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## IBM Internal Use Only

The Personal Computer has a habit of displaying error codes that are so far not documented or otherwise unexplained. This listing may be of use to users in problem determination.

NOTE: This is not generally a complete or definitive list of codes. If you don't find what you're looking for here, try the relevant Hardware Maintenance and Service Manual (if you can find one) or, if that doesn't work, try a note in ERRCODES FORUM.

| Recent changes to the list are marked with a bar, like this.

CODES	Description
101	Main system board failed (processor error).
101	* PS/2 - interrupt failure
102	BIOS ROM checksum error. (Try reseating the ROM chips!)
102	* PS/2 - timer failure
102	* PS/2 - real time clock 64 byte CMOS RAM test
103	BASIC ROM(s) checksum error.
103	* PS/2 - timer interrupt failure
103	* PS/2 - 2KB CMOS RAM test
104	8259 interrupt controller error.
104	* PS/2 - protect mode failure
104	* PS/2 - real time clock timing test
105	8253 timer error.
105	* PS/2 - last 8042 command not accepted
106	* PS/2 - converting logic test
107	Interrupt failure.
107	* PS/2 - hot NMI test
108	* PS/2 - timer bus test
109	Direct memory access test error
109	* PS/2 - low meg chip select test
109	* PS/2 - DMA or arbitration error
110	* PS/2 - planar parity
111	* PS/2 - I/O parity
111	* PS/2 - 80286 type protect mode test
112	* PS/2 - watchdog time out
112	* PS/2 - test 80386 new extended registers
113	* PS/2 - DMA arbitration time out
113	* PS/2 - test 80386 new instructions
114	* PS/2 - external ROM checksum error
114	* PS/2 - test 80386 32-bit addressing mode
115	* PS/2 - test 80386 protect mode (80386 TSSs, VM8086, Paging)
121	Unexpected hardware interrupts occurred.
121	* PS/2 - test hot reset of processor
131	Cassette wrap test failed.
131	* PS/2 - test DMA compatibility registers
132	* PS/2 - test DMA extended registers
133	* PS/2 - test DMA verify logic
134	* PS/2 - test DMA arbitration logic
152	* PS/2 - real time clock or CMOS error
160	* PS/2 - planar ID not recognized
161	Systems options not set (run SETUP)
162	Systems options not set (run SETUP)

163 Time & date not set (run SETUP)  
164 Memory Size Error (run SETUP).  
165 \* PS/2 - systems options not set - card ID mismatch (run SETUP)  
166 \* PS/2 - card busy error  
167 \* PS/2 - clock not updating  
199 User indicated configuration not correct.  
201 Memory test failed  
201 \* PS/2 - data miscompare, parity error or bad adapter  
202 \* PS/2 - memory address error  
203 \* PS/2 - memory address error or refresh failure  
204 \* PS/2 - relocated memory (run diagnostics again)  
205 \* PS/2 - CMOS error  
207 \* PS/2 - ROM failure  
211 \* PS/2 - base 64K on I/O channel failed  
215 \* PS/2 - base 64K on daughter card 2 card failed  
216 \* PS/2 - base 64K on daughter card 1 card failed  
301 Keyboard did not respond to software reset correctly or a stuck key failure was detected. If a stuck key was detected, the scan code for the key is displayed.  
302 User indicated error from the keyboard test.  
303 \* PS/2 - keyboard or system board error  
304 \* PS/2 - system board error  
305 \* PS/2 - keyboard +5v error  
401 Monochrome memory test, horizontal sync frequency test, or video test failed.  
401 \* PS/2 - CRT error or parallel port error  
408 User indicated display attributes failure.  
416 User indicated character set failure.  
424 User indicated 80X25 mode failure.  
432 Parallel port test failed ( monochrome adapter ).  
501 Color memory test failed, horizontal sync frequency test, or video test failed.  
501 \* PS/2 - CRT error  
508 User indicated display attribute failure.  
516 User indicated character set failure.  
524 User indicated 80x25 mode failure.  
532 User indicated 40x25 mode failure.  
540 User indicated 320x200 graphics mode failure.  
548 User indicated 640x200 graphics mode failure.  
601 Diskette power on diagnostics test failed.  
601 \* PS/2 - diskette drive or controller error  
602 Diskette test failed  
602 \* PS/2 - diskette boot record error  
606 Diskette verify function failed.  
607 Write protected diskette.  
608 Bad command diskette status returned.  
610 Diskette initialization failed.  
611 Timeout - diskette status returned.  
612 Bad NEC - diskette status returned.  
613 Bad DMA - diskette status returned.  
621 Bad seek - diskette status returned.  
622 Bad CRC - diskette status returned.  
623 Record not found - diskette status returned.  
624 Bad address mark - diskette status returned.  
625 Bad NEC seek - diskette status returned.  
626 Diskette data compare error.

630 \* PS/2 - index stuck HI (drive A)  
631 \* PS/2 - index stuck LO (drive A)  
632 \* PS/2 - track 0 stuck off (drive A)  
633 \* PS/2 - track 0 stuck on (drive A)  
640 \* PS/2 - index stuck HI (drive B)  
641 \* PS/2 - index stuck LO (drive B)  
642 \* PS/2 - track 0 stuck off (drive B)  
643 \* PS/2 - track 0 stuck on (drive B)  
650 \* PS/2 - drive speed error  
651 \* PS/2 - format failure  
652 \* PS/2 - verify failure  
653 \* PS/2 - read failure  
654 \* PS/2 - write failure  
655 \* PS/2 - controller error  
656 \* PS/2 - drive failure  
657 \* PS/2 - write protect stuck (protected)  
658 \* PS/2 - change line stuck (changed)  
659 \* PS/2 - write protect stuck (unprotected)  
660 \* PS/2 - change line stuck (unchanged)

7xx 8087 math coprocessor  
7xx \* PS/2 - 80287 math co-processor  
702 \* PS/2 - 80387 math co-processor exception errors test  
703 \* PS/2 - 80387 math co-processor rounding test  
704 \* PS/2 - 80387 math co-processor arithmetic test 1  
705 \* PS/2 - 80387 math co-processor arithmetic test 2  
706 \* PS/2 - 80387 math co-processor arithmetic test 3 (80387 only)  
707 \* PS/2 - 80387 math co-processor combination test  
708 \* PS/2 - 80387 math co-processor integer/store test  
709 \* PS/2 - 80387 math co-processor equivalent expressions  
710 \* PS/2 - 80387 math co-processor exceptions (interrupts)  
711 \* PS/2 - 80387 math co-processor save state (FSAVE)  
712 \* PS/2 - 80387 math co-processor protected mode test  
713 \* PS/2 - 80387 math co-processor special test (voltage/temp sensitive)

9xx Parallel printer adapter test failed.  
901 Printer adapter DATA REGISTER LATCH error.  
902 Printer adapter CONTROL REGISTER LATCH error.  
903 Printer adapter register address decode error.  
904 Printer adapter address decode error.  
910 Status line(s) wrap connector error. (PN 8529228 ?)  
911 Status line bit 7 wrap error.  
912 Status line bit 7 wrap error.  
913 Status line bit 6 wrap error.  
914 Status line bit 5 wrap error.  
915 Status line bit 4 wrap error.  
916 Printer adapter interrupt wrap failed.  
917 Unexpected printer adapter interrupt.  
92x Feature register error. (Special card.)

10xx Parallel printer adapter.

1101 Asynchronous communications adapter test failed.  
1101 \* PS/2 - 16550 ASYNC chip error  
1101 \* PS/2 - POST error  
1102 \* PS/2 - card selected feedback error



1103 \* PS/2 - port 102H register test failure  
1106 \* PS/2 - serial option can not be put to sleep  
1107 \* PS/2 - cable error  
1108 \* PS/2 - ASYNC IRQ3 error  
1109 \* PS/2 - ASYNC IRQ4 error  
1110 \* PS/2 - 16550 ASYNC chip register failure  
1111 \* PS/2 - internal wrap test of 16550 modem control line failure  
1112 \* PS/2 - external wrap test of 16550 modem control line failure  
1113 \* PS/2 - 16550 transmit error  
1114 \* PS/2 - 16550 receive error  
1115 \* PS/2 - 16550 receive error data not equal transmit data  
1116 \* PS/2 - 16550 interrupt function error  
1117 \* PS/2 - 16550 fails baud rate test  
1118 \* PS/2 - 16550 interrupt driven receive external data wrap test failure  
1119 \* PS/2 - 16550 FIFO

1201 Alternate asynchronous communications adapter test failed.

1201 \* PS/2 - can not detect presence of dual ASYNC adapter  
1202 \* PS/2 - dual ASYNC adapter card selected feedback error  
1203 \* PS/2 - dual ASYNC adapter port 102H register test failure  
1206 \* PS/2 - dual ASYNC adapter serial option can not be put to sleep  
1207 \* PS/2 - dual ASYNC adapter cable error  
1208 \* PS/2 - dual ASYNC adapter ASYNC IRQ3 error  
1209 \* PS/2 - dual ASYNC adapter ASYNC IRQ4 error  
1210 \* PS/2 - 16550 ASYNC chip register failure  
1211 \* PS/2 - internal wrap test of 16550 modem control line failure  
1212 \* PS/2 - external wrap test of 16550 modem control line failure  
1213 \* PS/2 - 16550 transmit error  
1214 \* PS/2 - 16550 receive error  
1215 \* PS/2 - 16550 receive error data not equal transmit data  
1216 \* PS/2 - 16550 interrupt function error  
1217 \* PS/2 - 16550 fails baud rate test  
1218 \* PS/2 - 16550 interrupt driven receive external data wrap test failure  
1219 \* PS/2 - 16550 FIFO  
1225 \* PS/2 - 16550 ASYNC chip register failure  
1226 \* PS/2 - internal wrap test of 16550 modem control line failure  
1227 \* PS/2 - external wrap test of 16550 modem control line failure  
1228 \* PS/2 - 16550 transmit error  
1229 \* PS/2 - 16550 receive error  
1230 \* PS/2 - 16550 receive error data not equal transmit data  
1231 \* PS/2 - 16550 interrupt function error  
1232 \* PS/2 - 16550 fails baud rate test  
1233 \* PS/2 - 16550 interrupt driven receive external data wrap test failure  
1234 \* PS/2 - 16550 FIFO

1301 Game control adapter test failed.

1302 Joystick test failed.

14xx Printer test failed.

1401 \* PS/2 - printer failure  
1402 Printer NOT READY error.  
1402 \* PS/2 - out of paper  
1403 Printer NO PAPER error.  
1403 \* PS/2 - interrupt failure  
1404 \* PS/2 - system board time out  
1405 \* PS/2 - parallel adapter failure  
1406 \* PS/2 - presence test failed

15xx SDLC communications adapter errors.  
1510 8255 port B failure.  
1511 8255 port A failure.  
1512 8255 port C failure.  
1513 8253 timer 1 did not reach terminal count.  
1514 8253 timer 1 stuck on.  
1515 8253 timer 0 did not reach terminal count.  
1516 8253 timer 0 stuck on.  
1517 8253 timer 2 did not reach terminal count.  
1518 8253 timer 2 stuck on.  
1519 8273 port B error.  
1520 8273 port A error.  
1521 8273 command/read timeout.  
1522 Interrupt level 4 failure.  
1523 Ring Indicate stuck on.  
1524 Receive clock stuck on.  
1525 Transmit clock stuck on.  
1526 Test Indicate stuck on.  
1527 Ring Indicate not on.  
1528 Receive clock not on.  
1529 Transmit clock not on.  
1530 Test Indicate not on.  
1531 Data Set Ready not on.  
1532 Carrier Detect not on.  
1533 Clear To Send not on.  
1534 Data Set Ready stuck on.  
1536 Clear To Send stuck on.  
1537 Level 3 interrupt failure.  
1538 Receive interrupt results error.  
1539 Wrap data miscompare.  
1540 DMA channel 1 error.  
1541 DMA channel 1 error.  
1542 Error in 8273 error checking or status reporting.  
1547 Stray interrupt level 4  
1548 Stray interrupt level 3  
1549 Interrupt presentation sequence timeout.

17xx Fixed disk errors.  
1701 Fixed disk POST error.  
1702 Fixed disk adapter error.  
1703 Fixed disk drive error.  
1704 Fixed disk adapter or drive error.  
1750 \* PS/2 - drive "x" verify failure  
1751 \* PS/2 - drive "x" read failure  
1752 \* PS/2 - drive "x" write failure  
1753 \* PS/2 - drive "x" random read test error  
1754 \* PS/2 - drive "x" seek test error  
1755 \* PS/2 - controller failure  
1756 \* PS/2 - controller ECC test failure  
1757 \* PS/2 - controller head select failure  
1780 Fixed disk drive 0 time out  
1781 Fixed disk drive 1 time out  
1782 Fixed disk controller error  
1790 Fixed disk drive 0 error  
1791 Fixed disk drive 1 error

18xx I/O Expansion unit errors.  
1801 I/O Expansion unit POST error.  
1810 Enable/Disable failure.  
1811 Extender card wrap test failed (disabled).  
1812 High order address lines failure (disabled).  
1813 Wait state failure (disabled).  
1814 Enable/Diaable could not be set on.  
1815 Wait state failure (enabled).  
1816 Extender card wrap test failed (enabled).  
1817 High order address lines failure (enabled).  
1818 Disable not functioning  
1819 Wait request switch not set correctly  
1820 Receiver card wrap test failure  
1821 Receiver high order address lines failure

20xx BISYNC communications adapter errors  
2010 8255 port A failure  
2011 8255 port B failure  
2012 8255 port C failure  
2013 8253 timer 1 did not reach terminal count  
2014 8253 timer 1 stuck on  
2016 8253 timer 2 did not reach terminal count or timer 2 stuck on.  
2017 8251 Data Set Ready failed to come on  
2018 8251 Clear To Send not sensed  
2019 8251 Data Set Ready stuck on  
2020 8251 Clear To Send stuck on  
2021 8251 hardware reset failed  
2022 8251 software reset failed  
2023 8251 software "error reset" failed  
2024 8251 transmit ready did not come on  
2025 8251 receive ready did not come on  
2026 8251 could not force "overrun" error status  
2027 Interrupt failure-no timer interrupt  
2028 Interrupt failure-transmit, replace card or planar  
2029 Interrupt failure-transmit, replace card  
2030 Interrupt failure-receive, replace card or planar  
2031 Interrupt failure-receive, replace card  
2033 Ring Indicate stuck on  
2034 Receive clock stuck on  
2035 Transmit clock stuck on  
2036 Test Indicate stuck on  
2037 Ring Indicate stuck on  
2038 Receive clock not on  
2039 Transmit clock not on  
2040 Test Indicate not on  
2041 Data Set Ready not on  
2042 Carrier Detect not on  
2043 Clear To Send not on  
2044 Data Set Ready stuck on  
2045 Carrier Detect stuck on  
2046 Clear To Send stuck on  
2047 Unexpected transmit interrupt  
2048 Unexpected receive interrupt  
2049 Transmit data did not equal receive data  
2050 8251 detected overrun error  
2051 Lost Data Set Ready during data wrap  
2052 Receive timeout during data wrap

21xx Alternate BISYNC communications adapter errors  
2110 8255 port A failure  
2111 8255 port B failure  
2112 8255 port C failure  
2113 8253 timer 1 did not reach terminal count  
2114 8253 timer 1 stuck on  
2116 8253 timer 2 did not reach terminal count or  
2117 8251 Data Set Ready failed to come on  
2117 8251 Clear To Send not sensed  
2118 8251 Data Set Ready stuck on  
2119 8251 Clear To Send stuck on  
2120 8251 hardware reset failed  
2121 8251 software reset failed  
2122 8251 software "error reset" failed  
2123 8251 transmit ready did not come on  
2124 8251 receive ready did not come on  
2125 8251 could not force "overrun" error status  
2126 Interrupt failure-no timer interrupt  
2128 Interrupt failure-transmit, replace card or  
2129 Interrupt failure-transmit, replace card  
2130 Interrupt failure-receive, replace card or planar  
2131 Interrupt failure-receive, replace card  
2133 Ring Indicate stuck on  
2134 Receive clock stuck on  
2135 Transmit clock stuck on  
2136 Test Indicate stuck on  
2137 Ring Indicate stuck on  
2138 Receive clock not on  
2139 Transmit clock not on  
2140 Test Incicate not on  
2142 Data Set Ready not on  
2142 Carrier Detect not on  
2143 Clear To Send not on  
2144 Data Set Ready stuck on  
2145 Carrier Detect stuck on  
2146 Clear To Send stuck on  
2147 Unexpected transmit interrupt  
2148 Unexpected receive interrupt  
2149 Transmit data did not equal receive data  
2150 8251 detected overrun error  
2151 Lost Data Set Ready during data wrap  
2152 Receive timeout during data wrap

22XX Cluster adapter

23XX Plasma monitor adapter

24xx Enhanced graphics adapter  
2401 \* PS/2 - planar video error  
2402 \* PS/2 - diagnostic video error

2601-2655 XT/370-M card (Note: P-Processor, M-Memory, EM-Emulator)  
2657-2668 XT/370-M card  
2672 XT/370-M card  
2673-2674 XT/370-P card  
2677-2680 XT/370-P card

File: ERRORS LIST A (USERDA) 4/13/88 15:29:06 V/80/691/30

2681 XT/370-M card  
 2682-2694 XT/370-P card  
 2697 XT/370-P card  
 2698 XT/370 Diagnostic diskette error  
 2701-2703 XT/370-EM card  
 28xx 3278/79 emulation (unplug coax before running diagnostics!)

29XX Color Printer

30xx Primary PC network adapter error  
 3001 CPU failure  
 3002 ROM failure  
 3003 ID failure  
 3004 RAM failure  
 3005 HIC failure  
 3006 +/- 12v failed  
 3007 Digital loopback failure  
 3008 Host detected HIC failure  
 3009 Sync fail & No Go Bit  
 3010 HIC test OK & No Go Bit  
 3011 Go Bit & no CMD 41  
 3012 Card not present  
 3013 Digital failure ( fall thru )  
 3015 Analog failure  
 3041 Hot carrier (not this card)  
 3042 Hot carrier (this card !!)

31xx Secondary network adapter error  
 3101 CPU failure  
 3102 ROM failure  
 3103 ID failure  
 3104 RAM failure  
 3105 HIC failure  
 3106 +/- 12v failed  
 3107 Digital loopback failure  
 3108 Host detected HIC failure  
 3109 Sync fail & No Go Bit  
 3110 HIC test OK & No Go Bit  
 3111 Go Bit & no CMD 41  
 3112 Card not present  
 3113 Digital failure ( fall thru )  
 3115 Analog failure  
 3141 Hot carrier (not this card)  
 3142 Hot carrier (this card !!)

32xx Display adapter (3270PC or AT)

35xx Enhanced display station emulation adapter (what's that?)  
 3504 Adapter connected on the twinaxial cable during offline test.  
 3508 Workstation address in use by another workstation  
 Diagnostic diskette from another IBM PC was used  
 3509 Diagnostic program failing (recreate Adapter Integrated Diagnostic  
 diskette on a blank diskette).  
 3540 Work station address invalid, not configured at the controller.  
 Twinaxial cable not connected , or is failing.  
 Diagnostic diskette from another IBM PC was used.  
 3588 Enhanced display station emulation adapter

Feature not installed  
 Device I/O address switches set incorrectly  
 3599 Diagnostic program failing (recreate Adapter Integrated Diagnostic  
 diskette on a blank diskette).  
  
 36xx GPIB adapter  
  
 38xx Data acquisition and control adapter  
  
 39xx Professional graphics adapter  
  
 44xx Display attachment unit and display  
  
 45xx IEEE interface adapter card (IEEE-488)  
  
 56xx Financial communications system  
  
 71xx - Voice communications adapter  
 7101 - I/O control register  
 7102 - Instruction or external data memory  
 7103 - PC to VCA interrupt  
 7104 - Internal data memory  
 7105 - DMA  
 7106 - Internal registers  
 7107 - Interactive shared memory  
 7108 - VCA to PC interrupt  
 7109 - DC wrap  
 7111 - External analog wrap & tone output  
 7112 - Mic to spkr wrap  
 7114 - Telephone attach test  
  
 | 76xx - 4216 Pageprinter  
 | 7601 - Printer adapter card error  
 | 7602 - Printer adapter card error  
 | 7603 - Printer error  
 | 7604 - Printer cable error  
  
 86xx \* PS/2 - mouse-related errors?  
 8601 \* PS/2 - system board error or mouse error  
 8602 \* PS/2 - user indicated mouse error  
 8603 \* PS/2 - system board or mouse error  
 8604 \* PS/2 - system board or mouse error  
  
 100xx \* PS/2 - multiprotocol comm. adapter  
 10001 \* PS/2 - can not detect presence of multi protocol comm. adapter  
 10002 \* PS/2 - card selected feedback error  
 10003 \* PS/2 - port 102H register test failure  
 10004 \* PS/2 - port 103H register test failure  
 10006 \* PS/2 - serial option can not be put to sleep  
 10007 \* PS/2 - cable error  
 10008 \* PS/2 - ASYNC IRQ3 error  
 10009 \* PS/2 - ASYNC IRQ4 error  
 10010 \* PS/2 - 16550 ASYNC chip register failure  
 10011 \* PS/2 - internal wrap test of 16550 modem control line failure  
 10012 \* PS/2 - external wrap test of 16550 modem control line failure  
 10013 \* PS/2 - 16550 transmit error  
 10014 \* PS/2 - 16550 receive error

10015 \* PS/2 - 16550 receive error data not equal transmit data  
10016 \* PS/2 - 16550 interrupt function error  
10017 \* PS/2 - 16550 fails baud rate test  
10018 \* PS/2 - 16550 interrupt driven receive external data wrap test failure  
10019 \* PS/2 - 16550 FIFO  
10026 \* PS/2 - 8255 port A error  
10027 \* PS/2 - 8255 port B error  
10028 \* PS/2 - 8255 port C error  
10029 \* PS/2 - 8254 timer 0 error  
10030 \* PS/2 - 8254 timer 1 error  
10031 \* PS/2 - 8254 timer 2 error  
10032 \* PS/2 - BISYNC DSR response to DTR error  
10033 \* PS/2 - BISYNC CTS response to RTS error  
10034 \* PS/2 - 8251 hardware reset test failed  
10035 \* PS/2 - 8251 function error:  
10035 \* PS/2 - 8251 internal software reset test failed  
10035 \* PS/2 - 8251 error reset command failed  
10035 \* PS/2 - 8251 can not detect overrun error  
10036 \* PS/2 - 8251 status error:  
10036 \* PS/2 - 8251 Tx ready error  
10037 \* PS/2 - 8251 Rx ready error  
10037 \* PS/2 - BISYNC timer interrupt error  
10038 \* PS/2 - BISYNC transmit interrupt error  
10039 \* PS/2 - BISYNC receive interrupt error  
10040 \* PS/2 - stray IRQ3 error  
10041 \* PS/2 - stray IRQ4 error  
10042 \* PS/2 - BISYNC external wrap error  
10044 \* PS/2 - BISYNC data wrap error  
10045 \* PS/2 - BISYNC line status/condition error  
10046 \* PS/2 - BISYNC time out error during data wrap test  
10050 \* PS/2 - 8273 command acceptance or results ready time out error  
10051 \* PS/2 - 8273 port A error  
10052 \* PS/2 - 8273 port B error  
10053 \* PS/2 - SDLC modem status change logic error  
10054 \* PS/2 - SDLC timer interrupt (IRQ4) error  
10055 \* PS/2 - SDLC modem status change interrupt (IRQ4) error  
10056 \* PS/2 - SDLC external wrap error  
10057 \* PS/2 - SDLC interrupt results error  
10058 \* PS/2 - SDLC data wrap error  
10059 \* PS/2 - SDLC transmit interrupt error  
10060 \* PS/2 - SDLC receive interrupt error  
10061 \* PS/2 - DMA channel 1 error (transmit)  
10062 \* PS/2 - DMA channel 1 error (receive)  
10063 \* PS/2 - 8273 status detect failure  
10064 \* PS/2 - 8273 error detect failure  
10101 \* PS/2 - can not detect presence of modem  
10102 \* PS/2 - card selected feedback error  
10103 \* PS/2 - port 102H register test failure  
10106 \* PS/2 - serial option can not be put to sleep  
10108 \* PS/2 - ASYNC IRQ3 error  
10109 \* PS/2 - ASYNC IRQ4 error  
10010 \* PS/2 - 16450 ASYNC chip register failure  
10111 \* PS/2 - internal wrap test of 16450 modem control line failure  
10113 \* PS/2 - 16450 transmit error  
10114 \* PS/2 - 16450 receive error  
10115 \* PS/2 - 16450 receive error data not equal transmit data  
10116 \* PS/2 - 16450 interrupt function error

File: ERRCODES LIST A (USERDA) 4/13/88 15:29:06 V/80/691/30

10 = data bit 4 ( fifth chip after the parity chip )

Original list from D. A. Tracy, TRACY at BCRVM1; many contributors since.  
Contribution of other codes welcome in ERRCODES FORUM.







## Memory Configuration

• The individual ram chip is referred to as a bit by the computer and displayed as a two-digit number in 8088/8086 based computers ( IBM PC, XT ), and a four-digit number in 80286 based computers ( IBM AT ). The type and speed of the chips is usually written on the chip. The most common types are usually 16, 64, 128, and 256 KB ram chips. The speed measured in nanoseconds, usually 200, 150, or 120 nanoseconds. For example, the number "MCM6665AP20" written on a chip means that it is a 64 KB ram chip, and the speed is 200 Nanoseconds. The ram chip should also have a marking, or notch on it to show where pin 1 is, so that it can be aligned in pin 1 of the socket when it is installed.

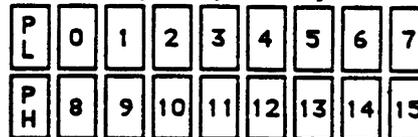
• Memory Banks are usually arranged in the IBM PC, XT and most 8088/8086 based computers as 8 or 9 chips each. The 9 chip bank has a Parity chip, and it is the most common type found. The first chip in this bank is the Parity chip, followed by 0, 1, 2, 3, 4, 5, 6, and 7.

• Memory Banks are usually arranged in the IBM AT and most 80286 based computers as 18 chips each. Each group of 9 chips has one parity chip. The first chip in this bank is Parity Low, followed by 0, 1, 2, 3, 4, 5, 6, 7 and then Parity High, followed by 8, 9, 10, 11, 12, 13, 14, and 15.

Ram chips in a 9 chip bank are logically ( maybe not physically ) arranged in this order:



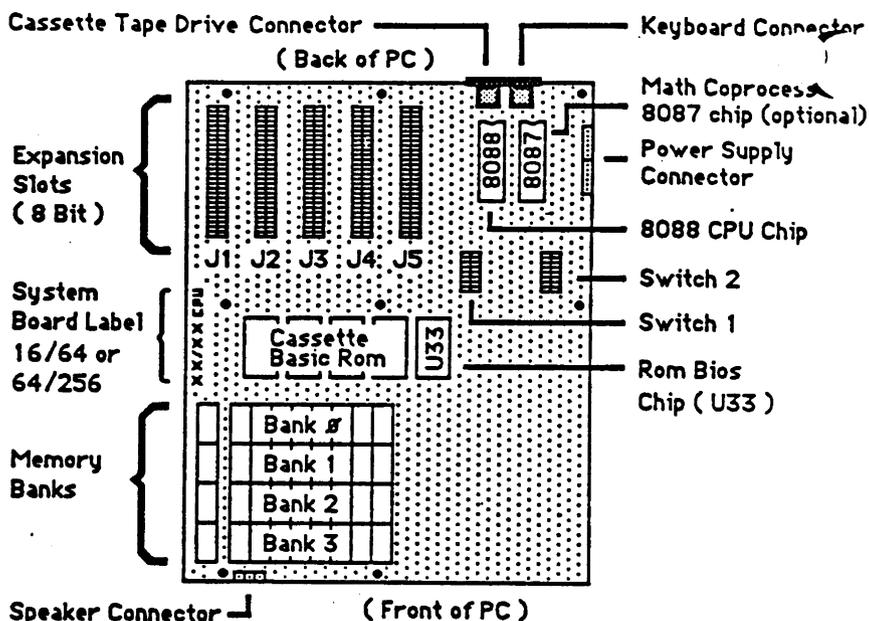
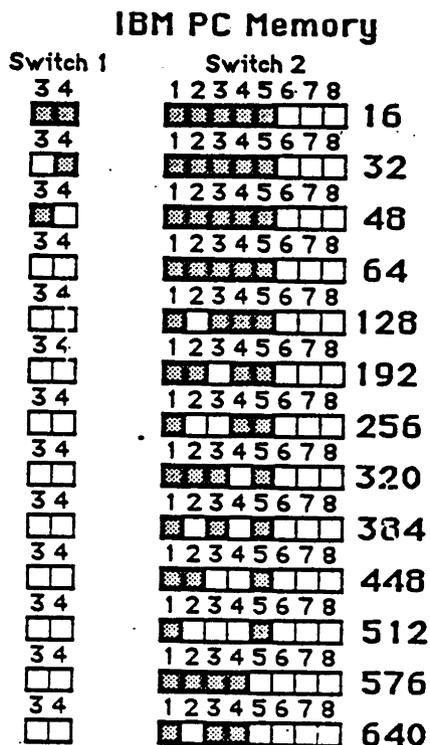
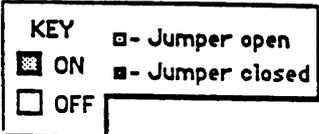
Ram chips in an 18 chip bank are logically ( maybe not physically ) arranged in this order:



## Memory Errors - Techniques

- Always check the switches, jumpers, IBM AT Setup program or expanded memory program that may effect memory.
- On IBM and most MS-Dos compatible computers, memory errors will be displayed as a Memory Location Error. It is important to note exactly what this error is to troubleshoot the defective chip. These memory location errors are usually in the format of ( 1 ) 64KB Block of Memory location, and ( 2 ) Bit Address location.
- If you suspect that the defective ram chip is soldered into the board, replace the entire memory board. In the field, only work on memory chips that are seated in a chip socket.
- Remove the entire bank of ram chips and reseal them. Check for bent pins. Remember to reseal the chips properly.
- Check to see if the chips have any corrosion on the pins. This happens usually to older computers. The pins should be silver or gold, not black, multi-colored, or copper-colored. If the pins are discolored you can clean them off easily with a pencil eraser or a file. Corrosion causes poor contact and can be responsible for intermittent memory errors.
- Parity Check 1 indicates an error on the system board.
- Parity Check 2 indicates an error on an expansion memory board. ( This can be any expansion board with memory on it, including the IBM Color Graphics Adapter, the IBM EGA, the IBM Token Ring Network Adapter, etc... )
  1. The Parity Check error may occur due to a software problem. Notably, ram-resident software such as " SideKick " caused parity check errors with older versions of " Lotus 1-2-3 ". If you are unable to find a hardware error, use your DOS to boot the system and check to see if the problem recurs. If it does not, there may be something in the CONFIG.SYS or AUTOEXEC.BAT files that is causing the software to crash.
  2. Occasionally, when the Parity Check error message is displayed, the actual memory location error may have been displayed for just one second. Make note of this error.
- All of the chips on individual banks of ram on expansion boards should be at the same Nanosecond speed. This is very important. If a bank of ram chips on an expansion memory board has two or more different speed chips on the same bank, it can cause very intermittent and strange errors ( such as infrequent garbage being printed in a long report ). On some boards, such as the older Quadboards, it is best that all the chips on the entire board be the same speed.
- When in doubt, replace the entire bank. ( Don't forget to find out which chip is actually defective and dispose of it. )
- When you know which bank has the defective chip, but not the bit location, it is most efficient to troubleshoot the bank by replacing the bank 3 chips at a time.
- Often, a memory error will signify a chip that is not defective, but another chip on the bank, usually one that is right next to it. This is most common on memory expansion boards. If this is the case, replace 3 chips on the bank, the ones before, at, and after the memory location error.
- If the power supply is good and the error is No Beep, No Boot, and No Video, the problem may be a defective ram chip in the first bank of memroy. Replacing all the chips in the first bank of ram may solve the problem. ( Don't forget to find out which chip is actually defective and dispose of it. )
- If the parity chip is defective, it may cause difficulties in finding its location, such as an incorrect bit error in the bank, changing bit errors from time to time, etc. If the parity chip is bad, and another chip in the bank is also defective, it may stay hidden, until the other chip is replaced.
- If a system does not count up its full memory, and the memory configuration is correct, there may be a defective chip in the first ram bank that is not being counted.

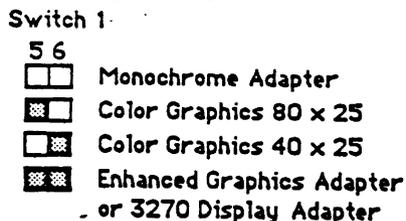
# IBM PC System Board



The IBM PC System Board has the following features:

- 5 8 Bit Expansion Slots ( J1, J2, J3, J4, J5 )
- 4 Banks with 9 chips each of System Board Memory
- 1 8088 CPU Chip
- A socket for an 8087 Math Coprocessor
- Connectors for Keyboard, Cassette Tape Drive, Power Supply & Speaker
- 2 Switch Blocks
- 4 Cassette Basic Rom Chips
- 1 IBM ROM BIOS Chip ( U33 )

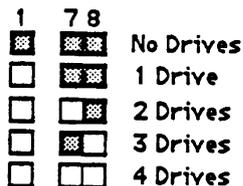
### Display Adapter



### Math Coprocessor



### Diskette Drives



The IBM PC has two revisions of system boards. From the outside without removing the cover, a letter " B " stamped on the back of the chassis indicates that the PC is a PC-2, if missing, it is probably a PC-1. Also, the PC-1 came with only two chassis screws, and the PC-2 has five chassis screws.

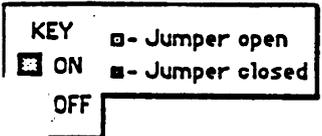
Note System Board Label printed on the board:

1. PC-1 is the first board released in 1981.
  - A. System Board Label is marked "16/64".
  - B. It uses only 16KB Ram Chips for memory.
  - C. It usually has the Old Rom Bios. ( See below )
2. PC-2 is the most common system board released in 1983.
  - A. System Board Label is marked "64/256".
  - B. It uses 64KB Ram Chips for memory.
  - C. It usually has the New Rom Bios. ( See Below )

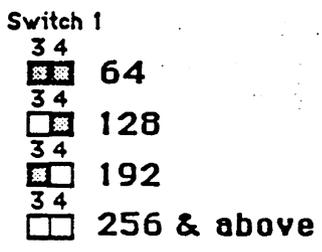
The IBM PC has two revisions of ROM BIOS Chips:

1. Old Rom Bios - 1981 PN# 5700671 10/19/81  
 Can access a maximum of 576 KB memory.  
 Can not access a hard disk drive.  
 Can not use the IBM Enhanced Graphics Adapter.
2. New Rom Bios - 1982 PN# 5101476 10/27/82  
 Can access a maximum of 640 KB memory.  
 Can access a hard disk drive.  
 Can use the IBM Enhanced Graphics Adapter.

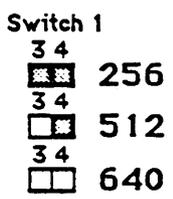
# IBM XT System Board



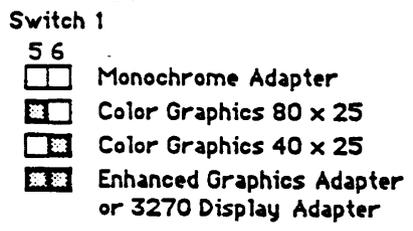
## IBM XT Memory XT-1 64/256 Board



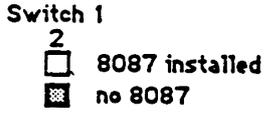
## IBM XT Memory XT-2 256/640 Board



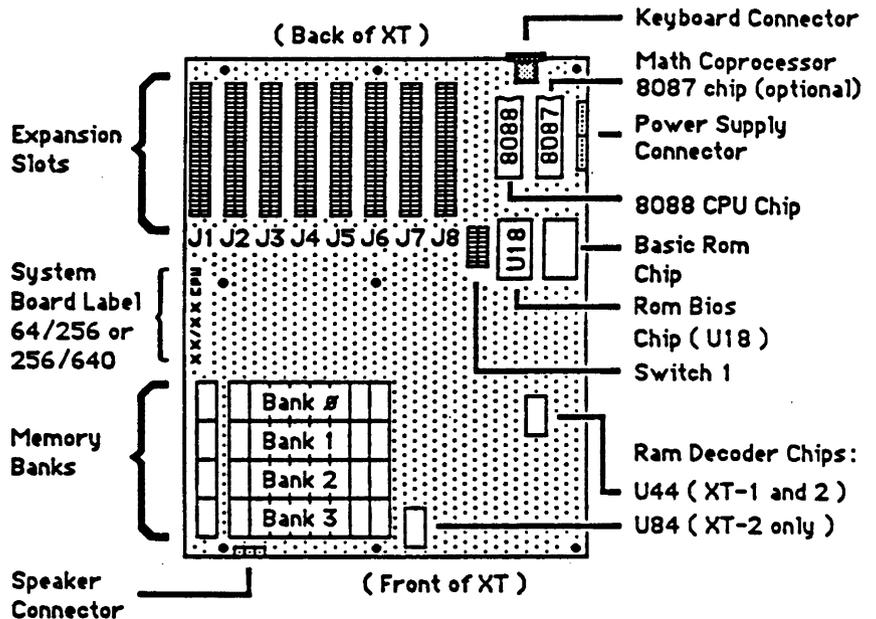
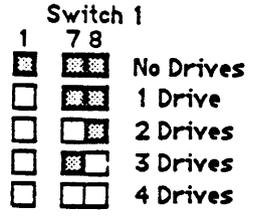
## Display Adapter



## Math Coprocessor



## Diskette Drives



The IBM XT System Board has the following features:

- 8 8 Bit Expansion Slots ( J1 , J2 , J3 , J4 , J5 , J6 , J7 , J8 )
- 4 Banks with 9 chips each of System Board Memory
- 1 8088 CPU Chip
- A socket for an 8087 Math Coprocessor
- Connectors for Keyboard, Power Supply & Speaker
- 1 Switch Block
- 1 Basic Rom Chip
- 1 IBM Rom Bios Chip ( U47 )

The IBM XT has two revisions of system boards.  
 Note System Board Label printed on board.

1. XT-1 is the most common system board released in 1982.
  - A. System Board Label is marked "64/256".
  - B. It uses 64KB Ram Chips for system board memory.
  - C. It uses one ram decoder chip in socket U44.
2. XT-2 is the most recent version of the system board released in 1986.
  - A. System Board Label is marked "256/640".
  - B. It uses 256KB Ram Chips in the first two ram banks, and 64KB Ram Chips in the last two ram banks for system board memory.
  - C. It uses two ram decoder chips in sockets U44 and U84.

The IBM XT Rom Bios Chip:

Rom Bios - 1981, 1983 PN# 1501512 11/08/82

# IBM XT-1, XT-2 System Board Memory

JW03'88

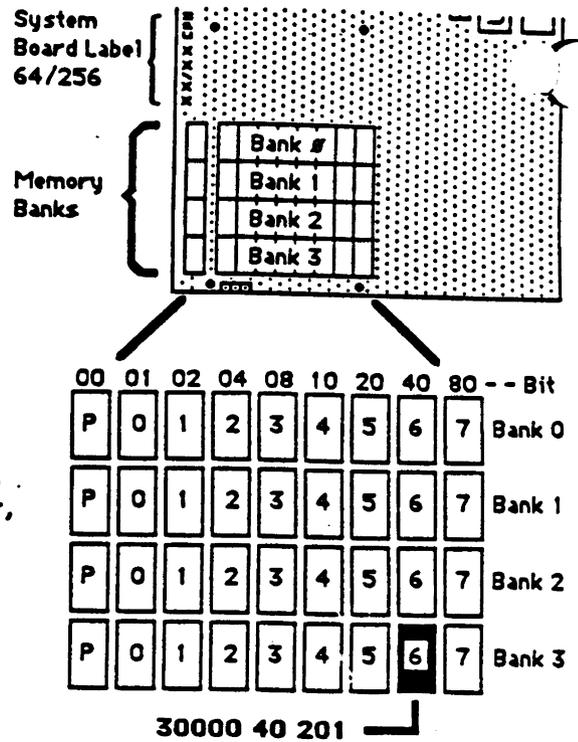
## IBM XT-1 ( 64 K RAM Chips )

The XT-1 System Board uses 64 K Ram Chips. Defective Ram Chips are usually displayed with an error during the POST ( Power-On-Self-Test ). The exception to this would be an error in Bank 0, the first 64 KB of memory, which may cause No Boot, No Beep, No Video.

**Error Codes:**  
 XYAAA ZZ 201  
 X - 64 K Bank in error  
 Y, A - anything ( not used )  
 Z - Bit in error ( See chart below )

**Situation Location**  
 X = 0 Bank 0  
 X = 1 Bank 1  
 X = 2 Bank 2  
 X = 3 Bank 3  
 X = 4 or more Add in memory board

**Example:** The darkened chip location to the right would give an error on the XT-1 as "30000 40 201". The "201" indicates a memory error, the "3" indicates that the defective chip is on bank 3, and the "40" indicates that the defective chip is #6, the 8th chip from the left. Note that system board memory errors may display "Parity Check 1".



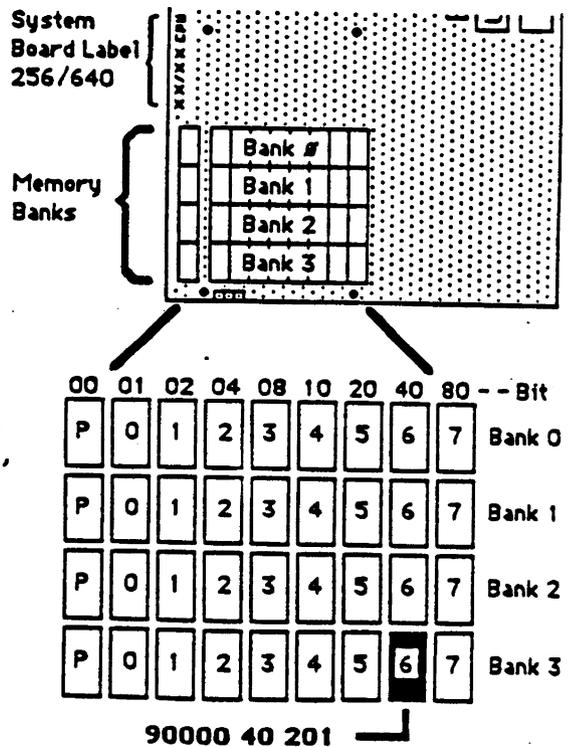
## IBM XT-2 ( 64 and 256 K RAM Chips )

The XT-2 System Board uses 64 KB and 256 KB Ram Chips. Banks 0 and 1 contain 256 KB Ram Chips, and Banks 2 and 3 contain 64 KB Ram chips. Defective Ram Chips are usually displayed with an error during the POST ( Power-On-Self-Test ). The exception to this would be an error in Bank 0, the first 256 KB of memory, which may cause No Boot, No Beep, and No Video.

**Error Codes:**  
 XYAAA ZZ 201  
 X - 64 K Bank in error  
 Y, A - anything ( not used )  
 Z - Bit in error ( See chart below )

**Situation Location**  
 X = 0, 1, 2, 3 Bank 0  
 X = 4, 5, 6, 7 Bank 1  
 X = 8 Bank 2  
 X = 9 Bank 3

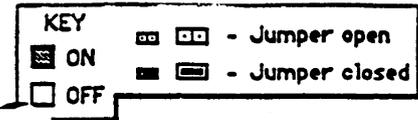
**Example:** The darkened chip location to the right would give an error on the XT-2 as "90000 40 201". The "201" indicates a memory error, the "9" indicates that the defective chip is on Bank 3, and the "40" indicates that the defective chip is #6, the 8th chip from the left. Note that system board memory errors may display "Parity Check 1".



Memory Error Location Chart										
Bit in error	00	01	02	04	08	10	20	40	80	
Chip Location	P	0	1	2	3	4	5	6	7	
64 KB Block of Ram in error	0	1	2	, etc.						
64 KB Block of Ram				1st	2nd	3rd	, etc.			

# IBM PC, XT 64/256 KB Memory Card

B-16-BE



The IBM 64/256 Memory Card uses 64 KB ram chips. It can increase system memory in 64 KB increments by accessing 1 or more of the 4 banks of memory on the board.

### Switch Settings

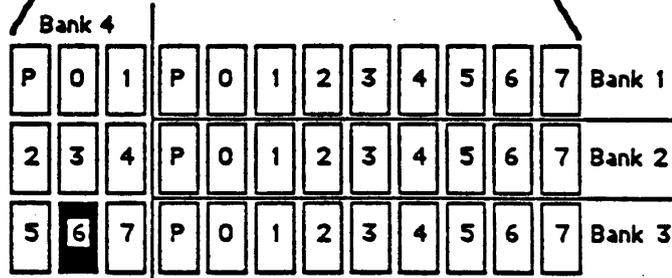
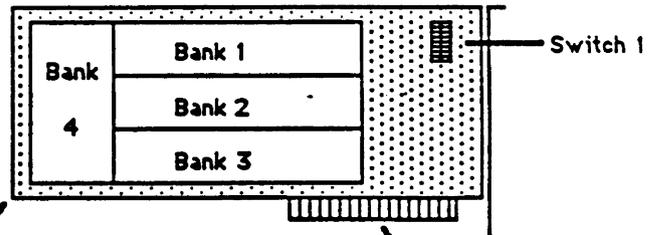
Starting Address	Banks Installed
1 2 3 4 [X][X][X][X] 64	5 6 7 8 [X][ ][ ][ ] 1 Bank
1 2 3 4 [X][X][ ][ ] 128	5 6 7 8 [X][ ][ ][ ] 2 Banks
1 2 3 4 [X][ ][ ][ ] 192	5 6 7 8 [ ][X][ ][ ] 3 Banks
1 2 3 4 [X][X][X][ ] 256	5 6 7 8 [ ][X][X][ ] 4 Banks
1 2 3 4 [X][ ][ ][ ] 320	
1 2 3 4 [ ][X][X][ ] 384	
1 2 3 4 [X][ ][ ][ ] 448	
1 2 3 4 [ ][X][ ][ ] 512	
1 2 3 4 [X][X][X][ ] 576	

### Memory Errors:

The IBM 64/256 KB Memory Card has memory chips arranged differently from most PC expansion boards. Note the layout of ram banks to the right. The error code for a defective ram chip will be unique to the system it is in: PC-1, PC-2, or XT-1.

Example: The darkened chip to the right, if defective, would give different memory errors depending on which system it is installed in.

System	Error Code
PC-1	4040 201
PC-2	7040 201
XT-1	70000 40 201



System Type	Error Code:
PC-1	4040 201
PC-2	7040 201
XT-1	70000 40 201

Memory Error Location Chart										
Bit in error	00	01	02	04	08	10	20	40	80	
Chip Location	P	0	1	2	3	4	5	6	7	
64 KB Block of Ram in error	0	1	2	, etc.						
64 KB Block of Ram				1st	2nd	3rd	, etc.			

### Differences in the Error Codes:

The PC-1 with a fully populated system board is still only using 16 KB ram chips and can only have a total of 64 KB memory, one block, the first block, of 64 KB memory known as Bank 0. The memory on the 64/256 Memory Card then is counted in its 64KB ram banks as banks 1, 2, 3 and 4.

The PC-2 and XT-1 with a fully populated system board uses 64 KB ram chips and has a total of 256 KB memory, using banks 0, 1, 2 and 3. Therefore, the memory on the 64/256 Memory Card is then counted as banks 4, 5, 6 and 7.

The XT-2 ( and most clone boards ) are not mentioned because they already contain a total of 640 KB memory. This is the maximum amount of Conventional Dos Base Memory, the only amount that the 64/256 KB Memory Card can contain.

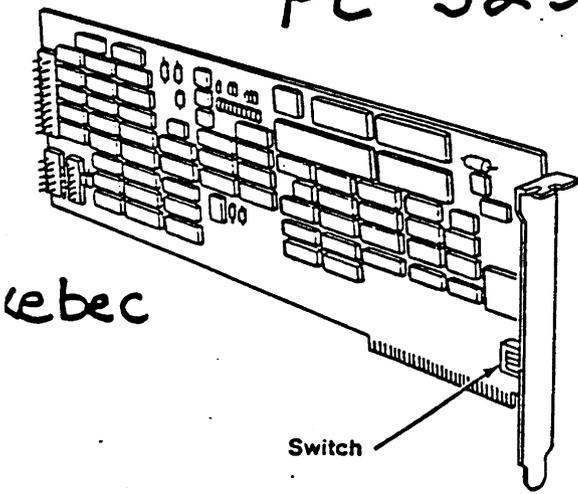
Note that expansion memory board errors may display the message " Parity Check 2 ".

Note: The example is for fully populated memory on the system board with this as the first memory board.

PC 509	Enhanced PC/XT Keybd.	1390290
PC 519	Enhanced Sys. Bd. XT	6489906
PC 520	Enhanced 3.5 inch Floppy Dr.	6450258
PC 521	Enhanced 5.25 inch Floppy Dr.	6450325
PC 522	Enhanced 20mb Harddisk	6450326
PC 523	Enhanced Harddisk Controller	6450327
PC 539	Enhanced XT Keyboard cable	6447051
PC 549	3.5 inch Floppy Cable Adapter Card	6489919

20MB Fixed Disk Drive Adapter

PC-523



SWITCH SETTINGS XT SYSTEM BOARD

SWITCH BLOCK 1

- 1 OFF-NORM ON-AUTOPOST
- 2 OFF-8087 ON-NO 8087

PC XT With 256/640K System Board (Note 1)	
Total Memory (Note 2)	System Board Switch Settings
	12345678
B0 256K	***↑****
B1 512K	**↓****
B3 576K	***↓****
B4 640K	**↓****

Note 1: The system board's identifier is located on its left edge.  
 Note 2: Memory adapters are not supported on 256/640K system boards.

Size	Fixed Disk Drive Type	Drive C	Drive D
20MB	Type 2 PC040017	1 2 ↓↑	3 4 ↓↑
	Type 13 PC522	1 2 ↓↓	3 4 ↓↓
	Type 16	1 2 ↑↓	3 4 ↑↓

Note: Types 2, 13, and 16 have the type marked on the label on top of the drive.

Type 1 10mb ↑↑  
 ↓↑↑↓

- 5-6 X X NO MONITOR OR EGA
- X 40X25 COLOR
- X - 80X25 COLOR
- - MONOCHROME /MORE THAN ONE MONITOR
- 7-8 X X 1 FLOPPY
- X 2 FLOPPY
- X - 3 FLOPPY
- - 4 FLOPPY

Any questions or updates call Harry Goepel

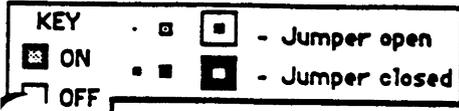


# ALL PC & XT's

## ■ IBM SYSTEM BOARD SWITCH SETTINGS ■

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# IBM PC, XT, AT Fixed (or Hard) Disk Drives

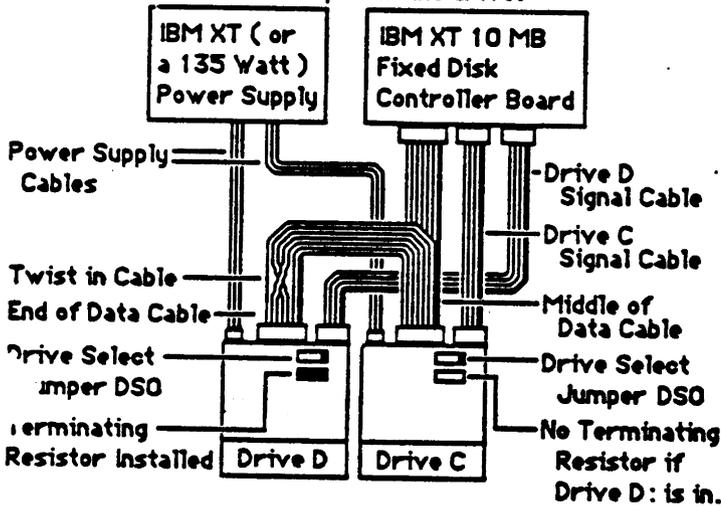


## Types of Common IBM Fixed Disk Drives:

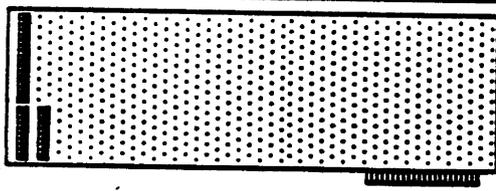
- 5.25" Full Height 10 MB Fixed Disk Drive. This is the first type of fixed disk drive used in the IBM XT computer.
- 5.25" Half-Height 10 MB Fixed Disk Drive.
- 5.25" Full Height 20 MB Fixed Disk Drive. This is the first type of fixed disk drive used in the IBM AT computer.
- 5.25" Half Height 20 MB Fixed Disk Drive. The most popular type is the Seagate ST-225.
- 5.25" Full Height 30 MB Fixed Disk Drive. Normally found in IBM AT computers. Seagate ST-4038.

### Layout of PC, XT with 10 MB Hard Disk Controller

The cabling for the IBM XT 10 MB Fixed Disk Controller is unique. The Drive Select jumpering for Drive C: and D: is DSO. Drive C: is located at the middle of the cable, and Drive D: at the end. The terminating resistor is usually on Drive C:, but if Drive D: is present, then it is there. Note that the IBM PC must have a newer ROM BIOS chip and either (1) upgrade the Power Supply to at least 135 Watts, or (2) use an IBM PC Expansion Unit to house and power the drive.

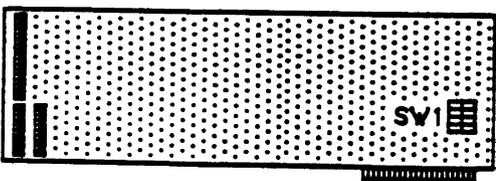


### IBM XT Fixed Disk Controller ( 10 MB )



Only for Full-Height 10 MB Fixed Drives - 306 Cylinders 4 Heads

### IBM XT Fixed Disk Controller ( 20 MB )

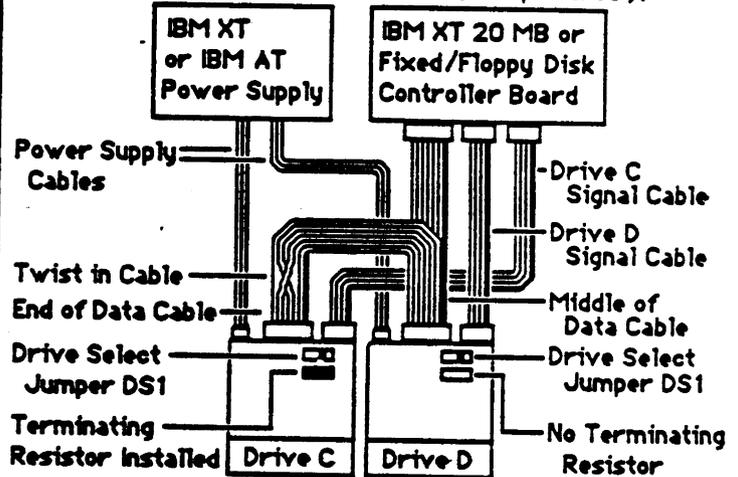


TYPE	Switch 1			
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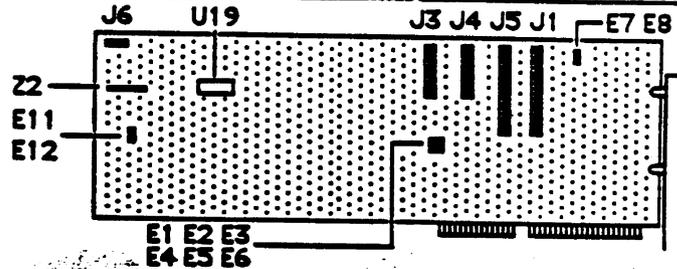
Drive 1 2

### Layout of PC, XT 20 MB, & AT Fixed Controllers:

The IBM XT 20 MB & IBM AT Fixed/Floppy Disk Controllers use the same cabling and drive selection. The Drive Select jumpering for Drive C: and D: is DS1. Actual drive selection is determined by the twist in the cable. A Terminating Resistor is installed at the end of the cabling at Drive C: Note that the IBM AT Fixed Disk Drives usually have a ground wire connected to the chassis ( Not pictured ).



### IBM AT Fixed Disk/Floppy Diskette Controller



- J1 - IBM AT Floppy Drive Cable Connector
- J3 - Fixed Drive C Signal Cable Connector
- J4 - Fixed Drive D Signal Cable Connector
- J5 - Fixed Drive Data Cable Connector
- J6 - LED Connector
- Jumper On - E2/E3, E5/E6, E7/E8, E11/E12
- Z2 - Resistor Pack, commonly breaks at card edge
- U19 - Older models had a defective T1 chip here

### IBM Diagnostics - Fixed Drive Test:

- On the PC/XT Diagnostics, select option 0 to test. Do not run the "Write Tests" on a users fixed disk!
- On the AT Diagnostics, select option 5 to run all the tests. It will do a write test on a special track that will not damage the users data on the hard disk.

### IBM PC, XT Setup:

The IBM PC (later ROM BIOS version) and IBM XT computers come ready to recognize a hard disk directly thru the hard disk controller and how that controller is set up.

### IBM AT Setup:

Usually the IBM AT uses its' own Floppy/ Fixed Disk Controller to recognize its' hard disk, and the IBM AT Setup Program must be used to recognize the hard disk. However, sometimes a hard drive will be installed with a separate controller and need to be specially configured.

# IBM PC, XT, AT Floppy Diskette Drives

**KEY**

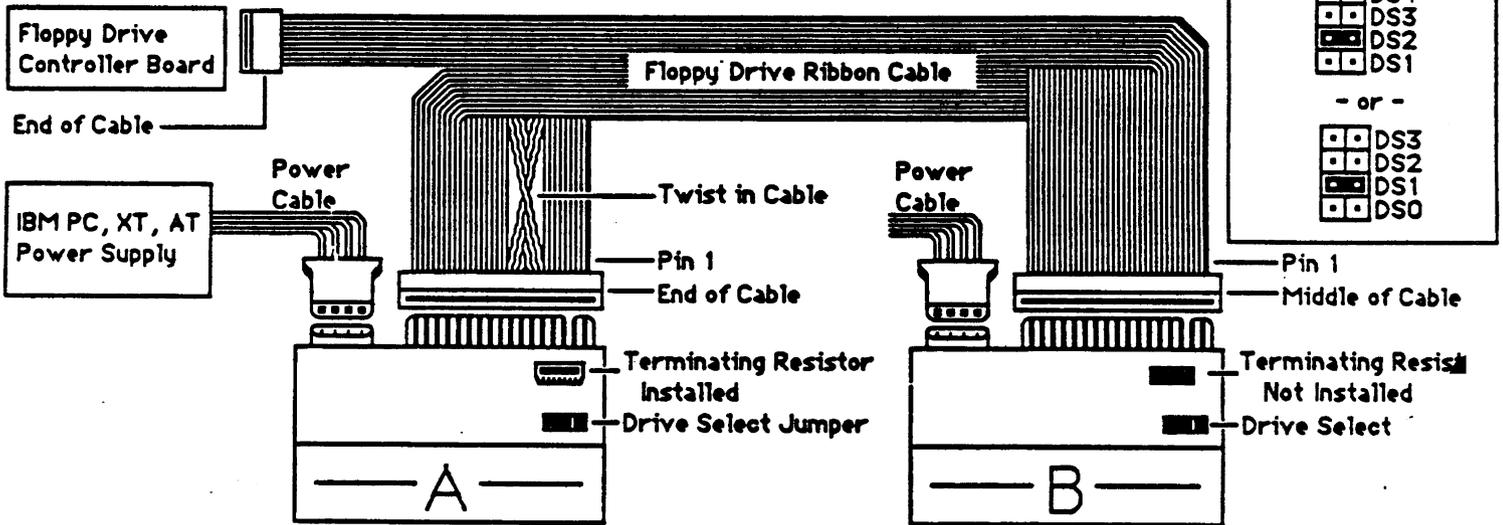
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<input checked="" type="checkbox"/>	- Jumper closed
<input checked="" type="checkbox"/>	ON
<input type="checkbox"/>	OFF

### Types of Common IBM Floppy Diskette Drives:

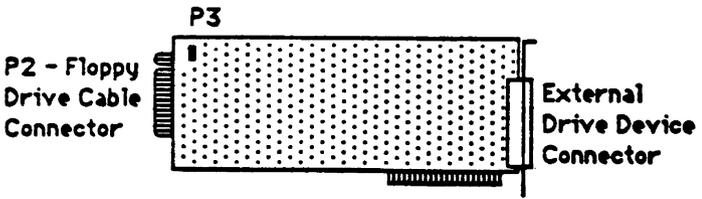
- 5.25" Double-Density 360 KB** - Use Double-Density diskettes only. Full-Height used in IBM PC, XT, and Half-Height used in IBM PC, XT, and Drive B: of IBM AT. In the IBM AT, the trace to pin 34 on the analog board of the drive is On the older IBM PCs, the first diskette drives were single-sided drives (180 KB).
- 5.25" High-Density 1.2 MB** - Use High-Density diskettes. Commonly found in Drive A: of the IBM AT. It can also read Double-Density diskettes, but may cause data errors when writing to them. It is best to use these diskettes in the Double-Density Drive B: of the IBM AT.
- 3.5" Double-Density 720 KB** - Use Double-Density 3.5" diskettes only. Commonly used in IBM PC, XT, and AT 3.5" diskette drives. The drives need special software and hardware to work properly. The 3.5" internal drive for the IBM AT will only format 720 KB with the later IBM AT ROM BIOS (1981, 1985 - 62X0820/1).

### Layout of PC, XT, AT Floppy Diskette Drives:

- Drive Select Jumper** - Most IBM PC/XT/AT diskette drives are hardware selected as the second physical diskette drive, Drive B: The twist in the cabling determines which is A: and which is B:
- Floppy Drive Cable** - The end of the cable with the twist selects diskette Drive A:
- Terminating Resistor** - Always at the end of the cable on Drive A: (Drive B: should not have one)



### IBM PC, XT Floppy Diskette Controller



- P2 - IBM PC, XT Floppy Drive Cable Connector
- P3 - Jumper On - Must be in for Controller to work
- External Drive Device Connector - A 37 Pin Female connector for external drive devices, such as the PC, XT external 3.5" floppy diskette drive, Irwin Tape Backup Drives, etc.

### IBM PC, XT Setup:

System Board

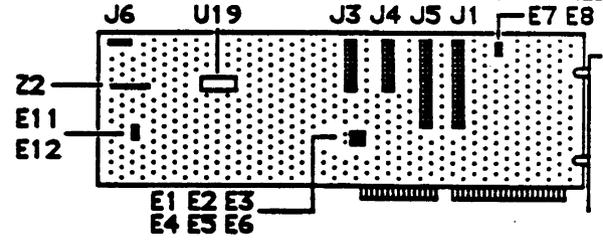
Switch 1

1	7 8	
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	No Drives
<input type="checkbox"/>	<input checked="" type="checkbox"/>	1 Drive
<input type="checkbox"/>	<input type="checkbox"/>	2 Drives
<input type="checkbox"/>	<input checked="" type="checkbox"/>	3 Drives
<input type="checkbox"/>	<input type="checkbox"/>	4 Drives

### IBM AT Setup:

Run the IBM AT Setup Program.  
 Drive A: is usually High Density.  
 Drive B: is usually Double Density and usually has an "\*" character on the faceplate.

### IBM AT Fixed Disk/Floppy Diskette Controller



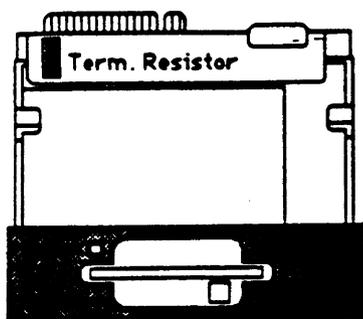
- J1 - IBM AT Floppy Drive Cable Connector
- J3 - Fixed Drive C Signal Cable Connector
- J4 - Fixed Drive D Signal Cable Connector
- J5 - Fixed Drive Data Cable Connector
- J6 - LED Connector
- Jumper On - E2/E3, E5/E6, E7/E8, E11/E12
- Z2 - Resistor Pack, commonly breaks at card edge
- U19 - Older models had a defective TI chip here

### IBM Diagnostics - Diskette Drive Test:

- Use Blank Formatted Diskettes
- Test 4 is the speed test. If the drive has a stobe pattern on the spindle, it usually can be adjusted in the field. Adjust for the outside pattern, 60 Hz.

# IBM PC, XT, AT 3.5" Floppy Diskette Drives ( Double-Sided, Double-Density )

## PC/XT Internal 3.5" Drive



The drive should be installed as drive B:, without a terminating resistor.

Note: Terminating Resistor can be a switch block, all switches should be off.

Connect the drive to the middle connector of the floppy drive cable. The drive will now work as drive B: - connecting to the IBM PC/XT Floppy Diskette Controller.

Verify that the PC/XT system board switches for internal floppy diskette drives are correct. For 2 drives, Switch 1-7 is off, 1-8 is on.

The Drive needs a special software installation program. From the A: prompt type: "35INSTAL". This program will automatically create a CONFIG.SYS file with the line:

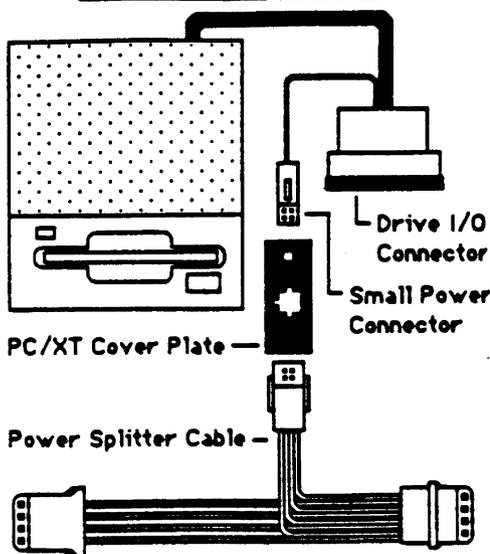
```
Device=\indskbio.sys
```

The only files that are actually needed are:

```
CONFIG.SYS
INDSKBIO.SYS
```

You must use IBM Dos version 3.2 or higher.

## PC/XT External 3.5" Drive



Connect the Drive I/O Connector to the IBM PC/XT Floppy Diskette Controller. Connect the Small Power Connector to the Power Splitter Cable ( through the cover plate on the back of the PC/XT ).

Connect the Power Splitter Cable to one of the diskette drive power connectors and a diskette drive power cable from the power supply. Do not change switches on the system board.

The drive needs a special software configuration. Two files are needed to access the drive:

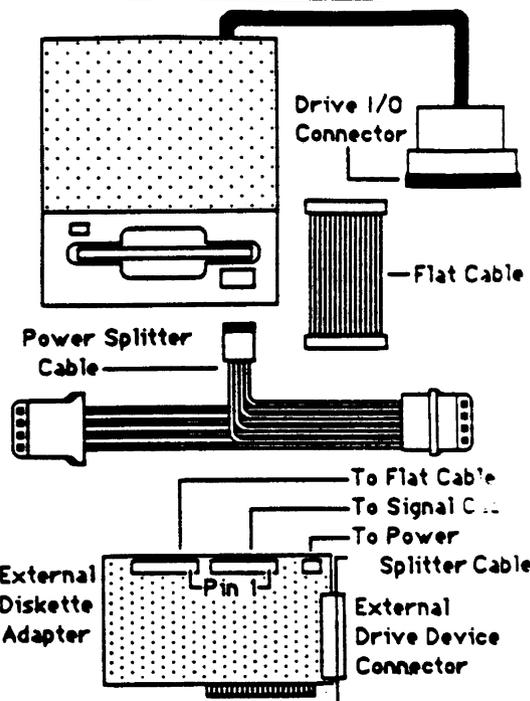
```
CONFIG.SYS
DRIVER.SYS
```

The CONFIG.SYS file must have the line:

```
Device=\driver.sys /D:2 /T:80 /S:9 /H:2
```

Use Dos 3.2 or higher only.

## AT External 3.5" Drive



Install the External Diskette Adapter in slot 6 or 7. Unplug the Signal Cable (J1) from the IBM AT Drive Controller & plug it into the right side connector on the External Diskette Adapter. Connect the Flat Cable from the left side of the External Diskette Adapter to J1 of the IBM AT Drive Controller (where the Signal Cable was connected). Connect the Power Splitter Cable to: 1) the External Diskette Adapter, 2) one of the diskette drive power connectors, and 3) one of the diskette drive power cables from the power supply. Do not change the IBM AT Setup Program.

A special software configuration is needed to access the drive. Three files are needed:

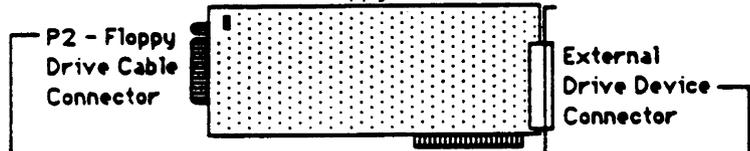
```
CONFIG.SYS
DRIVER.SYS
EXDSKBIO.DRV
```

The CONFIG.SYS file must have these 2 lines:

```
Device=\exskbio.drv
Device=\driver.sys /D:2 /T:80 /S:9 /H:2 /C
```

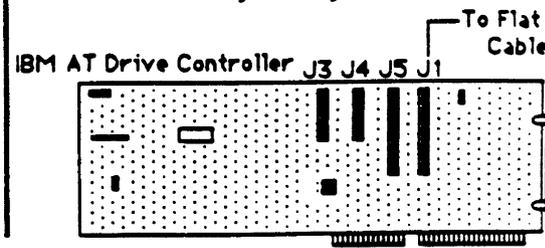
Use Dos 3.2 or higher only.

## IBM PC/XT Floppy Diskette Controller



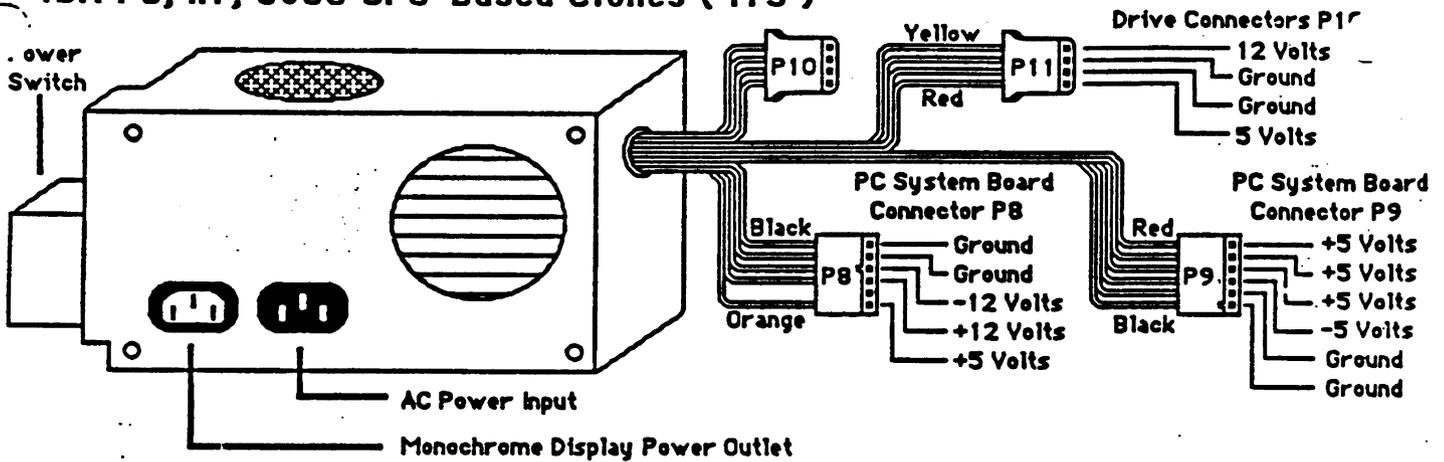
Connect to internal floppy drives A: and B:, including the PC/XT Internal 3.5" Floppy Drive.

Connect to Drive I/O Connector of the PC/XT External 3.5" Floppy Diskette Drive.



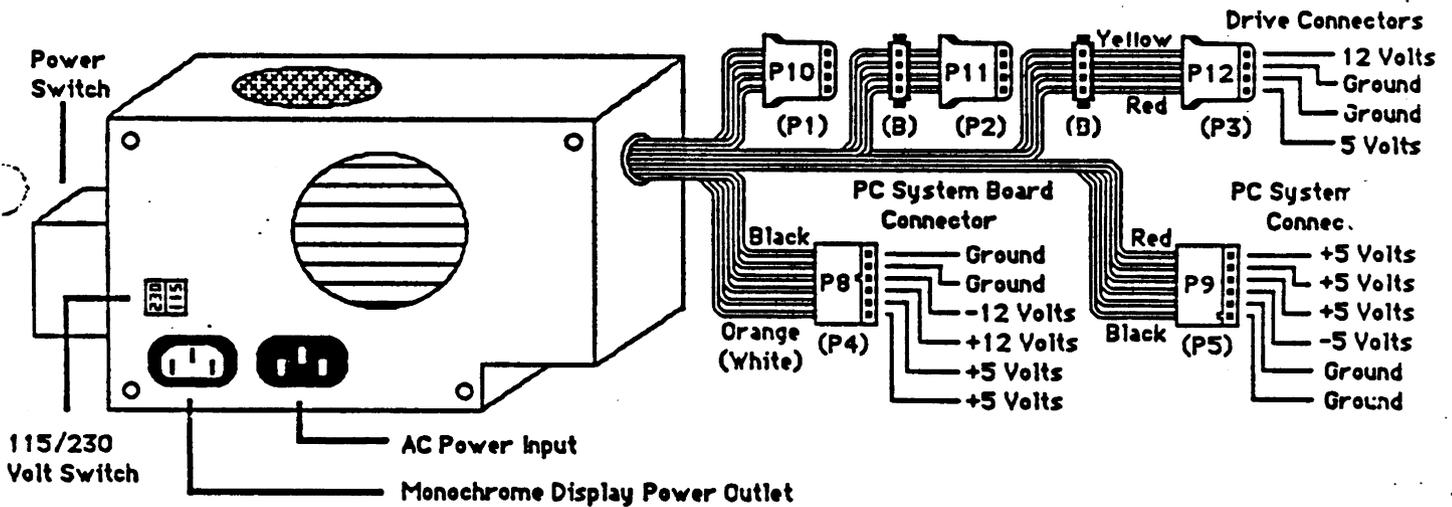


IBM PC, XT, 8088 CPU-Based Clones ( ITS )

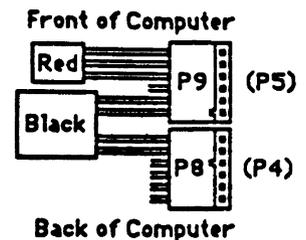


Note: IBM PC's normally have 63.5 Watt Power Supplies, which is usually inadequate to power a hard disk. The IBM XT and Clone computers have 135 or 150 Watt Power Supplies.

IBM AT, 80286 CPU Clones - ITS AT 286 - Two versions A and ( B )



- Most PC look-alike clones have power supplies with identical power outputs.
- It should only be necessary to test the voltage output of the power supply when the following situation occurs - No Boot, No Beep, No Video, but the fan in the power supply works. If the fan does not work, the power supply is probably defective and should be replaced.
- In most PC's, the power supply connectors to the system board are keyed, meaning that they will only plug in one way. However, some of the clone power supplies are not keyed, and P8 and P9 can easily be reversed. Never seat these connectors in the wrong sockets. Always insert the connector with the 3 red wires closest to the front of the computer, with the two black wires on P8 next to the black wires on P9. See the diagram to the right, and next time you have the cover off of a PC, have a look.



# IBM Parallel Communications

JRG:BB  
6-22-88

DB25-Female



Champ 36 Pin Female



**Connectors:** There is only one type of parallel port installed in IBM computers. It is a DB-25 Pin Female Port. It is found in the IBM PC, XT and AT computers. The connector on the centronics parallel printer will usually be a "Champ" 36 Pin Female Port.

**Diagnostics:** All technicians should have loop-back wrap plugs to test the DB-25 parallel ports. In IBM Advanced Diagnostics, tests 4, 9, and 10 are for the parallel ports.

Pin-outs for the IBM Parallel Loop-Back Plug:  
DB-25 Male Connector

- 1 - 13
- 2 - 15
- 10 - 16
- 11 - 17
- 12 - 14

- 4 - Monochrome Display and Printer Adapter ( Allways LPT1)
- 9 - Printer Adapter ( LPT1, or if 4 is listed, LPT2 )
- 10 - Alternate Printer Adapter ( LPT2, or if 4 is listed, LPT3 )

The test may fail on some older parallel ports, such as old Quadram boards, but on almost all other parallel ports it should pass.

**Specifications:** Most Parallel Ports must be configured properly. The IBM Monochrome Display and Printer Adapter Card will always force itself to be LPT1. Other boards must be configured properly.

A) **System Setup** - The computer must recognize the parallel ports in 2 different ways:

- 1) If there is no IBM Monochrome Display and Printer Adapter, or a board using base I/O address H3BC:

Without display /printer adapter using Base I/O Address H3BC	Order	Device	Base I/O Address
	first	LPT1	H378
	second	LPT2	H278

- 2) If there is an IBM Monochrome Display and Printer Adapter, or a board using base I/O address H3BC:

With display /printer adapter using Base I/O Address H3BC	Order	Device	Base I/O Address
	first	LPT1	H3BC
	second	LPT2	H378
	third	LPT3	H278

Note that even though the second and thrid parallel ports will respond logically as LPT2 and LPT3, the ports should be physically set as LPT1 and LPT2. This is because the Monochrome Display and Printer Adapter Card will force itself to be LPT1 and " bump " the other LPT1 port to LPT2, and LPT2 to LPT3. The only exception to this would be a board that has different parallel port settings depending on whether or not an IBM Monochrome Display and Printer Adapter Card is present, such as the AST Advantage board.

Also note that normally LPT1 is set at IRQ7, and sometimes LPT2 is set as IRQ5. However, it is usually not necessary to specify an interrupt level for the parallel printer ports.

B) **Communication Setup** - The parallel port is set to communicate in parallel centronics mode with another parallel device with parallel centronics communications. There is nothing to configure. Default printing will go to LPT1.

**Cabling:**

The standard IBM Parallel Printer Port is used to drive a parallel printer and it has no other purpose. The cable is normally DB-25 Pin Male ( PC ) to Centronics Champ 36 Pin Male ( Parallel Printer ). The standard IBM PC Parallel Printer Cable will work with most all common centronics parallel printers, such as Epson, Okidata, Hewlett-Packard, Talaris, NEC, Citech, Data Products, etc.

Note that there are distance limitations with parallel communications, unlike serial communications. It is not recommended to extend a parallel printer cable more than 12 feet from PC to Printer. Past this distance can cause data loss or corruption. It is recommended to use either a special parallel cable extension device, such as " Long Link " ( which converts parallel to serial, sends that signal, converts it back to parallel, and boosts the power of the signal at each end ), or use serial communications entirely.

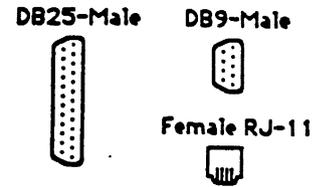
1-28

# IBM Serial RS-232 Communications

**Connectors:** There are usually 3 main types of serial ports installed in IBM computers.

- 1) DB-25 Pin Male ( Usually IBM PC, XT and sometimes AT. )
- 2) DB-9 Pin Male ( Usually IBM AT, but sometimes IBM PC, XT. )
- 3) RJ-11 4 Pin Female Modem Port ( In any computer with an internal modem. )

The connector on the other serial communication device will usually be a DB-25 Pin Female Port.



**Diagnostics:** All technicians should have loop-back wrap plugs to test the DB-25 and DB-9 serial ports. In IBM Advanced Diagnostics, tests 11 and 12 are for the serial ports.

- 11 - Asynchronous Communications Adapter ( COM1 )
- 12 - Alternate Asynchronous Communications Adapter ( COM2 )

There is no loop-back wrap plug for the Internal Modem Port.

**Pin-outs for the IBM Serial Loop-Back Plugs:**

DB-25 Female Connector	DB-9 Female Connector
1 - 7	1 - 7 - 8
2 - 3	2 - 3
4 - 5 - 8	4 - 6
6 - 20	
11 - 22	
17 - 15 - 23	
18 - 25	

**Specifications:** All Serial RS-232 Ports must be configured properly.

The IBM PC, XT and AT can recognize no more than 2 serial ports, known as COM1 and COM2. Some I/O Boards have settings for COM3 and COM4, but only special software will recognize these ports.

- 1) **System Setup** - The computer must have the serial port setup to be recognized by the CPU
- 2) **Communication Setup** - The serial port in the computer must be set to "talk" in the same way as the device it is connected to. There are four main settings, determined by the IBM MS-Dos software, to configure these settings.

- Baud Rate - 9600, 4800, 2400, 1200, 600, 300, 50
- Data Bits - 7, 8
- Stop Bits - 1, 2
- Parity - No, Yes, Even, Odd

COM port	I/O	Base I/O Address
COM 1	4	03F8
COM 2	3	02F8

IBM MS-Dos uses software to do this, namely the MODE Command. Example: MODE COM1 : = 9600, n, 8, 1, - . The serial port, and the other device it is connected to, must be configured to communicate in the same way. The other device may use either software or hardware for these settings.

Note: Default printing on the IBM PC, XT, and AT computers goes to parallel port LPT1. However, the MODE Command can be used to make either COM1 or COM2 the default printing device. Example: MODE LPT1 : = COM1 .

**Cabling: 2 Main Types -**

**Modem Cable** - A modem cable connects DTE to DCE ( Data Terminal Equipment to Data Communication Equipment ). This cable is normally a "straight-thru" type of cable.

The PC/XT Modem Cable is a "straight-thru" type of cable      The IBM AT Modem Cable\* is not a "straight-thru" type of cable

1 - 1	1 - 8
2 - 2	2 - 3
3 - 3	3 - 2
4 - 4	4 - 20
: - :	5 - 7
: - :	6 - 6
23 - 23	7 - 4
24 - 24	8 - 5
25 - 25	9 - 22

The Modem Cable is used for 2 purposes:

- 1) **Serial Port to External Modem** ( DTE to DCE ).
- 2) **Extension** - to give extra length to other cabling. This would only work for cable that has a "straight-thru" type of pin-out, with similar connectors at each end; not the IBM AT Modem Cable\*.

**Nul-Modem Cable** - A nul-modem cable connects 2 devices of like types ( DTE to DTE ) or ( DCE to DCE ). In most cases it is used to connect a computer ( DTE ) to a serial printer ( DTE ). Almost all nul-modem cables for IBM PC/XT computers have pins 2 and 3 crossed.

- 2 - 3
- 3 - 2

This is because they both transmit and receive on the same pins. There are many different types of nul-modem cables, all depending on the devices they are connected to. Pins 4, 5, 6, 7, 8 and 20 are the most common pins used in a variety of combinations.

The IBM AT with a DB-9 Pin serial port should be able to use any IBM PC/XT modem or nul-modem cable, as long as there is an IBM AT Modem Cable connected to the port first.

The IBM AT Modem Cable is used to convert the DB-9 Pin serial port pin-outs to that of the IBM PC/XT DB-25 Pin serial port. This means that most all cables that work on the PC/XT should work on the IBM AT with this cable.



# Printer Sharing

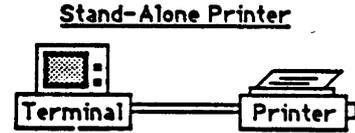
Printer Sharing is when 2 or more terminals ( or PCs ) are connected and can access 1 or more printers.

There are 3 main types of printer sharing devices:

- 1) A manually operated signal switching device. This is the simplest form of printer sharing. It would include the A-B Switchbox, A-B-C-D Switchbox. ( Note that Switchboxes usually come with DB-25 Pin Female Ports . )
- 2) A separately powered signal switching device. This is a more complicated form of printer sharing that can usually be used with more terminals and printers, and needs a separate power supply. These type of devices are sometimes referred to as Multi-Plexers. The Logical Connection and NetCommander would be in this category.
- 3) A networked environment. Networks, including communications to any Computer Network Servers, Minicomputers or Mainframes, are the most complex form of printer sharing. IBM Token Ring Network, Banyan Vines Network, Novell and Appletalk are all networks that commonly use network communications to share printers.

## Stand-Alone Printing:

A stand-alone printer is a printer that is dedicated/connected to only one terminal/PC and can not be accessed by any other terminal/PCs.



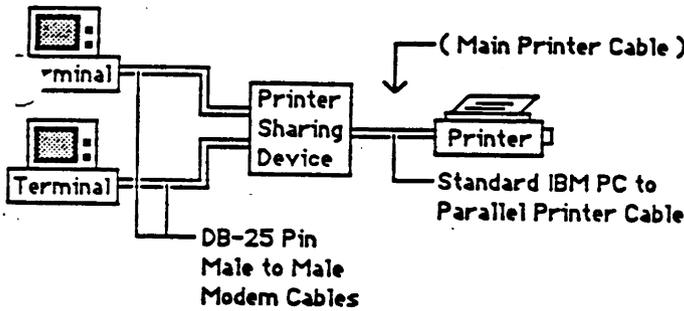
## Cabling:

When using computers and printers in a printer sharing environment it is always important to configure the cabling properly. Always connect the main printer cable directly to the printer. That means that if the printer is a parallel printer, connect the parallel centronics cable to its parallel centronics port, and if the printer is serial, connect the special nuI-modem cable to its serial port. Connect the other end of this cable to the printer sharing device.

## Printer Sharing:

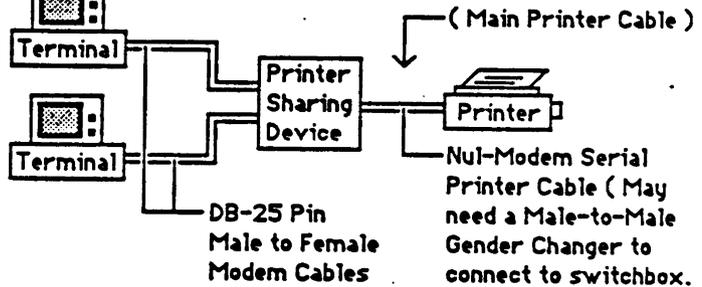
- 1) Manually operated signal switching device, or an A-B Switchbox. The cabling below is for switchboxes with DB-25 Pin Female Ports.

### Parallel Printer to IBM PC Cabling ( PC, XT, AT )

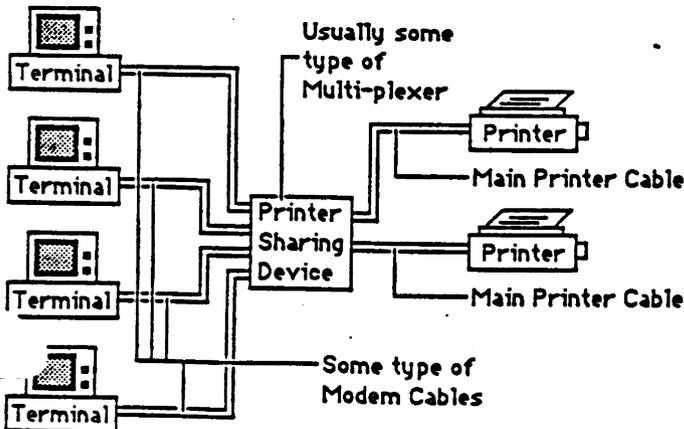


### Serial Printer to IBM PC Cabling ( PC, XT )

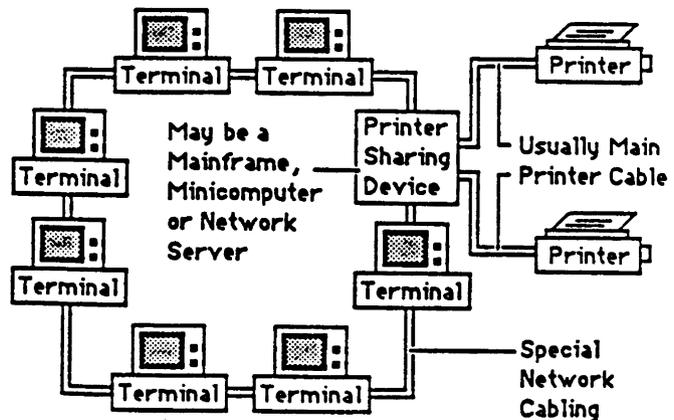
( IBM AT uses DB-9 Pin Serial Port )



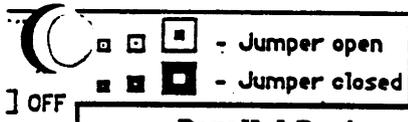
- 2) Separately powered signal switching devices. The cable from the printer to the printer sharing device is usually the main printer cable, but all other cabling may be quite different, such as RJ11 Telephone line cable, used with the NetCommander.



- 3) Networked printer sharing. The cable from the printer to the printer sharing device is usually the main printer cable, unless it is a special printer built for networking, such as the Apple LaserWriter. All other cabling is usually specific for that particular network.



# IBM Serial and Parallel Interface in PC, XT, AT type computers



### Parallel Ports:

If the system does not have a display adapter with a built-in parallel port at Base I/O Address H3BC, it will be able to access up to two (2) parallel ports in this order:

Without display /printer adapter using Base I/O Address H3BC	Order	Device	Base I/O Address
	first	LPT1	H378
	second	LPT2	H278

If the system has a display adapter with a built-in parallel port at Base I/O Address H3BC, it will be able to access up to three (3) parallel ports in this order:

With display /printer adapter using Base I/O Address H3BC	Order	Device	Base I/O Address
	first	LPT1	H3BC
	second	LPT2	H378
	third	LPT3	H278

Normally, parallel ports only come with settings for LPT1 and LPT2. The IBM Monochrome Display and Printer Adapters' parallel port uses Base I/O Address H3BC and always forces the system to recognize it as LPT1. The other two ports may be hardware set at LPT1 (H378) and LPT2 (H278), but will now be recognized as LPT2 (H378) and LPT3 (H278).

Software driven parallel printer software uses IRQ 7. To insure that the software operates correctly, enable IRQ 7 for LPT1. LPT2 is sometimes set as IRQ 5, but many times it is not set at all. Do not use an interrupt level for LPT3.

**Default Printing:** All default printing ( shift-printscreens ) will go to LPT1 unless otherwise redirected.

**Physical Port - IBM PC, XT, AT - DB25 Female**

### Serial Ports:

The system unit will recognize up to two (2) serial RS232 interface ports in this order:

Order	Device	Base I/O Address	IRQ
first	COM1	03F8	4
second	COM2	02F8	3

The serial port is commonly used for two purposes.  
 1. Communications - Modems in particular. All internal modems are recognized as regular serial ports and must be set accordingly.  
 2. Printing - to serial RS232 printers only.

When using the serial ports, it is necessary to use software to define its parameters, namely, Baud Rate, Data Bits, Stop Bits, and Parity. In the case of the serial printer, for example, the MODE command can be used like this:

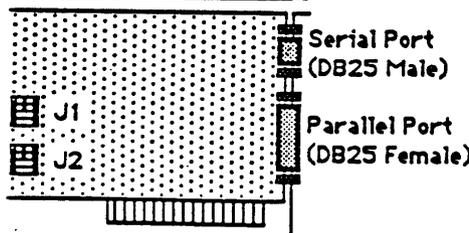
MODE COM1 : 9600, N, 8, 1, P  
 will set serial port COM1 at 9600 Baud, no parity, 8 data bits, 1 stop bit, and use for serial printing.

**Default Printing:** Default printing is always at LPT1 but can be redirected to a serial port using the MODE command:

MODE LPT1 : = COM1

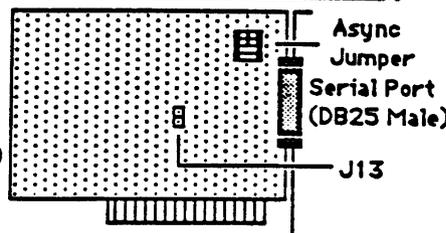
**Physical Port - IBM PC, XT - DB25 Male**  
**IBM AT - DB9 Male**

### IBM AT Serial/Parallel Adapter (AT, AT/3270)



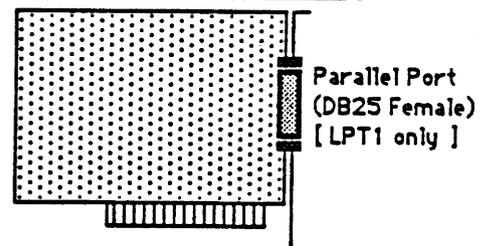
Jumper J1	Jumper J2
Com1	Lpt1
Com2	Lpt2

### IBM Asynchronous Comm. Adapter (PC, XT, PC/3270)

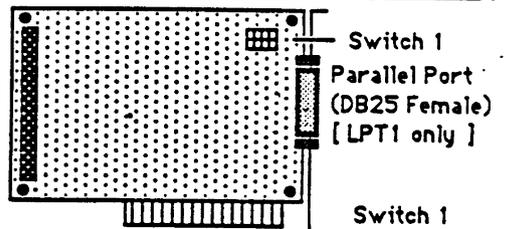


Com1  
Com2  
J13 must be in if board is in slot 8 of the XT or 3270

### IBM Parallel Printer Adapter (PC, XT, 3270)



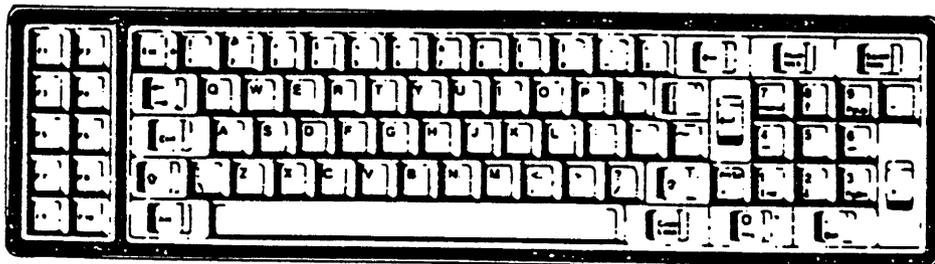
### IBM 128K Memory/Parallel Printer Adapter (PC, XT, PC/3270)



Starting Address 256K \_\_\_\_\_  
 With 256K Memory Expansion Card attached \_\_\_\_\_

## KEY CODE CHART

HEXADECIMAL SCAN CODE	KEY LOCATION	HEXADECIMAL SCAN CODE	KEY LOCATION
01	ESC	1A	[/]
02	/	1B	]/
03	@ 2	1C	↵ (return)
04	# 3	1D	CTRL
05	\$ 4	1E	A
06	% 5	1F	S
07	6	20	D
08	& 7	21	F
09	' 8	22	C
0A	( 9	23	H
0B	) 0	24	J
0C	- _	25	K
0D	+ =	26	L
0E	← (BACKSPACE)	27	:/
0F	⇠ (TAB)	28	"/
10	Q	29	~/^
11	W	2A	⇧ (SHIFT)
12	E	2B	/
13	R	2C	Z
14	T	2D	X
15	Y	2E	C
16	U	2F	V
17	I	30	B
18	O	31	N
19	P	32	M
33	< .	4C	5
34	> .	4D	6/—
35	? /	4E	+
36	⇧ (SHIFT)	4F	1/END
37	PRTSC/•	50	2/↑
38	ALT	51	3/PG DN
39	SPACEBAR	52	0/INS
3A	CAPS LOCK	53	DEL
3B	F1		
3C	F2		
3D	F3		
3E	F4		
3F	F5		
40	F6		
41	F7		
42	F8		
43	F9		
44	F10		
45	NUM LOCK		
46	SCROLL LOCK/BREAK		
47	7/HOME		
48	8/↑		
49	9/PG UP		
4A	—		
4B	4/—		



1-4.1

1-32

# IBM Keyboards

JRG388  
10-21-88

## Keyboard Types:

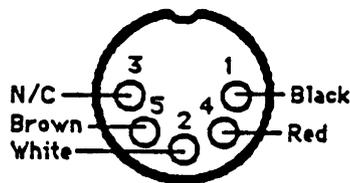
1. IBM PC, XT Standard Keyboard - Standard Keyboard used with almost all older IBM PC and XT computers. It will work in most 8088 based computers, but not in 80286 based computers like the IBM AT.
2. IBM AT Standard Keyboard - Standard keyboard used with almost all older IBM AT computers. It will not work in 8088 based computers, like the IBM PC and XT.
3. IBM 3270 Standard Keyboard - Standard keyboard used with almost all older IBM PC 3270 and AT 3270 computers. It must have a special keyboard cable connection and a special expansion board installed in the computer, called a Keyboard Timer.
4. IBM Enhanced Keyboard - Compatible keyboard for all PC, XT and AT computers. It will also work on the 3270, but it must have a special adapter cable and keyboard software.

## Keyboard Operation:

The keyboard sends and receives data in a serial format, 11 bit frame - 1 start bit, 8 data bits, 1 odd parity bit, and 1 stop bit - with the keyboard encoder chip on the system board. The data is either special controller command communication, or a ScanCode, which is the actual character typed in. Errors with the keyboard will sometimes relate to an actual ScanCode, which refers to the individual key with the problem. Many times, a defective key may be fixed by reseating either the cap or the keyswitch.

## Keyboard Cable Connector:

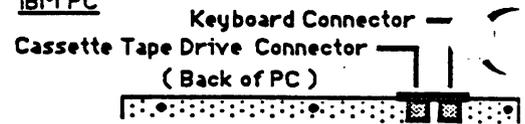
All PC Keyboards have cables that connect them to the system board. The cable has a 5 pin din connector, with a notch on the top. Wires to the connector are color-coded.



Round 5 pin din plug

## Types of Computers:

### IBM PC



### IBM XT and 3270



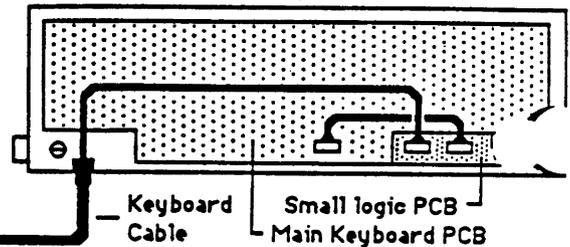
### IBM AT and AT/3270



## Keyboard - Internal Connection:

Inside the Keyboard, the cable connects to the Keyboard PCB. In the old style PC20 Keyboard, there is a separate logic PCB that the keyboard cable connects to, and from this PCB there is another cable that connects to the main Keyboard PCB.

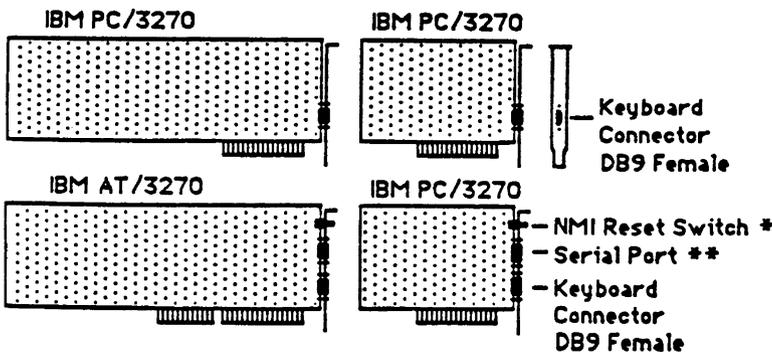
PC20 Keyboard



## IBM PC/3270 and AT/3270 Keyboard

The IBM 3270 and AT/3270 Keyboards need special cabling, and an Expansion Board installed in the computer called a Keyboard Timer.

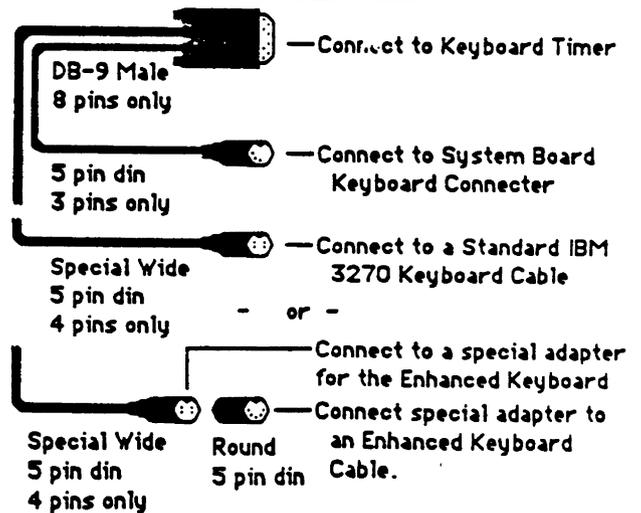
### 3270 Keyboard Timer Adapters:



\*\* Note that this serial port is only used for special IBM 3270 software. It has unique pin-outs and I/O address (1B8 and 1B9).

\* The NMI Reset Switch generates INT 2 when pressed. If no program is running to handle this interrupt, "Parity Check" is displayed. If the 3270 Control Program is active, it traps the interrupt and takes a system dump if requested by user. The system can then be restarted. This eliminates the need for a power off to reactivate a hung system.

### 3270 PC Keyboard Adapter Cable:

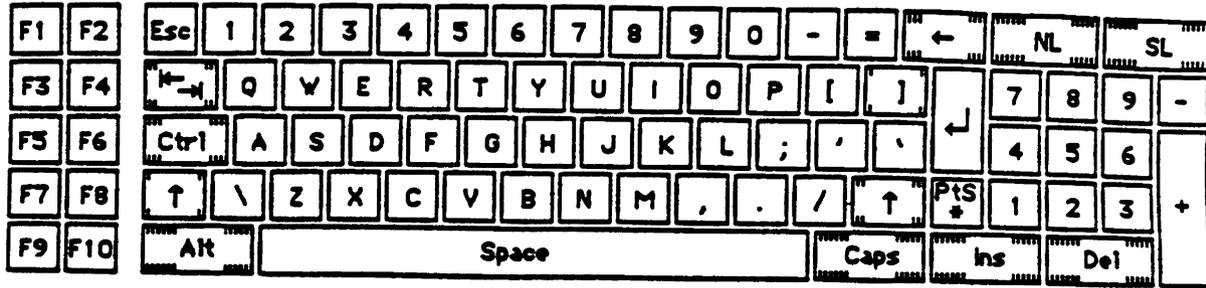


1-34

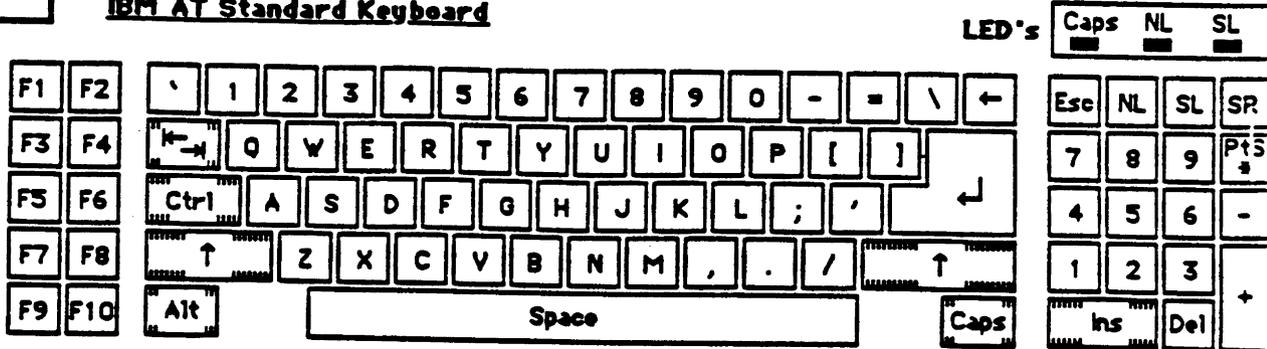
# IBM Keyboards - Layout

- KEY:**  
 Esc - Escape  
 Ctrl - Control  
 Alt - Alternate  
 Ins - Insert  
 Del - Delete  
 Pts - PrintScreen  
 Caps - Caps Lock  
 SL - Scroll Lock/Break  
 NL - Numeric Lock  
 ↵ - Return, or Enter  
 ⇧ - Tab  
 ↑ - Shift  
 ← - Backspace

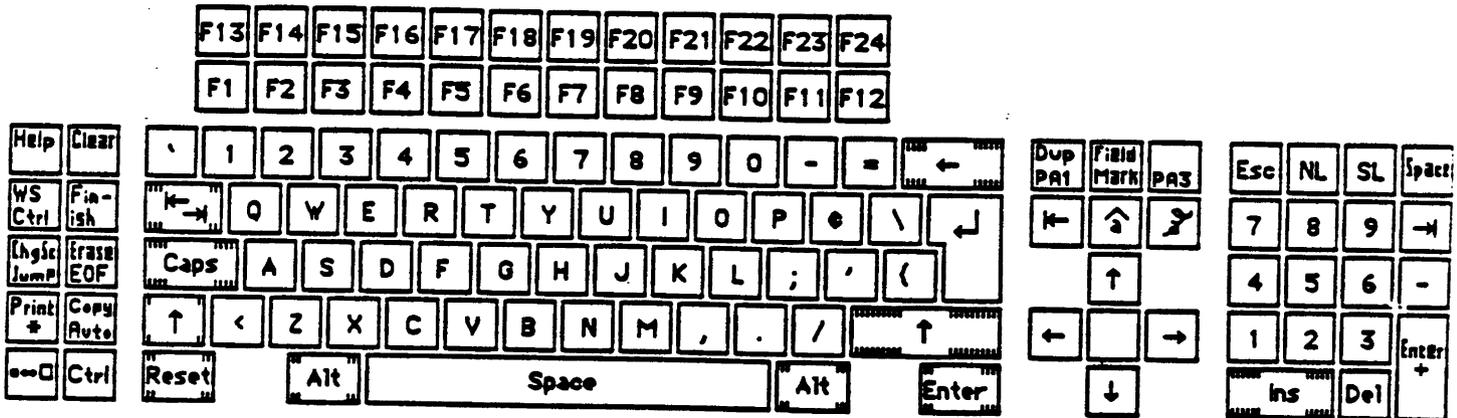
## IBM PC, XT Standard Keyboard



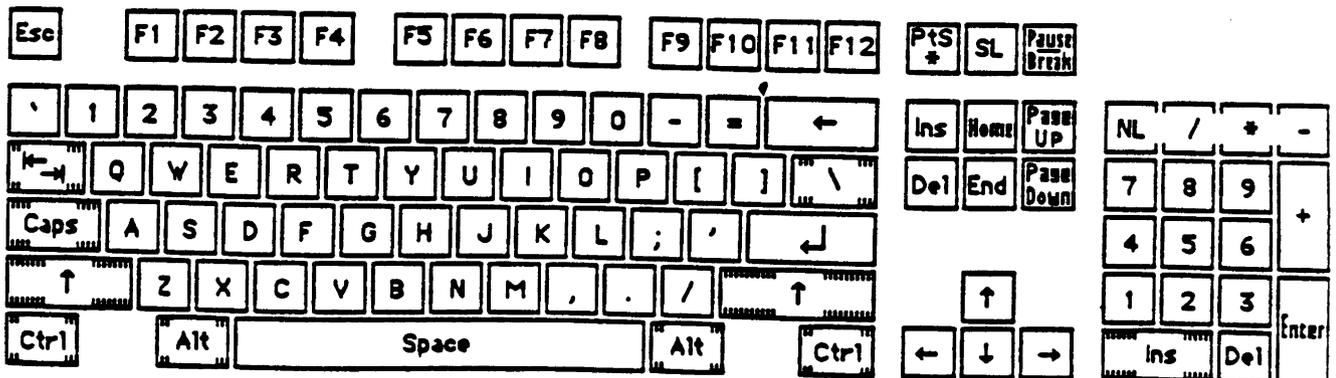
## IBM AT Standard Keyboard

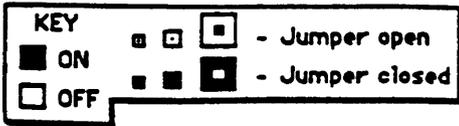


## IBM 3270 Standard Keyboard



## IBM Enhanced Keyboard ( PC, XT, AT & 3270 with a special connector )





## IBM Monochrome Display and Printer Adapter

The IBM Monochrome Display and Printer Adapter has two functions. Its primary use is for a Monochrome Display Monitor. It can do only Monochrome text, and no graphics whatsoever. Its other use is as a parallel printer port. It can be used as LPT1 only, using interrupt level 7.



Monochrome Display Port (DB-9 Female)  
Parallel Port (DB-25 Female)

Label on Board - "BLACK & WHITE/PARALLEL"

To install the board in a PC or XT, set switch block 1, 5 and 6 "off".



To install the board in an IBM AT, set the video switch on the system board towards the back of the computer.

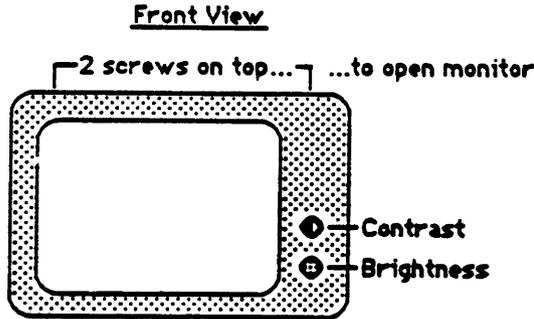
Monochrome  towards back of the AT

After setting this switch, run the AT Setup program.

Important Note: When running IBM Diagnostics on the Display, do not run the Sync Test. It may damage the monitor.

## IBM Monochrome Display Monitor

The IBM Monochrome Display is usually powered by the power supply in the computer it is attached to. It has several adjustments that can be made to it. On the outside, only Contrast and Brightness. The cover must be removed to make other adjustments.

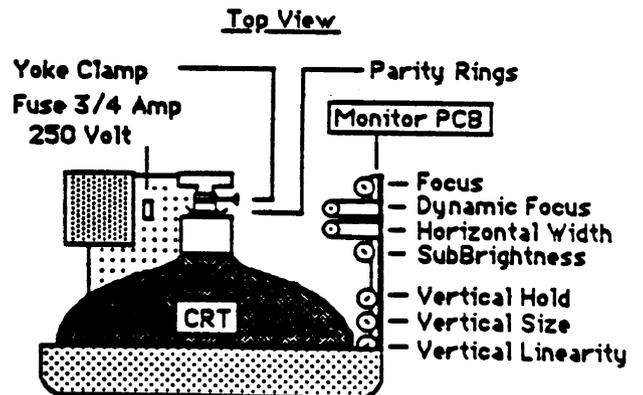
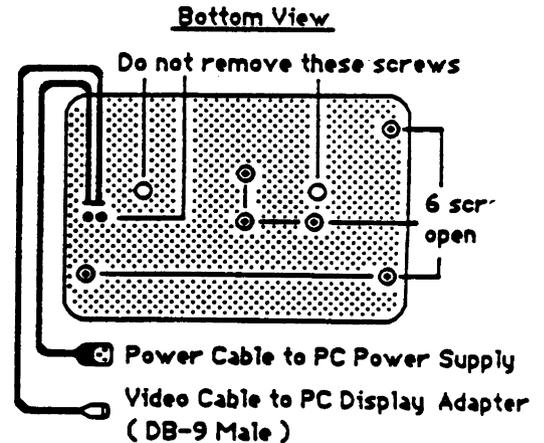


To remove the cover there are two screws on the top, and six screws on the bottom.

BE CAREFUL! Whenever working with a monitor, be extremely careful not to touch the CRT. Keep hands and face away from the CRT. This is also true for the FlyBack Transformer. When working on adjustments inside a monitor, touch only the actual points of adjustment. Try to use plastic tools only.

### Adjustments:

- Too much, or too little, raster or brightness - SubBrightness
- Out of Focus - Focus
- Vertical alignment problem - Vertical Hold, Size, Linearity
- Horizontal alignment problem - Horizontal Width (May not be able to do this if the pot is glued, and use a plastic tool)
- Crooked, or slanted display - Parity Rings or Yoke Clamp
- Characters out of proportion - Vertical Size
- Incorrect characters on display - Not a monitor problem, check display adapter and software
- No power, blown fuse - don't bother replacing the fuse in the field - it is soldered in, and a replacement will probably blow anyway



### Reassembly:

Be sure to put the assembly back together correctly. The easiest way to reassemble the monitor is to put it right-side as you put the cover back on, then reinstall the screws.

To: Glenn

### IBM PC and XT Configuration Chart

✓ Adapter Cards	IRQ Interrupt							DMA Channels				IO Port (Hex address)										
	2	3	4	5	6	7	0	1	2	3	None	100-1FF	200-20F	210-21F	220-22F	230-23F	240-24F	250-25F	260-26F	270-27F	280-28F	
AST-5251 Local Model 11	.							.														
AST-5251 Remote Model 12	.																					
AST-PCnet I and II										..												..
AST MegaPlus II																						..
Serial 1			.																			.
Serial 2																						.
Parallel 1																						.
Parallel 2																						.
AST Resource Sharing Network	.																					..
AST SixPakPlus																						..
Serial 1			.																			.
Serial 2																						.
Parallel 1																						.
Parallel 2																						.
Game I/O																						.
Clock Calendar																						..
Compaq DeskPro Async/Clock																						..
Serial 1			.																			.
Serial 2																						.
Clock Calendar																						..
Compaq DeskPro 128K and 512K Upgrades																						..
Corvus Omninet Transporter	.																					..
Digital Comm Assoc IRMA 3278/79 Emulator														..								..
Hayes Smartmodem 1200/1200B/2400														..								..
Serial 1			.																			.
Serial 2																						.
Hercules Color Card and Graphics Card <sup>a</sup>																						..
IBM 64K Memory Module Kit																						..
IBM 64K/256K Memory Expansion Option																						..
IBM Async Comm																						..
Serial 1			.																			.
Serial 2																						.
IBM Monochrome Display and Printer																						..
Parallel 1																						..
Mono Display																						..
IBM PC Network Adapter	.																					..
IBM Color/Graphics Display																						..
IBM Binary Synchronous Comm			..	..																		..
IBM Synchronous Data Link-SDLC			..	..																		..
IBM Fixed Disk																						..
IBM 5-1/4" Diskette Drive																						..
IBM Printer																						..
Parallel 1																						.
Parallel 2																						.
IDE IDEAmx 64K																						..
Serial 1			.																			.
Serial 2																						.
Parallel 1																						.
Parallel 2																						.
Clock Calendar																						..
Game I/O																						.
Intel Above Board/PC																						..
Omega Bernoulli PC0/PC1B/PC2B Host Adapters																						.

<sup>a</sup>Default is no IRQ interrupt level for both cards.



### IBM PC and XT Configuration Chart (cont'd)

✓	Adapter Cards	IRQ Interrupt					DMA Channels				I/O Port (Hex address)												
		2	3	4	5	6	7	0	1	2	3	None	100-1FF	200-20F	210-21F	220-22F	230-23F	240-24F	250-25F	260-26F	270-27F	280-3FF	
	Maynard Floppy Disk Controller				••					••													••
	Maynard 6000 Hard Disk Controller				••					••													••
	Maynard 6003 Floppy/Hard Disk Controller				••					••													••
	Quadram Quadcolor I Color Display																						••
	Quadram Quadcolor II Color Display																						•
	Quadram Quadcolor II Game I/O																						•
	Quadram Expanded Quadboard 384K and Silver Board																						
	Serial 1			•																			•
	Serial 2																						•
	Parallel 1						•																•
	Parallel 2																						•
	Tallgrass Interface 4000/6000 Series TG20/21/22 <sup>D</sup>		•								•												••
	Tecmar Graphics Master																						••
	3COM EtherLink		•							•													••
	3COM EtherLink Plus		•							•													300-
	Titan Accelerator PC																						300-
	Ven-Tel Half Card and PC Modem Plus/1200																						
	Serial 1																						
	Serial 2		•																				•
	1																						
	2																						
	3																						
	4																						
	5																						
	6																						
	7																						
	8																						
	9																						
	Options Used																						
	DEST Scanner Controller			•						•						•							

• Default.

•• Mandatory, cannot be changed or disabled.

<sup>D</sup>IRQ Interrupts can be disabled.

# CHARACTER SETS

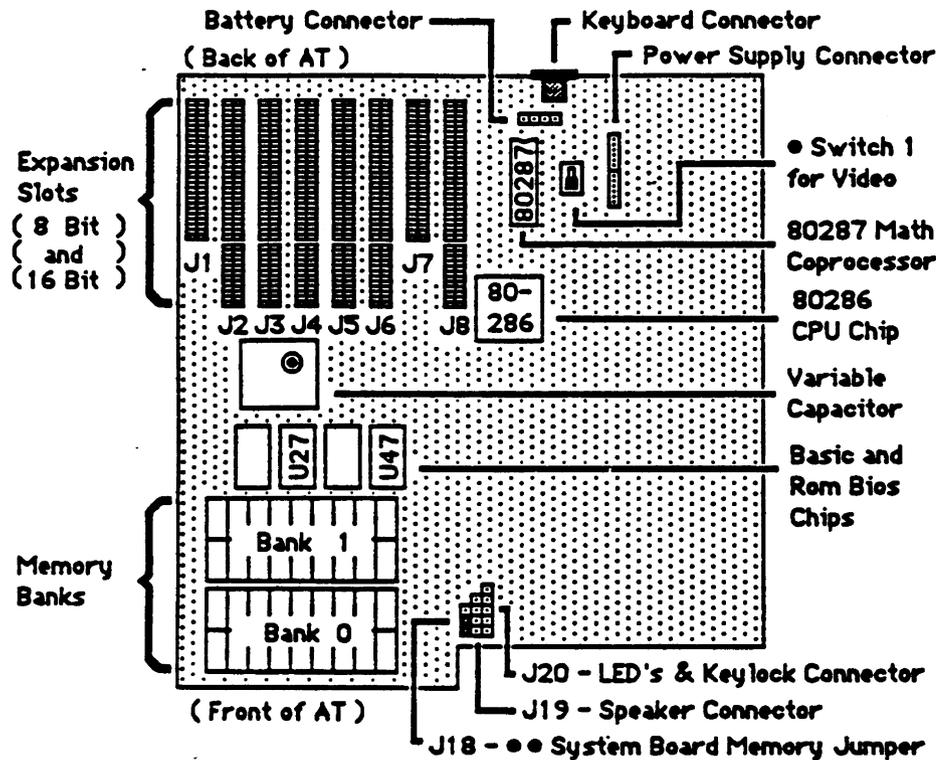
## U.S. ASCII

BINARY	000	001	010	011	100	101	110	111
0000	0 N	16 P	32 R	48 0	64 @	80 P	96 ,	112 p
0001	1 N	17 Q	33 S	49 1	65 A	81 Q	97 a	113 q
0010	2 N	18 R	34 T	50 2	66 B	82 R	98 b	114 r
0011	3 N	19 S	35 U	51 3	67 C	83 S	99 c	115 s
0100	4 N	20 T	36 V	52 4	68 D	84 T	100 d	116 t
0101	5 N	21 U	37 W	53 5	69 E	85 U	101 e	117 u
0110	6 N	22 V	38 X	54 6	70 F	86 V	102 f	118 v
0111	7 N	23 W	39 Y	55 7	71 G	87 W	103 g	119 w
1000	8 N	24 X	40 (	56 8	72 H	88 X	104 h	120 x
1001	9 N	25 Y	41 )	57 9	73 I	89 Y	105 i	121 y
1010	10 N	26 Z	42 *	58 :	74 J	90 Z	106 j	122 z
1011	11 N	27 [	43 +	59 ;	75 K	91 [	107 k	123 [
1100	12 N	28 \	44 ,	60 <	76 L	92 \	108 l	124 
1101	13 N	29 ]	45 -	61 =	77 M	93 ]	109 m	125 }
1110	14 N	30 ^	46 .	62 >	78 N	94 ^	110 n	126 ~
1111	15 N	31 _	47 /	63 ?	79 O	95 _	111 o	127 _



1-41

**IBM AT System Board Type A**



● **Switch 1 - Video**

Monochrome towards back of the AT  
Color towards front of the AT

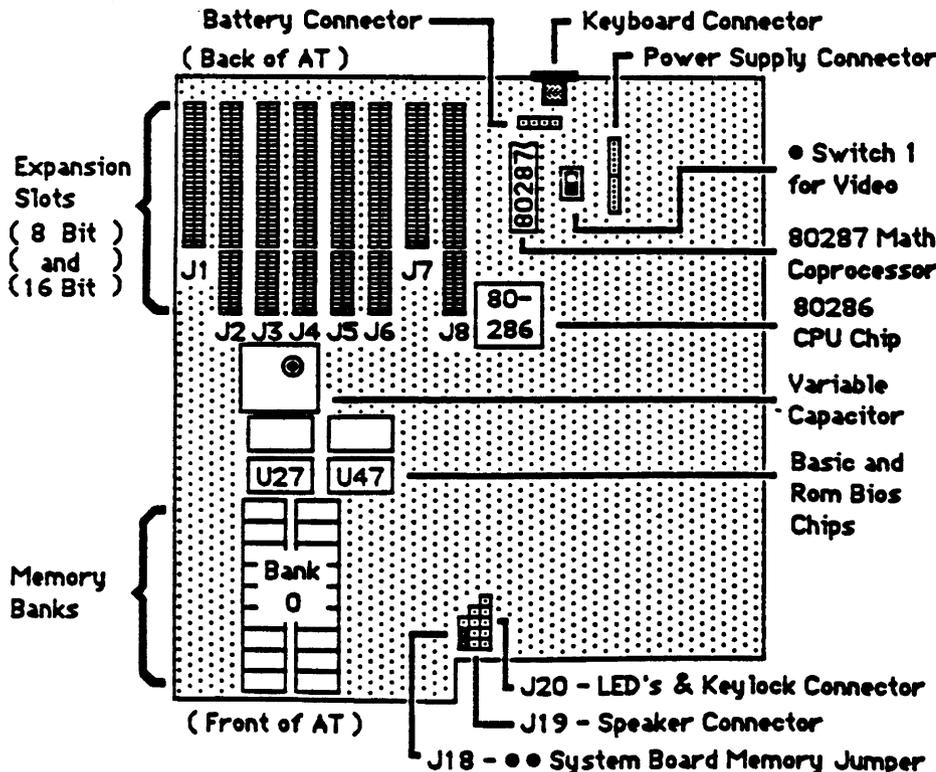
●● **System Board Memory Jumper J18**

256 towards back of the AT  
512 towards front of the AT

The IBM AT System Board features:

- ◇ 1 80286 CPU Chip
- ◇ A socket for an 80287 Math Coprocessor
- ◇ 8 Expansion Slots - 2 8 Bit Slots  
- 6 16 Bit Slots
- ◇ Connectors for Keyboard, Power Supply, Battery, Speaker, LED's & Keylock
- ◇ System Board Memory up to 512KB Ram
- ◇ Jumper J18 for System Board Memory
- ◇ Basic & Rom Bios Chips in U27 & U47
- ◇ Variable Capacitor - adjust composite vide
- ◇ 1 Switch Block for video

**IBM AT System Board Type B**



System Board Types:

Type A

- ◇ Memory is configured with 2 Banks of 18 Chips each using 128KB "piggyback" Ram
- ◇ The 80286 CPU Chip is 6 Mhz

Type B

- ◇ Memory is configured with 1 Bank of 18 Chips, using 256 KB Ram Chips
- ◇ The 80286 CPU Chip is 8 or 10 Mhz

The IBM AT has two revisions of Rom Bios.

The old Rom Bios can access Hard Disk Types 1 to 15. It can not format an internal 3.5" floppy drive as 720 KB, only 360 KB.

U27 - 6181028 1981, 1984  
TMM23256-5878  
U47 - 6181029 1981, 1984  
TMM23256-5879

The new Rom Bios can access Hard Disk Types 1 to 42. It can format an internal 3.5" floppy drive as 720 KB.

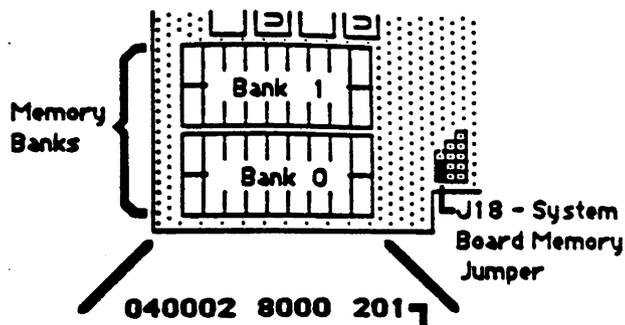
U27 - 62X0820 1981, 1985  
TMM23256-6746  
U47 - 62X0821 1981, 1985  
TMM23256-6747

# IBM AT System Board Memory

JWG388

## IBM AT Type 1 ( 128 KB Ram Chips )

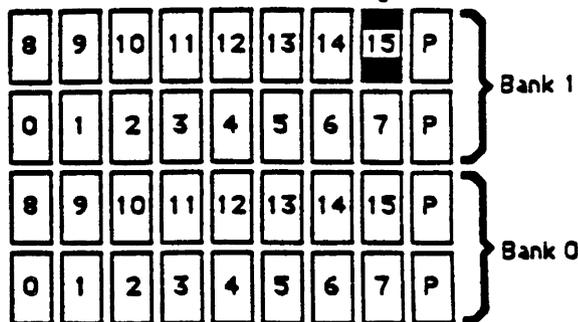
The IBM AT accesses banks of ram as 18 chips each, with 2 parity chips - one for each group of 9 chips. Jumper J18 enables or disables the last 256 KB block of system board memory. The AT-1 system board uses 128 KB "piggyback" ram chips, so a bank of ram on the system board is 256 KB. Defective ram chips are usually displayed with an error during the POST ( Power-On-Self-Test ).



**Error Codes:**            XX - 64 KB Block of ram in error  
 XXAAAA ZZZZ 201        ZZZZ - Bit in error ( See chart below )  
                                   A - Anything

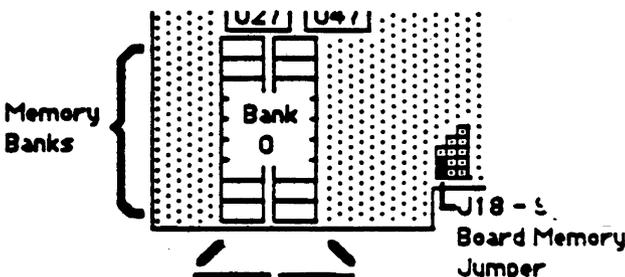
<u>Situation</u>	<u>Location</u>
XX = 00, 01, 02, 03	Bank 0
XX = 04, 05, 06, 07	Bank 1
XX = 08 or more	Add in memory board

**Example:** The darkened chip to the right may give an error code of " 040002 8000 201 ". The " 201 " indicates a memory error, the " 04 " indicates bank 1, and the " 8000 " indicates chip 15, the 8th chip from the left on the second row of 128 KB ram chips. Note that system board memory errors may display " Parity Check 1 " .



## IBM AT Type 2 ( 256 KB Ram Chips )

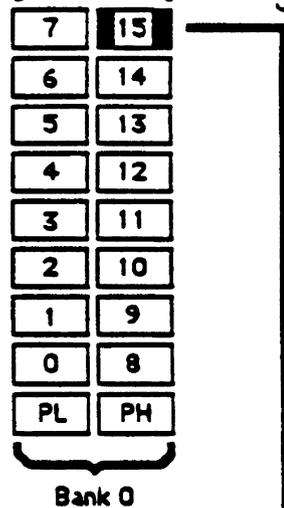
The IBM AT accesses banks of ram as 18 chips each, with 2 parity chips - one for each group of 9 chips. Jumper J18 enables or disables the last 256 KB block of memory on the system board. The AT-2 uses 256 KB ram chips, so a bank of ram on the AT-2 system board is 512 KB. Defective ram chips are usually displayed with an error during the POST ( Power-On-Self-Test ).



**Error Codes:**            XX - 64 KB Block of ram in error  
 XXAAAA ZZZZ 201        ZZZZ - Bit in error ( See chart below )  
                                   A - Anything

<u>Situation</u>	<u>Location</u>
XX = 00, 01, 02, 03, 04, 05, 06, 07	Bank 0
XX = 08 or more	Add in memory board

**Example:** The darkened chip to the right may give an error code of " 000000 8000 201 ". The " 201 " indicates a memory error, the " 00 " indicates bank 0, and the " 8000 " indicates chip 15, the 9th chip from the bottom on the right row of 256 KB ram chips. Note that system board memory errors may display " Parity Check 1 " .



000000 8000 201

**J18 - System Board Memory Jumper**

256     towards back of the AT  
 512     towards front of the

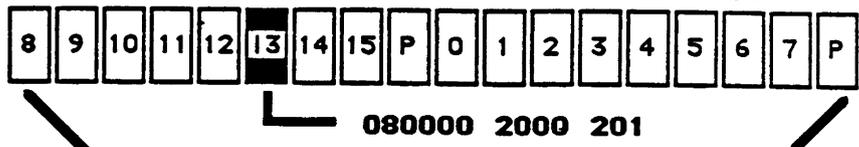
IBM AT Memory Error Location Chart					
Bit in Error	Chip Location	Bit in Error	Chip Location	64 KB Block of ram in error	64 KB Block of ram
0000	P	0000	P	<u>Dos/Base/Conventional Memory</u>	
0001	0	0100	8	00, 01, 02, 03	System Board
0002	1	0200	9	04, 05, 06, 07	
0004	2	0400	10	08, 09	Expansion Board
0008	3	0800	11	<u>Extended Memory 128 KB / 256 KB Ram Chips</u>	
0010	4	1000	12	10, 11, 12, 13	1st bank
0020	5	2000	13	14, 15, 16, 17	
0040	6	4000	14	18, 19, 1A, 1B	2nd bank
0080	7	8000	15	1C, 1D, 1E, 1F	

# IBM AT 128 KB & 128/640 KB Memory Expansion Adapters

**KEY**  
 - Jumper open  
 ON - Jumper closed

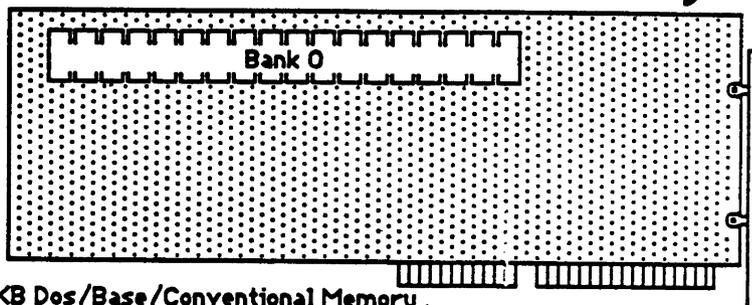
## IBM AT 128 KB Memory Expansion Adapter ( Conventional Memory )

The 128 KB Memory Expansion Adapter uses 64 KB Ram Chips. The IBM AT automatically accesses it as Dos/Base/Conventional Memory from 512 KB to 640 KB. Note the layout of the Ram Chips.



**Error Codes: XXAAAA ZZZZ 201**  
 XX - 64 KB Block of ram in error  
 ZZZZ - Bit in error ( See chart below )  
 A - Anything

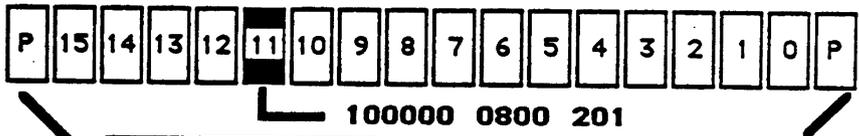
Situation	Location
XX = 08, 09	Bank 0



**Example:** If the darkened chip to the right is defective it may give a memory error of "080000 2000 201". The "201" indicates a memory error, the "08" indicates the first bank of expansion board memory of 512 KB to 640 KB Dos/Base/Conventional Memory, and "2000" indicates chip number 13, the 6th chip from the left side of the expansion board. Note that this example is for a 128 KB Memory Expansion Board installed in an IBM AT with a fully populated system board of 512 KB memory.

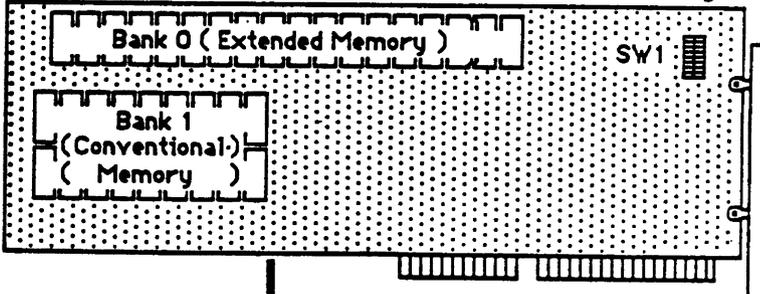
## IBM AT 128/640 KB Memory Expansion Ad. ( Conventional & Extended Memory )

The 128/640 KB Memory Board uses 64 KB Ram Chips in Bank 1 and 256 KB Ram Chips in Bank 0. The memory on Bank 1 is accessed as Dos/Base/Conventional Memory and the memory on Bank 0 is accessed as IBM AT "Extended" Memory.

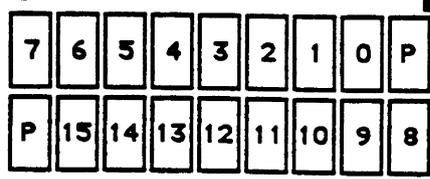


**Codes: XXAAAA ZZZZ 201**  
 XX - 64 KB Block of ram in error  
 ZZZZ - Bit in error ( See chart below )  
 A - Anything

Situation	Location
XX = 08, 09	Bank 1
XX = 10,11,12,13,14,15,16,17	Bank 0



**Example:** If the darkened chip to the right is defective, it may give an error code of "100000 0800 201". The "201" indicates a memory error, the "100000" indicates the first bank of Extended Memory, and the "0800" indicates chip number 11, the 6th chip from the left side of the board.



**Switch Settings:**

Switch 1  
 1 2 3 4 5 6 7 8  
        **No Extended Memory in Bank 1**

Bank 1 activated - Extended Memory Starting Address:

Switch 1  
 1 2 3 4 5 6 7 8  
        **0 KB**

1 2 3 4 5 6 7 8  
        **512 KB**

1 2 3 4 5 6 7 8  
        **1024 KB**

1 2 3 4 5 6 7 8  
        **1536 KB**

1 2 3 4 5 6 7 8  
        **2048 KB**

1 2 3 4 5 6 7 8  
        **2560 KB**

1 2 3 4 5 6 7 8  
        **3072 KB**

IBM AT Memory Error Location Chart						
Bit in Error	Chip Location	Bit in Error	Chip Location	64 KB Block of ram in error	64 KB Block of ram	
0000	P	0000	P	<u>Dos/Base/Conventional Memory</u>		
0001	0	0100	8	00, 01, 02, 03	System Board	
0002	1	0200	9	04, 05, 06, 07		
0004	2	0400	10	08, 09	Expansion Board	
0008	3	0800	11	<u>Extended Memory</u> 128 KB / 256 KB Ram Chips		
0010	4	1000	12	10, 11, 12, 13	} 1st bank	
0020	5	2000	13	14, 15, 16, 17		
0040	6	4000	14	18, 19, 1A, 1B		} 2nd bank
0080	7	8000	15	1C, 1D, 1E, 1F		

# IBM AT

JPG3'88  
8-31-88

## 512 KB & 512/2 MB Memory Expansion Adapters

**KEY**

- Jumper open
- ON  - Jumper closed
- OFF

### IBM AT 512 KB Memory Expansion Adapter (Extended Memory)

The 512 KB Memory Expansion Adapter uses 128 KB Ram Chips. The IBM AT accesses this memory as "Extended" memory only.

**Error Codes: XXAAAA ZZZZ 201**

XX - 64 KB Block of ram in error

ZZZZ - Bit in error ( See chart below )

A - Anything

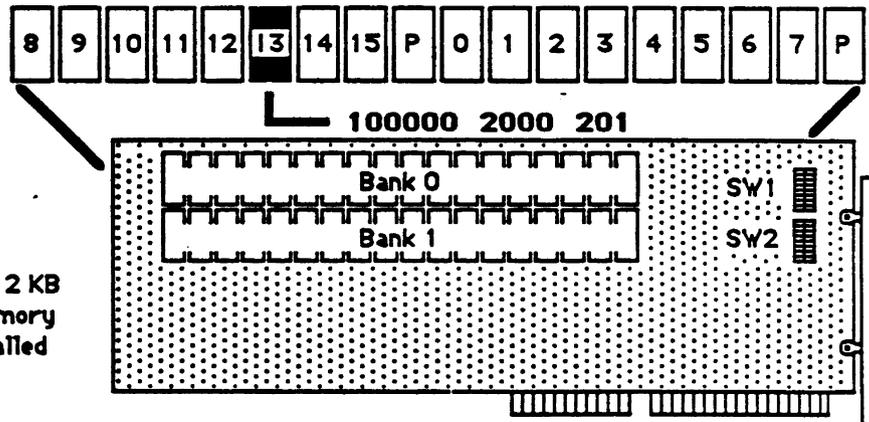
Situation	Location
XX = 10,11,12,13	Bank 0
XX = 14,15,16,17	Bank 1

#### Switch Settings:

SW1 (Bank 0)	SW2 (Bank 1)
1 2 3 4 5 6 7 8	1 2 3 4 5 6 7 8
<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>
1 2 3 4 5 6 7 8	1 2 3 4 5 6 7 8
<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>
1 2 3 4 5 6 7 8	1 2 3 4 5 6 7 8
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Amount of 512 KB  
Extended Memory  
Already Installed

- 0 KB
- 512 KB
- 1024 KB
- 1536 KB
- 2048 KB
- 2560 KB



**Example:** The darkened chip above may give an error code of "100000 2000 201" if defective. The "201" indicates a memory error, the "10" indicates the first bank of Extended Memory, and the "2000" indicates chip number 13, the sixth chip from the left side of the expansion board. Note that memory errors on expansion boards may give the error "Parity Check 2". Also note the chip layout of this board.

### IBM AT 512/2 MB Memory Expansion Board (Extended Memory)

The 512/2 MB Memory Board uses 256 KB Ram chips. The IBM AT accesses this memory as "Extended" memory only.

**Error Codes: XXAAAA ZZZZ 201**

XX - 64 KB Block of ram in error

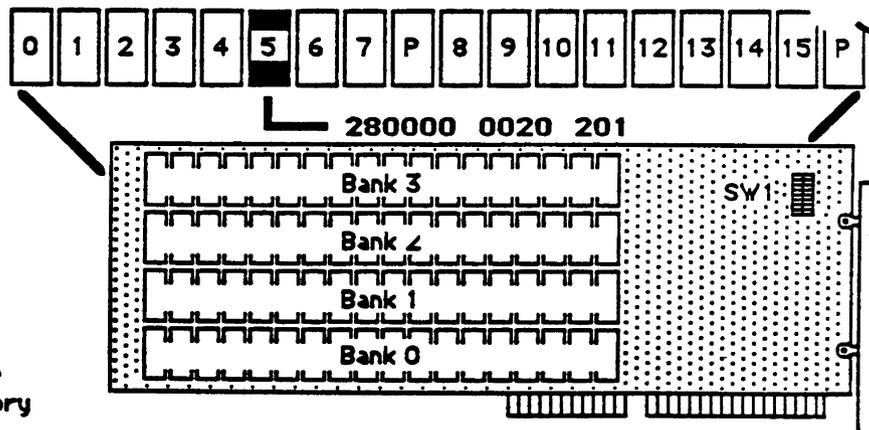
ZZZZ - Bit in error ( See chart below )

A - Anything

Situation	Location
XX = 10,11,12,13,14,15,16,17	Bank 0
XX = 18,19,1A,1B,1C,1D,1E,1F	Bank 1
XX = 20,21,22,23,24,25,26,27	Bank 2
XX = 28,29,2A,2B,2C,2D,2E,2F	Bank 3

#### Switch Settings:

The Switch Settings for SW1 on this board are the same as the settings for SW1 on the 512 KB Memory Expansion Adapter above.



#### Example:

The darkened chip above may give an error code of "280000 0020 201" if defective. The "201" indicates a memory error, the "28" indicates Bank 3 of Extended Memory, and "0020" indicates chip number 5, the sixth chip from the left side of the board. Note that memory errors on expansion boards may give the error "Parity Check 2". Also note the chip layout of this board - it is different from the other board.

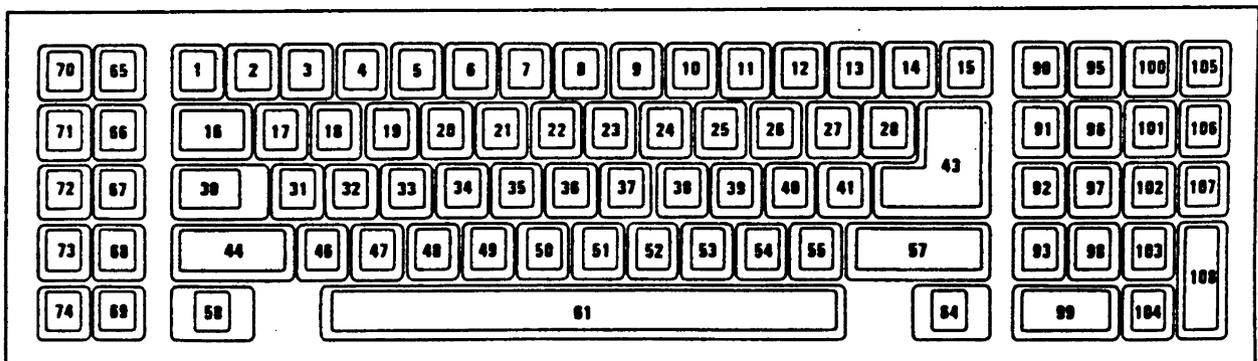
IBM AT Memory Error Location Chart					
Bit in Error	Chip Location	Bit in Error	Chip Location	64 KB Block of ram in error	64 KB Block of ram
0000	P	0000	P	<u>Dis/Base/Conventional Memory</u>	
0001	0	0100	8	00, 01, 02, 03	System Board
0002	1	0200	9	04, 05, 06, 07	
0004	2	0400	10	08, 09	Expansion Board
0008	3	0800	11	<u>Extended Memory 128 KB / 256 KB Ram Chips</u>	
0010	4	1000	12	10, 11, 12, 13	1st bank
0020	5	2000	13	14, 15, 16, 17	
0040	6	4000	14	18, 19, 1A, 1B	2nd bank
0080	7	8000	15	1C, 1D, 1E, 1F	

The following figure lists the positions of the keys and their make scan codes.

Key Positions and Their Make Codes				
1--DE	18--1D	36--33	55--4A	90--76
2--16	19--24	37--3B	56--51	91--6C
3--1E	20--2D	38--42	57--59	92--6B
4--26	21--2C	39--4B	58--11	93--69
5--25	22--35	40--4C	60--19	94--77
6--2E	23--3C	41--52	61--29	96--75
7--36	24--43	43--5A	64--58	97--73
8--3D	25--44	44--12	65--D6	98--72
9--3E	26--4D	46--1A	66--DC	99--70
10--46	27--54	47--22	67--0B	100--7E
11--45	28--5B	48--21	68--0A	101--7D
12--4E	30--14	49--2A	69--09	102--74
13--55	31--1C	50--32	70--05	103--7A
14--5D	32--1B	51--31	71--04	104--71
15--66	33--23	52--3A	72--D3	105--84
16--0D	34--2B	53--41	73--83	106--7C
17--15	35--34	54--49	74--01	107--7B

Make Scan Codes

AT Keyboard Scan Codes





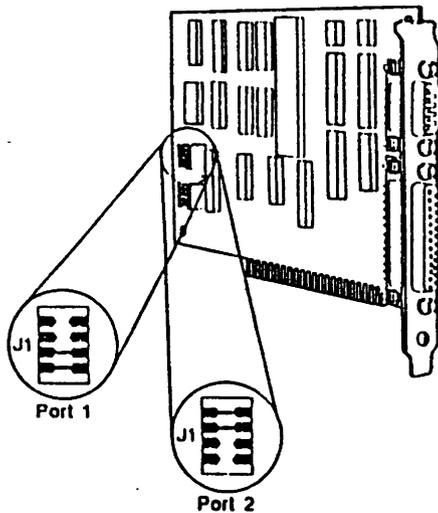
SERIAL PORT

- 1 - CARRIER DETECT
- 2 - RECEIVE DATA
- 3 - TRANSMIT DATA
- 4 - DATA TERMINAL READY
- 5 - GROUND
- 6 - DATA SET READY
- 7 - REQUEST TO SEND
- 8 - CLEAR TO SEND
- 9 - RING INDICATOR

PARALLEL PORT

- 1 - STROBE
- 2 - DATA BIT 0
- 3 - DATA BIT 1
- 4 - DATA BIT 2
- 5 - DATA BIT 3
- 6 - DATA BIT 4
- 7 - DATA BIT 5
- 8 - DATA BIT 6
- 9 - DATA BIT 7
- 10 - ACKNOWLEDGE
- 11 - BUSY
- 12 - PAPER OUT
- 13 - SELECT
- 14 - AUTO FEED XT
- 15 - ERROR
- 16 - INITIALIZE
- 17 - SELECT IN
- 18-25 GROUND

Communications Application



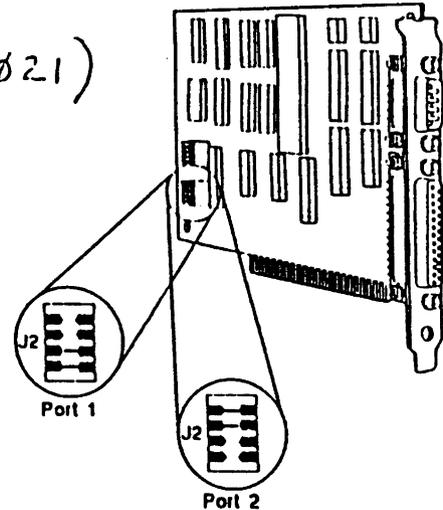
LEX40036

Figure 3-44. "AT" Serial/Parallel Adapter

The serial output port may be addressed as either communications port 1 or communications port 2 as defined by jumper J1 in this section. Hex addresses begin with an X which can be either a 3 for communications port 1 (interrupt level 4) or a 2 for communications port 2 (interrupt level 3).

Parallel Portion

(PC040021)



LEX41773

Figure 3-45. "AT" Serial/Parallel Adapter

The parallel portion of the adapter makes possible the attachment of various devices that accept eight bits of parallel data at standard TTL levels. The rear of the adapter has a 25-pin, D-shell connector. This port may be addressed as either parallel port 1 or 2. The port address is determined by the position of jumper J2.

# IBM AT Configuration Chart

Adapter Cards	IRQ Interrupt							DMA Channels				IO Port (Hex address)												
	2	3	4	5	6	7	14	0	1	2	3	None	100-1FF	200-20F	210-21F	220-22F	230-23F	240-24F	250-25F	260-26F	270-27F	280-28F		
AST Advantage/AT																								
Serial 1																								
Serial 2																								
Parallel 1																								
Parallel 2																								
Parallel 3																								
Game I/O																								
AST-5251 Local Model 11 <sup>a</sup>																								
AST-5251 Remote Model 12																								
AST-PCnet I and II																								
AST MegaPlus II																								
Serial 1																								
Serial 2																								
Parallel 1																								
Parallel 2																								
AST Resource Sharing Network																								
Corvus Omninet Transporter																								
Digital Comm Assoc IRMA 3278/79 Emulator																								
Hayes Smartmodem 1200/1200B/2400																								
Serial 1																								
Serial 2																								
Hercules Color Card and Graphics Card <sup>b</sup>																								
IBM 128K Memory Expansion																								
IBM 512K Memory Expansion																								
IBM Monochrome Display and Printer																								
Parallel 1																								
Mono Display																								
IBM PC Network Adapter																								
IBM Serial/Parallel/AT																								
Serial 1																								
Serial 2																								
Parallel 1																								
Parallel 2																								
IBM Color/Graphics Display																								
IBM Binary Synchronous Comm																								
IBM Synchronous Data Link-SDLC																								
IBM Fixed Disk and Diskette																								
Diskette																								
Fixed Disk																								
IDE IDEAmx 64K																								
Serial 1																								
Serial 2																								
Parallel 1																								
Parallel 2																								
Clock Calendar																								
Game I/O																								
Intel Above Board/AT																								
Omega Bernoulli PC0/PC1B/PC2B Host Adapters																								
Quadram Quadcolor I																								
Color Display																								
Quadram Quadcolor II																								
Color Display																								
Game I/O																								

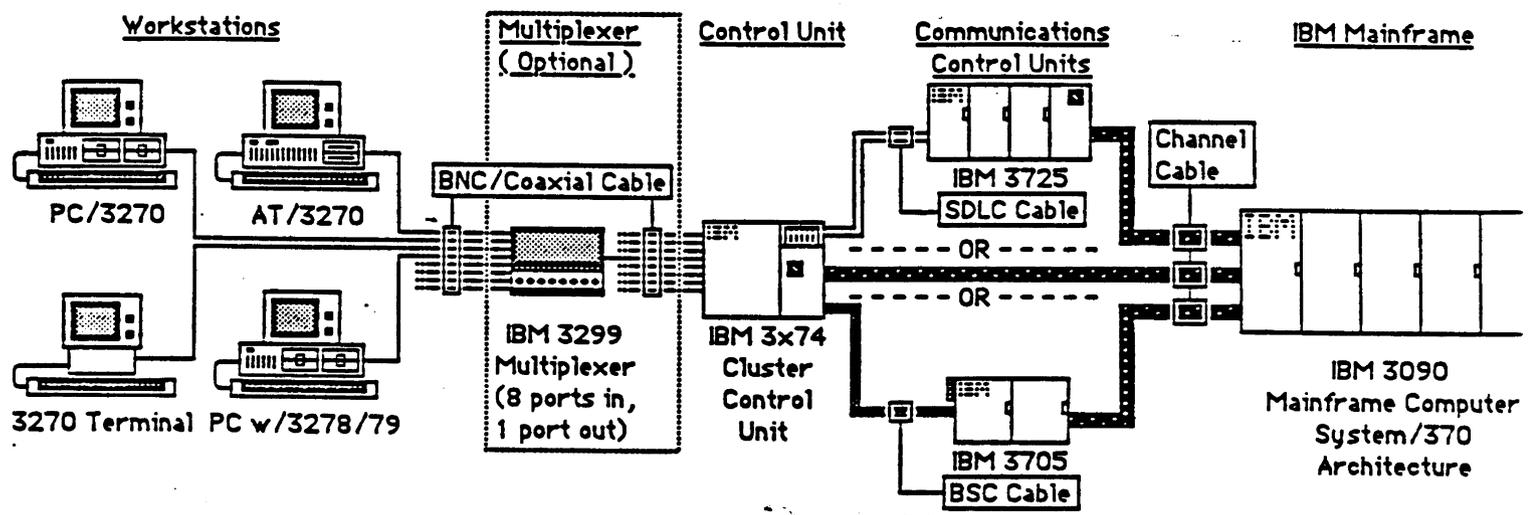
<sup>a</sup>DMA channels 5-7 may also be used.

<sup>b</sup>Default is no IRQ interrupt level for both cards.



# IBM PC/3270 and AT/3270 Computers

The IBM PC/3270 & AT/3270 Personal Computers are IBM XT and AT microcomputers that are able to emulate the popular IBM 3270 Terminals. They are connected with coaxial cable, like 3270 Terminals, through a Cluster Control Unit, to a Communications Control Unit, to an IBM Mainframe. The PC/3270 & AT/3270 must run IBM 3270 terminal emulation software to access the Mainframe as an IBM 3270. The PC/3270 & AT/3270 have the added features of being able to use the "Jump" key, not only for different mainframe sessions, but also to get back to MS-Dos, and data can be easily uploaded from, and downloaded to, the microcomputers disk drives. Data from the Mainframe can also be printed on the microcomputers local stand-alone printer.



The IBM PC/3270 and AT/3270 are actually IBM XT and AT microcomputers with 3 different features:

- 1) A 3270 Coaxial Adapter - There are two versions known as the "Long" board and the "Short" Board. Only the Short board will work in the IBM AT. This is the adapter that uses a coaxial cable to connect to the IBM Mainframe.
- 2) 3270 Display Adapter - It can use the IBM 3270 Color Display (5272) or IBM Monochrome Display (5150). The 3270 Display Adapter can be used with several display "options" that use special connector(s) that plug into the top of the boards. The AT/3270, because of its 16 bit slots, can usually only use 1 of these options, but the PC/3270 can have one or two at the same time. The 3270 Display Adapter "Options" are the following:
  - All Points Addressable (APA) Graphics Adapter - Used to let PC programs designed to use the IBM Color Graphics Adapter run with the 3270 display adapter. However, not all PC graphics are compatible because of the higher resolution of the 3270 display, 720 x 350 pels, and the Color Graphics Adapter is only 640 x 200 pels.
  - Programmed Symbols (PS) Graphics Adapter - is an option used to display host graphics from the IBM Mainframe. The board has been designed to work with GDDM.
  - Expanded Graphics Adapter (XGA) -
- 3) 3270 Keyboard Timer Adapter (there are 4 types of Keyboard Timer Adapters - 3 for PC/3270, 1 for AT/3270) The board must be used with either an IBM 3270 Keyboard or an IBM Enhanced Keyboard with a special connector.

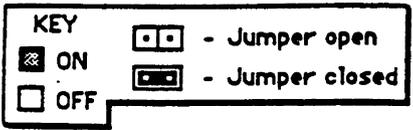
Other PC/3270 and AT/3270 Options:

- \* 3270-PC Short Memory Adapter Card (Printer/Memory Card). The card contains one parallel port, which can only be LPT1, and 128 KB of memory. A 256 KB piggyback card plugs into the printer/memory card to increase system memory up to 640 KB without using any long slots. This board is only used in the IBM PC/3270.
- \* 3270-PC Expanded Memory Adapter (XMA) - This board comes standard with 1 MB of memory and a parallel printer port, which can be configured as LPT1 or LPT2. An additional 1 MB of memory can be added with an optional piggyback card. The memory on this board can be used as base and, with the 3270/PC Control Program version 3, expanded memory. The Control Program can use the memory on the XMA card to run up to 6 independent large PC applications simultaneously (multi-tasking). The card is only used in the AT/3270.

General Information:

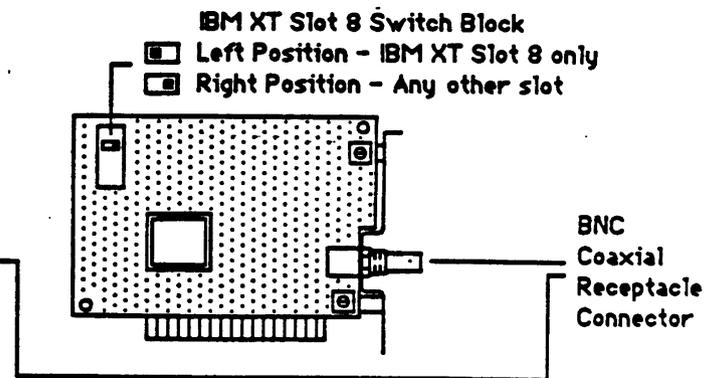
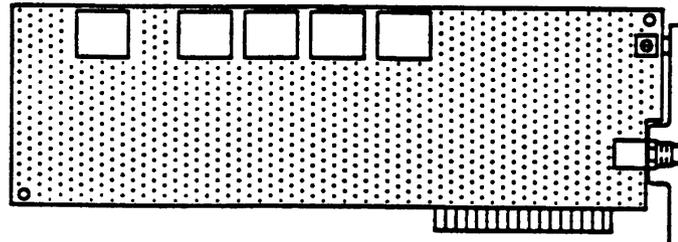
Adapters that will slow the system down if located in the Expansion Unit are: Printer/memory adapter, memory expansion adapters, display adapters, APA Graphics adapter and PS adapter.

# IBM PC, XT, 3270, AT 3270 Emulation Adapters



## Distributed Functions Communications Adapter ( Long Board - 4.77 MHz )

## Distributed Functions Communications Adapter or 3278/79 Emulation Adapter ( Short Board - 4.77 to 8 MHz )



The IBM 3270 " Coaxial " Adapter cards are used to make IBM PC, XT and AT computers emulate IBM 3270-type Terminals. They use coaxial connectors to cable to the IBM Mainframe, via other I/O devices such as the IBM Cluster Control Unit and Communications Unit. There are two versions of the board:

- The " Long " board - This is the original card used in the IBM PC/3270. It is made to work in the IBM PC and XT based systems at 4.77 MHz. It can be used in regular PCs with IBM 3278/79 emulation software. The board uses Base ROM address C0000 and 4K of Ram at CE000-CEFFF.
- The " Short " board - In 1986, this second card replaced the long card. It can be used in computers running at 6 and 8 MHz. It will work in the IBM AT and AT/3270 computers. It can be used in regular PC with IBM 3278/79 emulation software. The board uses Base ROM address CA000 and 8K of Ram at CE000-CFFFF.

Both 3270 boards use Interrupt Request Level 2. There is no way to change their interrupt level. In any PC, XT, AT or compatible computer, there must be no other boards using IRQ 2. Any other boards that are using it, must either be removed or reconfigured with a different interrupt request level. The board uses Base I/O address 2D0-2DF Hex.

The boards have BNC Coaxial ( Receptacle ) connectors that connect to BNC Coaxial ( Plug connector ) Cable. This cabling is the same as IBM 3270 Terminals. This coaxial cable connects the PC to an IBM 3x74 Cluster Control Unit. From there, the system connects to a Communications Processor Unit and finally to the IBM Mainframe.

- ① To install the Coaxial Cable, line up the bump on the receptacle connector with the slot on the plug cable.
- ② Next, push the cable on the connector and turn to the right until it clips into place.



To test the 3270 board in a PC/3270 or AT/3270, run diagnostics, test number 28. This test will also work for 3270 boards installed in regular IBM PC, XT and AT computers. The 3278/79 emulation adapter (which is also the short board) comes with its own diskette that runs the same test.

- If the board passes the test, the code " 2800 " appears on the display.
- If the board fails, check the following:
  - If the message " Error - Not Connected To Control Unit " is displayed, check the coaxial cable connection. If it is good, it is probably not connected to the Control Unit. If the connection is good, replace the board and/or cable.
  - If there is any other error message, the board is not functioning correctly. Make sure that there are no other boards that may be causing a hardware conflict by removing all other unnecessary boards to do the test. If there is still a problem, replace the board.

Board Conflicts: The short board using Base ROM address CA000 will have a conflict with any other adapter using the same ROM address, such as a second fixed disk controller, like the Plus Hardcard 20 set up as Drive D: The IBM PC/327 Workstation Program will not work, but some other 3270 emulation programs ( such as " Extra " ) may work.

1-51

# IBM 3270 Display Adapter and Adapter Options

## IBM 3270 Display Adapter

The IBM 3270 Display Adapter can use one of two monitors: the IBM 5272 Color Display or the IBM 5150 Monochrome Display. These monitors do not support 40 column text, border colors, high intensity, or the use of a light pen. The board can be used in the PC/3270 (XT system board, long slot only, usually in J1, J2 or J3) or the AT/3270 (8 bit slot only, always J1). The board has three 30-pin connectors (Y1, Y2 and Y3) for 3270 Display Adapter "Enhancement" Options. When installing in the IBM XT system board, set switch block 1, 5 and 6 "on", same as the EGA display adapter. When installing in the IBM AT system board, set the video switch "forward", for color display. Note: There will be NO VIDEO unless there is a 3270 Keyboard Timer Board installed. To test the 3270 Display Adapter and Option Adapters (if any) run test 32 from the IBM PC/3270 or AT/3270 Diagnostics.

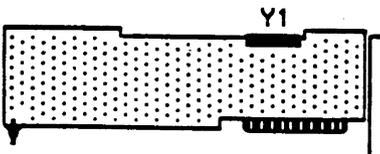
### 3270 Display Adapter Options:

1. All Points Addressable Graphics Adapter (APA), and
2. Extended Graphics Adapter (XGA)

These two boards, which are not interchangeable, allow PC Programs written to use the IBM Color Graphics Adapter run on the 3270 Display Adapter. However, not all programs written for the Color Display (640 x 200 pels) will work with the 5272 Color Display (720 x 350 pels) because of the higher resolution. The APA Option is for PC/3270, and the XGA Option is for the AT/3270.

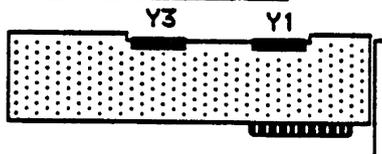
#### IBM PC/3270

All Points Addressable  
(APA) Graphics Option Adapter



#### IBM AT/3270

Extended Graphics Adapter  
(XGA) Option Adapter

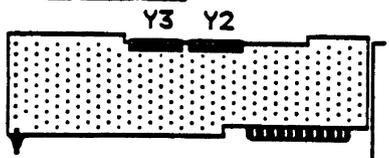


### 3. Programmed Symbols Graphics Adapter (PS)

There are two types, one for the PC/3270 and one for the AT/3270. The Programmed Symbols Graphics Adapter Option is designed to display "host-based program symbol graphics". The host application treats the computer as a 3279 Display Terminal. Because of the cell size, horizontal resolution and vertical resolution, the display is not identical to the 3279 Display Terminal, the host application (usually GDDM) may have to be modified.

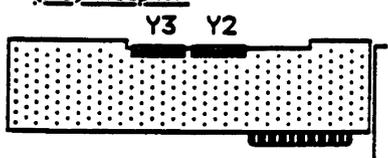
#### IBM PC/3270

Programmed Symbols  
(PS) Adapter

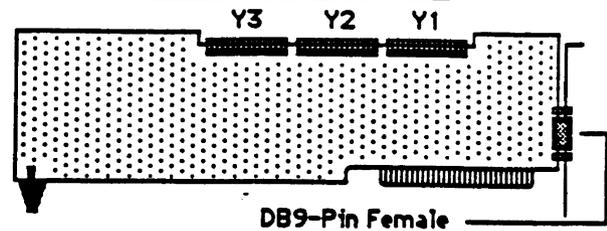


#### IBM AT/3270

Programmed Symbols  
(PS) Adapter

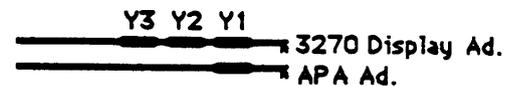


## IBM 3270 Display Adapter

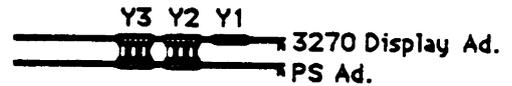
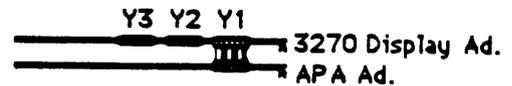


### Installation of 3270 Display Adapter and Option Adapters

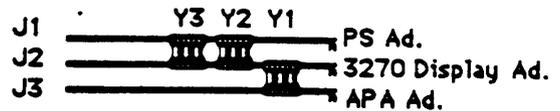
The 3270 Display Adapter is put in one of the far left slots (J1 or J2) of the PC/3270, and the 8-bit slot (J1) at the far left side of the AT/3270.



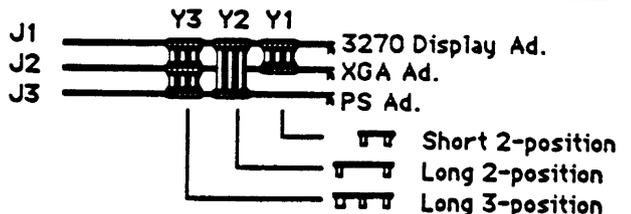
The 3270 Display Adapter must be installed in an 8-bit slot. The Option Adapters are installed in a slot next to the 3270 Display Adapter.



The "Short 2-position" top card connectors are used to connect the Option Adapters to the 3270 Display Ad.



In the PC/3270, two Option Adapters can be connected to the 3270 Display Adapter at the same time from both sides. The same top card connectors are used.



In the AT/3270, two Option Adapters can be connected to the 3270 Display Adapter at the same time, but only from one side. To do this, three different top card connectors must be used. Y1 - Short 2-position; Y2 - Long 2-position; Y3 - Long 3-position (with the thick leg in the PS Option Adapter).

IBM no longer sells the PC/3270 or AT/3270, and no longer sells Option Adapters. They can only be attained as exchange/replacement for defective ones.

# IBM 5272 Color Display (3270 Display)

The IBM 5272 Color Display, (or "IBM 3270 Personal Computer 5272 Color Display"), is found only on the IBM 3270-PC and 3270-AT computers. It can only be used with the 3270 Display Adapter Card. It requires its own power source. It is a high-resolution color display (720 x 350 pixels). The character box is 9 x 14 pels, and character size is 7 x 14 pels. Reverse image, blinking, underscore, and nondisplay are not supported.

For host and notepad sessions, 1920 characters are available, 24 lines x 80 characters, and the 25th line for operator information.

For PC Dos sessions, 2000 characters are available, with 25 lines x 80 characters.

There is an adjustment on the front for brightness. There are adjustments on the back for: Focus, G1 Bias (brightness/voltage), Horizontal Hold, Vertical Hold, Vertical Size, Vertical Linearity, and Vertical Position. Note that the adjustments on the back have very small openings and must have very narrow tools to adjust them this way without removing the cover.

To remove the cover, first remove the monitor stand. Next, remove the two screws on the top, and the two on the bottom.

**BE CAREFUL!** Whenever working with a monitor, be extremely careful not to touch the CRT. Keep hands and face away from the CRT. This is also true for the FlyBack Transformer. When working on adjustments inside a monitor, only touch the actual point of adjustment. Try to use plastic tools only.

### Adjustments:

Too much, or too little, raster or brightness - Screen Out of Focus - Focus

Vertical alignment problem - Vertical Hold, Size

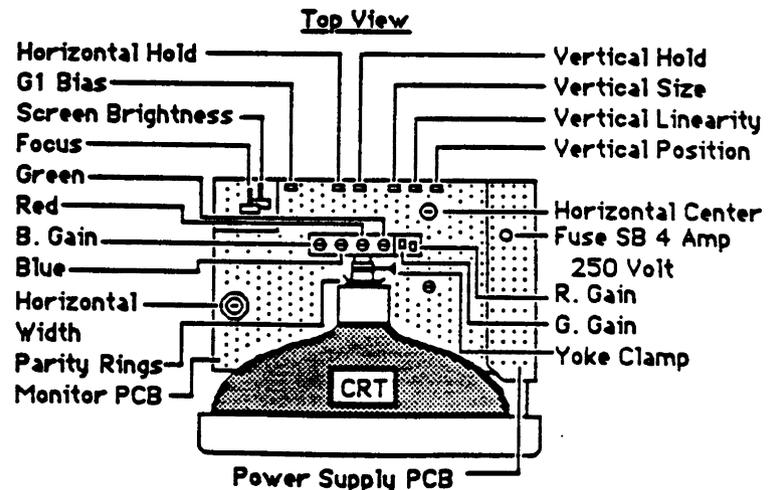
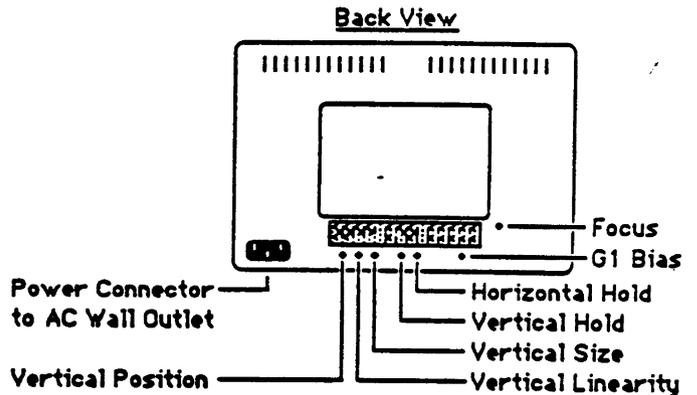
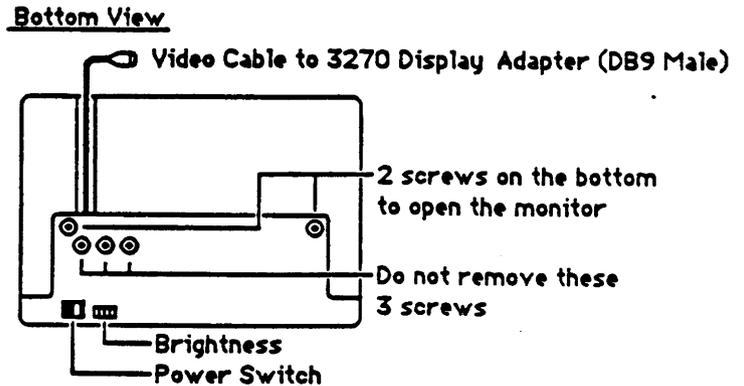
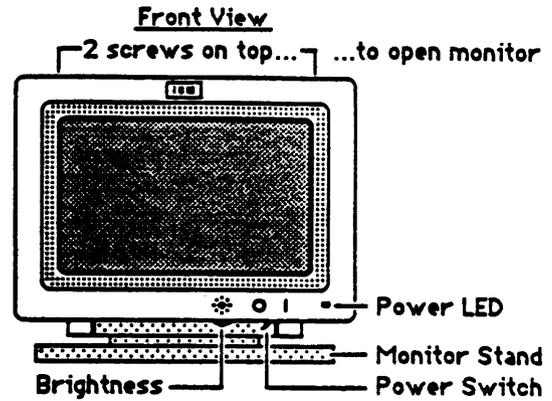
Horizontal alignment problem - Horizontal Phase, Horizontal Hold, Horizontal Center, or Horizontal Width ( may not be able to do this if pot is glued, and use a plastic tool )

Characters out of proportion - Vertical Size  
Incorrect characters on display - Not a monitor problem, check display adapter and software

No power - Power Supply board, may be fuse

Red, Green, or Blue video adjustment - It should not be necessary to make adjustments to RGB signals, unless the color adjustment will be very slight. The Red, Blue and Green Gain adjustments on the Yoke Assembly are these minor adjustments to the color signals. Do not adjust the Red, Green and Blue driver pots.

Do not make adjustments in the field with the Parity Rings and the Yoke Clamp



## IBM 3270/G Display and Adapter

JRG389  
4-11-89

The IBM 3270-PC/G and IBM 3270-AT/G use a specifically different play - adapter and monitor - than the standard 3270 PC and AT.

The 3270/G Display Adapter is designed to use the IBM 5278 Display Attachment Unit with the IBM 5279 Color Display. The card has a 62 pin female connector and looks very similar to the IBM PC Expansion Unit Receiver Card. The word "RECEIVER" is NOT printed on the 3270/G Display Adapter, but the part number "1503902" is on it.

The 3270/G Display Adapter is a half-length card, and is usually found in a slot to the left side of the XT or AT system board. It has a 62 pin female port to connect to the 5278 Display Attachment Unit via a 3 foot male-to-male signal cable. (This is the same cable as the IBM PC Expansion Unit Signal Cable.)

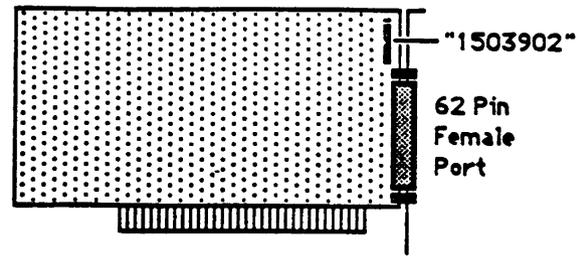
The 5278 Display Attachment Unit provides alphanumeric and graphics processing functions, buffer storage for the 5279 Color Display, and emulation of the IBM Color Graphics Adapter (similar to the APA Option Adapter of the 3270-PC). The 5278 contains hardware to assist in drawing lines and filling areas to draw a graphics picture. The 5278 connects to the system unit via a 3 foot 62 pin signal cable. The 5278 connects to the 5279 Color Display via a 37 pin male-to-female cable. The 5278 Display Attachment Unit receives its power from the 5279 Color Display through this cable.

The 5279 Color Display has a 14 inch diagonal screen. It can display 32 rows of 80 characters (2560 characters) or 49 rows of 80 characters (3920 characters) as selected by the 3270 Control Program. The screen resolution is 720 x 512 pels. Character size is 9 x 10 pels (8 x 10 in a DOS session) in a 9 x 16 box. Due to the vertical resolution, horizontal resolution and character cell size, some PC programs may not be compatible with the 5279 Color Display.

To test the 3270/G, run the "IBM 3270-PC/G or /GX Diagnostics" or the "IBM 3270-AT/G or /GX Diagnostics", test number 44.

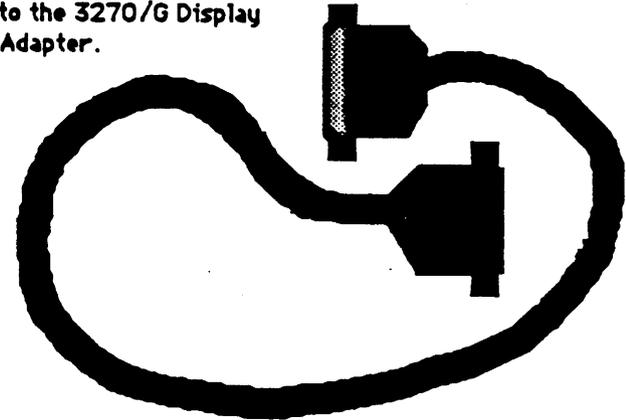
The IBM 3270 Graphics Control Program ver. 1 is for the 3270-PC/G and /GX only, and operates with DOS 2.1 only. Versions 2 and 3 are for the 3270-AT/G and /GX and operate only under DOS 3.1 and 3.2.

### 3270/G Display Unit Adapter



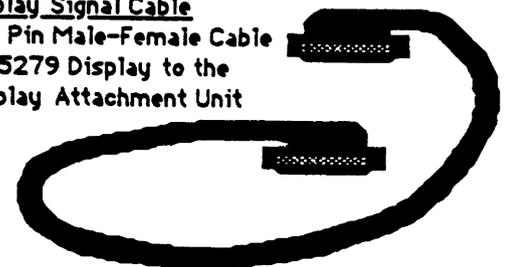
### 5278 System Unit Cable

3 Foot 62 Pin Male-to-Male Cable (same as the IBM PC Expansion Unit Signal Cable) connects the 5278 Display Attachment Unit to the 3270/G Display Adapter.

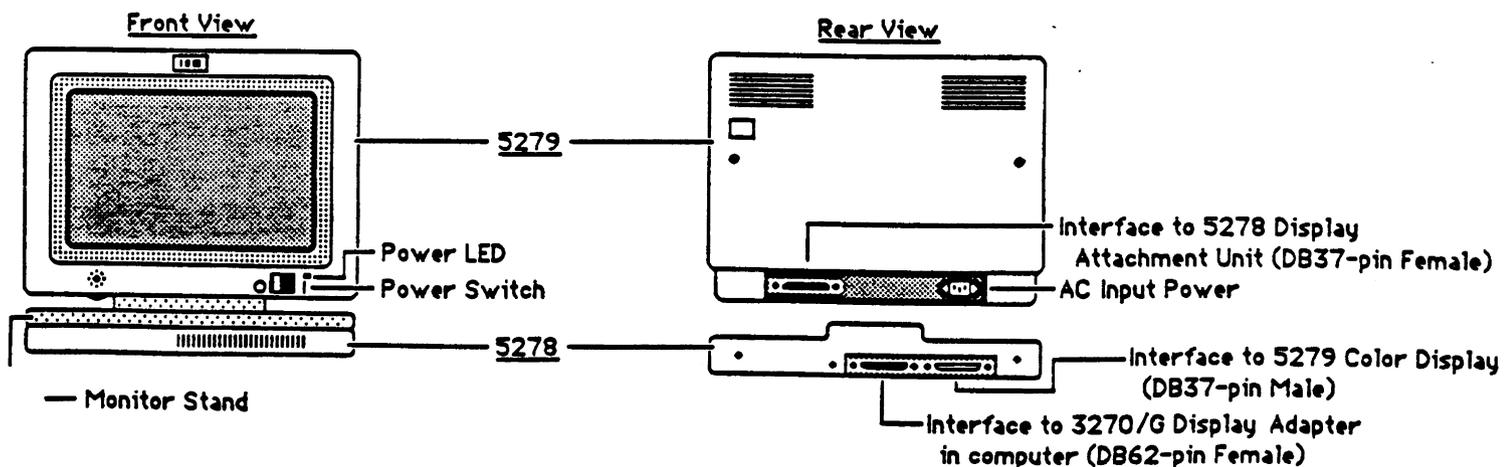


### 5279 Display Signal Cable

2 Foot 37 Pin Male-Female Cable connects 5279 Display to the 5278 Display Attachment Unit



### IBM 5279 Color Display and IBM 5278 Display Attachment Unit





# IBM AT, AT 3270

JRG3'B

Instead of Switches and Jumpers, the IBM AT uses a Setup Program that is saved in its memory in the System Board. It uses a battery to retain this information when it is powered off. To access this setup program, boot the IBM AT Diagnostics run option number 4 to setup the system. This program will setup the following:

Date and Time ( This is the only way to permanently save changes made to the time and date. )

Floppy Diskette Drive(s) ( Number of drives and type of drives ) Drive Types:

Drive A is usually a 1.2 MB High Density Diskette Drive.

Drive B is usually a 360 KB Double Density Diskette Drive; look for an asterick " \* " on the front of the drive.

Hard Disk Drive(s) ( Number of drives and type of drives ) Drive Types:

The drive type is normally labeled on the front of the hard drive and can be seen by removing the cover ( or using a penlight to see through the front of the cover ).

Type 2 is a 20 MB Hard Disk Drive.

Type 20 is a 30 MB Hard Disk Drive.

Display ( will always try to be the present display you are using automatically )

Math Coprocessor ( will always know if one is present or not automatically )

Conventional ( or Base ) Memory

This is all memory up to 640 KB. All IBM AT's have either 256 or 512 KB memory located on the system board. The remaining 128 KB to access up to 640 KB must be located on another memory expansion board.

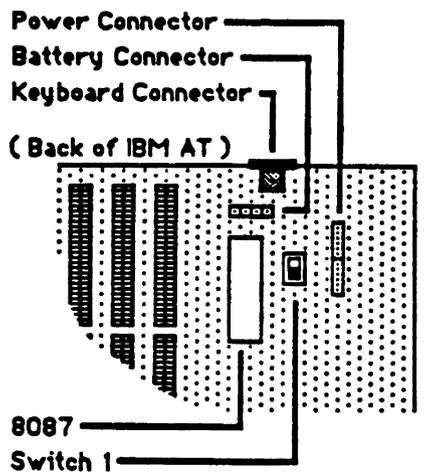
Expanded ( or Extended ) Memory

This is the only type of memory the setup program can directly access past 640 KB. When the memory count on the AT passes 640 KB during the power on self-test, this is the memory being used. It is only used for VDISK, print spooling, ram disks and the XENIX or UNIX Operating System. MS-Dos can not recognize this memory.

## Two Types of Expanded Memory

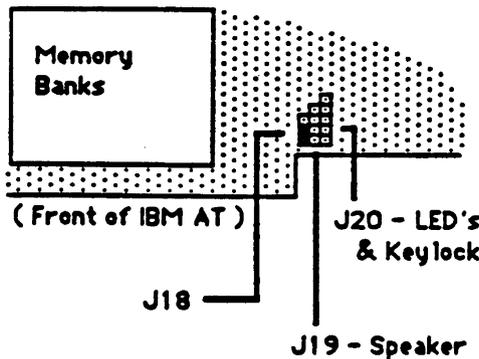
Due to the confusion in terminology between various manufacturers, I will refer to the memory that the IBM AT Setup Program can access after 640 KB as "Extended Memory", and the memory after 640 KB that the program can not access "Paged Memory". The definition for "Extended Memory" is given in the above paragraph. The AST Advantage board can access this type of memory. "Paged Memory" is a different type of memory that can be used in MS-Dos applications. "Paged Memory" must always have a program loaded, usually from the "config.sys" file, to enable this type of memory. Common boards that use this type of memory are the AST Rampage boards, the Intel Above boards, and the IBM Expanded Memory Board ( XMA, used in the AT 3270 only ).

### IBM AT, AT 3270 System Board



#### Switch 1 - Video

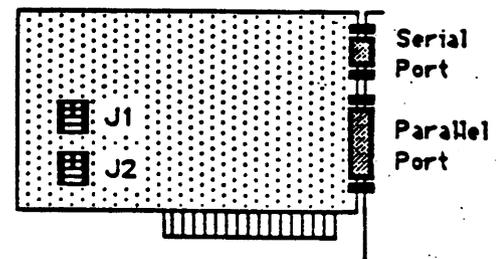
Monochrome <input type="checkbox"/>	Color <input type="checkbox"/>
towards back of the AT	towards front of the AT



#### System Board Memory Jumper J18

256 <input type="checkbox"/>	512 <input type="checkbox"/>
towards back of the AT	towards front of the AT

### IBM AT Serial/Parallel Adapter



#### Jumpers J1 and J2

J1	J2
Com1 <input type="checkbox"/>	Lpt1 <input type="checkbox"/>
Com2 <input type="checkbox"/>	Lpt2 <input type="checkbox"/>

STANDARD COMPONENTS

Multicolor Graphics Array MCGA Video cable connector socket.  
Color text better than EGA!

Micro Channel Expansion Slots: three 8/16-bit slots for PC and XT boards. Slots are horizontally mounted, parallel with system board.

Serial, male DB-25 cable socket (up to 19200 baud).

Parallel, female DB-25 cable socket.

Mouse, 6-pin DIN plug socket.

Keyboard, 6-pin DIN plug socket.

Power supply interface for a 70 Watts power supply.

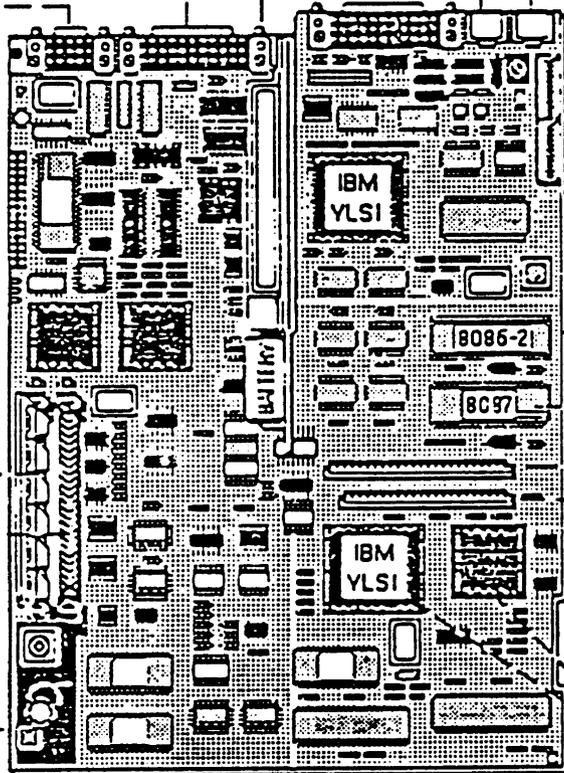
Processor: Intel™ 8086-2 has 16-bit data bus, with a 16-bit internal data path. Maximum speed is 8Mhz..

Math Coprocessor: Intel™ 8087. Maximum speed is 10Mhz..

Interface socket (male) for a 20 Mb hard disk drive.

Interface socket (male) for a microfloppy drive: 3.5-inch 720K.

VLSI: IBM proprietary Very Large Scale Intergrated chips.



FRONT OF DESKTOP-TYPE SYSTEM

Expansion slots for Static Inline Memory Module (SIMM) boards. Illustration shows one of two 256K DRAM boards installed. One 128K bank of RAM soldered into system board.

Battery for clock calendar.

Speaker for system.

Maximum RAM is 640K. System designed for DOS (3.3 or better) only.

Programmable Option Select, POS, in one 64K CMOS RAM chip. Handles system set up; time of day; automatically detects installed cards and configures according to priority.

STANDARD COMPONENTS

Micro Channel Expansion Slots: four 8/16-bit slots for PC and XT boards; one Video Graphic Array (VGA) expansion slot for 8514A display Adapter Board (16-color 1024x768 pixel format) linked into system board's built-in VGA circuitry.

Programmable Option Select POS in one 64K CMOS RAM chip for system set up; time of day; automatically detects installed cards and configures according to priority.

Video cable connector socket.

Parallel, female DB-25 cable socket.

Serial, male DB-25 cable socket (up to 19200 baud).

Mouse 6-pin DIN plug socket.

Keyboard 6-pin DIN plug socket.

Fan connector socket.

Video Memory handled by eight 4-bit 64K chips.

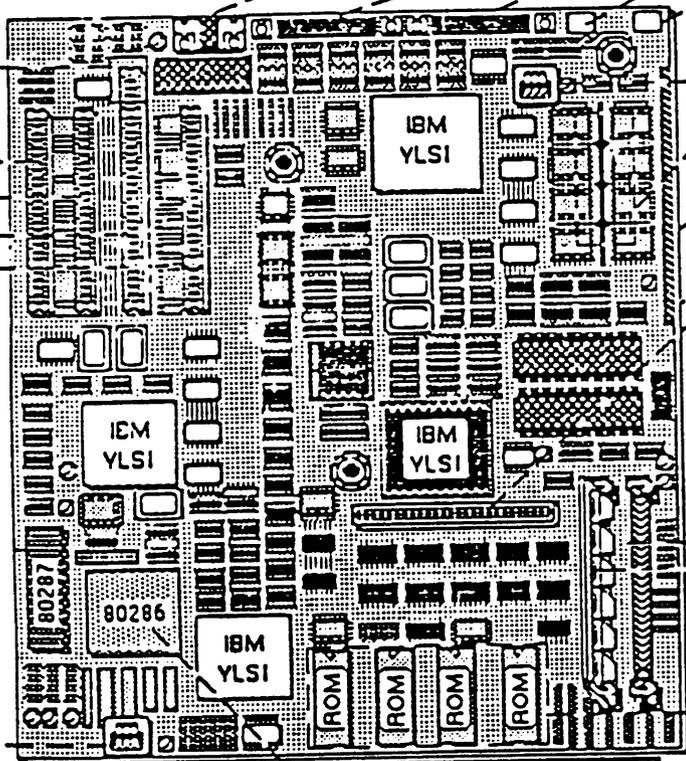
Power supply interface

Interface sockets for a microfloppy drive board with interfaces for two 3.5-inch 1.44Mb. The hard disk option also uses this micro channel expansion slot.

IBM proprietary Very Large Scale Intergrated (VLSI) chips.

Expansion slots for Static Inline Memory Module (SIMM) boards. Illustration shows one of two 512K DRAM boards installed.

Four 32K ROM BIOS chips.



FRONT OF DESKTOP-TYPE SYSTEM

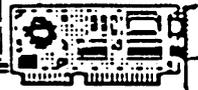
Plug to system speaker

Math Coprocessor: Intel 80287. Maximum speed is 10Mhz.

Processor: Intel™ 80286 (a square 68-pin chip design) has 16-bit data bus, accepts 8-, and 16-bit data types, 24-bit internal data path. Maximum speed is 20 Mhz. Maximum addressable RAM is 16 Mbs.; virtual memory up to 1Gb. Model 50 comes with a 10Mhz. 80286-10 processor.

# PS/2™ MODEL 60 SYSTEM BOARD

ILLUSTRATIONS



## STANDARD COMPONENTS

System power supply interface.

System's Fuse.

Keyboard plug socket.

Mouse plug socket.

Parallel DB-25 cable socket.

Serial DB-25 cable socket.

Video cable connector socket.

IBM proprietary Very Large Scale Integrated VLSI chips.

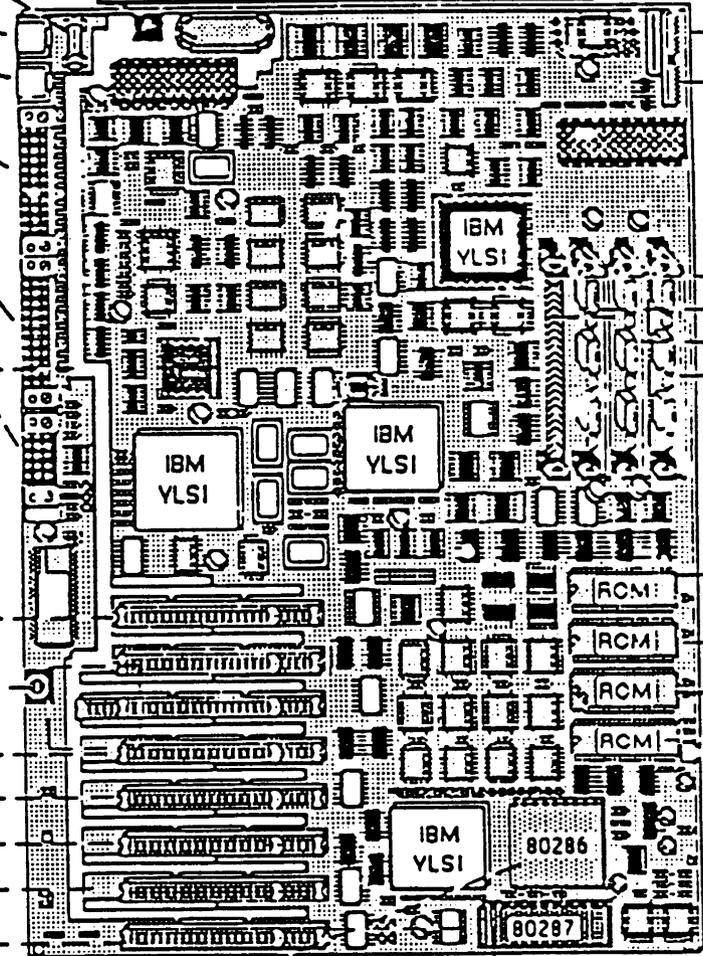
Metal grounding strap.

Interface sockets for 3.5-inch 1.44Mb drive.

System comes with options for an additional Hard Disk drive (maximum 70 Mb.).

Expansion slots for Static Inline Memory Module (SIMM) boards. Illustration shows three of four 256K boards installed (vertically).

### TOP OF TOWER-TYPE SYSTEM



### BACK OF TOWER-TYPE SYSTEM

Micro Channel Expansion Slots: Seven 8/16-bit slots for PC and XT Boards; one expansion slot for Video Graphic Array (VGA) alternative video adapter board linked into system board's built-in VGA circuitry.

Processor: Intel™ 80286 (a square 68-pin chip design) has 16-bit data bus accepts 8-, and 16-bit data types; 24-bit internal data path. Maximum speed is 20 Mhz. Maximum addressable RAM is 16 megabytes; virtual memory up to 1 Gb., requires OS/2..

Model 60 comes with a 10Mhz 80286-10 processor.

Math Coprocessor: Intel™ 80287. Maximum speed is 10Mhz..

Plug to speaker

128K ROM

# PS/2™ MODEL 80 SYSTEM BOARD

ILLUSTRATIONS



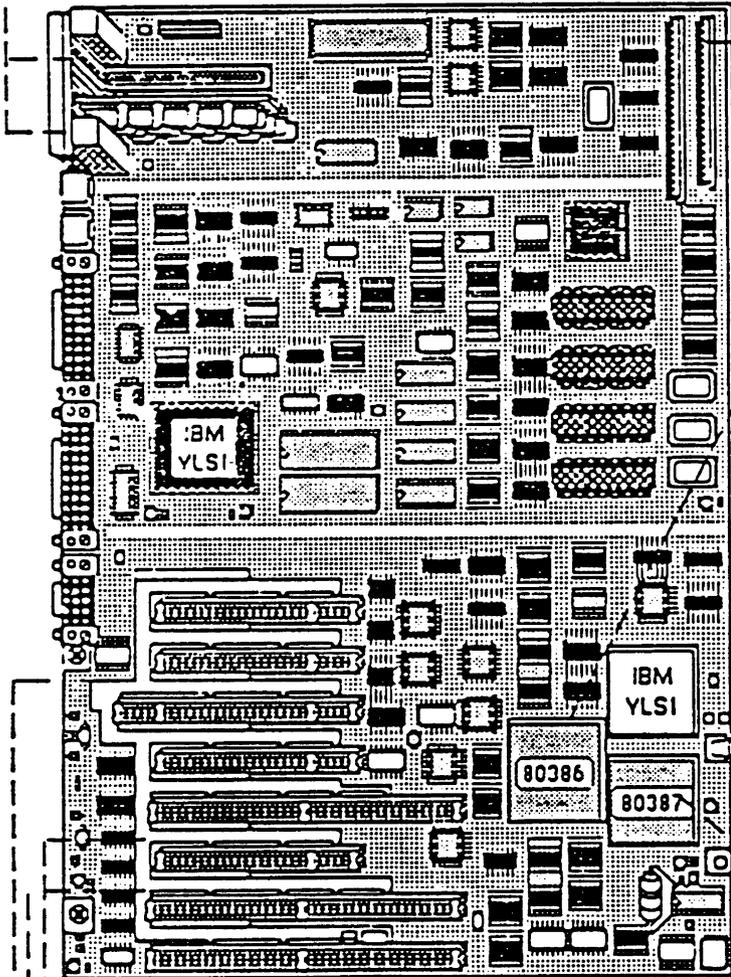
## STANDARD COMPONENTS

Expansion slots for two Static Inline Memory Module (SIMM) boards: 512K each (Model 80-78); 2Mb each (Model 90-111). (RAM speed is 30 ns.). Illustration shows one board installed (vertically).

TOP OF  
"TOWER-TYPE"  
SYSTEM

IBM proprietary Very Large Scale Integrated (VLSI) chips.

NOTE: IBM uses Surface Mounted Devices to conserve space. SMD's cannot be desoldered.



Expansion slots (male) for optional one 3.5-inch, 1.44 Mb., microfloppy drive and two Hard Disk drives (maximum 115 Mb.).

### FRONT OF TOWER-TYPE SYSTEM

Processor: Intel™ 80386. 32-bit data bus accepts 8-, 16- and 32-bit data types. 32-bit internal data path with 7 registers. Maximum speed is 24 Mhz. Maximum addressable RAM is 4 gigabytes; virtual memory up to 64 terabytes.

Model 80 comes with either a 80386-16, or -20 processor with either 16 or 20 Mhz processing speed. Maximum RAM expansion is 16 Mb, a combination of SIMMS and other expansion boards.

To speaker plug socket.

Math Coprocessor: Intel™ 80387. Maximum speed is 20 Mhz. Illustration shows a Model 80-111 with a 80387-16 which performs calculations at 16 Mhz. speed.

### Micro Channel Expansion Slots:

Four 8/16-bit slots for PC and XT Boards;

Three 32-bit slots, usually for RAM expansion;

One Video Graphic Array (VGA) expansion slot for alternative video adapter board linked into system board's built-in VGA circuitry.

NOTE: metal grounding strap wraps around expansion slots.

## Chapter 13. Personal System/2 Options and Adapters (8550, 8555, 8560, 8570, 8573, and 8580)

This section addresses Personal System/2 (PS/2) options and adapters designed to function with the PS/2's Micro Channel™ architecture.

### Feature Compatibility Chart

Option Name	Option No.	FRU No.	Machine Type					
			8550	8555	8560	8570	8573	8580
PC Network Adapter/A	1501222	25F8279 <i>PC130037</i>	X	X	X	X	X	X
PC Baseband Adapter/A	1501223	72X8102 <i>PC130056</i>	X	X	X	X	X	X
Display Adapter 8514/A	1887972	1887971 <i>PC130048</i>	X	X	X	X		X
8514 Memory Expansion	1887989	1887708 <i>PC130062</i>	X	X	X	X		X
80286 Expansion Memory Adapter/A	1497252 <i>PC120023</i>	1497253	X		X			
0Mb - 8Mb Expansion Memory Adapter/A	1497259 <i>PC120044</i>	1497253	X	X	X			
2Mb Memory Module Kit	30F5360	74X8637 <i>PC120012</i>	X	X	X			
0.5Mb Memory Module Kit	30F5348	1497256 <i>PC120011</i>	X	X	X			
80286 Memory Expansion Adapter	6450344	72X8532 <i>PC120015</i>	X		X			
80286 Memory Kit (SIPs)	6450345	61X8906 <i>PC120014</i>	X		X			
80386 System Board Memory Expansion Kit	6450375	72X6670 <i>PC130027</i>						1
80386 Memory Expansion	6450367 <i>PC130044</i>	72X6671 <i>PC130053</i>				X	X	X
80386 Memory Kit	6450372	72X6672				X	X	X
2Mb - 8Mb 80386 Memory Expansion Option	6450605 <i>PC130031</i>	90X9556 <i>90X7391</i>				X	X	X
1Mb Memory Module 85 ns	6450603 <i>16-10MHZ F2-</i>	90X8624 <i>PC120036</i>	X	X	X	X		X
2Mb Memory Module 85 ns	6450604	90X8625 <i>PC120037</i>	X	X	X	X	X	X

Table 13-1 (Page 2 of 4). PS/2 Options Compatibility Chart

Option Name	Option No.	FRU No.	Machine Type					
			8550	8555	8560	8570	8573	8580
2Mb Memory Module 80 ns for 25 MHz System Boards	6450608	15F7658				4		
Dual Asynchronous Adapter/A	6451013 <i>72x 8529</i>	34F0008 <i>PC1200 3</i>	X	X	X	X	X	X
Multiprotocol Adapter/A	6451003 <i>72x 8520</i>	90X8995 <i>PC1200 4</i>	X	X	X	X	X	X
300/1200 Modem Adapter/A	6450349 <i>72x 8522</i>	34F0006 <i>PC1200 3</i>	X	X	X	X	X	X
Pointing Device (Mouse)	6450350 <i>PC1100 33</i>	61X8923	X	X	X	X	X	X
4869 Diskette Adapter/A	6450245 <i>PC1200 15</i>	72X6758	X		X	X		X
5.25-in Diskette Adapter/A	6451007 <i>72x 8525</i>	15F7996	X	X	X	X	X	X
1.44Mb Diskette Drive	6450353 N/A N/A	72X8523 33F8211 38F5936	<i>72x 8523</i>	X	X	X	X	X
30Mb Fixed Disk	N/A N/A	90X9403 6128277	X	X				
44Mb Fixed Disk	6450354	72X8541			X			X
60Mb Fixed Disk	6450606 N/A	90X8627 6128272	X	X		X	X	
70Mb Fixed Disk	6450355	72X8519			X			X
115Mb Fixed Disk	6450377	90X7392			X			X
120Mb Fixed Disk	N/A	90X9286				X	X	
314Mb Fixed Disk	6450381	90X8745						X
80287 Math Coprocessor	6450356	72X8528	X		X			
80387SX Math Coprocessor	N/A	33F8160		X				
80387 Math Coprocessor (16 MHz)	6450369	72X6673				X		2
80387 Math Coprocessor (20 MHz)	6450378	90X7393				X	X	3
80387 Math Coprocessor (25 MHz)	6450607	15F7661				4		
6157 Tape Drive Adapter	92X1458	92X1459	X	X	X	X	X	X
Token-Ring Adapter/A	69X8138 <i>PC1200 20</i>	83X7488	X	X	X	X	X	X
Token-Ring Network RPL	25F8887	83X9180	X	X	X	X		X

30K6

1.2.06

Option Name	Option No.	FRU No.	Machine Type					
			8550	8555	8560	8570	8573	8580
Token-Ring 16/4 Adapter/A	16F1133	16F1144	X	X	X	5	X	X
3270 Connection/B	25F8448	25F8450 <i>PC/20031</i>	X	X	X	X	X	X
Internal Optical Drive	63X4166	68X8825	X	X	X		X	X
Optical Drive Adapter	63X4166	63X4266	X	X	X		X	X
High Speed Adapter/A	65X1905	65X1900	X	X	X	X	X	X
3117 Adapter/A	65X1925	65X1920	X	X	X	5	X	X
Pageprinter Adapter/A	75X8267	75X8213	X	X	X	X	X	X
System 36/38 Workstation Emulation Adapter/A	69X6279	69X6292	X	X	X	X	X	X
4680 Store Loop Adapter	83X8187	96X4852			X	X		X
4680 Store Loop Cable	6316840	6316840			X	X		X
4680 Second Store Loop Adapter	83X7575	96X4852			X	X		X
3119 PageScanner Adapter/A	94X2415	94X2425	X	X	X	X	X	X
Artic Multiport/2 (512Kb)	09F1897	09F1888	X	X	X	X	X	X
Artic Multiport/2 w/ 1Mb memory	16F1820	09F1962	X	X	X	X	X	X
X.25 Interface Coprocessor/2	16F1858	15F8888	X	X	X	X		X
Internal Tape Backup Unit	30F5279	30F5273	X		X	X		X
5.25-in 1.2Mb Internal Diskette Drive	6451006	15F6912			X			X
2Mb - 8Mb 80286 Memory Expansion Option (w/o memory)	6450609	15F8292	X	X	X			
Display Station Emulation Adapter/A	92X0743	69X6283	X	X	X	X	X	X
Image Adapter/A	07F4400	07F4401	X	X	X	X	X	X
300/1200/2400 Internal Modem/A	94X1755	65X1253	X	X	X	X	X	X



Table 13-1 (Page 4 of 4). PS/2 Options Compatibility Chart

Option Name	Option No.	FRU No.	Machine Type					
			8550	8555	8560	8570	8573	8580
Enhanced 80386 Memory Option w/o Memory	—	34F2825				X	X	X
• 2Mb Kit	34F3077	90X8625				X	X	X
• 4Mb Kit	34F3011	—				X	X	X
• 4Mb Memory Module	34F2933	34F2934				X	X	X
<b>Legend:</b> 1 = Model 041 only 2 = Models 041 and 071 only 3 = Not used on Models 041 and 071			4 = Model 8570-A21 only 5 = Model 8570-E61 and 8570-121 only.					

The following list describes the PS/2 family options and adapters. Most options are listed in the option compatibility chart at the beginning of this chapter.

Option cards are smaller and redesigned for the new Micro Channel architecture. Therefore, PS/2 family options and IBM PC family products options are not compatible with each other.

#### 80287 Math Coprocessor (8550 and 8560)

This companion processor to the 80286 Microprocessor increases speed and precision in arithmetic, logarithmic, and trigonometric functions. The parallel operation decreases operating time by allowing the coprocessor to do mathematical calculations while the 80286 Microprocessor continues to do other functions. A special socket on the system board is reserved for this optional processor chip.

#### 80387 Math Coprocessor (8555, 8570, 8573, and 8580)

This companion processor to the 80386 Microprocessor increases speed and precision in arithmetic, logarithmic, and trigonometric functions. The option is available in three speeds: 16 MHz, 20 MHz, and 25 MHz for Models 70, 73, and 80.

The optional 80387SX Math Coprocessor provides enhanced performance in arithmetic calculations for the PS/2 Model 8555.

#### 80286 Memory Expansion option (8550 and 8560)

This option comes with 512Kb of random access memory (RAM) and is expandable in 512Kb increments to a maximum of 2Mb. The base field replaceable unit (FRU) card contains no RAM.

Two 256 × 9 single inline packages (SIPs) form a bank of 512Kb of pluggable, dynamic RAM. Each expansion card can support four banks. Special connectors allow easy memory expansion and repair. This option card plugs into any expansion slot in the system unit.

#### 80286 Memory Expansion Kit (8550 and 8560)

This kit provides an additional 512Kb memory on the memory expansion option adapter. Each kit contains two 256Kb memory SIPs. Each memory expansion adapter comes with one memory expansion kit installed. Three additional kits can be installed on each memory adapter, for a total of 2Mb maximum on each adapter card.

#### System Board Memory Expansion Kit (8580)

This memory expansion kit provides 1Mb of 80 nanosecond (ns) memory (Model 041 only) on the system board. The addition of this option completes the 2Mb capacity of the system board. No user setup is required.

#### 80386 Memory Expansion Adapter (8570, 8573, and 8580)

The 2Mb–6Mb memory expansion option is a single, full-length, family two-circuit card and provides the expansion of supported memory to 16Mb. The adapter comes standard with 2Mb of 80 ns memory inserted in one of the three 96-pin connectors provided for memory expansion kits. It is designed to fit into any of the three 32-bit I/O connectors located on the system board and has no switch settings or setup requirements for the user. This adapter can be used without fully populating the system board memory slots.

#### 80386 Memory Expansion Kit (8570, 8573, and 8580)

This memory expansion kit provides 2Mb of 80 ns memory and can be installed only on the memory expansion option card. Memory read operations are performed at the same speed as the system board memory through the use of a unique architectural feature called the Matched Memory Cycle. Using the new 1Mb chips, 6Mb can be installed on one option card. No user setup is required.

## **Chapter 14. Diagnostic MAPs**

MAP 0020: Power (Type 8550)	14-2	MAP 0300: Keyboard (Type 8573)	14-38
MAP 0020: Power (Type 8555)	14-5	MAP 0600: Diskette Drive	14-40
MAP 0020: Power (Type 8560)	14-8	MAP 0600: Diskette Drive Start (Type 8555)	14-43
MAP 0020: Power (Type 8570)	14-11	MAP 0600: Diskette Drive Start (Type 8573)	14-44
MAP 0020: Power (Type 8573)	14-14	MAP 0600: Diskette Drive (Type 8555)	14-45
MAP 0020: Power (Type 8580)	14-17	MAP 0600: Diskette Drive (Type 8573)	14-47
MAP 0200: Memory Start	14-21	MAP 2400: System Board Video	14-49
MAP 0200: Memory (Type 8550)	14-22	MAP 7400: IBM Personal System/2 Display Adapter 8514/A	14-51
MAP 0200: Memory (Type 8555)	14-24	MAP 14900: Plasma Display Adapter (Type 8573)	14-57
MAP 0200: Memory (Type 8560)	14-26		
MAP 0200: Memory (Type 8570)	14-27		
MAP 0200: Memory (Type 8573)	14-30		
MAP 0200: Memory (Type 8580)	14-32		
MAP 0300: Keyboard	14-35		

# MAP 0020: Power (Type 8550)

Symptom Explanation	Conditions That Could Cause This Symptom
You have entered this MAP because you were unable to complete the POST, or you suspect a power problem.	<ul style="list-style-type: none"> <li>• The power supply is failing.</li> <li>• The system board is failing.</li> <li>• An external device is failing.</li> <li>• A diskette or fixed disk drive is failing.</li> <li>• An option adapter is failing.</li> <li>• The math coprocessor is failing.</li> </ul>

**001**

- Power off the system.
- Disconnect all cables and external devices, except the display, keyboard, and power cord, from the system unit.
- Power on the system.

Did the failing symptom remain?

Yes No

**002**

**CAUTION:**

Power off the system before connecting any device.

- Connect the external devices to the system unit one at a time (power off the system each time) until the failing symptom returns.

Repair or replace the device causing the failure.

**003**

Is the fan running?

Yes No

**004**

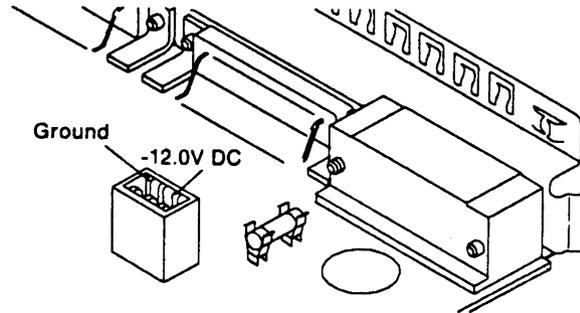
- Go to Step 006.

**005**

- Go to Step 009.

**006**

- Power off the system.
- Remove the fan assembly.
- Power on the system.
- Check the fan connector for approximately -12V DC (includes a range of -9.0 to -15.0V DC), as shown in Figure 14-1.



LEX42745

Figure 14-1. Fan Connector

Is the voltage correct?

Yes No

**007**

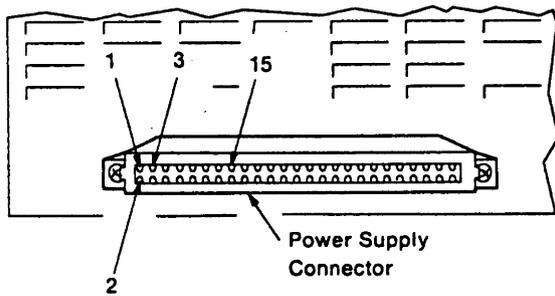
- Go to Step 009.

**008**

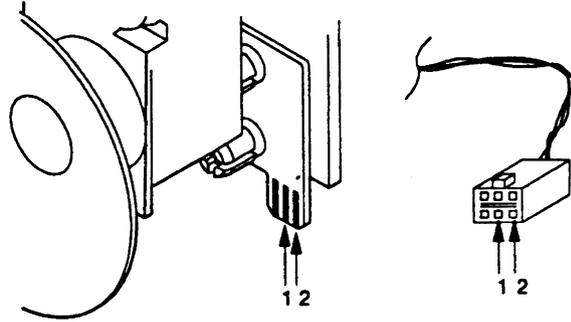
- Replace the fan assembly.

**009**

- Power off the system.
- Unplug the power cord.
- Remove the power supply and place it on a work surface with the power supply connector facing up.
- Plug in the power cord and power on the power supply.
- Check the power supply connector for the voltages shown in Figure 14-2.



LEX42796



LEX42797

(V DC) Minimum	(V DC) Maximum	Ground Pin	Pin Number
-9.0	-15.0	2	1
+9.0	+15.0	2	3
+3.7	+ 6.2	2	15

Figure 14-2. Power Supply Voltages

Are the voltages correct?

Yes No

010

Replace the power supply.

011

Is the power-good light on?

Yes No

012

Replace the power supply.

013

- Power off the power supply and reinstall it in the system.
- Remove the battery and speaker assembly.
- Depending on which battery and speaker assembly is installed, check the speaker continuity at points 1 and 2, as shown in Figure 14-3. (If the assembly has a detachable cable, remove it and check it for continuity.)

Figure 14-3. Speaker Continuity

Is there continuity?

Yes No

014

Replace the failing FRU.

015

You may have a failing diskette drive or fixed disk drive. Perform the following:

- Power off the system.
- Reinstall the battery and speaker assembly.
- Remove all of the drives.
- Power on the system.

Did the failing symptom remain?

Yes No

016

- Install the drives one at a time (power off the system each time) until the failing symptom returns.

Replace the drive causing the failure.

017

You may have a failing fixed disk adapter, diskette drive bus adapter, or option adapter. Perform the following:

- Power off the system.
- Remove the fixed disk adapter, diskette drive bus adapter, and all option adapters.
- Power on the system.

(Step 017 continues)

017 (continued)

Did the failing symptom remain?

Yes No

018

- Install the fixed disk adapter, diskette drive bus adapter, and all option adapters one at a time (power off the system each time) until the failing symptom returns. Replace the FRU causing the failure.

019

You may have a failing math coprocessor. Is a math coprocessor installed in the system?

Yes No

020

Go to Step 023.

021

- Power off the system.
- Remove the math coprocessor.
- Power on the system.

Did the failing symptom remain?

Yes No

022

- Power off the system. Replace the math coprocessor.
- or -
- If that does not correct the problem, replace the system board.
- or -
- If that does not correct the problem, replace the power supply.

023

- Power off the system.
- Disconnect the keyboard cable from the system unit.
- Power on the system.

Did the failing symptom remain?

Yes No

024

Go to "MAP 0300: Keyboard."

025

- Power off the system.
- (Step 025 continues)

025 (continued)

Replace the system board.

- or -

If that does not correct the problem, replace the memory module packages.

---

# MAP 0020: Power (Type 8555)

Symptom Explanation	Conditions That Could Cause This Symptom
You have entered this MAP because you were unable to complete the POST, or you suspect a power problem.	<ul style="list-style-type: none"> <li>• An external device is failing.</li> <li>• The power supply is failing.</li> <li>• A diskette drive is failing.</li> <li>• A disk drive is failing.</li> <li>• An adapter is failing.</li> <li>• The system board is failing.</li> <li>• The math coprocessor is failing.</li> <li>• The speaker is failing.</li> <li>• The bus adapter is failing.</li> </ul>

**001**

- Power off the system.
- Disconnect all external cables and devices, except the display, keyboard, and power cord, from the system unit.
- Power on the system.

Did the failing symptom remain?

Yes No

**002**

**CAUTION:**

Power off the system before connecting any device.

- Connect the external devices to the system unit, one at a time (power off the system each time), until the failing symptom returns.

Repair or replace the device causing the failure.

**003**

- Power off the system.
- Unplug the power cord.
- Unplug the power supply connectors P7 and P14 from the system board.
- Plug in the power cord.
- Power on the power supply.

Does the fan run continuously?

Yes No

**004**

Replace the power supply.

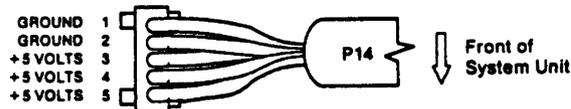
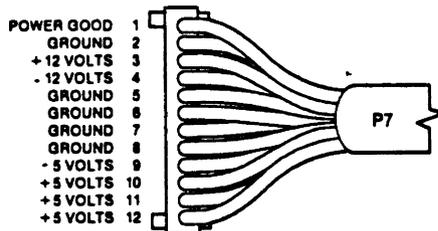
**005**

(Step 005 continues)

**005** (continued)

- Check the power supply voltages.

(V DC) Minimum	(V DC) Maximum	-Lead Pin	+Lead Pin
+ 4.8	+ 5.2	P7-5	P7-10
- 4.5	- 5.4	P7-9	P7-5
+11.5	+12.6	P7-5	P7-3
+10.8	+12.9	P7-4	P7-8



(V DC) Minimum	(V DC) Maximum	-Lead Pin	+Lead Pin
+ 4.8	+ 5.2	P14-1	P14-3
+ 4.8	+ 5.2	P14-1	P14-4
+ 4.8	+ 5.2	P14-2	P14-5

Figure 14-4. P7/P14 Power Check

(Step 005 continues)

005 (continued)

Are the voltages correct?

Yes No

006

Replace the power supply.

007

- Power off the system.
- Check the continuity between pins P7-1 and P7-2.

Is the continuity above 1K ohms?

Yes No

008

Replace the power supply.

009

- Power off the system.
- Connect the power supply connectors to the system board.
- Unplug the speaker cable from the bus adapter.
- Check the continuity of the speaker as shown in Figure 14-5.

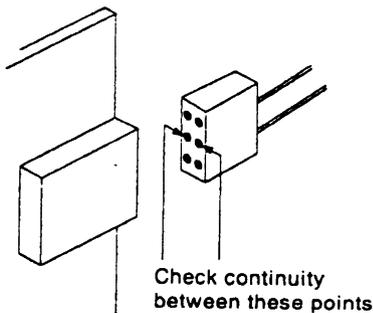


Figure 14-5. Speaker Continuity

Does the speaker have continuity?

Yes No

010

Replace the speaker.

011

You may have a failing fixed disk drive, fixed disk drive cable, or bus adapter.

- Connect the speaker cable to the bus adapter.
- Unplug the fixed disk drive cable from the top of the bus adapter.

(Step 011 continues)

011 (continued)

- Power on the system.

Did the failing symptom remain?

Yes No

012

Replace the fixed disk drive.

- or -

If the problem continues, replace the fixed disk drive cable.

- or -

If the problem continues, replace the bus adapter.

013

You may have a failing diskette drive or diskette drive cable.

- Power off the system.
- Connect the fixed disk drive cable to the bus adapter.
- Disconnect the diskette drive cable from the system board.
- Power on the system.

Did the failing symptom remain?

Yes No

014

Replace the diskette drive.

- or -

If the problem continues, replace the diskette drive cable.

015

You may have a failing bus adapter, option adapter, or device.

- Power off the system.
- Connect the diskette drive cable to the system board.
- Remove all option adapters, devices, and the bus adapter.

Note: If an 8514/A display adapter is installed, it will be removed with the bus adapter. Move the display signal cable to the system board display connector.

- Power on the system.

Did the failing symptom remain?

Yes No

016

Go to Step 028.

017

You may have a failing math coprocessor.  
Is a math coprocessor installed in the system?

Yes No

018

Go to Step 023.

019

- Power off the system.
- Remove the math coprocessor.
- Power on the system.

Did the failing symptom remain?

Yes No

020

Replace the math coprocessor.

- or -

If the problem continues, replace the system board.

- or -

If the problem continues, replace the power supply.

021

- Power off the system.
- Disconnect the keyboard cable from the system unit.
- Power on the system.

Did the failing symptom remain?

Yes No

022

Go to MAP 0300: Keyboard.

023

Is a memory module kit installed in the slot nearest the bus adapter?

Yes No

024

Go to Step 027.

025

- Power off the system.
- Remove the memory module kit nearest the bus adapter.

(Step 025 continues)

025 (continued)

- Power on the system.

Did the symptom remain?

Yes No

026

Replace the memory module kit.

027

Replace the system board.

- or -

If the problem continues, replace the memory module kits.

- or -

If the problem continues, replace the bus adapter.

---

028

- Install the bus adapter, then the option adapters and devices, one at a time (power off the system each time), until the failing symptom returns.

Does the adapter or device that caused the failing symptom to return consist of more than one FRU?

Yes No

029

Replace the FRU.

030

Remove FRUs from the adapter or device one by one (power off the system each time), until the failing symptom goes away. Replace the last FRU removed. If the problem continues, replace the adapter or device. If the problem continues, replace the system board.

---



## MAP 0020: Power (Type 8560)

Symptom Explanation	Conditions That Could Cause This Symptom
You have entered this MAP because you were unable to complete the POST, or you suspect a power problem.	<ul style="list-style-type: none"> <li>• An external device is failing.</li> <li>• The power supply is failing.</li> <li>• A diskette drive is failing.</li> <li>• A fixed disk drive is failing.</li> <li>• An option adapter is failing.</li> <li>• The system board is failing.</li> <li>• The math coprocessor is failing.</li> <li>• The speaker is failing.</li> </ul>

001

- Power off the system.
- Disconnect all cables and external devices, except the display, keyboard, and power cord, from the system unit.
- Power on the system.

Did the failing symptom remain?

Yes No

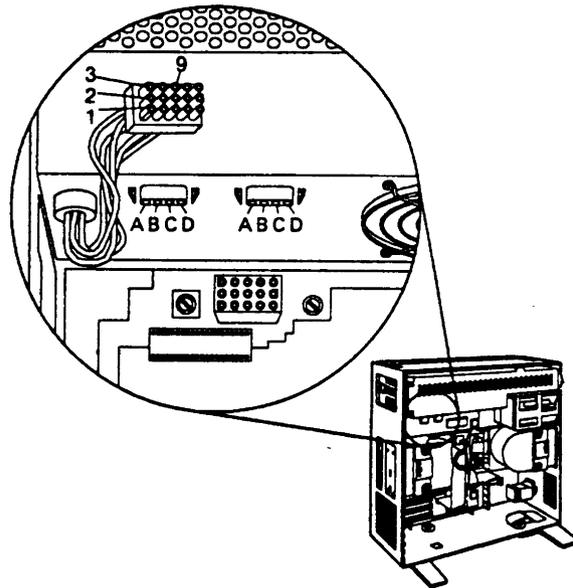
002

**CAUTION:**

Power off the system before connecting any device.

- Connect the external devices to the system unit one at a time (power off the system each time) until the failing symptom returns.

Repair or replace the device causing the failure.



003

- Power off the system.
- Unplug the three power supply connectors.
- Power on the power supply.
- Check the power supply connectors for the voltages shown in Figure 14-6.

LEX42803

(V DC) Minimum	(V DC) Maximum	Ground Pin	Pin Number
-9.0	-15.0	2	9
+9.0	+15.0	2	3
+3.7	+ 6.2	2	1
+3.8	+ 6.3	B	D
+9.0	+15.0	C	A

Figure 14-6. Power Supply Voltages

(Step 003 continues)

003 (continued)  
Are the voltages correct?

Yes No

004

Replace the power supply.

005

Is the power-good light on?

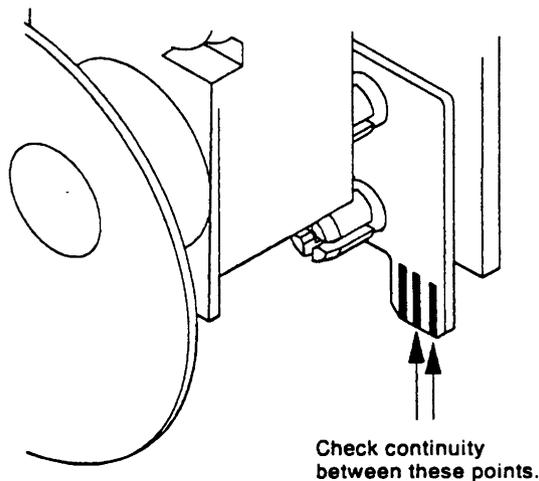
Yes No

006

Replace the power supply.

007

- Power off the power supply and reconnect the three power supply connectors.
- Remove the speaker assembly and the speaker assembly cable.
- Check the continuity of the speaker assembly cable.
- Check the continuity of the speaker, as shown in Figure 14-7.



LEX42804

Figure 14-7. Speaker Continuity

Do the speaker and speaker assembly cable have continuity?

Yes No

008

(Step 008 continues)

008 (continued)  
Replace the failing FRU.

009

You may have a failing fixed disk adapter, fixed disk cables, diskette cable, failing diskette drive, fixed disk drive, or option adapter. Perform the following:

- Power off the system.
- Reinstall the speaker assembly and the speaker assembly cable.
- Remove the fixed disk adapter, fixed disk cables, diskette cable, and all option adapters. Do not remove the system board memory.
- Power on the system.

Did the failing symptom remain?

Yes No

010

- Install the fixed disk adapter, fixed disk cables, diskette cable, and all option adapters one at a time (power off the system each time) until the failing symptom returns.

Go to Step 018.

011

You may have a failing math coprocessor. Is a math coprocessor installed in the system?

Yes No

012

- Power off the system.
- Replace the system board.

013

- Power off the system.
- Remove the math coprocessor.
- Power on the system.

Did the failing symptom remain?

Yes No

014

- Power off the system.
- Replace the math coprocessor.
- or -
- If that does not correct the problem, replace the system board.
- or -
- If that does not correct the problem, replace the power supply.

**015**

- Power off the system.
- Disconnect the keyboard cable from the system unit.
- Power on the system.

**Did the failing symptom remain?**

Yes No

**016**

Go to MAP 0300: Keyboard.

**017**

- Power off the system.
- Replace the system board.

- or -

If that does not correct the problem, replace the system board memory.

---

**018**

**Was the failure a memory adapter?**

Yes No

**019**

Replace the failing FRU. In the case of a drive failure, replace the drive first and then the cable.

**020**

- Power off the system.
- Remove all memory from the failing adapter.
- Power on the system.

If the failure remains, replace the memory adapter.

- or -

If the failure does not remain, install the memory onto the adapter one kit at a time (power off the system each time) until the failing symptom returns. Replace the memory kit causing the failure.

---

# MAP 0020: Power (Type 8570)

Symptom Explanation	Conditions That Could Cause This Symptom
You have entered this MAP because you were unable to complete the POST, or you suspect a power problem.	<ul style="list-style-type: none"> <li>• An external device is failing.</li> <li>• The power supply is failing.</li> <li>• A diskette drive is failing.</li> <li>• A disk drive is failing.</li> <li>• An adapter is failing.</li> <li>• The system board is failing.</li> <li>• The math coprocessor is failing.</li> <li>• The speaker is failing.</li> </ul>

**001**

- Power off the system.
- Disconnect all cables and external devices, except the display, keyboard, and power cord, from the system unit.
- Power on the system.

Did the failing symptom remain?

Yes No

**002**

**CAUTION:**

Power off the system before connecting any device.

- Connect the external devices to the system unit one at a time (power off the system each time) until the failing symptom returns.

Repair or replace the device causing the failure.

**003**

- Power off the system.
- Unplug the power cord.
- Remove the power supply and place it on a work surface with the power supply connector facing up.
- Plug in the power cord.
- Power on the power supply.

Does the fan run continuously?

Yes No

**004**

Replace the power supply.

**005**

(Step 005 continues)

**005 (continued)**

Is the power-good light on?

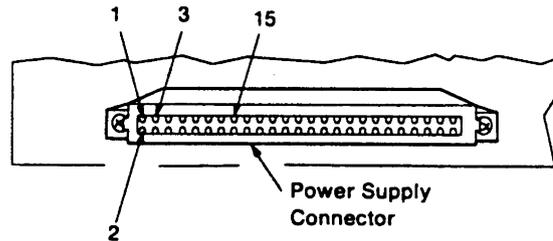
Yes No

**006**

Replace the power supply.

**007**

- Check the power supply connector for the voltages shown in Figure 14-8.



LEX42801

(V DC) Minimum	(V DC) Maximum	Ground Pin	Pin Number
-9.0	-15.0	2	1
+9.0	+15.0	2	3
+3.7	+ 6.2	2	15

Figure 14-8. Power Supply Voltages

(Step 007 continues)

007 (continued)  
**Are the voltages correct?**  
 Yes No

008  
 Replace the power supply.

009  
 - Power off the power supply and reinstall it in the system.  
 - Remove the speaker assembly.  
 - Check the speaker continuity at points 1 and 2, as shown in Figure 14-9. (If the assembly has a detachable cable, remove it and check the cable for continuity.)

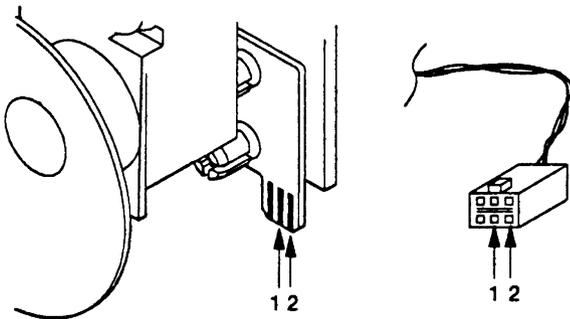


Figure 14-9. Speaker Continuity

**Does the speaker have continuity?**  
 Yes No

010  
 Replace the speaker.

011  
 You may have a failing diskette drive or fixed disk drive. Perform the following:  
 - Power off the system.  
 - Reinstall the speaker assembly.  
 - Remove all of the drives.  
 - Power on the system.

**Did the failing symptom remain?**  
 Yes No

012  
 - Install the drives one at a time (power off the system each time) until the failing symptom returns.  
 Replace the drive causing the failure.  
 (Step 012 continues)

012 (continued)  
 - or -  
 If problem is not corrected, replace the system board.

013  
 You may have a failing fixed disk and diskette drive bus adapter. Perform the following:  
 - Power off the system.  
 - Remove the fixed disk and diskette drive bus adapter.  
 - Power on the system.

**Did the failing symptom remain?**

Yes No  
 014  
 Replace the fixed disk and diskette drive bus adapter.

015  
 You may have a failing option adapter or device. Perform the following:  
 - Power off the system.  
 - Remove all option adapters and devices.  
 - Power on the system.

**Did the failing symptom remain?**

Yes No  
 016  
 Go to Step 024.

017  
 You may have a failing math coprocessor.  
**Is a math coprocessor installed in the system?**

Yes No  
 018  
 - Power off the system.  
 Replace the system board.

019

**019 (continued)**

- Power off the system.
- Remove the math coprocessor.
- Power on the system.

**Did the failing symptom remain?**

Yes No

**020**

- Power off the system.
- Replace the math coprocessor.
- or -
- If that does not correct the problem, replace the system board.
- or -
- If that does not correct the problem, replace the power supply.

**021**

- Power off the system.
- Disconnect the keyboard cable from the system unit.
- Power on the system.

**Did the failing symptom remain?**

Yes No

**022**

Go to MAP 0300: Keyboard.

**023**

- Power off the system.
- Replace the system board.
- or -
- If that does not correct the problem, replace the memory module kits.
- 

**024**

- Install the option adapters and devices, one at a time (power off the system each time), until the failing symptom returns.

**Does the adapter or device that caused the failing symptom to return consist of more than one FRU?**

Yes No

**025**

Replace the FRU.

**026**

Remove FRUs from the adapter or device one by one (power off the system each time) until the failing symptom goes away. Replace the last FRU removed. If that does not correct the problem, replace the adapter or device.

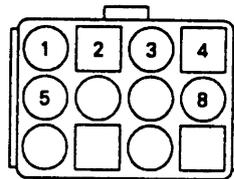
---

# MAP 0020: Power (Type 8573)

Symptom Explanation	Conditions That Could Cause This Symptom
You have entered this MAP because you were unable to complete the POST, or you suspect a power problem.	<ul style="list-style-type: none"> <li>• An external device is failing.</li> <li>• The power supply is failing.</li> <li>• A diskette drive is failing.</li> <li>• A disk drive is failing.</li> <li>• An adapter is failing.</li> <li>• The system board is failing.</li> <li>• The math coprocessor is failing.</li> <li>• The speaker is failing.</li> <li>• The plasma display adapter is failing.</li> </ul>

**001**

- Power off the system.
- Disconnect all external cables and devices, except the keyboard and power cord, from the system unit.
- Power on the system.



Did the failing symptom remain?

Yes No

**002**

**CAUTION:**

Power off the system before connecting any device.

- Connect the external devices to the system unit, one at a time (power off the system each time), until the failing symptom returns.

Repair or replace the device causing the failure.

**003**

- Power off the system.
- Unplug the power cord.
- Remove the power supply connector from the system board.
- Plug in the power cord.
- Power on the power supply.
- Check the voltages at the connector shown in Figure 14-10.

(V DC) Minimum	(V DC) Maximum	Ground Pin	Pin Number
- 10.2	-13.8	8	1
+ 10.2	+13.8	8	2
+ 4.5	+ 5.5	8	3, 4, or 5

Figure 14-10. Power Supply Voltages

Are the voltages correct?

Yes No

**004**

Replace the power supply.

**005**

Is the power-good light on?

Yes No

**006**

Replace the power supply.

**007**

- Power off the power supply and reconnect the power supply connector to the system board.
  - Disconnect the speaker cable.
- (Step 007 continues)

007 (continued)

- Check the continuity of the speaker at **1** and **2** as shown in Figure 14-11.

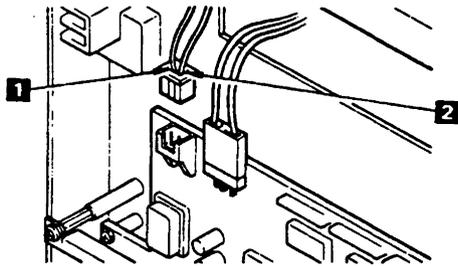


Figure 14-11. Speaker Continuity

Does the speaker have continuity?

Yes No

008

Replace the speaker.

009

You may have a failing diskette drive or fixed disk drive. Perform the following:

- Power off the system.
- Reinstall the speaker assembly.
- Disconnect all of the drive cables from the system board.
- Power on the system.

Did the failing symptom remain?

Yes No

010

- Connect the drive cables, one at a time (power off the system each time), until the failing symptom returns.

Replace the drive causing the failure.

- or -

If that does not correct the problem, replace the drive cable causing the failure.

011

You may have a failing option adapter or device. Perform the following:

- Power off the system.
- Remove all option adapters and devices.
- Power on the system.

(Step 011 continues)

011 (continued)

Did the failing symptom remain?

Yes No

012

Go to Step 020.

013

You may have a failing math coprocessor.

Is a math coprocessor installed in the system?

Yes No

014

- Go to Step 017.

015

- Power off the system.
- Remove the math coprocessor.
- Power on the system.

Did the failing symptom remain?

Yes No

016

- Power off the system.

Replace the math coprocessor (ensure that the beveled corner of the math coprocessor faces the beveled corner in the socket).

- or -

If that does not correct the problem, replace the system board.

- or -

If that does not correct the problem, replace the power supply.

017

- Power off the system.
- Disconnect the keyboard cable from the system board.
- Power on the system.

Did the failing symptom remain?

Yes No

018

Go to MAP 0300: Keyboard (Type 8573).

019

(Step 019 continues)



**019 (continued)**

– Power off the system.

Replace the system board.

– or –

If that does not correct the problem, replace the memory module kits.

– or –

If that does not correct the problem, replace the plasma display adapter.

---

**020**

– Install the option adapters and devices, one at a time (power off the system each time), until the failing symptom returns.

**Does the adapter or device that caused the failing symptom to return consist of more than one FRU?**

Yes No

**021**

Replace the FRU.

**022**

Remove FRUs from the adapter or device one by one (power off the system each time), until the failing symptom goes away. Replace the last FRU removed. If that does not correct the problem, replace the adapter or device.

---

# MAP 0020: Power (Type 8580)

Symptom Explanation	Conditions That Could Cause This Symptom
You have entered this MAP because you were unable to complete the POST, or you suspect a power problem.	<ul style="list-style-type: none"> <li>• An external device is failing.</li> <li>• The power supply is failing.</li> <li>• A diskette drive is failing.</li> <li>• A fixed disk drive is failing.</li> <li>• An adapter is failing.</li> <li>• The system board is failing.</li> <li>• The math coprocessor is failing.</li> <li>• The speaker is failing.</li> <li>• The system board memory is failing.</li> </ul>

**001**

- Power off the system.
- Disconnect all cables and external devices, except the display, keyboard, and power cord, from the system unit.
- Power on the system.

Did the failing symptom remain?

Yes No

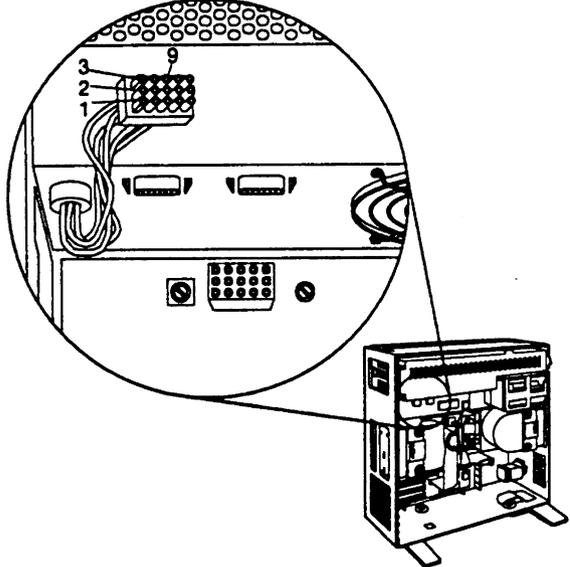
**002**

**CAUTION:**

Power off the system before connecting any device.

- Connect the external devices to the system unit one at a time (power off the system each time) until the failing symptom returns.

Repair or replace the device causing the failure.



**003**

- Power off the system.
- Unplug the three power supply connectors.
- Power on the power supply.
- Check the 15-pin power supply connector for the voltages shown in Figure 14-12.

LEX42798

(V DC) Minimum	(V DC) Maximum	Ground Pin	Pin Number
-9.0	-15.0	2	9
+9.0	+15.0	2	3
+3.7	+ 6.2	2	1

Figure 14-12. Power Supply Voltages (15-Pin Connector)

(Step 003 continues)

003 (continued)  
 Are the voltages correct?

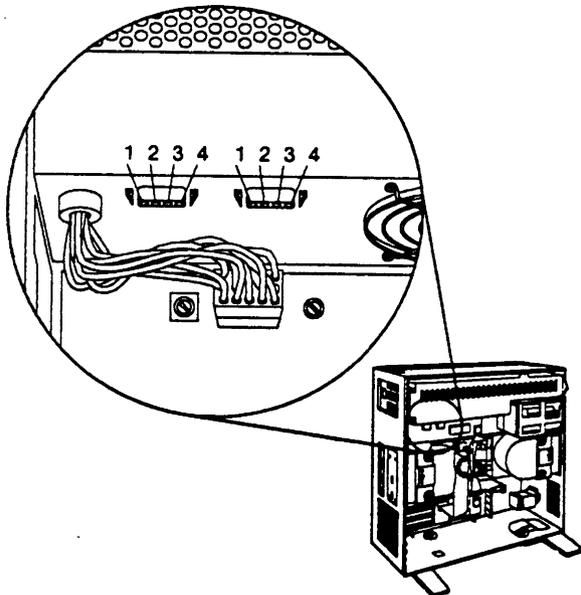
Yes No

004

Replace the power supply.

005

- Power off the power supply.
- Plug the power supply connector into the system board.
- Power on the power supply.
- Check the 4-pin power supply connectors for the voltages shown in Figure 14-13.



LEX42799

(V DC) Minimum	(V DC) Maximum	Ground Pin	Pin Number
+ 4.8	+ 5.2	2	4
+11.5	+12.6	3	1

Figure 14-13. Power Supply Voltages (4-Pin Connectors)

(Step 005 continues)

005 (continued)  
 Are the voltages correct?

Yes No

006

Replace the power supply.

007

Is the power-good light on?

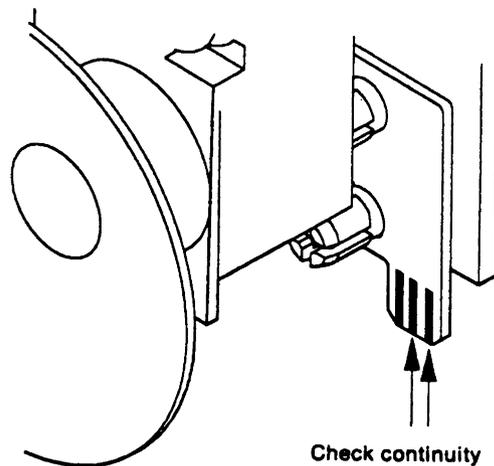
Yes No

008

Replace the power supply.

009

- Power off the power supply and reconnect the remaining two power supply connectors.
- Remove the speaker assembly and the speaker assembly cable.
- Check the continuity of the speaker assembly cable.
- Check the continuity of the speaker, as shown in Figure 14-14.



Check continuity between these points.

LEX42800

Figure 14-14. Speaker Continuity

Do the speaker and speaker assembly cable have continuity?

Yes No

010

(Step 010 continues)

010 (continued)  
Replace the failing FRU.

011

You may have a failing diskette drive or fixed disk drive. Perform the following:

- Power off the system.
- Reinstall the speaker assembly and the speaker assembly cable.
- Disconnect all cables from each drive.
- Power on the system.

Did the failing symptom remain?

Yes No

012

- Connect the cables to the drives one drive at a time (power off the system each time) until the failing symptom returns.
- Replace the drive causing the failure.

013

Are any memory adapters installed?

Yes No

014

Go to Step 017.

015

You may have a failing memory adapter. Perform the following:

- Power off the system.
- Remove the memory adapters. Do not remove the system board memory cards.
- Power on the system.

Did the failing system remain?

Yes No

016

- Install the memory adapters one at a time (power off the system each time) until the failing symptom returns.
- Power off the system.
- Remove all memory from the failing adapter.
- Power on the system.

If the failure remains, replace the memory adapter.

- or -

If the failure does not remain, install the memory into the adapter one card at a time (power off the system each time) until the failing symptom returns. Replace the memory

card causing the failure.

017

- Power off the system.
- Reinstall the memory adapters, if removed.

You may have a failing fixed disk adapter, fixed disk cables, diskette cable, or option adapter.

Perform the following:

- Remove the fixed disk adapter, fixed disk cables, diskette cable, and all option adapters.

Do not remove the system board memory cards.

- Power on the system.

Did the failing system remain?

Yes No

018

- Install fixed disk adapter, fixed disk cables, diskette cable, and all option adapters one at a time (power off the system each time) until the failing symptom returns.

Replace the FRU causing the failure.

019

You may have a failing math coprocessor.

Is a math coprocessor installed in the system?

Yes No

020

Go to Step 023.

021

- Power off the system.
- Remove the math coprocessor.
- Power on the system.

Did the failing symptom remain?

Yes No

022

- Power off the system.

Replace the math coprocessor (ensure that the beveled corner on the math coprocessor is toward the bottom and rear of the system).

- or -

If that does not correct the problem, replace the system board.

- or -

If that does not correct the problem, replace the power supply.

023

- Power off the system.
- Disconnect the keyboard cable from the system unit.
- Power on the system.

**Did the failing system remain?**

Yes No

024

- Connect the keyboard to the system unit.
- Go to MAP 0300: Keyboard.

025

Replace the system board.

- or -

If that does not correct the problem, replace the system board memory cards one at a time (power off the system each time).

---

## MAP 0200: Memory Start

Symptom Explanation	Conditions That Could Cause This Symptom
<p>You have entered this MAP because you received one of the following error messages:</p> <ul style="list-style-type: none"><li>• 110 or 111</li><li>• XXXXXX XXXX 201</li><li>• 201, 215, or 216.</li></ul>	<ul style="list-style-type: none"><li>• One or more system board memory components is failing.</li><li>• One or more memory expansion adapter components is failing.</li><li>• The system board is failing.</li></ul>

001

Find your system type in the following figure and go to the MAP indicated.

System Type	MAP
Type 8550	MAP 0200: Memory (Type 8550)
Type 8555	MAP 0200: Memory (Type 8555)
Type 8560	MAP 0200: Memory (Type 8560)
Type 8570	MAP 0200: Memory (Type 8570)
Type 8573	MAP 0200: Memory (Type 8573)
Type 8580	MAP 0200: Memory (Type 8580)

Figure 14-15. System Identification

# MAP 0200: Memory (Type 8550)

Symptom Explanation	Conditions That Could Cause This Symptom
You have entered this MAP because you received a memory error message.	<ul style="list-style-type: none"> <li>• One, or both, system board memory module packages is failing.</li> <li>• The system board is failing.</li> <li>• A memory adapter is failing.</li> </ul>

**001**

Go to the step indicated for the error message you received.

Error Message	Action
110	Go to Step 002.
111	Go to Step 005.
201	Go to Step 008.

Figure 14-16. Error Messages

**002**

- A 110 message indicates a System Board Parity Check error. Run the memory test to identify the failure.

Were you able to successfully run the memory tests?

Yes No

**003**

Replace the system board memory module packages. If that does not solve the problem, replace the system board.

**004**

Take the action indicated by the tests.

**005**

- A 111 message indicates a Memory Adapter Parity Check error. Run the memory tests to identify the failure.

Were you able to successfully run the memory tests?

Yes No

**006**

Remove the memory adapters one at a time until the error disappears, then replace the last adapter removed.

**007**

Take the action indicated by the tests.

**008**

- Model 50 system board memory diagnostic tests differ, depending on the number of memory connectors.

Does the system board have only one memory connector?

Yes No

**009**

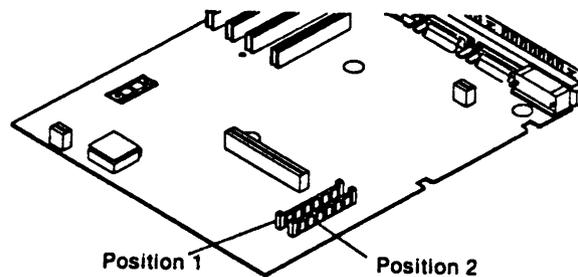
Go to Step 011.

**010**

Replace the memory module package. If that does not solve the problem, replace the system board.

**011**

- An XXXXXX XXXX 201 message indicates a memory module package or the system board is failing. Use the middle group of 4 characters to determine which FRU to replace; see Figure 14-17.



LEX42817

Middle 4 Characters	Replace
00XX	Memory module package in position 1
XX00	Memory module package in position 2
XXXX	Both memory module packages
0000	Either memory module package. (Replace them one at a time. If this does not fix the problem, replace the system board.)

Figure 14-17. Memory Module Package Error Message

**Note:** XX is a combination of characters other than 00.

---



# MAP 0200: Memory (Type 8555)

Symptom Explanation	Conditions That Could Cause This Symptom
<p>You have entered this MAP because you received one of the following error messages:</p> <ul style="list-style-type: none"> <li>• 110 or 111</li> <li>• 201, 215, or 216.</li> </ul>	<ul style="list-style-type: none"> <li>• One or more system board memory module kits are failing.</li> <li>• One or more memory expansion adapter components are failing.</li> <li>• The system board is failing.</li> </ul>

**Note:** In some cases, a failing math coprocessor might cause false errors and invalid system responses.

**001**

Find your error message in the following figure and take the action indicated.

Error Message	Action
110 (System board parity check)	Go to Step 002.
111 (Memory adapter parity check)	Go to Step 010.
201, 215, or 216	Go to Step 005.

Figure 14-18. Error Messages

**002**

You are here because you received a 110 error message.

Can you run the advanced diagnostic memory tests?

Yes No

**003**

Go to Step 005.

**004**

Replace the memory indicated by the advanced diagnostics tests.

— or —

If the problem continues, replace the system board.

**005**

(Step 005 continues)

**005 (continued)**

Is more than one system board memory module kit installed?

Yes No

**006**

Replace the memory module kit.

— or —

If the problem continues, replace the system board.

**007**

- Power off the system.
- Remove the memory module kit in position 2.
- Power on the system.

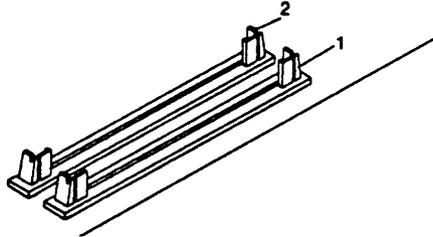


Figure 14-19. System Board Memory Module Kit Locations

Did the error remain?

Yes No

**008**

Replace the kit removed from position 2.

— or —

If the problem continues, replace the system board.

**009**

Replace the memory module kit installed in position 1.

(Step 009 continues)

1-87

009 (continued)

- or -

If the problem continues, replace the system board.

---

010

You are here because you received a 111 error message.

Can you run the advanced diagnostic memory tests?

Yes No

011

Go to Step 013.

012

Replace the memory indicated by the advanced diagnostics tests.

- or -

If the problem continues, replace the system board.

---

013

Is more than one memory expansion adapter installed?

Yes No

014

Go to Step 018.

015

- Power off the system.
- Remove all memory adapters.
- Power on the system.

Did the error remain?

Yes No

016

- Install the memory adapters one at a time (power off the system each time), until the failing symptom returns. The last adapter installed contains the failing memory.
- Go to Step 018 to isolate the failing memory.

017

Replace the system board.

---

018

(Step 018 continues)

018 (continued)

Is more than one memory expansion kit installed on the failing memory adapter?

Yes No

019

Replace the memory expansion kit.

- or -

If the problem continues, replace the memory expansion adapter.

020

- Power off the system.
- Remove all but one memory expansion kit from the failing memory adapter.
- Power on the system.

Did the error remain?

Yes No

021

- Install the memory expansion kits, one at a time (power off the system each time), until the error returns.
- Replace the kit that caused the error to return.

022

Replace the memory expansion kit installed on the adapter.

- or -

If the problem continues, replace the memory expansion adapter.

---

# MAP 0200: Memory (Type 8560)

Symptom Explanation	Conditions That Could Cause This Symptom
You have entered this MAP because you received an XXXXXX XXXX 201 error message.	<ul style="list-style-type: none"> <li>One or more system board memory module packages is failing.</li> <li>The system board is failing.</li> </ul>

The error message XXXXXX XXXX 201 indicates that a memory module package or the system board is failing. The first group of 6 characters indicates which bank of memory module packages is failing. The middle group of 4 characters determines which memory module package within that bank is failing.

**001**

Is the error message 000000 0000 201?

Yes No

**002**

Go to Step 006.

**003**

- Power off the system.
- Refer to Figure 14-20 and swap the memory module packages in Bank 1 and Bank 2.
- Power on the system.

Did the error message 000000 0000 201 remain?

Yes No

**004**

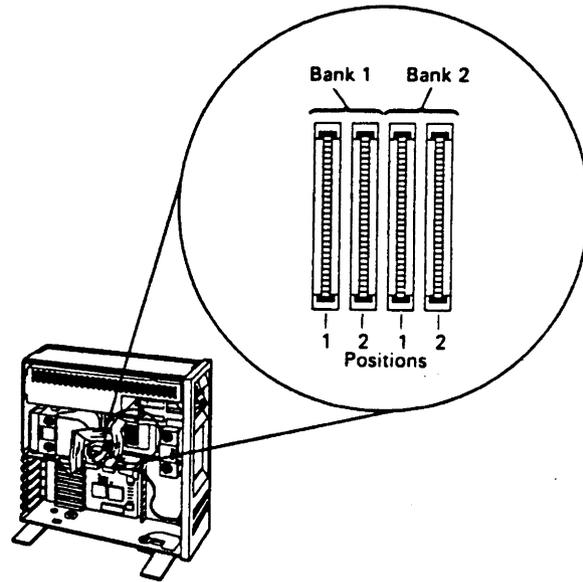
Go to Step 006.

**005**

Replace the system board.

**006**

Use Figure 14-20 to determine which memory module package to replace.



LEX42816

First 6 Characters	Failure is in Bank	Middle 4 Characters	Replace
Up to 080000	1	00XX	Memory module package in position 1
080000 and above	2	XX00	Memory module package in position 2
		XXXX	Both memory module packages

Figure 14-20. Memory Module Package Error Message

Note: XX is any combination of characters other than 00.

# MAP 0200: Memory (Type 8570)

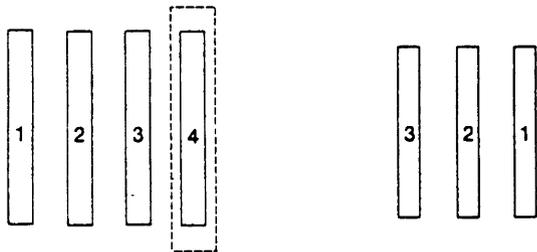
Symptom Explanation	Conditions That Could Cause This Symptom
<p>You have entered this MAP because you received one of the following error messages:</p> <ul style="list-style-type: none"> <li>• 110 or 111</li> <li>• 201, 215, 216, 221, or 225.</li> </ul>	<ul style="list-style-type: none"> <li>• One or more system board memory module kits is failing.</li> <li>• Adapter memory is failing.</li> <li>• The system board is failing.</li> </ul>

**Notes:**

1. For adapter memory kit locations, see Figure 14-23.
2. In some cases, a failing math coprocessor can cause false errors and invalid system responses.

**001**

Verify that a memory module kit is installed in position 1. The positions are shown below in Figure 14-21.



Full Size System Board (Position 4-25-MHz systems only.)      Reduced Size System Board

Figure 14-21. System Board Memory Positions (Top Front View)

Find your error message in the following figure and take the action indicated.

Error Message	Action
110 or 201 (System board parity check)	Go to Step 002.
111 (Memory adapter parity check)	Go to Step 010.
215, 216, or 225	Go to Step 005.
221	Go to Step 023.

Figure 14-22. Error Messages

**002**

Can you run the advanced diagnostic memory tests?

Yes No

**003**

Go to Step 005.

**004**

Replace the memory indicated by the advanced diagnostic tests.

– or –

If that does not correct the problem, replace the system board.

**005**

Is more than one system board memory module kit installed?

Yes No

**006**

Replace the memory module kit.

– or –

If that does not correct the problem, replace the system board.

**007**

- Power off the system.
- Remove all memory module kits except the one installed in position 1.
- Power on the system.

Did the error remain?

Yes No

**008**

- Install the system board memory module kits one at a time (power off the system each time) until the error returns.

Replace the kit that caused the error to return.

(Step 008 continues)

008 (continued)

- or -

If that does not correct the problem, replace the system board.

009

Replace the memory module kit installed in position 1.

- or -

If that does not correct the problem, replace the system board.

010

Can you run the advanced diagnostic memory tests?

Yes No

011

Go to Step 013.

012

Replace the memory indicated by the advanced diagnostic tests.

- or -

If that does not correct the problem, replace the system board.

013

Is more than one memory expansion option installed?

Yes No

014

Go to Step 018.

015

- Power off the system.
- Remove all memory expansion options.
- Power on the system.

Did the error remain?

Yes No

016

- Install the memory expansion options one at a time (power off the system each time) until the failing symptom returns. The last one installed contains the failing memory.

Go to Step 018 to isolate the failing memory.

017

Replace the system board.

018

Is more than one memory kit installed on the failing memory expansion option?

Yes No

019

Replace the memory kit.

- or -

If that does not correct the problem, replace the memory expansion option.

020

- Power off the system.
- Remove all but one memory kit from the failing memory expansion option.
- Power on the system.

Did the error remain?

Yes No

021

- Install the memory kits one at a time (power off the system each time) until the error returns.

Replace the memory kit that caused the error to return.

022

Replace the memory kit installed on the adapter.

- or -

If that does not correct the problem, replace the memory expansion option.

023

- Run the "Set configuration" program, using "Run automatic configuration."
- Power off the system. Wait 10 seconds, then power on the system.

Do you still have a 221 error?

Yes No

024

- You have corrected a problem that was caused by an error in the configuration information.

025

(Step 025 continues)

025 (continued)

- Remove all memory module kits except the one in position 1. (The positions are shown in Figure 14-21.)
- Run the "Set configuration" program, using "Run automatic configuration."
- Power off the system. Wait 10 seconds, then power on the system.

Did the error remain?

Yes No

026

- Install the system board memory module kits, one at a time (power off the system each time), until the error returns.

Replace the kit that caused the error to return. Run the configuration program, power off, wait 10 seconds, then power on.

- or -

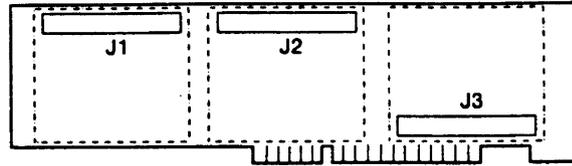
If that does not correct the problem, replace the system board. Run the configuration program, power off, wait 10 seconds, then power on.

027

Replace the memory module kit in position 1. Run the configuration program, power off, wait 10 seconds, then power on.

- or -

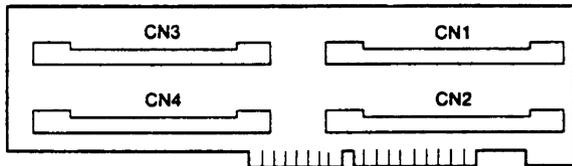
If that does not correct the problem, replace the system board. Run the configuration program, power off, wait 10 seconds, then power on.



LEX42812

80386 Memory Expansion Option

Figure 14-23. Memory Kit Locations



LEX42811

2Mb - 8Mb 80386 Memory Expansion Option

## MAP 0200: Memory (Type 8573)

Symptom Explanation	Conditions That Could Cause This Symptom
<p>You have entered this MAP because you received one of the following error messages:</p> <ul style="list-style-type: none"> <li>• 110 or 111</li> <li>• 201, 211, 215, or 216.</li> </ul>	<ul style="list-style-type: none"> <li>• One or more system board memory module kits are failing.</li> <li>• One or more memory expansion adapter components are failing.</li> <li>• The system board is failing.</li> </ul>

**Note:** In some cases, a failing math coprocessor might cause false errors and invalid system responses.

**001**

Find your error message in the following figure and take the action indicated.

Error Message	Action
110 (System board parity check)	Go to Step 002.
111 (Memory adapter parity check)	Go to Step 010.
201, 215, or 216	Go to Step 005.

Figure 14-24. Error Messages

**002**

You are here because you received a 110 error message.

Can you run the advanced diagnostic memory tests?

Yes No

**003**

Go to Step 005.

**004**

Replace the memory indicated by the advanced diagnostics tests.

– or –

If that does not correct the problem, replace the system board.

**005**

(Step 005 continues)

**005 (continued)**

Is more than one system board memory module kit installed?

Yes No

**006**

Replace the memory module kit.

– or –

If that does not correct the problem, replace the system board.

**007**

- Power off the system.
- Remove all memory module kits except the one installed in position 1.
- Power on the system.

Did the error remain?

Yes No

**008**

– Install the system board memory module kits, one at a time (power off the system each time), until the error returns.

Replace the kit that caused the error to return.

– or –

If that does not correct the problem, replace the system board.

**009**

Replace the memory module kit installed in position 1.

– or –

If that does not correct the problem, replace the system board.

**010**

(Step 010 continues)

**010 (continued)**

You are here because you received a 111 error message.

**Can you run the advanced diagnostic memory tests?**

Yes No

**011**

Go to Step 013.

**012**

Replace the memory indicated by the advanced diagnostics tests.

- or -

If that does not correct the problem, replace the system board.

---

**013**

**Is more than one 80386 Memory Expansion Kit installed on the failing memory adapter?**

Yes No

**014**

Replace the 80386 Memory Expansion Kit.

- or -

If that does not correct the problem, replace the 80386 Memory Expansion Adapter.

**015**

- Power off the system.
- Remove all but one 80386 Memory Expansion Kit at a time from the failing memory adapter.
- Power on the system.

**Did the error remain?**

Yes No

**016**

- Install the 80386 Memory Expansion Kits, one at a time (power off the system each time), until the error returns.

Replace the 80386 Memory Expansion Kit that caused the error to return.

**017**

Replace the 80386 Memory Expansion Kit installed on the adapter.

- or -

If that does not correct the problem, replace the 80386 Memory Expansion Adapter.

---



# MAP 0200: Memory (Type 8580)

Symptom Explanation	Conditions That Could Cause This Symptom
<p>You have entered this MAP because you received one of the following error messages:</p> <ul style="list-style-type: none"> <li>• 110</li> <li>• 111</li> <li>• 215</li> <li>• 216.</li> </ul>	<ul style="list-style-type: none"> <li>• One or more system board memory expansion kits is failing.</li> <li>• Adapter memory is failing.</li> <li>• The system board is failing.</li> <li>• The standard system board memory was moved from connector J16 after configuration.</li> <li>• No system board memory is installed in connector J16.</li> </ul>

**Notes:**

1. For memory kit locations see Figure 14-25.
2. In some cases, a failing math coprocessor can cause false errors and invalid system responses.

**001**

Find the error message in the following figure and take the action indicated.

Error Message	Action
110 (System board parity check)	Go to Step 002.
111 (Memory adapter parity check)	Go to Step 010.
215	Go to Step 023.
216	Go to Step 002.

Figure 14-25. Error Messages

**002**

You are here because you received a 110 or 216 error message.

Can you run the advanced diagnostic memory tests?

Yes No

**003**

Go to Step 005.

**004**

Replace the memory indicated by the advanced diagnostic tests.

**005**

(Step 005 continues)

**005 (continued)**

Are system board memory expansion kits installed in both connectors J16 and J15?

Yes No

**006**

Replace the memory expansion kit in connector J16.

— or —

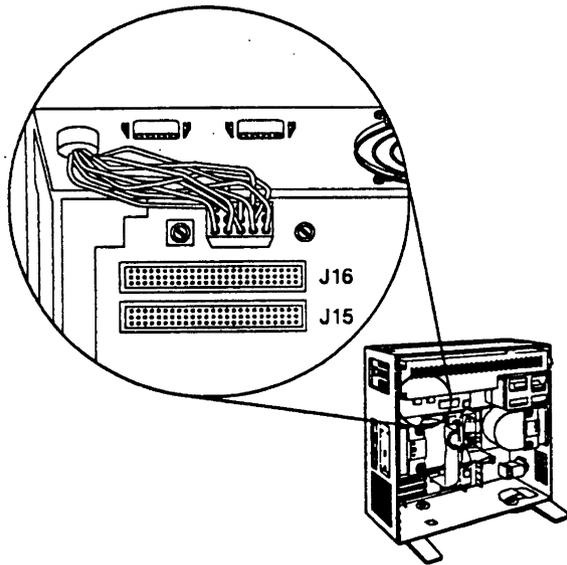
If the memory expansion kit was in connector J15, move it to connector J16; remove the battery to erase the configuration stored in the CMOS, then reconfigure the system using the "Set configuration" program.

— or —

If that does not correct the problem, replace the system board.

**007**

- Power off the system.
- Remove the system board memory expansion kit installed in connector J15 (see Figure 14-26).
- Power on the system.



LEX42810

Figure 14-26. System Board Memory Locations

Did the error remain?

Yes No

008

Replace the system board memory expansion kit removed from connector J15.

009

Replace the system board memory expansion kit in connector J16.

- or -

If that does not correct the problem, replace the system board.

010

You are here because you received a 111 error message.

Can you run the advanced diagnostic memory tests?

Yes No

011

Go to Step 013.

012

Replace the memory indicated by the advanced diagnostic tests.

013

Is more than one memory expansion option installed?

Yes No

014

Go to Step 018.

015

- Power off the system.
- Remove all memory expansion options.
- Power on the system.

Did the error remain?

Yes No

016

- Install the memory expansion options one at a time (power off the system each time) until the failing symptom returns. The last card installed contains the failing memory.

Go to Step 018 to isolate the failing memory.

017

Replace the system board.

018

Is more than one memory kit installed on the failing memory expansion option?

Yes No

019

Replace the memory kit.

- or -

If that does not correct the problem, replace the memory expansion option.

020

- Power off the system.
- Remove all but one memory kit from the failing memory expansion option.
- Power on the system.

Did the error remain?

Yes No

021

- Install the memory kits one at a time (power off the system each time) until the error returns.

(Step 021 continues)

021 (continued)  
Replace the memory kit that caused the error to return.

022

Replace the memory kit installed on the adapter.  
- or -  
If that does not correct the problem, replace the memory expansion option.

---

023

You are here because you received a 215 error message.

Are two system board memory expansion kits installed?

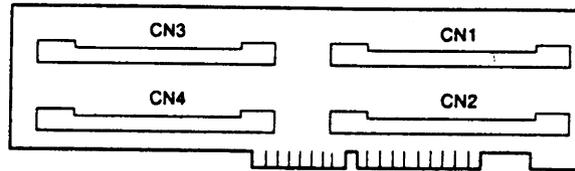
Yes No

024

Replace the system board memory expansion kit.

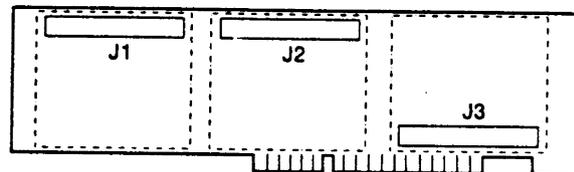
025

Replace both system board memory expansion kits.  
- or -  
If that does not correct the problem, replace the system board.



LEX42811

#### 2-8Mb 80386 Memory Expansion Option



LEX42812

#### 80386 Memory Expansion Option

Figure 14-27. Memory Kit Locations

---

# MAP 0300: Keyboard

Symptom Explanation	Conditions That Could Cause This Symptom
You have entered this MAP because you suspect a keyboard problem.	<ul style="list-style-type: none"> <li>• The keyboard is failing.</li> <li>• The keyboard cable is failing.</li> <li>• The keyboard fuse is failing.</li> <li>• The system board is failing.</li> </ul>

**001**

Do you have a completely nonfunctioning keyboard?

Yes No

**002**

Go to Step 020.

**003**

Is a pointing device connected to the system?

Yes No

**004**

Go to Step 007.

**005**

- Power off the system.
- Disconnect the pointing device.
- Power on the system.

Is the keyboard still nonfunctional?

Yes No

**006**

Replace the pointing device cable. If the cable cannot be disconnected from the pointing device, or if replacing the cable does not fix the problem, replace the pointing device.

**007**

- Power off the system.
- Disconnect the keyboard cable from the keyboard.
- Power on the system.
- Check the voltage on the keyboard connector as shown in Figure 14-28. All voltages are  $\pm 5\%$ .

Pin	Voltage (V DC)
1	+5.0
2	0 (Not Used)
3	Ground
4	+5.0
5	+5.0
6	0 (Not Used)



LEX42808

Figure 14-28. Voltage Check

Are the voltages correct?

Yes No

**008**

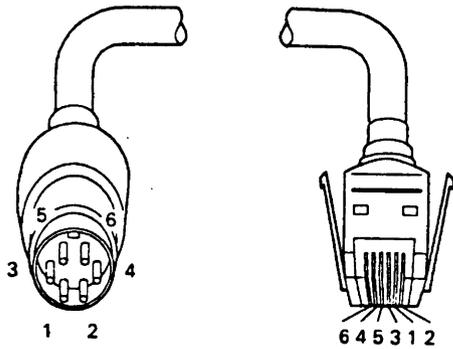
Go to Step 010.

**009**

Replace the keyboard.

**010**

- Check the keyboard cable for continuity as shown in Figure 14-29.



LEX42809

Figure 14-29. Cable Continuity Check

**Note:** Wires 2 and 6 are not used.

Is there continuity on all wires?

Yes No

011

Replace the keyboard cable.

012

Is there a fuse on the system board?

Yes No

013

Go to Step 017.

014

- Power off the system.
- Remove the fuse and check it for continuity.

Does the fuse have continuity?

Yes No

015

Replace the fuse.

**Note:** A blown fuse may be caused by a short circuit in the keyboard cable or the pointing device cable. If replacing the fuse does not solve the problem, remove both cables from the system unit, then attach the cables one at a time until the problem returns. Replace the last cable you attached.

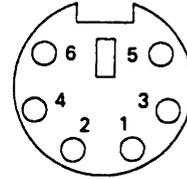
016

Replace the system board.

017

- Power off the system.
- Disconnect the keyboard cable from the system board.
- Power on the system.
- Check the voltage at the system board keyboard connector as shown in Figure 14-30. All voltages are  $\pm 5\%$ .

Pin	Voltage (V DC)
1	+5.0
2	Not Used
3	Ground
4	+5.0
5	+5.0
6	Not Used



LEX42807

Figure 14-30. Keyboard Connector Voltage Check

Are the voltages correct?

Yes No

018

Replace the system board.

019

Replace the keyboard cable.

020

- Make sure your reference diskette is in drive A.
- Restart the system.
- Observe the POST.

Did you receive a 3XX or a keyboard error message?

Yes No

021

- Run the keyboard tests.

- If you successfully completed the keyboard tests and you suspect an intermittent problem, start an error log.

**Note:** On systems without a fuse, a short in the keyboard cable could cause a voltage-regulating device on the system board to disable the 5V DC to the keyboard; the keyboard is totally nonfunctional until the shorted condition is relieved.

- If you are unable to complete the tests due to nonfunctioning keys, replace the keyboard.

022

Go to Step 007.

---

# MAP 0300: Keyboard (Type 8573)

Symptom Explanation	Conditions That Could Cause This Symptom
You have entered this MAP because you suspect a keyboard problem.	<ul style="list-style-type: none"> <li>The keyboard is failing.</li> <li>The keyboard cable is failing.</li> <li>The system board is failing.</li> </ul>

**001**

Do you have a completely nonfunctioning keyboard?

Yes No

**002**

Go to Step 016.

**003**

Is a pointing device connected to the system?

Yes No

**004**

Go to Step 007.

**005**

- Power off the system.
- Disconnect the pointing device.
- Power on the system.

Is the keyboard still nonfunctional?

Yes No

**006**

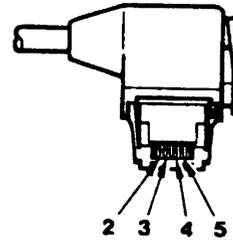
Replace the pointing device cable. If the cable cannot be disconnected from the pointing device, replace the pointing device.

**007**

- Power off the system.
- Disconnect the keyboard cable from the keyboard.
- Power on the system.
- Check the voltage on the keyboard connector as shown in Figure 14-31. All voltages are  $\pm 5\%$ .

Pin	Voltage (V DC)
2	+ 5.0
3	Ground
4	+ 5.0
5	+ 5.0

Figure 14-31. Keyboard Connector Voltage Check



Is the voltage correct?

Yes No

**008**

If voltage is present on line 2, 4, or 5, go to Step 010.

— or —

If lines 2, 4, and 5 measure 0V DC, go to Step 013.

**009**

Replace the keyboard.

**010**

- Check the keyboard cable for continuity as shown in Figure 14-32.

From Pin	To Pin
1	2
2	3
3	4
4	5

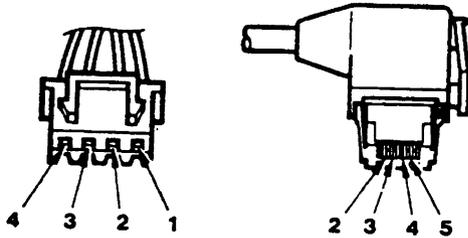


Figure 14-32. Keyboard Cable Continuity

Do you have continuity on all wires?

Yes No

011

Replace the keyboard cable.

012

Replace the system board.

013

- Power off the system.
- Disconnect the keyboard cable from the system board.
- Power on the system.
- Check the voltage at the system board keyboard connector as shown in Figure 14-33. All voltages are  $\pm 5\%$ .

Pin	Voltage (V DC)
1	+5.0
2	Ground
3	+5.0
4	+5.0

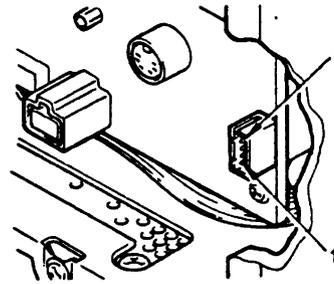


Figure 14-33. Keyboard Connector Voltage Check

Are the voltages correct?

Yes No

014

Replace the system board.

015

Replace the keyboard cable.

016

- Insert the Reference Diskette into drive A.
- Power on the system.
- Observe the POST.

Did you receive a 3xx or a keyboard error message?

Yes No

017

- Run the keyboard tests.
    - If you successfully completed the keyboard tests and you suspect an intermittent problem, start an error log.
- Note:** A short in the keyboard cable causes a voltage regulating device on the system board to disable the 5V DC to the keyboard; the keyboard is totally nonfunctional until the shorted condition is relieved.
- If you are unable to complete the tests due to nonfunctioning keys, replace the keyboard.

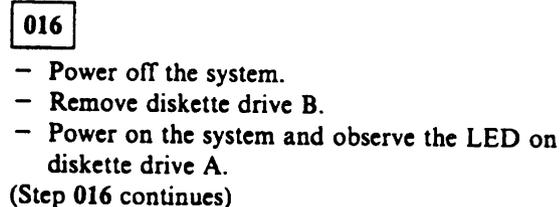
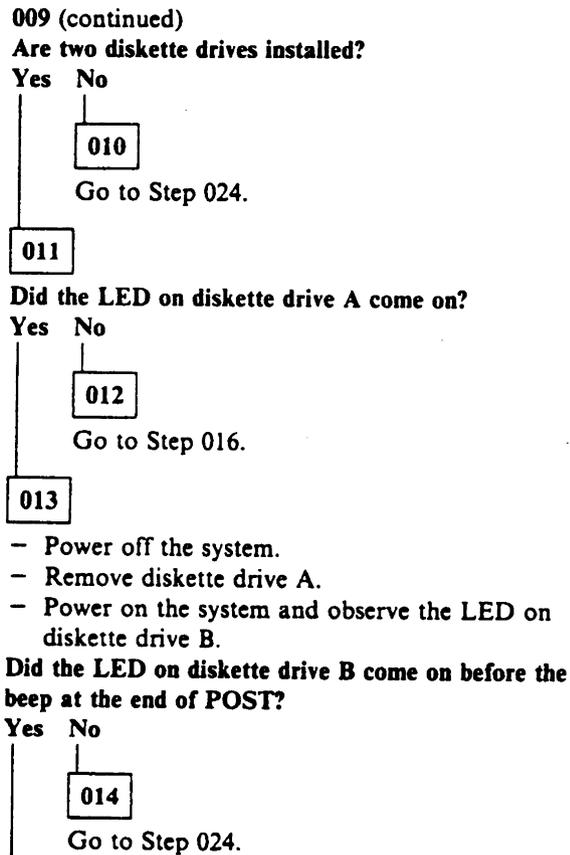
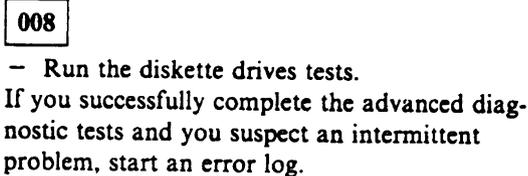
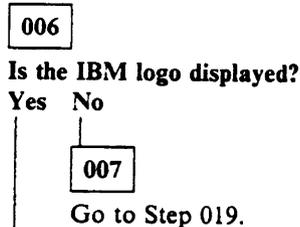
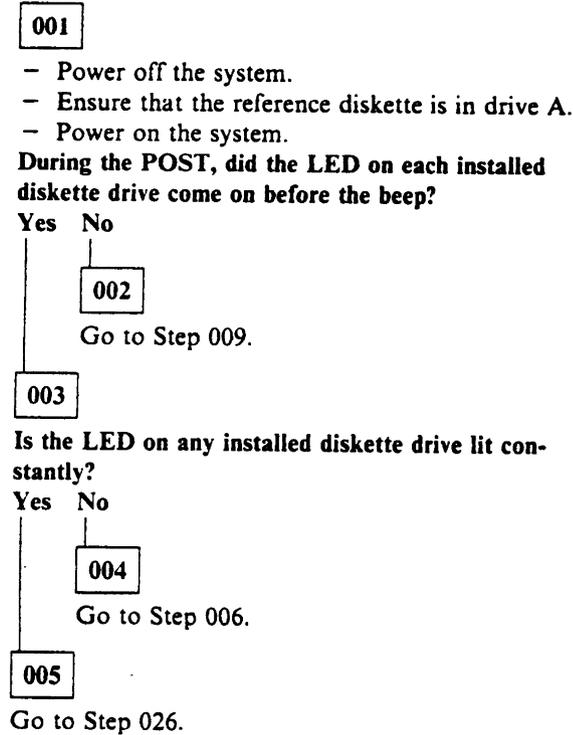
018

Go to Step 007.



# MAP 0600: Diskette Drive

Symptom Explanation	Conditions That Could Cause This Symptom
You have entered this MAP because you suspect a diskette drive problem.	<ul style="list-style-type: none"> <li>• A diskette drive is failing.</li> <li>• The system board is failing.</li> <li>• The diskette drive bus adapter or cable is failing.</li> <li>• The power supply is failing.</li> </ul>



016 (continued)

Did the LED on diskette drive A come on before the beep at the end of POST?

Yes No

017

Go to Step 024.

018

Replace diskette drive B.

019

Are two diskette drives installed?

Yes No

020

Go to Step 024.

021

- Power off the system.
- Remove diskette drive B.
- Power on the system.

Is the IBM logo displayed at the end of POST?

Yes No

022

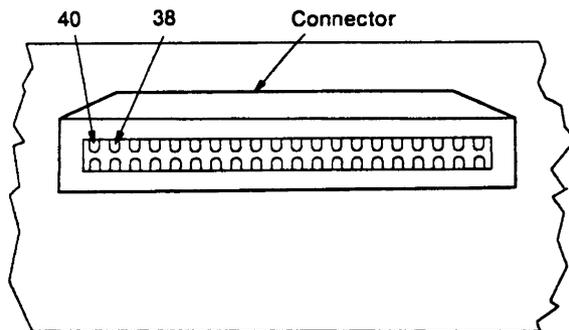
Go to Step 029.

023

Replace diskette drive B.

024

- Remove the diskette drives, and check the connector of each diskette drive for the voltages shown in Figure 14-34.



(V DC) Minimum	(V DC) Maximum	Pin Number
+ 4.8	+ 5.2	38 to ground
+11.5	+12.6	40 to ground

Figure 14-34. Connector Voltages (Diskette Drives Removed)

Note: When measuring voltages, use the power supply frame as ground.

Are the voltages correct?

Yes No

025

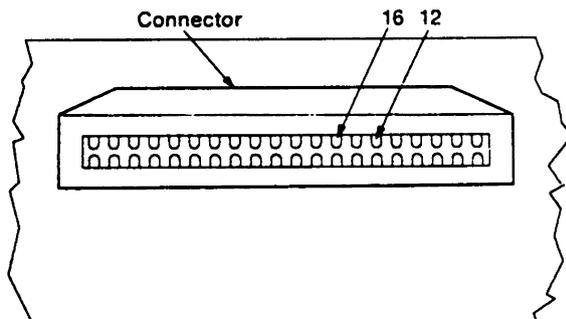
Go to MAP 0020: Power.

026

- With the drives removed, check the connector of each diskette drive for the voltages at the pins shown in Figure 14-35. The voltages should increase from approximately 0V DC to approximately 5V DC during the POST (run the POST for each voltage check).

Notes:

1. Approximately 0V DC includes a range of 0 to 0.8V DC, approximately 5V DC includes a range of 2.0 to 5.5V DC.
2. When measuring voltages, use the power supply frame as ground.



LEX42805

Figure 14-35. Drive Select Voltages (Diskette Drives Removed)

(Step 026 continues)

LEX42806

026 (continued)

Did the voltages increase from approximately 0V DC to 5V DC?

Yes No

027

Replace the system board.

- or -

If that does not solve the problem, replace the bus adapter or cable.

028

Replace the failing drive.

- or -

If that does not solve the problem, replace the system board.

- or -

If that does not solve the problem, replace the bus adapter or cable.

029

- Power off the system.
- Remove drive A.
- Remove drive B and install it as drive A.
- Install the remaining drive as drive B.
- Insert the reference diskette into drive A.
- Power on the system.

**Note:** You may receive an error during the POST. Disregard the error and continue with POST.

Is the IBM logo displayed at the end of POST?

Yes No

030

Go to Step 032.

031

Replace the drive installed as B.

---

032

- Remove drive A and check its connector for the voltages shown in Figure 14-34.

Are the voltages correct?

Yes No

033

Go to MAP 0020: Power.

034

Replace the system board.

- or -

If that does not solve the problem, replace the bus adapter or cable.

---

## MAP 0600: Diskette Drive Start (Type 8555)

Symptom Explanation	Conditions That Could Cause This Symptom
You have entered this MAP because you received a 6XX error code, or you have been directed here from another MAP.	<ul style="list-style-type: none"> <li>The diskette drive is failing.</li> <li>The 5.25-in External Diskette Drive attachment feature group is failing.</li> <li>The power supply is failing.</li> </ul>

**001**

Is a 5.25-in external diskette drive attached?

Yes No

**002**

Go to Step 006.

**003**

Are you having a problem with the 5.25-in external diskette drive?

Yes No

**004**

Go to Step 006.

**005**

– Replace the parts in the following sequence:

- 5.25-in External Diskette Drive Assembly
- Attachment feature group.

**006**

Find your system type in the following figure and go to the MAP indicated.

System Type	MAP
Type 8555	MAP 0600: Diskette Drive (Type 8555)
Type 8573	MAP 0600: Diskette Drive (Type 8573)
All other types	MAP 0600: Diskette Drive

Figure 14-36. System Identification

1-106

## MAP 0600: Diskette Drive Start (Type 8573)

Symptom Explanation	Conditions That Could Cause This Symptom
You have entered this MAP because you received a 6XX error code, or you have been directed here from another MAP.	<ul style="list-style-type: none"> <li>The diskette drive is failing.</li> <li>The 5.25-in External Diskette Drive attachment feature group is failing.</li> <li>The power supply is failing.</li> </ul>

**001**

Is a 5.25-in external diskette drive attached?

Yes No

**002**

Go to Step 006.

**003**

Are you having a problem with the 5.25-in external diskette drive?

Yes No

**004**

Go to Step 006.

**005**

Replace the parts in the following sequence:

- 5.25-in External Diskette Drive Assembly
- Attachment feature group.

**006**

Find your system type in the following figure and go to the MAP indicated.

System Type	MAP
Type 8550	MAP 0600: Diskette Drive
Type 8555	MAP 0600: Diskette Drive (Type 8555)
Type 8560	MAP 0600: Diskette Drive
Type 8570	MAP 0600: Diskette Drive
Type 8555	MAP 0600: Diskette Drive
Type 8580	MAP 0600: Diskette Drive

Figure 14-37. System Identification

## MAP 0600: Diskette Drive (Type 8555)

Symptom Explanation	Conditions That Could Cause This Symptom
You have entered this MAP because you suspect a diskette drive problem.	<ul style="list-style-type: none"> <li>• A diskette drive is failing.</li> <li>• The system board is failing.</li> <li>• The diskette drive cable is failing.</li> <li>• The power supply is failing.</li> </ul>

**001**

- Power off the system.
- Ensure that the reference diskette is in Drive A.
- Power on the system.

During the POST, did the LED on the diskette drive come on before the beep?

Yes No

**002**

Go to Step 009.

**003**

Is the LED on the diskette drive lit constantly?

Yes No

**004**

Go to Step 006.

**005**

Go to Step 011.

**006**

Is the IBM logo displayed?

Yes No

**007**

Go to Step 009.

**008**

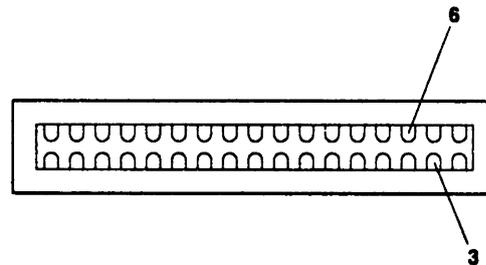
- Run the diskette drive tests.

If you successfully complete the advanced diagnostic tests and you suspect an intermittent problem, start an error log.

If the tests instructed you to replace a FRU and you are here the second time for the same problem, go to Step 009.

**009**

- Remove the diskette drive cable from the diskette drive and measure the voltages shown in the following figure.



(V DC) Minimum	(V DC) Maximum	Pin Number
+ 4.8	+ 5.2	3 to Ground
+11.5	+12.6	6 to Ground

Figure 14-38. Connector Voltages (Diskette Drive Cable)

Note: When measuring voltages, use the power supply frame as ground.

Are the voltages correct?

Yes No

**010**

Go to MAP 0020: Power (Type 8555).

**011**

- With the drive disconnected, check the connector of the diskette drive cable for the voltages at the pins shown in Figure 14-39. The voltages should increase from approximately 0V DC to approximately 5V DC during the POST (run the POST for each voltage check).

**Notes:**

1. Approximately 0V DC includes a range of 0 to 0.8 V DC; approximately 5V DC includes a range of 2.0V DC to 5.5V DC.
2. When measuring voltages, use the power supply frame as ground.

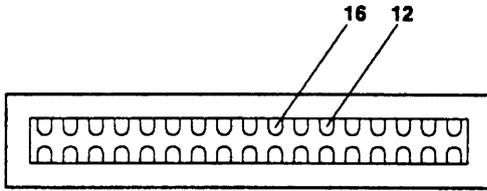


Figure 14-39. Drive Select Voltages (Diskette Drive Cable)

**Did the voltages increase from approximately 0V DC to 5V DC?**

Yes No

**012**

Replace the system board.

- or -

If the problem continues, replace the diskette drive cable.

**013**

Replace the diskette drive.

- or -

If the problem continues, replace the system board.

- or -

If the problem continues, replace the diskette drive cable.

---

# MAP 0600: Diskette Drive (Type 8573)

Symptom Explanation	Conditions That Could Cause This Symptom
You have entered this MAP because you suspect a diskette drive problem.	<ul style="list-style-type: none"> <li>• A diskette drive is failing.</li> <li>• The system board is failing.</li> <li>• The diskette drive cable is failing.</li> <li>• The power supply is failing.</li> </ul>

**001**

- Power off the system.
- Ensure that the reference diskette is in Drive A.
- Power on the system.

During the POST, did the diskette drive in-use light come on before the beep?

Yes No

**002**

Go to Step 009.

**003**

Is the diskette drive in-use light lit continuously?

Yes No

**004**

Go to Step 006.

**005**

Go to Step 011.

**006**

Is the IBM logo displayed?

Yes No

**007**

Go to Step 009.

**008**

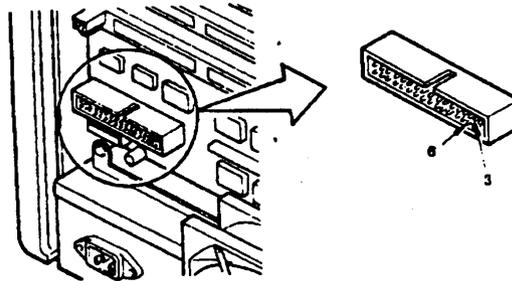
- Run the diskette drive test.  
If you successfully complete the advanced diagnostic tests and you suspect an intermittent problem, start an error log.

**009**

- Disconnect the diskette drive signal cable from the system board.  
(Step 009 continues)

**009** (continued)

- Check the voltages at the connector shown in Figure 14-40.



(V DC) Minimum	(V DC) Maximum	Pin Number
+ 4.8	+ 5.2	3 to ground
+11.5	+12.6	6 to ground

Figure 14-40. Diskette Drive Connector Voltages

Note: When measuring voltages, use the power supply frame as ground.

Are the voltages correct?

Yes No

**010**

Go to MAP 0020: Power (Type 8573).

**011**

- With the diskette drive signal cable disconnected, check the signal cable connector of the diskette drive for the voltages at the pins 12 and 16 shown in Figure 14-41. The voltages should increase from approximately 0V DC to approximately 5V DC during the POST (run the POST for each voltage check).

Notes:

(Step 011 continues)



011 (continued)

1. Approximately 0V DC includes a range of 0V DC to 0.8V DC, approximately 5V DC includes a range of 2.0V DC to 5.5V DC.
2. When measuring voltages, use the power supply frame as ground.

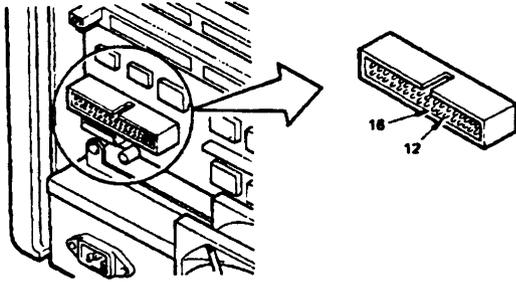


Figure 14-41. Drive Select Voltages (Diskette Drive Removed)

Did the voltages increase from approximately 0V DC to 5V DC?

Yes No

012

Replace the system board.

— or —

If that does not solve the problem, replace the signal cable.

013

Replace the drive.

— or —

If that does not solve the problem, replace the system board.

— or —

If that does not solve the problem, replace the signal cable.

---

1-111

# MAP 2400: System Board Video

Symptom Explanation	Conditions That Could Cause This Symptom
You have entered this MAP because you suspect a display problem.	<ul style="list-style-type: none"> <li>The display is failing.</li> <li>The display power cord is failing.</li> <li>The system board is failing.</li> </ul>

**Note:** For 2401 or 2402 errors, refer to Chapter 4., 8550 Diagnostic Tips, 2401 or 2402 Errors, Flickering/Changing Colors.

- 001**
- Power off the system.
  - Set the display contrast control to its maximum position (toward the front of the display).
  - Set the display brightness control to its middle position (the control has a detent in the middle position, which you can feel if you turn the control slowly).
  - Ensure that the reference diskette is in drive A.
  - Power on the system.

Is the screen blank (dark with no image)?

Yes No

**002**  
Go to Step 010.

**003**

- Power off the system.
- Disconnect the display signal cable from the system unit.
- Power on the display.

Is the screen still dark?

Yes No

**004**  
Power off the system.  
Replace the system board.

**005**

Does the display have a detachable power cord?

Yes No

**006**  
Replace the display.

**007**

(Step 007 continues)

007 (continued)

Does the display power cord have continuity?

Yes No

**008**  
Replace the display power cord.

**009**

Replace the display.

**010**

Is an image visible on the display (for example: characters, menu, icon)?

Yes No

**011**  
Go to Step 021.

**012**

Does the display have any obvious problems such as jittering, rolling, shifting, or out-of-focus characters?

Yes No

**013**  
Go to Step 019.

**014**

Is the screen readable enough to run the diagnostic tests?

Yes No

**015**  
Go to Step 021.

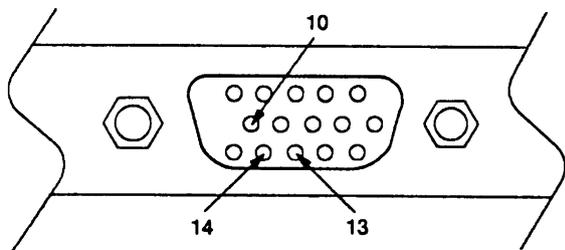
**016**

Advance to the Video Test Menu in the advanced diagnostic tests (do not start the video tests).

(Step 016 continues)

**016 (continued)**

- Disconnect the display signal cable from the system unit (do not power off the system unit).
- Use the procedure in Figure 14-42 and check the system unit display connector for the proper voltages.



LEX42818

1. Press 7 (do not press Enter), then check for:
  - 0 to +0.2V DC from pin 13 to 10 (ground)
  - 0 to +0.2V DC from pin 14 to 10 (ground).
2. Press Enter, then check for:
  - +3.0 to 4.0V DC from pin 13 to 10 (ground)
  - 0 to +0.2V DC from pin 14 to 10 (ground).
3. Press Enter, then check for:
  - 0 to +0.2V DC from pin 13 to 10 (ground)
  - 0 to +0.2V DC from pin 14 to 10 (ground).
4. Press Enter, then check for:
  - +0 to 1.0V DC from pin 13 to 10 (ground)
  - +3.0 to 5.2V DC from pin 14 to 10 (ground).

Figure 14-42. Display Connector Voltages

Are the voltages correct?

Yes No

**017**

- Power off the system.
- Replace the system board.

**018**

Replace the display.

---

**019**

Do all the display controls work properly?

Yes No

**020**

Replace the display.

**021**

Does the display have a self test?

Yes No

**022**

Go to Step 026.

**023**

- Activate the display self test.

Did the display self test complete successfully?

Yes No

**024**

Replace the display.

**025**

Replace the system board.

---

**026**

Did you receive one short beep during POST?

Yes No

**027**

- Power off the system.
- Replace the system board.

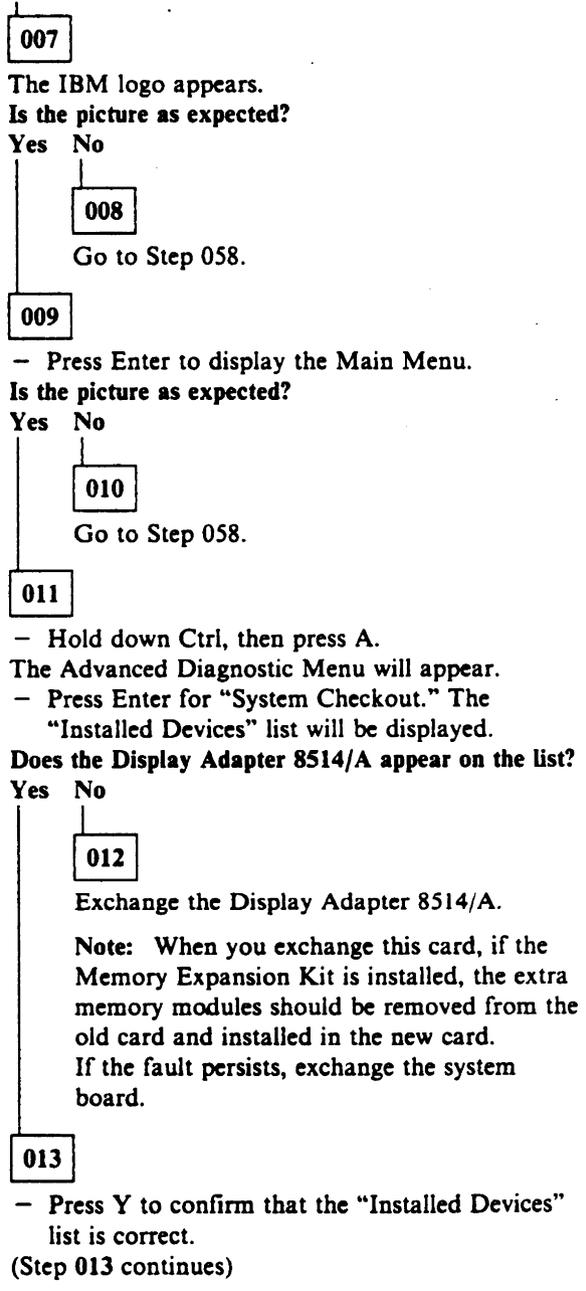
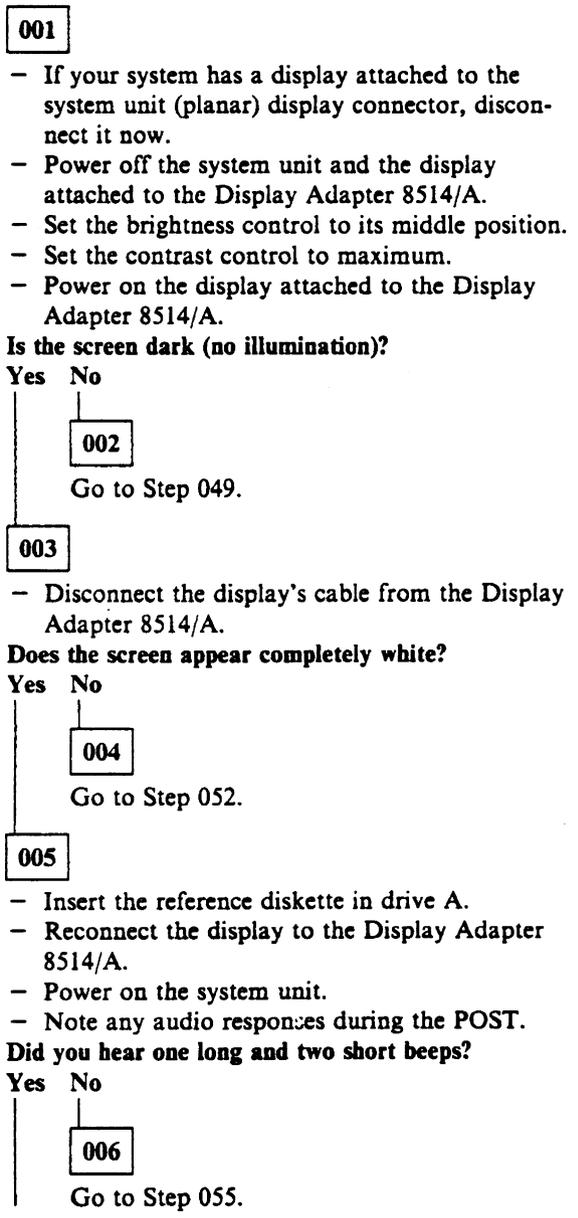
**028**

Replace the display.

---

## MAP 7400: IBM Personal System/2 Display Adapter 8514/A

Symptom Explanation	Conditions That Could Cause This Symptom
You have entered this MAP because you suspect a problem with the display connected to the Display Adapter 8514/A, you were directed here by an audible error code, or you have a 74XX error code.	<ul style="list-style-type: none"> <li>The display attached to the Display Adapter 8414 is failing.</li> <li>The Display Adapter 8514/A is failing.</li> </ul>



1-114

013 (continued)

- Press Enter for "Test One Time." The "Installed Devices" list will be displayed.
- Move the highlighted line down the menu as far as the test for the Display Adapter 8514/A, and press Enter.
- Press Enter to select "Display Adapter and Memory" test.

Did you receive an error code?

Yes No

014

Go to Step 028.

015

Is the error code 7435?

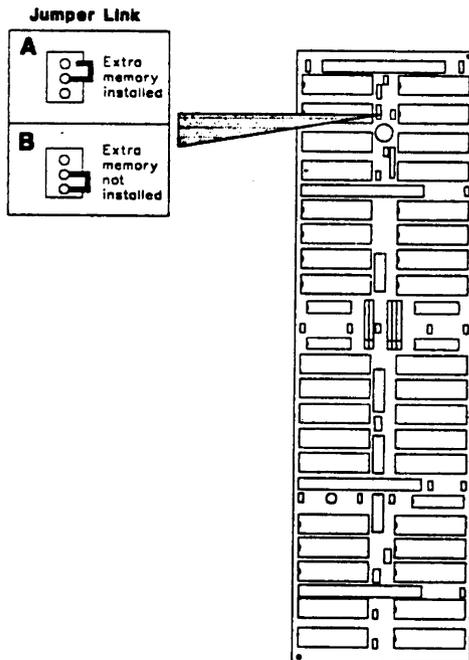
Yes No

016

Go to Step 018.

017

The jumper on the auxiliary (storage) part of the Display Adapter 8514/A is in the wrong position. See Figure 14-43 for details.



LEX42907

Figure 14-43. Jumper Link

14-52

1-115

- If the Memory Expansion Kit is installed, the jumper should be fitted to link the two pins shown in A above.
- If the Memory Expansion Kit is not installed, the jumper should be fitted to link the two pins shown in B above.

If the jumper is correct, exchange the Display Adapter 8514/A.

Note: When you exchange this card, if the Memory Expansion Kit is installed, the extra memory modules should be removed from the old card and installed in the new card.

018

Is the error code 7421, 7422, 7423, 7424, 7425, or 7427?

Yes No

019

Go to Step 021.

020

- Exchange the Display Adapter 8514/A.

Note: When you exchange this card, if the Memory Expansion Kit is installed, the extra memory modules should be removed from the old card and installed in the new card.

021

Is the error code 7426?

Yes No

022

Go to Step 024.

023

- Exchange the display attached to the Display Adapter 8514/A.
- If the fault remains, exchange the Display Adapter 8514/A.

Note: When you exchange this card, if the Memory Expansion Kit is installed, the extra memory modules should be removed from the old card and installed in the new card.

024

(Step 024 continues)

024 (continued)

Is the error code 7458 or 7478?

Yes No

025

Go to Step 027.

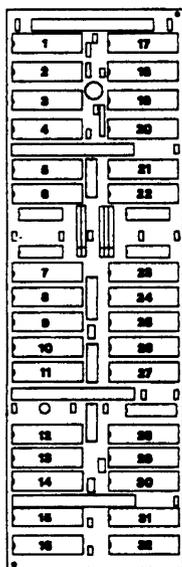
026

– Exchange the Display Adapter 8514/A.

**Note:** When you exchange this card, if the Memory Expansion Kit is installed, the extra memory modules should be removed from the old card and installed in the new card.

027

- Check that the jumper on the auxiliary (storage) part of the Display Adapter 8514/A is in the correct position. See Figure 14-43.
- If the jumper is correct, exchange the module on the Display Adapter 8514/A auxiliary card that corresponds with the error code in Figure 14-44.



Error Code	Module No	Error Code	Module No
7440	31	7460	18
7441	30	7461	27
7442	29	7462	26
7443	28	7463	25
7444	22	7464	24
7445	21	7465	23
7446	18	7466	20
7447	17	7467	19
7448	32	7468	15
7449	14	7469	11
7450	13	7470	10
7451	12	7471	9
7452	6	7472	8
7453	5	7473	7
7454	2	7474	4
7455	1	7475	3

LEX43125

Figure 14-44. Display Adapter 8514/A Auxiliary Card

028

The Display Adapter 8514/A Menu is displayed.

- Move the highlighted line down one line, to “Test Pattern(s),” and press Enter.

Is the picture on the screen stable and readable?

Yes No

029

Exchange the Display Adapter 8514/A. If the fault remains, exchange the display attached to the Display Adapter 8514/A.

**Note:** When you exchange this card, if the Memory Expansion Kit is installed, the extra memory modules should be removed from the old card and installed in the new card.

030

Is the “1024 x 768” test pattern displayed?

Yes No

031

Go to Step 033.

032

Go to Step 036.

033

Is an IBM Personal System/2 Color Display 8514 attached to your Display Adapter 8514/A?

Yes No

034

Go to Step 039.

035

- Exchange the IBM Personal System/2 Color Display 8514.
- If the fault remains, exchange the Display Adapter 8514/A.

**Note:** When you exchange this card, if the Memory Expansion Kit is installed, the extra memory modules should be removed from the old card and installed in the new card.

036

Is the test pattern correct and the center box blank?

Yes No

037

Exchange the Display Adapter 8514/A.

Note: When you exchange this card, if the Memory Expansion Kit is installed, the extra memory modules should be removed from the old card and installed in the new card.

038

- Press Y and then Enter. (You will not see the character "Y" appear on screen.) The 640 x 480 test pattern will be displayed.

039

Is the test pattern correct and the center box blank?

Yes No

040

Exchange the Display Adapter 8514/A.

Note: When you exchange this card, if the Memory Expansion Kit is installed, the extra memory modules should be removed from the old card and installed in the new card.

041

- Press Y and then Enter. (You will not see the character "Y" appear on screen.)

Is the display attached to your Display Adapter 8514/A a monochrome display?

Yes No

042

Go to Step 046.

043

The 320 x 200 Color Graphics screen displays with one gray bar.

Is the screen correct?

Yes No

044

Exchange the Display Adapter 8514/A.

Note: When you exchange this card, if the Memory Expansion Kit is installed, the extra memory modules should be removed from the

old card and installed in the new card.

045

Go to Step 064.

046

The 320 x 200 Color Graphics screen displays with four color bars.

Is the screen correct?

Yes No

047

Exchange the Display Adapter 8514/A.

Note: When you exchange this card, if the Memory Expansion Kit is installed, the extra memory modules should be removed from the old card and installed in the new card.

048

Go to Step 064.

049

- Check the continuity between pin 12 on the 15-way video connector on the adapter and pin 10 (ground).

Is there continuity?

Yes No

050

Exchange the Display Adapter 8514/A.

Note: When you exchange this card, if the Memory Expansion Kit is installed, the extra memory modules should be removed from the old card and installed in the new card.

051

- Exchange the display attached to the Display Adapter 8514/A.

052

Is the display's power-on indicator lit?

Yes No

053

If the display power cord is detachable, check its continuity. If the power cord has continuity or is not detachable, exchange the display attached to the Display Adapter

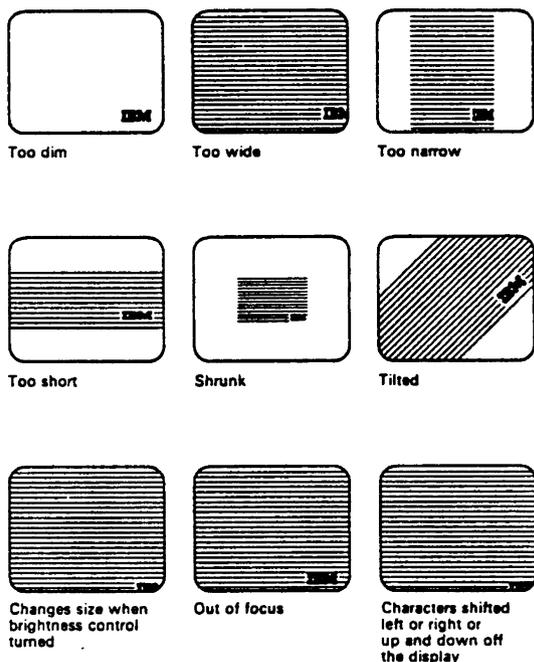
8514/A.

**054**

- Exchange the display attached to the Display Adapter 8514/A.

**055**

Is there a visible screen problem similar to one of the examples in Figure 14-45?



LEX43126

Figure 14-45. Screen Examples

Yes No

**056**

Go to Step 007.

**057**

- Exchange the display attached to the Display Adapter 8514/A.

**058**

- Disconnect the display from the Display Adapter 8514/A, and connect it to the system unit (planar) display connector.

(Step 058 continues)

058 (continued)

Is the picture now as expected?

Yes No

**059**

Go to Step 061.

**060**

- Exchange the Display Adapter 8514/A.

Note: When you exchange this card, if the Memory Expansion Kit is installed, the extra memory modules should be removed from the old card and installed in the new card.

**061**

- Power off the system unit.
- Remove the Display Adapter 8514/A from the system unit.
- Power on.
- Ignore the 165 Setup error message.
- Observe the IBM logo screen and Main Menu.

Is the picture now as expected?

Yes No

**062**

Leave the system in this configuration. There is a system VGA failure. Go to MAP 2400: System Board Video. When the problem is resolved replace the Display Adapter 8514/A and its display.

**063**

- Exchange the Display Adapter 8514/A.

Note: When you exchange this card, if the Memory Expansion Kit is installed, the extra memory modules should be removed from the old card and installed in the new card.

**064**

You have gone through this MAP without solving your problem. The following steps may help you to find additional audio and visual symptoms.

- Check the entire system for loose or damaged connectors.
- Review MAP 0000, the "Start" MAP.
- Select "Log Utilities" in the diagnostic menu to start an error log, then select "Run Tests." This allows you to operate the system thoroughly to identify the symptom.

(Step 064 continues)



**064 (continued)**

- When you have identified the symptom, go to the "Start" MAP, or the appropriate MAP for the symptom.

If you have followed these procedures and still have a problem, seek technical assistance.

# MAP 14900: Plasma Display Adapter (Type 8573)

Symptom Explanation	Conditions That Could Cause This Symptom
You have entered this MAP because you suspect a plasma display or external display problem.	<ul style="list-style-type: none"> <li>• The plasma display is failing.</li> <li>• The external display is failing.</li> <li>• The plasma display power cable is failing.</li> <li>• The plasma display signal cable is failing.</li> <li>• The external display power cord is failing.</li> <li>• The plasma display adapter is failing.</li> <li>• The system board is failing.</li> </ul>

**Notes:**

1. When an external display is attached, nothing can be displayed on the plasma display even if the external display power is off.
2. If the auto dim function is working, nothing is displayed on the plasma display screen. Press the shift key to return to normal operation.

**001**

- Power off the system.
- Disconnect the external display cable from the system unit (if attached).
- Insert the reference diskette into Drive A.
- Power on the system.

**Did the POST complete with one long and two short beeps?**

Yes No

**002**  
Go to Step 004.

**003**

Replace the plasma display adapter.  
- or -  
If that does not solve the problem, replace the system board.

**004**

**Is the plasma display screen blank?**

Yes No

**005**  
Go to Step 007.

**006**

Go to Step 020.

**007**

**Did the post 14901 error occur?**

Yes No

**008**  
Go to Step 010.

**009**

Replace the plasma display adapter.  
- or -  
If that does not solve the problem, replace the system board.

**010**

**Did the Advanced Diagnostics Menu display on the plasma display, and is it readable?**

Yes No

**011**  
Go to Step 020.

**012**

**Did you observe any obvious problems on the plasma display screen?**

Yes No

**013**  
Go to Step 015.

**014**  
Go to Step 020.

015

Did the plasma display test complete without an error?

Yes No

016

Follow the instructions on the screen.

017

Do you suspect the external display problem?

Yes No

018

If you successfully completed the plasma display test and you suspect an intermittent problem, start an error log.

019

Go to Step 025.

020

- Measure the continuity on all pins of the plasma display signal cable.

Is there continuity between the pins on the plasma display signal cable?

Yes No

021

Replace the plasma display signal cable.

022

- Power off the system.
- Remove the plasma power cable at both ends.
- Measure the continuity on all pins of the plasma display power cable.

Is there continuity between the pins on the plasma display power cable?

Yes No

023

Replace the plasma display power cable.

024

(Step 024 continues)

024 (continued)

Replace the plasma display.

- or -

If that does not solve the problem, replace the plasma display adapter.

025

- Power off the system.
- Connect the external display cable to the system unit.
- Set the contrast control of the external display to its maximum position (toward the front of the display).
- Set the brightness control of the external display to its middle position (the control has a detent in the middle position, which you can feel if you turn the control slowly).
- Ensure that the reference diskette is in Drive A.
- Power on the system.

Is the screen blank (dark with no image)?

Yes No

026

Go to Step 034.

027

- Power off the system.
- Disconnect the external display cable from the system unit.
- Power on the display.

Is the screen still dark?

Yes No

028

- Power off the system.  
Replace the plasma display adapter.

- or -

If that does not solve the problem, replace the system board.

029

Does the external display have a detachable power cord?

Yes No

030

Replace the external display.

031

Does the external display power cord have continuity?

Yes No

032

Replace the external display power cord.

033

Replace the external display.

---

034

Is an image visible on the display (for example: characters, menu, icon)?

Yes No

035

Go to Step 041.

036

– Advance to the external display test menu in the advanced diagnostic tests.

Does the display have any problems such as jittering, rolling, shifting, or out-of-focus characters?

Yes No

037

Go to Step 039.

038

Replace the external display.

---

039

Do all the display controls work properly?

Yes No

040

Replace the external display.

041

Does the external display have a self test?

Yes No

042

(Step 042 continues)

042 (continued)

Go to Step 046.

043

– Activate the display self test. If you need instructions, refer to the *Hardware Maintenance Reference* manual.

Did the display self test complete successfully?

Yes No

044

Replace the external display.

045

Replace the plasma display adapter.

– or –

If that does not solve the problem, replace the system board.

---

046

Did you receive one short beep during POST?

Yes No

047

– Power off the system.

Replace the plasma display adapter.

– or –

If that does not solve the problem, replace the system board.

048

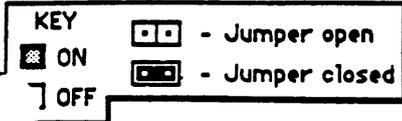
Replace the external display.

---

14-60

1-123

# Toshiba T1100 Plus Portable (Laptop) Computer



The Toshiba T1100 Plus is a portable personal computer which is compatible with the IBM PC. Most of the chips are CMOS type, so the power consumption is very little ( 3.0 W ) and weighs only 4.5 Kg ( less than 10 pounds ).

The T1100 Plus comes in two types:

1. F type - Only one Floppy Disk Drive.
2. F/F type - Two Floppy Disk Drives.

The T1100 Plus is composed of a System PCB, Keyboard, LCD (Liquid Crystal Display), one or two 3.5" FDD(s) (Floppy Disk Drives), and Power Supply Unit. The LCD can display 640 x 400 pixels in graphics mode and 2000 characters in text mode. The 3.5" FDD have capacity of 720 KB. The standard memory size is 256 KB and it is able to extend up to 640 KB with an optional Memory Card. Options for the T1100 Plus are:

Internal Options - Memory Card (384 KB), Modem Card and Interface Card

External Options - I/O Expansion Box, 5.25" External FDD (storage capacity of 360 KB)

The T1100 Plus has connectors for Color CRT Display port, RS232 Serial port and Printer/FDD Port on the rear panel.

The T1100 Plus is a 8086-based system with an i80C86-2 CPU chip ( high speed, CMOS, 8086 chip ). It runs at a clock speed of 4.77 MHz or 7.16 MHz ( 7.16 MHz at boot-up ).

To toggle from Normal Speed (4.77 MHz) to Turbo Speed (7.16 MHz), type <Control><Alt><Page Up>.

To toggle from Turbo Speed (7.16 MHz) to Normal Speed (4.77 MHz), type <Control><Alt><Page Down>.

To toggle from internal to external display, type <Control><Alt><End>.

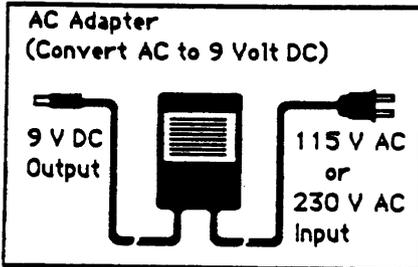
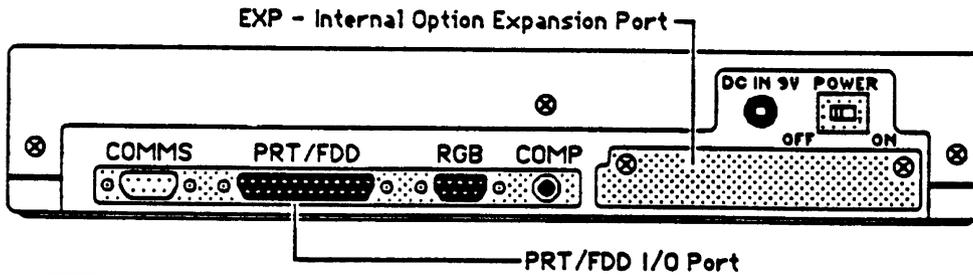
To toggle from external to internal display, type <Control><Alt><Home>.

The system board has an 80C86-2 CPU chip, no option for math coprocessor, and 2 switches, described below. To test or check system setup, run "TEST" from Toshiba's MS-Dos. The power supply uses 9 Volts DC, and gets it from 2 sources:

1. An AC Adapter with 9 V DC output to the T1100 Plus. There are two types of AC Adapters -
  - a) U.S.A. version - input 115 Volts AC, and
  - b) European version - input 230 Volts AC.
2. A Nickel-Cadmium (Nicad) battery is inside the computer and is not user replacable. The battery must be initially charged before it is ready to use. If the battery is low, the "Low Battery" LED comes on, there is approximately 20 minutes of power left in the battery. To charge the battery, connect the AC Adapter to the 9 Volt DC Input port with the power switch off. Remember, if the battery is completely dead, the "Low Battery" LED may not light and it may take more than 5 minutes of charging the T1100 Plus before the computer can be powered on.

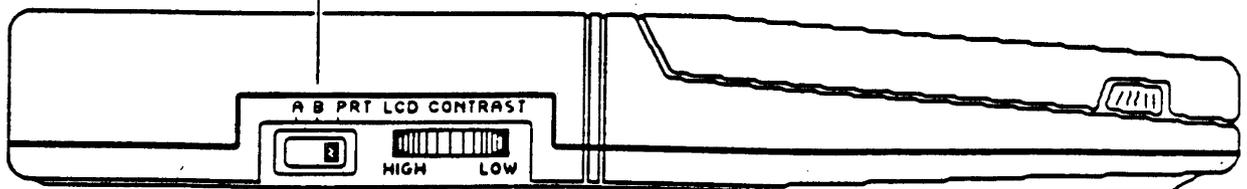
S2 - Configuration DIP Switches (must remove cover to access)	
Switch	Description
1	Always off <input type="checkbox"/>
2, 3	System Board Memory
2 3	<input checked="" type="checkbox"/> 256 KB <input type="checkbox"/> 512 KB
2 3	<input type="checkbox"/> 384 KB <input checked="" type="checkbox"/> 640 KB
4	Number of Floppy Drives
4	1 drive - <input checked="" type="checkbox"/> 2 drives - <input type="checkbox"/>
5	RS232 Port and (optional) port for Modem Card
5	RS232 Com1, Modem Com2 - <input checked="" type="checkbox"/>
5	RS232 Com2, Modem Com1 - <input type="checkbox"/>
6	System Bd. Display Controller
6	Enable - <input checked="" type="checkbox"/> Disable - <input type="checkbox"/>

Rear Panel



S1 - PRT/FDD Selection Switch	External Drive or Parallel Port	Type /F Internal Drive	Type F/F Internal Drives	Top	Bottom
A <input type="checkbox"/>	Drive A	Drive B	Disabled	Drive B	Drive B
B <input type="checkbox"/>	Drive B	Drive A	Drive A	Drive A	Disabled
Prt <input type="checkbox"/>	LPT1	Drive A	Drive A	Drive A	Drive A

Left Side



## Toshiba T1200 Portable (Laptop) Computer

The Toshiba T1200 is a portable personal computer which is compatible with the IBM PC. Most of the chips are CMOS so the power consumption is very low and weighs less than 11 pounds.

The T1200 is composed of a System PCB, Keyboard, LCD (Liquid Crystal Display), one 3.5" FDD (Floppy Disk Drive), Power Supply Unit, and a 3.5" HDD (Hard Disk Drive). The LCD can display 640 x 400 pixels in graphics mode and 2000 characters in text mode. The 3.5" FDD has a capacity of 720 KB, and the 3.5" HDD has a capacity of 20 MB. The standard memory size is 1 MB, 640 KB for conventional memory. The additional 384 KB Ram can be used for Hard Ram (Ram Disk - Drive D:) or Expanded Memory. These memory configurations are setup using the "SETUP12" program on Toshiba's MS-Dos.

Options for the T1200 include:

Internal Options - Modem Card

External Options - I/O Expansion Chassis, 5.25" External FDD (storage capacity of 360 KB), Numeric Keypad, PC Floppy Link (allows the use of one of the 5.25" diskette drives of an IBM PC, XT or AT with the T1200)

The T1200 has connectors for Color RGB and Composite External Displays, RS232 Serial port, Parallel Printer Port, External Floppy Drive Port, and Numeric Keypad. The T1200 is an 8086-based computer, using an i80C86-1 CPU Chip (high speed, CMOS, 8086 chip) with a clock speed of 4.77 MHz and 9.54 MHz (9.54 MHz at boot-up).

To toggle from Normal Speed (4.77 MHz) to Turbo Speed (9.54 MHz), type <Control><Alt><Page Up>.

To toggle from Turbo Speed (9.54 MHz) to Normal Speed (4.77 MHz), type <Control><Alt><Page Down>.

To toggle from internal to external display, type <Control><Alt><End>.

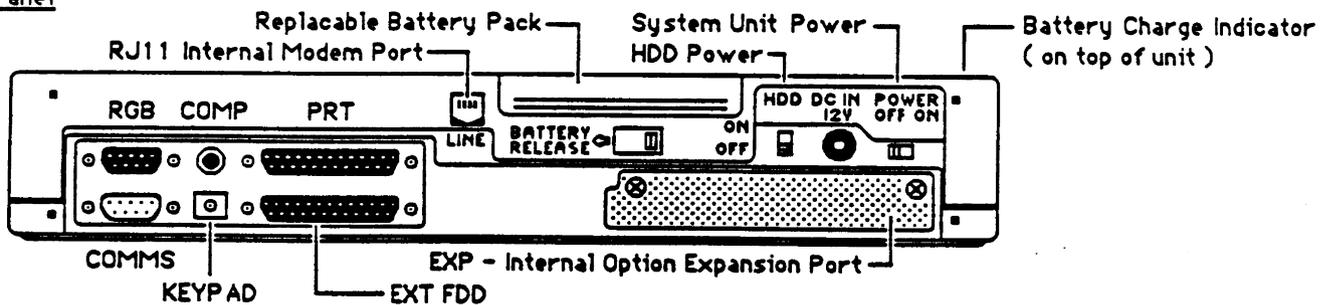
To toggle from external to internal display, type <Control><Alt><Home>.

To configure system setup, run the program "SETUP12", and to test the T1200, run the program "TEST12".

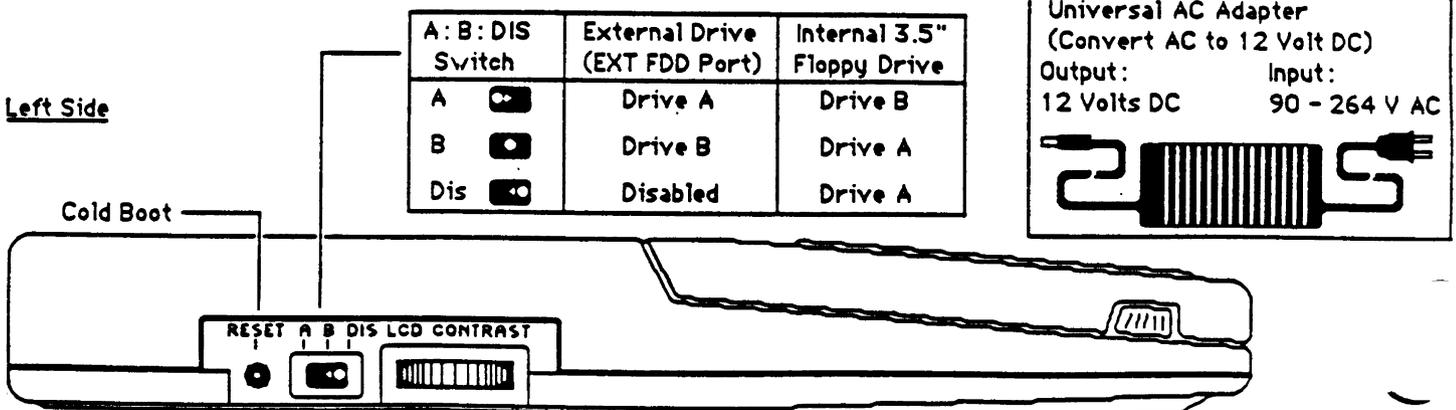
The power supply uses only 12 Volts DC. It receives its power from one of two sources:

1. A Universal AC Adapter to supply 12 Volts DC to the T1200. It can accept AC Voltage between 90 and 264. This Universal AC Adapter is compatible with U.S. (110 V AC) and European (220 V AC) Current.
2. A User-Replaceable rechargeable Nickel-Cadmium (Nicad) Battery when fully charged can power the system for up to 7 hours. To charge the battery, connect the AC Adapter to the 12 Volt DC input port with the power switch off - a full charge may take 6 to 8 hours. A charge indicator light tells you when the battery is charging (RED) or when the battery is fully charged (GREEN) while the AC Adapter is connected. There is another LED, the "Low Battery" light, located the upper right side of the keyboard, that flashes or glows when the batteries get low, and there is also an audible battery alarm. If this happens, there may be two to nine minutes of battery power left. Whenever the battery removed, or to see the approximate amount of power left in the battery, type <FN><Sys Req> to see a Pop-Up.

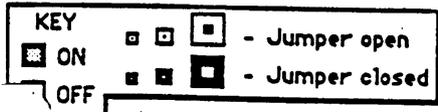
### Rear Panel



### Left Side



# Toshiba T3100 Portable (Laptop) Computer



The Toshiba T3100 is a portable personal computer which is compatible with IBM PC. Most of the IC chips are CMOS type, the power consumption is very little (15 W). The T3100 system has the following two types:

1. F/F type - Two Floppy Disk Drives
2. F/H-10 type - One Floppy Disk Drive and one 10 MB Hard Disk Drive.
3. F/H-20 type - One Floppy Disk Drive and one 20 MB Hard Disk Drive.

The T3100 is composed of a System PCB, Keyboard, Plasma Display, Power Supply Unit, Case, 3.5" FDD (Floppy Disk Drive) and for the F/H types, a 3.5" HDD (Hard Disk Drive). The Plasma Display can display 640 x 400 pixels in graphic mode and 2000 characters in character mode. The 3.5" FDD has a capacity of 720 KB. The 3.5" HDD has a capacity of 10 or 20 MB.

The standard memory size is 640 KB and it is able to extend up to 2 MB with an optional Memory Card.

Internal Options - Memory Card (2 MB), Modem Card and Interface Card

External Options - I/O Expansion Box, 5.25" External FDD (storage capacity of 360 KB)

The T3100 has connectors for Color CRT Display port, RS232C Serial port and Printer/FDD port on the rear panel.

The T3100 is an 80286-based system, with a clock speed of 4.77 MHz or 7.16 MHz in turbo mode. The system at boot-up automatically runs at 7.16 MHz.

To toggle from Normal Speed (4.77 MHz) to Turbo Speed (7.16 MHz), type <Control><Alt><Page Up>.

To toggle from Turbo Speed (7.16 MHz) to Normal Speed (4.77 MHz), type <Control><Alt><Page Down>.

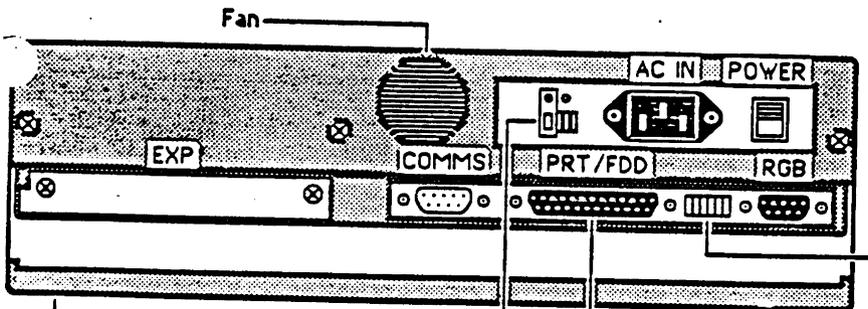
To toggle from internal to external display, type <Control><Alt><End>.

To toggle from external to internal display, type <Control><Alt><Home>.

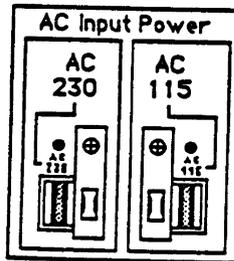
To test the Toshiba T3100, run the program "TESTCE" from Toshiba's MS-Dos 3.2.

Make sure the Voltage is set correctly on the power supply, either 115 Volts for U.S., or 230 Volts for Europe.

Rear Panel



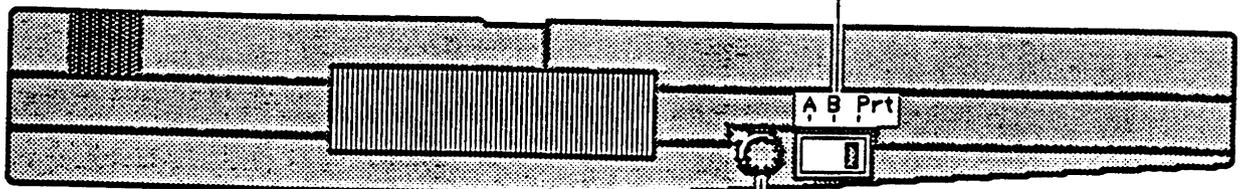
Switch Block ( * default - all off )		
1	ON	North European Font
	OFF	* Normal Font
2	ON	512 KB Ram
	OFF	* 640 KB Ram
3	ON	Disable internal CRTC
	OFF	* Enable internal CRTC
4	ON	Printer Port for Input/Output
	OFF	* Printer Port for Printer Port
5	ON	Plasma display font double dots
	OFF	* Plasma display font single dot
6	ON	Comm Port Address '2FA'
	OFF	* Comm Port Address '3FA'



PRT/FDD I/O Port

PRT/FDD Selection Switch	External Drive or Parallel Port	Internal Drive
A <input type="checkbox"/>	Drive A	Drive B
B <input type="checkbox"/>	Drive B	Drive A
Prt <input type="checkbox"/>	LPT1	Drive A

Left Side



External Numeric Keypad Connector



**NORTHSTAR DIMENSION HARD DRIVE PROCEDURES**

- 1.) EITHER ASK THE CUSTOMER OR IF POSSIBLE BRING UP THE DIMENSION TO SEE IF THEY ARE USING NOVELL NETWORK SOFTWARE. IF THE SYSTEM IS BOOTABLE THE FIRST SCREEN ON THE WORKSTATION WILL TELL YOU IF IT IS NOVELL.
- 2.) IF THE SYSTEM IS NOVELL TO RUN THE DIAGNOSTICS YOU MUST DISCONNECT THE HARD DRIVE. (NOTE THIS IS ONLY APPLICABLE WHEN YOU USE NORTHSTAR DIMENSION SERVICE DISKETTE #1.) THE NOVELL SOFTWARE WILL NOT LET YOU BOOT FROM THE FLOPPY DRIVE.
- 3.) IF THE SYSTEM IS NOT NOVELL THEN YOU CAN BOOT THE SYSTEM UP WITH NORTHSTAR DIMENSION SERVICE DISKETTE #1. THIS DISKETTE IS FOR THE CENTRAL BOARD AND WORKSTATION CHECKOUT, NOT FOR THE HARD DRIVE. TO TEST OUT THE HARD DRIVE IT IS BEST TO RUN THE CUSTOMERS SOFTWARE IF IT IS ACCESSIBLE. HAVE THE CUSTOMER RUN A PROGRAM AND ALSO RUN CHKDSK IF POSSIBLE. THE NORTHSTAR DIAGNOSTICS FOR THE HARD DRIVE ARE ALL DESTRUCTIVE (SERVICE DISKETTE #2), SO USE THEM AS A LAST RESORT.
- 4.) IF THE SYSTEM WILL NOT BOOT OFF THE HARD DRIVE, BUT WILL OFF THE FLOPPY, LOAD DOS FROM THE FLOPPY AND THEN TRY TO ACCESS THE HARD DRIVE. THIS IS TO CHECK AND SEE WHAT IS ACCESSIBLE FOR THREE REASONS |
  - A1. IN CASE THE CUSTOMER WANTS TO RETRIEVE ANY DATA.
  - A2. TO SEE IF YOU CAN GET TO THE HARD DRIVE.  
IT'S POSSIBLE YOU MAY HAVE A BAD CENTRAL BOARD (THE HARD DRIVE CONTROLLER IS ON THIS BOARD.) ALWAYS TRY ANOTHER CENTRAL BOARD BEFORE REFORMATTING OR REPLACING A HARD DRIVE. THIS WILL SAVE TIME AND THE CUSTOMERS DATA IF THEY ARE NOT BACKED UP. HOWEVER IF THE CUSTOMER IS BACKED UP AND YOU DO NOT HAPPEN TO HAVE A CENTRAL BOARD WITH YOU, USE YOUR OWN JUDGEMENT. ALSO DON'T FORGET TO CHECK THE HARD DRIVE CABLES FOR SEATING.
  - A3. IT MAY BE ONLY ONE OR MORE PARTITIONS THAT ARE UNACCESSIBLE. IF THIS IS THE CASE THEN YOU COULD POSSIBLY GO IN AND RE-FORMAT ONLY THOSE PARTITIONS. TO DO THIS JUST TYPE IN FORMAT <d>, INDICATING WHICH LOGICAL DRIVE PARTITION. THIS SOMETIMES DOES THE TRICK AND ALL THE CUSTOMER HAS TO DO IS RE-INSTALL THE PROGRAMS OR DATA BACK ONTO THOSE PARTITIONS. HOWEVER IF THERE IS AN ERROR IN FORMATTING, THEN YOU WILL HAVE TO DO A LOW LEVEL FORMAT ON THE ENTIRE DRIVE. TO DO THIS, (SEE STEP 5).

STEP 5)

INSTALLING A NEW HARD DRIVE  
OR PERFORMING LOW LEVEL  
FORMAT ON EXISTING DRIVE

- A) WHETHER YOU ARE DOING A LOW LEVEL FORMAT ON A EXISTING DRIVE OR INSTALLING A NEW VIRGIN HARD DRIVE YOU MUST FOLLOW THE SAME STEPS AS FOLLOWS.  
LOAD NORTHSTAR DOS FROM THE FLOPPY DRIVE. (NOTE | MUST BE DISKETTE #1 OF 4 ).
- B) REMOVE THIS DISKETTE AND INSERT THE NORTHSTAR SERVICE DISKETTE #2.
- C) TYPE DISKTOOL <CR>
- D) SELECT OPTION TO FORMAT HARD DRIVE.
- E) SELECT HARD DRIVE TYPE AND ADD IN ANY BAD TRACKS WRITTEN ON THE FLAW MAP STICKER (LOCATED ON THE TOP OF THE HARD DRIVE).
- F) AFTER HARD DRIVE HAS BEEN FORMATTED SUCCESSFULLY, REBOOT THE DIMENSION WITH NORTHSTAR DOS DISKETTE 1 OF 4.
- G) LOG IN AS FOLLOWS | USERNAME | MANAGER    PASSWORD | PASSWORD
- H) TYPE MANAGER ON <CR>
- I) TYPE SETUP <CR>
- J) FOLLOW THE INSTRUCTIONS, IT WILL GO IN AND CREATE PARTITION ZERO AND ONE. IT WILL ASK YOU TO KEEP INSERTING DISKETTES PERIODICALLY, UNTIL ALL FOUR OF THE SET HAVE BEEN LOADED.
- K) NOW REBOOT THE DIMENSION WITHOUT A DISKETTE AND IT SHOULD LOAD OFF THE HARD DRIVE. LOG IN THE SAME AS ABOVE.
- L) TYPE MANAGER ON <CR>
- M) TYPE MAINT <CR>
- N) SELECT CREATE PARTITIONS FIRST (USE CUSTOMERS WORKSHEET FOR PARTITION SIZE, AND WHETHER THE PARTITION IS PUBLIC, PERSONAL, OR SHARED.) ALL THIS DOES IS CREATE ALL THE PARTITIONS TO BE USED, THEN YOU SELECT WHO CAN USE WHAT PARTITION.
- O) AFTER RETURNING TO MAIN MENU SELECT ADD USERS (USE WORKSHEET).
- P) NEXT SELECT ADD PRINTERS (USE WORKSHEET).
- Q) EXIT THE MAINTENANCE PROGRAM AND TYPE FORMAT <d> FOR EACH PARTITION, (EXCEPT C DRIVE, IT'S ALREADY FORMATTED). THIS COMPLETES THE INSTALL, NOW HAVE CUSTOMER RESTORE THEIR FILES.



Memory Address Switches - Revision E Board

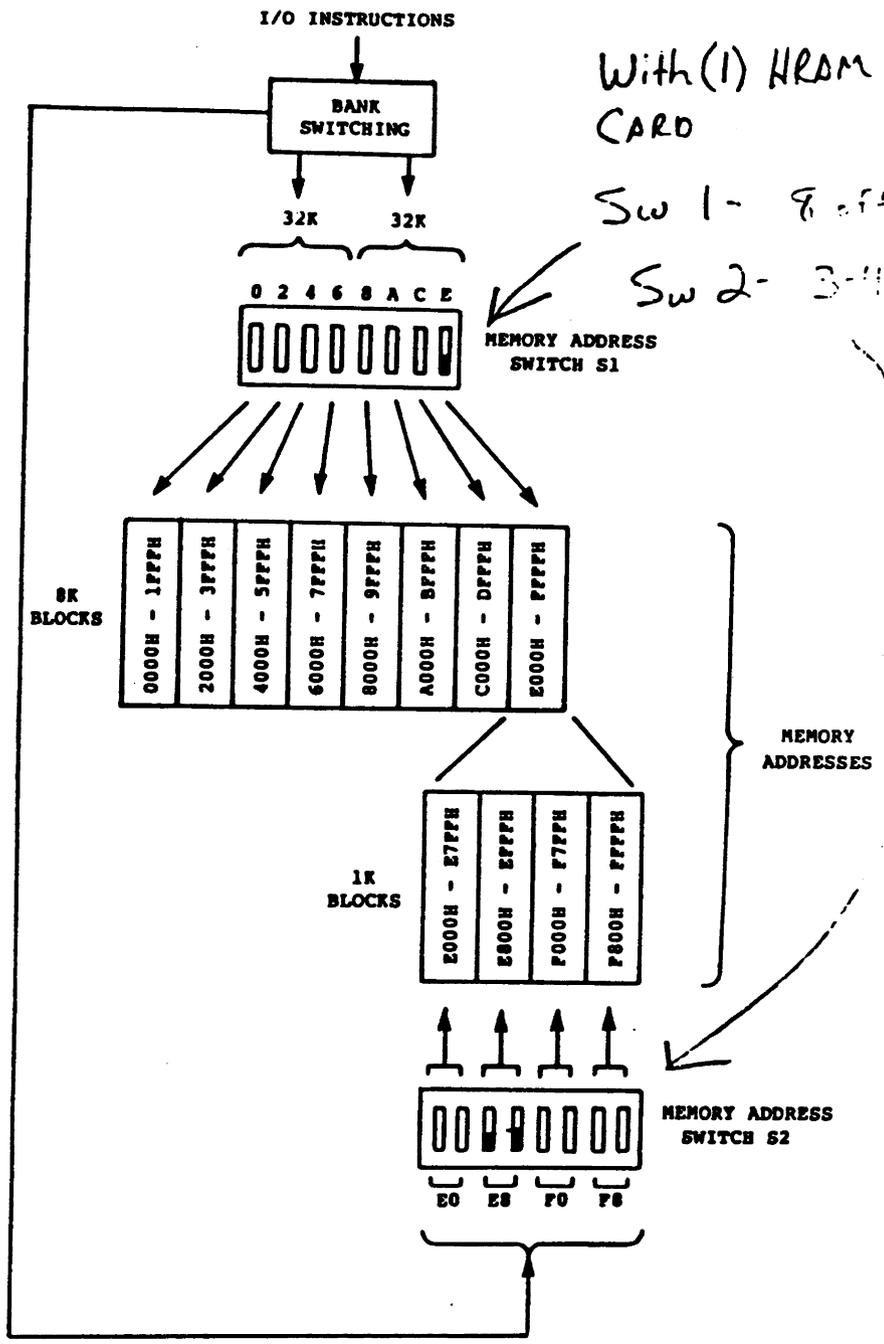


Figure 3-11

HRAM BOARD  
Horizon

---

**INSTALLING THE HRZ-UP BOARDS**

---

**Introduction** This chapter describes the step-by-step procedure for installing the 8/16 HRZ-UP boards. To install the boards you:

1. Configure the HRZ-UP boards to set correct addresses and install each board. The board address is composed of two hexadecimal digits:
  - The upper digit (switches 1-4) represents the board type:
    - 2 = UP8 board
    - 4 = UP16 board
    - 7 = UP8 board used as Background Batch (see Chapter 4).
  - The lower digit (switches 5-7) identifies a particular board: first, second, etc.
  - The lowest-order digit (switch 8) is always set open ("1") for normal operation (the switch is set closed to invoke a special service diagnostic). This gives the low-order address digit odd numbering: 1, 3, 5, etc.
2. Install any 384K boards.
3. Connect the HRZ-UP boards by installing the associated TIO boards and cables.
4. Connect the CRT terminals.

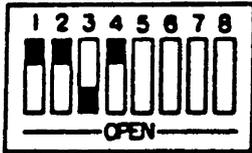
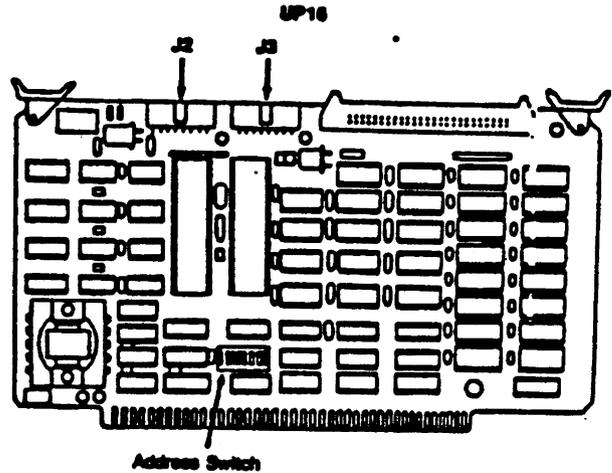
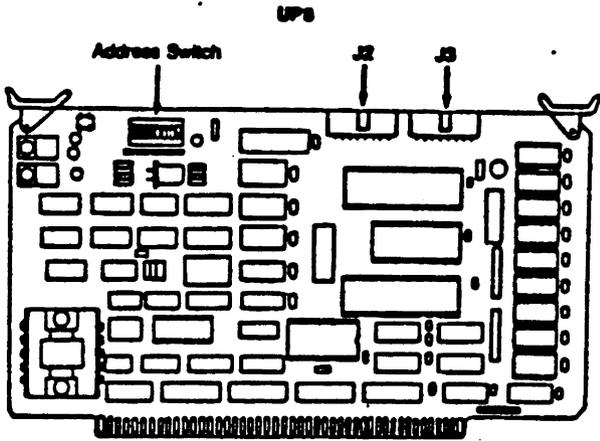
**INSTALLING THE HRZ-UP BOARDS**  
**Configure HRZ-UP Boards**

---

**Procedure: Configure the HRZ-UP Boards**

---

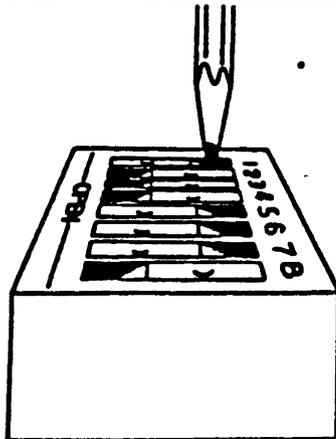
1. Remove each HRZ-UP board from its protective cover, locate the address switches, and use a small pointed tool to set the first four switches as shown below.



(0010xxxx)



(0100xxxx)



**NOTE:** The figure at the left shows a sample DIP switch setting, with dark areas (as in the figures above) pushed in.

**INSTALLING THE HRZ-UP BOARDS  
(cont.) Configure HRZ-UP Boards**

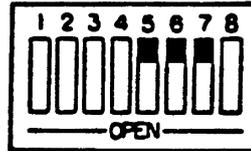
---

**Procedure**

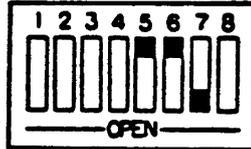
---

2. Set address switches 5, 6, and 7 on each HRZ-UP board as follows:

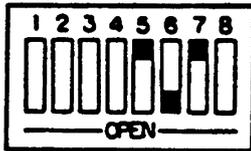
The first board  
(xxxx000x)



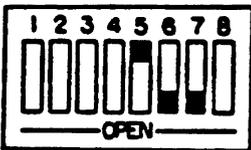
The second board  
(xxxx001x)



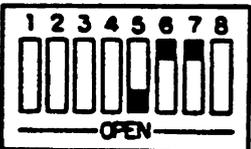
The third board  
(xxxx010x)



The fourth board  
(xxxx011x)



The fifth board  
(xxxx100x)



----->

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1-9.3

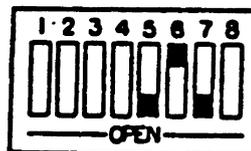
**INSTALLING THE HRZ-UP BOARDS**  
**Configure HRZ-UP Boards (cont.)**

---

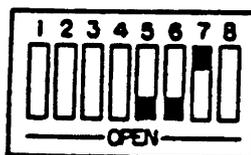
**Procedure**

---

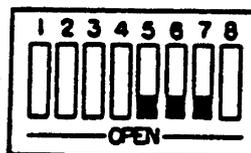
The sixth board  
(xxxx101x)



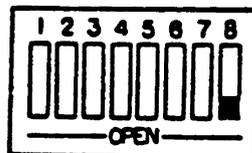
The seventh board  
(xxxx110x)



The eighth board  
(xxxx111x)



- 
3. Set the 8th address switch to OPEN. This allows the HRZ-UP board to operate in its standard mode.



(xxxxxx1)

**Note:** This switch is set to CLOSED to invoke the special Diagnostics environment. For this mode, see the 8/16 Technical Manual.

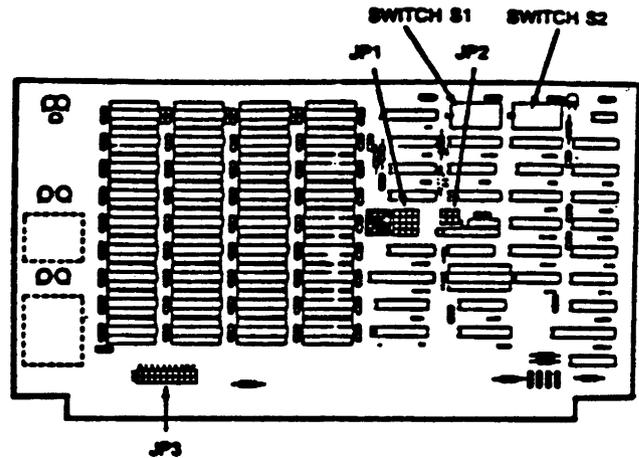
---

----->



**Procedure**

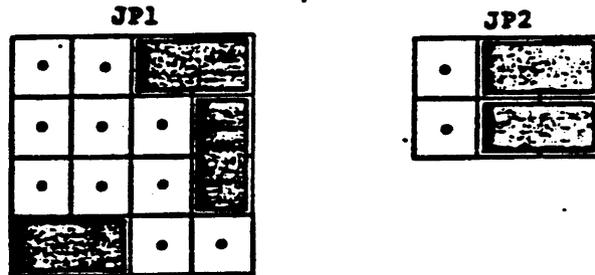
6. Use the illustrations at the right to locate and correctly set the switches and jumper plugs.



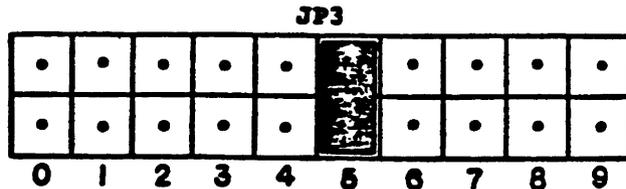
o S1/S2 select 64K RAM with E800-EBFF (hex) de-selected for the Boot PROM and floppy drive controller.



o JP1/JP2 cause the HRAM board memory to always be selected on system reset.



o JP3 causes memory parity to be vectored to Vector Interrupt 5.



---->

# Tech Talk

## Micro Products

December 17, 1984

## NORTHSTAR Advantage

Category C. Firmware

### C1 ADVANTAGE BOOT ROM

Previous releases no longer available:

00117B Early boot ROM without NorthNet  
00117C Released for NorthNet load option

Current release PROM and enhancements are:

03277/YY012786 (Revision B is required for the HD-30)

LOAD SYSTEM options:

BOOT	WITH	
Drs1	or	
Drs2	D 2	cr=RETURN key
Drs3	D 3	^ =CONTROL key
Drs4	D 4	
SIO	S cr	
Network	N	
Mini Mon	^ C	

### INSTALLATION

The boot ROM is at location L-10 on the main logic board. Early ROM's were 2K, the new ROM is 4K. Carefully exchange ROM's. Then check jumper W-6 for 4K connection as follows:

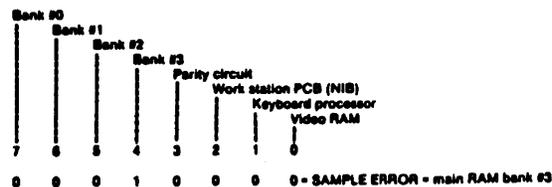


### NOTE

Some main PCB's may not have the 3-pin header installed at W-6. DO NOT FIELD INSTALL CHANGE IF HEADER IS NOT PRESENT!

### C2 POWER-ON INTEGRITY TEST

The power-on integrity test ends with the LOAD SYSTEM prompt if there is no failure or a register dump which identifies the failing area as follows:



# Tech Talk

## Micro Products

December 17, 1984

## NORTHSTAR Advantage

Category D. Hardware

### D1 ADVANTAGE REVISION

The Advantage system has been revised from internal designation C2 to C3, better identified as above serial number 025001. This change has no contract variations but does have a logistics impact. The base equipment uses power supply components, logic board, and cables which are not interchangeable. All I/O is compatible with the following exceptions:

C2 B/16 upgrade requires power boost module; C3 does not.

Only C3's can be NorthNet servers.

Hard disks use a different shield.

If a half-high floppy is used, power cable must be revision D.

### D2 SERIAL PRINTER BUFFER CONTROL

Serial printer interfacing to all NorthStar systems use RS-232C pin 20 to indicate printer ready. This requirement must be available on any printer used on NorthStar, communicating above 300 baud, to prevent buffer overflow.

### D3 NORTHSTAR FLOPPY DISKS

There are three floppy disk drives used on the Advantage. They are listed below with jumper settings.

Tandon TM-100-2	DS0 or DS1, all others open
MPI 52	DS1 or DS2 and 1-14 others open
Shugart SA455	DS1 or DS2 and DS with MX open

All drives are 48TPI and require no special installation with the exception of revision D power cable for Advantage using half-high and the SA455 metric screws.

### D4 HARD DISKS

NorthStar offers 5, 15, and 30 Meg 5.25-inch Winchester hard disks on the Advantage. They are compatible with all systems as long as the OS (operating system) revisions are correct. The only hardware change required is the 4K boot ROM revision B with the HD-30.

Codes are used by the software to identify the hard disk so that the correct parameters will be used. This code is required to be entered or confirmed at the start of the Advantage hard disk supplement. At the completion of the format and diagnostics, the code is then written on the system track of the hard disk.

CODE	MANUFACTURER	TYPE	JUMPERS
• 8QSA	SEAGATE	ST508	1-16 open,
• 8QSB	SEAGATE	ST408	others closed
• TNSA	TANDON	TM802	3-14 and 8-9 open,
• TNSB	TANDON	TM501	others closed
MS150	MINISCRIBE	4020	1-16 and 3-14 open
MS15E	MINISCRIBE	4020	1-16 and 4-13 open
RD30E	RODIME	RO208	P8 1-2 closed

• Indicates the only drives that are compatible with GHDOS below revision 2.1.0. If the customer software is below revision 2.0.0 be sure to use only the HD-5 drives indicated.

The minimum software levels for all the other drives are:

GCP/M	1.2.0
GDOS	2.1.0
TBS/OS	2.1.1
HDSUP	2.1.0 (HD-5/15) 2.2.0 (HD-30)

MAI Sorbus Service

MAI Sorbus Service

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CONTINUED —

The system track also contains the SKIP TABLE (bad spot) which may contain as many as 16 bad sectors (less than 1 percent capacity) before replacement need be considered.

**D5 GRAPHICS PRINTING**

At present, NorthStar only supports information for graphics printing using the NS100 (Epson MX100) printer. Other printers, of course, may be used but keep in mind the following requirements for the NS100:

**SERIAL** — The serial I/O in the printer must have at least a 2K buffer.

**PARALLEL** — Graphics used with the PIO requires software at or higher than, GDOS revision 2.0, GCP/M revision 1.1.0.

Originator: Ed Ehlisen

4/15/83

**D6 C3 GROUNDING REQUIREMENT**

Check to be sure that there is a ground connection between the I/O plate, ac power panel, and the disk drive tower. The retrofit kit required to add this ground is PN 02210, which includes all parts and instructions.

Originator: Ed Ehlisen

4/15/83

**C3 FLOPPY DISK ALIGNMENT ROUTINE**

The floppy disk alignment program resident in the mini monitor. Following ^ C, the prompt will be an ^, inputting an A will enter you into the alignment routine. The screen will display the I/O register, floppy disk register, and a track indicator. The following characters control the disk system:

- D Change selected drive
- H Change selected head
- I Step head in one track
- O Step head out one track
- ^ W Read/write test on selected drive, head and track
- Q Exit to MINI MON / QUIT R/W test, return to ALIGN  
(exit MINI MON to LOAD SYSTEM)

To ensure the track counter integrity, step head out to physical track 00 any time the counter has gone beyond 35 or drive selection has changed.

**NOTE**

Read/write test will indicate normal "T" type errors on failures.

**C4 KEYBOARD ROM**

The current release keyboard ROM is revision F, which has increased cursor response. Be sure to note the customer's revision when replacing the main PCB. Do not replace an F with an 3, for the customer will feel that his system is running slower. Also, if the customer has revision E, be sure to ask if revision F is desired.

# Tech Talk



## NORTH STAR

### SECTION IV. HARD DISK

4/15/83

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#### 7 HARD DISK SKIP TABLE (BAD SPOT)

Skip or bad spot tables are listed when diagnostics are run to indicate drive condition. Please note that the maximum quantity of skips allowed is 16, less than 1% capacity, and drives should not be replaced for any quantity less.

Originator: Ed Ellefsen

4/15/83

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#### 8 HD-5 SERVICE HINTS

Be aware that the HD-5 drive does not travel well and therefore must be stored and shipped in factory approved boxes.

All five 1/4 HD units must be installed in the system cabinet in place of the usual floppy; remote enclosures are not factory authorized or supported.

Power supplies in the older Advantages are marginal for supporting the HD units and should be checked carefully when troubleshooting HD errors.

Advantage HD-5 installations should include a cardboard insulator, nylon washers for the mounting screws, a tin shield, and a ground lead from shield to drive. The drive needs to be shielded, and drive/shield needs to be insulated from the drive mounting tower.

Originator: Ed Ellefsen

4/15/83

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SG 5A - Seagate 5MB  
TN 5A - TANDON 5MB  
MS 15 E - MINISCRIBE 15MB  
RD 30 E Rodine 30mb

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## NORTHSTAR HARD DISKS

## Tech Talk

## NORTH STAR

## SECTION IV. HARD DISK



5/7/81

## 1 HARD DISK ERROR CODES

CODE	SYMBOL	MEANING
1	MFSNF	Sync not found
2	MFCRC	CRC error
3	MFVYF	Verify checksum error
4	MFNIP	Drive or diskette not available
5	MFDMM	Density mismatch on read or verify
6	MFWRP	Attempt to write on protected diskette
7	MFCCX	Control-C detected from terminal
8	MFIDW	Illegal call to DWRIT
9	MFIDN	Illegal drive number
10	MFIDA	Illegal disk address
11	MFITL	Illegal transfer length
12	MFIDC	Illegal command to DCOM

## FILE MANAGER MESSAGE CODES

CODE	SYMBOL	MEANING
0	MOK	Operation okay
1	MONE	Account not empty
21	MULMP	Attempt to create duplicate directory
22	MULUL	Directory full
23	MULFD	Matching directory entry found
24	MDBAD	Bad directory structure
25	MDFNF	File name not found in directory
26	MFANF	Account name not found in directory
27	MCADS	Can't allocate requested disk space
28	MOFUL	Open File Table full; can't open file
29	MOAVL	Entry available in the Open File Table
30	MILDN	Illegal decimal number
31	MILFN	Illegal file name
32	MILAN	Illegal account name
33	MILUN	Illegal unit number
34	MILID	Illegal account ID number
35	MWRP	Attempt to write on write-protected file
36	MDEP	Attempt to delete a delete-protected file
37	MADEP	Attempt to delete a delete-protected account
38	MCCPF	Attempt to change a protected field in Field Manager
39	MPARA	Parameter invalid or out of range
40	MFRT	Improper file type specified
41	MFNO	File not open; open file required
42	MFOPN	File open; unopened file required
43	MFAIL	General failure, usually indicates hardware malfunction
44	MEOLA	End of list with available space
45	MEOL	End of list with no available space
46	MIFMR	Illegal File Manager request
47	MFZSZ	File size not zero
48	MIFZ	Illegal file size
49	MEOF	End of file reached during data transfer
50	MPEOF	Transfer attempted beyond end of file
51	MMEMP	Memory protect violation
52	MUNPU	Unit not powered up
53	MNYI	Operation not yet implemented
54	MFMO	File multiply opened
55	MDLRE	Disk level revision error
56	MDNSL	Drive label mismatch error
57	MDNSS	Drive size mismatch error
103	MIBIFID	Buffer error
104	MAMIPLS	Missing index pulse
105	MSHDR	PLL sync error on read

## CONTINUED -

CODE	SYMBOL	MEANING
106	MROFL	Failure to format drive
107	MRCER	Drive error during command execution
108	MVCRCE	CRC error during verify
109	MVDATE	Compare error in data during verify
110	MDCRCE	Data CRC error
111	MDSHE	CRC error on read sector header
112	MFWSOR	Found wrong sector during read or verify
113	MDWRTE	Write unsafe or attempt to write on protected cylinder
114	MCNTFL	Read/write flip-flop will not set in controller
115	MILLDA	Illegal disk address
116	MHDCRC	CRC error in header during position verify
117	MCYLER	Drive on wrong cylinder
118	MDSLER	Head select error
119	MDEKDS	Drive error during seek
120	MBADRV	Drive number too big
121	MTSHDR	Target sector has CRC error in header
122	MDRDFL	Failure in drive read electronics
123	MCNFTS	Can't find target sector
124	MDWNR	Drive wmt not ready after command started
125	MCNPR	Controller not there
126	MDNACC	Drive not ready for command
127	MDNROY	Drive not ready - out of speed

Originator: Ed Ellefsen

4/15/83

## 2 HD-18 INSPECTION

## GENERAL

Check all physical connections for tight fit and check power connections in particular for overheating. If burned connectors are found, replace them. They can not be reformed for a permanent fix. Also check sealing of relay under sealed unit.

A grinding noise when the drive powers down is caused by a loose collar on the motor shaft above the brake.

If the large, black, start capacitor blows, suspect and check the brake adjustment.

The leads out from the main transformer, where they connect to the coils, may only be twisted and not soldered.

## NEVADA BD

Switch block S1, S1-2 closed; all others open. This selects S12 bytes/sector.

New PROM set at A18, A19 should be marked 23980-002 and 23981-002, respectively. Also be sure that RC network is installed at approximately location A5.

IC at location A53 should not be T1 or 74500; it should be 7400.

## CONTROLLER

The 74LS74 IC's at locations 1D, 1E, 3B, 4E, 5D, and 6D should not be TI (Texas Instruments). Also, location 3D should not be T1 or 74500 but should be 7400. The 10W resistor next to the heat sink should be 10 ohms; some earlier resistors were 4.7 ohms.

Disconnect I/O cables from controller and check PI pin 1 for 3.1 volts minimum; if too low, the SIP resistor packs may be installed backwards (the artwork is incorrect).

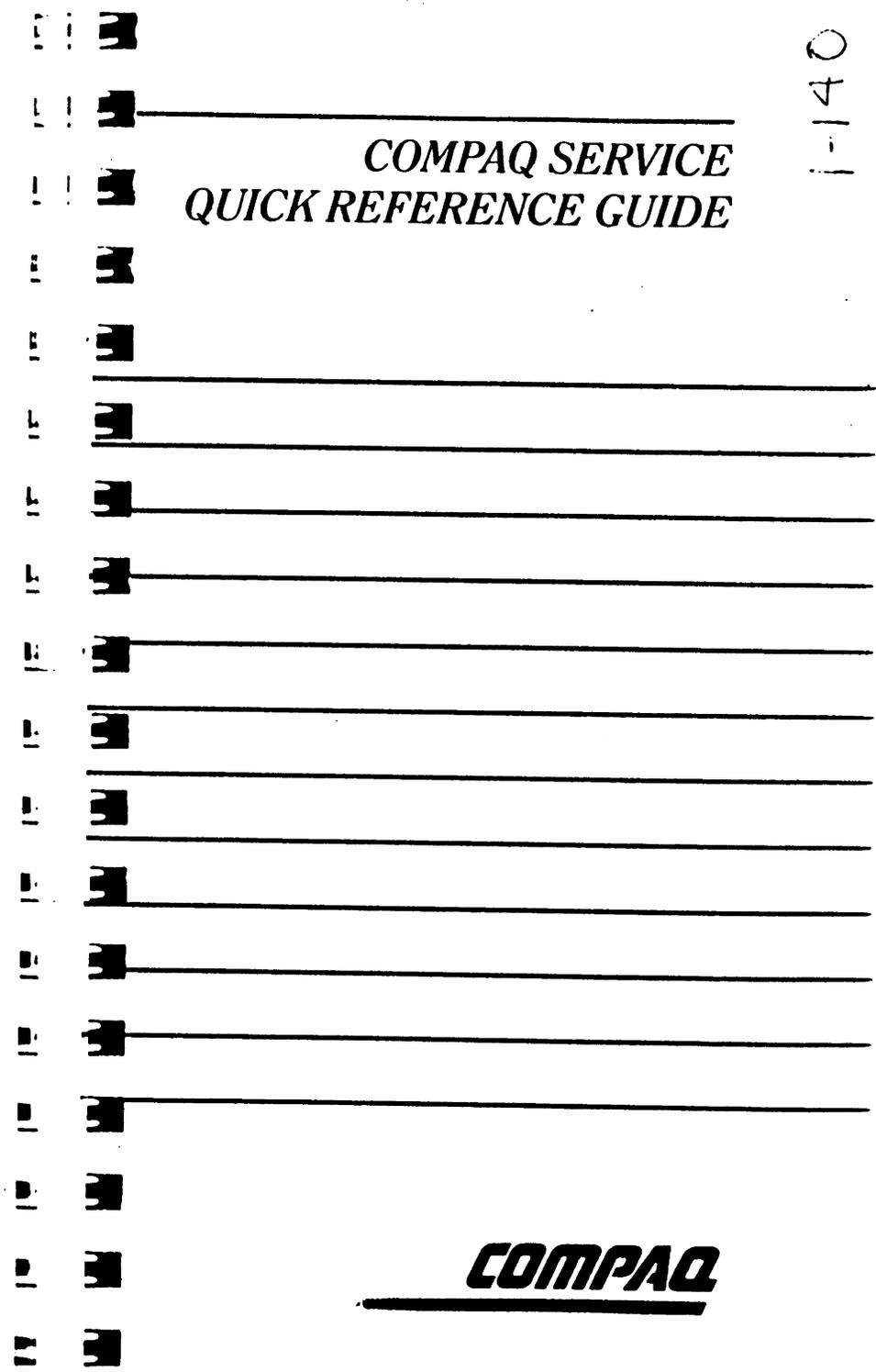
If the four diodes near the transformer blow, suspect the transformer.

## CABLES

The I/O cables must not be more than 20 feet long and should be properly shielded.

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*COMPAQ SERVICE  
QUICK REFERENCE GUIDE*



November 1989

Part No. 107315-008

***COMPAQ***



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#### COMPAQ SERVICE QUICK REFERENCE GUIDE

Eighth Edition (November 1989)

Guide Number 107315-008

The numbers listed next to board names and ROM revisions are for identification only and can be found somewhere on the board or ROM. Do not use these numbers to order spare parts.

#### NOTE

Throughout this document, numbers under the PAGE heading indicate the page(s) where board jumper/switch settings are found. An X under this heading indicates no jumper/switch settings on the board, but jumper/switch settings may be required on another board.

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COMPAQ PORTABLE III	31
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COMPAQ LTE/286	41
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12-MHz COMPAQ DESKPRO 286	65
COMPAQ DESKPRO 286e	71
COMPAQ DESKPRO 386	79
COMPAQ DESKPRO 386s	85
COMPAQ DESKPRO 386/20	91
COMPAQ DESKPRO 386/20e	95
COMPAQ DESKPRO 386/25	101
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**BOARD INDEX**

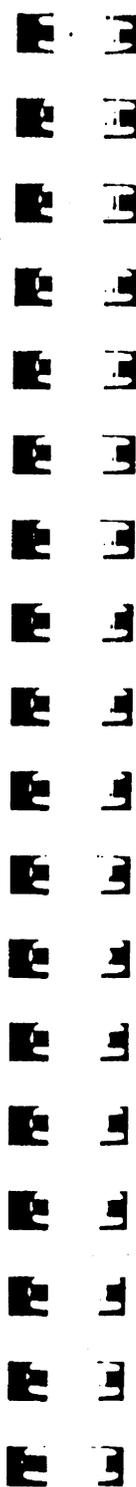
**MEMORY BOARDS/MODULES  
(In Assy No. Order)**

**MEMORY BOARDS/MODULES (Cont'd)  
(In Assy No. Order)**

Board/Module	Assy No.	Spare Part No.	Used In	Page
System Memory	000130	102710-001	DESKPRO 286-8	60
System Memory	000178	102710-001	DESKPRO 286-8	60
512/2048 KB Mem Exp	000307	105033-001	PORTABLE 286 PORTABLE II DESKPRO 286-8 DESKPRO 286-12	121
512/2048 KB Mem Exp	000308	105033-001	PORTABLE 286 PORTABLE II DESKPRO 286-8 DESKPRO 286-12	121
512/1536 KB Mem Exp	000330	104176-001	PORTABLE II	X*
System Memory	000382	102710-001	DESKPRO 286-8	60
32-Bit System Memory	000413	108059-001	DESKPRO 386	82
1-2 MB 32-Bit Mem Exp	000450	108082-001	DESKPRO 386	82
0.5-2 MB 16-Bit	000458	108138-001	DESKPRO 386	82
4 MB 32-Bit Mem Exp	000459	108083-001	DESKPRO 386	82
Memory Expansion	000543	107378-001	PORTABLE III	34
512 KB Memory Module	000576	107687-001	PORTABLE 386	X
1-2 MB Memory Exp	000579	107686-001	PORTABLE 386	X
4 MB Memory Exp	000582	107688-001	PORTABLE 386	X
4 MB Memory Ext	000585	107685-001	PORTABLE 386	X
Expanded Memory	000718	107805-001	PORTABLE III	34
1 MB System Memory	000752	113224-001	DESKPRO 386/20 DESKPRO 386/25	X
4 MB Memory Module	000758	113226-001	DESKPRO 286e DESKPRO 386/20 DESKPRO 386/20e DESKPRO 386/25	X
1 MB Memory Module	000762	113225-001	DESKPRO 286e DESKPRO 386/20 DESKPRO 386/20e DESKPRO 386/25	X
4 MB System Memory	000765	113222-001	DESKPRO 386/20 DESKPRO 386/25	X
1 MB Memory	000857	110357-001	SLT/286	X

\* Switch settings on system board must be changed for additional memory

Continued



Board/Module	Assy No.	Spare Part No.	Used In	Page
1 MB 32-Bit Memory	000960	112518-001	DESKPRO 386/20e	X
4 MB 32-Bit Memory	000963	112517-001	DESKPRO 386/20e	X
1 MB 16-MHz Mem Exp	000966	112522-001	DESKPRO 386s	X
4 MB 16-MHz Mem Exp	000969	112521-001	DESKPRO 386s	X
1 MB Memory Module	000981	113225-001	DESKPRO 286e 112519-001 DESKPRO 386s 113225-001 DESKPRO 386/20 113225-001 DESKPRO 386/20e 113225-001 DESKPRO 386/25	X
4 MB Memory Module	000993	113226-001	DESKPRO 286e 112520-001 DESKPRO 386s 113226-001 DESKPRO 386/20 113226-001 DESKPRO 386/20e 113226-001 DESKPRO 386/25	X
1 MB Memory Module	001076-001/ 002/003/004/ 005/006/007/ 008	113225-001	DESKPRO 386/20 DESKPRO 386/20e DESKPRO 386/25	X
1 MB Memory Module	001076-003/ 004/007/008	112519-001	DESKPRO 386s	X
1 MB System Memory	001103	113224-001	DESKPRO 386/20 DESKPRO 386/25	X
4 MB Memory Module	001142-001/ 002	113226-001	DESKPRO 286e DESKPRO 386/20 DESKPRO 386/20e DESKPRO 386/25	X
4 MB Memory Module	001142-002	112520-001	DESKPRO 386s	X
1 MB Memory Module	001151-001	113225-001	DESKPRO 386/20 DESKPRO 386/20e DESKPRO 386/25	X
1 MB Memory Module	001151-002	112519-001	DESKPRO 386s	X

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**MEMORY BOARDS/MODULES (Cont'd)**  
(In Assy No. Order)

Board/Module	Assy No.	Spare Part No.	Used In	Page
4 MB Memory Module	001166-001/002	113226-001	DESKPRO 286e	X
			DESKPRO 386/20	
			DESKPRO 386/20e	
			DESKPRO 386/25	
4 MB Memory Module	001166-002	112520-001	DESKPRO 386s	X
1 MB 16-Bit Mem Exp	001244	117471-001	DESKPRO 286e	74
4 MB 16-Bit Mem Exp	001247	117470-001	DESKPRO 286e	75
2 MB Memory Module	001250	115184-001	DESKPRO 386/33	X
			SYSTEMPRO	
			DESKPRO 486/25	
1 MB Memory Module	001256-001/002/003/004/005/006/007/008	113225-001	DESKPRO 286e	X
			DESKPRO 386/20	
			DESKPRO 386/20e	
			DESKPRO 386/25	
1 MB Memory Module	001256-003/004/007/008	112519-001	DESKPRO 386s	X
1 MB Memory Module	001259-001/002	113225-001	DESKPRO 286e	X
			DESKPRO 386/20	
			DESKPRO 386/20e	
1 MB Memory Module	001259-002	112519-001	DESKPRO 386s	X
			DESKPRO 386/33	X
			DESKPRO 386/25	
2 MB Memory Exp	001286	115187-001	DESKPRO 386/33	X
8 MB Memory Module (Single)	001361	116800-001	SYSTEMPRO	X
			DESKPRO 486/25	
8 MB Memory Module (Double)	001364	116801-001	SYSTEMPRO	X
			DESKPRO 486/25	
32 MB Memory Module (Double)	001367	116802-001	SYSTEMPRO	X
			DESKPRO 486/25	
System Memory	001370	116799-001	SYSTEMPRO	X
Memory Expansion	001376	116803-001	SYSTEMPRO	X
4 MB Mem Expansion	001508	120549-001	DESKPRO 486/25	X
Expanded Memory	117077	117267-001	LTE	X
1 MB Mem Expansion	117081-001	117266-001	LTE/286	X
2 MB Mem Expansion	117081-002	117265-001	LTE/286	X

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(In Assy No. Order)

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80286 System	000094	102774-001	DESKPRO 286-8	59
80286 System	000148	101795-001	PORTABLE 286	22
8086 System	000315	105191-001	DESKPRO	53
80286 System	000318	104175-001	PORTABLE II	27
80286 System	000324	104444-001	PORTABLE II	27
80286 System	000361	106434-001	DESKPRO 286-8	59
8086 System	000364	106374-001	DESKPRO	53
8088 System	000383	100478-001	Portable/PLUS	13
386 System	000401	108060-001	DESKPRO 386	81
386 System	000510	107683-001	PORTABLE 386	47
80286 System	000540	107372-001	PORTABLE III	33
80286 System	000555	106707-001	DESKPRO 286-12	67
386 System	000558	108407-001	DESKPRO 386	81
80286 System	000700	106707-001	DESKPRO 286-12	67
80286 System	000709	107372-001	PORTABLE III	33
386 System	000749	113223-001	DESKPRO 386/20	93
80286 System	000851	110355-001	SLT/286	38
386 System	000935	112571-001	DESKPRO 386/20e	97
386 System	000944	115526-001	DESKPRO 386/25	104
386SX System	000954*	112572-001	DESKPRO 386s	87
386 System	001056	115526-001	DESKPRO 386/25	104
386 System	001069	115526-001	DESKPRO 386/25	104
386 System	001118	115526-001	DESKPRO 386/25	104
386SX System	001145	112572-001	DESKPRO 386s	87
386SX System	001148	112572-001	DESKPRO 386s	87
386SX System	001157	112572-001	DESKPRO 386s	87
80286 System	001160**	110355-001	SLT/286	38
386 System	001184	115190-001	DESKPRO 386/33	109
386 System	001196	112571-001	DESKPRO 386/20e	97
80286 System	001226	117469-001	DESKPRO 286e	73
80C86 System	001271	117116-001	LTE	X
80C286 System	001274	117117-001	LTE/286	X
386 System	001316	112571-001	DESKPRO 386/20e	97
386 System	001496	112571-001	DESKPRO 386/20e	98
486 System	001532	120548-001	DESKPRO 486/25	117
386 System	001514-002	116797-001	SYSTEMPRO	X
386 System Processor	001358	116795-001	SYSTEMPRO	113

\* Comes with VGC Board (Assy No. 001059) mounted on system board

\*\* Comes with Memory Module (Assy No. 001163) mounted on system board

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**BOARD INDEX**

**BOARD INDEX**

**CONTROLLER BOARDS  
(In Assy No. Order)**

**CONTROLLER BOARDS (Cont'd)  
(In Assy No. Order)**

Storage Device	Assy No.	Spare Part No.	Used In	Page
Fixed Disk Cntrl	WD1002HX4	101672-001	DESKPRO	121
Fixed Disk Cntrl	WD1002SWX2	101672-001	DESKPRO	53
Fixed Disk Cntrl	WD1002WAH	102778-001	PORTABLE 286 DESKPRO 286-8 DESKPRO 286-12 DESKPRO 386	121
Fixed Disk Cntrl	WD1002WX2	101672-001	DESKPRO	121
Fixed Disk Cntrl	WD1003IWH	N/A	PORTABLE II	27
ESDI Fixed Disk (3 1)	WD1005WAH	108140-001	DESKPRO 286-8 DESKPRO 286-12 DESKPRO 386	121
ESDI 130/300	WD1007AWAH	113265-001	DESKPRO 286-8 DESKPRO 286-12 DESKPRO 386 DESKPRO 386/20	121
Diskette/Printer	000010	100480-001	Portable/PLUS	X
Diskette/Printer	000043	101341-001	Portable/PLUS DESKPRO	X
Multipurpose Cntrl	000142	102705-001	PORTABLE 286 PORTABLE II DESKPRO 286-8	122
Multipurpose Cntrl	000181-001 000181-021	102705-001	PORTABLE 286 PORTABLE II DESKPRO 286-8	122
Diskette/Printer	000181-011	101341-001	Portable/PLUS DESKPRO	122
Multipurpose Cntrl	000336	104174-001	PORTABLE II DESKPRO 286-8	122
Multipurpose Cntrl	000519	104174-001	PORTABLE II DESKPRO 286-8	123
Tape Adapter (135 & 150/250 MB)	000774	113259-001	DESKPRO 286-12 DESKPRO 286e DESKPRO 386 DESKPRO 386s DESKPRO 386/20 DESKPRO 386/20e DESKPRO 386/25 DESKPRO 386/33 SYSTEMPRO DESKPRO 486/25	123

Storage Device	Assy No.	Spare Part No.	Used In	Page
Multipurpose Cntrl	000815	104174-001	PORTABLE II	123
		104174-001	DESKPRO 286-8	
		113446-001	DESKPRO 286-12	
		113446-001	DESKPRO 386	
		113446-001	DESKPRO 386/20	
Multipurpose Cntrl	000957	115511-001	DESKPRO 386/25	123
Multipurpose ESDI	000996	115519-001	DESKPRO 386/25	104
ESDI External 300/600	001091	115839-001	PORTABLE 386 DESKPRO 286-12 DESKPRO 286e DESKPRO 386 DESKPRO 386s DESKPRO 386/20 DESKPRO 386/20e DESKPRO 386/25	123
ESDI Cntrl (15 MHz)	001283	115188-001	DESKPRO 286-12 DESKPRO 286e DESKPRO 386 DESKPRO 386s DESKPRO 386/20 DESKPRO 386/20e DESKPRO 386/25 DESKPRO 386/33 SYSTEMPRO DESKPRO 486/25	124
32-Bit Drive Array Adapt.	001373	116807-001	SYSTEMPRO	X
SCSI Adapter	001379	116809-001	SYSTEMPRO DESKPRO 486/25	124
ESDI/Diskette Cntrl	001472	115374-001	DESKPRO 486/25 DESKPRO 286-12 DESKPRO 286e DESKPRO 386 DESKPRO 386s DESKPRO 386/20 DESKPRO 386/20e DESKPRO 386/25 DESKPRO 386/33	124
Diskette Cntrl	001475	115373-001	DESKPRO 386/33	X
Fixed Disk Cntrl	100637	100644-001	PLUS	X

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**BOARD INDEX**

**VIDEO BOARDS  
(In Board Type Order)**

Video Board	Assy No.	Spare Part No.	Used In	Page
Enh Color Graphics	000410	106373 001	Portable/PLUS	125
	000471	109196 001	PORTABLE 286	
			PORTABLE II	
			PORTABLE III	
			PORTABLE 386	
			DESKPRO	
			DESKPRO 286-8	
			DESKPRO 286-12	
			DESKPRO 386	
			DESKPRO 386/20	
Plasma Disp Cntrl	000392	107374 001	PORTABLE III	34
Plasma Disp Cntrl	000743	107787 001	PORTABLE 386	X
Plasma Disp Cntrl	000932	107787 001	PORTABLE 386	X
VDU	000007	100479 001	Portable/PLUS	12
VDU	000031	101340 001	Portable, PLUS	125
	000160		PORTABLE 286	125
	000345		PORTABLE II	125
	000525		DESKPRO	127
			DESKPRO 286 8	
			DESKPRO 286-12	
			DESKPRO 386	
		DESKPRO 386/20		
		DESKPRO 386/25		
VGC	000806	109253 001	PORTABLE III	127
	001241		PORTABLE 386	
	109360		DESKPRO	
			DESKPRO 286-8	
			DESKPRO 286-12	
			DESKPRO 386	
		DESKPRO 386/20		
		DESKPRO 386/25		
Adv Graphics 1024	109958	114201 001	PORTABLE III	X
			DESKPRO 286-12	
			DESKPRO 286e	
			ALL 386 BASED	
			DESKPRO 486/25	
Adv Graphics Memory	109959	114202 001	PORTABLE III	X
			DESKPRO 286-12	
			DESKPRO 286e	
			ALL 386 BASED	
			DESKPRO 486/25	

Continued

**BOARD INDEX**

**VIDEO BOARDS (Cont'd)  
(In Board Type Order)**

Video Board	Assy No.	Spare Part No.	Used In	Page
VGA Pass-Through	001430	114241-001	DESKPRO 286e	X
			DESKPRO 386s	
			DESKPRO 386/20e	
			DESKPRO 386/33	
			SYSTEMPRO	
			DESKPRO 486/25	

**MISCELLANEOUS BOARDS  
(In Assy No. Order)**

Miscellaneous	Assy No.	Spare Part No.	Used In	Page
2400 Baud Modem	CEF6CK14373	107791-001	PORTABLE III	X
			PORTABLE 386	
Asynchronous Serial	000016	101095-001	Portable/PLUS	12
Async Comm/Clock	000061	101440-001	Portable/PLUS	128
			DESKPRO	
Auto Power Switch	000342	104273-001	PORTABLE II	27
16-Bit Mem/Modem	000549/755	107375-001	PORTABLE III	X
Async Comm/Pri Ptr	000570	106886-001	Portable/PLUS	128
			PORTABLE 286	129
			PORTABLE II	
			PORTABLE III	
			PORTABLE 386	
			ALL DESKTOPS	
			SYSTEMPRO	
32-Bit Mem/Modem	000588	107684-001	PORTABLE 386	X
2nd Async Comm*	000715		PORTABLE III	X
			PORTABLE 386	
Weitek/387-20	000777	113267-001	DESKPRO 386/20	X
Async Comm Interface	000854	110360-001	SLT/286	X
2400 Baud Modem	000866	110352-001	SLT/286	X
Extender Connector**	000872	110600-001	SLT/286	X
Backlight Inv	000908	110452-001	SLT/286	X
LED Indicator	000978	110453-001	SLT/286	X

\*Available for use outside the U.S. and Canada

\*\* Used in Desktop Expansion Base only

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BOARD INDEX

MISCELLANEOUS BOARDS (Cont'd)  
(In Assy No. Order)

Miscellaneous	Assy No.	Spare Part No.	Used In	Page
2400 Baud Modem	001070	112693-001	PORTABLE II DESKPRO DESKPRO 286-8 DESKPRO 286-12 DESKPRO 286e DESKPRO 386 DESKPRO 386s DESKPRO 386/20 DESKPRO 386/20e DESKPRO 386/25 DESKPRO 386/33 SYSTEMPRO DESKPRO 486/25	X
80C86 I/O Interface	001277	117118-001	LTE	X
80C286 I/O Interface	001280	117119-001	LTE/286	X
CPU Connector**	001340	110601-001	SLT/286	X
1200 Baud Modem	107041	107376-001	PORTABLE III PORTABLE 386	X
2400 Baud Modem	117070	117270-001	LTE LTE/286	X
Async Serial	117078	117271-001	LTE LTE/286	X

COMPAQ PORTABLE/COMPAQ PLUS

BOARD COMPATIBILITY LIST

Product	Assy No.	Spare Part No.	Page
<b>SYSTEM BOARDS</b>			
8088 System	000004/000383	100478-001	13
<b>MEMORY CHIPS</b>			
64 X 1 (150 ns) DRAM		105152-001	X
64 X 4 (150 ns) DRAM		106330-001	X
256 X 1 (150 ns) DRAM		105151-001	X
<b>CONTROLLER BOARDS</b>			
Diskette/Printer	000010	100480-001	X
Diskette/Printer	000043	101341-001	X
Diskette/Printer	000181-011	101341-001	122
Fixed Disk Cntrl*	100637	100644-001	X
<b>VIDEO BOARDS</b>			
Enh Color Graphics*	000410	106373-001	125
Enh Color Graphics*	000471	109196-001	125
VDU	000007	100479-001	12
VDU	000031/000160/ 000345	101340-001	125
VDU	000525	101340-001	127
<small>* Requires minimum system ROM G or later</small>			
<b>MISCELLANEOUS</b>			
Async Serial	000016	101095-001	12
Async Comm/Clock	000061	101440-001	128
Async Comm/Prl Ptr	000570	106886-001	128
Async Comm/Prl Ptr	000990	106886-001	129

COMPAQ PORTABLE/COMPAQ PLUS

FIXED DISK DRIVE

Drive Size	Drive Type	Inter-leave	Inte-grated	Min ROM	Spare Part No.	Controller Assy No.
10 MB	1	3 1	N	C	100643 001	100637

\* Drive type set by switch settings on the fixed disk drive controller board or by hard wiring on the drive itself, depending on the fixed disk drive controller board.

DISKETTE DRIVE

Size	Spare Part No.
360 KB	101421-001

CABLE INFORMATION

Cable Function	Used With	Spare Part No.	
FDD Cable Set	10-MB FDD	100641-001	
FDD Signal	10 MB FDD	101601-001	34 Pin
FDD Signal	10-MB FDD	101601-002	20 Pin
Diskette Cable*	Single Drive	100048-002	
Diskette Cable*	Dual Drives	100048-004	
VDU Signal*	Display	100047-001	
Cable Set	Diskette/Display	100512-001	

\*Included in Cable Kit (PN 100512-001)

BOARD JUMPER/SWITCH SETTINGS

ASYNCHRONOUS SERIAL BOARD (000016)

Jumper	Pin 1 to Pin 2	Pin 2 to Pin 3
J702*	COM2 Address (2FX)	COM1 Address (3FX)
J703*	IRQ3	IRQ4

Shunt	Status
U11	Pins 5 to 12, 6 to 11, 7 to 10, 8 to 9 connected Serial RS-232C operation
	Pins 1 to 16, 2 to 15, 3 to 14, 4 to 13 connected 20-mA current loop operation

\*Jumpers J702 & J703 must be changed together

VIDEO DISPLAY CONTROLLER BOARD (000007)

Jumper	Pin 1 to Pin 2	Pin 2 to Pin 3
E4	For monitor requiring negative horizontal sync pulse	For monitor requiring positive horizontal sync pulse (default)
E5	For monitor requiring positive vertical sync pulse (default)	For monitor requiring negative vertical sync pulse

COMPAQ PORTABLE/COMPAQ PLUS

BOARD JUMPER/SWITCH SETTINGS

SYSTEM BOARD (000004 & 000383)  
SW1 Settings

1	2	3	4	5	6	7	8	Function
OFF								Reserved (always off)
ON**								Coprocessor not installed
OFF								Coprocessor Installed
		OFF	OFF					Reserved (always off)
				OFF	ON			40 X 25 COMPAQ VDU* primary, 3rd-party monochrome secondary
				ON**	OFF**			80 X 25 COMPAQ VDU primary, 3rd-party monochrome secondary
				ON	ON			COMPAQ EGA, compatible EGA, RGBI primary, 3rd-party monochrome secondary
				OFF	OFF			3rd-party monochrome (MDA only) - primary, RGBI - secondary
						ON**	ON**	One diskette drive
						OFF	ON	Two diskette drives
						ON	OFF	Three diskette drives
						OFF	OFF	Four diskette drives

\*Applicable with a Rev F or later system ROM

\*\* Default

SW2 Settings\*\*\*

1	2	3	4	5	6	7	8	Function
ON	OFF	ON	ON	OFF	OFF	OFF	OFF	128 KB total memory
ON	ON	OFF	ON	OFF	OFF	OFF	OFF	192 KB total memory
ON	OFF	OFF	ON	OFF	OFF	OFF	OFF	256 KB total memory
ON	ON	ON	OFF	OFF	OFF	OFF	OFF	320 KB total memory
ON	OFF	ON	OFF	OFF	OFF	OFF	OFF	384 KB total memory
ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	448 KB total memory
ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	512 KB total memory
OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	544 KB total memory

\*\*\*With a Rev C or later system ROM, SW2 is ignored. Rev C ROM is required to reach 640 KB

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# COMPAQ PORTABLE/COMPAQ PLUS

## PROCESSOR/COPROCESSOR LOCATIONS

Processor (8088)	Coprocessor (8087)
U24 (4.77 MHz)	U13

## SYSTEM ROM INFORMATION

### SYSTEM ROM LOCATIONS

ROM Location	System Board	ROMs Required
U40 & U47	000004 Rev B	Need 2 ROMs
U40	000004 Rev C or later	Need 1 Rev C or later
U40	000383 All Rev	Need 1 Rev C or later

### SYSTEM ROM REVISIONS

Spare Part No. 100699-001

Rev	PN on ROM
B	100518-001
C	100666-001
E	100298-004
F	100298-005
G	105681-001
H	106265-001
J	106265-002

## MEMORY ADDRESS DECODER PROM (For 000004 & 000383 System Boards)

PROM Location	Memory	PN on Chip	Spare PN
U35	256K	100340-001	N/A
U35	448K	101255-001	105417-001
U35	640K	101257-001	105416-001

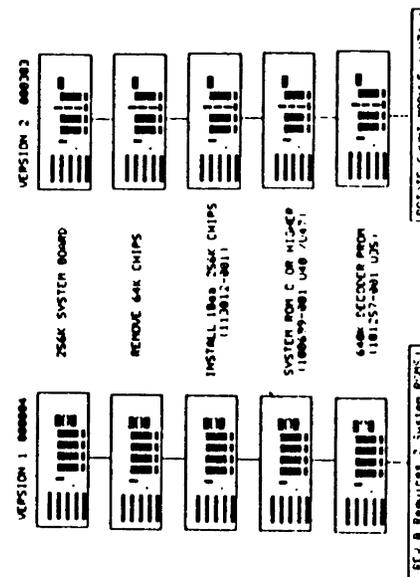
## POWER SUPPLY

Spare Part No. 100475 001

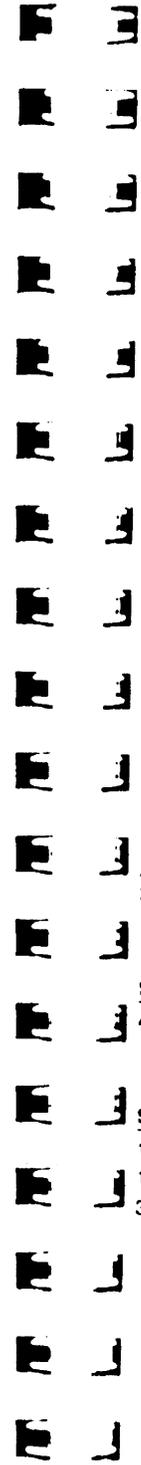
Assy No 000001 001

## BATTERY

Spare Part No. 101260 001 (Mounted on Async Comm./Clock Board)



**COMPAQ LTE  
BOARD COMPATIBILITY LIST**



Product	Assy No.	Spare Part No.	Page
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**SYSTEM BOARDS**

80C86 System	001271	117116-001	X
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**MEMORY BOARDS**

512 KB Mem Exp	117077	117267-001	X
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**MISCELLANEOUS INTERNAL**

80C86 I/O Interface	001277	117118-001	X
Asynchronous Serial	117078	117271-001	X
2400-Baud Int Modem	117070	117270-001	X

**MISCELLANEOUS EXTERNAL**

Product	Option Part No.	Spare Part No.
External Storage Module	117079-001	N/A
External Numeric Keypad	117092-001	117263-001
AC Adapter/Charger	N/A	117108-001
Automobile Adapter	117094-001	117289-001
Battery Pack	117229-001	117113-001

**FIXED DISK DRIVES**

Drive Size	Drive Type	Inter-leave	Inte-grated	Min ROM	Spare Part No.	Controller Assy No.
20 MB	2	1:1	Y	A	117115-001	N/A

**TAPE DRIVES**

Size	Spare Part No.
40 MB	112524-001 (Used in External Storage Module only)

**DISKETTE DRIVES**

Size	Spare Part No.
1.44 MB	117120-001
1.2 MB	112566-001 (Used in External Storage Module only)
360 KB	112567-001 (Used in External Storage Module only)

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LTE

**COMPAQ LTE**

**CABLE INFORMATION**

Cable Function	Used With	Spare Part No.
Cable Kit*	All	117109-001

\*Includes all system cables

**JUMPER SETTINGS**

**External Storage Module**

J1 Settings	Function
Disk	Enables diskette drive
Tape	Enables tape drive

**PROCESSOR LOCATION**

Processor (80C86)	U11
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**SYSTEM ROM INFORMATION**

**System ROM Locations**

U4 ODD

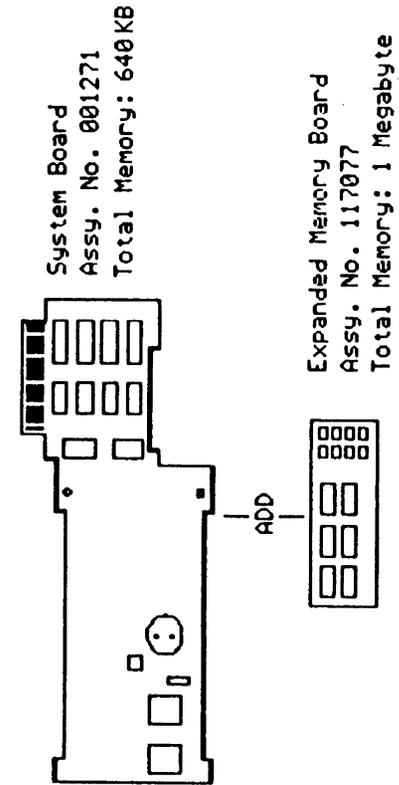
U5 EVEN

System ROM Revision  
Spare Part No. 117101-001

Revision	PN on ODD ROM	PN on EVEN ROM
A	117062-001	117063 001

**CLOCK/BATTERY**

Spare Part No. 117099 001



**COMPAQ PORTABLE 286**

**BOARD COMPATIBILITY LIST**

Product	Assy No.	Spare Part No.	Page
<b>SYSTEM BOARDS</b>			
80286 System	000148	101795-001	22
<b>MEMORY BOARDS</b>			
512/2048 Mem Exp	000307/000308	105033-001	121
<b>MEMORY CHIPS</b>			
256 X 1 (150 ns) DRAM		105151-001	X
<b>CONTROLLER BOARDS</b>			
Fixed Disk Cntrl	WD1002WAH	102778-001	121
Multipur Cntrl	000142	102705-001	122
Multipur Cntrl	000181-001/021	102705-001	122
<b>VIDEO BOARDS</b>			
Enh Color Graphics*	000410	106373-001	125
Enh Color Graphics*	000471	109196-001	125
VDU	000031/000160/ 000345	101340-001	125
VDU	000525	101340-001	127
* Requires system ROM F or later			
<b>MISCELLANEOUS</b>			
Async Comm/Pri Ptr	000570	106886-001	128
Async Comm/Pri Ptr	000990	106886-001	129

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**COMPAQ PORTABLE 286**

**FIXED DISK DRIVES**

Drive Size	Drive Type	Inter-leave	Inte-grated	Min ROM	Spare Part No.	Controller Assy No.
20 MB	2	2:1	N	A	102706-001	WD1002WAH
20 MB	2	2:1	Y	C	104405-001	WD1002WAH

**TAPE DRIVE**

Size	Spare Part No.
10 MB	102779-001

**DISKETTE DRIVES**

Size	Spare Part No.
360 KB	102928-001
1.2 MB	102775-001

**CABLE INFORMATION**

Cable Function	Used With	Spare Part No.	
FDD Signal	All Fixed Disk Drives	101601-001	34 Pin
FDD Signal	All Fixed Disk Drives	101601-002	20 Pin
FDD Cable Set	All Fixed Disk Drives	100641-001	
Monitor Power*	Display	101742-001	
VDU Signal	Display	100047-001	
System Power*	System	101746-001	
Cable Set	All	102933-001	

\*Included in Cable Kit (PN 102933-001)

**BOARD JUMPER/SWITCH SETTINGS**

**SYSTEM BOARD (000148)**

Jumper	Pins	Function
ED	1 to 2	3rd-party monochrome (MDA only)
ED	2 to 3	COMPAQ VDU, COMPAQ ECG, compatible EGA or RGBI (default)
ES	1 to 2	CPU boot speed 8 MHz (default)
ES	2 to 3	CPU boot speed 6 MHz
EM		Reserved
E1-E3 (MS)	1 to 2	128 KB, 256 KB, or 512 KB*
E1-E3 (MS)	2 to 3	640 KB

\*Needs PAL (105045-001) in socket U2 for 512 KB

**COMPAQ PORTABLE 286**

**PROCESSOR/COPROCESSOR LOCATIONS**

**SYSTEM BOARD (000148)**

Processor (80286-8)	U116
Coprocessor (80287-3 or -8)	U122

**SYSTEM ROM INFORMATION**

**SYSTEM ROM LOCATIONS**

System Board	ODD ROM Location	EVEN ROM Location
000148	U39	U94

**SYSTEM ROM REVISIONS**  
 Spare Part No. 105035-001

Rev	PN on ODD ROM	PN on EVEN ROM
A	102667-001	102669-001
B	102667-002	102669-002
C	102667-003	102669-003
D	105620-001	105622-001
E	106261-001	106263-001
F	106437-001	106438-001
G	106580-001	106581-001
J	106778-001	106779-001
K	106778-002	106779-002
M	106970-001	106971-001
N.3	106970-002	106971-002
P.1	109739-001	109740-001
R.2	109739-002	109740-002
S.1	109739-003	109740-003

**POWER SUPPLY**

Spare Part No. 102818-001  
 Assy No. 000076-001

**BATTERY:**

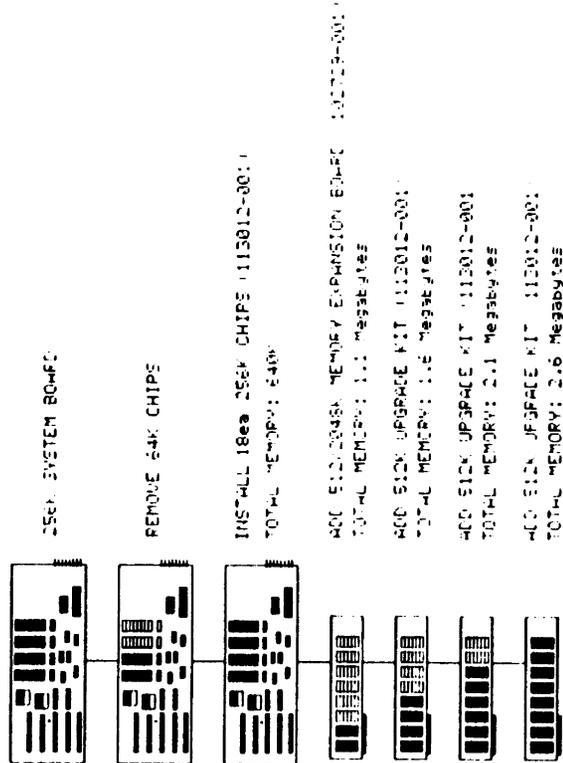
Spare Part No. 102929-002

**COMPAQ PORTABLE II  
BOARD COMPATIBILITY LIST**

Product	Assy No.	Spare Part No.	Page
<b>SYSTEM BOARDS</b>			
80286 System	000318	104175-001	27
80286 System	000324	104444-001	27
<b>MEMORY BOARDS</b>			
512/1536 Mem Exp	000330	104176-001	X*
512/2048 Mem Exp	000307/000308	105033-001	121
* Switch settings on system board must be changed for additional memory			
<b>MEMORY CHIPS</b>			
64 X 1 (150 ns) DRAM		105152-001	X
256 X 1 (150 ns) DRAM		105151-001	X
<b>CONTROLLER BOARDS</b>			
Fixed Disk Cntrl	WD1003IWH	N/A	27
Multipur Cntrl	000142	102705-001	122
Multipur Cntrl	000181-001/021	102705-001	122
Multipur Fixed Disk	000336	104174-001	122
Multipur Fixed Disk	000519/000815	104174-001	123
<b>VIDEO BOARDS</b>			
Enh Color Graphics*	000410	106373-001	125
Enh Color Graphics*	000471	109196-001	125
VDU	000031/000160/ 000345	101340-001	125
VDU	000525	101340-001	127
*Requires system ROM F or later			
<b>MISCELLANEOUS</b>			
2400-Baud Int Modem	001070	112693-001	X
Async Comm/Pri Ptr	000570	106886-001	128
Async Comm/Pri Ptr	000990	106886-001	129
Auto Pwr Switch	000342	104273-001	27

**COMPAQ PORTABLE 286 MEMORY UPGRADE CHART**

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COMPAQ PORTABLE II

FIXED DISK DRIVES

Drive Size	Drive Type	Inter-leave	Inte-grated	Min ROM	Spare Part No.	Controller Assy No.
10 MB	1	2:1	Y	D	104183-001	WD1003IWH* 000336/519/ 815
20 MB	2	2:1	Y	D	104405-001	WD1003IWH 000336/519/ 815

\* Provided with Fixed Disk Drive Spares Kit

DISKETTE DRIVES

Size	Spare Part No.
360 KB	104184-001/107360-001
1.2 MB	104479-001/107359-001
1.44 MB*	109595-001

\* Requires system ROM N 3 or later for use with MS DOS and system ROM P 1 or later for use with MS OS 2 Version 1.1. Requires MS DOS Version 3.31 Revision A if installed as drive B, and MS DOS Version 3.31 Revision B if installed as drive A.

CABLE INFORMATION

Cable Function	Used With	Spare Part No.	
Mass Storage Power	Diskette Drive C	101741-001	6 in.
Mass Storage Power*	All Diskette Drives	104006-001	
Diskette Signal	All Diskette Drives	104008-002	
Mass Storage Power	All Fixed Disk Drives	104092-002	
FDD Signal*	All Fixed Disk Drives	104093-001	
VDU Signal*	Display	104007-001	
Cable Kit	All	104191-001	

\* Included in Cable Kit (PN 104191-001)

COMPAQ PORTABLE II

BOARD JUMPER/SWITCH SETTINGS

SYSTEM BOARD (000318 & 000324)

Jumper	Pins	Function
ED	1 to 2	3rd-party monochrome (MDA only)
ED	2 to 3	COMPAQ VDU, COMPAQ EGA, compatible EGA or RGBI (default)
ES	1 to 2	CPU boot speed 8 MHz (default)
ES	2 to 3	CPU boot speed 6 MHz
EM		Reserved

Setting	Function
MS1 = G, MS2 = G	Disable memory and ROM
MS1 = V, MS2 = G	256 KB memory
MS1 = G, MS2 = V	512 KB memory
MS1 = V, MS2 = V	640 KB memory (default)
MS3 = 1.0 or V	1 MB of memory recognized*
MS3 = 1.5 or G	1.5 MB of memory recognized* (default)

\* On 512/1536 KB Memory Expansion Board

AUTOMATIC POWER SWITCHING BOARD CONNECTIONS (000342)

- Connect 2-pin fan connector to P301 on APS board
- Connect 3-pin connector on APS board to J201 on power supply board
- Connect 4-pin connector on APS board to J202 on power supply board

FIXED DISK DRIVE CONTROLLER BOARD (WD1003IWH)

Jumper	Pins	Function
W1		Reserved
W2		Reserved
W3	1 - 2	20 Megabyte Fixed Disk Drive
	2 - 3	10 Megabyte Fixed Disk Drive
W4		Reserved

PROCESSOR/COPROCESSOR LOCATIONS

	000318 Sys Bd	000324 Sys Bd
Processor (80286-8)	U100	U69
Coprocessor (80287-3 or -8)	U114	U76

# PORT II

## COMPAQ PORTABLE II SYSTEM ROM INFORMATION

### SYSTEM ROM LOCATIONS

System Board	ODD ROM Location	EVEN ROM Location
000318	U18	U3
000324	U29	U28

### SYSTEM ROM REVISIONS Spare Part No. 105035-001

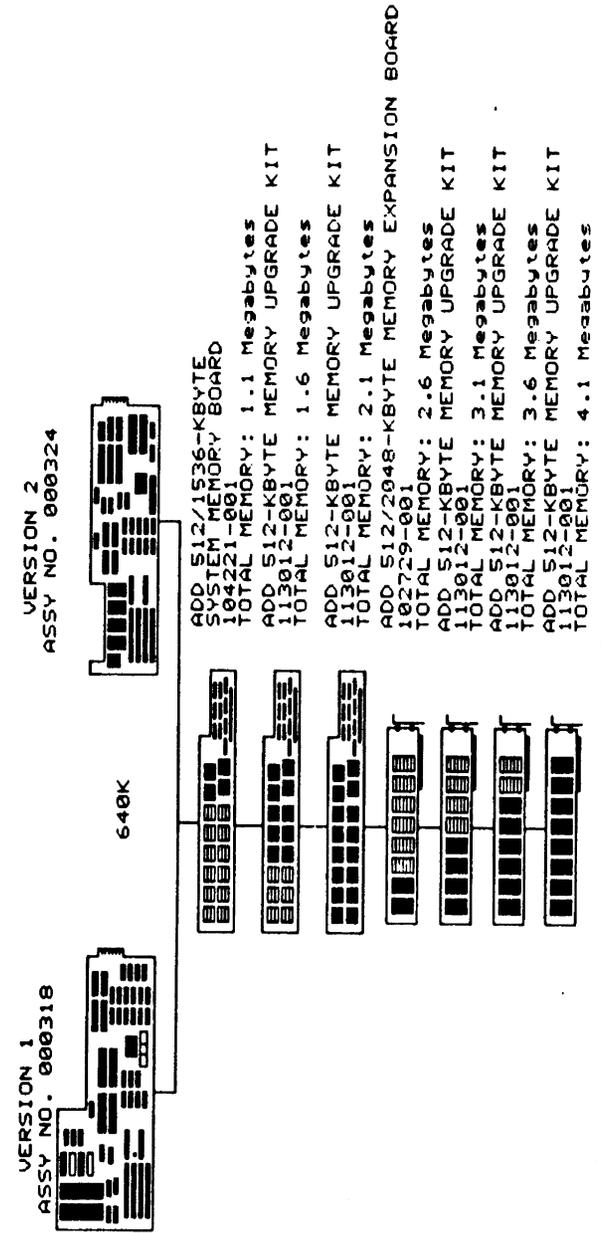
Rev	PN on ODD ROM	PN on EVEN ROM
D	105620-001	105622-001
F	106261-001	106263-001
F	106437-001	106438-001
G	106580-001	106581-001
J	106778-001	106779-001
K	106778-002	106779-002
M	106970-001	106971-001
N3	106970-002	106971-002
P1	109739-001	109740-001
R.2	109739-002	109740-002
S.1	109739-003	109740-003

### POWER SUPPLY

Spare Part No. 104180-001  
Assy No. 000175-001 or 000522-001

### BATTERY

Spare Part No. 104186-001



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COMPAQ PORTABLE III

BOARD COMPATIBILITY LIST

Product	Assy No.	Spare Part No.	Page
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SYSTEM BOARDS

80286 System	000540/000709	107372-001	33/34
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MEMORY BOARDS

Expanded Memory	000718	107805-001	34
Memory Expansion	000543	107378-001	34

MEMORY MODULES

256 X 9 SIMM		107380-001	X
1 MB X 9 SIMM		107379-001	X

VIDEO BOARDS

Enh Color Graph*	000410	106373-001	125
Enh Color Graph*	000471	109196-001	125
Plasma Display	000392	107374-001	34
VGC*	000806/001241/ 109360	109253-001	

Advanced Graphics 1024	109958	114201-001	X
Advanced Graphics Memory	109959	114202-001	X

\*ECG and VGC require system ROM K or later

MISCELLANEOUS

2nd Async Comm*	000715		X
16-Bit Mem/Modem	000549/000755	107375-001	X
1200-Baud Int. Modem	107041	107376-001	X
2400-Baud Int. Modem	CEF6CK14373	107791-001	X
Async Comm/Pri Ptr	000570	106886-001	128
Async Comm/Pri Ptr	000990	106886-001	129

\*Available for use outside of the U S and Canada

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NOTES

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COMPAQ PORTABLE III

FIXED DISK DRIVES

Drive Size	Drive Type	Inter-leave	Inte-grated	Min ROM	Spare Part No.	Controller Assy No.
20 MB	2	1 1	Y	K	107890-001	N/A
20 MB	2	3 1	Y	K	107358-001	N/A
40 MB	17	3 1	Y	K	107357-001	N/A
40 MB*	43	1 1	Y	P	114106-001	N/A

\* Requires MS DOS 3.2 or later

TAPE DRIVE

Size	Spare Part No.
40 MB	107785-001 (Installed in Expansion Unit <i>only</i> .)

DISKETTE DRIVES

Size	Spare Part No.
360 KB	107360-001
1.2 MB	107359-001
1.44 MB*	109595-001

\* Requires system ROM N 2 or later for use with MS DOS and system ROM P 2 or later for use with MS OS 2 Version 1.1. Requires MS DOS Version 3.31 Revision A if installed as drive B, and MS DOS Version 3.31 Revision B if installed as drive A.

CABLE INFORMATION

Cable Function	Used With	Spare Part No.
Mass Storage Power	Fixed Disk Drive Drive C	101741-001
Mass Storage Power	Fixed Disk Drives	101741-004
FDD Signal	All Fixed Disk Drives	107176-001
Diskette Signal	All Diskette Drives Single Drive	107177-001
Diskette Signal	All Diskette Drives Dual Drives	107177-002
Display Data	Display	107171-001
Display Controller	Display	107173-001
Display Intensity	Display	107174-001
Display Power	Display	107175-001
RGB Port	Display	107172-001
Modem Jack	Modem (RJ11 to RJ11)	107518-001
Cable Kit	All	107382-001

COMPAQ PORTABLE III

BOARD JUMPER/SWITCH SETTINGS

SYSTEM BOARD (000540 & 000709)

Jumper Settings*	Function
E1-1 to E1-2**	CPU speed 12 or 8 MHz when accessing diskette drive
E1-2 to E1-3	CPU speed 8 MHz when accessing diskette drive
E2	Reserved - No jumper installed
E3-1 to E3-2**	Serial device COM1
E5-2 to E16-2	IRQ4
E3-2 to E4-2	Serial device COM2
E5-1 to E5-2	IRQ3
E3-1 to E4-1	Modem for COM1
E16-1 to E16-2	IRQ4
E4-1 to E4-2**	Modem for COM2
E5-1 to E16-1	IRQ3
E7-2 to E7-3**	Enable parallel interface
E7-1 to E7-2	Disable parallel interface
E8-1 to E8-2**	Diskette drive primary address
E8-2 to E8-3	Diskette drive secondary address
E8-4 to E8-5**	Fixed disk drive primary address
E8-5 to E8-6	Fixed disk drive secondary address
E10-1 to E10-2	16-KB ROM
E10-2 to E10-3**	32-KB ROM
E12-1 to E12-2	Enable ROM set 2
E12-2 to E12-3**	Disable ROM set 2
E17-2 to E17-3** &	No extended memory
E17-4 to E17-5	When using the expanded memory board
E17-2 to E17-3 &	Address bank 1 (extended memory)
E17-5 to E17-6	(J201 and J202)
E17-1 to E17-2 &	Address bank 1 & 2 (extended memory)
E17-4 to E17-5	(J201 through J204)
E17-1 to E17-2 &	Address banks 1, 2, & 3 (extended memory)
E17-5 to E17-6	(J201 through J206)

\* If another serial device or a third party modem is used, the jumpers for that device's address must be removed

\*\* Default

Continued

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# COMPAQ PORTABLE III

## BOARD JUMPER/SWITCH SETTINGS

### SYSTEM BOARD (000540 & 000709) SW1 Settings

1	2	3	4	5	6	7	8	Function
ON	ON							Reserved
ON	OFF							0-256 KB
OFF	ON							0-512 KB
OFF*	OFF*							0-640 KB
		ON*	OFF*					Select 256KB X 9 DRAM module for expansion memory
		OFF	ON					Select 1MB X 9 DRAM module for expansion memory
		OFF	OFF					Reserved
		ON	ON					Reserved
				ON*				Enable fixed disk drive
				OFF*				Disable fixed disk drive
					ON			CPU boot speed 8 MHz
					OFF*			CPU boot speed 12 MHz
						ON*		Plasma display in CGA mode
						OFF		Plasma display in monochrome mode
							OFF	Reserved

\*Default

### EXPANDED MEMORY BOARD (000718)

Jumper	Function
E1 1-2	
E2 1-2	256-KB modules installed (default)
E1 2-3	
E2 2-3	1-MB modules installed

### MEMORY EXPANSION BOARD (000543)

Jumper	Function
1-2	256-KB modules installed (default)
2-3	1-MB module installed

### PLASMA DISPLAY CONTROLLER BOARD (000392)

Jumper E1	Function
1-2	Primary Address 3XXX (default)
2-3	Secondary Address 2XXX

# PORT III

## COMPAQ PORTABLE III

### PROCESSOR/COPROCESSOR LOCATIONS

PROCESSOR (80286-12)	COPROCESSOR (80287-8)
U52	U43

### SYSTEM ROM INFORMATION

#### SYSTEM ROM LOCATIONS

U72 ODD  
U89 EVEN

#### SYSTEM ROM REVISIONS Spare Part No. 107592-001

Rev	PN on ODD ROM	PN on EVEN ROM
K	106778-002	106779-002
N.2	107824-001	107825-001
P.2	109737-001	109738-001
R.2	109737-002	109738-002

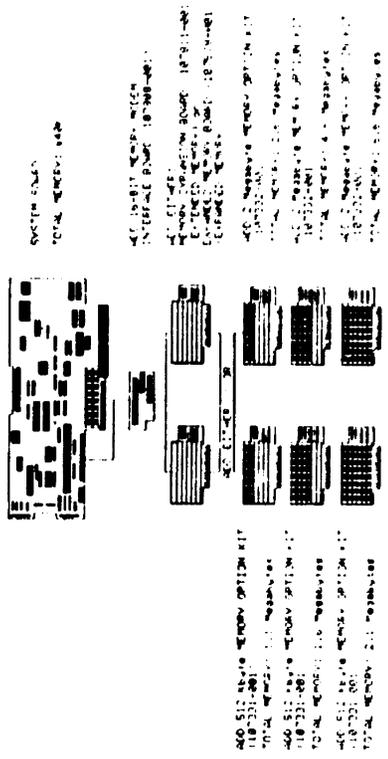
### POWER SUPPLY

Spare Part No. 107373-001

### BATTERY

Spare Part No. 107385-001 (For System Board 000709-001)  
Spare Part No. 107872-001 (For System Board 000709-003)

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COMPAQ PORTABLE III MEMORY UPGRADE CHART

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COMPAQ SLT/286  
COMPATIBILITY LIST

Product	Assy No.	Spare Part No.	Page
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SYSTEM BOARDS

80286 System	000851	110355-001	38
80286 System	001160*	110355-001	38

\*Comes with Memory Module (Assy No. 001163) mounted on system board

MEMORY BOARDS

1 MB Memory	000857	110357-001	X
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MISCELLANEOUS INTERNAL

2400-Baud Int Modem	000868	110352-001	X
Async Comm Interface	000854	110360-001	X
Backlight Invt	000908	110452-001	X
LED Indicator	000978	110453-001	X
Extender Connector*	000872	110600-001	X
CPU Connector*	001340	110601-001	X

\* Used in Desktop Expansion Base only

MISCELLANEOUS EXTERNAL

Product	Option Part No.	Spare Part No.
External Numeric Keypad	110052-001	110454-001
Desktop Expansion Base	110059-001	N/A
Battery Pack	110287-001	110351-001
Automobile Adapter	110288-001	110708-001
External Battery Charger	110700-001	110706-001
External Storage Module	110281-001	N/A
AC Adapter	117093-001	110353-001

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## COMPAQ SLT/286

### COMPATIBILITY LIST

#### FIXED DISK DRIVES

Drive Size	Drive Type	Inter-leave	Inte-grated	Min ROM	Spare Part No.	Controller Assy No.
20 MB	2	1:1	Y	F 2	110670-001	N/A
20 MB	2	3:1	Y	F 2	110359-001	N/A
40 MB	22	1:1	Y	F.2	110358-001	N/A

#### TAPE DRIVE

Size	Spare Part No.
40 MB	112524-001 (Used in External Storage Module only.)

#### DISKETTE DRIVES

Size	Spare Part No.
1.2 MB	112566-001 (Used in External Storage Module only.)
360 KB	112567-001 (Used in External Storage Module only.)
1.44 MB	110356-001

#### CABLE INFORMATION

Cable Function	Used With	Spare Part No.
Mass Storage Power	All FDD	110007-001
FDD Signal	All FDD	110008-001
Diskette Power/Signal	Internal Diskette	110005-001
Signal Cable	Ext Storage Module	110268-001
Power Cable	Ext Storage Module	110270-001
Ground Cable	Display	110503-001
Power Cord	AC Adapter	110543-001
Telephone Cable	Modem	112666-001
Cable Kit (4 Cables)		110551-001
Cable Kit (2 Cables)		110553-001

#### BOARD JUMPER/SWITCH SETTINGS

##### System Board (000851 & 001160)\*

J1 Settings	Function
1 to 2	8-MHz 80287
2 to 3	12-MHz 80C287

\*Jumpers E2, E3, and E4 reserved. These jumpers must be installed for proper board operation.

## COMPAQ SLT/286

### JUMPER/SWITCH SETTINGS (Cont'd)

#### External Storage Module

Jumper	Function
Disk	Enables diskette drive
Tape	Enables tape drive

#### PROCESSOR/COPROCESSOR LOCATIONS

Processor (80C286-12)	Coprocessor (80287-8 or 80C287-12)
U31	U45

#### SYSTEM ROM INFORMATION

##### System Rom Locations

U56 ODD  
U57 EVEN

##### System Rom Revision (Spare Part No. 110542-001)

Rev	PN on ODD ROM	PN on EVEN ROM
F.2	110091-002	110092-002
F.5	110091-003	110092-003
G.1	110091-004	110092-004
G.2	110091-005	110092-005
H.1	110091-006	110092-006
H.2	110091-007	110092-007
H.3	110091-008	110092-008
H.4	110091-009	110092-009
H.5	110091-010	110092-010
H.6	110091-011	110092-011
H.7	110091-012	110092-012

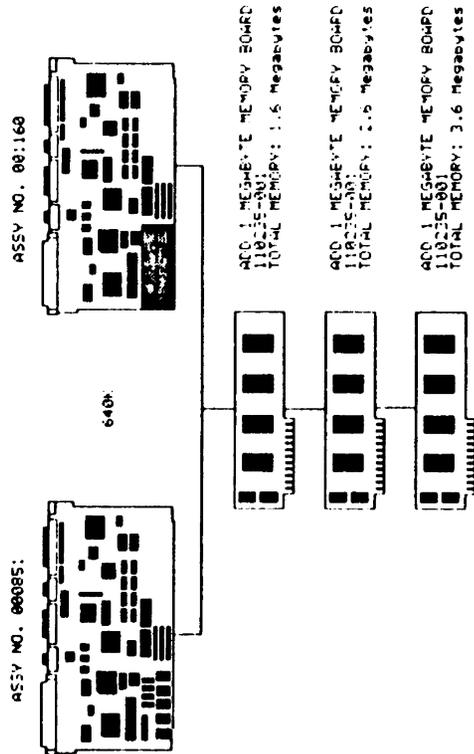
#### POWER SUPPLIES

AC Adapter Power Supply	DC Internal Power Supply
Spare Part No. 110353-001	Spare Part No. 110361-001

Desktop Expansion Base Power Supply
Spare Part No. 110599-001

External Storage Module Power Supply
Spare Part No. 110448-001

**COMPAQ LTE/286**  
**BOARD COMPATIBILITY LIST**



**COMPAQ SLT/286 MEMORY UPGRADE CHART**

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Product	Assy No.	Spare Part No.	Page
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**SYSTEM BOARDS**

80C286 System	001274	117117-001	X
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**MEMORY BOARDS**

1 MB Mem Exp	117081-001	117266-001	X
2 MB Mem Exp	117081-002	117265-001	X

**MISCELLANEOUS INTERNAL**

80C286 I/O Interface	001280	117119-001	X
Asynchronous Serial	117078	117271-001	X
2400-Baud Int Modem	117070	117270-001	X

**MISCELLANEOUS EXTERNAL**

Product	Option Part No.	Spare Part No.
External Storage Module	117079-001	N/A
External Numeric Keypad	117092-001	117263-001
AC Adapter/Charger	N/A	117108-001
Automobile Adapter	117094-001	117289-001
Battery Pack	117229-001	117113-001

**FIXED DISK DRIVES**

Drive Size	Drive Type	Inter-leave	Inte-grated	Min ROM	Spare Part No.	Controller Assy No.
20 MB	54	1:1	Y	A	117115-001	N/A
40 MB	53	1:1	Y	A	117288-001	N/A

**TAPE DRIVES**

Size	Spare Part No.
40 MB	112524-001 (Used in External Storage Module only)

**DISKETTE DRIVES**

Size	Spare Part No.
1.44 MB	117120-001
1 2 MB	112566-001 (Used in External Storage Module only)
360 KB	112567-001 (Used in External Storage Module only)

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**COMPAQ LTE/286**

**CABLE INFORMATION**

Cable Function	Used With	Spare Part No.
Cable Kit*	All	117109-001

\*Includes all system cables

**JUMPER SETTINGS**

**External Storage Module**

J1 Settings	Function
F (Disk)	Enables diskette drive
T (Tape)	Enables tape drive

**PROCESSOR/COPROCESSOR LOCATIONS**

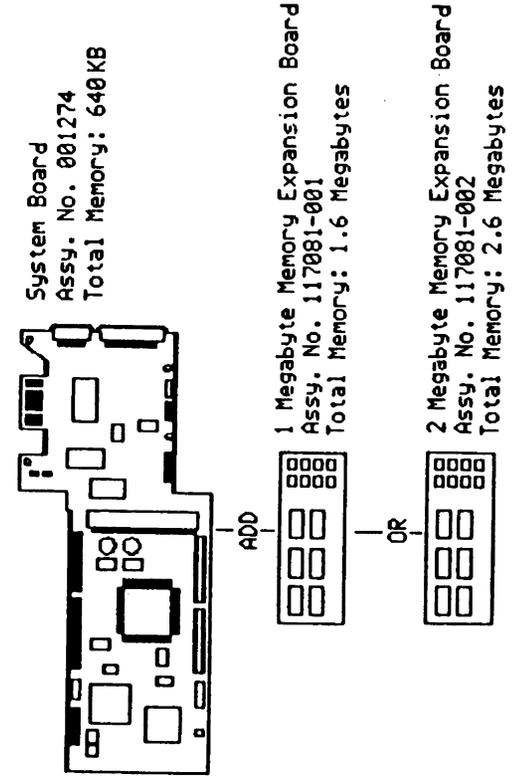
Processor (80C286-12)
U8
Coprocessor (80287-12) (Spare Part No. 117264-001)
U500

**SYSTEM ROM INFORMATION**

System ROM Locations		
U504 ODD		
U503 EVEN		
System ROM Revision Spare Part No. 117100-001		
Revision	PN on ODD ROM	PN on EVEN ROM
A	117221-001	117222-001

**CLOCK/BATTERY**

Spare Part No. 117099-001



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COMPAQ PORTABLE 386

BOARD COMPATIBILITY LIST

Product	Assy No.	Spare Part No.	Page
<b>SYSTEM BOARDS</b>			
80386 System	000510	107683-001	47-49
<b>MEMORY BOARDS/MODULES</b>			
1-2 MB Mem Exp	000579	107686-001	X
4 MB Mem Exp	000582	107688-001	X
4 MB Mem Ext	000585	107685-001	X
512 KB SIMM	000576	107687-001	X
<b>CONTROLLER BOARDS</b>			
ESDI External	001091	115839-001	123
<b>VIDEO BOARDS</b>			
Enh Color Graphics*	000410	106373-001	125
Enh Color Graphics*	000471	109196-001	125
Plasma Display	000743/000932	107787-001	X
VGC* **	000806/001241/ 109360	109253-001	127
Advanced Graphics** 1024	109958	114201-001	X
Advanced Graphics** Memory	109959	104202-001	X
* ECG and VGC require system ROM H or later ** Installed in Expansion Unit only			
<b>MISCELLANEOUS</b>			
2nd Async Comm*	000715	N/A	X
32-Bit Mem/Modem	000588	107684-001	X
1200-Baud Int Modem	107041	107376-001	X
2400-Baud Int Modem	CEF6CK14373	107791-001	X
Async Comm/Pri Ptr	000570	106886-001	128
Async Comm/Pri Ptr	000990	106886-001	129
*Available outside of the U S and Canada			

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COMPAQ PORTABLE 386

FIXED DISK DRIVES

Drive Size	Drive Type	Inter-leave	Inte-grated	Min ROM	Spare Part No.	Controller Assy No.
40 MB	17	3 1	Y	H.2	107357-001	N/A
40 MB <sup>1</sup>	43	1:1	Y	J	114106-001	N/A
100 MB	45	3 1	Y	H.2	107790-001	N/A
110 MB <sup>1</sup>	33	1:1	Y	K	107982-001	N/A
300 MB <sup>2</sup>	38	1:1	N	K	113219-001	001091

<sup>1</sup> Requires MS DOS 3.2 or later

<sup>2</sup> Used in External Fixed Disk Drive Expansion Unit. Requires MS DOS 3.2 or later

TAPE DRIVE

Size	Spare Part No.
40 MB	107785-001 (Installed in Expansion Unit <i>only</i> )

DISKETTE DRIVES

Size	Spare Part No.
360 KB	107360-001
1.2 MB	107359-001
1.44 MB*	109595-001

\*Requires system ROM J.2 or later for use with MS DOS and system ROM J.4 or later for use with MS OS/2 Version 1.1. Requires MS DOS Version 3.31 Revision A if installed as drive B and MS DOS Version 3.31 Revision B if installed as drive A.

CABLE INFORMATION

Cable Function	Used With	Spare Part No.
Mass Storage Power	Internal Fixed Disk Drives	101741-003
Mass Storage Power	Fixed Disk Drives (Drive D)	101741-004
FDD Signal	Internal Fixed Disk Drives	107798-001
Diskette Controller	All Diskette Drives (Single Drive)	107177-001
Diskette Controller	All Diskette Drives (Dual Drives)	107177-002
Display Data	Display	107171-001
Display Control	Display	107173-001
Display Intensity	Display	107174-001
Display Power	Display	107175-001
RGB Port	Display	107172-001
Modem Jack	Modem (RJ11 RJ11)	107518-001
Cable Kit		107382-001

15 in.

COMPAQ PORTABLE 386

BOARD JUMPER/SWITCH SETTINGS

SYSTEM BOARD (000510)  
Jumper Function

INTERNAL SERIAL INTERFACE

E3 2 to 3  
E4 1 to 2  
E8 1 to 2  
E8 3 to 4  
E9 1 to 3  
E9 2 to 4  
E3 2 to 3  
E4 1 to 2  
E8 1 to 3  
E8 2 to 4  
E9 1 to 2  
E9 3 to 4  
E3 2 to 3  
E4 2 to 3  
E8 1 to 2  
E8 3 to 4  
E9 1 to 3  
E9 2 to 4  
E3 1 to 2  
E4 2 to 3  
E8 1 to 2  
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E9 1 to 2  
E9 3 to 4  
E3 2 to 3  
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E8 1 to 3  
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E9 1 to 2  
E9 3 to 4  
E3 1 to 2  
E4 2 to 3  
E8 1 to 3  
E8 2 to 4  
E9 1 to 3  
E9 2 to 4  
E3 1 to 2  
E4 1 to 2  
E8 1 to 2  
E8 3 to 4  
E9 1 to 2  
E8 3 to 4  
E9 1 to 3  
E9 2 to 4

Asynchronous communications interface as COM1 (3FX, IRQ4) & modem or 2nd asynchronous communications interface as COM2 (2FX, IRQ3) (default)

Asynchronous communications interface as COM2 (2FX, IRQ3) & modem or 2nd asynchronous communications interface as COM1 (3FX, IRQ4)

Asynchronous communications interface as COM1 (3FX, IRQ4), disable internal COM2

Asynchronous communications interface as COM2 (2FX, IRQ3), disable internal COM1

Modem or 2nd asynchronous communications interface as COM1 (3FX, IRQ4), disable internal COM2

Modem or 2nd asynchronous communications interface as COM2 (2FX, IRQ3), disable internal COM1

Disable both internal serial interfaces

Continued

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**COMPAQ PORTABLE 386  
BOARD JUMPER/SWITCH SETTINGS**

**SYSTEM BOARD (000510)**  
Jumper Function

<b>MASS STORAGE DEVICES</b>	
E5 1 to 2	Enable fixed disk drive (default)
F5 2 to 3	Disable fixed disk drive
F6 2 to 3	Diskette drive primary address (default)
F6 1 to 2	Diskette drive secondary address
<b>TOTAL 32-BIT MEMORY INSTALLED</b>	
E15 1 to 2	
E16 1 to 2	1 Megabyte (default)
E17 1 to 2	
F15 2 to 3	
F16 1 to 2	2 Megabyte
E17 1 to 2	
F15 1 to 2	
F16 2 to 3	3 Megabyte
E17 1 to 2	
E15 2 to 3	
F16 2 to 3	4 Megabyte
F17 1 to 2	
E15 1 to 2	
E16 2 to 3	6 Megabyte
E17 2 to 3	
E15 2 to 3	
E16 2 to 3	10 Megabyte
F17 2 to 3	
<b>32-BIT MEMORY USED AS BASE MEMORY</b>	
E13 1 to 2 & E14 1 to 2	640 Kbyte (default)
F13 1 to 2 & F14 2 to 3	512 Kbyte
E13 2 to 3 & E14 2 to 3	256 Kbyte
<b>INTERNAL PARALLEL PRINTER INTERFACE</b>	
F1 2 to 3 & E2 1 to 2	LPT1 (default)
E1 1 to 2 & E2 2 to 3	LPT2
E1 1 to 2 & E2 1 to 2	LPT3
F1 2 to 3 & E2 2 to 3	Disable interface
E7 1 to 2	Primary interrupt (IRQ7) (default)
F7 2 to 3	Alternate interrupt (IRQ5)

**COMPAQ PORTABLE 386  
BOARD JUMPER/SWITCH SETTINGS**

**SYSTEM BOARD (000510)**  
Jumper Function

<b>MISCELLANEOUS</b>	
E20 1 to 2	387 coprocessor installed or Weitek 3167 coprocessor not installed
F20 2 to 3	387 coprocessor not installed or Weitek 3167 coprocessor installed (default)
E21 1 to 2	CPU boot speed 20 MHz except when accessing diskette drive, then 8 MHz (default)
E21 2 to 3	CPU boot speed 20 MHz (always)
E23 1 to 2	COMPAQ Plasma Display in CGA mode (default)
E23 2 to 3	COMPAQ Plasma Display in monochrome mode
E12 1 to 2	Reserved
E18 2 to 3	Reserved
E19 1 to 2	Reserved
E22 2 to 3	Reserved
E24 1 to 2	Reserved
E25 1 to 2	Reserved

**PROCESSOR/COPROCESSOR LOCATIONS**

<b>PROCESSOR (386-20)</b>	<b>COPROCESSOR (387-20/Weitek 3167)</b>
U62	U69

**SYSTEM ROM INFORMATION**

**SYSTEM ROM LOCATIONS**

U32 ODD	U40 EVEN
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**SYSTEM ROM REVISION ( Spare Part No. 107796-001)**

<b>Rev</b>	<b>PN on ODD ROM</b>	<b>PN on EVEN ROM</b>
H.2	107733-003	107734-003
J.4	109593-001	109594-001
K.3	109593-002	109594-002

**POWER SUPPLY**

Spare Part No. 107373-001

**BATTERY**

Spare Part No. 107786-001

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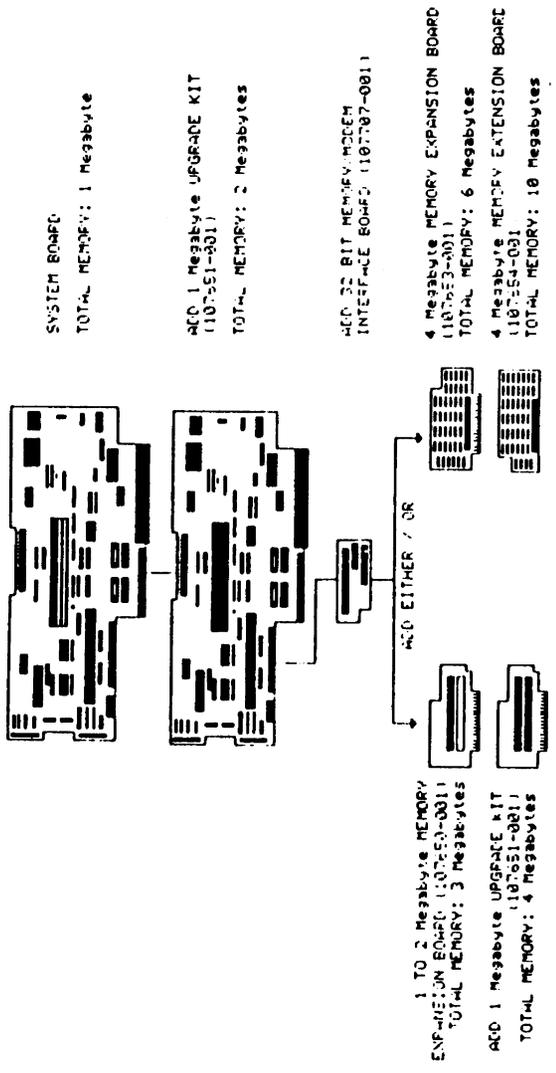


COMPAQ DESKPRO  
BOARD COMPATIBILITY LIST

Product	Assy No.	Spare Part No.	Page
<b>SYSTEM BOARDS</b>			
8086 System	000058	101339-001	53
8086 System	000315	105191-001	53
8086 System	000364	106374-001	53
<b>MEMORY CHIPS</b>			
64 X 1 (150 ns) DRAM		105152-001	X
64 X 4 (150 ns) DRAM		106330-001	X
256 X 1 (150 ns) DRAM		105151-001	X
<b>CONTROLLER BOARDS</b>			
Fixed Disk Cntrl	WD1002SWX2	101672-001	53
Fixed Disk Cntrl	WD1002WX2/ WD1002HX4	101672-001	121
Diskette/Printer	000043	101341-001	X
Diskette/Printer	000181-011	101341-001	122
<b>VIDEO BOARDS</b>			
Enh Color Graphics*	000410	106373-001	125
Enh Color Graphics*	000471	109196-001	125
VDU	000031/000160/ 000345	101340-001	125
VDU	000525	101340-001	127
VGC*	000806/001241/ 109360	109253-001	127
* ECG and VGC require system ROM H or later			
<b>MISCELLANEOUS</b>			
Async Comm/Clock	000061	101440-001	128
Async Comm/Pri Ptr	000570	106886-001	128
Async Comm/Pri Ptr	000990	106886-001	129
2400-Baud Int Modem	001070	112693-001	X

COMPAQ PORTABLE 386 MEMORY UPGRADE CHART

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COMPAQ DESKPRO

FIXED DISK DRIVES

Drive Size	Drive Type	Inter-leave	Inte-grated	Min ROM	Spare Part No.	Controller Assy No.
10 MB*	1	4 1	N	E	101437-001	WD1002SWX2 WD1002WX2 WD1002HX4
20 MB*	2	4 1	N	F	102777-001	WD1002SWX2 WD1002WX2 WD1002HX4
30 MB*	6	3 1	N	F	101064-001	WD1002SWX2 WD1002WX2 WD1002/HX4

\*Drive types are set by switch settings on the fixed disk drive controller board or are hard wired depending on the fixed disk drive controller used.

TAPE DRIVE

Size	Spare Part No.
10 MB	101438-001

DISKETTE DRIVE

Size	Spare Part No.
360 KB	102928-001

CABLE INFORMATION

Cable Function	Where Used	Spare Part No.	
Diskette/Tape Signal <sup>1</sup>	All Diskette Drives 10-MB Tape	101380-002	Y
Mass Storage Power <sup>1</sup>	All Diskette, Tape & Fixed Disk Drives	101137-001	
FDD Signal <sup>2</sup>	10- & 30-MB FDD	101601-001 101601-002	34 Pin 20 Pin
FDD Signal	20- & 30 MB FDD	100625-003 100625-004	34 Pin 20 Pin
FDD Signal	10-MB FDD (Connects C- & D.)	101554-001	34 Pin

<sup>1</sup> Part of kits 102934-001 & 108146-001

<sup>2</sup> Part of kits 100641-002 & 102934-001

COMPAQ DESKPRO

BOARD JUMPER/SWITCH SETTINGS

SYSTEM BOARD (000058, 000315, & 000364)

SW1 SETTINGS

1	2	3	4	5	6	7	8	Function
OFF								Reserved (always OFF)
ON**								No coprocessor
OFF								Coprocessor installed
		ON	OFF					128 KB memory
		OFF	OFF					256 KB memory
		OFF	ON					512 KB memory
		ON	ON		ON	ON		640 KB memory
								80 X 25 COMPAQ EGA, compatible EGA, VGA or RGBI primary, 3rd-party monochrome (MDA only) secondary.
					OFF	ON		40 X 25 COMPAQ VDU* primary, 3rd-party monochrome (MDA only) secondary.
					ON	OFF		80 X 25 COMPAQ VDU primary, 3rd-party monochrome (MDA only) secondary.
					OFF	OFF		3rd-party monochrome (MDA only) primary, RGBI secondary.
						ON	ON	One diskette drive
						OFF	ON	Two diskette drives
						ON	OFF	Three diskette drives
						OFF	OFF	Four diskette drives

\*With a revision F or later system ROM.  
\*\* Default

FIXED DISK DRIVE CONTROLLER BOARD (WD1002SWX2)

Drive	SW1 for Drive D		SW1 for Drive C	
	1	2	3	4
10 MB	OFF	OFF	OFF	OFF
20 MB	ON	OFF	ON	OFF
30 MB	ON	ON	ON	ON

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DESKPRO

COMPAQ DESKPRO

PROCESSOR/COPROCESSOR LOCATIONS

PROCESSOR (8086-2)	COPROCESSOR (8087-2)
U52	U44

SYSTEM ROM INFORMATION

SYSTEM ROM LOCATION: U21

SYSTEM ROM REVISIONS  
Spare Part No. 100699-001

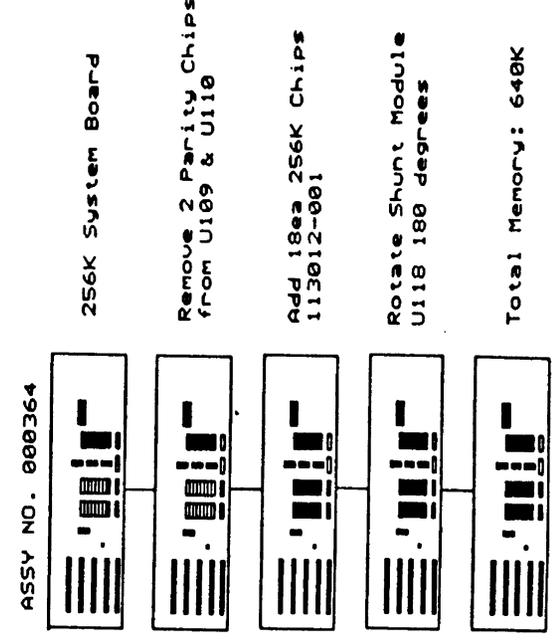
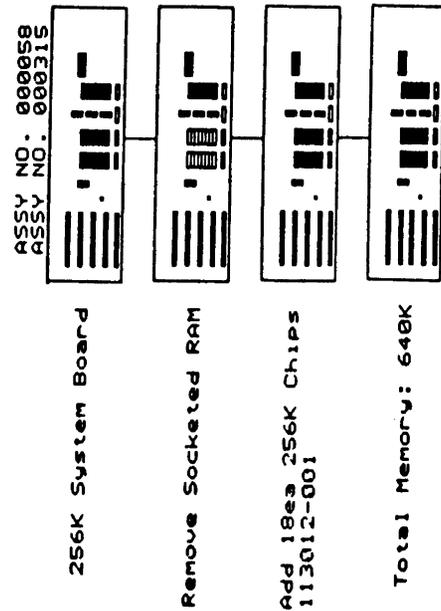
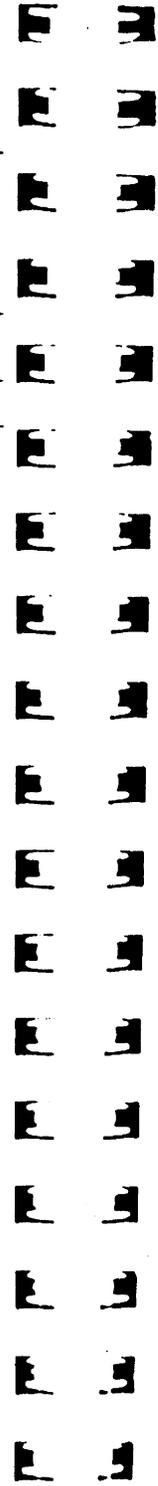
Revision	PN ON ROM
E	100298-004
F	100298-005
G	105681-001
H	106265-001
J	106265-002

POWER SUPPLY

Spare Part No. 102927-001

BATTERY

Spare Part No. 101260-001 (Mounted on the Async Clock/Comm Board)



8-MHz COMPAQ DESKPRO 286

BOARD COMPATIBILITY LIST

Product	Assy No.	Spare Part No.	Page
<b>SYSTEM BOARDS</b>			
80286 System	000094	102774-001	59
80286 System	000361	106434-001	59
<b>MEMORY BOARDS</b>			
512/2048 Mem Exp	000307/000308	105033-001	121
System Memory	000130/000178/000382	102710-001	60
<b>MEMORY CHIPS</b>			
64 X 1 (150 ns) DRAM		105152-001	X
256 X 1 (150 ns) DRAM		105151-001	X
<b>CONTROLLER BOARDS</b>			
Fixed Disk Cntrl	WD1002WAH	102778-001	121
Multipur Cntrl	000142	102705-001	122
Multipur Cntrl	000181-001/021	102705-001	122
Multipur Fixed Disk	000336	104174-001	122
Multipur Fixed Disk	000519/000815	104174-001	123
ESDI Fixed Disk (3:1)	WD1005WAH	108140-001	121
ESDI 130/300	WD1007AWAH	113265-001	121
<b>VIDEO BOARDS</b>			
Enh Color Graphics*	000410	106373-001	125
Enh Color Graphics*	000471	109196-001	125
VDU	000031/000160/000345	101340-001	125
VDU	000525	101340-001	127
VGC*	000806/001241/109360	109253-001	127
* ECG and VGC require system ROM F or later			
<b>MISCELLANEOUS</b>			
Async Comm/Pri Ptr	000570	106886-001	128
Async Comm/Pri Ptr	000990	106886-001	129
2400-Baud Int. Modem	001070	112693-001	X

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8-MHz COMPAQ DESKPRO 286

FIXED DISK DRIVES

Drive Size	Drive Type	Inter-leave	Inte-grated	Min ROM	Spare Part No.	Controller Assy No.
20 MB <sup>1</sup>	2	4:1	N	A	102777-001	WD1002WAH
30 MB <sup>1</sup>	6	3:1	N	F	101664-001	WD1002WAH
40 MB*	17	3:1	Y	F	108058-001	000336 000519 000815
70 MB	12	2:1	N	F	102932-001	WD1002WAH
130 MB <sup>2</sup>	25 <sup>3</sup>	3:1	N	F	108080-001	WD1005WAH
	35 <sup>3</sup>	1:1		F		WD1007AWAH

\* See page 133 for dual 40 MB drive configuration information

<sup>1</sup> Comes formatted for the COMPAQ DESKPRO. Must be reformatted when used in the 8 MHz COMPAQ DESKPRO 286.

<sup>2</sup> Comes formatted as type 35 for the WD1007AWAH controller. If used with the WD1005WAH controller (type 25) you must perform an unconditional format followed by a surface analysis using ADVANCED DIAGNOSTICS 5.04 or greater.

<sup>3</sup> MS-DOS 3.1 or earlier supports type 25 only. MS-DOS 3.2 or later supports either type. Use type 25 if the application software supports only 17 sectors per track.

TAPE DRIVES

Size	Spare Part No.
10 MB	101438-001
40 MB	108081-001

DISKETTE DRIVES

Size	Spare Part No.
360 KB	102928-001
1.2 MB	102775-001
1.44 MB*	113263-001 (Requires minimum sys. ROM N.3)

\* Requires MS-DOS Version 3.31 Revision A if installed as drive B, and MS-DOS Version 3.31 Revision B if installed as drive A.

CABLE INFORMATION

Cable Function	Used With	Spare Part No.
Diskette/Tape Signal <sup>1</sup>	All Diskette Drives All Tape Drives	101380-002
Mass Storage Power <sup>1</sup>	All Diskette, Tape, & Fixed Disk Drives	101137-001
FDD Signal <sup>2</sup>	30-MB FDD	101601-001 101601-002
FDD Signal	20-, 30- & 70-MB FDD	100625-003 100625-004
FDD Signal <sup>3</sup>	40-MB FDD	108086-001
FDD Signal	40-MB FDD (Dual Drives)	108087-001
FDD Signal <sup>4</sup>	130-MB FDD	100625-005 100625-006

<sup>1</sup> Part of kits 102934-001 & 108146-001

<sup>2</sup> Part of kits 100641-002 & 102934-001

<sup>3</sup> Part of kit 108146-001

<sup>4</sup> Part of kit 108249-001

8-MHz COMPAQ DESKPRO 286

BOARD JUMPER/SWITCH SETTINGS

SYSTEM BOARD 000094

Jumper	Pins	Function
ED	1 to 2	3rd-party monochrome (MDA only)
ED	2 to 3	COMPAQ VDU, COMPAQ EGA, compatible EGA, RGBI, or VGC (default)
ES	1 to 2	CPU boot speed 8 MHz (default)
ES	2 to 3	CPU boot speed 6 MHz
EM		Reserved

SYSTEM BOARD 000361  
SW1 SETTINGS

1	2	3	4	5	6	7	8	Function
ON								With 64K X 1 DRAM
OFF								With 256K X 1 DRAM
	ON	ON						Disable RAM and ROM
	ON	OFF						0-256 KB base memory
	OFF	ON						0-512 KB base memory
	OFF	OFF						Enable all base memory
			OFF	OFF				With 64K X 1 DRAM
			ON	ON				256K X 1 DRAM. No extended memory
		150ns (or faster) 256K X 1 chips only	ON	OFF				Enable bank 2 for 1.0 to 1.5 MB of memory
			OFF	ON				Enable banks 2 & 3 for 1.0 to 2.0 MB of memory
			OFF	OFF				Enable all banks for 1.0 to 2.5 MB of memory
						OFF*		CPU boot speed 8 MHz
						ON		CPU boot speed 6 MHz
							OFF	Reserved
							ON*	COMPAQ VDU & EGA, compatible EGA, RGBI, or VGC
							OFF	3rd-party monochrome (MDA only)

\* Default

8-MHz COMPAQ DESKPRO 286  
BOARD JUMPER/SWITCH SETTINGS

SYSTEM MEMORY BOARD 000130\*

Memory Type	Jumper Settings	Address Range Enabled
64K X1 chips	E1 to E2	0 - 640 KB
	E5 to E6	
64K X 1 chips	E2 to E3	0 - 512 KB
	E4 to E5	
	E2 to E3	
256K X 1 chips	E2 to E3	0 - 640KB**
	E5 to E6	
256K X 1 chips	E2 to F3	0 - 640 KB
	E4 to E5	

\*Not PAL dependent  
\*\* 640 KB to 1 MB reserved

SYSTEM MEMORY BOARD (000178\* and 000382\*\*) - PAL in U90

Memory Type	E1 Jumper Pins	Address Range Enabled
64K X 1 chips	1 to 2	0 - 640 KB
	5 to 6	
64K X 1 chips	1 to 2	0 - 512 KB
	4 to 5	
64K X 1 chips*	2 to 3	0 - 256 KB
	4 to 5	
256K X 1 chips	2 to 3	0 - 640 KB***
	5 to 6	
256K X 1 chips**	2 to 3	0 - 640 KB
	4 to 5	

\* Only valid with 102665 PAL  
\*\* Only valid with 105615 PAL  
\*\*\* 640 KB to 1 MB reserved

PROCESSOR LOCATIONS  
(80286-8)

000094 System Board	000361 System Board
U60	U3

COPROCESSOR LOCATIONS  
(80287-3 or -8)

000094 System Board	000361 System Board
U74	U17

8-MHz COMPAQ DESKPRO 286  
SYSTEM ROM INFORMATION

SYSTEM ROM LOCATIONS

000130 Sys Memory Bd	000178 & 000382 Sys Mem Bd	000361 System Bd
U82 ODD	U84 ODD	U92 ODD
U88 EVEN	U92 EVEN	U49 EVEN

SYSTEM OPTION ROM LOCATIONS

000130 Sys Memory Bd	000178 & 000382 Sys Mem Bd	000361 System Bd
U78 ODD	U79 ODD	U116 ODD
U85 EVEN	U89 EVEN	U75 EVEN

SYSTEM ROM REVISIONS  
Spare Part No. 105035-001

Rev	PN on ODD ROM	PN on EVEN ROM
A	102667-001	102669-001
B	102667-002	102669-002
C	102667-003	102669-003
D	105620-001	105622-001
E	106261-001	106263-001
F	106437-001	106438-001
G	106580-001	106581-001
J	106778-001	106779-001
K	106778-002	106779-002
M	106970-001	106971-001
N.3	106970-002	106971-002
P.1	109739-001	109740-001
R.2	109739-002	109740-002
S.1	109739-003	109740-003

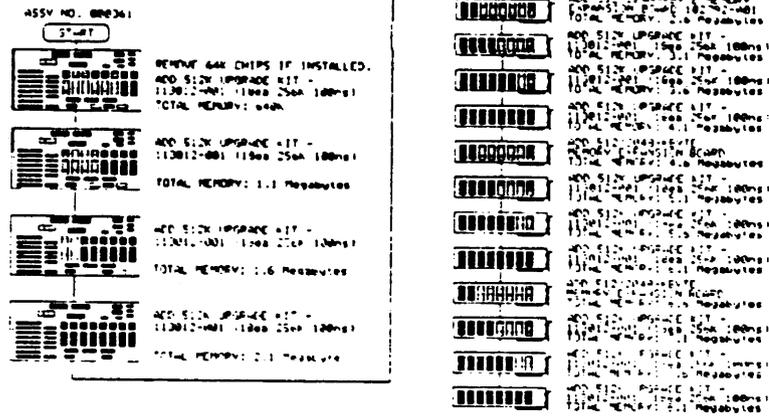
POWER SUPPLY

Spare Part No. 102927-001

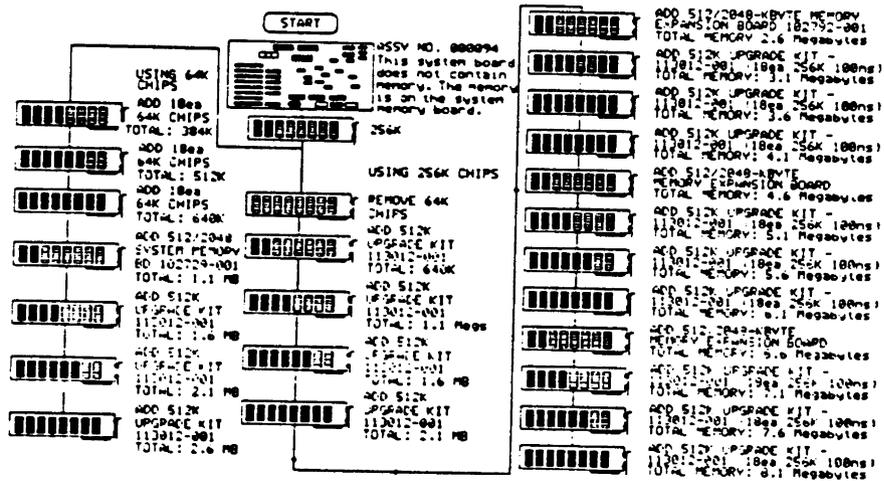
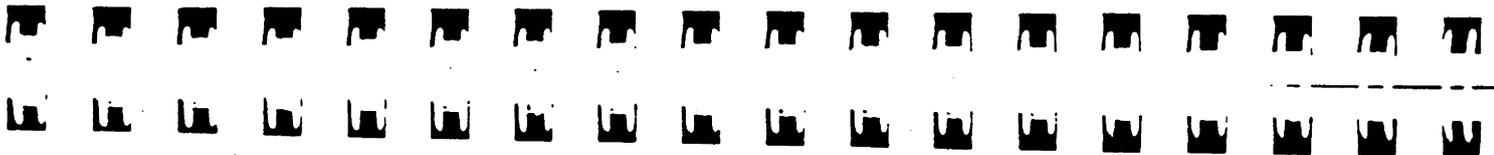
BATTERY/CLOCK MODULE

Spare Part No. 102929-001

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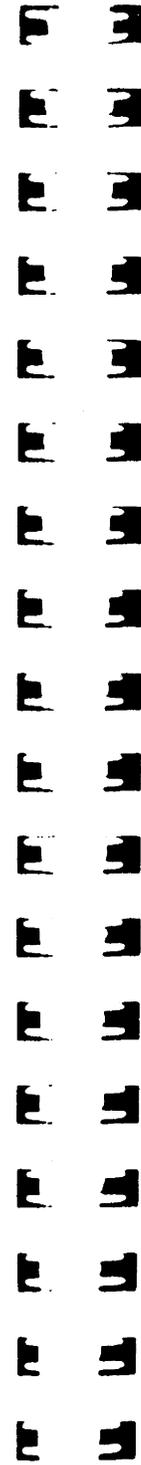
### 8-MHz COMPAQ DESKPRO 286 MEMORY UPGRADE CHART No. 1



### 8-MHz COMPAQ DESKPRO 286 MEMORY UPGRADE CHART No. 2

12-MHz COMPAQ DESKPRO 286

BOARD COMPATIBILITY LIST



Product	Assy No.	Spare Part No.	Page
<b>SYSTEM BOARDS</b>			
80286 System	000555/000700	106707-001	67
<b>MEMORY BOARDS</b>			
512/2048 Mem Exp	000307/000308	105033-001	121
<b>MEMORY CHIPS</b>			
256 X 1 (100 ns) DRAM		113017-001	X
<b>CONTROLLER BOARDS</b>			
Fixed Disk Cntrl	WD1002WAH	102778-001	121
ESDI Fixed Disk (3:1)	WD1005WAH	108140-001	121
ESDI 130/300	WD1007AWA1:	113265-001	121
Tape Adapter	000774	113259-001	123
Multipur Fixed Disk	000815	113446-001	123
ESDI External 300/600	001091	115839-001	123
ESDI Cntrl (15 MHz)	001283	115188-001	124
ESDI/Diskette Cntrl	001472	115374-001	124
<b>VIDEO BOARDS</b>			
Enh Color Graphics*	000410	106373-001	125
Enh Color Graphics*	000471	109196-001	125
VDU	000031/000160/ 000345	101340-001	125
VDU	000525	101340-001	127
VGC*	000806/001241/ 109360	109253-001	127
Advanced Graphics 1024	109958	114201-001	X
Advanced Graphics Memory	109959	114202-001	X
* ECG and VGC require system ROM K or later			
<b>MISCELLANEOUS</b>			
Async Comm/Pri Ptr	000570	106886-001	128
Async Comm/Pri Ptr	000990	106886-001	129
2400-Baud Int Modem	001070	112693-001	X

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12-MHz COMPAQ DESKPRO 286

12-MHz COMPAQ DESKPRO 286

FIXED DISK DRIVES

CABLE INFORMATION

Drive Size	Drive Type	Inter-leave	Inte-grated	Min ROM	Spare Part No.	Controller Assy No.
20 MB	2	1:1	Y	K	114463-001	000815
20 MB	2	3:1	Y	K	113016-001	000815
40 MB*	17	3:1	Y	K	108058-001	000815
40 MB <sup>1</sup>	43	1:1	Y	K	113030-001	000815
70 MB	12	2:1	N	K	102932-001	WD1002WAH
130 MB <sup>2</sup>	25 <sup>3</sup>	3:1	N	K	108080-001	WD1005WAH
	35 <sup>3</sup>	1:1		K		WD1007AWAH
300 MB <sup>4</sup>	38	1:1	N	P.1	113219-001	001091 001283 001472
650 MB <sup>4</sup>	49	1:1	N	P.1	115181-001	001091 001283 001472

Cable Function	Used With	Spare Part No.
Diskette/Tape Signal <sup>1</sup>	All Diskette Drives 40-MB Tape	101380-002
Mass Storage Power <sup>1</sup>	All	101137-001
Tape Signal	135-MB Tape 150/250 MB Tape	113198-001 115196-001
FDD Signal	70-MB FDD	100625-003 100625-004
		34 Pin 20 Pin
FDD Signal <sup>2</sup>	20-MB (1:1 & 3:1), 40-MB (1:1 & 3:1)	108086-001
FDD Signal	Dual 20 & 40-MB FDD	108087-001
FDD Signal <sup>3</sup>	130-MB FDD	100625-005 100625-006
		34 Pin 20 Pin
External I/O	Expansion Unit	115810-001 100625-006
		34 Pin 20 Pin
Telephone Cable	Modem	112666-001

\* See page 133 for dual 40 MB drive configuration information

<sup>1</sup> Requires MS DOS 3.2 or later

<sup>2</sup> Comes formatted as type 35 for the WD1007AWAH controller. If used with the WD1005WAH controller (type 25) you must perform an unconditional format followed by a surface analysis using ADVANCED DIAGNOSTICS 5.04 or greater.

<sup>3</sup> MS DOS 3.1 or earlier supports type 25 only. MS DOS 3.2 or later supports either type. Use type 25 if the application software supports only 17 sectors per track.

<sup>4</sup> Used in Fixed Disk Drive Expansion Unit. Requires MS DOS 3.2 or later.

<sup>1</sup> Part of kits 102934-001 & 108146-001

<sup>3</sup> Part of kit 108249-001

<sup>2</sup> Part of kit 108146-001

<sup>4</sup> Part of kit 115812-001

BOARD JUMPER/SWITCH SETTINGS

SYSTEM BOARD (000555 & 000700)

SW1 SETTINGS

1	2	3	4	5	6	7	8	Function
ON								With 64K X 1 DRAM
OFF*								With 256K X 1 DRAM
ON	ON							Disable RAM and ROM
ON	OFF							0-256 KB base memory
OFF	ON							0-512 KB base memory
OFF*	OFF*							Enable all base memory
			OFF	OFF				With 64K X 1 DRAM
			ON*	ON*				256K X 1 DRAM. No extended memory
			ON	OFF				Enable bank 2 for 1.0 to 1.5 MB of memory
			OFF	ON				Enable banks 2 & 3 for 1.0 to 2.0 MB of memory
			OFF	OFF				Enable all banks for 1.0 to 2.5 MB of memory
					OFF*			CPU boot speed 12 MHz
					ON			CPU boot speed 8 MHz
						OFF		Reserved
							ON*	COMPAQ VDU & EGA, compatible EGA, RGBI, or VGC
							OFF	3rd-party monochrome (MDA only)

100 ns (or faster 256K X 1 chips only)

Jumper E5

1-2	CPU boot speed 12 MHz
2-3*	CPU boot speed 12 MHz except 8 MHz when accessing diskette drive

\* Default

TAPE DRIVES

Size	Spare Part No.
40 MB	108081-001
135 MB	113218-001
150/250 MB	115368-001

DISKETTE DRIVES

Size	Spare Part No.
360 KB	102928-001
1.2 MB	102775-001
1.44 MB*	113263-001

\* Requires system ROM N.3 or later for use with MS DOS and system ROM P.1 or later for use with MS OS/2 Version 1.1. Requires MS DOS Version 3.31 Revision A if installed as drive B, and MS DOS Version 3.31 Revision B if installed as drive A.

12-MHz COMPAQ DESKPRO 286  
PROCESSOR/COPROCESSOR LOCATIONS

Processor (80286-12)	Coprocessor (80287-8)
U3	U17

SYSTEM ROM INFORMATION

SYSTEM ROM LOCATIONS	SYSTEM OPTION ROM LOCATIONS
U92 ODD	U116 ODD
U49 EVEN	U75 EVEN

SYSTEM ROM REVISIONS  
Spare Part No. 105035-001

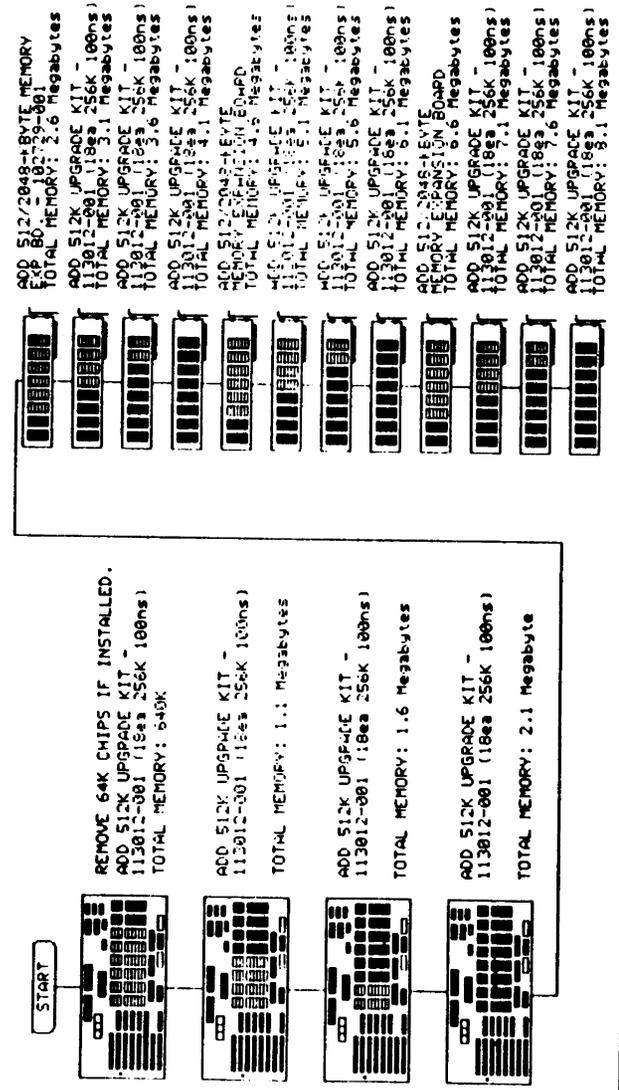
Rev	PN on ODD ROM	PN on EVEN ROM
K	106778-002	106779-002
M	106970-001	106971-001
N 3	106970-002	106971-002
P 1	109739-001	109740-001
R 2	109739-002	109740-002
S 1	109739-003	109740-003

POWER SUPPLY

Spare Part No. 108065-001

BATTERY/CLOCK MODULE

Spare Part No. 102929-001



12-MHz COMPAQ DESKPRO 286 MEMORY UPGRADE CHART

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COMPAQ DESKPRO 286e

BOARD COMPATIBILITY LIST

Product	Assy No.	Spare Part No.	Page
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SYSTEM BOARDS

80286 System	001226	117469-001	73/74
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MEMORY BOARDS

4MB Memory Module	000758/000993/ 001142-001/002 001166-001/002	113226-001	X
1MB Memory Module	000762/000981/ 001256 001259	113225-001	X
1MB 16-Bit Mem Exp	001244	117471-001	74
4MB 16-Bit Mem Exp	001247	117470-001	75

CONTROLLER BOARDS

Tape Adapter	000774	113259-001	123
ESDI External 300/600	001091	115839-001	123
ESDI Cntrl (15 MHz)	001283	115188-001	124
ESDI/Diskette Cntrl	001472	115374-001	124

VIDEO BOARDS

Advanced Graphics 1024	109958	114201-001	X
Advanced Graphics Memory	109959	114202-001	X
VGA Pass-Through	001430	114241-001	X

MISCELLANEOUS

Async Comm/Pri Ptr	000570	106886-001	128
Async Comm/Pri Ptr	000990	106886-001	129
2400-Baud Int Modem	001070	112693-001	X

Keyboard	CZ188	112573-001	
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Power Supply		112570-001	
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Monitor Assy (MONO)		107254-001	
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MONITOR Assy (COLOR)		107255-001	
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Monitor Assy, Advanced Graphics		119066-001	
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NOTES

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Enhanced II

COMPAQ DESKPRO 286e

FIXED DISK DRIVES

Drive Size	Drive Type	Inter-leave	Integrated	Min ROM	Spare Part No.	Controller Assy No.
20 MB	2	1:1	Y	A	114465-001	N/A
40 MB	43	1:1	Y	A	112526-001	N/A
84 MB	27	1:1	Y	A	112438-001	N/A
110 MB	33	1:1	Y	A	112525-001	N/A
300 MB*	38	1:1	N	A	113219-001	001091 001283 001472
650 MB*	49	1:1	N	A	115181-001	001091 001283 001472

\* Used in External Fixed Disk Drive Expansion Unit. Requires MS-DOS 3.2 or later.

TAPE DRIVES

Size	Spare Part No.
40 MB	112524-001
135 MB	112523-001
150/250 MB	115220-001

DISKETTE DRIVES

Size	Spare Part No.
360 KB	112567-001
1.2 MB	112566-001
1.44 MB*	112565-001

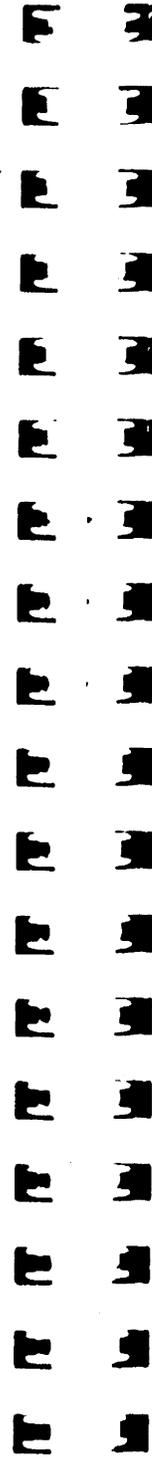
\* Requires MS-DOS Version 3.31 Revision A if installed as drive B, and MS-DOS Version 3.31 Revision B if installed as drive A.

CABLE INFORMATION

Cable Function	Used With	Spare Part No.	
Diskette/Tape Signal	All Diskette Drives 40 MB Tape	113594-001	
Mass Storage Power	All Diskette & Tape Drives	113596-001 112669-003	
Mass Storage Power	All Internal FDD Drive C	101741-001	6 In.
Mass Storage Power	All Internal FDD Drive D	101741-004	15 In.
Tape Signal	135 & 150/250 MB Tape	113198-002	18 In.
FDD Signal	All Internal FDD Drive C	113595-001	
FDD Signal	All Internal FDD Drive D	112528-001	
External I/O	Expansion Unit	115810-001	
Telephone Cable	Modem	112666-001	
VGA Pass-Through	Adv Graphics	114229-001	

COMPAQ DESKPRO 286e

BOARD JUMPER/SWITCH SETTINGS



SYSTEM BOARD (001226)

SW1 SETTINGS

1	2	3	4	5	6	Function
ON*	ON*					Base Memory 640 KB
ON	OFF					Base Memory 512 KB
OFF	OFF					Base Memory 256 KB
OFF	ON					Reserved
		ON				Option ROM enable
		OFF*				Option ROM disable
			ON*			CPU boot speed 12 MHz, except 8 MHz when accessing diskette drive
			OFF			CPU boot speed 12 MHz Reserved
				OFF		Reserved
					ON*	EGA, RGBI, or VGC
					OFF	3rd-party monochrome (MDA only)

\* Default

SYSTEM BOARD (001226)

SW2 SETTINGS

1	2	3	4	5	6	7	8	Function
OFF*								Primary diskette & fixed disk drive address select (3FX & 1FX)
ON								Secondary diskette & fixed disk drive address select (37X & 17X)
OFF*								Enable power-on pass- word
ON								Disable power-on pass- word
OFF*								Enable integrated fixed disk drive controller
ON								Disable integrated fixed disk drive controller
			OFF*	OFF*				Serial interface COM1 (3FX, IRQ4)
			ON	OFF				Serial interface COM2 (2FX, IRQ3)
			OFF	ON				Reserved
			ON	ON				Disable serial interface
					ON*	OFF*		Select printer interface LPT1 or LPT2 (3BX)
					OFF	ON		Select printer interface LPT2 (37X)
					OFF	OFF		Reserved
					ON	ON		Disable printer interface
							ON	Disable integrated VGC
							OFF*	Enable integrated VGC

\* Default

Continued

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COMPAQ DESKPRO 286e

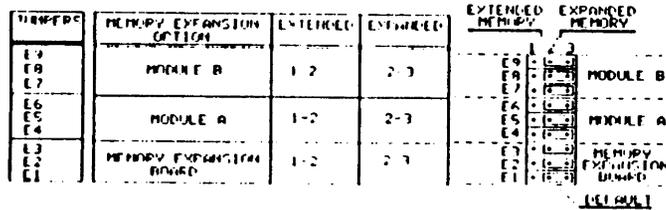
BOARD JUMPER/SWITCH SETTINGS

SYSTEM BOARD (001226)

Jumper	Setting	Function
E4	1-2	Enable IRQ12 from bus, disable pointing device
E4	2-3*	Enable pointing device interface
E11	1-2	8-MHz coprocessor
E11	2-3*	12-MHz coprocessor

\* Default

EXTENDED/EXPANDED MEMORY JUMPER SETTINGS



Mem Exp Bd	Mem Mod A	Mem Mod B	1-MB Expansion Board (001244) Jumper Settings			Total Mem	Ext Mem	Exp Mem
			E1-E3	E4-E6	E7-E9			
1 MB			1-2 EXT	2-3*	2-3*	2 MB	1 MB	
			2-3 EXP	2-3*	2-3*	2 MB		1 MB
1 MB	1 MB		1-2 EXT	1-2 EXT	2-3*	3 MB	2 MB	
			1-2 EXT	2-3 EXP	2-3*	3 MB	1 MB	1 MB
			2-3 EXP	2-3 EXP	2-3*	3 MB		2 MB
1 MB	1 MB	1 MB	1-2 EXT	1-2 EXT	1-2 EXT	4 MB	3 MB	
			1-2 EXT	1-2 EXT	2-3 EXP	4 MB	2 MB	1 MB
			1-2 EXT	2-3 EXP	2-3 EXP	4 MB	1 MB	2 MB
1 MB	4 MB		1-2 EXT	1-2 EXT	2-3*	6 MB	5 MB	
			1-2 EXT	2-3 EXP	2-3*	6 MB	1 MB	4 MB
			2-3 EXP	2-3 EXP	2-3*	6 MB		5 MB
1 MB	1 MB	4 MB	1-2 EXT	1-2 EXT	1-2 EXT	7 MB	6 MB	
			1-2 EXT	1-2 EXT	2-3 EXP	7 MB	2 MB	4 MB
			1-2 EXT	2-3 EXP	2-3 EXP	7 MB	1 MB	5 MB
1 MB	4 MB	1 MB	1-2 EXT	1-2 EXT	1-2 EXT	7 MB	6 MB	
			1-2 EXT	1-2 EXT	2-3 EXP	7 MB	5 MB	1 MB
			1-2 EXT	2-3 EXP	2-3 EXP	7 MB	1 MB	5 MB
1 MB	4 MB	4 MB	1-2 EXT	1-2 EXT	1-2 EXT	10 MB	9 MB	
			1-2 EXT	1-2 EXT	2-3 EXP	10 MB	5 MB	4 MB
			1-2 EXT	2-3 EXP	2-3 EXP	10 MB	1 MB	8 MB

\* Default NOTE: Expanded memory limited to 8 MB

COMPAQ DESKPRO 286e

EXTENDED/EXPANDED MEMORY JUMPER SETTINGS (Cont'd)

Mem Exp Bd	Mem Mod A	Mem Mod B	4-MB Expansion Board (001247) Jumper Settings			Total Mem	Ext Mem	Exp Mem
			E1-E3	E4-E6	E7-E9			
4 MB			1-2 EXT	2-3*	2-3*	5 MB	4 MB	
			2-3 EXP	2-3*	2-3*	5 MB		4 MB
4 MB	1 MB		1-2 EXT	1-2 EXT	2-3*	6 MB	5 MB	
			1-2 EXT	2-3 EXP	2-3*	6 MB	4 MB	1 MB
			2-3 EXP	2-3 EXP	2-3*	6 MB		5 MB
4 MB	1 MB	1 MB	1-2 EXT	1-2 EXT	1-2 EXT	7 MB	6 MB	
			1-2 EXT	1-2 EXT	2-3 EXP	7 MB	5 MB	1 MB
			1-2 EXT	2-3 EXP	2-3 EXP	7 MB	4 MB	2 MB
4 MB	4 MB		1-2 EXT	1-2 EXT	2-3*	9 MB	8 MB	
			1-2 EXT	2-3 EXP	2-3*	9 MB	4 MB	4 MB
			2-3 EXP	2-3 EXP	2-3*	9 MB		8 MB
4 MB	1 MB	4 MB	1-2 EXT	1-2 EXT	1-2 EXT	10 MB	9 MB	
			1-2 EXT	1-2 EXT	2-3 EXP	10 MB	5 MB	4 MB
			1-2 EXT	2-3 EXP	2-3 EXP	10 MB	4 MB	5 MB
4 MB	4 MB	1 MB	1-2 EXT	1-2 EXT	1-2 EXT	10 MB	9 MB	
			1-2 EXT	1-2 EXT	2-3 EXP	10 MB	8 MB	1 MB
			1-2 EXT	2-3 EXP	2-3 EXP	10 MB	4 MB	5 MB
4 MB	4 MB	4 MB	1-2 EXT	1-2 EXT	1-2 EXT	13 MB	12 MB	
			1-2 EXT	1-2 EXT	2-3 EXP	13 MB	8 MB	4 MB
			1-2 EXT	2-3 EXP	2-3 EXP	13 MB	4 MB	8 MB

\* Default NOTE: Expanded memory limited to 8 MB.

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# DP286e

## COMPAQ DESKPRO 286e

### PROCESSOR/COPROCESSOR LOCATIONS

PROCESSOR (80286-12)	COPROCESSOR (80287-8 or 80C287-12)
U102	U1124

### SYSTEM ROM INFORMATION

#### SYSTEM ROM LOCATIONS

System Board Assy	System ROM Locations
001226	U78 ODD U61 EVEN

#### SYSTEM ROM REVISIONS

Spare Part No. 117481-001

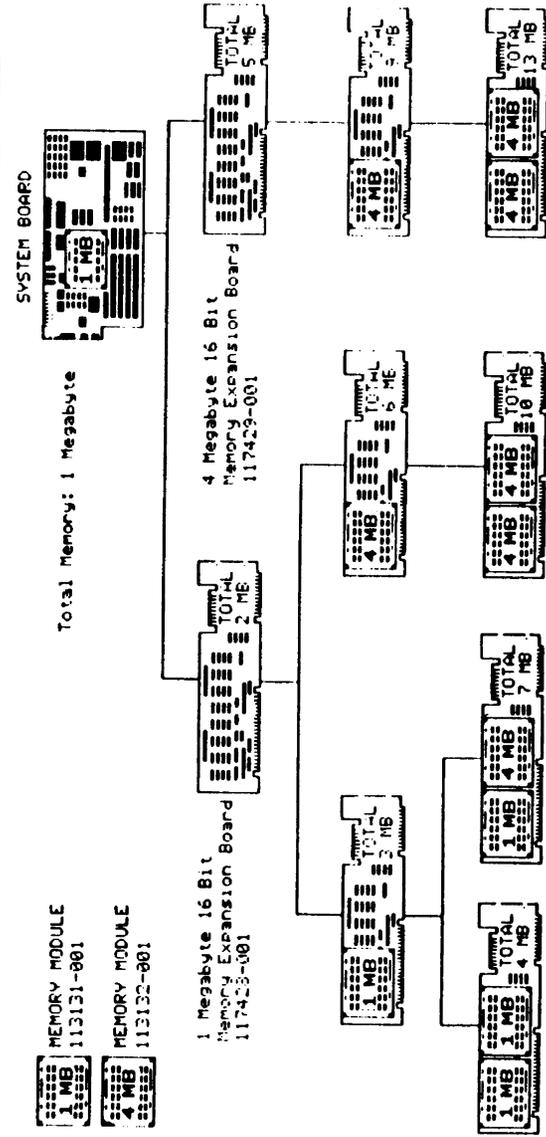
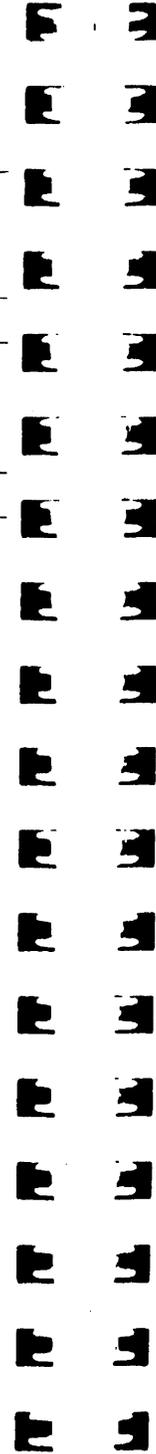
Rev.	PN on ODD ROM	PN on EVEN ROM
A	117507 001	117508 001
B	117507 002	117508 002
B 3	117507 003	117508 003
C O	117507 004	117508 004

### POWER SUPPLY

Spare Part No. 112570 001

### BATTERY/CLOCK MODULE

Spare Part No. 107872 001



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COMPAQ DESKPRO 386

BOARD COMPATIBILITY LIST

Product	Assy No.	Spare Part No.	Page
<b>SYSTEM BOARDS</b>			
386 System	000401	108060-001	81
386 System	000558	108407-001	81
<b>MEMORY BOARDS</b>			
32-Bit Sys Mem	000413	108059-001	82
1 - 2 MB 32-Bit	000450	108082-001	82
0.5-2.0 MB 16-Bit	000458	108138-001	82
4 - 8 MB 32-Bit	000459	108083-001	82
<b>MEMORY CHIPS</b>			
256 X 1 (100 ns) SCRAM		108143-001	X
1 MB X 1 (100 ns) SCRAM		108144-001	X
<b>CONTROLLER BOARDS</b>			
Fixed Disk Cntrl	WD1002WAH	102778-001	121
ESDI Fixed Disk (3:1)	WD1005WAH	108140-001	121
ESDI 130/300	WD1007AWAH	113265-001	121
Tape Adapter	000774	113259-001	123
Multipurpose Fixed Disk	000815	113446-001	123
ESDI External 300/600	001091	115839-001	123
ESDI Cntrl (15 MHz)	001283	115188-001	124
ESDI/Diskette Cntrl	001472	115374-001	124
<b>VIDEO BOARDS</b>			
Enh Color Graphics*	000410	106373-001	125
Enh Color Graphics*	000471	109196-001	125
VDU	000031/000160/ 000345	101340-001	125
VDU	000525	101340-001	127
VGC*	000806/001241 109360	109253-001	127
Advanced Graphics 1024	109958	114201-001	X
Advanced Graphics Memory	109959	114202-001	X
* ECG and VGC require system ROM E or later			
<b>MISCELLANEOUS</b>			
Async Comm/Pri Ptr	000570	106886-001	128
Async Comm/Pri Ptr	000990	106886-001	129
2400-Baud Int Modem	001070	112693-001	X

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COMPAQ DESKPRO 386

FIXED DISK DRIVES

Drive Size	Drive Type	Inter-leave	Inte-grated	Min ROM	Spare Part No.	Controller Assy No.
40 MB <sup>1</sup>	17	3:1	Y	F	108058-001	000815
70 MB	12	2:1	N	F	102932-001	WD1002WAH
130 MB <sup>1</sup>	25 <sup>2</sup>	3:1	N	F	108080-001	WD1005WAH
	35 <sup>2</sup>	1:1		F		WD1007AWAH
300 MB <sup>3</sup>	38	1:1	N	H 8	113219-001	001091 001283 001472
650 MB <sup>3</sup>	49	1:1	N	H 8	115181-001	001091 001283 001472

<sup>1</sup> See page 111 for dual 40 MB drive configuration information.

<sup>2</sup> Comes formatted as type 15 for the WD1007AWAH controller. If used with the WD1005WAH controller (type 25) you must perform an unconditional format followed by a surface analysis using ADVANCED DIAGNOSTICS 5.04 or greater.

<sup>3</sup> MS-DOS 3.1 or earlier supports type 25 only. MS-DOS 3.2 or later supports either type. Use type 25 if the application software supports only 17 sectors per track.

<sup>4</sup> Used in Fixed Disk Drive Expansion Unit. Requires MS-DOS 3.2 or later.

TAPE DRIVES

Size	Spare Part No.
40 MB	109081-001
135 MB	113218-001
150/250 MB	115368-001

DISKETTE DRIVES

Size	Spare Part No.
360 KB	102928-001
1.2 MB	102775-001
1.44 MB <sup>4</sup>	113263-001

<sup>4</sup> Requires system ROM H 8 or later. Use pre-3 with MS-DOS and system ROM J 4 or later for use with MS OS 2 Version 1.1. Requires MS-DOS Version 3.11 Revision A if installed as drive B, and MS-DOS Version 3.31 Revision B if installed as drive A.

CABLE INFORMATION

Cable Function	Used With	Spare Part No.	
Diskette/Tape Signal <sup>1</sup>	All Diskette Drives 40 MB Tape	101380-002	
Mass Storage Power <sup>1</sup>	All Diskette, Tape & Fixed Disk Drives	101137-001	
Tape Signal	135-MB Tape 150/250-MB Tape	113198-001	
FDD Signal	70-MB FDD	100625-003 100625-004	34 Pin 20 Pin
FDD Signal <sup>2</sup>	Single 40-MB FDD	108086-001	
	Dual 40-MB FDD (1:1)	108087-001	
FDD Signal <sup>3</sup>	130-MB FDD	100625-005 100625-006	34 Pin 20 Pin
External I/O <sup>4</sup>	Expansion Unit	115810-001	
Telephone Cable	Modem	112666-001	

<sup>1</sup> Part of kits 102934-001 & 108146-001

<sup>2</sup> Part of kits 100641-002 & 102931-001

<sup>3</sup> Part of kit 108146-001

<sup>4</sup> Part of kit 108249-001

COMPAQ DESKPRO 386

BOARD JUMPER/SWITCH SETTINGS

SYSTEM BOARD (000401)

SW1 SETTINGS

1	2	3	4	5	6	Function
ON						Reserved
ON						80287 coprocessor installed
OFF*						80287 coprocessor not installed
	ON					Coprocessor speed 4 MHz
	OFF*					Coprocessor speed 8 MHz
		ON*				CPU boot speed 16 MHz except when accessing diskette drive, then 8 MHz
		OFF				CPU boot speed 16 MHz (always)
			OFF			Reserved
				ON*		COMPAQ VDU, COMPAQ EGA, compatible EGA, RGBI, or VGC
					OFF	3rd-party monochrome (MDA only)

\* Default

SYSTEM BOARD (000558)

SW1 SETTINGS

1	2	3	4	5	6	7	8	Function
ON								Reserved
	ON							Coprocessor installed
	OFF*							No coprocessor installed
		ON						80287-3 or -6 co- processor speed 4 MHz
		OFF*						80287-8 coprocessor speed 8 MHz
			ON*					CPU boot speed 16 MHz except when accessing diskette drv, then 8 MHz
			OFF					CPU boot speed 16 MHz (always)
				OFF				Reserved
					ON*			COMPAQ VDU & EGA compatible EGA, RGBI or VGC
					OFF			3rd-party monochrome (MDA only)
						ON*		80287-3, -6, or -8 copro- cessor or no co- processor installed
						OFF		387-16 coprocessor
							ON	Reserved

\* Default

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**COMPAQ DESKPRO 386  
BOARD JUMPER/SWITCH SETTINGS**

**32-Bit System Memory Board (000413)**

Jumper Setting	Function
E1 to E2, E4 to E5	256 KB base memory
E2 to E3, E4 to E5	512 KB base memory
E2 to E3, E5 to E6	640 KB base memory (default)
E7 to E8	Disables extended memory (default)
E8 to E9	Enables extended memory

CAUTION: DO NOT connect E3 to E4 or E6 to E7. System board damage may occur.

**0.5 to 2 MB 16-Bit Memory Board (000458)**

Jumper Settings	Base Address
1 to 2, 4 to 5	4 MB (default)
1 to 2, 5 to 6	6 MB
2 to 3, 4 to 5	10 MB
2 to 3, 5 to 6	12 MB

**1- to 2-MB (000450) & 4- to 8-MB (000459) 32-Bit Memory Expansion Boards**

J101 Setting	1- to 2-MB Board	4- to 8-MB Board
1 to 2	Enables second 1 MB of memory	Enables second 4 MB of memory
2 to 3 (default)	Disables second 1 MB of memory	Disables second 4 MB of memory

**PROCESSOR/COPROCESSOR LOCATIONS**

	000558 Sys Bd	000401 Sys Bd
Processor (386-16)	U76	U56
Coprocessor (387-16)	U60	N/A
Coprocessor (80287-3, -6, or -8)	U42	U39

**COMPAQ DESKPRO 386  
SYSTEM ROM INFORMATION**

**SYSTEM ROM LOCATIONS**

000401 Sys Bd	000558 Sys Bd
U13 ODD	U15 ODD
U11 EVEN	U13 EVEN

**SYSTEM ROM REVISIONS  
Spare Part No. 108283-001**

Rev	PN on ODD ROM	PN on EVEN ROM
E	108284-001	108285-001
F	108327-001	108328-001
G	108327-002	108328-002
H 8	113269-008	113270-008
J.4	109591-001	109592-001
K.2	109591-003	109592-003
M.1	109591-004	109592-004
N.1	109591-005	109592-005

**POWER SUPPLY**

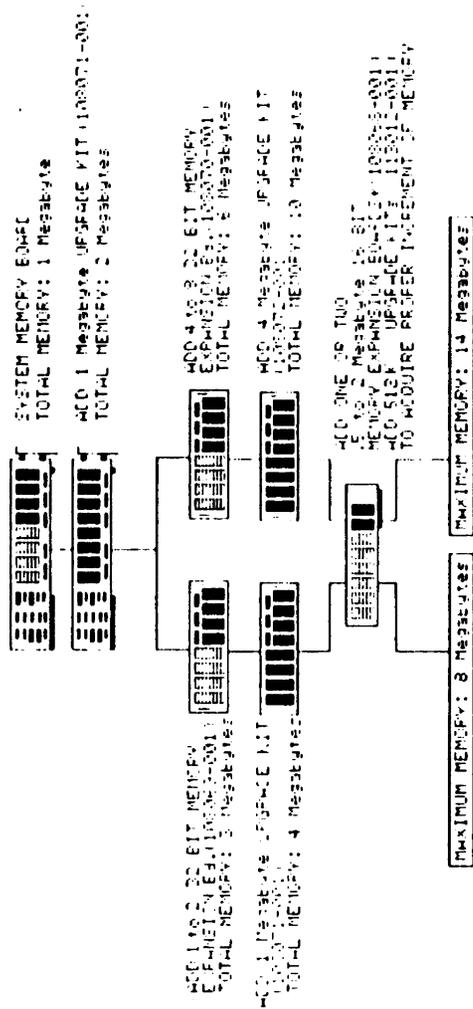
Spare Part No. 108065-001

**BATTERY/CLOCK MODULE**

Spare Part No. 102929-001

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\*Because this memory is only 16 data bits wide, any data or programs contained in the 16 bit memory will have slower access than 32 bit memory.

### COMPAQ DESKPRO 386 MEMORY UPGRADE CHART

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## COMPAQ DESKPRO 386s

### BOARD COMPATIBILITY LIST

Product	Assy No.	Spare Part No.	Page
<b>SYSTEM BOARDS</b>			
386SX System	000954*/001145 001148/001157/	112572-001	87/88
*Comes with VGC Board (Assy No. 001059) mounted on system board			
<b>MEMORY BOARDS</b>			
1-MB 16-MHz Mem Exp	000966	112522-001	X
4 MB 16-MHz Mem Exp	000969	112521-001	X
1-MB Mem Module	000981	112519-001	X
	001076 003/004/007/008 001151-002 001256-003/004/007/008 001259-002		
4 MB Mem Module	000993/001142-002/ 001166-002	112520-001	X
<b>CONTROLLER BOARDS</b>			
Tape Adapter	000774	113259-001	123
ESDI External 300/600	001091	115839-001	123
ESDI Cntrl (15 MHz)	001283	115188-001	124
ESDI/Diskette Cntrl	001472	115374-001	124
<b>VIDEO BOARDS</b>			
Advanced Graphics 1024	109958	114201-001	X
Advanced Graphics Memory	109959	114202-001	X
VGA Pass Through	001430	114241-001	X
<b>MISCELLANEOUS</b>			
Async Comm/Pri Ptr	000570	106886-001	128
Async Comm/Pri Ptr	000990	106886-001	129
2400-Baud Int Modem	001070	112693-001	X

COMPAQ DESKPRO 386s

FIXED DISK DRIVES

Drive Size	Drive Type	Inter-leave	Inte-grated	Min ROM	Spare Part No.	Controller Assy No.
20 MB*	2	1 1	Y	M 3	114165-001	N/A
20 MB*	2	3 1	Y	M 3	112527-001	N/A
40 MB*	43	1.1	Y	M 3	112526-001	N/A
84 MB	27	1.1	Y	M 3	112438-001	N/A
110 MB*	33	1.1	Y	M 3	112525-001	N/A
300 MB <sup>1</sup>	38	1.1	N	M 3	113219-001	001091 001283 001472
320 MB	28	1.1	N	M 3	115182-001	001283
650 MB <sup>1</sup>	49	1.1	N	M 3	115181-001	001091 001283 001472

\* See page 133 for single and dual fixed disk drive switch settings and configuration

<sup>1</sup> Used in Fixed Disk Expansion Unit. Requires MS DOS 3.2 or later.

TAPE DRIVES

Size	Spare Part No.
40 MB	112524-001
135 MB	112523-001
150/250 MB	115220-001

DISKETTE DRIVES

Size	Spare Part No.
360 KB	112567-001
1.2 MB	112566-001
1.44 MB*	112565-001

\* Requires MS DOS Version 3.31 Revision A if installed as drive B and MS DOS Version 3.31 Revision B if installed as drive A.

CABLE INFORMATION

Cable Function	Used With	Spare Part No.
Diskette/Tape Signal	All Diskette Drives 40 MB Tape	113594-001
Mass Storage Power	All Diskette & Tape Drives	113596-001
Mass Storage Power	20-, 40-, & 110 MB FDD Drive C	101741-001
Mass Storage Power	20-, 40-, & 110 MB FDD Drive D	101741-004
Tape Signal	135- & 150/250 MB Tape Drives	113198-002
FDD Signal	20-, 40-, & 110-MB FDD Drive C	113595-001
FDD Signal	20-, 40-, & 110 MB FDD Drive D	112528-001
External I/O	Expansion Unit	115810-001
Telephone Cable	Modem	112666-001
VGA Pass-Through	Adv Graphics	114229-001

COMPAQ DESKPRO 386s

BOARD JUMPER/SWITCH SETTINGS

SYSTEM BOARD (000954, 001145, 001148 & 001157)

SW1 SETTINGS

1	2	3	4	5	6	Function
ON*						Enable fail-safe timer
OFF						Disable fail-safe timer
ON						387SX coprocessor installed
OFF*						387SX coprocessor not installed
		OFF				Reserved
			ON*			CPU boot speed 16 MHz except when accessing diskette drive, then 8 MHz
			OFF			CPU boot speed 16 MHz (always)
				OFF		Reserved
				ON*		EGA, RGBI, or VGC
				OFF		3rd-party monochrome (MDA only)

\* Default

SYSTEM BOARD (000954, 001145, 001148 & 001157)

SW2 SETTINGS

1	2	3	4	5	6	7	8	Function
OFF*								Primary diskette & fixed disk drive address select (3FX & 1FX)
ON								Secondary diskette & fixed disk drive address select (37X & 17X)
OFF*								Enable power-on password
ON								Disable power-on password
		OFF						Enable fixed disk drive
		ON						Disable fixed disk drive
			OFF*	OFF*				Serial interface COM1 IRQ4
			ON	OFF				Serial interface COM2 IRQ3
			ON	ON				Disable serial interface
			OFF	ON				Reserved
					ON*	OFF*		Select printer interface LPT1 or LPT2 (38X)
					OFF	ON		Select printer interface LPT2 (37X)
					ON	ON		Disable printer interface
					OFF	OFF		Reserved
							OFF*	Enable integrated VGC
							ON	Disable integrated VGC

\* Default

Continued

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**COMPAQ DESKPRO 386s**  
**BOARD JUMPER/SWITCH SETTINGS**

**SYSTEM BOARD (000954, 001145, 001148 & 001157)**

**SW3 Settings**

1	2	Function
ON	ON	640 KB base memory limit (default)
ON	OFF	512 KB base memory limit
OFF	OFF	256 KB base memory limit
OFF	ON	Reserved

**SW3 Settings (continued)**

3	4	5	6	Mem Exp	Memory Mod A	Memory Mod B	Total Mem
ON	ON	ON	ON		1 MB on system board only (default)		
ON	ON	ON	OFF	1 MB			2 MB
ON	ON	OFF	ON	1 MB	1 MB		3 MB
ON	ON	OFF	OFF	1 MB	1 MB	1 MB	4 MB
OFF	ON	ON	OFF	4 MB			5 MB
ON	OFF	OFF	ON	1 MB	4 MB		6 MB
ON	OFF	ON	ON	1 MB	1 MB	4 MB	7 MB
OFF	ON	OFF	ON	4 MB	4 MB		9 MB
ON	OFF	OFF	OFF	1 MB	4 MB	4 MB	10 MB
OFF	ON	OFF	OFF	4 MB	4 MB	4 MB	13 MB

**SYSTEM BOARD (000954)**

Jumper	Setting	Function
E4	1-2	Enable IRQ12 from bus, disable printing device
E4	2-3*	Enable printing device interface
E3	Jumper on	Reserved
E2	Jumper on	Reserved

\* Plus closed to U64

**COMPAQ DESKPRO 386s**  
**PROCESSOR/COPROCESSOR LOCATIONS**

System Board Assy	Processor (386SX-16)	Coprocessor (387SX-16)
000954, 001145	U80	U104
001148, 001157	U97	U115

**SYSTEM ROM INFORMATION**

**SYSTEM ROM LOCATIONS**

System Board Assy	System ROM	System Option ROM
000954, 001145	U81 ODD U67 EVEN	
001148, 001157	U90 ODD U74 EVEN	U47 ODD U40 EVEN

**SYSTEM ROM REVISIONS**  
 Spare Part No. 112564-001

Rev	PN on ODD ROM	PN on EVEN ROM
M.3	112593-008	112594-008
N.2	112593-009	112594-009
N.4	112593-010	112594-010

**POWER SUPPLY**

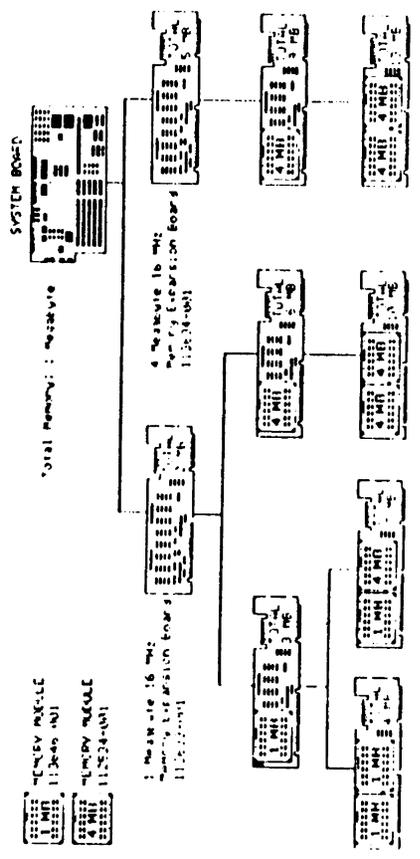
Spare Part No. 112570-001

**BATTERY/CLOCK MODULE**

Spare Part No. 112654-001

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COMPAQ DESKPRO 386s MEMORY UPGRADE CHART

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COMPAQ DESKPRO 386/20

BOARD COMPATIBILITY LIST

Product	Assy No.	Spare Part No.	Page
<b>SYSTEM BOARDS</b>			
386 System	000749	113223-001	93
<b>MEMORY BOARDS</b>			
1MB System Mem	000752/001103	113224-001	X
4MB System Mem	000765	113222-001	X
4MB Memory Module	000758/000993/ 001142-001/002 001166-001/002	113226-001	X
1MB Memory Module	000762/000981/ 001076/001151-001 001256/001259	113225-001	X
<b>CONTROLLER BOARDS</b>			
ESDI 130/300 Tape Adapter	WD1007AWAH 000774	113265-001 113259-001	121 123
Multipurpose Fixed Disk	000815	113446-001	123
ESDI External 300/600	001091	115839-001	123
ESDI Cntrl (15 MHz)	001283	115188-001	124
ESDI/Diskette Cntrl	001472	115374-001	124
<b>VIDEO BOARDS</b>			
Enh Color Graphics*	000410	106373-001	125
Enh Color Graphics*	000471	109196-001	125
VDU	000031/000160/ 000345	101340-001	125
VDU	000525	101340-001	127
VGC*	000806/001241 109360	109253-001	127
Advanced Graphics 1024	109958	114201-001	X
Advanced Graphics Memory	109959	114202-001	X
* ECG and VGC require system ROM H or later			
<b>MISCELLANEOUS</b>			
Async Comm/Pril Ptr	000570	106886-001	128
Async Comm/Pril Ptr	000990	106886-001	129
Weitek/387-20	000777	113267-001	X
2400-Baud Int Modem	001070	112693-001	X

COMPAQ DESKPRO 386/20

FIXED DISK DRIVES

Drive Size	Drive Type	Inter-leave	Inte-grated	Min ROM	Spare Part No.	Controller Assy No.
60 MB <sup>1*</sup>	47	2 1	Y	118	113217-001	000815
130 MB	35	1 1	N	118	108080-001	WD1007AWAH
300 MB <sup>1</sup>	38	1 1	N	118	113219-001	WD1007AWAH
300 MB <sup>2</sup>	38	1 1	N	118	113219-001	001091 001283 001472
650 MB <sup>2</sup>	49	1 1	N	118	115181-001	001091 001283 001472

\* See page 133 for dual 60 MB fixed disk drive jumper settings and configuration information

<sup>1</sup> Requires MS DOS 4.2 or later

<sup>2</sup> Used in Fixed Disk Expansion Unit. Requires MS DOS 4.2 or later

TAPE DRIVES

Size	Spare Part No.
40 MB	108081-001
135 MB	113218-001
150/250 MB	115368-001

DISKETTE DRIVES

Size	Spare Part No.
360 KB	102928-001
1.2 MB	102775-001
1.44 MB*	113263-001

\* Requires MS DOS Version 3.11 Revision A if installed as drive B, and MS DOS Version 3.11 Revision B if installed as drive A

CABLE INFORMATION

Cable Function	Used With	Spare Part No.
Diskette/Tape Signal <sup>1</sup>	All Diskette Drives 40 MB Tape	101380-002
Tape Signal	135- & 150/250 MB Tape Drives	113198-001 8 In.
Mass Storage Power <sup>1</sup>	All Diskette, Tape & Fixed Disk Drives	101137-001
FDD Signal <sup>2</sup>	60-MB FDD	108086-001
FDD Signal	60 MB FDD (Dual Drives)	108087-001
FDD Signal <sup>3</sup>	130 MB FDD 300 MB FDD	100625-005 34 Pin 100625-006 20 Pin
External I/O	Expansion Unit	115810-001
Telephone Cable	Modem	112666-001

<sup>1</sup> Part of kits 102933-001 & 108146-001

<sup>2</sup> Part of kit 108146-001

<sup>3</sup> Part of kit 100629-001

COMPAQ DESKPRO 386/20

BOARD JUMPER/SWITCH SETTINGS

SYSTEM BOARD (000749)

SW1 SETTINGS

1	2	3	4	5	6	7	8	Function
ON								Reserved
ON								387 coprocessor in- stalled on system board or Weitek board with 387
OFF*								387 coprocessor not in- stalled or Weitek board without 387
OFF								Reserved
	ON*							CPU boot speed 20 MHz except 8 MHz when accessing diskette drive
	OFF							CPU boot speed 20 MHz
			OFF					Reserved
				ON*				COMPAQ VDU & EGA, compatible EGA, RGBI or VGC
				OFF				3rd-party monochrome (MDA only)
					OFF	OFF		256 KB base memory
					OFF	ON		512 KB base memory
					ON*	ON*		640 KB base memory

\* Default

PROCESSOR/COPROCESSOR LOCATIONS

Processor (386-20)	Coprocessor (387 - 20)
U61	U60

SYSTEM ROM INFORMATION

SYSTEM ROM LOCATIONS

U9 ODD  
U8 EVEN

SYSTEM ROM REVISIONS  
Spare Part No. 108283-001

Rev	PN on ODD ROM	PN on EVEN ROM
H.8	113269-008	113270-008
J.4	109591-001	109592-001
K.2	109591-003	109592-003
M.1	109591-004	109592-004
N.1	109591-005	109592-005

POWER SUPPLY

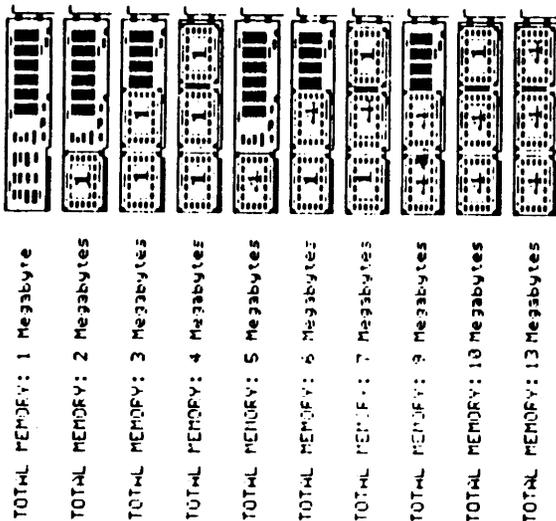
Spare Part No. 108065-001

BATTERY/CLOCK MODULE: Spare Part No. 102929-001

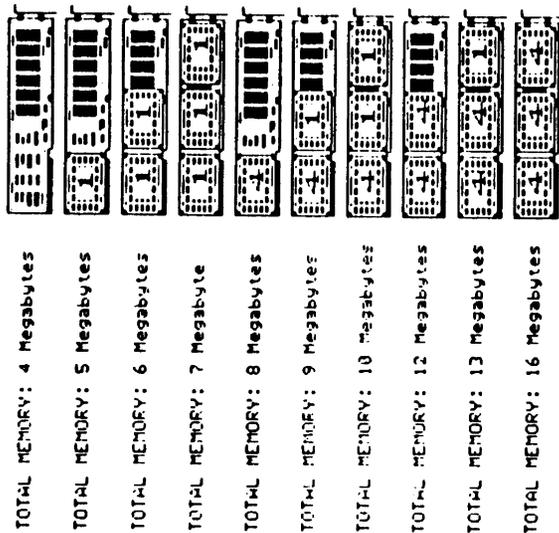
881-1

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1 MEGABYTE BASE MEMORY BOARD



4 MEGABYTE BASE MEMORY BOARD (113190-001)



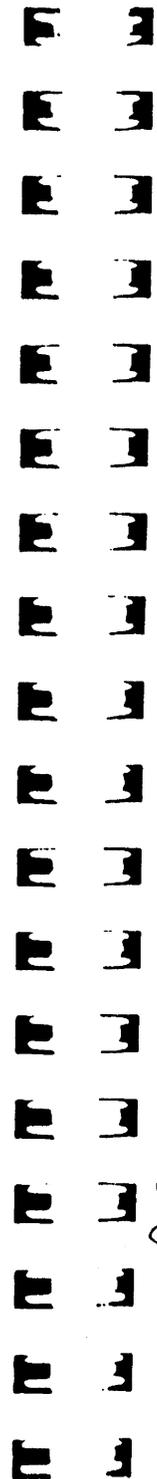
1 MEGABYTE MEMORY MODULE - 113131-001



4 MEGABYTE MEMORY MODULE - 113132-001

COMPAQ DESKPRO 386/20 MEMORY UPGRADE CHART

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COMPAQ DESKPRO 386/20e

BOARD COMPATIBILITY LIST

Product	Assy No.	Spare Part No.	Page
<b>SYSTEM BOARDS</b>			
386/20e System	000935/001196/ 001316 C2020072	112571-001	97/98
386/20e System	001496	112571-001	98
<b>MEMORY BOARDS</b>			
4MB Memory Module	000758/000993/ 001142-001/002 001166-001/002	113226-001 C2020005	X
1MB Memory Module	000762/000981/ 001076/001151-001 001256/001259	113225-001 C2020004	X
1MB 32-Bit Memory	000960 C2020004	112518-001	X
4MB 32-Bit Memory	000963	112517-001	X
<b>CONTROLLER BOARDS</b>			
Tape Adapter	000774 C2020047	113259-001	123
ESDI External 300/600	001091	115839-001	123
ESDI Cntrl (15 MHz)	001283	115188-001	124
ESDI/Diskette Cntrl	001472	115374-001	124
<b>VIDEO BOARDS</b>			
Advanced Graphics 1024	109958	114201-001	X
Advanced Graphics Memory	109959	114202-001	X
VGA Pass-Through	001430	114241-001	X
<b>MISCELLANEOUS</b>			
Async Comm/Pri Ptr	000570	106886-001	128
Async Comm/Pri Ptr	000990	106886-001	129
2400-Baud Int Modem	001070	112693-001	X
Wd. tck/387-20	000777 C2020007	113267-001	
P/S - 112570-001 - C2020052			

COMPAQ DESKPRO 386/20e

COMPAQ DESKPRO 386/20e

FIXED DISK DRIVES

BOARD JUMPER/SWITCH SETTINGS

Drive Size	Drive Type	Inter-leave	Inte-grated	Min ROM	Spare Part No.	Controller Assy No.
20 MB*	2	1 1	Y	M.2	114465-001	N/A
20 MB*	2	3 1	Y	M.2	112527-001	N/A
40 MB*	43	1 1	Y	M.2	112526-001	N/A
84 MB	27	1 1	Y	M.2	112438-001	N/A
110 MB*	33	1 1	Y	M.2	112525-001	N/A
300 MB <sup>1</sup>	38	1 1	N	M.4	113219-001	001091 001283 001472
320 MB	28	1 1	N	M.4	115182-001	001283
650 MB <sup>1</sup>	49	1 1	N	M.4	115181-001	001091 001283 001472

\* See page 133 for single and dual fixed disk drive switch settings and configuration

<sup>1</sup> Used in Fixed Disk Expansion Unit. Requires MS-DOS 3.2 or later.

TAPE DRIVES

Size	Spare Part No.
40 MB	112524-001
135 MB	112523-001
150/250 MB	115220-001

DISKETTE DRIVES

Size	Spare Part No.
360 KB	112567-001
1.2 MB	112566-001
1.44 MB*	112565-001

\* Requires MS-DOS Version 3.31 Revision A if installed as drive B, and MS-DOS Version 3.31 Revision B if installed as drive A.

CABLE INFORMATION

Cable Function	Used With	Spare Part No.
Diskette/Tape Signal	All Diskette Drives 40 MB Tape	113594-001
Mass Storage Power	All Diskette & Tape Drives	113596-001
Mass Storage Power	20-, 40-, & 110-MB FDD Drive C	101741-001
Mass Storage Power	20-, 40-, & 110-MB FDD Drive D	101741-004
Tape Signal	135- & 150/250 MB Tape Drives	113198-002
FDD Signal	20-, 40-, & 110-MB FDD Drive C	113595-001
FDD Signal	20-, 40-, & 110-MB FDD Drive D	112528-001
External I/O	Expansion Unit	115810-001
Telephone Cable	Modem	112666-001
VGA Pass-Through	Adv Graphics	114229-001

SYSTEM BOARD (000935, 001196, & 001316)

SW1 SETTINGS

1	2	3	4	5	6	7	8	Function
ON*								Enable fail-safe timer
OFF								Disable fail-safe timer
	ON							387 coprocessor installed
	OFF*							387 coprocessor not installed/Weitek installed
		ON						Disable memory caching in 12 thru 16-MB range
		OFF						Enable memory caching in 12 thru 16-MB range
			ON*					CPU boot speed 20 MHz except 8 MHz when accessing diskette drive
			OFF					CPU boot speed 20 MHz
				OFF				Reserved
					ON*			EGA, RGBI, or VGC
					OFF			3rd-party monochrome (MDA only)
						OFF	OFF	256 KB base memory
						ON	OFF	512 KB base memory
						ON	ON	640 KB base memory
						OFF	ON	Reserved

\* Default

Continued

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**COMPAQ DESKPRO 386/20e**  
**BOARD JUMPER/SWITCH SETTINGS**

**SYSTEM BOARD (000935, 001196, & 001316)**

**SW2 SETTINGS**

1	2	3	4	5	6	7	8	Function
OFF*								Primary diskette & fixed disk drive address select (3FX & 1FX)
ON								Secondary diskette & fixed disk drive address select (37X & 17X)
OFF*								Enable power-on password
ON								Disable power-on password
OFF*								Enable integrated fixed disk drive controller
ON								Disable integrated fixed disk drive controller
	OFF*	OFF*						Serial interface COM1 IRQ4
	ON	OFF						Serial interface COM2 IRQ3
	ON	ON						Disable serial interface
	OFF	ON						Reserved
			ON*	OFF*				Select printer interface LPT1 (3FX)
			OFF	ON				Select printer interface LPT2 (37X)
			ON	ON				Disable printer interface
			OFF	OFF				Reserved
						OFF*		Enable integrated VGC
						ON		Disable integrated VGC

Jumper	Setting	Function
E4	1-2	Enable IRQ12 from bus, disable pointing device
E4	2-3*	Enable pointing device interface
E10	1-2*	8-bit video ROM
E10	2-3	16-bit video ROM

\* Default

**SYSTEM BOARD (001496)**

**SW1 Settings**

1	2	Function
ON*		Enable Integrated VGA
OFF		Disable Integrated VGA
	ON*	Disable Power On Password
	OFF	Enable Power-On Password

**COMPAQ DESKPRO 386/20e**  
**PROCESSOR/COPROCESSOR LOCATIONS**

Processor (386-20)      Coprocessor (387-20)

U154      U155

Weitek 3167 Coprocessor (Spare Part No. 115517-001)

U155

**SYSTEM ROM INFORMATION**

**SYSTEM ROM LOCATIONS**

U141 ODD

U156 EVEN

**SYSTEM ROM REVISIONS**

Spare Part No. 112694-001

Rev	PN on ODD ROM	PN on EVEN ROM
M.2	112673-003	112674-003
M.4	112673-004	112674-004
N.2	112673-005	112674-005
N.3	112673-006	112674-006

**POWER SUPPLY**

Spare Part No. 112570-001 C2020052

**BATTERY/CLOCK MODULE**

Spare Part No. 112654-001

COMPAQ DESKPRO 386/25

BOARD COMPATIBILITY LIST

Product	Assy No.	Spare Part No.	Page
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SYSTEM BOARDS

386 System	000944/001056/ 001069/001118	115526-001	104
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MEMORY BOARDS

1MB System Mem	000752/001103	113224-001	X
4MB System Mem	000765	113222-001	X
4MB Memory Module	000758/000993/ 001142-001/002 001166-001/002	113226-001	X
1MB Memory Module	000762/000981/ 001076/001151-001 001256/001259/	113225-001	X

CONTROLLER BOARDS

Tape Adapter	000774	113259-001	123
Multipurpose Fixed Disk	000957	115511-001	123
Multipurpose ESDI	000996	115519-001	104
ESDI External 300/600	001091	115839-001	123
ESDI Cntrl (15 MHz)	001283	115188-001	124
ESDI/Diskette Cntrl	001472	115374-001	124

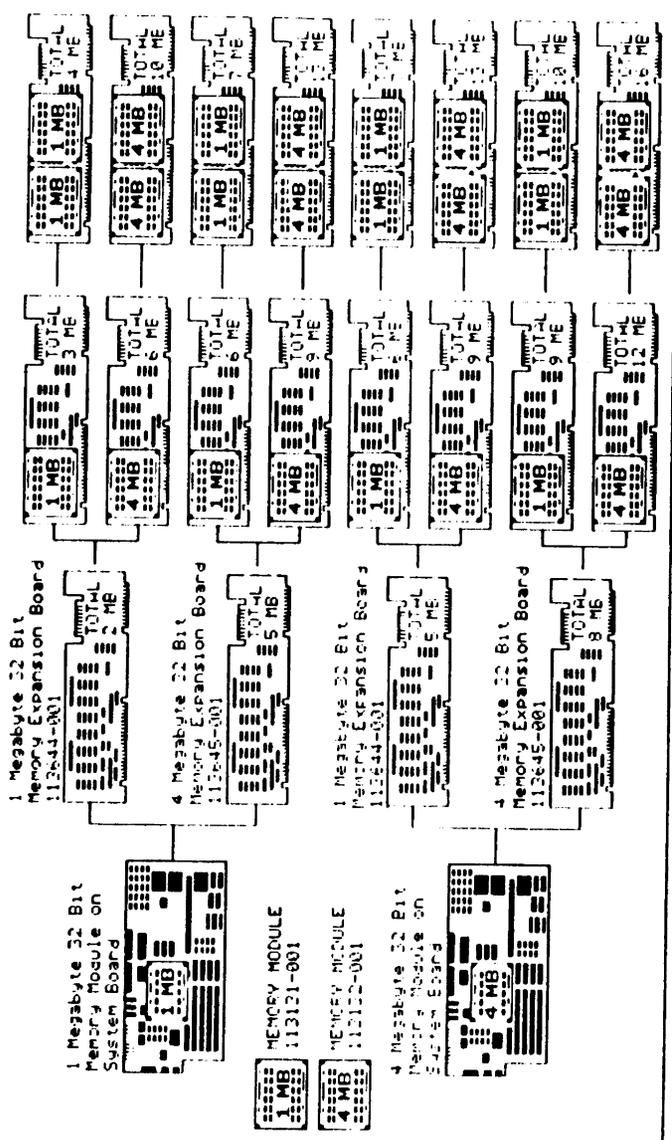
VIDEO BOARDS

VDU	000031/000160/ 000345	101340-001	125
VDU	000525	101340-001	127
VGC*	000806/001241 109360	109253-001	127
Advanced Graphics 1024	109958	114201-001	X
Advanced Graphics Memory	109959	114202-001	X

\* VGC requires system ROM K 2 or later

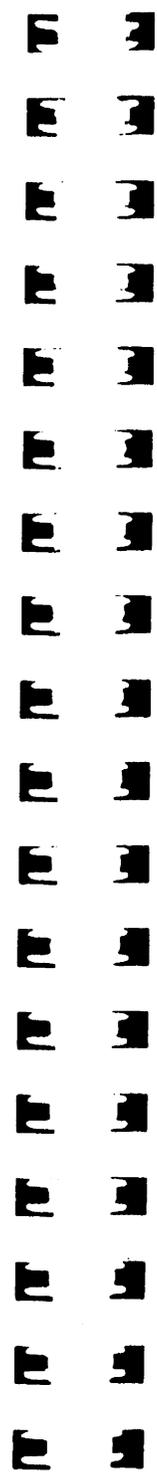
MISCELLANEOUS

Async Comm/Prl Ptr	000570	106886-001	128
Async Comm/Prl Ptr	000990	106886-001	129
2400 Baud Int Modem	001070	112693-001	X



COMPAQ DESKPRO 386/20e MEMORY UPGRADE CHART

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COMPAQ DESKPRO 386/25

COMPAQ DESKPRO 386/25

FIXED DISK DRIVES

CABLE INFORMATION

Drive Size	Drive Type	Inter-leave	Inte-grated	Min ROM	Spare Part No.	Controller Assy No.
60 MB <sup>1</sup> *	47	2:1	Y	K.2	113217-001	000957
60 MB*	47	1:1	Y	K.2	115649-001	000957
84 MB	27	1:1	Y	K.2	115668-001	000957
110 MB*	33	1:1	Y	K.2	115579-001	000957
300 MB <sup>1</sup>	38	1:1	N	K.2	113219-001	000996
650 MB <sup>2</sup>	49	1:1	N	K.2	115181-001	001091 001283 001472
300 MB <sup>2</sup>	38	1:1	N	K.2	113219-001	001091 001283 001472

\* See page 133 for dual fixed disk drive jumper settings and configuration information.

<sup>1</sup> Requires MS-DOS 3.2 or later.

<sup>2</sup> Used in Fixed Disk Expansion Unit. Requires MS-DOS 3.2 or later.

TAPE DRIVES

Size	Spare Part No.
40 MB	108081-001
135 MB	113218-001
150/250 MB	115368-001

DISKETTE DRIVES

Size	Spare Part No.
360 KB	102928-001
1.2 MB	102775-001
1.44 MB*	113263-001

\*Requires MS-DOS Version 3.31 Revision A if installed as drive B, and MS-DOS Version 3.31 Revision B if installed as drive A.

Cable Function	Used With	Spare Part No.
Diskette/Tape Signal <sup>1</sup>	All Diskette Drives 40-MB Tape	101380-002
Tape Signal	135- & 150/250-MB Tape Drives	113198-001
Mass Storage Power <sup>1</sup>	All Diskette, Tape & Fixed Disk Drives	101137-001
FDD Signal <sup>2</sup>	60-MB FDD 60-MB 1:1 FDD 110-MB FDD	108086-001
FDD Signal	60-MB FDD 60-MB 1:1 FDD 110 MB FDD (Dual Drives)	108087-001
FDD Signal <sup>3</sup>	300-MB FDD 650-MB FDD	100625-005 100625-006
External I/O	Expansion Unit	115810-001
Telephone Cable	Modem	112666-001

34 Pin  
20 Pin

<sup>1</sup> Part of kits 102934-001 & 108146-001

<sup>2</sup> Part of kit 108146-001

<sup>3</sup> Part of kit 108249-001

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**COMPAQ DESKPRO 386/25  
BOARD JUMPER/SWITCH SETTINGS**

**SYSTEM BOARD (000944, 001056, 001069, & 001118)**

**SW1 SETTINGS**

1	2	3	4	5	6	7	8	Function
ON								Reserved
ON								387 coprocessor installed
OFF*								387 coprocessor not installed
	ON							Cachable mem 0 - 12MB
	OFF*							Cachable mem 0 - 16MB
		ON*						CPU boot speed 25 MHz except 8 MHz when accessing diskette drive
			OFF					CPU boot speed 25 MHz
				OFF				Reserved
					ON*			COMPAQ VDU, EGA, RGBI or VGC
						OFF		3rd-party monochrome (MDA only)
						OFF	OFF	256 KB base memory
						OFF	ON	512 KB base memory
						ON*	ON*	640 KB base memory

\* Default

E14 Setting	Location	Function
1 - 2*	Pins closest to 50-MHz crystal	25-MHz processor speed
2 - 3	Pins closest to 48-MHz crystal	24-MHz processor speed

\*Default

**MULTIPURPOSE ESDI FIXED DISK DRIVE CONTROLLER BOARD (000996)**

**SW500 Settings**

1	2	3	4	5	6	Function
OFF*						Primary diskette & fixed disk drive address select (3FX & 1FX)
ON						Secondary diskette & fixed disk drive address select (37X & 17X)
	OFF					Enable fixed disk drive
	ON					Disable fixed disk drive
		OFF*	OFF*			Serial interface COM1 IRQ4
		ON	OFF			Serial interface COM2 IRQ3
		ON	ON			Disable serial interface
				OFF	ON	Select printer interface LPT1
				ON	OFF	Select printer interface LPT2
				OFF	OFF	Select printer interface LPT3
				ON	ON	Disable printer interface

\*Default

**COMPAQ DESKPRO 386/25**

**PROCESSOR/COPROCESSOR LOCATIONS**

Processor (386-25)	Coprocessor (387-25)
U72	U73
Witek 3167 Coprocessor	Cache (82385-25)
U57	U59

**SYSTEM ROM INFORMATION**

**SYSTEM ROM LOCATIONS**

U10 ODD  
U2 EVEN

**SYSTEM ROM REVISIONS  
Spare Part No. 108283-001**

Rev	PN on ODD ROM	PN on EVEN ROM
K.2	109591-003	109592-003
M.1	109591-004	109592-004
N.1	109591-005	109592-005

**POWER SUPPLY**

Spare Part No. 108065-001

**BATTERY/CLOCK MODULE**

Spare Part No. 102929-001

h61-1

COMPAQ DESKPRO 386/33

BOARD COMPATIBILITY LIST

Product	Assy No.	Spare Part No.	Page
<b>SYSTEM BOARDS</b>			
386 System	001184	115190-001	109
<b>MEMORY BOARDS/MODULES</b>			
2MB Memory Exp	001286	115187-001	X
2MB Memory Module	001250	115184-001	X
<b>CONTROLLER BOARDS</b>			
Tape Adapter	000774	113259-001	123
ESDI Cntrl (15 MHz)	001283	115188-001	124
ESDI/Diskette Cntrl	001472	115374-001	124
Diskette Cntrl	001475	115373-001	X
<b>VIDEO BOARDS</b>			
Advanced Graphics 1024	109958	114201-001	X
Advanced Graphics Memory	109959	114202-001	X
VGA Pass-Through	001430	114241-001	X
<b>MISCELLANEOUS</b>			
Async Comm/Pri Ptr	000570	106886-001	128
Async Comm/Pri Ptr	000990	106886-001	129
2400-Baud Int. Modem	001070	112693-001	X

1 MEGABYTE BASE MEMORY BOARD

TOTAL MEMORY: 1 Megabyte	
TOTAL MEMORY: 2 Megabytes	
TOTAL MEMORY: 3 Megabytes	
TOTAL MEMORY: 4 Megabytes	
TOTAL MEMORY: 5 Megabytes	
TOTAL MEMORY: 6 Megabytes	
TOTAL MEMORY: 7 Megabytes	
TOTAL MEMORY: 9 Megabytes	
TOTAL MEMORY: 10 Megabytes	
TOTAL MEMORY: 13 Megabytes	

1 MEGABYTE MEMORY MODULE - 113131-001



4 MEGABYTE BASE MEMORY BOARD (113190-001)

TOTAL MEMORY: 4 Megabytes	
TOTAL MEMORY: 5 Megabytes	
TOTAL MEMORY: 6 Megabytes	
TOTAL MEMORY: 7 Megabyte	
TOTAL MEMORY: 8 Megabytes	
TOTAL MEMORY: 9 Megabytes	
TOTAL MEMORY: 10 Megabytes	
TOTAL MEMORY: 12 Megabytes	
TOTAL MEMORY: 13 Megabytes	
TOTAL MEMORY: 16 Megabytes	

4 MEGABYTE MEMORY MODULE - 113132-001



COMPAQ DESKPRO 386/25 MEMORY UPGRADE CHART

COMPAQ DESKPRO 386/33

FIXED DISK DRIVES

Drive Size	Drive Type	Inter-leave	Inte-grated	Min ROM	Spare Part No.	Controller Assy No.
84 MB*	27	1:1	Y	A	112438-001	N/A
110 MB*	33	1:1	Y	A	112525-001	N/A
320 MB	28	1:1	N	A	115182-001	001283
300 MB <sup>1</sup>	38	1:1	N	A	113219-001	001283 001472
650 MB <sup>1</sup>	49	1:1	N	A	115181-001	001283 001472

\* See page 133 for dual fixed disk drive jumper settings and configuration information.

<sup>1</sup> Used internally and in Fixed Disk Expansion Unit. Requires MS-DOS Version 3.2 or later.

TAPE DRIVES

Size	Spare Part No.
40 MB	112524-001
135 MB	113218-001
150/250 MB	115220-001

DISKETTE DRIVES

Size	Spare Part No.
360 KB	112567-001
1.2 MB	112566-001
1.44 MB*	112565-001

\* Requires MS-DOS Version 3.31 Revision A if installed as drive B, and MS-DOS Version 3.31 Revision B if installed as drive A.

CABLE INFORMATION

Cable Function	Used With	Spare Part No.	
ESDI/Diskette Signal	All ESDI/Diskette 40-MB Tape Drive	115376-001	28 In.
ESDI/Diskette Signal	ESDI/Diskette	115375-001	33 In.
Tape Signal	135- & 150/250 MB Tape Drives	115196-001	20 In.
FDD Power	Single FDD	115215-001	
Diskette Power	Dual Diskette	112669-004	
FDD Power	Dual FDD	112669-001	
FDD Signal	Dual FDD	115195-001	
FDD Signal	320- & 650-MB FDD (Single Drive)	100625-006 115197-001	20 Pins 34 Pins
FDD Signal	320- & 650-MB FDD (Dual Drives)	100625-006 115811-001	20 Pins 34 Pins
FDD Signal	84- & 110-MB FDD	115195-001	
External I/O	Expansion Unit	115810-001	
VGA Pass-Through	Adv. Graphics	114229-001	

COMPAQ DESKPRO 386/33

BOARD JUMPER/SWITCH SETTINGS

System Board (001184)

SW1 Settings

1	2	Function
ON*		Enable Integrated VGA
OFF		Disable Integrated VGA
	ON*	Enable Power-On Password
	OFF	Disable Power-On Password

\*Default

PROCESSOR/COPROCESSOR LOCATIONS

Processor (386-33)

Coprocessor (387-33)

U7	U8
----	----

Walttek 3167-033 Coprocessor

U39
-----

SYSTEM ROM INFORMATION

SYSTEM ROM LOCATIONS

U15 ODD
U16 EVEN

SYSTEM ROM REVISIONS

Spare Part No. 115290-001

Rev	PN on ODD ROM	PN on EVEN ROM
A	115305-002	115306-002
B.2	115305-003	115306-003
C.0	115305-004	115306-004

POWER SUPPLY

Spare Part No. 115189-001

BATTERY/CLOCK MODULE

Spare Part No. 107872-001

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COMPAQ DESKPRO 386/33 MEMORY UPGRADE CHART

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COMPAQ SYSTEMPRO

BOARD COMPATIBILITY LIST

Product	Assy No.	Spare Part No.	Page
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SYSTEM BOARDS

System Board	001514-002	116796-001	X
386 System Processor	001358	116795-001	113

MEMORY BOARDS/MODULES

System Memory Board (4 Socket)	001370	116799-001	X
Memory Exp. Board (6 Socket)	001376	116803-001	X
2MB Memory Module (Single)	001250	115184-001	X
8MB Memory Module (Single)	001361	116800-001	X
8MB Memory Module (Double)	001364	116801-001	X
32MB Memory Module* (Double)	001367	116802-001	X

\* Marked with red lettering for quick identification

CONTROLLER BOARDS

32-Bit Drive Array Adapter	001373	116807-001	X
SCSI Adapter	001379	116809-001	124
Tape Adapter	000774	113259-001	123
ESDI Cntrl (15 MHz)	001283	115159-001	124

VIDEO BOARDS

Advanced Graphics 1024	109958	114201-001	X
Advanced Graphics Memory	109959	114202-001	X
VGA Pass-Through	001430	114241-001	X

MISCELLANEOUS

Async Comm/Pri Ptr	000570	106886-001	128
Async Comm/Pri Ptr	000990	106886-001	129
2400-Baud Int. Modem	001070	112693-001	X

COMPAQ SYSTEMPRO

FIXED DISK DRIVES

Drive Size	Drive Type	Inter-leave	Inte-grated	Min ROM	Spare Part No.	Controller Assy No.
120 MB	51	1:1	Y	A	116806-001	N/A
210 MB	50	1:1	Y	A	116805-001	N/A
300 MB*	38	1:1	N	A	113219-001	001283
320 MB	28	1:1	N	A	115182-001	001283
650 MB <sup>1</sup>	49	1:1	N	A	115181-001	001283
240 MB <sup>2</sup> (Dual)	(120 MB Drive Array Pair)			A		001373
420 MB <sup>2</sup> (Dual)	(210 MB Drive Array Pair)			A		001373

\* Used only with Fixed Disk Expansion Unit

<sup>1</sup> Drive Type 49 with MS DOS, drive type 42 with MS OS/2 Version 1.0, and drive type 41 with operating systems from SCO

<sup>2</sup> See page 133 for drive array pair jumper settings

TAPE DRIVES

Size	Spare Part No.
150/250 MB	115220-001
320/525 MB	116804-001

DISKETTE DRIVES

Size	Spare Part No.
360 KB	112567-001
1.2 MB	112566-001
1.44 MB*	112565-001

\* Requires MS-DOS Version 3.31 Revision A if installed as drive B, and MS-DOS Version 3.31 Revision B if installed as drive A

CABLE INFORMATION

Cable Function	Used With	Spare Part No.	
Diskette Power	Diskette Locations Q1, Q2, & Q3	116939-001	
Diskette Signal	Diskette Locations Q1, Q2, & Q3	116940-001	
FDD Power	Single FDD	116941-001	
FDD Signal	Single FDD	119510-001	
FDD Signal Kit	ESDI FDD	115812-001	17 in.
FDD Power	Drive Array Pair Locations L1 & L2	116936-001	
FDD Signal	Drive Array Pair Locations L1 & L2	116942-001	
FDD Power	Drive Array Pair Locations L3 & L4	116935-001	
FDD Signal	Drive Array Pair Locations L3 & L4 Front	116938-001	
FDD Signal	Drive Array Pair Locations L3 & L4 Rear	116937-001	
Tape Power	320/525MB Tape	116932-001	
Tape Signal	320/525MB Tape	116933-001	24 in.
Tape Signal	150/250MB Tape	116931-001	24 in.
VGA Pass-Through	Adv. Graphics	114229-001	

COMPAQ SYSTEMPRO

BOARD JUMPER SETTINGS

System I/O Bus Board (001358)

Jumper	Pins	Function
E1	1 - 2	Bypass extended memory on power-on (Maintenance Mode)
E1	2 - 3*	Read extended memory on power-on (Standard Mode)
E2		Reserved
E3	1 - 2*	Enable Power-On Password
E3	2 - 3	Disable Power-On Password
E4	1 - 2	Disable Integrated VGA
E4	2 - 3*	Enable Integrated VGA

\*Default

COPROCESSOR LOCATIONS

(On System Processor Board 001358)

Coprocessors

U1	Weitek 3167-033
U2	387-33

SYSTEM ROM INFORMATION

(On System Board 001514)

SYSTEM ROM LOCATIONS

U55	ODD
U54	EVEN

SYSTEM ROM REVISIONS  
Spare Part No. 116797-001

Rev	PN on ODD ROM	PN on EVEN ROM
A	116686-001	116687-001

POWER SUPPLY

PN 116798-001

BATTERY/CLOCK MODULE

PN 107872-001

261-1

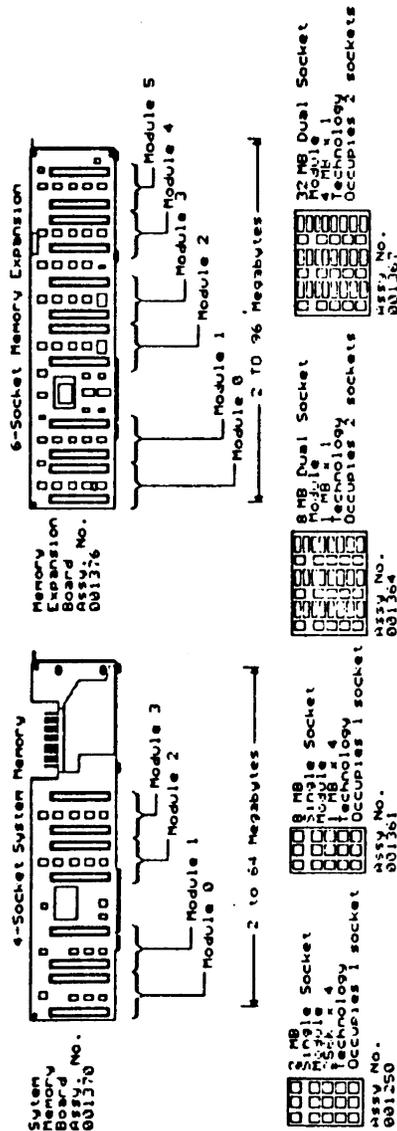


COMPAQ DESKPRO 486/25

BOARD COMPATIBILITY LIST

Product	Assy No.	Spare Part No.	Page
<b>SYSTEM BOARDS</b>			
486 System	001532	120548-001	117
<b>MEMORY BOARDS/MODULES</b>			
4MB Memory Expansion	001508	120549-001	X
2MB Memory Module	001250	115184-001	X
8MB Memory Module (Single)	001361	116800-001	X
8MB Memory Module (Double)	001364	116801-001	X
32MB Memory Module (Double)*	001367	116802-001	X
* Marked with red lettering for quick identification			
<b>CONTROLLER BOARDS</b>			
Tape Adapter	000774	113259-001	123
ESDI Cntrl (15 MHz)	001283	115188-001	124
Disk Array Cntrl	001373	116807-001	X
SCSI Adapter	001379	116809-001	124
<b>VIDEO BOARDS</b>			
Advanced Graphics 1024	109958	114201-001	X
Advanced Graphics Memory	109959	114202-001	X
VGA Pass-Through	001430	114241-001	X
<b>MISCELLANEOUS</b>			
Async Comm/Pri Ptr	000570	106886-001	128
Async Comm/Pri Ptr	000990	106886-001	129
2400-Baud Int. Modem	001070	112693-001	X

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o A System Memory Board is standard on all models.  
o No memory is included with system boards or expansion boards. All memory is added with modules.  
o Memory Expansion Boards are identical. A maximum of two boards may be used for a total memory of 256 Megabytes.  
o If slot 18 is occupied by a second System Processor Board, then a second Memory Expansion Board cannot be installed.

COMPAQ SYSTEMPRO MEMORY UPGRADE CHART

COMPAQ DESKPRO 486/25

COMPAQ DESKPRO 486/25

FIXED DISK DRIVES

BOARD JUMPER SETTINGS

Drive Size	Drive Type	Interleave	Integrated	Min ROM	Spare Part No.	Controller Assy No.
120 MB	51	1 1	Y	A	116806-001	N/A
210 MB	50	1 1	Y	A	116805-001	N/A
300 MB*	38	1.1	N	A	113219-001	001283
320 MB	28	1 1	N	A	115182-001	001283
650 MB <sup>1</sup>	49	1.1	N	A	115181-001	001283
420 MB (Two 210 MB drives in array)						001373

\* Used only in Fixed Disk Expansion Unit

<sup>1</sup> Drive type 49 with MS DOS, drive type 42 with MS OS 2 Version 1.0, and drive type 41 with operating systems from SCO

TAPE DRIVES

Size	Spare Part No.
150/250 MB	115220-001
320/525 MB	116804-001

DISKETTE DRIVES

Size	Spare Part No.
360 KB	112567-001
1.2 MB	112566-001
1.44 MB*	112565-001

\*Requires MS-DOS Version 3.31 Revision A if installed as drive B, and MS-DOS Version 3.31 Revision B if installed as drive A

CABLE INFORMATION

Cable Function	Used With	Spare Part No.
Diskette Power	Dual Diskette	120592-001
Diskette/Tape Signal	All Diskette	120593-001
FDD Power	All FDD	120591-001
FDD/Tape Power	FDD, Tape Drive	120590-001
FDD Signal	Dual 120MB FDD	120589-001
FDD Power	Dual FDD	120588-001
ESDI FDD Signal	320 & 650MB FDD	120587-001 120586-001
Tape Interface	150/250MB Tape	116931-001
Tape Power	320/525MB Tape	116932-001
Tape Signal	320/525MB Tape	116933-001
VGA Pass-Through	Adv. Graphics	114229-001

34 Pins  
20 Pins

System Board (001532)

Jumper	Pins	Function
E1	1 - 2	Bypass extended memory at power-on (Maintenance Configuration)
E1	2 - 3*	Read extended memory at power-on (Standard Configuration)
E2	1 - 2	Disable Power-On Password
E2	2 - 3*	Enable Power-On Password
E3	1 - 2	Disable Integrated VGA
E3	2 - 3*	Enable Integrated VGA

\*Default

PROCESSOR LOCATION

Processor (486-25)

U10

COPROCESSOR LOCATION

Coprocessor (Weitek 4167)

U12

SYSTEM ROM INFORMATION

SYSTEM ROM LOCATIONS

U115 ODD  
U131 EVEN

SYSTEM ROM REVISIONS  
Spare Part No. 120582-001

Rev	PN on ODD ROM	PN on EVEN ROM
A	116686-001	116687-001

POWER SUPPLY

PN 115189-001

BATTERY/CLOCK MODULE

PN 107872-001

1-2000



# FIXED DISK EXP UNIT

## COMPAQ 300-/650-MEGABYTE FIXED DISK EXPANSION UNIT

### SPARE PARTS

#### FIXED DISK DRIVES

Drive Size	Drive Type	Inter-leave	Inte-grated	Spare Part No.	Controller Assy No.
300 MB	38	1:1	N	113219-001	001283 001472
650 MB	49	1:1	N	116181-001	001283 001472

#### CONTROLLER BOARDS

Board	Assy No.	Spare Part No.	Page
ESDI Interface Adapter II <sup>1</sup>	001313	115191-001	X
ESDI Cntrl (15 MHz) <sup>2</sup>	001283	115188-001	124
ESDI/Diskette Cntrl <sup>2</sup>	001472	115374-001	124

<sup>1</sup> Used in Expansion Unit

<sup>2</sup> Used in COMPAQ personal computer

#### CABLES

Cable	Spare Part No.
External I/O <sup>1</sup>	115810-001
FDD Power <sup>2</sup>	115851-001
FDD Signal <sup>2</sup>	100625-006      20 Pins 115811-001      34 Pins

<sup>1</sup> Connects COMPAQ personal computer to Expansion Unit

<sup>2</sup> Used in Expansion Unit

#### POWER SUPPLY

Spare Part No 108065-001

#### USED WITH

COMPAQ PORTABLE III  
COMPAQ PORTABLE 386  
12 MHz COMPAQ DESKPRO 286  
COMPAQ DESKPRO 286e  
All 386-Based  
All 486-Based

## MULTIPRODUCT BOARDS

### BOARD JUMPER/SWITCH SETTINGS

#### MEMORY BOARDS

#### 512/2048 MEMORY EXPANSION BOARDS (000307 & 000308)

Jumper Settings	Address Range *
E1 to E2, E5 to E6	1 to 3 Megabytes
E1 to E2, E4 to E5	2.5 to 4.5 Megabytes
E2 to E3, E5 to E6	4.5 to 6.5 Megabytes
E2 to E3, E4 to E5	6.5 to 8.5 Megabytes

\* Memory address range is dependent on system memory board configuration

#### CONTROLLER BOARDS

#### FIXED DISK DRIVE CONTROLLER BOARD (WD1002WAH)

Jumper/Setting*	Function
W1 1-2	Primary controller
W2 NL	LED operation
J4	No connections

\* Jumpers set at the factory Do not change

#### FIXED DISK DRIVE CONTROLLER BOARD (WD1002WX2/HX4)\* \*\*

Drive	SW1 for Drive D		SW1 for Drive C	
	1	2	3	4
10 MB	ON	ON	ON	ON
20 MB	OFF	ON	OFF	ON
30 MB	OFF	OFF	OFF	OFF

\* Do not remove jumpers E17-E18

\*\* Earlier versions of this board have no switch settings and are fixed for 10MB

#### ESDI FIXED DISK DRIVE CONTROLLER BOARD (WD1005WAH)

Jumper	Status
W1	Reserved - Not installed
W2	Reserved - Not installed
W3	Reserved - 2 to 3

#### ESDI 130/300 FIXED DISK DRIVE CONTROLLER BOARD (WD1007AWAH)

Jumper	Setting	Function
J5	No jumper	Reserved
W3	No jumper	Reserved
W8	Jumper on	Reserved
W9	No jumper	Reserved
W10	No jumper	Reserved
W11	No jumper	Reserved
W12	No jumper	Reserved

1-202

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**MULTIPRODUCT BOARDS**  
**BOARD JUMPER/SWITCH SETTINGS**

**MULTIPURPOSE CONTROLLER BOARD (000142)**

Jumper	Pin 1 to Pin 2	Pin 2 to Pin 3
J1	Secondary diskette controller address	Primary diskette controller address (default)
J2*	Serial interface COM1	Serial interface COM2
J4*	Serial interface IRQ4	Serial interface IRQ3
J3	Disable parallel interface	Enable parallel interface

\* J2 & J4 must be changed together.

**MULTIPURPOSE CONTROLLER BOARDS (000181-001/000181-021) and MULTIPURPOSE FIXED DISK DRIVE CONTROLLER BOARDS (000336-001/000336-021)**

Jumper/Switch	Setting/Function	
J1	Open connectors on left Open connectors on right	Serial interface COM1 IRQ4* Serial interface COM2 IRQ3
J2	Open connectors on left Open connectors on right	Primary diskette controller address* Secondary diskette controller address
SW1-1**	ON OFF	Enable fixed disk drive Disable fixed disk drive
SW1-2	ON OFF	Enable parallel interface* Disable parallel interface
SW1-3***	ON OFF	Enable serial interface* Disable serial interface
SW1-4	OFF	Reserved

\* Default  
\*\* SW1-1 reserved on 000181 boards  
\*\*\* SW1-3 reserved on 000181 001 (all Revs) & 000336 001 Rev P or earlier boards

**DISKETTE/PRINTER BOARD (000181-011)**

Switch	Setting/Function	
SW1-1	OFF	Reserved
SW1-2	ON OFF	Enable parallel interface (default) Disable parallel interface
SW1-3	OFF	Reserved
SW1-4	OFF	Reserved

**MULTIPRODUCT BOARDS**  
**BOARD JUMPER/SWITCH SETTINGS**

**MULTIPURPOSE FIXED DISK DRIVE CONTROLLER BOARD (000519, 000815, & 000957)**

Switch	Setting/Function	
SW500-1	OFF*	Primary diskette and fixed disk drive address select
	ON	Secondary diskette and fixed disk drive address select
SW500-2	OFF	Disable high-speed transfer rates (for systems without 1.2-MB diskette drive or 40-MB tape drive)
	ON*	Enable high-speed transfer rates (for systems with 1.2-MB diskette drive or 40-MB tape drive)
SW500-3	OFF*	Enable fixed disk drive
	ON	Disable fixed disk drive
SW500-4	OFF*	Serial interface COM1 IRQ4
	ON	Serial interface COM2 IRQ3
SW500-5	OFF*	Enable serial interface
	ON	Disable serial interface
SW500-6	OFF*	Enable printer interface
	ON	Disable printer interface

**TAPE ADAPTER (000774)**

1	2	3	4	5	6	7	8	Function
ON*	OFF*							Interrupt select IRQ5
OFF	ON							Interrupt select IRQ3
		ON*	OFF*	ON*	OFF*			DMA channel 3
		OFF	ON	OFF	ON			DMA channel 1
						ON*	OFF*	Base address 300 hex
						OFF	ON	Base address 200 hex

\*Default

**ESDI EXTERNAL FIXED DISK DRIVE CONTROLLER BOARD (001091)**

SW500 Settings	Function			
1	2	3	4	
OFF*				Primary fixed disk drive address select
ON				Secondary fixed disk drive address select
	OFF	OFF		Interrupt select IRQ15
	ON*	OFF*		Interrupt select IRQ14
	OFF	ON		Interrupt select IRQ12
	ON	ON		Interrupt select IRQ11
			OFF	Reserved

\*Default

**MULTIPRODUCT BOARDS**  
**BOARD JUMPER/SWITCH SETTINGS**

**ESDI FIXED DISK DRIVE CONTROLLER BOARD (15 MHz) (001283)**

1	2	3	4	Function
ON				Secondary address 37X and 17X
OFF*				Primary address 3FX and 1FX
	OFF	OFF		Interrupt Select IRQ15
	ON*	OFF*		Interrupt Select IRQ14
	OFF	ON		Interrupt Select IRQ12
	ON	ON		Interrupt Select IRQ11
			OFF	Reserved

\* Default

**SCSI ADAPTER (001379)**

**SW1 Settings**

1	2	3	4	Function
ON*				Base I/O Address 330h
OFF				Base I/O Address 130h
	OFF*			Reserved
		ON		DMA channel 5
		OFF*		DMA channel 7
			ON	Interrupt select IRQ3
			OFF*	Interrupt select IRQ5

**ESDI/DISKETTE CONTROLLER (001472)**

Jumper Setting	Function
Jumper ON	Enabled
Jumper OFF	Disabled

**SW1 Settings**

1	2	3	4	Function
ON				Secondary Address 37X and 17X
OFF*				Primary Address 3FX and 1FX
	OFF	OFF		Interrupt Select IRQ15
	ON*	OFF*		Interrupt Select IRQ14
	OFF	ON		Interrupt Select IRQ12
	ON	ON		Interrupt Select IRQ11
			OFF*	Reserved

**MULTIPRODUCT BOARDS**

**VIDEO BOARDS**

**VIDEO DISPLAY CONTROLLER BOARDS (000031, 000160, & 000345)**

J3	J5	Function
2-3	2-3	Enable RGBI & composite video (high-scan) (Desktops default)
1-2	1-2	Disable RGBI & composite video (high-scan) (Portables default)

**COMPAQ ENHANCED COLOR GRAPHICS BOARD (000410 & 000471)**

**SW1 Settings (As the Only/Primary Video Display Controller Board)**

1	2	3	4	Monitor Type	Power-On Mode	Mode
OFF	ON	ON	OFF	COMPAQ Color Compatible Enh Color COMPAQ Dual-Mode	80x25 (640x350)	Color
ON	ON	ON	OFF	COMPAQ Color Compatible Enh Color COMPAQ Dual-Mode	80x25 (640x200)	Color
OFF	OFF	OFF	ON	RGBI Color COMPAQ Dual-Mode	80x25 (640x200)	Color
ON	OFF	OFF	ON	RGBI Color COMPAQ Dual-Mode	40x25 (320x200)	Color
OFF	OFF	ON	OFF	COMPAQ Dual-Mode	80x25 (720x350)	Mono

**COMPAQ ENHANCED COLOR GRAPHICS BOARD (000410 & 000471)**

**SW1 Settings (As the Secondary Video Display Controller Board)**

1	2	3	4	Monitor Type	Power-On Mode	Mode
OFF	OFF	ON	ON	COMPAQ Color Compatible Enh. Color COMPAQ Dual-Mode	80x25 (640x350)	Color
ON	OFF	ON	ON	COMPAQ Color Compatible Enh. Color COMPAQ Dual-Mode	80x25 (640x200)	Color
OFF	ON	ON	ON	RGBI Color COMPAQ Dual-Mode	80x25 (640x200)	Color
ON	ON	ON	ON	RGBI Color COMPAQ Dual-Mode	40x25 (320x200)	Color
OFF	ON	OFF	ON	COMPAQ Dual-Mode	80x25 (720x350)	Mono

Continued

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**MULTIPRODUCT BOARDS**  
**BOARD JUMPER/SWITCH SETTINGS**

**MULTIPRODUCT BOARDS**  
**BOARD JUMPER/SWITCH SETTINGS**

**COMPAQ ENHANCED COLOR GRAPHICS BOARD (000410 & 000471)**

**SW2 Settings**

1	2	3	4	5	6	Monitor Type
OFF	OFF					COMPAQ Color Compatible Enhanced Color (external)
ON	OFF					RGBI Color (external)
OFF	ON					COMPAQ Dual-Mode (external)
ON	ON					No external (Portables)
		OFF				COMPAQ Dual-Mode internal (COMPAQ Portable, COMPAQ PLUS, COMPAQ PORTABLE 286, & COMPAQ PORTABLE II)
			ON			No internal (COMPAQ PORTABLE III*, COMPAQ PORTABLE 386*, Desktops)
				ON	OFF ON	Reserved

\* Set system board setting to monochrome mode

**SW3 Settings (000410 only)**

If installed, all OFF (Reserved)

**Jumper P1 (External Monitor)**

Pins	Monitor Type
1-2	COMPAQ Color or Enhanced Color
2-3	RGBI Color or COMPAQ Dual Mode

**Jumper JP3**

Pins	Address Select
1-2	3xxh (default)
2-3	2xxh

**MINIMUM SYSTEM ROM REQUIRED FOR CECGB**

Product	Minimum ROM
COMPAQ Portable	G
COMPAQ PLUS	G
COMPAQ PORTABLE 286	F
COMPAQ PORTABLE II	F
COMPAQ PORTABLE III	K
COMPAQ PORTABLE 386	H
COMPAQ DESKPRO	H
8-MHz COMPAQ DESKPRO 286	F
12-MHz COMPAQ DESKPRO 286	K
COMPAQ DESKPRO 386	E
COMPAQ DESKPRO 386/20	H

**CECGB VIDEO ROM REV (Spare Part No. 106686-001)**

ROM	PN on ROM
B	108281-001
C	106633-001
D	106633-002
E	106633-003

**VIDEO DISPLAY CONTROLLER BOARD (000525)**

J3/5	Function
2-3	Enable RGBI & composite video (high-scan) (Desktops default)
1-2	Disable RGBI & composite video (high-scan) (Portables default)

**VIDEO GRAPHICS CONTROLLER BOARD (000806, 001241, & 109360)**

Jumper	Function	Setting
J1	Video RAM	1-2 16-bit (default) 2-3 8-bit
J2	Video ROM	2-3 8-bit (default) 1-2 16-bit

**MINIMUM SYSTEM ROM REQUIRED FOR VGC**

Product	Minimum ROM
COMPAQ PORTABLE III	K
COMPAQ PORTABLE 386	H
COMPAQ DESKPRO	H
8-MHz COMPAQ DESKPRO 286	F
12-MHz COMPAQ DESKPRO 286	K
COMPAQ DESKPRO 386	E
COMPAQ DESKPRO 386/20	H
COMPAQ DESKPRO 386/25	K.2

**VGC ROM LOCATIONS**

U11 EVEN  
U12 ODD

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**MULTIPRODUCT BOARDS**  
**BOARD JUMPER/SWITCH SETTINGS**

**VGC ROM REVISION (Spare Part No. 109315-001)**

Rev	PN on ODD ROM	PN on EVEN ROM
A 0	109327-001	109328-001
A 1	109327-002	109328-002
A 2	109327-003	109328-003
B 0	109793-001	109794-001
B 1	109793-002	109794-002
D 0	109793-003	109794-003

**MISCELLANEOUS**

**ASYNCHRONOUS COMMUNICATIONS/CLOCK BOARD (000061)**

Jumper	Pin 1 to Pin 2	Pin 2 to Pin 3
J702 *	COM2 address (2FX)	COM1 address (3FX)
J703 *	IRQ3	IRQ4

Jumper	Status
J704	Jumper enables 8th slot No jumper disables 8th slot
J705 **	Jumper enables clock No jumper disables clock

Shunt	Status
U13	Pins 5 to 12, 6 to 11, 7 to 10, 8 to 9 connected Serial RS232C operation ----- Pins 1 to 16, 2 to 15, 3 to 14, 4 to 13 connected 20-mA current loop operation

\* Jumpers J702 & J703 must be changed together  
\*\* If no physical jumper, clock is enabled

**ASYNCHRONOUS COMMUNICATIONS/PARALLEL PRINTER BOARD (000570)**

1	2	3	4	5	6	Function
OFF						Reserved
ON						Enable asynchronous interface
OFF						Disable asynchronous interface
	ON	ON				Parallel printer interface LPT1
	OFF	ON				Parallel printer interface LPT2
	ON	OFF				Parallel printer interface LPT3
	OFF	OFF				Disable parallel printer interface
			ON	ON		Asynchronous interface COM1
			OFF	ON		Asynchronous interface COM2

**MULTIPRODUCT BOARDS**  
**BOARD JUMPER/SWITCH SETTINGS**

**ASYNCHRONOUS COMMUNICATIONS/PARALLEL PRINTER BOARD (000990)**

1	2	3	4	5	6	Function
OFF						Reserved
	OFF					Reserved
		ON	ON			Parallel printer interface LPT1
		OFF	ON			Parallel printer interface LPT2
		ON	OFF			Parallel printer interface LPT3
		OFF	OFF			Disable parallel printer interface
				ON	ON	Asynchronous interface COM1
				OFF	ON	Asynchronous interface COM2
				OFF	OFF	Disable asynchronous interface

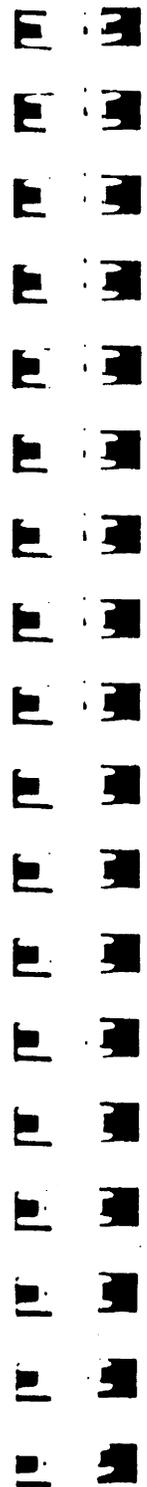
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NOTES

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CONNECTOR PINS/FUNCTIONS



**25-PIN ASYNCHRONOUS/SERIAL CONNECTOR**

Pin	Description
1	Protective Ground
2	Transmit Data (TX)
3	Receive Data (RX)
4	Request to Send (RTS)
5	Clear to Send (CTS)
6	Data Set Ready (DSR)
7	Signal Ground (GND)
8	Carrier Detect (CD)
9	+ Transmit Current Loop Data (20 mA)
10	+ 5 Vdc 200 mA (fuse on board)
11	- Transmit Current Loop Return (20 mA)
12	Reverse Channel Option
13 - 17	No connection
18	+ Receive Current Loop Data (20 mA)
19	No connection
20	Data Terminal Ready (DTR)
21	No connection
22	Ring Indicator (RI)
23 - 24	No connection
25	- Receive Current Loop Return (20 mA)

**25-PIN PARALLEL CONNECTOR**

Pin	Description
1	Strobe
2	Data Bit 0
3	Data Bit 1
4	Data Bit 2
5	Data Bit 3
6	Data Bit 4
7	Data Bit 5
8	Data Bit 6
9	Data Bit 7
10	Acknowledge
11	Busy
12	Paper End
13	Select
14	Auto Feed
15	Error
16	Initialize Printer
17	Select Input
18 - 25	Signal Ground

CONNECTOR PINS/FUNCTIONS

9-PIN ASYNCHRONOUS/SERIAL CONNECTOR

Pin	Description
1	Carrier Detect (CD)
2	Receive Data (RX)
3	Transmit Data (TX)
4	Data Terminal Ready (DTR)
5	Signal Ground (GND)
6	Data Set Ready (DSR)
7	Request to Send (RTS)
8	Clear to Send (CTS)
9	Ring Indicator (RI)

COMPAQ DESKTOP STORAGE DEVICE

POWER CONNECTIONS

J109	Drive C
J110	Tape Drive (Drive D)
J111	Drive B
J112	Drive A

FIXED DISK DRIVE JUMPER/SWITCH SETTINGS

SINGLE AND ARRAYED CONFIGURATION FIXED DISK DRIVE SWITCH SETTINGS

Drive	Setting
20-MB	E7 ON, E6 OFF, E5 ON
40-MB	ACT ON, DSP OFF, C/D ON, HSP OFF
110-MB	ACT ON, DSP OFF, C/D ON, HSP OFF
120 MB*	C/D ON, DSP OFF
210 MB*	C/D ON, DSP OFF

\*Single configuration or arrayed configuration

DUAL CONFIGURATION FIXED DISK DRIVE SWITCH SETTINGS\*

Drive In C	Setting	Drive in D	Setting
20 MB (3:1)	E7 ON, E6 ON, E5 OFF	20-MB (3:1)	E7 OFF, E6 ON, E5 OFF
40-MB or 110-MB or 20 MB (1:1)	ACT OFF, DSP ON, C/D ON, HSP OFF	40-MB or 110-MB* or 20 MB (1:1)	ACT OFF, DSP OFF, C/D OFF, HSP ON
40-MB or 110-MB or 20 MB (1:1)	ACT OFF, DSP ON, C/D ON, HSP OFF	40-MB or 110-MB* or 20 MB (1:1)	ACT OFF, DSP OFF, C/D OFF, HSP OFF

\*Requires dual cable part number 108087-001

DUAL 40-MB FIXED DISK DRIVE CONFIGURATIONS\*

Drive C	Drive D
3 1/2-Inch E5 OFF E6 ON E7 ON	3 1/2-Inch E5 OFF E6 ON E7 OFF
	5 1/4-Inch Remove jumper IN:C

\*Requires dual cable part number 108087-001

DUAL 60-MB FIXED DISK DRIVE CONFIGURATIONS

Drive C	Drive D
Jumper IN:C ON	Jumper IN:C OFF

\*Requires dual cable part number 108087-001

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**FIXED DISK DRIVE JUMPER/SWITCH SETTINGS  
(Cont'd)**

**DUAL CONFIGURATION FIXED DISK DRIVE JUMPER/SWITCH SETTINGS**

Drive in C					Drive in D				
Setting					Setting				
84-MB	ACT	DSP	C/D	HSP	84-MB	ACT	DSP	C/D	HSP
	OFF	ON	ON	OFF		OFF	OFF	OFF	OFF

**GENERAL SOFTWARE INFORMATION**

**ERROR CODES**

**ERROR CODE CATEGORIES**

101	System ROM BIOS
102	System Board or System Memory Board
162	System Options
163	Time and Date
164	Memory Size
2XX	Memory
3XX	Keyboard
4XX	Parallel Interface/Monochrome Adapter
501	Color Display Adapter
6XX	Diskette
702	Coprocessor
11XX	Asynchronous Interface/Modem
12XX	2nd Asynchronous Interface/Modem
17XX	Fixed Disk Drive
19XX	Tape
24XX	ECGB and VGCB
51XX	Plasma Display

**COMPAQ SOFTWARE UTILITIES/EQUIPMENT CROSS-REFERENCE**

Utility	Personal Computer
ADAPT	COMPAQ PORTABLE III COMPAQ SLT/286 COMPAQ PORTABLE 386 COMPAQ LTE COMPAQ LTE/286
CACHE CEMM	ALL PRODUCTS COMPAQ PORTABLE 386 COMPAQ DESKPRO 386 COMPAQ DESKPRO 386s COMPAQ DESKPRO 386/20e COMPAQ DESKPRO 386/20 COMPAQ DESKPRO 386/25 COMPAQ DESKPRO 386/33 COMPAQ SYSTEMPRO
CEMMP	COMPAQ DESKPRO 486/25 COMPAQ PORTABLE III COMPAQ SLT/286 COMPAQ DESKPRO 286e COMPAQ LTE COMPAQ LTE/286
CHARSET	ALL PRODUCTS

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### Micro Products

December 17, 1984

Category A. General

#### A1 MAINTENANCE APPROACH

This product will be maintained by both Computer Repair Centers and on-site maintenance. All repairs on-site and in the Computer Repair Centers will be subassembly replacement only. Repairable subassemblies will be repaired to the component level in the Production Department in King of Prussia and in class 1 Computer Repair Centers which have been approved for multi-layered PCB repair.

#### NOTE

Class 1 Computer Repair Centers may find it more cost effective to swap subassemblies rather than repair to the component level.

#### A2 SORBUS MACHINE TYPES, FEATURE NUMBERS

DESCRIPTION	MFG. PN	O/S M/T	CRC M/T	FEATURE NO.
Commuter 1083		6779	9779	

#### A3 FIELD REPLACEABLE PARTS LISTING

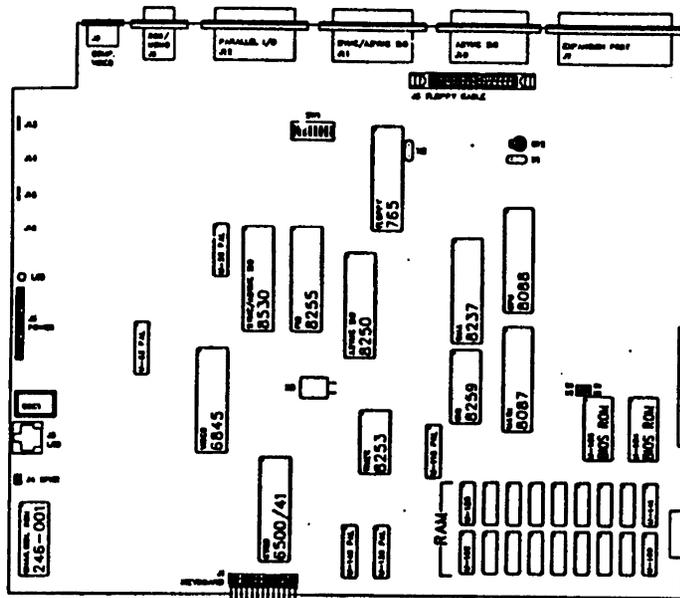
DESCRIPTION	MFG. PN	SORBUS PN
Main logic board w/ 128K and connector bracket	PA033-A01 PN007-005	VT000201 VT000201
Diskette drive (SD-521)	DF002-A0X	VT000202
Disk drive cable	---	VT000216
Disk drive mount	BR004-00X	VT000211
Keyboard	KB011-011	VT000203
Keyboard cable	CL016-A01	VT000218
Display,	DM001-A01	VT000204
LCD w/cable	CL019-A0X	VT000204
and bezel	CU002-001-003	VT000204
Flip cover	DZ002-A0X	VT000208
Speaker w/cable	SB001-A01	VT000221
Power supply	PA022-A01	VT000205
AC panel ass'y	PN007-A06	VT000224
w/line filter	---	VT000224
and switch	(NS000011)	VT000224
Fan and AC harness ass'y	FN001-A01	VT000222
DC harness ass'y	WA006-A03	VT000215
Earthing (ground) harness	WA011-A01	VT000220
Handle ass'y	GZ001-006	VT000210
Top cover	---	VT000207
w/disk drive bezel	CU002-001-003	VT000212
Base	BU002-A0X	VT000206
Rear door	PN007-006	VT000210
Latches L & R (flip cover)	---	VT000227
Latches L & R (rear door)	---	VT000228
IC, RAM 64K x 1	4164	YY012064
IC, RAM 256K x 1	41256	YY014874

**VISUAL COMMUTER LOGIC BOARD (VT000201)**  
**MANUFACTURER PART NO. PA033-A01**

**INSTALLATION INSTRUCTION SHEET**

**CAUTION**

Static sensitive device. Handle only at a static-free workstation or use an antistatic service kit. Package the device in a conductive bag with an insulated antistatic liner.



**NOTE**

Other information is available in Micro Tech Talks.

**SWITCHES**

SW1: POSITION	FUNCTION				
1	Always OFF				
2	8087 Math co-processor:	OFF - Installed			
		ON - NOT installed			
3,4	MEMORY:	AMOUNT	3	4	
		64K	ON	ON	
		128K	OFF	ON	
		256K	ON	OFF	
		512K	OFF	OFF	
5,6	DISPLAY:	TYPE	5	6	
		18x80 LCD	ON	ON	
		25x80 LCD	ON	OFF	
		25x40 COLOR	OFF	ON	
		25x80 COLOR	ON	OFF	
		IBM MONO	OFF	OFF	
7,8	DRIVES:	QTY	7	8	
		1	ON	ON	
		2	OFF	ON	

CONTINUED —

**NOTE**

Display configurations may also be changed from the keyboard:  
 Mono CTRL-ALT-M 25 line LCD CTRL-ALT-8 25 x 40 color CTRL-ALT-4  
 16 line LCD CTRL-ALT-L 25 x 80 color CTRL-ALT-8

**JUMPERS**

Up to 64K of BIOS may be installed in ROM positions U-103 and U-104. Depending upon the capacity of the ROM IC's, jumpers W4, W5, W6, and W7 will be configured differently to ensure correct addressing. Unless you are swapping ROM's, don't worry about this (refer to following table).

**Individual ROM Capacity**  
 8K x 8 bit (2764)  
 16K x 8 bit (27128)  
 32K x 8 bit (27256)

**Installed Jumpers**  
 W6 and W7 (A13 and A14 tied HIGH)  
 W4 and W6 (A13 connected and A14 tied HIGH)  
 W4 and W5 (A13 and A14 connected)

**SPECIAL TOOLS**

To perform the serial port test, a special wrap plug is required. It can be manufactured locally as follows: obtain a female DB-25J connector (OR999374) and backshell (YY012715). Wire pins: 2-3, 4-5-22, and 6-8-20.

**INSTALLATION**

When installing this board, be careful of the RAM. You must configure the new board the same as the customer's original board. If it is necessary to swap RAM IC's from the customer's board, then you must also swap the PAL in location U-115 (RAM address decoder) and set the configuration switches for the total amount of RAM installed (see the following table).

MEMORY	PAL	S3	S4
2 rows of 64K IC's	1B001-002-00A	OFF	ON
1 row of 256K IC's	1B001-003-00A	ON	OFF
2 rows of 256K IC's	1B001-004-00A	OFF	OFF

Options which may also need to be transferred from the customer's original board are:

- An 8087 numeric co-processor. It is installed in location U-87 and must have switch position 2 turned OFF if installed.
- A synchronous/asynchronous serial port. It is installed in location U-59 and must have PAL 1B301-001A removed from location U-150 and replaced with PAL 1B301-002A.

**NOTE**

Since the synchronous/asynchronous option is rarely installed, Visual produced many boards without connector J-11. This is normal. If your customer has this option and you receive a board without J-11, contact Logistics. Otherwise, install the boards without J-11.

**SOFTWARE**

Visual Commuter (MS-) DOS: the customer has this. It contains diagnostics for the floppy drives and LCD display. (All other diagnostics are in the BIOS ROM's.)

PC-77 and PC-777 appear to work well on the Commuter. (As with all clones, PC-777 is not 100% compatible.)

**ASSOCIATED PART NUMBERS**

**IC's:**

765	_____	8259	YY003625	PAL 1B001-003-00A	VT000231
6500/41	_____	8284	YY004177	PAL 1B001-004-00A	VT000232
6845	YY010678	8288	YY010973	PAL 1B301-001	_____
8088/10	YY010676	8530	_____	PAL 1B301-002	_____
8087	YY012525	ROM 246-001	_____	4164	YY012064
8237	YY010677	ROM 246-002	YY015756	41256	YY014874
8253	YY012762	ROM 246-003	YY015757		
8255	YY002521	PAL 1B001-002-00A	VT000230		

# Tech Talk

## VISUAL TECHNOLOGY Commuter

### Micro Products

October 20, 1986

Category D. Hardware

#### D1 MEMORY CONFIGURATIONS (Revised 10/06/86)

MEMORY SIZE	D-RAM	IC's	PAL PART NO. (U-115)	SWITCHBACK		SORBUS PART NO.
				S3	S4	
128K	64K	(two rows)	1B001-002-00A	OFF	ON	VT000230
256K	256K	(one row)	1B001-003-00A	ON	OFF	VT000231
512K	256K	(two rows)	1B001-004-00A	OFF	OFF	VT000232

There are only two rows of RAM sockets in this machine. If only one row is used, as in the 256K configuration, use the row away from the front (U-133 through U-141). Be sure the PAL and switch settings are correct for your specific configuration.

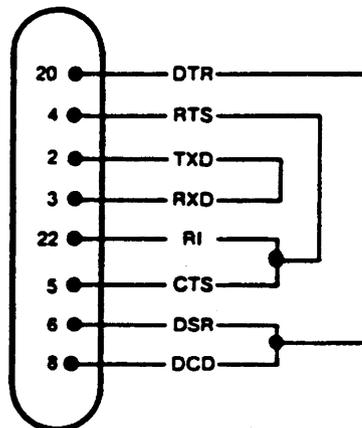
#### NOTE

These parts are for REPLACEMENT ONLY. Upgrades are sold by Visual Technology customer service.

Originator: Bob Appel, 12/03/84

#### D2 COMMUNICATION TEST WRAPAROUND PLUG

There is a special wraparound plug required for performing the ROM-based communication port test with external wraparound. This wraparound plug is manufactured locally. The plug, a female DB-25 connector (PN OR999374) and backshell (PN YY12715) is available through the stock system. Wire the plug as shown below.



EXTERNAL WRAPAROUND PLUG WIRING DIAGRAM

Originator: Bob Appel, 12/04/84

#### D3 SYSTEM BOARD CONFIGURATION/SWITCH SETTINGS

There is one 8-position switch pack on the system PCB. It controls the configuration of the number of floppy drives, type of display, amount of memory, and installation of math coprocessor.

POSITION	FUNCTION
1	Always OFF
2	Math coprocessor: OFF — INSTALLED ON — NOT installed

CONTINUED —

3, 4	Memory:	AMOUNT	3	4
		64K	ON	ON
		128K	OFF	ON
		256K	ON	OFF
		512K	OFF	OFF
5, 6	Display:	TYPE	5	6
		16x80 LCD	ON	ON
		25x80 LCD	ON	ON
		25x40 COLOR	OFF	ON
		25x80 COLOR /	ON	OFF
		IBM MONOCHROME	OFF	OFF
7, 8	Drives:	NUMBER OF	7	8
		1	ON	ON
		2	OFF	ON

**NOTE**

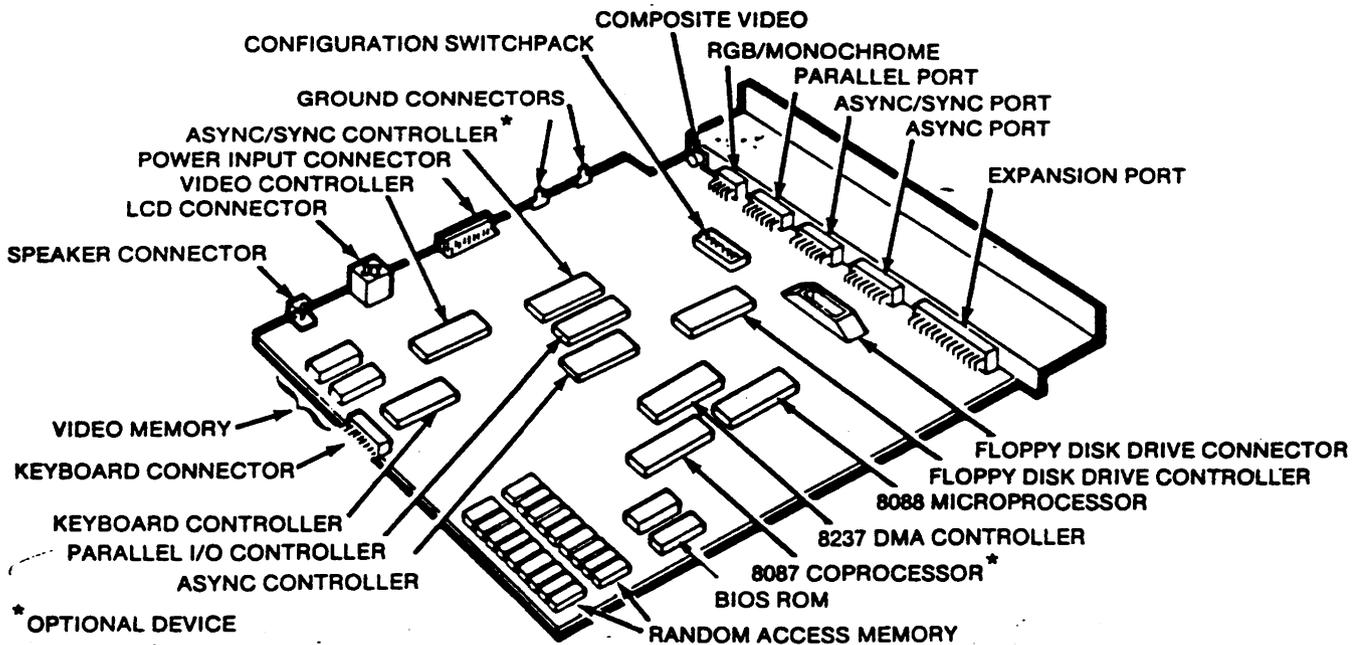
Switch positions 5 and 6 (display type) can be temporarily overridden by entering the key sequences below. The display type will revert back to the default (switch setting) whenever there is a cold or warm boot.

DISPLAY	SEQUENCE
16x80 LCD	Hold CTRL and ALT and press L
25x80 LCD	Hold CTRL and ALT and press 8
25x40 COLOR	Hold CTRL and ALT and press 4
25x80 COLOR	Hold CTRL and ALT and press 8
IBM MONOCHROME	Hold CTRL and ALT and press M

Originator: Bob Appel 12/04/84

**D4 SYSTEM PCB COMPONENT LAYOUT**

The figure below gives the general location of major components and connections on the COMMUTER system board.



Originator: Bob Appel 12/04/84

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AT&T  
6300

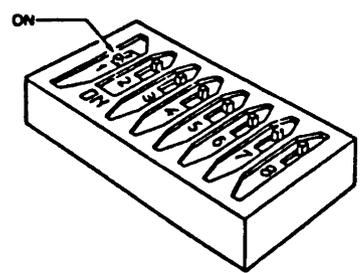
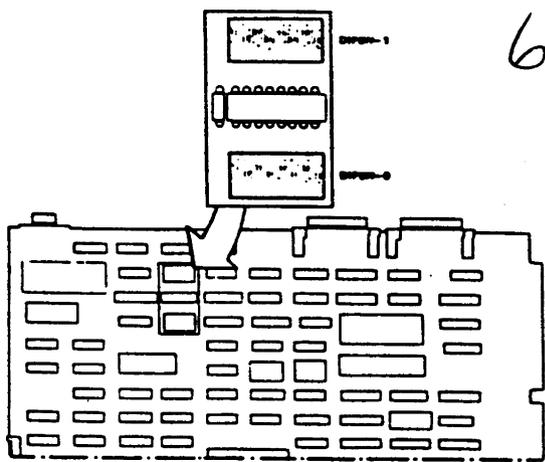
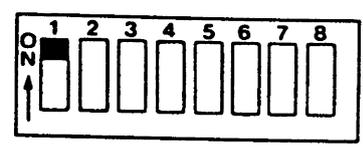


Figure 2-46. Motherboard DIP Switches

Switch DIPSW-0



Position	Function
1-3	System memory
4	64Kx1 or 256Kx1 DRAMs on Motherboard (select)
5	Numeric Data Processor, Intel 8087
6	Serial Communication Controller, RS232
7	Not Used
8	Read-only memory, 4Kx8 or 8Kx8 ROM, PROMs

System Memory

System Memory	SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	Location
128K	0	1	1	1	1	1	1	1	128K - Motherboard
256K	1	0	1	1	1	1	1	1	256K - Motherboard
512K	0	0	1	1	1	1	1	1	512K - Expansion Board - 128K - Motherboard
1MB	1	1	0	1	1	1	1	1	1MB - Expansion Board - 512K - Motherboard
2MB	0	1	0	1	1	1	1	1	2MB - Motherboard - 512K - Expansion Board
4MB	1	1	1	0	1	1	1	1	4MB - Motherboard Banks
8MB	0	1	1	0	1	1	1	1	8MB - Motherboard BANKS - 128K - Motherboard BANK1
16MB	0	1	0	0	1	1	1	1	16MB - Motherboard BANKS - 512K - Motherboard BANK1

Motherboard

Numeric Data Processor, Intel 8087

SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	Function
x	x	x	x	1	x	x	x	8087 not installed
x	x	x	x	0	x	x	x	8087 installed

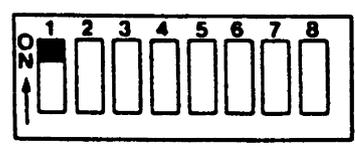
Serial Communication Controller, RS232

SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	Function
x	x	x	x	x	1	x	x	RS232 installed
x	x	x	x	x	0	x	x	Z8530 installed

Read-Only Memory, 1Kx8 or 8Kx8 ROM/EPROMs

SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	Function
x	x	x	x	x	x	x	1	1Kx8 PROMs installed
x	x	x	x	x	x	x	0	8Kx8 PROMs installed

Switch DIPSW-1



Position	Function
1	MFD(s), 96 TPI or 48 TPI
2	Start-up Speed for MFD(s)
3-4	Hard Disk Unit (HDU) Type
5-6	Display type
7-8	Number of MFDs

Motherboard

MFD(s), 96 TPI or 48 TPI

SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	Function
0	x	x	x	x	x	x	x	96 TPI MFD(s) installed
1	x	x	x	x	x	x	x	48 TPI MFD(s) installed

Start-up Speed for MFD(s)

SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	Function
x	1	x	x	x	x	x	x	Slow Start-up, 200 ms
x	0	x	x	x	x	x	x	Fast Start-up, 11 ms

Hard Disk Unit (HDU) Type

SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	Function
x	x	0	x	x	x	x	x	1" or external hard disk mode
x	x	1	x	x	x	x	x	1" or internal hard disk mode
x	x	x	1	x	x	x	x	Reserved for future use

Display Type

SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	Function
x	x	x	1	1	1	1	1	Reserved for future use
x	x	x	0	0	0	0	0	Monochrome Display
x	x	x	0	1	1	1	1	80 x 25 Line - Setting with Display Controller Board Shades of Green - Color
x	x	x	1	0	1	1	1	80 x 25 Line - Setting with Display Controller Board Shades of Green - Color

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Number of MFDs

SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	Function
x	x	x	x	x	x	1	1	1 MFD
x	x	x	x	x	x	0	1	2 MFDs
x	x	x	x	x	x	1	0	3 MFDs
x	x	x	x	x	x	0	0	4 MFDs

Introduction

The Memory Expansion Board (Figure 4-1) read/write memory is divided into three banks: BANK0, BANK1, and BANK2. Each bank has a low-byte bank and a high-byte bank (Figure 4-2). In its minimum configuration, the Memory Expansion Board has one bank equipped with 64K-bit RAMs to provide 128K x 9 of read/write memory. The second and third memory banks may also be equipped with 64K-Bit RAMs to provide 256K x 9 of read/write memory or a total of 384K x 9 of read/write memory.

In addition to the memory banks, the Memory Expansion Board provides bus buffering, memory control logic, address multiplexing and parity generation and checking.

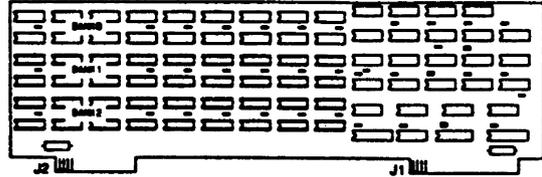


Figure 4-1. Memory Expansion Board

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4-2

Power Supply

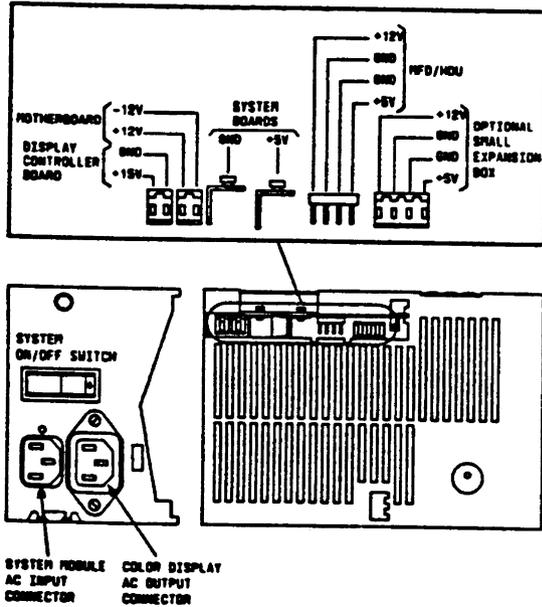


Figure 8-1. Power Supply Connectors

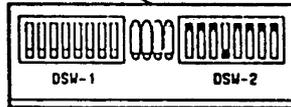
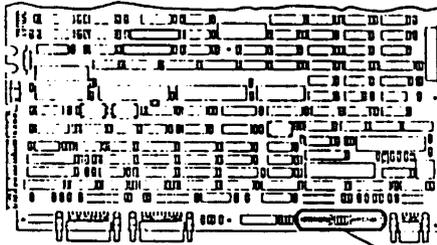
1-215

# 6300+

## Setting System DIP Switches

The AT&T Personal Computer 6300 PLUS has two DIP switches located on the Motherboard in the main unit. These two DIP switches are called DSW-1 and DSW-2.

To expose these DIP switches, you must remove the lower cover of the main unit (see the appendix "Removing the Main Unit Covers").



DSW-1 Settings								
SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	FUNCTION
OFF	X	X	X	X	X	X	X	96 TPI MFDS installed (Drive B)
ON	X	X	X	X	X	X	X	18 TPI MFDS installed (Drive B)
X	OFF	X	X	X	X	X	X	96 TPI MFDS installed (Drive A)
X	ON	X	X	X	X	X	X	18 TPI MFDS installed (Drive A)
X	X	OFF	OFF	X	X	X	X	In combination with switches on the HDC determines the HDD type
X	X	X	X	ON	OFF	X	X	AT&T Color or Monochrome Display 80 x 25 Line - Setting with Display Controller Board (standard)
X	X	X	X	OFF	ON	X	X	80 x 25 Line - Setting with display Controller Board
X	X	X	X	OFF	OFF	X	X	IBM Monochrome Display
X	X	X	X	ON	ON	X	X	Reserved for future use
X	X	X	X	X	X	ON	ON	1 MFD
X	X	X	X	X	X	OFF	ON	2 MFDs
X	X	X	X	X	X	ON	OFF	3 MFDs

### DSW-2 Settings

Switches SW1 through SW4 of DSW-2 are used to define the total amount of memory present on the Motherboard and the type of memory chips used. The remaining switches are used as follows:

- SW5—Reflects the presence of 80287 Numeric Processor Extension.
- SW6—Reserved. Leave on.
- SW7—Denotes whether the Hard Disk Controller (HDC) BIOS software to be used is on the Motherboard or on the HDC Board.
- SW8—Defines type of PROM chip used (27128 or 27256).

The various settings for DSW-2 are shown on the next page.

DSW-2 Settings								
SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	FUNCTION
OFF	ON	ON	ON	X	X	X	X	128 KB memory Bank 1 64 Kbit
ON	OFF	ON	ON	X	X	X	X	256 KB memory Bank 1 64 Kbit Bank 2 64 Kbit
ON	ON	OFF	ON	X	X	X	X	256 KB memory Bank 1 64 Kbit Bank 2 64 Kbit
ON	ON	ON	OFF	X	X	X	X	512 KB memory Bank 1 256 Kbit
OFF	ON	ON	OFF	X	X	X	X	640 KB memory Bank 1 64 Kbit Bank 2 256 Kbit
ON	ON	OFF	OFF	X	X	X	X	640 KB memory Bank 1 256 Kbit Bank 2 64 Kbit
ON	OFF	ON	OFF	X	X	X	X	640 KB memory Bank 1 256 Kbit Bank 2 64 Kbit
OFF	OFF	ON	OFF	X	X	X	X	1 MB memory Bank 1 256 Kbit Bank 2 256 Kbit
X	X	X	X	ON	X	X	X	80287 installed
X	X	X	X	OFF	X	X	X	80287 not installed
X	X	X	X	X	X	ON	X	HDC BIOS ROM on Motherboard being used (standard)
X	X	X	X	X	X	OFF	X	HDC BIOS ROM on HDC board being used
X	X	X	X	X	X	X	ON	27128 EPROMS installed 64 Kbit total (standard)
X	X	X	X	X	X	X	OFF	27256 EPROMS installed 256 Kbit total
X	X	X	X	X	ON	X	X	Reserved - leave in OFF position

1-215.1

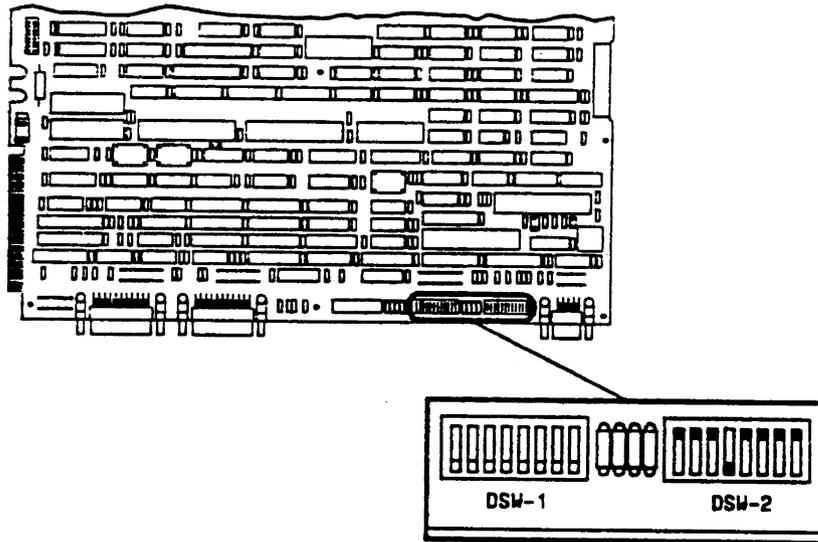
1-215.2

## Setting System DIP Switches

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The AT&T Personal Computer 6300 PLUS has two DIP switches located on the Motherboard in the main unit. These two DIP switches are called DSW-1 and DSW-2.

To expose these DIP switches, you must remove the lower cover of the main unit (see the appendix "Removing the Main Unit Covers").



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## Appendix D

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### DSW-1 Settings

Switches SW1 through SW8 of DSW-1 are used to reflect options associated with the mini-floppy disk (MFD) drives, hard disk unit (HDU), and the display. The various switch settings for DSW-1 are shown on the next page.

The 360-KB diskette drives have 48 tracks per inch (TPI) and the 1.2-MB diskette drives have 96 TPI.

If your PC 6300 PLUS doesn't have a hard disk, SW4 and SW5 are "don't cares." A don't care condition is shown as "X."

Appendix D

DSW-1 Settings								
SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	FUNCTION
OFF	X	X	X	X	X	X	X	96-TPI MFD(s) installed (Drive B)
ON	X	X	X	X	X	X	X	48-TPI MFD(s) installed (Drive B)
X	OFF	X	X	X	X	X	X	96-TPI MFD(s) installed (Drive A)
X	ON	X	X	X	X	X	X	48-TPI MFD(s) installed (Drive A)
X	X	OFF	OFF	X	X	X	X	In combination with switches on the HDC determines the HDU type.
X	X	X	X	ON	OFF	X	X	AT&T Color or Monochrome Display 80 x 25 Line—Setting with Display Controller Board (standard)
X	X	X	X	OFF	ON	X	X	40 x 25 Line—Setting with display Controller Board
X	X	X	X	OFF	OFF	X	X	IBM Monochrome Display
X	X	X	X	ON	ON	X	X	Reserved for future use
X	X	X	X	X	X	ON	ON	1 MFD
X	X	X	X	X	X	OFF	ON	2 MFDs
X	X	X	X	X	X	ON	OFF	3 MFDs

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## Appendix D

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### DSW-2 Settings

Switches SW1 through SW4 of DSW-2 are used to define the total amount of memory present on the Motherboard and the type of memory chips used. The remaining switches are used as follows:

- SW5—Reflects the presence of 80287 Numeric Processor Extension.
- SW6—Reserved. Leave on.
- SW7—Denotes whether the Hard Disk Controller (HDC) BIOS software to be used is on the Motherboard or on the HDC Board.
- SW8—Defines type of PROM chip used (27128 or 27256).

The various settings for DSW-2 are shown on the next page.

Appendix D

DSW-2 Settings								
SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	FUNCTION
OFF	ON	ON	ON	X	X	X	X	128 KB—memory Bank 1—64 Kbit
ON	OFF	ON	ON	X	X	X	X	256 KB—memory Bank 1—64 Kbit Bank 2—64 Kbit
ON	ON	OFF	ON	X	X	X	X	256 KB—memory Bank 1—64 Kbit Bank 2—64 Kbit
ON	ON	ON	OFF	X	X	X	X	512 KB—memory Bank 1—256 Kbit
OFF	ON	ON	OFF	X	X	X	X	640 KB—memory Bank 1—64 Kbit Bank 2—256 Kbit
ON	ON	OFF	OFF	X	X	X	X	640 KB—memory Bank 1—256 Kbit Bank 2—64 Kbit
ON	OFF	ON	OFF	X	X	X	X	640 KB—memory Bank 1—256 Kbit Bank 2—64 Kbit
OFF	OFF	ON	OFF	X	X	X	X	1 MB—memory Bank 1—256 Kbit Bank 2—256 Kbit
X	X	X	X	ON	X	X	X	80287 installed
X	X	X	X	OFF	X	X	X	80287 not installed
X	X	X	X	X	X	ON	X	HDC BIOS ROM on Motherboard being used (standard)
X	X	X	X	X	X	OFF	X	HDC BIOS ROM on HDC board being used
X	X	X	X	X	X	X	ON	27256 ROMS installed 64-KB total (standard)
X	X	X	X	X	X	X	OFF	27128 ROMS installed 32-KB total
X	X	X	X	X	ON	X	X	Reserved—leave in ON position

1-220



1-221

286/386

DRIVE TYPE

LISTING



**IBM  
DRIVE TYPES**

<u>TYPE</u>	<u>CYL</u>	<u>HDS</u>	<u>PRECOMP</u>	<u>CAPACITY</u>
1	306	4	128	10MB
2	615	4	300	20MB
3	615	6	300	30MB
4	940	8	512	62MB
5	940	6	512	46MB
6	615	4	NONE	20MB
7	462	8	256	30MB
8	733	5	NONE	30MB
9	900	15	NONE	112MB
10	820	3	NONE	20MB
11	855	5	NONE	35MB
12	855	7	NONE	49MB
13	306	8	128	20MB
14	733	7	NONE	42MB
15	1024	15	NONE	127MB
16	612	4	NONE	20MB
17	977	5	300	40MB
18	977	7	NONE	56MB
19	1024	7	512	59MB
20	733	5	300	30MB
21	733	7	300	42MB
22	733	5	300	30MB
23	306	4	0	10MB
24	612	4	300	20MB
25	306	4	NONE	10MB
26	612	4	NONE	20MB
27	698	7	300	42MB
28	976	5	488	42MB
29	306	4	0	10MB
30	612	4	306	20MB
31	732	7	300	44MB
32	1023	5	NONE	44MB

The IBM PC/AT supports Drive types 1 through 23. Drive types 16 through 23 are only available if the system board has new BIOS ROMS, dated 06/15/85. This can be determined with PC-777 Diagnostics.

Setup for IBM AT Diagnostics Ver 2.03 or higher supports drive types 1-23.

The IBM PS/2 Model 30 supports drive types 1 through 26 while Models 50,60, and 80 of the PS/2 support drive types 1 through 32.

Drive types 33 through 47 are reserved.

**KAYPRO 286I  
DRIVE TYPES**

<u>TYPE</u>	<u>CYL</u>	<u>HDS</u>	<u>PRECOMP</u>	<u>CAPACITY</u>
1	306	4	128	10MB
2	615	4	300	20MB
3	615	6	NONE	30MB
4	940	8	512	62MB
5	940	6	512	46MB
6	615	4	NONE	20MB
7	462	8	256	30MB
8	733	5	NONE	30MB
9	900	15	NONE	112MB
10	820	3	NONE	20MB
11	855	5	NONE	35MB
12	855	7	NONE	49MB
13	306	8	128	20MB
14	733	7	NONE	42MB
15	1024	15	NONE	127MB
16	612	4	0	20MB
17	977	5	300	40MB
18	977	7	NONE	56MB
19	1024	7	512	59MB
20	733	5	300	30MB
21	733	7	300	42MB
22	733	5	300	30MB
23	306	4	0	10MB
24	1024	13	NONE	110MB
25	615	4	0	20MB
26	1024	4	NONE	34MB
27	1024	5	NONE	42MB
28	1024	8	NONE	68MB
29	512	8	256	34MB
30	615	2	NONE	10MB
31	989	5	0	41MB
32	1024	15	NONE	127MB
33	987	5	NONE	40MB
34	987	7	NONE	57MB
35	1024	9	NONE	76MB
36	1024	5	512	42MB
37	830	10	NONE	68MB
38	823	10	256	68MB
39	615	4	128	20MB
40	615	8	128	40MB
41	917	15	NONE	114MB
42	1023	15	NONE	127MB
43	823	10	512	68MB
44	820	6	NONE	40MB
45	1024	8	NONE	68MB
46	925	9	NONE	69MB
47	699	7	256	40MB

COMPAQ  
DRIVE TYPES

<u>TYPE</u>	<u>CYL</u>	<u>HDS</u>	<u>PRECOMP</u>	<u>CAPACITY</u>
1	306	4	128	10MB
2	615	4	300	20MB
3	615	6	NONE	30MB
4	1024	8	512	71MB
5	940	6	512	46MB
6	697	5	128	30MB
7	462	8	256	30MB
8	925	5	128	40MB
9	900	15	NONE	112MB
10	980	5	NONE	42MB
11	925	7	128	56MB
12	925	9	128	72MB
13	612	8	256	42MB
14	980	4	128	34MB
15	---	--	---	----
16	612	4	0	20MB
17	977	5	300	40MB
18	966	6	128	50MB
19	1023	8	NONE	71MB
20	733	5	300	30MB
21	733	7	300	42MB
22	805	6	NONE	42MB
23	924	8	NONE	64MB
24	966	14	NONE	117MB
25	966	16	NONE	134MB
26	1023	14	NONE	124MB
27	966	10	NONE	84MB
28	748	16	NONE	104MB
29*	805	6	NONE	64MB
30*	615	4	128	31MB
31*	615	8	128	62MB
32*	905	9	128	104MB
33+	748	7	NONE	104MB
34+	966	7	NONE	117MB
35+	966	8	NONE	134MB
36+	966	9	NONE	151MB
37+	966	5	NONE	84MB
38@	611	16	NONE	315MB
39+	1023	11	NONE	190MB
40+	1023	15	NONE	267MB
41+	1023	15	NONE	259MB
42@	1023	16	NONE	527MB
43*	805	4	NONE	42MB
44*	805	2	NONE	21MB
45+	748	8	NONE	101MB
46+	748	6	NONE	75MB
47*	966	5	128	61MB

\* = 25 SECTORS PER TRACK, RLL  
 + = 34 SECTORS PER TRACK, ESDI  
 @ = 63 SECTORS PER TRACK, ESDI

**PACKARD BELL VT286  
DRIVE TYPES**

<u>TYPE</u>	<u>CYL</u>	<u>HDS</u>	<u>PRECOMP</u>	<u>CAPACITY</u>
1	306	4	128	10MB
2	615	4	300	20MB
3	615	6	NONE	30MB
4	940	8	512	62MB
5	940	6	512	46MB
6	615	4	NONE	20MB
7	462	8	256	30MB
8	733	5	NONE	30MB
9	900	15	NONE	112MB
10	820	3	NONE	20MB
11	855	5	NONE	36MB
12	855	7	NONE	51MB
13	306	8	128	21MB
14	733	7	NONE	44MB
15	----	--	----	----
16	612	4	0	20MB
17	977	5	300	40MB
18	977	7	NONE	56MB
19	1024	7	512	59MB
20	733	5	300	30MB
21	733	7	300	42MB
22	733	5	300	30MB
23	306	4	0	10MB
24	----	--	----	----
25	615	4	0	20MB
26	1024	4	NONE	34MB
27	1024	5	NONE	42MB
28	1024	8	NONE	68MB
29	512	8	256	34MB
30	----	--	----	----
31	----	--	----	----
32	----	--	----	----
33	----	--	----	----
34	----	--	----	----
35	1024	9	1024	78MB
36	1024	5	512	43MB
37	830	10	NONE	70MB
38	823	10	256	68MB
39	615	4	128	20MB
40	615	8	128	40MB
41	917	15	NONE	114MB
42	1023	15	NONE	127MB
43	823	10	512	68MB
44	820	6	NONE	40MB
45	1024	8	NONE	68MB
46	925	9	NONE	69MB
47	699	7	256	40MB

**PACKARD BELL PB286  
DRIVE TYPES**

<u>TYPE</u>	<u>CYL</u>	<u>HDS</u>	<u>PRECOMP</u>	<u>CAPACITY</u>
1	306	4	128	10MB
2	615	4	300	20MB
3	615	6	NONE	30MB
4	940	8	512	62MB
5	940	6	512	46MB
6	615	4	NONE	20MB
7	462	8	256	30MB
8	733	5	NONE	30MB
9	900	15	NONE	112MB
10	820	3	NONE	20MB
11	977	5	NONE	40MB
12	1024	9	NONE	76MB
13	1024	8	512	68MB
14	1024	5	512	42MB
15	----	--	----	----
16	612	4	0	20MB
17	977	5	300	40MB
18	977	7	NONE	56MB
19	1024	7	512	59MB
20	733	5	300	30MB
21	733	7	300	42MB
22	733	5	300	30MB
23	306	4	0	10MB
24	615	6	300	30MB
25	615	4	0	20MB
26	1024	4	NONE	34MB
27	1024	5	NONE	42MB
28	1024	8	NONE	68MB
29	512	8	256	34MB
30	1024	3	0	25MB
31	809	6	300	41MB
32	----	--	----	----
33	----	--	----	----
34	----	--	----	----
35	855	7	NONE	49MB
36	733	7	NONE	42MB
37	830	10	NONE	68MB
38	823	10	256	68MB
39	615	4	128	20MB
40	615	8	128	40MB
41	917	15	NONE	114MB
42	1023	15	NONE	127MB
43	823	10	512	68MB
44	820	3	NONE	20MB
45	1024	8	NONE	68MB
46	925	9	NONE	69MB
47	699	7	256	40MB



**AST PREMIUM 286  
DRIVE TYPES**

<u>TYPE</u>	<u>CYL</u>	<u>HDS</u>	<u>PRECOMP</u>	<u>CAPACITY</u>
1	306	4	128	10MB
2	615	4	300	20MB
3	615	6	NONE	30MB
4	940	8	512	62MB
5	940	6	512	46MB
6	615	4	NONE	20MB
7	462	8	256	30MB
8	733	5	NONE	30MB
9	900	15	NONE	112MB
10	1023	10	0	89MB
11	968	14	0	118MB
12	1023	14	NONE	124MB
13	968	16	0	151MB
14	733	7	NONE	42MB
15	---	--	----	----
16	612	4	0	20MB
17	977	5	300	40MB
18	1223	14	NONE	149MB
19	1024	7	512	59MB
20	733	5	300	30MB
21	733	7	300	42MB
22	782	4	NONE	43MB
23	805	4	NONE	43MB
24	1053	3	NONE	45MB
25	1053	7	NONE	105MB
26	968	7	0	118MB
27	1023	7	NONE	124MB
28	1223	7	NONE	149MB
29	1223	11	NONE	234MB
30	1223	13	NONE	276MB
31	989	5	0	41MB
32	968	9	0	151MB
33	1023	5	0	89MB
34	1223	15	NONE	317MB
35	1024	9	NONE	76MB
36	745	4	NONE	42MB
37	830	10	NONE	68MB
38	823	10	256	68MB
39	1631	15	NONE	576MB
40	615	8	128	40MB
41	917	15	NONE	114MB
42	1023	15	NONE	127MB
43	776	8	NONE	104MB
44	820	6	NONE	40MB
45	1024	8	NONE	68MB
46	925	9	NONE	69MB
47	1024	5	NONE	44MB

ZENITH  
DRIVE TYPES

<u>TYPE</u>	<u>CYL</u>	<u>HDS</u>	<u>PRECOMP</u>	<u>CAPACITY</u>
1	306	4	128	10MB
2	615	4	300	20MB
3	699	5	256	30MB
4	940	8	512	62MB
5	940	6	512	46MB
6	615	4	NONE	20MB
7	699	7	256	42MB
8	733	5	NONE	30MB
9	900	15	NONE	112MB
10	925	5	0	40MB
11	855	5	NONE	37MB
12	855	7	NONE	52MB
13	306	8	128	20MB
14	733	7	NONE	42MB
15	612	4	0	21MB
16	977	5	300	40MB
17	977	7	NONE	56MB
18	1024	7	512	59MB
19	733	5	300	30MB
20	733	7	300	42MB
21	733	5	300	30MB
22	306	4	0	10MB
23	612	2	NONE	10MB
24	615	6	300	32MB
25	462	8	256	32MB
26	820	3	NONE	21MB
27	981	7	NONE	59MB
28	754	11	NONE	72MB
29	918	15	NONE	119MB
30	987	5	NONE	42MB
31	830	6	400	43MB
32	697	4	0	24MB
33	615	4	NONE	21MB
34	615	4	128	21MB
35	1024	9	NONE	80MB
36	1024	5	512	44MB
37	820	6	NONE	42MB
38	615	4	306	21MB

CITIZEN MATE/12  
DRIVE TYPES

<u>TYPE</u>	<u>CYL</u>	<u>HDS</u>	<u>PRECOMP</u>	<u>CAPACITY</u>
1	306	4	128	10MB
2	615	4	300	20MB
3	615	6	NONE	30MB
4	940	8	512	62MB
5	940	6	512	46MB
6	615	4	NONE	20MB
7	462	8	256	30MB
8	733	5	NONE	30MB
9	900	15	NONE	112MB
10	820	3	NONE	20MB
11	855	5	NONE	36MB
12	855	7	NONE	51MB
13	306	8	128	21MB
14	733	7	NONE	44MB
15	----	--	----	----
16	612	4	0	20MB
17	977	5	300	40MB
18	977	7	NONE	56MB
19	1024	7	512	59MB
20	733	5	300	30MB
21	733	7	300	42MB
22	733	5	300	30MB
23	306	4	0	10MB
24	----	--	----	----
25	615	4	0	20MB
26	1024	4	NONE	34MB
27	1024	5	NONE	42MB
28	1024	8	NONE	68MB
29	512	8	256	34MB
30	615	2	615	10MB
31	989	5	0	42MB
32	1020	15	NONE	127MB
33	----	--	----	----
34	----	--	----	----
35	1024	9	1024	78MB
36	1024	5	512	43MB
37	830	10	NONE	70MB
38	823	10	256	68MB
39	615	4	128	20MB
40	615	8	128	40MB
41	917	15	NONE	114MB
42	1023	15	NONE	127MB
43	823	10	512	68MB
44	820	6	NONE	40MB
45	1024	8	NONE	68MB
46	925	9	NONE	69MB
47	699	7	256	40MB

February 27, 1987

Technical Bulletin

To: All Micro F.E.'s  
From: Glenn Rhodes  
Subj. Hard Drives

Sometimes you may receive a Hard drive from Sorbus West that is not the same type as the original one in the customer's machine, or you may be installing a new hard drive and you can not get it to work.

To properly test for the correct jumper settings on the address header of the hard drives logic board, the following rule of thumb applies.

You can determine which pins need to be jumpered on the IBM XT by taking your Ohm meter and connecting one lead to (Pin #26 on the 34 pin edge connector on the hard drive logic card, this is the Drive Select #1 line) and the other lead should be touched, one at a time to each pin on the address header, also on the hard drive logic card. (note: only one side of the header works of course).

When the Ohm meter shows continuity, that is the correct pin to be jumpered for Drive Select #1. All other pins should show no continuity.

Last but not least, it is important to remember that the IBM AT uses Drive Select #2 for both hard drives, the cable takes care of the addressing for drive D:. NOT LIKE THE IBM PC/XT.

The IBM PC/XT uses Drive Select #1 for both drives.  
The following standard edge connectors are for all Hard Drives

34 PIN CONNECTOR

PIN #26 - DRIVE SELECT #1  
PIN #28 - DRIVE SELECT #2  
PIN #30 - DRIVE SELECT #3  
PIN #32 - DRIVE SELECT #4

NOTE: This is why some drives come from stock for AT's that do not work, because many times they were tested out at the factory set up using Drive Select #1, and the AT cables use #2.

grr/GRR

2-11

2-11

2-12

TECH ALERT

PROBLEM: IBM 20MB OR GREATER HARD DRIVES GIVE ERROR "BAD TRACK ZERO" WHEN DOING DOS VERSION 2.1 FORMAT ROUTINE.

NOTE: THE LOW LEVEL FORMAT RUNS FINE.

SOLUTION: THE PROBLEM IS THAT THERE IS A BUG IN THE IBM DOS VERSION 2.1. IF THERE ARE ANY BAD TRACKS FLAGGED ABOVE 15MB THE DOS FORMAT PROGRAM GENERATES THE CYLINDER FLAGGED AS A NEGATIVE NUMBER, AND CONVERTS IT TO TRACK ZERO.

TO CORRECT THIS PROBLEM, PERFORM A DEBUG OPERATION ON FORMAT.COM, WE HAVE IN THE FOLLOWING EXAMPLE CREATED A NEW FORMAT PROGRAM, CALLED FMTPLUS.COM IN ADDITON TO THE ORIGINAL FORMAT.COM THIS IS SO NOT TO VIOLATE ANY MODIFICATION LAWS TO IBM SOFTWARE.

NOTE: THIS SHOULD BE DONE TO DOS VERSION 2.0 OR 2.1 NOT 3.1.

-----  
TYPE DEBUG FORMAT.COM

-E 2DA (RETURN)

0F7D:02DA 7D.73 (TYPE 73 AND PRESS RETURN)

-E 323 (RETURN)

0F7D:0323 7F.73 (TYPE 73 AND PRESS RETURN)

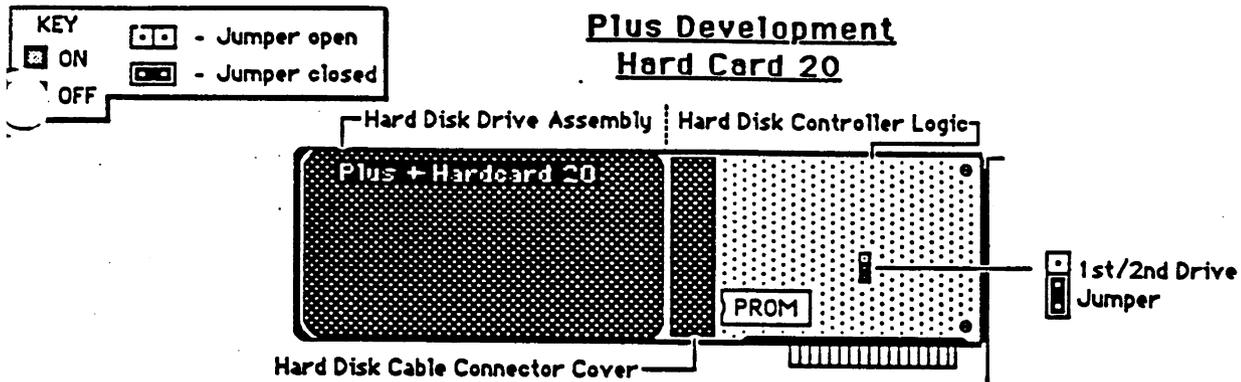
-N FMTPLUS.COM (THIS IS OPTIONAL IF YOU WANT TO CREATE A NEW FILE CALLED FMTPLUS.COM IN ADDITON TO THE OLD FORMAT.COM PROGRAM. REMEMBER TO PRESS RETURN.)

W (PRESS RETURN) THIS WRITES THE FILE TO DISK

Q (PRESS RETURN) THIS QUILTS THE DEBUG  
-----

FORMAT Routine  
up Date x





The Plus Development Hardcard 20 is a hard disk and controller for IBM PC, XT, AT and compatible computers. It uses Interrupt Request Level 5, and DMA Channel 3.

As the first drive ( Drive C: )

Uses Base ROM Address C8000, and Port Address 320-323 Hex.

As the second drive ( Drive D: )

Uses Base ROM Address CA000, and Port Address 324-327 Hex.

Note that the IBM 3270 Emulation Adapter (Short Board) Base ROM Address is CA000 ( Hardware conflict if Drive D: ). However, some IBM 3270 Workstation Programs can access the 3270 ROM slightly differently, and work properly.

The old Plus Hardcard 20 boards have a serial number beginning with "CB", written on the outside of the slot cover. It is only these Hardcards that may need the new ROM BIOS. The other Hardcards should have the new ROM BIOS already installed.

The BIOS PROM will not need to be upgraded if the Hardcard 20 is being installed in an IBM PC or XT-type (8088/8086 based) computer using IBM Dos 3.2 or lower - or - Compaq MS-Dos 3.1 or lower. The new BIOS ROM will be marked "4.2" or "4.6". It should be installed in:

- 1) IBM PC or XT-type (8088/8086 based) computers using IBM Dos 3.3 or higher - or - Compaq MS-Dos 3.2 or higher.
- 2) IBM AT, IBM XT/286, Compaq Portable II, or Compaq Deskpro 286-type (80286 based) computers.
- 3) IBM PS/2 Model 30 using IBM Dos 3.3 or higher.

The Hardcard 20 is hardware compatible with the IBM PC XT's hard disk controller; it is not hardware compatible with the IBM AT hard disk controller. Therefore, any 286/AT software that bypasses the BIOS will not work on the upgraded Hardcard 20. This includes non-Dos operating systems such as Xenix.

The Hardcard 20 has built-in procedures in the BIOS to protect it from having a low-level format run on it. The low-level format and bad-track table are preset at the factory and should not be changed.

The Hardcard 20 runs at an interleave of 3. It can be changed with the Debug program by entering the command "g=C800:5", or if it is the 2nd drive, "g=CA00:5".

Some versions of DOS, when run on the IBM PC AT, require modifying before they can access the Hardcard 20. The "ATPLUS" program will check your DOS operating system files and modify one of them if necessary. The command "ATPLUS C:" will modify operating system files on the boot drive if necessary. If the modification is made, you will be directed to reboot the computer to load the newly modified system.

Loading DOS on the Hardcard 20. The Hardcard 20 is fully compatible with the IBM DOS 2.0 or higher FDISK, SYS, and FORMAT commands. It is possible to either run the regular DOS commands to format the drive, or the Hardcard 20 "INSTALL" command. To use it, type "INSTALL C:", or if it is the 2nd drive, type "INSTALL D:". It will automatically install DOS onto the hard disk ( into the root directory ) and create an automatic menu system with batch files and empty sub-directories. It will also create a "Reinstallation" diskette. This process takes a good deal longer than the regular DOS FDISK and FORMAT commands. It is best to follow the software installation procedures in the "Hardcard 20 Installation and Reference Manual".





# Old Style

## I/O MEGA SWITCH SETTINGS

ADAPTER CARD - SWITCH 2,5 ON REST OFF

DIGITAL BOARD - (BOTTOM LOGIC BOARD ON MASTER DRIVE)

DEFAULT (NORMAL SETTING) 1,5 ON REST OFF

DIAGNOSTICS ( RUNS ONCE ) 3- ON 4- OFF

DIAGNOSTICS ( LOOPING ) 3- ON 4- ON

EMPTY SOCKET SHOULD HAVE PIN#1 JUMPERED

DRIVE INTERFACE BOARD (SMALL CARD ON BACK OF EACH I/O MEGA DRIVE)

IF SINGLE DRIVE OR ON THE LEFT, SWITCHES ARE ALL UP

IF DOUBLE DRIVE OR ON THE RIGHT, 5 ON, REST OFF

Verify that the switch settings are as desired.

### Switch Settings

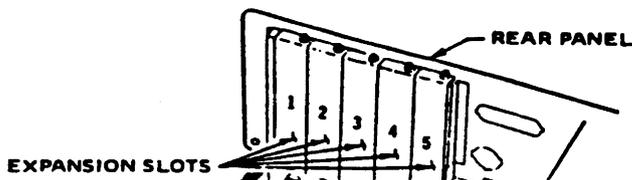
Switch 1, preset to two drives at the factory, controls the number of *Alpha-10™* CDS drives. Switches 2 through 5, which control the I/O port address of the adapter, are preset at the factory to 330 hexadecimal. Another address may be selected if conflicts arise with other adapter boards.

The address range is from 330 to 370 in steps of 8 hex.

Switch	Factory Setting (Two Drives)	Switch Option (One Drive)							
		338	340	348	350	358	360	368	370
1	O (Hexadecimal) 330								
2	C	O	C	O	C	O	C	O	C
3	O	O	C	C	O	O	C	C	O
4	O	O	C	C	C	C	O	O	O
5	C	C	O	O	O	O	O	O	O
6	X	X	X	X	X	X	X	X	X
7	X	X	X	X	X	X	X	X	X
8	X	X	X	X	X	X	X	X	X

O = Open  
C = Closed  
X = Don't Care

- Select one available expansion slot from among the slots in the rear panel for installation of the *Alpha-10™* CDS bus adapter card.



2-18

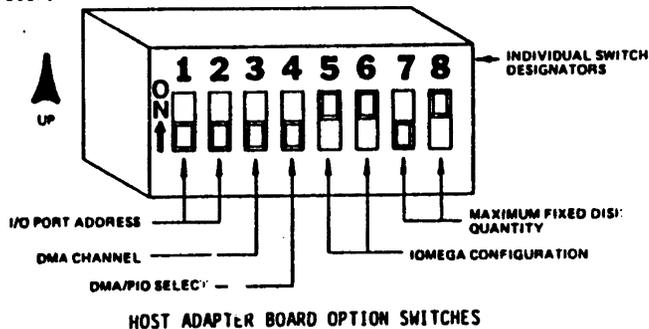
New Style

### CHAPTER 3 BOARD DESCRIPTION

This chapter provides information about the specific switch and jumper settings used on the Host Adapter Board to help optimize the performance of your IOMEGA disk drives, and on the compatibility of the Host Adapter Board with various computer systems. This information is intended for system programmers and experienced computer users and is not necessary for the normal installation or operation of the Host Adapter Board.

#### 3.1 HOST ADAPTER BOARD OPTION SWITCH SETTINGS

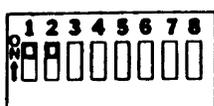
Eight switches are located on the Host Adapter Board to allow you to select the various options and configurations available for your system. Three switches were set at the factory for the most typical application used with your computer.



HOST ADAPTER BOARD OPTION SWITCHES

Switches 1 and 2 define the port addresses.

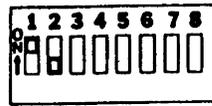
You can select one of four groups of port addresses used by your Host Adapter Board to communicate with IOMEGA subsystems. When selecting a series of port addresses, make certain there is no conflict with other hardware accessing any of the same port addresses.



340 Through 343H



350 Through 353H



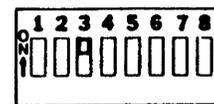
360 Through 363H



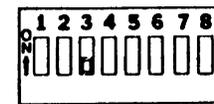
370 Through 373H

Switch 3 selects the Direct Memory Address (DMA).

Your Host Adapter Board uses Switch 3 to select the DMA channel used to communicate with your computer. Only channels 1 or 3 may be selected. Most networking schemes use Channel 1 for communication, so if your computer is part of a network, it is advisable to use Channel 3.



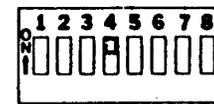
DMA Channel 1



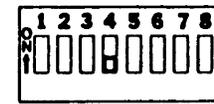
DMA Channel 3

Switch 4 selects DMA or Ported Input/Output (PIO).

Selecting PIO disables DMA communications and results in a decrease in transfer rates. However, PIO prevents problems with other hardware using DMA.



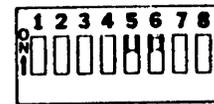
PIO Selected



DMA Selected

Switches 5 and 6 select the configuration of your IOMEGA subsystems.

The Host Adapter Board can handle several IOMEGA subsystems. These switches select one of four possible subsystem configurations. All four of these configurations are built into the Host Adapter Board but only one has been defined. Therefore, setting these switches to one of the other configurations prevents your computer from recognizing the IOMEGA drives.



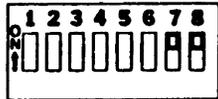
SUBSYSTEM CONFIGURATION 1

New Style

Switches 7 and 8 select the maximum number of fixed disk drives that your operating system can handle.

These switches indicate the maximum number of fixed disk drives that can be operated by your selected operating system. For example, PC-DOS supports only two fixed disk drives; the switches are set to two at the factory. The number of IOMEGA drives operating in Mode 1 is the value determined by switches 7 and 8 minus the number of fixed disk drives already connected to the system. Any additional IOMEGA drives operate in Mode 2. Thus, it is possible to force all of your IOMEGA drives to operate in Mode 2 by setting these switches for zero drives. This would optimize the performance of your IOMEGA drives but would require you to boot from one of the other drives on your system.

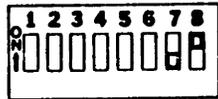
**CAUTION**  
Setting these switches to a number higher than the maximum for your operating system can cause unpredictable results.



0 DRIVES



4 DRIVES



2 DRIVES

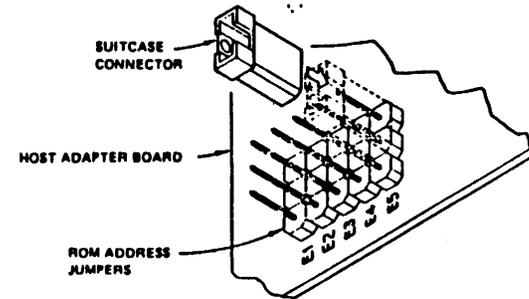


8 DRIVES

### 3.2 HOST ADAPTER BOARD JUMPER SETTINGS

Five suitcase connectors on your Host Adapter Board enable you to select the starting address of the ROM on your board. This address is the memory location where the computer finds your IOMEGA Host Adapter Board. No other hardware can use this same address or conflicts will occur. The Host Adapter Board currently uses 8K of memory and the connectors are installed at the factory to begin that memory at address CE00:0000.

Any address listed on the charts that follow may be accessed by moving the suitcase connectors into the illustrated configuration. Problems can arise when moving the connectors from one jumper to another. First, the Host Adapter Board does not operate without all five connectors in place on the board. Second, certain addresses can be used by other devices connected to your computer. For example, the IBM XT uses the addresses starting at C800:0000; setting the Host Adapter Board starting address at that location prevents the operation of your IBM XT drive and of your IOMEGA drives. Take care to avoid address conflicts when changing the positions of the connectors.

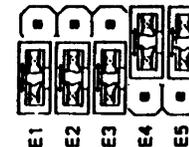


EXTERNAL APPEARANCE OF SUITCASE CONNECTOR ON BOARD

EFFECTIVE ADDRESSES

REQUIRE THESE JUMPER POSITION SETTINGS

CE00:0000  
to  
CFF0:0000



2-  
61-2

2-20

Effective Addresses	Jumper Settings	Effective Addresses	Jumper Settings
C000:0000 to C1F0:0000		D800:0000 to D9F0:0000	
* C200:0000 to C3F0:0000		DA00:0000 to DBF0:0000	
+ C400:0000 to C5F0:0000		DC00:0000 to DDF0:0000	
+ C600:0000 to C7F0:0000		DE00:0000 to DDF0:0000	
* C800:0000 to C9F0:0000		E000:0000 to E1F0:0000	
CA00:0000 to CBF0:0000		E200:0000 to E3F0:0000	
CC00:0000 to CDF0:0000		E400:0000 to E5F0:0000	
** CE00:0000 to CFF0:0000		E600:0000 to E7F0:0000	
D000:0000 to D1F0:0000		E800:0000 to E9F0:0000	
D200:0000 to D3F0:0000		EA00:0000 to EBF0:0000	
D400:0000 to D5F0:0000		EC00:0000 to EDF0:0000	
D600:0000 to D7F0:0000		EE00:0000 to EFF0:0000	

\*Used by IBM XT Computer.  
 \*\*IOmega factory setting.  
 +Do not use with IBM PC/XT Computer.

Effective Addresses	Jumper Settings	Effective Addresses	Jumper Settings
F000:0000 to F1F0:0000		+ F800:0000 to F9F0:0000	
* F200:0000 to F3F0:0000		+ FA00:0000 to FBF0:0000	
+ F400:0000 to F5F0:0000		+ FC00:0000 to FDF0:0000	
+ F600:0000 to F7F0:0000		+ FE00:0000 to FFF0:0000	

+Do not use with IBM PC/XT Computer.

### 3.3 HOST ADAPTER BOARD COMPATIBILITY

The IOmega Host Adapter Board can be made compatible with several computers by changing the ROM chip. See the ROM Kit flier accompanying your Host Adapter Board ROM, for ROM compatibility information. Chapter 5 contains ordering information for ROM kits.

### 3.4 ADDITIONAL TECHNICAL MATERIAL

Additional technical material is available. See ordering information in Chapter 5.

ADAPTOR CARD COMPARISON

	PC-0	PC-1B	TI-1	PC-2	PC-2B	PC-2W	PC-2BW	PC-2x
PCDOS	2.x 3.0 3.1	2.x	(MS) 2.11	2.x 3.x	2.x 3.x	3.x	3.x	3.1 3.2 3.3
OMEGA UTILITY	2.3 (2.31)	3.0	3.0	4.11 (4.12)	4.12	4.3 (4.32)	4.32	4.42 4.44
HOST	IBM PC, XT,AT AND COMPATS.	IBM PC, XT, ONLY	TI PRO SERIES	IBM PC, XT,AT AND COMPAQS		IBM-AT w/3.1		IBM PC, XT,AT AND COMPAQS
JUMPERS	NONE	1,2,3 DN; 4,5, UP	1,2,3,5, DN; 4 UP	NONE	1,2 UP; 3,4 DN	S A M E		S A M E
SET SWITCH	2,5 ON; OTHERS OFF	5,6,8 ON; OTHERS OFF	4,5,6,8 ON; OTHERS OFF	1,2 ON; OTHERS OFF		S A M E		S A M E
REMARKS:	NON-BOOT; DMA CH 3; ONLY ONE CDS (1 OR 2 DRIVE); USE IOMEGA; FORMAT. ----- AVAIL;RUNS; SLOWER;ADD; ON DVR FOR; OVER 2 HRD; REQ'D;CODE; IS -001; DMA/PIO SELECT'BL; NO DRIVER REQ'D FOR O.S. -----	NON-BOOT; (DR-C); FIXED DISC; SIMUL; MODES 1&2; DOS PAR- TIONING IS; AVAIL;RUNS; SLOWER;ADD; ON DVR FOR; OVER 2 HRD; REQ'D;CODE; IS -001; DMA/PIO SELECT'BL; NO DRIVER REQ'D FOR O.S. -----	NON-BOOT; DRIVES G&H; PI0 ONLY NO DMA. ----- MENU DRIVEN UTILITY; EASY INSTALLATION; DMA/PIO SELECTABLE; DMA CH 1/3 SELECT- ABLE; ----- BOOT ROM= 00700197 -----	NON-BOOT; UPGRADE- ABLE TO PC-2B. ABLES ROM; OMEGA PARTIONING; MENU DRIVEN UTILITY; EASY INSTALLATION; DMA/PIO SELECTABLE; DMA CH 1/3 SELECT- ABLE; ----- BOOT ROM= 00700197 -----	BOOTABLE; ALL JMPRS; DOWN DIS- ABLES ROM; AS PC2 & PC2B ----- BOOT ROM= 00463600 ----- BOOT ROM= 01008101 -----	WORKS WITH B.B + SAME AS PC2 & PC2B ----- BOOT ROM= 00463600 ----- BOOT ROM= 01008101 -----		

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## Installing the Adapter Board

If your adapter board has not already been installed, the following information will guide you through the procedure.

The only tools you need to install your adapter board are screwdrivers to remove the cover from your computer and to install the adapter board in the computer.

Run the SETUP program on the utilities diskette. Make sure the switches and jumpers on the adapter board are set according to the information in the SETUP program. Specific information about the adapter board switch and jumper settings is listed in the *RCD Owner's Manual*.

**CAUTION:** Discharge any built-up static electricity by touching a grounded metal object before proceeding further. Take this precaution particularly in low humidity environments to prevent damage to electronic parts by static electricity being discharged through them.

## Inspect Your Adapter Board.

Figure 4 shows the components of the Model PC2 and PC2B adapter boards.

If you wish to upgrade your PC2 board to a PC2B (bootable) board, you can order a kit that includes the three chips and four address jumpers necessary to do so. Contact your dealer to order the upgrade kit. Installation instructions are included in the kit.

Compare your adapter board with the ones pictured. Make sure you have the correct board and that all components are complete and undamaged. If you have a problem, contact your dealer.

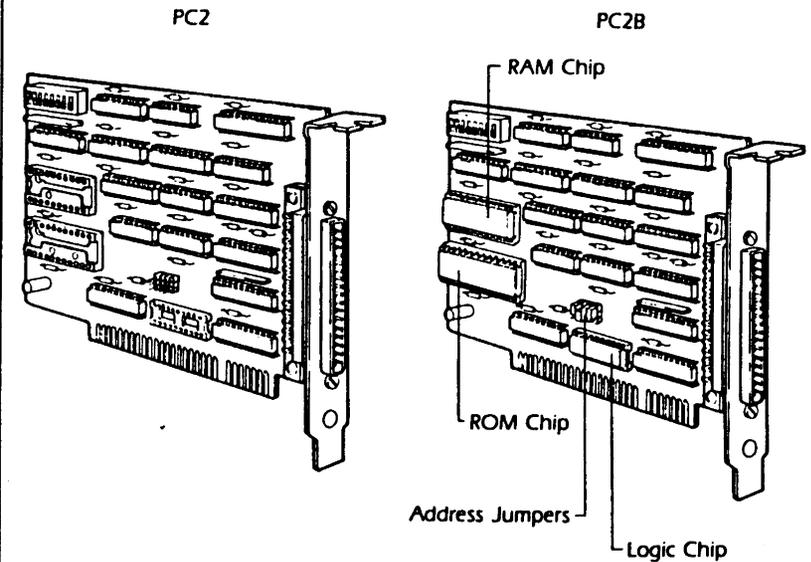


Figure 4. Adapter Boards

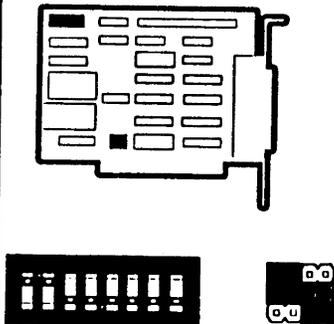




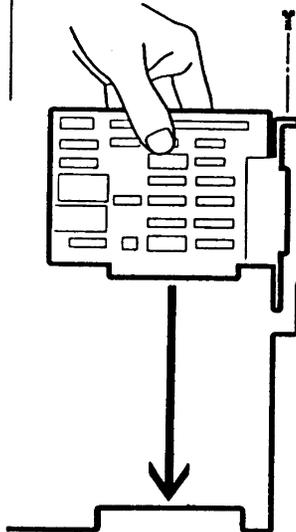
## HARDWARE INSTALLATION

### ADAPTER BOARD INSTALLATION

Check the switch and jumper settings. All the jumpers must be in place on the adapter board or the board will not operate. The settings illustrated are the factory settings for the adapter board. See the RCD SETUP program for appropriate settings for your system configuration.

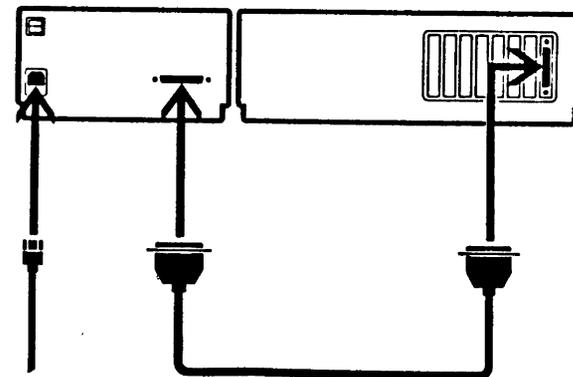


Install the adapter board in an empty slot of your computer.



Install the adapter board connector cable to the RCD and the adapter board.

Attach the power cord to the RCD and plug it into a grounded outlet (3-prong in the U.S.).



**CAUTION:** If you turn the RCD power on before allowing it to adjust to room temperature, the cooling fan will force room air through the drive, causing condensation. If the drive is operated while condensation exists in the drives, the cartridge disks could be severely damaged and the read/write head inside the drive could become clogged. The result could be immediate disk failure or severely shortened cartridge life.



**NOTE:** The ROM address jumpers, the host clock speed jumper, and the Interrupt jumper must be on the host adapter board or it will fail to operate properly. If a jumper is changed from its factory setting be sure that no conflicts exist with other hardware in the system.

Figure 4-1 shows the position of the ROM address (J3), interrupt (J4), and host speed (J5) jumpers on the host adapter board.

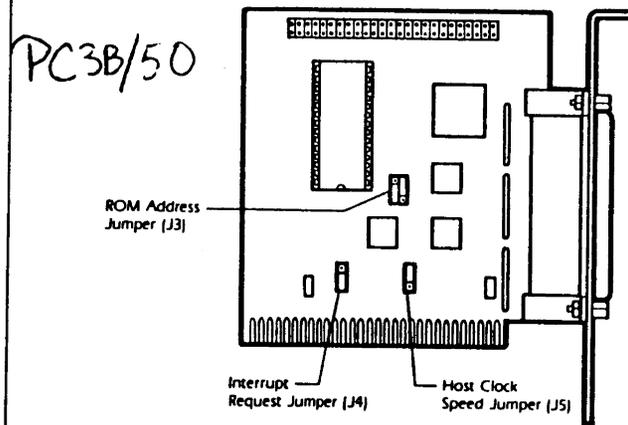


Figure 4-1. Host Adapter Board Jumpers

### Base ROM Address Jumpers

The base ROM address jumpers (J3) consist of three connectors that enable the selection of the starting address of the ROM. The ROM address is the memory location at which the computer finds the RCD adapter board. The adapter board currently uses 8K bytes of memory; the connectors are installed at the factory to begin that memory at address CE00:0000 (Figure 4-2).

Figure 4-2 shows all the addresses that can be accessed by repositioning the address jumpers.

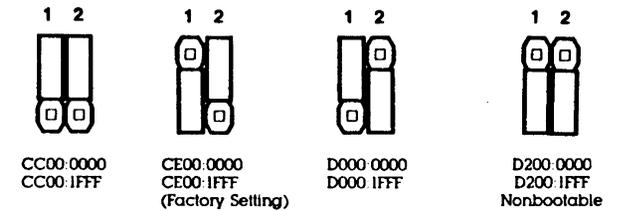


Figure 4-2. Possible Base ROM Address Jumper Settings

### Host Clock Speed Jumper

This jumper (J5) is provided to help match the speed of the host adapter board with the clock speed of the computer. This jumper must be connected or the host adapter board will not operate correctly. Figure 4-3 shows the two speeds available with the host adapter board.

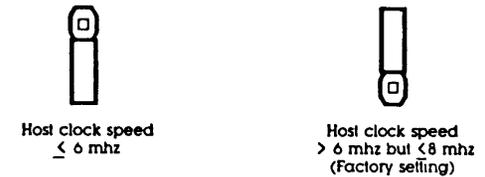


Figure 4-3. Host Clock Speed Jumper Settings

**NOTE:** Computer clock speeds higher than 8 mhz are not supported by this host adapter board.

### Interrupt Request Jumper

The host adapter board supports interrupt requests IRQ 5 and IRQ 7. Figure 4-4 shows the jumper (J4) settings that select these interrupts.



Figure 4-4. Interrupt Request Jumper Settings

4-2

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If everything checks out and the RCD still will not operate, contact an IOMEGA authorized dealer for service information.

### Reading and Writing Problems

If the RCD begins producing errors during read/write operations, try the following procedures.

**Retry.** Perform the operation several times to confirm that the problem really exists.

**Software installation.** Make sure the RCD device driver is properly installed on the system boot disk.

**Hardware installation.** Make sure the RCD host adapter board is properly installed in the system unit. Make sure that no address conflicts exist with other pieces of hardware in the system.

**Compatibility.** Make sure the software program that is running is compatible with fixed disks and that the program is properly installed for a fixed disk environment.

**Read/write heads.** Clean the read/write heads in the RCD using an RCD cleaning cartridge. Refer to the head cleaning instructions provided with the RCD cleaning cartridge.

**Disk cartridge.** Try the operation with another disk cartridge. If the problem persists, contact your dealer for assistance.

If the problem does not occur with a second disk, make sure the files on the first disk cartridge are backed up and then reformat the first disk using the surface verify ( / F ) option in the RCD FORMAT utility. Refer to the *RCD Utilities User's Manual and Reference Guide* for information on RCD FORMAT. The disk cartridge probably is worn out or defective if it fails to format after several attempts. Discard the disk cartridge and clean the read/write head.

If everything checks out correctly and the RCD still generates errors, look in your RCD owner's manual for service information.

### Running RCDDIAG Diagnostics Program

The RCD diagnostics program, RCDDIAG, is used to provide qualified service technicians with information that will help diagnose problems that may occur in the RCD, its host adapter board, or the RCD device driver.

Use the following procedure to run the RCDDIAG program.

1. Load MS-DOS as you normally would.
2. Insert a working copy of the RCD utilities diskette into drive A.

Type:

A :

then press **Enter** to log onto drive A.

Type:

RCDDIAG

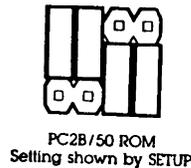
Then press **Enter**.

**NOTE:** If more than one type of IOMEGA host adapter board is installed in the system, a selection screen will appear and allow you to select the host adapter board and connected drives on which you wish to run diagnostics. For the PC3B/50 select PC3B/50 Adapter.

A menu similar to the following will appear on the screen.

RCD Diagnostics		Version X.X
Item	Status	
Host adapter board at CE00H supporting:	-OK-	
20Mb removable (5 1/4 inch)		
20Mb removable (5 1/4 inch)		
Add-on driver	-OK-	
Boot ROM	-OK-	
Press ESC - Exit to DOS      Enter - Show selected item		
R - Retest                      ↑ & ↓ - Select item		

### To Boot From PC2B/50



PC3B/50 Bootability Disabled

#### CONFIG.SYS File

```
DEVICE = RCD.SYS  
DEVICE = RCD3.SYS  
BUFFERS = 4
```

Figure 2-1. Host Adapter Board Boot Setups (continued)

**NOTE:** You must use the correct SETUP program for the board the computer will boot from. The correct program is found on the utilities diskette that came with the board.

### The PC3B/50 and an Internal Fixed Disk

If an internal fixed disk is in the system or some other reason prevents any of the RCDs from being drive C and the computer cannot use an IOMEGA drive for booting, disable the PC2B/50 ROM and adjust the CONFIG.SYS file as shown in Figure 2-1 for booting from the PC3B/50. This configuration allows the system to boot from the fixed disk and assures that DOS assigns consecutive drive letters to the RCDs connected to the different host adapter boards.

### Utilities Operation

Operation of the RCD utilities is discussed in the *RCD Utilities User's Manual and Reference Guide*.

## CHAPTER 3 Solving Problems

Problems encountered while operating a Removable Cartridge Drive (RCD) fall into two categories: operational problems and read/write problems. Operational problems include several conditions that could prevent the RCD from operating. Read/write problems include conditions that affect the transfer of data between the RCD and the host computer. Refer to the following sections if operational or read/write errors occur.

For additional problem solving help, an RCD diagnostics program, RCDDIAG, is included on the RCD utilities diskette. The program is designed to help diagnose problems affecting the operation of the drive, host adapter board, and device driver. Refer to "Running RCDDIAG Diagnostics Program" for more information.

### Operational Problems

Check the following items if the RCD fails to operate, if the green ready light on the front panel of the drive does not come on, or if the light comes on and goes right back off.

**Power.** Make sure that power is getting to the drive. Make sure the power cables are securely connected to the RCD.

**Host interface cable.** Make sure the host interface cable is securely connected at both ends.

**Read/write heads.** Clean the read/write heads with an RCD cleaning cartridge. Refer to the head cleaning instructions provided with the RCD cleaning cartridge.

**Disk cartridge.** Make sure the disk cartridge in use has been properly formatted. Try using a cartridge that has been in use before.

**Hardware installation.** Make sure the RCD host adapter board is correctly installed in the computer. Check jumper settings on the board and make sure that no conflicts exist in the system from different hardware devices trying to access the same addresses. Refer to Chapter 4 for information about the various host adapter board jumper settings.

**Software installation.** Make sure the RCD device driver, RCD3.SYS, is properly installed on the system boot disk. Make sure the RCD utilities are in the current directory or current path.

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### The RCD Device Driver

The RCD device driver, RCD3.SYS, is installed in the CONFIG.SYS file on the system boot disk. This software driver works in conjunction with the host adapter board to allow the system to communicate with and use the RCDs. The device driver must be installed in the CONFIG.SYS file and must be on the boot disk before the system can recognize and use the RCDs. For specific information on installing the device driver refer to Chapter 2.

The RCD device driver has two options available for use with 8 inch RCDs. A drive lock option and a single drive option.

The drive lock option is used when operating the 8 inch RCDs found in the Bernoulli Box as part of the IBM PC Network. When this option is installed all of the disk cartridges in 8 inch RCDs in the system are locked into the drives when the system boots up and the drives are accessed. This option is used to prevent the accidental removal of a shared cartridge while the network is operating. The drives may be unlocked by using the RCD TOOLS utility. RCD TOOLS is described in the *RCD Utilities User's Manual and Reference Guide*. To install the drive lock option, use your word processor or line editor to change the line in the CONFIG.SYS file that reads DEVICE = RCD3.SYS to DEVICE = RCD3.SYS /N.

The second option is the single drive option used to let the system know that the Bernoulli Box connected to the host adapter board contains only a single RCD. You must use this option if you have a Bernoulli Box with a single 8 inch RCD. To install the option, use your word processor or line editor to change the line in the CONFIG.SYS file that reads DEVICE = RCD3.SYS to DEVICE = RCD3.SYS /S. This option is not necessary if the Bernoulli Box has two drives.

### Operation with the Model PC2/50 and PC2B/50 Host Adapter Boards

The PC3B/50 host adapter board will operate in the same computer with a PC2/50 or PC2B/50 host adapter board. This configuration could be necessary if some of the 8 inch RCDs in a computer system are to be used as shared devices on a network other than the IBM PC Network.

### The PC3B/50 and the PC2/50

If a PC3B/50 host adapter board is to be used with a PC2/50 host adapter board in the same host computer, the only concern is the order of the device drivers in the CONFIG.SYS file on the boot disk. If the computer is booting from an RCD connected to the PC3B/50 host adapter board then it's device driver, RCD3.SYS, must come before the PC2 device driver, RCD.SYS, in the CONFIG.SYS file. In this case the CONFIG.SYS file should have the following lines in the following order.

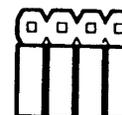
```
DEVICE = RCD3.SYS
DEVICE = RCD.SYS
```

Use your text editor to edit the CONFIG.SYS file so that the lines are in the correct order.

### The PC3B/50 and the PC2B/50

If a PC3B/50 host adapter board is to operate in the same host computer with a PC2B/50 host adapter board, a decision must be made about which board will control the RCD from which the computer will boot. To boot from an RCD connected to one board, that board's device driver must be listed first in the CONFIG.SYS file, the drive must be drive C, and the ROM on the other board must be disabled by moving the ROM address jumpers to the down position. Figure 2-1 shows the ROM jumper position and sample CONFIG.SYS files for booting from each of the two boards.

#### To Boot From PC3B/50



PC2B/50 ROM Disabled



PC3B/50 ROM Setting shown by SETUP

#### CONFIG.SYS File

```
DEVICE = RCD3.SYS
DEVICE = RCD.SYS
BUFFERS = 4
```

Figure 2-1. Host Adapter Board Boot Setups

## Bernoulli Box II 44 Jumper Settings

The Bernoulli Box II 44 has one set of jumpers used for setting the SCSI address of the subsystem and the logical unit number (LUN) of the subsystem and for use by qualified technicians in diagnosing problems with the drive. Four jumpers are provided by omega for setting the SCSI address and LUN. The factory settings for the jumpers are shown in Figure 4-1.

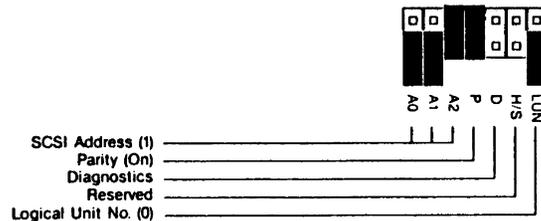


Figure 4-1. Factory Jumper Settings for Bernoulli Box II 44

The factory settings should work for most installations. The logical unit number of the master drive determines the logical unit number of the slave drive. If the master is set to LUN 0 then the slave becomes LUN 1 and if the master is set to LUN 1 then the slave becomes LUN 0.

► **Caution** Power to the drives should be turned off before changing the positions of the jumpers. Moving jumpers with the power on could cause damage to the drive and/or computer system. ◀

All available jumper settings are shown in Figure 4-2. When changing the position of the jumpers make sure that no other devices in the system are using the same SCSI address.

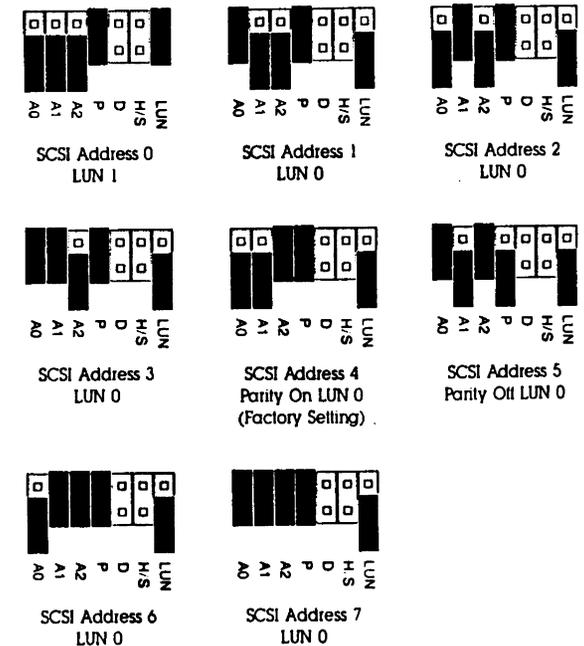


Figure 4-2. SCSI Address and LUN Jumper Settings for the Bernoulli Box II 44

## Bernoulli Box II 44 Drive Size Specifications

### Without Drive Front Panel

Height	41.30 mm (1.625 in.)
Width	146.05 mm (5.750 in.)
Depth	202.25 mm (8.000 in.)
Weight	1.76 kg (3.9 lb)

### With Drive Front Panel

Height	42.80 mm (1.685 in.)
Width	149.00 mm (5.866 in.)
Depth	207.25 mm (8.200 in.)
Weight	1.76 kg (3.9 lb)

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### Bernoulli Box II 44 Power Requirements

#### DC Voltage Requirements

	Master Only	Master and Slave
5 vdc $\pm$ 5%	1.2 amps maximum continuous	1.8 amps maximum continuous
12 vdc $\pm$ 5%	1.5 amps maximum continuous 4.0 amps peak	2.5 amps maximum continuous 4.5 amps peak
+5 vdc maximum ripple	30 mv RMS (120 mv P-P)	
+12 vdc maximum ripple	60 mv RMS (300 mv P-P)	

#### Maximum Continuous Power Consumption

Master Drive	24 watts
Master and Slave Drives	39 watts

### Bernoulli Box II Technical Information

The following sections contain information specific to the Bernoulli Box II drives. For information on the Bernoulli Box II 44 drives, refer to the Bernoulli Box II 44 drive sections.

### Environmental Specifications

The Bernoulli Box II subsystems operate most reliably when environmental factors are held within the limits shown in the table below. Operation of the drives outside the recommended environmental specifications could cause problems with disk cartridge wear and/or read/write head contamination. Special care should be taken to prevent condensation from forming in the drives or disk cartridges. If condensation is present do not operate the drives until all condensation has evaporated.

#### BERNOULLI BOX II ENVIRONMENTAL SPECIFICATIONS

Factor	Operation	Storage (6 mo)	Shipping (96 hr)
Temperature Drive	10° to 46°C (50° to 115°F)	-22° to 52°C (-8° to 124°F)	-40° to 60°C (-40° to 140°F)
Disk Cartridge	10° to 46°C (60° to 115°)	-22° to 51°C (-8° to 124°F)	-40° to 51°C (-40° to 124°F)
Relative Humidity (noncondensing)	10 to 80%	10 to 90%	10 to 90%
Altitude	To 3,048 m 10,000 ft	N/A	N/A

4-4

Technical Information

### Bernoulli Box II Jumper and Switch Settings

The Bernoulli Box II has two sets of jumpers. One set is used for setting the SCSI address of the subsystem and for use by qualified technicians in diagnosing problems with the drive. On some versions of the Bernoulli Box II master drive a switch may be used instead of this set of jumpers. The second set is used to set the logical unit number (LUN) of the subsystem.

#### LUN Jumper Settings

A block of four jumpers is used to set the LUN for the master and slave drives. The factory settings (see Figure 4-3) should work for all installations. If you change the positions of the jumpers, make sure that all the jumpers are on the posts and that both drives do not have the same LUN.

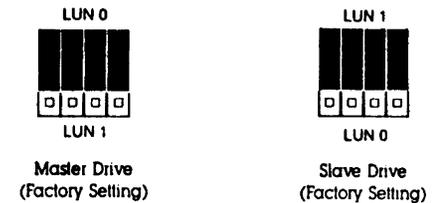


Figure 4-3. Factory Settings for LUN Jumpers

#### SCSI Address/Option Jumper and Switch Settings

A block of six jumpers or switches is used to set the SCSI address and to set various options for the subsystem (see Figures 4-4 and 4-5). The factory settings should work for most installations.

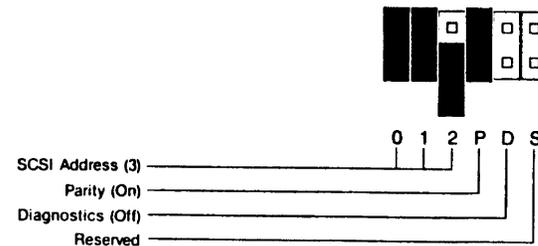


Figure 4-4. Factory Settings for SCSI Address/Option Jumpers

Technical Information

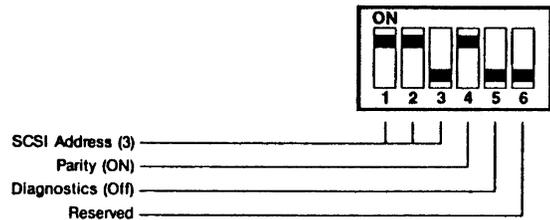


Figure 4-5. Factory Settings for SCSI Address/Option Switches

Jumpers 0, 1, and 2 or switches 1, 2, and 3 are used to set the SCSI address for the subsystem. All available jumper settings are shown in Figures 4-6 and 4-7. If you change the positions of the jumpers, make sure that no other devices in the system are using the same SCSI address.

► **Caution** Power to the drives should be turned off before changing the positions of the jumpers. Moving jumpers with the power on could cause damage to the drive and/or computer system ◀

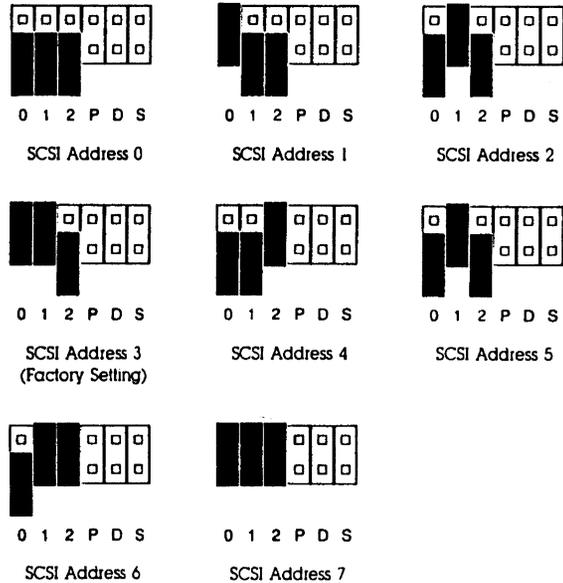


Figure 4-6. SCSI Address Jumper Settings

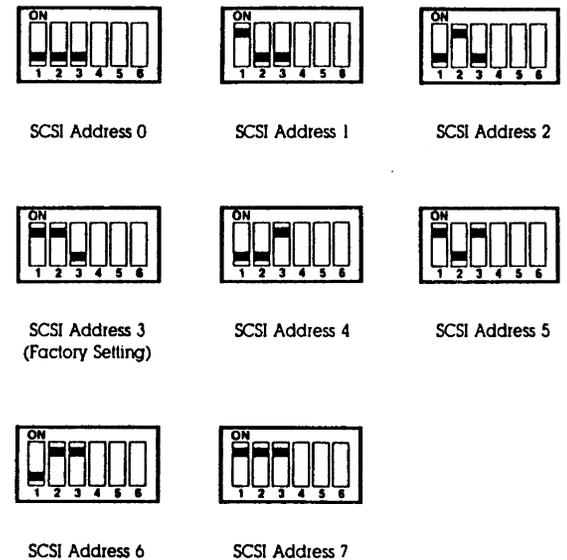


Figure 4-7. SCSI Address Switch Settings

### Bernoulli Box II Drive Size Specifications

#### Without Drive Front Panel

Height	41.30 mm (1.625 in.)
Width	146.05 mm (5.750 in.)
Depth	202.25 mm (8.000 in.)
Weight	1.76 kg (3.9 lb)

#### With Drive Front Panel

Height	42.80 mm (1.685 in.)
Width	149.00 mm (5.866 in.)
Depth	208.00 mm (8.200 in.)
Weight	1.76 kg (3.9 lb)

2-3-3



# ALPHA-20H

## 1.0 GENERAL DESCRIPTION

The 21.4 megabyte, half height 8 inch disk storage subsystem (Figure 1) is a high capacity, high performance, direct access data storage device using flexible media. The subsystem, with Small Computer System Interface (SCSI), is intended for use with small to medium sized systems requiring online storage with removable cartridges of 21.4 megabytes each. The subsystem consists of a controller with an intelligent host level interface and up to two disk drives attached daisy-chain style to the controller.

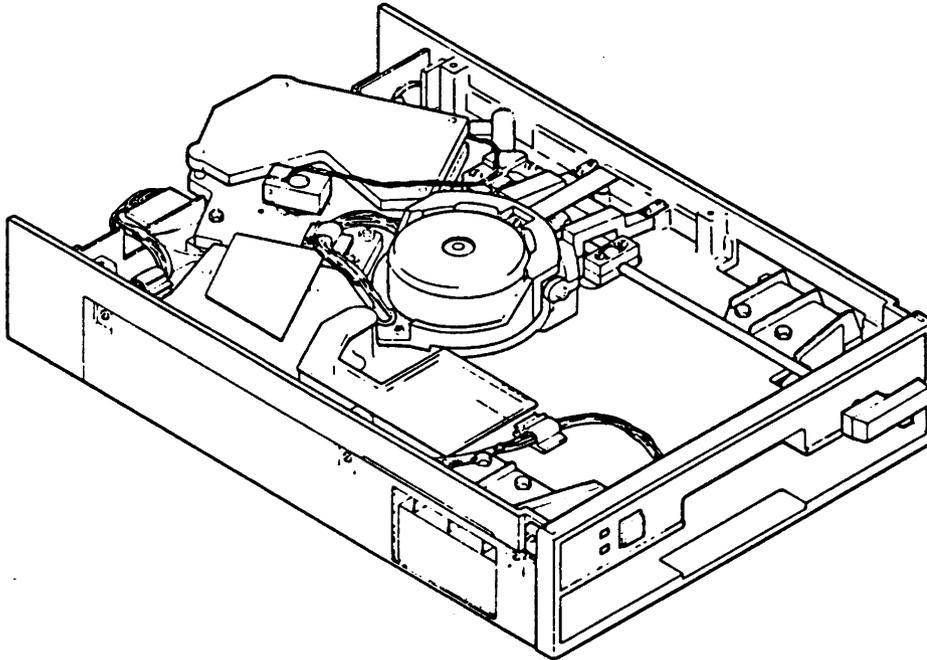


Figure 1. The 21.4 Megabyte, Half Height 8 Inch Disk Storage Subsystem

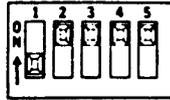
## 1.1 OVERVIEW OF SUBSYSTEM FEATURES

The subsystem incorporates a number of new and innovative technologies that make it a very versatile and adaptable data storage peripheral. The features described in this section include:

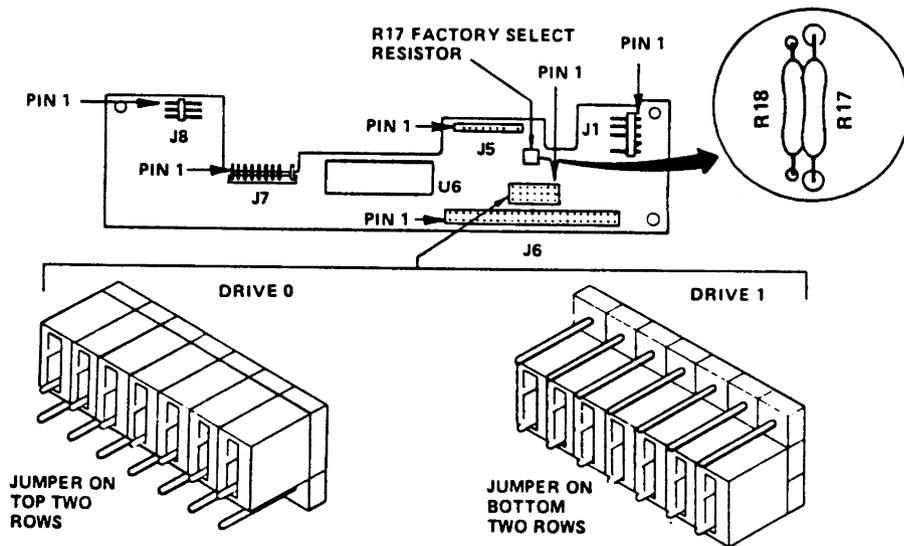
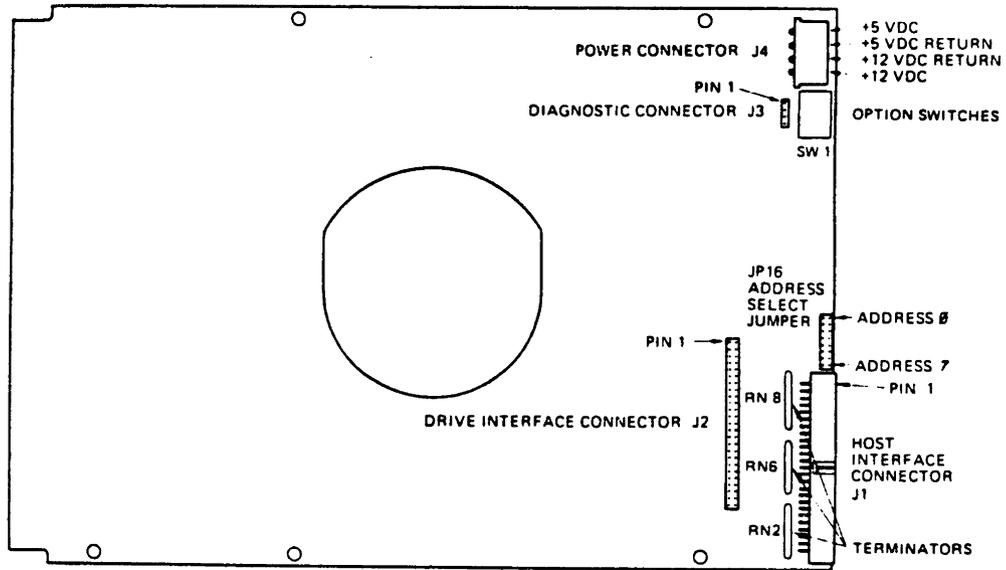
### Drive and Controller

- One or two drives per controller.
- Removable, 21.4 megabyte data cartridge.
- Embedded servo control.
- Run length limited code (RLLC) encoding/decoding.
- Utility commands for sector and track sparing.
- A 1.13 megabyte/sec instantaneous transfer rate.

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- SW1 OFF = MANUAL POWER ON RESET  
(MUST BE SWITCHED OFF FOR SUBSYSTEM TO OPERATE)
- SW2 OFF = PARITY CHECKING  
ON = NO PARITY CHECKING
- SW3 SW4  
OFF OFF = RETRIES ENABLED WITHOUT STARTUP DIAGNOSTICS  
OFF ON = RETRIES DISABLED WITHOUT STARTUP DIAGNOSTICS  
ON OFF = RETRIES ENABLED WITH STARTUP DIAGNOSTICS  
ON ON = REPEATING STARTUP DIAGNOSTICS
- SW5 NOT USED



(Actuator cables and jumpers are identified in Figure 12.)

Figure 14. Terminations and Address Options

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## ERROR READOUT ASSEMBLY (IOMEGA P/N 00714700)

The error readout assembly (P/N 00714700) which provides error code information on two hex displays (Figure B-3), includes both the IOMEGA unique cable and circuit board for displaying diagnostic information. It connects directly to the diagnostic port on the drive controller board.

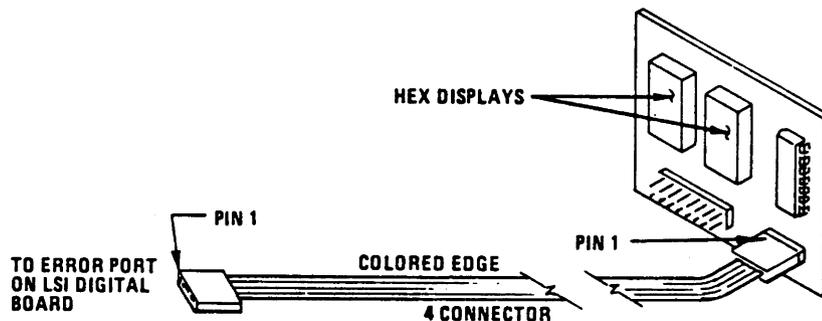


Figure B-3. Error Readout Assembly

## USER FABRICATED CABLE HARNESSES

Table 1 shows the details for custom manufacturing the cable harnesses.

TABLE B-1  
CABLE CONNECTOR IDENTIFICATION

Cable	Location	Connector Number	Component					
			Connector			Cable		
			Type	Part Number		Type	Part Number	
				Molex	3M		Molex	3M
Host Interface Cable	Host to Controller	J1	50 Pin	4700 15-25-4505	3425-6000	50 Cond Flat 28 AWG	82-28-5750	3365/5
Drive Interface Cable	Controller to Drive Interface*	J2	50 Pin	4700 15-25-2505	3425-6000	50 Cond Flat 28 AWG	82-28-5750	3365/5
Power Cable	Power Supply to Controller	J4	4 Pin	1-480424-0	--	18 AWG 16/30 Twisted Pair	3075 (Alpha Wire)	--
Error Port Cable	LSI Digital Board	J3	4 Pin	--	--	4 Cond Flat 28 AWG	--	--

\* Pins 43 and 34 are clipped and plugged for keying

TABLE A-1  
ERROR CODES

Diagnostic Port Error Codes***		SCSI Equivalent Error Codes			
No.	Description	Sense*		No.	Description
		Key	Class*		
00	NORMAL COMPLETION	0	0	0	NO SENSE
80	CARTRIDGE WRITE PROTECTED	7	1	7	WRITE PROTECTED
82	CARTRIDGE NOT LOADED	2	0	9	MEDIA NOT LOADED
83	HARDWARE/DISK SYNC ERROR	4	0	1	NO INDEX SIGNAL
84	CANNOT READ Z-TRACK	9	0	6	NO TRACK 0
86	SPINUP FAIL	4	0	4	DRIVE NOT READY
87	DRIVE NOT READY	4	0	0	DRIVE NOT READY
89	PARITY ERROR	4	2	3	VENDOR UNIQUE
8A	OVERRUN ON RECORD 1	4	1	B	DATA TRANSFER NOT COMPLETE
8B	OVERRUN ON RECORD 2	4	1	B	DATA TRANSFER NOT COMPLETE
8C	MEDIA CHANGED	6	0	0	NO SENSE
8D	ECC WAS INVOKED	1	1	8	CORRECTABLE DATA CHECK
8F	NO OPTION	9	1	C	NO ECC/ARB OPTION
40	SECTOR NOT FOUND	3	1	4	RECORD NOT FOUND
41	SEEK FAIL	4	1	5	SEEK ERROR
42	OUT OF SYNC	3	0	1	NO INDEX SIGNAL
43	SECTOR MARK ERROR	3	1	2	ID ADDRESS MARK NOT FOUND
44	PES ERROR	3	0	3	WRITE FAULT
45	DATA CRC ON RECORD 1	3	1	1	UNCORRECTABLE DATA ERROR
46	DATA CRC ON RECORD 2	3	1	1	UNCORRECTABLE DATA ERROR
47	DATA SYNC ON RECORD 1	3	1	3	DATA ADDRESS MARK NOT FOUND
48	DATA SYNC ON RECORD 2	3	1	3	DATA ADDRESS MARK NOT FOUND
49	PREWRITE CRC ON RECORD 1 (ECC)	9	1	C	VENDOR UNIQUE
4A	PREWRITE CRC ON RECORD 2 (ECC)	9	1	C	VENDOR UNIQUE
4B	POST-WRITE CRC ON RECORD 1 (ECC)	3	0	3	WRITE FAULT
4C	POST-WRITE CRC ON RECORD 2 (ECC)	3	0	3	WRITE FAULT
4D	NONRECOVERABLE ERROR ON RECORD 1 (ECC)	3	1	1	UNCORRECTABLE DATA ERROR
4E	NONRECOVERABLE ERROR ON RECORD 2 (ECC)	3	1	1	UNCORRECTABLE DATA ERROR
4F**	NONRECOVERABLE ERROR ON ECC SECTOR	9	1	D	VENDOR UNIQUE
20	INVALID COMMAND	5	2	0	INVALID COMMAND
21	INVALID ADDRESS	5	2	1	ILLEGAL BLOCK ADDRESS
22	INTERLEAVE BAD	5	1	A	INTERLEAVE ERROR
25	CARTRIDGE FULL	5	0	A	INSUFFICIENT CAPACITY
26	INVALID REQUEST	5	0	0	NO SENSE
10	NO SPARE SECTOR	3	0	A	INSUFFICIENT CAPACITY
11	NO SPARE TRACK	3	0	A	INSUFFICIENT CAPACITY
12-16	FLAG SECTOR FAILURE	9	1	E	VENDOR UNIQUE
01	ROM TEST FAILURE	-	-	-	] SEE SUBSECTION 3.3, TECHNICAL DESCRIPTION MANUAL, 00701300
02	RAM TEST FAILURE	-	-	-	
03	INTERFACE BUFFER TEST FAILURE	-	-	-	
90	ILLEGAL WRITE ERROR	9	1	F	VENDOR UNIQUE
91-95	SYNCHRONIZATION ERROR	9	-	C	VENDOR UNIQUE***
97	MESSAGE PARITY ERROR	9	1	1	MESSAGE PARITY ERROR
98	INITIATOR DETECTED ERROR	9	1	1	INITIATOR DETECTED ERROR
FO-FC	DIAGNOSTICS FAILURE	A	3	O-C	DIAGNOSTIC ERROR

\* See ANSC X3T9.2 Proposed Standard, Small Computer System Interface.

\*\* Could be any one of the following errors: 40, 44, 47, 48, 4B through 4E. Code 4F is not actually seen on the LEDs.

\*\*\* See Diagnostic Port Error Codes listing in this Appendix.

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## SECTION 2 BERNOULLI BOX II EXTERNAL SUBSYSTEM

This section describes the components contained within the enclosure cover of the Bernoulli Box II external subsystem and specifications pertinent to the subsystem.

### 2.1 Component Description

The following paragraphs contain brief descriptions of the major components contained in the Bernoulli Box II enclosure, plus an abbreviated description of the IOMEGA adapter board mounted in the host computer.

#### 2.1.1 Cartridge Disk Drive Assembly

Bernoulli Box II external subsystem configurations include (1) single drive master or slave removable cartridge drive subsystems and (2) dual drive assemblies that include both master and slave drives. For consistency, this manual covers a master/slave drive configuration. The information also is applicable to single drive configurations.

The master drive incorporates a drive mechanism and a drive controller printed circuit assembly (PCA), which includes both analog and digital functions. The controller board in the master drive services both master and slave drives. A more detailed description of the removable cartridge disk drive is contained in the IOMEGA Technical Description Manual for the 20 Megabyte, 5¼ Inch Cartridge Disk Drive.

#### 2.1.2 Power Supply Assembly

A single, switching type power supply assembly, which is mounted in an electromagnetic interference (EMI) shield, provides regulated direct (dc) electrical power to the dual, removable cartridge disk drive(s) and associated circuitry for the Bernoulli Box II external subsystem.

**2.1.2.1 Electrical Characteristics.** The Bernoulli Box II external subsystem employs a switching type power supply rather than a linear or dissipative power supply to increase efficiency and to enable a reduction in size and weight.

Line voltage enters the power supply through the fuse and filter before it reaches the power supply rectifiers. For applications at 115 vac, the rectifiers and filter capacitors function as a voltage doubler. By changing the jumper to 230 vac for international applications, the rectifiers and filter capacitors perform as a full wave rectifier and ripple filter.

**2.1.2.2 Power Supply Mechanical Characteristics.** The power supply printed circuit board (PCB) is mounted to the sheet metal base with four screws. Force-convection cooling is provided with circulated air supplied by the cooling fan.

**2.1.2.3 Power Supply Pin Connections.** Pin connection assignments for the power supply are listed in Table 2-1.



TABLE 2-1. POWER SUPPLY PIN CONNECTION ASSIGNMENTS

Pin	Connector	Signal Name
1	J101	Line (Hot)
2	J101	Line (Neutral)
3	J101	Safety Ground
1	J102	+12 vdc
2	J102	Not Connected
3	J102	+12 vdc
4 & 5	J102	Ground
6 & 7	J102	+5 vdc

### 2.1.3 AC/DC Power Cable Harness

An ac/dc power cable harness provides either ac or dc current to enclosure components. The cable harness provides ac power input from the rocker on/off power switch through a 5x20 mm, 1.6 amp fuse to the power supply. The dc leads on the harness deliver regulated dc power from the power supply to the Bernoulli II drives and the fan.

### 2.1.4 Controls and Indicators

The location of externally mounted controls and indicators is illustrated in Figure 2-1. Control and indicator descriptions are contained in Table 2-2.

TABLE 2-2. EXTERNAL SUBSYSTEM CONTROLS AND INDICATORS

Control/Indicator	Functional Description
Removable Cartridge Disk Drive Indicator Light (Green LED)	<ul style="list-style-type: none"> <li>a. When green LED is blinking, drive motor is not up to speed.</li> <li>b. When green LED glows steady, drive motor is at operating speed.</li> </ul>
Removable Cartridge Disk Drive Indicator Light (Amber LED)	When amber LED is illuminated, drive is selected and read/write head is accessing disk.
Electrical Power ON/OFF Switch*	Turns ac power ON and OFF.
Stop Button	Causes drive motor to spin up or down when button is pressed.

\*Red ON/OFF switch should NOT be used on export models.

---

## 2.3.2 Error Message Indications

Error messages applicable to isolating a reparable problem are listed and described in Appendix A. To use Appendix A, find the applicable error message(s) in the "Error Message" column, check the "Possible Causes" column for an explanation of all possible problem sources, and perform the procedure listed in the "Recommended Corrective Action" column.

## 2.3.3 Troubleshooting Procedures

Troubleshooting procedures include preservice tips, a method for performing a systematic functional check, use of the Troubleshooting Guide (Appendix B), application of the power-on confidence check, and performing the comprehensive drive diagnostics.

**2.3.3.1 Preservice Tips.** Before testing for a specific problem, check with the customer regarding the following items to determine whether they contributed to the cause of the malfunction.

- Was the host connector cable (connecting the Bernoulli Box II to the host adapter board in the customer's computer) installed correctly and securely seated?
- Is the host adapter board correctly installed? Are the option and address settings on the board correct?
- Is the IOMEGA drive (RCD.SYS or RCD3.SYS) file correctly installed on the customer's system disk? Is it operating with the proper operating system?
- Confirm that no memory address conflict exists between the host adapter board and another peripheral device on the system.
- Confirm that the customer had formatted the cartridge disk.

Before attempting any repair or other troubleshooting procedure, attempt to duplicate the customer's problem by performing the functional check described in subsection 2.3.3.2.

Conduct a visual inspection of the Bernoulli Box II subsystem with the enclosure cover removed. (See cover removal procedure in subsection 2.4.2.1.) During this inspection, look for broken or damaged wires or cables, or obviously damaged components. Look for any discoloration of components that may be a sign of heat damage. Also, make the following preliminary checks.

- Confirm that the power input cord connected to the power receptacle is delivering ac electrical power to the Bernoulli Box II.
- Check the power supply for correct output voltage. Voltage should be within 5% (measured at the drive) of the specified dc outputs.
- Examine all wires, plugs, and cable harnesses to ensure they are seated properly.
- Check that the DIP switch on the controller board is set correctly. Set switch 4 to ON and switches 5 and 6 to OFF. Switches 1 through 3 control the SCSI device address. These three switches set in combination create a unique address. Consult the installation manual for possible settings, which must differ from other devices on the SCSI bus.
- Make sure that the device (controller) select jumpers on both the the master and/or slave drive are in the correct positions (Figure 2-3). The jumper block must be set on the back two rows on both the master drive and slave drive printed circuit boards.

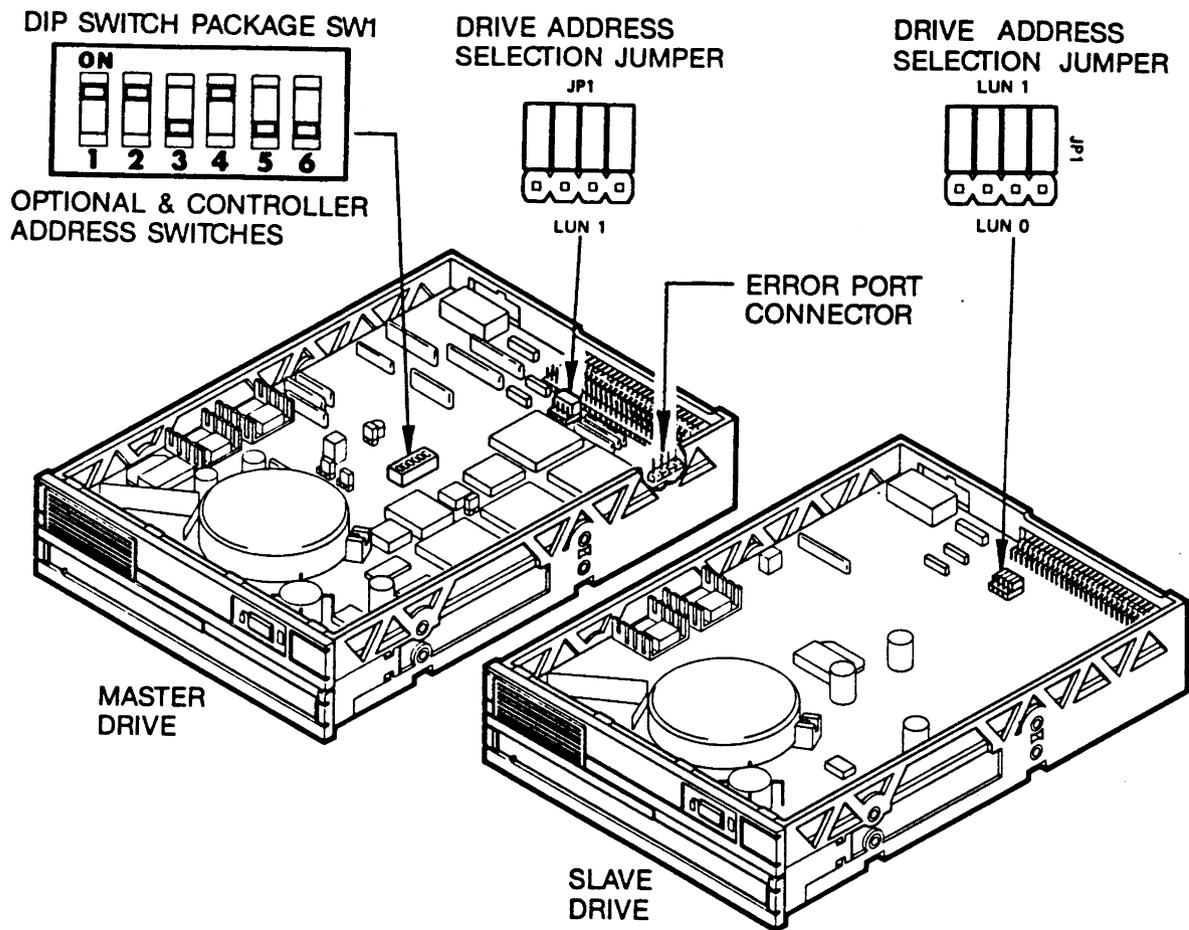


Figure 2-3. Bernoulli Drive Switch/Jumper Settings

2.3.3.2 Functional Check. When the corrective action for a customer complaint or problem is not indicated by an error message or is not otherwise obvious, try to duplicate the problem by performing a functional check of the subsystem. The functional check is designed to help you systematically isolate the most probable cause(s) of the problem. To perform a functional check, proceed as follows.

- Step 1 — Connect the Bernoulli Box II to a computer of the IBM PC family or a proved compatible computer system configured as follows.
- IOMEGA host adapter board installed.
  - Operating with MS-DOS.
  - Minimum of 256K RAM.
  - IOMEGA driver (RCD.SYS or RCD3.SYS) installed. Refer to the host adapter manual for the correct utilities setup.
- Step 2 — Confirm that all cable connectors are firmly seated and securely attached.

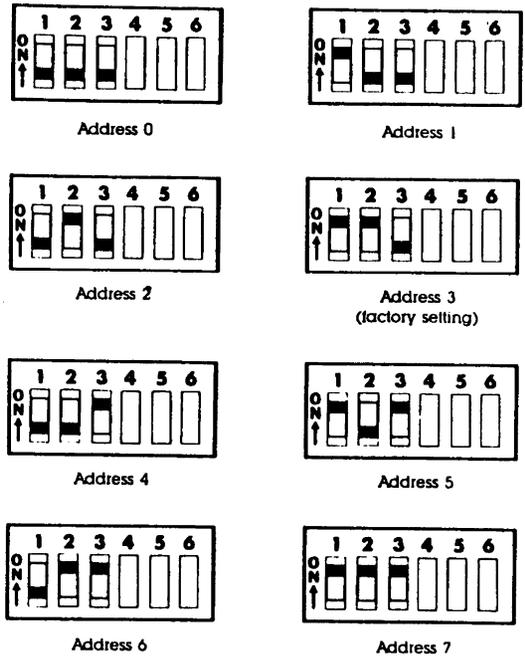


Figure 3-2. Possible SCSI Bus Address Settings

**Switch 4 — Parity Checking.** Setting this switch to ON enables parity checking for all data bytes read from the SCSI bus. Setting the switch to OFF disables parity checking.

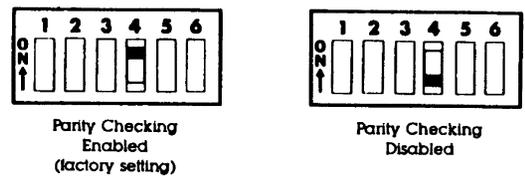


Figure 3-3. Parity Checking Switch Settings

**Switch 5 — Drive Diagnostics.** This switch should be used by service technicians only. The switch should be in the factory setting of OFF for the drive to function normally.

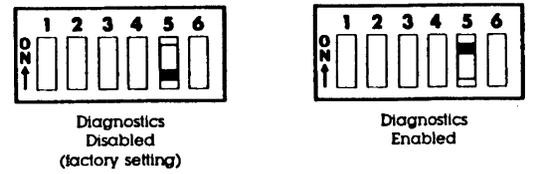


Figure 3-4. Diagnostics Switch Settings

**Switch 6 — Manual Power-on Reset.** This switch should be used by service technicians only. The switch must be in the factory setting of OFF or the drive will not operate.

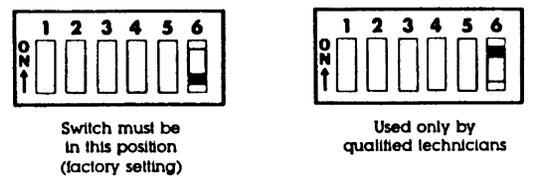


Figure 3-5. Manual Power-on Reset Switch Settings

**Drive Performance Specifications**

**Data Transfer Rate**

Drive-to-Controller	5.33 Mbits/sec
Controller-to-Host	
Single Record Burst (256 bytes)	1.5 Mbytes/sec

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2-44

- Do not store the disk cartridge in temperatures below 10°C (50°F) or above 52°C (126°F), nor in a relative humidity (noncondensing) outside the 10 to 80% range.
- Allow the disk cartridge time to adjust to the operating environment prior to use. Permanent damage to the data surface can occur if the cartridge is inserted under condensing conditions (cold cartridge/hot drive).
- To protect data from being erased, remember to move the cartridge write-protect switch to the WRITE-PROTECT position, as explained on the insert included on the cartridge sleeve, and shown in Figure 2-4.

**CAUTION:** Do not move the write-protect switch when the cartridge is in use. Finish whatever operation is being performed, remove the cartridge from the drive, and then move the write-protect switch.

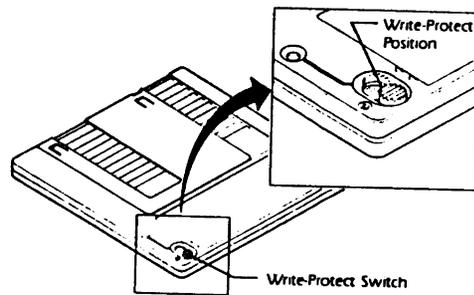


Figure 2-4. Write-protecting a Disk Cartridge

- Be sure to keep a backup copy of valuable data to prevent data loss resulting from a worn or defective disk cartridge. Refer to your *RCD Utilities User's Manual and Reference Guide* for disk-copying and backup procedures.

**NOTE:** After a period of time, a disk cartridge does wear out. If a cartridge begins producing frequent read/write errors and reformatting the cartridge does not alleviate the problem, the cartridge may need to be replaced.

### Removing a Disk Cartridge with the Power Off

Should power to the Bernoulli Drive II fail, you may find it necessary to remove the disk cartridge from the RCD. Use the following procedure to remove a disk cartridge from an RCD with power off.

1. Turn off the power switch for the Bernoulli Drive II and unplug the power cord from the wall receptacle.
2. Remove the motor access panel from the front of the drive. See Figure 2-5.

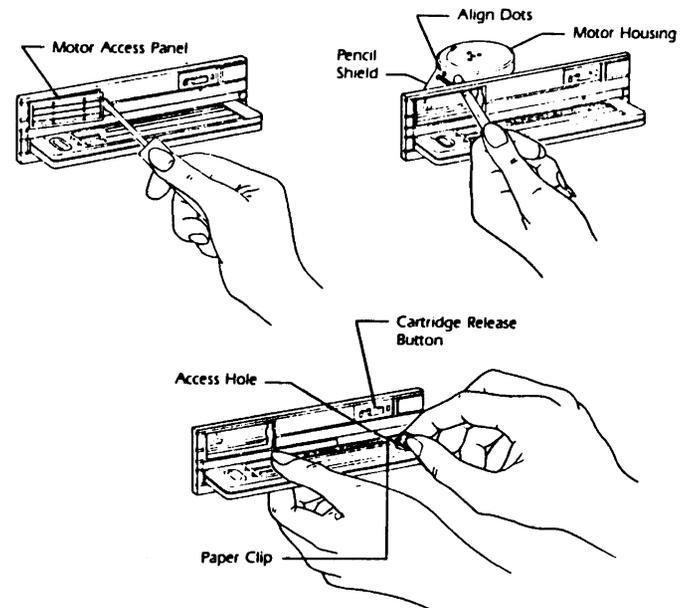


Figure 2-5. Power Off Cartridge Removal

## SECTION 3 BERNOULLI BOX II INTERNAL SUBSYSTEM

This section describes maintenance and repair procedures for Bernoulli Box II drives installed as mass data storage internal subsystems in personal computer systems. The section includes: (1) a description of the components; (2) specialized information regarding problem identification, analysis, and troubleshooting; (3) instructions for component removal and replacement; and (4) identification and listing of replaceable parts.

### 3.1 Component Description

The following paragraphs contain brief descriptions of Bernoulli Box II internal subsystem components.

#### 3.1.1 Cartridge Disk Drive Assembly

Either one Bernoulli Box II drive (a master drive) or two drives (a master drive and a slave drive) may be mounted in selected host computers.\* The master drive incorporates a drive mechanism and a drive controller printed circuit board (PCB), which contains both analog and digital functions. The controller board in the master drive services both the master and slave drives. A more detailed description of the cartridge disk drive is contained in the IOMEGA Technical Description Manual for the 20 Megabyte, 5¼ Inch Cartridge Disk Drive.

To gain access to your Bernoulli Box II internal subsystem, remove the cover following the instructions in the computer guide to operations.

#### 3.1.2 Controls and Indicators

The location of externally mounted controls and indicators is illustrated in Figure 3-1. Control and indicator descriptions are contained in Table 3-1.

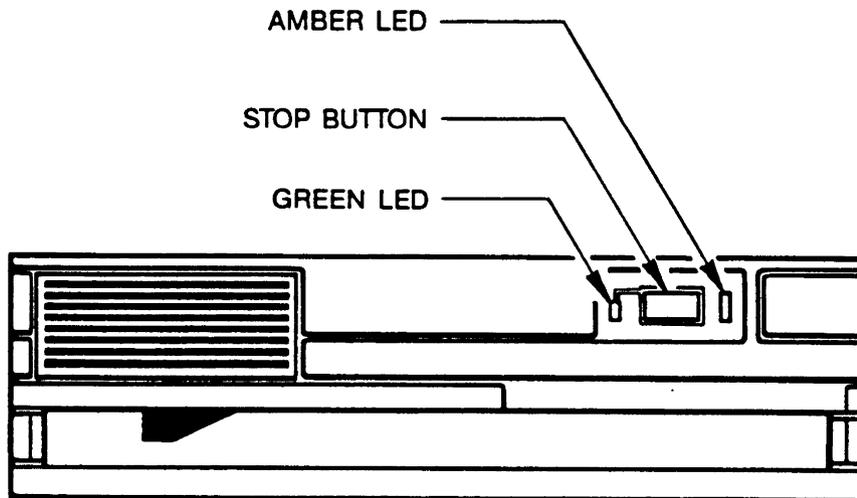
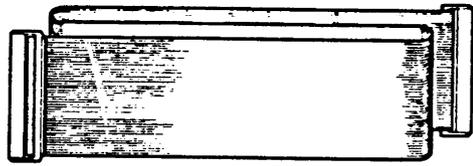


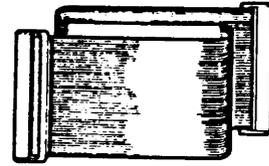
Figure 3-1. Subsystem Controls and Indicators

\*For a current list of compatible host computers, check with the IOMEGA Customer Service department.

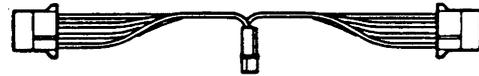
2-45



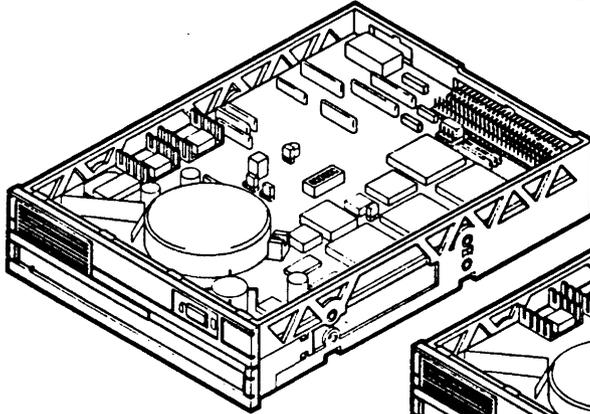
DRIVE-TO-HOST CABLE



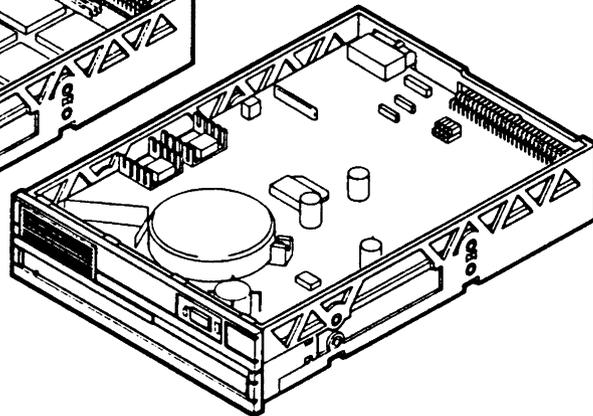
DRIVE-TO-DRIVE CABLE



POWER DC Y-CABLE



MASTER DRIVE



SLAVE DRIVE

Figure 3-2. Internal Subsystem Components

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## Error Messages (continued)

Error Message	Possible Causes	Recommended Corrective Action
<ul style="list-style-type: none"> <li>• <b>Sector not found</b></li> </ul>	<p>Drive could not find correct sector on cartridge disk during read/write operation.</p>	<p>Retry the operation. If error recurs:</p> <ol style="list-style-type: none"> <li>1. Clean read/write head using an IOMEGA head cleaning cartridge.</li> <li>2. Reformat the cartridge disk.</li> <li>3. Perform power-on confidence test and comprehensive drive diagnostics as described in subsections 2.3.3.4 and 2.3.3.5.</li> </ol>
<ul style="list-style-type: none"> <li>• <b>Seek error</b></li> </ul>	<p>Drive could not find correct track on the cartridge disk during read/write operation.</p>	<p>Retry the operation. If error recurs:</p> <ol style="list-style-type: none"> <li>1. Clean read/write head using an IOMEGA head cleaning cartridge.</li> <li>2. Reformat the cartridge disk.</li> <li>3. Perform power-on confidence test and comprehensive drive diagnostics as described in subsections 2.3.3.4 and 2.3.3.5.</li> </ol>
<ul style="list-style-type: none"> <li>• <b>Unknown unit</b></li> </ul>	<p>The selected drive does not exist.</p>	<ol style="list-style-type: none"> <li>1. Try the command again with a valid letter designator.</li> <li>2. Check switch settings on the adapter board.</li> </ol>
<ul style="list-style-type: none"> <li>• <b>Write fault</b></li> </ul>	<p>An error occurred while head was writing data to the cartridge disk.</p>	<p>Retry the operation. If error recurs:</p> <ol style="list-style-type: none"> <li>1. Clean read/write head using an IOMEGA head cleaning cartridge.</li> <li>2. Reformat the cartridge disk using the VERIFY (/F) option to discard bad sectors.</li> <li>3. Perform power-on confidence test and comprehensive drive diagnostics as described in subsections 2.3.3.4 and 2.3.3.5.</li> </ol>
<ul style="list-style-type: none"> <li>• <b>Error. Drive x: cannot be read</b></li> <li>• <b>Error trying to access x:</b></li> </ul>	<p>May occur when RCDREST.EXE tries to access a drive</p>	<p>Retry the operation. If error recurs:</p> <ol style="list-style-type: none"> <li>1. Clean read/write head using an IOMEGA head cleaning cartridge.</li> <li>2. Reformat the cartridge disk using the VERIFY (/F) option to discard bad sectors.</li> <li>3. Perform power-on confidence test and comprehensive drive diagnostics as described in subsections 2.3.3.4 and 2.3.3.5.</li> </ol>
<ul style="list-style-type: none"> <li>• <b>Error. Drive x: is write protected</b></li> </ul>	<p>Either the cartridge in the specified drive is write protected or a hardware malfunction exists.</p>	<p>Remove the cartridge disk and set the write protect switch to the write enable position. Retry the operation. If problem persists, perform the power-on confidence test and the comprehensive drive diagnostics as described in subsections 2.3.3.4 and 2.3.3.5.</p>

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## APPENDIX A ON-SCREEN DIAGNOSTIC ERROR MESSAGES

This tabulated list of on-screen error messages can help to diagnose malfunctions occurring with the Bernoulli Box II. To use the information, find the applicable error message(s) in the "Error Message" column, check the "Possible Causes" column for an explanation of all possible problem sources, and perform the procedure listed in the "Recommended Corrective Action" column as appropriate. Subsection references in this Appendix apply to corresponding subsections in the basic Bernoulli Box II Service Manual, 00635000.

### Error Messages

Error Message	Possible Causes	Recommended Corrective Action
<ul style="list-style-type: none"> <li>• <b>Bad disk, format failure</b></li> </ul>	The cartridge disk is worn out or defective.	Append the VERIFY option (/F)* to the format command and retry the format operation. If the cartridge disk still fails to format, it should be discarded.
<ul style="list-style-type: none"> <li>• <b>Data error (CRC)</b></li> <li>• <b>Read fault</b></li> <li>• <b>Seek error</b></li> <li>• <b>Write fault</b></li> </ul>	<ol style="list-style-type: none"> <li>1. An error occurred while accessing the cartridge disk.</li> <li>2. Read/write head needs cleaning.</li> <li>3. Cartridge disk may be bad.</li> <li>4. Cartridge disk drive may be bad.</li> </ol>	<ol style="list-style-type: none"> <li>1. Retry the operation. If the error recurs, check other possible causes and corrective actions.</li> <li>2. Clean the read/write heads using an IOMEGA head cleaning cartridge.</li> <li>3. Reformat the cartridge using the VERIFY option (/F). If the cartridge disk fails to format, discard it.</li> <li>4. Perform power-on confidence test and comprehensive drive diagnostics using the procedures described in subsections 2.3.3.4 and 2.3.3.5.</li> </ol>
<ul style="list-style-type: none"> <li>• <b>Drive not ready</b></li> <li>• <b>Error. Drive x: is not ready</b></li> </ul>	Cartridge may not be fully inserted in drive.	Confirm cartridge is fully inserted in drive and green LED is glowing steadily.
<ul style="list-style-type: none"> <li>• <b>General failure</b></li> </ul>	Unknown factor prevented program execution.	<ol style="list-style-type: none"> <li>1. Reboot the system and retry the operation.</li> <li>2. Check all cables and connectors for broken drive leads or loose connectors.</li> <li>3. Perform power-on confidence test and comprehensive drive diagnostics using the procedures described in subsection 2.3.3.4 and 2.3.3.5.</li> </ol>

\* The slash--F (/F) is appended to the FORMAT when the command line mode is used. If the FORMAT menu mode is used, select the SURFACE VERIFY option from the menu.

## BERNOULLI BOX II TROUBLESHOOTING GUIDE (continued)

Problem	Subsystem Affected	Possible Cause	Recommended Action
<b>Disk won't format</b>	External Subsystem	Defective bulkhead cable.	Replace defective bulkhead cable and recheck subsystem for proper operation.
		Defective power supply.	Verify operation of the power supply in accordance with subsection 2.3.4.3.
<b>Disk won't format</b>	Either Subsystem	Disk is write protected.	Change switch to the write enable position.
		Read/write head dirty.	Clean head as described in subsection 2.4.1.1.
		Cartridge disk worn or defective.	Try a different cartridge disk.
		IOMEGA driver not properly installed.	Check boot (system) disk that RCD.SYS or RCD3.SYS is properly entered in the CONFIG.SYS file.
		Defective host connector cable.	Replace the host connector cable and check operation of the subsystem.
		Defective host adapter board.	Replace host adapter board with a known good board and check operation of the subsystem.
		Drive may be bad.	Check drive by performing the power-on confidence test and comprehensive drive diagnostics described in subsections 2.3.3.4 and 2.3.3.5.
<b>Read/write error keeps occurring</b>	External Subsystem	Power supply may be delivering insufficient power.	Check power supply using procedure described in subsection 2.3.4.3.
		Defective bulkhead cable.	Replace defective bulkhead cable and recheck subsystem for proper operation.
<b>Read/write error keeps occurring</b>	Either Subsystem	Read/write head dirty.	Clean head as described in subsection 2.4.1.1.
		Cartridge disk worn or defective.	Try a different cartridge disk.
		Defective host connector cable.	Replace the host connector cable and check operation of the subsystem.
		Defective host adapter board.	Replace host adapter board with a known good board and check operation of the subsystem.
		Drive may be bad.	Check drive by performing the power-on confidence test and comprehensive drive diagnostics described in subsections 2.3.3.4 and 2.3.3.5.

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## APPENDIX B TROUBLESHOOTING GUIDE

This Troubleshooting Guide is designed to help you isolate most Bernoulli Box II malfunctions and to select the best corrective action. The information is presented in tabular format for ease in matching a listed problem with the malfunction you are trying to diagnose. The first column contains a list of possible problems. The second column identifies whether the problem affects the external or internal subsystem, or both subsystems. The third column describes one or more possible causes for each combination of affected drives, and the fourth column outlines recommended corrective actions. Possible causes and recommended corrective actions are presented in a preferred order of consideration/application. Apply the first corrective action listed; if it fails to fix the problem, try the next one, and so on. After applying the recommended corrective action(s), if the problem persists, contact the IOMEGA Service Center. Subsection and figure references in this appendix correspond to subsections and figures in the basic Bernoulli Box II Service Manual, number 00635000.

### BERNOULLI BOX II TROUBLESHOOTING GUIDE

Problem	Subsystem Affected	Possible Cause	Recommended Action
<b>Computer won't access drive</b>	External Subsystem	Insufficient or no power.	Check power supply following procedure in subsection 2.3.4.3.
		Faulty bulkhead connector cable.	Check bulkhead connector cable. Replace if not serviceable, and check operation.
	Either Subsystem	IOMEGA driver not properly installed.	Check boot (system) disk that RCD.SYS or RCD3.SYS is properly entered in the CONFIG.SYS file.
		Defective or improperly installed cables/connectors.	Check cables to confirm that they are seated correctly and securely.
		Option switches or jumper or jumper blocks are not set correctly.	Check option switches and jumper blocks for correct setting/positions (see Figure 2-3).
		Defective drive interconnect cable.	Check drive interconnect cable and replace if not serviceable.
		Option switches on host adapter board not set correctly.	Check option switches on host adapter board for correct setting, as illustrated in host adapter board owner's manual.
		Defective host adapter board.	Replace host adapter board with a known good board and check operation of the subsystem.
		Drive may be bad.	Check faulty drive by performing the power-on confidence test and comprehensive drive diagnostics as described in subsections 2.3.3.4 and 2.3.3.5.

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## BERNOULLI BOX II TROUBLESHOOTING GUIDE (continued)

Problem	Subsystem Affected	Possible Cause	Recommended Action
<b>Drive not operating properly or at all (cont)</b>	Either Subsystem (cont)	Cartridge disk is worn or defective.	Try the cartridge disk in another drive. If problem persists, try to reformat the disk using the VERIFY option (/F). If the cartridge disk fails to format, it should be discarded.
		Defective or improperly installed cables/connectors.	Check cables to confirm that they are seated correctly and securely.
		Option switches or jumper blocks are not set correctly.	Check option switches and jumper blocks for correct setting/positions (see Figure 2-3).
		Defective host adapter board.	Replace host adapter board with a known good board and check operation of the subsystem.
		Drive may be bad.	Check drive by performing the power-on confidence test and comprehensive drive diagnostics described in subsections 2.3.3.4 and 2.3.3.5.
<b>Green ready light illuminates but amber light does not come on when drive is selected.</b>	External Subsystem	Faulty bulkhead connector cable.	Check bulkhead connector cable, replace if not serviceable, and check operation.
	Either Subsystem	Defective drive interconnect cable.	Check drive interconnect cable and replace if not serviceable.
		A communication problem exists between the computer and the Bernoulli Box II.	Check boot disk to ensure that RCD.SYS or RCD3.SYS is properly entered in the CONFIG.SYS file.
			Check cables to confirm that they are seated correctly and securely. If problem persists, replace the connector cables, checking the system after each component is changed to determine if the problem is solved.
	Defective host adapter board.	Check option jumper blocks for correct settings/positions (see Figure 2-3). Install a new host adapter board and check operation.	
	Drive may be bad.	Check drive by performing the power-on confidence test and comprehensive drive diagnostics described in subsections 2.3.3.4 and 2.3.3.5.	

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## BERNOULLI BOX II TROUBLESHOOTING GUIDE (continued)

Problem	Subsystem Affected	Possible Cause	Recommended Action
<b>Drive indicates ready, then turns off</b>	External Subsystem	Power supply may be delivering insufficient power.	Check power supply using procedure described in subsection 2.3.4.3.
	Either Subsystem	Read/write head dirty.	Clean head as described in subsection 2.4.1.1.
		Cartridge disk worn or defective.	Try a different cartridge disk.
		Drive-select jumpers on both drives are selecting the same drive.	Check drive-select jumper blocks on drives to determine whether they are set correctly (see Figure 2-3).
	Drive may be bad.	Check drive by performing the power-on confidence test and comprehensive drive diagnostics described in subsections 2.3.3.4 and 2.3.3.5.	
<b>Drive makes screeching noises (skating)</b>	External Subsystem	Defective power supply.	Verify operation of the power supply using the procedure outlined in subsection 2.3.4.3.
	Either Subsystem	Read/write head dirty.	Clean head as described in subsection 2.4.1.1.
		Cartridge disk worn or defective.	Try another cartridge disk.
		Drive may be bad.	Check drive by performing the power-on confidence test and comprehensive drive diagnostics described in subsections 2.3.3.4 and 2.3.3.5.
<b>Drive won't spin up (no green light)</b>	External Subsystem	Defective power supply.	Verify operation of the power supply using the procedure outlined in subsection 2.3.4.3.
	Either Subsystem	Defective drive interconnect cable.	Change defective drive interconnect cable and recheck subsystem operation.
		Drive may be defective.	If problem persists, perform the power-on confidence test and comprehensive drive diagnostics described in subsections 2.3.3.4 and 2.3.3.5.
<b>Drive not operating properly or at all</b>	External Subsystem	Insufficient or no power.	Verify operation of the power supply using the procedure described in subsection 2.3.4.3.
		Faulty bulkhead connector cable.	Check bulkhead connector cable, replace if not serviceable, and check operation.
	Either Subsystem	IOMEGA driver not properly installed.	Check boot (system) disk to be sure RCD.SYS or RCD3.SYS is properly entered in the CONFIG.SYS file.

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## BERNOULLI BOX II TROUBLESHOOTING GUIDE (continued)

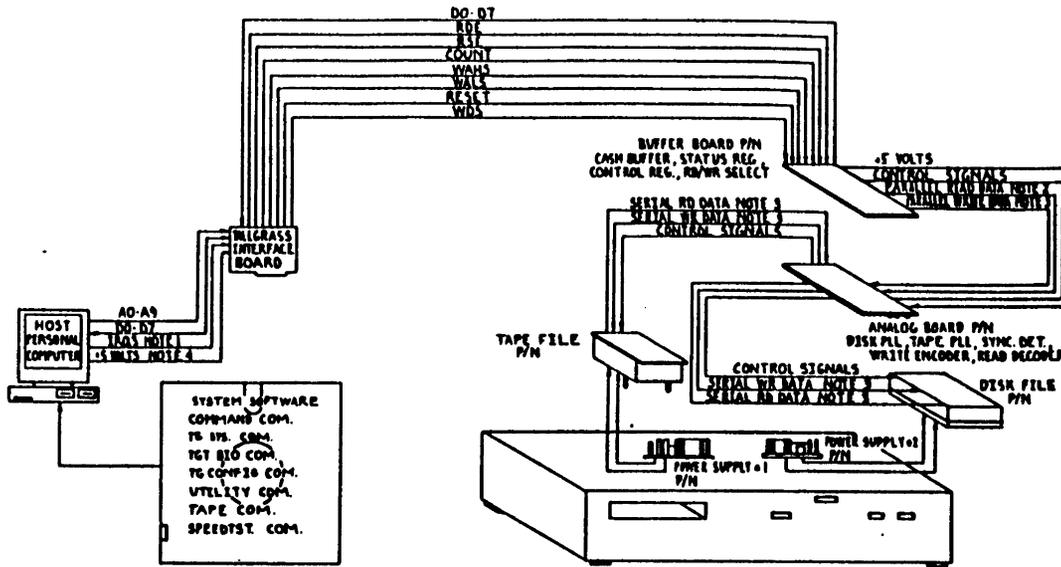
Problem	Subsystem Affected	Possible Cause	Recommended Action
<b>Insufficient or no power</b>	External Subsystem	Either the receptacle fuse or the power supply fuse is blown.	If the fan does not operate, check the receptacle fuse using the procedure described in subsection 2.4.2.6; an operating fan precludes a blown receptacle fuse. If problem persists, check the power supply fuse using the procedure described in subsection 2.4.2.7.
		Defective ac/dc harness.	Check ac/dc harness and all connections. Replace the harness if unserviceable.
		Faulty power supply.	Check power supply using procedure described in subsection 2.3.4.3. If faulty, replace the power supply using the procedure described in subsection 2.4.2.3.
<b>Fan not operating</b>	External Subsystem	Either a burned-out receptacle fuse, power supply fuse, defective power supply, or fan.	After disconnecting electrical power, check dc connections from the switch to the fan.  Check receptacle and power supply fuses and replace if faulty.  Check power supply. Replace if faulty.  If problem persists, replace the fan.
<b>Host computer appears to reboot spontaneously</b>	Internal Subsystem	Either the host power supply cannot handle the power required by the drives or the power loads are unevenly distributed.	Check that the master drive and host adapter board are not on the same drive power cable.  Check that the master drive is not sharing the same power cable with a fixed disk drive.

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Figure 2.1B Functional Block Diagram B



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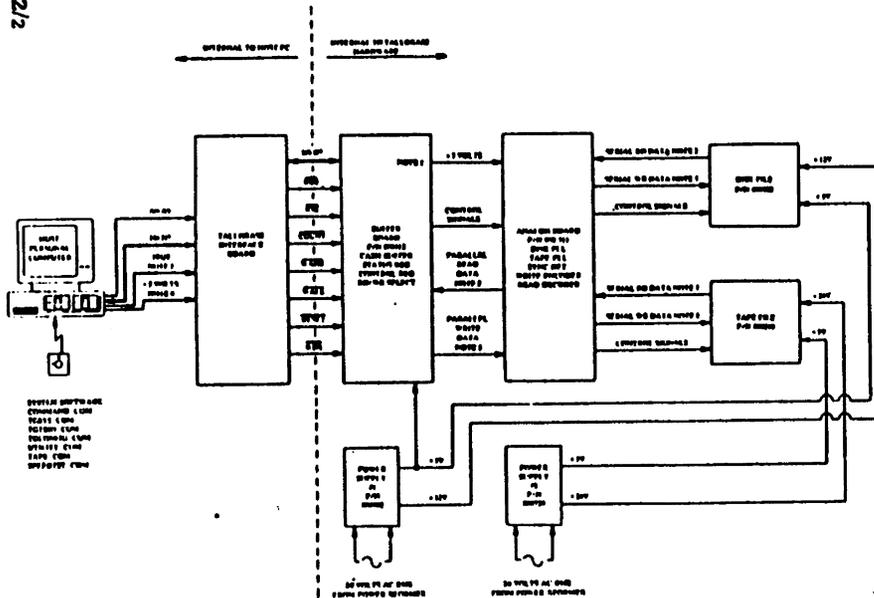


Figure 2.1A Functional Block Diagram A

Notes - Functional Block Diagram

1. IRQ3 may be changed to one of the other interrupt request lines. However, a software change will also be required.
2. Parallel read and write data exchanged between the buffer board and the analog board are in the form of 4-bit nibbles.
3. Serial read and write data exchanged between the disk file and the analog board and between the tape file and the analog board are in the form of 8-bit nibbles.
4. +5 Vdc power for the interface board is supplied by the host computer.
5. See Section 5, Flow Chart #8 for buffer board strapping.

2.1.3 Interrupts

Interrupts, unlike DMA, may not be shared. Typically, Interrupt 3 is unoccupied in the host and is available for use by the Tallgrass Interface Board.

If it is necessary to use a different interrupt, the DEBUG program must be used to change the Tallgrass software driver, and the interface board will have to be restrapped. See Section 4.4.7 for complete instructions in making these changes.

Failure to provide an isolated (unshared) interrupt for the Tallgrass system can result in an erratic and unreliable operation which will produce "Time Out" audible error messages (beep).

Multifunction boards that include a serial port frequently utilize COM2/Interrupt 3. You should carefully determine whether your multifunction board uses COM2/Interrupt 3. If so, you must disable the COM2 (serial) port on the multifunction board or move the interrupt on the Tallgrass Interface Board to another interrupt not used by the host. See Figure 2.0 (below) for typical interrupt locations.

Typical Interrupt Request Assignments (IRQ)	
IRQ#	Assigned to:
0	System Unit Refresh
1	Counter Timer/Sparker
2	Orchid Tech. "PC-NET"
3	COM2: TALLGRASS HardFile
4	COM1
5	IIM Fixed Disk Controller, Orchid Tech. "PC-NET"
6	IIM Diskette Controller
7	Parallel Printer

Figure 2.0 Typical Interrupt Request Assignments  
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## 2.7.2 Tape Drive: Recording Characteristics

The Tallgrass 3000 Series models use 20 Mb 4-track tape drives and the Tallgrass 3100 Series models use 45 Mb 9-track tape drives.

The drives record at a rate of 10,000 frpi (flux reversals per inch); 10 frpi = 8000 DPI (bits per inch) or 1 byte GCR encoded.

Both the 4-track and the 9-track tape drives have a transfer rate of 90K bytes per second (900K frps) at 90ips (inches per second).

They record in serpentine fashion which means that recording takes place on adjacent tracks in opposite directions. Even-numbered tracks are recorded in a forward direction and odd-numbered tracks in a reverse direction. Thus, the tape does not have to be rewound to continue reading or writing after reaching the end of a track. The read channels will not, however, read data from a track in the opposite direction to which it has been recorded.

Tape capacity while recording in a file-by-file mode is less than while recording in a streaming backup mode. The difference is shown in Figure 2.24.

TAPE TYPE	STREAMING BACKUP	FILE-BY-FILE BACKUP
DC-300XL*	3 Mb per track	2.4 Mb per track
DC-600A	5 Mb per track	3.5 Mb per track

\*used on older units only

Figure 2.24 Capacity Differences File-by-File and Streaming Tape Backup

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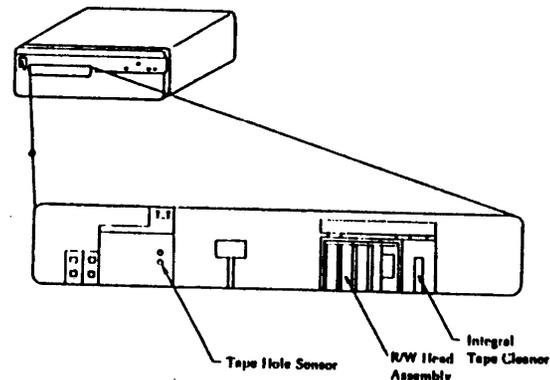


Figure 2.30 Tape Head Cleaning Locations

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## 2.7.8 The Tape Drive Storage Medium

The tape used as storage medium is 1/4"-wide, 600 feet long, DC-600A cartridge tape. (DC-300XL cartridge tape is used in older Tallgrass units.)

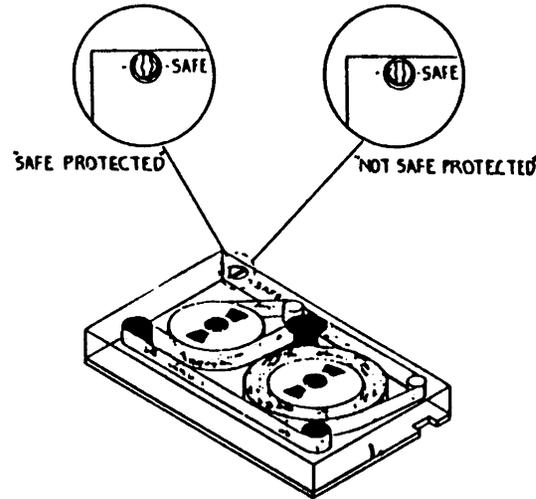


Figure 2.29 Tape Cartridge Detail

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### 3.8.6.b [C] CRC Test

This test checks the CRC (Cyclic Redundancy Check) time. This value will be displayed in milliseconds and should be between 11.18 and 13.18, depending on the host and the age of the Tallgrass unit. Figure 3.18 lists CRC times.

Computer	CRC Times
IBM PC	11.58 - 12.98
IBM PCXT	11.58 - 12.98
Columbia	11.18 - 12.54
Compaq	11.77 - 13.18
T.I.	- 12.45

[The lower times listed are for Tallgrass HardFiles manufactured prior to October 1, 1983.]

Figure 3.18 In-Range CRC Times by Computer Brands

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See screen error message "CRC Generator is bad" in 4.1.1, and Flow Chart #2 for more information regarding the CRC test.

### 3.8.6.a [M] Motor Speed

The system checks the motor speed of the disk drive and displays it as a hexadecimal number. (See Figure 3.10 below.)

Tallgrass Model	Hard Disk Capacity	Operating Motor Speed	Current Base	Last Count	Last Hang
TL-3000	8 Mb	1M20-1M30	1M28-1M30	1M20-1M30	1M28-1M30
TL-3012	12 Mb	1M20-1M30	1M28-1M30	1M20-1M30	1M28-1M30
TL-3020	20 Mb	1M20-1M30	1M28-1M30	1M20-1M30	1M28-1M30
TL-3135	35 Mb	1M50-1M58	1M50-1M58	1M50-1M58	1M50-1M58
TL-3170	70 Mb	1M20-1M30	1M28-1M30	1M20-1M30	1M28-1M30

Figure 3.17 Disk Drive Motor Speed

Be sure the HardFile has been running for at least ten seconds before checking the motor speed to give it time to adjust to optimum speed.

When the "M" option of the SPEEDTST program is selected, three four-digit hexadecimal number values will be displayed on the screen:

CURRENT BASE = xxxx  
LAST COUNT = xxxx  
LAST HANG = xxxx

CURRENT BASE is an indication of the current HardFile motor speed. This number value will change as the program detects minor variations in motor speed.

See Flow Chart #1, "Cannot Check Motor Speed" for troubleshooting guidance regarding problems with the motor speed.

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3.8.6.c M Move to Landing Zone 3-57

This feature moves the read/write heads to the track designated as the Landing Zone. See Figure 3.19 for landing zone and diagnostic track numbers.

If the Landing Zone option was not activated from the TGSYS program, the heads should be landed manually through the SPEEDTST program when the HardFile is transported, even from room to room.

If "Move to Landing Zone" is selected in SPEEDTST by mistake, the system will have to be rebooted before operation can continue. Press the Control, Alternate and Delete keys simultaneously, with the Tallgrass Boot Diskette in drive A:.

Hard Disk Type	Landing Zone Track	Diagnostic Track (in decimal)
TI 6 Mb	not specified	153
M/S 6 Mb	not specified	306
M/S 12 Mb	not specified	306
M/S 6 Mb	336	306
M/S 12 Mb	336	306
M/S 20 Mb	522	480
CDC 35 Mb	696	696
WT 70 Mb	986	986

Key: TI = Texas Instrument; M/S = MiniScribe;  
 CDC = Control Data; WT = Wangtek

Figure 3.19 Landing Zone and Diagnostic Track Numbers

3.8.6.d O Quit

Quit allows the user to exit from the SPEEDTST program, and reboots the system automatically so that normal operation can continue.

**Winchester drive not ready! Program aborting! (T)**

This message is issued by UTILITY.COM when it loads and begins to execute. It indicates that the READY signal in the ST-506 interface is not asserted properly. Make sure the HardFile is powered up. Check to see whether the hard disk is spinning. Check to be sure that the interface cable and interface board are seated properly.

If the hard disk isn't spinning, check the power supply; if the power supply is defective or not functioning properly, change it, and try again. See Section 4.2.2, "Unit Disassembly."

If the power supply checks out okay and the hard disk is not spinning, check the MiniScribe diagnostic LED. See Section 4.1.4., "LED Error Messages." If the LED message indicates problems with the hard disk, see Section 4.2.3, "Troubleshooting Using UTILITY."

If the disk is spinning and the interface cable and card are properly seated, change the buffer board. (The status register that reads the READY signal is located on the buffer board.) See Section 4.2.2, "Unit Disassembly."

See also "Disk drive not ready" and Flow Chart #4.

**Write fault (T)**

This message is issued by UTILITY.COM in response to detection of the Write Fault signal in the ST-506 interface from the disk drive. The Write Fault condition can only be cleared by turning the HardFile system off and back on. The Write Fault condition is an indication of one or more gross failures in the system, e.g.,

- power supply voltages out of spec
- failure of recording circuits in disk
- failure of encoding circuits in analog board.

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Cannot check motor speed (T)

This message is issued by TGTBIO.COM during boot (IPL) time only. It indicates that the diagnostic track was unreadable. **It does not mean that the motor speed is wrong.** It only means that it was unable to perform the diagnostic test.

This error message is frequently caused by corruption of the diagnostic track due to any of the reasons listed below.

1. an illegal exit from a program, such as control C (AC)
2. a reset during the boot sequence by accidentally pressing the control, alternate and delete keys
3. selection of the Landing Zone option (in the 35 Mb and 70 Mb units only) because heads of these units land on the diagnostic track.

If the disk appears to be functional, use UTILITY and select the EXAMINE SPECIFIED TRACK function to exercise and reform the diagnostic track of heads 0 and 7.

Model No.	Hard Disk Size	Diagnostic Track
TG-3006	6 Mb	track 132 Hex (306 decimal)
TG-3012	12 Mb	track 132 Hex (306 decimal)
TG-3020	20 Mb	track 1E0 Hex (480 decimal)
TG-3135	35 Mb	track 288 Hex (696 decimal)
TG-3170	70 Mb	track 3DA Hex (986 decimal)

Figure 4.1 Diagnostic/Landing Zone Track Numbers

If the EXAMINE function indicates errors while exercising the diagnostic track, the HardFile may require repair. See Section 4.2.3, "Troubleshooting Using UTILITY," and Section 5, Flow Chart #1.

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**4.1.1.c Tallgrass Error Codes for Numbered Error Messages**

Some error messages are reported by a number. An explanation of the Tallgrass numbered error codes follows.

**TG Error Code No. 01 = CRC Generator Timeout**

This message is generated by TGTBIO.COM. The CRC calculation did not occur within the predetermined time. Try rebooting the system. See error message "CRC Generator is Bad", and Flowchart #2.

**TG Error Code No. 02 = Disk Drive Not Ready**

See "Disk drive not ready"

**TG Error Code No. 03 = DMA Time Out**

This message is generated by TGTBIO.COM. A DMA transfer was initiated but was unsuccessful. Try the operation again. If it is still unsuccessful, check the hardware. You may have to replace the DMA chips.

**TG Error Code No. 04 = DMA Error and Time Out on Seek**

DMA Error = DMA Time Out. See Error #03. "Time Out on Seek" may suggest a corrupted track because the seek operation could not be successfully completed. Run the READ test from the UTILITY program and then examine any specified track found to be bad.

*Run  
0.1.1.3  
Read test  
Examine  
bad track  
with table*

**TG Error Code No. 05 = Time out during homing the disk**

This message is generated by TGTBIO.COM. A command was given to move a read/write head to track 00, but the command was unsuccessful.

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TG Error Code No. 06 = Seek Error

See screen error message "SEEK ERROR".

TG Error Code No. 07 = Time-out on Seek

See screen error message "SEEK ERROR".

TG Error Code No. 09 = Time Out on Read

This message is generated from TGTBIO.COM. It indicates that a read operation was initiated but a valid preamble was not detected. Run the READ test from the UTILITY menu.

TG Error Code No.10 = Write Fault

See screen error message "Write fault"

TG Error Code No.12 = General Disk Failure

This message is issued by TGTBIO.COM. It corresponds to the messages, "Winchester drive not ready! Program aborting!" or "Disk Drive not ready." See Flow Chart #4.

TG Error Code No.15 = Dual CRC Retry

This message is issued by TGTBIO.COM. It means the CRC was not good. Reboot the system and try the operation again. If the message continues, make a new system diskette. If that doesn't solve the problem, see screen error message "CRC Generator is bad" and Flow Chart #2.

*TGTbios.com*  
TG 03160716 01 - inter. in software doesn't match inter. set on board (inter. bus)  
e some other device has same interrupt

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#### 4.1.2.b Soft Errors

A soft error is a Random C error caused by chance disruptions such as power line transients, mechanical noise, or power supply noise. A track that reads with a soft error once will usually not repeat the error on subsequent retries.

The odds of a soft error repeating are extremely low. For example, a 20 Mb drive has 1920 tracks, so the odds become 1920 to one that the error will occur twice. DOS would have to encounter a soft error three times before it would issue a standard DOS message.

Soft errors usually accumulate only one or at most two errors. Random soft errors might indicate that the phase lock loop on the hard disk needs adjusting. Sometimes soft errors will cluster on one head which might indicate that the hard disk is bad.

The maximum allowable number of SOFT ERRORS per pass on FORMAT is listed below.

Tallgrass Model	HardFile Size	Max Errors 1 Pass	Max Errors 2 Passes	Max Errors 3 Passes
TG-3006	6 Mb	1	1	2
TG-3012	12 Mb	1	2	4
TG-3020	20 Mb	2	4	8
TG-3135	35 Mb	4	7	11
TG-3170	70 Mb	7	14	21

Figure 4.4 Maximum Allowable Soft Errors

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#### 4.1.2 Hard, Soft, and Firm Errors

Three classes of READ errors can be distinguished using several passes of the READ test in UTILITY.COM. They may first appear during the final burn-in process. They are:

- hard errors
- soft errors
- format (or firm) errors.

Each is discussed below.

##### 4.1.2.a Hard Errors

Hard errors correspond to physical flaws in the magnetic recording medium. They are usually confined to one track, but it is not unusual for a flaw to affect two or three adjacent tracks. If these hard errors accumulate around the low numbered tracks (the directory area of the disk), the disk drive might be unusable.

Hard errors stay put. That is, the track is bad when it is read during each pass and should be entered in the BADTRACK file. The error count of a hard error usually goes up at the same rate as the pass count. The total maximum allowable number of hard errors (including the manufacturer's reported flaws) is shown below.

Tallgrass Model	HardFile Size	Heads/ Surfaces	Max Errors Per Head	Max Errors Per Drive
TG-3006	6 Mb	2	4 errors	8 errors
TG-3012	12 Mb	4	10 errors	20 errors
TG-3020	20 Mb	4	10 errors	20 errors
TG-3135	35 Mb	5	12 errors	36 errors
TG-3170	70 Mb	7	20 errors	70 errors

Figure 4.3 Maximum Allowable Hard Errors

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##### 4.1.2.c Firm Errors

Firm errors appear to be hard errors when they are read as in the READ test, but will disappear when the track is written to.

Firm errors are the result of logical damage to the data format on the track rather than physical damage to the recording medium. They are repaired by running the EXAMINE feature in the UTILITY program. EXAMINE reformats the track in question so it is again usable.

By allowing the READ test to run for several passes and watching the error counts, error types can usually be identified and patterns detected that will aid in further troubleshooting.

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Sec 1 EXTERNAL HARDWARE INSTALLATION

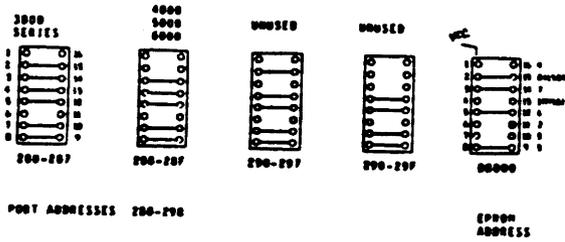


Figure 1 THE Interface Port Address and EPROM Address

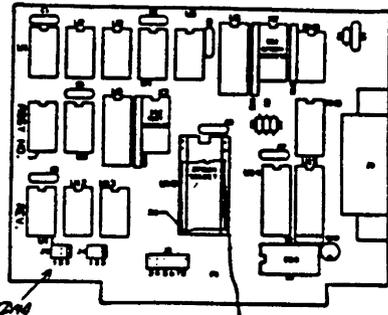


Figure 2 THE Interface Board

Sec 1 EXTERNAL HARDWARE INSTALLATION

AIC EPROM Address Select Package (S3) Version 1.3 & 2.x

Switch #	1	2	3	4	5	6	7	8
C0000	on	on	on	OFF	on	OFF	on	on
C4000	on	on	on	OFF	OFF	OFF	on	on
C8000	on	on	on	OFF	on	OFF	OFF	on
CC000	on	on	on	OFF	OFF	OFF	OFF	on
D0000	OFF	on	on	OFF	on	OFF	on	on
D4000	OFF	on	on	OFF	on	OFF	OFF	on
D8000	OFF	on	on	OFF	on	OFF	OFF	on
DC000	OFF	on	on	OFF	OFF	OFF	OFF	on
E0000	on	on	on	OFF	on	OFF	on	OFF
E4000	on	on	on	OFF	OFF	OFF	on	OFF
E8000	on	on	on	OFF	on	OFF	OFF	OFF
EC000	on	on	on	OFF	OFF	OFF	OFF	OFF
BINARY WEIGHT	4	8	7	1	6	2	5	3

\* C0000 is the address at which resident hard disks are recognized.  
 \* D0000 is the default address setting for the Tallgrass hard disk.  
 \* The IBM AT computer does not allow for EPROM recognition at addresses higher than DC000.

AIC Port Address Dip Switch Package (S2) Version 1.3 & 2.x

Port #	1	2	3	4	5	6	7	8
200 - 20F	OFF	OFF	ON	ON	ON	OFF	ON	ON

AITE Port Address Dip Switch Package Version 2.x

Port #	1	2	3	4	5	6	7	8
200 - 20F	ON	OFF	ON	OFF	ON	ON	ON	OFF

TALLGRASS 6000

Sec 1 EXTERNAL HARDWARE INSTALLATION

AIC Controller Board Jumpers

- J1 37 pin external interface connector. It can drive one tape drive and one hard disk.
  - J2 20 pin secondary (Drive 1) hard disk data cable. It is used only if the internal drives are daisy chained. This configuration cannot support an external device.
  - J3 40 pin tape only or disk and tape controller and data cable. It is used for TG-10201 and TG-20251 applications currently. J15 open indicates to software that the hard disk connected via J3 is recognized as logical drive zero.
  - J4 30 pin hard disk control signal cable. It is used to send control signals to the hard disk in conjunction with J-5 and/or J2 data signals.
  - J5 20 pin primary (Drive 0) hard disk data cable. It is used to send data signals to the primary hard disk. It is recognized as logical drive 1 if J15 is open.
  - J6 4 pin LED attachment. This is for installation in IBM AT. Pin 1 is to +5V, pin 2 LED cathode. There is no connection on other pins.
  - J7 8 pin (optional) boot ROM address decoding. It allows address lines to be attenuated for proper decoding of EPROM's larger than the 2732.
  - J8 8 pin (optional) boot ROM voltage supply routing. It applies +5V or address lines to appropriate location for alternate size EPROM's.
  - J9 12 pin interrupt request selection. The interrupt request is selected by shorting a "pin pair" from the top to the bottom of the row. The default setting is pin pair #1 shorted. The interrupt request signals relationship pin pair numbering. They are as follows:
- | Pin Pair # | Interrupt Request # |
|------------|---------------------|
| 1          | IRQ # 3             |
| 2          | IRQ # 4             |
| 3          | IRQ # 5             |
| 4          | IRQ # 6             |
| 5          | IRQ # 7             |
| 6          | IRQ # 2             |

J10 2 pin DMA acknowledge (BACK #2). J10 must be used in conjunction with J-12. Active is shorted. It requires patches to the software and EPROM.

Sec 1 EXTERNAL HARDWARE INSTALLATION

J11 8 pin, 2 jumpers DMA acknowledge and DMA request for one channel one and three. The default setting is pin pair #3 (DMA3) and pin pair #4 (BACK #3) shorted. J12 active setting pin pair #1 (DMA1) and pin pair #2 (BACK #1) shorted require patches to software and EPROM.

J12 2 pin DMA request (BACK #2). J12 must be used in conjunction with J-10. Active is shorted. It requires patches to software and EPROM.

J13 3 pin (optional) optional selection for Write Data Level or Write Data Pulse operation. Position #1 Write Data Level operation. Position #2 write data pulse operation. Correctly shorted in position #1. This jumper applies only to tape circuitry.

J14 3 pin cylinder zero write-protect option. Position #1 allows writing to cylinder zero. Position #2 inhibits ability to write to cylinder zero. (Position #2 is user default setting).

J15 2 pin Drive Type Select table expansion option. Default setting is open. If shorted it allows another full sequence of settings on switch block #1 to be used.

J16 2 pin drive zero select. When shorted J16 indicates that drive zero is connected via J4 and J5. When open J1 indicates that drive zero is connected via J1 or J3.

J16 must be removed on the Tallgrass models TG-20251 and TG-20250 that use a single cable to control tape and disk operations.

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### 4.1.3 Audible Error Codes

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Since it is sometimes impractical to display certain error messages on the screen, the Tallgrass BIOS also communicates errors by using a series of beeps that the PC emits when certain specific errors occur. The beeps are patterned to correspond to binary representations of numbered error codes, resulting in a "beep code" that tells what type of error has occurred. The table below shows the pattern and meaning for each of these codes.

KEY: S = SHORT BEEP L = LONG BEEP

Error Code	Sound Pattern	Error Condition
1	SSSL	CRC Generator Timeout. The CRC calculation did not occur within the predetermined amount of time.
2	SSLS	Read Timeout. A Read operation was initiated but a valid preamble was not detected.
3	SSSL	DMA Timeout. A DMA transfer was initiated but was unsuccessful.
4	SLSS	Head Stepping Error. A R/W head position command was issued but was unsuccessful.
5	SLSL	Head Homing Error. A command was given to position the R/W head to track 00 and was unsuccessful.
6	SLLS	Seek Error. The specified head failed to access the designated cylinder.

Figure 4.5 Audible Error Code

### 4.2.3.b C—CRC Error

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If the letter C is displayed in the column "Error Type" during the READ test, it indicates a CRC error. If CRC errors occur on all or many tracks when performing the READ test, escape from the READ test and select the INTERFACE test from the UTILITY menu. The INTERFACE test will run error free on properly-operating systems. Errors during the INTERFACE test must be eliminated before further testing can be attempted.

If the unit cannot pass the INTERFACE test and the CRC errors continue to occur, it indicates a bad buffer board or interface board. Replace the buffer board and/or the interface. See Section 4.2.2, "Unit Disassembly."

If the unit passes the INTERFACE test, but CRC errors continue from the READ test, exit from the INTERFACE test and enter the WRITE test.

NOTE: The WRITE test will destroy all data stored in the areas tested. Back up valuable data using the file-by-file method if possible because the streaming tape backup will simply put the errors back where they were using the UNSAVE from tape to disk.

If the unit cannot pass the WRITE test (if CRC errors persist), a bad buffer board is indicated. Replace the buffer board. See Section 4.2.2, "Unit Disassembly."

If the unit passes the WRITE test, go to the READ test.

If the initial READ test showed no errors or problems, load the data to the drive and run programs as usual.

If the unit cannot pass the READ test, call Tallgrass Customer Support. See Figure 4.3 for maximum allowable errors.

If the unit passes the READ test on one head only, pick up the HardFile and rotate the unit VERY SLOWLY on every possible axis while the READ test continues.

### 4.2.3.a T—Track Errors

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Stop the test and check the diagnostic MiniScribe LED. The LED is attached to the front of the MiniScribe hard disk enclosure. You must remove the HardFile cover in order to see it. (See Section 4.2.2, "Unit Disassembly.") If it is blinking even when the test is stopped, either the hard disk or the power supply is malfunctioning and must be replaced.

If the track error occurs on track 0 and only track 0, see if you can write to track 0 to reformat it. The problem may be a corrupted format, a firm error. Use EXAMINE to try to reformat the track.

If the track error occurs ONLY on track 0 and you cannot reformat it, the hard disk is unusable. Tracks 0, 1, 2, and 3 of all heads are used to store directory and mapping information. They are required to be defect-free. Tracks 0, 1, 2, and 3 are certified at the factory to be defect-free. If defects occur on these tracks, they are almost certainly the result of rough handling. Replace the hard disk. See Section 4.2.2, "Unit Disassembly."

If track errors occur on all tracks, possible shipping damage is indicated. Keeping in mind that the WRITE test is a destructive test, escape from the READ test and select WRITE from the UTILITY menu which will appear on the screen. Perform the WRITE test on all tracks of the drive in question.

If the unit passes the WRITE test without errors, escape the WRITE test and reinitiate the READ test performing it on all tracks.

Check the buffer board, the buffer connection, and cable.

Check the analog board, the analog connection, and cable.

Check the inter-board connector.

If the WRITE and/or READ tests do not solve the problem, replace the hard disk. See Section 4.2.2, "Unit Disassembly."

If errors occur as the HardFile is rotated, check the adjustment of the PLL. See Section 4.4.1, "Adjusting the Phase Lock Loop."

If the PLL checks okay, replace the hard disk. See Section 4.2.2, "Unit Disassembly."

If there is one CRC error that does not match a known badtrack, let the READ test run five passes to determine if the error is soft, firm, or hard. If the error is a hard error on a low order track, i.e. track 0, 1, 2, 3, use the EXAMINE SPECIFIED TRACK feature of UTILITY on the track where the error occurred. Should the C errors slowly increase as the READ test runs, you should troubleshoot the analog and buffer boards. See Flow Chart #2. Keep in mind that EXAMINE requires file erasure if a file resides on the track to be examined.

If examining the track reveals it to be bad, it must be entered in the BADTRACK file for that drive.

If examining the track shows it to be in working order, the problem has been corrected. Run the READ test again for the drive in question to confirm.

If the CRC error occurs in a low-numbered track (track 0, 1, 2), it could indicate a problem in the directory for that drive.

If the Duplicate Directory option has been activated, use the EXAMINE SPECIFIED TRACK feature and then the command COPYDUP to install a new directory. After the new directory is installed, try the READ test again.

If the CRC error occurs in a low-numbered track (track 0, 1, 2, 3) and the Duplicate Directory option is not activated, select the FORMAT/CERTIFY feature of UTILITY and begin formatting until the track showing errors has been passed. Escape from the FORMAT/CERTIFY feature at approximately track 03 and manually re-enter the known bad tracks in the BADTRACK file.

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If no errors were indicated by the formatting operation, the problem is solved. The user should take this opportunity at this point to enter any bad tracks that need to be added to the BADTRACK file for that drive.

Initiate the READ test again to verify that the track has been reformatted successfully.

If you have data that has been backed up on a tape cartridge, transfer it back to the logical drive.

#### 4.2.3.c C—Random CRC Errors

(New or different errors occur at each pass during the read test.)

Check the PLL. See Section 4.4.1 or 4.4.2, "Adjusting the Phase Lock Loop." If the PLL cannot be adjusted to give the proper result, and you are getting a small number of errors or getting duplicate errors for the same track, use EXAMINE SPECIFIED TRACK to correct. The duplicate errors should be entered in the BADTRACK file.

If you are getting a large number of C errors (more than five) or the READ test aborts, replace the buffer board. See Section 4.2.2, "Unit Disassembly."

#### 4.2.3.d D—Decoder Errors

Check the PLL. See Section 4.4.1 or 4.4.2, "Adjusting the Phase Lock Loop." If the PLL cannot be adjusted to give the proper result, replace the analog board. See Section 4.2.2, "Unit Disassembly." Run the READ test on the unit again to confirm that the problem has been corrected.

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#### 4.2.3.g W—Write Errors

Run EXAMINE SPECIFIED TRACK in the UTILITY program and enter any bad tracks in the BADTRACK file. EXAMINE sometimes corrects the error as it reformats the track being examined.

Run the INTERFACE test in the UTILITY program to check interface connections.

Replace the buffer board. See Section 4.2.2, "Unit Disassembly."

#### 4.2.3.h B—Busy Error

This error occurs when multiple systems are being formatted with the UL11 software.

#### 4.2.3.e V—Verify Errors

(These will occur during the INTERFACE test.)

Check the microprocessor for conditions that could interfere with the HardFile, such as power line noise.

If this error occurs, replace the interface board. See Section 4.2.2, "Unit Disassembly." Then use the READ test of UTILITY to see if the problem has been corrected.

If replacing the interface board did not solve the problem, replace the buffer board. Again check the unit with the READ test to confirm that the problem has been corrected.

#### 4.2.3.f R—Ready Errors

These errors occur if the hard disk is not completely up to speed or if the system is losing power. Check the power sources including the system line cord, the fuse, the transformer, and the power supply. See Section 4.4.6, "Adjusting the Dual Power Supply," or Flow Chart #4.

Run SPEEDTST to check the motor speed.

Reboot with your Tallgrass Boot Diskette to check the power-up process.

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Strapping the Controller Board (see Figure 7)

The following charts are used to determine the correct pin number, the number of drives, and if a device driver is used.

The Board Strapping - (Revision 1) Software Version 1.3, ROM 1.4 Revision A&B Pins 9 & 1 are reversed

Count from right to left on jumper block, start with 0.

Tallgrass Model	Attributes	Pin #	Drive Type	TS Code	Device Driver Needed
(None)		0			
TG-6025	One 25MB drive	1	A/B	no	
TG-6150	50MB drive opt. 1-16 drives	2	CDC	C	Yes
TG-6135	35MB drive opt. 1-16 drives	3	CDC	C	no
TG-6150	Two 25MB drives	4	CDC	B	Yes
TG-6100	50MB drive opt. 1-16 drives	5	CDC	C	Yes
TG-6025	Two 12.5MB drives	6	A/B	no	
TG-6135	One 20MB drive	7	Misc	no	
TG-6012	One 12MB drive	8	CDC	B	no
TG-6150	50MB drive opt. 1-16 drives	10	Misc	C	Yes
TG-6150	Two 25MB drives	11	Misc	C	no
(None)		12-16			

The Board Strapping - (Revision A & B) Version 1.0, ROM 1.3 and Version 2.0, ROM 2.0

Tallgrass Model	Attributes	Pin #	Drive Type	TS Code	Device Driver Needed
(None)		0			
TG-6150	50MB drive opt. 1-16 drives	1	Misc	C	Yes
TG-6025	One 25MB drive	2	A/B	no	
TG-6135	35MB drive opt. 1-16 drives	3	CDC	B	Yes
TG-6150	Two 25MB drives	4	Misc	C	Yes
TG-6100	50MB drive opt. 1-16 drives	5	CDC	B	Yes
TG-6025	Two 12.5MB drives	6	A/B	no	
TG-6020	One 20MB drive	7	Misc	no	
TG-6135	One 17.5MB drive	8	CDC	B	no
TG-6012	One 12MB drive	9	Misc	C	no
TG-6150	Two 25MB drives	10	CDC	C	no
TG-6150	50MB drive opt. 1-16 drives	11	CDC	C	Yes
(None)		12-16			

\*25MB code A drives are Seagate, LaPine, or Misc; code B drives are Fujitsu

AIC Drive Select Dip Switch Chart Version 1.3

Tallgrass Drive Type/Size	# of Logical Drives	Switch Number							
		1	2	3	4	5	6	7	8
A/25MB	1	00	00	00	00	00	00	00	00
	2	00	00	OFF	00	00	00	00	00
B/35MB	2	00	00	00	00	00	00	OFF	00
	1 to 16	OFF	00	00	00	00	00	00	00
C/50MB	2	00	00	00	00	OFF	00	00	00
	1 to 16	00	00	00	00	00	00	00	OFF
E/50MB	2	00	00	00	00	00	00	OFF	00
	1 to 16	00	00	00	00	00	00	OFF	OFF
B/50MB	1 to 16*	00	00	00	OFF	00	00	00	00

\*The 50MB drive defaults as 1 physical drive which can be divided into 16 logical drives. A device driver is necessary to configure 2 - 16 drives.

AIC Drive Select Dip Switch Package Version 2.0

Tallgrass Drive Type/Size	# of Logical Drives	Switch Number							
		1	2	3	4	5	6	7	8
A/B/25MB	1	00	00	00	00	00	00	OFF	00
	2	00	00	OFF	00	00	00	00	00
B/35MB	2	OFF	00	00	00	00	00	00	00
	1 to 16	00	00	00	00	00	00	OFF	00
C/50MB	2	00	00	00	00	00	00	OFF	00
	1 to 16	00	00	00	00	00	00	OFF	OFF
E/50MB	2	00	00	00	00	OFF	00	00	00
	1 to 16	00	00	00	00	00	00	00	OFF
B/50MB	1 to 16*	00	00	00	OFF	00	00	00	00

Figure 8 AIC Board Drive Select Dip Switches

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Boot Strap Size

Fixed Boot: size for drive 1 is fixed (no Option on P015K)

- All units with user selected jumpers or switches will have a default boot drive which may not be changed by the user. ROM Version 1.2 will default boot at approximately 50MB for 50MB drive. ROM Version 1.3 sets the boot drive at 5MB for models 50MB and 50MB drives. A 50MB drive requires 1.3 ROM and 1.4 Tallgrass disk software.

Alternate Boot: variable size for drive 1 (no Configure Logical Drives option on P015K)

- All units with no ROM installed on the interface will have 1-16 installable logical drives. These units will not have self-boot capability and must be booted from a floppy or a resident hard drive. They should be set as user selected or problems may occur.

Boot ROM Sizes The Revision A Boards

TS Unit	Pin #	1.2	1.3	2.0 Version
None	0			
50MB	1	4.60MB	4.60MB	5.97MB
35MB	2	23.86MB	23.86MB	23.86MB
50MB/2	4	24.96MB	24.96MB	24.96MB
50MB	5	11.91MB	11.91MB	11.91MB
25MB/2	6	11.97MB	4.92MB	4.92MB
25MB	7	18.71MB	11.97MB	11.97MB
35MB/2	8	8.39MB	18.71MB	8.39MB
12MB	9	11.91MB	4.92MB	4.92MB
50MB	10	Error Reading	41.91MB	11.91MB
50MB/2	11	Fixed disk TG-021	4.92MB	4.15MB
None	12		24.96MB	24.96MB
None	13			
None	14			

Using the Status Determination Chart

- Before running P015K, refer to the Status Determination Chart. Here is an example of how to use the chart.

- If you have a 50MB hard disk on which you changed the default drive setting and you have 1 resident 50MB Tallgrass drive, the chart indicates that you have 2 Tallgrass drives each containing 12.5MB. Five options appear on your P015K Main Menu. You have a ROM device driver because DOS limits ROM drives to two. Your resident drive is ignored (unless you change your configuration using Appendix B). The two Tallgrass drives are identified as C and B.

5.2 TEST

Disk test is found on version 1.3 and 2.0 disk and tape software. Also it is accessed through the Main Menu of ITEST on a special version of 2.0 software.

Power On

- Turn on PC and Hardfile.
- No errors are allowed on power up boot sequence.
- If any occur, see section Appendix G or Appendix H.
- Once the system is booted up, say in:

ITEST if you have a TMC board  
 ITEST/E16 if you have an AIC board  
 ITEST/E0 if you have an AIC board

- ITEST will display "Interface test in progress." Interface from PC to trace buffer on TMC Board is being tested.

- ITEST runs approximately 30 seconds. Then it displays "Interface test is completed successfully."

- No errors are allowed on interface test. Remember Interrupt 03 must be selected for ITEST to work.

Note: Other cards addressing interrupt 03 may need to be temporarily removed in order to successfully complete ITEST which exercises interrupt 03. The jumper may then be removed or disabled from the Tallgrass Interface Card because normal operation does not use interrupt 03.

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5.3 DTEST

**Definition:** DTEST is a program available to end-users on version 1.3 software. It tests the HardFile using configuration information entered when running the PBISE program. This program will not write to physical track zero. Flawed tracks found differ slightly from the flow map inside the cover of the HardFile.

We recommend the use of CBISK. CBISK must be run to format/certify or to write flow map to physical track zero. See Section 5.4 for CBISK information.

**General Information**

**Controller functions**

- Once DTEST is completed, key in DTEST.
- From DTEST menu, select "R" for Read Test. Allow Read Test to go 1 pass.
- Any errors with "F" in the type of error column are factory flaws and may be disregarded.
- Select "3" to stop Read Test and press any key to return to DTEST menu.
- From the DTEST menu, select "W" to start Write Test.
- Write Test may be terminated after 20 cylinders have been written by striking the "3" key.
- No errors are allowed on Write Test excluding "F" type errors which are known factory flaws.
- After Write Test return to DTEST menu and select "R" to quit DTEST. If any of the previous conditions have not been met, refer to Appendix I, Troubleshooting.

**DTEST Screen Features**

- Write test, 2 passes
- Verify test, 3 passes
- Certify
- Examine specified track - on any other than "F" type errors if tracks examined fail and they are not listed in the flow map, you must run DBISE program on that drive.
- Display flow map *if you want to see the flow map*
- Quit

**Write Test DATA DESTRUCTIVE**

**Definition:** This is a quick test of the disk surface and stepper for shipping damage operated by writing a pattern and reading it back.

- Execute 2 passes.
- Any track incurring 2 total errors will be logged into the bad track file.
- Examine other than "F" type errors (see Examine).
- You must run DBISE, if bad tracks are found.

**Read Test NON-DESTRUCTIVE**

**Definition:** This is a program used to verify the ability of the hard disk to read all disk drive surfaces.

**General Information**

- After you execute 3 passes, press 3 to stop the test.
- It tests all tracks and surfaces for errors.
- It reads each track of data into track buffer.
- It generates new CRC and compares to CRC what was read from disk.

**Certify DATA DESTRUCTIVE**

**Definition:** This is a program which certifies the hard disk by writing and reading test data to and from the specified drive.

**General Information**

- You should execute 1 pass and Examine any soft errors to be sure they are soft.
- Certify tests each track with 32 different writes and reads.
- Certify tests each track 5 seconds.

**Hard and Soft Errors**

- Hard errors show up as 2 or more in the # of tries column on the Certify screen.
- Soft errors show up as 1 error in # of tries column on the format screen. A soft error to a tracking error that DOS would pick up.
- Verify all errors with CBISK.

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5.4 CBISK

**Definition:** CBISK is the factory diagnostic program for the hard drive and should not be released to end-users. CBISK is required to access physical track 0. It may be used to reformat and certify a drive, to reload the flow map, and to test the data integrity of the Tallgrass system.

**Backup**

- Before running CBISK, make a backup of data on the hard disk.

**Setup**

- Format a bootable floppy. At the B> key in `FORMAT B: /s`
- Copy the diagnostic disk software to the diskette.
- Copy ANSI.SYS from your DOS program files to the diskette.
- If you have not booted from a drive with ANSI.SYS on the root and with DEVICE=ANSI.SYS in the CDMFIS.SYS file, you will get garbage when you try to run CBISK.
- Make a CDMFIS.SYS file that loads ANSI.SYS, by keying in

```
Copy con CDMFIS.SYS <CR>
Device=ANSI.SYS <CR>
01 <CR>
```

- At this point your screen should display "one file copied."

Write to Track 0 (Jumpers 16 & 18 on THE Controller Board, Rev A & B and above)

- Rev A and newer boards have a hardware enable/disable write to physical track zero. (See Figure 6). The jumper must be set on J16 to allow writing to the flow map. This is necessary for Write and Format/Certify. Set the Jumper on J16 after completion to disable the ability to write to track zero. Rev 1 boards are not affected.

**Operation**

- Boot up from a floppy to run CBISK.
- Key in CBISK <CR>.
- Make your selection from the following menu:

```
Tallgrass Technologies Corporation
Manufacturing's CBISK
32 MB Version for TMC Drive
```

- ```
F - Format/Certify ***ERASES ALL INFORMATION***
1 - Show errors for Part 200
2 - Show errors for Part 200
3 - Show errors for Part 200
4 - Show errors for Part 200
5 - Show Pass Statistics
R - Resume Routine After Power Fall
V - Verify (Read Test)
W - Write Test
E - Display Flawed Tracks
X - Examine a Track
Q - Quit
```

- Enter your selection.

**\*NOTE** If you have not booted from a drive with ANSI.SYS on the root and with device=ANSI.SYS in the CDMFIS.SYS file, you will get garbage when you try to run CBISK.

**Program Functions**

- Remember your interface card is factory set to port 200. When you choose format/certify, other parts are displayed as aborted, and the errors on the screen refer to the active part. The errors are displayed starting in the first column regardless of which port is selected.
- **F - Format/Certify DATA DESTRUCTIVE**
- This test allows certification of the hard drive and allows you to enter bad tracks to the flow map on cylinder zero. This should be done with caution because the existing flow map will be destroyed.
- Any tracks found bad with two or more errors during the certify process will be added to the flow map that you enter when you selected (F)format/certify.
- Now bad tracks found in Format/Certify should be added to the Flow Map sticker inside the cover for future reference. Use a ball point pen to record this information.
- Use the [Esc] key to rebuild the flow map without completing certification.

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To run Format/Certify

- Enter F from menu.
  - Set number of passes to be made. <CR> for default of 3.
  - Enter the tracks from the flow list sticker located inside the cover or on the bottom of the drive. After all bad tracks are entered, press <CR> to proceed.
- Errors may be corrected using the backspace key and re-entering the number. If an incorrect number is entered, you will need to return to the menu and start over.
- Select Y to continue or Esc to return to menu. Y is necessary to create a new flow map or format the drive.
- As the program is running, you will see errors for port 280, the default port. All other ports will show an abort for the error count.
  - Optional, use the Esc key without completing Format/Certify to rewrite the flow map on physical track zero. FDISK and DDISK will need to be run again.

Example of Errors on Port 280. Notice the other ports are aborted.

| CERTIFYING |      |       | Track 0000 |      |       | Head 00 280 |      |       | Press <ESC> to exit. |      |       |
|------------|------|-------|------------|------|-------|-------------|------|-------|----------------------|------|-------|
| Port       | Pass | Error | Port       | Pass | Error | Port        | Pass | Error | Port                 | Pass | Error |
| 280        | 0000 | ABORT | 280        | 0000 | 00000 | 290         | 0000 | ABORT |                      |      |       |
| Trk        | Ms   | Cat   | T          | P    | Pl    | Trk         | Ms   | Cat   | T                    | P    | Pl    |
| 01A        | 00   | 01A   | F          | 0    | 10    |             |      |       |                      |      |       |
| 256        | 00   | 010   | F          | 0    | 03    |             |      |       |                      |      |       |
| 312        | 02   | 01A   | C          | 0    | 12    |             |      |       |                      |      |       |
| 312        | 03   | 011   | F          | 0    | 09    |             |      |       |                      |      |       |

S - Show Pass Statistics NON DESTRUCTIVE

This function displays a table that shows on which reads and writes certify errors have occurred. Certify attempts to write and read 32 times to each track on each pass. An error is counted each time that read fails to read what is written on a track.

B - Resume Routine After Power Fail During Format DESTRUCTIVE

Resume recovers information written to the disk during Format/Certify. It sets up the screen so the errors were last recorded and resume certify at that point.

A drive that has aborted the test with too many errors does not restart.

V - Verify (Read Test) NON DESTRUCTIVE

Read test attempts to read each track one time per pass. It will detect hard and soft errors. Tracks written to the flow map may appear with either "F" (flow flag set) or "C" (can not be read) type errors.

Tracks that show up bad are not listed on the flow map should be examined.

W - Write Test DATA DESTRUCTIVE

Write test is identical to Certify except it writes only once to each track per pass. It may be used as a quick erase to clear a disk.

D - Display Flamed Tracks NON DESTRUCTIVE

This function shows the flow map from track zero. If you rewrite the flow map, it may be necessary to quit from CDISK to flush the buffer so that you can read the new changes.

E - Examine Track DATA DESTRUCTIVE

ALWAYS BACK UP LIVE DATA BEFORE USING EXAMINE

Examine allows you to fix soft errors, tracks that appear to be bad, and to show hard errors, tracks that are bad.

Hard errors must be added to the flow map using Format/Certify or the Write Test. Examine will not alter the flow map.

Q - Quit NON DESTRUCTIVE

This will move the heads to the landing zone and exit the program to DOS.

TALLGRASS 6000

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# Tech Talk

DAVONG  
Internal and UDS

## Micro Products

September 9, 1985

Category D. Hardware

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### D1 FIXED DISK SWITCH SETTINGS

Adapter for UDS (external drive):

SW1 - 4, 7, and 8 OFF; All others ON

SW2 - 2, 4, and 8 ON; All others OFF

Controller for internal drive:

Single board: SW1 - 4, 7, and 8 OFF; All others ON

Double board (piggyback):

SW1 - 4, 7, and 8 OFF; All others ON

SW2 - 2, 4, and 8 ON; All others OFF

Originator: Ron Rowe 10/25/84

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### D2 DISK DRIVE SPECIFICATIONS

|              | MODEL | SIZE    | CYLS. | HEADS |
|--------------|-------|---------|-------|-------|
| TANDON       |       |         |       |       |
|              | 501   | 5 MB    | 306   | 2     |
|              | 502   | 10 MB   | 306   | 4     |
|              | 503   | 15 MB   | 306   | 6     |
|              | 602   | 5 MB    | 153   | 4     |
|              | 603   | 12 MB   | 230   | 6     |
| DISCTRON     |       |         |       |       |
|              | 507   | 5 MB    | 306   | 2     |
|              | 514   | 10 MB   | 306   | 4     |
|              | 519   | 15 MB   | 306   | 6     |
|              | 526   | 21 MB   | 306   | 8     |
| CMI          |       |         |       |       |
|              | 5206  | 5 MB    | 306   | 2     |
|              | 5412  | 10 MB   | 306   | 4     |
|              | 5619  | 15 MB   | 306   | 6     |
|              | 6213  | 10.5 MB | 640   | 2     |
|              | 6426  | 21 MB   | 640   | 6     |
|              | 6640  | 31.5 MB | 640   | 6     |
| QUANTUM      |       |         |       |       |
|              | 540   | 34 MB   | 511   | 8     |
| RODIME/AMPEX |       |         |       |       |
|              | P7    | 5 MB    | 230   | 2     |
|              | P13   | 10 MB   | 320   | 4     |
|              | P20   | 15 MB   | 320   | 6     |
|              | P27   | 21 MB   | 320   | 8     |
| RODIME       |       |         |       |       |
|              | 202   | 10 MB   | 320   | 4     |
|              | 203   | 15 MB   | 320   | 6     |
|              | 204   | 21 MB   | 320   | 8     |
|              | 203E  | 32 MB   | 640   | 6     |
|              | 204E  | 40 MB   | 640   | 8     |

Reference: Davong

Originator: Ron Rowe

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# Wren Controllers

| Company<br>Telephone<br>Model            | Disk Drive<br>Interface    |                       |                  | Applicable<br>Host Bus     |                            |                                 |                                      |                  |                                      |                            |                       |                       |                                      |  |
|------------------------------------------|----------------------------|-----------------------|------------------|----------------------------|----------------------------|---------------------------------|--------------------------------------|------------------|--------------------------------------|----------------------------|-----------------------|-----------------------|--------------------------------------|--|
|                                          | S<br>T<br>S<br>D<br>S<br>I | E<br>S<br>C<br>S<br>I | S<br>C<br>S<br>I | I<br>B<br>M<br>-<br>P<br>C | I<br>B<br>M<br>-<br>X<br>T | I<br>B<br>M<br>-<br>V<br>M<br>E | M<br>I<br>C<br>R<br>O<br>V<br>A<br>X | Q<br>B<br>U<br>S | M<br>U<br>L<br>T<br>I<br>B<br>U<br>S | U<br>N<br>I<br>B<br>U<br>S | S<br>B<br>B<br>I<br>T | 1<br>B<br>B<br>I<br>T | M<br>C<br>R<br>O<br>C<br>H<br>N<br>L |  |
| <b>Adaptec, Inc.</b><br>408-946-8800     |                            |                       |                  |                            |                            |                                 |                                      |                  |                                      |                            |                       |                       |                                      |  |
| ACB-2322                                 |                            | X                     |                  |                            |                            | X                               |                                      |                  |                                      |                            |                       |                       |                                      |  |
| ACB-2320                                 |                            | X                     |                  |                            |                            | X                               |                                      |                  |                                      |                            |                       |                       |                                      |  |
| ACB-2010A                                | X                          |                       |                  | X                          |                            |                                 |                                      |                  |                                      |                            |                       |                       |                                      |  |
| ACB-4000A                                | X                          |                       |                  | X                          |                            |                                 |                                      |                  |                                      |                            |                       |                       |                                      |  |
| ACB-4010A                                | X                          |                       |                  | X                          |                            |                                 |                                      |                  |                                      |                            |                       |                       |                                      |  |
| ACB-4020                                 |                            | X                     |                  | X                          |                            |                                 |                                      |                  |                                      |                            |                       |                       |                                      |  |
| ACB-4520A                                |                            | X                     |                  | X                          |                            |                                 |                                      |                  |                                      |                            |                       |                       |                                      |  |
| ACB-5500                                 | X                          |                       |                  | X                          |                            |                                 |                                      |                  |                                      |                            |                       |                       |                                      |  |
| ACB-2072 (RLL)                           | X                          |                       |                  |                            | X                          |                                 |                                      |                  |                                      |                            |                       |                       |                                      |  |
| ACB-2370 (RLL)                           | X                          |                       |                  |                            | X                          |                                 |                                      |                  |                                      |                            |                       |                       |                                      |  |
| ACB-4070 (RLL)                           | X                          |                       |                  | X                          |                            |                                 |                                      |                  |                                      |                            |                       |                       |                                      |  |
| AHA-1530                                 |                            |                       | X                |                            |                            |                                 |                                      |                  | X                                    |                            |                       |                       |                                      |  |
| <b>Andromeda</b><br>818-708-7800         |                            |                       |                  |                            |                            |                                 |                                      |                  |                                      |                            |                       |                       |                                      |  |
| UDC-11                                   | X                          |                       |                  |                            |                            |                                 | X                                    | X                |                                      |                            |                       |                       |                                      |  |
| UDC-11X                                  | X                          |                       |                  |                            |                            |                                 | X                                    | X                |                                      |                            |                       |                       |                                      |  |
| WDC-11                                   | X                          |                       |                  |                            |                            |                                 | X                                    | X                |                                      |                            |                       |                       |                                      |  |
| ESDC                                     |                            | X                     |                  |                            |                            |                                 | X                                    | X                |                                      |                            |                       |                       |                                      |  |
| <b>Centan</b><br>408-734-1006            |                            |                       |                  |                            |                            |                                 |                                      |                  |                                      |                            |                       |                       |                                      |  |
| NDC 5027                                 | X                          |                       |                  | X                          |                            |                                 |                                      |                  |                                      |                            |                       |                       |                                      |  |
| <b>Ciprico</b><br>612-558-2034           |                            |                       |                  |                            |                            |                                 |                                      |                  |                                      |                            |                       |                       |                                      |  |
| 1400                                     |                            | X                     |                  |                            |                            |                                 |                                      |                  | X                                    |                            |                       |                       |                                      |  |
| 3400                                     |                            | X                     |                  |                            |                            | X                               |                                      |                  |                                      |                            |                       |                       |                                      |  |
| 3500                                     |                            |                       | X                |                            |                            | X                               |                                      |                  |                                      |                            |                       |                       |                                      |  |
| <b>Data Syst. Design</b><br>408-946-5800 |                            |                       |                  |                            |                            |                                 |                                      |                  |                                      |                            |                       |                       |                                      |  |
| 5317                                     | X                          |                       |                  |                            |                            |                                 |                                      |                  |                                      |                            | X                     |                       |                                      |  |

| Company<br>Telephone<br>Model                           | Disk Drive<br>Interface    |                       |                  | Applicable<br>Host Bus     |                            |                                 |                                      |                  |                                      |                            |                       |                       |                                      |  |
|---------------------------------------------------------|----------------------------|-----------------------|------------------|----------------------------|----------------------------|---------------------------------|--------------------------------------|------------------|--------------------------------------|----------------------------|-----------------------|-----------------------|--------------------------------------|--|
|                                                         | S<br>T<br>S<br>D<br>S<br>I | E<br>S<br>C<br>S<br>I | S<br>C<br>S<br>I | I<br>B<br>M<br>-<br>P<br>C | I<br>B<br>M<br>-<br>X<br>T | I<br>B<br>M<br>-<br>V<br>M<br>E | M<br>I<br>C<br>R<br>O<br>V<br>A<br>X | Q<br>B<br>U<br>S | M<br>U<br>L<br>T<br>I<br>B<br>U<br>S | U<br>N<br>I<br>B<br>U<br>S | S<br>B<br>B<br>I<br>T | 1<br>B<br>B<br>I<br>T | M<br>C<br>R<br>O<br>C<br>H<br>N<br>L |  |
| <b>Data Technology</b><br>408-727-8898                  |                            |                       |                  |                            |                            |                                 |                                      |                  |                                      |                            |                       |                       |                                      |  |
| 6180                                                    |                            | X                     |                  |                            |                            |                                 |                                      |                  | X                                    |                            |                       |                       |                                      |  |
| 6280                                                    |                            | X                     |                  |                            |                            |                                 |                                      |                  | X                                    |                            |                       |                       |                                      |  |
| 7180                                                    | X                          |                       |                  |                            |                            |                                 |                                      |                  | X                                    |                            |                       |                       |                                      |  |
| 7187 (RLL)                                              | X                          |                       |                  |                            |                            |                                 |                                      |                  | X                                    |                            |                       |                       |                                      |  |
| DTC-510DB                                               | X                          |                       |                  | X                          |                            |                                 |                                      |                  |                                      |                            |                       |                       |                                      |  |
| DTC-520DB                                               | X                          |                       |                  | X                          |                            |                                 |                                      |                  |                                      |                            |                       |                       |                                      |  |
| DTC-530DB                                               | X                          |                       |                  | X                          |                            |                                 |                                      |                  |                                      |                            |                       |                       |                                      |  |
| DTC-5150                                                | X                          |                       |                  |                            | X                          | X                               |                                      |                  |                                      |                            |                       |                       |                                      |  |
| DTC-5160 (RLL)                                          | X                          |                       |                  |                            | X                          | X                               |                                      |                  |                                      |                            |                       |                       |                                      |  |
| DTC-5250                                                | X                          |                       |                  |                            | X                          | X                               |                                      |                  |                                      |                            |                       |                       |                                      |  |
| DTC-5180                                                | X                          |                       |                  |                            |                            | X                               |                                      |                  |                                      |                            |                       |                       |                                      |  |
| DTC-5187 (RLL)                                          | X                          |                       |                  |                            |                            | X                               |                                      |                  |                                      |                            |                       |                       |                                      |  |
| DTC-5287 (RLL)                                          | X                          |                       |                  | X                          | X                          |                                 |                                      |                  |                                      |                            |                       |                       |                                      |  |
| DTC-5280 (RLL)                                          | X                          |                       |                  |                            | X                          |                                 |                                      |                  |                                      |                            |                       |                       |                                      |  |
| DTC-51-2                                                | X                          |                       |                  | X                          |                            |                                 |                                      |                  |                                      |                            | X                     |                       |                                      |  |
| <b>Dilog</b><br>714-937-5700                            |                            |                       |                  |                            |                            |                                 |                                      |                  |                                      |                            |                       |                       |                                      |  |
| DQ614                                                   | X                          |                       |                  |                            |                            |                                 |                                      |                  | X                                    | X                          |                       |                       |                                      |  |
| DQ615                                                   | X                          |                       |                  |                            |                            |                                 |                                      |                  | X                                    | X                          |                       |                       |                                      |  |
| DQ656                                                   |                            | X                     |                  |                            |                            |                                 |                                      |                  |                                      | X                          |                       |                       |                                      |  |
| DQ686                                                   |                            | X                     |                  |                            |                            |                                 |                                      |                  |                                      | X                          |                       |                       |                                      |  |
| SQ706                                                   |                            |                       | X                |                            |                            |                                 |                                      |                  |                                      | X                          | X                     |                       |                                      |  |
| <b>Distributed<br/>Processing Tech.</b><br>305-830-5522 |                            |                       |                  |                            |                            |                                 |                                      |                  |                                      |                            |                       |                       |                                      |  |
| PM3010/50                                               | X                          |                       |                  |                            |                            |                                 |                                      |                  | X                                    |                            |                       |                       |                                      |  |
| PM3010C/XX                                              |                            | X                     |                  |                            |                            |                                 |                                      |                  | X                                    |                            |                       |                       |                                      |  |
| <b>Dual System Corp.</b><br>415-548-3854                |                            |                       |                  |                            |                            |                                 |                                      |                  |                                      |                            |                       |                       |                                      |  |
| VESDI-32E                                               |                            | X                     |                  |                            |                            |                                 |                                      |                  |                                      | X                          |                       |                       |                                      |  |
| VUSC                                                    |                            | X                     |                  |                            |                            |                                 |                                      |                  |                                      | X                          |                       |                       |                                      |  |





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# Wren Controllers

| Company<br>Telephone<br>Model           | Disk Drive<br>Interface |                  |                  |                  | Applicable<br>Host Bus     |                            |                                 |             |                                      |                  |                            |                                      |                  |                       |                                      |
|-----------------------------------------|-------------------------|------------------|------------------|------------------|----------------------------|----------------------------|---------------------------------|-------------|--------------------------------------|------------------|----------------------------|--------------------------------------|------------------|-----------------------|--------------------------------------|
|                                         | S<br>S<br>S<br>S        | T<br>E<br>D<br>S | E<br>C<br>S<br>C | S<br>C<br>S<br>C | I<br>B<br>M<br>-<br>P<br>C | I<br>B<br>M<br>-<br>X<br>T | I<br>B<br>M<br>-<br>A<br>M<br>E | V<br>A<br>X | M<br>I<br>C<br>R<br>O<br>V<br>A<br>X | Q<br>B<br>U<br>S | U<br>N<br>I<br>B<br>U<br>S | M<br>U<br>L<br>T<br>I<br>B<br>U<br>S | S<br>B<br>I<br>T | 1<br>S<br>B<br>I<br>T | M<br>C<br>R<br>O<br>C<br>H<br>N<br>L |
| <b>Emulex Corp.</b><br>714-862-5800     |                         |                  |                  |                  |                            |                            |                                 |             |                                      |                  |                            |                                      |                  |                       |                                      |
| DM01                                    | X                       |                  |                  |                  |                            |                            |                                 |             |                                      | X                |                            |                                      |                  |                       |                                      |
| DM02                                    |                         | X                |                  |                  |                            |                            |                                 |             |                                      | X                |                            |                                      |                  |                       |                                      |
| MD01                                    | X                       |                  |                  | X                |                            |                            |                                 |             |                                      |                  |                            |                                      |                  |                       |                                      |
| MD21                                    |                         | X                |                  | X                |                            |                            |                                 |             |                                      |                  |                            |                                      |                  |                       |                                      |
| <b>IB02</b>                             |                         |                  | X                |                  | X                          | X                          | X                               |             |                                      |                  |                            |                                      |                  |                       |                                      |
| QD21                                    |                         | X                |                  |                  |                            |                            |                                 |             |                                      | X                |                            |                                      |                  |                       |                                      |
| UC04                                    |                         | X                |                  |                  |                            |                            |                                 |             | X                                    | X                |                            |                                      |                  |                       |                                      |
| MD23                                    |                         | X                |                  | X                |                            |                            |                                 |             |                                      |                  |                            |                                      |                  |                       |                                      |
| <b>Future Domain</b><br>714-258-0400    |                         |                  |                  |                  |                            |                            |                                 |             |                                      |                  |                            |                                      |                  |                       |                                      |
| TMC-1620                                |                         |                  |                  | X                |                            |                            |                                 |             |                                      | X                |                            |                                      |                  |                       |                                      |
| TMC-1670                                |                         |                  |                  | X                |                            |                            |                                 |             |                                      | X                |                            |                                      |                  |                       |                                      |
| TMC-870                                 |                         |                  |                  | X                |                            | X                          | X                               | X           |                                      | X                |                            |                                      |                  |                       |                                      |
| TMC-830                                 |                         |                  |                  | X                |                            | X                          | X                               | X           |                                      | X                |                            |                                      |                  |                       |                                      |
| TMC-820                                 |                         |                  |                  | X                |                            | X                          | X                               | X           |                                      | X                |                            |                                      |                  |                       |                                      |
| MCS-350                                 |                         |                  |                  | X                |                            |                            |                                 |             |                                      |                  |                            |                                      |                  |                       | X                                    |
| <b>General Robotics</b><br>414-673-6800 |                         |                  |                  |                  |                            |                            |                                 |             |                                      |                  |                            |                                      |                  |                       |                                      |
| QD01/D                                  | X                       |                  |                  |                  |                            |                            |                                 |             |                                      | X                |                            |                                      |                  |                       |                                      |
| QD21                                    |                         | X                |                  |                  |                            |                            |                                 |             |                                      | X                |                            |                                      |                  |                       |                                      |
| MWV22                                   | X                       |                  |                  |                  |                            |                            |                                 |             | X                                    | X                |                            |                                      |                  |                       |                                      |
| <b>HSC</b><br>408-870-0242              |                         |                  |                  |                  |                            |                            |                                 |             |                                      |                  |                            |                                      |                  |                       |                                      |
| SCSIPC-5380                             |                         |                  |                  | X                |                            |                            | X                               |             |                                      |                  |                            |                                      |                  |                       |                                      |
| <b>Interphase Corp.</b><br>214-350-9000 |                         |                  |                  |                  |                            |                            |                                 |             |                                      |                  |                            |                                      |                  |                       |                                      |
| Storage                                 | X                       | X                |                  |                  |                            |                            |                                 |             |                                      |                  |                            |                                      | X                |                       |                                      |
| V/ESDI-3201                             |                         | X                |                  |                  |                            |                            |                                 |             | X                                    |                  |                            |                                      |                  |                       |                                      |
| <b>Introl</b><br>612-631-7800           |                         |                  |                  |                  |                            |                            |                                 |             |                                      |                  |                            |                                      |                  |                       |                                      |
| 300                                     |                         |                  |                  | X                |                            |                            |                                 |             | X                                    |                  |                            |                                      |                  |                       |                                      |
| <b>Kenan Corp.</b><br>802-346-1300      |                         |                  |                  |                  |                            |                            |                                 |             |                                      |                  |                            |                                      |                  |                       |                                      |
| DJ1100                                  | X                       |                  |                  |                  | X                          |                            |                                 |             |                                      |                  |                            |                                      |                  |                       |                                      |
| ESDI-2200                               |                         | X                |                  | X                |                            |                            |                                 |             |                                      |                  |                            |                                      |                  |                       |                                      |

| Company<br>Telephone<br>Model                       | Disk Drive<br>Interface |                  |                  |                  | Applicable<br>Host Bus     |                            |                                 |             |                                      |                  |                            |                                      |                  |                       |                                      |
|-----------------------------------------------------|-------------------------|------------------|------------------|------------------|----------------------------|----------------------------|---------------------------------|-------------|--------------------------------------|------------------|----------------------------|--------------------------------------|------------------|-----------------------|--------------------------------------|
|                                                     | S<br>S<br>S<br>S        | T<br>E<br>D<br>S | E<br>C<br>S<br>C | S<br>C<br>S<br>C | I<br>B<br>M<br>-<br>P<br>C | I<br>B<br>M<br>-<br>X<br>T | I<br>B<br>M<br>-<br>A<br>M<br>E | V<br>A<br>X | M<br>I<br>C<br>R<br>O<br>V<br>A<br>X | Q<br>B<br>U<br>S | U<br>N<br>I<br>B<br>U<br>S | M<br>U<br>L<br>T<br>I<br>B<br>U<br>S | S<br>B<br>I<br>T | 1<br>S<br>B<br>I<br>T | M<br>C<br>R<br>O<br>C<br>H<br>N<br>L |
| <b>Micro Technology</b><br>714-632-7580             |                         |                  |                  |                  |                            |                            |                                 |             |                                      |                  |                            |                                      |                  |                       |                                      |
| MQD12                                               | X                       |                  |                  |                  |                            |                            |                                 |             |                                      | X                |                            |                                      |                  |                       |                                      |
| MQD13                                               |                         | X                |                  |                  |                            |                            |                                 |             |                                      | X                |                            |                                      |                  |                       |                                      |
| MQD14                                               | X                       | X                |                  |                  |                            |                            |                                 |             |                                      | X                |                            |                                      |                  |                       |                                      |
| <b>Mini Computer Tech</b><br>408-942-1616           |                         |                  |                  |                  |                            |                            |                                 |             |                                      |                  |                            |                                      |                  |                       |                                      |
| MCT1700                                             |                         | X                |                  |                  |                            |                            |                                 |             |                                      |                  | X                          |                                      |                  |                       |                                      |
| MCT6700                                             |                         | X                |                  |                  |                            |                            |                                 |             | X                                    |                  |                            |                                      |                  |                       |                                      |
| <b>MDS</b><br>714-888-8800                          |                         |                  |                  |                  |                            |                            |                                 |             |                                      |                  |                            |                                      |                  |                       |                                      |
| MLSI-ESDI-RM                                        |                         | X                |                  |                  |                            |                            |                                 |             |                                      | X                | X                          |                                      |                  |                       |                                      |
| <b>NCR</b><br>1-800-325-8CSI                        |                         |                  |                  |                  |                            |                            |                                 |             |                                      |                  |                            |                                      |                  |                       |                                      |
| ADP-46                                              | X                       |                  |                  |                  |                            |                            |                                 |             | X                                    |                  |                            |                                      |                  |                       |                                      |
| ADP-41                                              | X                       |                  |                  |                  |                            |                            |                                 |             | X                                    |                  |                            |                                      |                  |                       |                                      |
| ADP-32                                              |                         |                  | X                |                  |                            |                            |                                 |             |                                      |                  |                            |                                      |                  | X                     |                                      |
| ADP-31A                                             |                         |                  | X                |                  |                            |                            |                                 |             | X                                    | X                | X                          |                                      |                  |                       |                                      |
| ADP-33                                              |                         |                  | X                |                  |                            |                            |                                 |             | X                                    |                  |                            |                                      |                  |                       |                                      |
| ADP-47                                              |                         | X                |                  | X                |                            |                            |                                 |             |                                      |                  |                            |                                      |                  |                       |                                      |
| <b>Plessey Periph.</b><br>714-216-9845              |                         |                  |                  |                  |                            |                            |                                 |             |                                      |                  |                            |                                      |                  |                       |                                      |
| DCV51                                               | X                       |                  |                  |                  |                            |                            |                                 |             |                                      | X                |                            |                                      |                  |                       |                                      |
| <b>Performance<br/>Technologies</b><br>716-586-6727 |                         |                  |                  |                  |                            |                            |                                 |             |                                      |                  |                            |                                      |                  |                       |                                      |
| PT-VME 420                                          |                         |                  | X                |                  |                            |                            |                                 |             |                                      | X                |                            |                                      |                  |                       |                                      |
| <b>Qualogy, Inc.</b><br>408-434-5200                |                         |                  |                  |                  |                            |                            |                                 |             |                                      |                  |                            |                                      |                  |                       |                                      |
| QE2                                                 |                         | X                |                  |                  |                            |                            |                                 |             |                                      |                  |                            |                                      |                  | X                     |                                      |
| <b>Rancho<br/>Technologies</b><br>714-987-3966      |                         |                  |                  |                  |                            |                            |                                 |             |                                      |                  |                            |                                      |                  |                       |                                      |
| RT2003-PC                                           | X                       |                  |                  |                  |                            |                            |                                 |             |                                      | X                |                            |                                      |                  |                       |                                      |



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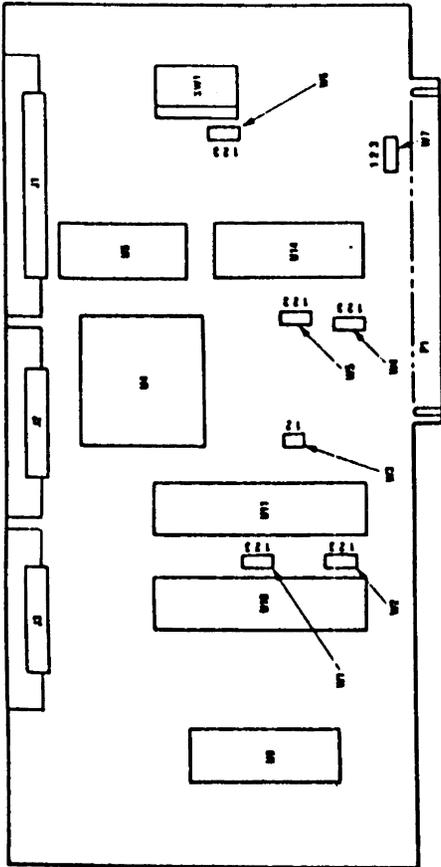


| Jumper | Pin Connects | Status                                                                                              |
|--------|--------------|-----------------------------------------------------------------------------------------------------|
| W1     | 2-1<br>2-3   | NORMAL*<br>Factory Test Only                                                                        |
| W2     | 2-1<br>2-3   | NORMAL*<br>Factory Test Only                                                                        |
| W3     | CLOSED       | BIOS ROM enabled*<br>BIOS ROM disabled                                                              |
| W4     | 2-3          | Device Address 320H*                                                                                |
| W5     | 2-1<br>2-3   | Device Address 321H*<br>BIOS ROM SIZE 32K or 64K**                                                  |
| W6     | 2-1<br>2-3   | BIOS ROM SIZE 16K<br>REINJECTED WRITE CURRENT (8 heads)*                                            |
| W7     | 2-1<br>2-3   | HEAD SEL 3 (16 heads)<br>INTRQ to INTRQ 5 on host connector**<br>INTRQ to INTRQ 2 on host connector |

**W1 - W7 Jumper Positions**

Starbed Jumpers  
 CLOSED - Jumper is installed  
 OPEN - Jumper is not installed  
 \* - As shipped - Jumper is installed  
 \*\* - As shipped - Instead of jumper, pins 1 and 2 are joined via an etch on the PCB.  
 To change, the etch must be carefully cut and a jumper installed.

**CAUTION**  
 Modify jumpers W1-W7 only under the direction of a qualified individual, i.e., your dealer.



**JUMPER LOCATIONS**

If you require further information or other technical support, please contact your authorized dealer:

**FCC CERTIFICATION**

THIS WESTERN DIGITAL PRODUCT HAS BEEN CERTIFIED TO COMPLY WITH THE LIMITS FOR A CLASS B COMPUTING DEVICE PURSUANT TO SUBPART J OF PART 15 OF FCC RULES. THIS DOES NOT GUARANTEE THAT INTERFERENCE WILL NOT OCCUR IN INDIVIDUAL INSTALLATIONS. WESTERN DIGITAL IS NOT RESPONSIBLE FOR ANY TELEVISION, RADIO, OR OTHER INTERFERENCE CAUSED BY UNAUTHORIZED MODIFICATIONS OF THIS PRODUCT.

IF INTERFERENCE PROBLEMS DO OCCUR, PLEASE CONSULT THE SYSTEM EQUIPMENT OWNER'S MANUAL FOR SUGGESTIONS. SOME OF THESE INCLUDE RELOCATION OF THE COMPUTER SYSTEM AWAY FROM THE TELEVISION OR RADIO, PLACING THE COMPUTER AC POWER CONNECTION ON ANOTHER CIRCUIT OR OUTLET, OR USING SHIELDED INTERCONNECTING CABLE ON PERIPHERALS.

**WD1002S-WX2  
 Winchester  
 Disk Controller  
 USER'S  
 GUIDE**

Making the leading edge work for you.

**WESTERN DIGITAL**  
 CORPORATION  
 2445 McCabe Way, Irvine, CA 92714

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2

## Installation Instructions

This section contains instructions for installation of the WD1002S-WX2 (S-WX2) board. If the disk drive(s) are being installed internally, it is best to locate the S-WX2 Controller Board in the closest available expansion slot.

### CAUTION

Handle the controller board by the ends of the board. Some of the chips are static sensitive and damage may occur if the board is incorrectly handled.

At this time, verify that the jumper settings on the controller board are correct. Refer to pages 9 and 10 of this document for information on the jumper settings.

Next, remove the blank expansion slot bracket. Put the bracket away and save it for possible future use. The screw will be used to hold the new controller board in place.

Connect the 34-pin (wide control cable) connector to J1 on the S-WX2 board. Make sure that Pin 1 of the cable connector goes to Pin 1 on the controller board. Pin 1 of the cable connector is typically located on the color coded side of the cable.

Connect the 20-pin (data cable) to J2 (Drive 0 Data Connector) on the controller board. Make sure that Pin 1 on the cable is connected to Pin 1 on the controller board.

If a second drive is being installed, connect the Drive 1 data cable to J3 likewise.

At this time, also verify that the disk drive(s) is properly installed. This includes correct placement of drive select jumpers and drive terminator installation. Refer to the disk drive installation manual for further instructions. **DO NOT USE THE RADIAL SELECT OPTION.**

Install the controller board into the expansion slot. Make sure that the board is seated properly by pressing down on both ends of the board. Secure the board with the bracket screw.

### CAUTION

When routing the cables, be careful not to pinch them. Cables must not get caught between the cover and the boards nor should they obstruct any air flow path from fans or vents.

Install the disk drive(s) per manufacturer's instructions.

## Standard BIOS ROM Format Instructions

The following procedures are a complete set of instructions for formatting one or two disk drives when using a WD1002S-WX2 Controller Board with a standard BIOS ROM. (P/N 62-0000 42-xxx).

### Running the DEBUG Utility

The DEBUG Utility is used to initiate the S-WX2 format program to physically format the drive. During execution, the user is prompted to define the interleave factor. Please refer to the DOS operating manual for detailed instructions regarding this utility.

### Step Instructions

1. At the A> prompt, load and run the DOS debug utility by typing DEBUG followed by a RETURN. "CR" stands for carriage return or ENTER.

A> DEBUG CR

The next step changes the drive address and sector interleave factor. If not modified, the drive number will default to 00 and the interleave factor will default to three. Proceed with step 2 if there are two hard disk drives configured into the system and/or the desired interleave factor is to be other than three. If neither applies, go directly to step 3.

2. At the debug prompt, type the following line to set the target drive number and interleave factor. The debug prompt is the hyphen "-".

- rax CR

CPU response:

AX 0000

:-

At the colon prompt, enter drive number and interleave factor in hexadecimal followed by a RETURN.

xyy CR

Where: xx = the relative drive number  
yy = the interleave factor

NOTE: Relative Drive C: = 00, Relative Drive D: = 01. An interleave factor of 03 is standard. If formatting two drives, this operation must be run twice; first with the relative drive number = 00 and again with it = 01.

3. At the debug prompt, initiate the S-WX2 format program by typing in the following command line.

-g=c800:5 CR

The S-WX2 format program will display the following:

WX2 Format Revision 7.0 (C) Copyright Western Digital Corp. 1985

(AH) = Relative drive number (0-7)

(AL) = Interleave factor (S is standard)

Press "Y" to begin formatting drive XX with Interleave YY

### CAUTION

Before responding, please remember that all data on the target drive will be lost during execution of the format program. Hit any other key to abort the format program and save the data.

4. Press "Y" followed by a RETURN to begin formatting the drive.

Y CR

System responses:

If any key other than "Y" is typed, the program displays the following message and returns the operator to DOS.

CPU response:

Nothing done exit

A>

If "Y" is typed, formatting is initiated. The format program can take up to five minutes. If there are no resulting errors, the program displays the following message and returns the operator to DOS.

CPU response:

Format Successful

A>

If an error occurs while formatting, the program will immediately terminate, display the following error message, and return the operator to DOS. XX is the hexadecimal S-WX2 BIOS completion code. Refer to page 8.

CPU response:

Error ---- completion code XX

A>

If a second drive is to be formatted, repeat steps 1 through 5 with the relative drive number equal to 01. Otherwise, continue with step 5.

5. Load and execute the FDISK and FORMAT utilities. Refer to your DOS manual for more information on FDISK and FORMAT.

## Auto-Config Option

This section contains instructions for performing the low level or physical format of one or two ST506/ST412 Winchester disk drives when using Western Digital's WD1002S-WX2 controller board, an Auto-Config BIOS ROM, and its resident Auto-Config software. (P/N 62-0000 43-xxx).

Auto-Config has four formatting options as follows:

1. Format one or two physical drive(s) by entering the drive parameters and bad track list via the keyboard.
2. Format one physical drive as two virtual drives by entering the drive parameters, cylinder partition values, and bad track list via the keyboard.
3. Format one or two physical drive(s) by using the drive tables selected by SW1. The bad track list is entered via the keyboard.
4. Format one physical drive as two virtual drives by using the drive tables. Virtual cylinder partition values and bad track list are entered via the keyboard.

### Drive Parameters

Drive parameters that have to be established during the format procedure include the maximum number of cylinders, maximum number of heads, cylinder for reduced write current, cylinder for write precompensation, error burst length, and CCB option byte — step rate.

Auto-Config supports keyboard entry of these parameters. It also supports the pre-programmed drive table entry of parameters.

A single jumper chooses between keyboard entry or the use of drive tables. The ability to enter configuration information from the keyboard may be disabled by placing a jumper on SW1-5 of the controller board. If disabled, the drive tables are selected by SW1-1 to SW1-4. See page 9.

### Virtual Formatting

Auto-Config supports virtual drive formatting. Virtual drive formatting is a method by which one physical drive is split into two logical or virtual drives. The virtual drives are referenced as Drive C: and Drive D:.

Current versions of DOS allow no more than 32 megabytes per drive. Therefore, a 40 megabyte drive may be divided into two virtual drives using the virtual option. The following table provides an example of how to calculate total drive capacity and establish virtual parameters.

The capacity of a drive can be easily calculated as follows:

Capacity =

(#Cyl.)(#Heads)(#Sectors/Track)(Sector Size in Bytes)

If a drive has 612 cylinders, 8 heads, 17 sectors per track and a 512 byte sector size, then calculate the logical split as follows:

Total capacity = 42,614,784 bytes or  
(612)(8)(17)(512)

To split the drive into 2 logical drives of 30 and 10 megabytes each of X and Y respectively, do the following calculations.

Because (X)(heads)(sectors/track)(sector size)  
= 30 megabytes.

Note: 1 megabyte = 2<sup>20</sup> bytes = 1,048,576 bytes.

X = (31,457,280)/(8)(17)(512)

X = 451.8 = 451 cylinders

Note: Round X down to the nearest whole number.

Since Y = Total capacity - X

Y = 612 - 451 or 161

The split = 451 161

## Logical Format Calculation

If this option is chosen, a second physical drive may not be installed on the S-WX2 since DOS will only support two drives. The ability to virtually configure a drive may be disabled by placing a jumper on SW1-6 (page 9).

### Low Level Format

The low level format is run just once on a drive that is to be virtually configured. However, the DOS FDISK and FORMAT utilities must be run on both logical drives.

If two physical drives are to be formatted, the low level format is run on each drive. As before, the DOS FDISK and FORMAT utilities are run on each drive.

### Auto-Config Formatting Procedures

The following instructions contain a detailed step by step description of the actions required to execute the Auto-Config procedures.

## Step Instructions

1. Verify jumper settings. Refer to pages 9 and 10.

and execute the debug utility.

3. At the debug prompt, initiate the S-WX2 format program by typing the following command line. The debug prompt is the hyphen "-":

-g = c800:5 CR

4. The S-WX2 format program will display the following message:

WX2 Format Revision T.8 (C) Copyright Western Digital Corp. 1985

Key in drive no and interleave as follows: d ii where

d = relative no (0-1)

ii = interleave factor (1-16)

Enter d and ii separated by a space and followed with a RETURN.

EXAMPLE:

0 03 CR

NOTE: Drive C: = 0, Drive D: = 1. An interleave factor of 3 is standard. If formatting two drives, this option must be run twice; once with d = 0 and again with d = 1.

5. The following message will be displayed.

Key in disk characteristics as follows: ccc h rrr ppp ee oo where

ccc = total number of cylinders (1-4 digits)

h = number of heads (1-2 digits)

rrr = starting reduced write cylinder (1-4 digits)

ppp = write precomp cylinder (1-4 digits)

ee = max correctable error burst length (1-2 digits)

oo = CCB option byte (1 hex digit)

Enter each value separated by a space and follow the complete entry with a RETURN.

EXAMPLE:

306 4 128 128 11 5CR

6. CPU response:

Are you virtually configuring the drive — Answer Y/N

Enter a "Y" and RETURN for yes or "N" and RETURN for no.

Y CR or N CR

7. If Yes, the following message is displayed.

Key in virtual drive size list as vvvv . . .

where vvvv = virtual drive size (1-4 digits)

Enter two cylinder numbers, separated by a space and followed by a RETURN. See page 5.

NOTE: The sum of these two numbers cannot exceed the maximum number of available cylinders.



2-80

**EXAMPLE:**

153 153CR

If no, continue to next step.

**8. The following message will be displayed.**

Press "y" to begin formatting drive d with interleave ii.

NOTE: d = relative drive number and ii = interleave factor.

Type "Y" followed by a RETURN.

Y CR

**9. System responses:**

If any key other than "Y" is typed, the program displays the following message and returns the operator to DOS.

CPU response:

Nothing done exit — returning to system . . .

A>

If an error occurs while formatting, the program will immediately terminate, display the following error message, and return the operator to DOS. XX is the hexadecimal S-WX2 BIOS completion code. See page 8.

CPU response:

Error ---- completion code XX

A>

If "Y" is typed, formatting is initiated. If there are no resulting errors, the program displays the following message.

CPU response:

Do you want to format bad tracks — answer Y/N

The user should type "Y" and a RETURN for yes; "N" and a RETURN for no.

Y CR or N CR

The user is prompted to enter, via the keyboard, a bad track list. This list should be provided by the drive manufacturer. However, due to DOS limitations, this procedure is not recommended.

Because of the logical addressing used by DOS, marking an entire track bad will result in more than one logical address being marked bad. As DOS can only accept a limited number of defects, a drive with excessive media defects may cause the FORMAT program to terminate with an error. The displayed error is typically, "TRACK 00 BAD - DRIVE UNUSABLE."

As a recommended alternative, execution of the DOS utility program FORMAT should correctly locate and deallocate all media defects.

**10. If yes, the following message is displayed.**

Key in bad track list as follows: ccc h . . .

where

ccc = bad track cylinder no (1-4 digits)

h = bad track head number(1-2 digits)

Type is the cylinder and head numbers for the bad tracks, separate them with spaces, and follow with a RETURN.

EXAMPLE:

160 1 161 1 304 3 223 4 223 2 CR

The bad track message will be displayed again. To terminate bad track entry, type "N" followed by a RETURN.

N CR

**11. The following message is displayed.**

Format Successful — Returning to system

If a second drive is to be formatted, repeat steps 2 through 12 with d = 01. Otherwise, continue with step 12.

**12. Load and Execute the FDISK and FORMAT UTILITIES.** Refer to your DOS Manual for further information on these utilities.

| CODES | COMPLETION CODE SUMMARY            |
|-------|------------------------------------|
| 01    | Bad Command                        |
| 02    | Address Mark Not Found             |
| 04    | Sector Not Found                   |
| 05    | Reset Failed                       |
| 07    | Set Parameters Failed              |
| 09    | Attempt to DMA Across 64K Boundary |
| 0B    | Bad Track                          |
| 10    | Uncorrectable Data Error           |
| 11    | ECC Error Corrected                |
| 20    | Controller Failure                 |
| 40    | Seek Failure                       |
| 80    | Time-out                           |
| BB    | Undefined Error                    |
| FF    | Read Status Failed                 |

WX2 Error Codes

| BIOS TABLE | DRIVE 1<br>SW1 - 1 | DRIVE 1<br>SW1 - 2 | DRIVE 0<br>SW1 - 3 | DRIVE 0<br>SW1 - 4 | FORMATTED CAPACITY | HEADS | CYLINDERS | PRE-COMP RWC             |
|------------|--------------------|--------------------|--------------------|--------------------|--------------------|-------|-----------|--------------------------|
| 0          | CLOSE              | CLOSE              | CLOSE              | CLOSE              | 20 MB              | 4     | 612       | None (613)<br>None (613) |
| 1          | CLOSE              | CLOSE              | OPEN               | CLOSE              | 10 MB              | 2     | 612       | 128<br>128               |
| 2          | CLOSE              | OPEN               | CLOSE              | OPEN               | 20 MB              | 4     | 612       | 128<br>None (613)        |
| 3*         | OPEN*              | OPEN*              | OPEN*              | OPEN*              | 10 MB              | 4     | 306       | All (0)<br>None (306)    |

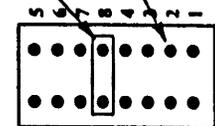
SW1  
1 through 4  
Settings

\*Factory setting.

| POSITION | STATUS | STATE                 |
|----------|--------|-----------------------|
| SW1 - 8  | OPEN   | Reserved for BIOS ROM |
| SW1 - 7  | OPEN   | Reserved for BIOS ROM |
| SW1 - 6  | OPEN   | Reserved for BIOS ROM |
|          |        | Virtual option        |
| SW1 - 5  | OPEN   | Reserved for BIOS ROM |
|          |        | Auto-Config Option    |

SW1  
5 through 8  
Settings

CLOSED — Jumper is installed by connecting identified pin with pin located immediately opposite of same as shown.  
OPEN — No jumper is installed.



Example of Jumper Installation  
turner = Here P/N 76438 - 101

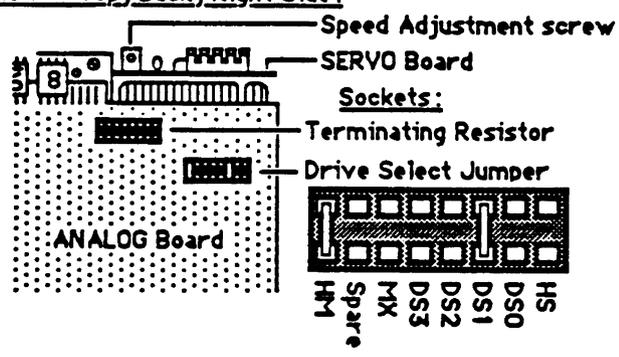
# IBM-type 5.25" DSDD Floppy Drives Layout, Speed Adjustment

**KEY**

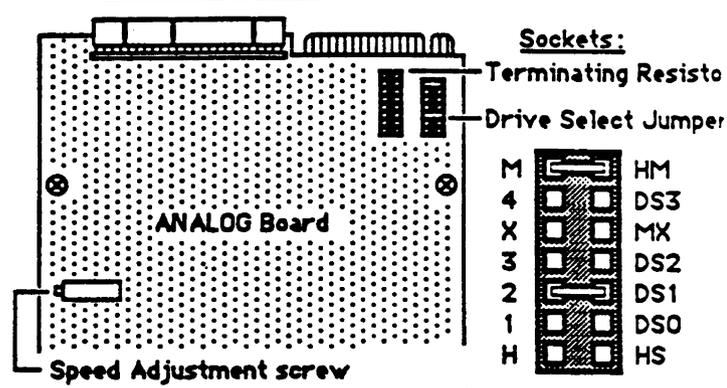
- Jumper open
- ON
- OFF
- Jumper closed

The following Double-Sided, Double-Density Floppy Diskette Drive Layouts show various manufacturers drives and how they should be set up in the IBM PC, XT, AT and most IBM-compatible computers. The location of the terminating resistor and drive select jumpering is shown. The Speed Adjustment is also shown on these drives. To adjust the speed, run IBM Diagnostics, test 6 for diskette drives, option 4 for the Speed Test. While the test is running, it will display what the speed of the drive presently is. Make the adjustment while this test is running.

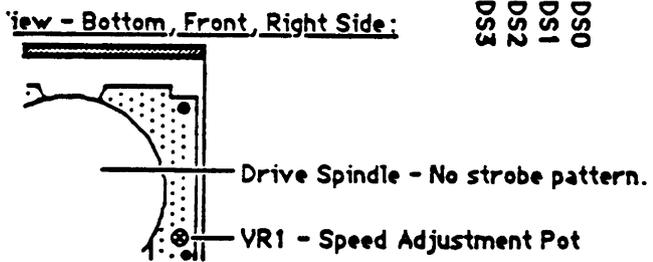
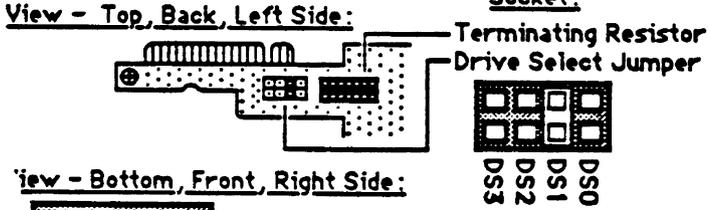
**Tandon TM-100 (or IBM label)**  
(Full-Height, Double-Density.)  
View - Top, Back, Right Side:



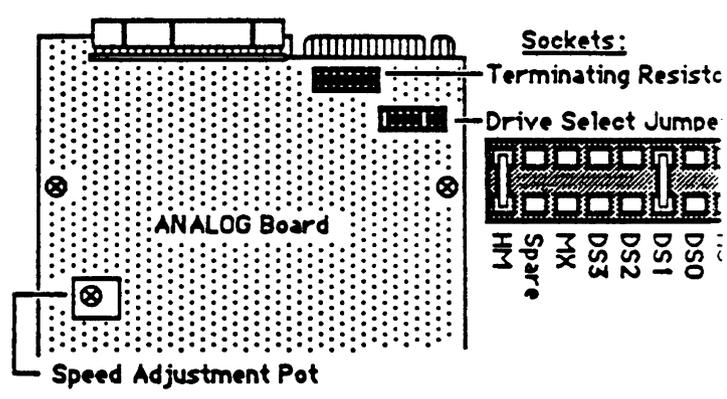
**CDC/MPI Equip. Ident. No. BR8B1A (or IBM label)**  
(Full-Height, Double-Density.)  
View - Top, Back



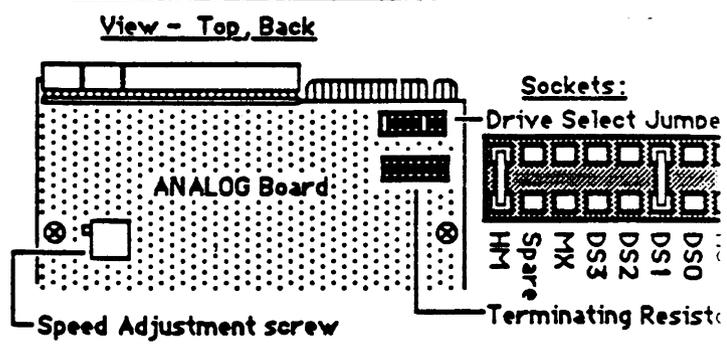
**ALPS Electric Co. Model DFC222B02A**  
(Half-Height, Double-Density.)  
View - Top, Back, Left Side:



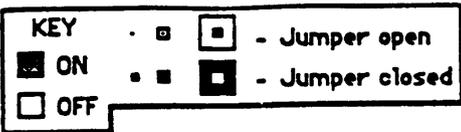
**CDC/MPI Equip. Ident. No. BR8B2A (or IBM label)**  
(Full-Height, Double-Density.)  
View - Top, Back



**CDC/MPI Model No. 52S (or IBM label)**  
(Full-Height, Double-Density.)  
View - Top, Back



## IBM-type 5.25" DSHD Floppy Drives Layout



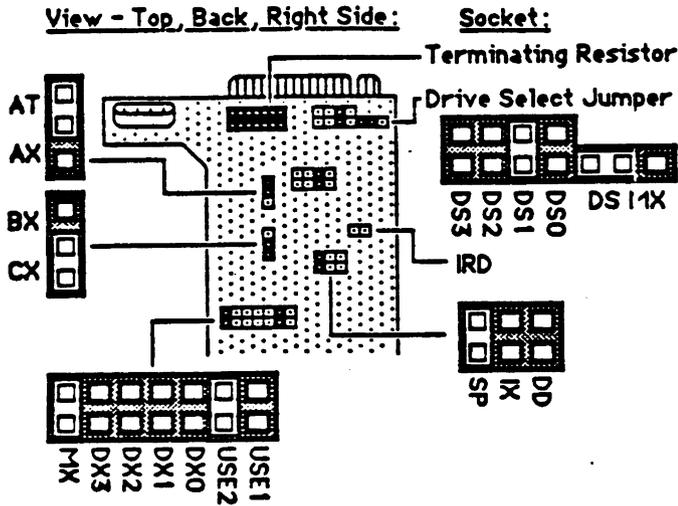
The following Double-Sided, High-Density Floppy Diskette Drive Layouts show various manufacturers drives and they should be set up in the IBM AT and most AT-compatible computers. The location of the terminating resistor drive select jumpering is shown.

The Speed Adjustment is shown if present. To adjust the speed, boot up IBM Diagnostics, run test 6 for the diskette drives, option 4 for Speed Test. While the test is running, it will display what the proper range should be, and what the speed of the drive presently is. Make the adjustment while this test is running.

### Panasonic JU-475-2AGG

(Half-Height, High-Density)

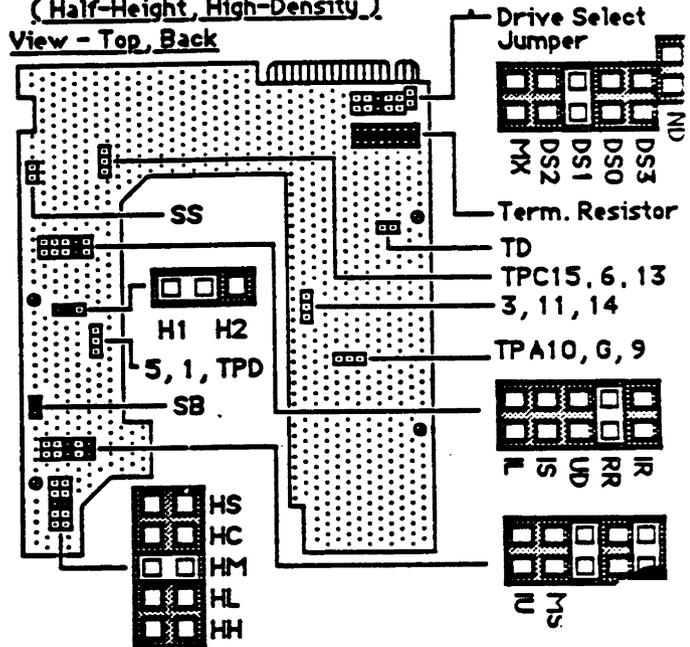
View - Top, Back, Right Side:



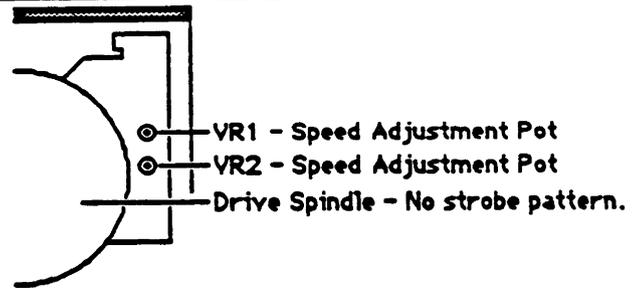
### Mitsubishi Model M4854-367US

(Half-Height, High-Density)

View - Top, Back

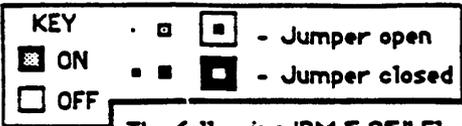


View - Bottom, Front, Right Side:



**IBM**

**5.25" Floppy Drives Layout**



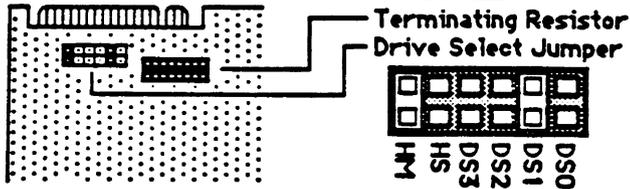
The following IBM 5.25" Floppy Diskette Drives are manufactured specifically by and/or for IBM. Other drives not shown here that may have an IBM label would be either Tandon, CDC or MPI. These drives pictured show the position of the terminating resistor and drive select jumpering. The Speed Adjustment is shown if there is one. To adjust the speed, run IBM Diagnostics, test 6 for diskette drives, option 4 for the Speed Test. While the test is running, it will display what the speed of the drive presently is. Make the adjustment while this test is running.

**IBM AT 1.2 MB YD-380 Type 1711**

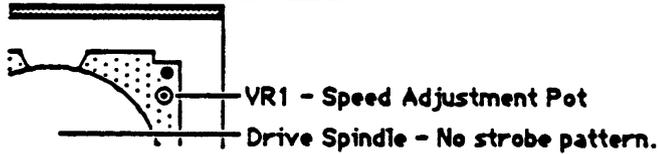
(Half-Height, High-Density)

View - Top, Back, Left Side:

Socket:



View - Bottom, Front, Right Side:

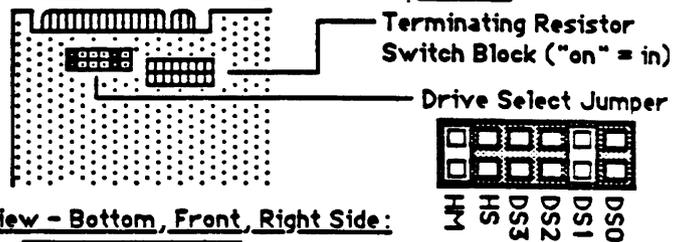


**IBM AT 360 KB YD-380 Type 1710 ( # )**

(Half-Height, Double-Density)

View - Top, Back, Left Side:

Socket:



View - Bottom, Front, Right Side:

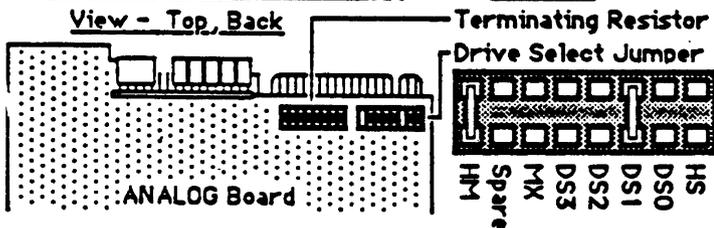


**IBM PC, XT Type 0384-002 (Malaysian)**

(Full-Height, Double-Density)

View - Top, Back

Sockets:

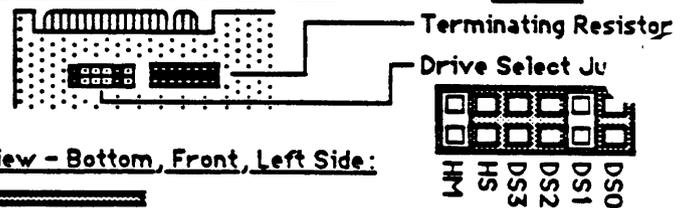


**IBM AT 360 KB YD-580 Type 1355 ( # )**

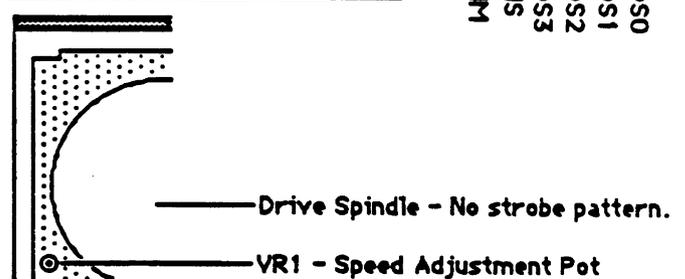
(Half-Height, Double-Density)

View - Top, Back, Left Side:

Socket:



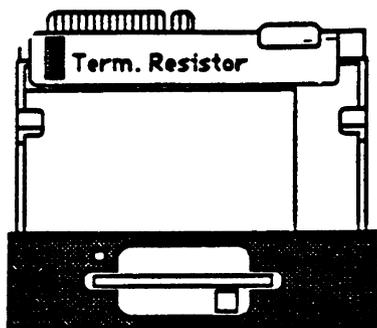
View - Bottom, Front, Left Side:



# IBM PC, XT, AT

## 3.5" Floppy Diskette Drives (Double-Sided, Double-Density)

### PC/XT Internal 3.5" Drive



The drive should be installed as drive B:, without a terminating resistor.

Note: Terminating Resistor can be a switch block, all switches should be off.

Connect the drive to the middle connector of the floppy drive cable. The drive will now work as drive B: - connecting to the IBM PC/XT Floppy Diskette Controller.

Verify that the PC/XT system board switches for internal floppy diskette drives are correct. For 2 drives, Switch 7 is off, 1-8 is on.

The Drive needs a special software installation program.

From the A: prompt type:  
"35INSTAL". This program will automatically create a CONFIG.SYS file with the line:

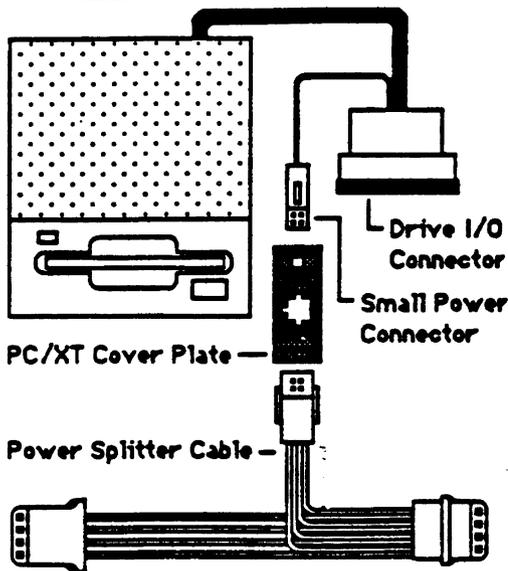
```
Device=\indskbio.sys
```

The only files that are actually needed are:

- CONFIG.SYS
- INDSKBIO.SYS

You must use IBM Dos version 3.2 or higher.

### PC/XT External 3.5" Drive



Connect the Drive I/O Connector to the IBM PC/XT Floppy Diskette Controller. Connect the Small Power Connector to the Power Splitter Cable (through the cover plate on the back of the PC/XT).

Connect the Power Splitter Cable to one of the diskette drive power connectors and a diskette drive power cable from the power supply. Do not change switches on the system board.

The drive needs a special software configuration. Two files are needed to access the drive:

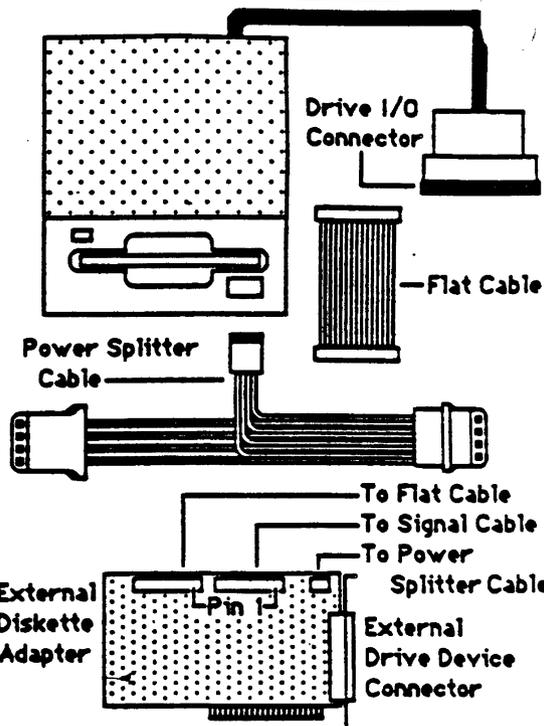
- CONFIG.SYS
- DRIVER.SYS

The CONFIG.SYS file must have the line:

```
Device=\driver.sys /D:2 /T:80 /S:9 /H:2
```

Use Dos 3.2 or higher only.

### AT External 3.5" Drive



Install the External Diskette Adapter in slot 6 or 7. Unplug the Signal Cable (J1) from the IBM AT Drive Controller & plug it into the right connector on the External Diskette Adapter.

Connect the Flat Cable from the left side of the External Diskette Adapter to J1 of the IBM AT Drive Controller (where the Signal Cable was connected). Connect the Power Splitter Cable to: 1) the External Diskette Adapter, 2) one of the diskette drive power connectors, and 3) one of the diskette drive power cables from the power supply. Do not change the IBM AT Setup Program.

A special software configuration is needed to access the drive. Three files are needed:

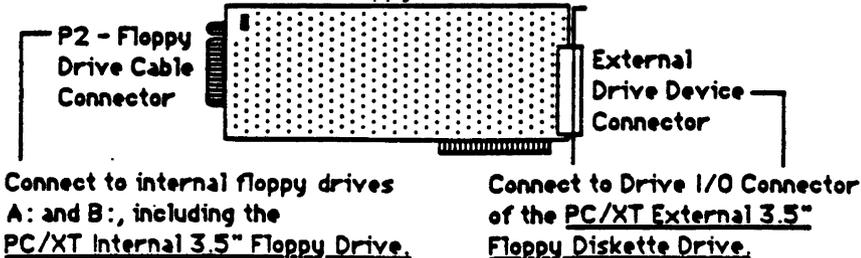
- CONFIG.SYS
- DRIVER.SYS
- EXDSKBIO.DRV

The CONFIG.SYS file must have these 2 lines:

```
Device=\exdskbio.drv
Device=\driver.sys /D:2 /T:80 /S:9 /H:2 /C
```

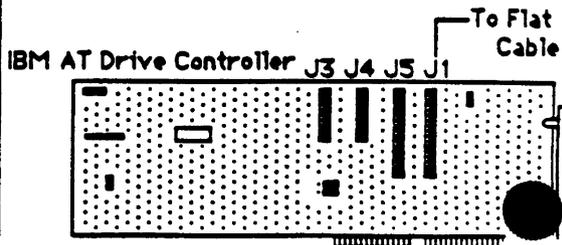
Use Dos 3.2 or higher only.

### IBM PC/XT Floppy Diskette Controller



Connect to internal floppy drives A: and B:, including the PC/XT Internal 3.5" Floppy Drive.

Connect to Drive I/O Connector of the PC/XT External 3.5" Floppy Diskette Drive.



IBM AT Drive Controller J3 J4 J5 J1

# IBM-type 5.25" Floppy Drives Layout

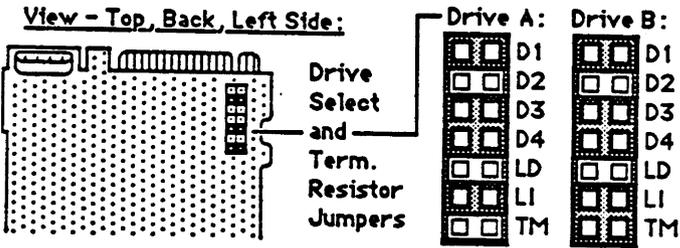


The following Floppy Diskette Drive Layouts show various manufacturers drives and how they should be set up in the IBM PC, XT, AT and most IBM-compatible computers. The location of the Terminating Resistor and Drive Select Jumper is shown. There is no adjustment for speed.

### Toshiba MD-04D

(Half-Height, Double-Density,)

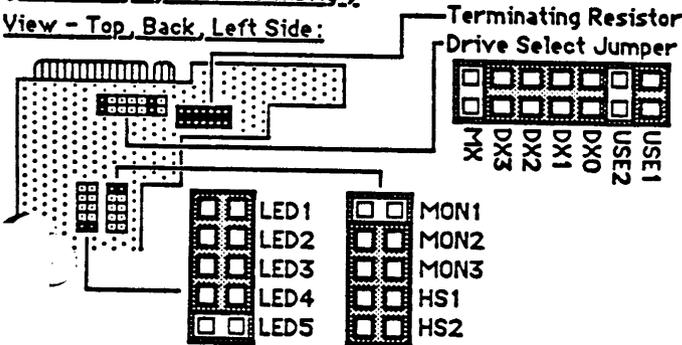
View - Top, Back, Left Side:



### NEC Model FD1053

(Half-Height, Double-Density,)

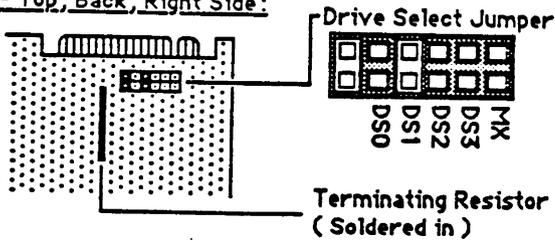
View - Top, Back, Left Side:



### BACHELOR Model E2550F FD-104

(Half-Height, Double-Density,)

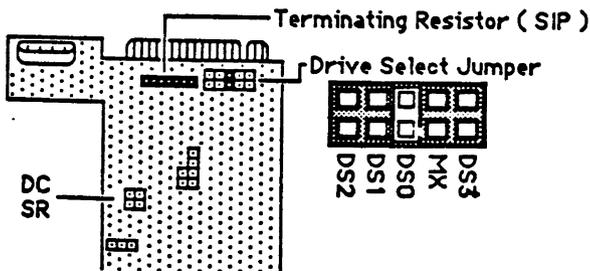
View - Top, Back, Right Side:



### Mitsubishi Model MF501B-312UD

(Half-Height, Double-Density,)

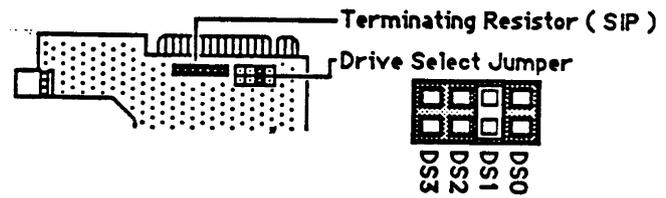
View - Top, Back, Right Side:



### Fujitsu Model M251A

(Half-Height, Double-Density,)

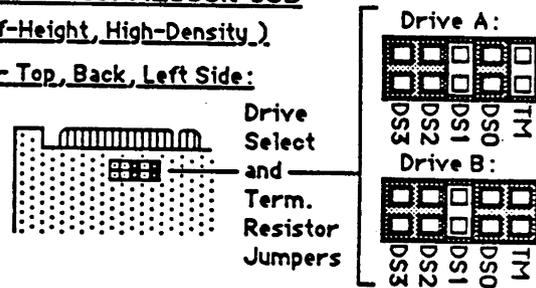
View - Top, Back, Right Side:



### Fujitsu Model M2553K 03B

(Half-Height, High-Density,)

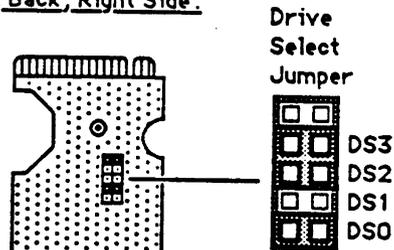
View - Top, Back, Left Side:



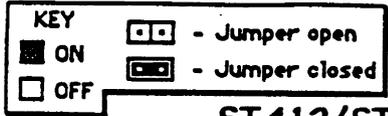
### Mitsumi Elec. Co. Model D503

(Half-Height, Double-Density,)

View - Top, Back, Right Side:



**Seagate Technology, Inc.**  
**Fixed Disk Drives**

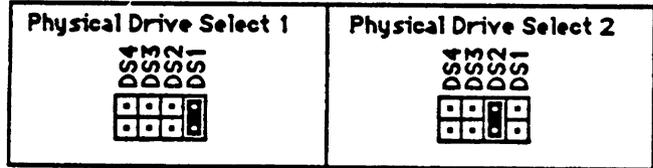


**ST412/ST506 Interface Drives:**

The ST412/ST506 Interface Drives have two card edge connectors. One is for the Data Cable ( 34-pin ) and the other is for the Signal Cable ( 20-pin ). These drives use either MFM Encoding at 5.0 megabits per second, or RLL (Run Length Limited - 2,7) Encoding at 7.5 megabits per second. Use only MFM controllers with MFM hard disk drives. Use only RLL controllers with RLL hard disk drives. RLL drives, except for early models of the ST-238, have a letter " R " appended to the model number.

**Write Precompensation** - for optimum performance, provide write precompensation on the drives as follows:  
 ST-213, ST-225      Cylinder 300 to 614  
 ST-4038              Cylinder 300 to 732  
 Some controllers provide a default precompensation setting from cylinder 256. The above mentioned drives will perform adequately at this default.

- Drive Select Jumpers and Drive Cables:**
- " C " Drive Configuration:
    - If you have a twisted cable, configure the drive as drive select 2.
    - If you have straight cable, configure the drive as drive select 1.
  - " D " Drive Configuration:
    - Configure the drive as drive select 2.



**SCSI Interface Drives:**

Seagate intelligent drives have an onboard controller which supports the SCSI interface as defined in the ANSI X3T9.2/82-2 document. The drives are designated by a letter " N " appended to the model number.

System connection is via a 50-pin connector. The SCSI address jumpers are located adjacent to the 50-pin, SCSI interface connector.

Some system busses require parity bit checking. Most drives have an additional two jumper pins to enable parity. They are located with the SCSI address jumper pins.

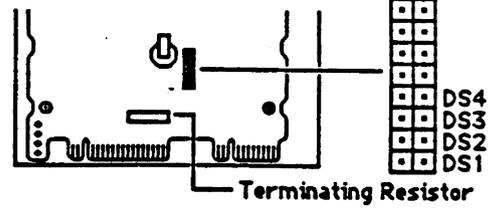
**Resistor Termination Packs** - If you are installing a single drive, the resistor termination packs must remain installed. When installing resistor packs, note that pin-1 is designated by a dot or numeral one on the pack. A square pad on the board indicates pin-1 at the resistor pack socket.

- If you are installing two or more drives, remove the resistor packs on all but the last drive in the chain.

**SCSI ID Jumpers** - all SCSI devices must have an SCSI ID number in the chain. The computer is normally SCSI ID number 0. It is alright for the drive to be any other number, as long as it is not being used by another device in the chain.

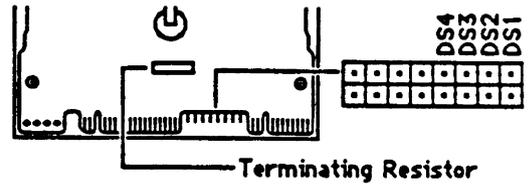
**MFM/RLL 3.5" Control Assembly**

Back, Bottom view of drive



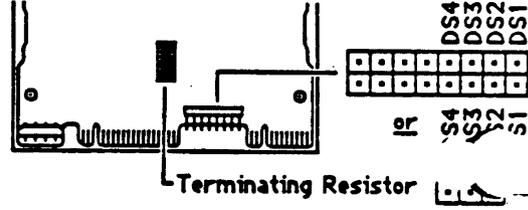
**MFM/RLL 5.25" Half-Height Control Assy PCB**

Back, Bottom view of drive



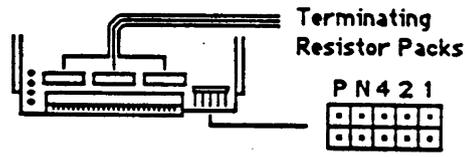
**MFM/RLL 5.25" Full-Height Control Assy PCB**

Back, Bottom view of drive



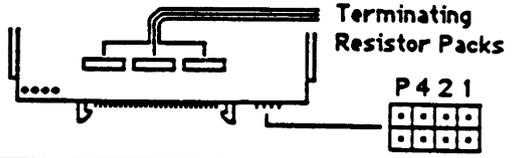
**SCSI 3.5" Control Assy PCB**

Back, Bottom view of drive

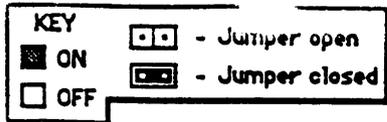


**SCSI 5.25" Control Assy PCB**

Back, Bottom view of drive



| SCSI ID | 4                        | 2                                   | 1                                   | SCSI ID | 4                        | 2                                   | 1                                   |                                        |
|---------|--------------------------|-------------------------------------|-------------------------------------|---------|--------------------------|-------------------------------------|-------------------------------------|----------------------------------------|
| 0       | <input type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            | 4       | <input type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            | P - Parity Jumper<br>N - Not Connected |
| 1       | <input type="checkbox"/> | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | 5       | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |                                        |
| 2       | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | 6       | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |                                        |
| 3       | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | 7       | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |                                        |



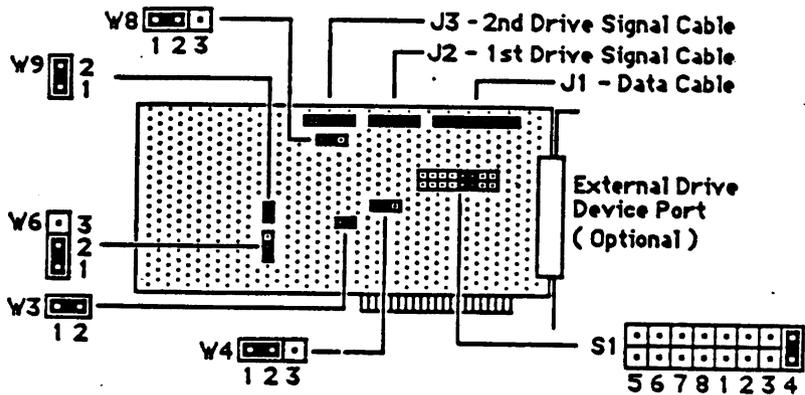
**Everex Systems, Inc.**  
**Fixed Disk Controllers - EV-392 & RLL Half-Card**

7-21-88

**EV-392 Hard Disk Controller**

EV-390 Hard Disk Controller is for IBM PC, XT type computers. It allows the use of one or two ST-506 type industry standard winchester fixed disk drives that are RLL (2,7) encoding qualified.

- W1, W2 - 2-1 - NORMAL  
          2-3 - Factory Test Only
- W3 - Closed - BIOS ROM enabled  
      Open - " " disabled
- W4 - 2-3 - Device Address 320H (Default)  
      2-1 - " " 324H
- W6 - 2-3 - Reduced Write Current (8 heads)  
      2-1 - Head Select 3 (16 heads)

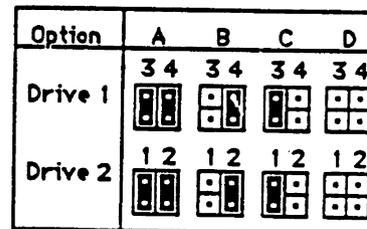


External Drive Device Port (Optional)

Jumpers S1-1 through S1-4 are for selecting the hard disk drive type being used with the controller. Use the table at the right for selecting the proper drive type.

Jumpers S1-5 through S1-8 are reserved for BIOS ROM. They should all be left OPEN.

| DRIVE SELECT TYPE JUMPERS |        |      |       |           |        |
|---------------------------|--------|------|-------|-----------|--------|
| Manufacturer              | Model  | MB   | Heads | Cylinders | Option |
| Tandon                    | TM755  | 65.3 | 5     | 981       | A      |
| Vertex                    | V150   | 65.3 | 5     | 981       | A      |
| Priam                     | V170   | 92.0 | 7     | 987       | B      |
| MiniScribe                | 3425   | 32.6 | 4     | 612       | C      |
| MicroScience              | HH725  | 32.6 | 4     | 612       | C      |
| Seagate                   | ST238R | 32.6 | 4     | 615       | D      |

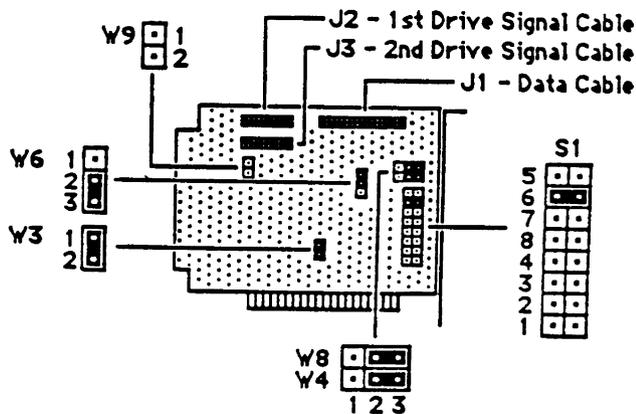


Note that Everex gets its hard disk controllers from other manufacturers and installs its own EPROMs.

**RLL Half-Card Controller**

The Everex RLL Half-Card Hard Disk Drive Controller is an occasional substitute for the EV-392. It is only to be used with the Seagate ST-238R hard disk drive.

- W3 - Closed - BIOS ROM enabled  
      Open - " " disabled
- W4 - 2-3 - Device Address 320H (Default)  
      1-2 - " " 324H
- W6 - 2-3 - Reduced Write Current (8 heads)  
      2-1 - Head Select 3 (16 heads)
- W8 - 2-3 - Standard Factory Setting  
      1-2 - Special setting for Original Equipment Manufacturers

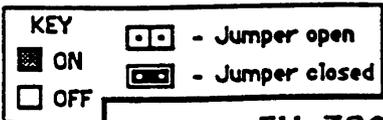


Note that Everex gets its hard disk controllers from other manufacturers and installs its own EPROMs.

This controller is meant to use only the Seagate ST-238R (RLL) hard disk drive. It can access 1 or 2 of these drives.



**Everex Systems, Inc.**  
**Fixed Disk Controllers - EV-390 & EV-391**

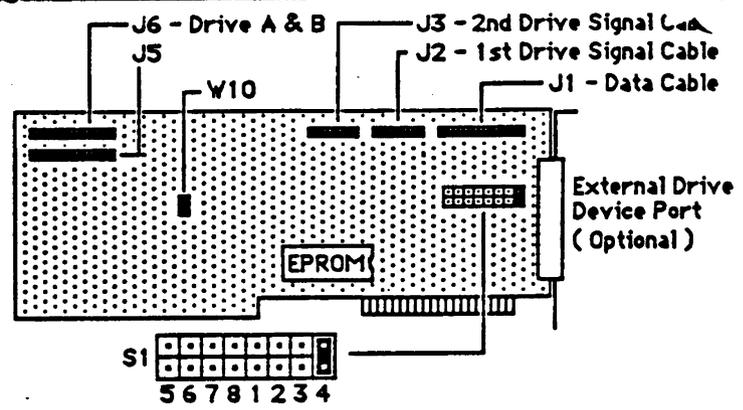


**EV-390 Hard Disk/Floppy Disk Controller**

The EV-390 Hard Disk/Floppy Disk Controller is for IBM PC, XT type computers. It allows the use of one or two ST412/506 type industry standard winchester fixed disk drives using MFM encoding, and 1 or 2 floppy disk drives.

The settings on the drawing are for 1 hard disk (no 2nd drive), and the drive type as 615 cylinders and 4 heads, such as the Seagate ST-225.

Read General Information below for drive type select settings and common info about the boards.

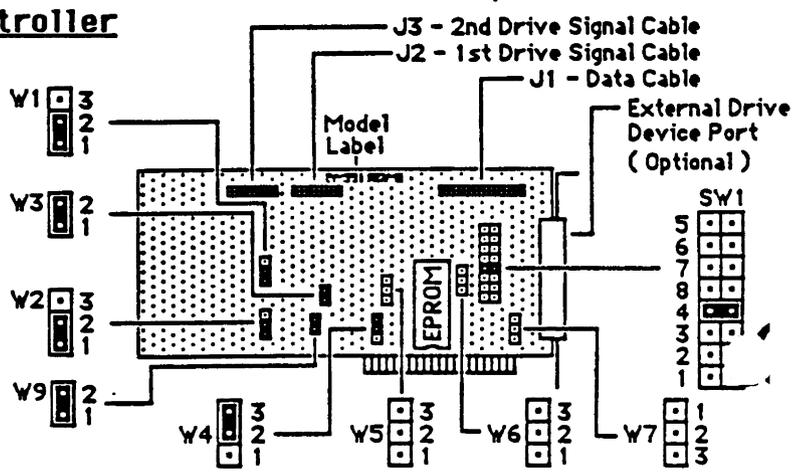


**EV-391 Hard Disk Controller**

The EV-391 Hard Disk Controller is for IBM PC, XT type computers. It allows the use of one or two ST506/ST412 type industry standard winchester fixed disk drives using MFM encoding.

- W1, W2 - 2-1 - NORMAL
- 2-3 - Factory Test Only
- W3 - Closed - BIOS ROM enabled
- Open - " - disabled
- W4 - 2-3 - Device Address 320H (Default)
- 2-1 - " - 324H
- W6 - 2-3 - Reduced Write Current (8 heads)
- 2-1 - Head Select 3 (16 heads)

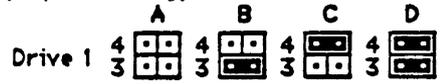
Read General Information below for drive type select settings and common info about the boards.



The settings on the drawing are for 1 hard disk (no 2nd drive), and the drive type as 615 cylinders, 4 heads - such as the Seagate ST-225.

**EV-390 and EV-391 General Information:**

Jumpers S1-1 through S1-4 are for selecting the hard disk drive type being used with the controller. Use the table at the right and below for selecting the proper drive type.



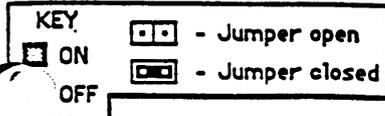
Jumpers S1-5 through S1-8 are reserved for BIOS ROM. They should all be left OPEN.

Note that Everex gets its hard disk controllers from other manufacturers and installs its own EPROMs.

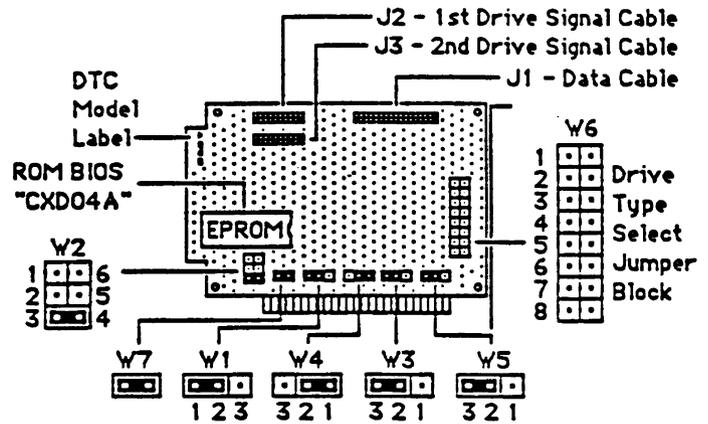
| DRIVE SELECT TYPE JUMPERS |        |      |       |           | Everex EPROMs |      |      |      |      |      |
|---------------------------|--------|------|-------|-----------|---------------|------|------|------|------|------|
| Manufacturer              | Model  | MB   | Heads | Cylinders | 3.92A         | 3.93 | 3.94 | 3.95 | 3.96 | 3.97 |
| Micropolis                | 1333A  | 44.5 | 5     | 1024      | -             | -    | -    | -    | A    | -    |
| Micropolis                | 1335   | 71.3 | 8     | 1024      | -             | -    | -    | -    | B    | -    |
| MicroScience              | 612    | 10.3 | 4     | 306       | A             | A    | A    | -    | -    | -    |
| MiniScribe                | 3650   | 42.2 | 6     | 809       | -             | -    | -    | -    | -    | A    |
| MiniScribe                | 6085   | 71.3 | 8     | 1024      | -             | -    | -    | -    | B    | -    |
| NEC                       | 5146   | 42.8 | 8     | 615       | -             | -    | B    | B    | -    | -    |
| Seagate                   | ST213  | 10.7 | 2     | 615       | B             | B    | -    | -    | -    | B    |
| Seagate                   | ST225  | 21.4 | 4     | 615       | C             | C    | C    | C    | C    | C    |
| Seagate                   | ST251  | 42.8 | 6     | 820       | -             | -    | D    | D    | -    | -    |
| Seagate                   | ST4026 | 21.4 | 4     | 615       | C             | C    | C    | C    | C    | C    |
| Seagate                   | ST4038 | 31.9 | 5     | 733       | D             | -    | -    | -    | D    | D    |
| Seagate                   | ST4051 | 42.5 | 5     | 977       | D*            | D    | -    | -    | -    | D    |
| Seagate                   | ST4096 | 80.2 | 9     | 1024      | -             | -    | -    | A    | -    | -    |

\* The ST4051 will have a formatted capacity of 31.9 MB when using the D op\* with the 3.92A EPROM.

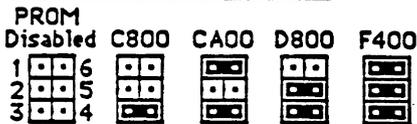
# Data Technology Corp. 5150CRH Fixed Disk Controller



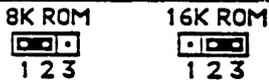
The DTC 5150CRH fixed disk drive controller is for IBM PC, XT type computers. It is able to control one or two ST-506/412 type industry standard 3.5" or 5.25" winchester disk drives using MFM encoding. The operating system must be IBM Dos Version 2.0 or later ( or compatible Dos ). Make note of the ROM BIOS on the controller; it must have a "CXDxxx" number on it. DTC sells its hard disk controllers to other companies that use their own EPROM, that may totally change the settings for the board.



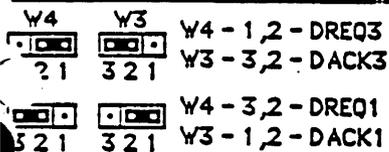
**W2 PROM ADDRESS Jumper:**



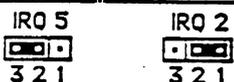
**W1 BIOS ROM Select Jumper:**



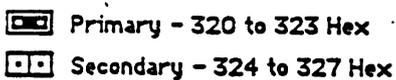
**W4/W3 DMA Channel Select Jumper:**



**W5 Interrupt Selection Jumper:**



**W7 Primary /Secondary Port Address Jumper:**



**Cables:**

The cables with these controllers are flat ribbon cables with no twist in the 34 Pin Data Cable. The drive select is determined by the drive.

**Formatting:**

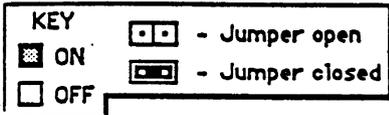
A hard drive can be formatted using the IBM Dos "DEBUG" program. At the "-" prompt, type "g=c800:5". The best interleave for this controller is 3. A drive table will appear. If all the W6 Jumpers are "off" you will need to select the proper drive type, or run **FDISK** **FORMAT**. After formatting, run the Dos "FDISK" and "FORMAT" commands.

**W6 - Drive Select Jumper:**

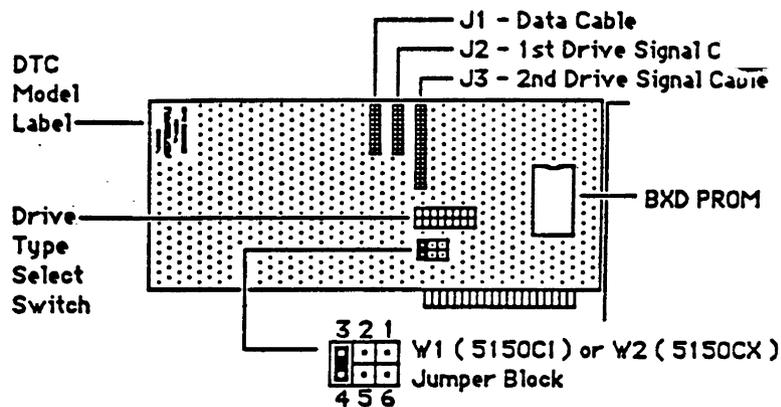
Note that the settings below include information for the first and second fixed disk drives. If there is only one fixed disk installed with this board, set jumpers 1, 2, 5 and 6 all open, or "off".

| Drive Type                                    | Capacity | Drive Type |           | W6 Jumper Settings                                    |                                                       |                                                       |                                                       |
|-----------------------------------------------|----------|------------|-----------|-------------------------------------------------------|-------------------------------------------------------|-------------------------------------------------------|-------------------------------------------------------|
|                                               |          | Heads      | Cylinder: | 1st Drive                                             |                                                       | 2nd Drive                                             |                                                       |
| 0: Seagate ST-225<br>Tandon-262               | 20 MB    | 4          | 612       | 3 <input type="checkbox"/> 7 <input type="checkbox"/> | 4 <input type="checkbox"/> 8 <input type="checkbox"/> | 1 <input type="checkbox"/> 5 <input type="checkbox"/> | 2 <input type="checkbox"/> 6 <input type="checkbox"/> |
| 1: Seagate ST-4038                            | 32 MB    | 5          | 733       | 3 <input type="checkbox"/> 7 <input type="checkbox"/> | 4 <input type="checkbox"/> 8 <input type="checkbox"/> | 1 <input type="checkbox"/> 5 <input type="checkbox"/> | 2 <input type="checkbox"/> 6 <input type="checkbox"/> |
| 2: MiniScribe-3425<br>MicroScience-725        | 20 MB    | 4          | 612       | 3 <input type="checkbox"/> 7 <input type="checkbox"/> | 4 <input type="checkbox"/> 8 <input type="checkbox"/> | 1 <input type="checkbox"/> 5 <input type="checkbox"/> | 2 <input type="checkbox"/> 6 <input type="checkbox"/> |
| 3: Seagate ST-212<br>Seagate ST-412           | 10 MB    | 4          | 306       | 3 <input type="checkbox"/> 7 <input type="checkbox"/> | 4 <input type="checkbox"/> 8 <input type="checkbox"/> | 1 <input type="checkbox"/> 5 <input type="checkbox"/> | 2 <input type="checkbox"/> 6 <input type="checkbox"/> |
| 4: Priam V150                                 | 43 MB    | 5          | 987       | 3 <input type="checkbox"/> 7 <input type="checkbox"/> | 4 <input type="checkbox"/> 8 <input type="checkbox"/> | 1 <input type="checkbox"/> 5 <input type="checkbox"/> | 2 <input type="checkbox"/> 6 <input type="checkbox"/> |
| 5: Priam V170                                 | 60 MB    | 7          | 987       | 3 <input type="checkbox"/> 7 <input type="checkbox"/> | 4 <input type="checkbox"/> 8 <input type="checkbox"/> | 1 <input type="checkbox"/> 5 <input type="checkbox"/> | 2 <input type="checkbox"/> 6 <input type="checkbox"/> |
| 6: Seagate ST-425                             | 20 MB    | 8          | 306       | 3 <input type="checkbox"/> 7 <input type="checkbox"/> | 4 <input type="checkbox"/> 8 <input type="checkbox"/> | 1 <input type="checkbox"/> 5 <input type="checkbox"/> | 2 <input type="checkbox"/> 6 <input type="checkbox"/> |
| 7: Tandon-362<br>Seagate ST-138               | 20 MB    | 4          | 615       | 3 <input type="checkbox"/> 7 <input type="checkbox"/> | 4 <input type="checkbox"/> 8 <input type="checkbox"/> | 1 <input type="checkbox"/> 5 <input type="checkbox"/> | 2 <input type="checkbox"/> 6 <input type="checkbox"/> |
| 8: Seagate ST-4051<br>Tandon-755              | 42 MB    | 5          | 977       | 3 <input type="checkbox"/> 7 <input type="checkbox"/> | 4 <input type="checkbox"/> 8 <input type="checkbox"/> | 1 <input type="checkbox"/> 5 <input type="checkbox"/> | 2 <input type="checkbox"/> 6 <input type="checkbox"/> |
| 9: Seagate ST-251                             | 42 MB    | 6          | 820       | 3 <input type="checkbox"/> 7 <input type="checkbox"/> | 4 <input type="checkbox"/> 8 <input type="checkbox"/> | 1 <input type="checkbox"/> 5 <input type="checkbox"/> | 2 <input type="checkbox"/> 6 <input type="checkbox"/> |
| 10: Seagate ST-213<br>MiniScribe 3012/3212    | 10 MB    | 2          | 612       | 3 <input type="checkbox"/> 7 <input type="checkbox"/> | 4 <input type="checkbox"/> 8 <input type="checkbox"/> | 1 <input type="checkbox"/> 5 <input type="checkbox"/> | 2 <input type="checkbox"/> 6 <input type="checkbox"/> |
| 11: Tandon-703                                |          | 5          | 695       | 3 <input type="checkbox"/> 7 <input type="checkbox"/> | 4 <input type="checkbox"/> 8 <input type="checkbox"/> | 1 <input type="checkbox"/> 5 <input type="checkbox"/> | 2 <input type="checkbox"/> 6 <input type="checkbox"/> |
| 12: Maxtor-1085                               | 71 MB    | 8          | 1024      | 3 <input type="checkbox"/> 7 <input type="checkbox"/> | 4 <input type="checkbox"/> 8 <input type="checkbox"/> | 1 <input type="checkbox"/> 5 <input type="checkbox"/> | 2 <input type="checkbox"/> 6 <input type="checkbox"/> |
| 13: Seagate ST-4096                           | 80 MB    | 9          | 1024      | 3 <input type="checkbox"/> 7 <input type="checkbox"/> | 4 <input type="checkbox"/> 8 <input type="checkbox"/> | 1 <input type="checkbox"/> 5 <input type="checkbox"/> | 2 <input type="checkbox"/> 6 <input type="checkbox"/> |
| 14: Okidata OKI-540                           | 33 MB    | 6          | 640       | 3 <input type="checkbox"/> 7 <input type="checkbox"/> | 4 <input type="checkbox"/> 8 <input type="checkbox"/> | 1 <input type="checkbox"/> 5 <input type="checkbox"/> | 2 <input type="checkbox"/> 6 <input type="checkbox"/> |
| 15: Auto-Configuration<br>( Factory Setting ) |          |            |           | 3 <input type="checkbox"/> 7 <input type="checkbox"/> | 4 <input type="checkbox"/> 8 <input type="checkbox"/> | 1 <input type="checkbox"/> 5 <input type="checkbox"/> | 2 <input type="checkbox"/> 6 <input type="checkbox"/> |

# Data Technology Corp. 5150CI/CX Fixed Disk Controllers



The DTC 5150CI and 5150CX are fixed disk drive controllers for IBM PC, XT type computers. They allow the use of one or two ST506/ST412 type industry standard winchester fixed disk drives using MFM encoding. The operating system must be IBM Dos Version 2.0 or later ( or compatible Dos ). Make note of the PROM on the controller, it must have the numbers BXDxx. DTC sells its hard disk controllers to other companies that use their own PROM, that may totally change the settings for the board. Also note that the switches and jumpers on the board may be installed up-side-down.



### W1/W2 Jumper Settings:

|                                     |                                     |                                     |                      |
|-------------------------------------|-------------------------------------|-------------------------------------|----------------------|
| 3-4                                 | 2-5                                 | 1-6                                 | <b>PROM ADDRESS:</b> |
| <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | PROM Disabled        |
| <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            | C800:0000            |
| <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | D000:0000            |
| <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | D800:0000            |
| <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | F400:0000            |

\* Default setting

### Sector Size:

The 5150CI and 5150CX defaults to a sector size of 512 bytes per sector.

### Port Address:

The port addresses are fixed at 320 to 323 Hex.

### Cables:

Normally, the cables with these controllers are flat ribbon cables with no twist in the 34 Pin Data Cable. This means that the drive select for drive 1 and 2 must be set as DS0 for drive 1, and DS1 for drive 2.

### Formatting:

A hard drive can be formatted using the IBM Dos "DEBUG" program. At the "-" prompt, type "g=c800:5". The best interleave to use with this controller is 4. After formatting, run the Dos "FDISK" and "FORMAT" commands.

### Drive Select Switch:

Note that the settings below include information for the first and second fixed disk drive. If there is only one fixed disk installed with this board, set switches 1, 2, 5 and 6 as if there is a second drive of the same type.

| Switch Settings                     |                                     | Drive                               | Drive Type                          |                                     |                                     |                                     |                                     |        |                                                       |       |           |                                                   |
|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|--------|-------------------------------------------------------|-------|-----------|---------------------------------------------------|
| 1                                   | 2                                   | 3                                   | 4                                   | 5                                   | 6                                   | 7                                   | 8                                   | Number | Capacity                                              | Heads | Cylinders | Comments                                          |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | 1      | 20 MB                                                 | 4     | 612       | No Write PreComp                                  |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | 2      |                                                       |       |           |                                                   |
| <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | 1      | 32 MB                                                 | 5     | 733       |                                                   |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | 2      |                                                       |       |           |                                                   |
| <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | 1      | 20 MB                                                 | 4     | 612       | Write PreComp at 128 (Seagate ST-)                |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | 2      |                                                       |       |           |                                                   |
| <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | 1      | 10 MB                                                 | 4     | 306       |                                                   |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | 2      |                                                       |       |           |                                                   |
| <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | 1      | 43 MB                                                 | 5     | 987       |                                                   |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | 2      |                                                       |       |           |                                                   |
| <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | 1      | 60 MB                                                 | 7     | 987       |                                                   |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | 2      |                                                       |       |           |                                                   |
| <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | 1      | 20 MB                                                 | 8     | 306       |                                                   |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | 2      |                                                       |       |           |                                                   |
| <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | 1      | Reserved for non-standard drives only.                |       |           |                                                   |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | 2      |                                                       |       |           |                                                   |
| <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | 1      | 42 MB                                                 | 5     | 977       |                                                   |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | 2      |                                                       |       |           |                                                   |
| <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | 1      | 42 MB                                                 | 6     | 820       |                                                   |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | 2      |                                                       |       |           |                                                   |
| <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | 1      | 10 MB                                                 | 2     | 612       |                                                   |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | 2      |                                                       |       |           |                                                   |
| <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | 1      | 62 MB                                                 | 7     | 1024      |                                                   |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | 2      |                                                       |       |           |                                                   |
| <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | 1      | 71 MB                                                 | 8     | 1024      |                                                   |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | 2      |                                                       |       |           |                                                   |
| <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | 1      | 80 MB                                                 | 9     | 1024      |                                                   |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | 2      |                                                       |       |           |                                                   |
| <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | 1      | 33 MB                                                 | 6     | 640       |                                                   |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | 2      |                                                       |       |           |                                                   |
| <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | 1      | Set 3, 4, 7 and 8 for drive type; 1, 2, 5 and 6 "off" |       |           | physical drive 1 will be split into two logical d |

# Zenith Z-159

## 3.5" Internal Floppy Diskette Drive Installation

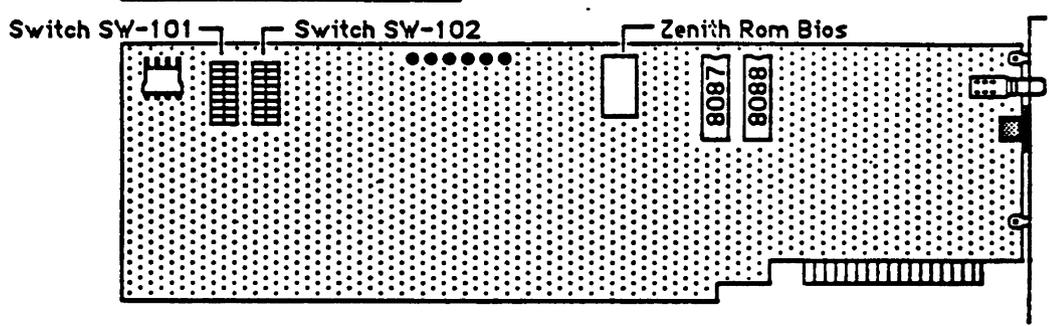
### HARDWARE

#### A. Zenith Z-159 CPU Board

Make sure that the CPU Board is set for the correct number of floppy diskette drives.

| Number of floppy drives | SW-101 |    |
|-------------------------|--------|----|
|                         | 6      | 7  |
| 1                       | on     | on |
| 2                       | off    | on |

#### Zenith Z-159 CPU Board



#### B. Cabling Configuration

Both 3.5" drives need a power connector converter cable, 134-1884, and usually a power splitter cable. One of two types of drive cables, straight or twisted, must be used and set up with the hardware properly:

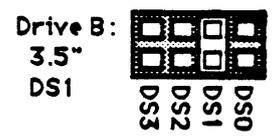
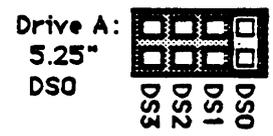
1. "Straight" - there are two known drive cables that will work with the 3.5" internal drive (Kit ZCA-16):

- Cable 134-1928 connects to the 3.5" drive at the end of the cable
- Cable 134-2016 connects to the 3.5" drive at the middle of the cable

These cables must have the Zenith Floppy Controller set for "straight" cabling, and the floppy diskette drive A: as the first physical drive (DS0), and Drive B: as the second physical drive (DS1).

Straight Cabling -  
(Drive Select Jumpers select Drive A: and B:)

| Physical Drive Selection |         |     |
|--------------------------|---------|-----|
| 5.25 "                   | DRIVE A | DS0 |
| 3.5 "                    | DRIVE B | DS1 |



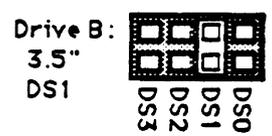
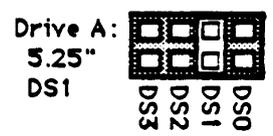
2. "Twisted" - there is one known drive cable that will work with the 3.5" internal drive:

- Cable 134-1942 connects to the 3.5" drive at the end of the cable (ZCA-15)

This cable must have the Zenith Floppy Controller set for "twisted" cabling, and the floppy diskette drives A: and B: must both be set as the second physical drive (DS1).

Twisted Cabling -  
(Twist in cable selects Drive A: and B:)

| Physical Drive Selection |         |     |
|--------------------------|---------|-----|
| 5.25 "                   | DRIVE A | DS1 |
| 3.5 "                    | DRIVE B | DS1 |

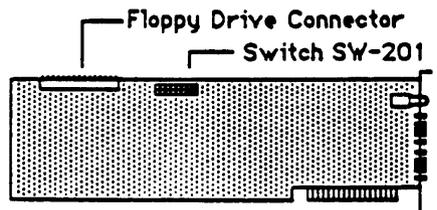


#### C. Zenith Z-159 Floppy Controller

Make sure that the switch settings on the Floppy/Video/Serial Controller or Floppy/Serial Controller are set for the correct type of floppy diskette drive cabling.

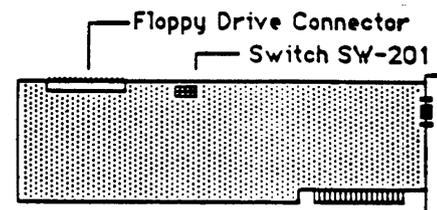
#### Zenith Z-159 Floppy/Video/Serial Controller

| Type of cable | SW-201 |
|---------------|--------|
| 5             |        |
| straight      | off    |
| twisted       | on     |



#### Zenith Z-159 Floppy/Serial Controller

| Type of cable | SW-201 |
|---------------|--------|
| 3             |        |
| straight      | on     |
| twisted       | off    |



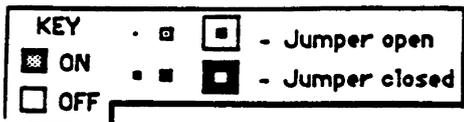
### II. SOFTWARE

To allow the 3.5" Floppy Diskette Drive to be capable of formatting at 720 KB capacity, it must the following special driver program loaded in the CONFIG.SYS file:

```
DRIVPARM = /d:01
```

*Handwritten notes:*  
 2-91  
 RECO SIZE drive 720K

## Zenith-type Floppy Drives Layout

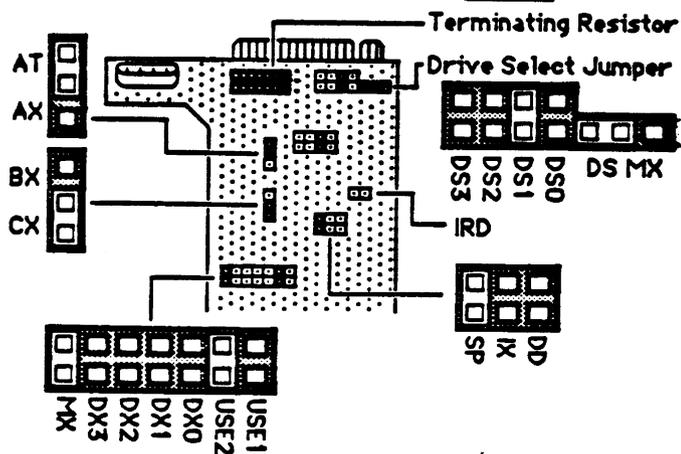


The following Floppy Diskette Drive Layouts show various manufacturers drives and how they should be set up in the Zenith Z-159, Z-286 and most PC-Compatible computers. The location of the Terminating Resistor and the Drive Select Jumper is shown. Other jumpers and speed adjustment are shown if present. It should be noted that the Zenith Z-159 computers do not have a twist at the Drive A: end of the Drive Cable.

### Panasonic JU-475-2AGG

(Half-Height, High-Density, 5.25", Z-286.)

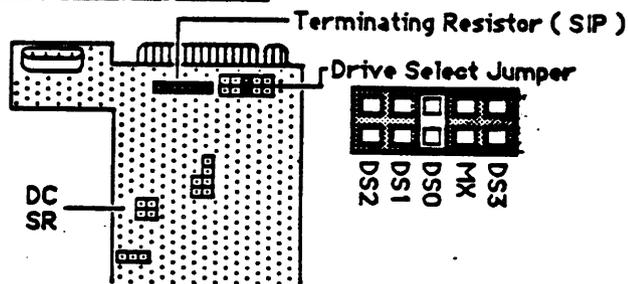
View - Top, Back, Right Side: Socket:



### Mitsubishi Model MF501B-312UD

(Double-Sided, Double-Density, 5.25", Z-159.)

View - Top, Back, Right Side:



Zenith 3.5" Drives -

LED on Right side 720 KB

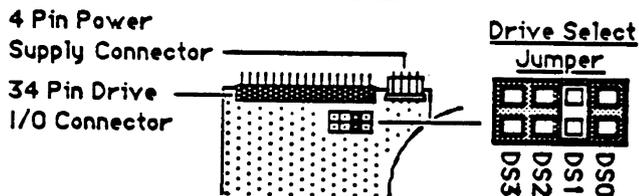
" " Left " 1.44 MB

for certain Zenith manufacturers

### Fujitsu Model F-3504-1000B

(Half-Height, Double-Density, 3.5", Z-159.)

View - Bottom, Back, Left Side:

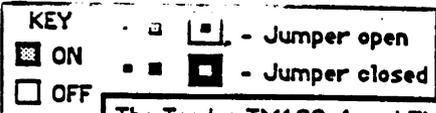


| <u>Zenith Drive Cables</u> |                                  |                                  |                      |
|----------------------------|----------------------------------|----------------------------------|----------------------|
| Drive Cables:              | Z-159 (ZDH-1217)                 | Z-286 (ZDH-2217)                 | Z-286 (ZDF-2237)     |
| Floppy Drive Cable         | *134-1822 ✕                      | *134-1818 ✕                      | *134-1818            |
| Hard Disk Data Cable       | 134-1924                         | 134-1869                         | 134-1552             |
| Hard Disk Signal Cable     | 134-1925                         | 134-1870                         | 134-2011<br>134-1870 |
| Internal 3.5" Cable        | 134-1928<br>134-1942<br>134-2016 | 134-1941<br>134-1942<br>134-1948 |                      |

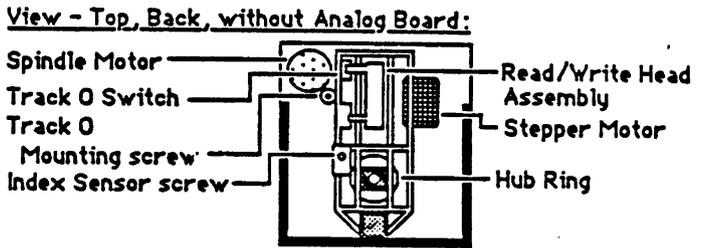
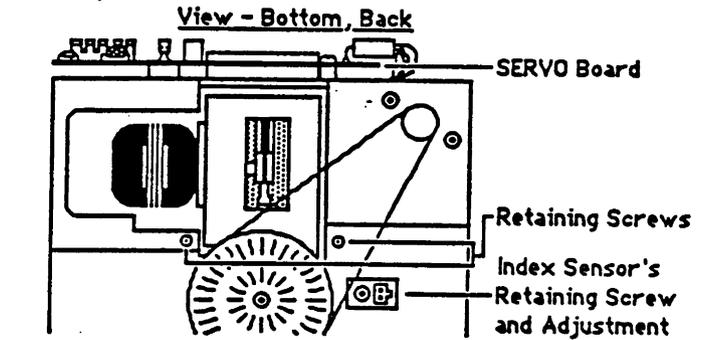
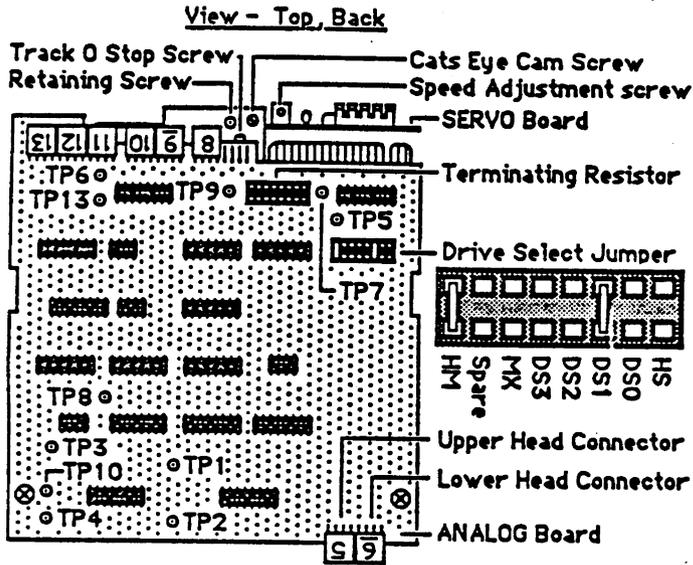
*2-72...*

- ext. 3.5" floppy wire  
Z-AT Kit ZCA-15  
7-XT Kit ZCA-16

# Tandon Corp. TM100-1 and TM100-2 Disk Drives



The Tandon TM100-1 and TM100-2 diskette drives are the most common type of 5.25" Full-Height Floppy Disk Drives found in older IBM PCs and XT's. The TM100-1 is single-sided, and the TM100-2 is double-sided. They use double density 5.25" floppy diskettes. They are 48 tracks per inch drives.



**Maintenance Checks and Adjustments:** ( Use Analog Alignment Diskette 48 TPI ).

| Oscilloscope Settings: | Track 0 Test                                                                                                          | Head Radial (Cats Eye)                                                                          | Azimuth Test                                                                                                  | Index Burst                                                                                                         | Index Pulse                                                |
|------------------------|-----------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|
| Volts per Div.         | 0.1 V                                                                                                                 | 50 MV, or 0.1 V                                                                                 | 50 MV, or 0.1V                                                                                                | 0.1 V                                                                                                               | 2 V                                                        |
| Time Base              | 2 MS                                                                                                                  | 20 MS                                                                                           | 1 MS                                                                                                          | 50 uS                                                                                                               | 1 MS                                                       |
| Ch. 1 Coupling         | AC                                                                                                                    | AC                                                                                              | AC                                                                                                            | AC                                                                                                                  | AC                                                         |
| Coupling               | AC                                                                                                                    | AC                                                                                              | AC                                                                                                            | AC                                                                                                                  | AC                                                         |
| Source                 | Normal                                                                                                                | Normal                                                                                          | Normal                                                                                                        | External                                                                                                            | Normal                                                     |
| Trigger Mode           | Normal                                                                                                                | Normal                                                                                          | Normal                                                                                                        | Normal                                                                                                              | Normal                                                     |
| Probes:                | See Probe Setup 1                                                                                                     | See Probe Setup 1                                                                               | See Probe Setup 1                                                                                             | See Probe Setup 1                                                                                                   | See Probe Setup 2                                          |
| Test Track:            | Track 0                                                                                                               | Track 16                                                                                        | Track 34                                                                                                      | Track 1, 34                                                                                                         | Any Track                                                  |
| Waveform Pattern:      | <br>Flickering solid horizontal band                                                                                  | <br>2 circles - one must be at least 75-80% the size of the other                               | <br>4 vertical bars - 2 outside are shorter than 2 on the inside                                              | <br>Pattern at 200-250 uS for best setting. Gridblock = 50 uS                                                       | <br>Pattern should be at least 4 MS long. Gridblock = 1 MS |
| Adjustment:            | Unscrew & lean back Analog Bd., loosen Track 0 Mounting screw, adjust Track 0 Sensor, & Track 0 Stop screw if needed. | Loosen (half-turn), the 3 Retaining screws. Adjust the cam screw with a flatblade screw-driver. | Loosen (half-turn) the 3 Retaining screws, adjust Read Write Head Assy. left and right. Test Cat's Eye again. | Unscrew & lean back Analog Bd., loosen Index Sensor screw on top near hub ring, or on bottom with index adjustment. | Same adjustment as Index Burst.                            |

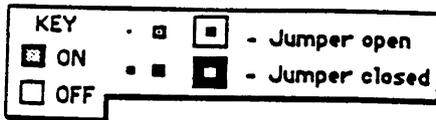
**Probe Setup 1**

Probe 1 Lead - TP3 - to Channel 1 of Oscilloscope  
 " " Ground - TP10 - Ground ( part of probe cable )

**Probe Setup 2**

Probe 1 Lead - TP7 - to Channel 1 of Oscilloscope  
 " " Ground - TP10 - Ground ( part of probe cable )  
 Probe 2 - TP7 - to Trigger Positive Slope of Oscilloscope

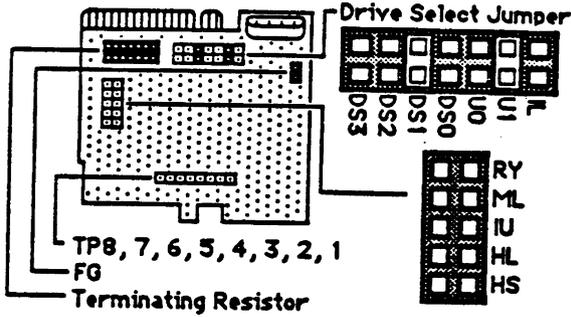
# TEAC Corp. 5.25" Floppy Drives Layout



The following Floppy Diskette Drive Layouts show various TEAC drives and how they should be set up in IBM PC, AT, and most IBM-compatible computers. The location of the Terminating Resistor and Drive Select Jumper is shown. Other jumpers, if any, are shown, and an adjustment for speed is shown if there is one.

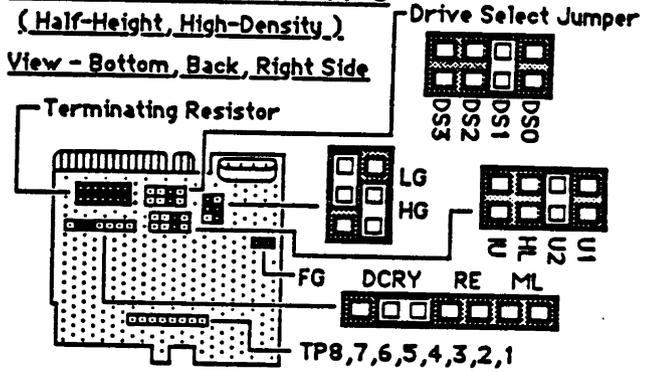
**TEAC Model FD-55BR-500-U**  
(Half-Height, Double-Density)

View - Bottom, Back, Right Side:



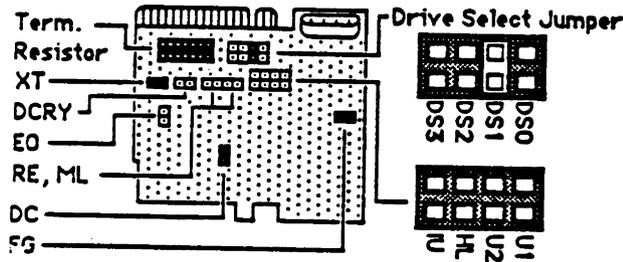
**TEAC Model FD-55GFV-17-U**  
(Half-Height, High-Density)

View - Bottom, Back, Right Side:



**TEAC Model FD-55BV-06-U**  
(Half-Height, Double-Density)

View - Bottom, Back, Right Side:



**NEW VERSION JUMPER TABLE**

The four jumper blocks (F, S, I, and D) and the host ROM (SR) on your Mountain hard disk controller board are used to specify the storage capacity of the hard disks connected to your system. Jumpers F and S specify the capacity of the first drive, and jumpers I and D specify the capacity of the second drive. FIGURE 2 shows the location of these jumpers.

Jumper settings will vary according to the version of the host ROM, and the size and type of hard disk. Consult the following tables for the proper jumper settings and ROM version. "00" in these tables means that a jumper is installed, "01" means that no jumper is installed. Extra jumpers are provided with the controller card to ease you into changing the jumper configuration.

Note: If this procedure seems too difficult for you to perform yourself, you can ask your dealer for assistance.

**Table 1 NEW VERSION 2.1A**

| Main 1 Jumper |    | Main 2 Jumper |    | System Size | Drive Type               | Cylinders, Heads |
|---------------|----|---------------|----|-------------|--------------------------|------------------|
| F             | S  | I             | D  |             |                          |                  |
| 00            | 00 | 00            | 00 | 5 MB        | Shugart ST506 (not used) | 124,2            |
| 00            | 01 | 00            | 01 | 10 MB       | Shugart ST519            | 204,6            |
| 01            | 00 | 01            | 00 | 10 MB       | ITT Standard 10 MB       | 204,6            |

**Table 2 NEW VERSION 2.2B**

| Main 1 Jumper |    | Main 2 Jumper |    | System Size | Drive Type                  | Cylinders, Heads |
|---------------|----|---------------|----|-------------|-----------------------------|------------------|
| F             | S  | I             | D  |             |                             |                  |
| 00            | 00 | 00            | 00 | (not used)  |                             |                  |
| 00            | 01 | 00            | 01 | 20 MB       | Shugart ST519, Electro 9532 | 322,8            |
| 01            | 00 | 01            | 00 | 10 MB       | Shugart ST519               | 204,6            |
| 01            | 01 | 01            | 01 | 10 MB       | ITT Standard 10 MB          | 204,6            |

**Table 7 NEW VERSION 2.2B**

| Main 1 Jumper |    | Main 2 Jumper |    | System Size | Drive Type         | Cylinders, Heads |
|---------------|----|---------------|----|-------------|--------------------|------------------|
| F             | S  | I             | D  |             |                    |                  |
| 00            | 00 | 00            | 00 | 10 MB       | Shugart ST506      | 212,8            |
| 00            | 01 | 00            | 01 | 20 MB       | Shugart ST519      | 312,8            |
| 01            | 00 | 01            | 00 | 10 MB       | Electro 9532       | 204,6            |
| 01            | 01 | 01            | 01 | 10 MB       | ITT Standard 10 MB | 204,6            |

In addition, jumpers E and G (and F, if your controller has it) must be 00 for correct operation.

As an example, if the following is true:

- You have ROM version 2.2F (Table 6)
- Your first disk is a 10 MB IT drive
- Your second disk is a 20 MB Shugart

then you would set the jumpers as follows:

F S I D  
01 01 00 01

Jumpers E, G, and F would also be 00.

# MOUNTAIN HARD DRIVES

**Table 3 NEW VERSION 2.2B**

| Main 1 Jumper |    | Main 2 Jumper |    | System Size | Drive Type               | Cylinders, Heads |
|---------------|----|---------------|----|-------------|--------------------------|------------------|
| F             | S  | I             | D  |             |                          |                  |
| 00            | 00 | 00            | 00 | 5 MB        | Shugart ST506 (not used) | 204,2            |
| 00            | 01 | 00            | 01 | 10 MB       | Shugart ST519            | 204,6            |
| 01            | 00 | 01            | 00 | 10 MB       | Electro 9532             | 204,6            |

**Table 4 NEW VERSION 2.2B**

| Main 1 Jumper |    | Main 2 Jumper |    | System Size | Drive Type                  | Cylinders, Heads |
|---------------|----|---------------|----|-------------|-----------------------------|------------------|
| F             | S  | I             | D  |             |                             |                  |
| 00            | 00 | 00            | 00 | 5 MB        | Shugart ST506               | 204,2            |
| 00            | 01 | 00            | 01 | 20 MB       | Shugart ST519, Electro 9532 | 322,8            |
| 01            | 00 | 01            | 00 | 10 MB       | Shugart ST519               | 204,6            |
| 01            | 01 | 01            | 01 | 10 MB       | Electro 9532                | 204,6            |

**Table 5 NEW VERSION 2.2B**

| Main 1 Jumper |    | Main 2 Jumper |    | System Size | Drive Type         | Cylinders, Heads |
|---------------|----|---------------|----|-------------|--------------------|------------------|
| F             | S  | I             | D  |             |                    |                  |
| 00            | 00 | 00            | 00 | 20 MB       | Shugart ST506      | 312,8            |
| 00            | 01 | 00            | 01 | 20 MB       | Shugart ST519      | 312,8            |
| 01            | 00 | 01            | 00 | 10 MB       | Electro 9532       | 204,6            |
| 01            | 01 | 01            | 01 | 10 MB       | ITT Standard 10 MB | 204,6            |

**Table 6 NEW VERSION 2.2F**

| Main 1 Jumper |    | Main 2 Jumper |    | System Size | Drive Type         | Cylinders, Heads |
|---------------|----|---------------|----|-------------|--------------------|------------------|
| F             | S  | I             | D  |             |                    |                  |
| 00            | 00 | 00            | 00 | 20 MB       | Shugart ST506      | 312,8            |
| 00            | 01 | 00            | 01 | 20 MB       | Shugart ST519      | 312,8            |
| 01            | 00 | 01            | 00 | 10 MB       | Electro 9532       | 204,6            |
| 01            | 01 | 01            | 01 | 10 MB       | ITT Standard 10 MB | 204,6            |

**APPENDIX A NEW VERSION JUMPER TABLES**

When a second hard disk is added, you must check the Mountain hard disk controller card "jumpers" and "host ROM" to make sure the controller is set up properly for the drive type and size.

The four jumper blocks (F, S, I, and D) and the host ROM (SR) on the Mountain hard disk controller board are used to specify the storage capacities and types of the hard disks connected to your system. Jumpers F and S specify the capacity and type of the first drive, and jumpers I and D specify the second drive.

Jumper settings will vary according to the version of the host ROM, and the size and type of hard disk. Consult the following tables for the proper jumper settings and ROM version. "00" in these tables means that a jumper is installed, "01" means that no jumper is installed. Extra jumpers are provided with the controller card to ease you into changing the jumper configuration.

Note that ROM version 2.2C and 2.2D will not work with IT drives.

**Table 1 NEW VERSION 2.1A**

| Main 1 Jumper |    | Main 2 Jumper |    | System Size | Drive Type               | Cylinders, Heads |
|---------------|----|---------------|----|-------------|--------------------------|------------------|
| F             | S  | I             | D  |             |                          |                  |
| 00            | 00 | 00            | 00 | 5 MB        | Shugart ST506 (not used) | 124,2            |
| 00            | 01 | 00            | 01 | 10 MB       | Shugart ST519            | 204,6            |
| 01            | 00 | 01            | 00 | 10 MB       | ITT Standard 10 MB       | 204,6            |

**Table 2 NEW VERSION 2.2B**

| Main 1 Jumper |    | Main 2 Jumper |    | System Size | Drive Type                  | Cylinders, Heads |
|---------------|----|---------------|----|-------------|-----------------------------|------------------|
| F             | S  | I             | D  |             |                             |                  |
| 00            | 00 | 00            | 00 | (not used)  |                             |                  |
| 00            | 01 | 00            | 01 | 20 MB       | Shugart ST519, Electro 9532 | 322,8            |
| 01            | 00 | 01            | 00 | 10 MB       | Shugart ST519               | 204,6            |
| 01            | 01 | 01            | 01 | 10 MB       | ITT Standard 10 MB          | 204,6            |



**Table 3 IBM VMEbus 2.2B**

| Bus 1<br>Jumpers<br>P Q | Bus 2<br>Jumpers<br>I D | System<br>RAM | Drive<br>Type      |
|-------------------------|-------------------------|---------------|--------------------|
| ON ON                   | ON ON                   | 32 MB         | Quantum Q240       |
| ON OFF                  | ON OFF                  | 32 MB         | Quantum Q230       |
| OFF ON                  | OFF ON                  | 16 MB         | Seagate ST510      |
| OFF OFF                 | OFF OFF                 | 16 MB         | IST Standard 16 MB |

**Table 4 IBM VMEbus 2.2F**

| Bus 1<br>Jumpers<br>P Q | Bus 2<br>Jumpers<br>I D | System<br>RAM | Drive<br>Type      |
|-------------------------|-------------------------|---------------|--------------------|
| ON ON                   | ON ON                   | 32 MB         | Quantum Q240       |
| ON OFF                  | ON OFF                  | 32 MB         | Seagate ST225      |
| OFF ON                  | OFF ON                  | 16 MB         | Seagate ST512      |
| OFF OFF                 | OFF OFF                 | 16 MB         | IST Standard 16 MB |

**Table 5 IBM VMEbus 2.2B**

| Bus 1<br>Jumpers<br>P Q | Bus 2<br>Jumpers<br>I D | System<br>RAM | Drive<br>Type      |
|-------------------------|-------------------------|---------------|--------------------|
| ON ON                   | ON ON                   | 32 MB         | Quantum Q240       |
| ON OFF                  | ON OFF                  | 32 MB         | Seagate ST225      |
| OFF ON                  | OFF ON                  | 16 MB         | Seagate ST512      |
| OFF OFF                 | OFF OFF                 | 16 MB         | IST Standard 16 MB |

In addition, jumpers E and G (and F, if your controller has it) must be ON for correct operation.

- As an example, if the following is true:
- The base IBM version 2.2F (Table 4)
  - Your first disk is a 16 MB ST drive
  - Your second disk is a 32 MB Seagate

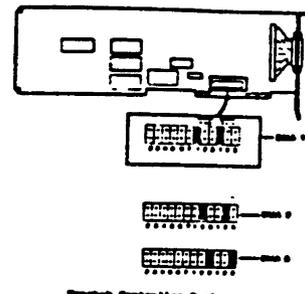
then you would set the jumpers as follows:

|     |     |    |     |
|-----|-----|----|-----|
| P   | Q   | I  | D   |
| OFF | OFF | ON | OFF |

Jumpers E, G, and F would also be ON.

**Tap Installation**

**2.2.0 Magnet Controller Card**  
The following illustration shows how to select the possible bus channels on the Magnet Controller Card.



Magnet Controller Card

**2.2.1 Connecting the Cables**  
The tape cables enable the tape controller card to communicate with the computer. If they are not connected properly, the system will not work properly. Refer to the appropriate Mountain Installation and Operation's Guide for additional information. Review the following installation cautions to make sure the hardware is installed correctly.

- 2.2.1 Installation Cautions**
- [ ] Bus not correctly on the tape controller card?
  - [ ] Controller card firmly seated in expansion slot assembly?
  - [ ] I/O cable correctly connected?
  - [ ] I/O cable connector screws tightened?

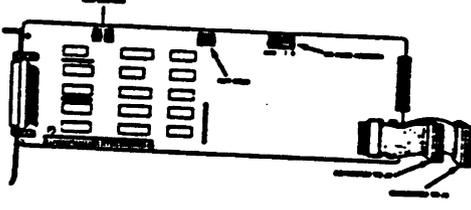
# MOUNTAIN HARDDRIVES

**Tap Installation**

**2.1 TYPES OF TAP CONTROLLER CARDS USED BY MOUNTAIN SYSTEMS**  
The tape controller cards that Mountain uses are:

- 625-02 Long Controller
- 625-02 Short Controller
- Archive Type 1 Controller
- Archive Type 2 Controller
- Magnet Controller

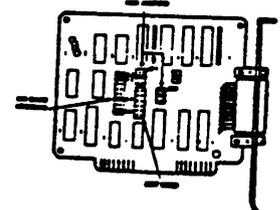
**2.1.1 625-02 Long Tap Controller**  
The following illustration shows the jumpers and connectors on the 625-02 Long Tap Controller.



625-02 Long Tap Controller Card

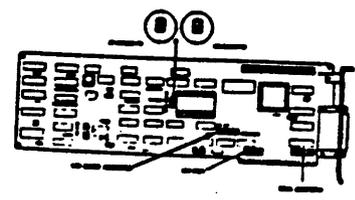
**Tap Installation**

**2.1.2 625-02 Short Tap Controller**  
The following illustration shows the jumpers and connectors on the 625-02 Short Tap Controller.



625-02 Short Tap Controller Card

**2.1.3 Archive Type 1 Controller Card**  
The following illustration shows the jumpers and connectors on the Archive Type 1 Controller Card.



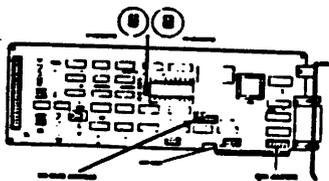
Archive Type 1 Controller Card

2-96

2-9.2

2.1.4 Archive Type 2 Controller Card

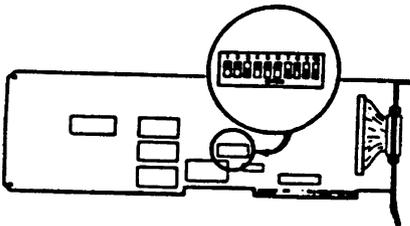
The following illustration shows the jumpers and connectors on the Archive Type 2 Controller Card.



Archive Type 2 Controller Card

2.1.5 Single Controller Card

The following illustration shows the correct address switch setting for the Single Controller Card.



Single Controller Card

2-4

# MOUNTAIN HARDDRIVES

2.2 CHECKING THE DMA CHANNEL SETTINGS

The tape controller cards can be set for a particular DMA channel by using a pair of jumpers. DMA stands for Direct Memory Access and is a method for rapidly transferring data between peripheral devices and the computer's main memory. Computers have four DMA channels DMA0, DMA1, DMA2 and DMA3. Each of these channels is usually reserved for specific functions. For example:

- DMA0 - used for memory refresh and therefore is not available for use.
- DMA1 - used by many local area networks if used at all.
- DMA2 - used for floppy disk drive controllers.
- DMA3 - used for hard disks, except on AS/400.

Although DMA channels can be shared, conflicts can arise if the computer tries to use a given DMA channel for more than one operation at a time. Operations might fail and "hang" the computer.

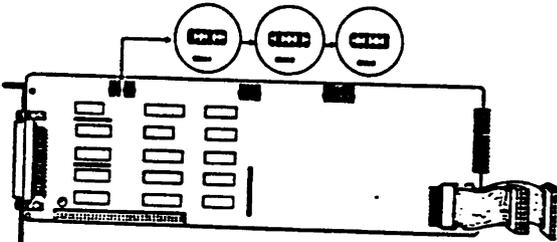
Because the tape drive uses DMA to obtain optimum performance, a clear DMA channel must be found in your particular computer. If you need to change the DMA setting on your tape controller card, you will also need to change the PDMACMD file that comes on the FileWare Tape Utilities discette.

**CAUTION:** DMA channels are selected in pairs. To properly set the channel on any board, make sure you set the jumpers on the same DMA numbers for both sets of DMA jumper blocks.

2-5

2.2.1 QSE-02 Long Tape Controller

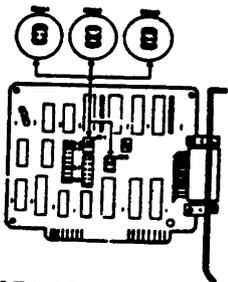
The following illustration shows how to select the possible DMA channels on the QSE-02 Long Tape Controller.



QSE-02 Long Tape Controller Card

2.2.2 QSE-02 Short Tape Controller

The following illustration shows how to select the possible DMA channels on the QSE-02 Short Tape Controller.

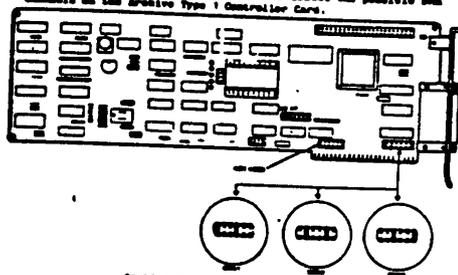


QSE-02 Short Tape Controller Card

2-6

2.2.3 Archive Type 1 Controller Card

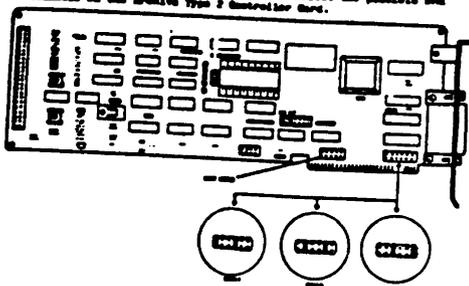
The following illustration shows how to select the possible DMA channels on the Archive Type 1 Controller Card.



Archive Type 1 Controller Card

2.2.4 Archive Type 2 Controller Card

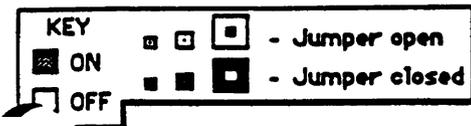
The following illustration shows how to select the possible DMA channels on the Archive Type 2 Controller Card.



Archive Type 2 Controller Card

2-7

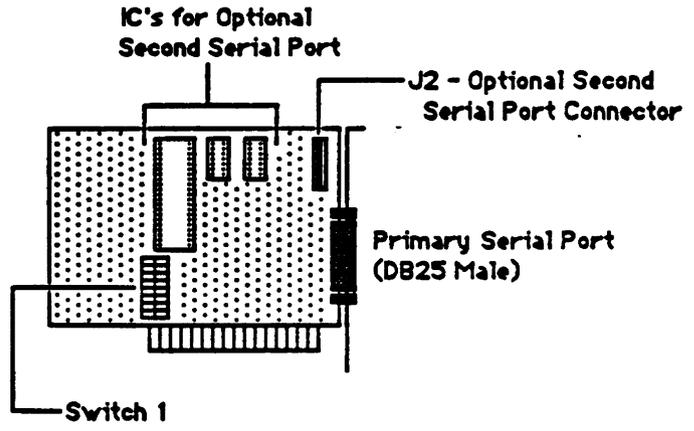
2-98



# Quadram Asynchronous Adapter Card

PC122

The Quadram Asynchronous Adapter Card is an RS232 Serial interface board for the IBM PC, XT, AT or compatibles. It has one serial port built-in and a second optional serial port. It has a switch block to determine its setting.



### Primary Serial Port

|                                     |                                     |                  |
|-------------------------------------|-------------------------------------|------------------|
| Switch 1                            |                                     |                  |
| 1                                   | 3                                   | Base I/O Address |
| <input checked="" type="checkbox"/> | <input type="checkbox"/>            | 3F8 - 3FF *      |
| 1                                   | 3                                   |                  |
| <input type="checkbox"/>            | <input checked="" type="checkbox"/> | 3E8 - 3EF **     |

### Primary Serial Port Interrupt Selection

|                                     |                                     |               |
|-------------------------------------|-------------------------------------|---------------|
| Switch 1                            |                                     |               |
| 5                                   | 6                                   |               |
| <input checked="" type="checkbox"/> | <input type="checkbox"/>            | IRQ 4 - COM 1 |
| 5                                   | 6                                   |               |
| <input type="checkbox"/>            | <input checked="" type="checkbox"/> | IRQ 3 - COM 2 |

### Optional Second Serial Port

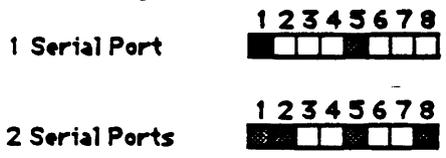
|                                     |                                     |                  |
|-------------------------------------|-------------------------------------|------------------|
| Switch 1                            |                                     |                  |
| 2                                   | 4                                   | Base I/O Address |
| <input checked="" type="checkbox"/> | <input type="checkbox"/>            | 2F8 - 2FF *      |
| 2                                   | 4                                   |                  |
| <input type="checkbox"/>            | <input checked="" type="checkbox"/> | 2E8 - 2EF **     |
| 2                                   | 4                                   |                  |
| <input type="checkbox"/>            | <input type="checkbox"/>            | Disabled         |

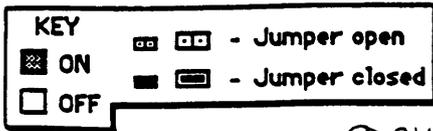
### Optional Second Serial Port Interrupt Selection

|                                     |                                     |              |
|-------------------------------------|-------------------------------------|--------------|
| Switch 1                            |                                     |              |
| 7                                   | 8                                   |              |
| <input checked="" type="checkbox"/> | <input type="checkbox"/>            | IRQ 4 - COM1 |
| 7                                   | 8                                   |              |
| <input type="checkbox"/>            | <input checked="" type="checkbox"/> | IRQ 3 - COM2 |
| 7                                   | 8                                   |              |
| <input type="checkbox"/>            | <input type="checkbox"/>            | Disabled     |

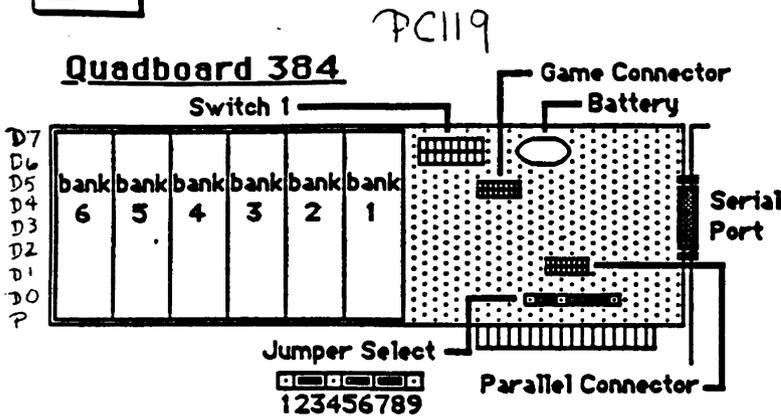
\* - Default Setting, recognized by both PC-DOS and BASICA.  
\*\* - Requires user-supplied software.

### Common Settings:



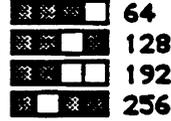


**Quadram Corp.**  
**Multi-Function Boards (DOS Base Memory only.)**

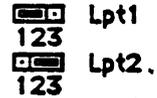


**Starting Address**

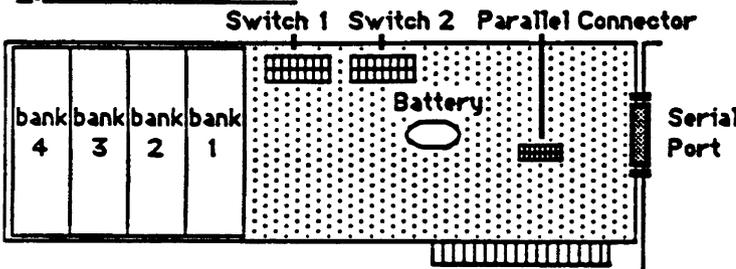
Switch 1  
5 6 7 8



- Switch 1
- 1 - Game Port enabled - on
  - 2 - Clock enabled - on
  - 3 - Parity enabled - on
  - 4 - Memory enabled - on

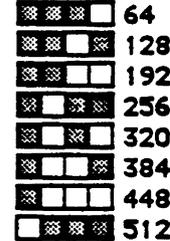


**Quadboard 256**    PC120



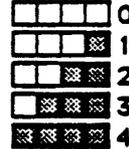
**Starting Address**

Switch 1  
1 2 3 4



**Banks Installed**

Switch 1  
5 6 7 8



**Switch 2**

- 1 - Parity enabled - on
  - 2 - Clock enabled - on
  - 3 - not used - off
  - 4 - Always off
- 5 6    7 8
- Lpt1     Com1
- Lpt2     Com2
- none     n

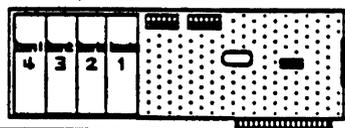
The 256 and 384 Quadram "Quadboards" are multi-function boards for the IBM PC & XT type computers. They feature base/conventional memory expansion, serial, parallel & game ports, a clock/calendar, and ram disk & print spool software. The boards come with a "Quadmaster" diskette with software for the clock/calendar, ram disk & print spool.

- QUADCLOCK.SYS and QUADCLOCK.COM - used to set the Quadboard clock/calendar. It can be set 2 different ways:  
 QUADCLOCK.SYS - loaded as a device driver in the CONFIG.SYS file - use the MS-DOS DATE and TIME commands to set Quadboard clock.  
 QUADCLOCK.COM - loaded in the AUTOEXEC.BAT file - use "QUADCLOCK/DATE=MM:DD:YY" and "QUADCLOCK/TIME=HH:MM" to set the Quadboard clock.
- QSPPOOL1.SYS, QUSPOOL2.SYS, QUSPOOL3.SYS - are print spool programs for parallel ports LPT1, LPT2 and LPT3.
- QSPPOOLSR.SYS - is a print spool program for serial port COM1 only.
- QSWAP.COM - is a program to logically swap parallel port output. If no parameters are given, it swaps LPT1 and LPT2.
- QUADNOTE.TXT - is a text file that explains the use of all the Quadmaster software.

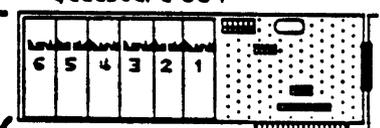
Note that some Quadboards may be using the older "PWRUPCLK" program for the clock, but the new files should also work.

**Memory Layout:**

Quadboard 256



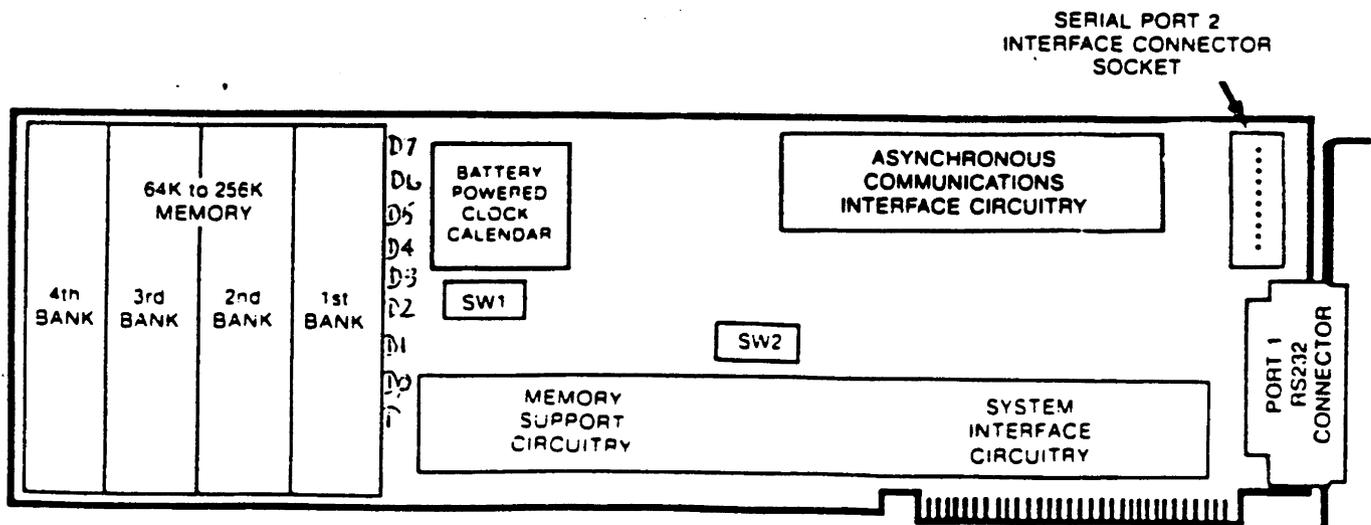
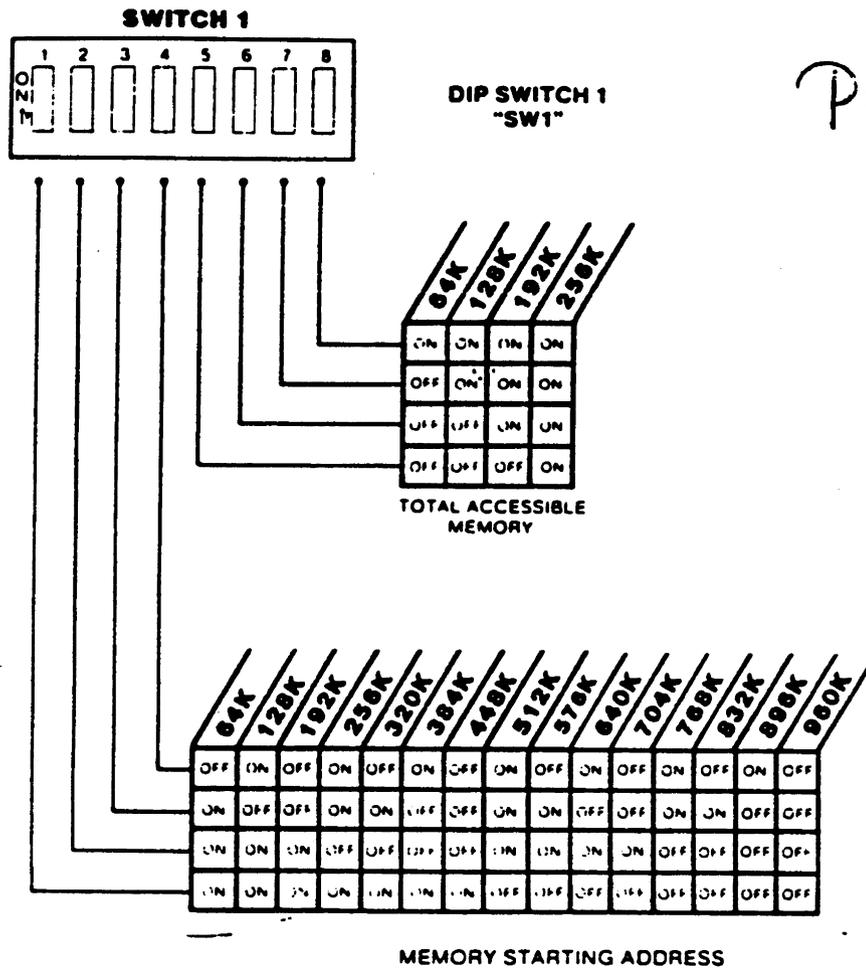
Quadboard 384

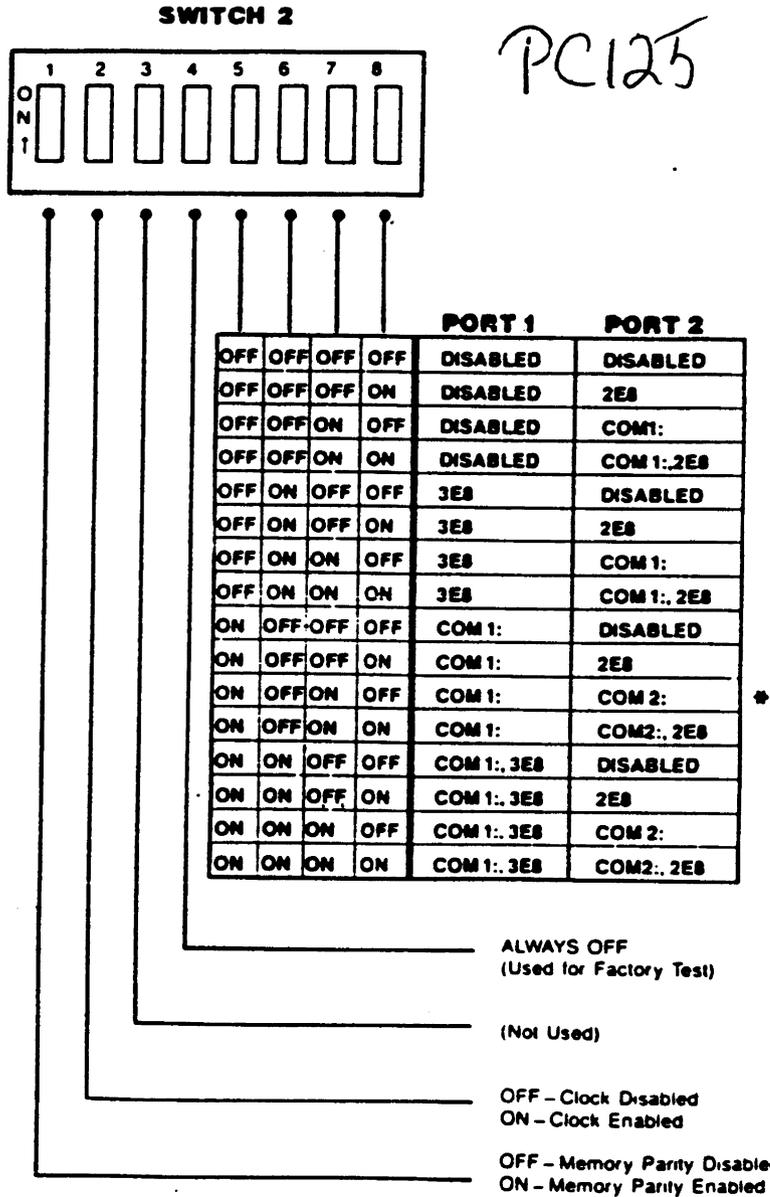


| Memory Error Location Chart |     |    |     |        |     |    |        |    |    |  |
|-----------------------------|-----|----|-----|--------|-----|----|--------|----|----|--|
| Bit in error                | 00  | 01 | 02  | 04     | 08  | 10 | 20     | 40 | 80 |  |
| Chip Location               | P   | 0  | 1   | 2      | 3   | 4  | 5      | 6  | 7  |  |
| 64 KB Block of Ram in error | 0   | 1  | 2   | , etc. |     |    |        |    |    |  |
| 64 KB Block of Ram          | 1st |    | 2nd |        | 3rd |    | , etc. |    |    |  |



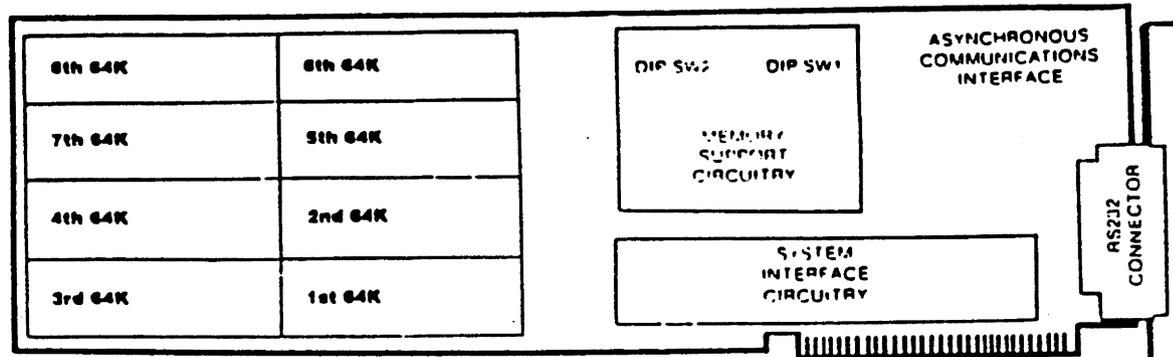
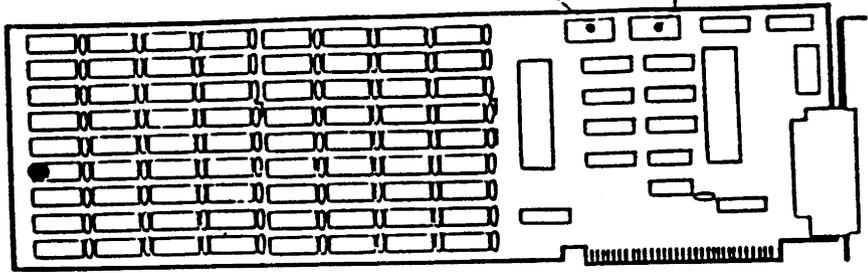
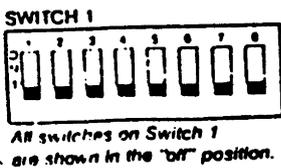
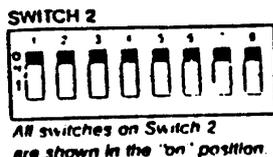
PC125





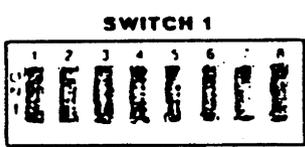
COM 1 and COM 1 are supported by Disk and Advanced BASIC and DOS  
 3E8 and 2E8 are alternate hex I/O addresses at which port 1 and port 2 may be  
 addressed, respectively  
 The user must supply software to use these alternate addresses

\* This is the most commonly used configuration.

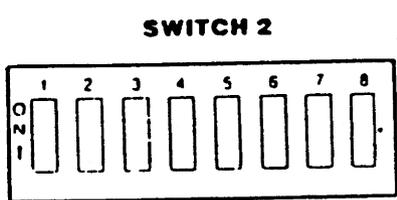


QUAD 512 + MEMORY STARTING ADDRESS QUICK REFERENCE

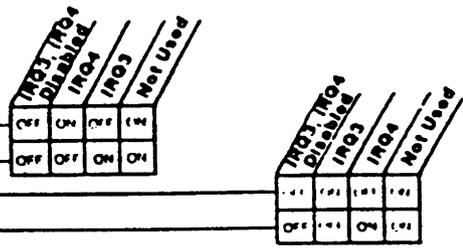
QUAD 512 + DIP SWITCH 2 — QUICK REFERENCE



QUAD 512 + DIP SWITCH 1 "SW1"



QUAD 512 + DIP SWITCH 2 "SW 2"



| 64K | 128K | 192K | 256K | 320K | 384K | 448K | 512K | 576K | 640K | 704K | 768K | 832K | 896K | 960K |
|-----|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| ON  | ON   | ON   | ON   | ON   | ON   | ON   | ON   | ON   | ON   | ON   | ON   | ON   | ON   | ON   |
| ON  | ON   | ON   | ON   | ON   | ON   | ON   | ON   | ON   | ON   | ON   | ON   | ON   | ON   | ON   |
| ON  | ON   | ON   | ON   | ON   | ON   | ON   | ON   | ON   | ON   | ON   | ON   | ON   | ON   | ON   |
| ON  | ON   | ON   | ON   | ON   | ON   | ON   | ON   | ON   | ON   | ON   | ON   | ON   | ON   | ON   |

QUAD 512 + MEMORY STARTING ADDRESS

| 64K | 128K | 192K | 256K | 320K | 384K | 448K | 512K |
|-----|------|------|------|------|------|------|------|
| ON  | ON   | ON   | ON   | ON   | ON   | ON   | ON   |
| ON  | ON   | ON   | ON   | ON   | ON   | ON   | ON   |
| ON  | ON   | ON   | ON   | ON   | ON   | ON   | ON   |
| ON  | ON   | ON   | ON   | ON   | ON   | ON   | ON   |
| ON  | ON   | ON   | ON   | ON   | ON   | ON   | ON   |
| ON  | ON   | ON   | ON   | ON   | ON   | ON   | ON   |
| ON  | ON   | ON   | ON   | ON   | ON   | ON   | ON   |
| ON  | ON   | ON   | ON   | ON   | ON   | ON   | ON   |
| ON  | ON   | ON   | ON   | ON   | ON   | ON   | ON   |

TOTAL ACCESSIBLE QUAD 512 + MEMORY

\*This may cause software problems as IBM only directly addresses 544K (64K + 512K = 576K).

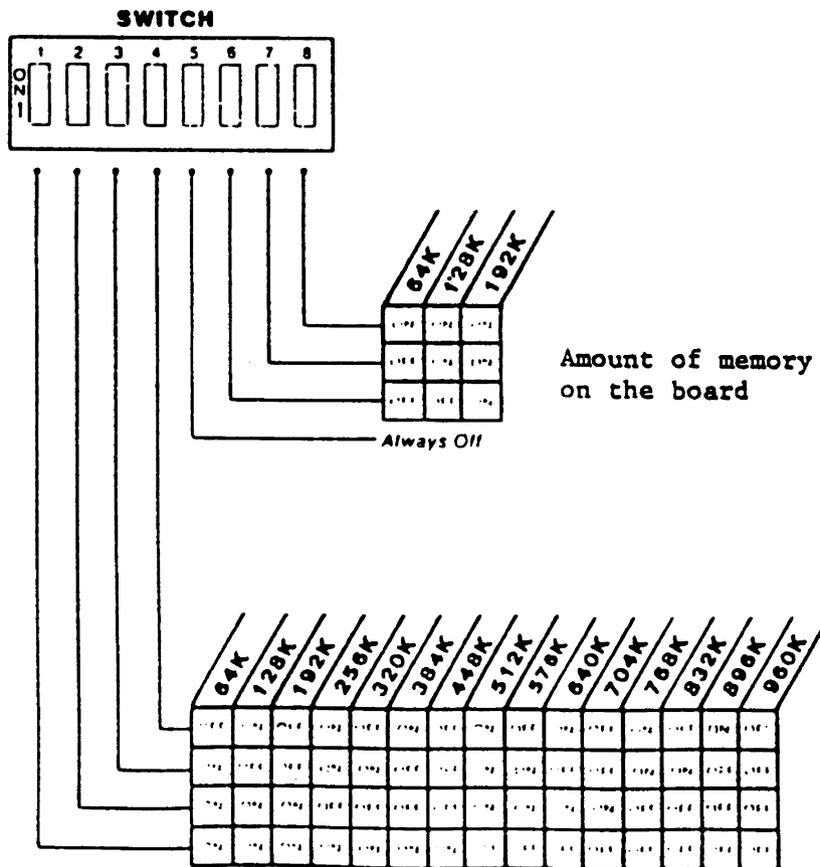
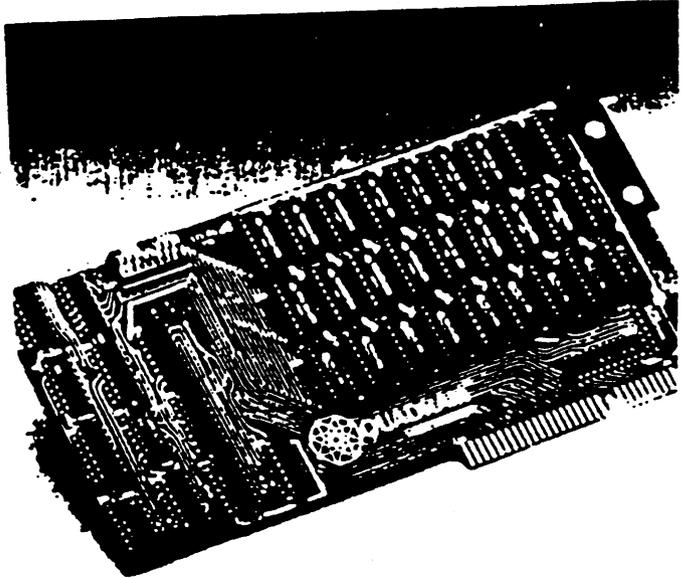




# Quadboard

PC121

## MEMORY EXPANSION BOARD



2-23

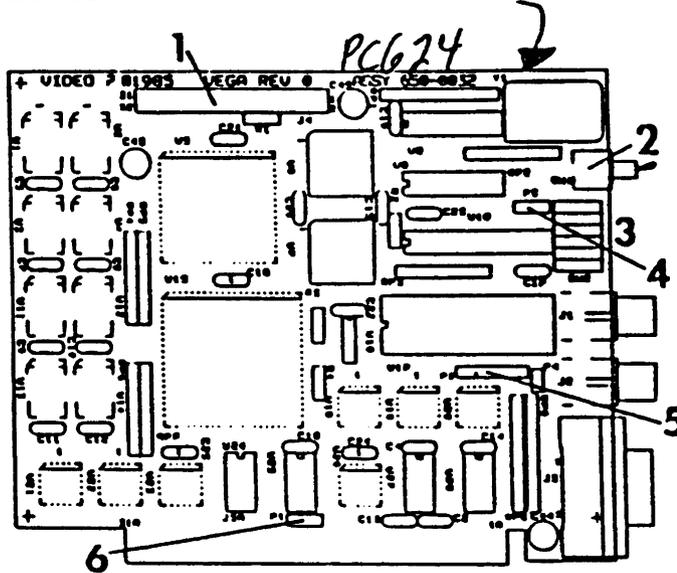
3-7

3-8

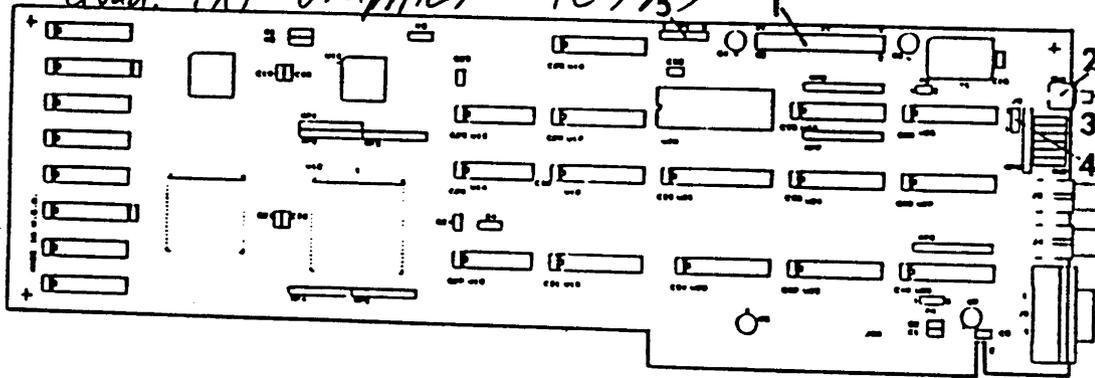
PC525

- 1. FEATURE CONNECTOR
- 2. TOGGLE SWITCH
- 3. SWITCH BLOCK
- 4. 2XX/3XX JUMPER BLOCK
- 5. LIGHT PEN PORT
- 6. SLOT 8 JUMPER BLOCK

*video 7  
Vega+*



*Quad. EXT Graphics = PC525*



**QuadEGA+ Emulation Mode**

QuadEGA+ Emulation Mode: Switch 5 on the QuadEGA+ Switch Block enables or disables the QuadEGA+ Emulation Mode.

| Emulation | Sw5 | QEGA.COM |
|-----------|-----|----------|
| Off       | Off | No       |
| On        | On  | Yes      |

| Command        | Description                                                                               |
|----------------|-------------------------------------------------------------------------------------------|
| QEGA CGA:ON    | Enable CGA emulation.                                                                     |
| QEGA CGA:OFF   | Disable CGA emulation.                                                                    |
| QEGA MONO:ON   | Enable HGC emulation.                                                                     |
| QEGA MONO:OFF  | Disable HGC emulation.                                                                    |
| QEGA MONO:HALF | Enable HGC emulation (1 page graphics).                                                   |
| QEGA MONO:FULL | Enable HGC emulation (2 page graphics).                                                   |
| QEGA SAVE:ON   | Enable Screen Saver function.                                                             |
| QEGA SAVE:{n}  | Enable Screen Saver function to shut off video after 'n' minutes of no keyboard activity. |
| QEGA SAVE:OFF  | Disable Screen Saver function.                                                            |

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**APPENDIX A: QuadEGA+ SWITCHES AND CONNECTORS**

**APPENDIX A: QuadEGA+ SWITCHES AND CONNECTORS**

**SETTING THE SWITCHES:**

Switches 1 through 4 are used to set the QuadEGA+ in these basic configurations. The switches are set either to ON or to OFF. If the switch is in the down position it is ON. If it is set in the up position it is OFF.

Find your configuration in the following tables, and set your QuadEGA+ switches accordingly:

**QuadEGA+ ALONE**

| QuadEGA+ Configured as | Display Used  | Switches |     |     |     |
|------------------------|---------------|----------|-----|-----|-----|
|                        |               | Sw1      | Sw2 | Sw3 | Sw4 |
| MDA                    | MD            | Off      | Off | On  | Off |
| CGA (40x25)            | CD/ED         | On       | Off | Off | On  |
| CGA (80x25)            | CD/ED         | Off      | Off | Off | On  |
| EGA                    | ED (normal)   | On       | On  | On  | Off |
| EGA                    | ED (enhanced) | Off      | On  | On  | Off |

**QuadEGA+ With MDA Co-Resident**

Primary adapter: QuadEGA+  
Secondary adapter: MDA

| QuadEGA+ Configured as | Display Used  | Switches |     |     |     |
|------------------------|---------------|----------|-----|-----|-----|
|                        |               | Sw1      | Sw2 | Sw3 | Sw4 |
| CGA (40x25)            | CD/ED         | On       | Off | Off | On  |
| CGA (80x25)            | CD/ED         | Off      | Off | Off | On  |
| EGA                    | ED (normal)   | On       | On  | On  | Off |
| EGA                    | ED (enhanced) | Off      | On  | On  | Off |

Primary adapter: MDA  
Secondary adapter: QuadEGA+

| QuadEGA+ Configured as | Display Used  | Switches |     |     |     |
|------------------------|---------------|----------|-----|-----|-----|
|                        |               | Sw1      | Sw2 | Sw3 | Sw4 |
| CGA (40x25)            | CD/ED         | On       | On  | On  | On  |
| CGA (80x25)            | CD/ED         | Off      | On  | On  | On  |
| EGA                    | ED (normal)   | On       | Off | On  | On  |
| EGA                    | ED (enhanced) | Off      | Off | On  | On  |

**QuadEGA+ With CGA Co-Resident**

Primary adapter: QuadEGA+ (with Monochrome Display)  
Secondary adapter: CGA

| CGA Mode | Switches |     |     |     |
|----------|----------|-----|-----|-----|
|          | Sw1      | Sw2 | Sw3 | Sw4 |
| 40 x 25  | On       | On  | Off | On  |
| 80 x 25  | Off      | Off | On  | Off |

Primary adapter: CGA  
Secondary adapter: QuadEGA+ (with Monochrome Display)

| CGA Mode | Switches |     |     |     |
|----------|----------|-----|-----|-----|
|          | Sw1      | Sw2 | Sw3 | Sw4 |
| 40 x 25  | On       | On  | Off | On  |
| 80 x 25  | Off      | On  | Off | Off |

**Quick Reference**

**QuadEGA+ Switch Settings**

| Primary Adapter       | Secondary Adapter     | QuadEGA+ Switches |     |     |     |
|-----------------------|-----------------------|-------------------|-----|-----|-----|
|                       |                       | Sw1               | Sw2 | Sw3 | Sw4 |
| OEGA w/ CD (40x25)    | MDA or None           | On                | Off | Off | On  |
| OEGA w/ CD (80x25)    | MDA or None           | Off               | Off | Off | On  |
| OEGA w/ ED (normal)   | MDA or None           | On                | On  | On  | Off |
| OEGA w/ ED (enhanced) | MDA or None           | Off               | On  | On  | Off |
| OEGA w/ MD            | CGA (40x25)           | On                | Off | On  | Off |
| OEGA w/ MD            | CGA (80x25) or None   | Off               | Off | On  | Off |
| MDA                   | OEGA w/ CD (40x25)    | On                | On  | On  | On  |
| MDA                   | OEGA w/ CD (80x25)    | Off               | On  | On  | On  |
| MDA                   | OEGA w/ ED (normal)   | On                | Off | On  | On  |
| MDA                   | OEGA w/ ED (enhanced) | Off               | Off | On  | On  |
| CGA (40x25)           | OEGA w/ MD            | On                | On  | Off | On  |
| CGA (80x25)           | OEGA w/ MD            | Off               | On  | Off | On  |

**Abbreviations:**

**Adapters**  
MDA: Monochrome Display Adapter  
CGA: Color Graphics Display Adapter  
EGA: Enhanced Graphics Adapter  
HGC: Hercules Graphics Card

**Monitors**  
MD: Monochrome Display  
CD: Color Display  
ED: Enhanced Display

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QUAD EGA PROSYNC IS A HIGH RESOLUTION, ADVANCED GRAPHICS ADAPTER FOR THE IBM PC SERIES COMPUTERS, DESIGNED TO BE FULLY COMPATIBLE WITH THE IBM (EGA). THE QUAD EGA PROSYNC SUPPORTS ALL THE FEATURES OF THE FOLLOWING MONITORS:

|        |                               |
|--------|-------------------------------|
|        | NEC MULTISYNC (OR EQUIVALENT) |
| EGA=ED | IBM ENHANCED COLOR DISPLAY    |
| CGA=CD | IBM COLOR DISPLAY             |
| MDA=MD | IBM MONOCHROME DISPLAY        |

**INSTALLATION**

FOR THE IBM PC/XT

(SET THE DIP SWITCHES 5 & 6 TO ON) ON THE SYSTEM BOARD FOR EGA MODE ONLY. SW 5-ON 6-OFF FOR CGA, AND 5-OFF 6-OFF FOR MDA.

FOR THE IBM AT

(CHOOSE OPTION IN SETUP PERTAINING TO IBM EGA)

QUAD EGA PROSYNC ALONE

| DISPLAY USED | QUADEGA PROSYNC CONFIGURED AS | QUADEGA PROSYNC SWITCHES SW1 | SW2 | SW3 | SW4 |
|--------------|-------------------------------|------------------------------|-----|-----|-----|
| MD           | MDA                           | OFF                          | OFF | ON  | OFF |
| CD/ED        | CGA (40X25)                   | ON                           | OFF | OFF | ON  |
| CD/ED        | CGA (80X25)                   | OFF                          | OFF | OFF | ON  |
| ED/NORMAL    | EGA                           | ON                           | ON  | ON  | OFF |
| ED/ENHANCED  | EGA                           | OFF                          | ON  | ON  | OFF |

QUAD EGA WITH MDA CO-RESIDENT

PRIMARY ADAPTER: QUADEGA PROSYNC

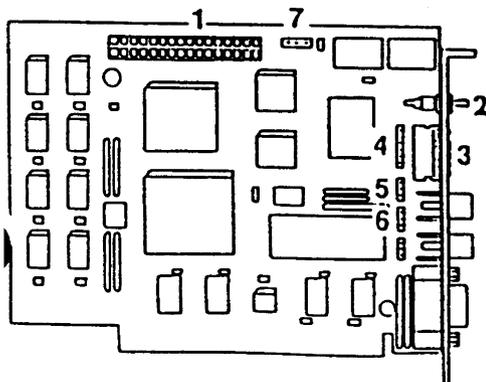
SECONDARY ADAPTER: MDA

| DISPLAY USED | QUAD PROSYNC CONFIGURED AS | QUADEGA PROSYNC SWITCHES SW1 | SW2 | SW3 | SW4 |
|--------------|----------------------------|------------------------------|-----|-----|-----|
| CD/ED        | CGA (40X25)                | ON                           | OFF | OFF | ON  |
| CD/ED        | CGA (80X25)                | OFF                          | OFF | OFF | ON  |
| ED/NORMAL    | EGA                        | ON                           | ON  | ON  | OFF |
| ED/ENHANCED  | EGA                        | OFF                          | ON  | ON  | OFF |

PRIMARY ADAPTER: MDA

SECONDARY ADAPTER: QUADEGA PROSYNC

| DISPLAY USED | QUADEGA PROSYNC CONFIGURED AS | QUADEGA PROSYNC SWITCHES SW1 | SW2 | SW3 | SW4 |
|--------------|-------------------------------|------------------------------|-----|-----|-----|
| CD/ED        | CGA (40X25)                   | ON                           | ON  | ON  | ON  |
| CD/ED        | CGA (80X25)                   | OFF                          | ON  | ON  | ON  |
| ED/NORMAL    | EGA                           | ON                           | OFF | ON  | ON  |
| ED/ENHANCED  | EGA                           | OFF                          | OFF | ON  | ON  |



1. Feature Connector
2. Toggle Switch
3. Switch Block
4. Light Pen Port
5. 2XX/1XX Jumper Block
6. Slot # Jumper Block
7. Feature Clock Jumper Block



QUADEGA PROSYNC WITH CGA CO-RESIDENT

PRIMARY ADAPTER: QUADEGA PROSYNC (WITH MONOCHROME DISPLAY)  
SECONDARY ADAPTER: CGA

| CGA MODE | QUADEGA PROSYNC SWITCHES |     |     |     |
|----------|--------------------------|-----|-----|-----|
|          | SW1                      | SW2 | SW3 | SW4 |
| 40x25    | ON                       | OFF | ON  | OFF |
| 80X25    | OFF                      | OFF | ON  | OFF |

PRIMARY ADAPTER: CGA  
SECONDARY ADAPTER: QUADEGA PROSYNC (WITH MONOCHROME DISPLAY)

| CGA MODE | QUADEGA PROSYNC SWITCHES |     |     |     |
|----------|--------------------------|-----|-----|-----|
|          | SW1                      | SW2 | SW3 | SW4 |
| 40X25    | ON                       | ON  | OFF | ON  |
| 80X25    | OFF                      | ON  | OFF | ON  |

SWITCH 5 SHOULD BE ON IF USING QUADEGA SOFTWARE, OFF AND IT BECOMES FULLY COMPATIBLE WITH THE IBM ENHANCED DISPLAY AND EGA. CGA AND HGC ARE DISABLED. WHEN SW 5 IS ON IT WILL AUTOMATICALLY EMULATE THE CGA AND HGC ONCE THE QEGA PROGRAM HAS BEEN RUN.

SWITCH 6 IS NOT USED.

|                              |              |
|------------------------------|--------------|
| TOGGLE SWITCH - MONITOR USED | TOGGLE       |
| ENHANCED DISPLAY             | TO THE LEFT  |
| COLOR DISPLAY                | TO THE RIGHT |
| MONOCHROME DISPLAY           | TO THE RIGHT |

THE QUADEGA PROSYNC 2XX/3XX JUMPER BLOCK  
DEFAULT SETTINGS ARE ON PINS 1 AND 2 (3XX)

THE QUADEGA PROSYNC SLOT-8 JUMPER BLOCK  
INSTALL IN SLOT 8 JUMPER PINS 1 AND 2  
DO NOT INSTALL IN SLOT 8 PINS 2 AND 3

THE QUADEGA PROSYNC FEATURE CONNECTOR SUPPORTS ADD-ON FEATURE ADAPTERS MADE TO ENHANCE THE QUADEGA. TWO RCA VIDEO JACKS ARE CONNECTED TO IT, AND WILL SUPPORT VIDEO OUTPUT FROM FUTURE ADAPTERS.

THE QUADEGA PROSYNC FEATURE CLOCK JUMPER BLOCK  
TO ACTIVATE A SECOND CLOCK JUMPER PINS 2 AND 3 (CLOSEST TO CLOCK)  
TO DEACTIVATE THE CLOCK JUMPER PINS 1 AND 2

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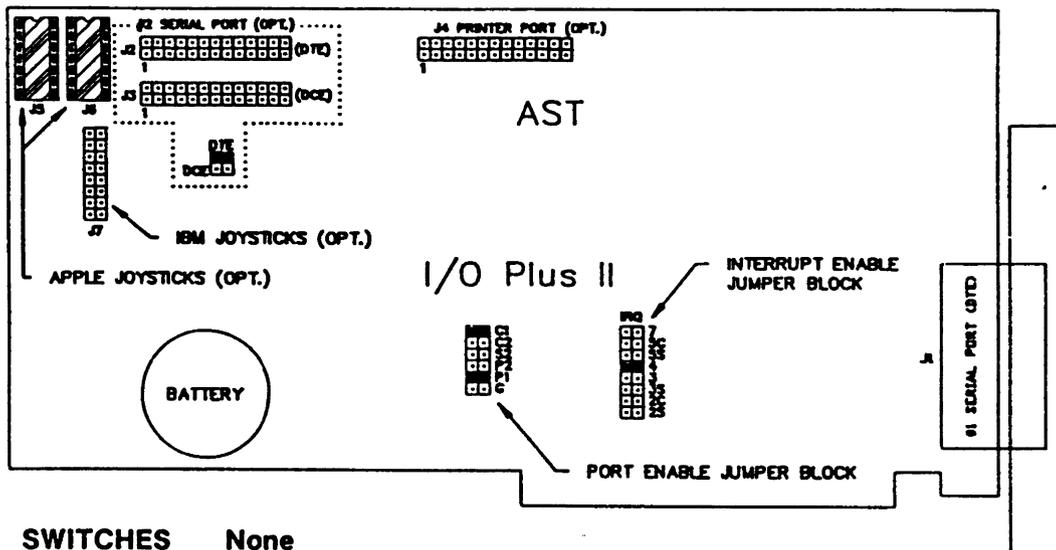
SOFTWARE

DIAG.COM - SHOULD DISPLAY 256K OF VIDEO MEMORY AND CONFIG. INFO.  
INSTALL.COM - HELPS YOU CONFIG. YOUR SYSTEM FOR USE WITH QUADEGA.  
QEGABOOT.SYS - CREATES PRE-BOOT DISKETTE FOR USE WITH GAMES.  
QEGA.COM - SET SPECIAL FEATURES FOR THE QUAD EGA  
ROMDATE.COM - DISPLAYS ROMDATE, IF BEFORE 04/83 WON'T SUPPORT EGA.

## INSTALLATION INSTRUCTION SHEET

### CAUTION

Static sensitive device. Handle only at a static-free workstation or use an antistatic service kit. Package the device in a conductive bag with an insulated antistatic liner.



**SWITCHES** None

**JUMPERS**

### NOTE

\*Default settings on drawing

#### Port Enable Jumper Block

- \* C1= Enable #1 Serial Port as COM1:
- C2= Enable #1 Serial Port as COM2:
- S2= Enable #2 Serial Port as COM2:
- P2= Enable Parallel Printer Port as LPT2:
- \* P1= Enable Parallel Printer Port as LPT1:
- G=Enable Game Port

#### IRQ (Interrupt Request) Jumper Block

- 7= Optional Parallel Printer Interrupt #7
- 5C= Optional Real-Time-Clock Interrupt #5
- 5S= Optional #2 Serial Port Interrupt #5
- \* 4= #1 Serial Port COM1: Interrupt #4
- 3= #1 Serial Port COM2: Interrupt #3
- 3S= #2 Serial Port COM2: Interrupt #3
- 2C= Optional Real-Time-Clock Interrupt #2
- 2S= Optional #2 Serial Port Interrupt #2

#### DTE/DCE Jumper Block

- \* DTE= Enable Use of #2 Serial Port Connector J2
- DCE= Enable Use of #2 Serial Port Connector J3 (Ties Carrier Detect to Data Terminal Ready.)

**SPECIAL TOOLS** None

### INSTALLATION

**#1 Serial Port (J1).** #1 Serial Port is set up for DTE only.

- COM1: = Jumpers C1 and 4
- COM2: = Jumpers C2 and 3
- Disabled = No Jumpers on C1, C2, or #4

CONTINUED—

**#2 Serial Port (J2/J3)**

Make sure there are no other COM ports installed besides the #1 Serial Port. (No Internal modems, other add-in serial ports, etc.)

Make sure IC's U2 (1488) and U3 (1489) are in place.

Make sure #1 Serial Port is set for COM1: (#2 Serial Port can be COM2: ONLY).

COM2: = Jumpers S2 and 3S

Disabled = No jumpers on S2 and 3S

DTE Wiring (IBM Standard)(To MODEM) = Jumper on DTE and use J2

DCE Wiring (To Printer) = Jumper on DCE and use J3.

**Parallel Printer**

Make sure IC'S U14(LS244), U15(LS374), U16(LS174), U17(LS240), and U24(LS138) are in place.

Besides a Monochrome-Printer Port, be sure there is no more than one other Parallel Printer Port.

LPT1: = Jumper on P1

LPT2: = Jumper on P2

Disabled = No jumper on P1 or P2

**Game Port (J5/J6, J7)**

IBM Joysticks: Be sure IC's U10(NE558), U11(LS244), and U19(LS32) are in place.

APPLE II Joysticks: Also add IC U1(LS05).

Install jumper at G.

**SOFTWARE: AST Superpak Revision No.\_\_\_\_\_**

**Real-Time-Clock**

ASTCLOCK.COM = (1.) Set time and date in AST Real-Time-Clock.

(2.) Transfer time and date to System.

- 1. Boot DOS with no AUTOEXEC. BAT file.

Type in: ASTCLOCK/R CR

Type in: Time CR

Answer prompts.

Type in: Date CR

Answer prompts.

- 2. Boot DOS with ASTCLOCK.COM on boot disk and ASTCLOCK in AUTOEXEC.BAT file.

**Other:**

SUPERDRV.COM = RamDisk program, (for USERS only)

SUPERSPL.COM = Print spooler program, (for USERS only)

RAMCLEAR.COM = Initializes RAM above usable addresses to avoid random PARITY ERRORS.

**ASSOCIATED PART NUMBERS**

**IC's**

|                  |          |         |          |
|------------------|----------|---------|----------|
| Battery (BR2325) | YY013517 | 74LS138 | YY003021 |
| NE558            | YY011359 | 74LS174 | YY000446 |
| 1488             | YY006079 | 74LS240 | YY011038 |
| 1489             | YY003599 | 74LS244 | YY003591 |
| 74LS32           | YY002495 | 74LS374 | YY003597 |

**Cables**

Serial Adapter Cable \_\_\_\_\_

Parallel Adapter Cable PC000196

Game Adapter Cable \_\_\_\_\_

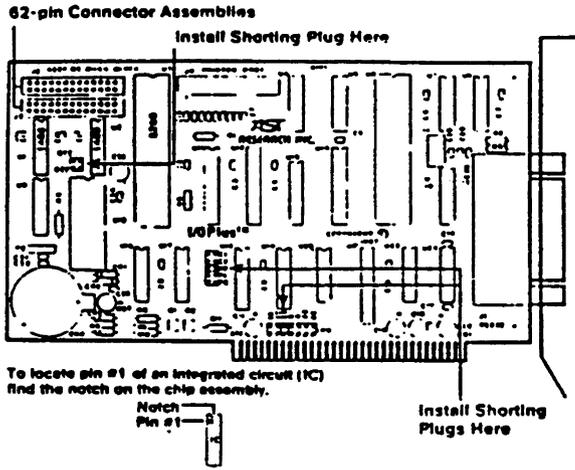
**Miscellaneous**

Jumpers HN-2286

3-16

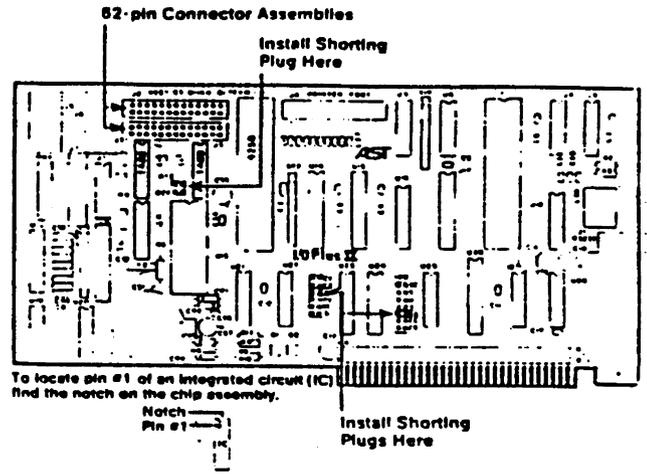
# Serial Port Option

PC192



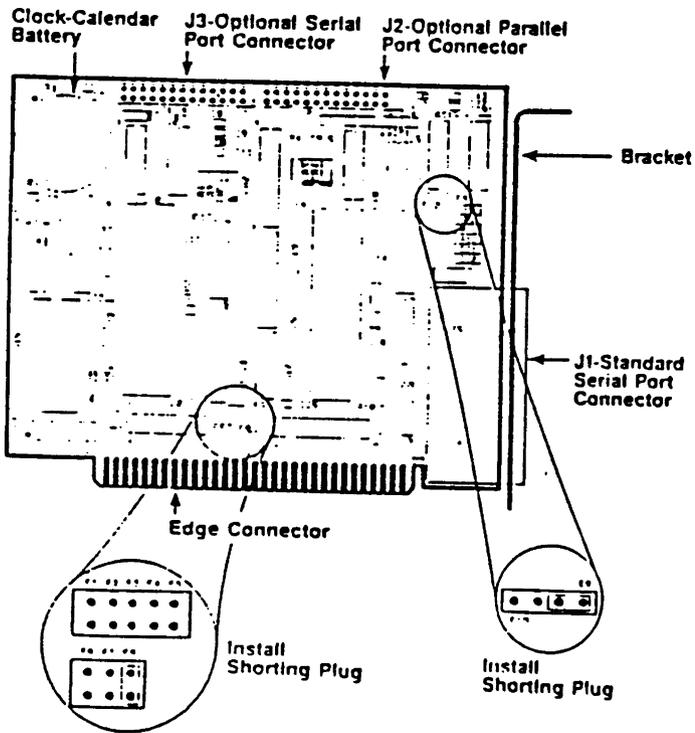
I/O Plus Board Layout

PC192



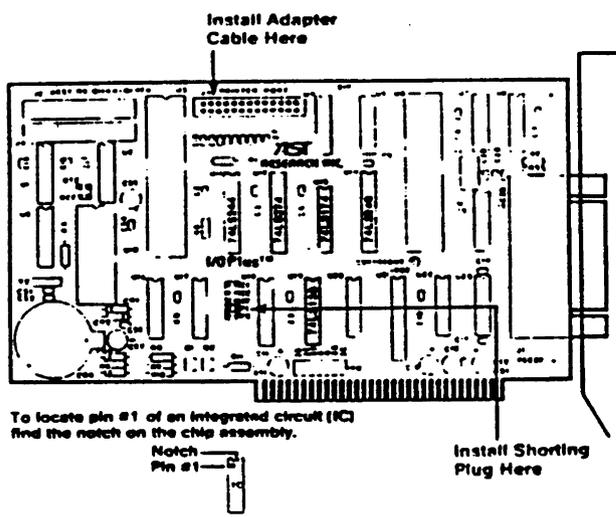
I/O Plus II Board Layout

PC552

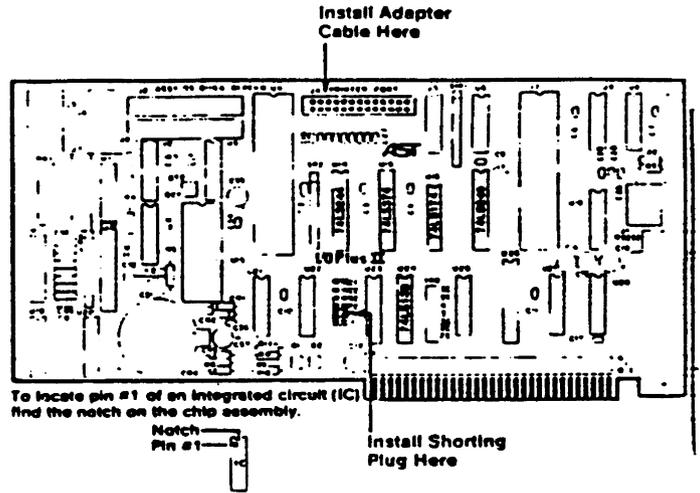


I/O Mini Board Layout

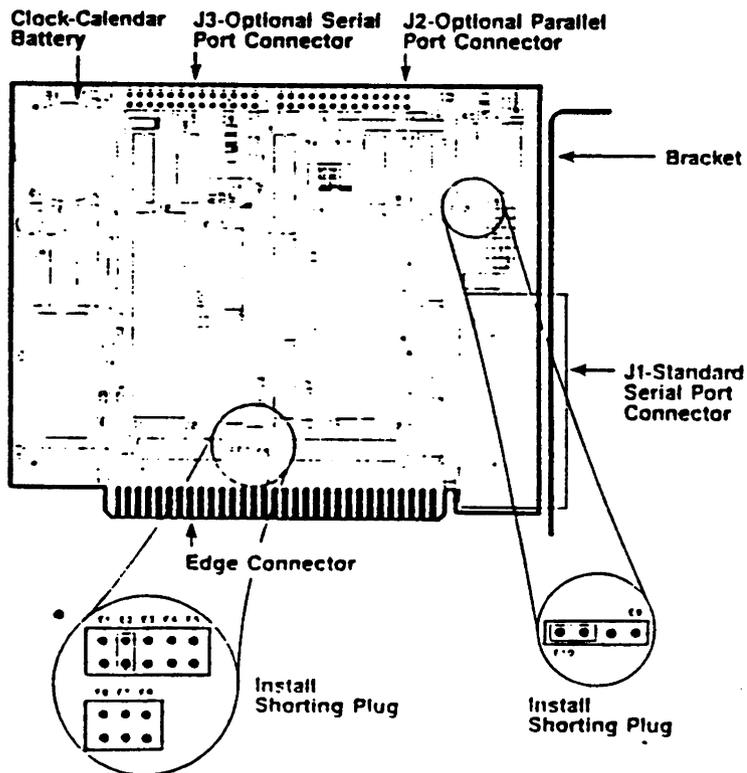
# Parallel Printer Port Option



I/O Plus Board Layout



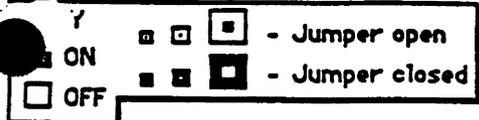
I/O Plus II Board Layout



I/O Mini Board Layout

3-18

## AST Research, Inc. I/O Mini II Multi-Function Board



The AST I/O Mini II Card is a multi-function board for the IBM PC, XT and compatible computers. It has the following features:

**Clock/Calendar**

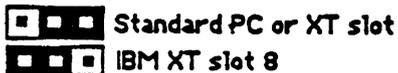
Serial RS232 interface port, and an optional 2nd serial port

Parallel Port

Game Port

It also comes with software for the clock/calendar, ram disk and print spooler.

**Slot Selection Jumper E7:**



**Clock/Calendar - Jumper E13 to enable, remove to disable.**

The clock/calendar uses Base I/O Address 02C0.

The program ASTCLOCK is used to read the clock.

ASTCLOCK/R reads the clock and selects the "resident" option

so that the time and date can be updated in both the PC Memory and the AST I/O Mini II clock chip. After selecting this option, run the dos TIME and DATE programs to enter in new settings for the clock.

**Serial Port -**

1st Serial Port - to enable COM1-IRQ4, jumper E8 and E16.

to enable COM2-IRQ3, jumper E9 and E15.

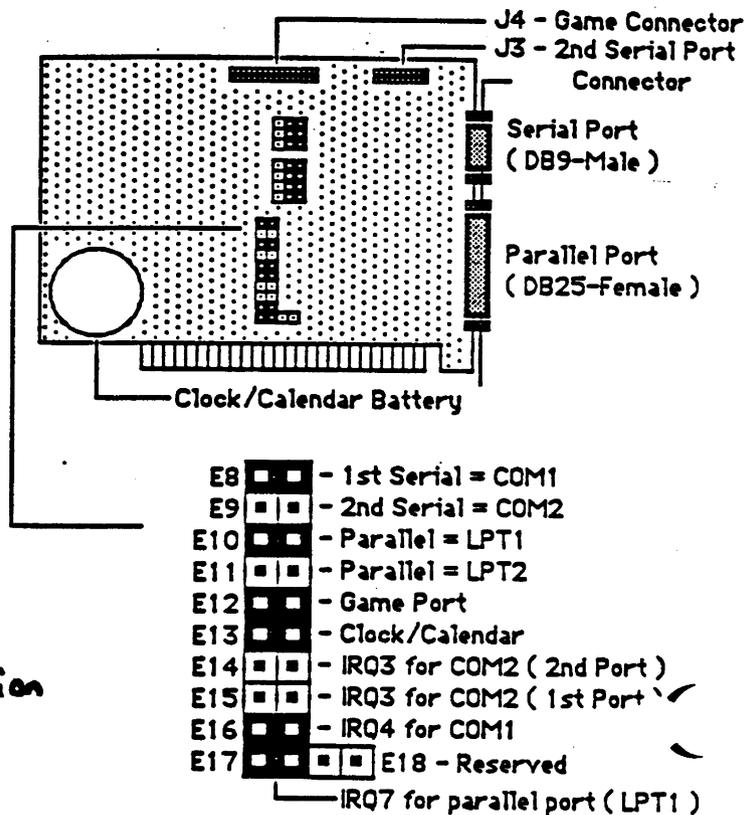
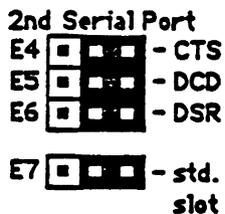
2nd Serial Port - enable as COM2-IRQ3, jumper E9 and E14.

| Order  | Device | Base I/O Address | IRQ |
|--------|--------|------------------|-----|
| first  | COM1   | 03F8             | 4   |
| second | COM2   | 02F8             | 3   |

Only jumper serial ports that are being used and remove all other jumpers for serial ports that are not being used. Do not change any of the RS232 Interface jumpers for the serial ports.

**Game Port - to enable game port, jumper E12**

The game port uses Base I/O Address 0200 or 020h.



**Parallel Port -**

to enable it for LPT1- IRQ7, jumper E10 and E17.

to enable it for LPT2- IRQ7, jumper E11 and E17.

Remove these jumpers to disable the parallel port.

Parallel ports are accessed in the order listed below.

| Order  | Device | Base I/O Address |
|--------|--------|------------------|
| first  | LPT1   | H378             |
| second | LPT2   | H278             |

However, if there is a display adapter with a built-in parallel port, such as the IBM Monochrome Display and Printer Adapter, LPT1 will respond as LPT2, and LPT2 will respond as LPT3.

| Printer Port     | Order  | Device | Base I/O Address |
|------------------|--------|--------|------------------|
| Display Ad. Port | first  | LPT1   | H3BC             |
| Port set as LPT1 | second | LPT2   | H378             |
| Port set as LPT2 | third  | LPT3   | H278             |

Interrupt driven parallel printer software uses IRQ7. To insure that this type of software operates correctly, insure that IRQ7 is already in use by another device, probably LPT1 on another board, disable IRQ7 on the AST I/O Mini II Board - jumper E17.

# AST Research Advantage Premium (Base, Extended, & Expanded Mem.)

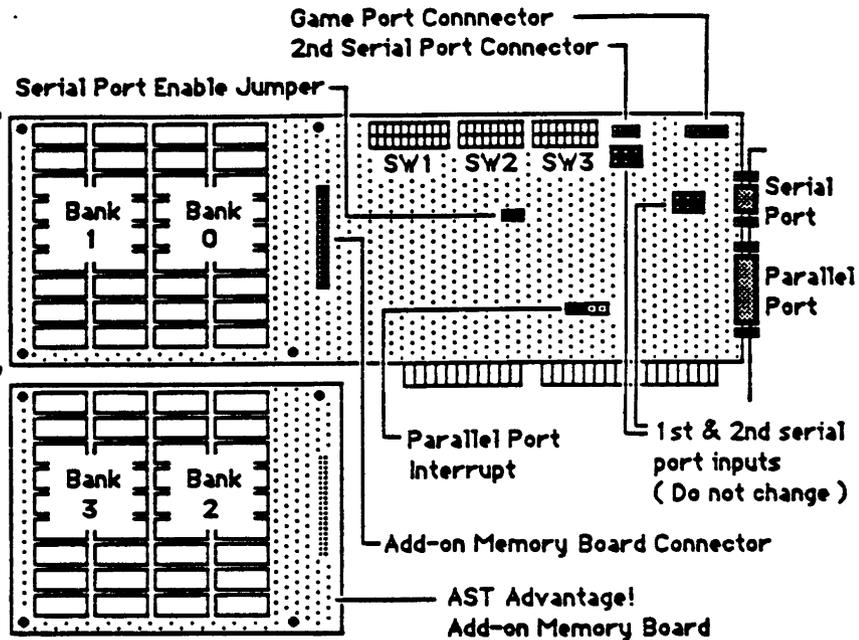
**KEY**

ON      - Jumper open

OFF      - Jumper closed

The AST Advantage Premium is a multi-function board for IBM AT type computers. It has memory for a combination of conventional, extended and expanded memory types, using 64 and/or 256 KB ram chips. It has a serial and parallel port built in. It has options for an add-on "piggyback" memory expansion board, and options for a second serial port and game port.

|    |    |
|----|----|
| PH | PL |
| 15 | 7  |
| 14 | 6  |
| 13 | 5  |
| 12 | 4  |
| 11 | 3  |
| 10 | 2  |
| 9  | 1  |
| 8  | 0  |



**Conventional/Extended Memory Size:**

|                                                                                                          |                                                                                                            |                              |
|----------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|------------------------------|
| Switch 1                                                                                                 | Switch 1                                                                                                   |                              |
| 1 2 3 4                                                                                                  | 1 2 3 4                                                                                                    |                              |
| <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> 1152 | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> 128 *  | Default Setting              |
| <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> 1280 | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> 256    |                              |
| <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> 1408 | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> 384 ** | Best operation with DESQview |
| <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> 1536 | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> 512    |                              |
| <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> 1664 | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> 640    |                              |
| <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> 1792 | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> 768    |                              |
| <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> 1920 | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> 896    |                              |
| <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> 2048 | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> 1024   |                              |

**Base I/O Address: Starting Memory Address:**

|                                                                                                            |                                                                                                                                                                 |                              |
|------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|
| Switch 1                                                                                                   | Switch 2                                                                                                                                                        |                              |
| 5 6 7 8                                                                                                    | 1 2 3 4 5 6 7                                                                                                                                                   |                              |
| <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> 0208   | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> 256 KB *  | Default Setting              |
| <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> 0218 * | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> 512 KB ** |                              |
| <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> 0258   | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> 640 KB    | Best operation with DESQview |
| <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> 0268   | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> 1024 KB   |                              |
| <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> 02A8   |                                                                                                                                                                 |                              |
| <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> 02B8   |                                                                                                                                                                 |                              |
| <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> 02E8   |                                                                                                                                                                 |                              |

**Dual Page Mode:**

Switch 1 - 9 "on" to enable Dual Page mode. For best performance with "DESQview" set the IBM AT System Board Memory Jumper J18 towards the back of the computer for 256 KB system board memory.

| Bit in Error Location | Chip | Bit in Error Location | Chip | 64 KB Block of ram in error             | 64 KB Block of ram                                                                            |
|-----------------------|------|-----------------------|------|-----------------------------------------|-----------------------------------------------------------------------------------------------|
| 0000                  | P    | 0000                  | P    | <u>Dos/Base/Conventional Memory</u>     |                                                                                               |
| 0001                  | 0    | 0100                  | 8    | 00, 01, 02, 03                          | System Board                                                                                  |
| 0002                  | 1    | 0200                  | 9    | 04, 05, 06, 07 *                        | * If J18 disables the 2nd block of 256 KB memory, errors 04 thru 07 will be the Expansion Bd. |
| 0004                  | 2    | 0400                  | 10   |                                         |                                                                                               |
| 0008                  | 3    | 0800                  | 11   |                                         |                                                                                               |
| 0010                  | 4    | 1000                  | 12   | 08, 09                                  | Expansion Board                                                                               |
| 0020                  | 5    | 2000                  | 13   | <u>Extended Memory 256 KB Ram Chips</u> |                                                                                               |
| 0040                  | 6    | 4000                  | 14   | 10, 11, 12, 13                          | } 1st bank                                                                                    |
| 0080                  | 7    | 8000                  | 15   | 14, 15, 16, 17                          |                                                                                               |

**Software**

1. Run the IBM AT Setup program, if necessary, for conventional and extended memory.
2. Run the AST "INSTALL" program. (Save installation). This program installs a device driver in the CONFIG.SYS file ( " DEVICE = REMM.SYS ... " ), to access the expanded memory management program

**Parity Check:**

To enable parity, turn Switch 2 - 8 " on "

**Serial Ports:**

|                                                                                       |       |                                         |                        |
|---------------------------------------------------------------------------------------|-------|-----------------------------------------|------------------------|
| Switch 3                                                                              | 1 2 3 | <u>1st Serial Port</u>                  | <u>2nd Serial Port</u> |
| <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>            |       | Disabled                                | Disabled               |
| <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> |       | Com1                                    | Disabled               |
| <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> |       | Com2                                    | Disabled               |
| <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> |       | Com1                                    | Com2                   |
| Switch 3                                                                              | 7 8   |                                         |                        |
| <input checked="" type="checkbox"/> <input type="checkbox"/>                          |       | IRQ 4 enabled for first serial port     |                        |
| <input type="checkbox"/> <input checked="" type="checkbox"/>                          |       | IRQ 3 enabled for second serial port    |                        |
| Switch 1                                                                              | 10    |                                         |                        |
| <input checked="" type="checkbox"/>                                                   |       | To enable IRQ 3 for second serial port  |                        |
| <input type="checkbox"/>                                                              |       | To disable IRQ 3 for second serial port |                        |

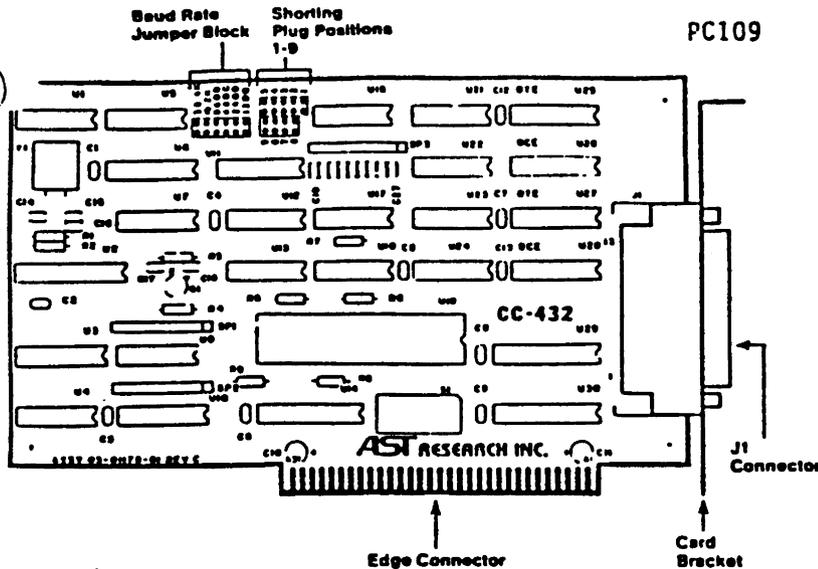
**Parallel Port:**

|                                                                                       |     |                                     |
|---------------------------------------------------------------------------------------|-----|-------------------------------------|
| Switch 3                                                                              | 4 5 |                                     |
| <input checked="" type="checkbox"/> <input type="checkbox"/>                          |     | LPT1 ( 378-37F )                    |
| <input type="checkbox"/> <input checked="" type="checkbox"/>                          |     | LPT2 ( 278-27F )                    |
| <input type="checkbox"/> <input type="checkbox"/>                                     |     | Disabled                            |
| <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> |     | IRQ 7 enabled for parallel port     |
| <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> |     | IRQ 5 enabled for parallel port     |
| <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> |     | No interrupt line for parallel port |

**Game Port:**

Switch 3 - 6 "off" to disable game port.

# CC-432 Advanced Communication Board



To verify proper factory default configuration, check your CC-board settings:

1. DIP switch SW1 set as follows:
 

|    |    |     |     |     |     |     |     |     |
|----|----|-----|-----|-----|-----|-----|-----|-----|
| 1  | 2  | 3   | 4   | 5   | 6   | 7   | 8   | 9   |
| ON | ON | OFF | OFF | OFF | OFF | OFF | OFF | OFF |
2. DIP shunts installed in positions U25 and U27 (D)
3. Shorting plugs installed in positions 1, 3, and 6.

## 2.8 CC-432 Shorting Plug Summary

Table 2-7 summarizes the functions that correspond to the shorting plugs installed in positions 1 through 9 (illustrated in Figure 2-1) on the AST Research CC-432 board.

Table 2-7. CC-432 Shorting Plug (Positions 1-9) Summary

| Shorting Plug Position | Function                                                                                                                                                                                                                                                                           |
|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1                      | DTE Mode: Routes J1 pin 17 Receive Clock Input to the SIO RxCA Receive Clock input.<br>DCE Mode: No function.                                                                                                                                                                      |
| 2                      | DTE Mode: Routes the internal baud rate generator clock to the SIO RxCA Receive Clock input<br>DCE Mode: Same as DTE. Also routes same clock to J1 pin 15 Transmit Clock output.                                                                                                   |
| 3                      | DTE Mode: Routes J1 pin 15 Transmit Clock Input to the SIO TxCA Transmit Clock input.<br>DCE Mode: No function.                                                                                                                                                                    |
| 4                      | DTE Mode: Routes the internal baud rate generator clock to the SIO TxCA Transmit Clock output, and to the J1 pin 24 Transmit Clock input<br>DCE Mode: Routes the internal baud rate generator clock to the SIO TxCA Transmit Clock input and to the J1 pin 17 Receive Clock output |
| 5                      | DTE Mode: No function.<br>DCE Mode: Routes the J1 pin 24 Transmit Clock input to the SIO RxCA Receive Clock input.                                                                                                                                                                 |
| 6                      | DTE Mode: Routes J1 pin 22 Ring Indicator Input to the SIO DCDB Input<br>DCE Mode: Forces J1 pin 22 Ring Indicator into a false state.                                                                                                                                             |
| 7                      | DTE Mode: Routes J1 pin 25 Test Indicator input to the SIO DCDB input<br>DCE Mode: Routes J1 pin 18 Test Input to the SIO DCDB Input.                                                                                                                                              |
| 8                      | DTE Mode: Performs loopback of J1 pin 25 Test Indication Input to J1 pin 18 Test output<br>DCE Mode: Performs loopback of J1 pin 18 Test input to J1 pin 25 Test Indication output.                                                                                                |
| 9                      | DTE Mode: Routes SIO RTSB output to J1 pin 18 Test output<br>DCE Mode: Routes SIO RTSB output to J1 pin 25 Test Indication output.                                                                                                                                                 |

## 2.4 Port Configuration

The communications port on the AST Research CC-432 board can be configured as DTE or DCE. The eight-position shunts that configure the port also carry signals that can be used for modem controls. Install the shunts in the positions (shown in Figure 2-1) summarized in Table 2-3 for the desired configuration

Table 2-3. DTE and DCE Configurations

| Configuration | Shunt Positions |
|---------------|-----------------|
| DCE           | U25, U29        |
| DTE*          | U25, U27        |

\*The factory default configuration is for DTE operation

## 2.3 I/O Address and Function Selection

The CC-432 occupies 16 consecutive locations of the IBM PC I/O address space. To avoid conflict with existing IBM PC peripheral boards, use an address range that is not used by any of the peripherals in your PC (Appendix A gives the standard I/O address map for the IBM PC). Positions 1 and 2 on DIP switch S1 select the I/O address range for the CC-432 (Table 2-1).

Table 2-1. CC-432 I/O Address Select

| S1 Position |     | Hexadecimal I/O Addresses |
|-------------|-----|---------------------------|
| 1           | 2   |                           |
| ON          | OFF | 300-30F*                  |
| OFF         | ON  | 320-32F                   |
| ON          | OFF | 340-34F                   |
| OFF         | OFF | 350-36F                   |

### NOTE

\*The factory default setting for the CC-432 board is for I/O addresses 300-30F.

AST Research communications packages normally use I/O addresses 300-30F (S1 positions 1 and 2 OFF). Consult your user's manual for information on other available address settings where applicable.

3-21



# I/O ADDRESS MAP

Appendix A lists the I/O address map for the IBM PC. To avoid conflict with existing devices in your PC, do not use their corresponding I/O address ranges.

## NOTE

AST Research communications packages normally use I/O addresses 300-30F (S1 positions 1 and 2 ON). Consult your user's manual for information on other available address settings where applicable.

| Hexadecimal Address Range | Application                                       |
|---------------------------|---------------------------------------------------|
| 000-00F                   | DMA Chip 8237A-5                                  |
| 020-021                   | Interrupt 8259A                                   |
| 040-043                   | Timer 8253-5                                      |
| 060-063                   | PPI 8255A-5                                       |
| 080-083                   | DMA Page Register                                 |
| 0A0*                      | Non Mask Interrupt (NMI) Mask Register            |
| 0Cn                       | Reserved                                          |
| 0En                       | Reserved                                          |
| 200-20F                   | Game Control                                      |
| 210-217                   | Expansion Unit                                    |
| 220-24F                   | Reserved                                          |
| 278-27F                   | Printer                                           |
| 2C0-20F                   | AST CLOCK                                         |
| 2F0-2F7                   | Reserved                                          |
| 2F8-2FF                   | Asynchronous Communications (secondary)           |
| 300-31F                   | Prototype Card                                    |
| 320-32F                   | Fixed Disk                                        |
| 378-37F                   | Printer                                           |
| 380-38C**                 | IBM SDLC Communications                           |
| 380-389**                 | IBM Binary Synchronous Communications (secondary) |
| 3A0-3A9                   | IBM Binary Synchronous Communications (primary)   |
| 3B0-3BF                   | IBM Monochrome Display/Printer                    |
| 3C0-3CF                   | Reserved                                          |
| 3D0-3DF                   | Color/Graphics                                    |
| 3E0-3E7                   | Reserved                                          |
| 3F0-3F7                   | Diskette                                          |
| 3F8-3FF                   | Asynchronous Communications (primary)             |

\*The NMI to the microprocessor is masked off at power-on. You can set and reset the mask bit via system software as follows:

To set the mask bit (enable NMI): Write hex 80 to I/O address A0.

To reset the mask bit (disable NMI): Write 00 to I/O address A0.

\*\*Do not use SDLC Communications and Secondary Binary Synchronous Communications together: their I/O addresses overlap.

Table 2-4. SIO Data and Modem Control Signals

| SIO Signal     | DTE Mode  |        | DCE Mode  |        |
|----------------|-----------|--------|-----------|--------|
|                | J1 Signal | J1 Pin | J1 Signal | J1 Pin |
| TxD Output     | TxD       | 2      | RxD       | 3      |
| RxD Input      | RxD       | 3      | TxD       | 2      |
| RTSA Output    | RTS       | 4      | DCD       | 8      |
| CTSA Input     | CTS       | 5      | -         | -      |
| DCDA Input     | DCD       | 9      | RTS/CTS   | 4/5**  |
| CTSB Input     | DSR       | 6      | DTR       | 20     |
| DTRA Output    | DTR       | 20     | DSR       | 6      |
| TxCA Input     | TxC       | 15     | TxC       | 15***  |
| RxCA Input     | RxC       | 17     | RxC       | 17***  |
| Chassis Ground |           | 1      |           | 1      |
| Signal Ground  |           | 7      |           | 7      |

## S1 Position

|   |      |
|---|------|
| 8 | IRQ2 |
| 7 | IRQ3 |
| 6 | IRQ4 |
| 5 | IRQ5 |
| 4 | IRQ6 |
| 3 | IRQ7 |

## Interrupt Line

## NOTE

AST Research communications packages normally use IRQ2. Consult your user's manual for information on other available interrupt options where applicable.

For all applications, make sure that the selected IRQ line is not used by another system device. Only one IRQ position on the CC-432 can be ON at any time. Appendix B lists standard IBM assigned IRQ applications.

When you operate the CC-432 board with the SIO in the vectored interrupt mode and there is an interrupt from the SIO, you must read I/O address 3nF during the interrupt routine. The contents of that address tell you what condition caused the interrupt (that is, which of the eight interrupt service routines is pointed to). This vector must be read in the interrupt service routine regardless of whether the vector information is used. Failure to read this value can cause improper SIO interrupt operation. The SIO reference manual details programming and vector interpretation.

## APPENDIX B

### HARDWARE INTERRUPT LINES

Appendix B gives the standard IBM-assigned hardware interrupt listing for the IBM PC. To avoid conflicts with installed devices, do not use their corresponding interrupt lines.

## NOTE

AST Research communications packages normally use IRQ2. Consult your user's manual for information on other available interrupt options where applicable.

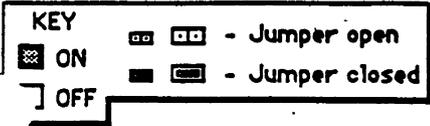
Only one IRQ switch position (positions 3 through 8 on DIP switch S1) on the CC-432 can be ON at any time.

## IRQ Line Application

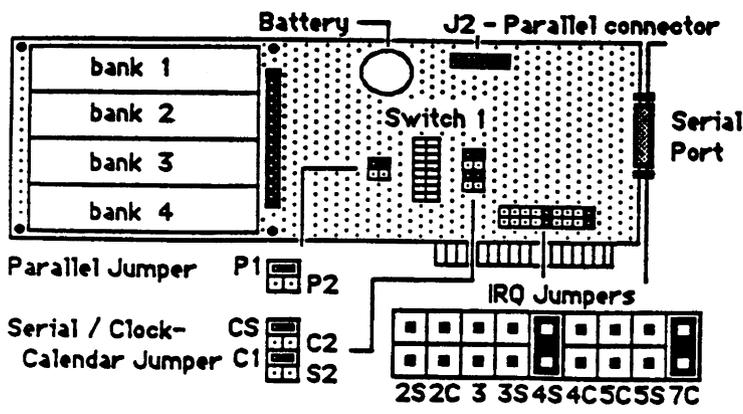
| IRQ Line | Application                                                                                                                  |
|----------|------------------------------------------------------------------------------------------------------------------------------|
| NMI*     | Parity                                                                                                                       |
| 0        | Timer                                                                                                                        |
| 1        | Keyboard                                                                                                                     |
| 2        | Reserved                                                                                                                     |
| 3        | Asynchronous Communications (COM1)<br>IBM SDLC communications products<br>IBM BSC (secondary) products<br>Non-IBM hard disks |
| 4        | Asynchronous Communications (COM2)<br>IBM SDLC communications products<br>IBM BSC (primary) products<br>IBM fixed disk       |
| 5        | IBM fixed disk                                                                                                               |
| 6        | Diskette adaptor board                                                                                                       |
| 7        | Printer                                                                                                                      |

\*Non Maskable Interrupt

# AST Research MegaPlus II, ComboPlus Multi-Function Boards (DOS Base Memory only.)



## AST MegaPlus II Board (PC194)



**Starting Address**

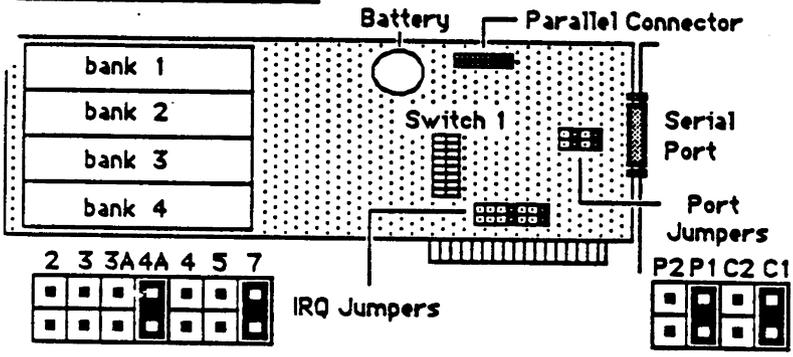
Switch 1

|   |   |   |   |     |
|---|---|---|---|-----|
| 1 | 2 | 3 | 4 | 64  |
| ☑ | ☑ | ☑ | ☑ | 128 |
| ☑ | ☑ | ☑ | ☐ | 192 |
| ☑ | ☑ | ☐ | ☐ | 256 |
| ☑ | ☐ | ☐ | ☐ | 320 |
| ☑ | ☐ | ☑ | ☐ | 384 |
| ☑ | ☐ | ☐ | ☑ | 448 |
| ☐ | ☐ | ☐ | ☐ | 512 |

|    |    |                          |
|----|----|--------------------------|
| CS | C2 | Clock/Calendar - Enabled |
| C1 | S2 |                          |
| P1 | P2 | 7C Lpt1 (P1, 7C)         |
| P1 | P2 | 7C Lpt2 (P2, 7C)         |
| CS | C2 | 4S (or 4) Com1 (C1, 4S)  |
| C1 | S2 |                          |
| CS | C2 | 3S Com2 (C2, 3S)         |
| C1 | S2 |                          |

Switch 7 - Parity enabled - on    Switch 5, 6, 8 - not used - off

## AST Combo Plus



**Starting Address**

Switch 1

|   |   |   |   |   |   |   |     |
|---|---|---|---|---|---|---|-----|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 64  |
| ☑ | ☑ | ☑ | ☑ | ☑ | ☑ | ☑ | 128 |
| ☑ | ☑ | ☑ | ☑ | ☑ | ☑ | ☐ | 192 |
| ☑ | ☑ | ☑ | ☑ | ☑ | ☐ | ☐ | 256 |
| ☑ | ☑ | ☑ | ☑ | ☐ | ☐ | ☐ | 320 |
| ☑ | ☑ | ☑ | ☐ | ☐ | ☐ | ☐ | 384 |
| ☑ | ☑ | ☐ | ☐ | ☐ | ☐ | ☐ | 448 |
| ☑ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | 512 |

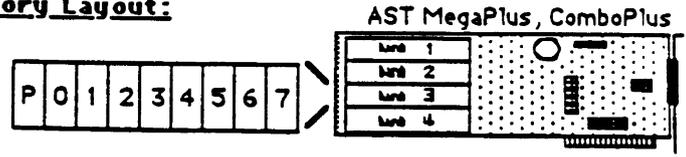
Switch 8 - Parity enable - off

No setting for clock

|    |    |      |
|----|----|------|
| 7  | P1 | Lpt1 |
| 7  | P2 | Lpt2 |
| 4A | C1 | Com1 |
| 3A | C2 | Com2 |

The AST MegaPlus and ComboPlus are multi-function boards for IBM PC & XT computers. They feature base memory expansion, serial, parallel & game ports, a clock/calendar, ram disk and print spool software. They come with a SuperPak diskette with software for the clock/calendar, ram disk and print spool. To read the clock, type "ASTCLOCK", and to set the clock, type "ASTCLOCK/R" and then use the dos Date & Time commands. To use the "SUPERDRIVE" software for the ram disk, the PC, XT system board switches must be set to recognize the ram disk as another physical floppy diskette drive.

### Memory Layout:



**Memory Error Location Chart**

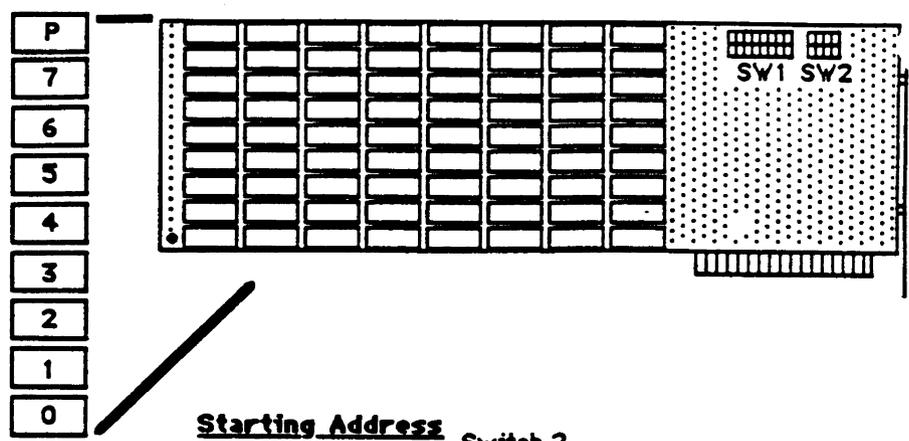
|                             |    |     |     |        |        |    |    |    |    |
|-----------------------------|----|-----|-----|--------|--------|----|----|----|----|
| Bit in error                | 00 | 01  | 02  | 04     | 08     | 10 | 20 | 40 | 80 |
| Chip Location               | P  | 0   | 1   | 2      | 3      | 4  | 5  | 6  | 7  |
| 64 KB Block of Ram in error | 0  | 1   | 2   | , etc. |        |    |    |    |    |
| 64 KB Block of Ram          |    | 1st | 2nd | 3rd    | , etc. |    |    |    |    |

# AST Research RAMpage ( Base and Expanded Memory )

**KEY**

ON      - Jumper open  
 OFF      - Jumper closed

AST RAMpage Board is strictly a memory board for IBM PC, XT-type computers. It can be loaded with 2 MBs of memory, which can be a combination of base and expanded memory. The expanded memory supports the "enhanced expanded memory specification" (EEMS), and uses software to access this memory. It uses only 256 KB ram chips, so a bank of ram is 512 KB memory.



**Base I/O Address**

Switch 1  
1 2 3 4

|                                     |       |   |                          |                          |       |  |
|-------------------------------------|-------|---|--------------------------|--------------------------|-------|--|
| <input checked="" type="checkbox"/> | 0208h |   |                          |                          |       |  |
| <input checked="" type="checkbox"/> | 0218h | ← | <b>Default Setting</b>   |                          |       |  |
| <input checked="" type="checkbox"/> | 0258h |   |                          |                          |       |  |
| <input checked="" type="checkbox"/> | 0268h |   | <input type="checkbox"/> | <input type="checkbox"/> | 02B9h |  |
| <input checked="" type="checkbox"/> | 02A8h |   | <input type="checkbox"/> | <input type="checkbox"/> | 02E8h |  |

**Banks Available as Base Memory**

Switch 1  
5 6

|                                     |              |   |                        |
|-------------------------------------|--------------|---|------------------------|
| <input checked="" type="checkbox"/> | 0            |   |                        |
| <input type="checkbox"/>            | 1 ( 256 KB ) |   |                        |
| <input checked="" type="checkbox"/> | 2 ( 512 KB ) | ← | <b>Default Setting</b> |
| <input type="checkbox"/>            | 3 ( 768 KB ) |   |                        |

If RAMpage starting address is 640 KB, then all RAMpage memory is allocated as expanded memory, regardless of the banks available setting.

**Dual Page Mode**

( This setting allows the Rampage to handle multitasking more efficiently. )  
Dual Page Mode - enabled Switch 1 - 7 " on ".

**Parity Check:**

To enable parity, turn Switch 1 - 8 " on ".

| PC, XT Memory Error Location Chart |    |     |     |        |        |    |    |    |    |  |
|------------------------------------|----|-----|-----|--------|--------|----|----|----|----|--|
| Bit in error                       | 00 | 01  | 02  | 04     | 08     | 10 | 20 | 40 | 80 |  |
| Chip Location                      | P  | 0   | 1   | 2      | 3      | 4  | 5  | 6  | 7  |  |
| 64 KB Block of Ram in error        | 0  | 1   | 2   | , etc. |        |    |    |    |    |  |
| 64 KB Block of Ram                 |    | 1st | 2nd | 3rd    | , etc. |    |    |    |    |  |

**Starting Address**

Switch 2  
1 2 3 4

|        |                                     |                                     |                                     |                                     |
|--------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
| 0 KB   | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 64 KB  | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 128 KB | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 192 KB | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| 256 KB | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| 320 KB | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 384 KB | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 448 KB | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 512 KB | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 576 KB | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 640 KB | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |

← **Default Setting**

**PC, XT Hardware Configuration:**

Set PC, XT switch settings to reflect any changes made to Base/Conventional Memory.

**Software Configuration:**

There are several configuration files that come with the AST RAMpage Board. Use the one(s) that best fit the needs of the user:

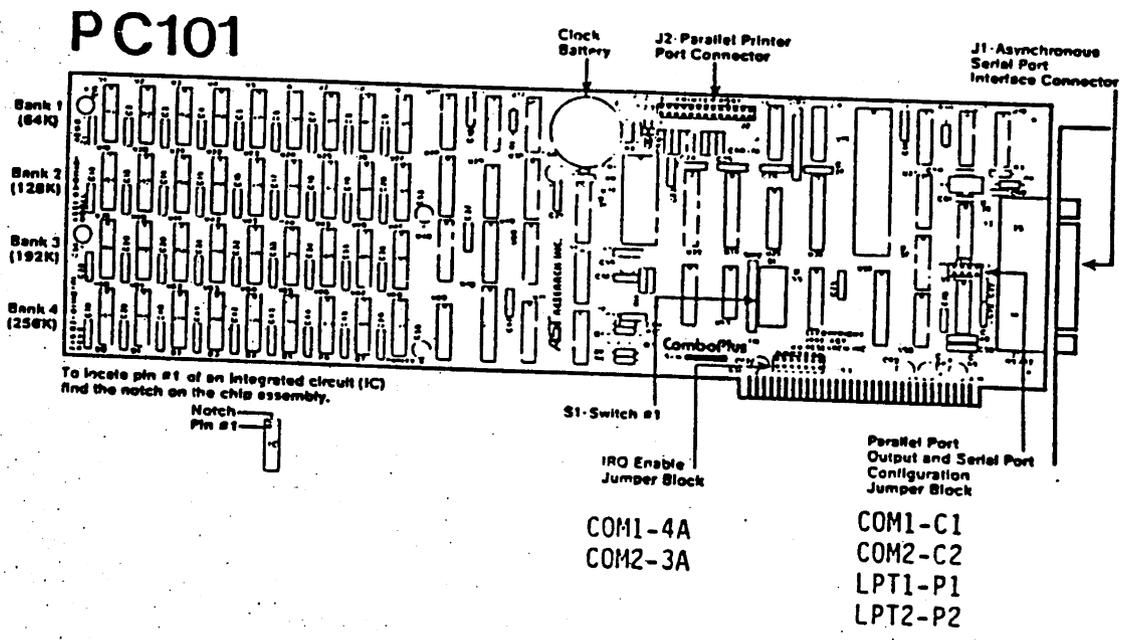
| Requirements:                                                                                       | File(s):                     |
|-----------------------------------------------------------------------------------------------------|------------------------------|
| Wants expanded memory - No virtual disk software ( SuperDrive/fASTdisk )<br>Requires 256 KB memory. | CONFIG1.SYS                  |
| Intends to use SuperSpool, but not SuperDrive. Requires 512 memory.                                 | CONFIG2A.SYS<br>AUTOEX2B.BAT |
| Wants to use both SuperSpool and SuperDrive. Requires 1 MB memory.                                  | CONFIG2B.SYS<br>AUTOEX2B.BAT |
| Wants to use fASTdisk and SuperSpool<br>Has 1 MB memory available.                                  | CONFIG3A.SYS                 |
| Wants to use fASTdisk and SuperSpool<br>Has 2 MB memory available.                                  | CONFIG3B.SYS<br>AUTOEX3B.BAT |

After choosing the appropriate file, ren the CONFIGxx.sys as the CONFIG.SYS file. Rename the AUTOEXxx.BAT as the AUTOEXEC.BAT file. Copy all the AST software to your boot disk.

# ComboPlus

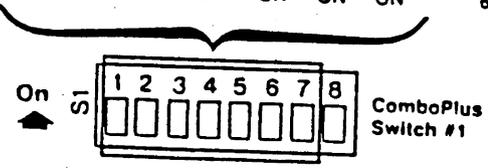
1-4

ComboPlus Board Layout



## ComboPlus Starting Memory Address

| Starting Address | 1   | 2   | 3   | 4   | 5   | 6   | 7   | Maximum Usable RAM On ComboPlus |
|------------------|-----|-----|-----|-----|-----|-----|-----|---------------------------------|
| 64K (:10000)     | ON  | ON  | ON  | OFF | OFF | OFF | OFF | 256K                            |
| 128K (:20000)    | ON  | ON  | OFF | ON  | OFF | OFF | OFF | 256K                            |
| 192K (:30000)    | ON  | ON  | OFF | OFF | OFF | OFF | OFF | 256K                            |
| 256K (:40000)    | ON  | OFF | ON  | ON  | OFF | OFF | OFF | 256K                            |
| 320K (:50000)    | ON  | OFF | ON  | OFF | OFF | OFF | OFF | 256K                            |
| 384K (:60000)    | ON  | OFF | OFF | ON  | OFF | OFF | OFF | 256K                            |
| 448K (:70000)    | ON  | OFF | OFF | OFF | OFF | OFF | ON  | 192K                            |
| 512K (:80000)    | OFF | ON  | ON  | ON  | OFF | ON  | ON  | 128K                            |
| 576K (:90000)    | OFF | ON  | ON  | OFF | ON  | ON  | ON  | 64K                             |



Parity Enable-S8 ON  
Parity Disabled-S8 OFF

**STEP 1**

If you have not already done so, copy the ASTCLOCK.COM program from a SuperPak diskette (version 4.3 or later) to your PC boot diskette.

If you are unsure how to COPY a file, consult your DOS manual.

**STEP 2**

If your working DOS diskette already has an AUTOEXEC.BAT file, you must alter that file to include the ASTCLOCK command. To see the current contents of your AUTOEXEC file, insert the working DOS diskette in drive A: and from the A> prompt, enter this command:

```
TYPE AUTOEXEC.BAT <Enter>
```

Your screen will display the contents of your AUTOEXEC file. Now you must create a new AUTOEXEC file in which the command ASTCLOCK precedes these other command(s). Enter this command sequence:

```
COPY CON: AUTOEXEC.BAT <Enter>
ASTCLOCK <Enter>
.
.   (other commands)
.
<Function key F8> <Enter> or <Ctrl-Z> <Enter>
```

If your working DOS diskette has no AUTOEXEC file, use the sequence above to create one (the only command in the file will be ASTCLOCK).

**STEP 3**

Reboot your PC (press <Ctrl-Alt-Del>).

The ASTCLOCK command will display the time and date on the screen. If necessary, use the ASTCLOCK /R utility to set the TIME and DATE on the SixPakPlus as detailed in Section 3.3.

**STEP 3**

Enter this command:

```
A>DATE<Enter>
```

Your PC will display the current date (the actual date displayed may be different):

```
Current date is Tue 5-21-1985
Enter new date:
```

Enter the new month, day, and year as follows:

```
mm-dd-yy <Enter>
```

where mm is the one- or two digit month designation, dd is the day, and yy is the year.

If you do not want to change the date, press <Enter> only.

**STEP 4**

Enter this command:

```
A>TIME <Enter>
```

Your PC will then display the current time (the actual time displayed may be different):

```
Current time is 8:14:15.82
Enter new time:
```

Enter the new hour, minute, and second as follows:

```
hh:mm:ss <Enter>
```

where hh is the hour, mm is the minute, and ss is the second. Be sure to use 24 hour format for the hour (that is, 1:00 PM = 13, 2:00 PM = 14, and so on).

**3.3 Setting the Clock-Calendar TIME & DATE**

This subsection tells you how to set the time and date in the SixPakPlus clock chip.

**NOTE**

You must use a version 4.3 (or later) SuperPak diskette to set the SixPakPlus clock chip.

Once you have copied ASTCLOCK to your PC boot diskette, you can update the clock-calendar on the SixPakPlus internal microprocessor chip. DOS TIME and DATE commands only update the system's time and date parameters in memory; they don't permanently update the values stored in the SixPakPlus clock chip until you execute this procedure.

**STEP 1**

Boot the system with a diskette that contains the ASTCLOCK.COM program.

**STEP 2**

Enter this command:

```
A>ASTCLOCK /R <Enter>
```

Your PC will then display a message like this (the actual date and time will be different):

```
ASTClock      Version x.xx
©Copyright AST Research, Inc.,
1982, 1984.
```

```
resident clock/calendar
DATE & TIME processors loaded.
```

```
Current date is 05/21/85
Current time is 08:07:58.65
```

Do not enter hundredths of a second. If you do not want to change the time, press <Enter> only.

Hint: For maximum accuracy, type in a time that is 10 to 15 seconds ahead of the actual time, then observe a digital watch, and press <Enter> when the seconds reading on the watch catches up to the value that you typed in.

**STEP 3**

Reboot your computer by pressing <Ctrl-Alt-Del>.

**NOTE**

Selecting the ASTCLOCK "/R" parameter selects the resident option, which allows you to update the date and time in both PC memory and the SixPakPlus clock chip (you cannot update the clock chip unless a certain portion of the ASTCLOCK.COM program is resident).

If you use the ASTCLOCK command without the /R parameter, it simply initializes the PC's date and time by reading that information from the SixPakPlus clock chip, and then "goes away"; no portion of ASTCLOCK remains resident, so you cannot update the date and time information in the clock chip.

**3.4 The Clock-Calendar Battery**

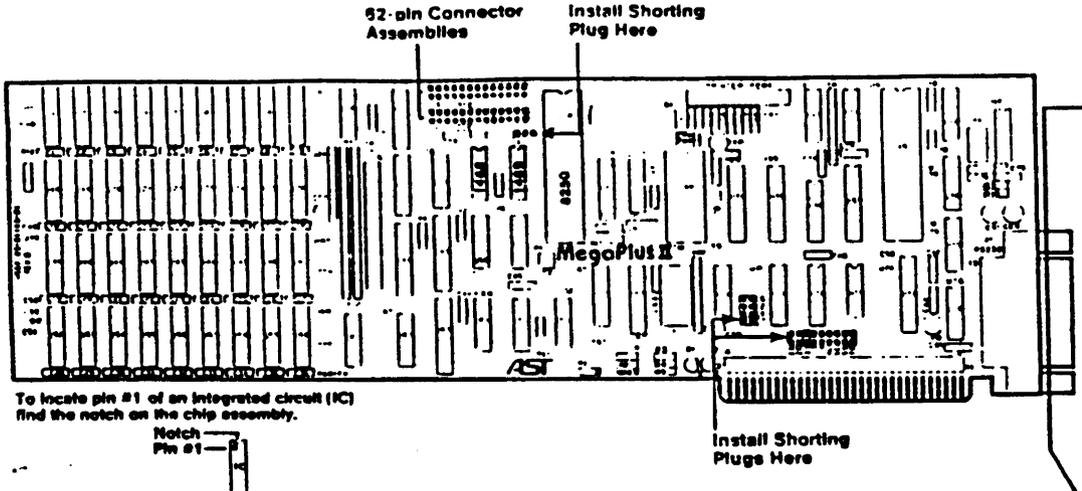
The lithium clock-calendar battery should last for about a year, and is easily replaceable. You can purchase replacement batteries from your dealer.

3-26

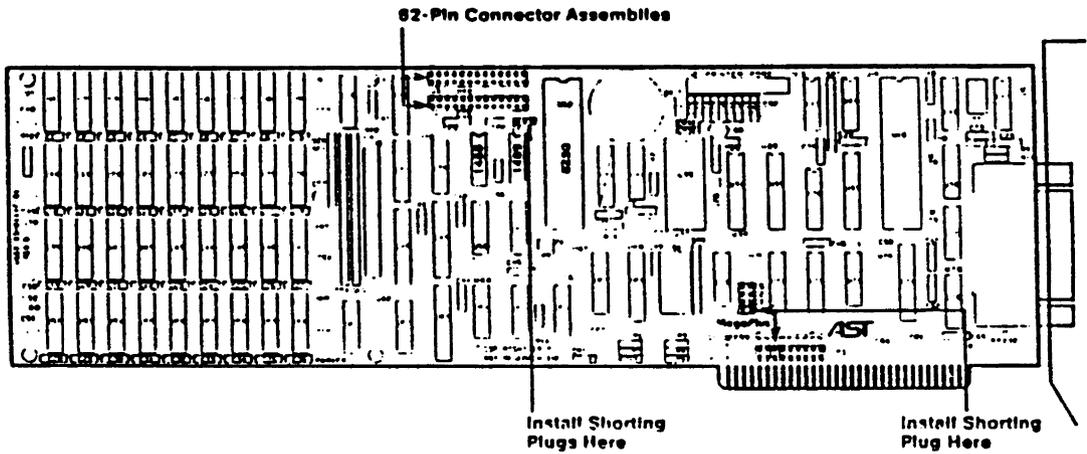
# ABI RESEARCH INC.

## Serial Port Option

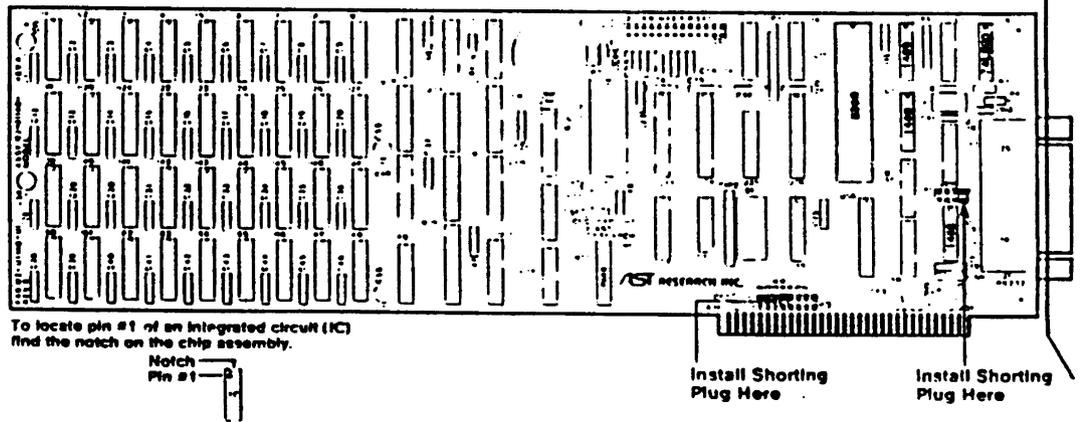
MegaPlus II Board Layout



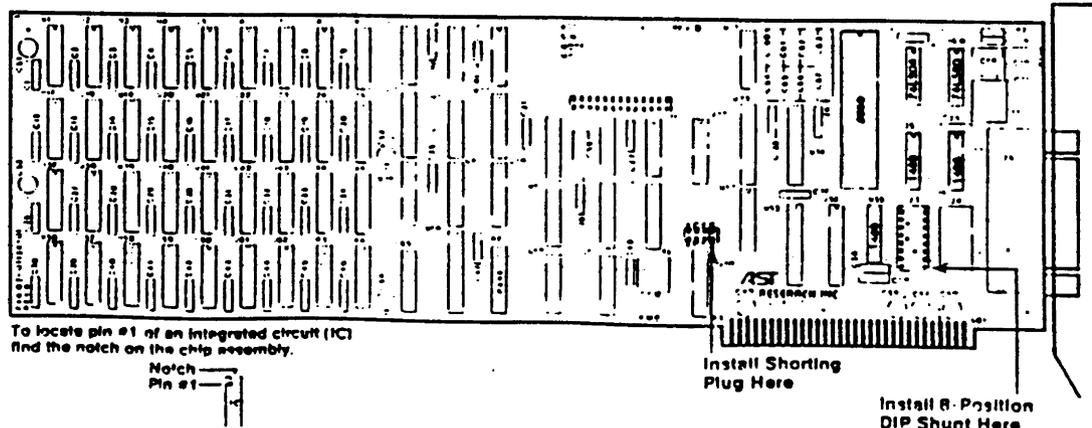
MegaPlus Board Layout



ComboPlus Board Layout

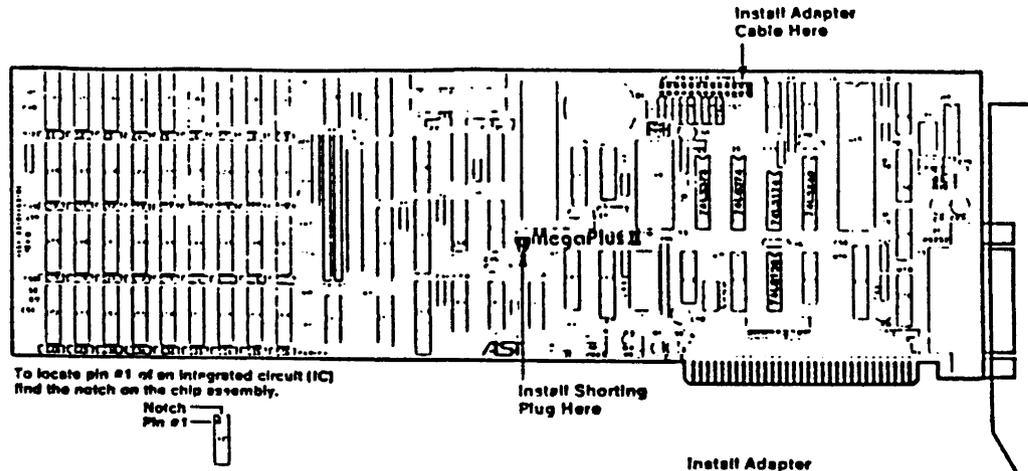


Combo Card Layout

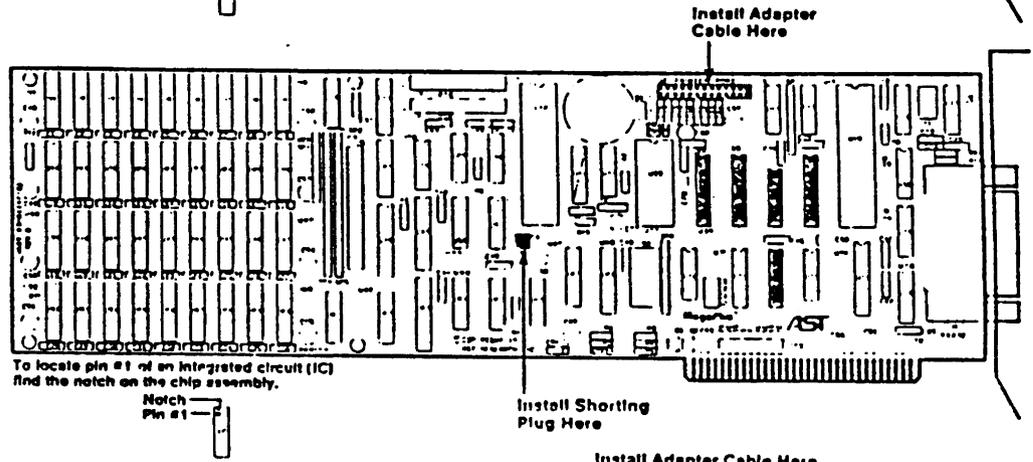


# Parallel Printer Port Option

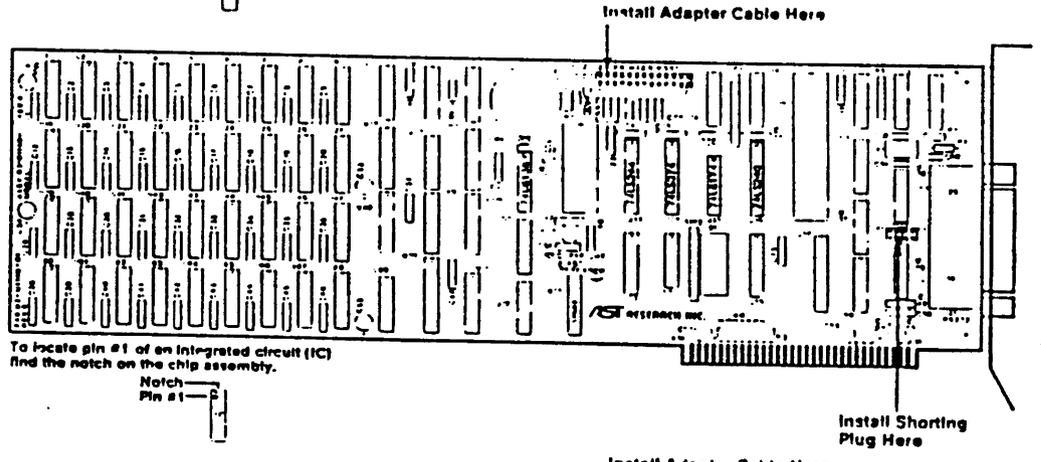
MegaPlus II Board Layout



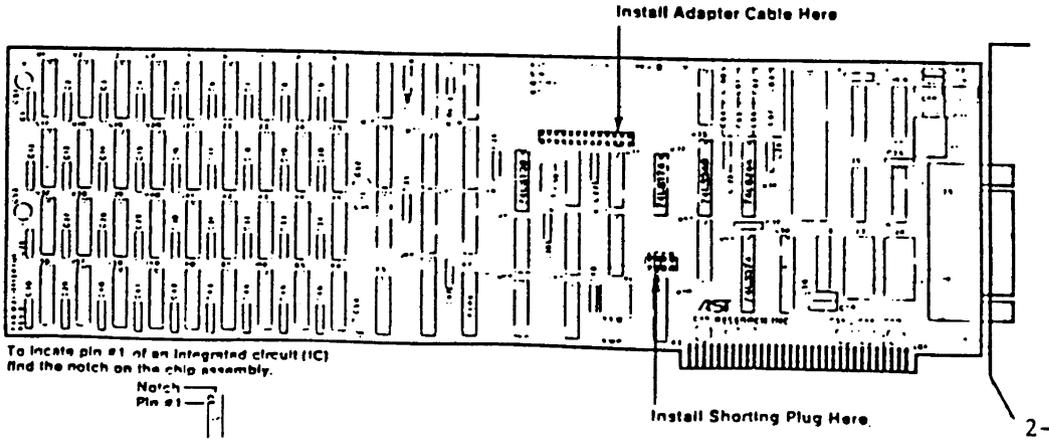
MegaPlus Board Layout



ComboPlus Board Layout



Combo Card Layout



3-28

# AST Research

## RAMpage AT/286 ( Base, Extended & Expanded Memory )

**KEY**

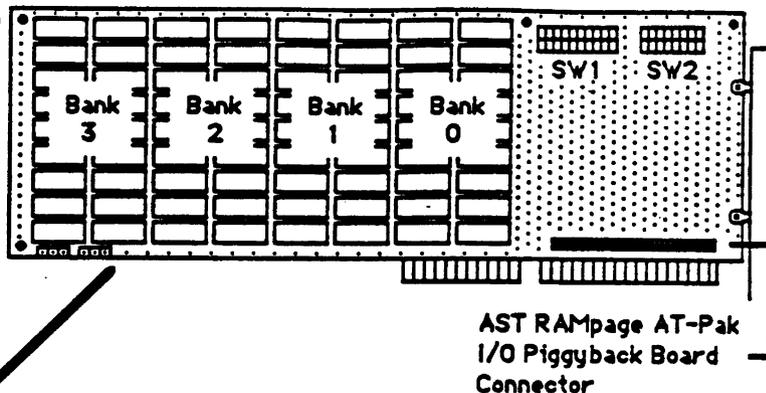
ON  OFF

- Jumper open

- Jumper closed

The AST RAMpage AT and RAMpage 286 are strictly memory boards for IBM AT-type computers. They can be loaded with 2 MBs of memory, which can be a combination of base, extended, and expanded memory. The expanded memory supports the "enhanced expanded memory specification" ( EEMS ), and uses software to access this memory. It uses 256 KB ram chips, so a bank of ram is 512 KB memory. NOTE: It is recommended to use the RAMpage AT with the IBM AT, & the RAMpage 286 with 80286 based AT compatibles.

|    |    |
|----|----|
| PH | PL |
| 15 | 7  |
| 14 | 6  |
| 13 | 5  |
| 12 | 4  |
| 11 | 3  |
| 10 | 2  |
| 9  | 1  |
| 8  | 0  |



### Software

1. Run the IBM AT Setup program, if necessary, for conventional and extended memory.
2. Run the AST "INSTALL" program. ( Save installation ). This program installs a device driver in the CONFIG.SYS file ( " DEVICE = REMM.SYS ... " ), to access the expanded memory management program.

### RAMpage Conventional / Extended Memory Size Switch Settings

( These settings are ignored if all memory is to be used as expanded memory SW2 - 1 thru 7 off )

Switch 1  
1 2 3 4

|                                                                                                                                                 |       |                                                                   |
|-------------------------------------------------------------------------------------------------------------------------------------------------|-------|-------------------------------------------------------------------|
| <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> | 128   | ← Default Setting                                                 |
| <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>            | 256   |                                                                   |
| <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>                       | 384 * | * Best operation with Multi-tasking software ( DESQview )         |
| <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>                                  | 512   |                                                                   |
| <input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>            | 640   |                                                                   |
| <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>                       | 768   |                                                                   |
| <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>                                  | 896   | <input type="checkbox"/> <input type="checkbox"/> 1536            |
| <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>                                             | 1024  | <input type="checkbox"/> <input checked="" type="checkbox"/> 1664 |
| <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>                                  | 1152  | <input type="checkbox"/> <input type="checkbox"/> 1792            |
| <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>                                  | 1280  | <input type="checkbox"/> <input type="checkbox"/> 1920            |
| <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>                                             | 1408  | <input type="checkbox"/> <input type="checkbox"/> 2048            |

### Base I/O Address Settings

Switch 1  
5 6 7 8

|                                                                                                                                                 |       |                                                                    |
|-------------------------------------------------------------------------------------------------------------------------------------------------|-------|--------------------------------------------------------------------|
| <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> | 0208h |                                                                    |
| <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>            | 0218h | ← Default Setting                                                  |
| <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>                       | 0258h |                                                                    |
| <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>                                  | 0268h | <input type="checkbox"/> <input type="checkbox"/> 02B8h            |
| <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>                                             | 02A8h | <input type="checkbox"/> <input checked="" type="checkbox"/> 02E8h |

### Dual Page Mode

( This setting allows the Rampage to handle multitasking more efficiently. )

Dual Page Mode - enabled Switch 1 - 9 " on "

Switch 1 - 10 is not used.

### Conventional / Extended Starting Memory

Switch 2  
1 2 3 4 5 6 7

|                                                                                                                                                                                                                                                             |       |                                                           |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-----------------------------------------------------------|
| <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> | 512   | ← Default Setting                                         |
| <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>                       | 256 * | * Best operation with Multi-tasking software ( DESQview ) |
| <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>                                                                              |       |                                                           |

If all memory on the RAMpage Board is to be used as expanded memory only, set SW2 - 1 thru 7 "off".

| Bit in Error Location | Chip | Bit in Error Location | Chip | 64 KB Block of ram in error                                                                   | 64 KB Block of ram |
|-----------------------|------|-----------------------|------|-----------------------------------------------------------------------------------------------|--------------------|
| 0000                  | P    | 0000                  | P    | Dos/Base/Conventional Memory                                                                  |                    |
| 0001                  | 0    | 0100                  | 8    | System Board                                                                                  |                    |
| 0002                  | 1    | 0200                  | 9    | * If J18 disables the 2nd block of 256 KB memory, errors 04 thru 07 will be the Expansion Bd. |                    |
| 0004                  | 2    | 0400                  | 10   | Expansion Board                                                                               |                    |
| 0008                  | 3    | 0800                  | 11   | Expansion Board                                                                               |                    |
| 0010                  | 4    | 1000                  | 12   | Expansion Board                                                                               |                    |
| 0020                  | 5    | 2000                  | 13   | Expansion Board                                                                               |                    |
| 0040                  | 6    | 4000                  | 14   | Extended Memory 256 KB Ram Chips                                                              |                    |
| 90                    | 7    | 8000                  | 15   | 10, 11, 12, 13 } 1st bank                                                                     |                    |
|                       |      |                       |      | 14, 15, 16, 17 } 1st bank                                                                     |                    |

### Parity Check:

To enable parity, turn Switch 1 - 8 " on ".

### \* IBM AT System Board Memory Jumper

When setting the RAMpage Board to use multi-tasking software ( DESQview ), it is important to use only 256 KB of system board memory, and disable the other 256 KB memory, if they have any, by positioning Jumper J18 on the IBM AT System Board towards the back of the computer.



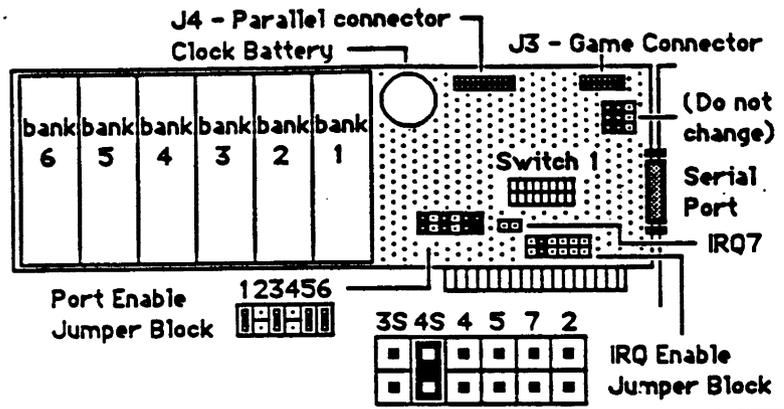
# AST Research SixPakPlus Multi-Function Boards (DOS Base Memory only)

**KEY**

ON     - Jumper open

OFF     - Jumper closed

## Type 1 - 1983



**Starting Address**

| Switch 1                            | 1                                   | 2                                   | 3                                   |
|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
| <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            |
| <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            |
| <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |

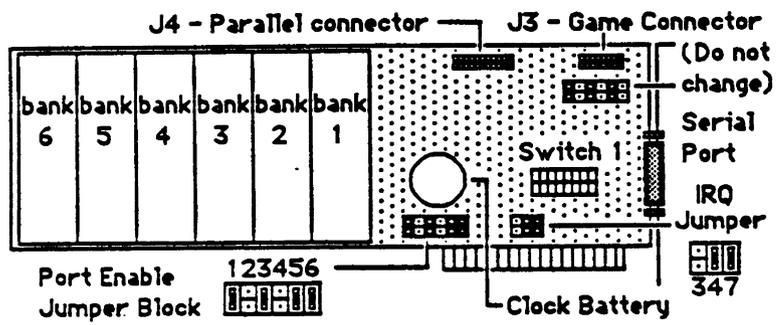
**Banks Installed**

| Switch 1                            | 4                                   | 5                                   | 6                                   |
|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
| <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            |
| <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            |
| <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            |
| <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |

Switch 7 - not used  
Switch 8 - Parity - on

| 123456                              | 347                                 | CLK                                 | 347                                 |
|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
| <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            |
| <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            |
| <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            |
| <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |

## Type 2 - 1984



**Starting Address**

| Switch 1                            | 1                                   | 2                                   | 3                                   |
|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
| <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            |
| <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            |
| <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            |
| <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |

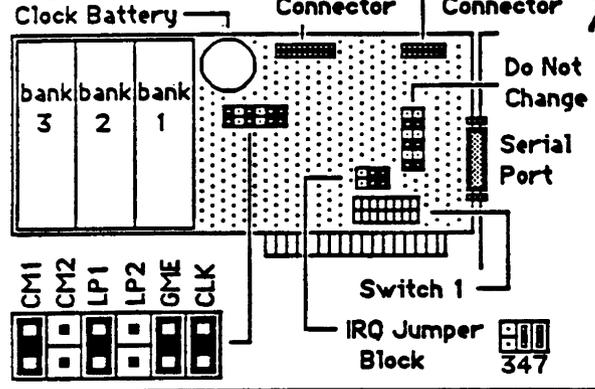
**Banks Installed**

| Switch 1                            | 4                                   | 5                                   | 6                                   |
|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
| <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            |
| <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            |
| <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            |
| <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |

Switch 7 - not used  
Switch 8 - Parity - on

| 123456                              | 347                                 | CLK                                 | 347                                 |
|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
| <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            |
| <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            |
| <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            |
| <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |

## Type 3 - 1987



**Starting Address**

| Switch 1                            | 1                                   | 2                                   | 3                                   |
|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
| <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            |
| <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            |
| <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            |
| <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |

**Banks Installed**

| Bank | Bank | Bank | Switch 1                            | Total Ram |
|------|------|------|-------------------------------------|-----------|
| 0    | 1    | 2    | 4 5 6                               | 0 KB      |
| -    | -    | -    | <input type="checkbox"/>            | 0 KB      |
| 64   | -    | -    | <input checked="" type="checkbox"/> | 64 KB     |
| 64   | 64   | -    | <input type="checkbox"/>            | 128 KB    |
| 256  | -    | -    | <input checked="" type="checkbox"/> | 256 KB    |
| 64   | 256  | -    | <input type="checkbox"/>            | 320 KB    |
| 64   | 64   | 256  | <input checked="" type="checkbox"/> | 384 K     |
| 256  | 256  | -    | <input type="checkbox"/>            | 512 KB    |
| 64   | 256  | 256  | <input type="checkbox"/>            | 576 KB    |

Switch 7 - not used  
Switch 8 - Parity - on

| CLK                                 | 347                                 | CLK                                 | 347                                 |
|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
| <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            |
| <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            |
| <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            |
| <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |

The AST SixPakPlus is a multi-function board for the IBM PC & XT type computers. It features base memory expansion, serial, parallel & game ports, a clock/calendar, ram disk and print spool software. It comes with a SuperPak diskette with software for the clock/calendar, ram disk & print spool. To read the clock, type "ASTCLOCK"; to set the clock, type "ASTCLOCK/R" & then use the dos Date & Time commands. To use the "SUPERDRIVE" software for the ram disk, the PC, XT system board switches must be set to recognize the ram disk as another physical floppy diskette drive.

### Memory Layout:

|   |
|---|
| P |
| 7 |
| 6 |
| 5 |
| 4 |
| 3 |
| 2 |
| 1 |

**Memory Error Location Chart**

| Bit in error                | 00 | 01  | 02  | 04     | 08     | 10 | 20 | 40 | 80 |
|-----------------------------|----|-----|-----|--------|--------|----|----|----|----|
| Chip Location               | P  | 0   | 1   | 2      | 3      | 4  | 5  | 6  | 7  |
| 64 KB Block of Ram in error | 0  | 1   | 2   | , etc. |        |    |    |    |    |
| 64 KB Block of Ram          |    | 1st | 2nd | 3rd    | , etc. |    |    |    |    |

# SixPakPlus

## PC190

Number of Banks Installed on the SixPakPlus

| Banks Installed | S1-4 | S1-5 | S1-6 | Total SixPakPlus RAM |
|-----------------|------|------|------|----------------------|
| NONE            | OFF  | OFF  | OFF  | 0KB                  |
| 1               | OFF  | OFF  | ON   | 64KB                 |
| 2 (1-2)         | OFF  | ON   | OFF  | 128KB                |
| 3 (1-3)         | OFF  | ON   | ON   | 192KB                |
| 4 (1-4)         | ON   | OFF  | OFF  | 256KB                |
| 5 (1-5)         | ON   | OFF  | ON   | 320KB                |
| 6 (1-6)         | ON   | ON   | OFF  | 384KB                |



SixPakPlus Starting Memory Address

| Starting Address | S1-1 | S1-2 | S1-3 | Maximum RAM On SixPakPlus |
|------------------|------|------|------|---------------------------|
| 64KB (10000)     | OFF  | OFF  | OFF  | 384KB                     |
| 128KB (20000)    | OFF  | OFF  | ON   | 384KB                     |
| 192KB (30000)    | OFF  | ON   | OFF  | 384KB                     |
| 256KB (40000)    | OFF  | ON   | ON   | 384KB                     |
| 320KB (50000)    | ON   | OFF  | OFF  | 320KB                     |
| 384KB (60000)    | ON   | OFF  | ON   | 256KB                     |
| 448KB (70000)    | ON   | ON   | OFF  | 192KB                     |
| 512KB (80000)    | ON   | ON   | ON   | 128KB                     |



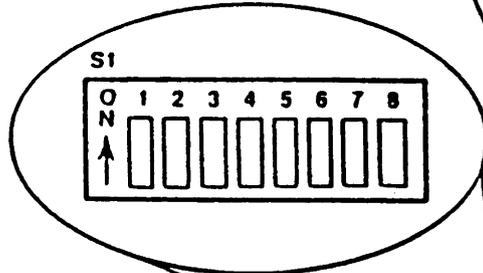
Parity Enable S8 ON  
Parity Disabled S8 OFF

- (Default) PIN 1- COM1
- PIN 2- COM2
- (Default) PIN 3- LPT1
- PIN 4- LPT2
- PIN 5- GAME PORT
- PIN 6- CLOCK ENABLE

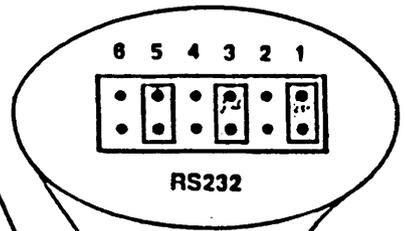
(Default) IRQ3-COM2  
IRQ4-COM1  
IRQ7-LPT1

- Bank 6 (384 KB)
- Bank 5 (320 KB)
- Bank 4 (256 KB)
- Bank 3 (192 KB)
- Bank 2 (128 KB)
- Bank 1 (0 KB)

DIP Switch S1  
Configure for starting address,  
memory size, parity

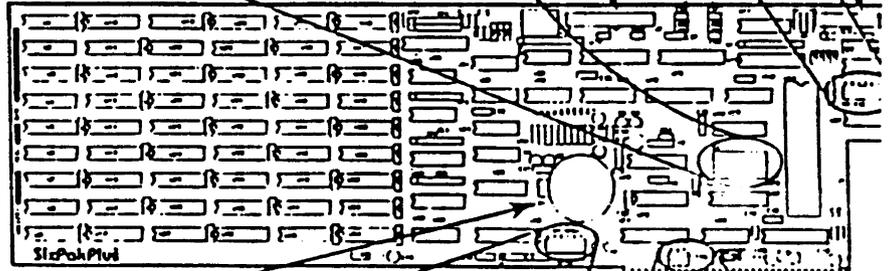


J2—Parallel  
Port Connector

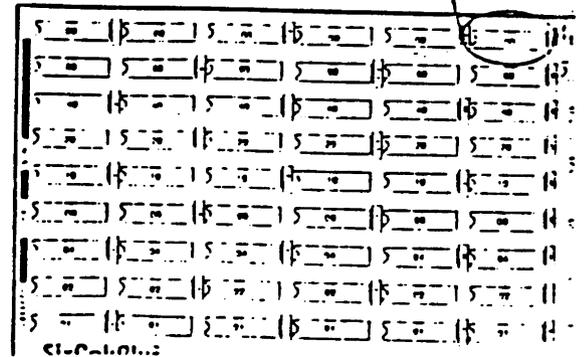
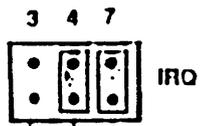
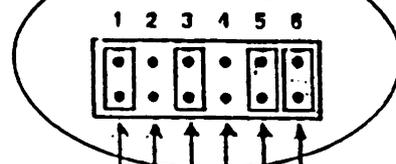


J3—Game  
Connecto

Bt



PORT ENABLE



**STEP 1**

If you have not already done so, copy the ASTCLOCK.COM program from a SuperPak diskette (version 4.3 or later) to your PC boot diskette.

If you are unsure how to COPY a file, consult your DOS manual.

**STEP 2**

If your working DOS diskette already has an AUTOEXEC.BAT file, you must alter that file to include the ASTCLOCK command. To see the current contents of your AUTOEXEC file, insert the working DOS diskette in drive A: and from the A> prompt, enter this command:

```
TYPE AUTOEXEC.BAT <Enter>
```

Your screen will display the contents of your AUTOEXEC file. Now you must create a new AUTOEXEC file in which the command ASTCLOCK precedes these other command(s). Enter this command sequence:

```
COPY CON: AUTOEXEC.BAT <Enter>
ASTCLOCK <Enter>
.
.   (other commands)
.
<Function key F6> <Enter> or <Ctrl-Z> <Enter>
```

If your working DOS diskette has no AUTOEXEC file, use the sequence above to create one (the only command in the file will be ASTCLOCK).

**STEP 3**

Reboot your PC (press <Ctrl-Alt-Del>).

The ASTCLOCK command will display the time and date on the screen. If necessary, use the ASTCLOCK /R utility to set the TIME and DATE on the SixPakPlus as detailed in Section 3.3.

**3.3 Setting the Clock-Calendar TIME & DATE**

This subsection tells you how to set the time and date in the SixPakPlus clock chip.

**NOTE**

You must use a version 4.3 (or later) SuperPak diskette to set the SixPakPlus clock chip.

Once you have copied ASTCLOCK to your PC boot diskette, you can update the clock-calendar on the SixPakPlus internal microprocessor chip. DOS TIME and DATE commands only update the system's time and date parameters in memory; they don't permanently update the values stored in the SixPakPlus clock chip until you execute this procedure:

**STEP 1**

Boot the system with a diskette that contains the ASTCLOCK.COM program.

**STEP 2**

Enter this command:

```
A>ASTCLOCK /R <Enter>
```

Your PC will then display a message like this (the actual date and time will be different):

```
ASTClock      Version x.xx
©Copyright AST Research, Inc.,
1982, 1984.
```

```
resident clock/calendar
DATE & TIME processors loaded.
```

```
Current date is 05/21/85
Current time is 08:07:56.65
```

**STEP 3**

Enter this command:

```
A>DATE <Enter>
```

Your PC will display the current date (the actual date displayed may be different):

```
Current date is Tue 5-21-1985
Enter new date:
```

Enter the new month, day, and year as follows:

```
mm-dd-yy <Enter>
```

where mm is the one- or two digit month designation, dd is the day, and yy is the year.

If you do not want to change the date, press <Enter> only.

**STEP 4**

Enter this command:

```
A>TIME <Enter>
```

Your PC will then display the current time (the actual time displayed may be different):

```
Current time is 8:14:15.82
Enter new time:
```

Enter the new hour, minute, and second as follows:

```
hh:mm:ss <Enter>
```

where hh is the hour, mm is the minute, and ss is the second. Be sure to use 24 hour format for the hour (that is, 1:00 PM = 13, 2:00 PM = 14, and so on).

Do not enter hundredths of a second. If you do not want to change the time, press <Enter> only.

Hint: For maximum accuracy, type in a time that is 10 to 15 seconds ahead of the actual time, then observe a digital watch, and press <Enter> when the seconds reading on the watch catches up to the value that you typed in.

**STEP 5**

Reboot your computer by pressing <Ctrl-Alt-Del>.

**NOTE**

Selecting the ASTCLOCK "/R" parameter selects the *resident* option, which allows you to update the date and time in both PC memory and the SixPakPlus clock chip (you cannot update the clock chip unless a certain portion of the ASTCLOCK.COM program is resident).

If you use the ASTCLOCK command without the /R parameter, it simply initializes the PC's date and time by reading that information from the SixPakPlus clock chip, and then goes away. No portion of ASTCLOCK remains resident, so you cannot update the date and time information in the clock chip.

**3.4 The Clock-Calendar Battery**

The lithium clock calendar battery should last for about a year, and is easily replaceable. You can purchase replacement batteries from your dealer.

3-32

# Tech Talk

## Micro Products

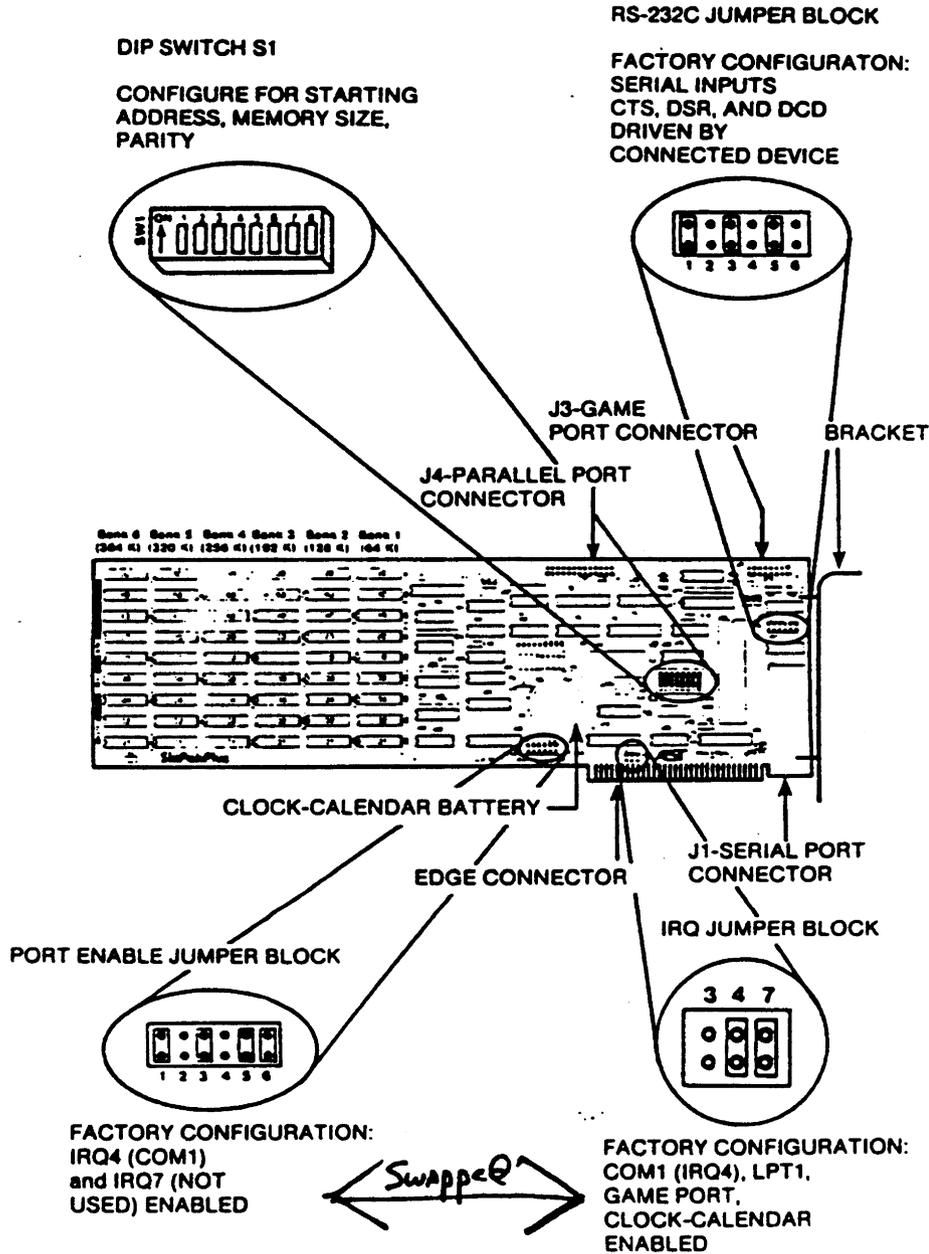
September 30, 1985

**AST  
SixPackPlus  
New Style**

Category D. Hardware

### D5 LAYOUT

The battery of the new style board is located at the bottom.

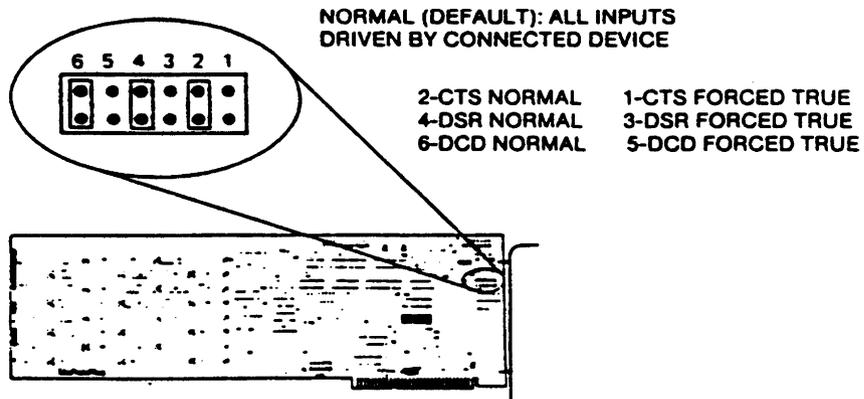
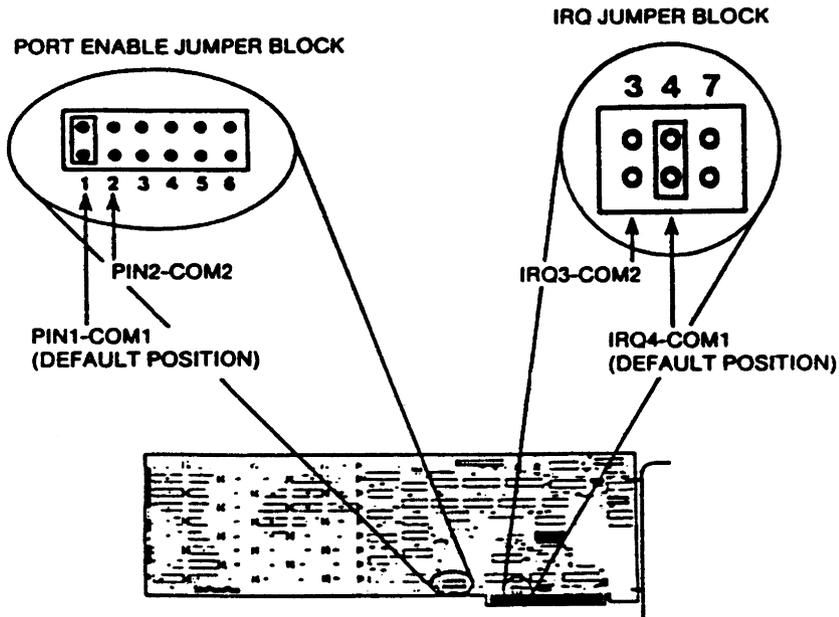


SixPakPlus Board Layout

3-

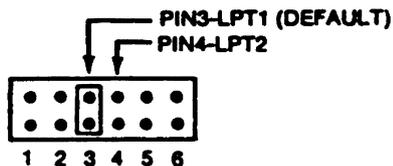
3-33

**D6 COMMUNICATIONS PORT CONFIGURATION**



### D1 PARALLEL PORT CONFIGURATION

#### PORT ENABLE JUMPER BLOCK



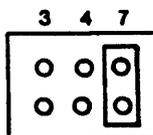
#### NOTE

When IBM Monochrome Card is installed, SixPakPlus LPT1 will respond as LPT2, and SixPakPlus LPT2 will respond as LPT3.

### INTERRUPT-DRIVEN PARALLEL PRINTER SOFTWARE

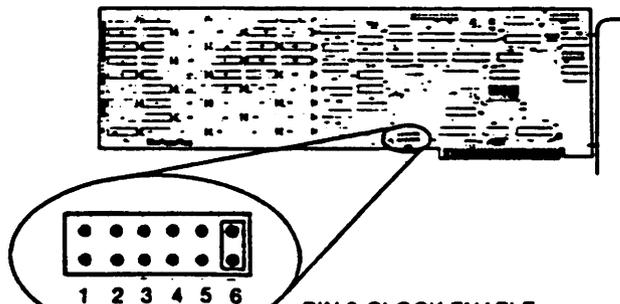
Interrupt-driven parallel printer software uses IRQ7. To ensure that your interrupt-driven parallel printer software operates correctly, you must enable IRQ7 on the SixPakPlus. It will not harm anything to enable IRQ7 even if you do not run interrupt-driven software for your parallel printer.

#### IRQ JUMPER BLOCK



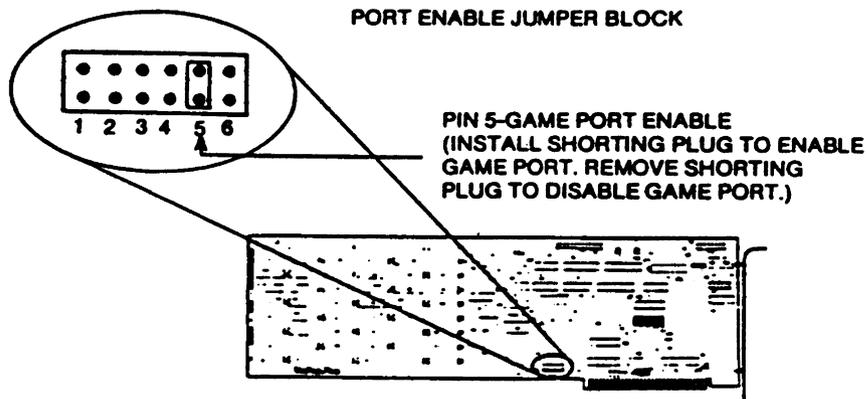
### D2 CLOCK-CALENDAR CONFIGURATION

#### PORT ENABLE JUMPER BLOCK



PIN 6-CLOCK ENABLE  
(INSTALL SHORTING PLUG TO ENABLE CLOCK-CALENDAR.  
REMOVE SHORTING PLUS TO DISABLE CLOCK-CALENDAR.)

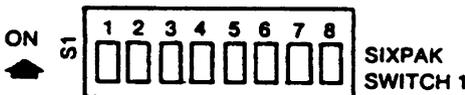
**D3 GAME PORT CONFIGURATION**



**D4 MEMORY SWITCH SETTINGS**

**SIXPAKPLUS STARTING MEMORY ADDRESS**

| STARTING ADDRESS | S1  | S2  | S3  | MAXIMUM RAM ON SIXPAK |
|------------------|-----|-----|-----|-----------------------|
| 64K (:10000)     | OFF | OFF | OFF | 384K                  |
| 128K (:20000)    | OFF | OFF | ON  | 384K                  |
| 192K (:30000)    | ON  | ON  | OFF | 384K                  |
| 256K (:40000)    | OFF | ON  | ON  | 384K                  |
| 320K (:50000)    | OFF | OFF | OFF | 320K                  |
| 384K (:60000)    | ON  | OFF | ON  | 256K                  |
| 448K (:70000)    | ON  | ON  | OFF | 192K                  |
| 512K (:80000)    | ON  | ON  | ON  | 128K                  |

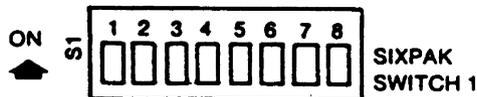


**NUMBER OF BANKS INSTALLED ON THE SIXPAKPLUS**

| BANKS INSTALLED | S4  | S5  | S6  | TOTAL SIXPAK RAM |
|-----------------|-----|-----|-----|------------------|
| NONE            | OFF | OFF | OFF | 0K               |
| 1               | OFF | OFF | ON  | 64K              |
| 2 (1-2)         | OFF | ON  | OFF | 128K             |
| 3 (1-3)         | OFF | ON  | ON  | 192K             |
| 4 (1-4)         | ON  | OFF | OFF | 256K             |
| 5 (1-5)         | ON  | OFF | ON  | 320K             |
| 6 (1-6)         | ON  | ON  | OFF | 384K             |

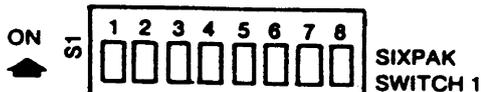
**NOTE**

Position 7 on SixPakPlus switch S1 is not used, and it can be ON or OFF.



**SIXPAKPLUS MEMORY SIZE SETTING**

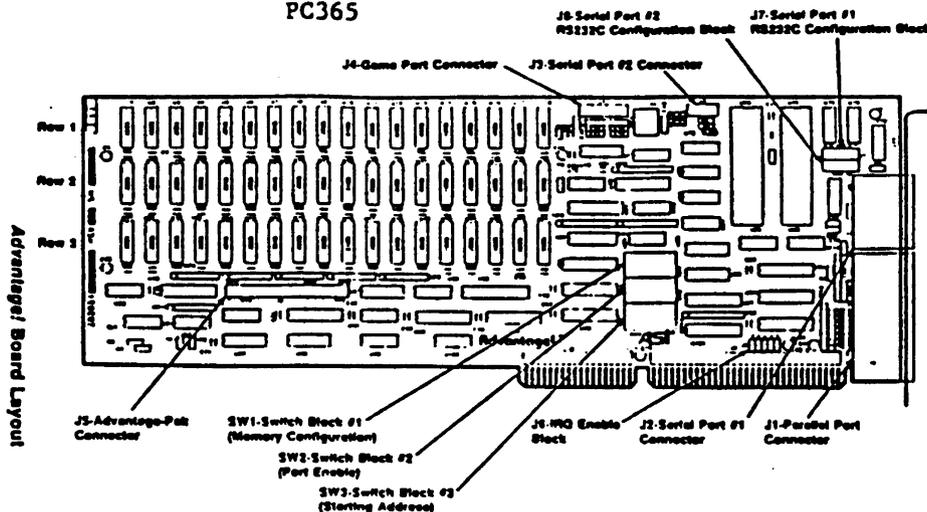
**PARITY CHECK ENABLE**



S-8 ON = PARITY ENABLED  
S-8 OFF = PARITY DISABLED

# Memory Expansion and I/O Board

PC365



## Configuring the Starting Memory Address

The next thing you need to tell the *Advantage!* is where its memory will be located in the AT's memory addressing range. This is done by configuring the settings of Switch Block #3 on the *Advantage!*.

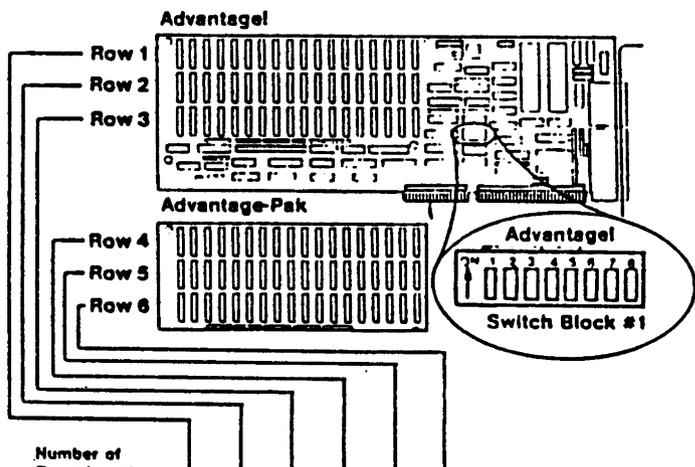
When configuring Switch Block #3, note the following:

- If you are using no other memory cards in your AT, follow the instructions in this section.
- If you are using the IBM 128K memory card in your AT, follow the instructions in this section.
- If you are using a variety of memory cards in your AT (excluding the IBM 128K card), or if you are using more than one *Advantage!*, follow the instructions in Section 4.3, "If You Have Other Memory Cards".
- If you have 256K on your AT system board, you must use Option #1 below to configure Switch Block #3 (You must also configure your AT system board; instructions for doing so will be given later in Installation Step 7, as well as in Appendix E of this manual.)
- If you have 512K on your AT system board, you must use either Option #2 or Option #3 to configure Switch Block #3.
- Appendix D lists all possible starting address switch settings for the *Advantage!*.

The starting memory address of the *Advantage!* should be selected from one of the following three options, depending on the configuration of your AT:

- Option #1—Split Memory Addressing in a 256K AT. This *Advantage!* configuration is mandatory in all 256K ATs.
- Option #2—Split Memory Addressing in a 512K AT.
- Option #3—Contiguous Memory Addressing in a 512K or 640K AT.

If the configuration you want does not fall into one of the above three categories, please refer to Section 4.



| Number of Rows Installed on Advantage! | Row1 | Row2 | Row3 | Row4 | Row5 | Row6 | SW1 | SW2 | SW3 | SW4 | SW5 |
|----------------------------------------|------|------|------|------|------|------|-----|-----|-----|-----|-----|
| 1                                      | 128K |      |      |      |      |      | OFF | OFF | OFF | OFF | ON  |
| 1                                      | 512K |      |      |      |      |      | OFF | OFF | ON  | ON  | ON  |
| 2                                      | 128K | 128K |      |      |      |      | OFF | OFF | OFF | ON  | OFF |
| 2                                      | 128K | 512K |      |      |      |      | ON  | OFF | OFF | OFF | OFF |
| 2                                      | 512K | 512K |      |      |      |      | OFF | ON  | OFF | OFF | OFF |
| 3                                      | 128K | 128K | 128K |      |      |      | OFF | OFF | OFF | ON  | ON  |
| 3                                      | 128K | 128K | 512K |      |      |      | ON  | OFF | ON  | OFF | ON  |
| 3                                      | 128K | 512K | 512K |      |      |      | ON  | OFF | OFF | OFF | ON  |
| 3                                      | 512K | 512K | 512K |      |      |      | OFF | ON  | OFF | OFF | ON  |
| 4                                      | 128K | 128K | 128K | 128K |      |      | OFF | OFF | ON  | OFF | OFF |
| 4                                      | 128K | 128K | 128K | 512K |      |      | ON  | ON  | OFF | OFF | ON  |
| 4                                      | 128K | 128K | 512K | 512K |      |      | ON  | OFF | ON  | ON  | OFF |
| 4                                      | 128K | 512K | 512K | 512K |      |      | ON  | OFF | OFF | ON  | OFF |
| 4                                      | 512K | 512K | 512K | 512K |      |      | OFF | ON  | OFF | ON  | OFF |
| 5                                      | 128K | 128K | 128K | 128K | 128K |      | OFF | OFF | ON  | OFF | ON  |
| 5                                      | 128K | 128K | 128K | 128K | 512K |      | ON  | ON  | ON  | OFF | OFF |
| 5                                      | 128K | 128K | 128K | 512K | 512K |      | ON  | ON  | OFF | ON  | OFF |
| 5                                      | 128K | 128K | 512K | 512K | 512K |      | ON  | OFF | ON  | ON  | ON  |
| 5                                      | 128K | 512K | 512K | 512K | 512K |      | ON  | OFF | OFF | ON  | ON  |
| 5                                      | 512K | 512K | 512K | 512K | 512K |      | OFF | ON  | OFF | ON  | ON  |
| 6                                      | 128K | 128K | 128K | 128K | 128K | 128K | OFF | OFF | ON  | ON  | OFF |
| 6                                      | 128K | 128K | 128K | 128K | 128K | 512K | ON  | ON  | ON  | ON  | OFF |
| 6                                      | 128K | 128K | 128K | 128K | 512K | 512K | ON  | ON  | ON  | OFF | ON  |
| 6                                      | 128K | 128K | 128K | 512K | 512K | 512K | ON  | ON  | OFF | ON  | ON  |
| 6                                      | 128K | 128K | 512K | 512K | 512K | 512K | ON  | ON  | OFF | OFF | OFF |
| 6                                      | 128K | 512K | 512K | 512K | 512K | 512K | ON  | ON  | OFF | ON  | OFF |
| 6                                      | 512K | 512K | 512K | 512K | 512K | 512K | OFF | ON  | ON  | OFF | OFF |

## Setting the Advantage! Memory Size



Memory Addressing on the Advantage! using the switch settings in Figure 3-4.

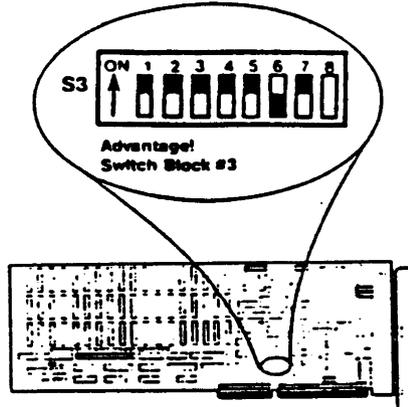


Figure 3-4. Split Memory Addressing in a 256K AT

In this configuration, the first 384K of memory on the Advantage! is dedicated to rounding out the AT's base memory area to its 640K maximum.

Please note the following facts regarding Advantage! installation in a 256K AT:

- If the Advantage! has more than 384K on it, the first 384K is used to round out the AT's base memory to 640K, with the remaining Advantage! memory addressed as expansion memory.
- If the Advantage! has 384K or less on it, this memory is added to the AT's 256K system board memory, for total base memory of 384K, 512K or 640K. There would be no expansion memory in the 15 MB extended memory area.
- If you are installing the Advantage! in a 256K AT, or if you are changing the AT system board memory configuration at this time, you must properly configure your AT system board. Instructions for doing so are given later in Installation Step 7, as well as in Appendix E of this manual.

Split Memory Addressing Memory Allocation

| TOTAL MEMORY ROWS POPULATED | NUMBER 64K CHIPS | NUMBER 256K CHIPS | TOTAL ADVIC. MEMORY (K) | 256K AT   |           |            | 512K AT   |           |            |
|-----------------------------|------------------|-------------------|-------------------------|-----------|-----------|------------|-----------|-----------|------------|
|                             |                  |                   |                         | BASE MEM. | EXP. MEM. | TOTAL MEM. | BASE MEM. | EXP. MEM. | TOTAL MEM. |
| 1                           | 1                | 0                 | 128                     | 384       | 0         | 384        | 640       | 304       | 1024       |
| 1                           | 0                | 0                 | 512                     | 640       | 120       | 760        | 640       | 640       | 1280       |
| 2                           | 2                | 0                 | 256                     | 512       | 0         | 512        | 640       | 120       | 760        |
| 2                           | 1                | 1                 | 640                     | 640       | 256       | 896        | 640       | 512       | 1152       |
| 2                           | 0                | 2                 | 1024                    | 640       | 640       | 1280       | 640       | 896       | 1536       |
| 3                           | 3                | 0                 | 384                     | 640       | 0         | 640        | 640       | 256       | 896        |
| 3                           | 2                | 1                 | 768                     | 640       | 384       | 1024       | 640       | 640       | 1280       |
| 3                           | 1                | 2                 | 1152                    | 640       | 768       | 1408       | 640       | 1024      | 1648       |
| 3                           | 0                | 3                 | 1536                    | 640       | 1152      | 1792       | 640       | 1408      | 2048       |
| 4                           | 4                | 0                 | 512                     | 640       | 120       | 760        | 640       | 304       | 1024       |
| 4                           | 3                | 1                 | 896                     | 640       | 512       | 1152       | 640       | 768       | 1408       |
| 4                           | 2                | 2                 | 1280                    | 640       | 896       | 1536       | 640       | 1152      | 1792       |
| 4                           | 1                | 3                 | 1664                    | 640       | 1280      | 1920       | 640       | 1536      | 2176       |
| 4                           | 0                | 4                 | 2048                    | 640       | 1664      | 2304       | 640       | 1920      | 2560       |
| 5                           | 5                | 0                 | 640                     | 640       | 256       | 896        | 640       | 512       | 1152       |
| 5                           | 4                | 1                 | 896                     | 640       | 512       | 1152       | 640       | 768       | 1408       |
| 5                           | 3                | 2                 | 1408                    | 640       | 1024      | 1648       | 640       | 1280      | 1920       |
| 5                           | 2                | 3                 | 1792                    | 640       | 1408      | 2048       | 640       | 1664      | 2304       |
| 5                           | 1                | 4                 | 2176                    | 640       | 1792      | 2416       | 640       | 2048      | 2688       |
| 5                           | 0                | 5                 | 2560                    | 640       | 2176      | 2816       | 640       | 2432      | 3072       |
| 6                           | 6                | 0                 | 768                     | 640       | 384       | 1024       | 640       | 640       | 1280       |
| 6                           | 5                | 1                 | 1152                    | 640       | 768       | 1408       | 640       | 1024      | 1648       |
| 6                           | 4                | 2                 | 1536                    | 640       | 1152      | 1792       | 640       | 1408      | 2048       |
| 6                           | 3                | 3                 | 1920                    | 640       | 1536      | 2176       | 640       | 1792      | 2432       |
| 6                           | 2                | 4                 | 2304                    | 640       | 1920      | 2560       | 640       | 2176      | 2816       |
| 6                           | 1                | 5                 | 2688                    | 640       | 2304      | 2944       | 640       | 2560      | 3200       |
| 6                           | 0                | 6                 | 3072                    | 640       | 2688      | 3328       | 640       | 2944      | 3584       |

Conversion Chart for calculating the amount of base memory and expansion memory in the AT when using split memory addressing on the Advantage!

of memory on the Advantage! to round out the AT's base memory area to its 640K maximum by setting the Advantage! switch settings as shown in Figure 3-5.

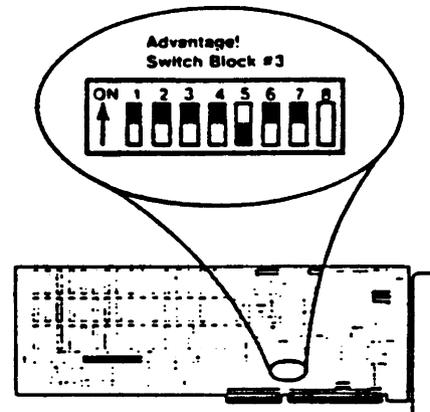


Figure 3-5. Split Memory Addressing in a 512K AT

In this configuration, the first 128K of memory on the Advantage! is dedicated to rounding out the AT's base memory area to its 640K maximum.

- If the Advantage! has exactly 128K on it, this memory is added to the 512K system board memory, for total base memory of 640K. There would be no expansion memory in the 15 MB extended memory area.
- If the Advantage! has more than 128K on it, the first 128K is used to round out net base memory to 640K, with the remaining Advantage! memory addressed as expansion memory.

The configuration described in Option #2 may be useful if you are using application software which can access a full 640K of base memory.

Option #3—Contiguous Memory Addressing in a 512K or 640K AT: If your AT has 512K on its system board, you may address all of the Advantage! memory as expansion memory in the 15 MB extended memory area. You should also use this configuration if you have the IBM 128K card in your AT.

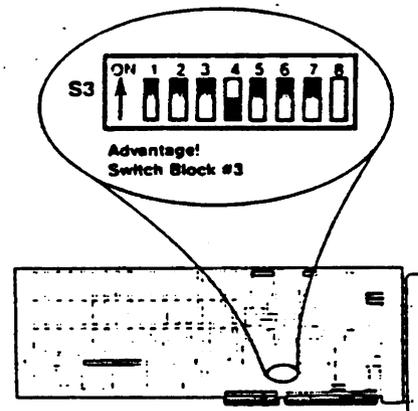


Figure 3-6. Contiguous Memory Addressing in a 512K or 640K AT

In this configuration, all of the memory on the Advantage! is used as expansion memory. The 640K base area is not affected by the Advantage!.



TECH TALKS  
MICRO PRODUCTS

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Category D Hardware

SWITCH SETTINGS

Record all switch settings before removing board!

Combo Boards are factory pre-configured for the following:

64K of RAM on the system board and no additional memory boards

Switches 1-4 are used to select the starting location of the Combo Board's memory

Switch 5 ON = Disable first Combo bank of 64K  
Switch 6 ON = Disable second Combo bank of 64k  
Switch 7 ON = Disable third Combo bank of 64k

Switch 8 ON = Disable parity check (for REV.D PCB)

| Starting Address Position | Switch 1 (on Combo Board) |   |   |   |           |   |   |   |         |
|---------------------------|---------------------------|---|---|---|-----------|---|---|---|---------|
|                           | 'X' = ON                  |   |   |   | '-' = OFF |   |   |   |         |
|                           | 1                         | 2 | 3 | 4 | 5         | 6 | 7 | 8 |         |
| 64K                       | X                         | X | X | - | -         | - | - | - | factory |
| 128K                      | X                         | X | - | X | -         | - | - | - |         |
| 192K                      | X                         | X | - | - | -         | - | - | - |         |
| 256K                      | X                         | - | X | X | -         | - | - | - |         |
| 320K                      | X                         | - | X | - | -         | - | - | - |         |
| 384K                      | X                         | - | - | X | -         | - | X | - |         |
| 448K                      | X                         | - | - | - | -         | X | X | - |         |
| 512K                      | -                         | X | X | X | X         | X | X | - |         |

Up until the introduction of the newer 256K and XT System Board models, the IBM memory boundary switch settings and I/O port jumpers on AST cards normally did not change.

TECH TALKS  
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| AST23C Name | J1 Pin# | Signal Name          | Signal Direction |
|-------------|---------|----------------------|------------------|
| A4          | 1       | (Protective Ground)  | Common           |
| A8          | 2       | IX (Trematic Data)   | OUTPUT           |
| B8          | 3       | IX (Receive Data)    | INPUT            |
| CA          | 4       | RTS (Req. To Send)   | OUTPUT           |
| CB          | 5       | CTS (Clear To Send)  | INPUT            |
| CC          | 6       | SRQ (Data Set Ready) | INPUT            |
| AC          | 7       | SC (Signal Ground)   | Common           |
| CF          | 8       | CD (Carrier Det.)    | INPUT            |
| CD          | 10      | RTN (Data Set Ready) | OUTPUT           |
| CE          | 22      | RT (Data Indicator)  | INPUT            |

TECH TALKS  
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PARALLEL PORT PRINT

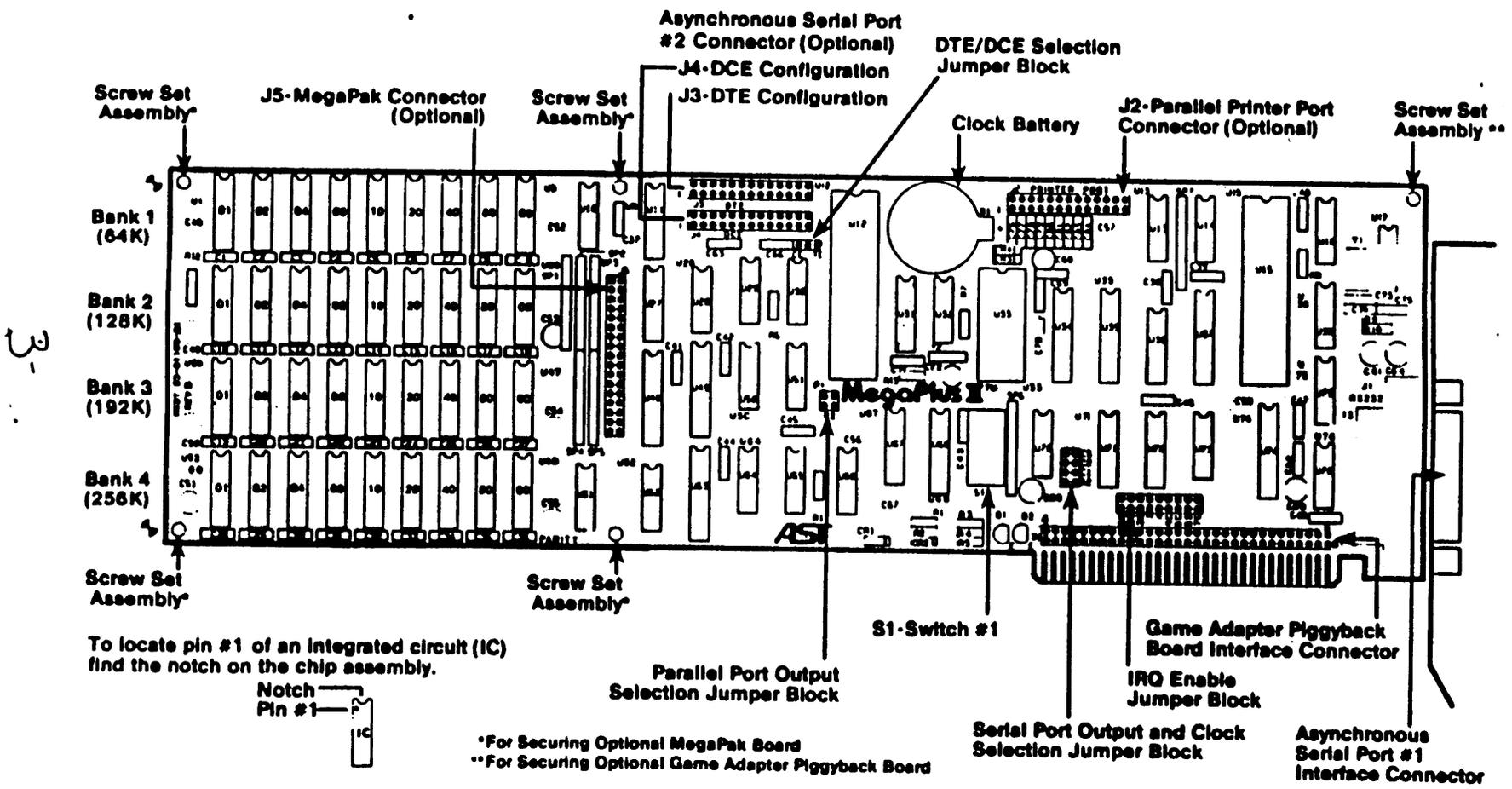
Note: The cable supplied with your ComboPlus card connects the parallel port to the printer. The parallel port line signal format listed in the chart below. The J1 line outputs are supplied for reference only.

| Line Name | J2 Pin# | AST Cable | IBM     |
|-----------|---------|-----------|---------|
|           |         | Signal    | Printer |
| -STRIDE   | 1       | 1         | 1       |
| RD        | 2       | 2         | 2       |
| RT        | 3       | 3         | 3       |
| RTS       | 4       | 4         | 4       |
| RD        | 5       | 5         | 5       |
| RTS       | 6       | 6         | 6       |
| RD        | 7       | 7         | 7       |
| RTS       | 8       | 8         | 8       |
| RD        | 9       | 9         | 9       |
| RTS       | 10      | 10        | 10      |
| RD        | 11      | 11        | 11      |
| RTS       | 12      | 12        | 12      |
| RD        | 13      | 13        | 13      |
| RTS       | 14      | 14        | 14      |
| RD        | 15      | 15        | 15      |
| RTS       | 16      | 16        | 16      |
| RD        | 17      | 17        | 17      |
| RTS       | 18      | 18        | 18      |
| RD        | 19      | 19        | 19      |
| RTS       | 20      | 20        | 20      |
| RD        | 21      | 21        | 21      |
| RTS       | 22      | 22        | 22      |
| RD        | 23      | 23        | 23      |
| RTS       | 24      | 24        | 24      |
| RD        | 25      | 25        | 25      |
| RTS       | 26      | 26        | 26      |
| RD        | 27      | 27        | 27      |
| RTS       | 28      | 28        | 28      |
| RD        | 29      | 29        | 29      |
| RTS       | 30      | 30        | 30      |
| RD        | 31      | 31        | 31      |
| RTS       | 32      | 32        | 32      |
| RD        | 33      | 33        | 33      |
| RTS       | 34      | 34        | 34      |
| RD        | 35      | 35        | 35      |
| RTS       | 36      | 36        | 36      |
| RD        | 37      | 37        | 37      |
| RTS       | 38      | 38        | 38      |
| RD        | 39      | 39        | 39      |
| RTS       | 40      | 40        | 40      |
| RD        | 41      | 41        | 41      |
| RTS       | 42      | 42        | 42      |
| RD        | 43      | 43        | 43      |
| RTS       | 44      | 44        | 44      |
| RD        | 45      | 45        | 45      |
| RTS       | 46      | 46        | 46      |
| RD        | 47      | 47        | 47      |
| RTS       | 48      | 48        | 48      |
| RD        | 49      | 49        | 49      |
| RTS       | 50      | 50        | 50      |
| RD        | 51      | 51        | 51      |
| RTS       | 52      | 52        | 52      |
| RD        | 53      | 53        | 53      |
| RTS       | 54      | 54        | 54      |
| RD        | 55      | 55        | 55      |
| RTS       | 56      | 56        | 56      |
| RD        | 57      | 57        | 57      |
| RTS       | 58      | 58        | 58      |
| RD        | 59      | 59        | 59      |
| RTS       | 60      | 60        | 60      |
| RD        | 61      | 61        | 61      |
| RTS       | 62      | 62        | 62      |
| RD        | 63      | 63        | 63      |
| RTS       | 64      | 64        | 64      |
| RD        | 65      | 65        | 65      |
| RTS       | 66      | 66        | 66      |
| RD        | 67      | 67        | 67      |
| RTS       | 68      | 68        | 68      |
| RD        | 69      | 69        | 69      |
| RTS       | 70      | 70        | 70      |
| RD        | 71      | 71        | 71      |
| RTS       | 72      | 72        | 72      |
| RD        | 73      | 73        | 73      |
| RTS       | 74      | 74        | 74      |
| RD        | 75      | 75        | 75      |
| RTS       | 76      | 76        | 76      |
| RD        | 77      | 77        | 77      |
| RTS       | 78      | 78        | 78      |
| RD        | 79      | 79        | 79      |
| RTS       | 80      | 80        | 80      |
| RD        | 81      | 81        | 81      |
| RTS       | 82      | 82        | 82      |
| RD        | 83      | 83        | 83      |
| RTS       | 84      | 84        | 84      |
| RD        | 85      | 85        | 85      |
| RTS       | 86      | 86        | 86      |
| RD        | 87      | 87        | 87      |
| RTS       | 88      | 88        | 88      |
| RD        | 89      | 89        | 89      |
| RTS       | 90      | 90        | 90      |
| RD        | 91      | 91        | 91      |
| RTS       | 92      | 92        | 92      |
| RD        | 93      | 93        | 93      |
| RTS       | 94      | 94        | 94      |
| RD        | 95      | 95        | 95      |
| RTS       | 96      | 96        | 96      |
| RD        | 97      | 97        | 97      |
| RTS       | 98      | 98        | 98      |
| RD        | 99      | 99        | 99      |
| RTS       | 100     | 100       | 100     |

Note: A dash in front of the line name denotes lines which are functionally active when low.

LAYOUT

Category D Hardware



3-

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AST Mega+II

Category D Hardware

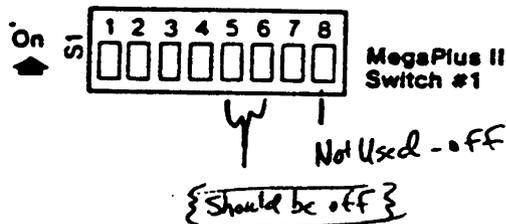
{ 714 963-9991 }

SWITCHES

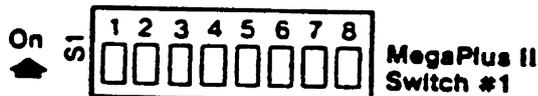
AST Mega+II

**MegaPlus II Starting Memory Address**

| Starting Address | S1  | S2  | S3  | S4  | Maximum Usable RAM<br>On MegaPlus II |
|------------------|-----|-----|-----|-----|--------------------------------------|
| 64K (:10000)     | ON  | ON  | ON  | OFF | 512K                                 |
| 128K (:20000)    | ON  | ON  | OFF | ON  | 512K                                 |
| 192K (:30000)    | ON  | ON  | OFF | OFF | 448K                                 |
| 256K (:40000)    | ON  | OFF | ON  | ON  | 384K                                 |
| 320K (:50000)    | ON  | OFF | ON  | OFF | 320K                                 |
| 384K (:60000)    | ON  | OFF | OFF | ON  | 256K                                 |
| 448K (:70000)    | ON  | OFF | OFF | OFF | 192K                                 |
| 512K (:80000)    | OFF | ON  | ON  | ON  | 128K                                 |
| 576K (:90000)    | OFF | ON  | ON  | OFF | 64K                                  |



**Parity Check Enable**



S-7 ON = Parity Enabled  
S-7 OFF = Parity Disabled

### Configuring the Parallel Port

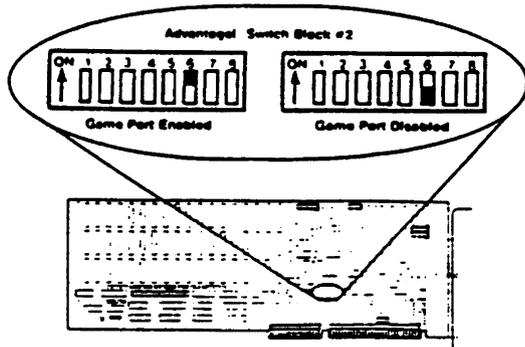
Single-user PC-DOS will support up to 3 parallel printer ports, called LPT1, LPT2, and LPT3. If your AT has a color-type display card without a built-in printer adapter port, use Table 3-3 to configure the *Advantage!*. If your AT has a monochrome-type display card with a built-in printer adapter port, use Table 3-4 to configure the *Advantage!*.

**Table 3-3. Parallel Port Configuration in AT with Color-Type Display Card**

| Number of Parallel Ports Already in the AT | Switch Block #2 | IRQ Jumpers | Function of Advantage! Parallel Port |
|--------------------------------------------|-----------------|-------------|--------------------------------------|
| 0                                          |                 |             | LPT1                                 |
| 1                                          |                 |             | LPT2                                 |
| 2                                          |                 |             | Disabled                             |
| 3                                          |                 |             | Disabled                             |

### Parallel Port Configuration in AT with Monochrome-Type Display Card

| Number of Parallel Ports Already in the AT (with Monochrome Card) | Switch Block #2 | IRQ Jumpers | Function of Advantage! Parallel Port |
|-------------------------------------------------------------------|-----------------|-------------|--------------------------------------|
| 1                                                                 |                 |             | LPT2                                 |
| 2                                                                 |                 |             | LPT3 (No interrupt)                  |
| 3                                                                 |                 |             | Disabled                             |



Game Port Enable

### Configuring the Serial Ports

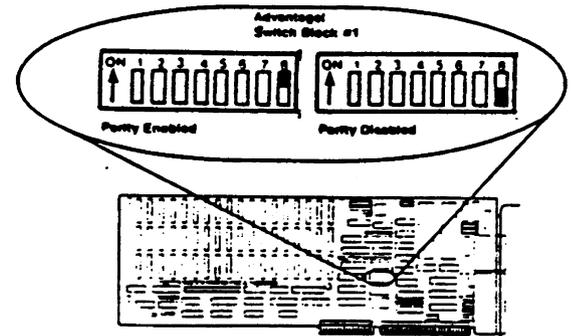
The AT running under single-user PC-DOS will support up to 2 serial ports, called COM1 and COM2. Depending on how many ports your AT already has installed and how many ports your *Advantage!* has, set Switch Block #2 on the *Advantage!* according to either Table 3-1 or Table 3-2.

**Table 3-1. Configuration for Advantage! with One Serial Port**

| Number of Serial Ports Already in the AT | Switch Block #2 | IRQ Jumpers | Function of Advantage! Serial Ports               |
|------------------------------------------|-----------------|-------------|---------------------------------------------------|
| 0                                        |                 |             | Serial #1 functions as COM1<br>Serial #2 disabled |
| 1                                        |                 |             | Serial #1 functions as COM2<br>Serial #2 disabled |
| 2                                        |                 |             | Serial #1 disabled<br>Serial #2 disabled          |

### Configuration for Advantage! with Two Serial Ports

| Number of Serial Ports Already in the AT | Switch Block #2 | IRQ Jumpers | Function of Advantage! Serial Ports                         |
|------------------------------------------|-----------------|-------------|-------------------------------------------------------------|
| 0                                        |                 |             | Serial #1 functions as COM 1<br>Serial #2 functions as COM2 |
| 1                                        |                 |             | Serial #1 functions as COM 2<br>Serial #2 disabled          |
| 2                                        |                 |             | Serial #1 disabled<br>Serial #2 disabled                    |



Enabling/Disabling Parity

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Table 2-1. Default SixPakPremium Configuration.

| Parameter                              | Default Setting                                                                                                                                                                                                                                                                                              |
|----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Starting memory address                | 256 KB: 256 KB of memory already installed in your PC (SW1-1 through 4).                                                                                                                                                                                                                                     |
| Dual page mode                         | Enabled: Allows two sets of mapping registers — ensures proper multitasking operation (SW1-7).                                                                                                                                                                                                               |
| Parity checking                        | Enabled: Ensures reliable memory over checking (SW1-8).                                                                                                                                                                                                                                                      |
| Base IO address                        | 0210: Hexadecimal address SixPakPremium uses to communicate with your PC so it can make use of expanded memory (SW2-1 through 4).                                                                                                                                                                            |
| SixPakPremium conventional memory size | Up to 512 KB: The maximum amount of SixPakPremium memory that is allocated in the 0- to 640-KB memory area (SW2-7 through 8). After rounding out memory to 640 KB, all remaining SixPakPremium memory is allocated as expanded (paged) memory.                                                               |
| First serial port                      | COM1 enabled (jumper E3).                                                                                                                                                                                                                                                                                    |
| COM1 using IRQ4                        | Enabled: First serial port COM1 uses IRQ4 (jumper E25).                                                                                                                                                                                                                                                      |
| Second (optional) serial port          | COM2: enabled only if second serial port is installed (jumper E4). Disabled if second serial port is not installed.                                                                                                                                                                                          |
| COM2 using IRQ3                        | Enabled only if second serial port COM2 is installed. Disabled if second port not installed (jumper E18).                                                                                                                                                                                                    |
| Serial port inputs                     | Serial inputs driven by connected device (allows reconfiguration in case your PC is attached to a device that requires inputs forced true — your serial device documentation will tell you if you need to change this parameter) (First port: jumpers E21 through E26; second port: jumpers E19 through E24) |
| Parallel port                          | LPT1: Responds as LPT2 if a display adapter with a built-in parallel port is installed in your PC (jumper E6).                                                                                                                                                                                               |
| LPT1 using IRQ7                        | Enabled: Parallel port uses IRQ7 (jumper E17).                                                                                                                                                                                                                                                               |
| Game port (optional)                   | Enabled only if game port installed (jumper E9). Disabled if game port not installed.                                                                                                                                                                                                                        |
| Check-calendar                         | Enabled (jumper E8).                                                                                                                                                                                                                                                                                         |

Figure 2-1 shows the standard SixPakPremium configuration.

2-2

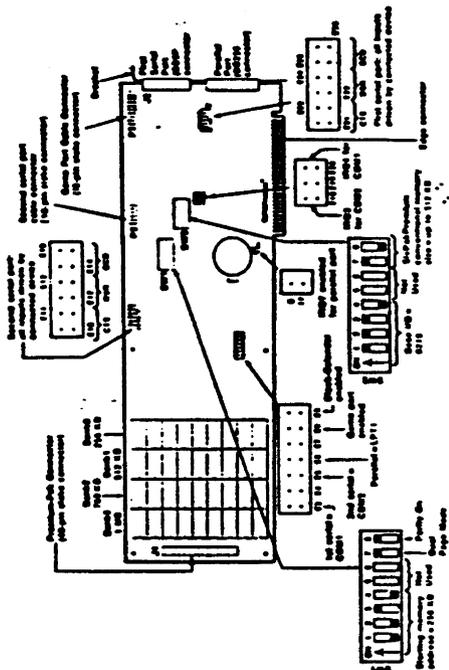


Figure 2-1. SixPakPremium Board Layout (Default Configuration).

AST Sixpak Premium

2-3

Hardware Configuration and Installation

3.6.2 Parity Checking

Figure 3-13 shows how to enable or disable parity error checking. To ensure the most reliable memory operation, leave parity checking enabled.

| Parity Checking   | SW1-8 |
|-------------------|-------|
| *Enabled          | ON    |
| Disabled          | OFF   |
| *Default setting. |       |



Figure 3-13. Parity Error Checking.

3.6.3 SixPakPremium Conventional Memory Size

Figure 3-14 shows the SixPakPremium maximum conventional memory size settings. Conventional memory is the user-addressable memory between 0 and 640 KB. Conventional memory can be added until the PC's limit of 640 KB is reached.

Each enabled 256-KB bank is allocated as conventional (non-paged) memory until a total of 640 KB of conventional memory is present. All remaining SixPakPremium memory is then allocated as expanded (paged) memory.

For example, your PC has 256 KB of conventional memory already installed on the system board, and you want to use SixPakPremium to fill out conventional memory to its 640-KB maximum. SixPakPremium must meet these requirements:

- Adequate SixPakPremium memory must be installed.
- The conventional memory size setting must be equal to or greater than the amount you want.

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Hardware Configuration and Installation

3.6.1 Starting Memory Address

Figure 3-12 shows the possible SixPakPremium starting addresses. This setting tells SixPakPremium how much conventional memory is already installed in your PC, and prevents parity errors at power-on time, during memory sizing.

| Starting Memory Address | SW1-1 | SW1-2 | SW1-3 | SW1-4 |
|-------------------------|-------|-------|-------|-------|
| 0 KB                    | OFF   | OFF   | OFF   | OFF   |
| 64 KB                   | ON    | OFF   | OFF   | OFF   |
| 128 KB                  | OFF   | ON    | OFF   | OFF   |
| 192 KB                  | ON    | ON    | OFF   | OFF   |
| *256 KB                 | OFF   | OFF   | ON    | OFF   |
| 320 KB                  | ON    | OFF   | ON    | OFF   |
| 384 KB                  | OFF   | ON    | ON    | OFF   |
| 448 KB                  | ON    | ON    | ON    | OFF   |
| 512 KB                  | OFF   | OFF   | OFF   | ON    |
| 576 KB                  | ON    | OFF   | OFF   | ON    |
| **640 KB                | OFF   | ON    | OFF   | ON    |

\*\*Default setting.  
\*This starting address allocates all SixPakPremium memory as expanded memory. Set any additional AST expanded memory boards (such as RAMC091) installed in the same PC to use a starting address of 640 KB.



Figure 3-12. Starting Memory Address.

AST Sixpak Premium

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To provide 384 KB of conventional memory, two banks (512 KB) must be installed on SixPakPremium. To provide 384 KB of conventional memory, set SixPakPremium conventional memory size to up to 512 KB (the default setting). This setting allocates 384 KB as system memory. The remaining 128 KB of that 512 KB is then allocated as expanded memory.

**NOTE**

To prevent parity errors, do not set the conventional memory size for more memory than is actually installed on SixPakPremium. For example, if 256 KB is installed on SixPakPremium, do not set the conventional memory for size up to 512 KB.

To allocate all SixPakPremium memory as expanded memory, simply set the starting address to 640 KB. This ensures that no SixPakPremium is allocated as conventional memory, regardless of the conventional memory size setting.

| SixPakPremium Conventional Memory Size | SW2-7 | SW2-8 |
|----------------------------------------|-------|-------|
| 0 KB                                   | ON    | ON    |
| Up to 256 KB                           | OFF   | ON    |
| *Up to 512 KB                          | ON    | OFF   |
| Up to 640 KB                           | OFF   | OFF   |

\*Default setting.



Figure 3-14. SixPakPremium Conventional Memory Size.

3-19

AST 6pak Premium

**3.6.5 Serial Port (COM1/COM2)**

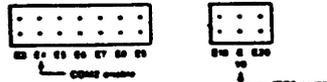
Figure 3-16 shows the possible SixPakPremium serial port assignments.

If the optional second serial port is not installed, it must be disabled to avoid I/O address conflicts.

\*First serial port enabled as COM1, using IRQ4:



First serial port enabled as COM2, using IRQ3:



\*Second serial port enabled as COM2, using IRQ3:



\*Default configuration

For all serial ports, remove shorting plugs to completely disable port.

Figure 3-16. Serial Port COM Assignments.

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**3.6.4 Base I/O Address**

Figure 3-15 shows the SixPakPremium base I/O address settings. This setting defines the base I/O address used by SixPakPremium to communicate with the PC, so that it can make use of expanded memory.

**NOTE**

If more than one AST expanded memory board is installed in a PC, each must use a different I/O address. To prevent I/O address conflicts, make sure that no other devices in your PC use the same I/O address.

| Base I/O | SixPakPremium Switch Settings |       |       |       |
|----------|-------------------------------|-------|-------|-------|
|          | SW2-1                         | SW2-2 | SW2-3 | SW2-4 |
| 0206     | ON                            | ON    | ON    | ON    |
| *0218    | ON                            | ON    | ON    | OFF   |
| 0258     | ON                            | OFF   | ON    | OFF   |
| 0258     | ON                            | OFF   | OFF   | ON    |
| 02A8     | OFF                           | ON    | OFF   | ON    |
| 02B8     | OFF                           | ON    | OFF   | OFF   |
| 02E8     | OFF                           | OFF   | OFF   | ON    |

\*Default setting



Figure 3-15. SixPakPremium Base I/O Address Settings.

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AST Sixpak Premium

**3.6.6 Serial Port Inputs**

Figure 3-17 shows how to configure serial inputs CTS, DSR, and DCD to be driven by the connected device or "forced true". This parameter provides a convenient means of reconfiguring the serial port for special requirements of certain serial devices (the documentation for the serial device will tell you if you need to force any of the serial inputs true).

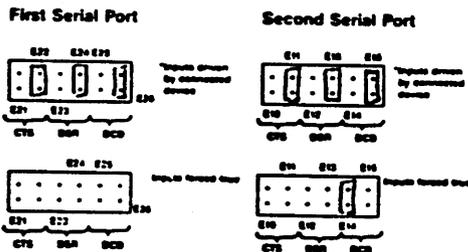


Figure 3-17. Serial Port Input Configuration.

3-22

3-

NOTE

If a display adapter (such as the IBM monochrome adapter) with a built-in parallel port is installed, LPT1 will respond as LPT2, and LPT2 will respond as LPT3.

3.6.8 Game Port

Figure 3-19 shows how to enable or disable the SixPakPremium game port.

If the optional game port is not installed, it should be disabled to avoid I/O address conflicts.

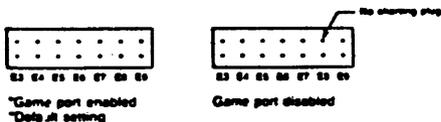


Figure 3-19. Game Port Configuration.

3.6.9 Clock-Calendar

Figure 3-20 shows how to enable or disable the SixPakPremium clock-calendar.

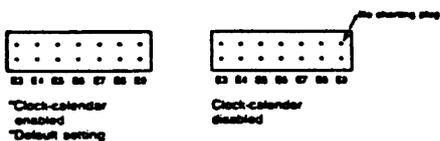


Figure 3-20. Clock-Calendar Configuration.

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3.6.7 Parallel Port

Figure 3-18 shows how to configure the SixPakPremium parallel port as LPT1, LPT2, or disabled.

NOTE

If a display adapter with a built-in parallel port is installed in your PC, SixPakPremium LPT1 will respond as LPT2, and LPT2 will respond as LPT3.

\*LPT1 (I/O 378-37F) enabled:



\*LPT2 (I/O 278-27F) enabled:



Parallel port disabled:



\*Default setting

Figure 3-18. Parallel Port Configuration.

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AST Sixpak Premium

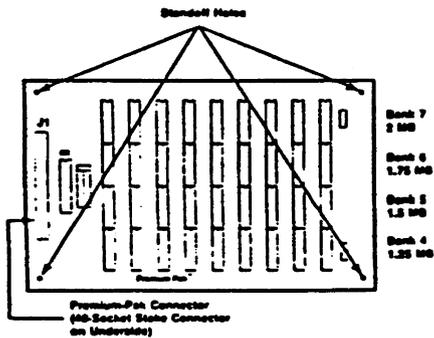


Figure 3-3. Premium-Pak Board Layout.

Follow this procedure to install Premium-Pak onto SixPakPremium:

STEP 1

Install standoffs: Locate the four nylon standoffs that come with Premium-Pak. Snap them into the standoff holes on SixPakPremium (Figure 3-4).

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3.6.10 Dual Page Mode

Figure 3-21 shows how to enable or disable Dual Page mode. Dual Page mode allows expanded memory to maintain two sets of mapping registers, which ensures best proper multitasking operation. Unless you have a special reason to do otherwise, leave Dual Page mode enabled.



Figure 3-21. Dual Page Mode Configuration.

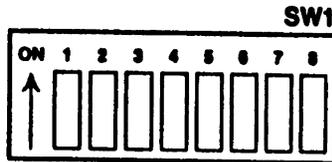
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| Hexadecimal<br>Base I/O<br>Address | RAMpage! Switch Settings |       |       |       |
|------------------------------------|--------------------------|-------|-------|-------|
|                                    | SW1-1                    | SW1-2 | SW1-3 | SW1-4 |
| 0208                               | ON                       | ON    | ON    | ON    |
| *0218                              | ON                       | ON    | ON    | OFF   |
| 0258                               | ON                       | OFF   | ON    | OFF   |
| 0268                               | ON                       | OFF   | OFF   | ON    |
| 02A8                               | OFF                      | ON    | OFF   | ON    |
| 02B8                               | OFF                      | ON    | OFF   | OFF   |
| 02E8                               | OFF                      | OFF   | OFF   | ON    |



\*Default setting

Figure A-1. RAMpage! Base I/O Address Settings.

SW1-5 and SW1-6: Defines how much RAMpage! memory (if any) is available for allocation as system memory, as shown in Figure A-2.

If the starting address for the RAMpage! board is set to 640 KB (the factory default setting), then all RAMpage! memory will be used as expanded memory regardless of the banks available switch settings.

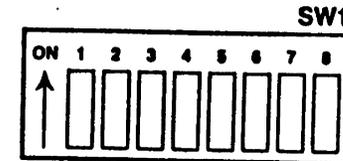
**NOTE**

Set switches for at least as much RAMpage! system memory as you will need to fill PC system memory to 640 KB. System memory will be filled up to the 640 KB limit, then the rest will automatically be allocated as expanded memory.

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3-

| Banks Available<br>as System Memory | SW1-5 | SW1-6 |
|-------------------------------------|-------|-------|
| 0                                   | ON    | ON    |
| 1 (256 KB)                          | OFF   | ON    |
| * 2 (512 KB)                        | ON    | OFF   |
| ** 3 (768 KB)                       | OFF   | OFF   |



\* Default setting.

\*\* A maximum of 640 KB will be used as system memory in any PC or PC-compatible. The amount of RAMpage! memory used as system memory is also determined by the starting address of your RAMpage! board.

Figure A-2. Banks Available as System Memory Configuration.

**A.2 Dual Page Mode**

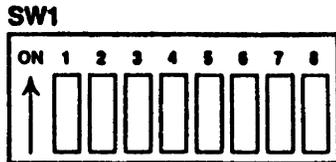
SW1-7: Enables or disables Dual Page mode as shown in Figure A-3. Dual Page mode allows you to maintain two sets of Mapping registers. Dual Page mode is useful for multitasking applications.

Although the default setting is for Dual Page mode enabled, it is up to your applications software to make use of this feature. DESQview uses Dual Page mode.

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**RAMpage! Switch Settings**

| Dual Page Mode | SW1-7 |
|----------------|-------|
| • Enabled      | ON    |
| Disabled       | OFF   |



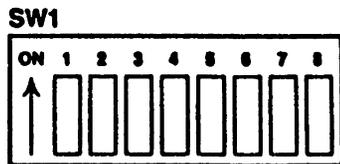
• Default Setting.

**Figure A-3. Dual Page Mode Settings.**

**A.3 Parity Error Checking**

SW1-8: Enables or disables the parity error generation circuitry, as shown in Figure A-4.

| Parity Checking | SW1-8 |
|-----------------|-------|
| • Enabled       | ON    |
| Disabled        | OFF   |



• Default Setting.

**Figure A-4. Parity Error Checking Settings.**

**A.4 Starting Memory Address**

SW2-1 through SW2-4: Defines the RAMpage! starting address, as shown in Figure A-5. This setting tells RAMpage! software how much RAMpage! memory is to be used as system memory (0-640 KB).

A-4

3-

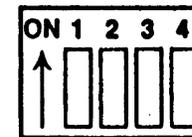
**RAMpage! Switch Settings**

**CAUTION**

To prevent memory conflicts, make sure that the RAMpage! starting address does not conflict with the memory used by any add-on memory installed in your PC. The starting address must be equal to the total of your PC system board memory plus any installed add-on memory in your PC.

All switch settings other than those shown below are reserved.

| Starting Address | SW2-1 | SW2-2 | SW2-3 | SW2-4 |
|------------------|-------|-------|-------|-------|
| 0 KB             | OFF   | OFF   | OFF   | OFF   |
| 64 KB            | ON    | OFF   | OFF   | OFF   |
| 128 KB           | OFF   | ON    | OFF   | OFF   |
| 192 KB           | ON    | ON    | OFF   | OFF   |
| 256 KB           | OFF   | OFF   | ON    | OFF   |
| 320 KB           | ON    | OFF   | ON    | OFF   |
| 384 KB           | OFF   | ON    | ON    | OFF   |
| 448 KB           | ON    | ON    | ON    | OFF   |
| 512 KB           | OFF   | OFF   | OFF   | ON    |
| 576 KB           | ON    | OFF   | OFF   | ON    |
| • 640 KB         | OFF   | ON    | OFF   | ON    |



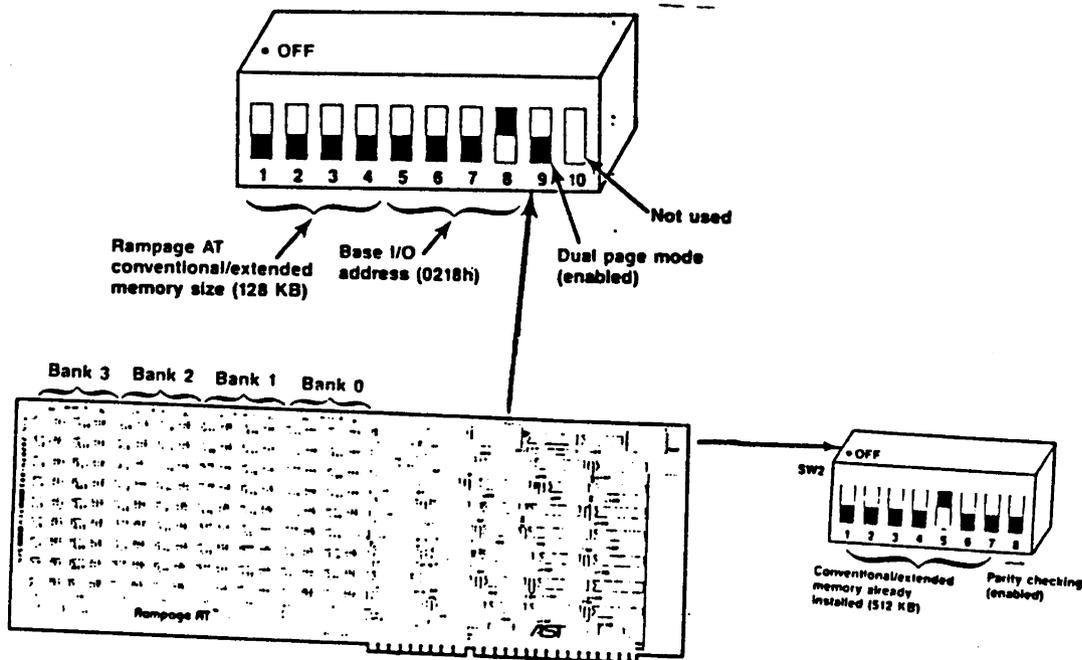
SW2

• Default Setting.

**Figure A-5. RAMpage! Starting Address Settings.**

A-5

## Expanded Memory Card



| Amount of RAM | Install RAM in these banks |
|---------------|----------------------------|
| 512 KB        | 0                          |
| 1 MB          | 0, 1                       |
| 1.5 MB        | 0, 1, 2                    |
| 2 MB          | 0, 1, 2, 3                 |

**Rampage AT Conventional/Extended Memory Size.**

| Rampage AT Conventional/Extended Memory Size * | SW1-1 | SW1-2 | SW1-3 | SW1-4 |
|------------------------------------------------|-------|-------|-------|-------|
| ** 128 KB                                      | ON    | ON    | ON    | ON    |
| 256 KB                                         | ON    | ON    | ON    | OFF   |
| *** 384 KB                                     | ON    | ON    | OFF   | ON    |
| 512 KB                                         | ON    | ON    | OFF   | OFF   |
| 640 KB                                         | ON    | OFF   | ON    | ON    |
| 768 KB                                         | ON    | OFF   | ON    | OFF   |
| 896 KB                                         | ON    | OFF   | OFF   | ON    |
| 1024 KB                                        | ON    | OFF   | OFF   | OFF   |
| 1152 KB                                        | OFF   | ON    | ON    | ON    |
| 1280 KB                                        | OFF   | ON    | ON    | OFF   |
| 1408 KB                                        | OFF   | ON    | OFF   | ON    |
| 1536 KB                                        | OFF   | ON    | OFF   | OFF   |
| 1664 KB                                        | OFF   | OFF   | ON    | ON    |
| 1792 KB                                        | OFF   | OFF   | ON    | OFF   |
| 1920 KB                                        | OFF   | OFF   | OFF   | ON    |
| 2048 KB                                        | OFF   | OFF   | OFF   | OFF   |

\* These settings are ignored if all Rampage AT memory is used as expanded memory (SW2-1 through SW2-7 OFF).

\*\* 128 KB setting

\*\*\* For best operation with DESQview (assuming you set the PC-AT to recognize 256 KB of system board memory).

**Base I/O Address Settings (SW1-5 through SW1-8)**

The base I/O address is determined by switches SW1-5 through SW1-8. The default position for these switches sets the Rampage AT base I/O address to 0218h. Leave SW1-5 through SW1-8 in the default positions unless you have another expanded memory board in your computer with base I/O address 0218h, or another device that uses the base I/O address 0218h or any address that belongs to the same group with base I/O address 0218h. (The group of addresses is provided in the note given below.)

If you have another expanded memory board in your PC-AT (such as another Rampage AT or an Advantage Premium), or another device with a conflicting I/O address, configure Rampage AT to use a different base I/O address (Table 2-3 summarizes the possible base I/O addresses).

**Table 2-3. Rampage AT Base I/O Address.**

| Base I/O Address | Rampage AT Switch Settings |       |       |       |
|------------------|----------------------------|-------|-------|-------|
|                  | SW1-5                      | SW1-6 | SW1-7 | SW1-8 |
| 0208h            | ON                         | ON    | ON    | ON    |
| * 0218h          | OFF                        | ON    | ON    | OFF   |
| 0258h            | ON                         | OFF   | ON    | OFF   |
| 0268h            | ON                         | OFF   | OFF   | ON    |
| 02A8h            | OFF                        | ON    | OFF   | ON    |
| 02B8h            | OFF                        | ON    | OFF   | OFF   |
| 02E8h            | OFF                        | OFF   | OFF   | ON    |

\*Default setting

**Conventional/Extended Memory Installed (SW2-1 through SW2-7)**

The amount of conventional/extended memory already installed in your PC-AT before adding Rampage AT determines how you should set switch positions SW2-1 through SW2-7.

Leave switches SW2-1 through SW2-7 in their default setting if your PC-AT has 512 KB already installed and you do not plan to use DESQview.

To use all of Rampage AT memory as expanded memory, set SW2-1 through SW2-7 to OFF.

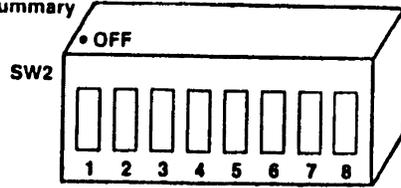
If you plan to use DESQview, and your Rampage AT board has enough memory installed, it is a good idea to change the switch setting as shown in Figure 2.5. The more Rampage AT memory that is allocated in the area from 0-640 KB, the greater the enhancement of DESQview's performance. See Appendix B for more information on memory allocation with DESQview.

**Dual Page Mode (SW1-9)**

Switch position SW1-9 enables or disables dual page mode. Dual page mode is enabled by default on your Rampage AT. Dual page mode allows Rampage AT to handle multitasking — handling several jobs at once — efficiently, as when you use the DESQview program. Dual page mode should be left enabled.

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Switch Setting Summary



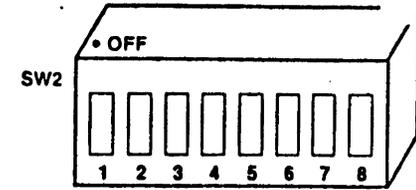
| Non-Paged Memory Already Installed | SW2-1 | SW2-2 | SW2-3 | SW2-4 | SW2-5 | SW2-6 | SW2-7 |
|------------------------------------|-------|-------|-------|-------|-------|-------|-------|
| 0 KB                               | ON    | ON    | ON    | ON    | ON    | ON    | ON    |
| 128 KB                             | ON    | ON    | ON    | ON    | ON    | ON    | OFF   |
| 256 KB                             | ON    | ON    | ON    | ON    | ON    | ON    | OFF   |
| 384 KB                             | ON    | ON    | ON    | ON    | ON    | ON    | OFF   |
| 512 KB                             | ON    | ON    | ON    | ON    | ON    | OFF   | ON    |
| 640 KB                             | ON    | ON    | ON    | ON    | OFF   | ON    | OFF   |
| 768 KB                             | ON    | ON    | ON    | ON    | OFF   | OFF   | ON    |
| 896 KB                             | ON    | ON    | ON    | ON    | OFF   | OFF   | OFF   |
| 1024 KB                            | ON    | ON    | ON    | OFF   | ON    | ON    | ON    |
| 1152 KB                            | ON    | ON    | ON    | OFF   | ON    | ON    | OFF   |
| 1280 KB                            | ON    | ON    | ON    | OFF   | ON    | OFF   | ON    |
| 1408 KB                            | ON    | ON    | ON    | OFF   | ON    | OFF   | OFF   |
| 1536 KB                            | ON    | ON    | ON    | OFF   | OFF   | ON    | ON    |
| 1664 KB                            | ON    | ON    | ON    | OFF   | OFF   | ON    | OFF   |
| 1792 KB                            | ON    | ON    | ON    | OFF   | OFF   | OFF   | ON    |
| 1920 KB                            | ON    | ON    | ON    | OFF   | OFF   | OFF   | OFF   |
| 2048 KB                            | ON    | ON    | OFF   | ON    | ON    | ON    | ON    |
| 2176 KB                            | ON    | ON    | OFF   | ON    | ON    | ON    | OFF   |
| 2304 KB                            | ON    | ON    | OFF   | ON    | ON    | ON    | OFF   |
| 2432 KB                            | ON    | ON    | OFF   | ON    | ON    | OFF   | ON    |
| 2560 KB                            | ON    | ON    | OFF   | ON    | ON    | OFF   | OFF   |
| 2688 KB                            | ON    | ON    | OFF   | ON    | ON    | ON    | ON    |
| 2816 KB                            | ON    | ON    | OFF   | ON    | OFF   | ON    | OFF   |
| 2944 KB                            | ON    | ON    | OFF   | ON    | OFF   | OFF   | ON    |
| 3072 KB                            | ON    | ON    | OFF   | OFF   | ON    | ON    | OFF   |
| 3200 KB                            | ON    | ON    | OFF   | OFF   | ON    | ON    | ON    |
| 3328 KB                            | ON    | ON    | OFF   | OFF   | ON    | OFF   | ON    |
| 3456 KB                            | ON    | ON    | OFF   | OFF   | ON    | OFF   | ON    |
| 3584 KB                            | ON    | ON    | OFF   | OFF   | ON    | ON    | ON    |
| 3712 KB                            | ON    | ON    | OFF   | OFF   | OFF   | ON    | OFF   |
| 3840 KB                            | ON    | ON    | OFF   | OFF   | OFF   | ON    | OFF   |
| 3968 KB                            | ON    | ON    | OFF   | OFF   | OFF   | OFF   | ON    |
| 4096 KB                            | ON    | OFF   | ON    | ON    | ON    | ON    | ON    |
| 4224 KB                            | ON    | OFF   | ON    | ON    | ON    | ON    | OFF   |
| 4352 KB                            | ON    | OFF   | ON    | ON    | ON    | OFF   | ON    |
| 4480 KB                            | ON    | OFF   | ON    | ON    | ON    | OFF   | ON    |
| 4608 KB                            | ON    | OFF   | ON    | ON    | OFF   | ON    | ON    |
| 4736 KB                            | ON    | OFF   | ON    | ON    | OFF   | ON    | OFF   |
| 4864 KB                            | ON    | OFF   | ON    | ON    | OFF   | ON    | OFF   |
| 4992 KB                            | ON    | OFF   | ON    | ON    | OFF   | OFF   | ON    |
| 5120 KB                            | ON    | OFF   | ON    | ON    | OFF   | OFF   | ON    |
| 5248 KB                            | ON    | OFF   | ON    | OFF   | ON    | ON    | ON    |
| 5376 KB                            | ON    | OFF   | ON    | OFF   | ON    | ON    | OFF   |
| 5504 KB                            | ON    | OFF   | ON    | OFF   | ON    | OFF   | ON    |
| 5632 KB                            | ON    | OFF   | ON    | OFF   | ON    | OFF   | ON    |
| 5760 KB                            | ON    | OFF   | ON    | OFF   | ON    | ON    | ON    |
| 5888 KB                            | ON    | OFF   | ON    | OFF   | OFF   | ON    | OFF   |
| 6016 KB                            | ON    | OFF   | ON    | OFF   | OFF   | ON    | ON    |
| 6144 KB                            | ON    | OFF   | OFF   | ON    | ON    | ON    | ON    |
| 6272 KB                            | ON    | OFF   | OFF   | ON    | ON    | ON    | OFF   |
| 6400 KB                            | ON    | OFF   | OFF   | ON    | ON    | OFF   | ON    |
| 6528 KB                            | ON    | OFF   | OFF   | ON    | ON    | OFF   | ON    |
| 6656 KB                            | ON    | OFF   | OFF   | ON    | ON    | OFF   | ON    |
| 6784 KB                            | ON    | OFF   | OFF   | ON    | OFF   | ON    | OFF   |
| 6912 KB                            | ON    | OFF   | OFF   | ON    | OFF   | ON    | OFF   |
| 7040 KB                            | ON    | OFF   | OFF   | ON    | OFF   | OFF   | ON    |
| 7168 KB                            | ON    | OFF   | OFF   | ON    | ON    | ON    | ON    |
| 7296 KB                            | ON    | OFF   | OFF   | ON    | ON    | ON    | OFF   |
| 7424 KB                            | ON    | OFF   | OFF   | ON    | ON    | OFF   | ON    |
| 7552 KB                            | ON    | OFF   | OFF   | ON    | ON    | OFF   | ON    |
| 7680 KB                            | ON    | OFF   | OFF   | ON    | OFF   | OFF   | ON    |
| 7808 KB                            | ON    | OFF   | OFF   | ON    | OFF   | ON    | ON    |
| 7936 KB                            | ON    | OFF   | OFF   | ON    | OFF   | ON    | ON    |
| 8064 KB                            | ON    | OFF   | OFF   | ON    | OFF   | OFF   | ON    |

\* Default setting

NOTE

Do not count memory in the 640 KB-1 MB range when determining the amount of conventional/ extended memory already installed.

Switch Setting Summary



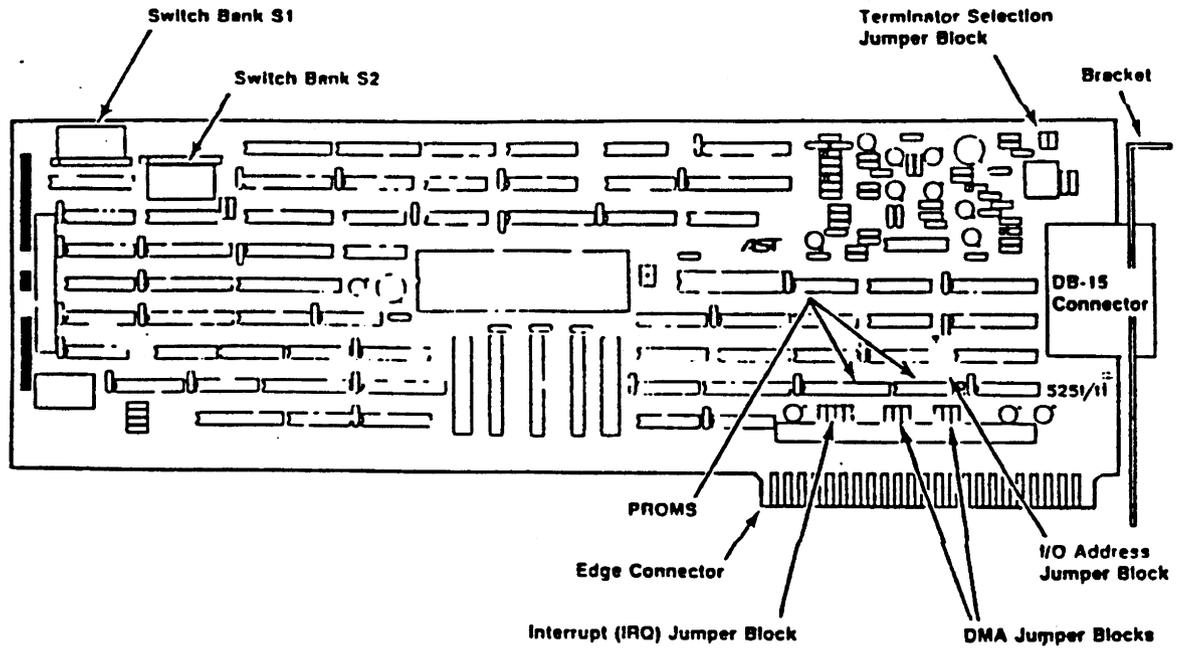
| Non-Paged Memory Already Installed | SW2-1 | SW2-2 | SW2-3 | SW2-4 | SW2-5 | SW2-6 | SW2-7 |
|------------------------------------|-------|-------|-------|-------|-------|-------|-------|
| 8192 KB                            | OFF   | ON    | ON    | ON    | ON    | ON    | ON    |
| 8320 KB                            | OFF   | ON    | ON    | ON    | ON    | ON    | ON    |
| 8448 KB                            | OFF   | ON    | ON    | ON    | ON    | ON    | OFF   |
| 8576 KB                            | OFF   | ON    | ON    | ON    | ON    | ON    | OFF   |
| 8704 KB                            | OFF   | ON    | ON    | ON    | ON    | OFF   | ON    |
| 8832 KB                            | OFF   | ON    | ON    | ON    | ON    | OFF   | ON    |
| 8960 KB                            | OFF   | ON    | ON    | ON    | OFF   | ON    | ON    |
| 9088 KB                            | OFF   | ON    | ON    | ON    | OFF   | OFF   | ON    |
| 9216 KB                            | OFF   | ON    | ON    | OFF   | ON    | ON    | ON    |
| 9344 KB                            | OFF   | ON    | ON    | OFF   | ON    | ON    | ON    |
| 9472 KB                            | OFF   | ON    | ON    | OFF   | ON    | ON    | OFF   |
| 9600 KB                            | OFF   | ON    | ON    | OFF   | ON    | OFF   | OFF   |
| 9728 KB                            | OFF   | ON    | ON    | OFF   | OFF   | ON    | ON    |
| 9856 KB                            | OFF   | ON    | ON    | OFF   | OFF   | ON    | OFF   |
| 9984 KB                            | OFF   | ON    | ON    | OFF   | OFF   | OFF   | ON    |
| 10112 KB                           | OFF   | ON    | ON    | OFF   | OFF   | OFF   | OFF   |
| 10240 KB                           | OFF   | ON    | OFF   | ON    | ON    | ON    | ON    |
| 10368 KB                           | OFF   | ON    | OFF   | ON    | ON    | ON    | OFF   |
| 10496 KB                           | OFF   | ON    | OFF   | ON    | ON    | OFF   | ON    |
| 10624 KB                           | OFF   | ON    | OFF   | ON    | ON    | OFF   | OFF   |
| 10752 KB                           | OFF   | ON    | OFF   | ON    | OFF   | ON    | ON    |
| 10880 KB                           | OFF   | ON    | OFF   | ON    | OFF   | ON    | OFF   |
| 11008 KB                           | OFF   | ON    | OFF   | ON    | OFF   | OFF   | ON    |
| 11136 KB                           | OFF   | ON    | OFF   | ON    | OFF   | OFF   | OFF   |
| 11264 KB                           | OFF   | ON    | OFF   | OFF   | ON    | ON    | ON    |
| 11392 KB                           | OFF   | ON    | OFF   | OFF   | ON    | ON    | OFF   |
| 11520 KB                           | OFF   | ON    | OFF   | OFF   | ON    | ON    | OFF   |
| 11648 KB                           | OFF   | ON    | OFF   | OFF   | ON    | OFF   | OFF   |
| 11776 KB                           | OFF   | ON    | OFF   | OFF   | OFF   | ON    | ON    |
| 11904 KB                           | OFF   | ON    | OFF   | OFF   | OFF   | ON    | OFF   |
| 12032 KB                           | OFF   | ON    | OFF   | OFF   | OFF   | OFF   | ON    |
| 12160 KB                           | OFF   | ON    | OFF   | OFF   | OFF   | OFF   | OFF   |
| 12288 KB                           | OFF   | OFF   | ON    | ON    | ON    | ON    | ON    |
| 12416 KB                           | OFF   | OFF   | ON    | ON    | ON    | ON    | OFF   |
| 12544 KB                           | OFF   | OFF   | ON    | ON    | ON    | OFF   | ON    |
| 12672 KB                           | OFF   | OFF   | ON    | ON    | ON    | OFF   | OFF   |
| 12800 KB                           | OFF   | OFF   | ON    | ON    | OFF   | ON    | ON    |
| 12928 KB                           | OFF   | OFF   | ON    | ON    | OFF   | ON    | OFF   |
| 13056 KB                           | OFF   | OFF   | ON    | ON    | OFF   | OFF   | ON    |
| 13184 KB                           | OFF   | OFF   | ON    | ON    | OFF   | OFF   | ON    |
| 13312 KB                           | OFF   | OFF   | ON    | OFF   | ON    | ON    | ON    |
| 13340 KB                           | OFF   | OFF   | ON    | OFF   | ON    | ON    | OFF   |
| 13568 KB                           | OFF   | OFF   | ON    | OFF   | ON    | OFF   | ON    |
| 13696 KB                           | OFF   | OFF   | ON    | OFF   | ON    | OFF   | OFF   |
| 13824 KB                           | OFF   | OFF   | ON    | OFF   | OFF   | ON    | ON    |
| 13952 KB                           | OFF   | OFF   | ON    | OFF   | OFF   | ON    | OFF   |
| 14080 KB                           | OFF   | OFF   | ON    | OFF   | OFF   | OFF   | ON    |
| 14208 KB                           | OFF   | OFF   | ON    | OFF   | OFF   | OFF   | OFF   |
| 14366 KB                           | OFF   | OFF   | OFF   | ON    | ON    | ON    | OFF   |
| 14464 KB                           | OFF   | OFF   | OFF   | ON    | ON    | ON    | ON    |
| 14592 KB                           | OFF   | OFF   | OFF   | ON    | ON    | ON    | OFF   |
| 14720 KB                           | OFF   | OFF   | OFF   | ON    | ON    | OFF   | ON    |
| 14848 KB                           | OFF   | OFF   | OFF   | ON    | OFF   | ON    | ON    |
| 14976 KB                           | OFF   | OFF   | OFF   | ON    | OFF   | ON    | OFF   |
| 15104 KB                           | OFF   | OFF   | ON    | OFF   | ON    | OFF   | ON    |
| 15232 KB                           | OFF   | OFF   | OFF   | ON    | OFF   | OFF   | OFF   |
| 15360 KB                           | OFF   | OFF   | OFF   | OFF   | ON    | ON    | ON    |
| 15488 KB                           | OFF   | OFF   | OFF   | OFF   | ON    | ON    | ON    |
| 15616 KB                           | OFF   | OFF   | OFF   | OFF   | ON    | OFF   | ON    |
| 15744 KB                           | OFF   | OFF   | OFF   | OFF   | ON    | OFF   | ON    |
| 15872 KB                           | OFF   | OFF   | OFF   | OFF   | OFF   | ON    | ON    |
| All RAMpage                        | OFF   | OFF   | OFF   | OFF   | OFF   | OFF   | ON    |
| AT memory                          | OFF   | OFF   | OFF   | OFF   | OFF   | OFF   | ON    |
| paged                              | OFF   | OFF   | OFF   | OFF   | OFF   | OFF   | ON    |

NOTE

Do not count memory in the 640 KB-1 MB range when determining the amount of conventional/ extended memory already installed.

3-51

# 5251/11, 5291, or 5292-1 Display Terminal Emulation

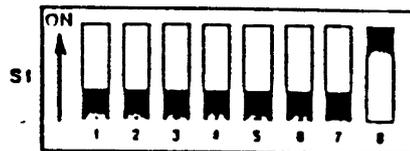


Layout of the Twinax Adapter Board.

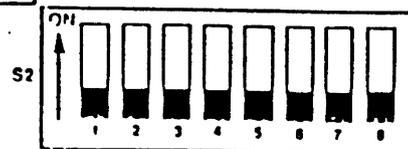
## Device Numbers — Switch Numbers.

| S1 Number  | Device Number | S2 Number<br>(Selects Type*) |
|------------|---------------|------------------------------|
| 8          | 0             | 8                            |
| 7          | 1             | 7                            |
| 6          | 2             | 6                            |
| 5          | 3             | 5                            |
| 4          | 4             | 4                            |
| 3          | 5             | 3                            |
| 2          | 6             | 2                            |
| 1 NOT USED |               | 1 NOT USED                   |

\* If S2 switch is "ON, the device is a printer.



S1 # ON Selects  
Device/Unit Number 0



S2 # OFF Selects  
Device/Unit Number 0  
As A Display Station

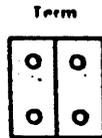
Example of Switch Settings.



### Terminator Selection

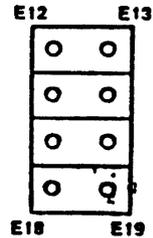
If the PC is the last display station on a local twinax cable, it must be identified as the "terminator" or end of the line. This selection is made by installing two jumpers on the two pin-pairs marked "TERM" on the Twinax Adapter Board.

Locate these two pin-pairs in the upper right corner of the board. (See Figure 3-1.) The factory configuration selects the PC as the last display station on the line (the terminator), as shown in Figure 3-6.



Factory Configuration—Terminator Selected.

If your PC is not the last PC on the local twinax cable, REMOVE the two jumpers and save them for possible later use.



Factory Configuration—I/O Address, 02 0257 Hex.

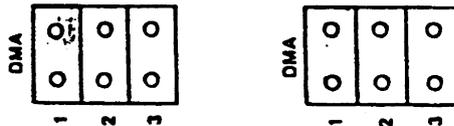
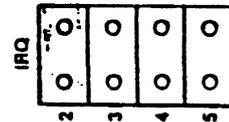


Figure 3-2. Factory Configuration — DMA Channel 1.

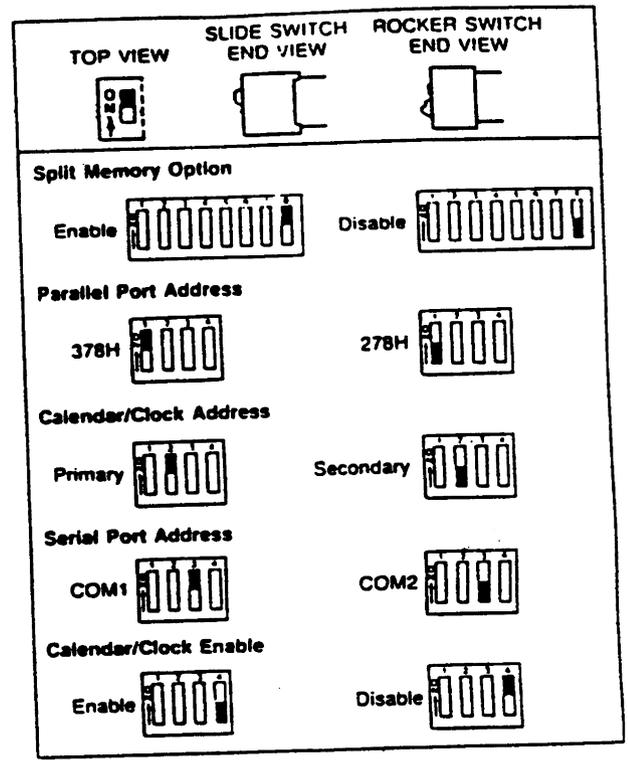
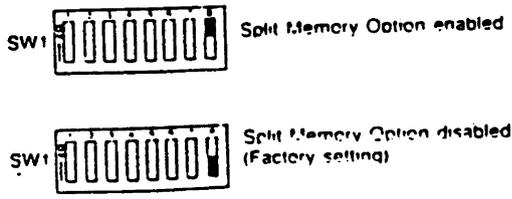
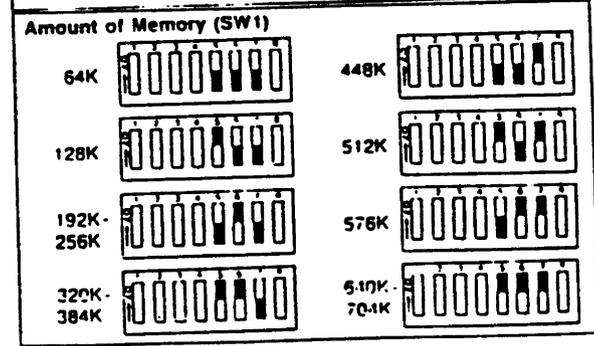
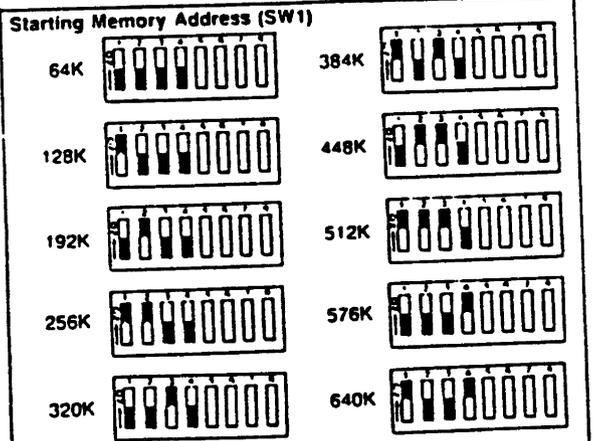
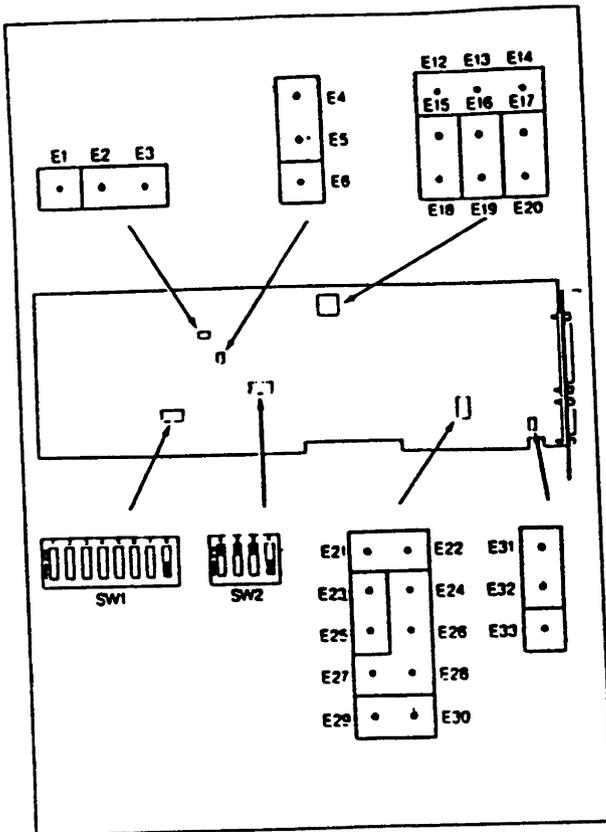
If you want to select either DMA channel 2 or 3, remove the two jumpers currently on the two sets of pins marked "1" and place the two jumpers on the two sets of pins that correspond to the DMA channel you want to select. Both jumpers must be installed on the same number position.

#### NOTE

Both jumpers must be set for the same channel.

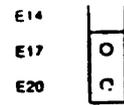


Factory Configuration — Interrupt Level



- SW2 This setting assigns address 378H to the SB-II Module parallel port. This address is the factory setting.
- SW2 This setting assigns address 278H to the SB-II Module parallel port.
- SW2 This setting assigns primary address 350H to the SB-II Module calendar/clock. This setting is the factory configuration.
- SW2 This setting assigns secondary address 250H to the SB-II Module calendar/clock.
- SW2 This setting assigns the communications channel 1 address range 3F8H-3FFH (COM1) to the SB-II Module communications channel. This address is the factory setting. Interrupt level 4 is the standard interrupt level used with the COM1 address.
- SW2 This setting assigns communications channel 2 address range 2F8H-2FFH (COM2) to the SB-II Module communications channel. Interrupt level 3 is the standard interrupt level used with the COM2 address.
- SW2 This setting enables the calendar/clock. It is the factory setting.
- SW2 This setting disables the calendar/clock.

|               |                              |                    |
|---------------|------------------------------|--------------------|
| Serial Port   | Interrupt level IRQ2         | E26 E28            |
|               | Interrupt level IRQ3         | E25 E27            |
|               | Interrupt level IRQ4         | E23 E25            |
|               | Interrupt level IRQ5         | E24 E26            |
| Serial Port   | RS-232 C Interface           | E29 E30            |
|               | TTL Interface                | None               |
| Serial Port   | +5V Connected to Pin 9       | E32 E33            |
|               | Ring Connected to Pin 9      | E31 E32            |
| Parallel Port | Centronics Interface         | E17 E20            |
|               | Dataproducts Interface       | E17 E14            |
| Parallel Port | Unidirectional Port Control  | E15 E18            |
|               | Bidirectional Port Control   | E12 E15            |
| Parallel Port | External Directional Control | E12 E15<br>E13 E16 |
|               | Internal Directional Control | E12 E15<br>E16 E19 |
| Parallel Port | Interrupt level IRQ5         | E27 E24            |
|               | Interrupt level IRQ7         | E21 E22            |
| Memory        | Enable zero wait state       | E1 E2              |
|               | Disable zero wait state      | E2 E3              |
| Memory        | Enable Parity                | E4 E5              |
|               | Disable Parity               | E5 E6              |



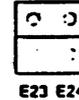
This jumper plug placement selects the Centronics interface. It is the factory setting.



This jumper plug placement selects the Dataproducts interface.

**Parallel Port Interface Jumper Plug Placement**

E21 E22



Selects interrupt level IRQ7 (Factory Setting)

E23 E24



Selects interrupt level IRQ5. This setting is standard on the PC-AT if the parallel port is at address 278H.

E21 E22



E23 E24

**Parallel Port Interrupt Level**

E1 E2 E3



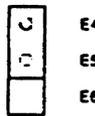
Zero Wait State Enabled

E1 E2 E3

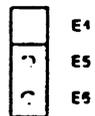


Zero Wait State (Factory Setting)

**Enabling and Disabling Zero Wait State**

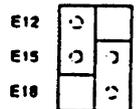


Memory Parity Enabled (Factory Setting)

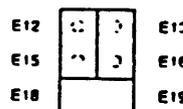


Memory Parity Disabled

**Enabling and Disabling Memory Parity**

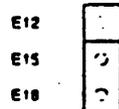


Internal (Factory Setting)

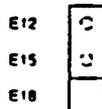


External

**Internal/External Directional Control Jumper Plug Placement**

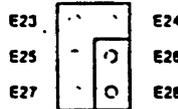


Unidirectional (Factory Setting)

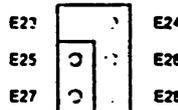


Bidirectional

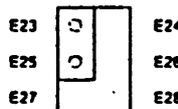
**Directional Mode Jumper Plug Placement**



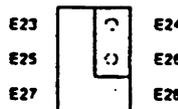
Interrupt level IRQ2



Interrupt level IRQ3



Interrupt level IRQ4 (Factory setting)



Interrupt level IRQ5

**Serial Port Interrupt Levels**

E29 E30



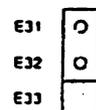
RS-232 Interface (Factory setting)

E29 E30

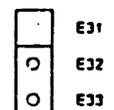


TTL Interface

**TTL Serial Interface Jumper Plug Placements.**



Ring Indicator Connected (Factory Setting)



+5V Connected

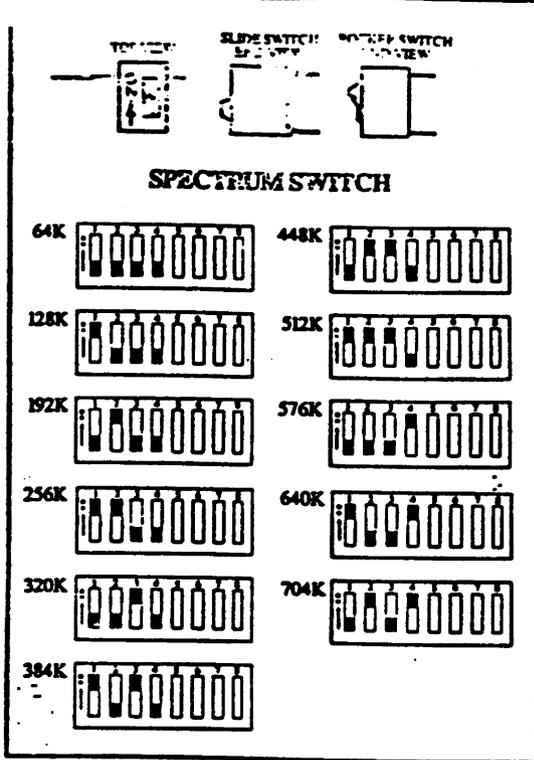


Figure 6. SPECTRUM Memory Starting Address Switch Position Settings

Spectrum 3-8

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4. **SETTING PARALLEL PRINTER INTERRUPT LEVEL**  
 The I/O Channel Interrupt Level for the printer adapter will normally be IRQ7 (IBM Standard). For the special applications or multiple printer installations, the interrupt level may be reassigned by using the small needlenose pliers to move a jumper plug (See Figure 5) on the SPECTRUM Board to the desired position shown in Figure 8.

| Level | Jumper  |
|-------|---------|
| IRQ2  | E58-E57 |
| IRQ3  | E61-E60 |
| IRQ5  | E61-E62 |
| IRQ7  | E58-E59 |

Figure 8. Parallel Printer Interrupt Level Jumper Settings

Persyst  
SPECTRUM

### 3. SETTING PARALLEL PRINTER ADDRESS

Before you install your SPECTRUM parallel printer port, the I/O channel device address and interrupt level must be selected.

#### NOTE

Unless special ordered, your SPECTRUM parallel printer port will come configured as the primary IBM Stand Alone Parallel Printer Adapter card (Device Address: X378 Interrupt Level: 7).

In a system with only the SPECTRUM parallel printer port installed, no changes are required. In a system utilizing additional parallel printer ports, the address switches and interrupt level jumper will have to be set. Refer to Figure 7 and Figure 8 to select the proper switch and jumper option settings.

#### NOTE

Experience has shown that most problems can be traced directly to improperly set switch or jumper options. Please contact your dealer or PERSYST if there are any questions.

| SPECTRUM SWITCH<br>7 8 | DESCRIPTION                                                                                                                                                                                                                                           |
|------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ON ON                  | No SPECTRUM Printer Option                                                                                                                                                                                                                            |
| ON OFF                 | SPECTRUM Printer Option installed as parallel printer port on IBM Monochrome Display and Printer Adapter Card (3BC).<br>NOTE: DO NOT SELECT THIS ADDRESS IF YOUR SYSTEM HAS AN IBM MONOCHROME DISPLAY AND PRINTER ADAPTER CARD INSTALLED.             |
| OFF ON                 | SPECTRUM Printer Option installed as primary stand alone parallel printer port (378).<br>NOTE: DO NOT SELECT THIS ADDRESS IF YOUR SYSTEM HAS AN UNMODIFIED IBM PARALLEL PRINTER ADAPTER CARD INSTALLED.                                               |
| OFF OFF                | SPECTRUM Printer Option installed as secondary stand alone parallel printer port (278).<br>NOTE: DO NOT SELECT THIS ADDRESS IF YOUR SYSTEM HAS A MODIFIED IBM PARALLEL PRINTER ADAPTER CARD INSTALLED WITH A MATCHING HEX I/O CHANNEL DEVICE ADDRESS. |

Other I/O channel addresses available by special order.

Figure 7. SPECTRUM Parallel Printer Address Switch Position Settings

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Spectrum 3-

### 5. PARALLEL PRINTER CONNECTOR PINOUT TABLE

The Printer connector pinout table, Figure 9, shows the signal locations and pin connections for the SPECTRUM, CENTRONIX and DATA PRODUCTS cable connectors.

| SIGNAL      | SPECTRUM<br>40 PIN HEADER | CENTRONIX<br>36 PIN HEADER | DATA PRODUCTS<br>36 PIN HEADER |
|-------------|---------------------------|----------------------------|--------------------------------|
| STROBE      | 1                         | 1                          | 36                             |
| D0          | 3                         | 2                          | 19                             |
| D2          | 5                         | 3                          | 20                             |
| D3          | 7                         | 4                          | 1                              |
| D4          | 9                         | 5                          | 41                             |
| D5          | 11                        | 6                          | 34                             |
| D6          | 13                        | 7                          | 43                             |
| D7          | 15                        | 8                          | 36                             |
| D8          | 17                        | 9                          | 28                             |
| ACK/HLG     | 19                        | 10                         | -                              |
| BUSY        | 21                        | 11                         | 3                              |
| PE          | 23                        | 12                         | 27                             |
| SLCT        | 25                        | 13                         | -                              |
| SWT         | 26                        | 14                         | 31                             |
| AUTOFEED KT | 27                        | 15                         | 30                             |
| ERROR       | 28                        | 16                         | 22                             |
| SLOT IN     | 30                        | 18                         | -                              |
| GND         | 2, 4, 6, 8, 10, 12        | 19, 20, 31, 32, 33         | 2, 3, 6, 7, 11, 18             |
|             | 14, 16, 18, 20            | 34, 35, 36, 37, 38         | 35, 37, 40, 42, 44             |
|             | 22, 24, 30, 31, 33        | 29, 30, 33, 16, 17         | -                              |
| MC          | 29, 32, 34, 35            | 15, 34, 35, 18             | 5, 6, 8, 9, 10, 12             |
|             | 37, 38, 39, 40            | -                          | 13, 14, 15, 16, 17             |
|             | -                         | -                          | 21, 24, 25, 26, 29             |
|             | -                         | -                          | 32, 33, 39, 43, 46             |
|             | -                         | -                          | 47, 48, 49, 50                 |

Figure 9. Parallel Printer Connector Pinout

## 6. ASYNCHRONOUS COMMUNICATIONS

AD1

Before you install the SPECTRUM Asynchronous Communications (Serial) Channel(s) in your system, the I/O Channel device address(es) and interrupt level(s) must be selected. If the SPECTRUM board contains the only serial channel in the system, the single port should be assigned the COMM1 address.

If another serial channel is already installed in the system, for example, the IBM Asynchronous Communication Adapter, it would normally be assigned as COMM1. In this case, the one serial channel on the SPECTRUM should be assigned as COMM2.

The desired addresses should be set using switches 5 and 6 of the eight position switch (See Figure 5) on the SPECTRUM board to positions shown in Figure 10.

### NOTE

*Experience has shown that most problems can be traced directly to improperly set switch or jumper options. Please contact your dealer or PERSYST if there are any questions.*

| SPECTRUM SWITCH                                         |     | OPTION DESCRIPTION                                                                                                   |
|---------------------------------------------------------|-----|----------------------------------------------------------------------------------------------------------------------|
| 5                                                       | 6   |                                                                                                                      |
| ON                                                      | ON  | No SPECTRUM Asynchronous Communications Option                                                                       |
| ON                                                      | OFF | Single Channel on SPECTRUM<br>Desired Address = COMM1 or AUX1 (3F8)                                                  |
| OFF                                                     | ON  | Single Channel on SPECTRUM<br>Desired Address = COMM2 (2F8)                                                          |
| OFF                                                     | OFF | Two Channels on SPECTRUM<br>Address of First Channel = COMM1, AUX1 (3F8)<br>Address of Second Channel = COMM2, (2F8) |
| Other I/O channel addresses available by special order. |     |                                                                                                                      |

Figure 10. I/O Channel Address Selection

## 7. SETTING ASYNCHRONOUS COMMUNICATIONS INTERRUPT LEVEL

The IBM Standard I/O Channel Interrupt levels for the Asynchronous Communications Channels are IRQ4 for COMM1 and IRQ3 for COMM2. Once the addresses have been assigned, the interrupt levels may be assigned by using the small needlenose pliers to move jumper plug on the SPECTRUM board (See Figure 5) as shown in Figure 11.

| INTERRUPT LEVEL | First SPECTRUM Channel | Second SPECTRUM Channel |
|-----------------|------------------------|-------------------------|
| IRQ2            | E22-E23                | E52-E53                 |
| IRQ3            | E25-E26                | E55-E56                 |
| IRQ4            | E25-E24                | E55-E54                 |
| IRQ5            | E22-E21                | E52-E51                 |

Figure 11. I/O Channel Interrupt Level Selection

3-3.3

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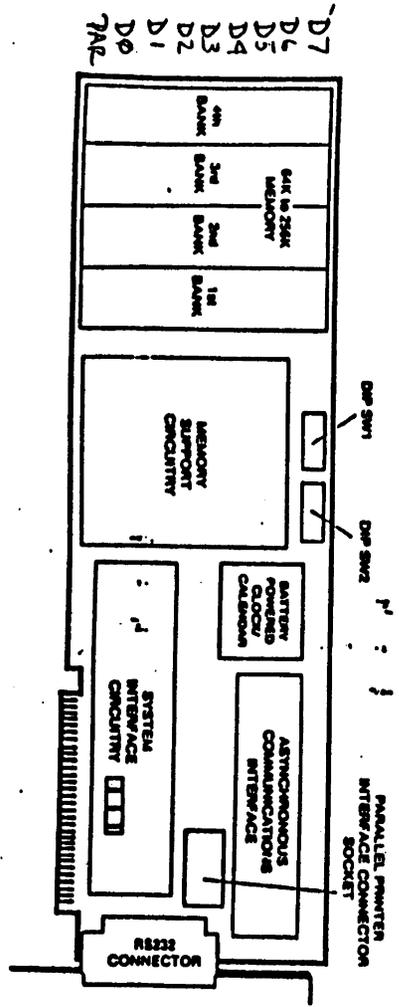


ILLUSTRATION / LOCATIONS

PERIPHERAL MFG: QUADRAM PRODUCT: Quadboard

3-

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**IMPORTANT NOTICE - ATTENTION**

BEFORE INSTALLING YOUR RAMPAK OR READING YOUR RAMPAK INSTALLATION GUIDE, READ THE FOLLOWING PARAGRAPHS AND THEN SELECT THE CORRECT PLA FOR YOUR PC.

THE PERSYST TIME SPECTRUM MODULE WITH RAMPAK REQUIRES A SPECIFIC MEMORY ADDRESSING PLA (PROGRAMMABLE LOGIC ARRAY), BASED ON THE PC MODEL AND MEMORY CAPACITY OF THE SYSTEM.

IF YOUR PERSYST RAMPAK WAS ATTACHED TO YOUR TIME SPECTRUM BOARD AT THE FACTORY, A SPECIAL PLA FOR THE IBM PC OR XT (256KB MOTHERBOARD) WAS INSTALLED ON THE TIME SPECTRUM BOARD. (THAT PLA HAS A BROWN DOT AND GREEN DOT ON IT.) IF THAT PLA IS INCORRECT FOR YOUR SYSTEM ACCORDING TO THE TABLE BELOW, INSERT THE PLA (TWO GREEN DOTS) (SHIPPED IN YOUR TIME SPECTRUM PACKAGE) IN YOUR TIME SPECTRUM BOARD ACCORDING TO INSTRUCTIONS GIVEN IN THE RAMPAK INSTALLATION GUIDE, SECTION 5.1.

|                         | ORIGINAL PC | ORIGINAL PC WITH EXP BOX | NEW PC      | PC XT WITH 128KB | PC XT WITH 256KB |
|-------------------------|-------------|--------------------------|-------------|------------------|------------------|
| MAX MEMORY SUPPORTED    | 544KB       | 640KB                    | 640 KB      | 640KB            | 640KB            |
| SYSTEM BOARD MEM -      | 64KB        | 64KB                     | 256KB       | 128KB            | 256KB            |
| MAX ADDITIONAL MEMORY   | 484KB       | 576KB                    | 384KB       | 512KB            | 384KB            |
| PLA TO USE (DOT COLORS) | GREEN/GREEN | GREEN/GREEN              | BROWN/GREEN | GREEN/GREEN      | BROWN/GREEN      |

\*PLA USED ON TIME SPECTRUM/RAMPAK (ASSEMBLED) SHIPPED FROM FACTORY.

Persyst Time Spectrum

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### 4.3 PARITY JUMPER

The memory parity check option is enabled by the jumper plug placed between E5-E6. This jumper connects the parity error detection circuitry on the SB module to the IOCHCK line. A parity error is indicated when the IOCHCK line is pulled low. Refer to Figure 3-6 for the jumper location on the module. Figure 4-9 shows the jumper plug placement for the memory parity option.

The memory parity check option is disabled when the jumper between E5-E6 is removed.

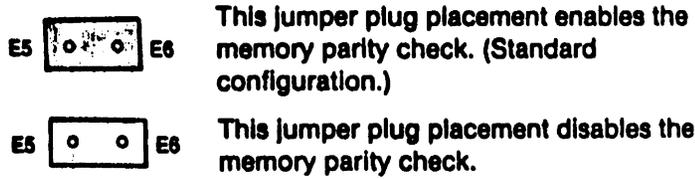


Figure 4-9. Parity Jumper Plug Placement.

### 4.4 EXTERNAL EQUIPMENT CONNECTIONS

External equipment is connected to the SB module serial asynchronous communications channel via the RS232 male connector available at the rear of the system unit after the SB module is installed.

The external printer is connected to the parallel printer port via the Cliffhanger assembly whose connector housing is available at the rear of the system unit after the SB module is installed. The connector housing contains a DB25 female connector that is compatible with the IBM printer cable. Thus, the IBM printer cable can be used to complete the connection to the printer. Figure 4-10 lists the pin assignments on the Cliffhanger connector. For reference, the figure also lists the pin assignments on the 26-pin port connector on the SB module and on the Centronics 36-pin connector at the printer end of the IBM printer cable.

### 4.5 CALENDAR/CLOCK INFORMATION

Figure 4-11 shows the switch settings for assigning the calendar/clock address.

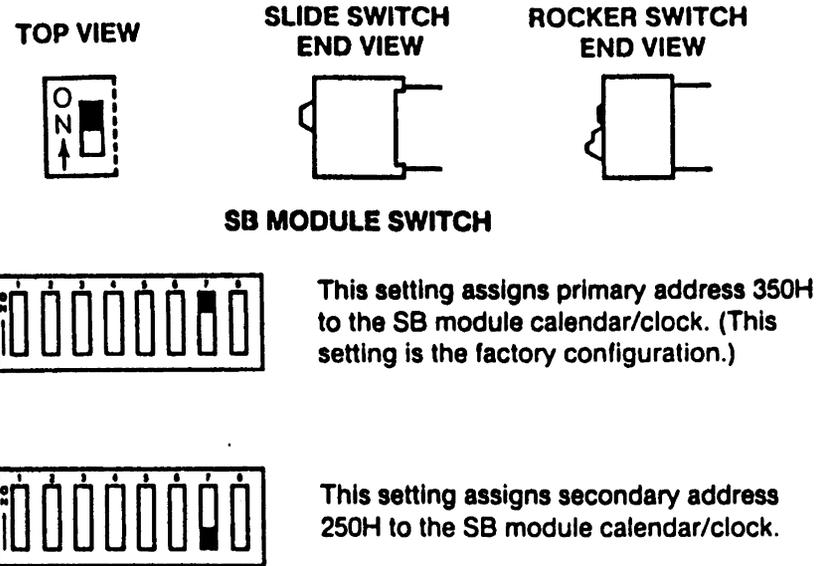


Figure 4-11. Calendar/Clock Address Switch Setting.

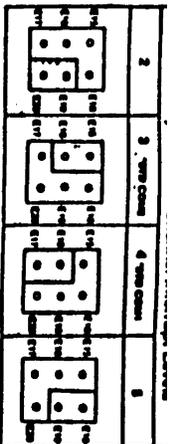


Figure 4-3. Jumper Plug Placements for Selecting Interrupt Levels for the Serial Async Communications Channel.

#### 4.2 PARALLEL PORT

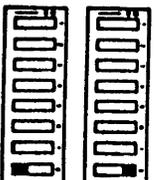
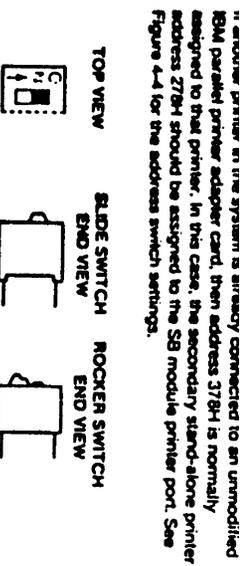
The parallel port on this module can be configured as either a parallel printer port or a bidirectional parallel port. The factory configuration is for the parallel printer port, which has a unidirectional (or one-way) data flow.

When configured as a bidirectional parallel port, you can interface with custom devices that require two-way communications. The standard and optional configurations are described in the following subsections.

##### Address Switch Settings

If the system includes a parallel printer connected to the IBM Monochrome Display/Printer Adapter card, that printer uses address 3B04 and becomes the primary system printer. If not, then a printer assigned the primary stand-alone printer address 37B4 becomes the primary system printer.

If the printer connected to the SB module is the first stand-alone printer in the system, address 37B4 should be assigned to it regardless of whether or not a printer is connected to the IBM Monochrome Display/Printer Adapter card. See Figure 4-4 for the address switch settings.



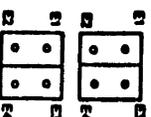
This setting assigns the primary stand-alone printer address 37B4 to SB module parallel port.

This setting assigns the secondary stand-alone printer address 27B4 to SB module parallel port.

Figure 4-4. Parallel Port Address Switch Setting.

##### Selecting Interfaces

The jumper plug placement for the standard parallel printer port Centronics interface is E3-E4. If you want to configure your board for a Data Products interface, remove the jumper plug from E3-E4 and place it on E1-E2. These two jumper plug placements are shown in Figure 4-5.



This jumper plug placement selects the Centronics interface.

This jumper plug placement selects the Data Products interface.

Figure 4-5. Parallel Port Configuration Jumper Placement.

##### Selecting Interrupt Levels

Figure 4-6 shows jumper plug placements for selecting interrupt levels for the parallel port.

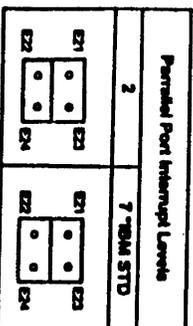


Figure 4-6. Jumper Plug Placements for Selecting Interrupt Levels for the Parallel Port.

##### Bidirectional Port Control

The parallel port is configured at the factory for an IBM standard Centronics printer interface. This configuration is unidirectional, or one way. That is, data are ONLY transferred from the IBM PC to the device attached to the SB module. With the standard configuration, NO data are transferred from the external device to the IBM PC. The one-way flow is the normal case for a printer interface.

However, the SB module also supports two nonstandard configurations for controlling the bidirectional port. These configurations allow the user to interface with custom devices that require two-way communications. These configurations — the external and internal directional control configurations — are described in the following paragraphs.

##### EXTERNAL DIRECTIONAL CONTROL

In external control mode, data can be transferred either to or from the external device under control of the external device. The external device controls the direction by applying a logic level at Pin 13 of the DB25 connector. A low voltage level (logic '0') selects a data flow TO the external device and a high voltage level (logic '1') selects a data flow FROM the device to the IBM PC.

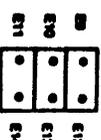
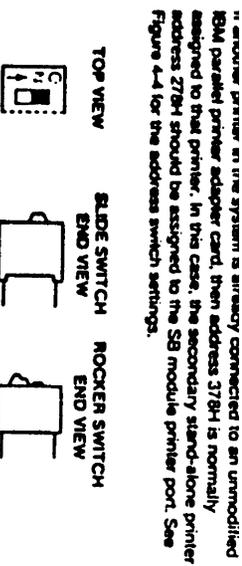


Figure 4-7. External Directional Control Jumper Plug Placement.

##### INTERNAL DIRECTIONAL CONTROL

In internal directional control mode, data can be transferred either to or from the external device under program control.

The internal device (IBM PC) asserts control of the desired direction of data transfer by loading a "1" or "0" in bit 5 of the Control Register (CRA or 2FA).

If logic "0" is loaded in bit 5 of the Control Register, data transfer is from the IBM PC to the external device. If a logic "1" is loaded in bit 5 of the Control Register, data transfer is from the external device to IBM PC.

To select the internal directional control mode, REMOVE the jumper at E11-E14 AND INSTALL the jumper at E9-E12. Refer to Figure 3-6 for the jumper location on the module. Figure 4-8 shows the jumper plug placement for internal directional control mode.

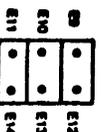


Figure 4-8. Internal Directional Control Jumper Plug Placement.

Persyst Time Spectrum



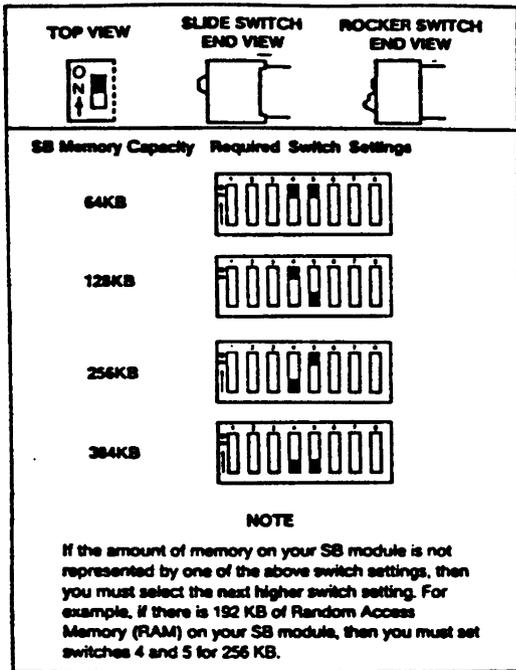


Figure 3-9. Switch Settings for Amount of Memory on the SB Module. (Set switches 4 and 5.)

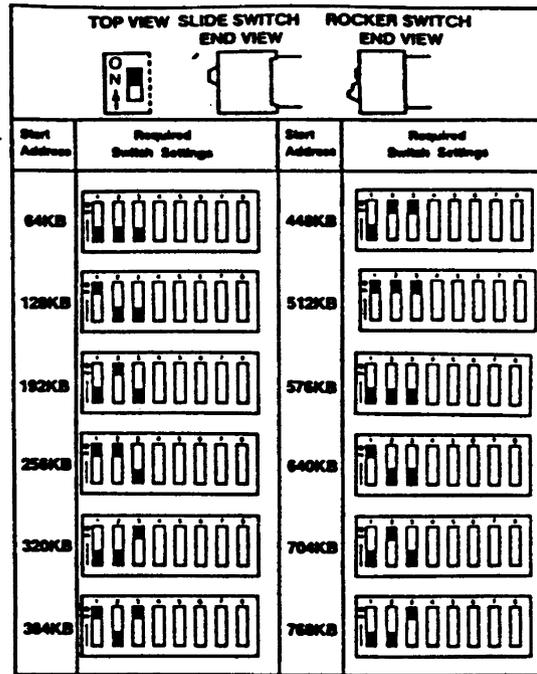


Figure 3-7. SB Switch Settings for the Starting Memory Address. (Set switches 1-3.)

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The CLOCK.COM program now automatically displays the date and time information and sets it in the system whenever the system is booted or reset. The program also allows you to enter other commands that deal with the date and time information. Those commands are described below.

- CLOCK** This command reads and displays the time and date maintained on the SB module.
- CLOCK/I** This command initializes the calendar/clock device on the SB module. First, it displays the time and date and prompts you for new entries in the format displayed. If you do not wish to update the information, press the Enter key; the current information remains unchanged.
- CLOCK/S** This command displays the time and date and sets the system time and date. This command can be inserted into the AUTOEXEC.BAT file to automatically display and set the system time when the system is booted or reset.
- CLOCK/VS** This command combines the functions of the CLOCK/I and CLOCK/S functions described above.

**Programming the PERSYST Clock**

This subsection gives you information to read and set the PERSYST clock from within your applications program. The information presented is the same method used by the CLOCK.COM program that you received on your diskette.

Switch 7 on the switch bank on the board assigns the primary or secondary port address for the clock. You may read from the following ranges depending on the setting of switch 7:

| Switch 7 | Address Range            |
|----------|--------------------------|
| OFF      | 250H to 25FH (Inclusive) |
| ON       | 350H to 35FH (Inclusive) |

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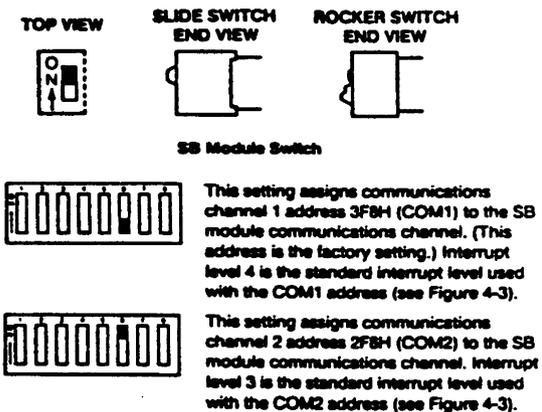


Figure 4-1. Serial Asynchronous Communications Channel Address Switch Settings

The standard configuration shown in Figure 4-2 is used when the SB module channel is interfacing with a modem or some other data communications equipment (DCE) device.

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3-25

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# Tech Talk

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1stMATE

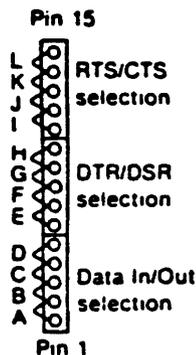
Category D. Hardware

CONTINUED—

- J2 — This jumper selects between the standard RS-232 data input and the current loop data input. Position A should be connected with the blue jumper connector for standard RS-232 data input. Position B should be connected for current loop input. The board is shipped with the jumper in position A.



- J3 — This jumper allows for the selection of the serial port as either DTE or DCE. DTE means data terminal equipment. DCE means data communication equipment. Some devices such as modems are configured as DCE; others such as terminals are configured as DTE. The configurations differ only in the pin-out organization of the control and data lines. This allows two serial ports to be connected by a cable without any special wiring if one port is DCE and one is DTE. Typically, if both ports are configured the same, then one connector will have to be rewired. These jumpers allow configuring the control signals and the data lines so that a special cable will not be needed. The configuration is done by changing the locations of the small pieces of wire to connect the appropriate points on J3. (See Figure 1 in this Tech Talk.)



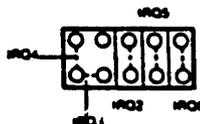
DTE: Connect positions A, C, E, G, I and K.

DCE: Connect positions B, D, F, H, J and L.

The board is shipped wired for DTE. It can therefore be connected to a modem using a straight ribbon cable fitted on both sides with DB-25 connectors. To connect it to a serial printer, another IBM-compatible serial port, or some other device with a straight cable, you must jumper the board for DCE.

The modem control signals RI and RLSD and the two 20mA current loop data signals cannot have their signals changed by changing a jumper. It is necessary to make the appropriate connections in the cable if these signals are required.

- J4 — This jumper block is for selecting the IRQ (interrupt request) lines for the serial port and for the time-of-day circuit. The time-of-day interrupt source may be connected to either IRQ2 or IRQ5 or IRQ6. This is done by placing a blue or black plastic jumper (provided) over the two pins of the corresponding interrupt line. If no interrupts are to be used from the time-of-day section, then do not connect IRQ-2, 5, or 6 and set the jumper aside.



The serial port must be connected to IRQ4 when set as COM1 and must be connected to IRQ3 when set as COM2. The blue jumper should be placed to connect the indicated pins for either COM1 (IRQ4) or COM2 (IRQ3).

3-

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CONTINUED—

**J5 — This jumper controls the addressing of the three I/O sections on the 1stMATE board: the serial port, the parallel port, and the time-of-day/encryption port. The use of this jumper section is as follows:**



**Time-of-Day:**

Use position A for Time 1.

Use position B for Time 2.

Remove the jumper completely to disable the clock/calendar.

**Serial port:**

Use position C for COM1.

Use position D for COM2.

Remove the jumper completely to disable the serial port.

**Parallel port:**

Use position E for LPT1 (LPT2 if monochrome adapter is in use, equivalent to IBM printer adapter board).

Use position F for LPT2 (LPT3 if monochrome adapter and another parallel port are in use).

The board is shipped with the jumpers set for Time 1, COM1, and LPT1. The use of the serial port as COM2 and the printer port as LPT2 is covered in the IBM PC manuals. Time 2 can be used if there is a second 1stMATE board in the system and the user desires to have two unique clocks. Time 2 and LPT2 must be used if an IBM parallel printer adapter is in your system, since the IBM board creates address conflicts with the Time 1 I/O location.

Originator: Ron Rowe

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3-

# Tech Talk

## Micro Products

September 30, 1985

**TECMAR  
1stMATE**

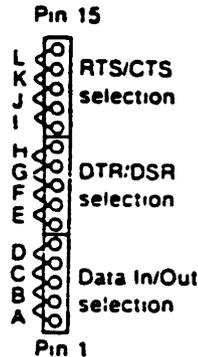
Category D. Hardware

CONTINUED—

- J2 — This jumper selects between the standard RS-232 data input and the current loop data input. Position A should be connected with the blue jumper connector for standard RS-232 data input. Position B should be connected for current loop input. The board is shipped with the jumper in position A.



- J3 — This jumper allows for the selection of the serial port as either DTE or DCE. DTE means data terminal equipment. DCE means data communication equipment. Some devices such as modems are configured as DCE; others such as terminals are configured as DTE. The configurations differ only in the pin-out organization of the control and data lines. This allows two serial ports to be connected by a cable without any special wiring if one port is DCE and one is DTE. Typically, if both ports are configured the same, then one connector will have to be rewired. These jumpers allow configuring the control signals and the data lines so that a special cable will not be needed. The configuration is done by changing the locations of the small pieces of wire to connect the appropriate points on J3. (See Figure 1 in this Tech Talk.)



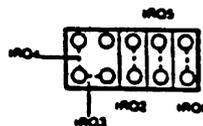
DTE: Connect positions A, C, E, G, I and K.

DCE: Connect positions B, D, F, H, J and L.

The board is shipped wired for DTE. It can therefore be connected to a modem using a straight ribbon cable fitted on both sides with DB-25 connectors. To connect it to a serial printer, another IBM-compatible serial port, or some other device with a straight cable, you must jumper the board for DCE.

The modem control signals RI and RLSD and the two 20mA current loop data signals cannot have their signals changed by changing a jumper. It is necessary to make the appropriate connections in the cable if these signals are required.

- J4 — This jumper block is for selecting the IRQ (interrupt request) lines for the serial port and for the time-of-day circuit. The time-of-day interrupt source may be connected to either IRQ2 or IRQ5 or IRQ6. This is done by placing a blue or black plastic jumper (provided) over the two pins of the corresponding interrupt line. If no interrupts are to be used from the time-of-day section, then do not connect IRQ-2, 5, or 6 and set the jumper aside.



The serial port must be connected to IRQ4 when set as COM1 and must be connected to IRQ3 when set as COM2. The blue jumper should be placed to connect the indicated pins for either COM1 (IRQ4) or COM2 (IRQ3).

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A Bell Atlantic Company

CONTINUED—

J5 — This jumper controls the addressing of the three I/O sections on the 1stMATE board: the serial port, the parallel port, and the time-of-day/encryption port. The use of this jumper section is as follows:



**Time-of-Day:**

Use position A for Time 1.

Use position B for Time 2.

Remove the jumper completely to disable the clock/calendar.

**Serial port:**

Use position C for COM1.

Use position D for COM2.

Remove the jumper completely to disable the serial port.

**Parallel port:**

Use position E for LPT1 (LPT2 if monochrome adapter is in use, equivalent to IBM printer adapter board).

Use position F for LPT2 (LPT3 if monochrome adapter and another parallel port are in use).

The board is shipped with the jumpers set for Time 1, COM1, and LPT1. The use of the serial port as COM2 and the printer port as LPT2 is covered in the IBM PC manuals. Time 2 can be used if there is a second 1stMATE board in the system and the user desires to have two unique clocks. Time 2 and LPT2 must be used if an IBM parallel printer adapter is in your system, since the IBM board creates address conflicts with the Time 1 I/O location.

Originator: Ron Rowe

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# Tech Talk

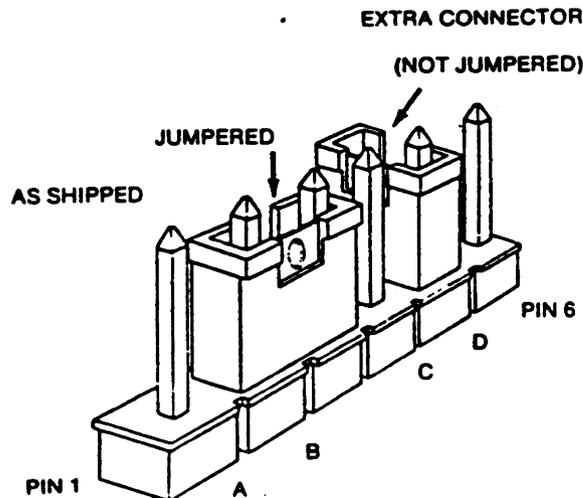
## Micro Products

September 30, 1985

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Captain**

Category D. Hardware

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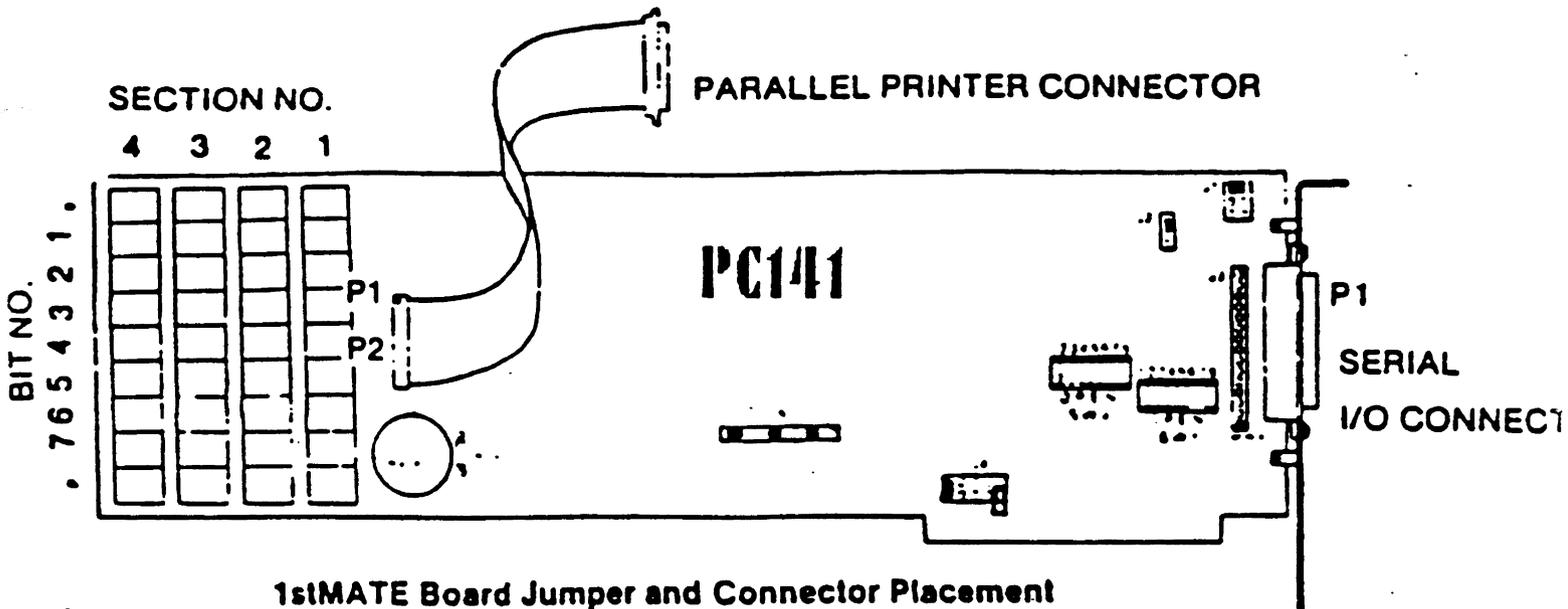
Jumper Block JPR3

3-65

3-4.4

Originator: Ron Rowe

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1stMATE Board Jumper and Connector Placement

MEMORY UPGRADE SWITCH SETTINGS

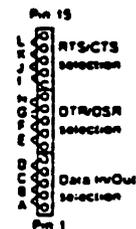
0 = Open  
X = Closed

| CURRENT MEMORY | MEMORY UPGRADE WANTED | POPULATE SECTIONS | TECMAR SWITCH 2<br>1 2 3 4 5 6 7 8 | TECMAR SWITCH 1<br>1 2 3 4 5 6 7 8 |
|----------------|-----------------------|-------------------|------------------------------------|------------------------------------|
| 64K            | 64K*                  | 2                 | 0X000000                           | 00000000                           |
|                | 128K*                 | 2 3               | 0X X00000                          | 00000000                           |
|                | 192K*                 | 2 3 4             | 0X X X0000                         | 00000000                           |
|                | 256K*                 | 2 3 4 1           | 0X X X X000                        | 00000000                           |
| 128K           | 64K*                  | 3                 | 00X00000                           | 00000000                           |
|                | 128K*                 | 3 4               | 00X X0000                          | 00000000                           |
|                | 192K*                 | 3 4 1             | 00X X X000                         | 00000000                           |
|                | 256K*                 | 3 4 1 2           | 00X X X X00                        | 00000000                           |
| 192K           | 64K*                  | 4                 | 000X0000                           | 00000000                           |
|                | 128K*                 | 4 1               | 000 X X000                         | 00000000                           |
|                | 192K*                 | 4 1 2             | 000 X X X00                        | 00000000                           |
|                | 256K*                 | 4 1 2 3           | 000 X X X X0                       | 00000000                           |
| 256K           | 64K                   | 1                 | 0000X000                           | 00000000                           |
|                | 128K                  | 1 2               | 0000 X X00                         | 00000000                           |
|                | 192K                  | 1 2 3             | 0000 X X X0                        | 00000000                           |
|                | 256K                  | 1 2 3 4           | 0000 X X X X                       | 00000000                           |
| 320K           | 64K                   | 2                 | 00000X00                           | 00000000                           |
|                | 128K                  | 2 3               | 00000 X X0                         | 00000000                           |
|                | 192K                  | 2 3 4             | 00000 X X X                        | 00000000                           |
|                | 256K**                | 2 3 4 1           | 00000 X X X X                      | X0000000                           |
| 384K           | 64K                   | 3                 | 000000X0                           | 00000000                           |
|                | 128K                  | 3 4               | 000000 X X                         | 00000000                           |
|                | 192K**                | 3 4 1             | 000000 X X X                       | X0000000                           |
|                | 256K**                | 3 4 1 2           | 000000 X X X X                     | X X000000                          |
| 448K           | 64K                   | 4                 | 0000000X                           | 00000000                           |
|                | 128K**                | 4 1               | 0000000 X                          | X0000000                           |
|                | 192K**                | 4 1 2             | 0000000 X X                        | X X000000                          |
| 512K           | 64K**                 | 1                 | 00000000                           | X0000000                           |
|                | 128K**                | 1 2               | 00000000                           | X X000000                          |
| 64K            | 64K**                 | 2                 | 00000000                           | 0X000000                           |

J2 - The jumper selects between the standard RS-232 data input and the current loop data input. Position A should be connected with the blue jumper connector for standard RS-232 data input. Position B should be connected for current loop if board is shipped with the jumper in position A.



J3 - This jumper allows for the selection of the serial port as either DTE or DCE. DTE means data terminal equipment, DC data communication equipment. Some devices such as modems are configured as DCE; others such as terminals configured as DTE. The configurations differ only in the pin-out organization of the control and data lines. This allows parts to be connected by a cable without any special wiring if one part is DCE and one is DTE. Typically, if both configured the same, then one connector will have to be rewired. These jumpers allow configuring the control signal data lines so that a special cable will not be needed. The configuration is done by changing the location of the small wire to connect the appropriate points on J3. (See Figure 1 in the Tech Tab.)



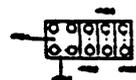
DTE: Connect positions A, C, E, G, I and K

DCE: Connect positions B, D, F, H, J and L

The board is shipped wired for DTE. It can therefore be connected to a modem using a straight ribbon cable with DB-25 connectors. To connect it to a serial printer, another IBM-compatible serial port, or some other device with cable, you must jumper the board for DCE.

The modem control signals RI and RLSD and the two 20mA current loop data signals cannot have their signals changed by a jumper. It is necessary to make the appropriate connections in the cable if these signals are required.

J4 - This jumper block is for selecting the IRQ (interrupt request) lines for the serial port and for the time-of-day, time-of-day interrupt source may be connected to other IRQs or IRQs. This is done by placing a blue or blue jumper (provided) over the two pins of the corresponding interrupt line. If no interrupts are to be used from the 1st section, then do not connect IRQ-2, 5, or 6 and set the jumper aside.



The serial port must be connected to IRQ4 when set as COM1 and must be connected to IRQ3 when set as COM2. Jumper should be placed to connect the indicated pins for either COM1 (IRQ4) or COM2 (IRQ3).

J5 - This jumper controls the addressing of the three I/O sections on the 1stMATE board, the serial port, the parallel port, and the time-of-day/clock section. The use of this jumper section is as follows:



Time-of-Day  
Use position A for Time 1  
Use position B for Time 2  
Remove the jumper completely to disable the clock/calendar

Serial port  
Use position C for COM1  
Use position D for COM2  
Remove the jumper completely to disable the serial port

Parallel port  
Use position E for LPT1 (LPT2 if monochrome adapter is in use, equivalent to IBM printer adapter board)

Use position F for LPT2 (LPT3 if monochrome adapter and another parallel port are in use).

The board is shipped with the jumpers set for Time 1, COM1, and LPT1. The use of the serial port as COM2 and the printer as LPT2 is covered in the IBM PC manual. Time 2 can be used if there is a second 1stMATE board in the system and the L

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# Memory Address Switch Settings

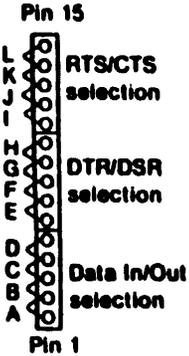
**J1** This jumper section is for selecting either the standard RS-232 serial data output or the 20 mA current loop output. Position A should be connected for standard RS-232 (this is the way the board is shipped). Positions B and C should be connected if the 20mA current loop output is to be used.



**J2** This jumper selects between the standard RS-232 data input and the current loop data input. Position A should be connected with the blue jumper connector for standard RS-232 data input. Position B should be connected for current loop input. The board is shipped with the jumper in position A.



**J3** This jumper allows for the selection of the serial port as either 'DTE' or 'DCE'. 'DTE' means Data Terminal Equipment. 'DCE' means Data Communication Equipment. Some devices such as modems are configured as 'DCE'; others such as terminals are configured as 'DTE'. The configurations differ only in the pin-out organization of the control and data lines. This allows two serial ports to be connected by a cable without any special wiring if one port is 'DCE' and one is 'DTE'. Typically, if both ports are configured the same, then one connector will have to be rewired. These jumpers allow configuring the control signals and the data lines so that a special cable will not be needed. The



configuration is done by changing the locations of the small pieces of wire to connect the appropriate points on J3.

- DTE: Connect positions A,C,E,G,I and K.
- DCE: Connect positions B,D,F,H,J and L.

The board is shipped configured for 'DTE' and, therefore, a modem or similar device can be connected with an ordinary cable. If a terminal or similar device is to be connected to the serial port then the board (jumper J3) should be reconfigured as 'DCE' to allow the use of an ordinary cable. In this case, the signals RTS and CTS should be excluded from the cable. If you experience any difficulty with a serial interface, refer to Appendix B.

The modem control signals RI and RLSD and the two 20mA current loop data signals cannot have their signals changed by changing a jumper. If necessary to make the appropriate connections in the cable required.

The 8088 CPU used in the IBM Personal Computer can utilize up to approximately 1 million bytes of memory. Some of this space is reserved by IBM for certain applications and cannot or should not be overlaid with end user memory. However, there is still approximately 500,000 memory locations that can be used by end users. Since this memory board is only 256K bytes maximum, it must be set up to occupy only a portion of the available memory space. This is done by setting switches so that the board will respond only to certain address locations. Software that references any other location will not affect this board in any way.

The 256K bytes of memory on the 1STMATE Board are organized in four 64K byte segments. Each of these 64K byte segments may be placed in one of four 64K byte segments in the IBM's one megabyte memory space by setting its associated switch to 'ON'. If the associated switch is set to 'OPEN' then the 64K byte segment on the 1STMATE Board is not mapped into that segment of the IBM Personal Computer's memory.

The switch to memory address assignments are:

| Switch | Memory     | Starting Address In Hexadecimal | Segment Number |
|--------|------------|---------------------------------|----------------|
| SW2-1  | 0- 64K     | 0*                              | 1              |
| SW2-2  | 64K-128K   | 10000                           | 2              |
| SW2-3  | 128K-192K  | 20000                           | 3              |
| SW2-4  | 192K-256K  | 30000                           | 4              |
| SW2-5  | 256K-320K  | 40000                           | 1              |
| SW2-6  | 320K-384K  | 50000                           | 2              |
| SW2-7  | 384K-448K  | 60000                           | 3              |
| SW2-8  | 448K-512K  | 70000                           | 4              |
| SW1-1  | 512K-576K  | 80000                           | 1              |
| SW1-2  | 576K-640K  | 90000                           | 2              |
| SW1-3  | 640K-704K  | A0000*                          | 3              |
| SW1-4  | 704K-768K  | B0000*                          | 4              |
| SW1-5  | 768K-832K  | C0000                           | 1              |
| SW1-6  | 832K-896K  | D0000                           | 2              |
| SW1-7  | 896K-960K  | E0000                           | 3              |
| SW1-8  | 960K-1024K | F0000*                          | 4              |

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PC-141

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# Tech Talk

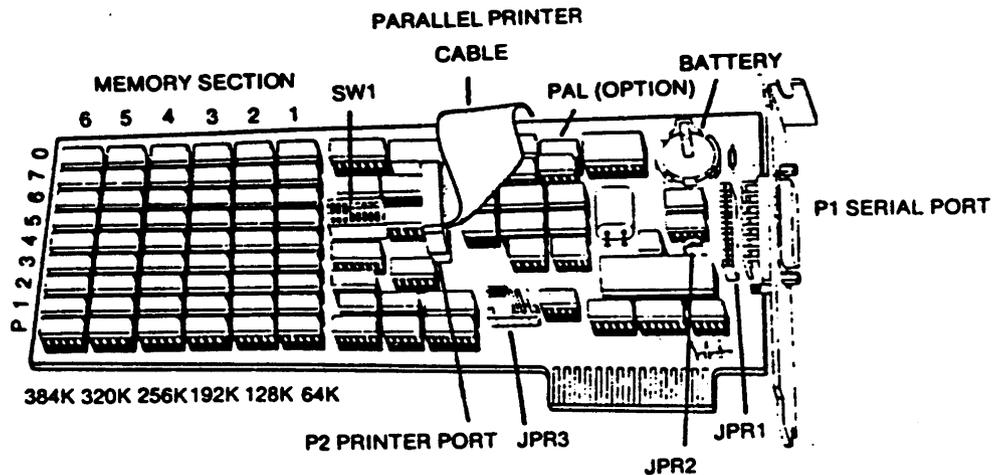
**TECMAR  
Captain**

## Micro Products

September 9, 1985

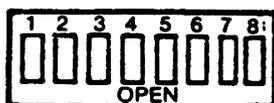
Category D. Hardware

### D1 BOARD LAYOUT



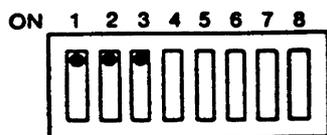
Originator: Ron Rowe

### D2 SWITCH 2 FUNCTIONS

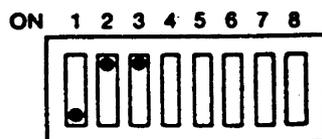


- ENABLE/DISABLE PRINTER PORT CLOCK/CALENDAR
- ENABLE/DISABLE SERIAL PORT
- LPT1/LPT2 SELECT FOR PRINTER PORT
- COM1/COM2 SELECT FOR SERIAL PORT
- STARTING MEMORY ADDRESS
- MEMORY ACTIVATION

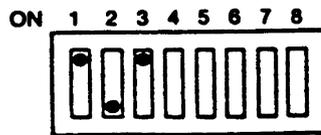
#### INSTALLED MEMORY



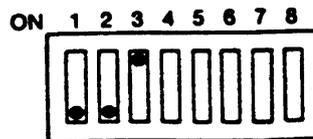
0 BYTES ACTIVATED



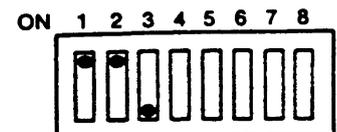
64K ACTIVATED



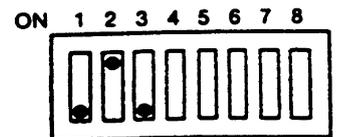
128K ACTIVATED



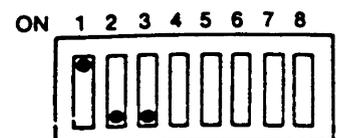
192K ACTIVATED



256K ACTIVATED



320K ACTIVATED



384K ACTIVATED

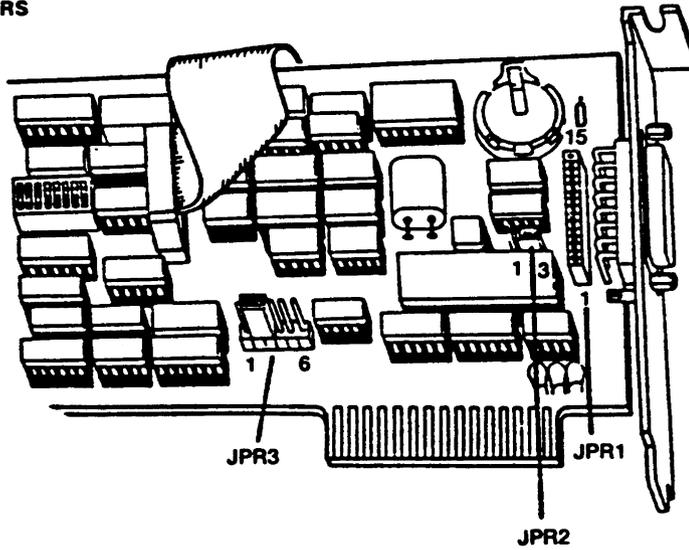
Originator: Ron Rowe

3-

**Sorbus**  
A Bell Atlantic Company

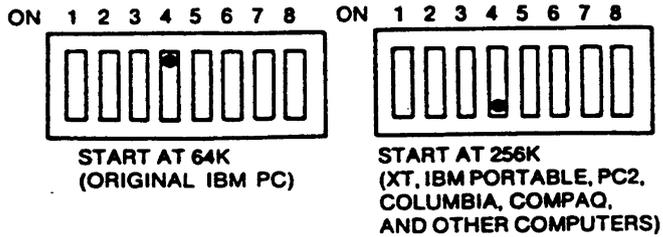
3-70

**D3 LOCATION OF JUMPERS**

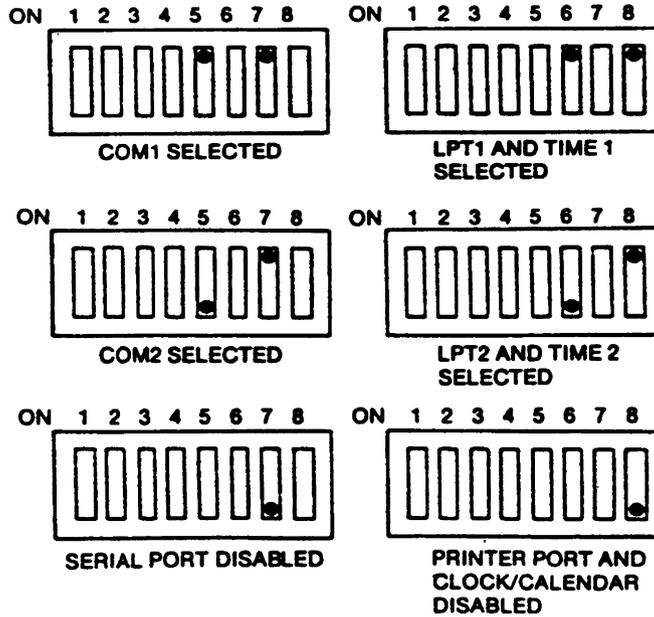


Originator: Ron Rowe

**D4 STARTING ADDRESSES**



**PORTS**



Originator: Ron Rowe

# Tech Talk

## Micro Products

September 30, 1985

**TECMAR  
Captain**

Category D. Hardware

### D5 JPR1 SERIAL PORT

The jumper block JPR1 is used to set the serial port as either data terminal equipment (DTE) or data communication equipment (DCE). Some peripherals such as modems, are set as DCE. Others, such as printers, are set as DTE.

#### NOTE

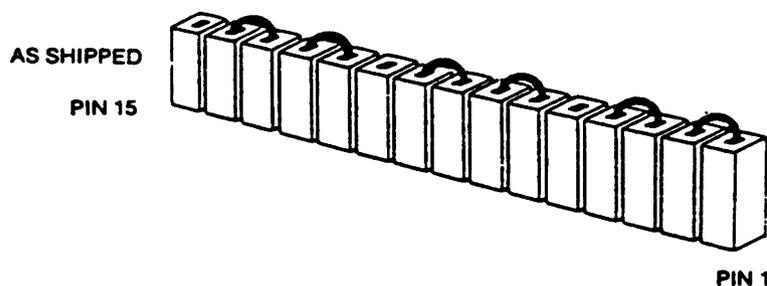
DTE ports only communicate with DCE devices, and DCE ports must communicate with DTE devices.

The setups differ only in the pin location of the signals on the pins of the serial port. The purpose of block JPR1 is to change the pin location of the signals. This allows two different ports to be connected without any special wiring in the cable.

The Captain is set up for DTE when shipped by Tecmar. Therefore, you do not have to change the jumper block if you will be connecting your serial port to a device configured as DCE, such as a modem.

#### DTE SETTINGS

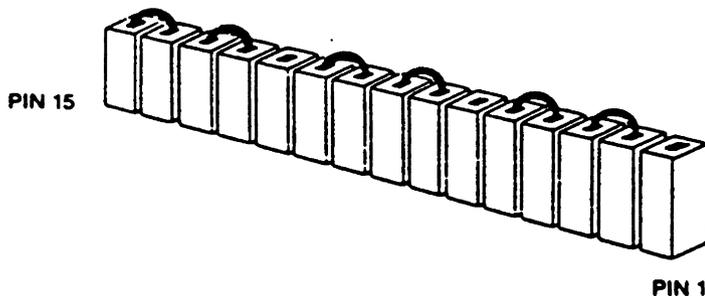
Check the manual included with the device you will be connecting to the serial port for its setup (DCE or DTE). The diagram below shows the connections for DTE.



DTE Factory Setting of JPR1

#### DCE SETTINGS

If you are connecting your serial port to a serial printer or another IBM-compatible serial port, change the jumper block to DCE. The diagram below shows the connections for DCE.



DCE Setting of JPR1

Originator: Ron Rowe

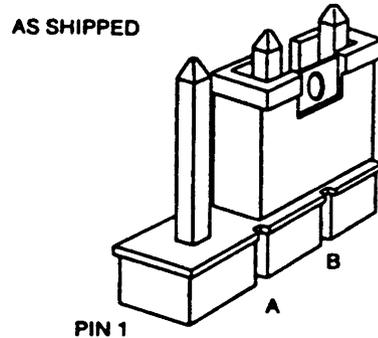
3-72

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## D6 JPR2 SERIAL PORT

Jumper block JPR2 allows you to choose between two types of data input.

- Connect position B to select the standard RS-232 data input, which is good for communication within 100 feet.
- If you have a terminal that requires current loop output, connect position A to select the current loop data input. It is good for communications up to 1000 feet.
- The board is shipped jumpered in position B as illustrated below.



Factory Setting Jumper Block JPR2

The connections at jumpers block JPR3 are shown below.

Connections at Jumper Block JPR3

| POSITION | INTERRUPT SOURCE | INTERRUPT REQUEST LINE | INTERRUPT NO. |
|----------|------------------|------------------------|---------------|
| A        | Serial port      | IRQ3 (for COM2)        | OB hex        |
| B        | Serial port      | IRQ4 (for COM1)        | OC hex        |
| C        | Clock/calendar   | IRQ5                   | OD hex        |
| D        | Clock/calendar   | IRQ7                   | OF hex        |

To connect the two pins corresponding to one of the functions, place one of the jumper connectors provided with the board over the two pins of the jumper position.

Originator: Ron Rowe

---

## D7 JPR3 INTERRUPTS

You must connect the serial port to an interrupt request line (IRQ line) in your computer.

Jumper block JPR3 can be used to connect the serial ports and the clock/calendar to various IRQ lines.

Your Captain was shipped jumpered at position B. This setting, illustrated below, is appropriate for most applications.

Don't use an IRQ line for the clock/calendar unless you will be using a special application that requires generating an interrupt from the Captain's clock chip.

Configuration

Remember that if jumper 4 is set, each bank of memory on the jrCaptain contains 64K bytes of memory. If jumper 4 is not set, each bank of memory contains 256K bytes of memory. Jumper 4 does not affect the banks of memory on the jrCadet board. Each bank of memory on the jrCadet board always contains 64K bytes of memory.

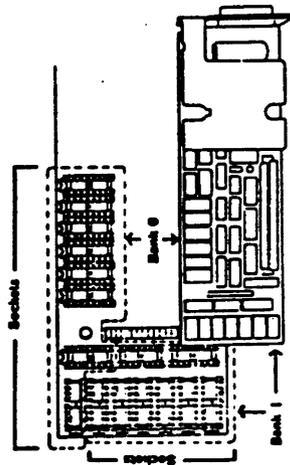
The chart on the next page describes the function of each switch on the jrCaptain board in combination with the state of jumper 4. The amount of memory enabled by the switch along with the address where the memory resides in physical memory is given.

**Note:** By using 256K RAM chips instead of 64K RAM chips, it is possible to have more than 640K bytes of memory on the IBM PCjr. It is, however, not advisable to add more than 832K bytes of memory to the IBM PCjr. The physical addresses corresponding to memory above 832K bytes may be used by the cartridge ROM and ROM BIOS.

| SW1 | Selected Bank    | JPR4 Setting       |                                                               |
|-----|------------------|--------------------|---------------------------------------------------------------|
|     |                  | Jumped             | Unjumped                                                      |
| 1   | jrCaptain Bank 0 | 64K<br>20000-2FFFF | 256K<br>20000-5FFFF                                           |
| 2   | jrCaptain Bank 1 | 64K<br>30000-3FFFF | 256K<br>60000-9FFFF                                           |
| 3   | jrCadet Bank 0   | 64K<br>40000-4FFFF | 64K<br>A0000-AFFFF                                            |
| 4   | jrCadet Bank 1   | 64K<br>50000-5FFFF | 64K<br>B0000-B7FFF<br><small>(256K bytes usable only)</small> |
| 5   | jrCadet Bank 2   | 64K<br>60000-67FFF | 64K<br>C0000-CFFFF                                            |
| 6   | jrCadet Bank 3   | 64K<br>70000-7FFFF | (has no effect)                                               |
| 7   | jrCadet Bank 4   | 64K<br>80000-87FFF | (has no effect)                                               |
| 8   | jrCadet Bank 5   | 64K<br>90000-9FFFF | (has no effect)                                               |

jr CAPTAIN BOARD

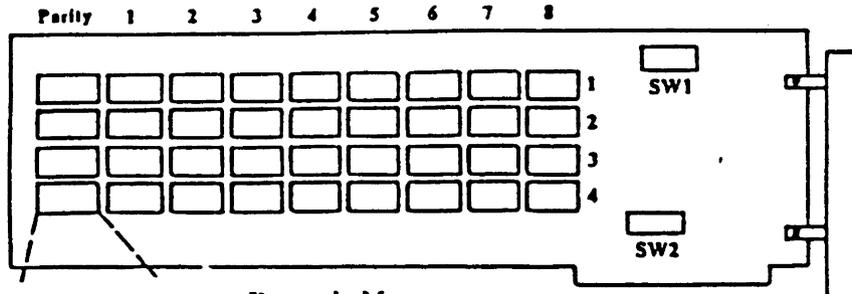
15. Look at the diagram below. Find the banks and the RAM chip sockets on your jrCaptain board.



Notes: Each socket has eight rows of pins that represent the holes where the pins of the RAM chips will be inserted.

3-75

# Tecmar



## Dynamic Memory Memory Switch Settings

0 = Open  
X = Closed

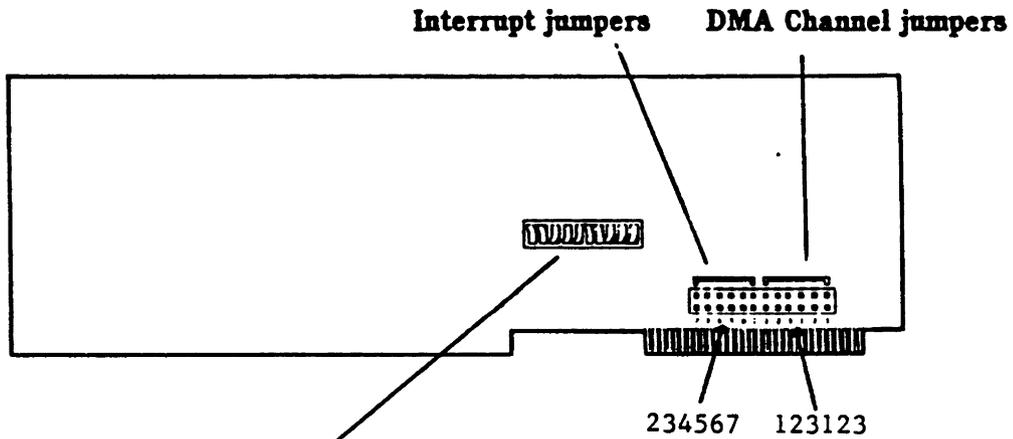
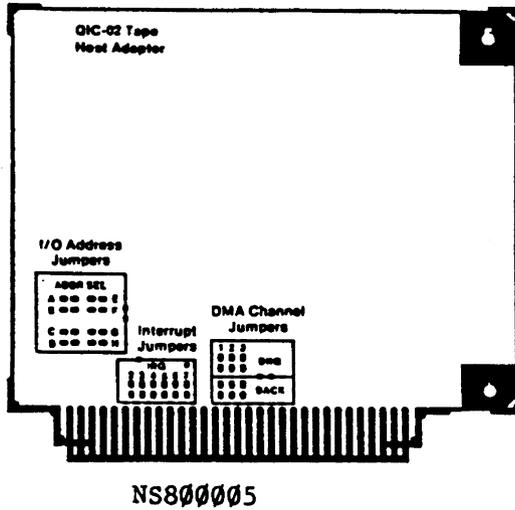
| Current System Memory | Memory Upgrade Wanted | Tecmar Switch 1 |   |   |   |   |   |   |   | Tecmar Switch 2 |   |   |   |   |   |   |   | Populate Banks |
|-----------------------|-----------------------|-----------------|---|---|---|---|---|---|---|-----------------|---|---|---|---|---|---|---|----------------|
|                       |                       | 1               | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 1               | 2 | 3 | 4 | 5 | 6 | 7 | 8 |                |
| 64K*                  | 64K                   | 0               | X | 0 | 0 | 0 | 0 | 0 | 0 | 0               | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2              |
|                       | 128K                  | 0               | X | X | 0 | 0 | 0 | 0 | 0 | 0               | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 23             |
|                       | 192K                  | 0               | X | X | X | 0 | 0 | 0 | 0 | 0               | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 234            |
|                       | 256K                  | 0               | X | X | X | X | 0 | 0 | 0 | 0               | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2341           |
| 128K*                 | 64K                   | 0               | 0 | X | 0 | 0 | 0 | 0 | 0 | 0               | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3              |
|                       | 128K                  | 0               | 0 | X | X | 0 | 0 | 0 | 0 | 0               | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 34             |
|                       | 192K                  | 0               | 0 | X | X | X | 0 | 0 | 0 | 0               | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 341            |
|                       | 256K                  | 0               | 0 | X | X | X | X | 0 | 0 | 0               | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3412           |
| 192K*                 | 64K                   | 0               | 0 | 0 | X | 0 | 0 | 0 | 0 | 0               | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4              |
|                       | 128K                  | 0               | 0 | 0 | X | X | 0 | 0 | 0 | 0               | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 41             |
|                       | 192K                  | 0               | 0 | 0 | X | X | X | 0 | 0 | 0               | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 412            |
|                       | 256K                  | 0               | 0 | 0 | X | X | X | X | 0 | 0               | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4123           |
| 256K                  | 64K                   | 0               | 0 | 0 | 0 | X | 0 | 0 | 0 | 0               | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1              |
|                       | 128K                  | 0               | 0 | 0 | 0 | X | X | 0 | 0 | 0               | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 12             |
|                       | 192K                  | 0               | 0 | 0 | 0 | X | X | X | 0 | 0               | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 123            |
|                       | 256K                  | 0               | 0 | 0 | 0 | X | X | X | X | 0               | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1234           |
| 320K                  | 64K                   | 0               | 0 | 0 | 0 | 0 | X | 0 | 0 | 0               | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2              |
|                       | 128K                  | 0               | 0 | 0 | 0 | 0 | X | X | 0 | 0               | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 23             |
|                       | 192K                  | 0               | 0 | 0 | 0 | 0 | X | X | X | 0               | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 234            |
|                       | 256K                  | 0               | 0 | 0 | 0 | 0 | X | X | X | X               | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2341           |
| 384K                  | 64K                   | 0               | 0 | 0 | 0 | 0 | 0 | X | 0 | 0               | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3              |
|                       | 128K                  | 0               | 0 | 0 | 0 | 0 | 0 | X | X | 0               | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 34             |
|                       | 192K                  | 0               | 0 | 0 | 0 | 0 | 0 | X | X | X               | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 341            |
|                       | 256K                  | 0               | 0 | 0 | 0 | 0 | 0 | X | X | X               | X | 0 | 0 | 0 | 0 | 0 | 0 | 3421           |
| 448K                  | 64K                   | 0               | 0 | 0 | 0 | 0 | 0 | 0 | X | 0               | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4              |
|                       | 128K                  | 0               | 0 | 0 | 0 | 0 | 0 | 0 | X | X               | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 41             |
|                       | 192K                  | 0               | 0 | 0 | 0 | 0 | 0 | 0 | X | X               | X | 0 | 0 | 0 | 0 | 0 | 0 | 412            |
| 512K                  | 64K                   | 0               | 0 | 0 | 0 | 0 | 0 | 0 | 0 | X               | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1              |
|                       | 128K                  | 0               | 0 | 0 | 0 | 0 | 0 | 0 | 0 | X               | X | 0 | 0 | 0 | 0 | 0 | 0 | 12             |
| 576K                  | 64K                   | 0               | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0               | X | 0 | 0 | 0 | 0 | 0 | 0 | 2              |

\*These settings only apply to the IBM Personal Computer with a 64K system board (original model)



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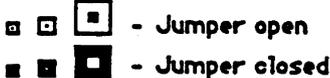
## QIC-60



| I/O Address | (For PC Host Controller)<br>Select Jumpers | (For PC-36 Controller)<br>Set DIP Switches |
|-------------|--------------------------------------------|--------------------------------------------|
| 338-33B     | BDEG                                       |                                            |
| 368-36B     | BCEH                                       |                                            |
| 398-39B     | ADFG                                       |                                            |
| 3C8-3CB     | ACFH                                       |                                            |



# IBM Serial and Parallel Interface in PC, XT, AT type computers



## Parallel Ports:

If the system does not have a display adapter with a built-in parallel port at Base I/O Address H3BC, it will be able to access up to two (2) parallel ports in this order:

| Without display /printer adapter using Base I/O Address H3BC | Order  | Device | Base I/O Address |
|--------------------------------------------------------------|--------|--------|------------------|
|                                                              | first  | LPT1   | H378             |
|                                                              | second | LPT2   | H278             |

If the system has a display adapter with a built-in parallel port at Base I/O Address H3BC, it will be able to access up to three (3) parallel ports in this order:

| With display /printer adapter using Base I/O Address H3BC | Order  | Device | Base I/O Address |
|-----------------------------------------------------------|--------|--------|------------------|
|                                                           | first  | LPT1   | H3BC             |
|                                                           | second | LPT2   | H378             |
|                                                           | third  | LPT3   | H278             |

Normally, parallel ports only come with settings for LPT1 and LPT2. The IBM Monochrome Display and Printer Adapters' parallel port uses Base I/O Address H3BC and always forces the system to recognize it as LPT1. The other two ports may be hardware set at LPT1 (H378) and LPT2 (H278), but will now be recognized as LPT2 (H378) and LPT3 (H278).

Printer driven parallel printer software uses IRQ 7. To insure that the software operates correctly, enable IRQ 7 for LPT1. IRQ 7 is sometimes set as IRQ 5, but many times it is not set at all. Do not use an interrupt level for LPT3.

**Default Printing:** All default printing ( shift-printscreens ) will go to LPT1 unless otherwise redirected.

**Physical Port** - IBM PC, XT, AT - DB25 Female

## Serial Ports:

The system unit will recognize up to two (2) serial RS232 interface ports in this order:

| Order  | Device | Base I/O Address | IRQ |
|--------|--------|------------------|-----|
| first  | COM1   | 03F8             | 4   |
| second | COM2   | 02F8             | 3   |

The serial port is commonly used for two purposes.

1. Communications - Modems in particular. All internal modems are recognized as regular serial ports and must be set accordingly.

2. Printing - to serial RS232 printers only.

When using the serial ports, it is necessary to use software to define its parameters, namely, Baud Rate, Data Bits, Stop Bits, and Parity. In the case of the serial printer, for example, the MODE command can be used like this:

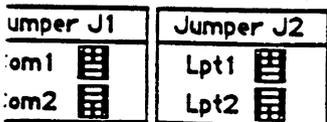
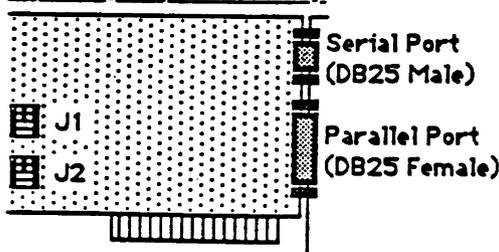
MODE COM1 : 9600, N, 8, 1, P  
will set serial port COM1 at 9600 Baud, no parity, 8 data bits, 1 stop bit, and use for serial printing.

**Default Printing:** Default printing is always at LPT1 but can be redirected to a serial port using the MODE command:

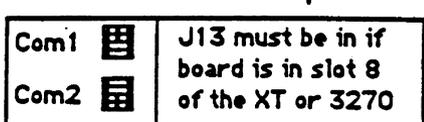
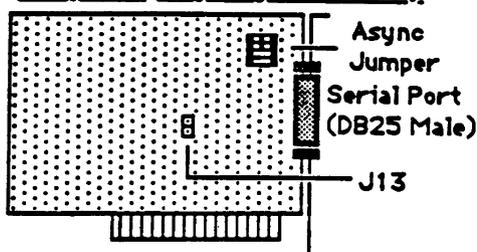
MODE LPT1 : = COM1

**Physical Port** - IBM PC, XT - DB25 Male  
IBM AT - DB9 Male

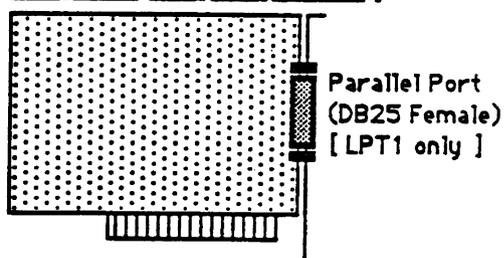
### IBM AT Serial/Parallel Adapter (AT, AT/3270)



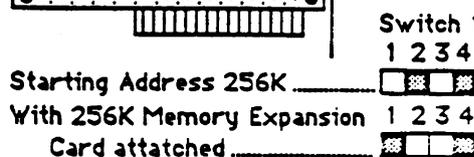
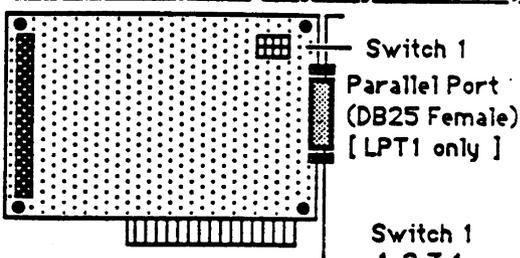
### IBM Asynchronous Comm. Adapter (PC, XT, PC/3270)



### IBM Parallel Printer Adapter (PC, XT, 3270)

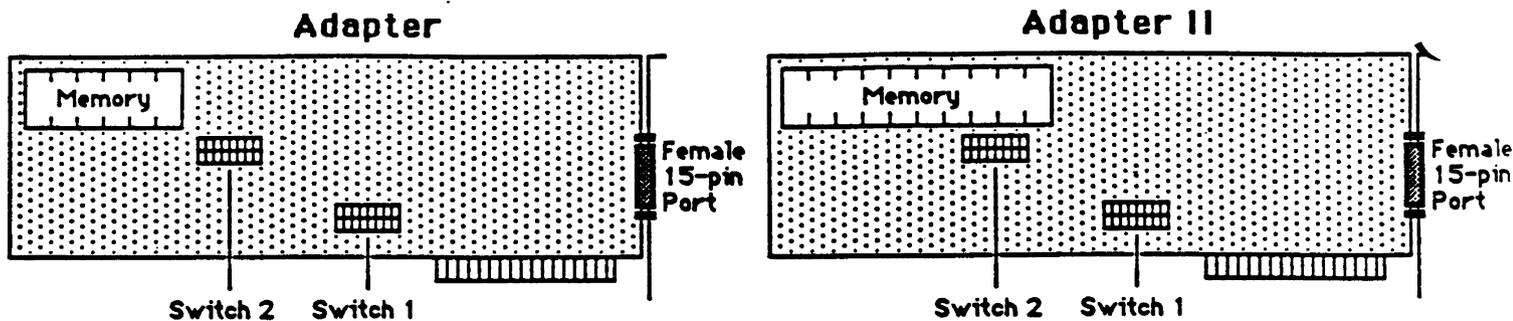


### IBM 128K Memory/Parallel Printer Adapter (PC, XT, PC/3270)



# IBM Token Ring Local Area Network Boards

|                                        |                                                     |
|----------------------------------------|-----------------------------------------------------|
| KEY                                    | <input type="checkbox"/> - Jumper open              |
| <input checked="" type="checkbox"/> ON | <input checked="" type="checkbox"/> - Jumper closed |
| <input type="checkbox"/> OFF           |                                                     |



The IBM Token Ring Network Adapters come in two versions: Adapter and Adapter II. The Adapter has 8 KB of memory. The Adapter II has 16 KB of memory and a different manufacturer's switch setting. The Adapter II is needed when running the IBM Token Ring Network Bridge Program.

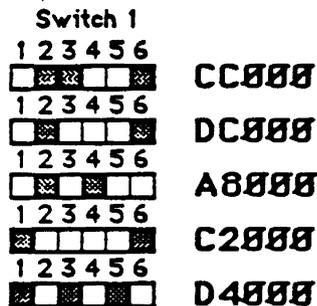
The Switches on the Token Ring Network Adapter determine:

- Base Rom Address
- Interrupt Level
- Primary or Alternate Adapter

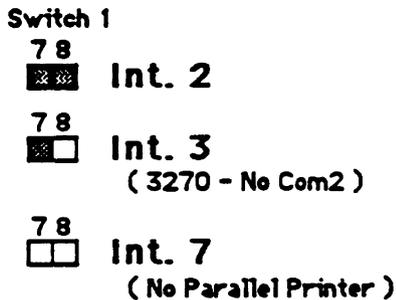
### Manufacturer's Permanent Setting



### Base Rom Address



### Interrupt Level



### Primary-Alternate Switch



## Token Ring Software:

The Token Ring Network can be accessed by using the program TOKREUI. When used in Banyan Network, with Intel Above Board, run "PCCONFIG" change ROM address from D8 to C0. The Token Ring Network Adapter may have an address conflict with another board, such as the IBM Enhanced Graphics Adapter and the Intel Above Board 286. Before changing the Base Rom Address switch setting on the Token Ring Network Adapter, try to modify the Base Address location with the Token Ring Software:

|               |                                      |                       |
|---------------|--------------------------------------|-----------------------|
| TOKREUI ,C200 | ( "TOKREUI" <space> <comma> "C200" ) | If still problem, try |
| TOKREUI ,C400 | ( "TOKREUI" <space> <comma> "C400" ) | " TOKREUI ,CA00 " and |
| TOKREUI ,C600 | ( "TOKREUI" <space> <comma> "C600" ) | " TOKREUI ,AA00 ".    |

## Notes:

The Token Ring Network Adapters come with a manual and a diagnostic diskette. Always run the diagnostic program after installing the board or when troubleshooting. However, depending on the version of the diagnostics, the d program may fail on the IBM XT/286 and some compatible computers. The best test is to see if it can access ti.

## Parity Checks

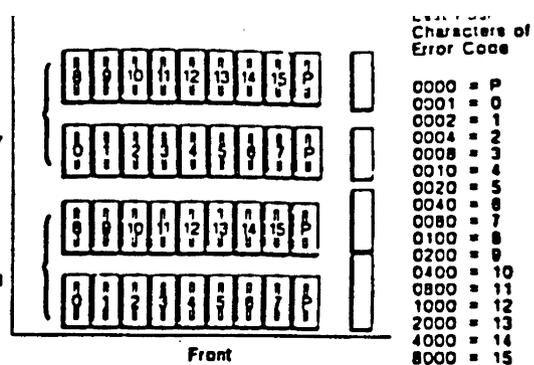
Parity Check 1 indicates a system board parity error.  
Parity Check 2 indicates a memory expansion adapter parity error.

## Memory Errors Bit/Bank Locations

| First Two Characters of Error Code  | Problem Area                     |
|-------------------------------------|----------------------------------|
| 00, 01, 02, or 03<br>04, 05, 06, 07 | System Board                     |
| 08 or 09                            | 128Kb Memory Expansion Adapter   |
| 10, 11, 12, 13,<br>14, 15, 16, 17   | 512Kb Memory Expansion Adapter 1 |
| 18, 19, 1A, 1B,<br>1C, 1D, 1E, 1F   | 512Kb Memory Expansion Adapter 2 |
| 20, 21, 22, 23,<br>24, 25, 26, 27   | 512Kb Memory Expansion Adapter 3 |
| 28, 29, 2A, 2B,<br>2C, 2D, 2E, 2F   | 512Kb Memory Expansion Adapter 4 |
| 30, 31, 32, 33,<br>34, 35, 36, 37   | 512Kb Memory Expansion Adapter 4 |

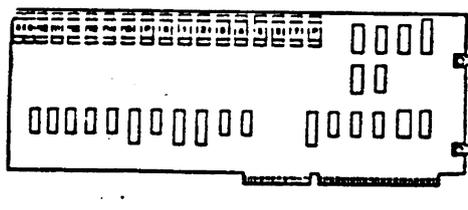
Bank 1  
04, 05  
08, or 07

Bank 0  
00, 01  
02, or 03



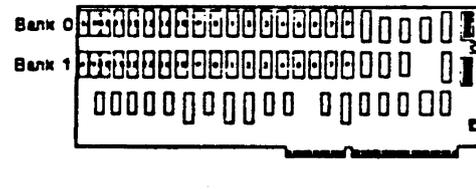
| Bank | Memory Expansion Adapter Switch Settings |    |     |     |     |     |    |     |
|------|------------------------------------------|----|-----|-----|-----|-----|----|-----|
|      | 1                                        | 2  | 3   | 4   | 5   | 6   | 7  | 8   |
| 0    | On                                       | On | On  | Off | On  | On  | On | On  |
| 1    | On                                       | On | On  | Off | On  | Off | On | Off |
| 0    | On                                       | On | On  | Off | Off | On  | On | On  |
| 1    | On                                       | On | On  | Off | Off | Off | On | Off |
| 0    | On                                       | On | Off | On  | On  | On  | On | On  |
| 1    | On                                       | On | Off | On  | Off | Off | On | Off |
| 0    | On                                       | On | Off | Off | On  | On  | On | On  |
| 1    | On                                       | On | Off | Off | On  | Off | On | Off |

Last Four Characters of Error Code



|      |      |
|------|------|
| 0000 | = P  |
| 0001 | = 0  |
| 0002 | = 1  |
| 0004 | = 2  |
| 0008 | = 3  |
| 0010 | = 4  |
| 0020 | = 5  |
| 0040 | = 6  |
| 0080 | = 7  |
| 0100 | = 8  |
| 0200 | = 9  |
| 0400 | = 10 |
| 0800 | = 11 |
| 1000 | = 12 |
| 2000 | = 13 |
| 4000 | = 14 |
| 8000 | = 15 |

Last Four Characters of Error Code

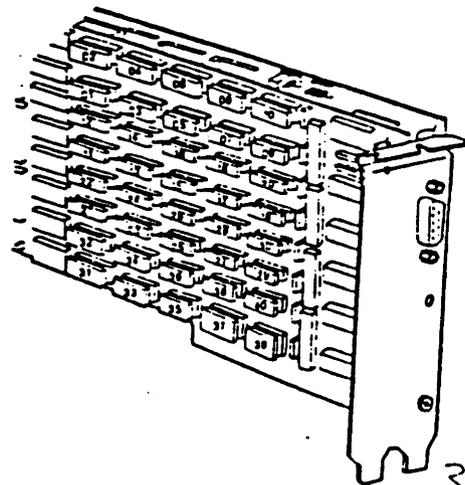


|      |      |
|------|------|
| 0000 | = F  |
| 0001 | = 0  |
| 0002 | = 1  |
| 0004 | = 2  |
| 0008 | = 3  |
| 0010 | = 4  |
| 0020 | = 5  |
| 0040 | = 6  |
| 0080 | = 7  |
| 0100 | = 8  |
| 0200 | = 9  |
| 0400 | = 10 |
| 0800 | = 11 |
| 1000 | = 12 |
| 2000 | = 13 |
| 4000 | = 14 |
| 8000 | = 15 |

## Professional Graphics Controller (PGC) Memory Errors

There are 40 replaceable memory modules on the PGC card. If a memory failure is found while the diagnostic test is running, a U XX error is posted to the screen. The XX in the error code will correspond to the failing memory module.

Use Figure 22-17 to locate the failing memory module for error U 31.



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### IBM PC/AT 128K MEMORY EXPANSION CARD

This card can be installed in any of the 16-bit slots in the PC or AT.

When running the AT setup program this card's memory must be added to the total base memory otherwise you will get a memory size error.

### IBM PC/AT 512K MEMORY EXPANSION CARD

This card can be installed in any of the 16-bit slots in the PC or AT.

You can have up to 5 of these boards installed in the system.

|           | Bank 0 |   |   |   |   |   |   |   | Bank 1 |   |   |   |   |   |   |   |
|-----------|--------|---|---|---|---|---|---|---|--------|---|---|---|---|---|---|---|
|           | 1      | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 1      | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 1st board | x      | x | x | - | x | x | x | x | x      | x | x | - | x | - | x | - |
| 2nd board | x      | x | x | - | - | x | x | x | x      | x | x | - | - | - | x | - |
| 3rd board | x      | x | - | x | x | x | x | x | x      | x | - | x | x | - | x | - |
| 4th board | x      | x | - | x | - | x | x | x | x      | x | x | - | x | - | - | x |
| 5th board | x      | x | - | - | x | x | x | x | x      | x | - | - | x | - | x | - |

x = on    - = off

### ADDING A SECOND HARD DRIVE IN THE PC/AT

The terminator pack must be removed on the second hard drive for proper operation.

The cover plate under the 1.2 Mb floppy drive must also be removed to install the drive.

It is not possible to have two hard drives, a 1.2 Mb floppy drive and a 360 floppy drive installed in the AT.

### SETTING THE TYPE OF MONITOR IN THE AT

There is a single switch located near the power supply which is used to set the type of monitor in the system.

Moving the switch to the forward position (closest to the front of the system) sets the system up to use a color monitor.

Moving the switch to the rear position (closest to the rear of the system) sets the system up to use a monochrome monitor.

### IBM 3270PC/PC/PC-XI EXTENDER CARD

This card must be installed in order to add an expansion unit to the 3270PC.

The switch settings on the extender card must reflect the total amount of memory installed in the system unit.

SWITCH 1    SWITCH 2    SWITCH 3    SWITCH 4

|      |     |     |     |     |
|------|-----|-----|-----|-----|
| 256K | ON  | OFF | ON  | ON  |
| 320K | ON  | OFF | ON  | OFF |
| 384K | ON  | OFF | OFF | ON  |
| 448K | ON  | OFF | OFF | OFF |
| 512K | OFF | ON  | ON  | ON  |
| 576K | OFF | ON  | ON  | OFF |
| 640K | OFF | ON  | OFF | ON  |

3-83

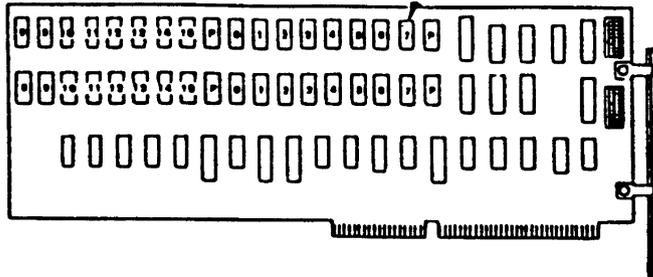
3-

copy

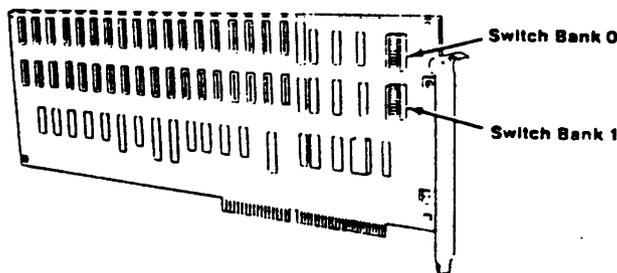
3

# 512KB Memory Expansion Option

PC040003



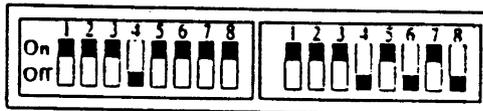
- 0000 = P
- 0001 = 0
- 0002 = 1
- 0004 = 2
- 0008 = 3
- 0010 = 4
- 0020 = 5
- 0040 = 6
- 0080 = 7
- 0100 = 8
- 0200 = 9
- 0400 = 10
- 0800 = 11
- 1000 = 12
- 2000 = 13
- 4000 = 14
- 8000 = 15



Switch Bank 0

Switch Bank 1

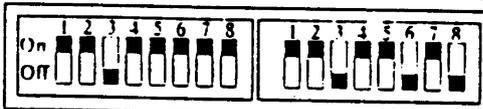
1st 512KB  
Memory  
Expansion  
Adapter



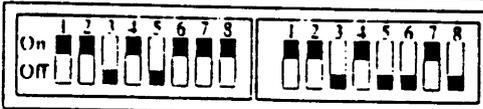
2nd 512KB  
Memory  
Expansion  
Adapter



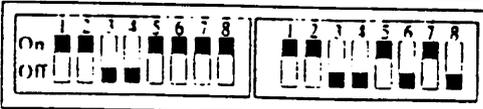
3rd 512KB  
Memory  
Expansion  
Adapter



4th 512KB  
Memory  
Expansion  
Adapter



5th 512KB  
Memory  
Expansion  
Adapter



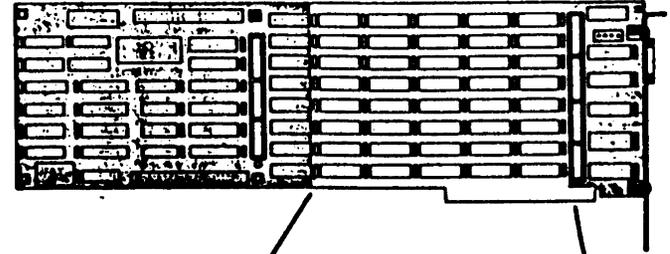


3-85

Match the U-XX error code with the module location in the following illustration, then replace the memory module (see Section 5).

5-86

3-

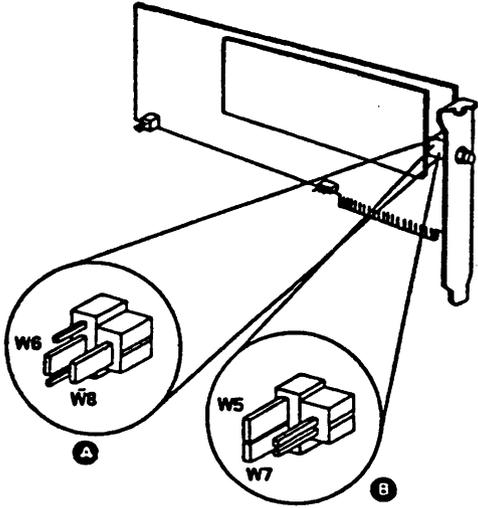


|     |     |     |     |     |
|-----|-----|-----|-----|-----|
| U2  | U4  | U6  | U8  | U10 |
| U1  | U3  | U5  | U7  | U9  |
| U12 | U14 | U16 | U18 | U20 |
| U11 | U13 | U15 | U17 | U19 |
| U22 | U24 | U26 | U28 | U30 |
| U21 | U23 | U25 | U27 | U29 |
| U32 | U34 | U36 | U38 | U40 |
| U31 | U33 | U35 | U37 | U39 |

Professional Graphics Adapter

3-87

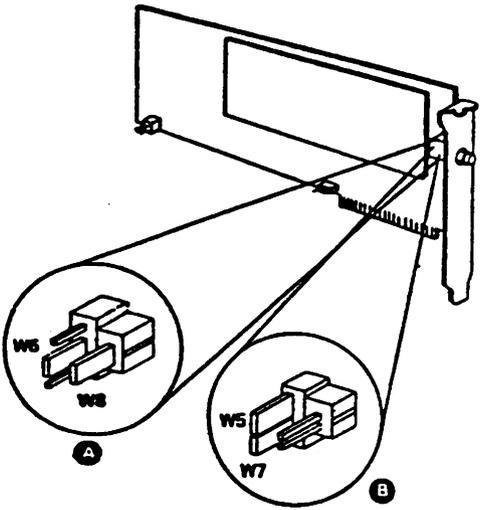
1. Set the Power switch on the system unit to Off.
2. Remove the cover on the system unit.
3. When one PC Network Adapter is installed make sure that W8 (the ROM enable jumper) is positioned as **A**.
4. When two PC Network Adapters are installed make sure that W8 is positioned as **A** in one adapter and W8 is removed as **B** in the other adapter.



CONTINUE

3-3000-2

07/31/84

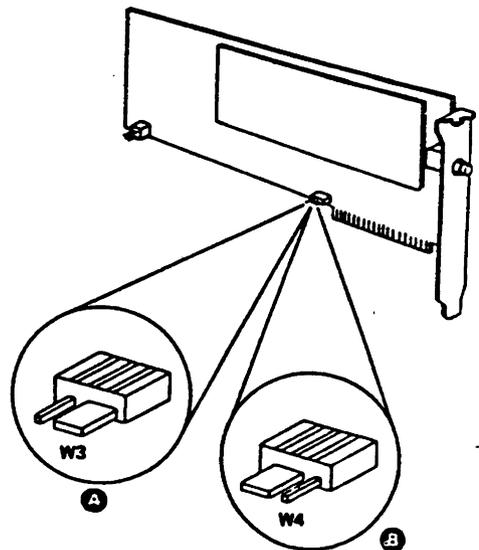


CONTINUE

07/31/84

3-3000-3

8. When W3 is jumpered as **A** the PC Network Adapter uses interrupt level 2.
9. When W4 is jumpered as **B** the PC Network Adapter uses interrupt level 3.
10. When two PC Network Adapters are installed make sure that one adapter is jumpered as **A** and the other as **B**.



IBM PC Network Adapter (3-88)

Install the covers, then continue.

3-

3-3000-4

07/31/84

The following figures list the possible PC Network errors. Take the action indicated if an error occurs.

| Error | Cause                         | Action                               |
|-------|-------------------------------|--------------------------------------|
| 3101  | Processor Error               | Replace Primary PC Network Adapter   |
| 3102  | ROM Failure                   | Replace Primary PC Network Adapter   |
| 3103  | ID Failure                    | Replace Primary PC Network Adapter   |
| 3104  | RAM Failure                   | Replace Primary PC Network Adapter   |
| 3105  | Host Interrupt Failure        | Replace Primary PC Network Adapter   |
| 3106  | + or - 12-Volt Failure        | Replace Primary PC Network Adapter   |
| 3107  | Digital Wrap Failure          | Replace Primary PC Network Adapter   |
| 3108  | Host Interrupt Failure        | Replace Primary PC Network Adapter   |
| 3109  | Sync Failure                  | Replace Primary PC Network Adapter   |
| 3110  | Time Out Failure              | Replace Primary PC Network Adapter   |
| 3111  | Time Out Failure              | Replace Primary PC Network Adapter   |
| 3112  | Digital Failure               | Replace PC Network Adapter           |
| 3113  | Digital Failure               | Replace Alternate PC Network Adapter |
| 3114  | Digital Failure               | Replace Alternate PC Network Adapter |
| 3115  | Analog Failure (RF)           | Go to page 3-3000-13                 |
| 3120  | ROM BIOS Failure              | Go to page 3-3000-11                 |
| 3141* | Continuous RF signal detected | Go to page 3-3000-13                 |
| 3142* | Continuous RF signal sent     | Replace Primary PC Network Adapter   |

\* If a 3041 or 3042 error occurs with the cover removed, install the cover and re-run the test. If the error remains, take the action indicated in the figure above.

CONTINUE

3-3000-8

June 8, 1985

| Error | Cause                         | Action                               |
|-------|-------------------------------|--------------------------------------|
| 3101  | Processor Error               | Replace Alternate PC Network Adapter |
| 3102  | ROM Failure                   | Replace Alternate PC Network Adapter |
| 3103  | ID Failure                    | Replace Alternate PC Network Adapter |
| 3104  | RAM Failure                   | Replace Alternate PC Network Adapter |
| 3105  | Host Interrupt Failure        | Replace Alternate PC Network Adapter |
| 3106  | + or - 12-Volt Failure        | Replace Alternate PC Network Adapter |
| 3107  | Digital Wrap Failure          | Replace Alternate PC Network Adapter |
| 3108  | Host Interrupt Failure        | Replace Alternate PC Network Adapter |
| 3109  | Sync Failure                  | Replace Alternate PC Network Adapter |
| 3110  | Time Out Failure              | Replace Alternate PC Network Adapter |
| 3111  | Time Out Failure              | Replace Alternate PC Network Adapter |
| 3112  | Digital Failure               | Replace PC Network Adapter           |
| 3113  | Digital Failure               | Replace Alternate PC Network Adapter |
| 3114  | Digital Failure               | Replace Alternate PC Network Adapter |
| 3115  | Analog Failure (RF)           | Go to page 3-3000-13                 |
| 3120  | ROM BIOS Failure              | Go to page 3-3000-11                 |
| 3141* | Continuous RF signal detected | Go to page 3-3000-13                 |
| 3142* | Continuous RF signal sent     | Replace Alternate PC Network Adapter |

\* If a 3141 or 3142 error occurs with the cover removed, install the cover and re-run the test. If the error remains, take the action indicated in the figure above.

PC NETWORK

June 8, 1985

3-3000-9

3-89

( PC79 )

IBM 5250 EMULATION BOARD  
2 SWITCH BLOCKS

| 6 POSITION SWITCH |     |     |                  |
|-------------------|-----|-----|------------------|
| 1                 | 2   | 3   | TERMINAL ADDRESS |
| OFF               | OFF | OFF | 0                |
| OFF               | OFF | ON  | 1                |
| OFF               | ON  | OFF | 2                |
| OFF               | ON  | ON  | 3                |
| ON                | OFF | OFF | 4                |
| ON                | OFF | ON  | 5                |
| ON                | ON  | OFF | 6                |
| ON                | ON  | ON  | 7 (INVALID)      |

| 4   |     | 5 | TERMINATED (LAST TERMINAL ON CABLE)<br>NOT TERMINATED (CABLE THRU) |
|-----|-----|---|--------------------------------------------------------------------|
| ON  | ON  |   |                                                                    |
| OFF | OFF |   |                                                                    |

| 6   | INTERRUPT #5 |
|-----|--------------|
| ON  | INTERRUPT #3 |
| OFF |              |

| 8 POSITION SWITCH |                     |
|-------------------|---------------------|
| * 1               | - OFF               |
| * 2               | - ON                |
| * 3               | - ON                |
| * 4               | - OFF               |
| * 5               | - ON                |
| * 6               | - OFF               |
| * 7               | - ON                |
| 8                 | - ON - INTERRUPT #3 |
|                   | OFF - INTERRUPT #5  |

\* = DEFAULT

3-

3-90

3-91

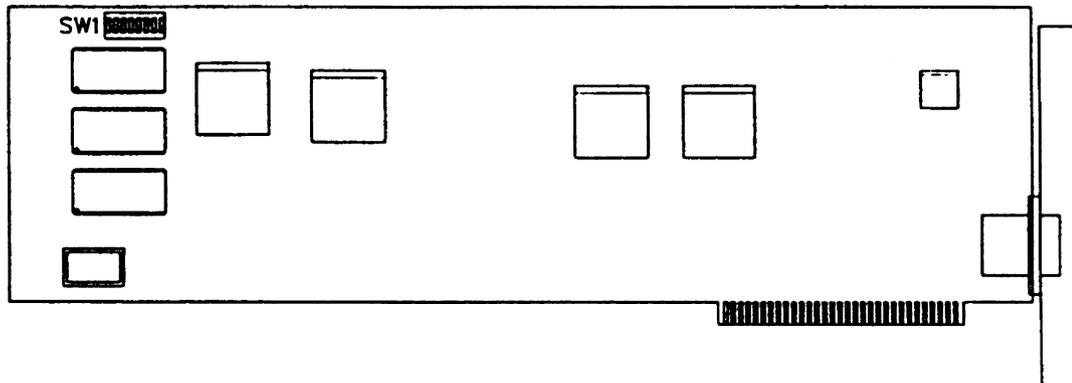
## ENHANCED DISPLAY STATION ADAPTER (PC000375)

MANUFACTURER PART NO. 6403630

### INSTALLATION INSTRUCTION SHEET

#### CAUTION

Static sensitive device. Handle only at a static-free workstation or use an antistatic service kit. Package the device in a conductive bag with an insulated antistatic liner.



#### SWITCHES:

SW1 selects the I/O mapped command address. Normally not changed from the default settings. Positions 7 and 8 are reserved for unnamed future use and should be left off. Default settings are 1 and 6 on; 2, 3, 4, 5, 7, and 8 off. This allows the program to use I/O address 271X. Any other setting should be copied from the original card or determined by the customer. Refer to chapter 8 of the Maintenance and Technical Reference Manual (G570-2200) for details.

**JUMPERS:** None

**SPECIAL TOOLS:** None

#### INSTALLATION

Create a diagnostic diskette by copying both your existing diagnostic diskette and enhanced emulator adapter diagnostic diskette to a formatted blank. Verify switch settings and install the card. Attach the cable assembly (PC501) to the card and to the twinax cable from the customer's system. Run diagnostics for device 35 both offline and online. The host must be operating and configured for the adapter (device address in workstation configuration) to run the online test. Get the display station address from the system operator.

#### SOFTWARE

This card requires the Enhanced 5250 Emulation Program.

#### DIAGNOSTICS

A diagnostic diskette (IBM P/N 6403636) is normally included in the customer's installation manual. The file D5250US.DGS should be copied to your advanced diagnostic diskette.

#### ASSOCIATED PART NUMBERS

|       |                    |                                                              |
|-------|--------------------|--------------------------------------------------------------|
| PC501 | Cable asm          | 15-pin to twinax adapter                                     |
| PC502 | Emulator conv. kit | Emulator board with cable adapter, T-connector and software. |

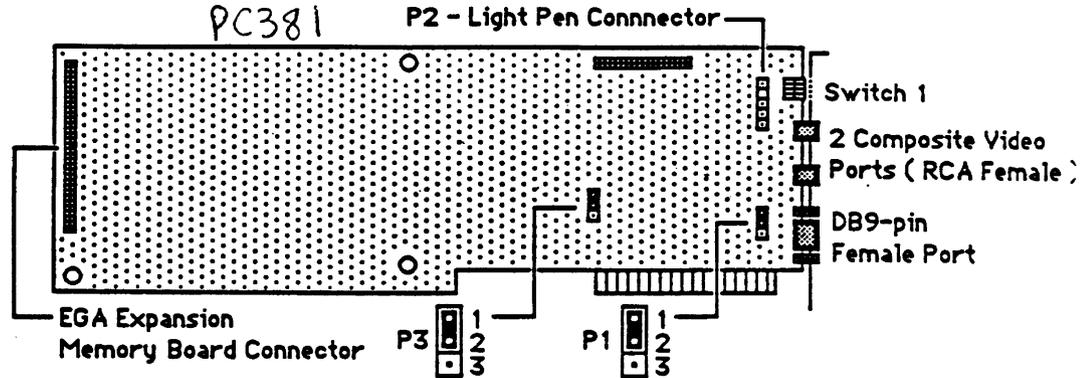
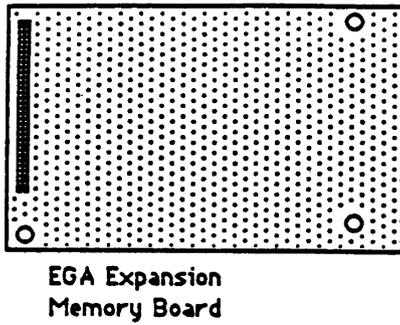
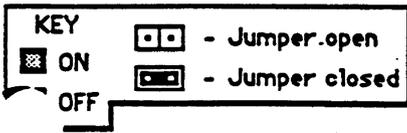
Part numbers used by IBM for the same card: 6403690, 55X3367, 55X3365

PC000375



3-93

# IBM Enhanced Graphics Adapter



The IBM Enhanced Graphics Adapter is a video display board for IBM PC ( New RCM BIOS only ), XT and AT type computers. It can drive either a monochrome, color, or enhanced color display. The board must be set up with jumpers P1 and P3 and Switch Block 1 correctly to drive the monitor it is connected to. The board comes with 64 KB Ram for graphics memory. It has an option for a Graphics Memory Expansion Board to increase graphics memory to 256 KB Ram.

Set jumpers P1 and P3 correctly. This is important, an improper setting can damage the board or the monitor.

**IBM PC, XT Setup:**

- \*Set System Board Switch Block 1 as follows:
- Switch 1
- 5 6
- Enhanced Color Adapter

**IBM AT Setup:**

- \*Set the System Board Video Switch for color:
- Color  towards front of the AT
- \*Boot the IBM AT Diagnostics and run option 4 for Setup.

| Monitor Type                        | P3                                                                                                | P1                                                                                                |
|-------------------------------------|---------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|
| Color Display or Monochrome Display | <input type="checkbox"/> 1<br><input checked="" type="checkbox"/> 2<br><input type="checkbox"/> 3 | <input type="checkbox"/> 1<br><input checked="" type="checkbox"/> 2<br><input type="checkbox"/> 3 |
| Enhanced Color Display              | <input type="checkbox"/> 1<br><input checked="" type="checkbox"/> 2<br><input type="checkbox"/> 3 | <input type="checkbox"/> 1<br><input checked="" type="checkbox"/> 2<br><input type="checkbox"/> 3 |

**EGA is the only display adapter:**

| Switch 1<br>1 2 3 4                                                                                                       | Type of Monitor connected to the EGA Board |
|---------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|
| <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>                       | Monochrome                                 |
| <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>            | Color 40 x 25                              |
| <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>            | Color 80 x 25                              |
| <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | Enhanced Color ( Normal Mode )             |
| <input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> | Enhanced Color ( Enhanced Mode )           |

**EGA is the Primary Display Adapter, with Color Graphics Adapter Secondary:**

The EGA must be connected to a monochrome display.

| Switch 1<br>1 2 3 4                                                                                            | Type of Monitor connected to the |                    |
|----------------------------------------------------------------------------------------------------------------|----------------------------------|--------------------|
|                                                                                                                | EGA Board                        | COLOR GRAPHICS AD. |
| <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | Monochrome                       | Color 40 x 25      |
| <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | Monochrome                       | Color 80 x 25      |

**Color Graphics Adapter is the Primary Adapter, with the EGA as Secondary:**

The EGA must be connected to a monochrome display.

| Switch 1<br>1 2 3 4                                                                                            | Type of Monitor connected to the |                    |
|----------------------------------------------------------------------------------------------------------------|----------------------------------|--------------------|
|                                                                                                                | EGA Board                        | COLOR GRAPHICS AD. |
| <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | Mono. or none                    | Color 40 x 25      |
| <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> | Mono. or none                    | Color 80 x 25      |

**EGA is the Primary Display Adapter, with the Monochrome Display/Printer Adapter Secondary:**

The EGA must be connected to a color display.

| Switch 1<br>1 2 3 4                                                                                                       | Type of Monitor connected to the |                    |
|---------------------------------------------------------------------------------------------------------------------------|----------------------------------|--------------------|
|                                                                                                                           | EGA Board                        | Monochrome Ad.     |
| <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>            | Color 40 x 25                    | Monochrome or none |
| <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>            | Color 80 x 25                    | Monochrome or none |
| <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | Enhanced Color ( Normal Mode )   | Monochrome or none |
| <input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> | Enhanced Color ( Enhanced Mode ) | Monochrome or none |

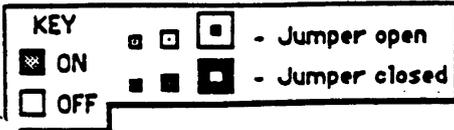
**Monochrome Display/Printer Adapter is the Primary Adapter, with the EGA Board Secondary:**

The EGA must be connected to a color display.

| Switch 1<br>1 2 3 4                                                                                                       | Type of Monitor connected to the |                |
|---------------------------------------------------------------------------------------------------------------------------|----------------------------------|----------------|
|                                                                                                                           | EGA Board                        | Monochrome Ad. |
| <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | Color 40 x 25                    | Monochrome     |
| <input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> | Color 80 x 25                    | Monochrome     |
| <input checked="" type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> | Enhanced Color ( Normal Mode )   | Monochrome     |
| <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> | Enhanced Color ( Enhanced Mode ) | Monochrome     |

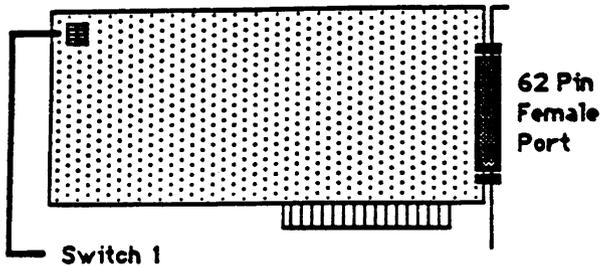
# IBM Expansion Unit

JWG387



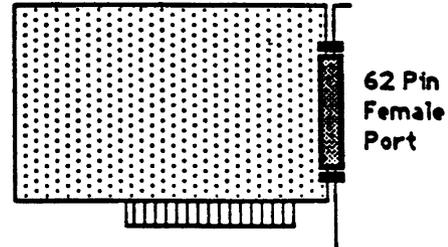
## Expansion Unit Extender Card

( Installed in the IBM PC )



## Expansion Unit Receiver Card

( Installed in the IBM Expansion Unit )

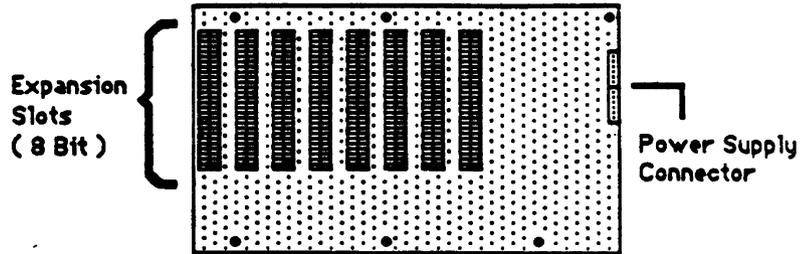


## Extender Card Switch Settings for Total System Memory

| Switch 1                           | Memory Range |
|------------------------------------|--------------|
| 1 2 3 4<br>[ON] [OFF] [OFF] [OFF]  | 16K to 64K   |
| 1 2 3 4<br>[ON] [ON] [OFF] [OFF]   | 96K to 128K  |
| 1 2 3 4<br>[ON] [ON] [ON] [OFF]    | 160K to 192K |
| 1 2 3 4<br>[ON] [ON] [ON] [ON]     | 224K to 256K |
| 1 2 3 4<br>[OFF] [OFF] [OFF] [OFF] | 288K to 320K |
| 1 2 3 4<br>[OFF] [OFF] [ON] [OFF]  | 352K to 384K |
| 1 2 3 4<br>[OFF] [OFF] [ON] [ON]   | 416K to 448K |
| 1 2 3 4<br>[OFF] [ON] [ON] [ON]    | 480K to 512K |
| 1 2 3 4<br>[OFF] [ON] [ON] [OFF]   | 544K to 576K |
| 1 2 3 4<br>[OFF] [ON] [OFF] [ON]   | 608K to 640K |

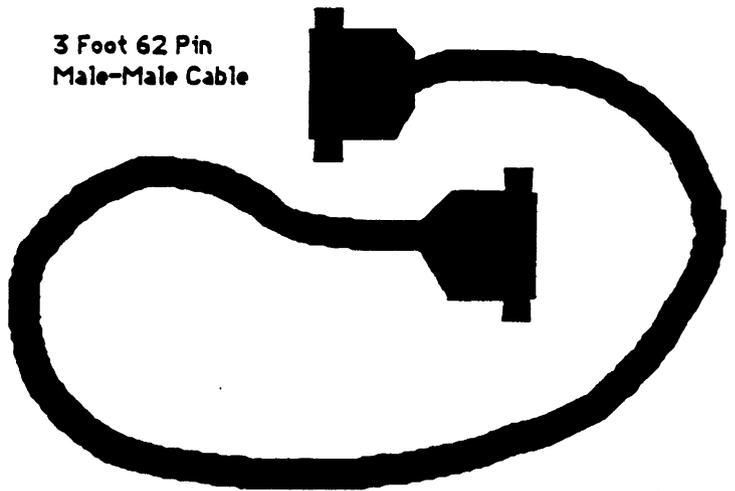
## IBM Expansion Unit Expansion Board

( Back of Expansion Unit )



## IBM Expansion Unit Cable

3 Foot 62 Pin Male-Male Cable

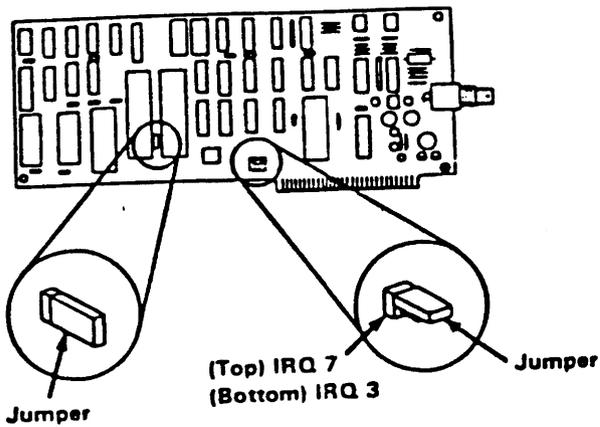


The IBM Expansion Unit was introduced in 1983 to primarily give older IBM PCs the capability to access a hard disk drive. The unit looks on the outside like a regular IBM PC or XT. The front label says IBM Expansion Unit. Features:

- 135 Watt Power Supply
- No System Board, but an Expansion Board that has 8 8 bit Expansion slots like the IBM XT.
- A Receiver Board to install in the Expansion Unit.
- An Extender Board to install in the IBM PC computer that has a switch block to select total system memory.
- A 3 foot 62 Pin Male to Male Cable.

For the Expansion Unit to work the IBM PC computer must have the new Rom Bios Chip PN # 1501476 - 1981, 1983. It is important to note that the Expansion Unit should be powered on before the IBM PC computer. If it is done the other way, an 1801 error will occur.

# Cluster Adapter



| Station Address | Switch Block 1 | Station Address | Switch Block 1 |
|-----------------|----------------|-----------------|----------------|
| 0               |                | 11              |                |
| 1               |                | 12              |                |
| 2               |                | 13              |                |
| 3               |                | 14              |                |
| 4               |                | 15              |                |
| 5               |                | 16              |                |
| 6               |                | 17              |                |
| 7               |                | 18              |                |
| 8               |                | 19              |                |
| 9               |                | 20              |                |
| 10              |                | 21              |                |

The following figure shows the setting for switch 8 of switch block 1. When this switch is set to ON, the Personal Computer will request an Initial Program Load (IPL) from another station in the cluster. This request delays the completion of POST by 30 seconds.

|                                               |  |
|-----------------------------------------------|--|
| Remote IPL ON<br>Switch Block 1,<br>Switch 8  |  |
| Remote IPL OFF<br>Switch Block 1,<br>Switch 8 |  |

LD1-0276

Figure 28-23. Switch 8, Switch Block 1

The following figure shows the settings for switches 1 through 4 of switch block 2 for adapters 1 through 4.

Switches 5 through 8 of switch block 2 are always set to OFF. If one Cluster Adapter is installed in an IBM Personal Computer, it must be set as adapter 1. Each additional adapter must have a different Cluster Adapter number.

|                                              |  |
|----------------------------------------------|--|
| Select Adapter 1<br>Switch Block 2, Switch 1 |  |
| Select Adapter 2<br>Switch Block 2, Switch 2 |  |
| Select Adapter 3<br>Switch Block 2, Switch 3 |  |
| Select Adapter 4<br>Switch Block 2, Switch 4 |  |

LD1-0277

Figure 28-24. Cluster Switches 1 - 4, Switch Block 2, Adapters 1 to 4

| Station Address | Switch Block 1 | Station Address | Switch Block 1 |
|-----------------|----------------|-----------------|----------------|
| 22              |                | 33              |                |
| 23              |                | 34              |                |
| 24              |                | 35              |                |
| 25              |                | 36              |                |
| 26              |                | 37              |                |
| 27              |                | 38              |                |
| 28              |                | 39              |                |
| 29              |                | 40              |                |
| 30              |                | 41              |                |
| 31              |                | 42              |                |
| 32              |                | 43              |                |

| Station Address | Switch Block 1 | Station Address | Switch Block 1 |
|-----------------|----------------|-----------------|----------------|
| 44              |                | 54              |                |
| 45              |                | 55              |                |
| 46              |                | 56              |                |
| 47              |                | 57              |                |
| 48              |                | 58              |                |
| 49              |                | 59              |                |
| 50              |                | 60              |                |
| 51              |                | 61              |                |
| 52              |                | 62              |                |
| 53              |                | 63              |                |

3-96  
1 0 7



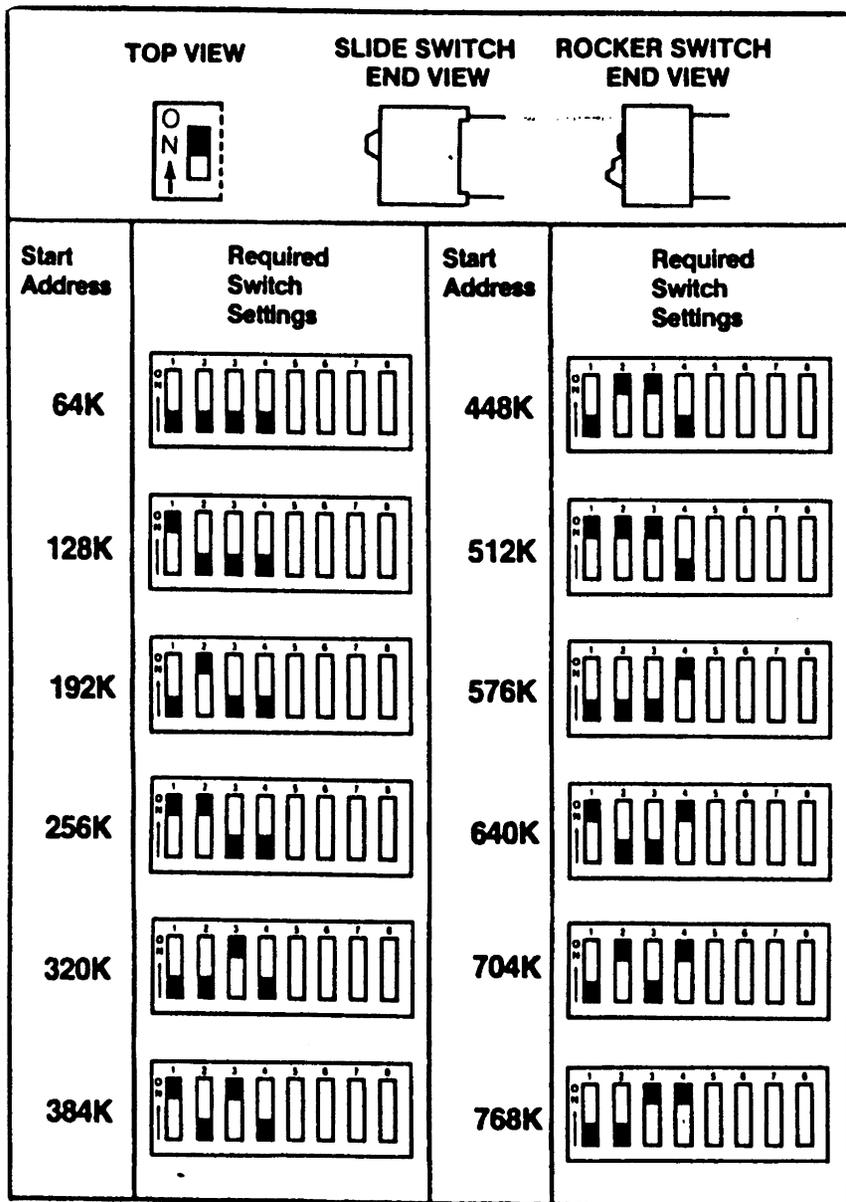


Figure 6. STC Switch Settings for the Memory Starting Address. (For the UPGRADED PC, the Starting Address Must Be 256K).

After you set these switches, you are ready to install the STC module in the system unit UNLESS your module contains an optional function. If your module is equipped with an optional communications channel or the parallel printer port, read the following subsection.

STC-10

**INTERRUPT LEVELS**

The calendar/clock can operate with interrupt levels; however, interrupts occur only if enabled by a user-supplied program. Figure 27 shows the jumper placements for selecting interrupt levels.

3-98

3-6.1

| LEVEL                 | CALENDAR/CLOCK | ASYNC COMM CHANNEL | PARALLEL PRINTER |
|-----------------------|----------------|--------------------|------------------|
| 2                     |                |                    |                  |
| 3<br>*STD FOR COM 2   |                |                    |                  |
| 4<br>*STD FOR COM 1   |                |                    |                  |
| 5                     |                |                    |                  |
| 7<br>*IBM STD FOR LPT |                |                    |                  |

Figure 27. Jumper Placements to Select Interrupt Levels

STC BOARD

STC-35



RAM+ installation procedure.

**SYSTEM BOARD SETUP.** There must be 64K installed on the IBM system board, and positions 3 and 4 of Switch 1 must be OFF. Positions 1 through 4 of Switch 2 set the amount of system memory added (above the first 64K) in units of 32K. If you're into binary, position 1 is the least significant bit and ON is a zero; Table 1 enumerates the possibilities. The setting for system memory must be less than total memory if you're using FLASH DISK.

**RAM+ SETUP.** The starting address of the RAM+ memory is set with positions 4 through 8 of the RAM+ DIP switch. Corresponding address bits are marked above the switch, "A19," ..., "A15"; turning a position ON is a one. Use Table 2.

The other three positions of the switch tell the RAM+ its capacity. These MUST be changed if memory chips are added to or deleted from the board. Table 3 shows settings.

Four blue jumpers set additional RAM+ options. SERIAL PORT and PARITY ERROR REPORT should normally both be ON. PORT and IRQ should both either be in the COM1 position or the COM2 position, depending on your choice for referencing the serial port.

| System memory | Switch 2 |     |     |     |
|---------------|----------|-----|-----|-----|
|               | 1        | 2   | 3   | 4   |
| 64K           | on       | on  | on  | on  |
| 96K           | off      | on  | on  | on  |
| 128K          | on       | off | on  | on  |
| 160K          | off      | off | on  | on  |
| 192K          | on       | on  | off | on  |
| 224K          | off      | on  | off | on  |
| 256K          | on       | off | off | on  |
| 288K          | off      | off | off | on  |
| 320K          | on       | on  | on  | off |
| 352K          | off      | on  | on  | off |
| 384K          | on       | off | on  | off |
| 416K          | off      | off | on  | off |
| 448K          | on       | on  | off | off |
| 480K          | off      | on  | off | off |
| 512K          | on       | off | off | off |
| 544K          | off      | off | off | off |

TABLE 1. Setting amount of system memory on Switch 2 of the IBM System Board. Does not include memory for FLASH DISK.

RAM+ 5-2

Seattle RAM+

| Size of RAM+ board | 1 S1 | 2 S0 | 3 E | Hexadecimal memory address |
|--------------------|------|------|-----|----------------------------|
| 64K                | off  | off  | off | 10000                      |
| 96K                | off  | off  | off | 18000                      |
| 128K               | off  | off  | on  | 20000                      |
| 160K               | off  | off  | on  | 28000                      |
| 192K               | off  | off  | on  | 30000                      |
| 224K               | off  | off  | on  | 38000                      |
| 256K               | off  | on   | off | 40000                      |
| 288K               | off  | on   | off | 48000                      |
| 320K               | off  | on   | off | 50000                      |
| 352K               | off  | on   | off | 58000                      |
| 384K               | off  | on   | off | 60000                      |
| 416K               | off  | on   | off | 68000                      |
| 448K               | off  | on   | on  | 70000                      |
| 480K               | off  | on   | on  | 78000                      |
| 512K               | on   | off  | off | 80000                      |
| 544K               | on   | off  | off | 88000                      |

TABLE 2. Setting starting address of RAM+ memory on the RAM+ DIP switch.

| Number of columns of memory chips | Size of RAM+ board | 1 S1 | 2 S0 | 3 E |
|-----------------------------------|--------------------|------|------|-----|
| 0                                 | 0                  | off  | off  | off |
| 1                                 | 64K                | off  | off  | on  |
| 2                                 | 128K               | off  | on   | on  |
| 3                                 | 192K               | on   | off  | on  |
| 4                                 | 256K               | on   | on   | on  |

TABLE 3. Setting memory capacity of RAM+ board on the RAM+ DIP switch.

RAM+ installation procedure.

**SYSTEM BOARD SETUP.** There must be 64K installed on the IBM system board, and positions 3 and 4 of Switch 1 must be OFF. Positions 1 through 4 of Switch 2 set the amount of system memory added (above the first 64K) in units of 32K. If you're into binary, position 1 is the least significant bit and ON is a zero; Table 1 enumerates the possibilities. The setting for system memory must be less than total memory if you're using FLASH DISK.

**RAM+ SETUP.** The starting address of the RAM+ memory is set with positions 4 through 8 of the RAM+ DIP switch. Corresponding address bits are marked above the switch, "A19," ..., "A15"; turning a position ON is a one. Use Table 2.

The other three positions of the switch tell the RAM+ its capacity. These MUST be changed if memory chips are added to or deleted from the board. Table 3 shows settings.

Four blue jumpers set additional RAM+ options. SERIAL PORT and PARITY ERROR REPORT should normally both be ON. PORT and IRQ should both either be in the COM1 position or the COM2 position, depending on your choice for referencing the serial port.

| System memory | Switch 2 |     |     |     |
|---------------|----------|-----|-----|-----|
|               | 1        | 2   | 3   | 4   |
| 64K           | on       | on  | on  | on  |
| 96K           | off      | on  | on  | on  |
| 128K          | on       | off | on  | on  |
| 160K          | off      | off | on  | on  |
| 192K          | on       | on  | off | on  |
| 224K          | off      | on  | off | on  |
| 256K          | on       | off | off | on  |
| 288K          | off      | off | off | on  |
| 320K          | on       | on  | on  | off |
| 352K          | off      | on  | on  | off |
| 384K          | on       | off | on  | off |
| 416K          | off      | off | on  | off |
| 448K          | on       | on  | off | off |
| 480K          | off      | on  | off | off |
| 512K          | on       | off | off | off |
| 544K          | off      | off | off | off |

TABLE 1. Setting amount of system memory on Switch 2 of the IBM System Board. Does not include memory for FLASH DISK.

RAM+ 5-2

| Amount of memory already in machine | A19 | A18 | A17 | A16 | A15 | Hexadecimal memory address |
|-------------------------------------|-----|-----|-----|-----|-----|----------------------------|
| 64K                                 | off | off | off | on  | off | 10000                      |
| 96K                                 | off | off | off | on  | on  | 18000                      |
| 128K                                | off | off | on  | off | off | 20000                      |
| 160K                                | off | off | on  | off | on  | 28000                      |
| 192K                                | off | off | on  | on  | off | 30000                      |
| 224K                                | off | off | on  | on  | on  | 38000                      |
| 256K                                | off | on  | off | off | off | 40000                      |
| 288K                                | off | on  | off | off | on  | 48000                      |
| 320K                                | off | on  | off | on  | off | 50000                      |
| 352K                                | off | on  | off | on  | on  | 58000                      |
| 384K                                | off | on  | on  | off | off | 60000                      |
| 416K                                | off | on  | on  | off | on  | 68000                      |
| 448K                                | off | on  | on  | on  | off | 70000                      |
| 480K                                | off | on  | on  | on  | on  | 78000                      |
| 512K                                | on  | off | off | off | off | 80000                      |
| 544K                                | on  | off | off | off | on  | 88000                      |

TABLE 2. Setting starting address of RAM+ memory on the RAM+ DIP switch.

| Number of columns of memory chips | Size of RAM+ board | 1 S1 | 2 S0 | 3 E |
|-----------------------------------|--------------------|------|------|-----|
| 0                                 | 0                  | off  | off  | off |
| 1                                 | 64K                | off  | off  | on  |
| 2                                 | 128K               | off  | on   | on  |
| 3                                 | 192K               | on   | off  | on  |
| 4                                 | 256K               | on   | on   | on  |

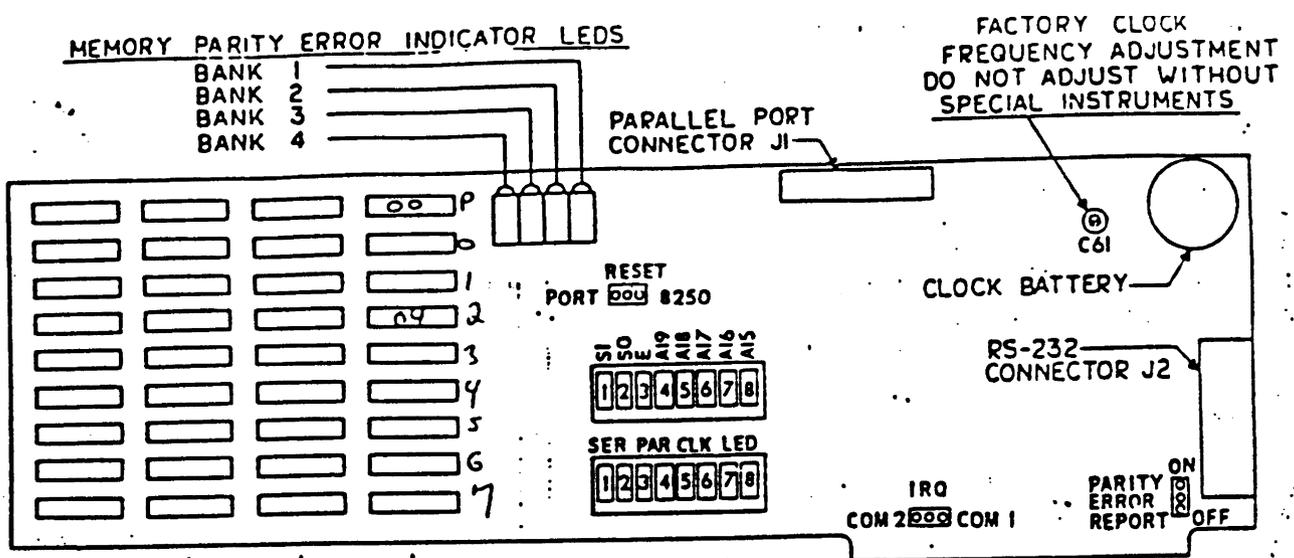
TABLE 3. Setting memory capacity of RAM+ board on the RAM+ DIP switch.

3-100

RAM+ 5-3



3-101



# RAM +3 MULTI CARD

PC131

**MEMORY CONFIGURATION**

| Amount of memory already in machine | 4<br>A19 | 5<br>A18 | 6<br>A17 | 7<br>A16 | 8<br>A15 | Hexadecimal memory address |
|-------------------------------------|----------|----------|----------|----------|----------|----------------------------|
| 64K                                 | off      | off      | off      | on       | off      | 10000                      |
| 96K                                 | off      | off      | off      | on       | on       | 18000                      |
| 128K                                | off      | off      | on       | off      | off      | 20000                      |
| 160K                                | off      | off      | on       | off      | on       | 28000                      |
| 192K                                | off      | off      | on       | on       | off      | 30000                      |
| 224K                                | off      | off      | on       | on       | on       | 38000                      |
| 256K                                | off      | on       | off      | off      | off      | 40000                      |
| 288K                                | off      | on       | off      | off      | on       | 48000                      |
| 320K                                | off      | on       | off      | on       | off      | 50000                      |
| 352K                                | off      | on       | off      | on       | on       | 58000                      |
| 384K                                | off      | on       | on       | off      | off      | 60000                      |
| 416K                                | off      | on       | on       | off      | on       | 68000                      |
| 448K                                | off      | on       | on       | on       | off      | 70000                      |
| 480K                                | off      | on       | on       | on       | on       | 78000                      |
| 512K                                | on       | off      | off      | off      | off      | 80000                      |
| 544K                                | on       | off      | off      | off      | on       | 88000                      |

| SERIAL |     | Function            |
|--------|-----|---------------------|
| 1      | 2   |                     |
| on     | on  | COM1                |
| off    | on  | COM2                |
| on     | off | Serial port disable |
| off    | off | Serial port disable |

TABLE 2. Setting starting address of RAM+3 memory on the upper RAM+3 DIP switch

| Number of columns of memory chips | Size of RAM+3 board | PARALLEL |         |        |
|-----------------------------------|---------------------|----------|---------|--------|
|                                   |                     | 1<br>S1  | 2<br>S0 | 3<br>Z |
| 0                                 | 0                   | off      | off     | off    |
| 1                                 | 64K                 | off      | off     | on     |
| 2                                 | 128K                | off      | on      | on     |
| 3                                 | 192K                | on       | off     | on     |
| 4                                 | 256K                | on       | on      | on     |

| PARALLEL |     | Function                   |
|----------|-----|----------------------------|
| 3        | 4   |                            |
| on       | on  | Normal printer adapter     |
| off      | on  | Alternate printer adapter  |
| on       | off | Monochrome printer adapter |
| off      | off | Parallel port disabled     |

TABLE 3. Setting memory capacity of the RAM+3 on the upper RAM+3 DIP switch.

3-102

3-103

# RAM I/O Switch Settings

The STB RAM I/O board has two sets of switches (SW1 and SW2) located near the bottom edge of the board. The switches are used to configure the RIO board for your particular application. Switch SW1 is a 7 or 8 section switch (only sections 1-6 are actually connected) used to enable, disable, or offset each of the three I/O sections of the RIO board (serial/parallel/game). Switch SW2 is a 4 section switch that is used to set the starting address of the memory array on the RIO board. The function of each section of the switches is outlined below:

**SW1-1: Game paddle adapter offset**—In the OFF position the game paddle adapter circuitry will respond to I/O instructions at address 201H. This is the IBM standard device address. In the ON position the game paddle adapter will respond to address 200H. This allows multiple game paddle adapters to be used in custom applications.

**SW1-2: Serial adapter offset**—In the OFF position the asynchronous serial adapter circuitry will respond as the COM1: channel (3F8H-3FFH). In the ON position the serial adapter will respond as the COM2: channel (2F8-2FFH).

**SW1-3: Parallel port enable**—In the ON position the parallel I/O adapter circuitry will be enabled. In the OFF position the parallel I/O circuitry will be totally disabled and will not respond to any I/O accesses.

**SW1-4: Game paddle adapter enable**—In the ON position the game paddle adapter circuitry will be enabled. In the OFF position the circuitry will be totally disabled and will not respond to any I/O accesses.

**SW1-5: Serial adapter enable**—In the ON position the asynchronous serial adapter circuitry will be enabled. In the OFF position the serial adapter will be totally disabled and will not respond to any I/O accesses.

**SW1-6: Parallel I/O adapter offset**—In the OFF position the parallel I/O adapter will respond to the I/O addresses of 378-37BH. This is device LPT1: (LPT2: if the system contains a monochrome video adapter/printer adapter board). In the ON position the parallel I/O circuitry will respond at I/O addresses 278-27BH (LPT2: or LPT3: with the monochrome board). This allows up to three parallel ports in the system.

## SWITCH 2

SW2 is used to set the starting address of the 256K memory block that the RIO board responds to. The block may start on any 32K boundary. Positions 1 through 4 correspond to address bits 1-3 through A16 respectively. Use the table below to set SW2 based upon how much memory your system board and additional memory adapters (not including the memory on the RIO board) contain:

| SWITCH POSITION | 1   | 2   | 3   | 4   | ADDR   |
|-----------------|-----|-----|-----|-----|--------|
| PREVIOUS MEMORY |     |     |     |     |        |
| 64K.....        | OFF | OFF | OFF | ON  | 10000H |
| 128K.....       | OFF | OFF | ON  | OFF | 20000H |
| 192K.....       | OFF | ON  | ON  | ON  | 30000H |
| 256K.....       | OFF | ON  | OFF | OFF | 40000H |
| 320K.....       | OFF | ON  | OFF | ON  | 50000H |
| 384K.....       | OFF | ON  | ON  | OFF | 60000H |
| 448K.....       | OFF | ON  | ON  | ON  | 70000H |
| 512K.....       | ON  | OFF | OFF | OFF | 80000H |
| 576K.....       | ON  | OFF | OFF | ON  | 90000H |

For most systems in which the RIO board is the only memory on the board in the system (besides the disk and video adapters, then the switches on the RIO board will look like this:

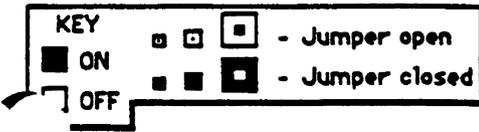
|      |     |     |     |    |    |     |   |   |
|------|-----|-----|-----|----|----|-----|---|---|
| SW 1 | 1   | 2   | 3   | 4  | 5  | 6   | 7 | 8 |
|      | OFF | OFF | ON  | ON | ON | OFF | — | — |
| SW 2 | 1   | 2   | 3   | 4  |    |     |   |   |
|      | OFF | OFF | OFF | ON |    |     |   |   |

STB RAM I/O

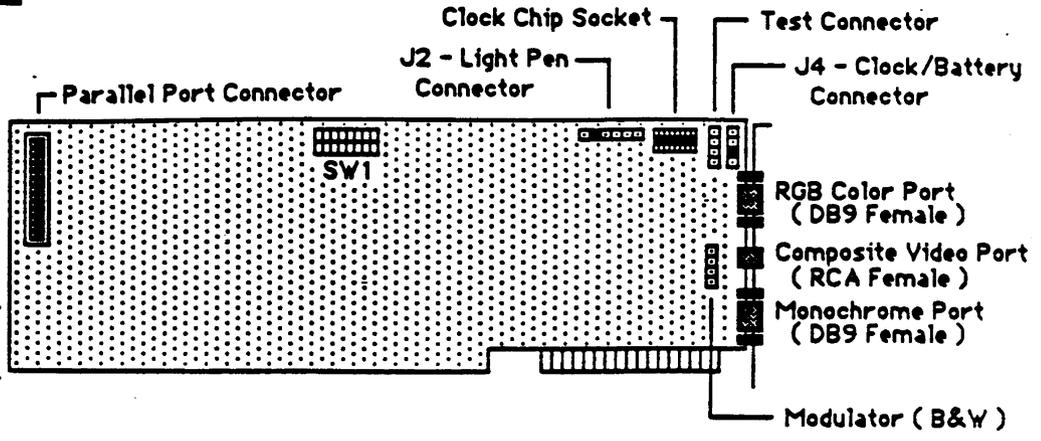
3-104  
3-104

3-105

# STB Graphix Plus II Video Display Adapter



The STB Graphix Plus II Video Display Adapter has several functions. Its primary use is for video display. It can do "Dual Monitor Support" and be configured as a color graphics and/or monochrome/printer adapter. It has a "PC Accelerator" diskette that comes with display drivers for color and monochrome graphics with "LOTUS 1-2-3" and "SYMPHONY". It also has a composite video port, and options for a parallel port and a clock/calendar.



### PC, XT Configuration :

Set PC, XT system board switches for primary display used with video board.

#### PC, XT Switch 1

- 5 6
- STB with Monochrome
  - STB with Color
  - STB with Monochrome and Color  
(Use Monochrome as primary display, and use Mode command to switch between displays.)

**Important Note:** When running IBM Diagnostics on the display do not run the Sync Test. It may damage the monitor.

### Lotus 1-2-3 and Symphony.

Use the "PC Accelerator" diskette that comes with the STB Board to install the graphics display drivers for Lotus 1-2-3 and Symphony. Go to the installation program for Lotus 1-2-3 and Symphony and select Advanced Options. Add graphics display drivers from the PC Accelerator diskette here.

### STB Board Configuration :

#### Common Settings

- Switch 1
- 1 2 3 4 5 6 7 8
- STB with both Monochrome and Color Display Monitors
  - STB with Color Display Only
  - STB with Monochrome Display Only

#### Parallel Printer Port

- 1
- Parallel Port is a Printer Port
  - Parallel Port is SASI/SCSI Port

#### Video Display Output and Parallel Port I/O Address

- | Video Display Output                                                            | 2 3                                                                     | Parallel Port I/O Address |
|---------------------------------------------------------------------------------|-------------------------------------------------------------------------|---------------------------|
| Both Monochrome and Color Display.....                                          | <input type="checkbox"/> <input type="checkbox"/>                       | LPT1: ( &H3BC )           |
| Monochrome Display/Printer Adapter Only                                         | <input checked="" type="checkbox"/> <input type="checkbox"/>            | LPT1: ( &H378 )           |
| Color Graphics Adapter Only.....                                                | <input type="checkbox"/> <input checked="" type="checkbox"/>            | LPT3: ( &H278 )           |
| Board responds the same as the Graphix Plus I Board in monochrome graphics mode | <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> | LPT3: ( &H278 )           |

#### Video output signals

- 4
- Video output signals switch automatically to the monitor currently in use by the software
  - All video signals ( including graphics ) are sent only to the monochrome display connector

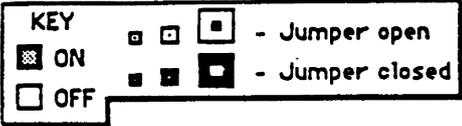
#### Monochrome Video

- 5
- Disable monochrome video when monochrome display is off
  - Monochrome video is always enabled

#### RGB Signals

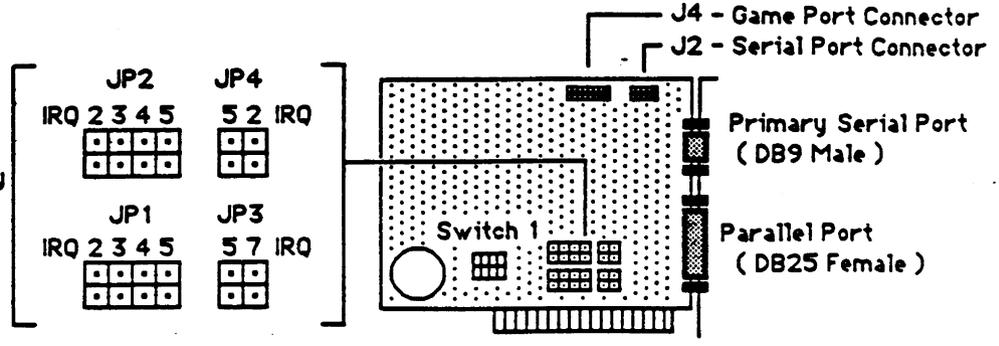
- 6 7 8
- These three switches control which colors are sent to the monochrome display. 6 = Red, 7 = Green, 8 = Blue. On sends the color, off blocks it.

# Suntek I/O Extension XT Multi-Function Board



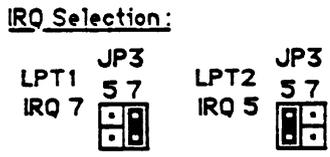
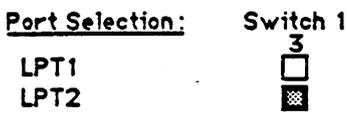
The Suntek I/O Extension XT Board is a multi-function board for IBM PC, XT and compatible computers. Its features are:

- A parallel printer port
  - An RS232 serial interface port
  - A game port
  - A Clock/Calendar with replaceable battery
- It has software for the clock - SCLK and RCLK - and for print spooling - SPOOL. It can also have an option installed for a second RS232 serial interface port.



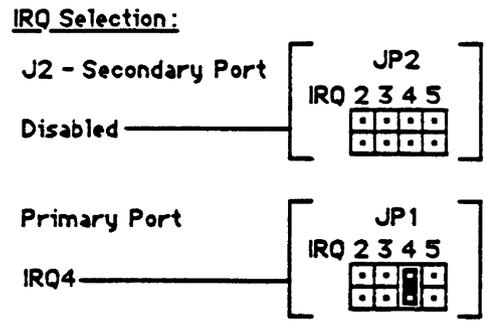
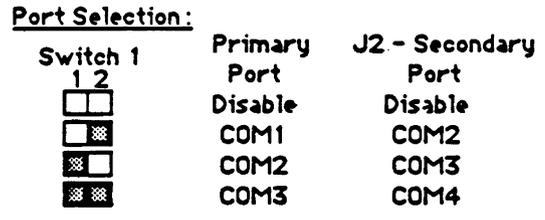
### Parallel Printer Port:

If there is a printer port using Base I/O Address H3BC, LPT1 will be LPT2, and LPT2 will be LPT3.



**Base I/O Address:**  
LPT1 378  
LPT2 278

### RS232 Serial Port:



**Base I/O Address:**  
COM1 3F8  
COM2 2F8  
COM3 3E8  
COM4 2E8

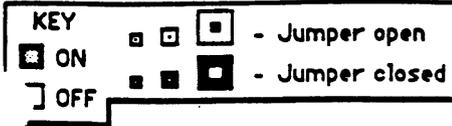
### Clock/Calendar:



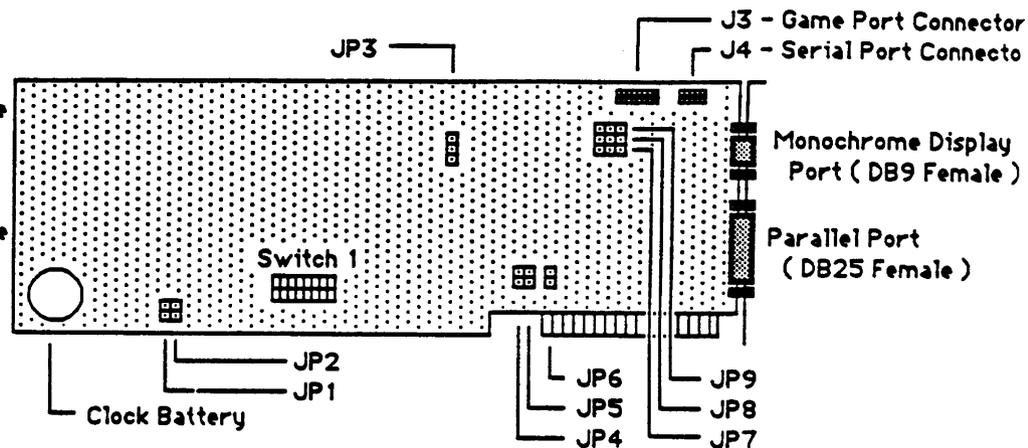
Base I/O Address - 200

The clock/calendar comes with two programs, SCLK and RCLK. Use RCLK in the AUTOEXEC.BAT file to read the clock. Use the SCLK file, then the DATE and TIME commands, to set the clock.

# Suntek MONOPAK Monochrome Display Adapter/Multifunction Bd.



The Suntek MONOPAK Board is a multifunction board, with its primary function as a monochrome display adapter. Its features are: Monochrome Graphics Adapter with Hercules compatibility, parallel printer port, options for serial and game ports and a clock/calendar. It comes with software for the clock/calendar and a print spooler.



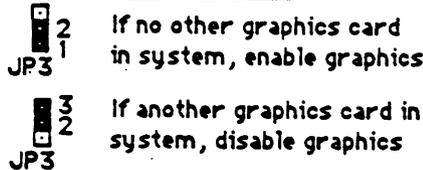
**PC, XT Configuration :**

To install the board in a PC, XT-type computer, set system board switch block 1, 5 and 6 "off".

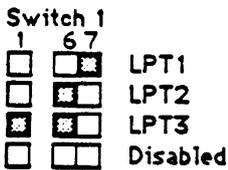


**Suntek MONOPAK Configuration :**

**Monochrome Graphics**



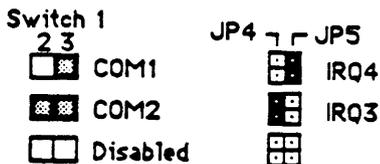
**Parallel Printer Port**



**Interrupt Level for Parallel Port**



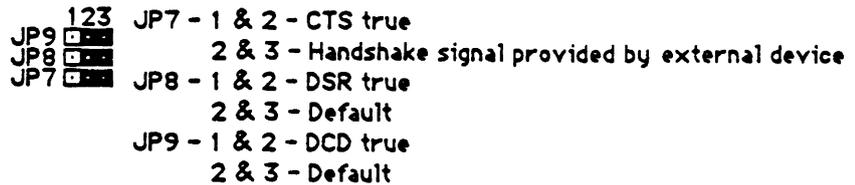
**RS232 Serial Port**



(Switch 1-8 is not used.)

**RS232 Configuration Jumper Block**

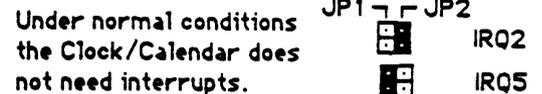
(Do not change)



**Clock/Calendar**



**Clock/Calendar Interrupt**



**Game Port**

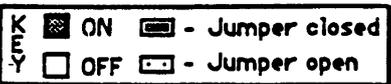


**Software**

SCLK - set clock. After running this program, run the DOS DATE and TIME programs and enter the correct date and time. Reboot the computer, and run the program - RCLK - read clock. This program loads date and time from the boards' calendar into DOS DATE and TIME setup. SPOOL - set up a print spool. Uses special parameters for setting aside part of RAM in Dos for a print spooler. SPOOL ? will show the parameters that can be entered to setup the print spooler.

Important Note: When running IBM Diagnostics on the display, do not run the Sync Test. It may damage the monitor.



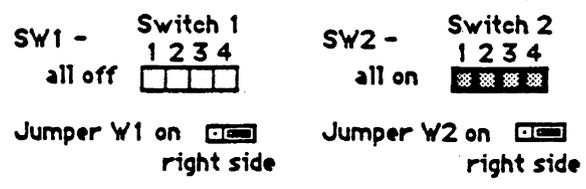


## Sysgen: External Floppy Drive and Omni-Bridge Bd. Installation in Zenith XT(Z159) and Zenith AT(Z286)

JPG3B  
4-28-81

The Sysgen Omni-Bridge floppy diskette drive controller and the Sysgen external floppy diskette drive are used to give IBM PC, XT, AT and compatible computers access to various different diskette drives. However, the Zenith XT (Z-159) and the Zenith AT (Z-286) are not 100 percent hardware compatible computers, and need a special configuration not mentioned in the Omni-Bridge Owners Manual. Do not run the Omni-Bridge software installation program "INSTALL". It will not work with the Zenith XT and Zenith AT. Instead, use the following directions:

1) On the Omni-Bridge diskette controller, set all switches and jumpers as follows:



2) Install the Omni-Bridge board into any available slot in the Zenith computer. DO NOT CHANGE any of the internal cabling, switch/jumper settings, DSKSETUP or the Zenith AT SETUP program.

3) Connect the external 37 Pin cable to:  
 \* Omni-Bridge Board - External Drive Device Connector. TIGHTEN THE THUMB SCREWS.  
 \* External Floppy Diskette Drive - LOWER PORT. TIGHTEN THE THUMB SCREWS.

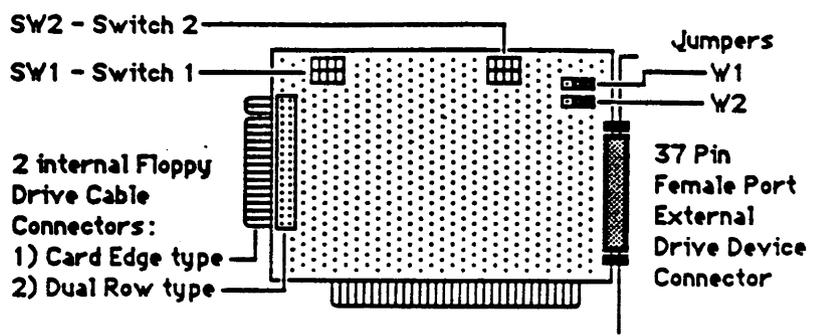
4) Copy the OMNIBRG.SYS file onto the boot disk, and add this line to the CONFIG.SYS file:

```
DEVICE = OMNIBRG.SYS /D:1 /D:1 /D:X /D:1
where X = 0 System Drive
          1 No Drive
          2 360 KB 5.25" Double Density
          3 1.2 MB 5.25" High Density
          4 720 KB 3.5" Double Density
          5 1.44 MB 3.5" High Density
```

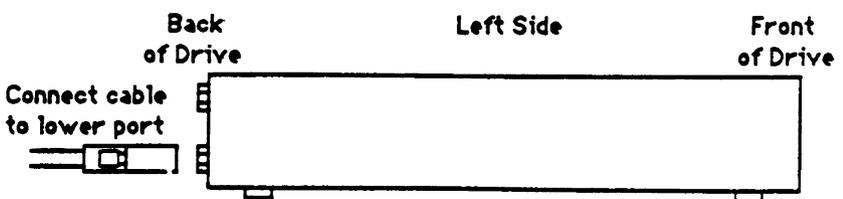
In this configuration, the X represents the type of Sysgen External Diskette Drive being used. In most cases, it will be a 5.

After rebooting, the external diskette drive should usually respond as Drive D: (depending on the number of hard disks, if any, hard disk partitions, ram disks, etc.).

### The Omni-Bridge Diskette Drive Controller (PN#267)



### Sysgen Bridge-File External Floppy Diskette Drive



5) To format a diskette depends on the version of Zenith MS-Dos, Sysgen external drive and type of floppy diskette.

a) For Zenith MS-Dos 3.2, format accordingly:

| Sysgen Drive    | Type of Diskette | Format command | Result  |
|-----------------|------------------|----------------|---------|
| 1.2 MB HD 5.25" | 360 KB           | Format D:/4    | 360 KB  |
| " " " "         | 1.2 MB           | Format D:      | 1.2 MB  |
| 720 KB DD 3.5"  | 720 KB           | Format D:      | 720 KB  |
| 1.44 MB HD 3.5" | 720 KB           | Format D:/D    | 720 KB  |
| " " " "         | 1.44 MB          | Format D:      | 1.44 MB |

b) For Zenith MS-Dos 3.3, format accordingly:

| Sysgen Drive    | Type of Diskette | Format command     | Result  |
|-----------------|------------------|--------------------|---------|
| 1.2 MB HD 5.25" | 360 KB           | Format D:/4        | 360 KB  |
| " " " "         | 1.2 MB           | Format D:          | 1.2 MB  |
| 720 KB DD 3.5"  | 720 KB           | Format D:          | 720 KB  |
| 1.44 MB HD 3.5" | 720 KB           | Format D:/T:80/N:9 | 720 KB  |
| " " " "         | 1.44 MB          | Format D:          | 1.44 MB |

Zenith Dos "BIOS Version 3.30.05" has a bug in the FORMAT.COM command that will not allow it to FORMAT D:/T:80/N:9.

It can be fixed in the following way:

- Copy the Format file, type: COPY FORMAT.COM EXTFM.COM
- Use the Debug program to edit the EXTFM.COM file. Type:  
 DEBUG EXTFM.COM (Edit EXTFM.COM, "-" prompt appears)  
 -E 116C EB 2D (Edit part of the programming code)  
 -W (Write and save the change)  
 -Q (Quit Debug, return to Dos pr  
 Now EXTFM D:/T:80/N:9 should work on the external di

## SECTION 6. SYSGEN IMAGE Utility Software

### 6.1 GENERAL

The SYSGEN IMAGE support software diskette contains seven files:

| Name          | Description                                                                      |
|---------------|----------------------------------------------------------------------------------|
| FSAVE .EXE    | File save utility program                                                        |
| ISAVE .EXE    | Image save utility program                                                       |
| CHECKOUT .EXE | Diagnostic program to test DMA transfer                                          |
| IMAGE .SYS    | IMAGE (FSAVE and ISAVE) Device Drivers                                           |
| INSTALL.BAT   | DOS Command batch file used in adding routines to your operating system software |
| INSTALL.EDL   | File used by INSTALL.BAT                                                         |
| REL 2.04      | Identifies the revision of this diskette only                                    |

Each of the three executable files (those ending in ".EXE") will be explained in section 6.1.

#### 6.1.1 FSAVE.EXE

The FSAVE utility program allows you to transfer one or a

Scanning the directory will show that config.sys is there. Remove the diskette from drive A and reboot the system. During the boot operation the message "IMAGE device driver loaded" will be displayed.

Your installation is now complete!

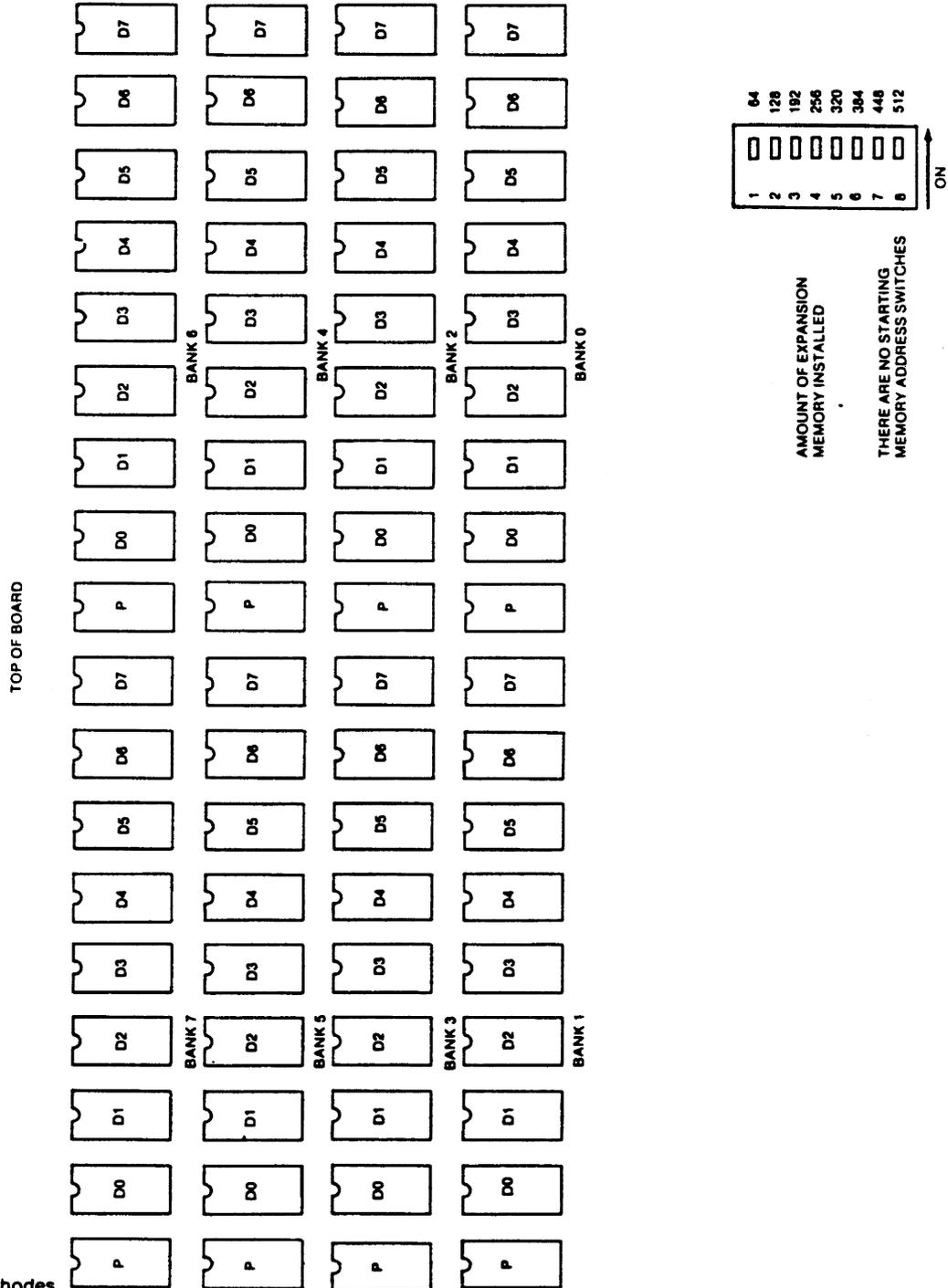
**NOTE:** The installation procedure always adds the line "device = image.sys" to the beginning of any existing config.sys file. Consequently, if you ever "install" to a system which has already been installed, you will get the message "IMAGE device driver loaded" twice when you boot. If this happens, you must either delete the config.sys file and reinstall, or use edlin to remove all but the first "device = image.sys" from config.sys.

2  
011-5

3-111

### D1 LOCATION OF BANKS AND BITS

This information is to help the technician determine where the banks and bits are located on the Memory Technologies MT512-XIB board.



Originator: Glenn Rhodes

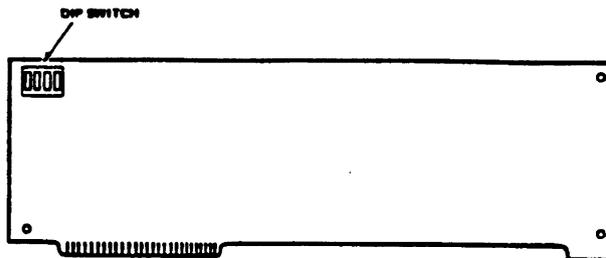
3-112

3-113

# FORTE COMMUNICATIONS

## FORTE PJ (3278/79)

PC156



Location of Forte PJ DIP Switches

Table 2-1 defines the Forte PJ switch settings and the corresponding base I/O addresses. All addresses are shown in hexadecimal.

| Switch Settings                     | Note | Address Range | Possible PC or XT Conflict |
|-------------------------------------|------|---------------|----------------------------|
| <u>1</u> <u>2</u> <u>3</u> <u>4</u> |      |               |                            |
| on on on on                         | 2    | x'200'-x'21f' | Game Control Unit          |
| on on on off                        | 2    | x'220'-x'23f' | None                       |
| on on off on                        | 2    | x'240'-x'25f' | None                       |
| on on off off                       | 2    | x'260'-x'27f' | None                       |
| on off on on                        | 1,2  | x'280'-x'29f' | None                       |
| on off on off                       | 2    | x'2A0'-x'2Bf' | None                       |
| on off off on                       | 2    | x'2C0'-x'2Df' | None                       |
| on off off off                      | 3    | x'2E0'-x'2Ff' | COM 2                      |
| off on on on                        | 2    | x'300'-x'31f' | Prototype Card             |
| off on on off                       | 3    | x'320'-x'33f' | Fixed Disk                 |
| off on off on                       | 2    | x'340'-x'35f' | None                       |
| off on off off                      | 3    | x'360'-x'37f' | Printer                    |
| off off on on                       | 2    | x'380'-x'39f' | SDLC/BSC Secondary         |
| off off on off                      | 3    | x'3A0'-x'3Bf' | BSC Primary/Monochrome     |
| off off off on                      | 3    | x'3C0'-x'3Df' | Color Graphics             |
| off off off off                     | 3    | x'3E0'-x'3Ff' | Diskette/COM 1             |

on = 1  
off = 0

Notes:

- 1 Factory shipped configuration
- 2 Address searched for in the emulator
- 3 Address not searched by default

Table 2-1: Base I/O Address Table

3-114

3-15C

## PROGRAMS THAT LOAD FROM CONFIG.SYS

## EMM (Expanded Memory Manager)

Use the command `DEVICE = EMM.SYS c m i` to load the EMM.

| Possible values for "c": |                   | Possible values for "m": |  | Possible values for "i": |  |
|--------------------------|-------------------|--------------------------|--|--------------------------|--|
| Value                    | Meaning           |                          |  |                          |  |
| pc                       | 8 bit system      | C400                     |  | 208h                     |  |
|                          |                   | C800                     |  | 218h                     |  |
|                          |                   | CC00                     |  | 258h                     |  |
| mod30                    | IBM PS/2 model 30 | D000                     |  | 268h                     |  |
|                          |                   | D400                     |  | 2A8h                     |  |
|                          |                   | D800                     |  | 2B8h                     |  |
|                          |                   | DC00                     |  | 2E8h                     |  |
|                          |                   | E000                     |  |                          |  |

## OPTIONAL EMM PARAMETERS

| Parameter | Meaning |
|-----------|---------|
|-----------|---------|

|       |                                                                                                                   |
|-------|-------------------------------------------------------------------------------------------------------------------|
| EXP=x | "x" should equal to the total expanded memory amount. Generates an error message if EMM finds a different amount. |
| ND    | Abbreviated diagnostics for quicker Warm Boot.                                                                    |
| NP    | No pause after EMM errors or messages.                                                                            |
| H=x   | Set EMM Handle count to "x" ("x" must be less than 256).                                                          |

## QUIKMEM (RAM disk in Expanded memory)

Use the command `DEVICE = QUIKMEM2.SYS x` to create a RAM disk.

Possible values for "x": size of RAM disk in K-Bytes expressed as a multiple of 16 (256, 512, 800, etc.). You don't need to type a "K" after the number.

## PROGRAMS THAT LOAD FROM A BATCH FILE OR DOS PROMPT

## QUIKBUF (Printer buffer in Expanded memory)

Use the command `QUIKBUF2 c x d t` to create a Printer Buffer.

| Possible values for "c": |              | Possible values for "x":                                                                                         |  | Possible values for "d": |            | Possible values for "t": |          |
|--------------------------|--------------|------------------------------------------------------------------------------------------------------------------|--|--------------------------|------------|--------------------------|----------|
| Value                    | Meaning      | Value                                                                                                            |  | Value                    | Meaning    | Value                    | Meaning  |
| pc                       | 8 bit system | size of buffer in K-bytes expressed as a multiple of 16. (Non-multiples are rounded up the next higher multiple) |  | M                        | IBM Mono   | P                        | Parallel |
|                          |              |                                                                                                                  |  | H                        | Herc. Mono | S1                       | COM1     |
|                          |              |                                                                                                                  |  | G                        | IBM CGA    | S2                       | COM2     |
|                          |              |                                                                                                                  |  | E                        | IBM EGA    |                          |          |
|                          |              |                                                                                                                  |  | V                        | IBM VGA    |                          |          |
|                          |              |                                                                                                                  |  | O                        | Other      |                          |          |

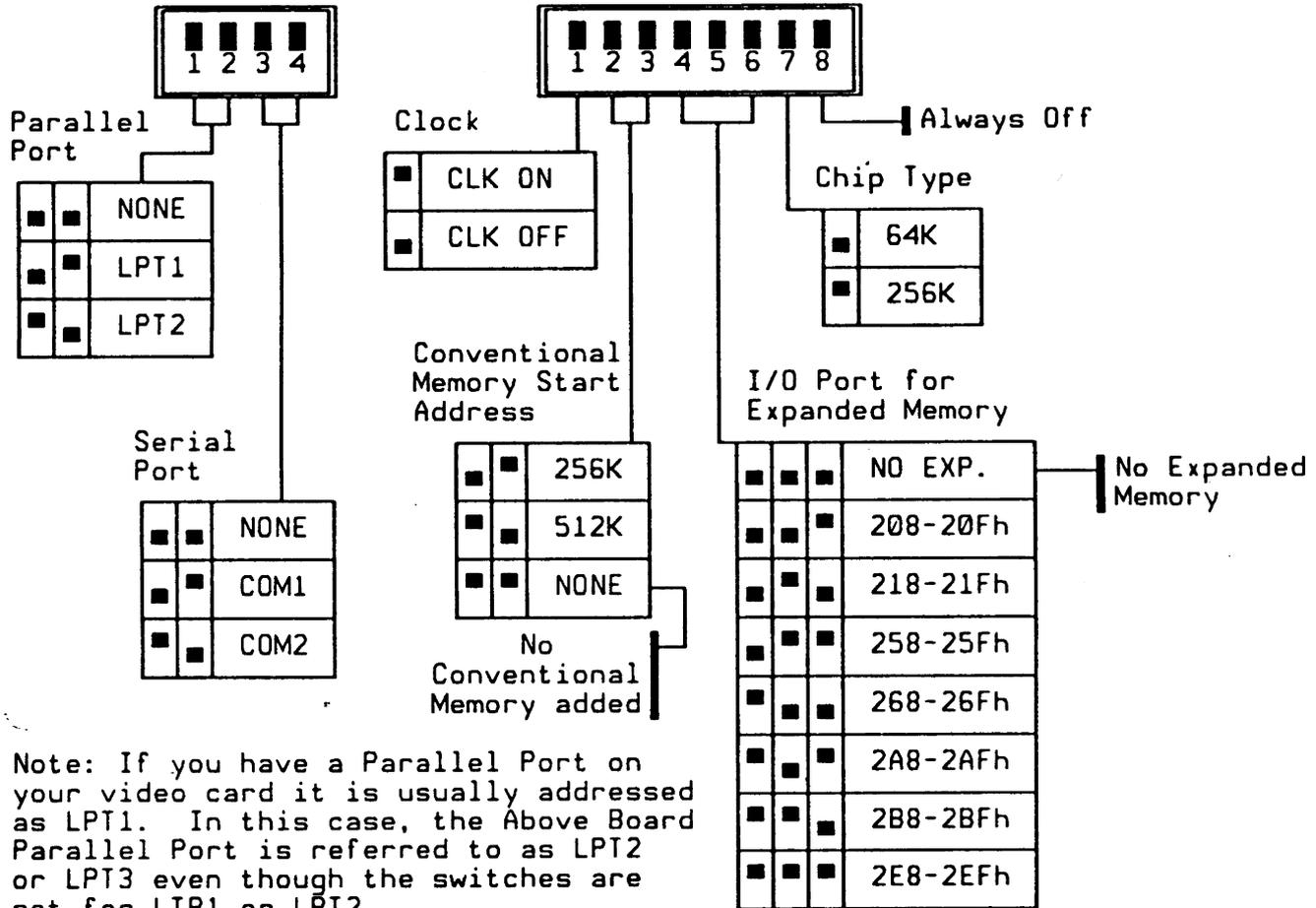


4-2

INTRODUCTION

This document contains all the information an experienced user needs to install an Above Board and its software.

SWITCH SETTINGS



INSTALLING THE SOFTWARE

If you notice error messages saying, "One or more of the parameters are missing or invalid...", while installing the following programs, you probably have an earlier version of the software. Download the latest versions from the Intel BBS using your modem or request them from Intel Customer Support.

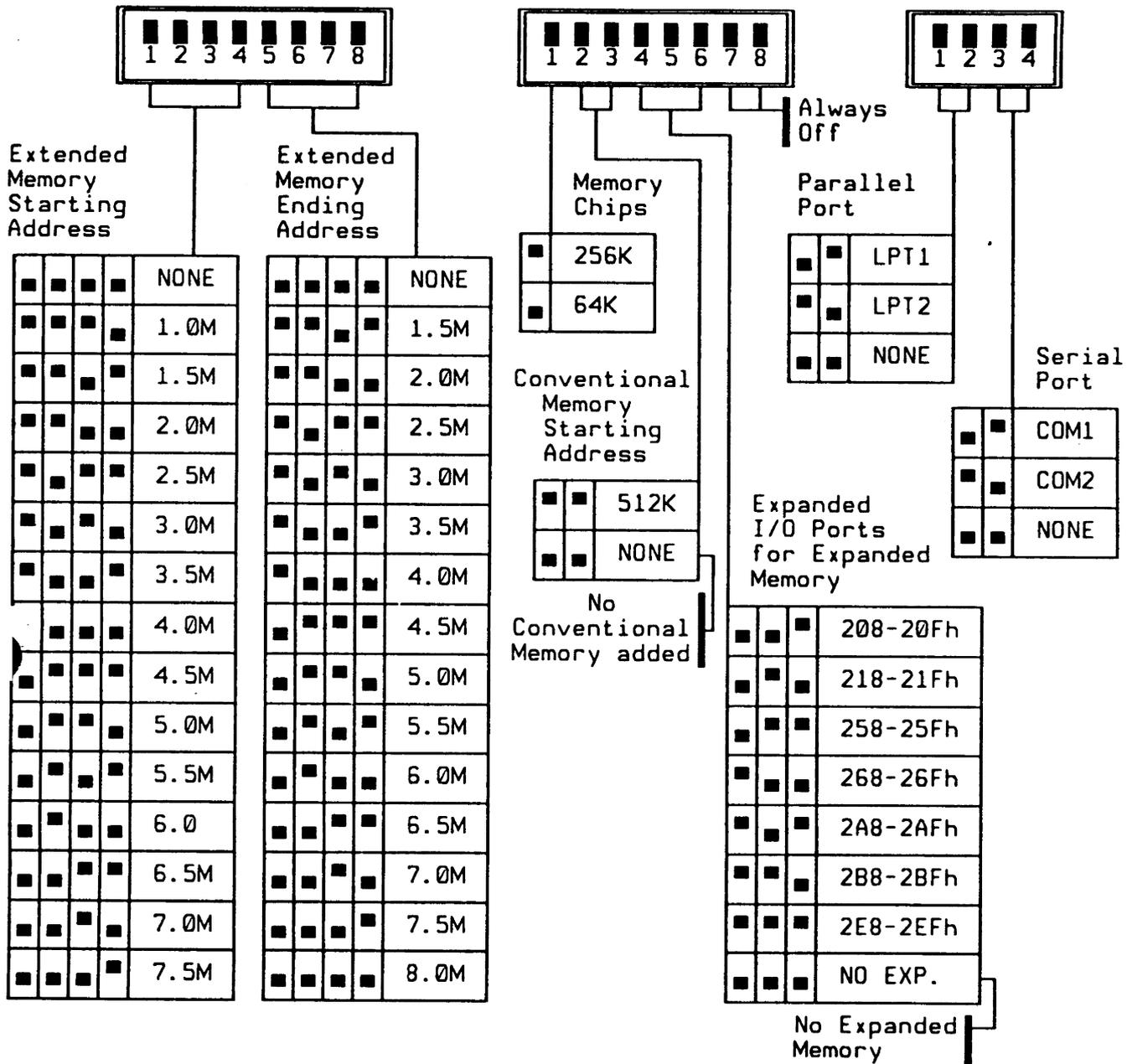
Intel BBS: 503-645-6275 (up to 2400 baud, 8 bits, NO parity, 1 stop)  
 Intel Customer Support: 800-538-3373 (Oregon & International 503-629-7354)



INTRODUCTION

This document contains all the information an experienced user needs to install an Above Board and its software.

SWITCH SETTINGS





# Intel Corporation

## Above Board 286 and PS/286 (base, extended and expanded memory)

## Above Board Plus and Plus I/O (base, extended and expanded memory)

### General Information

The Intel Above Boards, 286 and Plus, are memory boards. The Intel Above Boards, PS/286 and Plus I/O, are memory boards with parallel and serial ports. These boards are for the IBM PC, XT, PS/2 Model 30 & 8088/8086 based computers, and for the IBM AT and 80286 computers. They can be loaded with up to 2 MBs of memory, either base, extended, or expanded memory. They use only 256 KB ram chips. To access the expanded memory a program, "EMM.SYS" is used in the CONFIG.SYS file. Version 4.0, Revision C can do true multi-tasking. Extended memory is only available on 80286 (or higher) based computers. The Plus boards are later versions of the 286 boards. The Plus boards can do: 1) true multi-tasking, and 2) 128 KB increments of extended memory. Intel sells an upgrade kit for the older 286 boards to the function like the new Plus boards.

### Hardware Configuration:

IBM AT and 80286 based computers:

- Make sure the PC Selection Chip is not installed.
- Install the board in a 16 bit slot.
- If increasing base or extended memory, run the 80286 computer's "Setup" program.

IBM PC, XT, PS/2 Model 30, & 8088/8086 computers:

- Install the PC Selection Chip in the socket.
- Install the board in an 8 bit "long" slot.
- If increasing base memory, set the switches properly on the system board. (Except for the PS/2 Model 30, which already has 640 KB base memory on the system board, and no switches.)

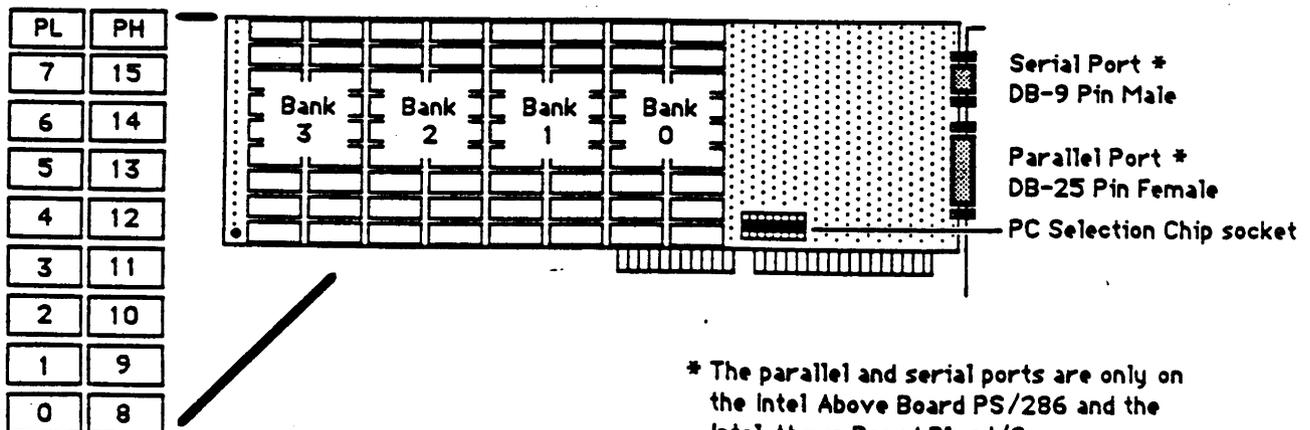
### Intel Software Configuration:

1. Since the boards have no switches, the hardware configuration is done with the "SETBOARD" program.
  - \* For the Above Board PS/286 and Above Board Plus I/O, use this program to set up the serial and parallel ports.
2. To test the memory board, run the "TESTAB" program.
3. If the board is to be configured for any expanded memory, either configure the CONFIG.SYS file manually, or run the Intel software. Intel has revised this software many times over the years:
  - "SETUP286" for Intel software version before 4.0. Only for Above Board 286 and PS/286.
  - "INSTALL" for Intel software version 4.0, Revision A (1-28-88 or before 4-12-89). SEE WARNING BELOW about using this program!
  - "SOFTSET" for Intel software version 4.0, Revision C (4-12-89 or later). This program will work for all four boards - the Above Board 286, PS/286, Plus and Plus I/O. This software automatically detects if the board is capable of multi-tasking or not. The Intel Above Board Plus and Plus I/O, and upgraded versions of the Intel Above Board 286 and PS/286 can do true multi-tasking.

These programs will automatically create or modify the CONFIG.SYS and AUTOEXEC.BAT files. These programs will install a device driver in the CONFIG.SYS file ( "DEVICE = EMM.SYS ..." ), to access the expanded memory management program. They will also set up, if requested, ram disk and print spool utility software.

**WARNING:** Never run the INSTALL program without booting from a clean disk with NO CONFIG.SYS and NO AUTOEXEC.BAT files. Failure to do so may damage the disk the software is being loaded on to. If a RAM CACHE is active, the "INSTALL" program will destroy the disk's File Allocation Table.

4. Use the Intel "CHKMEM" program to do a quick check of base, expanded, (and if used in an IBM AT type computer - extended) memory.



\* The parallel and serial ports are only on the Intel Above Board PS/286 and the Intel Above Board Plus I/O.

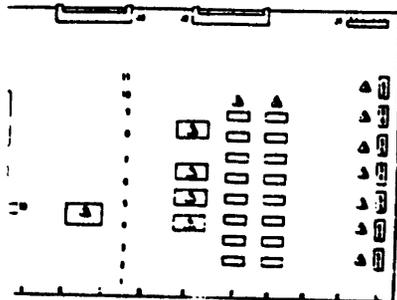
# ADM 42

TECH TALKS  
MICRO PRODUCTS

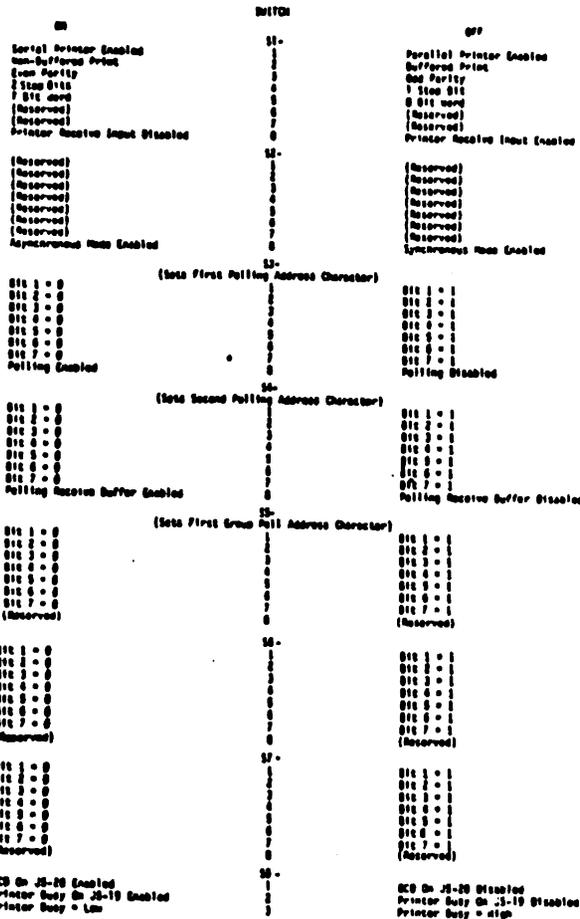
Lear-Siegler  
ADM-42

Category D Hardware

SWITCH SETTINGS:



129720-20 (cont)  
Printer Board



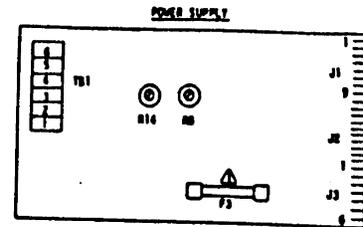
Configuration Notes:

- ⚠ Locations E4, E5, E6, and E8 are for the Option Control Program. Location E6 is normally Printer and E8 is for Polling. If the replacement Option Board does not have the same part numbers, contact the Option Control Program.
- ⚠ Asynchronous Printer option - P/N 129721-3-2. (Also requires Program.) Parts are non standard on the Option Board.
- ⚠ Polling option - P/N 129721-3-4. (Also requires Program.) Note the terminal address when replacing an option board with Polling installed. If the address switches are not set correctly, unit will not operate on line.
- ⚠ Programmable Function Key option - P/N 129721-3-5. Provides either 32 or 64 Character Function keys (user defined) per the following:
  - IC's at Locations FF-F9 = 32 Characters per key (non standard)
  - IC's at Locations JE-F9 and HJ-H9 = 64 Character per key
- ⚠ The options that use connectors J6 and J8 are not available.

TECH TALKS  
MICRO PRODUCTS

Lear-Siegler  
ADM-42

Category D Hardware



Part Number: 129720-21  
Lear-Siegler Linear Power Supply

Connector Assignments:

| Power Supply  | Terminal                       | Signal Name      | Wire Color Code |
|---------------|--------------------------------|------------------|-----------------|
| J1-1          | Main Logic Board (Ground Stud) | Equipment Ground | Green/Yellow    |
| J1-2          | J1-6                           | Ground           | White           |
| J1-3          | J1-7                           | +5 VDC           | Orange          |
| J1-4          | J1-6 (Key)                     | Ground           | -               |
| J1-5          | J1-5                           | -12 VDC          | White           |
| J1-6          | J1-4                           | +12 VDC          | Yellow          |
| J1-7          | J1-3                           | Ground           | Red             |
| J1-8          | J1-2                           | +5 VDC           | Orange          |
| J1-9          | J1-1                           | Ground           | White           |
| (Ground Stud) | J1-9                           | Ground           | Green/Yellow    |
| J2-1          | Option Board                   | Ground           | White           |
| J2-2          | J1-6                           | +5 VDC           | Orange          |
| J2-3          | J1-4 (Key)                     | Ground           | -               |
| J2-4          | J1-3                           | Ground           | White           |
| J2-5          | J1-2                           | -12 VDC          | Yellow          |
| J2-6          | J1-1                           | +12 VDC          | Red             |
| (Ground Stud) | J1-7                           | Ground           | Green/Yellow    |
| T01-1         | Power I/FM                     | -                | Red             |
| T01-2         | -                              | -                | Red             |
| T01-3         | -                              | -                | Yellow          |
| T01-4         | -                              | -                | Orange          |
| T01-5         | -                              | -                | Yellow          |
| T01-6         | -                              | -                | Yellow/Blue     |
|               |                                |                  | Red/Yellow      |

Adjustments:

Only the +5 VDC output is adjustable, and, is normally factory set. If the output measures between 4.90 and 5.10 volts, do not adjust the supply. If the measured output is not between these levels, adjust R14 for +5.00 volts DC (+ .10 volts). Also check the voltage at several places on both logic boards to insure that there is not excessive voltage drop across the boards. Do NOT adjust R8 which is the current limit adjust. This is a factory setting only.

Configuration Notes:

- ⚠ Fuse F3 is NOT installed on an ADM-42.
- 2. The power supply/logic board cable part numbers are as follows:
  - Power Supply to main logic board - P/N 129722-01
  - Power Supply to option board - P/N 129722-01

4-3-3

**Intel Corporation**

**Above Board/PC ( Conventional and Expanded Memory )**

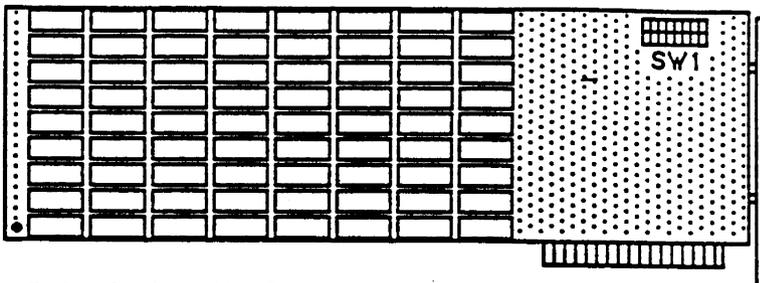
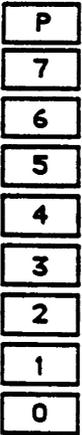
**KEY**

- Jumper open

ON   - Jumper closed

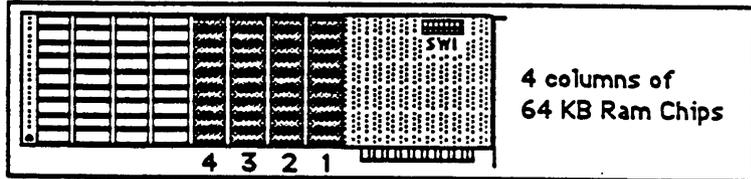
FF

The Intel Above Board/PC is strictly a memory board for IBM PC and XT type computers. It can be loaded with 2 MBs of memory, which can be a combination of Base/Conventional and expanded memory. The expanded memory supports the "enhanced expanded memory specification" (EEMS), and uses software to access this memory. The board uses either 256 KB or 64 KB ram chips, but not both at the same time. Note the configuration of memory chips on the board is different depending on which chips are used. The Above Board/PC needs a starting conventional memory address of at least 256 KB ram.

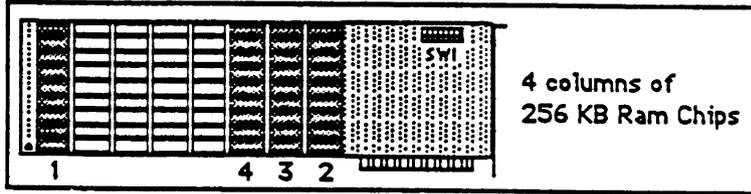


Order for inserting Ram Chips in columns:

|     |     |     |     |     |     |     |     |                  |
|-----|-----|-----|-----|-----|-----|-----|-----|------------------|
| 8th | 7th | 6th | 5th | 4th | 3rd | 2nd | 1st | 64 KB Ram Chips  |
| 1st | 8th | 7th | 6th | 5th | 4th | 3rd | 2nd | 256 KB Ram Chips |



4 columns of 64 KB Ram Chips



4 columns of 256 KB Ram Chips

**Ram Chip Type:**

Switch 1

- 1
- 64 KB Ram Chips only
- 256 KB Ram Chips only

**Conventional / Expanded Memory. Intel Above Board:**

Switch 1 Starting System Memory

2 3 4

- 256 KB
- 320 KB
- 384 KB
- 448 KB
- 512 KB
- 576 KB
- 640 KB ( all Intel Above Board / PC is used for Expanded Memory )

**Base I/O Address Settings**

Switch 1  
5 6 7 8

- 0258h ← **Default Setting**
- 0268h
- 0208h
- 0218h
- 0268h
- 02A8h
- 02B8h
- 02E8h

**PC and XT Hardware Configuration:**

If the Intel Above Board/PC is being used for conventional Dos memory, change the switches on the PC/XT system board to reflect the new total conventional Dos system memory.

**Software**

1. Run the " SETUPAB " program to create or modify the CONFIG.SYS and AUTOEXEC.BAT files. This program installs the device driver in the CONFIG.SYS file, " DEVICE = EMM.SYS ... " to access the expanded memory management program. Do not select the installation for any one particular application program, but use the option for " Other " application programs.
2. Run the Intel " TESTAB " program to test the memory on the Intel Above Board/PC.
3. Use the Intel " CHKMEM " program to do a quick check of the memory available for Conventional, Expanded ( and if using this program in an IBM AT type computer - Extended ) Memory.

| PC, XT Memory Error Location Chart |    |     |     |        |        |    |    |    |    |
|------------------------------------|----|-----|-----|--------|--------|----|----|----|----|
| Bit in error                       | 00 | 01  | 02  | 04     | 08     | 10 | 20 | 40 | 80 |
| Chip Location                      | P  | 0   | 1   | 2      | 3      | 4  | 5  | 6  | 7  |
| 64 KB Block of Ram in error        | 0  | 1   | 2   | , etc. |        |    |    |    |    |
| 64 KB Block of Ram                 |    | 1st | 2nd | 3rd    | , etc. |    |    |    |    |



Result of Terminal Self-Test

A test pattern will display, showing all character sets, visual attributes, firmware version number, and copyright information. If any component errors are detected, a message will display in the lower portion of the screen.

**NOTE**

Some characters may display which are not accessible using the standard firmware.

Possible error messages are:

CMOS CHECKSUM ERROR  
DATA RAM ERROR  
DISPLAY RAM ERROR  
ROM ERROR

If any of the above error messages display on the screen:

1. Press CTRL/SHIFT/RESET to reset the terminal.
2. Enter Set-up mode and set the parameters. Press SHIFT/S to save the parameters and exit Set-up mode.
3. Enter Set-up mode again. Type: 1  
(System will undergo another self-test procedure.)
4. Verify any error messages:
  - a. If the error message no longer displays, the terminal is ready to operate.
  - b. If the error message still displays, contact an Ampex service location immediately. Do not attempt to correct the problem.
5. Press CTRL/SHIFT/RESET to reset the terminal and clear the screen.

**NOTE:** Ampex service locations are listed on the Warranty Information sheet included in the box with the terminal.

4-4.2

**Introduction.**

The Image Technology SHOPT RAM CARD is a random access memory card for the IBM Personal Computer and other similar computers. The memory card expands a computers memory by up to 512K bytes. The card uses 41256 256K RAM chips for data storage and for the storage of the parity checking information.

**Card Switch Settings.**

Before you can install the RAM Card you must set the switches on the RAM Card. NOTE: Expansion RAM cards cannot be used until the system board has been fully populated with PAM. Four switches on the DIP switch, marked SWA on the board, determine where and how much memory on the RAM card will be addressed in the computers memory area. Some combinations of switch settings may result in damage to your computer; so carefully check to make sure the switches are set correctly before you install the RAM card. Table 1. lists the correct switch settings for the various system board sizes: First determine the amount of RAM your computer contains before you install the Image Tech. card. Then determine the size of the Short RAM Card II by choosing a Short RAM Card II size that when combined with the existing RAM in the computer, will not exceed 640K. (Most computer will operate with up to 704K. If you wish to operate at 704K choose a size the will not exceed 704K.)

Table 1.

Switch Settings for Short Card II

| System Board Size | Short Card II Size   | Switch on card settings |       |       |       |
|-------------------|----------------------|-------------------------|-------|-------|-------|
|                   |                      | POS 1                   | POS 2 | POS 3 | POS 4 |
| 0K                | 512K                 | ON                      | ON    | ON    | ON    |
| 64K               | 512K                 | ON                      | ON    | ON    | OFF   |
| 64K               | 256K                 | ON ↑                    | ON ↑  | OFF ↓ | ON ↑  |
| 128K              | 512K                 | ON                      | ON    | OFF ↓ | OFF ↑ |
| 128K              | 256K                 | ON                      | OFF   | ON    | ON    |
| 192K              | 448K                 | ON                      | OFF   | ON    | OFF   |
| 256K              | 448K                 | ON                      | OFF   | OFF   | ON    |
| 256K              | 384K                 | ON                      | OFF   | OFF   | OFF   |
| 256K              | 256K                 | OFF                     | ON    | ON    | ON    |
| 320K              | 384K                 | OFF                     | ON    | ON    | OFF   |
| 320K              | 320K                 | OFF                     | ON    | OFF   | ON    |
| 384K              | 256K                 | OFF                     | ON    | OFF   | OFF   |
| 448K              | <del>192K</del> 256K | OFF                     | OFF   | ON    | ON    |
| 512K              | 192K                 | OFF                     | OFF   | ON    | OFF   |
| 512K              | 128K                 | OFF                     | OFF   | OFF   | ON    |
| 576K              | 64K                  | OFF                     | OFF   | OFF   | OFF   |

Image Technology 512K SHORT RAM CARD

3-

HI-1071C

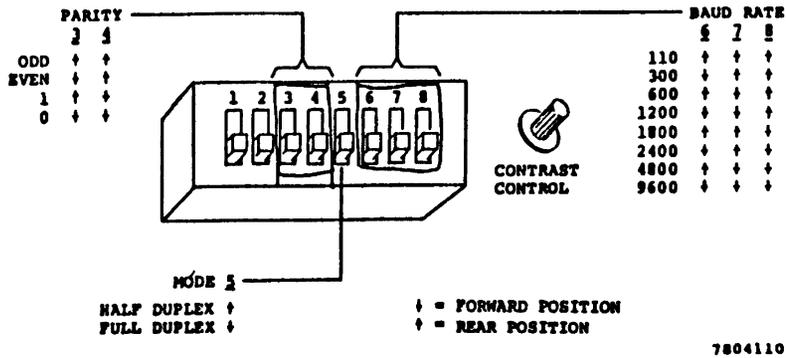


Figure 3-1. Controls Under Access Plate

7804110



HI-1079

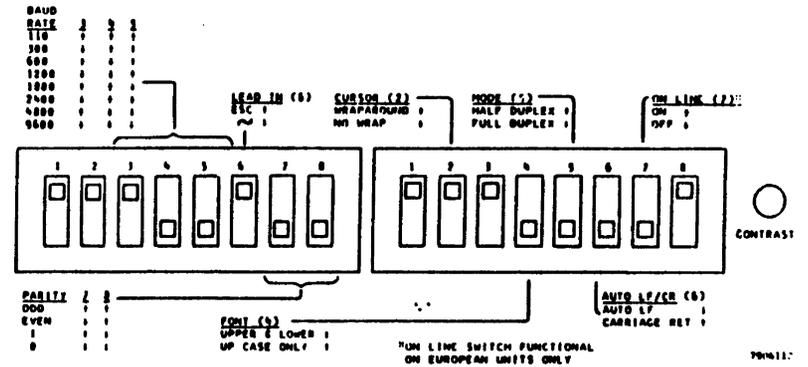
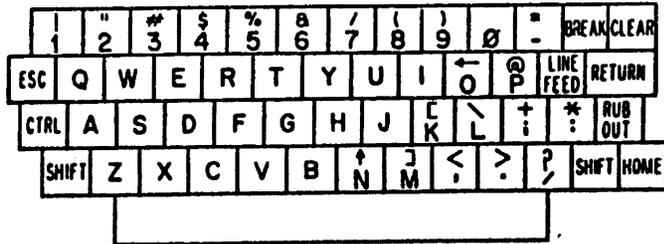


Figure 3-1. Controls Under Access Panel

4-5.2

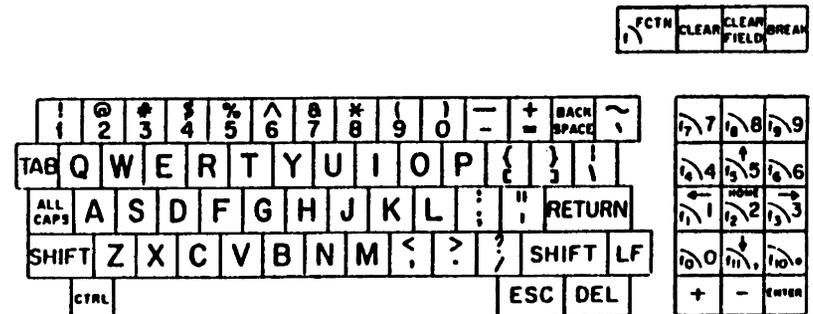


7805094

**HAZELTINE 1400/1410**

Figure 3-2. Keyboard

3-2



7905051

**Hazeltine 1420**

Figure 3-2. Keyboard

3-2

11986 Dorsett Road  
Maryland Heights, Missouri 63043  
314/432 0425

MARION T. ...  
BY: GLENN BRIDGES  
ST. LOUIS, MO.  
005

TECHNICAL BULLETIN

IRMA BOARD  
PC-16P

THERE ARE A FEW WAYS TO CHECK FOR AN IRMA BOARD THAT ARE NOT KNOWN BY ALL THE FIELD.

- 1) THE EASIEST WAY TO CHECK FOR A GOOD BOARD IS TO JUST INSTALL THE BOARD AND LOOK IT UP TO THE INSTALLED COAX CABLE, ENA, THE IRMA SOFTWARE, AND ADD TO THE HOST SYSTEM.
- 2) IF STEP 1 FAILS, CHECK THE GREEN LED ON THE IRMA BOARD. IT SHOULD FLASH ONCE ABOUT EVERY SECOND. IF IS RUNNING DIAGNOSTIC ON ITSELF, AND SHOULD CONTINUE THIS INDEFINITELY.
- 3) IF STEP 2 PASSES, ANOTHER WAY OF CHECKING THE IRMA IS DONE THROUGH THE PROGRAM "IRMA\_DUMP.EXE". THIS PROGRAM IS FOUND ON THE CUSTOMERS IRMA DISKETTE AND IS EXECUTED RIGHT FROM DOS, THE IRMA SOFTWARE PROGRAM "E78" SHOULD NOT BE LOADED. AFTER EXECUTION OF IRMA\_DUMP IT GIVES YOU A STATUS SCREEN.

IF THE BOARD IS NOT CONNECTED UP VIA CABLE, THE FOLLOWING ARE TRUE..

MAIN STATUS 28    AUX STATUS 00    ALL ERROR STATUS ARE 00

IF THE MAIN STATUS = 1A AND AUX STATUS = 1A THEN THE IRMA IS BAD.

---

IF THE IRMA IS CONNECTED VIA CABLE TO A HOST SYSTEM THEN THE FOLLOWING ARE TRUE..

MAIN STATUS A0    AUX STATUS 40

IF YOU RUN IRMA\_DUMP AGAIN THIS EXECUTES A POLLING PROCEDURE AND THE STATUS SHOULD CHANGE TO THE FOLLOWING..

MAIN STATUS    A0    AUX STATUS 41

IF IT DOES NOT CHANGE THEN IT IS HIGHLY PROBABLE THAT THE HOST CONTROLLER IS NOT RESPONDING.

---

IF YOU SEE ERRORS ON ERROR PARITY THEN IT IS POSSIBLE ANOTHER CARD INSTALLED IN THE PC IS CAUSING PARITY ERRORS ON THE BUS.

C13 SWITCH CONTROL

ON = 0 (Low)

OFF = 1 (high)

SWITCH POSITION

|   |                                                                                                                                        |
|---|----------------------------------------------------------------------------------------------------------------------------------------|
| 1 | PRINTER USE ONLY<br>This switch selects the number of STOP bits in the printer word structure.<br>ON = 1 STOP bit<br>OFF = 2 STOP bits |
| 2 | PRINTER USE ONLY<br>This selects PARITY ENABLED or NO PARITY<br>ON = Parity enabled<br>OFF = No parity                                 |
| 3 | PRINTER USE ONLY<br>This switch selects EVEN or ODD parity<br>ON = Odd parity<br>OFF = Even parity                                     |
| 4 | MAIN PORT USE ONLY<br>This switch selects the number of STOP bits.<br>ON = 1 STOP bit<br>OFF = 2 STOP bits                             |
| 5 | MAIN PORT USE ONLY<br>This selects PARITY ENABLED or NO PARITY<br>ON = Parity enabled<br>OFF = No parity                               |
| 6 | MAIN PORT USE ONLY<br>This switch selects main port word length<br>ON = 7 bit word<br>OFF = 8 bit word                                 |
| 7 | MAIN PORT USE ONLY<br>This switch selects EVEN or ODD parity<br>ON = Odd parity<br>OFF = Even parity                                   |
| 8 | MAIN PORT USE ONLY<br>This switch is for Bit Eight (8) control<br>ON = Bit 8 always "0" (low)<br>OFF = Bit 8 always "1" (high)         |

TABLE 7-2

4-6.2

**Soroc IQ120**

BAUD RATE TABLE

| <u>SWITCH POSITION</u> | <u>BAUD RATE</u> |
|------------------------|------------------|
| 0                      | 75               |
| 1                      | 110              |
| 2                      | 150              |
| 3                      | 300              |
| 4                      | 600              |
| 5                      | 1000             |
| 6                      | 1200             |
| 7                      | 1800             |
| 8                      | 2000             |
| 9                      | 2400             |
| 10                     | 3600             |
| 11                     | 4800             |
| 12                     | 7200             |
| 13                     | 9600             |
| 14                     | 19200            |
| 15                     | 19200            |

TABLE 7-5

HOW TO SET JUMPERS P1 AND P3

A jumper is a small block with two holes in the bottom which fits over two pins on a pad. The jumper block contains an electrical path which actually shorts the two pins together. The jumper pad on the EGA 256 has 3 pins. The center pin is always used and is shorted to one of the outer two pins with the jumper block depending on which feature you want to select (Figure 3).

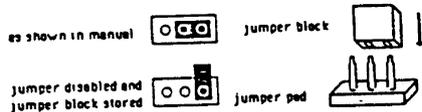


Figure 3. Jumper made up of jumper pad and jumper block.

To change a jumper setting, remove the jumper block by pulling straight up on it. Position it over the two pins you want to short and press straight down until the block is as far down as it will go. Press firmly.

Table 5. SW Switch Settings for EGA 256 when Primary Display Card: Monochrome and printer adapter or equivalent Secondary Display Card: EGA 256

| Type of monitor attached: |                               | Switch Settings |     |     |     |
|---------------------------|-------------------------------|-----------------|-----|-----|-----|
| Primary Monochrome        | Secondary EGA 256             | SW1             | SW2 | SW3 | SW4 |
| MONO                      | NONE                          | OFF             | ON  | ON  | ON  |
| MONO                      | COLOR 80x25                   | OFF             | ON  | ON  | ON  |
| MONO                      | COLOR 40x25                   | ON              | ON  | ON  | ON  |
| MONO                      | ENHANCED COLOR standard mode* | ON              | OFF | ON  | ON  |
| MONO                      | ENHANCED COLOR enhanced mode* | OFF             | OFF | ON  | ON  |

Table 6. SW Switch Settings for EGA 256 when Primary Display Card: EGA 256 Secondary Display Card: Color/Graphics or equivalent

| Type of monitor attached: |                          | Switch Settings |     |     |     |
|---------------------------|--------------------------|-----------------|-----|-----|-----|
| Primary EGA 256           | Secondary Color/Graphics | SW1             | SW2 | SW3 | SW4 |
| MONO                      | NONE                     | OFF             | OFF | ON  | OFF |
| MONO                      | COLOR 80x25              | OFF             | OFF | ON  | OFF |
| MONO                      | COLOR 40x25              | ON              | OFF | ON  | OFF |

\* Mode can be changed by programming also.

3-

Table 7. SW Switch Settings for EGA 256 when Primary Display Card: Color/Graphics or equivalent Secondary Display Card: EGA 256

| Type of monitor attached: |                   | Switch Settings |     |     |     |
|---------------------------|-------------------|-----------------|-----|-----|-----|
| Primary Color Graphics    | Secondary EGA 256 | SW1             | SW2 | SW3 | SW4 |
| COLOR 80x25               | MONO or NONE      | OFF             | ON  | OFF | ON  |
| COLOR 40x25               | MONO or NONE      | ON              | ON  | OFF | ON  |

JUMPER SETTINGS FOR JUMPERS P1 AND P3

Two jumpers, P1 and P3 (Figure 1), are used to indicate the type of monitor attached to the EGA 256 and whether the EGA 256 is the primary or secondary I/O address. Use the table below to determine the correct jumper settings for these jumpers. These settings are used for whichever monitor is attached to the EGA 256—it does not matter if the EGA 256 and monitor are the primary or secondary display.

WARNING: The EGA 256 and/or the monitor may be damaged if these settings are not correct.

Table 8. Jumper Settings for P1 and P3 which determine the type of monitor attached to the EGA 256.

| Monitor attached to EGA 256 | Jumper P1 | Setting P3 |
|-----------------------------|-----------|------------|
| COLOR or MONOCHROME         | 2&3       | 1&2        |
| ENHANCED COLOR*             | 1&2       | 1&2        |

\* Jumpers P1 and P3 are set for use with an Enhanced Color monitor at the factory.

Table 3. SW Switch Settings for EGA 256 when Primary Display Card: EGA 256 Secondary Display Card: none

| Type of monitor               | Switch Settings |     |     |     |
|-------------------------------|-----------------|-----|-----|-----|
|                               | SW1             | SW2 | SW3 | SW4 |
| MONOCHROME                    | OFF             | OFF | ON  | OFF |
| COLOR 80x25                   | OFF             | OFF | OFF | ON  |
| COLOR 40x25                   | ON              | OFF | OFF | ON  |
| ENHANCED COLOR standard mode* | ON              | ON  | ON  | OFF |
| ENHANCED COLOR enhanced mode* | OFF             | ON  | ON  | OFF |

Table 4. SW Switch Settings for EGA 256 when Primary Display Card: EGA 256 Secondary Display Card: Monochrome and printer adapter or equivalent

| Type of monitor attached:     |                      | Switch Settings |     |     |     |
|-------------------------------|----------------------|-----------------|-----|-----|-----|
| Primary EGA 256               | Secondary Monochrome | SW1             | SW2 | SW3 | SW4 |
| COLOR 80x25                   | MONO or NONE         | OFF             | OFF | OFF | ON  |
| COLOR 40x25                   | MONO or NONE         | ON              | OFF | OFF | ON  |
| ENHANCED COLOR standard mode* | MONO or NONE         | ON              | ON  | ON  | OFF |
| ENHANCED COLOR enhanced mode* | MONO or NONE         | OFF             | ON  | ON  | OFF |

\* Mode can be changed by programming also.

3-130







| FUNCTION                        | 912C/920C | 925                     |
|---------------------------------|-----------|-------------------------|
| Extension Mode On               | ESC (r    | ESC (r                  |
| Extension Mode Off              | ESC A     | ESC A                   |
| Print (Page Print)              | ESC P     | ESC P                   |
| Transparent Print On            |           | ESC                     |
| Transparent Print Off           |           | ESC a                   |
| Load User Line                  |           | ESC [ (text) CR         |
| Display User Line               |           | ESC g                   |
| Turn Off 25th Line              |           | ESC h                   |
| Reverse Linefeed                |           | ESC j                   |
| Set Local Edit Mode             |           | ESC k                   |
| Set Duplex Edit Mode            |           | ESC l                   |
| Select Termination Character    |           | ESC x 4 <sup>xxx</sup>  |
| Set Cursor Attribute            |           | ESC . n                 |
| Set Print Termination Character |           | ESC pn                  |
| Load Time                       |           | ESC sp l n1 n2 n3 n4 n5 |
| Read Time                       |           | ESC sp 2                |

### S1 (RIGHT REAR)

|      | 1                   | 2         | 3         | 4         | 5         | 6         | 7                      | 8         | 9         | 10        |
|------|---------------------|-----------|-----------|-----------|-----------|-----------|------------------------|-----------|-----------|-----------|
|      | BAUD RATE           | BAUD RATE | BAUD RATE | BAUD RATE | DATA BITS | STOP BITS | BAUD RATE              | BAUD RATE | BAUD RATE | BAUD RATE |
| UP   | SEE CHART           |           |           |           | 7 BIT     | 2 BIT     | SEE CHART              |           |           |           |
| DOWN | MAIN PORT BAUD RATE |           |           |           | 8 BIT     | 1 BIT     | PRINTER PORT BAUD RATE |           |           |           |

### S2 (LEFT REAR)

|      | 1         | 2         | 3      | 4      | 5      | 6            | 7     | 8    | 9       | 10              |
|------|-----------|-----------|--------|--------|--------|--------------|-------|------|---------|-----------------|
|      | EDIT MODE | EMULATION | PARITY | PARITY | PARITY | SCREEN VIDEO | MODE  | MODE | REFRESH | CARRIAGE RETURN |
| UP   | LOCAL     | 912/920   | SEE    |        |        | WOB          | SEE   |      | 60 HZ   | CR/LF           |
| DOWN | DUPLEX    | 925       | CHART  |        |        | BOW          | CHART |      | 50 HZ   | CR              |

345                      78  
 DDD NO PARITY            DD HDX  
 DDU ODD PARITY        UD FDX  
 DUU EVEN PARITY       DU BLK  
 LDU MARK PARITY  
 LUU SPACE PARITY

### S3 (INTERNAL)

|      | 1        | 2        | 3        | 4                | 5                | 6              | 7         | 8        | 9        | 10       |
|------|----------|----------|----------|------------------|------------------|----------------|-----------|----------|----------|----------|
|      | KEYCLICK | CHAR SET | CHAR SET | CURSOR ATTRIBUTE | CURSOR ATTRIBUTE | TIME OUT BLANK | ATTRIBUTE | DCD      | DSR      | DTR      |
| UP   | OFF      | SEE      |          |                  |                  | ON             | PAGE      | DISCONN. | DISCONN. | DISCONN. |
| DOWN | ON       | CHART    |          |                  |                  | OFF            | LINE      | CONN.    | CONN.    | CONN.    |

23                      56  
 DD ENGLISH            DD BLINKING BLOCK  
 DU GERMAN            DU BLINKING UNDERLINE  
 UD FRENCH            UD STEADY BLOCK  
 UU SPANISH            UU STEADY UNDERLINE

### S1

|    | 7  | 8  | 9  | 10 |       |
|----|----|----|----|----|-------|
|    | 1  | 2  | 3  | 4  |       |
| DN | DN | DN | DN | DN | 9100  |
| DN | DN | DN | DN | DN | 500   |
| DN | DN | DN | DN | DN | 70    |
| DN | DN | UP | UP | DN | 110   |
| DN | UP | DN | DN | DN | 135   |
| DN | UP | DN | DN | DN | 150   |
| DN | UP | UP | DN | DN | 300   |
| DN | UP | UP | UP | UP | 600   |
| UP | DN | DN | DN | DN | 1200  |
| UP | DN | DN | UP | UP | 1800  |
| UP | DN | UP | DN | DN | 2400  |
| UP | DN | UP | UP | UP | 3600  |
| UP | UP | DN | DN | DN | 4800  |
| UP | UP | DN | UP | UP | 7200  |
| UP | UP | UP | DN | DN | 9600  |
| UP | UP | UP | UP | UP | 19200 |

IRVIN COMPATIBILITY TABLE

**INTERNAL MODELS**  
 CAP. SORBUS # MDL  
 10MB 110D  
 110X  
 MD130006 110A  
 20MB MD130011 120D  
 MD130009 120X  
 120A  
 220P  
 125D  
 125X  
 MD130010 125A  
 225P  
 40MB 145D  
 145X  
 145A  
 MD130245 245P  
 64MB 165C  
 165X  
 265P  
 20MB MD130249 2020  
 40MB 2040  
 80MB 2080

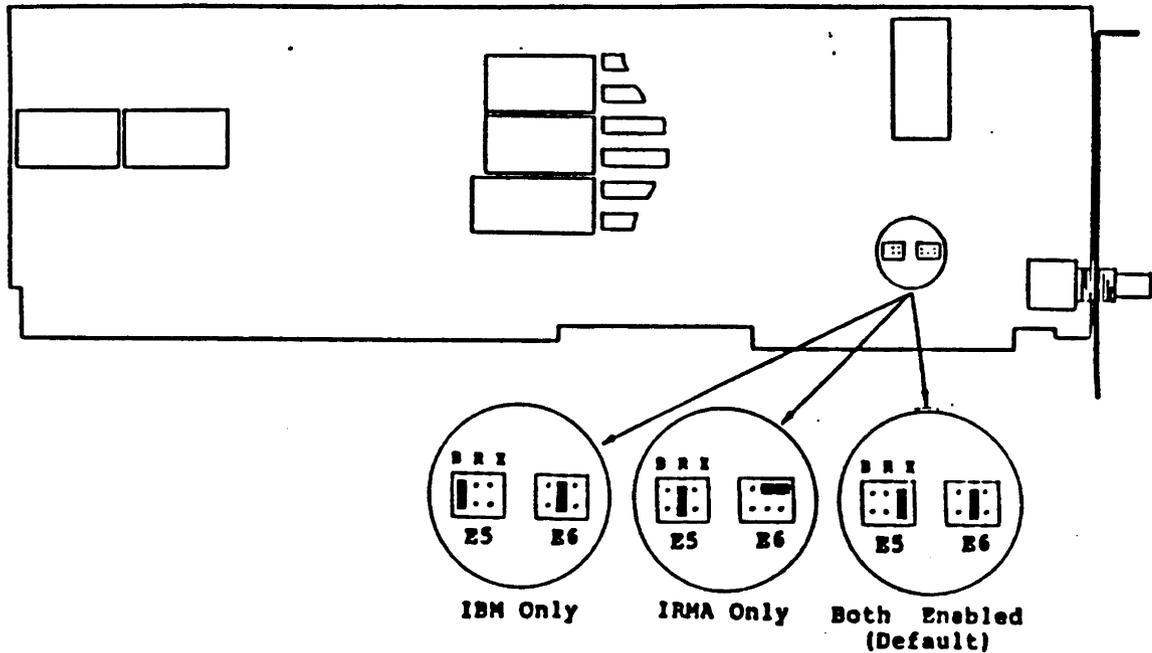
| COMPAQ             |         |        | AT&T         |               |              | CLONES         |                | PC FAMILY |           |           |    | PS/2 FAMILY |            |            |            |            |
|--------------------|---------|--------|--------------|---------------|--------------|----------------|----------------|-----------|-----------|-----------|----|-------------|------------|------------|------------|------------|
| PORT286<br>DPRO286 | DPRO386 | PORT11 | AT&T<br>6300 | AT&T<br>6300+ | AT&T<br>6310 | PC/XT<br>CLONE | PC/AT<br>CLONE | PC<br>089 | XT<br>286 | XT<br>ALL | AT | PS/2<br>30  | PS/2<br>50 | PS/2<br>60 | PS/2<br>70 | PS/2<br>80 |
| *                  | *       |        |              |               |              | *              | *              | *         |           |           |    |             |            |            |            |            |
|                    |         |        | *            | *             | *            |                |                | *         | *         |           | *  |             |            |            |            |            |
|                    |         |        |              |               |              |                |                |           |           |           | *  |             |            |            |            |            |
| *                  | *       |        |              |               |              | *              |                | *         | *         |           |    |             |            |            |            |            |
|                    |         |        | *            | *             | *            |                | *              |           |           |           | *  |             |            |            |            |            |
|                    |         |        |              |               |              |                | *              |           |           |           | *  |             |            |            |            |            |
|                    |         |        |              |               |              |                |                |           |           |           |    |             | 3          | 4          |            | 4          |
| *                  | *       |        |              |               |              |                |                |           |           |           | *  |             |            |            |            |            |
|                    |         |        |              | *             | *            |                |                |           | *         |           |    |             |            |            |            |            |
|                    |         |        |              |               |              |                | *              |           |           |           | *  |             |            |            |            |            |
|                    |         |        |              |               |              |                |                |           |           |           |    |             | 3          | 4          |            | 4          |
| *                  | *       |        |              |               |              |                |                |           |           |           | *  |             |            |            |            |            |
|                    |         |        |              | *             | *            |                |                |           | *         |           |    |             |            |            |            |            |
|                    |         |        |              |               |              |                | *              |           |           |           | *  |             |            |            |            |            |
|                    |         |        |              |               |              |                |                |           |           |           |    |             | 3          | 4          |            | 4          |
| *                  | *       |        |              |               |              |                |                |           | *         |           | *  |             |            |            |            |            |
|                    |         |        |              | *             | *            |                |                |           | *         |           |    |             |            |            |            |            |
|                    |         |        |              |               |              |                | *              |           |           |           | *  |             |            |            |            |            |
|                    |         |        |              |               |              |                |                |           |           |           |    |             | 3          | 4          |            | 4          |
| *                  | *       |        |              |               |              |                |                |           | *         |           | *  |             |            |            |            |            |
|                    |         |        |              | *             | *            |                |                |           | *         |           |    |             |            |            |            |            |
|                    |         |        |              |               |              |                | *              | B         | B         | C         | C  | B           | D          | D          |            | D          |
|                    |         |        |              |               |              |                | *              | B         | B         | C         | C  | B           | D          | D          |            | D          |
|                    |         |        |              |               |              |                | *              | B         | B         | C         | C  | B           | D          | D          |            | D          |

**EXTERNAL MODELS**  
 CAP. SORBUS # MDL  
 10MB 410X  
 410A  
 MD130007 310D  
 20MB MD130019 420X  
 MD130018 420A  
 MD130020 720SP  
 MD130017 425A  
 725SP  
 40MB MD130015 445A  
 MD130248 745SP  
 64MB 465A  
 765SP

- |                                                                    |                                                         |
|--------------------------------------------------------------------|---------------------------------------------------------|
| 1. 4250 or 4251 Interface Board (MD130016 -4250)                   | B. (MD130250) 8425 kit, 5.25" bezel, XT/AT adapter      |
| 2. 4251 Interface Board Required                                   | C. (MD130251) 8426 kit, 5.25" bezel, XT, AT card, cable |
| A. 8330 PS/2 Mdl 30 accessory kit for Irvin Externals              | D. ( ) 8470 kit, 3.5" bezel, PS/2 adapter card          |
| 3. 8450 PS/2 Mdl 50 accessory kit                                  | E. ( ) 8451E kit, T-board, cable, D-shell, PS/2         |
| 4. 8460 PS/2 Mdl 60 & Mdl 80 accessory kit (MD130252)              | F. (MD130253) 8461E kit, buffer bd, cable, PS/2 back-   |
| 5. IBM PS/2 5.25 inch Ext. Diskette Drive Adapter, IBM P/N 6450244 | plane connector.                                        |
| 6. IBM PS/2 5.25 inch Ext. Diskette Drive Adapter, IBM P/N 6450245 | Note: E suffix denotes external model.                  |



## 3270 COAX ADAPTER



### I/O AND MEMORY ADDRESSES

#### Introduction

The 3270 Coax Adapter responds in two ranges of PC I/O addresses and one range of PC memory addresses. Any one of the 3270 Coax Adapter's addresses can be modified to resolve address conflicts with other adapters installed in your PC. This section provides instructions for modifying PC I/O and memory addresses. Note that a conflict is an unusual condition.

#### DCA-IRMA I/O Address

To emulate the functional characteristics of the DCA-IRMA Board, the 3270 Coax Adapter acknowledges I/O addresses 220H-227H. These addresses are enabled with the factory default settings.

#### IBM 3278/79 Emulation Adapter

To emulate the functional characteristics of the IBM 3278/79 Emulation Adapter, the 3270 Coax Adapter acknowledges I/O addresses 2D0H-2D7H and memory addresses CE000-CFFFF. These addresses are enabled with the factory default settings.

#### Selective Address Enabling

The I/O or memory addresses can be selectively enabled by changing one of two jumper block settings. The jumper blocks are located on the lower front end corner of the 3270 Coax Adapter board. (See Figure B-1 on page B-4 for further reference.)

If you enable IRMA addresses only, the IRMA addresses will be disabled. If you enable IRMA addresses only, the IRMA addresses will be disabled. Note that the factory default selection is "Both Enabled". The following sections of Appendix B cover address enabling in more detail.

#### Jumper Block E5 - I/O Addresses

This jumper block contains three positions used to select the desired I/O addresses for IRMA only (labeled R), IBM only (labeled B) or Both Enabled (labeled X). The position of the movable plastic jumper on the jumper block determines the option. (For reference, see Figure B-1 on the page B-4.)

#### BOTH ENABLED (LABELED X)

This jumper position, which is the factory default, indicates both IRM and IRMA I/O addresses are enabled. You will find the movable plastic jumper in the "Both Enabled" setting when you receive the 3270 Coax Adapter from the factory. (See Figure B-1 on page B-4 for reference.)

#### IRMA ONLY (LABELED R)

This jumper position indicates that only IRMA addresses 220H-227H are enabled and IRMA addresses are disabled. Note that EXTRA! Connectivity Software, when used with the 3270 Coax Adapter, uses the IRMA addresses as its primary method of communication with the 3270 Coax Adapter. With these IRMA addresses disabled, you must tell the program you have a DCA-IRMA board instead of an IBM 3270 Coax Adapter during customization. Also note that this position does not allow the Attachmate Diagnostic Test to operate. (See Figure B-1 on page B-4 for reference.)

#### IBM ONLY (LABELED B)

This jumper position indicates that only the IBM 3278/79 Emulation Adapter I/O addresses 2D0H-2D7H are enabled and that the IRMA addresses are disabled. When you choose this jumper setting, you will also need to enable the IBM memory addresses. See "Jumper Block E6 - Memory Addresses" below for more information. (Also see Figure B-1 on page B-4 for reference.)

#### Jumper Block E6 - Memory Addresses

This block contains two jumper settings used to enable or disable IBM memory addresses (CE000H-CFFFFH). A movable plastic jumper is used to select the desired option.

**Note:** Jumper block E6, located next to E5, is not labeled on the circuit board. See Figure B-1 on page B-4 for reference.

#### IBM MEMORY ENABLED (BOTH ENABLED)

This position enables the IBM memory addresses (CE000-CFFFFH). This is the factory default position and is required if "IBM Only" or "Both Enabled" jumper settings are selected in the I/O address block. (See Figure B-1 on page B-4 for reference.)

#### IBM MEMORY DISABLED (IRMA ONLY)

This position disables the IBM memory addresses (CE000-CFFFFH). This should not be used if "IBM Only" or "Both Enabled" jumper settings are selected in the I/O address block. Note that this position does not allow the Diagnostic Test to operate. (See Figure B-1 on page B-4 for reference.)

3-136

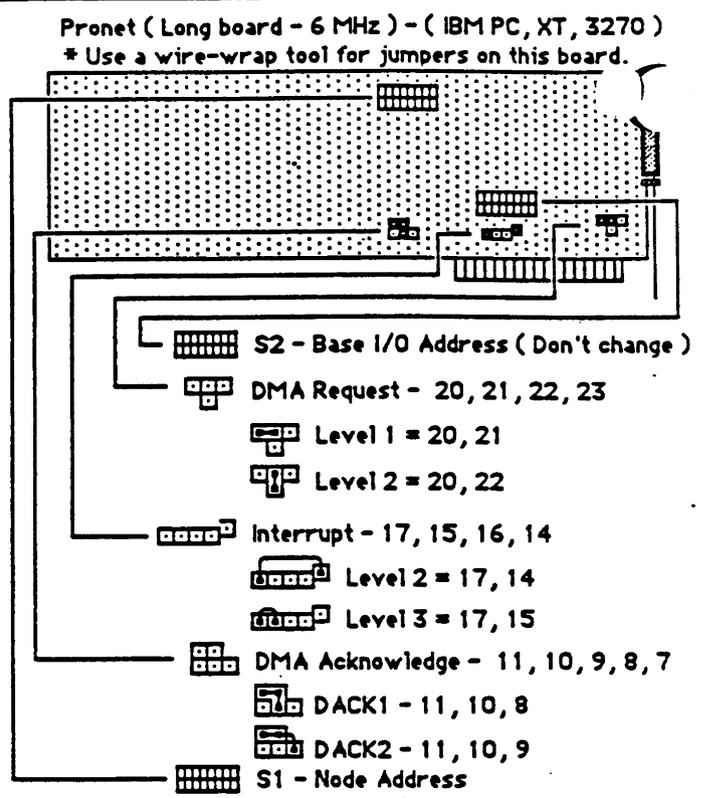
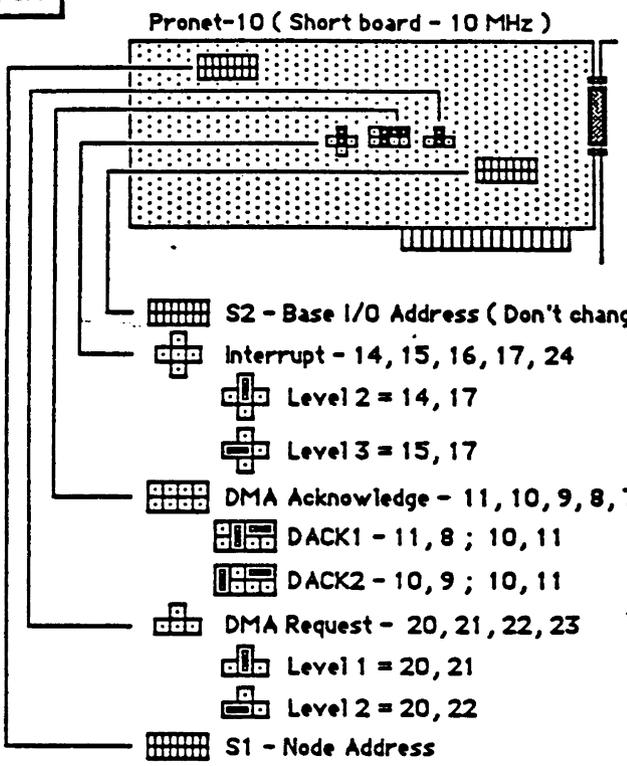


# Proteon P1300 Pronet Local Area Network Boards (Shown with default settings)

**KEY**

ON       - Jumper open

OFF       - Jumper closed



**Setting the Hexadecimal Node Address:**

|             |   |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |
|-------------|---|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|
| Decimal     | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| Hexadecimal | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | A  | B  | C  | D  | E  | F  |

Note: Down is actually in the "ON" position, opposite of board description.

**Decimal Address:**

Switch 1

|                                     |                                     |                                     |                                     |                          |                          |                          |                          |
|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| 1                                   | 2                                   | 3                                   | 4                                   | 5                        | 6                        | 7                        | 8                        |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

=

|                                     |                                     |                          |                          |                          |                          |                          |                          |
|-------------------------------------|-------------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| 1                                   | 2                                   | 4                        | 8                        | 16                       | 32                       | 64                       | 128                      |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

=

|                                     |                                     |                                     |
|-------------------------------------|-------------------------------------|-------------------------------------|
| 1                                   | 2                                   | 8                                   |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| 4                                   | 1                                   |                                     |
| <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            |

Decimal Address = 197

**Hexadecimal Address:**

Switch 1

|                                     |                                     |                                     |                                     |                          |                          |                          |                          |
|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| 1                                   | 2                                   | 3                                   | 4                                   | 5                        | 6                        | 7                        | 8                        |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

=

|                                     |                                     |                                     |                                     |
|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
| 1                                   | 2                                   | 4                                   | 8                                   |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 1                                   | 2                                   | 4                                   | 8                                   |
| <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |

Right side is most significant bit, so the address is C5.

4 + 1 = 5    4 + 8 = C

Hexadecimal Address = C5

**Base I/O Address:**

Switch 2

|                          |                          |                          |                          |                                     |                                     |                                     |                                     |
|--------------------------|--------------------------|--------------------------|--------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
| 1                        | 2                        | 3                        | 4                        | 5                                   | 6                                   | 7                                   | 8                                   |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |

Conflict with:

|      |                          |                          |                          |                          |                                     |                                     |                                     |
|------|--------------------------|--------------------------|--------------------------|--------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
| 300H | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 308H | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| 310H | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| 318H | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 320H | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| 328H | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| 330H | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| 338H | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 340H | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| 348H | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| 350H | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| 358H | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| 360H | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| 368H | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| 370H | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| 378H | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            |

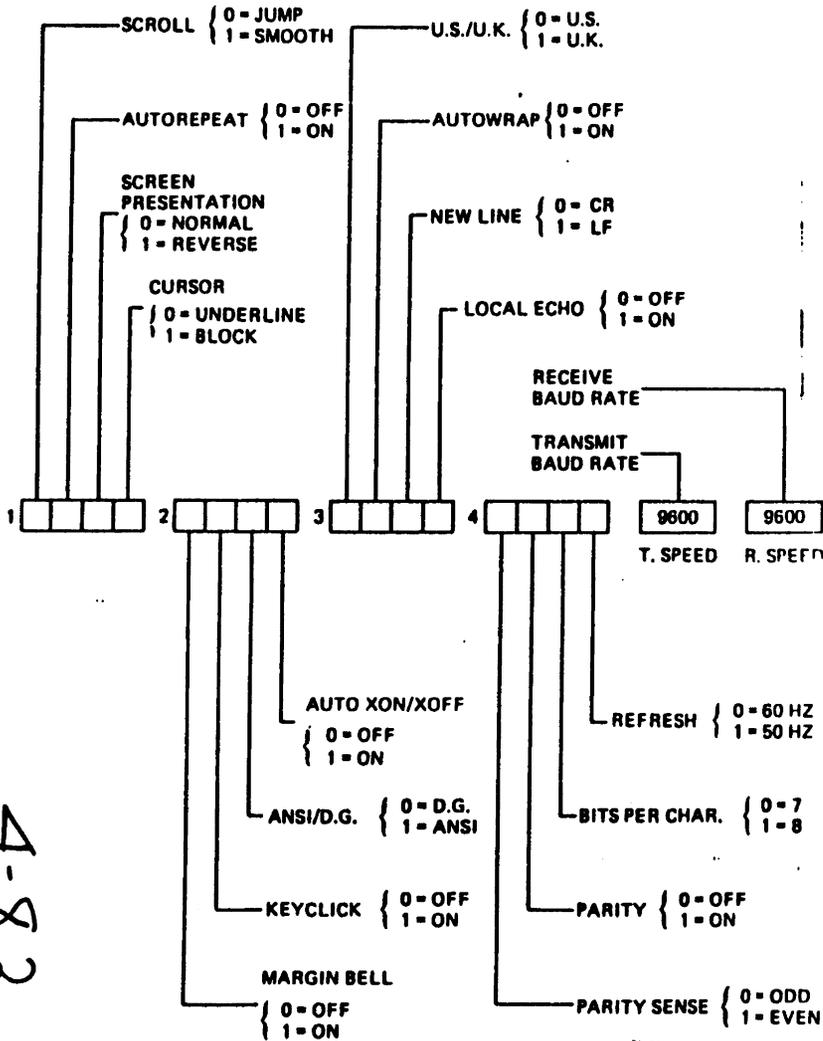
Fixed Disk

Fixed Disk

Printer

**Notes about the boards:**

1. When in doubt, use a high address, one that is greater than 50 hex.
2. Always use interrupt level 3 in the IBM PC 3270 computers.
3. When used with a Banyan Server, never use Hex Addresses 0-A in a workstation. These addresses are reserved for use in the Banyan Network Server.
4. Run "DIAGPRON" to verify that the board is set up correctly. ( It may not work in some clone computers. )
5. When changing interrupt level or DMA Request, run "PCCONFIG" to save the new configuration.
6. Duplicate Address errors are in decimal address, while diagnostics gives you the hexadecimal address.
7. The difference between the boards - The long board can run up to 6 MHz clock speed and needs a wire-wrap to change the jumpers. The short board ( Pronet-10 ) can run up to 10 MHz clock speed and has regular jumpers.



4-8.2

Note  
For Mark Parity, the first three bits of group 4 are 1, 0, 1.  
For Space Parity the first three bits of group 4 are 0, 0, 1.

Figure 3-3 SET-UP B Summary

APPENDIX V  
TURN-AROUND CONNECTOR FOR INTERFACE TESTS

Turn-around Connector for Current Loop tests.

Solutions 2,3,8 ON 4,5 OFF

2 17 18 25

Turn-around Connector for EIA tests.

Solutions 1,2,3,4,5,6,7 OFF 8 ON

2 3 4 8 9 20

VISUAL TECHNOLOGY INCORPORATED, 640 MAIN STREET, TEWKSBURY, MA 01876

6.3.11 Test Commands

Alpha Display, ESC 88 (Priority)

This command causes the screen to be filled with upper case 'E's, and is used for focus and alignment of the display.

Alpha Shift Test, ESC (2; P; r Priority)

This command is used to test one or more of the various shift tests on the VISUAL 110. The address to test is indicated by the number in parentheses which must be performed. The parameter value is arrived at by taking the length of each test and adding them together. A parameter value of 0 causes a reset.

Test

- Power-up shift test
- Interrupt Test (Loop Back)
- EIA Test
- Reset Test until power-off

\*See Appendix V for turn-around plug.

TABLE 3-1  
SET-UP FEATURE CHANGE SUMMARY

| SET UP Feature      | Changed in SET-UP A | Changed in SET-UP B | Qualified Key Used to Change Feature | Permanent Control when Display Key to Change Feature | Changeable from Host |
|---------------------|---------------------|---------------------|--------------------------------------|------------------------------------------------------|----------------------|
| Line/Lead           | ✓                   | ✓                   | 1                                    |                                                      | ✓                    |
| Character Per Line  | ✓                   |                     | 1                                    |                                                      | ✓                    |
| Tab                 | ✓                   |                     | 9 and 11                             |                                                      | ✓                    |
| Screen Brightness   | ✓                   | ✓                   | 1                                    |                                                      | ✓                    |
| ANSI/D.G. Mode      | ✓                   | ✓                   |                                      | ✓                                                    | ✓                    |
| Smooth/Sharp Scroll | ✓                   | ✓                   |                                      | ✓                                                    | ✓                    |
| Autorepeat          | ✓                   | ✓                   |                                      | ✓                                                    | ✓                    |
| Autowrap            | ✓                   | ✓                   |                                      | ✓                                                    | ✓                    |
| Margin Bell         | ✓                   | ✓                   |                                      | ✓                                                    | ✓                    |
| Key Click           | ✓                   | ✓                   |                                      | ✓                                                    | ✓                    |
| Auto XON/XOFF       | ✓                   | ✓                   |                                      | ✓                                                    | ✓                    |
| U.S./U.K. Char. Set | ✓                   | ✓                   |                                      | ✓                                                    | ✓                    |
| Autorepeat          | ✓                   | ✓                   |                                      | ✓                                                    | ✓                    |
| New Line            | ✓                   | ✓                   |                                      | ✓                                                    | ✓                    |
| Local Echo          | ✓                   | ✓                   |                                      | ✓                                                    | ✓                    |
| Refresh Rate        | ✓                   | ✓                   |                                      | ✓                                                    | ✓                    |
| Interrupt Speed     | ✓                   | ✓                   | 1                                    |                                                      | ✓                    |
| Power-on Shift      | ✓                   | ✓                   | 1                                    |                                                      | ✓                    |
| Interrupt Test      | ✓                   | ✓                   | 1                                    |                                                      | ✓                    |
| Reset Test          | ✓                   | ✓                   | 1                                    |                                                      | ✓                    |

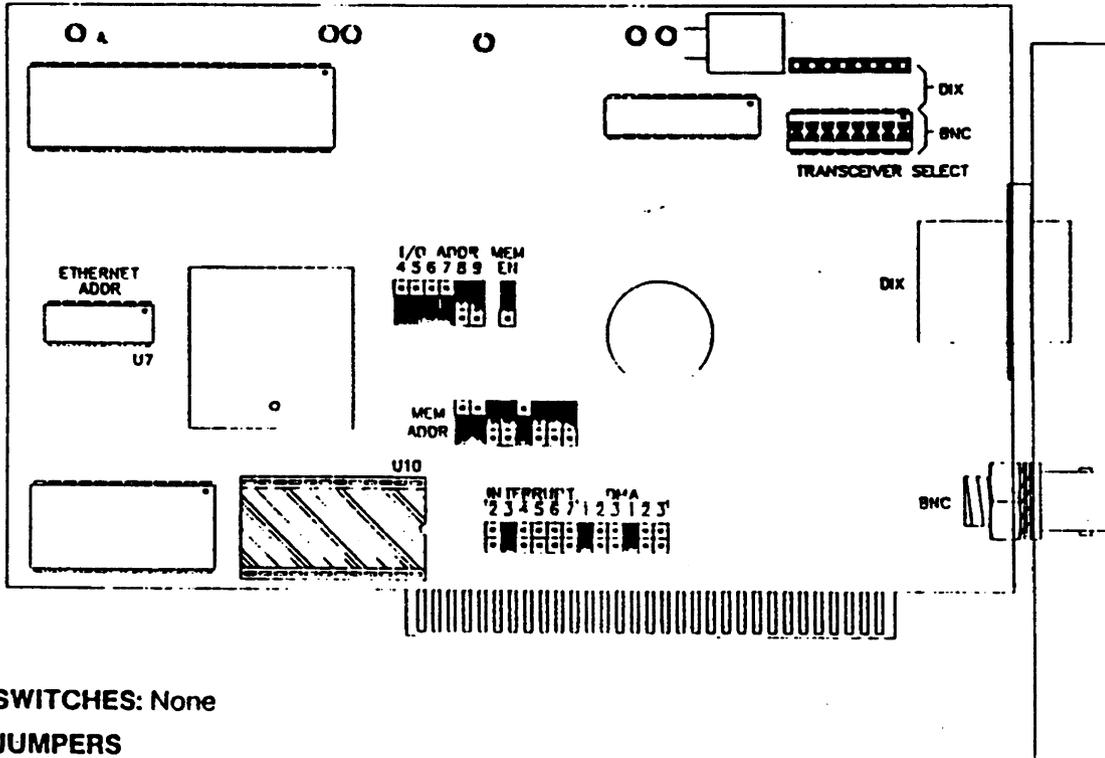
# 3COM NETWORK INTERFACE CARD (PC270040)

MANUFACTURER PART NO. 1221-00

## INSTALLATION INSTRUCTION SHEET

### CAUTION

Static sensitive device. Handle only at a static-free workstation or use an antistatic service kit. Package the device in a conductive bag with an insulated antistatic liner.



**SWITCHES:** None

**JUMPERS**

### NOTE

Default setting on drawing

#### Transceiver Select Plug

Move shunt to upper position if connecting to an external transceiver. Leave shunt in lower position to use the BNC connector.

#### DMA Select

Two jumpers required to select DMA channel 1, 2, 3; one for ACK and one for REQUEST. Requires software modification if not default. Refer to User's Manual.

#### Hardware Interrupt

One jumper to select the interrupt level: 2 to 7 allowed; 3 preferred. Requires software modification if not default. Refer to User's Manual.

#### I/O Address

Jumper high order 6 bits to 1 or 0. Starting address can be set to any I/O block starting between 0 and 3FOH. Default is set to 300H. Requires software modification if not default.

#### Memory Enable

Enables EtherStart ROM located in U10. This is an option for use in diskless workstations. Move jumper to lower position if installing the EtherStart ROM.

#### Mem Address

Sets the starting address for the EtherStart ROM in U10.

PC270040

3-140

~~3-140~~

hardware compatible to the IBM PC and IBM XT, and that contain an 8088 microprocessor on a socket. TinyTurbo fits in a normal IBM expansion slot and uses the host computer's 8088 socket. It consumes about 7 Watts of power.

**CAUTION:** Do not install the TinyTurbo in a computer that contains an 8086, 80186, or 80286 microprocessor. You might damage the TinyTurbo.

### JUMPER SETUP

Before installing the TinyTurbo in your computer, make sure the jumpers are set for your configuration.

The factory configuration of the TinyTurbo is as follows:

- o 5MHz 80287 math chip
- o Caching enabled
- o A host computer with 640K of memory

You can change the configuration by moving the jumpers as required. The jumpers on the TinyTurbo are clearly marked. Their functions are given below.

To install a jumper, the black plastic sleeve must cover two opposite pins, with a pin in each hole of the sleeve. If it is hard to get a grip on a jumper, try using the IC extractor tool that comes with your TinyTurbo.

### 80287 MATH COPROCESSOR CHIP

The TinyTurbo 286 comes with a socket for an 8MHz or 5MHz 80287 math chip. To install it on the board, follow these steps:

1. Insert it in the socket so that the indentation on the end of the top surface of the chip is at the same end of the socket as the socket's indentation.
2. Make sure all of the pins are aligned with their corresponding holes in the socket and press down firmly.

Be careful not to allow any pins to bend. If you bend some, be careful straightening them, because the pins can only be flexed a few times before breaking.

3. Install the jumper on the pins that correspond to the 80287's clock frequency, either 5MHz or 8MHz.

The chips are usually marked as follows:

8MHz - 80287-8  
5MHz - 80287-3 or 80287

### CACHE DISABLE/ENABLE (W1)

This jumper will normally be left in the factory-default setting with W1 installed so that caching is enabled. It will need to be removed for operation in some of the less compatible workalikes.

- o With cache enabled (W1 installed) the TinyTurbo runs programs in its cache memory for highest performance.
- o With cache disabled (W1 removed), TinyTurbo runs programs in normal PC memory, without caching.

### HOST COMPUTER MEMORY SIZE (W2-W5)

These jumpers are needed if caching is enabled. They tell the TinyTurbo how much host memory to cache.

**NOTE:** If you set the jumpers for more memory than the host computer contains, the TinyTurbo will not pass the power-on or cold-boot self test.

# TinyTurbo 286

### INSTALLING IN YOUR COMPUTER

In this procedure, you will remove the PC's 8088, put it on the TinyTurbo, plug the Turbo's cable into the 8088 socket, and plug in the Turbo.

**NOTE:** TinyTurbo 286 only works in computers that use 8088 microprocessors.

1. Remove the 8088 from the PC. Use the removal tool supplied with the Turbo or small screwdriver.

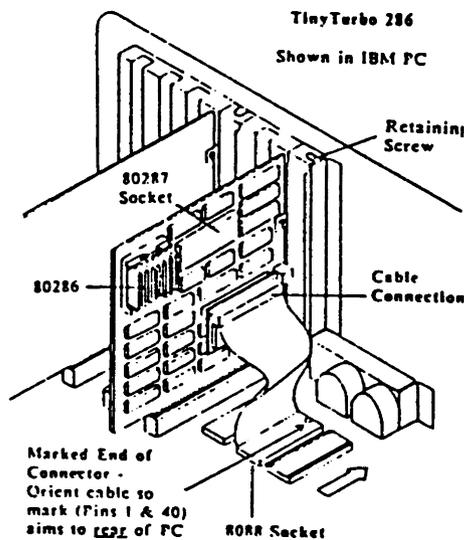
**CAUTION:** Do not pry up at too much of an angle. Be careful not to bend the pins.

2. Plug the 8088 into the socket on the TinyTurbo's small daughtercard. Make sure the indentation on the end of the 8088 is at the end of the socket marked Pin 40.
3. Plug the TinyTurbo cable into the 8088 socket on the PC.

**NOTE:** The cable has a mark on the connector indicating Pin 1 and Pin 40. Plug in the cable so that this mark aims toward the indentation on the 8088 socket.

In the IBM PC or XT the marking (on Pin 1 and Pin 40) will aim toward the LE2E, as shown on the next page.

4. Slide the TinyTurbo into the expansion slot closest to the PC's 8088 socket (J7 or J8 in the IBM XT).



5. Plug the other end of the TinyTurbo cable onto the double row of pins on the TinyTurbo.

If installed properly in an IBM PC or XT, the cable will not have a twist in it.

6. Secure the TinyTurbo by fastening the retaining screw into the adapter bracket and put the system back together.

### THE TURBO SWITCH

TinyTurbo has a switch on the back of the metal adapter bracket. This switch allows you to change back to normal PC operation for timing-sensitive software like games and some copy-protection programs.

UP - TURBO (80286) mode  
DOWN - PC (8088) mode

In the up position you are running on the Turbo's 7.2 MHz 80286 CPU; in the down position you are running on the PC's 4.77 MHz 8088 CPU.

The Turbo switch acts like a reset switch: When you flip the switch, the system waits two seconds and does a cold boot.

This is a useful feature if a program crashes and pressing <Ctrl>-<Alt>-<Del> won't cause a warm boot. Simply flip the switch back and forth to reset the system. This is better for the PC than flipping the power switch.

**CAUTION:** Do not flip the Turbo switch while you are running a program unless you have saved your data to disk.

### Compatibles

Changing the cache jumpers will cure some hardware incompatibilities. Removing jumper W1, to disable caching, allows the TinyTurbo to run in some compatibles in which it would not otherwise work.

### Boards from Other Manufacturers

Adapter boards that manipulate the memory below 640K may conflict with TinyTurbo's caching. To avoid this conflict, either:

- o Disable caching by removing jumper W1. You will not get the benefits of TinyTurbo's caching, but your system will still run much faster than a normal PC.
- o Set TinyTurbo's jumpers W2 - W5 to indicate a memory size below the addresses used by the conflicting board.

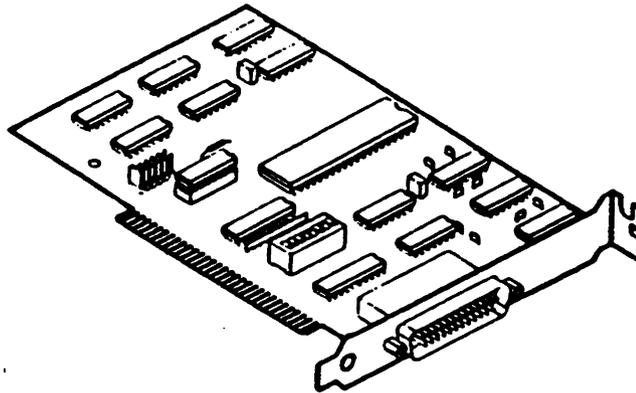
For example: If the other board uses addresses between 512K and 640K for a non-standard version of EMS Memory, by setting the TinyTurbo's jumpers for 512K of system memory.



# BlueLynx Remote

## SNA/SDLC

### Remote



PC569

#### The DIP Switches

Make sure that the switches and jumper on your BlueLynx Remote board are set correctly. They are set by us before shipping, but vibration in transit can change them. You should be sure that everything is firmly set the way it is intended to be.

(Technical Note: The DIP Switches are for setting the "Base Address", indicating where in the I/O buffer you are. They are shipped at 340-35F on the BlueLynx Remote board, which itself contains 32 decimal (20 hex) addresses. DIP switch #1 is the least significant digit and #8 is the most. Five zeros are assumed to the right of #1. You can reset the board anywhere from 000-FFF, in increments of 20 hex.)

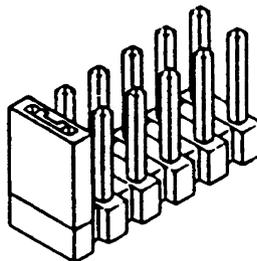
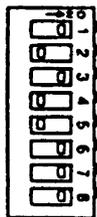


Figure 1-2  
The BlueLynx Remote DIP Switches & Jumpers

For most users, DIP switches 2, 4 & 5 should be set away from the mounting bracket, in the OFF position. All the others (1, 3, 6, 7 & 8) should be set toward the bracket, in the ON position. See Figure 1-2 for details.

#### The Jumpers

At the lower left corner of the board there are six pairs of protruding jumper posts. The black jumper should be in place over the bottom horizontal pair of posts (again, see Figure 1-2 for the exact locations of the DIP switches and the jumpers).

As you will notice during the software installation procedure described in Chapter 2, the interrupt request level ("IRQ") on your BlueLynx Remote board can be reset. The default setting in both the hardware and the software is level 2, however these can be changed if necessary to avoid a conflict with other hardware and/or software running on your system. The bottom set of posts is for interrupt level 2, not 1, so if you move the jumper up one set of posts, you need to change the interrupt level in the software configuration to level 3; if you move it up two sets, the level must be set to 4, etc. It's very important that the jumper setting and the interrupt level chosen during configuration should match perfectly. Note that the lowest set of brass connectors on the jumper is interrupt level 2, not level 1.

3-144

### Ⓔ V. SIZE CONTROL

Turn this knob for the proper vertical size of the display. Turn the knob clockwise for a larger display; turn it counterclockwise for a smaller display.

### Ⓜ V. POSITION CONTROL

Turn this knob for the proper vertical position of the display. Turn the knob clockwise for a lower display position; turn it counterclockwise for a higher display position.

### Ⓝ V. HOLD CONTROL

Adjusts the vertical stability of the display.

### Ⓟ H. POSITION CONTROL

Turn this knob for the proper horizontal position of the display. Turn the knob clockwise to reposition display to the right; turn it counterclockwise to reposition to the left.

### Ⓠ TEXT SWITCH

This switch controls the text mode of MultiSync.

When it is ON, the text of the display will appear in one color selected by the TEXT COLOR SWITCH (Nos. 2, 3 and 4 of the dip switch on the rear of MultiSync), regardless of the colors of the software program being used.

When it is OFF, the color of the software program being used will again be displayed.

The diagram below of the dip switches shows how to display text in your choice of seven colors.

| TEXT COLOR | DIP SWITCH |        |        |
|------------|------------|--------|--------|
|            | 2<br>R     | 3<br>G | 4<br>B |
| RED        | ON         | OFF    | OFF    |
| GREEN      | OFF        | ON     | OFF    |
| BLUE       | OFF        | OFF    | ON     |
| YELLOW     | ON         | ON     | OFF    |
| CYAN       | OFF        | ON     | ON     |
| MAGENTA    | ON         | OFF    | ON     |
| WHITE      | ON         | ON     | ON     |

#### NOTE

The text switch works only in the TTL mode.

### Ⓡ H. WIDTH SWITCH

Adjust this switch for the horizontal size of display preferred. When this switch is ON, the width of the display size changes.

#### NOTE

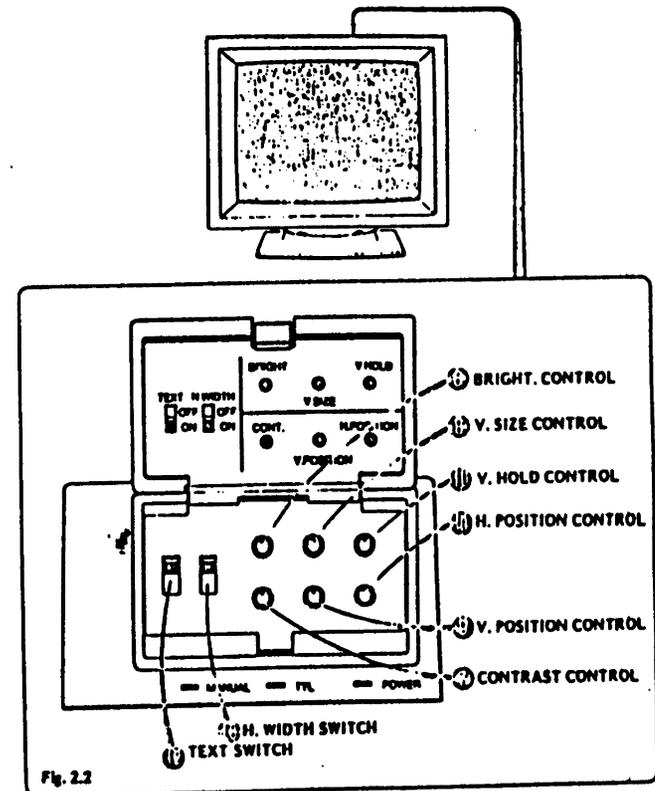
When the horizontal scanning frequency is between 15 and 20 kHz, H. WIDTH cannot be adjusted.

*Nec JC-1401P3A Intelligent Monitor*

*MultiSync*

8

## 2.2.2 ADJUSTING THE TOP CONTROLS



### Ⓢ BRIGHT. CONTROL

Used to adjust the picture brightness of the screen.

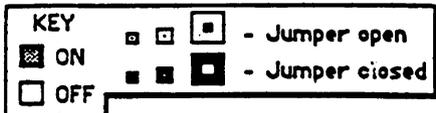
### Ⓣ CONTRAST CONTROL

Adjusts the display to the contrast preferred by the user.

*Nec JC-1401P3A Int. Monitor*

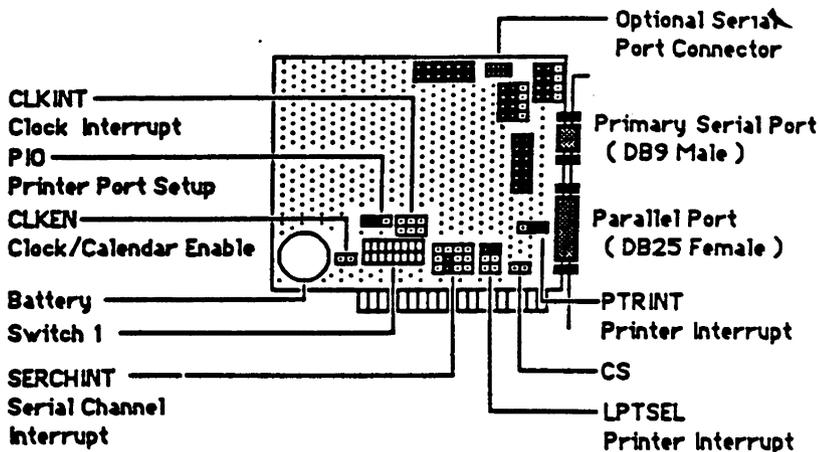
7

# Everex Magic I/O EV170 and EV170A Multi-Function Board



The Everex Magic I/O is a multi-function board for IBM PC, XT, AT and compatible computers. Its features are:

- A parallel printer port
  - An RS232 serial interface port
  - A Clock/Calendar with replaceable battery
- It has an option for a second RS232 serial port. It comes with software, a Utility diskette with several programs. EV170 is a program to setup the board and test it. The Clock/Calendar with two programs, SCLOCK and EVECLOCK.



### Parallel Printer Port:

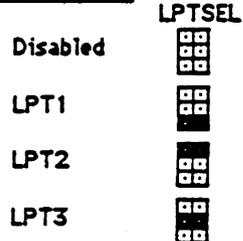
The printer port can be used as either a printer port or a bi-directional general purpose I/O port.



### Interrupt Selection:



### Port Selection:

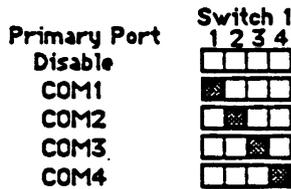


### Base I/O Address:

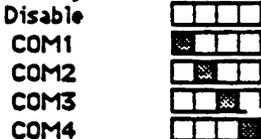
|      |           |
|------|-----------|
| LPT1 | 3BC - 3BF |
| LPT2 | 378 - 37F |
| LPT3 | 278 - 27F |

### RS232 Serial Port:

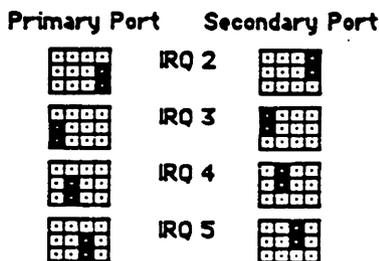
#### Port Selection:



#### Secondary Port



#### Interrupt Selection:



### Base I/O Address:

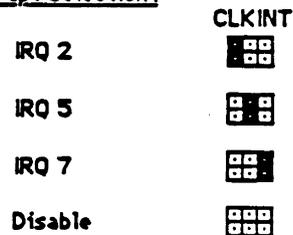
|      |           |
|------|-----------|
| COM1 | 3F8 - 3FF |
| COM2 | 2F8 - 2FF |
| COM3 | 3E8 - 3EF |
| COM4 | 2E8 - 2EF |

### Clock/Calendar:

If you have an EV170A model of the Everex Magic I/O, it is made for the IBM AT, which does not need a clock. All parts involving the clock are missing from this board.

The Clock/Calendar is enabled by two-pin jumper CLKEN. If you are going to install the Magic I/O Board in a computer that already has a Clock/Calendar disable the Magic I/O's clock by removing the CLKEN jumper.

### Interrupt Selection:



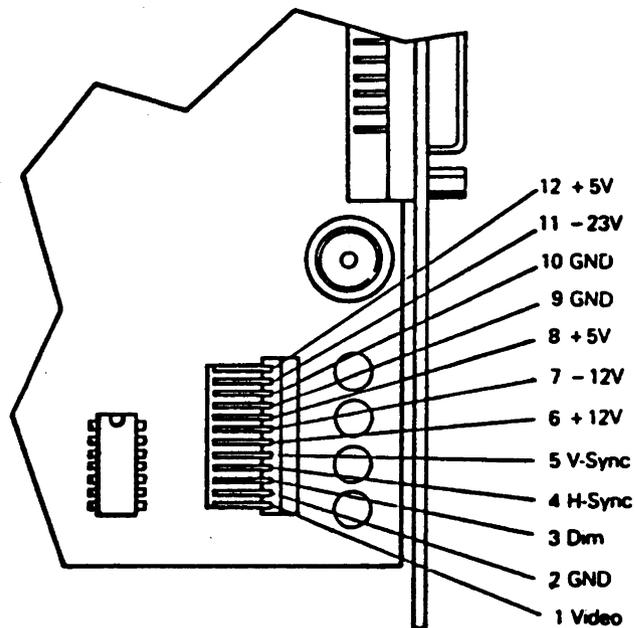
The default setting is disable - No IRQ.

The Base I/O Address of the Magic I/O Clock/Calendar is 2C0 - 2DF.

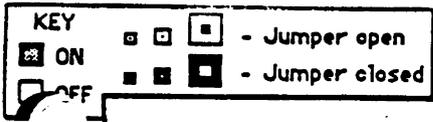
**TO ADJUST DISPLAY SCREEN:**

1. TURN TERMINAL ON
2. PRESS BLOCK . LOOK FOR BLCK ABOVE THE STATUS LINE.
3. PRESS ESC #8. THIS DISPLAYS 26 ROWS OF "E".
4. AFTER THE ADJUSTMENTS ARE MADE HOLD CTRL AND SHIFT. THEN PRESS HOME. THIS CLEARS THE E TEST PATTERN.

**Figure 3-3 Power Connector at the Microprocessor PCB**



4-9.1



# Samsung SM-12SS39A7 TTL Monochrome Display

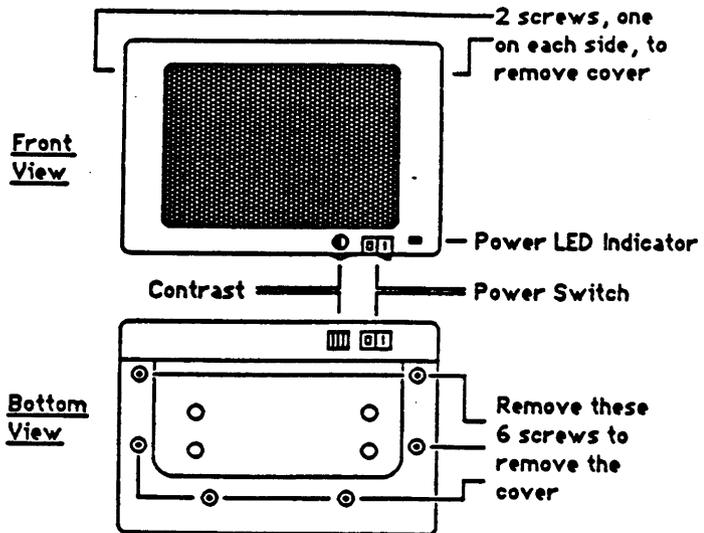
JRG388

The Samsung SM-12 Monochrome Display Monitor is powered directly from a wall outlet, not the PC power supply. It has several adjustments that can be made to it.

On the outside, on the front, is an adjustment for the Contrast.

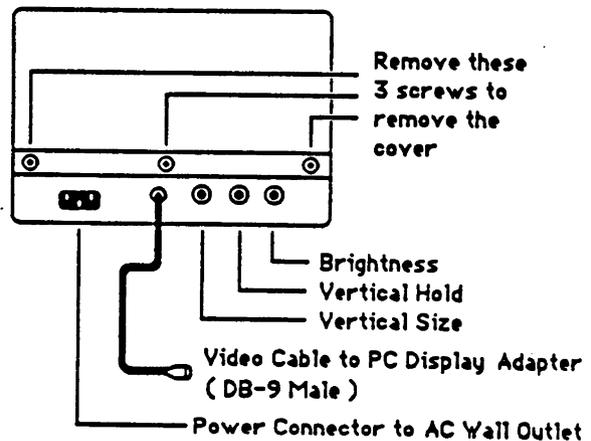
On the outside, on the back, are adjustments for Vertical Hold, Vertical Size and Brightness.

The cover must be removed to make other adjustments. To remove the cover, remove 11 screws, 1 on each side, 3 on the back, and 6 on the bottom.



**BE CAREFUL!** Whenever working with a monitor, be extremely careful not to touch the CRT. Keep hands and face away from the CRT. This is also true for the Flyback Transformer. When working on adjustments inside a monitor, touch only the actual points of adjustment. Try plastic tools only.

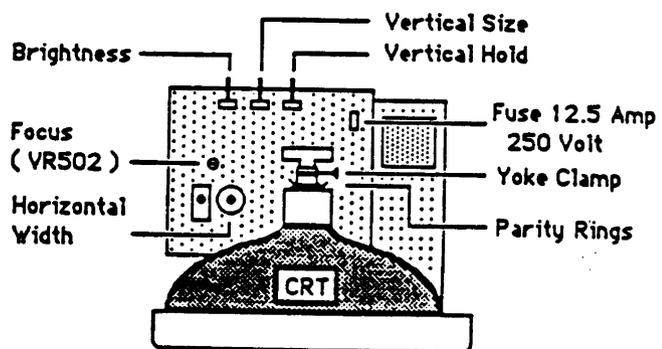
## Back View



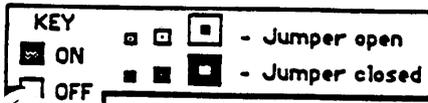
## Adjustments:

- Too much, or too little, raster or brightness - SubBrightness
- Out of Focus - Focus
- Vertical alignment problem - Vertical Hold, Size
- Horizontal alignment problem - Horizontal Width (May not be able to do this if the pot is glued, and use a plastic tool)
- Crooked, or slanted display - Parity Rings or Yoke Clamp
- Characters out of proportion - Vertical Size
- Incorrect characters on display - Not a monitor problem, check display adapter and software

## Top View



# Princeton MAX-12 TTL Monochrome Display



The Princeton MAX-12 Monochrome Display Monitor is powered directly from a wall outlet, not the PC power supply. It has several adjustments that can be made to it.

On the outside, on the front, are adjustments for Contrast and Brightness.

On the outside, on the back, are adjustments for Vertical Hold and Horizontal Hold.

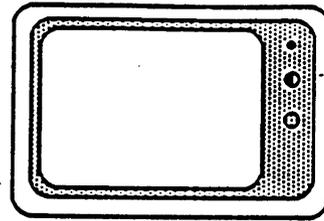
The cover must be removed to make other adjustments. To remove the cover, remove 4 screws - 2 on top, and 2 on the bottom.

**BE CAREFUL!** Whenever working with a monitor, be extremely careful not to touch the CRT. Keep hands and face away from the CRT. This is also true for the FlyBack Transformer. When working on adjustments inside a monitor, touch only the actual points of adjustment. Try to use plastic tools only.

**Adjustments:**

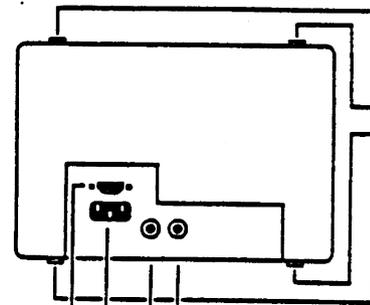
- much, or too little, raster or brightness - SubBrightness
- Out of Focus - Focus
- Vertical alignment problem - Vertical Hold, Size, Linearity
- Horizontal alignment problem - Horizontal Center, or Horizontal Width ( May not be able to do this if the pot is glued, and use a plastic tool )
- Crooked, or slanted display - Parity Rings or Yoke Clamp
- Characters out of proportion - Vertical Size
- Incorrect characters on display - Not a monitor problem, check display adapter and software

Front View



- Power LED Indicator
- Contrast/Pull Power On
- Brightness

Back View



- Remove 4 screws to remove cover

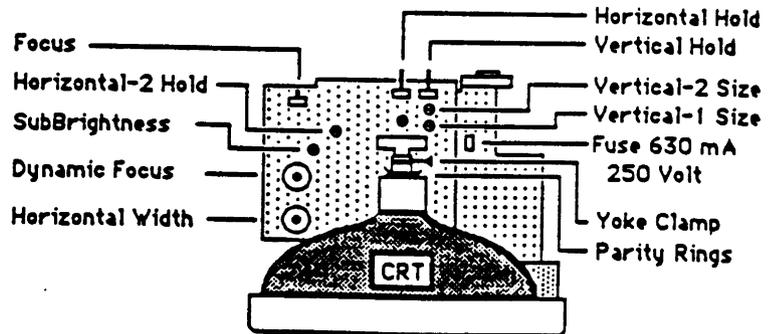
- Horizontal Hold
- Vertical Hold
- Power Connector to AC Wall Outlet
- Video Cable Connector to PC Display Adapter ( DB-9 Female )

**Princeton MAX-12 Monochrome Monitor Cable**

DB9Male - DB9Male

|   |   |   |
|---|---|---|
| 1 | - | 1 |
| 2 | - | 2 |
| 3 | - | 3 |
| 4 | - | 4 |
| 5 | - | 5 |
| 6 | - | 6 |
| 7 | - | 7 |
| 8 | - | 8 |
| 9 | - | 9 |

Top View



- Horizontal Hold
- Vertical Hold
- Vertical-2 Size
- Vertical-1 Size
- Fuse 630 mA 250 Volt
- Yoke Clamp
- Parity Rings
- Focus
- Horizontal-2 Hold
- SubBrightness
- Dynamic Focus
- Horizontal Width

PRINCETON GRAPHICS MONITOR  
I N F O R M A T I O N

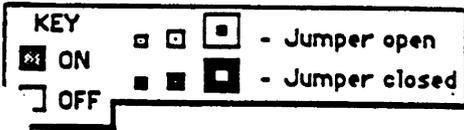
| MODEL      | CG | COMPATIBLE MONITOR ADAPTER CARDS                                                              |
|------------|----|-----------------------------------------------------------------------------------------------|
| MAX-12     | A  | MDA, CGA                                                                                      |
| HX-12      | A  | CGA                                                                                           |
| HX-12E     | B  | EGA, CGA                                                                                      |
| HX-9       | A  | CGA                                                                                           |
| HX-9E      | B  | EGA, CGA                                                                                      |
| SR-12      | A  | CGA W/SCAN DOUBLER OR SIGMA DESIGN COLOR 400                                                  |
| SR-12P     | C  | PGA (IBM PROFESSIONAL GRAPHICS ADAPTER)                                                       |
| ULTRA-SYNC | D  | MDA, CGA, EGA, PGA, VGA, MAC-II (& ALL OTHER MODES OF OPERATION)                              |
| MAX-15     | D  | MDA, CGA, EGA, PGA, VGA, MAC-II (& ALL OTHER MODES OF OPERATION)                              |
| PSC-28     | E  | VGA (COLOR)                                                                                   |
| PSM-03     | E  | VGA (MONOCHROME)                                                                              |
| LM-300     | F  | DESK TOP PUBLISHING (LASERPAGE CARD BY PGS)                                                   |
| LM-301     | F  | DESK TOP PUBLISHING (LASERVIEW CARD BY SIGMA DESIGN OR PEPPER 1600 CARD BY NUMBER NINE CORP.) |

CG = VIDEO CABLE GROUP, ALL MONITORS WITH THE SAME CABLE GROUP NUMBER WILL SHARE THE SAME CABLE.

| MODEL      | SORBUS PART NUMBER                |
|------------|-----------------------------------|
| MAX-12     | NS120500 (REV1. W/EXT CONTROL)    |
| MAX-12     | NS120502 (REV2. W/O EXT CONTROL)  |
| HX-12      | NS120008                          |
| HX-12E     | NS120010                          |
| HX-9       | NS120100                          |
| HX-9E      | N/A                               |
| SR-12      | NS120300 (REV1. W/CONTRAST POT)   |
| SR-12      | NS120302 (REV2. W/O CONTRAST POT) |
| SR-12P     | N/A                               |
| ULTRA-SYNC | N/A                               |
| MAX-15     | N/A                               |
| PSC-28     | N/A                               |
| PSM-03     | N/A                               |
| LM-300     | N/A                               |
| LM-301     | N/A                               |

# Princeton HX-12 RGB Color Display

JWG3'88



The Princeton HX-12 Color Display Monitor is powered directly from a wall outlet, not the PC power supply. It has several adjustments that can be made to it.

On the outside, on the front, is an adjustment for brightness.

On the outside, on the back, are adjustments for Vertical Size, Vertical Hold, Horizontal Hold and B+ Voltage.

The cover must be removed to make other adjustments. To remove the cover, remove 6 screws - 2 on top and 4 on bottom.

**BE CAREFUL!** Whenever working with a monitor, be extremely careful not to touch the CRT. Keep hands and face away from the CRT. This is also true for the FlyBack Transformer. When working on adjustments inside a monitor, touch only the actual points of adjustment. Try to use plastic tools only.

**Adjustments:**

Too much, or too little, raster or brightness - Screen

Out of Focus - Focus

Vertical alignment problem - Vertical Hold, Size

Horizontal alignment problem - Horizontal Phase, Horizontal Hold, Horizontal Center, or Horizontal Width ( may not be able to do this if pot is glued, and use a plastic tool )

Characters out of proportion - Vertical Size

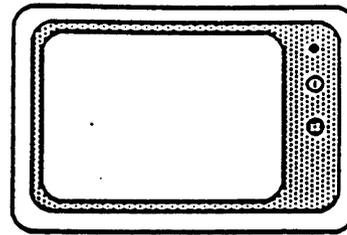
Incorrect characters on display - Not a monitor problem, check display adapter and software

No power - Power Supply board, may be fuse

Red, Green, or Blue video adjustment - It should not be necessary to make adjustments to RGB signals, unless the color adjustment will be very slight. The Red, Blue and Green Bias adjustments on the Yode Assembly are these minor adjustments to the color signals. Do not adjust the Blue and Red Driver pots.

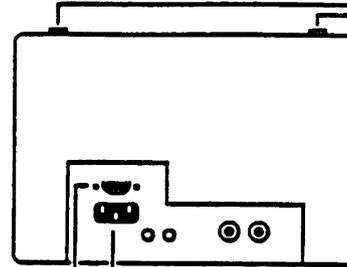
Do not make adjustments in the field with the Parity Rings and the Yoke Clamp

Front View



- Power LED Indicator
- Pull Power On
- Brightness

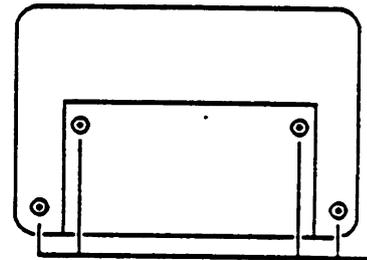
Back View



Remove 2 screws on top to open cover

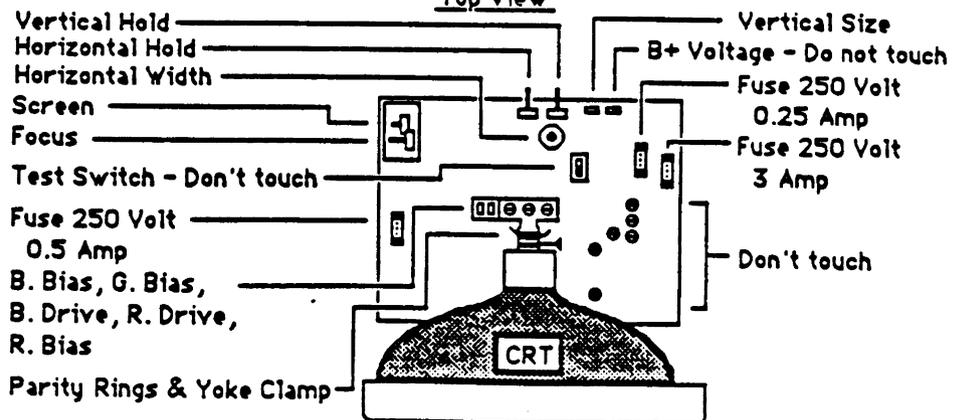
- Horizontal Hold
- Vertical Hold
- B+ Voltage - Do not touch
- Vertical Size
- Power Connector to AC Wall Outlet
- Video Cable Connector to PC Display Adapter ( DB-9 Female )

Bottom View



Remove these 4 screws to open cover

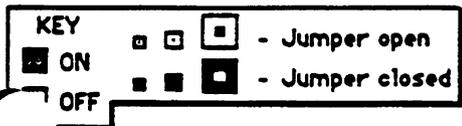
Top View



| Monitor Cable |   |                   |
|---------------|---|-------------------|
| DB9Male       | - | DB9Male           |
| 1             | - | 1 Ground          |
| 2             | - | 2 Ground          |
| 3             | - | 3 Red             |
| 4             | - | 4 Green           |
| 5             | - | 5 Blue            |
| 6             | - | 6 Intensity       |
| 7             | - | 7 Monochrome only |
| 8             | - | 8 Horizontal Sync |
| 9             | - | 9 Vertical Sync   |

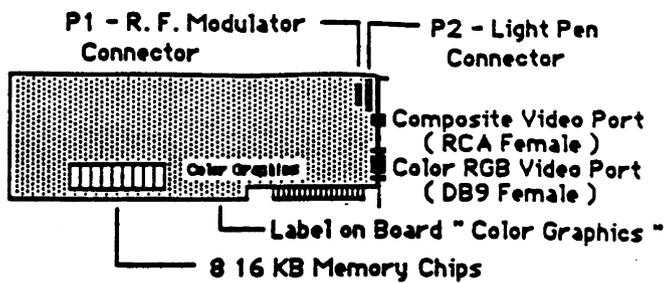


4-15

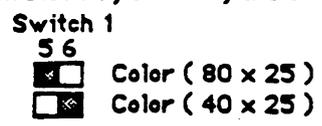


## IBM Color Graphics Video Display Adapter

The IBM Color Graphics Display Adapter is used only for video display. It can do Color RGB and Composite Video. It has extra connectors for a light pen and R.F. Modulator. The R.F. Modulator is used in the IBM Portable Computer. It has 16 KB of ram for color graphics. Most MS-Dos software written for color uses this board, the Dos Mode command uses it, and the Dos Basic games use it.



To install the board in a PC or XT, set switch block 1, 5 " on ", and 6 " off ".



To install the board in an IBM AT, set the video switch on the system board towards the front of the computer.

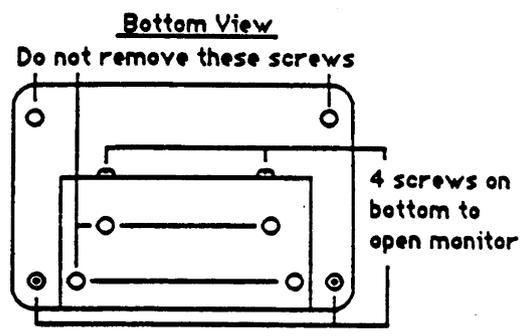
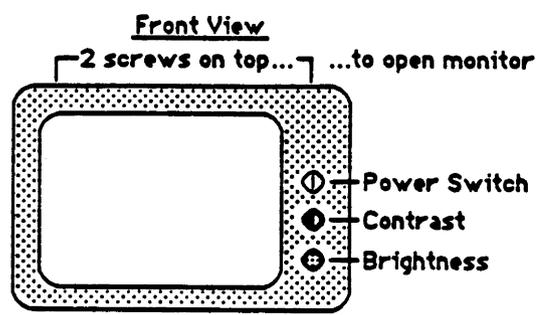


Important Note: Do not run the Sync test on the display. It may damage the monitor.

After setting this switch, run the AT Setup program.

## IBM Color Display Monitor

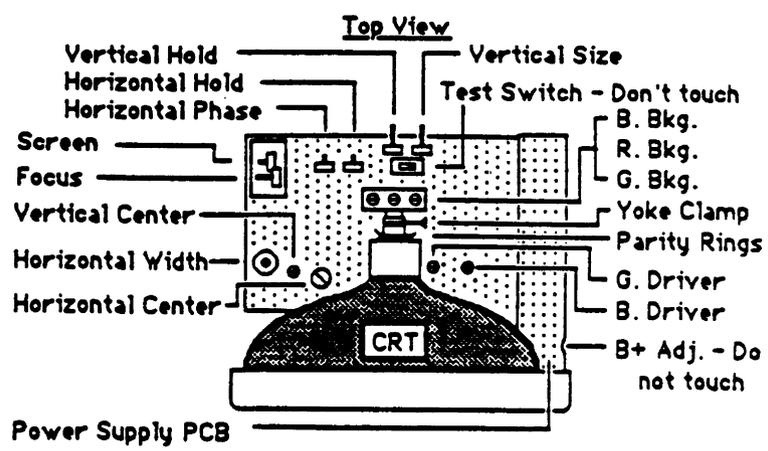
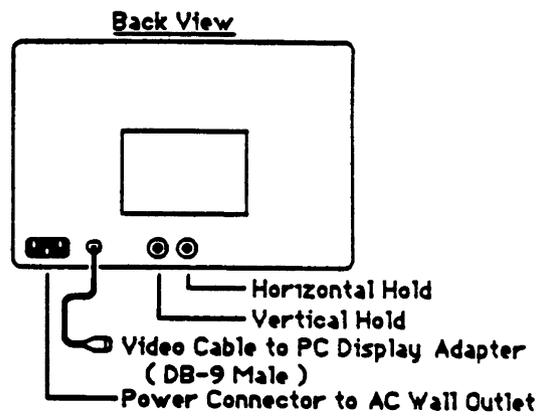
The IBM Color Display is powered separately through a wall outlet. It has several adjustments that can be made to it. On the outside, on the front, Brightness and Contrast. On the back, Vertical Hold and Vertical Size.



To remove the cover, there are two screws on the top, and six on the bottom.

**BE CAREFUL!** Whenever working with a monitor, be extremely careful not to touch the CRT. Keep hands and face away from the CRT. This is also true for the FlyBack Transformer. When working on adjustments inside a monitor, only touch the actual point of adjustment. Try to use plastic tools only.

- Adjustments:**
- Too much, or too little, raster or brightness - Screen
  - Out of Focus - Focus
  - Vertical alignment problem - Vertical Hold, Size
  - Horizontal alignment problem - Horizontal Phase, Horizontal Hold, Horizontal Center, or Horizontal Width ( may not be able to do this if pot is glued, and use a plastic tool )
  - Characters out of proportion - Vertical Size
  - Incorrect characters on display - Not a monitor problem, check display adapter and software
  - No power - Power Supply board, may be fuse
  - Red, Green, or Blue video adjustment - It should not be necessary to make adjustments to RGB signals, unless the color adjustment will be very slight. The Red, Blue and Green Bkg. adjustments on the Yoke Assembly are these minor adjustments to the color signals. Do not adjust the Green and Blue Driver pots.
  - Do not make adjustments in the field with the Parity Rings
  - Do not touch the Yoke Clamp



|     |  |     |
|-----|--|-----|
| KEY |  | ON  |
|     |  | OFF |

## IBM Enhanced Color Display (5154)

The IBM 5154 Enhanced Color Display was designed for use with the Enhanced Graphics Adapter, but can also work with a Color Graphics Adapter. It can operate in two modes, both CGA and EGA. This dual frequency mode automatically switches between Mode 1 (CGA) and Mode 2 (EGA). When in Mode 1 (CGA), it has the same characteristics as the IBM Color Display, and can display all CGA modes (80 x 25 vertical characters, 640 x 200 graphics, 15.750 KHz horizontal scan rate, 60 Hz screen refresh rate, and 16 colors) In Mode 2 (EGA), it can generate higher resolution graphics and text (80 x 43 vertical characters, 640 x 350 graphics, 21.850 KHz horizontal scan rate, 60 Hz screen refresh rate, and 16 colors from a palette of 64 in three different graphics modes).

### IBM PC, XT Setup:

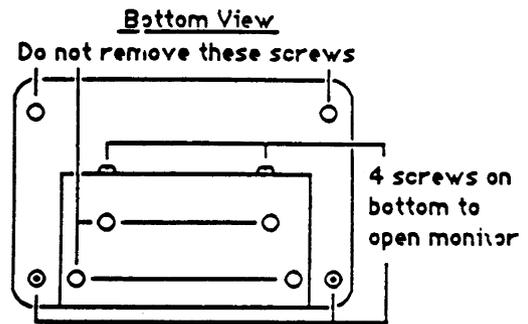
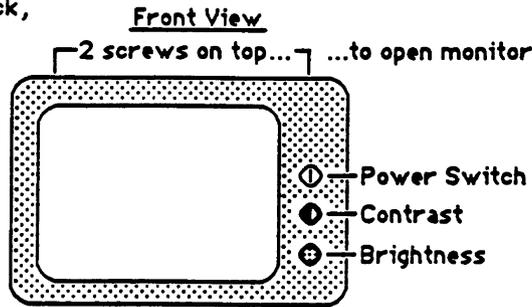
- \*Set System Board Switch Block 1 as follows:  
Switch 1  
5 6  
 Enhanced Color Adapter

### IBM AT Setup:

- \*Set the System Board Video Switch for color:  
Color towards front of the AT
- \*Boot the IBM AT Diagnostics and run option 4 for Setup.

The Enhanced Color Display is powered separately through a wall outlet. It has several adjustments that can be made to it. On the outside, on the front, Brightness and Contrast. On the back, Vertical Size (1 and 2), and further adjustments for Brightness and Contrast.

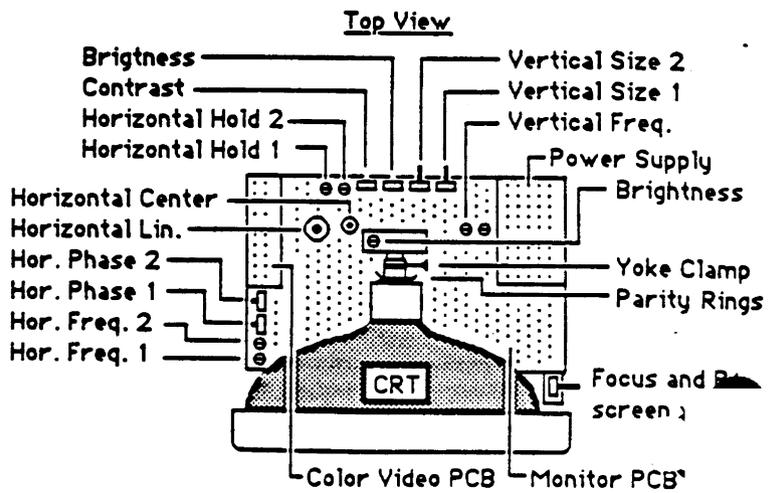
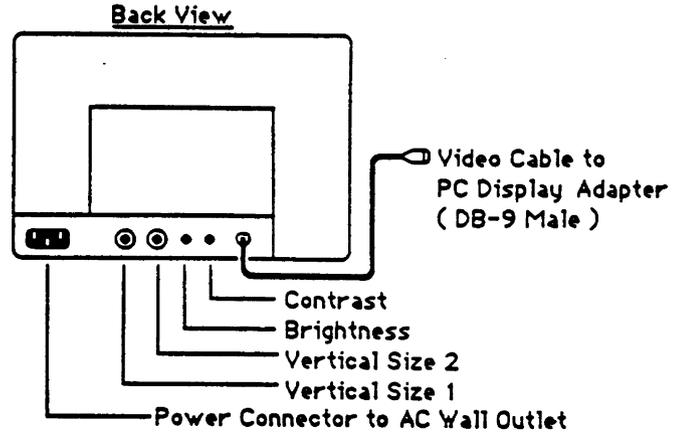
To remove the cover, there are two screws on the top, and four on the bottom.



**BE CAREFUL!** Whenever working with a monitor, be extremely careful not to touch the CRT. Keep hands and face away from the CRT. This is also true for the FlyBack Transformer. When making adjustments inside a monitor, only touch the actual point of adjustment. Try to use plastic tools only.

#### Adjustments:

- Too much, or too little, raster or brightness - Screen Out of Focus - Focus
- Vertical alignment problem - Vertical Hold, Size
- Horizontal alignment problem - Horizontal Phase, Horizontal Hold, Horizontal Center, or Horizontal Width ( may not be able to do this if pot is glued, and use a plastic tool )
- Characters out of proportion - Vertical Size
- Incorrect characters on display - Not a monitor problem, check display adapter and software
- No power - Power Supply board, may be fuse
- Red, Green, or Blue video adjustment - It should not be necessary to make adjustments to RGB signals, unless the color adjustment will be very slight. The Red, Blue and Green Bkg. adjustments on the Yoke Assembly are these minor adjustments to the color signals. Do not adjust the Green and Blue Driver pots.
- Do not make adjustments in the field with the Parity Rings and the Yoke Clamp



HAYES SMARTMODEM SWITCH SETTINGS

HIGHLITE IS DEFAULT

| EXTERNAL 1200              |                              |
|----------------------------|------------------------------|
| OLD STYLE - 8 SWITCH       |                              |
| UP                         | DOWN                         |
| 1 SUPPORTS RS232C DTR LEAD | IGNORES RS232C DTR LEAD      |
| 2 WORD RESULT CODE         | DIGIT RESULT CODE            |
| 3 NO RESULT CODES SENT     | RESULT CODES ARE SENT        |
| 4 ECHOES CHAR. IN CMD SET  | NO ECHO UNLESS HALF DUPLEX   |
| 5 AUTO ANSWER ON 1ST RING  | MODEM WILL NOT ANSWER A CALL |
| 6 READS STATUS OF CD LEAD  | RS232 CD IS TRUE ALWAYS      |
| 7 SINGLE LINE RJ11 JACK    | MULTILINE RJ12 OR RJ13       |
| 8 DISABLE CMD RECOGNITION  | ENABLE COMMAND RECOGNITION   |

| EXTERNAL 1200                                     |                                                       |
|---------------------------------------------------|-------------------------------------------------------|
| NEW STYLE - 10 SWITCH                             |                                                       |
| UP                                                | DOWN                                                  |
| 1 SUPPORTS RS232C DTR LEAD                        | IGNORES RS232C DTR LEAD                               |
| 2 WORD RESULT CODES                               | DIGIT RESULT CODES                                    |
| 3 RESULT CODES NOT DISPLAYED                      | RESULT CODES DISPLAYED                                |
| 4 ECHOES CHAR. IN CMD SET                         | NO ECHO UNLES HALF DUPLEX                             |
| 5 AUTO ANSWER ON 1ST RING                         | MODEM WILL NOT AUTO ANSWER                            |
| 6 READS STATUS OF CD                              | CD IS ALWAYS TRUE, HIGH                               |
| 7 SINGLE LINE RJ11                                | MULTILINE RJ12 OR 13                                  |
| 8 DISABLES COMMAND RECOG.                         | ENABLES COMMAND RECOGNITION                           |
| 9 COMPATIBLE W/BELL 103/212                       | COMPATIBLE W/CCIT V.22 MODEM                          |
| 10 HANG UP IF DTR GOES LOW<br>(IF SWITCH 1 IS UP) | MODEM RESETS WHEN DTR GOES LOW<br>(IF SWITCH 1 IS UP) |

| PC-302 INTERNAL 1200B     |                      |
|---------------------------|----------------------|
| OLD STYLE 3 SWITCH        |                      |
| 1 ON COM1                 | OFF COM2             |
| 2 ON MULTILINE RJ12 OR 13 | OFF SINGLE LINE RJ11 |
| 3 ON READS THE CD LINE    | OFF FORCES DTR TRUE  |

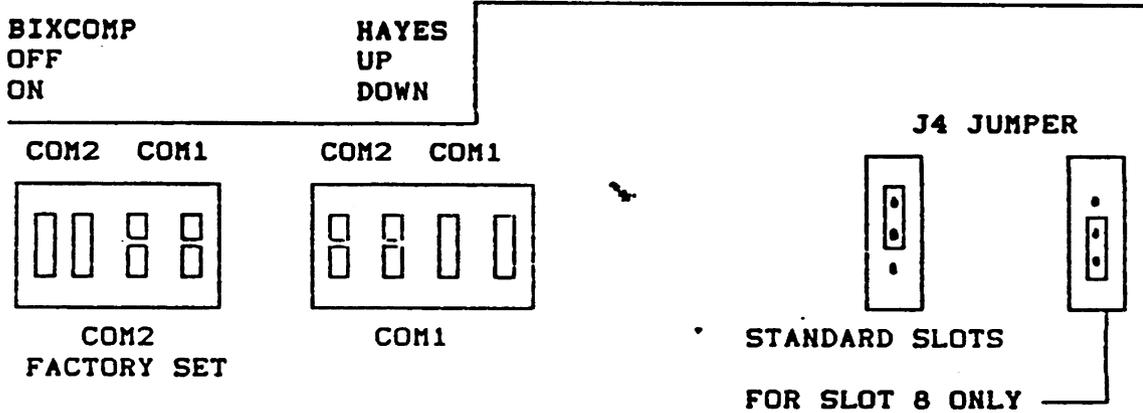
| INTERNAL 1200B PC-415                 |                           |
|---------------------------------------|---------------------------|
| NEW STYLE 6 SWITCH                    |                           |
| 1 UP COM2                             | DN COM1                   |
| 2 UP SINGLE LINE                      | DN MULTILINE              |
| 3 UP CD LOGIC 1                       | DN CD LOGIC 0             |
| 4 UP HANG UP WHEN DTR GOES LO         | DN IGNORES DTR            |
| 5 UP BELL 103/212A COMPATIBLE         | DN CCITT V.22 COMPATIBLE  |
| 6 UP DIALPULSE RATIO 39% MK<br>69% BK | DN DP RATIO 33% MK 67% BK |

| INTERNAL 1200B NEW STYLE 4SW      |                     |
|-----------------------------------|---------------------|
| 1 RIGHT COM1                      | LEFT COM2           |
| 2 LEFT SINGLE LINE                | RIGHT MULTI LINE    |
| 3 RIGHT READS CD LINE             | LEFT FORCES CD HIGH |
| 4 LEFT HANGS UP WHEN DTR GOES LOW | RIGHT IGNORES DTR   |

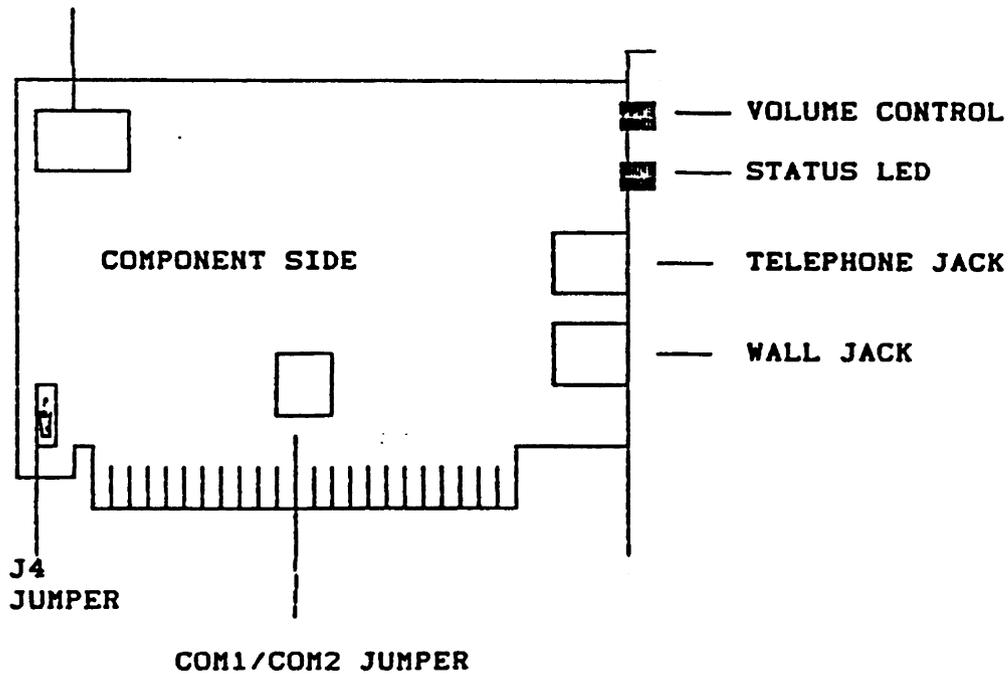
**BIZCOM INTERNAL  
MODEM**

**EIGHT POSITION DIP SWITCH**

The functions of each switch are identical to that of the Hayes modem. You only need to remember that the Hayes UP and DOWN positions are equivalent to the BIZCOMP OFF and ON positions.



**8 position  
DIP Switch**



5-2

### Command Summary

| COMMAND | DESCRIPTION                                                                                                  |
|---------|--------------------------------------------------------------------------------------------------------------|
| AT      | Command line prefix (Attention exists; precedes command lines except + + + (escape) and A (escape) commands) |
| A/      | Re-execute last command line; (A/ is not followed by a carriage return)                                      |
| A       | On-hook in answer mode                                                                                       |
| B       | Selects CCITT V.22 operation when communicating at 1200 bps                                                  |
| B1      | Selects Bell 212A operation when communicating at 1200 bps                                                   |
| D       | Dial number which follows D in the command line                                                              |
| E       | Modem does not "echo" commands back to terminal                                                              |
| E1      | Modem "echoes" commands back to terminal                                                                     |
| H       | On Hook (hang up)                                                                                            |
| H1      | Operates switch-hook and auxiliary relay                                                                     |
| I       | Request product identification Code                                                                          |
| H       | Performs checksum on firmware ROM; returns checksum                                                          |
| H       | Performs checksum on firmware ROM; returns OK or ERROR                                                       |
| LL1     | Low speaker volume                                                                                           |
| L2      | Medium speaker volume                                                                                        |
| L3      | High speaker volume                                                                                          |
| M       | Speaker off                                                                                                  |
| M1      | Speaker on until carrier detected                                                                            |
| M2      | Speaker always on                                                                                            |
| M3      | Speaker on until carrier detected except during dialing                                                      |
| O       | Return to on-line state                                                                                      |
| O1      | Return to on-line state and initialize equalizer circuit                                                     |
| O       | Modem returns result codes                                                                                   |
| O1      | Modem does not return result codes                                                                           |
| Sr = n  | Set register r to value n                                                                                    |
| Sr?     | Request contents of register r                                                                               |
| V       | Short form numeric result codes                                                                              |
| V1      | Full word result codes                                                                                       |

| COMMAND | DESCRIPTION                                                                                                                           |
|---------|---------------------------------------------------------------------------------------------------------------------------------------|
| X       | Smartmodem 300 compatibility mode; CONNECT result code enabled                                                                        |
| X1      | Modem blind dial; all CONNECT XXXX result codes enabled; busy signal not detected                                                     |
| X2      | Modem waits for dial tone before dialing; all CONNECT XXXX result codes enabled; busy signal not detected                             |
| X3      | Modem blind dial; all CONNECT XXXX result codes enabled; modem sends BUST result code if busy signal detected                         |
| X4      | Modem waits for dial tone before dialing; all CONNECT XXXX result codes enabled; modem sends BUST result code if busy signal detected |
| Y       | Long space disconnect enabled                                                                                                         |
| Y1      | Long space disconnect enabled                                                                                                         |
| Z       | Load saved configuration profile                                                                                                      |
| BC      | DCD always ON                                                                                                                         |
| BC1     | DCD ON indicates presence of data carrier                                                                                             |
| BD      | Modem ignores DTR                                                                                                                     |
| BD1     | Modem assumes command state when ON-to-OFF transition detected on DTR                                                                 |
| BD2     | Modem hangs up, assumes command state and enables auto answer upon detecting ON-to-OFF transition on DTR                              |
| BD3     | Modem assumes extension state upon detecting an ON-to-OFF transition on DTR                                                           |
| BF      | Load factory configuration profile                                                                                                    |
| GG      | No guard tone                                                                                                                         |
| GG1     | 260 Hz guard tone                                                                                                                     |
| GG2     | 1800 Hz guard tone                                                                                                                    |
| GJ      | RJ-11/RJ-45/RJ-45E (RJ-45E) tone jack                                                                                                 |
| GJ1*    | RJ-12/RJ-13 tone jack type                                                                                                            |
| SL      | Selects startup (switched) line                                                                                                       |
| SL1     | Searches loaded line                                                                                                                  |
| AM      | Asynchronous mode                                                                                                                     |
| AM1     | Synchronous mode 1 (Sync/Async mode)                                                                                                  |
| AM2     | Synchronous mode 2 (Dial Stored Number mode)                                                                                          |
| AM3     | Synchronous mode 3 (DTR control of Data/Talk)                                                                                         |

Hayes 2400 External

### S Register

| COMMAND | DESCRIPTION                                                                                  |
|---------|----------------------------------------------------------------------------------------------|
| BP      | Pulse dial makebreak rate = 26/91 (USA)                                                      |
| BP1     | Pulse dial makebreak rate = 33/67 (UK/FR)                                                    |
| BR      | CTS follows RTS                                                                              |
| BR1     | Modem ignores RTS; CTS always ON                                                             |
| BS      | DTR always ON                                                                                |
| BS1     | DTR operates in accordance with EIA RS-232C specification                                    |
| BT      | Terminates test in progress                                                                  |
| BT1     | Issue Local Answer Loopback test                                                             |
| BT2     | Issue digital loopback                                                                       |
| BT3     | Modem grants request from remote modem for FDL                                               |
| BT4     | Modem denies request from remote modem for FDL                                               |
| BT5     | Issue Remote Digital Loopback test                                                           |
| BT6     | Issue Remote Digital Loopback with call test                                                 |
| BT7     | Issue Local Answer Loopback with call test                                                   |
| BT8     | Issue Local Answer Loopback with call test                                                   |
| BW      | Write active configuration profile to nonvolatile memory                                     |
| BX      | Modem sources internal clock for synchronous modes                                           |
| BX1     | Data terminal source external clock for synchronous modes                                    |
| BX2     | Modem sources internal clock for synchronous operation from receive carrier (slow operation) |
| BZ      | Show hardware number                                                                         |

Note: Defaults are in bold.

### Dial Modifiers

| COMMAND | DESCRIPTION                           |
|---------|---------------------------------------|
| P       | Pulse dial                            |
| T       | Tone dial                             |
| F       | Flash                                 |
| ·       | Flash                                 |
| W       | Wait for silence                      |
| W1      | Wait for second dial tone             |
| ·       | Return to command state after dialing |
| R       | Originate call in answer mode         |
| S       | Dial stored number                    |

| REGISTER | DEFAULTS          | DEFAULT | DESCRIPTION                   |
|----------|-------------------|---------|-------------------------------|
| *S0      | 0-256 Rings       | 00      | Ring to answer on             |
| S1       | 0-256 Rings       | 00      | Ring count                    |
| S2       | 0-127 ASCII       | 43      | Escape code character         |
| S3       | 0-127 ASCII       | 15      | Carriage return character     |
| S4       | 0-127 ASCII       | 10      | Line feed character           |
| S5       | 0-127 ASCII       | 08      | Back space character          |
| S6       | 0-255 sec         | 02      | Wait for dial tone            |
| S7       | 1-255 sec         | 30      | Wait for data carrier         |
| S8       | 0-255 sec         | 02      | Pause time for carrier        |
| S9       | 1-255 10ths sec   | 05      | Carrier detect response time  |
| S10      | 1-255 10ths sec   | 14      | Last carrier to hang-up delay |
| S11      | -                 | -       | Not used                      |
| S12      | 0-255 50ths sec   | 00      | Escape code guard time        |
| S13      | Not Used          |         |                               |
| *S14     | None              | AA hex  | Bit mapped options            |
| S15      | Not Used          |         |                               |
| S16      | None              | 00      | Modem test options            |
| S17      | Not Used          |         |                               |
| *S18     | 0-255 sec         | 00      | Test timer                    |
| S19      | Not Used          |         |                               |
| S20      | Not Used          |         |                               |
| *S21     | None              | 00      | Bit mapped options            |
| *S22     | None              | 75 hex  | Bit mapped options            |
| *S23     | None              | 07      | Bit mapped options            |
| S24      | Not Used          |         |                               |
| *S25     | 0-255 1/100th sec | 05      | Detect DTR change             |
| *S26     | 0-255 1/100th sec | 01      | RTS to CTS delay              |
| *S27     | None              | 40 hex  | Bit mapped options            |

\*This S-Register is stored in the Smartmodem 2400 nonvolatile memory upon receipt of the SW command so that the contents are preserved when modem power is removed. It is automatically restored from the nonvolatile memory when the modem is powered up, or when the Smartmodem 2400 receives the Z command.

All numeric values are expressed in decimal (base 10) unless otherwise specified.

5-3

5-3

### Programmable Options Which Can Be Saved In Nonvolatile Memory:

Communications rate (2400, 1200, 300)  
 Asynchronous parity option (even, odd, mark, space, none)  
 Number of ring to answer on  
 Automatic answer (yes/no)  
 Command echo (yes/no)  
 Result Codes (yes/no)  
 Short tone or full word result codes  
 Touch tone or pulse dial  
 Test timer duration  
 Teletype jack type  
 RTS/CTS circuit option  
 RTS/CTS delay  
 DTR circuit option  
 DCD circuit option  
 DSR circuit option  
 Long space disconnect (yes/no)  
 Speaker volume  
 Result code subset  
 Pulse dial make/break ratio  
 GrandDaisy RDL request  
 Guard tone selection (550 Hz, 1000 Hz, none)  
 Minimum DTR pulse width  
 Transmission mode (Asynchronous/Synchronous)  
 Duplex or leased line  
 Terminal clock source (synchronous only)  
 Bell or CCITT compatibility at 1200 bps

### Factory Configuration Profile

2400 bps  
 Bell 212A operation at 1200 bps  
 Even parity  
 Auto answer disabled  
 Command echo ON  
 All result codes enabled  
 Wait for dial tone before dialing  
 Detects busy signal  
 Full word result codes  
 Pulse dial make/break ratio = 30/61  
 Test timer set to 0 seconds  
 RJ-11 jack type  
 CTS follows RTS after delay in S26  
 RTS to CTS delay = 10 milliseconds  
 Modem ignores DTR  
 DCD always ON  
 DSR always ON  
 Long space disconnect disabled  
 Speaker enabled but off when receiving carrier  
 Speaker volume set to medium  
 Local modem will grant RDL request from remote modem  
 Guard tones disabled  
 Minimum DTR pulse width = .05 seconds  
 Modem sources terminal clock (synchronous only)  
 Ring count = 00  
 Escape code character = 43  
 Carriage return character = 13  
 Line feed character = 10  
 Back space character = 08  
 Duration of wait for dial tone = 02 sec  
 Duration of wait for carrier after dialing = 30 sec  
 Duration of dial pulse (normal) = 02 sec  
 Carrier detect response time = 00.6 sec  
 Last Carrier to hang-up delay = 01.4 sec  
 Escape code guard time = 01 sec

Hayes 2400 External

### Diagnostic and Test Facilities



#### Applications

Failures in a point-to-point communications link, usually characterized by unacceptably high error rates or total inability to communicate, may be the fault of either the local or remote data terminal equipment, the local or remote modem, or the telephone company circuit. The Smartmodem 2400 diagnostic and test facilities enable you to determine the source of the outage and avoid time-consuming "finger pointing" between you and your telephone company.

The Local Analog Loopback with Self Test may be performed at both local and remote stations to verify the integrity of the modems. If the modems test good, the Remote Digital Loopback with Self Test may be performed to verify the complete modem to modem communications path. If both modems pass the local analog loopback test, but the remote digital loopback with self test fails, this is a good indication that the telephone circuit is at fault. If multiple attempts at establishing a satisfactory connection fail, and these symptoms remain consistent, you should report the problem to your telephone company.

The Local Analog Loopback test will verify both the modem and the data terminal equipment. If the local analog loopback with self test checks good, but the local analog loopback test fails, this is a good indication that the data terminal equipment is at fault.

5-4

5 4

All of the diagnostic tests are initiated from the asynchronous command state. To use the remote or local digital loopback tests, a dialup or leased line connection must first be established. To return to the command state once the connection is established you will need to issue the escape sequence (see The Escape Code Sequence in Chapter 7) or generate an ON-OFF transition on DTR if the DTR option is selected. The following tests are provided:

- 1) Local Analog Loopback—Tests the path which includes the local modem and local data terminal equipment.
- 2) Local Analog Loopback with Self Test—Tests local modem.
- 3) Remote Digital Loopback—Tests the path which includes the local data terminal equipment, local modem, remote modem, and telephone circuit.
- 4) Remote Digital Loopback with Self Test—Tests the path which includes the local modem, remote modem, and telephone circuit.
- 5) Local Digital Loopback.

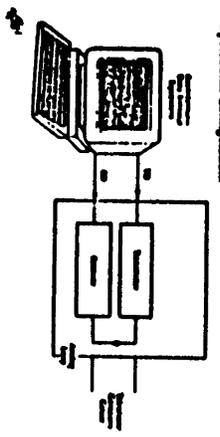
### Terminating a Test in Progress

**Test Timer**  
 Begins: S16 when set to a non-zero value, establishes the duration of the Statusmodem 2400 diagnostic tests. When a test is active for a period equal to the value chosen for this register (from 1 to 255 seconds), the modem will automatically halt the test and return to the command state. Loading S16 with zero disables the test timer (factory setting).

87D Command  
 A test may be terminated from the command state at any time by issuing the 87D command to the Statusmodem 2400. If the Local Analog Loopback or Remote Digital Loopback tests are being performed, it is necessary to issue the escape sequence to return to the command state prior to sending the 87D command. Commands which follow 87D in a command line are ignored.

### 87T Local Analog Loopback L3

**Application:**  
 Used to verify the integrity of the path which includes the local modem, and the local data terminal equipment (see also Local Analog Loopback L1 with Self Test).  
**Note:** If the Statusmodem 2400 is on-line, this test causes the modem to lose carrier.



Operational Configuration

### Programming examples

Assume starting from the command state, local data terminal equipment set to expect characters to be echoed, and the local modem is set to echo commands received from the local data terminal.

**Example 1—Test timer disabled:**

```
Terminal: ATZSA-041T1      Start Test
                          User keys in
                          jumped over the busy test message
                          dog
Modem:   OK
Terminal: ATZSA1D         Escape sequence
                          Acknowledges +++
Modem:   OK
Terminal: ATZSA1D         End test
                          Test terminated
```

If the local Statusmodem 2400 echoes the test message back to the local data terminal exactly as it was transmitted, then the local modem test is good.

**Example 2—Test timer set to 50 (seconds):**

```
Terminal: ATZSA-041T1      Start Test
                          The quick brown fox
                          jumped over the lazy
                          dog
Modem:   OK
                          Timer expired
```

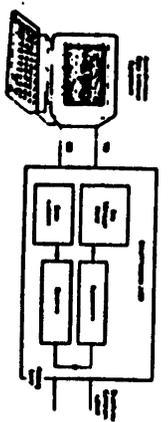
Again, if the local modem echoes the test message back to the local data terminal exactly as it was transmitted, then the local modem test is good.

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Hayes 2400 External

### 87B Local Analog Loopback L3 with Self Test

**Application:**  
 To verify the integrity of the local modem transmit and receive circuits.  
**Note:** If the Statusmodem 2400 is on-line, this test causes the modem to lose carrier.



Operational Configuration

### Programming examples

Assume starting from the command state, local data terminal set to expect transmit characters to be echoed, and the local modem is set to echo commands received from the local data terminal.

**Example 1—Test timer disabled:**

```
Terminal: ATZSA-041T3      Start Test
                          End Test
Modem:   000
                          No errors
                          Acknowledgment
                          OK
```

**Test performed with 12 errors:**

```
Terminal: ATZSA-041T3      Start Test
Terminal: ATZSA1D         End Test
Modem:   012
                          12 errors
                          Acknowledgment
                          OK
```

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Example 2--Test timer set to 30 seconds.

```
Test performed with no errors:
Terminal: AT31A-0A81B      Start Test
Modem:      000              Timer expires
OK
Test performed with 12 errors:
Terminal: AT31A-0A81B      Start Test
Modem:      012              Timer expires
OK
```

Note: An error count of 255 indicates that 255 or more errors were detected.

### 816 Remote Digital Loopback L2

#### Applications

To test the local data terminal equipment, the local and remote modem, and the telephone circuit. The local data terminal sends a test message to the remote station. The remote modem when properly conditioned will loop its receive stream back to the local data station. The local data terminal can then compare the receive data stream with its transmitted message to verify the connection. If the match then either the local data terminal, the local or remote modem, or the telephone circuit is at fault. If this is the case, both local and remote modems may initiate local analog loopback tests to further isolate the source of the problem.

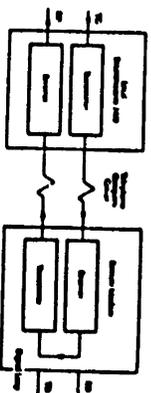
- The data terminal operator initiates the remote digital loopback test by:
- establishing a dial or leased line connection.
  - returning to the command state by issuing the escape sequence or if the ADI DTR option is selected, by generating an On-hook-Off-hook action on DTR.
  - issuing the 816 command once in the command state.

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The local modem requires a digital loopback with the remote modem through a special CCITT standard handshake sequence (see CCITT Recommendation V.54 for details). The remote modem automatically acknowledges the request if it has been conditioned to do so. The remote modem then loops the output of the modem receiver into the input of the modem transmitter to test the remote modem circuit.

The Smartmodem 2400 may be conditioned to accept a request from a remote modem for a remote digital loopback with the 816 command factory setting. The Smartmodem 2400 can be programmed to refuse such a request by issuing the 817 command. See also Remote Digital Loopback with Self Test in this chapter.

#### Operational Configuration:



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#### Programming examples

Assume starting from the on-line state, local data terminal equipment set to expect characters to be echoed, and the local modem is set to echo commands received from the local data terminal.

Example 1--Test timer disabled:

```
Terminal: +++
Modem:    OK
Terminal: AT31A-0A81B
           The quick brown fox
           jumped over the lazy
           dog.
Modem:    +++
           Escape sequence
           Acknowledgegment
           Start Test
           User keys in
           text message
           eg.
```

```
Modem:    OK
Terminal: AT810
           End test
           Test terminated
```

If the local Smartmodem 2400 echoes the test message back to the local data terminal exactly as it was transmitted, then the local terminal and the local and remote modems and the telephone circuit are good.

Example 2--Test timer set to 60 seconds:

```
Terminal: +++
Modem:    OK
Terminal: AT31A-60A1B
           The quick brown fox
           jumped over the lazy
           dog.
Modem:    OK
           Timer expires
```

Again, if the local modem echoes the test message back to the local data terminal exactly as it was transmitted, then the local data terminal, the local and remote modems and the telephone circuit are good.

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### 817 Remote Digital Loopback L2 with Self Test

#### Applications

To test the remote modem, and the telephone circuit. The local modem sends a standard test message to the remote station. The remote modem, when properly conditioned, loops its receive stream back to the local data station. The local modem examines the receive pattern and increments an internal error counter each time an error is detected. At the end of the test, the Smartmodem 2400 returns a three-digit error count representing the errors accumulated during the test interval.

If the error count is 000, both the local and remote modems and the telephone circuit are good. If errors were encountered, you may want to initiate local analog loopback tests to further isolate the source of the problem.

The data terminal operator initiates the remote digital loopback with self test by:

- establishing a dial or leased line connection.
- returning to the command state by issuing the escape sequence, or if the ADI DTR option is selected, by generating an On-hook-Off-hook action on DTR.
- issuing the 817 command once in the command state.

The local modem requests a digital loopback with the remote modem through a special CCITT standard handshake sequence (see CCITT Recommendation V.54 for details). The remote modem automatically acknowledges the request if it has been conditioned to do so. The remote modem then loops the output of the modem receiver into the input of the modem transmitter to test the remote modem circuit.

5-6

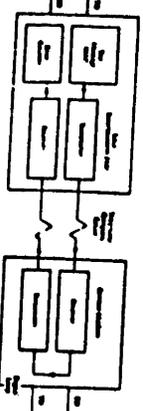
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Hayes 2400 External

5-6

The Smartmodem 2400 may be conditioned to accept a request from a remote modem for a remote digital loopback with the ATZ command (factory default). The Smartmodem 2400 can be programmed to refuse such a request by issuing the AT55 command.

**Operational Configurations**



**Programming examples**

Assume starting from the on-line state, local data terminal set to expect uppercase characters to be echoed, and the local modem is set to echo commands received from the local data terminal.

Example 1—Test timer disabled:

Test performed with no errors:

|           |             |                 |
|-----------|-------------|-----------------|
| Terminal: | +++         | Escape sequence |
| Modem:    | OK          | Acknowledgement |
| Terminal: | ATZ&L-0&L17 | Start Test      |
| Modem:    | 000         | End Test        |
|           | OK          | No errors       |
|           |             | Acknowledgement |

Test performed with 12 errors:

|           |             |                 |
|-----------|-------------|-----------------|
| Terminal: | +++         | Escape sequence |
| Modem:    | OK          | Acknowledgement |
| Terminal: | ATZ&L-0&L17 | Start Test      |
| Modem:    | 012         | End Test        |
|           | OK          | 12 errors       |
|           |             | Acknowledgement |

Example 2—Test timer set to 10 seconds:

Test performed with no errors:

|           |              |                 |
|-----------|--------------|-----------------|
| Terminal: | +++          | Escape sequence |
| Modem:    | OK           | Acknowledgement |
| Terminal: | ATZ&L-10&L17 | Start Test      |
| Modem:    | 000          | Test expired    |
|           | OK           | Test completed  |

Test performed with 19 errors:

|           |              |                 |
|-----------|--------------|-----------------|
| Terminal: | +++          | Escape sequence |
| Modem:    | OK           | Acknowledgement |
| Terminal: | ATZ&L-10&L17 | Start Test      |
| Modem:    | 019          | Timer expired   |
|           | OK           | Test completed  |

Note: An error count of 255 indicates that 255 or more errors were detected.

E:10 E:11 E:12 E:13 E:14 E:15 E:16 E:17 E:18 E:19 E:20 E:21 E:22 E:23 E:24 E:25 E:26 E:27 E:28 E:29 E:30 E:31 E:32 E:33 E:34 E:35 E:36 E:37 E:38 E:39 E:40 E:41 E:42 E:43 E:44 E:45 E:46 E:47 E:48 E:49 E:50 E:51 E:52 E:53 E:54 E:55 E:56 E:57 E:58 E:59 E:60 E:61 E:62 E:63 E:64 E:65 E:66 E:67 E:68 E:69 E:70 E:71 E:72 E:73 E:74 E:75 E:76 E:77 E:78 E:79 E:80 E:81 E:82 E:83 E:84 E:85 E:86 E:87 E:88 E:89 E:90 E:91 E:92 E:93 E:94 E:95 E:96 E:97 E:98 E:99 E:100

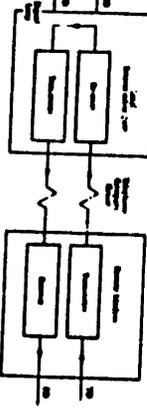
Pages 2400 EXTENSIBLE

**AT3 Local Digital Loopback**

**Application:**

To loop the data stream received from the remote modem back to the remote modem. The remote data terminal, by transmitting a known data pattern to the local modem and comparing this pattern with that of the receive data stream, can verify the integrity of both the local and remote modems and the telephone circuit. The primary application for the local digital loopback is to permit a remote modem that is not CCITT V.24 compatible to engage in a remote digital loopback test with the Smartmodem 2400.

**Operational Configurations**



E:10 E:11 E:12 E:13 E:14 E:15 E:16 E:17 E:18 E:19 E:20 E:21 E:22 E:23 E:24 E:25 E:26 E:27 E:28 E:29 E:30 E:31 E:32 E:33 E:34 E:35 E:36 E:37 E:38 E:39 E:40 E:41 E:42 E:43 E:44 E:45 E:46 E:47 E:48 E:49 E:50 E:51 E:52 E:53 E:54 E:55 E:56 E:57 E:58 E:59 E:60 E:61 E:62 E:63 E:64 E:65 E:66 E:67 E:68 E:69 E:70 E:71 E:72 E:73 E:74 E:75 E:76 E:77 E:78 E:79 E:80 E:81 E:82 E:83 E:84 E:85 E:86 E:87 E:88 E:89 E:90 E:91 E:92 E:93 E:94 E:95 E:96 E:97 E:98 E:99 E:100

**Programming example**

Assume local modem is in the on-line state prior to issuing the test command:

|           |             |                 |
|-----------|-------------|-----------------|
| Terminal: | +++         | Escape sequence |
| Modem:    | OK          | Acknowledgement |
| Terminal: | ATZ&L-0&L17 | Start Test      |
| Modem:    | OK          | Loopback ON     |

When the remote operator modifies the local operator (e.g. by voice telephone) that the test is complete, the local operator issues the following command to terminate the local loopback:

|           |        |                 |
|-----------|--------|-----------------|
| Terminal: | AT&L10 | End Test        |
| Modem:    | OK     | Test terminated |

**AT3 Grant RDL Request from Remote Station**

**Application:**

Condition the local Smartmodem 2400 to grant a request from the remote modem for a remote digital loopback test (factory default setting).

**AT5 Deny RDL Request from Remote Station**

**Application:**

Prohibit the local Smartmodem 2400 from granting a request from the remote modem for a remote digital loopback test.

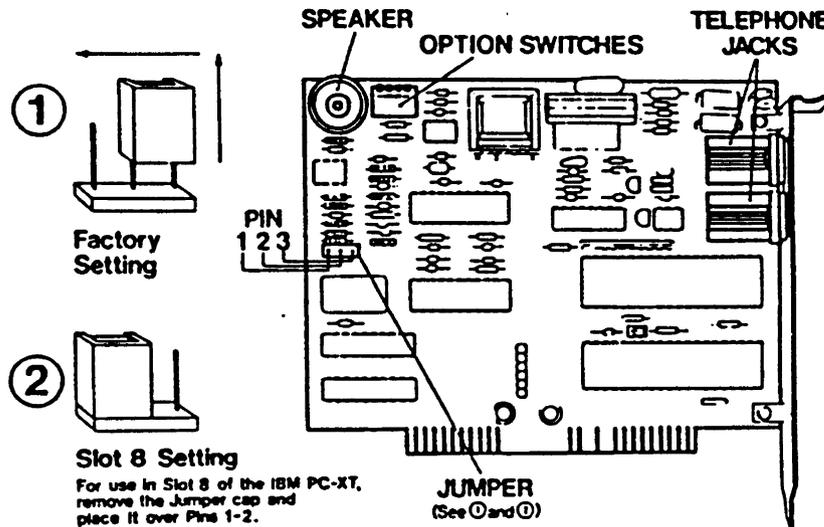
5-17

5-7

5-8

# Ven-Tel Half Card™ Modem PC480

# Ven-Tel Half Card™ 24 Modem PC613



The Half Card 24 modem is compatible with IBM Personal Computers and "workalikes." The following chart lists some of the popular models available, and the slots in which to install the modem:

| Compatible Computers        | Slots         | Comments                              |
|-----------------------------|---------------|---------------------------------------|
| IBM PC                      | Any available |                                       |
| XT                          | Any available | Also fits in shorts slots 7 & 8.      |
| AT                          | Slots 2-6     | Fully compatible with "16 bit slots." |
| Portable PC                 | Slots 4,5,6   | All Portable slots are half-size.     |
| 3270                        | Any available | Also fits in short slots.             |
| Compaq                      | Any available |                                       |
| Compaq Plus                 | Any available |                                       |
| Compaq Deskpro              | Any available |                                       |
| Panasonic Sr. Partner       | Any Available | All slots are shorter than standard.  |
| Panasonic Executive Partner | Any Available |                                       |
| AT&T                        | Any available |                                       |
| ITT Xtra                    | Any available |                                       |

Installation of the Half Card 24 modem is basically the same in any model of Personal Computer. Exceptions and potential problems are noted.

Your Half Card 24 modem is capable of performing several advanced self tests. This chapter explains how to perform these tests using the AT&T command. These test features allow you to check not only your own modem, but a remote modem, your local data equipment and the phone lines as well. By combining one or more of these tests, you can often isolate where a problem might lie.

The list of possible commands is summarized in the following chart.

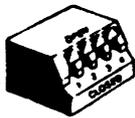
| Command | Result                                               |
|---------|------------------------------------------------------|
| AT&T0   | Terminates any test in progress.                     |
| AT&T1   | Initiate Local Analog Loopback Test, CCITT V.34, L3. |
| AT&T3   | Initiate Local Digital Loopback.                     |
| AT&T4   | Enables response to Remote Digital Loopback request. |
| AT&T5   | Disable response to Remote Digital Loopback request. |
| AT&T6   | Initiate Remote Digital Loopback.                    |
| AT&T7   | Initiate Remote Digital Loopback with Self-test.     |
| AT&T8   | Initiate Analog Loopback with Self-test.             |

## A WORD ABOUT COMM PORTS

The IBM PC allows 2 Comm ports, Comm 1 and Comm 2. Your modem takes up one of these ports. Your computer requires that if only one Comm port will be used, it must be Comm 1. The machine will not function with only Comm 2. For computers that have more than two comm ports, the Half Card 24 modem allows comm ports 1, 2, 3 or 4.

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4-24

ALL SWITCHES OPEN



| Switch | Setting       | Description                                                                                                                       |
|--------|---------------|-----------------------------------------------------------------------------------------------------------------------------------|
| 1      | <b>OPEN</b>   | DTR is not forced. DTR will be on only when the modem has received the signal from the computer.                                  |
|        | <b>CLOSED</b> | DTR is forced. The computer will assume that DTR is on at all times.                                                              |
| 2      | <b>OPEN</b>   | Auto answer is enabled.                                                                                                           |
|        | <b>CLOSED</b> | Auto answer is disabled.                                                                                                          |
| 3      | <b>OPEN</b>   | Modem is set for comm 2 when Switch 4 is <b>OPEN</b> and set for comm 4 when Switch 4 is <b>CLOSED</b> . See the following chart. |
|        | <b>CLOSED</b> | Modem is set for comm 1 when Switch 4 is <b>OPEN</b> and set for comm 3 when Switch 4 is <b>CLOSED</b> . See the following chart. |
| 4      | <b>OPEN</b>   | Modem is set for comm 2 when Switch 3 is <b>OPEN</b> and set for comm 1 when Switch 3 is <b>CLOSED</b> . See the following chart. |
|        | <b>CLOSED</b> | Modem is set for comm 4 when Switch 3 is <b>OPEN</b> and set for comm 3 when Switch 3 is <b>CLOSED</b> . See the following chart. |

The following chart provides complete information on comm port settings.

| Desired Comm Port Setting: | Switch 3 Position | Switch 4 Position |
|----------------------------|-------------------|-------------------|
| Comm 1                     | <b>CLOSED</b>     | <b>OPEN</b>       |
| Comm 2                     | <b>OPEN</b>       | <b>OPEN</b>       |
| Comm 3                     | <b>CLOSED</b>     | <b>CLOSED</b>     |
| Comm 4                     | <b>OPEN</b>       | <b>CLOSED</b>     |

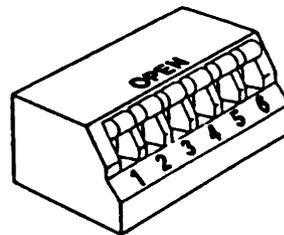
The factory default settings are in bold and are the proper settings for use with most software. Please note the following exceptions:

• Auto-Answer

Switch 2 controls the auto-answer operation. In the **OPEN** position, the modem is set to answer the phone automatically. When the modem needs to share the phone line with people, it is probably better to turn auto-answer off by putting switch 2 **CLOSED**. If the line is used only for data, the auto-answer should be left on.

| Use of Phone Line | Position of Switch 2 | Result                                                 |
|-------------------|----------------------|--------------------------------------------------------|
| Data only         | <b>OPEN</b>          | Modem will automatically answer all incoming calls.    |
| Data and voice    | <b>CLOSED</b>        | Modem will not answer incoming calls unless commanded. |

ALL SWITCHES OPEN



| Switch | Setting       | Description                                                                                                                       |
|--------|---------------|-----------------------------------------------------------------------------------------------------------------------------------|
| 1      | <b>OPEN</b>   | DTR is not forced. DTR will be on only when the modem has received the signal from the computer.                                  |
|        | <b>CLOSED</b> | DTR is forced. The computer will assume that DTR is on at all times.                                                              |
| 2      | <b>OPEN</b>   | Auto answer is enabled.                                                                                                           |
|        | <b>CLOSED</b> | Auto answer is disabled.                                                                                                          |
| 3      | <b>OPEN</b>   | Modem is set for comm 2 when Switch 4 is <b>OPEN</b> and set for comm 4 when Switch 4 is <b>CLOSED</b> . See the following chart. |
|        | <b>CLOSED</b> | Modem is set for comm 1 when Switch 4 is <b>OPEN</b> and set for comm 3 when Switch 4 is <b>CLOSED</b> . See the following chart. |
| 4      | <b>OPEN</b>   | Modem is set for comm 2 when Switch 3 is <b>OPEN</b> and set for comm 1 when Switch 3 is <b>CLOSED</b> . See the following chart. |
|        | <b>CLOSED</b> | Modem is set for comm 4 when Switch 3 is <b>OPEN</b> and set for comm 3 when Switch 3 is <b>CLOSED</b> . See the following chart. |

| Switch | Setting       | Description                                                                                                                   |
|--------|---------------|-------------------------------------------------------------------------------------------------------------------------------|
| 5      | <b>OPEN</b>   | Carrier detect responds to carrier. Carrier detect will be true only when a valid carrier is detected by the modem.           |
|        | <b>CLOSED</b> | The modem keeps the carrier detect signal on all of the time, rather than reflecting whether the carrier is actually present. |
| 6      | <b>OPEN</b>   | Switch 6 should be <b>OPEN</b> except when the Half Card 24 modem is installed in slot 8 of the IBM PC-XT.                    |
|        | <b>CLOSED</b> | The Half Card 24 modem can be used in slot 8 of the IBM PC-XT.                                                                |

The following chart provides complete information on comm port settings.

| Desired Comm Port Setting: | Switch 3 Position | Switch 4 Position |
|----------------------------|-------------------|-------------------|
| Comm 1                     | <b>CLOSED</b>     | <b>OPEN</b>       |
| Comm 2                     | <b>OPEN</b>       | <b>OPEN</b>       |
| Comm 3                     | <b>CLOSED</b>     | <b>CLOSED</b>     |
| Comm 4                     | <b>OPEN</b>       | <b>CLOSED</b>     |

The factory default settings are in bold and are the proper settings for use with most software. Please note the following exceptions:

• AUTO-ANSWER

Switch 2 controls the auto-answer operation. In the **OPEN** position, the modem is set to answer the phone automatically. When the modem needs to share the phone line with people, it is probably better to turn auto-answer off by putting switch 2 **CLOSED**. If the line is used only for data, the auto-answer should be left on.

5-10



Ven-Tel 2400 Plus

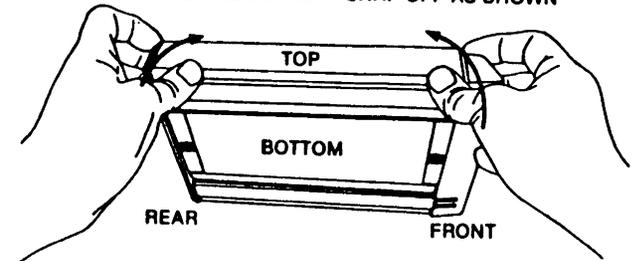
Telephone lines in this country are generally of excellent quality and will readily transfer data with the use of a high quality modem. However, it should be noted that ALL 2400 baud modems can be expected to encounter data errors more frequently at 2400 bps than at 1200 bps. The reason for this is that telephone lines are pushed to extreme limits at this speed. Do not be concerned that your modem is not operating correctly if errors are encountered. See Chapter 5 for information on self-tests the 2400 Plus can perform to verify its operation.

### 2.7 Option Switches

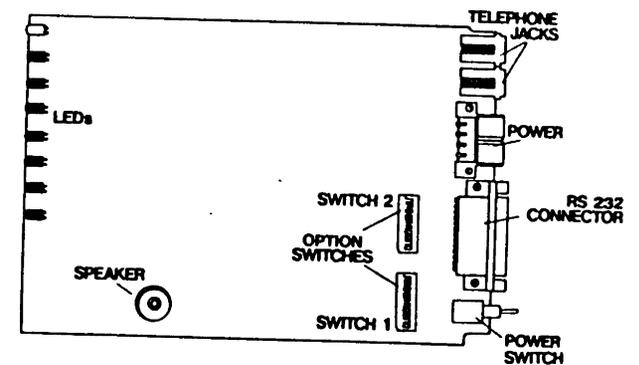
There are two sets of option switches on the 2400 Plus: Switch Box 1 with switches 1-1 through 1-10 and Switch Box 2 with switches 2-1 through 2-10. The setting of these switches establishes the operating parameters of the modem whenever it is turned on. Some of these default settings may be overridden by software or keyboard command. However, if a switch is changed, you will need to reset the modem, using either the ATZ command or by momentarily disconnecting power. This causes the modem to reset and re-read the switches. If changes are made by command, the modem will reset to the default values established by the switches the next time the modem is repowered or reset. See Section 4.28 for additional information on overriding option switches by command.

It should not be necessary to make frequent changes to the switches. If you need to change a switch, first disconnect the cables. With your fingers braced against the plastic endpiece, press your thumb against the metal case as shown. To replace the cover, just snap it back into place.

CASE TOP REMOVAL — SNAP OFF AS SHOWN



MODEM BOARD



The factory settings for the switches are defined in the following tables. Before using the modem, check to make sure that the switches conform to the factory settings. Please note that we will refer to the position of the switches as ON or OFF.

Switch Pack #1 has the same switches as the Ven-Tel 1200 Plus. Switch Pack #2 is used for synchronous operations and for controlling the international features. Most asynchronous users will never need to adjust these settings.

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Chapter 2

SWITCH PACK #1

| Switch | Factory Setting | Function                                                                                                                               |
|--------|-----------------|----------------------------------------------------------------------------------------------------------------------------------------|
| 1-1    | OFF             | RS-232C Data Terminal Ready is not forced. The TR light is on only when the modem and the computer or terminal are on and connected. * |
| 1-2    | OFF             | Result codes are displayed in English words.                                                                                           |
| 1-3    | ON              | Result codes will be sent to your terminal or computer screen.                                                                         |
| 1-4    | OFF             | Modem will echo characters while you are in the command mode so that the commands you enter will be displayed on the screen.           |
| 1-5    | OFF             | Modem is set to answer the phone automatically.                                                                                        |
| 1-6    | OFF             | Carrier detect responds to carrier. The CD light will come on only when a valid carrier is detected by the modem.                      |
| 1-7    | OFF             | Not used.                                                                                                                              |
| 1-8    | ON              | AT command set enabled.                                                                                                                |
| 1-9    | ON              | Data Set Ready signal always on.                                                                                                       |
| 1-10   | ON              | Modem speaker will operate.                                                                                                            |

\* This switch determines whether the 2400 Plus will respond to the data terminal ready (DTR) signal on the cable or whether the modem will assume that the signal is always on. If your computer does not support the RS-232C DTR signal (Pin 20), then Switch 1 should be put in the ON position.



▶ NOTE: If a change is made to an option switch, the modem must be reset with the ATZ command or by turning the power on and off. The reset is necessary to enable any changes made to take place. Consult Section 4.28 for further information about the option switches.

SWITCH PACK #2

| Switch | Factory Setting | Function                                                      |
|--------|-----------------|---------------------------------------------------------------|
| 2-1    | OFF             | Originate selection is the Bell 212-A standard at 1200 bps. * |
| 2-2    | OFF             | Synchronous mode 2 disabled.                                  |
| 2-3    | OFF             | Synchronous mode 3 disabled.                                  |
| 2-4    | OFF             | External clock disabled.                                      |
| 2-5    | OFF             | Slave clock disabled.                                         |

Switches 6, 7, 8, 9, and 10 are not used and should be left in the OFF position.

\* Switch 2-1 sets the initial originate mode. The choice between the 212-A and V.22 standards is significant only for international 1200 baud calls. All U.S. calls use the Bell 212-A standard; all European calls use V.22. The 2400 Plus will automatically connect with either a 1200 or 2400 baud modem; however, a connection between your modem and the remote modem will be faster if the switch is set to the correct type. Switch 2-1 determines the mode when the modem is first powered up.

## General User Maintenance: Procedure to maintain a backup of the hard disk drive

This backup procedure is similar for all MS-Dos Computers. It applies to most IBM, Compaq, ITS, Toshiba, and Zenith Computers. The files CHKDSK.COM, FORMAT.COM, BACKUP.COM and RESTORE.COM can be found on most all versions of MS-Dos. On most MS-Dos computers with a hard disk, there will be a sub-directory with the MS-Dos files on it. If there is none, find the MS-Dos Diskettes.

If you have never done a backup before, or if you are unsure of how many diskettes you will need, go to Section A (other side). Otherwise, proceed with Section B to backup the hard disk.

### Section B.

To backup the hard disk, use the MS-Dos BACKUP.COM file. It is important to make a universal backup, which includes all of the sub-directories. It is possible to make different types of specific backups. These are explained in further detail in the MS-Dos Users Manual. However, we will proceed to do a complete, universal backup of all files, in all sub-directories, to make sure all of the data on the hard disk properly stored.

Type BACKUP C: A:/S

This will backup all files, in all sub-directories, from hard disk drive C: to floppy drive A: The backup program will instruct you to insert backup disk 1 into floppy drive A: When it fills up this diskette, it will prompt you to remove that diskette, and insert backup diskette 2, and so on, until the backup is complete.

After finishing the backup, store your backup diskettes in a secured place. When you backup again, you can use the same diskettes. Remember to have a few extra formatted diskettes in case you increase the amount of data on the hard disk and need more backup diskettes.

### Section C.

If at any time the hard disk loses all of its data, either by reformatting or by being replaced, use the MS-Dos "RESTORE.COM" file. It is important to make a complete universal restore, that will include all files and all sub-directories. It is possible to make different types of specific restores. These are explained in the further detail in the MS-Dos Users Manual. However, we will proceed to do a complete, universal restoration of all files, in all sub-directories, to make sure all of the data on the backup diskettes is properly reloaded on the hard disk.

Type RESTORE A: C:\\*.\* /S/P

This will restore all files, in all sub-directories back to the hard disk. It will also prompt you if it finds a file with the same name on the hard disk with a message asking you if you would like to "Replace file with same name found on drive C:?" Always answer "No" to this question. This is to prevent you from replacing the boot files and Dos files that are already on the hard disk.

After finishing the restore, store your backup diskettes back in their secured place.



## General User Maintenance: Procedure to maintain a backup of the hard disk drive

**Section A.** If you have never done a backup before, or if you are unsure of how many diskettes you will need, proceed with the following four steps. Otherwise, go to Section B. (other side).

1. First, you need to find out how much disk space is being used on the hard disk that needs to be backed up. To do this, use the MS-Dos CHKDSK.COM command. At the Dos prompt, type CHKDSK C:. Using the information given, do some subtraction:

|                              |                     |
|------------------------------|---------------------|
| bytes total disk space       | Example: 21,329,083 |
| - bytes available on disk    | - 12,425,916        |
| bytes needed to be backed up | 8,903,167           |

2. To do an MS-Dos backup, you must have some blank, formatted diskettes. How many diskettes will you need to format? First, this depends on whether you will be backing up to a double-density diskette drive, or a high-capacity disk drive. It also depends on whether this drive is a 3.5 inch or 5.25 inch disk drive. Use the following information to help you do your backup:

| Computer                       | Diskette Drive A: commonly used for backing up to: |
|--------------------------------|----------------------------------------------------|
| Compaq Deskpro 286             | ** 5.25" High-Density                              |
| Compaq Portable                | 5.25" Double-Density                               |
| IBM PC, XT, PC/3270            | 5.25" Double-Density                               |
| IBM AT, AT/3270                | ** 5.25" High-Density                              |
| IBM PS/2                       | 3.5" Double-Density                                |
| ITS, Omicron, and PC/XT Clones | 5.25" Double-Density                               |
| ** ITS 286 and 286/AT Clones   | ** 5.25" High-Density                              |
| Toshiba Portables              | 3.5" Double-Density                                |
| Zenith Z-159                   | 5.25" Double-Density                               |
| Zenith Z-286                   | ** 5.25" High-Density                              |

\*\* Note that some of these computers may have been ordered with only Double-Density drives in Drive A: If you can not format a High-Density diskette in this drive, then it is Double-Density.

3. Now, use this table to determine how many diskettes you will need to do the backup:

| Type of diskette drive used: | Number of diskettes needed:                    |
|------------------------------|------------------------------------------------|
| 5.25 inch Double-Density     | 3 diskettes per Megabyte ( 1,000,000 bytes )   |
| 5.25 inch High-Density       | 1 diskette per Megabyte ( 1,000,000 bytes )    |
| 3.5 inch Double-Density      | 1.5 diskettes per Megabyte ( 1,000,000 bytes ) |

In the previous example we needed to backup 8,903,167 bytes of information. To be safe, round up to the nearest megabyte, which would be 9,000,000 bytes, or 9 megabytes. The number of diskettes needed to be used for the backup depends on the floppy diskette drive being used.

| Type of diskette drive used: | Number of diskettes needed to backup 9 MBs:     |
|------------------------------|-------------------------------------------------|
| 5.25 inch Double-Density     | 3 diskettes per MB, 3 x 9 = 27                  |
| 5.25 inch High-Density       | 1 diskette per MB, 1 x 9 = 9                    |
| 3.5 inch Double-Density      | 1.5 diskettes per MB, 1.5 x 9 = 13.5 ( use 14 ) |

4. Now use the MS-Dos FORMAT.COM command, by typing FORMAT A:. After formatting your diskettes, go to Section B. (other side) to backup the hard disk.

### Computer Virus:

Known as the "BRAIN" or "Pakistani" Virus.  
Found on IBM PC-DOS or MS-DOS computer operating systems.

#### symptoms:

- Changes volume label of disk to "BRAIN". However, this may not mean that the disk is infected. ( See "Comments about the virus" below ).
- Changes information on the boot track, sector 00 of the disk and states the following "Welcome to the dungeon....Lahore, Pakistan...(Pakistan telephone number)...call us for vaccination...".
- Damages certain track(s) on disks, causing disk I/O errors.

### Virus Removal Procedure:

#### Preparation:

- An IBM PC, XT or AT computer or compatible.
- A disk utility, such as Norton Utilities.
- A known, good, un-infected, write-protected copy of DOS - similar in version to the infected diskette.

#### Examination:

- Make sure the computer is started from a cold start, powered off. Power the computer on and after it boots, load Norton Utilities as follows: " NU X: " The X: being the diskette drive letter that the infected diskette is in. You will be in the top level menu.
- Choose F1 to " Change Selection ".
- Choose F5 to " Select Disk Sector ".
- Type " 00 " and press <Enter>. You will be in the top level menu.
- Choose F2 to " Explore Disk Information ".
- Choose F5 to " Display or Change contents of selected item ". You will be in Sector 00 in Boot Area in Hex Format. At this time, the BRAIN virus message " Welcome to the Dungeon..." will appear in the right column.
  - If it is NOT there, the diskette is NOT INFECTED. However, change the volume label to something other than " BRAIN " to avoid confusion in the future.
  - If the " Welcome ... " message IS there, the diskette IS INFECTED. Do the following:

#### Vaccination:

- Press the <Escape> key. You will be back in the menu " Explore Disk Information ".
- At this time, remove the infected diskette from the drive, and insert the known, good, un-infected diskette into the drive.
- Choose F5 to " Display or Change contents of selected item ". You will be in Sector 00 in Boot Area in Hex Format. At this time, the BRAIN virus message " Welcome to the Dungeon..." SHOULD NOT appear in the right column.
- Press the <Down-Arrow> key 17 times until the cursor is at OFFSET 408. ( OFFSET is shown in the upper right corner of the screen. )
- Press the <Tab> key.
- If it is a Capital " R ", replace it with a lower case " r ".  
If it is a lower case " r ", replace it with a capital " R ".  
Change this letter by typing in the new one.
- Press the <Escape> key. You will be in a different menu " Save or Discard changes made to data ".
- At this time, remove the good, un-infected diskette from the drive and insert the infected diskette.
- Choose F1 to " Write the changed data, saving it on the disk ".
- Press the <Escape> key.

The computer virus has been removed. Change the volume label on the diskette to something other than " BRAIN ", using the DOS "LABEL" Command. Also note that this virus has different strains, written by other programmers to make it more destructive and corrupt hard disk drives. This vaccination procedure may not work for all forms of the virus.

### Comments about the virus:

The virus stores itself on the boot track, sector 00 of a disk. When the DIRECTORY command is invoked, the virus loads itself into the computers memory, or RAM. From now on, whenever the DIRECTORY command is invoked, the virus changes the volume label on that disk. After 4 times, it installs the harmful virus, itself, on that disk and damages certain track(s) on the disk. Also note that there are other "strains" of the virus that may be more destructive.



## The Microsoft (IBM) Disk Operating System (MS-DOS).

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### Section 3. - DOS Commands ( Continued )

**X** - CTTY device-name - changes the standard input and output console to an auxiliary console, or restores the keyboard and screen as the standard input and output devices.

Example: CTTY AUX Meaning DOS will use the AUX device for its I/O operations. CTTY CON is the console.

**DATE** - DATE - Use to enter or change the date known to DOS.

**DEL (DELETE)** - DEL [d:][path]filename[.ext] - Deletes the specified file.

Example: DEL A:FILE1.BAT Meaning delete FILE1.BAT on drive A:

**DIR (Directory)** - See Section Two ( 2 ).

**DISKCOMP** - [d:][path] DISKCOMP [d:[d:]][/1]/[8] - Compares the contents of the diskette in the first specified drive to the contents of the diskette in the second drive.

/1 - to compare only the first side of the diskettes, even if the diskettes and drives are dual-sided.

/8 - to compare only 8 sectors per track, even if the first diskette contains 9/15 sectors per track.

Example: DISKCOMP A: B: Meaning compare the contents of the diskette in drive A: to the diskette in drive B:

**DISKCOPY** - [d:][path] DISKCOPY [d:[d:]]/1] - Copies the contents of the diskette in the source drive to the diskette in the target drive. The target diskette is formatted if necessary, during the copy.

Example: DISKCOPY A: B: Meaning copy the diskette in drive A: to the diskette in drive B:

**DISKINTT** - See Section Four ( 4 ).

**EDLIN (Line Editor)** - See Section Seven ( 7 ).

**ERASE** - ERASE [d:][path] filename [.ext] - Erases the specified file.

Example: ERASE A:FILE.BAT Meaning erase the file FILE.BAT in drive A:

**EXE2BIN** - [d:][path]EXE2BIN[d:][path]filename[.ext] [d:][path][filename[.ext]] - Changes .EXE to .COM or .BIN files.

**FDISK** - See Section Four ( 4 ).

**FIND** - [d:][path] FIND [/V]/[C]/[N] "string" [[d:][path] filename[.ext]...] - Sends all lines from the specified filenames that contain the specified string to the standard output device.

Example: FIND "Littleton" BOOK.TXT Meaning display all lines from BOOK.TXT that contain the string "Littleton".

**FORMAT** - [d:][path] FORMAT [d:]/[S]/[1]/[8]/[V]/[B]/[4]/[Q]/[T]/[N] - Initializes the disk in the designated or default drive to a recording format acceptable to DOS; analyzes the entire disk for any defective tracks; and prepares the disk to accept DOS files by initializing the directory, File Allocation Table, and system loader. ( Also see Section Four ( 4 ) ).

/S - to copy the operating system files from the DOS diskette in the default drive to the new disk in the following order: IBMBIO.COM, IBMDOS.COM, and COMMAND.COM.

/1 - to format a diskette for single-sided use regardless of the drive type.

/8 - to format a diskette for 8 sectors per track. ( Normally 9/15 physical sectors. )

/V - to give the disk a volume label to uniquely identify each disk.

/B - to format a diskette for 8 sectors per track with space allocated for IBMBIO.COM and IBMDOS.COM files

/4 - to format a double-sided diskette in a high-capacity drive. CAUTION - don't use them in regular drives.

/Q - ( ARC Dos 3.1 ) to format 3.5 " diskettes in the internal 3.5" floppy diskette drive.

/T - ( IBM Dos 3.3 ) number of tracks on diskette

/N - ( IBM Dos 3.3 ) number of sectors on diskette

Example: FORMAT B:/S Meaning the diskette in drive B: is formatted with the system loader files.

Example: FORMAT B:/Q ( In a clone computer with ARC Dos 3.1 ) format 3.5" floppy in internal 3.5" drive B:

Example: FORMAT A: /N:9 /T:80 ( In an IBM PS/2 with Dos 3.3 ) format a 3.5" Double-Sided/Double-Density diskette in a 1.44 MB internal diskette drive A:

**GRAFTABL** - [d:][path]GRAFTABL - Loads a table of additional character data for color/graphics adapter into memory.

Example: GRAFTABL Meaning the system now supports display of ASCII characters 128 through 255 in the graphics mode on the color/graphics adapter.



### Section 3. - DOS Commands ( Continued )

**RE** - [d:][path] MORE - Reads data from the standard input device, and sends one screen of data to the standard output device, and then pauses with the message "-- More --".

Example: MORE < TEST.ASM Meaning display the contents of the file TEST.ASM one screen at a time.

**PATH** - ( Search specified directory ) - See Section Two ( 2 ).

**PRINT** - [d:][path] PRINT [/D:device][/B:buffsiz][/U:busytick][/M:maxtick][/S:timeslice][/Q:queusize] [/C]/[T]/[P]

[[d:][path][filename][.ext]...] - Prints a queue (list) of data files on the printer while you are doing other tasks.

/D:device - specify the print device, default device is PRN. ( If specified, /D must be first )

/B:buffsiz - set the size in bytes of the internal buffer, default is 512 bytes.

/Q:quesiz - specify how many print files you can have in the queue, range is 1 to 32 files, default is 10 )

/S:timeslice - specify the time-slice value, range 1 to 255, default is 8 time slices.

/U:busytick - specify number of clock ticks that PRINT will wait for until the print device is available, default is 1.

/M:maxtick - specify how many clock ticks PRINT can have to print characters, range is 1 to 255, default is 2.

/T - set the terminate mode. All queued files are canceled from the print queue. If a file is currently being printed, printing stops, a cancelation message is printed, paper is advanced, and printer alarm sounds.

/C - set the cancel mode - select which file(s) to cancel. The preceding filename and all following filenames are canceled from the print queue until a /P is found on the command line, or until you press the Enter key.

/P - set the print mode. The preceding filename and all following filenames are added to the print queue until a /C is found on the command line, or until you press the Enter.

Example: PRINT TEMP1.TST/C TEMP2.TST/P Meaning remove the file TEMP1.TST from the print queue, and add TEMP2.TST to the print queue.

**PROMPT** - PROMPT [ [prompt-text][...] ] - Sets a new DOS prompt, where prompt-text is in the form "\$c", where c is:

b - the : character

d - date

e - the ESCape character

g - the > character

h - a backspace; the previous character is erased

l - the < character

n - default drive letter

p - current directory or default drive

q - the = character

t - time

v - version number

\_ - the CR LF sequence ( go to beginning of new line )

Example: PROMPT SP\$G Meaning the prompt is current directory of the default drive plus the > character.

**OVER** - [d:][path] RECOVER [d:][path] filename [.ext] or [d:][path] RECOVER d: - Recovers files from a disk that has a defective sector. You can recover the file that contains the bad sector (minus the data in the bad sector).

Or, all the files on the disk can be recovered if the directory has been damaged.

Example: RECOVER A: MYPROG.TST Meaning recover the file MYPROG.TST from drive A:, reading it sector-by-sector, skipping the bad sectors.

**RENAME** - REN [AME ] [d:][path] filename[.ext] filename [.ext] - Changes the name of the file specified in the first parameter to the name and extension given in the second parameter.

Example: RENAME B:MYPROG.TXT YOURPROG.TXT Meaning rename the file MYPROG.TXT as YOURPROG.TXT.

**RESTORE** - [d:][path] RESTORE d: [d:][path] filename[.ext][/S]/[P] - Restores one or more backup files from a disk to another disk.

/S - restore all files in subdirectories in addition to the files in the specified directory. Includes all levels.

/P - to have RESTORE prompt you before restoring files that have changed since they were last backed up, or that are marked read-only. You can then choose to restore the file or not.

Example: RESTORE A: C:\\*.\* /S Meaning restore all files, including those in subdirectories, on the backup diskettes in drive A: to the fixed disk drive C:

**RD or RMDIR ( Remove Directory )** - See Section Two ( 2 ).

**SELECT** - [d:][path] SELECT xxx yy - Allows you to select the keyboard layout and the date and time format, where:

xxx - specify country code

yy - specify keyboard code

The SELECT command uses the DISKCOPY command to make a copy of your DOS diskette. It also creates the following two files on the copy of the DOS diskette:

- A CONFIG.SYS file with COUNTRY = command
- An AUTOEXEC.BAT file with the KEYBxx command

| Country        | Country Code | Keyboard Code |
|----------------|--------------|---------------|
| United States  | 001          | US            |
| France         | 033          | FR            |
| Spain          | 034          | SP            |
| Italy          | 039          | IT            |
| United Kingdom | 044          | UK            |
| Germany        | 049          | GR            |



Section 3. - DOS Commands ( Continued )

**SET** - SET [name=[parameter]] - This command inserts strings into the command processor's environment. A copy of entire series of strings in the environment is made available to all commands and applications.

Example: SET PGMS=LEVEL1 Meaning add the string PGMS=LEVEL1 to the environment.

**SHARE** - [d:][path] SHARE [/F:filesize][/L:locks] - Loads support for file sharing, where:

/F:filesize - allocates file space in bytes for the area used for recording the information necessary for file sharing.

Each open file requires the length of the full filename plus 11 bytes, default 2048 bytes.

/L:locks - allocates space for the number of locks you want, default is 20 locks.

**SORT** - [d:][path] SORT [/R] [/+n] - Reads data from the standard input device, sorts the data, then writes the data to the standard output device, where:

/R - sort in reverse order.

/+n - start sorting with column n. The n is an integer value, default is column 1, maximum sort file is 63K.

Example: SORT /R <UNSORT.TXT >SORT.TXT Meaning read the file UNSORT.TXT, sort in reverse order, and write the output to the file SORT.TXT.

**SUBST** - [d:][path] SUBST or [d:][path] SUBST d: d:path or [d:][path] SUBST d: /D - Allows you to use a different drive specifier to refer to another drive or path.

/D - to delete a substitution ( Example: SUBST G: /D Meaning remove the substitution for drive G: )

Example: SUBST G: C:\REPORTS\FILES Meaning substitute drive G for the path C:\REPORTS\FILES.

**SYS** - [d:][path] SYS d: - Transfers the operating system files IBMDOS.COM and IBMBIO.COM from the first drive specified to the second drive specified.

Example: A:SYS C: Meaning transfer the operating system files from drive A: to drive C:

**TIME** - TIME [hh:mm:[ss[.xx]]] - Use to enter or change the time known to DOS.

**TREE** - ( Display directory paths ) - See Section Two ( 2 ).

**TYPE** - TYPE [d:][path] filename [.ext] - Displays the contents of the specified file on the standard output device.

Example: TYPE B:MYFILE.ONE Meaning display the file MYFILE.ONE on drive B: on the standard output device.

**VDISK** - See Section Five ( 5 ) ( Device = Vdisk.sys ).

**VER** - VER - Displays the DOS version number that you are working with on the display screen or output device.

**VERIFY** - VERIFY [ ON | OFF ] - Verifies that the data written on a disk has been correctly recorded.

**VOL** - VOL [d:] - Displays the disk volume label of the specified drive.

## Section 4. - Prepare the Fixed Disk

### Assigning to Disk Drives

DOS assigns drive letters to the diskette and fixed ( or hard ) disk drives. Typically, A and B for the floppy diskette drives, and C, D, and E for the fixed disks or other drives.

### The Fixed Disk Format Procedure

When replacing or reformatting a fixed disk, use the following procedures in this order to install DOS on the fixed disk :

- ( 1 ) Low-Level Format ( Lowform, IBM AT Diagnostics, Compaq Diagnostics )
- ( 2 ) Create a DOS Partition ( Fdisk, Diskinit )
- ( 3 ) Format the DOS Partition on the fixed disk ( Format, Diskinit )
- ( 4 ) Copy DOS to a subdirectory named DOS ( Copy, Diskinit )

### ( 1 ) Low-Level Formats

When replacing or reformatting a fixed disk, before formatting it with DOS, it is a good idea to first format the disk with a low-level format program. The low-level format does a better job of flagging defective tracks on the fixed disk than the DOS format. It is recommended at this time to use:

**LOWFORM** - ( IBM PC, XT, 3270; Compaq Portable, Portable Plus & Deskpro; 8088 & 8086 based Clones ) - Low-level format program for the 8088 and 8086 cpu based computers . To access the program load the diskette containing the LOWFORM program in drive A: and at the A: prompt type: LOWFORM and press Enter. The program will ask you for the desired Interleave to enter for formatting the fixed disk. If you are unsure, use the default value of 6. Use the table below for information on fixed disk interleave values:

| Interleave: | Disk:                                                                               |
|-------------|-------------------------------------------------------------------------------------|
| 6           | Common IBM 10 MB Miniscribe, almost all 10 MB fixed disks, most 20 MB fixed disks   |
| 3           | Seagate ( ST 225 ) 20 MB, IBM ( Western Digital WD-25 ) 20 MB, 20 MB Plus Hard Card |

**IBM AT ADVANCED DIAGNOSTICS** - ( IBM AT, AT 3270, XT 286, and 80286 based Clones ) The IBM AT Advanced Diagnostics Diskette has a low-level fixed disk format option within the section for testing the fixed disk drive. Before running the test be sure you know exactly what "type" of fixed disk you are formatting and that it is correctly set in the IBM AT Setup program, also on the diagnostic diskette. It is also possible to manually flag defective tracks to be locked out. To see a list of the defective tracks, remove the cover and look for a list written on the fixed disk. If you do not select any defective tracks, the format will usually lock these areas out anyway. Use the table below for setting up the fixed disk drive types in the Setup program:

| Type: | Disk:                                               |
|-------|-----------------------------------------------------|
| 2     | Common IBM 20 MB, CDI 20 MB, most 20 MB fixed disks |
| 20    | Seagate ( ST 4038 ) 30 MB, most 30 MB fixed disks   |

**COMPAQ 286 DIAGNOSTICS** - ( Compaq Portable II, III, Deskpro 286 ) The Compaq Diagnostics have a low-level fixed disk format program similar to the IBM AT Advanced Diagnostics within the section for testing the fixed disk drive. There are two versions of the diagnostics. The first is DIAG286 to be used on most Deskpro 286 computers. To run the diagnostics, insert the diagnostic diskette into drive A: and at the A: prompt type: DIAG286. The second is Diagnostics 5.02 for the Portable II and III. This second diagnostic should also be used on a Compaq 286 with a 40 MB fixed disk, Type 17. To run this diagnostic, boot the diskette in drive A: and type: TEST. After doing the low-level format with this diagnostic, it is then necessary to run the program DISKINIT. Do not run FDISK and FORMAT with a 40 MB hard disk. It is recommended to use the Compaq low-level diagnostic program because (1) it has been specially written for the Compaqs, and (2) the drive types are not exactly the same as the IBM AT drive types.

| Type: | Disk:                   |
|-------|-------------------------|
| 17    | Compaq 40 MB fixed disk |

Section 4. - Prepare the Fixed Disk ( Continued )(2) Dividing your Fixed Disk ( Fdisk )

You can divide a fixed disk drive into 1, 2, 3, or 4 sections called "partitions". Partitions separate fixed disk space into individual areas. To prepare your fixed disk for DOS, you create a partition for DOS called a "DOS partition". To do this, you will use the fixed disk setup program supplied by DOS called FDISK. If you are using DOS as your only operating system, you only need one partition. If you are using Compaq DOS 3.2 on a Compaq 286 with a fixed disk of 40 MB or more, than you will need to use the DISKINIT program to divide the fixed disk into two or more DOS partitions. DOS can not access much more than 30 MB per drive, and DISKINIT separates the DOS partitions into different logical disk drives.

(3) Formatting the DOS Partition

With the DOS diskette in drive A: type: **FORMAT C:/S**. This will format your DOS partition and install the system files so that the DOS partition will boot.

(4) Copying DOS to the DOS Partition

It is important to copy the DOS files to the fixed disk. Create a subdirectory called DOS and copy all the files from the DOS diskette into this subdirectory, not the root directory, by inserting your DOS diskette into Drive A: and typing:

1. At the C: prompt type: **MD\ DOS** ( Create a subdirectory called DOS. )
2. Type: **COPY A:.\* C:\DOS** ( Copy DOS files into the DOS subdirectory. )
3. Repeat step 2 with the Supplemental DOS diskette if available.

DOS Fixed Disk Format Commands

**DISKINIT** - [d:][path] DISKINIT - ( Compaq DOS 3.2 for Compaq 286 computers only ) Allows you to format a fixed disk 40 MB or larger. This command is found on Compaq DOS 3.2 and is used to give the fixed disk two or more DOS partitions, and access these separate DOS partitions as different drive letters ( such as C and D ). This command does the equivalent of steps 2, 3, and 4 of preparing the fixed disk.

Example: **DISKINIT** Meaning load the program DISKINIT from the default drive, setup the DOS partitions, format the DOS partitions, and copy DOS to a DOS subdirectory.

**EDISK** - [d:][path] FDISK - allows you to (1) Create a DOS partition, (2) Change an active partition, (3) Delete a DOS partition, (4) Display partition data, (5) Select the next fixed disk drive for partitioning if you have more than one.

With the DOS diskette in drive A: type: **FDISK**. You will next see an option menu listing these five choices.

1. Creating a DOS Partition - Normally, use the entire disk for the DOS Partition, otherwise, consult the DOS Manual
2. Changing the Active Partition - The fixed disk can have many partitions, but only one can be "active". Use this option to select the one you want to be active.
3. Deleting a DOS Partition - Use this to delete the DOS partition.
4. Displaying Partition Information - Display information that tells how the fixed disk is partitioned.
5. Select the Next Fixed Disk Drive - To select a different fixed disk drive than C:

**FORMAT** - [d:][path] FORMAT [d:][S][1][8][V][B][4] - Initializes the DOS partition in the fixed disk to a recording format acceptable to DOS; analyzes the disk for any defective tracks; and prepares the disk to accept DOS files by initializing the directory, File Allocation Table, and system loader. ( Also see Section Three ( 3 ) ).

/S - to copy the operating system files from the DOS diskette in the default drive to the fixed disk in the following order: **IBMBIO.COM**, **IBMDOS.COM**, and **COMMAND.COM**.

Example: **A: FORMAT C:/S** Meaning load the file **FORMAT** from drive A: and format the logical fixed disk drive C: with the operating system files.

Replacing a Previous Version of DOS

If you wish to replace a previous version of DOS with a later version of DOS, 3.1 or later, follow these steps:

1. Boot with your new version of DOS.
2. At the A: prompt type : **SYS C:**
3. After you see the message "System Transferred", copy the **COMMAND.COM** to the root directory of fixed disk by typing at the A: prompt : **COPY A:COMMAND.COM C:\**
4. Copy all of the DOS files from your floppy disk in drive A: to the subdirectory of DOS in the fixed disk drive C: by typing : **COPY A:.\* C:\DOS**
5. Repeat step 4 with the Supplemental DOS diskette if available.

## Section 5. - Configuration Files

A configuration file contains commands that are used to configure your system. Each time you start DOS, DOS searches the root directory of the drive it was started from for the file named CONFIG.SYS. If the file CONFIG.SYS is found, DOS reads the file and interprets the commands within the file.

Creating a CONFIG.SYS File - to create a CONFIG.SYS File use an editor ( like EDLIN, See Section Seven ( 7 ) ). At the DOS prompt type : COPY CON CONFIG.SYS and press Enter. Type the "configuration commands" and press Enter after each one. When you have finished, press the F6 key and then Enter. Reboot the computer to activate the CONFIG.SYS file.

### Configuration Commands

BREAK (Control Break) - BREAK = [ON | OFF] - Allows you to instruct DOS to check for a control break whenever a program requests DOS to perform any functions. Default value is set at BREAK OFF.

Example: BREAK = ON Meaning: DOS checks for Ctrl-Break whenever it is requested. BREAK = OFF Meaning DOS only checks for Ctrl-Break during standard input, output, print device, and auxiliary device operations.

BUFFERS - BUFFERS = x - Allows you to determine the number of disk buffers that DOS will allocate in memory when it starts, where:

x - a number between 1 and 99. This is the number of disk buffers that DOS allocates in memory when it starts.

The default value is 2, 3 for the IBM AT, and this value remains in effect until DOS is restarted with a different value specified in the configuration file.

A disk buffer is a block of memory that DOS uses to hold data being read from, or written to a disk. It is much faster for DOS to read data from a buffer already in memory than reading data from a disk. It is recommended that fixed disks use a minimum of 3 buffers, data bases between 10 and 20, and 10 to 25 for subdirectories.

COUNTRY - COUNTRY = xxx - Use to specify the date and time format for a given country, where:

xxx - is a 3-digit international country code for the telephone system, default is US country code of 001.

DEVICE - DEVICE = [d:][path] filename [.ext] - Allows you to specify the name of a file containing a device driver.

Standard device drivers loaded by DOS support the standard input, standard output, standard printer, diskette, and fixed disk devices. A clock driver is also loaded. You don't need any DEVICE = commands for DOS to support these devices.

DEVICE = ANSISYS - causes DOS to replace the standard input and standard output support with extended keyboard and screen features.

DEVICE = [d:][path] VDISK.SYS [bbb][sss][ddd][E:m] - simulates a disk drive by using a portion of your computer's memory as the storage medium. These simulated disks are called "virtual disks".

bbb - virtual disk size in K bytes, default is 64, range is 1 to amount of memory available

sss - sector size in bytes, default is 128, allowable range is 128, 256, or 512.

ddd - number of directory entries (files) that the virtual disk can contain, default is 64, range is 2 to 512.

/E - a parameter that tells VDISK to use extended memory, which is only available on the IBM AT, at or above 1 MB.

m - the maximum number of sectors ( size of sss ).

Example: DEVICE = VDISK.SYS 160 512 64 Meaning install a 160K-byte virtual disk with 512-byte sectors and 64 directory entries.

FCBS - FCBS = m, n - Allows you to specify the number of file control blocks that can be concurrently open by DOS.

m - total number of files opened by FCBS that can be open at one time, default is 4, range is 1 to 255

n - number of files opened by FCBS that cannot be closed automatically by DOS if a program tries to have more than "m" files opened by FCBS at one time.

Example: FCBS = 3,1 Meaning set the total number of FCB files that can be open at one time to 3, and the number protected from being closed to 1.

FILES - FILES = x - Allows you to specify the maximum number of file handles that can be open concurrently.

x - number between 1 and 255, default is 8. However, the maximum number of files that a process can have open is 20.

LASTDRIVE - LASTDRIVE = x - Sets the maximum number of drives that you may access, where:

x - any alphabetic character A through Z. It represents the last valid drive DOS may accept, default is E.

Example: LASTDRIVE = P Meaning set the number of drives equal to 16.

SHELL - SHELL = [d:][path] filename [.ext] - Allows you to specify the name and location of a top-level command processor that DOS initialization loads in place of COMMAND.COM.

Section 6. - Batch Files

Batch commands are DOS commands that are contained in a specified file called a "batch" file. When you execute a batch file, DOS executes the commands you include in the batch file.

[d:][path] filename[.BAT] [parameters]

A batch file is a file containing one or more commands that DOS executes one at a time. All batch files must have the extension .BAT. You can pass parameters ( using replacable parameters ) to the filename.BAT file when the file is executed. Therefore, the file can do similar work with different data during each execution.

CREATE A BATCH FILE by using the line editor, EDLIN ( See Section Seven ( 7 ) ), or by using the COPY CON command directly from the standard input device. To create a batch file type : COPY CON filename.BAT and press Enter. Type the commands you want to include in the batch file and press Enter after each one. When done press F6 and then press Enter. To create a sample batch file, type in the following:

```
COPY CON TEST.BAT
ECHO OFF           ( suppresses prompt and commands )
CLS                ( clears the screen )
PATH C:\DOS        ( path to check "dos" sub-directory for files )
DATE               ( asks for current date )
TIME               ( asks for current time )
PROMPT $PSG        ( gives prompt )
COMMAND            ( loads secondary command processor )
PROMPT $PSG        ( gives prompt correctly after secondary command processor is loaded )
(Press F6 and Enter) ( ends and saves new batch file )
```

To execute this batch file, type: TEST.

EXECUTE A BATCH FILE by typing the name of the batch file at the DOS prompt and press Enter. To execute a batch file named TEST.BAT type : TEST and press Enter. You do not need to type the extension .BAT.

TERMINATE A BATCH FILE by typing Ctrl-Break.

AUTOEXEC.BAT File

Every time you start DOS, the command processor searches for a file named AUTOEXEC.BAT in the root directory on the disk that DOS was started from. An AUTOEXEC.BAT file is a special type of file that is automatically executed when you start or restart DOS.

BATCH FILES WITH REPLACABLE PARAMETERS

Within a batch file you can include "dummy" parameters that can be replaced by values supplied when the batch file executes. For example, TEST.BAT contains:

```
COPY %1. MAC %2. MAC
TYPE %2. PRN
TYPE %0. BAT
```

The replacable parameters %0, %1, and %2 are replaced sequentially by the parameters you supply when you execute the file. The %0 is always replaced by the drive specifier, if specified, and the filename of the batch file. To execute the batch file with replacable parameters, type the batch filename followed by the parameters you want sequentially substituted for %1, %2, etc. If you type : TEST A: PROG1 B: PROG2, TEST is substituted for %0, A: PROG1 for %1, and B: PROG2 for %2. The result is the same if you typed:

```
A> COPY A: PROG1. MAC B: PROG2. MAC
A> TYPE B: PROG2. PRN
A> TYPE TEST. BAT
```

Section 6. - Batch Files ( Continued )Batch File Commands

**ECHO** - ECHO [ ON | OFF | message ] - Allows or inhibits the screen display of DOS commands executed from a batch file. It does not interfere with messages produced while the commands are executing.

Example: ECHO OFF                      Results: A> ECHO OFF  
           DIR A:/W                      Volume on drive A: has no ID  
                                           Directory of A:\  
                                           file1.ext    file2.ext    file3.ext  
                                           3 file(s)    xxxxx bytes free

A >

**FOR** - FOR % % variable IN ( set ) DO command - Allows iterative execution of DOS commands. The "% % variable" is sequentially set to each member of "set" and then the "command" is evaluated and executed. If a member of "set" is an expression involving \* and / or ?, then the "% % variable" is set to each matching filename from disk. Path names are allowed in "set".

Example: FOR % % F IN ( PROG1.ASM PROG2.ASM PROG3.ASM ) DO DIR % % F is the same as typing:  
           DIR PROG1.ASM  
           DIR PROG2.ASM  
           DIR PROG3.ASM

**GOTO** - GOTO : label - Transfers control to the line following the one containing the appropriate label. A label is inserted in a batch file as a colon ( : ) followed by the label name. The GOTO label causes commands to be executed beginning with the line immediately after :label. If :label is not defined, the current batch file terminates with the message Label not found. A label in a batch file is defined as a character string where the first 8 characters are significant.

Example: : LOOP                              Results: This batch file produces an indefinite sequence of looping.  
           GOTO LOOP

**IF [NOT] condition command** - Allows conditional execution of DOS commands, where the conditional parameter is

1) ERRORLEVEL number - true if the previous program had an exit code of "number" or higher.

Example: FILE1  
           IF ERRORLEVEL 1 ECHO FILE1 FAILED

Meaning after the batch file processed FILE1 completes its processing successfully, it sets the errorlevel to 0. If unsuccessful, the errorlevel is set to 1, the condition is true & ECHO displays the message FILE1 FAILED .

(2) string1 == string2 - true when string1 and string2 are identical.

Example: IF %1 == FILE1 ECHO FILE1 WAS FOUND Meaning when a batch file containing this command with FILE1 given as the %1 parameter would make the condition true.

(3) EXIST [d:][path] filename [.ext] - true if filename is found in the specified directory.

Example: IF EXIST FILE1 GOTO ABC Meaning if FILE1 is found, the GOTO ABC command is executed.

(4) The NOT condition is true if the condition is false.

**PAUSE** - PAUSE [remark] - Suspends system processing and displays the message Strike a key when ready...

**REM** - REM [remark] - Displays remarks from within a batch file. If ECHO is OFF, then they are not displayed.

**SHIFT** - SHIFT - Allows command lines to make use of more than 10 ( %0 - %9 ) replacable parameters.

Example: ECHO %0 %1 %2                      Results: ( with parameters FILE1 FILE2 FILE3 )  
           SHIFT                              FILE1 FILE2 FILE3  
           ECHO %0 %1 %2                      FILE2 FILE3

Section 7. - The Line Editor ( EDLIN )

You can use the Line Editor ( EDLIN ) to create, change, and display source files or text files. Source files are unassembled programs in source language format. Text files appear in legible format.

**EDLIN** - [d:][path] EDLIN [d:][path] filename[.ext] [/B] - create, change, and display source or text files, where:  
/B - if not specified, EDLIN will stop loading the file when the first Ctrl-Z ( end-of-file mark ) is found.

EDLIN Command Parameters

**line** - Specify a line number by one of the following parameters:

1. Enter a decimal integer from 1 - 65529, line numbers must be separated by a comma or space.
2. Enter a pound sign ( # ) to specify the line after the last line in memory.
3. Enter a period ( . ) to specify the current line ( last change to the file ).

**n** - Denotes when you must specify lines.

**string** - Denotes when one or more characters to represent text to be found, replaced, deleted, or to replace other text.

EDLIN Commands

**A (Append Lines)** - [n] A - Adds the specified number of lines from disk to the file being edited in memory. The lines are added at the end of the current lines in memory. It is only necessary if the file being edited is too large to fit in memory.

**C (Copy Lines)** - [line],[line], line [,count] C - Copies the lines in the specified range to the line number specified by this third parameter. The new data is placed ahead of the line that was specified in the third parameter. This third parameter is not optional. The operation is repeated the number of times specified in "count".

Example: 1, 5, 8C Meaning copy lines 1 through 5 to line 8. Line 8 becomes the current line.

**D (Delete Lines)** - [line] [,line] D - Deletes a specified range of lines.

Example: 3, 20D Meaning delete lines 3 through 20. Line 3 becomes the current line.

**(Edit Line)** - [line] - Allows you to edit a line of text by entering the line number of the line to be edited.

Example: 6 - Meaning edit line 6

Function Key Options:

F1 - Replace previous line one character at a time

F2 - Press F2 and then the character you wish to move the cursor to move to

F3 - Repeat the entire line from where the cursor is to the end of the line

**E (End Edit)** - E - Ends EDLIN and saves the edited file.

**I (Insert Lines)** - [line] I - Inserts lines of text immediately before the specified line. When you create a new file, you must enter the Insert Lines command before text can be inserted.

- If you don't specify line, or if you specify line as a period ( . ), the insert is made immediately before the current line.

- If a line number already exists for the line specified, the new line is inserted before the old line.

- During the insert mode, successive line numbers appear automatically each time Enter is pressed.

- You must press Ctrl-Break to discontinue the insert mode of operation.

Example: 3I Meaning insert text before line 3, creating a new line 3, and more, until Ctrl-Break is pressed.

**L (List Lines)** - [line] [,line] L - Display a specified range of lines. The current line remains unchanged.

Example: L Meaning list all lines, starting 11 lines before and 11 lines after the current line

Example: 3, 25L Meaning list lines 3 through 25

**M (Move Lines)** - [line],[line],lineM - Moves the range of lines specified by the first two line parameters ahead of the line specified in the third line parameter. The third parameter is not optional.

Example: , +25, 100M Meaning move the data from the current line plus 25 lines to line 100.

**P (Page)** - [line] [,line] P - Lists the specified block of lines.

**Q (Quit Edit)** - Q - Quits the editing session without saving any changes you may have entered. When you type the letter Q, the following message appears: Abort edit ( Y/N )?

**R (Replace Text)** - [line],[line][?] R [string][<F6>string] - Replaces all occurrences of the first string in the specified range of lines with the second string, where:

? - to request a prompt OK? after each display of a modified line.

Example: 1,7 Rand ( Then press F6 and type "or" ) Meaning replace all occurrences of "and" with "or" in lines 1 to 7.

**S (Search Text)** - [line],[line][?] S [string] - Searches a specified range of lines in order to locate a specified string.

Example: 1,7 Sand Meaning search for the first occurrence of "and" in the file.

**T (Transfer Lines)** - [line] T: [d:] filename - Transfers (merges) the contents of a specified file into the file currently being edited. The filename contents are inserted ahead of the line in the file being edited.

**W (Write Lines)** - [n] W - Writes a specified number of lines to disk from the lines being edited in memory. Lines are written beginning with line number 1. Only meaningful if the file you are editing is too large to fit in memory.

## DOS VERSIONS

11-14-87 AT 6:40 a.m.

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| MFG        | VER  | FILE NAME   | SIZE   | DATE     | TIME    |
|------------|------|-------------|--------|----------|---------|
| AT&T       | 2.11 | IBMBIO.COM  | 8,192  | 06-11-84 | 1:09pm  |
| AT&T       | 2.11 | IBMDOS.COM  | 17,176 | 05-16-84 | 11:32am |
| AT&T       | 2.11 | COMMAND.COM | 15,957 | 11-10-83 | 12:03pm |
| AT&T       | 2.11 | ANSI.SYS    | 2,504  | 06-11-84 | 1:05pm  |
| BASIC FOUR | 3.1  | IBMBIO.COM  | 8,268  | 01-08-86 | 1:17am  |
| BASIC FOUR | 3.1  | IBMDOS.COM  | 27,760 | 05-14-85 | 12:02am |
| BASIC FOUR | 3.1  | COMMAND.COM | 23,210 | 05-14-85 | 12:02am |
| BASIC FOUR | 3.1  | ANSI.SYS    | 3,986  | 04-26-85 | 1:16am  |
| COMPAQ     | 2.11 | IBMBIO.COM  | 5,120  | 05-03-84 | 12:pm   |
| COMPAQ     | 2.11 | IBMDOS.COM  | 17,408 | 05-03-84 | 12:pm   |
| COMPAQ     | 2.11 | COMMAND.COM | 18,272 | 05-03-84 | 12:pm   |
| COMPAQ     | 2.11 | ANSI.SYS    | 1,593  | 05-03-84 | 12:pm   |
| COMPAQ     | 2.12 | IBMBIO.COM  | 5,120  | 01-01-80 | 12:pm   |
| COMPAQ     | 2.12 | IBMDOS.COM  | 17,408 | 01-01-80 | 12:pm   |
| COMPAQ     | 2.12 | COMMAND.COM | 18,272 | 12-04-84 | 12:pm   |
| COMPAQ     | 2.12 | ANSI.SYS    | 1,593  | 12-04-84 | 12:pm   |
| COMPAQ     | 3.1  | IBMBIO.COM  | 9,728  | 12-17-85 | 12:pm   |
| COMPAQ     | 3.1  | IBMDOS.COM  | 27,760 | 12-17-85 | 12:pm   |
| COMPAQ     | 3.1  | COMMAND.COM | 23,210 | 12-17-85 | 12:pm   |
| COMPAQ     | 3.1  | ANSI.SYS    | 1,593  | 12-17-85 | 12:pm   |
| IBM        | 1.1  | IBMBIO.COM  | 1,920  | 05-07-82 | 12:pm   |
| IBM        | 1.1  | IBMDOS.COM  | 6,400  | 05-07-82 | 12:pm   |
| IBM        | 1.1  | COMMAND.COM | 4,959  | 05-07-82 | 12:pm   |
| IBM        | 2.0  | IBMBIO.COM  | 4,608  | 03-08-83 | 12:pm   |
| IBM        | 2.0  | IBMDOS.COM  | 17,152 | 03-08-83 | 12:pm   |
| IBM        | 2.0  | COMMAND.COM | 17,664 | 03-08-83 | 12:pm   |
| IBM        | 2.0  | ANSI.SYS    | 1,664  | 03-08-83 | 12:pm   |
| IBM        | 2.1  | IBMBIO.COM  | 4,736  | 10-20-83 | 12:pm   |
| IBM        | 2.1  | IBMDOS.COM  | 17,024 | 10-20-83 | 12:pm   |
| IBM        | 2.1  | COMMAND.COM | 17,792 | 10-20-83 | 12:pm   |
| IBM        | 2.1  | ANSI.SYS    | 1,664  | 10-20-83 | 12:pm   |
| IBM        | 3.0  | IBMBIO.COM  | 8,964  | 07-05-84 | 3:pm    |
| IBM        | 3.0  | IBMDOS.COM  | 27,920 | 07-05-84 | 3:pm    |
| IBM        | 3.0  | COMMAND.COM | 22,042 | 08-14-84 | 8:am    |
| IBM        | 3.0  | ANSI.SYS    | 1,641  | 08-14-84 | 8:am    |
| IBM        | 3.1  | IBMBIO.COM  | 9,564  | 03-07-85 | 1:43pm  |
| IBM        | 3.1  | IBMDOS.COM  | 27,760 | 03-07-85 | 1:43pm  |
| IBM        | 3.1  | COMMAND.COM | 23,210 | 03-07-85 | 1:43pm  |
| IBM        | 3.1  | ANSI.SYS    | 1,651  | 03-07-85 | 1:43pm  |
| IBM        | 3.2  | IBMBIO.COM  | 16'369 | 12-30-85 | 12:pm   |
| IBM        | 3.2  | IBMDOS.COM  | 28,477 | 12-30-85 | 12:pm   |
| IBM        | 3.2  | COMMAND.COM | 23,791 | 12-30-85 | 12:pm   |
| IBM        | 3.2  | ANSI.SYS    | 1,615  | 12-30-85 | 12:pm   |
| IBM        | 3.3  | IBMBIO.COM  | 22100  | 3/18/87  | 12:pm   |
| IBM        | 3.3  | IBMDOS.COM  | 30159  | 3/17/87  | 12:pm   |
| IBM        | 3.3  | COMMAND.COM | 25307  | 3/17/87  | 12:pm   |
| IBM        | 3.3  | ANSI.COM    | 1678   | 3/17/87  | 12:pm   |
| VISUAL     | 2.11 | IBMBIO.COM  | 4,843  | 07-03-84 | 3:00pm  |
| VISUAL     | 2.11 | IBMDOS.COM  | 17,257 | 07-03-84 | 3:00pm  |
| VISUAL     | 2.11 | COMMAND.COM | 18,000 | 07-03-84 | 3:00pm  |
| VISUAL     | 2.11 | ANSI.SYS    | 1,581  | 07-03-84 | 3:00pm  |

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