WANGCO
A UNIT OF
PERKIN ELMER DATA SYSTEMS

MODEL 82 MICROFLOPPY (TM) FLEXIBLE DISC DRIVE

OPERATION AND MAINTENANCE MANUAL

023-0058

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MODEL 82

MICROFLOPPY FLEXIBLE DISC DRIVE

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REVISION LEVEL

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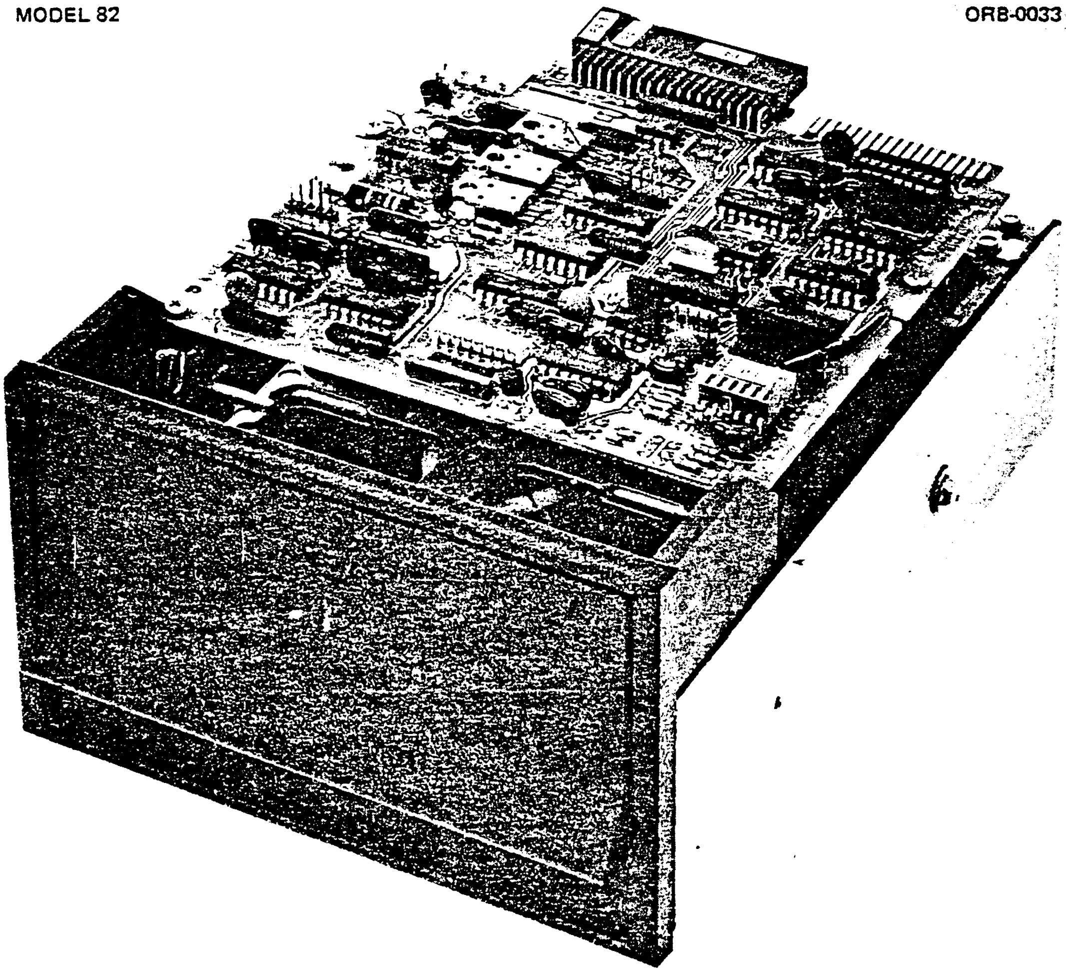
GENERAL DESCRIPTION



Frontispiece - WANGCO Model 82 Microfloppy Flexible Disc Drive

1.1.4 HEAD CHARACTERISTICS

The recording head is a single Read/Write gap-type with trailing tunnel-erase structures to insure interchange capability by enhancing off-track reading capability. The written track is 0.013-inch (0.033 cm) wide and the 40 tracks are centered at 1/48-inch (0.053 cm) intervals. The head carriage is positioned by a lead screw which is driven by a stepper motor.

1.2 SPECIFICATIONS

Specifications for the Model 82 Microfloppy Disc Drive are listed in Table 1-1. Data capacity is listed in Table 1-2.

TABLE 1-1. Model 82 Microfloppy Flexible Disc Drive Specifications (continued)

GENERAL	
Parameter	**Characteristics**
Tracks	35 or 40
Track Density	48 TPI
Physical Sectors	0, 10 or 16 with available hard sector media
Rotational Speed	300 rpm
Access Time	
Track-to-track	30 msec
Average (35 tracks)	370 msec
Settle Time	20 msec
Average Latency	100 msec
Recording Density	1770 BPI
Data Flux Density	5538 fci
Head Load Time	60 msec
Power Up Delay	1 sec
PHYSICAL	
Height	3.25 inches (8.255 cm)
Width	5.75 inches (14.605 cm)
Length	8.00 inches (20.320 cm)
Weight	3.5 pounds (1.60 kg)

TABLE 1-1. Model 82 Microfloppy Flexible Disc Drive Specifications (concluded)

PHYSICAL

Media Requirements	
Type 820	Soft Sector Format
Type 821	10 Physical Sectors
Type 822	16 Physical Sectors
Power	+12 VDC ± 5%, 1.2A
	+5 VDC ± 5%, 0.5A
Typical Power Dissipation	18W Operation
	6W Standby

ENVIRONMENTAL

Parameter	Operating	Shipping
Temperature	4 to 46°C (40 to 115°F)	-40 to 60°C (-40 to 140°F)
Relative Humidity	20 to 80% (noncondensing)	5 to 95% (noncondensing)

TABLE 1-2. Data Capacity Unformatted

	Single Density		Double Density (MFM,M^2FM)	
	Single Side	Double Side	Single Side	Double Side
Track Capacity	3.13K bytes	6.26K bytes	6.26K bytes	12.52K bytes
Disc Capacity 35 tracks	109.375K bytes	218.750K bytes	218.75K bytes	437.50K bytes
40 tracks	125K bytes	250K bytes	250K bytes	500K bytes

SECTION 2

INSTALLATION AND INTERFACE

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INSTALLATION AND INTERFACE

2.1 UNPACKING AND INSPECTION

Use the following procedure during unpacking and inspection:

A. Remove contents of shipping container and inspect for in-transit damage. If damage is evident, notify the carrier and the manufacturer. Specify nature and extent of damage.

B. Verify that contents of shipping container agree with shipping list. Notify a WANGCO representative if anything is missing.

C. Verify that model designation and serial number agree with those on the shipping invoice.

D. Inspect assemblies for loose hardware. Tighten hardware if necessary.

2.2 INSTALLATION

The Model 82 Microfloppy Disc Drive may be mounted in one of the following positions:

A. Horizontally, with printed circuit board facing up.

B. Vertically, on either the right or left side, with the door opening to one side or the other.

C. Vertically, with the door opening upwards. Figure 2-1 is an isometric view, and Figure 2-2 shows the outline and mounting dimensions.

2.3 INTERFACE

Communication between the Model 82 and the Controller is established through an I/O cable. Power is brought to the Model 82 through a separate cable. Provision has been made to terminate the input lines in each unit as-shipped. For a system, only the last drive is terminated; other drives must have their terminations disconnected. Maximum cable length between Controller and last drive should be no greater than 10 feet (3.05 m).

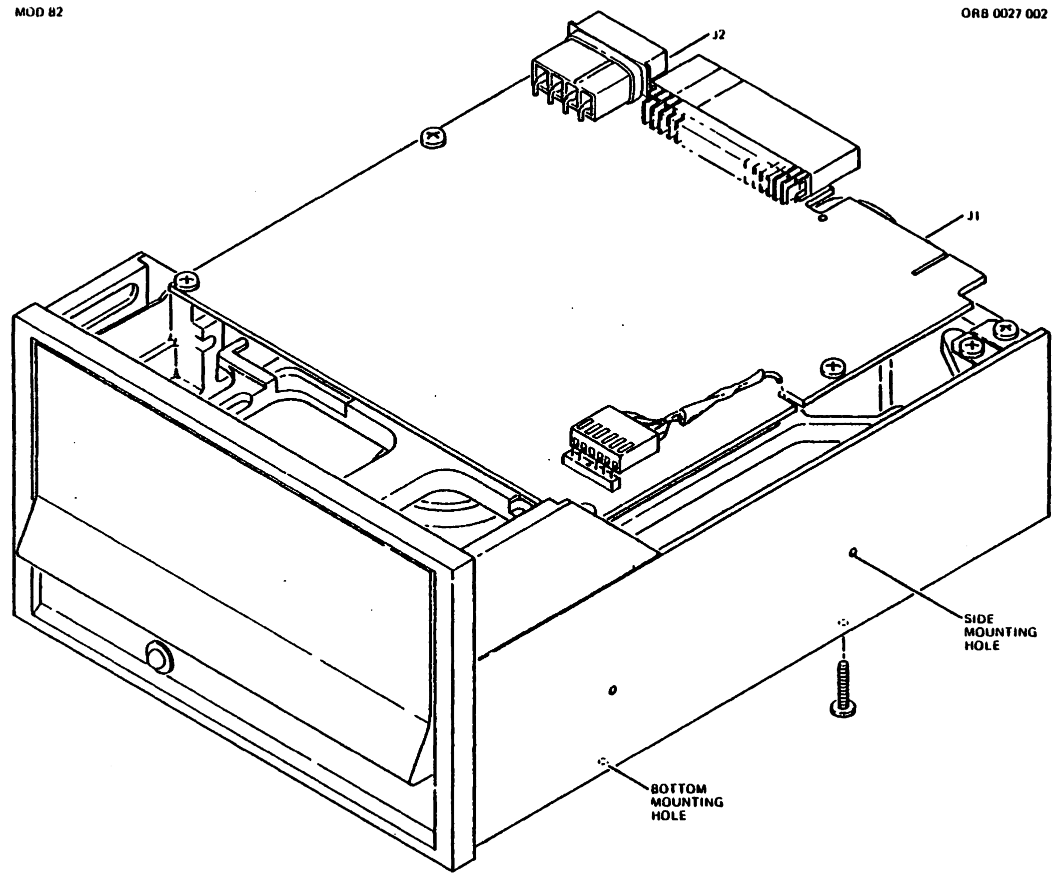


Figure 2-1. Model 82 - Isometric View

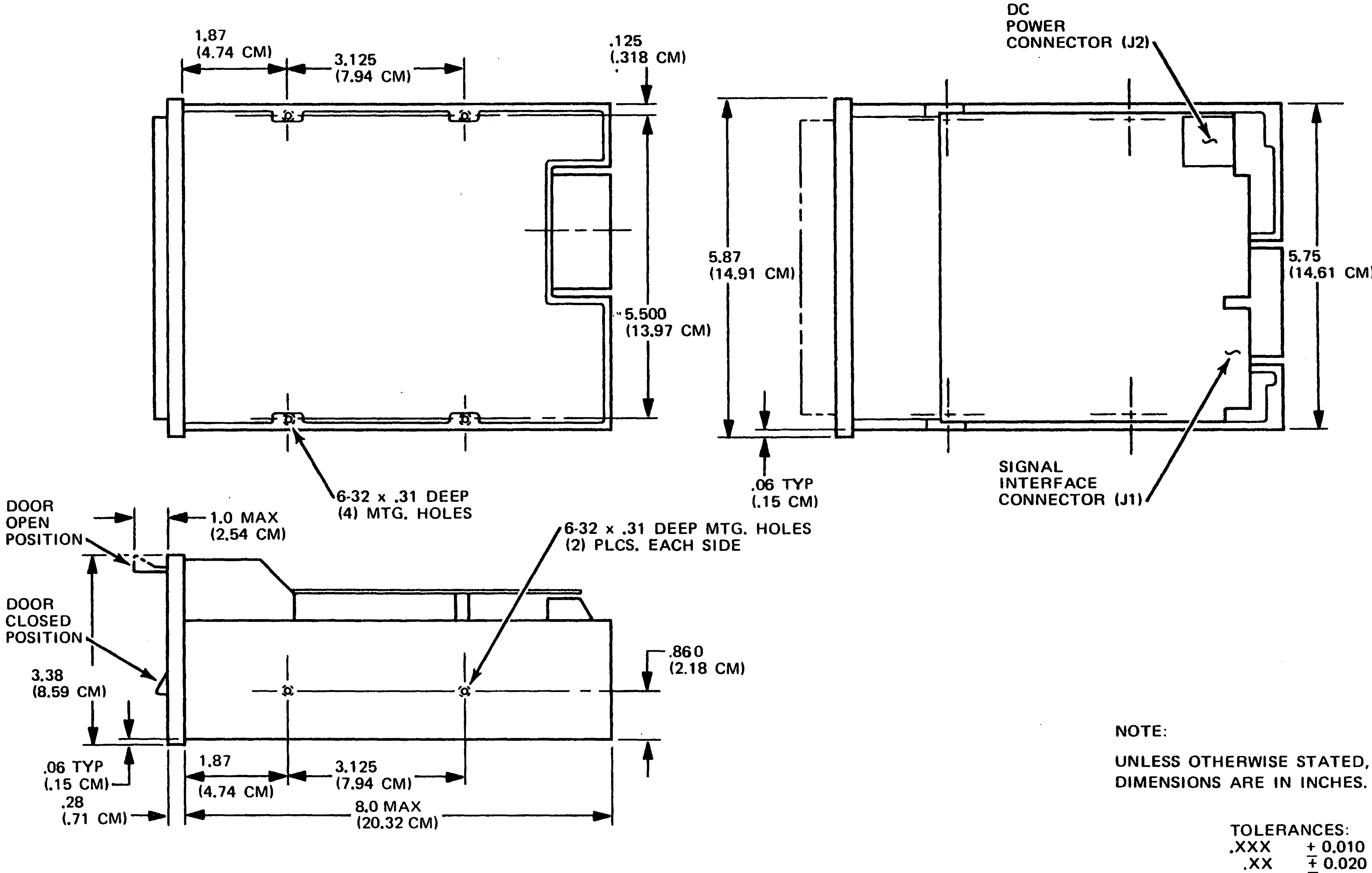


Figure 2-2. Outline and Mounting Dimensions

2.3.1 ELECTRICAL CONNECTORS

The interface between the Model 82 and the Controller consists of two connectors, J1 and J2. J1 provides the signal interface and J2 provides DC power. There is also a frame ground "Fast-on" terminal.

2.3.1.1 Signal Interface Connector. The signal interface (J1) is a 34-pin PWB edge connector with dimensions as shown in Figure 2-3. Even-numbered pins are located on the component side of the PWB; while odd-numbered pins are located on the solder side. Pin 2 is located closest to the corner of the board. A slot is provided between pins 4 and 6 for connector keying. The recommended connectors for P1 are listed in Table 2-1.

Table 2-1. Recommended Connectors - P1

TYPE OF CABLE	MANUFACTURER	CONNECTOR P/N	CONTACT P/N
Twisted Pair, 26	AMP	583717-S	1-583616-1
Flat Cable	3M "Scotchflex"	3463-0001	N.A.

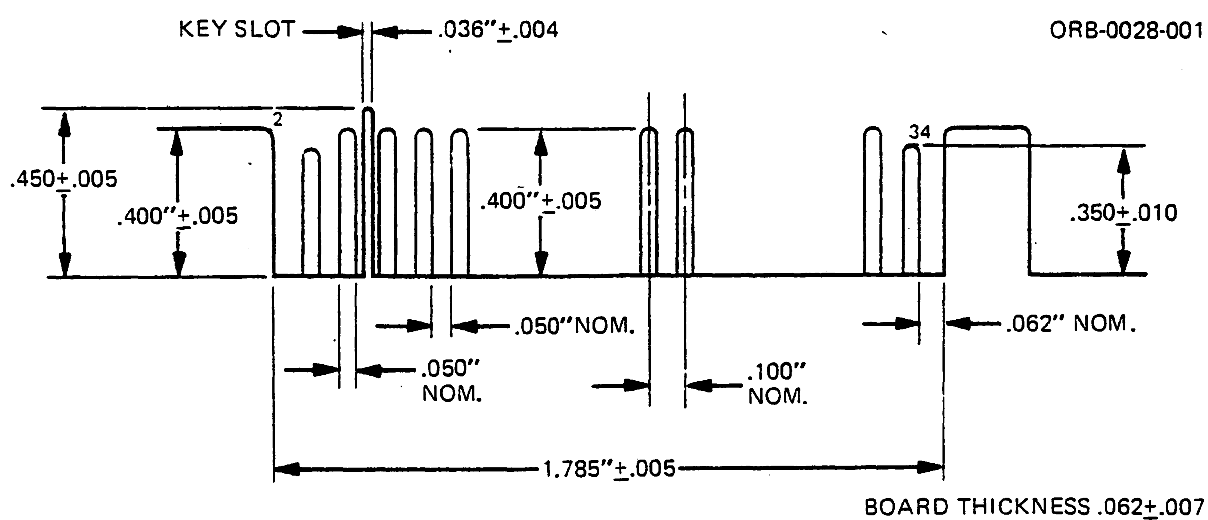


Figure 2-3. Connector Dimensions - J1

2.3.1.2 Power Connector. The DC power connector (J2) is mounted opposite to J1 on the component side of the PWB. Power connector J2 is a 4-pin AMP P/N 1-480426-0. The recommended mating connector P2 is AMP P/N 1-480424-0 utilizing AMP pins P/N 60619-1. The recommended wire size is #18 AWG. Figure 2-4 shows the pin-numbering sequence of J2. The 5-volt and 12-volt power returns are tied together and connected to the chassis at the drive.

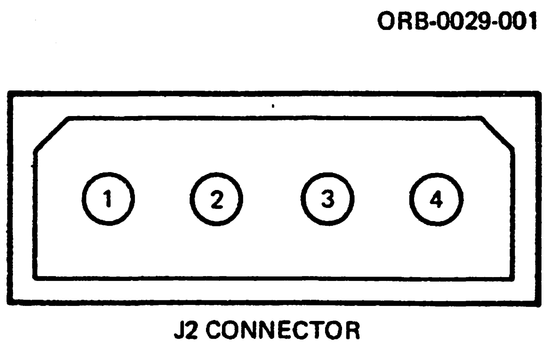


Figure 2-4. Connector Outline - J2

2.3.1.3 Frame Ground. The Model 82 must be grounded to the Controller to insure proper operation and low noise susceptability. The AC ground or neutral wire should be connected to the disc drive frame. A Fast-on tab is provided on the drive. The tab is an E.T.C. P/N 3431, and the mating connector is AMP P/N 60972-1.

2.3.2 SYSTEM CONFIGURATION

The Model 82 can be connected in either single drive or daisy chain configuration. In single drive configuration, each device requires a terminator. A maximum of three Model 82 Disc Drives can be used in a system configuration, using the WANGCO Model 8201 Controller.

Figure 2-5 is a diagram of interface connections between the Model 82 and the Controller.

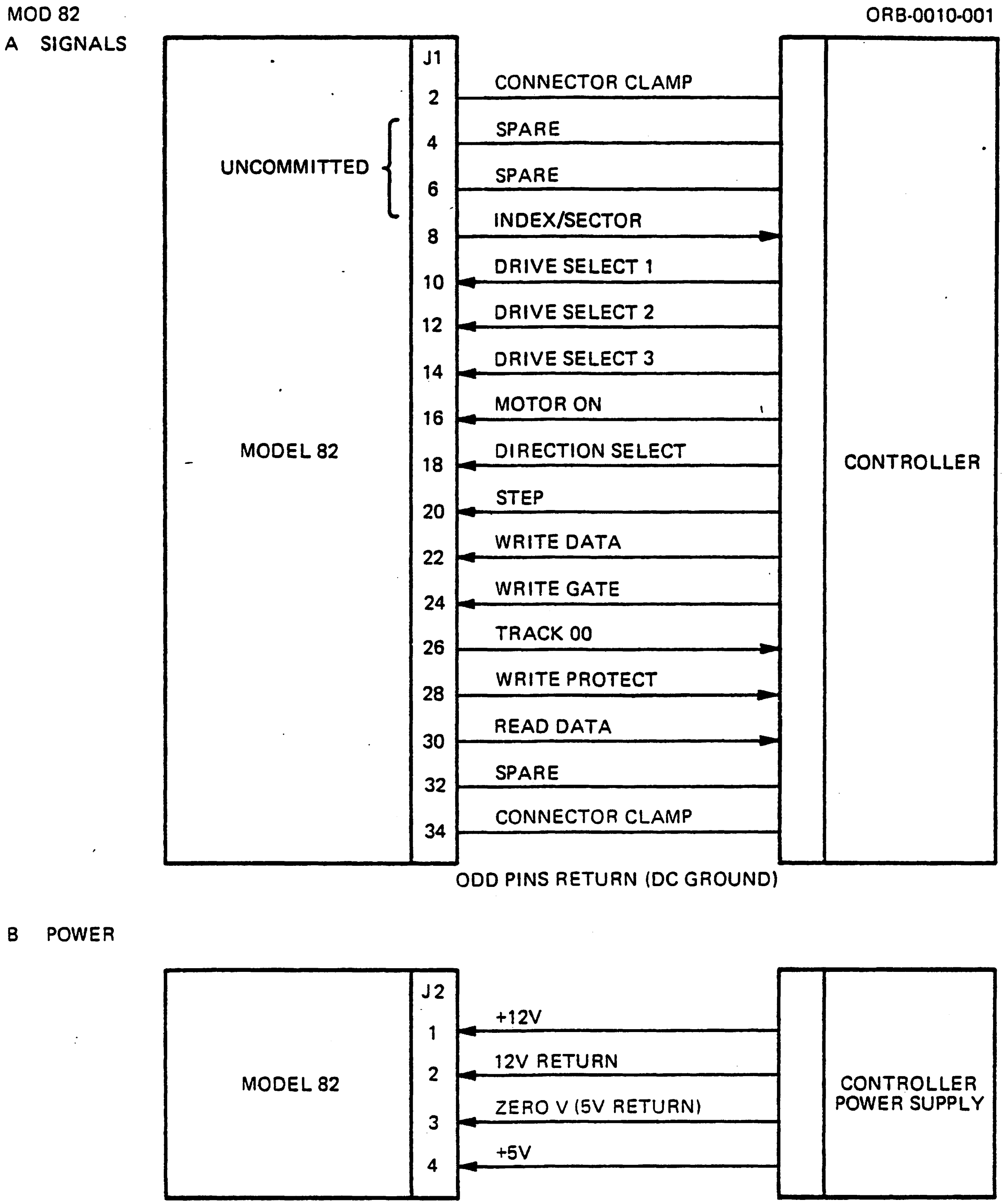


Figure 2-5. Interface Signals - Model 82

2.3.3 TRANSMITTER CHARACTERISTICS

The Model 82 utilizes SN7438 or equivalent to transmit all control and data signals. The SN7438 is capable of sinking 48 mA with a low level of 0.4-V. Output signals must be terminated at the Controller interface.

2.3.4 RECEIVER CHARACTERISTICS

The Model 82 utilizes SN7414 or equivalent to receive all transmitted signals from the Controller. The input of each receiver is terminated by a resistor network.

2.3.5 TERMINATOR NETWORK

Provision has been made on the P/N 650191-001 circut board to terminate all input lines by means of a terminating network installed in a socket at location 1E. Each input line of the network consists of a 220-Ohm resistor to +5V and a 330-Ohm resistor to ground. In a single drive system, this network should be kept in place to provide proper termination. In a multiple drive system, only the last drive on the interface should have the terminating network in place. All other drives in the system must have their terminating networks removed.

On the P/N 620311-003 circuit board, termination is accomplished through the program shunt module located at 1F. In a single drive system, the program shunt is left unaltered. In a multiple drive system, only the last drive has an unaltered program shunt. Other drives in the system must have their terminations disconnected by cutting the appropriate parts of their program shunts.

2.4 INTERFACE SIGNALS

Figure 2-6 is a diagram of Model 82 interface signal timing requirements.

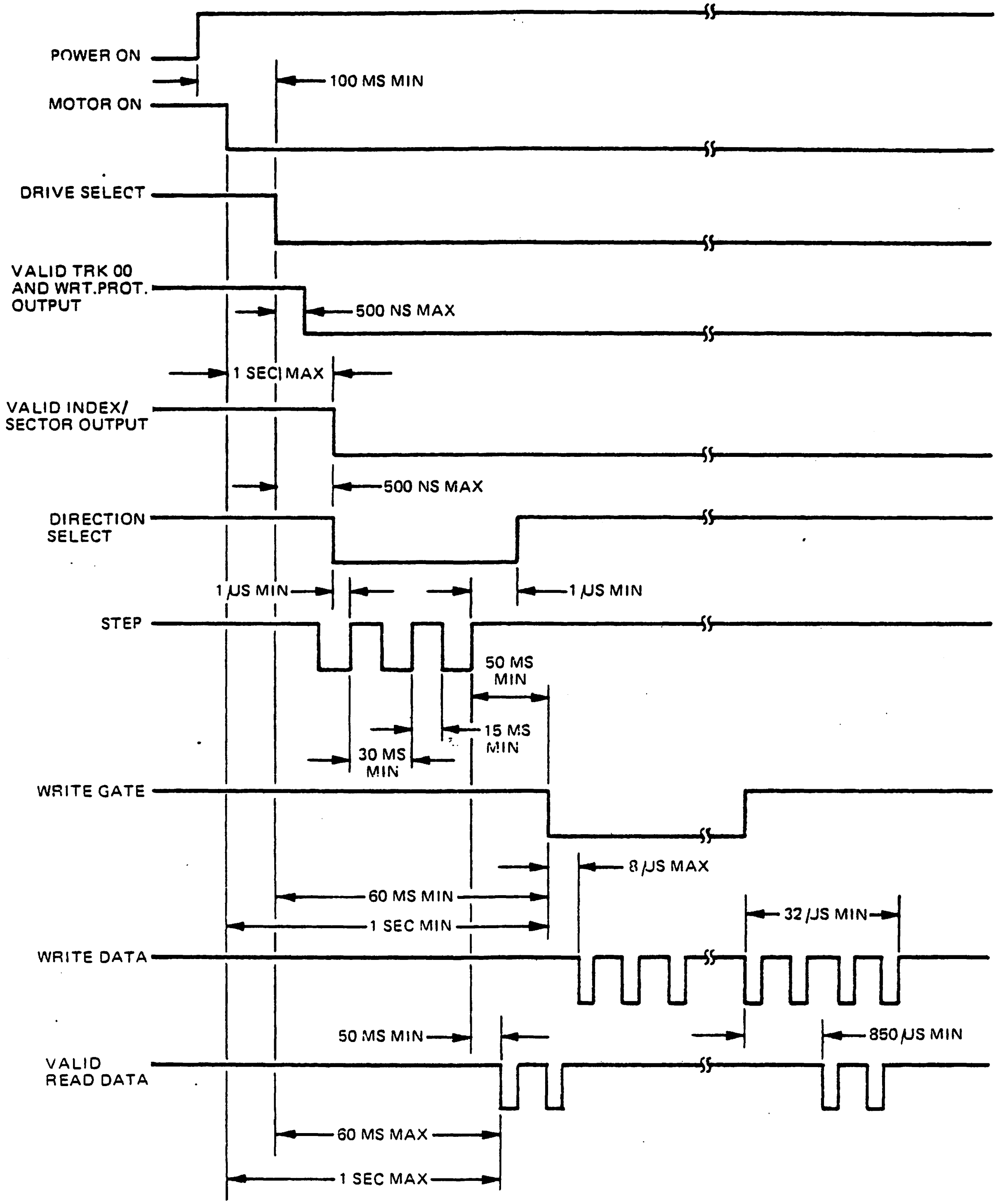


Figure 2-6. Model 82 Interface Timing Requirements

2.4.1 INPUT CONTROL LINES

2.4.1.1 Drive Select (3 lines). One of three lines (DS1, DS2, and DS3), which when true, allows the Controller to communicate with the Model 82. This line must remain true during all communications with the device. All transmitters and receivers are gated with Drive Select; therefore, they can only be activated by a Drive Select command from the Controller. The LED activity light is turned on by the Drive Select signal. In a multiple-drive system, the user must alter the program option module. This change allows the multiplexing of I/O lines.

2.4.1.2 Motor On. This feature is provided for the user to directly control (via the interface) the DC spindle motor. A low true at the interface will turn the spindle motor on. The spindle takes one second after this line is activated to come up to speed before any reading or writing is attempted. If such an option is not desirable, the spindle motor can be kept on by permanently grounding the Motor On line. However, use of this feature is recommended to reduce average power consumption and increase overall life of the drive. If the Motor On signal is used, the program option module should be changed.

2.4.1.3 Direction Select. This line controls the direction of the head motion. A low true on this line causes the head to move toward the center of the spindle only when a step signal also occurs.

2.4.1.4 Step. A pulse on this line, together with Direction Select, initiates a single track move of the heads. Head movement begins on the trailing edge of this pulse. Minimum pulse width should be no less than 1.0 μsec with a maximum step frequency of 33.33 Hz.

2.4.1.5 Write Gate. A low true on this line enables the Write data to be written on the diskette. A high on this line enables the stepper logic and Read data logic.

2.4.2 OUTPUT LINES

2.4.2.1 Track 00. A low true on this line informs the Controller that the position of the Read/Write head is Track 00.

2.4.2.2 Index/Sector. For soft sector operation using a single hole media, this line transmits a reference pulse once every revolution indicating the beginning of a track. For hard sector operation using multi-hole media, this line transmits Index/Sector pulses where Sector pulses indicate the beginning of a sector. Pulse width for both Index and Sector is 4±1.5 milliseconds. Two sets of photosensors are located on Model 82 assembly enabling either side of the diskette to be recorded. Figure 2-7 shows the Index/Sector timing.

2.4.2.3 Write Protect. A photosensor assembly senses the presence of absence of a notch in the diskette. If a notch is not detected, a low true signal is transmitted to the Controller to indicate a Read Only diskette has been inserted into the Model 82.

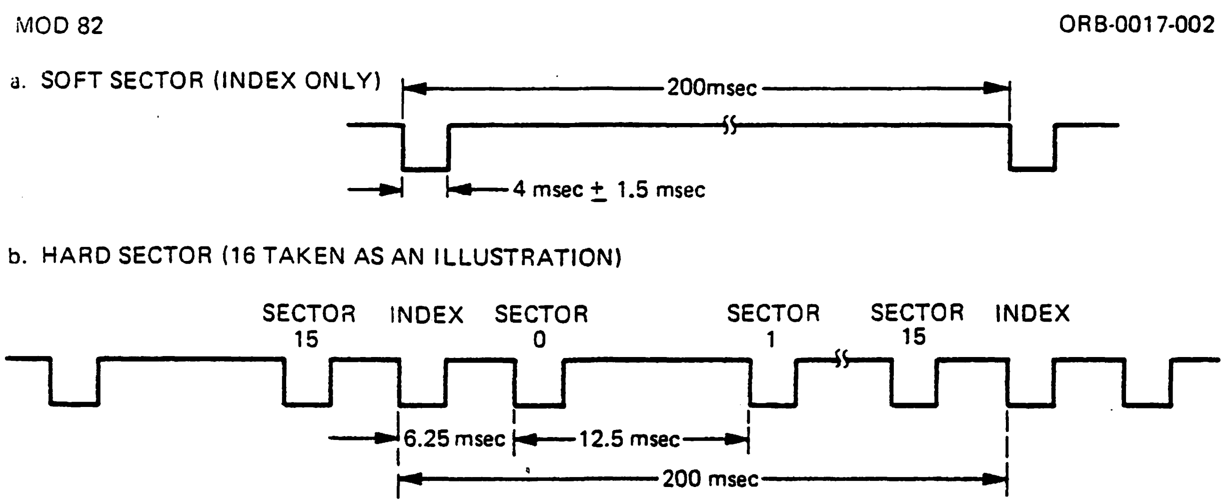


Figure 2-7. Index/Sector Timing

2.4.3 DATA LINES

2.4.3.1 Write Data. On this dedicated line, the Controller transmits information to be encoded on the diskette. Pulse width of Clock and data bits should be a minimum of 250 nanoseconds and a maximum of 2.1 μsec. At 125 kHz. Clock interval will be 8 μsec, while Clock-to-data or data-to-Clock will be 4 μsec. Write Clock frequency should be held within ± 0.5 percent.

2.4.3.2 Read Data. This dedicated line furnishes previously recorded information to the Controller. Information is transmitted in the encoding scheme used without discriminating Clock and data bits. Decoding of data is accomplished by the Controller. Data and Clock pulse widths are 1 μsec ± 250 nanoseconds at the encoded frequency.

2.5 PROGRAM SHUNT MODULE - CIRCUIT BOARD 650191-001

Figure 2-8 shows the program shunt module with the program shunt installed. The module is an IC socket located on the PWB near J1. The IC socket has seven sets of pin receptacles, while the program shunt has six sets of pins. One set of pin receptacles at either end of the IC socket is always unused.

2.5.1 HS - HEAD SELECT OPTION

The Head Select option causes the head of the disc drive to load when the Drive Select signal is received. The program shunt is installed so that the HS position is shorted (ref. figure 2-8B). The HS position can be used in either single drive or multiple drive configuration.

2.5.2 HM - HEAD MOTOR OPTION

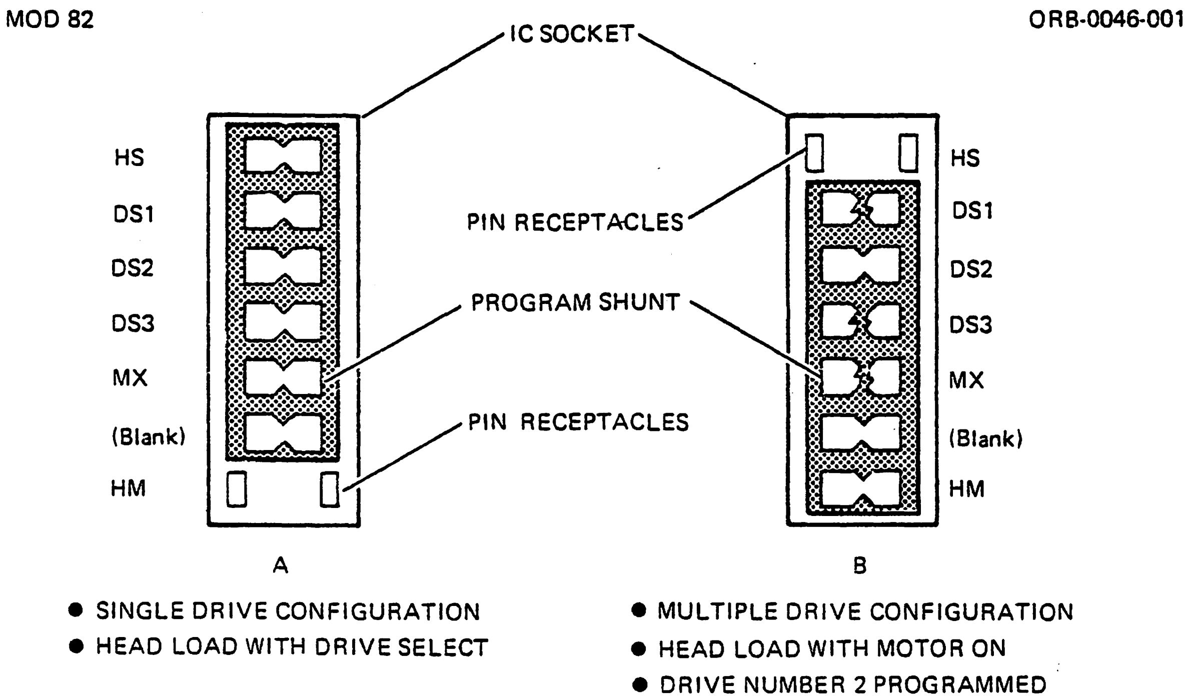
The Head Motor option causes the head of the disc drive to load when the Motor On signal is received. The program shunt is installed so that the HM position is shorted (ref. figure 2-8B). The HM position can be used in either single drive or multiple drive configuration.

2.5.3 SINGLE DRIVE CONFIGURATION

With a single drive configuration, the program shunt need not be altered in any way except to select either the HS or HM positions. Any Drive Select signal will activate the drive.

2.5.4 MULTIPLE DRIVE CONFIGURATION

With a multiple drive system, the MX (Multiplex) position and two of the three DS (Drive Select) positions must be cut (ref. figure 2-8B). The shunt positions can be cut using AMP special tool, P/N 435705.



HS – HEAD SELECT – HEAD IS LOADED BY DRIVE SELECT SIGNAL
DS1 – DRIVE SELECT 1 – SELECT SIGNAL FOR DRIVE ONE.
DS2 – DRIVE SELECT 2 – SELECT SIGNAL FOR DRIVE TWO.
DS3 – DRIVE SELECT 3 – SELECT SIGNAL FOR DRIVE THREE.
MX – MULTIPLEX – MUST BE CUT FOR MULTIPLE DRIVE CONFIGURATION.
HM – HEAD MOTOR – HEAD IS LOADED BY MOTOR ON SIGNAL.

Figure 2-8. Program Shunt Module - Circuit Board 650191-001

2.6 PROGRAM SHUNT MODULE - CIRCUIT BOARD 620311-001

The 620311-001 circuit board has a program shunt module at location 1F. The program shunt can be altered as necessary to allow single drive or multiple drive configurations. All input lines T1 through T5 are terminated through the program shunt to a resistor network. Five input lines with their respective program shunt terminations are listed in Table 2-2.

TABLE 2-2. Program Shunt Terminations

Input	Designator	Socket Pins (1F)
Motor On	T1	4 to 13
Direction Select	T2	5 to 12
Step	T3	6 to 11
Write Data	T4	7 to 10
Write Gate	T5	8 to 9

2.6.1 SINGLE DRIVE CONFIGURATION

With a single drive configuration, the program shunt should not be altered in any way, as shown in Figure 2-9A. All input lines are terminated through the shunt, and any Drive Select signal will activate the drive.

2.6.2 MULTIPLE DRIVE CONFIGURATION

In a multiple drive configuration, the last drive in the daisy chain retains the T1 through T5 shunts; however, the DS1 and DS2 shunts must be cut. Other drives in the system must have all the shunts cut with the exception of the applicable Drive Select line. Figure 2-9B shows the program shunt configuration for the second drive in a three drive system. The shunt positions can be cut using AMP special tool P/N 435705. In addition, the MUX (Multiplex) etched line on the circuit board must be cut on all drives in the multiple system.

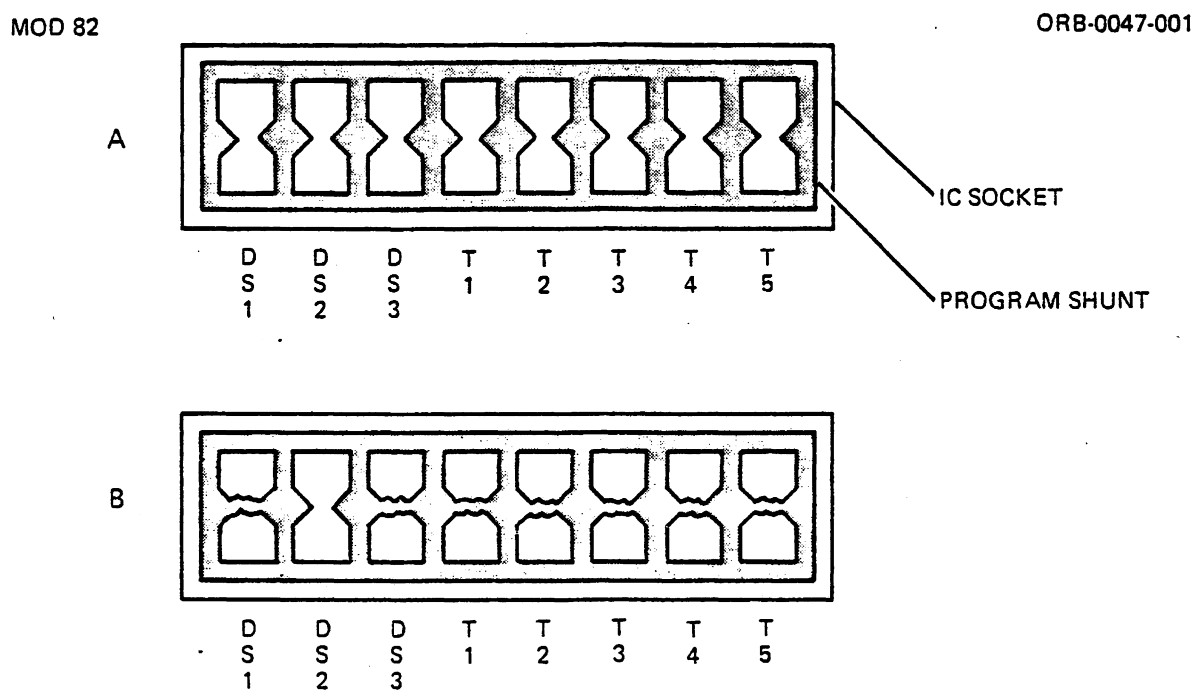


Figure 2-9. Program Shunt Module - Circuit Board 620311-001

2.7 HEAD LOAD WITH MOTOR ON OPTION

With the 620311-001 circuit board, the head is normally loaded when the Drive Select signal is received. As an option, the head may be loaded with the Motor On signal. This option is accomplished by connecting a wire from pad M to pad F, and cutting the etched line between pad J and pad K.

2.8 STEPPER POWER OPTION

The stepper power option reduces the total power consumption of the drive by reducing the power to the stepper motor while maintaining the position of the head on a track. This option is accomplished by connecting an input Stepper Power line to spare input line J1-4, and connecting a wire between pad H and pad S/P. The etched line between pad S/P and ground must be cut.

2.9 DRIVE Ø OPTION

A fourth drive may be added to a MOD 82 system by connecting a Drive Select Ø (DSØ) input line to spare input line J1-6, and connecting a wire between pad E and pad D.

SECTION 3

OPERATION PROCEDURES

SECTION 3

OPERATION PROCEDURES

3.1 GENERAL

There are no front panel controls on the Model 82. A single front panel indicator lamp illuminates when the Model 82 is selected. All power and control functions are handled through the interface. Operating procedures consist primarily of loading and unloading the microdiskette. Adjustments and corrective maintenance procedures are covered in the Maintenance section.

3.2 MICRODISKETTE

The diskette recording media is contained in a sealed envelope measuring 5.25 inches (13.34 cm) square. The disc media is 5 1/8 inches (13.02 cm) in diameter and is made of mylar coated with magnetic oxide on both sides. The diskette has 40 circular tracks spaced 0.02083-inch (0.5283mm) apart.

3.3 MICRODISKETTE HANDLING

Protection of the diskette requires the same careful handling specified for computer magnetic tapes.
These procedures are as follows:

A. Return the diskette to its storage envelope whenever it is removed from the disc drive.
B. Keep diskettes away from magnetic fields and ferromagnetic materials.
C. Replace storage envelopes when they become worn, cracked, or distorted.
D. Do not write on the plastic jacket with a lead pencil or ball-point pen. Use a felt tip pen.

E. Do not touch or try to clean the disc surface. Abrasions may cause loss of data.

F. Do not expose diskette to heat or sunlight.

3.4 LOADING THE MICRODISKETTE

To load the diskette, open the door on the front panel of the Model 82 Microfloppy, insert the diskette, and close the door. A door interlock mechanism prevents the door from closing if the diskette is not fully inserted. The door may be closed when no diskette is present.

3.5 WRITE PROTECT FEATURE

The diskette is protected from writing when a Write Protect tab is used. Figure 3-1 shows an unprotected and a Write-protected (Read-only) diskette. A photoelectric sensor detects the presence or absence of a slot or notch in the diskette. When the notch is open, writing is allowed. When the notch is covered with a tab, writing is inhibited, and an interface line informs the Controller that a Write Protect condition exists.

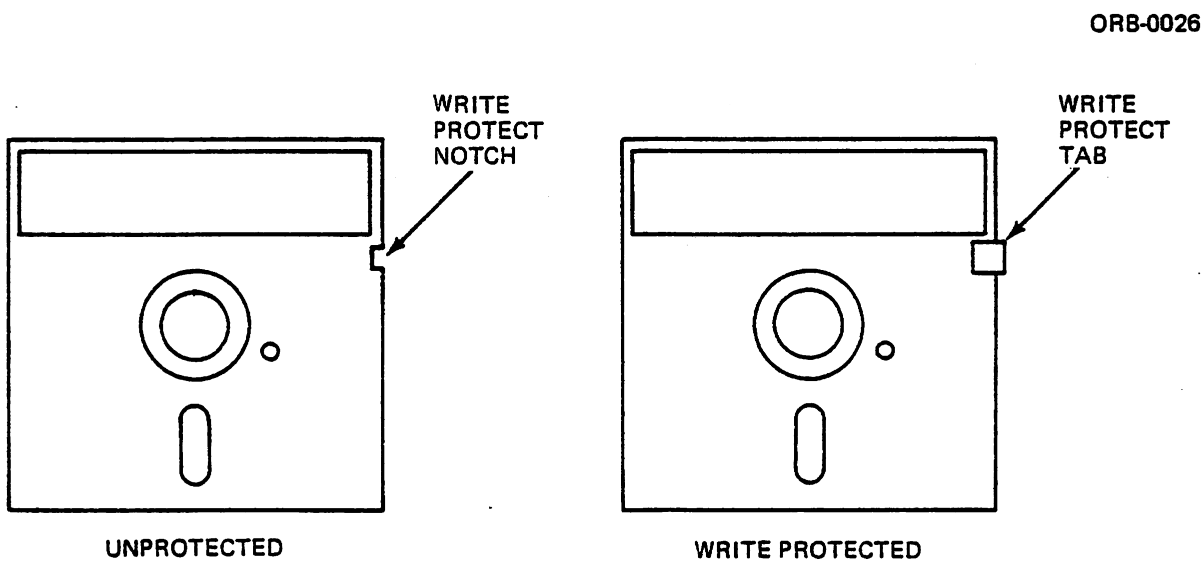


Figure 3-1. Write Protect Feature

SECTION 4

THEORY OF OPERATION

SECTION 4

THEORY OF OPERATION

4.1 FUNCTIONAL DESCRIPTION

Figure 4-1 is a functional block diagram which shows the overall operation of the Model 82 Microfloppy flexible Disc Drive. The Drive has one PWB which contains Read, Write, and Control logic. Power consists of +12 V. and +5 V. which are brought in from the interface.

4.1.1 DRIVE SELECT

A low true level on the appropriate Drive Select line activates the Drive by enabling the Read and Write circuits. The Drive Select signal also energizes the LED activity light. In single drive configurations, the Drive Select circuit is grounded; therefore, it is active at all times.

4.1.2 DRIVE MOTOR

A low true level on the Motor On Line results in application of 12 V. to the Drive Motor. The Drive Motor stabilizes in approximately one second and rotates the spindle hub at 300 rpm by means of a belt. A tachometer in the Drive Motor assembly feeds back a signal to the Drive Motor control circuits which act to keep the Diskette at 300 rpm.

4.1.3 HEAD LOAD LINE

The Head Load signal is applied through control logic to the head load solenoid. The solenoid allows the Diskette envelope with its rotating media to be pushed against the Read/Write head so that contact is made through the slot in the envelope. The Head Load Line is optional.

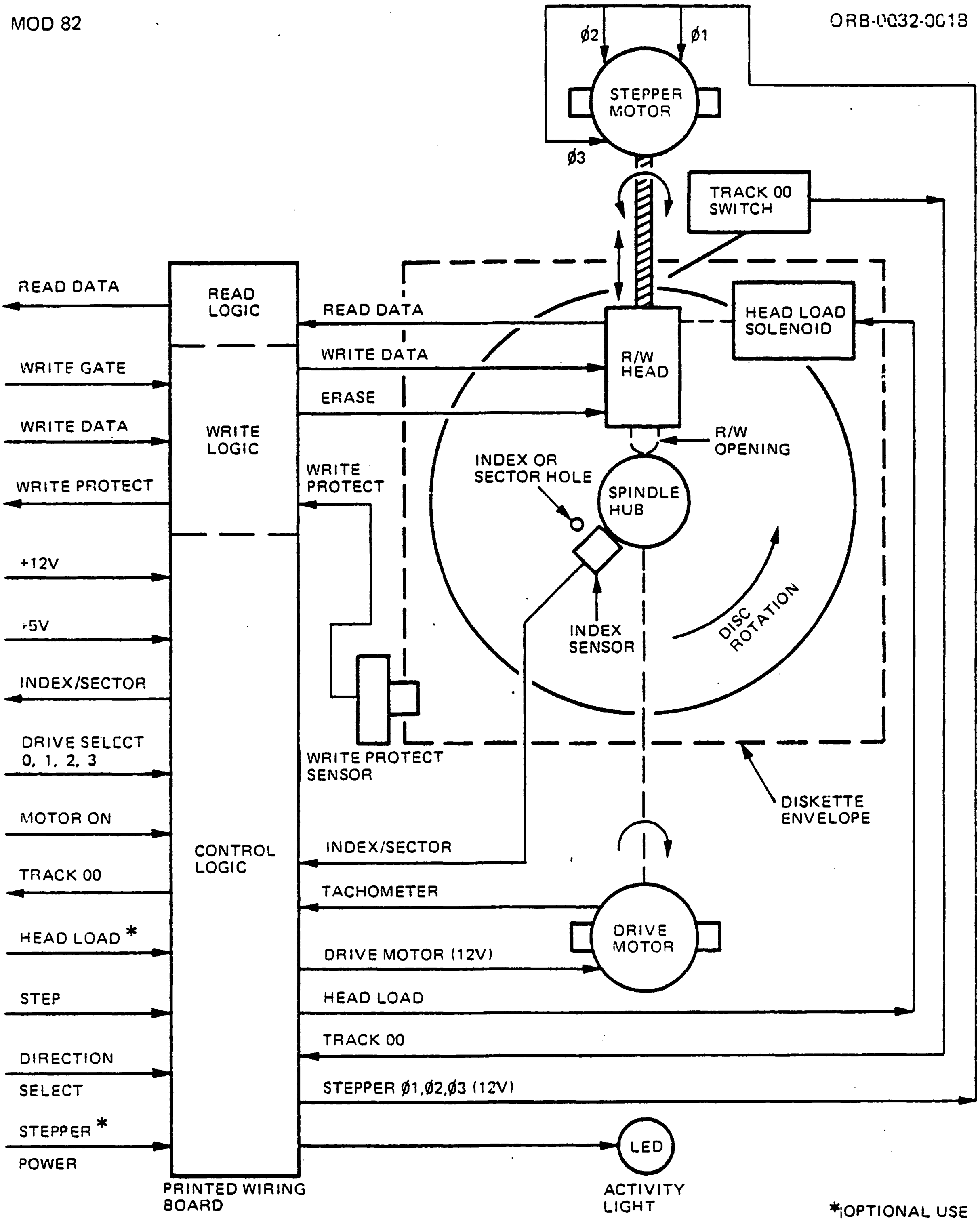


Figure 4-1. Functional Block Diagram

Without use of this option, the head is loaded when either the Drive Select or Motor On signals are activated.

4.1.4 READ/WRITE HEAD

The Read/Write head carriage is mounted on a threaded shaft connected to the stepper motor. As the stepper motor turns in one direction, the head is stepped outward toward the edge of the Diskette. When the motor turns in the other direction, the head is stepped inward toward the spindle hub thus allowing access to any track on the Diskette.

4.1.5 TRACK ACCESSING

Direction Select from the interface or Controller determines the direction of rotation of the stepper motor, while the number of Step pulses determines the amount of rotation. The control logic translates these input pulses into a sequential pattern of phase currents to the stepper motor. Each pulse on the Step line causes the Read/Write head to move one track in or out, depending on the state of the Direction Select line. Multiple track accessing is accomplished by repeated pulsing of the Step line until the desired track has been reached.

4.1.6 SENSORS AND SWITCHES

The index sensor is a light-sensitive device which is activated whenever an index or sector hole passes it in rotation. The sensor output is a pulse which is fed back to the interface as the Index/Sector signal. Track 00 is generated when the Read/Write head carriage trips a microswitch as it reaches Track 00 on the Diskette. The Track 00 signal is then transmitted back to the interface. The Write Protect sensor detects the presence or absence of a slot in the Diskette envelope. If a tab is covering the slot (indicating a Read-Only Diskette), a Write Protect signal is sent back to the interface. The Write Protect signal also disables the Write logic so that no writing is possible on the Diskette.

4.1.7 WRITING

The Read/Write head is a ring with a small gap and coils wound around a portion of the ring. When current flows through the coils, a flux is induced at the gap. As the Diskette surface passes by the gap, the flux magnetizes the surface in a longitudinal direction. When the current in the coils reverses direction, the flux is reversed causing the Diskette surface to be magnetized in the reverse direction. The flux reversals in the Diskette surface constitute the written data on one portion of the track. Writing is accomplished by applying a Write Gate from the interface followed by Write Data pulses which are transferred to the Diskette as flux reversals.

4.1.8 ERASING

The Erase circuitry is also enabled by the Write Gate, and the Erase currents are applied to the Read/Write head erase coils when writing. The erase poles erase an area just to each side of a track to assure off-track reading ability, thereby providing worst-case capability.

4.1.9 READING

Reading is the opposite of writing. As a recorded Diskette track passes under the Read/Write head, small currents are induced in the Read/Write coils by the flux reversals in the Diskette surface. The coil currents are sensed, amplified, and shaped by the Read logic then transferred to the interface as Read data.

4.2 DRIVE MOTOR CONTROL

The drive motor is a DC motor with an integral tachometer and is activated by a separate Motor On interface line. The drive motor requires approximately one second to come up to speed and stabilize. Application of the Motor On signal causes a current driver to turn on, thus applying current to the motor windings through J4-40.

An output voltage signal from the tachometer is compared to a reference voltage level and applied to the motor control circuit which increases or decreases the motor winding current as required.

Motor speed adjustment is accomplished by varying potentiometer R21 which changes the tachometer voltage reference level. R21 is set to maintain the motor speed at a level resulting in Diskette rotational speed of 300 rpm.

4.3 POSITIONING CHARACTERISTICS

A. Time for a single track move is 30 msec. This is defined as the time to move the Read/Write head between any pair of adjacent tracks.

B. The random average positioning time is 370 msec and is defined as the sum of all the moves divided by all possible moves.

C. The time to move the Read/Write head 39 tracks is 1170 msec. It is defined as the time to move the head from track 0 to track 39, or from track 39 to track 0.

D. Head load time is 60 msec and is defined as the time required for the head load arm to contact the Diskette and settle down before a Read/Write operation commences.

E. Head settling time is 20 msec. This is the time required for the head assembly to cease oscillating after the head has achieved nominal track location following a move.

4.4 DATA FORMAT

To perform data transfer, the operating system must be able to locate specific data areas on the disc. Two such format schemes exist; both involve detecting and establishing a reference point on the disc to organize data on a track and further divide this track into smaller segments called sectors. Such a subdivision can be achieved by either hard or soft sector schemes. All drive tolerances have been taken into account in developing the formats.

4.4.1 HARD SECTOR FORMAT

The Controller may record from 10 or 16 sectors (records) per track. Each track is started by a physical index pulse, and each sector is started by a physical sector pulse which is present on J1-8. Figure 4-2 shows a hard-sectored format. The number of sectors is determined by the number of sector holes in the diskette.

4.4.2 SOFT SECTOR FORMAT

The Controller may record one long record or several small records in this type of format. The index pulse starts each track, and a unique record identifier precedes each record. Figure 4-3 shows a soft-sectored format.

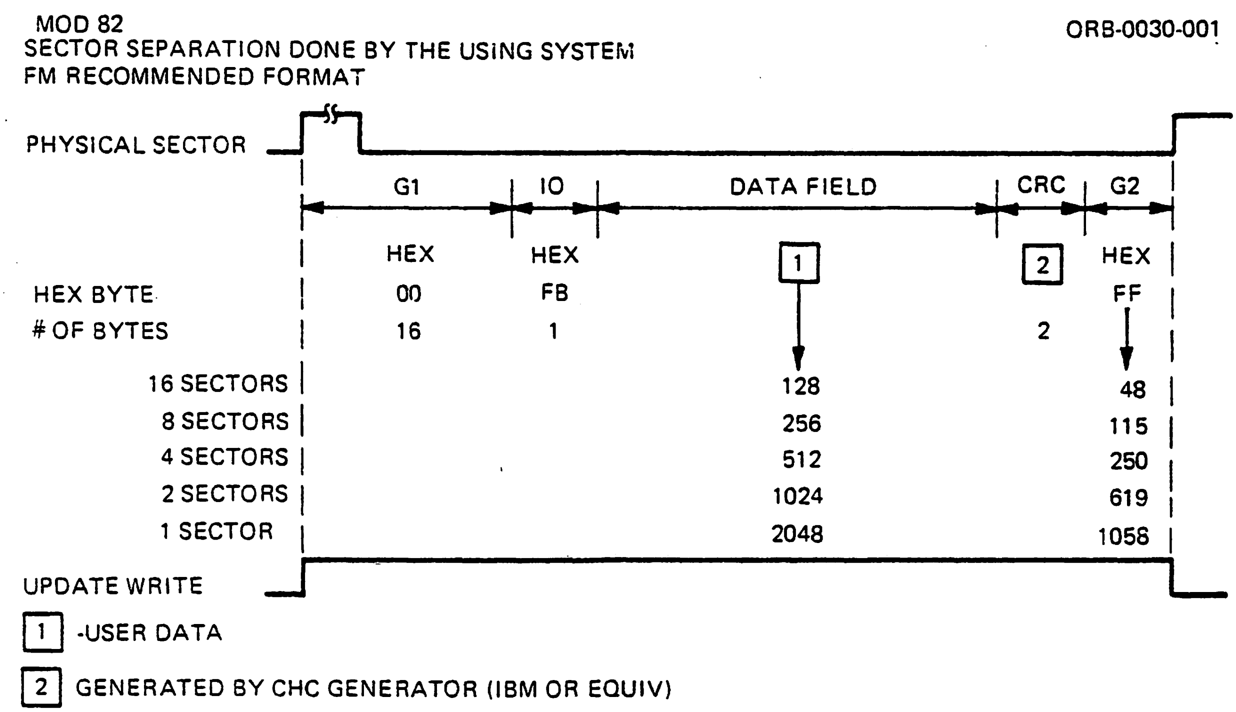


Figure 4-2. Hard-sectored Format

PHYSICAL INDEX

		REPEATED FOR EACH RECORD											
		ID FIELD					DATA FIELD						
	G1	SYNC	AM	ID	CRC	G2	SYNC	AM	DATA	CRC	WG OFF	G3	G4A
HEXBYTE	FF	00	FE	[1]	[2]	FF	00	[3]	[4]	[2]	FF	FF	FF
# OF BINARY BYTES	16	4	1	2	2	6	4	1		2	1		
[5] 18 REC									128			16	103
17 REC									140			14	100
16 REC									150			15	101
15 REC									162			15	109
14 REC									176			16	99
13 REC									191			18	93
12 REC									209			19	97
11 REC									231			20	95
[5] 10 REC									256			22	99
9 REC									288			25	85
8 REC									327			27	93
7 REC									378			31	85
6 REC									446			36	79
[5] 5 REC									512			72	74
4 REC									685			54	61
3 REC									927			71	46
[5] 2 REC									1024			503	9
[5] 1 REC									2048			0	115

UPDATE WRITE

NOTES:

[1] TRACK ADDR AND SECTOR ADDR
[2] GENERATED BY CRC GENERATOR (IBM OR EQIV)
[3] FB FOR DATA FIELD OR FB FOR DELTED DATA FIELD
[4] USER DATA
[5] EVEN BINARY RECORD LENGTHS

Figure 4-3. Soft-sectored Format

SECTION 5

MAINTENANCE

SECTION 5

MAINTENANCE

5.1 RELIABILITY

To establish mean time between failures, mean time to repair, and service life, operation time must be greater than 10,000 hours, and field performance data from all field sites shall be used in the calculation.

5.1.1 MEAN TIME BETWEEN FAILURES (MTBF)

The following expression defines MTBF:

$$\text{MTBF} = \frac{\text{Operating Hours}}{\text{Number of Failures}}$$

Operating hours means power-on hours minus any maintenance times. MTBF design goal for the Model 82 is 8500 hours.

5.1.2 MEAN TIME TO REPAIR (MTTR)

This is defined as the average time for an adequately trained service engineer to diagnose and correct problems on-site. MTTR for the Model 82 is 30 minutes and does not include travel time or time when the unit is not released to the service engineer.

5.1.3 SERVICE LIFE

The Model 82 is designed and constructed for a useful life of five years.

5.2 DIAGNOSTIC TECHNIQUES

Incorrect operating procedures, faulty programming, damaged Diskettes, and soft errors created by airborne contaminants, random electrical noise, and other external cuases, can produce errors falsely attributed to drive failure or maladjustment. Unless visual inspection of the drive discloses an obvious misalignment or broken part, attempt to repeat the fault with the original Diskette; then, attempt to duplicate fault on second Diskette.

5.3 ERROR RATES

5.3.1 WRITE ERRORS

For a successful Write, the operation should always be followed by a Write Check or Read during the next revolution. It is recommended that no more than five such Write and verifications be attempted. In the event a record cannot be successfully written within five attempts, that sector or track must be labeled defective, and an alternate track must be assigned. If more than two defective tracks are encountered, the Diskette should be replaced.

5.3.2 READ ERRORS

In the event of a Read error, up to ten attempts should be made to recover data. Repositioning the head on the desired track is recommended if the error persists. The Read recoverable error is no greater than 1 in 10^9 bits transferred. The Read unrecoverable error is no greater than 1 in 10^{12} bits transferred.

5.3.3 SEEK ERRORS

Unless the stepping rate is exceeded, Seek errors will rarely occur. Recalibration of track location can be achieved by initiating Step Out commands until track '00' is sensed. The Seek errors shall be no greater than 1 in 10^6 Seeks.

5.4 ERROR DETECTION AND CORRECTION

5.4.1 WRITE ERRORS

If an error occurs during a Write operation, it will be detected on the next revolution by doing a Read operation commonly called a "Write Check." To correct the error, another Write and Write Check operation must be done. If the Write operation is not successful after five attempts, error correction should be attempted on another track. If the error still persists, the Diskette should be considered defective and be discarded or re-initialized.

5.4.2 READ ERRORS

Most errors that occur will be "soft" errors; that is, by performing an error recovery procedure, the data will be recovered.

Soft errors are usually caused by:

A. Airborne contaminants that pass between the Read/Write head and the disk. These contaminants will generally be removed by the cartridge self-cleaning wiper.

B. Random electrical noise which usually lasts for a few microseconds.

C. Small defects in the written data and/or track not detected during the Write operation which may cause a soft error during a Read.

5.4.3 ERROR RECOVERY PROCEDURE

The following procedures are recommended to recover from the described soft errors:

A. Reread the track five times or until such time as the data is recovered.

B. If data is not recovered after using Step A, access the head to the adjacent track in the same direction previously moved, then return to the desired track.

C. Repeat Step A.

D. If data is not recovered, the error is not recoverable.

5.5 MAINTENANCE FEATURES

5.5.1 ALIGNMENT DISKETTE

The Alignment Diskette (P/N 620340-001) is used for alignment of the Model 82 Microfloppy. The following adjustments and checks can be made using the Alignment Diskette.

A. Read/Write head radial adjustment using tracks 16 and 17.

B. Index photo detector alignment using track 01 on both sides and track 39 on side Ø.

C. Track 00 is recorded with a 125 kHz signal (2F). This track is used to determine if the head is positioned over track Zero when the Track Zero indication is true.

D. Track 34 has 125 kHz and 62.5 kHz signals (2F and IF recorded on it. and is used to determine if the head is positioned over track 34 and to check Read/Write head resolution. Caution should be exercised in order to preserve precorded alignment tracks. These tracks are 00, 01, 16, 17, 34, and 39. The write protect tab should always be installed on the Alignment Diskette to prevent accidental writing upon it.

5.5.2 TESTER

The tester is a Model 63 A tester with a cable set. The tester PWB can be used in a stand-alone mode, built into a test station, or used in a tester for product support. The tester enables the user to make all adjustments and tests required on the Model 82 Microfloppy. The tester has intelligent data handling capabilities and can write a 2F, 125 kHz signal which is the recording frequency used for amplitude check in the Model 82. The tester can also start and stop the drive motor, and enable Read to allow checking for proper readback signals.

5.5.3 SPECIAL TOOLS

The following special tools are available for maintenance on the Model 82:

A.	Alignment Diskette	P/N 620340-001
B.	Model 63A Tester	P/N 620291-001

5.6 MAINTENANCE

In the following paragraphs, test points etc., in parentheses refer to PWB 620311-003. Test points not in parentheses refer to PWB 650191-001.

5.7 REMOVAL AND ADJUSTMENT PROCEDURES

Refer to the Illustrated Parts Breakdown in Appendix D.

5.7.1 FRONT BEZEL: REMOVAL AND INSTALLATION

A. Open the door.

B. Carefully push the two plastic studs on the front bezel forward through the two retainers from the bottom of the drive

C. Dislodge the two clips on the top of the bezel from the diskette guides and remove the bezel with a forward motion.

D. The bezel may be replaced by simply pushing it back on to the unit. Use care to guide it on squarely.

5.7.2 DRIVE MOTOR ASSEMBLY: REMOVAL AND INSTALLATION

A. Remove drive belt (remove from large pulley first).

B. Disconnect connector P4-3 from the main PWB.

C. Remove head cable connector. Remove four screws and remove PWB.

D. Remove the drive motor as an assembly by removing the mounting screws.

E. To reinstall, reverse the above procedure.

F. Adjust motor speed as per paragraph 5.8.

5.7.3 STEPPER MOTOR AND LEAD SCREW

A. Remove connectors P4-2 from connector J4 on the PWB.

B. Remove the head cable connector P3.

C. Remove the four screws which connect the PWB to the unit, turn the unit on its side, and carefully fold the PWB back out of the way (about 120 deg.).

D. Loosen the two screws which hold the stepper motor clamps. Turn the clamp 90 deg., away from the groove in the Stepper Motor housing.

E. Note the clearance between the front bearing housing of the head carriage and the spring-loaded antibacklash nut (approx. 0.12-inch). Remove the stepper motor/lead screw assembly out through the back by gently turning the lead screw in a CCW motion as viewed from the back of the motor.

F. To install a new unit reverse the above procedure. When replacing the antibacklash nut, insure that it is positioned with the 0.12-inch clearance.

5.7.4 HEAD AND CARRIAGE ASSEMBLY

A. Remove the stepper motor/lead screw assembly in accordance with paragraph 5.7.3.

B. Pivot the carriage away from the lead screw and off the guide rod. Carefully remove the head cable.

C. To reinstall, reverse the above procedure. Be careful to insure that there is enough slack after installing the head cable to allow the carriage to go to track Zero, and that the cable is routed so that it will not rub against any other parts.

D. Readjust the carriage stop if a new carriage is installed in accordance with paragraph 5.11.

E. Align the head to the correct track position using the alignment diskette. See paragraph 5.13.

5.7.4.1 Read/Write Head Load Button: Removal and Installation

A. Remove drive PWB.
B. To remove the old button, hold the load arm out away from head, squeeze the locking tabs together with a pair of needle nose pliers and press forward.
C. To install load button, press the button into the arm, from the head side, and it will snap into place. Reference the IPB.
D. Adjust according to section 5.9.

5.7.5 SPINDLE HUB AND PULLEY/ASSEMBLY

These assemblies are not field replaceable.

5.7.6 CLUTCH ASSEMBLY REPLACEMENT

A. Remove the drive PWB.
B. Remove the E-ring from the clutch shaft on the carrier. The entire assembly can now be removed from the carrier frame. Care should be taken not to overstress the carrier frame mounting pivot springs.
C. To reinstall: Place the clutch assembly and spring in place on the spindle hub.
D. Press the carrier frame slowly down towards the spindle until the clutch shaft protrudes through its mounting hole in the carrier frame. This is accomplished by slowly closing the door.
E. Install the E-ring onto the shaft. Readjustment is not necessary.

5.7.7 CARRIER FRAME ASSEMBLY REMOVAL

Removal of this assembly is not normally required or recommended. The only time removal would be required in the field is to replace the entire assembly.

A. Remove the drive PWB.

B. Remove the harness wires, noting color coding.

C. Remove the two mounting screws that hold the pivot springs to the main frame casting.

D. The frame assembly can now be lifted clear of the casting.

5.7.7.1 Carrier Frame Assembly Installation and Adjustment

A. Put the carrier frame onto drive and lightly tighten mounting screws removed in Step C of Removal Procedures.

B. Latch the carrier frame closed by closing the door.

C Position the carrier frame until the clutch shaft is centered in its mounting hole in the frame. Now tighten the mounting screws for the carrier frame pivot springs.

D. Check that the door assembly does not bind in the front bezel. If binding occurs, loosen the carrier frame mounting screws and reposition until it is free of binds.

E. Reinstall the drive PWB and cable harness.

F. Check and readjust the index timing. Refer to section 5.12.

5.7.8 WRITE PROTECT SENSOR REMOVAL

The write protect sensors are integral to the diskette guide assemblies. The sensors are electro-optical devices and do not normally require replacement. The procedure below outlines the replacement procedure.

A. Remove the PWB.

B. Note the color coding of the wiring harness leading to the top and bottom optical devices and disconnect them.

C. Remove the front bezel (see Section 5.7.1).

D. Remove the Carrier Frame Assembly (see Section 5.7.7).

E. Remove the two screws which attach the diskette guide to the main frame and remove the guide.

F. To reinstall the guide, reverse the above procedure. An alignment tool, part number 650160-T115 must be used to position the diskette guide as it is being attached to the main frame casting.

5.7.9 INDEX SENSOR ASSEMBLY REMOVAL

A. Remove drive PWB.

B. Note color coding of harness to the sensor to be replaced and disconnect the two pins from the sensor assembly.

C. Remove the screw and washer which hold the sensor block to the main frame. The sensor may now be removed from the top.

D. The new sensor assembly is installed by reversing the procedure. Insure that the sensor block mounting surface is smooth and that it is installed correctly.

E. The index timing must be set using the procedure in Section 5.12.

5.7.10 INDEX LED REMOVAL

A. Remove the drive PWB.

B. Remove the harness connector from the applicable LED on the carrier frame.

C. Using an Exacto knife or similar tool, remove the epoxy from around the LED and remove it from the back. Use extreme caution so as not to bend or distort the carrier frame.

D. Replace the unit by reversing the procedure and bonding the LED into the frame in the same orientation as the one which was removed.

E. Check and readjust index timing if necessary per the procedure in Section 5.12.

5.7.11 TRACK ZERO SWITCH REMOVAL

A. Disconnect the wires N/C (white), N/O (black), and common (purple).

B. The switch is removed by removing its two mounting screws.

C. To reinstall, reverse the above procedure.

D. Readjust the switch per Section 5.10.

5.7.12 HEAD AMPLITUDE CHECK

These checks are only valid when writing and reading back as described below. If the amplitude is below the minimum specified, the load pad should be replaced and the head should be cleaned if necessary before rewriting and rechecking. Insure the diskette used for this check is not "worn" or otherwise shows evidence of damage on either the load pad or the head side. Proceed as follows:

A. Install known good diskette.

B. Start the motor.

C. Select the drive and step to track 34.

D. Sync the oscilloscope external on TP5 (2D-6) (+Index).
Set the oscilloscope to measure the differential signal between TP1 and TP2 (TP10).
Ground the probe to TP3 (common).

E. Set volts-per-division to 50 mV and timebase to 20 msec per division.

F. Write the entire track with all one's.

G. The average minimum read-back amplitude, peak to peak, should be 600 mV.

5.7.12.1 If a new load pad does not bring the amplitude to the minimum level, proceed as follows:

A. Install a different diskette and recheck.

B. Check motor speed, Section 5.8.

C. If the output from the PWB looks inappropriate, change the PWB and recheck.

D. If steps A, B, and C check out but the amplitude is still low, the head and carriage assembly will require replacement.

5.8 MOTOR SPEED ADJUSTMENT

A. Insert a diskette, energize the drive, and start the motor. Step the head to track 16 and keep the head loaded.

B. Adjust potentiometer R-28 (R-21) until the dark lines on the spindle pulley appear motionless. For 60 Hz power, use the outside ring of lines. For 50 Hz power, use the inside ring. This adjustment can only be made where there is fluorescent lighting.

5.8.1 MOTOR SPEED ADJUSTMENT WITH FREQUENCY COUNTER

A. Install a WANGCO 820 scratch diskette.

B. Start the motor, load the head, and step to track 16.

C. Connect the frequency counter to TP5 (2D-6) (+Index) on the PWB.

D. Adjust potentiometer R28 (R21) located on the PWB for 200 msec $\pm$ 1 msec.

5.9 READ/WRITE HEAD LOAD BUTTON ADJUSTMENT

A. Insert an alignment diskette or any diskette with data on track 34.

B. Connect oscilloscope to TP1 and TP2 (TP10) and sync external positive on TP5 (2D-6) (+Index).

D. Select the drive and step carriage to track 34.

E. Observing read signal on oscilloscope, rotate the load button counterclockwise in small increments (10 deg.) maximum amplitude is obtained.

5.10 TRACK ZERO SWITCH ADJUSTMENT

A. Install an alignment diskette (P/N 620340-001)

B. Power up the drive and step to track ØØ. This will energize Phase 1 in the stepper motor.

C. Adjust the switch so it just makes by moving its mounting bracket.

D. Step to track 02. TP8 (1) should go low (high; if not, readjust the track zero microswitch.

E. Step to track 03. TP8 (1) should go high (low); if not, readjust the microswitch.

5.11 TRACK ØØ/39 STOP

A. Unplug the head cable and remove the PWB from the drive, leaving the interface and PWB connectors installed.

B. Step to track ØØ, with the drive selected.

C. Adjust the track ØØ stop horizontally and vertically until there is 0.010±0.005-inch (0.254±0.127 mm) between the post on the main frame and the track ØØ stop.

D. Step to track 34 and insure that there is clearance between the post and the stop on the carriage.

E. Reinstall the drive PWB and plug in the head cables.

5.12 INDEX/SECTOR TIMING ADJUSTMENT

A. Insert Alignment Diskette P/N 620340-001.

B. Start the motor and select the drive.

C. Sync oscilloscope with external positive on TP5 (2D-6) (+Index).
Set time base to 50 μsec/division.

D. Connect the probe to TP1 and TP2 (TP10). Ground the probe to TP3 (common). Set the inputs to AC. Set vertical deflection to 500 mV/division.

E. Step to track ØØ.

F. Observe the timing between the start of the sweep and the first data pulse. This should be 200 ± 100 μsec. If the timing is not within tolerance, continue with the adjustment.

G. Loosen the mounting screw in the Index Sensor block until the assembly is just able to be moved. This is located on the bottom of the drive.

H. Observing the timing, adjust the sensor until the timing is 200 ± 50 μsec. Insure that the detector assembly is against the registration surface.

I. Tighten the mounting screw slowly. Do not overtighten.

J. Open and close the door; then, recheck the timing.

K. Repeat Step 5.12 J at least five times.

5.13 HEAD/RADIAL ALIGNMENT

A. Start the motor and select the drive.

B. Load the P/N 620340-001 Alignment Diskette.

C. Step the carriage to track 16.

D. Sync the oscilloscope with external positive on TP5 (2D-6). Set the time base to 20 msec per division. This will provide a display over one revolution.

E. Set the oscilloscope to measure the differential signal between TP1 and TP2 (TP10). Ground the probes to TP3 (common). Set the inputs to AC. Set the vertical deflection to 100 mV/division.

F. Loosen the two mounting screws which mount the stepper motor to the main frame.

G. Rotate the stepper motor to move the head radially in and out (less than ±5 deg.)Find the location where the scope signal is maximum and carefully lock down thc two mounting screws.

NOTE

The Dysan-type 224 alignment diskette may also be used for radial alignment of the head. Instructions for its use are included with the diskette.

H. Check the adjustment by stepping off several tracks and returning.
   Check in both directions and readjust as required.

I. Whenever the Head Radial Alignment has been adjusted, the carriage and track zero switch adjustment must be checked (Section 5.10.)

NOTE

Alignment diskette should be at room conditions for at least one hour before alignment.

5.14 HEAD LOAD BAIL ADJUSTMENT

A. Select the drive and load the head to energize the head load solenoid.

B. Adjust the two stop screws to obtain a minimal clearance of 0.020 to 0.040-inch (0.050 to 0.101 cm) between the load bail and the load arm. This check is made at track zero and track 39 with the door closed and the head loaded.

APPENDIX A

SPARE PARTS LIST

APPENDIX A

SPARE PARTS LIST - MODEL 82

Part Number	Description
620311-00X	Assembly, PWB
650191-00X	Assembly, PWB
640169-001	Assembly, Spindle Drive Motor
640170-001	Assembly, Stepper Motor
650168-001	Assembly, Head Carriage
650166-002	Assembly, Carrier
640181-001	Assembly, Diskette Guide, Right Spare
640181-002	Assembly, Diskette Guide, Left Spare
640162-001	Assembly, Index Sensor
630258-001	Assembly, Button Head Load
640155-001	Assembly, Head Load Solenoid
630275-001	Belt, Spindle Drive
617502-001	LED, Status Indicator

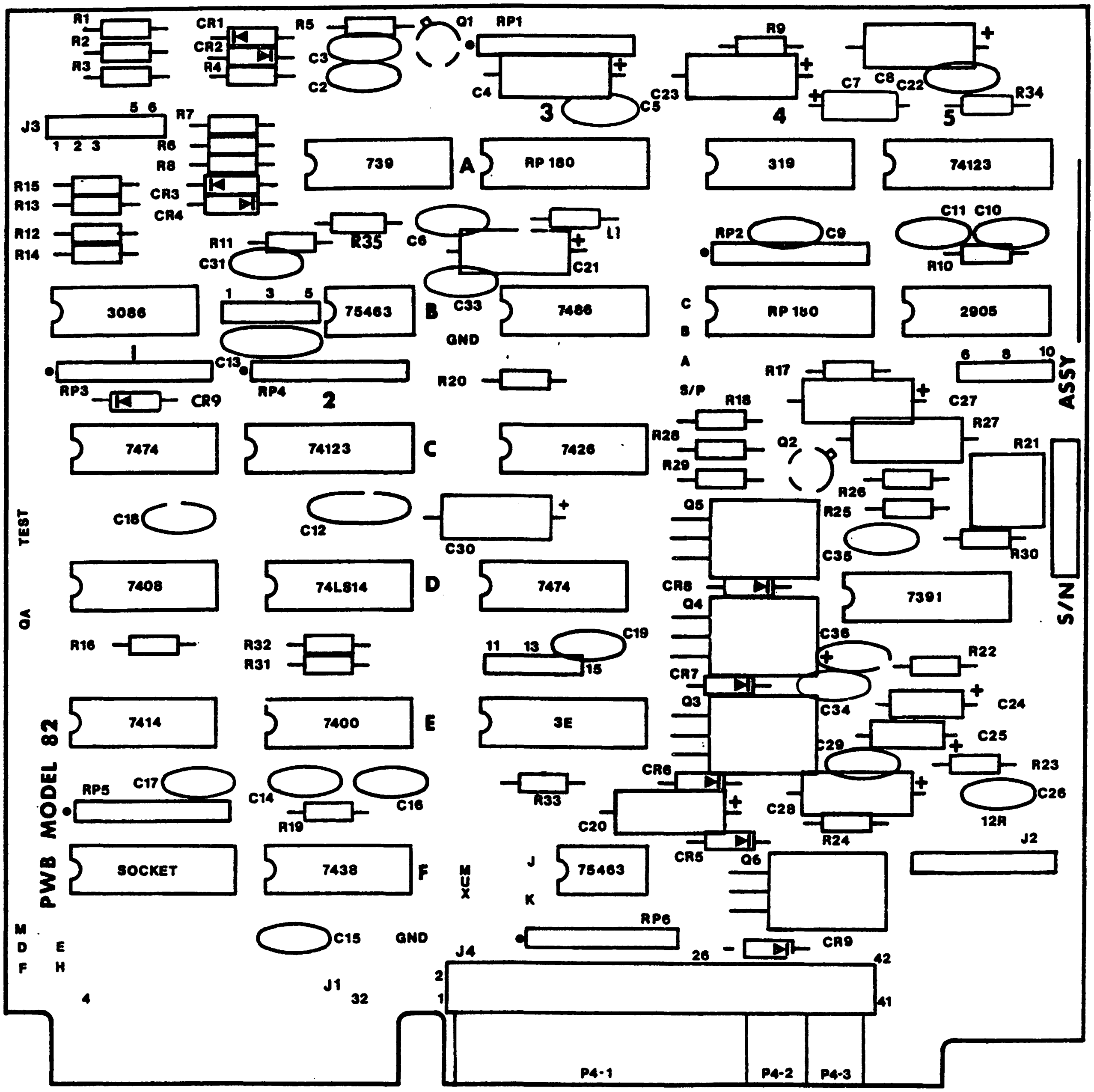
APPENDIX B

ASSEMBLY DRAWINGS AND MATERIAL LISTS

APPENDIX B

MODEL 82 MICROFLOPPY

ASSEMBLY DWGS. AND MATERIAL LISTS INDEX



Assembly - PWB 620311-003

(TO BE SUPPLIED)

Assembly - PWB 650191-001

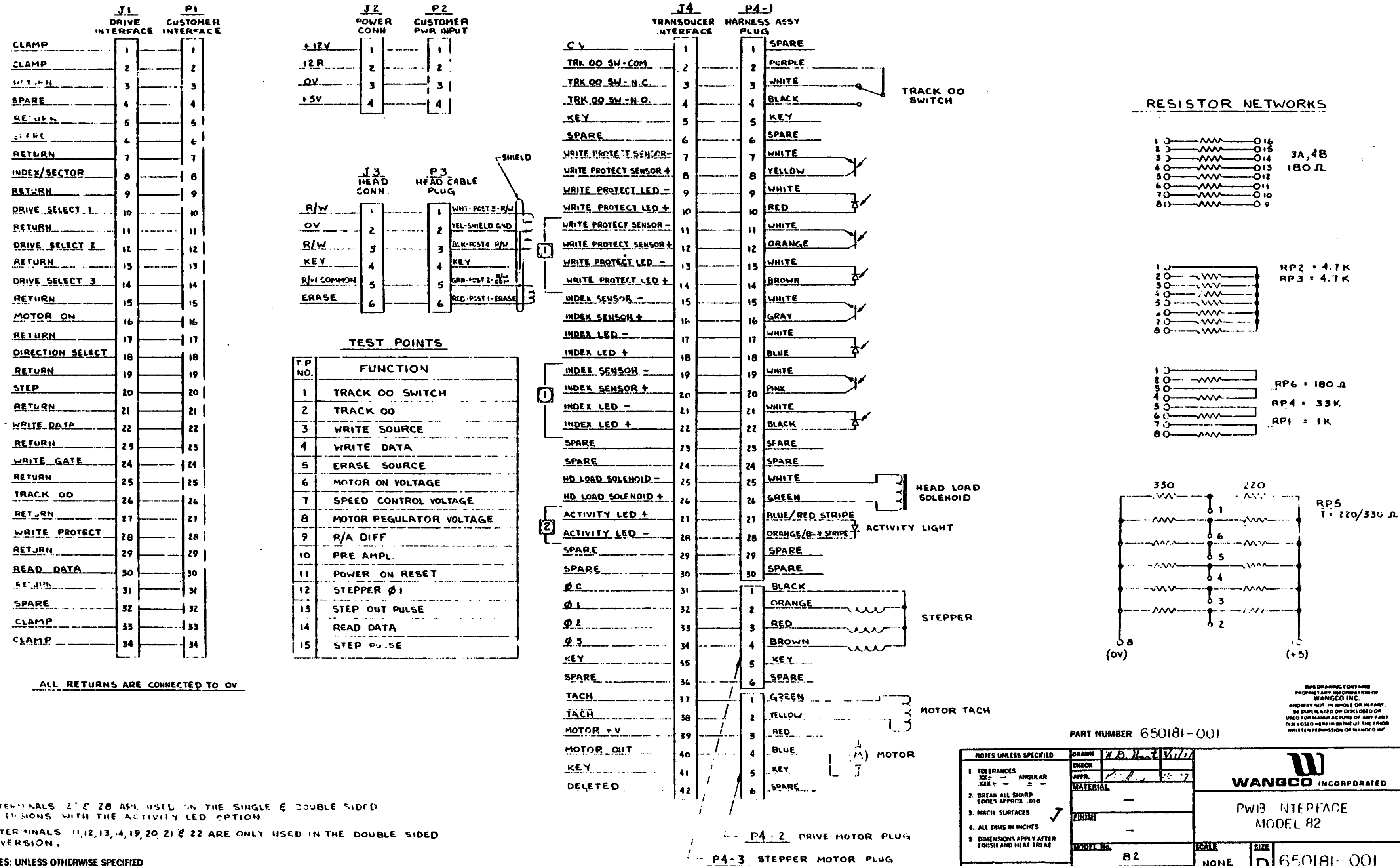
APPENDIX C

LOGIC DIAGRAMS AND SCHEMATICS

APPENDIX C

LOGIC DIAGRAMS AND SCHEMATICS INDEX

REV.	DESCRIPTION	CHK.	DATE	APPROVED
B	PILOT RELEASE			



TEST POINTS

T.P. NO.	FUNCTION
1	TRACK 00 SWITCH
2	TRACK 00
3	WRITE SOURCE
4	WRITE DATA
5	ERASE SOURCE
6	MOTOR ON VOLTAGE
7	SPEED CONTROL VOLTAGE
8	MOTOR REGULATOR VOLTAGE
9	R/A DIFF
10	PRE AMPL.
11	POWER ON RESET
12	STEPPER Ø1
13	STEP OUT PULSE
14	READ DATA
15	STEP PULSE

[2] TERMINALS 27 & 28 ARE USED ON THE SINGLE & DOUBLE SIDED VERSIONS WITH THE ACTIVITY LED OPTION

[1] TERMINALS 11,12,13,14,19,20,21 & 22 ARE ONLY USED IN THE DOUBLE SIDED VERSION.

NOTES: UNLESS OTHERWISE SPECIFIED

PART NUMBER 650181-001

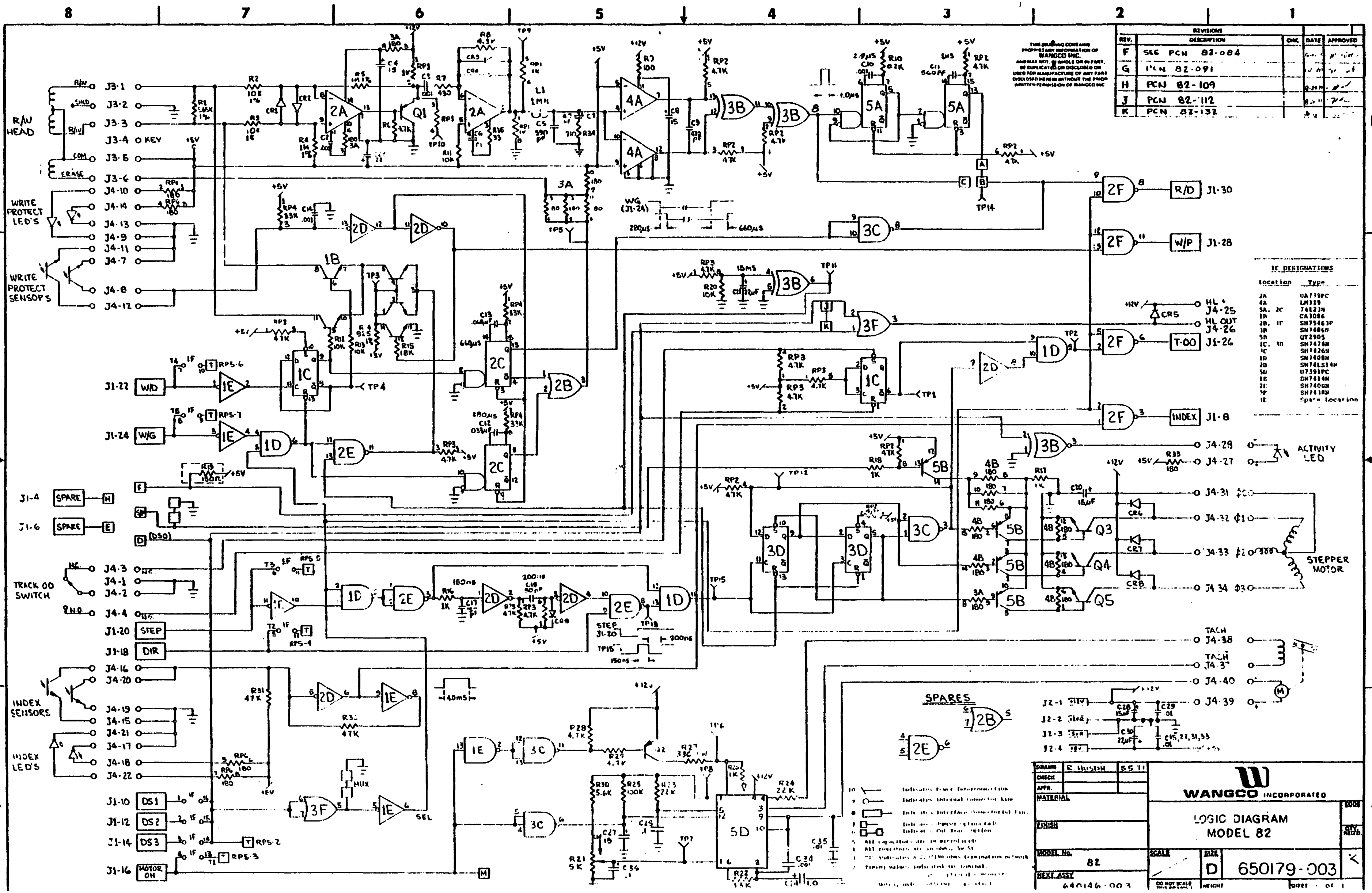
NOTES UNLESS SPECIFIED
1. TOLERANCES XX± — ANGULAR XXX± — ±
2. BREAK ALL SHARP EDGES APPROX. .010
3. MACH. SURFACES
4. ALL DIMS IN INCHES
5. DIMENSIONS APPLY AFTER FINISH AND HEAT TREAT

MATERIAL —
FINISH —
MODEL NO. 82

WANGCO INCORPORATED

PWB INTERFACE MODEL 82

SCALE	SIZE	DWG NO.	REV
NONE	D	650181-001	B



REVISIONS
REV. | DESCRIPTION | CHK | DATE | APPROVED
F SEE PCN 82-084
G PCN 82-091
H PCN 82-109
J PCN 82-112
K PCN 82-132
THIS DRAWING CONTAINS PROPRIETARY INFORMATION OF WANGCO INC.
R/W HEAD
J3-1
J3-2
J3-3
J3-4 KEY
J3-5
J3-6
ERASE
WRITE PROTECT LED'S
J4-10
J4-14
J4-13
J4-9
J4-11
J4-7
WRITE PROTECT SENSORS
J4-8
J4-12
J1-22 W/D
J1-24 W/G
J1-4 SPARE
J1-6 SPARE
TRACK 00 SWITCH
J4-3
J4-1
J4-2
J4-4
J1-20 STEP
J1-18 DIR
INDEX SENSORS
J4-16
J4-20
J4-19
J4-15
J4-21
INDEX LED'S
J4-17
J4-18
J4-22
J1-10 DS1
J1-12 DS2
J1-14 DS3
J1-16 MOTOR ON
R/D J1-30
W/P J1-28
HL + J4-25
HL OUT J4-26
T-00 J1-26
INDEX J1-8
J4-28
J4-27
ACTIVITY LED
J4-31
J4-32
J4-33
J4-34
STEPPER MOTOR
TACH J4-38
TACH J4-37
J4-40
J4-39
J2-1
J2-2
J2-3
J2-4
SPARES
IC DESIGNATIONS
Location Type
2A UA733PC
4A LM319
5A, 2C 74123N
1B CA3086
2B, 1F SN75463P
3B SN7486N
5B UT2905
1C, 3D SN7474N
3C SN7426N
1D SN7408N
2D SN74LS14N
5D U7391PC
2E SN7414N
2E SN7400N
2F SN7438N
1E Spare Location
SEL
MUX
WG (J1-24)
280µs
660µs
STEP J1-20
TP15
150ns
200ns
40mS
DRAWN R. HUSTON
WANGCO INCORPORATED
LOGIC DIAGRAM MODEL 82
MODEL No. 82
NEXT ASSY 640146-003
SIZE D
650179-003

(TO BE SUPPLIED)

Logic Diagram, Model 82 - 650193-001

APPENDIX D

ILLUSTRATED PARTS BREAKDOWN

APPENDIX D

IPB ILLUSTRATION INDEX

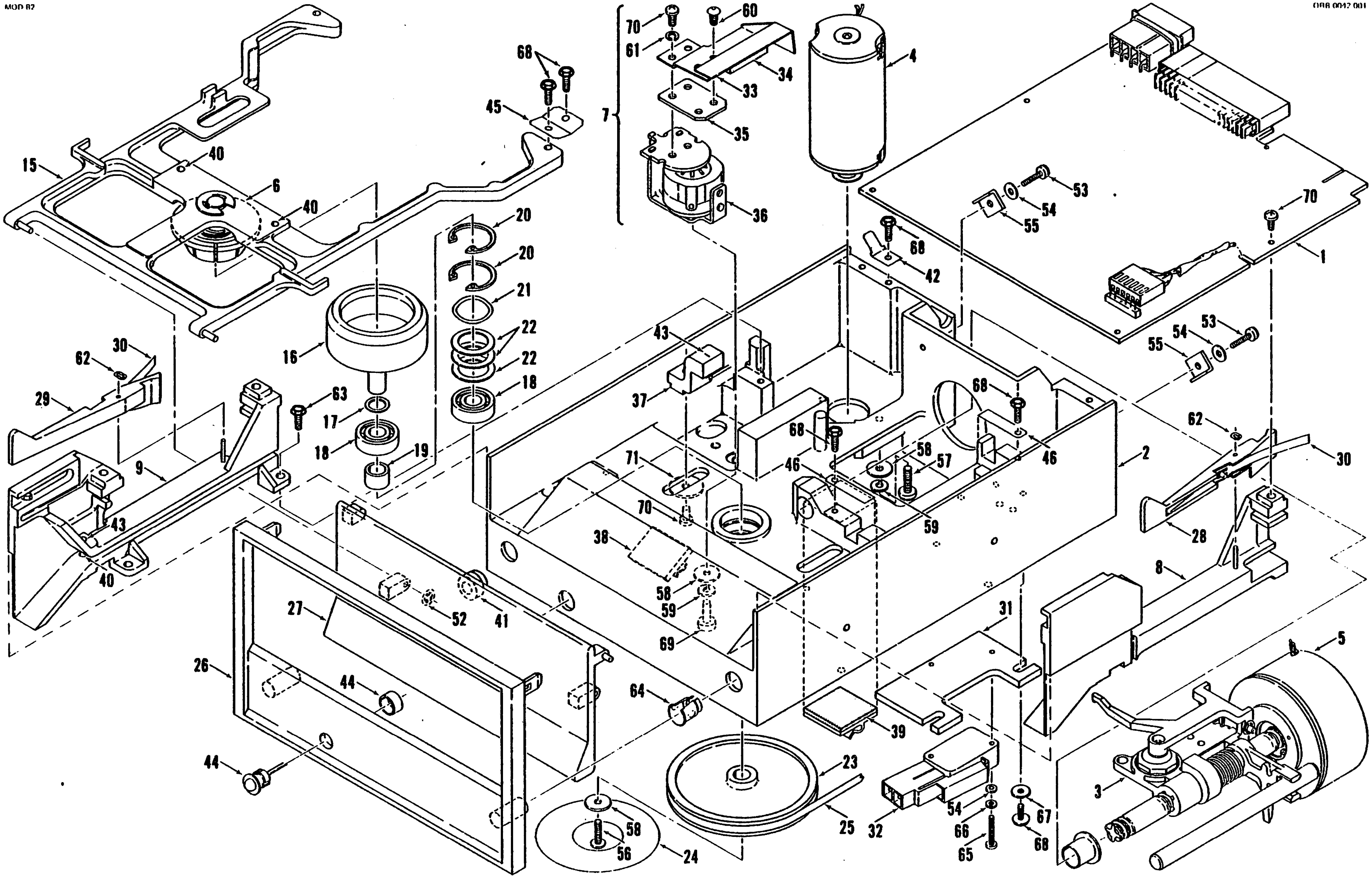


Figure D-1. Model 82 Microfloppy-Overall View

SHEET 1 OF 2

ITEM NO.	PART NO. TOP ASSY	PART NO. SUB ASSY	PART NO. COMPONENT	DESCRIPTION	FIGURE NO.	QUANTITY
1	620311–003			Assembly, PWB	D-1	1
--	650191–001			Assembly, PWB		1
2	650183–001			Main Frame, Machined		1
3	650168–001			Assembly, Carriage		1
4	640169–001			Assembly, Drive Motor		1
5	640170–001			Assembly, Stepper Motor		1
6	650166–002			Assembly, Carrier		1
7	640155–001			Assembly, Solenoid		1
8	640166–001			Assembly, Guide-Disk (Right)		1
9	640166–002			Assembly, Guide-Disk (Left)		1
10						
11						
12						
13						
14						
			* * * * * *	COMPONENT PARTS * * * * * *		
15		650180–001		Carrier, Machined		
16		640147–001		Hub, Drive		1
17		613950–001		Shim, Small Dia. .001		A/R
–		613950–002		Shim, Small Dia. .005		A/R
–		613950–003		Shim, Small Dia. .003		A/R
18		610202–002		Bearing		2
19		640143–001		Spacer, Bearing		1
20		100001–004		Ring, Retaining		2
21		100134–003		Washer, Wave		1
22		640148–004		Shim, Large Dia.		3
23		640179–001		Pulley, Hub, Machined		1
24		630273–001		Label, Strobe Spindle		1
25		630275–001		Belt, Drive to Hub		1
26		640176–001		Bezel, Front		1
27		640141–001		Door		1
28		640156–001		Arm, Disk Protect (Right)		1
29		640156–002		Arm, Disk Protect (Left)		1
30		630264–001		Spring, Disk Protect		2
31		640161–001		Plate, Switch Mount		1
32		618808–001		Micro-Switch, SPDT		1
33		640142–001		Arm, Diskette Load		1
34		630278–001		Pad, Diskette Load		1
35		630261–001		Bracket, Arm Adjustment		1
36		618302–001		Solenoid		1
37		640162–001		Index Block	D-1	

ITEM NO.	PART NO. (TOP ASSY / SUB ASSY / COMPONENT)	DESCRIPTION	FIGURE NO.	QUANTITY
38	610958–002	Clamp, Cable	D-1	1
39	610958–001	Clamp, Cable		1
40	617502–001	LED, Emitter		4
41	610700–001	Bumper		1
42	617811–001	Ground Lug		1
43	619411–001	Photo Transistor		4
44	617500–001	Indicator Light Assy, Red		1
45	630263–001	Hinge, Leaf		2
46	630277–001	Clamp, Guide Shaft		2
47				
48				
49				
50				
51				
	** * ***	ATTACHING HARDWARE * * * * * *		
52	612753–001	Ring, Retaining		1
53	100041–204	Screw, Soc Hd Cap, 4-40 x 1/4		2
54	100047–200	Washer, Flat, No. 4		4
55	610952–002	Clamp, Motor		2
56	613005–303	Screw, Button Hd, 8-32 x 3/16		1
57	613000–306	Screw, Phillips Hd, 6-32 x 3/8		2
58	613800–004	Washer, Flat, No. 6		4
59	613803–004	Washer, Split Lock, No. 6		3
60	613005–204	Screw, Button Hd, Soc, 6-32 x 1/4		2
61	100042–200	Washer, Split Lock, No. 4		2
62	612751–001	Ring, Grip		2
63	613011–206	Screw, Hex Hd, Thread Forming, 4-40		4
64	611301–001	Fastener, Tubular Type		2
65	613000–209	Screw, Phillips Hd, 4-40		2
66	613803–003	Washer, Split Lock, No. 4		2
67	613800–003	Washer, Flat, No. 4		2
68	613011–204	Screw, Hex Hd, Thread Forming, 4-40		9
69	613000–308	Screw, Phillips Hd, 6-32 x 1/2		1
70	613000–204	Screw, Phillips Hd, 4-40 x 1/4		7
71	613804–003	Washer, Large Dia, No. 4	D-1	2

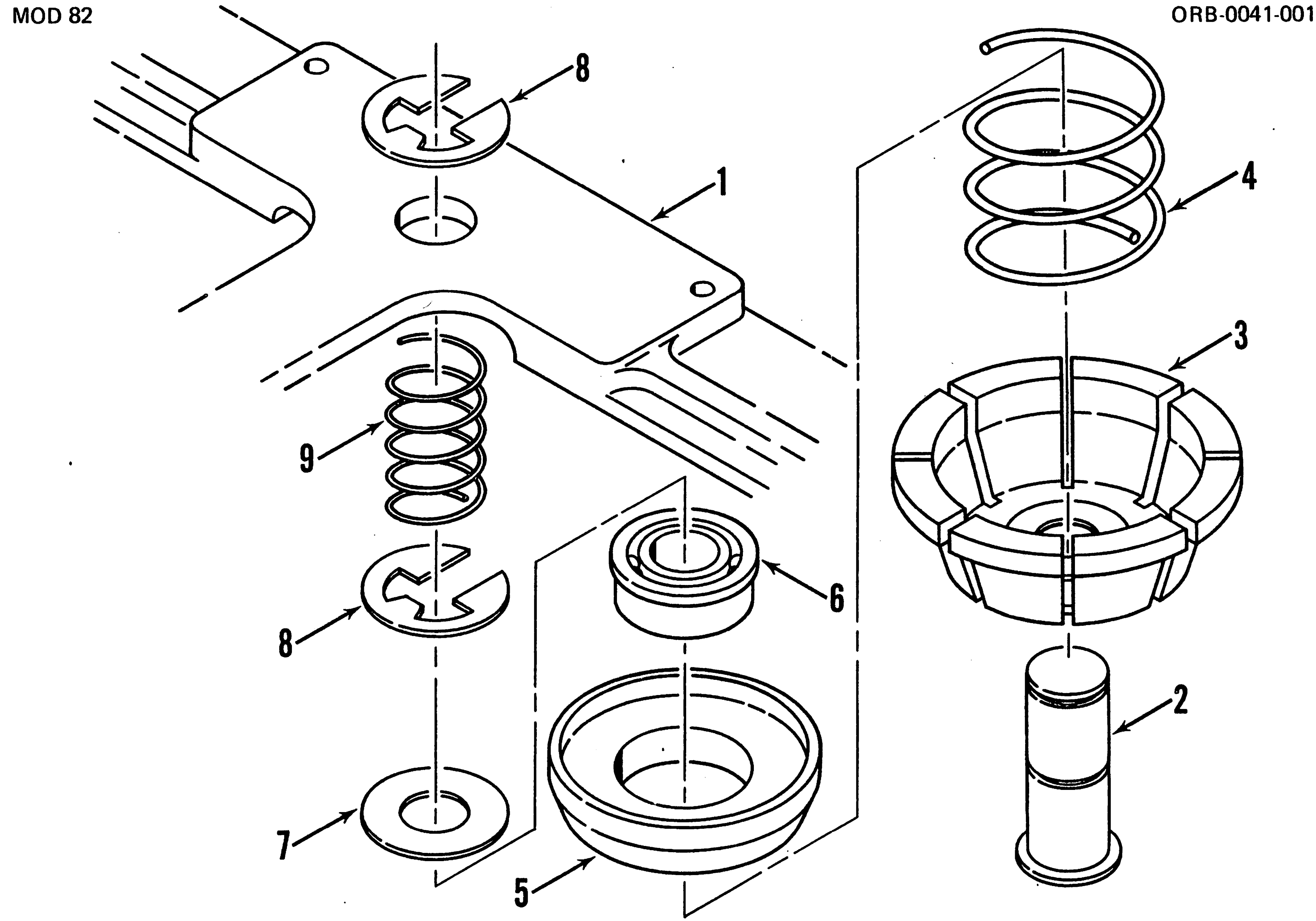


Figure D-2 Model 82 Microfloppy - Carrier Assembly

IPB LIST – MODEL 82 MICROFLOPPY – CARRIER ASSEMBLY

SHEET 1 OF 1

ITEM NO.	PART NO. TOP ASSY	PART NO. SUB ASSY	PART NO. COMPONENT	DESCRIPTION	FIGURE NO.	QUANTITY
1			650180–001	Carrier, Machined	D-2	1
2			630262–001	Shaft		1
3			640151–001	Cone Thrust		1
4			630271–001	Spring, Cone		1
5			640152–001	Cone Follower		1
6			610205–001	Bearing		1
7			613950–002	Shim, .005", Sm. Dia.		2
8			612750–001	Ring, Retaining		2
9			613250–008	Spring, Clutch	D-2	1

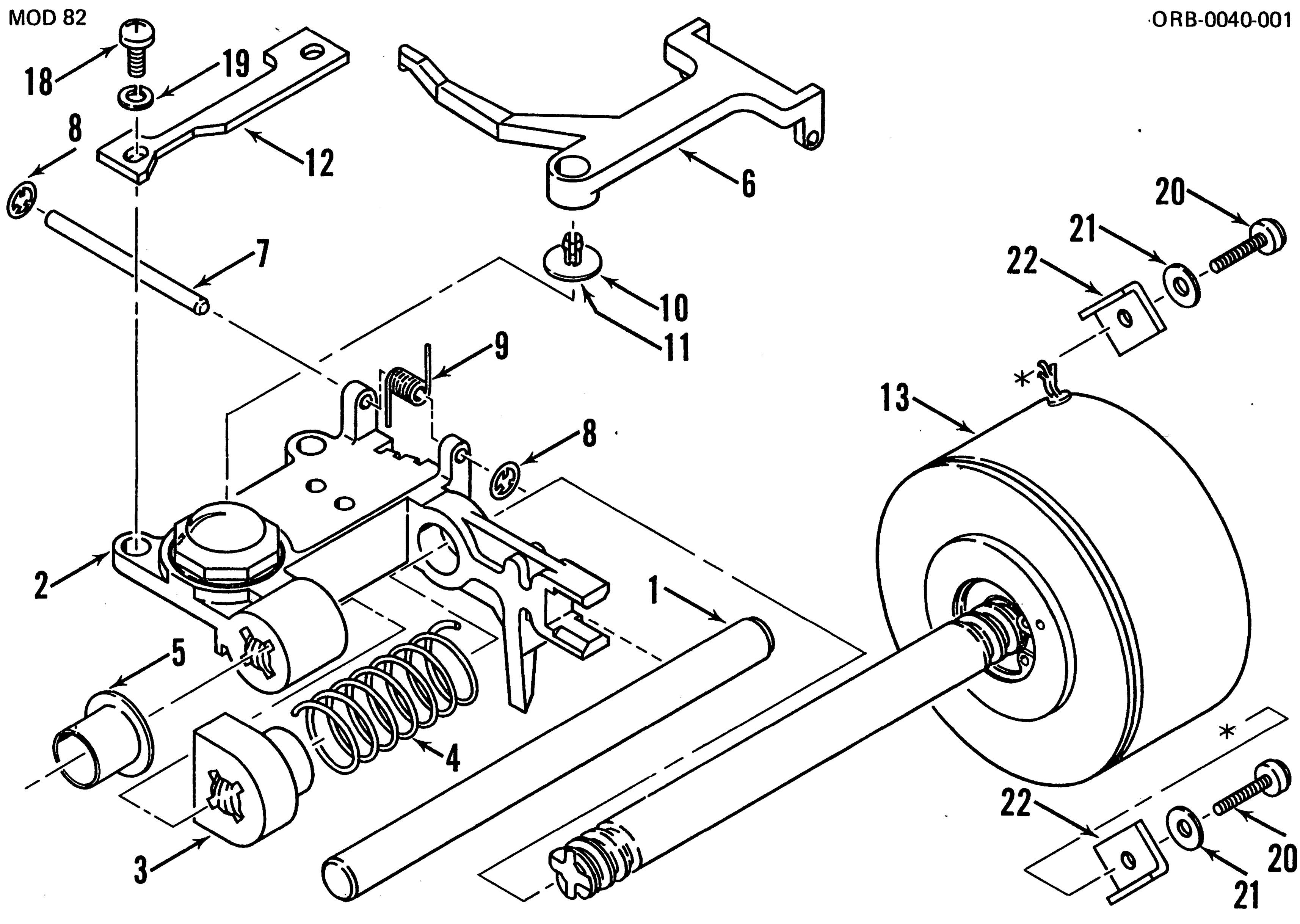
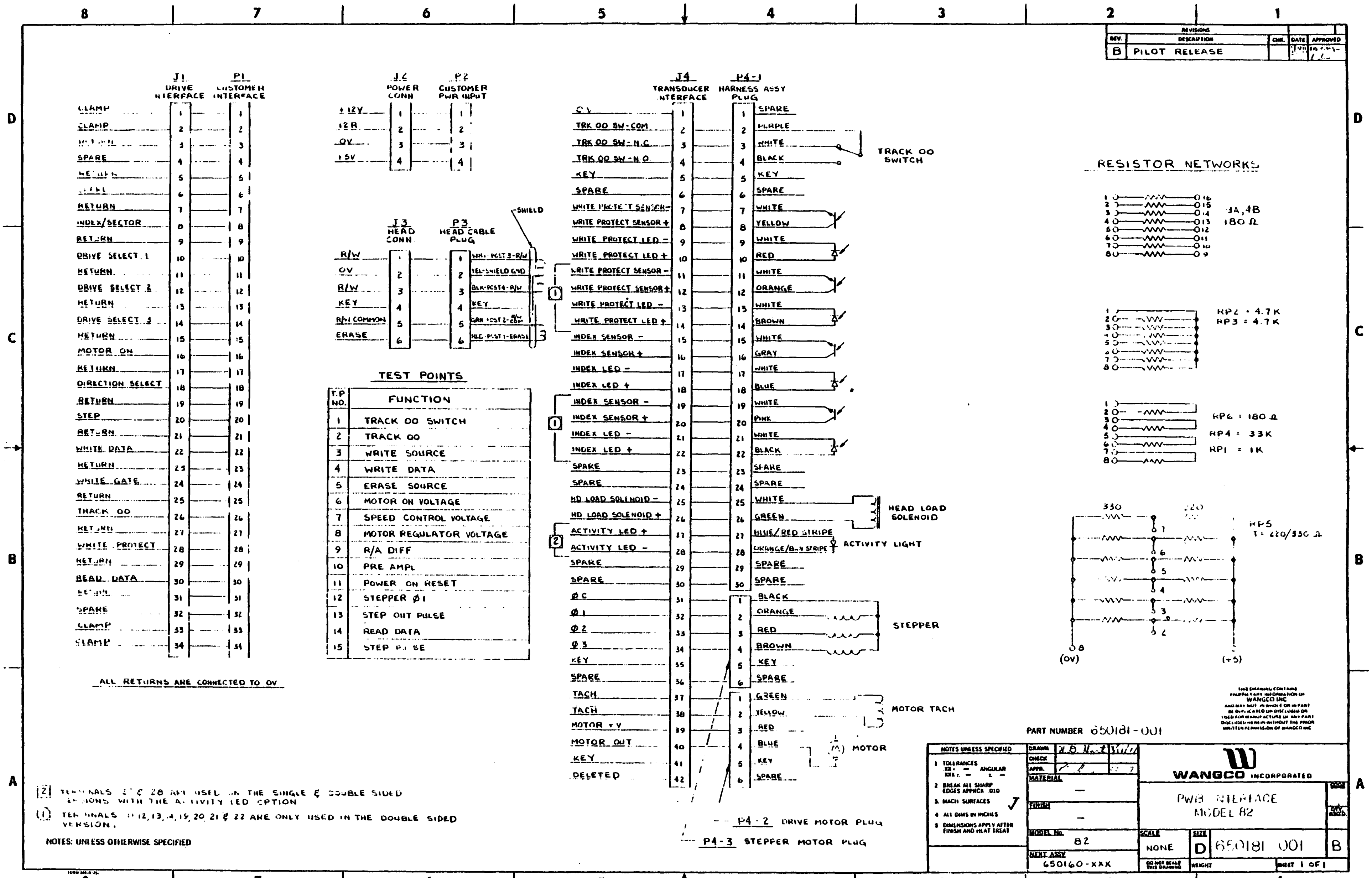


Figure D-3 Model 82 Microfloppy - Carriage Assembly

IPB LIST – MODEL 82 MICROFLOPPY – CARRIAGE ASSEMBLY

SHEET 1 OF 1

ITEM NO.	PART NO. TOP ASSY	PART NO. SUB ASSY	PART NO. COMPONENT	DESCRIPTION	FIGURE NO.	QUANTITY
1			613111–001	Shaft, Carriage Guide	D-3	1
2			650169–001	Carriage and Read/Write Head		1
3			640160–001	Nut, Carriage		1
4			630270–001	Spring, Nut-Carriage		1
5			610751–002	Bushing, Flanged		1
6			650177–001	Arm, Head Load		1
7			100045–226	Pin, Dowel		1
8			612753–001	Ring, Retainer, Push-On		2
9			630276–001	Spring, Arm Return		1
10			640158–001	Button		1
11			630075–002	Pad		1
12			640165–001	Stop		1
13			650174–001	Motor, Stepper		1
14						
15						
16						
17						
			* * * * * *	ATTACHING PARTS * * * * * *		
18			613000–204	Screw, Phillips Hd, 4-40 x 1/4		2
19			613803–003	Washer, Split Lock, No. 4		2
20			100041–204	Screw, Soc Hd Cap, 4-40 x 1/4		2
21			100047–200	Washer, Flat, No. 4		2
22			610952–002	Clamp, Motor	D-3	2



J1 DRIVE INTERFACE
P1 CUSTOMER INTERFACE
J2 POWER CONN
P2 CUSTOMER PWR INPUT
J3 HEAD CONN
P3 HEAD CABLE PLUG
SHIELD
J4 TRANSDUCER INTERFACE
P4-1 HARNESS ASSY PLUG
TRACK 00 SWITCH
HEAD LOAD SOLENOID
ACTIVITY LIGHT
STEPPER
MOTOR TACH
MOTOR
P4-2 DRIVE MOTOR PLUG
P4-3 STEPPER MOTOR PLUG
RESISTOR NETWORKS
3A, 4B 180 Ω
RP2 = 4.7K
RP3 = 4.7K
RP6 = 180 Ω
RP4 = 33K
RP1 = 1K
RP5 1 = 220/330 Ω
(OV)
(+5)
TEST POINTS
T.P. NO. FUNCTION
1 TRACK 00 SWITCH
2 TRACK 00
3 WRITE SOURCE
4 WRITE DATA
5 ERASE SOURCE
6 MOTOR ON VOLTAGE
7 SPEED CONTROL VOLTAGE
8 MOTOR REGULATOR VOLTAGE
9 R/A DIFF
10 PRE AMPL
11 POWER ON RESET
12 STEPPER Ø1
13 STEP OUT PULSE
14 READ DATA
15 STEP PULSE
ALL RETURNS ARE CONNECTED TO OV
2 TERMINALS 27 & 28 ARE USED ON THE SINGLE & DOUBLE SIDED VERSIONS WITH THE ACTIVITY LED OPTION
1 TERMINALS 11, 12, 13, 14, 19, 20, 21 & 22 ARE ONLY USED IN THE DOUBLE SIDED VERSION.
NOTES: UNLESS OTHERWISE SPECIFIED
B PILOT RELEASE
PART NUMBER 650181-001
WANGCO INCORPORATED
PWB INTERFACE MODEL 82
MODEL NO. 82
NEXT ASSY 650160-XXX
SCALE NONE
SIZE D 650181 001 B
SHEET 1 OF 1

C-3

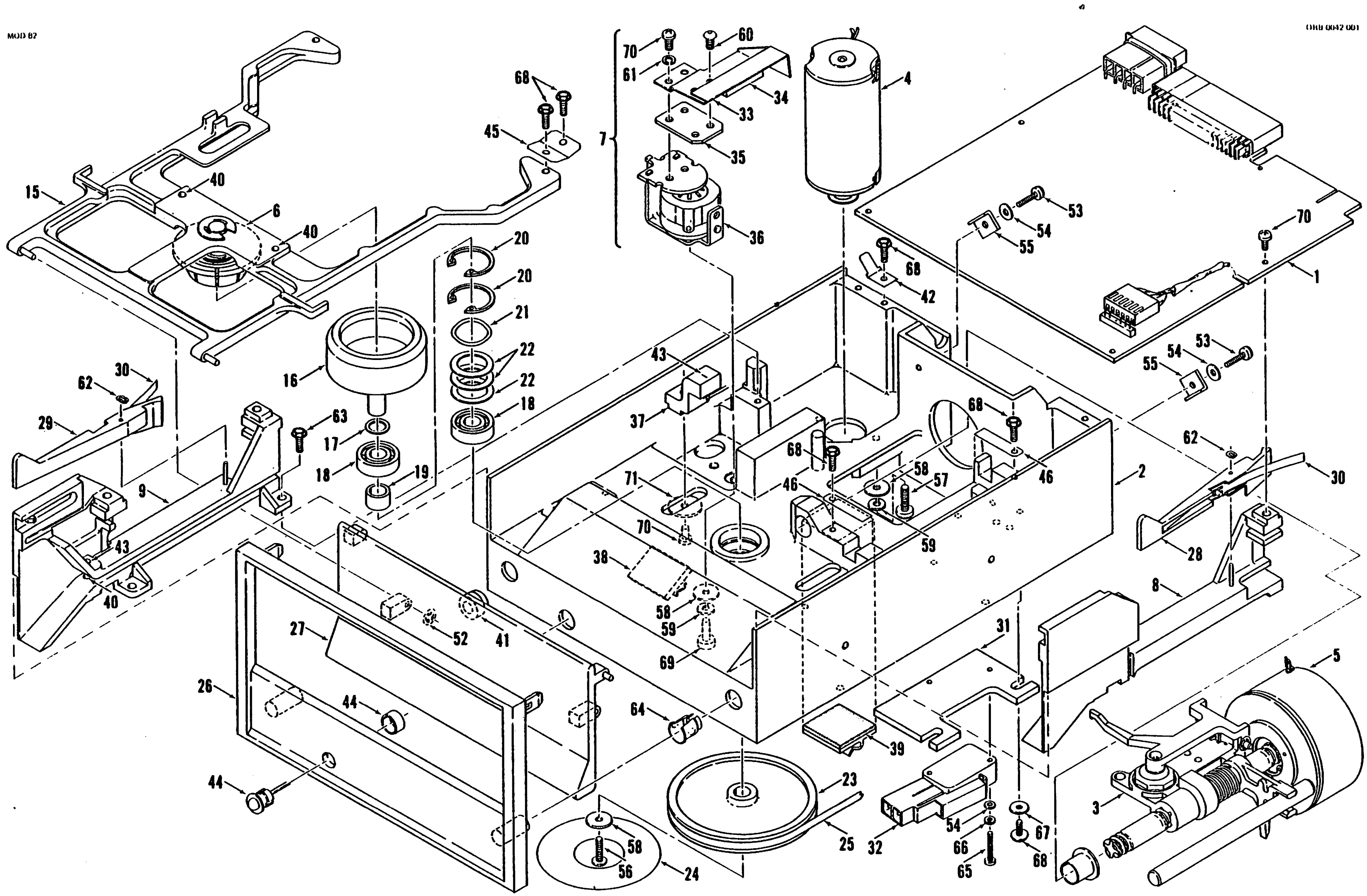
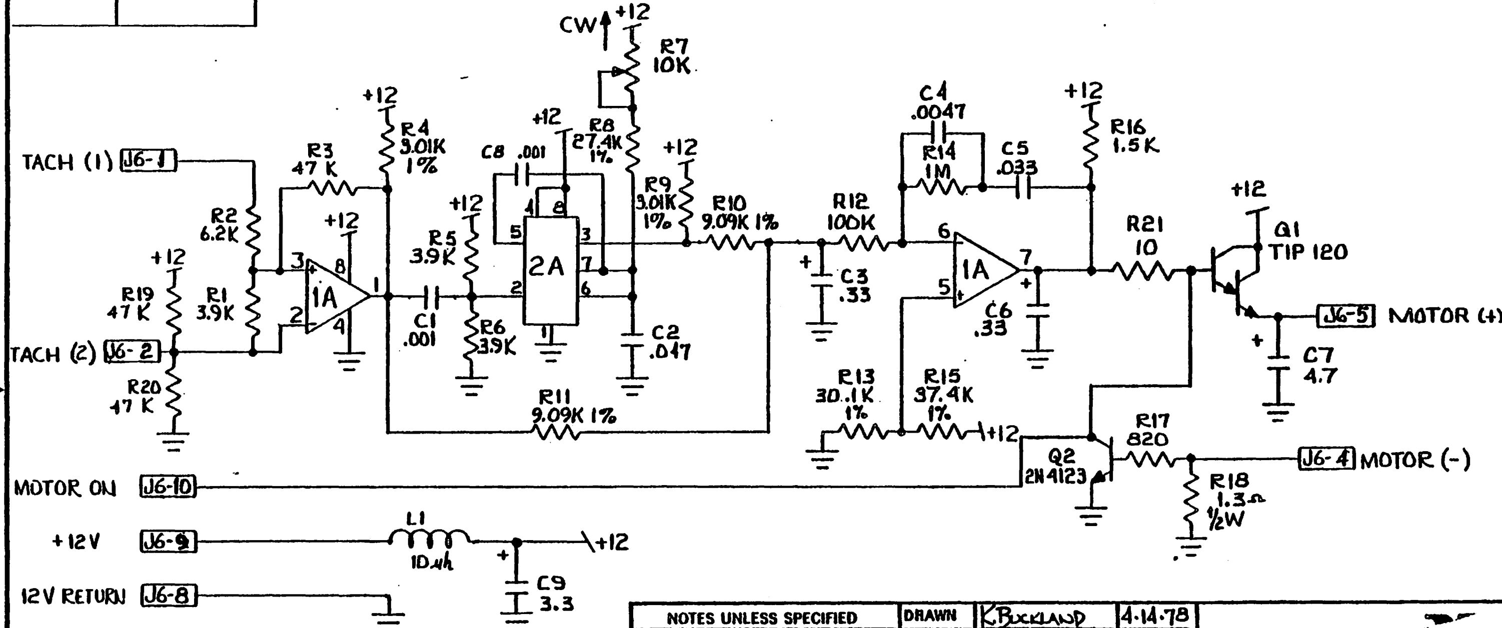


Figure D-1. Model 82 Microfloppy-Overall View

REF. DESIGNATIONS	
LAST USED	NOT USED
R21	
C9	
L1	
Q2	

I C DESIGNATIONS	
LOCATION	TYPE
1A	LM393
2A	NE555

REVISIONS				
REV.	DESCRIPTION	CHK.	DATE	APPROVED
A	PILOT RELEASE		11-16-78	
A	MFG. RELEASE		3-16-79	
B	CR/O 50462		5/23/79	
C	CR/O 50474		7/5/79	



3. R21 IS NOT REQUIRED WITH 640212-001 BOARDS, REVS A AND B.
2. ALL CAPACITORS IN MICROFARADS
1. ALL RESISTORS IN OHMS, 1/4W, 5%.

NOTES: UNLESS OTHERWISE SPECIFIED

NOTES UNLESS SPECIFIED

1. TOLERANCES .XX± .XXX± ANGULAR ±
2. BREAK ALL SHARP EDGES APPROX. .010
3. MACH. SURFACES
4. ALL DIMS IN INCHES.
5. DIMENSIONS APPLY AFTER FINISH AND HEAT TREAT

DRAWN	K BUCKLAND	4·14·78
CHECK		
APPR.		

MATERIAL

FINISH

MODEL No. FDD 100-5B/200 5N

NEXT ASSY

SIEMENS CORP. INCORPORATED

SCHEMATIC DIAGRAM
MOTOR DRIVE PWB

CODE FD 108

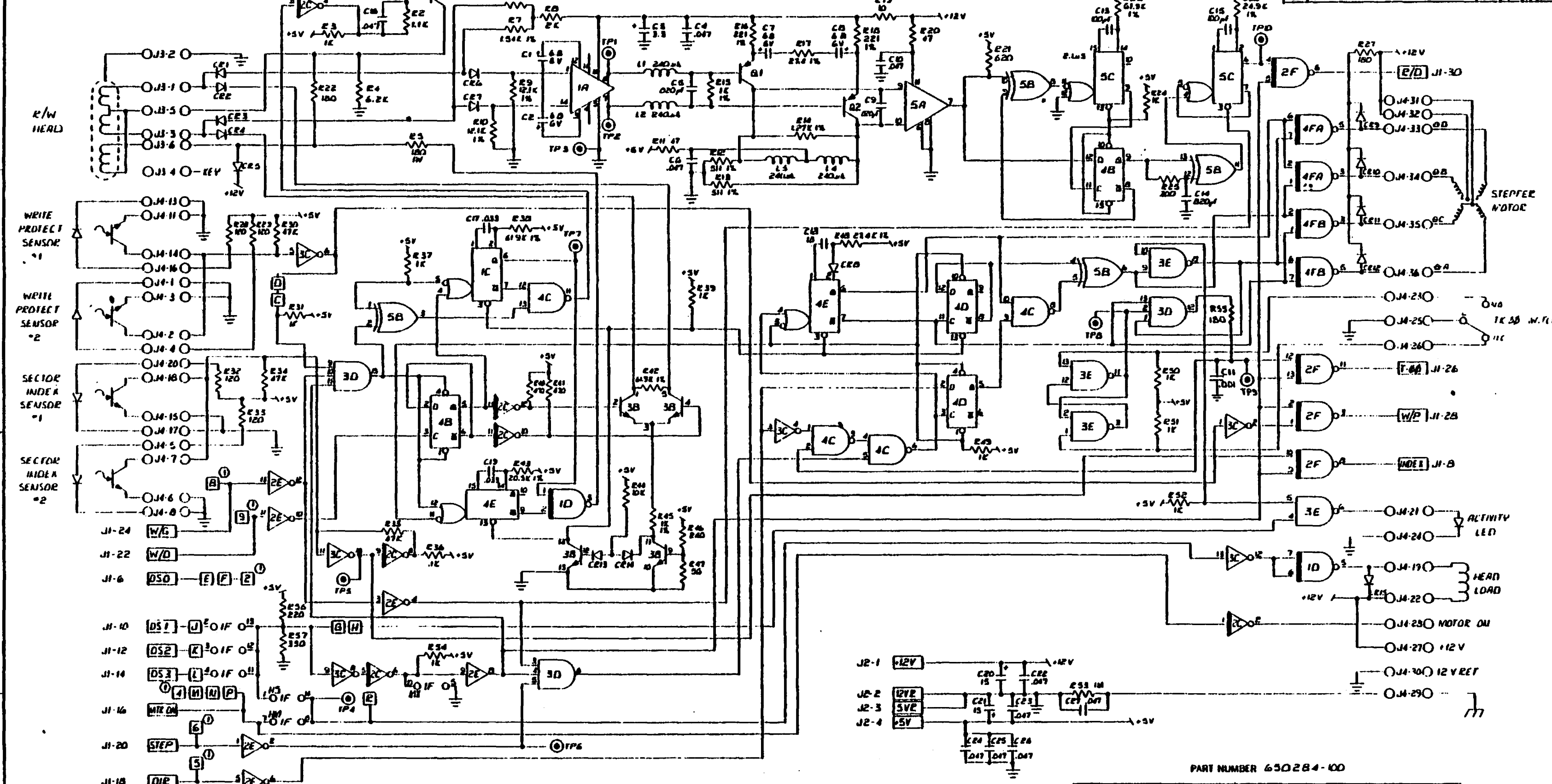
QTY. REQ'D.

SCALE | SIZE B | 630322-100 | C

DO NOT SCALE THIS DRAWING | WEIGHT | SHEET 1 OF 1

FORM (7/75)

REV.	DESCRIPTION	CHK.	DATE	APPROVED
A	PILOT RELEASE			
B	CRO # 50412			
C	CR/R 50432			
C	MFG. REL.			



PART NUMBER 650284-100

9. INDICATES OPEN COLLECTOR
8. INDICATES POWER INTERCONNECTION
7. INDICATES INTERNAL CONNECTOR
6. INDICATES INTERFACE CONNECTOR
5. INDICATES JUMPER OPTION PADS
4. ALL CAPACITORS ARE IN MICROFARADS
3. ALL RESISTORS ARE IN OHMS, 1/4W, 5%
2. TIMING VALUES INDICATED ARE NOMINAL
1. TYPICAL TERMINATION WHEN PART Nº 618417-001 IS INSTALLED IN LOCATION 1E

NOTES: UNLESS OTHERWISE SPECIFIED

IC DESIGNATIONS				REFERENCE DESIGNATIONS	
LOCATION	TYPE	LOCATION	TYPE	LAST USED	NOT USED
1A	UA733	4C, 3E	74LS00	R57	
5A	LM319	1D	75452	C27	C12
3B	CA3086	3C, 2E	74LS14	L4	
4B, 4D	74LS74	3D	74LS11	CR15	
5B	74LS86	2F	7438	Q3	
1C, 5C, 4E	96L02	4FA, 4FB	75472	TP10	
2C	74LS05				

NOTES UNLESS SPECIFIED
1. TOLERANCES
2. BREAK ALL SHARP EDGES APPROX. .010
3. MACH SURFACES
4. ALL DIMS IN INCHES
5. DIMENSIONS APPLY AFTER FINISH AND HEAT TREAT

DRAWN L. Bxxxxx 10-16-78
CHECK
APPR.
MATERIAL
FINISH
MODEL No. 82A
NEXT ASSY

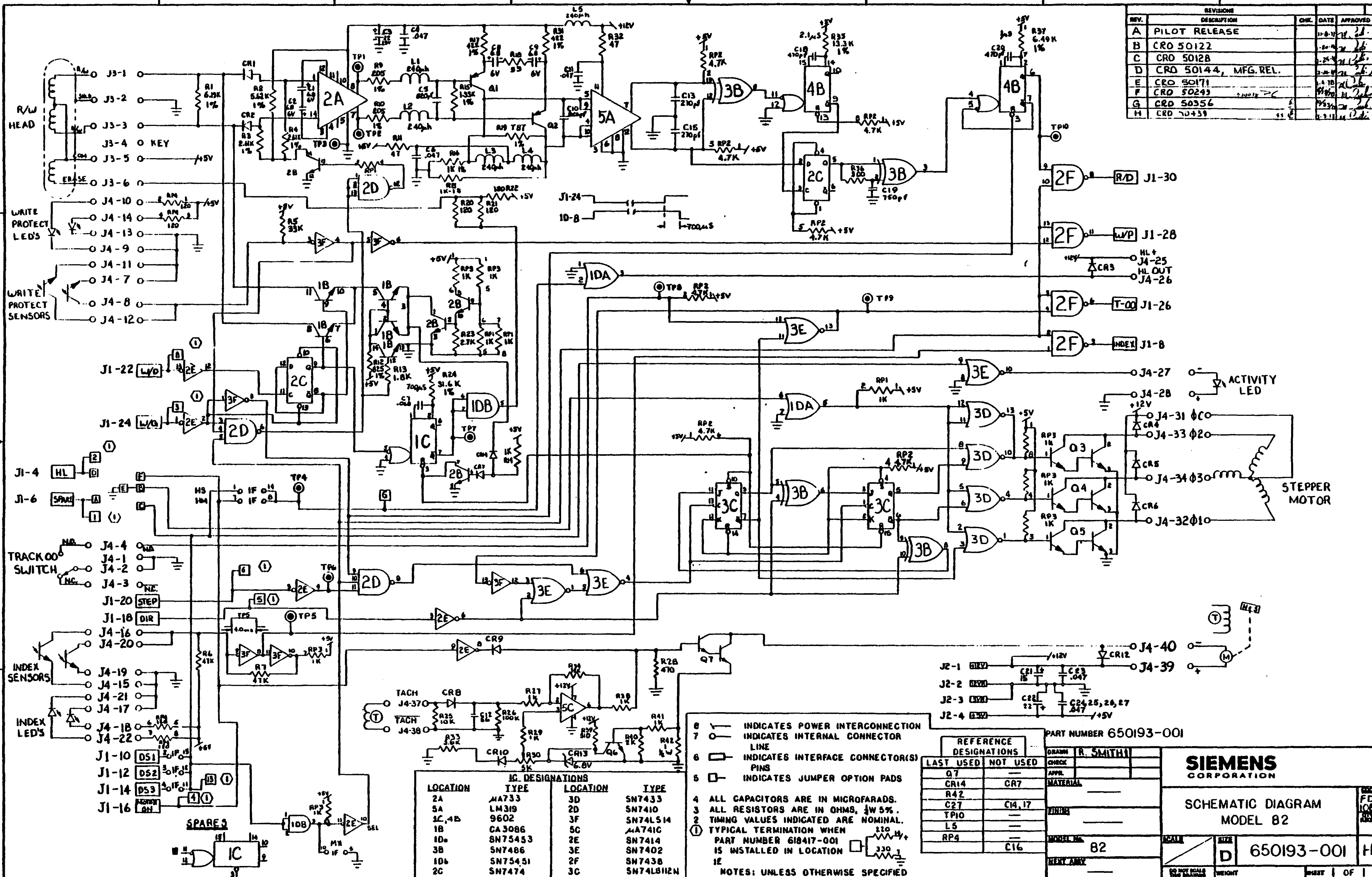
SIEMENS CORP.

SCHEMATIC DIAGRAM MODEL 82A

FD 108

SCALE — | SIZE D | 650284-100 | REV. C

DO NOT SCALE THIS DRAWING | CODE IDENT 52465 | SHEET 1 OF 1



REVISIONS

REV.	DESCRIPTION	CHK.	DATE	APPROVED
A	PILOT RELEASE			
B	CRO 50122			
C	CRO 50128			
D	CRO 50144, MFG. REL.			
E	CRO 50171			
F	CRO 50243			
G	CRO 50356			
H	CRO 50439			

IC DESIGNATIONS

LOCATION	TYPE	LOCATION	TYPE
2A	μA733	3D	SN7433
5A	LM319	2D	SN7410
1C, 4B	9602	3F	SN74LS14
1B	CA3086	5C	μA741C
1Da	SN75453	2E	SN7414
3B	SN7486	3E	SN7402
1Db	SN75451	2F	SN7438
2C	SN7474	3C	SN74LS112N

8 INDICATES POWER INTERCONNECTION
7 INDICATES INTERNAL CONNECTOR LINE
6 INDICATES INTERFACE CONNECTOR(S) PINS
5 INDICATES JUMPER OPTION PADS

4 ALL CAPACITORS ARE IN MICROFARADS.
3 ALL RESISTORS ARE IN OHMS, ¼W 5%.
2 TIMING VALUES INDICATED ARE NOMINAL.
1 TYPICAL TERMINATION WHEN PART NUMBER 618417-001 IS INSTALLED IN LOCATION 1E

NOTES: UNLESS OTHERWISE SPECIFIED

REFERENCE DESIGNATIONS

LAST USED	NOT USED
Q7	—
CR14	CR7
R42	
C27	C14, 17
TP10	—
L5	—
RP4	—
	C16

PART NUMBER 650193-001

DRAWN R. SMITH

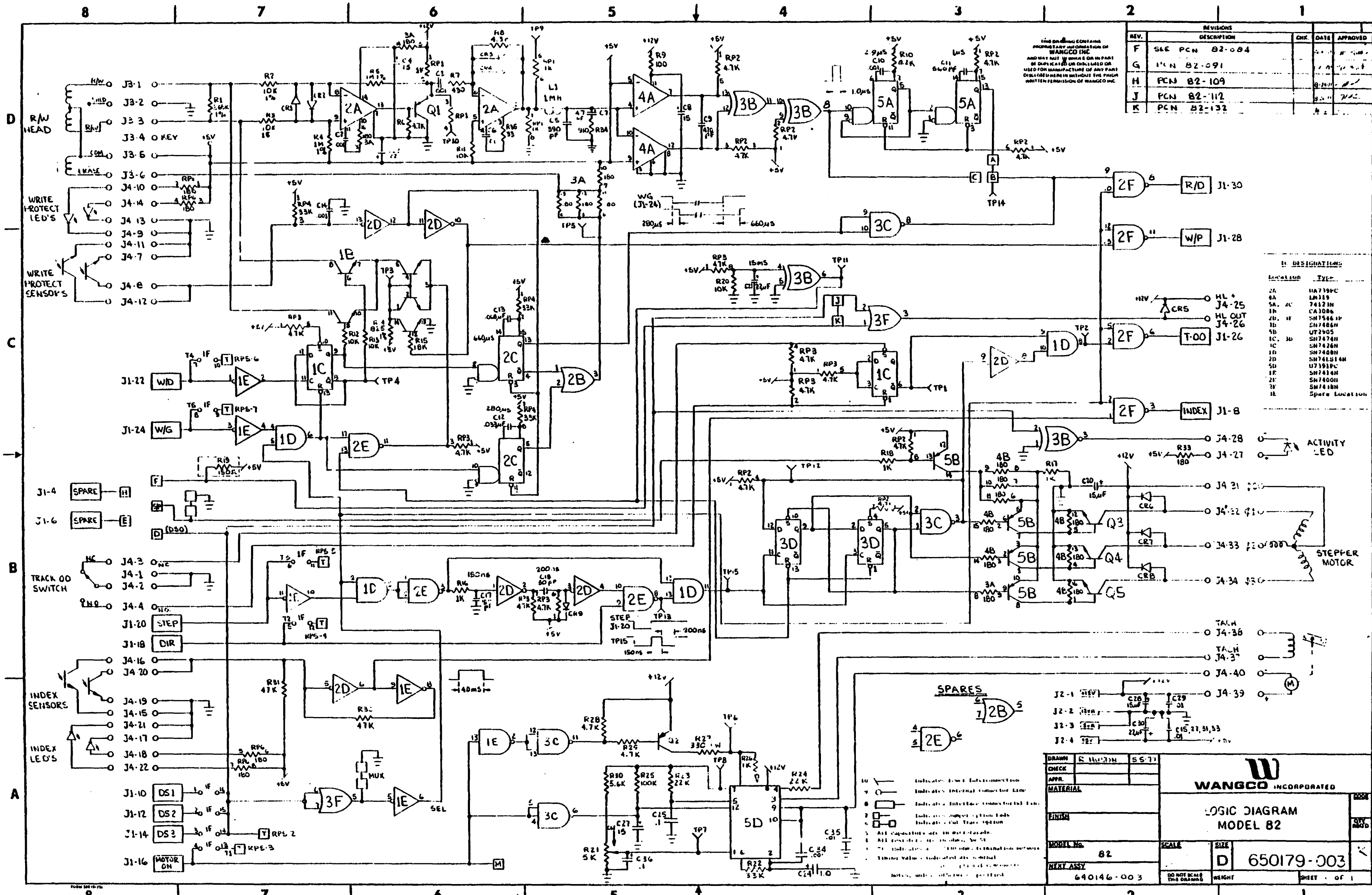
SIEMENS CORPORATION

SCHEMATIC DIAGRAM MODEL 82

MODEL No. 82

SIZE D 650193-001 H

SHEET 1 OF 1


REVISIONS
REV. DESCRIPTION CHK. DATE APPROVED
F SEE PCN 82-084
G PCN 82-091
H PCN 82-109
J PCN 82-112
K PCN 82-133
R/W HEAD
WRITE PROTECT LED'S
WRITE PROTECT SENSORS
TRACK 00 SWITCH
INDEX SENSORS
INDEX LED'S
ACTIVITY LED
STEPPER MOTOR
SPARES
R/D
W/P
T-00
INDEX
W/D
W/G
STEP
DIR
SPARE
DS1
DS2
DS3
MOTOR ON
MUX
SEL
WANGCO INCORPORATED
LOGIC DIAGRAM
MODEL 82
MODEL No. 82
NEXT ASSY 640146-003
SIZE D
650179-003

C-5