

OPERATING AND SERVICE MANUAL

PART 2

7970B/7970C

DIGITAL MAGNETIC TAPE UNIT

TAPE TRANSPORT

Printed-Circuit Assemblies:

07970-60481, Series 1101
07970-61010, Series 1323
07970-61020, Series 1229
07970-61080, Series 1042
07970-61150, Series 1049
07970-62172, Series 1322
07970-62173, Series 1329
07970-62086, Series 1013
07970-62089, Series 1206

7970B/7970C PART 2
TAPE TRANSPORT

SECTION I DESCRIPTION

1-1. INTRODUCTION.

1-2. This section describes the transport for the Hewlett-Packard 7970B/7970C Digital Magnetic Tape Units and provides a functional description of the transport circuits. Speed critical assemblies are defined and optional assemblies are described.

1-3. PHYSICAL DESCRIPTION.

1-4. The tape unit consists of a transport casting assembly and a sheet metal housing assembly. The housing assembly contains the power supply, the power distribution assembly, the control and status assembly, and interfacing provisions. The read and write modules are also contained in the housing assembly.

1-5. The transport casting assembly consists of all tape moving assemblies, reel motors, capstan servo motor, tension arm assemblies and the circuits associated with these assemblies. The magnetic tape head assembly, photosense assembly, write interconnect assembly, and read preamplifier assembly are also mounted to the transport casting assembly. All standard and optional switch assemblies are mounted to the transport casting assembly. All assemblies are accessible and all circuits will operate with the transport assembly open.

1-6. SPEED CRITICAL ASSEMBLIES.

1-7. The tape unit will operate at tape speeds between 10 ips and 45 ips. The actual tape speed of the unit is specified when the unit is ordered. The following are limited or critical to tape speed:

- a. Reel Motor Assembly.
- b. Capstan Motor Assembly.
- c. Capstan Servo PC Assembly.
- d. Magnetic Tape Head Assembly.
- e. Read Modules.
- f. Write Modules.

1-8. REEL MOTORS.

1-9. Reel Motors B1/B2, part number 07970-60170, are used on tape units with tape speed ranges between 10 ips and 37.5 ips. Reel Motors B1/B2, part number 07970-60171, are used on tape units with tape speed ranges between 37.6 and 45 ips.

1-10. CAPSTAN MOTOR ASSEMBLY.

1-11. Capstan Motor Assembly MG1, part number 07970-60140, is used on tape units with tape speed ranges between 10 ips and 37.5 ips. Capstan Motor Assembly MG1, part number 07970-60141, is used on tape units with tape speed ranges between 37.6 ips and 45 ips.

Note

Capstan Motor Assembly MG1, part number 07970-60140, may be used on tape units operating at 45 ips. However, program restrictions must be maintained.

1-12. CAPSTAN SERVO PRINTED-CIRCUIT ASSEMBLY.

1-13. The capstan servo PCA is equipped with a dummy connector that functions as a strapping network. The dummy connector is installed in one of six positions, depending upon the speed range of the tape unit and capstan motor assembly used. See figure 7-10, Capstan Servo PCA A9 Schematic Diagram, for details of dummy connector.

CAUTION

Ensure that dummy connector is installed in the proper position prior to applying power to the unit. Attempting to operate the unit without the connector installed or with the connector in the wrong position may result in damage to the unit.

1-14. MAGNETIC TAPE HEAD ASSEMBLY.

1-15. The magnetic tape head assembly consists of tape guides, a tape cleaner, and, depending upon configuration, read, write, and erase heads. The tape head assembly is speed critical; refer to section VI for part numbers and speed ranges of the magnetic tape head assembly.

1-16. READ MODULES.

1-17. The read modules are described in detail in part 3 or part 5 of this manual.

1-18. WRITE MODULES.

1-19. The write modules are described in detail in part 4 of this manual.

1-20. BASIC AND OPTIONAL ASSEMBLIES.

1-21. The tape unit is available in a variety of configurations. Regardless of tape speed, the following assemblies are basic and applicable to all tape units.

- a. Transformer Assembly.
- b. Photosense Assembly.
- c. Tension Assemblies (two).
- d. Capstan Assembly.
- e. Reel Motor Assemblies (two).
- f. Reel Servo Printed-Circuit Assembly.
- g. Capstan Servo Printed-Circuit Assembly.
- h. Control and Status Printed-Circuit Assembly.

- i. Power Distribution Assembly.
- j. Power Regulator Printed-Circuit Assembly.

1-22. The control switch assembly is a basic assembly; however, if the tape unit is equipped with write data circuits, the control switch assembly will contain the write enable indicator.

1-23. The following assemblies are optional and, depending upon the use of the tape unit, may or may not be a part of the tape unit.

- a. Write Enable Assembly.
- b. Density Select Assembly.
- c. Unit Select Assembly.

SECTION II

THEORY OF OPERATION

2-1. INTRODUCTION.

2-2. This section provides an overall functional description of the tape transport and description of the transport circuits. Block diagrams are included to aid in understanding the operation of the transport circuits.

2-3. OVERALL FUNCTIONAL DESCRIPTION.

2-4. The tape transport controls the movement of magnetic tape, provides power for read and write data circuits, and supplies status signals to the interface. Off-line commands (High-Speed, Reverse, Forward, Rewind, and Off-Line) are generated by the interface. The off-line and on-line commands are processed by the control and status circuits and result in controlling signals for the capstan servo, reel servo, and data circuits. Status signals for the interface and front panel indicators are also provided by the control and status circuits. Figure 2-1 is a functional block diagram of the tape transport circuits.

2-5. At initial power-on, the capstan motor circuit is open, and the reel servo motors are shorted. When the LOAD switch is pressed, the capstan motor and reel motor circuits are completed. When tape tension is established, the tension arms swing away from the tension limit switches. With tape tensioned, the capstan and reel motor returns are maintained. When the LOAD switch is released, the control and status circuits initiate a load point search. During load point search, the reel servo circuit operates with voltage feedback and the capstan servo pulls tape forward at 20 ips.

2-6. When the load point tab is detected by the photo-sense assembly, the control and status circuits terminate the load point search, and tape motion stops. The control and status circuits provide a load point status to the interface, and the front panel LOAD indicator illuminates.

2-7. Pressing the ON-LINE switch establishes interface control of the tape unit. Except for RESET, the front panel controls have no control of the tape unit. Pressing RESET releases the interface control and allows front panel control of the tape unit.

2-8. When the tape unit is under interface control and data is being processed, the tape unit pulls tape at synchronous speed as required. The reel servo circuits operate with voltage feedback and tension is maintained. When the end-of-tape tab is detected, the control and status circuits provide the interface with an end-of-tape (EOT) status.

2-9. A Rewind command generated by the interface will initiate the rewind sequence. The control and status circuits place the capstan servo circuits in a high-speed reverse mode and switch the reel servo feedback circuits. The capstan rewinds tape at 160 ips and the reel servo operates with current feedback. When the trailing edge of the beginning-of-tape (BOT) tab is detected, the control and status circuits terminate the rewind mode, and after a one-second delay, establish a load point search mode.

2-10. Pressing RESET releases the tape unit from interface control. Pressing REWIND in this condition rewinds the tape on the supply reel. When the tape is run-off of the take-up reel, the tension arms contact the tension arm limit switches, the capstan motor circuit is broken and the reel motors are shorted. This provides dynamic braking of the reel motors.

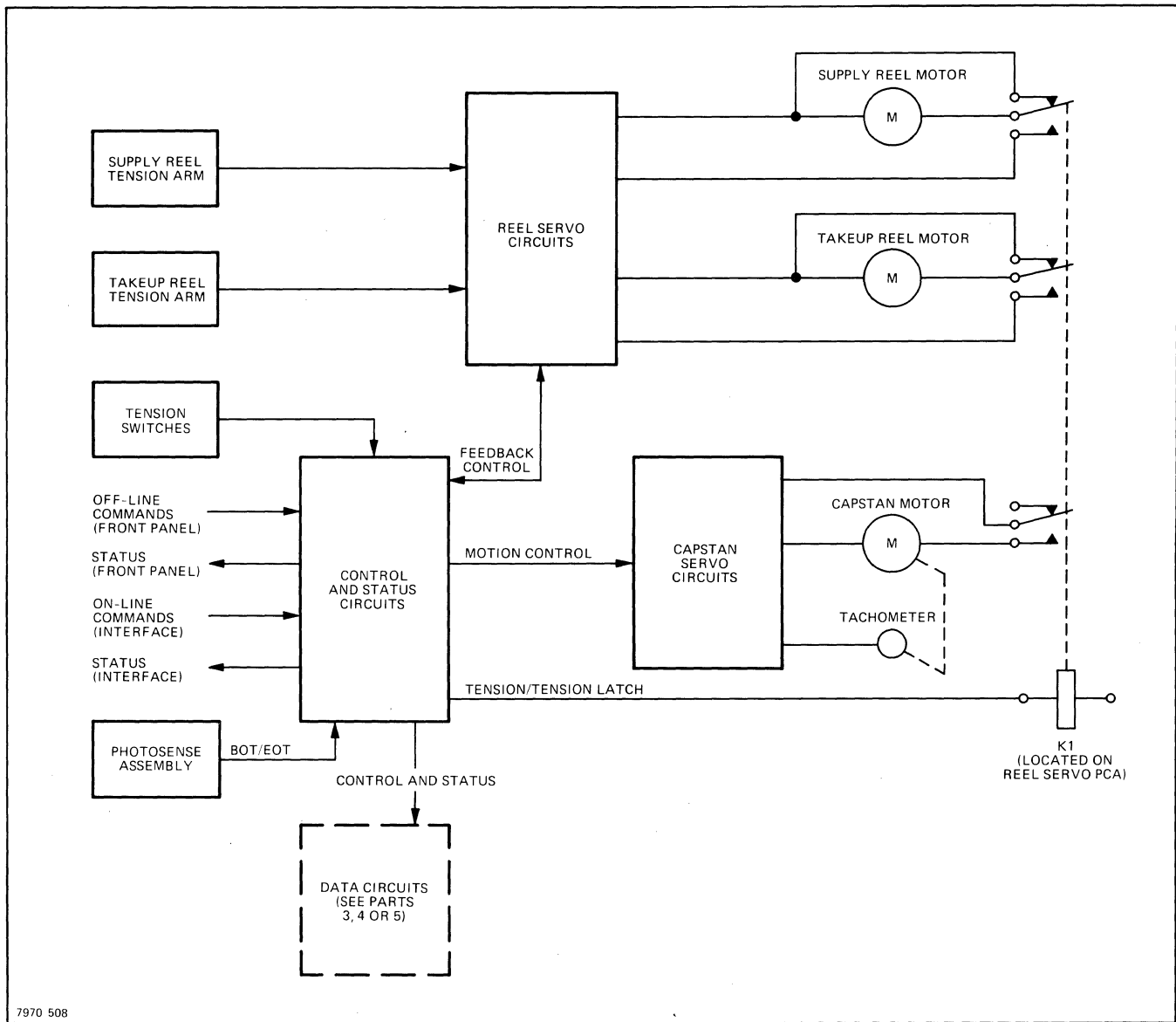
2-11. CIRCUIT DESCRIPTIONS.

2-12. The following paragraphs describe the power supply circuits, control and status circuits, capstan servo circuits and reel servo circuits of the tape transport. Block Diagrams of the circuits are provided as an aid in understanding the operation of the circuits. Refer to section VII for detailed schematic diagrams of the tape transport.

2-13. POWER SUPPLY AND POWER DISTRIBUTION CIRCUITS.

2-14. The power supply of the tape transport consists of a power transformer, three center-tapped bridge rectifiers, filter capacitors, and bleeder resistors. (See figure 7-2.) The primary circuit of the power supply transformer includes a switch that allows selection of 115 or 230 Vac operation, a power on-off switch, and a line filter/power connector. When 115 Vac power is selected, the two primary windings of the power transformer are in parallel and fuse F1 provides overload protection. When 230 Vac power is selected, the two primary windings of the power transformer are in series, and fuse F2 is placed in series with the primary winding to provide overload protection.

2-15. The power distribution circuits are on the power distribution PCA. The assembly contains secondary fuses and connectors for power distribution. The assembly also contains a printed-circuit connector for the power regulator printed-circuit assembly. Silicon diodes in the ± 20 volt circuits and the ± 12 volt distribution circuits provide circuit protection.



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Figure 2-1. Tape Transport Functional Block Diagram

2-16. Unregulated power from the power supply is distributed to the power regulator printed-circuit assembly and to heatsink-mounted power transistors. Unregulated ± 40 volts (57.5 volts nominal) from the power supply is routed through heatsink-mounted resistors to the power regulator printed-circuit assembly. Regulated power (+5V, +12V, and -12V) from the regulator-controlled transistors (heatsink-mounted) are distributed to the transport circuits and data circuits by the power distribution printed-circuit assembly.

2-17. Unregulated ± 20 volts (22.5 volts nominal) from the power supply is provided for the reel servo circuit. Steering diodes CR1 and CR2 allows the $\pm 20/40$ volt lines to switch from 22.5 volts dc to 57.5 volts dc.

2-18. POWER REGULATOR CIRCUITS.

2-19. The power regulator printed-circuit assembly contains a +12 volt regulator circuit, a -12 volt regulator circuit, and a +5 volt regulator circuit. (See figure 2-2.) The power regulator printed-circuit assembly also contains a reel servo voltage switching circuit and a delay circuit. These circuits are described with related circuits.

2-20. +12 VOLT REGULATOR. The +12 volt regulator uses an integrated circuit voltage regulator with an internal temperature compensated voltage reference. Regulation is obtained by dividing the output voltage (R3, R4, and R5)

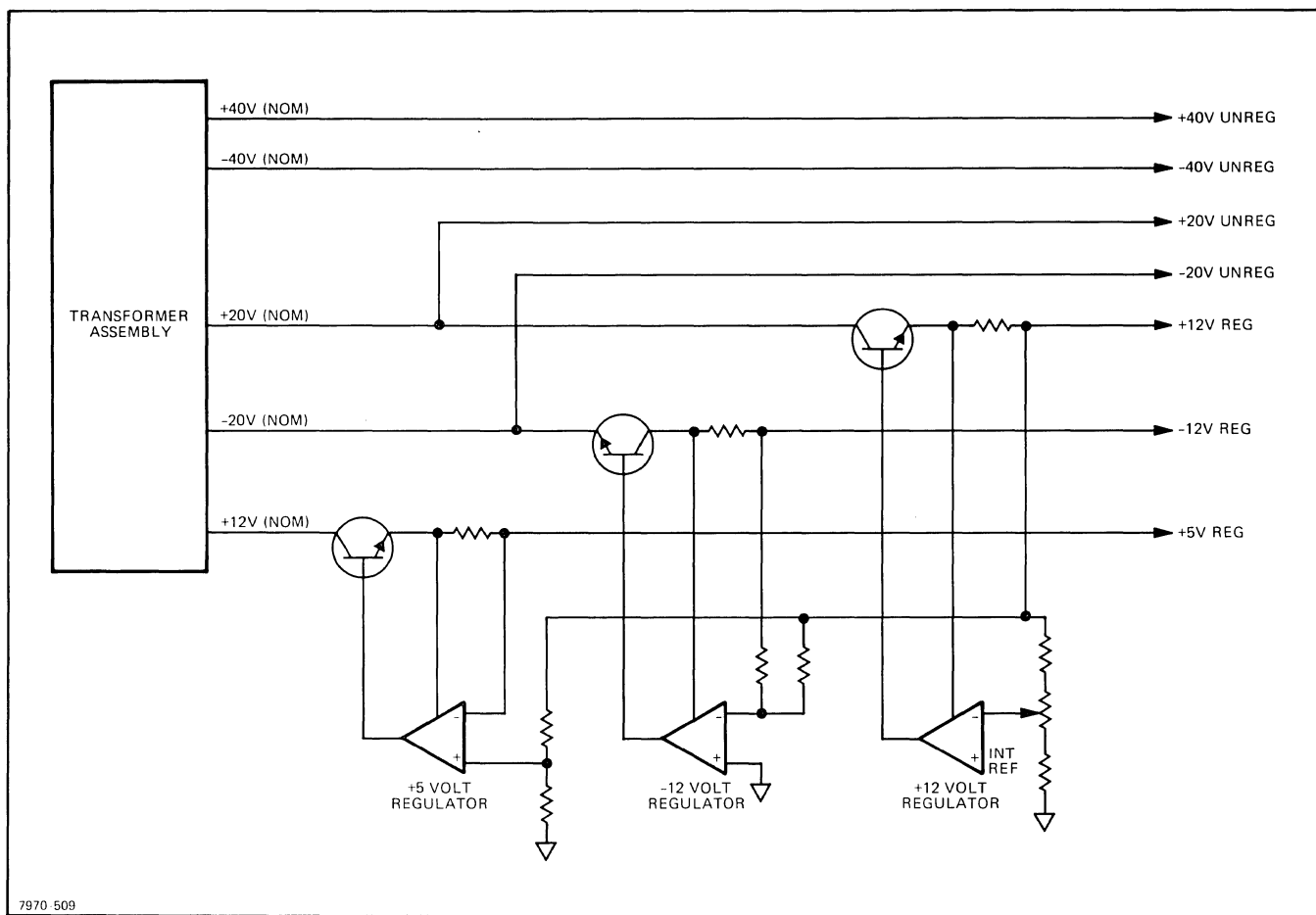


Figure 2-2. Power Supply Voltage Regulators, Simplified Diagram

and comparing the divided voltage with the internal reference. The output voltage of the +12 volt regulator is adjustable by variable resistor R4. Series pass transistor Q2 (located on a heatsink external of the regulator) is protected by current limiting. The current foldback knee is set to approximately 2.8 amperes by R1 and R2. Short circuit current is set to approximately 1.3 amperes by R7 and R8 (located on heatsink external to the regulator).

2-21. -12 VOLT REGULATOR. The -12 volt regulator uses an integrated circuit voltage regulator. The reference for the -12 volt regulator is derived from the regulated +12 volt source. Current limiting of the -12 volt regulator is set at 1.2 amperes as determined by R9 and R20. Diode CR14 protects the -12 volt regulator against excessive common mode voltage. Diode CR17 limits the output voltage to -14.7 volts in the event that the +12 volt reference is lost.

2-22. +5 VOLT REGULATOR. The +5 volt regulator uses an integrated circuit voltage regulator. The reference for the +5 volt regulator is generated from the +12 volt regulator output using R23, R25, and R26. Current limit of the +5 volt regulator is approximately 4.0 amperes controlled

by current sense resistor R6, located external of the regulator on a heatsink. In the event of an over-voltage, silicon controlled rectifier CR1 conducts and shorts the +5 volt supply. The 4 ampere short circuit current will blow fuse F5 which is in series with the +10 volt unregulated supply.

2-23. CONTROL AND STATUS CIRCUITS.

2-24. The control and status circuits process commands from the front panel controls and interface and generate controlling signals for the tape transport and data circuits. The control and status circuits also generate status signals for the interface and front panel indicators.

2-25. After power is applied, the tape is not tensioned, limit switch W2S1 is open and the capstan and reel servo circuits are disabled (figure 2-3). The capstan and reel servo circuits are disabled because relay K1 is deenergized and because ground voltage is supplied to the Tape Tension signal line through the B contacts of deenergized relay K1. Ground voltage supplied to Q4, on the control and status PCA, results in an inactive output from the LDFD FF to the capstan servo circuit.

Also, ground voltage supplied to Q22 on the capstan servo PCA holds switch Q20 on the capstan servo PCA closed, grounding the input to motor drive amplifiers Q2, Q4, and Q6. Ground voltage applied to Q19 on the reel servo amplifier PCA, by the Tape Tension signal and through the normally closed contacts of the LOAD switch, cause it to close switches Q16, Q17, and Q20 on the reel servo amplifier PCA. With the inputs to the reel servo amplifiers grounded, the reel motors are disabled. Relay K1 is also kept deenergized through the normally closed contacts of the LOAD switch and Q13 on the reel servo amplifier PCA. When the LOAD switch is pressed, +5 volts is supplied through R9 and R103 to activate the Tension signal to Q13 and Q19 on the reel servo amplifier PCA. The high input to Q13 energizes relay K1. (Once energized, K1 remains energized, through R109, CR11, and Q13, until tension is lost.) Pressing the LOAD switch also applies a high input to Q19 on the reel servo amplifier PCA. NAND gate Q19 holds Q16, Q17, and Q20 open if either of its inputs are high. With K1 energized, both inputs to Q19 are high causing switches Q16, Q17, and Q20 on the reel servo amplifier PCA to open. Thus, both requirements for enabling the reel servos (K1 energized and switches Q16 and Q17 open) are met and the reel servos tension the tape. Thus, with K1 energized and Q20 on the reel servo amplifier PCA open, Q22 on the capstan servo PCA (through Q21) opens Q20 on the capstan servo PCA and enables the amplifier. With tape tension established, tension arm switch W2S1 closes, supplying a high input to terminal D of the Load Forward FF and to Q19 to the reel servo amplifier PCA.

2-26. When the LOAD switch is released, the load point search sequence is initiated. Load Latch (U1A and U2A) is set. The output of the load latch is gated with REW (false) to clock the Load Forward flip-flop (U12A). The LFWD signal is gated with DELAY to provide the capstan servo with the load point search command.

2-27. The DELAY signal is generated by a delay circuit located on the power regulator printed-circuit assembly. The delay circuit provides a one-second delay when changing from a high speed operation to a synchronous or load point search mode.

2-28. When the load point tab is detected (BOT), the Load Forward flip-flop is cleared by LP through U16D and U13B. Pressing RESET will also clear the Load Forward flip-flop. When Load Forward is cleared, tape load point search motion will stop. The edge transition of $\overline{\text{LDFD}}$ clocks Load Complete flip-flop U12B. Except for a rewind condition, Load Complete remains set during normal operation of the tape transport.

2-29. Rewind flip-flop U6B is cleared by pressing the REWIND switch when the unit is off-line, or by interface command $\overline{\text{REW}}$ when the unit is on-line. When the Rewind flip-flop is cleared, the Rewind Status flip-flop (U4B and U3A) is set. This provides rewind status $\overline{\text{SRW}}$

to the interface and rewind status to the control switch assembly to illuminate the REWIND indicator.

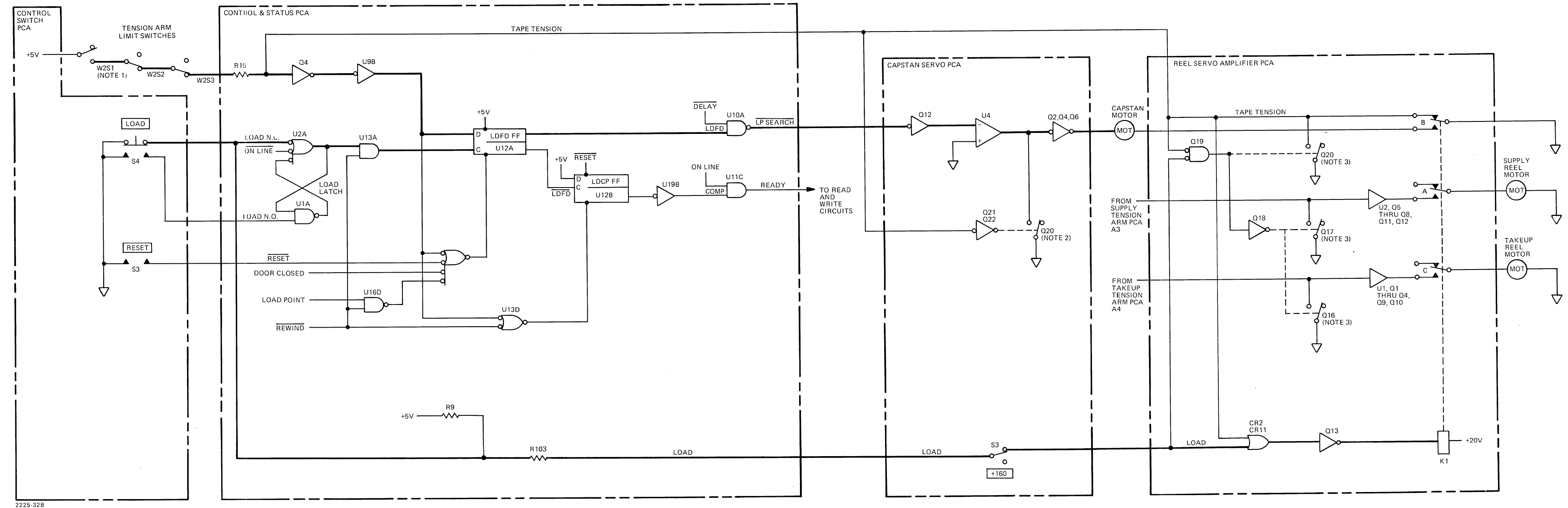
2-30. When the trailing edge of the load point tab is detected during rewind the Load Point flip-flop is set and the Rewind flip-flop is set through the rewind clock input (U6B-11). Load point also gates U3B to prevent rewind commands from clearing the Rewind flip-flop. With the Rewind flip-flop set, the Load Forward flip-flop is set through gate U13A. This starts the load point search mode.

2-31. The control and status printed-circuit assembly contains a unit select network that allows up to four units to be controlled by one interface. The network consists of a jumper (W1) and 5 connecting pins (OFF, 0, 1, 2, 3). The position of the jumper determines the unit to be selected by the interface. If the units connected to the interface are equipped with the unit select switch option, the jumper must be in the OFF position. With the jumper in the OFF position the select match circuitry of the control and status printed-circuit assembly is disabled. If the tape units are not equipped with the unit select switch option, the jumper must be connected to positions 0 through 3 depending upon unit designation.

2-32. The unit select command from the interface ($\overline{\text{CS0}}$, $\overline{\text{CS1}}$, $\overline{\text{CS2}}$ or $\overline{\text{CS3}}$) is gated with ON-LINE to generate SOLA and SOLB (selected and on-line). The SOLA condition allows status signals to be supplied to the interface. The SOLB condition is gated with COMP (load sequence completed) to generate EXT (external control). The EXT condition allows interface commands to be processed. The OFF-LINE command from the interface does not require the EXT condition. The OFF-LINE command is gated with the unit select command to clear the On-Line latch (U1D and U2B).

2-33. The Rewind command ($\overline{\text{REW}}$) from the interface is gated with EXT to clear (assert) the Rewind flip-flop (U6B), provided that tape is not at load point. The forward, reverse, and high-speed ($\overline{\text{FWD}}$, $\overline{\text{REV}}$ and $\overline{\text{HIGH SPEED}}$) are gated to provide motion commands to the tape transport servos and data circuits.

2-34. All status signals to the interface are gated with SOLA. The load point status ($\overline{\text{SLP}}$) indicates that the tape unit is at load point (load point tab under photosense head). The end-of-tape status ($\overline{\text{SET}}$) indicates that the tape is at or beyond the end-of-tape tab. The rewind status ($\overline{\text{SRW}}$) indicates that the tape is rewinding or in an automatic load point search operation. The ready status ($\overline{\text{SR}}$) indicates that the tape unit is selected, on-line, and that the load sequence is complete (not rewinding and not in a load point search mode). The on-line status ($\overline{\text{SL}}$) and file protect status ($\overline{\text{SFP}}$) indicate that the unit is on-line, and that the tape reel installed on the supply reel hub is not equipped with a write enable ring.



- NOTES:
1. WHEN THERE IS NO TAPE TENSION, SWITCH W2S1 IS HELD OPEN, AS SHOWN, BY UPPER TENSION ARM.
 2. SWITCH Q20 ON THE CAPSTAN SERVO PCA, CLOSES WHENEVER THE TAPE TENSION SIGNAL IS INACTIVE (GND OR OPEN CIRCUIT).
 3. SWITCHES Q16, Q17, & Q20 ON THE REEL SERVO PCA, CLOSE WHENEVER BOTH THE LOAD & TAPE TENSION SIGNALS ARE SIMULTANEOUSLY INACTIVE (GND OR OPEN CIRCUIT).

Figure 2-3. Load Function, Simplified Logic Diagram

2-35. The one-second delay (generated on the power regulator printed-circuit assembly) following a high-speed reverse command prevents additional high speed commands from being processed by the control and status circuits. The delay also prevents the load point search from occurring for one-second following a rewind operation.

2-36. CAPSTAN SERVO CIRCUITS.

2-37. The capstan servo circuits control the speed and direction of tape motion across the magnetic head assembly. The capstan servo consists of a capstan motor/tachometer and a capstan servo printed-circuit assembly. The servo circuit employs current and velocity feedback. The velocity feedback is provided by the magnetic moving coil tachometer attached to the capstan motor shaft. Current feedback is provided by a pair of sensing resistors in the capstan motor return circuit. Figure 2-4 is a block diagram of the capstan servo circuit.

2-38. Motion commands from the control and status printed-circuit assembly control switching circuits and a bipolar ramp generator. The output of the ramp generator and high-speed control signals control the capstan closed-loop servo amplifier. The capstan servo amplifier consists of an integrated circuit servo preamplifier (U4) and a capstan power amplifier (Q1 through Q6).

2-39. The forward and reverse switching circuits contain temperature compensated zener diodes that provide a basic reference voltage for forward and reverse speeds. When a $\overline{\text{FWD}}$ command from the control and status circuits of FWD service switch S2 is placed in the on position (up), Q7 is reverse biased. Bias current for CR6 is then provided through R33 to establish a -6.2 volt reference for the ramp generator (U2 and U3). A $\overline{\text{REV}}$ command or placing the REV service switch in the on position (up) will provide bias current for CR2 through R27. CR2 will provide a $+6.2$ volt reference for the ramp generator. The forward and reverse reference voltages at the output of U3 are independently adjustable to control the forward or reverse speeds.

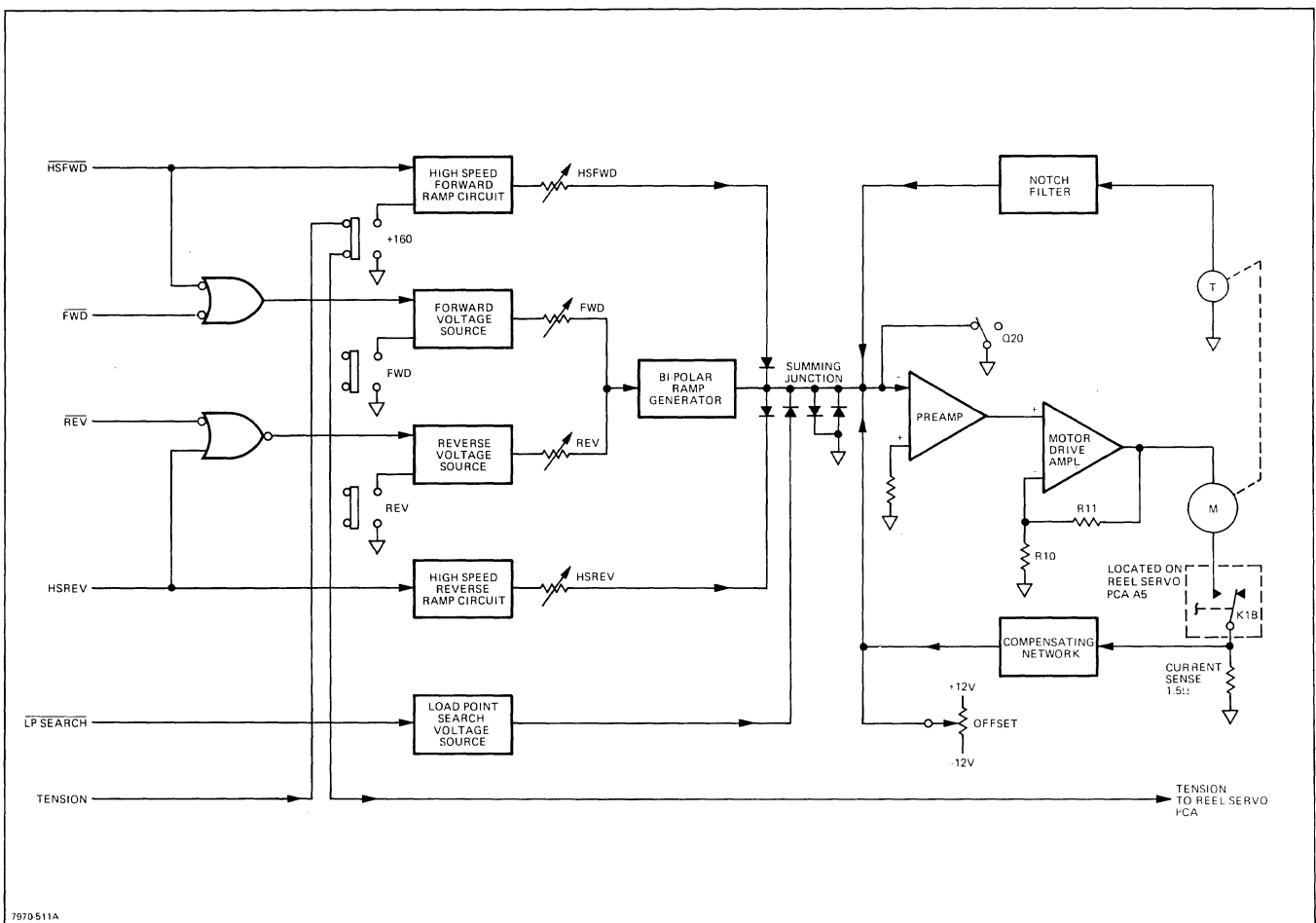


Figure 2-4. Capstan Servo, Block Diagram

2-40. The bi-polar ramp generator consists of two integrated circuit operational amplifiers (U2 and U3), a symmetrical 8-volt clipping network (CR7 through CR11), and a ramp control network (R42/C28).

2-41. Operational amplifier U2 initially operates as a saturating comparator when a forward or reverse command is given or removed. Near the end of a ramp-up or ramp-down U2 changes from a saturating comparator to a linear amplifier with the non-inverting input at 0-volts.

2-42. The output of U2 is held to 8 volts by a symmetrical clipping network (CR7 through CR11) which establishes current for the ramp control network. The slope of the ramp is determined by the current through R42 (RAMP control) into integrating capacitor C28. Feedback through R66 nulls the reference input voltage to U2 and the output voltage of the ramp generator (U3-6) is held steady by the ratio determined by R66 (R35 + R34) or R66 (R29 + R28).

2-43. When the Forward or Reverse command is removed, the current through R66 drives operational amplifier U2 into saturation and the ramp integrates the 0 volts. As the output of the ramp generator (U3-6) approaches 0 volts, U2 reverts to a linear amplifier and the output of the ramp generator is maintained at 0 volts.

2-44. A High-Speed Forward command (HSFWD) from the control and status circuits or placing the +160 service switch in the on position (up) will allow CR12 and CR13 to conduct and reverse bias Q8. With Q8 reverse biased, C25 is charged through R49. The exponential voltage at the base of Q9 rises to +12 volts but is clipped at +6 volts when Q9 saturates. When the HSFWD command is removed or the +160 service switch is placed in the off position (down), U1B conducts placing U1B-4, CR12, and CR13 at 0 volts. This allows Q8 to conduct and C25 discharges through R48. The threshold caused by the base emitter turn-on voltage of Q9 and the diode drop across CR14 results in a delay of approximately 100 ms before motion starts or stops.

2-45. A High-Speed Reverse command (HSREV) or placing the -160 service switch in the on position, (up) will cause the high-speed reverse ramp circuit to function the same as the high-speed forward ramp circuit, except that voltage polarities are reversed. Capacitor C26 is charged through R56 and discharged through R54 and R55.

2-46. The LOAD command from the control and status circuits does not control a ramp circuit. The load switch of the capstan servo is a single step input to the capstan servo amplifier resulting in a nominal 20 ips tape motion.

2-47. The outputs of the bi-polar ramp generator, high-speed forward ramp generator, high-speed reverse ramp generator and load switch form a summing junction at the input of the capstan servo preamplifier (U4). Diodes CR17 and CR18 provide clipping to protect the amplifier from overload. The preamplifier drives the capstan motor power amplifier (Q1 through Q6). The dc gain of the power amplifier

is 10 volts per volt determined by R10 and R11. The power amplifier is operated in class B with Q6 providing negative current for forward motion and Q5 providing positive current for reverse motion.

2-48. A notch filter in the velocity feedback circuit from the tachometer is selected to attenuate the mechanical response of the motor-tachometer combination. A compensating network in the current feedback circuit is also selected depending upon synchronous speed of the tape unit.

2-49. Transistor switch Q22 senses the presence of tape tension. While the tape is tensioned, Q22 is on, keeping switch Q20 off. However, when tension is lost Q22 turns off, allowing Q20 to turn on and switch the input of motor drive amplifiers Q2, Q4, and Q6 to ground. This disables the capstan servo. The capstan motor circuit is completed through the B contacts of relay K1 on the reel servo amplifier PCA when K1 is energized. Relay K1 is energized when the LOAD push-button is pressed. Once energized, it remains energized until tension is removed.

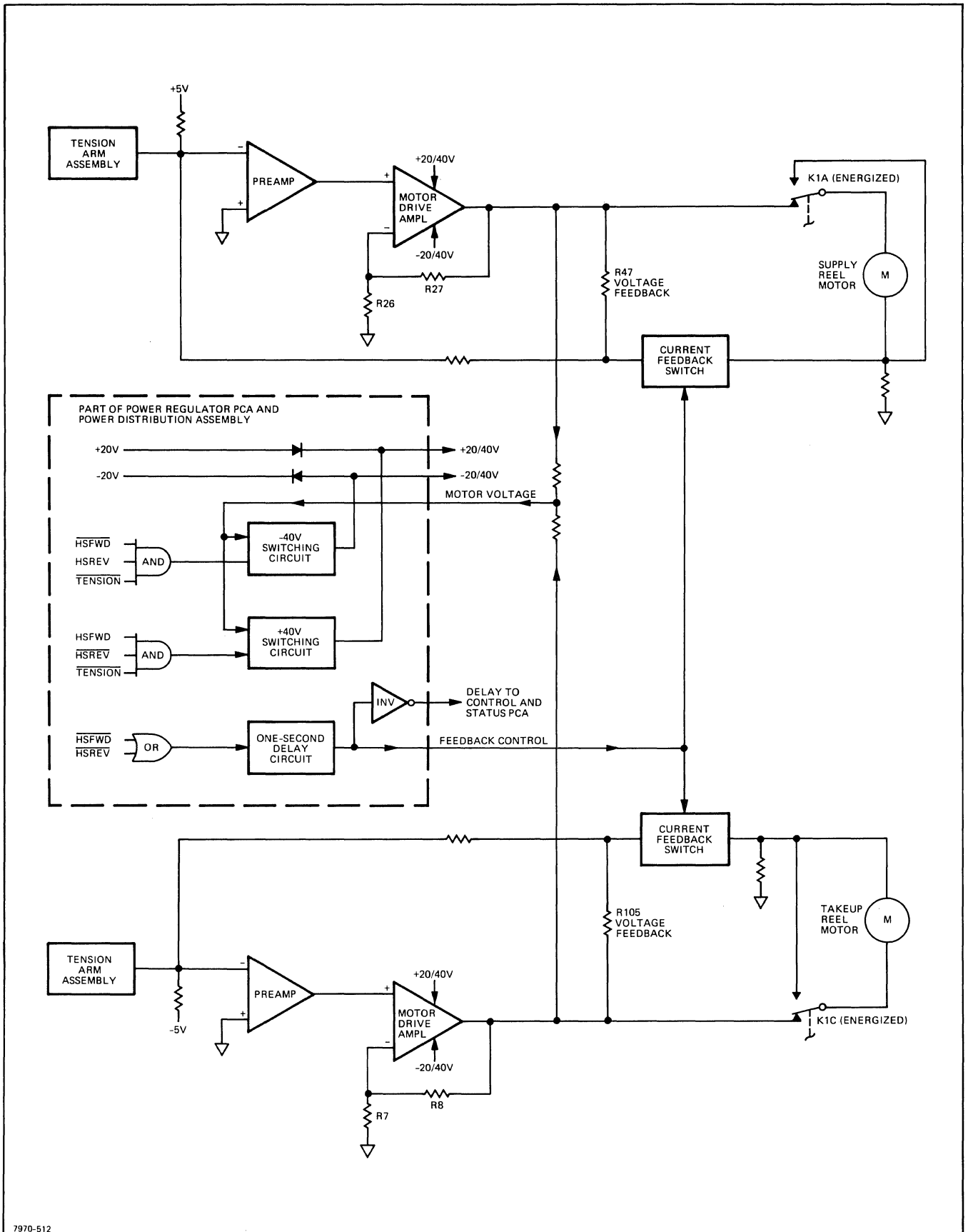
2-50. REEL SERVO CIRCUITS.

2-51. The reel servo circuits consist of a tension circuit, a voltage switching circuit, a delay circuit, voltage/current feedback switches, tension arm photosense circuits, preamplifiers, motor power amplifiers, and reel motors. Figure 2-5 is a block diagram of the reel servo circuit.

2-52. At initial power-on, the tension circuit is disabled. The normally closed contacts of LOAD pushbutton switch prevent Q13 of the tension circuit from conducting. Pressing the LOAD control allows Q13 to conduct, energizing relay K1. With K1 energized, the capstan and reel servo motor circuits are completed. As tape is tensioned and the tension arms swing away from the limit switches, power through the limit switches maintain a forward bias of Q13. When power is removed, or tape tension is lost, the relay contacts short across the reel motor windings to provide dynamic breaking.

2-53. The voltage switching circuit is located on the power regulator printed-circuit assembly. During a high-speed operation forward or reverse, power to the motor power amplifiers is switched from 22.5 volts to 57.5 volts (nominal).

2-54. During a high-speed reverse operation (rewind), the HSREV command from the control and status circuits is gated with TENSION. When both reel motors approach full r/min, the motor voltage exceeds the break-down voltage of CR4. The condition established by the gating of HSREV and Tension allows current through CR4 to forward bias Q5. Voltage switch Q6/Q7 conducts placing +57.5 volts on the +20/40 line. Diode CR2 on the power distribution printed-circuit assembly is back-biased preventing +57.5 volts from entering the +20 volts line.



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Figure 2-5. Reel Servo, Block Diagram

2-55. During a high-speed forward operation, the voltage switching circuits function the same as in the fast reverse operation. $\overline{\text{HSFWD}}$ is gated with tension to allow motor voltage to switch the -40 volt switch (Q12/Q13).

2-56. The delay circuit is located on the power regulator printed-circuit assembly. The delay circuit provides an additional one-second delay following the end of a high-speed command. The one-second delay prevents further high-speed commands from the interface from being processed during the one-second period. The one-second delay is also used to switch the reel servo operating mode from voltage feedback to current feedback. The additional one-second following a high speed operation allows the reel servo to operate in a current feedback mode until reels are slowed.

2-57. During normal operation, U5A-3 and U5B-4 rest at 0 volts. A $\overline{\text{HSFWD}}$ or $\overline{\text{HSREV}}$ command from the control and status circuits will cut-off U5A or U5B and base current for Q15 is supplied through R28 or R29. When Q15 conducts, capacitor C8 immediately discharges through Q15 causing Q16 and Q18 to be cut-off. Feedback control to the reel servo changes from approximately +8 volts to approximately -8 volts. The negative potential also reverse biases Q17 and the DELAY line switches to +5 volts.

2-58. When the high-speed command ($\overline{\text{HSFWD}}$ or $\overline{\text{HSREV}}$) is removed and Q15 loses base current, capacitor

C8 is then charged through R33 (one-second time constant). When C8 is charged to +5V, Q16 and Q18 conduct and the feedback control changes from -8V to +8V. The DELAY switches to 0 volts.

2-59. The reel servo tension arm assemblies contain dual element photo-conductors that are illuminated by a lamp shining through a slotted disc. The slot is in the form of a spiral attached to the tension arm. As the arm moves, the slot exposes different areas of the photo-conductor. As a result, the output of the photo-conductor is proportional to the position of the tension arm.

2-60. The reel servo preamplifier is an integrated operational amplifier that amplifies the position error of the tension arm. The tension arm photo-conductor output is single-ended, therefore, an off-set is provided by R39 or R41. The preamplifier drives a class B motor drive amplifier. The motor power amplifier has a gain of 10 volts per volt.

2-61. When operating in a normal mode (synchronous or load speed), the servo operates with voltage feedback. The +8 volts from the feedback switching network (feedback control) back-biases the feedback FET switch (Q14 and Q15). Feedback is then provided through R47 and R105. During a high-speed operation, the feedback control changes to -8 volts. The feedback FET switch is forward biased and feedback is current through the switch.

SECTION III

PERFORMANCE CHECKOUT

3-1. INTRODUCTION.

3-2. This section provides checkout instructions to verify that the tape unit conforms to published performance specifications. The test procedure assumes that the following general conditions apply at all times unless specific instructions to the contrary are stated as part of a test routine.

3-3. TEST EQUIPMENT REQUIRED.

3-4. For the purpose of this procedure, it is presumed that the person conducting the test will be using either a computer or an off-line test set that is capable of meeting the following requirements. It is also presumed that operating instructions for the equipment is provided by documentation applicable to the equipment.

- a. Provides all standard functional commands.
- b. Responds to all status outputs.

3-5. An HP 13191A Control and Status Test Board is available as a service accessory and will meet the needs for all adjustments. Computer operation is also suitable. The following electronic test instruments (or equivalent) are also required:

- a. HP 140A Oscilloscope with HP 1421A Time Base Generator.
- b. HP 1421A Dual-Trace Preamplifier (for HP 140A).
- c. HP 5245L Counter with HP 5265A Digital Voltmeter Plug-In.

3-6. In addition to the listed test equipment, a transport test tape HP part number 5080-4525 that generates various signals for accurate speed measurements is required.

3-7. CHECKOUT PROCEDURES.

3-8. Performance checkout procedures for the tape unit consist of:

- a. Preliminary Power-Off Checks.
- b. Operator Control Checks.

c. Service Switches and Accessory Checks.

d. Tape Path Evaluation.

e. Power Supply Voltage Checks.

f. Tape Speed and Capstan Servo Checks.

g. Transport Function, Motion, and Status Checks.

3-9. PRELIMINARY POWER-OFF CHECKS.

3-10. Preliminary power-off checks are performed as follows:

a. Tape Rollers: The tape rollers must operate freely and have no end play.

b. Head Crosstalk Shield: The head crosstalk shield should operate freely and should have clearance between face of head and shield (room to slip a punched card thickness without binding).

c. Tension Arm Limit Switches: The three limit switches associated with the tension arms must operate when the arm is approximately 1/8 inch from the rubber stop. The roller on the switch arm should be approximately on the center of the arm when the arm is fully against the stop. There should be positive travel of the switch lever beyond the point at which it actuates the microswitch. The check can be made audibly if ambient noise level permits, or with an ohmmeter if room noise is too high.

d. Write Enable Sensing: The write enable sensing finger nominal location dimensions should be as follows:

- (1) The distance between the outside surface of the write enable sensing finger and the outside flange diameter of the reel turntable should be 3/32-inch (nominal).
- (2) In the file protected position (inoperative), the dimension between the outer tip of the sensing finger and the outer face of the reel turntable should be 3/16-inch (nominal) above the turntable surface.
- (3) In the write enable position (with solenoid energized) the outer tip of the sensing finger should be 1/16-inch below the turntable surface.
- (4) The sensing finger must not touch the turntable under any condition.

e. Reel Retaining Knob: With the locking lever released, the reel should slip over the rubber grip ring easily, and it should be possible to easily rotate the reel. When the lever is closed, positive resistance should be felt as the rubber is compressed. In the locked position, it should not be possible to move the reel by hand. If slippage is suspected, place a piece of masking tape on the reel, and another on the hub. A mark placed in alignment on both pieces of tape should not become misaligned by more than 1/8 inch in 16 hours of operation. To correct tape reel slippage, release locking lever and loosen the pozidrive screw, rotate the reel retainer knob clockwise, and tighten the screw. Repeat until tape reel mounts firmly and does not slip.

3-11. OPERATOR CONTROL CHECKS.

3-12. Verify position of 115/230 volt selector switch; connect unit to appropriate power source and check the following operating modes.

3-13. TAPE LOADING AND WRITE ENABLE. Place a reel of tape (with write enable ring) on unit and thread with the power switch on. After threading tape, press LOAD and verify that the following takes place.

a. Tape tension is established. RESET indicator illuminates.

b. WRITE ENABLE indicator illuminates.

c. Tape moves forward at 20 ips to load point tab (BOT tab).

d. LOAD indicator illuminates.

3-14. ON-LINE TRANSFER AND RESET. Place the control and status PC assembly unit select jumper in the OFF pin (this is not the same as OFF on unit select option) and load tape. Following completion of a load sequence with tape positioned at load point (LOAD indicator on), press ON-LINE and verify that unit will respond to external commands. Pressing ON-LINE while load point search is in process will also result in ON-LINE operation upon completing the search (LOAD indicator is ON). While ON-LINE, the unit will not respond to local controls with the exception of RESET.

3-15. DYNAMIC BRAKING AND RECOVERY FROM POWER FAILURE. Place unit in rewind mode after tape is well into take-up reel. When full rewind speed is reached, turn power switch off to simulate power failure. Tape should stop without any damage to tape. Proceed with recovery to on-line status by following normal load sequence. Except that when tape unit goes into the load point search mode, load point tab may be simulated by pressing the RESET button. This can then be followed by an on-line command.

3-16. REWIND OPERATION. The REWIND control is operational only while the unit is in the reset state which permits local control. The rewind command will override

the load command and will return the tape to the load point position (LOAD indicator on with tape stopped). Rewind may be terminated prior to load point by pressing RESET. Transfer to on-line is also possible immediately following this sequence.

3-17. SERVICE SWITCHES AND ACCESSORY CHECKS.

3-18. There are three service switches incorporated in the capstan servo card. These together with the REWIND and LOAD controls provide a means of operating all five drive modes for service and/or adjustment purposes. There is no capability for cyclic drive operation.

3-19. The HP 13191A Control and Status Test Board is available for use with the tape unit. With this test board it is possible to completely adjust and verify the performance of the control and status function of a tape unit under off-line conditions. Complete operating details are included with the test board. The HP 13191A Control and Status Test Board provides normal drive modes as well as cyclic programming which is suitable for adjustment of the capstan start/stop ramp. The board also includes status indicator lamps to verify all normal status functions. The test board is installed in the connector of the tape unit control and status PCA.

3-20. TAPE PATH EVALUATION.

3-21. With undamaged tape threaded on the tape unit and with the unit in the appropriate operating mode, evaluate the following characteristics of the tape path.

a. Capstan Height: Capstan height should be such that the tape is guided equal distance in from the outer and inner edge of the capstan. The air escape grooves provide a means for judging.

b. Tension Position: Arms should be aligned with the centering marks on the rear of the casting. Position is acceptable provided the arm is not out of location by more than the diameter of the arm.

c. Tape Tracking Over the Tape Guides: Tracking over the guides should be smooth with no evidence of edge forces anywhere in the tape path. Transverse reflected light may be used to assist in judging. Light reflections across the 1/2-inch width of the tape should not be bent due to points of stress.

d. Photosense Position: Face of photosense head assembly should be parallel to the path of the tape and positioned 1/8 inch from the tape.

3-22. POWER SUPPLY VOLTAGE CHECKS.

3-23. Both regulated and unregulated supplies should be checked for the following specifications.

3-24. **REGULATED SUPPLY VOLTAGES.** Regulated voltages will remain within tolerances over a primary voltage range of ± 10 percent. DC voltages and tolerances are to be as specified below. The peak-to-peak ripple values are nominal and minor variances may be expected. Ripple is stated under tension-only conditions.

- a. The +5 volt supply must be $+5.000 \pm 0.050$ Vdc.
- b. The ± 12 volt supplies must be 12.000 ± 0.360 Vdc.

3-25. **UNREGULATED SUPPLY VOLTAGES.** Unregulated supply voltages are a direct function of line voltage. The following table of nominal values should be judged only at a line voltage of 115 volts. RMS ripple values are nominal and apply at 60 Hz.

- a. ± 40 Vdc: Nominal value is ± 57.5 volts; ripple of 150 mv p-p (sawtooth).
- b. +20 Vdc: Nominal value is +22.5 volts; ripple of 600 mv p-p (sawtooth).
- c. -20 Vdc: Nominal values is -22.5 volts; ripple of 300 mv p-p (sawtooth).
- d. +10 Vdc: Nominal value is +12 volts; ripple of 900 mv p-p (sawtooth).

3-26. **TAPE SPEED AND CAPSTAN SERVO CHECKS.**

3-27. The tape speed and capstan servo checks consist of measuring capstan motor offset current, measuring long term speed variation (tape units capable of reading data), measuring start and stop time and distance, measuring instantaneous speed variations, and measuring fast forward, reverse, start and stop. Included is a dynamic tape skew check for tape units equipped with read and write electronic circuits.

3-28. **CAPSTAN MOTOR OFFSET CURRENT.** Connect a suitable dc voltmeter or oscilloscope across the 3 ohm 1 percent resistor (R21 or R22). The return side of the resistors is connected to pin 2 of CJ-1. With the tape under tension but no tape motion, the voltage should not exceed the following referenced to 0 Vdc.

- a. Maximum acceptable operating limit: ± 100 mv dc at 25°C .
- b. Adjustment recommended if greater than: ± 80 mv dc.

3-29. **LONG TERM SPEED VARIATION.** Measure the tape speed accuracy over any interval greater than one second and under each of the five drive speeds. The principle of measurement requires that a tape having highly accurate

bit-to-bit distances be read, and that the output of the read preamplifier be connected to a suitable counter. HP part number 5080-4525 Transport Test Tape provides frequencies accurately spaced to better than 0.1 percent. For the following tests reference frequencies are based on using the signal that will be available from the channel 3 preamplifier of nine-track units and channel 6 preamplifier of seven-track units. This has a bit-to-bit spacing of 0.00150 inch and will produce a frequency of 10,000 Hz when reproduced at a tape speed of 30,000 ips. Frequencies for other speeds are in direct ratio to the change in speed relation to 30 ips. Example: 60 ips would produce 20,000 Hz. Use this principle and check the following:

a. High-Speed Forward: 160 ips, basic frequency is 53,333 Hz.

- (1) Maximum acceptable operating limit: ± 1050 Hz (± 2 percent).
- (2) Adjustment recommended if greater than: ± 800 Hz (± 1.5 percent).

b. Rewind (High-Speed Reverse): Checked identically to the limits applicable to high-speed forward, except that the rewind mode is used.

c. Forward and Reverse Drive: Frequency depends on tape speed and must be calculated for speeds other than 25 ips and 37.5 ips which are tabulated below. Maximum acceptable operating limit is based on ± 1 percent with adjustment recommended if speed error is +0.8 percent or greater.

- (1) The 25 ips drive nominal frequency is 8,333 Hz. Acceptable limits are ± 83 Hz; adjustment is required if greater than ± 65 Hz.
- (2) The 37.5 ips drive nominal frequency is 12,500 Hz. Acceptable limits are ± 125 Hz; adjustment is recommended if greater than ± 100 Hz.

d. Load Point Search: 20 ips; basic frequency is 6,667 Hz.

- (1) Maximum acceptable limit is ± 1330 Hz (± 20 percent).
- (2) No adjustment is provided.

3-30. **START MEASUREMENT.** Start measurements (both forward and reverse) are made as follows. Measurement of the characteristics defined requires that the tape unit be driven with commands that are adjustable to periods greater than the specified start/stop times and that there be a provision to synchronize an oscilloscope sweep directly from these commands (both start and stop). The tape to be read may be any previously recorded tape, preferably at 800 cpi, as this provides the best resolution where measurements from preamplifier outputs are required. Wavelength

accuracy is not a factor in this test. Do not make measurements during read-after write operation.

Note

The definitions apply for both forward and reverse directions. The capstan tachometer voltage will reverse polarity when direction is changed; however, there will be no observable difference in the preamplifier output waveforms.

a. **Start-Ramp Delay Time:** The time (following a start command) required for the capstan tachometer voltage to reach a value that is greater than 0 Vdc but less than 3 percent of the value reached at normal drive speed. Specification is 0.5 ± 0.5 ms.

b. **Start-Ramp 100 Percent Time:** The time (following a start command) required for the analog output of any preamplifier track to first reach 100 percent of the peak-to-peak (or 0-to-peak) value established while reading an all "1's" tape under steady state drive conditions. This is a function of tape speed; the following limits apply with the capstan ramp adjustment being made during the forward start mode only.

- (1) The 25 ips start-ramp 100 percent time should be 14.5 ± 0.2 ms for forward ramp, ± 0.3 ms for reverse ramp.
- (2) The 37.5 ips start-ramp 100 percent time should be 9.5 ± 0.2 ms for forward ramp, ± 0.3 ms for reverse ramp.

3-31. **START DISTANCE.** Start distance is calculated as follows. Measurement of the characteristics defined requires that the tape unit be driven with commands that are adjustable to periods greater than the specified start/stop times and that there be a provision to synchronize an oscilloscope directly from these commands (both start and stop). The tape to be read may be any previously recorded tape, preferably at 800 cpi as this provides the best resolution where measurements from preamplifier outputs are required. Wavelength accuracy is not a factor in this test. Do not make measurements during the read-after-write operation.

Note

The definitions apply for both forward and reverse directions. The capstan tachometer voltage will reverse polarity when direction is changed; however, there will be no observable difference in the preamplifier output waveforms.

a. **Start-Ramp Time:** This is the time required to accelerate the tape from zero ips to the drive speed. It is determined by subtracting the start delay time (measured) from the start-ramp 100 percent time (also measured).

b. **Start Balance Time:** This is the time difference between the start-ramp 100 percent time and the specified start time for the tape speed involved. This period of time is allowed to provide a balance in tape distance as it offsets the time delay at full drive speed represented by the stop-ramp delay time.

c. **One-half of the start-ramp time plus the start balance time (both in milliseconds) multiplied by the tape speed in inches per second equals the start distance (in inches $\times 10^{-3}$).** Specifications 0.187 ± 0.020 inch.

3-32. **STOP MEASUREMENT.** Stop measurements (both forward and reverse) are made as follows:

a. **Stop-Ramp Delay Time:** The time (following a stop command) required for the analog output of any preamplifier to fall to a peak-to-peak (or 0-to-peak) value that is less than 100 percent but greater than 97 percent of the value established under steady-state drive conditions while reading in all "1's" tape. Specification is 0.5 ± 0.5 ms.

b. **Stop-Ramp 100 Percent Time:** The time (following a stop command) required for the capstan tachometer voltage to reach a level between 3 percent of normal drive speed value and 0 Vdc. Specification is a function of tape speed and must not exceed a time that is at least 0.2 ms less than the specified stop time for the tape speed involved.

3-33. **STOP DISTANCE.** Stop distance is calculated as follows:

a. Determine stop-ramp delay time.

b. **Determine Stop-Ramp Time:** This is the time required to decelerate the tape to zero ips from the drive speed. It is determined by subtracting the stop-ramp delay time (measured) from the stop-ramp 100 percent time (also measured).

c. **The stop-ramp delay time plus one-half the stop ramp time (both in milliseconds) multiplied by the tape speed in inches per second equals the stop distance (in inches $\times 10^{-3}$).** Specification is 0.187 ± 0.020 inch.

3-34. **INSTANTANEOUS SPEED VARIATION.** Instantaneous speed variation is a measurement of the short term departure of the tape velocity from its long term average speed. Measurement is made as follows:

a. Write a length of all "1's" tape at 800 cpi and rewind as required to be in position to reproduce this section of tape.

b. Connect oscilloscope to any convenient preamplifier output, position so that waveform is centered on screen, and adjust main sweep sync for positive slope and to trigger at the zero crossover.

c. Use the delayed sweep feature to position the delayed sweep at the next zero axis crossover (this corresponds to one bit-to-bit distance) with the delayed sweep auto triggered from a main (delaying) sweep.

d. Adjust delayed sweep rate to permit good resolution of the time shift band at the zero axis crossover. During this evaluation the vertical gain and the delaying sweep time may be adjusted to optimize the resolution. If the correct point is being observed, it will be the waveform that is coming from top left of screen to bottom right with the slope depending on the gain and delayed sweep speed.

e. Observe the jitter band under conditions in step "d" in microseconds peak-to-peak time displacement and multiply by tape speed to determine this distance in microinches. This value must not exceed the following limits which are based on ± 3 percent instantaneous speed variation:

- (1) 800 cpi must not exceed ± 37.5 microinches (75 microinches peak-to-peak).
- (2) 556 cpi must not exceed ± 54 microinches (108 microinches peak-to-peak).
- (3) 200 cpi must not exceed ± 150 microinches (300 microinches peak-to-peak).

Note

The above values apply to both the forward and reverse modes.

3-35. **DYNAMIC TAPE SKEW.** Dynamic tape skew is that variation in tape velocity which generates a differential time position between the two outermost tracks on the tape. Measurement is made as follows:

a. Write a length of all "1's" tape. Rewind as required to reproduce this section of tape.

b. Use dual-trace oscilloscope and connect to preamplifier output of the two outside tracks (channels 4 and 5). Use chopped mode (triggered by channel A) with the main sweep synchronized for positive slope triggered at zero axis crossover. (Use negative slope in reverse direction.)

c. Adjust both channel gains and positions to superimpose the two waveforms (amplitude only; there will be varying degrees of time difference due to static skew characteristics).

d. Use the delayed sweep feature to present the next (one bit-to-bit distance later) zero axis crossover on the delayed sweep. The delayed sweep must be on internal sync, triggered on the negative slope. (Use positive slope in reverse direction.) The earliest of the two tracks will sync the delayed sweep and the other will arrive later and will have jitter that represents the time differential in microseconds

peak-to-peak. Again gains must be adjusted as high as possible (both the same) and the delayed sweep trigger set for maximum stability of the stable waveform. There will be a considerable dead zone in the delaying sweep adjustment. Use the first operating position as the sweep is moved out from minimum delay position. There is no significance to the time differential between the stable and unstable waveforms. This does not represent static skew. The difference is a function of oscilloscope gain and position settings.

e. Measure the peak-to-peak time band of the unstable waveform as it crosses the zero axis. Convert this to microinches peak-to-peak for the tape speed involved. Worst case must not exceed ± 50 microinches (100 microinches peak-to-peak) and applies to forward or reverse mode.

3-36. **FAST FORWARD/REVERSE START/STOP CHARACTERISTIC.** Fast forward and fast reverse characteristics are measured by synchronizing an oscilloscope with the appropriate drive command, and observing the dc output of the tachometer using the TACH test point on the capstan servo printed-circuit assembly.

CAUTION

Do not issue sequential fast drive commands without allowing time to reach full speed or to return to zero speed. Failure to observe this precaution may cause excessive power dissipation in the reel servo amplifier circuitry. Minimum time between commands should be 1 second or the sum of the start and stop times (whichever is greater).

3-37. Fast forward/reverse start or stop times are measured by observing the time (following a start or stop command) required for the tachometer output to either reach its maximum value (for start time) or to fall to zero (for stop time). Nominal times are from 400 to 700 milliseconds. Typically, the value will be 600 milliseconds.

3-38. Fast forward/reverse start or stop distances are determined by the time required for the ramp to move from one state to the other. This time is nominally 500 milliseconds. One-half of this time multiplied by 160 ips equals the nominal start/stop distance of 40 inches.

3-39. **TRANSPORT FUNCTION, MOTION, AND STATUS CHECKS.**

3-40. The following checks cover the I/O lines in the status and motion command connector. Use appropriate off-line test equipment to verify proper performance as indicated.

3-41. **FUNCTION COMMANDS.** Select, \overline{CS} : The control and status PC assembly includes a jumper that can serve to establish unit identification where the front panel select

option is not present. If no select function is desired, the jumper can be placed in the off position which will permit response to controller commands, when unit is in on-line with load sequence completed, and is not rewinding. Verify the following conditions to check the select (\overline{CS}) line:

a. Unit responds to commands with jumper connected to OFF.

b. Unit responds to 0 through 3 positions when corresponding $\overline{CS0}$ through $\overline{CS3}$ is selected by the controlling device.

c. When front panel select option is included, place internal jumper in the off position and verify that response to pushbuttons 0 through 3 is same as in step "b" above. When the front panel OFF pushbutton is pressed, unit must not respond to any commands from the controlling device.

3-42. Verify that the off-line (\overline{CL}) line clears the write condition and returns the selected tape unit to the reset condition.

3-43. MOTION COMMANDS. Verify that the following external commands will place the selected and on-line tape unit in the corresponding drive mode:

a. Forward (\overline{CF}): Tape drives forward.

b. Reverse (\overline{CR}): Tape drives reverse then stops at load point tab.

c. Rewind (\overline{CRW}): Tape unit enters rewind mode, remains on-line.

d. High Speed (\overline{CH}): Tape unit will respond only when this is combined with either a forward or reverse command. When so combined, tape will drive at 160 ips speed. \overline{CH} with \overline{CR} will drive reverse past load point.

CAUTION

Do not issue sequential fast drive commands without allowing time to reach full speed or to return to zero speed. Failure to observe this precaution may cause excessive power dissipation in the reel servo amplifier circuitry. Minimum time between commands should be 1 second or the sum of the start and stop times (whichever is greater).

3-44. STATUS OUTPUTS. Verify that the following status outputs are true (low assertion) when a selected and ready tape unit is in the condition indicated.

a. On-Line (\overline{SL}): True when selected tape unit has been manually placed on-line.

b. Ready (\overline{SR}): True when selected unit is on-line, tape loading cycle is completed, and tape unit is not in rewind mode.

c. Load Point (\overline{SLP}): True when selected tape unit has tape positioned at the load point reflective strip.

d. Density ($\overline{SD2}$, $\overline{SD5}$, or $\overline{SD8}$): Verify that selected tape unit will display the density selected by the tape unit density switch if this option is present. Without this option, the tape unit will be set at 800 cpi but there will be no $\overline{SD8}$ output.

e. Rewind (\overline{SRW}): Verify that this status remains true as long as the selected unit is in the rewind mode. Must remain true until tape is repositioned at load point tab.

f. File Protect (\overline{SFP}): True when selected unit is not write-enabled.

g. End-of-Tape (\overline{EOT}): True when selected unit has moved end-of-tape tab beyond photosense head. Will remain true until tab again passes photosense head in the reverse direction.

SECTION IV

REPAIR AND REPLACEMENT

4-1. INTRODUCTION.

4-2. This section provides repair and replacement procedures for the tape transport of the HP 7970B/7970C Digital Magnetic Tape Units.

4-3. REPAIR.

4-4. The etched printed-circuit assemblies (PCA's) used are of the plated-through type consisting of metal bonded to both sides of an insulating material. The metallic conductors are extended through the component holes by a plating process. Soldering can be performed on either side of the PCA with equally good results. Table 4-1 lists recommended tools and materials for use in repairing etched PCA's. The following are recommendations and precautions pertinent to PCA repair work.

a. Avoid unnecessary component substitution; it can result in damage to the PCA circuit board and/or adjacent components.

b. Do not use a high-power soldering iron. Excessive heat may lift a conductor or damage the board.

CAUTION

Do not use a sharp metal object such as an awl or twist drill to remove solder. Sharp objects may damage the plated-through conductor.

c. Use a suction device (table 4-1) or wooden toothpick to remove solder from component mounting holes.

d. After soldering, remove excess flux from the solder areas and apply a protective coating to prevent contamination and corrosion.

Table 4-1. Printed-Circuit Assembly Repair Equipment

ITEM	USE	DESCRIPTION	RECOMMENDED MODEL
Soldering Tool	Soldering and unsoldering	Wattage rating: 47-1/2 to 56-1/2W Tip Temp: 850° to 900°F	Ungar #776 Handle with Ungar #4037 Heating Unit*
Soldering Tip*	Soldering and unsoldering	Shape: pointed	Ungar #PL111*
Suction Device	Removes molten solder from connection		Soldapullt by Edsyn Co., Arleta, California
Resin (Flux) Solvent	Removes excess flux from soldered area before application of protective coating	Must not dissolve etched circuit base board material or conductor bonding agent	Freon Aceton Lacquer Thinner Isopropyl Alcohol (100% dry)
Solder	Component replacement, printed-circuit board repair, and wiring connections	Resin (flux) core, high tin content (60/40 tin/lead), 18 gauge (SWG) preferred	
Protective Coating	Contamination and corrosion protection	Good electrical insulation, corrosion-prevention properties	Krylon R** #1302 Humiseal Protective Coating, Type 1B12 by Columbia Technical Corp., Woodside 77, New York

* For working on etched boards; for general purpose work, use Ungar #1237 Heating Unit (37.5W, tip temp of 750° to 800°F) and Ungar #PL113 1/8-inch chisel tip.

** Kryton, Inc., Norristown, Pennsylvania

4-5. The following procedures are recommended when component replacement is necessary.

- a. Remove defective component from board.
- b. If component was unsoldered, remove solder from mounting holes with a suction device (table 4-1) or a wooden toothpick.
- c. Shape the leads of replacement component to match mounting hole spacing.
- d. Insert component leads into mounting holes and position component as original was positioned. Do not force leads into mounting holes; sharp lead ends may damage plated-through conductor.

Note

Although not recommended when both sides of the PCA are accessible, axial lead components such as resistors and tubular capacitors can be replaced without soldering. Clip ends of defective component near body. Straighten leads left in board. Wrap leads of replacement component one turn around original leads. Solder wrapped connection and clip off excess leads.

4-6. REPLACEMENT.

4-7. The 7970B/7970C is of modular design. All major transport assemblies are easily accessible for repair or replacement. The following paragraphs describe replacement of critical transport assemblies. Refer to section VI for detailed views of mechanical assemblies.

4-8. TAPE ROLLER AND BEARING ASSEMBLY.

4-9. The tape rollers are precision referenced to a step on the mounting shaft. The bearings are very critical to preloading. When replacing the tape roller and bearing assemblies refer to section V for adjustment procedures to properly preload the bearings.

4-10. CAPSTAN (10 - 37.5 IPS UNITS ONLY).

4-11. The capstan replacement requires that the capstan motor assembly be removed from the transport. The position of the capstan is referenced to the mounting surface of the capstan motor assembly. The following procedures describe capstan replacement.

- a. Disconnect capstan motor and tachometer connectors from capstan servo printed-circuit assembly.
- b. Remove four socket-head screws securing the capstan motor assembly to the transport casting.

- c. Loosen two socket-head set-screws holding the capstan to the motor shaft and remove capstan.

- d. Place the capstan on the motor shaft and using a scale with 1/64-inch graduations, position the front edge (top) of the capstan 1-1/32 ($\pm 1/64$) inch from the motor mounting surface. (See figure 4-1.)

- e. Tighten capstan set-screws and reinstall capstan motor assembly.

- f. Reconnect capstan motor and tachometer connectors to capstan servo printed-circuit assembly.

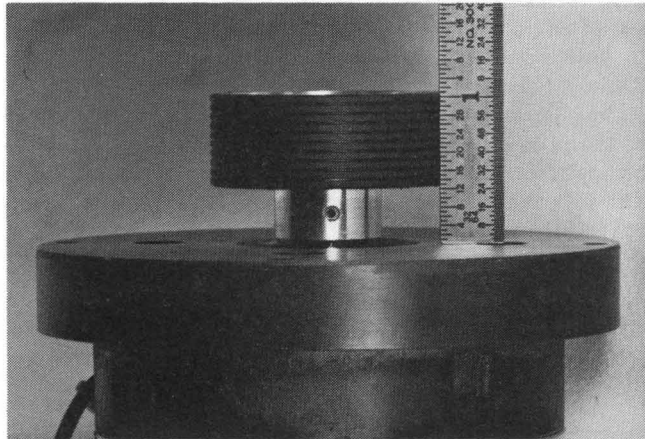


Figure 4-1. Capstan Position

4-12. CAPSTAN (37.6 - 45 IPS UNITS ONLY).

4-13. The capstan replacement for 37.6 - 45 ips units is the same as the 10 - 37.5 ips units except that a single screw secures the capstan to the motor shaft. The capstan position on the shaft is not adjustable.

4-14. REEL HOLDDOWN ASSEMBLY.

4-15. The replacement of the reel holddown assembly is not critical; however, an adjustment of the reel retaining knob must be made to ensure that the tape reel mounts firmly and does not slip. Refer to section V for a description of the reel retaining knob adjustment.

4-16. TENSION ARM ASSEMBLY.

4-17. The replacement of the tension arm assembly is not critical; however, the tape rollers are critical to preloading. The following procedures describe replacing the tension arm assembly.

- a. Disconnect the tension arm photosense connector from the reel servo assembly.

b. Using retaining ring pliers, remove outer retaining ring holding tape roller to tension arm. (See figure 6-6.)

c. Note the positions of the shims and washers and remove the shims, washers, and tape roller from tension arm shaft.

d. Remove the tension arm spring.

e. Remove the three screws and washers that secure the tension arm to the transport casting.

f. Mount the new tension arm assembly and reassemble in reverse order of disassembly.

g. Perform adjustment procedures described in section V.

4-18. PHOTOSENSE ASSEMBLY.

4-19. The photosense assembly (EOT/BOT) position relative to the tape path is critical. The following procedures describe replacing the EOT/BOT photosense assembly.

a. Loosen (do not remove) the two screws that secure the photosense assembly to the transport housing.

b. Remove the photosense assembly from the housing.

c. Note the color-coding of the wires attached to the photosense assembly and remove the wires.

d. Strip and solder the wires to the new photosense assembly in the same positions noted in step "c."

e. Inspect the photosense insulator remaining on the transport. If the insulator is damaged, remove and replace with a new insulator (HP part number 07970-01176).

f. Place the new photosense assembly into position and tighten the screws just enough to allow the position of the photosense assembly to be shifted.

g. Thread a reel of tape on the transport and position the photosense assembly 1/8-inch from the tape. Ensure that the face of the assembly is parallel to the tape path.

h. Tighten the photosense mounting screws.

4-20. MAGNETIC HEAD ASSEMBLY.

4-21. The magnetic head assembly contains all critical tape path components. Use extreme care in handling the assembly. The following procedures describe replacing the magnetic head assembly.

a. Disconnect the magnetic head assembly connectors from the read preamplifier assembly and write interconnect assembly (units equipped with write data modules).

b. Remove the two screws that secure the read preamplifier assembly to the transport casting.

c. Position the read preamplifier assembly to allow access to the magnetic head assembly.

d. Remove the three hex-head screws that secure the magnetic head assembly to the transport casting.

e. Carefully remove the magnetic head assembly.

CAUTION

The magnetic head assembly contains all critical tape path elements. Do not allow the guides, cleaner, or head assemblies to contact the transport casting. Use extreme care in positioning the magnetic head assembly as not to scratch the head surface or misalign the tape path elements.

f. Carefully place the new head assembly into position and secure it to the transport casting with mounting hardware.

g. Replace the read preamplifier assembly and reconnect the magnetic head assembly connectors.

4-22. REEL SERVO PRINTED-CIRCUIT ASSEMBLY.

4-23. The reel servo printed-circuit assembly replacement is not critical; however, the mounting bracket of the assembly also serves as a heatsink. Prior to installing a new or repaired reel servo printed-circuit assembly, ensure that the transport mounting surface and the assembly mounting surface are well coated with a thermal-compound.

4-24. CAPSTAN SERVO PRINTED-CIRCUIT ASSEMBLY.

4-25. The capstan servo printed-circuit assembly replacement is not critical; however, the assembly contains a strapping network in the form of a dummy DIP connector. The position of this connector on the assembly is very critical. If the unit is operated with the connector removed or in the wrong position, damage to the unit may result. Refer to figure 7-10, Capstan Servo Assembly Schematic Diagram to determine correct position of the connector.

4-26. The mounting bracket of the capstan servo printed-circuit assembly also serves as a heatsink. Prior to installing a new or repaired capstan servo assembly, ensure that the transport mounting surface and the assembly mounting surface are well coated with a thermal compound.

SECTION V

ADJUSTMENT PROCEDURES

5-1. INTRODUCTION.

5-2. This section provides adjustment procedures for the tape transport of the HP 7970B/7970C Digital Magnetic Tape Units. The adjustment procedures consist of mechanical adjustments, power supply adjustments, capstan servo adjustments, and reel servo adjustments.

5-3. TEST EQUIPMENT REQUIRED.

5-4. The following test equipment or equipment with equivalent capacity is required to perform the adjustments.

a. A means of dynamically operating the tape unit at drive rates specified in the procedure. The HP 13191A Control and Status Test Board is available as a service accessory and will meet the needs for all adjustments. Computer operation is also suitable.

b. HP 140A Oscilloscope.

c. HP 1421A Time Base and Delay Generator (for HP 140A).

d. HP 1402A Dual-Trace Amplifier (for HP 140A).

e. HP 5245L Counter.

f. HP 5265A Digital Voltmeter Plug-In (for HP 5245L).

5-5. In addition to the listed test equipment, Transport Test Tape HP part number 5080-4525 is required.

5-6. MECHANICAL ADJUSTMENTS.

5-7. Transport mechanical adjustments consists of tape roller, reel servo arm, write enable switch, and reel retaining knob adjustments.

5-8. TAPE ROLLER.

5-9. All tape rollers are precision referenced to the step in the shaft on which they are mounted. Under no circumstances should any adjusting shims be placed between the inner bearing and this step. Shimming is done at the outer end of the roller. Assembly should consist of one shim next

to the bearing, then the preload washer, followed by shims to remove all end play. Proper preload will exist when there is one shim beyond the number required to just remove the end play. Shim thickness is 0.005 inch, nominal.

5-10. Tape roller loading is critical. Tape roller loading must be performed whenever the tape roller is dismantled or repaired. The exploded tape roller assembly is illustrated in figure 5-1. To obtain the proper tape roller loading, proceed as follows:

a. Assure that brass nut (figure 5-1, 8) is torqued to 5 inch-pounds.

b. Install assembly components as indicated in figure 5-1. Use Retaining Ring Pliers (Waldes 18-23; Industrial Retaining Ring Corp P100; or equivalent). Avoid distorting retaining ring.

c. Check tape roller bearing assembly (6) end-play. Add/remove flat washers (3 or 2) until end-play is just removed.

d. Spin bearing assembly and check for drag. The tape roller must spin freely. If the tape roller does not spin freely, loading is excessive; recheck end-play clearance.

5-11. TENSION ARM.

5-12. The tension arm adjustments consist of properly positioning the photosense assembly relative to the photosense mask and positioning the limit switches relative to the tension arm.

5-13. TENSION ARM PHOTOSENSE. This adjustment is critical. Adjust as required to assure that the tension arm photosense mask does not touch the photosense lamp and cell assembly. There should be a nominal clearance of 0.010 inch minimum between the cell and the outer side of the mask.

5-14. TENSION ARM LIMIT SWITCHES. The limit switch mounting bracket pivots on the screw that mounts the tension arm rubber stop. The hole for the adjacent screw is elongated to provide limit switch positioning adjustment; this screw locks the mounting bracket in position after completion of the adjustment. Mounting holes for the microswitch are also elongated, providing slight additional limit switch adjustment movement. To position the limit switch, rotate the bracket and/or adjust height position to achieve the following conditions:

a. When arm is fully against bumper, the roller on the microswitch should be approximately at the high point of the arm diameter without being over center.

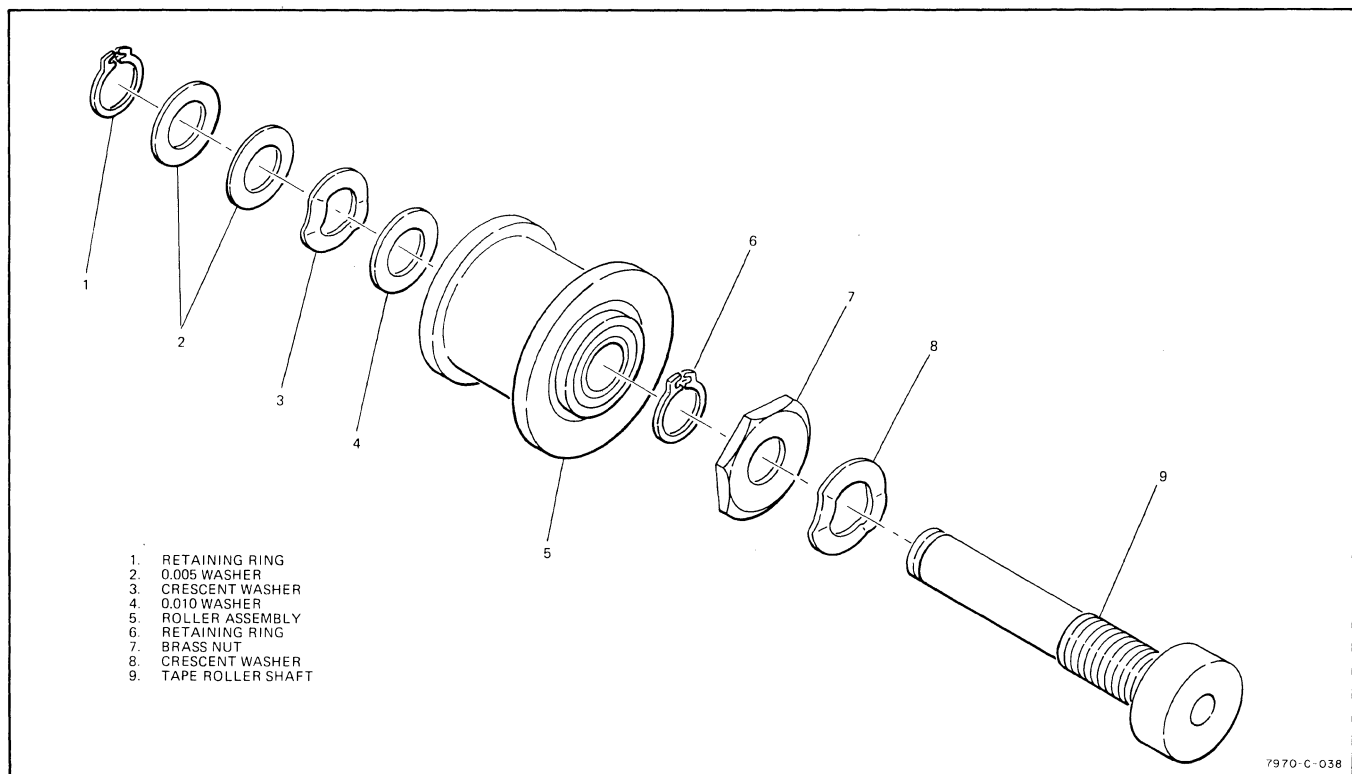


Figure 5-1. Tape Roller and Bearing Assembly, Exploded View

b. When the arm is within 1/8 inch of the bumper stop, the microswitch must operate. Also there must be further positive movement of the switch arm between the point at which the switch closes and the tension arm is in full stopped condition against the rubber bumper.

c. Verify that all screws are tight prior to final confirmation of "a" and "b." Repeat adjustment for all three limit switches. If background noise permits, switch operation can be checked audibly; otherwise connect a suitable ohmmeter across the switch terminals. If ohmmeter is used, verify that power is not applied to the tape unit.

5-15. WRITE ENABLE SWITCH.

5-16. The write enable switch must be positioned to assure clearance when operated with a reel that does not have the write enable ring installed (reel is file protected) and to assure both retraction and operating clearance when used with a reel that has the write enable ring installed. These conditions will be established when the proper dimensional relationships exist between the write enable sensing finger and the outer face of the reel turntable. To obtain these required dimensional relationships, perform the adjustment procedure in the order indicated. (See figure 5-2.)

a. Loosen switch S1 mounting screws.

b. Manually place the sensing finger even with the edge of the turntable. With power removed, adjust the position S1 until an audible click indicates that switch S1 is closed.

c. Tighten switch S1 mounting screws.

d. Apply power and manually place the sensing finger even with the turntable. Verify that the solenoid energizes and completely retracts the sensing finger.

e. Adjust the reel turntable flange diameter clearance as follows:

- (1) Loosen write enable assembly mounting screws.
- (2) Position the write enable assembly so that the sensing finger will clear the reel flange diameter throughout solenoid travel.
- (3) Tighten write enable assembly mounting screws.

5-17. REEL RETAINING KNOB.

5-18. This adjustment is made during manufacture but may require some correction during the life of the tape unit.

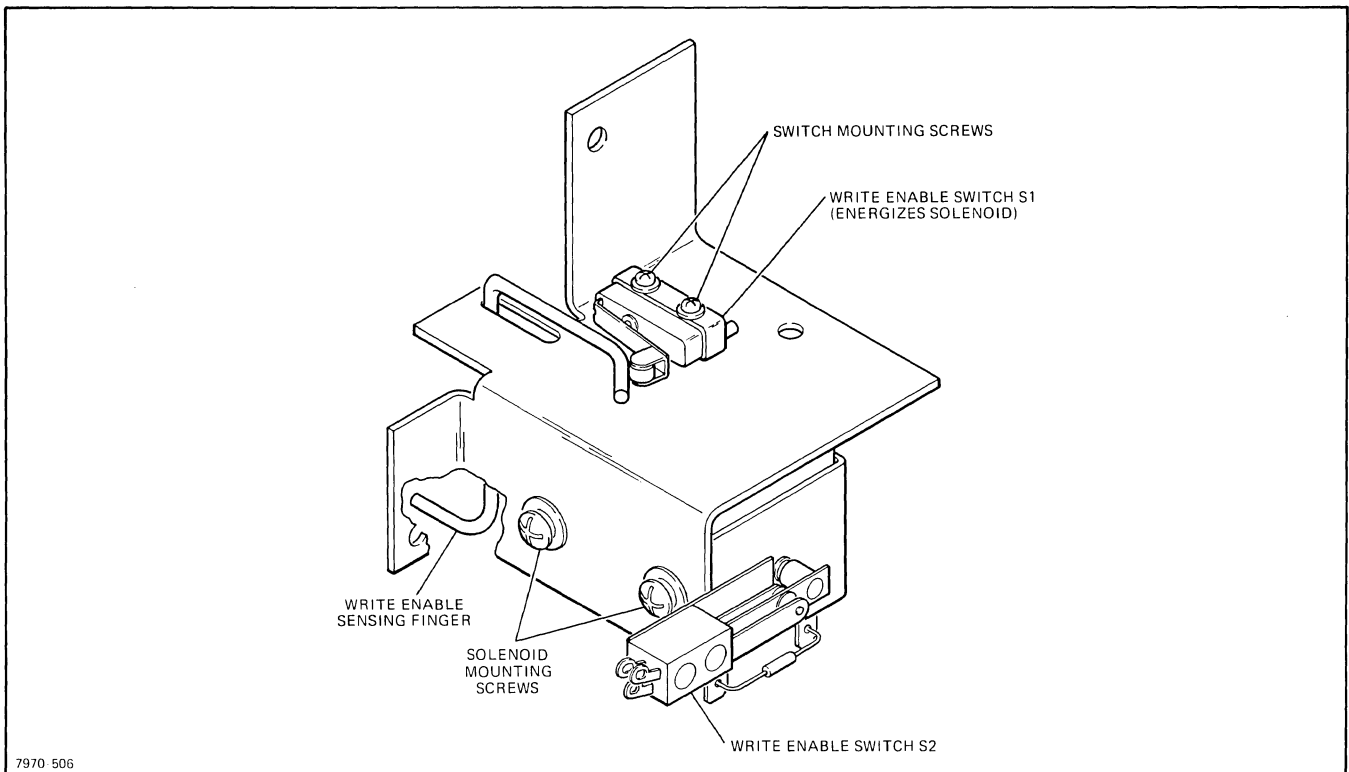


Figure 5-2. Write Enable Assembly

When the locking lever is working properly, it should be possible to place the reel over the rubber with a minimum of interference. When the locking lever is closed, positive resistance should be encountered as the rubber is compressed. In the locked position, it should not be possible to move the reel by hand. If slippage is suspected, place a piece of masking tape on the reel, another on the hub. A mark placed in alignment on both pieces of tape should not become misaligned by more than 1/8 inch in 16 hours of operation. To correct tape reel slippage, release locking lever and loosen the pozidrive screw, rotate the reel retainer knob clockwise, and tighten screw. Repeat until tape reel mounts firmly and does not slip.

5-19. ELECTRICAL ADJUSTMENTS.

5-20. The electrical adjustments of the tape unit are very critical and must be performed in the following sequence:

- a. Power supply adjustments.
- b. Capstan motor offset current adjustment.
- c. Capstan servo forward and reverse drive speed adjustments.
- d. Capstan servo high-speed forward adjustment.
- e. Capstan servo high-speed reverse adjustment.
- f. Capstan servo ramp slope adjustment.
- g. Reel servo adjustments.

5-21. POWER SUPPLY ADJUSTMENTS.

5-22. Only one adjustment is provided for the three regulated supplies. The adjustment control is located in the circuitry for the +12 volt supply but is adjusted to establish the value of the +5 volt supply, which is held to a tighter operating tolerance. The value of the +12 and -12 volt supplies is established by a precision resistor network. The control is located on the power regulator printed-circuit assembly. Voltage is correctly adjusted when the following conditions are met:

- a. $+5 \pm 0.050$ Vdc. (Adjust to ± 0.010 Vdc when adjustment is required.)
- b. $+12 \pm 0.360$ Vdc.
- c. -12 ± 0.360 Vdc.

Note

Final reel servo adjustments must be made after the capstan servo adjustments. The capstan speed must be within tolerance in order to properly adjust the reel servo. However, tension must be maintained in order to make the capstan servo adjustments. If the tape unit does not maintain tension, perform the reel servo adjustments initially, complete the capstan servo adjustments, and repeat the reel servo adjustments.

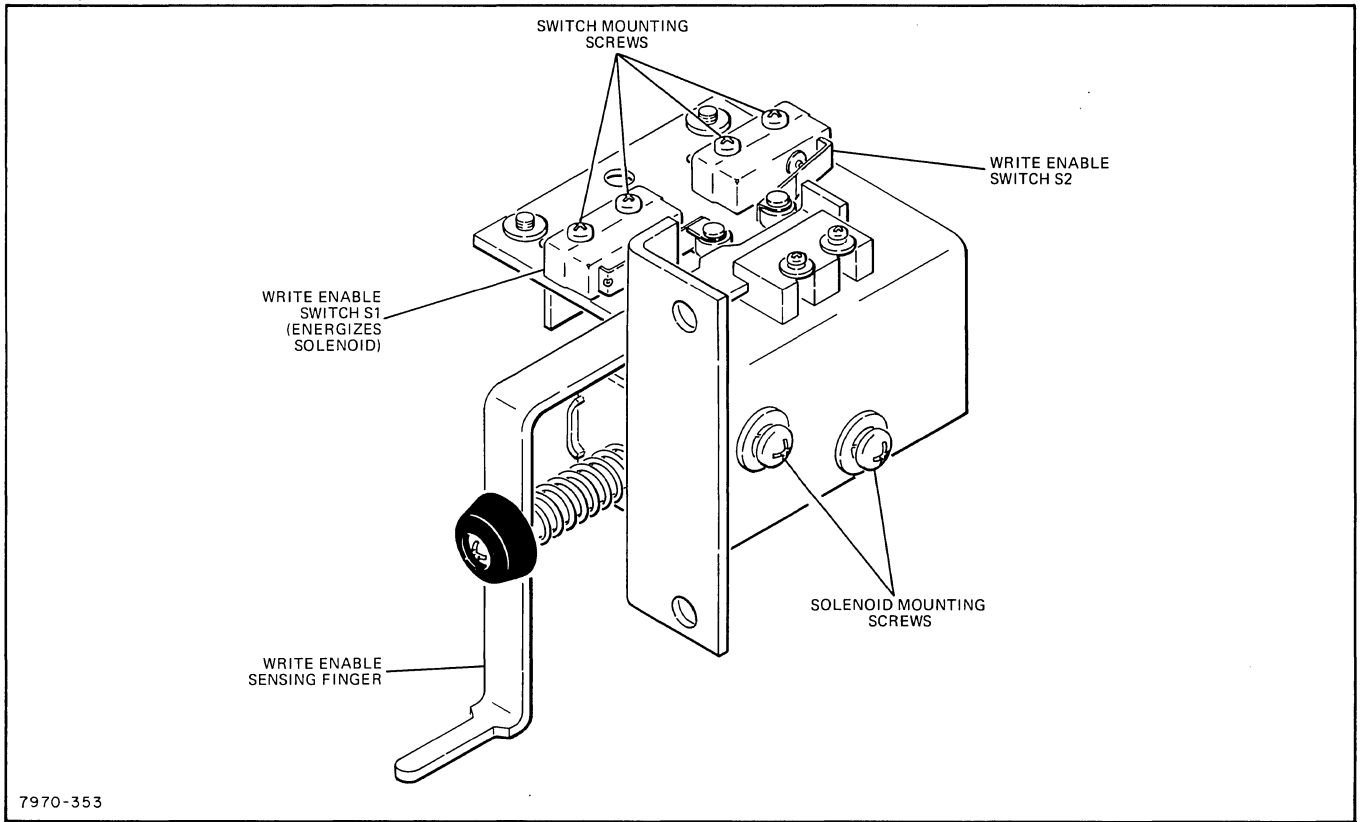


Figure 5-2. Write Enable Assembly

5-23. CAPSTAN MOTOR OFFSET CURRENT ADJUSTMENT.

5-24. Prior to making the capstan motor offset current adjustment, verify that the power supply voltages have been adjusted. Figure 5-3 shows the location of the capstan motor offset adjustment variable resistor.

5-25. Connect a suitable dc voltmeter (capable of resolution to ± 5 mv dc) across a 3-ohm resistor (R21 or R22) connected in series with the capstan motor. The common side of the resistance is associated with pin 2 of CJ1 and the high or motor side is associated with pin 2 of CJ2.

5-26. Load the tape transport and be sure tape is stopped. Adjust OFFSET control until voltmeter reading is minimum. An acceptable minimum is any value which is between +0.100 Vdc and -0.100 Vdc. Typical adjustment at room ambient temperature (25°C) will be in the order of ± 0.080 Vdc.

5-27. CAPSTAN SERVO FORWARD AND REVERSE DRIVE SPEED ADJUSTMENTS.

5-28. Prior to performing the servo forward and reverse drive speed adjustment, ensure that power supply voltages

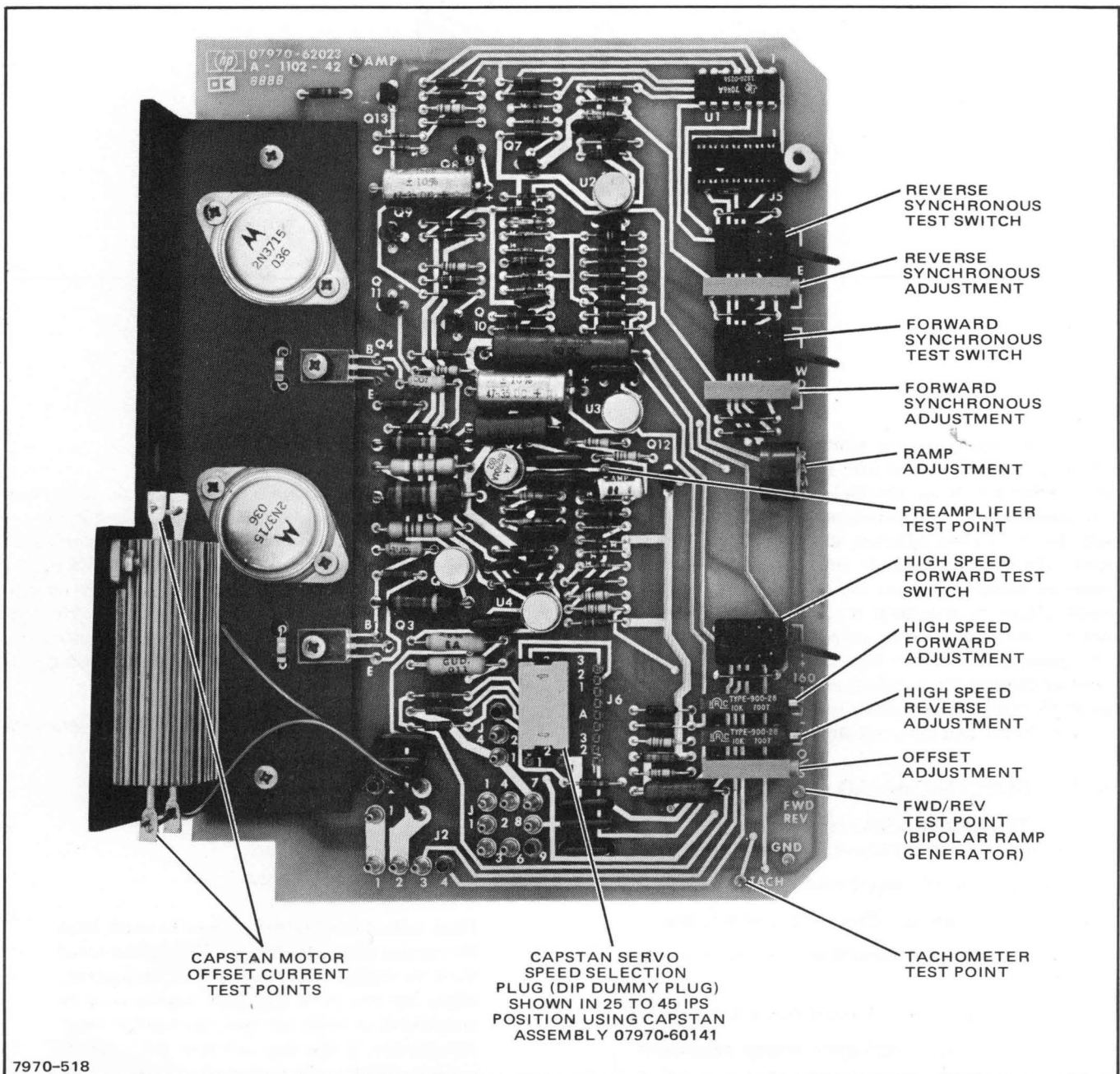


Figure 5-3. Capstan Servo PC Assembly, Test Points and Adjustments

and offset current are within tolerance. Figure 5-3 shows the location of service switches and forward and reverse drive adjustment potentiometers.

5-29. Accurate adjustment is based on reading (into a counter) data bits that have been recorded with high average accuracy. The 5080-4525 Test Tape has bit-to-bit accuracy of better than 0.1 percent when measured over 2000 bits or more. In using this tape, it is important to recognize that there are two data bits for each cycle counted when the counter is connected to the preamplifier analog output signal, and also that the frequency at other than the specified tape speeds may be calculated on a direct ratio basis. The signal used for the following adjustments appears in preamplifier channel 3 of nine-track units and preamplifier channel 6 of seven-track units. The test tape provides a signal of 10,000 Hz at a tape speed of 30 ips and has a bit-to-bit distance of 0.0015 inch.

a. Load test tape and place unit in forward drive mode using FWD service switch (S2).

b. Adjust the FWD synchronous control (R34) until counter indication is correct for the tape speed involved. The values for speeds of 25 ips and 37.5 ips will follow. Values for other speeds may be readily calculated by direct ratio to speed and application of the percentage tolerances indicated.

c. For 25 ips speeds, the counter indication should be $8,333 \pm 16$ Hz when adjustment is completed. No adjustment is necessary as long as counter indication is within ± 65 Hz.

d. For 37.5 ips speeds, the counter indication should be $12,500 \pm 25$ Hz. No adjustment is necessary if reading is within ± 100 Hz.

e. Repeat steps "a" and "b" with unit in reverse drive mode.

5-30. CAPSTAN SERVO HIGH-SPEED FORWARD ADJUSTMENT.

5-31. The high-speed forward adjustment principles and requirements are the same as the forward and reverse drive adjustment. Ensure that all previous adjustments are within tolerance.

a. Load the test tape on the transport and connect a counter to the appropriate channel preamplifier output.

b. Place unit in high-speed forward mode with the high-speed forward (+160) service switch (figure 5-3), and use the high-speed forward (+160) adjustment (R53) to adjust speed until counter indicates $53,333 \pm 100$ Hz. No adjustment is required if counter indicates between 52,533 and 54,133.

Note

If high-speed forward is required for seven-track tape units equipped with parity options and having normal drive speeds less than 15 ips, high-speed mode must not exceed a factor of 12 times the normal drive speed.

5-32. CAPSTAN SERVO HIGH-SPEED REVERSE ADJUSTMENT.

5-33. The high-speed reverse adjustment is identical to the high-speed forward adjustment, except that the local REWIND control is used to place the unit in the high-speed reverse mode and the high-speed reverse (-160) adjustment variable resistor (R60, figure 5-3) is used.

5-34. CAPSTAN SERVO RAMP SLOPE ADJUSTMENT.

5-35. The ramp slope adjustment determines the start and stop distances for both forward and reverse drive modes. The following procedure describes how to adjust the slope of the bi-polar ramp generator on the capstan servo PC assembly. This adjustment sets the start distance to 0.1875 inch. The top of the ramp is rounded, therefore, the 90% point of the voltage waveform is used. (See figure 5-4.)

a. Operate the tape unit in a forward-stop-forward mode.

b. Connect an oscilloscope to the FWD/REV test point on the capstan servo PC assembly. Sync the oscilloscope with the negative going edge of the forward command. (Test point 9 of the control and status PC assembly or test point CF of the control and status test board.)

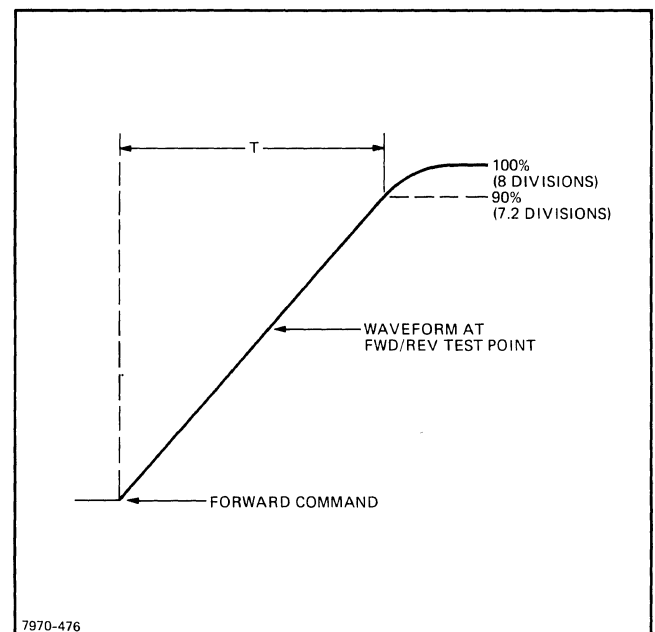


Figure 5-4. Start/Stop Ramp Time

c. Adjust the capstan servo PC assembly RAMP control (See figure 5-3.) to obtain the time listed in table 5-1 for tape unit synchronous speed. Use the vertical gain vernier control of the oscilloscope to expand the waveform so that the 90% point may be conveniently measured.

Note

On HP 180 Oscilloscopes, the vertical spacing is a special horizontal time scale at 7.2 divisions which may be used to measure the time at the 90% level.

Table 5-1. Capstan Servo Start/Stop Time

SPEED (IPS)	TIME (90%)
12.5	26.1 ms
18.75	17.1 ms
22.5	14.1 ms
25	12.6 ms
37.5	8.1 ms
45	6.6 ms

5-36. REEL SERVO ADJUSTMENTS.

5-37. Load a short length of tape onto the transport and bring to load point. The following adjustments determine the peak deflections of the tension arms. The amount of deflection desired is a function of the synchronous speed. At the highest speed (45 ips) the deflection is set so the tension arms deflect to the outer marks located on the back side of the casting, both in forward and reverse drive modes. At lower speeds the amount of deflection is smaller (i.e., at 25 ips the deflection is about half (25/45) the amount at 45 ips). Due to non-linearity of the tension arm transducer the swing of the tension arm may be unsymmetrical in the forward and reverse drive modes. (This will mean the tension arm will not be centered when there is no tape motion and is normal.) With the supply reel loaded with approximately 200 feet of tape, rotate the supply (upper) variable resistor (R106) fully clockwise and run the tape unit in the forward mode. Rotate the supply (lower) variable resistor counter-clockwise for the proper deflection. Stop tape motion and put in reverse drive and make sure the amount of deflection is the same as in forward drive. If not, readjust the mask position until symmetrical swings of the proper amount are achieved. Repeat procedure for the takeup reel with approximately 200 feet of tape on the takeup reel.

SECTION VI

REPLACEABLE PARTS

6-1. INTRODUCTION.

6-2. This section provides information for ordering replacement parts for the tape transport of the HP 7970B/7970C Digital Magnetic Tape Units.

6-3. This section contains assembly parts lists, supporting illustrations, ordering information, and a part number cross reference.

6-4. ASSEMBLY PARTS LIST.

6-5. The assembly parts list presents a breakdown of all replaceable parts of the tape transport. The information contained in the lists are under the following headings:

- a. FIGURE & INDEX NO.
- b. PART NUMBER.
- c. DESCRIPTION.
- d. UNITS PER ASSY.

6-6. FIGURE AND INDEX NUMBER.

6-7. The figure and index number column identifies the figure that illustrates each listed item and the index number that identifies the item on the illustration.

6-8. PART NUMBER.

6-9. The part number column provides the Hewlett-Packard part number for each item listed in the assembly parts list.

6-10. DESCRIPTION.

6-11. The description column describes the items within the equipment. An indented column arrangement is used to show the relationship between a part and the parts next higher assembly. The top assembly of each listing appears in

indentation 1. Primary subassemblies (of the top assembly) and attaching parts appear in indentation 2. This method of indentation is continued through indentation 3, 4, etc, until all replaceable parts are listed. Attaching parts are listed immediately following the part they attach. Attaching parts are identified by the abbreviation (AP) enclosed in parenthesis at the end of the description.

6-12. Reference designation and manufacture information (if applicable) is also included in the description column.

6-13. UNITS PER ASSEMBLY.

6-14. The quantity shown in the units per assembly column reflects the total quantity of a part required by the next higher assembly of that part. This quantity is not necessarily the total used for the complete equipment. The abbreviation AR is used to indicate usage as required of a particular item. The abbreviation REF is used to indicate that the quantity of an item used per assembly is listed in the next higher assembly of the assembly parts list.

6-15. ORDERING INFORMATION.

6-16. To order replacement parts, address the order or inquiry to the local Hewlett-Packard Sales and Service Office. (Refer to the list at the end of this manual for addresses.) Specify the following information for each part ordered.

- a. Identification of the unit, kit, or assembly containing the part.
- b. Hewlett-Packard part number for each part.
- c. Description of each part.
- d. Circuit reference designation (if applicable).

6-17. PART NUMBER CROSS REFERENCE.

6-18. Table 6-1 at the end of this section provides a cross reference between Hewlett-Packard part numbers and manufacturer's part numbers.

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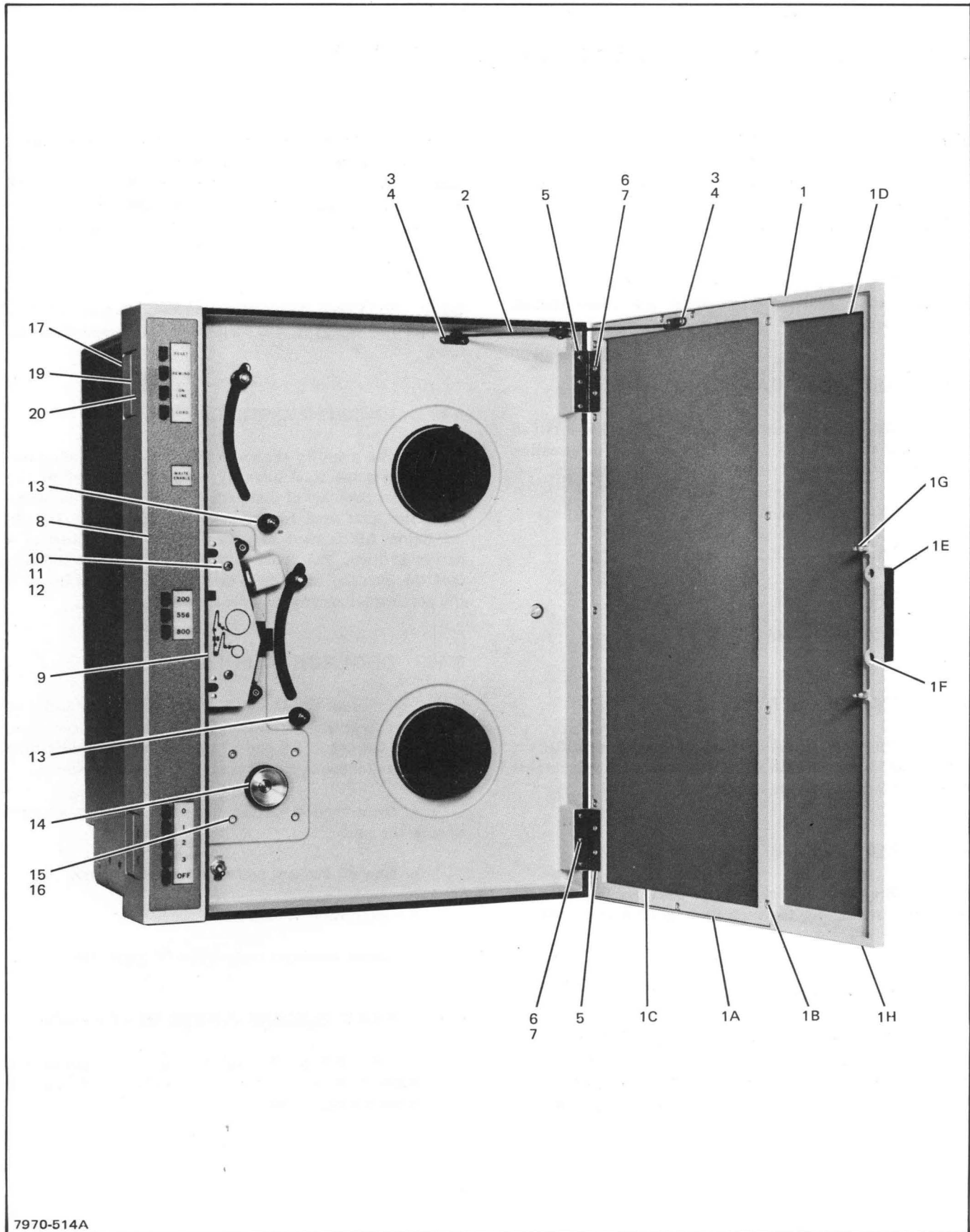
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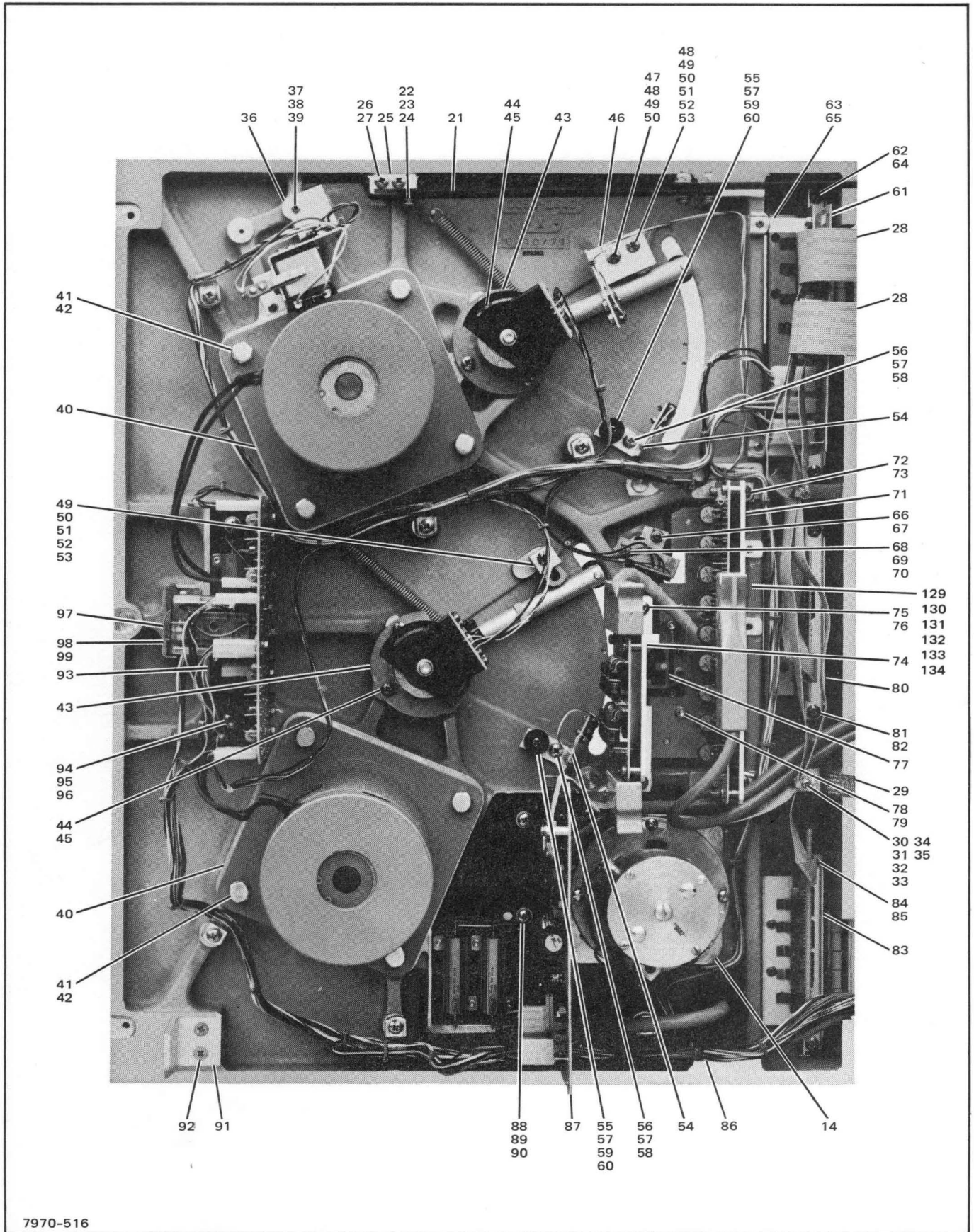
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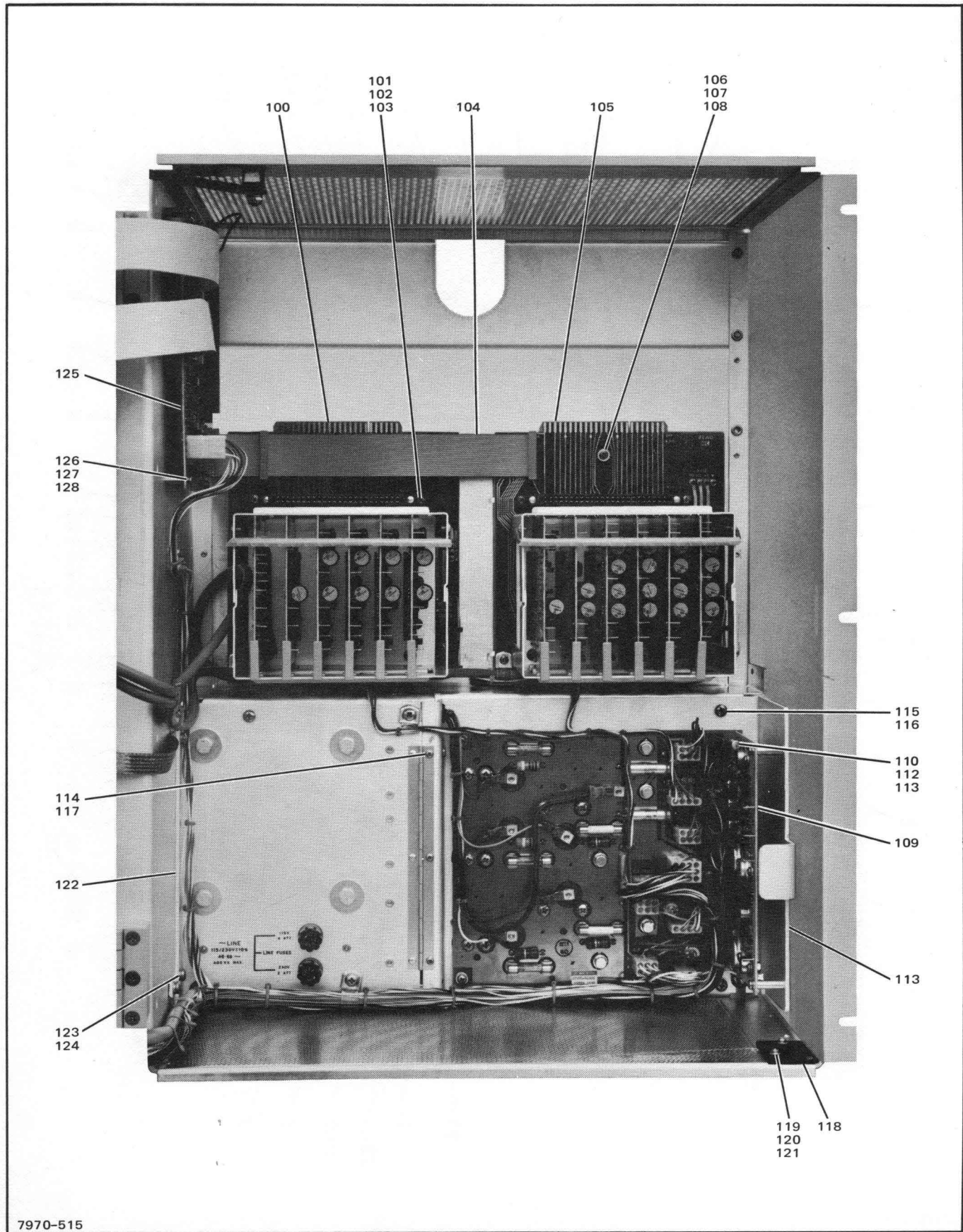
7970-514A

Figure 6-1. 7970B/7970C Digital Magnetic Tape Unit (Sheet 1 of 3)



7970-516

Figure 6-1. 7970B/7970C Digital Magnetic Tape Unit (Sheet 2 of 3)



7970-515

Figure 6-1. 7970B/7970C Digital Magnetic Tape Unit (Sheet 3 of 3)

FIGURE & INDEX NO.	PART NUMBER	DESCRIPTION	UNITS
			PER ASSY
6-1-		7970B/7970C DIGITAL MAGNETIC TAPE UNIT	REF
-1	07970-60160	. COVER DOOR ASSEMBLY	1
-1A	07970-20830	. INSERT, cover door.	1
-1B	2200-0139	. SCREW, no. 4-40, 0.25-inch, pozi (AP)	12
-1C	07970-20832	. WINDOW, cover door	1
-1D	07970-01186	. PANEL, cover door	1
-1E	07970-20831	. HANDLE, cover door	1
-1F	0624-0208	. SCREW, tapping, no. 6-32, 0.5-inch, pozi (AP)	2
-1G	0510-1107	. FASTENER, panel	2
-1H	07970-20829	. FRAME, cover door	1
-2	07970-60010	. . . . . HINGE ASSEMBLY, door stop	1
-3	2190-0003	. . . . . WASHER, lock, helical (AP)	4
-4	2200-0139	. . . . . SCREW, no. 4-40, 0.25-inch, pozi (AP)	4
-5	07970-20480	. . . . . HINGE, cover door	2
-6	2190-0003	. . . . . WASHER, lock, helical (AP)	10
-7	2200-0139	. . . . . SCREW, no. 4-40, 0.25-inch, pozi (AP)	10
-8	07970-01000	. PANEL, switch cover (unit address, density select, write enable equipped units only)	1
	07970-01010	. PANEL, switch cover (density select and write enable equipped units only)	1
	07970-01020	. PANEL, switch cover (unit address and write enable equipped units only)	1
	07970-01030	. PANEL, switch cover (write enable equipped units only)	1
	07970-01040	. PANEL, switch cover (unit address and density select equipped units only)	1
	07970-01050	. PANEL, switch cover (density select equipped units only)	1
	07970-01060	. PANEL, switch cover (unit select equipped units only)	1
	07970-01070	. PANEL, switch cover (basic unit only).	1
	07970-01160	. PANEL, switch cover (read/read units only)	1
-9	07970-00130	. COVER, head assembly	1
-10	3050-0065	. . . . . WASHER, flat (AP)	2
-11	2190-0034	. . . . . WASHER, lock, helical (AP)	2
-12	2680-0103	. . . . . SCREW, no. 6-32, 0.5-inch, pozi (AP)	2
-13	07970-60130	. TAPE ROLLER AND BEARING ASSEMBLY (see figure 6-2 for details and attaching parts)	2
-14	07970-60140	. CAPSTAN MOTOR ASSEMBLY MG1, 10 - 37.5 ips (see figure 6-3 for details)	1
	07970-60141	. CAPSTAN MOTOR ASSEMBLY MG1, 37.6 - 45 ips (see figure 6-4 for details)	1
-15	2190-0429	. . . . . WASHER, lock, helical (AP).	4
-16	3030-0047	. . . . . SCREW, no. 10-32, 0.625-inch, socket head (AP)	4
-17	07970-20070	. HINGE BLOCK, mounting	2
-18	07970-01204	. . . . . SPACER, hinge	2
-19	07970-20470	. HINGE, transport	2
-20	2680-0104	. . . . . SCREW, no. 10-32, 0.5-inch, pozi (AP)	5
-21	07970-62106	. DOOR STOP ASSEMBLY	1
-22	2190-0034	. . . . . WASHER, lock, helical (AP).	2
-23	2190-0420	. . . . . WASHER, flat (AP)	2
-24	2190-0475	. . . . . WASHER, nylon (AP)	2
-25	07970-20120	. BLOCK, door stop	1
-26	2190-0034	. . . . . WASHER, lock, helical (AP).	2
-27	2680-0065	. . . . . SCREW, no. 10-32, 1.25-inches, pozi (AP).	2
-28	07970-60890	. RIBBON CABLE ASSEMBLY W5	2
-29	07970-00510	. GROUND STRAP.	1
-30	2190-0416	. . . . . WASHER, flat (AP)	1
-31	0380-0013	. . . . . SPACER (AP)	1

FIGURE & INDEX NO.	PART NUMBER	DESCRIPTION					UNITS PER ASSY
		1	2	3	4	5	
6-1-32	2190-0003	. .	. .	. .	. .	. .	1
-33	2190-0008	. .	. .	. .	. .	. .	1
-34	07970-00610	. .	. .	. .	. .	. .	1
-35	2200-0125	. .	. .	. .	. .	. .	1
-36	07970-62122	. .	. .	. .	. .	. .	1
-37	2190-0416	. .	. .	. .	. .	. .	3
-38	2190-0003	. .	. .	. .	. .	. .	3
-39	2200-0125	. .	. .	. .	. .	. .	3
-40	07970-60170	. .	. .	. .	. .	. .	2
	07970-60171	. .	. .	. .	. .	. .	2
-41	2190-0432	. .	. .	. .	. .	. .	4
-42	0570-0082	. .	. .	. .	. .	. .	4
-43	07970-60181	. .	. .	. .	. .	. .	2
-44	2190-0034	. .	. .	. .	. .	. .	3
-45	2680-0105	. .	. .	. .	. .	. .	3
-46	07970-01190	. .	. .	. .	. .	. .	1
-47	0380-1012	. .	. .	. .	. .	. .	1
-48	2190-0420	. .	. .	. .	. .	. .	2
-49	2190-0034	. .	. .	. .	. .	. .	2
-50	2680-0111	. .	. .	. .	. .	. .	2
-51	07970-01191	. .	. .	. .	. .	. .	1
-52	4320-0256	. .	. .	. .	. .	. .	1
-53	07970-20834	. .	. .	. .	. .	. .	1
-54	07970-00120	. .	. .	. .	. .	. .	2
-55	0380-0016	. .	. .	. .	. .	. .	1
-56	3050-0002	. .	. .	. .	. .	. .	1
-57	2190-0034	. .	. .	. .	. .	. .	2
-58	2680-0099	. .	. .	. .	. .	. .	1
-59	2680-0103	. .	. .	. .	. .	. .	1
-60	0403-0163	. .	. .	. .	. .	. .	1
-61	07970-62089	. .	. .	. .	. .	. .	1
-62	2190-0034	. .	. .	. .	. .	. .	2
-63	2190-0003	. .	. .	. .	. .	. .	1
-64	2680-0129	. .	. .	. .	. .	. .	2
-65	2200-0143	. .	. .	. .	. .	. .	1
-66	07970-61150	. .	. .	. .	. .	. .	1
-67	07970-01176	. .	. .	. .	. .	. .	1
-68	3050-0105	. .	. .	. .	. .	. .	2
-69	2190-0003	. .	. .	. .	. .	. .	2
-70	2200-0141	. .	. .	. .	. .	. .	2
-71	07970-60500	. .	. .	. .	. .	. .	1
	07970-62000	. .	. .	. .	. .	. .	1
	07970-62001	. .	. .	. .	. .	. .	1
	07970-62012	. .	. .	. .	. .	. .	1
-72	2190-0034	. .	. .	. .	. .	. .	2
-73	2680-0103	. .	. .	. .	. .	. .	2
-74	07970-60300	. .	. .	. .	. .	. .	1
	07970-62165	. .	. .	. .	. .	. .	1
	07970-60300	. .	. .	. .	. .	. .	1
-75	2190-0034	. .	. .	. .	. .	. .	2
-76	2680-0099	. .	. .	. .	. .	. .	2

FIGURE & INDEX NO.	PART NUMBER	DESCRIPTION	1 2 3 4 5					UNITS PER ASSY
6-1-77	07970-60580	. MAGNETIC TAPE HEAD ASSEMBLY A1, 9-track, write/read, 21 - 45 ips (see figure 6-9 for details)						1
	07970-60581	. MAGNETIC TAPE HEAD ASSEMBLY A1, 7-track, write/read, 21 - 45 ips (see figure 6-9 for details)						1
	07970-60582	. MAGNETIC TAPE HEAD ASSEMBLY A1, 9-track, read, 21 - 45 ips (see figure 6-9 for details)						1
	07970-60583	. MAGNETIC TAPE HEAD ASSEMBLY A1, 7-track, read, 21 - 45 ips (see figure 6-9 for details)						1
	07970-60584	. MAGNETIC TAPE HEAD ASSEMBLY A1, 7-track, write/read, 10 - 20.9 ips (see figure 6-9 for details)						1
	07970-62031	. MAGNETIC TAPE HEAD ASSEMBLY A1, 9-track, write/read, 10 - 20.9 ips (see figure 6-9 for details)						1
	07970-60586	. MAGNETIC TAPE HEAD ASSEMBLY A1, 7-track, read, 10 - 20.9 ips (see figure 6-9 for details)						1
	07970-60587	. MAGNETIC TAPE HEAD ASSEMBLY A1, 9-track, read, 10 - 20.9 ips (see figure 6-9 for details)						1
	07970-60588	. MAGNETIC TAPE HEAD ASSEMBLY A1, 7/9-track, read/read, 10 - 20.9 ips (see figure 6-9 for details)						1
	07970-60589	. MAGNETIC TAPE HEAD ASSEMBLY A1, 7/9-track, read/read, 21 - 45 ips (see figure 6-9 for details)						1
-78	2190-0034	. . WASHER, lock, helical (AP)						3
-79	3030-0038	. . SCREW, no. 10-32, 0.5-inch, socket head (AP)						3
-80	07970-62087	. DENSITY SELECT SWITCH ASSEMBLY A12, read, write/read (refer to part 3)						1
	07970-62088	. DENSITY SELECT SWITCH ASSEMBLY A12, read/read (refer to part 5)						1
-81	2190-0034	. . WASHER, lock, helical (AP)						2
-82	2680-0129	. . SCREW, no. 10-32, 0.132-inch, pozi (AP)						2
-83	07970-62086	. UNIT ADDRESS SWITCH ASSEMBLY A13 (see figure 6-10 for details)						1
-84	2190-0034	. . WASHER, lock, helical (AP)						2
-85	2680-0129	. . SCREW, no. 10-32, 0.132-inch, pozi (AP)						2
-86	07970-60600	. TRANSPORT HARNESS ASSEMBLY W2 (see figure 6-11 for details and attaching parts)						1
-87	07970-62172	. CAPSTAN SERVO PC ASSEMBLY A9 (see figure 6-12 for details)						1
-88	2190-0034	. . WASHER, lock, helical (AP)						3
-89	2190-0312	. . WASHER, fiber (AP)						3
-90	2680-0101	. . SCREW, no. 10-32, 0.438-inch, pozi (AP)						3
-91	07970-20680	. GUIDE, lifter						1
-92	2680-0118	. . SCREW, no. 10-32, 0.5-inch, pozi (AP)						2
-93	07970-62024	. REEL SERVO PC ASSEMBLY A7 (see figure 6-13 for details)						1
-94	2190-0312	. . WASHER, fiber (AP)						3
-95	2190-0034	. . WASHER, lock, helical (AP)						3
-96	2680-0101	. . SCREW, no. 10-32, 0.438-inch, pozi (AP)						3
-97	1390-0228	. PANEL FASTENER						1
-98	2190-0034	. . WASHER, lock, helical (AP)						2
-99	2680-0099	. . SCREW, no. 10-32, 0.375-inch, pozi (AP)						2
-100	07970-60230	. WRITE ASSEMBLY A17 (refer to part 4)						1
-101	2190-0085	. . WASHER, lock, helical (AP)						5
-102	3050-0016	. . WASHER, flat (AP)						5
-103	2360-0195	. . SCREW, no. 6-32, 0.312-inch, pozi (AP)						5
-104	07970-60900	. RIBBON CABLE ASSEMBLY (write/read units only)						1
	07970-60890	. RIBBON CABLE ASSEMBLY (read units only)						1
-105	07970-60390	. READ ASSEMBLY A18 (refer to part 3)						1
	07970-62003	. READ/READ ASSEMBLY A18 (refer to part 5)						1
-106	2190-0085	. . WASHER, lock, helical (AP)						5
-107	3050-0016	. . WASHER, flat (AP)						5
-108	2360-0195	. . SCREW, no. 6-32, 0.312-inch, pozi (AP)						5

FIGURE & INDEX NO.	PART NUMBER	DESCRIPTION					UNITS PER ASSY
		1	2	3	4	5	
6-1-109	07970-61010	.	.	.	.	.	1
-110	3050-0227	.	.	.	.	.	2
-111	2190-0085	.	.	.	.	.	2
-112	2200-0141	.	.	.	.	.	2
-113	07970-61051	.	.	.	.	.	1
-114	2190-0034	.	.	.	.	.	2
-115	2190-0004	.	.	.	.	.	3
-116	2680-0129	.	.	.	.	.	2
-117	2200-0141	.	.	.	.	.	3
-118	07970-00561	.	.	.	.	.	1
-119	2190-0416	.	.	.	.	.	2
-120	2190-0004	.	.	.	.	.	2
-121	2200-0141	.	.	.	.	.	2
-122	07970-60471	.	.	.	.	.	1
-123	2190-0034	.	.	.	.	.	9
-124	2680-0129	.	.	.	.	.	9
-125	07970-61080	.	.	.	.	.	1
-126	3050-0016	.	.	.	.	.	4
-127	2190-0085	.	.	.	.	.	4
-128	2360-0195	.	.	.	.	.	4
-129	07970-61030	.	.	.	.	.	1
-130	3101-0877	.	.	.	.	.	1
-131	2680-0129	.	.	.	.	.	2
-132	2190-0034	.	.	.	.	.	2
-133	3050-0002	.	.	.	.	.	2
-134	07970-00200	.	.	.	.	.	1

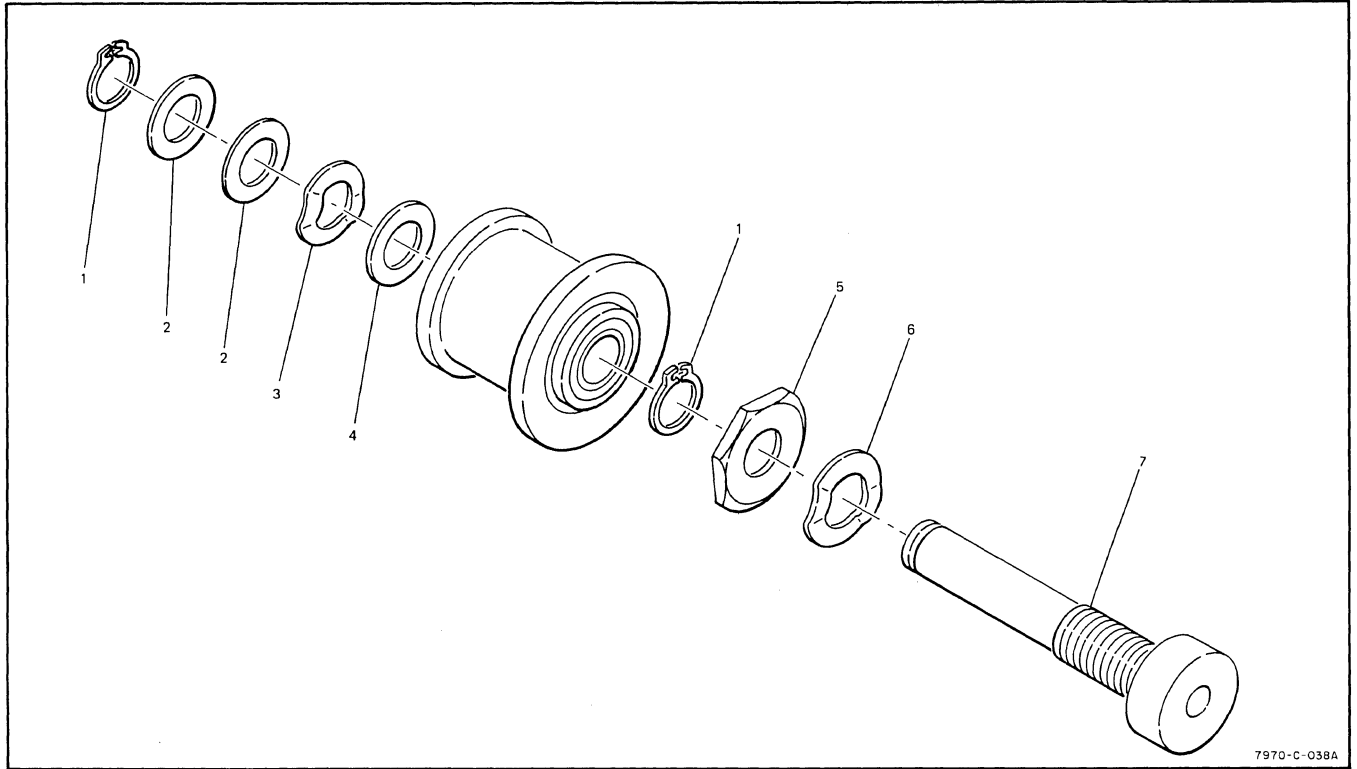
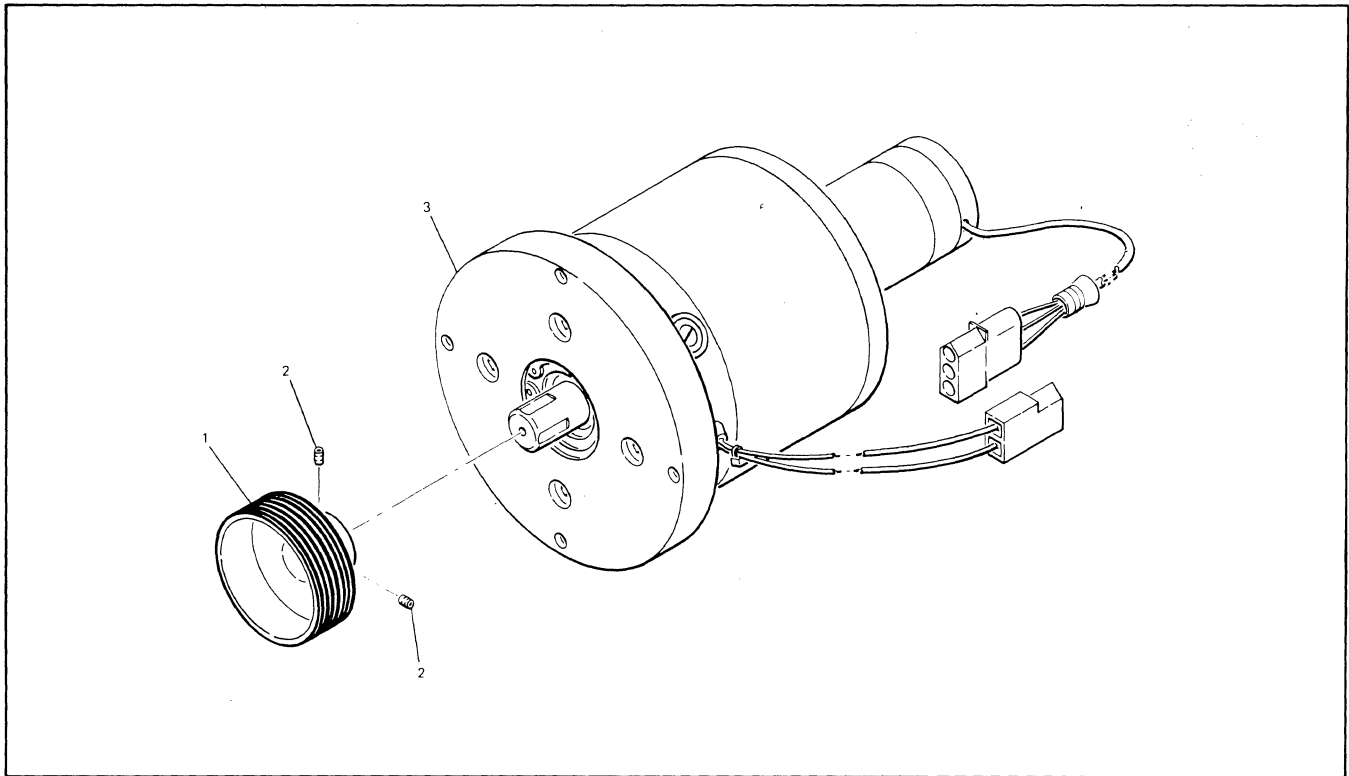


Figure 6-2. Tape Roller and Bearing Assembly

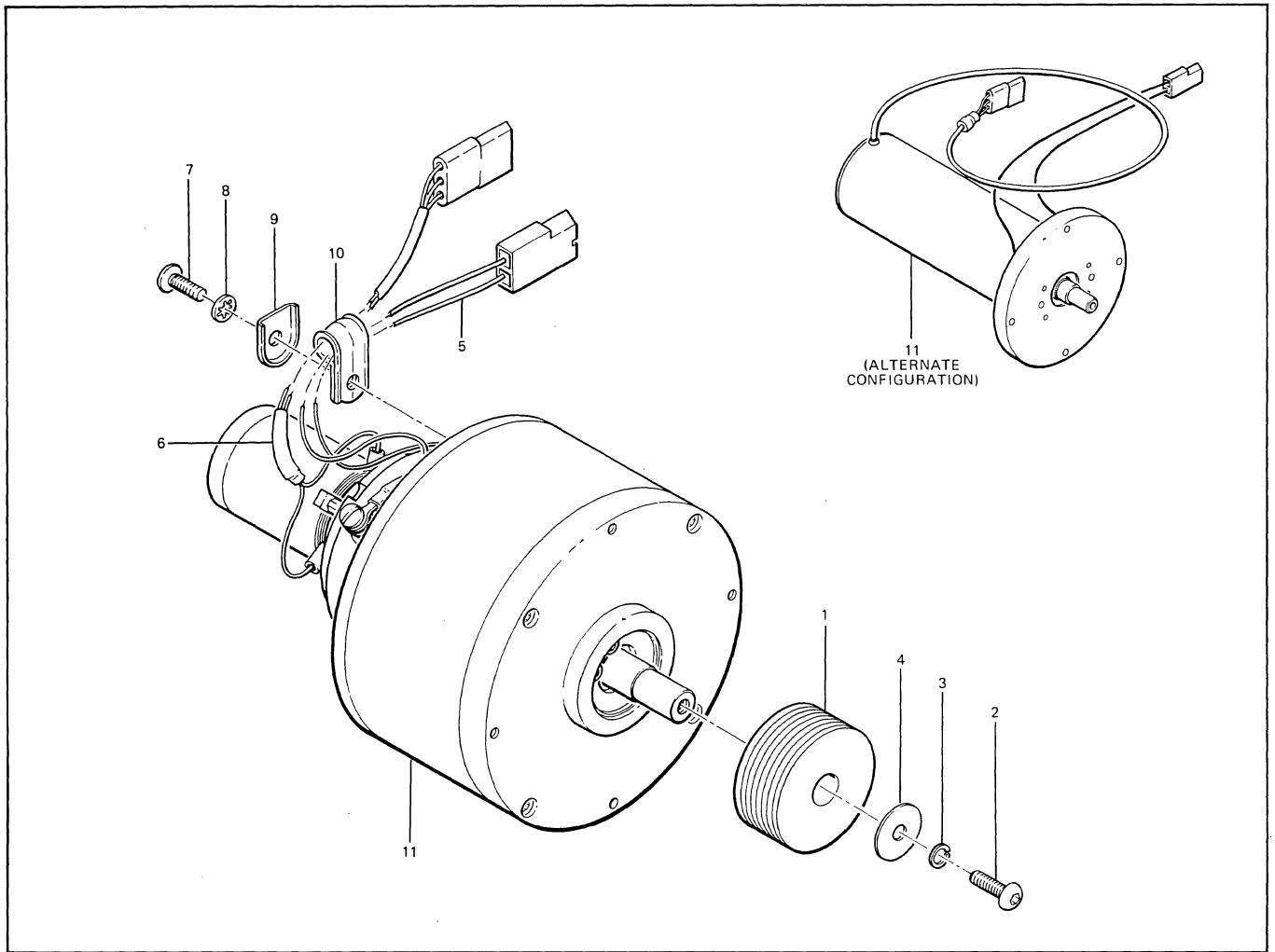
FIGURE & INDEX NO.	PART NUMBER	DESCRIPTION					UNITS PER ASSY
		1	2	3	4	5	
6-2-	07970-60130	TAPE ROLLER AND BEARING ASSEMBLY					REF
-1	0510-0238	.	RING, retaining (AP) . . . . .	.	.	2
-2	2190-0181	.	WASHER, flat, 0.005-inch (AP) . . . . .	.	.	AR
-3	3050-0253	.	WASHER, crescent (AP) . . . . .	.	.	1
-4	3050-0032	.	WASHER, shim, 0.010-inch (AP) . . . . .	.	.	1
-5	2950-0036	.	NUT, no. 25-38, 0.4375-inch (AP) . . . . .	.	.	1
-6	3050-0424	.	WASHER, crescent (AP) . . . . .	.	.	1
-7	07970-20460	.	SHAFT, tape roller . . . . .	.	.	REF



2225-110

Figure 6-3. Capstan Motor Assembly MG1, 10 - 37.5 ips

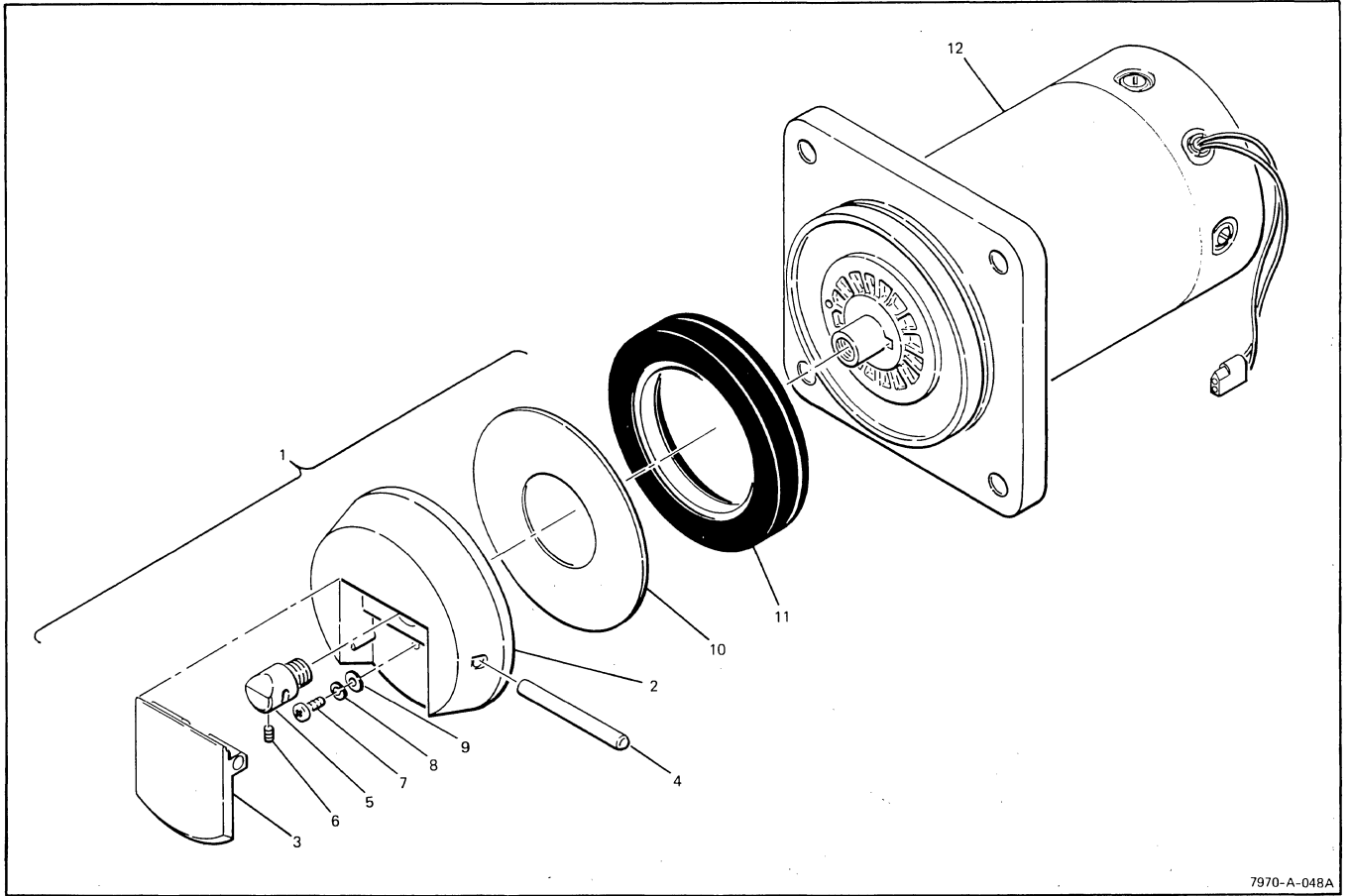
FIGURE & INDEX NO.	PART NUMBER	DESCRIPTION					UNITS PER ASSY
		1	2	3	4	5	
6-3-	07970-60140	CAPSTAN MOTOR ASSEMBLY MG1, 10 - 37.5 ips					REF
-1	07970-20390	. CAPSTAN					1
-2	3030-0329	. . SETSCREW, no. 4-40, 0.125-inch, stl (AP)					2
-3	3140-0705	. CAPSTAN MOTOR SUBASSEMBLY					1



7970-540

Figure 6-4. Capstan Motor Assembly MG1, 37.6 - 45 ips

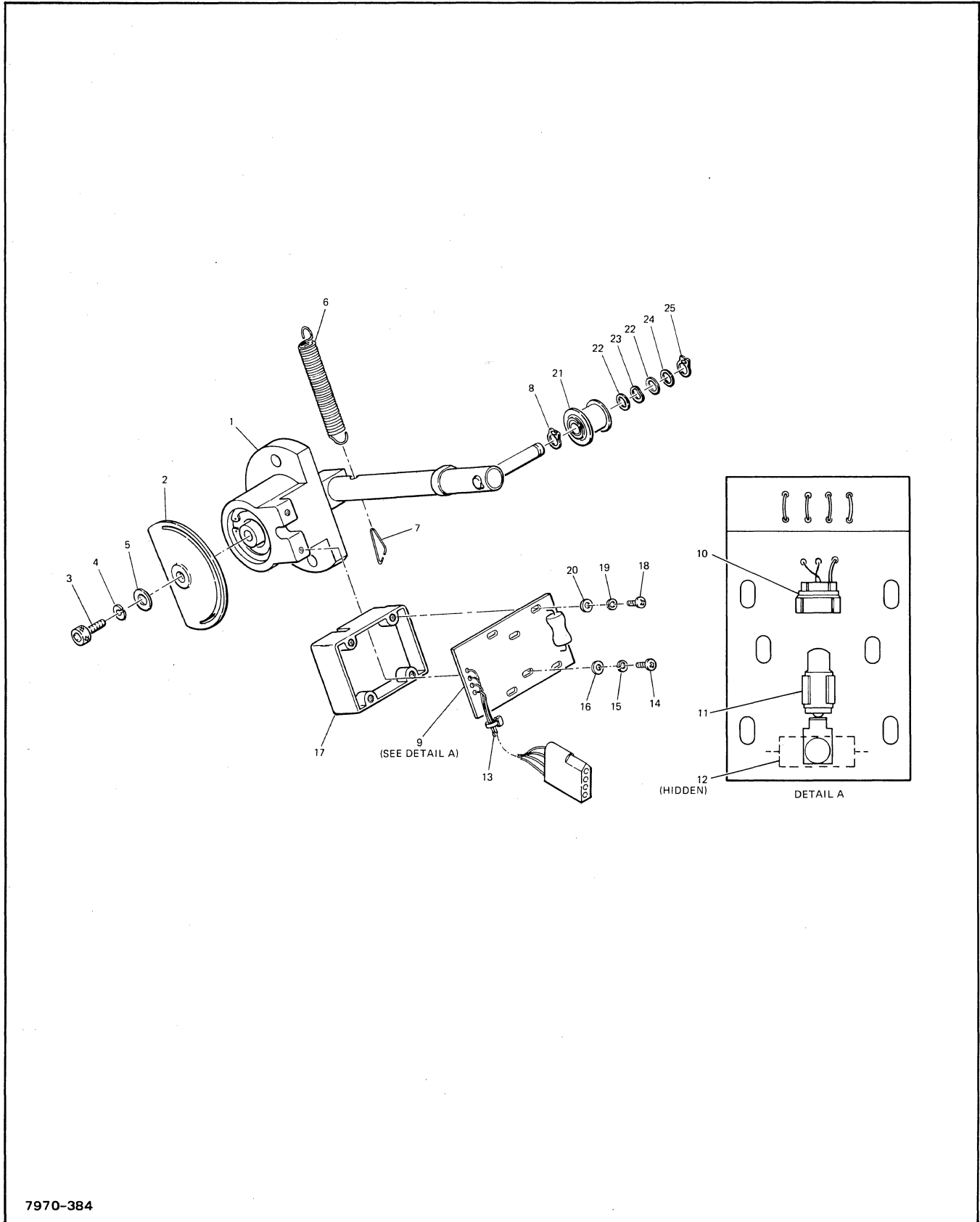
FIGURE & INDEX NO.	PART NUMBER	DESCRIPTION					UNITS PER ASSY
		1	2	3	4	5	
6-4-	07970-60141	CAPSTAN MOTOR ASSEMBLY MG1, 37.6 - 45 ips					REF
-1	07970-20391	. CAPSTAN					1
-2	3030-0425	. . SCREW, no. 10-32, 0.5-inch, socket head.					1
-3	2190-0483	. . WASHER, lock					1
-4	3050-0232	. . WASHER, flat					1
-5	07970-62160	. LEAD ASSEMBLY, capstan motor					1
-6	07970-62161	. CABLE ASSEMBLY, capstan motor					1
-7	2360-0201	. . SCREW, no. 6-32, 6.5-inch (AP)					1
-8	2190-0007	. . WASHER, lock (AP).					1
-9	2190-0452	. . WASHER, clamp (AP)					1
-10	1400-0292	. . CLAMP, cable					1
-11	3140-0748	. CAPSTAN MOTOR ASSEMBLY					1



7970-A-048A

Figure 6-5. Reel Motor Assembly B1/B2

FIGURE & INDEX NO.	PART NUMBER	DESCRIPTION					UNITS PER ASSY
		1	2	3	4	5	
6-5-	07970-60170	REEL MOTOR ASSEMBLY B1/B2, 10 - 37.5 ips					REF
	07970-60171	REEL MOTOR ASSEMBLY B1/B2, 37.6 - 45 ips					REF
-1	07970-61040	. REEL HOLDDOWN ASSEMBLY					1
-2	07970-40070	. . . BODY, holddown					1
-3	07970-40090	. . . HANDLE, holddown					1
-4	07970-20440	. . . PIN, holddown					1
-5	07970-20700	. . . STUD, holddown					1
-6	3030-0196	. . . SETSCREW, no. 4-40, 0.188-inch, socket head (AP)					1
-7	2200-0153	. . . SCREW, no. 4-40, 0.875-inch, pozi (AP)					1
-8	2190-0003	. . . WASHER, lock, helical (AP)					1
-9	3050-0105	. . . WASHER, brass (AP)					1
-10	3050-0729	. . . WASHER, flat (AP)					1
-11	07970-40080	. RING, reel retaining					1
-12	07970-62267	. REEL MOTOR SUBASSEMBLY (used on 07970-60170)					1
	07970-62266	. REEL MOTOR SUBASSEMBLY (used on 07970-60171)					1

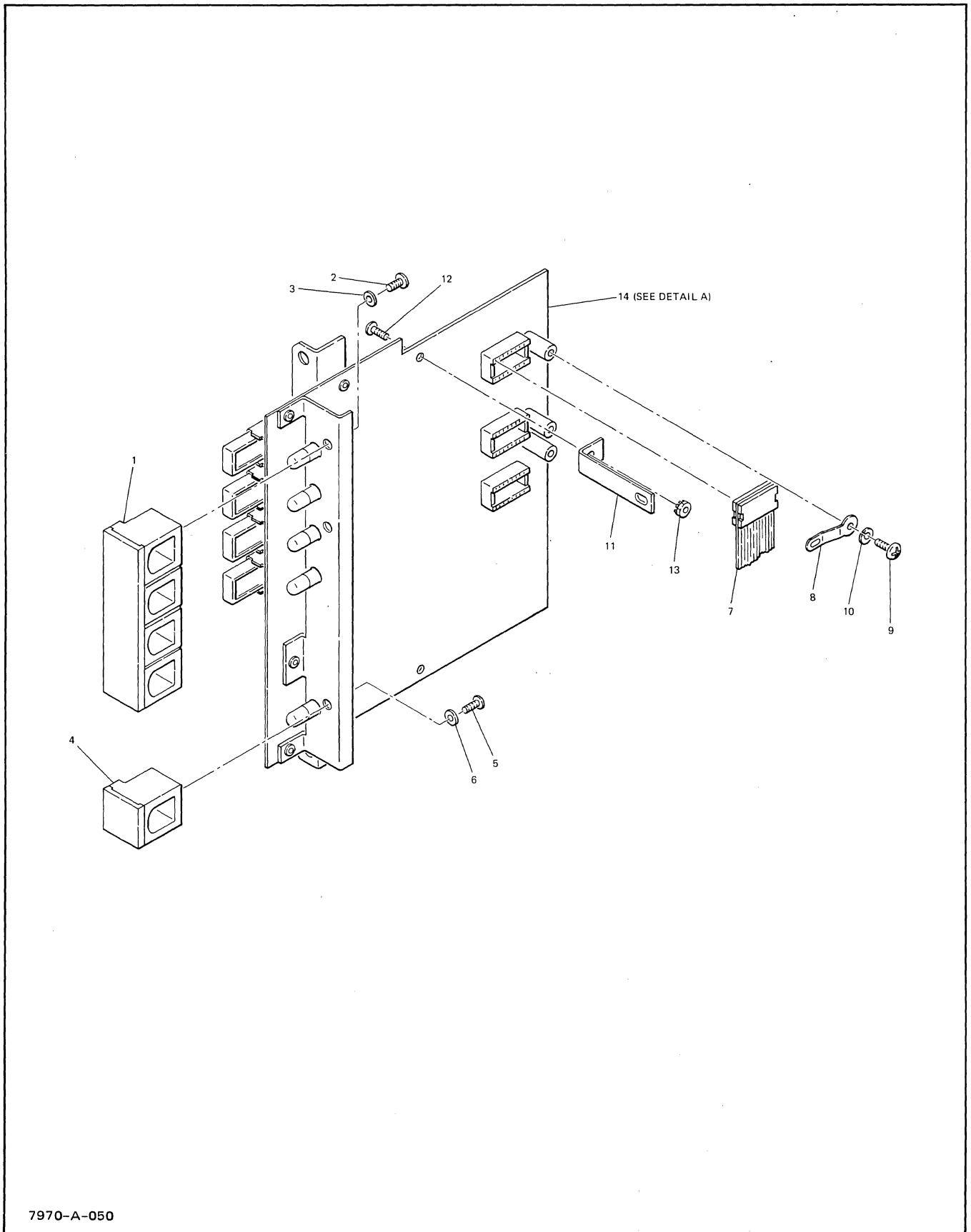


7970-384

Figure 6-6. Tension Arm Assembly A3/A4

FIGURE & INDEX NO.	PART NUMBER	DESCRIPTION					UNITS PER ASSY
		1	2	3	4	5	
6-6-	07970-60181	TENSION ARM ASSEMBLY A3/A4					REF
-1	07970-62108	. TENSION ARM SUBASSEMBLY					1
-2	07970-00380	. PHOTOCCELL SHADE					1
-3	3030-0038	. . SCREW, no. 10-32, 0.500-inch, socket head (AP)					1
-4	2190-0034	. . WASHER, lock, helical (AP)					1
-5	3050-0002	. . WASHER, flat (AP)					1
-6	1460-1181	. SPRING, extension					1
-7	1460-1250	. SPRING, tension arm					1
-8	0510-0238	. RING, retaining					1
-9	07970-60481	. TENSION ARM PC ASSEMBLY A1					1
-10	1990-0307	. . PHOTOCONDUCTOR, dual, cadmium sulfide (Q1)					1
-11	2140-0351	. . LAMP, incandescent, 6V, 2A (DS1)					1
-12	0698-3620	. . RESISTOR, fxd, 100 ohms, 5%, 2W (R1)					1
-13	07970-60870	. . WIRING HARNESS, tension arm (W1)					1
-14	2200-0141	. . SCREW, no. 4-40, 0.312-inch, pozi (AP)					2
-15	2190-0005	. . WASHER, lock (AP)					2
-16	3050-0105	. . WASHER, flat (AP)					2
-17	07970-40203	. . HOOD, tension arm					1
-18	2200-0141	. . . SCREW, no. 4-40, 0.312-inch, pozi (AP)					4
-19	2190-0005	. . . WASHER, lock, helical (AP)					4
-20	3050-0105	. . . WASHER, flat (AP)					4
-21	07970-60130	. ROLLER ASSEMBLY, tension arm					1
-22	3050-0032	. . WASHER, brass (AP)					2
-23	3050-0253	. . WASHER, crescent					1
-24	2190-0181	. . WASHER, flat (AP)					1
-25	0510-0238	. . RING, retaining (AP)					1





7970-A-050

Figure 6-7. Control Switch Assembly A11 (Sheet 1 of 2)

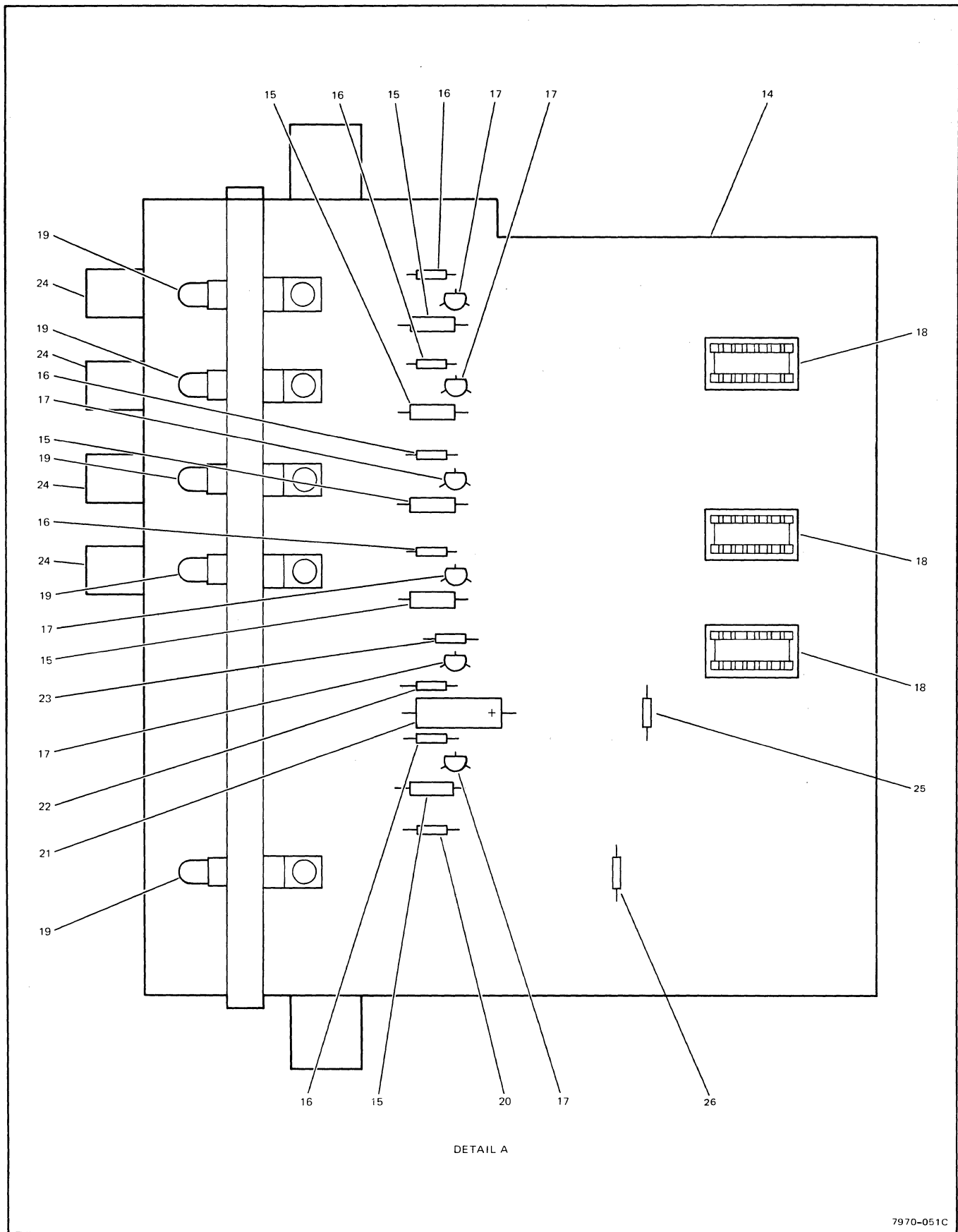


Figure 6-7. Control Switch Assembly A11 (Sheet 2 of 2)

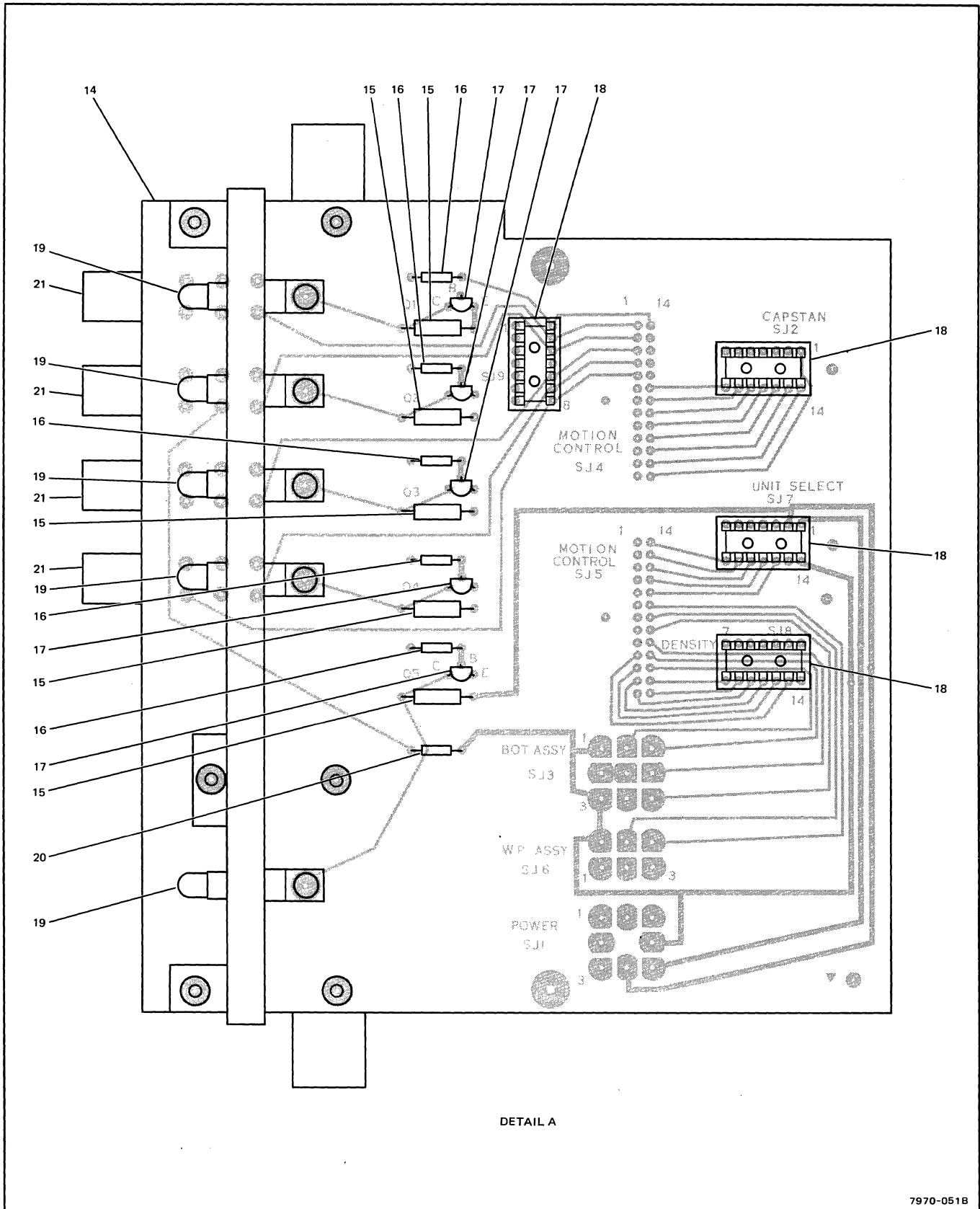


Figure 6-7. Control Switch Assembly A11 (Sheet 2 of 2)

FIGURE & INDEX NO.	PART NUMBER	DESCRIPTION					UNITS PER ASSY
		1	2	3	4	5	
6-7-	07970-62089	CONTROL SWITCH ASSEMBLY A11					REF
-1	07970-60340	. LENS BLOCK ASSEMBLY, control switch					1
-2	0624-0077	. . SCREW, tapping, no. 4-40, 0.312-inch, pozi (AP)					2
-3	2190-0416	. . WASHER, flat (AP)					2
-4	07970-60960	. LENS BLOCK ASSEMBLY, write enable					1*
-5	0624-0077	. . SCREW, tapping, no. 4-40, 0.312-inch, pozi (AP)					1*
-6	2190-0416	. . WASHER, flat (AP)					1*
-7	07970-60610	. CABLE, capstan					1
-8	07970-00620	. . CLAMP, connector (AP)					1
-9	2360-0193	. . SCREW, no. 6-32, 0.250-inch, pozi (AP)					1
-10	2190-0085	. . WASHER, lock, helical (AP)					1
-11	07970-00310	. BRACKET, angle					2
-12	2360-0195	. . SCREW, no. 6-32, 0.312-inch, pozi (AP)					1
-13	2420-0001	. . NUT, hex, no. 6-32 (AP)					1
-14	07970-60080	. CONTROL SWITCH PC ASSEMBLY					1
-15	0686-2215	. . RESISTOR, fxd, 220 ohms, 5%, 1/2W (R6, R7, R8, R9, R10)					5
-16	0683-3315	. . RESISTOR, fxd, 330 ohms, 5%, 1/2W (R1, R2, R3, R4, R5)					5
-17	1854-0215	. . TRANSISTOR, NPN, Si, 2N3904 (Q1, Q2, Q3, Q4, Q5, Q6)					6
-18	1200-0426	. . SOCKET, integrated circuit, 14 pin					3
-19	2140-0209	. . LAMP, 14V, 0.08A (DS1, DS2, DS3, DS4, DS5)					5
-20	0683-6815	. . RESISTOR, fxd, 680 ohms, 5%, 1/4W (R11)					1
-21	0180-0061	. . CAPACITOR, fxd, 100 μF, 16V (C1)					1
-22	0683-3925	. . RESISTOR, fxd, 3.9k, 1/4W (R12)					1
-23	0683-1035	. . RESISTOR, fxd, 10k, 1/4W (R13)					1
-24	Ref. Only	. . SWITCH ASSEMBLY (S1 thru S4) (not field replaceable)					1
-25	1902-0041	. . DIODE, breakdown, 5.11V (CR1)					1
-26	0698-0090	. . RESISTOR, fxd, 464 ohms, 1%, 1/2W (R14)					1

* Used only in write configuration.

FIGURE & INDEX NO.	PART NUMBER	DESCRIPTION					UNITS PER ASSY
		1	2	3	4	5	
6-7-	07970-62089	CONTROL SWITCH ASSEMBLY A11					REF
-1	07970-6-340	. . LENS BLOCK ASSEMBLY, control switch					1
-2	0624-0077	. . . SCREW, tapping, no. 4-40, 0.312-inch, pozi (AP)					2
-3	2190-0416	. . . WASHER, flat (AP)					2
-4	07970-60960	. . LENS BLOCK ASSEMBLY, write enable.					1*
-5	0624-0077	. . . SCREW, tapping, no. 4-40, 0.312-inch, pozi (AP)					1*
-6	2190-0416	. . . WASHER, flat (AP)					1*
-7	07970-60610	. . CABLE, capstan					1
-8	07970-00620	. . . CLAMP, connector (AP).					1
-9	2360-0193	. . . SCREW, no. 6-32, 0.250-inch, pozi (AP)					1
-10	2190-0085	. . . WASHER, lock, helical (AP)					1
-11	07970-00310	. . BRACKET, angle					2
-12	2360-0195	. . . SCREW, no. 6-32, 0.312-inch, pozi (AP)					1
-13	2420-0001	. . . NUT, hex, no. 6-32 (AP)					1
-14	07970-60080	. . CONTROL SWITCH PC ASSEMBLY					1
-15	0686-2215	. . . RESISTOR, fxd, 220 ohms, 5%, 1/2W (R6, R7, R8, R9, R10).					5
-16	0683-3315	. . . RESISTOR, fxd, 330 ohms, 5%, 1/2W (R1, R2, R3, R4, R5)					5
-17	1854-0215	. . . TRANSISTOR, NPN, Si, 2N3904 (Q1, Q2, Q3, Q4, Q5)					5
-18	1200-0426	. . . SOCKET, integrated circuit, 14 pin					4
-19	2140-0209	. . . LAMP, 14V, 0.08A (DS1, DS2, DS3, DS4, DS5).					5
-20	0683-6815	. . . RESISTOR, fxd, 680 ohms, 5%, 1/4W (R11).					1
-21	3101-0846	. . . SWITCH ASSEMBLY (S1 thru S4) (not field replaceable)					1

* Used only in write configuration.

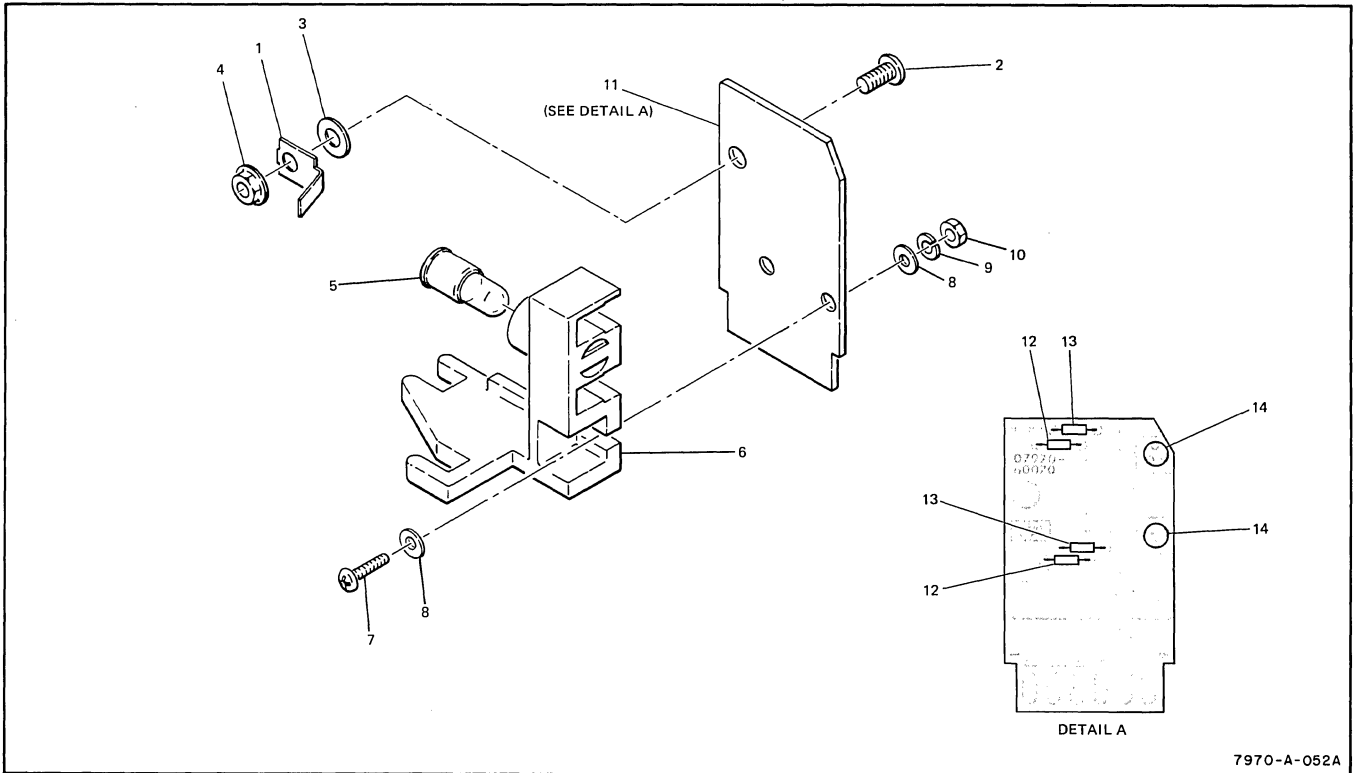
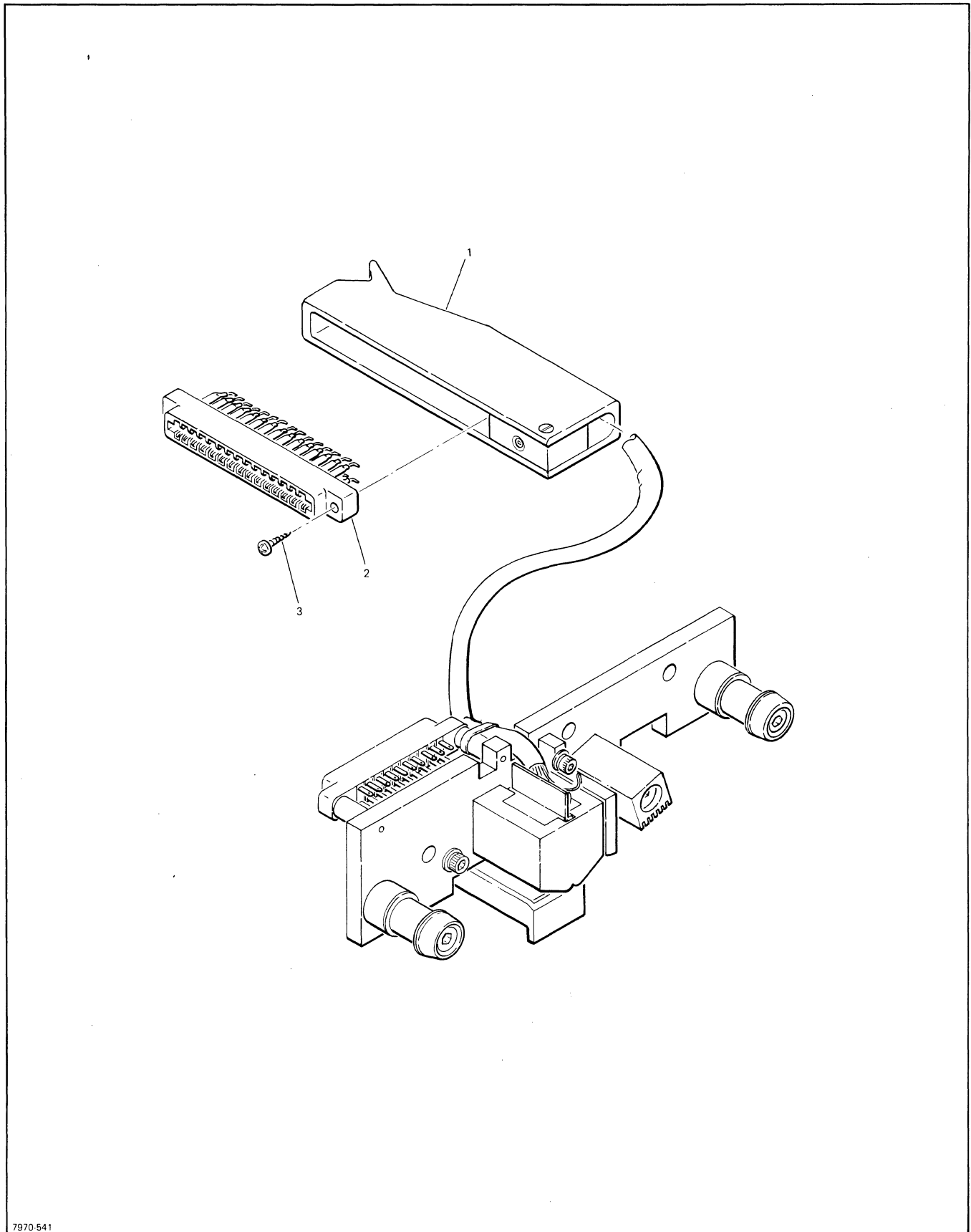


Figure 6-8. Photosense Head Assembly A2

FIGURE & INDEX NO.	PART NUMBER	DESCRIPTION					UNITS PER ASSY
		1	2	3	4	5	
6-8-	07970-61150	PHOTOSENSE HEAD ASSEMBLY A2					REF
-1	07970-00010	. CONTACT, lamp					1
-2	2200-0139	. . SCREW, no. 4-40, 0.25-inch, pozi (AP)					1
-3	3050-0105	. . WASHER, flat (AP)					1
-4	2260-0009	. . NUT, kep, no. 4-40 (AP)					1
-5	2140-0203	. LAMP, incandescent, 5V (DS1)					1
-6	Ref Only	. CASTING, photosense (not field replaceable)					1
-7	0520-0129	. . SCREW, no. 2-56, 0.312-inch, pozi (AP)					2
-8	2190-0417	. . WASHER, flat (AP)					4
-9	2190-0040	. . WASHER, lock, helical (AP)					2
-10	0610-0001	. . NUT, hex, no. 2-56 (AP)					2
-11	Ref Only	. PHOTSENSE HEAD PC ASSEMBLY A1 (not field replaceable)					1
-12	0698-7027	. . RESISTOR, fxd, 10M, 10%, 1/8W (R2, R4)					2
-13	0698-5999	. . RESISTOR, fxd, 4.7k, 5%, 1/8W (R1, R3)					2
-14	1990-0087	. . PHOTOTRANSISTOR, Si (Q1, Q2)					2



7970-541

Figure 6-9. Magnetic Head Assembly A1

FIGURE & INDEX NO.	PART NUMBER	DESCRIPTION					UNITS PER ASSY
		1	2	3	4	5	
6-9-	07970-60580	MAGNETIC TAPE HEAD ASSEMBLY A1, 9-track, write/read, 20.1 - 45 ips . .					REF
	07970-60581	MAGNETIC TAPE HEAD ASSEMBLY A1, 7-track, write/read, 20.1 - 45 ips . .					REF
	07970-60582	MAGNETIC TAPE HEAD ASSEMBLY A1, 9-track, read only, 20.1 - 45 ips . .					REF
	07970-60583	MAGNETIC TAPE HEAD ASSEMBLY A1, 7-track, read only, 20.1 - 45 ips . .					REF
	07970-60584	MAGNETIC TAPE HEAD ASSEMBLY A1, 7-track, write/read, 10 - 20 ips . . .					REF
	07970-62031	MAGNETIC TAPE HEAD ASSEMBLY A1, 9-track, write/read, 10 - 20 ips . . .					REF
	07970-60586	MAGNETIC TAPE HEAD ASSEMBLY A1, 7-track, read only, 10 - 20 ips . . .					REF
	07970-60587	MAGNETIC TAPE HEAD ASSEMBLY A1, 9-track, read only, 10 - 20 ips . . .					REF
	07970-60588	MAGNETIC TAPE HEAD ASSEMBLY A1, 7/9-track, read/read, 10 - 20 ips . .					REF
	07970-60589	MAGNETIC TAPE HEAD ASSEMBLY A1, 7/9-track, read/read, 20.1 - 45 ips . .					REF
-1	1251-2874	. CONNECTOR HOOD ASSEMBLY					1
-2	1251-0159	. CONNECTOR, printed-circuit, 30 contact					1
-3	0624-0098	. . SCREW, tapping, 4-40, 0.438-inch, pozi (AP)					2
NOTE							
Head assemblies must be returned to factory for repair or refurbishment.							

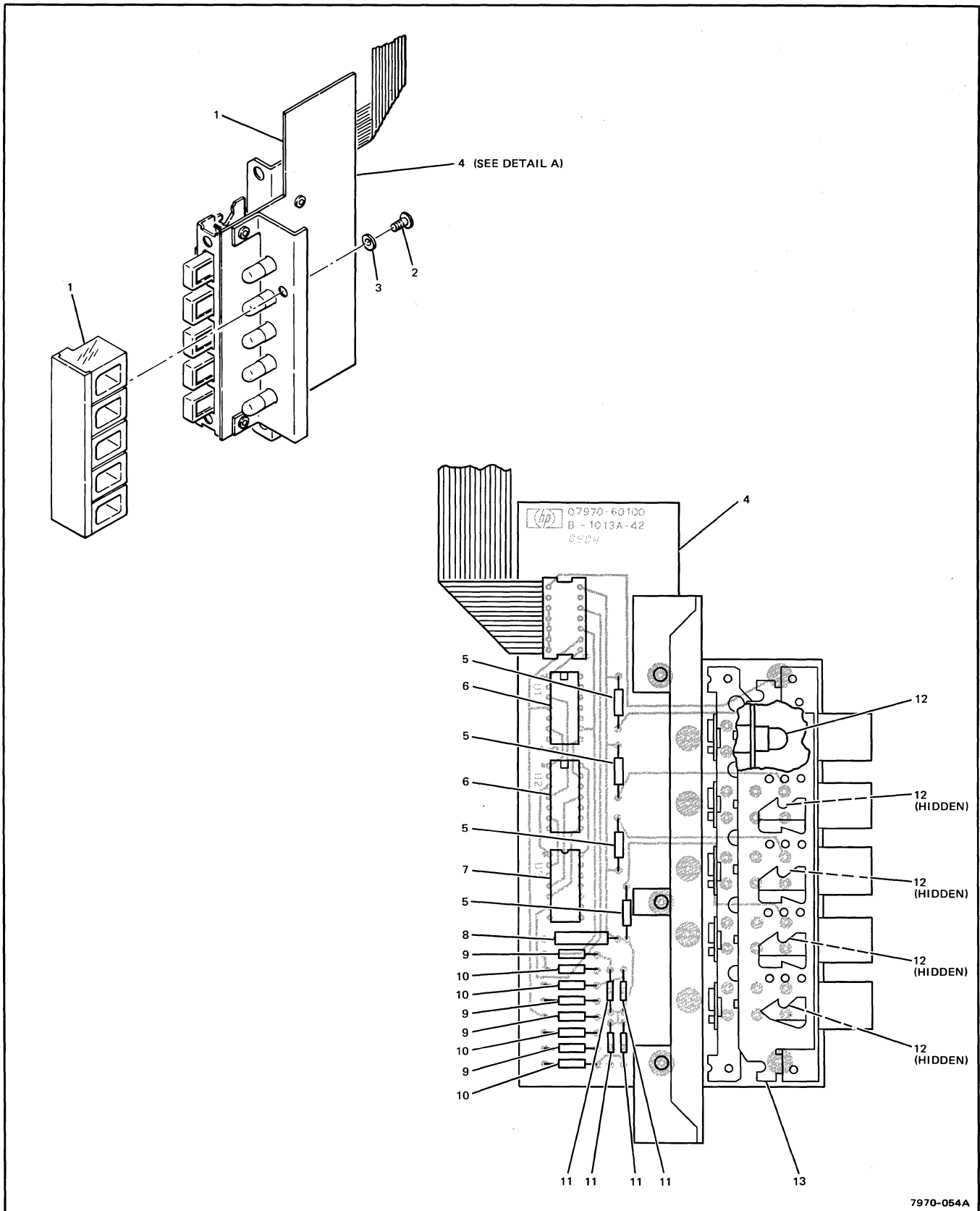


Figure 6-10. Unit Address Switch Assembly A13

FIGURE & INDEX NO.	PART NUMBER	DESCRIPTION					UNITS PER ASSY
		1	2	3	4	5	
6-10-	07970-62086	UNIT ADDRESS SWITCH ASSEMBLY A13					REF
-1	07970-60360	. LENS BLOCK ASSEMBLY, unit address switch.					1
-2	0624-0077	. . SCREW, tapping, no. 4-40, 0.312-inch, pozi (AP)					1
-3	2190-0416	. . WASHER, flat (AP)					2
-4	07970-60100	. UNIT ADDRESS PC ASSEMBLY					1
-5	0757-0280	. . RESISTOR, fxd, 1k, 1%, 1/8W (R1, R2, R3, R4)					4
-6	1820-0054	. . INTEGRATED CIRCUIT, 7400N (U1, U2)					2
-7	1820-0348	. . INTEGRATED CIRCUIT, 844 (U3)					1
-8	0160-0161	. . CAPACITOR, fxd, My, 0.01 μ F, 10% (C1)					1
-9	0757-0428	. . RESISTOR, fxd, 1.62k, 1%, 1/8W (R6, R8, R10, R12).					4
-10	0757-0418	. . RESISTOR, fxd, 619 ohms, 1%, 1/8W (R5, R7, R9, R11)					4
-11	1901-0040	. . DIODE, Si (CR1, CR2, CR3, CR4)					4
-12	2140-0209	. . LAMP, 14V, 0.08A (DS1 thru DS5)					5
-13	Ref. Only	. . SWITCH ASSEMBLY (S1 thru S5) (not field replaceable)					1

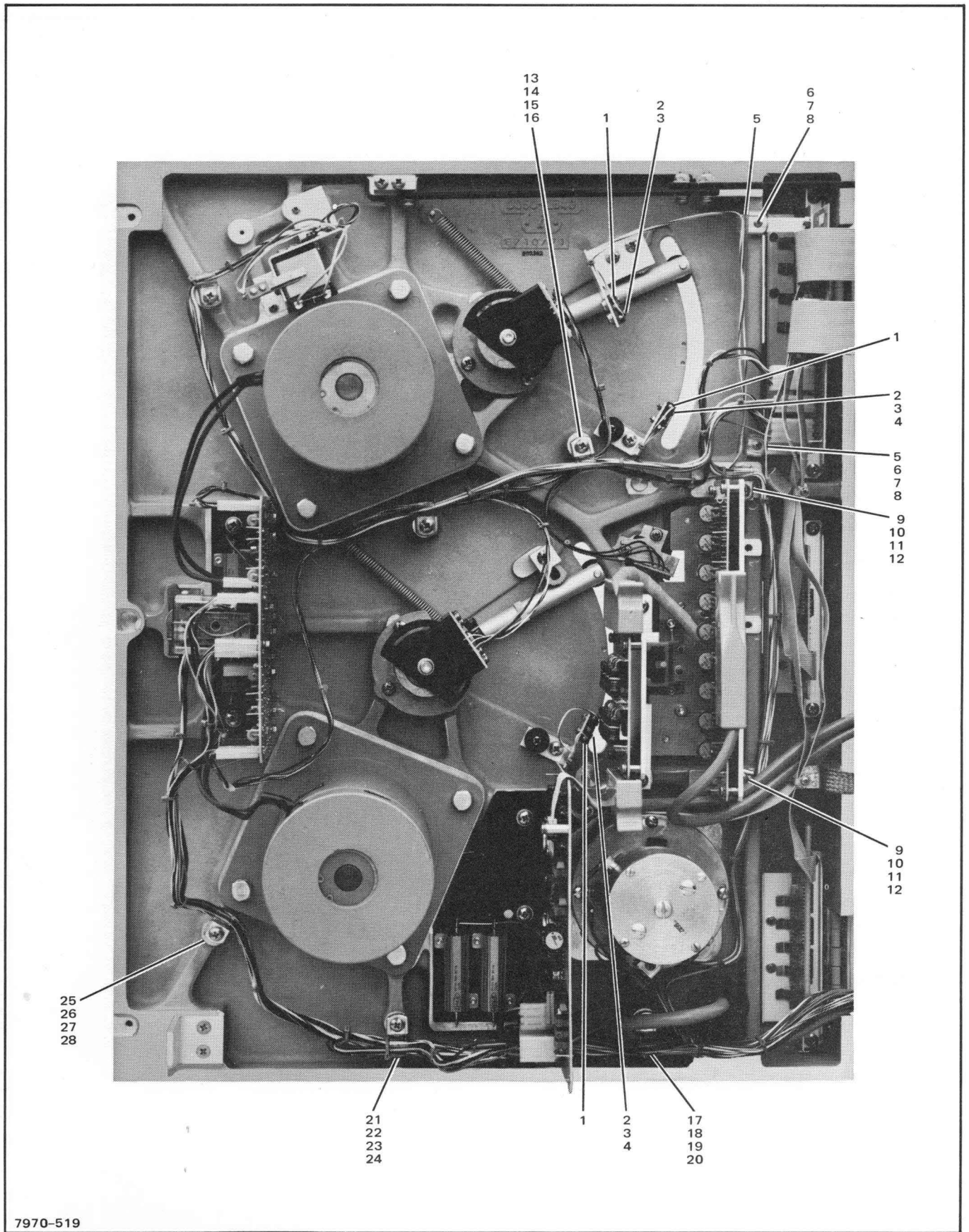
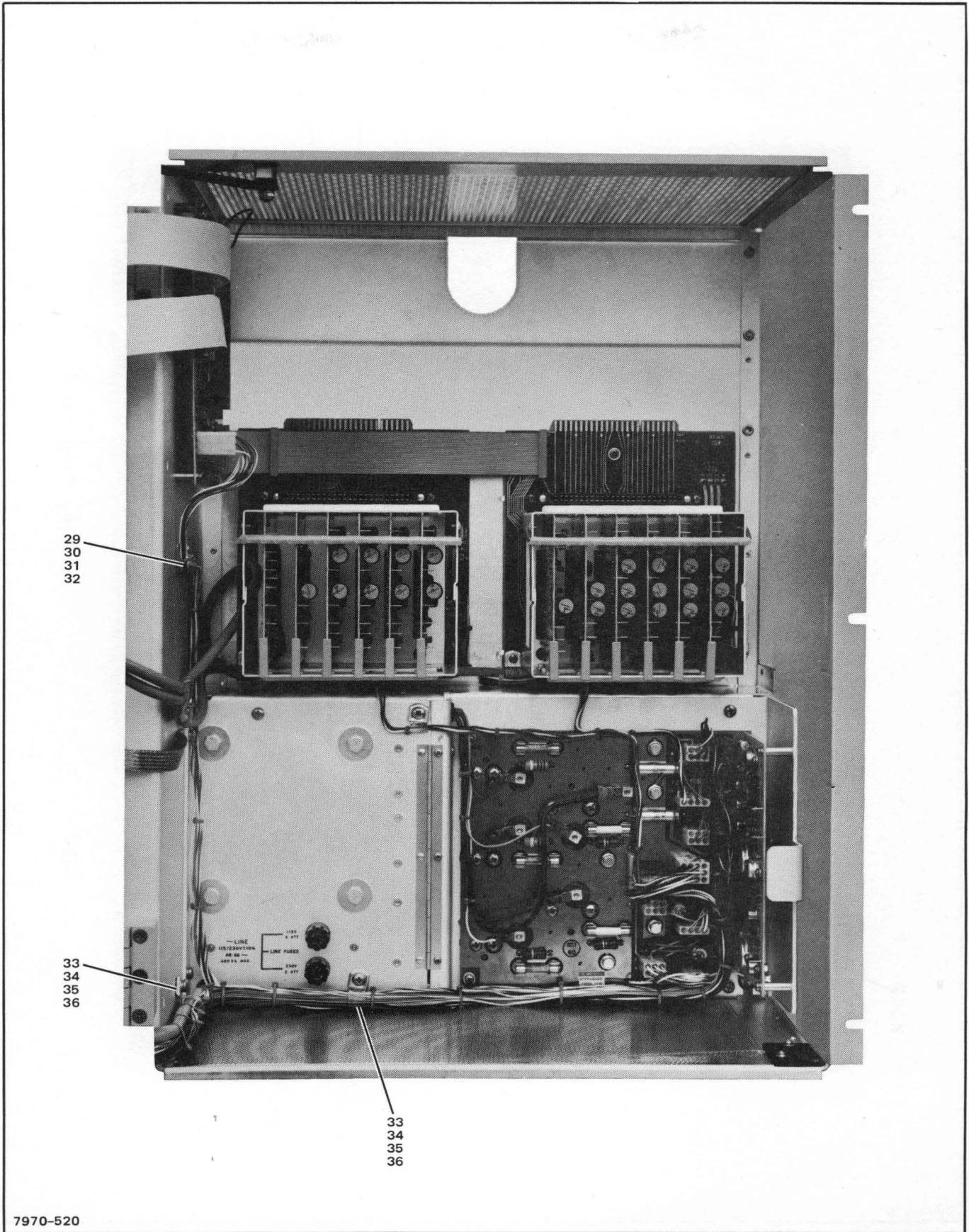


Figure 6-11. Transport Harness Assembly W2 (Sheet 1 of 2)



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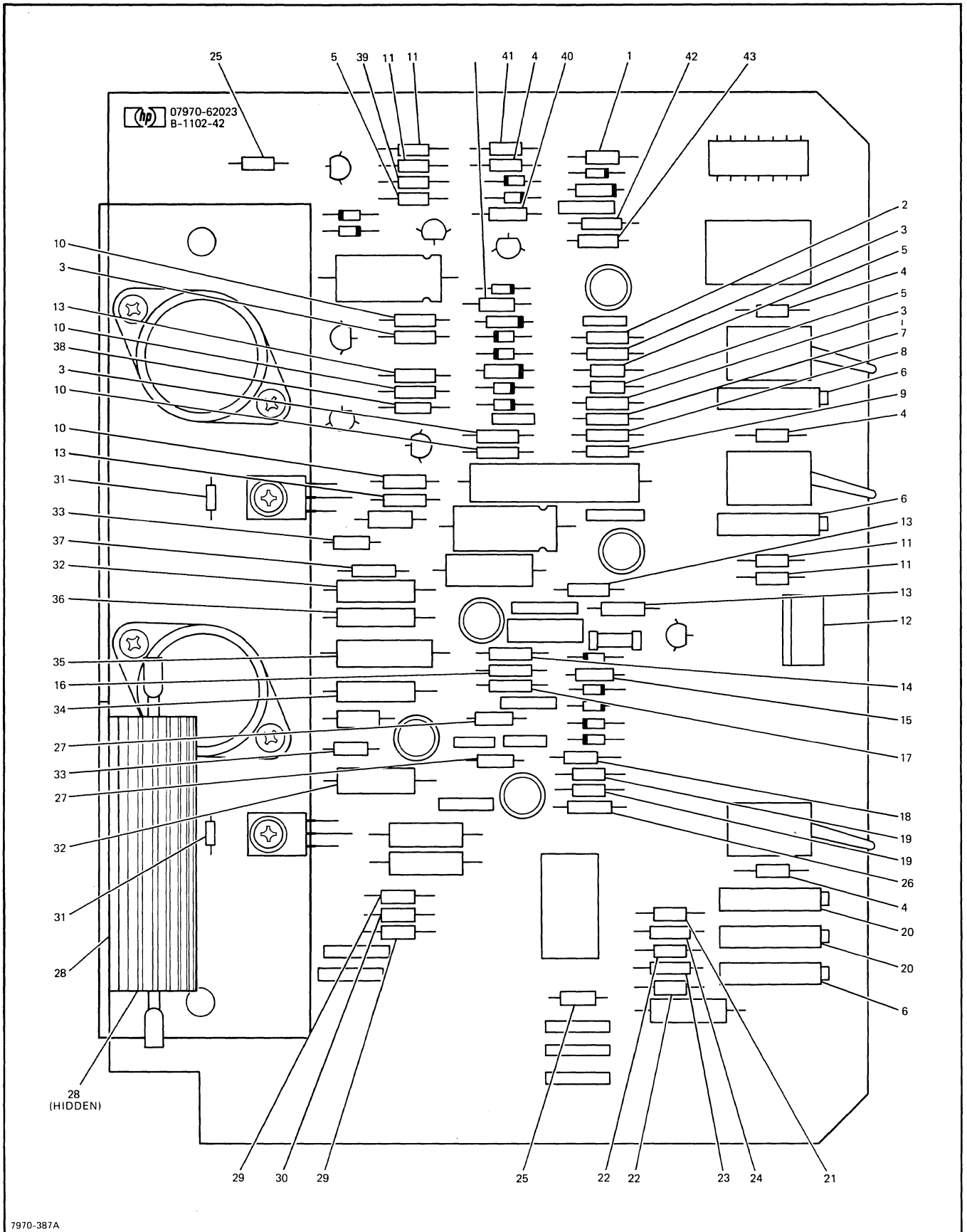
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7970-520

Figure 6-11. Transport Harness Assembly W2 (Sheet 2 of 2)

FIGURE & INDEX NO.	PART NUMBER	DESCRIPTION					UNITS PER ASSY
		1	2	3	4	5	
6-11-	07970-60600	TRANSPORT HARNESS ASSEMBLY W2					REF
-1	3102-0009	. SWITCH, sensing, spdt (S1, S2, S3)					3
-2	0520-0131	. . SCREW, no. 2-56, 0.438-inch, pozi (AP)					2
-3	2190-0014	. . WASHER, lock (AP).					2
-4	0610-0001	. . NUT, hex, no. 2-56 (AP)					2
-5	1400-0302	. CLAMP, cable, 0.125-inch					2
-6	2200-0147	. . SCREW, no. 4-40, 0.5-inch, pozi (AP).					1
-7	2190-0003	. . WASHER, lock, helical (AP)					1
-8	2190-0451	. . WASHER, D-type (AP)					1
-9	1400-0292	. CLAMP, cable, 0.25-inch					2
-10	2680-0103	. . SCREW, no. 10-32, 0.5-inch, pozi (AP)					1
-11	2190-0034	. . WASHER, lock, helical (AP)					1
-12	2190-0453	. . WASHER, D-type (AP)					1
-13	1400-0292	. CLAMP, cable, 0.25-inch (read/write units)					1
	1400-0291	. CLAMP, cable, 0.187-inch (read only units)					1
-14	2680-0099	. . SCREW, no. 10-32, 0.375-inch, pozi (AP) (read only units)					1
	2680-0101	. . SCREW, no. 10-32, 0.438-inch, pozi (AP) (read/write units)					1
-15	2190-0034	. . WASHER, lock, helical (AP)					1
-16	2190-0453	. . WASHER, D-type (AP)					1
-17	1400-0294	. CLAMP, cable, 0.5-inch					2
-18	2680-0099	. . SCREW, no. 10-32, 0.375-inch, pozi (AP).					1
-19	2190-0034	. . WASHER, lock, helical (AP)					1
-20	2190-0453	. . WASHER, D-type (AP)					1
-21	1400-0293	. CLAMP, cable, 0.375-inch					1
-22	2680-0099	. . SCREW, no. 10-32, 0.375-inch, pozi (AP)					1
-23	2190-0034	. . WASHER, lock, helical (AP)					1
-24	2190-0453	. . WASHER, D-type (AP)					1
-25	1400-0187	. CLAMP, cable, 0.312-inch					1
-26	2680-0099	. . SCREW, no. 10-32, 0.375-inch, pozi (AP)					1
-27	2190-0034	. . WASHER, lock, helical (AP)					1
-28	2190-0453	. . WASHER, D-type (AP)					1
-29	1400-0292	. CLAMP, cable, 0.25-inch					1
-30	2680-0099	. . SCREW, no. 10-32, 0.375-inch, pozi (AP)					1
-31	2190-0034	. . WASHER, lock, helical (AP)					1
-32	2190-0453	. . WASHER, D-type (AP)					1
-33	1400-0296	. CLAMP, cable, 0.625-inch					1
-34	2680-0099	. . SCREW, no. 10-32, 0.375-inch, pozi (AP).					1
-35	2190-0034	. . WASHER, lock, helical (AP)					1
-36	2190-0453	. . WASHER, D-type (AP)					1

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Figure 6-12. Capstan Servo PC Assembly A9 (Sheet 1 of 2)

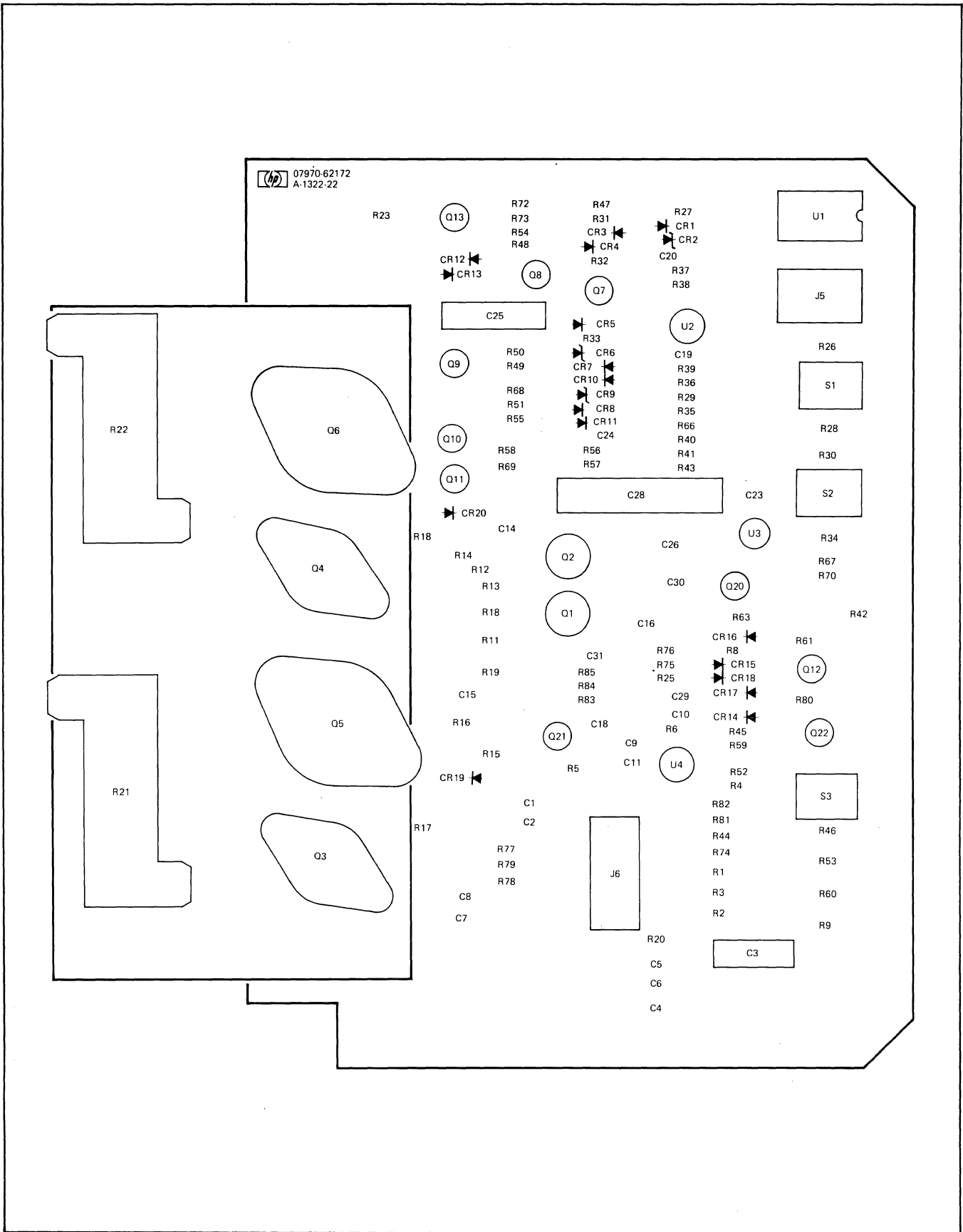


Figure 6-12. Capstan Servo PC Assembly A9

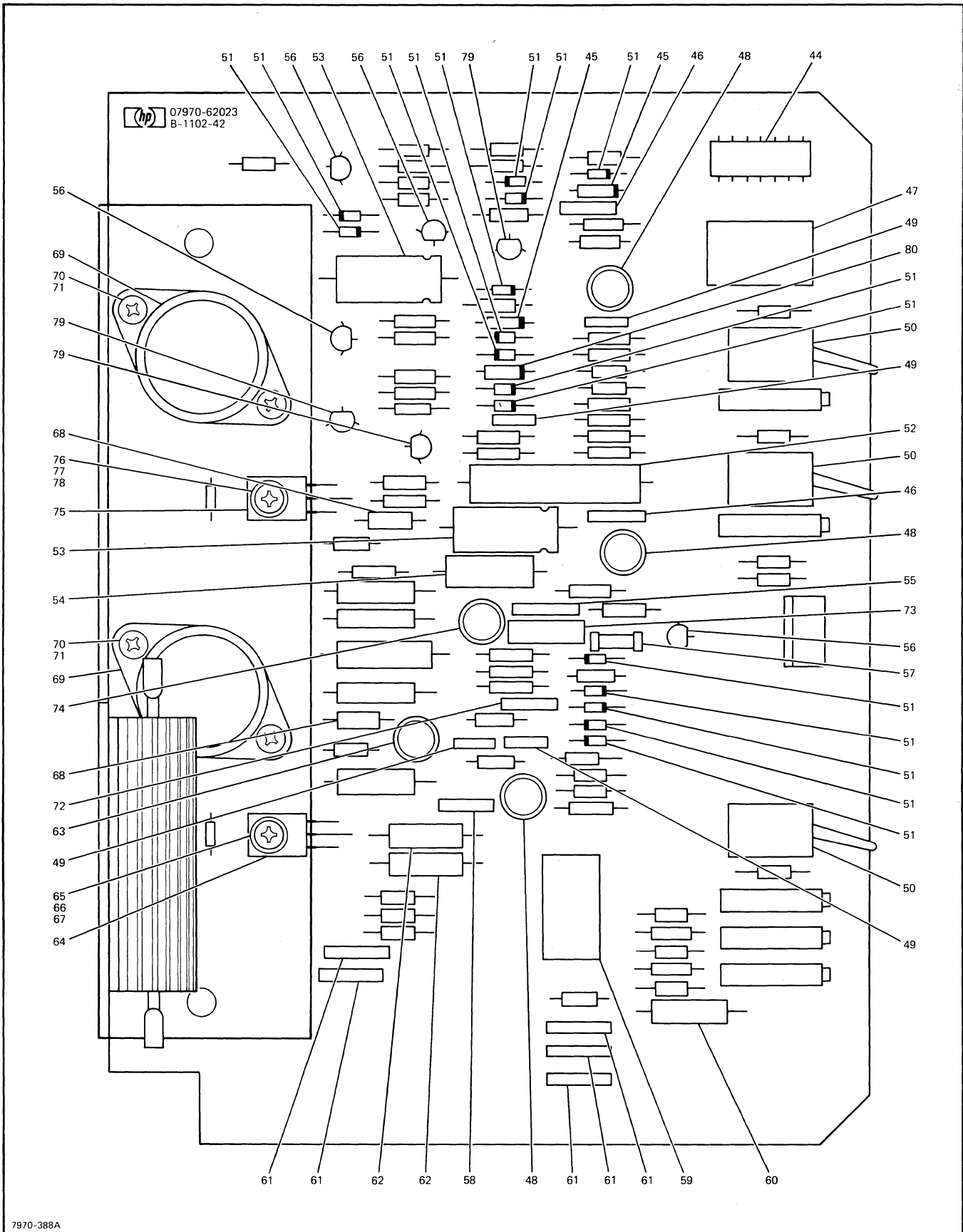


Figure 6-12. Capstan Servo PC Assembly A9 (Sheet 2 of 2)

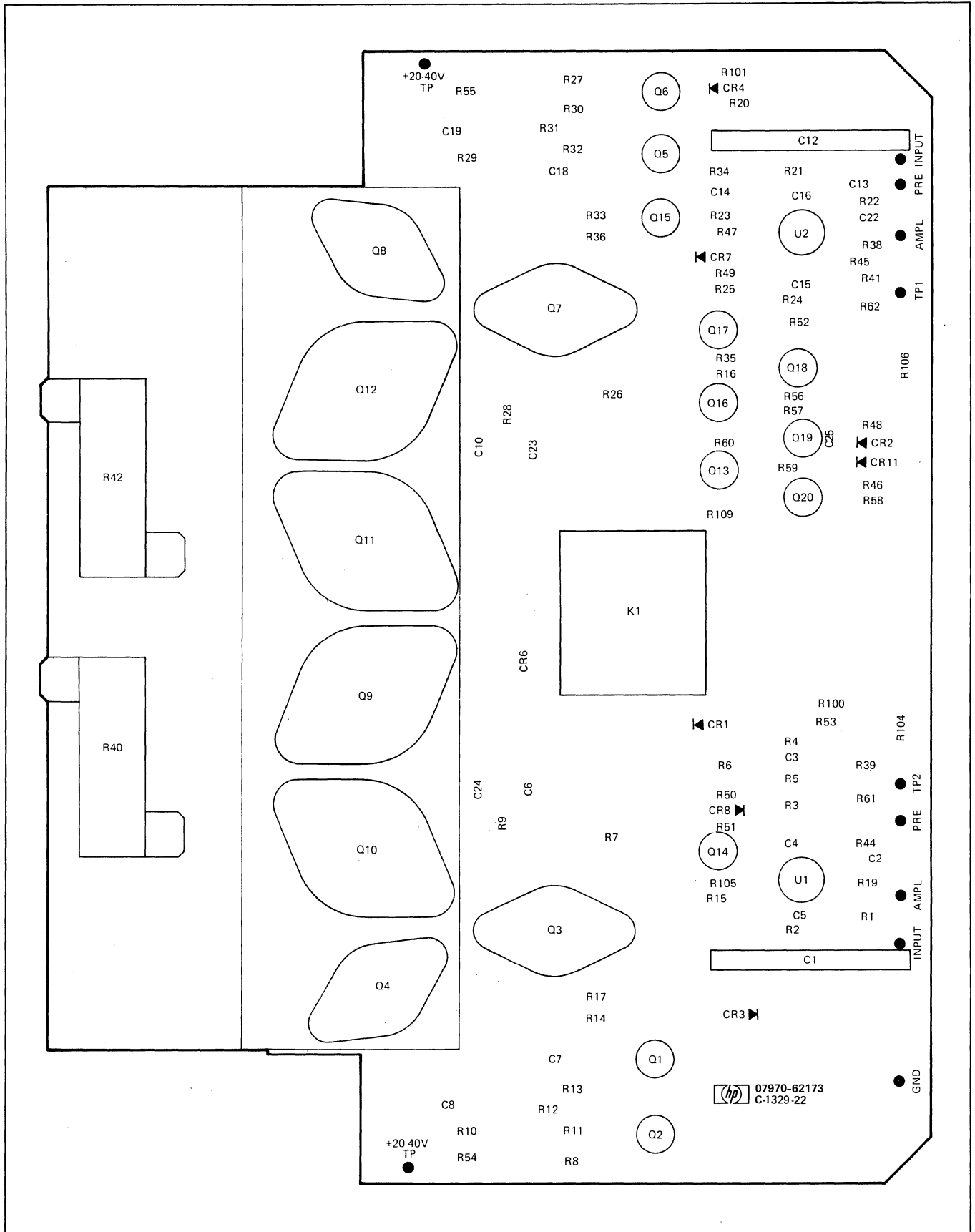
Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A9	07970-62172	1	CAPSTAN SERVO PCA (SERIES 1322)	28480	07970-62172
C1	0160-2151	2	C:FXD MY 0.011 UF 5%	28480	0160-2151
C2	0160-2151		C:FXD MY 0.011 UF 5%	28480	0160-2151
C3	0160-2414	1	C:FXD MY 0.022 UF 5% 200VDCW	28480	0160-2414
C4	0150-0121	6	C:FXD CER 0.1 UF +80-20% 50VDCW	56289	5C50BIS-CML
C5	0150-0121		C:FXD CER 0.1 UF +80-20% 50VDCW	56289	5C50BIS-CML
C6	G150-0121		C:FXD CER 0.1 UF +80-20% 50VDCW	56289	5C50BIS-CML
C7	0150-0121		C:FXD CER 0.1 UF +80-20% 50VDCW	56289	5C50BIS-CML
C8	0150-0121		C:FXD CER 0.1 UF +80-20% 50VDCW	56289	5C50BIS-CML
C9	0160-2055	4	C:FXD CER 0.01 UF +80-20% 100VDCW	56289	C023F101F103ZS22-CDH
C10	0160-2055		C:FXD CER 0.01 UF +80-20% 100VDCW	56289	C023F101F103ZS22-CDH
C11	0160-2207	1	C:FXD MICA 300 PF 5%	28480	0160-2207
C14	0160-0153	2	C:FXD MY 0.001 UF 10% 200VDCW	56289	192P10292-PTS
C15	0160-0153		C:FXD MY 0.001 UF 10% 200VDCW	56289	192P10292-PTS
C16	0160-0165	1	C:FXD MY 0.056 UF 10% 200VDCW	56289	192P56392-PTS
C18	0160-2250	1	C:FXD CER 5.1 PF 500VDCW	72982	301-000-COHO-519E
C19	0160-2055		C:FXD CER 0.01 UF +80-20% 100VDCW	56289	C023F101F103ZS22-CDH
C20	0160-2199	2	C:FXD MICA 30 PF 5% 300VDCW	28480	0160-2199
C23	0160-2199		C:FXD MICA 30 PF 5% 300VDCW	28480	0160-2199
C24	0160-2055		C:FXD CER 0.01 UF +80-20% 100VDCW	56289	C023F101F103ZS22-CDH
C25	0180-0097	2	C:FXD TANT. 47 UF 10% 35VDCW	56289	150D476X9035S2-DYS
C26	0180-0097		C:FXD TANT. 47 UF 10% 35VDCW	56289	150D476X9035S2-DYS
C28	0160-3387	1	C:FXD MY 0.39 UF 10% 80VDCW	56289	192P3949R8PTS
C29	0160-3536	1	C:FXD MICA 620 PF 5% 100VDCW	00853	RDM15F621J1C
C30	0160-0174	1	C:FXD CER 0.47 UF +80-20% 25VDCW	56289	5C11875-CML
C31	0160-2224	1	C:FXD MICA 1800 PF 5%	28480	0160-2224
CR1	1901-0040	15	DICDE:SILICON 50 MA 30 WV	07263	FDG1088
CR2	1902-0033	2	DIODE:BREAKDCWN 6.2V	04713	1N823
CR3	1901-0040		DICDE:SILICON 50 MA 30 WV	07263	FDG1088
CR4	1901-0040		DIODE:SILICON 50 MA 30 WV	07263	FDG1088
CR5	1901-0040		DIODE:SILICON 50 MA 30 WV	07263	FDG1088
CR6	1902-0033		DIODE:BREAKDCWN 6.2V	04713	1N823
CR7	1901-0040		DICDE:SILICON 50 MA 30 WV	07263	FDG1088
CR8	1901-0040		DICDE:SILICON 50 MA 30 WV	07263	FDG1088
CR9	1902-0048	1	DIODE:BREAKDCWN 6.81V 5%	04713	SZ10939-134
CR10	1901-0040		DIODE:SILICON 50 MA 30 WV	07263	FDG1088
CR11	1901-0040		DICDE:SILICON 50 MA 30 WV	07263	FDG1088
CR12	1901-0040		DIODE:SILICON 50 MA 30 WV	07263	FDG1088
CR13	1901-0040		DIODE:SILICON 50 MA 30 WV	07263	FDG1088
CR14	1901-0040		DIODE:SILICON 50 MA 30 WV	07263	FDG1088
CR15	1901-0040		DICDE:SILICON 50 MA 30 WV	07263	FDG1088
CR16	1901-0040		DIODE:SILICON 50 MA 30 WV	07263	FDG1088
CR17	1901-0040		DICDE:SILICON 50 MA 30 WV	07263	FDG1088
CR18	1901-0040		DIODE:SILICON 50 MA 30 WV	07263	FDG1088
CR19	1901-0026	2	DIODE:SILICON 0.75A 200PIV	04713	SR1358-8
CR20	1901-0026		DIODE:SILICON 0.75A 200PIV	04713	SR1358-8
Q1	1854-0053	1	TSTR:SI NPN	80131	2N2218
Q2	1853-0012	1	TSTR:SI PNP	80131	2N2904A
Q3	1853-0323	1			
Q4	1854-0399	1	TSTR:SI NPN	80131	2N4912
Q5	1854-0576	2			
Q6	1854-0576				
Q7	1853-0036	4	TSTR:SI PNP	80131	2N3906
Q8	1854-0215	5	TSTR:SI NPN	80131	2N3904
Q9	1854-0215		TSTR:SI NPN	80131	2N3904
Q10	1853-0036		TSTR:SI PNP	80131	2N3906
Q11	1853-0036		TSTR:SI PNP	80131	2N3906
Q12	1854-0215		TSTR:SI NPN	80131	2N3904
Q13	1854-0215		TSTR:SI NPN	80131	2N3904
Q20	1853-0322	1	TSTR:SI PNP	80131	2N2946A
Q21	1853-0036		TSTR:SI PNP	80131	2N3906
Q22	1854-0215		TSTR:SI NPN	80131	2N3904
R1	0698-3152	2	R:FXD MET FLM 3.48K OHM 1% 1/8W	28480	0698-3152
R2	0698-3152		R:FXD MET FLM 3.48K OHM 1% 1/8W	28480	0698-3152
R3	0698-3202	1	R:FXD MET FLM 1.74K OHM 1% 1/8W	28480	0698-3202
R4	0757-C290	1	R:FXD MET FLM 6.19K OHM 1% 1/8W	28480	0757-0290
R5	0683-1015	2	R:FXD COMP 100 OHM 5% 1/4W	01121	CB 1015
R6	0683-1015		R:FXD COMP 100 OHM 5% 1/4W	01121	CB 1015
R8	0683-1055	1	R:FXD COMP 1 MEGOHM 5% 1/4W	01121	CB 1055
R9	2100-1972	3	R:VAR WW 20K OHM 10% 1W	28480	2100-1972
R10	0757-0797	1	R:FXD MET FLM 90.9 OHM 1% 1/2W	28480	0757-0797
R11	0698-3637	1	R:FXD MET OX 820 OHM 5% 2W	28480	0698-3637

FIGURE & INDEX NO.	PART NUMBER	DESCRIPTION					UNITS PER ASSY
		1	2	3	4	5	
6-12-	07970-62023	CAPSTAN SERVO PC ASSEMBLY A9					REF
-1	0757-0419	. RESISTOR, fxd, 681 ohms, 1%, 1/8W (R27, R33)					2
-2	0698-0083	. RESISTOR, fxd, 1.96k, 1%, 1/8W (R39)					1
-3	0757-0447	. RESISTOR, fxd, 16.2k, 1%, 1/8W (R36, R49, R56, R66)					4
-4	0757-0280	. RESISTOR, fxd, 1k, 1%, 1/8W (R26, R30, R31, R46)					4
-5	0757-0443	. RESISTOR, fxd, 11k, 1%, 1/8W (R29, R35, R48)					3
-6	2100-1972	. RESISTOR, var, 20k, 10% (R9, R28, R34)					3
-7	0757-0289	. RESISTOR, fxd, 13.3k, 1%, 1/8W (R40)					1
-8	0698-0085	. RESISTOR, fxd, 2.61k, 1%, 1/8W (R41)					1
-9	0698-3446	. RESISTOR, fxd, 383 ohms, 1%, 1/8W (R43)					1
-10	0757-0418	. RESISTOR, fxd, 619 ohms, 1%, 1/8W (R50, R51, R57, R58)					4
-11	0757-0438	. RESISTOR, fxd, 5.11k, 1%, 1/8W (R67, R70, R72, R73)					4
-12	2100-1762	. RESISTOR, var, 20k, 5% (R42)					1
-13	0757-0199	. RESISTOR, fxd, 21.5k, 1%, 1/8W (R61, R63, R68, R69)					4
-14	0698-3457	. RESISTOR, fxd, 316k, 1%, 1/8W (R76)					1
-15	0683-1055	. RESISTOR, fxd, 1M, 1/4W (R8)					1
-16	0757-0470	. RESISTOR, fxd, 162k, 1%, 1/8W (R75)					1
-17	0698-3260	. RESISTOR, fxd, 464k, 1%, 1/8W (R25)					1
-18	0757-0463	. RESISTOR, fxd, 82.5k, 1%, 1/8W (R45)					1
-19	0698-3153	. RESISTOR, fxd, 3.83k, 1%, 1/8W (R52, R59)					2
-20	2100-2850	. RESISTOR, var, 10k (R53, R60)					2
-21	0757-0466	. RESISTOR, fxd, 110k, 1%, 1/8W (R74)					1
-22	0698-3152	. RESISTOR, fxd, 3.48k, 1%, 1/8W (R1, R2)					2
-23	0698-3202	. RESISTOR, fxd, 1.74k, 1%, 1/8W (R3)					1
-24	0757-0465	. RESISTOR, fxd, 100k, 1%, 1/8W (R44)					1
-25	0683-1035	. RESISTOR, fxd, 10k, 1/4W (R20, R23)					2
-26	0757-0290	. RESISTOR, fxd, 6.19k, 1%, 1/8W (R4)					1
-27	0683-1015	. RESISTOR, fxd, 100 ohms, 1/4W (R5, R6)					2
-28	0811-2966	. RESISTOR, fxd, 3 ohms, 1%, ww (R21, R22)					2
-29	0698-3151	. RESISTOR, fxd, 2.87k, 1%, 1/8W (R77, R78)					2
-30	0757-0317	. RESISTOR, fxd, 1.33k, 1%, 1/8W (R79)					1
-31	0698-3113	. RESISTOR, fxd, 100 ohms, 1/8W (R17, R18)					2
-32	0761-0058	. RESISTOR, fxd, 750 ohms, 5%, 1W (R13, R15)					2
-33	0683-1025	. RESISTOR, fxd, 1k, 1/4W (R14, R16)					2
-34	0757-0198	. RESISTOR, fxd, 100 ohms, 1/2W (R19)					1
-35	0698-3637	. RESISTOR, fxd, 820 ohms, 2W (R11)					1
-36	0757-0797	. RESISTOR, fxd, 90.9 ohms, 1/2W (R10)					1
-37	0757-0401	. RESISTOR, fxd, 100 ohms, 1/8W (R12)					1
-38	0757-0424	. RESISTOR, fxd, 1.10k, 1%, 1/8W (R55)					1
-39	0757-0279	. RESISTOR, fxd, 3.16k, 1%, 1/8W (R54)					1
-40	0757-0444	. RESISTOR, fxd, 12.1k, 1%, 1/8W (R32)					1
-41	0757-0428	. RESISTOR, fxd, 1.62k, 1%, 1/8W (R47)					1

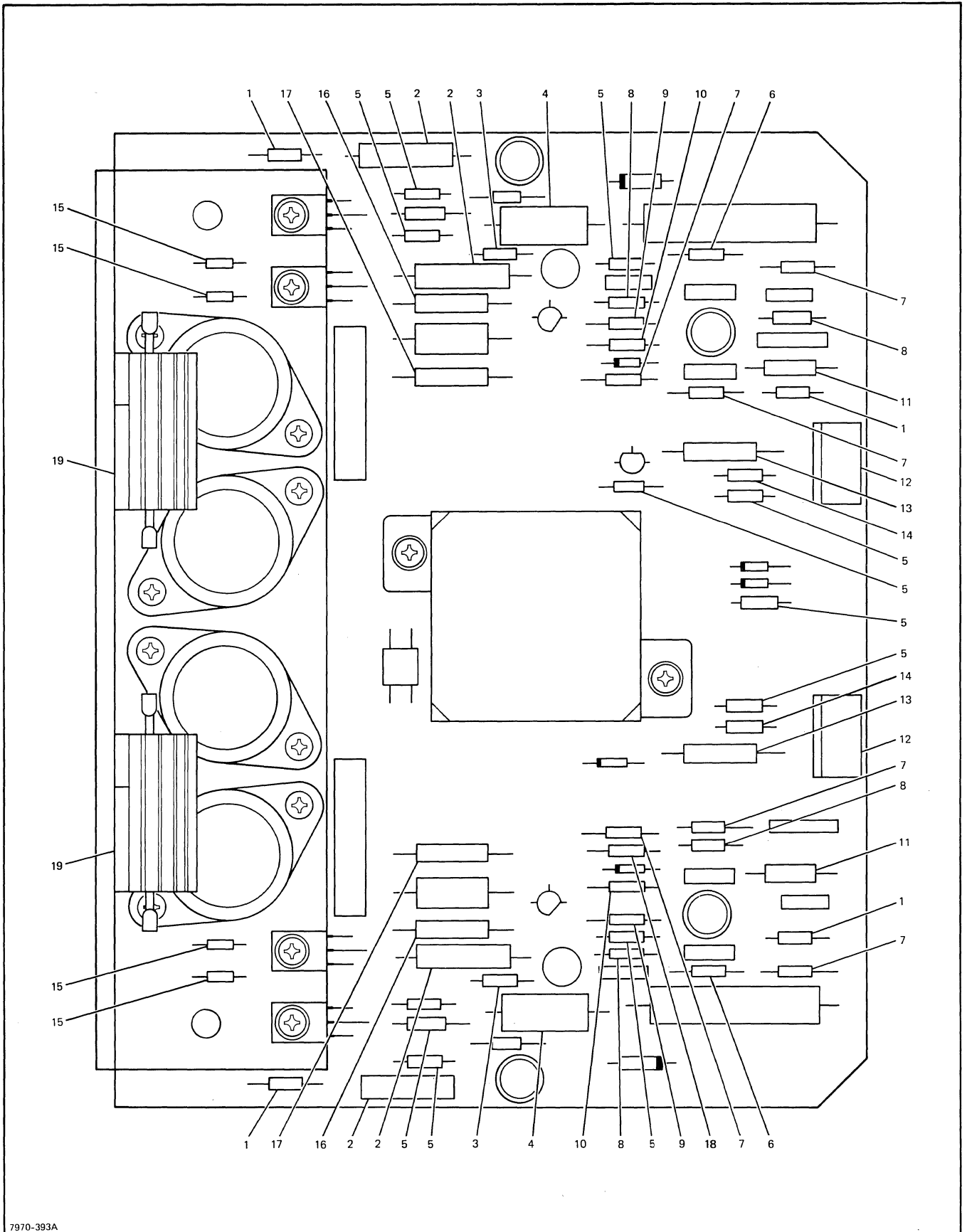
Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
R12	0757-0401	1	R:FXD MET FLM 100 OHM 1% 1/8W	28480	0757-0401
R13	0761-0058	2	R:FXD MET CX 750 OHM 5% 1W	28480	0761-0058
R14	0683-1025	2	R:FXD COMP 1000 OHM 5% 1/4W	01121	CB 1025
R15	0761-0058		R:FXD MET CX 750 OHM 5% 1W	28480	0761-0058
R16	0683-1025		R:FXD COMP 1000 OHM 5% 1/4W	01121	CB 1025
R17	0698-3113	2	R:FXD CARBON 100 OHM 5% 1/8W	28480	0698-3113
R18	0698-3113		R:FXD CARBON 100 OHM 5% 1/8W	28480	0698-3113
R19	0757-0198	1	R:FXD MET FLM 100 OHM 1% 1/2W	28480	0757-0198
R20	0683-1035	2	R:FXD COMP 10K OHM 5% 1/4W	01121	CB 1035
R21	0811-2966	2	R:FXD WW 30 OHM 1.0% 50W	28480	0811-2966
R22	0811-2966		R:FXD WW 30 OHM 1.0% 50W	28480	0811-2966
R23	0683-1035		R:FXD COMP 10K OHM 5% 1/4W	01121	CB 1035
R25	0698-3260	1	R:FXD MET FLM 464K OHM 1% 1/8W	28480	0698-3260
R26	0757-0280	5	R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
R27	0757-0419	2	R:FXD MET FLM 681 OHM 1% 1/8W	28480	0757-0419
R28	2100-1972		R:VAR WW 20K OHM 10% 1W	28480	2100-1972
R29	0757-0443	3	R:FXD MET FLM 11.0K OHM 1% 1/8W	28480	0757-0443
R30	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
R31	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
R32	0757-0444	1	R:FXD MET FLM 12.2K OHM 1% 1/8W	28480	0757-0444
R33	0757-0419		R:FXD MET FLM 681 OHM 1% 1/8W	28480	0757-0419
R34	2100-1972		R:VAR WW 20K OHM 10% 1W	28480	2100-1972
R35	0757-0443		R:FXD MET FLM 11.0K OHM 1% 1/8W	28480	0757-0443
R36	0757-0447	4	R:FXD MET FLM 16.2K OHM 1% 1/8W	28480	0757-0447
R37	0757-0441	1	R:FXD MET FLM 8.25K OHM 1% 1/8W	28480	0757-0441
R38	0698-3456	1	R:FXD MET FLM 287K OHM 1% 1/8W	28480	0698-3456
R39	0698-0083	1	R:FXD MET FLM 1.96K OHM 1% 1/8W	28480	0698-0083
R40	0757-0289	1	R:FXD MET FLM 13.3K OHM 1% 1/8W	28480	0757-0289
R41	0698-0085	1	R:FXD MET FLM 2.61K OHM 1% 1/8W	28480	0698-0085
R42	2100-1762	1	R:VAR WW 20K 5% 1W	75042	CT-106-4
R43	0698-3446	1	R:FXD MET FLM 383 OHM 1% 1/8W	28480	0698-3446
R44	0757-0465	1	R:FXD MET FLM 100K OHM 1% 1/8W	28480	0757-0465
R45	0757-0463	1	R:FXD MET FLM 82.5K OHM 1% 1/8W	28480	0757-0463
R46	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
R47	0757-0428	1	R:FXD MET FLM 1.62K OHM 1% 1/8W	28480	0757-0428
R48	0757-0443		R:FXD MET FLM 11.0K OHM 1% 1/8W	28480	0757-0443
R49	0757-0447		R:FXD MET FLM 16.2K OHM 1% 1/8W	28480	0757-0447
R50	0757-0418	4	R:FXD MET FLM 619 OHM 1% 1/8W	28480	0757-0418
R51	0757-0418		R:FXD MET FLM 619 OHM 1% 1/8W	28480	0757-0418
R52	0698-3153	2	R:FXD MET FLM 3.83K OHM 1% 1/8W	28480	0698-3153
R53	2100-2850	2	R:VAR WW 10K OHM 10% 1W	28480	2100-2850
R54	0757-0279	1	R:FXD MET FLM 3.16K OHM 1% 1/8W	28480	0757-0279
R55	0757-0424	1	R:FXD MET FLM 1.10K OHM 1% 1/8W	28480	0757-0424
R56	0757-0447		R:FXD MET FLM 16.2K OHM 1% 1/8W	28480	0757-0447
R57	0757-0418		R:FXD MET FLM 619 OHM 1% 1/8W	28480	0757-0418
R58	0757-0418		R:FXD MET FLM 619 OHM 1% 1/8W	28480	0757-0418
R59	0698-3153		R:FXD MET FLM 3.83K OHM 1% 1/8W	28480	0698-3153
R60	2100-2850		R:VAR WW 10K OHM 10% 1W	28480	2100-2850
R61	0757-0199	4	R:FXD MET FLM 21.5K OHM 1% 1/8W	28480	0757-0199
R63	0757-0199		R:FXD MET FLM 21.5K OHM 1% 1/8W	28480	0757-0199
R66	0757-0447		R:FXD MET FLM 16.2K OHM 1% 1/8W	28480	0757-0447
R67	0757-0438	6	R:FXD MET FLM 5.11K OHM 1% 1/8W	28480	0757-0438
R68	0757-0199		R:FXD MET FLM 21.5K OHM 1% 1/8W	28480	0757-0199
R69	0757-0199		R:FXD MET FLM 21.5K OHM 1% 1/8W	28480	0757-0199
R70	0757-0438		R:FXD MET FLM 5.11K OHM 1% 1/8W	28480	0757-0438
R72	0757-0438		R:FXD MET FLM 5.11K OHM 1% 1/8W	28480	0757-0438
R73	0757-0438		R:FXD MET FLM 5.11K OHM 1% 1/8W	28480	0757-0438
R74	0757-0466	1	R:FXD MET FLM 110K OHM 1% 1/8W	28480	0757-0466
R75	0757-0470	1	R:FXD MET FLM 162K OHM 1% 1/8W	28480	0757-0470
R76	0698-3457	1	R:FXD MET FLM 316K OHM 1% 1/8W	28480	0698-3457
R77	0698-3151	2	R:FXD MET FLM 2.87K OHM 1% 1/8W	28480	0698-3151
R78	0698-3151		R:FXD MET FLM 2.87K OHM 1% 1/8W	28480	0698-3151
R79	0757-0317	1	R:FXD MET FLM 1.33K OHM 1% 1/8W	28480	0757-0317
R80	0757-0438		R:FXD MET FLM 5.11K OHM 1% 1/8W	28480	0757-0438
R81	0757-0403	1	R:FXD MET FLM 121 OHM 1% 1/8W	28480	0757-0403
R82	0757-1094	1	R:FXD MET FLM 1.47K OHM 1% 1/8W	28480	0757-1094
R83	0757-0438		R:FXD MET FLM 5.11K OHM 1% 1/8W	28480	0757-0438
R84	0757-0416	1	R:FXD MET FLM 511 OHM 1% 1/8W	28480	0757-0416
R85	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
S2	3101-1213		SWITCH:TOGGLE DPST-DB SUB-MINIATURE	81640	T8001
S3	3101-1213		SWITCH:TOGGLE DPST-DB SUB-MINIATURE	81640	T8001
U1	1820-0256	1	IC:DTL QUAC 2-INPUT POWER GATE	04713	MC858P
U2	1820-0223	3	INTEGRATED CIRCUIT:OPERATIONAL AMPL.	28480	1820-0223
U3	1820-0223		INTEGRATED CIRCUIT:OPERATIONAL AMPL.	28480	1820-0223
U4	1820-0223		INTEGRATED CIRCUIT:OPERATIONAL AMPL.	28480	1820-0223

FIGURE & INDEX NO.	PART NUMBER	DESCRIPTION					UNITS PER ASSY
		1	2	3	4	5	
6-12-42	0698-3456	.	RESISTOR, fxd, 287k, 1%, 1/8W (R38)	.	.	.	1
-43	0757-0441	.	RESISTOR, fxd, 8.25k, 1%, 1/8W (R37)	.	.	.	1
-44	1820-0256	.	INTEGRATED CIRCUIT, MC858P (U1)	.	.	.	1
-45	1902-0033	.	DIODE, reference, 6.2V, 1N823 (CR2, CR6)	.	.	.	2
-46	0160-2199	.	CAPACITOR, fxd, 30 pF, mica (C20, C23)	.	.	.	2
-47	1200-0426	.	SOCKET, integrated circuit (J5)	.	.	.	1
-48	1820-0223	.	INTEGRATED CIRCUIT, operational amplifier (U2, U3, U4)	.	.	.	3
-49	0160-2055	.	CAPACITOR, fxd, 0.01 μ F, cer (C9, C10, C19, C24)	.	.	.	4
-50	3101-1213	.	SWITCH, toggle (S1, S2, S3)	.	.	.	3
-51	1901-0040	.	DIODE, Si, 30V, 3 mA (CR1, Cr3, CR4, CR5, CR7, CR8, CR10, CR11, CR12, CR13, CR14, CR15, CR16, CR17, CR18)	.	.	.	15
-52	0160-3387	.	CAPACITOR, fxd, 0.39 μ F, 80V (C28)	.	.	.	1
-53	0180-0097	.	CAPACITOR, fxd, 47 μ F, 35V (C25, C26)	.	.	.	2
-54	0160-0165	.	CAPACITOR, fxd, 0.056 μ F, My (C16)	.	.	.	1
-55	0160-0174	.	CAPACITOR, fxd, 0.47 μ F, cer (C30)	.	.	.	1
-56	1854-0215	.	TRANSISTOR, 2N3904 (Q8, Q9, Q12, Q13)	.	.	.	4
-57	0160-2250	.	CAPACITOR, fxd, cer, 5 pF (C18)	.	.	.	1
-58	0160-2207	.	CAPACITOR, fxd, mica, 300 pF (C11)	.	.	.	1
-59	07970-62025	.	DUMMY PLUG ASSEMBLY (J6)	.	.	.	1
-60	0160-2414	.	CAPACITOR, fxd, My, 0.022 μ F (C3)	.	.	.	1
-61	0150-0121	.	CAPACITOR, fxd, cer, 0.1 μ F (C4, C5, C6, C7, C8)	.	.	.	5
-62	0160-2151	.	CAPACITOR, fxd, My, 0.011 μ F (C1, C2)	.	.	.	2
-63	1854-0053	.	TRANSISTOR, 2N2218 (Q1)	.	.	.	1
-64	1853-0204	.	TRANSISTOR, 2N4920 (Q3)	.	.	.	1
-65	2200-0147	.	SCREW, no. 4-40, 0.50-inch, pozi (AP)	.	.	.	1
-66	3050-0105	.	WASHER, flat (AP)	.	.	.	1
-67	2260-0009	.	NUT, hex, no. 4-40 (AP)	.	.	.	1
-68	0160-0153	.	CAPACITOR, fxd, My, 0.001 μ F (C14, C15)	.	.	.	2
-69	1854-0264	.	TRANSISTOR, NPN, Si, 2N3715 (Q5, Q6)	.	.	.	2
-70	2200-0145	.	SCREW, no. 4-40, 0.438-inch, pozi (AP)	.	.	.	2
-71	2260-0009	.	NUT, hex, no. 4-40 (AP)	.	.	.	2
-72	0160-3536	.	CAPACITOR, fxd, 620 pF, 5% (C29)	.	.	.	1
-73	0160-2224	.	CAPACITOR, fxd, mica, 1800 pF (C31)	.	.	.	1
-74	1853-0012	.	TRANSISTOR, PNP, Si, 2N2904A (Q2)	.	.	.	1
-75	1854-0347	.	TRANSISTOR, NPN, Si, 2N4923 (Q4)	.	.	.	1
-76	2200-0147	.	SCREW, no. 4-40, 0.50-inch, pozi (AP)	.	.	.	1
-77	3050-0105	.	WASHER, flat (AP)	.	.	.	1
-78	2260-0009	.	NUT, hex, no. 4-40 (AP)	.	.	.	1
-79	1853-0036	.	TRANSISTOR, PNP, Si, 2N3906 (Q7, Q10, Q11)	.	.	.	3
-80	1902-0048	.	DIODE, reference, 6.81V (CR9)	.	.	.	1



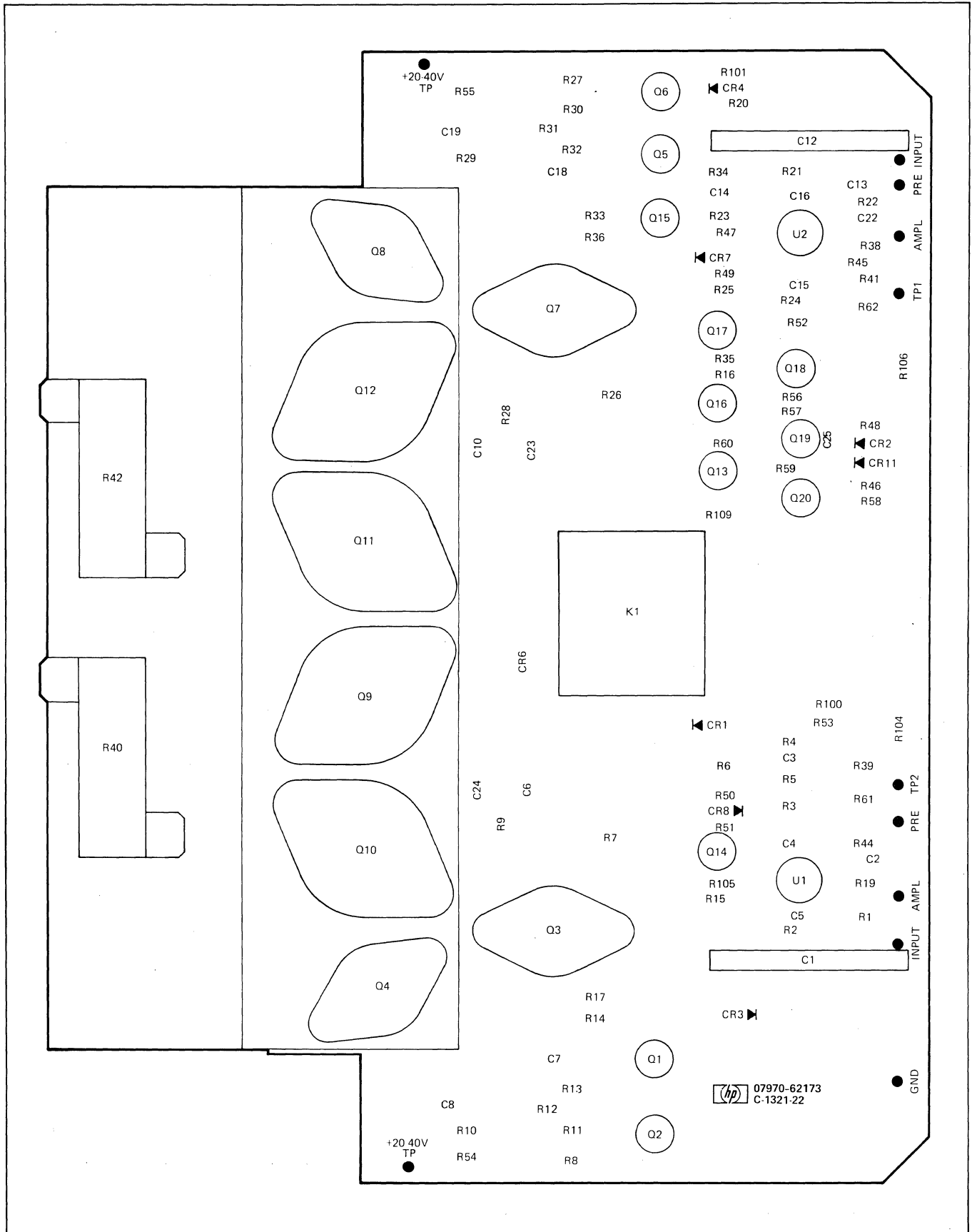
7970-62173A

Figure 6-13. Reel Servo PC Assembly A7 (Sheet 1 of 2)



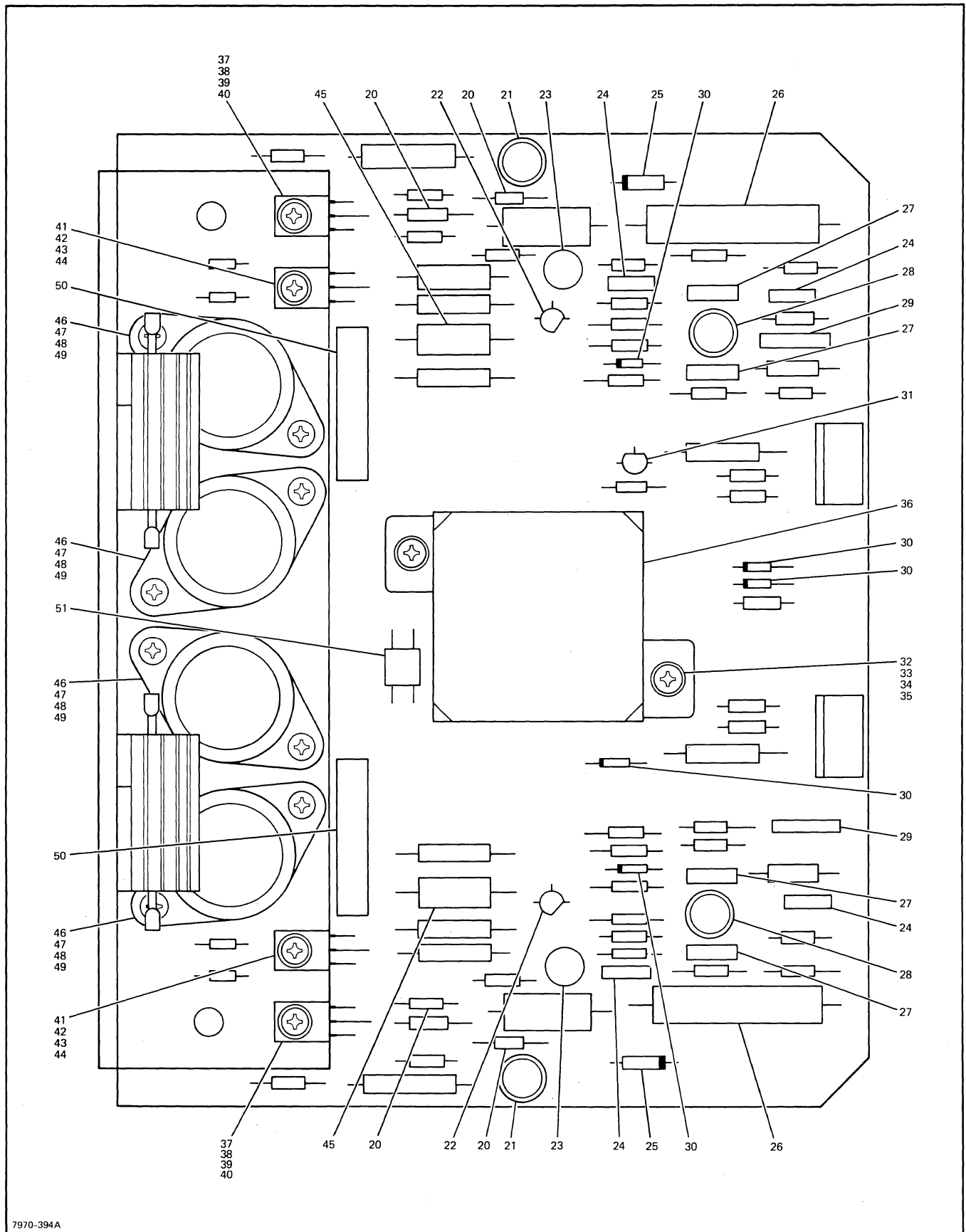
7970-393A

Figure 6-13. Reel Servo PC Assembly A7 (Sheet 1 of 2)



7970 G2173A

Figure 6-13. Reel Servo PC Assembly A7 (Sheet 2 of 2)



7970-394A

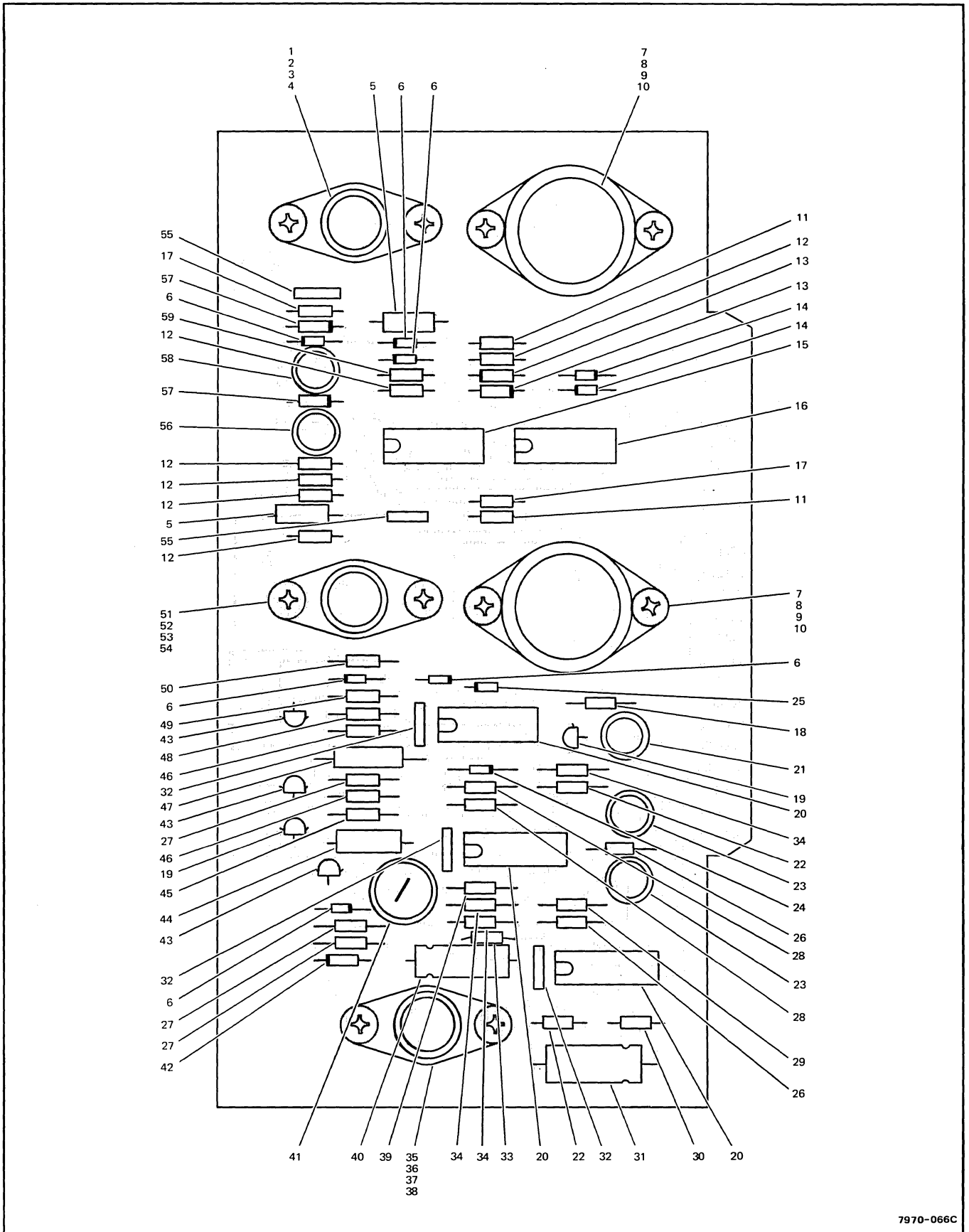
Figure 6-13. Reel Servo PC Assembly A7 (Sheet 2 of 2)

REFERENCE DESIGNATION	HP PART NO.	DESCRIPTION	MFR CODE	MFR PART NO.
	07970-62173	Reel Servo PCA	28480	07970-62173
C1, 12	0160-0380	Capacitor, Fxd, My, 0.22 μ F, 10%, 200 VDCW	28480	0160-0380
C2, 3, 13, 14	0160-2055	Capacitor, Fxd, Cer, 0.01 μ F, +80 -20%, 100 VDCW	36289	C023F101F103ZS22-CD
C4, 5, 15, 16	0160-2199	Capacitor, Fxd, Mica, 30 pF, 5%, 300 VDCW	28480	0160-2199
C6, 10, 23, 24	0160-2128	Capacitor, Fxd, My, 0.33 μ F, 20%, 200 VDCW	56289	225P33402Y-PWM
C7, 8, 18, 19	0160-0154	Capacitor, Fxd, Mica, 0.0022 μ F, 10%, 200 VDCW	56289	192P22292-PTS
C21, 22	0150-0121	Capacitor, Fxd, 0.1 μ F, +80 -20%, 50 VDCW	56289	5C50BIS-CML
C25	0160-0127	Capacitor, Fxd, Cer, 1 μ F, 25V	56289	5C13CS-CML
CR1, 2, 5, 7, 8	1901-0040	Diode, Si, 30 mA, 30 WV	07263	FDG1088
CR3, 4	1902-0048	Diode, Breakdown, 6.81V, 5%	04713	SZ10939-134
CR6	1901-0364	Diode, Si, 200 PIV	28480	1901-0364
CR10	1902-3024	Diode, Breakdown, 2.87V, 5%	04713	SZ10939-158
K1	0490-0891	Relay, 3 PDT, 10A, 24 VDC	77342	KUP14D15
Q1, 5	1854-0022	Transistor, Si, NPN	07263	S17843
Q2, 6	1853-0080	Transistor, Si, PNP	80131	2N4888
Q3, 7	1853-0323	Transistor, Si, PNP	80131	2N4900
Q4, 8	1854-0399	Transistor, Si, NPN	80131	2N4912
Q9 thru Q12	1854-0490	Transistor, Si, NPN	28480	1854-0490
Q13, 19, 20, 21	1854-0215	Transistor, Si, NPN	80131	2N3904
Q14, 15	1855-0056	Transistor, Si, FET	80131	2N4342
Q16, 17	1853-0322	Transistor, Si, PNP	80131	2N2946A
Q18	1853-0036	Transistor, Si, PNP	80131	2N3906
R1, 5, 6, 20, 24, 25	0698-3458	Resistor, Fxd, Flm, 348k ohms, 1%, 1/8W	28480	0698-3458
R2, 21	0698-3159	Resistor, Fxd, Flm, 26.1k ohms, 1%, 1/8W	28480	0698-3159
R3, 4, 22, 23	0683-1015	Resistor, Fxd, Comp, 100 ohms, 5%, 1/4W	01121	CB1015
R7, 26	0757-0797	Resistor, Fxd, Flm, 90.9 ohms, 1%, 1/2W	28480	0757-0797
R8, 27	0698-3637	Resistor, Fxd, Ox, 820 ohms, 5%, 2W	28480	0698-3637
R9, 10, 15, 28, 29, 34, 100, 101	0683-1025	Resistor, Fxd, Comp, 1000 ohms, 5%, 1/4W	01121	CB1025
R11, 13, 30, 32	0761-0058	Resistor, Fxd, Met Ox, 750 ohms, 5%, 1W	28480	0761-0058
R12, 31	0757-0401	Resistor, Fxd, Flm, 100 ohms, 1%, 1/8W	28480	0757-0401
R14, 17, 33, 36	0698-3113	Resistor, Fxd, Carbon, 100 ohms, 5%, 1/8W	28480	0698-3113
R16, 35	0757-0280	Resistor, Fxd, Flm, 3.16k ohms, 1%, 1/8W	28480	0757-0279
R19, 38, 54, 55	0683-1035	Resistor, Fxd, Comp, 10k ohms, 5%, 1/4W	01121	CB1035
R39, 41	0698-3260	Resistor, Fxd, Flm, 464 ohms, 1%, 1/8W	28480	0698-3260
R40, 42	0811-2048	Resistor, Fxd, WW, 0.25 ohm, 1%, 25W	28480	0811-2048
R44, 45	0686-1035	Resistor, Fxd, Comp, 10k ohms, 5%, 1/2W	01121	EB1035
R46, 59	0757-0279	Resistor, Fxd, Flm, 3.16k ohms, 1%, 1/8W	28480	0757-0279
R47, 105	0757-0289	Resistor, Fxd, Flm, 13.3k ohms, 1%, 1/8W	28480	0757-0289
R48, 65	0757-0278	Resistor, Fxd, Flm, 1.78k ohms, 1%, 1/8W	28480	0757-0278
R49, 51	0757-0465	Resistor, Fxd, Flm, 100k ohms, 1%, 1/8W	28480	0757-0465
R50	0757-0458	Resistor, Fxd, Flm, 51.1k ohms, 1%, 1/8W	28480	0757-0458
R52	0686-2225	Resistor, Fxd, Comp, 2200 ohms, 5%, 1/2W	01121	EB2225
R56	0757-0403	Resistor, Fxd, Flm, 121 ohms, 1%, 1/8W	28480	0757-0403
R57, 58	0757-1094	Resistor, Fxd, Flm, 1.47k ohms, 1%, 1/8W	28480	0757-1094
R60, 64	0757-0438	Resistor, Fxd, Flm, 5.11k ohms, 1%, 1/8W	28480	0757-0438
R61, 62	0698-3456	Resistor, Fxd, Flm, 287k ohms, 1%, 1/8W	28480	0698-3456
R104, 106	2100-1759	Resistor, Var, WW, 2k ohms, 5%, 1W	28480	2100-1759
R107	0698-3438	Resistor, Fxd, Flm, 147 ohms, 1%, 1/8W	28480	0698-3438
R108	0698-3440	Resistor, Fxd, Flm, 196 ohms, 1%, 1/8W	28480	0698-3440
U1, 2	1820-0223	Integrated Circuit	28480	1820-0223

FIGURE & INDEX NO.	PART NUMBER	DESCRIPTION					UNITS PER ASSY
		1	2	3	4	5	
6-13-	07970-62024	REEL SERVO PC ASSEMBLY A7					REF
-1	0683-1035	. RESISTOR, fxd, 10k, 5%, 1/4W (R19, R38, R54, R55)					4
-2	0761-0058	. RESISTOR, fxd, 750 ohms, 5%, 1W (R11, R13, R30, R32)					4
-3	0757-0401	. RESISTOR, fxd, 100 ohms, 1/8W (R12, R31)					2
-4	0698-3637	. RESISTOR, fxd, 820 ohms, 2W (R8, R27)					2
-5	0683-1025	. RESISTOR, fxd, 1k, 1/4W (R9, R10, R15, R28, R29, R34, R43, R46, R100, R101)					10
-6	0698-3159	. RESISTOR, fxd, 26.1k, 1%, 1/8W (R2, R21)					2
-7	0698-3458	. RESISTOR, fxd, 348k, 1%, 1/8W (R1, R5, R6, R20, R24, R25)					6
-8	0683-1015	. RESISTOR, fxd, 100 ohms, 1/4W (R3, R4, R22, R23)					4
-9	0757-0289	. RESISTOR, fxd, 13.3k, 1%, 1/8W (R47, R105)					2
-10	0757-0442	. RESISTOR, fxd, 10k, 1%, 1/8W (R49, R51)					2
-11	0686-1035	. RESISTOR, fxd, 10k, 1/2W (R44, R45)					2
-12	2100-1759	. RESISTOR, var, 2k, 5% (R104, R106)					2
-13	0757-0869	. RESISTOR, fxd, 681k (R39, R41)					2
-14	0757-0278	. RESISTOR, fxd, 1.78k, 1%, 1/8W (R48, R53)					2
-15	0698-3113	. RESISTOR, fxd, 100 ohms, 1/8W (R14, R17, R33, R36)					4
-16	0757-0198	. RESISTOR, fxd, 100 ohms, 1/2W (R18, R37)					2
-17	0757-0797	. RESISTOR, fxd, 90.9 ohms, 1/2W (R7, R26)					2
-18	0775-0199	. RESISTOR, fxd, 21.5k, 1%, 1/8W (R50)					1
-19	0811-2048	. RESISTOR, fxd, 0.25 ohm, 25W (R40, R42)					2
-20	0160-0153	. CAPACITOR, fxd, 0.001 μ F, My (C7, C8, C18, C19)					4
-21	1854-0022	. TRANSISTOR, NPN, Si, 2N2102 (Q1, Q5)					2
-22	1855-0052	. TRANSISTOR, field effect, 2N4360 (Q14, Q15)					2
-23	1853-0080	. TRANSISTOR, 2N4888 (Q2, Q6)					2
-24	0160-2055	. CAPACITOR, fxd, 0.01 μ F, cer (C2, C3, C13, C14)					4
-25	1902-0048	. DIODE, breakdown, 6.81V (CR3, CR4)					2
-26	0160-0380	. CAPACITOR, fxd, 0.22 μ F, My (C1, C12)					2
-27	0160-2199	. CAPACITOR, fxd, 30 pF, mica (C4, C5, C15, C16)					4
-28	1820-0223	. INTEGRATED CIRCUIT, operational amplifier (U1, U2)					2
-29	0150-0121	. CAPACITOR, fxd, 0.1 μ F, cer (C21, C22)					2
-30	1901-0040	. DIODE, Si, 30V, 30 mA (CR1, CR2, CR5, CR7, CR8)					5
-31	1854-0215	. TRANSISTOR, NPN, Si, 2N3904 (Q13)					1
-32	0490-0890	. SOCKET, relay (XK1)					1
-33	2200-0147	. . SCREW, no. 4-40, 0.5-inch, pozi (AP)					2
-34	3050-0105	. . WASHER, flat (AP)					2
-35	2260-0009	. . NUT, hex, no. 4-40 (AP)					2
-36	0490-0891	. RELAY, 10A (K1)					1
-37	1853-0204	. TRANSISTOR, PNP, Si, 2N4920 (Q3, Q7)					2
-38	2200-0147	. . SCREW, no. 4-40, 0.5-inch, pozi (AP)					1
-39	3050-0105	. . WASHER, flat (AP)					1
-40	2260-0009	. . NUT, hex, no. 4-40 (AP)					1

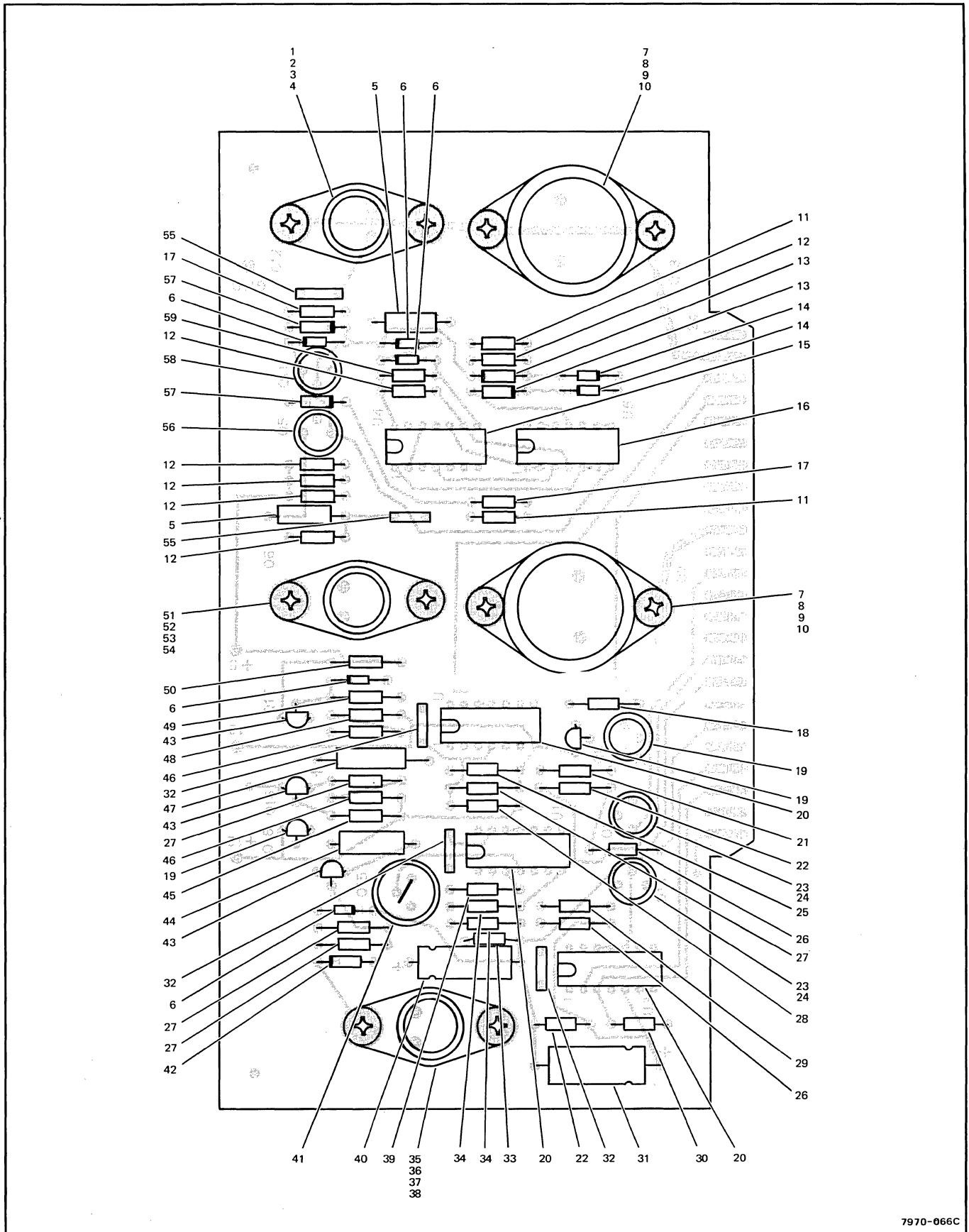


FIGURE & INDEX NO.	PART NUMBER	DESCRIPTION					UNITS PER ASSY
		1	2	3	4	5	
6-13-41	1854-0347	.	.	.	.	.	2
-42	2200-0147	.	.	.	.	.	1
-43	3050-0105	.	.	.	.	.	1
-44	2260-0009	.	.	.	.	.	1
-45	0160-0165	.	.	.	.	.	2
-46	1854-0490	.	.	.	.	.	4
-47	2200-0145	.	.	.	.	.	2
-48	3050-0105	.	.	.	.	.	2
-49	2260-0009	.	.	.	.	.	2
-50	0160-2128	.	.	.	.	.	2
-51	1901-0364	.	.	.	.	.	1



7970-066C

Figure 6-14. Power Regulator PC Assembly A21



7970-066C

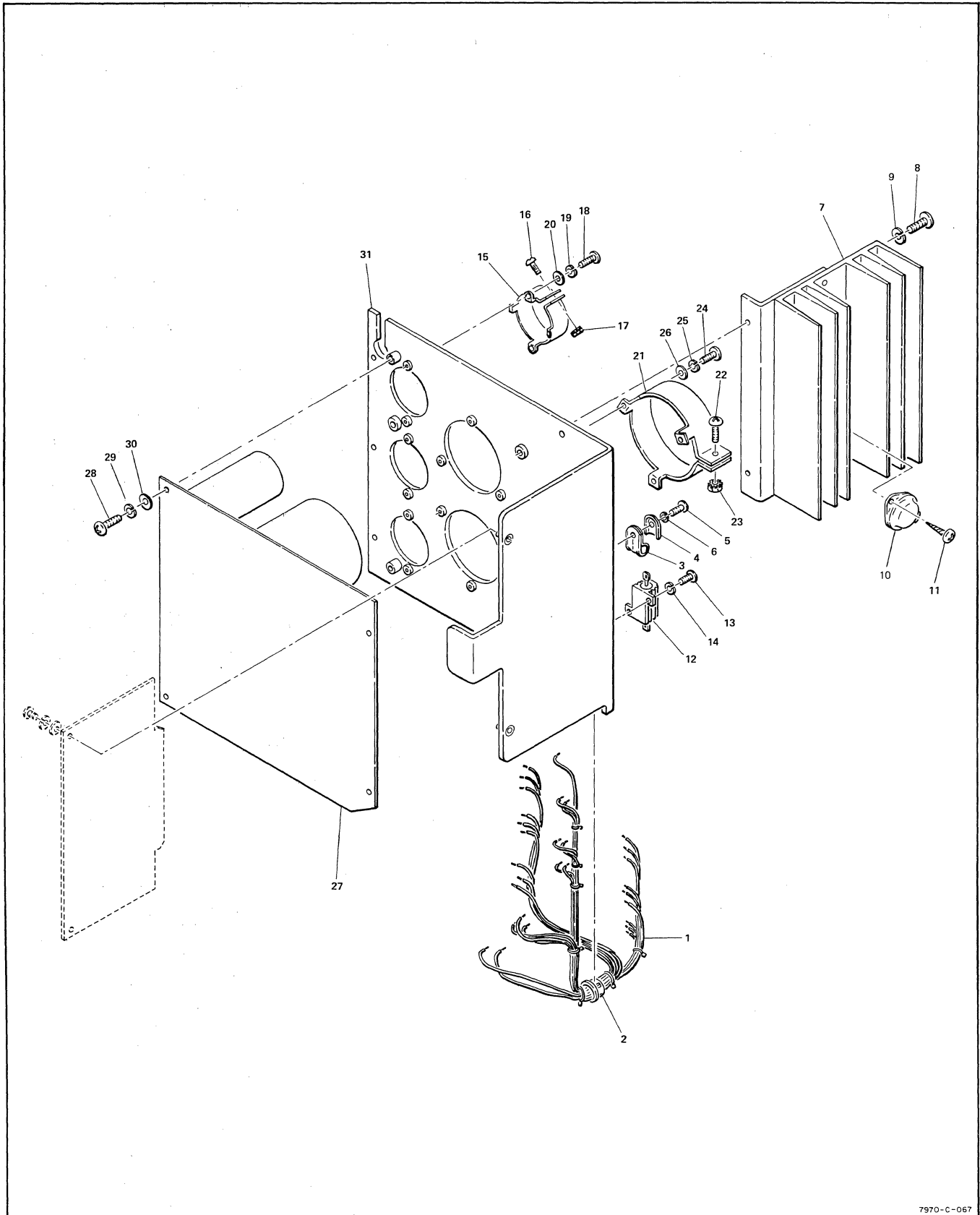
Figure 6-14. Power Regulator PC Assembly A21

FIGURE & INDEX NO.	PART NUMBER	DESCRIPTION					UNITS PER ASSY
		1	2	3	4	5	
6-14-	07970-61010	POWER REGULATOR PC ASSEMBLY A21					REF
-1	1854-0072	. TRANSISTOR, NPN, Si, 2N3054 (Q12)					1
-2	0340-0180	. . INSULATOR, transistor, mica					1
-3	2360-0195	. . SCREW, no. 6-32, 0.312-inch, pozi					2
-4	2420-0001	. . NUT, hex, no. 6-32					2
-5	0683-3325	. RESISTOR, fxd, 3.3k, 5%, 1/4W (R10, R20)					2
-6	1901-0040	. DIODE, Si (CR9, CR10, CR11, CR12, CR13, CR17)					6
-7	1854-0063	. TRANSISTOR, NPN, Si (Q7, Q13)					2
-8	1200-0077	. . INSULATOR, transistor					1
-9	2360-0197	. . SCREW, no. 6-32, 0.375-inch, pozi					2
-10	2420-0001	. . NUT, hex, no. 6-32					2
-11	0683-1015	. RESISTOR, fxd, 100 ohms, 5%, 1/4W (R12, R22)					2
-12	0683-1025	. RESISTOR, fxd, 1k, 5%, 1/4W (R7, R9, R11, R21, R28, R29)					6
-13	1902-3171	. DIODE, zener, Si (CR4, CR6)					2
-14	1901-0025	. DIODE, Si (CR3, CR5)					2
-15	1820-0348	. INTEGRATED CIRCUIT, type 844 (U4).					1
-16	1820-0256	. INTEGRATED CIRCUIT (U5)					1
-17	0683-2425	. RESISTOR, fxd, 2.4k, 5%, 1/4W (R8, R19)					2
-18	0686-2025	. RESISTOR, fxd, 2k, 5%, 1/2W (R18).					1
-19	1853-0036	. TRANSISTOR, PNP, Si, 2N3906 (Q8, Q18)					2
-20	1820-0439	. INTEGRATED CIRCUIT, voltage regulator (U1, U2, U3)					3
-21	1853-0027	. TRANSISTOR, PNP, Si, 2N3245 (Q9)					1
-22	0698-3150	. RESISTOR, fxd, 2.37k, 1%, 1/8W (R2, R26)					2
-23	1854-0039	. TRANSISTOR, NPN, Si, EIA, 2N3053 (Q1, Q14)					2
-24	1902-0049	. DIODE, zener, 6.19V (CR16)					1
-25	1902-2303	. DIODE, zener, 14.7V (CR15)					1
-26	0698-3438	. RESISTOR, fxd, 147 ohms, 1%, 1/8W (R1, R25)					2
-27	0757-0438	. RESISTOR, fxd, 5.11k, 1%, 1/8W (R30, R31, R35)					3
-28	0757-0290	. RESISTOR, fxd, 6.19k, 1%, 1/8W (R14, R15)					2
-29	0757-1094	. RESISTOR, fxd, 1.47k, 1%, 1/8W (R6)					1
-30	0757-0317	. RESISTOR, fxd, 1.33k, 1%, 1/8W (R27)					1
-31	0180-0059	. CAPACITOR, fxd, 10 μ F, 25 Vdcw (C7)					1
-32	0160-3456	. CAPACITOR, fxd, 0.001 μ F, 10%, 250 Vdcw (C1, C3, C6)					3
-33	0683-6815	. RESISTOR, fxd, 680 ohms, 5%, 1/4W (R24).					1
-34	0757-0279	. RESISTOR, fxd, 3.16k, 1%, 1/8W (R5, R23, R16)					3
-35	1884-0088	. THYRISTOR, 2N3228 (CR1)					1
-36	0340-0180	. . INSULATOR, transistor, mica					1
-37	2360-0195	. . SCREW, no. 6-32, 0.312-inch, pozi					2
-38	2420-0001	. . NUT, hex, no. 6-32, 0.312-inch					2
-39	0698-0084	. RESISTOR, fxd, 2.15k, 1%, 1/8W (R3)					1
-40	0180-0172	. CAPACITOR, fxd, 5 μ F, 15 Vdcw (C5)					1
-41	2100-1773	. RESISTOR, var, ww, 1k, 5%, 1W (R4)					1

FIGURE & INDEX NO.	PART NUMBER	DESCRIPTION					UNITS PER ASSY
		1	2	3	4	5	
6-14-	07970-61010	POWER REGULATOR PC ASSEMBLY A21					REF
-1	1854-0072	. TRANSISTOR, NPN, Si, 2N3054 (Q12)					1
-2	0340-0180	. . INSULATOR, transistor, mica					1
-3	2360-0195	. . SCREW, no. 6-32, 0.312-inch, pozi					2
-4	2420-0001	. . NUT, hex, no. 6-32					2
-5	0683-3325	. RESISTOR, fxd, 3.3k, 5%, 1/4W (R10, R20)					2
-6	1901-0040	. DIODE, Si (CR9, CR10, CR11, CR12, CR13)					5
-7	1854-0063	. TRANSISTOR, NPN, Si (Q7, Q13)					2
-8	1200-0077	. . INSULATOR, transistor.					1
-9	2360-0197	. . SCREW, no. 6-32, 0.375-inch, pozi					2
-10	2420-0001	. . NUT, hex, no. 6-32					2
-11	0683-1015	. RESISTOR, fxd, 100 ohms, 5%, 1/4W (R12, R22)					2
-12	0683-1025	. RESISTOR, fxd, 1k, 5%, 1/4W (R7, R9, R11, R21, R28, R29)					6
-13	1902-3171	. DIODE, zener, Si (CR4, CR6)					2
-14	1901-0025	. DIODE, Si (CR3, CR5)					2
-15	1820-0348	. INTEGRATED CIRCUIT, type 844 (U4).					1
-16	1820-0256	. INTEGRATED CIRCUIT (U5).					1
-17	0683-5125	. RESISTOR, fxd, 5.1k, 5%, 1/4W (R8, R19)					2
-18	0686-0083	. RESISTOR, fxd, 1.96k, 5%, 1/2W (R18)					1
-19	1853-0036	. TRANSISTOR, PNP, Si, 2N3906 (Q8, Q9, Q18)					3
-20	1820-0439	. INTEGRATED CIRCUIT, voltage regulator (U1, U2, U3)					3
-21	0757-0441	. RESISTOR, fxd, 8.25k, 1%, 1/8W (R16)					1
-22	0698-3150	. RESISTOR, fxd, 2.37k, 1%, 1/8W (R2, R26)					2
-23	1854-0039	. TRANSISTOR, NPN, Si, EIA, 2N3053 (Q1, Q14)					2
-24	0340-0164	. . INSULATOR, transistor					1
-25	0757-0440	. RESISTOR, fxd, 7.5k, 1%, 1/8W (R17)					1
-26	0698-3438	. RESISTOR, fxd, 147 ohms, 1%, 1/8W (R1, R25)					2
-27	0757-0438	. RESISTOR, fxd, 5.11k, 1%, 1/8W (R15, R30, R31, R35)					4
-28	0757-0290	. RESISTOR, fxd, 6.19k, 1%, 1/8W (R14)					1
-29	0757-1094	. RESISTOR, fxd, 1.47k, 1%, 1/8W (R6)					1
-30	0757-0317	. RESISTOR, fxd, 1.33k, 1%, 1/8W (R27)					1
-31	0180-0059	. CAPACITOR, fxd, 10 μ F, 25 Vdcw (C7)					1
-32	0160-3456	. CAPACITOR, fxd, 0.001 μ F, 10%, 250 Vdcw (C1, C3, C6)					3
-33	0683-6815	. RESISTOR, fxd, 680 ohms, 5%, 1/4W (R24)					1
-34	0757-0279	. RESISTOR, fxd, 3.16k, 1%, 1/8W (R5, R23)					2
-35	1884-0088	. THYRISTOR, 2N3228 (CR1)					1
-36	0340-0180	. . INSULATOR, transistor, mica					1
-37	2360-0195	. . SCREW, no. 6-32, 0.312-inch, pozi					2
-38	2420-0001	. . NUT, hex, no. 6-32, 0.312-inch					2
-39	0698-0084	. RESISTOR, fxd, 2.15k, 1%, 1/8W (R3)					1
-40	0810-0172	. CAPACITOR, fxd, 5 μ F, 15 Vdcw (C5)					1
-41	2100-1773	. RESISTOR, var, ww, 1k, 5%, 1W (R4)					1

FIGURE & INDEX NO.	PART NUMBER	DESCRIPTION	1 2 3 4 5					UNITS PER ASSY
6-14-42	1902-0048	. DIODE, zener, 6.8V, 1N3210 (CR2)						1
-43	1854-0215	. TRANSISTOR, NPN, Si, 2N3904 (Q15, Q16, Q17).						3
-44	0757-0198	. RESISTOR, fxd, 100 ohms, 1%, 1/2W (R32)						1
-45	0757-0465	. RESISTOR, fxd, 100k, 1%, 1/8W (R33)						1
-46	0757-0280	. RESISTOR, fxd, 1k, 1%, 1/8W (R34, R36)						2
-47	0180-0228	. CAPACITOR, fxd, 22 μ F, 10%, 15 Vdcw (C8)						1
-48	0757-0458	. RESISTOR, fxd, 51.1k, 1%, 1/8W (R37)						1
-49	0757-0458	. RESISTOR, fxd, 51.1k, 1%, 1/8W (R38)						1
-50	0757-0419	. RESISTOR, fxd, 681 ohms, 1%, 1/8W (R39)						1
-51	1853-0052	. TRANSISTOR, PNP, Si, 2N3740 (Q6)						1
-52	0340-0180	. . INSULATOR, transistor, mica						1
-53	2360-0195	. . SCREW, no. 6-32, 0.312-inch, pozi						2
-54	2420-0001	. . NUT, hex, no. 6-32, 0.312-inch						2
-55	0160-2055	. CAPACITOR, fxd, 0.01 μ F, 100 Vdcw (C2, C4).						2
-56	1854-0022	. TRANSISTOR, NPN, Si (Q5)						1
-57	1902-3311	. DIODE, zener, 38.5V (CR7, CR8)						2
-58	1853-0080	. TRANSISTOR, PNP, Si, 2N4888 (Q11)						1
-59	0683-4715	. RESISTOR, fxd, 470 ohms, 5%, 1/4W (R13).						1
-60	1902-0040	. DIODE, silicon (CR14)						1
-61	0757-0441	. RESISTOR, fxd, 8.25k, 1%, 1/8W (R40)						1

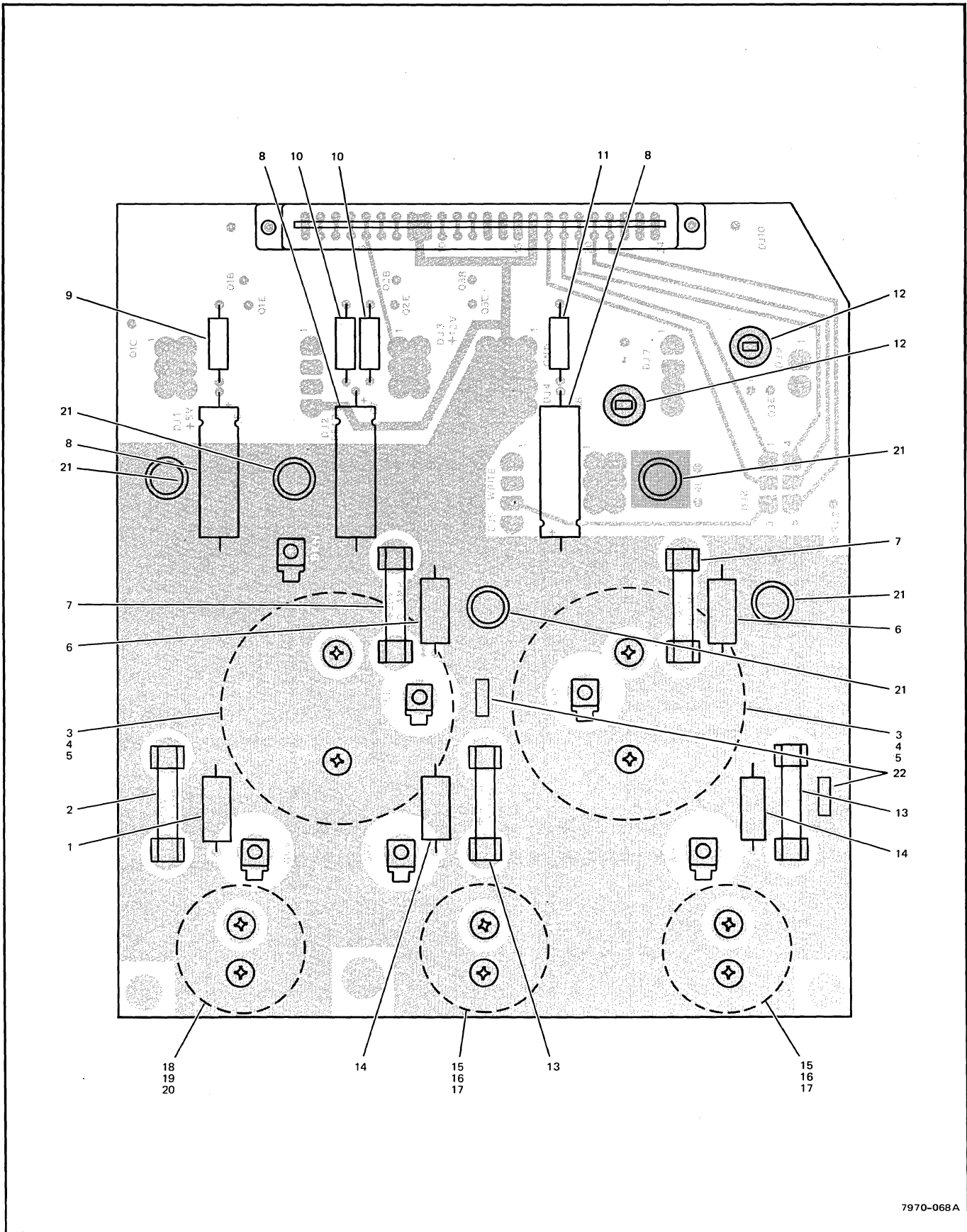
FIGURE & INDEX NO.	PART NUMBER	DESCRIPTION					UNITS PER ASSY
		1	2	3	4	5	
6-14-42	1902-0048	.	.	.	.	.	1
-43	1854-0215	.	.	.	.	.	3
-44	0757-0198	.	.	.	.	.	1
-45	0757-0465	.	.	.	.	.	1
-46	0757-0280	.	.	.	.	.	2
-47	0180-0228	.	.	.	.	.	1
-48	0757-0199	.	.	.	.	.	1
-49	0698-3157	.	.	.	.	.	1
-50	0757-0419	.	.	.	.	.	1
-51	1853-0052	.	.	.	.	.	1
-52	0340-0180	.	.	.	.	.	1
-53	2360-0195	.	.	.	.	.	2
-54	2420-0001	.	.	.	.	.	2
-55	0160-2055	.	.	.	.	.	2
-56	1854-0022	.	.	.	.	.	1
-57	0340-0114	.	.	.	.	.	1
-58	1902-3311	.	.	.	.	.	2
-59	1853-0080	.	.	.	.	.	1
-60	0683-4715	.	.	.	.	.	1



7970-C-067

Figure 6-15. Power Distribution Assembly A20

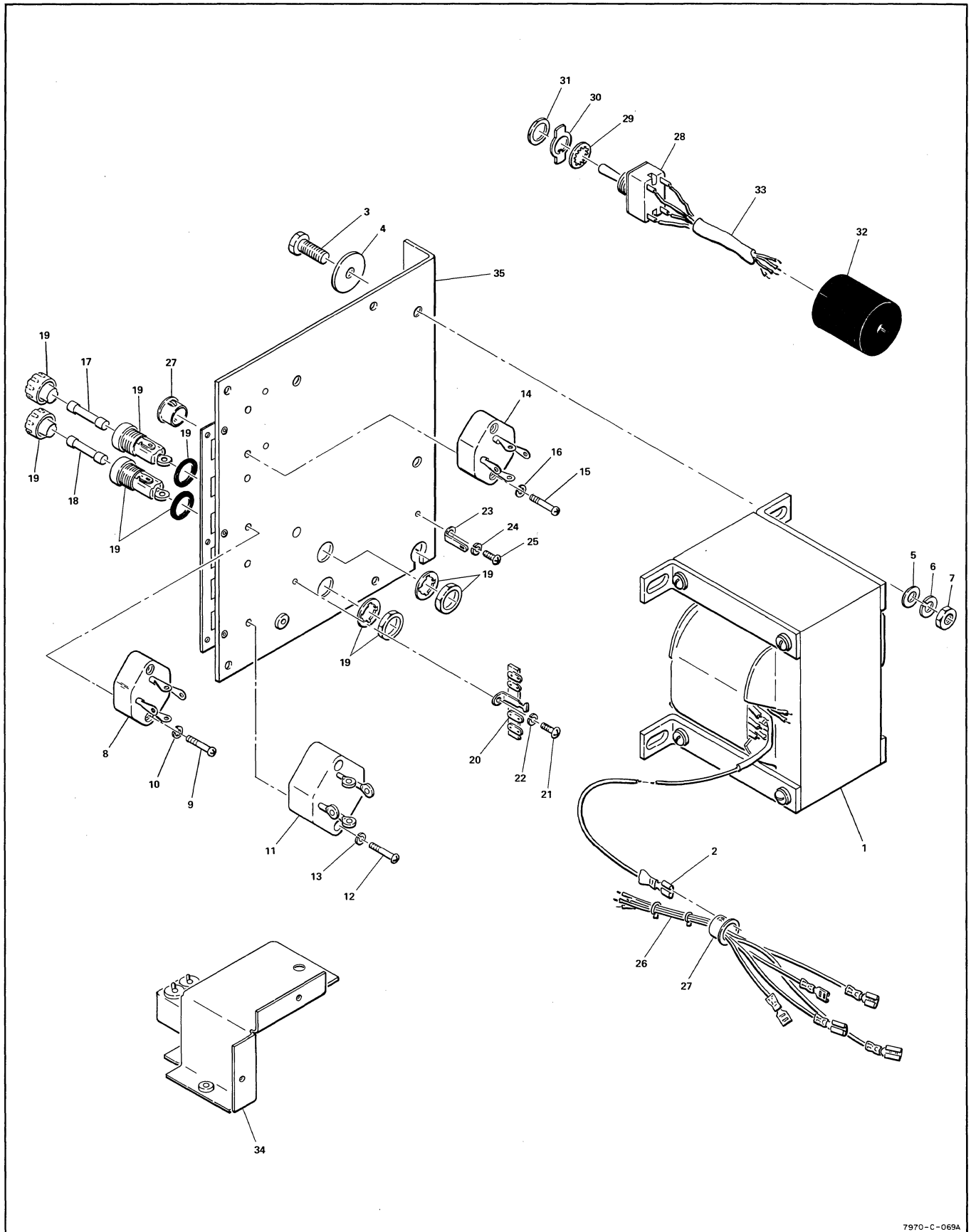
FIGURE & INDEX NO.	PART NUMBER	DESCRIPTION					UNITS PER ASSY
		1	2	3	4	5	
6-15-	07970-61051	POWER DISTRIBUTION ASSEMBLY A20					REF
-1	07970-60650	. WIRING HARNESS, power supply (W1)					1
-2	0400-0056	. . BUSHING, snap, nylon (AP)					1
-3	1400-0187	. . CLAMP, cable (AP)					1
-4	2190-0453	. . WASHER (AP)					1
-5	2680-0101	. . SCREW, no. 10-32, 0.438-inch, pozi (AP)					1
-6	2190-0034	. . WASHER, lock, helical (AP)					1
-7	07970-60442	. HEAT DISSIPATOR ASSEMBLY, transistor (contains XQ1, XQ2, and XQ3)					1
-8	2680-0101	. . SCREW, no. 10-32, 0.438-inch, pozi (AP)					2
-9	2190-0034	. . WASHER, lock, helical (AP)					2
-10	1854-0063	. TRANSISTOR, NPN, Si (Q1, Q2, Q3)					3
-11	0624-0062	. . SCREW, tapping, no. 6-20, 0.625-inch, pozi (AP)					2
-12	0811-2180	. RESISTOR, fxd, ww, 12k, 5%, 5W (R1, R2).					2
-13	2200-0141	. . SCREW, no. 4-40, 0.312-inch, pozi (AP)					2
-14	2190-0071	. . WASHER, lock (AP).					2
-15	0160-2149	. CLAMP, capacitor					3
-16	2360-0201	. . SCREW, no. 6-32, 0.500-inch, pozi (AP)					1
-17	2420-0001	. . NUT, hex, no. 6-32 (AP)					1
-18	2200-0143	. . SCREW, no. 4-40, 0.375-inch, pozi (AP)					2
-19	2190-0003	. . WASHER, lock, helical (AP)					2
-20	3050-0105	. . WASHER, brass (AP)					2
-21	0180-1970	. CLAMP, capacitor					2
-22	2360-0201	. . SCREW, no. 6-32, 0.500-inch, pozi (AP)					1
-23	2420-0001	. . NUT, hex, no. 6-32 (AP)					1
-24	2200-0143	. . SCREW, no. 4-40, 0.375-inch, pozi (AP)					3
-25	2190-0003	. . WASHER, lock, helical (AP)					3
-26	3050-0105	. . WASHER, brass (AP)					3
-27	07970-61020	. POWER DISTRIBUTION PC ASSEMBLY A1 (see figure 6-16 for details)					1
-28	2360-0195	. . SCREW, no. 6-32, 0.312-inch, pozi (AP)					4
-29	2190-0085	. . WASHER, lock, helical (AP)					4
-30	3050-0227	. . WASHER, flat (AP)					4
-31	07970-00280	. CHASSIS, power distribution assembly					1



7970-068A

Figure 6-16. Power Distribution PC Assembly

FIGURE & INDEX NO.	PART NUMBER	DESCRIPTION					UNITS PER ASSY
		1	2	3	4	5	
6-16-	07970-61020	POWER DISTRIBUTION PC ASSEMBLY					REF
-1	0698-3629	. RESISTOR, fxd, 270 ohms, 5%, 2W (R1)					1
-2	2110-0003	. FUSE, 3A, 250V (F5)					1
-3	0180-2327	. CAPACITOR, fxd, 24,000 μ F, 30 Vdcw (C2, C3)					2
-4	2680-0128	. . SCREW, no. 10-32, 0.25-inch, pozi (AP)					2
-5	2190-0012	. . WASHER, lock (AP)					2
-6	0698-3635	. RESISTOR, fxd, 680 ohms, 5%, 2W (R2, R3)					2
-7	2110-0051	. FUSE, ceramic body, 10A, 250V (F2, F3)					2
-8	0180-0104	. CAPACITOR, fxd, 200 μ F, 15 Vdcw (C6, C7, C8)					3
-9	0812-0045	. RESISTOR, fxd, ww, 0.15 ohm, 5%, 3W (R6)					1
-10	0811-0666	. RESISTOR, fxd, ww, 1 ohm, 5%, 2W (R7, R8)					2
-11	0811-1665	. RESISTOR, fxd, ww, 0.56 ohm, 5%, 2W (R9)					1
-12	1901-0630	. DIODE, Si (CR1, CR2)					2
-13	2110-0303	. FUSE, slo blo, 2A, 250V (F1, F4)					2
-14	0764-0043	. RESISTOR, fxd, 2.7k, 5%, 2W (R4, R5)					2
-15	0180-2325	. CAPACITOR, fxd, 1500 μ F, 75 Vdcw (C4, C5)					2
-16	2680-0128	. . SCREW, no. 10-32, 0.25-inch, pozi (AP)					2
-17	2190-0012	. . WASHER, lock (AP)					2
-18	0180-2326	. CAPACITOR, fxd, 10,000 μ F, 15 Vdcw (C1)					1
-19	2680-0128	. . SCREW, no. 10-32, 0.25-inch, pozi (AP)					2
-20	2190-0012	. . WASHER, lock (AP)					2
-21	1901-0415	. DIODE, Si (CR3, CR4, CR5, CR6, CR7)					5
-22	1901-0026	. DIODE, Si (CR8, CR9)					2



7970-C-069A

Figure 6-17. Transformer Assembly A19

FIGURE & INDEX NO.	PART NUMBER	DESCRIPTION					UNITS PER ASSY
		1	2	3	4	5	
6-17-	07970-60471	TRANSFORMER ASSEMBLY A19					REF
-1	9100-3120	. TRANSFORMER, power (T1)					1
-2	1251-2550	. . CONNECTOR (P1)					1
-3	0570-0108	. . SCREW, no. 1/4-20, 0.750-inch (AP)					4
-4	3050-0723	. . WASHER, flat (AP)					4
-5	3050-0099	. . WASHER, brass (AP)					4
-6	2190-0032	. . WASHER, lock, helical (AP)					4
-7	2950-0004	. . NUT, hex, no. 1/4-20 (AP)					4
-8	1906-0007	. DIODE ASSEMBLY, full wave bridge rectifier (CR1)					1
-9	2200-0151	. . SCREW, no. 4-40, 0.750-inch, pozi (AP)					2
-10	2190-0061	. . WASHER, lock, helical (AP)					2
-11	1901-0161	. DIODE ASSEMBLY, full wave bridge rectifier (CR2)					1
-12	2200-0153	. . SCREW, no. 4-40, 0.875-inch, pozi (AP)					2
-13	2190-0061	. . WASHER, lock, helical (AP)					2
-14	1906-0008	. DIODE ASSEMBLY, full wave bridge rectifier (CR3)					1
-15	2200-0151	. . SCREW, no. 4-40, 0.750-inch, pozi (AP)					2
-16	2190-0061	. . WASHER, lock, helical (AP)					2
-17	2110-0365	. FUSE, slo blo, 4A, 250V (F1)					1
-18	2110-0303	. FUSE, slo blo, 2A, 250V (F2)					1
-19	1400-0084	. FUSEHOLDER, 3 AG fuse, extractor post type (XF1, XF2)					2
-20	0360-1590	. TERMINAL STRIP, lug type (TB1)					1
-21	2200-0139	. . SCREW, no. 4-40, 0.250-inch, pozi (AP)					1
-22	2190-0061	. . WASHER, lock, helical (AP)					1
-23	0360-0043	. TERMINAL LUG, 5 stud (E1)					1
-24	2200-0139	. . SCREW, no. 4-40, 0.250-inch, pozi (AP)					1
-25	2190-0061	. . WASHER, lock, helical (AP)					1
-26	07970-60920	. WIRING HARNESS, power transformer (W2)					1
-27	0400-0056	. . BUSHING, snap, nylon					2
-28	3101-0003	. SWITCH, dpst (S1)					1
-29	2190-0102	. . WASHER, lock (AP)					1
-30	7122-0006	. . PLATE, indicator ON-OFF (AP)					1
-31	2950-0035	. . NUT, hex, no. 15/32-32 (AP)					1
-32	1401-0083	. CAP, protective					1
-33	8120-1496	. CABLE, shielded (W1)					1
-34	07970-60461	. CONNECTOR BRACKET, line power (includes FL/J1 and S2)					1
-35	07970-00211	. PANEL, power transformer					1

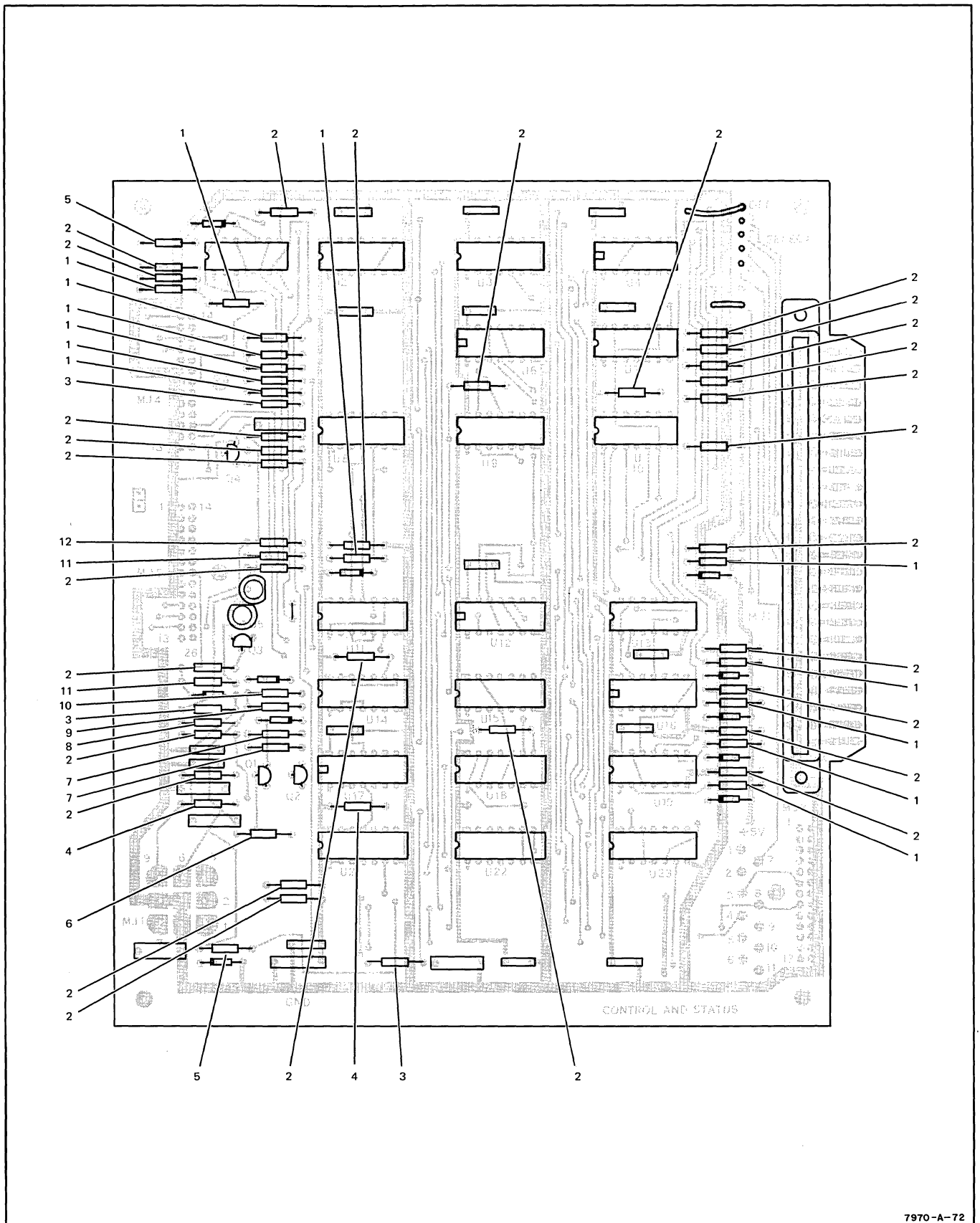


Figure 6-18. Control and Status PC Assembly A16 (Sheet 1 of 2)

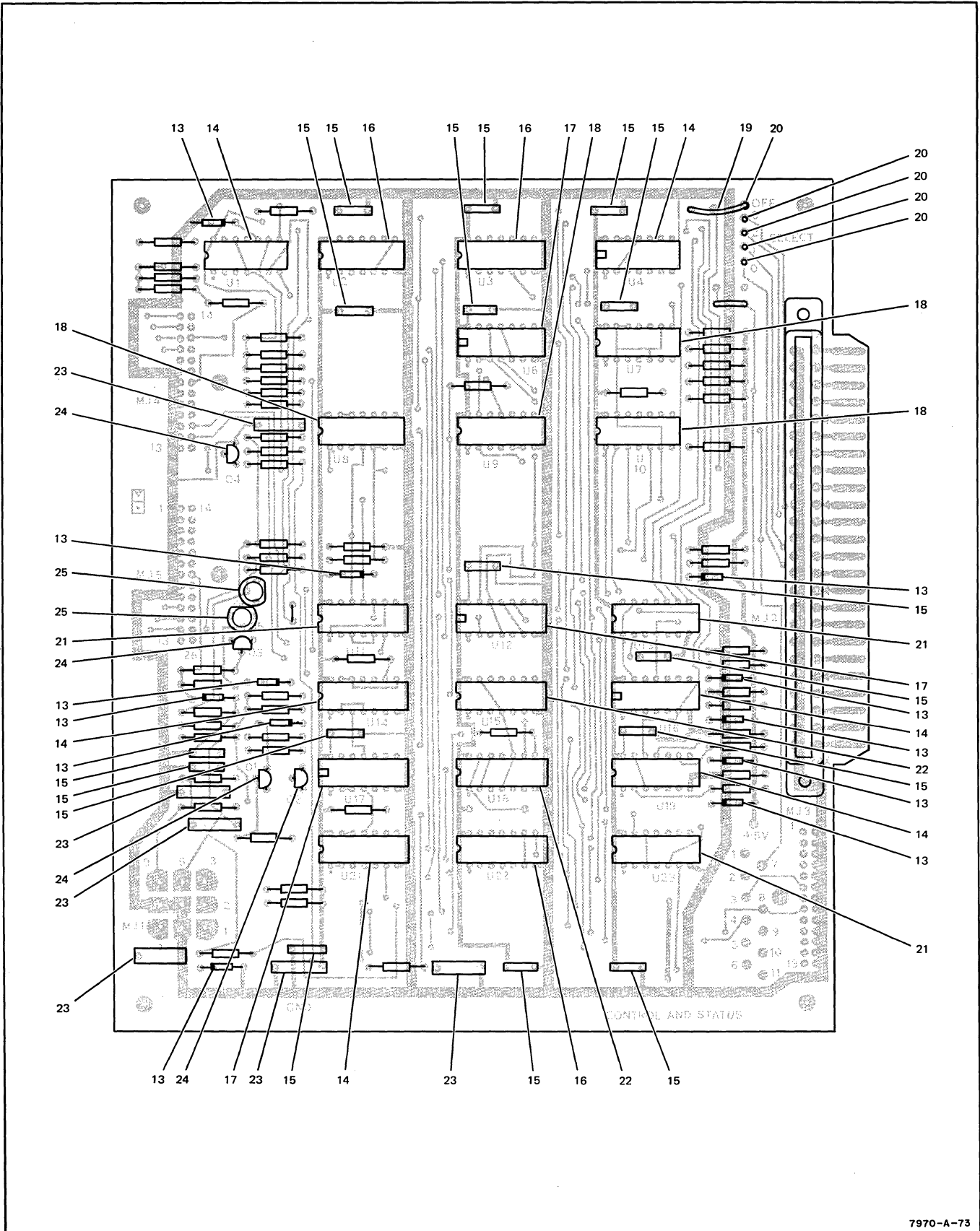


Figure 6-18. Control and Status PC Assembly A16 (Sheet 2 of 2)

FIGURE & INDEX NO.	PART NUMBER	DESCRIPTION					UNITS PER ASSY
		1	2	3	4	5	
6-18-	07970-61080	CONTROL AND STATUS PC ASSEMBLY A16					REF
-1	0757-0418	. RESISTOR, fxd, 619 ohms, 1%, 1/8W (R1, R2, R3, R4, R5, R9, R27, R41, R42, R44, R46, R48, R103)					13
-2	0757-0428	. RESISTOR, fxd, 1.62k, 1%, 1/8W (R7, R8, R10, R11, R12, R14, R17, R28, R29, R31 thru R40, R43, R45, R47, R49, R50, R51, R100, R101, R102)					28
-3	0757-0280	. RESISTOR, fxd, 1k, 1%, 1/8W (R13, R24, R30)					3
-4	0698-0084	. RESISTOR, fxd, 2.15k, 1%, 1/8W (R18, R23)					2
-5	0757-0439	. RESISTOR, fxd, 6.81k, 1%, 1/8W (R6, R112)					2
-6	0757-0199	. RESISTOR, fxd, 21.5k, 1%, 1/8W (R110)					1
-7	0757-0421	. RESISTOR, fxd, 825 ohms, 1%, 1/8W (R19, R21)					2
-8	0757-0442	. RESISTOR, fxd, 10k, 1%, 1/8W (R26)					1
-9	0698-3161	. RESISTOR, fxd, 38.3k, 1%, 1/8W (R22)					1
-10	0698-3162	. RESISTOR, fxd, 46.4k, 1%, 1/8W (R20)					1
-11	0698-3446	. RESISTOR, fxd, 383 ohms, 1%, 1/8W (R16, R25)					2
-12	0757-0401	. RESISTOR, fxd, 100 ohms, 1%, 1/8W (R15)					1
-13	1901-0040	. DIODE, Si (CR2 thru CR11, CR100)					11
-14	1820-0054	. INTEGRATED CIRCUIT, type 7400N (U1, U4, U14, U16, U19, U21)					6
-15	0160-2055	. CAPACITOR, fxd, 0.01 μ F (C1, C2, C4, C6 thru C17)					13
-16	1820-0069	. INTEGRATED CIRCUIT, type 7420N (U2, U3, U22)					3
-17	1820-0077	. INTEGRATED CIRCUIT, type 7474N (U6, U12, U17)					3
-18	1820-0256	. INTEGRATED CIRCUIT (U7, U8, U9, U10)					4
-19	1200-0063	. RECEPTACLE (P/O W1)					1
-20	0360-0124	. TERMINAL, pin, PC board (X1, X2, X3, X4, X5)					5
-21	1820-0141	. INTEGRATED CIRCUIT (U11, U13, U23)					3
-22	1820-0348	. INTEGRATED CIRCUIT, type 844 (U15, U18)					2
-23	0150-0121	. CAPACITOR, fxd, 0.1 μ F, 50 Vdcw (C3, C5, C20, C21, C22, C23)					6

Table 6-1. Part Number Cross Reference

HP PART NUMBER	MFR CODE	MFR PART NUMBER	HP PART NUMBER	MFR CODE	MFR PART NUMBER
0050-1647	28480	0050-1647	0698-0084	28480	0698-0084
0150-0121	56289	5C50BIS-CML	0698-0085	28480	0698-0085
0160-0153	56289	192P10292-PTS	0698-3113	28480	0698-3113
0160-0161	56289	192P10392-PTS	0698-3150	38480	0698-3150
0160-0165	56289	192P56392-PTS	0698-3151	28480	0698-3151
0160-0174	56289	5C11B7S-CML	0698-3152	28480	0698-3152
0160-0380	28480	0160-0380	0698-3153	28480	0698-3153
0160-2055	56289	C023F101F103ZS22-CDH	0698-3157	28480	0698-3157
0160-2128	56289	225P33402Y-PWM	0698-3159	28480	0698-3159
0160-2149	56289	4586-97A	0698-3161	28480	0698-3161
0160-2151	28480	0160-2151	0698-3162	28480	0698-3162
0160-2199	28480	0160-2199	0698-3202	28480	0698-3202
0160-2207	28480	0160-2207	0698-3260	28480	0698-3260
0160-2224	28480	0160-2224	0698-3438	38480	0698-3438
0160-2250	72982	301-000-COHO-519E	0698-3446	28480	0698-3446
0160-2414	28480	0160-2414	0698-3456	28480	0698-3456
0160-3387	56289	192P3949R8PTS	0698-3457	28480	0698-3457
0160-3456	56289	C067F251F102KE12-CDH	0698-3458	28480	0698-3458
0160-3536	00853	RDM15F621JIC	0698-3620	28480	0698-3620
0180-0059	28480	0180-0059	0698-3629	28480	0698-3629
0180-0097	56289	150D476X9035S2-DYS	0698-3635	28480	0698-3635
0180-0104	56289	30D207G015DF4-DSM	0698-3637	28480	0698-3637
0180-0172	56289	30D505G015BA2-DSM	0698-5999	28480	0698-5999
0180-0228	56289	150D226X9015B2-DYS	0698-7027	01121	BB 1061
0180-1970	56289	4586-2D	0757-0198	28480	0757-0198
0180-2325	90201	CGS152U075BD3L	0757-0199	28480	0757-0199
0180-2326	90201	CGS103U015BD3L	0757-0278	28480	0757-0278
0180-2327	90201	CGS243U030ED3L	0757-0280	28480	0757-0280
0340-0164	28480	0340-0164	0757-0289	28480	0757-0289
0340-0180	28480	0340-0180	0757-0290	28480	0757-0290
0360-0043	00000	OBD	0757-0317	28480	0757-0317
0360-0124	28480	0360-0124	0757-0401	28480	0757-0401
0360-1590	71785	SPECIAL OBD	0757-0418	28480	0757-0418
0380-0013	00000	OBD	0757-0419	28480	0757-0419
0380-0016	00000	OBD	0757-0421	28480	0757-0421
0400-0056	28520	SB-500-6	0757-0424	28480	0757-0424
0403-0163	00000	OBD	0757-0428	28480	0757-0428
0490-0890	77342	27E046	0757-0438	28480	0757-0438
0490-0891	77342	KUP14D15	0757-0439	28480	0757-0439
0510-0238	79136	5100-18-C	0757-0440	28480	0757-0440
0510-1107	78553	P116-625-6-495	0757-0441	28480	0757-0441
0520-0129	00000	OBD	0757-0442	28480	0757-0442
0520-0131	00000	OBD	0757-0443	28480	0757-0443
0570-0082	00000	OBD	0757-0444	28480	0757-0444
0570-0108	00000	OBD	0757-0447	28480	0757-0447
0610-0001	00000	OBD	0757-0463	28480	0757-0463
0624-0062	00000	OBD	0757-0465	28480	0757-0465
0624-0098	00000	OBD	0757-0466	28480	0757-0466
0683-1015	01121	CB 1015	0757-0470	28480	0757-0470
0683-1025	01121	CB 1025	0757-0869	28480	0757-0869
0683-1025	01121	CB 1025	0757-1094	28480	0757-1094
0683-1035	01121	CB 1035	0761-0058	28480	0761-0058
0683-3315	01121	CB 3315	0764-0043	28480	0764-0043
0683-3325	01121	CB 3325	0811-1665	28480	0811-1665
0683-4715	01121	CB 4715	0811-1666	28480	0811-1666
0683-5125	01121	CB 5125	0811-2048	28480	0811-2048
0683-6815	01121	CB 6815	0811-2180	28480	0811-2180
0686-1035	01121	EB 1035	0811-2966	28480	0811-2966
0686-2215	01121	EB 2215	0812-0045	28480	0812-0045
0698-0083	28480	0698-0083	1200-0063	28480	1200-0063

Table 6-1. Part Number Cross Reference (Continued)

HP PART NUMBER	MFR CODE	MFR PART NUMBER	HP PART NUMBER	MFR CODE	MFR PART NUMBER
1200-0077	16037	112	2100-1972	28480	2100-1972
1200-0426	01295	IC-014ST-7519	2100-2850	28480	3100-2850
1251-2550	00779	42844-1	2110-0003	75915	312003
1251-2874	23880	8018-15	2110-0051	71400	ABC-10AMP
1390-0228	94222	44-1-11-0	2110-0303	71400	MDX-2A
1400-0084	75915	342014	2110-0365	71400	MDA-4 AMP
1400-0187	95987	5/16-6B	2140-0203	71744	CM8-428
1400-0291	95987	3/16-6B	2140-0209	03508	382
1400-0292	95987	1/4-6B	2140-0351	00000	L328
1400-0293	95987	3/8-6B	2190-0003	28480	2190-0003
1400-0294	95987	1/2-6B	2190-0004	00000	OBD
1400-0296	95987	5/8-6B	2190-0005	00000	OBD
1400-0302	95987	1/8-6B	2190-0007	28480	2190-0007
1401-0083	77969	3276 MODIFIED	2190-0008	00000	OBD
1460-1035	00000	OBD	2190-0012		
1460-1181	00000	OBD	2190-0014	28480	2190-0014
1460-1250	00000	OBD	2190-0032		
1820-0054	01295	SN7400N	2190-0034	28480	2190-0034
1820-0069	01295	SN7420N	2190-0040	00000	OBD
1820-0077	01295	SN7474N	2190-0061	00000	OBD
1820-0141	04713	MC3001P	2190-0071	78189	1804-00
1820-0223	28480	1820-0223	2190-0085	00000	OBD
1820-0256	04713	MC858P	2190-0102	28480	2190-0102
1820-0348	04713	MC844P	2190-0149	00000	OBD
1820-0439	07263	U6E7723393	2190-0181	00000	OBD
1853-0012	80131	2N2904A	2190-0312	00000	OBD
1853-0027	07263	S1554S	2190-0416	00000	OBD
1853-0036	80131	2N3906	2190-0417	00000	OBD
1853-0052	80131	2N3740	2190-0420	00000	OBD
1853-0080	80131	2N4888	2190-0429	00000	OBD
1853-0204	80131	2N4920	2190-0432	00000	OBD
1854-0022	07263	S17843	2190-0451	95987	D6-128
1854-0039	80131	2N3053	2190-0452	95987	D6-140
1854-0045	04713	2N956	2190-0453	95987	D6-191
1854-0053	80131	2N2218	2190-0475	08289	NY-10-030
1854-0063	80131	2N3055	2190-0483	00000	OBD
1854-0072	80131	2N3054	2200-0125	00000	OBD
1854-0215	80131	2N3904	2200-0139	00000	OBD
1854-0264	80131	2N3715	2200-0141	00000	OBD
1854-0347	80131	2N4923	1854-0053	80131	2N2218
1854-0490	28480	1854-0490	1854-0063	80131	2N3055
1855-0052	80131	2N4360	1854-0072	80131	2N3054
1884-0088	86684	2N3228	1854-0215	80131	2N3904
1901-0025	07263	FD 2387	1854-0264	80131	2N3715
1901-0040	07263	FDG1088	1854-0347	80131	2N4923
1901-0161	28480	1901-0161	1854-0490	28480	1854-0490
1901-0364	28480	1901-0364	1855-0052	80131	2N4360
1901-0415	28480	1901-0415	1884-0088	86684	2N3228
1901-0630	28480	1901-0630	1901-0025	07263	FD 2387
1902-0033	04713	1N823	1901-0040	07263	FDG1088
1902-0048	04713	SZ10939-134	1901-0161	28480	1901-0161
1902-3171	28480	1902-3171	1901-0364	28480	1901-0364
1902-3311	28480	1902-3311	1901-0415	28480	1901-0415
1906-0007	04713	MDA952-3	1901-0630	28480	1901-0630
1906-0008	04713	MDA-952-1	1902-0033	04713	1N823
1990-0087	03508	2N5777	1902-0048	04713	SZ10939-134
1990-0307	28480	1990-0307	1902-3171	28480	1902-3171
2100-1759	28480	2100-1759	1902-3311	28480	1902-3311
2100-1762	75042	CT-106-4	1906-0007	04713	MDA952-3
2100-1773	28480	2100-1773	1906-0008	04713	MDA-952-1

Table 6-1. Part Number Cross Reference (Continued)

HP PART NUMBER	MFR CODE	MFR PART NUMBER	HP PART NUMBER	MFR CODE	MFR PART NUMBER
1990-0087	03508	2N5777	2200-0166	00000	OBD
1990-0307	28480	1990-0307	2260-0002	00000	OBD
2100-1759	28480	2100-1759	2260-0009	00000	OBD
2100-1762	75042	CT-106-4	2360-0193	00000	OBD
2100-1773	28480	2100-1773	2360-0195	00000	OBD
2100-1972	28480	2100-1972	2360-0197	00000	OBD
2100-2850	28480	2100-2850	2360-0201	00000	OBD
2110-0003	75915	312003	2360-0210	00000	OBD
2110-0051	71400	ABC-10AMP	2420-0001	78189	OBD
2110-0303	71400	MDX-2A	2680-0065	00000	OBD
2110-0365	71400	MDA-4 AMP	2680-0099	00000	OBD
2140-0203	71744	CM8-428	2680-0101	00000	OBD
2140-0209	03508	382	2680-0103	0000	OBD
2140-0351	00000	L328	2680-0104	00000	OBD
2190-0003	28480	2190-0003	2680-0105	00000	OBD
2190-0004	00000	OBD	2680-0118	00000	OBD
2190-0005	00000	OBD	2680-0128	0000	OBD
2190-0007	28480	2190-0007	2680-0129	0000	OBD
2190-0008	00000	OBD	2950-0004	00000	OBD
2190-0012			2950-0035	00000	OBD
2190-0014	28480	2190-0014	2950-0036	73734	9006
2190-0032			3030-0038		
2190-0034	28480	2190-0034	3030-0047	0000	OBD
2190-0040	00000	OBD	3030-0196	00000	OBD
2190-0061	00000	OBD	3030-0310	0000	OBD
2190-0071	78189	1804-00	3030-0329	0000	OBD
2190-0085	00000	OBD	3030-0401	0000	OBD
2190-0102	28480	2190-0102	3030-0425	0000	OBD
2190-0149	00000	OBD	3050-0002	00000	OBD
2190-0181	00000	OBD	3050-0016	00000	OBD
2190-0312	00000	OBD	3050-0032	00000	OBD
2190-0416	00000	OBD	3050-0065	0000	OBD
2190-0417	00000	OBD	3050-0099	00000	OBD
2190-0420	00000	OBD	3050-0105	28480	3050-0105
2190-0429	00000	OBD	3050-0227	80120	AN960AC-6
2190-0432	00000	OBD	3050-0232	00000	OBD
2190-0451	95987	D6-128	3050-0253	28480	3050-0253
2190-0452	95987	D6-140	3050-0424	78189	3515-14-12
2190-0453	95987	D6-191	3050-0723	00000	OBD
2190-0475	08289	NY-10-030	3050-0729	00000	OBD
2190-0483	00000	OBD	3101-0003	04009	81024-GT
2200-0125	00000	OBD	3101-0846	82389	75061-A-30A
2200-0139	00000	OBD	3101-1213	81640	T8001
2200-0141	00000	OBD	3102-0009	80207	2LMW-E
2200-0143	00000	OBD	3140-0705	28480	3140-0705
2200-0145	00000	OBD	3140-0748	28480	3140-0748
2200-0147	00000	OBD	3980-0062	28480	3980-0062
2200-0151	00000	OBD	4320-0237	00000	OBD
2200-0153	00000	OBD	7122-0006	18911	827-228F3
			8120-1496	70903	2258-4
			9100-3120	28480	9100-3120

SECTION VII

MAINTENANCE DIAGRAMS

This section contains schematic and parts location diagrams for the tape transport of the HP 7970B/7970C Digital Magnetic Tape Unit.

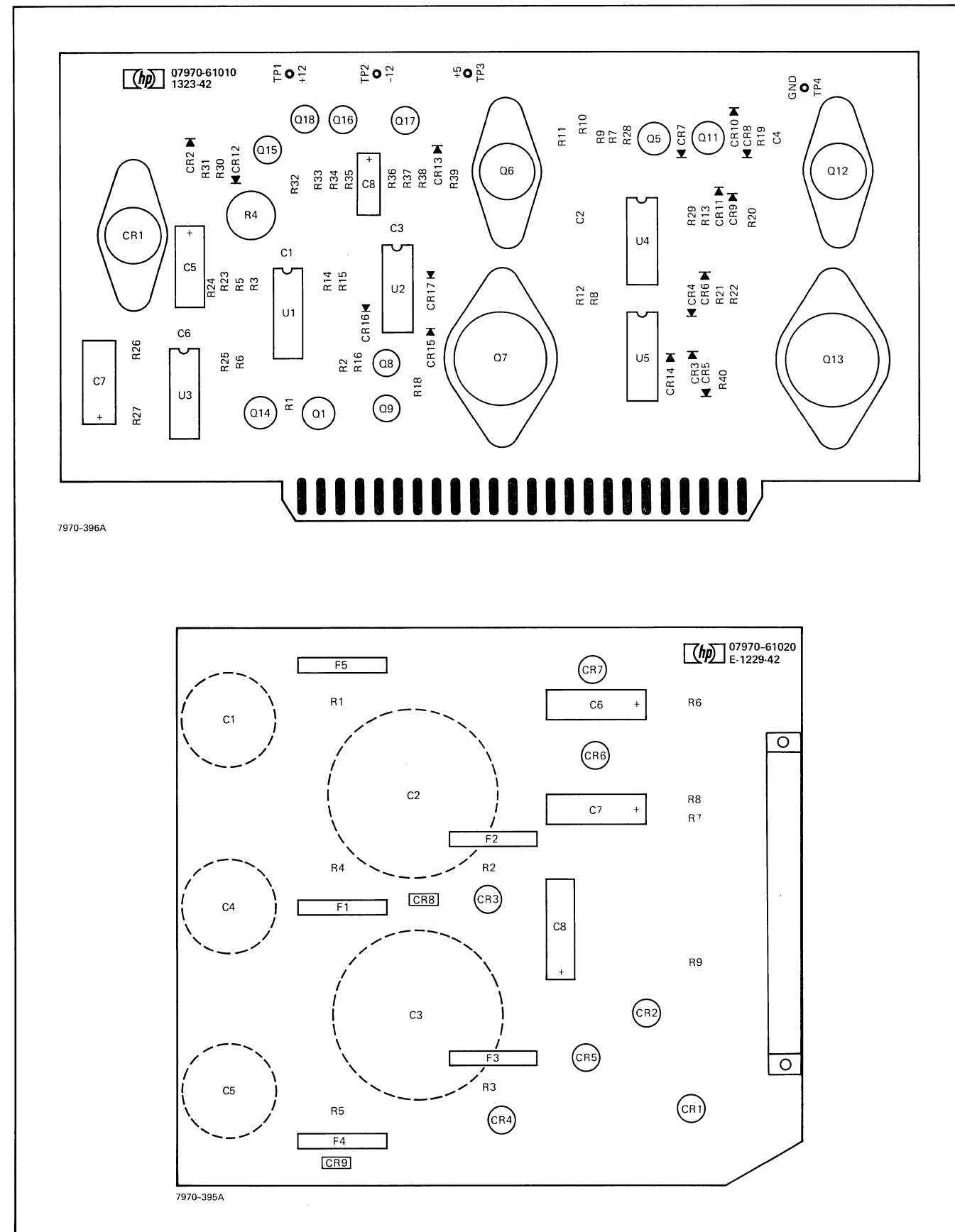


Figure 7-1. Power Distribution PC Assembly A20 and Power Regulator PC Assembly A21, Parts Location Diagrams

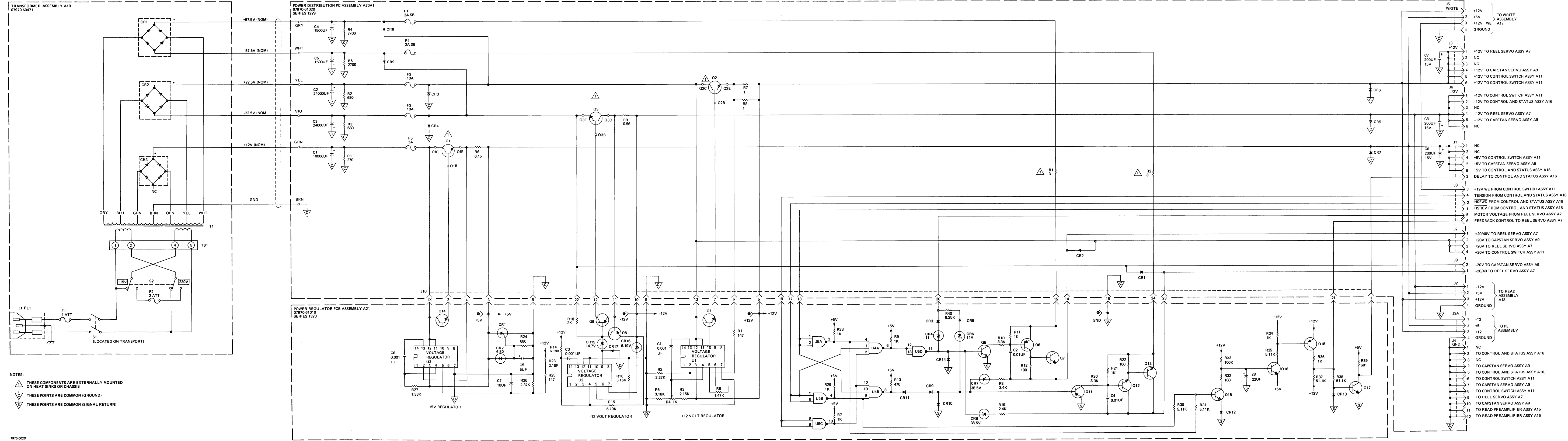


Figure 7-2. Power Supply and Distribution Assemblies A19, A20, and A21, Schematic Diagrams

7970B/7970C

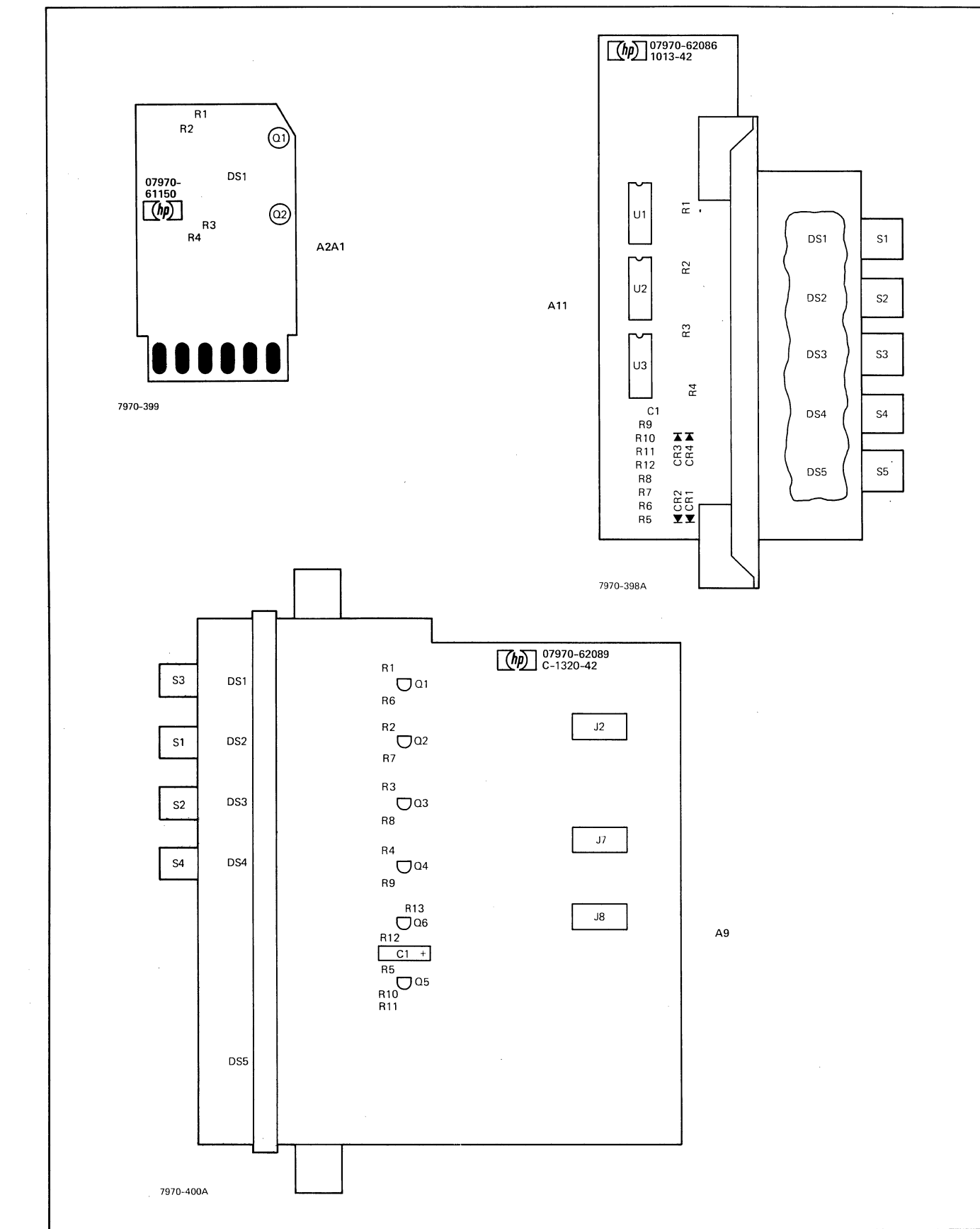


Figure 7-3. Unit Address Switch Assembly A13, Photosense Assembly A2, and Control Switch Assembly A11, Parts Location Diagrams

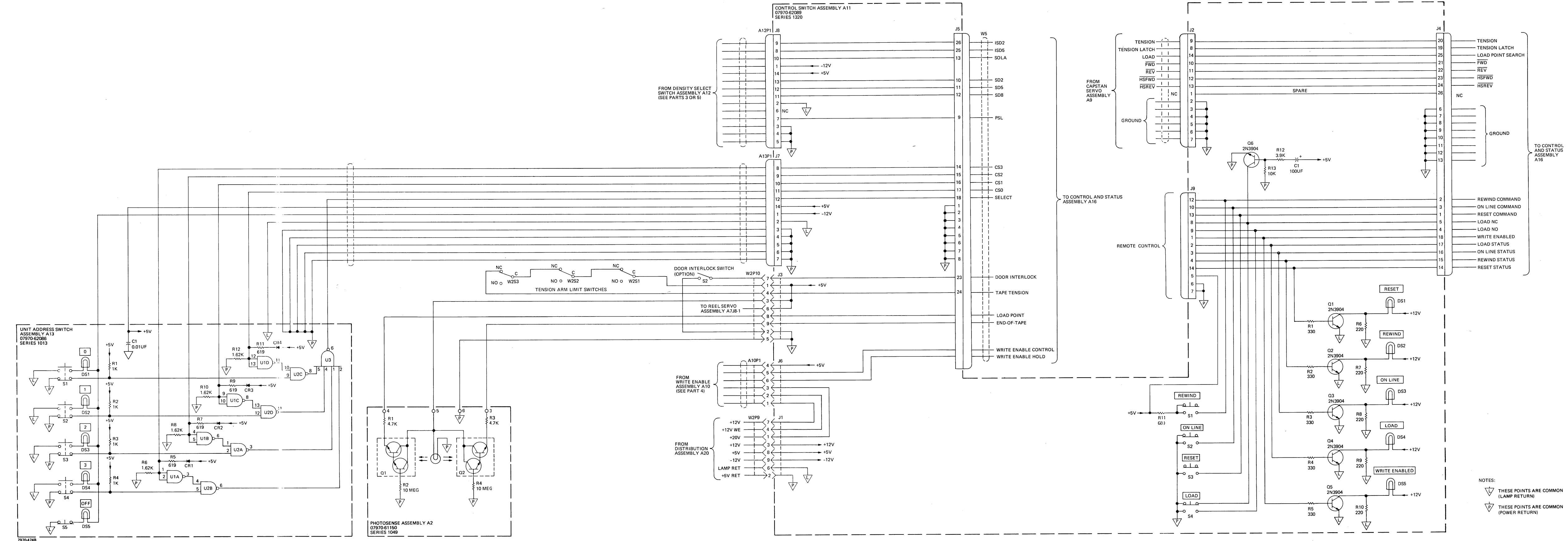


Figure 7-4. Unit Address Switch Assembly A13, Photosense Assembly A2, and Control Switch Assembly A11, Schematic Diagrams

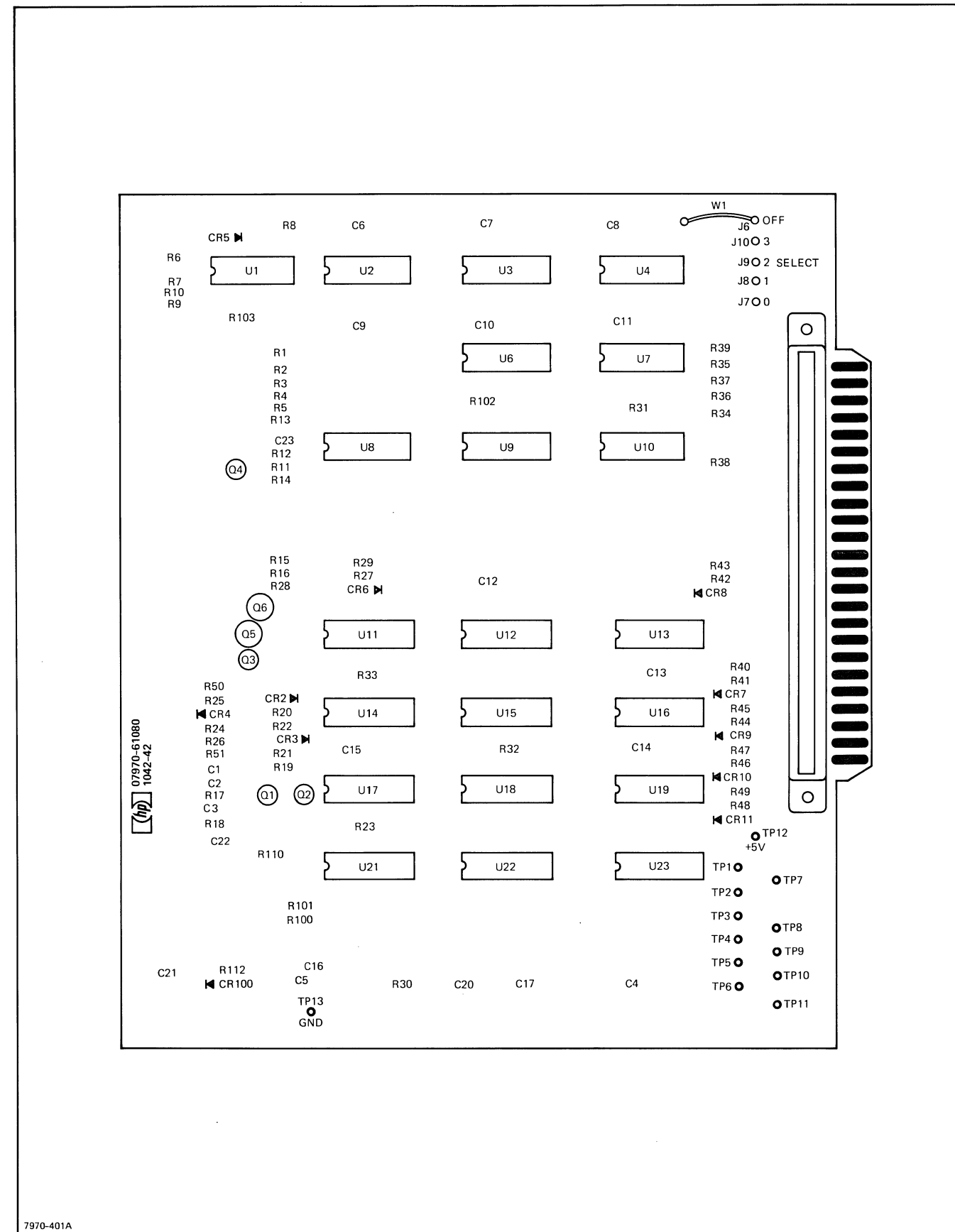


Figure 7-5. Control and Status PC Assembly A16, Parts Location Diagram

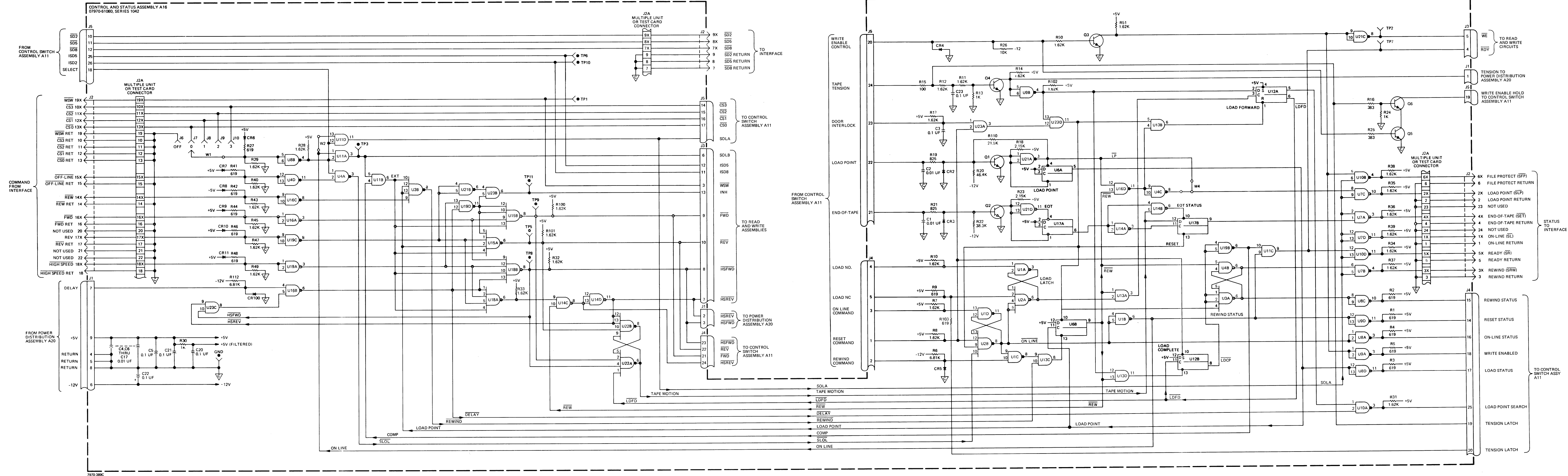


Figure 7-6. Control and Status PC Assembly A16, Schematic Diagram

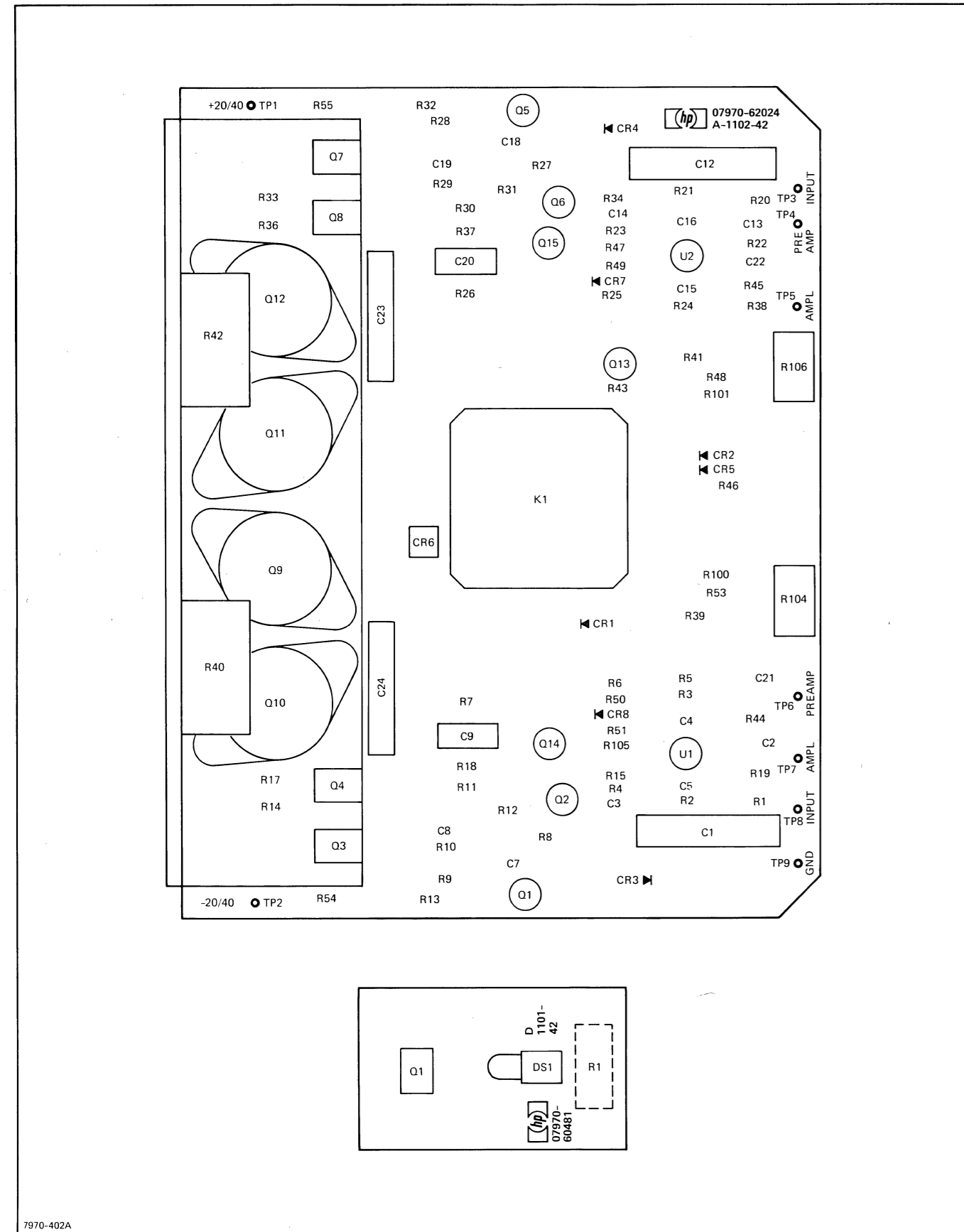


Figure 7-7. Reel Servo Assemblies A3/A4 and A7, Parts Location Diagram

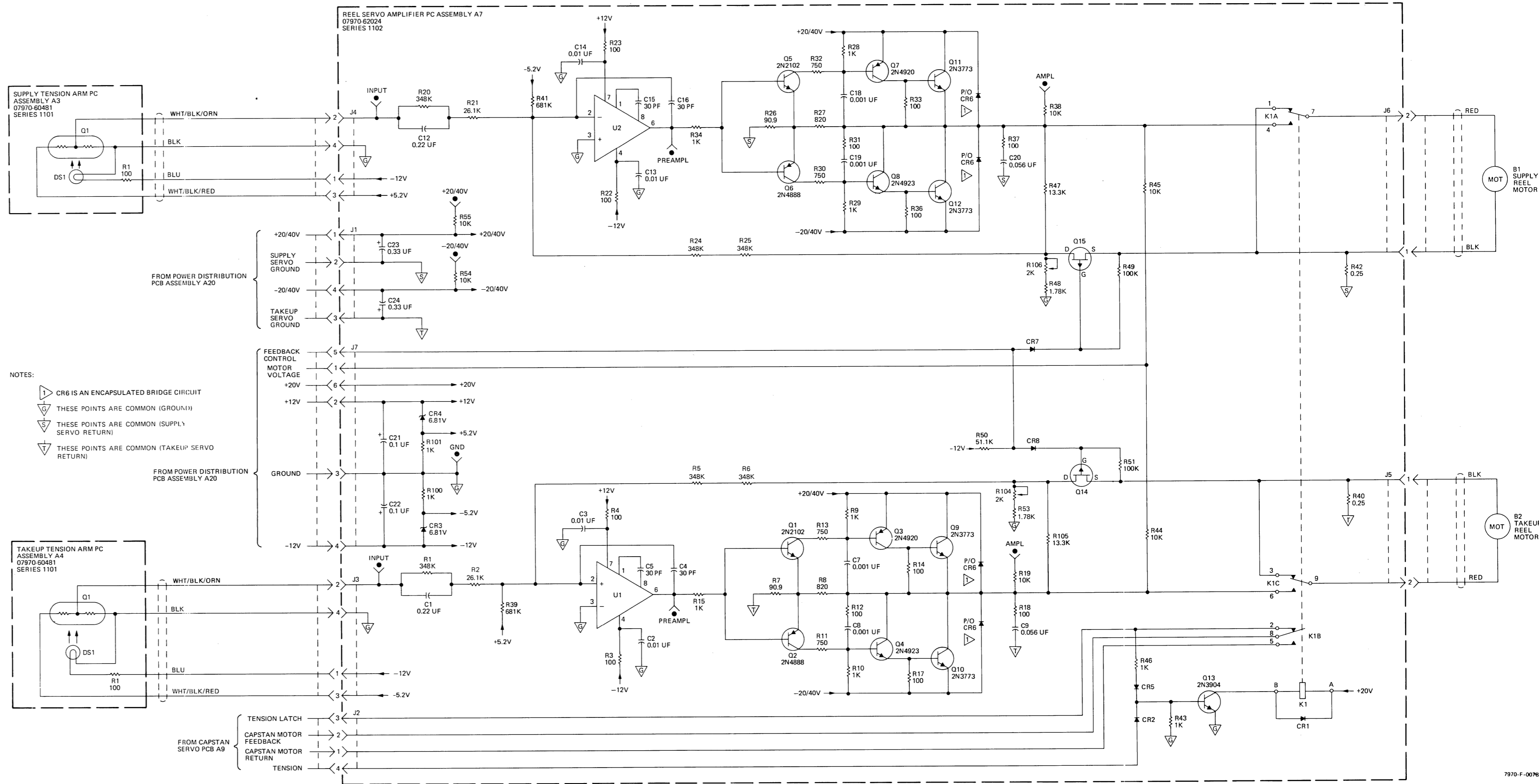


Figure 7-8. Reel Servo Assemblies A3/A4 and A7, Schematic Diagram

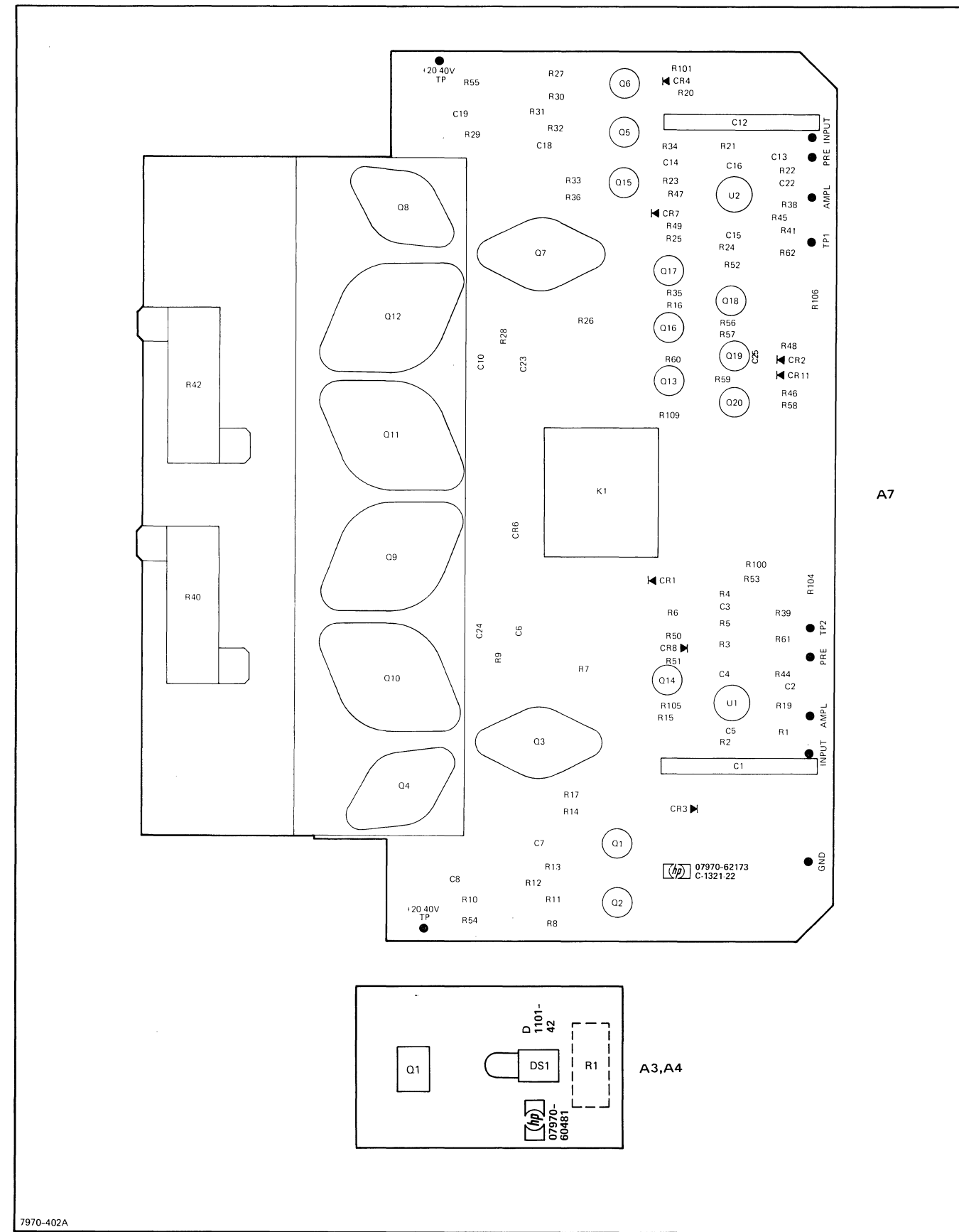


Figure 7-7. Reel Servo Assemblies A3/A4 and A7, Parts Location Diagram

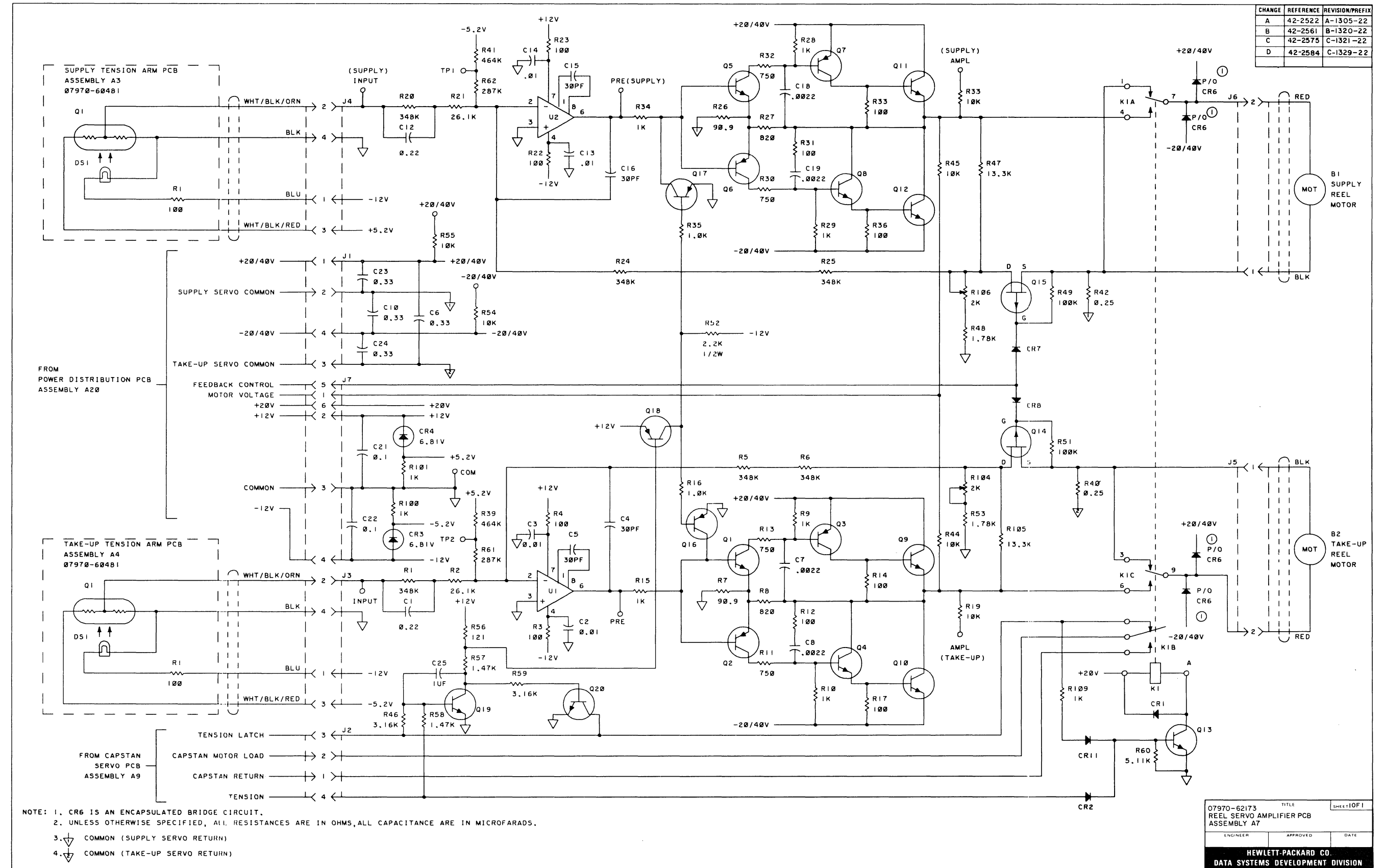


Figure 7-8. Reel Servo Assemblies A3/A4 and A7, Schematic Diagram

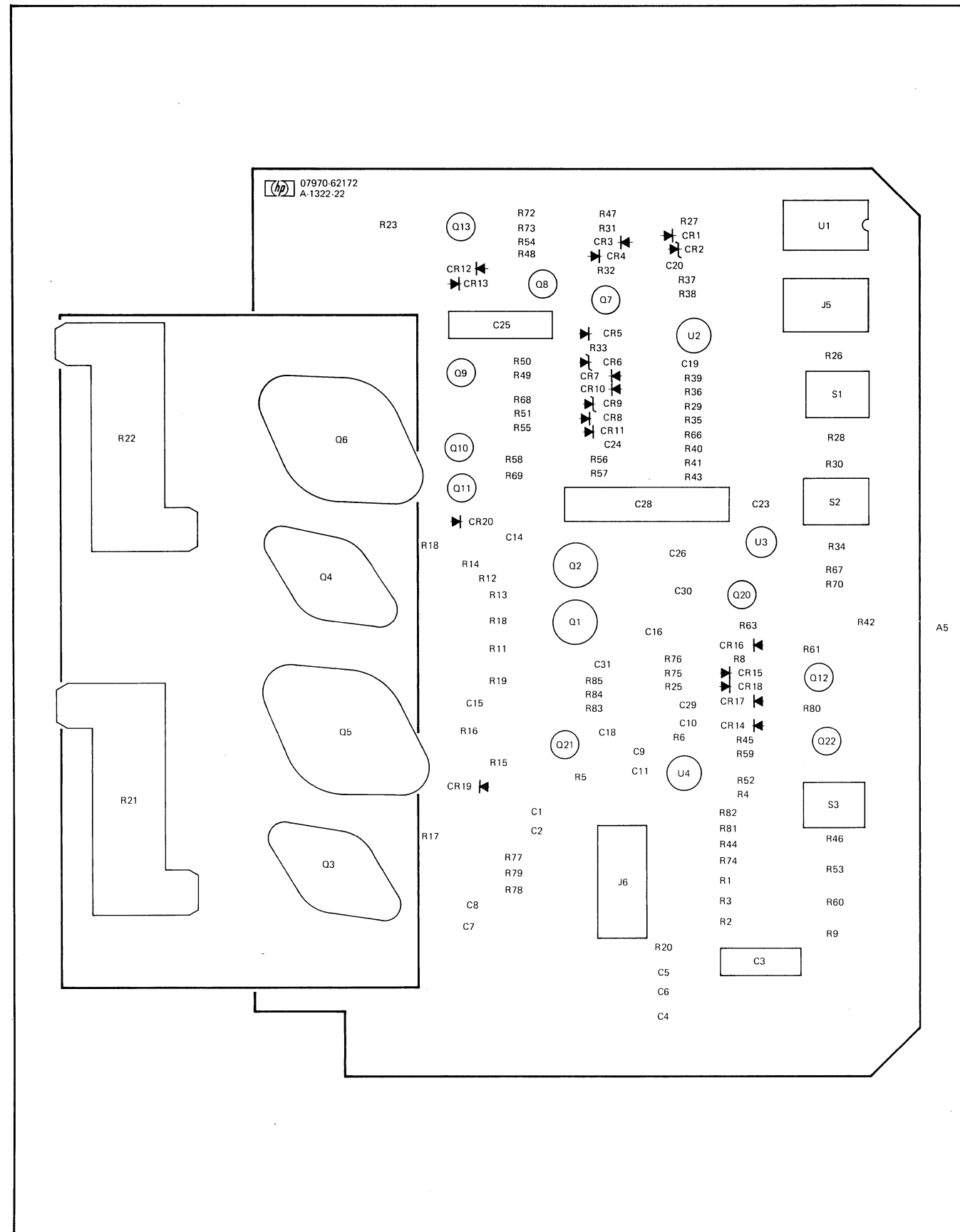


Figure 7-9. Capstan Servo PC Assembly A6, Parts Location Diagram

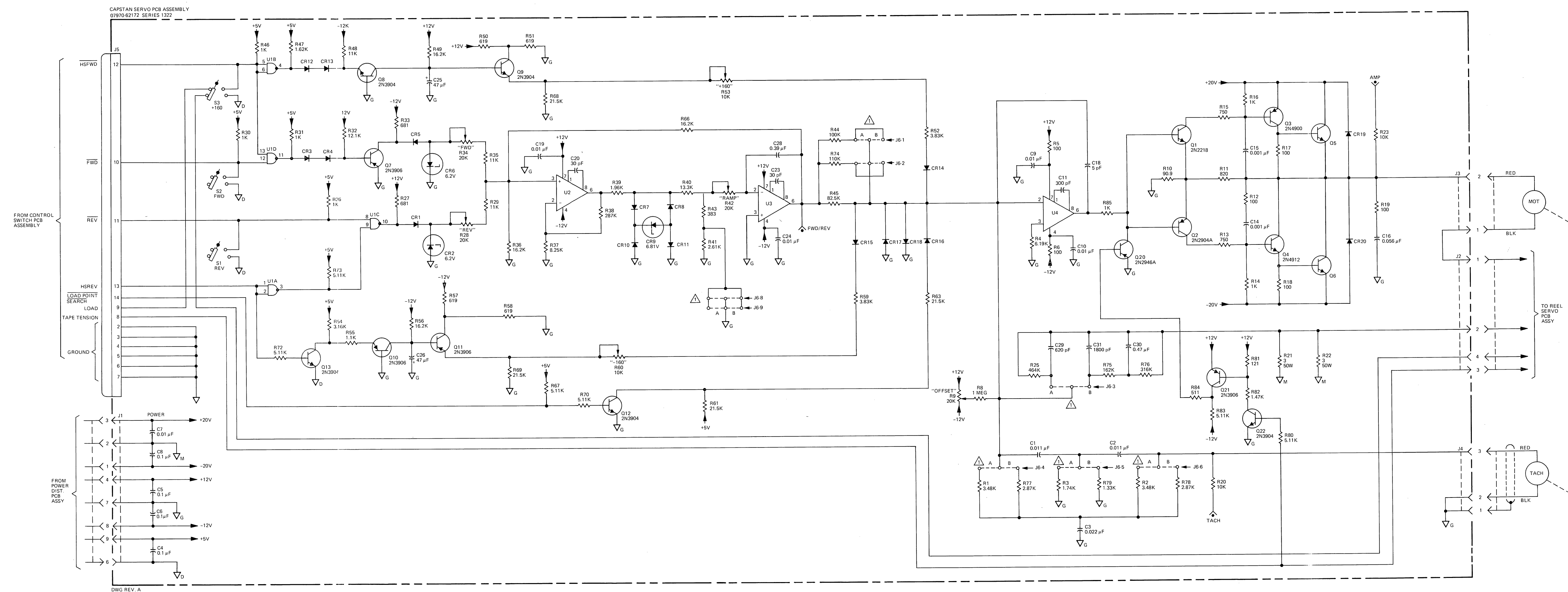
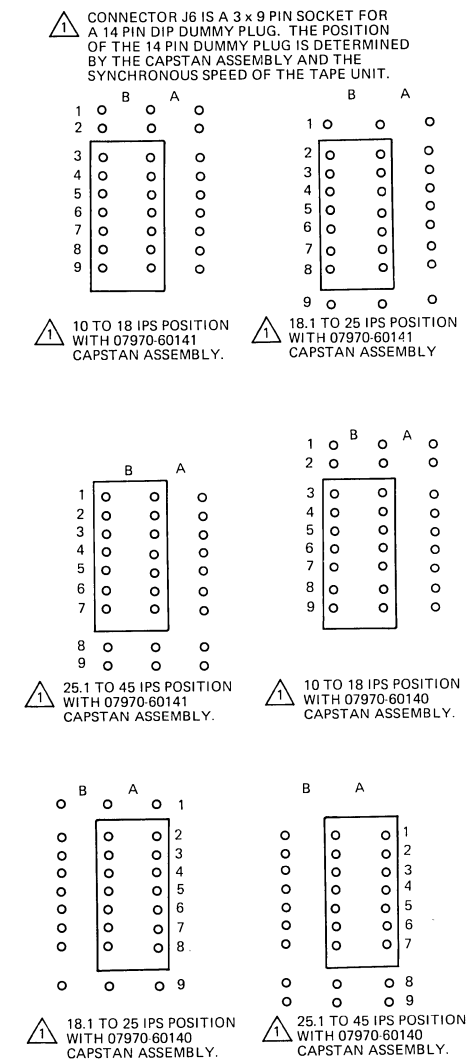


Figure 7-10. Capstan Servo PC Assembly A6, Schematic Diagram



- NOTES:
- UNLESS OTHERWISE SPECIFIED, ALL RESISTANCE VALUES ARE IN OHMS.
 - ANALOG RETURN (±12V)
 - MOTOR RETURN (±20V)
 - DIGITAL RETURN (±5V)

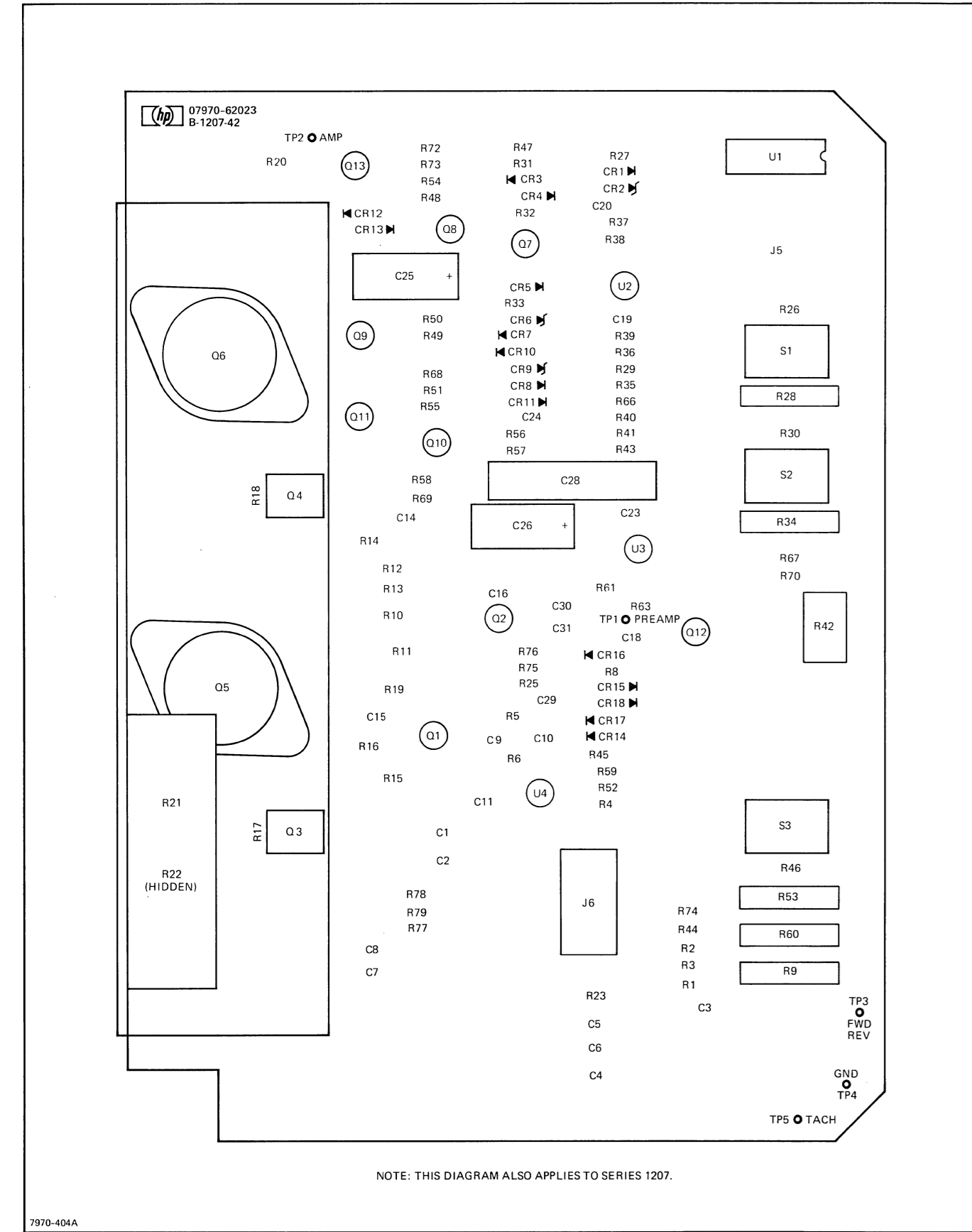


Figure 7-9. Capstan Servo PC Assembly A6, Parts Location Diagram

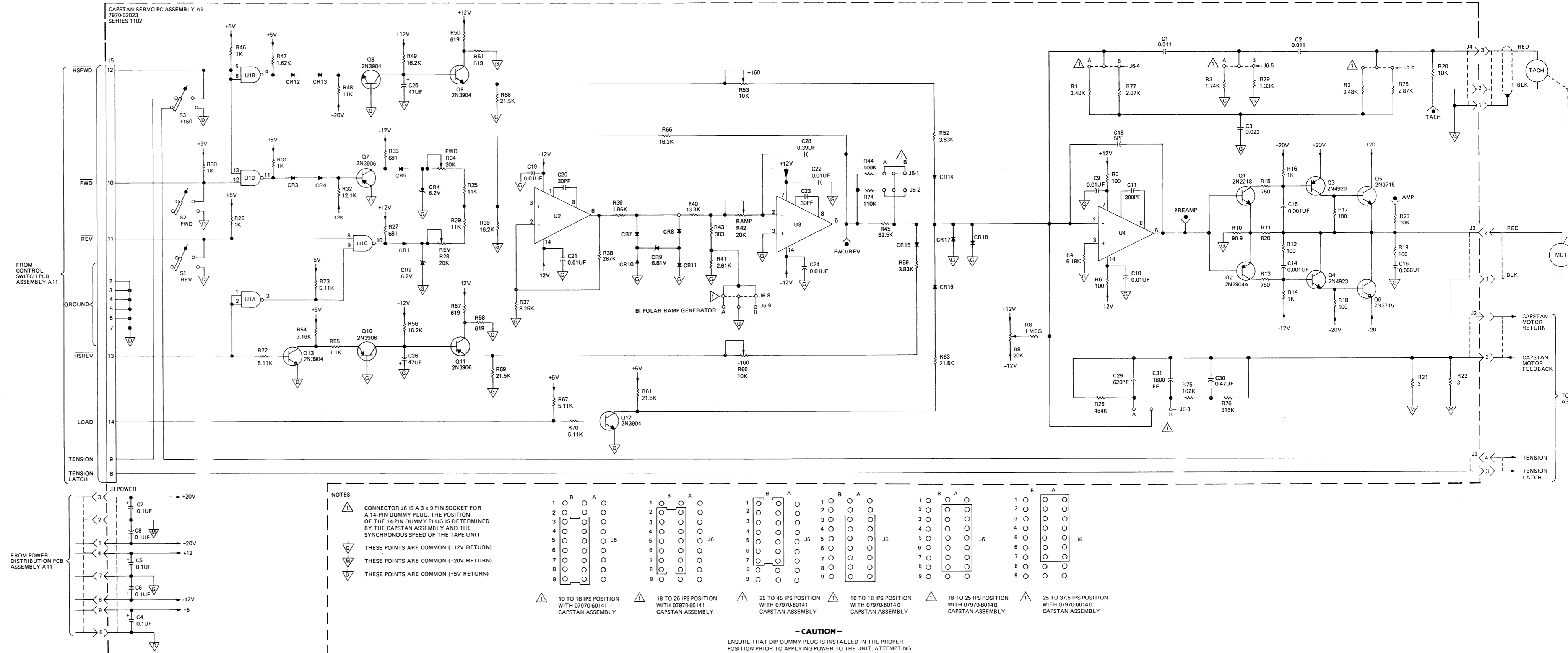
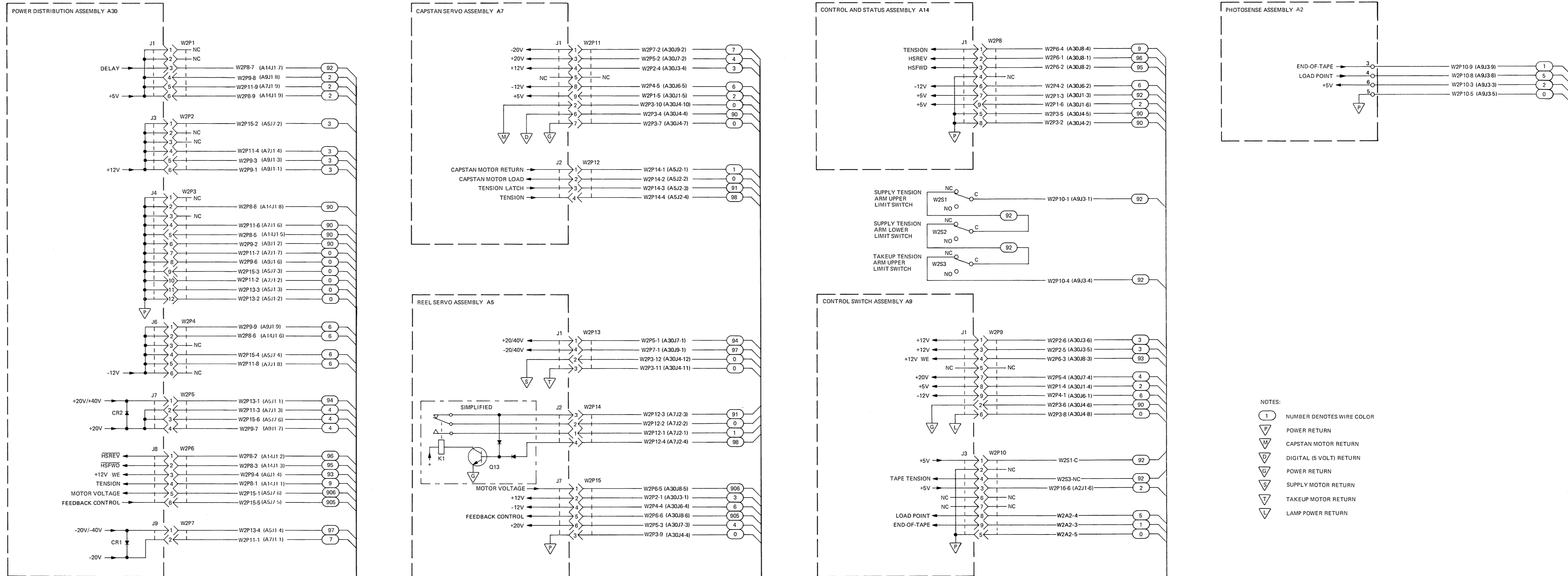


Figure 7-10. Capstan Servo PC Assembly A6, Schematic Diagram



7970-F-0108

Figure 7-11. Cable Assembly W2, Wiring Diagram