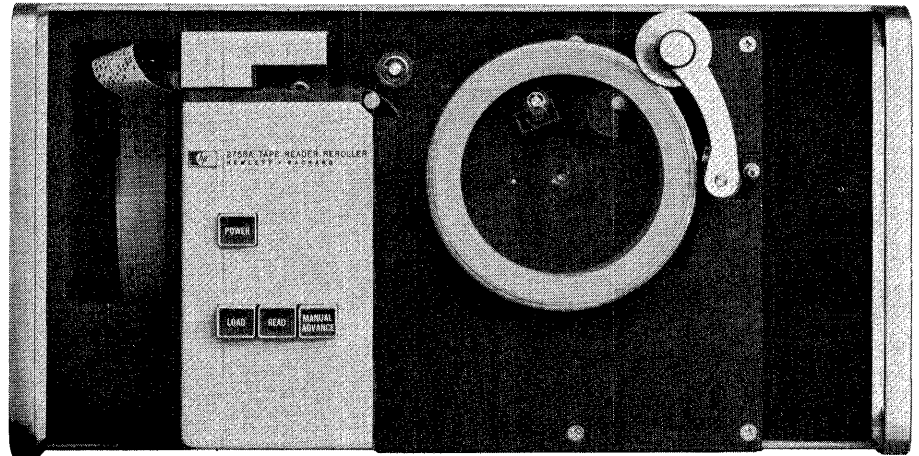


OPERATING AND SERVICE MANUAL

**2758A**  
**TAPE READER-REROLLER**



HEWLETT  PACKARD



## CERTIFICATION

*The Hewlett-Packard Company certifies that this instrument was thoroughly tested and inspected and found to meet its published specifications when it was shipped from the factory. The Hewlett-Packard Company further certifies that its calibration measurements are traceable to the U.S. National Bureau of Standards to the extent allowed by the Bureau's calibration facility.*

## WARRANTY AND ASSISTANCE

All Hewlett-Packard products are warranted against defects in materials and workmanship. This warranty applies for one year from the date of delivery, or, in the case of certain major components listed in the operating manual, for the specified period. We will repair or replace products which prove to be defective during the warranty period. No other warranty is expressed or implied. We are not liable for consequential damages.

For any assistance contact your nearest Hewlett-Packard Sales and Service Office. Addresses are provided at the back of this manual.



# OPERATING AND SERVICE MANUAL

## **2758A**

### TAPE READER-REROLLER

Serial Numbers Prefixed: 848-



## TABLE OF CONTENTS

Section	Page	Section	Page
<b>I</b>		<b>IV</b>	
<b>GENERAL INFORMATION</b>		<b>MAINTENANCE</b>	
1-1. Introduction . . . . .	1-1	4-1. Introduction . . . . .	4-1
1-3. General Description . . . . .	1-1	4-3. Preventive Maintenance . . . . .	4-1
1-6. Identification . . . . .	1-1	4-5. Inspection . . . . .	4-1
1-9. Specifications . . . . .	1-2	4-7. Cleaning . . . . .	4-1
		4-10. Lubrication . . . . .	4-1
		4-13. Adjustment Procedures . . . . .	4-1
<b>II</b>		4-15. Clutch Adjustment . . . . .	4-1
<b>INSTALLATION AND OPERATION</b>		4-17. Pinch Roller Adjustment . . . . .	4-2
2-1. Introduction . . . . .	2-1	4-19. Power Supply Assembly A1 Adjustment . . . . .	4-3
2-3. Installation . . . . .	2-1	4-21. Read Head Assembly A5 Adjustment . .	4-3
2-4. Unpacking and Inspection . . . . .	2-1	4-25. Loop Sensor Assembly A7 and Malfunction Detector Assembly A8 Adjustments . . . . .	4-4
2-6. Rack or Bench Mounting . . . . .	2-1	4-29. Eddy-Current Brake and Canister Brake Adjustments . . . . .	4-4
2-9. Power Requirements . . . . .	2-2	4-32. Troubleshooting . . . . .	4-4
2-12. Lubrication . . . . .	2-2	4-34. Power Supply Assembly A1 Checkout .	4-6
2-14. Shipping Instructions . . . . .	2-2	4-37. Operational Checkout . . . . .	4-7
2-18. Operating Controls . . . . .	2-2	4-39. Control Assembly A2 Checkout . . . . .	4-7
2-20. Operating Instructions . . . . .	2-4	4-41. Mechanical Checkout . . . . .	4-7
2-22. Threading Tape in Read Head Assembly A5 . . . . .	2-4	4-43. Read Head Assembly A5 and Interface Assembly A3 Checkout . . . . .	4-7
2-24. Operation with Long Tape Lengths . .	2-4	4-45. Punched Tape Checkout . . . . .	4-9
2-31. Operation with Short Tape Lengths . .	2-6	4-47. Loop Sensor Assembly A7 Checkout . .	4-10
2-35. Tape Splicing . . . . .	2-7	4-49. Malfunction Detector Assembly A8 Checkout . . . . .	4-10
		4-51. Removal and Replacement . . . . .	4-10
<b>III</b>		4-53. Illustrations . . . . .	4-10
<b>THEORY OF OPERATION</b>		<b>V</b>	
3-1. Introduction . . . . .	3-1	<b>REPLACEABLE PARTS</b>	
3-3. Overall Functional Description . . . . .	3-1	5-1. Introduction . . . . .	5-1
3-7. Detailed Circuit Descriptions . . . . .	3-2	5-6. Ordering Information . . . . .	5-1
3-9. Read Head Assembly A5 . . . . .	3-2	<b>APPENDIX A</b> . . . . .	A-1
3-17. Interface Assembly A3 . . . . .	3-2		
3-22. Loop Sensor Assembly A7 . . . . .	3-3		
3-24. Malfunction Detector Assembly A8 . . .	3-3		
3-26. Control Circuitry . . . . .	3-3		
3-34. Power Supply Assembly A1 . . . . .	3-4		



## LIST OF ILLUSTRATIONS

Figure	Title	Page	Figure	Title	Page
1-1.	Hewlett-Packard 2758A Tape Reader-Reroller . . . . .	1-1	4-4.	Troubleshooting Flow Chart . . . . .	4-5
2-1.	Tape Reader-Reroller Rear Panel . . . . .	2-1	4-5.	Punched Tape Specifications . . . . .	4-9
2-2.	Tape Reader-Reroller Front Panel . . . . .	2-3	4-6.	Tape Reader-Reroller Logic Diagram . . . . .	4-11
2-3.	Tape Canister Malfunction . . . . .	2-3	4-7.	Read Head Assembly A5 Schematic Diagram . . . . .	4-13
2-4.	Tape Threading Diagram . . . . .	2-4	4-8.	Interface Assembly A3 Schematic and Parts Location Diagrams . . . . .	4-15
2-5.	Unloading Tape Canister . . . . .	2-5	4-9.	Control Assembly A2 Schematic and Parts Location Diagrams . . . . .	4-17
2-6.	Tape Loading for Long Lengths of Tape . . . . .	2-6	4-10.	Power Supply Assembly A1 Schematic and Parts Location Diagrams . . . . .	4-19
2-7.	Helix Tape Guide Slot . . . . .	2-6	5-1.	Tape Reader-Reroller Parts Location Diagram . . . . .	5-3
2-8.	Tape Loading for Short Lengths of Tape . . . . .	2-7	5-2.	Front Panel Assembly Exploded View . . . . .	5-9
3-1.	Tape Reader-Reroller Functional Block Diagram . . . . .	3-1	5-3.	Deck Assembly Parts Location Diagram . . . . .	5-11
3-2.	Tape Reader-Reroller Timing Diagram . . . . .	3-3	5-4.	Rear Panel Assembly Parts Location Diagram . . . . .	5-13
3-3.	Feedhold Schmitt Trigger Input and Output Waveforms . . . . .	3-3	A-1.	Voltage Regulator Equivalent Schematic Diagram . . . . .	A-1
4-1.	Clutch Alignment Tool . . . . .	4-2			
4-2.	Clutch Adjustment . . . . .	4-2			
4-3.	Phototransistor Reference Voltage Variable Resistors . . . . .	4-3			

## LIST OF TABLES

Table	Title	Page	Table	Title	Page
1-1.	HP 2758A Tape Reader-Reroller Specifications . . . . .	1-2	4-7.	Power Supply Assembly A1 Replaceable Parts . . . . .	4-18
2-1.	Pin Assignments for Connector J2 . . . . .	2-2	5-1.	Tape Reader-Reroller Replaceable Parts . . . . .	5-2
4-1.	Preventive Maintenance Schedule . . . . .	4-1	5-2.	Front Panel Assembly Replaceable Parts . . . . .	5-4
4-2.	Power Supply Assembly A1 Checkout . . . . .	4-6	5-3.	Deck Assembly Replaceable Parts . . . . .	5-10
4-3.	Operational Chart . . . . .	4-8	5-4.	Rear Panel Assembly Replaceable Parts . . . . .	5-12
4-4.	Read Head Assembly A5 and Interface Assembly A3 Checkout . . . . .	4-9	5-5.	Tape Reader-Reroller Electrical Parts . . . . .	5-14
4-5.	Interface Assembly A3 Replaceable Parts . . . . .	4-14	5-6.	Tape Reader-Reroller Mechanical Parts . . . . .	5-16
4-6.	Control Assembly A2 Replaceable Parts . . . . .	4-16	5-7.	Reference Designations and Abbreviations . . . . .	5-19
			5-8.	Code List of Manufacturers . . . . .	5-20





## SECTION I

### GENERAL INFORMATION

#### 1-1. INTRODUCTION.

1-2. This operating and service manual covers general information, installation, operation, theory of operation, and maintenance instructions for the Hewlett-Packard 2758A Tape Reader-Reroller. (See figure 1-1.)

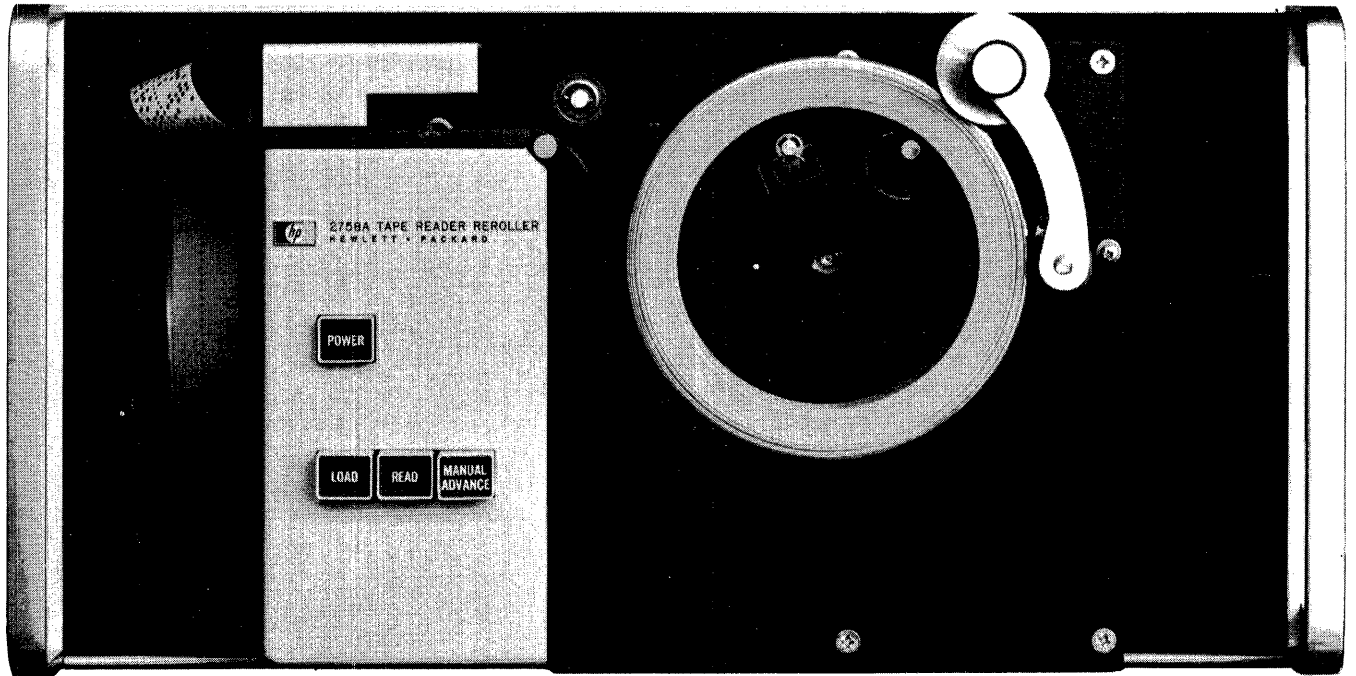
#### 1-3. GENERAL DESCRIPTION.

1-4. The tape reader-reroller photoelectrically detects coded data characters punched on perforated tape. A unidirectional mechanical-drive mechanism advances the tape through the read head where phototransistors are used to detect the data. Tape can be rerolled automatically in plastic canisters (lengths up to 250 feet), or the tape can be run through loose in unrolled lengths. The tape reader-reroller simultaneously reads and rerolls the tape inside the canister from the outside-in so that after a length of tape is rerolled, it may be removed from the canister and immediately run through the instrument again without a separate rewind process.

1-5. The tape reader-reroller accepts 8-track, 1-inch tape. Reading rate is up to 500 characters-per-second. Forward tape drive after loading is initiated by an external step command or by actuating the MANUAL ADVANCE pushbutton on the instrument.

#### 1-6. IDENTIFICATION.

1-7. Hewlett-Packard uses a two-section eight digit serial number (000-00000) located on the rear panel to identify each instrument. The first three digits are a special prefix number used to identify a special instrument model. The last five digits identify each specific instrument. If the serial number prefix on your instrument does not agree with those on the title page of this manual, there are differences between your instrument and the instrument described in this manual. These differences are described in change sheets and manual supplements available at the nearest HP Sales and Service Office.



2017-6

Figure 1-1. Hewlett-Packard 2758A Tape Reader-Reroller

1-8. Printed-circuit card revisions are identified by a letter and a date code stamped on the card. The letter code identifies the version of the etched trace pattern on the unloaded card. The date code refers to the electrical characteristics of the loaded card. If date codes stamped on printed-circuit cards do not agree with date codes shown on schematics in this manual for each printed-circuit card, there are differences between your instrument and the instrument described in this manual. These differences are

described in change sheets and manual supplements available at the nearest HP Sales and Service Office.

### 1-9. SPECIFICATIONS.

1-10. Specifications for the HP 2758A Tape Reader-Reroller are listed in table 1-1.

Table 1-1. HP 2758A Tape Reader-Reroller Specifications

GENERAL	TAPE
<p>Power Requirement: 115 volts ac <math>\pm</math> 10%, 60 Hz, 425 watts</p> <p>Mounting: Standard 19-inch rack</p> <p>Panel Height: 8-3/4 inches</p> <p>Width: 17 inches</p> <p>Depth: 16 inches</p> <p>Finish: Light grey baked enamel and flat black with black-filled panel engravings</p>	<p>Material: Any diffuse material with less than 60% transmissivity</p> <p>Code: 8 level</p> <p>Width: 1 inch</p> <p>Canister Size: 5-inch diameter</p> <p>Canister Capacity: 250 feet of paper or paper-mylar tape</p> <p>Leader: Requires 2 feet of leader tape</p>
<p>Operating Temperature Range: 0° to 55°C (32° to 132°F)</p> <p>Nonoperating Temperature Range: -40° to 75°C (-40° to 167°F)</p> <p>Relative Humidity: 95 percent at 25° to 40°C</p>	<p><b>SPEED</b></p> <p>Reading: Up to 500 characters per second</p> <p>Stop Time: Less than 500 <math>\mu</math>sec</p> <p>Start Time: Less than 6 ms (up to full speed in 10 ms)</p>

## SECTION II

### INSTALLATION AND OPERATION

#### 2-1. INTRODUCTION.

2-2. This section contains information on unpacking, inspection, installation, and operation for the HP 2758A Tape Reader-Reroller.

#### 2-3. INSTALLATION.

#### 2-4. UNPACKING AND INSPECTION.

2-5. If the shipping carton is damaged upon receipt, request that the carrier's agent be present when the instrument is unpacked. Inspect the instrument for damage (scratches, dents, broken parts, etc.). If the instrument is damaged or fails to meet specifications, notify the carrier and the nearest Hewlett-Packard Sales and Service Office immediately. (Sales and Service Offices are listed at the back of this manual.) Retain the shipping container and the padding material for the carrier's inspection. The Hewlett-Packard Sales and Service Office will arrange for the repair or replacement of the damaged instrument without waiting for any claims against the carrier to be settled.

#### 2-6. RACK OR BENCH MOUNTING.

2-7. The tape reader-reroller is designed for either bench installation or mounting in a standard 19-inch rack. To mount the instrument in a rack, follow the instructions contained in the rack mounting kit furnished with the instrument. All necessary hardware is furnished as part of the rack mounting kit.

#### CAUTION

A minimum of six inches of clearance is required below the tape reader-reroller to allow for excursions of tape loops. Without this clearance, snagged tape loops and broken tape may result.

2-8. All necessary accessories are supplied except interconnecting cables and interface kits for interfacing with associated equipment. These cables will be supplied upon special order to the nearest Hewlett-Packard Sales and Service Office. The maximum interconnecting cable length is

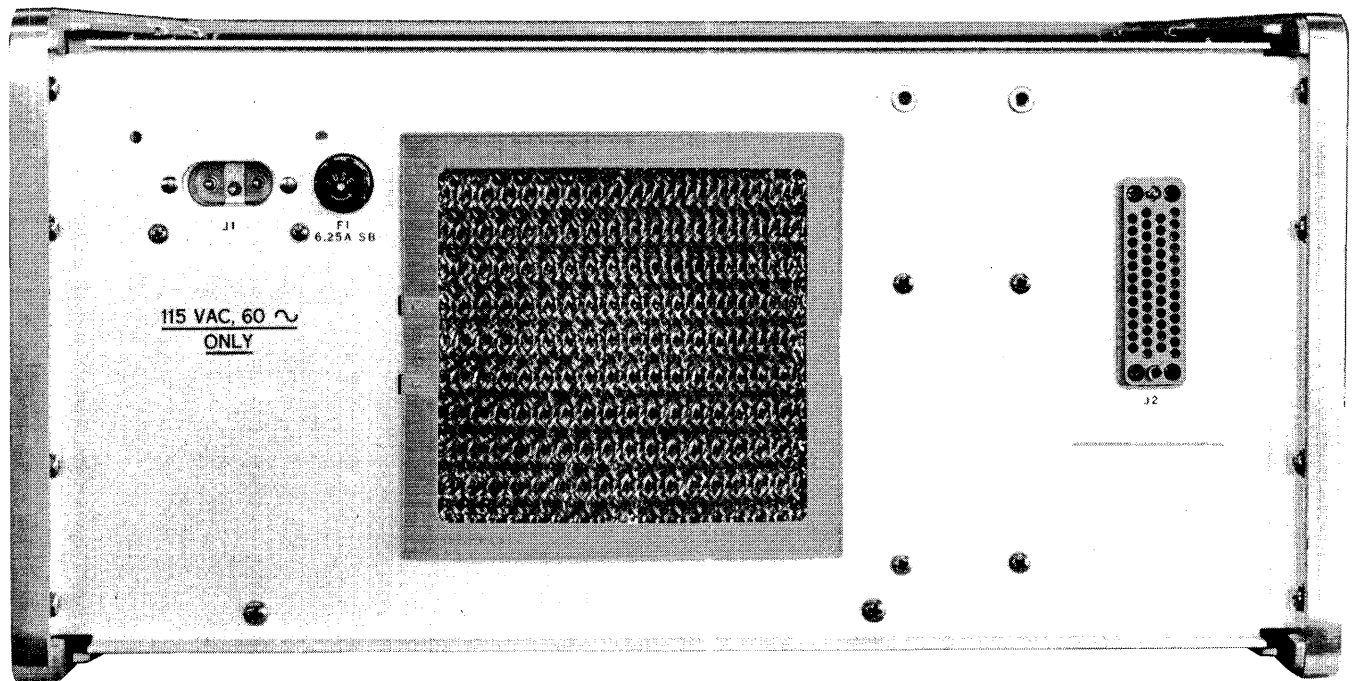


Figure 2-1. Tape Reader-Reroller Rear Panel

50 feet. Pin assignments for interfacing connector J2 are listed in table 2-1. Figure 2-1 shows the rear panel of the tape reader-roller.

Table 2-1. Pin Assignments for Connector J2

CONNECTOR J2,PIN	FUNCTION
B	Data Bit 1
F	Data Bit 2
L	Data Bit 3
R	Data Bit 4
V	Data Bit 5
Z	Data Bit 6
d	Data Bit 7
j	Data Bit 8
HH	Ground
AA	Read Command
FF	Feedhole

**2-9. POWER REQUIREMENTS.**

2-10. The tape reader-roller operates from a 115-volt, 60-Hz power source and requires 425 watts of power. The instrument is protected from power overloads by a 6.25 ampere slow-blow type fuse which is located in a fuse holder on the rear panel. Check the ampere rating of the fuse supplied with the instrument before applying power.

2-11. A detachable three-conductor power cord is supplied with the instrument. When operating the instrument from a two-contact outlet, use a three-conductor to two-conductor adapter and connect the adapter ground wire to a suitable ground.

**2-12. LUBRICATION.**

2-13. The tape reader-roller was lubricated before shipment and normally should not require lubrication before initial operation. However, failure to check the instrument periodically for proper lubrication may result in serious and costly damage to the instrument. Complete lubrication intervals and procedures are provided in section IV of this manual.

**2-14. SHIPPING INSTRUCTIONS.**

2-15. If the instrument is to be shipped to Hewlett-Packard for service or repair, attach a tag to the instrument identifying the owner and indicating the service or repair to be accomplished. Include the model number and full serial number of the instrument.

2-16. Place the instrument in the original container if available. If the original container is not available, a suitable container and packing material can be purchased from a local Hewlett-Packard Sales and Service Office.

2-17. If the original container is not used, wrap the instrument in heavy paper and place it in an inner container. Place adequate packing material around all sides of the instrument and place a cardboard strip over the front panel. Place the instrument and inner container in a heavy carton or wooden box and bind with strong tape or metal bands. Mark the shipping container "FRAGILE".

**Note**

In any correspondence, identify the instrument by model number and serial number prefix. Refer any questions to the nearest Hewlett-Packard Sales and Service Office.

**2-18. OPERATING CONTROLS.**

2-19. Operating controls for the tape reader-roller consist of four switches mounted on the front panel and a single switch on control assembly A2. (See figure 2-2.) Functions of the controls are as follows:

a. **POWER switch:** Applies primary ac power to the instrument.

b. **LOAD switch:** Releases reader brake and pinch roller and stops reader capstan to allow for tape threading. The feedhole signal is inhibited when this switch is engaged.

c. **READ switch:** Allows read command to control tape movement through instrument.

d. **MANUAL ADVANCE switch:** Advances tape through instrument as long as switch is manually engaged. When switch is released, tape will not advance. The feedhole signal is inhibited when this switch is engaged.

e. **Malfunction stop/read switch** (located on control assembly A2): When set to MF READ, allows instrument to advance tape through read head even though a malfunction is present in tape roller mechanism. (See figure 2-3.) Tape will not rereol, however, if a malfunction is sensed. When set to MF STOP, instrument will stop advancing tape as soon as a malfunction is sensed and will continue to inhibit tape advance until malfunction is corrected. Tapes that have been severely folded or otherwise mishandled and mutilated cannot be consistently rereoled into a tape canister without experiencing a malfunction.

**Note**

A malfunction here is defined as any improperly rereoled tape in the take-up canister such that the tape breaks the light path to the malfunction detector. This should not be confused with an equipment malfunction.

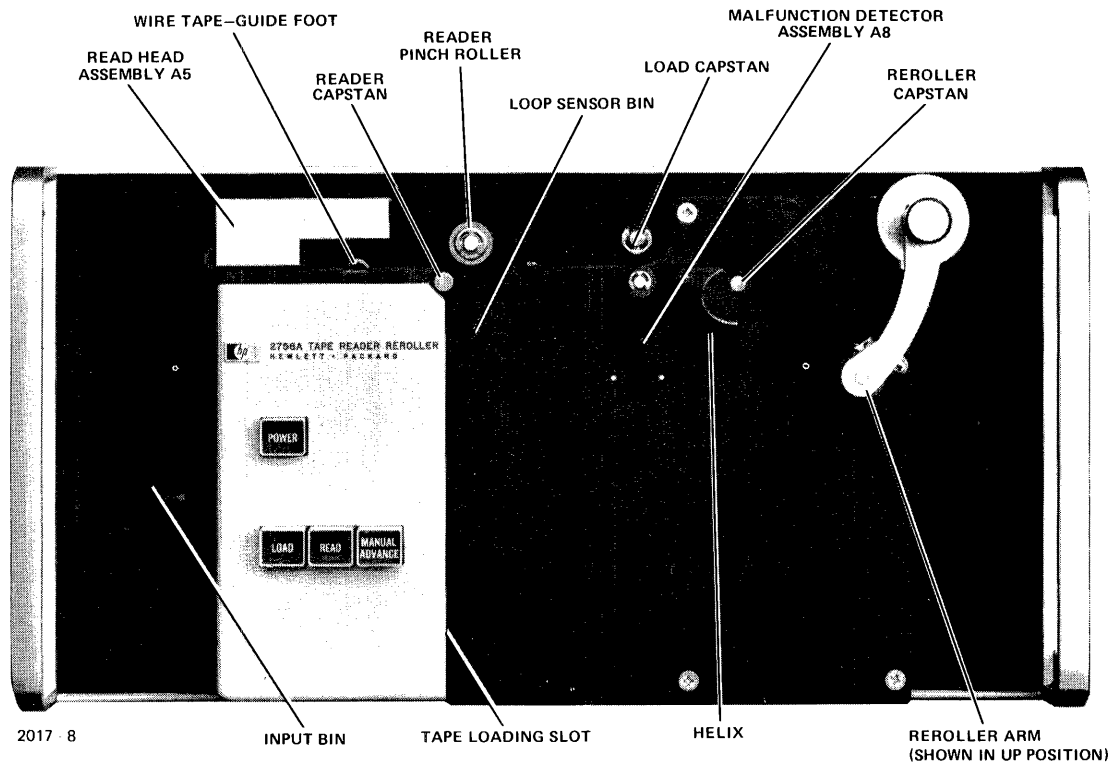


Figure 2-2. Tape Reader-Reroller Front Panel

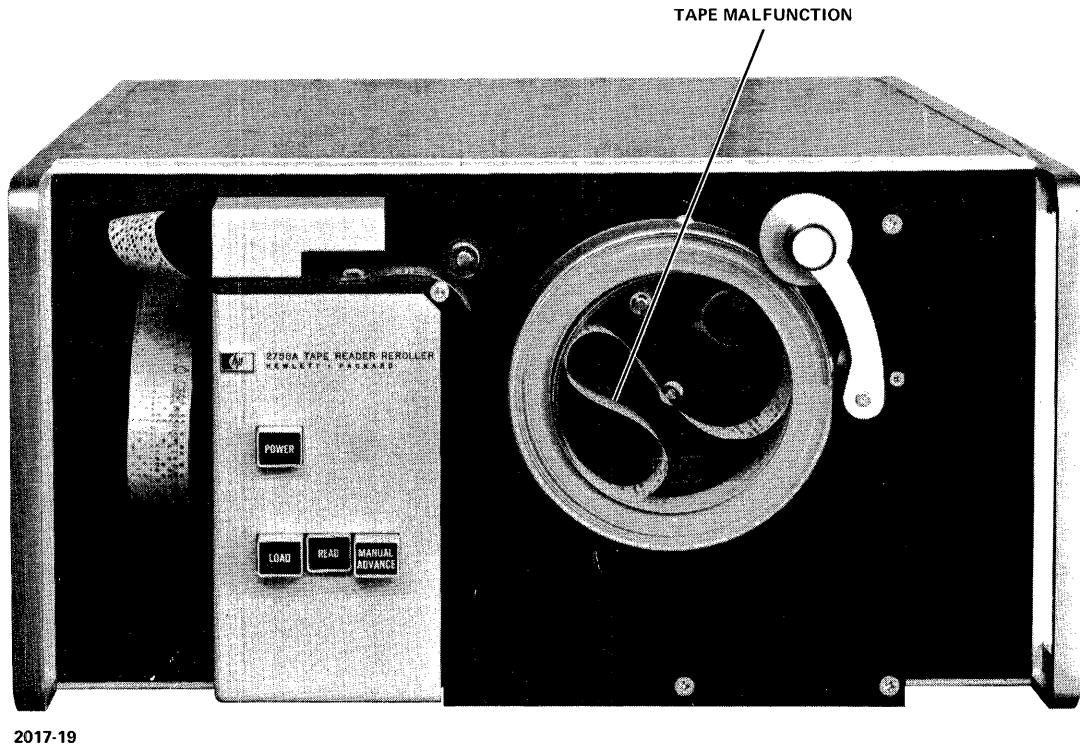


Figure 2-3. Tape Canister Malfunction

**2-20. OPERATING INSTRUCTIONS.**

2-21. Operating instructions for the tape reader-roller are given in the following paragraphs. Separate instructions are given for operating the instrument with a long length of tape to be rerolled in the canister and a short length of tape (or a tape loop) for which the reroll mechanism is inhibited. Refer to paragraph 2-24 for long tape lengths and to paragraph 2-31 for short tape lengths. Paragraph 2-22 describes the procedure for threading tape in the read head and is applicable to short or long tapes.

**2-22. THREADING TAPE IN READ HEAD ASSEMBLY A5.**

2-23. When threading tape in read head assembly A5, see figure 2-4 and proceed as follows:

a. Pull approximately 12 inches of tape out of input bin and over tape guide as shown in figure 2-4A.

b. Hold tape between thumb and forefinger of both hands as shown in figure 2-4B.

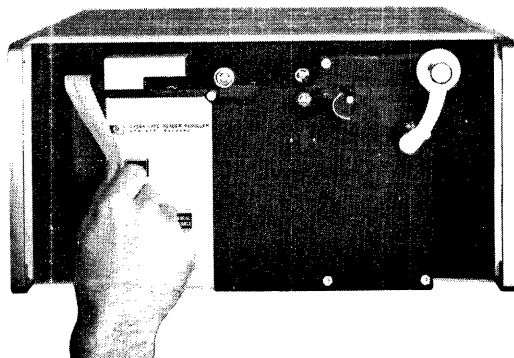
c. With the tape drawn tightly and at an angle to the read head assembly as shown in figure 2-4C, begin sliding tape into slot in the read head.

d. Hold tape down against the read head surface, and slide tape from left to right and back into the slot in the read head assembly as shown in figure 2-4D. The tape should slip easily into the recessed tape guide slot and under the plastic-covered wire foot on the read head assembly.

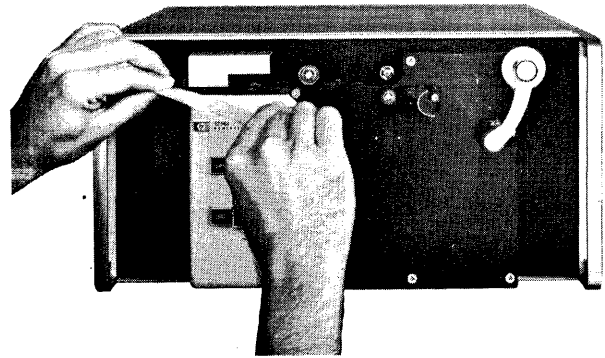
**2-24. OPERATION WITH LONG TAPE LENGTHS.**

2-25. To operate the tape reader-roller with long lengths of tape, proceed as instructed in the following paragraphs. Perform preliminary procedures in paragraph 2-26, load tape as instructed in paragraph 2-27, and operate the instrument in accordance with paragraph 2-28.

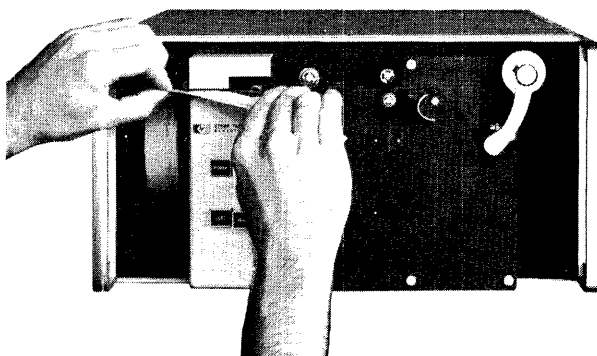
2-26. PRELIMINARY PROCEDURES. The only preliminary procedure to be accomplished is to make certain that the malfunction stop/read switch is set for the desired mode of operation (MF STOP or MF READ). To set this



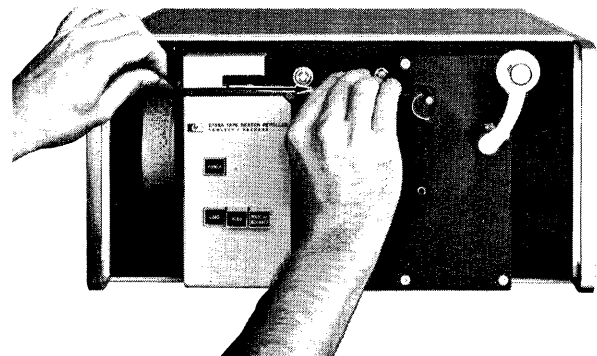
STEP A



STEP B



STEP C



STEP D

2017-4

Figure 2-4. Tape Threading Diagram

switch, remove the top cover from the instrument and set switch S4 on control assembly A2 to MF STOP or MF READ, as desired. Replace the cover on the instrument.

2-27. **TAPE LOADING.** To load long lengths of tape in the tape reader-rewinder, proceed as follows:

- a. Energize instrument by pressing POWER switch on.
- b. Press LOAD switch.
- c. Remove tape roll from plastic canister by firmly pressing in on tape roll through unloading hole in canister and lifting tape out of canister with other hand. (See figure 2-5.)



Figure 2-5. Unloading Tape Canister

- d. Place tape in input bin so that tape unrolls from the bottom of the roll.
- e. Load tape as shown in figure 2-6, making certain that approximately 1/2-inch of leader tape is inserted into tape guide slot in helix. (See figure 2-7.) Special instructions are given in paragraph 2-22 for threading tape in the read head assembly.
- f. Lift reroller arm and place empty canister on reroller capstan. Lower reroller arm into position on canister.
- g. Press either READ switch or MANUAL ADVANCE switch, depending on desired mode of operation. Tape will automatically thread around helix and into canister.

#### Note

If READ mode is selected, tape will not advance until a read command is received from the computer or controlling device.

2-28. **OPERATING PROCEDURES.** After the instrument has been loaded with tape and the READ switch or the MANUAL ADVANCE switch has been pressed, the instrument will normally run until all of the tape has passed from the input bin into the takeup canister. (This assumes that a continuous read command is present for the READ mode or that the MANUAL ADVANCE switch is held on for the MANUAL ADVANCE mode.) However, if a malfunction occurs, the tape reroller mechanism will stop. In case of a malfunction, proceed in accordance with either paragraph 2-29, when the instrument is in the MF STOP mode, or paragraph 2-30 when the instrument is in the MF RUN mode.

2-29. **MALFUNCTION IN MF STOP MODE.** When a malfunction occurs in the MF STOP mode, the tape advance mechanism immediately stops and remains off until the malfunction is corrected. To correct a malfunction, proceed as follows:

- a. Press LOAD switch.
- b. Lift reroller arm, remove partially filled canister of tape, and correct fouled tape loops.

#### Note

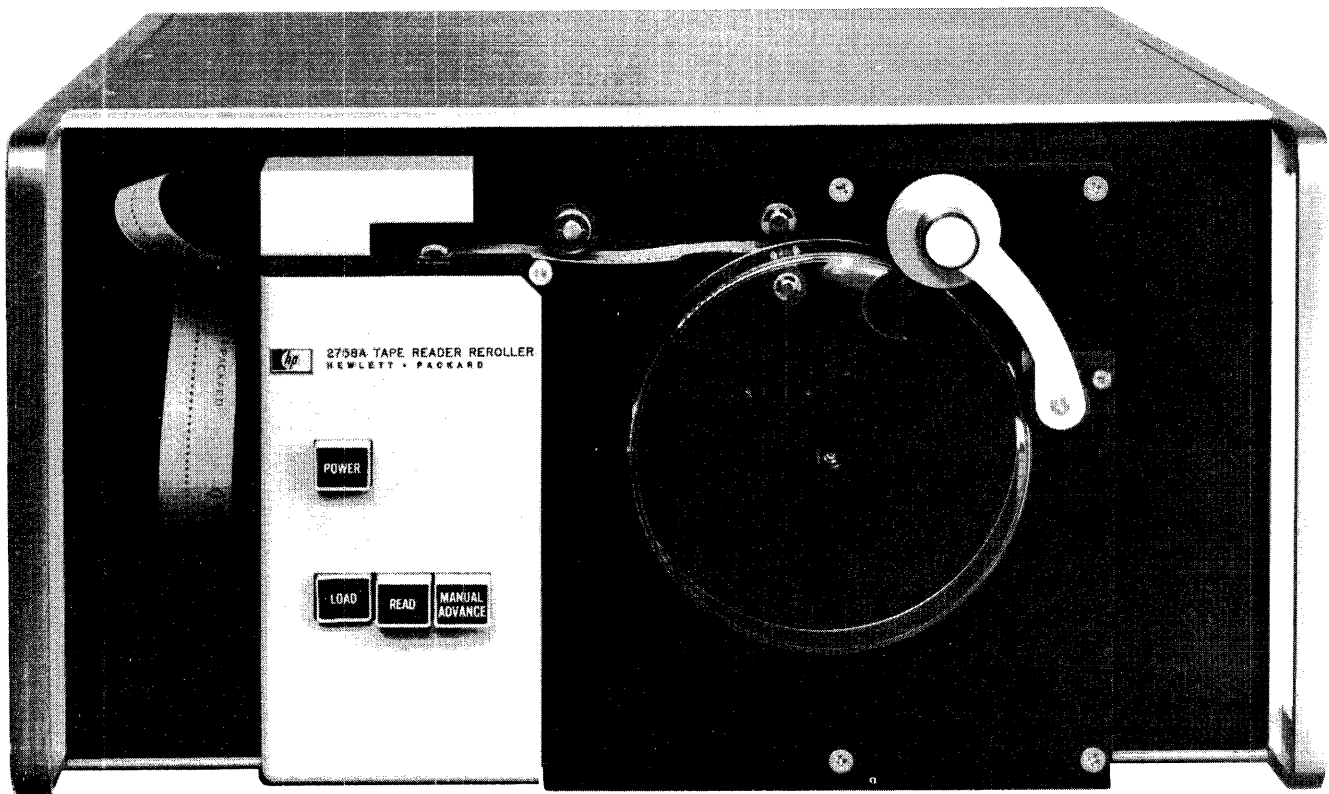
When correcting fouled tape loops, be careful not to pull tape past the read head, or tape reading errors may result.

c. Replace tape and canister on reroller capstan. Lower reroller arm against canister.

d. Instrument is now ready to advance tape. Press READ switch or MANUAL ADVANCE switch as desired.

2-30. **MALFUNCTION IN MF READ MODE.** When a malfunction occurs in the MF READ mode, the tape reroller mechanism stops, but the tape advance mechanism will continue to advance tape through the read head and out through the bottom of the loop sensor bin. This allows a complete program to be run into the computer without stopping, despite the malfunction. After the tape has all run through the read head, proceed as follows:

- a. Press LOAD switch.
- b. Turn pile of loose tape on floor over to minimize tangles as tape is rerolled.
- c. Press MANUAL ADVANCE switch to reroll tape into canister. Release MANUAL ADVANCE switch and untangle tape loops as necessary until all of tape has been rerolled into canister.



2017-5

Figure 2-6. Tape Loading for Long Lengths of Tape

### 2-31. OPERATION WITH SHORT TAPE LENGTHS.

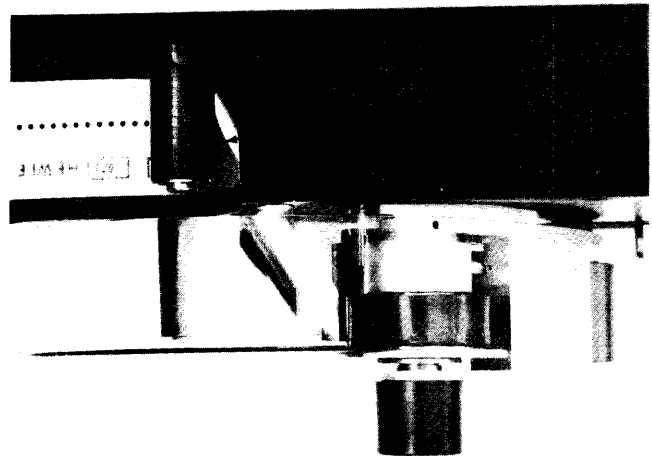
2-32. To operate the tape reader-reroller with short lengths or loops of tape, proceed as instructed in the following paragraphs. (Minimum loop length is 22 inches for a closed tape loop.) Load tape as instruction in paragraph 2-33 and operate instrument in accordance with paragraph 2-34.

2-33. **TAPE LOADING.** To load short lengths of tape in the tape reader-reroller, proceed as follows:

- a. Energize instrument by pressing POWER switch on.
- b. Press LOAD switch.
- c. Load tape as shown in figure 2-8. (Note slot in side of buffer bin to allow for threading of closed tape loops.) Special instructions are given in paragraph 2-22 for threading tape in the read head assembly.
- d. Raise reroller arm into up position.

2-34. **OPERATING PROCEDURES.** Once the instrument has been loaded, all that is required to begin operation is to press either the READ switch or the MANUAL ADVANCE switch, depending on the desired mode of operation.

2-6

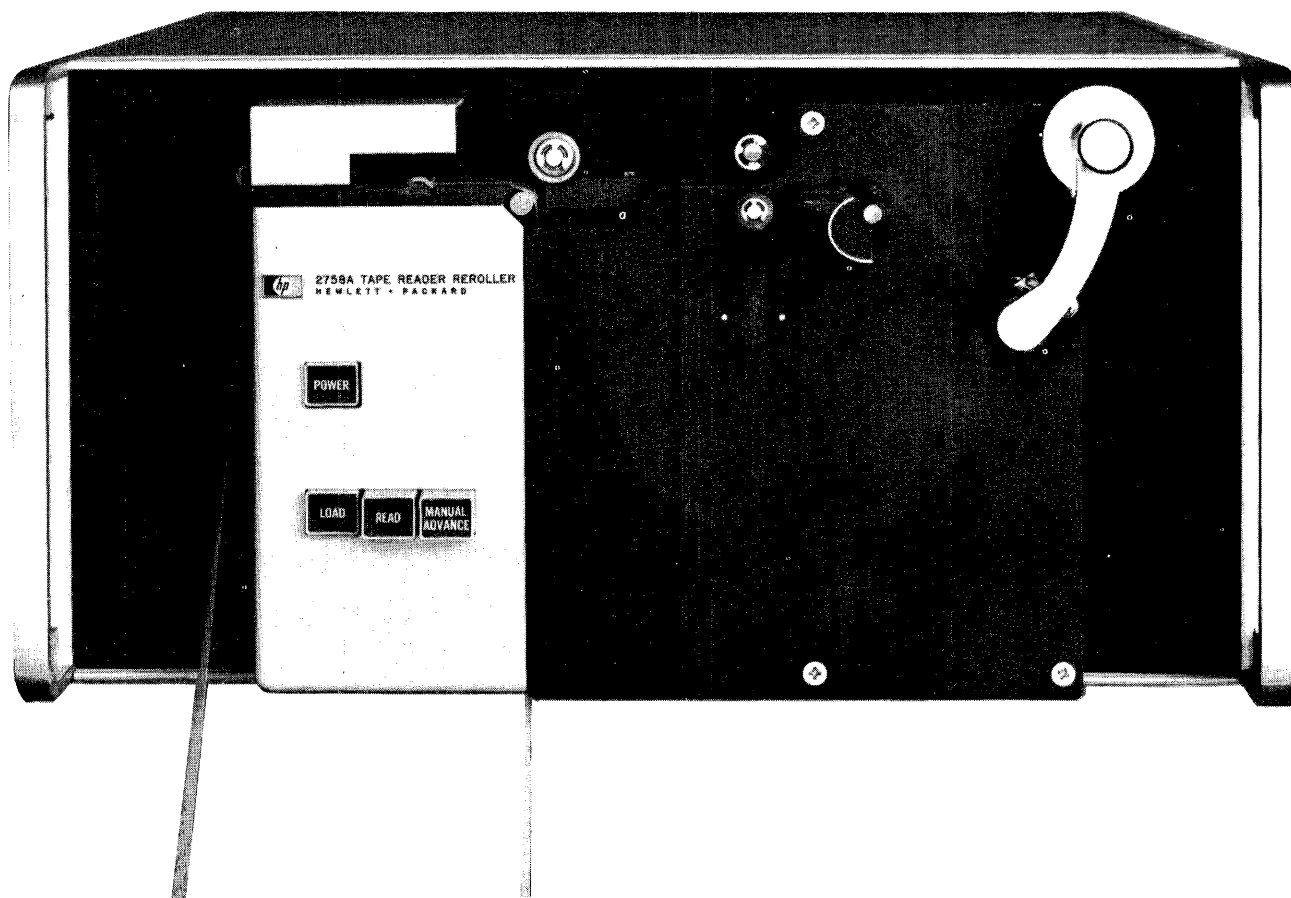


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Figure 2-7. Helix Tape Guide Slot

ation. Once the switch has been pressed, all of the tape will advance through the read head. (This assumes that a continuous read command is present for the READ mode or that the MANUAL ADVANCE switch is held on for the MANUAL ADVANCE mode.)





2017-7

Figure 2-8. Tape Loading for Short Lengths of Tape

## 2-35. TAPE SPLICING.

2-36. At times it may be necessary to splice tape, either to repair torn tape or to form continuous tape loops. When repairing torn tape, special adhesive tape with data and feed holes punched in it should be used (such as Data Link Corporation DL-113PS pressure sensitive adhesive tape). Otherwise, some of the data holes may be covered, and the punched data will be altered. When forming tape loops, butt the ends of the tape together with no overlap and join

together with a single layer of transparent cellophane tape. The joining tape must be sufficiently opaque to reliably interrupt the light to the phototransistors in the read head (such as Scotch Magic Transparent Tape No. 810). Make certain that the adhesive tape is at a right angle to the edge of the punched tape and that the adhesive tape does not cover any required data characters. Also make certain that where a data character has been covered, the corresponding feedhole has also been covered. (Wherever a feedhole appears, the tape reader-reroller will read a data character.)



## SECTION III

### THEORY OF OPERATION

#### 3-1. INTRODUCTION.

3-2. This section contains an overall functional description and detailed circuit descriptions for the tape reader-roller.

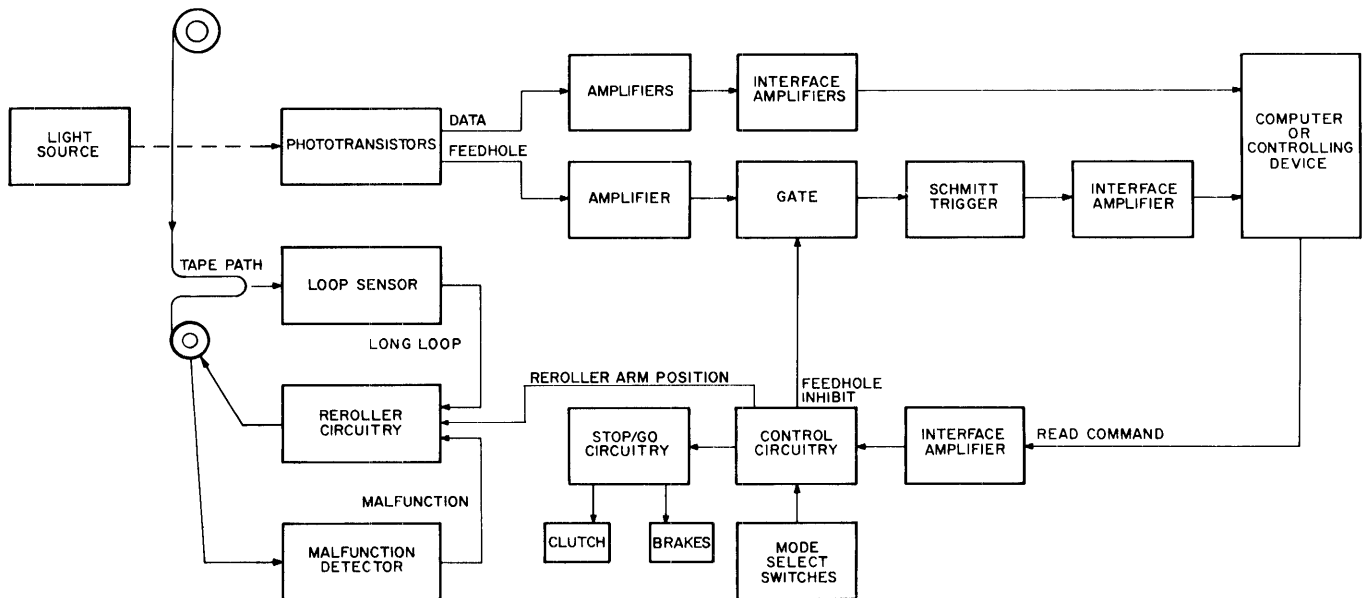
#### 3-3. OVERALL FUNCTIONAL DESCRIPTION.

3-4. A functional block diagram of the tape reader-roller is shown in figure 3-1. During operation, the punched tape being read passes between a light source and light-sensitive phototransistors. When holes in the tape permit light to reach the phototransistors, respective data bit outputs (eight possible) and a single feedhole output from the phototransistors are applied to amplifiers. The data bits are further amplified by interface amplifiers and connected to the computer or controlling device that is interpreting the data. The feedhole output is used as the trigger to inform the computer when to read. The output from the feedhole phototransistor is used to fire a Schmitt trigger rather than being applied directly to the computer. Use of the Schmitt trigger ensures that each character is read only once. A feedhole inhibit signal from the control circuitry can turn the feedhole signal off and stop the instrument from reading.

3-5. While in the read mode of operation (READ switch on), instrument operation is initiated by a read command from the computer. The read command is driven

by an interface amplifier and applied to the instrument control circuitry. The control circuitry releases the brake and engages the reader capstan clutch, and the tape is read. While tape is being read and rerolled, a phototransistor loop sensor monitors the length of the tape loop in the loop sensor bin. Whenever the tape loop is long enough to break the light path to the loop sensor phototransistor, the reroller circuitry is energized and the tape is rerolled in the canister. As soon as enough tape is rerolled to restore the light path to the phototransistor, the reroller motor stops. This action is repeated until all of the tape has been read and rerolled unless a malfunction occurs in the reroller mechanism. The malfunction detector also uses a phototransistor to monitor the reroller canister. If fouled tape loops occur in this canister, the reroll circuitry is inhibited until the malfunction is corrected. If the instrument has been set for the malfunction read mode, the reader portion of the instrument continues to operate until all of the tape in the input bin has been read, despite the malfunction. In the malfunction stop mode, the advance of the tape through the read head will be stopped whenever a malfunction occurs in the reroller canister.

3-6. Stop and go circuitry controls the brake and clutch solenoids and allows the instrument to read in a stop/go mode. When the read command is removed, the tape will be stopped on the character initiating the stop without overshooting any characters. When the read command is restored, the tape reader-roller will advance the tape, and reading begins on the character immediately after the character that initiated the stop.



2017-2A

Figure 3-1. Tape Reader-Reroller Functional Block Diagram

### 3-7. DETAILED CIRCUIT DESCRIPTIONS.

3-8. Detailed circuit descriptions of each of the functional circuits in the tape reader-roller are provided in the following paragraphs. Schematic diagrams for each of these circuits are included in section IV of this manual.

#### 3-9. READ HEAD ASSEMBLY A5.

3-10. Read head assembly A5 consists of phototransistors, a lamp and an amplifier for each phototransistor, a reference voltage circuit, and a brake solenoid. A schematic diagram of the complete assembly is shown in figure 4-7.

3-11. The lamps are located in the upper portion of read head assembly A5 on subassembly A5A3 and are accurately positioned over the tape holes by placing the tips of the lamp envelopes in guide holes. The lamps are series connected to provide burnout protection. If a single lamp filament opens, the lamp circuit opens and all lamps will go off. This provides some degree of protection against reading errors that might otherwise be caused by open lamp filaments.

3-12. Subassembly A5A2 contains the phototransistors. Each phototransistor has been selected and matched during manufacture to ensure close grouping of sensitivities within any one phototransistor subassembly.

3-13. The reference voltage circuit is included to compensate for changes in phototransistor sensitivity due to temperature changes. The reference voltage circuit uses a lamp (A5A3DS1) and a phototransistor (A5A2V1) that are essentially the same as those used to read the tape and will therefore be affected by temperature changes to the same extent. Transistor A5A1Q10 and emitter-follower A5A1Q9 act together to form a low-gain operational amplifier. Before light shines on A5A2V1, the voltage at the base of A5A1Q10 is near ground. When light shines on A5A2V1, a negative-going voltage change occurs at the base of A5A1Q10. The output of A5A1Q10 (and A5A1Q9) then goes positive, causing a current to flow through A5A1R2 and A5A1R3 in an amount approximately equal to the collector-to-emitter current in A5A2V1, thus maintaining the voltage at the base of A5A1Q10 near ground. As light intensity or temperature increases, the current through A5A2V1 increases, and the output of amplifier A5A1Q9-A5A1Q10 increases in a proportional amount. In this manner, the desired reference voltage is maintained. The light path of the reference hole is enclosed to keep out dust and other debris that could obstruct the light path. Variable resistor A5A1R2 can be adjusted to compensate for differences in phototransistor sensitivities that may be experienced if it is necessary to replace a phototransistor subassembly.

3-14. During operation of the tape reader-roller, the turn-on threshold level of the data amplifiers on A5A1 is controlled by the level of the reference voltage described previously. All eight data circuits are identical. Typically, if enough light hits A5A2V2, the collector-to-emitter current in A5A2V2 will exceed the current in A5A1R4, so

A5A1Q1 will turn off. The voltage in the collector of A5A1Q1 will then rise to about +5.75 vdc. When the light path to A5A2V2 is blocked, A5A1Q1 conducts to saturation and the collector voltage drops to about 0 vdc.

3-15. The feedhole circuit is similar to that described above for the data circuits except that an emitter-follower is used as the output amplifier. Therefore, the negative-going output from the feedhole phototransistor is not inverted by the amplifier and the output at pin K of A1 is negative whenever a feedhole is sensed and positive when the feedhole light path is cut off.

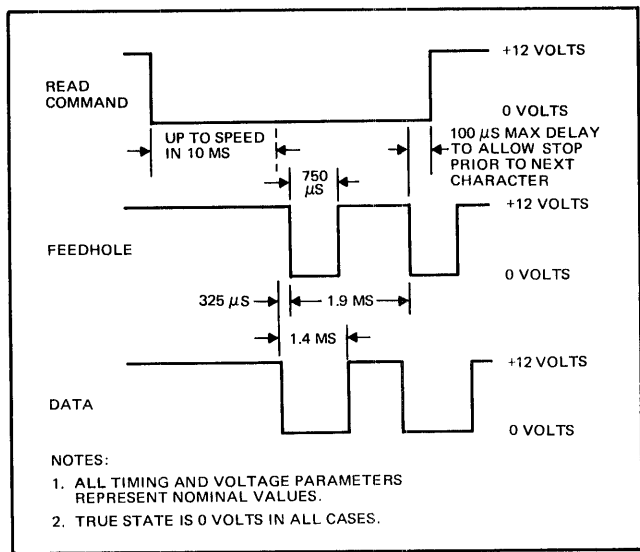
3-16. The brake circuit consists of a solenoid which energizes whenever a signal is received from control assembly A2. When the brake is de-energized, a spring-loaded iron disc in read head assembly A5 is held lightly against the paper tape. The spring prevents bouncing between the iron disc and the solenoid that could cause delays in stopping the tape when the brake is energized. When the solenoid is energized, the iron disc is attracted to the solenoid, clamping the punched tape between the braking surfaces of the solenoid and the iron disc.

#### 3-17. INTERFACE ASSEMBLY A3.

3-18. The interface circuitry consists of 11 common-emitter amplifiers, a Schmitt trigger with a diode inhibit gate, and an eight-input diode OR-gate. A complete schematic diagram of interface assembly A3 is shown in figure 4-8.

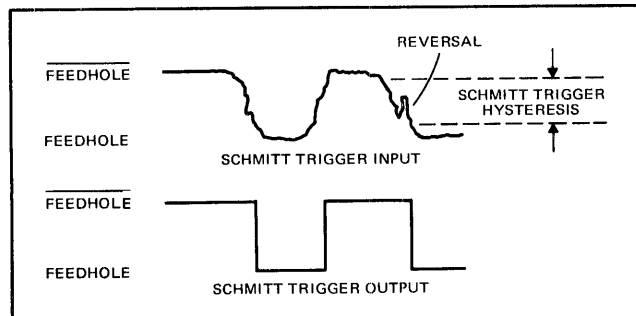
3-19. Transistors Q1 through Q8 amplify and invert the data bit signals from read head assembly A5 and apply the output signal to connector J2 on the rear panel of the instrument. Base-to-collector capacitors on each amplifier slow the rise and fall times of the inverter outputs to prevent cross coupling between the output signals and other circuits. The diodes connected to each of the amplifier input lines form an OR-gate which gives a positive output at pin BB anytime a data bit is present.

3-20. The feedhole circuit utilizes a Schmitt trigger to ensure that each character on the punched tape is read only once. The location and size relationship of the feedhole to the data holes in the punched tape is such that the data holes will always be in position to be read when the feedhole is in position. Because of this relationship, the leading edge of the feedhole is used as the timing element to trigger the computer or controlling device to read. The computer or controlling device will look at the data only when the feedhole output goes true. Figure 3-2 shows the timing diagram for the tape reader-roller using idealized waveforms. In reality, the feedhole waveform probably looks more like that shown in figure 3-3. Note the noise and slight reversals on the waveform that are caused by lint or paper fibers on the edges of the holes. The Schmitt trigger hysteresis is designed to ignore any reversals such as these and thus avoid rereading a character. When pin 24 is near ground potential, Q11 is held off and feedholes are not passed on to the device receiving the data. Common-emitter amplifiers Q12 and Q13 invert the Schmitt trigger output



2017-15

Figure 3-2. Tape Reader-Reroller Timing Diagram



2017-16

Figure 3-3. Feedhold Schmitt Trigger Input and Output Waveforms

twice before passing the signal on to connector J2. Capacitor C4 slows the rise and fall times of the signal from C13.

3-21. Transistor Q9 inverts the read command from the computer or controlling device and provides sufficient gain to drive the control circuitry on control assembly A2. Input RC network R80, R81, R83, R85, and C2 slows the circuit response to prevent transients from operating the circuit.

### 3-22. LOOP SENSOR ASSEMBLY A7.

3-23. Loop sensor assembly A7 consists of a lamp, a phototransistor, and a common-emitter amplifier. A schematic diagram of the assembly is shown in figure 4-9. The loop sensor is used to monitor the length of the tape loop in the loop sensor bin while the tape reader-reroller is operating in the read mode. When the tape loop exceeds a predetermined length, the light path to phototransistor A7V11 is interrupted and the voltage level at pin 1 of A7 drops to about 0 vdc. When the light path is restored, the voltage level returns to about +4.5 vdc. Pin 1 is connected through control assembly A2 to the motor control circuit

for the reroll motor. The change in voltage level at pin 1 turns the reroll motor on and off as the tape loop breaks and restores the light path to A7V11. A reference voltage generated by read head assembly A5 is connected to pin 4 and is used to compensate for changes in phototransistor sensitivity. The setting of variable resistor A7R81 determines the threshold level for the light sensing circuit.

### 3-24. MALFUNCTION DETECTOR ASSEMBLY A8.

3-25. Malfunction detector assembly A8 consists of a lamp, a phototransistor, and a common-emitter amplifier. A schematic diagram of the assembly is shown in figure 4-9. The malfunction detector is used to monitor the tape as it is being rerolled in the canister. If the tape misrolls, the light path to phototransistor A8V12 is interrupted and the voltage level at pin 4 of A8 drops to about 0 vdc. When the light path is restored and the malfunction flip-flop on A2 has been reset by raising and lowering the reroller arm or by pressing the LOAD switch, the voltage level returns to about +4.5 vdc. Pin 4 of A8 is connected through control assembly A2 to the motor control circuit for the reroll motor. Whenever the voltage level at pin 4 drops to 0 vdc, the malfunction flip-flop is set, turning the reroll motor off until the malfunction flip-flop is reset. A reference voltage generated by read head assembly A5 is connected to pin 5 and is used to compensate for changes in phototransistor sensitivity. The setting of variable resistor A7R83 determines the threshold level for the light sensing circuit.

### 3-26. CONTROL CIRCUITRY.

3-27. The control circuitry includes flip-flops and gates on control assembly A2 and related components on the tape reader-reroller chassis. A schematic diagram of the control circuitry is shown in figure 4-9 and a logic diagram in figure 4-6. Also, refer to the instrument operational chart, table 4-3, to determine the states of the control components for each mode of operation. The primary function of the control circuit is to interpret commands from the computer, the loop sensor, the malfunction detector, the read head, and various instrument switch settings and to originate appropriate signals to carry out these commands. Control assembly A2 outputs control the mechanical features of the tape reader-reroller to provide a specified mode of operation.

3-28. The brake and clutch circuit is designed to allow the tape being read to start and stop rapidly. The tape is stopped on command without overshooting characters. The inductive reactance of the brake and clutch solenoids normally makes these components slow to energize. Inductor L1 allows a higher voltage to be applied to the component being energized. For example, when the brake goes off and the clutch is energized, the clutch initially resists any change in current as does inductor L1. The brake circuit is now open and the clutch is refusing to conduct much current. The inductance of L1 tries to maintain its current level by increasing the voltage at the junction of L1 and K3 from about +11 vdc to over +100 vdc. This higher voltage

across the clutch allows a rapid current buildup, and the clutch is pulled in much more rapidly than would have been possible at +12 vdc. The reverse is also true when the brake comes on and the clutch is de-energized.

3-29. An adjustable eddy-current brake consisting of K5 and variable resistor R74 passes a magnetic field through the reroller motor flywheel whenever the tape in the read head is stopped. The magnetic field has a braking effect to help overcome the inertia of the takeup canister. A brake on the reroller arm consisting of K6, Q27, and variable resistor R75 applies a braking force directly to the takeup canister. The canister brake is applied whenever the reroller motor goes off and releases whenever the reroller motor comes back on.

3-30. A clamping circuit made up of A2CR39, A2CR40, and zener diode CR71 limits the voltage level in the collectors of Q24 and Q25 to +125 vdc to prevent damage to these transistors. Shunt resistor R72 over-compensates for the difference in current in the clutch and the brake and allows an extra high current to be switched into the brake solenoid when the brake is energized. Diodes A2CR37, A2CR41, and A2CR42 eliminate the possibility of the collectors of Q24 and Q25 being driven negative during the switching time. Diode A25CR41 also blocks current flow from TB1-2 through A2CR42 and R72, and back through the clutch when the clutch is de-energized. If this current path were not blocked, the release of the clutch would be delayed.

3-31. If the brake is energized without tape in the brake gap, the iron disc could be attracted to the brake solenoid by residual magnetism, even after the brake is de-energized. To overcome this charged condition of the brake surfaces, A2R61, A2C5, and A2C6 act as a degaussing circuit to demagnetize the surfaces of the brake.

3-32. The reroller motor is switched on with triac Q22. The current through A2CR33 and R71 to the gate of Q22 switches the triac into conduction as long as relay A2K2 is open. The triac conducts in both directions as long as it has been gated on and it remains on until the anode current is reduced below a minimum holding current. In this particular circuit, reroller motor B3 operates as long as voltage is present on TB1-5 and TB1-6, and relay A2K2 is open. When A2K2 closes, anode 1 of Q22 is shorted to the gate and the triac stops conducting as soon as the anode current is reduced below a minimum holding current. Relay A2K2 thus provides isolation between the line voltage and the components of assembly A2.

3-33. The run flip-flop consists primarily of transistors A2Q9 and A2Q10. This flip-flop is set or reset by the READ switch on the instrument front panel. The run flip-flop provides isolation between the switch contacts and the other control circuitry. Without this isolation, switch contact bounce could be interpreted as a series of pulsed signals. The first data flip-flop (A2Q7, A2Q8) is set by a signal from interface assembly A3, which indicates the presence of punched data on the tape, and is reset by the READ switch being off. The malfunction flip-flop (A2Q4,

A2Q5) sets when a signal from malfunction detector assembly A7 indicates a tape reroll malfunction and may be reset by pressing the LOAD switch or by raising the reroller arm.

### 3-34. POWER SUPPLY ASSEMBLY A1.

3-35. Power supply assembly A1 consists of four power supply circuits, which provide output voltages of  $\pm 12$  vdc, -45 vdc, and -5 vdc. See figure 4-10 for a complete schematic diagram of power supply assembly A1, and appendix A for the equivalent schematic diagram of voltage regulators A1U1 and A1U2. The following paragraphs discuss each of these circuits.

3-36. -12 VOLT CIRCUIT. The -12 volt circuit uses full-wave bridge rectifier A1CR1 through A1CR4 to convert ac voltage from one set of secondary windings on transformer T1 to dc voltage. Voltage regulation is provided by integrated circuit A1U1, which is connected to utilize fold-back current limiting. The unregulated -12 volt input from the bridge rectifier is applied to pin 3 of A1U1 and the regulated output is applied to pin 4 of A1U1. A booster output at pin 2 of A1U1 is amplified by A1Q3 and applied to amplifier Q1. Resistor A1R12 in the emitter circuit of Q1 is used as the current sensing device for overload protection. When the current through A1R12 becomes excessive, a more positive voltage will be applied to pin 1 of A1U1 by voltage divider A1R13 and A1R14. The voltage sensed at pin 1 of A1U1 causes the output voltage of the circuit to be reduced to a safe level. Removal of the overload condition will allow the output voltage to return to the normal level. The reference feedback voltage to pin 6 of A1U1 is adjustable by variable resistor A1R16, allowing the output voltage of the -12 volt circuit to be adjusted.

3-37. +12 VOLT CIRCUIT. The +12 volt circuit is similar to the -12 volt circuit in that an integrated circuit is used for voltage regulation and foldback current limiting is used for overload protection. The +12 volt circuit, however, uses a center-tapped rectifier to provide the dc voltage. Rectifier A1CR11-A1CR12 converts ac voltage from one set of secondary windings on transformer T1 to an unregulated dc supply. The unregulated voltage is applied to pin 3 of A1U2 and the regulated output is applied to pin 8 of A1U2. The booster output at pin 2 of A1U2 is amplified by A1Q8 and two emitter-follower amplifiers, Q9 and Q10 to give the output the desired gain. Resistor A1R54 is used as the sensing device for overload protection, and the combination of A1R54, A1R55 and A1R56 provide the voltage to pin 1 of A1U2 that will cut off the +12 volt supply during an overload condition. A reference feedback voltage to pin 6 of A1U2 is adjustable by variable resistor A1R52 to allow adjustment of the +12 volt regulated output.

3-38. -45 VOLT CIRCUIT. Full-wave bridge rectifier A1CR6 through A1CR9 converts ac voltage from one set of secondary windings on transformer T1 to provide an unregulated supply between pins S and U of power supply assembly A1. Current limiting is used to provide overload protection in the circuit. Regulation is provided by utilizing a differential amplifier which compares the -45 volt output

with a regulated -12 volt dc reference voltage from the -12 volt circuit. The voltage developed at the junction of A1R25 and A1R26 is applied to the base of A1Q4 and -12 volts is applied through A1R30 to the base of A1Q5, the other half of the differential amplifier. Resistor A1R30 matches the source impedance of each side of the differential amplifier. The output of the differential amplifier at the collector of A1Q5 is amplified by emitter-followers A1Q7 and Q2. The output current of the -45 volt circuit passes through resistor A1R35, which is used as the sensing device for overload protection. When the voltage across A1R35 becomes excessive, the voltage developed at the base of A1Q6 by voltage divider A1R36 and A1R37 turns on

A1Q6. The collector voltage of A1Q6 then starts to go in the negative direction, causing A1Q7 to reduce the drive on Q2. Emitter-follower Q2 then begins to turn off, cutting off the -45 volt output until the current through A1R35 is restored to normal.

3-39. -5 VOLT CIRCUIT. The -5 volt circuit uses the -12 volt supply as a current source and a zener diode as a shunt voltage regulator. The -5 volt output is applied to pins K and 9 of power supply assembly A1. Load current in the circuit is limited by A1R18 and regulation is provided by zener diode A1CR5.





## SECTION IV MAINTENANCE

### 4-1. INTRODUCTION.

4-2. This section contains information and instructions necessary for maintenance, troubleshooting, and repair of the tape reader-roller.

### 4-3. PREVENTIVE MAINTENANCE.

4-4. The tape reader-roller is designed for a minimum of maintenance. Table 4-1 lists the schedules for periodic inspection, cleaning, and lubrication of the instrument.

Table 4-1. Preventive Maintenance Schedule

ROUTINE	SCHEDULE
Inspection (paragraph 4-5)	Monthly
Cleaning (paragraph 4-7)	Weekly
Lubrication (paragraph 4-10)	Quarterly

### 4-5. INSPECTION.

4-6. The tape reader-roller should be periodically inspected for signs of mechanical and electrical defects. Electronic components that show signs of overheating, leakage, frayed insulation, and other signs of deterioration should be checked and a thorough investigation of the associated circuitry should be made to verify proper operation. Mechanical parts should be inspected for excessive wear, looseness, misalignment, corrosion, and other signs of deterioration.

### 4-7. CLEANING.

4-8. The tape reader-roller should be kept free of dust, moisture, grease, and foreign matter to ensure trouble-free operation. A dry, clean cloth, a soft bristled brush, or a cloth saturated with diluent lacquer or a similar cleaning compound may be used. The rubber roller surfaces on the read capstan and the reroller arm brake should be cleaned with diluent lacquer whenever the surfaces become discolored from an accumulation of dirt and oil.

4-9. It is especially important that the area around the read head be kept clean. Check and clean the glass slide covering the phototransistors, the light holes, the brake surface, the drive capstan, and the plastic-covered wire foot that holds the tape flat against the read head. Accumulated lint around any of these parts can cause errors in readout. A stiff-bristle brush, a cotton swab and filuent lacquer, and compressed air can be used to clean the read head.

### WARNING

This instrument has dangerous line voltage present at various points within the chassis. Use extreme caution when working on the instrument with the cover removed, or serious injury or death to personnel may result.

### 4-10. LUBRICATION.

4-11. The tape drive motor and the reroller motor have oil wicks located on the back end of the motor housings. These should be kept saturated with oil. If wicks appear to be drying, oil with 2 or 3 drops of a light (20 weight) machine oil. Wipe all excess oil from the housings with a soft cloth.

#### Note

If the tape reader-roller is being operated in extreme environmental temperature (hot or cold), the motors may require more frequent oiling than the schedule indicates. When first operating the instrument, check the oil wicks frequency to determine a suitable interval for the particular environment.

4-12. All other mechanical parts on the instrument are either permanently oiled during manufacture or are of a synthetic material that does not require lubrication.

### 4-13. ADJUSTMENT PROCEDURES.

4-14. The following paragraphs contain mechanical and electrical adjustment procedures for the tape reader-roller. These procedures should be performed whenever parts are replaced that may affect adjustment or whenever the instrument is suspected to be out of adjustment for any reason.

### WARNING

This instrument has dangerous line voltage present at various points within the chassis. Use extreme caution when working on the instrument with the cover removed, or serious injury or death to personnel may result.

### 4-15. CLUTCH ADJUSTMENT.

4-16. The clutch should be adjusted any time a new clutch or any part that may affect clutch alignment has

been replaced. Failure to properly align and adjust the clutch will result in early clutch failure. A clutch alignment tool, part no. 02758-2008, is required for proper clutch alignment. The tool is shown in figure 4-1. To adjust the clutch, proceed as follows:

a. Remove retaining rings from reader capstan shaft. Loosen setscrew in clutch plate and remove capstan shaft and clutch plate. (See figure 4-2.)

b. Slide clutch alignment tool into former position of reader capstan shaft. Tool should slide easily into motor-end of clutch assembly without hanging up on clutch hub. If tool does not enter smoothly, loosen the six socket-head cap screws that secure motor plate assembly to bearing carrier and move motor plate as necessary. When motor plate is properly positioned, clutch alignment tool should slip easily into and out of bore in clutch.

c. Tighten socket-head cap screw in middle of motor plate (no washer on this screw) and verify proper alignment. Retighten remaining five screws and again verify proper alignment with clutch alignment tool.

d. Replace capstan shaft and clutch plate. With a feeler gauge, check clutch gap and adjust, if necessary, for a  $0.010 \pm 0.005$ -inch gap. Adjust gap by loosening screw in clutch plate, setting clutch plate on capstan shaft for proper clearance, and tightening screw in clutch plate. Recheck gap after final tightening.

#### 4-17. PINCH ROLLER ADJUSTMENT.

4-18. The first part of the pinch roller adjustment procedure adjusts the force with which the pinch roller bears against the drive capstan. The last part of the procedure aligns the pinch roller with the drive capstan so that the pinch roller makes contact with the drive capstan along the entire length of the pinch roller. This procedure should be performed whenever parts are replaced that may affect the pinch roller spring tension or alignment, or anytime inspection indicates that adjustment is required. A spring scale with a capacity of 1 pound (or more) and a resolution of 1

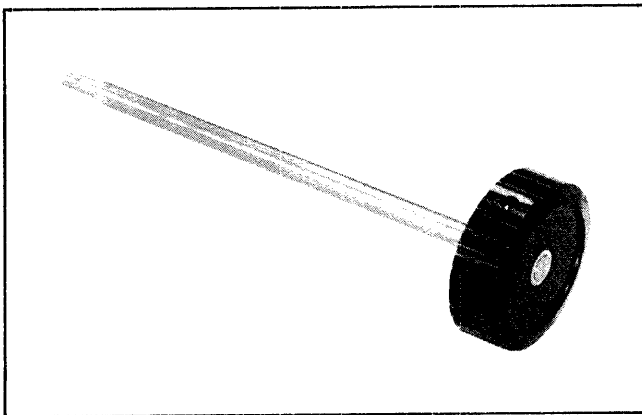


Figure 4-1. Clutch Alignment Tool

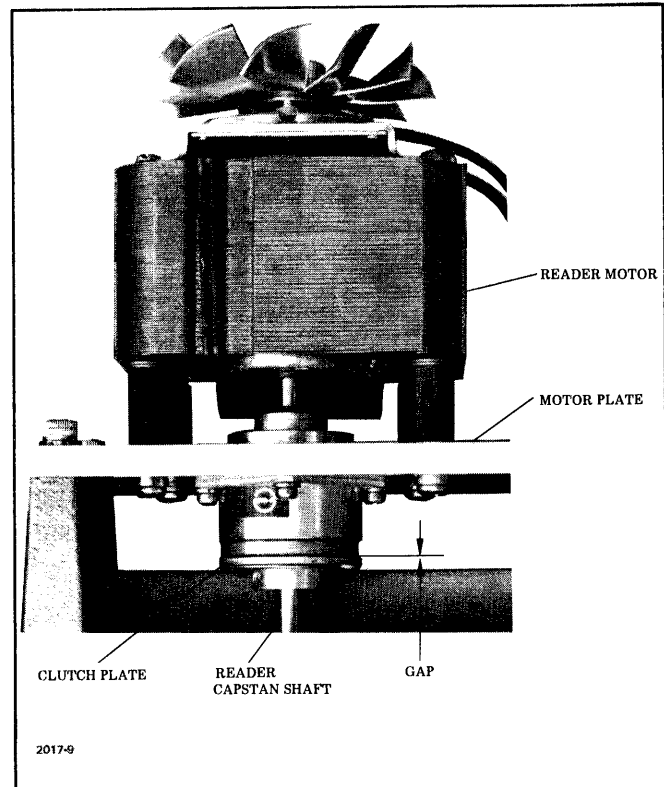


Figure 4-2. Clutch Adjustment

ounce is required to make the adjustment. To adjust the pinch roller, proceed as follows:

a. On tape reader-rewinder, place POWER switch on and press READ switch. The pinch roller should be engaged against the drive capstan.

b. With spring scale, measure force with which the pinch roller bears against the drive capstan. The spring scale should indicate 10 to 14 ounces of force. To adjust pinch roller spring tension, remove top cover from instrument and bend spring bracket up or down with pliers to increase or decrease tension. Alternately check spring tension and bend spring bracket until desired results are obtained.

c. Press READ switch and observe contact surfaces between the pinch roller and the drive capstan. The surfaces must be in contact along the entire length of the pinch roller. If surfaces are mating properly, adjustment is complete; if not, proceed to step "d".

d. Disconnect power from instrument. Remove side covers and top extrusion from instrument. (Refer to parts location information in section V.)

e. Loosen both the top and bottom setscrews in the block at the front panel end of the pinch roller arm mounting shaft.

f. Reconnect power to instrument and press POWER switch on.

g. Press READ switch. If pinch roller makes contact at front end of capstan only, turn bottom setscrew in mounting shaft block in until the two surfaces are making proper contact. If contact is at back of capstan only, turn top setscrew in until contact is made along entire length of pinch roller. After setting pinch roller with one or the other of the two screws, turn the screw not used for the adjustment in until it is tight against the pinch roller mounting shaft and locks the adjustment.

h. Repeat step "g" until pinch roller and drive capstan are in contact along entire length of pinch roller.

#### 4-19. POWER SUPPLY ASSEMBLY A1 ADJUSTMENT.

4-20. The following paragraphs provide a procedure for adjusting the  $\pm 12$  volt adjustment resistors on power supply assembly A1. This procedure should be performed whenever the assembly is replaced or whenever parts are replaced that may affect the  $\pm 12$  volt output levels. The only equipment necessary to perform this adjustment is an HP 427A Voltmeter, or equivalent. To adjust power supply assembly A1, proceed as follows:

#### WARNING

This instrument has dangerous line voltage present at various points within the chassis. Use extreme caution when working on the instrument with the cover removed, or serious injury or death to personnel may result.

- a. Remove top cover from instrument.
- b. Extend power supply assembly A1 with card extender (part no. 02758-6017).
- c. Press POWER switch on instrument on. Press READ switch.
- d. Connect voltmeter between pin B on A1 and ground.
- e. Adjust variable resistor A1R52 until voltmeter indicates  $+12 \pm 0.1$  volts dc.
- f. Connect voltmeter between pin 24 on A1 and ground.
- g. Adjust variable resistor A1R16 until voltmeter indicates  $-12 \pm 0.1$  volts dc.

#### 4-21. READ HEAD ASSEMBLY A5 ADJUSTMENT.

4-22. The following steps provide a procedure for adjusting the reference voltage variable resistor that determines the threshold level for the phototransistor on read head assembly A5. This procedure should be performed whenever read head assembly A5 or parts of the assembly are replaced that may affect the read head reference voltage.

4-23. The only equipment required to perform the adjustment procedure is an HP 427A Voltmeter, or equivalent.

4-24. To adjust the read head reference voltage, proceed as follows:

a. Remove switch cover on front of tape reader-rewinder by pulling cover straight out from instrument front panel and turn variable resistor A5A1R2 (see figure 4-3) to maximum clockwise position.

b. On tape reader-rewinder, press POWER switch on and press READ switch on.

c. Interrupt all phototransistor light paths with a piece of opaque paper.

d. Slowly turn A5A1R2 counterclockwise until voltage at each of pins B,F,L,R,V,Z,d,j, and FF on connector J2 goes to 0 volts.

#### Note

Turn A5A1R2 in small increments at a time, checking the voltages for each increment so that the threshold point where all pins go to 0 volts is reached, but not exceeded.

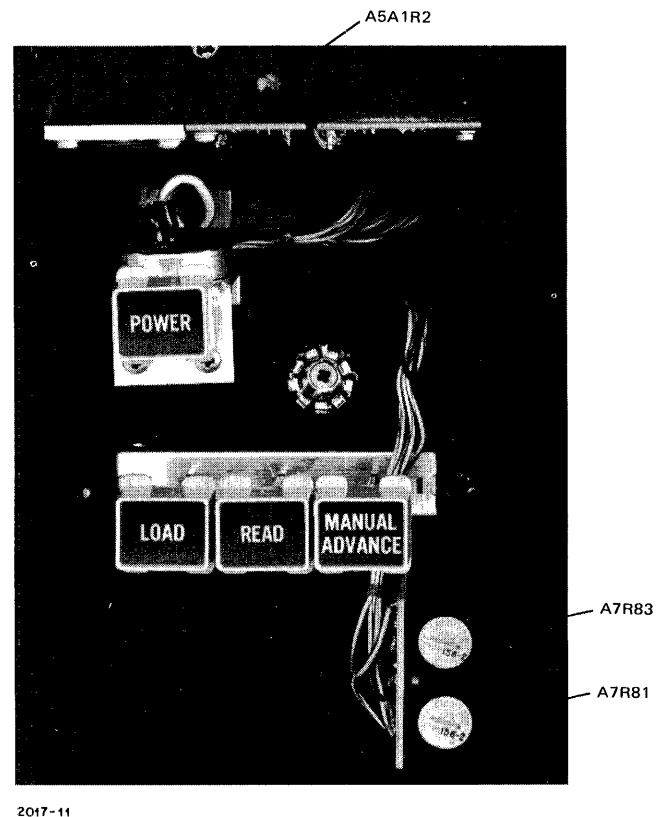


Figure 4-3. Phototransistor Reference Voltage Variable Resistors

e. Measure reference voltage at A5, pin F with voltmeter.

f. Turn A5A1R2 counterclockwise until reference voltage at A5, pin F is one-half of the value measured in step "e".

#### 4-25. LOOP SENSOR ASSEMBLY A7 AND MALFUNCTION DETECTOR ASSEMBLY A8 ADJUSTMENTS.

4-26. The following steps provide a procedure for adjusting the reference voltage variable resistors that determine the threshold level for the phototransistors in loop sensor assembly A7 and malfunction detector assembly A8. This procedure should be performed whenever read head assembly A5 or other parts are replaced or adjustments are made that may affect the read head reference voltage.

4-27. Equipment required to perform the adjustment procedure is as follows (or equivalent):

- a. HP 427A Voltmeter.
- b. Piece of matte surface Mylar drafting film, approximately 4 inches long by 1 inch wide.

4-28. To adjust A7 and A8 proceed as follows:

- a. Remove top cover from instrument.
- b. Extend control assembly A2 with card extender (part no. 02758-6017).
- c. Remove switch cover panel from front of instrument by pulling cover straight out from front panel of instrument. Press POWER switch on.
- d. Connect voltmeter between pin S on A2 and chassis ground. Place Mylar drafting film in loop sensor bin with glossy side against loop sensor light hole.
- e. Adjust A7R81 (see figure 4-3) to threshold point where voltmeter indication swings from about +0.5 to +4.5 volts dc. Remove drafting film.
- f. Place reroller arm in up position. Connect voltmeter between pin W and A2 and ground. Place glossy side of Mylar drafting film against malfunction detector light source hole.
- g. Adjust A7R83 (see figure 4-3) to threshold point where voltmeter indication swings from about +0.5 to +4.5 volts dc. Remove drafting film.

h. Adjustment is complete. Remove power cord and disconnect test equipment. Replace top cover and switch cover on instrument.

#### 4-29. EDDY-CURRENT BRAKE AND CANISTER BRAKE ADJUSTMENTS.

4-30. The following steps provide a procedure for adjusting the eddy-current brake on the reroller motor and the canister brake on the reroller arm. This adjustment should be performed whenever the reroller mechanism is coasting too far after the read command is removed, causing the tape to be drawn tight across the loop sensor bin. No test equipment is required to perform this adjustment.

4-31. To adjust the eddy-current and canister brakes, proceed as follows:

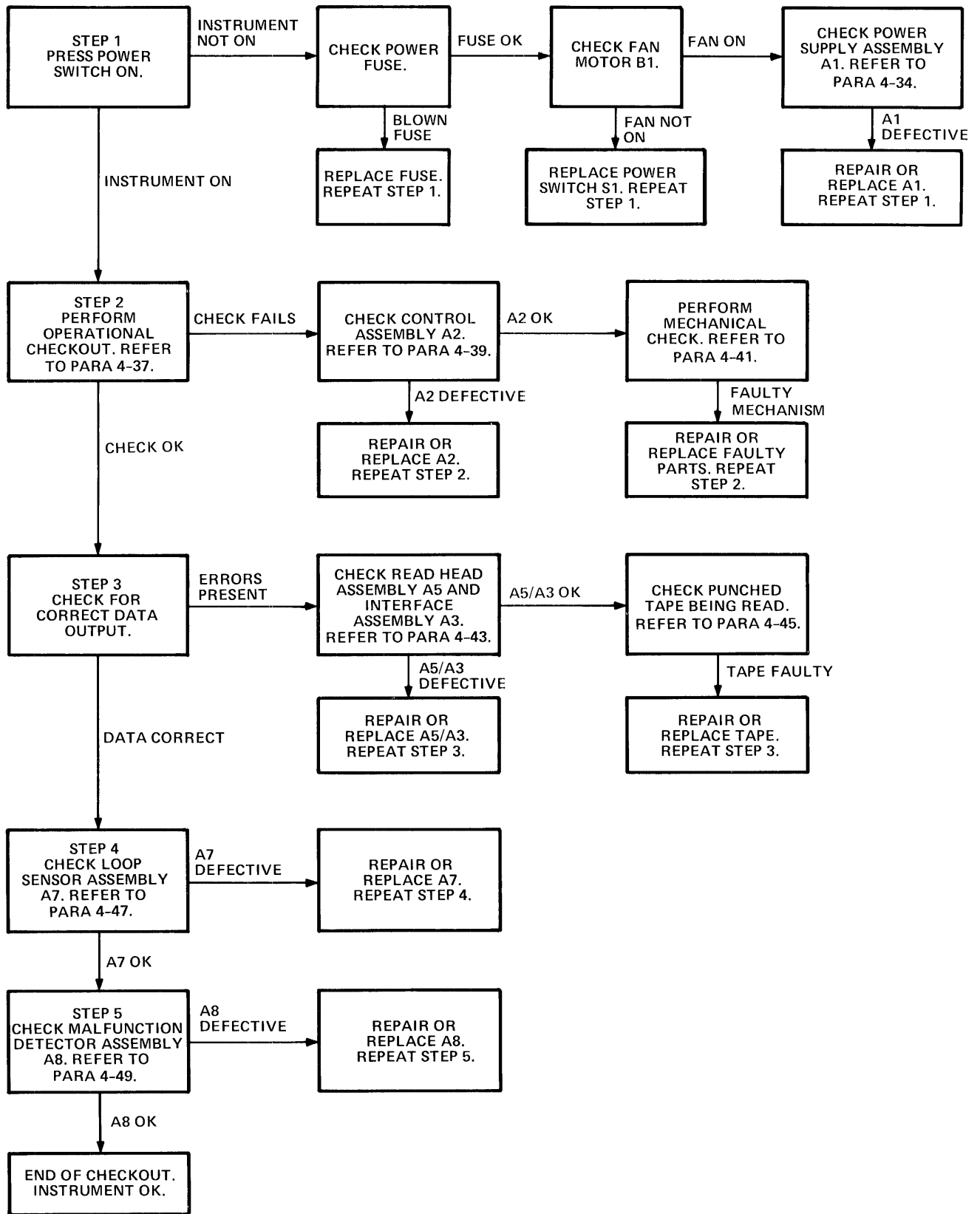
- a. Remove top cover from instrument. Set POWER switch on. Turn R75 on main deck fully counterclockwise.
- b. Place a roll of 200 to 250 feet of tape in tape reader-reroller input bin and advance most of tape into takeup canister.
- c. Remove any cables from connector J2 on rear of instrument. Press READ switch to on.
- d. Momentarily ground pin J2-AA, causing instrument to run. When tape loop in loop sensor bin reaches a maximum downward excursion, remove ground from J2-AA. Eddy-current brake should stop reroller mechanism before tape is drawn tight across top of loop sensor bin. If brake fails to do this, increase braking force by turning variable resistor R74 located on bracket behind reroller motor clockwise (as viewed from rear of instrument).
- e. Repeat step "d" several times until desired results are obtained or until R74 is set to a full clockwise position.

f. Run and stop instrument by momentarily grounding pin J2-AA several times. Turn R75 on main deck clockwise until tape is being rerolled tightly in canister. The first inside layer of tape in canister should not pull loose (forming a smaller loop) when ground is removed from J2-AA and canister comes to a stop.

g. Ground J2-AA and allow tape reader-reroller to run. If canister brake is adjusted to give too much braking, canister will strike against lower roller on reroller arm as reroller motor goes off and on. If this is the case, turn R75 counterclockwise very slowly while tape is being rerolled into canister until this condition is corrected.

#### 4-32. TROUBLESHOOTING.

4-33. Troubleshooting information for the tape reader-reroller consists of a troubleshooting flow chart, checkout procedures for the instrument, and a logic diagram. When troubleshooting the instrument, perform steps "1" through "5" on the flow chart (figure 4-4) to isolate the problem to a particular assembly. Then, check the assembly by referring to the appropriate checkout procedure referenced on the flow chart. Checkout procedures in the following



2017-3

Figure 4-4. Troubleshooting Flow Chart

paragraphs need only be performed when directly referenced by a step on the flow chart.

### WARNING

This instrument has dangerous line voltage present at various points within the chassis. Use extreme caution when working on the instrument with the cover removed, or serious injury or death to personnel may result.

#### 4-34. POWER SUPPLY ASSEMBLY A1 CHECKOUT.

4-35. Power supply assembly A1 can be checked by monitoring the +12 volt dc, -12 volt dc, -45 volt dc, and -5 volt dc outputs while varying the ac line voltage to ensure that the outputs remain within tolerance. Test equipment required is as follows (or equivalent):

- a. Variable AC Transformer (102 to 128 volts ac output).
- b. HP 427A Voltmeter.
- c. HP 175A Oscilloscope.
- d. HP 1750B Dual Trace Vertical Amplifier.

4-36. To check power supply assembly A1, proceed as follows:

a. Remove top cover from instrument. Extend power supply assembly A1 with card extender (part no. 02758-6017).

b. Connect ac input of instrument to variable transformer and adjust variable transformer for 115 volts ac output.

c. Press LOAD switch. Place reroller arm in up position and set POWER switch on.

d. Press READ switch. Use voltmeter to measure output voltage and oscilloscope to measure ripple of +12 volt circuit as shown in step "1" of table 4-2 while varying line voltage from 102 to 128 volts ac.

e. Use voltmeter to measure output voltage and oscilloscope to measure ripple of -12 volt circuit as shown in step "2" of table 4-2 while varying line voltage from 102 to 128 volts ac.

f. Use voltmeter to measure output voltage and oscilloscope to measure ripple of -45 volt circuit as shown in step "3" of table 4-2 while varying line voltage from 102 to 128 volts ac.

g. Use voltmeter to measure output voltage of -5 volt circuit as shown in step "4" of table 4-2 while varying line voltage from 102 to 128 volts ac.

h. If power supply assembly A1 or parts on A1 are replaced, perform adjustment procedure described in paragraph 4-19.

Table 4-2. Power Supply Assembly A1 Checkout

STEP	MEASURE AT A1, PIN	OUTPUT VOLTAGE (DC)	MAXIMUM RIPPLE (MV P-P)	IF INDICATION IS ABNORMAL
1	B	+12 ± 0.1	71	Check A1CR11, A1CR12, A1Q8, Q9, Q10, A1U2, and A1R52 if voltage is not within tolerance. Check C23 if maximum allowable ripple is being exceeded. If voltage oscillates, check C22. Refer to voltage readings on schematic diagram, figure 4-10.
2	24	-12 ± 0.1	71	Check A1CR1 thru A1CR4, A1Q3, Q1, A1U1, and A1R16 if voltage is not within tolerance. Check C5 if maximum allowable ripple is being exceeded. If voltage oscillates, check C6. Refer to voltage readings on schematic diagram, figure 4-10.
3	12	-45 ± 2	71	Check A1CR6 thru A1CR9, A1Q4 thru A1Q7, and Q2 if voltage is not within tolerance. Check C3 if maximum allowable ripple is being exceeded. If voltage oscillates, check C4. Refer to voltage readings on schematic diagram, figure 4-10.
4	K	-5 ± 0.5	---	Check A1CR5 and A1R18 if voltage is not within tolerance. Refer to voltage readings on schematic diagram, figure 4-10.

## 4-37. OPERATIONAL CHECKOUT.

4-38. The operational checkout is performed by applying power to the instrument, setting switches and input commands for the desired mode of operation as shown in table 4-3, and verifying that the operating conditions of the instrument agree with the conditions listed in the second half of table 4-3 for each respective operating mode.

## 4-39. CONTROL ASSEMBLY A2 CHECKOUT.

4-40. If control assembly A2 is defective, a malfunction will generally be obvious during the operational check in paragraph 4-37. Malfunctions associated with control assembly A2 can be traced to defective components by referring to the logic diagram (figure 4-6). Trace signal flow through the logic diagram, checking for signals that should be present for a given mode of operation and isolating improper signal interruption to faulty components.

## 4-41. MECHANICAL CHECKOUT.

4-42. The steps below check several possible sources of mechanical trouble in the tape reader-roller. If the instrument is not operating properly and the control circuitry (control assembly A2) has been checked and found to be functioning properly, the trouble may be traced to one or more of the following mechanical troubles. Replace any parts that are found to be defective. (Refer to removal and replacement procedures, paragraph 4-51.) Perform the mechanical checkout as follows:

- a. Remove top cover from instrument.
- b. Operate instrument and listen for excessive bearing or clutch noise. (Refer to paragraph 4-15 for clutch adjustment.)
- c. Check roller surfaces for excessive wear and contamination.
- d. Check mating roller surfaces during operation to ensure that there are no gaps in contact area between the two roller surfaces. (Refer to paragraph 4-17 for pinch roller adjustment.)
- e. Turn rotating parts by hand, with no power applied, to ensure that parts turn freely (no binding).
- f. Check for cracked, broken, or loose parts and any signs of unusual wear or corrosion.
- g. Check tape guide wire on read head assembly A5 for proper adjustment (0.008 to 0.020 inch gap between tape guide wire and glass cover).

## 4-43. READ HEAD ASSEMBLY A5 AND INTERFACE ASSEMBLY A3 CHECKOUT.

## Note

If read head assembly A5 is found to be defective during troubleshooting, the complete assembly may be replaced by a rebuilt assembly on an exchange basis by contacting a Hewlett-Packard Sales and Service Office.

4-44. Read head assembly A5 and interface assembly A3 may be checked by energizing the instrument and interrupting the light path to the phototransistors on A5 while monitoring the output for each data channel at connector J2. In this manner, a malfunction may be isolated to a specific channel and components for the respective channel can then be checked. While performing this checkout procedure, refer to the logic diagram for the instrument, figure 4-6. The only test equipment required is an HP 427A Voltmeter, or equivalent. To check A5 and A3, proceed as follows:

- a. Press LOAD switch. Press POWER switch on. All lamps on read head assembly A5 should light with approximately equal intensity.
- b. With voltmeter, measure voltage levels at pins of rear connector J2 with light path to phototransistors obstructed and then unobstructed as indicated in table 4-4.

## Note

If a single phototransistor on A5A2 is defective, the complete phototransistor subassembly (A5A2) must be replaced.

- c. Remove switch cover from front of instrument and connect voltmeter to loop sensor assembly A7, pin 4. Voltmeter should indicate between 2.0 and 11.5 volts dc and should be variable with variable resistor A5A1R2. If indication is abnormal, check A5A1Q9, A5A1Q10, A5A1R2, and A5A2V1.
- d. Remove top cover from read head assembly A5 and carefully lift lamp subassembly out of position so that light no longer reaches phototransistors on A5A2. Voltmeter should now indicate between 0.6 and 0.8 volts dc and should vary with variable resistor A5A1R2. If indication is abnormal, check A5A1Q9, A5A1Q10, A5A1R2, and A5A2V1.
- e. Replace lamp subassembly and cover on read head assembly A5.
- f. Press READ switch.
- g. With voltmeter, measure voltage at pin J2-FF. With light path to phototransistors open, voltage should be 0, +0.5, -0, volts dc. With light path obstructed, voltage should be  $+12 \pm 0.5$  volts. dc. If indication is abnormal, check A3Q10 through A3Q13, A3CR91, A5Q11, and A5V5.

- h. With a jumper wire, apply chassis ground to pin J2-AA. Use voltmeter to measure voltage at pin Z of inter-

Table 4-3. Operational Chart

MODE OF OPERATION					OPERATING CONDITIONS					
REROLLER ARM POSITION	SWITCH SELECTED	INPUT COMMAND (J2-AA)	LENGTH OF TAPE LOOP IN LOOP SENSOR	FIRST APPEARANCE OF DATA HOLES OF TAPE	PAPER BRAKE	READER CAPSTAN DRIVEN	READER PINCH ROLLER	FEEDHOLE OUTPUT (J2-FF)	LOAD CAPSTAN	REROLLER CAPSTAN DRIVEN
Down	None	—	—	—	Off	No	Engaged	Inhibited	Released	No
	LOAD	—	—	—	Off	No	Released	Inhibited	Released	No
	READ	READ	Long	Before	Off	Yes	Engaged	Inhibited	Engaged	Yes
		READ	Short	Before	Off	Yes	Engaged	Inhibited	Released	No
		$\overline{\text{READ}}$	Long	Before	On	No	Engaged	Inhibited	Engaged	Yes
		$\overline{\text{READ}}$	Short	Before	On	No	Engaged	Inhibited	Released	No
		READ	Short	After	Off	Yes	Engaged	Enabled	Released	No
		$\overline{\text{READ}}$	Short	After	On	No	Engaged	Enabled	Released	No
		READ	Long	After	Off	Yes	Engaged	Enabled	Released	Yes
		$\overline{\text{READ}}$	Long	After	On	No	Engaged	Enabled	Released	Yes
	MANUAL ADVANCE	—	—	Before	Off	Yes	Engaged	Inhibited	Engaged	Yes
		—	—	After	Off	Yes	Engaged	Inhibited	Released	Yes
Up	None	—	—	—	Off	No	Engaged	Inhibited	—	—
	LOAD	—	—	—	Off	No	Released	Inhibited	—	—
	READ	READ	—	Before	Off	Yes	Engaged	Inhibited	—	—
		$\overline{\text{READ}}$	—	Before	On	No	Engaged	Inhibited	—	—
		READ	—	After	Off	Yes	Engaged	Enabled	—	—
		$\overline{\text{READ}}$	—	After	On	No	Engaged	Enabled	—	—
	MANUAL ADVANCE	—	—	—	Off	Yes	Engaged	Inhibited	—	—

NOTES

1. READ indicates that a read command is present (J2-AA is grounded).  $\overline{\text{READ}}$  indicates absence of a read command.
2. A reroller malfunction will inhibit either the reroller capstan or both the reader capstan and the reroller capstan, depending on the position of malfunction stop/read switch A2S4.
3. A malfunction may be reset by lifting the reroller arm or by pressing the LOAD switch.
4. The reroller arm brake is on whenever the reroller capstan is not driven and is off whenever the reroller capstan is driven.
5. When the feedhole output is inhibited, the voltage at J2-FF will be  $+12 \pm 0.5$  volts dc.



Table 4-4. Read Head Assembly A5 and Interface Assembly A3 Checkout

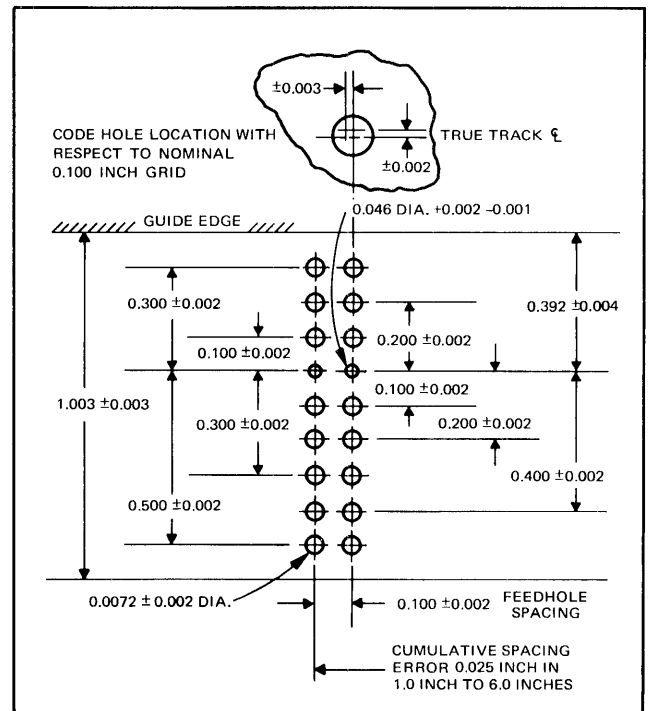
MEASURE AT CONNECTOR J2 PIN	LIGHT PATH TO PHOTOTRANSISTORS	NORMAL INDICATION (VDC)	IF INDICATION IS ABNORMAL
B	Open	0, +0.5 -0	Check A3Q1, A5A1Q1, and A5A2V2.
	Closed	+12 ± 0.5	
F	Open	0, +0.5 -0	Check A3Q2, A5A1Q2, and A5A2V3.
	Closed	+12 ± 0.5	
L	Open	0, +0.5 -0	Check A3Q3, A5A1Q3, and A5A2V4.
	Closed	+12 ± 0.5	
R	Open	0, +0.5 -0	Check A3Q4, A5A1Q4, and A5A2V6.
	Closed	+12 ± 0.5	
V	Open	0, +0.5 -0	Check A3Q5, A5A1Q5, and A5A2V7.
	Closed	+12 ± 0.5	
Z	Open	0, +0.5 -0	Check A3Q6, A5A1Q6, and A5A2V8.
	Closed	+12 ± 0.5	
d	Open	0, +0.5 -0	Check A3Q7, A5A1Q7, and A5A2V9.
	Closed	+12 ± 0.5	
j	Open	0, +0.5 -0	Check A3Q8, A5A1Q8, and A5A2V10.
	Closed	+12 ± 0.5	

face assembly A3. Voltmeter should indicate +12 ± 0.5 volts dc. Remove ground connection at pin J2-AA. Voltmeter should now indicate 0, +0.5, -0, volts dc. If indication is abnormal, check A3Q9.

4-45. PUNCHED TAPE CHECKOUT.

4-46. The tape reader-roller will perform satisfactorily with a wide variety of punched tapes, as long as the tape transmissivity is less than 60 percent and the tape has been punched within the tolerances shown in figure 4-5. However, the condition of the tape can cause serious difficulty in the operation of the instrument. Some of the more common tape reader-roller malfunctions can often be traced to the condition of the punched tape being read, especially if errors in readout are being obtained. Faulty conditions to look for when checking tape as follows:

a. Pulled Sprocket Holes: Some tapes have an occasional elongated sprocket hole. This is usually caused by a misadjusted tape punch or a misloaded supply reel on the punch. If the sprocket holes arrive too soon because of this, the data holes may be completely ignored by the tape reader-roller.



2017-18

Figure 4-5. Punched Tape Specifications

b. **Chad in Tape:** Chad fits tightly in tape holes and may cause misreading of the tape. Tape should never be fed from a chad box.

c. **Lint on Tape:** Lint on a tape can accumulate under the tape reader-reroller lamp and block off the light. Tapes and their containers should be kept clean.

d. **Ragged Edges:** A code hole that has been torn, leaving ragged edges, will normally be read correctly. But the bit of paper that folds back and covers the next hole may cause the following character to be misread.

e. **Oil Spots:** Normal oil-impregnated tapes should not affect instrument operation, but oil from other sources can. Lubricating oil may even bleach the color from the tape. Oil contamination is usually the result of allowing tape to stand for long periods in the head or tape holder of a tape punch.

#### 4-47. LOOP SENSOR ASSEMBLY A7 CHECKOUT.

4-48. Loop sensor assembly A7 may be checked by energizing the instrument and interrupting the light path to the phototransistor on A7 while monitoring the output of the assembly. While performing this checkout procedure, refer to the logic diagram for the instrument, figure 4-6. The only test equipment required is an HP 427A Voltmeter, or equivalent. To check A7, proceed as follows:

a. Remove top cover from instrument and use card extender to extend control assembly A2.

b. Press POWER switch.

c. Connect voltmeter common lead to chassis ground and measure voltage at A2, pin S. Voltage should be  $+4.5 \pm 0.5$  volts dc.

d. With voltmeter still connected to A2 pin S, interrupt light path to phototransistor on loop sensor assembly A7. Voltage should be 0,  $+0.5 -0$ , volts dc.

e. If indication is abnormal in either step "c" or "d", check A7Q30 and A7V11. Also, check adjustment of A7R81. (Refer to paragraph 4-25.)

f. If loop sensor assembly A7 or parts on A7 are replaced, perform adjustment procedure described in paragraph 4-25.

#### 4-49. MALFUNCTION DETECTOR ASSEMBLY A8 CHECKOUT.

4-50. Malfunction detector assembly A8 may be checked by energizing the instrument and interrupting the light path to the phototransistor on A8 while monitoring the output of the assembly. While performing this checkout procedure, refer to the logic diagram for the instrument, figure 4-6. The only test equipment required is an HP 427A Voltmeter, or equivalent. To check A8, proceed as follows:

a. Remove top cover from instrument and use card extender to extend control assembly A2.

b. Press POWER switch. Press LOAD switch.

c. Connect voltmeter common lead to chassis ground and measure voltage at A2, pin W. Voltage should be  $+4.5 \pm 0.5$  volts dc.

d. With voltmeter still connected to A2, pin W, interrupt light path to phototransistor on malfunction detector assembly A8 and simultaneously measure voltage. Voltage should be 0,  $+0.5 -0$ , volts dc.

e. If indication is abnormal in either step "c" or "d", check A8Q31 and A8V12. Also, check adjustment of A7R83. (Refer to paragraph 4-25.)

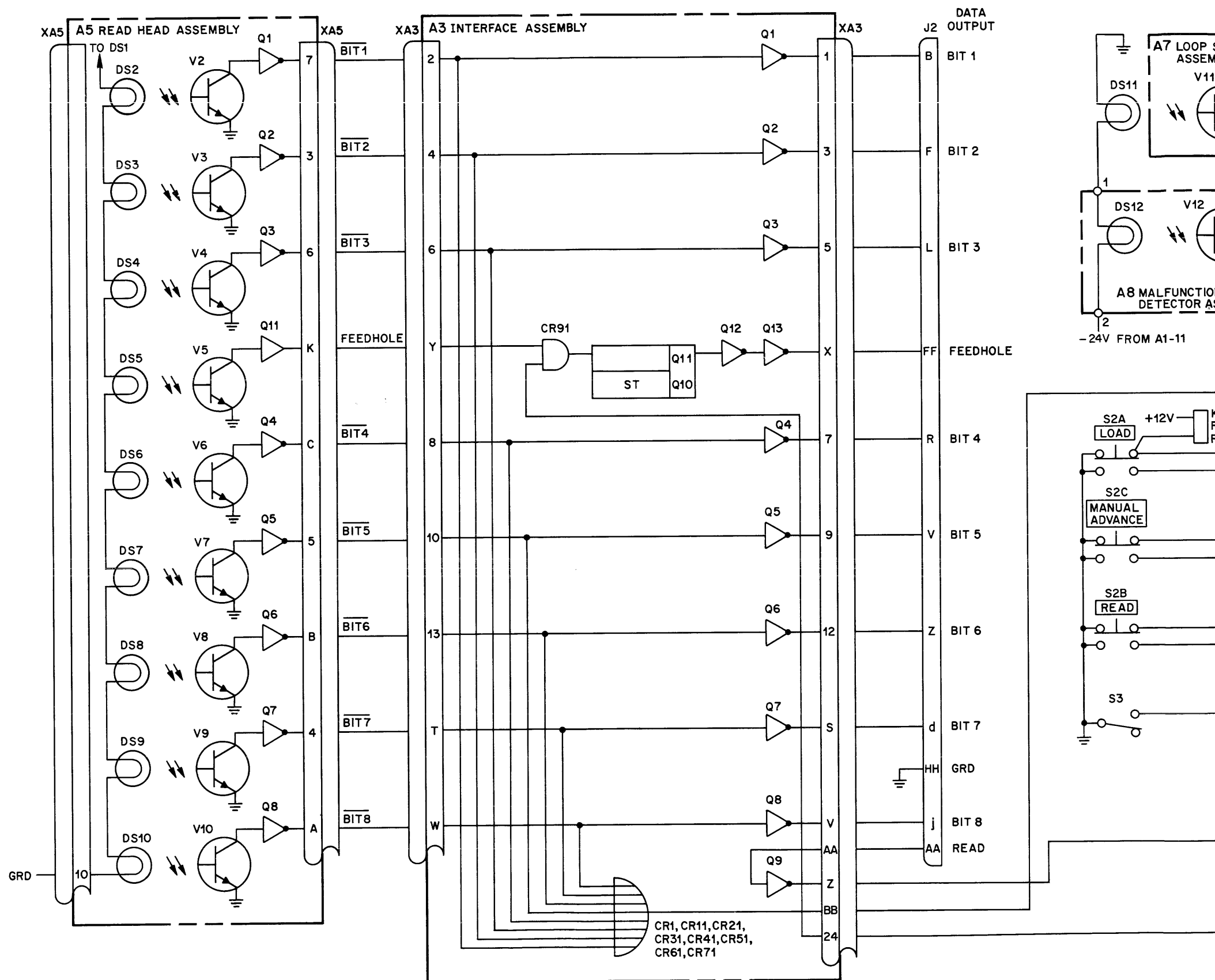
f. If malfunction detector A8 or parts on A8 are replaced, perform adjustment procedure described in paragraph 4-25.

#### 4-51. REMOVAL AND REPLACEMENT.

4-52. When disassembling the tape reader-reroller to replace parts, refer to the parts location diagrams in section V of this manual. Remove parts in accordance with the appropriate portion of the exploded view and replace in the reverse order of disassembly. Refer to the index numbers for order of disassembly.

#### 4-53. ILLUSTRATIONS.

4-54. The following illustrations include a logic diagram, schematic diagrams, and printed-circuit card parts location drawings for the tape reader-reroller. Also included on the schematic diagrams are parts lists for each assembly.



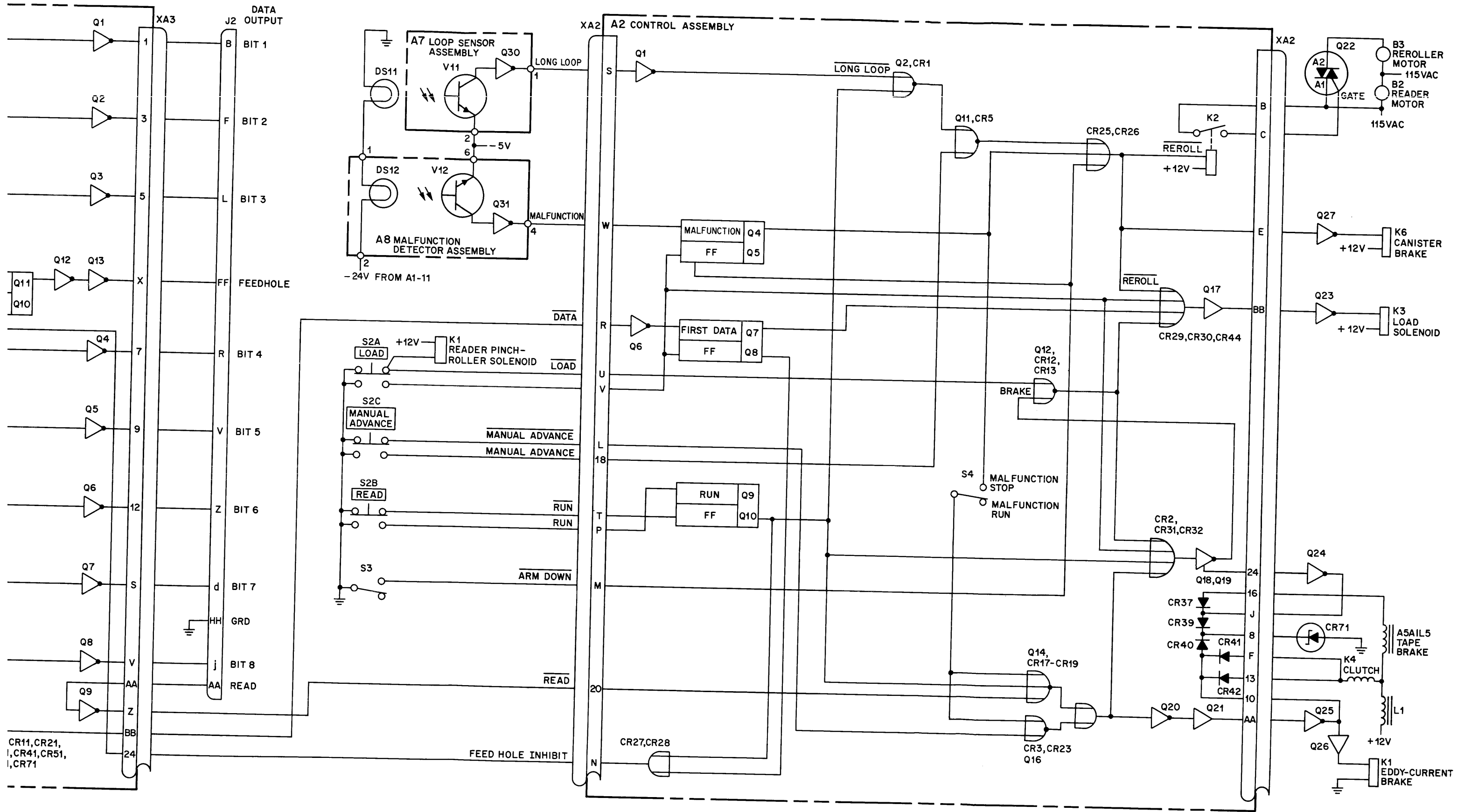
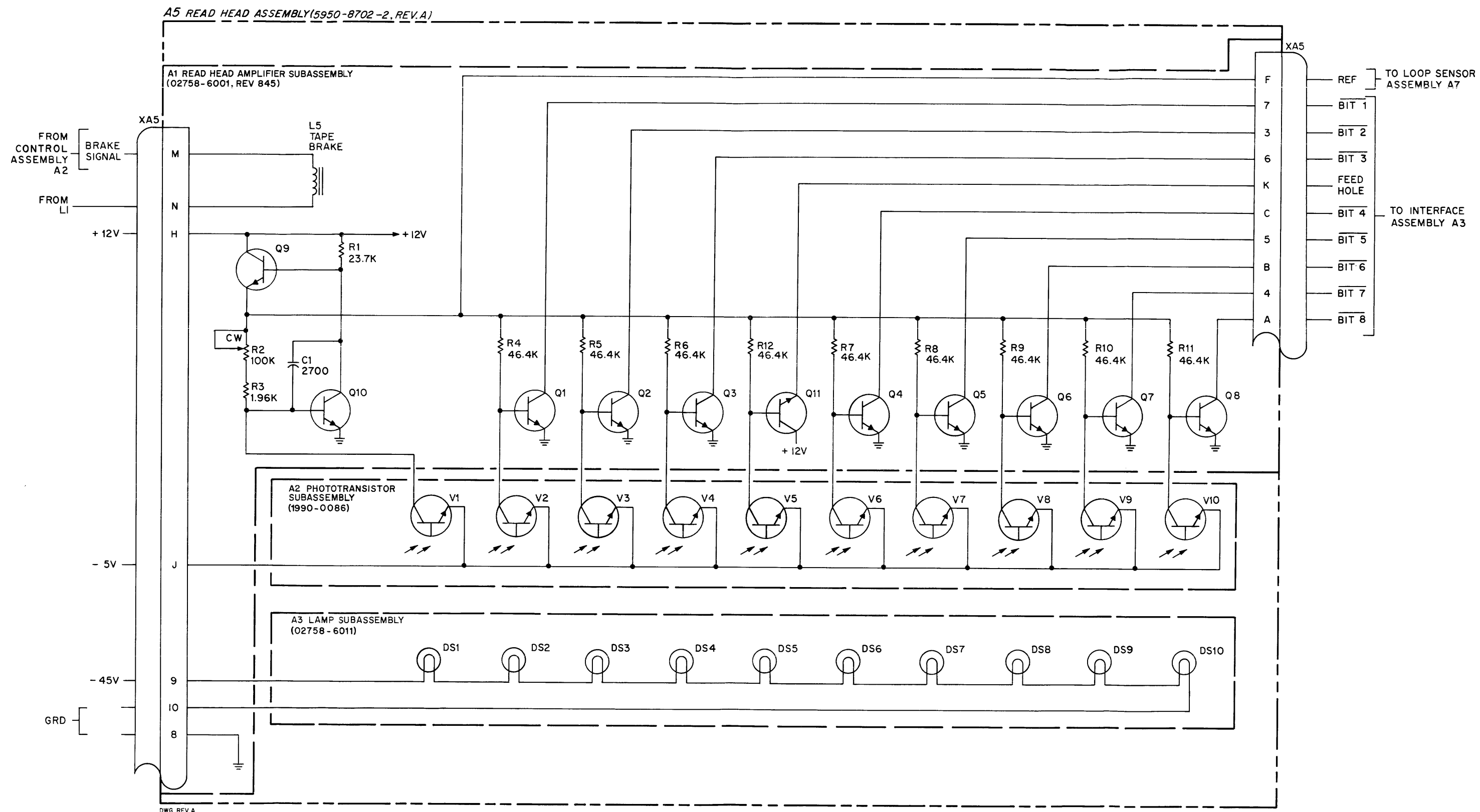


Figure 4-6. Tape Reader-Reroller Logic Diagram



DWG REV A

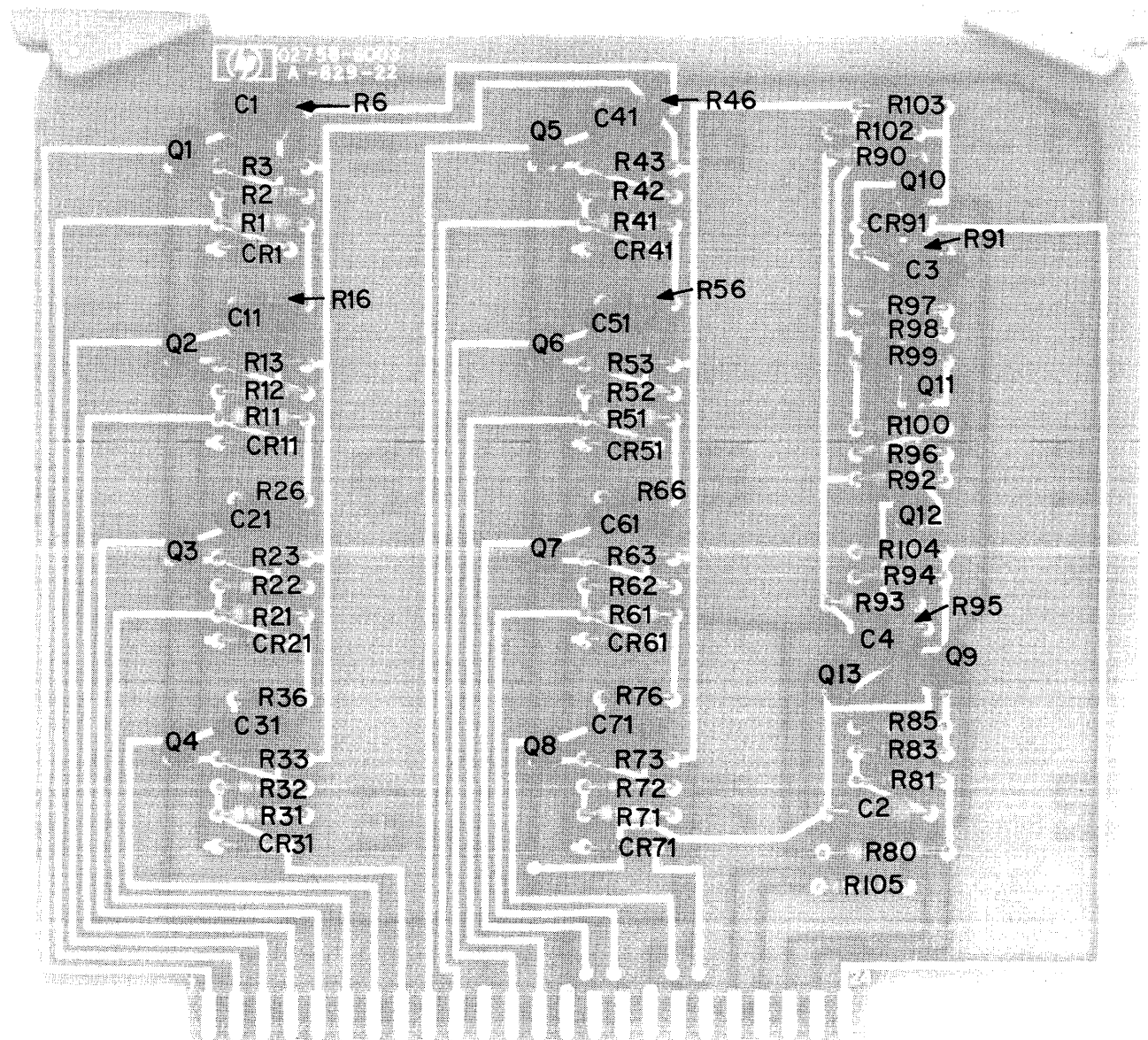
NOTES:

1. CAPACITANCE VALUES ARE IN PICOFARADS.

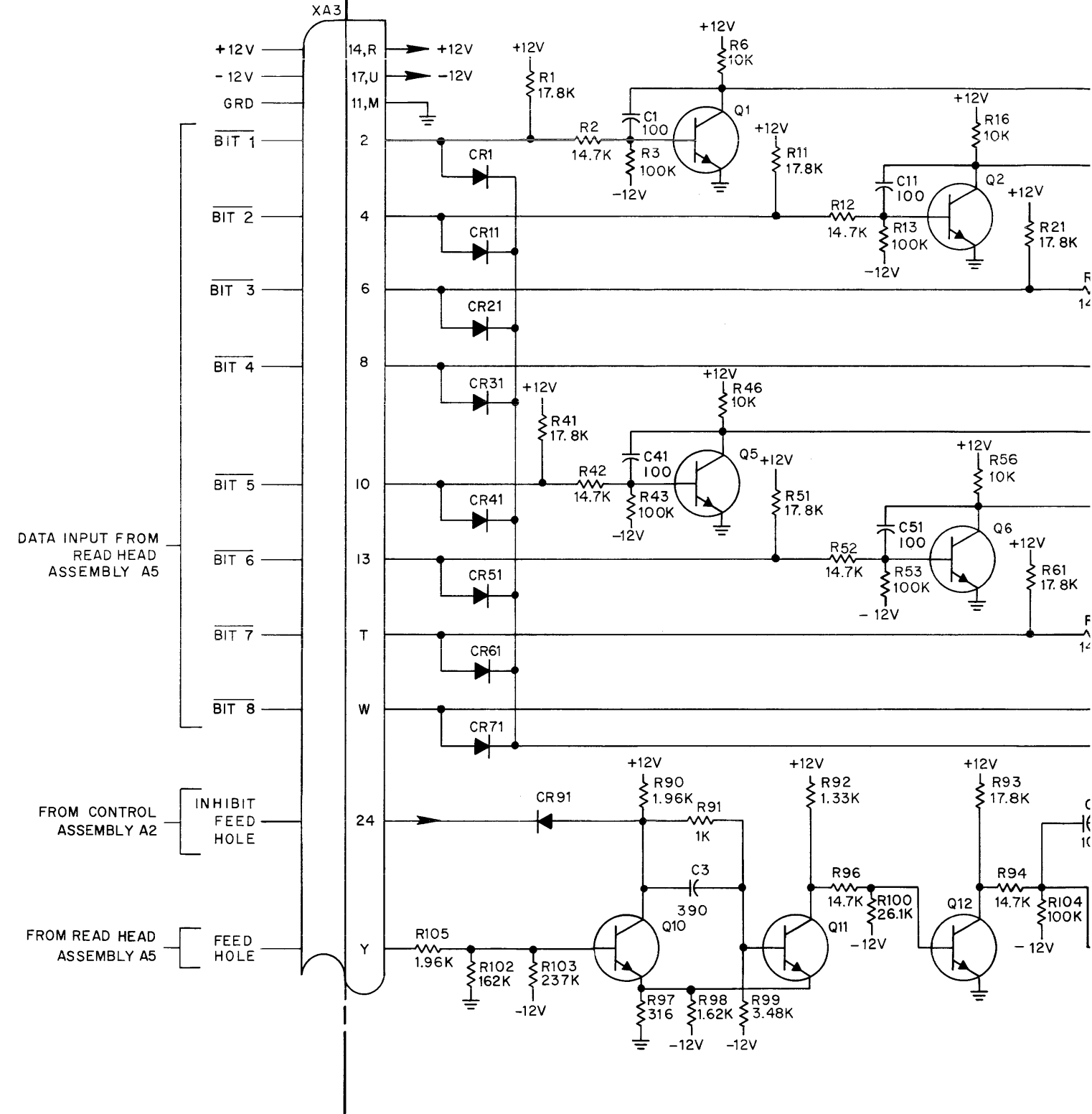
Figure 4-7. Read Head Assembly A5 Schematic Diagram

Table 4-5. Interface Assembly A3 Replaceable Parts

REFERENCE DESIGNATION	HP PART NO.	DESCRIPTION	MFR CODE	MFR PART NO.
A3	02758-6003	Interface Assembly	28480	02758-6003
C1,4,11,21,31,41,51,61,71	0160-2204	Capacitor, Fxd, Mica, 100 pf, 5%	28480	0160-2204
C2	0140-0300	Capacitor, Fxd, My, 0.0027 uf, 10%, 200 VDCW	28480	0160-0300
C3	0160-0200	Capacitor, Fxd, Mica, 390 pf, 5%	28480	0140-0200
CR1,11,21,31,41,51,61,71,91	1901-0081	Diode, Si, 50 VDCW	07263	FD1415
Q1 thru Q13	1854-0071	Transistor, Si, NPN	28480	1854-0071
R1,11,21,31,41,51,61,71,93	0698-3136	Resistor, Fxd, Met Flm, 17.8K, 1%, 1/8W	28480	0698-3136
R2,12,22,32,42,52,62,72,94,96	0698-3156	Resistor, Fxd, Met Flm, 14.7K, 1%, 1/8W	28480	0698-3156
R3,13,23,33,43,53,63,73,104	0757-0465	Resistor, Fxd, Met Flm, 100K, 1%, 1/8W	14674	C4 OBD
R6,16,26,36,46,56,66,76,95	0686-1035	Resistor, Comp, 10K, 5%, 1/2W	01121	EB1035
R80	0757-0338	Resistor, Fxd, Met Flm, 1.00K, 1%, 1/8W	28480	0757-0338
R81,83	0757-0438	Resistor, Fxd, Met Flm, 5.11K, 1%, 1/8W	14674	C4 OBD
R85	0698-3157	Resistor, Fxd, Met Flm, 19.6K, 1/, 1/8W	14674	C4 OBD
R90,105	0698-0083	Resistor, Fxd, Met Flm, 1.96K, 1%, 1/8W	28480	0698-0083
R91	0757-0280	Resistor, Fxd, Met Flm, 1K, 1%, 1/8W	28480	0757-0280
R92	0757-0317	Resistor, Fxd, Met Flm, 1.33K, 1%, 1/8W	28480	0757-0317
R97	0698-3444	Resistor, Fxd, Met Flm, 316 ohms, 1%, 1/8W	28480	0698-3444
R98	0757-0428	Resistor, Fxd, Met Flm, 1.62K, 1%, 1/8W	14674	C4 OBD
R99	0698-3125	Resistor, Fxd, Met Flm, 1.50 megohms, 1%, 1/8W	28480	0698-3125
R100	0698-3159	Resistor, Fxd, Met Flm, 26.1K, 1%, 1/8W	28480	0698-3159
R102	0757-0470	Resistor, Fxd, Met Flm, 162K, 1%, 1/8W	28480	0757-0470
R103	0698-3266	Resistor, Fxd, Met Flm, 237K, 1%, 1/8W	28480	0698-3266



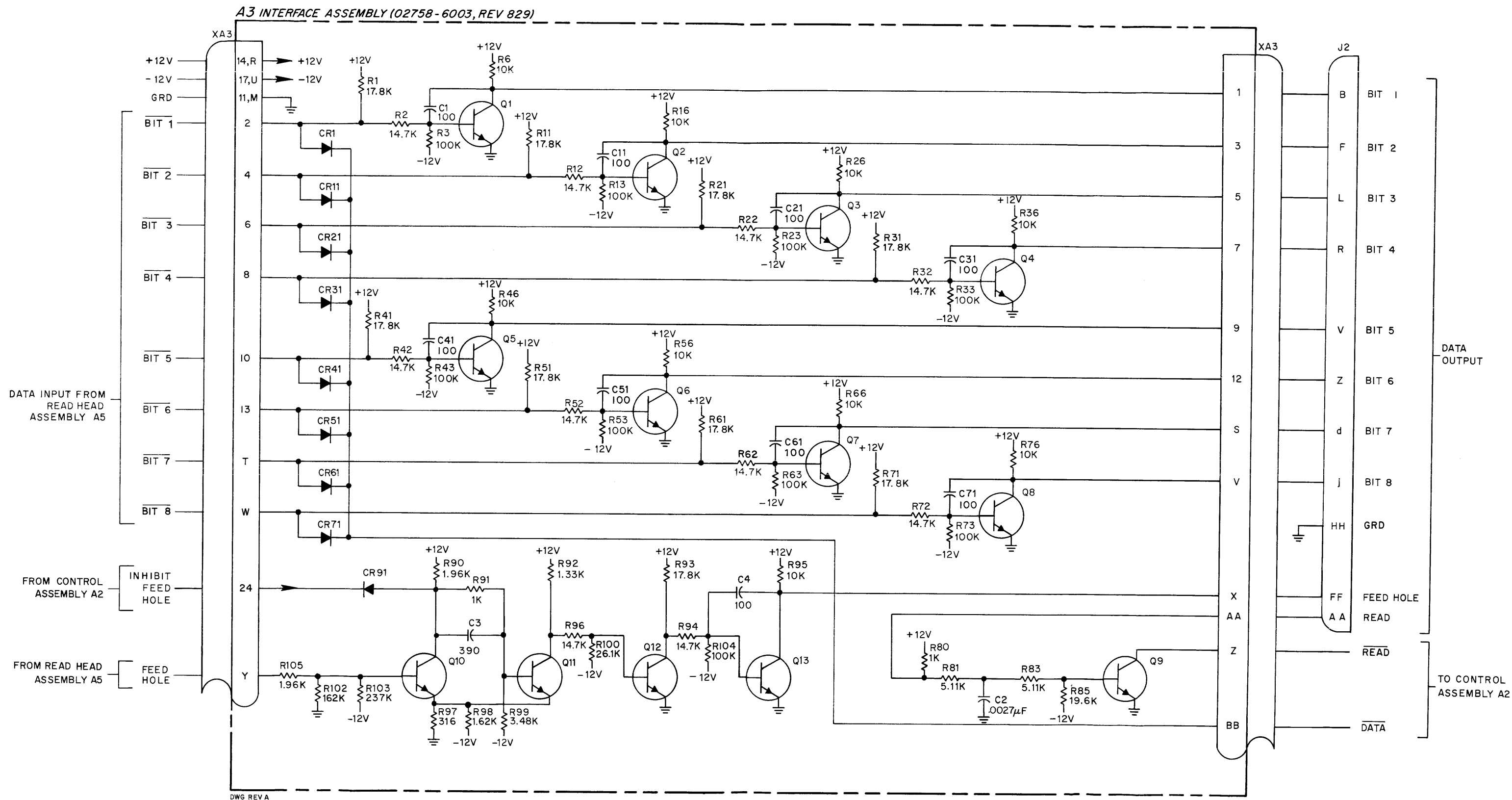
A3 INTERFACE ASSEMBLY (02758-6003, REV 829)



DWG REV A

NOTES:

- UNLESS OTHERWISE SPECIFIED:  
ALL RESISTANCE VALUES ARE IN OHMS.  
ALL CAPACITANCE VALUES ARE IN PICOFARADS.



DWG REV A

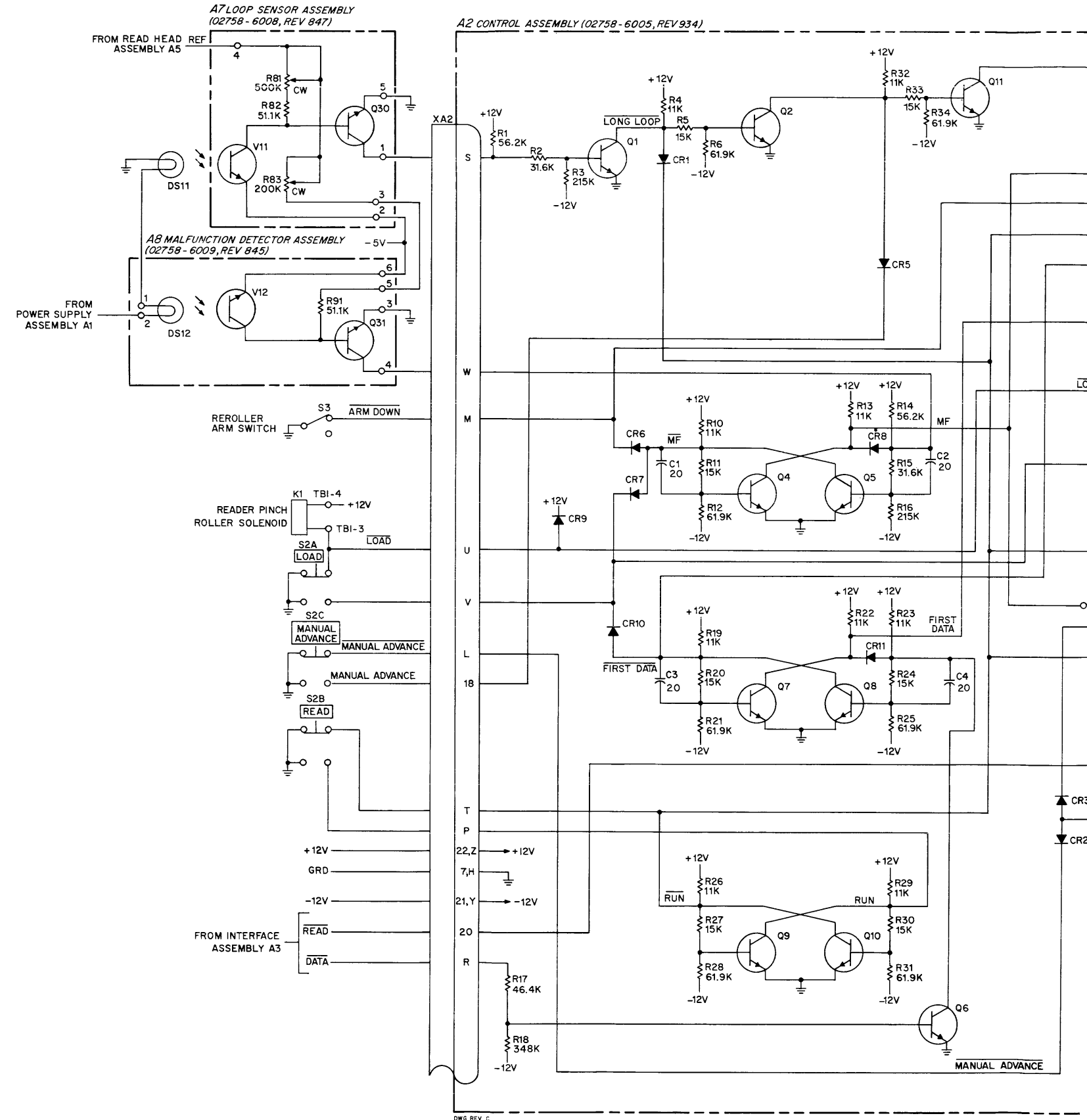
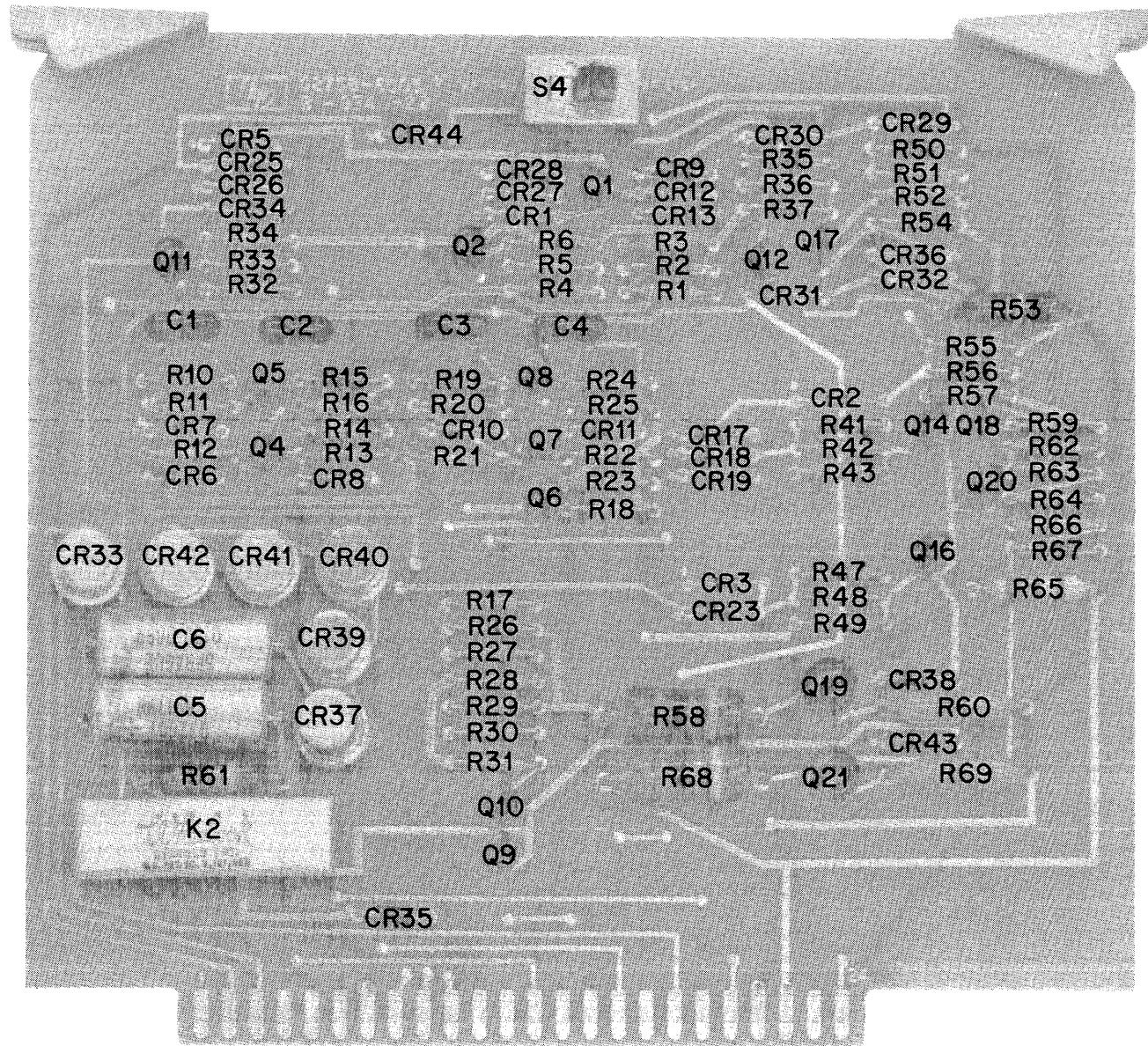
NOTES:  
 1. UNLESS OTHERWISE SPECIFIED:  
 ALL RESISTANCE VALUES ARE IN OHMS.  
 ALL CAPACITANCE VALUES ARE IN PICOFARADS.

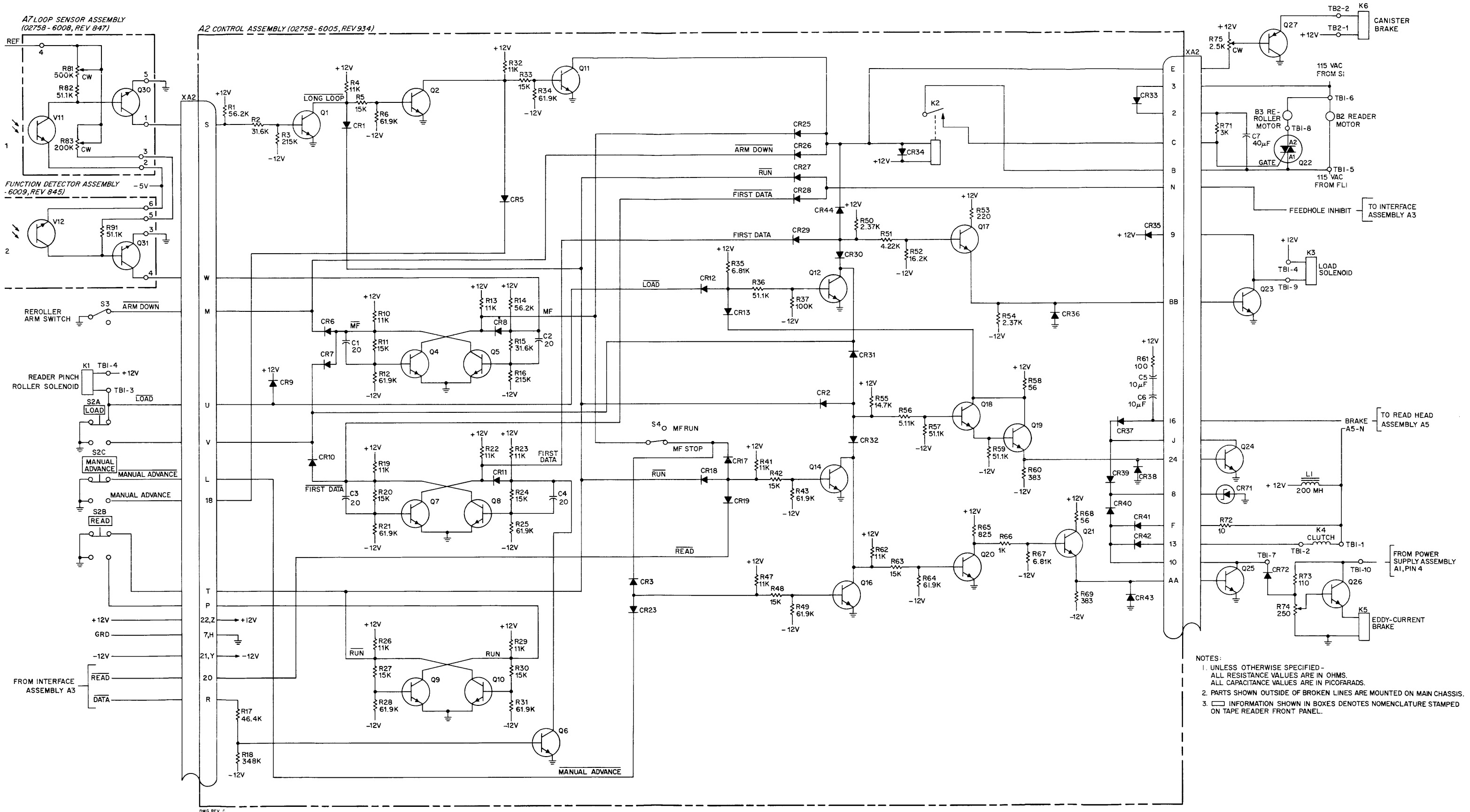
Figure 4-8. Interface Assembly A3 Schematic and Parts Location Diagrams



Table 4-6. Control Assembly A2 Replaceable Parts

REFERENCE DESIGNATION	HP PART NO.	DESCRIPTION	MFR CODE	MFR PART NO.
A2	02758-6005	Control Assembly	28480	02758-6005
C1 thru C4	0160-2198	Capacitor, Fxd, Mica, 20 pf, 5%	28480	0160-2198
C5,6	0180-0089	Capacitor, Fxd, Elect, 10 uf, -10+100%, 150VDCW	56289	B0D106G150DF4
CR1,2,3 5 thru 8,10 thru 13,17,18, 19,25 thru 32,34,36,38,43,44	1901-0081	Diode, Si, 50 VDCW	07263	FD1415
CR9,35	1901-0049	Diode, Si, 50 piv	28480	1901-0049
CR33	1901-0492	Diode, Si, 3 amp	04713	1N5002
CR37,39 thru 42	1901-0416	Diode, Si, 200 piv, 3 amp	28480	1901-0416
K2	0490-0412	Relay, 1 form A, 250V, 1 amp	02116	262-1A-12
Q1,2,4 thru 12,14,16 thru 18, 20	1854-0071	Transistor, Si, NPN	28480	1854-0071
Q19,21	1854-0246	Transistor, Si, NPN	28480	1854-0246
R1,14	0757-0459	Resistor, Fxd, Met Flm, 56.2K, 1%, 1/8W	28480	0757-0459
R2,15	0698-3160	Resistor, Fxd, Met Flm, 31.6K, 1%, 1/8W	14674	C4 OBD
R3,16	0698-3454	Resistor, Fxd, Met Flm, 215K, 1%, 1/8W	28480	0698-3454
R4,10,13,19,22,23,26,29,32,41, 47,62	0757-0443	Resistor, Fxd, Met Flm, 11.0K, 1%, 1/8W	28480	0757-0443
R5,11,20,24,27,30,33,42,48,63	0757-0446	Resistor, Fxd, Met Flm, 15.0K, 1%, 1/8W	28480	0757-0446
R6,12,21,25,28,31,34,43,49,64	0757-0460	Resistor, Fxd, Met Flm, 61.9K, 1%, 1/8W	28480	0757-0460
R17	0698-3162	Resistor, Fxd, Met Flm, 46.4K, 1%, 1/8W	28480	0698-3162
R18	0698-3458	Resistor, Fxd, Met Flm, 348K, 1%, 1/8W	28480	0698-3454
R35,67	0757-0439	Resistor, Fxd, Met Flm, 6.81K, 1%, 1/8W	28480	0757-0439
R36,57,59	0757-0458	Resistor, Fxd, Met Flm, 51.1K, 1%, 1/8W	28480	0757-0458
R37	0757-0465	Resistor, Fxd, Met Flm, 100K, 1%, 1/8W	14674	C4 OBD
R50,54	0698-3150	Resistor, Fxd, Met Flm, 2.37K, 1%, 1/8W	28480	0698-3150
R51	0698-3154	Resistor, Fxd, Met Flm, 4.22K, 1%, 1/8W	28480	0698-3154
R52	0757-0447	Resistor, Fxd, Met Flm, 16.2K, 1%, 1/8W	28480	0757-0447
R53	0761-0026	Resistor, Fxd, Met Ox, 220 ohms, 5%, 1W	14674	C-32 OBD
R55	0698-3156	Resistor, Fxd, Met Flm, 14.7K, 1%, 1/8W	28480	0698-3156
R56	0757-0438	Resistor, Fxd, Met Flm, 5.11K, 1%, 1/8W	14674	C4 OBD
R58,68	0764-0013	Resistor, Fxd, Met Ox, 56 ohms, 5%, 2W	28480	0764-0013
R60,69	0698-3404	Resistor, Fxd, Met Flm, 383 ohms, 1%, 1/2W	28480	0698-3404
R61	0760-0024	Resistor, Fxd, Met Ox, 100 ohms, 5%, 1W	14674	C-32 OBD
R65	0757-0731	Resistor, Fxd, Met Flm, 825 ohms, 1%, 1/4W	28480	0757-0731
R66	0757-0280	Resistor, Fxd, Met Flm, 1K, 1%, 1/8W	28480	0757-0280
S4	3101-0973	Switch, Slide, DPDT, 0.05 amp, 125V, AC/DC	79727	G126-0018



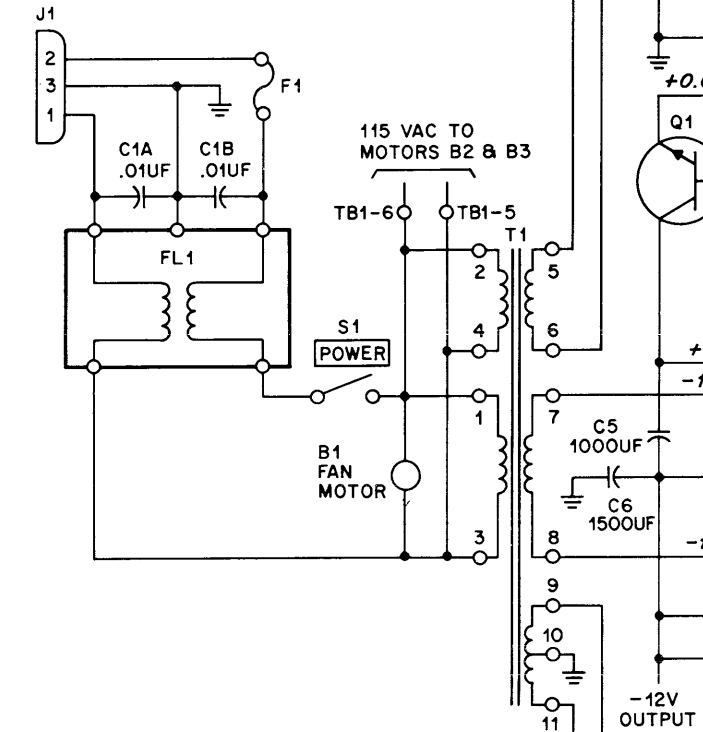
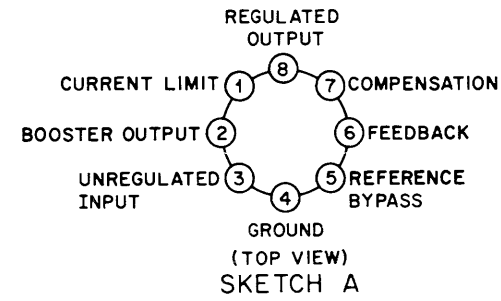
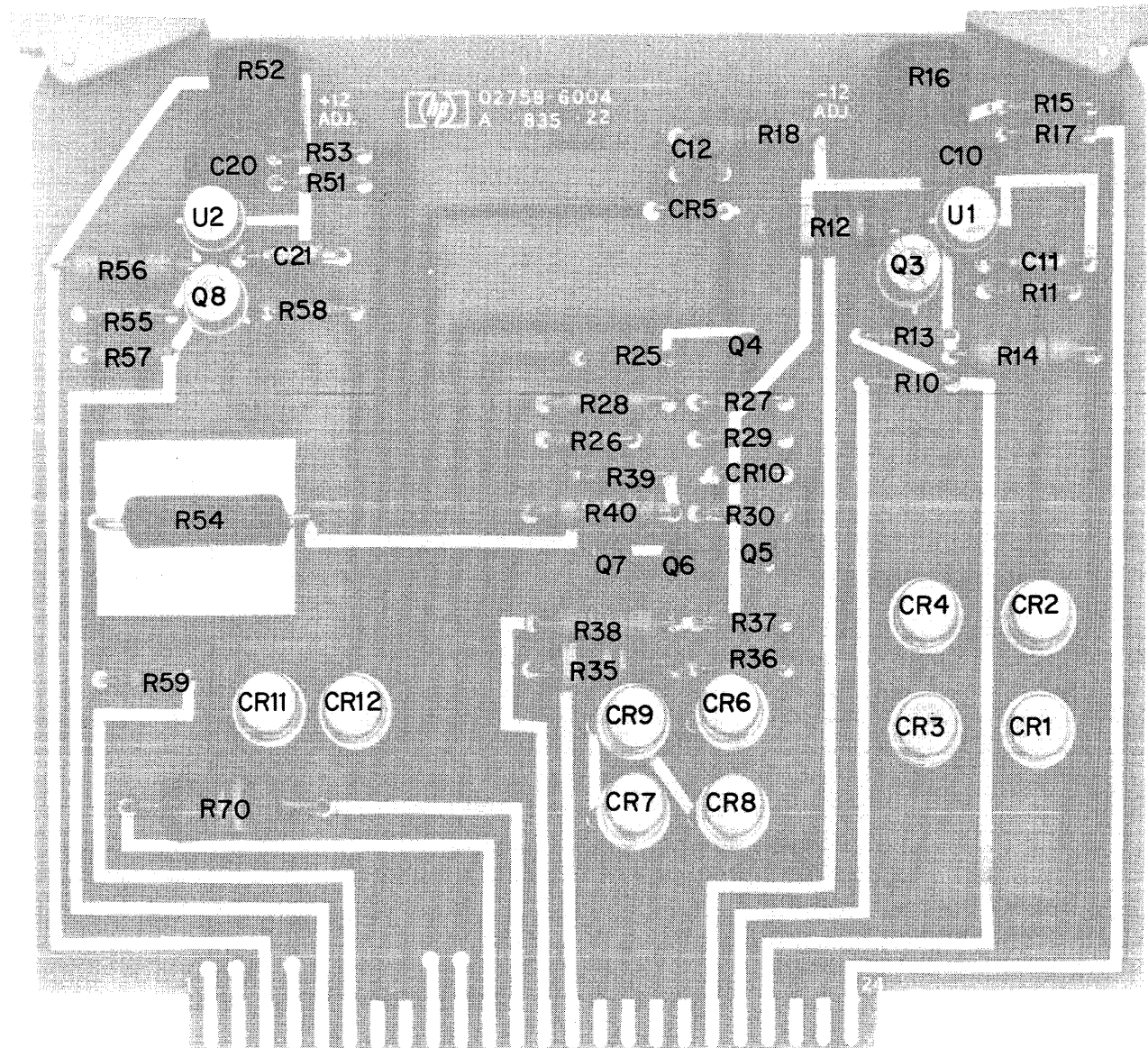


NOTES:  
 1. UNLESS OTHERWISE SPECIFIED - ALL RESISTANCE VALUES ARE IN OHMS. ALL CAPACITANCE VALUES ARE IN PICOFARADS.  
 2. PARTS SHOWN OUTSIDE OF BROKEN LINES ARE MOUNTED ON MAIN CHASSIS.  
 3. INFORMATION SHOWN IN BOXES DENOTES NOMENCLATURE STAMPED ON TAPE READER FRONT PANEL.

Figure 4-9. Control Assembly A2 Schematic and Parts Location Diagrams

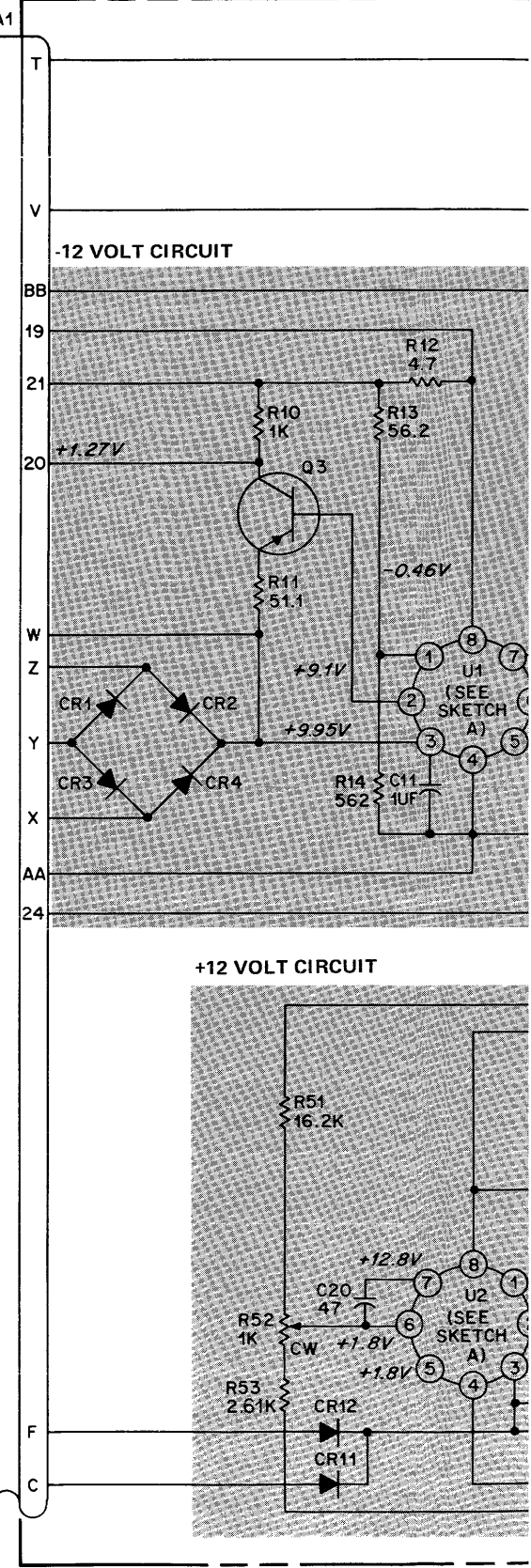
Table 4-7. Power Supply Assembly A1 Replaceable Parts

REFERENCE DESIGNATION	HP PART NO.	DESCRIPTION	MFR CODE	MFR PART NO.
A1	02758-6004	Power Supply Assembly	28480	02758-6004
C10,20	0160-2307	Capacitor, Fxd, Mica, 47 pf, 5%	28480	0160-2307
C11,21	0180-0291	Capacitor, Fxd, Elect, 1.0 uf, 10%, 35 VDCW	28480	0180-0291
C12	0150-0093	Capacitor, Fxd, Cer, 0.01 uf, +80-20%, 100 VDCW	91418	OBD
CR1 thru 4,6 thru 9,11,12	1901-0200	Diode, Si, 100 piv, 3 amp	02735	1N4998
CR5	1902-0041	Diode, Breakdown, 5.11V, 5%, 400 MW	28480	1902-0041
CR10	1901-0081	Diode, Si, 50 VDCW	07263	FD1415
MC1,2	1820-0123	Integrated Circuit, voltage regulator	12040	LM300
Q3,8	1853-0041	Transistor, Si, PNP	02735	38640
Q4 thru 7	1854-0071	Transistor, Si, NPN	28480	1854-0071
R10,36	0698-3358	Resistor, Fxd, Met Flm, 1K, 0.5%, 1/8W	28480	0698-3358
R11,58	0757-0394	Resistor, Fxd, Met Flm, 51.1K, 1%, 1/8W	14674	C4 OBD
R12,35	0811-1674	Resistor, Fxd, WW, 4.7 ohms, 5%, 2W	28480	0811-1674
R13,R55	0757-0395	Resistor, Fxd, Met Flm, 56.2 ohms, 1%, 1/8W	28480	0757-0395
R14,R56	0757-0815	Resistor, Fxd, Met Flm, 562 ohms, 1%, 1/2W	28480	0757-0815
R15,37,53	0757-0447	Resistor, Fxd, Met Flm, 16.2K 1%, 1/8W	28480	0757-0447
R16,52	2100-1758	Resistor, Var, WW, 1K, 1/2W	28480	2100-1758
R17,51	0698-0085	Resistor, Fxd, Met Flm, 2.15K, 1%, 1/8W	28480	0698-0085
R18	0698-3402	Resistor, Fxd, Met Flm, 316 ohms, 1%, 1/2W	28480	0698-3402
R25	0757-0452	Resistor, Fxd, Met Flm, 27.4K, 1%, 1/8W	28480	0757-0452
R26	0757-0442	Resistor, Fxd, Met Flm, 10.0K, 1%, 1/8W	14674	C4 OBD
R27,29	0698-3438	Resistor, Fxd, Met Flm, 147 ohms, 1%, 1/8W	28480	0698-3438
R28	0757-0752	Resistor, Fxd, Met Flm, 8.25K, 1%, 1/4W	91637	MF-1/8-44
R30	0757-0440	Resistor, Fxd, Met Flm, 7.50K, 1%, 1/8W	14674	C4 OBD
R38	0757-0816	Resistor, Fxd, Met Flm, 681 ohms, 1%, 1/2W	28480	0757-0816
R39	0757-0438	Resistor, Fxd, Met Flm, 5.11K, 1%, 1/8W	14674	C4 OBD
R40	0757-1090	Resistor, Fxd, Met Flm, 261 ohms, 1%, 1/2W	28480	0757-1090
R57	0698-3446	Resistor, Fxd, Met Flm, 383 ohms, 1%, 1/8W	28480	0698-3446
R59	0757-0398	Resistor, Fxd, Met Flm, 75 ohms, 1%, 1/8W	28480	0757-0398
R70	0698-3629	Resistor, Fxd, Met Ox, 270 ohms, 5%, 2W	28480	0698-3629



- NOTES:
1. UNLESS OTHERWISE SPECIFIED— ALL RESISTANCE VALUES ARE IN OHMS. ALL CAPACITANCE VALUES ARE IN PICOFARADS.
  2. PARTS SHOWN OUTSIDE OF BROKEN LINE ARE MOUNTED ON MAIN CHASSIS.
  3.   INFORMATION SHOWN IN BOXES DENOTES NOMENCLATURE STAMPED ON TAPE READER FRONT PANEL.
  4. REFERENCE VOLTAGES SHOWN ARE FOR TROUBLESHOOTING PURPOSES AND REPRESENT NOMINAL VALUES. VOLTAGE MEASUREMENTS WERE TAKEN WITH LINE VOLTAGE AT 115 VAC, POWER SWITCH ON, AND LOAD, READ, AND MANUAL ADVANCE SWITCHES OFF.

A1 POWER SUPPLY ASSEMBLY (02758-6004, REV B)



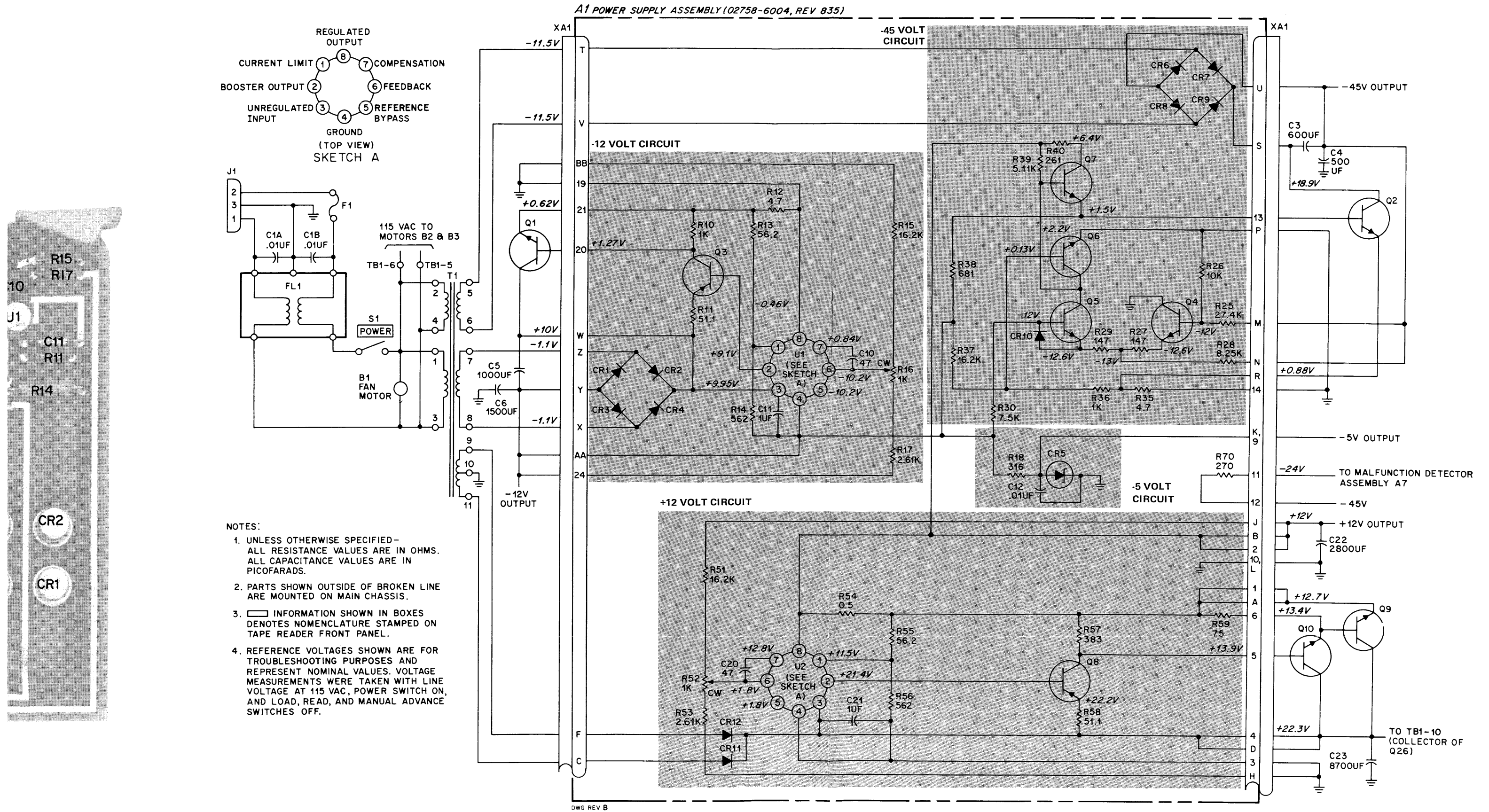


Figure 4-10. Power Supply Assembly A1 Schematic and Parts Location Diagrams

## SECTION V

### REPLACEABLE PARTS

#### 5-1. INTRODUCTION.

5-2. This section contains information for ordering replacement parts for the tape reader-reroller. Tables 5-1 through 5-4 are parts lists for the parts called out in figures 5-1 through 5-4, respectively. Index numbers for the parts in these figures and tables correspond to disassembly sequence for the instrument or assembly. Assembly order is the reverse of the disassembly order. Table 5-5 is a total quantity listing of all the electrical parts in the tape reader-reroller, and table 5-6 is a total quantity listing of all the mechanical parts in the instrument. The parts in tables 5-5 and 5-6 are listed in numerical order by part number.

5-3. Separate parts lists and parts location diagrams are provided for each printed-circuit card. These are located in section IV of this manual, adjacent to the respective schematic diagrams for the cards.

5-4. Tables 5-1 through 5-6 list the following information for each part:

- a. Hewlett-Packard part number.
- b. Description of the part. (Refer to table 5-7 for an explanation of abbreviations used in the DESCRIPTION column.)
- c. A five-digit code that corresponds to the manufacturer of the part. (Refer to table 5-8 for a listing of the manufacturers that correspond to the codes.)
- d. Manufacturer's part number.

e. Total quantity of each part used in the respective assembly (tables 5-1 through 5-4 only).

f. Total quantity of each part used in the instrument (tables 5-5 and 5-6 only).

5-5. Items in the DESCRIPTION column of the replaceable parts lists are indented to indicate item relationships, as follows:

#### DESCRIPTION

##### MAJOR ASSEMBLY

- \* Subassembly
- \* Attaching Parts for Subassembly
- \*\* Subassembly Parts
- \*\* Attaching Parts for Subassembly Parts

#### 5-6. ORDERING INFORMATION.

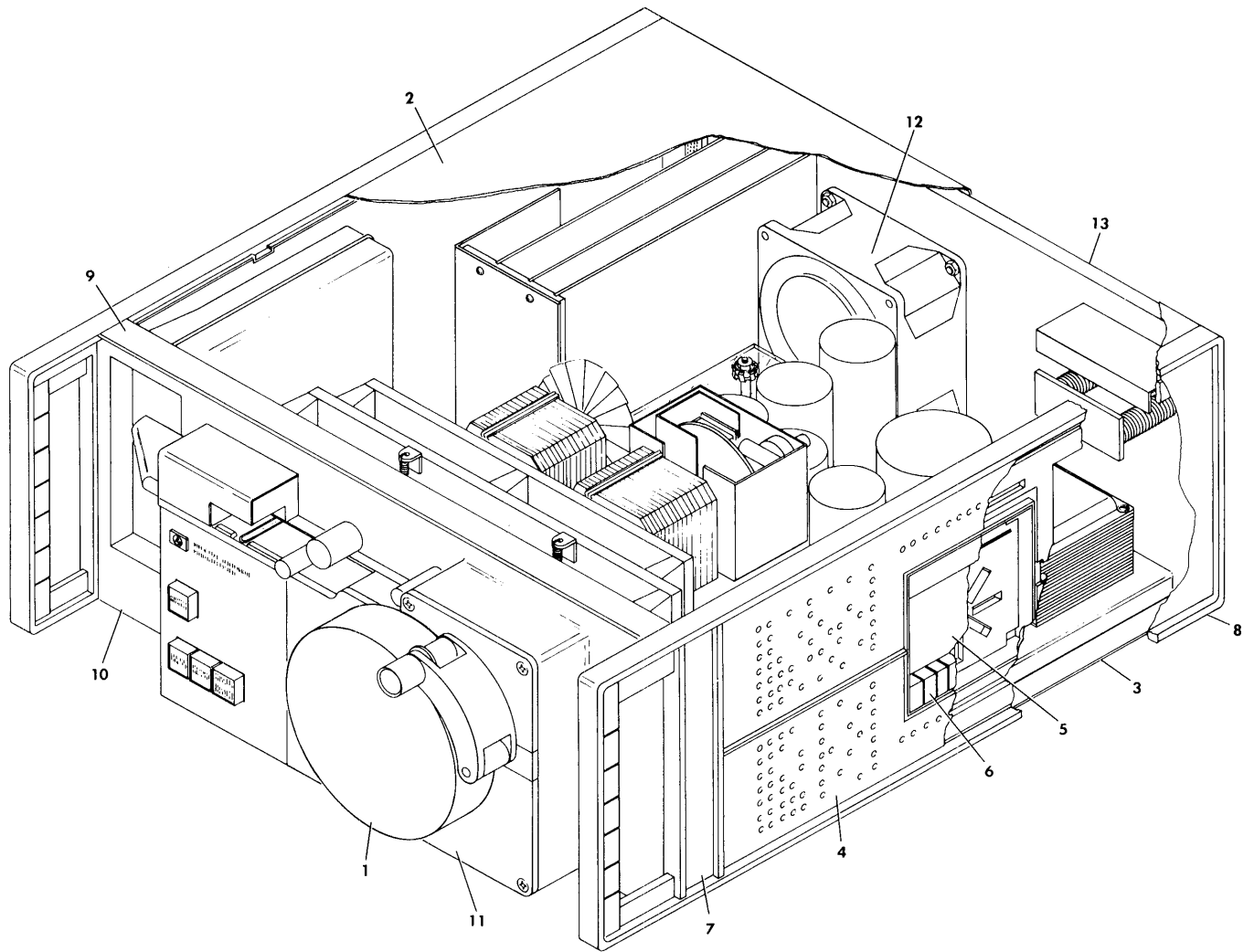
5-7. To order replacement parts, address order or inquiry to the local Hewlett-Packard Sales and Service Office. (Refer to list at the end of this manual for addresses.) Specify the following information for each part ordered:

- a. Instrument model and serial number.
- b. Hewlett-Packard stock number for each part.
- c. Description of each part.
- d. Circuit reference designation (if applicable).

Table 5-1. Tape Reader-Reroller Replaceable Parts

FIG. & INDEX NO.	HP PART NO.	DESCRIPTION	MFR CODE	MFR PART NO.	UNITS PER ASSY
5-1-1	02758-6016	2758A TAPE READER-REROLLER * Canister	28480	02758-6016	1
2	05100-6062	* Top Cover (Attaching Parts)	28480	05100-6062	1
	2360-0210	* Screw, Machine, FH, No. 6-32, 5/8 in. ----x----	00000	OBD	4
3	02758-6019	* Bottom Cover (Attaching Parts)	28480	02758-6019	1
	2360-0210	* Screw, Machine, FH, No. 6-32,5/8 in. ----x----	00000	OBD	4
4	5000-0747	* Side Cover (Attaching Parts)	28480	5000-0747	1
	2360-0192	* Screw, Machine, FH, No. 6-32, 1/4 in. ----x----	00000	OBD	4
5	5060-0765	* Handle Retainer (Attaching Parts)	28480	5060-0765	1
	2510-0107	* Screw, Machine, PH, No. 8-32, 1/2 in. ----x----	00000	OBD	2
6	5060-0222	* Handle Assy, Side	28480	5060-0222	1
7	5000-0053	* Trim, aluminum	28480	5000-0053	1
8	5060-0736	* Frame (Attaching Parts)	28480	5060-0736	1
	2510-0106	* Screw, Machine, FH, No. 8-32, 1/2 in.	00000	OBD	4
	2580-0003	* Nut, Assembled Washer, No. 8-32, 5/8 in.	00000	OBD	4
	2360-0210	* Screw, Machine, FH, No. 8-32, 5/8 in. ----x----	00000	OBD	5
9	5020-0901	* Extrusion, Top	28480	5020-0901	1
10	5020-0900	* Extrusion, Bottom	28480	5020-0900	1
11		* Front Panel Assy (See fig. 5-2)			
12		* Deck Assy (See fig. 5-3)			
13		* Rear Panel Assy (See fig. 5-4)			
	02748-6002	ACCESSORIES (Not shown in figure 5-1.) Accessory Kit	28480	02748-6002	1
	1251-0337	* Connector, 50 pin	28480	1251-0337	1
	1251-0339	* Connector, Housing	28480	1251-0339	1
	1251-1908	* Contacts	28480	1251-1908	1
	8520-0017	* Brush, Nylon	28480	8520-0017	1
	5060-0777	* Rack Mounting Kit	28480	5060-0777	1
	02758-6017	* Extender Board Assy	28480	02758-6017	1
	8120-0078	Power Cord	28480	8120-0078	1
	5060-0767	Foot Assy	28480	5060-0767	1
	02758-90173	2748A Tape Reader-Reroller Manual	28480	02758-90173	1





2017-12

Figure 5-1. Tape Reader-Reroller Parts Location Diagram

Table 5-2. Front Panel Assembly Replaceable Parts

FIG. & INDEX NO.	HP PART NO.	DESCRIPTION	MFR CODE	MFR PART NO.	UNITS PER ASSY
5-2-		FRONT PANEL ASSY			
1	7120-1254	* Control Panel	28480	7120-1254	1
2	1390-0107	* Button Latch (Attaching Parts)	13061	B10-B1	1
3	2200-0144	* Screw, Machine, FH, No. 4-40, 3/8 in. ----x----	00000	OBD	1
4	2200-0152	* Screw, Machine, FH, No. 4-40, 3/4 in.	00000	OBD	1
5	0380-0002	* Spacer, 1/4 in.	00000	OBD	1
6	0510-0045	* Ring, Retaining, 3/16 in.	00000	OBD	1
7	02758-2019	* Roller, RR, Support	28480	02758-2019	1
8	02758-2028	* Shaft, RR, Support	28480	02758-2028	1
9	2510-0106	* Screw, Machine, FH, No. 8-32, 1/2 in.	00000	OBD	4
	02758-6009	* Malfunction Detector Assy (Attaching Parts)	28480	02758-6009	1
10	2200-0139	* Screw, Machine, PH, No. 4-40, 1/4 in.	00000	OBD	2
11	3050-0229	* Washer, Flat, No. 4 ----x----	00000	OBD	2
12	02116-0001	** Contact, Light Bulb	28480	02116-0001	1
13	2140-0209	** Lamp, Incandescent, 14V, 0.08A (DS12)	03508	382	1
14	0757-0458	** Resistor Fxd Met Flm, 51.1K, 1%, 1/8W (R91)	28480	0757-0458	1
15	1854-0071	** Transistor, Si, NPN (Q31)	28480	1854-0071	1
16	1990-0085	** Phototransistor, 30V (V12)	07263	FPT-100	1
17	0361-0140	** Rivet, Semitubular, 1/8 in.	00000	OBD	1
18	02758-8009	** PC Board, Blank	28480	02758-8009	1
19	02758-4001	** Malfunction Detector Mount	28480	02758-4001	1
20	02758-2016	* Reroller Panel	28480	02758-2016	1
21	2200-0103	* Screw, Machine, W/Ext Lock, PH, No. 4-40, 1/4 in.	00000	OBD	1
22	3050-0229	* Washer, Flat, No. 4	00000	OBD	1
23	02116-0001	* Contact, Light Bulb	28480	02116-0001	1
24	0360-0272	* Solder Lug, No. 4	00000	OBD	1
25	2140-0209	* Lamp, 14V, .08 amp, (DS11)	28480	2140-0209	1
26	02758-0011	* Contact, Light Bulb	28480	02758-0011	1
	02758-6008	* Loop Sensor Assy (Attaching Parts)	28480	02758-6008	1
27	2200-0103	* Screw, Machine, W/Ext Lock, PH No. 4-40, 1/4 in.	00000	OBD	1
28	3050-0229	* Washer, Flat, No. 4 ----x----	00000	OBD	1
29	0757-0458	** Resistor Fxd Met Flm, 51.1K, 1%, 1/8W (CR82)	28480	0757-0458	1
30	1854-0071	** Transistor, Si, NPN (Q30)	28480	1854-0071	1
31	1990-0085	** Phototransistor, 30V (V11)	07263	FPT-100	1
32	2100-1967	** Resistor, Var. 200K, 20%, 3/4W, (R81,R82)	28480	2100-1967	2
33	02758-8008	** PC Board, Blank	28480	02758-8008	1
34	02758-6020	* Buffer Bin (Attaching Parts)	28480	02758-6020	1
35	2510-0109	* Screw, Machine PH, No. 8-32, 5/8 in. ----x----	00000	OBD	2
36	02758-2037	* Spacer, Tape (Attaching Parts)	28480	02758-2037	1
37	2200-0152	* Screw, Machine, FH, No. 4-40, 3/4 in. ----x----	00000	OBD	2
38	02758-2045	* Spacer, Bin (Attaching Parts)	28480	02758-2045	1
39	2510-0109	* Screw, Machine, PH, No. 8-32, 5/8 in. ----x----	00000	OBD	2
40	1480-0112	* Roll Pin, 1/16, 1/2 in.	00000	OBD	1
41	3030-0033	* Setscrew, 6-32, .188 in.	00000	OBD	1
42	0370-0448	* Knob	28480	0370-0448	1
43	5000-0530	* Knob Insert	28480	5000-0530	1

Table 5-2. Front Panel Assembly Replaceable Parts (Continued)

FIG. & INDEX NO.	HP PART NO.	DESCRIPTION	MFR CODE	MFR PART NO.	UNITS PER ASSY
44	02758-2026	* Shaft, Press Roll	28480	02758-2026	1
45	1500-0276	* Brake, Magnetic (Attaching Parts)	16554	17EC-08B-3	1
46	2200-0144	* Screw, Machine, PH, No. 4-40, 3/8 in.	00000	OBD	1
47	2260-0001	* Nut, Plain, Hexagon, No. 4, 1/4 in.	00000	OBD	1
48	2190-0003	* Washer, Lock, No. 4 ---- x ----	00000	OBD	1
49	No Number	* Brake Disk (Part of Brake, item 45) (Attaching Parts)			1
50	No Number	* Rivet (Part of Brake, item 45) ---- x ----			2
51	1410-0015	* Bearing, Ball, annular	00000	OBD	1
52	02758-2018	* Roller, Can, Guide	28480	02758-2018	1
53	02758-20469	* Tire, Canister Guide, Roller	28480	02758-20469	1
54	1480-0112	* Roll Pin, 1/16, 1/2 in.	00000	OBD	1
55	02758-2042	* Roller, Cam, Idler	28480	02758-2042	1
56	02758-2033	* Pressure Arm, RR	28480	02758-2033	1
	02758-6012	* Read Head Assy (Attaching Parts)	28480	02758-6012	1
57	2510-0065	* Screw, Machine, PH, No. 8-32, 1-3/4 in.	00000	OBD	1
58	2190-0009	* Washer, Lock, Int. No. 8 ---- x ----	00000	OBD	1
59	02758-0001	* * Lamp Head Cover (Attaching Parts)	28480	02758-0001	1
60	2200-0139	* * Screw, Machine, PH, No. 4-40, 1/4 in.	00000	OBD	1
61	3050-0222	* * Washer, Flat, No. 4, 5/16 in. ---- x ----	00000	OBD	1
62	No Number	* * Read Head (cannot be ordered separately)			1
63	No Number	* * Lamp Head (cannot be ordered separately)			1
64	1990-0086	* * Lamp Assembly (V1-V10)	28480	02758-6001	1
65	02758-8013	* * Read Head Gasket	28480	02758-8013	1
66	5080-1570	* Switch, Pushbutton (S1) (Attaching Parts)	28480	5080-1570	1
67	2200-0143	* Screw, Machine, PH, No. 4-40, 3/8 in.	00000	OBD	2
68	2190-0003	* Washer, Lock, No. 4 ---- x ----	00000	OBD	2
69	0370-0118	* * Pushbutton	28480	0370-0118	1
70	02758-8006	* * Label, Power	28480	02758-8006	1
71	0510-1055	* Ring, Retaining, 1/4 in.	00000	OBD	1
72	1410-0015	* Bearing, Ball, Annular	00000	OBD	1
73	02758-2017	* Pinch Roller	28480	02758-2017	1
74	1410-0015	* Bearing, Ball, Annular	00000	OBD	1
75	0510-1055	* Ring, Retaining, 1/4 in.	00000	OBD	1
76	4040-0411	* Input Bin (Attaching Parts)	28480	4040-0411	1
77	2510-0045	* Screw, Machine, PH, No. 8-32, 3/8 in.	00000	OBD	6
78	3050-0139	* Washer, Flat, No. 8 ---- x ----	00000	OBD	6
79	3030-0007	* Setscrew, 4-40, 1/8 in.	00000	OBD	1
80	0510-1055	* Ring, Retaining, 1/4 in.	00000	OBD	1
81	0510-1055	* Ring, Retaining, 1/4 in.	00000	OBD	1
82	02758-2029	* Capstan, Main Drive Shaft	28480	02758-2029	1
83	1500-0275	* Armature and Hub	16554	EC-11-064	1
84	3030-0020	* Setscrew, 8-32, 3/16 in.	00000	OBD	1
85	0510-1055	* Ring, Retaining, 1/4 in.	00000	OBD	1
86	3030-0001	* Setscrew, 8-32, 3/16 in.	00000	OBD	1
87	02758-2046	* Pulley, Drive	00000	02758-2046	1
88	0905-0354	* O-Ring, 1.734 ID	00000	OBD	1
89	0510-1055	* Ring, Retaining, 1/4 in.	00000	0510-1055	1
90	02758-2029	* Capstan, RR, Drive Shaft	28480	02758-2029	1

Table 5-2. Front Panel Assembly Replaceable Parts (Continued)

FIG. & INDEX NO.	HP PART NO.	DESCRIPTION	MFR CODE	MFR PART NO.	UNITS PER ASSY
91	3030-0001	* Setscrew, 8-32, 3/16 in.	00000	OBD	1
92	2510-0109	* Screw, Machine, PH, No. 8-32, 5/8 in.	00000	OBD	4
93	2190-0076	* Washer, Lock, No. 8	00000	OBD	4
94	3030-0001	* Setscrew, 8-32, 3/16 in.	00000	OBD	1
95	02758-20466	* Spacer Block, Adjust (Attaching Parts)	28480	02758-20466	1
96	2510-0106	* Screw, Machine, FH, No. 8-32, 1/2 in. ---- x ----	00000	OBD	2
97	0510-1055	* Ring, Retaining, 1/4 in.	00000	OBD	1
98	02758-2021	* Pulley, Idler	28480	02758-2021	1
99	1410-0015	* Bearing, Ball, Annular	00000	OBD	1
100	02758-2027	* Shaft, Idler Mount	28480	02758-2027	1
101	1480-0014	* Pin, Dowel, No. 1/8, 3/4 in.	00000	OBD	1
102	02758-2010	* Helix, Cover	28480	02758-2010	1
103	02758-2009	* Helix (Attaching Parts)	28480	02758-2009	1
104	2360-0204	* Screw, Machine, FH, No. 6-32, 3/4 in. ---- x ----	00000	OBD	1
105	1251-0338	* Connector, Receptacle (J2) (Attaching Parts)	95238	25-50-SS	1
106	2200-0149	* Screw, Machine, PH, No. 4-40, 5/8 in.	00000	OBD	2
107	0590-0076	* Nut, Hexagon, Self-Locking, No. 4 ---- x ----	00000	OBD	2
108	3101-0729	* Switch, Pushbutton (S2) (Attaching Parts)	28480	3101-0719	1
109	2360-0183	* Screw, Machine, FH, No. 6-32, 3/8 in.	00000	OBD	2
110	2190-0037	* Washer Lock, Int, No. 6 ---- x ----	00000	OBD	2
111	0370-0118	** Pushbutton	28480	0370-0118	3
112	02758-8006	** Label	28480	02758-8006	1
113	2510-0063	* Screw, Machine, PH, No. 8-32, 1-1/2 in.	00000	OBD	1
114	2190-0076	* Washer, Lock, No. 8	00000	OBD	1
115	3050-0139	* Washer, Flat No. 8	00000	OBD	1
116	0380-0010	* Spacer, 5/8 in.	00000	OBD	2
117	2510-0109	* Screw, Machine, PH, No. 8-32, 5/8 in.	00000	OBD	1
118	2190-0076	* Washer, Lock, No. 8	00000	OBD	1
119	3050-0139	* Washer, Flat, No. 8	00000	OBD	1
120	1400-0082	* Cable Clamp	00000	OBD	1
121	1460-1080	* Spring, .375 O.D.	00000	OBD	1
122	0380-0006	* Spacer, 3/8 in.	00000	OBD	1
123	1480-0112	* Rollpin, 1/16, 1/2 in.	00000	OBD	1
124	02758-2031	* Arm, Tension, RR	28480	02758-2031	1
125	0510-1055	* Ring, Retaining, 1/4 in.	00000	OBD	1
126	5020-0233	* Ring Collar, 1/4 in. (Attaching Parts)	00000	OBD	1
127	3030-0001	* Setscrew, 6-32, 3/16 in. ---- x ----	00000	OBD	1
128	02758-2025	* Shaft, Press Arm	28480	02758-2025	1
129	3102-0015	* Switch, Micro (S3) (Attaching Parts)	28480	3102-0015	1
130	0520-0136	* Screw, Machine, PH, No. 2-56, 5/8 in.	00000	OBD	2
131	2190-0045	* Washer, Lock, No. 2 ---- x ----	00000	OBD	2
132	3101-0167	* Actuator	28480	3101-0167	1
133	0360-0038	* Terminal Board (Attaching Parts)	28480	0360-0038	1
134	2360-0203	* Screw, Machine, PH, No. 6-32, 5/8	00000	OBD	2
135	2190-0851	* Washer, Lock, No. 6 ---- x ----	00000	OBD	2
136	1410-0015	* Bearing, Ball, Annular	00000	OBD	1
137	1410-0015	* Bearing, Ball, Annular	00000	OBD	1

Table 5-2. Front Panel Assembly Replaceable Parts (Continued)

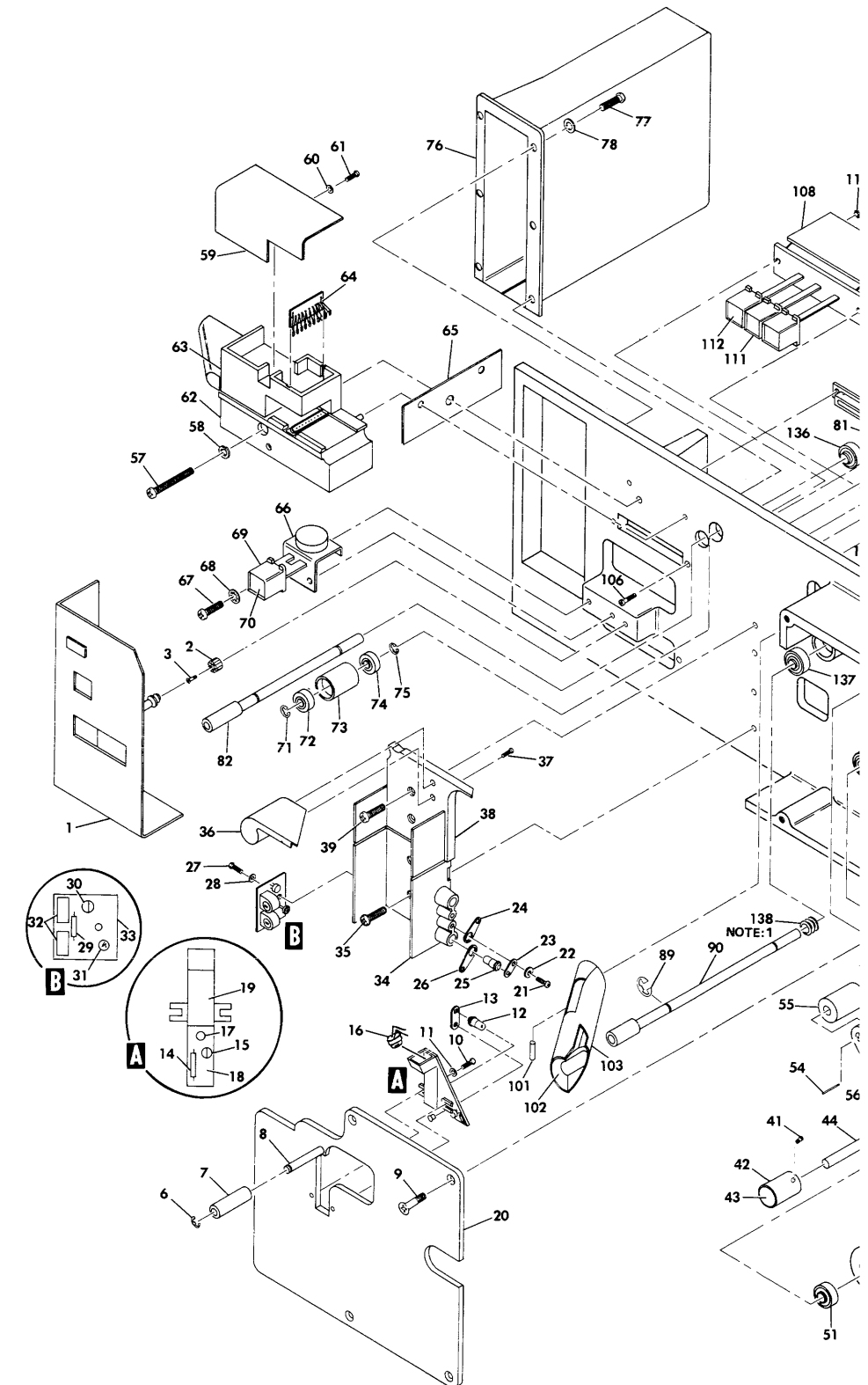
FIG. & INDEX NO.	HP PART NO.	DESCRIPTION	MFR CODE	MFR PART NO.	UNITS PER ASSY
138		* See figure 5-2, note 1.	00000	OBD	
139	02758-2012	* Front Panel	28480	02758-2012	1
140	2360-0201	* Screw, Machine, PH, No. 6-32, 1/2 in.	00000	OBD	1
141	2420-0001	* Nut, Assembled, Washer, No. 6	00000	OBD	1
142	02758-0013	* Bracket, Spring	28480	02758-0013	1
143	0510-0052	* Ring, Grip, 1/8 in.	00000	OBD	1
144	1460-0033	* Spring, .125 O.D.	00000	OBD	1
145	0510-0052	* Ring, Grip, 1/8 in.	00000	OBD	1
146	0510-0052	* Ring, Grip, 1/8 in.	00000	OBD	1
147	0510-0052	* Ring, Grip, 1/8 in.	00000	OBD	1
148	0510-0052	* Ring, Grip, 1/8 in.	00000	OBD	1
149	1460-1105	* Spring, .250 O.D.	00000	OBD	1
150	1480-0014	* Dowel Pin, 1/8 in. 3/4 in.	00000	OBD	1
151	No Number	* Armature (Part of Solenoid, item 178)			1
152	02758-2023	* Shaft, Load and Pinch Roller	28480	02758-2023	1
153	1480-0084	* Pin, Split, 1/8 in. 1/2 in.	00000	OBD	1
154	1410-0045	* Bushing, bronze, .315 O.D., .189 I.D.	28480	1410-0045	2
155	02758-2020	* Arm Load and Pinch Roller	28480	02758-2020	1
156	0510-1055	* Ring, Retaining, 1/4 in.	00000	OBD	1
157	2360-0201	* Screw, Machine, PH, 6-32, 1/2 in.	00000	OBD	1
158	2420-0001	* Nut, assembled, Washer, No. 6	00000	OBD	1
159	02758-0013	* Bracket, Spring	28480	02758-0013	1
160	0510-0052	* Ring, Grip, 1/8 in.	00000	OBD	1
161	0510-1055	* Ring, Retaining, 1/4 in.	00000	OBD	1
162	1460-0033	* Spring, .125 O.D.	00000	OBD	1
163	0510-0052	* Ring, Grip, 1/8 in.	00000	OBD	1
164	0510-0052	* Ring, Grip, 1/8 in.	00000	OBD	1
165	1480-0014	* Dowel Pin, 1/8 in., 3/4 in.	00000	OBD	1
166	02758-0007	* Link, Load Roller	28480	02758-0007	1
167	No Number	* Armature (Part of Solenoid, item 181)			1
168	0510-1055	* Ring, Retainer, 1/4 in.	00000	OBD	1
169	02758-2022	* Load - Capstan	28480	02758-2022	1
170	0510-1055	* Ring, Retainer, 1/4 in.	00000	OBD	1
171	02758-2023	* Shaft, Load and Pinch Roller	28480	02758-2023	1
172	1480-0084	* Pin, Split, 1/8 in. 1/2 in.	00000	OBD	1
173	1410-0045	* Bushing, bronze, .315 O.D., .819 I.D.	28480	1410-0045	2
174	0510-1055	* Ring, Retainer, 1/4 in.	00000	OBD	1
175	2510-0109	* Screw, Machine, PH, No. 8-32, 5/8 in.	00000	OBD	6
176	2190-0076	* Washer, Lock, No. 8	00000	OBD	6
177	02758-20468	* Solenoid (K1) (Attaching Parts)	28480	02758-20468	1
178	2360-0197	* Screw, Machine, PH, No. 6-32, 3/8 in.	00000	OBD	2
179	2190-0008	* Washer, Lock, Ext, No. 6 --- x ---	00000	OBD	2
180	02758-20468	* Solenoid (K3) (Attaching Parts)	28480	02758-20468	1
181	2360-0197	* Screw, Machine, PH, No. 6-32, 3/8 in.	00000	OBD	2
182	2190-0008	* Washer, Lock, Ext, No. 6 --- x ---	00000	OBD	2
183	1410-0015	* Bearing, Ball, Annular	00000	OBD	1
184	1410-0015	* Bearing, Ball, Annular	00000	OBD	1
185	02758-2024	* Shaft, Load and Pinch Roller Mount	28480	02758-2024	1
186	02758-2024	* Shaft, Load and Pinch Roller Mount	28480	02758-2024	1
187	02758-2014	* Bearing Carrier	28480	02758-2014	1
188	1500-0245	* Flexible, Coupler (Attaching Parts)	28480	1500-0245	1
189	3030-0020	* Setscrew, 8-32, 3/16 in. --- x ---	00000	OBD	1

Table 5-2. Front Panel Assembly Replaceable Parts (Continued)

FIG. & INDEX NO.	HP PART NO.	DESCRIPTION	MFR CODE	MFR PART NO.	UNITS PER ASSY
190	3030-0007	* Setscrew, 4-40, 1/8 in.	00000	OBD	1
191	1500-0226	* Clutch, (K4) (Attaching Parts)	16554	BEC-11CC-4-3	1
192	2220-0009	* Screw, Machine, Fil H, No. 4-40, 5/16 in.	00000	OBD	4
193	2190-0003	* Washer, Lock, No. 4 --- x ---	00000	OBD	4
194	02758-2043	* Fan (Attaching Parts)	28480	02758-2043	1
195	3030-0001	* Setscrew, No. 8-32, 3/16 in. --- x ---	00000	OBD	1
196	3140-0446	* Motor, Shaded, Pole (Attaching Parts)	28480	3140-0446	1
197	2360-0203	* Screw, Machine, PH, No. 6-32, 5/8 in.	00000	OBD	4
198	2190-0851	* Washer, Lock, No. 6 --- x ---	00000	OBD	4
199	No Number	* Standoff (Part of Motor, item 201)			
200	3050-0227	* Washer, Flat, No. 6, 3/8 in.	00000	OBD	4
201	3140-0446	* Motor, Shaded, Pole (Attaching Parts)	28480	3140-0446	1
202	2360-0203	* Screw, Machine, PH, No. 6-32, 5/8 in.	00000	OBD	4
203	2190-0851	* Washer, Lock, No. 6 --- x ---	00000	OBD	4
204	02758-2015	* Motor Plate	28480	02758-2015	1
205	02758-2038	* Flywheel (Attaching Parts)	28480	02758-2038	1
206	3030-0001	* Setscrew, 8-32, 3/16 in. --- x ---	00000	OBD	1
207	02758-20461	* Pole Piece	28480	02758-20461	1
208	9100-2901	* Coil (K5) (Attaching Parts)	28480	9100-2901	1
209	2200-0147	* Screw, Machine, PH, No. 4-40, 1/2 in.	00000	OBD	2
210	2190-0005	* Washer, Lock, Ext, No. 4 --- x ---	00000	OBD	2
211	02758-00162	* Magnet, Armature (Attaching Parts)	28480	02758-00162	1
212	2200-0147	* Screw, Machine, PH, No. 4-40, 1/2 in.	00000	OBD	2
213	2190-0005	* Washer, Lock, Ext, No. 4 --- x ---	00000	OBD	2
214	0816-0020	* Resistor, FXD, WW, 110 ohms, 10%, 10W (R73) (Attaching Parts)	28480	0816-0020	1
215	2360-0220	* Screw, Machine, PH, No. 6-32, 2-1/4 in.	0000	OBD	1
216	3050-0005	* Washer, Nonmetallic, No. 6	00000	OBD	1
217	2420-0001	* Nut, Assembled Washer, No. 6 --- x ---	00000	OBD	1
218	0360-0279	* Standoff, No. 4-40, 1/4 in. (Attaching Parts)	28480	0360-0279	1
219	2200-0139	* Screw, Machine, PH, No. 4-40, 1/4 in.	00000	OBD	1
220	2190-0005	* Washer, Lock, Ext, No. 4 --- x ---	00000	OBD	1
221	0360-0279	* Standoff, No. 4-40, 1/4 in. (Attaching Parts)	28480	0360-0279	1
222	2200-0139	* Screw, Machine, PH, No. 4-40, 1/4 in.	00000	OBD	1
223	2190-0005	* Washer, Lock, Ext, No. 4 --- x ---	00000	OBD	1
224	0360-0272	* Solder Lug, No. 4	00000	OBD	1
225	1854-0072	* Transistor, Si, NPN, (Q26) (Attaching Parts)	02735	2N3054	1
226	2360-0117	* Screw, Machine, PH, No. 6-32, 3/8 in. --- x ---	00000	OBD	2

Table 5-2. Front Panel Assembly Replaceable Parts (Continued)

FIG. & INDEX NO.	HP PART NO.	DESCRIPTION	MFR CODE	MFR PART NO.	UNITS PER ASSY
227	2100-0079	* Resistor, Var. Comp, 250 ohms, 2W (Attaching Parts)	28480	2100-0079	1
228	0590-0035	* Nut, Pot Locking	28480	0590-0035	1
229	0590-0036	* Bushing, Pot Lock	28480	0590-0036	1
230	2950-0001	* Nut, Hexagon, Brass, 3/8-32, 1/2 in.	00000	OBD	1
231	2190-0016	* Washer, Lock, Int. No. 3/8 in. --- x ---	00000	OBD	1
232	02758-00161	* Brake Mount Bracket	28480	02758-00161	1



ued)

QTY	MFR PART NO.	UNITS PER ASSY
30	2100-0079	1
30	0590-0035	1
30	0590-0036	1
30	OBD	1
30	OBD	1
30	02758-00161	1

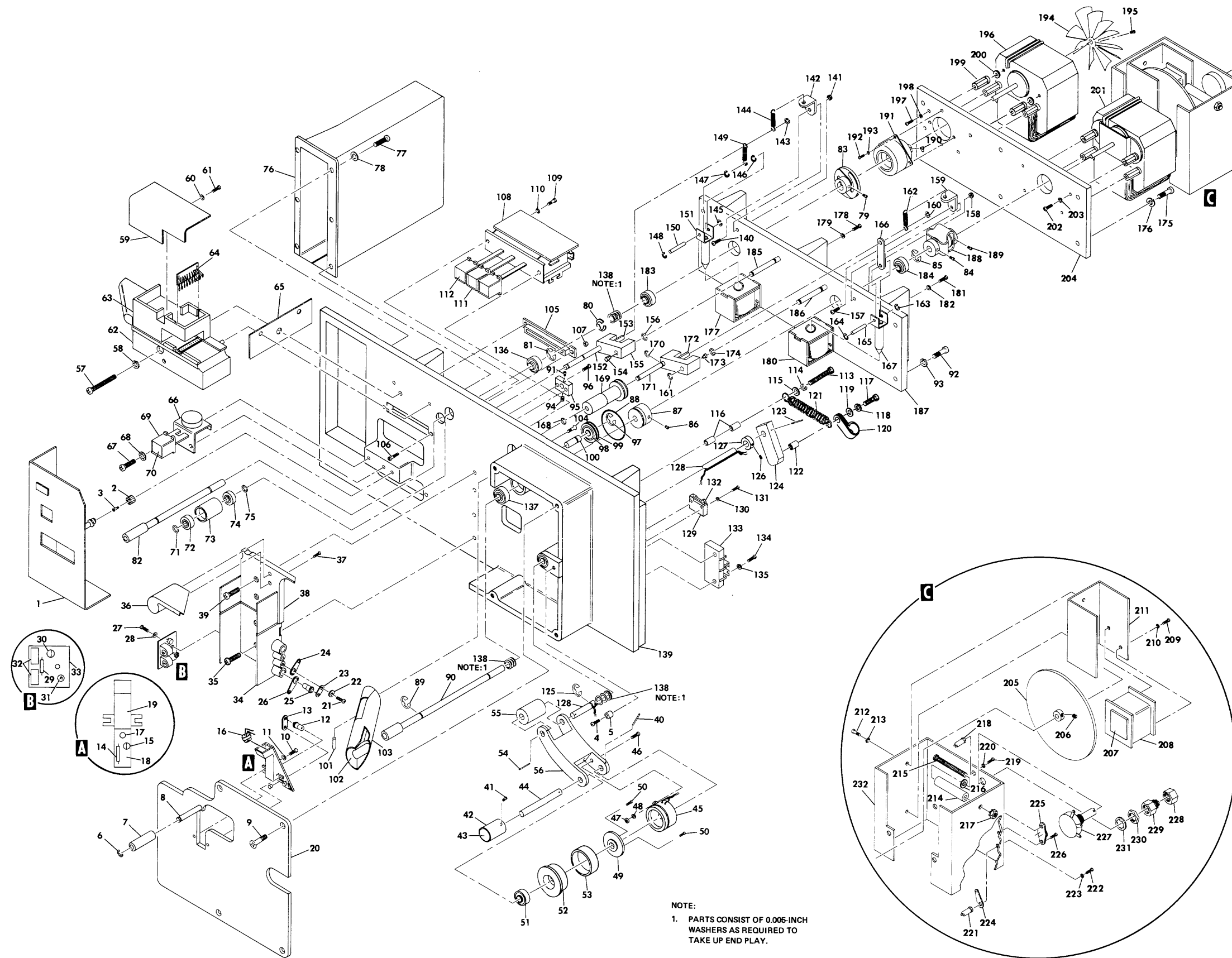


Figure 5-2. Front Panel Assembly Exploded View



Table 5-3. Deck Assembly Replaceable Parts

FIG. & INDEX NO.	HP PART NO.	DESCRIPTION	MFR CODE	MFR PART NO.	UNITS PER ASSY
5-3-1	02758-20464	DECK ASSEMBLY	28480		1
	7120-0137	* High Voltage Shield	83309	02758-20464	3
2	1390-0107	* Decal, High Voltage	13061	3521	4
		* Button Latch (Attaching Parts)		B10-B1	4
3	2360-0210	* Screw, Machine, FH, No. 6-32, 5/8 in.	00000	OBD	4
4	2420-0004	* Nut, Assembled Washer, No. 6-32, 5/16 in.	00000	OBD	4
5	3050-0228	* Washer, Flat, No. 6, 5/16 in.	00000	OBD	4
	2360-0183	* Screw, Machine, FH, No. 6-32, 3/8 in.	00000	OBD	4
		---- x ----			
6	02758-20465	* Spacer (Attaching Parts)	28480	02758-20465	4
7	2360-0183	* Screw, Machine, FH, No. 6-32, 3/8 in.	00000	OBD	4
8	2190-0851	* Washer, Lock, No. 6	00000	OBD	4
		---- x ----			
9	9100-2801	* Choke, 2 ohms, 1.0A, L1 (Attaching Parts)	28480	9100-2801	1
10	2520-0013	* Screw, Machine, slotted head, No. 8-32, 2-1/4 in.	00000	OBD	4
11	3050-0239	* Washer, Nonmetallic, No. 8	00000	OBD	4
	2580-0004	* Nut, Plain, Hexagon, No. 8-32	00000	OBD	4
	2190-0076	* Washer, Lock, No. 8	00000	OBD	4
	2580-0003	* Nut, Assembled Washer, No. 8-32	00000	OBD	4
		---- x ----			
12	02758-0002	* PC Guide Bracket (Attaching Parts)	28480	02758-0002	1
	2360-0197	* Screw, Machine, PH, No. 6-32, 3/8 in.	00000	OBD	4
	2190-0851	* Washer, Lock, No. 6	00000	OBD	4
		---- x ----			
13	02758-2008	* PC Guide (Attaching Parts)			
	2360-0203	* Screw, Machine, PH, No. 6-32, 5/8 in.	00000	OBD	2
	2190-0851	* Washer, Lock, No. 6	00000	OBD	4
	0380-0165	* Spacer, 9/16 in.	00000	OBD	2
	2360-0131	* Screw, Machine, PH, No. 6-32, 1-1/4 in.	00000	OBD	2
	2420-0002	* Nut, Plain, Hexagon, No. 6-32	00000	OBD	4
		---- x ----			
14	02758-6004	* Power Supply Assy A1 (See figure 4-10)	28480	02758-6004	1
15	02758-6005	* Control Assy A2 (See figure 4-9)	28480	02748-6001	1
16	02758-6003	* Interface Assy (See figure 4-8)	28480	02758-6003	1
17	0811-1655	* Resistor, Fxd, WW, 10 ohms, 5%, 20W, R71	91637	0811-1655	1
18	2100-0463	* Resistor, Var, 2.5K, 10%, 2.25W, R72	28480	2100-0463	1
19	1902-0035	* Diode, Breakdown, 120V, 10W, CR71	28480	1902-0035	1
20	1854-0072	* Transistor, Si, NPN, Q1 (Attaching Parts)	02735	2N3054	1
	2360-0117	* Screw, Machine, PH, No. 6-32, 3/8 in.	00000	OBD	2
	1200-0168	* Socket, Transistor, XQ1	28480	1200-0168	1
		---- x ----			
21	1854-0072	* Transistor, Si, NPN, Q10 (Attaching Parts)	02735	2N3054	1
	2360-0117	* Screw, Machine, PH, No. 6-32, 3/8 in.	00000	OBD	2
	1200-0168	* Socket, Transistor (XQ10)	28480	1200-0186	1
		---- x ----			
22	1884-0062	* Thyristor, Q22 (Attaching Parts)	04713	40429	1
	2360-0117	* Screw, Machine, PH, No. 6-32, 3/8 in.	00000	OBD	2
	1200-0168	* Socket, Thyristor, (XQ22)	28480	1200-0186	1
		---- x ----			
23	1854-0072	* Transistor, Si, NPN, Q23 (Attaching Parts)	02735	2N3054	1
	2360-0117	* Screw, Machine, PH, No. 6-32, 3/8 in.	00000	OBD	2
	1200-0168	* Socket, Transistor (XQ23)	28480	1200-0186	1
		---- x ----			

Table 5-3. Deck Assembly Replaceable Parts (Continued)

FIG. & INDEX NO.	HP PART NO.	DESCRIPTION	MFR CODE	MFR PART NO.	UNITS PER ASSY
24	1854-0052	* Transistor, Si, NPN, Q27 (Attaching Parts)	02735	2N3054	1
	2360-0117	* Screw, Machine, PH, No. 6-32, 3/8 in.	00000	OBD	2
	1200-0168	* Socket, Transistor (XQ27) ---- x ----	28480	1200-0186	1
25	1854-0217	* Transistor, Si, NPN, Q2 (Attaching Parts)	02735	2N3442	1
	2360-0117	* Screw, Machine, PH, No. 6-32, 3/8 in.	00000	OBD	2
	1200-0041	* Socket, Transistor (XQ2) ---- x ----	28480	1200-0041	1
27	1854-0217	* Transistor Si, NPN, Q24 (Attaching Parts)	02735	2N3442	1
	2360-0117	* Screw, Machine, PH, No. 6-32, 3/8 in.	00000	OBD	2
	1200-0041	* Socket, Transistor (XQ24) ---- x ----	28480	1200-0041	1
28	1854-0217	* Transistor, Si, NPN, Q25 (Attaching Parts)	02735	2N3442	1
	2360-0117	* Screw, Machine, PH, No. 6-32, 3/8 in.	00000	OBD	2
	1200-0041	* Socket, Transistor (XQ25) ---- x ----	28480	1200-0041	1
26	1854-0063	* Transistor Si, NPN, Q9 (Attaching Parts)	04713	2N3055	1
	2360-0117	* Screw, Machine, PH, No. 6-32, 3/8 in.	00000	OBD	2
	1200-0041	* Socket, Transistor (XQ9) ---- x ----	28480	1200-0041	1
29	0180-0046	* Capacitor, fxd, Elect, 600 uf, -10 +75%, 200 VDCW, C3	56289	D32569-DFP	1
30	0180-0047	* Capacitor, fxd, Alum, 500 uf, 75VDCW, C4	56289	D32443-DFP	1
31	0180-0056	* Capacitor, fxd, Elect, 1000 uf, 50VDCW, C5	56289	D32429-DFP	1
32	0180-0198	* Capacitor, fxd, Elect, 1500 uf, 50VDCW, C6	56289	D42962-DFP	1
33	0180-0204	* Capacitor, fxd, Al-elect, 2800uf, -10+100%, 40 VDCW, C22	56289	D37694-DFP	1
34	0180-0208	* Capacitor, fxd, Elect, 40uf, 450 VDCW, C71	56289	D33148	1
35	0180-1869	* Capacitor, fxd, Al-elect, 8700uf, +75-10%, 50VDCW, C23 (Attaching Parts)	56289	32D8726050	1
	2360-0117	* Screw, Machine, PH, No. 6-32, 3/8 in.	00000	OBD	3
	3050-0227	* Washer, Lock, No. 6	00000	OBD	1
	2420-0001	* Nut, Assembled, Washer, No. 6 ---- x ----	00000	OBD	3
36	9100-1234	* Transformer, Power, T1 (Attaching Parts)	28480	9100-1234	1
37	2520-0013	* Screw, Machine, slotted head, No. 8-32, 2-1/4 in.	00000	OBD	4
38	3050-0239	* Washer, Nonmetallic, No. 8	00000	OBD	4
	2580-0003	* Nut, Assembled Washer, No. 8-32, 11/32 in. ---- x ----	00000	OBD	4
39	2100-0463	* Resistor, Var, 2.5K, 10%, 2.25W, R75 (Attaching Parts)	28480	2100-0463	1
	0590-0035	* Nut, Pot Locking	28480	0590-0035	1
	0590-0036	* Bushing, Pot Locking	28480	0590-0036	1
	2950-0001	* Nut	00000	OBD	1
	2190-0016	* Washer, Lock, Int, No. 3/8 in. ---- x ----	00000	OBD	1
40	0360-1156	* Barrier Block, 10 term. (Attaching Parts)	71785	353-18-10-001	1
	2300-0201	* Screw, Machine, PH, No. 6-32, 1/2 in. ---- x ----	00000	OBD	2
41	02758-0004	* Deck	28480	02758-0004	1

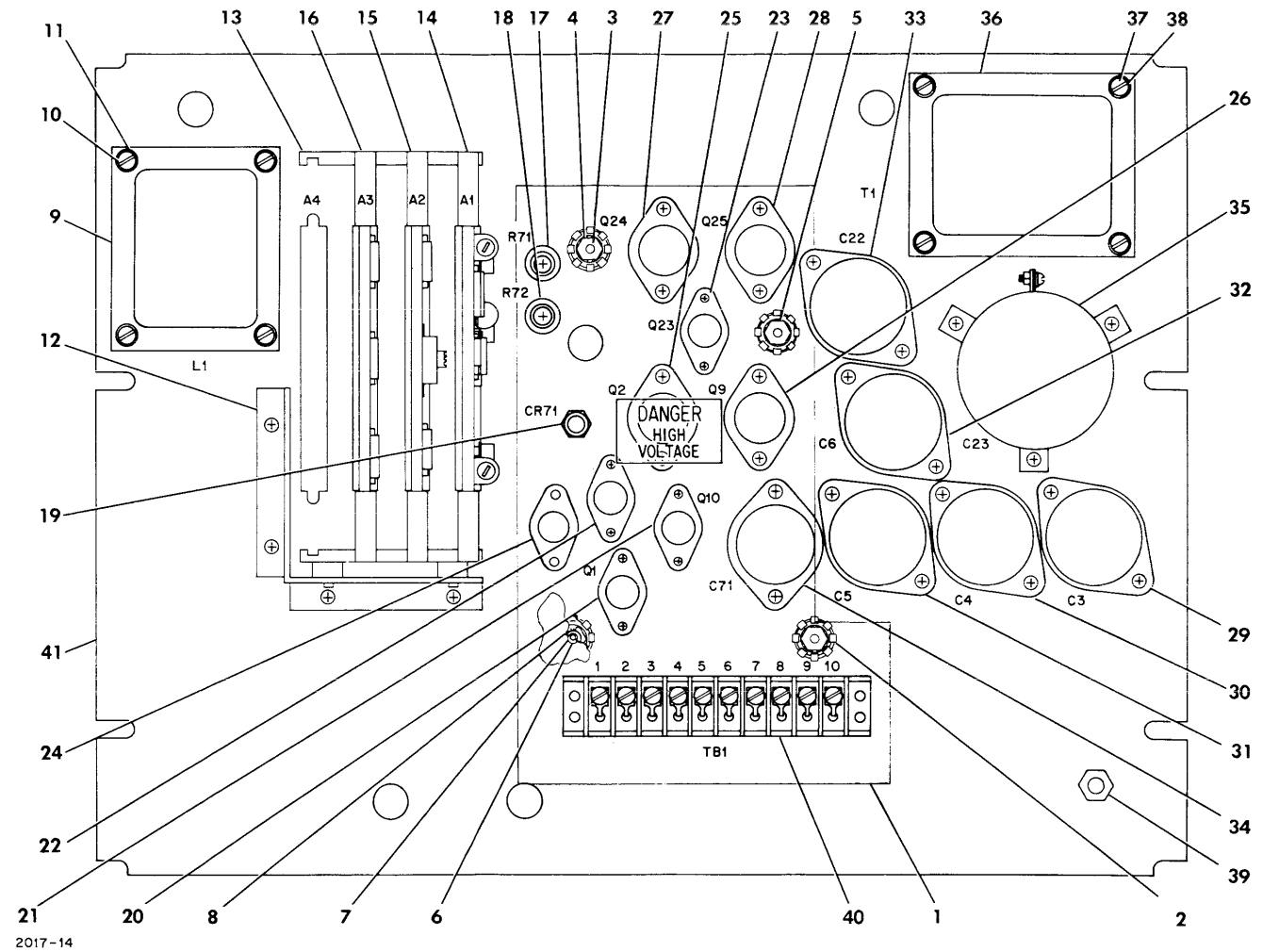
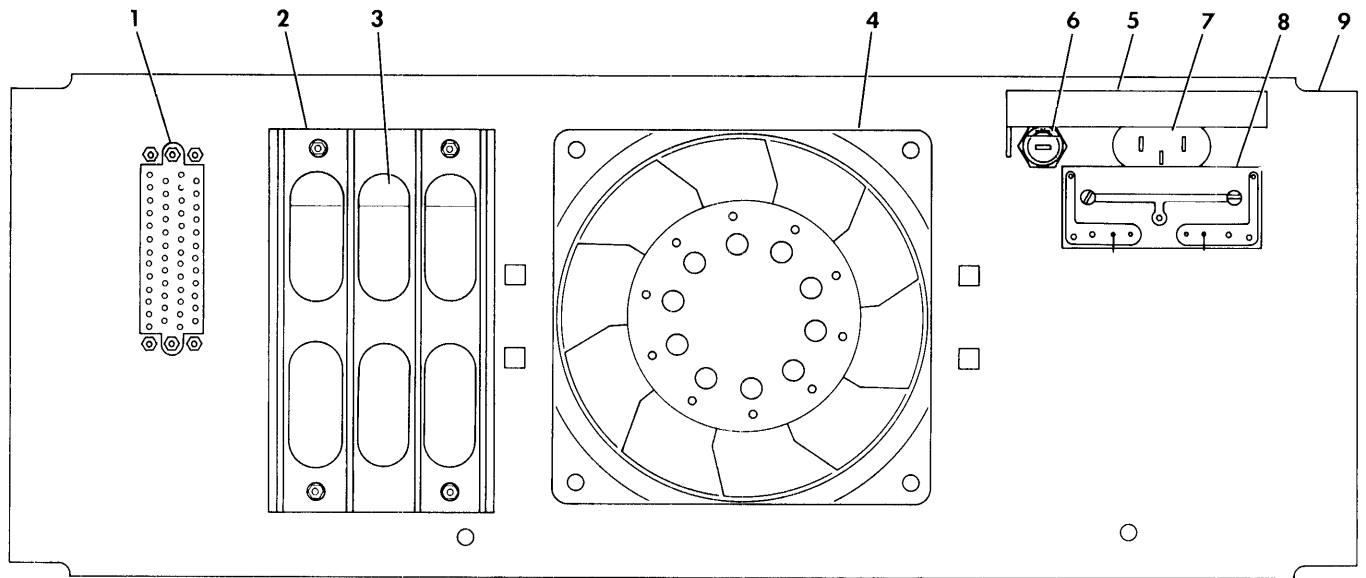


Figure 5-3. Deck Assembly Parts Location Diagram

Table 5-4. Rear Panel Assembly Replaceable Parts

FIG. & INDEX NO.	HP PART NO.	DESCRIPTION	MFR CODE	MFR PART NO.	UNITS PER ASSY
5-4-1	1251-0338	REAR PANEL ASSEMBLY * Connector Insert, 50 pin (Attaching Parts)	95238	25-50-SS	1
	2200-0143	* Screw, Machine, PH, No. 4-40, 3/8 in.	00000	OBD	4
	2190-0003	* Washer, Lock, No. 4	00000	OBD	4
	2260-0002	* Nut, Plain, Hexagon, No. 4-40, 3/16 in. --- x ---	00000	OBD	4
2	02758-2008	* P.C. Guide (Attaching Parts)	28480	02758-2008	1
	2360-0203	* Screw, Machine, PH, No. 6-32, 5/8 in.	00000	OBD	2
	2360-0131	* Screw, Machine, PH, No. 6-32, 1-1/4 in.	00000	OBD	2
	2190-0851	* Washer, Lock, No. 6	00000	OBD	4
	0380-0165	* Spacer, 9/16 in.	00000	OBD	2
	2420-0002	* Nut, Plain, Hexagon, No. 6-32 --- x ---	00000	OBD	4
3	02758-0003	* P.C. Guide Bracket (Attaching Parts)	28480	02758-0003	1
	2360-0183	* Screw, Machine, PH, No. 6-32, 3/8 in.	00000	OBD	2
	2190-0851	* Washer, Lock, No. 6 --- x ---	00000	OBD	2
4	3160-0072	* Fan Assy, Tubeaxial (Attaching Parts)	23936	Model 2500	1
	2360-0210	* Screw, Machine, FH, No. 6-32, 5/8 in.	00000	OBD	4
	2420-0001	* Nut, Assembled Washer, No. 6-32, 5/16 in. --- x ---	00000	OBD	4
5	02758-0016	* Shield (Attaching Parts)	28480	02758-0016	1
	2360-0183	* Screw, Machine, PH, No. 6-32, 3/8 in.	00000	OBD	2
	2190-0851	* Washer, Lock, No. 6 --- x ---	00000	OBD	2
6	2110-0023	* Fuse, 6.25A, F1	00000	OBD	1
	1400-0084	* Fuse Holder, XF1	75915	342014	1
7	9100-2183	* Line Filter (Attaching Parts)	28480	9100-2183	1
	2200-0143	* Screw, Machine, PH, No. 4-40, 3/8 in.	00000	OBD	2
	2190-0003	* Washer, Lock, No. 4	00000	OBD	2
	5020-1917	* Standoff --- x ---	28480	5020-1917	2
	0150-0119	* Capacitor, Fxd, Cer, 2x.01 uf, 20% 2500 VDCW, C1	56289	32C219A-CDH	1
8	1251-0148	* Connector, Receptacle, power, J1	82389	AC3G	1
	5060-0878	* Cover, Fan Filter	28480	5060-0878	1
9	02758-0005	* Rear Panel (Attaching Parts)	28480	02748-0006	1
	2510-0103	* Screw, Machine, PH, No. 8-32, 3/8 in.	00000	OBD	2
	2190-0076	* Washer, Lock, No. 8	00000	OBD	2



2017 - 13

Figure 5-4. Rear Panel Assembly Parts Location Diagram

Table 5-5. Tape Reader-Reroller Electrical Parts

HP PART NO.	DESCRIPTION	MFR CODE	MFR PART NO.	TQ
0140-0200	Capacitor, Fxd, Mica, 390 pf, 5%	28480	0140-0200	1
0150-0093	Capacitor, Fxd, Cer. 0.01 uf +80-20%, 100VDCW	91418	TA OBD	1
0150-0119	Capacitor, Fxd, Cer, 2x.01 uf, 20%, 2500 VDCW	56289	32C219A-CDH	1
0160-0300	Capacitor, Fxd, My, 0.0027 uf, 10%, 200 VDCW	28480	0160-0300	1
0160-2198	Capacitor, Fxd, Mica, 20 pf, 5%	28480	0160-2198	4
0160-2204	Capacitor, Fxd, Mica, 100 pf, 5%	28480	0160-2204	9
0160-2307	Capacitor, Fxd, Mica, 47 pf, 5%	28480	0160-2307	2
0180-0089	Capacitor, Fxd, Elect, 10 uf -10% +100%, 150 VDCW	56289	30D106G150DF4	2
0180-0291	Capacitor, Fxd, Elect, 1.0 uf, 10%, 35 VDCW	28480	0180-0291	2
0180-0046	Capacitor, Fxd, Elect, 600 uf, -10 +75%, 200 VDCW	56289	D32569-DFP	1
0180-0047	Capacitor, Fxd, Alum, 500 uf, 75 VDCW	56289	D32443-DFP	1
0180-0056	Capacitor, Fxd, Elect, 1000 uf, 50 VDCW	56289	D32429-DFP	1
0180-0089	Capacitor, Fxd, Elect, 10 uf, -10 +100%, 150 VDCW	56289	D0D106G150DF4	2
0180-0198	Capacitor, Fxd, Elect, 1500 uf, 50 VDCW	56289	D42962-DFP	1
0180-0204	Capacitor, Fxd, Al-Elect, 2800 uf, -10 +100%, 40 VDCW	56289	D37694-DFP	1
0180-0208	Capacitor, Fxd, Elect, 40 uf, 450 VDCW	56289	D33148	1
0180-0291	Capacitor, Fxd, Elect, 1.0 uf, 10%, 35 VDCW	28480	0180-0291	2
0180-1869	Capacitor, Fxd, Al-Elect, 8700 uf, +75 -10%, 50 VDCW	56289	BF2A-DQC	1
0490-0412	Relay, 1 form A, 250V, 1A	02116	262-1A-12	1
0686-1035	Resistor, Fxd, Comp, 10K ohms, 5%, 1/2W	01121	EB1035	9
0698-0083	Resistor, Fxd, Met Flm, 1.96K, 1%, 1/8W	28480	0698-0083	2
0698-0085	Resistor, Fxd, Met Flm, 2.15K, 1%, 1/8W	28480	0698-0085	2
0698-3125	Resistor, Fxd, Depec, 1.50 megohm, 1%, 1/8W	28480	0698-3125	1
0698-3136	Resistor, Fxd, Met Flm, 17.8K, 1%, 1/8W	28480	0698-3136	9
0698-3150	Resistor, Fxd, Met Flm, 2.37K, 1%, 1/8W	28480	0698-3150	2
0698-3154	Resistor, Fxd, Met Flm, 4.22K, 1%, 1/8W	28480	0698-3154	1
0698-3156	Resistor, Fxd, Met Flm, 14.7K, 1%, 1/8W	28480	0698-3156	11
0698-3157	Resistor, Fxd, Met Flm, 19.6K, 1%, 1/8W	14674	C4 OBD	1
0698-3159	Resistor, Fxd, Met Flm, 26.1K, 1%, 1/8W	28480	0698-3159	1
0698-3160	Resistor, Fxd, Met Flm, 31.6K, 1%, 1/8W	14674	C4 OBD	2
0698-3162	Resistor, Fxd, Met Flm, 46.4K, 1%, 1/8W	28480	0698-3162	1
0698-3266	Resistor, Fxd, Met Flm, 237K, 1%, 1/8W	28480	0698-3266	1
0698-3358	Resistor, Fxd, Met Flm, 1K, 0.5%, 1/8W	28480	0698-3358	2
0698-3402	Resistor, Fxd, Met Flm, 316 ohms, 1%, 1/2W	28480	0698-3402	1
0698-3404	Resistor, Fxd, Met Flm, 383 ohms, 1%, 1/2W	28480	0698-3404	2
0698-3438	Resistor, Fxd, Met Flm, 147 ohms, 1%, 1/8W	28480	0698-3438	2
0698-3444	Resistor, Fxd, Met Flm, 316 ohms, 1%, 1/8W	28480	0698-3444	1
0698-3446	Resistor, Fxd, Met Flm, 383 ohms, 1%, 1/8W	28480	0698-3446	1
0698-3454	Resistor, Fxd, Met Flm, 215K, 1%, 1/8W	28480	0698-3454	2
0698-3458	Resistor, Fxd, Met Flm, 348K, 1%, 1/8W	28480	0698-3458	1
0698-3629	Resistor, Fxd, Met Ox, 270 ohms, 5%, 2W	28480	0698-3629	1
0757-0280	Resistor, Fxd, Met Flm, 1K, 1%, 1/8W	28480	0757-0280	2
0757-0317	Resistor, Fxd, Met Flm, 1.33K, 1%, 1/8W	28480	0757-0317	1
0757-0338	Resistor, Fxd, Met Flm, 1.00K, 1%, 1/4W	28480	0757-0338	1
0757-0394	Resistor, Fxd, Met Flm, 51.1 ohms, 1%, 1/8W	14674	C4 OBD	2
0757-0395	Resistor, Fxd, Met Flm, 56.2 ohms, 1%, 1/8W	28480	0757-0395	2
0757-0398	Resistor, Fxd, Met Flm, 75 ohms, 1%, 1/8W	28480	0757-0398	1
0757-0428	Resistor, Fxd, Met Flm, 1.62K, 1%, 1/8W	14674	C4 OBD	1
0757-0438	Resistor, Fxd, Met Flm, 5.11K, 1%, 1/8W	14674	C4 OBD	4
0757-0439	Resistor, Fxd, Met Flm, 6.81K, 1%, 1/8W	28480	0757-0439	2
0757-0440	Resistor, Fxd, Met Flm, 7.50K, 1%, 1/8W	14674	C4 OBD	1
0757-0442	Resistor, Fxd, Met Flm, 10.0K, 1%, 1/8W	14674	C4 OBD	1
0757-0443	Resistor, Fxd, Met Flm, 11.0K, 1%, 1/8W	28480	0757-0443	12
0757-0446	Resistor, Fxd, Met Flm, 15.0K, 1%, 1/8W	28480	0757-0446	10
0757-0447	Resistor, Fxd, Met Flm, 16.2K, 1%, 1/8W	28480	0757-0447	4
0757-0452	Resistor, Fxd, Met Flm, 27.4K, 1%, 1/8W	28480	0757-0452	1
0757-0458	Resistor, Fxd, Met Flm, 51.1K, 1%, 1/8W	28480	0757-0458	5
0757-0459	Resistor, Fxd, Met Flm, 56.2K, 1%, 1/8W	28480	0757-0459	2
0757-0460	Resistor, Fxd, Met Flm, 61.9K, 1%, 1/8W	28480	0757-0460	10
0757-0465	Resistor, Fxd, Met Flm, 100K, 1%, 1/8W	14674	C4 OBD	10

Table 5-5. Tape Reader-Reroller Electrical Parts (Continued)

HP PART NO.	DESCRIPTION	MFR CODE	MFR PART NO.	TQ
0757-0470	Resistor, Fxd, Met Flm, 162K, 1%, 1/8W	28480	0757-0470	1
0757-0731	Resistor, Fxd, Met Flm, 825 ohms, 1%, 1/4W	28480	0757-0731	2
0757-0752	Resistor, Fxd, Met Flm, 8.25K, 1%, 1/4W	91637	MF-1/8-44	1
0757-0815	Resistor, Fxd, Met Flm, 562 ohms, 1%, 1/2W	28480	0757-0815	2
0757-0816	Resistor, Fxd, Met Flm, 681 ohms, 1%, 1/2W	28480	0757-0816	1
0757-1090	Resistor, Fxd, Met Flm, 261 ohms, 1%, 1/2W	28480	0757-1090	1
0760-0024	Resistor, Fxd, Met Ox, 100 ohms, 5%, 1W	14674	C-32 OBD	1
0761-0026	Resistor, Fxd, Met Ox, 220 ohms, 5%, 1W	14674	C-32 OBD	1
0764-0013	Resistor, Fxd, Met Ox, 56 ohms, 5%, 2W	28480	0764-0013	2
0811-1674	Resistor, Fxd, WW, 4.7 ohms, 5%, 2W	28480	0811-1674	2
0813-0038	Resistor, Fxd, WW, 0.5 ohm, 10%, 5W	28480	0813-0038	1
0816-0020	Resistor, Fxd, WW, 110 ohms, 10%, 10W	28480	0180-0020	1
1251-0148	Connector, Receptacle, power	82389	AC3G	1
1251-0338	Connector, Insert, 50 pin	95238	25-50-SS	2
1500-0226	Clutch	16554	BEC-11CC-4-3	1
1500-0276	Brake, Magnetic	16554	17EC-08-B-3	1
1820-0123	Integrated Circuit, voltage regulator	12040	LM300	2
1853-0041	Transistor, Si, PNP	02735	38640	2
1854-0052	Transistor, Si, NPN	02735	2N3054	1
1854-0063	Transistor, Si, NPN	04713	2N3055	1
1854-0071	Transistor, Si, NPN	28480	1854-0071	35
1854-0072	Transistor, Si, NPN	02735	2N3054	4
1854-0217	Transistor, Si, NPN	02735	2N3442	3
1854-0246	Transistor, Si, NPN	28480	1854-0246	2
1884-0062	Thyristor	04713	40429	1
1901-0049	Diode, Si, 50 piv	28480	1901-0049	2
1901-0081	Diode, Si, 50 VDCW	07263	FD1415	37
1901-0200	Diode, Si, 100 piv, 3 amp	02735	1N4998	10
1901-0416	Diode, Si, 200 piv, 3 amp	28480	1901-0416	5
1901-0492	Diode, Si, 3 amp	04713	1N5002	1
1902-0035	Diode, Breakdown, 120V, 10W	28480	1902-0035	1
1902-0041	Diode, Breakdown, 5.11V, 5%	28480	1902-0041	1
1990-0085	Phototransistor, 30V	07263	FPT-100	2
1990-0086	Lamp Assy	28480	1990-0086	1
2100-0079	Resistor, Var, Comp, 250 ohms, 2W	28480	2100-0079	1
2100-0463	Resistor, Var, 2.5K, 10%, 2.25W	28480	2100-0463	2
2100-1758	Resistor, Var, WW, 1K, 10%, 1/2W	28480	2100-1758	2
2100-1967	Resistor, Var, 200K, 20%, 3/4W	28480	2100-1967	2
2110-0023	Fuse, 6.25 amp	00000	OBD	1
2140-0209	Lamp, Incandescent, 14V, 0.08 amp	03508	382	2
3101-0729	Switch, Pushbutton	28480	3101-0729	1
3101-0973	Switch, Slide, DPDT, 0.05 amp, 125V, AC/DC	79727	G126-0018	1
3102-0015	Switch, micro	28480	3102-0015	1
3140-0446	Motor, Shaded, Pole	28480	3140-0046	2
3160-0072	Fan Assy, Tubeaxial	23936	Model 2500	1
5080-1570	Switch, Pushbutton	28480	5080-1570	1
9100-1234	Transformer, Power	28480	9100-1234	1
9100-2183	Line Filter	28480	9100-2183	1
9100-2801	Choke, 2 ohms, 1.0 amp	28480	9100-2801	1
9100-2901	Coil	28480	9100-2901	1
02758-6003	Interface Card	28480	02758-6003	1
02758-6004	Power Supply Assy	28480	02758-6004	1
02758-6005	Control Card	28480	02758-6005	1
02758-6008	Loop Sensor Assy	28480	02758-6008	1
02758-6009	Malfunction Detector Assy	28480	02758-6009	1
02758-6012	Read Head Assy	28480	02758-6012	1
02758-8008	P.C. Board Blank	28480	02758-8008	1
02758-8009	P.C. Board Blank	28480	02758-8009	1
02758-20468	Solenoid	28480	02758-20468	2

Table 5-6. Tape Reader-Reroller Mechanical Parts

HP PART NO.	DESCRIPTION	MFR CODE	MFR PART NO.	TQ
0360-0038	Terminal Board	28480	0360-0038	1
0360-0272	Solder Lug, No. 4	00000	OBD	2
0360-0279	Standoff, No. 4-40, 1/4 in.	28480	0360-0279	2
0360-1156	Barrier Block, 10 term.	71785	353-18-10-001	1
0361-0140	Rivet, Semitubular, 1/8 in.	00000	OBD	1
0370-0118	Pushbuttons	28480	0370-0118	4
0370-0448	Knob	28480	0370-0448	1
0380-0002	Spacer, 1/4 in.	00000	OBD	1
0380-0006	Spacer, 3/8 in.	00000	OBD	1
0380-0010	Spacer, 5/8 in.	00000	OBD	2
0380-0165	Spacer, 9/16 in.	00000	OBD	4
0510-0045	Ring, Retaining, 3/16 in.	00000	OBD	1
0510-0052	Ring, Grip, 1/8 in.	00000	OBD	8
0510-1055	Ring, Retaining, 1/4 in.	00000	OBD	13
0520-0136	Screw, Machine, PH, No. 2-56, 5/8 in.	00000	OBD	2
0590-0035	Nut, Potlocking	28480	0590-0035	2
0590-0036	Bushing, Potlocking	28480	0590-0036	2
0590-0076	Nut, Hexagon, Self-Locking, No. 4	00000	OBD	2
0905-0354	O-Ring, 1.734 ID	00000	OBD	1
1200-0041	Socket, Transistor	28480	1200-0041	4
1200-0168	Socket, Transistor	28480	1200-0168	6
1390-0107	Button Latch	13061	B10-B1	5
1400-0082	Cable Clamp	00000	OBD	1
1400-0084	Fuse Holder	75915	342014	1
1410-0015	Bearing, Ball, Annular	28480	1410-0015	8
1410-0045	Bushing, Bronze, .315 OD, .189 ID	28480	1410-0045	4
1460-0033	Spring, .125 OD	00000	OBD	2
1460-1080	Spring, .375 OD	00000	OBD	1
1460-1105	Spring, .250 OD	00000	OBD	1
1480-0014	Pin, Dowel, No. 1/8, 3/4 in.	00000	OBD	3
1480-0084	Pin, Split, 1/8 in., 1/2 in.	00000	OBD	2
1480-0112	Roll Pin, 1/16 in., 1/2 in.	00000	OBD	3
1500-0245	Flexible Coupler	28480	1500-0245	1
1500-0275	Armature & Hub	16554	EC-11-064	1
1500-0276	Brake, Magnetic	16554	17EC-08B-3	1
2190-0003	Washer, Lock, No. 4	00000	OBD	13
2190-0005	Washer, Lock, Ext, No. 4	00000	OBD	6
2190-0008	Washer, Lock, Ext, No. 6	00000	OBD	2
2190-0009	Washer, Lock, Int, No. 8	00000	OBD	1
2190-0016	Washer, Lock, Int, No. 3/8 in.	00000	OBD	2
2190-0037	Washer, Lock, Int, No. 6	00000	OBD	2
2190-0045	Washer, Lock, No. 2	00000	OBD	2
2190-0076	Washer, Lock, No. 8	00000	OBD	16
2190-0851	Washer, Lock, No. 6	00000	OBD	30
2200-0103	Screw, Machine, W/Ext Lock, PH, No. 4-40, 1/4 in.	00000	OBD	2
2200-0139	Screw, Machine, PH, No. 4-40, 1/4 in.	00000	OBD	5
2200-0143	Screw, Machine, PH, No. 4-40, 3/8 in.	00000	OBD	8
2200-0144	Screw, Machine, FH, No. 4-40, 3/8 in.	00000	OBD	2
2200-0147	Screw, Machine, PH, No. 4-40, 1/2 in.	00000	OBD	4
2200-0149	Screw, Machine, PH, No. 4-40, 5/8 in.	00000	OBD	2
2200-0152	Screw, Machine, FH, No. 4-40, 3/4 in.	00000	OBD	3
2220-0009	Screw, Machine, Fil H, No. 4-40, 5/16 in.	00000	OBD	4
2260-0001	Nut, Plain, Hexagon, No. 4, 1/4 in.	00000	OBD	1
2260-0002	Nut, Plain, Hexagon, No. 4, 3/16 in.	00000	OBD	4
2360-0117	Screw, Machine, PH, No. 6-32, 3/8 in.	00000	OBD	22
2360-0131	Screw, Machine, PH, No. 6-32, 1-1/4 in.	00000	OBD	4
2360-0183	Screw, Machine, FH, No. 6-32, 3/8 in.	00000	OBD	14
2360-0197	Screw, Machine, PH, No. 6-32, 3/8 in.	00000	OBD	8
2360-0201	Screw, Machine, PH, No. 6-32, 1/2 in.	00000	OBD	4
2360-0203	Screw, Machine, PH, No. 6-32, 5/8 in.	00000	OBD	14
2360-0204	Screw, Machine, PH, No. 6-32, 3/4 in.	00000	OBD	1

Table 5-6. Tape Reader-Reroller Mechanical Parts (Continued)

HP PART NO.	DESCRIPTION	MFR CODE	MFR PART NO.	TQ
2360-0210	Screw, Machine, FH, No. 6-32, 5/8 in.	00000	OBD	8
2360-0220	Screw, Machine, PH, No. 6-32, 2-1/2 in.	00000	OBD	1
2420-0001	Nut, Assembled Washer, No. 6-32, 5/16 in.	00000	OBD	10
2420-0002	Nut, Plain, Hexagon, No. 6-32	00000	OBD	8
2420-0004	Nut, Assembled Washer, No. 6-32, 5/16 in.	00000	OBD	4
2510-0045	Screw, Machine, PH, No. 8-32, 3/8 in.	00000	OBD	6
2510-0063	Screw, Machine, PH, No. 8-32, 1-1/2 in.	00000	OBD	1
2510-0065	Screw, Machine, PH, No. 8-32, 1-3/4 in.	00000	OBD	1
2510-0103	Screw, Machine, PH, No. 8-32, 3/8 in.	00000	OBD	2
2510-0106	Screw, Machine, FH, No. 8-32, 1/2 in.	00000	OBD	6
2510-0109	Screw, Machine, PH, No. 8-32, 5/8 in.	00000	OBD	15
2520-0013	Screw, Machine, Slotted Head, No. 8-32, 2-1/2 in.	00000	OBD	8
2580-0003	Nut, Assembled Washer, No. 8-32	00000	OBD	8
2580-0004	Nut, Plain, Hexagon, No. 8-32	00000	OBD	4
2950-0001	Nut, Hexagon, Brass, 3/8-32, 1/2 in.	00000	OBD	2
3030-0001	Setscrew, 8-32, 3/16 in.	00000	OBD	5
3030-0007	Setscrew, 4-40, 1/8 in.	00000	OBD	5
3030-0020	Setscrew, 8-32, 3/16 in.	00000	OBD	2
3030-0033	Setscrew, 6-32, .188 in.	00000	OBD	1
3050-0005	Washer, Nonmetallic, No. 6	00000	OBD	1
3050-0139	Washer, Flat, No. 8	00000	OBD	8
3050-0222	Washer, Flat, No. 4, 5/16 in.	00000	OBD	1
3050-0227	Washer, Flat, No. 6, 3/8 in.	00000	OBD	5
3050-0228	Washer, Flat, No. 6, 5/16 in.	00000	OBD	4
3050-0229	Washer, Flat, No. 4	00000	OBD	4
3050-0239	Washer, Nonmetallic, No. 8	00000	OBD	8
3101-0167	Actuator	28480	3101-0167	1
4040-0411	Input Bin	28480	4040-0411	1
5000-0530	Knob Insert	28480	5000-0530	1
5020-0233	Collar, 1/4 in.	00000	OBD	1
5020-1917	Standoff	28480	5020-1917	2
5060-0878	Cover, Fan Filter	28480	5060-0878	1
7120-0137	Decal, High Voltage	83309	3521	3
7120-1254	Control Panel	28480	7120-1254	1
02116-0001	Contact, Light Bulb	28480	02116-0001	1
02758-0001	Lamp Head Cover	28480	02758-0001	1
02758-0002	PC Guide Bracket	28480	02758-0002	1
02758-0003	PC Guide Bracket	28480	02758-0003	1
02758-0004	Deck	28480	02758-0004	1
02758-0005	Rear Panel	28480	02758-0005	1
02758-0007	Link, Load Roller	28480	02758-0007	1
02758-0011	Contact, Light Bulb	28480	02758-0011	1
02758-0015	Read Head, Gasket	28480	02758-0015	1
02758-0016	Shield	28480	02758-0016	1
02758-2008	PC Guide	28480	02758-2008	2
02758-2009	Helix	28480	02758-2009	1
02758-2010	Helix Cover	28480	02758-2010	1
02758-2012	Front Panel	28480	02758-2012	1
02758-2014	Bearing Carrier	28480	02758-2014	1
02758-2015	Motor Plate	28480	02758-2015	1
02758-2016	Reroller Panel	28480	02758-2016	1
02758-2017	Pinch Roller	28480	02758-2017	1
02758-2018	Roller, Can Guide	28480	02758-2018	1
02758-2019	Roller, RR Support	28480	02758-2019	1
02758-2020	Arm Load & Pinch Roller	28480	02758-2020	1
02758-2021	Pully, Idler	28480	02758-2021	1
02758-2022	Load—Capstan	28480	02758-2022	1
02758-2023	Shaft, Load & Pinch Roller	28480	02758-2023	2
02758-2024	Shaft, Load & Pinch Roller Mount	28480	02758-2024	2
02758-2025	Shaft, Press Arm	28480	02758-2025	1



Table 5-6. Tape Reader-Reroller Mechanical Parts (Continued)

HP PART NO.	DESCRIPTION	MFR CODE	MFR PART NO.	TQ
02758-2026	Shaft, Press Roll	28480	02758-2026	1
02758-2027	Shaft, Idler, Mount	28480	02758-2027	1
02758-2028	Shaft, RR, Support	28480	02758-2028	1
02758-2029	Capstan, Main Drive Shaft	28480	02758-2029	2
02758-2031	Arm, Tension, RR	28480	02758-2031	1
02758-2033	Pressure Arm, RR	28480	02758-2033	1
02758-2037	Spacer Tape	28480	02758-2037	1
02758-2038	Flywheel	28480	02758-2038	1
02758-2042	Roller, Cam, Idler	28480	02758-2042	1
02758-2043	Fan	28480	02758-2043	1
02758-2045	Spacer Bin	28480	02758-2045	1
02758-2046	Pulley, Drive	28480	02758-2046	1
02758-4001	Malfunction Detector Mount	28480	02758-4001	1
02758-6016	Canister	28480	02758-6016	1
02758-6020	Buffer Bin	28480	02758-6020	1
02758-8006	Lable, Power	28480	02758-8006	1
02758-00161	Brake Mount Bracket	28480	02758-00161	1
02758-00162	Magnet Armature	28480	02758-00162	1
02758-20461	Pole Piece	28480	02758-20461	1
02758-20464	High Voltage Shield	28480	02758-2-464	1
02758-20465	Spacer	28480	02758-20465	1
02758-20466	Spacer Block Adjust	28480	02758-20466	1
02758-20469	Tire, Canister Guide Roller	28480	02758-20469	2

Table 5-7. Reference Designations and Abbreviations

REFERENCE DESIGNATIONS		
A = assembly	J = receptacle connector	TB = terminal board
B = motor	K = relay	TP = test point
BT = battery	L = inductor	U = integrated circuit
C = capacitor	M = meter	V = vacuum tube, neon bulb, photocell, etc.
CP = coupler	MC = microcircuit	VR = voltage regulator
CR = diode	P = plug connector	W = cable, jumper
DL = delay line	Q = transistor	X = socket
DS = device signaling (lamp)	R = resistor	Y = crystal
E = misc hardware	RT = thermistor	Z = tuned cavity, network
F = fuse	S = switch	
FL = filter	T = transformer	
ABBREVIATIONS		
A = amperes	IMPG = impregnated	P/O = part of
AC = alternating current	IN. = inch, inches	POLY = polystyrene
AFC = automatic frequency control	INCD = incandescent	PORC = porcelain
ALUM = aluminum	INCL = include(s)	POS = position(s)
AL-ELECT = aluminum electrolytic	INS = insulation(ed)	POT = potentiometer
ASSY = assembly	INT = internal	PP = peak-to-peak
BFO = beat frequency oscillator	I/O = input/output	PT = point
BE CU = beryllium copper	K = kilo = 1000	PWV = peak working voltage
BH = binder head	LH = left hand	R = resistor
BP = bandpass	LIN = linear taper	RECT = rectifier
BRS = brass	LK WASH = lock washer	RF = radio frequency
BWO = backward wave oscillator	LOG = logarithmic taper	RH = round head or right hand
C = capacitor	LPF = low pass filter	RMO = rack mount only
CCW = counterclockwise	M = milli = 10 <sup>-3</sup>	RMS = root-mean square
CER = ceramic	MEG = mega = 10 <sup>6</sup>	RWV = reverse working voltage
CMO = cabinet mount only	MET FLM = metal film	S-B = slow-blow
COEF = coefficient	MET OX = metal oxide	SCR = screw
COM = common	MFR = manufacturer	SE = selenium
COMP = composition	MHz = megahertz	SECT = section(s)
COMPL = complete	MINAT = miniature	SEMICON = semiconductor
CONN = connector	MOM = momentary	SI = silicon
CP = cadmium plate	MTG = mounting	SIL = silver
CRT = cathode-ray tube	MY = Mylar	SL = slide
CTL = capacitor-transistor logic	N = nano (10 <sup>-9</sup> )	SPDT = single-pole, double-throw
CW = clockwise	N/C = normally closed	SPG = spring
DC = direct current	NE = neon	SPL = special
DEPC = deposited carbon	NI PL = nickel plate	SPST = single-pole, single-throw
DPDT = double-pole, double-throw	NO. = number	SR = split ring
DPST = double-pole, single-throw	N/O = normally open	SST = stainless steel
DR = drive	NPN = negative-positive-negative	STL = steel
ELECT = electrolytic	NPO = negative positive zero (zero temperature coefficient)	TA = tantalum
ENCAP = encapsulated	NRFR = not recommended for field replacement	TD = time delay
EXT = external	NSR = not separately replaceable	TGL = toggle
F = farads	OBD = order by description	THD = thread
FH = flat head	OD = outer diameter	TI = titanium
FIL H = fillister head	OH = oval head	TOL = tolerance
FXD = fixed	OX = oxide	TRIM = trimmer
G = giga (10 <sup>9</sup> )	P = peak	TTL = transistor-transistor logic
GE = germanium	PC = printed circuit	TWT = traveling wave tube
GL = glass	PF = picofarads = 10 <sup>-12</sup> farads	U (μ) = micro = 10 <sup>-6</sup>
GND/GRD = ground(ed)	PH = Phillips head	VAR = variable
H = henries	PH BRZ = phosphor bronze	VDCW = direct current working volts
HDW = hardware	PHL = Phillips	W/ = with
HEX = hexagonal	PIV = peak inverse voltage	W = watts
HG = mercury	PNP = positive-negative-positive	WIV = working inverse voltage
HR = hour(s)		WW = wirewound
HZ = hertz		W/O = without
ID = inner diameter		
IF = intermediate frequency		

Table 5-8. Code List of Manufacturers

The following code numbers are from the Federal Supply Code for Manufacturers Cataloging Handbooks H4-1 (Name to Code) and H4-2 (Code to Name) and their latest supplements. The date of revision and the date of the supplements used appear at the bottom of each page. Alphabetical codes have been arbitrarily assigned to suppliers not appearing in the H4 Handbooks.

Code No.	Manufacturer	Address	Code No.	Manufacturer	Address	Code No.	Manufacturer	Address
00000	U. S. A. Common	Any supplier of U. S.	05245	Components Corp.	Chicago, Ill.	09145	Tech. Ind. Inc. Atohm Elect.	Burbank, Calif.
00136	McCoy Electronics	Mount Holly Springs, Pa.	05277	Westinghouse Electric Corp.		09250	Electro Assemblies, Inc.	Chicago, Ill.
00213	Sage Electronics Corp.	Rochester, N. Y.		Semi-Conductor Dept.	Youngwood, Pa.	09353	C & K Components Inc.	Newton, Mass.
00287	Cemco Inc.	Danielsville, Conn.	05347	Ultronix, Inc.	San Mateo, Calif.	09569	Mallory Battery Co. of	Canada, Ltd. Toronto, Ontario, Canada
00334	Humidial	Colton, Calif.	05397	Union Carbide Corp., Elect. Div.	New York, N. Y.	09922	Burdoy Corp.	Norwalk, Conn.
00348	Microtron Co., Inc.	Valley Stream, N. Y.	05574	Viking Ind. Inc.	Canoga Park, Calif.	10214	General Transistor Western Corp.	Los Angeles, Calif.
00373	Garlock Inc.	Cherry Hill, N. J.	05593	Icore Electro-Plastics Inc.	Sunnyvale, Calif.	10411	Ti-Tal, Inc.	Berkeley, Calif.
00656	Aerovox Corp.	New Bedford, Mass.	05616	Cosmo Plastic		10646	Carborundum Co.	Niagara Falls, N. Y.
00779	Amp. Inc.	Harrisburg, Pa.		(c/o Electrical Spec. Co.)	Cleveland, Ohio	11236	CTS of Berne, Inc.	Berne, Ind.
00781	Aircraft Radio Corp.	Boonton, N. J.	05624	Barber Colman Co.	Rockford, Ill.	11237	Chicago Telephone of California, Inc.	So. Pasadena, Calif.
00815	Northern Engineering Laboratories, Inc.	Burlington, Wis.	05728	Triffen Optical Co.	Roslyn Heights, Long Island, N. Y.	11242	Bay State Electronics Corp.	Waltham, Mass.
00853	Sangamo Electric Co., Pickens Div.	Pickens, S. C.	05729	Metro-Tel Corp.	Westbury, N. Y.	11312	Teledyne Inc., Microwave Div.	Palo Alto, Calif.
00866	Goe Engineering Co.	City of Industry, Cal.	05783	Stewart Engineering Co.	Santa Cruz, Calif.	11314	National Seal	Downey, Calif.
00891	Carl E. Holmes Corp.	Los Angeles, Calif.	05820	Wakefield Engineering Inc.	Wakefield, Mass.	11453	Precision Connector Corp.	Jamaica, N. Y.
00929	Micro-lab Inc.	Livingston, N. J.	06004	Bassick Co., Div. of Stewart Warner Corp.	Bridgeport, Conn.	11534	Duncan Electronics Inc.	Costa Mesa, Calif.
01002	General Electric Co., Capacitor Dept.	Hudson Falls, N. Y.	06090	Raychem Corp.	Redwood City, Calif.	11711	General Instrument Corp., Semiconductor Div., Products Group	Newark, N. J.
01009	Alden Products Co.	Brockton, Mass.	06175	Bausch and Lomb Optical Co.	Rochester, N. Y.	11717	Imperial Electronic, Inc.	Buena Park, Calif.
01121	Allen Bradley Co.	Milwaukee, Wis.	06402	E. T. A. Products Co. of America	Chicago, Ill.	11870	Melabs, Inc.	Palo Alto, Calif.
01255	Litton Industries, Inc.	Beverly Hills, Calif.	06540	Amatom Electronic Hardware Co., Inc.	New Rochelle, N. Y.	12040	National Semiconductor	Danbury, Conn.
01281	T.R.W. Semiconductors, Inc.	Lawndale, Calif.	06555	Beede Electrical Instrument Co., Inc.	Penacook, N. H.	12136	Philadelphia Handle Co.	Camden, N. J.
01295	Texas Instruments, Inc., Transistor Products Div.	Dallas, Texas	06666	General Devices Co., Inc.	Indianapolis, Ind.	12361	Grove Mfg. Co., Inc.	Shady Grove, Pa.
01349	The Alliance Mfg. Co.	Alliance, Ohio	06751	Components Inc., Ariz. Div.	Phoenix, Ariz.	12574	Gulton Ind. Inc. Data System Div.	Albuquerque, N. M.
01589	Pacific Relays, Inc.	Van Nuys, Calif.	06812	Torrington Mfg. Co., West Div.	Van Nuys, Calif.	12697	Clarostat Mfg. Co.	Dover, N. H.
01670	Gudebrod Bros. Silk Co.	New York, N. Y.	06980	Varian Assoc. Eimac Div.	San Carlos, Calif.	12728	Elmar Filter Corp.	W. Haven, Conn.
01930	Amerock Corp.	Rockford, Ill.	07088	Kelvin Electric Co.	Van Nuys, Calif.	12859	Nippon Electric Co., Ltd.	Tokyo, Japan
01961	Pulse Engineering Co.	Santa Clara, Calif.	07126	Digitran Co.	Pasadena, Calif.	12881	Metex Electronics Corp.	Clark, N. J.
02114	Ferroxcube Corp. of America	Saugerties, N. Y.	07137	Transistor Electronics Corp.	Minneapolis, Minn.	12930	Delta Semiconductor Inc.	Newport Beach, Calif.
02116	Wheelock Signals, Inc.	Long Branch, N. J.	07138	Westinghouse Electric Corp. Electronic Tube Div.	Elmira, N. Y.	12954	Dickson Electronics Corp.	Scottsdale, Arizona
02286	Cole Rubber and Plastics Inc.	Sunnyvale, Calif.	07149	Filmohm Corp.	New York, N. Y.	13103	Thermolloy	Dallas, Texas
02260	Amphenol-Borg Electronics Corp.	Broadview, Ill.	07233	Cinch-Graphik Co.	City of Industry, Calif.	13396	Telefunken (GmbH)	Hanover, Germany
02735	Radio Corp. of America, Semiconductor and Materials Div.	Somerville, N. J.	07256	Silicon Transistor Corp.	Carle Place, N. Y.	13835	Midland-Wright Div. of Pacific Industries, Inc.	Kansas City, Kansas
02771	Vocaline Co. of America, Inc.	Old Saybrook, Conn.	07261	Avnet Corp.	Culver City, Calif.	14099	Sem-Tech	Newbury Park, Calif.
02777	Hopkins Engineering Co.	San Fernando, Calif.	07263	Fairchild Camera & Inst. Corp. Semiconductor Div.	Mountain View, Calif.	14193	Calif. Resistor Corp.	Santa Monica, Calif.
02875	Hudson Tool & Die Co.	Newark, N. J.	07322	Minnesota Rubber Co.	Minneapolis, Minn.	14298	American Components, Inc.	Conshohocken, Pa.
03508	G. E. Semiconductor Prod. Dept.	Syracuse, N. Y.	07387	Birtcher Corp., The	Monterey Park, Calif.	14433	ITT Semiconductor, A Div. of Int. Telephone & Telegraph Corp.	West Palm Beach, Fla.
03705	Apex Machine & Tool Co.	Dayton, Ohio	07397	Sylvania Elect. Prod. Inc., Mt. View Operations	Mountain View, Calif.	14493	Hewlett-Packard Company	Loveland, Colo.
03797	Eldema Corp.	Compton, Calif.	07700	Technical Wire Products Inc.	Cranford, N. J.	14655	Cornell Dublier Electric Corp.	Newark, N. J.
03818	Parker Seal Co.	Los Angeles, Calif.	07829	Bodine Elect. Co.	Chicago, Ill.	14674	Corning Glass Works	Corning, N. Y.
03877	Transitron Electric Corp.	Wakefield, Mass.	07910	Continental Device Corp.	Hawthorne, Calif.	14752	Electro Cube Inc.	San Gabriel, Calif.
03888	Pyrofilm Resistor Co., Inc.	Cedar Knolls, N. J.	07933	Raytheon Mfg. Co., Semiconductor Div.	Mountain View, Calif.	14960	Williams Mfg. Co.	San Jose, Calif.
03954	Singer Co., Diehl Div.	Sumerville, N. J.	07980	Hewlett-Packard Co., Boonton Radio Div.	Rockaway, N. J.	15203	Webster Electronics Co.	New York, N. Y.
04009	Arrow, Hart and Hegeman Elect. Co.	Hartford, Conn.	08145	U. S. Engineering Co.	Los Angeles, Calif.	15287	Scionics Corp.	Northridge, Calif.
04013	Taurus Corp.	Lambertville, N. J.	08289	Blinn, Delbert Co.	Pomona, Calif.	15291	Adjustable Bushing Co.	N. Hollywood, Calif.
04062	Arco Electronic Inc.	Great Neck, N. Y.	08358	Burgess Battery Co.	Niagara Falls, Ontario, Canada	15558	Micron Electronics	Garden City, Long Island, N. Y.
04222	Hi-Q Division of Aerovox	Myrtle Beach, S. C.	08524	Deutsch Fastener Corp.	Los Angeles, Calif.	15566	Amprobe Inst. Corp.	Lynbrook, N. Y.
04354	Precision Paper Tube Co.	Wheeling, Ill.	08664	Bristol Co., The	Waterbury, Conn.	15631	Cabletronics	Costa Mesa, Calif.
04404	Dymec Division of Hewlett-Packard Co.	Palo Alto, Calif.	08717	Sloan Company	Sun Valley, Calif.	15772	Twentieth Century Coil Spring Co.	Santa Clara, Calif.
04651	Sylvania Electric Products, Microwave Device Div.	Mountain View, Calif.	08718	ITT Cannon Electric Inc., Phoenix Div.	Phoenix, Arizona	15801	Fenwal Elect. Inc.	Framingham, Mass.
04673	Dakota Engr. Inc.	Culver City, Calif.	08727	National Radio Lab. Inc.	Paramus, N. J.	15818	Amelco Inc.	Mt. View, Calif.
04713	Motorola, Inc., Semiconductor Prod. Div.	Phoenix, Arizona	08792	CBS Electronics Semiconductor Operations, Div. of C. B. S. Inc.	Lowell, Mass.	16037	Spruce Pine Mica Co.	Spruce Pine, N. C.
04732	Filtron Co., Inc. Western Div.	Culver City, Calif.	08806	General Electric Co. Miniat. Lamp Dept.	Cleveland, Ohio	16179	Omni-Spectra Inc.	Farmington, Mich.
04773	Automatic Electric Co.	Northlake, Ill.	08984	Mel-Rain	Indianapolis, Ind.	16352	Computer Diode Corp.	Lodi, N. J.
04796	Sequoa Wire Co.	Redwood City, Calif.	09026	Babcock Relays Div.	Costa Mesa, Calif.	16585	Boots Aircraft Nut Corp.	Pasadena, Calif.
04811	Precision Coil Spring Co.	El Monte, Calif.	09134	Texas Capacitor Co.	Houston, Texas	16688	Ideal Prec. Meter Co., Inc. De Jur Meter Div.	Brooklyn, N. Y.
04870	P. M. Motor Company	Westchester, Ill.				16758	Delco Radio Div. of G. M. Corp.	Kokoma, Ind.
04919	Component Mfg. Service Co.	W. Bridgewater, Mass.				17109	Thermometrics Inc.	Canoga Park, Calif.
05006	Twentieth Century Plastics, Inc.	Los Angeles, Calif.				17474	Tranex Company	Mountain View, Calif.
						17554	Components Inc.	Biddeford, Me.
						17675	Hamlin Metal Products Corp.	Akron, Ohio
						17745	Angstrom Prec. Inc.	No. Hollywood, Calif.

Table 5-8. Code List of Manufacturers (Continued)

Code No.	Manufacturer	Address	Code No.	Manufacturer	Address	Code No.	Manufacturer	Address
17870	McGraw-Edison Co.	Manchester, N. H.	62119	Universal Electric Co.	Owosso, Mich.	73899	JFD Electronics Corp.	Brooklyn, N. Y.
18042	Power Design Pacific Inc.	Palo Alto, Calif.	63743	Ward-Leonard Electric Co.	Mt. Vernon, N. Y.	73905	Jennings Radio Mfg. Corp.	San Jose, Calif.
18083	Clevite Corp., Semiconductor Div.	Palo Alto, Calif.	64959	Western Electric Co., Inc.	New York, N. Y.	73957	Groov-Pin Corp.	Ridgefield, N. J.
18324	Signetics Corp.	Sunnyvale, Calif.	65092	Weston Inst. Inc. Weston-Newark	Newark, N. J.	74276	Signalite Inc.	Neptune, N. J.
18476	Ty-Car Mfg. Co., Inc.	Holliston, Mass.	66295	Wittek Mfg. Co.	Chicago, Ill.	74455	J. H. Winns, and Sons	Winchester, Mass.
18486	TRW Elect. Comp. Div.	Des Plaines, Ill.	66346	Minnesota Mining & Mfg. Co. Revere	Mincon Div. St. Paul, Minn.	74861	Industrial Condenser Corp.	Chicago, Ill.
18583	Curtis Instrument, Inc.	Mt. Kisco, N. Y.	70276	Allen Mfg. Co.	Hartford, Conn.	74868	R. F. Products Division of Amphenol-Borg Electronics Corp.	Danbury, Conn.
18612	Vishay Instruments Inc.	Malvern, Pa.	70309	Allied Control	New York, N. Y.	74970	E. F. Johnson Co.	Waseca, Minn.
18873	E. I. DuPont and Co., Inc.	Wilmington, Del.	70318	Allmetal Screw Product Co., Inc.	Garden City, N. Y.	75042	International Resistance Co.	Philadelphia, Pa.
18911	Durant Mfg. Co.	Milwaukee, Wis.	70417	Amplex, Div. of Chrysler Corp.	Detroit, Mich.	75263	Keystone Carbon Co., Inc.	St. Marys, Pa.
19315	The Bendix Corp., Navigation & Control Div.	Teterboro, N. J.	70485	Atlantic India Rubber Works, Inc.	Chicago, Ill.	75378	CTS Knights Inc.	Sandwich, Ill.
19500	Thomas A. Edison Industries, Div. of McGraw-Edison Co.	West Orange, N. J.	70563	Amperite Co., Inc.	Union City, N. J.	75382	Kulka Electric Corporation	Mt. Vernon, N. Y.
19589	Concoa	Baldwin Park, Calif.	70674	ADC Products Inc.	Minneapolis, Minn.	75818	Lenz Electric Mfg. Co.	Chicago, Ill.
19644	LRC Electronics	Horseheads, N. Y.	70903	Belden Mfg. Co.	Chicago, Ill.	75915	Littlefuse, Inc.	Des Plaines, Ill.
19701	Electra Mfg. Co.	Independence, Kansas	70998	Bird Electronic Corp.	Cleveland, Ohio	76005	Lord Mfg. Co.	Erie, Pa.
20183	General Altronics Corp.	Philadelphia, Pa.	71002	Birnbach Radio Co.	New York, N. Y.	76210	C. W. Marwedel	San Francisco, Calif.
21226	Executone, Inc.	Long Island City, N. Y.	71034	Bliley Electric Co., Inc.	Erie, Pa.	76433	General Instrument Corp., Micamold Division	Newark, N. J.
21335	Fafnir Bearing Co., The	New Britain, Conn.	71041	Boston Gear Works Div. of Murray Co. of Texas	Quincy, Mass.	76487	James Millen Mfg. Co., Inc.	Malden, Mass.
21520	Fansteel Metallurgical Corp.	N. Chicago, Ill.	71218	Bud Radio, Inc.	Willoughby, Ohio	76493	J. W. Miller Co.	Los Angeles, Calif.
23042	Texscan Corp.	Indianapolis, Ind.	71279	Cambridge Thermionics Corp.	Cambridge, Mass.	76530	Cinch-Monadnock, Div. of United Carr Fastener Corp.	San Leandro, Calif.
23783	British Radio Electronics Ltd.	Washington, D. C.	71286	Camloc Fastener Corp.	Paramus, N. J.	76545	Mueller Electric Co.	Cleveland, Ohio
24455	G. E. Lamp Division	Nela Park, Cleveland, Ohio	71313	Cardwell Condenser Corp.	Lindenhurst L. I., N. Y.	76703	National Union	Newark, N. J.
24655	General Radio Co.	West Concord, Mass.	71400	Bussmann Mfg. Div. of McGraw-Edison Co.	St. Louis, Mo.	76854	Oak Manufacturing Co.	Crystal Lake, Ill.
24681	Mencor Inc., Comp. Div.	Huntington, Ind.	71436	Chicago Condenser Corp.	Chicago, Ill.	77068	The Bendix Corp., Electrodynamics Div.	N. Hollywood, Calif.
24796	Parelco Inc.	San Juan Capistrano, Calif.	71447	Calif. Spring Co., Inc.	Pico-Rivera, Calif.	77075	Pacific Metals Co.	San Francisco, Calif.
26365	Gries Reproducer Corp.	New Rochelle, N. Y.	71450	CTS Corp.	Elkhart, Ind.	77221	Phanostran Instrument and Electronic Co.	South Pasadena, Calif.
26462	Grobet File Co. of America, Inc.	Carlstadt, N. J.	71468	ITT Cannon Electric Inc.	Los Angeles, Calif.	77252	Philadelphia Steel and Wire Corp.	Philadelphia, Pa.
26851	Compac/Hollister Co.	Hollister, Calif.	71471	Cinema, Div. Aerovox Corp.	Burbank, Calif.	77342	American Machine & Foundry Co. & Brunfield Div.	Potter Princeton, Ind.
26992	Hamilton Watch Co.	Lancaster, Pa.	71482	C. P. Clare & Co.	Chicago, Ill.	77630	TRW Electronic Components Div.	Camden, N. J.
27251	Specialties Mfg. Co., Inc.	Stratford, Conn.	71590	Centralab Div. of Globe Union Inc.	Milwaukee, Wis.	77638	General Instrument Corp., Rectifier Div.	Brooklyn, N. Y.
28480	Hewlett-Packard Co.	Palo Alto, Calif.	71616	Commercial Plastics Co.	Chicago, Ill.	77764	Resistance Products Co.	Harrisburg, Pa.
28520	Heyman Mfg. Co.	Kenilworth, N. J.	71700	Cornish Wire Co., The	New York, N. Y.	77969	Rubbercraft Corp. of Calif.	Torrance, Calif.
30817	Instrument Specialties Co., Inc.	Little Falls, N. J.	71707	Coto Coil Co., Inc.	Providence, R. I.	78189	Shakeproof Division of Illinois Tool Works	Elgin, Ill.
33173	G. E. Receiving Tube Dept.	Owensboro, Ky.	71744	Chicago Miniature Lamp Works	Chicago, Ill.	78277	Sigma	So. Braintree, Mass.
35343	Lectrohm Inc.	Chicago, Ill.	71785	Cinch Mfg. Co., Howard B. Jones Div.	Chicago, Ill.	78283	Signal Indicator Corp.	New York, N. Y.
36196	Stanwyck Coil Products Ltd.	Hawkesbury, Ontario, Canada	71984	Dow Corning Corp.	Midland, Mich.	78290	Struthers-Dunn Inc.	Pitman, N. J.
36287	Cunningham, W. H. & Hill, Ltd.	Toronto Ontario, Canada	72136	Electro Motive Mfg. Co., Inc.	Williamant, Conn.	78424	Specialty Leather Prod. Co.	Newark, N. J.
37942	P. R. Mallory & Co. Inc.	Indianapolis, Ind.	72619	Dialight Corp.	Brooklyn, N. Y.	78452	Thompson-Bremer & Co.	Chicago, Ill.
39543	Mechanical Industries Prod. Co.	Akron, Ohio	72656	Indiana General Corp., Electronics Div.	Keasby, N. J.	78471	Tilley Mfg. Co.	San Francisco, Calif.
40920	Miniature Precision Bearings, Inc.	Keene, N. H.	72699	General Instrument Corp., Cap. Div.	Newark, N. J.	78488	Stackpole Carbon Co.	St. Marys, Pa.
42190	Muter Co.	Chicago, Ill.	72765	Drake Mfg. Co.	Harwood Heights, Ill.	78493	Standard Thomson Corp.	Waltham, Mass.
43990	C. A. Norgren Co.	Englewood, Colo.	72825	Hugh H. Eby Inc.	Philadelphia, Pa.	78553	Tinnerman Products, Inc.	Cleveland, Ohio
44655	Ohmite Mfg. Co.	Skokie, Ill.	72928	Gudeman Co.	Chicago, Ill.	78790	Transformer Engineers	San Gabriel, Calif.
46384	Penn Eng. & Mfg. Corp.	Doylestown, Pa.	72962	Elastic Stop Nut Corp.	Union, N. J.	78947	Ucinite Co.	Newtonville, Mass.
47904	Polaroid Corp.	Cambridge, Mass.	72964	Robert M. Hadley Co.	Los Angeles, Calif.	79136	Waldes Kohnoor Inc.	Long Island City, N. Y.
48620	Precision Thermometer & Inst. Co.	Southampton, Pa.	72982	Erie Technological Products, Inc.	Erie, Pa.	79142	Veeder Root, Inc.	Hartford, Conn.
49956	Microwave & Power Tube Div.	Waltham, Mass.	73061	Hansen Mfg. Co., Inc.	Princeton, Ind.	79251	Wenco Mfg. Co.	Chicago, Ill.
52090	Rowan Controller Co.	Westminster, Md.	73076	H. M. Harper Co.	Chicago, Ill.	79727	Continental-Wirt Electronics Corp.	Philadelphia, Pa.
52983	Sanborn Company	Waltham, Mass.	73138	Helipot Div. of Beckman Inst., Inc.	Fullerton, Calif.	79963	Zierick Mfg. Corp.	New Rochelle, N. Y.
54294	Shallcross Mfg. Co.	Selma, N. C.	73293	Hughes Products Division of Hughes Aircraft Co.	Newport Beach, Calif.	80031	Mepco Division of Sessions Clock Co.	Morristown, N. J.
55026	Simpson Electric Co.	Chicago, Ill.	73445	Ampetex Elect Co.	Hicksville, L. I., N. Y.	80120	Schnitzer Alloy Products Co.	Elizabeth, N. J.
55933	Sonotone Corp.	Elmsford, N. Y.	73506	Bradley Semiconductor Corp.	New Haven, Conn.	80131	Electronic Industries Association. Any brand Tube meeting EIA Standards-Washington, D. C.	
55938	Raytheon Co. Commercial Apparatus & Systems Div.	So. Norwalk, Conn.	73559	Carling Electric, Inc.	Hartford, Conn.	80207	Unimax Switch, Div. Maxon Electronics Corp.	Wallingford, Conn.
56137	Spaulding Fibre Co., Inc.	Tonawanda, N. Y.	73586	Circle F Mfg. Co.	Trenton, N. J.	80223	United Transformer Corp.	New York, N. Y.
56289	Sprague Electric Co.	North Adams, Mass.	73682	George K. Garrett Co., Div. MSL Industries Inc.	Philadelphia, Pa.	80248	Oxford Electric Corp.	Chicago, Ill.
59446	Telex Corp.	Tulsa, Okla.	73734	Federal Screw Products Inc.	Chicago, Ill.	80294	Bourns Inc.	Riverside, Calif.
59730	Thomas & Betts Co.	Elizabeth, N. J.	73743	Fischer Special Mfg. Co.	Cincinnati, Ohio	80411	Acro Div. of Robertshaw Controls Co.	Columbus, Ohio
60741	Triplétt Electrical Inst. Co.	Bluffton, Ohio	73793	General Industries Co., The	Elyria, Ohio			
61775	Union Switch and Signal, Div. of Westinghouse Air Brake Co.	Pittsburgh, Pa.	73846	Goshen Stamping & Tool Co.	Goshen, Ind.			



## APPENDIX A

A-1. Figure A-1 is an equivalent schematic diagram for the National Semiconductor Corporation LM 300 integrated circuit voltage regulator used in power supply

assembly A1 (A1U1 and A1U2). The Hewlett-Packard part number for the integrated circuit is 1820-0123.

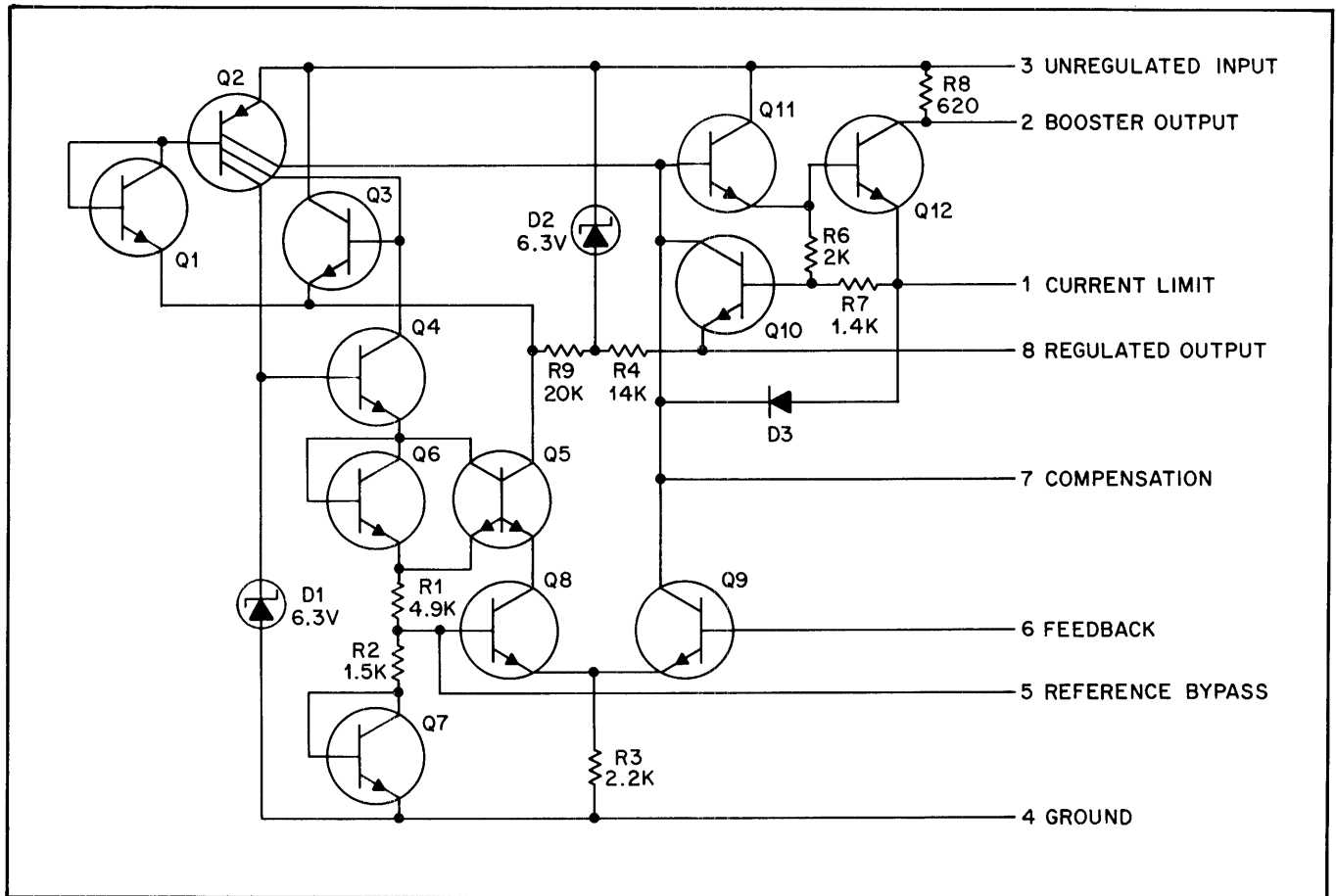


Figure A-1. Voltage Regulator Equivalent Schematic Diagram

# HEWLETT • PACKARD SALES AND SERVICE

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### ALABAMA

P.O. Box 4207  
2003 Byrd Spring Road S.W.  
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TWX: 810-726-2204

### ARIZONA

3009 North Scottsdale Road  
Scottsdale 85251  
Tel: (602) 945-7601  
TWX: 910-950-1282

### CALIFORNIA

1430 East Orangethorpe Ave.  
Fullerton 92631  
Tel: (714) 870-1000

3939 Lankershim Boulevard  
North Hollywood 91604  
Tel: (213) 877-1282  
TWX: 910-499-2170

1101 Embarcadero Road  
Palo Alto 94303  
Tel: (415) 327-6500  
TWX: 910-373-1280

### COLORADO

2591 Carlsbad Avenue  
Sacramento 95821  
Tel: (916) 482-1463  
TWX: 910-367-2092

1055 Shafter Street  
San Diego 92106  
Tel: (714) 223-8103  
TWX: 910-335-2000

### CONNECTICUT

508 Tolland Street  
East Hartford 06108  
Tel: (203) 289-9394  
TWX: 710-425-3416

## CANADA

### ALBERTA

Hewlett-Packard (Canada) Ltd.  
11745 Jasper Ave.  
Edmonton  
Tel: (403) 482-5561  
TWX: 610-831-2431

### BRITISH COLUMBIA

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3284 East 1st Ave.  
Vancouver 12  
Tel: (604) 255-7781  
TWX: 610-922-5059

### MANITOBA

Hewlett-Packard (Canada) Ltd.  
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St. James  
Tel: (204) 786-7581  
TWX: 610-671-3531

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Hewlett-Packard (Canada) Ltd.  
2745 Dutch Village Rd.  
Suite 203  
Halifax  
Tel: (902) 455-0511  
TWX: 610-271-4482

### ONTARIO

Hewlett-Packard (Canada) Ltd.  
880 Lady Ellen Place  
Ottawa 3  
Tel: (613) 722-4223  
TWX: 610-562-1952

Hewlett-Packard (Canada) Ltd.  
50 Galaxy Blvd.  
Rexdale  
Tel: (416) 677-9611  
TWX: 610-492-4246

### QUEBEC

Hewlett-Packard (Canada) Ltd.  
275 Hyman Boulevard  
Pointe Claire  
Tel: (514) 697-4232  
TWX: 610-422-3022  
Telex: 01-20607

### FOR CANADIAN AREAS NOT LISTED:

Contact Hewlett-Packard (Canada) Ltd. in Pointe Claire, at the complete address listed above.

## CENTRAL AND SOUTH AMERICA

### ARGENTINA

Hewlett-Packard Argentina  
S.A.C.e.I.  
Lavalle 1171 - 3°  
Buenos Aires  
Tel: 35-0436, 35-0627, 35-0431  
Telex: 012-1009  
Cable: HEWPACKARG

### BRAZIL

Hewlett-Packard Do Brasil  
l.e.c. Ltda.  
Rua Coronel: Oscar Porto, 691  
Sao Paulo - 8, SP  
Tel: 71-1503  
Cable: HEWPACK Sao Paulo

Hewlett-Packard Do Brasil  
l.e.c. Ltda.  
Avenida Franklin Roosevelt 84-  
Grupo 203  
Rio de Janeiro, RC-39, GB  
Tel: 32-9733  
Cable: HEWPACK Rio de Janeiro

### CHILE

Hector Calcagni P.  
Bustos, 1932-3er Piso  
Casilla 13942  
Santiago  
Tel: 4-2396

### COLOMBIA

Instrumentacion  
Henrik A. Langebaek & Kier  
Ltda.  
Carrera 7 #48-59  
Apartado Aereo 6287  
Bogota, 1 D.E.  
Tel: 45-78-06, 45-55-46  
Cable: AARIS Bogota

### COSTA RICA

Lic. Alfredo Gallegos Curdián  
Apartado 3243  
San José  
Tel: 21-86-13  
Cable: GALGUR San José

### ECUADOR

Laboratorios de Radio-Ingenieria  
Calle Guayaquil 1246  
Post Office Box 3199  
Quito  
Tel: 2496  
Cable: HORVATH Quito

### EL SALVADOR

Electrónica  
Apartado Postal 1589  
27 Avenida Norte 1133  
San Salvador  
Tel: 25-74-50  
Cable: ELECTRONICA  
San Salvador

### GUATEMALA

Oliander Associates Latin America  
Apartado 1226  
7a. Calle, 0-22, Zona 1  
Guatemala City  
Tel: 22812  
Cable: OLALA Guatemala City

### JAMAICA

General Engineering Services,  
Ltd.  
27 Dunrobin Ave.  
Kingston  
Tel: 42657  
Cable: GENSERV

### MEXICO

Hewlett-Packard Mexicana, S.A.  
de C.V.  
Moras 439  
Col. del Valle  
Mexico 12, D.F.  
Tel: 5-75-46-49

### NICARAGUA

Roberto Terán G.  
Apartado Postal 689  
Edificio Terán  
Managua  
Tel: 3051, 3452  
Cable: ROTERAN Managua

### PANAMA

Electrónica Balboa, S.A.  
P.O. Box 4929  
Ave. Manuel Espinosa No. 13-50  
Bldg. Alina  
Panama City  
Tel: 30833  
Cable: ELECTRON Panama City

### PERU

Fernando Ezeta B.  
Avenida Petit Thouars 4719  
Miraflores  
Casilla 3061  
Lima  
Tel: 50346  
Cable: FEPPERU Lima

### PUERTO RICO

San Juan Electronics, Inc.  
P.O. Box 5167  
Ponce de Leon 154  
Pda. 3-Pta. de Tierra  
San Juan 00906  
Tel: (809) 725-3342  
Cable: SATRONICS San Juan  
Telex: SATRON 3450 332

### URUGUAY

Pablo Ferrando S.A.  
Comercial e Industrial  
Avenida Italia 2877  
Casilla de Correo 370  
Montevideo  
Tel: 40-3102  
Cable: RADIIUM Montevideo

Hewlett-Packard De Venezuela  
C.A.  
Apartado del Este 10934  
Chacabito  
Caracas  
Tel: 71.88.05, 71.88.69, 71.88.76  
Cable: HEWPACK Caracas

### FOR AREAS NOT LISTED, CONTACT:

Hewlett-Packard Inter-Americas  
3200 Hillview Ave.  
Palo Alto, California 94304  
Tel: (415) 326-7000  
TWX: 910-373-1267  
Cable: HEWPACK Palo Alto  
Telex: 034-8461

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Uniabor GmbH  
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Rummelhardtgasse 6/3  
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Tel: 42 61 81  
Cable: LABORINSTRUMENT  
Vienna  
Telex: 75 762

**BELGIUM**  
Hewlett-Packard Benelux S.A.  
348 Boulevard du Souverain  
Brussels 16  
Tel: 72 22 40  
Cable: PALOBEN Brussels  
Telex: 23 494

**DENMARK**  
Hewlett-Packard A/S  
Langebjerg 6  
2850 Naerum  
Tel: (01) 80 40 40  
Cable: HEWPACK AS  
Telex: 66 40

**FINLAND**  
Hewlett-Packard Oy  
Gydenintie 3  
Helsinki 20  
Tel: 67 35 38  
Cable: HEWPACKOY-Helsinki  
Telex: 12-1563

**FRANCE**  
Hewlett-Packard France  
Quartier de Courtaboeuf  
Boite Postale No. 6  
91 Orsay  
Tel: 920 88 01  
Cable: HEWPACK Orsay  
Telex: 60048

Hewlett-Packard France  
4 Quai des Etroits  
69 Lyon 5ème  
Tel: 42 63 45  
Cable: HEWPACK Lyon  
Telex: 31617

**GERMANY**  
Hewlett-Packard Vertriebs-GmbH  
Lietzenburgerstrasse 30  
1 Berlin W 30  
Tel: 24 60 65/66  
Telex: 18 34 05

Hewlett-Packard Vertriebs-GmbH  
Herrenbergerstrasse 110  
703 Böblingen, Württemberg  
Tel: 07031-6671  
Cable: HEPAG Böblingen

Telex: 72 65 739  
Hewlett-Packard Vertriebs-GmbH  
Achenbachstrasse 15  
4 Düsseldorf 1  
Tel: 68 52 58/59  
Telex: 85 86 533

Hewlett-Packard Vertriebs-GmbH  
Berliner Strasse 117  
6 Frankfurt Nieder-Eschbach  
Tel: 50 10 64  
Cable: HEWPACKSA Frankfurt  
Telex: 41 32 49

Hewlett-Packard Vertriebs-GmbH  
Beim Strohhaue 26  
2 Hamburg 1  
Tel: 24 05 51/52  
Cable: HEWPACKSA Hamburg  
Telex: 21 53 32

Hewlett-Packard Vertriebs-GmbH  
Reginfriedstrasse 13  
8 München 9  
Tel: 0811 69 59 71/75  
Cable: HEWPACKSA München  
Telex: 52 49 85

**GREECE**  
Kostas Karayannis  
18, Ermou Street  
Athens 126  
Tel: 230 301  
Cable: RAKAR Athens  
Telex: 21 59 62

**IRELAND**  
Hewlett-Packard Ltd.  
224 Bath Road  
Slough, Bucks, England  
Tel: 07031-6671  
Cable: HEWPIE Slough  
Telex: 84413

**ITALY**  
Hewlett-Packard Italiana S.p.A.  
Via Amerigo Vespucci 2  
20124 Milano  
Tel: 6251 (10 lines)  
Cable: HEWPACKIT Milan  
Telex: 32046

Hewlett-Packard Italiana S.p.A.  
Palazzo Italia  
Piazza Marconi 25  
00144 Rome - Eur  
Tel: 591 2544  
Cable: HEWPACKIT Rome  
Telex: 61514

**NETHERLANDS**  
Hewlett-Packard Benelux, N.V.  
Weerdestein 117  
Amsterdam, Z 11  
Tel: 42 77 77  
Cable: PALOBEN Amsterdam  
Telex: 13 216

**NORWAY**  
Hewlett-Packard Norge A/S  
Box 149  
Nesveien 13  
Haslum  
Tel: 53 83 60  
Cable: HEWPACK Oslo  
Telex: 6621

**PORTUGAL**  
Telectra  
Rua Rodrigo da Fonseca 103  
P.O. Box 2531  
Lisbon 1  
Tel: 68 60 72  
Cable: TELETRA Lisbon  
Telex: 1598

**SPAIN**  
Ataio Ingenieros  
Ganduxer 76  
Barcelona 6  
Tel: 211-44-66  
Ataio Ingenieros  
Enrique Larreta 12  
Madrid, 16  
Tel: 235 43 44  
Cable: TELETAIO Madrid  
Telex: 2 72 49

**SWEDEN**  
Hewlett-Packard (Sverige) AB  
Hagakergatan 9C  
S 431 04 Möndal 4  
Tel: 031 - 27 68 00

Hewlett-Packard (Sverige) AB  
Svetsarvägen 7  
S171 20 Solna 1  
Tel: (08) 98 12 50  
Cable: MEASUREMENTS  
Stockholm  
Telex: 10721

**SWITZERLAND**  
Hewlett-Packard (Schweiz) AG  
Zürcherstrasse 20  
8952 Schlieren  
Zürich  
Tel: (051) 98 18 21/24  
Cable: HEWPACKAG Zurich  
Telex: 53933

Hewlett-Packard (Schweiz) A.G.  
Rue du Bois-du-Lan 7  
1217 Meyrin-Geneva  
Tel: (022) 41 54 00  
Cable: HEWPACKSA Geneva  
Telex: 2 24 86

**TURKEY**  
Telekom Engineering Bureau  
P.O. Box 376 - Galata  
Istanbul  
Tel: 49 40 40  
Cable: TELEMATIION Istanbul

**UNITED KINGDOM**  
Hewlett-Packard Ltd.  
224 Bath Road  
Slough, Bucks  
Tel: Slough 33341  
Cable: HEWPIE Slough  
Telex: 84413

**YUGOSLAVIA**  
Belram S.A.  
83 avenue des Mimosas  
Brussels 15, Belgium  
Tel: 34 33 32, 34 26 19  
Cable: BELRAMEL Brussels  
Telex: 21790

**FOR AREAS NOT LISTED, CONTACT:**  
Hewlett-Packard S.A.  
Rue du Bois-du-Lan 7  
1217 Meyrin-Geneva  
Tel: (022) 41 54 00  
Cable: HEWPACKSA Geneva  
Telex: 2.24.86

## AFRICA, ASIA, AUSTRALIA

**ANGOLA**  
Telectra Empresa Técnica  
de Equipamentos Eléctricos  
SAR  
Rua de Barbo: a Rodrigues  
42-1°  
Box 6487  
Luanda  
Cable: TELETRA Luanda

**AUSTRALIA**  
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Pty. Ltd.  
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Glen Iris, 3146  
Victoria  
Tel: 20.1371 (4 lines)  
Cable: HEWPARD Melbourne  
Telex: 31024

Hewlett-Packard Australia  
Pty. Ltd.  
61 Alexander Street  
Crows Nest 2065  
New South Wales  
Tel: 43.7866  
Cable: HEWPARD Sydney  
Telex: 21561

Hewlett-Packard Australia  
Pty. Ltd.  
97 Churchill Road  
Prospect 5082  
South Australia  
Tel: 65.2366  
Cable: HEWPARD Adelaide  
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Yahala Building  
Staples Street  
Colombo 2  
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58/59 Cunningham St.  
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**Hong Kong**  
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**INDIA**  
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6, Tej Bahadur Sapru Road  
Allahabad 1  
Tel: 2451  
Cable: SICO Allahbad

The Scientific Instrument  
Co., Ltd.  
12/5 Dis-kenson Road  
Bangalore -1  
Cable: SICO Bangalore  
The Scientific Instrument  
Co., Ltd.  
240, Dr. Dadabhai Naoroji Road  
Bombay 1  
Tel: 26-2642  
Cable: SICO Bombay

The Scientific Instrument  
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11, Esplanade East  
Calcutta 1  
Tel: 23-4129  
Cable: SICO Calcutta  
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30, Mount Road  
Madras 2  
Tel: 86339  
Cable: SICO Madras

The Scientific Instrument Co. Ltd.  
5-8-525 Mahatma Gandhi Road  
Hyderabad-1 (A-P) India  
Cable: SICO Hyderabad

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New Delhi 1  
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Cable: SICO New Delhi

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16, Kremenetski Street  
Tel-Aviv  
Tel: 35021 (4 lines)  
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Telex: Bastel Tv 033-569

**JAPAN**  
Yokogawa-Hewlett-Packard Ltd.  
Nisei Ibaragi Bldg.  
2-2-8 Kasuga  
Ibaragi-Shi  
Osaka  
Tel: 23-1641

Yokogawa-Hewlett-Packard Ltd.  
Ito Building  
No. 59, Kotori-cho  
Nakamura-ku, Nagoya City  
Tel: 551-0215

Yokogawa-Hewlett-Packard Ltd.  
Ohashi Building  
5S Yoyogi 1-chrome  
Shibuya-ku, Tokyo  
Tel: 3/0-2281/7  
Telex: 232-2024YHP  
Cable: YHPMARKET TOK 23-724

**KENYA**  
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Seoul  
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P.O. Box 7213  
Beirut  
Tel: 220846  
Cable: ELECTRONUCLEAR Beirut

**MALAYSIA**  
MECOMB Malaysia Ltd.  
2 Lorong 13/6A  
Section 13  
Petaling Jaya, Selangor  
Cable: MECOMB Kuala Lumpur

**MOZAMBIQUE**  
A. N. Goncalves, LDA.  
4.1 Apt. 14 Av. D. Luis  
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Lourenco Marques  
Cable: NEGON

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Hewlett-Packard (N.Z.) Ltd.  
32-34 Kent Terrace  
P.O. Box 9442  
Wellington, N.Z.  
Tel: 56-409  
Cable: HEWPACK Wellington

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31, Jinnah Avenue  
Dacca  
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Mushko & Company, Ltd.  
Oosman Chambers  
Victoria Road  
Karachi 3  
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2129 Pasong Tamo  
Makati, Rizal  
P.O. Box 4326  
Manila  
Tel: 88-91-71 or 88-83-76  
Cable: ELEMEX Manila

**SINGAPORE**  
Mechanical and Combustion  
Engineering Company Ltd.  
9, Jalan Kilang  
Singapore, 3  
Tel: 642361-3  
Cable: MECOMB Singapore

**SOUTH AFRICA**  
Hewlett-Packard South Africa  
(Pty.), Ltd.  
Hill House  
43 Somerset Rd.  
Cape Town  
Tel: 3-6019  
Cable: HEWPACK Cape Town  
Telex: 7038CT

Hewlett-Packard South Africa  
(Pty.), Ltd.  
P.O. Box 31716  
30 De Beer Street  
Braamfontein, Johannesburg  
Tel: 724-4172 724-4195  
Telex: 0226 JH  
Cable: HEWPACK Johannesburg

**TAIWAN**  
Hwa Sheng Electronic Co., Ltd.  
P. O. Box 1558  
Room 404  
Chia Hsin Building  
No. 96 Chung Shan  
North Road, Sec. 2  
Taipei  
Tel: 555211 Ext. 532-539  
Cable: VICTRONIX Taipei

**TANZANIA**  
R. J. Tilbury Ltd.  
P.O. Box 2754  
Suite 517/518  
Hotel Ambassadeur  
Nairobi  
Tel: 25670, 26803, 68206, 58196  
Cable: ARJAYTEE Nairobi

**THAILAND**  
The International  
Engineering Co., Ltd.  
P. O. Box 39  
614 Sukhumvit Road  
Bangkok  
Tel: 910722 (7 lines)  
Cable: GYSOM Bangkok

**UGANDA**  
R. J. Tilbury Ltd.  
P.O. Box 2754  
Suite 517/518  
Hotel Ambassadeur  
Nairobi  
Tel: 25670, 26803, 68206, 58196  
Cable: ARJAYTEE Nairobi

**VIETNAM**  
Peninsular Trading Inc.  
P.O. Box H-3  
216 Hien-Vuong  
Saigon  
Tel: 20.805  
Cable: PENINSULA Saigon

**ZAMBIA**  
R. J. Tilbury (Zambia) Ltd.  
P.O. Box 2792  
Lusaka  
Zambia, Central Africa

**FOR AREAS NOT LISTED, CONTACT:**  
Hewlett-Packard Export  
Marketing  
3200 Hillview Ave.  
Palo Alto, California 94304  
Tel: (415) 326-7000  
TWX: 910-373-1267  
Cable: HEWPACK Palo Alto  
Telex: 034-8461



