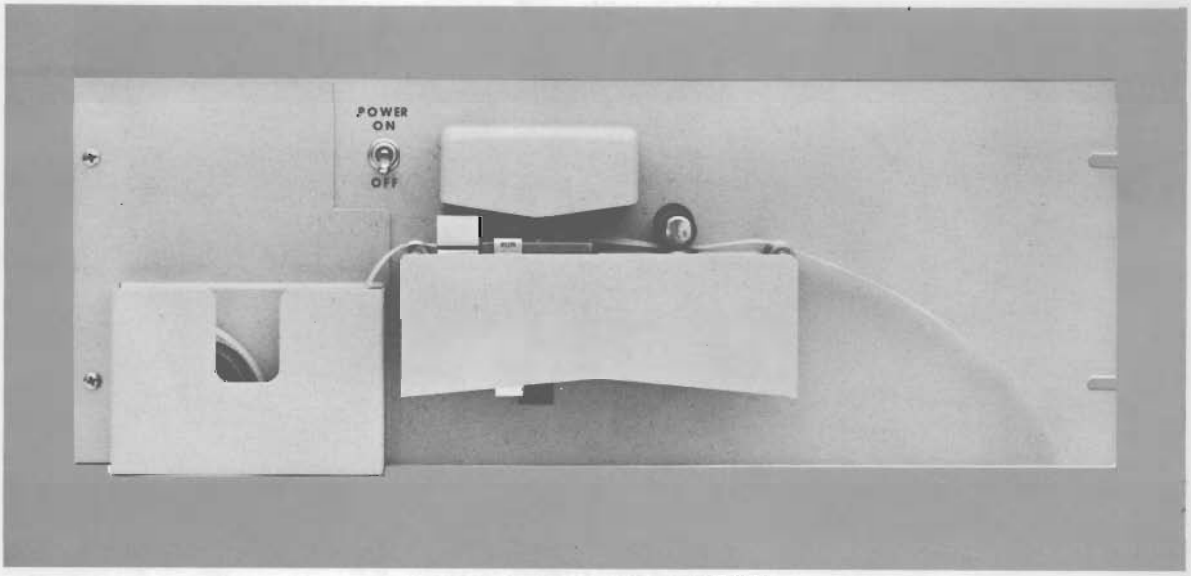
HEWLETT hp PACKARD

OPERATING AND SERVICE MANUAL

MODEL HP 2737A/B
PUNCHED TAPE READER



HP 2737A Punched Tape Reader

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OPERATING AND SERVICE MANUAL

MODEL HP 2737A/B
PUNCHED TAPE READER

SERIALS PREFIXED FOR 2737A: 723-

SERIALS PREFIXED FOR 2737B: 718-

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1-2. ELECTRICAL DESCRIPTION.

1-3. The HP 2737A and HP 2737B Punched Tape Readers consist of a REMEX tape transport mechanism with added Hewlett-Packard electronics. Supplemental information pertaining specifically to the transport mechanism is contained in Appendices A and B of this manual.

1-4. These Readers detect, through photoelectric means, the coded data characters punched on paper tape. An electrical output derived from these detected characters is then made available as an input to associated instruments such as the HP 2116A Digital Computer and the HP 2560A Punched Tape Programmer. The Readers also detect feed (sprocket) holes which are present on punched tapes between tracks 3 and 4 (IBM channel numbers 4 and 8, respectively). The output signal derived from these feedholes is then applied to the associated instruments to synchronize the detected data characters.

1-5. The HP 2737A and HP 2737B models are similar except that the HP 2737A does not include motors and control circuitry for tape wind and rewind. Both models, however, include the motor and control circuitry for tape advance, and a special feedhole differential amplifier circuit to compensate for variations (0 to 40%) in tape transmissivities. Forward tape drive is started by an external step command (positive or negative); removal of this command causes the tape to stop. Reading speed is 300 characters per second synchronous (continuous command) or 100 characters per second asychronous (10 ms step command). The standard instruments as shipped accept one-inch tape (IBM 8 track) but may also accept 5/8- and 7/8-inch tapes with a simple adjustment of the photo-block.

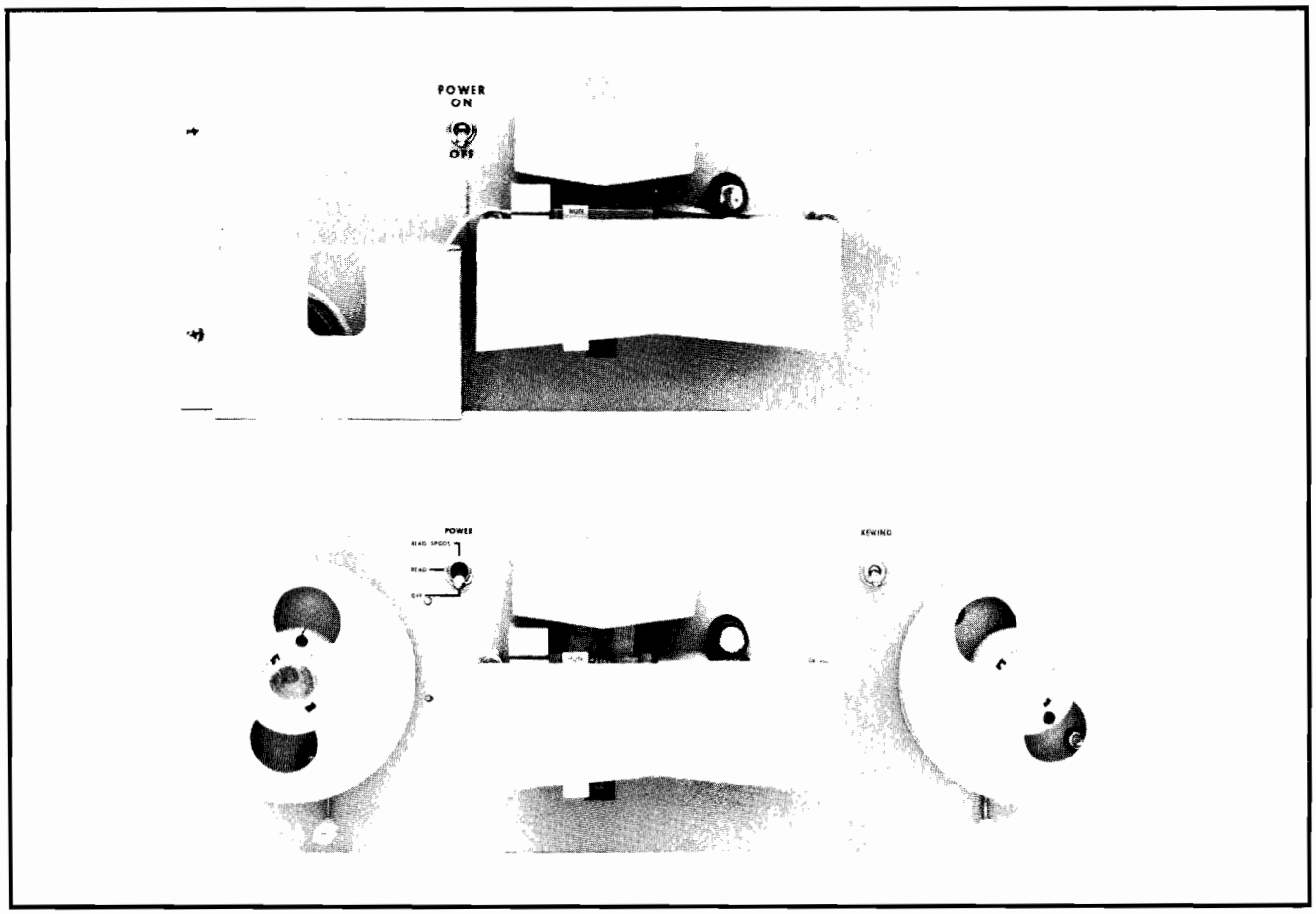

Figure 1-1. HP 2737A (top) and HP 2737B (bottom) Punched Tape Readers

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 (000-) are a serial prefix number used to identify a special model instrument. The last five digits (00000) identify your specific instrument. If the serial prefix on your instrument does not appear on the title page of this manual, there are differences between your instrument and the instrument this manual describes. These differences are described in change sheets and manual supplements available from your nearest Hewlett-Packard field office.

1-8. SPECIFICATIONS.

Note

The specifications for the HP 2737A/B Punched Tape Readers are based upon using Mylar or equivalent high-quality tape or paper having low moisture content and transmissivities less than 40%. Optimum performance requires the use of high quality tapes and paper.

1-9. Specifications for the HP 2737A/B Punched Tape Readers are given in Table 1-1.

1-10. DRIVE AND BRAKE MECHANISM.

1-11. An electromagnetic jam roller presses the tape against a constant velocity drive roller for forward tape advance. On HP 2737B Readers, the jam roller is released during rewind operation. The power supply provides 600 mA drive current in the forward drive operation.

1-12. An electromagnetic brake shoe clamps the tape against a brake pad for braking action. The power supply provides 600 mA brake current for the brake shoe electromagnet.

1-13. TAPE SENSING.

1-14. The photo-block contains eight photoelectric cells for detecting data tracks and one cell for detecting feed holes. The cells are arranged in a common anode configuration to provide negative outputs. The photo-block is illuminated by a Rheem axial cartridge lamp through a cylindrical focusing lens.

1-15. A special feedhole differential amplifier circuit provides compensation for variations in tape transmissivities of 0 to 40%.

Table 1-1. Specifications

GENERAL

Power Requirement: 115 vac ± 10%, 50 to 60 Hz at 150 watts for HP 2737A or 420 watts for HP 2737B.

Mounting: Standard 19-inch rack

Panel Height: 7 inches.

Depth: 9-3/8 inches

Weight: HP 2737A - 14 lbs. Net, 16 lbs. Shipping
HP 2737B - 22 lbs. Net, 27 lbs. Shipping

Finish: Light-grey baked enamel with black-filled engravings

Environmental: 0° to 55°C ambient temperatures; relative humidity to 95% at 40°C (with Mylar tape)

TAPE

Code: Any 8, 7 or 5 level

Width: 1, 7/8 or 5/8 inches

Reel Size (HP 2737B only): 4-5/8 inch diameter; 2-5/8 inch core diameter

Reel Capacity (HP 2737B only): 200 feet of 4 mil tape

SPEED

Reading: 300 characters per second ±10% synchronously (constant read command) at 115 volts, 60 Hz or 250 characters per second at 50 Hz

Starting: 6 ms from rest (HP 2737A)
8 ms from rest (HP 2737B)

Stopping: 1.0 ms on command character or between characters as desired

Rewind: 40 inches per second average at 60 Hz line frequency (HP 2737B)

SECTION II

INSTALLATION AND OPERATION

2-1. INTRODUCTION.

2-2. This section contains information on unpacking, inspection, installation, and operation.

2-3. UNPACKING AND INSPECTION.

2-4. If the shipping carton is damaged upon receipt, request that the carrier's agent be present when unpacking. 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 field office immediately (field offices are listed at the back of this manual). Retail the shipping carton and the padding material for the carrier's inspection. The Hewlett-Packard field office will arrange for the repair or replacement of your instrument without waiting for any claims against the carrier to be settled.

2-5. STORAGE AND SHIPMENT.

2-6. PACKAGING. To protect your instrument during storage or shipment, always use the best packaging material available. Your Hewlett-Packard field office can provide packing material such as that used for original factory shipping.

2-7. INSTALLATION.

2-8. RACK OR BENCH INSTALLATION. Your instrument is designed for either a bench installation or installation in a standard 19-inch rack. All necessary accessories are also supplied except interconnecting cables for associated instruments which are supplied with those instruments. These cables may also be supplied upon special order to your nearest Hewlett-Packard field office.

CAUTION

Check the ampere rating of each main fuse before installation of your instrument. These fuses are located on the left side of the main chassis.

2-9. LUBRICATION. Your instrument was lubricated before shipment. However, failure to check your instrument for proper lubrication periodically may result in serious and costly damage to the instrument. Complete lubrication procedures are provided in Table 4-4 of this manual.

2-10. PRELIMINARY OPERATION PROCEDURES.

2-11. The preliminary operation procedures given in this section will ready your instrument for safe and dependable operation. Failure to observe these procedures and precautionary measures may cause improper operation and/or damage of your instrument.

2-12. Proceed as follows:

a. Place the front panel POWER switch to OFF.

b. Refer to Figure 4-2 and adjust the photo-block assembly for the appropriate tape level.

Note

As shipped from the factory, the photo-block is set for 8-level tape (1-inch). To adjust for 7 or 5 level tape (7/8- or 5/8-inch, respectively), remove the lower front cover and replace the No. 4-40 level stop screw with a shorter No. 4-40 screw. Then push up on the bottom of the photo-block for the desired level (as shown in Figure 4-2). Now replace the front cover.

c. Set the RUN-LOAD slide switch to LOAD (down as shown in Figure 4-2). Then throw the REWIND switch OFF (down).

d. Now connect the AC power cord (HP Stock No. 8120-0078) to connector J101 located on left side of main chassis.

e. Connect your receiving instrument's input cable to connector J2 (located on left side of main chassis). Pin assignments for J2 are shown in Table 2-1.

Note

Normally pins K and HH will be internally tied together, but the connection may be removed if it is desired to operate the instrument at other than power line ground. Also, on HP 2737B models, a remote rewind contact closure may be made between pins EE and HH.

f. Now loosen the two screws under the top front cover and rotate the cover clockwise. Make sure the lamp under the cover is seated properly. Then replace the cover.

Table 2-1. Connector J2 Pin Assignments

J2 Pin	Description
B	Data Track 1 (-)
F	1 (+)
L	2 (-)
R	2 (+)
V	3 (-)
Z	3 (+)
d	4 (-)
j	4 (+)
p	5 (-)
u	5 (+)
y	6 (-)
cc	6 (+)
D	7 (-)
J	7 (+)
N	8 (-)
T	8 (+)
x	Feedhole (-)
b	Feedhole (+)
s	Tape Drive (+)
w	Tape Drive (-)
k	Common
HH	Chassis Ground
EE	Remote Rewind

CAUTION

Instruments with serial numbers prefixed 718- and higher use an HP Stock No. 2140-0252 lamp. This lamp is identified by yellow dots painted on each end cap. It is imperative that instruments with serial numbers prefixed 718- and higher have this type lamp installed. Instruments with serial numbers prefixed 650- and lower use an HP Stock No. 2140-0091 lamp. This lamp has no identifying marks and must not be used on instruments with serial numbers prefixed 718- and higher. Refer to Section 4-18 for lamp voltage requirements.

2-13. OPERATION.

2-14. The operating procedures in this section must be performed exactly as given to ensure proper operation.

2-15. OPERATING MODES.

2-16. The operating modes for the HP 2737B Punched Tape Reader are READ, READ/SPOOL and REWIND. The HP 2737A Punched Tape Reader has only one operating mode which is READ. Therefore, the operating procedures given for READ/SPOOL and REWIND do not apply to HP 2737A instruments.

2-17. TAPE LOADING.

2-18. Load the tape as follows:

a. Thread the tape left to right over the left tape roller and through the guide block. Then make sure that the tape passes between the drive and jam rollers as shown in Figure 2-1. Finally, run the tape over the right tape roller.

Note

When loading an HP 2737B Punched Tape Reader, the tape must feed from, and to the top of, the supply and take-up reels. Make sure that the tape passes under the two tension rollers as shown in Figure 2-1.

b. The tape must be threaded so that when moving left to right, the characters appear in the original sequence punched and the feed holes are nearer the front panel (as shown in Figures 4-2 and 4-7).

c. Now place the RUN-LOAD slide switch to RUN.

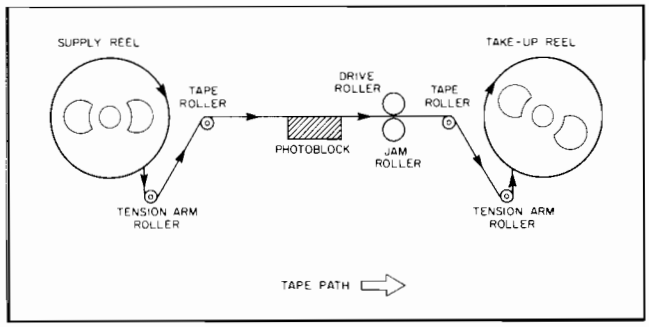

Figure 2-1. Tape Loading Diagram

2-19. OPERATING PROCEDURES.

2-20. READ MODE. This mode is applicable to both the HP 2737A and HP 2737B Punched Tape Readers. It is specifically intended to read unspooled or tape loops only. To start this mode of operation, throw the POWER switch to ON (HP 2737A) or READ (HP 2737B).

2-21. READ/SPOOL MODE. This mode is applicable to the HP 2737B Punched Tape Reader only. It is specifically intended for reading spooled tapes. To start this mode, place the POWER switch to READ/SPOOL.

2-22. REWIND MODE. This mode is applicable to the HP 2737B Punched Tape Reader only. It is specifically intended to rewind tapes completely or search a particular section of tape. This mode may be started by one of two methods.

a. Local: Place the front panel REWIND switch ON (up).

b. Remote: Make a contact closure between pins EE and HH on connector J2.

Note

The POWER switch must be set to the READ/SPOOL position for rewind operation.

SECTION III
THEORY OF OPERATION

3-1. INTRODUCTION.

3-2. The theory of operation for the HP 2737A and HP 2737B Punched Tape Readers is similar except for the wind and rewind circuitry added to an HP 2737B Reader. Descriptions provided in the following sections are therefore valid for both models unless otherwise specified.

3-3. Applicable schematic and logic diagrams for both models are included in Section IV. Figure 4-11 is a schematic and logic diagram for the HP 2737A; and Figure 4-12 is a schematic and logic diagram for the HP 2737B. The Read and Control Board (A2) schematic shown in Figure 4-13 is valid for both models.

3-4. DETAILED CIRCUIT THEORY.

3-5. LAMP CIRCUIT.

3-6. The lamp control circuitry is shown in Figure 4-13 and in either Figure 4-11 (HP 2737A) or Figure 4-12 (HP 2737B). An axial cartridge lamp (DS1) is used as a constant intensity light source to illuminate photo-block A1. This light activates the nine photocells (A1PD1 through A1PD9) when passed through a perforated tape. Variable resistor A2R53 sets the lamp voltage at approximately 20 volts. Transistors A2Q30 and Q3 then provide the necessary voltage regulation. The bias on Q3 is set by the conduction of A2Q30. In turn, the conduction of Q3 sets the voltage appearing across the lamp and variable resistor A2R53. In this manner, any voltage change across the lamp appears across A2R53 which changes the conduction of A2Q30 and hence the bias on Q3. Thus, any attempted lamp voltage change from 20 volts is immediately compensated for by the conduction of Q3.

3-7. FORWARD DRIVE CIRCUIT.

3-8. The forward drive circuit is shown in either Figure 4-11 (HP 2737A) or Figure 4-12 (HP 2737B), and Figure 4-13 for both models. A negative input to pin J2-w (or a positive input to pin J2-s) is inverted by transistor A2Q31, amplified by A2Q32, and then inverted again by A2Q33. This conditioned input is applied to switching transistors Q1 and Q2. When the RUN-LOAD switch S1A is closed (RUN), Q1 is switched on by the negative input appearing at A2-y. Transistor Q2 is simultaneously switched off by the positive input appearing at A2-z. Now with Q1 switched on, forward jam roller coil L1 is energized and the drive roller motor B1 advances the tape. Then, when the input at pin J2-w or J2-s is removed, the base of Q2 returns to zero level and Q2 is switched on. Transistor Q1 becomes biased by the voltage appearing across R2 and the current through Q1 is not sufficient to hold L1 energized. Brake shoe coil L2 is then energized and the tape is braked to a stop by the brake shoes.

3-9. When the RUN/LOAD switch S1A is set to the LOAD position (S1A open) the emitter return circuit is broken and neither Q1 nor Q2 can be switched on. This action releases the brake mechanism during the tape loading operation and removes ac power from the drive circuit (via S1B). Also, with S1A open, a ground is applied to A2-15 which complements an "or" gate (A2CR14 and A2CR15) in the differential amplifier circuit. This "or" gate disables the feedhole Differential Amplifier A2Q25 and prevents generation of false feedhole outputs.

3-10. FEEDHOLE CIRCUIT.

3-11. Feedholes detected by photocell A1PD9 cause negative pulses to be applied to Differential Amplifier A2Q25 (via J1-9 and A2-1). This differential amplifier circuit compensates for temperature variations and loads the photocell circuitry in such a manner that a 200 mV differential must exist on the base of A2Q25 to detect a feedhole input. This assures that the tape is read correctly even though transmissivities may vary 0 to 40%. This is important because the feedhole output is used by computers and programmers to strobe the data channels.

3-12. Variable resistor A2R33 sets the feedhole sensitivity. Transistor A2Q25 amplifies the feedhole signal appearing at A2-1 which is then applied to a Schmitt Trigger consisting of A2Q26 and A2Q27. This conditioned feedhole signal is then supplied to output connector J2 via transistor drivers A2Q28 and A2Q29.

3-13. DATA CHANNEL CIRCUITS.

3-14. The photocell detected input for each data track appears at connector J1, on pins 1 through 8. Channel 1 circuitry for track 1 is shown in Figure 4-13; the remaining seven channels use identical circuitry and are shown in block form on this diagram.

3-15. A negative-going pulse at pin J1-1 and A2-2 is amplified by A2Q1 and A2Q9, and then appears as a negative output at A2-13 and J2-B. This data signal is also inverted by transistor A2Q17 to provide a positive output at A2-14 and J2-F.

3-16. WIND AND REWIND CIRCUITS (HP 2737B).

3-17. The wind and rewind circuitry is shown in Figure 4-12. When the POWER switch (S2) is set to READ/SPOOL, forward drive roller motor B1 causes tape to advance and the tension arm drops. This

causes the normally open contacts on tension switch S3 to close (slack). Relay K2 is then energized via K1-E, tension switch S3, and the relay rectifier circuit CR9 through CR12. With K2 energized, take-up motor B3 (right reel) is turned on via POWER switch S2B, RUN-LOAD switch S1B, POWER switch S2A, relay K1-A, and the now closed contacts on K2. The tape is then spooled. Now, this action causes tape tension to increase and the contacts on tension switch S3 to open. Relay K2 then de-energizes and the take-up motor B3 is turned off. At the same time, the shading coil for B3 is shorted out (via S3 and K1-F) so that B3 is dynamically braked.

3-18. The feed motor B2 (left reel) operates in a manner opposite to take-up motor B3. When tape tension increases, the normally open contacts on tension switch S4 close, causing B2 to feed out tape until the tension relaxes. The contacts on S4 then open again and power is removed from B2.

3-19. When REWIND switch S5 is closed, or a remote ground closure is applied to pin J2-EE, rewind relay K1 energizes. This causes the forward jam roller and brake shoe circuit to be inhibited (via K1-G) so that the tape is released. The connections to B2 and B3 are now reversed (via K1-C and K1-E) so that both motors run in reverse. The motors now operate in a manner opposite to that for the wind mode. That is, take-up motor B3 now feeds tape whenever tape tension increases. Feed motor B2 is now energized constantly (via K1-B) regardless of tension switch S4. Also, take-up motor B3 is not dynamically braked in rewind as K1-F contacts are now open. Relay K2 is de-energized via the D contacts on relay K1.

3-20. POWER SUPPLY.

3-21. The main power supply is shown in either Figure 4-11 (HP 2737A) or Figure 4-12 (HP 2737B). Either figure is applicable since both models use the same power supply. The line source (115 vac) is accepted through connector J101. When the POWER switch is set to ON (HP 2737A) and READ or READ/SPOOL (HP 2737B) the source voltage is coupled across transformer T1 to a dual secondary. One secondary winding supplies the bridge rectifier consisting of diodes CR5 through CR8 and an associated filter network (R6 and C1). This rectifier provides the -30 vdc unregulated bus, and the regulated -12 vdc bus via power transistor Q4 and the -12 vdc control circuit. The other secondary winding provides the regulated voltage for the +5 vdc regulated bus via the +5 vdc power supply.

3-22. -12V REGULATED VOLTAGE CONTROL. The -30 vdc unregulated bus is applied to power transistor A2Q34 via A4 and J2-17. A breakdown diode connected across this power transistor maintains the output at -12 vdc. This output is then coupled to the -12 vdc regulated bus. Any attempted change in the -12 vdc bus occasions a change in the conduction of Q4 which controls the conduction of A2Q34 in such a manner as to compensate for the voltage change. Breakdown diode A2CR8 assures that the output voltage never drops below 11.7 volts.

3-23. +5V POWER SUPPLY. The unregulated source voltage is applied to a bridge rectifier consisting of A2CR10 through A2CR13. A breakdown diode (A2CR9) assures that any attempted change in the +5 vdc bus changes the conduction of regulating transistor A2Q35 which supplies the current for the rectifier. A change in this current then causes a change in the output voltage.

SECTION IV
MAINTENANCE

4-1. INTRODUCTION.

4-2. The HP 2737A/B Punched Tape Readers should require very little maintenance when periodically adjusted properly. A suggested preventive maintenance schedule is shown in Table 4-1. This section will describe the procedures for complete mechanical and electrical adjustments for the Readers, and provide information on the more common malfunctions that may occur over a period of extended usage.

4-3. PRELIMINARY PRECAUTIONS.

4-4. The HP 2737A/B Punched Tape Readers will perform satisfactorily with a wide variety of punched tapes. However, the type and condition of the tape can affect operation. In general, Mylar tape is preferred, but any type tape not seriously affected by moisture will suffice. The tape color should be such that the "transmissivity" does not exceed 40%.

4-5. The condition of the tape can cause serious difficulty in the operation of the Readers. Some of the more common Reader malfunctions can usually be traced to one of the following conditions:

a. Pulled Sprocket Holes: Some tapes have an occasional elongated sprocket hole. This is usually caused by a mis-adjusted tape punch or a mis-loaded supply reel on the punch. If the sprocket holes arrive too soon, the code holes may be completely ignored by the Reader.

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

c. Lint on Tape: Lint on a tape can accumulate under the Reader lamp and block off the light. Tapes and their containers should be kept clean. The Reader should be brushed out and air blasted periodically.

Table 4-1. Preventive Maintenance Schedule

Item	Time	Procedure
Photocell Block	Semi-Weekly or more frequently as required.	Check the condition of the glass slide covering the aperature plate. This is extremely important since any dirt or foreign material covering an aperture can create errors in readout. A stiff bristle brush is included for general cleaning. Use a cotton swab and water, if necessary, to remove foreign matter.
Focusing Lens	Semi-Weekly	Check and clean if necessary. Use the same materials for cleaning as mentioned in the Photocell Block Item.
Jam and Drive Rollers	Weekly	Check for the following: a. Cleanliness of the surface. Cleaning is easily accomplished by abrading their surfaces with a soft eraser of the "Pink Pearl" type. b. Wear or indentations on the roller surfaces.
Brake Shoe	Weekly	Check for accumulation of foreign matter that might tend to reduce the braking force and clean, if necessary. Refer to Section 4-15.
Lamp Intensity	Monthly	Check the voltage across the reading lamp. Refer to Section 4-18.

d. Ragged Edges: A code hole that has been torn out 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 Reader operation. But oil from other sources will. 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.

4-6. TAPE SPLICING. A butt splice is recommended whenever a tape breaks. This type splice is made by bringing the ends of the tape together without any overlapping and securing them firmly together with the splicing material. A butt splice is shown in Figure 4-1. Silver Scotch Tape No. 852 is the recommended splicing material. Make sure the splicing material ends between feed holes and is trimmed coincident with the tape edge.

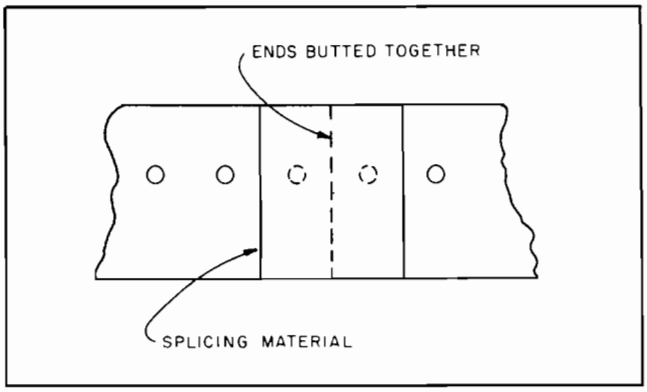

Figure 4-1. Tape Splicing

4-7. ELECTRICAL AND MECHANICAL ADJUSTMENTS.

4-8. The mechanical and electrical adjustment procedures described in this section should be performed whenever a malfunction is suspected. In this manner, the trouble may be corrected by one of the adjustments, or may be isolated to a particular component.

4-9. MECHANICAL ADJUSTMENT AND CALIBRATION.

4-10. Proper operation of your instrument depends upon making and maintaining accurate mechanical adjustments. A quick visual check will normally indicate the need for making these mechanical adjustments.

4-11. GUIDE BLOCK ADJUSTMENTS. The correct guide block adjustment for 5, 7, and 8 level tapes is shown in Figure 4-2. As shipped from the factory, the No. 4-40 level stop screw provides a positive stop for 8 level tape. To operate this instrument with 5 or 7 level tape, it is necessary to replace this screw with a shorter screw and then adjust the guide block for the desired level (as shown on Figure 4-2). The guide block position should be checked before each and every operation to ensure proper positioning.

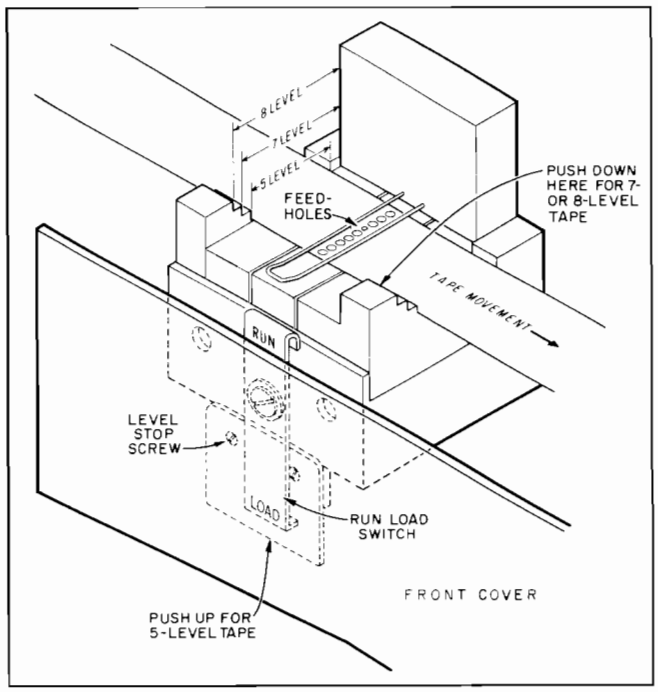

Figure 4-2. Guide Block Adjustment

4-12. DRIVE AND JAM ROLLER GAP ADJUSTMENT. The drive and jam roller gap adjustment is made with the rocker stop as shown in Figure 4-3. This adjustment is made as follows:

a. Throw the POWER switch to OFF.

b. Remove tape from the Reader.

c. Loosen the rocker stop lock nut.

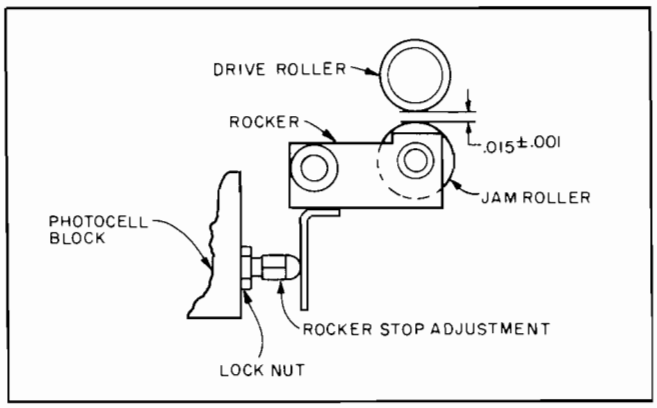

Figure 4-3. Driver and Jam Roller Gap Adjustment

d. With the rocker placed against the rocker stop (as shown in Figure 4-3), rotate the stop until the gap is 0.015 ± 0.001 inch.

e. Now tighten the lock nut. Then recheck the gap size.

4-13. DRIVE MAGNET AIR GAP ADJUSTMENT. The drive magnet air gap adjustment is made with the rocker and magnet as shown in Figure 4-4. The adjustment is made as follows:

a. Throw POWER switch to OFF.

b. Remove tape.

c. Now rotate the rocker until the rollers are fully engaged (as shown in Figure 4-4).

d. Loosen the drive magnet adjustment screws. Then move the magnet until the gap between the angle attached to the rocker and the magnet end is 0.020 ± 0.004 inches. Make sure the longitudinal axis running through the magnet makes a right angle (90°) to the vertical (as shown in Figure 4-4).

e. Tighten the drive magnet adjustment screws. Then recheck the gap size.

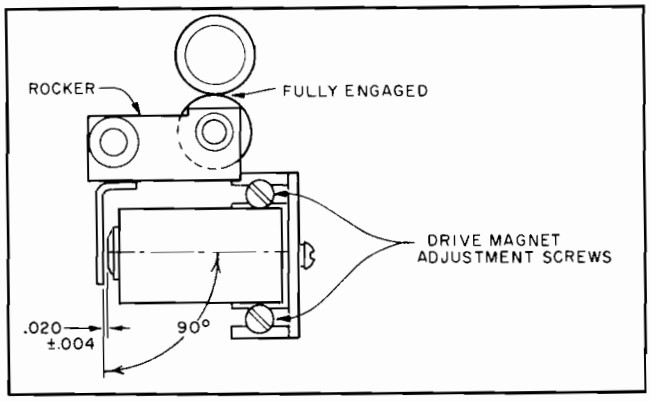

Figure 4-4. Drive Magnet Air Gap Adjustment

4-14. REWIND AND TAKE-UP MOTOR BRAKE TENSION ADJUSTMENT (HP 2737B Models only). The rewind and take-up motors (M2 and M3) brake tension adjustments are made as shown in Figure 4-5. To make these adjustments, proceed as follows:

a. Use a screwdriver (as shown in Figure 4-5A) to slide the armature back approximately 1/8 inch and hold it in that position.

b. Loosen the set screw at the rear of the motor and move the fan assembly toward the motor until the brake surfaces are engaged. Now tighten the set screw.

c. Remove the screwdriver.

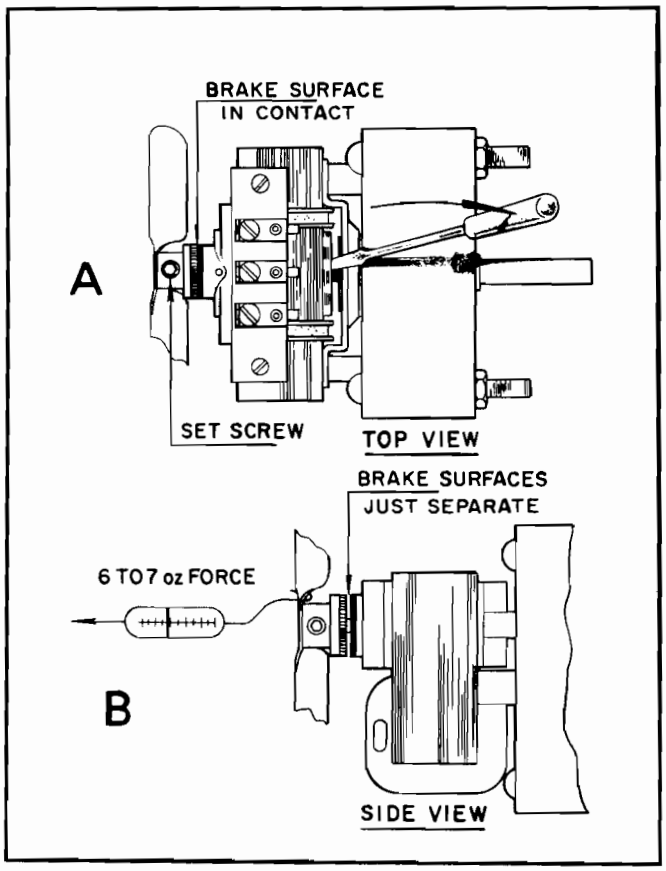

Figure 4-5. Rewind and Take-up Motor Brake Tension Adjustment

d. Attach a spring scale to the fan (as shown in Figure 4-5B) and pull back the armature shaft until the brake surfaces just separate. The required force should be between 6 and 7 ounces.

e. Now pull the armature shaft all the way back. The gap between brake surfaces must be greater than 0.005 inches.

f. Repeat steps "a" through "e" until the desired results are obtained.

4-15. BRAKE MAGNET CLEANING PROCEDURE. The brake magnet cleaning procedure is accomplished as follows:

a. Remove the upper cover.

b. Refer to Figure 4-6 and loosen the two No. 4-40 allen screws which hold the brake shoe housing (top half of brake).

c. Insert a screwdriver under the brake shoe while carefully removing the housing from the mounting block. Be sure to keep the parts intact while removing the housing, and leave the mounting block secured to the panel.

d. Now use water or alcohol to clean the residue from the housing, the brake shoe, the spring and the magnet face.

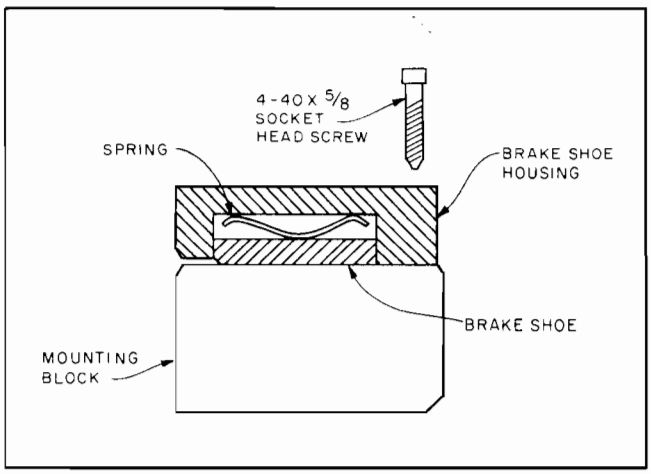

Figure 4-6. Proper Placement of Spring In Brake Shoe Housing

e. Reassemble the brake shoe housing (as shown in Figure 4-6) and remount it to the mounting block. It is important for maximum braking action that the spring be placed as shown, and not inverted.

4-16. ELECTRICAL ADJUSTMENT.

4-17. The following procedure is used for adjusting the lamp brilliance and the output level of the photocells. The lamp voltage is set by variable resistor A2R53 which is accessible on the rear of the main chassis. This adjustment controls the level of brilliance. The gain of each data photocell amplifier is set by variable resistors A2R101 through A2R108 which are accessible through the bottom chassis cover plate. The threshold level for the feedhole amplifier is set by variable resistor A2R33 also accessible on the rear of main chassis. These procedures apply to both the HP 2737A and HP 2737B models unless otherwise specified.

4-18. Adjust the lamp voltage and photocell output as follows:

a. Open the top cover on front panel by loosening two screws under the cover and then rotating the cover clockwise.

b. Set the front panel RUN/LOAD slide switch to LOAD. On HP 2737B models, set the REWIND switch to off (down) and remove any remote rewind contact closure from connector pin J2-EE.

c. Now place the POWER switch to ON (HP 2737A) or READ (HP 2737B). Make sure that the lamp (DS1) is shining brightly on all photocells (as shown in Figure 4-7).

d. Now connect a VTVM across the lamp terminals (located on left side of the front panel). Then adjust A2R53 for a VTVM reading of 20.0 volts.

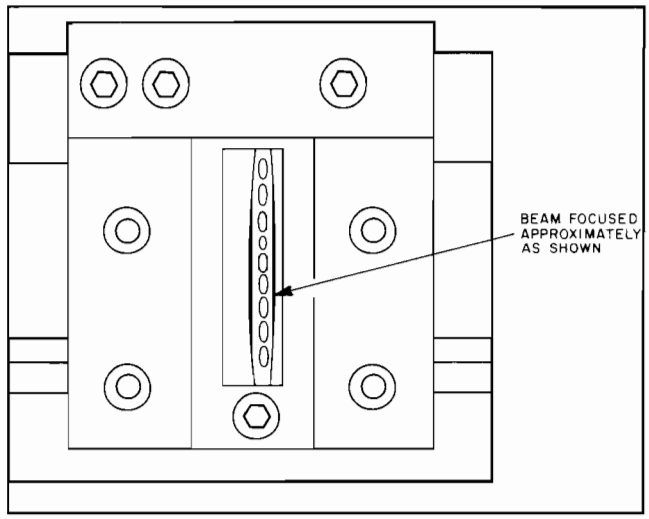

Figure 4-7. Proper Focused Beam Alignment

CAUTION

Instruments with serial numbers prefixed 718- and above use an HP Stock No. 2140-0252 lamp. This lamp is identified by yellow dots painted on each lamp end cap. The voltage adjustment for this type lamp is critical at 20.0 volts. Instruments with serial numbers prefixed 650- and lower use an HP Stock No. 2140-0091 lamp. This type lamp has no identifying marks and is adjusted for 21.0 volts. Be sure to check the lamp type before making the above voltage adjustment.

e. Load a test tape with all holes punched in the Tape Reader. Then set the RUN/LOAD slide switch to RUN as shown in Figure 4-2.

f. Now connect one probe of a dual trace Oscilloscope (such as HP 175) to each data output pin on connector J2 (as shown in Table 4-2). These positive-going data pulses should be -8 volts (± 1 volt) to zero volts (± 0.5 volts).

Table 4-2. Test Points and Adjustments

J2 Pin	A2 Pin	Adjustments
F	14	R101
R	W	R102
Z	V	R103
j	S	R104
u	12	R105
CC	P	R106
J	M	R107
T	L	R108

g. Now adjust A2R101 through A2R108 so that each positive-going pulse is 2 ms in duration as shown in Figure 4-8B.

h. Now connect the test probe to connector pin J2-b. Then adjust variable resistor A2R33 so that the displayed waveform is on for 0.9 ms as shown in Figure 4-8A. Leave this test probe connected to pin J2-b.

i. Using the second test probe, monitor each data pulse as in step "f". The minimum delay between any data pulse and the feedhole pulse should not be less than 300 μs as shown in Figure 4-8B.

j. Repeat steps "g" and "h" until the desired results are obtained. If these results cannot be obtained, refer to Paragraph 4-19 and perform the partial lamp adjustment. Then repeat steps "g" and "h" of this paragraph.

k. Remove all test equipment and the test tape. Place the POWER switch to OFF.

4-19. PARTIAL LAMP ADJUSTMENT.

4-20. When errors are detected in the instrument's operation after extended usage, the most probable cause is lamp aging. Errors due to lamp aging may sometimes be corrected by increasing the lamp voltage or lowering the feedhole threshold level.

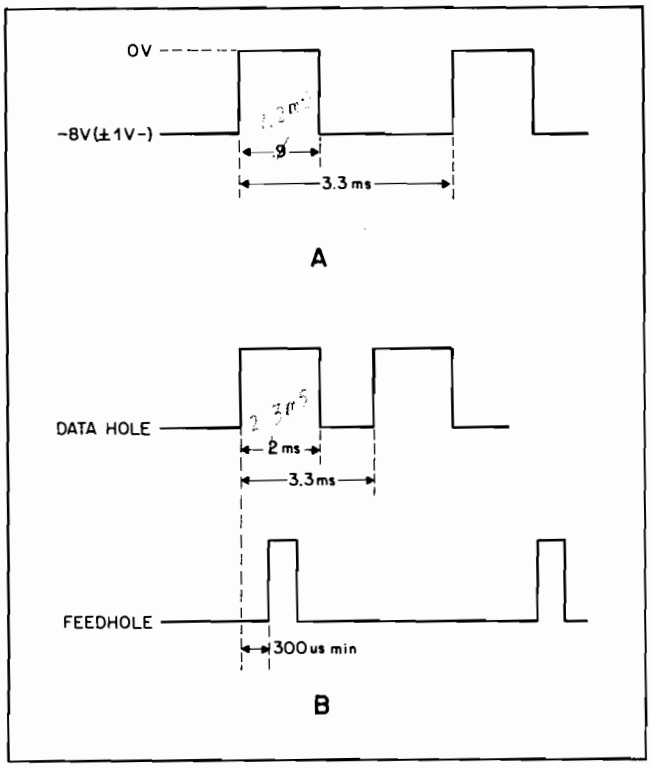

Figure 4-8. Feedhole and Data Pulses

4-21. The lamp voltage may be increased by turning A2R53 in a clockwise direction 1 or 2 times. Always count the number of turns so that the variable resistor may be returned to its original setting. If adjusting A2R53 does not eliminate the error, vary the feedhole threshold-level variable resistor A2R33 ± 3 turns, both at the original and new setting of A2R53.

4-22. MAINTENANCE PROCEDURES.

4-23. When errors are detected in the instrument's operation after having been adjusted and calibrated, the most probable causes are:

a. Dirty focusing lens, or glass slide covering the aperture plate.

b. Flat spots on the lamp, or focusing lens.

c. Permanently weakened lamp.

d. Defective photocell.

e. Changes in tape transmissivity.

f. Misalignment of photoblock.

4-24. The focusing lens and/or glass slide covering the aperature plate may become contaminated with foreign material. This condition may be corrected using the cleaning procedures given in Table 4-1.

4-25. Variations in construction and/or extended usage may cause flat spots to develop on the focusing lens and lamp. This condition can normally be corrected by rotating the lens or lamp. The lens should be rotated in 90 degree increments until the focused light beam is properly oriented as shown in Figure 4-7.

4-26. A permanently weakened lamp or a lamp with an unsymmetrical filament must be replaced. When replacing a lamp, make certain the filament is parallel with the holes in the photo-block and that the focused beam will just cover all holes as shown in Figure 4-7.

4-27. Because of lamp surface dissymmetry, it may be necessary to rotate the lamp to achieve optimum brilliance. Long nose pliers may be used on the lamp base. Be careful not to break loose the base. It may also be necessary to loosen the lamp mounting bracket screws and move the bracket slightly (as shown in Figure 4-9).

4-28. A defective data or feedhole photocell will cause errors in Reader operation. Figure 4-10 illustrates the minimum photocell output using the lamp voltage described in paragraph 4-18. The data shown is for N on P cells which give negative outputs with respect to the common anodes. Each data track and the feedhole track output may be checked by connecting a high impedance voltmeter between each pin (as shown in Table 4-3) of connector J1 and chassis ground.

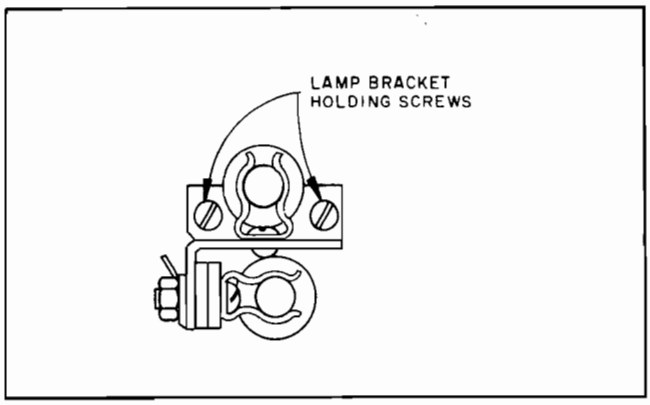

Figure 4-9. Lamp Mounting Bracket

4-29. Changes in the transmissivity of the punched tape and/or misalignment of the photo-block will cause pronounced erratic operation of the Readers. Procedures for correcting these conditions are contained in paragraphs 4-30 and 4-33, respectively.

4-30. TRANSMISSIVITY OF A TAPE.

4-31. Semi-transparent tapes which transmit up to 40% of the light applied are capable of being read by the Readers. Any higher level may not be compensated for by the Feedhole Differential Amplifier thereby giving false outputs. A tape that has a transmissivity higher than 40% must not be used with the HP 2737A/B Punched Tape Readers.

4-32. The procedure for determining the percentage of light transmissivity of a tape is as follows:

a. Remove plug P1 connected to J1 on photo-block.

b. Connect a 100-ohm, 1/2-watt resistor across pins 9 and 10 of connector J1.

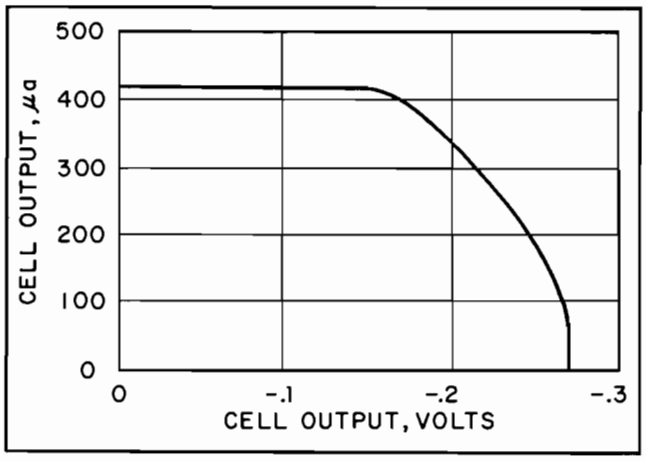

Figure 4-10. Minimum Output by Photocells

Table 4-3. Photocell Output Test Points

J1 Pin	Photocell
1	Data Track 1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	Feedhole Track

c. Now connect a VTVM across the 100-ohm resistor.

d. Throw the POWER switch to ON (HP 2737A) or READ (HP 2737B).

e. Record the VTVM reading.

f. Now insert a non-punched section of the tape to be measured in the Reader.

g. Record this VTVM reading.

h. Divide the reading obtained in step "g" by the reading obtained in step "e".

i. Multiply the result obtained in Step "h" by 100 to give the percentage of transmissivity.

j. Remove the tape and resistor, and replace P1. Turn the Reader OFF.

Note

The transmissivity of a tape along a longitudinal section is not generally linear. Therefore, several sections of the same tape should be tested to obtain an overall average of the transmissivity.

4-33. PHOTO-BLOCK ALIGNMENT.

4-34. Photo-block misalignment will cause disruptions in the feedhole and data-hole output timing sequence. This condition is manifested in misreading of punched characters and misfires. Photo-block alignment may be checked by comparing leading edges of the data-hole pulses on tracks 1 and 8. If there is a difference greater than 300 μs, the photo-block must be realigned.

Note

A mispunched tape or a tape having a high degree of skew may give a false indication of photo-block misalignment. Your tape punch manual should be consulted for instructions on measuring skew before attempting photo-block alignment.

4-35. The procedure for photo-block alignment is as follows:

a. Load a "black" test tape with all holes punched on the Reader.

b. Throw the POWER switch to ON (HP 2737A) or READ (HP 2737B).

c. Now use a dual-trace Oscilloscope (such as HP 175A) to compare the outputs on pins B and N of connector J2. If the difference between leading edges of the displayed pulses is greater than 300 μs, proceed to step "d".

d. Loosen the front screw on the photo-block. Now, gently tap the photo-block first in one direction and then the other while observing the displayed pulses. Then position the block so that the difference in leading edges is less than 300 μs.

CAUTION

Do not loosen the rear screw on the photo-block unless absolutely necessary. Once the block is entirely mispositioned, it requires valuable and costly time to reposition correctly.

e. Now tighten the front screw and recheck the displayed pulses. Repeat this procedure until the desired results are obtained.

4-36. LUBRICATION.

4-37. Especially important to the Readers' long life and trouble-free service are proper lubrication intervals and techniques. Motor bearings, shafts and gear trains are lubricated before shipment. However, extensive usage resulting in friction and wear requires that these components be lubricated at specified time intervals. A lubrication kit (HP Stock No. 5080-6610) is supplied with your instrument. Table 4-4 provides complete lubrication intervals and procedures. Accessible component locations are provided in Appendix A (HP 2737A) and Appendix B (HP 2737B).

Computer Museum

Table 4-4. Lubrication Chart

Component	Interval	Procedure
Motor Pads	6 months	Place 6 to 9 drops of a light (20 weight) machine oil on each pad in gear box. When oiling M2 or M3, make sure no oil is applied to the brake discs.
Motor Ends	6 months	Place 2 to 3 drops of light (20 weight) machine oil on each motor end bearing.
Gear Trains	6 months	Remove each gear box cover and apply machine grease (Lubriplate) to each gear train.
Arm Shafts	6 months	Place 1 drop of light (20 weight) oil between the bearing seated in the front panel and the arm shaft.

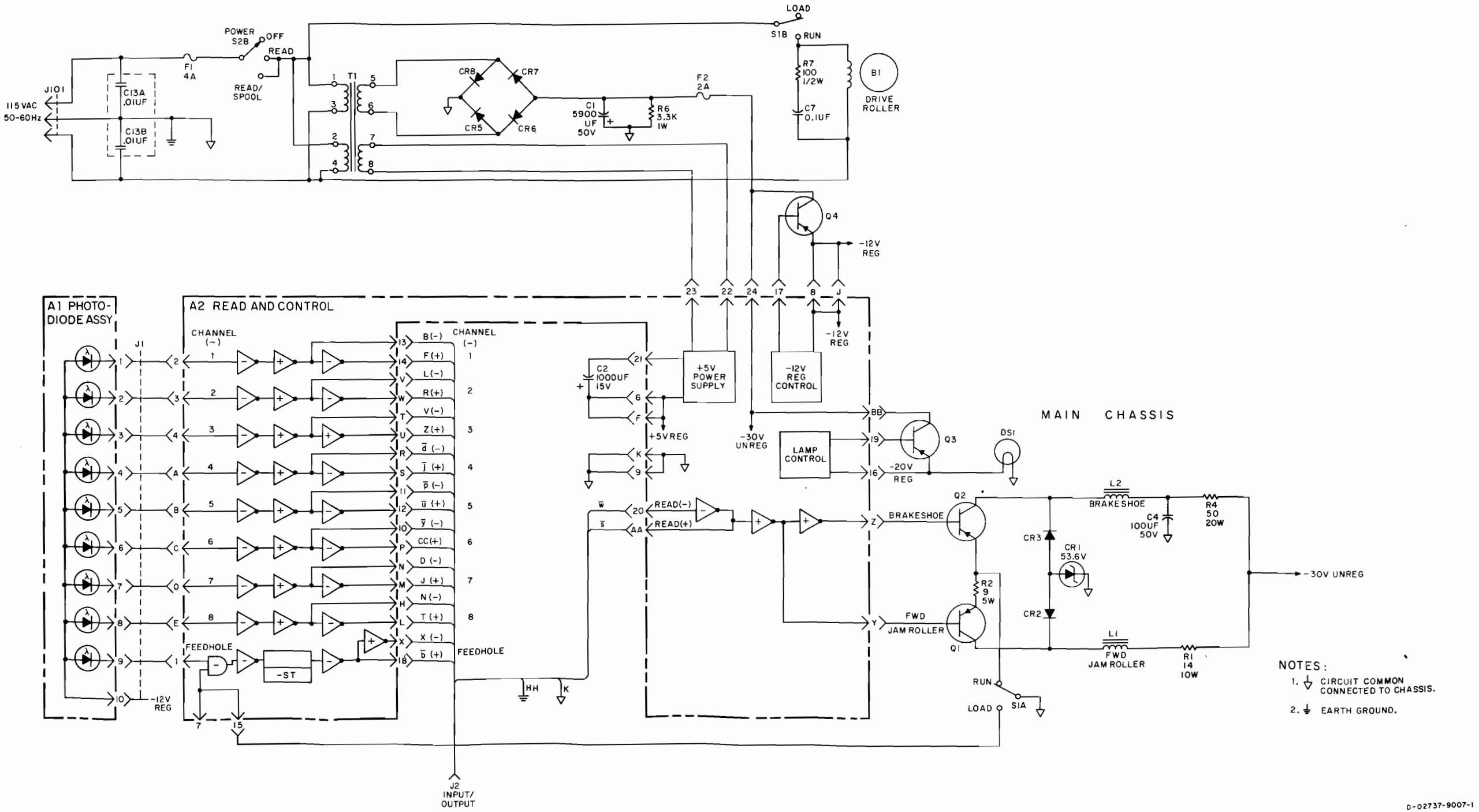

Figure 4-11. HP 2737A Logic and Wiring

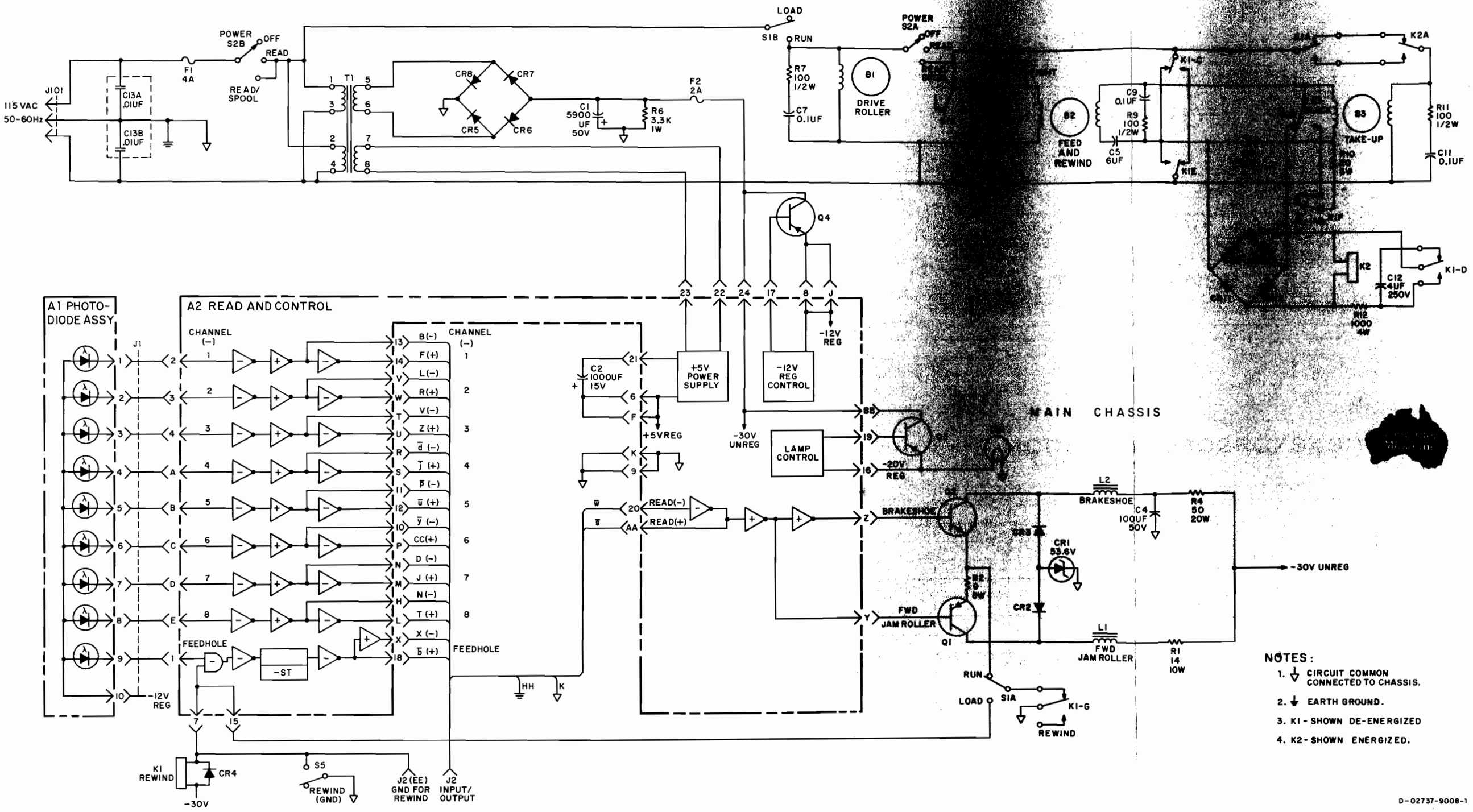

Figure 4-12. HP 2737B Logic and Wiring

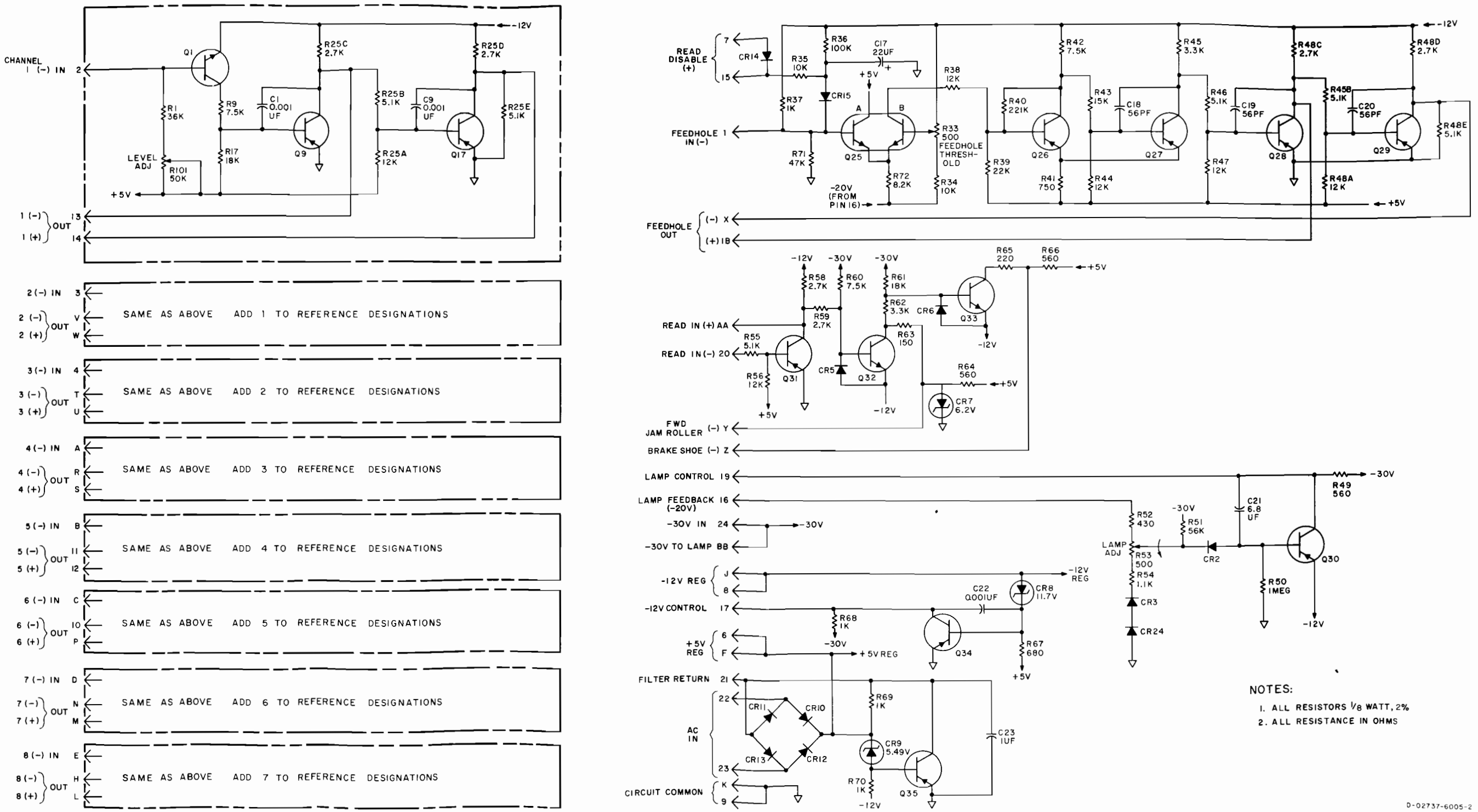

Figure 4-13. HP 2737A/B Read and Control Assembly A2

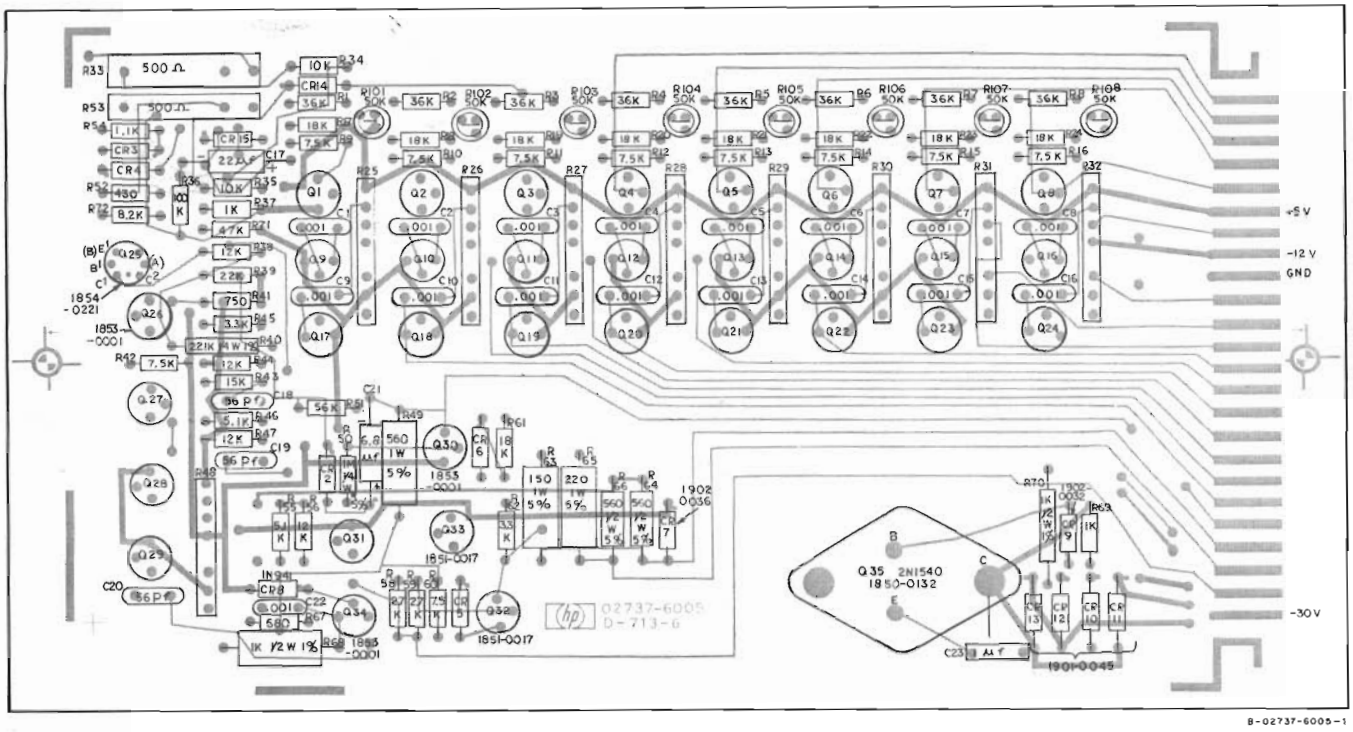

Figure 4-14. HP 2737A/B Read and Control Assembly A2 Component Location

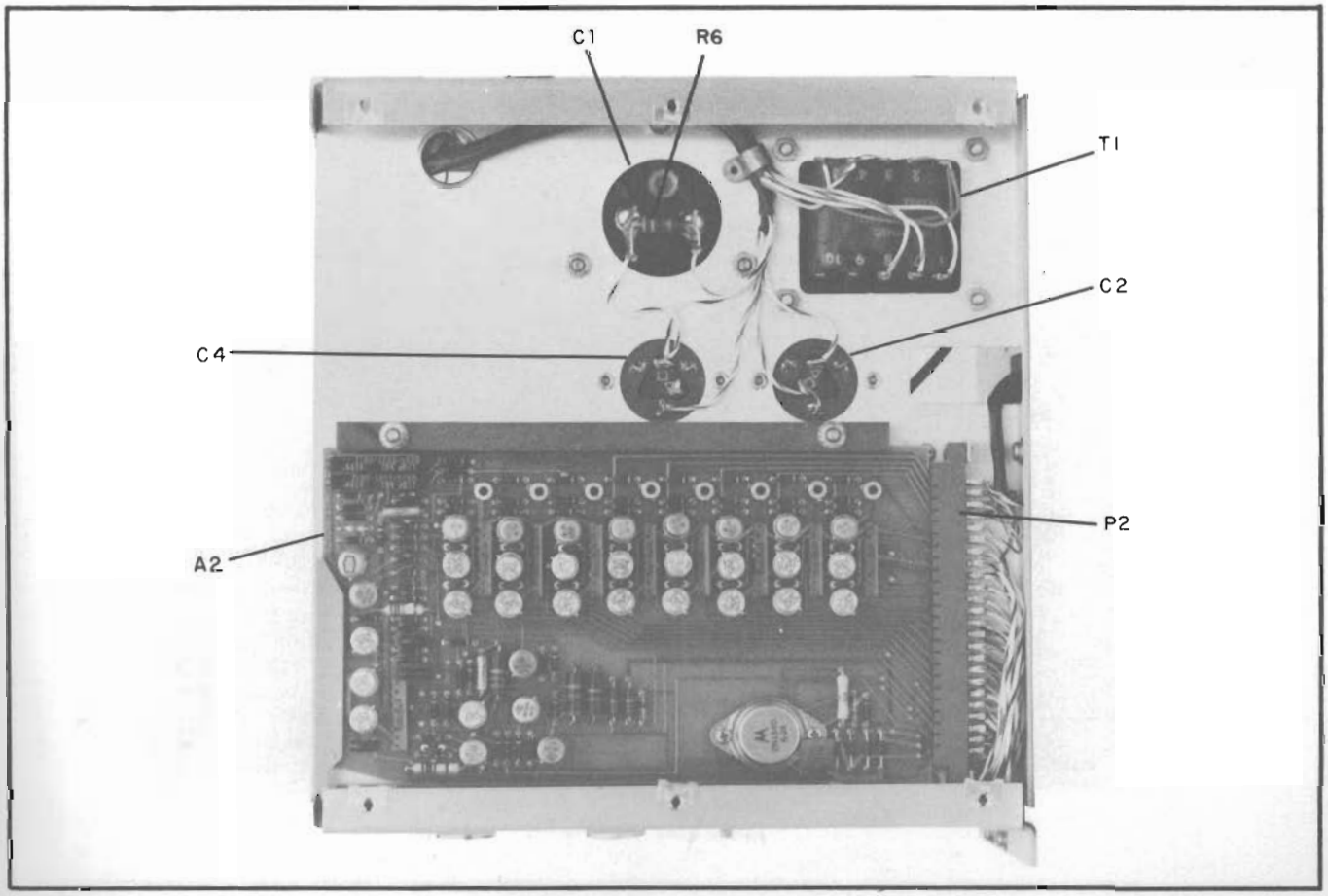

Figure 4-15. HP 2737A and HP 2737B Electronic Chassis Bottom View

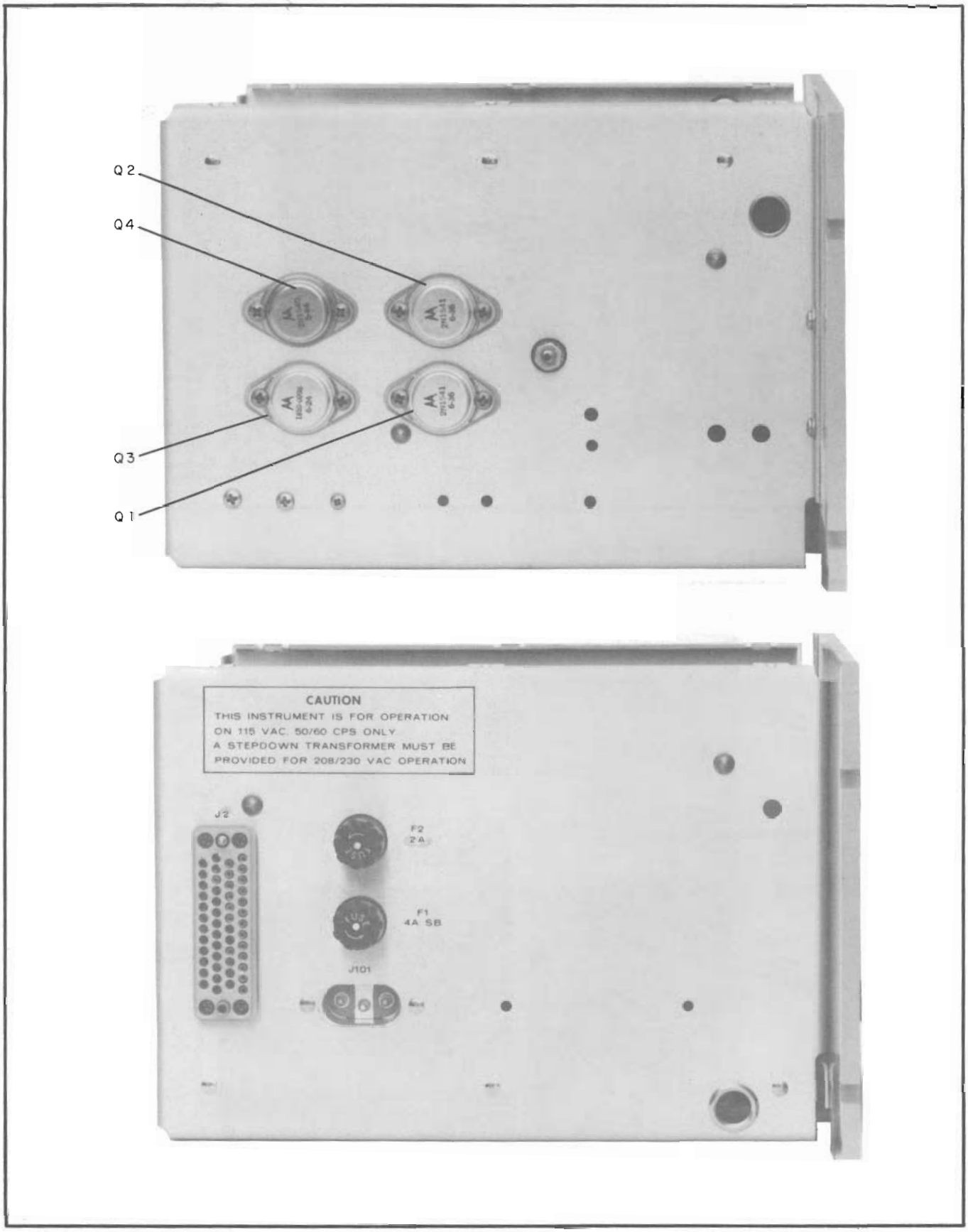

Figure 4-16. HP 2737A and HP 2737B Electronic Chassis Right Side (top) and Left Side (bottom) Views

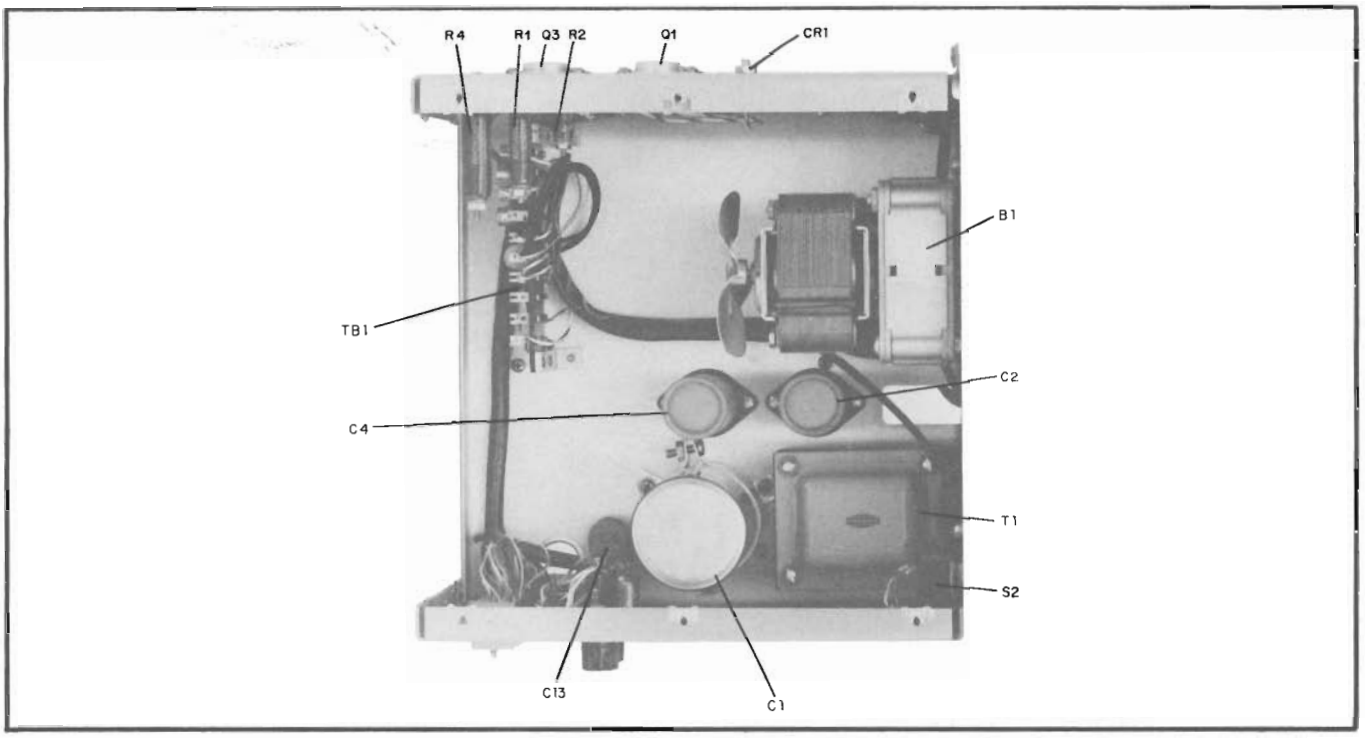

Figure 4-17. HP 2737A Electronic Chassis Top View

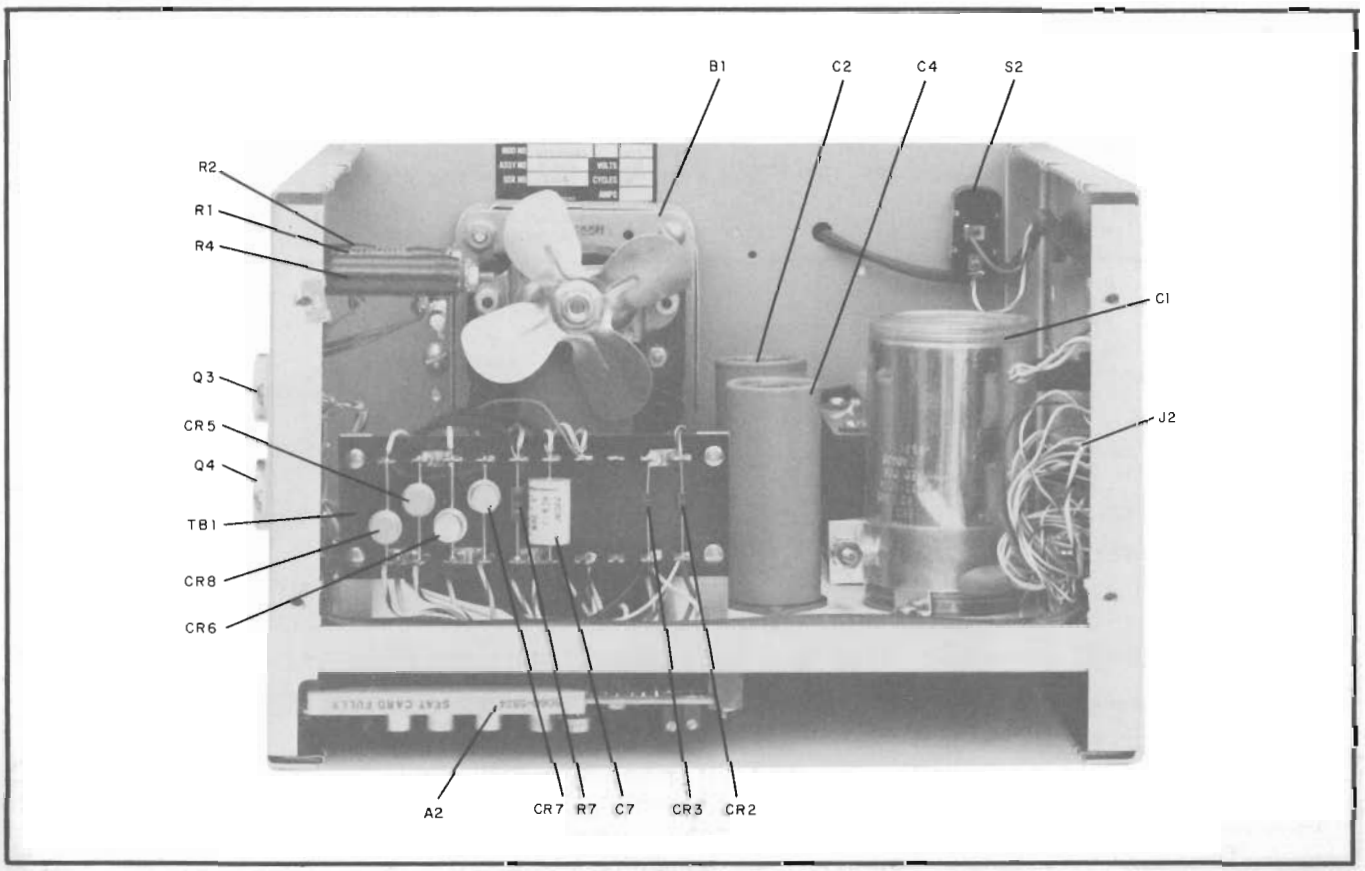

Figure 4-18. HP 2737A Electronic Chassis Rear View

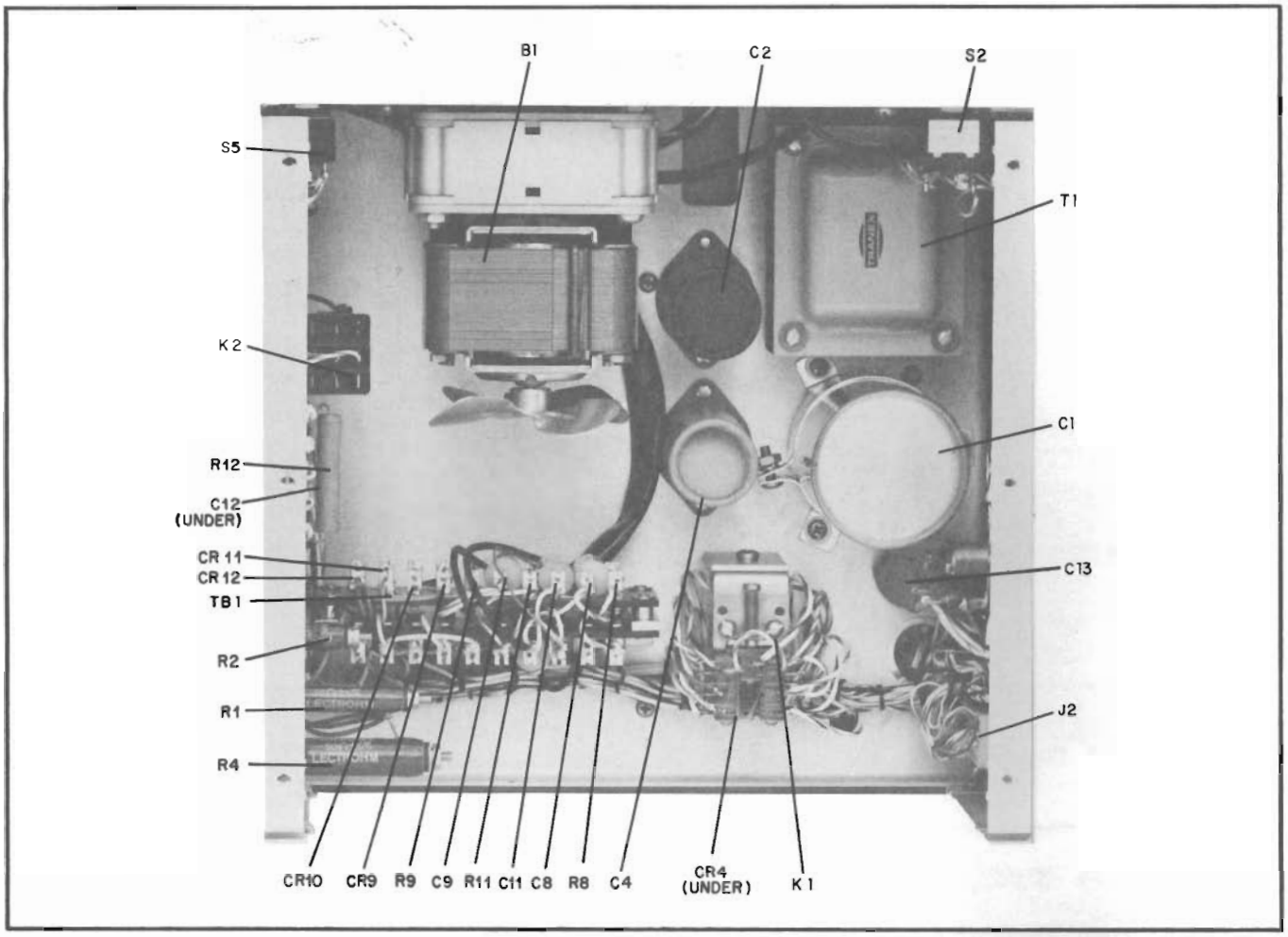

Figure 4-19. HP 2737B Electronic Chassis Top View

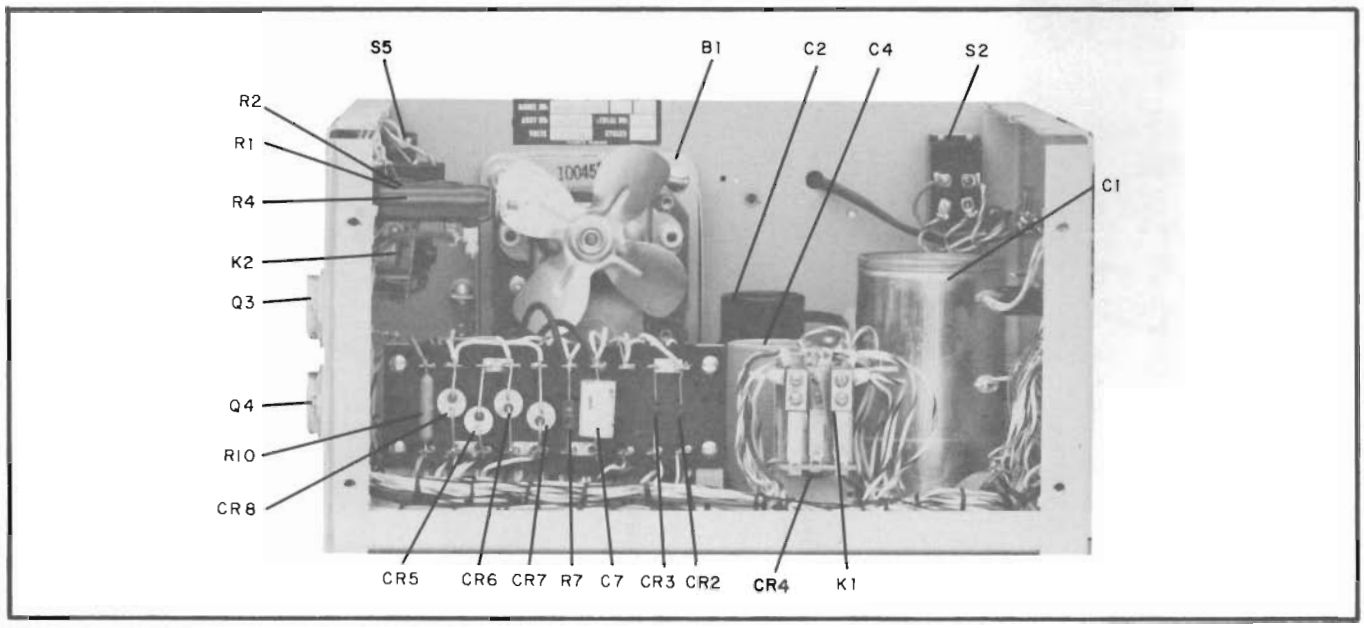

Figure 4-20. HP 2737B Electronic Chassis Rear View

SECTION V
REPLACEABLE PARTS

5-1. INTRODUCTION.

5-2. This section contains information for ordering replacement parts. Table 5-1 lists parts in alpha-numerical order of their reference designators and indicates the description and HP stock number of each part, together with the following information on each part:

a. Typical manufacturer of the part in a five-digit code; see list of manufacturers in Table 5-2.

b. Manufacturer's part number.

c. Total quantity used in the assembly.

d. Recommended spare part quantity for one year of isolated service.

5-3. Miscellaneous parts are listed at the end of Table 5-1.

5.4. ORDERING INFORMATION.

5-5. To obtain replacement parts, address order or inquiry to your local Hewlett-Packard Field Office (see lists at rear of this manual for addresses). Identify parts by their Hewlett-Packard stock numbers.

5-6. To obtain a part that is not listed, include:

a. Instrument model number.

b. Instrument serial number.

c. Description of the part.

d. Function and location of the part.

REFERENCE DESIGNATORS

A = assembly	F = fuse	MP = mechanical part	V = vacuum, tube, neon bulb, photocell, etc.
B = motor	FL = filter	P = plug	
BT = battery	IC = integrated circuit	Q = transistor	VR = voltage regulator
C = capacitor	J = jack	R = resistor	W = cable
CP = coupler	K = relay	RT = thermistor	X = socket
CR = diode	L = inductor	S = switch	Y = crystal
DL = delay line	LS = loud speaker	T = transformer	Z = tuned cavity, network
DS = device signaling (lamp)	M = meter	TB = terminal board	
E = misc electronic part	MK = microphone	TP = test point	

ABBREVIATIONS

A = amperes	H = henries	N/O = normally open	RMO = rack mount only
AFC = automatic frequency control	HDW = hardware	NPO = negative positive zero (zero temperature coefficient)	RMS = root-mean square
AMPL = amplifier	HEX = hexagonal		RWV = reverse working voltage
	HG = mercury		
BFO = beat frequency oscillator	HR = hour(s)	NPN = negative-positive-negative	S-B = slow-blow
BE CU = beryllium copper	HZ = hertz	NRFR = not recommended for field replacement	SCR = screw
BH = binder head	IF = intermediate freq		SE = selenium
BP = bandpass	IMPG = impregnated	NSR = not separately replaceable	SECT = section(s)
BRS = brass	INCD = incandescent		SEMICON = semiconductor
BWO = backward wave oscillator	INCL = include(s)		SI = silicon
	INS = insulation(ed)	OBD = order by description	SIL = silver
CCW = counter-clockwise	INT = internal	OH = oval head	SL = slide
CER = ceramic		OX = oxide	SPG = spring
CMO = cabinet mount only	K = kilo = 1000		SPL = special
COEF = coefficient		P = peak	SST = stainless steel
COM = common	LH = left hand	PC = printed circuit	SR = split ring
COMP = composition	LIN = linear taper	PF = picofarads = 10^{-12} farads	STL = steel
COMPL = complete	LK WASH = lock washer		
CONN = connector	LOG = logarithmic taper	PH BRZ = phosphor bronze	TA = tantalum
CP = cadmium plate	LPF = low pass filter	PHL = Phillips	TD = time delay
CRT = cathode-ray tube		PIV = peak inverse voltage	TGL = toggle
CW = clockwise	M = milli = 10^{-3}	PNP = positive-negative-positive	THD = thread
	MEG = meg = 10^{6}		TI = titanium
DEPC = deposited carbon	MET FLM = metal film	P/O = part of	TOL = tolerance
DR = drive	MET OX = metallic oxide	POLY = polystyrene	TRIM = trimmer
	MFR = manufacturer	PORC = porcelain	TWT = traveling wave tube
ELECT = electrolytic	MHZ = mega hertz	POS = position(s)	
ENCAP = encapsulated	MINAT = miniature	POT = potentiometer	U = micro = 10^{-6}
EXT = external	MOM = momentary	PP = peak-to-peak	
	MTG = mounting	PT = point	VAR = variable
F = farads	MY = "mylar"	PWV = peak working voltage	VDCW = dc working volts
FH = flat head			
FIL H = fillister head	N = nano (10^{-9})	RECT = rectifier	W/ = with
FXD = fixed	N/C = normally closed	RF = radio frequency	W = watts
	NE = neon	RH = round head or right hand	WIV = working inverse voltage
G = giga (10^{9})	NI PL = nickel plate		
GE = germanium			WW = wirewound
GL = glass			W/O = without
GRD = ground(ed)			

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Table 5-1. Table of Replaceable Parts

CIRCUIT REFERENCE	DESCRIPTION	STOCK NO.	MFR. CODE NO.	MFR. PART NO.	QTY.	1-YR. SPA.
	HP 2737A TAPE READER					
	Transport (purchased part)	0950-0708	04404	-	1	0
A1	Photodiode Assy (Ref Appendix A or B)				1	
A2	Read & Control A2	5060-5824	04404	-	1	0
B1	Motor (Ref M1 Appendix A or B)				1	
C1	C: fxd, al-elect, 5900 μf, -10 +75%, 50v	0180-0389	56289	36D592G050BB6B	1	1
C2	C: fxd, al-elect, 1000 μf, -10 +100%, 20v	0180-0220	56289	OBD	1	1
C4	C: fxd, al-elect, 2 × 100 μf, -10 + 150%, 50v	0180-0168	37942	WP2025	1	1
C7	C: fxd, my, .1 μf, 20%, 600v	0170-0022	09134	Type 24	1	1
C13A/B	C: fxd, cer, 2 × .01 μf, 20%, 250v	0150-0119	56289	41C159A	1	1
CR1	Diode: avalanche, 53.6v	1902-1186	04713	OBD	1	2
CR2, 3	Diode: Si	1901-0025	28480	-	3	2
CR5-8	Diode: rect, Si	1901-0164	28480	-	4	3
DS1	Lamp: 24v, 20 w	2140-0252	04404	-	1	3
F1	Fuse: 4a, 125v, s-b	2100-0014	28480	-	1	5
F2	Fuse: 2a, 250v	2110-0002	28480	-	2	5
	Fuseholder, F1, 2	1400-0084	75915	342014	2	0
J2	Conn: insert, 50 pin	1251-0338	81312	MRAC50S-J	1	1
J1	Conn: 15 pin, female (Ref. Appendix A or B)	1251-0219	71468	DAM15S	1	1
J101	Conn: power, 3 pin, male	1251-0148	28480	-	1	1
L1	Inductor: (Ref. Magnet Assy Appendix A or B)				1	
L2	Inductor: (Ref. Magnet Assy Appendix A or B)				1	
P1	(Ref. Appendix A or B)					
Q1, 2	Transistor: Ge, PNP	1850-0129	04713	OBD	2	1
Q3	Transistor: Ge, PNP	1850-0098	28480	-	1	1
Q4	Transistor: Ge, PNP	1850-0132	04713	2N1540	1	1
R1	R: fxd, ww, 14Ω, 5%, 10 w	0816-0019	28480	-	1	1
R2	R: fxd, ww, 9Ω, 5%, 5 w	0813-0016	28480	-	1	1
R4	R: fxd, ww, 50Ω, 5%, 20 w	0819-0022	28480	-	1	1
R6	R: fxd, comp, 3.3K, 5%, 1 w	0689-3325	28480	-	1	1
R7	R: fxd, comp, 100Ω, 5%, 1/2 w	0686-1015	28480	-	1	1
S1	Switch: Micro (Ref. Appendix A or B)				1	0
S2A/B	Switch: (Ref Appendix A)				1	
T1	Transformer: power	9100-0231	04404	-	1	0
XA1	Conn: pc, 48 pin	1251-0335	28480	-	1	1
	A2 READ & CONTROL	5060-5824				
C1-16, 22	C: fxd, cer, .001 μf, 10%, 200v	0160-2097	72982	865024Y5R102K	17	2
C17	C: fxd, Ta, 22 μf, 10%, 15v	0180-0365	56289	150D226X9015B2	1	1
C18-20	C: fxd, mica, 56 pf, 5%, 300v	0140-0191	04062	DM15E560J300v	3	1
C21	C: fxd, Ta-elect, 6.8 μf, 10%, 35v	0180-0116	28480	-	1	1
C23	C: fxd, cer, 1 μf, 20%, 25v	0160-0127	56289	5C13	1	1
CR2-6, 14, 15	Diode: Si	1901-0025	28480	-	7	4
CR7	Diode: avalanche, 6.19v	1902-0036	28480	-	1	2

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Table 5-1. Table of Replaceable Parts (Cont'd)

CIRCUIT REFERENCE	DESCRIPTION	STOCK NO.	MFR. CODE NO.	MFR. PART NO.	QTY.	1-YR. SPA.
	A2 (Cont'd.)					
CR8	Diode: avalanche, 11.7v, 1N941	1902-0018	04713	OBD	1	2
CR9	Diode: avalanche, 5.49v	1902-0032	28480	-	1	2
CR10-13	Diode: Si	1901-0045	28480	-	4	3
Q1-8	Transistor: Si, NPN, similar to 2N1711	1854-0003	28480	-	8	1
Q9-24,27-29, 31	Transistor: Ge, PNP, SPL2N404	1850-0062	28480	-	20	2
Q25	Transistor: Si, NPN, dual	1854-0221	28480	-	1	1
Q26, 30, 34	Transistor: Si, PNP	1853-0001	28480	-	3	1
Q32, 33	Transistor: Ge, NPN	1851-0017	04713	2N1304	2	1
Q35	Transistor: Ge, PNP	1850-0132	04713	2N1540	1	1
R1-8	R: fxd, metox, 36K, 2%, 1/8 w	0757-0961	28480	-	8	3
R9-16,42,60	R: fxd, metox, 7.5K, 2%, 1/8 w	0757-0945	28480	-	10	3
R17-24, 61	R: fxd, metox, 18K, 2%, 1/8 w	0757-0954	28480	-	9	3
R25-32, 48	R: network, metflm, 5%, 1/10 w	0844-0001	28480	-	9	3
R33, 53	R: var, ww, 500Ω, 10%, 1 w	2100-1656	28480	-	2	0
R34, 35	R: fxd, metox, 10K, 2%, 1/8 w	0757-0948	28480	-	2	1
R36	R: fxd, metox, 100K, 2%, 1/8 w	0757-0972	28480	-	1	1
R37, 69	R: fxd, metox, 1K, 2%, 1/8 w	0757-0924	28480	-	2	1
R38, 44, 47, 56	R: fxd, metox, 12K, 2%, 1/8 w	0757-0950	28480	-	4	2
R39	R: fxd, metox, 22K, 2%, 1/8 w	0757-0956	28480	-	1	1
R40	R: fxd, metox, 221K, 1%, 1/4 w	0757-0783	28480	-	1	1
R41	R: fxd, metox, 750Ω, 2%, 1/8 w	0757-0921	28480	-	1	1
R43	R: fxd, metox, 15K, 2%, 1/8 w	0757-0952	28480	-	1	1
R45, 62	R: fxd, metox, 3.3K, 2%, 1/8 w	0757-0936	28480	-	2	1
R46, 55	R: fxd, metox, 5.1K, 2%, 1/8 w	0757-0941	28480	-	2	1
R49	R: fxd, comp, 560Ω, 5%, 1 w	0689-5615	28480	-	1	1
R50	R: fxd, comp, 1M, 5%, 1/4 w	0683-1055	28480	-	1	1
R51	R: fxd, metox, 56K, 2%, 1/8 w	0757-0966	28480	-	1	1
R52	R: fxd, metox, 430Ω, 2%, 1/8 w	0757-0915	28480	-	1	1
R54	R: fxd, metox, 1.1K, 2%, 1/8 w	0757-0925	28480	-	1	1
R58, 59	R: fxd, metox, 2.7K, 2%, 1/8 w	0757-0934	28480	-	2	1
R63	R: fxd, comp, 150Ω, 5%, 1 w	0689-1515	28480	-	1	1
R64, 66	R: fxd, comp, 560Ω, 5%, 1/2 w	0686-5615	28480	-	2	1
R65	R: fxd, comp, 220Ω, 5%, 1 w	0689-2215	28480	-	1	1
R67	R: fxd, metox, 680Ω, 2%, 1/8 w	0757-0920	28480	-	1	1
R68, 70	R: fxd, metox, 1K, 1%, 1/2 w	0757-0159	28480	-	2	1
R71	R: fxd, metox, 47K, 2%, 1/8 w	0757-0964	28480	-	1	1
R72	R: fxd, metox, 8.2K, 2%, 1/8 w	0757-0946	28480	-	1	1
R101-108	R: var, metflm, 50K, 30%, 1/2 w	2100-2031	28480	-	8	2

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Table 5-1. Table of Replaceable Parts (Cont'd)

CIRCUIT REFERENCE	DESCRIPTION	STOCK NO.	MFR. CODE NO.	MFR. PART NO.	QTY.	1-YR. SPA.
	HP 2737B TAPE READER SPOOLER					
	Ref HP 2737A except as follows:					
	Delete: Transport; (Ref Appendix A) Switch S2A/B (Ref. Appendix A)	0950-0708	04404			
	Add:					
	Transport Assembly (Ref. Appendix B)	0950-0707			1	0
B2	Motor (Ref M2 Appendix B)				1	
B3	Motor (Ref M3 Appendix B)				1	
C5, 6	C: fxd, 6 μf, 220v	OBD	00853	7522.6.1	1	1
C7-9, 11	C: fxd, my, .1 μf, 20%	0170-0022	09134	Type 24	1	1
C12	C: fxd, al-elect, 4 μf, -10 +100%, 250v	0180-0186	14655	BBR4250	1	1
CR4	Diode: Si	1901-0025	28480		1	1
CR9-12	Diode: rect, Si	1901-0028	28480		4	1
K1	Relay: 7C, 5a, 30v	0490-0448	77342	GA26D	1	1
K2	Relay: SPDT, 4C, 4a/110v,	0490-0015	77342	KA5D110v	1	1
R8, 9, 11	R: fxd, comp, 100Ω, 5%, 1/2 w	0686-1015	28480		3	1
R10	R: fxd, ww, 20Ω, 5%, 5 w	0813-0040	28480		1	1
R12	R: fxd, metflm, 1K, 5%, 4 w	0770-0008	28480		1	1
S2	Switch: toggle, DPST, 15a/125v	3101-0041	88140	8906K370	1	0
S3	Switch: (Ref Appendix B)				1	
S4	Switch: (Ref Appendix B)				1	
S5A/B	Switch: toggle, SPDT, 3a, 125v	3101-0002	88140	8908433	1	0
	Accessories:					
	Kit, lubrication:	5080-6610	04404	-	1	
	Applicator	8710-0001	04404	-	1	
	Oil, teletype	5080-6614	04404	-	1	
	Grease, teletype	6040-0074	04404	-	1	
	Accessory Box Assy:	5060-6263	04404	-	1	
	Brush, artist #2	8520-0005	04404	-	1	
	Brush, stiff	8520-0015	04404	-	1	
	Brush, bristle	9300-0082	04404	-	1	
	Grease, moly	6040-0012	04404	-	1	

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Table 5-2. 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
00000	U.S.A. Common	Any supplier of U.S.
00136	McCoy Electronics	Mount Holly Springs, Pa.
00213	Sage Electronics Corp.	Rochester, N.Y.
00287	Cemco Inc.	Danielson, Conn.
00334	Humidial	Colton, Calif.
00348	Microtron Co., Inc.	Valley Stream, N.Y.
00373	Garlock Inc., Electronics Products Div.	Camden, N.J.
00656	Aerovox Corp.	New Bedford, Mass.
00779	Amp. Inc.	Harrisburg, Pa.
00781	Aircraft Radio Corp.	Boonton, N.J.
00815	Northern Engineering Laboratories, Inc.	Burlington, Wis.
00853	Sangamo Electric Co., Pickens Div.	Pickens, S.C.
00866	Goe Engineering Co.	Los Angeles, Calif.
00891	Carl E. Holmes Corp.	Los Angeles, Calif.
00929	Microlab Inc.	Livingston, N.J.
01002	General Electric Co., Capacitor Dept.	Hudson Falls, N.Y.
01009	Alden Products Co.	Brockton, Mass.
01121	Allen Bradley Co.	Milwaukee, Wis.
01255	Litton Industries, Inc.	Beverly Hills, Calif.
01281	TRW Semiconductors, Inc.	Lawndale, Calif.
01295	Texas Instruments, Inc., Transistor Products Div.	Dallas, Texas
01349	The Alliance Mfg. Co.	Alliance, Ohio
01589	Pacific Relays, Inc.	Van Nuys, Calif.
01930	Amerock Corp.	Rockford, Ill.
01961	Pulse Engineering Co.	Santa Clara, Calif.
02114	Ferroxcube Corp. of America	Saugerties, N.Y.
02116	Wheelock Signals, Inc.	Long Branch, N.J.
02286	Cole Rubber and Plastics Inc.	Sunnyvale, Calif.
02660	Amphenol-Borg Electronics Corp.	Chicago, Ill.
02735	Radio Corp. of America, Semiconductor and Materials Div.	Somerville, N.J.
02771	Vocaline Co. of America, Inc.	Old Saybrook, Conn.
02777	Hopkins Engineering Co.	San Fernando, Calif.
03508	G.E. Semiconductor Prod. Dept.	Syracuse, N.Y.
03705	Apex Machine & Tool Co.	Dayton, Ohio
03797	Eldema Corp.	Compton, Calif.
03877	Transitron Electric Corp.	Wakefield, Mass.
03888	Pyrofilm Resistor Co., Inc.	Cedar Knolls, N.J.
03954	Singer Co., Diehl Div. Finderne Plant	Sumerville, N.J.
04009	Arrow, Hart and Hegeman Elect. Co.	Hartford, Conn.
04013	Taurus Corp.	Lambertville, N.J.
04222	Hi-Q Division of Aerovox	Myrtle Beach, S.C.
04354	Precision Paper Tube Co.	Chicago, Ill.
04404	Dymec Division of Hewlett-Packard Co.	Palo Alto, Calif.
04651	Sylvania Electric Products, Microwave Device Div.	Mountain View, Calif.
04713	Motorola, Inc., Semiconductor Prod. Div.	Phoenix, Arizona
04732	Filtron Co., Inc. Western Div.	Culver City, Calif.
04773	Automatic Electric Co.	Northlake, Ill.
04796	Sequoia Wire Co.	Redwood City, Calif.
04811	Precision Coil Spring Co.	El Monte, Calif.
04870	P.M. Motor Company	Westchester, Ill.
04919	Component Mfg. Service Co.	W. Bridgewater, Mass.
05006	Twentieth Century Plastics, Inc.	Los Angeles, Calif.
05277	Westinghouse Electric Corp. Semi-Conductor Dept.	Youngwood, Pa.
05347	Ultronix, Inc.	San Mateo, Calif.
05397	Union Carbide Corp., Linde Div., Kemel Dept.	Cleveland, Ohio
05593	Illumitronic Engineering Co.	Sunnyvale, Calif.
05616	Cosmo Plastic (c/o Electrical Spec. Co.)	Cleveland, Ohio
05624	Barber Colman Co.	Rockford, Ill.
05728	Tiffen Optical Co.	Roslyn Heights, Long Island, N.Y.
05729	Metro-Tel Corp.	Westbury, N.Y.
05783	Stewart Engineering Co.	Santa Cruz, Calif.
05820	Wakefield Engineering Inc.	Wakefield, Mass.
06004	Bassick Co., The	Bridgeport, Conn.
06090	Raychem Corp.	Redwood City, Calif.
06175	Bausch and Lomb Optical Co.	Rochester, N.Y.
06402	E.T.A. Products Co. of America	Chicago, Ill.
06540	Amatom Electronic Hardware Co., Inc.	New Rochelle, N.Y.
06555	Beede Electrical Instrument Co., Inc.	Penacook, N.H.
06666	General Devices Co., Inc.	Indianapolis, Ind.
06751	Semcor Div. Components Inc.	Phoenix, Ariz.
06812	Torrington Mfg. Co., West Div.	Van Nuys, Calif.
06980	Varian Assoc. Eimac Div.	San Carlos, Calif.
07088	Kelvin Electric Co.	Van Nuys, Calif.
07126	Digitran Co.	Pasadena, Calif.
07137	Transistor Electronics Corp.	Minneapolis, Minn.
07138	Westinghouse Electric Corp. Electronic Tube Div.	Elmira, N.Y.
07149	Filmohm Corp.	New York, N.Y.
07233	Cinch-Graphik Co.	City of Industry, Calif.
07261	Avnet Corp.	Culver City, Calif.
07263	Fairchild Camera & Inst. Corp. Semiconductor Div.	Mountain View, Calif.
07322	Minnesota Rubber Co.	Minneapolis, Minn.
07387	Birtcher Corp., The	Monterey Park, Calif.
07397	Sylvania Elect. Prod. Inc., Mt. View Operations	Mountain View, Calif.
07700	Technical Wire Products Inc.	Cranford, N.J.
07910	Continental Device Corp.	Hawthorne, Calif.
07933	Raytheon Mfg. Co., Semiconductor Div.	Mountain View, Calif.
07980	Hewlett-Packard Co., Boonton Radio Div.	Rockaway, N.J.
08145	U.S. Engineering Co.	Los Angeles, Calif.
08289	Blinn, Delbert Co.	Pomona, Calif.
08358	Burgess Battery Co.	Niagara Falls, Ontario, Canada
08524	Deutsch Fastener Corp.	Los Angeles, Calif.
08664	Bristol Co., The	Waterbury, Conn.
08717	Sloan Company	Sun Valley, Calif.
08718	ITT Cannon Electric Inc., Phoenix Div.	Phoenix, Arizona
08792	CBS Electronics Semiconductor Operations, Div of C.B.S. Inc.	Lowell, Mass.
08984	Mel-Rain	Indianapolis, Ind.
09026	Babcock Relays Div.	Costa Mesa, Calif.
09134	Texas Capacitor Co.	Houston, Texas
09145	Atohm Electronics	Sun Valley, Calif.
09250	Electro Assemblies, Inc.	Chicago, Ill.
09569	Mallory Battery Co. of Canada, Ltd.	Toronto, Ontario, Canada
10214	General Transistor Western Corp.	Los Angeles, Calif.
10411	Ti-Tal, Inc.	Berkeley, Calif.
10646	Carborundum Co.	Niagara Falls, N.Y.
11236	CTS of Berne, Inc.	Berne, Ind.
11237	Chicago Telephone of California, Inc.	So. Pasadena, Calif.
11242	Bay State Electronics Corp.	Waltham, Mass.
11312	Teledyne Inc., Microwave Div.	Palo Alto, Calif.
11534	Duncan Electronics Inc.	Costa Mesa, Calif.
11711	General Instrument Corp., Semiconductor Div., Products Group	Newark, N.J.
11717	Imperial Electronic, Inc.	Buena Park, Calif.
11870	Melabs, Inc.	Palo Alto, Calif.
12136	Philadelphia Handle Co.	Camden, N.J.
12361	Grove Mfg. Co., Inc.	Shady Grove, Pa.
12574	Gulton Ind. Inc., CG Elect. Div.	Albuquerque, N.M.
12697	Clarostat Mfg. Co.	Dover, N.H.
12728	Elmar Filter Corp.	W. Haven, Conn.
12859	Nippon Electric Co., Ltd.	Tokyo, Japan
12881	Melex Electronics Corp.	Clark, N.J.
12930	Delta Semiconductor Inc.	Newport Beach, Calif.
12954	Dickson Electronics Corp.	Scottsdale, Arizona
13103	Thermolloy	Dallas, Texas
13396	Telefunken (GmbH)	Hanover, Germany
13835	Midland-Wright Div. of Pacific Industries, Inc.	Kansas City, Kansas
14099	Sem-Tech	Newbury Park, Calif.
14193	Calif. Resistor Corp.	Santa Monica, Calif.
14298	American Components, Inc.	Conshohocken, Pa.
14433	ITT Semiconductor, A Div. of Int. Telephone & Telegraph Corp.	West Palm Beach, Fla.
14493	Hewlett-Packard Company	Loveland, Colo.
14655	Cornell Dublier Electric Corp.	Newark, N.J.
14674	Corning Glass Works	Corning, N.Y.
14752	Electro Cube Inc.	So. Pasadena, Calif.
14960	Williams Mfg. Co.	San Jose, Calif.
15203	Webster Electronics Co.	New York, N.Y.
15287	Scionics Corp.	Northridge, Calif.
15291	Adjustable Bushing Co.	N. Hollywood, Calif.
15558	Micron Electronics	Garden City, Long Island, N.Y.
15566	Amprobe Inst. Corp.	Lynbrook, N.Y.
15631	Cabletronics	Costa Mesa, Calif.
15772	Twentieth Century Coil Spring Co.	Santa Clara, Calif.
15818	Amelco Inc.	Mt. View, Calif.
15909	Daven Div. Thomas A. Edison Ind. McGraw-Edison Co.	Long Island City, N.Y.
16037	Spruce Pine Mica Co.	Spruce Pine, N.C.
16179	Omni-Spectra Inc.	Detroit, Ill.
16352	Computer Diode Corp.	Lodi, N.J.
16688	Ideal Prec. Meter Co., Inc. De Jur Meter Div.	Brooklyn, N.Y.
16758	Delco Radio Div. of G.M. Corp.	Kokoma, Ind.
17109	Thermonetics Inc.	Canoga Park, Calif.
17474	Tranex Company	Mountain View, Calif.
17675	Hamlin Metal Products Corp.	Akron, Ohio
17745	Angstrohm Prec. Inc.	No. Hollywood, Calif.
18042	Power Design Pacific Inc.	Palo Alto, Calif.
18083	Clevite Corp., Semiconductor Div.	Palo Alto, Calif.
18476	Ty-Car Mfg. Co., Inc.	Holliston, Mass.
18486	TRW Elect. Comp. Div.	Des Plaines, Ill.
18583	Curtis Instrument, Inc.	Mt. Kisco, N.Y.
18873	E.I. DuPont and Co., Inc.	Wilmington, Del.
18911	Durant Mfg. Co.	Milwaukee, Wis.
19315	Bendix Corp., The Eclipse-Poineer Div.	Teterboro, N.J.
19500	Thomas A. Edison Industries, Div. of McGraw-Edison Co.	West Orange, N.J.
19589	Concoa	Baldwin Park, Calif.
19644	LRC Electronics	Horseheads, N.Y.
19701	Electra Mfg. Co.	Independence, Kansas
20183	General Atronics Corp.	Philadelphia, Pa.
21226	Executone, Inc.	Long Island City, N.Y.

From: FSC. Handbook Supplements
H4-1 Dated AUGUST 1966
H4-2 Dated NOV 1962

00015-43
Revised: May, 1967

Table 5-2. Code List of Manufacturers (Cont'd)

Code No.	Manufacturer	Address
21335	Fafnir Bearing Co., The	New Britain, Conn.
21520	Fansteel Metallurgical Corp.	N. Chicago, Ill.
23783	British Radio Electronics Ltd.	Washington, D.C.
24455	G.E. Lamp Division	Nela Park, Cleveland, Ohio
24655	General Radio Co.	West Concord, Mass.
26365	Gries Reproducer Corp.	New Rochelle, N.Y.
26462	Grobet File Co. of America, Inc.	Carlstadt, N.J.
26992	Hamilton Watch Co.	Lancaster, Pa.
28480	Hewlett-Packard Co.	Palo Alto, Calif.
28520	Heyman Mfg. Co.	Kenilworth, N.J.
33173	G.E. Receiving Tube Dept.	Owensboro, Ky.
35434	Lectrohm Inc.	Chicago, Ill.
36196	Stanwyck Coil Products Ltd.	Hawkesbury, Ontario, Canada
36287	Cunningham, W.H. & Hill, Ltd.	Toronto Ontario, Canada
37942	P.R. Mallory & Co. Inc.	Indianapolis, Ind.
39543	Mechanical Industries Prod. Co.	Akron, Ohio
40920	Miniature Precision Bearings, Inc.	Keene, N.H.
42190	Muter Co.	Chicago, Ill.
43990	C.A. Norgren Co.	Englewood, Colo.
44655	Ohmite Mfg. Co.	Skokie, Ill.
46384	Penn Eng. & Mfg. Corp.	Doylestown, Pa.
47904	Polaroid Corp.	Cambridge, Mass.
48620	Precision Thermometer & Inst. Co.	Southampton, Pa.
49956	Microwave & Power Tube Div.	Waltham, Mass.
52090	Rowan Controller Co.	Westminster, Md.
52983	Sanborn Company	Waltham, Mass.
54294	Shallcross Mfg. Co.	Selma, N.C.
55026	Simpson Electric Co.	Chicago, Ill.
55933	Sonotone Corp.	Elmsford, N.Y.
55938	Raytheon Co. Commercial Apparatus & Systems Div.	So. Norwalk, Conn.
56137	Spaulding Fibre Co., Inc.	Tonawanda, N.Y.
56289	Sprague Electric Co.	North Adams, Mass.
59446	Telex, Inc.	St. Paul, Minn.
59730	Thomas & Betts Co.	Elizabeth, N.J.
60741	Triplett Electrical Insl. Co.	Bluffton, Ohio
61775	Union Switch and Signal, Div. of Westinghouse Air Brake Co.	Pittsburgh, Pa.
62119	Universal Electric Co.	Owosso, Mich.
63743	Ward-Leonard Electric Co.	Mt. Vernon, N.Y.
64959	Western Electric Co., Inc.	New York, N.Y.
65092	Weston Inst. Inc. Weston-Newark	Newark, N.J.
66295	Wittek Mfg. Co.	Chicago, Ill.
66346	Revere Wollansak Div. Minn. Mining & Mfg. Co.	St. Paul, Minn.
70276	Allen Mfg. Co.	Hartford, Conn.
70309	Allied Control	New York, N.Y.
70318	Allmetal Screw Product Co., Inc.	Garden City, N.Y.
70485	Atlantic India Rubber Works, Inc.	Chicago, Ill.
70563	Amperite Co., Inc.	Union City, N.J.
70674	ADC Products Inc.	Minneapolis, Minn.
70903	Belden Mfg. Co.	Chicago, Ill.
70998	Bird Electronic Corp.	Cleveland, Ohio
71002	Birnbach Radio Co.	New York, N.Y.
71041	Boston Gear Works Div. of Murray Co. of Texas	Quincy, Mass.
71218	Bud Radio, Inc.	Willoughby, Ohio
71286	Camloc Fastener Corp.	Paramus, N.J.
71313	Cardwell Condenser Corp.	Lindenhurst L.I., N.Y.
71400	Bussmann Mfg. Div. of McGraw-Edison Co.	St. Louis, Mo.
71436	Chicago Condenser Corp.	Chicago, Ill.
71447	Calif. Spring Co., Inc.	Pico-Rivera, Calif.
71450	CTS Corp.	Elkhart, Ind.
71468	ITT Cannon Electric Inc.	Los Angeles, Calif.
71471	Cinema, Div. Aerovox Corp.	Burbank, Calif.
71482	C.P. Clare & Co.	Chicago, Ill.
71590	Centralab Div. of Globe Union Inc.	Milwaukee, Wis.
71616	Commercial Plastics Co.	Chicago, Ill.
71700	Cornish Wire Co., The	New York, N.Y.
71707	Coto Coil Co., Inc.	Providence, R.I.
71744	Chicago Miniature Lamp Works	Chicago, Ill.
71753	A.O. Smith Corp., Crowley Div.	West Orange, N.J.
71785	Cinch Mfg. Co., Howard B. Jones Div.	Chicago, Ill.
71984	Dow Corning Corp.	Midland, Mich.
72136	Electro Motive Mfg. Co., Inc.	Willimantic, Conn.
72354	John E. Fast Co., Div. Victoreen Instr. Co.	Chicago, Ill.
72619	Dialight Corp.	Brooklyn, N.Y.
72656	Indiana General Corp., Electronics Div.	Keasby, N.J.
72699	General Instrument Corp., Cap. Div.	Newark, N.J.
72765	Drake Mfg. Co.	Chicago, Ill.
72825	Hugh H. Eby Inc.	Philadelphia, Pa.
72928	Gudeman Co.	Chicago, Ill.
72964	Robert M. Hadley Co.	Los Angeles, Calif.
72982	Erie Technological Products, Inc.	Erie, Pa.
73061	Hansen Mfg. Co., Inc.	Princeton, Ind.
73076	H.M. Harper Co	Chicago, Ill.
73138	Helipot Div. of Beckman Inst., Inc.	Fullerton, Calif.
73293	Hughes Products Division of Hughes Aircraft Co.	Newport Beach, Calif.
73445	Amperex Electronic Co., Div. of North American Phillips Co., Inc.	Hicksville, N.Y.
73506	Bradley Semiconductor Corp.	New Haven, Conn.
73559	Calling Electric, Inc.	Hartford, Conn.
73586	Circle F Mfg. Co.	Trenton, N.J.
73682	George K. Garrett Co., Div. MSL Industries Inc.	Philadelphia, Pa.
73734	Federal Screw Products Inc.	Chicago, Ill.
73743	Fischer Special Mfg. Co.	Cincinnati, Ohio
73793	General Industries Co., The	Elyria, Ohio
73846	Goshen Stamping & Tool Co.	Goshen, Ind.
73899	JFD Electronics Corp.	Brooklyn, N.Y.
73905	Jennings Radio Mfg. Corp.	San Jose, Calif.
74276	Signalite Inc.	Neptune, N.J.
74455	J.H. Winns, and Sons	Winchester, Mass.
74861	Industrial Condenser Corp.	Chicago, Ill.
74868	R.F. Products Division of Amphenol-Borg Electronics Corp.	Danbury, Conn.
74970	E.F. Johnson Co.	Waseca, Minn.
75042	International Resistance Co.	Philadelphia, Pa.
75378	CTS Knights Inc.	Sandwich, Ill.
75382	Kulka Electric Corporation	Mt. Vernon, N.Y.
75818	Lenz Electric Mfg. Co.	Chicago, Ill.
75915	Littlefuse, Inc.	Des Plaines, Ill.
76005	Lord Mfg. Co.	Erie, Pa.
76210	C.W. Marwedel	San Francisco, Calif.
76433	General Instrument Corp., Micamold Division	Newark, N.J.
76487	James Millen Mfg. Co., Inc.	Malden, Mass.
76493	J.W. Miller Co.	Los Angeles, Calif.
76530	Cinch-Monadnock, Div. of United Carr Fastener Corp.	San Leandro, Calif.
76545	Mueller Electric Co.	Cleveland, Ohio
76703	National Union	Newark, N.J.
76854	Oak Manufacturing Co.	Crystal Lake, Ill.
77068	Bendix Corp., The Bendix Pacific Div.	N. Hollywood, Calif.
77075	Pacific Metals Co.	San Francisco, Calif.
77221	Phanostran Instrument and Electronic Co.	South Pasadena, Calif.
77252	Philadelphia Steel and Wire Corp.	Philadelphia, Pa.
77342	American Machine & Foundry Co. Potter & Brumfield Div.	Princeton, Ind.
77630	TRW Electronic Components Div.	Camden, N.J.
77638	General Instrument Corp., Rectifier Div.	Brooklyn, N.Y.
77764	Resistance Products Co.	Harrisburg, Pa.
77969	Rubbercraft Corp. of Calif.	Torrance, Calif.
78189	Shakeproof Division of Illinois Tool Works	Elgin, Ill.
78283	Signal Indicator Corp.	New York, N.Y.
78290	Struthers-Dunn Inc.	Pitman, N.J.
78452	Thompson-Bremer & Co.	Chicago, Ill.
78471	Tilley Mfg. Co.	San Francisco, Calif.
78488	Stackpole Carbon Co.	St. Marys, Pa.
78493	Standard Thomson Corp.	Waltham, Mass.
78553	Tinnerman Products, Inc.	Cleveland, Ohio
78790	Transformer Engineers	San Gabriel, Calif.
78947	Ucinite Co.	Newtonville, Mass.
79136	Waldes Kohinoor Inc.	Long Island City, N.Y.
79142	Veeder Root, Inc.	Hartford, Conn.
79251	Wenco Mfg. Co.	Chicago, Ill.
79727	Continental-Wirt Electronics Corp.	Philadelphia, Pa.
79963	Zierick Mfg. Corp.	New Rochelle, N.Y.
80031	Mepco Division of Sessions Clock Co.	Morristown, N.J.
80120	Schnitzer Alloy Products Co.	Elizabeth, N.J.
80131	Electronic Industries Association. Any brand Tube meeting EIA Standards-Washington, DC.	
80207	Unimax Switch, Div. Maxon Electronics Corp.	Wallingford, Conn.
80223	United Transformer Corp.	New York, N.Y.
80248	Oxford Electric Corp.	Chicago, Ill.
80294	Bourns Inc.	Riverside, Calif.
80411	Acro Div. of Robertshaw Controls Co.	Columbus, Ohio
80486	All Star Products Inc.	Defiance, Ohio
80509	Avery Adhesive Label Corp.	Monrovia, Calif.
80583	Hammarlund Co., Inc.	New York, N.Y.
80640	Stevens, Arnold, Co., Inc.	Boston, Mass.
81030	International Instruments Inc.	Orange, Conn.
81073	Grayhill Co.	LaGrange, Ill.
81095	Triad Transformer Corp.	Venice, Calif.
81312	Winchester Elec. Div. Litton Ind., Inc.	Oakville, Conn.
81349	Military Specification	. . . . .
81483	International Rectifier Corp.	El Segundo, Calif.
81541	Airpax Electronics, Inc.	Cambridge, Mass.
81860	Barry Controls, Div. Barry Wright Corp.	Watertown, Mass.
82042	Carter Precision Electric Co.	Skokie, Ill.
82047	Sperti Faraday Inc., Copper Hewitt Electric Div.	Hoboken, N.J.
82142	Jeffers Electronics Division of Speer Carbon Co.	Du Bois, Pa.
82170	Fairchild Camera & Inst. Corp., Defense Prod. Division	Clifton, N.J.
82209	Maguire Industries, Inc.	Greenwich, Conn.
82219	Sylvania Electric Prod. Inc. Electronic Tube Division	Emporium, Pa.
82376	Astron Corp.	East Newark, Harrison, N.J.
82389	Switchcraft, Inc.	Chicago, Ill.
82647	Metals & Controls Inc. Spencer Products	Attleboro, Mass.
82768	Phillips-Advance Control Co.	Joliet, Ill.

From: FSC. Handbook Supplements
H4-1 Dated AUGUST 1966
H4-2 Dated NOV. 1962

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Table 5-2. Code List of Manufacturers (Cont'd)

Code No.	Manufacturer	Address
82866	Research Products Corp.	Madison, Wis.
82877	Rotron Mfg. Co., Inc.	Woodstock, N.Y.
82893	Vector Electronic Co.	Glendale, Calif.
83053	Western Washer Mfg. Co.	Los Angeles, Calif.
83058	Carr Fastener Co.	Cambridge, Mass.
83086	New Hampshire Ball Bearing, Inc.	Peterborough, N.H.
83125	General Instrument Corp., Capacitor Div.	Darlington, S.C.
83148	ITT Wire and Cable Div.	Los Angeles, Calif.
83186	Victory Eng. Corp.	Springfield, N.J.
83298	Bendix Corp., Red Bank Div.	Red Bank, N.J.
83315	Hubbell Corp.	Mundelein, Ill.
83330	Smith, Herman H., Inc.	Brooklyn, N.Y.
83332	Tech Labs	Palisade's Park, N.J.
83385	Central Screw Co.	Chicago, Ill.
83501	Gavitt Wire and Cable Co. Div. of Amerace Corp.	Brookfield, Mass.
83594	Burroughs Corp. Electronic Tube Div.	Plainfield, N.J.
83740	Union Carbide Corp. Consumer Prod. Div.	New York, N.Y.
83777	Model Eng. and Mfg., Inc.	Huntington, Ind.
83821	Loyd Scruggs Co.	Festus, Mo.
83942	Aeronautical Inst. & Radio Co.	Lodi, N.J.
84171	Arco Electronics Inc.	Great Neck, N.Y.
84396	A.J. Glesener Co., Inc.	San Francisco, Calif.
84411	TRW Capacitor Div.	Ogallala, Neb.
84970	Sarkes Tarzian, Inc.	Bloomington, Ind.
85454	Boonton Molding Company	Boonton, N.J.
85471	A.B. Boyd Co.	San Francisco, Calif.
85474	R.M. Bracamonte & Co.	San Francisco, Calif.
85660	Koiled Kords, Inc.	Hamden, Conn.
85911	Seamless Rubber Co.	Chicago, Ill.
86197	Clifton Precision Products Co., Inc.	Clifton Heights, Pa.
86579	Precision Rubber Products Corp.	Dayton, Ohio
86684	Radio Corp. of America, Electronic Comp. & Devices Div.	Harrison, N.J.
87034	Marco Industries	Anaheim, Calif.
87216	Philco Corporation (Lansdale Division)	Lansdale, Pa.
87473	Western Fibrous Glass Products Co.	San Francisco, Calif.
87664	Van Waters & Rogers Inc.	San Francisco, Calif.
87930	Tower Mfg. Corp.	Providence, R.I.
88140	Cutler-Hammer, Inc.	Lincoln, Ill.
88220	Gould-National Batteries, Inc.	St. Paul, Minn.
88421	Federal Telephone & Radio Corp.	Clifton, N.J.
88698	General Mills, Inc.	Buffalo, N.Y.
89231	Graybar Electric Co.	Oakland, Calif.
89665	United Transformer Co.	Chicago, Ill.
90179	US Rubber Co., Consumer Ind. & Plastics Prod. Div.	Passaic, N.J.
90970	Bearing Engineering Co.	San Francisco, Calif.
91146	ITT Cannon Elect, Inc., Salem Div.	Salem, Mass.
91260	Connor Spring Mfg. Co.	San Francisco, Calif.
91345	Miller Dial & Nameplate Co.	El Monte, Calif.
91418	Radio Materials Co.	Chicago, Ill.
91506	Augat Inc.	Attleboro, Mass.
91637	Dale Electronics, Inc.	Columbus, Nebr.
91662	Elco Corp.	Willow Grove, Pa.
91737	Gremar Mfg. Co., Inc.	Wakefield, Mass.
91827	K F Development Co.	Redwood City, Calif.
91886	Malco Mfg. Co., Inc.	Chicago, Ill.
91929	Honeywell Inc., Micro Switch Div.	Freeport Ill.
91961	Nahm-Bros. Spring Co.	Oakland, Calif.
92180	Tru-Connector Corp.	Peabody, Mass.
92367	Elgeet Optical Co. Inc.	Rochester, N.Y.
92196	Universal Industries, Inc.	City of Industry, Calif.
92607	Tensolite Insulated Wire Co., Inc.	Tarrytown, N.Y.
92702	IMC Magnetics Corp.	Wesbury Long Island, N.Y.
92966	Hudson Lamp Co.	Kearney, N.J.
93332	Sylvania Electric Prod. Inc. Semiconductor Div.	Woburn, Mass.
93369	Robbins and Myers, Inc.	New York, N.Y.
93410	Stevens Mfg. Co., Inc.	Mansfield, Ohio
93929	G.V. Controls	Livingston, N.J.
94137	General Cable Corp.	Bayonne, N.J.
94144	Raytheon Co., Comp. Div., Ind. Comp. Operations	Quincy, Mass.
94148	Scientific Electronics Products, Inc.	Loveland, Colo.
94154	Tung-Sol Electric, Inc.	Newark, N.J.
94197	Curtiss-Wright Corp. Electronics Div.	East Paterson, N.J.
94222	South Chester Corp.	Chester, Pa.
94310	Tru-Ohm Products Memcor Components Div.	Huntington, Ind.
94330	Wire Cloth Products, Inc.	Bellwood, Ill.
94682	Worcester Pressed Aluminum Corp.	Worcester, Mass.
94696	Magnecraft Electric Co.	Chicago, Ill.
95023	George A. Philbrick Researchers, Inc.	Boston, Mass.
95236	Allies Products Corp.	Miami, Fla.
95238	Continental Connector Corp.	Woodside, N.Y.
95263	Leecraft Mfg. Co., Inc.	Long Island, N.Y.
95264	Lerco Electronics, Inc.	Burbank, Calif.
95265	National Coil Co.	Sheridan, Wyo.
95275	Vitramon, Inc.	Bridgeport, Conn.
95348	Gordos Corp.	Bloomfield, N.J.
95354	Methode Mfg. Co.	Chicago, Ill.
95566	Arnold Engineering Co.	Marengo, Ill.
95712	Dage Electric Co., Inc.	Franklin, Ind.
95984	Siemon Mfg. Co.	Wayne, Ill.
95987	Weckesser Co.	Chicago, Ill.
96067	Huggins Laboratories	Sunnyvale, Calif.
96095	Hi-Q Div. of Aerovox Corp.	Olean, N.Y.
96256	Thordarson-Meissner Inc.	Mt. Carmel, Ill.
96296	Solar Manufacturing Co.	Los Angeles, Calif.
96330	Carlton Screw Co.	Chicago, Ill.
96341	Microwave Associates, Inc.	Burlington, Mass.
96501	Excel Transformer Co.	Oakland, Calif.
97464	Industrial Retaining Ring Co.	Irvington, N.J.
97539	Automatic & Precision Mfg.	Englewood, N.J.
97979	Reon Resistor Corp.	Yonkers, N.Y.
97983	Litton System Inc., Adler-Westrex Commun. Div.	New Rochelle, N.Y.
98141	R-Troncis, Inc.	Jamaica, N.Y.
98159	Rubber Teck, Inc.	Gardena, Calif.
98220	Hewlett-Packard Co., Moseley Div.	Pasadena, Calif.
98278	Microdot, Inc.	So. Pasadena, Calif.
98291	Sealectro Corp.	Mamaroneck, N.Y.
98376	Zero Mfg. Co.	Burbank, Calif.
98731	General Mills Inc., Electronics Div.	Minneapolis, Minn.
98734	Paeco Div. of Hewlett-Packard Co.	Palo Alto, Calif.
98821	North Hills Electronics, Inc.	Glen Cove, N.Y.
98978	International Electronic Research Corp.	Burbank, Calif.
99109	Columbia Technical Corp.	New York, N.Y.
99313	Varian Associates	Palo Alto, Calif.
99378	Atlee Corp.	Winchester, Mass.
99515	Marshall Ind. Elect. Products Div.	San Marino, Calif.
99707	Control Switch Division, Controls Co. of America	El Segundo, Calif.
99800	Delevan Electronics Corp.	East Aurora, N.Y.
99848	Wilco Corporation	Indianapolis, Ind.
99934	Renbrandt, Inc.	Boston, Mass.
99942	Hoffman Electronics Corp. Semiconductor Div.	El Monte, Calif.
99957	Technology Instrument Corp. of Calif.	Newbury Park, Calif.

THE FOLLOWING HP VENDORS HAVE NO NUMBER ASSIGNED IN THE LATEST SUPPLEMENT TO THE FEDERAL SUPPLY CODE FOR MANUFACTURERS HANDBOOK.

0000F	Malco Tool and Die	Los Angeles, Calif.
0000Z	Willow Leather Products Corp.	Newark, N.J.
000AB	ETA	England
000BB	Precision Instrument Components Co.	Van Nuys, Calif.
000CS	Hewlett-Packard Co., Colorado Springs	Colorado Springs, Colorado
000MM	Rubber Eng. & Development	Hayward, Calif.
000NN	A "N" D Mfg. Co.	San Jose, Calif.
000QQ	Cooltron	Oakland, Calif.
000WW	California Eastern Lab.	Burlington, Calif.
000YY	S.K. Smith Co.	Los Angeles, Calif.

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APPENDIX A

REMEX

TAPE TRANSPORT

MODEL RT0302RA/S44

FOR

HP 2737A PUNCHED TAPE READER

APPENDIX A

MODEL RT0302RA/S44

A-1. IDENTIFICATION OF COMPONENTS AND PARTS.

A-2. Figures A-1 and A-2 illustrate the component layout and the mechanical subassemblies of the REMEX Model RT0302RA/S44 Tape Transport Mechanism. Electronic components are identified by alpha-numeric symbols which correspond to the listings in Table A-1. Mechanical parts are identified by numbers only, which refer to reference numbers listed in Table A-2.

A-3. PARTS LIST.

A-4. ELECTRONICS PARTS LIST. Table A-1 lists the electronic components used in the REMEX Model RT0302RA/S44 Tape Transport. All items are available from REMEX Electronics, 5250 West El Segundo Boulevard, Hawthorne, California, 90251.

A-5. MECHANICAL PARTS LIST. Table A-2 lists the mechanical parts used in the REMEX Model RT0302RA/S44 Tape Transport Mechanism. Indented items are parts of the assembly under which they are indented. All items are available from REMEX Electronics, 5250 West El Segundo Boulevard, Hawthorne, California, 90251.

Table A-1. Electronics Parts, Remex RT0302RA/S44 Transport

Description	REMEX Part No.	Quantity	Symbol
Connector, Cannon DA-15P	706500-117	1	J1
Connector, Cannon DA-15S	706510-115	1	P1
Lamp, Rheem	715071-106	1	DS1
Motor	100455	1	M1
Switch, Micro-switch 115M1-T2	715058-109	1	S1
Switch, toggle AH&H 83001	715055-123	1	S2

Table A-2. Mechanical Parts, Remex RT0302RA/S44 Transport

Description	REMEX Part No.	Quantity	Symbol
Bumper	715021-103	1	2
Block, Lower	102546	1	3
Brake Assembly (L2)	101777	1	4
Brake Shoe	101780	1	
Brake Shoe, Housing	101781	1	
Mounting Block Assembly	102115	1	
Spring	101783	1	
Cover, Lower	103930-2	1	5
Cover, Upper	103738-3	1	6
Fan	715076-102	1	7
Front Panel	103956	1	8
Lamp Bracket Assembly	102530-1	1	9
Bracket	102543	1	
Clip	705750-112	2	
Mounting Plate	100696-2	1	

Table A-2. Mechanical Parts, Remex RT0302RA/S44 Transport (Cont'd)

Description	REMEX Part No.	Quantity	Symbol
Magnet Assembly (L1)	100349	1	10
Bracket	100334	1	
Coil	702500-104	1	
Core	100335	1	
Spacer	713600-102	1	
Photocell Block Assembly	102529-12	1	11
Block, Tape Adjuster	102699	1	
Block, Upper	102545	2	
Lens	100219	1	
Mounting Block	102535	1	
Readout Assembly (Photocells)	103611-2	1	
Rear Tape Guide	102544	1	
Spring	100531	1	
Steel Ball, 3/32 Diameter	716014-101	1	
Tape Adjustor	102389	1	
Tape Clip	100797	1	
Tape Guide	102390	2	
Rocker Assembly	100338	1	12
Bearing	714005-107	1	
Jam Roller	100756	1	
Retaining Ring	715025-107	3	
Rocker	100248	1	
Shaft, Pivot	100251-1	1	
Shaft, Roller	100251-2	1	
Torsion Spring	100324	1	
Rocker Stop	100251-7	1	13
Roller	100254-2	1	14
Tape Roller Assembly	102202	2	15
Bearing	714000-108	2	
Retainer Ring	715025-111	1	
Roller	101837	1	
Shaft	101836	1	

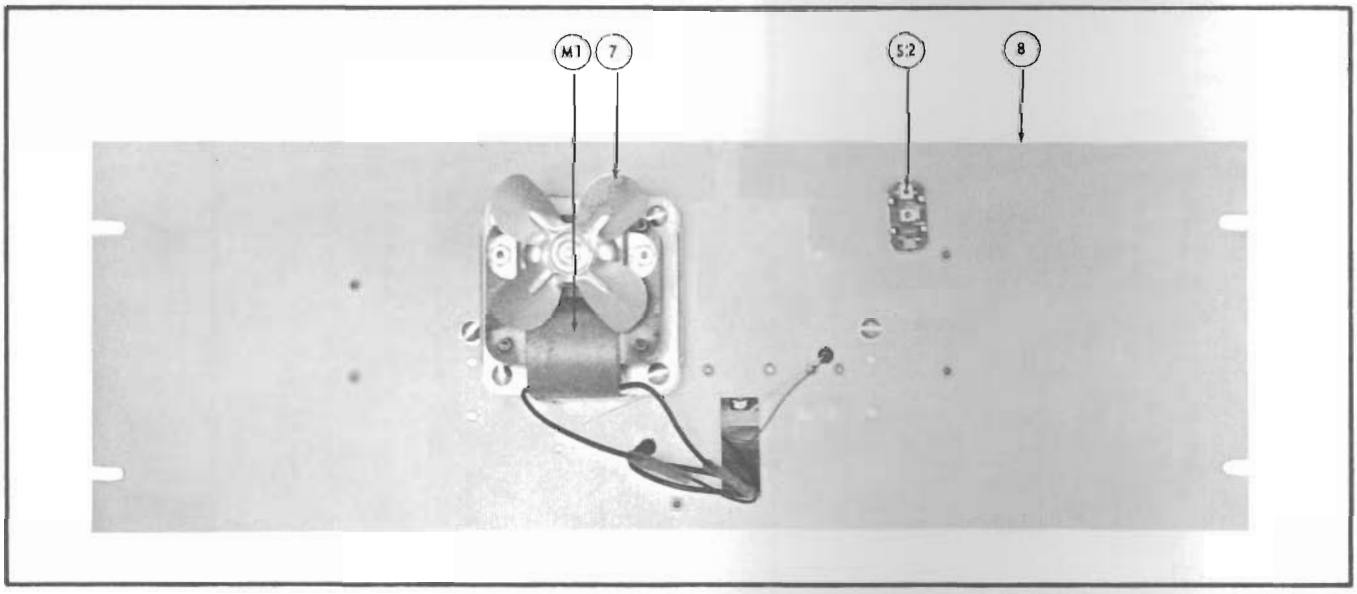

Figure A-1. Rear View of Transport Showing Location of Various Electronic and Mechanical Parts

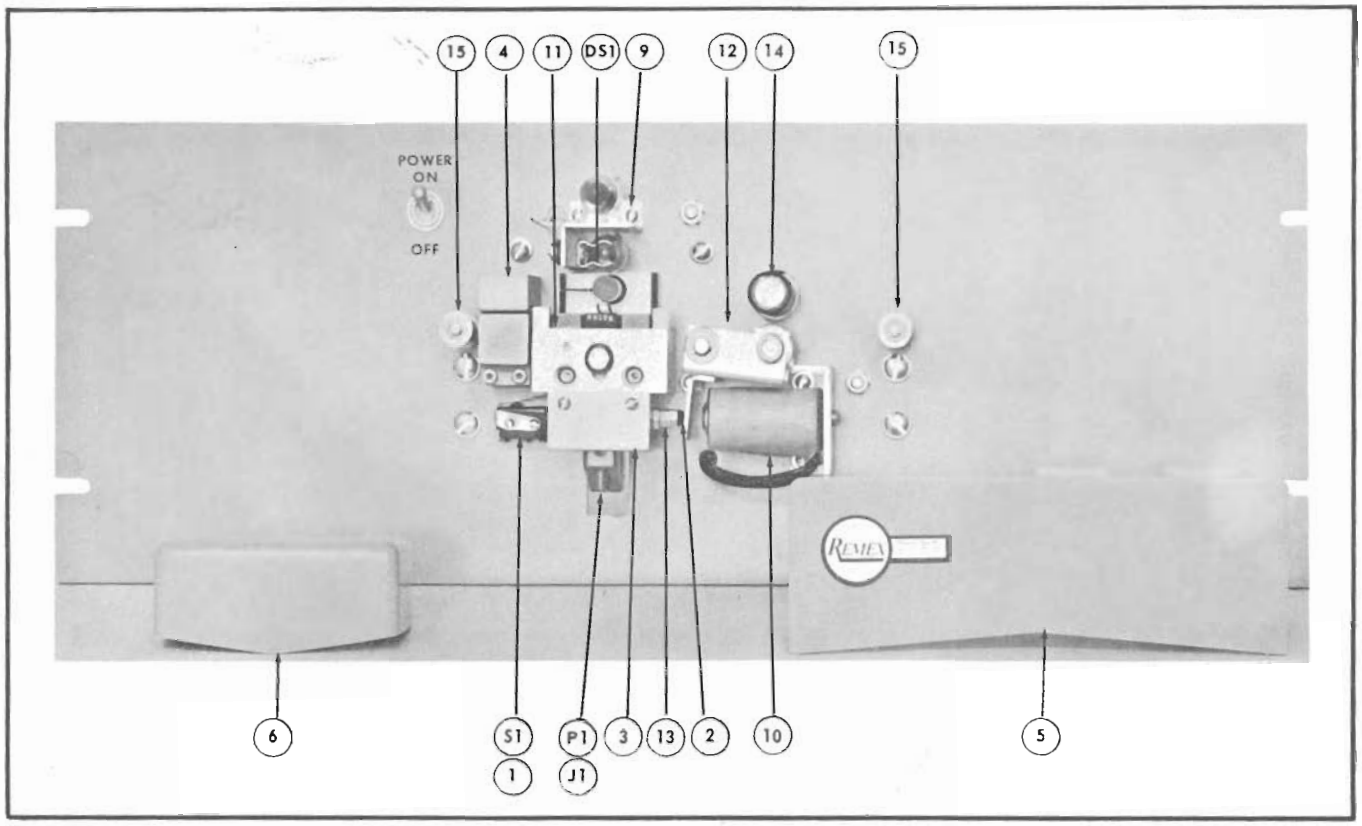

Figure A-2. Front View of Transport Showing Location of Various Electronic and Mechanical Parts

APPENDIX B

REMEX

TAPE TRANSPORT

MODEL RTS0302RC/S43

FOR

HP 2737B PUNCHED TAPE READER

APPENDIX B

MODEL RTS0302RC/S43

B-1. IDENTIFICATION OF COMPONENTS AND PARTS.

B-2. Figures B-1 and B-2 illustrate the component layout and the mechanical subassemblies of the REMEX Model RTS0302RC/S43 Tape Transport Mechanism. Electronic components are identified by alpha-numeric symbols which correspond to the listings in Table B-1. Mechanical parts are identified by numbers only which refer to reference numbers listed in Table B-2.

B-3. PARTS LIST.

B-4. ELECTRONICS PARTS LIST. Table B-1 lists the electronic components used in the REMEX Model RTS0302RC/S43 Tape Transport. All items are available from REMEX Electronics, 5250 West El Segundo Boulevard, Hawthorne, California, 90251.

B-5. MECHANICAL PARTS LIST. Table B-2 lists the mechanical parts used in the REMEX Model RTS0302RC/S43 Tape Transport Mechanism. Indented items are parts of the assembly under which they are indented. All items are available from REMEX Electronics, 5250 West El Segundo Boulevard, Hawthorne, California, 90251.

Table B-1. Electronics Parts, Remex RTS0302RC/S43 Transport

Description	REMEX Part No.	Quantity	Symbol
Capacitor 6 μf, 220 VAC	702452-605	2	C5,C6
Lamp, Rheem	715071-106	1	DS1
Motor, Reader	100455	1	M1
Motor, Rewind	103656	1	M2
Motor, Take-Up	104021	1	M3
Plug, Cannon DA-15S	706510-115	1	P1
Receptacle, Cannon DA-15P	706500-117	1	J1
Switch, Micro	715058-109	1	S1
Switch, Micro	715058-110	2	S3,S4

Table B-2. Mechanical Parts, Remex RTS0302RC/S43 Transport

Description	REMEX Part No.	Quantity	Symbol
Arm	103494	2	3
Block, Lower	102546	1	4
Brake Assembly (L2)	103764	1	5
Brake Shoe	101780	1	
Brake Shoe, Housing	101781	1	
Mounting Block Assembly	102115	1	
Spring	101783	2	
Bumper	715021-103	1	6
Bumper	715021-113	4	7
Cam	103609	2	8
Cover, Lower	103930-2	1	10
Cover, Upper	103738-3	1	11
Fan, M1	715076-102	1	12

Table B-2. Mechanical Parts, Remex RTS0302RC/S43 Transport (Cont'd)

Description	REMEX Part No.	Quantity	Symbol
Fan Assembly	103884	2	13
Brake Disc	103885	1	
Front Panel	103950	1	14
Grip-ring	715025-122	4	15
Hub, Left	103676-2	1	16
Hub, Right	103676-2	1	17
Junction Sheet, P1, Cannon DA-51211-1	716007-103	1	18
Lamp Bracket Assembly	102530-1	1	19
Bracket	102543	1	
Clip	705750-112	2	
Mounting Plate	100696-2	1	
Magnet Assembly (L1)	100349	1	20
Bracket	100334	1	
Coil	702500-104	1	
Core	100335	1	
Spacer	713600-102	1	
Photocell Block Assembly	102529-12	1	22
Block, Tape Adjustor	102699	1	
Block, Upper	102545	2	
Lens	100219	1	
Mounting Block	102535	1	
Readout Assembly (Photocells)	103611-2	1	
Rear Tape Guide	102544	1	
Spring	100531	1	
Steel Ball, 3/32 (Diameter)	716014-101	1	
Tape Adjustor	102389	1	
Tape Clip	100797	1	
Tape Guide	102390	2	
Plugbutton	715015-105	2	23
Reel	104284-1	2	24
Rocker Assembly	100338	1	25
Bearing	714005-107	2	
Jam Roller	100756	1	
Retaining Ring	715025-107	3	
Rocker	100248	1	
Shaft, Pivot	100251-1	1	
Shaft, Roller	100251-2	1	
Torsion Spring	100324	1	
Rocker Stop	100251-7	1	26
Roller, Drive	100254-2	1	27
Roller, Nylon	102945	2	28
Rollpin	713710-006	2	29
Shaft, Arm	103546	2	30
Spacer, M2 and M3	715030-133	6	31

Table B-2. Mechanical Parts, Remex RTS0302RC/S43 Transport (Cont'd)

Description	REMEX Part No.	Quantity	Symbol
Spring, Arm	103548	2	32
Spring, Hub	102940	4	33
Taper Roller Assembly	102202	2	34
Bearing	714000-108	2	
Retaining Ring	715025-111	1	
Roller	101837	1	
Shaft	101836	1	
Boot, (C5 and C6)	715019-101	1	
Bracket, (C5 and C6)	715045-120	4	

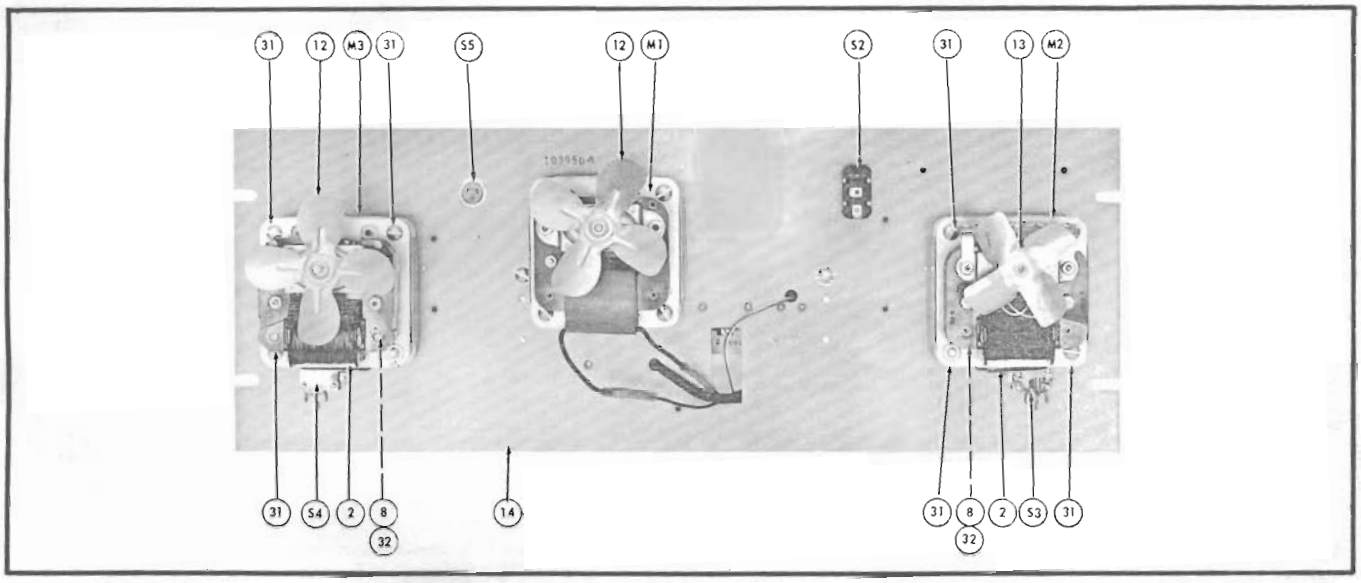

Figure B-1. Rear View of Transport Showing Location of Various Electronic and Mechanical Parts

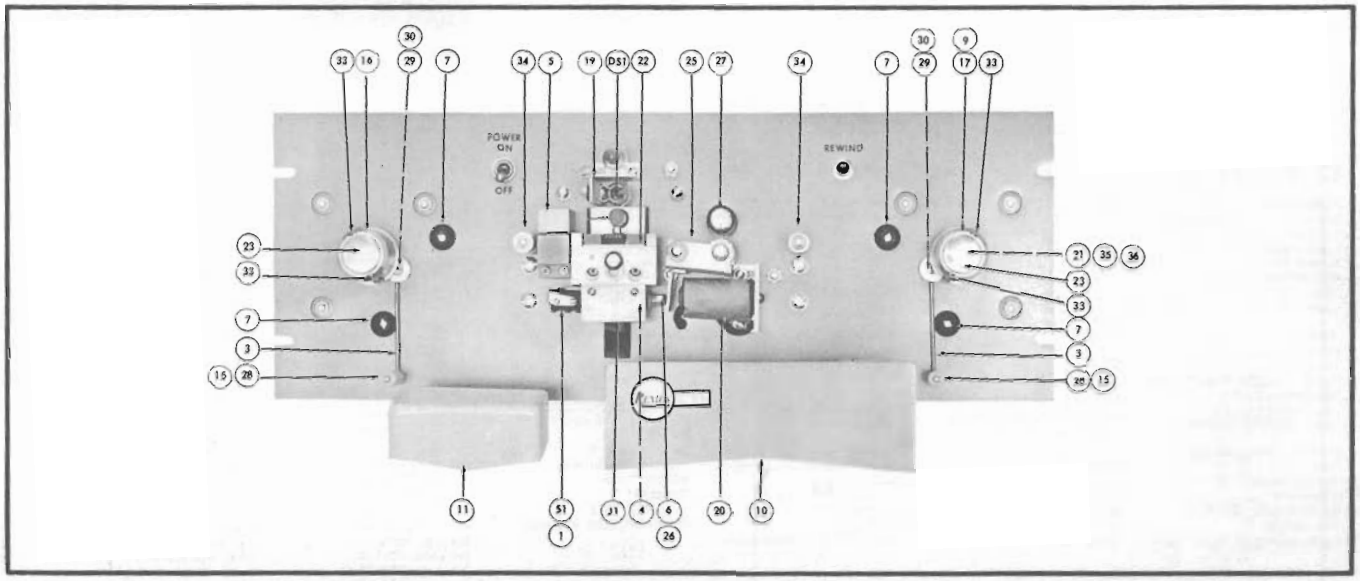

Figure B-2. Front View of Transport Showing Location of Various Electronic and Mechanical Parts

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