



OPERATING AND SERVICE MANUAL

(HP PART NO. 00740-90002)

**MODEL 740B
DC STANDARD/DIFFERENTIAL
VOLTMETER**

SERIALS PREFIXED: 610-, 722-

Copyright Hewlett-Packard Company 1966
P.O. Box 301, Loveland, Colorado 80537 U.S.A.

hp MANUAL CHANGES


MODEL 740B

DC STANDARD/DIFFERENTIAL VOLTMETER

Manual Serials Prefixed 610-, 722-
-hp- Part No. 00740-90002

► New or Revised Item

ERRATA

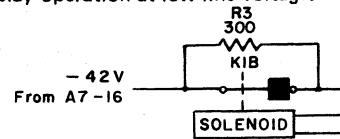
- **Page 1-1.** Table 1-1. Under AMPLIFIER, Performance Rating. Change Gain Accuracy to: $\pm (0.01\% + 5 \text{ ppm of range} + 2 \mu\text{V})$ referred to input.
Under GENERAL, Power Supply. Change to 48 Hz to 440 Hz.
- Page 1-2.** Paragraph 21. The 11054A and 11055A are also available packaged and sold as parts. See Page 6-16.
- Page 5-0.** Table 5-1. } Delete reference to -hp- 11100A
Page 5-2. Paragraph 5-14. } Series resistors; they are no longer
Page 5-8. Paragraph 5-33. } being manufactured.
- **Page 5-7.** Paragraph 5-31a, Change RANGE setting to 100 mV. Paragraph 5-31f, Change 10 microvolts to 1 microvolt. Paragraph 5-31e, An -hp- 200CD is required for this test.
- Page 5-10.** Paragraph 5-39b. Change A8R21 to A8R3.
- Page 5-12.** Paragraph 5-50a. Change RANGE setting to 100 V.
- Page 5-29.** Paragraph 5-92, Line 6. Change A3R19* to A3R9*.
- Page 5-32b.** Performance Test Card. Change AC Common Mode Rejection Test Limit to 1 microvolt max.
- Page 6-3.** Change MP7 to 5060-0222. Change MP8 (Setscrew) to 3030-0005. Change MP27 to 0400-0084. Change MP24 to Decals:
 $X1 = 5000-3270$. $X10 = 5000-3271$. $X10^2 = 5000-3272$.
 $X10^3 = 5000-3273$. $X10^4 = 5000-3274$. $X10^5 = 5000-3275$.
- Page 6-4.** Change A1R1 to -hp- Part No. 2100-3115.
- Page 6-6.** (REFERENCE DESIGNATOR column). Change A4C1 to A4C2. Change A4C2 to A4C1.
- Page 6-7.** (REFERENCE DESIGNATOR column). Change A4CR4 to A4CR10. Add A4CR4 thru A4CR9, Diode Si, -hp- Part No. 1901-0537. 1901-0537 is the preferred replacement.
- Page 6-9.** Change A6CR5 to Diode: Breakdown 6.81 V \pm 5% 400 mW.
- Page 6-11.** Change A10R6, R7 to R6* 0687-8241; R: fxd, 820 kilohms; and R7* 0687-1251 R: fxd, 1.2 megohms. Adjust values for optimum zero balance.
- **Page 6-12.** Change the connector under A18 to 1251-0469.
- **Page 6-13.** Change the connector under A19 to 1251-0468.
- **Page 6-14.** Q2 is a 2N2832, -hp- Part No. 1850-0437.
- Page 6-16.** Add 11054-60001, Input Cable Assy and 11055-60001, Output Cable Assy.
- Page 7-7.** Change value of A15R6 to 160 k Ω . Change S2CR2 to S2CR3. Change S2CR4 to S2CR1. Change S2CR1 to S2CR4. Change S2CR3 to S2CR2.
- Page 7-13/7-14.** A2 Component Locator. Change C15 (above R3) to C4.
- Page 7-19/7-20.** Change the amplitude of the first waveform under  from 0.2 V to 5 V.
- Page 7-23/7-24.** Change Q2 and Q3 to NPN. Label the unmarked resistor at Q2 collector: R8, 100 ohms.

Page 7-27/7-28. Change the voltages at the emitter of Q3 (Heater Control) as follows: - 22.5 V at turn on; - 12.5 V after 20 min. warm up. On newer instruments A13 pin 3 has been changed from base of Q1 to base of Q4.

Pages C-1, 2, 3, 4. Delete reference to -hp- 11100A series resistors, they are no longer being manufactured.

CHANGE 1: FOR SERIAL NO. 722-00791 AND GREATER.

Page 7-9. Change the wiring of K1 and R3 as shown. This change improves relay operation at low line voltage.



CHANGE 2: FOR SERIAL NO. 946-00951 AND GREATER.

Page 6-3. Change MP3 Part No. to 00740-00205.

Page 6-11. Change A10R1 Part No. to 0687-1001; value to 10 ohms and add * to designator.

Page 6-13. Change F1 Part No. to 2110-0338; value to 1.6 A for 115 V operation. Change F1 Part No. to 2110-0336; value to 0.8 A for 230 V operation. Change F2 Part No. to 2110-0004; value to 0.25 A for 230 V operation. Change J3 (chassis mounted) to Part No. 1251-2357. Add C19; 0170-0022; C: fxd, 0.1 microfarad.

Page 6-14. Change R3 to R3*, Part No. to 0816-0001, value to 250 ohms.

Page 6-15. Change W1 Part No. to 8120-1348.

• **Page 6-16.** Add Insulator Plate, Part No. 00740-04109.

CHANGE 3: FOR SERIAL NO. 946-00976 AND GREATER.

Page 6-15. Change S13 Part No. to 3101-1234.

CHANGE 4: FOR SERIAL NO. 946-01001 AND GREATER.

Page 6-14. Add R16, 0812-0017, R: fxd ww 0.25 Ω .

Page 7-23/7-24. Add R16, a 0.25 Ω resistor between F3 and T4. R16 reduces high voltage no load instability.

CHANGE 5: FOR SERIAL NO. 946-01026 AND GREATER.

Page 6-8. Change A5Q1, Q2 to 1853-0039; TSTR: Si PNP 2N3638A (TQ = 5).

Page 6-13. Change C14, C15 to 0160-3611; C: fxd 2x .0072 μF .

Page 7-7. Change C14, C15 to .0072 μF .

CHANGE 6: FOR SERIAL NO. 1106A01151 AND GREATER.

Page 6-3. Change MP10 to Part No. 00740-00207.

Page 6-15. Change S11 to Part No. 3101-1248. Change S12 to Part No. 3101-1557.



Figure 1-1. Model 740B DC Standard/Differential Voltmeter

Table 1-1. Specifications

DC STANDARD**RANGES:**

Output Voltage: 0 to 1000* volts in 4 decade ranges with outputs as follows:

- 0 to 1.000000 volts in 1 μ V steps
- 0 to 10.000000 volts in 10 μ V steps
- 0 to 100.000000 volts in 100 μ V steps
- 0 to 1000.000000 volts in 1 mV steps

PERFORMANCE RATING:

Accuracy: $\pm(0.002\%$ of setting + 0.0004% of range) at $23^{\circ}\text{C} \pm 1^{\circ}\text{C}$, less than 70% relative humidity, constant load.

Stability: Rated accuracy is met after 1 hour warm-up period, with a 30-day calibration cycle.

Short Term: 1 ppm of setting + 0.5 ppm of range/hour; 5 ppm of setting + 1 ppm of range/day. (< 100 volts output.)

Temp. Coefficient: Less than (2 ppm of setting or 1 ppm of range whichever is greater) per $^{\circ}\text{C}$; 10°C to 40°C .

OUTPUT CHARACTERISTICS:

Output Current: Current limiter continuously adjustable 5-50 mA nominal. Max. output current, 50 mA decreasing linearly to 20 mA at 1000 volts output.

Output Resistance: Less than $(0.0002 + 0.0001 E_o)$ ohms at DC.

Load Regulation: Less than $(0.0005\% + 10 \mu\text{V})$ change, no load to full load.

Line Regulation: Less than $\pm(0.0005\%$ of setting + 0.0001% of range) for 10% line voltage change.

Noise and Hum: .01 to 1 Hz: less than 1 ppm of range; 1 Hz to 1 MHz: 100 dB below full scale or 100 μV rms, whichever is greater.

Output Terminals: Plus and minus output, plus and minus sense, circuitguard, and chassis ground. Banana jacks mounted on remote terminal box (Accessory 11055B, furnished). Output and sense terminals are solid copper, goldflashed. A maximum of 500 Vdc may be applied between chassis ground and guard or circuit ground.

Zero Control Limits: $\pm 0.001\%$ of range nominal.

Readout: 5 digital display tubes indicate first 5 digits; meter displays 6th digit.

DC DIFFERENTIAL VOLTMETER

Voltage Ranges: 1 mV to 1000 V* DC in 7 decade ranges.

Resolution: Null ranges give full scale indication of $\pm 0.01\%$ of range. Max. resolution 1 ppm at full scale. Max. usable null sensitivity: 1 μV full scale.

PERFORMANCE RATING:

Accuracy: $\pm(0.005\%$ of reading + 0.0004% of range + 1 $\mu\text{V})$ at $23^{\circ}\text{C} \pm 1^{\circ}\text{C}$, less than 70% relative humidity.

Stability: Rated accuracy is met after a 1 hour warm-up period, with a 30-day calibration cycle.

Short-term: 1 ppm/hr., 5 ppm/day exclusive of zero drift. (< 100 volts input.)

Zero stability: (1 ppm of range + 2 $\mu\text{V})$ /day.

Temp. Coefficient: Less than $\pm(2 \text{ ppm of reading} + 1 \mu\text{V})/^{\circ}\text{C}$, 10°C to 40°C .

Line Regulation: Less than $\pm(0.001\%$ of reading + 2 $\mu\text{V})$ change for 10% line voltage change.

SECTION I

GENERAL INFORMATION

1-1. INTRODUCTION.

1-2. This section contains general information about the Model 740B DC Standard/Differential Voltmeter.

1-3. DESCRIPTION.

1-4. The Hewlett-Packard Model 740B is a precision multifunction instrument that operates as a dc standard voltage source, a dc differential voltmeter, a

high impedance dc voltmeter and a dc power and voltage amplifier. The instrument is designed for use in both the standards laboratory and the field.

1-5. DC STANDARD.

1-6. When used as a dc standard, the Model 740B provides output voltages from 0 to 1000 V in 4 decade ranges: 1 V, 10 V, 100 V and 1000 V. The output voltage on each range can be set with 6-digit resolution.

Table 1-1. Specifications (Cont'd)

INPUT CHARACTERISTICS:	<u>AMPLIFIER</u>
<u>Input Resistance:</u> > 10^{10} ohms 100 mV to 1000 V ranges. > 10^9 ohms on 10 mV range. > 10^8 ohms on 1 mV range. Independent of null condition.	<u>Voltage Gain: Recorder Output:</u> 120 dB max. <u>Output terminals:</u> 60 dB on 1 mV range 40 dB on 10 mV range 20 dB on 100 mV range Unity on 1 V to 1000 V ranges
<u>Superimposed AC Noise Rejection:</u> Less than 0.001% error for ac voltages above 60 Hz equal to DC signal (25 V rms max.).	<u>Performance Rating: (output terminals)</u> <u>Gain Accuracy:</u> $\pm(0.001\% + 5 \text{ ppm of range} + 2 \mu\text{V})$ referred to input.
<u>Effective AC Common Mode Rejection:</u> > 120 dB at 60 Hz with 1 k Ω unbalance.	<u>Linearity:</u> $\pm 0.002\%$ on any range. (1 mV and above)
<u>Input Terminals:</u> Plus, minus, guard, and chassis ground; Banana jacks mounted on remote terminal Box. Plus and minus terminals are solid copper, goldflashed. 500 Vdc maximum may be connected between chassis ground and guard or circuit ground.	<u>Output Current:</u> Same as DC Standard. <u>Bandwidth:</u> DC to 0.2 Hz. <u>Input Resistance:</u> Same as ΔVM . <u>Line Regulation:</u> Less than 0.0005% of reading + 2 μV referred to input for 10% line voltage change.
<u>HIGH IMPEDANCE VOLTMETER</u>	<u>Noise:</u> .01 Hz to 1 Hz (referred to input) < .5 μV pk - pk at 60 dB < 1.0 μV pk - pk at 40 dB gain. < 3 μV pk - pk at 20 dB gain. Unity gain (1 μV range and above) same as DC Standard.
<u>Voltage Ranges:</u> 1 μV to 1000* volts end scale in 10 zero centered ranges. (1 μV to 1 mV ranges obtained by using null sensitivity pushbuttons.)	1 Hz to 1 MHz: 1 V to 1000 V ranges: same as DC Standard. Below 1 V range: < 100 μV RMS.
<u>PERFORMANCE RATING:</u> <u>Accuracy:</u> $\pm(2\%$ of end scale + 0.1 $\mu\text{V})$.	<u>GENERAL</u>
<u>INPUT CHARACTERISTICS:</u> <u>Input Resistance:</u> > 10^{10} ohms 100 mV to 1000 V ranges. > 10^9 ohms on 10 mV range. > 10^8 ohms on 1 μV to 1 mV ranges.	<u>Operating Temperature:</u> + 10 $^{\circ}\text{C}$ to + 40 $^{\circ}\text{C}$. <u>Storage Temperature:</u> - 40 $^{\circ}\text{C}$ to + 65 $^{\circ}\text{C}$. <u>RFI:</u> Meets MIL Spec. 6181D. ** <u>Power Supply:</u> 115/230 Vac $\pm 10\%$, 50 Hz to 1000 Hz, 125 watts max.
<u>Zero Control Limits:</u> $\pm 10 \mu\text{V}$ nominal. <u>Zero Drift:</u> Less than 2 μV per day after 30 minute warm-up.	* A maximum of -500 Vdc with respect to line ground can be applied to or obtained from the -hp- Model 740B.
<u>Superimposed AC Rejection:</u> Ac voltages above 60 Hz; 60 dB greater than end scale affects reading less than 2% (25 V rms max.).	** Positive or negative output terminals of the output box (-hp- 11055B) connected to chassis, and guard and chassis terminals of the input box (-hp- 11054A) connected together.
<u>RECORDER OUTPUT</u>	
Adjustable 0 to ± 1 Vdc at 1 mA for end scale meter indication. Recorder negative terminal common with input negative terminal.	

The output voltage is accurate to within $\pm(0.002\%$ of setting + 0.0004% of range). Output voltage is indicated on digital readout tubes (first five digits) and the meter (sixth digit). Maximum output current is 50 mA on the 1 V range decreasing linearly to 20 mA at full output voltage on the 1000 V range. The front panel CURRENT LIMIT control allows adjustment of the maximum output current from approximately 10% to 100% of the available output current at each voltage setting. Remote sensing allows the output voltage to be regulated at the load, eliminating the effects of lead resistance. The output circuit is floating and guarded. A pushbutton switch allows the output voltage to be switched on and off without resetting the voltage dials.

1-7. DIFFERENTIAL VOLTMETER.

1-8. Used as a differential voltmeter, the Model 740B measures dc voltage on seven decade ranges from 1 mV to 1000 V. Voltage measurements are accurate within $\pm(0.005\%$ of reading + 0.0004% of range + $1 \mu\text{V}$). The measured voltage is indicated on five digital readout tubes (first five digits) and the meter (sixth digit). High input resistance ($> 10^{10} \Omega$ on all ranges above 10 mV) is maintained regardless of whether or not the voltage dials are nulled. The input circuit is floating and guarded, allowing accurate measurements to be made under conditions where ground loops are a problem.

1-9. HIGH IMPEDANCE VOLTMETER.

1-10. The Model 740B can also be used as a $\pm 2\%$ floating and guarded dc voltmeter with 10 voltage ranges from $1 \mu\text{V}$ to 1000 V. Input resistance is $> 10^{10} \Omega$ on all ranges above 10 mV. The measured voltage is indicated on the meter.

1-11. AMPLIFIER.

1-12. The Model 740B can be used as a dc power amplifier in the Voltmeter and Differential Voltmeter modes of operation by connecting the source to the input terminals and taking the output from the output terminals. Voltage gain is unity on the 1 V range and higher, but increases in 20 dB steps on the lower ranges to a maximum of 60 dB on the 1 mV range. Output current characteristics are the same as the DC Standard mode and the high input resistance characteristics of the Voltmeter and Differential Voltmeter modes are retained. Voltage gain accuracy is $\pm(0.01\% + 5 \text{ ppm of range} + 2 \mu\text{V})$.

1-13. The Model 740B can also be used as a voltage amplifier in the Voltmeter and Differential Voltmeter modes with up to 120 dB of voltage gain available at the rear panel RECORDER OUTPUT terminals. Voltage at these terminals is directly proportional to meter deflection and is 0 to $\pm 1 \text{ V}$ on all ranges, $1 \mu\text{V}$ to 1000 V.

1-14. INTERNAL ADJUSTMENT.

1-15. An internal bridging arrangement, requiring no external equipment, allows resistors in the first and second decades and the range divider to be ratio matched to compensate for long term aging effects. The front panel meter serves as a bridge null indi-

cator and an internal alignment switch sets up the bridge. A total of 12 adjustments match the resistors. The only other adjustment affecting basic instrument accuracy can easily be made with a standard cell or other known voltage source. The internal alignment procedure is outlined on the instrument internal guard cover and described in detail in Section V of this manual.

1-16. SPECIFICATIONS.

1-17. Table 1-1 lists the specifications for the Model 740B. Specifications are listed by instrument function. Those specifications listed with a function apply to that function only.

1-18. INSTRUMENT IDENTIFICATION.

1-19. Hewlett-Packard uses a two-section eight-digit serial number (000-00000). If the first three digits of the serial number on your instrument do not agree with those on the title page of this manual, a Manual Change Sheet supplied with this manual will define differences between your instrument and the Model 740B described in this manual. If a letter prefixes the serial number, the instrument was manufactured outside the United States.

1-20. ACCESSORY EQUIPMENT SUPPLIED.

1-21. The accessory equipment supplied with the Model 740B is listed in Table 1-2.

Table 1-2. Accessory Equipment Supplied

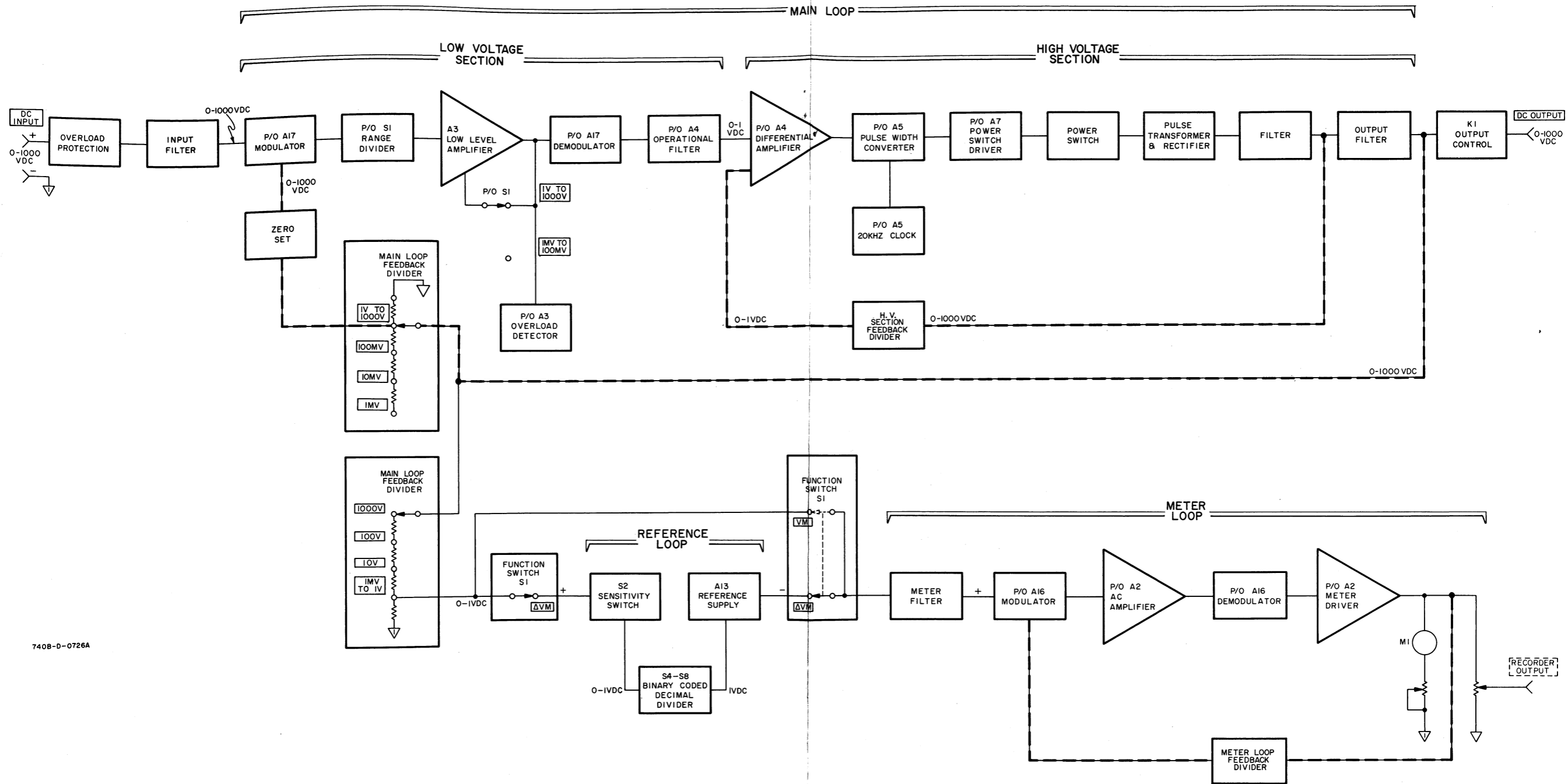
-hp- Part No.	Quantity	Description
11054A	1	Input Cable Assembly
11055B	1	Output Cable Assembly
5000-4932	1	Printed Circuit Board Extractor
5060-0776	1	7 inch Rack Mounting Kit
8120-0078	1	AC Power Cord
00740-66535	1	Printed Circuit Board Extender
00740-90002	1	Operating and Service Manual

1-22. ACCESSORY EQUIPMENT AVAILABLE.

1-23. Accessory equipment available for the Model 740B is listed in Table 1-3.

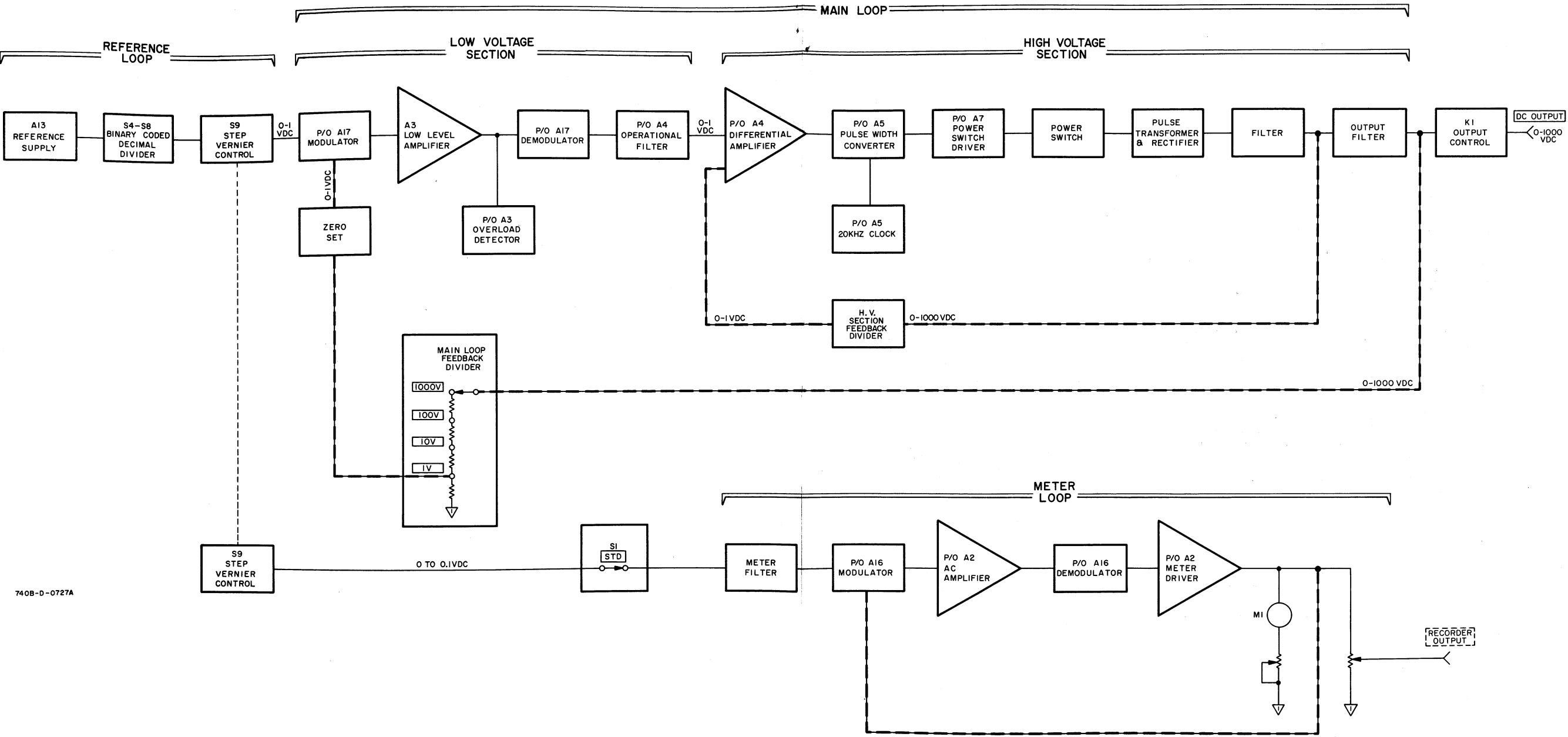
Table 1-3. Accessory Equipment Available

-hp- Part No.	Description
11000A	Test Cable: dual banana plug to dual banana plug (44 in.)
11002A	Test Cable: dual banana plug to alligator clips (60 in.)
11003A	Test Cable: dual banana plug to probe and alligator clip (60 in.)



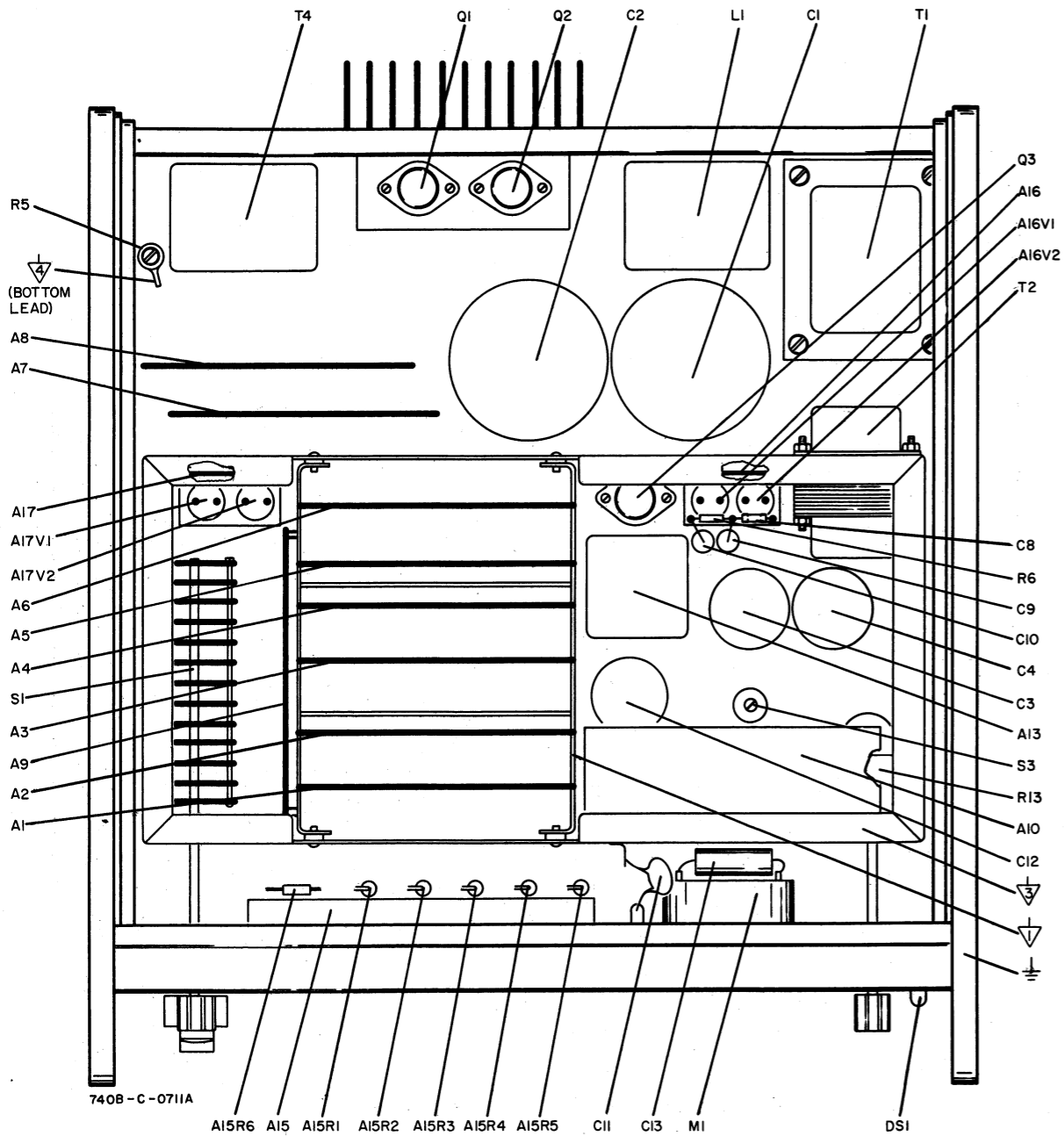
740B-D-0726A

Figure 7-1. DC Voltmeter and Differential Voltmeter Block Diagram

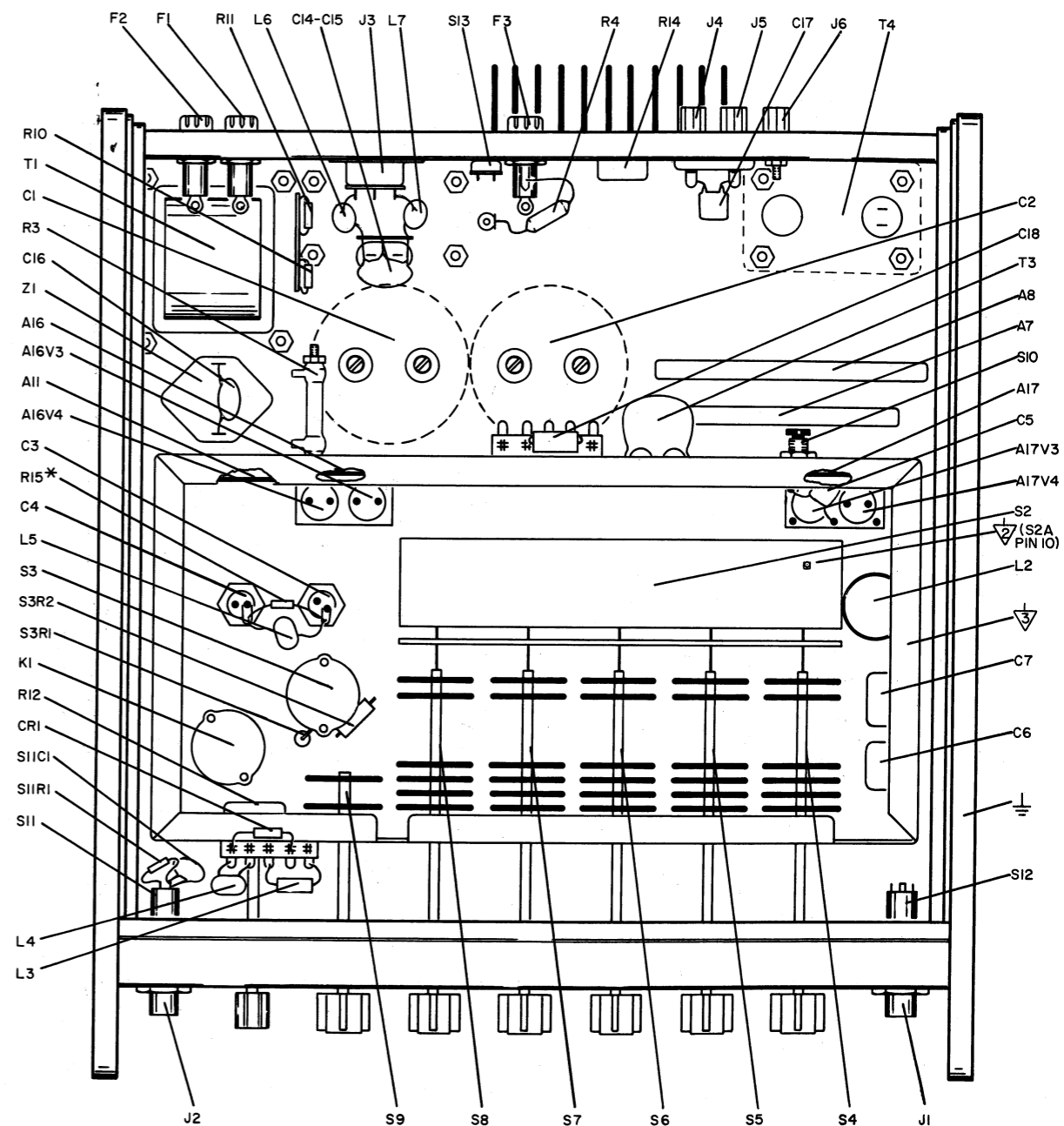


740B-D-0727A

Figure 7-2. DC Standard Block Diagram

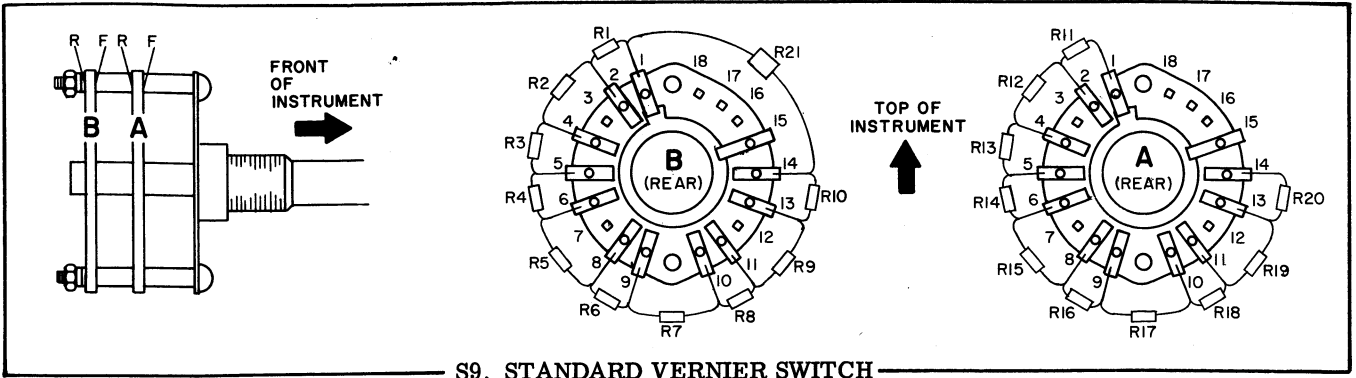


TOP
VIEW

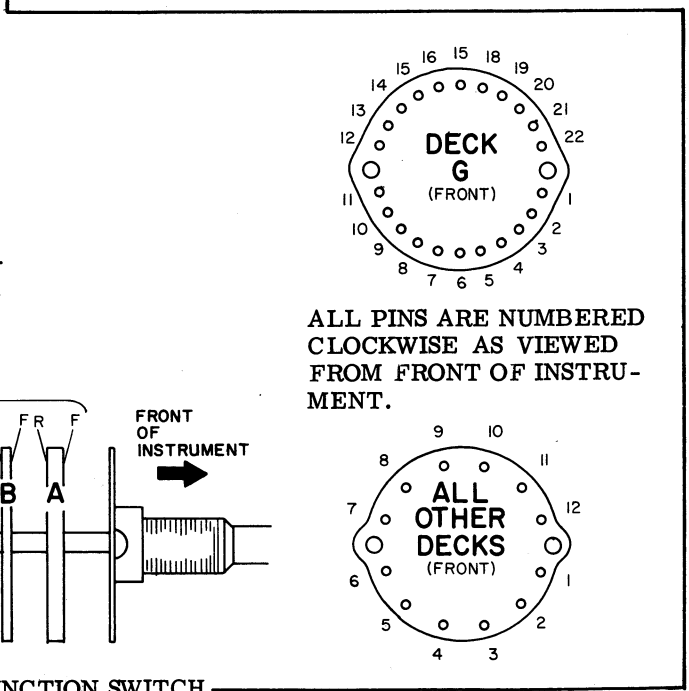
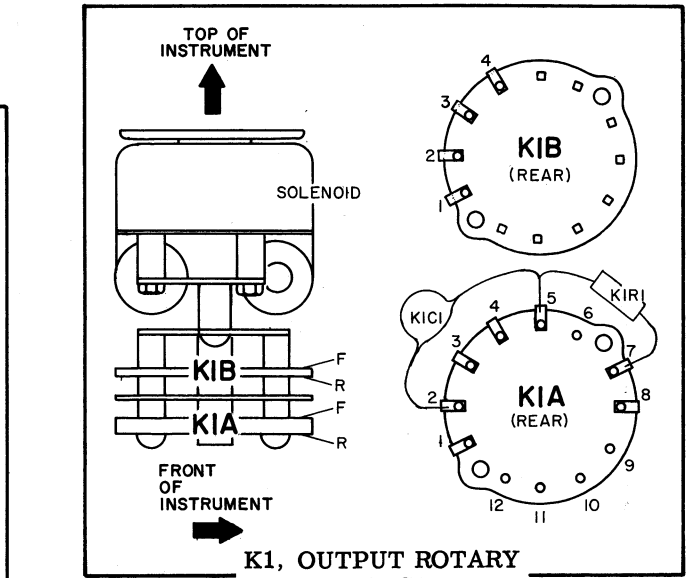


BOTTOM
VIEW

A1-A4 Component side Front
A5-A8 Component side Rear



RANGE/FUNCTION SWITCH, S1, COMPONENT LOCATIONS		
REFERENCE DESIGNATOR	VALUE	CONNECTED BETWEEN PINS
C1	0.1 μ F	F(F-7) and G(R-14)
C2	0.01 μ F	F(F-8) and F(F-10)
R1	160 k Ω	F(F-10) and F(F-12)
R2	1.6 M Ω	F(F-5) and F(F-7)
R3	16 k Ω	F(R-2) and G(R-3)
R4	1.6 k Ω	F(R-4) and G(R-5)
R5	NOT ASSIGNED	
R6	NOT ASSIGNED	
R7	100 k Ω	I(F-8) and J(R-8)
R8	2.2 M Ω	H(F-2) and H(F-11)
R9	2.2 M Ω	H(F-4) and H(F-8)
R10	8.2 k Ω	H(F-8) and H(F-11)
R11	10 k Ω	D(F-7) and D(F-8)
R12	100 k Ω	D(F-8) and D(F-9)
R13	560 k Ω	C(F-10) and D(F-10)
R14	430 k Ω	C(F-10) and D(F-9)
R15	18 Ω	D(R-11) and D(R-12)
R16	180 Ω	D(R-4) and D(R-5)
R17	4.7 k Ω	E(F-8) and E(F-10)
R18	18 k Ω	E(F-6) and E(F-8)
R19	120 Ω	Sw. Shaft and J(R-5)
*R20	10 Ω	G(F-7) and G(F-15)



* SERIAL NUMBERS 610-00376 AND ABOVE. EARLIER SERIAL NUMBERS DO NOT HAVE THIS PART.

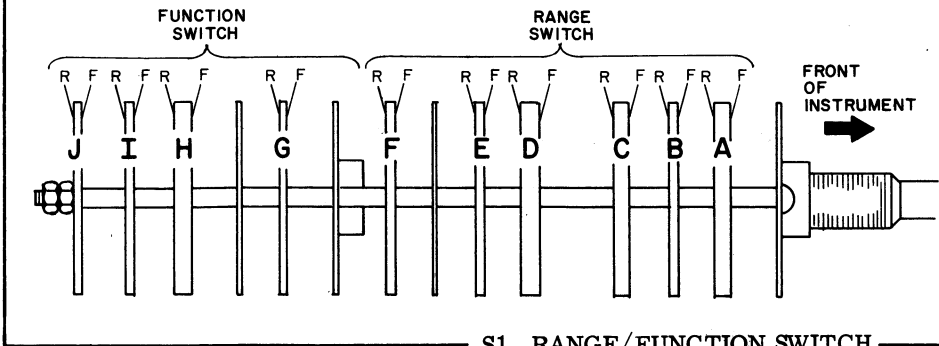
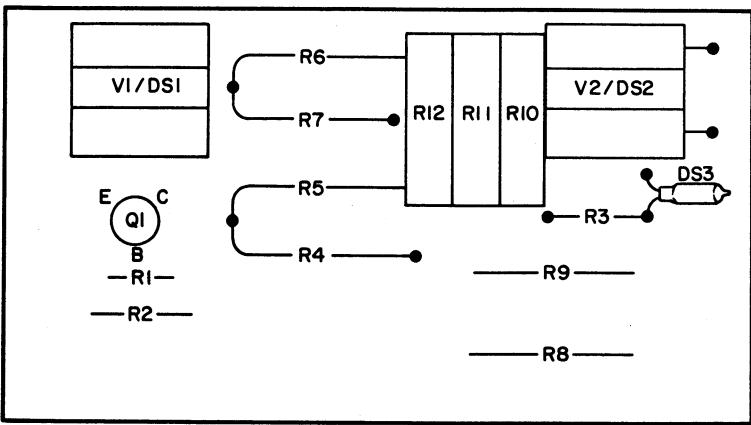


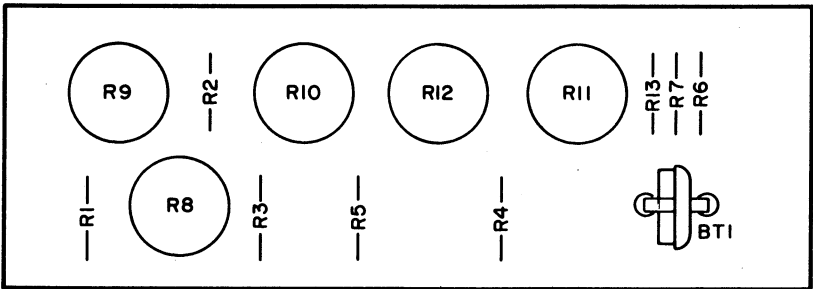
Figure 7-3. Functional and Component Location Diagram (Sheet 1 of 4)



740B-B-0751A

A9

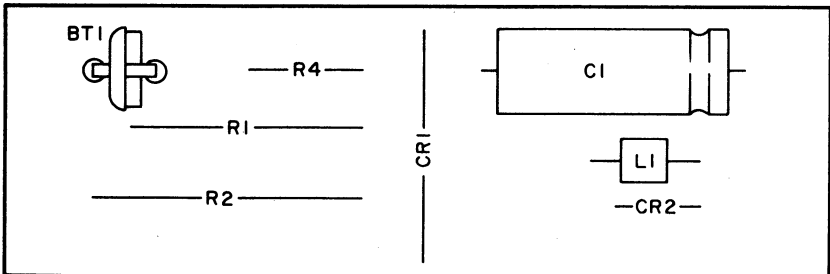
hp PART NO. 00740-66529



740B-B-0752A

A10

hp PART NO. 00740-66530



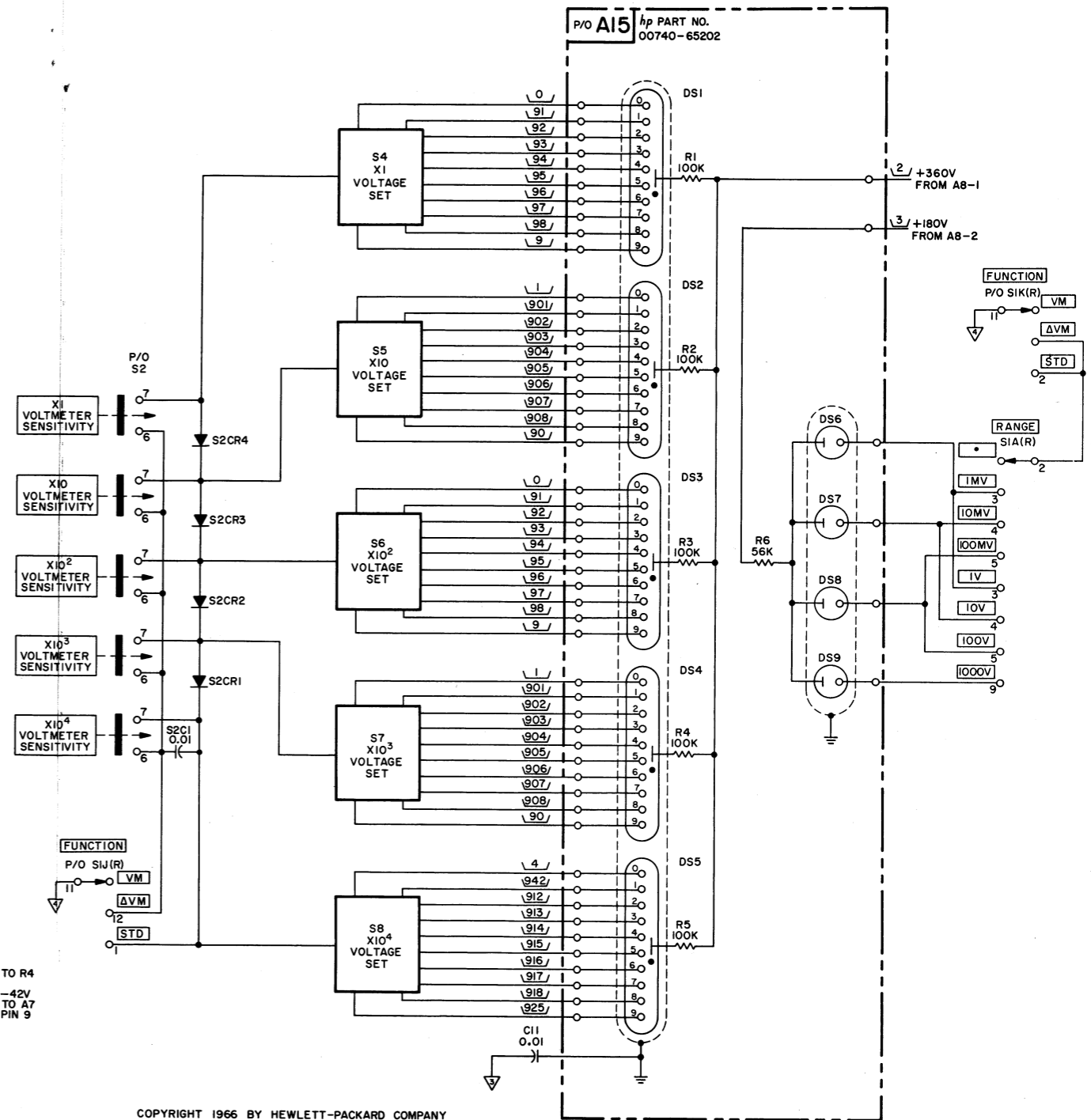
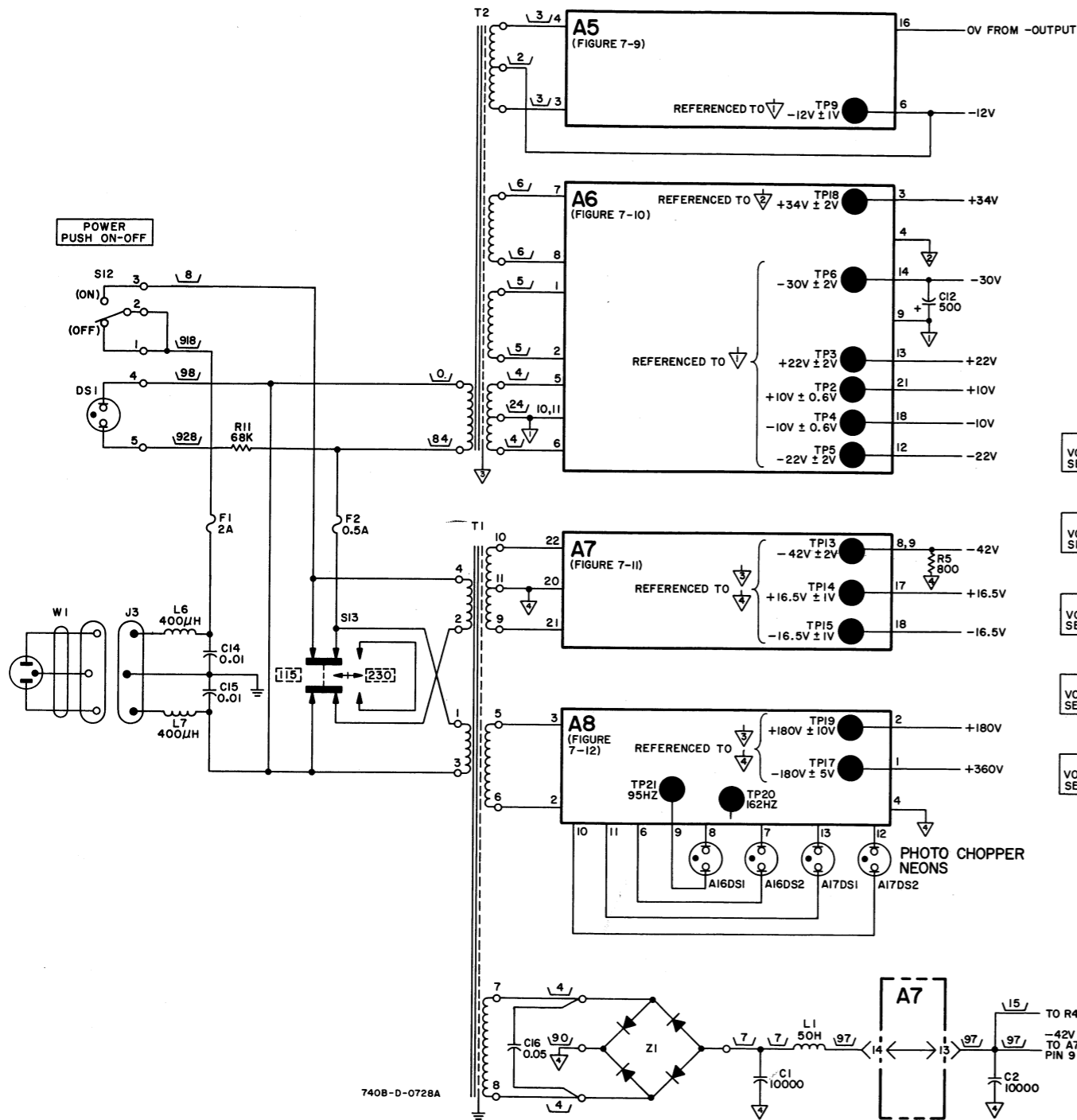
740B-B-0753A

A11

hp PART NO. 00740-66531

POWER SUPPLIES AND NEON DRIVERS

DIGITAL INDICATOR SWITCHING



COPYRIGHT 1966 BY HEWLETT-PACKARD COMPANY

Figure 7-3. Functional and Component Location Diagram (Sheet 2 of 4)

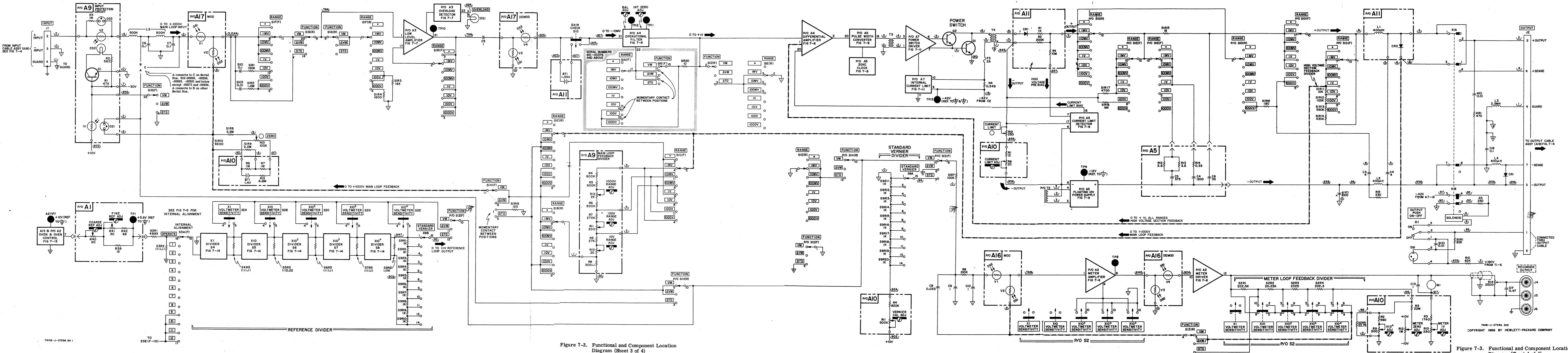


Figure 7-3. Functional and Component Location Diagram (Sheet 3 of 4)

Figure 7-3. Functional and Component Location Diagram (Sheet 4 of 4)

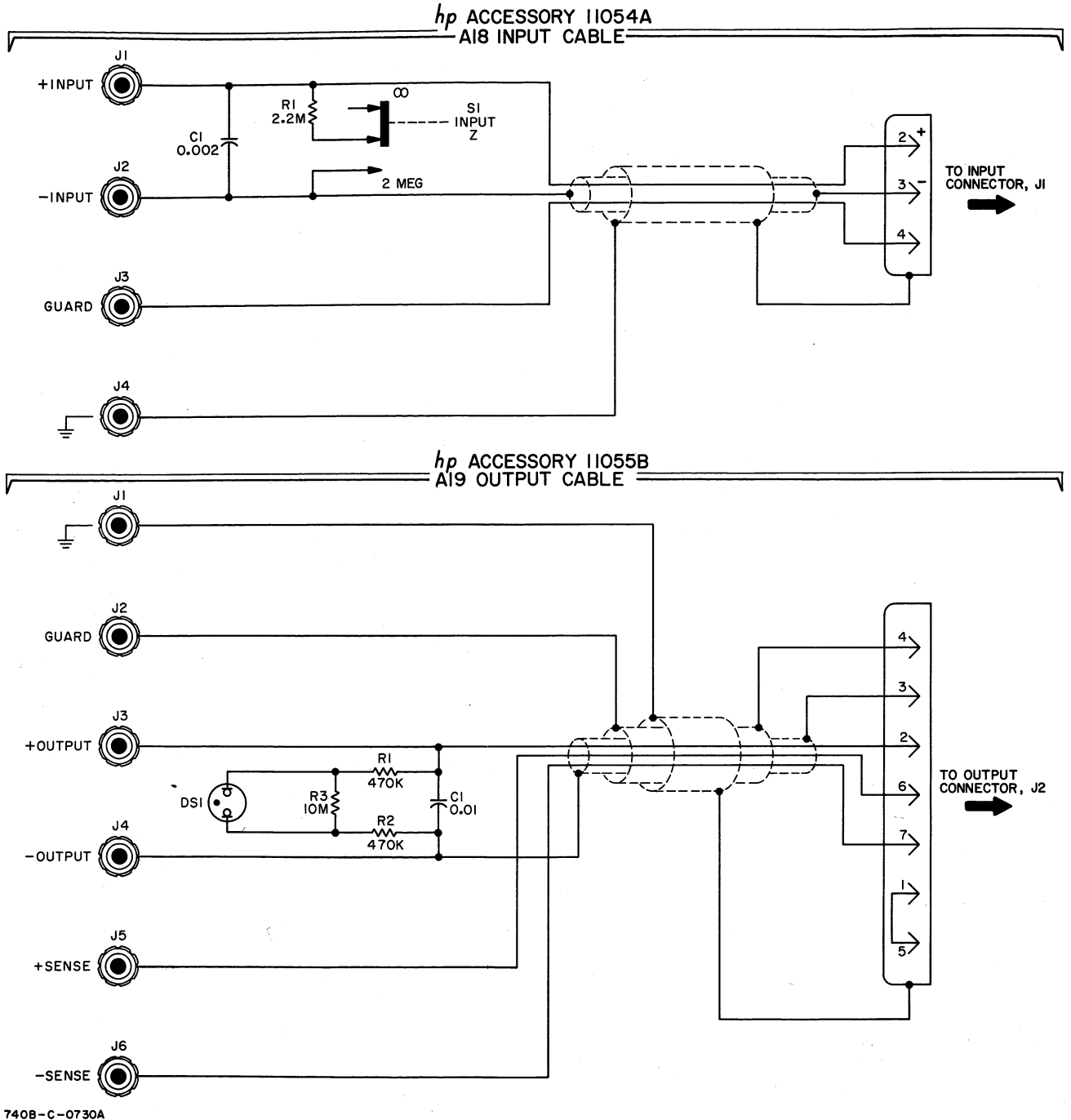
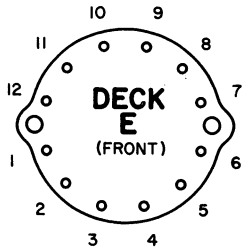
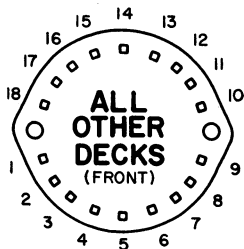
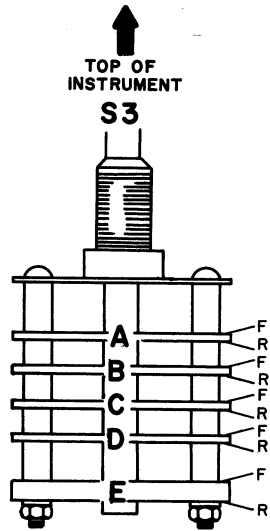
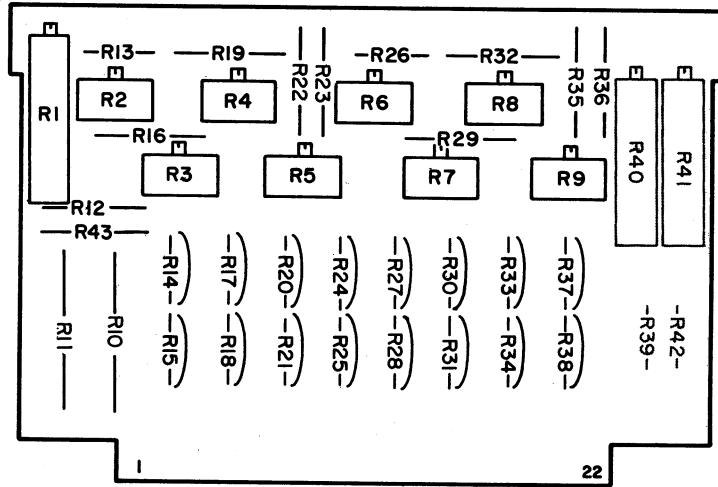


Figure 7-4. Input and Output Cable Assemblies Schematic Diagram



← FRONT OF INSTRUMENT




740B-8-0743A

A1

hp PART NO. 00740-66521

NOTES: FIGURE 7-5

1.  DENOTES JUMPER WIRE. JUMPER WIRE MAY NOT BE PRESENT. (See Paragraph 5-63).
2. INDICATED VOLTAGES ARE MEASURED WITH RESPECT TO ∇ AND ∇ IN STD MODE; ∇ ONLY IN OTHER MODES.
3. S4, S5, S6, S7 and S8 (VOLTAGE SET SWITCHES) MUST BE IN FIRST POSITION () FOR INTERNAL CALIBRATION.

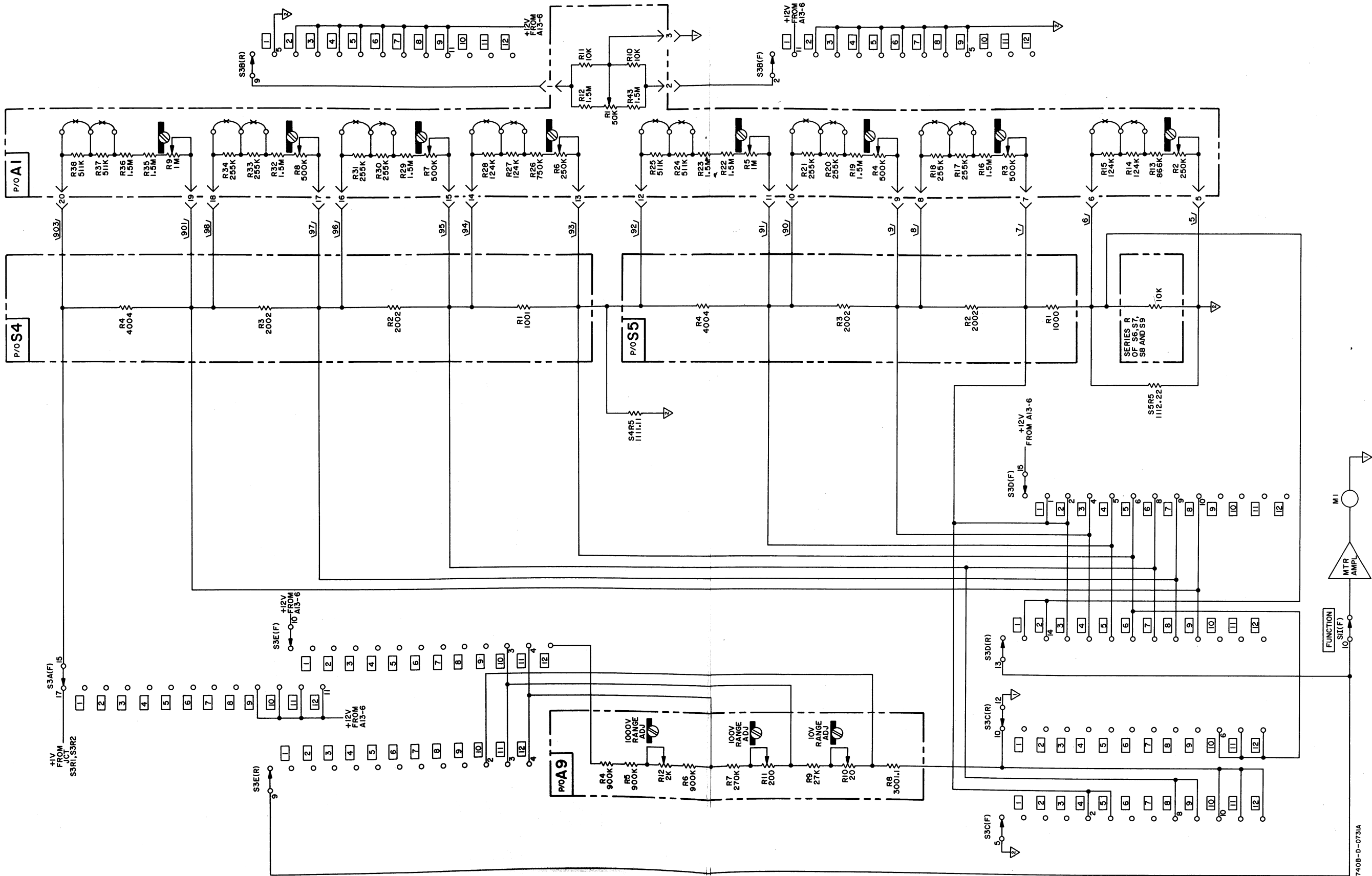
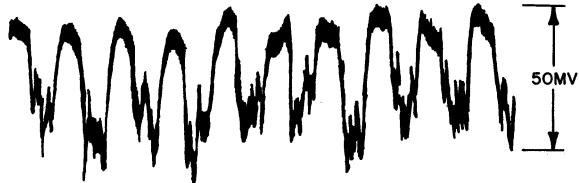


Figure 7-5. Internal Alignment Schematic and Component Location Diagram

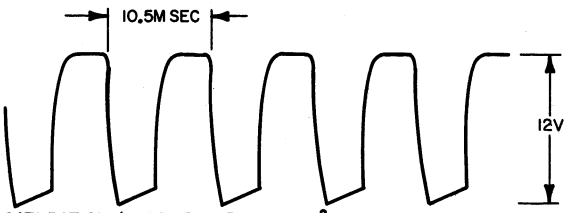
A2TP8



XI AND XIO SENSITIVITY, VM AND ΔVM, ALL RANGES (ON-SCALE METER DEFLECTION)

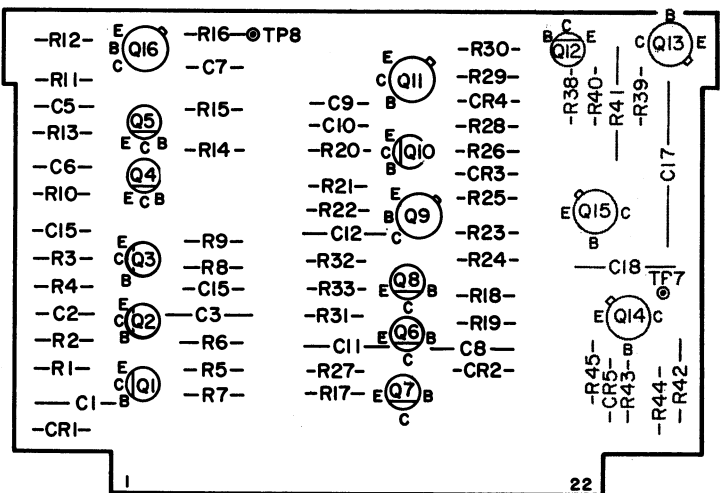


XIO², XIO³ AND XIO⁴ SENSITIVITY, VM AND ΔVM, ALL RANGES (ON-SCALE METER DEFLECTION)



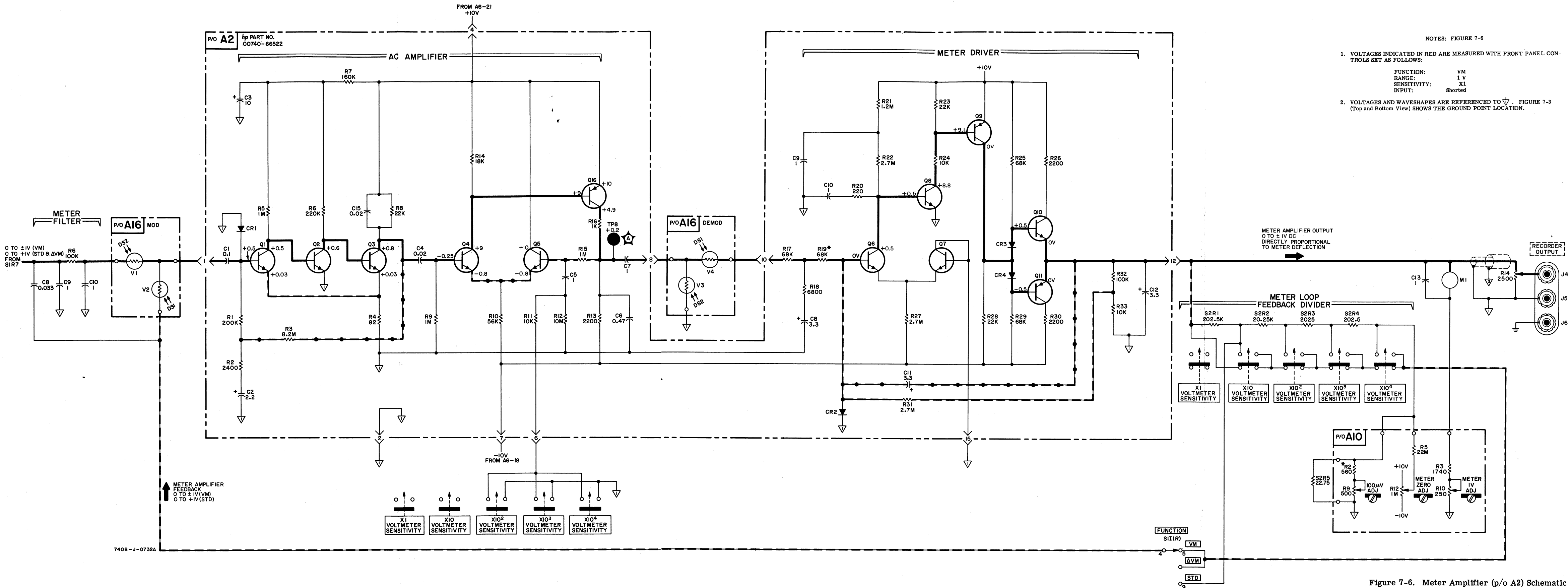
SATURATION (IV INPUT, IV RANGE, XIO² SENSITIVITY VM OR ΔVM)

740B-R0



740B-0744A

A2
hp PART NO. 00740-66522



A

INPUT SHORTED (VM AND Δ VM)
OV OUTPUT (STD)



PEAK TO PEAK AMPLITUDE
DEPENDS ON RANGE AND
FUNCTION.

Δ VM AND VM

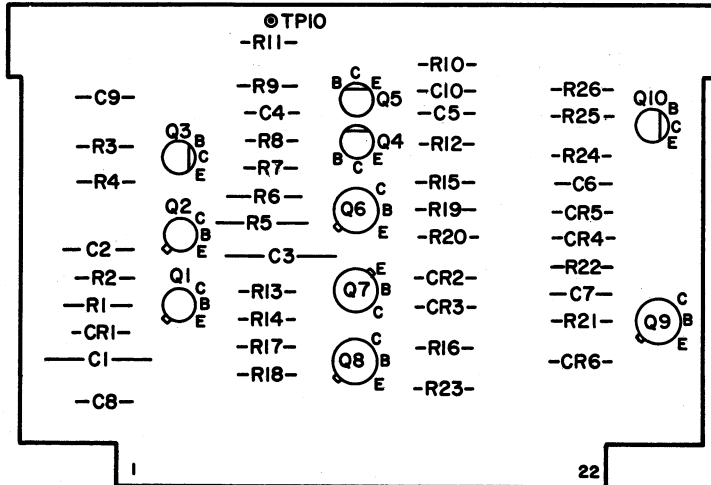
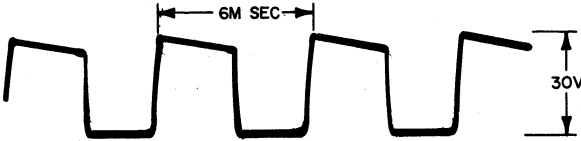
MV RANGES: 1V P-P
1V RANGE: 75MV P-P
10, 100, 1000V RANGES: 50MV P-P

STD

ALL RANGES: 75MV P-P

740B-RO

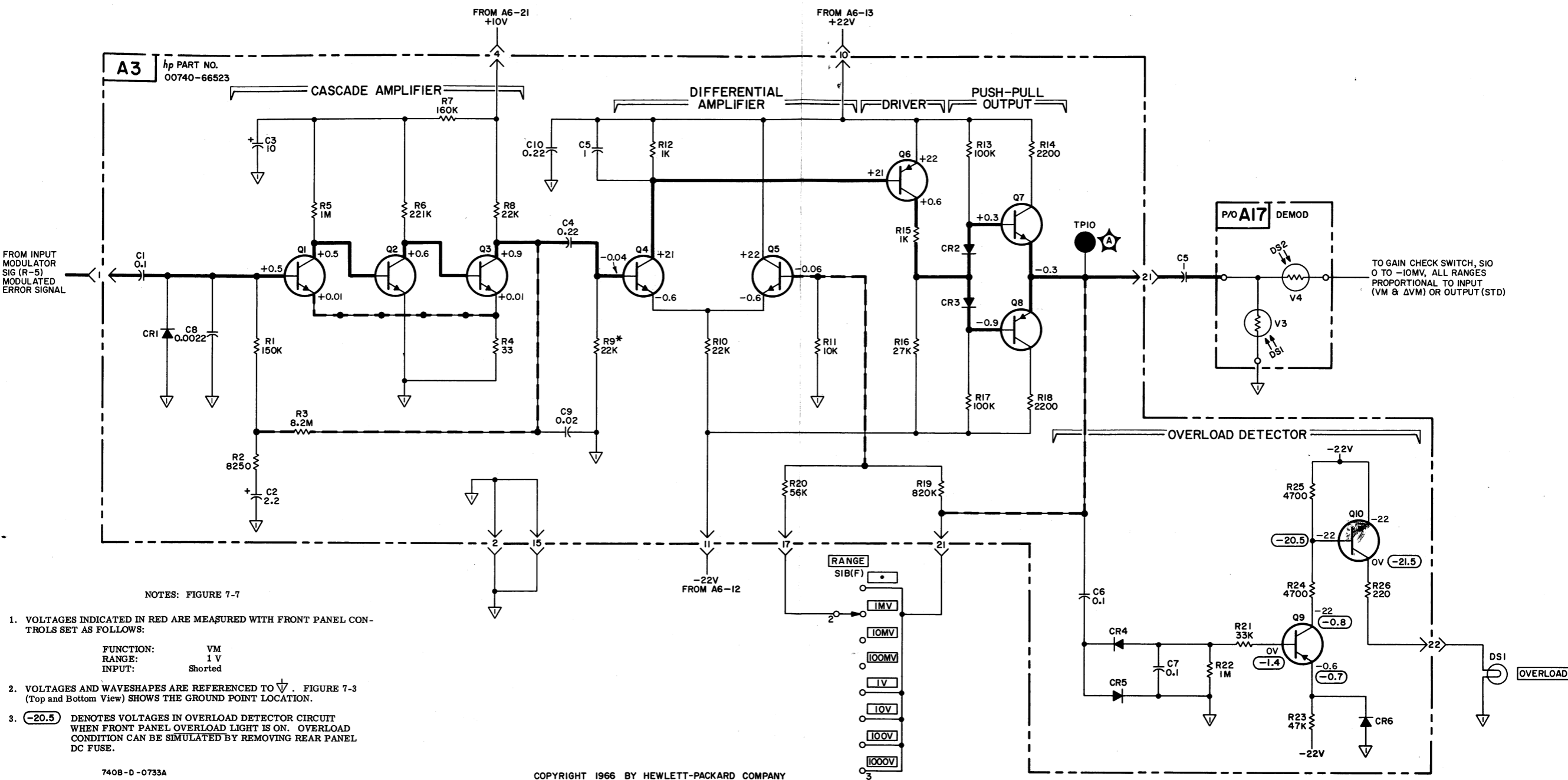
REAR PANEL DC FUSE REMOVED
(SATURATION)



740B-0745A

A3
hp PART NO. 00740-66523

7-15



A3 hp PART NO. 00740-66523

FROM INPUT MODULATOR SIG (R-5) MODULATED ERROR SIGNAL

TO GAIN CHECK SWITCH, S10 0 TO -10MV, ALL RANGES PROPORTIONAL TO INPUT (VM & ΔVM) OR OUTPUT (STD)

NOTES: FIGURE 7-7

1. VOLTAGES INDICATED IN RED ARE MEASURED WITH FRONT PANEL CONTROLS SET AS FOLLOWS:

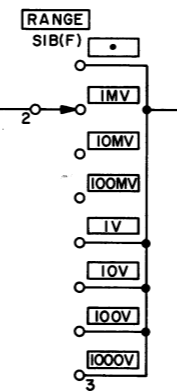
FUNCTION:	VM
RANGE:	1 V
INPUT:	Shorted

2. VOLTAGES AND WAVESHAPES ARE REFERENCED TO GND. FIGURE 7-3 (Top and Bottom View) SHOWS THE GROUND POINT LOCATION.

3. (-20.5) DENOTES VOLTAGES IN OVERLOAD DETECTOR CIRCUIT WHEN FRONT PANEL OVERLOAD LIGHT IS ON. OVERLOAD CONDITION CAN BE SIMULATED BY REMOVING REAR PANEL DC FUSE.

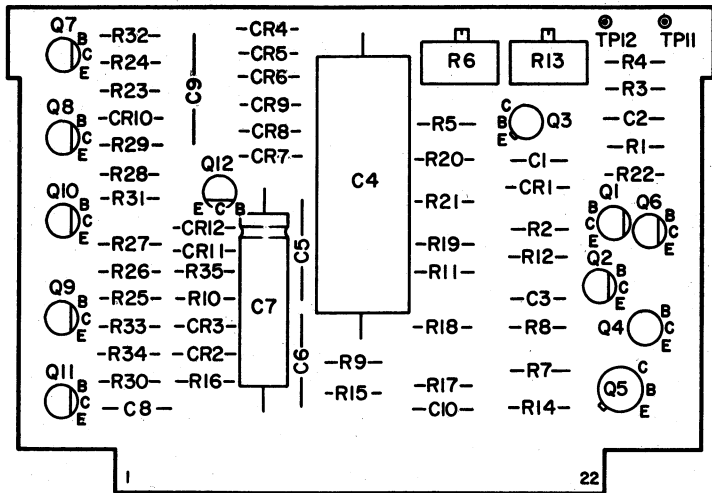
740B-D-0733A

COPYRIGHT 1966 BY HEWLETT-PACKARD COMPANY



01794-1

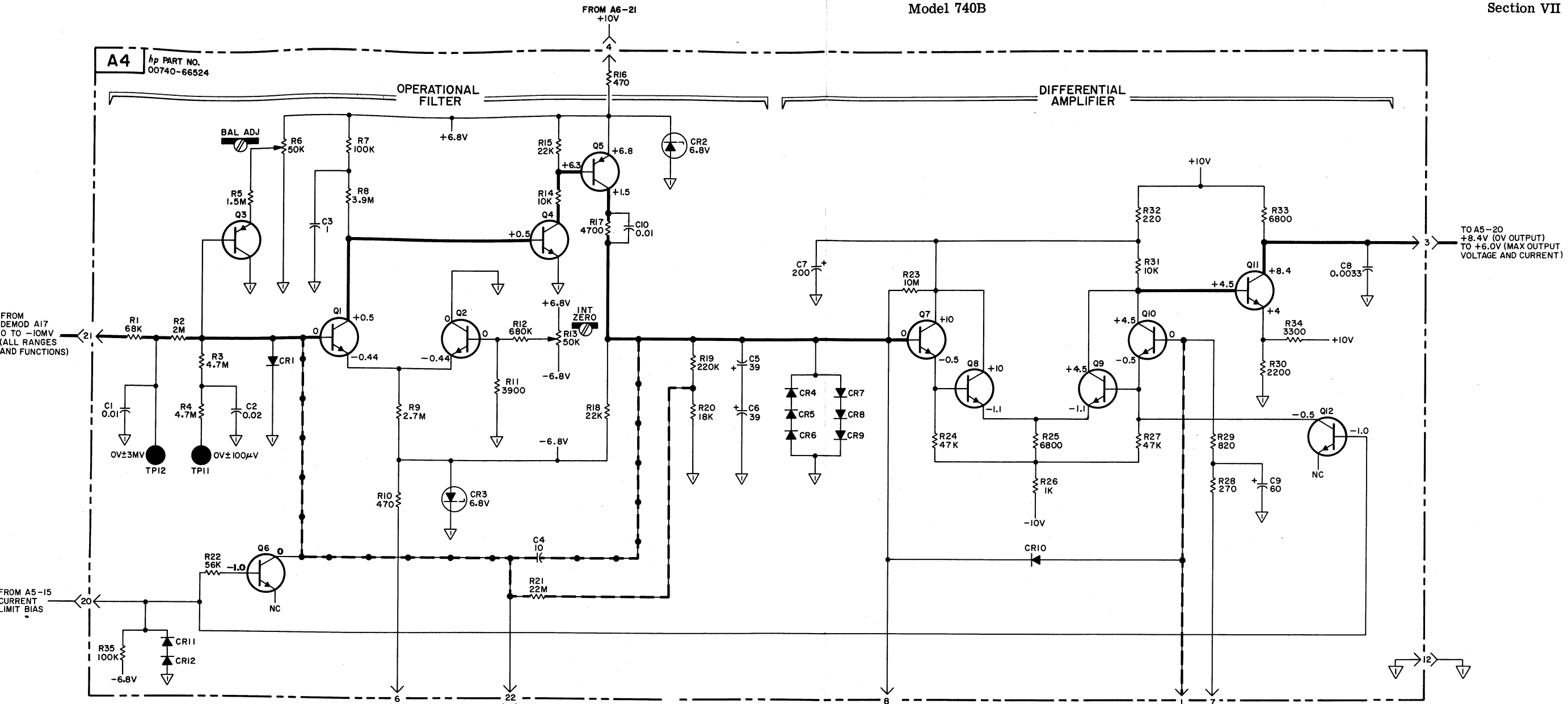
Figure 7-7. Low Level Amplifier (A3) Schematic and Component Location Diagram



740B-0746A

A4
 hp PART NO. 00740-66524

A4 hp PART NO. 00740-66524



- NOTES: FIGURE 7-8
- VOLTAGES INDICATED IN RED ARE MEASURED WITH FRONT PANEL CONTROLS SET AS FOLLOWS:
 FUNCTION: VM
 RANGE: 1 V
 INPUT: Shorted
 - VOLTAGES ARE REFERENCED TO GND. FIGURE 7-3 (Top and Bottom View) SHOWS THE GROUND POINT LOCATION.

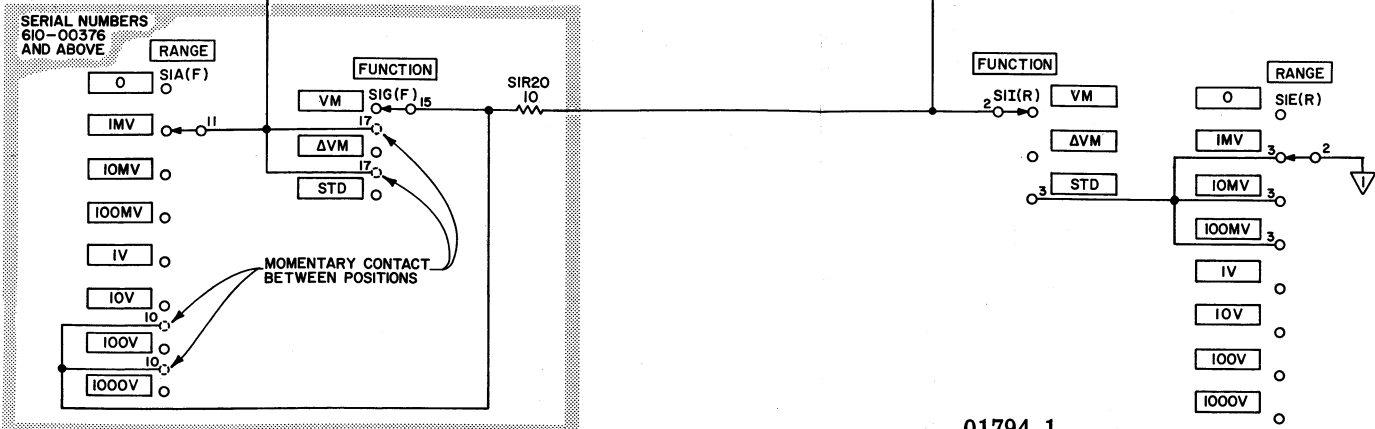


Figure 7-8. Operational Filter and Differential Amplifier (A4) Schematic and Component Location Diagram

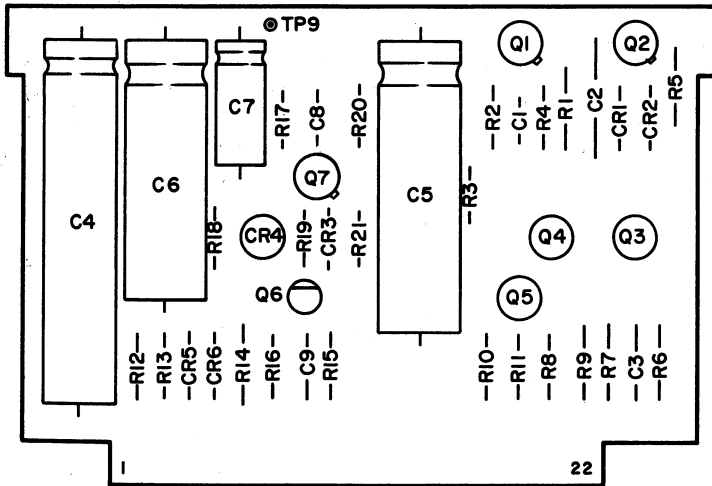
NOTES: FIGURE 7-9

1. VOLTAGES INDICATED IN RED ARE MEASURED WITH FRONT PANEL CONTROLS SET AS FOLLOWS:

FUNCTION: -STD
 RANGE: 1 V
 VOLTAGE SET: .00000

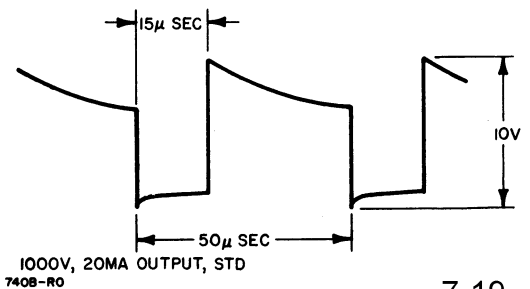
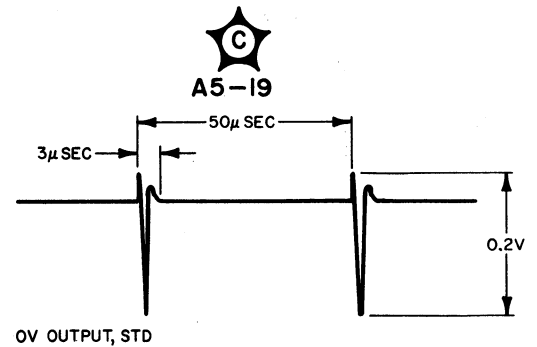
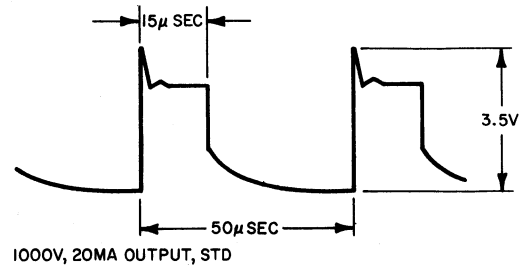
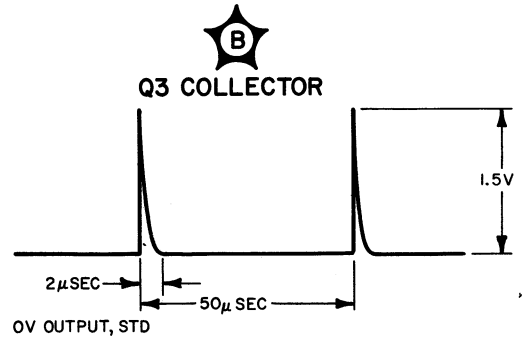
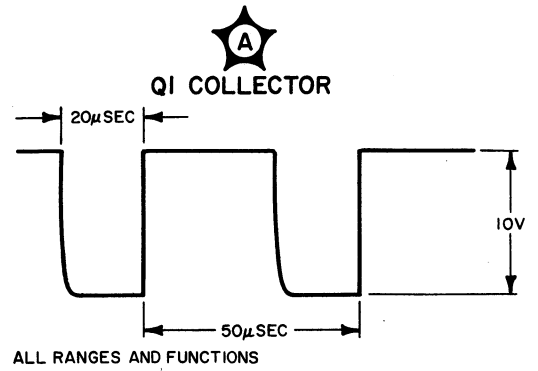
2. VOLTAGES AND WAVESHAPES ARE REFERENCED TO ∇ . FIGURE 7-3 (Top and Bottom View) SHOWS THE GROUND POINT LOCATION.

3. \ominus 12 DENOTES VOLTAGES IN CURRENT LIMIT DETECTOR CIRCUIT WHEN CURRENT LIMIT IS EXCEEDED (10 V OUTPUT, 100 Ω LOAD). INDICATED VOLTAGES WILL VARY WITH DEGREE OF OVERLOAD.



740B-0747A

A5
 hp PART NO. 00740-66525



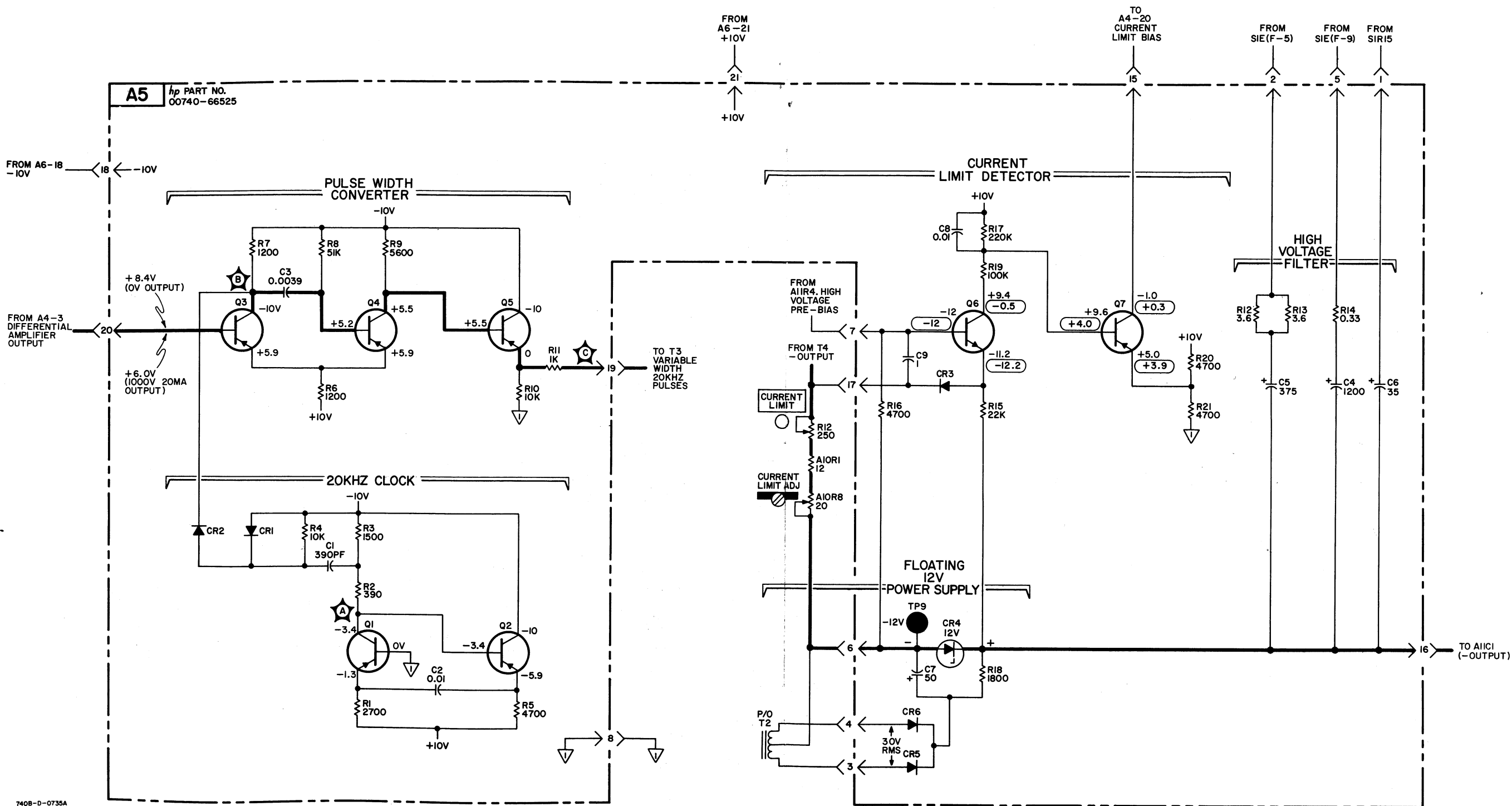
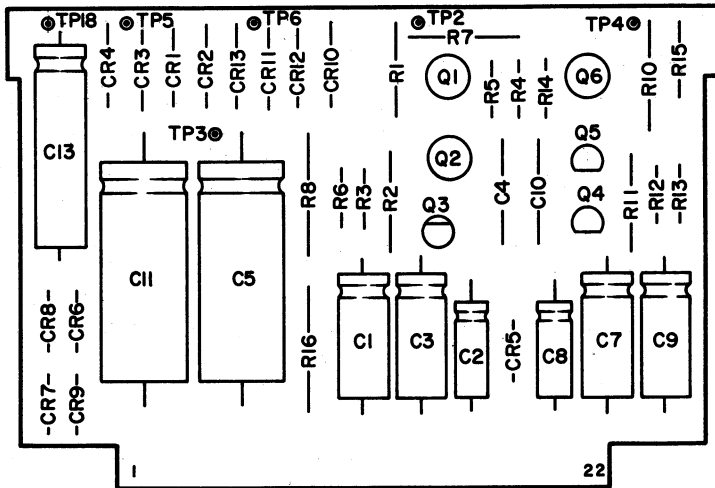


Figure 7-9. Pulse Width Converter, 20 kHz Clock and External Current Limit (A5) Schematic and Component Location Diagram

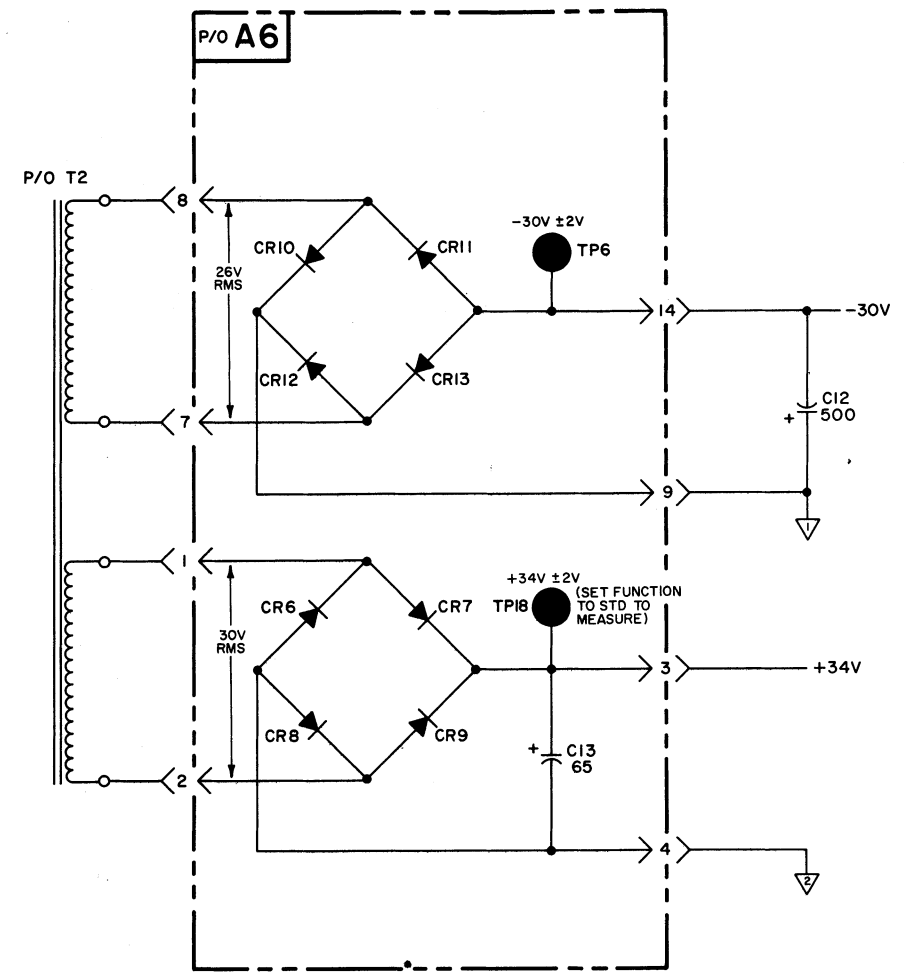
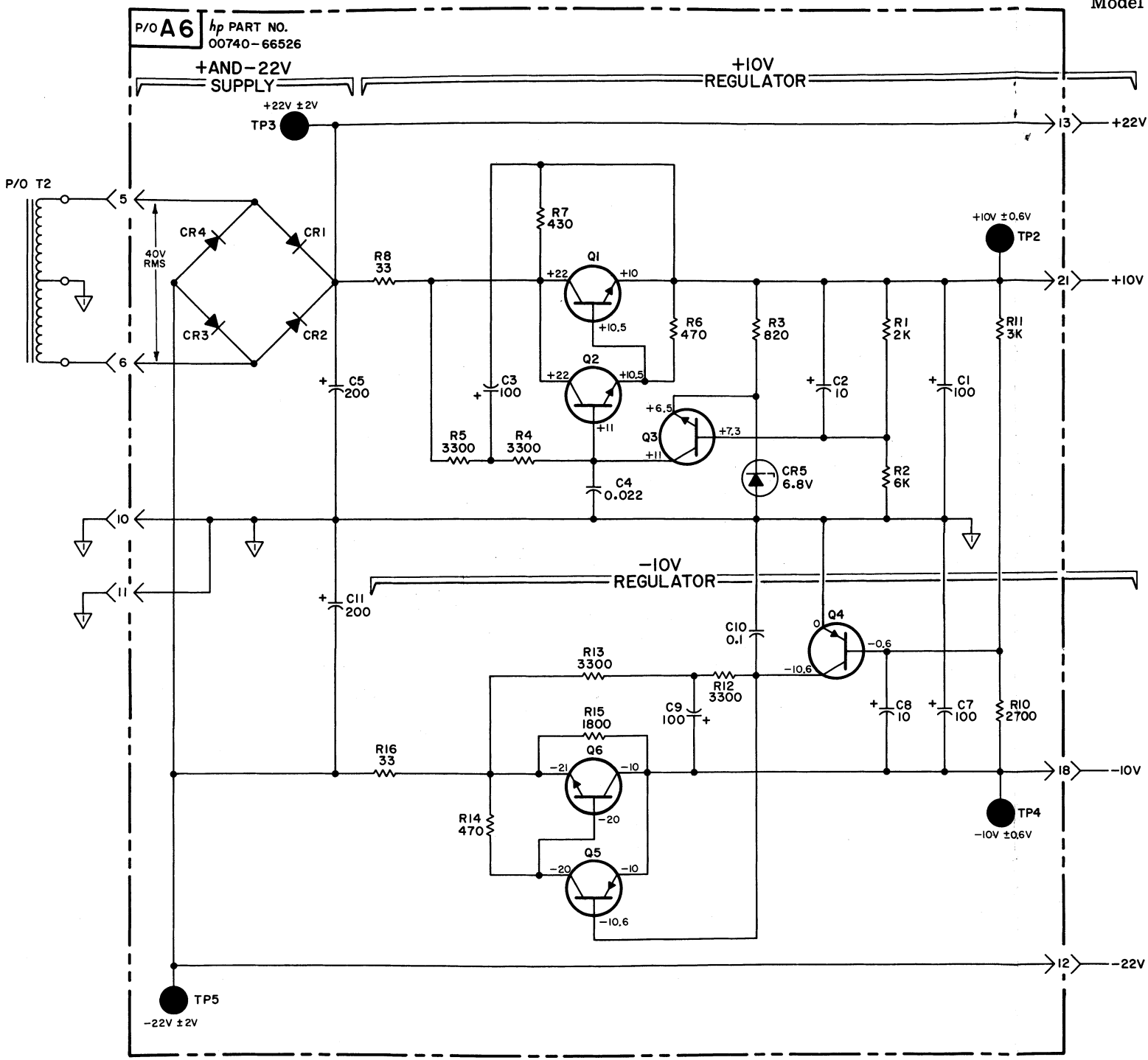


740B-0748A

A6

hp PART NO. 00740-66526

7-21



NOTES: FIGURE 7-10

1. VOLTAGES INDICATED IN RED ARE REFERENCED TO FIGURE 7-3 (Top and Bottom View) SHOWS THE GROUND POINT LOCATION.
2. AND ARE ELECTRICALLY COMMON IN STD MODE.

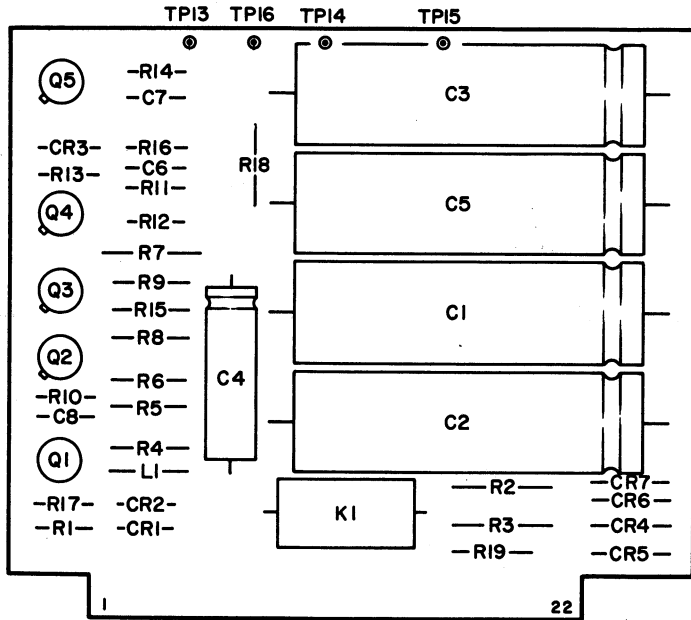
Figure 7-10. Guarded Power Supply (A6) Schematic and Component Location Diagram

NOTES: FIGURE 7-11

1. VOLTAGES INDICATED IN RED ARE MEASURED WITH FRONT PANEL CONTROLS SET AS FOLLOWS:

FUNCTION: STD
 RANGE: 1V
 VOLTAGE SET: .00000

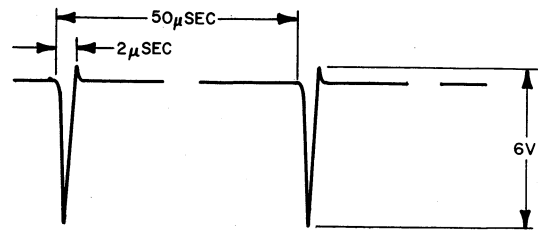
2. VOLTAGES AND WAVESHAPES ARE REFERENCED TO ∇ AND ∇ . FIGURE 7-3 (Top and Bottom View) SHOWS THE GROUND POINT LOCATIONS.



740B-B-0749A

A7
 hp PART NO. 00740-66527

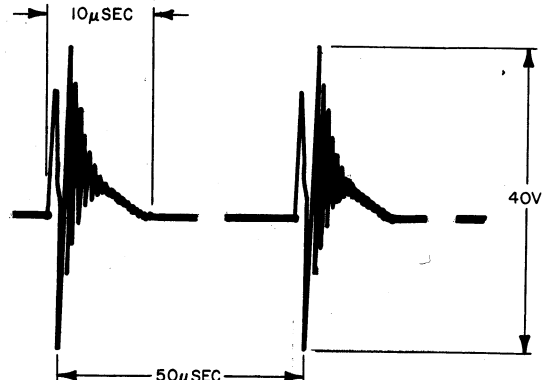
A
 A7 TPI6



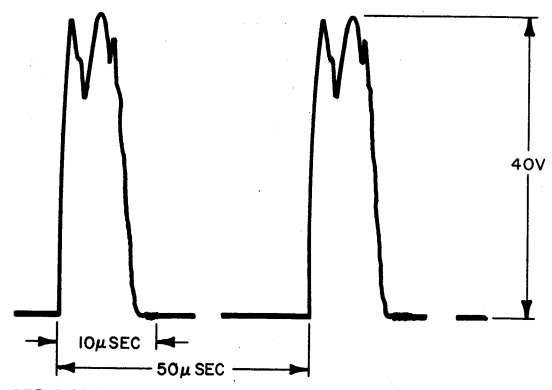
STD MODE, 1V RANGE, 0V OUTPUT

NOTE: PULSE WIDTH INCREASES TO 20μ SEC, AMPLITUDE TO 10V AT MAX OUTPUT VOLTAGE AND CURRENT.

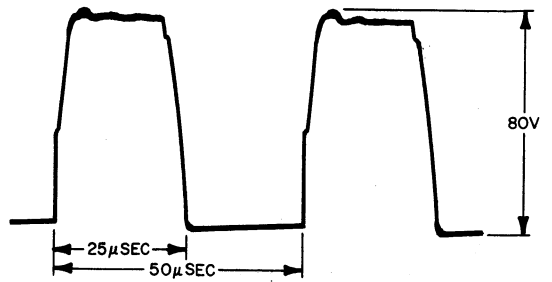
B
 Q1, Q2 COLLECTORS



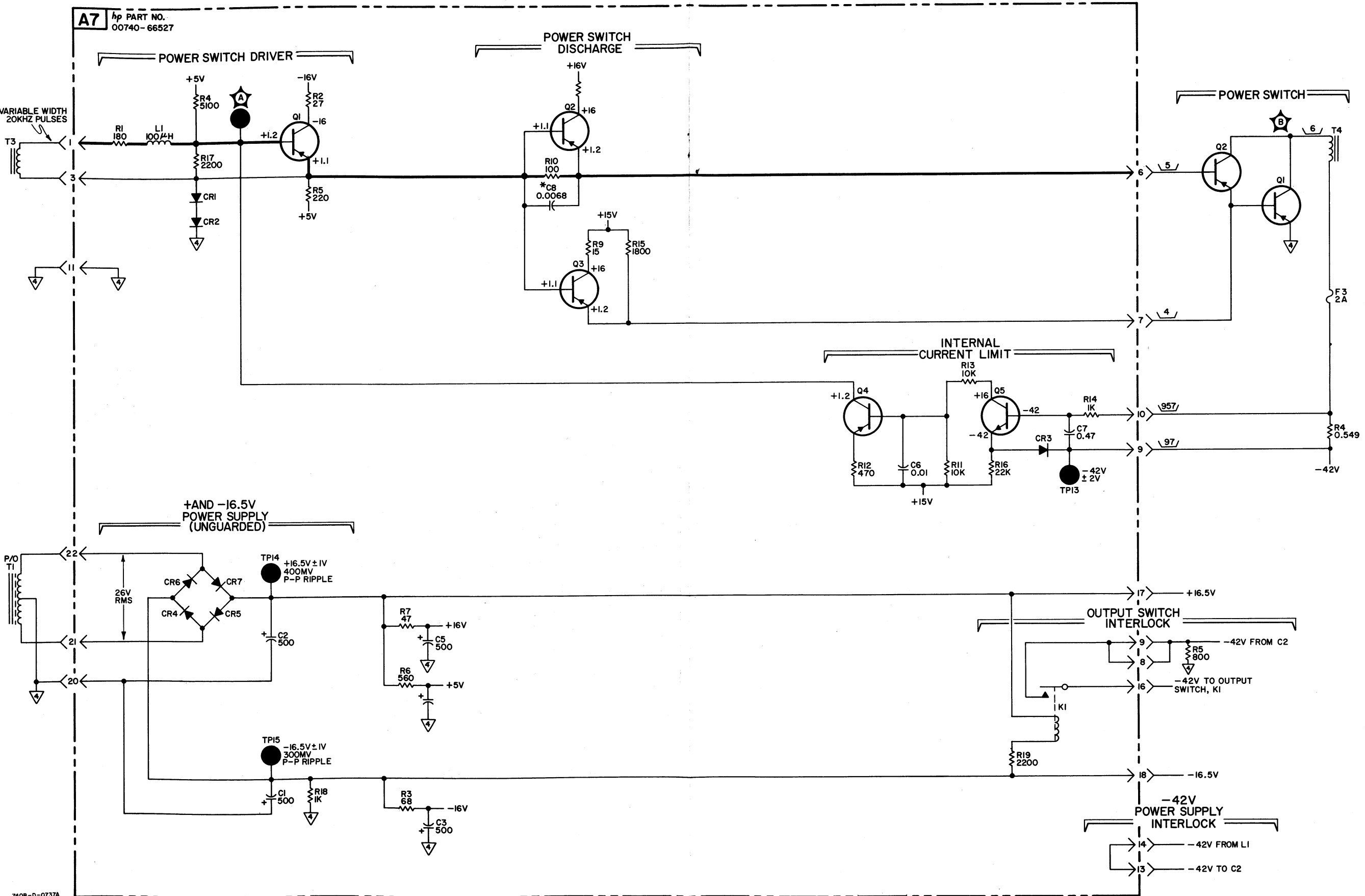
STD MODE, 1V RANGE, 0V OUTPUT



STD MODE, 10V RANGE 9V OUTPUT, 200Ω LOAD.

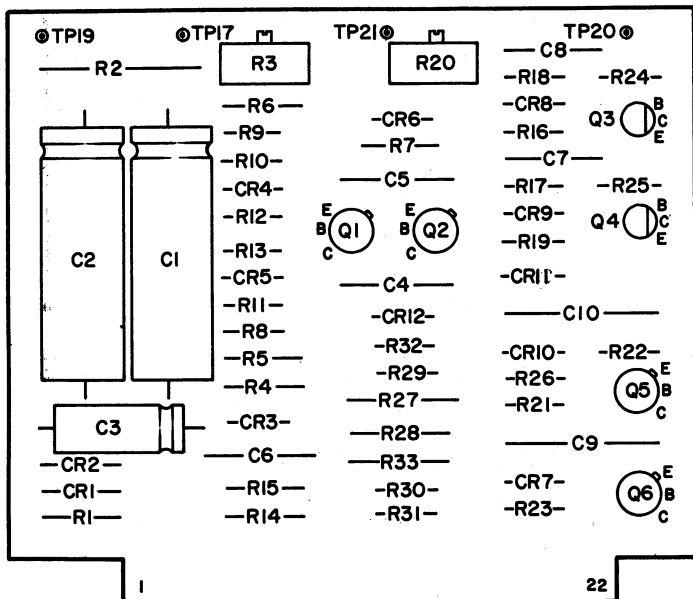


STD MODE, 1000V RANGE, 1000V OUTPUT, 50KΩ 20W LOAD



740B-D-0737A
COPYRIGHT 1966 BY HEWLETT-PACKARD COMPANY

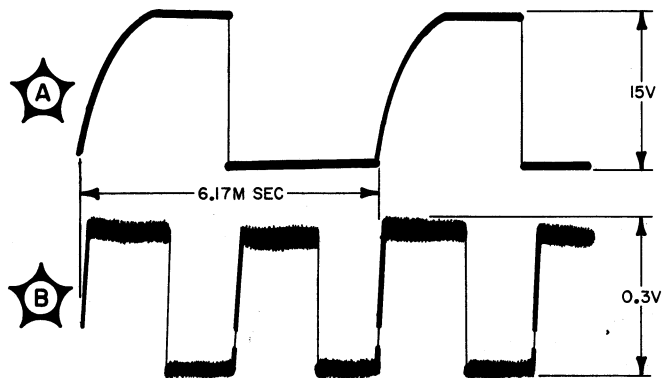
Figure 7-11. Power Switch Driver, Internal Current Limit and Unguarded Power Supply (A7) Schematic and Component Location Diagram



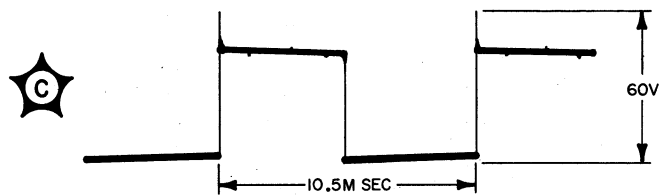
740B-B-0750A

A8
hp PART NO. 00740-66528

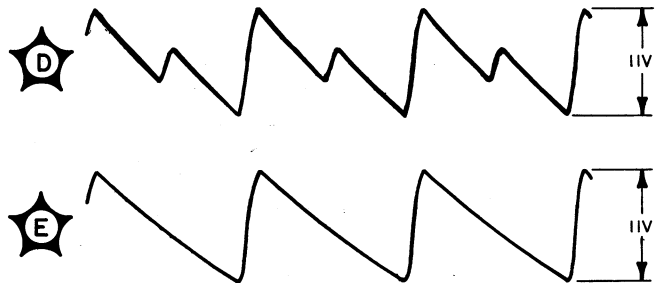
MAIN LOOP CHOPPER



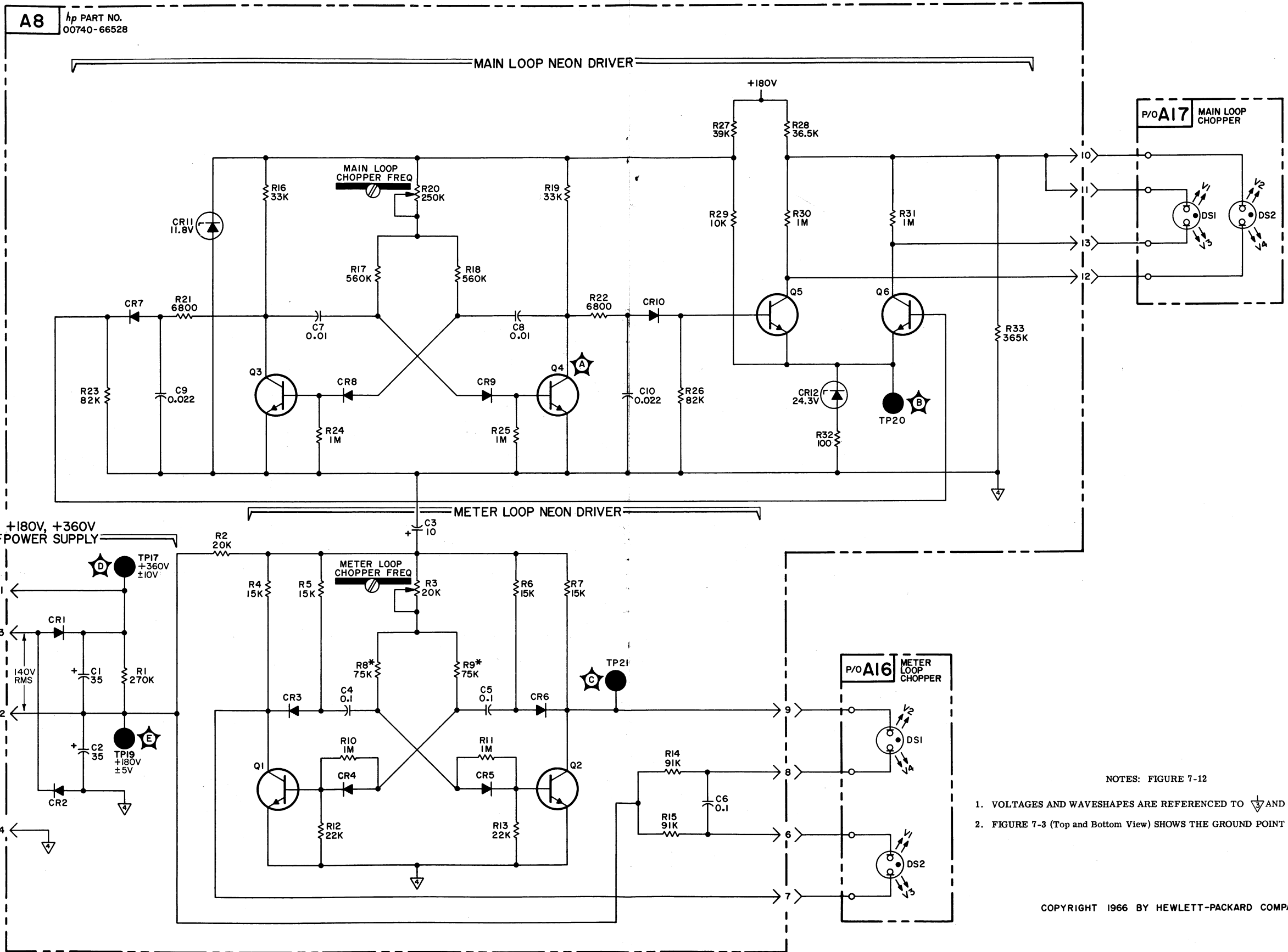
METER LOOP CHOPPER



POWER SUPPLY RIPPLE



740B-RO



NOTES: FIGURE 7-12

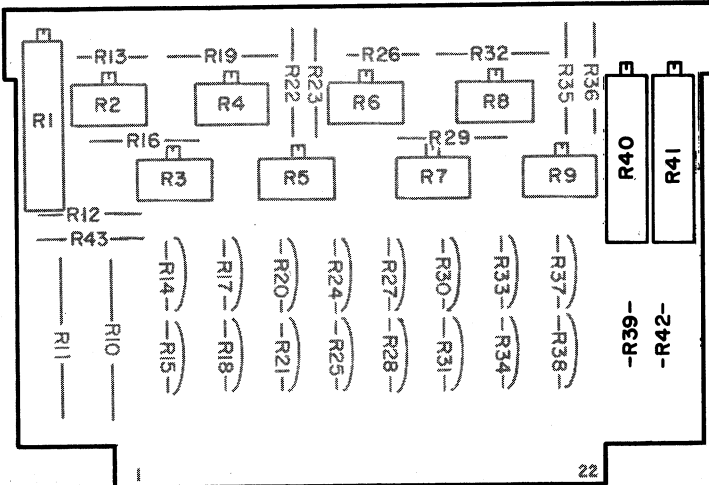
1. VOLTAGES AND WAVESHAPES ARE REFERENCED TO ∇ AND ∇ .
2. FIGURE 7-3 (Top and Bottom View) SHOWS THE GROUND POINT LOCATIONS.

COPYRIGHT 1966 BY HEWLETT-PACKARD COMPANY

Figure 7-12. Chopper Neon Drivers (A8) Schematic and Component Location Diagram

NOTES: FIGURE 7-13

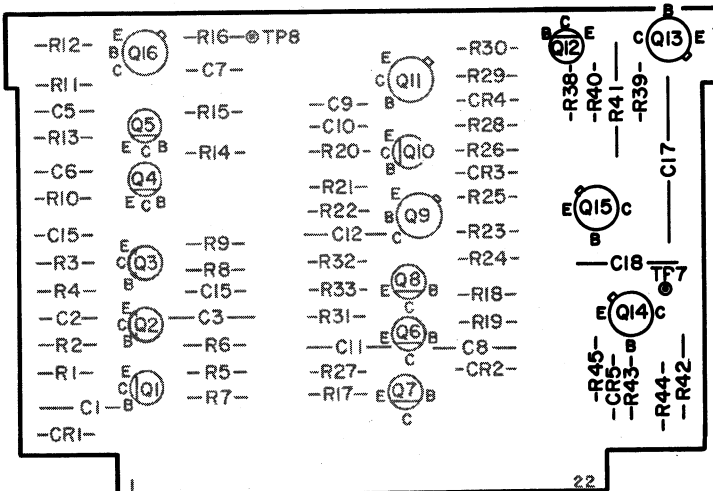
1. A13 COMPONENTS ARE FACTORY SELECTED AND ARE NOT SEPARATELY REPLACEABLE.
2. VOLTAGES INDICATED IN RED IN OVEN HEATER AND REGULATOR CIRCUIT ARE REFERENCED TO ▽.
3. VOLTAGES INDICATED IN RED IN 1 V REFERENCE SUPPLY CIRCUIT ARE REFERENCED TO ▽ AND ▽ IN STD MODE; ▽ ONLY IN OTHER MODES.
4. FIGURE 7-3 (Top and Bottom View) SHOWS THE GROUND POINT LOCATIONS.



740B-B-0743A

A1

hp PART NO. 00740-66521



740B-0744A

A2

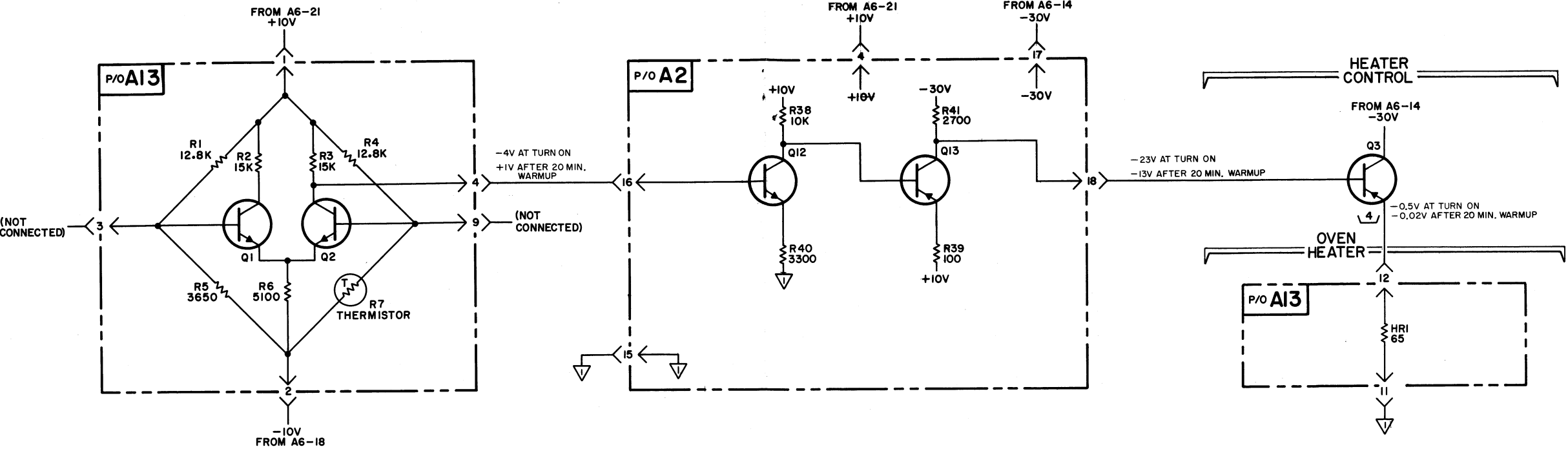
hp PART NO. 00740-66522

OVEN HEATER AND REGULATOR

OVEN TEMPERATURE SENSING BRIDGE

ERROR AMPLIFIER

HEATER CONTROL

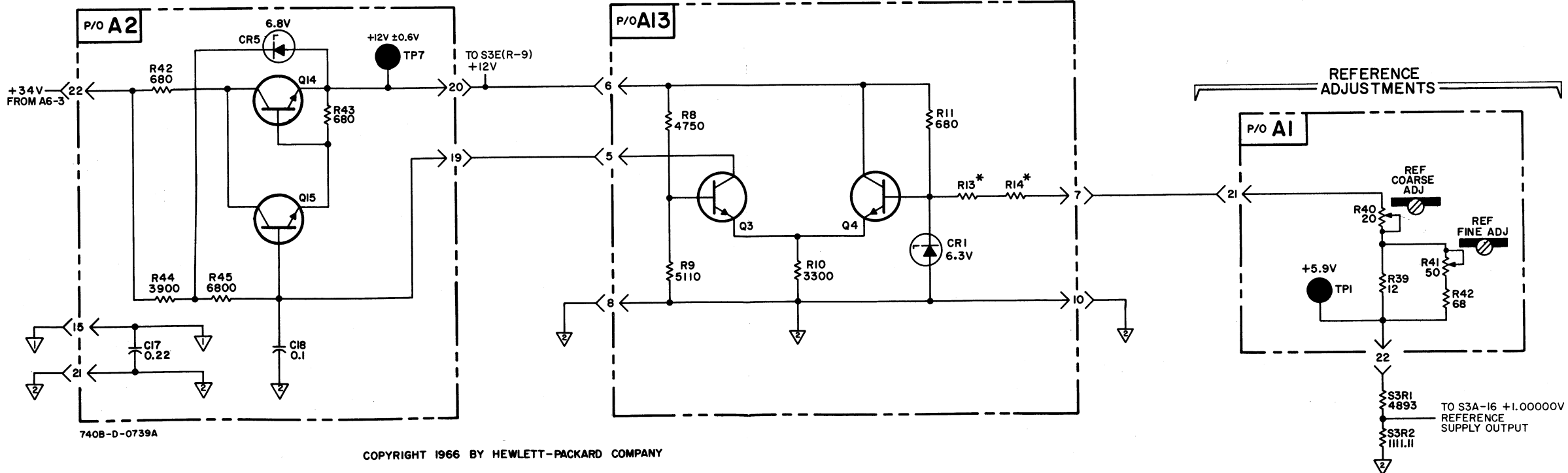


IV REFERENCE SUPPLY

SERIES REGULATOR

CONTROL DIFFERENTIAL AMPLIFIER

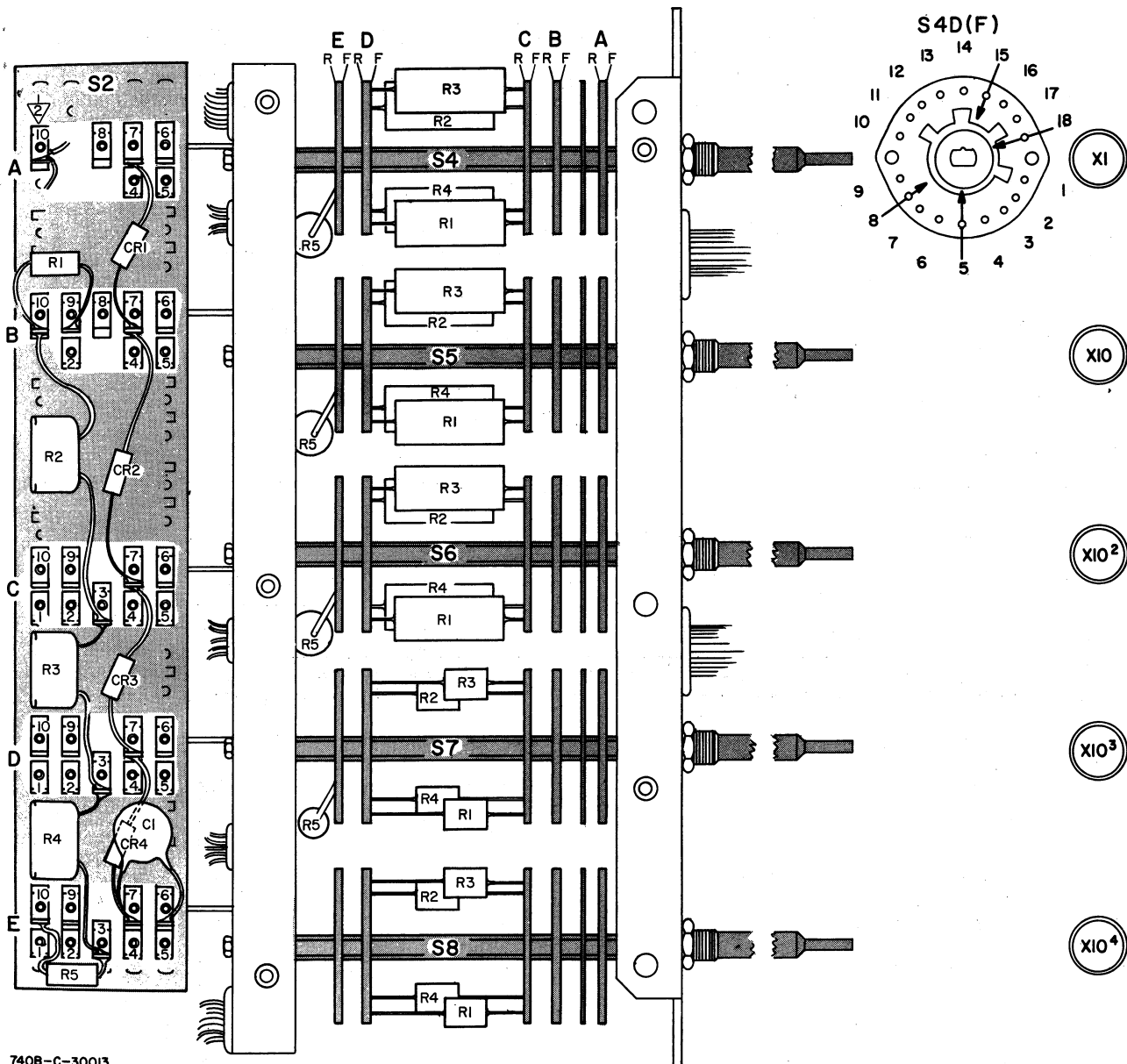
REFERENCE ADJUSTMENTS



740B-D-0739A

COPYRIGHT 1966 BY HEWLETT-PACKARD COMPANY

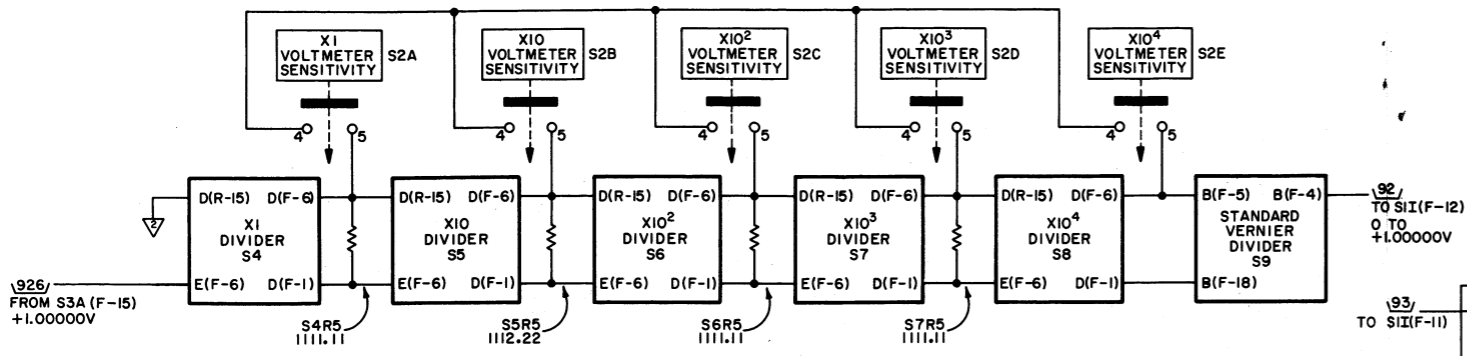
Figure 7-13. Oven Heater and 1 V Reference Supply (p/o A1, p/o A2, A13) Schematic and Component Location



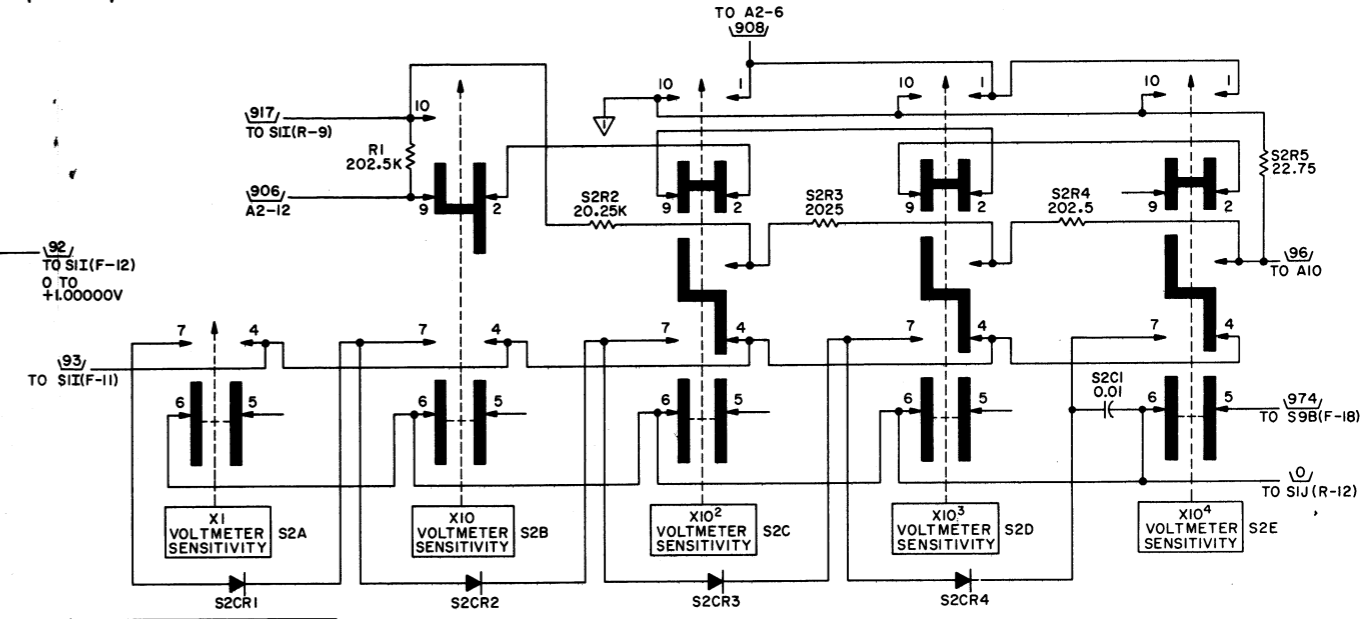
740B-C-30013

BOTTOM VIEW
 S2, S4 THRU S8
 hp PART NO. 00740-61906

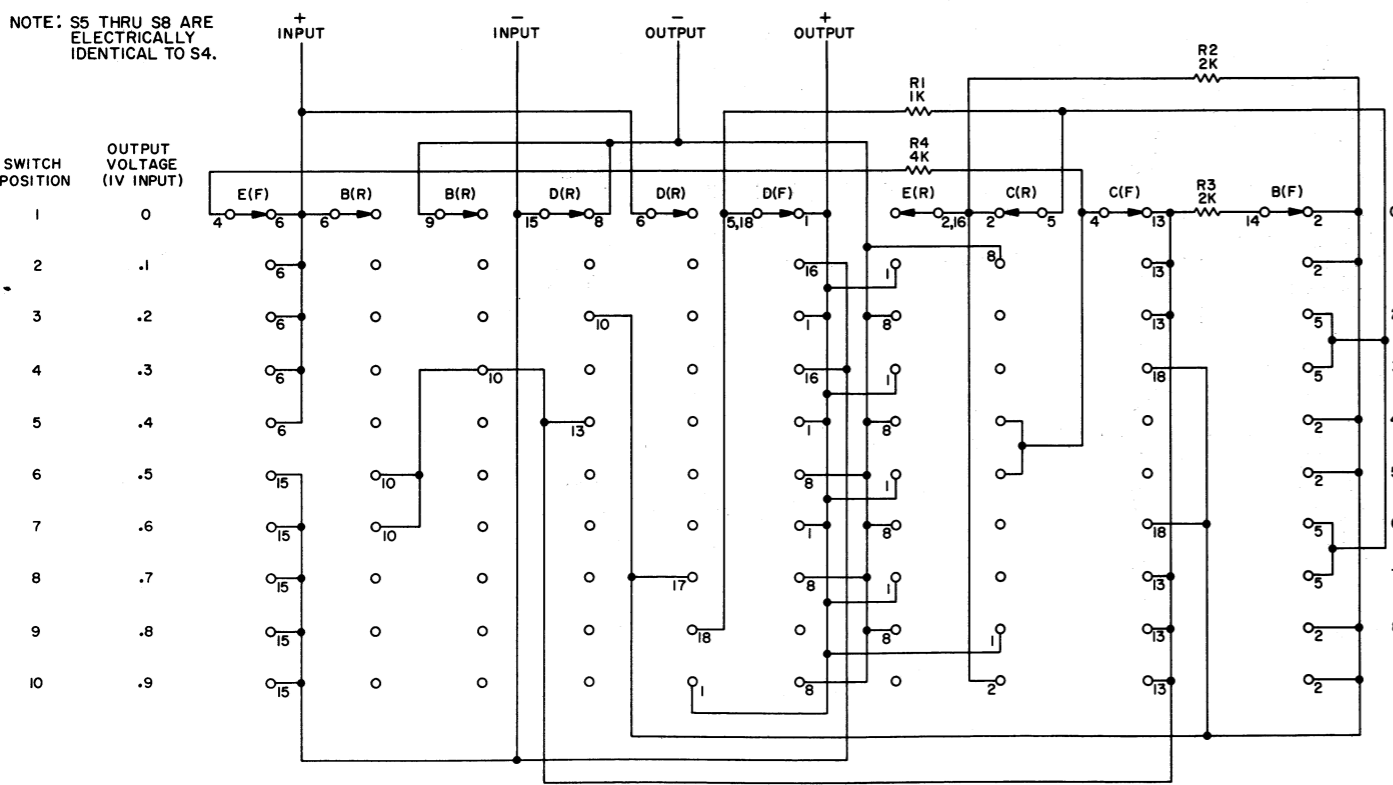
REFERENCE DIVIDER FUNCTIONAL DIAGRAM



S2, SENSITIVITY SWITCHING



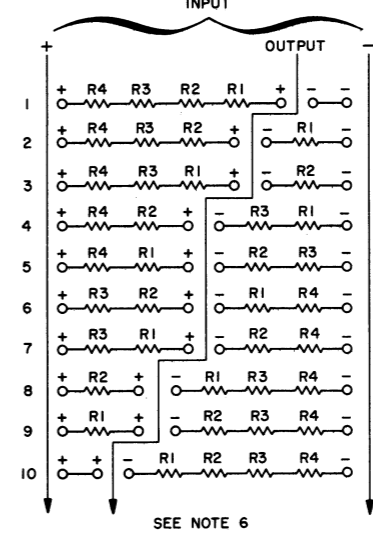
S4, VOLTAGE SET SWITCHING



NOTE: S5 THRU S8 ARE ELECTRICALLY IDENTICAL TO S4.

SWITCH POSITION	OUTPUT VOLTAGE (IV INPUT)
1	0
2	.1
3	.2
4	.3
5	.4
6	.5
7	.6
8	.7
9	.8
10	.9

S4 THRU S8 SWITCHING LOGIC



S2 SWITCH NOTES

- #6 CONTACTS CONTROL DIGITAL READOUTS.
- #5 CONTACTS GO TO VOLTAGE SET SWITCHES.
- OTHER CONTACTS CONTROL METER SENSITIVITY.

S4 THRU S8 SWITCH NOTES

- WAFERS ARE ALPHABETICAL STARTING AT THE FRONT.
- INDICATED VOLTAGES ARE MEASURED WITH RESPECT TO Δ .
- S4 - 8 ARE IDENTICAL EXCEPT FOR R5 (ON S4 - 7), SHOWN IN THE UPPER LEFT PORTION OF THIS PAGE. ADDITIONAL CONNECTIONS TO S4 AND S5 ARE SHOWN IN THE UPPER LEFT PORTION OF THIS PAGE AND IN FIGURE 7-5.
- WAFER "A" IS DIGITAL READOUT SWITCHING.
- FOR COMPLETE DESIGNATION, PREFIX WITH SWITCH NUMBER (R1 IS S4R1 ETC.).
- "SWITCHING LOGIC" SHOWS THE RESISTANCE BETWEEN THE POSITIVE AND NEGATIVE OUTPUTS FOR THE TEN POSITIONS OF THE SWITCH.

COPYRIGHT 1966 BY HEWLETT-PACKARD COMPANY

Figure 7-14. Voltage Set and Sensitivity Switching (S2, S4 thru S8) Schematic and Component Location Diagram