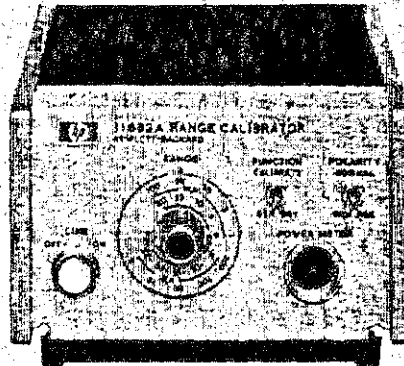


OPERATING AND SERVICE MANUAL

11683A Range Calibrator

Valuetronics International, Inc.
1-800-552-8258
MASTER COPY

General Information
Installation
Operation
Performance Test
Adjustments
Replaceable Parts
Service
Manual Changes



HEWLETT
PACKARD

MANUAL CHANGES

RANGE CALIBRATOR

MANUAL IDENTIFICATION

Model Number: HP 11683A
Date Printed: January 1980
Part Number: 11683-90005

ABOUT THIS SUPPLEMENT

Use this supplement to correct your manual or to update it for instrument changes that occurred after the manual was printed.

Some material in this supplement should be substituted for material in the manual. You can either perform the physical substitution or simply mark your manual with reference to appropriate pages in the supplement.

Change instructions are arranged in the manual's page-number order. Then, each instruction is identified by the word "Errata" or with a change number. Errata changes relate to all instruments. Instructions with change numbers relate only to certain instruments. These instruments are identified by serial number or prefix in the following table.

-- This symbol identifies instructions that are appearing in the supplement for the first time.

| Serial Prefix or Number | Make Manual Changes |
|-------------------------|---------------------|
| 2236A | 1 |
| 2401A | 1,2 |
| 2611A | 1 - 3 |
| 2702A | 1 - 4 |
| | |

| Serial Prefix or Number | Make Manual Changes |
|-------------------------|---------------------|
| | |
| | |
| | |

CHANGE INSTRUCTIONS

Page 2, paragraph 17:

Change the last part of the first sentence (48 to 440 Hz single phase) to the following:

For 100 and 120 Vac--48 to 66 Hz or 360 to 440 Hz at 125 mA

For 220 and 240 Vac--48 to 66 Hz at 62 mA
(*Errata*)

Change the last sentence to read:

Power consumption is less than 12 VA. (*Errata*)

Page 10, Table 3:

The recommended replacement for A2U1, if it fails, is found in Change 1. (*Errata*)

Change the part number and description for A2U1 to the following:

1826-0177 CD5 V RGLTR TO-100 15818 723BE. (*Change 1*)

NOTE

Manual change supplements are revised as often as necessary to keep manuals as current and accurate as possible. Hewlett-Packard recommends that you periodically request the latest edition of this supplement. Free copies are available from all HP offices. When requesting copies quote the manual identification information from your supplement, or the model number and print date from the title page of the manual.

1 May 1988
4 Pages



Printed in U.S.A.

CHANGE INSTRUCTIONS

Page 10, Table 3 (Cont'd):

Change the part number of the A3 assembly to the following:

11683-60008 CD8 (*Change 3*)

Change the part number of A3A1 to the following:

08481-60025 CD8 (*Errata*)

The recommended replacement for A3J1, if it needs to be replaced, is found in Change 2. (*Errata*)

A3J1 originally was 5180-2702. However the recommended replacement is found in Change 2. (*Change 1*)

Change the part number for A3J1 to 08481-60024 CD7. (*Change 2*)

The recommended replacement for A3MP5, if it needs to be replaced, is found in Change 1. (*Errata*)

Change the part number and description for A3MP5 to the following:

1460-1978 CD0 SPRING-CPRSN .088-IN-OD .188-IN-OA-LG
(*Change 1*)

The recommended replacement for A3MP6, if it needs to be replaced, is found in Change 2. (*Errata*)

Change the part number and description for A3MP6 to the following:

3030-0952 CD9 SCREW-SET 1/4-20 2-IN-LG CUP-PT STL.
(*Change 2*)

Change the part number and description of A3MP12 to the following:

08484-20020 CD2 FLANGE, FRONT (*Change 3*)

Page 11, Table 3:

The recommended replacement for MP3, if it needs to be replaced, is found in Change 3. (*Errata*)

Change the part number and description of MP3 to the following:

0590-1696 CD3 NUT-SHMET-J-TP 6-32-THD .017-IN-THK
(*Change 3*)

Add the following part number and description as MP14:

11683-80001 CD3 LABEL-INFORMATION (LINE MODULE)
(*Errata*)

Page 19, Figure 14:

Change the line frequency information (left side of schematic) to the following:

For 100 and 120 Vac--48 to 66 Hz or 360 to 440 Hz at 125 mA

For 220 and 240 Vac--48 to 66 Hz at 62 mA
(*Errata*)

Page 20, Figure 15:

Replace Figure 15 "A3 Assembly Component Locations" with the new Figure 15 in this change sheet. (*Change 4*)

OPERATING AND SERVICE MANUAL

11683A Range Calibrator

SERIAL NUMBERS

This manual applies directly to instruments with serial numbers prefixed 1719A. With the changes in the Appendix added, this manual applies to instruments with serial number prefixes 1314A and 1551A.

For additional important information about serial numbers see INSTRUMENTS COVERED BY MANUAL.

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Microfiche Part No. 11683-90006

Printed: JANUARY 1980

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CHANGE INSTRUCTIONS

Page 21, Figure 16:

Change the part number of the A3A1 assembly to 08481-60025. *(Errata)*

Change the value of R1 (left side of A3A1 assembly) to 464k. *(Errata)*

Delete the connection of C1 to U1 pin 1 (left side of A3A1 assembly). *(Errata)*

Connect the positive side of C1 to the SOURCE (S) of U1 on the A3A1 assembly. *(Errata)*

At J1 (right side of schematic) add pin A. Connect pin A to the junction of pins F, M and J. *(Change 1)*

At J1 (right side of schematic) remove the line connecting pin A to pins F, M and J. *(Change 2)*

Page 25, Figure A3 (bottom of page):

Add the following notes to Figure A3:

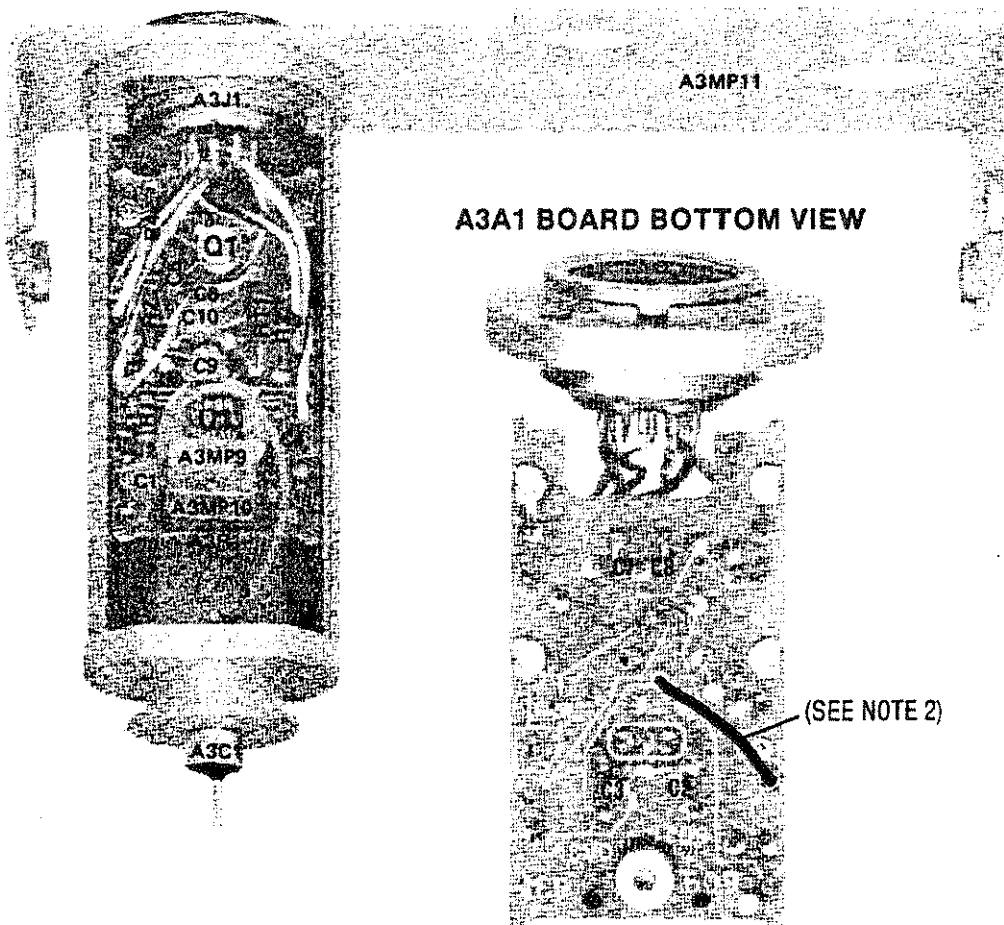
NOTES

1. Reference designations within this assembly are abbreviated. Add assembly number to abbreviation for complete designator.
2. Unless otherwise indicated, resistance is in ohms and capacitance in microfarads.
3. A capacitor may be found in only one of the two locations shown for A3A1C2 or it will be omitted. *(Errata)*

CHANGE INSTRUCTIONS

A3 ASSEMBLY COMPONENT LOCATIONS

A3 ASSEMBLY TOP VIEW



NOTE 1: A3 COMPONENT REFERENCE DESIGNATIONS ARE PRECEDED BY "A3". ALL OTHER COMPONENTS ARE PART OF THE A3A1 BOARD.

NOTE 2: WHEN THE A3A1 ASSEMBLY IS REPLACED AN INSULATED JUMPER WIRE MUST BE ADDED BETWEEN GUARD AND SIGNAL GROUND.

Figure 15. A3 Assembly Component Locations (Part of Change 4)

SAFETY CONSIDERATIONS

GENERAL — This is a Safety Class I instrument (provided with terminal for protective earthing).

OPERATION — BEFORE APPLYING POWER verify that the power transformer primary is matched to the available line voltage, the correct fuse is installed, and Safety Precautions are taken (see the following warnings). In addition, note the instrument's external markings which are described under "Safety Symbols."

WARNINGS

Servicing instructions are for use by service-trained personnel only. To avoid dangerous electric shock, do not perform any servicing unless qualified to do so.

BEFORE SWITCHING ON THE INSTRUMENT, the protective earth terminal of the instrument must be connected to the protective conductor of the (mains) power cord. The mains plug shall only be inserted in a socket outlet provided with a protective earth contact. The protective action must not be negated by the use of an extension cord (power cable) without a protective conductor (grounding). Grounding one conductor of a two conductor outlet is not sufficient protection.

If this instrument is to be energized via an auto-transformer (for voltage reduction) make sure the common terminal is connected to the earth terminal of the power source.

Any interruption of the protective (grounding) conductor (inside or outside the instrument) or disconnecting the protective earth terminal will cause a potential shock hazard that could result in personal injury.

Whenever it is likely that the protection has been impaired, the instrument must be made inoperative and be secured against any unintended operation.

Only fuses with the required rated current, voltage, and specified type (normal blow, time delay, etc.) should be used. Do not use repaired fuses or short circuited fuseholders. To do so could cause a shock or fire hazard.

Do not operate the instrument in the presence of flammable gases or fumes. Operation of any electrical instrument in such an environment constitutes a definite safety hazard.

Do not install substitute parts or perform any unauthorized modification to the instrument.

Adjustments described in the manual are performed with power supplied to the instrument while protective covers are removed. Energy available at many points may, if contacted, result in personal injury.

Any adjustment, maintenance, and repair of the opened instrument under voltage should be avoided as much as possible, and when inevitable, should be carried out only by a skilled person who is aware of the hazard involved.

Capacitors inside the instrument may still be charged even if the instrument has been disconnected from its source of supply.

SAFETY SYMBOLS



Instruction manual symbol: the product will be marked with this symbol when it is necessary for the user to refer to the instruction manual in order to protect against damage to the product.



Indicates hazardous voltages.



Earth terminal (sometimes used in manual to indicate circuit common connected to grounded chassis).

WARNING

The WARNING sign denotes a hazard. It calls attention to a procedure, practice, or the like, which, if not correctly performed or adhered to, could result in personal injury. Do not proceed beyond a WARNING sign until the indicated conditions are fully understood and met.

CAUTION

The CAUTION sign denotes a hazard. It calls attention to an operating procedure, practice, or the like, which, if not correctly performed or adhered to, could result in damage to or destruction of part or all of the product. Do not proceed beyond a CAUTION sign until the indicated conditions are fully understood and met.

1. GENERAL INFORMATION

2. This operating and service manual contains information pertaining to incoming inspection, operation, performance tests, adjustments, and service for the HP Model 11683A Range Calibrator.

3. Equipment recommended for use in performance tests, adjustments, and service to the 11683A is listed in Table 2. Test equipment which meets or exceeds the critical specifications of Table 2 must be used for calibration if the 11683A is expected to conform to the published specifications.

4. The 11683A and all supplied accessories are shown in Figure 1. The published specifications are listed in Table 1.

5. Instruments Covered by Manual

6. This instrument has a two-part serial number. The first four digits and the letter comprise the serial number prefix. The last five digits form the sequential suffix that is unique to each instrument. The contents of this manual apply directly to instruments having the same serial number prefix(es) as listed under SERIAL NUMBERS on the title page.

7. An instrument manufactured after the printing of this manual may have a serial prefix that is not listed on the title page. This unlisted serial prefix indicates that the instrument is different from those documented in this manual. The manual for this instrument is supplied with a yellow Manual Changes supplement that contains "change information" that documents the differences.

8. In addition to change information, the supplement may contain information for correcting errors in the manual. To keep this manual as current and accurate as possible, Hewlett-Packard recommends that you periodically request the latest Manual Changes supplement. The supplement for this manual is keyed to this manual's print date and part number, both of which appear on the title page. Complimentary copies of the supplement are available from Hewlett-Packard.

9. For information concerning a serial number prefix not listed on the title page or in the Manual Changes supplement, contact your nearest Hewlett-Packard office.

10. Description

11. The 11683A Range Calibrator is used to verify proper operation of compatible Power Meters such

Table 2. Recommended Test Equipment

| Instrument | Critical Specifications | Model | Use* |
|-------------------|---|-----------------------------|---------|
| Digital Voltmeter | Readout: 5 digits DC Measurements Ranges: 100 mV to 100 V full-scale Accuracy: ± 0.02% Resistance Measurements (four-wire measurement capability) Ranges: 100 Ω to 10 kΩ full-scale Sensitivity: 1 mΩ Accuracy: ± 0.02% | HP 3455A | P, A, T |
| Oscilloscope | Vertical Amplifier Bandwidth: DC to 5 MHz Deflection Factor: 50 mV/division minimum Attenuator Accuracy: ± 2% Time Base Time Span/division: 1 ms to 1 s Time base accuracy: ± 3% | HP 180C/ 1801A/ 1821A | A, T |
| Four-Wire Cable | Recommended Length: 5 feet maximum | (see Figure 2) | P |

*P = performance; A = adjustment; T = troubleshooting

as the HP Model 435A. The Power Meter's range-to-range accuracy and proper auto-zero operation can be easily verified. The 11683A can supply a full-scale test signal to the Power Meter for each Range Switch setting.

12. When set to CALIBRATE, the FUNCTION switch applies a dc voltage to the Power Meter; the input is grounded in STANDBY. The POLARITY switch increases ease of testing and adjusting the Power Meter auto-zero feedback circuit.

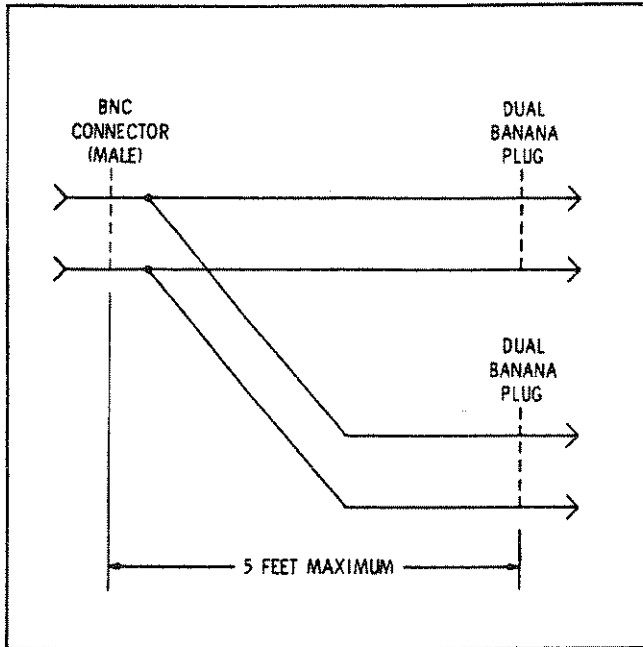


Figure 2. Four-Wire Cable

13. INSTALLATION

14. Initial Inspection

15. Inspect the shipping container for damage. If the shipping container or packing material is damaged it should be kept until the contents of the shipment have been checked mechanically and electrically. If there is mechanical damage or if the instrument does not pass the performance tests, notify the nearest Hewlett-Packard office. Keep the damaged shipping materials (if any) for the carrier and a Hewlett-Packard representative to inspect. The HP office will arrange for repair or replacement without waiting for claim settlement.

16. Power Requirements

17. The 11683A Range Calibrator requires a power source with an output of 100, 120, 220, or 240 Vac +5% -10%, 48 to 440 Hz single phase. Power consumption is less than 10 VA.

18. Line Voltage Selection

19. Figure 3 provides instruction for line voltage and fuse selection. The Line Voltage Selection Card and fuse are factory installed for 120 Vac operation.

20. Power Cable

21. In accordance with international safety standards, this instrument is equipped with a three-wire power cable. When connected to an appropriate ac power receptacle, this cable grounds the instrument cabinet. The type of power cable plug shipped with each instrument depends on the country of destination. Refer to Figure 4 for the part numbers of the power cable plugs available.

WARNING

The protection provided by grounding the instrument cabinet may be lost if any power cable other than the three-pronged type supplied is used to couple the ac line voltage to the instrument.

22. Interconnections

23. Refer to the Power Meter's operating and service manual for hookup instructions.

24. Operating Environment

25. The Operating environment should be within the following limitations:

- Temperature 0 to 55°C
- Humidity < 95% relative
- Altitude < 15,000 feet

26. Bench Operation

27. The instrument is equipped with plastic feet and a tilt stand for use on a bench.

28. Rack Mounting

29. The instrument can be rack mounted by using an adapter frame. The adapter frame is a rack frame that accepts several combinations of sub-modular units. For additional information, address inquiries to your nearest Hewlett-Packard office.

30. Storage and Shipment

31. The instrument should be stored in a clean, dry environment. The following environmental limitations apply to both storage and shipment:

- Temperature -40 to +75°C
- Humidity < 95% relative
- Altitude < 25,000 feet

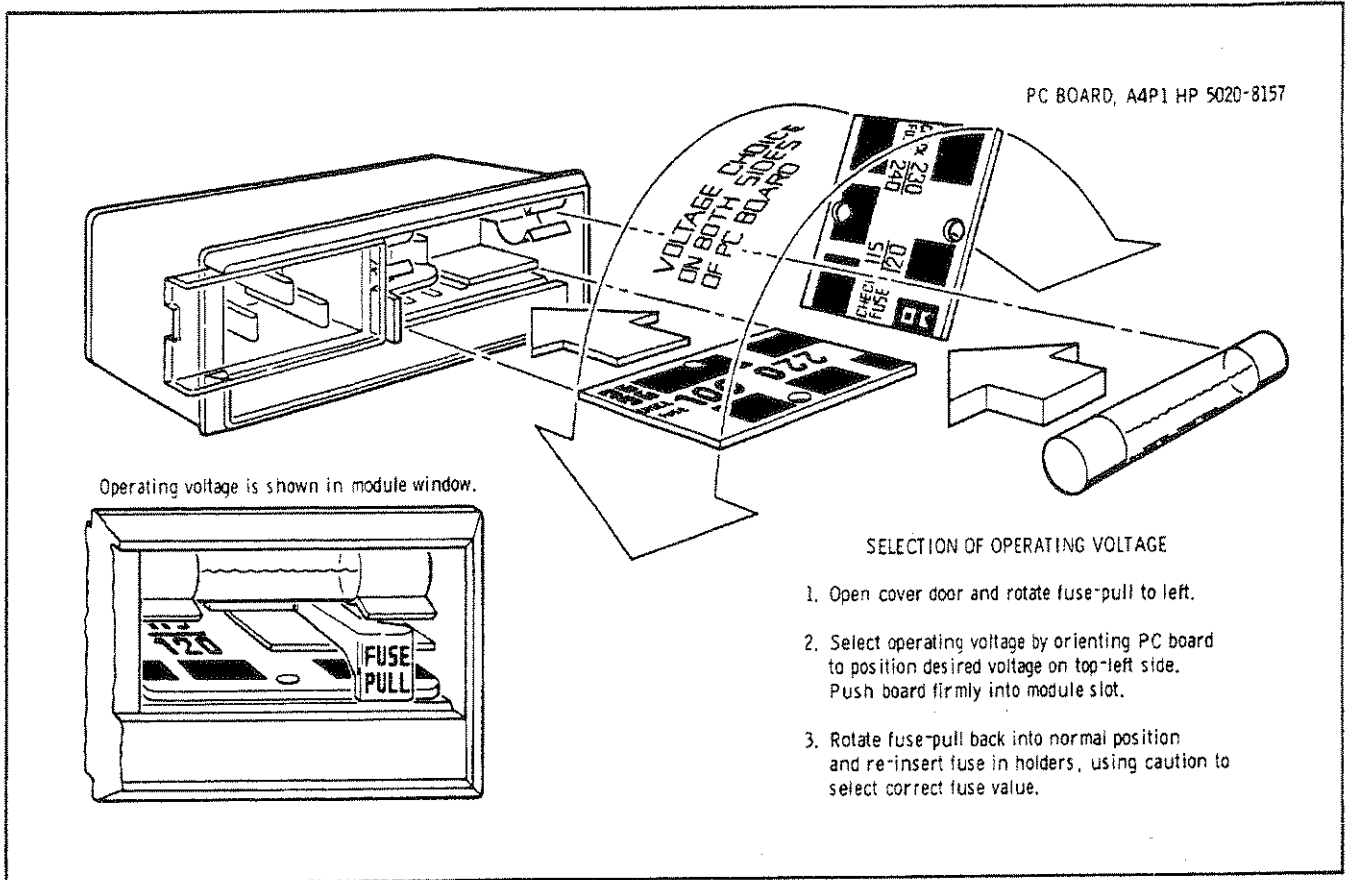


Figure 3. Line Voltage Selection

32. **Original Packaging.** Containers and materials identical to those used in factory packaging are available through Hewlett-Packard offices. If the instrument is being returned to Hewlett-Packard for servicing, attach a tag indicating the type of service required, return address, model number,

and full serial number. Also, mark the container FRAGILE to assure careful handling. In any correspondence, refer to the instrument by model number and full serial number.

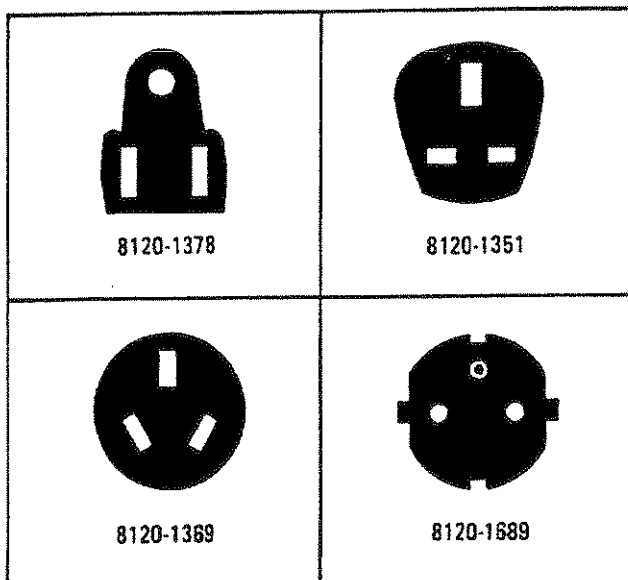


Figure 4. Power Cable HP Part Numbers Versus Mains Plugs Available

33. **Other Packaging.** The following general instructions should be used for re-packaging with commercially available materials:

a. Wrap the instrument in heavy paper or plastic. (If shipping to a Hewlett-Packard office or service center, attach a tag indicating the type of service required, return address, model number, and full serial number.)

b. Use a strong shipping container.

c. Use enough shock-absorbing material (3- to 4-inch layer) around all sides of the instrument to provide a firm cushion and prevent movement inside the container. Protect the control panel with cardboard.

d. Seal the shipping container securely.

e. Mark the shipping container FRAGILE to assure careful handling.

34. OPERATING AND MAINTENANCE INSTRUCTIONS

35. Operation of the controls of the 11683A is explained in Figure 6; Figure 7 provides operating and hookup instructions with a compatible Power Meter.

36. Maintenance by the operator consists of changing the fuse (refer to Figure 3), and LINE switch lamp replacement (refer to Figure 5).

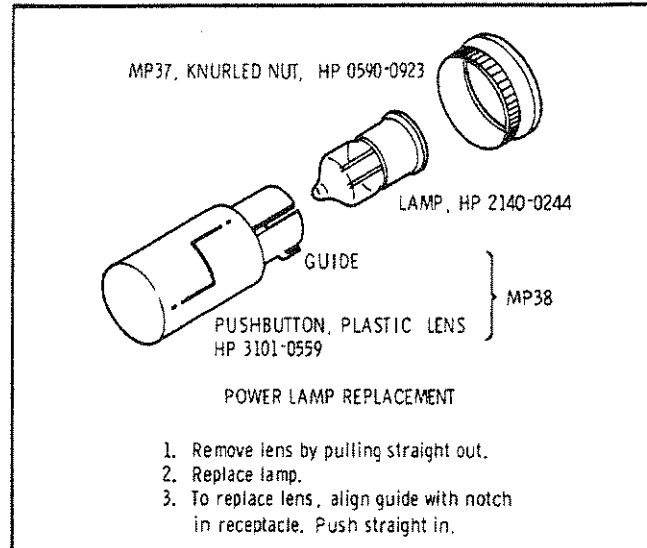
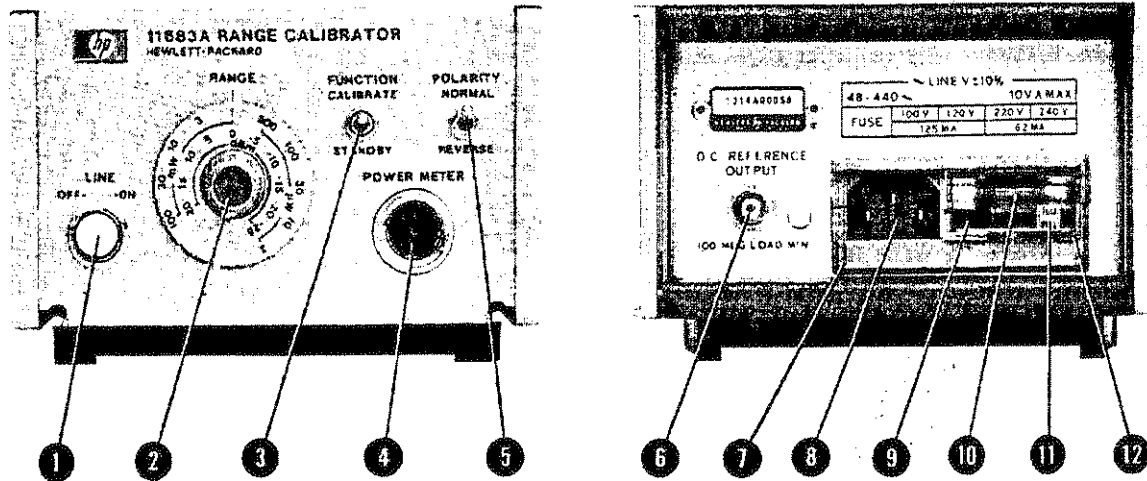


Figure 5. Line Switch Lamp Replacement

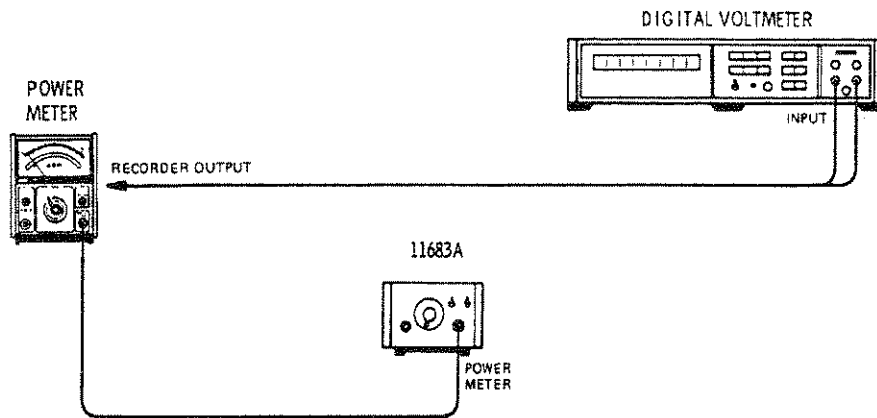
FRONT AND REAR PANEL FEATURES



- 1 **LINE Switch.** Controls primary power. Illuminated when instrument is ON.
- 2 **RANGE Switch.** Equivalent to compatible Power Meter's Range Switch; produces a full scale Power Meter reading when 11683A and Power Meter Range switches are set to same scale.
- 3 **FUNCTION Switch.** When the switch is set to CALIBRATE an output dependent on the RANGE switch setting is coupled to the Power Meter. In STANDBY mode the output is grounded.
- 4 **POWER METER Connector.** Connects the output to, and control signals from, compatible Power Meter via Power Sensor Cable.
- 5 **POLARITY Switch.** An upscale reading is obtained on the Power Meter when the switch is set to NORMAL. The REVERSE setting produces a down-scale reading.
- 6 **D.C. REFERENCE OUTPUT Connector.** DC reference voltage output from RANGE Switch. Load resistance must be $\geq 100 \text{ M}\Omega$ for proper operation of the 11683A.
- 7 **Power Module Assembly.**
- 8 **Receptacle.** Couples transformer primary to line voltage via power cable.
- 9 **Line Voltage Selection Card.** Matches transformer primary to line voltage. Refer to Figure 3.
- 10 **Fuse.** A 1/8 A fuse is used at 100/120 Vac; 1/16 A fuse at 220/240 Vac.
- 11 **Fuse Pull Handle.** Mechanical interlock; fuse must be removed before extraction of Line Voltage Selection Card.
- 12 **Window.** Safety interlock; fuse cannot be removed while power cable is coupled to Power Module Receptacle.

Figure 6. Front and Rear Panel Controls, Connectors, and Indicators

OPERATING INSTRUCTIONS



TURN ON

- a. Verify that the power transformer primary of the 11683A is matched to the line voltage. See Figure 3.
- b. Check the fuse, contained in the Power Module Assembly, for the correct rating. The voltage and amperage are shown on the rear panel. If necessary, change the fuse. See Figure 3.
- c. Connect the equipment together as shown above.
- d. Connect the Power Cable to the power outlet and Power Module receptacles. Press the LINE switch and release. The switch should remain in, the lamp within the plastic lens should be illuminated, and the cursor on the curved portion of the switch should indicate ON.

POWER METER PERFORMANCE TEST AND ADJUSTMENTS

- e. Refer to the Power Meter manual for Performance Test and Adjustment Procedures.

POWER METER TROUBLESHOOTING

- f. The 11683A may be used as a test signal source which is capable of a full scale meter reading in any range. The POLARITY switch increases the ease of Auto-Zero circuit troubleshooting, and the 11683A may be substituted for the Power Sensor in order to isolate a malfunction to the Power Meter/Power Sensor Cable or the Power Sensor. Troubleshooting information is found in Section VIII of the Power Meter Operating and Service Manual.

Figure 7. 11683A Operating Instructions

37. RANGE SWITCH PERFORMANCE TEST

38. The range-to-range accuracy of the 11683A Range Switch is checked to ensure a full-scale meter reading will be obtained when the 11683A and Power Meter Range Switches are set to the same scale.

39. **Description.** Voltage and resistance measurements are made at the rear panel output jack. Voltage measurements are made on the higher ranges. Because precise low voltage measurements are more difficult to make, resistance measurements are made at the lower RANGE switch settings. To achieve the needed accuracy, the four-wire resistance measurement technique is used.

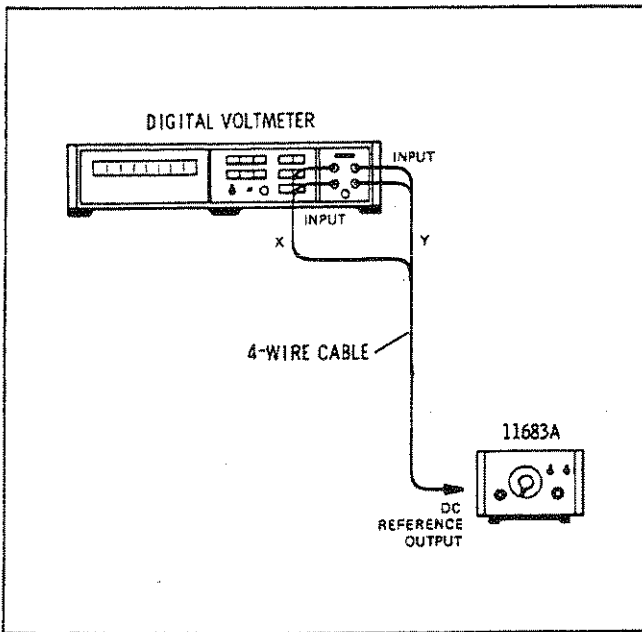


Figure 8. Range Switch Performance Test Setup

40. **Equipment.** Recommended equipment for performing these tests and adjustments are a digital voltmeter, HP 3455A, and a 4-wire cable for performing the resistance measurements (refer to Table 2).

NOTE

The 4-wire cable must connect directly to the 11683A. Do not use connectors or adaptors because their series resistance will reduce measurement accuracy.

41. Procedure.

a. Set the 11683A controls as follows:

RANGE 100 mW
 FUNCTION STANDBY
 POLARITY NORMAL

b. Set the DVM controls so measurements of up to +20 Vdc may be made. All measurements are to be 5-digit resolution.

c. Connect the equipment together as shown in Figure 8.

d. Set the 11683A FUNCTION control to CALIBRATE. On the table, record the dc voltage measured in each RANGE from 100 mW to 300 μW. If the voltage measured at the 1 mW range is beyond the limits shown on the table, when this procedure is completed, perform the Power Supply Adjustments. Calculate and record the ratio of the voltages using the formula shown in the table below.

| Range | DVM Reading | | | Ratio ($V_{100\text{ mW}} / V_{\text{range}}$) | | |
|--------|-------------|--------|------------|--|----------------|--------|
| | Min. | Actual | Max. | Min. | Actual | Max. |
| 100 mW | | _____ | | ----- | <u>1.0000</u> | ----- |
| 30 mW | | _____ | | 3.3457 | <u>3.35305</u> | 3.3604 |
| 10 mW | | _____ | | 10.768 | <u>10.715</u> | 10.815 |
| 3 mW | | _____ | | 34.394 | <u>34.4675</u> | 34.545 |
| 1 mW | 143.00mVdc | _____ | 147.00mVdc | 108.76 | <u>108.915</u> | 109.23 |
| 300 mW | | _____ | | 343.95 | <u>344.7</u> | 345.45 |

e. Set the 11683A FUNCTION switch to STANDBY. Set the DVM controls to measure resistance.

f. Measure the resistance at each RANGE setting from 300 to 3 μ W to 5-digit resolution and record the reading on the table below. Verify that each reading falls within the limits shown.

| Range | DVM Reading (Ohms) | | |
|-------------|--------------------|--------|--------|
| | Min. | Actual | Max. |
| 300 μ W | 3143.3 | _____ | 3157.1 |
| 100 μ W | 995.90 | _____ | 1000.2 |
| 30 μ W | 315.14 | _____ | 316.52 |
| 10 μ W | 99.749 | _____ | 100.18 |
| 3 μ W | 31.580 | _____ | 31.718 |

g. If any of the voltage ratios or resistance readings are incorrect, refer to the troubleshooting information.

42. ADJUSTMENTS

43. Power Supply Adjustment

44. The dc output of the 11683A is set to a specified level to ensure Power Meter full-scale deflection occurs when the RANGE controls of the Calibrator and Power Meter are set to the same scale.

45. Description. The 11683A RANGE switch is set to the 1 mW scale and the dc voltage at the rear panel D.C. REFERENCE OUTPUT is set to a specified level.

46. Equipment. The HP Model 3455A is the recommended Digital Voltmeter used to set the power supply voltage. A DVM that meets or exceeds the critical specifications of Table 2 may be substituted.

47. Procedure.

1. Connect the 11683A rear panel DC REFERENCE OUTPUT to the DVM INPUT.
2. Set the DVM controls to provide 5-digit resolution at 145 mVdc.
3. Remove the 11683A top cover.
4. Adjust A2R1 for a DVM reading of 145.00 ± 2.00 mVdc.

48. FET BALANCE ADJUSTMENT

49. The sampling gate balance is affected by the relative positions of the wires in the Power Sensor which connect to pins G and H of connector A3J1. One wire is black and white, and the other is brown and white. Once positioned, care must be used not to displace these wires.

NOTE

This procedure normally will have to be performed only when the U1 assembly is replaced or if the white/black or white/brown wires which connect A3A1 to A3J1 are moved since their relative position is critical.

50. Equipment. The HP Model 180C/1801A/1821A is the recommended oscilloscope for use in the balance adjustment. An oscilloscope that meets or exceeds the critical specifications for Table 2 may be substituted.

51. Procedure

a. Remove the A3 Assembly (refer to the paragraph Disassembly of the A3 Sampling Gate assembly, under the heading Repair). Reinstall the LINE and A1 RANGE switch in the front panel before proceeding.

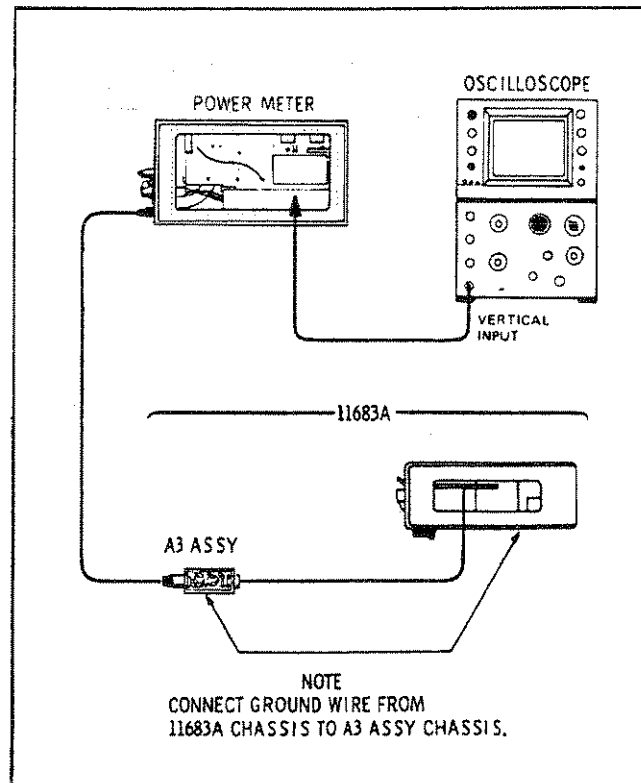


Figure 9. FET Balance Adjustment Setup

b. Connect the equipment as shown in Figure 9. The oscilloscope probe will be coupled to A4TP4 in the HP 435A Power Meter or A2TPAC in the 436A Power Meter.

c. Set the 11683A FUNCTION switch to STANDBY; the Power Meter RANGE switch to 3 μ W.

d. Press the Power Meter ZERO switch while monitoring the Oscilloscope for the switching transient (spike) waveform. Adjust the position of the black/white and brown/white wires until the amplitude is less than 1.0 Vp-p.

NOTE

The Power Meter ZERO Switch must be pressed for the duration of this adjustment procedure.

52. REPLACEABLE PARTS

53. Table 3 lists all replaceable parts in reference designator order. Table 4 contains the names and addresses that correspond to manufacturer's code numbers.

54. Replaceable Parts List

55. Table 3 is the list of replaceable parts and is organized as follows:

a. Electrical Assemblies and their components in alphanumeric order by reference designation.

b. Chassis-mounted parts in alpha-numerical order by reference designation.

c. Miscellaneous parts.

d. Illustrated parts breakdowns.

The information given for each part consists of the following:

a. The Hewlett-Packard part number.

b. Check digit (CD).

c. The total quantity (Qty) in the instrument.

d. The description of the part.

e. A typical manufacturer of the part in a five-digit code.

f. The manufacturer's number for the part.

The total quantity for each part is given only once -- at the first appearance of the part number in the list.

56. Ordering Information

57. To order a part listed in the replaceable parts table, quote the Hewlett-Packard part number, indicate the quantity required, and address the order to the nearest Hewlett-Packard office.

58. To order a part that is not listed in the replaceable parts table, include the instrument model number, instrument serial number, the description and function of the part, and the number of parts required. Address the order to the nearest Hewlett-Packard office.

Table 3. Replaceable Parts

| Reference Designation | HP Part Number | C D | Qty | Description | Mfr Code | Mfr Part Number |
|-----------------------|----------------|-----|-----|---|----------|----------------------|
| A1 | 11683-60005 | 5 | 1 | RANGE SWITCH ASSEMBLY (SEE MP8) | 28480 | 11683-60005 |
| A1R1 | 0811-0570 | 0 | 1 | RESISTOR 196K 1% .05W PWH TC0+10 | 20940 | 140-1/8-0-1963-8 |
| A1R2 | 0811-0571 | 1 | 1 | RESISTOR 363.3K 1% .05W PWH TC0+10 | 20940 | 140-1/8-0-36332-8 |
| A1R3 | 0811-0572 | 2 | 1 | RESISTOR 548.5K 1% .125W PWH TC0+10 | 28480 | 0811-0572 |
| A1R4 | 0811-0573 | 3 | 1 | RESISTOR 139.8K 1% .05W PWH TC0+10 | 20940 | 140-1/8-0-13982-8 |
| A1R5 | 0811-0574 | 4 | 1 | RESISTOR 26.88K 1% .05W PWH TC0+10 | 20940 | 140-1/8-0-26881-8 |
| A1R6 | 0811-0575 | 5 | 1 | RESISTOR 7.309K 1% .05W PWH TC0+10 | 20940 | 140-1/8-0-7309-8 |
| A1R7 | 0811-0576 | 6 | 1 | RESISTOR 2.207K 1% .05W PWH TC0+10 | 20940 | 140-1/8-0-2207-8 |
| A1R8 | 0811-0578 | 8 | 1 | RESISTOR 687.7 1% .05W PWH TC0+10 | 20940 | 140-1/8-0-6877-8 |
| A1R9 | 0811-0579 | 9 | 1 | RESISTOR 216.4 1% .05W PWH TC0+10 | 20940 | 140-1/8-0-2164-8 |
| A1R10 | 0811-0577 | 7 | 1 | RESISTOR 68.38 1% .05W PWH TC0+10 | 20940 | 140-1/8-0-6838-8 |
| A1R11 | 0811-3214 | 5 | 1 | RESISTOR 31.62 1% .05W PWH TC0+10 | 14140 | 140-1/40-3162-8 |
| A181 | 3100-3211 | 8 | 1 | SWITCH=ROTARY 1.250 STRUT CTR 3PCG; 10 | 28480 | 3100-3211 |
| A2 | 11683-60001 | 1 | 1 | POWER SUPPLY ASSEMBLY | 28480 | 11683-60001 |
| A2C1 | 0180-0141 | 2 | 1 | CAPACITOR=FXD 50UF+75-10% 50VDC AL | 56289 | 30D506050DD2 |
| A2C2 | 0160-2204 | 0 | 1 | CAPACITOR=FXD 100PF +/-5% 300VDC MICA | 28480 | 0160-2204 |
| A2CR1 | 1901-0328 | 8 | 4 | DIODE=PWR RECT 400V 1A 6US | 03508 | A140 |
| A2CR2 | 1901-0328 | 8 | | DIODE=PWR RECT 400V 1A 6US | 03508 | A140 |
| A2CR3 | 1901-0328 | 8 | | DIODE=PWR RECT 400V 1A 6US | 03508 | A140 |
| A2CR4 | 1901-0328 | 8 | | DIODE=PWR RECT 400V 1A 6US | 03508 | A140 |
| A2R1 | 2100-1788 | 9 | 1 | RESISTOR=TRMR 500 10% C TOP-ADJ 1-TRM | 73138 | 82PR500 |
| A2R2 | 0898-3433 | 8 | 1 | RESISTOR 28.7 1% .125W F TC0+100 | 03688 | PH85-1/4-70-287-F |
| A2R3 | 0898-3151 | 7 | 1 | RESISTOR 2.87K 1% .125W F TC0+100 | 24546 | CA-1/8-10-2871-F |
| A2R4 | 0898-3150 | 6 | 1 | RESISTOR 2.37K 1% .125W F TC0+100 | 24546 | CA-1/8-10-2371-F |
| A2B1 | 3101-0554 | 8 | 1 | SWITCH=TGL SUBMIN DPDT .02A 20VAC/DC PC (SEE MP4, MP9) | 28480 | 3101-0554 |
| A2B2 | 3101-0553 | 7 | 1 | SWITCH=TGL SUBMIN SPDT .02A 20VAC/DC PC (SEE MP4, MP9) | 28480 | 3101-0553 |
| A2U1 | 1620-0196 | 6 | 1 | IC 723 V RGLTR TO=100 | 04713 | MC1723C9 |
| A3 | 11683-60003 | 3 | 1 | SAMPLING GATE ASSEMBLY | 28480 | 11683-60003 |
| A3C1 | 0160-2357 | 4 | 1 | CAPACITOR=PDTHRU 1000PF +80 -20% 500V | 28480 | 0160-2357 |
| A3J1 | 1251-9759 | 0 | 1 | CONNECTOR- 12 CONTACT (SEE A3MP4) | 28480 | 1251-9759 |
| A3MP1 | 0470-0231 | 6 | 1 | ADHESIVE LOCTITE 242 POLYESTER 1P BLE | 05972 | 242 |
| A3MP2 | 0516-0009 | 4 | 1 | SCREWMACH 0-80 .312-IN-LG 82 DEG | 00000 | ORDER BY DESCRIPTION |
| A3MP3 | 3030-0436 | 4 | 1 | SCREWSKT HD CAP 0-80 .3-IN-LG SST-300 | 00000 | ORDER BY DESCRIPTION |
| A3MP4 | 1251-3363 | 8 | 1 | NUT,CONN,RND SPANNER NUT,AUDIO TYPE CONN (USED WITH A3J1) | 28480 | 1251-3363 |
| A3MP5 | 1660-1224 | 9 | 1 | SPRING=CPRN .088-IN-OD .188-IN-DA-LG | 28480 | 1660-1224 |
| A3MP6 | 3030-0422 | 8 | 8 | SCREWSKT HD CAP 0-80 .188-IN-LG SST-102 | 00000 | ORDER BY DESCRIPTION |
| A3MP7 | 08481-00002 | 5 | 2 | SHIELD | 28480 | 08481-00002 |
| A3MP8 | 08481-20011 | 8 | 2 | CHASSIS | 28480 | 08481-20011 |
| A3MP9 | 5040-6939 | 7 | 1 | CLAMP | 28480 | 5040-6939 |
| A3MP10 | 5040-6940 | 0 | 1 | BLOCK | 28480 | 5040-6940 |
| A3MP11 | 11683-00003 | 7 | 1 | PANEL, FRONT, SUB | 28480 | 11683-00003 |
| A3MP12 | 11683-20003 | 9 | 1 | ENDBELL, FRONT | 28480 | 11683-20003 |
| A3MP13 | 11683-20004 | 0 | 1 | ENDBELL, FEED-THRU | 28480 | 11683-20004 |
| A3MP14 | 11683-20005 | 1 | 1 | SHELL, PLASTIC | 28480 | 11683-20005 |
| A3R1 | 0898-7219 | 6 | 1 | RESISTOR 196 1% .05W F TC0+100 | 24546 | C3-1/8-70-196R-6 |
| A3A1 | 08481-60017 | 8 | 1 | BOARD ASSEMBLY, POWER SENSOR (FOR 8481A ONLY) | 28480 | 08481-60017 |
| A3A1C1 | 0180-2515 | 8 | 2 | CAPACITOR=FXD 47UF+20% 6VDC TA | 28480 | 0180-2515 |
| A3A1C2 | 0160-4306 | 7 | 4 | CAPACITOR=FXD 100PF +/-10% 100VDC CER | 51959 | 0805C101K3P |
| A3A1C3 | 0160-4306 | 7 | 1 | CAPACITOR=FXD 100PF +/-10% 100VDC CER | 51959 | 0805C101K3P |
| A3A1C4 | 0180-0594 | 9 | 1 | CAPACITOR=FXD 3.3UF+20% 15VDC TA | 14433 | T40-10=3.3/16-20 |
| A3A1C5 | 0160-3094 | 8 | 1 | CAPACITOR=FXD .1UF +/-10% 100VDC CER | 28480 | 0160-3094 |
| A3A1C6 | 0160-3879 | 7 | 1 | CAPACITOR=FXD .01UF +/-20% 100VDC CER | 28480 | 0160-3879 |
| A3A1C7 | 0160-4306 | 7 | 1 | CAPACITOR=FXD 100PF +/-10% 100VDC CER | 51959 | 0805C101K3P |
| A3A1C8 | 0160-4306 | 7 | 1 | CAPACITOR=FXD 100PF +/-10% 100VDC CER | 51959 | 0805C101K3P |
| A3A1C9 | 0180-2515 | 8 | 1 | CAPACITOR=FXD 47UF+20% 6VDC TA | 28480 | 0180-2515 |
| A3A1C10 | 0160-2545 | 4 | 1 | CAPACITOR=FXD 100UF+20% 4VDC TA | 28480 | 0160-2545 |
| A3A1B1 | 1854-0610 | 6 | 1 | TRANSISTOR MPN 81 TO=46 FT=800MHZ | 28480 | 1854-0610 |
| A3A1R1 | 0898-3260 | 9 | 1 | RESISTOR 460K 1% .125W F TC0+100 | 28480 | 0898-3260 |

See introduction to this section for ordering information

Table 3. Replaceable Parts

| Reference Designation | HP Part Number | C D | Qty | Description | Mfr Code | Mfr Part Number |
|-----------------------|----------------|-----|-----|---|----------|----------------------|
| A3A1R2 | 0498-7208 | 1 | 1 | RESISTOR 3.16K 1% .05W F TC90±100 | 24546 | C3=1/B=70=3161=0 |
| A3A1R3 | 0498-7224 | 3 | 1 | RESISTOR 316 1% .05W F TC90±100 | 24546 | C3=1/B=70=316A=6 |
| A3A1R4 | 0498-7236 | 7 | 1 | RESISTOR 1K 1% .05W F TC90±100 | 24546 | C3=1/B=70=1001=6 |
| A3A1RT1 | 0911-3210 | 1 | 1 | RESISTOR 31.6 5% .05W PWH TC9±250±252 | 14140 | 1409=1/20=31R=J |
| A3A1U1 | 1813-0060 | 8 | 1 | IC 70-6 | 28480 | 1813-0060 |
| | | | | MISCELLANEOUS PARTS | | |
| | 0590-1040 | 1 | 1 | THREADED INSERT-NUT 0-80 .06-LG SST | 26480 | 0590-1040 |
| | 5040-6536 | 2 | 1 | SPACER | 26480 | 5040-6536 |
| A6 | 0960-0443 | 1 | 1 | POWER MODULE ASSEMBLY | 28480 | 0960-0443 |
| A4J1 | 0360-0514 | 5 | 8 | TERMINAL | 28480 | 0360-0514 |
| A4J2 | 0360-0514 | 5 | | TERMINAL | 28480 | 0360-0514 |
| A4J3 | 0360-0514 | 5 | | TERMINAL | 28480 | 0360-0514 |
| A4J4 | 0360-0514 | 5 | | TERMINAL | 28480 | 0360-0514 |
| A4J5 | 0360-0514 | 5 | | TERMINAL | 28480 | 0360-0514 |
| A4J6 | 0360-0514 | 5 | | TERMINAL | 28480 | 0360-0514 |
| A4J7 | 0360-0514 | 5 | | TERMINAL | 28480 | 0360-0514 |
| A4J8 | 0360-0514 | 5 | | TERMINAL | 28480 | 0360-0514 |
| A4T81 | 5020-8122 | 2 | 1 | LINE VOLTAGE SELECTION CARD | 28480 | 5020-8122 |
| | | | | CHASSIS PARTS | | |
| D81 | 2140-8244 | 8 | 1 | LAMP-GLD A1M 135/105VDC 1.2MA T=2-BULB (PART OF 81) | 00460 | A1M |
| F1 | 2110-0027 | 8 | 1 | FUSE .125A 250V 1.25X.25 UL (FOR 100/120 VAC OPERATION) | 28480 | 2110-0027 |
| F1 | 2110-0011 | 0 | 1 | FUSE .062A 250V 1.25X.25 UL (FOR 220/240 VAC OPERATION) | 28480 | 2110-0011 |
| J1 | 1250-0063 | 1 | 1 | CONNECTOR-RF BNC PEM SGL-HOLE-PR 50-OHM (SEE MP8) | 28480 | 1250-0063 |
| MP1 | 0360-1190 | 5 | 1 | TERMINAL-BLDR LUG PL-MTG FOR-#3/8-SCR | 28480 | 0360-1190 |
| MP2 | 0370-2368 | 6 | 1 | KNOB-BASE-SAR/SKT 1/2 JGK .25-IN-ID | 28480 | 0370-2368 |
| MP3 | 0590-0052 | 1 | 1 | NUT-SHMET-J=TP 6=32-THD .3=RD 87L | 28480 | 0590-0052 |
| MP4 | 0590-0765 | 5 | 2 | NUT-KNRLD=R 1/4-40-THD .076-IN-TMK (USED WITH A281 AND A282) | 28480 | 0590-0765 |
| MP5 | 2190-0016 | 3 | 2 | WASHER-LK INTL T 3/8 IN .377-IN-ID | 28480 | 2190-0016 |
| MP6 | 2190-0067 | 4 | 2 | WASHER-LK INTL T 1/4 IN .250-IN-ID | 28480 | 2190-0067 |
| MP7 | 2360-0113 | 2 | 1 | SCREW-MACH 6=32 .25-IN-LG PAN=HD=POZI | 00000 | ORDER BY DESCRIPTION |
| MP8 | 2950-0043 | 8 | 2 | NUT-MEX=OBL=CHAM 3/8-32-THD .094-IN-TMK (USED WITH A1 AND J1) | 00000 | ORDER BY DESCRIPTION |
| MP9 | 2950-0052 | 9 | 2 | NUT-MEX=OBL=CHAM 1/4-40-THD .062-IN-TMK (USED WITH A281 AND A282) | 00000 | ORDER BY DESCRIPTION |
| MP10 | 11683-00004 | 8 | 1 | SUPPORT, P.C. BOARD | 28480 | 11683-00004 |
| MP11 | 11683-00005 | 9 | 1 | BRACKET, TRANSFORMER MOUNTING | 28480 | 11683-00005 |
| MP12 | 0590-0923 | 7 | 1 | NUT-KNRLD=R 1/2-32-THD .125-IN-TMK (PART OF 81) | 00000 | ORDER BY DESCRIPTION |
| MP13 | 3101-0559 | 3 | 1 | CAP-PUSHBUTTON TRL HHT; BLK.21Z=24G (PART OF 81) | 28480 | 3101-0559 |
| P1 | 0362-0063 | 3 | 8 | CONNECTOR-SGL CONT 8DISC=PEM | 28480 | 0362-0063 |
| P2 | 0362-0063 | 3 | | CONNECTOR-SGL CONT 8DISC=PEM | 28480 | 0362-0063 |
| P3 | 0362-0063 | 3 | | CONNECTOR-SGL CONT 8DISC=PEM | 28480 | 0362-0063 |
| P4 | 0362-0063 | 3 | | CONNECTOR-SGL CONT 8DISC=PEM | 28480 | 0362-0063 |
| P5 | 0362-0063 | 3 | | CONNECTOR-SGL CONT 8DISC=PEM | 28480 | 0362-0063 |
| P6 | 0362-0063 | 3 | | CONNECTOR-SGL CONT 8DISC=PEM | 28480 | 0362-0063 |
| P7 | 0362-0063 | 3 | | CONNECTOR-SGL CONT 8DISC=PEM | 28480 | 0362-0063 |
| P8 | 0362-0063 | 3 | | CONNECTOR-SGL CONT 8DISC=PEM | 28480 | 0362-0063 |
| R1 | 0757-0459 | 8 | 1 | RESISTOR 56.2K 1% .125W F TC90±100 (PART OF R2) | 24546 | C2=1/B=70=5622=7 |
| S1 | 3101-1394 | 6 | 1 | SWITCH-PB OPDT=OB ALING 10.5A 250VAC (PART OF R2; INCL D81, MP12, MP13) | 28480 | 3101-1394 |
| T1 | 9100-0532 | 0 | 1 | TRANSFORMER-POWER PRI; 100/115/230 V | 28480 | 9100-0532 |
| W1 | A120-1378 | 1 | 1 | CABLE 855Y 18AWG 3-CNDCT JGR=JKT | 28480 | A120-1378 |
| W2 | 11683-00004 | 4 | 1 | PRIMARY POWER CABLE (INCLUDES R1 AND 81) | 28480 | 11683-00004 |

Table 3. Replaceable Parts

| Reference Designation | HP Part Number | C D | Qty | Description | Mfr Code | Mfr Part Number |
|-------------------------------|----------------|-----|-----|--|----------|----------------------|
| CABINET PARTS (SEE FIGURE 10) | | | | | | |
| 1 | 2360-0182 | 5 | 2 | SCREEN=MACH 6=32 .512-IN=LG 82 DEG | 00000 | ORDER BY DESCRIPTION |
| 2 | 5060-8553 | 7 | 2 | COVER ASSEMBLY, TOP 5 X 8 | 28480 | 5060-8553 |
| 3 | 11683-00001 | 5 | 2 | PANEL, REAR | 28480 | 11683-00001 |
| 4 | 5060-0247 | 0 | 2 | FRAME ASSEMBLY | 28480 | 5060-0247 |
| 5 | 2360-0180 | 3 | 8 | SCREEN=MACH 6=32 .188-IN=LG 82 DEG | 00000 | ORDER BY DESCRIPTION |
| 6 | 5000-8766 | 8 | 2 | COVER, SIDE 3 X 8 | 28480 | 5000-8766 |
| 7 | 5000-8569 | 9 | 1 | COVER, BOTTOM 5 X 8 | 28480 | 5000-8569 |
| 8 | 11683-00002 | 6 | 1 | PANEL, FRONT | 28480 | 11683-00002 |
| 9 | 5060-0727 | 1 | 2 | FOOT ASBY | 28480 | 5060-0727 |
| 10 | 1490-0031 | 7 | 1 | TILT STAND 2,236-IN=W 4,438-IN=DA=LG 88T | 28480 | 1490-0031 |

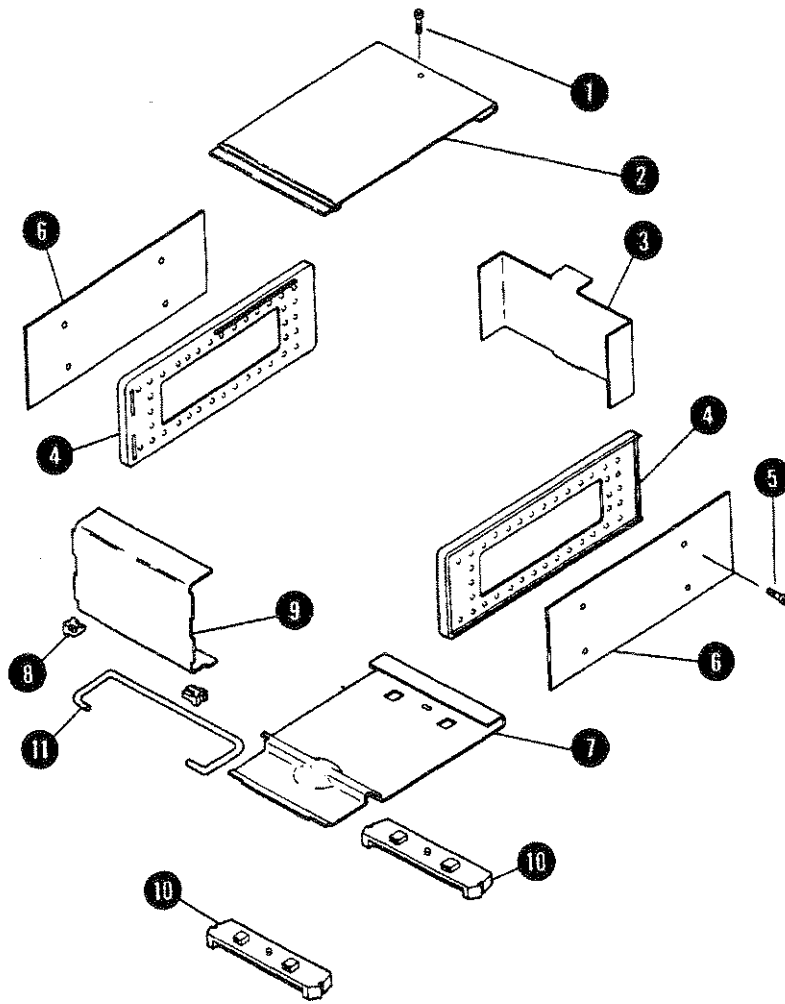


Figure 10. Cabinet Parts Exploded View

See introduction to this section for ordering information

Table 3. Replaceable Parts

| Reference Designation | HP Part Number | C | D | Qty | Description | Mfr Code | Mfr Part Number |
|---|----------------|---|---|-----|-------------|----------|-----------------|
| | | | | | | | |
| <p>Figure 11. A3 Assembly Exploded View</p> | | | | | | | |

Table 4. Code List of Manufacturers

| Mfr Code | Manufacturer Name | Address | Zip Code |
|----------|-------------------------------------|----------------|----------|
| 00000 | ANY SATISFACTORY SUPPLIER | | |
| 00466 | MORELCO NORTH AMER PHILIPS LTS CORP | LOS ANGELES CA | 90021 |
| 03568 | GE CO SEMICONDUCTOR PROD DEPT | SYRACUSE NY | 13201 |
| 03888 | KODI PYROFILM CORP | NEW JERSEY NJ | 07981 |
| 04713 | MOTOROLA SEMICONDUCTOR PRODUCTS | PHOENIX AZ | 85062 |
| 05972 | LOCTITE CORP | NEWINGTON CT | 06111 |
| 14140 | EDISON ELEK DIV MCGRAW-EDISON | MANCHESTER NH | 03130 |
| 14433 | ITT SEMICONDUCTORS DIV OF ITT CORP | PALM BEACH FL | 33401 |
| 20940 | MICRO-OMM CORP | EL MONTE CA | 91731 |
| 24546 | CORNING GLASS WORKS (BRADFORD) | BRADFORD PA | 16701 |
| 28480 | HEWLETT-PACKARD CO CORPORATE HQ | PALO ALTO CA | 94304 |
| 31959 | VIGLAN INC | SAN DIEGO CA | 92138 |
| 56289 | SPRAGUE ELECTRIC CO | NORTH ADAMS MA | 01247 |
| 73138 | BECKMAN INSTRUMENTS INC MELIPOT DIV | FULLERTON CA | 92630 |

59. SERVICE

60. Service Information is composed of Repair, Principles of Operation, and Troubleshooting, followed by the assembly and component locations diagrams (Figure 13 and 15) and schematic diagrams (Figures 14 and 16).

61. Test equipment that meets or exceeds the critical specifications of Table 2 may be used in place of the recommended test instruments.

WARNING

The service information is often used with power supplied and protective covers removed from the instrument. Energy available at many points may, if contacted, result in personal injury or death.

62. Repair

63. The repair information includes instructions for removing and installing the A3 Sampling Gate Assembly, and proper installation of the A3A1 Board.

64. Disassembly of A3 Sampling Gate Assembly. For steps 1 through 3 see Figure 11. Refer to Figure 10 steps 4 through 8.

a. Remove the top, bottom, and side covers of the 11683A.

b. Remove the right-side frame which is adjacent to A2 and A3 assemblies after removing five 6-32 x 1/4" flat head machine screws.

c. Remove the RANGE switch knob after loosening the socket set screws. Remove the 3/8-32 x 7/16" hex nut from the RANGE switch; remove the RANGE SWITCH.

d. Remove the 1/2-32 knurled nut on the LINE switch and lift the A3 Assembly, which is attached only by the orange wire, from the 11683A chassis.

e. To remove the A3 Assembly plastic covers, insert the blade of a screwdriver into the seam on each side of the bulkhead feedthrough. Gently twist until the covers snap apart. Remove the covers and the magnetic shields.

f. Remove the two 0-80 x 0.312" flat-head machine screws which attach the sub-panel to the upper chassis.

g. Remove the two 0-80 x 0.188" socket cap screws which secure the feedthrough endbell to the upper chassis. Loosen the lower cap screws and remove the upper chassis.

h. To reassemble the A3 Assembly follow the preceding instructions in reverse order.

65. A3A1 Assembly Installation. The relative position of the installed circuit board and some components on the board are critical for proper operation.

a. Place the circuit board in the correct position and insert four 0-80 x 0.188" socket cap screws.

b. Center the circuit board so there is equal air gap between each side and the chassis. Tighten the cap screws.

66. Principles of Operation

67. The principles of operation are intended to give the user a basic understanding of circuit operation and is, therefore, the most important troubleshooting aid available.

68. Power Supply. The A4 Power Module Assembly contains the Line Voltage Selector Card which matches the line voltage to power transformer primary. A line filter reduces line surge and transients.

The A2 Power Supply Assembly contains a bridge rectifier A2CR1-4, filter capacitor A2C1, a packaged voltage regulator circuit A2U1, and its associated components.

Within the IC package is a reference voltage generator, an operational amplifier, regulator driver, series regulator, and current limiting transistors. The reference voltage output, pin 4, is coupled to the non-inverting operational amplifier input, pin 3. The amplifier output drives the regulator driver and series regulator transistors and the regulated output is coupled from the emitter, through the current sense resistor A2R2, to the POLARITY switch A2S1. A2R3, R1, and R4 form

a voltage divider through which the feedback bias is coupled to A2U1 pin 2, the inverting input.

If the current flow through A2R2 exceeds 20 mA, the current limiting transistor is turned-on and the drive voltage to the regulator driver is reduced which drops the regulated voltage toward zero.

A2C2 provides high frequency rolloff which reduces the feedback loop tendency to support spurious oscillations.

69. A1 Range Switch Assembly. The Range switch is a voltage divider which changes the output voltage by a factor of approximately $\sqrt{10}$ for each sequential range change.

70. A3 Sampling Gate Assembly. The dc input from the Range Switch assembly is divided by one thousand and is coupled to the A3A1U1 Sampling Gate circuit. A 220 Hz squarewave drive signal from the Power Meter is coupled to the FET gates. When A3A1U1Q1 is conducting, the dc input is coupled to the Input Amplifier A3A1Q1. When A3A1U1A2 is conducting, the input to the amplifier is essentially ground. The signal coupled to the Input Amplifier is 220 Hz ac, with the amplitude directly proportional to the dc input level.

The Input Amplifier and the first amplifier in the Power Meter are the component parts of a Hybrid Operational Amplifier. The Amplifier, which has a gain of approximately 730, is shown in Figure 12.

71. Troubleshooting

72. The Troubleshooting information is intended to supplement the principles of operation and schematics. This information should reduce troubleshooting time and increase the ease of solving problems that do not have obvious answers.

73. Power Supplies. If the output noise level has increased and the dc voltage at A2U1 pin 8 has decreased slightly, one of the bridge rectifier diodes or A2C1 may be defective.

If the output voltage has decreased, 0.6 Vdc measured across A2R2 indicates the current limiter is operating.

Measure the voltage on A2U1 pins 2 and 3. If the voltage difference is >10 mVdc, verify that the

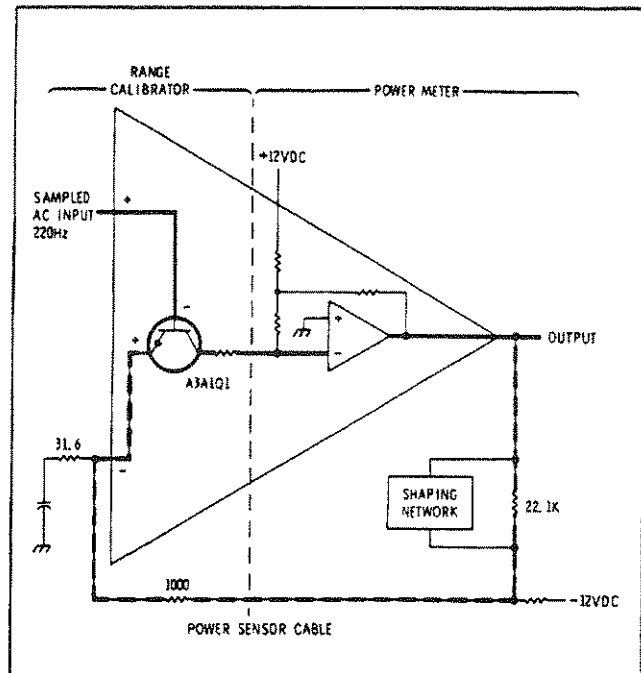


Figure 12. Hybrid Operational Amplifier

regulated output has correctly followed the change in input levels. The regulated output's relative change from normal should follow the non-inverting input change and be opposite to the inverting input change. If the preceding statement is not true, the integrated circuit is probably defective, otherwise, the problem is probably with the associated components of A2U1.

74. A1 Range Switch Assembly. Voltages and/or, resistance measurements, taken while performing the Range Switch Performance Test, may be out of the specified tolerances. This may be due to a definite change-in-resistance of one of the resistors mounted on the switch, high resistance contacts on the FUNCTION or RANGE switches, or a soldered connection which exhibits high resistance.

75. A3 Sampling Gate Assembly. The input to the A3 assembly is normally +15.8 mVdc with the RANGE switch set to a 100 mW.

NOTE

The following instructions apply after the A3A1 Circuit Board Assembly has been exposed. Refer to Disassembly of A3 Sampling Gate Assembly.

The multivibrator drive from the Power Meter to the FET Sampling Gate circuit may be checked on pins 4 or 6 of U1. This drive voltage is a 220 Hz square wave whose most positive level is

-0.05 ± 0.05 Vdc with the most negative level >9 V more negative.

In most cases it may be assumed that the operational amplifier, made up of the Input Amplifier and the first amplifier in the Power Meter, is operating correctly if the dc voltage found on the metal cover of A3A1Q1 is -70 ± 30 mVdc.

The FET's in A3A1U1 may be checked by the following procedure:

- a. Disconnect the cables from the 11683A.
- b. Remove the upper chassis from the A3 assembly. (Refer to disassembly procedures.)
- c. Measure the resistance between pins 1 and 2 of the A3A1U1. The resistance should be 15 ± 0.75 ohms. The same resistance should be found between pins 8 and 9 of A3A1U1.

- d. Short pins 4, 6, and 9 of A3A1U1. While the pins are shorted, measure the resistance between pins 2 and 3, and between pins 3 and 8, of A3A1U1. The resistance should be less than 40 ohms.

- e. Set a power supply to 10 Vdc.

- f. Connect the positive side of the power source to A3J1 pin E signal ground. Connect the negative power supply lead to pins 4 and 6 of A3A1U1.

- g. Measure the resistance between pins 2 and 3 of A3A1U1. Also measure the resistance between pins 3 and 8 of A3A1U1. In both cases, the resistance should be several hundred times the resistance found in step d.

If A3A1U1 is replaced it is recommended that the FET BALANCE ADJUSTMENT be performed to ensure the 11683A is operating at maximum capability.

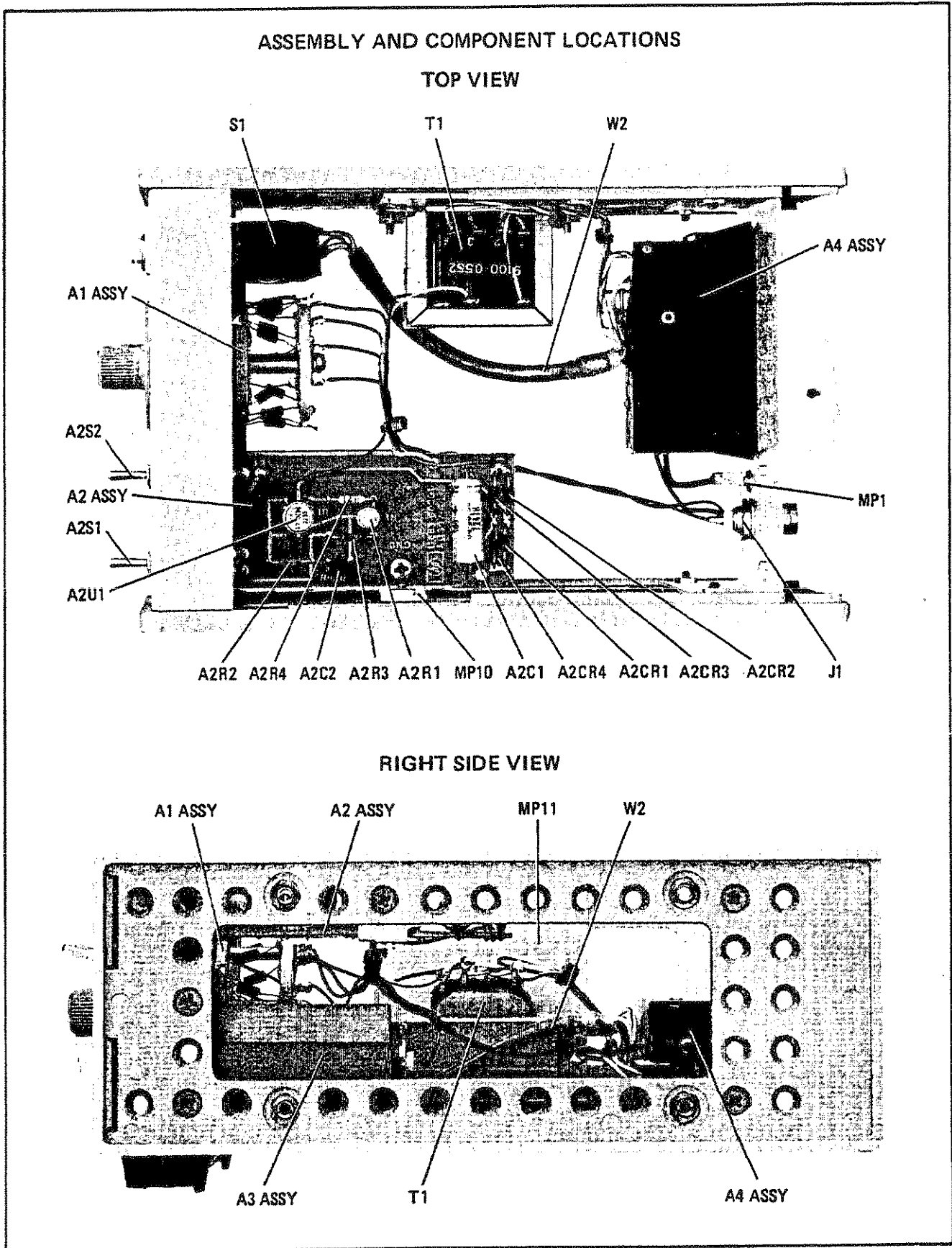
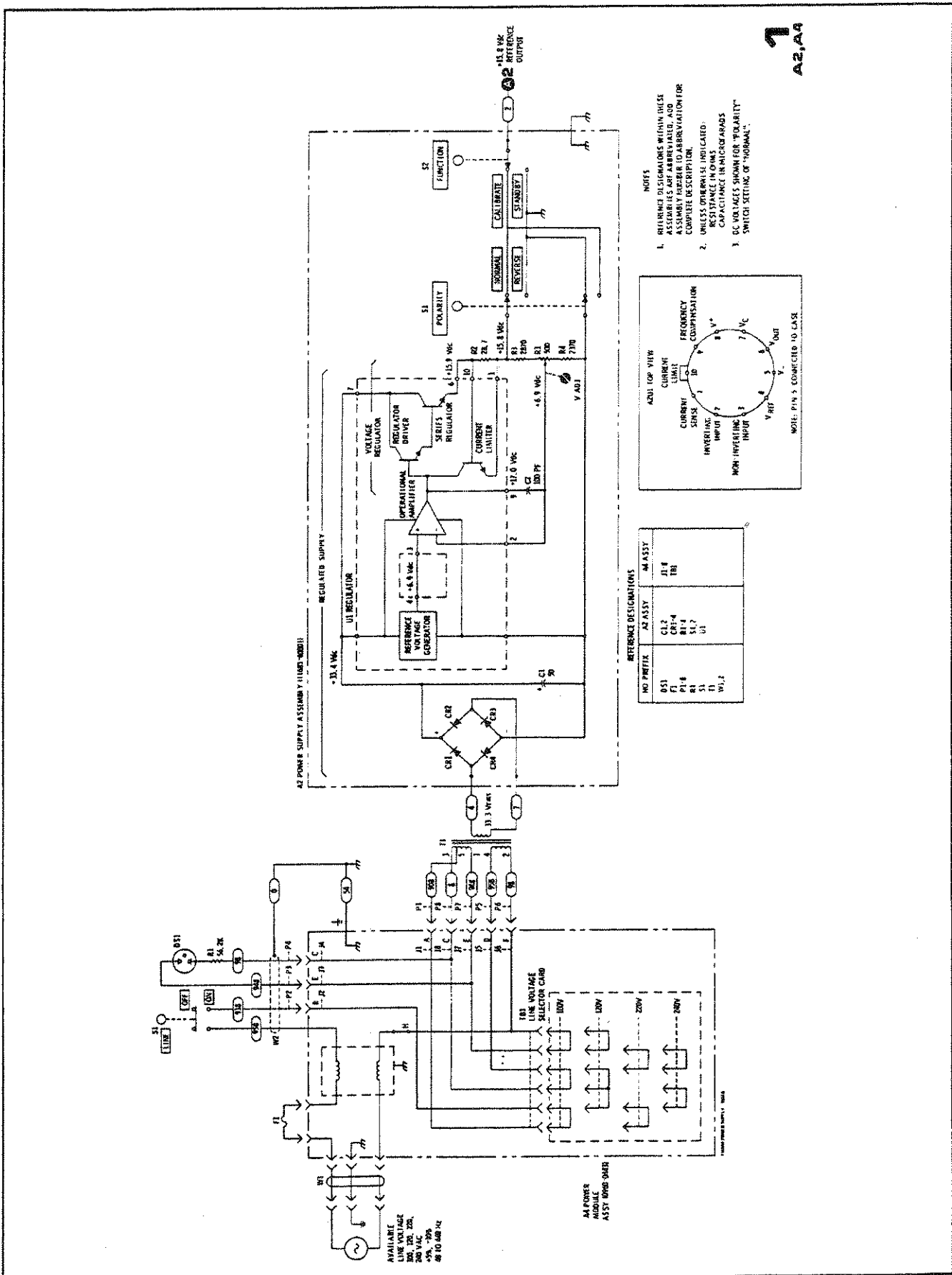
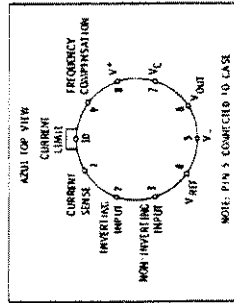


Figure 13. 11683A Assembly and Component Locations



- NOTES
1. REFERENCE DESIGNATIONS WITHIN THESE ASSEMBLIES ARE ABBREVIATED, AND SHOULD BE USED IN CONJUNCTION FOR COMPLETE DESCRIPTION.
 2. UNLESS OTHERWISE INDICATED, RESISTANCE IS IN OHMS, CAPACITANCE IN MICROFARADS.
 3. DC VOLTAGES SHOWN FOR "POLARITY" SWITCH SETTING OF "NORMAL".



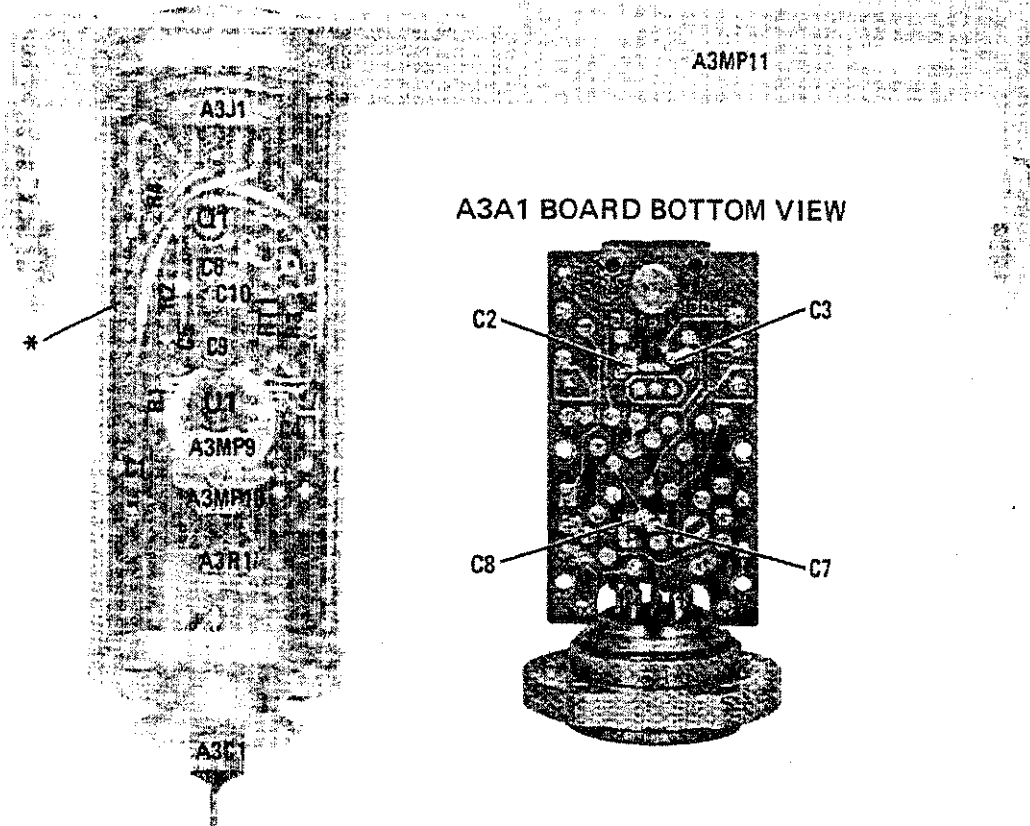
| NO. PARTIAL | A2 ASSY | A4 ASSY |
|-------------|---------|---------|
| 051 | C1,2 | J1,4 |
| F1 | CR1-4 | TR |
| P1,8 | R1-4 | |
| R1 | S1,7 | |
| T1 | U1 | |
| W1,2 | | |

1
A2, A4

Figure 14. Power Supply Schematic Diagram

A3 ASSEMBLY COMPONENT LOCATIONS

A3 ASSEMBLY TOP VIEW



NOTE: A3 COMPONENT REFERENCE DESIGNATIONS ARE PRECEDED BY "A3". ALL OTHER COMPONENTS ARE PART OF THE A3A1 BOARD.

* WHEN THE A3A1 ASSEMBLY IS REPLACED THE BROWN WIRE MUST BE ADDED BETWEEN GUARD AND SIGNAL GROUND.

Figure 15. A3 Assembly Component Locations

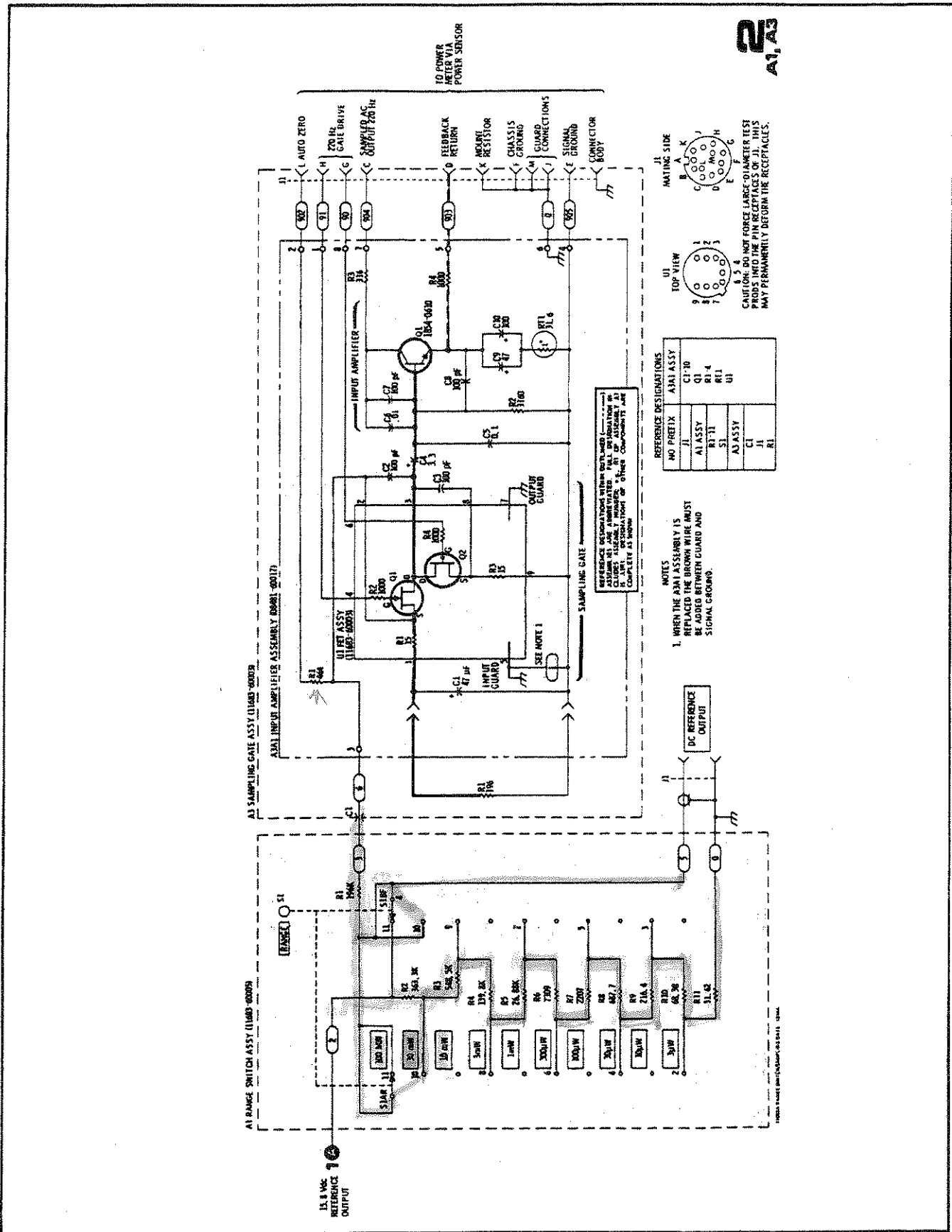


Figure 16. Range Switch/Sampling Gate Schematic Diagram

MANUAL CHANGES

APPENDIX

This appendix contains backdating information which makes this manual applicable to instruments with serial number prefixes 1314A and 1551A.

CHANGES

Page 8:

Replace paragraphs 49 to 52 with the following (leave the note following paragraph 49):

49. A characteristic of an FET Sampling Gate circuit is transient spikes caused by an imbalance in gate-to-drain capacitance. The imbalance can be corrected by making the effective junction capacitance equal. A capacitor of correct value is coupled across the gate-to-drain leads of the active component with the lower junction capacitance. Other factors keep the transient from being eliminated completely, therefore, the amplitude is reduced to a minimum.

50. **Description.** Adequate FET gate-to-drain capacitance balance is achieved when the transient spike amplitude is found to be < 1.0 Vp-p at the appropriate test location (TP4 in the HP Model 435A). Solder the selected capacitor in place.

51. **Equipment.** The HP Model 180C/1801A/1821A is the recommended oscilloscope for use in the balance adjustment. An oscilloscope that meets or exceeds the critical specifications of Table 2 may be substituted.

52. Procedure.

a. Remove the A3 assembly (refer to the paragraph, Disassembly of the A3 Sampling Gate Assembly, under the heading Repair). Reinstall the LINE and A1 RANGE switch in the front panel before proceeding.

b. Connect the equipment as shown in Figure 9. (The oscilloscope probe will be coupled to TP4 if the HP 435A Power Meter is being used.)

c. Set the 11683A FUNCTION switch to STANDBY; the Power Meter RANGE switch to 3 μ W.

d. Press the 435A ZERO Switch and check the spike amplitude on the oscilloscope display. Remove A2C2 and replace it, in the same location, with the next higher value capacitor. A2C2 may be located in one of the two positions or it may be omitted; see Figure 13.

NOTE

The 435A ZERO switch must be pressed for the duration of this adjustment procedure.

e. If the spike amplitude decreases, continue to increase the capacitor value, in sequence, until the minimum spike amplitude (balance point) is found. The capacitor normally will not be >7 pF. After two or three capacitors are tried, if the spike amplitude is constant or increases, a smaller value capacitor may be tried. If the lowest value capacitor is reached without finding the balance point, remove the capacitor and check the spike amplitude. Next begin to insert capacitors, in sequence, in the other A2C2 location. When the spike amplitude of <1.0 Vp-p at the appropriate test point is found, the circuit is considered balanced and the capacitor may be soldered in place.

MANUAL CHANGES

CHANGES (Cont'd)

Page 10, Table 3:

Replace the A3 portion of the parts list with the following:

Table 3. Replaceable Parts

| Reference Designation | HP Part Number | Qty | Description | Mfr Code | Mfr Part Number |
|-----------------------|----------------|-----|---|----------|--------------------|
| A3 | 11683-60003 | 1 | SAMPLING GATE ASSY | 28480 | 11683-60003 |
| A3C1 | 0160-2357 | 1 | C:FXD CER FEED-THRU 1000 PF +80-20X | 28480 | 0160-2357 |
| A3J1 | 1251-3228 | 1 | CONNECTOR:AUDIO, 12 FEMALE CONTACT (SEE A3MP4) | 74868 | 91-T-3638 |
| A3MP1 | 0470-0231 | 1 | COMPOUND:NUT LOCKING | 28480 | 0470-0231 |
| A3MP2 | 0516-0009 | 4 | SCREW:FLAT HD SLOT DR 0-80 X 0.312" LG | 00000 | 080 |
| A3MP3 | 3030-0436 | 1 | SCREW:SOCKET CAP 0-80 X 0.500" LG | 00000 | 080 |
| A3MP4 | 1251-3363 | 1 | NUT:CONNECTOR MOUNTING (USED WITH A3J1) | 28480 | 1251-3363 |
| A3MP5 | 1460-1330 | 1 | SPRING:COMPRESSION 0.150" | 28480 | 1460-1330 |
| A3MP6 | 3030-0422 | 8 | SCREW:SOCKET CAP 0-80 X 0.188" LG | 00000 | 080 |
| A3MP7 | 08481-00002 | 2 | SHIELD | 28480 | 08481-00002 |
| A3MP8 | 08481-20011 | 2 | CHASSIS | 28480 | 08481-20011 |
| A3MP9 | 08481-40003 | 1 | SPACER F.E.T. | 28480 | 08481-40003 |
| A3MP10 | 08481-40004 | 1 | CLAMP LEAD | 28480 | 08481-40004 |
| A3MP11 | 11683-00003 | 1 | PANEL:FRONT, SUB | 28480 | 11683-00003 |
| A3MP12 | 11683-20003 | 1 | ENOBELL:FRONT | 28480 | 11683-20003 |
| A3MP13 | 11683-20004 | 1 | ENOBELL:FEED THRU | 28480 | 11683-20004 |
| A3MP14 | 11683-20005 | 2 | SHELL:PLASTIC | 28480 | 11683-20005 |
| A3A1 | 0698-7219 | 1 | R:FXD FLM 196 OHM 2X 1/8W | 28480 | 0698-7219 |
| A3A1 | 11683-60002 | 1 | BOARD ASSY:SAMPLING GATE | 28480 | 11683-60002 |
| A3A1C1 | 0180-2515 | 2 | C:FXD ELECT 47 UF | 28480 | 0180-2515 |
| A3A1C2 | 0160-3872 | 1 | C:FXD CER 2.2 TO 0.25 PF 200VDCW FACTORY SELECTED PART | 72982 | 8121-8226-C0G-229C |
| A3A1C3 | 0180-2515 | 1 | C:FXD ELECT 47 UF | 28480 | 0180-2515 |
| A3A1C4 | 0160-3094 | 1 | C:FXD CER 0.1 UF 10X 100VDCW | 56289 | 2C18A1-CML |
| A3A1C5 | 0160-3879 | 1 | C:FXD CER 0.01 UF 20X 100VDCW | 72982 | 8121-8112-X7R-103M |
| A3A1C6 | 0180-2545 | 1 | C:FXD ELECT 100 UF | 28480 | 0180-2545 |
| A3A1Q1 | 1854-0610 | 1 | TRANSISTOR:SI NPN | 28480 | 1854-0610 |
| A3A1R1 | 0698-3260 | 1 | H:FXD MET FLM 464K OHM 1X 1/8W | 28480 | 0698-3260 |
| A3A1R2 | 0698-7248 | 1 | R:FXD FLM 3.16K OHM 2X 1/8W | 28480 | 0698-7248 |
| A3A1R3 | 0698-7236 | 3 | R:FXD FLM 1K OHM 2X 1/8W | 28480 | 0698-7236 |
| A3A1R4 | 0698-7236 | 1 | R:FXD FLM 1K OHM 2X 1/8W | 28480 | 0698-7236 |
| A3A1R5 | 0757-0180 | 1 | R:FXD MET FLM 31.6 OHM 1X 1/8W | 28480 | 0757-0180 |
| A3A1R6 | 0698-7224 | 1 | R:FXD FLM 31.6 OHM 2X 1/8W | 28480 | 0698-7224 |
| A3A1R7 | 0698-7236 | 1 | R:FXD FLM 1K OHM 2X 1/8W | 28480 | 0698-7236 |
| A3A2 | 08481-60002 | 1 | FET ASSEMBLY | 28480 | 08481-60002 |

MANUAL CHANGES

CHANGES (Cont'd)

Page 14, paragraph 65:

Add sub-paragraph c:

- c. Bend the 100 μ F capacitor, A3A1C6, so it touches A3A1Q1. Position A3A1C1 and A3A1C3 so they touch A3A1C6.

Page 14, 15:

Insert the following paragraphs and the Figure between paragraphs 65 and 66.

67. FET Assembly Removal

CAUTION

Excessive heat from the soldering iron when installing or removing the assembly may destroy the FET internal circuitry. Before removing the FET Assembly be sure that it must be replaced. The Troubleshooting information gives the correct procedures for verifying that the FET's are defective.

- a. Remove the A3A1 Circuit Board Assembly. Refer to Disassembly of A3 Sampling Gate Assembly.
- b. Remove the 0-80 x 0.500" cap screw, spring, clamp, and A3R1.
- c. Remove the RTV coating which covers the FET pin connections to the printed circuit board.
- d. With a desoldering tool, remove the solder from the six pins which hold the FET Assembly in place.
- e. Carefully break each pin loose from the printed circuit board with a soldering aid tool.
- f. Gently lift the FET Assembly and spacer from the circuit board. Refer to Figure 12.

68. FET Assembly Installation

- a. Insert the FET Assembly leads through the spacer and printed circuit board. Refer to Figure A1.
- b. Insert the clamp and cap screw to hold the spacer and assembly in place against the printed circuit boards.

- c. Quickly solder the FET leads to the circuit board.

- d. With hypodermic needle place RTV* into the hollow portion of the spacer. For this purpose the needle is inserted into the hole in the circuit board directly beneath the FET Assembly.

- e. Cover the soldered connections from the FET Assembly with RTV*.

- f. Cover the rest of the circuit side of the A2 assembly circuit board with Krylon**.

*RTV - 732 RTV Silicone Rubber Adhesive/Sealant by Dow Corning Corp., Midland, Michigan, 48640.

**Krylon - No. 1302 Humiseal Protective Coating, Type 1B12 by Columbia Technical Corp., Woodside 77, New York.

Krylon Inc., Norristown, Pennsylvania

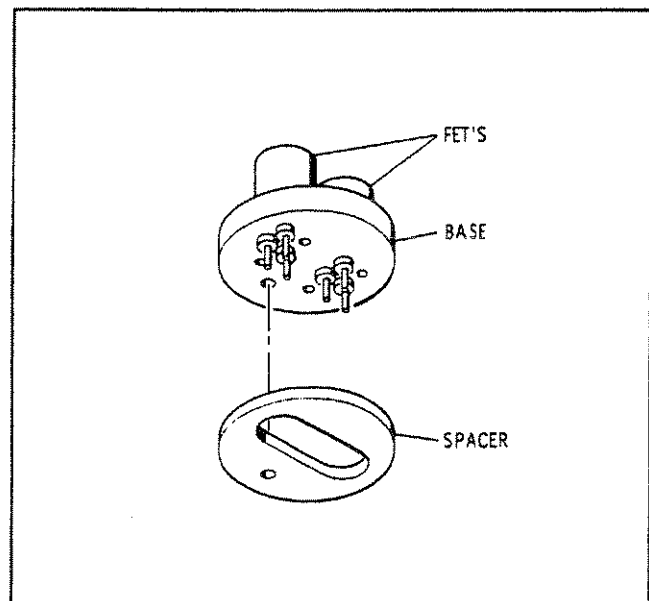


Figure A1. FET Assembly and Spacer

MANUAL CHANGES

CHANGES (Cont'd)

Page 20, Figure 15:

Replace Figure 15 with the one below:

A3 ASSEMBLY COMPONENT LOCATIONS

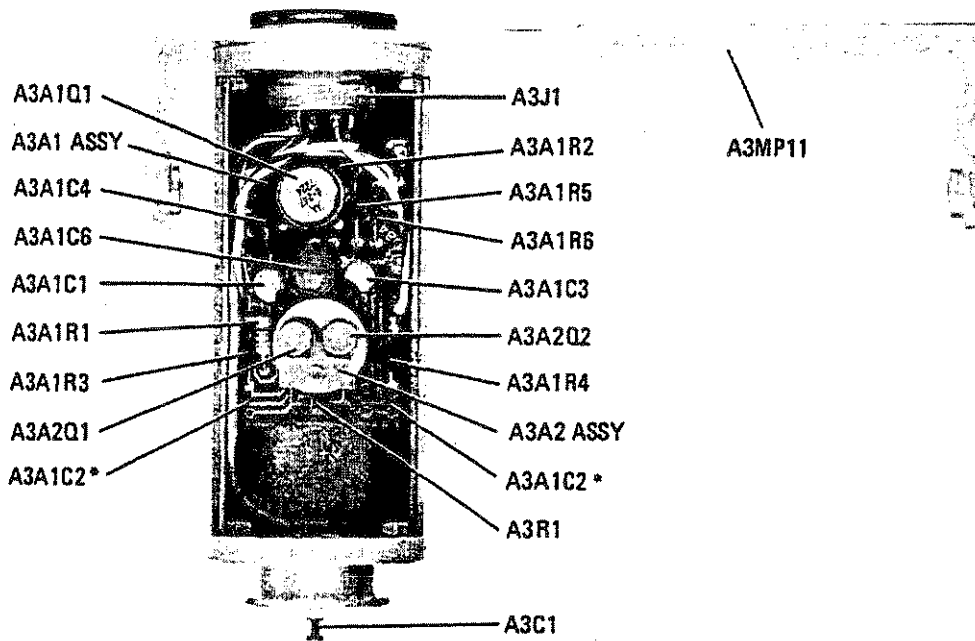


Figure A2. Assembly Component Locations

Page 21, Figure 16:

Replace the A3 portion of the schematic with the one below:

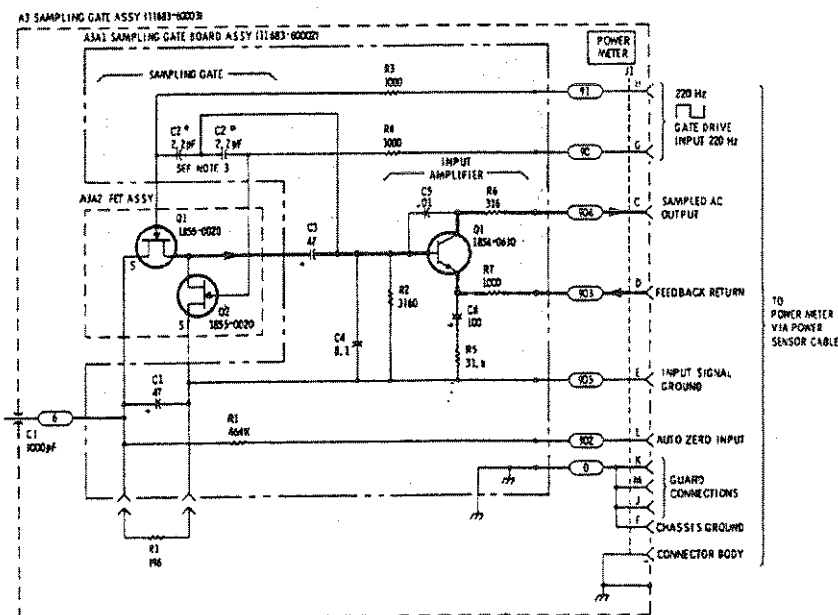


Figure A3. Range Switch/Sampling Gate Schematic Diagram (P/O Figure 18)

CERTIFICATION

Hewlett-Packard Company certifies that this product met its published specifications at the time of shipment from the factory. Hewlett-Packard further certifies that its calibration measurements are traceable to the United States National Bureau of Standards, to the extent allowed by the Bureau's calibration facility, and to the calibration facilities of other International Standards Organization members.

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