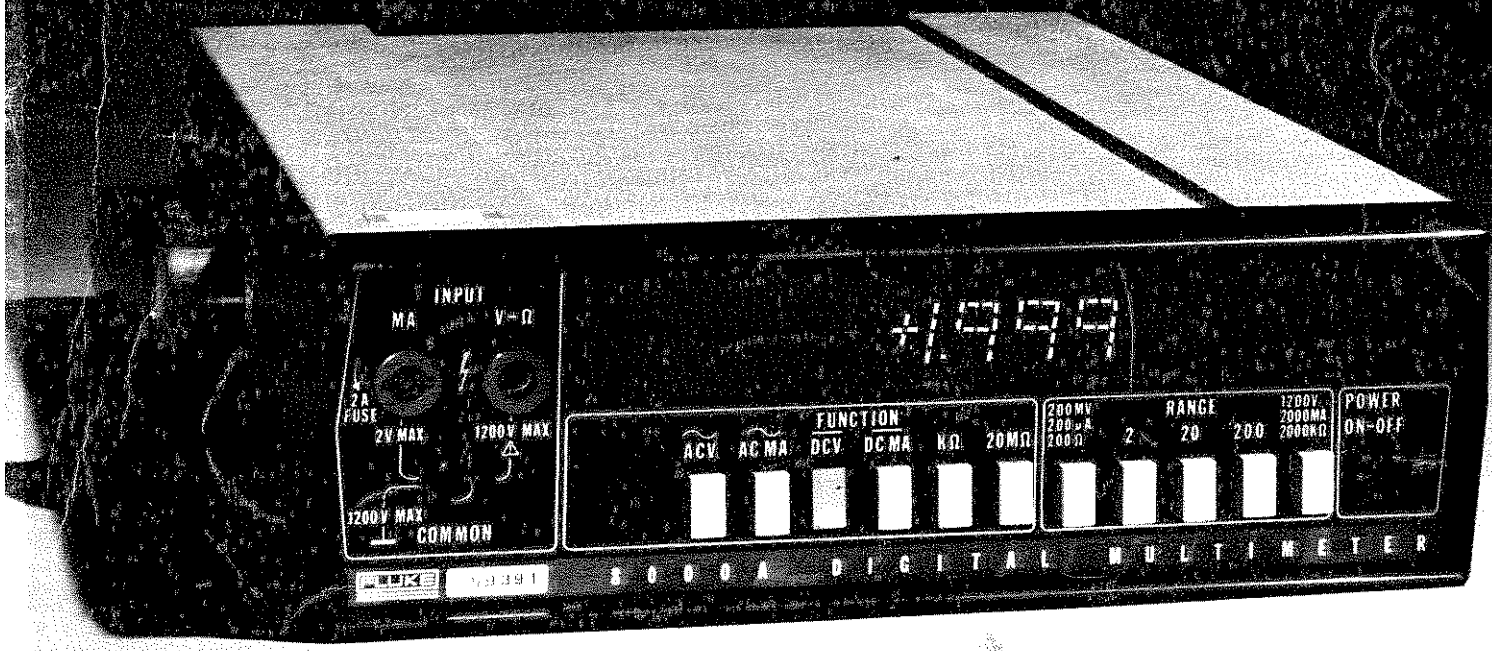
FLUKE®

8000A
digital multimeter

JOHN FLUKE MFG. CO., INC. P.O. BOX 43210 MOUNTLAKE TERRACE, WASHINGTON 98043



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MODEL

8000A

DIGITAL MULTIMETER

PN/347906

Table of Contents

(continued on page ii)

TABLE OF CONTENTS, *continued*

(continued on page iii)

TABLE OF CONTENTS, *continued*

List of Illustrations

(continued on page v)

LIST OF ILLUSTRATIONS, *continued*

List of Tables

Section 1
Introduction & Specifications

1-1. INTRODUCTION

1-2. The Model 8000A is a compact and light-weight digital multimeter (DMM). It features a 3½ digit display, push-button selection of range and function, auto polarity, self locating decimal point, self zeroing to eliminate offset uncertainties, and overload protection for all ranges. Several options and accessories are also available for use with the 8000A.

1-3. Push-button controls allow the selection of five ac and dc voltage ranges, five ac and dc current ranges, and six resistance ranges. The measurement capabilities of the 8000A range from 100 microvolts to 1199 volts ac and dc, 100 nanoamperes to 1.999 amperes ac and dc, and 100 milliohms to 19.99 megohms.

1-4. The front-panel readout features a 3½ digit display using light emitting diodes (LED's). The display includes a self locating decimal point and a + or – polarity indicator. Full-scale readout is 1999 for all ranges and functions except the 1200 volt ac and dc range, which is 1199. A blinking full-scale readout indicates that the 8000A is being operated in an overrange condition.

1-5. Front panel input connectors are banana type and provide separate connections for common, current, and volt-ohm inputs. Both the current and volt-ohm inputs are referenced to the common input. Common is isolated from earth ground and can operate at a potential of up to ± 1200 volts peak with reference to earth ground.

1-6. The overload features of the 8000A include a fused current input and an overvoltage protected volt-ohm input. This protection applies for any function and range selected.

1-7. Several options and accessories are available for use with the 8000A. The options are listed and described in Table 1-1, and option compatibility is defined in Table 1-2. Desired options must be specified at time of purchase. The accessories are listed and described in Table 1-3. Accessories are compatible with all options and can be ordered at time of purchase or after purchase. Detailed information concerning each option and accessory is given in Section 6 of this manual.

1-8. Input power for the 8000A is available in one-of-three versions. These are: 100 volts, 50 to 400 Hz; 115 volts, 50 to 400 Hz; and 230 volts, 50 to 400 Hz. The desired version must be specified at the time of purchase. Overall operation of the 8000A is the same for all versions of input power.

NOTE

Options –05 and –06 are incompatible with the 100 volt, 50 to 400 Hz version of the 8000A (See Table 1-1).

Table 1-1. 8000A OPTIONS AND LINE POWER COMPATIBILITY

OPTION	DESCRIPTION	AC LINE POWER VERSION		
		100	115	230
–01	Battery Pack	x	x	x
–02	Digital Printer Output	x	x	x
–05	10A Current Range	–	x	x
–06	Low Ohms Ranges (2 and 20 Ω)	–	x	x

x = Compatible
– = Incompatible

Table 1-2. OPTION COMPATIBILITY

OPTION	–01	–02	–05	–06
–01		–	x	●
–02	–		x	–
–05	x	x		–
–06	●	–	–	

● = Compatible, if ordered at the same time
x = Compatible
– = Incompatible
▨ = Not Applicable

Table 1-3. 8000A ACCESSORIES

ACCESSORY MODEL NO.	DESCRIPTION
C80	Carrying Case, Vinyl (7" x 9½")
C86	Carrying Case, Molded Plastic (8½" x 11")
M00-100-714	Front Panel Dust Cover
M00-200-611	Rack Mounting Kit, Center
M00-200-612	Rack Mounting Kit, Left/Right
M00-200-613	Rack Mounting Kit, Side-By-Side
A80	Deluxe Test Lead Kit
80I-600	AC High Current Probe, Clamp-On (2A–600A)
80K-40	High Voltage Probe
80RF-1	High Frequency Probe (100 kHz to 600 MHz)
81RF	High Frequency Probe (100 kHz to 100 MHz)

1-9. SPECIFICATIONS

DC Voltage

Ranges	±199.9 mV, ±1.999V, ±19.99V, ±199.9V, ±1199V
Accuracy: 1 year, 15°C to 35°C	±(0.1% of reading +1 digit)
Input Impedance	10 Megohms, all ranges
Normal Mode Rejection	Greater than 60 dB @ 50 Hz, 60 Hz
Common Mode Rejection (1 kΩ unbalance)	Greater than 120 dB @ dc and 50 Hz, 60 Hz
Response Time	500 ms
Maximum Input Voltage	1200V dc or 1200V rms (sinusoidal)

AC Voltage

Ranges	199.9mV, 1.999V, 19.99V 1199V
Accuracy: 1 year, 15°C to 35°C	45 Hz to 10 kHz ±(0.5% +2 digits) 10 kHz to 20 kHz ±(1% +2 digits)
Input Impedance	10 megohms in parallel with 100 pf
Common Mode Rejection (1 kΩ unbalance)	Greater than 60 dB @ 50 Hz, 60 Hz
Response Time (within one range)	3 seconds, worst case
Maximum Input Voltage	1200V rms (sinusoidal), not to exceed 10^7 volts - Hz product on 20, 200, 1200V ranges, 500V rms (sinusoidal) on 200mV and 2V ranges

Direct Current

Ranges	±199.9μA, ±1.999mA, ±19.99 mA, ±199.9 mA, ±1999mA
Accuracy: 1 year, 15°C to 35°C	±(0.3% of reading +1 digit)
Voltage Burden	0.3V maximum on all ranges except 0.6V on 2000mA range
Response Time	500 ms
Maximum Input	2 Amps rms (fuse protected)

Alternating Current

Ranges	199.9μA, 1.999mA, 19.99mA, 199.9mA, 1999mA
Accuracy:	
1 year, 15°C to 35°C	45 Hz to 10 kHz ±(1.0% of reading +2 digits) except 2000 mA range 45 Hz to 3 kHz ±(1.0% of reading +2 digits) on 2000 mA
Voltage Burden	0.25V maximum on all ranges except 0.5V on 2000 mA range
Response Time (within one range)	3 seconds
Maximum Input	2 Amps rms (fuse protected)

Resistance

Ranges	199.9Ω, 1.999kΩ,19.99kΩ, 199.9kΩ, 1999kΩ,19.99MΩ
Accuracy:	
1 year, 15°C to 35°C	200Ω, 2kΩ, 20kΩ,200kΩ, 2000kΩ ranges ±(0.2% of reading +1 digit) 20MΩ range ±(0.5% of reading +1 digit)
Response Time	200Ω, 2kΩ, 20kΩ, 200kΩ, 2000kΩ ranges: 500 ms 20MΩ range: 4 seconds
Current through Unknown	200Ω Range 1mA 2kΩ Range 1mA 20kΩ Range 100μA 200kΩ Range 1μA 200kΩ Range 1μA 20MΩ Range 0.1μA
Maximum Input Voltage	200Ω and 2kΩ Ranges 130V rms 20kΩ thru 20MΩ Ranges 250V rms

Temperature Coefficients (−10°C to 15°C and 35°C to 55°C)

DC V	±(0.01% reading/°C +.005% F.S./°C)
DC MA	±(0.015% reading/°C + 0.005% F.S./°C)
KΩ	±(0.015% reading/°C + 0.005% F.S./°C)
10 Meg	±(0.02% reading/°C + 0.005% F.S./°C)
AC V	±(0.01% reading/°C +0.005% F.S./°C)
AC MA	±(0.015% reading/°C + 0.005% F.S./°C)

Environmental

Operating Temp. Range	−10°C to +50°C
Storage Temp. Range	−40°C to +70°D (−40°C to +60°C with Option −01)
Humidity Range	0 to 80% RH
Shock and Vibration	Meets requirements of MIL-T-21200K and MIL-E-16400F

General

Maximum Common Mode Voltage	1200V peak
Display	7-segment LED, 0.25" character height
Size (inches)	2.52 high x 8.55 wide x 9.9 deep (see outline drawing Figure 1-1)
Weight	2¾ lbs. (1,2Kg) without batteries, 4 lbs. (1,8Kg) with Option −01)
Power	100-115-230V ac, 50 to 400 Hz, 2 watts

Battery Pack, Option −01

Continuous Operation	8 hours minimum
Charge Time	≈ 13 hours
Battery Life	300 to 500 charge-discharge cycles

Digital Printer Output Unit, Option −02

Data Available	Polarity, Overload, Digits and Overrange Bit
Flag	Busy (modifiable to Ready)
Control Inputs	Continuous Update and Data Update
Output Logic Levels	Logic 1 = 4.3 to 5.7 volts thru 15 kΩ pullup (modifiable to 15 volts maximum) Logic 0 = 0 to 0.4 volts, will sink 10mA
Printer Reference	5 volts thru 15 kΩ for reference high
Miscellaneous	TTL compatible and buffered outputs

10 Ampere Current Range, Option −05

DIRECT CURRENT

Ranges	±10.00A (1 min. operation from 10A to 20A)
Accuracy (1 year, 15°C to 35°C)	±(0.5% of reading +1 digit)
Voltage Burden	0.5V 0.5V @ 10A plus I · R drop of test leads
Response Time	500 ms

Maximum Input	20A (not fused)
Operating Time	10A and below, continuous Above 10A, 1 minute Max (Duty cycle 25%)

ALTERNATING CURRENT

Ranges	10.00A (1 min. operation from 10A to 20A)
Accuracy (1 year, 15°C to 35°C)	45 Hz to 3 kHz ±(1% of reading +2 digits)
Voltage Burden	0.5V maximum up to 10A
Response Time	3 seconds, worst case
Maximum Input	20A (not fused)
Operating Time	10A and below continuous Above 10A, 1 minute max. (Duty cycle 25%)

Low Ohms Ranges, Option –06

Ranges	1.999Ω, 19.99Ω, 199.9Ω, 1.999kΩ, 19.99kΩ, 199.9kΩ, 1999kΩ, (Note: the 19.99MΩ range has been removed to provide 2Ω and 20Ω function selection.)
Accuracy (1 year, 15°C to 35°C)	±(0.2% of reading +1 digit) all ranges except: ±(0.5% of reading +2 digits) on 20Ω range and ±(1% of reading +2 digits) on 2Ω range, 2Ω and 20Ω accuracy assumes lead resistance zeroed with front panel control
Response Time	500ms, all ranges
Current Through Unknown	2Ω range, 10 mA - 20Ω range, 10 mA
Maximum Input Voltage	2Ω through 2 kΩ ranges 130V rms (Note: Separate input for 2Ω and 20Ω ranges) 20 kΩ through 2000K ranges 250V rms.
Temperature Coefficient (2Ω and 20Ω)	±0.03/°C of input (assumes lead resistance zeroed with front panel control)
Max. Common Mode Voltage	500V peak

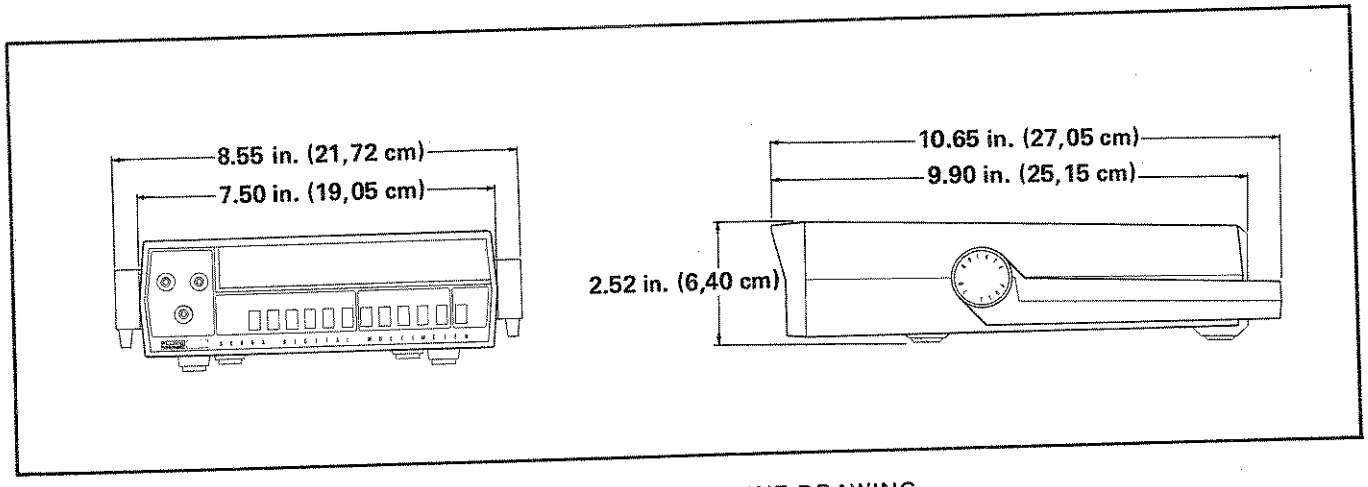


Figure 1-1. 8000A OUTLINE DRAWING

Section 2
Operating Instructions

2-1. INTRODUCTION

2-2. This section of the manual contains information regarding installation and operation of the Model 8000A DMM. It is recommended that the contents of this section be read and understood before any attempt is made to operate the instrument. Should any difficulties arise during operation, please contact your nearest John Fluke Sales Representative, or the John Fluke Mfg. Co., Inc., P.O. Box 43210, Mountlake Terrace WA, 98043, Tel.(206) 774-2211. A list of Sales Representatives is located in Appendix C of this manual.

2-3. SHIPPING INFORMATION

2-4. The 8000A is packaged and shipped in a foam-packed container. Upon receipt of the instrument, a thorough inspection should be made to reveal any possible shipping damage. Special instructions for inspection and claims are included in the shipping carton.

2-5. If reshipment of the instrument is necessary, the original container should be used. If the original container is not available, a new container can be obtained from the John Fluke Mfg. Co., Inc. Please reference the instrument model number when requesting a new shipping container.

2-6. INPUT POWER

2-7. The 8000A is factory wired to operate from one-of-three ac line voltages. These are: 100V ac, 50 to 400 Hz; 115V ac, 50 to 400 Hz; and 230V ac, 50 to 400 Hz. Before connecting the 8000A to the ac line, check to insure that the instrument is wired to accomodate the local line voltage. A decal on the underside of the 8000A specifies the particular line voltage required to operate the instrument.

2-8. The rear panel power input connector is a three-prong, U-ground connector which permits the instrument to be connected, via the power cord, to the appropriate line power. The offset prong on this connector is connected to the 8000A power supply, and should be connected, via the power cord, to a high quality earth ground.

2-9. RACK INSTALLATION

2-10. The 8000A is designed for either bench-top use or for installation in a standard 19-inch equipment rack using an optional accessory rack mounting kit. Rack mounting kits are available for left, right, center, or side-by-side mounting of the 8000A. Information regarding installation of the rack-mounting accessories is given in Section 6 under Rack Installation.

2-11. OPERATING FEATURES

2-12. The location of all 8000A controls, indicators and connectors are shown in Figure 2-1, and described in Table 2-1.

2-13. OPERATING NOTES

2-14. The following paragraphs describe various conditions which should be considered before operating the 8000A.

2-15. Option Information

2-16. Supplementary information is necessary when operating an 8000A which is equipped with one or more options. Detailed information regarding the operation of each available option is given in Section 6, Options and Accessories.

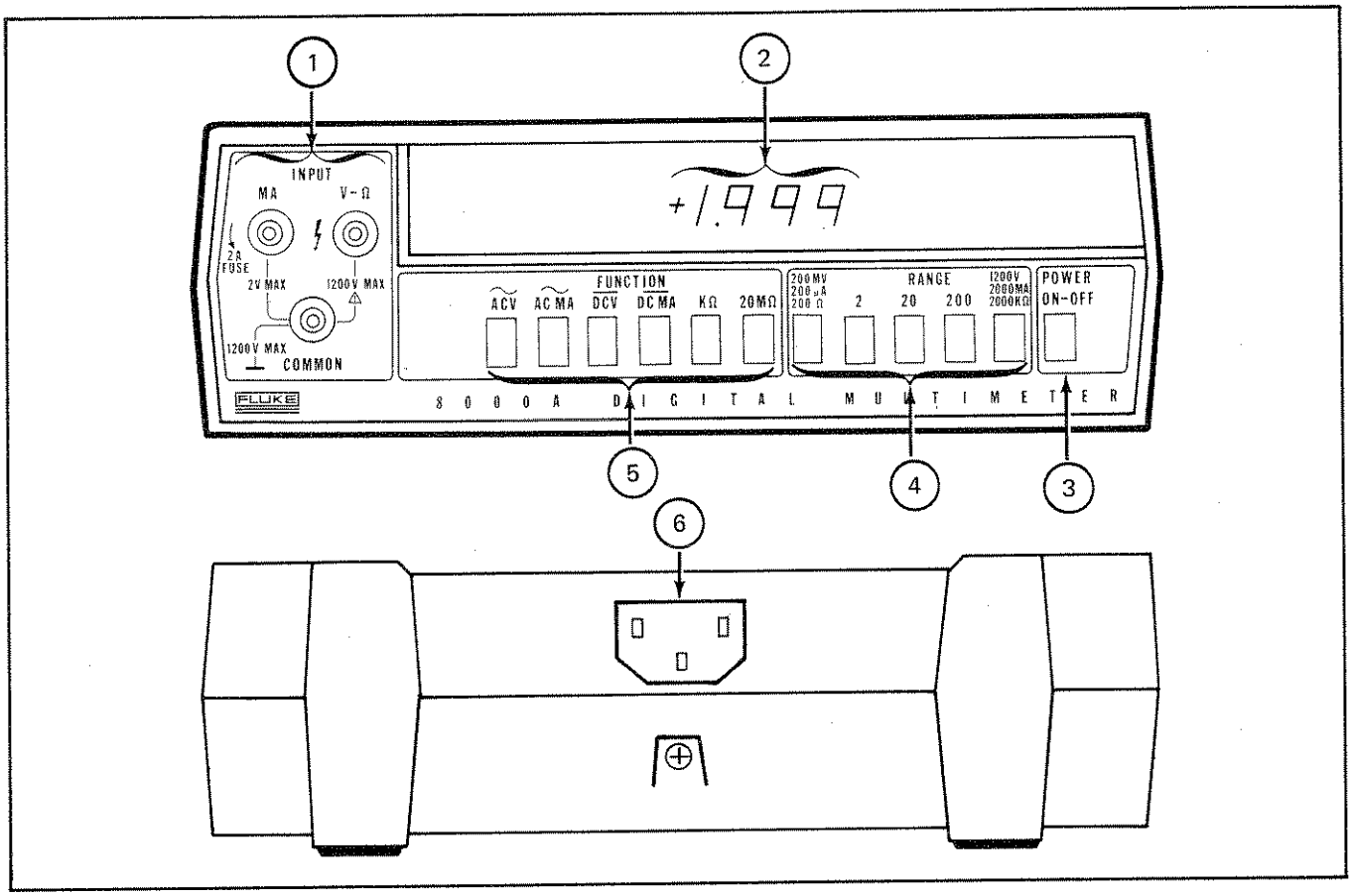


Figure 2-1. 8000A CONTROLS, INDICATORS AND CONNECTORS

Table 2-1. 8000A CONTROLS, INDICATORS AND CONNECTORS

FIG. 2-1 REF. NO.	NAME	FUNCTION
1	INPUT Connectors	Provides the input connections necessary to make current (MA), voltage (V), or resistance (Ω) measurements. All measurements are referenced to the COMMON INPUT connector.
2	Digital Readout	Provides a 3½ digit display (1999 maximum) of the measured input. The readout also includes a properly positioned decimal point, and a + or − sign for dc voltage and current measurements.
3	POWER Switch	Switches the 8000A on or off. The instrument is turned-on when the switch is depressed.
4	RANGE Switches	Provide pushbutton selection of one-of-five ranges which correspond to the selected function (current, voltage, or resistance). The available ranges are: Voltage: 200 MV, 2, 20, 200 and 1200V Current: 200µA, 2, 20, 200 and 2000 MA Resistance: 200Ω, 2, 20, 200 and 2000kΩ
5	FUNCTION Switches	Provide pushbutton selection of one-of-six measurement functions; ACV, AC MA, DCV, DC MA, KΩ, or 20MΩ.
6	Input Power Connector	Provides the means of connecting the instrument through the power cord to the ac power line.

2-17. Fuses

2-18. The 8000A is equipped with a line power fuse, and a current overload fuse for the current measuring function. The line fuse is located near the transformer on the inside of the instrument. To gain access, remove the retaining screw on the rear of the case and remove the instrument from the case. When replacement is necessary, use an AGC 1/8A fuse. The current input fuse is located behind the front-panel MA INPUT terminal, and is accessed by turning (ccw) and removing the MA INPUT terminal. Use a 2 amp AGX replacement fuse.

2-19. Overrange Indication

2-20. The front panel display, in addition to providing a measurement reading, is designed to serve as an overrange indicator. When the full scale capability of the selected range for any function is exceeded, the display will blink while indicating a full scale reading. The presence of an overrange indication does not necessarily mean that the instrument is being exposed to a damaging input condition.

2-21. Input Overload Protection 

CAUTION

Exceeding the maximum input overload conditions can damage the 8000A. Read Tables 2-2 and 2-3 before attempting to operate the instrument.

2-22. Each range and function of the 8000A is equipped with input overload protection. The maximum allowable input overload conditions for each function and range are given in Table 2-2.

2-23. OPERATION

2-24. Use the following procedure for initial turn-on of the 8000A:

a. Connect the instrument to ac line power. (See Paragraph 2-6)

b. Depress the POWER switch.

c. In accordance with Table 2-3, select the desired function and range; connect the test leads to the corresponding input connectors.

NOTE

Supplemental instructions may be required for instruments with options installed. These instructions, if any, are given in Section 6, Options and Accessories.

Table 2-2. 8000A MAXIMUM ALLOWABLE INPUT OVERLOAD CONDITIONS

SELECTED FUNCTION	SELECTED RANGE	MEASUREMENT INPUT CONNECTIONS	MAXIMUM INPUT OVERLOAD LIMITS
DC V	200MV, 2, 20, 200, or 1200V	V-Ω and COMMON	1200V dc or 1200V rms (sinusoidal)
DC MA	200μA, 2, 20, 200, or 200MA	MA and COMMON	① 2A (Fuse Protected)
AC V	20, 200 or 1200V	V-Ω and COMMON	1200V rms (sinusoidal), not to exceed 10^7 V - Hz
	200MV or 2V	V-Ω and COMMON	500V rms (sinusoidal)
AC MA	200μA, 2, 20, 200 or 2000MA	MA and COMMON	① 2A (Fuse Protected)
KΩ	200Ω or 2	V-Ω and COMMON	130V rms
	20, 200 or 2000KΩ	V-Ω and COMMON	250V rms
20MΩ	Not Applicable	V-Ω and COMMON	250V rms
Any	Any	Earth Ground and COMMON	1200V peak

① When measuring currents from sources having compliance voltages greater than 32 volts, replace the 2A current fuse with one of the required rating. (Later production instruments are equipped with a 250 - volt, 2A current fuse.)

Table 2-3. 8000A MEASUREMENT INSTRUCTIONS

DESIRED MEASUREMENT	SELECT FUNCTION	SELECT RANGE	MEASUREMENT INPUT CONNECTIONS
DC Volts	DC V	200MV, 2, 20, 200 or 1200V	V-Ω and COMMON
① DC Milliamperes	DC MA	200μA, 2, 20, 200 or 2000MA	MA and COMMON
AC Volts	AC V	200MV, 2, 20, 200 or 1200V	V-Ω and COMMON
① AC Milliamperes	AC MA	200μA, 2, 20, 200 or 2000MA	MA and COMMON
Kilohms	KΩ	200Ω, 2, 20, 200 or 2000KΩ	V-Ω and COMMON
Megohms	20MΩ	Not Applicable	V-Ω and COMMON

① To accommodate unusually high compliance voltages during current measurements, it may be necessary to use an externally-connected 1.5A (max.) fuse of the required voltage rating.

Section 3
Theory of Operation

3-1. INTRODUCTION

3-2. This section of the manual contains a simplified block diagram analysis followed by circuit description of the Model 8000A DMM. Simplified block diagrams and circuit diagrams are included, as necessary, to supplement the text. Schematic diagrams are included in Section 8 of this manual.

3-3. SIMPLIFIED BLOCK DIAGRAM ANALYSIS

3-4. Introduction

3-5. The 8000A, as shown in the simplified block diagram of Figure 3-1, can be divided into three major sections; the Input Signal Conditioner, the Analog-to-Digital (A/D) Converter, and the Front Panel Display. Each section is discussed separately in the following paragraphs.

3-6. Input Signal Conditioner

3-7. The function of the Input Signal Conditioner is to condition the applied input, according to the selected function, and to provide a scaled dc output voltage which is proportional to the applied input. The output voltage will be from 0 to ±0.2V dc, or 0 to ±2.0V dc depending on range selected. The RANGE switches, located in the Input Divider and Current Shunt circuits, scale the input signal to a level which is acceptable for the selected function. The FUNCTION switches place the Signal Conditioner in the configuration necessary to process the input signal.

3-8. A/D Converter

3-9. The A/D Converter changes the analog dc output voltage of the Signal Conditioner into a digital representation. This is accomplished in two stages using a voltage-to-frequency converter (Analog IC) and a digital counter/processor (Digital IC). The A/D Converter also controls the measurement and display period of the 8000A.

3-10. Display

3-11. The Display section of the 8000A accepts digital information from the A/D converter, and converts it into a visual, numeric presentation which corresponds to the value of the applied input signal. The display is updated at a rate governed by the A/D converter.

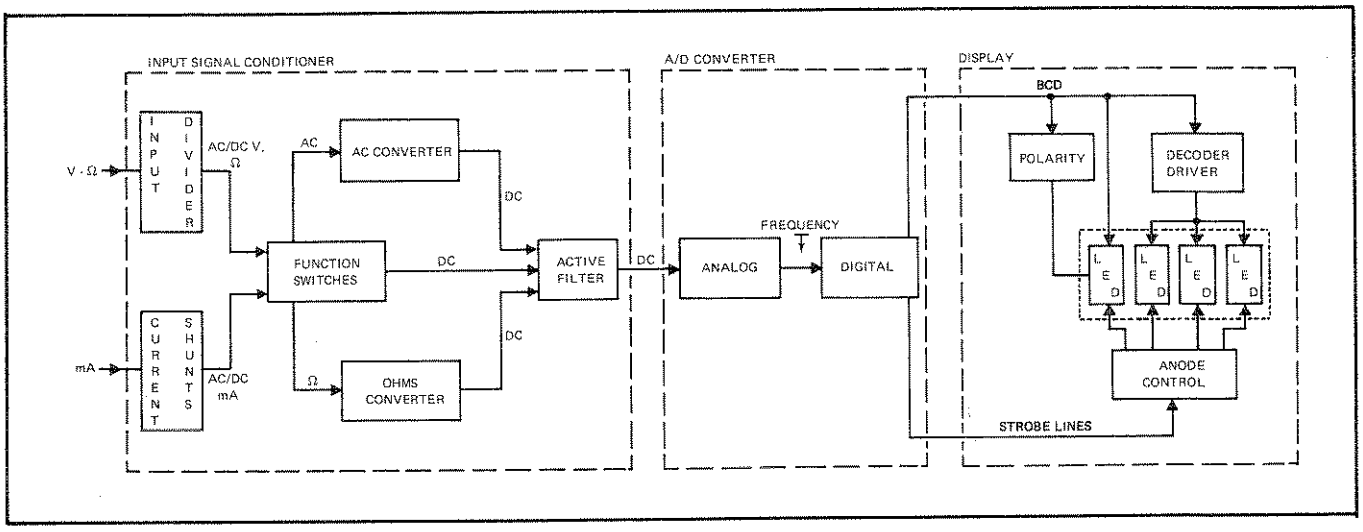


Figure 3-1. MODEL 8000A BLOCK DIAGRAM

3-12. CIRCUIT DESCRIPTION

3-13. The following circuit descriptions are keyed to the functional blocks defined in the simplified block diagram of Figure 3-1. Corresponding functional blocks are defined in the detailed schematics in Section 8. Refer to the schematics while reading the following circuit descriptions.

3-14. Signal Conditioning

3-15. INPUT VOLTAGE DIVIDER

3-16. Three series connected resistors (R1, R2 and R3) totaling 10 megohms are tapped to provide division ratios of 100 or 1000 to 1. The 20 and 200V ranges use the 100:1 tap, and the 1200V range uses the 1000:1 tap.

3-17. Trimming capacitors are connected across the Input Voltage Divider to maintain a flat frequency response when used for ac voltages. High frequency compensation during calibration can be accomplished with variable trimmer capacitor C3.

3-18. CURRENT SHUNTS

3-19. The current shunts consist of resistors R44 through R48. Series-connected resistors R44 through R47 are switched into the circuit, depending upon the RANGE selected. The resistor steps are 1000, 100, 10, and 1 ohms for the 0.2, 2, 20, and 200 milliampere ranges, respectively. A separate 100 milliohm four terminal shunt is used for the 2000MA range.

3-20. The maximum voltage developed across a single shunt or combination of shunts for full range indication is 0.2 volts. Current overload protection above 2 amperes is provided by fuse F2. The shunts are protected against over-voltage by diodes CR9 through CR12.

3-21. AC CONVERTER

3-22. The AC Converter consists of a buffer and an active rectifier (refer to Figure 3-2). Transistor Q1, connected as a voltage follower, operates as a buffer for the active rectifier. The buffer output is applied as a voltage, e_{in} to the non-inverting input of the operational amplifier. Negative feedback causes the voltage at the inverting input to follow the non-inverting input, causing a current, $e_{in}/R2$, through R2 to ground. Since diodes CR1 and CR2 conduct on alternate half cycles, one-half the average current flows through R1. The rectified voltage developed across R1 is filtered by R3 and C1 to produce the dc voltage required for the A/D Converter.

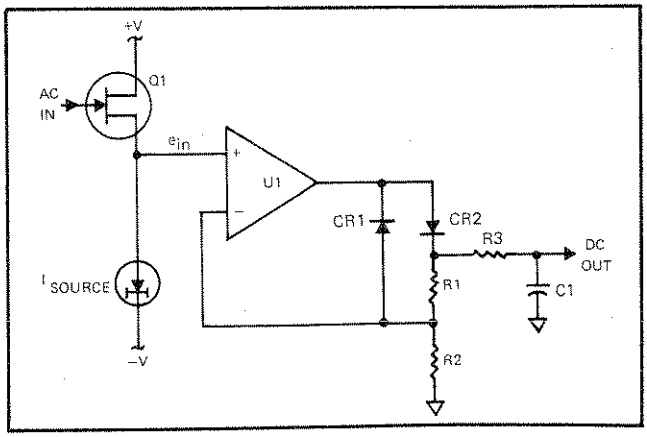


Figure 3-2. AC CONVERTER SIMPLIFIED DIAGRAM

3-23. The input to the AC Converter is in either the 0.2 volt or 2 volt basic range. To accommodate either range, the gain of the operation rectifier is adjusted accordingly by changing the feedback resistor (symbolized by R1). In the instrument, R51 sets the gain at unity for the 2 volt basic range. For the 0.2 volt basic range, the gain is increased by 10 by switching R50 in parallel with R51.

3-24. OHMS CONVERTER

3-25. The Ohms Converter supplies a dc voltage, proportional to the unknown resistance (R_X), to the A/D Converter. A simplified diagram of the circuit elements involved is illustrated in Figure 3-3. Operational Amplifier U2 bootstraps the current source. With the non-inverting input connected to the junction of R_A and R_X, current will flow through R_A and R_X such that a constant voltage is maintained across R_A for a given RANGE. If R_X is within the range selected, the voltage developed will be proportional to the value of R_X. For resistance ranges 200 ohms through 2000 kilohms, the constant voltage maintained is 10 volts. In the 20 megohm range, U2's feedback resistor, R_F, is changed so that a 1 volt potential is maintained.

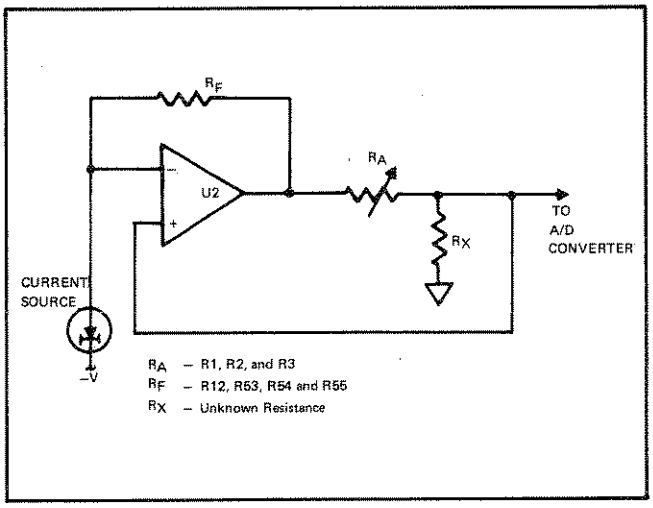


Figure 3-3. OHMS CONVERTER SIMPLIFIED DIAGRAM

3-26. ACTIVE FILTER

3-27. The Active Filter ensures that the input to the A/D Converter receives only dc voltages. The operational amplifier (U2) used for the Ohms Converter is also used in conjunction with R18, C11, R19, and C12 to form a two-pole Bessel-type active filter (see Figure 3-4). A cutoff frequency of 10 Hz and a 60 Hz rejection ratio of 32 db is provided by this filter. Normal mode rejection at frequencies other than even multiples of the integration period is also provided. Overloading of the A/D Converter by large ripple voltages is prevented by the filter.

3-28. Analog-to-Digital Converter

3-29. GENERAL

3-30. The A/D Converter uses a voltage-to-frequency conversion technique. A dc voltage at the input of the A/D Converter is changed to a frequency by the Analog Integrated Circuit. This frequency is characteristic of the magnitude and polarity of the dc input voltage. Counting of the output frequency from the Analog IC is accomplished by the Digital IC. The resultant count is transferred (in binary coded decimal format) to the display section.

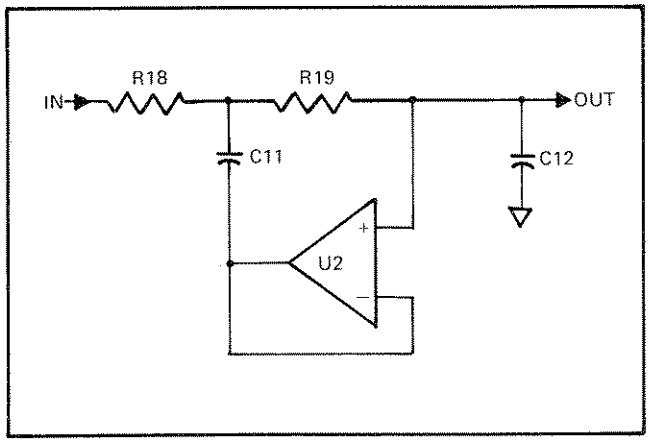


Figure 3-4. ACTIVE FILTER SIMPLIFIED DIAGRAM

3-31. ANALOG IC

3-32. The Analog IC is an LSI device which contains a two-input multiplexer, an amplifier, and a voltage controlled oscillator (VCO). In operation, the Analog IC samples between a reference voltage (0 V dc) and the output of the Active Filter (0 to ±.2 or 0 to ±2V dc) to provide two separate output frequencies. The difference between the two frequencies is an accurate digital representation of the input voltage. This A/D conversion technique automatically eliminates the zero-offset errors which are in-

herent in many A/D converters. For example, if the VCO rest frequency is ≈ 40 kHz during the reference sample and a 0V dc input is present during the voltage sample, the output of the VCO does not change. No change is equal to 0V dc. Therefore, as long as the oscillator does not drift during the two sample periods a zero-offset error cannot exist.

3-33. The range resistor, in Figure 3-5, symbolizes the dual range capability of the Analog IC. This resistance, external to the IC, consists of series resistors R23, R57, R25 and R58. When the instrument is in the 2 volt basic range, all four resistors are used to scale the current to the V/F Converter. Variable resistor R25 is the calibration adjustment for this range. For operation in the 0.2 volt basic range, the switching provides a short across R25 and R58. Therefore, only resistor R57 and calibration adjustment R23 scale the current to the proper level for the V/F Converter.

3-34. Timing circuitry for the A/D Converter is contained in the Analog IC. The connection between the Analog IC and the Digital IC is through R41, Q6, R56, and adjustment R20. Overload protection for the Analog IC is provided by transistors Q20 and Q21. Negative overload voltages are handled by Q20 and positive overloads by Q21.

3-35. DIGITAL IC

3-36. The output from the Analog IC alternates between the rest frequency during one time period, and a frequency corresponding to the A/D Converter input voltage during the next time period. Reversible counters in the Digital IC count these frequencies such that their difference is used to provide the bcd measurement information.

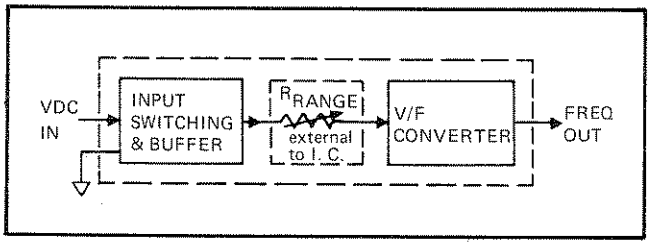


Figure 3-5. ANALOG IC BLOCK DIAGRAM

3-37. A four-line bcd output (W-X-Y-Z on schematic) and a four-line strobing pulse output (S1-S2-S3-S4 on schematic) are provided by the Digital IC to the Display section. The bcd lines W-X-Y-Z correspond to binary 8-4-2-1 positions, respectively.

3-38. Display

3-39. POLARITY

3-40. The polarity indicator consists of horizontal and vertical LED segments of DS1. These segments are strobed during the S1 time period, when the instrument is in the DCV or DC MA function. The horizontal segment is used alone for a negative indication, and together with the vertical segment to build a positive indication. Consequently, the horizontal segment must illuminate during each S1 time period. This is accomplished by S3D (DCV) or S4C (DC MA) which ground the cathodes of the horizontal LED segment. Illumination of the vertical segment relies upon the digital information provided by the Y bcd line during S1 time. When a positive voltage or current is applied to the INPUT terminals, the Y line goes high. This turns on Q8 and Q10 which allow the vertical segment to illuminate. With the Y line low Q8 and Q10 are cut off and the vertical segment does not illuminate.

3-41. DECODER DRIVER

3-42. The Decoder Driver, U5, translates the bcd information on the W-X-Y-Z lines for application to the LED readouts DS2, DS3, and DS4. Low inputs are provided by the Decoder Driver through a resistor network RN1 to the LED segments for construction of decimal numbers.

3-43. DECIMAL POINT

3-44. The LED readouts DS2, DS3, and DS4 contain a decimal point which is controlled by the RANGE switches. The selected range causes the resistor network RN2 to supply a negative voltage to the cathode of the decimal segment. Note on the schematic that the 20MΩ FUNCTION, which requires no range selection, shares the 20 RANGE decimal point of DS2.

3-45. ANODE CONTROL

3-46. The Anode Control circuit, Q11 through Q18 applies +5V dc to the anodes of the LED readouts. Strobe

pulses from the Digital IC determine which readout receives the proper anode voltage at a particular time. The strobe pulse sequence is S1-S3-S2-S4, yielding a display sequence of DS1-DS3-DS2-DS4. For example: when S2 goes high, Q12 and Q16 turn-on and apply approximately +5V dc to the anodes of the LED segments on DS2. Those segments with negative voltages on their cathodes, at S2 time, will illuminate and form a decimal number.

3-47. LED READOUTS

3-48. The LED readouts DS2, DS3, and DS4 each contain 7½ diode segments. One-half of a segment for a decimal point and seven segments to form decimal numbers. The segments are designated A through G for each readout on the schematic.

3-49. Readout DS1 indicates the most significant digit (MSD) and polarity. Two segments form a numerical "1" and two segments to form the polarity signs. Control of the MSD "1" indication is separate from the other readouts. The bcd information is produced on the Z line during the S1 time period. When line Z is high during time S1, Q7 and Q9 turn on to allow the "1" segment to illuminate.

3-50. Power Supply

3-51. The power supply, shown in the schematic diagram, provides ±15 and +5V dc outputs. Diode bridge CR15 through CR18 and filter capacitors C17 and C18 supply the unregulated ±15V dc. Diodes CR13 and CR14, and filter capacitor C19 supply the unregulated +5V dc.

Section 4
Maintenance

4-1. INTRODUCTION

4-2. This section of the manual contains maintenance information for the Model 8000A DMM. This includes service information, general maintenance, performance test, calibration and troubleshooting. The performance test is recommended as a preventative maintenance tool, and should be executed when it is necessary to verify proper instrument operation. A calibration interval of one year is recommended to insure that the 8000A is within the one-year specifications. Troubleshooting information is given in the form of flow charts at the end of this section. Table 4-1 lists the recommended test equipment necessary to maintain the 8000A. If the specified equipment is not available, other equipment having equivalent specifications may be used.

4-3. The Model 8000A DMM is warranted for a period of one year upon delivery to the original purchaser. The WARRANTY is given on the back of the title page located in the front of this manual. For the WARRANTY to become effective, the validation card included with the instruction manual must be completed and returned to the John Fluke Mfg. Co., Inc.

4-4. A unique 48-hour turnaround service is provided for the 8000A. Should your instrument need repair, send it to the nearest authorized service center. A complete list of service centers is included with the WARRANTY. Shipping information is given in Section 2 of this manual. If requested, an estimate will be provided to the customer before work is begun on instruments that are beyond the warranty period.

Table 4-1. RECOMMENDED TEST EQUIPMENT

EQUIPMENT NOMENCLATURE	SPECIFICATIONS	RECOMMENDED EQUIPMENT
DC Voltage Source	190mV to 1200V ±0.03%	Fluke Model 341A
DC Current Source	190μA to 1.9A ±0.1%	Fluke Model 382A
AC Voltage Source	190mV to 1200V (45Hz to 10 kHz) ±0.1%	Fluke Models 5200A/5205A
	190mV to 1200V (10 kHz to 20 kHz) ±0.2%	
AC Current Source	190μA to 190mA (100 Hz to 10 kHz) ±0.3%	Optimation AC 105, and Fluke Models 540B, 382A, A45, and A40 shunts (20mA, 200mA, and 2A)
	1.9A (100 Hz to 3 kHz) ±0.3%	
Resistors	190Ω, 1.9 kΩ, 19kΩ, 1.9MΩ and 19MΩ ±0.1% 1.9Ω, and 19Ω ±0.1% (–06 Option only)	
Frequency Counter	To measure positive 100 msec. pulse with 1μsec resolution	Fluke Model 1952B
Oscilloscope	General Purpose	Tektronix 545B W/1A1 plug-in

4-5. GENERAL MAINTENANCE

4-6. Access Information

4-7. Use the following procedure to gain access to the interior of the 8000A:

a. Set the POWER switch to off, and disconnect the line cord.

b. Remove the phillips screw at the rear of the instrument case.

c. Separate the instrument from the case.

4-8. Cleaning

4-9. Clean the 8000A periodically to remove dust, grease and other contamination. Use the following procedure:

CAUTION

Do not use aromatic hydrocarbons or chlorinated solvents to clean the 8000A. They will react with the plastic materials used in the instrument.

a. Clean the surface of the pcb using clean dry air at low pressure ($\leqslant$ 120 psi). If grease is encountered, spray with Freon T.G. Degreaser and remove grime with clean dry air at low pressure.

b. Clean the front panel and case with a soft cloth dampened with a mild solution of detergent and water.

4-10. Fuse Replacement

4-11. The input power fuse F1 is located on the interior of the instrument near the power transformer. If replacement is necessary, use an AGC 1/8A fuse (Use MDL 1/8A for battery powered instruments).

4-12. The current shunt protection fuse F2, is located behind the front panel MA INPUT connector. To remove the fuse, turn the MA INPUT connector ccw and pull it out. Use a 2 amp AGX replacement fuse.

4-13. Service Tools

4-14. No special tools are required to maintain or repair the 8000A.

4-15. PERFORMANCE TEST

4-16. The performance test is designed to verify the overall operation of the 8000A. The test can be used as an acceptance check and/or periodic maintenance check. Table 4-1 lists the equipment required to perform this test. If the 8000A fails any part of the performance test, corrective action is indicated. Troubleshooting information for fault isolation is given later in this section.

NOTE

The performance test should be performed at an ambient temperature of +22 to +25°C and at a relative humidity of less than 70%.

4-17. Zero Offset Test

4-18. Use the following procedure to test the zero offset of the 8000A:

a. Energize the instrument and depress the DCV and 200mV pushbuttons.

b. Place a shorting jumper between the V-Ω and COMMON input connectors. The readout should indicate 00.0, flashing $\pm$00.1 not more than 10 times in 10 seconds.

c. Remove the shorting jumper. The readout should indicate $\leqslant\pm$01.0.

4-19. Accuracy Test

4-20. The accuracy test compares the instruments performance to the accuracy specifications listed in Section 1. Use the following procedure to perform the accuracy test:

a. Set the 8000A FUNCTION and RANGE switches to AC MA and 2000 MA, respectively,

b. Connect the output of the ac current source to the MA and COMMON INPUT connectors of the 8000A.

c. Refer to Table 4-2. Sequentially select each range and apply the corresponding ac current at the frequency listed. Check to insure that the 8000A readout is within the limits shown.

d. Refer to paragraph 4-31, Range Adjustments/Checks, and check the accuracy of each of the remaining functions and ranges. Disregard the adjustment column of Table 4-3.

4-21. CALIBRATION

4-22. The 8000A should be calibrated at least once a year or whenever repairs have been made. Calibration should be accomplished at an ambient room temperature of +22 to +25°C, and at a relative humidity of less that 70%. Table 4-1 lists the required equipment.

4-23. Initial Procedure

4-24. Remove the case from the 8000A and energize the instrument.

WARNING !

The input power connector is at the ac line potential (100, 115 or 230V ac). Use caution when working in this area.

Table 4-2. AC MA PERFORMANCE CHECKS

RANGE	INPUT	DISPLAY LIMITS
200μA	190μA @ 100 Hz	187.9 to 192.1
200μA	190μA @ 10 kHz	187.9 to 192.1
2	1.9 mA @ 100 Hz	1.879 to 1.921
2	1.9 mA @ 10 kHz	1.879 to 1.921
20	19 mA @ 100 Hz	18.79 to 19.21
20	19 mA @ 10 kHz	18.79 to 19.21
200	190 mA @ 100 Hz	187.9 to 192.1
200	190 mA @ 10 kHz	187.9 to 192.1
2000 mA	1.9A @ 100 Hz	1879 to 1921
2000 mA	1.9A @ 3 kHz	1879 to 1921

4-25. Period Adjustment

4-26. Use the following procedure to adjust the 8000A measurement period:

a. Connect the frequency counter between TP5 and TP4 (common) as shown in Figure 4-1.

b. Set the frequency counter to the time interval operating mode.

c. Using an appropriate adjusting tool, adjust R20 (Period), shown in Figure 4-1, for a time period of 100 ms ±5μs. Variations of the time period should be ⩽ ±15μs.

4-27. Zero Offset Adjustment

4-28. The zero offset adjustment procedure applies only to instruments which fall into the catagory of Use Code D. The used codes are keyed to the instrument serial numbers and are given in paragraph 5-7. Use the following procedure to adjust the zero offset.

a. Depress the DCV and the 200 mV pushbuttons.

b. Install a shorting jumper between the V-Ω and COMMON input connectors.

c. The readout should indicate 00.0, flashing ±00.1 not more than 10 times in 10 seconds. Adjust R15, if required, to meet these limits.

d. Remove the shorting jumper. The readout should indicate ⩽ ±01.0.

4-29. Turn-Over Error Adjustment

4-30. Use the following procedure to adjust the turn-over error:

NOTE

Procedural steps noted with Use Code D apply only to instruments which fall into that catagory. The use codes are determined according to the instrument serial number and are listed in paragraph 5-7. Procedural steps which do not specify a use code apply to all 8000A's.

a. Depress the DCV and the 200 MV pushbuttons.

b. Connect a dc voltage source to the V-Ω and COMMON inputs. Set the supply for a +190 mV output.

c. Adjust R23 (see Figure 4-1) for a readout of +190.0.

d. Change the input voltage from +190 mV to −190 mV.

e. Readout should indicate −190.0 ±.1.

f. Use Code D only. If the instrument is not within limits adjust R15 to bring the instrument within the −190.0 ± .1 indication.

g. Use Code D only. Check and, if necessary, re-adjust the zero offset, paragraph 4-27.

4-31. Range Adjustment/Checks

4-32. The 8000A range adjustments are accomplished in accordance with the instructions given in Table 4-3. Perform each adjustment and/or check in the order listed. The shaded areas of the table separate the adjustments from the checks. Refer to Figure 4-1 for the location of the specified adjustment. The following test equipment from Table 4-1 is used to provide the input specified for each function.

a. DCV - DC Voltage Source

b. 20MΩ - Resistors

c. KΩ - Resistors

d. DC MA - DC Current Source

e. ACV - AC Voltage Source

4-33. TROUBLESHOOTING

4-34. The following information is designed to aid in troubleshooting the 8000A. Fault isolation is achieved by executing the performance test and isolating the problem to a functional circuit group using troubleshooting flow charts. The flow chart symbols are defined in Figure 4-2 and the troubleshooting flow charts are given in Figure 4-3.

4-35. If a component is found to be defective in either the Input Divider Resistor Set, the Analog Resistor Set, or the Ohms Resistor Set, the complete set must be replaced. The components contained in each set are listed on page 5-14 by reference designator. Typical descriptions of each component are also given.

4-36. Replacement Analog IC's and Digital IC's are packed in conductive foam when shipped. To protect them from damage by static discharge, they should not be removed from the conductive foam until the time of installation. The personnel handling the devices, and the working surface must be grounded.

Table 4-3. 8000A ADJUSTMENTS AND CHECKS

FUNCTION/ RANGE	INPUT	ADJUSTMENT	DISPLAY LIMITS
DCV/ 200 MV	+190 MV	"200 MVDC" (R23) Adjust for +190.0	+189.7 to +190.3
DCV / 2	+1.9V dc	"2 VDC" (R25) Adjust for +1.900	+1.897 to +1.903
DCV / 20	+19V dc	– – – – – – –	+18.97 to + 19.03
DCV / 200	+190V dc	– – – – – – –	+189.7 to +190.3
DCV / 1200V	+1000V dc	– – – – – – –	+998 to +1002
20 MΩ [1]	19 MΩ	"20 M" (R55) Adust for 19.00	18.89 to 19.11
KΩ / 20	19 KΩ	"K OHM" (R12) Adjust for 19.00	18.95 to 19.05
KΩ / 200Ω	190Ω	– – – – – – –	189.5 to 190.5
KΩ / 2	1.9K Ω	– – – – – – –	1.895 to 1.905
KΩ / 200	190 KΩ	– – – – – – –	189.5 to 190.5
KΩ / 2000 KΩ	1.9 MΩ	– – – – – – –	1895 to 1905
DC MA /200 μA	+190 μA	– – – – – – –	+189.3 to +190.7
DC MA / 2	+1.9 mA	– – – – – – –	+1.893 to +1.907
DC MA / 20	+19 mA	– – – – – – –	+18.93 to +19.07
DC MA / 200	+190 mA	– – – – – – –	+189.3 to +190.7
DC MA / 2000 MA	+1.9A	– – – – – – –	+1893 to 1907
ACV / 200 MV	190mV@100Hz	– – – – – – –	188.8 to 191.2
ACV / 200 MV	190mV@20kHz	– – – – – – –	187.9 to 192.1
ACV / 2	1.9V @ 100 Hz	– – – – – – –	1.888 to 1.912
ACV / 2	1.9V@20 kHz	– – – – – – –	1.879 to 1.921
ACV / 20	19V @ 20kHz	"HF ADJ" (C3) Adjust for 19.00	18.79 to 19.21
ACV / 20	19V @ 10 kHz	– – – – – – –	18.88 to 19.12
ACV / 200	190V@10 kHz	– – – – – – –	187.9 to 192.1
ACV / 200	190 @ 20 kHz	– – – – – – –	187.9 to 192.1
ACV / 1200V	1000V@100 Hz	– – – – – – –	993 to 1007
ACV / 1200V	1000V @ 10kHz	– – – – – – –	988 to 1012
LO Ω / 20	SHORT	NULL	0.00
[2]	19Ω	LO OHM (R78) Adjust for 19.00	18.88 to 19.12
LO Ω / 2	SHORT	NULL	0.00
[2]	1.9Ω	– – – – – – –	1.879 to 1.921

[1] The 20 MΩ function is not included on instruments with the –06 Option (LO Ω).

[2] The LO Ω function is only included on instruments with the –06 Option. Refer to Section 6 for operating instructions.

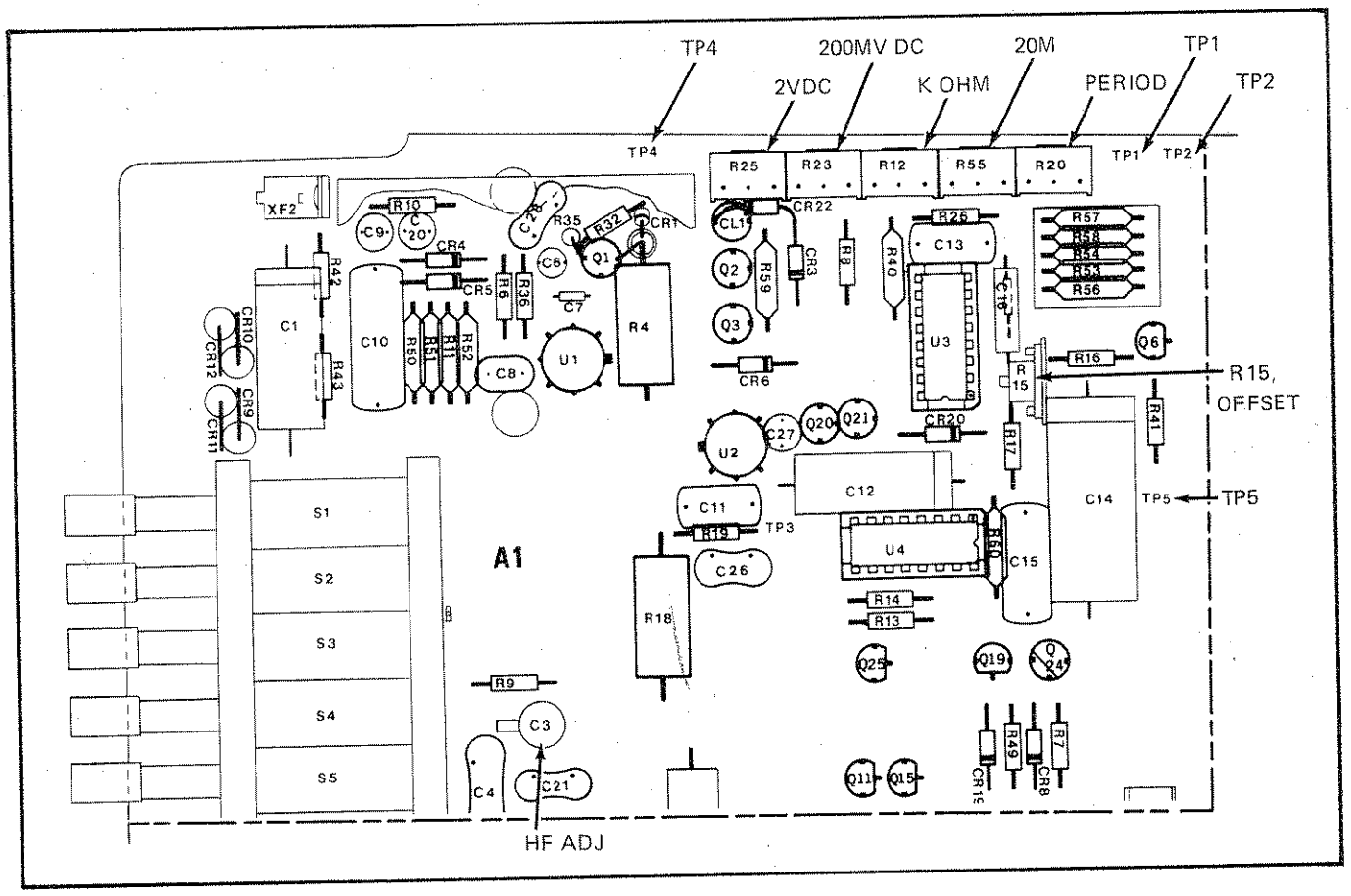


Figure 4-1. ADJUSTMENT AND TEST POINT LOCATIONS

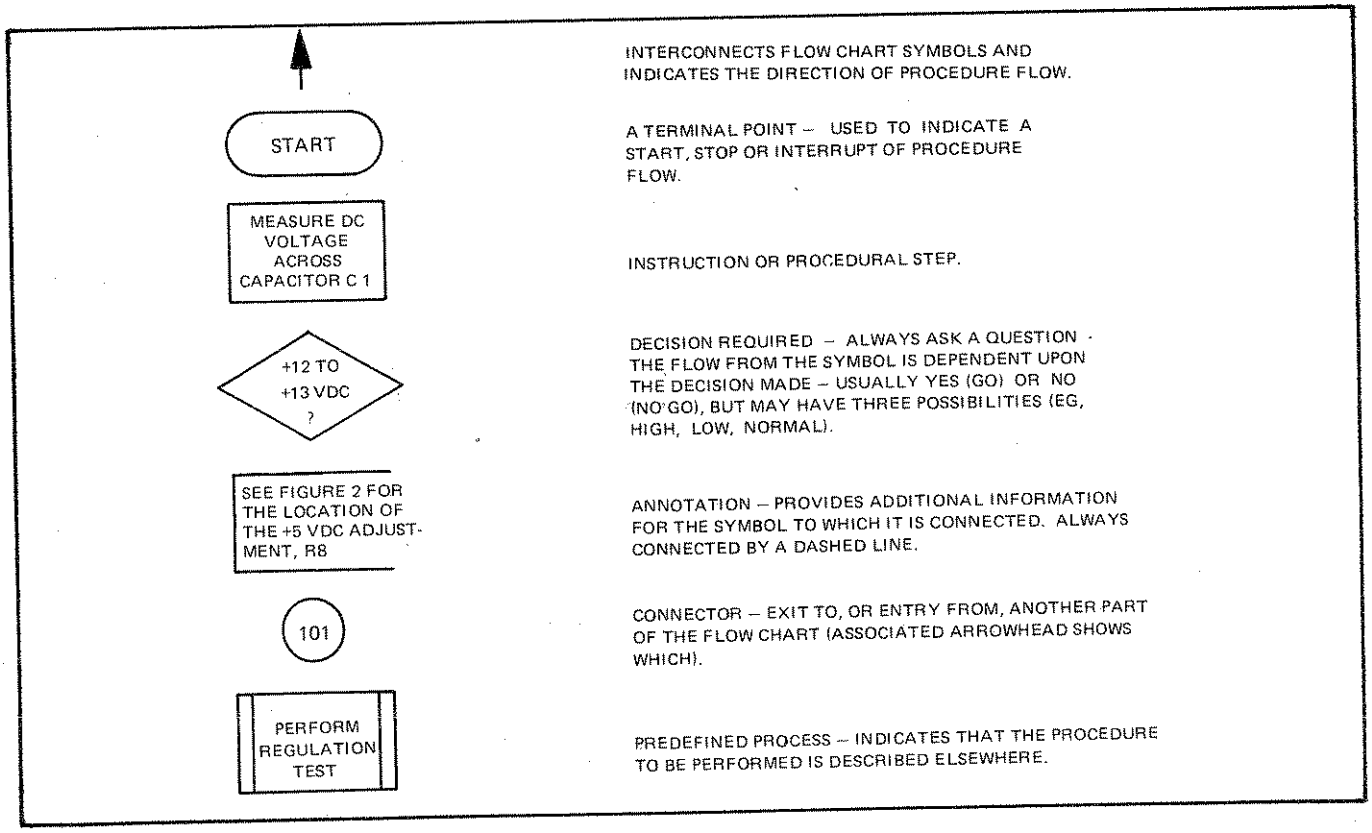


Figure 4-2. TROUBLESHOOTING FLOW CHART SYMBOLS

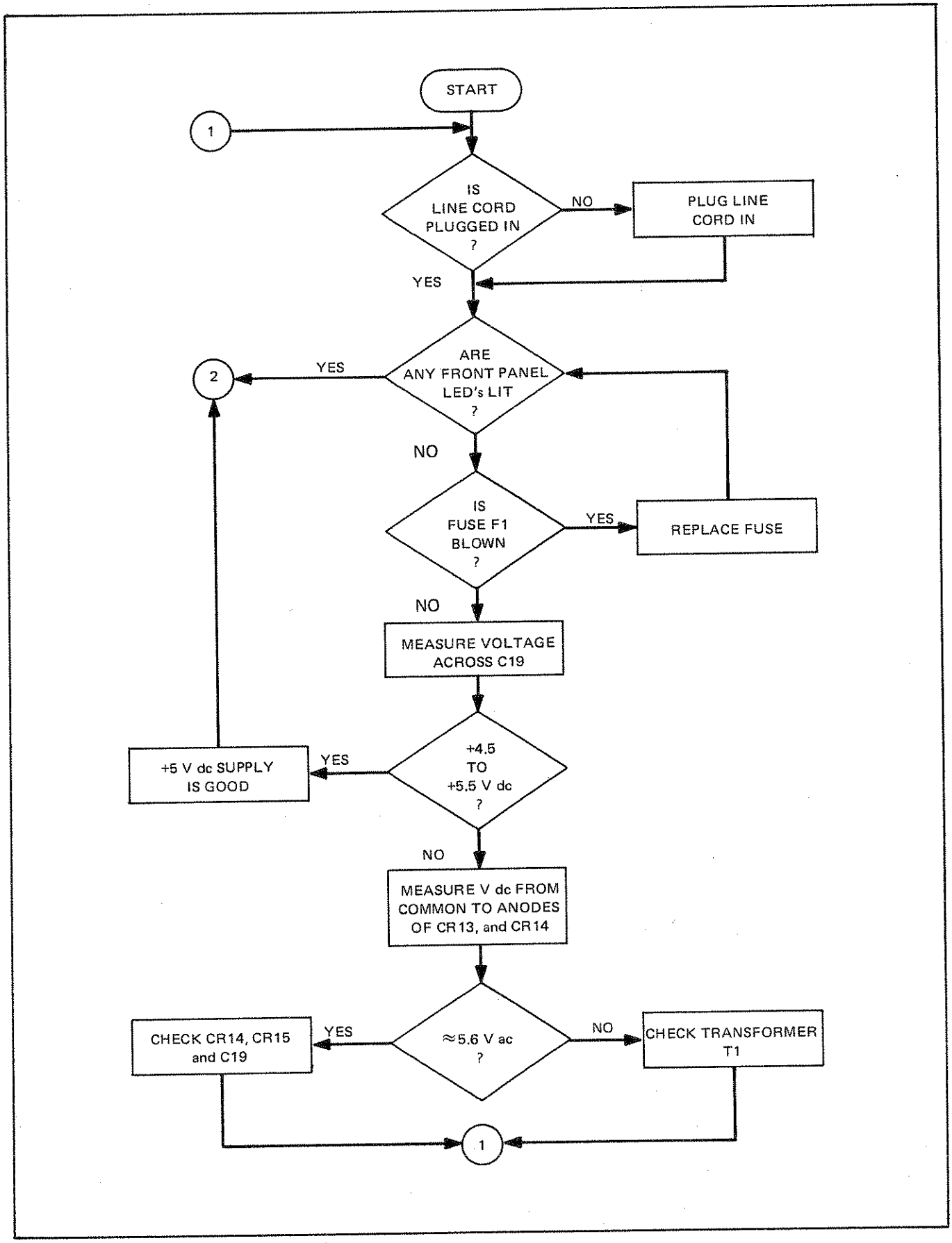


Figure 4-3. 8000A TROUBLESHOOTING FLOW CHART (Sheet 1 of 8)

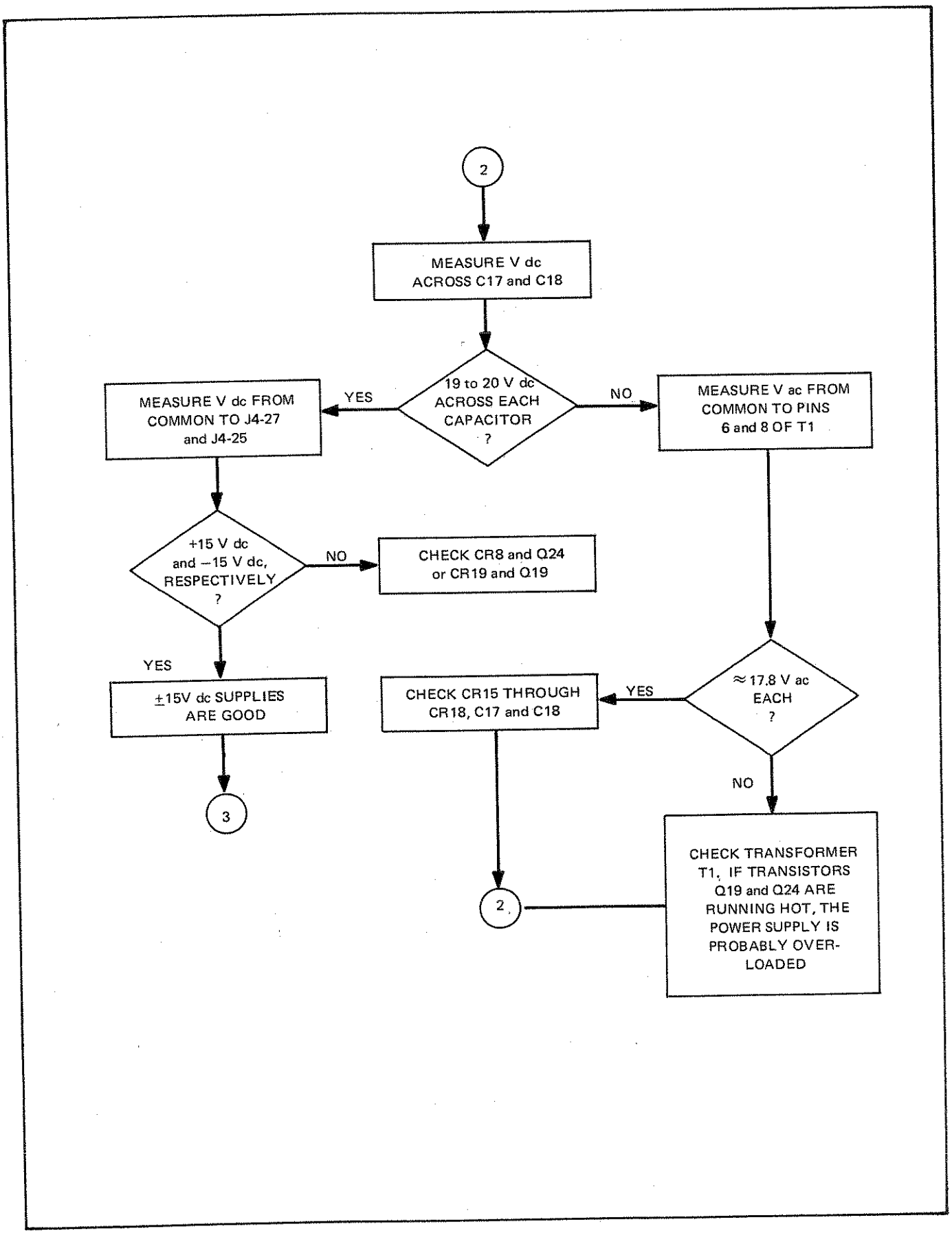


Figure 4-3. 8000A TROUBLESHOOTING FLOW CHART (Sheet 2 of 8)

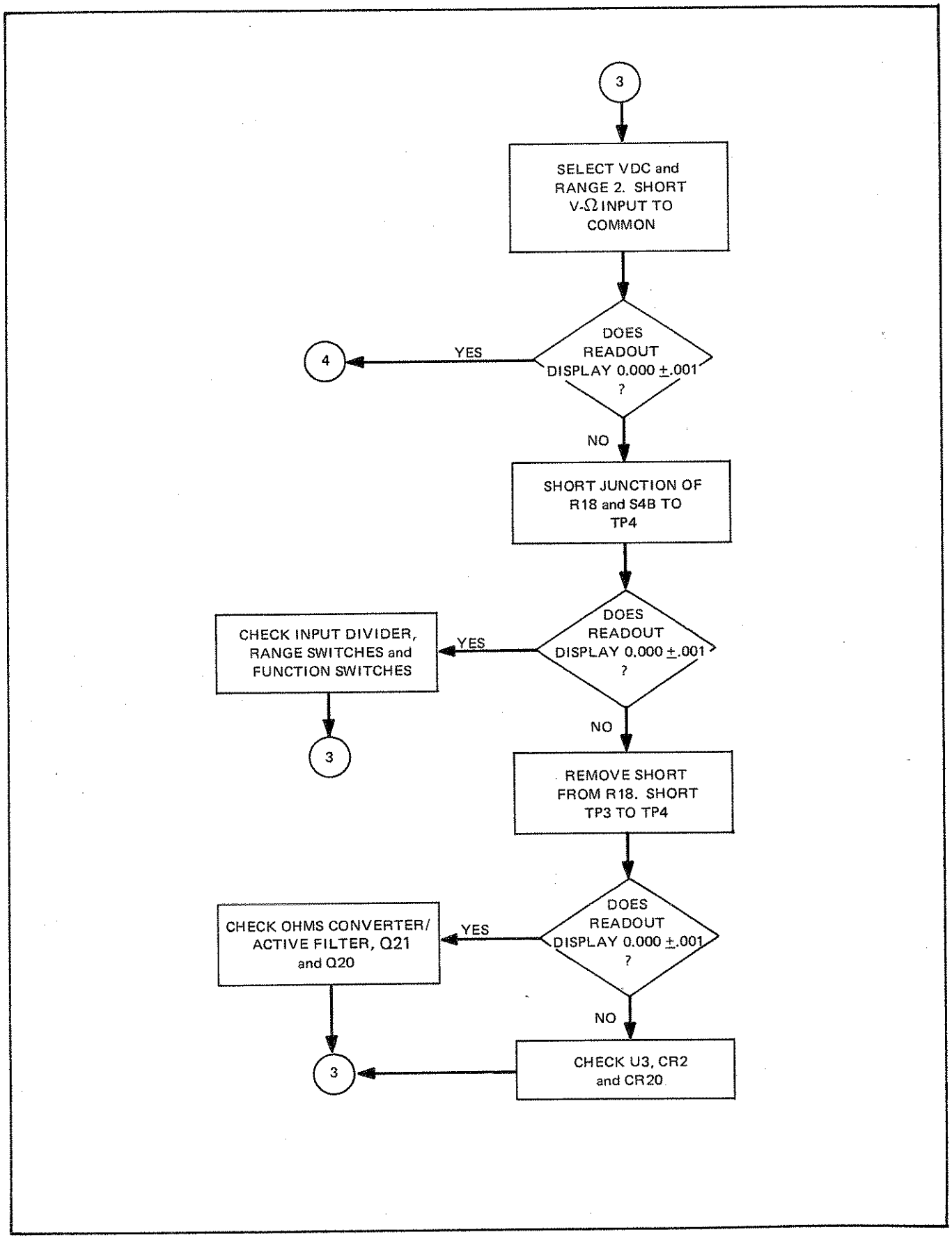


Figure 4-3. 8000A TROUBLESHOOTING FLOW CHART (Sheet 3 of 8)

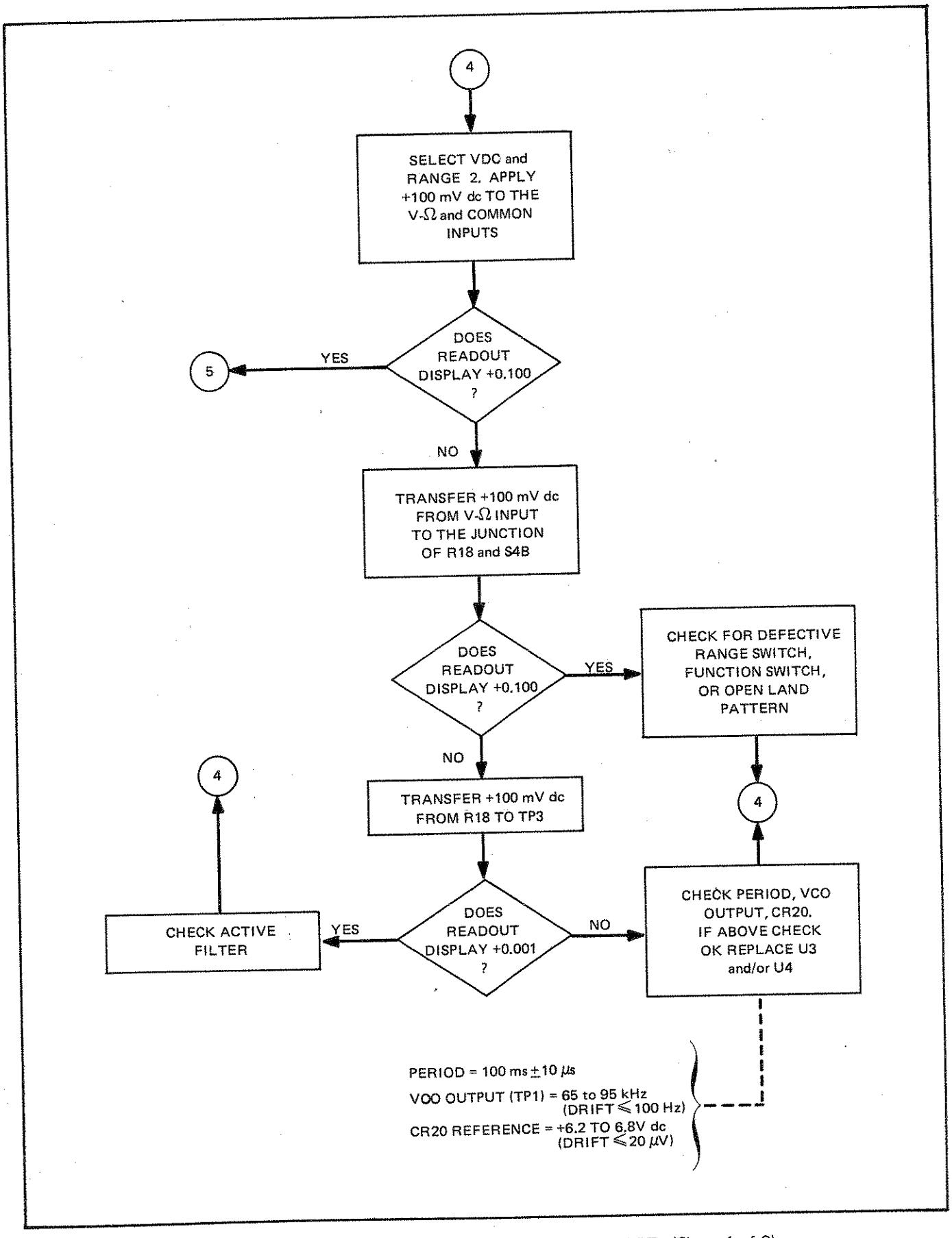


Figure 4-3. 8000A TROUBLESHOOTING FLOW CHART (Sheet 4 of 8)

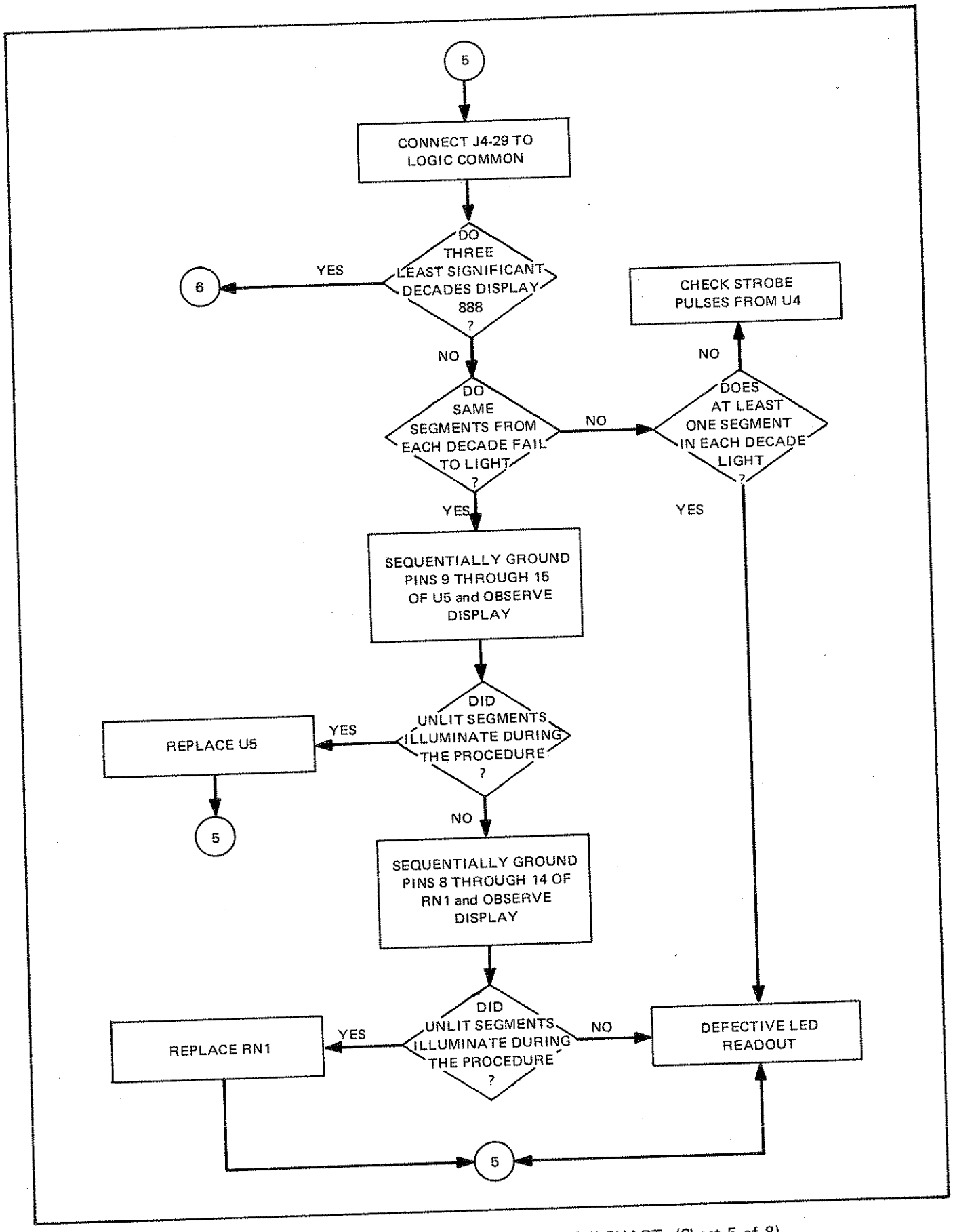


Figure 4-3. 8000A TROUBLESHOOTING FLOW CHART (Sheet 5 of 8)

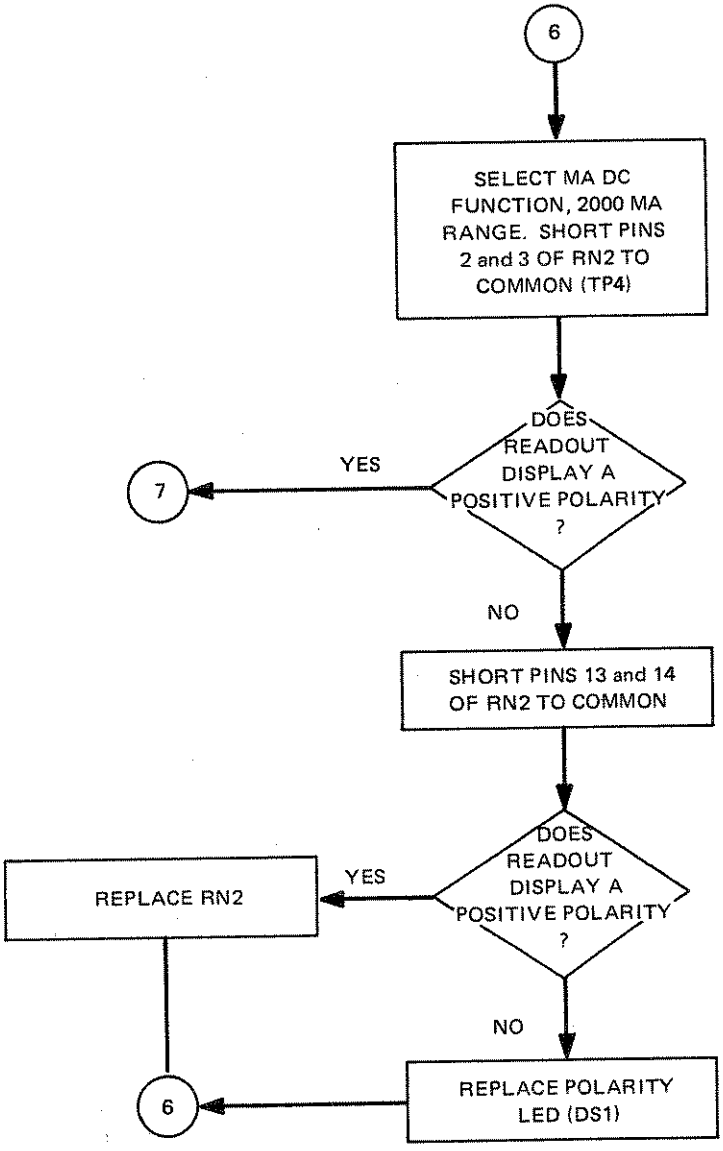


Figure 4-3. 8000A TROUBLESHOOTING FLOW CHART (Sheet 6 of 8)

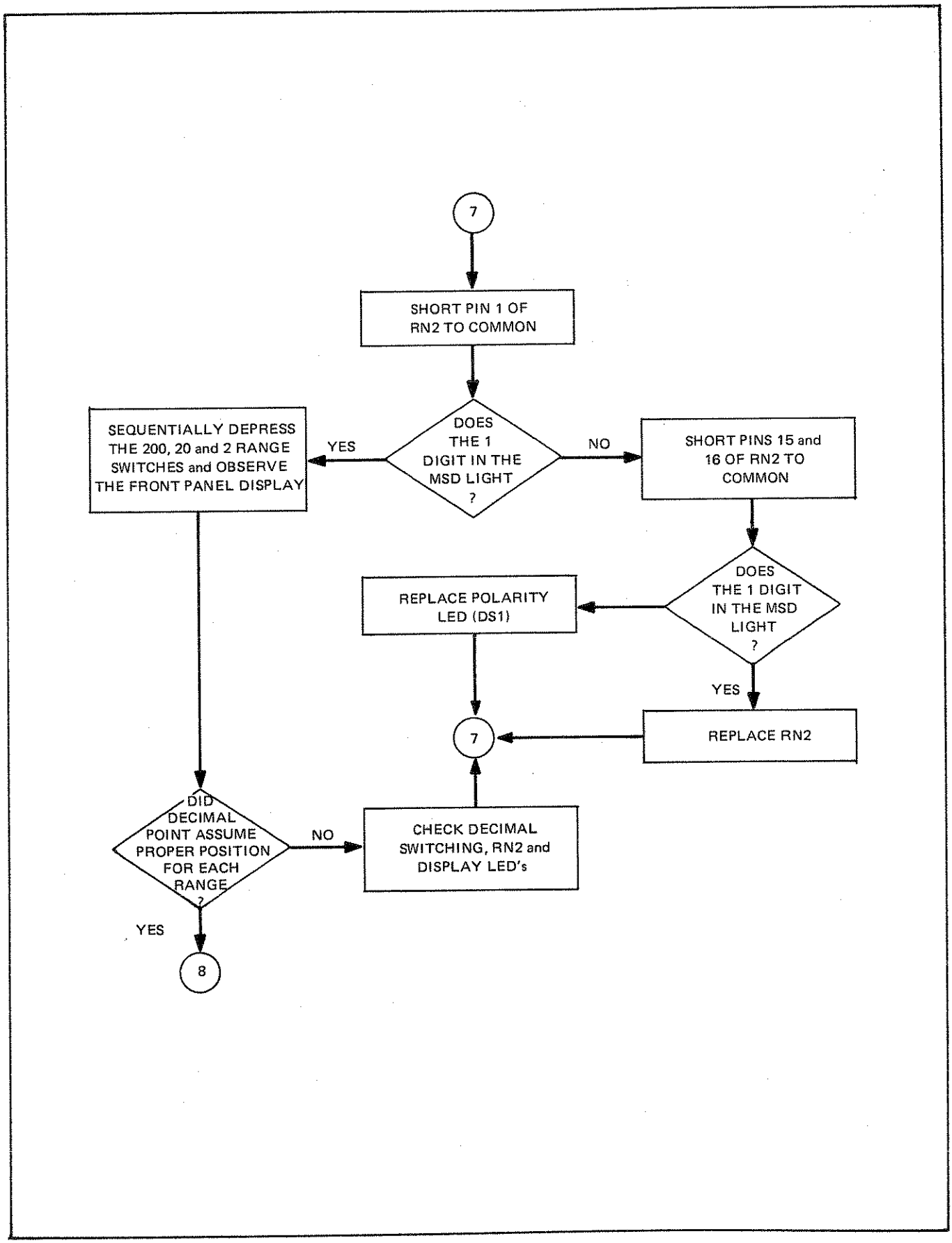


Figure 4-3. 8000A TROUBLESHOOTING FLOW CHART (Sheet 7 of 8)

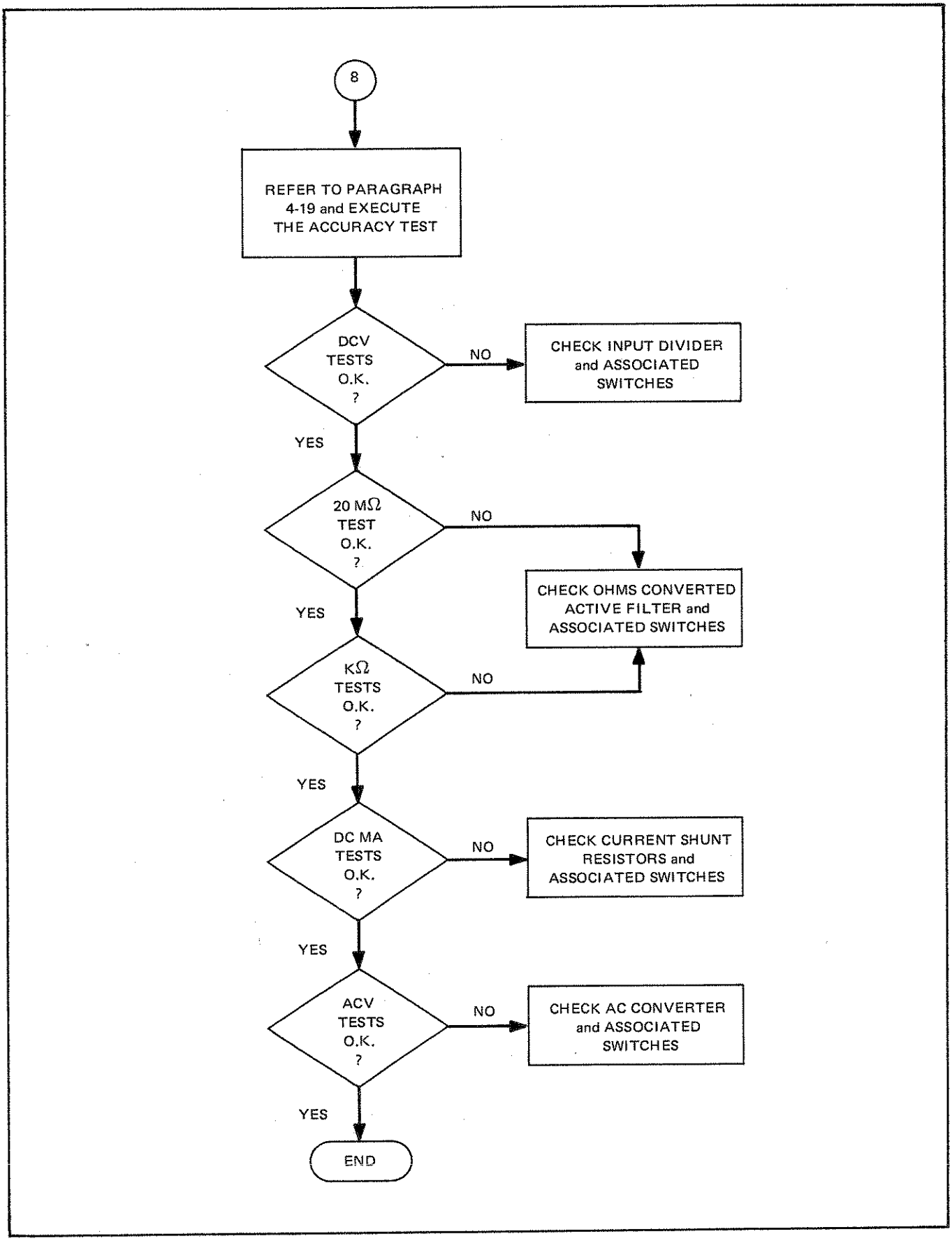


Figure 4-3. 8000A TROUBLESHOOTING FLOW CHART (Sheet 8 of 8)

Section 5

Lists of Replaceable Parts

TABLE OF CONTENTS

5-1. INTRODUCTION

5-2. This section contains an illustrated parts breakdown of the instrument. Components are listed alpha-numerically by assembly. Electrical components are listed by reference designation and mechanical components are listed by item number. Each listed part is shown in an accompanying illustration.

5-3. Parts lists include the following information:

a. Reference Designation or Item Number.

b. Description of each part.

c. Fluke Stock Number.

d. Federal Supply Code for Manufacturers. (See Appendix A for Code-to-Name list.)

e. Manufacturer's part Number or Type.

f. Total Quantity per assembly or component.

g. Recommended Quantity: This entry indicates the recommended number of spare parts necessary to support one to five instruments for a period of two years. This list presumes an availability of common electronic parts at the maintenance site. For maintenance for one year or more at an isolated site, it is recommended that at least one in each assembly in the instrument be stocked. In the case of optional subassemblies, plug-ins, etc. that are not always part of the instrument, or are deviations from the basic instrument mode, the REC QTY column lists the recommended quantity of the item in that particular assembly

h. Use Code is provided to identify certain parts that have been added, deleted or modified during production of the instrument. Each part for which a use code has been assigned may be identified with a particular instrument serial number by consulting the Use Code Effectivity, paragraph 5-7.

5-4. HOW TO OBTAIN PARTS

5-5. Components may be ordered directly from the manufacturer by using the manufacturer's part number, or from the John Fluke Mfg. Co., Inc. factory or authorized representative by using the FLUKE STOCK NUMBER. In the event the part you order has been replaced by a new or improved part, the replacement will be accompanied by an explanatory note and installation instructions, if necessary.

5-6. To ensure prompt and efficient handling of your order, include the following information.

a. Quantity.

b. FLUKE Stock Number.

c. Description.

d. Reference Designation or Item Number.

e. Printed Circuit Board Part Number.

f. Instrument model and Serial number

5-7. USE CODE EFFECTIVITY LIST

USE CODE	SERIAL NUMBER EFFECTIVITY
A	56400 and on
B	62300 and on
C	123 thru 644330, 64390 thru 66244, and 66845 thru 67784
D	64340 thru 64389, 66245 thru 66844, 67785 and on
E	60700 and on
F	68700 and on
G	123 thru 69999
H	70000 and on

FINAL ASSEMBLY, MODEL 8000A

REF DESIG OR ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG FED SPLY CDE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
	FINAL ASSEMBLY, MODEL 8000A						
A1	Main PCB Assembly						
	8000A – Figure 5-1	374223	89536	374223	1		
	8000A-01 – Figure 5-2	374231	89536	374231	1		
	8000A-01/05 – Figure 5-2	378224	89536	378224	1		
	8000A-05	378216	89536	378216	1		
	8000A-06 – Figure 5-3	384818	89536	384818	1		
A2	Front Panel Assembly						
A3	Display Assembly (8000A-05)	387720	89536	387720	1		
	Display Assembly (8000A, 8000A-01)	374355	89536	374355	1		
	Display Assembly (8000A-06)	338376	89536	338376	1		
	Case, molded	330076	89536	330076	1		
	Case, molded (8000A-02)	354274	89536	354274	1		
	Handle, molded	330092	89536	330092	1		
	Line Cord Assembly (115V ac)	343723	89536	343723	1		
	Line Cord Assembly (230V ac)	343780	89536	343780	1		
	Pad, foot	338632	89536	338632	2		
	Test lead set	343657	89536	343657	1		

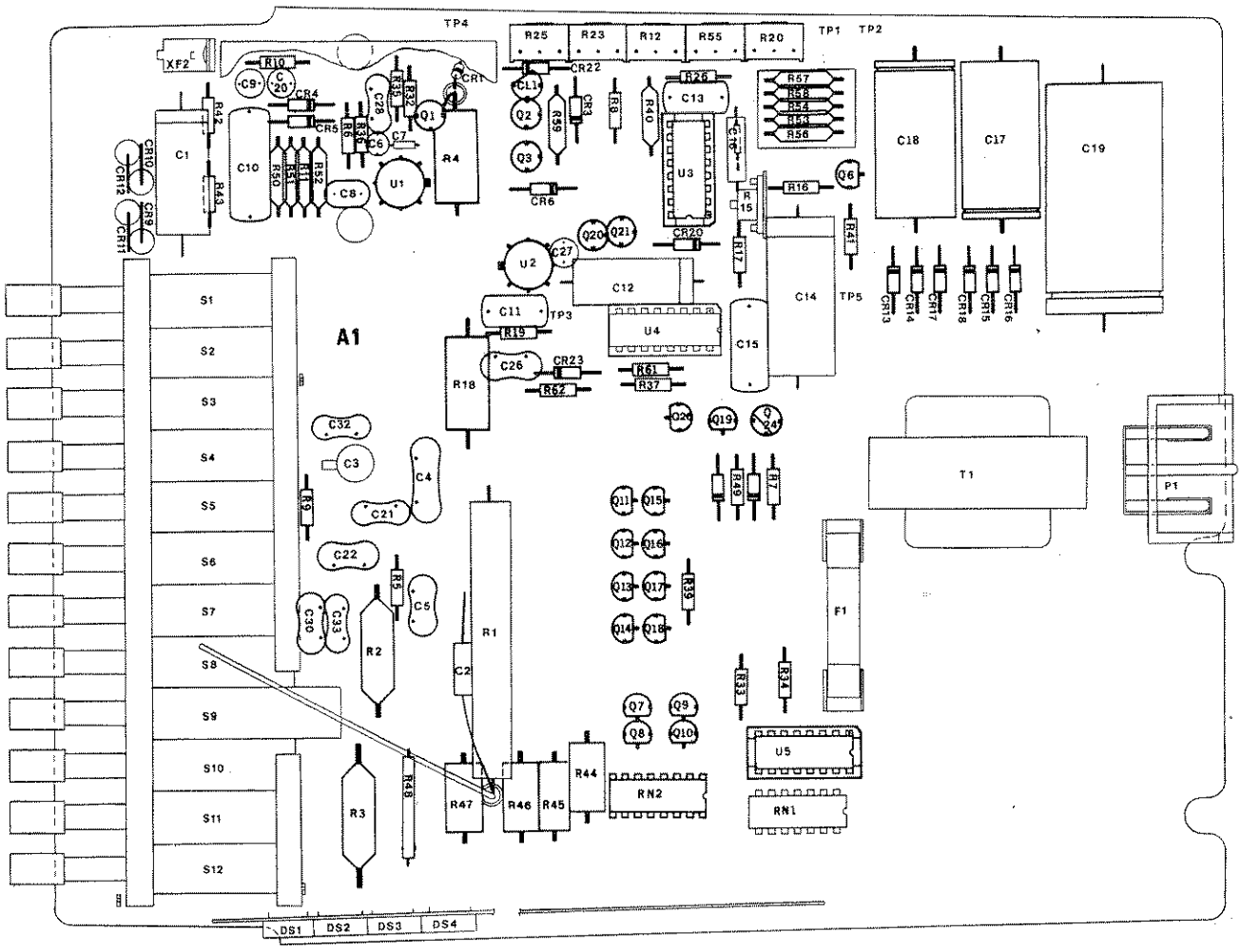


Figure 5-1. 8000A MAIN PCB ASSEMBLY

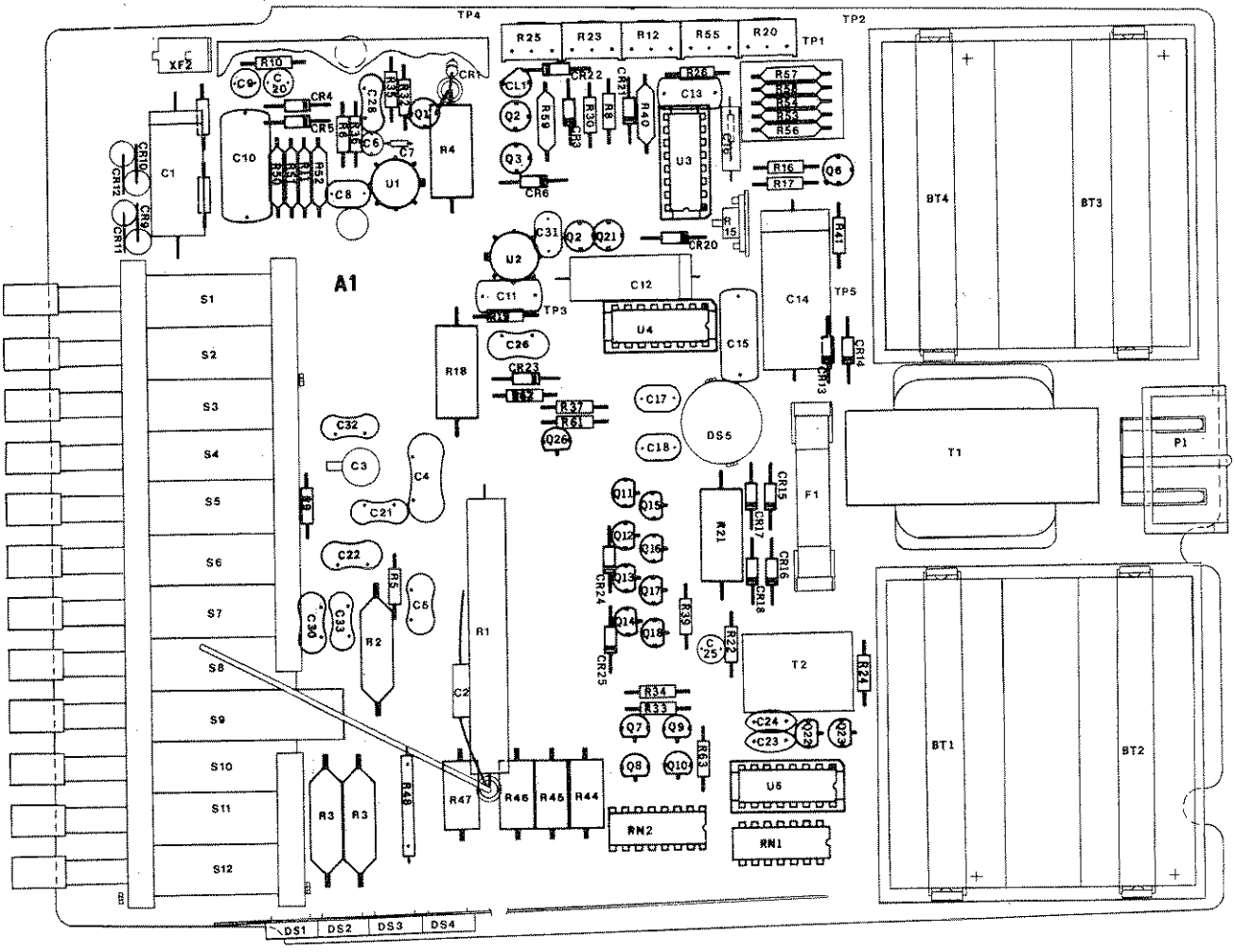


Figure 5-2. 8000A-01 MAIN PCB ASSEMBLY

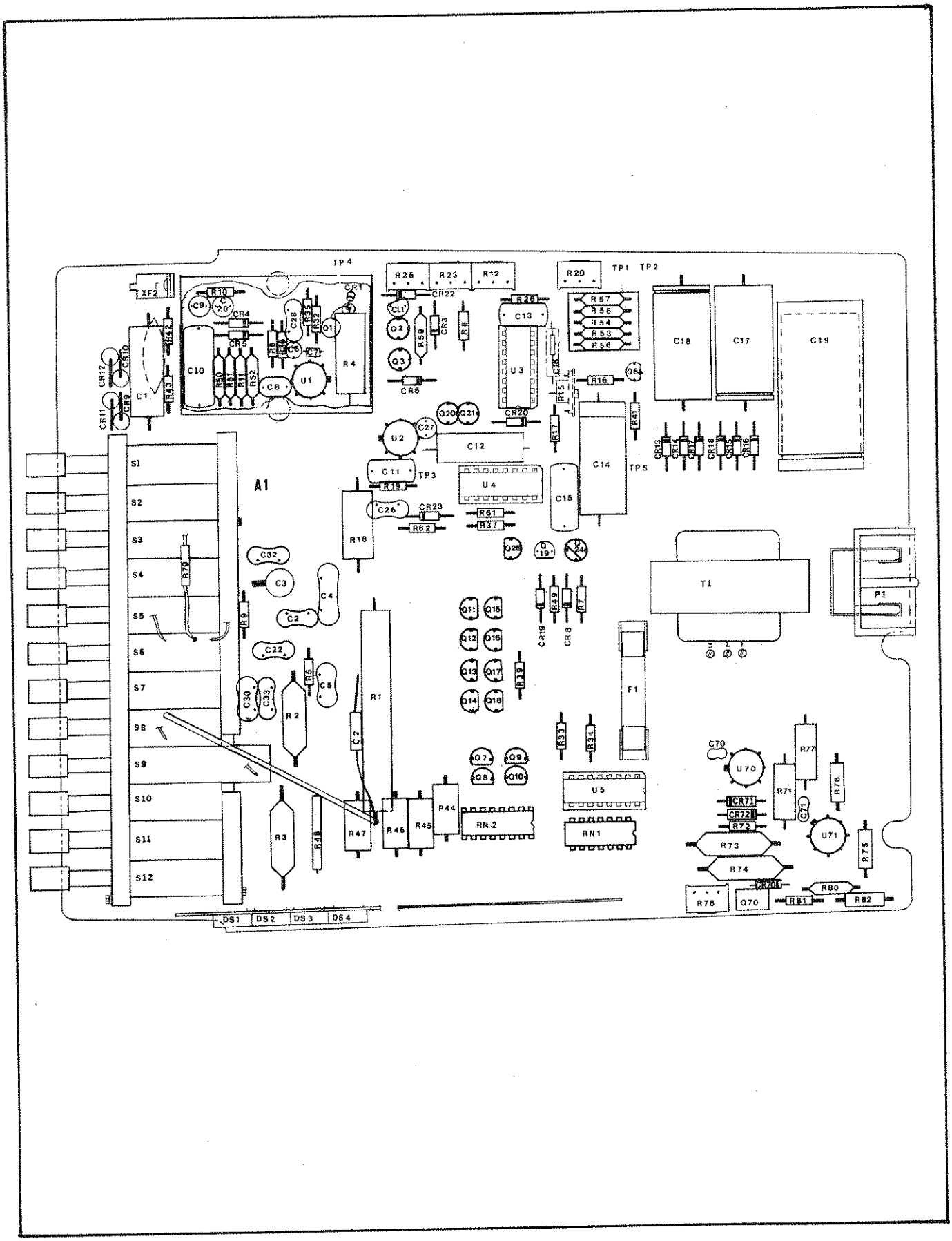


Figure 5-3. 8000A-06 MAIN PCB ASSEMBLY

MAIN PCB ASSEMBLY

REF DESIG OR ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG FED SPLY CDE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
A1	MAIN PCB ASSEMBLY				REF		
BT1 thru BT4	Battery, Ni Cd, 1.2V (8000A-01, 8000A-015)	346924	89536	346924	4		
C1	Cap, plstc, 0.33uf ±20%, 1200V	352120	01281	JF83	1		
C2	Cap, porc, 5.1 pf, ±0.25%, 1000V	347948	95275	VY13C5R1CA	1		
C3	Cap, Var, 4.5 - 50 pf, 250V	321117	78899	DVJ305A	1		
C4	Cap, mica, 510 pf ±5%, 500V	148411	71236	DM19ES11J	1		
C5	Cap, mica, 56 pf ±5%, 500V	148528	71236	DM15F5605	1		
C6	Cap, Ta, 0.22uf ±20%, 35V	161331	56289	196D224X0035 HA1	1		
C7	Cap, cer, 32 pf ±2%, 100V	354852	80031	2222-638-10339	1		
C8	Cap, Ta, 68uf ±20%, 15V	193615	56289	196D686X0015 LA3	1		
C9	Cap, Ta, 10uf ±20%, 20V	330662	56289	196D106X0020 JA1	3		
C10	Cap, plstc, 0.47uf ±10%, 250V	184366	73445	C280AE/A470K	1		
C11	Cap, plstc, 0.033uf ±10%, 50V	271841	06001	75F1R5A333	1		
C12	Cap, poly, 0.22uf ±10%, 100V	333823	84171	1PJ223K	1		
C13	Cap, plstc, 0.047uf ±10%, 50V	271858	06001	75F1R5A473	1		
C14	Cap, poly, 0.22uf ±5%, 50V	1			1		
C15	Cap, plstc, 0.22uf ±10%, 250V	194803	25088	B32234A3224K	1		
C16	Cap, cer, or porc, 390 pf ±5%, 500V	1					
C17, C18	Cap, elect, 400uf +50/−10%, 25V (8000A, 8000A-05, 8000A-06)	168153	25403	ET471X025A01	2		
C17, C18	Cap, Ta, 47uf ±20%, 20V (8000A-01)	348516	56289	196D476X0020 LA3	2		
C19	Cap, elect, 4000uf +100/−10%, 10V	330761	25088	B41010-4700/10	1		
C19	Not used on (8000A-01 and 8000A-015)						
C20	Cap, Ta, 10uf ±20%, 20V	330662	56289	196D106X0020 JA1	REF		

MAIN PCB ASSEMBLY

REF DESIG OR ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG FED SPLY CDE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
C21	Cap, mica, 39 pf ±5%, 500V	148544	71236	DM15E390J	2		
C22	Cap, mica, 390 pf ±5%	148437	71236	DM15F391J	1		
C23, C24	Cap, fxd cer, 1000 pf ±10%, 500V (8000A-01)	357806	56289	C106B102G-102K	2		
C25, C27	Cap, Ta, 10uf ±20%, 20V (8000A, 8000A-05, 8000A-06)	330662	56289	196D106X0020JA1	REF		
C27	Cap, mica, 100 pf ±5%, 500V	148494	71236	DM15F101J	1		
C28	Cap, mica, 22 pf ±5%, 500V	148551	71236	DM15C220J	1		
C29	Not used						
C30	Cap, mica, 30 pf ±5%, 500V	340570	71236	DM15E300J	1		
C30	Cap, mica, 240 pf ±5%, 500V (8000A-06)	362863	71236	DM15F241J	1		
C31	Cap, Ta, 47uf ±20%, 20V (8000A-01)	348516	56289	196D476X0020LA3			
C32	Cap, mica, 39 pf ±5%, 500V	148544	71236	DM15E390F	REF		
C33	Cap, mica, 30 pf ±5%, 500V	340570	71236	DM15E300J	1		
C70	Cap, disc, 300 pf ±10%, 500V	105734	71590	BB60301KW7W	1		
C71	Cap, cer, 33 pf ±2% (8000A-06)	354852	80031	2222-638-10339	1		
CL1	Diode, Current limiter	348482	17856	TYPE E505	1		
CR1, CR4, CR5, CR22, CR23	Diode, Si, small signal	348177	03508	DA2429	5		
CR2	Not used						
CR3	Diode, zener, comp	▷2◁			1		
CR6	Diode, zener, uncomp	246033	07910	1N965A	1		
CR7	Not used						
CR8, CR19	Diode, zener, uncomp (not used with 8000A-01)	352377	71590	R4846	2		
CR9, CR10, CR11, CR12	Diode, rectifier, Si	347559	14099	3SM05	4		

MAIN PCB ASSEMBLY

REF DESIG OR ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG FED SPLY CDE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
CR13, CR14	Diode, Si (8000A-01)	343491	77638	1N4200	2		
CR15, CR16, CR17, CR18	Diode, Si (8000A-01)	203323	03508	1N4148	4		
CR13, CR14, CR15, CR16, CR17, CR18	Diode, rectifier, Si	343491	77638	1N4002	6		
CR20	Diode, zener, 6.8V ±5%	1			1		
CR21	Diode, Instl in test if req						
CR24	Diode, rect, Si (8000A-01)	343491	77638	1N4002	2		
CR70	Diode, rect, Si (8000A-06)	368738	77638	1N4004	1		
CR71, CR72	Diode, Si, small signal (8000A-06)	348177	03508	DA2429	2		
DS5	Lamp, Incand, (8000A-01)	352237	08806	63	1		
F1	Fuse, fast act, 1/8 amp (8000A, 8000A-05, 8000A-06)	196790	71400	AGC	1		
F1	Fuse, Slo-Blo, 1/8 amp (8000A-01/05)	166488	71400	MDL	1		
XF1	Fuse, clip	284984	84613	3621-2	2		
XF2	Fuse, contact	338665	89536	338665	1		
P1	Plug power, 3 prong						
	Contact, voltage	338657	89536	338657	2		
	Contact, earth common	338640	89536	338640	1		
	Insulator, line contact	338624	89536	338624	1		
Q1	Xstr, FET, N-Channel	352112	15818	U2610E	1		
Q2, Q3	Xstr, Si, NPN	168716	07263	S19254	2		
Q4	Not used						
Q5	Not used						
Q6	Xstr, Si, PNP	288761	07933	RS2048	1		
Q7, Q8 Q9, Q10 Q15,Q16 Q17,Q18 Q26	Xstr, Si, NPN	218396	04713	2N3904	9		

MAIN PCB ASSEMBLY

REF DESIG OR ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG FED SPLY CDE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
Q11,Q12 Q13,Q14	Xstr, Si, PNP	340026	04713	MPS6563	4		
Q19	Xstr, Si, PNP (8000A, 8000A-06)	352369	04713	2N4403	1		
Q20	Xstr, Si, NPN	352138	89536	352138	1		
Q21	Xstr, Si, PNP	352146	89536	352146	1		
Q22,Q23	Xstr, Si, NPN (8000A-01)	330803	07263	MPS6560	2		
Q24	Xstr, Si, NPN	168708	03508	2N3391	1		
Q25	Not used						
Q70	Xstr	381731	89536	381731	1		
R1	Res, matched set	3					
R2	Res, matched set	3					
R3	Res, matched set	3					
R4	Res, comp, 100k ±10%, 2W	158659	01121	HB1041	1		
R5	Res, comp, 1M ±5%, ¼W	182204	01121	CB1055	1		
R6	Res, comp, 4.7M ±5%, ¼W	220046	01121	CB4755	1		
R7, R49,	Res, car dep, 1k ±5%, ¼W (not used on 8000A-01)	343426	TOYO	R251025	3		
R8	Res, car dep, 1k ±5%, ¼W (not used on 8000A-01)	343426	TOYO	R251025	REF		
R9	Res, comp, 10k ±5%, ¼W	148106	01121	CB1035	1		
R10, R42, R43	Res, car dep, 470k ±5%, ¼W	342634	TOYO	R254745	3		
R11	Res, met flm, 10k ±1%, 1/8W	168260	91637	MFF1-81012F	1		
R12	Res, var, cer, 500 ±10%, ½W	291120	71450	360S501A	1		
R13	Not used						
R14	Not used						
R15	Res, var, 50k ±30%, ¼W	358127	71450	X201503	1		
R16	Res, comp, 82k ±5%, ¼W	188458	01121	CB8235	1		
R17	Res, Car dep, 1 ±5%, ¼W	357665	TOYO	R251005	1		
R18	Res, comp, 470k ±10%, 2W	110247	01121	HB4741	1		

MAIN PCB ASSEMBLY

REF DESIG OR ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG FED SPLY CDE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
R19	Res, car dep, 560k ±5%, ¼W	342642	TOYO	R255645	1		
R20	Res, var, 20k ±10%, ½W	291609	71450	360S203A	1		
R21	Res, comp, 22 ±5%, 2W (8000A-01)	352229	01121	HB2205	1		
R22	Res, comp, 330 ± 5%, ¼W (8000A–01)	147967	01121	CB3315	1		
R23	Res, var, 100 ± 10%, ½W	285130	71450	360S101A	1		
R24	Res, comp, 82 ±5%, ¼W (8000–01)	149484	01121	CB8205	1		
R25	Res, var, 1k ±10%, ½W	285155	71450	360S102A	1		
R26	Res, comp, 150k ±5%, ¼W	182212	01121	CB1545	1		
R27, R28, R29, R31	Not used						
R30	Res, 6.8k (8000A-01) (May not be included)						
R32	Res, comp, 2.2k ±5%, ¼W	148049	01121	CB2225	1		
R33, R34, R41	Res, car dep, 3.9k ±5%, ¼W	342600	TOYO	R253R925	3		
R35	Res, comp, 20k ±5%, ¼W	221614	01121	CB2035	1		
R36	Res, comp, 30k ±5%, ¼W	193417	01121	CB3035	1		
R37	Res, carbon, 220k ±5%, ¼W (8000A-06)	348953	TOYO	R252245	1		
R38	Not used						
R39	Res, car dep, 470 ±5%, ¼W	343434	TOYO	R254715	1		
R40	Res, 499k (8000A) (May not be included)						
R44	Res, ww, current shunt, 900	312611	89536	312611	1		
R45	Res, ww, current shunt, 90	352401	89536	352401	1		
R46	Res, ww, current shunt, 9	352419	89536	352419	1		
R47	Res, ww, current shunt, 1	352427	89536	352427	1		
R48	Res, ww, 0.1 ±0.1%, ½W	345579	89536	345579	1		
R50	Res, met film, 498 ±0.1%, 1/8W	352252	91637	MFF1-84980Por M1PCT	1		

MAIN PCB ASSEMBLY

REF DESIG OR ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG FED SPLY CDE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
R51	Res, met flm, 4.53k ±0.1%, 1/8W	343467	91637	MFF1-84531PorM1PCT	1		
R52	Res, met flm, 10.02k ±0.1%, 1/8W	352245	91637	MFF1-810R021PorM1PCT	1		
R53	Part of Matched set see	2					
R54	Part of Matched set see	2					
R55	Res, var, cer, 50 ±10%, 1W (not used on 8000A-06)	285122	71450	360S500A	1		
R56	Res, selected in test	1			1		
R57	Res, selected in test	1			1		
R58	Res, selected in test	1			1		
R59	Res, met flm, 6.34k ±1%, 1/8W	2			1		
R60	Not used						
R61	Res, comp, 47k ±5%, ¼W	148163	01121	CB4735	1		
R62	Res, comp, 22M ±5%, ¼W	221986	01121	CB2265	1		
R63	Res, comp, 33 ±5%, ¼W (8000A–01)	175034	01121	CB3305	1		
R70	Res, comp, 100k ±10%, 2W (8000A-06)	158659	01121	HB1041	REF		
R71	Res, comp, 100k ±10%, 1W (8000A-06)	109397	01121	GB1041	1		
R72	Res, comp, 100k ±5%, ¼W (8000A-06)	148189	01121	CB1045	1		
R73	Res, met flm, 10k ±0.1%, ½W (8000A-06)	369363	91637	NFF1-2103	1		
R74	Res, met flm, 100k ±0.1%, ½W (8000A-06)	369371	91637	NFF1-2104	1		
R75	Res, comp, 18M ±10%, ½W (8000A-06)	108985	01121	EB1861	1		
R76	Res, comp, 15M ±10%, ½W (8000A-06)	108647	01121	EB1561	1		
R77	Res, met flm, 1.02k ±1%, 1/8W (8000A-06)	347138	91637	MFF1-81R022PorM1PCT	1		
R78	Res, var, 200 ±10%, ½W (8000A-06)	285148	80294	3389R-M09-201	1		
R80	Res, met flm, 634 ±1%, 1/8W (8000A-06)	289306	91637	MFF1-86340PorM1PCT	1		
R81	Res, comp, 390 ±5%, ¼W (8000A-06)	147975	01121	CB3915	1		
R82	Res, comp, 330 ±5%, ½W (8000A-06)	108936	01121	CB3315	1		

MAIN PCB ASSEMBLY

REF DESIG OR ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG FED SPLY CDE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
RN1	Res, network, 8 pc (8000A)	381616	89536	381616	1		
RN1	Res, network, 8 pc (8000A-01, 8000A-05, 8000A-06)	344069	89536	344069	1		
RN2	Res, network, 11 pc (8000A)	344077	89536	344077	1		
RN2	Res, network, 11 pc (8000A-01, 8000A-05, 8000A-06)	381608	89536	381608	1		
S1 thru S11	Switch Assembly	342915	89536	342915	1		
S12	Pushbutton, grn	352211	71590	J52305J71449	1		
T1	Xfmr, 115/230 (8000A, 8000A-02, 8000A-05, 8000A-06)	345629	89536	345629	1		
	Xfmr, 115/230 (8000A-01)	345637	89536	345637	1		
	Xfmr, 100V (8000A, 8000A-02)	345645	89536	345645	1		
	Xfmr, 100V (8000A-01)	345652	89536	345652	1		
T2	Xfmr, inverter (8000A-01)	354191	89536	354191	1		
U1	IC, Op, Amp	352930	49956	LM301AH	1		
U2	IC, Op, Amp, J-FET input	▷2			1		
U3	IC, Analog	▷1					
U4	IC, Digital	375154	89536	375154	1		
U5	IC, TTL Decoder/Driver	340109	01295	SN7447AN	1		
U70	IC, linear, op. amp (8000A-06)	288928	12040	LM308AH	1		
U71	IC, linear, op. amp (8000A-06)	271502	07933	LM301AH	1		
	Contact, battery (8000A-01)	344200	89536	344200	8		
	Holder, battery (8000A-01)	346932	89536	346932	2		
	Post, conn, uninsulated	267500	00779	86144-2	3		
	Shield, AC Conv	338673	89536	338673	1		
	Socket. IC, 16 pin (U3, U4, U5)	351916	82305	14-40P	3		
	Socket, short, 5 contact in-line	417899	52072	CA-055-105D	2		

MAIN PCB ASSEMBLY

REF DESIG OR ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG FED SPLY CDE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
	1 C14, C16, CR20, R56, R57, R58, and U3 are a matched set. For replacement, order ANALOG RESISTOR SET, stock number, 345496.						
C14	Cap, poly, 0.22 uF ±5%, 50V						
C16	Cap, cer, 390 pF ±5%, 500V						
CR20	Diode, zener, 6.8V ±5%						
R56	Res, mf, 392k to 499k, 1/8W						
R57	Res, mf, 1.74k to 2.15k, 1/8W						
R58	Res, mf, 15.8k to 19.6k, 1/8W						
U3	IC, Analog						
	2 CR3, R53, R54, R59 and U2 are a matched set. For replacement, order OHMS RESISTOR SET, stock number 345504.						
CR3	Diode, zener, 6.4V ±5%						
R53	Res, mf, 7.87k to 9.53k, 1/8W						
R54	Res, mf, 825 to 1.15k, 1/8W						
R59	Res, mf, 6.34k ±1%, 1/8W						
U2	IC, Opnl Ampl , FET input						
	3 R1, R2 and R3 are a matched set, For replacement, order INPUT DIVIDER RESISTOR SET, stock number 306407.						
R1	Res, mf, 9.9M, 2W						
R2	Res, mf, 90k, ½W						
R3	Res, mf, 10k, 1W						

FRONT PANEL ASSEMBLY

REF DESIG OR ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG FED SPLY CDE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
A2	**FRONT PANEL ASSEMBLY**						
F2	Fuse, fast acting, 2 amp	376582	71400	AGX	1		
J1	Jack, banana, red	162065	74970	108902	3		
J2/ XF2	Jack/Fuseholder, banana, red	345611	89536	345611	1		
J3	Jack, banana, blk	162073	74970	108903	2		
J5	Jack, banana, red (8000A-05)	162065	74970	108902	REF		
J6	Jack, banana, red (8000A-06)	162065	74970	108902	REF		
J6	Jack, banana, blk (8000A-05)	162073	74970	108903	REF		
R1/ S1	Res, var/Switch, DPDT (8000A-06)	381483	01121	12M937	1		
R1	Res, shunt, 0.01 ±0.2% (8000A-05)	374389	89536	374389	1		
	PCB, low ohms (8000A-06)	384917	89536	384917	1		
	Harness (8000A-06)	384925	89536	384925	1		
	Lens, red (8000A, 8000A-01)	338616	89536	338616	1		
	Lens, red (8000A-05)	374355	89536	374355	1		
	Lens, red (8000A-06)	384909	89536	384909	1		
	Retainer, neoprene	352484	28708	9109E	2		
	Clamp, cable	172080	06383	SST-1	1		
	Panel, front, molded (8000A, 8000A-01)	330084	89536	330084	1		
	Panel, front, molded (8000A-05, 8000A-06)	374363	89536	374363	1		
	Retainer, neoprene (8000A-06)	352484	28708	9109E	2		
	Decal, front panel	343756	89536	343756	1		
	Decal, front panel (8000A-06)	385369	89536	385369	1		
	Decal, 10A Range (8000A-05)	374371	89536	374371	1		
	Decal, disc (8000A-06)	236950	89536	236950	1		
	Knob, vernier (8000A-06)	241018	89536	241018	1		

DISPLAY ASSEMBLY

REF DESIG OR ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG FED SPLY CDE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
A3	**DISPLAY**	387738	89536	387738	REF		
	NOTE *Two different styles of LED's can be used in the 8000A Display Assembly. When ordering replacement LED's, order the same style as that currently installed in your instrument. The two styles are most easily identified by the color of their encasing, red or black. The description and part numbers for each style are listed separately below:*						
	Red Encased LED's						
DS1	Diode, light-emitting (± and 1)	380444	50579	DL707-812	1		
DS2, DS3, DS4	Diode, light-emitting, numeric	380436	50579	DL707-811	3		
	Black Encased LED's						
DS1	Diode, light-emitting (± and 1)	418400	29083	Q3203	1		
DS2, DS3, DS4	Diode, light-emitting, numeric	418392	29083	Q3202	3		

DIGITAL PRINTER OUTPUT UNIT, OPTION –02

REF DESIG OR ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG FED SPLY CDE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
	DIGITAL PRINTER OUTPUT UNIT, OPTION –02 (Figure 5-4)						
C1	Cap, cer, 500 pf ±10%, 500V	105692	71590	Type CE501	2		
C2	Cap, cer, 500pf ±10%, 500V	105692	71590	Type CE501	REF		
CR1	Diode, sil, 150mA	203323	07263	1N4148	4		
CR2	Diode, sil, 150mA	203323	07263	1N4148	REF		
CR3	Diode, sil, 150mA	203323	07263	1N4148	REF		
CR4	Diode, sil, 150mA	203323	07263	1N4148	REF		
P1	Connector, card edge, 20 contact	352310	NAT. CONN.	A202389-04	1		
R1	Res, comp, 10k ±5%, ¼W	148106	01121	CB1035	3		
R2	Res, comp, 100k ±5%, ¼W	148189	01121	CB1045	2		
R3	Not used						
R4	Res, comp, 33k ±5%, ¼W	148155	01121	CB3335	1		
R5	Res, comp, 10k ±5%, ¼W	148106	01121	CB1035	REF		
R6	Res, comp, 100k ±5%, ¼W	148189	01121	CB1045	REF		
R7	Res, comp, 10k ±5%, ¼W	148106	01121	CB1035	REF		
RN1	Res, network, 7 res, 15k ±5%, ¼W	352054	56289	#760-3	4		
RN2	Res, network, 7 res, 15k ±5%, ¼W	352054	56289	#760-3	REF		
RN3	Res, network, 7 res, 15k ±5%, ¼W	352054	56289	#760-3	REF		
RN4	Res, network, 13 res, 15k ±5%, ¼W	352047	56289	#760-1	1		
RN5	Res, network, 7 res, 15k ±5%, ¼W	352054	56289	#760-3	REF		E
U1	I.C.,MOS, dual D flip-flop	340117	04713	MC14013L	1		
U2	I.C., MOS, dual 4-bit shift register	340125	04713	MC14015CL	2		
U3	E.C., MOS, dual 4-bit shift register	340125	04713	MC14015CL	REF		
U4	I.C., hex inverter	352039	12040	SN7404N	1		
U5, U6, U7	Not used						

DIGITAL PRINTER OUTPUT UNIT, OPTION –02

REF DESIG OR ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG FED SPLY CDE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
U8	I.C., linear, 5 tstr., NPN sil	248906	95303	CA3046	4		
U9	I.C., linear, 5 tstr., NPN sil	248906	95303	CA3046	REF		
U10	I.C., linear, 5 tstr, NPN sil	248906	95303	CA3046	REF		
U11	I.C., linear, 5 tstr., NPN sil	248906	95303	CA3046	REF		
	Backshell, connector	357020	89536	357020	1		

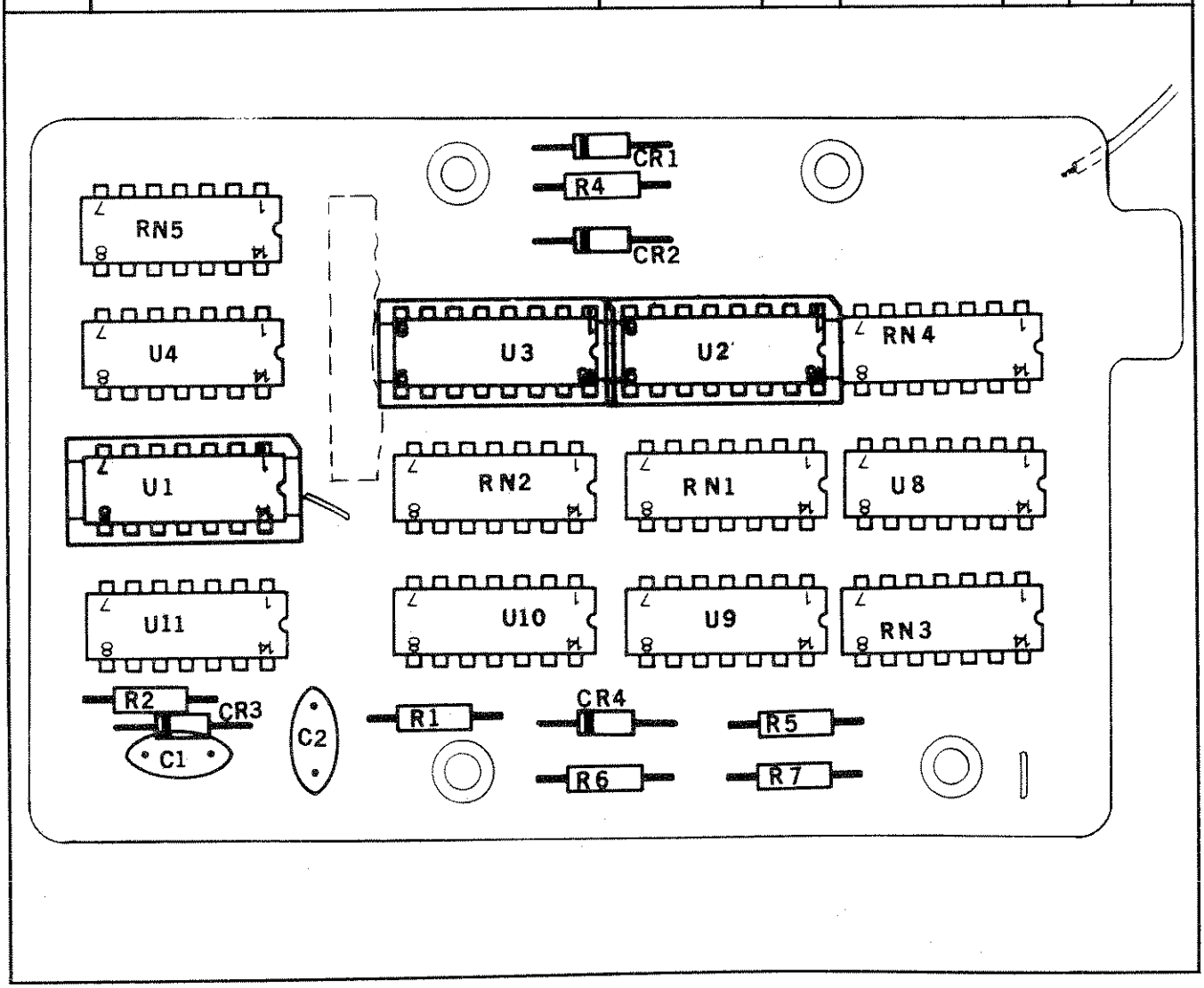


Figure 5-4. DPOU PCB ASSEMBLY, OPTION –02

Section 6

Option & Accessory Information

6-1. INTRODUCTION

6-2. This section of the manual contains information pertaining to the options and accessories available for your instrument. Each of the options and accessories are described under separate major headings containing the model or option number. The option descriptions contain applicable operating and maintenance instruction, and field installation procedures. Replaceable parts and schematics for all options are given in Sections 5 and 7, respectively.

6-3. CARRYING CASE (C80)

6-4. The Model C80 Carrying Case, Figure 6-1, is a soft vinyl plastic container, designed for the storage and transport of the 8000A. The case provides the 8000A with adequate protection against normal handling and storage conditions. A separate storage compartment is provided for test leads, power cord, and other compact accessories.

6-5. CARRYING CASE (C86)

6-6. The Model C86 Carrying Case, Figure 6-2, is a molded polyethylene container, with handle, designed for use in transporting the 8000A. This rugged case provides the 8000A with maximum protection against rough handling and adverse weather conditions. A separate storage compartment is provided for test leads, power cord, and other compact accessories.

6-7. FRONT PANEL DUST COVER (M00-100-714)

6-8. The front panel dust cover is a molded plastic snap-on accessory which fits over the front panel of the 8000A. The dust cover provides protection for the front panel controls, and is useful when storing or transporting the 8000A.

6-9. RACK MOUNTING KITS

6-10. Introduction

6-11. Three rack mounting kits are available for mounting the 8000A in a standard 19-inch equipment rack. The kits, listed in Table 6-1, provide the option of either offset mounting (left/right), center mounting or side-by-side mounting.

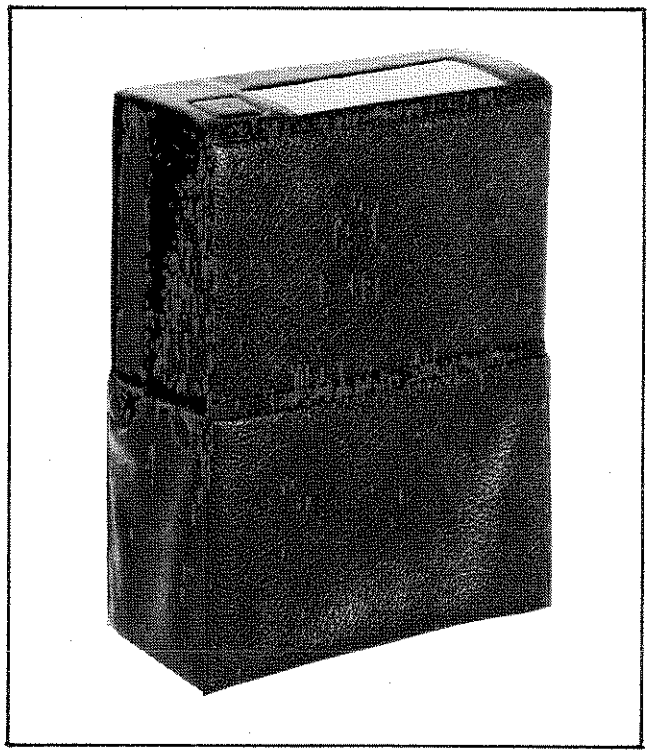


Figure 6-1. MODEL C80 CARRYING CASE

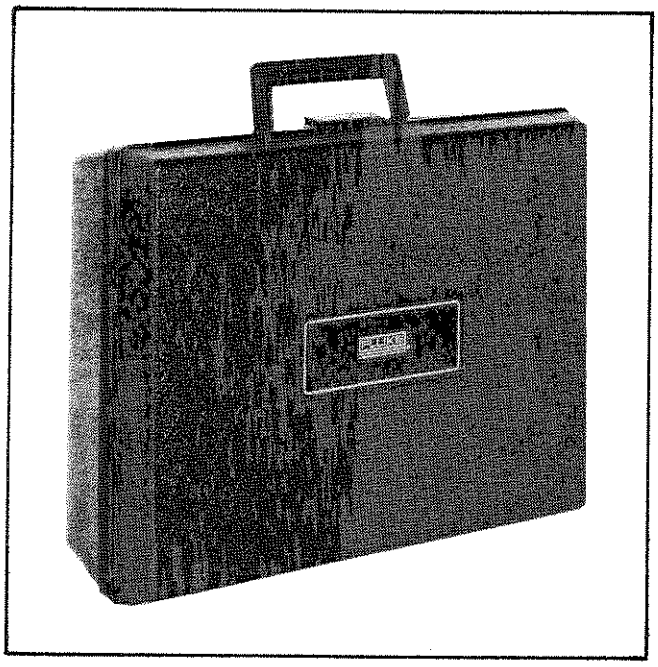


Figure 6-2. MODEL C86 CARRYING CASE

6-12. Installation Procedure

6-13. Installation instructions for each of the rack mounting kits is given in the following paragraphs. Use the procedure which corresponds to the model number of the kit being installed.

6-14. OFFSET AND CENTER MOUNTING KITS (M00-200-611 and M00-200-612)

a. Remove 8000A carrying handle by removing the handle disc decals and the handle mounting screws.

b. Remove screw from rear of case and separate the case from the 8000A.

c. Install the side mounting brackets, as shown in Figure 6-3, and secure them to the mounting panel using the nuts provided.

d. Insert the front of the 8000A case through the opening on the back side of the mounting panel.

e. Install the handle mounting screws through the side brackets into the handle mounting bosses. Don't over tighten these screws.

f. Slide the 8000A through the mounting panel and into the case. Install and tighten the retaining screw at the rear of the case.

6-15. SIDE–BY–SIDE MOUNTING KIT (M00-200-613)

a. Remove the carrying handles from both 8000A's by removing the handle disc decals and the handle mounting screws.

b. Remove the retaining screw from the rear of the cases and separate the instruments from their cases.

c. Install the center mounting bracket, as shown in Figure 6-4, and secure it to the mounting panel using the nuts provided.

d. Install the clamp screw in the center mounting bracket using the nuts and washers provided.

e. Insert the front of the 8000A cases through the openings on the back side of the mounting panel. Make sure the case's handle mounting bosses are inserted into the clamp hole of the center mounting bracket

f. Tighten the clamp screw.

g. Install the side mounting brackets and secure them to the front panel using the nuts provided.

h. Install the handle mounting screws through the side brackets into the handle mounting bosses. Don't over tighten these screws.

i. Slide the 8000A's through the mounting panel and into their cases. Install and tighten the retaining screw at the rear of both cases.

Table 6-1. RACK MOUNTING KITS

MOUNTING STYLE	MODEL NUMBER
Offset	M00-200-611
Center	M00-200-612
Side-By-Side	M00-200-613

6-16. DELUXE TEST LEAD KIT (A80)

6-17. The deluxe test lead kit, shown in Figure 6-5, contains two test leads with probes (red and black), and five pairs of universal probe tips. The probe tips include: alligator clips, test prod tips, pin tips, banana plug tips, and binding post lugs. A convenient plastic pouch is provided for storing the contents of the test lead kit.

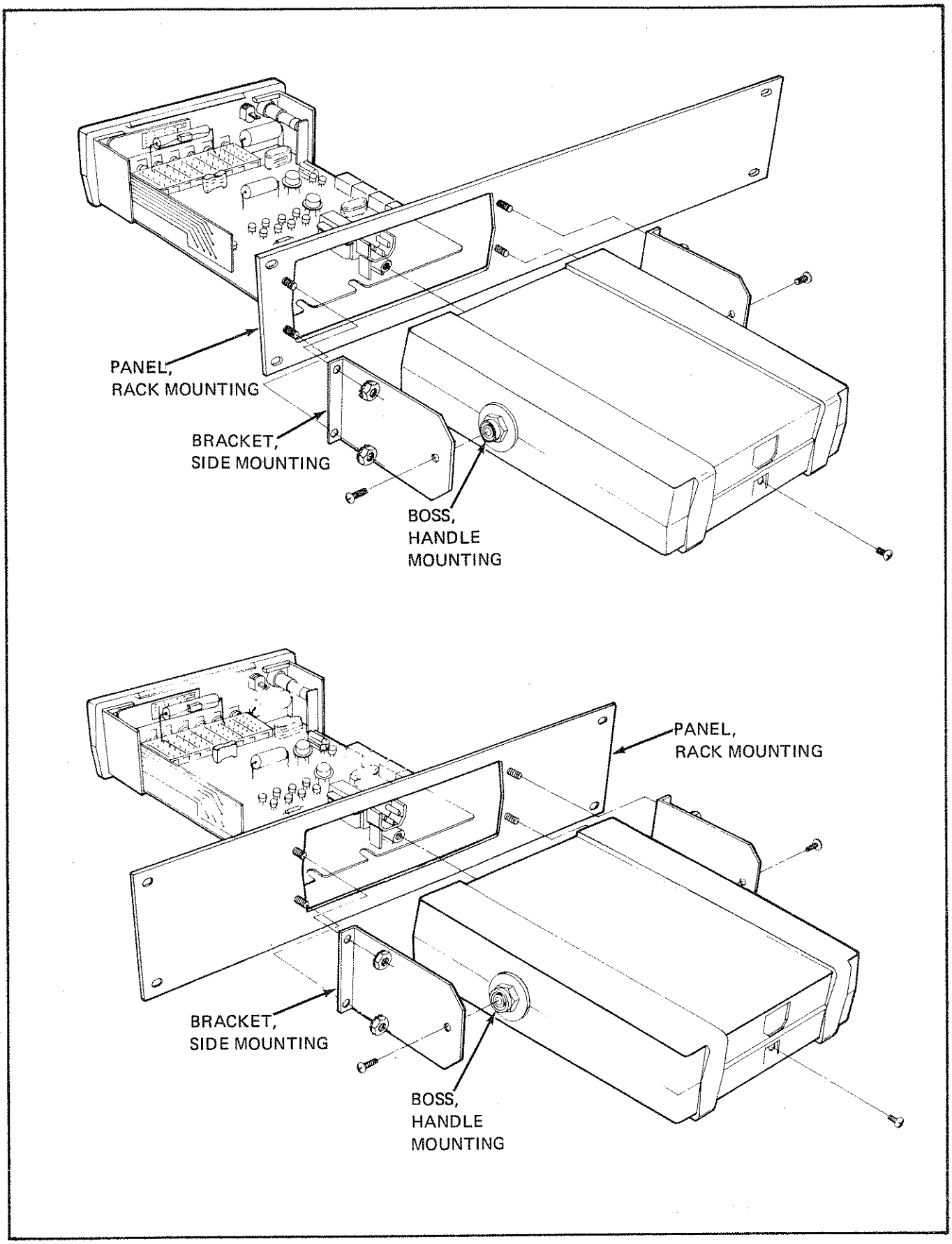


Figure 6-3. RACK MOUNTING KITS, OFFSET AND CENTER MOUNTING

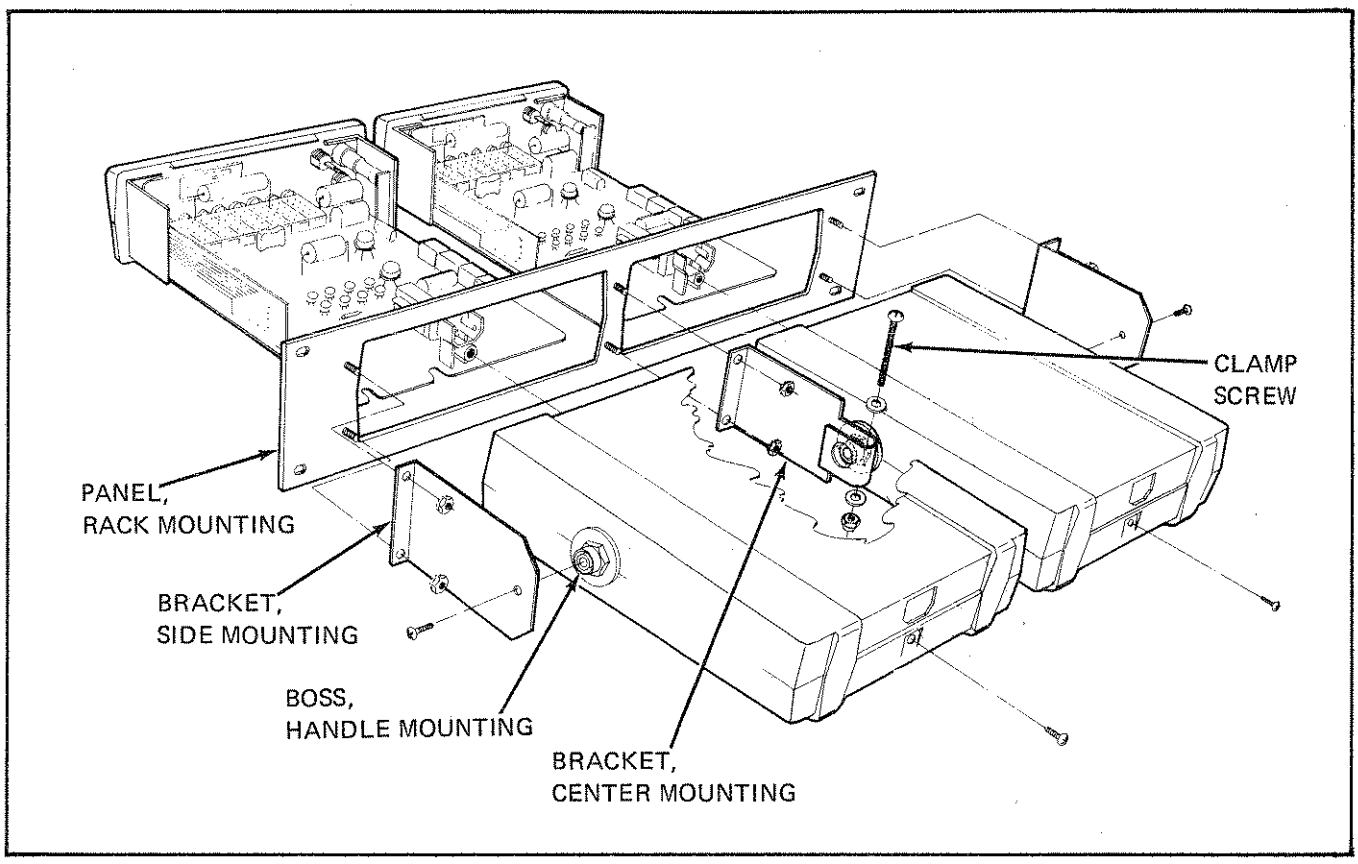


Figure 6-4. RACK MOUNTING KIT, SIDE-BY-SIDE MOUNTING

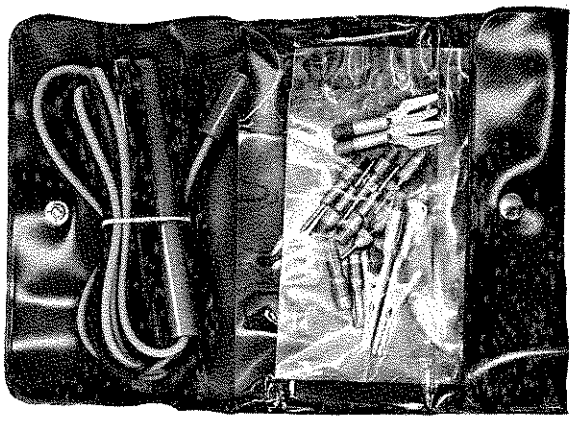


Figure 6-5. DELUXE TEST LEAD KIT (A80)

6-18. CURRENT PROBE, CLAMP-ON (80I-600)

6-19. Introduction

6-20. The Model 80I-600, as shown in Figure 6-6, is a clamp-on current probe which is used to extend the current measurement capabilities of the 8000A. The probe is designed to measure currents of 2 to 600 amperes at frequencies of up to 400 Hz with ±3% accuracy. The clamp-on feature allows current to be measured without breaking the circuit under test.

6-21. Operation

6-22. Use the following procedure for operating the 8000A with the 80I-600 probe:

a. Plug the 80I-600 dual-banana plug into the MA and COMMON INPUT terminals on the 8000A.

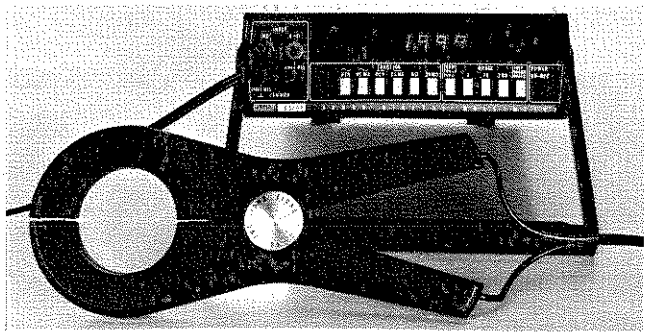


Figure 6-6. AC CURRENT PROBE, CLAMP-ON (80I-600)

b. Depress the AC MA pushbutton (FUNCTION)

c. Select the desired current range in accordance with Table 6-2.

d. Clamp probe around current carrying conductor to be measure.

e. Observe ac current reading in amperes on the 8000A readout.

NOTE

Clamping the probe around more than one current carrying conductor at a time produces a reading that is the vector sum of the currents in the conductors.

Table 6-2. 8000A RANGES FOR CURRENT PROBE (80I-600)

8000A RANGE SELECTED	8000A CURRENT RANGE WITH 80I-600 PROBE
2000 MA	200A to 600A
200	20A to 200A
20	2A to 20A

6-23. HIGH VOLTAGE PROBE (80K40)

6-24. Introduction

6-25. The Model 80K-40 High Voltage Probe as shown in Figure 6-7, provides the 1000X attenuation necessary to extend the dc voltage measuring capabilities of the 8000A up to 40 kV dc. A schematic of the 80K-40 probe is shown in Figure 6-8.

6-26. Specifications

Overall Accuracy:	20kV to 30kV ±2% (Calibrated 1% at 25kV)
Upper Limit:	Changes linear from 2% at 30kV to 4% at 40kV
Lower Limit:	Changes linear from 2% at 20kV to 4% at 1kV
Voltage Range:	1kV to 40kV
Input Resistance:	1000MΩ
Division Ratio:	1000:1

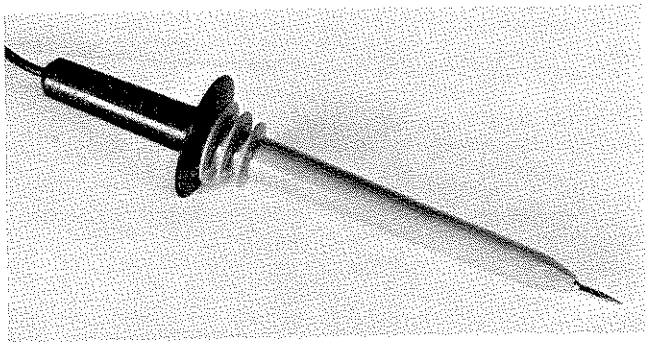


Figure 6-7. HIGH VOLTAGE PROBE (80K-40)

6-27. Operation

6-28. Use the following procedure for operating the 8000A with the 80K-40 probe:

a. Plug the 80K-40 dual-banana plug into the V-Ω and COMMON INPUT terminals on the 8000A.

b. Depress the DCV pushbutton (FUNCTION)

c. Select the desired voltage range in accordance with Table 6-3.

d. Connect the common probe lead to a suitable ground and touch the probe tip to the circuit point to be measured.

e. Observe dc voltage reading displayed in kilovolts on the 8000A readout.

CAUTION

Before touching probe tip to a high voltage source, always connected probe common lead to circuit common. Removal of the probe common connection during a measurement may result in damage to the 8000A.

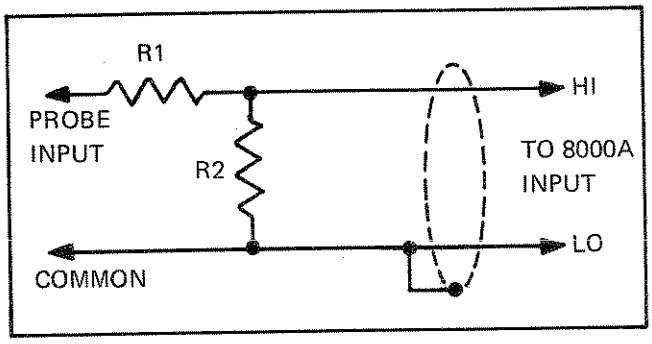


Figure 6-8. HIGH VOLTAGE PROBE, SCHEMATIC

Table 6-3. 8000A RANGES FOR DC HV PROBE (80K-40)

8000A RANGE SELECTED	8000A VOLTAGE RANGE WITH 80K-40 PROBE
200	20 to 40 kV
20	2 to 20 kV
2	1 to 2 kV

6-29. HIGH FREQUENCY PROBE (80RF-1)

6-30. Introduction

6-31. The Model 80RF-1 High Frequency Probe, Figure 6-9, extends the frequency range of the 8000A to include 100 kHz to 500 MHz for ac voltage measurements from 0.25 to 30V rms. The 80RF-1 operates in conjunction with the dc voltage ranges, and is connected to the 8000A using a shielded dual-banana plug and an adapter.

6-32. Specifications

Voltage: 0.25V to 30V

Response: Responds to peak value of input. Calibrated to read rms value of a sine wave input.

AC to DC Transfer Accuracy: Loaded with 10 megohms ±10%.

	100 kHz– 100 MHz	100 MHz– 500 MHz
+10°C to +30°C	+5%	+7%
–10°C to +40°C	+7%	+15%

< ±3 db at 10 kHz and 700 MHz

Input Impedance: 4 megohms shunted by 2 ±0.5 pf

Maximum Input: 30 volts rms ac, 200 volts dc

Cable Connections: Shielded dual banana plug fits all standard ¾-inch dual banana connectors.

Cable Length: 4 ft.(121,9 cm) minimum

Weight: 3½ oz. net

Accessories: Ground lead, straight tip, hook tip, high frequency adapter

6-33. Operating Notes

6-34. The straight and the hooked tips supplied with the probe are useful for making voltage measurements up to 100 MHz. For measurements above 100 MHz use the high frequency adapter tip with mating connector and 50 ohm terminations.

6-35. The maximum input to the probe is 30V rms or 200V dc. These voltage limits may be used in combination so that the ac component of an ac signal superimposed on dc level can be measured.

CAUTION

Changing the dc level of the input signal by more than 200 volts will damage the probe.

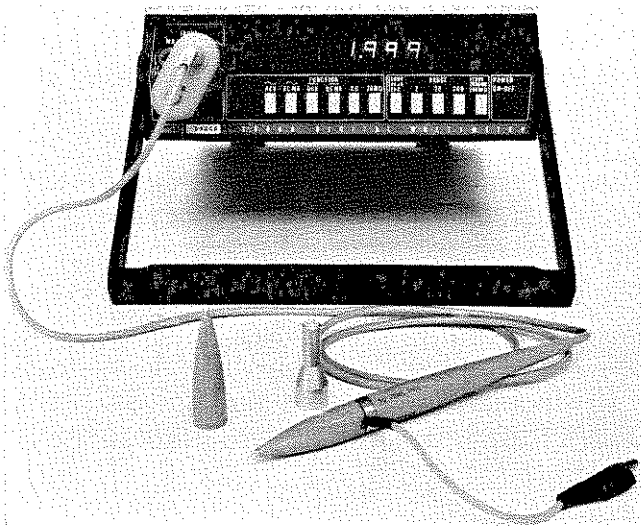


Figure 6-9. 80RF–1, HIGH FREQUENCY PROBE

6-36. Operation

6-37. Use the following procedure for operating the 8000A with the 80RF-1 probe:

a. Connect the 80RF-1 shielded dual-banana plug to the 8000A V-Ω and COMMON INPUT terminals.

b. Attach the desired probe tip to the probe body.

c. Depress the DCV pushbutton (FUNCTION)

d. Select the desired voltage range.

e. Connect the probe's ground lead to a suitable ground when using the straight or hooked probe tip. The ground clip is not required when using the high frequency adapter with an appropriate 50 ohm termination.

f. Touch the probe tip to the circuit point to be measured.

g. Observe the voltage reading displayed in volts rms on the 8000A readout.

6-38. Theory of Operation

6-39. A schematic diagram of the 80RF-1 High Frequency probe is given in Figure 6-10. Capacitor C1 is used as a dc blocking capacitor, diode CR1 is used as a detector, and resistors R1, R2, R3 and R_{in} form a divider network. During the negative half cycle of the ac input voltage, C1 charges through CR1 to the negative peak value of the input signal. This negative charge path provides the zero reference for the dc output signal. During the positive half cycle of the input signal the charge on C1 is added to the peak value of the positive input to produce a positive peak-peak voltage at the junction of C1 and CR1. The divider network scales this voltage to provide a dc output voltage which is equal to the rms value of the input signal.

6-40. Diode CR2 compensates for the non-linearity of the detector, and R3 is a selected part having a value of 50 kΩ to 100 kΩ.

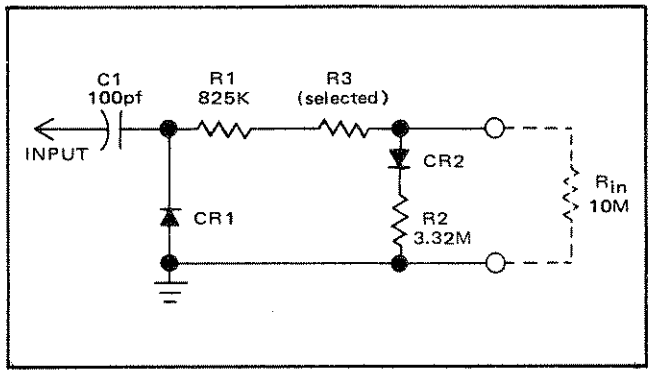


Figure 6-10. 80RF–1 SCHEMATIC

6-41. Maintenance

6-42. PERFORMANCE TEST

6-43. The low and high frequency tests given below are used to verify the ac-to-dc transfer accuracy of the 80RF-1 High Frequency Probe.

6-44. Low Frequency Response

6-45. Connect equipment as shown in Figure 6-11, and perform the following steps.

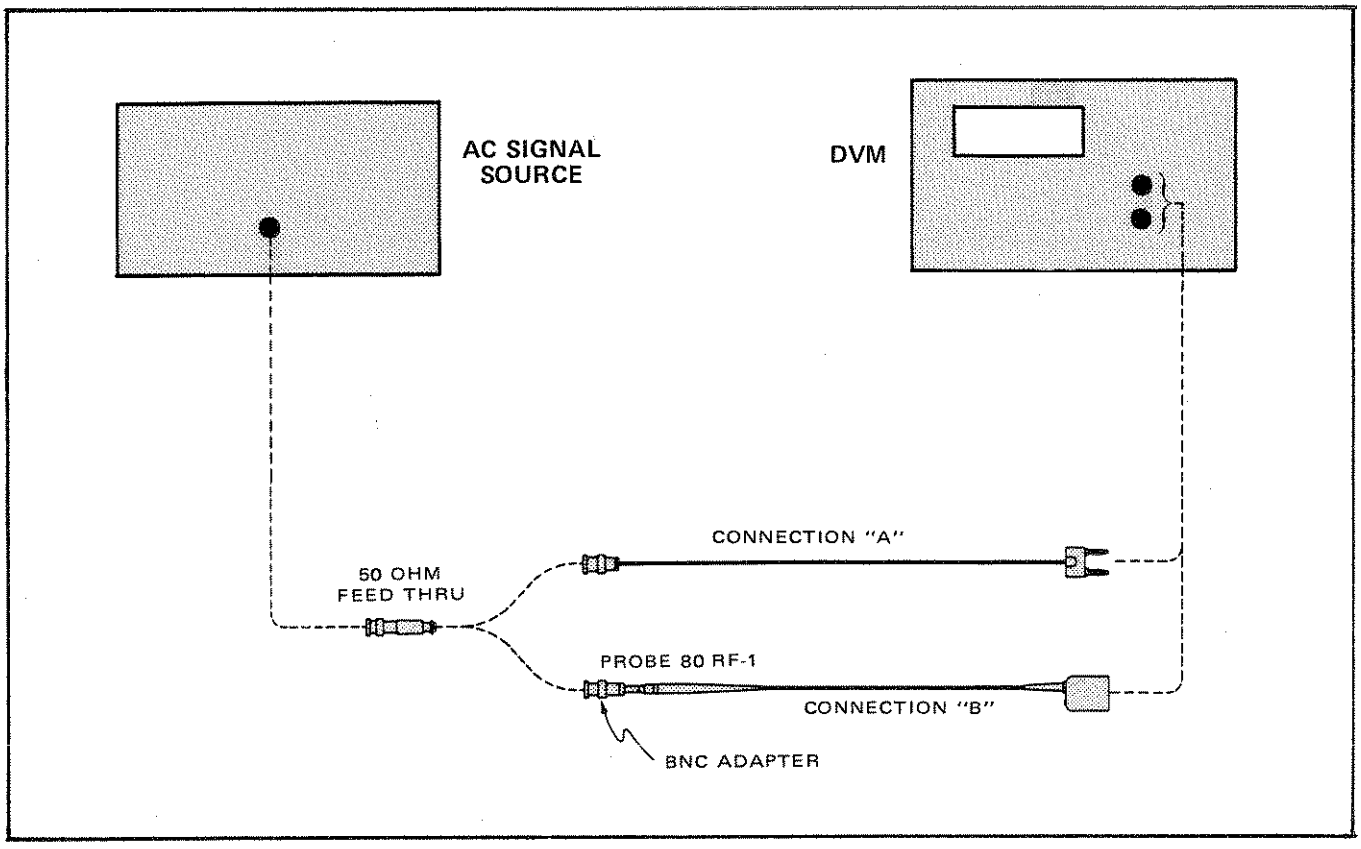


Figure 6-11. LOW FREQUENCY RESPONSE CHECK

a. With equipment as shown in connection "A" adjust the ac signal source for an output of 3.000V rms at 100 kHz as measured on the DVM.

b. In connection "B" with the DVM set to measure V dc, observe a probe output of 3.15 to 2.85V dc.

c. Placing cables back in connection "A", decrease the ac signal source by 10 db (0.95V rms).

d. Moving back to connection "B", observe a voltmeter indication of between 1.00 and 0.90V dc (10 db down from 3.0V dc).

e. In connection "A", decrease the ac signal source an additional 10 db (to 0.3V rms) as indicated by the voltmeter in its ac function.

f. Back to "B", observe a voltmeter reading of .315 to .285V dc.

g. Return the ac signal source back to 3.000V rms.

h. Repeat steps a through g with frequencies of 500 kHz, 1 MHz, and 10 MHz.

6-46. High Frequency Response

6-47. Connect equipment to the 80RF–1 probe as shown in Figure 6-12, and perform the following steps:

a. Set the ac signal source to 100 MHz with an output level of 10 milliwatts as indicated on the power meter. Ensure that the ac signal source has stabilized at the 10 milliwatt output.

b. Observe that the voltmeter indication is between 0.757 and 0.657V dc, (0.707V dc corresponds to 10 milliwatts into 50 ohms.)

c. Repeat the above for frequencies of 200 MHz, 300 MHz, 400 MHz, and 480 MHz.

6-48. CALIBRATION

6-49. Should the 80RF–1 require recalibration, perform the following steps:

a. Perform steps a and b in paragraph 6-44, with a frequency of 1 MHz.

b. Observe the dc voltmeter; a reading below 3V dc calls for a decrease in the value of R3, a reading above 3V dc calls for an increase in R3. Resistor R3 should be a 1/8W metal film type. In a probe that is working properly, a 30 kΩ change in R3 will produce about a 1% deviation in the reading.

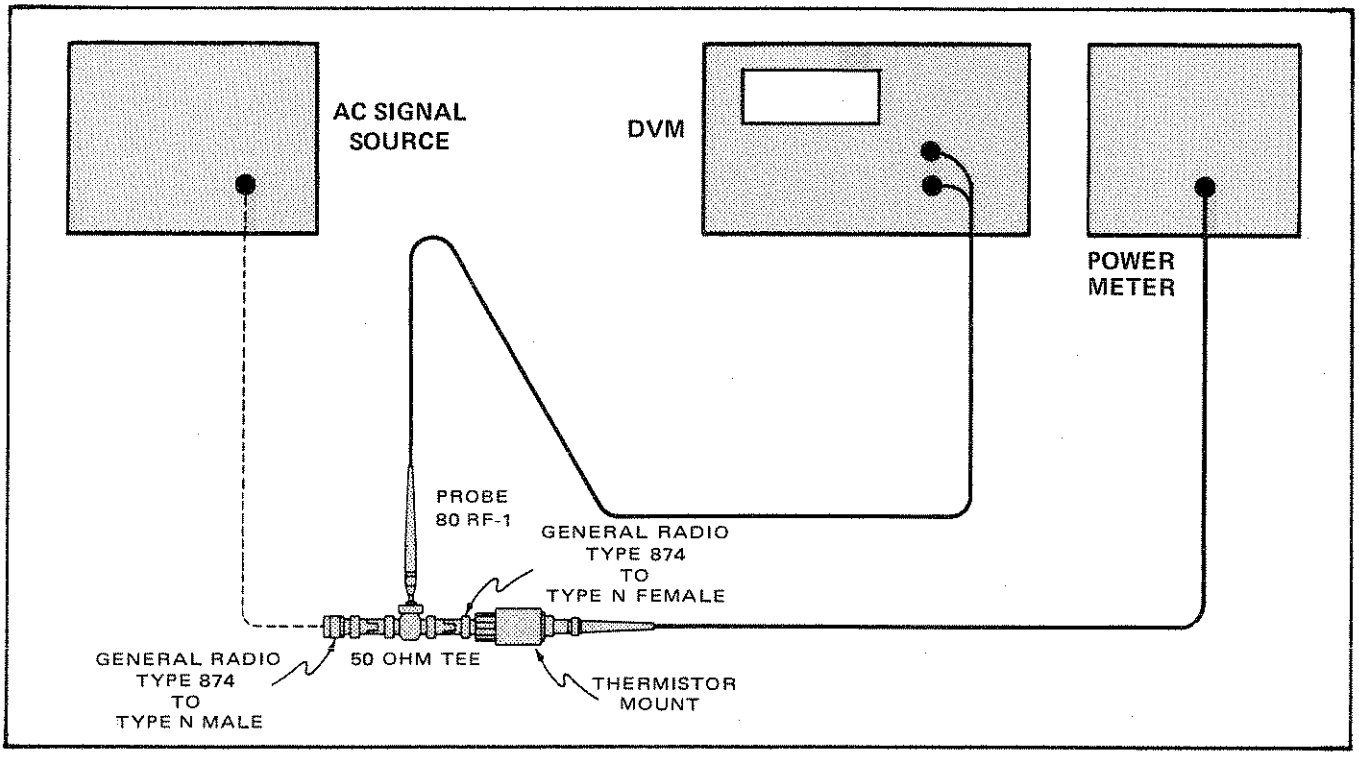


Figure 6-12. HIGH FREQUENCY RESPONSE CHECK

6-50. HIGH FREQUENCY PROBE (81RF)

6-51. Introduction

6-52. The Model 81RF High Frequency Probe, Figure 6-13, extends the frequency range of the 8000A to include 100 kHz to 100 MHz for ac voltage measurements from 0.25 to 30V rms. The 81RF operates in conjunction with the dc voltage ranges, and is connected to the 8000A using a shielded dual-banana plug and an adapter.

6-53. Specifications

Transfer Accuracy:	±1 dB from 100 kHz to 100 MHz
Voltage Range:	.25V rms to 30V rms (operated into a 10 MΩ input resistance voltmeter). Peak responding calibrated to read rms value of a sinewave.
Maximum DC Input:	350V
Input Impedance:	12MΩ shunted by ≈ 15 pf maximum

6-54. Operation

6-55. Use the following procedure for operating the 8000A with the 81RF probe:

a. Connect the 81RF shielded dual-banana plug to the 8000A V-Ω and COMMON INPUT terminals.

b. Attach the desired probe tip to the probe body.

c. Depress the DCV pushbutton (FUNCTION)

d. Select the desired voltage range.

e. Connect the probe's ground lead to a suitable ground.

f. Touch the probe tip to the circuit point to be measured.

g. Observe the voltage reading displayed in volts rms on the 8000A readout.

6-56. BATTERY PACK, OPTION –01

6-57. Introduction

6-58. The Battery Pack provides the 8000A with the capability of operating as a portable (battery-operated) instrument. Four nickel cadmium (Ni-cad) batteries allow at lease 8 hours of portable operation before recharging is necessary. The batteries are recharged by connecting the 8000A to the ac power line. If desired, the 8000A can be operated during the charging process, however, the charging time will be increased.

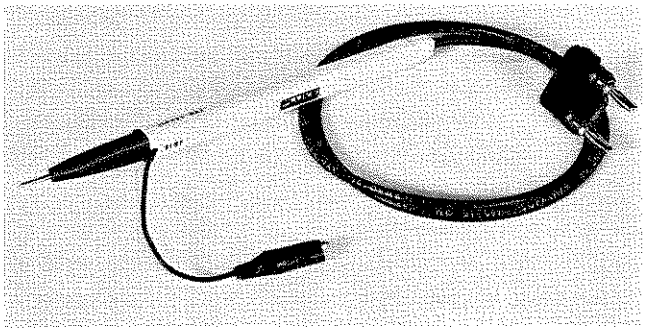


Figure 6-13. HIGH FREQUENCY PROBE (81RF)

6-59. Specification

6-60. The specifications for the Battery Pack are given in Section 1 of this manual.

6-61. Operation

CAUTION!

Damage may result if alkaline, zinc-carbon, or mercury batteries are charged in the 8000A.

6-62. With a fully charged Battery Pack, the 8000A can be disconnected from line power and operated for at least 8 hours, as a portable instrument. When the display digits are too dim to read, the Battery Pack should be recharged by switching the POWER switch to OFF and connecting the instrument to the ac power line. The total charge time is approximately 13 hours. If desired, the 8000A can be operated during the charging process, however, the charge time will be extended to approximately 43 hours.

NOTE

Battery manufacturers recommend that Ni-cad batteries be recharged at least every 90 days. Storage temperatures below +25°C are recommended.

6-63. Theory of Operation

6-64. The 8000A equipped with the Battery Pack Option (–01) uses the battery operated power supply shown in schematic drawing 8000A–1011. With the POWER switch ON, the batteries are connected to the input of a dc-to-dc converter which consists of Q22, Q23, T2, CR15 through

CR18, C17 and C18. Transistors Q22 and Q23, and transformer T2 form a 4 kHz multivibrator whose output signal is coupled by T2 to the diode rectifiers CR15 through CR18. Capacitors C17 and C18 filter the rectified voltage to supply the ±15V dc outputs. The unregulated +5V dc is supplied by the battery.

6-65. The battery is charged whenever the instrument is connected to ac line power. Transformer T1, CR13, and CR14 provide the rectified charging voltage. Lamp, D5, in parallel with R21 acts as a dynamic current control which limits the charging current to approximately 450 mA. With the instrument connected to line power and the POWER switch OFF, approximately 425 mA can be supplied to a discharged battery.

6-66. Maintenance

6-67. BATTERY REPLACEMENT

6-68. Use the following procedure for removing and replacing batteries:

CAUTION

Do not attempt to charge alkaline, zinc-carbon or mercury batteries in the 8000A.

a. Disconnect line cord. Remove retaining screw at rear of instrument case, and remove instrument from case.

b. On the underside of the pcb, remove the two threaded bolts securing the battery holders.

c. Remove the holder tops and batteries.

d. Replace the batteries with 1.2 volt nickel-cadmium batteries (JF Part No. 346924). Install the batteries in the direction indicated by the polarity markings on the battery holder.

6-69. FUSE REPLACEMENT

6-70. The input power fuse F1 is located on the interior of the instrument near the power transformer. If replacement is necessary, use an MDL 1/8A (slo-blo) for battery powered instruments.

CAUTION!

Line potential exists on the fuseholder whenever the instrument is plugged into the line.

6-71. DIGITAL PRINTER OUTPUT UNIT (OPTION –02)

6-72. Introduction

6-73. The Digital Printer Output Unit (DPOU) provides digital measurement information to a rear panel output connector for use in controlling a remote instrument. The output data is in parallel bcd format and is compatible with the Fluke Model 2010A Digital Printer

6-74. Specifications

6-75. The specifications for the DPOU are given in Section 1 of this manual.

6-76. Operation

6-77. INPUT/OUTPUT DATA

6-78. The input/output data available at the rear-panel DPOU connector is listed in Table 6-4. The pin assignments and logic level requirements for each signal are also given.

CAUTION

Logic Common, pin 16, is connected to the 8000A's LO INPUT terminal. Ground conflicts between measurement and interface equipment can cause sever damage to the instruments involved.

6-79. DATA UPDATE

6-80. The DPOU output can be updated by either a Data Update pulse or a Continuous Update command. The Data Update pulse, pin 15, should be a negative-going input pulse which is greater than 10 μs wide. Measurement data accumulated by the 8000A, after a Data Update pulse is received, will not appear at the DPOU connector. However, the new data will be displayed. The maximum allowable rate of the Data Update pulse is three times per second. The Continuous Update command, pin 17, when held low, will cause the DPOU output to be updated at the internal trigger rate of the DPOU; typically six times per second.

6-81. BUSY FLAG

6-82 The updating period of the DPOU is signified by a Busy Flag output at pin 13 of the DPOU connector. During this period all external Data Update pulses are ignored. A simple modification on the DPOU PCB Assembly allows the Busy Flag to be inverted for use as a ready flag. Use the following procedure to modify the Busy Flag:

Table 6-4. INPUT/OUTPUT DATA AVAILABLE AT DPOU CONNECTOR

PIN NO	SIGNAL	LINES	SIGNAL LOGIC		LOGIC LEVELS	
			HIGH =	LOW =	"1" =	"0" =
2	Most significant digit (MSD)	1	1	0		
10	8		8	0		
11	4		4	0		
12	2 — 2 MSD	4	2	0		
4	1		1	0		
19	8		8	0		
3	4		4	0	+4.3 to	0 to
6	2 — 3 MSD	4	2	0	+5.7V dc	+0.4V dc
14	1		1	0		
18	8		8	0		
7	4		4	0		
20	2 — Least Significant Digit (LSD)	4	2	0		
9	1		1	0		
8	Polarity	1	+	–		
5	Display overload	1	Overload	no Overload		
13	Busy Flag	1	Busy	Not Busy		
15	Data Update Pulse (≥ 10μs)	1	–	Update	Open or +5V dc	0 to +0.4V dc or contact closure to Common
17	Continuous Update Command	1	–	Update		
16	Logic Common	1				
1	+5V dc through 15kΩ	1				

a. Disconnect the line power cord.

b. Remove the retaining screw at the rear of the 8000A case.

c. Separate the instrument from the case.

d. Locate the DPOU PCB Assembly.

e. Refer to the DPOU schematic and remove jumper wire J1.

f. Install jumper wire J2.

g. Install the 8000A in its case.

6-83. DATA OUTPUT PULLUP VOLTAGE

6-84. Normally the output data lines at the DPOU connector are pulled-up through 15kΩ resistors to the +5V dc logic supply. A simple jumper modification on the DPOU PCB Assembly allows an external pull-up voltage (+15V dc maximum) to be applied at pin 1 of the DPOU Connector. Use the following procedure to incorporate the external pullup voltage feature:

a. Disconnect the line power cord.

b. Remove the retaining screw at the rear of the 8000A case.

c. Separate the instrument from the case.

d. Locate the DPOU PCB Assembly.

e. Refer to the DPOU schematic drawing, 8000A–1012, and remove jumper wire J3.

f. Install jumper wire at J4.

g. Install the 8000A in its case.

6-85. DPOU INTERFACE CABLE

6-86. A mating DPOU connector is supplied as part of the –02 option for use in fabricating a custom interface cable. Use the following procedure to fabricate the interface cable:

a. Assemble the following equipment:

1. Teflon or vinyl insulated wire, 26 gauge, 20 pieces cut to desired length.
2. Sleeving, # 16 for vinyl insulated wire, or #18 for teflon insulated wire.
3. Rosin core solder, 60/40
4. Wire strippers
5. Soldering Iron, pencil-type (45W max.)
6. DPOU mating connector
7. Mating connector for interfaced instrument
8. Connector vice

b. Slide cable wires through the DPOU connector backshell (hood) as shown in Figure 6-14.

c. Strip one-eight of an inch of insulation from the DPOU connector end of the cable. Tin the ends.

d. Cut 20 pieces of sleeving to a length of three-sixteenths of an inch.

e. Slide one piece of sleeving over each prepared wire end.

f. Place the DPOU mating connector in the connector vice, and tin each connector pin.

g. Solder one prepared wire to each connector pin.

h. Position the sleeving over the solder joints, and install the connector backshell (hood) and strain relief as shown in Figure 6-14.

i. Install the wires on the mating connector for the interfaced instrument using the DPOU connector information given in Table 6-4 and Figure 6-15.

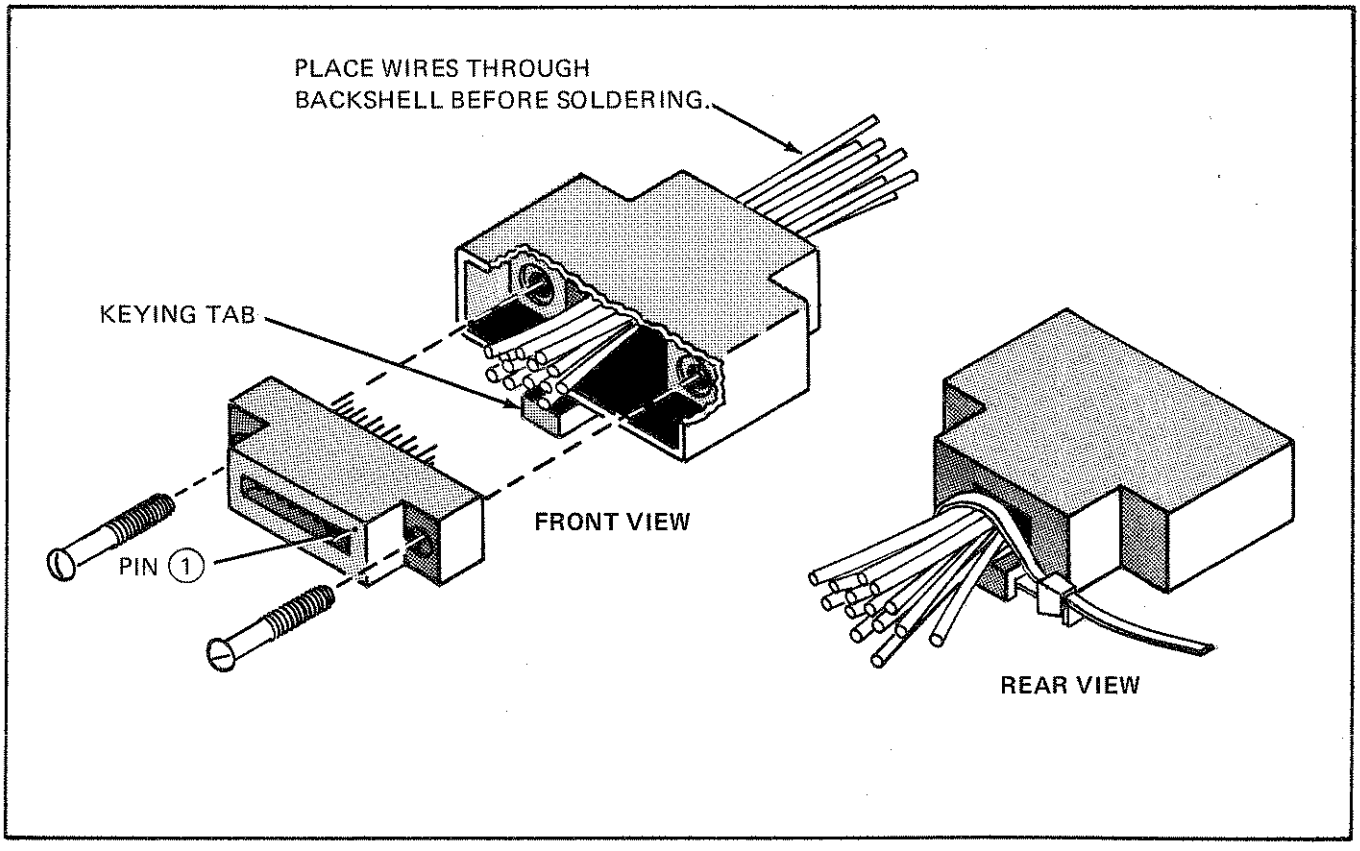


Figure 6-14. MATING CONNECTOR END OF THE DPOU INTERFACE CABLE

6-87. Theory of Operation

6-88. The DPOU consists of a series of shift registers which, when enabled, store the character serial measurement data generated by the 8000A. The storage process is enabled by an external update command, and is synchronized with the 8000A display strobe lines, S1 through S4. The shift registers retain the solicited data until a new update command is received. The stored parallel bcd measurement data, available at the shift register outputs, is buffered before being made available at the DPOU connector.

6-89. Numeric, polarity, and overload data from the 8000A is applied in character serial format to the input lines (W, X, Y and Z) of the DPOU. The serial sequence is controlled by the strobe lines (S1 through S4), and during period S1, the most significant digit (0 or 1), the display overload signal, and the polarity bit are present at the shift register input. During strobe periods S2, S3 and S4 the shift registers are presented with the second, third, and fourth measurement digits, respectively. Data is loaded into the shift registers by a clock pulse which is synchronized with the strobe pulses, S1 through S4.

6-90. The data update sequence is initiated when the Data Update line is pulled low. When the next positive transition of the T input occurs (see Figure 6-16) the Q output of flip-flop U1-1 is set high. When set, U1-1 enables a second flip-flop to set on the appearance of the S1 (strobe line) pulse. After the second flip-flop is set, the Busy Flag is generated and, the shift registers enter the character-serial data present on the W, X, Y, and Z inputs. Upon detecting the S4 input, flip-flop U1-1 is reset and on the completion of the subsequent clock pulse the second flip-flop is reset. The Busy Flag drops low to indicate the completion of the data update sequence.

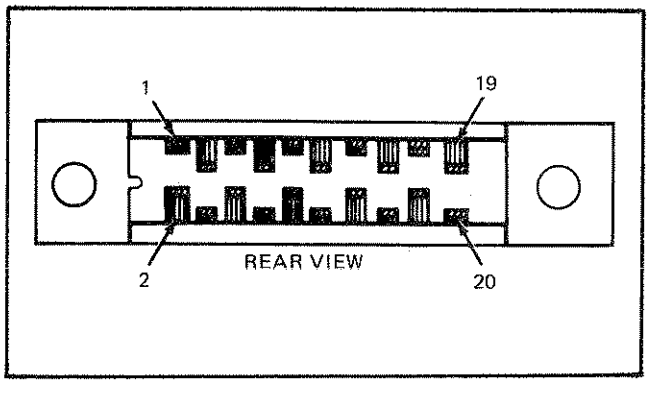


Figure 6-15. DPOU MATING CONNECTOR DETAIL

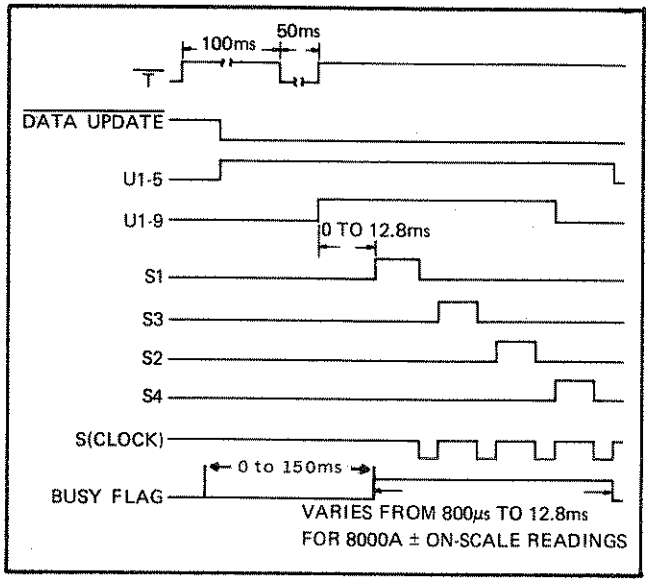


Figure 6-16. DPOU TIMING DIAGRAM

6-91. 10A CURRENT RANGE, OPTION –05

6-92. Introduction

6-93. The 10A Current Range, Option –05, extends the current measuring capability of the 8000A to include a 10A current range. With the Option –05 installed, the 8000A is capable of making continuous current measurements up to 10A and periodic current measurements from 10A to 20A. Current measurements in excess of 10A are limited to periods of less than 1 minute and a duty cycle of 25%. The standard operating characteristics of the 8000A are not altered by the installation of this option.

6-94. Specifications

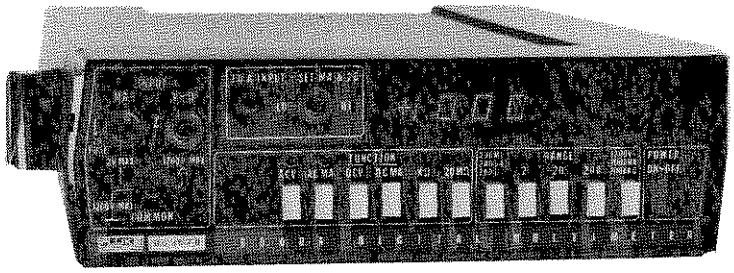
6-95. The specifications for the 10A Current Range are given in Section 1 of this manual.

6-96. Operation

6-97. Instructions for properly conditioning the front panel switches, and the Input connections for a current measurement on the 10A range are given in Figure 6-17.

6-98. Theory of Operation

6-99. The 10A Current Range as shown in Figure 6-18, consists of a 0.01 ohm resistor which is inserted in a low sense line of the current shunt circuit. Separate input terminals eliminate the need for additional range switching. The decimal point is properly positioned in the readout by depressing the 20 RANGE pushbutton.



DESIRED MEASUREMENT	SELECT FUNCTION	SELECT RANGE	MEASUREMENT INPUT CONNECTORS	MEASUREMENT PERIOD
2 to 20A dc	DC MA	20	Hi and LO 10A Inputs	Continuous to 10A. Above 10A, 1 minute or less (25% duty cycle)
2 to 20A ac	AC MA	20	HI and LO 10A inputs	

Figure 6-17. OPTION –05, MEASUREMENT INSTRUCTIONS

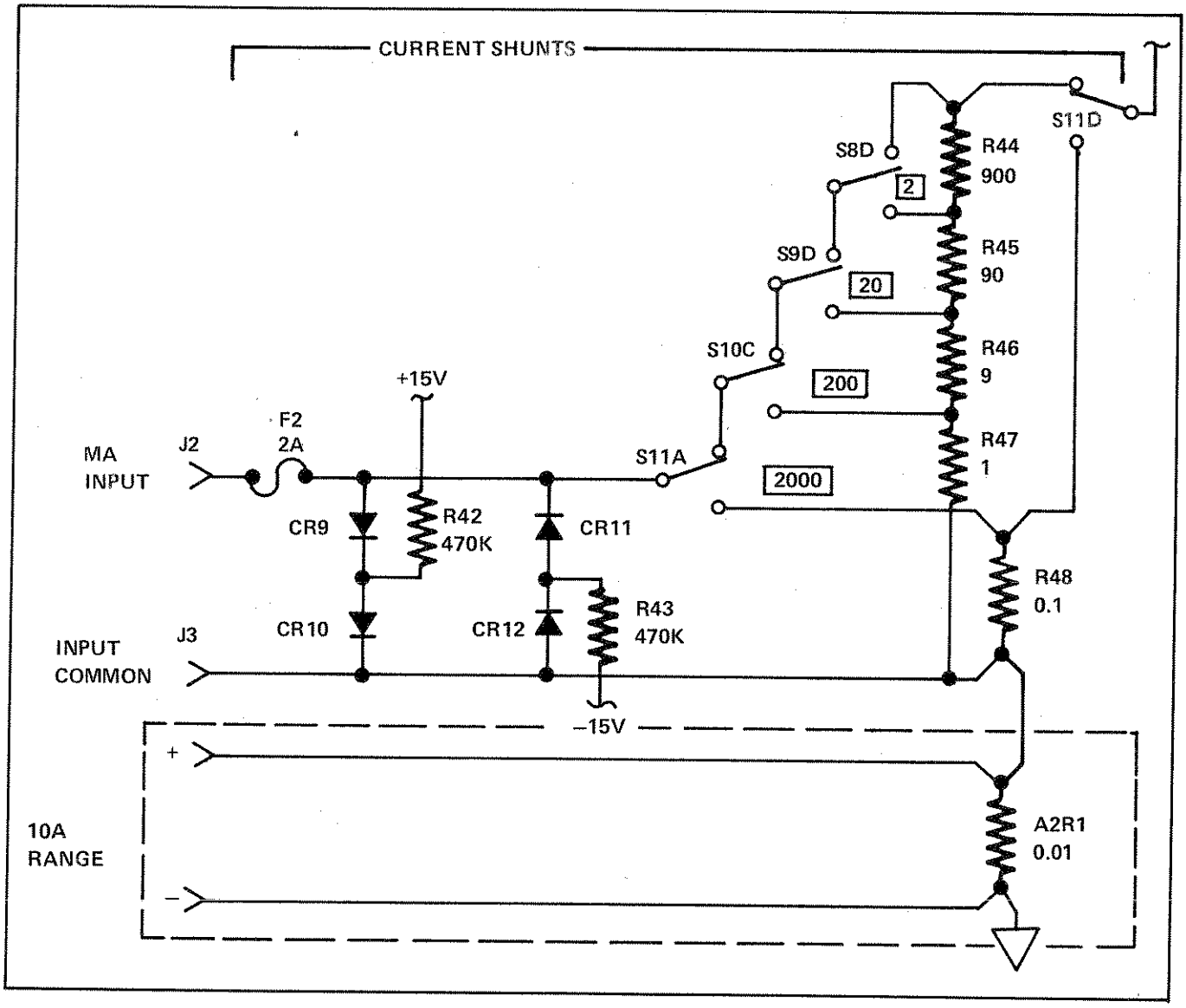


Figure 6-18. OPTION –05, SCHEMATIC DIAGRAM

6-100. LOW OHMS OPTION (–06)

6-101. Introduction

6-102. The Low Ohms Option (–06) provides the 8000A with both a 2 and 20 ohm full scale range. The option includes a separate set of front panel input terminals and an adjustment to null out the presence of test lead resistance. All standard 8000A features, with the exception of the 20 MΩ range, are maintained when the –06 options is installed. The 20 MΩ FUNCTION switch is deleted and replaced with a LO Ω FUNCTION switch.

6-103. Specifications

6-104. The specifications for the Low Ohms Option are given in Section 1 of this manual.

6-105. Operation

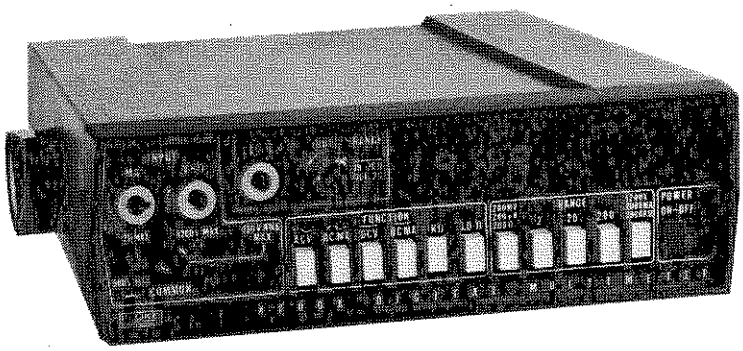
6-106. Instructions for conditioning the front panel switches, and completing the input connections necessary for a resistance measurement on the low ohm ranges are given in Figure 6-19.

NOTE

The test leads supplies with the 8000A should be used for low ohms measurements. Any leads used as substitutes should have a resistance of from 60 to 140 milliohms (lead resistance for a five foot pair of No. 20 wire is 100 milliohms.)

6-107. Maintenance

6-108. The performance test and calibration procedure for the Low Ohms Option are included in Section 4 of this manual. Refer to Figure 5-3 for the location of applicable components and adjustments.



DESIRED MEASUREMENT	SELECT FUNCTION	SELECT RANGE	MEASUREMENT INPUT CONNECTORS	NULL ADJUSTMENT
0 to 2Ω	LOΩ	2Ω (OUT)	LOΩ and COMMON	Prior to measurement, touch test leads together and adjust NULL control for an all zero reading.
2 to 20Ω	LOΩ	20Ω (IN)	LOΩ and COMMON	

Figure 6-19. OPTION –06, MEASUREMENT INSTRUCTIONS

Section 7
General Information

7-1. This section of the manual contains generalized user information as well as supplemental information to the Lists of Replaceable parts contained in Section 5. The following information is presented in this section:

Table 7-1. LIST OF ABBREVIATIONS AND SYMBOLS

A or amp	ampere	cont	continue
ac	alternating current	crt	cathode-ray tube
af	audio frequency	cw	clockwise
a/d	analog-to-digital	d/a	digital-to-analog
assy	assembly	dac	digital-to-analog converter
AWG	american wire guage	dB	decibel
B	bel	dc	direct current
bcd	binary coded decimal	dmm	digital multimeter
°C	Celsius	dvm	digital voltmeter
cap	capacitor	elect	electrolytic
ccw	counter clockwise	ext	external
cer	ceramic	F	farad
cermet	ceramic to metal (seal)	°F	Fahrenheit
ckt	circuit	FET	field-effect transistor
cm	centimeter	ff	flip-flop
cmrr	common mode rejection ratio	freq	frequency
comp	composition	FSN	federal stock number

Table 7-2. FEDERAL SUPPLY CODES FOR MANUFACTURERS

00213	Sage Electronics Corp. Rochester, New York
00327	Welwyn International, Inc. Westlake, Ohio
00656	Aerovox Corp. New Bedford, Massachusetts
00686	Film Capacitors Passaic, New Jersey
00779	AMP Inc. Harrisberg, Pennsylvania
01121	Allen-Bradley Co. Milwaukee, Wisconsin
01281	TRW Semiconductors Lawndale, California
01295	Texas Instruments, Inc. Semiconductor Components Div. Dallas, Texas
01537	Motorola Communications & Electrical Inc. Franklin Park, Illinois
01686	RCL Electronics Inc. Manchester, New Hampshire
01730	Deleted
01884	Dearborn Electronics Inc. Orlando, Florida
02114	Ferroxcube Corp. Saugerties, New York
02395	Rason Mfg. Co. Brooklyn, New York
02533	Snelgrove, C.R. Co., Ltd. Don Mills, Ontario, Canada M3B 1M2
02606	Replaced by 15801
02660	Amphenol-Borg Elect. Corp. Broadview, Illinois
02799	Areo Capacitors, Inc. Torrence, California
03508	General Electric Co. Semiconductor Products Syracuse, New York
03614	Replaced by 71400
03651	Replaced by 44655
03797	Eldema Corp. Compton, California
03877	Transistron Electronic Corp. Wakefield, Massachusetts
03888	Pyrofilm Resistor Co., Inc. Cedar Knolls, New Jersey
03911	Clairex Corp. New York, New York
03980	Muirhead Instruments, Inc. Mountainside, New Jersey
04009	Arrow Hart and Hegemen Electronic Company Hartford, Connecticut
04062	Replaced by 72136
04202	Replaced by 81312
04217	Essex Wire Corp. Wire & Cable Div. Anaheim, California
04221	Aemco, Div. of Midtex Inc. Mankato, Minnesota
04222	Aerovox Corp. (H-Q) Myrtle Beach, South Carolina
04645	Replaced by 75376
04713	Motorola Semiconductor Products Inc. Phoenix, Arizona
05082	Replaced by 94154
05236	Jonathan Mfg. Co. Fullerton, California
05277	Westinghouse Electric Corp. Semiconductor Dept. Youngwood, Pennsylvania
05278	Replaced by 43543
05397	Union Carbide Crop. Electronics Div. Cleveland, Ohio
05279	Southwest Machine & Plastic Co. Los Angeles, California
05397	Union Carbide Corp. Electronics Div. New York, New York
05571	Sprague Electric Co. Pacific Div. Los Angeles, California
05574	Viking Industries Chaisworth, California
05704	Alac, Inc. Glendale, California
05820	Wakefield Engineering Ind. Wakefield, Massachusetts
06001	General Electric Company Capacitor Department Irmo, South Carolina
06136	Replaced by 63743
06383	Panduit Corp Tinley Park, Illinois
06473	Amphenol Space & Missile Sys. Chatsworth, California
06555	Beede Electrical Instrument Co. Penacook, New Hampshire
06739	Electron Crop. Littletown, Colorado

Table 7-2. FEDERAL SUPPLY CODES FOR MANUFACTURERS (Continued)

06743	Clevite Corp. Cleveland, Ohio
06751	Semcor Div., Components, Inc. Phoenix, Arizona
06860	Gould National Batteries Inc. City of Industry, California
06980	Varian-Eimac San Carlos, California
07047	Ross Milton, Co., The South Hampton, Pennsylvania
07115	Replaced by 14674
07138	Westinghouse Electric Corp., Electronic Tube Division Elmira, New York
07233	TRW Electronic Components Cinch Graphic City of Industry, California
07256	Silicon Transistor Corp. Garden City, New York
07263	Fairchild Semiconductor Div. of Fairchild Camera & Instrument Corp. Mountain View, California
07344	Bircher Co., Inc. Rochester, New York
07792	Lerma Engineering Corp. Northampton, Massachusetts
07910	Teledyne Corp. (Continental Device) Hawthorne, California
08225	Industro Transistor Corp. Long Island City, New York
08261	Spectra Strip Corp Garden Grove, California
08530	Reliance Mica Corp. Brooklyn, New York
08792	Discontinued
08806	General Electric Co. Miniature Lamp Dept. Cleveland, Ohio
08863	Nylomatic Corp. Norrisville, Pennsylvania
08988	Skottie Electronics Inc. Archbald, Pennsylvania
09214	G.E. Semi-Conductor Products Dept. Auburn, New York
09353	C and K Components Watertown, Massachusetts
09423	Scientific Components, Inc. Santa Barbara, California
09922	Burndy Corp. Norwalk, Connecticut
09969	Dale Electronics Inc. Yankton, S Dakota
11236	CTS of Berne Berne, Indiana
11237	Chicago Telephone of Calif. Inc., (CTC) Paso Robles, California
11358	Discontinued
11403	Best Products Co. Chicago, Illinois
11503	Keystone Mfg. Div. of Avis Industrial Crop. Warren, Michigan
11711	General Instrument Corp Rectifier Division Hickville, New York
11726	Qualidyne Corp. Santa Clara, California
12014	Chicago Rivet & Machine Co. Bellwood, Illinois
12040	National Semiconductor Corp. Danburry, Connecticut
12060	Diodes, Inc. Chatsworth, California
12136	Philadelphia Handle Co. Camden, New Jersey
12300	Potter-Brumfield Division AMF Canada LTD. Guelph, Ontario, Canada
12323	Presin Co., Inc. Shelton, Connecticut
12327	Freeway Washer & Stamping Co. Cleveland, Ohio
12400	Replaced by 75042
12615	U.S. Terminals Inc. Cincinnati, Ohio
12617	Hamlin Inc. Lake Mills, Wisconsin
12697	Clarostat Mfg. Co. Dover, New Hampshire
12749	James Electronics Chicago, Illinois
12856	Micrometals Sierra Madre, California
12954	Dickson Electronics Corp. Scottsdale, Arizona
12969	Unitrode Corp. Watertown, Massachusetts
13103	Themalloy Co. Dallas, Texas
13327	Solitron Devices Inc. Tappan, New York

Table 7-2. FEDERAL SUPPLY CODES FOR MANUFACTURERS (Continued)

13511	Amphenol Corp. Los Gatos, California
13606	Sprague Electric Co. Transistor Div. Concord, New Hampshire
13839	Replaced by 23732
14099	Semtech Corp. Newbury Park, California
14193	California Resistor Corp. Santa Monica, California
14298	American Components, Inc. Conshohocken, Pennsylvania
14655	Cornell-Dubilier Electronics Newark, New Jersey
14674	Discontinued, see 16299
14752	Electro Cube Inc. San Gabriel, California
14869	Replaced by 96853
15636	Elec-Trol Inc. Northridge, California
15801	Fenwal Electronics Inc. Framingham, Massachusetts
15818	Amelco Semiconductor Div. of Teledyne Inc. Mountain View, California
15849	USECO, Inc. Mt. Vernon, New York
15898	International Business Machines (IBM) Essex Junction, Vermont
15909	Replaced by 17870
16299	Corning Glass Raleigh, North Carolina
16332	Replaced by 28478
16473	Cambridge Scientific Ind. Inc. Cambridge, Maryland
16742	Paramount Plastics Downey, California
16758	Delco Radio Div. of General Motors Kokomo, Indiana
17001	ITT Cannon Santa Ana, California
17069	Circuit Structures Lab. Upland, California
17338	High Pressure Eng. Co., Inc. Oklahoma City, Oklahoma
17856	Siliconix, Inc. Sunnyvale, California
17870	Daven Div. of Thomas A. Edison Ind. - McGraw - Edison Co. Manchester, New Hampshire
18083	Deleted
18178	Vactec Inc. Maryland Heights, Missouri
18324	Signetics Corp. Sunnyvale, California
18612	Vishay Intertechnology Inc. Malvern, Pennsylvania
18736	Voltronics Corp. Hanover, New Jersey
18927	G T E Sylvania Inc. Precision Material Group Parts Division Titusville, Pennsylvania
19429	Discontinued, use 89536
19451	Perine Machinery & Supply Co. Seattle, Washington
19701	Electra Mfg. Co. Independence, Kansas
25084	Enochs Mfg. Co. Indianapolis, Indiana
20891	Self-Organizing Systems, Inc. Dallas, Texas
21604	Buckeye Stamping Co. Columbus, Ohio
21845	Solitron Devices Inc. Transistor Division Riveria Beach, Florida
22767	ITT Semiconductors Div. of ITT Palo Alto, California
23050	Product Comp. Corp. Mount Vernon, New York
23732	Tracor Rockville, Maryland
23880	Stanford Applied Engrng. Santa Clara, California
23936	Pamotor Div., Wm. J. Purdy Co. Burlingame, California
24248	Southco Div. of South Chester Corp. Lester, Pennsylvania
24355	Analog Devices Inc. Norwood, Massachusetts
24655	General Radio Co. West Concord, Massachusetts
24759	Lenox-Fugle Electronics Plainfield, New Jersey
25088	Siemen Corp. Isilen, New Jersey
25403	Amperex Electronic Corp. Semiconductor & Receiving Tube Division Slatersville, Rhode Island

Table 7-2. FEDERAL SUPPLY CODES FOR MANUFACTURERS (Continued)

27014	National Semiconductor Corp. Santa Clara, California
27264	Molex Products Downers Grove, Illinois
28213	Minnesota Mining & Mfg. Co. Consumer Products Div. St. Paul, Minnesota
28425	Bohannan Industries Fort Worth, Texas
28478	Deltrol Controls, Corp. Milwaukee, Wisconsin
28480	Hewlett Packard Co. Palo Alto, California
28520	Heyman Mfg. Co. Kenilworth, New Jersey
29083	Monsanto, Co., Inc. Santa Clara, California
29604	Stackpole Components Co. Raleigh, North Carolina
30148	A B Enterprise Inc. ahoskie, North Carolina
30323	Illinois Tool Works, Inc. Chicago, Illinois
31091	Optimax Inc. Colmar, Pennsylvania
32539	Mura Corp. Great Neck, New York
32767	Griffith Plastic Products Co. Burlingame, California
32879	Advanced Mechanical Components Northridge, California
32897	Erie Technological Products, Inc. Frequency Control Div. Carlisle, Pennsylvania
32997	Bourns Inc. Trimpot Products Division Riverside, California
33173	General Electric Co. Tube Dept. Owensboro, Kentucky
34333	Silicon General Westminister, California
34335	Advanced Micro Devices Sunnyvale, California
37942	Mallory, P.R. & Co., Inc. Indianapolis, Indiana
42498	National Company Melrose, Massachusetts
43543	Nytronics Inc. Transformer Co. Div. Alpha, New Jersey
44655	Ohmite Mfg. Co. Skokie, Illinois
49671	Radio Corp. of America New York, New York
49956	Raytheon Company Lexington, Maine
50088	Mostek Corp. Carrollton, Texas
50579	Litronix Inc. Cupertino, California
51605	Scientific Components Inc. Linden, New Jersey
53021	Sanamo Electric Co. Springfield, Illinois
54294	Shallcross, A Cutler-Hammer Co. Selma North Carolina
55026	Simpson Electric Company Chicago, Illinois
56289	Sprague Electric Co. North Adams, Massachusetts
58474	Superior Electric Co. Bristol, Connecticut
60399	Torrington Mfg. Co. Torrington, Connecticut
62460	Deleted
63743	Ward Leonard Electric Co. Mount Vernon, New York
64834	West Mfg. Co. San Francisco, California
65092	Weston Instruments Inc. Newark, New Jersey
66150	Winslow Tele-Tronics Inc. Asbury Park, New Jersey
70563	Amperite Company Union City, New Jersey
70903	Belden Mfg. Co. Chicago, Illinois
71002	Birnbach Radio Co., Inc. New York, New York
71236	"ELMENCO" Willimantic, Connecticut
71400	Bussmann Mfg. Div. of McGray - Edison Co. Saint Louis, Missouri
71450	CTS Corp. Elkhart, Indiana
71468	ITT Cannon Electric Inc. Los Angeles, California
71482	Clare, C.P. & Co. Chicago, Illinois
71590	Centralab Div. of Globe Union Inc. Milwaukee, Wisconsin

Table 7-2. FEDERAL SUPPLY CODES FOR MANUFACTURERS (Continued)

71707	Coto Coil Co., Inc. Providence, Rhode Island
71744	Chicago Miniature Lamp Works Chicago, Illinois
71785	Cinch Mfg. Co. & Howard B. Jones Div. Chicago, Illinois
72005	Driver, Wilber B., Co. Newark, New Jersey
72092	Replaced by 06980
72136	Electro Motive Mfg. Co. Williamantic, Connecticut
72259	Nytronics Inc. Berkeley Heights, New Jersey
72354	Deleted
72619	Dialight Corp. Brooklyn, New York
72653	G. C. Electronics Rockford, Illinois
72665	Replaced by 90303
72794	Dzus Fastener Co., Inc. West Islip, New York
72928	Gudeman Co. (Gulton Ind.) Chicago, Illinois
72982	Erie Tech. Products Inc. Erie, Pennsylvania
73138	Beckman Instruments Inc. Helipot Division Fullerton, California
73293	Hughes Aircraft Co. Electron Dynamics Div. Torrence, California
73445	Amperex Electronic Corp. Hicksville, New York
73559	Carling Electric Inc. Hartford, Connecticut
73586	Circle F Industries Trenton, New Jersey
73734	Federal Screw Products, Inc. Chicago, Illinois
73743	Fischer Special Mfg. Co. Cincinnati, Ohio
73899	JFD Electronics Co. Brooklyn, New York
73949	Guardian Electric Mfg. Co. Chicago, Illinois
74199	Quam Nichols Co. Chicago, Illinois
74217	Radio Switch Corp. Marlboro, New Jersey
74276	Signalite Inc. Neptune, New Jersey
74306	Piezo Crystal Co. Carlisle, Pennsylvania
74542	Hoyt Elect. Instr. Works Penacook, New Hampshire
74970	Johnson, E. F., Co. Waseca, Minnesota
75042	IRC Inc. (Div. of TRW) Philadelphia, Pennsylvania
75376	Kurz-Kasch, Inc. Dayton, Ohio
75378	CTS Knights Inc. Sandwich, Illinois
75382	Kulka Electric Corp. Mount Vernon, New York
75915	Littlefuse Inc. Des Plaines, Illinois
76854	Oak Mfg. Co. Crystal Lake, Illinois
77342	Potter & Brumfield Div. of Amer. Machine & Foundry Princeton, Indiana
77638	General Instrument Corp. Rectifier Division Brooklyn, New York
77969	Rubbercraft Corp. of Calif. LTD. Torrance, California
78189	Shakeproof Div. of Illinois Tool Works Elgin, Illinois
78277	Sigma Instruments, Inc. South Braintree, Massachusetts
78488	Stackpole Carbon Co. Saint Marys, Pennsylvania
78553	Tinnerman Products Cleveland, Ohio
78136	Waldes Kohinoor Inc. Long Island City, New York
79497	Western Rubber Company Goshen, Indiana
79963	Zierick Mfg. Corp. New Rochelle, New York
80031	Mepco Div. of Sessions Clock Co. Morristown, New Jersey
80145	API Instruments Co. Chesterland, Ohio
80183	Spraque Products North Adams, Massachusetts
80294	Bourns Inc. Riverside, California
80583	Hammarlund Co., Inc. Mars Hill, North Carolina
80640	Stevens, Arnold Inc. Boston, Massachusetts

Table 7-2. FEDERAL SUPPLY CODES FOR MANUFACTURERS (Continued)

81073	Grayhill, Inc. La Grange, Illinois
81590	Korry Mfg. Co. Seattle, Washington
81312	Winchester Electronics Div. of Litton Industries Oakville, Connecticut
81439	Therm-O-Disc Inc. Mansfield, Ohio
81483	International Rectifier Corp. Los Angeles, California
81741	Chicago Lock Corp. Chicago, Illinois
82305	Palmer Electronics South Gate, California
82389	Switchcraft Inc. Chicago, Illinois
82415	Price Electric Corp. Frederick, Maryland
82872	Roanwell Corp. New York, New York
82877	Rotron Mfg. Co., Inc. Woodstock, New York
82879	ITT Wire & Cable Div. Pawtucket, Rhode Island
83003	Varo Inc. Garland, Texas
83298	Bendix Corp. Electric Power Division Eatontown, New Jersey
83330	Smith, Herman H., Inc. Brooklyn, New York
83478	Rubbercraft Corp. of America New Haven, Connecticut
83594	Burroughs Corp. Electronic Components Div. Plainfield, New Jersey
83740	Union Carbide Corp. Consumer Products Div. New York, New York
84171	Arco Electronics, Inc. Great Neck, New York
84411	TRW Ogallala, Nebraska
84613	Fuse Indicator Corp. Rockvillw, Maryland
86577	Precision Metal Products Stoneham, Massachusetts
86684	Radio Corp. of America Electronic Components & Devices Harrison, New Jersey
86689	Deleted
87034	Marco-Oak Inc. Anaheim, California
88245	Litton Products Inc. Van Nuys, California
88419	Use 14655
88690	Replaced by 04217
89536	Fluke, John Mfg. Co., Inc. Seattle, Washington
89730	Replaced by 08806
90201	Mallory Capacitor Co. Indianapolis, Indiana
90215	Best Stamp & Mfg. Co. Kansas City, Missouri
90211	Square D Co. Chicago, Illinois
90303	Mallory Battery Co. Tarrytown, New York
91293	Johanson Mfg. Co. Boonton, New Jersey
91407	Replaced by 58474
91502	Associated Machine Santa Clara, California
91506	Augat Attleboro, Massachusetts
91637	Dale Electronics Inc. Columbus, Nebraska
91662	Elco Corp. Willow Grove, Pennsylvania
91737	Gremar Mfg. Co., Inc. (ITT) Woburn, Massachusetts
91802	Industrial Devices, Inc. Edgewater, New Jersey
91833	Keystone Electronics Corp. New York, New York
91836	King's Electronics Tuckahoe, New York
91929	Honeywell Inc. Micro Switch Div. Freeport, Illinois
91934	Miller Electric Co., Inc. Pawtucket, Rhode Island
93332	Sylvania Electric Products Semiconductor Products Div. Woburn, Massachusetts
94145	Replaced by 49956
94154	Tung-Sol Div. of Wagner Electric Corp. Newark, New Jersey
95146	Alco Electronics Products Inc. Lawrence, Massachusetts
95263	Leecraft Mfg. Co. Long Island City, New York
95264	Replaced by 98278

Table 7-2. FEDERAL SUPPLY CODES FOR MANUFACTURERS (Continued)

95275	Vitramon Inc. Bridgeport, Connecticut
95303	Radio Corp. of America Solid State & Receiving Tube Div. Cincinnati, Ohio
95354	Methode Mfg. Corp. Rolling Meadows, Illinois
95712	Dage Electric Co., Inc. Franklin, Indiana
95987	Weckesser Co. Inc. Chicago, Illinois
96733	San Fernando Electric Mfg. Co. San Fernando, California
96853	Rustrak Instrument Co. Manchester, New Hampshire
96881	Thomson Industries, Inc. Manhasset, New York
97540	Master Mobile Mounts Div. of Whitehall Electronics Corp. Los Angeles, California
97913	Industrial Electronic Hdware Corp. New York, New York
97945	White, S.S. Co. Plastics Div. New York, New York
97966	Replaced by 11358
98094	Replaced by 49956
98159	Rubber-Teck, Inc. Gardena, California
98278	Microdot Inc. Pasadena, California
98291	Sealectro Corp. Conhex Div. Mamaroneck, New York
98388	Accurate Rubber & Plastics Culver City, California
98743	Replaced by 12749
98925	Deleted
99120	Plastic Capacitors, Inc. Chicago, Illinois
99217	Southern Electronics Corp. Burbank, California
99392	STM Oakland, California
99515	Marshall Industries Capacitor Div. Monrovia, California
99779	Barnes Corp. Lansdowne, Pennsylvania
99800	American Precision Industries Inc. Delevan Division East Aurora, New York
	Toyo Electronics (R-Ohm Corp.) Irvine, California
	National Connector Minneapolis, Minnesota

Table 7-3. FLUKE TECHNICAL CENTERS

Fluke Western Technical Center
2020 North Lincoln St.
Burbank, CA 91504
Tel. 213-849-4641
TWX: 910-497-2086

Fluke Western Technical Center
2359 De La Cruz Blvd.
Santa Clara, CA 95050
Tel. 408-244-1505
TWX: 910-338-0121

Fluke S.W. Technical Center
Unit 4
1980 South Quebec Street
Denver, CO 80231
Tel. 303-750-1228

Fluke S.E. Technical Center
P.O. Box 6578
940 North Fern Creek Avenue
Orlando, FL 32803
Tel. 305-896-2296
TWX: 810-850-0185

Fluke Midwestern Technical Center
1287 North Rand Road
Des Plaines, IL 60016
Tel. 312-298-7470
TWX: 910-233-4978

Fluke Mideastern Technical Center
11501 Huff Court
Kensington, MD 20795
Tel. 301-881-5300
TWX: 710-825-9645

Fluke N.E. Technical Center
109 Massachusetts Ave.
Lexington, MA 02173
Tel. 617-861-8620
TWX: 710-826-1715

Fluke Midwestern Technical Center
10800 Lyndale Avenue South
Minneapolis, MN 55420
Tel. 612-884-4541
TWX: 910-576-3141

Fluke Eastern Technical Center
101 Berkshire Ave.
Paterson, NJ 07502
Tel. 201-742-3215
TWX: 710-988-5945

Fluke Eastern Technical Center
4515 Culver Road
Rochester, NY 14622
Tel. 716-342-6940
TWX: 510-253-6145

Fluke S.E. Technical Center
P.O. Box 9619
1310 Beaman Place
Greensboro, NC 27408
Tel. 919-273-1918
TWX: 510-925-1173

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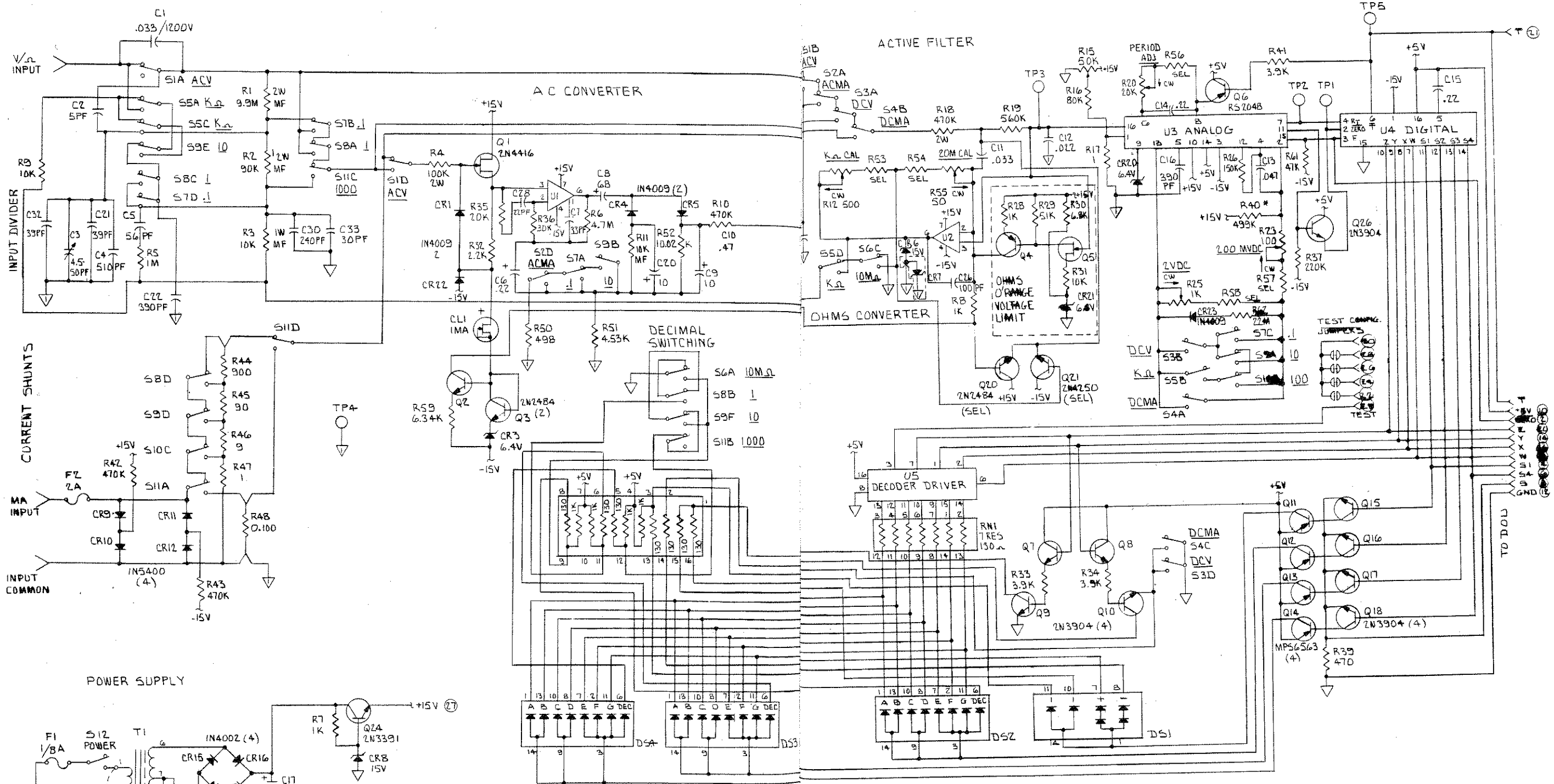
Table 7-1. LIST OF ABBREVIATIONS AND SYMBOLS (Continued)

g	gram
G	giga (10^9)
gd	guard
Ge	germanium
GHz	gigahertz
gmv	guaranteed minimum value
gnd	ground
H	henry
hd	heavy duty
hf	high frequency
Hz	hertz
IC	integrated circuit
if	intermediate frequency
in	inch(es)
intl	internal
I/O	input/output
k	kilo (10^3)
kHz	kilohertz
kΩ	kilohm(s)
kV	kilovolt(s)
lf	low frequency
LED	light-emitting diode
LSB	least significant bit
LSD	least significant digit
M	mega (10^6)
m	milli (10^{-3})
mA	milliampere(s)
max	maximum
mf	metal film
MHz	megahertz
min	minimum
mm	millimeter
ms	millisecond
MSB	most significant bit
MSD	most significant digit
MTBF	mean time between failures
MTTR	mean time to repair
mV	millivolt(s)
mv	multivibrator
MΩ	megohm(s)
n	nano (10^{-9})
na	not applicable
NC	normally closed
(—) or neg	negative
NO	normally open
ns	nanosecond
opnl ampl	operational amplifier
p	pico (10^{-12})
para	paragraph
pcb	printed circuit board
pF	picofarad
pn	part number
(+) or pos	positive
pot	potentiometer
p-p	peak-to-peak
ppm	parts per million
PROM	programmable read-only memory
psi	pound-force per square inch
RAM	random-access memory
rf	radio frequency
rms	root mean square
ROM	read-only memory
s or sec	second (time)
scope	oscilloscope
SH	shield
Si	silicon
serno	serial number
sr	shift register
Ta	tantalum
tb	terminal board
tc	temperature coefficient or temperature compensating
tcxo	temperature compensated crystal oscillator
tp	test point
u or μ	micro (10^{-6})
uhf	ultra high frequency
us or μs	microsecond(s) (10^{-6})
uut	unit under test
V	volt
v	voltage
var	variable
vco	voltage controlled oscillator
vhf	very high frequency
vlf	very low frequency
W	watt(s)
ww	wire wound
xfmr	transformer
xstr	transistor
xtal	crystal
xtlo	crystal oscillator
Ω	ohm(s)
μ	micro (10^{-6})

Section 8
Schematic Diagrams

TABLE OF CONTENTS

8000A



LAST NO. USED
C1-22, 26-28, 30, 33
CR1, 3-23 U1-5
CL1 DS1-4
Q1-21, 24, 26
R1-12, 15-20, 23, 25, 26, 28-37, 39, 41-62
RN1, 2 T1
F1, 2 TP1-5

NOTE:
* R40 INSTALLED IN TEST IF REQ'D FOR NEG. TURNOVER

FIGURE 8-1. 3½ DIGIT MULTIMETER, LINE OPERATED (8000A-1001)

8000A

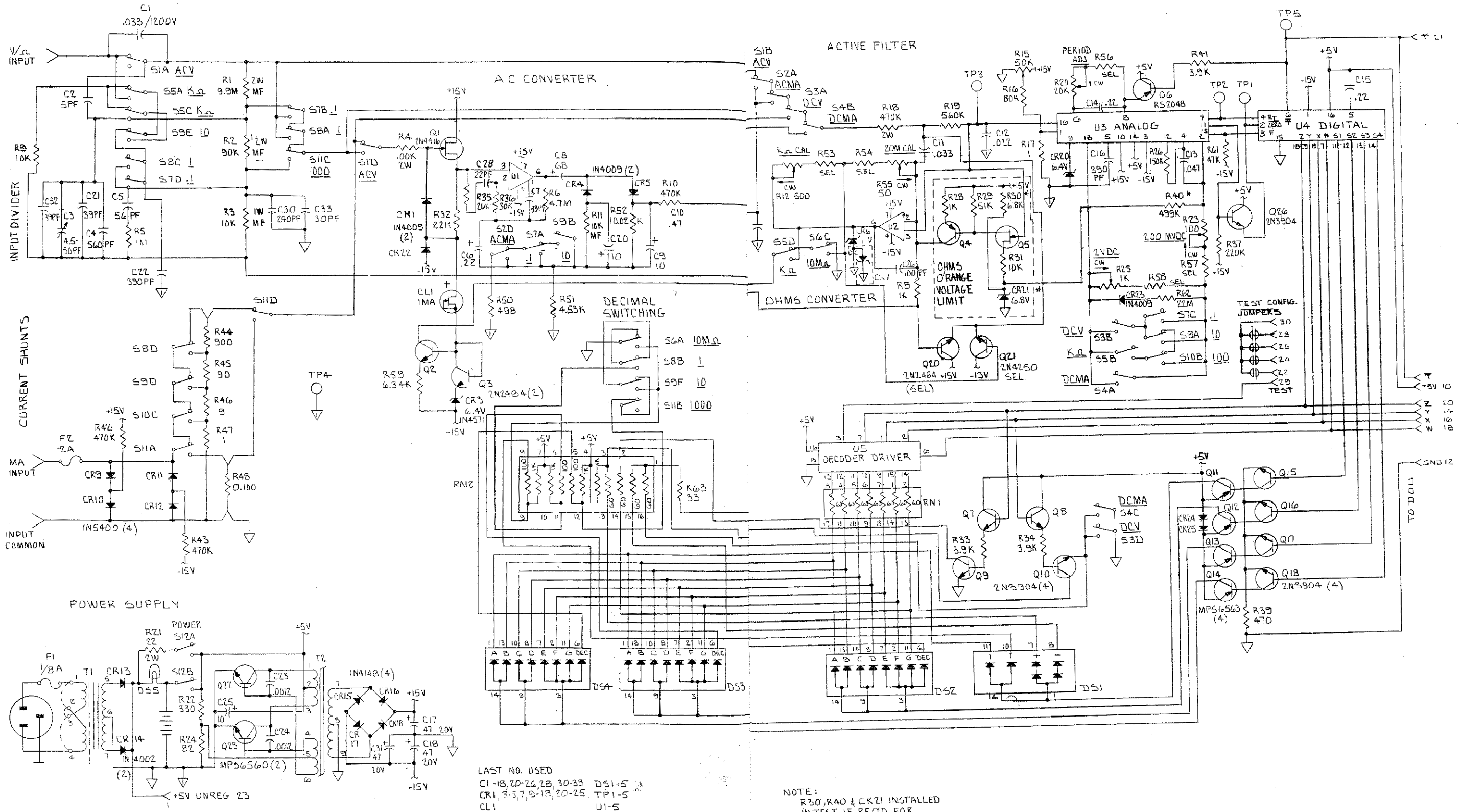
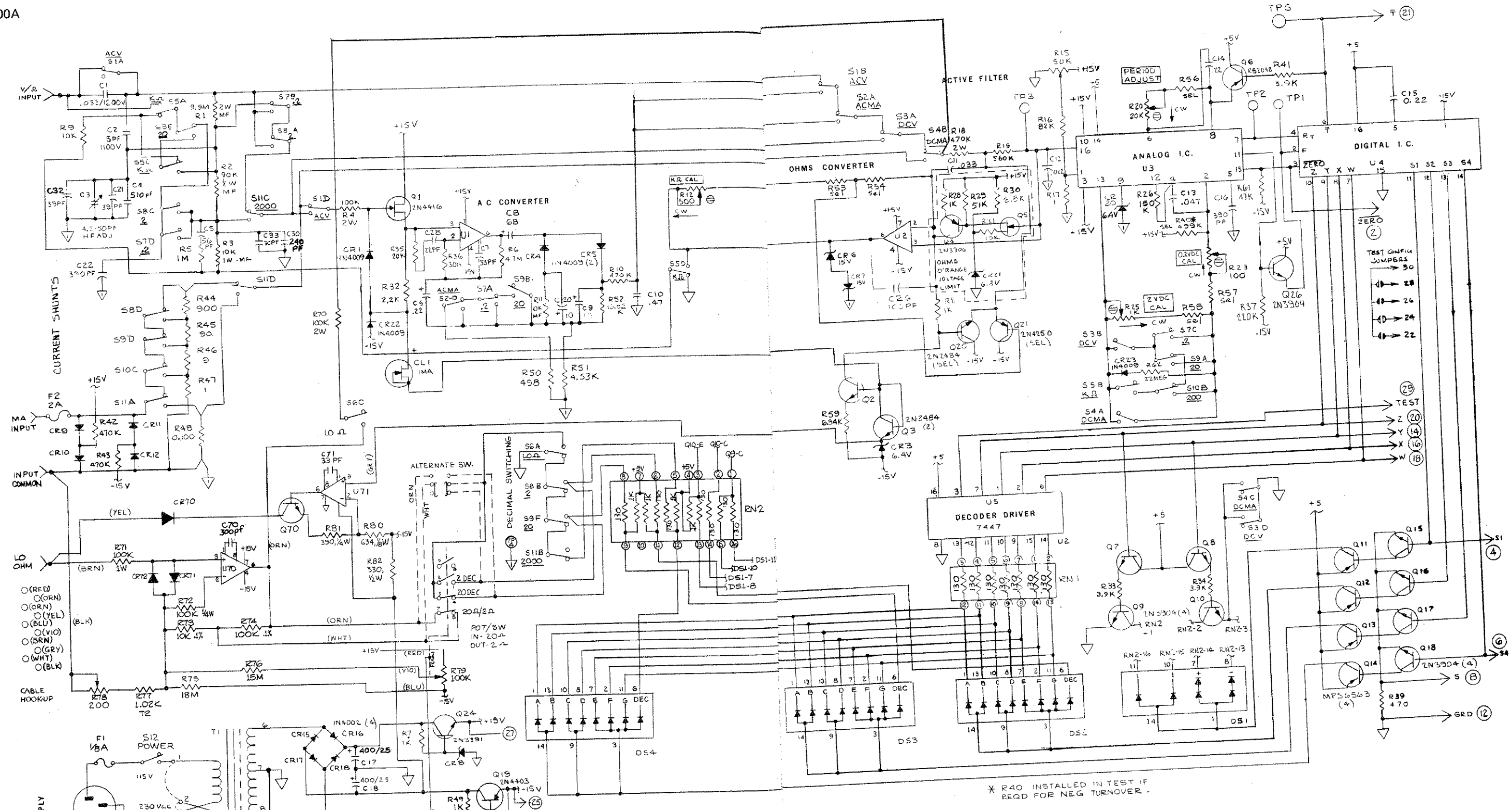


FIGURE 8-2. 3½ DIGIT MULTIMETER, BATTERY OPERATED, –01 OPTION (8000A-1011)



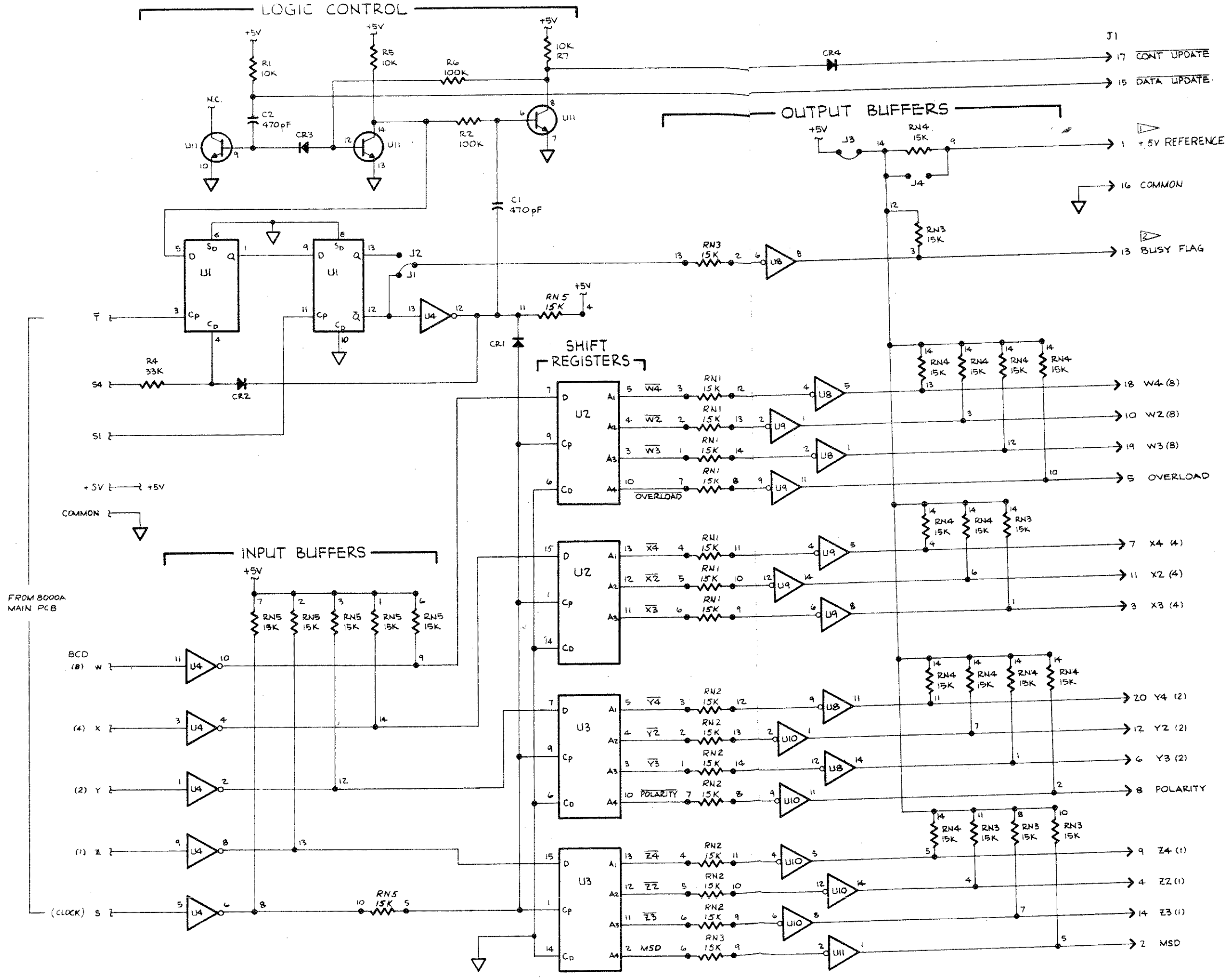
NOTES: (UNLESS OTHERWISE SPECIFIED)

1. ALL RESISTANCES IN OHMS, ALL CAPACITANCES IN MICROFARADS.

R 1-12, 15-26, 28 – 37, 39-62
C 1-28, 32, 33 RN1, 2
Q 1-3, 6-24, 26 CR1-2
CB 1, 3-23 DS1-5
U 1-5

FIGURE 8-3. 3½ DIGIT MULTIMETER, LOW OHMS, –06 OPTION (8000A-1006)

8000A



NOTES:

1. ALL RESISTANCE IS IN OHMS AND ALL CAPACITANCE IS IN MICROFARADS UNLESS OTHERWISE NOTED.
2.

BCD DIG.	8	4	2	1
2ND	W2	X2	Y2	Z2
3RD	W3	X3	Y3	Z3
4TH	W4	X4	Y4	Z4

3. [1] MODIFIABLE FOR CONNECTION OF EXTERNAL PULL-UP VOLTAGE. SEE INSTRUCTION MANUAL, SECTION 4
4. [2] MODIFIABLE TO READY FLAG. SEE INSTRUCTION MANUAL, SECTION 4.

FIGURE 8-4. DIGITAL PRINTER OUTPUT UNIT, –02 OPTION (8000A-1012)