

NOTE

This manual documents the Model 8026B and its assemblies at the revision levels shown in Appendix A. If your instrument contains assemblies with different revision letters, it will be necessary for you to either update or backdate this manual. Refer to the supplemental change/errata sheet for newer assemblies, or the backdating sheet in Appendix A for older assemblies.

8026B

Digital Multimeter

Instruction Manual

P/N 646414
JUNE 1982

©1982, John Fluke Mfg. Co., Inc.,
All rights reserved. Litho in U.S.A.



Dear Customer:

Congratulations! We at Fluke are proud to present you with the Model 8026B Multimeter. This instrument represents the very latest in integrated circuit and display technology. As a result, the end product is a rugged and reliable instrument whose performance and design exhibit the qualities of a finely engineered lab instrument.

To fully appreciate and protect your investment, we suggest you take a few moments to read the manual. As always, Fluke stands behind your 8026B with a full 2-year warranty and a worldwide service organization. If the need arises, please don't hesitate to call on us.

Thank you for your trust and confidence.

John Fluke Mfg. Co., Inc.

Table of Contents

SECTION	TITLE	PAGE
1	INTRODUCTION AND SPECIFICATIONS	1-1
1-1	INTRODUCTION	1-1
1-3	PREPARING FOR OPERATION	1-2
1-4	Unpacking	1-2
1-7	Battery and/or Fuse Installation/Replacement	1-2
1-9	PHYSICAL FEATURES	1-4
1-11	INITIAL CHECK-OUT PROCEDURE	1-4
1-13	ACCESSORIES	1-8
1-15	SPECIFICATIONS	1-8
2	OPERATING INSTRUCTIONS	2-1
2-1	INTRODUCTION	2-1
2-3	INPUT POWER	2-1
2-4	Battery Life	2-1
2-6	Line Power Operation	2-1
2-8	OPERATING NOTES	2-1
2-10	Input Overload Protection	2-2
2-12	Input Connections to COMMON	2-3
2-14	Fuse Check	2-3
2-16	Fuse Replacement	2-3
2-18	The Display	2-3
2-22	OPERATION	2-4
2-24	MEASUREMENT TECHNIQUES	2-4
2-26	AC Measurement	2-4
2-32	Voltage AC/DC	2-10
2-35	Current AC/DC	2-10
2-39	Resistance	2-13
2-43	Continuity	2-15
2-46	Conductance	2-16
2-50	APPLICATIONS	2-16
2-52	Transistor Tester	2-16
2-57	Leakage Tester	2-19

TABLE OF CONTENTS, *continued*

SECTION	TITLE	PAGE
3	THEORY OF OPERATION	3-1
	3-1. INTRODUCTION	3-1
	3-3. OVERALL FUNCTIONAL DESCRIPTION	3-1
	3-8. BLOCK DIAGRAM ANALYSIS	3-1
	3-9. A/D Converter	3-1
	3-18. Input Signal Conditioners	3-6
4	MAINTENANCE	4-1
	4-1. INTRODUCTION	4-1
	4-3. SERVICE INFORMATION	4-1
	4-7. GENERAL INFORMATION	4-2
	4-8. Access Information	4-2
	4-17. Cleaning	4-5
	4-19. Battery/Backup Fuse Replacement	4-5
	4-21. PERFORMANCE TEST	4-6
	4-23. Initial Procedure	4-6
	4-25. Display Test	4-6
	4-27. Resistance/Conductance Test	4-7
	4-29. Continuity Test	4-7
	4-31. DC Voltage Test	4-8
	4-33. AC Voltage Test	4-8
	4-35. DC Current Test	4-9
	4-37. CALIBRATION	4-10
	4-40. TROUBLESHOOTING	4-11
5	LIST OF REPLACEABLE PARTS	5-1
	5-1. INTRODUCTION	5-1
	5-4. HOW TO OBTAIN PARTS	5-1
6	ACCESSORY INFORMATION	6-1
	6-1. INTRODUCTION	6-1
	6-3. DELUXE CARRYING CASE (C-90)	6-1
	6-5. TEMPERATURE PROBE (80T-150C and 80T-150F)	6-1
	6-6. Introduction	6-1
	6-8. Specifications	6-1
	6-9. CURRENT TRANSFORMER (801-600)	6-4
	6-10. Introduction	6-4
	6-12. Specifications	6-4
	6-13. HIGH VOLTAGE PROBE (80K-6)	6-4
	6-14. Introduction	6-4
	6-16. Specifications	6-4
	6-17. HIGH VOLTAGE PROBE (80K-40)	6-4
	6-18. Introduction	6-4
	6-20. Specifications	6-4
	6-21. HIGH FREQUENCY PROBE (83RF)	6-5

TABLE OF CONTENTS, *continued*

SECTION	TITLE	PAGE
6-22.	Introduction	6-5
6-24.	Specifications	6-5
6-25.	HIGH FREQUENCY PROBE (85RF)	6-5
6-26.	Introduction	6-5
6-28.	Specifications	6-5
6-29.	BATTERY ELIMINATOR (A81-115)	6-6
6-31.	CURRENT SHUNT (80J-10)	6-6
6-32.	Introduction	6-6
6-34.	Specifications	6-7
6-35.	AC DC CURRENT PROBE (Y8100)	6-7
6-36.	Introduction	6-7
6-39.	Specifications	6-7
6-40.	AC CURRENT TRANSFORMER (Y8101)	6-8
6-41.	Introduction	6-8
6-43.	Specifications	6-8
6-44.	SAFETY DESIGNED TEST LEAD SET (Y8132)	6-8
6-46.	DELUXE TEST LEAD SET (Y8134)	6-8
6-48.	SLIM FLEX TEST LEAD SET (Y8140)	6-8
7	SCHEMATIC DIAGRAMS	7-1
	APPENDIX A	A-1

List of Tables

TABLE	TITLE	PAGE
1-1.	8026B Controls, Indicators and Connectors	1-6
1-2.	8026B Accessories	1-9
1-3.	8026B Specifications	1-9
2-1.	Input Overload Limits	2-2
2-2.	Voltage/Current Capability of Resistance Ranges	2-15
4-1.	List of Recommended Test Equipment	4-2
4-2.	Resistance/Conductance Checks	4-7.
4-3.	DC Voltage Checks	4-8.
4-4.	AC Voltage Test	4-9.
4-5.	DC Current (mA) Checks	4-10
4-6.	Troubleshooting Guide	4-12
5-1.	8026B Final Assembly	5-3.
5-2.	A1 Main PCB Assembly	5-6.
5-3.	A2 Annunciator PCB Assembly	5-10
5-4.	Federal Supply Codes for Manufacturers	5-12
6-1.	ARI Model Numbers and Input Power	6-6

List of Illustrations

FIGURE	TITLE	PAGE
1-1.	Removing the Battery Cover	1-3
1-2.	Battery Removal	1-4
1-3.	Controls, Indicators and Connectors	1-5
2-1.	Volts Operation	2-5
2-2.	Current Operation	2-6
2-3.	Resistance Operation	2-7
2-4.	Conductance Operation	2-8
2-5.	Continuity Operation	2-9
2-6.	Waveform Conversion	2-11
2-7.	Voltage Measurement Error Calculations	2-12
2-8.	Current Measurement Error Calculations	2-14
2-9.	Conductance-to-Resistance Conversion	2-17
2-10.	Transistor Beta Test Fixture	2-18
3-1.	Model 8026B Simplified Block Diagram	3-3
3-2.	Dual Slope A/D Converter	3-4
3-3.	Input Signal Conditioners	3-8
4-1.	Calibration Adjustment Locations	4-3
4-2.	LCD Display Assembly	4-4
5-1.	8026B Final Assembly	5-5
5-2.	A1 Main PCB Assembly	5-9
5-3.	A2 Annunciator PCB Assembly	5-11
6-1.	8026B Accessories	6-2

Section 1

Introduction and Specifications

1-1. INTRODUCTION

1-2. Your John Fluke Model 8026B is a pocket-size digital multimeter that is ideally suited for application in the field, lab, shop or home. Some of the features of your instrument are:

- All VOM functions plus conductance and continuity (8 in all) are included as standard.

DC Voltage - 100 μ V to 1000V

AC Voltage - 100 μ V to 750V

DC Current - 1 μ A to 2000 mA

AC Current - 1 μ A to 2000 mA

Resistance - 0 Ω - 20 M Ω

Diode Test

Conductance - 0.1 ns to 200 ns and .001 ms to 2 ms (S = siemens = 1/ Ω).

Continuity - Provides an immediate audible indication when continuity is detected

- True rms ac measurement for signals up to 10 kHz.
- CONDUCTANCE - Allows fast, accurate, noise-free resistance measurements up to 10,000 M Ω .
- An easy-to-read high contrast 3 1/2 digit liquid crystal display.
- Each range has
 - Full auto-polarity operation
 - Overrange indication
 - Effective protection from overloads
- Dual slope integration measurement technique to ensure noise-free measurements.
- Easy calibration - few adjustments.

- Lightweight - 369 grams (13 ounces).
- Up to 200 hours of continuous operation can be expected from a single, inexpensive, 9V, alkaline battery (transistor radio/calculator type).
- Low battery voltage automatically detected and displayed.
- Line operation is possible using a Model A81 Battery Eliminator (see Section 6, Accessories).
- Protected test leads - finger guards on the probes and shrouded contacts on the connectors discourage accidental contact with circuit voltages.
- A full line of accessories that extend the range and scope of your instrument.

1-3. PREPARING FOR OPERATION

1-4. Unpacking

1-5. Your 8026B was packed and shipped in an especially designed protective container. This manual, the multimeter, one 9V battery, and two test leads (one red and one black) should be packed in the shipping container. Check your shipment thoroughly. If anything is wrong with your shipment, contact the place of purchase immediately. If satisfaction is not obtained, contact the nearest John Fluke Service Center. A list of these service centers is located at the end of this manual.

1-6. If reshipment is necessary, please use the original shipping container. If the original container is not available, a new one can be obtained from the John Fluke Mfg. Co., Inc. Please state the instrument model number when requesting a new shipping container.

1-7. Battery and/or Fuse Installation/Replacement

1-8. Your 8026B is designed to operate on a single, inexpensive, 9V battery of the transistor radio/calculator variety (NEDA 1604). When you receive your 8026B the battery will not be installed in the DMM. Once the battery is installed, you can expect a typical operating life of up to 200 hours with an alkaline battery or 100 hours with a carbon-zinc battery. When the battery has exhausted about 80% of its useful life, the BT indicator will appear in the upper left corner of the display. Your 8026B will operate properly for at least 20 hours after BT appears. Use the following procedure to install or replace the battery and to replace the fuse.

WARNING

TO AVOID ELECTRICAL SHOCK HAZARDS REMOVE THE INPUT SIGNAL AND THE TEST LEADS FROM THE INPUT TERMINALS, AND SET THE POWER SWITCH TO OFF BEFORE OPENING THE BATTERY COMPARTMENT.

1. Set the 8026B power switch to OFF.
2. Remove the test leads from external circuit connections and from the 8026B input terminals.

3. Open the battery compartment on the bottom of the 8026B using the method shown in Figure 1-1.
4. Tilt the battery out as shown in Figure 1-2.
5. If fuse F1 is to be replaced, use a pointed tool such as a probe tip or small screwdriver to pry F1 from its holder. Replace the defective fuse with fuse type AGX2. (Instruments that accommodate metric fuses use 5 x 20 mm 2A 250V type F.)
6. Disconnect the battery clip from the battery.
7. Press the battery clip onto the replacement battery and return both to the battery compartment.
8. Make sure the battery leads are routed by the broad side of the battery and fully within the confines of the battery compartment before sliding the cover into place.

WARNING

DO NOT OPERATE THE 8026B UNTIL THE BATTERY COVER IS IN PLACE AND FULLY CLOSED.

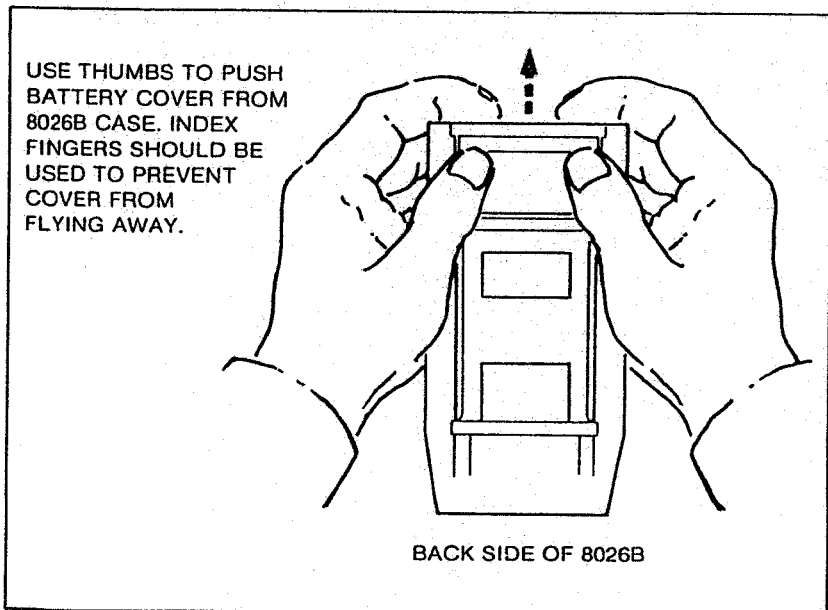


Figure 1-1. Removing the Battery Cover

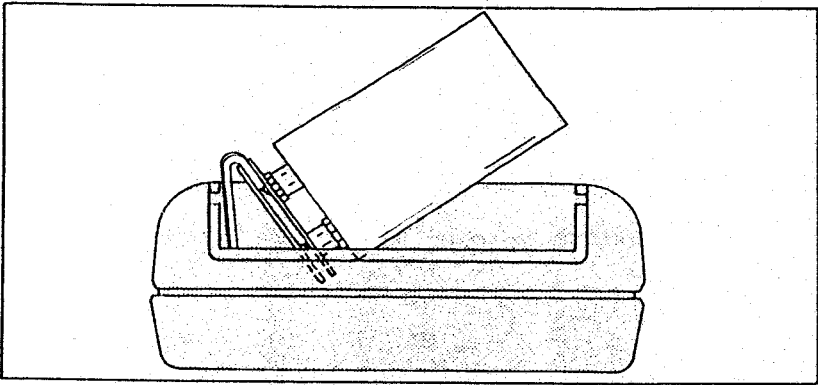


Figure 1-2. Battery Removal

1-9. PHYSICAL FEATURES

1-10. Before using your 8026B we suggest that you take a few minutes to get acquainted with your instrument. All of the externally accessible physical features of the 8026B are shown in Figure 1-3 and described in Table 1-1. Locate each feature on your 8026B as you read the description.

1-11. INITIAL CHECK-OUT PROCEDURE

1-12. Now that you have installed the battery, and know where everything is, let's make sure the unit is working properly. We'll run through a simple check-out procedure, starting with turn-on. No equipment other than the test leads will be required. If a problem is encountered, please recheck the battery, fuses, switch settings, and test lead connections before contacting your nearest authorized John Fluke Service Center.

NOTE

This procedure is intended to verify overall instrument operation, and is not meant as a substitute for the formal Performance Test given in Section 4. Limits shown exceed the specifications because the procedure uses one measurement to check another.

1. Set the power switch to OFF and all range and function switches to the released (out) position.
2. Set the power switch to ON and observe the display. It should read 00.0 ± 0.1 .
3. Connect the red test lead to the V/Ω input terminal.
4. Touch the red probe tip to the COMMON input terminal, and sequentially depress each of the six range switches starting at the top (20 M Ω). The display should read zero \pm one digit and the decimal point should be positioned as follows:

- a. 20M - 0.00
 - b. 2000k - 000
 - c. 200k - 00.0
 - d. 20k - 0.00
 - e. 2k - .000
 - f. 200 - 00.0
5. Press the 20V range switch and remove the probe from the COMMON input terminal.
 6. Look inside of the battery eliminator connector on the right side of the 8026B and locate the connector contacts (center post and side contact as shown in Figure 1-3).
 7. Touch the red probe tip to the center post of the battery eliminator connector. The display should read approximately $-6V$ dc.
 8. Touch the probe tip to the side contact of the battery eliminator connector. The display should read approximately $2.8V$ dc. Notice that the difference between the two readings is equal to the battery voltage (typically $8V$ to $9V$ dc). Remove the probe from the battery jack.

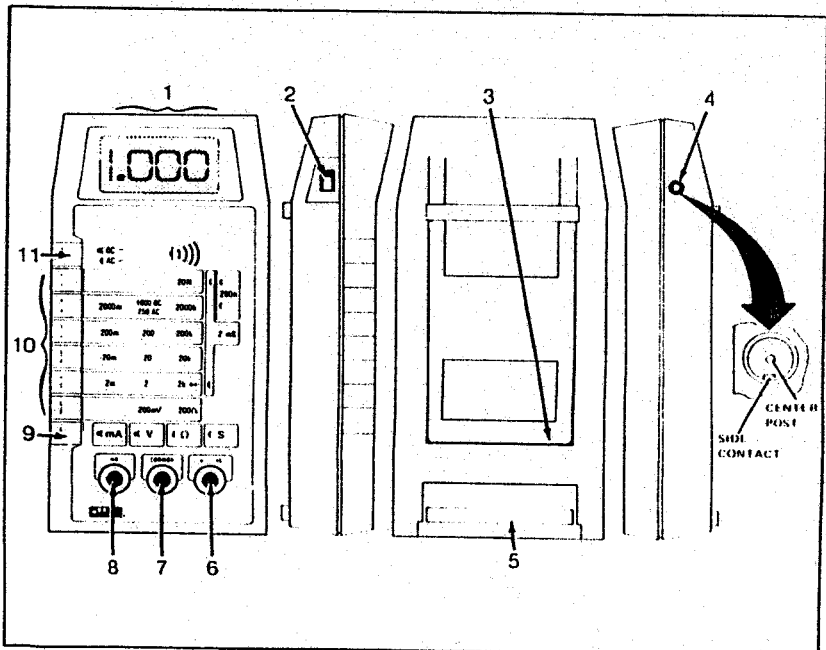


Figure 1-3. Controls, Indicators and Connectors

Table 1-1. 8026B Controls, Indicators and Connectors

ITEM NO.	NAME	FUNCTION
1	Display	A 3-1/2 digit display (1999 max, with decimal point and minus polarity indication, used to indicate measurement values, overrange conditions, and a low battery condition.
2	Power Switch	A slide switch used to turn the instrument off and on.
3	Tilt Bail	A removable fold-out stand which allows the instrument to be either tilted for bench-top applications or hung from a hook in the absence of a work surface.
4	Battery Eliminator and Connector	An external input power connector for use with the Model A81 Battery Eliminator accessory. (A81 is available in a variety of voltage and plug configurations. See Section 6.)
5	Battery Compartment and Cover	Cover for the 9V battery and the current-protection fuse. Refer to figure 1-1 for battery cover removal instructions.
6	V/ Ω /S Input Connector	Protected test lead connector used as the high input for all voltage, resistance, continuity and conductance measurements. Will accept banana plugs.
7	COMMON Input Connector	Protected test lead used as the low or common input for all measurements. Will accept banana plugs.
8	mA Input Connector	Protected test lead connector used as the high input for all current measurements. Will accept banana plugs.

Table 1-1. 8026B Controls, Indicators and Connectors (cont)

ITEM NO.	NAME	FUNCTION
9	mA/V- Ω /S Switch	A push-push switch (push on - push off, do not pull to select function) which is operated in conjunction with the high input connectors to select either the mA/V or Ω (conductance) measurement functions. When the switch is in or depressed Ω is selected. The mA or V function is selected in the out position depending upon the location of the high input lead.
10	Range Switches	<p>Interlocked push-button switches for selecting ranges; i.e., press the desired range switch to select that range and cancel previous switch depressions. Do not pull the switches to select a range.</p> <p>Voltage: 200 mV, 2V, 20V, 200V 1000V dc/750V ac</p> <p>Current: 2 mA, 20 mA, 200 mA, 2000 mA</p> <p>Resistance: 200Ω, 2 kΩ, 20 kΩ, 200 kΩ, 2000 kΩ, 20 MΩ</p> <p>Conductance: 100 nS or 2 mS (S = siemens = 1/Ω = international unit of conductance). Conductance requires simultaneous depression of two range switches.</p>
11	DC/AC/ i))) Switch	A push-push switch (push on - push off, do not pull to select function) used to select the ac or dc measurement function when measuring current or voltage. When in, or depressed, the ac function is selected. Output selects dc. When used with the Ω or S functions, the in position enables the audible continuity tone.

9. Depress the lower function button (Ω) and sequentially depress each of the six range switches. The display should read 1 as the most significant digit with no other numbers shown. This is the standard overrange indication. Notice that the decimal point changes position with the range switch settings just as it did in step 4 of this procedure.
10. Touch the red probe tip to the COMMON input terminal, and sequentially press each of the range buttons. The display should read zero at each range setting. Lead resistance may be sufficient to cause one or two tenths (0.1 or 0.2 Ω) indication on the 200 Ω range.
11. Touch the red probe tip to the mA input connector and press the 200 Ω switch. The display should read 99.0 to 101.0.
12. Press the 2 k Ω switch. The display should read .099 to .101. Remove the probe from the mA input connector.
13. Simultaneously depress the 2000 k Ω and the 20 M Ω range switches. This selects the 200 nS range. The display should read 00.0 to 01.0 (minimum conductance, maximum resistance).
14. Touch the red probe tip to the COMMON input connector. An overrange indication should be displayed since conductance is the reciprocal of resistance.
15. Connect the black test lead to the COMMON input connector.
16. Depress both AC/DC switch and the 750V ac range switch. Set the mA/V- Ω switch to the voltage (out) position.

WARNING

THE LOCAL LINE VOLTAGE IS MEASURED IN THE FOLLOWING STEP. BE CAREFUL NOT TO TOUCH THE PROBE TIPS WITH YOUR FINGERS, OR TO ALLOW THE PROBE TIPS TO CONTACT EACH OTHER.

17. Measure the local ac line voltage at a convenient output receptacle. The voltage should be displayed with 1 volt resolution.
18. If the 8026B has responded properly to this point, it is operational and ready for use.

1-13. ACCESSORIES

1-14. Table 1-2 lists the accessories available for use with the Model 8026B. Detailed information about each accessory is provided in Section 6.

1-15. SPECIFICATIONS

1-16. Table 1-3 lists the 8026B specifications.

Table 1-2. 8026B Accessories

ACCESSORY	DESCRIPTION
A81	Battery Eliminator
C-90	Vinyl Carrying Case
80T-150C	Temperature Probe °C
80T-150F	Temperature Probe °F
80I-600	Current Transformer 2" jaws
80K-6	High Voltage Probe
80K-40	High Voltage Probe
80J-10	Current Shunt
83RF	High Frequency Probe
85RF	High Frequency Probe
Y8100	AC/DC Current Probe
Y8101	Current Transformer 7/16" jaws
Y8132	Safety Designed Test Lead Set
Y8134	Deluxe Test Lead Set
Y8140	Slim Flex Test Lead Set

Table 1-3. 8026B Specifications

The following specifications assume a 1-year calibration cycle and an operating temperature of 18°C to 28°C (64°F to 82°F) at a relative humidity up to 80% unless otherwise noted.

FUNCTIONS DC Volts, AC Volts, DC Current, AC Current, Resistance, Conductance, and Continuity.

DC VOLTS

RANGE	RESOLUTION	ACCURACY
±200 mV	100 μ V	± (0.1% of reading + 1 digit)
±2V	1 mV	
±20V	10 mV	
±200V	100 mV	
±1000V	1V	

Overvoltage Protection 1000V dc or peak ac on all ranges.

Input Impedance 10 M Ω , all ranges.

Normal Mode Rejection Ratio >60 dB at 50 Hz and 60 Hz.

Common Mode Rejection

Ratio (1 k Ω unbalance) >100 dB at dc, 50 Hz and 60 Hz.

Response Time Less than one second.

Table 1-3. 8026B Specifications (cont)

AC VOLTS (True RMS, AC-Coupled)

RANGE	RESOLUTION	ACCURACY*			
		45 Hz to 1 kHz	1 kHz to 2 kHz	2 kHz to 5 kHz	5 kHz to 10 kHz
200 mV	100 μ V	$\pm(0.5\% + 2 \text{ digits})$		$\pm(1\% + 3 \text{ digits})$	$\pm(2\% + 3 \text{ digits})$
2V	1 mV				
20V	10 mV				
200V	0.1V	$\pm(1\% + 2 \text{ digits})$	Not specified		
750V	1V				

*Applicable from 5% of range to full range.

Overload Protection 750V rms or 1000V peak continuous, except 200 mV ac ranges (15 seconds maximum above 300V rms ac).

Common Mode Rejection

Ratio (1 k Ω unbalance) >60 dB at 50 Hz and 60 Hz.

Volt-Hz Product 1×10^6 maximum (for example, 200V @ 5 kHz).

Input Impedance 10 M Ω in parallel with <100 pF.

Crest Factor 3:1

DC CURRENT

RANGE	RESOLUTION	ACCURACY	BURDEN VOLTAGE
2 mA	1 μ A	$\pm(0.75\% \text{ of reading} + 1 \text{ digit})$	0.3V max.
20 mA	10 μ A		
200 mA	100 μ A		0.9V max.
2000 mA	1 mA		

Overload Protection 2A/250V fuse, in series with a 3A/600V fuse.

AC CURRENT

RANGE	RESOLUTION	ACCURACY*		BURDEN VOLTAGE
		45 Hz to 450 Hz	450 Hz to 1 kHz	
2 mA	1 μ A	$\pm(3\% \text{ rdg} + 2 \text{ d})$	Not Specified	0.3V rms max 0.9V rms max
20 mA	10 μ A	$\pm(1.5\% \text{ of reading} + 2 \text{ digits})$		
200 mA	100 μ A			
2000 mA	1 mA			

*Applicable from 5% of range to full range.

Overload Protection 2A/250V fuse, in series with a 3A/600V fuse.

Crest Factor 3:1

Table 1-3. 8026B Specifications (cont)

RESISTANCE

RANGE	RESOLUTION	ACCURACY	FULL-SCALE VOLTAGE	MAXIMUM TEST CURRENT
200 Ω	0.1 Ω	$\pm(0.2\%$ of reading +3 digits)	<0.25V	.35 mA
2 k Ω \rightarrow	1 Ω	$\pm(0.1\%$ of reading +1 digit)	>1.0V	1.1 mA
20 k Ω	10 Ω		<0.25V	13 μ A
200 k Ω	100 Ω		>0.7V	13 μ A
2000 k Ω	1 k Ω		<0.25V	0.13 μ A
20 M Ω	10 k Ω	$\pm(2\%$ of reading +1 digit)	>.7V	0.13 μ A

Overload Protection 500V dc rms ac on all ranges. 15 seconds maximum above 300 volts.

Open Circuit Voltage Less than 1.5V on all ranges except 2 k Ω range is less than 3.5V.

Diode Test (Hi-Lo Ohms) ... 2 k Ω , 200 k Ω , and 20 M Ω ranges supply enough voltage to turn on junctions allowing a "Diode Test". The 2 k Ω range is preferred and is marked with a diode symbol. 200 Ω , 20 k Ω , and 2000 k Ω ranges can make in-circuit measurements without turning on silicon junctions.

CONDUCTANCE

RANGE	ACCURACY
2 mS	$\pm(0.2\%$ of reading +1 digit)
200 nS	$\pm(2.0\%$ of reading +10 digits)

Overload Protection 500V dc/rms ac on all ranges. 15 seconds max. above 300V.

Open Circuit Voltage 2 mS <3.5V
200 nS <1.5V

Diode Test Both ranges will forward bias a typical PN junction.

CONTINUITY (for Passive Circuit Testing)

Ranges All resistance ranges. (2 k Ω range recommended for lowest resistance threshold)

Indication

CONTINUITY Audible tone
OPEN CIRCUIT No audible tone

Table 1-3. 8026B Specifications (cont)

Response Time	50 μ s (Minimum duration of continuity or open to toggle audible tone) on 2 k Ω range. Pulse stretcher holds tone on or off for approximately 200 ms.
Overload Protection	500V dc/rms ac on all ranges.
GENERAL	
Protection Class 2	Relates solely to insulation or grounding properties defined in IEC 348.
Maximum Common Mode	
Voltage	500V dc/rms ac.
Power Requirements	Single 9V battery, NEDA 1604.
BATTERY LIFE	
Alkaline	200 hours typical.
Carbon Zinc	100 hours typical.
BATTERY INDICATOR	"BT" on display illuminates when approximately 20% of battery life remains.
Display	3½ digit LCD (2,000 count!), autozero, autopolarity.
Size	L x W x H: 18.0 cm x 8.6 cm x 4.5 cm (7.1 in x 3.4 in x 1.8 in)
Weight	0.37 kg. (13 oz)
ENVIRONMENTAL	
Temperature	0°C to 50°C (32°F to 122°F) operating. -35°C to +60°C (-31°F to 140°F) storage.
Relative Humidity	0 to 80%, 0°C to 35°C, 0 to 70%, 35°C to 50°C (95-122°F)
Temperature Coefficient	<0.1 times the applicable accuracy specification per °C for 0°C to 18°C and 28°C to 50°C (32°F to 64.4°F and 50.4°F to 122°F).

Section 2

Operating Instructions

2-1. INTRODUCTION

2-2. To fully use the measurement capabilities of your 8026B, a basic understanding of its measurement techniques and limitations is required. This section of the manual provides that information, plus a few applications that may prove useful. For example, did you know your 8026B will provide direct-reading dc current gain (beta) measurements for both NPN and PNP transistors? Read this section of the manual, to find out how it's done.

2-3. INPUT POWER

2-4. Battery Life

2-5. The 8026B is designed to operate on an single, inexpensive 9V battery of the transistor radio/calculator variety (NEDA 1604). If an alkaline battery is used, a typical operating life of up to 200 hours can be expected. Carbon-zinc batteries will have a useful life of up to 100 hours. In either event, the 8026B will display a BT (in upper, left-hand corner) when the battery has exhausted approximately 80% of its useful life. When BT first appears, the battery is capable of properly operating the 8026B for at least another 20 hours.

CAUTION

To ensure multimeter operation within the accuracy specifications, the battery should be replaced when the voltage measured at the center of the battery eliminator connector falls below -3.00 volts (with respect to the COMMON input). If the battery voltage falls to a point where the "BT" is displayed and the digital display is inactive or no longer responds to an input signal, the battery should be replaced immediately to prevent damage to the LCD.

2-6. Line Power Operation

2-7. You can operate your 8026B from line power by using the A81 Battery Eliminator Accessory. Refer to Section 6 for additional information about the A81.

2-8. OPERATING NOTES

2-9. The following paragraphs will familiarize you with the capabilities and limitations of your Model 8026B and instruct you in routine operator maintenance.

2-10. Input Overload Protection

CAUTION

Exceeding the maximum input overload limits can damage your instrument. A transient overload protection circuit is designed into the 8026B to protect it against short duration high energy pulses. The components used limit the protection to approximately five pulses per second for 6 KV, 10 microsecond pulses, and about 0.6 watts average for lower amplitude pulses. Fast repetition rate pulses, such as those from a TV set, can damage the protection components; RJ1 - RJ4, R1 and R2. If any of these components require replacement, use only Fluke parts to ensure product safety. (R2 is a special flameproof fusible resistor. Use exact replacement to ensure safety.)

2-11. Each measurement function and its associated ranges are equipped with input overload protection. The overload limits for each function and range are given in Table 2-1.

Table 2-1. Input Overload Limits

SELECTED FUNCTION	SELECTED RANGE	INPUT CONNECTIONS	MAX. INPUT OVERLOAD
Voltage	200 mV, 2V, 20V, 200V, 750V ac, 1000V dc	V/ Ω /S and COMMON	1000V dc or peak ac on dc ranges. 1000V dc or 750V rms on ac range - 15 seconds max. above 300V on 200 mV ac range.
Current	2 mA, 20 mA, 200 mA, 2000 mA	mA and COMMON	2A and 500V dc/rms ac max. Fuse-protected by F1 (2A, 250V) in cir- cuits with open circuit voltage \leq 250V dc/rms ac. Fuse F2 (3A, 600V) provides protection from misuse — open circuit voltage \leq 600V dc/rms ac.
Resistance Conductance, or Continuity	200 Ω , 2 k Ω , 20 k Ω , 200 k Ω , 2000 k Ω , 20 M Ω , 200 nS, 2 mS	V/ Ω /S and COMMON	500V dc or rms ac. 15 seconds maximum above 300 volts.
ANY	ANY	COMMON	500V dc/rms ac with respect to earth ground.

2-12. Input Connections to COMMON

WARNING

TO AVOID ELECTRICAL SHOCK AND /OR INSTRUMENT DAMAGE DO NOT CONNECT THE COMMON INPUT TERMINAL TO ANY SOURCE OF MORE THAN 500 VOLTS DC OR RMS AC ABOVE EARTH GROUND.

2-13. The 8026B may be operated with the COMMON input terminal at a potential of up to 500V dc or 500V rms ac above earth ground. If this limit is exceeded, instrument damage may occur. This, in turn, may result in a safety hazard for the operator.

2-14. Fuse Check

2-15. The current (mA) function contains two fuses. Check them as follows:

1. Complete the set up steps for the RESISTANCE (Ω) function and select the 2 k Ω range.
2. Touch the red test probe to the mA input jack so that the V- Ω input and mA input are connected together.
3. If the display reads approximately .100 k Ω , both fuses are good.
4. If the display reads overrange (a 1 followed by blank digits), one or both fuses need replacement. See the following paragraph for replacement instructions.

2-16. Fuse Replacement

2-17. All ac and dc current ranges are fuse protected. Two series fuses are used:

1. F1, 2A@ 250V, replaceable at the battery compartment (see section 1 "Battery or Fuse Installation/Replacement").
2. F2, 3A@ 600V backup fuse (see section 4, Battery/Backup Fuse Replacement).

2-18. The Display

2-19. The Front Panel Display on your 8026B is a 3-1/2 digit Liquid Crystal Display. The 1/2 digit is the extreme left digit location. So, the displayed value can range from 000 through 999. For convenience, in discussion, the 999 is rounded to 1000. The decimal point position is determined by selected range and is not affected by the measurement function selected. Polarity, on the other hand is only used for the dc voltage and current measurement functions. A minus sign indicates that the input signal is negative with respect to the COMMON input terminal. Positive inputs are indicated by the absence of the minus sign.

NOTE

The minus sign (-) may flash momentarily as the 8026B comes out of an overrange condition. This will most likely be seen in the ohms mode as the open circuit test leads are applied to an in-range resistance value. If the minus sign remains on for in-range ohms readings, the circuit is live (a negative voltage is present at the input terminals due to charged capacitors, etc.), and incorrect resistance readings will be observed.

2-20. The Display has two abnormal status indicators, one for low battery power and one for instrument overrange. A "BT" is displayed when approximately 80% of the battery's life is exhausted (battery replacement is indicated). And, a "1" followed by three blanked digits is displayed (decimal point may be present) as an overrange indication. This does not necessarily mean that the instrument is being exposed to a damaging input condition. For example, when measuring resistance an open-input will cause an overrange indication.

NOTE

When the 8026B is powered with the A81 Battery Eliminator the "BT" indicator may come on. However, instrument operation will be normal.

2-21. The liquid crystal display used in the 8026B is a rugged and reliable unit which will give years of satisfactory service. Display life can be extended by observing the following practices:

1. Protect the display from extended exposure to bright sunlight.
2. Keep the voltmeter out of high temperature, high humidity environments, such as, the dash of a car on a hot, sunny day. Otherwise, the display may temporarily turn black. Recovery occurs at normal operating temperature.
3. Note that the display operation may be slowed in extremely low temperature environments. No damage will occur to the LCD, but response time is greatly increased. Recovery occurs at normal operating temperature.

2-22. OPERATION

2-23. The five figures, 2-1 through 2-5, each illustrate one of the measurement functions of the Model 8026B. Each figure has two parts. The top part shows your 8026B as it should look when ready to perform that type of measurement. The bottom part of the figure lists, in sequential order, the steps you should perform to make that type of measurement with your 8026B. To operate your 8026B turn to the operation figure corresponding to the measurement function desired and perform the steps listed in the figure. Operate the Model 8026B in accordance with the Input Overload Protection and the Input Connections to COMMON portions of the Operating Notes presented earlier in this section.

2-24. MEASUREMENT TECHNIQUES

2-25. The following paragraphs offer you techniques that improve the measurement accuracy of your 8026B. While these techniques are in general use throughout the electronics industry, these paragraphs offer specific information for use with your 8026B.

2-26. AC Measurement

2-27. The 8026B employs a true rms ac converter for ac signal measurements. The true rms value of an ac signal may be defined as the equivalent dc value that dissipates the same amount of heat in a resistor as the relative ac signal. Consider the following example: a light bulb is energized with an ac signal and the brightness is measured. The ac source is then removed from the light bulb and replaced by a variable dc source. The level of the dc signal is adjusted so that the brightness of the light bulb is the same as it was for the ac signal. This dc level is equivalent to the rms value of the ac signal. This cumbersome method is not practical for handheld multimeters, so an active log-antilog analog computation is continuously performed on the input signal.

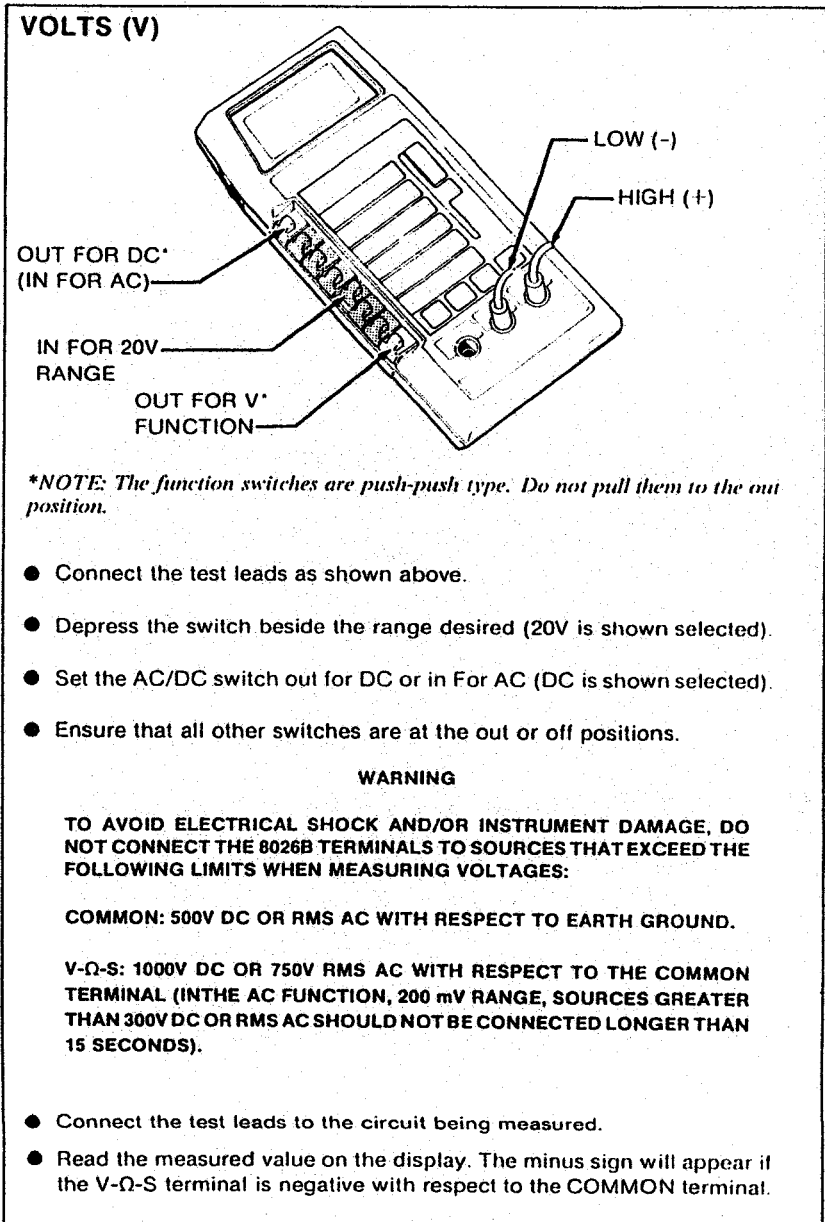


Figure 2-1. Volts Operation

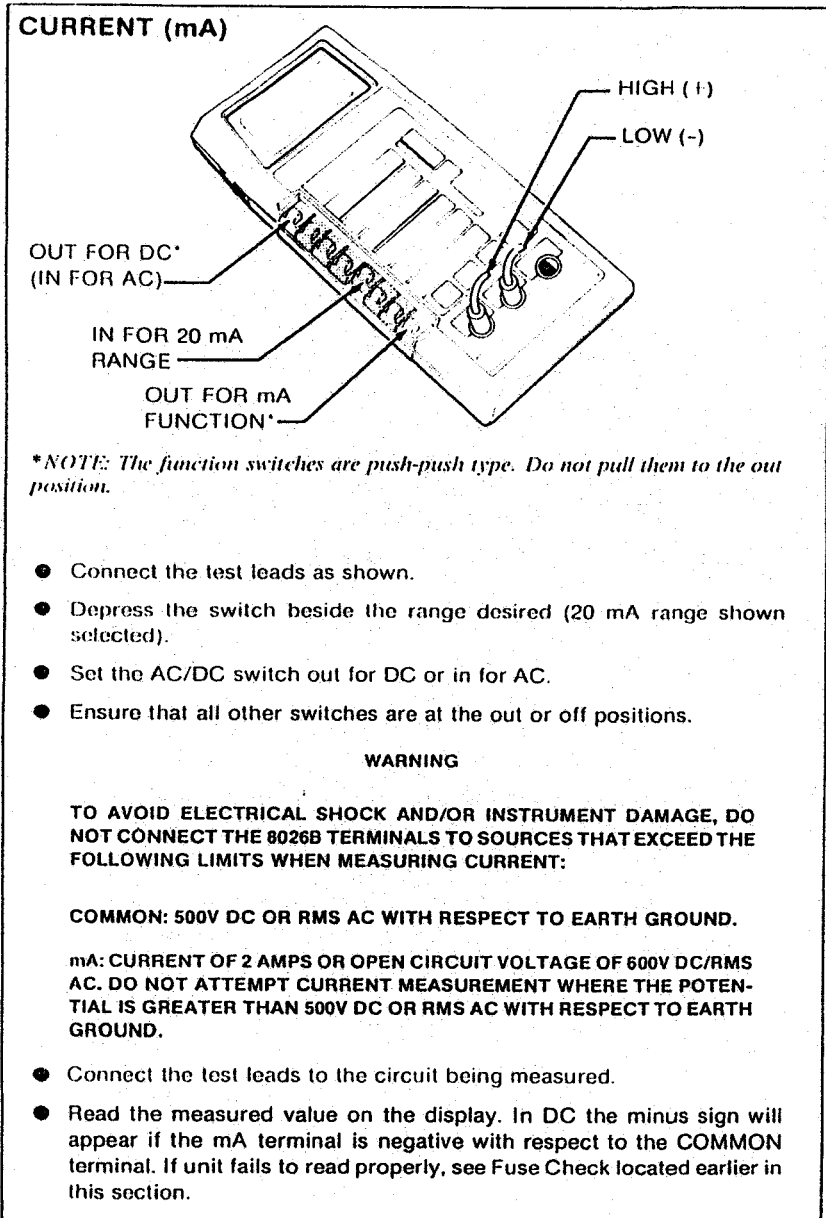
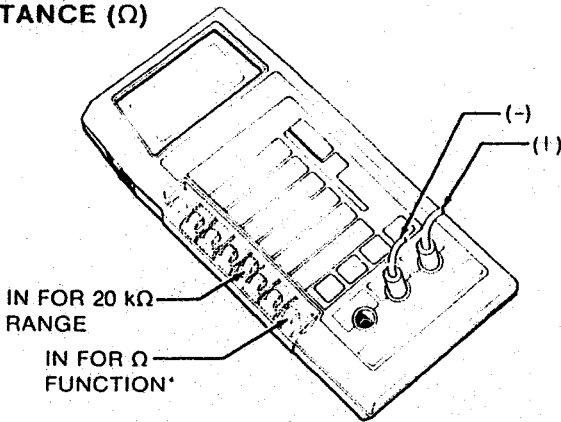


Figure 2-2. Current Operation

RESISTANCE (Ω)

**NOTE: The function switches are push-push type. Do not pull them to the out position.*

- Connect the test leads as shown.
- Depress the mA-V- Ω -S switch.
- Depress the switch beside the range desired (20k is shown selected).
- Ensure that all other switches are at the out or off positions.
- Make sure that the device being measured contains no electrical energy.

WARNING

TO AVOID ELECTRICAL SHOCK AND/OR INSTRUMENT DAMAGE, DO NOT CONNECT THE 8026B TERMINALS TO SOURCES THAT EXCEED THE FOLLOWING LIMITS WHEN MEASURING RESISTANCE OR CONTINUITY:

COMMON: 500V DC OR RMS AC WITH RESPECT TO EARTH GROUND.

V- Ω -S: 500V DC OR RMS AC WITH RESPECT TO THE COMMON TERMINAL. (15 SECONDS MAXIMUM ABOVE 300V.)

- Connect the test leads across the device being measured.
- Read the measured value on the display.

Figure 2-3. Resistance Operation

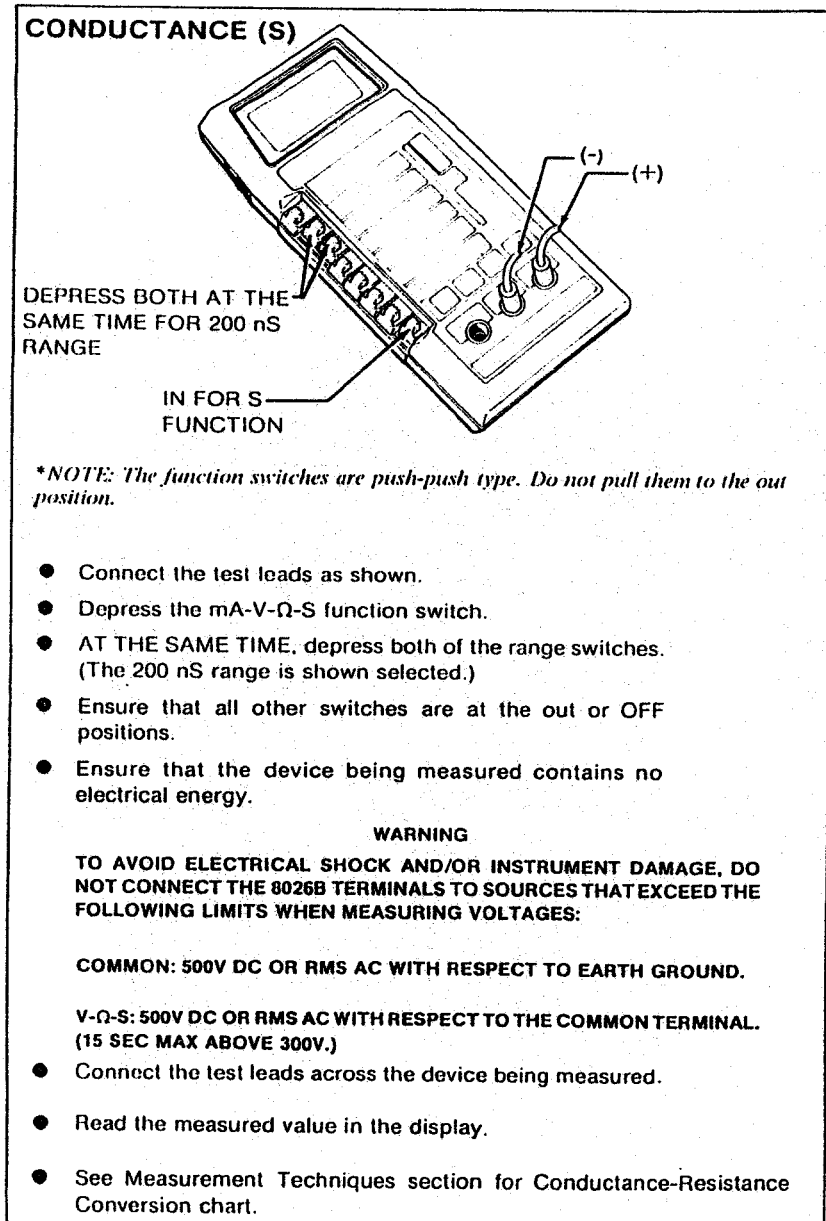
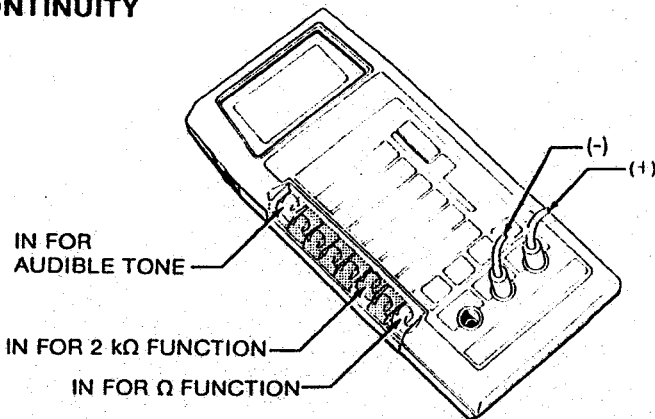


Figure 2-4. Conductance Operation

CONTINUITY

**NOTE: The function switches are push-push type. Do not pull them to the out position.*

- Connect the test leads as shown.
- Depress the mA-V-Ω-S function switch.
- Depress the 2 kΩ range switch.
- Depress the AC/DC function switch.
- Ensure that all other switches are at the out position.
- Ensure that the device being measured contains no electrical energy.

WARNING

TO AVOID ELECTRICAL SHOCK AND/OR INSTRUMENT DAMAGE, DO NOT CONNECT THE 8026B TERMINALS TO SOURCES THAT EXCEED THE FOLLOWING LIMITS WHEN MEASURING CONDUCTANCE:

COMMON: 500V DC OR RMS AC WITH RESPECT TO EARTH GROUND.

**V-Ω-S: 500V DC OR RMS AC WITH RESPECT TO THE COMMON TERMINAL.
(15 SEC MAX ABOVE 300V.)**

- Connect the leads to the circuit being measured.
- Continuity between the test leads will cause the audible tone to sound.

Figure 2-5. Continuity Operation

2-28. It should be noted that accurate measurements can only be guaranteed for ac input signals that have some reasonable limits with regard to the frequency and shape of the waveform. To help define what these reasonable limits are, a parameter known as "crest factor" has been developed. Crest factor is defined as the peak signal value divided by the rms value of the signal (with any dc component removed). For example, the crest factor of a 100% duty-cycle rectangular pulse train is 3.16, and the crest factor of a sine wave is 1.41.

2-29. It should also be noted that signals with high crest factors usually have wide bandwidth requirements which may be near the specified frequency limits for the selected range. Both crest factor and frequency response should be carefully considered when evaluating reading accuracies. Refer to Section 1 for the 8026B specifications for ac measurements.

2-30. Most analog and digital multimeters use average-responding ac converters. The gain in an average-responding ac converter is adjusted so that the multimeter measures sinusoidal signals correctly. However, if a signal is not perfectly sinusoidal, the multimeter with the average-responding ac converter will not measure the signal correctly. Figure 2-6 shows how the 8026B readings compare with average-responding multimeter readings for seven common waveforms.

2-31. You can also use the values in Figure 2-6 to calculate other waveform parameters from readings displayed on the 8026B. For example, if a rectified full wave sine wave is being measured and the 8026B displays the value 0.435 (V ac), then the pk-pk voltage would be 1.414V (the same as the 0-pk voltage). The dc component would be 0.900V (this could be verified by switching to the dc volts function). For another example, suppose the 8026B measures a rectified half wave sine wave and displays the value 1.000 (V ac). The pk-pk or 0-pk voltage would be $1.000V \times (2.000 \div 0.771) = 2.594V$. The dc component would be $1.000V \times (0.636 \div 0.771) = 0.825V$. For this same signal, an average-responding multimeter would measure $1.000V \times (0.764 \div 0.771) = 0.991V$, an error of 0.9%.

2-32. Voltage AC/DC

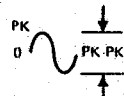
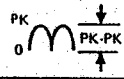
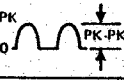
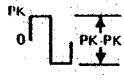
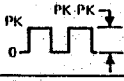
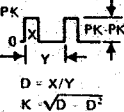
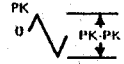
2-33. The 8026B is equipped with five ac and five dc voltage ranges; 200 mV, 2V, 20V, 200V, 750V ac/1000V dc. All ranges present an input resistance of 10 M Ω shunted by less than 100 pF. When making measurements, be careful not to exceed the overload limits given earlier in Table 2-1.

2-34. Measurement errors, due to circuit loading, can result when making either ac or dc voltage measurements on circuits with high source resistance. However, in most cases the error is negligible ($\leq 0.1\%$) as long as the source resistance of the measurement circuit is 10 k Ω or less. If circuit loading does present a problem, the percentage of error can be calculated using the appropriate formula in Figure 2-7.

2-35. Current AC/DC

WARNING

WHEN MEASURING CURRENT, DO NOT EXCEED THE 500V DC OR RMS AC MAXIMUM COMMON MODE VOLTAGE SPECIFICATION FOR THE INSTRUMENT. THE OPERATOR IS PROTECTED FROM POSSIBLE INJURY AND THE INSTRUMENT IS PROTECTED FROM POSSIBLE DAMAGE BY A 250V FUSE IN SERIES WITH A 600V FUSE.

AC COUPLED INPUT WAVEFORM	PEAK VOLTAGES		DISPLAY READINGS			DC AND AC TOTAL RMS [True RMS $\sqrt{v_{dc}^2 + v_{ac}^2}$]
	PK-PK	0-PK	AC COMPONENT ONLY		DC COMPONENT ONLY	
			RMS CAL AVE. SENSING	RMS SENSING (8026B)		
SINE 	2.828	1.414	1.000	1.000	0.000	1.000
RECTIFIED SINE (FULL WAVE) 	1.414	1.414	0.471	0.435	0.900	1.000
RECTIFIED SINE (HALF WAVE) 	2.000	2.000	0.764	0.771	0.636	1.000
SQUARE 	2.000	1.000	1.111	1.000	0.000	1.000
RECTIFIED SQUARE 	1.414	1.414	0.785	0.707	0.707	1.000
RECTANGULAR PULSE  $D = X/Y$ $K = \sqrt{D}$ D^2	2.000	2.000	2.221K	2K	2D	\sqrt{D}
TRIANGLE SAWTOOTH 	3.464	1.732	0.960	1.000	0.000	1.000

NOTE: High Frequency waveforms with fairly abrupt transitions (such as a 5 kHz pulse with a 10% duty cycle) have spectral components that are beyond the specified frequency limits for the selected range. Be sure to take this into account when evaluating measurements.

Figure 2-6. Waveform Conversion

1. DC VOLTAGE MEASUREMENTS

$$\text{Loading Error in \%} = 100 \times R_s \div (R_s + 10')$$

Where: R_s = Source resistance in ohms of circuit being measured.

2. AC VOLTAGE MEASUREMENTS

First, determine input impedance, as follows: *

$$Z_{in} = \frac{10'}{\sqrt{1 + (2\pi F \cdot R_{in} \cdot C)^2}}$$

Where: Z_{in} = effective input impedance

R_{in} = $10'$ ohms

C_{in} = 100×10^{-12} Farads

F = frequency in Hz

Then, determine source loading error as follows: *

$$\text{Loading Error in \%} = \frac{100 \times Z_s}{Z_s + Z_{in}}$$

Where: Z_s = source impedance

Z_{in} = input impedance (calculated)

*Vector algebra required

Figure 2-7. Voltage Measurement Error Calculations

2-36. Four ac and four dc current ranges are included on the 8026B; 2 mA, 20 mA, 200 mA, and 2000 mA. Each range is diode protected to 2 amps and fuse protected above 2 amps. If either fuse blows, refer to fuse replacement information given earlier in this section.

2-37. In high electrical noise environments (near ignition switches, fluorescent lights, relay switches, etc.) unstable or erroneous readings (exceeding specifications) may occur. The effect is most obvious when measuring low level current on the 2 mA range. If an

erratic or erroneous reading is suspected, temporarily jumper the V/ Ω connector to the mA connector. This is recommended for the 2 mA and 20 mA ranges only.

CAUTION

To avoid possible instrument damage and/or erroneous measurements remove the temporary V/ Ω -to-mA jumper before attempting voltage or resistance measurements.

2-38. Full-scale burden voltage (voltage drop across the fuse and current shunt) for all ranges except 2000 mA is less than 300 mV. The 2000 mA range has a full-scale burden voltage of less than 900 mV. These voltage drops can affect the accuracy of a current measurement, if the current source is unregulated and the shunt plus fuse resistance represents a significant portion (1/1000 or more) of the source resistance. If burden voltage does present a problem, the percentage of error can be calculated using the formula in Figure 2-8. This error can be minimized by using the highest current range that gives the necessary resolution. For example, if 20 mA is measured on the 2000 mA range the burden voltage is approximately 5 mV.

2-39. Resistance

2-40. Six direct reading resistance scales are provided on the 8026B: 20 M Ω , 2000 k Ω , 200 k Ω , 20 k Ω , 2 k Ω and 200 Ω . All scales employ a two-wire measurement technique. As a result, test lead resistance may influence measurement accuracy on the 200 Ω range. To determine the error, short the test leads together and read the lead resistance. Correct the measurement by subtracting the lead resistance from the measurement reading. The error is generally on the order of 0.2 to 0.3 ohms for a standard pair of test leads.

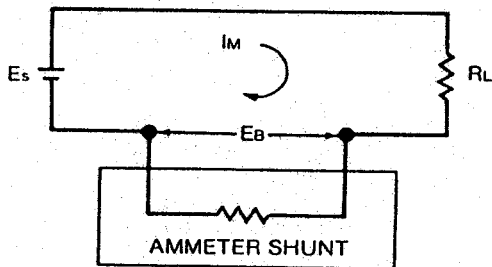
2-41. In-circuit resistance measurements can be made using the 200 Ω , 20 k Ω and 2000 k Ω ranges. The full scale measurement voltage produced on these ranges is not sufficient to forward bias silicon diode/emitter-base junctions, and thus, enables resistance values to be measured without removing diodes and transistors from the circuit. Conversely, the 2 k Ω , 200 k Ω , and 20 M Ω ranges produce a measurement voltage sufficient to forward bias a P-N junction. These ranges enable both diode- and transistor-junction checks to be made conveniently. Full scale voltage and short circuit current for each resistance range is given in Table 2-2. All values shown are referenced to the COMMON input terminal; i.e., the V/ Ω /S terminal is positive.

NOTE

Any change (greater than one or two digits) in apparent resistance when test leads are reversed may indicate either the presence of a diode junction or a voltage in the circuit.

CAUTION

Turn test circuit power off and discharge all capacitors before attempting in-circuit resistance measurements.



E_S = Source voltage

R_L = Load resistance + Source resistance

I_M = Measured current (display reading in mA)

E_B = Burden voltage (calculated), i.e., Display reading expressed as a % of full-scale ($100 \times \frac{\text{READING}}{\text{FULL-SCALE}}$)

times full-scale burden voltage for selected range. See Table.

RANGE	MAXIMUM BURDEN VOLTAGE
2 mA to 200 mA	0.3V
2000 mA	0.9V

Maximum current error due to Burden Voltage:

$$\text{Error in \%} = 100 \times \frac{E_B}{E_S - E_B}$$

$$\text{Error in mA} = \frac{E_B \times I_M}{E_S - E_B}$$

Example: $E_S = 14\text{V}$, $R_L = 9\Omega$, $I_M = 1497\text{ mA}$,

$$E_B = 100 \times \frac{1497}{2000} \times 0.9 \text{ (from Table)} =$$

$$74.9\% \times 0.9 = 0.674\text{V}$$

$$\text{Error in \%} = 100 \frac{.674}{14 - .674} = 100 \frac{.674}{13.326} = 5.06\%$$

Increase displayed current by 5.06% to obtain true current.

$$\text{Error in mA} = \frac{.674 \times 1497}{14 - .674} = \frac{1009}{13.326} = 76\text{ mA}$$

Increase displayed current by 76 mA to obtain true current.

Figure 2-8. Current Measurement Error Calculations

Table 2-2. Voltage/Current Capability of Resistance Ranges

RANGE	FULL-SCALE VOLTAGE (TYPICAL)	SHORT CIRCUIT CURRENT (TYPICAL)
20 M Ω	+800 mV	+0.12 μ A
2000 k Ω	+200 mV	+0.12 μ A
200 k Ω	+800 mV	+12 μ A
20 k Ω	+200 mV	+12 μ A
2 k Ω \rightarrow \rightarrow	+1.1V	+1.0 mA
200 Ω	+55 mV	+0.3 mA

2-42. Three of the 8026B resistance ranges have a high enough open-circuit voltage to turn on a silicon junction. These ranges (2 k Ω , 200 k Ω , and 20 M Ω) can be used to check silicon diodes and transistors. The 2 k Ω range is preferred for this function and is marked with a diode symbol. The open-circuit voltage of the three alternate ranges (200 Ω , 2 k Ω , and 2 M Ω) is not high enough to turn on a silicon junction. Use these three ranges to make in-circuit resistance measurements. For all resistance ranges, the V/ Ω /S input terminal is positive with respect to the COMMON input terminal.

2-43. Continuity

2-44. Audibly confirmed continuity measurements may be made using any of the resistance or conductance ranges. The 2 k Ω range is recommended for this mode since it provides the lowest resistance threshold, approximately 110 ohms. On this range a measured resistance lower than 110 ohms initiates the audible tone. To determine the exact threshold, use a variable resistor and observe the display reading at which the tone switches on and/or off. Note that in this mode resistance or conductance readings are also displayed. However, high resistance ranges and the 200 nS range may exhibit noisy or drifting readings due to ambient signal noise.

2-45. Intermittent open or short circuits with a duration of at least 50 μ s are detectable in the 2 k Ω range. A continuously intermittent connection is heard as a series of beeps. A series of beeps (due to environmental noise) is also encountered when a measurement is near the threshold of the selected range. The approximate thresholds for the continuity ranges are as follows:

RANGE	THRESHOLD
200 nS	900 kilohms
2 mS	110 ohms
20 M Ω	900 kilohms
2000 k Ω	900 kilohms
200 k Ω	9 kilohms
20 k Ω	9 kilohms
2 k Ω	110 ohms
200 Ω	360 ohms

2-46. Conductance

2-47. The conductance ranges, (200 nS and 2 mS) are included on the 8026B for making both conductance and resistance measurements. When either range is selected the display reads the measurement results in terms of conductance ($1/\Omega$). If resistance readings are required, refer to the conductance-to-resistance conversion information given in Figure 2-9.

2-48. The 200 nS range is intended for use in making fast, accurate, high-resistance measurements from 5 M Ω to 10,000 M Ω . Ordinarily, resistance measurements within this range are plagued by noise pick-up and require careful shielding. However, by measuring the resistance in terms of conductance, standard test leads are adequate for the 8026B to make noise-free measurements up to 10,000 M Ω . High value resistors, and low leakage components (i.e., diodes, etc.) are natural candidates for the 200 nS conductance range. Refer to applications later in this section for additional information.

2-49. The 2 mS range, in terms of resistance, starts at 500 Ω and goes up to 1 M Ω . It is intended for use in making either resistance measurements or direct-reading dc current gain (beta) measurements on transistors. Beta measurements require the use of a special test fixture, and are discussed later in this section under applications.

2-50. APPLICATIONS

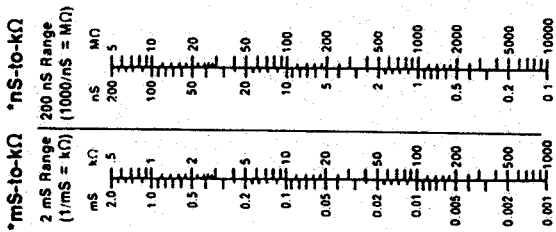
2-51. The applications described in the following paragraphs are suggested as useful extensions of the 8026B measurement capabilities. However, they are not intended as the equivalent of a manufacturer's recommended test methods. Rather, they are intended to provide repeatable and meaningful indications which will allow operator to make sound judgments concerning the condition of the device being tested; i.e., good, marginal, or defective.

2-52. Transistor Tester*NOTE*

The transistor tester described in the following paragraphs provides approximate test information. Beta is measured using a VCE of about 2V and an IC of about 200 μ A. The test method is very useful for making comparative and matching measurements.

2-53. Select the 2 mS range, plug the fixture shown in Figure 2-10 into the V/ Ω /S and COMMON input terminals, and you have transformed your 8026B into a transistor tester. Now, plug a transistor into the test socket and the 8026B will determine the following:

1. Transistor type (NPN or PNP).
2. Collector-to-emitter leakage (ICEs).
3. Beta from 1 to 1000 without changing range.



Conversion Scales

* S = siemens = / Ω = International unit of conductance formerly known as the mho.

Find the approximate resistance value using one of the scales at left. Then, on the table below, locate the most significant digit of the display reading on the vertical NO. column, and the next digit on the horizontal NO. row. The number at the intersecting coordinates represents the unknown resistance value. For example, a reading of 52.0 nS is equal to 19.2 M Ω . Decimal point location is determined from the scale approximation.

Interpolation Table (I/no.)

NO.	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9
1	.909	.833	.769	.714	.667	.625	.588	.556	.526	.500
2	.500	.476	.455	.435	.417	.400	.385	.370	.356	.345
3	.333	.323	.313	.303	.294	.286	.278	.270	.263	.256
4	.250	.244	.238	.233	.227	.222	.217	.213	.208	.204
5	.200	.196	.192	.187	.185	.182	.179	.175	.172	.169
6	.167	.164	.161	.159	.156	.154	.152	.149	.147	.145
7	.143	.141	.139	.137	.135	.133	.132	.130	.128	.127
8	.125	.123	.122	.121	.119	.118	.116	.115	.114	.112
9	.111	.110	.109	.108	.106	.105	.104	.103	.102	.101

Figure 2-9. Conductance-to-Resistance Conversion

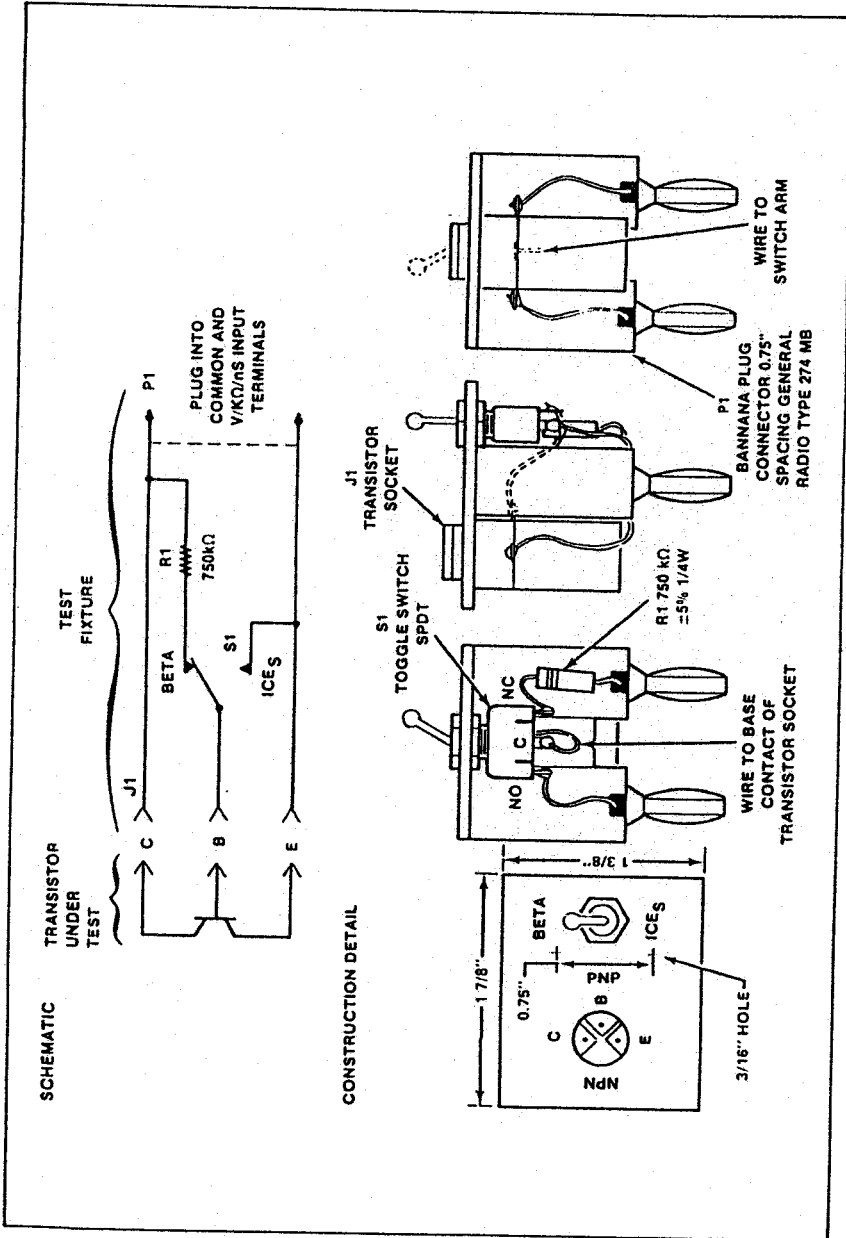


Figure 2-10. Transistor Beta Test Fixture

2-54. Transistor type is determined by setting the switch on the fixture to BETA and observing the display. If a low reading (≤ 0.010) is obtained, reverse the test fixture at the input terminals. If the collector is now positioned at the COMMON input terminal, the transistor is a PNP type. An NPN type will have its collector positioned at the V/ Ω /S input terminals. If the transistor is defective the indications will be as follows regardless of fixture position:

1. A shorted transistor will cause an overload indication.
2. An open transistor will read 0.001 or less.

2-55. After the transistor fixture is properly positioned, set the switch to ICTs for the leakage test. The transistor is turned off in this test (base shorted to emitter), and should appear as a very low conductance (high resistance) from collector-to-emitter. Therefore, the lower the reading, the lower the leakage. Silicon transistors that read more than 0.002 (6 μ A) should be considered questionable.

2-56. Beta is determined by setting the fixture switch to BETA, and observing the display. Mentally shift the decimal point three places to the right and read beta directly. For example, a display reading of 0.127 indicates a dc current gain (beta) of 127.

NOTE

Beta is a temperature sensitive parameter. Therefore, repeatable readings can only be obtained by allowing the transistor to stabilize at the ambient temperature while being tested. Avoid touching the transistor's case with your fingers.

2-57. Leakage Tester

2-58. The 200 nS conductance range effectively extends the resistance measurement capability of the 8026B (up to 10,000 M Ω) to the point where it can be used to provide useful leakage measurements on passive components. For example, you can detect leaky diodes, cables, connectors, printed circuit boards (pcbs), etc. In all cases, the test voltage is <1.5V dc.

2-59. RESISTIVE COMPONENTS

2-60. Leakage testing on purely resistive components such as cables and pcbs is straightforward. Select the 200 nS range, install the test leads in the V/ Ω /S and COMMON input terminals, connect the leads to the desired test points on the unit-under-test, and read leakage in terms of conductance. If an overrange occurs, select a resistance range that provides an on-scale reading.

NOTE

Under high humidity conditions (>80%) conductance measurements may be in error. To ensure accurate measurements connect clean test leads to the 8026B and (with the leads open) read the residual leakage in nanosiemens. Correct subsequent measurements by subtracting the residual from the readings. (Finger prints or other contamination on the pcb may also cause residual conductance readings.)

2-61. DIODES

2-62. Diode leakage (I_R) tests require that the diode junction be reverse biased when being measured. This is accomplished by connecting the anode of the diode to the COMMON input terminal and its cathode to the V/ Ω /S input terminal. Leakage can then be read in terms of conductance. In the event of an overrange, select a resistance range that provides an on-scale reading.

NOTE

Like all general-purpose multimeters, the 8026B generates and uses radio frequency energy. It is possible for radio frequency energy to interfere with radio or television reception. If interference does occur, try moving the 8026B to a different location, plugging the radio or television into a different socket, or reorienting the antenna.

Section 3

Theory of Operation

3-1. INTRODUCTION

3-2. This section of the manual contains an overall functional description followed by a block diagram analysis of the 8026B. A detailed schematic of the 8026B appears in Section 7.

3-3. OVERALL FUNCTIONAL DESCRIPTION

3-4. The Model 8026B as shown in Figure 3-1, is a hand-held 8 function digital multimeter. It features a total of 26 measurement ranges (dc volts-five, ac volts-five, ohms-six, dc current-four, ac current-four, and conductance-two); with overload protection for all ranges.

3-5. Operation centers around a custom LSI chip, U1, which contains a dual slope a/d converter and a display driver. Peripherals to U1 include range and function switches, input signal conditioners, and the display. When an input signal is applied to the 8026B it is routed through the range switches to one of four input signal conditioners as determined by the function switch setting. Each conditioner scales and converts the input to an acceptable dc input level (-0.2 to $+0.2V$ dc) that is presented to the a/d converter.

3-6. Timing for the overall operation of the a/d converter is derived from an external quartz crystal whose frequency is a multiple of the local line frequency. This allows the conditioned dc input data to be integrated over an integral number of power line cycles, thus optimizing both common mode and normal mode rejection.

3-7. Digitized measurement data is presented to the display as four decoded digits (seven segments) plus polarity. Decimal point position on the display is determined by the range switch settings.

3-8. BLOCK DIAGRAM ANALYSIS

3-9. A/D Converter

3-10. The entire analog-to-digital conversion process is accomplished by a single custom A/D Converter and Display Driver IC, U1. The IC employs the dual slope method of a/d conversion, and requires a series of external components to establish the basic timing and reference levels required for operation. These include an integrating capacitor, an autozero capacitor, and a flying capacitor (for applying a reference level of either

polarity). Since the power consumed for display operation is very low, the IC also contains the latches, decoders, and drivers required for the display.

3-11. The digital control portion of the a/d conversion process is an internal function of U1, and is keyed to the external crystal frequency. As a result, the conversion process is continuously repeated, and the display is updated at the end of every conversion cycle.

3-12. A simplified circuit diagram of the analog portion of the a/d converter is shown in Figure 3-2. Each of the switches shown represent analog gates which are operated by the digital section of the a/d converter. Basic timing for switch operation and, therefore, a complete measurement cycle is also included in the figure.

3-13. Any given measurement cycle performed by the a/d converter can be divided into three consecutive time periods, autozero (AZ), integrate (INTEG), and read. Both autozero and integrate are fixed time periods whose lengths are multiples of the clock frequency. A counter determines the length of both time periods by providing an overflow at the end of every 10,000 clock pulses. The read period is a variable time which is proportional to the unknown input voltage. The value of the voltage is determined by counting the number of clock pulses that occur during the read period.

3-14. During autozero a ground reference is applied as an input to the a/d converter. Under ideal conditions the output of the comparator would also go to zero. However, input-offset-voltage errors accumulate in the amplifier loop, and appear at the comparator output as an error voltage. This error is impressed across the AZ capacitor where it is stored for the remainder of the measurement cycle. The stored level is used to provide offset voltage correction during the integrate and read periods.

3-15. The integrate period begins at the end of the autozero period. As the period begins, the AZ switch opens and the INTEG switch closes. This applies the unknown input voltage to the input of the a/d converter. The voltage is buffered and passed on to the integrator to determine the charge rate (slope) on the INTEG capacitor. By the end of the fixed integrate period the capacitor is charged to a level proportional to the unknown input voltage. This voltage is translated to a digital indication by discharging the capacitor at a fixed rate during the read period, and counting the number of clock pulses that occur before it returns to the original autozero level.

3-16. As the read period begins, the INTEG switch opens and the read switch closes. This applies a known reference voltage to the input of the a/d converter. The polarity of this voltage is automatically selected to be opposite that of the unknown input voltage, thus, causing the INTEG capacitor to discharge at a fixed rate (slope). When the charge is equal to the initial starting point (autozero level), the read period is ended. Since the discharge slope is fixed during the read period, the time required for discharge is proportional to the unknown input voltage.

3-17. The autozero period and, thus, a new measurement cycle begins at the end of the read period. At the same time the counter is released for operation by transferring its contents (previous measurement value) to a series of latches. This stored data is then decoded and buffered before being used for driving the liquid crystal display.

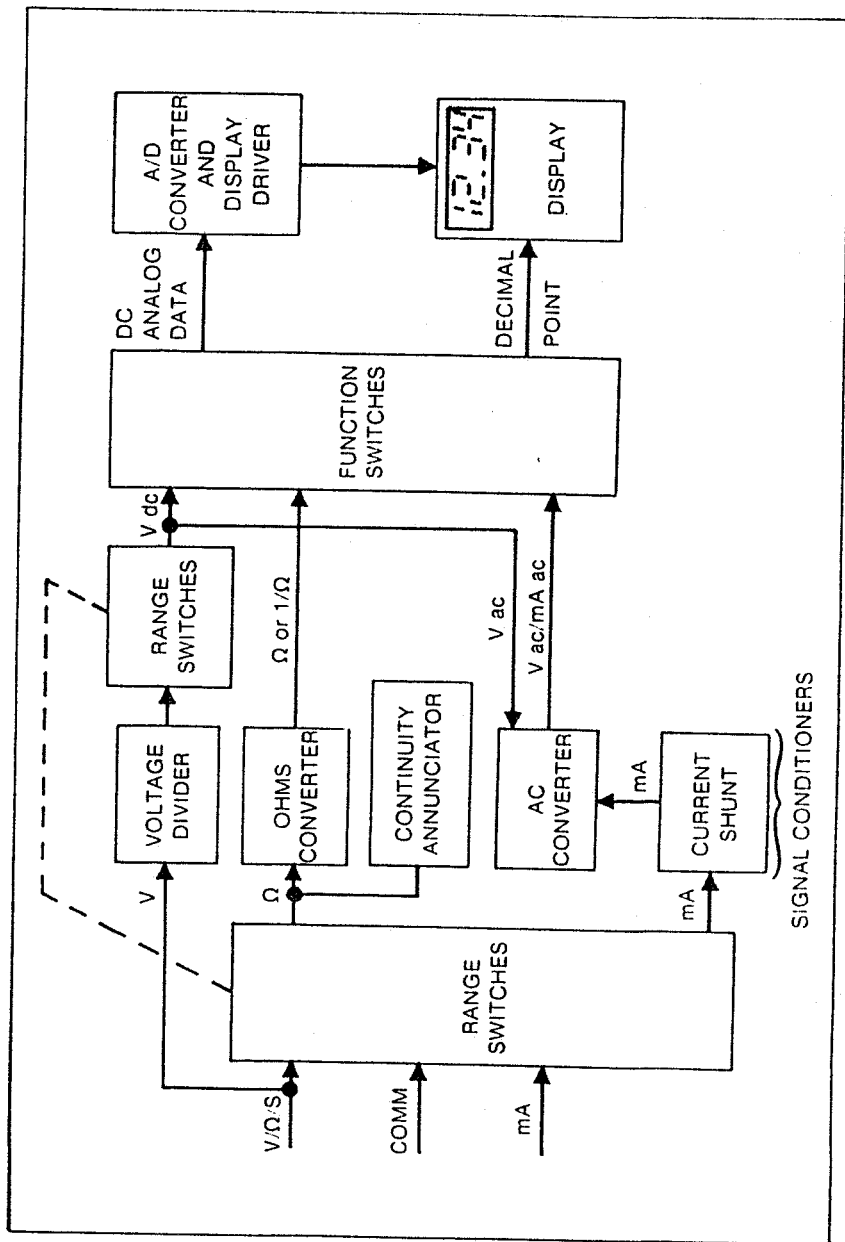


Figure 3-1. 8026B Simplified Block Diagram

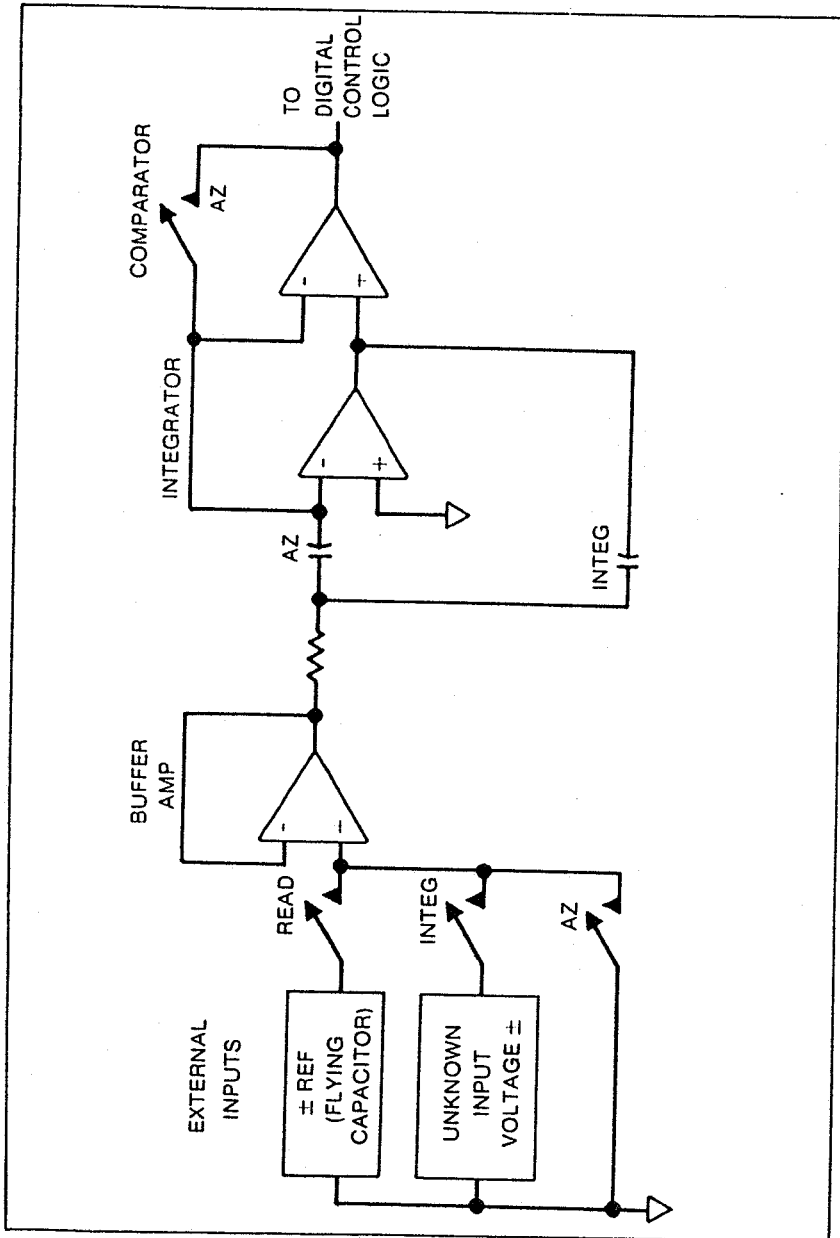


Figure 3-2. Dual Slope A/D Converter

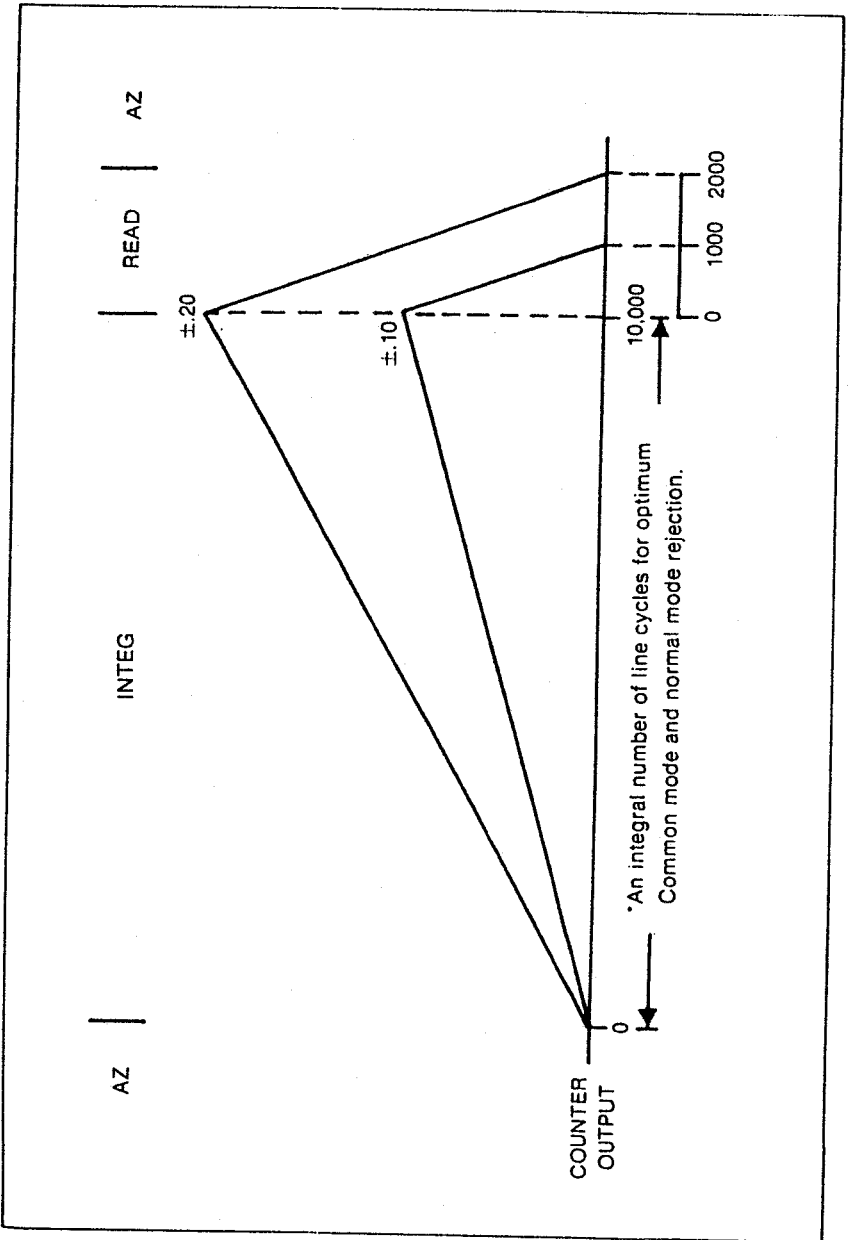


Figure 3-2. Dual Slope A/D Converter (cont)

3-18. Input Signal Conditioners

3-19. The a/d converter requires two externally supplied input voltages to complete a measurement cycle. One is reference voltage and the other is an unknown dc voltage within the range of -0.2 to $+0.2V$ dc. If the function being measured is other than a dc voltage within the ± 0.2 range, it must be scaled and/or conditioned before being presented to the a/d converter. For example, higher dc levels must be divided; ac inputs must be divided, rectified, and filtered; and resistance and current inputs must be scaled and converted to dc voltage levels. The following paragraphs describe the input signal conditioners used for each of the 8026B measurement functions.

3-20. VOLTAGE MEASUREMENT

3-21. Both the ac and dc voltage ranges use an over-voltage-protected, $10\text{ M}\Omega$ input divider as shown in Figure 3-3A. Under normal conditions, assuming a dc input level on the proper range, the divider output is a -0.2 to $+0.2V$ dc signal, and is an exact (power-of-10) ratio of the input signal. If the VAC function is selected, the divider output is ac coupled to an rms ac converter whose dc output is equivalent to the rms level of the ac inputs. The conditioned signal for the selected function (V ac or V dc) is then passed through a filter before being presented to the a/d converter as the unknown input.

3-22. CURRENT MEASUREMENT

3-23. Current measurements are made using a fuse protected, switchable, four-terminal current shunt (0.1Ω , 1Ω , 10Ω , or 100Ω) to perform the current-to-voltage conversion required by the a/d converter. See Figure 3-3B. The voltage ($I R$) drop produced across the selected shunt may be either ac or dc depending upon the selected function, mA AC or mA DC. If the input current is dc and the dc function is selected, the $I R$ drop is passed through a low-pass filter, and presented as the unknown input to the a/d converter. However, if the input current is ac and the AC function is selected, the $I R$ drop is processed by the ac converter before going to the low-pass filter. In either event the a/d converter receives a dc input voltage proportional to the current passing through the selected shunt.

3-24. RESISTANCE MEASUREMENTS

3-25. Resistance measurements are made using a ratio technique as shown in Figure 3-3C. When the Ω function is selected, a simple series circuit is formed by the internal reference voltage, a reference resistor from the voltage divider (selected by range switches), and the external unknown resistor. The ratio of the two resistor values is equal to the ratio of their respective voltage drops. Therefore, since the value of one resistor is known, the value of the second can be determined by using the voltage drop across the known resistor as a reference. This determination is made directly by the a/d converter.

3-26. Overall operation of the a/d converter during a resistance measurement is basically as described earlier in this section, with one exception. The reference voltage present during a voltage measurement is replaced by the voltage drop across the reference resistor. This allows the voltage across the unknown resistor to be read during the integrate period, and compared against the reference resistor during the read period. As before, the length of the read period is a direct indication of the value of the unknown.

3-27. CONDUCTANCE MEASUREMENTS

3-28. Conductance measurements are made using a ratio technique similar to that used in making resistance measurements. See Figure 3-3C. The main difference is that only two

ranges are provided (200 nS and 2 mS), and the function of the range and unknown resistors in the measurement cycle is reversed. That is, the voltage drop across the range resistor is used as the unknown input during the integrate period, and the voltage across the unknown resistor is used for the reference input during the read period. As a result the display provides a reading that is the reciprocal ($1/\Omega$) of the unknown input resistance, i.e., the higher the input resistance the lower the display reading.

3-29. CONTINUITY MEASUREMENTS

3-30. Continuity is a measurement feature that supplements the resistance and conductance measurement functions. The feature is enabled when the V/Ω and the AC/DC function switches are both pressed in. When a measurement is made, continuity is indicated by an audible tone. No tone indicates an open circuit or the equivalent of an open circuit.

3-31. The continuity circuit consists of a comparator, a one-shot, and a tone generator. See Figure 3-3D. During a measurement, R pull-up and V source develop a voltage across the measured resistance. The comparator compares this voltage against an internal 100 mV threshold reference. If the input voltage is greater than the 100 mV reference, the tone generator is not enabled, a no-continuity indication. Conversely, an indication of less than 100 mV causes the comparator to enable the tone generator which emits an audible continuity indication.

3-32. Since the values of V source and R pull-up vary with the selected range, it is convenient to think of the 100 mV threshold as a resistance threshold. The resistance threshold and the V source/ R pull-up values for each continuity range are given in the following list:

RANGE	R pull-up	V source (VOLTS)	THRESHOLD RESISTANCE
200 Ω	4 kilohms	1.2 volts	360 ohms
2 k Ω	3 kilohms	2.8 volts	110 ohms
2 mS	3 kilohms	2.8 volts	110 ohms
20 k Ω	100 kilohms	1.2 volts	9 kilohms
200 k Ω	100 kilohms	1.2 volts	9 kilohms
2000 k Ω	10 megohms	1.2 volts	900 kilohms
20 M Ω	10 megohms	1.2 volts	900 kilohms
200 nS	10 megohms	1.2 volts	900 kilohms

3-33. Extremely short changes in a continuity condition (intermittent open or short circuits) are detected by the one-shot and maintained for approximately 200 ms. This pulse stretching effect ensures that a reliable audio tone is generated for continuity changes as short as 50 μ s in the 2 k Ω range.

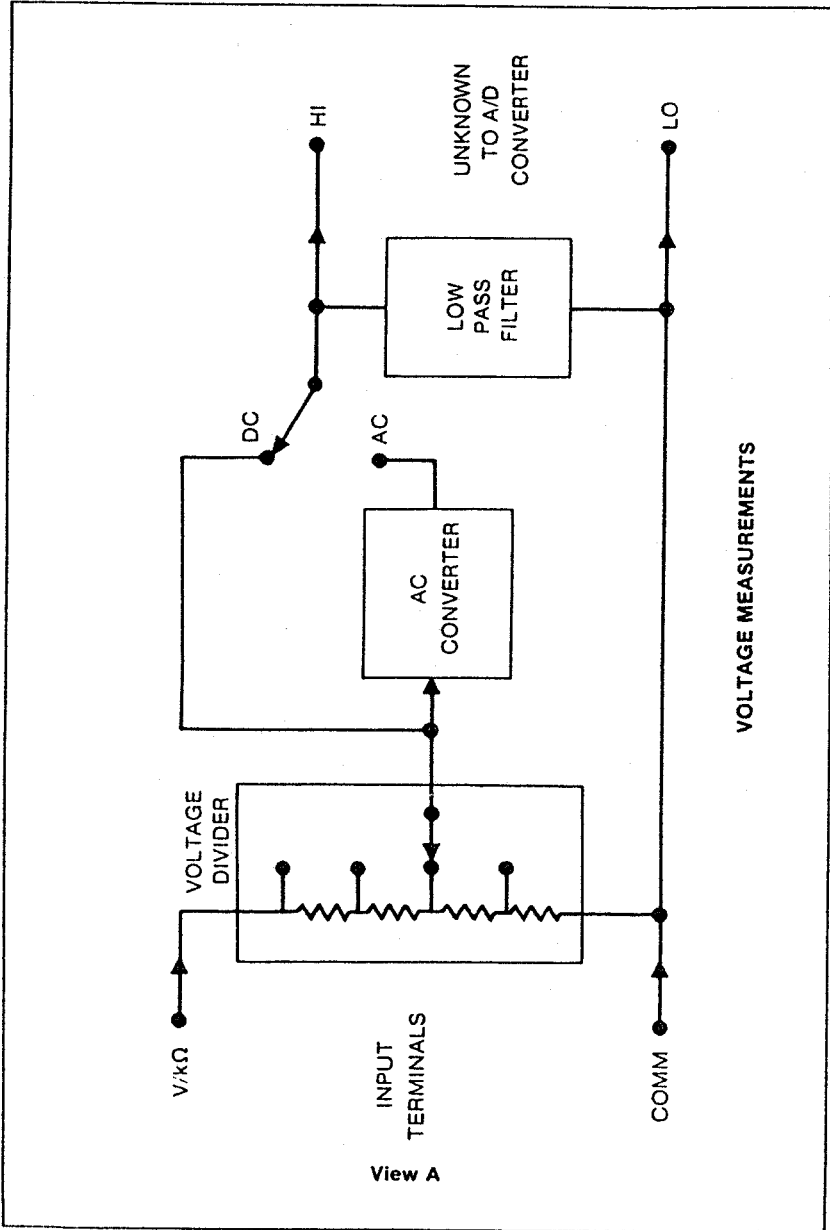


Figure 3-3. Input Signal Conditioners

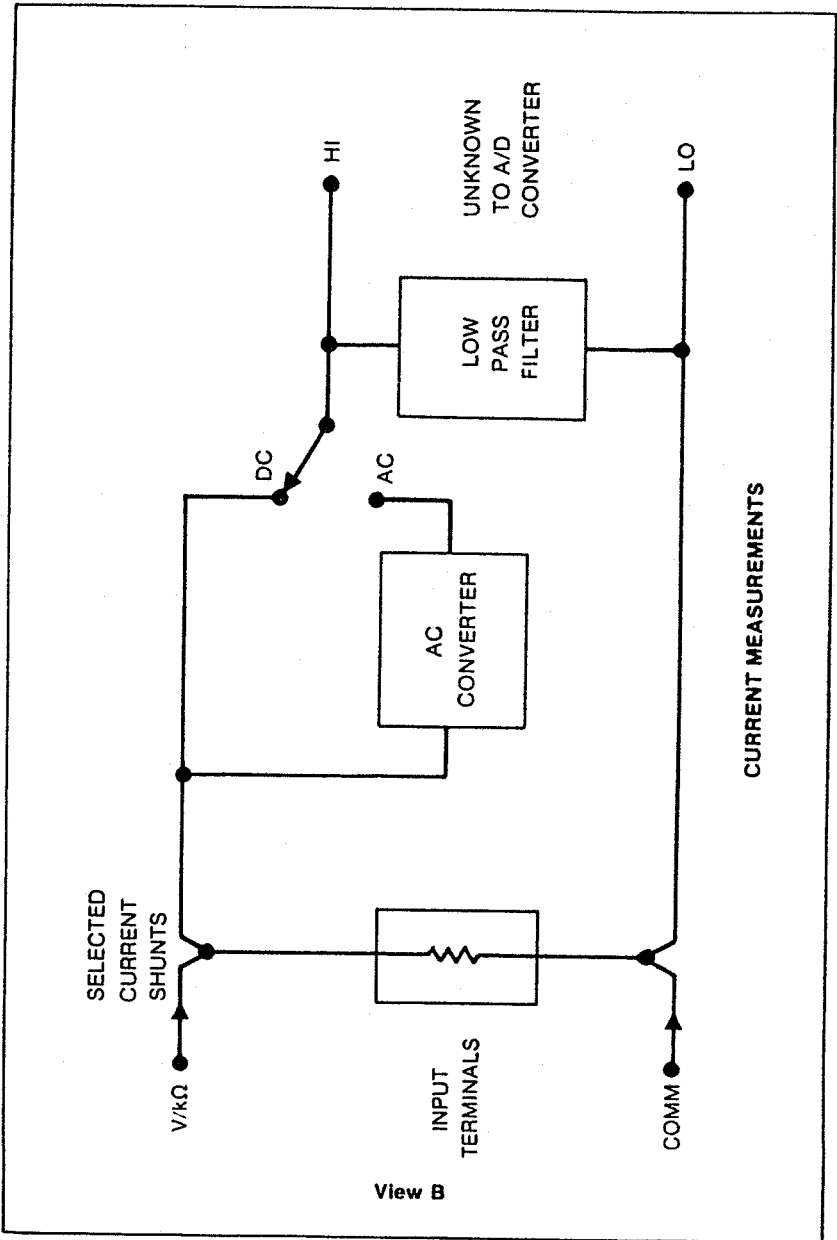


Figure 3-3. Input Signal Conditioners (cont)

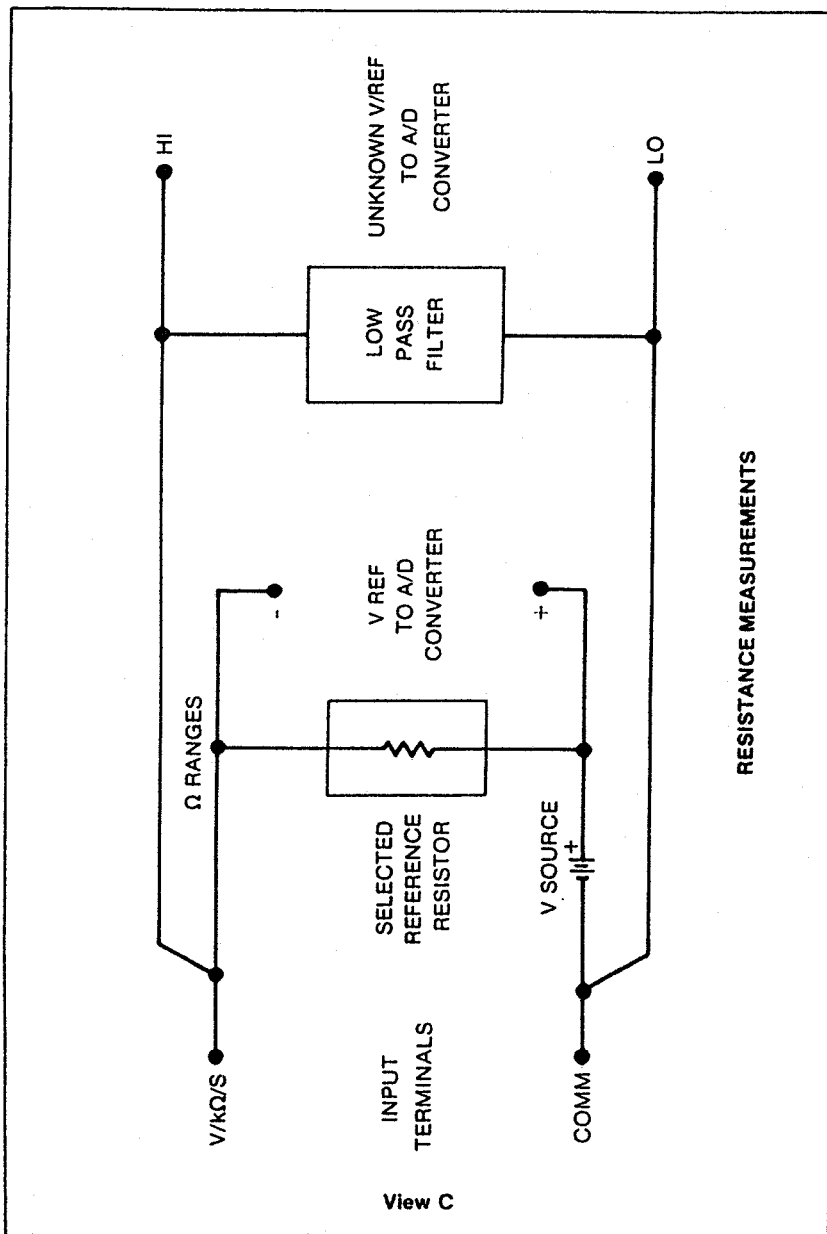


Figure 3-3. Input Signal Conditioners (cont)

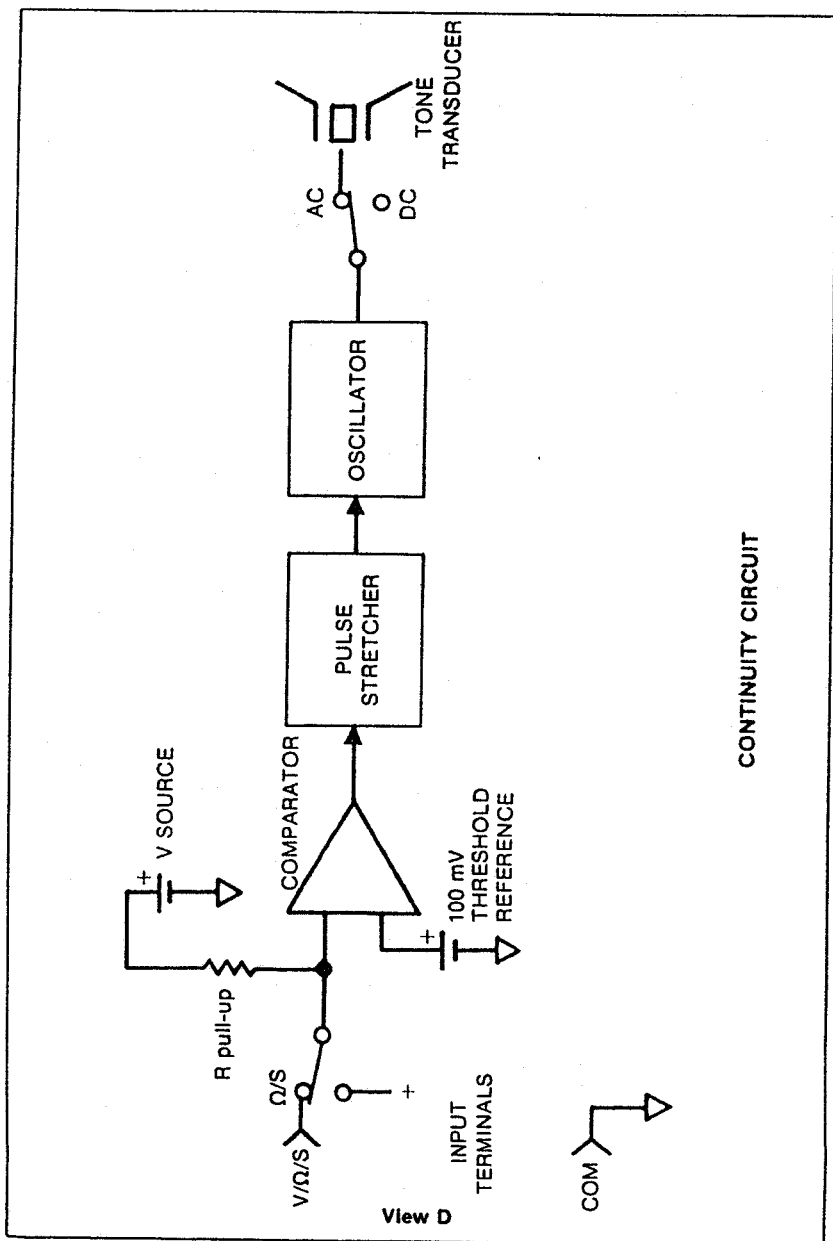
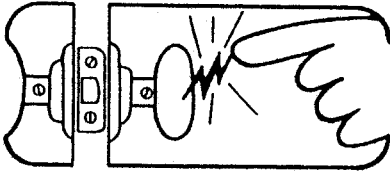


Figure 3-3. Input Signal Conditioners (cont)


static awareness


A Message From
John Fluke Mfg. Co., Inc.



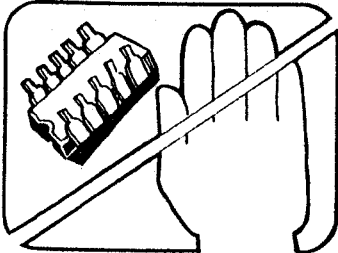
Some semiconductors and custom IC's can be damaged by electrostatic discharge during handling. This notice explains how you can minimize the chances of destroying such devices by:

1. Knowing that there is a problem.
2. Learning the guidelines for handling them.
3. Using the procedures, and packaging and bench techniques that are recommended.

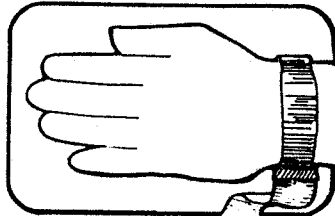
The Static Sensitive (S.S.) devices are identified in the Fluke technical manual parts list with the symbol



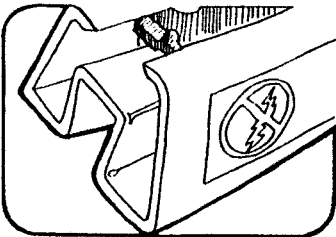
The following practices should be followed to minimize damage to S.S. devices.



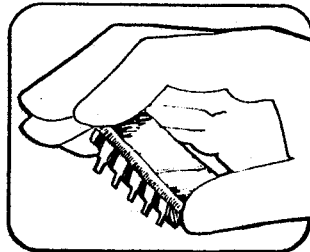
1. MINIMIZE HANDLING



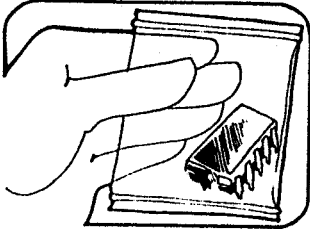
3. DISCHARGE PERSONAL STATIC BEFORE HANDLING DEVICES



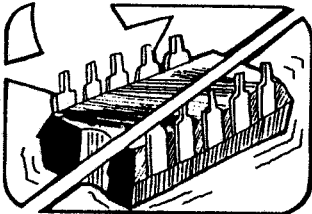
2. KEEP PARTS IN ORIGINAL CONTAINERS UNTIL READY FOR USE.



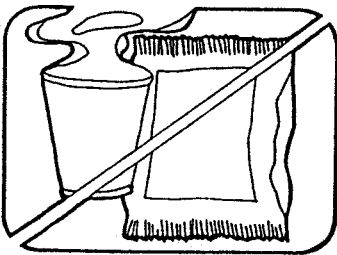
4. HANDLE S.S. DEVICES BY THE BODY



5. USE ANTI-STATIC CONTAINERS FOR HANDLING AND TRANSPORT

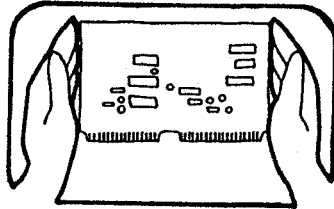


6. DO NOT SLIDE S.S. DEVICES OVER ANY SURFACE

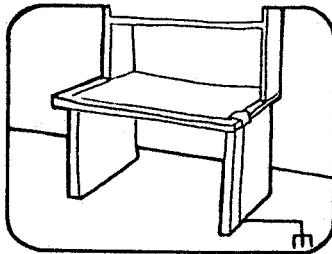


7. AVOID PLASTIC, VINYL AND STYROFOAM[®] IN WORK AREA

PORTIONS REPRINTED
WITH PERMISSION FROM TEKTRONIX, INC
AND GENERAL DYNAMICS, POMONA DIV



8. WHEN REMOVING PLUG-IN ASSEMBLIES, HANDLE ONLY BY NON-CONDUCTIVE EDGES AND NEVER TOUCH OPEN EDGE CONNECTOR EXCEPT AT STATIC-FREE WORK STATION. PLACING SHORTING STRIPS ON EDGE CONNECTOR USUALLY PROVIDES COMPLETE PROTECTION TO INSTALLED SS DEVICES.



9. HANDLE S.S. DEVICES ONLY AT A STATIC-FREE WORK STATION
10. ONLY ANTI-STATIC TYPE SOLDER-SUCKERS SHOULD BE USED.
11. ONLY GROUNDED TIP SOLDERING IRONS SHOULD BE USED.

Anti-static bags, for storing S.S. devices or pcbs with these devices on them, can be ordered from the John Fluke Mfg. Co., Inc. See section 5 in any Fluke technical manual for ordering instructions. Use the following part numbers when ordering these special bags.

John Fluke Part No.	Description
453522	6" X 8" Bag
453530	8" X 12" Bag
453548	16" X 24" Bag
454025	12" X 15" Bag
Pink Poly Sheet	Wrist Strap
30" x60" x60 Mil	P/N TL6-60
P/N RC-AS-1200	\$7.00
\$20.00	

J0089B-07U7810/SE EN Litho in U S A

Section 4

Maintenance

WARNING

THESE SERVICING INSTRUCTIONS ARE FOR USE BY QUALIFIED PERSONNEL ONLY. TO AVOID ELECTRIC SHOCK, DO NOT PERFORM ANY SERVICING OTHER THAN THAT CONTAINED IN THE OPERATING INSTRUCTIONS UNLESS YOU ARE QUALIFIED TO DO SO.

4-1. INTRODUCTION

4-2. This section of the manual contains maintenance information for the Model 8026B. This includes service information, general maintenance, performance test, calibration and troubleshooting. The performance test is recommended as an acceptance test when the unit is first received, and later as a preventive maintenance tool to verify proper instrument operation. A 1-year calibration cycle is recommended to maintain the specifications given in Section 1 of this manual. The test equipment required for both the performance test and calibration is listed in Table 4-1. If the recommended equipment is not available, instruments having equivalent specifications may be used.

4-3. SERVICE INFORMATION

4-4. The 8026B is warranted for a period of two years upon delivery to the original purchaser. Conditions of the warranty are given at the rear of this manual.

4-5. Malfunctions that occur within the limits of the warranty will be corrected at no cost to the purchaser. For in-warranty repair, call (toll-tree) 800 426-0361 for the address of the nearest Fluke Technical Service Center designated to service your instrument. (In Alaska, Hawaii, Washington or Canada call 206 356-5400.) Ship the instrument postpaid in the original shipping container (if available). Dated proof-of-purchase will be required for all in-warranty repairs.

4-6. Fluke Technical Service Centers are also available for calibration and/or repair of instruments that are beyond the warranty period. Call the number listed above for shipping information. Ship the instrument and remittance in accordance with instructions received.

Table 4-1. List of Recommended Test Equipment

INSTRUMENT TYPE	REQUIRED CHARACTERISTICS	RECOMMENDED MODEL
PREFERRED		
DMM Calibrator	John Fluke 5100A family	John Fluke Models 5100B, 5101B, 5102B
ALTERNATE		
AC Calibrator	Voltage Range: 0 to 750V ac Frequency Range: 100 to 450 Hz: $\pm 0.25\%$ Voltage Accuracy: 100 to 450 Hz: $\pm 0.1\%$	John Fluke Models 5200A and 5215A/5205
DC Calibrator	Voltage Range: 0 to 1000V dc Accuracy: $\pm 0.025\%$	John Fluke Model 343A
DC Current Calibrator	Current Range: 2 mA to 2A Accuracy: $\pm 0.2\%$	John Fluke Model 382A
Decade Resistor or Individual Resistors	Resistance Values: 190 Ω , 1.9 k Ω , 19 k Ω , 190 k Ω , 1.9 M Ω , and 10 M Ω Accuracy: $\pm 0.025\%$ Power Rating: $\geq 1/8$ watt	ESI Model DB62

4-7. GENERAL INFORMATION**4-8. Access Information***NOTE*

To avoid contaminating the pcb with oil from the fingers, handle it by the edges or wear gloves. If the pcb does become contaminated, refer to the cleaning procedure given later in this section.

4-9. BACKUP FUSE (F2) AND CALIBRATION ACCESS

4-10. Use the following procedure to access the 8026B calibration adjustments.

1. Set the power switch to OFF.
2. Disconnect test leads and battery eliminator, if attached.
3. Open the battery compartment and disconnect the battery.
4. Remove the three phillips-head screws from the bottom of the case.

5. Turn the instrument face-up and grasp the top cover at both sides of the input connectors. Then, pull the top cover from the unit.

6. Backup Fuse (F2) and all adjustments necessary to complete the calibration procedure are now accessible (see Figure 4-1).

4-11. COMPONENT/PCB ACCESS

4-12. Use the following procedure to remove the Main PCB Assembly from the case:

1. complete the calibration access procedure.
2. Remove the screw from shield.
3. Using your index finger, lift the lower right-hand corner of the pcb. When the pcb is freed, pull it to the right until it clears the shelf under the buttons, and then lift up. Handle the PCB by its edges to prevent surface contamination.
4. To reassemble the 8026B logically reverse this procedure.

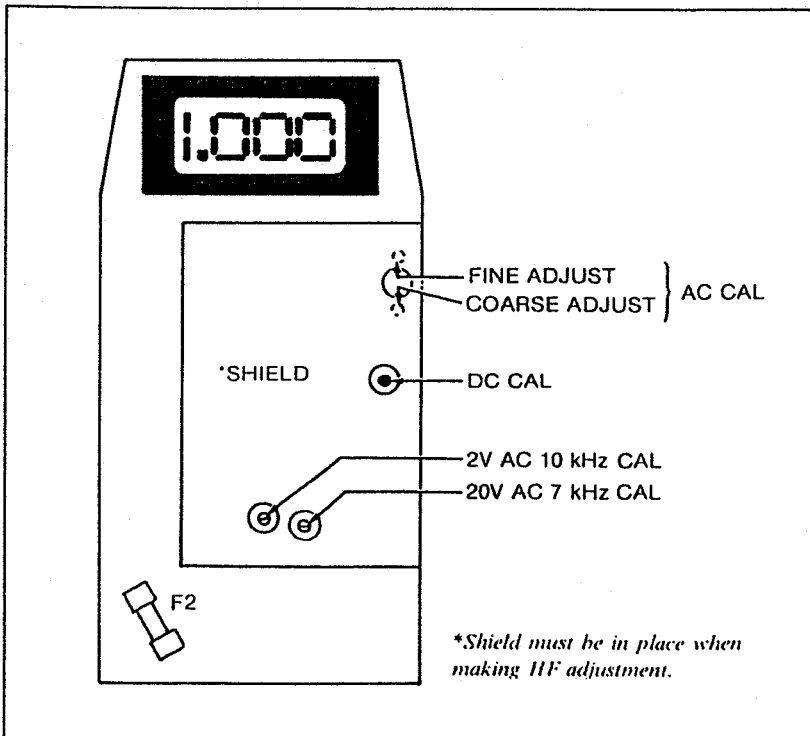


Figure 4-1. Calibration Adjustment Locations

NOTE

When installing the pcb, route the battery-clip wires behind the post on the left-hand side of the bottom case, and thread the battery-clip through the battery-cover opening. Also make sure that the removable plastic lip that resides beneath the range switch pushbuttons is properly installed in the bottom case. The green power switch cap should also be mounted on the power switch.

4-13. DISPLAY ACCESS

4-14. Refer to Figure 4-2 and the following procedure to remove/replace the LCD assembly.

1. Remove the Main PCB Assembly using the PCB access procedure.
2. Place your thumbs on either side of the display lens and carefully slide the lens out of the LCD bracket.
3. Turn the LCD bracket upside down, gently tap it against your palm. The LCD should fall out.

NOTE

When installing the LCD make certain that its flat surface is facing out and its connector pattern is on top of and makes contact with, the flexible layered connector. All of the parts indicated in figure 4-2 must be thoroughly cleaned and free of particles to assure proper display operation.

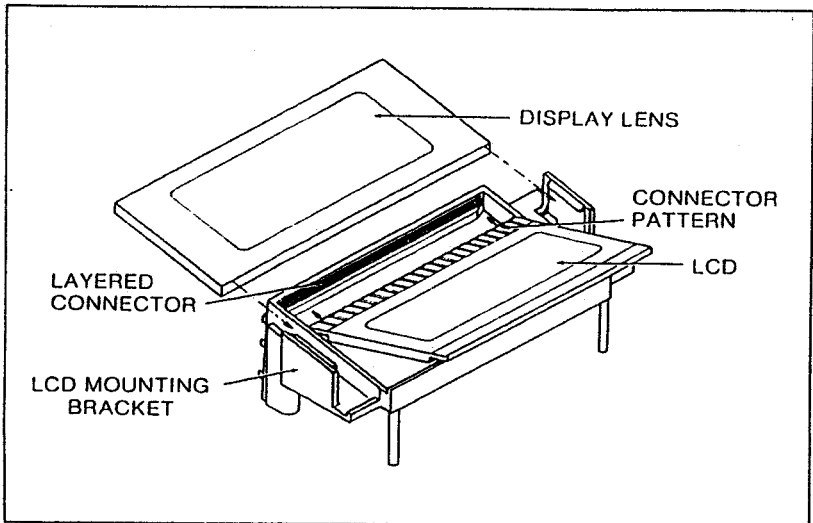


Figure 4-2. LCD Display Assembly

4-15. LSI (U1) ACCESS

4-16. Use the following procedure to remove/replace the A/D Converter and Display Driver IC, U1.

1. Remove the pcb assembly using the component/pcb access procedure.
2. On the bottom of the pcb locate and remove the two phillips-head screws from the display assembly.
3. Lift the display assembly from the pcb to expose U1.

CAUTION

U1 is a MOS device and is subject to damage by static discharge. Observe the precautions given later in this section under troubleshooting before attempting to remove or replace U1.

4. Use a screw driver or a reasonable substitute to rock (by prying up on each end of the IC) the IC out of it socket.
5. When installing U1 make sure all pins are lined up in the socket, and then carefully press it into place.

4-17. Cleaning**CAUTION**

Do not use aromatic hydrocarbons or chlorinated solvents for cleaning. These solutions will react with the plastic materials used in the instrument.

CAUTION

Do not allow the liquid crystal display to get wet. Remove the Display Assembly before washing the pcb and do not install it until the pcb has been fully dried.

4-18. Clean the front panel and case with a mild solution of detergent and water. Clean dust from the circuit board with low pressure (<20 psi) dry air. Contaminates can be removed from the circuit board with demineralized water and a soft brush (remove the Display Assembly before washing, and avoid getting excessive amounts of water on the switches). Dry with clean, dry air at low pressure, and then bake at 50 to 60°C (124-140°F) for 24 hours.

4-19. Battery/Backup Fuse Replacement**WARNING**

BATTERY/FUSE REPLACEMENT SHOULD ONLY BE PERFORMED AFTER THE TEST LEADS HAVE BEEN REMOVED FROM THE INPUT JACKS, AND THE POWER SWITCH IS SET TO OFF. BACKUP FUSE REPLACEMENT PROCEDURES MUST BE PERFORMED BY QUALIFIED SERVICE PERSONNEL ONLY. USE ONLY THE RECOMMENDED FUSE TYPE FOR REPLACEMENT.

4-20. Refer to Section I of this manual for battery and main fuse (F1) replacement procedure. Use the following procedure to replace the backup fuse (F2).

1. Complete the Backup Fuse and Calibration Access procedure located earlier in this section.
2. Using a pointed tool such as a probe tip, pry the backup fuse from its holder.
3. Replace the defective backup fuse with a 3A, 600V type BBS-3 only.

4-21. PERFORMANCE TEST

4-22. The performance test is used to compare the 8026B performance with the list of specifications given in Section I of this manual. It is recommended for incoming inspection, periodic maintenance, and to verify specifications. If the instrument fails any part of the test, calibration and/or repair is indicated.

4-23. Initial Procedure

4-24. Establish the following test conditions before continuing with the Performance Test:

1. Allow the unit to stabilize at an ambient temperature of $23 \pm 5^{\circ}\text{C}$ ($73 \pm 9^{\circ}\text{F}$).
2. Check and, if necessary, replace the fuses and battery.
3. Set the power switch to ON.

4-25. Display Test

4-26. The following procedure is used to test the operation of all display digits and segments:

1. Select the Ω function and the 20 k Ω range. The display should be blanked with the exception of the overrange indicator (1) in the left hand column and a decimal point in the center of the display.
2. Connect a Decade Resistor between the V/ Ω /S and COMMON input terminals.
3. Set the Decade Resistor to 10 k Ω and verify a display of 10.00 \pm 3 digits.
4. Sequentially increase the resistance in 1.11 k Ω steps and verify the operation of each digit and its segments.
5. Disconnect the Decade Resistor at the input terminals, and select the 2000 k Ω range. A decimal point should not be displayed.
6. Sequentially select the 200, 20 and 2 k Ω range. The decimal point should appear in the tenths, hundredths, and thousandths position, respectively.

4-27. Resistance/Conductance Test

4-28. The operation and accuracy of the resistance and conductance ranges are tested in the following procedure:

1. Connect the Decade Resistor between the $V/\Omega/S$ and COMMON input terminals.
2. Refer to Table 4-2, and select the range and input conditions specified in step 1. Verify that the display reading is within the limits shown.
3. Execute and verify steps 2 through 8 of Table 4-2, using the procedure described in step 2.

4-29. Continuity Test

4-30. Use the following procedure to verify proper operation of the continuity function:

1. Select the Ω function and 2 k Ω range.
2. Connect the test leads to the COMMON and V/Ω terminals.
3. Depress the AC/DC switch to activate the audible tone.
4. Momentarily short the test leads together and observe that the tone sounds.

WARNING

THE LOCAL LINE VOLTAGE IS USED IN THE FOLLOWING STEP. BE CAREFUL NOT TO TOUCH THE PROBE TIPS WITH YOUR FINGERS OR TO ALLOW THE 120V AC RECEPTACLE TO BECOME SHORTED.

Table 4-2. Resistance/Conductance Checks

STEP	RANGE	DECADE RESISTOR		JOHN FLUKE 5100B/5101B/5102B	
		INPUT RESISTANCE	DISPLAY READING	INPUT RESISTANCE	DISPLAY READINGS
1	200 Ω	Short	00.0 to 00.2	Short	00.0 to 00.2
2	2 k Ω	Short	0.000 to 0.001	Short	.000 to 0.001
3	200 Ω	190 Ω	189.3 to 190.7	100 Ω	99.5 to 100.5
4	2 k Ω	1.9 k Ω	1.897 to 1.903	1 k Ω	.998 to 1.002
5	20 k Ω	19 k Ω	18.97 to 19.03	10 k Ω	9.98 to 10.02
6	200 k Ω	190 k Ω	189.7 to 190.3	100 k Ω	99.8 to 100.2
7	2000 k Ω	1900 k Ω	1861 to 1939	1000 k Ω	980 to 1020
8	20 M Ω	10 M Ω	9.80 to 10.20	10 M Ω	9.80 to 10.20
9	200 nS	10 M Ω	97.0 to 103.0	10 M Ω	97.0 to 103.0
10	200 nS	Open	01.0 to 00.0	Open	01.0 to 00.0

5. At a convenient 120V ac receptacle, insert the test leads as if to measure the line voltage. A series of beeps at a rate of approximately 5 to 10 per second indicates proper operation of the pulse stretcher circuit.

4-31. DC Voltage Test

4-32. Use the following procedure to check the accuracy and overall operation of the dc voltage ranges:

WARNING

CONNECT THE GROUND/COMMON/LOW SIDE OF THE VOLTAGE CALIBRATOR TO COMMON ON THE 8026B.

1. Set the DC Calibrator for a zero volt output.
2. Connect the DC Calibrator output to the V/ Ω /S and COMMON input terminals of the 8026B (calibrator ground/common/low to 8026B COMMON).
3. With reference to Table 4-3, select the 8026B voltage range given in step 1, and set the DC Calibrator output to the corresponding 8026B input voltage. Verify that the display reading is within the limits shown.
4. Execute and verify steps 2 through 7 of Table 4-3, using the procedure described in step 3.

4-33. AC Voltage Test

4-34. The ac voltage ranges are checked for accuracy and operation using the following procedure:

WARNING

CONNECT THE GROUND/COMMON/LOW SIDE OF THE AC CALIBRATOR TO COMMON ON THE MODEL 8026B.

1. Set the AC Calibrator for a zero volt ac output.

Table 4-3. DC Voltage Checks

STEP	VOLTAGE RANGE	INPUT VOLTAGE, DC	DISPLAY READING
1	200 mV	+190.0 mV	189.7 to 190.3
2	200 mV	-190.0 mV	-189.7 to -190.3
3	2V	0.0V	-.001 to .001
4	2V	+1.9V	1.897 to 1.903
5	20V	+19V	18.97 to 19.03
6	200V	+190V	189.7 to 190.3
7	1000V	+1000V	998 to 1002

2. Connect the AC Calibrator output to the V/ Ω /S and COMMON input terminals for the 8026B (calibrator ground/common/low to 8026B COMMON).
3. With reference to Table 4-4, select the 8026B voltage range given in step 1, and set the AC Calibrator output to the corresponding 8026B input voltage and frequency. Verify that the display reading is within the limits shown.
4. Execute and verify steps 2 through 12 of Table 4-4, using the procedure described in step 3.

4-35. DC Current Test

4-36. The following procedure is used to check the operation and accuracy of the dc current ranges.

1. Set the output of the DC Current Calibrator to zero mA.
2. Connect the output of the DC Current Calibrator to the (A) and COMMON input terminals on the 8026B.
3. With reference to Table 4-5, select the 8026B current range indicated in step 1, and set the calibrator output to provide the corresponding 8026B input current. Verify that the display reading is within the limits shown.
4. Execute and verify steps 2 through 4 of Table 4-5, using the procedure described in step 3.

Table 4-4. AC Voltage Test

STEP	VOLTAGE RANGE	INPUT		DISPLAY READING
		VOLTAGE	FREQUENCY	
1	200 mV	Short	dc	00.0 to 00.2
2	200 mV	190.0 mV	50 Hz	188.9 to 191.2
3	200 mV	10.0 mV	50 Hz	9.7 to 10.3
4	200 mV	10.0 mV	10 kHz	9.5 to 10.5
5	2V	1.900V	10 kHz	1.859 to 1.941
6	2V	1.900V	5 kHz	1.878 to 1.922
7	2V	1.900V	2 kHz	1.889 to 1.912
8	2V	1.900V	50 Hz	1.889 to 1.912
9	20V	19.00V	50 Hz	18.89 to 19.12
10	20V	19.00V	2 kHz	18.89 to 19.12
11	20V	19.00V	5 kHz	18.78 to 19.22
12	20V	19.00V	10 kHz	18.59 to 19.41
13	200V	110.0V	2 kHz	108.7 to 111.3
14	200V	110.0V	50 Hz	109.3 to 110.8
15	750V	750V	50 Hz	744 to 756
16	750V	750V	1 kHz	744 to 756

Table 4-5. DC Current (mA) Checks

STEP	CURRENT RANGE	INPUT CURRENT, DC	DISPLAY READING
1	2 mA	+1.9 mA	1.885 to 1.915
2	20 mA	-19 mA	-18.85 to -19.15
3	200 mA	+190 mA	188.5 to 191.5
4	2000 mA	+1900 mA	1885 to 1915

4-37. CALIBRATION

4-38. Under normal operating conditions, the 8026B should be calibrated once a year to maintain the specifications given in Section 1 of this manual. If instrument repairs have been made or if the unit fails the performance test, immediate calibration is required. Equipment required for calibration is listed in Table 4-1. If the necessary equipment is not available, your nearest authorized Fluke Technical Service Center will be happy to help. A list of these service centers, as well as shipping information, is given at the back of this manual.

4-39. Use the following procedure to calibrate the 8026B.

NOTE

This procedure assumes an ambient temperature of $23 \pm 2^\circ\text{C}$ (70 to 77°F) and a relative humidity of less than 80%. The temperature of the unit should be allowed to stabilize for at least 30 minutes before calibration begins.

1. Remove the top cover from the 8026B using the access procedure given earlier in this section.
2. Set the 8026B power switch to ON and select the 200 mV DC range.
3. Set the output of the DC Calibrator to +190.0 mV and connect it to the 8026B input terminals; + to V/ Ω /S, and - to COMMON.
4. Adjust the DC CAL pot (R5), as shown in Figure 4-1, for a display of 190.0 or 190.1. (Use a plastic adjustment tool or a plastic screw driver for all adjustments.)
5. Disconnect the DC Calibrator from the 8026B input terminals.
6. Select the 200 mV AC range on the 8026B.
7. Set the output of the AC Calibrator to 190 mV at 100 Hz, and connect it to the 8026B input terminals: V/ Ω /S and COMMON.

NOTE

The calibration adjustment tool will need to be tilted slightly to gain access to R17 and R19 as required in the next two steps.

8. On the 8026B, adjust the AC CAL potentiometer marked "F" (fine adjust - R19) so that it is at mid-range.
9. Adjust the AC CAL potentiometer marked "C" (coarse-adjust - R17) so that the 8026B displays 190.0 ± 3 digits. Then adjust R19 ("F" - fine adjust) so that the 8026B displays 190.0 (an occasional flash of ± 1 digit is acceptable).
10. Select the 20V ac range on the 8026B.
11. Set the output of the AC Calibrator to 19.00V at 7 kHz.
12. Adjust the HF CAL 20V capacitor (C9) for a display of 18.98 to 19.02.
13. Select the 2V ac range on the 8026B.
14. Set the output of the AC Calibrator to 1.900V at 10 kHz.
15. Adjust the HF CAL 2V capacitor (C2) for a display of 1.898 to 1.902.
16. Reinstall the 8026B top cover. Execute the performance test given earlier in this manual to ensure that all fixed range resistors and other non-adjustable components are operating within their specified limits.

NOTE

The HF CAL adjustments performed in Steps 12 and 15 will be slightly affected when the 8026B top cover is reinstalled. If the high frequency ac performance is slightly outside the specified limits, remove the top cover and readjust C9 and C2 accordingly.

4-40. TROUBLESHOOTING

CAUTION

Static discharge can damage MOS components contained in the 8026B.

4-41. When troubleshooting or repairing the 8026B use the precautions listed on the Static Awareness sheet to prevent damage from static discharge. Never remove, install or otherwise connect or disconnect components without first setting the 8026B power switch to OFF.

4-42. A troubleshooting guide for the 8026B is given in Table 4-6. To properly use the guide complete the performance test given earlier in this section and note any discrepancies. Then locate the heading of the procedure in question in the Test and Symptom column (Table 4-6). Under that heading isolate the symptom that approximates the observed malfunction. Possible causes are listed to the right of the selected symptom. Details necessary to isolate a particular cause can be derived from the theory of operation in Section 3 and the schematic diagram in Section 7.

Table 4-6. Troubleshooting Guide

TEST AND SYMPTOM	POSSIBLE CAUSE
INITIAL PROCEDURE	
BT is displayed when unit is turned on.	Low battery, Q3, U2, U1. (See also operating note for A81 accessory.)
Display blank.	Dead battery, power switch, VR2 shorted, U1, J4, battery connector.
DISPLAY TEST	
One or more segments will not light through entire test.	Defective or contaminated display interconnect, display, or A/D Converter U1.
Decade inoperative or one or more segments always lit.	U1.
Improper decimal point indication.	Range switches, Z6, U2, or display. (Check signals at U2 to isolate.)
Minus sign improperly displayed.	U1.
Display lit but does not respond to changes in input.	Reference VR1, crystal Y1, A/D Converter U1.
RESISTANCE/CONDUCTANCE TEST	
Displayed reading is out of tolerance on at least one but not all ranges.	Range resistor Z1.
Readings are noisy on all ranges.	Thermistor RT1, R2 open.
Readings are out of tolerance on high ohms.	RJ1, RJ2, RJ3, RJ4 damaged from severe overload.
Residual reading with test leads open	PCB is contaminated (see cleaning procedure, Section 4.)
DC VOLTAGE TEST	
Display reading is out of tolerance on 200 mV range.	Out of calibration (DC), Vref (VR1) in error, Z2, U1, S1.
All ranges read 000.	R2 - fusible resistor open.
Readings are out of tolerance on all ranges except 200 mV.	Range resistor Z1, Z3, Z4.

Table 4-6. Troubleshooting Guide (cont)

TEST AND SYMPTOM	POSSIBLE CAUSE
<p>AC VOLTAGE TEST Displayed reading is out of tolerance in 200 mV range.</p> <p>All ranges read 000.</p> <p>Negative overload displayed.</p> <p>Readings are out of tolerance on some or all ranges except 200 mV at 45 Hz to approximately 500 Hz.</p> <p>One or more ranges other than 200 mV out of tolerance above approximately 1 KHz.</p>	<p>Out of calibration (AC), AC converter defective U4.</p> <p>R2 - fusible resistor open.</p> <p>Q5, Q4, VR3.</p> <p>Z1, Z3, Z4, U4.</p> <p>C2 out of cal (2V range only), C9 out of cal, C12, C14, foam input divider support missing, shield screw missing, negative regulator to U4 is 'full-on.' Q5, Q4, VR3. (Predominantly affects 2V range at 10 kHz as battery voltage drops). Instruments that have received mechanical abuse may need to be recalibrated for ac performance.</p>
<p>DC CURRENT TEST Input does not affect display.</p> <p>Displayed reading is out of tolerance on one or more ranges.</p>	<p>Fuse F1 and/or F2 open, CR6, U5</p> <p>If 2000 mA and 200 mA ranges are okay, Z3 is defective. Otherwise Z4 is defective.</p>
<p>CONTINUITY TEST Tone doesn't sound when test leads are shorted.</p>	<p>S1G, S8B, AR20, U20, LS1, Board interconnection, defective test load, test lead in mA jack.</p>
<p>CALIBRATION DC CAL pot at limit.</p> <p>AC CAL pot at limit.</p> <p>HF adjust at limit.</p>	<p>VR1, Z2, or R5.</p> <p>Z5, CR3, CR4, R9, AR1, dc calibration incorrect.</p> <p>S3D, Z1, C2, shield not installed.</p>

Section 5

List of Replaceable Parts

5-1. INTRODUCTION

5-2. This section contains an illustrated parts breakdown of the instrument. A similar parts listing for each of the Options will be found in Section 6. Components are listed alphanumerically by assembly. Both electrical and mechanical components are listed by reference designation. Each listed part is shown in an accompanying illustration.

5-3. Parts lists include the following information:

1. Reference Designation
2. Description of each part
3. FLUKE Stock Number
4. Federal Supply Code for Manufacturers (See Table 5-5 for Code-to-Name list)
5. Manufacturer's Part Number
6. Total Quantity per assembly or component
7. 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 of 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 model, the REC QTY column lists the recommended quantity of the item in that particular assembly.

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.

8026B

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

1. Quantity
2. FLUKE Stock Number
3. Description
4. Reference Designation
5. Printed Circuit Board Part Number
6. Instrument Model and Serial Number

CAUTION



Indicated devices are subject to damage by static discharge.

Table 5-1. 8026B Final Assembly

REF DES	DESCRIPTION	FLUKE STOCK NO.	MFG SPLY CODE	MFG PART NO.	TOT QTY	REC QTY	N I E
⊗ FINAL ASSEMBLY, 8026B FIGURE 5-1 (8026B-1&B)							
A1⊗	MAIN PCB ASSEMBLY	6 46 406	89536	6-8-806	1		
A2⊗	ANNUNCIATOR PCB ASSEMBLY	6 13 943	89536	6 13 943	1		
E1	BATTERY, PRIMARY 9V (NOT SHOWN)	446 823	837 40	NEBA #1604	1		
F 1	FUSE, FAST-BLO, 2A, 250V European type fuse	376582 46 0972	71400 89536	AGX2 46 0972	2	10	
F 2	FUSE, FIBRE, 3A, 600V	475004	71400	E5S-3	1	5	
H 1	SCREW, PHF, 4-40 X 3/16	129882	89536	129882	1		
E 2	SCREW, THD-FORK, 3/8	448456	89536	448456	2		
R 3	SCREW, THD-FORK, 3/4	447 953	89536	447 953	3		
MP 1	BAIL	6 16 961	89536	6 16 961	1	1	
MP 2	BRACKET, LCD MFG.	531657	89536	531657	1		
RP 3	BUTTON, FUNCTION SWITCH	6 06 889	89536	6 06 889	2		
NP 4	BUTTON, POWER SWITCH	456 491	89536	456 491	1		
MP 5	BUTTON, RANGE SWITCH	6 06 871	89536	6 06 871	6		
MP 6	CASE, BOTTOM European type Case Bottom	6 13 950 6 37 728	89536 89536	6 13 950 6 37 728	1		
MP 7	CASE, TOP	5 42 027	89536	5 42 027	1		
MP 8	CONNECTOR, ELASTOMERIC	520858	89536	520858	1		
MP 9	COVER, BATTERY	6 37 686	89536	6 37 686	1		
MP 10	DECAL, TOP CASE	6 42 835	89536	6 42 835	1		

Table 5-1. 8026B Final Assembly (cont)

REF DES	DESCRIPTION	FLUKE STOCK NO.	MFG SPLY CODE	MFG PART NO.	TOT QTY	REC QTY	W O T E
MP11	FLANGE, SWITCH	455881	89536	455881	1		
MP12	FOOT, NON-SKID	604397	89536	604397	4	4	
MP13	LENS, DISPLAY	606848	89536	606848	1		
MP14	PLATE, LCD MTG. BRACKET	531665	89536	531665	1		
MP15	RETAINER, SHIELD	654459	89536	654459	1		
MP16	SHIELD	604389	89536	604389	1		
MP17	SHOCK ABSORBER	428441	89536	428441	1		
MP18	SPACER, CASE	458588	89536	458588	2		
MP19	SUPPORT, INPUT DIV.	65586C	89536	65586C	1		
MP20	TEST LEADS & PROBE (NOT SHOWN)	516666	89536	516666	1	2	
TM1	INSTRUCTION MANUAL, 8026B	646414	89536	646414			
TM2	OPERATOR CARD, 8026B	646422	89536	646422	1		
U1	IC, C-MOS, A-D CONVERTER	429100	89536	429100	1	1	
U3	LCD, SCREENED	504324	89536	504324	1	1	
	RECOMMENDED SPARE PARTS KIT, 8026B	653360	89536	653360			

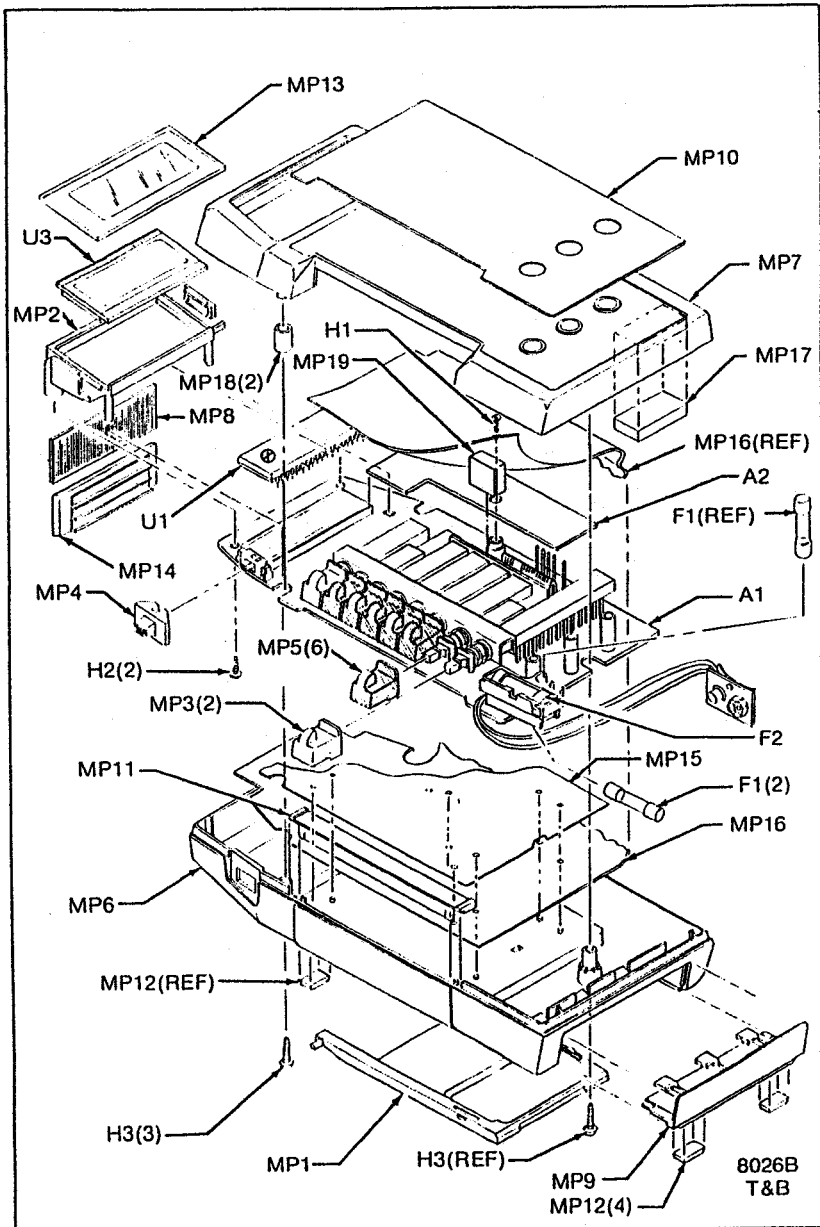


Figure 5-1. 8026B Final Assembly

Table 5-2. A1 Main PCB Assembly

REF DES	DESCRIPTION	FLUKE STOCK NO.	MFG SPLY CODE	MFG PART NO.	TOT QTY	REC QTY	NOTE
A1②	MAIN PCB ASSEMBLY FIGURE 5-2 (8026E-4001)	646406	89536	646406	REF		
C1	CAP, CER, 500 PF +/-10%, 1 KV	105692	71590	2DDH60H501K	3		
C2	CAP, VAR, 1.5 PF-C.25 PF, 2000V	218206	72982	530-000	2		
C3	CAP, AL. ELECT, 22 UF +/-20%, 16V	614750	89536	614750	1		
C4	CAP, NYLAR, 0.047 UF +/-10%, 100V	446773	89536	446773	2		
C5	CAP, POLY, 0.1 UF +/-10%, 100V	446781	89536	446781	1		
C6	CAP, POLY, 0.22 UF +/-10%, 100V	436113	73445	C2801AH11220K	1		
C7	CAP, NYLAR, 0.047 UF +/-10%, 100V	446773	89536	446773	REF		
C8	CAP, POLY, 0.022 UF +/-10%, 1000V	448183	55112	0.022/10/1000-7	1		
C9	CAP, VAR, 1.5 PF-0.25 PF, 2000V	218206	72982	530-000	REF		
C12	CAP, CER, 150 PF +/-5%, 100V, NPO	512988	89536	512988	1		
C14	CAP, CER, 1800 PF +/-5%, 50V, NPO	528547	89536	528547	1		
C15	CAP, CER, 500 PF +/-10%, 1 KV	105692	71590	2DDH60H501K	REF		
C16	CAP, AL. ELECT, 47 UF +/-20%, 10V	502334	89536	602334	1		
C17	CAP, TA, 39 UF +/-20%, 6V	163915	56289	196D396X0006RA1	1		
C18	CAP, CER, 500 PF +/-10%, 1 KV	105692	71590	2DDH60H501K	REF		
C19	CAP, CER, 0.22 PF +/-20%, 50V	519157	51406	RPE111Z50224M50V	1		
CH6	DIODE, SI, RECT. 2A, 50V	347559	65277	1M5400	1		
CH7	DIODE, SI, HI-SPEED SWITCHING	203323	07910	1R4448	2		
CH8	DIODE, SI, HI-SPEED SWITCHING	203323	07910	1R4448	REF		
J1-J3	RECEPTACLE, INPT	508606	89536	508606	3		
J4	JACK, DC POWER, PCB MOUNTING	423897	89536	423897	1		
J5	CONTACT ASSEMBLY	651653	89536	651653	1		

Table 5-2. A1 Main PCB Assembly (cont)

REF DES	DESCRIPTION	FLUXE STOCK NO.	-MFG SPLY CODE	MFG PART NO.	TOT QTY	REC QTY	IN T E
MP1	FUSE CAP	540716	89536	540716	1		
MP2	FUSE CLIP	534925	89536	534925	1		
MP3	FUSE CLIP	535203	89536	535203	1		
MP4	FUSE SPRING (HOT SHOWN)	535211	89536	535211	1		
MP5	SPACER	604371	89536	604371	1		
P1-P5	POST, CONNECTOR	603910	89536	603910	6		
Q1-Q3	TRANSISTOR, SI, NPN	218196	89536	218196	3	1	
Q4	TRANSISTOR, SI, PNP	195974	04713	2183906	1	1	
Q5	TRANSISTOR, J-FET, P-CHANNEL	413690	89536	413690	1	1	
R1	RES, COMP, 100K +/-10%, 1W	109397	01121	GB1031	2		
R2	RES, 1/4W, FUSIBLE, 1K +/-10%, 2W EXACT REPLACEMENT ONLY.	474080	01121	HB1021	1	2	
R3	RES, DEP. CAR, 200K +/-5%, 1/4W	441485	80031	CR251-4-5P200K	2		
R4	RES, DEP. CAR, 220K +/-5%, 1/4W	348953	80031	CR251-4-5P220K	1		
R5	RES, VAR, 500 +/-20%, 0.3W	603746	51406	RVS0707-V-100-3-501K	1		
R6	RES, COMP, 1M +/-10%, 1W	109793	01121	GB1051	1		
R7	RES, DEP. CAR, 200K +/-5%, 1/4W	441485	80031	CR251-4-5P200K	REF		
R8	RES, COMP, 100K +/-10%, 1W	109397	01121	GB1031	REF		
R9	RES, DEP. CAR, 4.3K +/-5%, 1/4W	441576	80031	CR251-4-5P4K3	1		
R10	RES, DEP. CAR, 100K +/-5%, 1/4W	348920	80031	CR251-4-5P100K	4		
R11	RES, COMP, 10M +/-5%, 1/4W	144944	01121	CB1065	1		
R12	RES, MTL. FILM, 4.22K +/-1%, 1/8W	168245	91637	CMF554221F	1		
R13	RES, MTL. FILM, 3.74K +/-1%, 1/8W	272096	91637	CMF553741F	1		
R14	RES, DEP. CAR, 1K +/-5%, 1/4W	343426	80031	CR251-4-5P1K	1		
R15	RES, DEP. CAR, 6.8 +/-5%, 1/4W	442251	80031	CR251-4-5P6E8	1		

Table 5-2. A1 Main PCB Assembly (cont)

REF DES	DESCRIPTION	FLUKE STOCK NO.	MFG SPLY CODE	MFG PART NO.	TOT QTY	REC QTY	N O T E
R16	RES, DEP. CAR, 100K +/-5%, 1/4W	348920	80031	CR251-4-5P100K	REF		
R17	RES, VAR, 1K +/-20%, 0.3W	614065	51406	RVS07 07 -V-100-3-102M	1		
R19	RES, VAR, 100 +/-20%, 0.3W	614057	51406	RVS07 07 -V-100-3-101M	1		
R31	RES, DEP. CAR, 22K +/-5%, 1/4W	348870	80031	CR251-4-5P22K	1		
R32	RES, DEP. CAR, 100K +/-5%, 1/4W	348920	80031	CR251-4-5P100K	REF		
R33	RES, DEP. CAR, 100K +/-5%, 1/4W	348920	80031	CR251-4-5P100K	REF		
RJ1-RJ4	VARIABLE RESISTOR, 430V +/-10%	447672	09214	V430MA7B	4	8	
RT1	THERMISTOR, P.T.C., 1K +/-40%, @25 DEG C	446849	50157	180010200	1	1	
S1-S8	SWITCH ASSEMBLY	453647	89536	453647	1		
S9	SWITCH, SLIDE	453365	34828	G1-116-0001-020-52	1		
U2②	IC, C-MOS,, QUAD XOR GATE	355222	02735	CD4030AE	1		
U4	IC, RMS, SELECTED	637801	89536	637801	1	1	
U5	IC, RECTIFIER BRIDGE, 1 AMP	418582	83003	VM08	1	1	
VR1	DIODE, BAND GAP REF.	508259	32293	ITS 6935-2	1	1	
VR2	DIODE, ZENER, 12V	113456	04713	118963A	1	1	
VR3	DIODE, ZENER, 5.4V UNCOMPENSATED	683730	89536	683730	1	1	
W1	POST, CONNECTOR	603910	89536	603910	REF		
XU1	SOCKET, IC, 40-PIN	429282	09922	DILB40P-108	1		
Y1	CRYSTAL, QUARTZ, 3.2 MHZ (50 HZ)	513937	89536	513937	1	1	
Z1	RESISTOR NETWORK	515874	89536	515874	1	1	
Z2	RESISTOR NETWORK	447680	89536	447680	1		
Z3	RESISTOR NETWORK	447706	89536	447706	1		
Z4	RESISTOR NETWORK	435727	89536	435727	1		
Z6	RESISTOR NETWORK	447714	89536	447714	1		

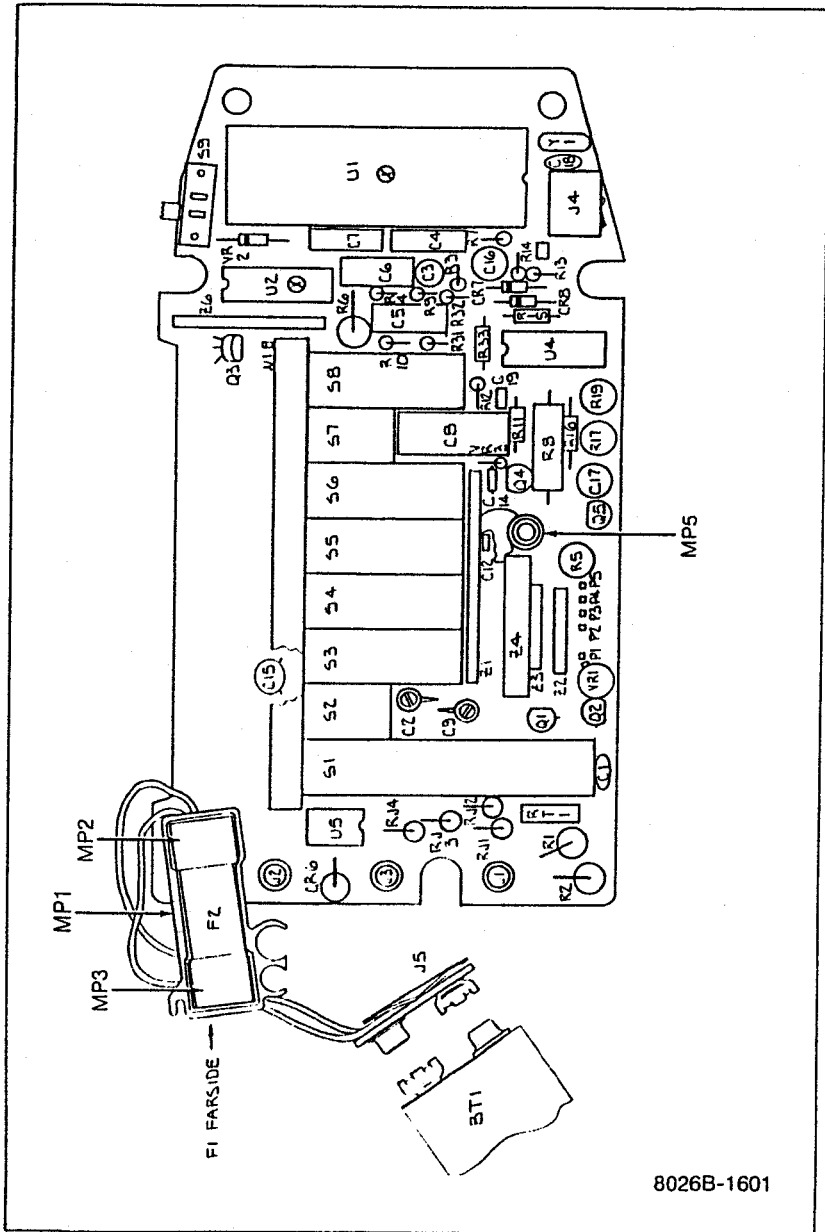


Figure 5-2. A1 Main PCB Assembly

Table 5-3. A2 Annunciator PCB Assembly

REF DES	DESCRIPTION	FLUKE STOCK NO.	MFG SPLY CODE	MFG PART NO.	TOT QTY	REC'D QTY	N O T E
A2②	ANNUNCIATOR PCB ASSEMBLY FIGURE 5-3 (8020B-4002T)	613943	89536	613943	REF		
AR20	IC, LO PWR J-FET INPUT OP AMP	604363	89536	604363	1	1	
C20	CAP, CER, 0.22 UF +/-20%, 50V	519157	51406	RPE11125U224K50V	1		
C21	CAP, CER, 150 PF +/-10%, 50V	614032	89536	614032	1		
J20	RECEPTACLE, SINGLE	614396	22526	75377-001	1		
J21	SOCKET, 4-PIN	417311	30035	SS-109-1-04	1		
LS1	TRANSDUCER, AUDIO	602490	51406	EFB-RD24C01	1		
R21	RES, DEP. CAR, 200K +/-5%, 1/4W	441485	80031	CR251-4-5P200K	4		
R22	RES, DEP. CAR, 18K +/-5%, 1/4W	348862	80031	CR251-4-5P18K	1		
R23	RES, DEP. CAR, 200K +/-5%, 1/4W	441485	80031	CR251-4-5P200K	REF		
R24	RES, DEP. CAR, 100K +/-5%, 1/4W	348920	80031	CR251-4-5P100K	1		
R25	RES, DEP. CAR, 200K +/-5%, 1/4W	441485	80031	CR251-4-5P200K	REF		
R26	RES, DEP. CAR, 200K +/-5%, 1/4W	441485	80031	CR251-4-5P200K	REF		
R27	RES, COMP, 10M +/-5%, 1/4W	194944	01121	CB1065	1		
R28	RES, DEP. CAR, 1M +/-5%, 1/4W	348987	80031	CR251-4-5P1M	1		
U20②	IC, C-MOS, QUAD 2-INPUT NAND GATE	418509	12040	MM74C00N	1	1	

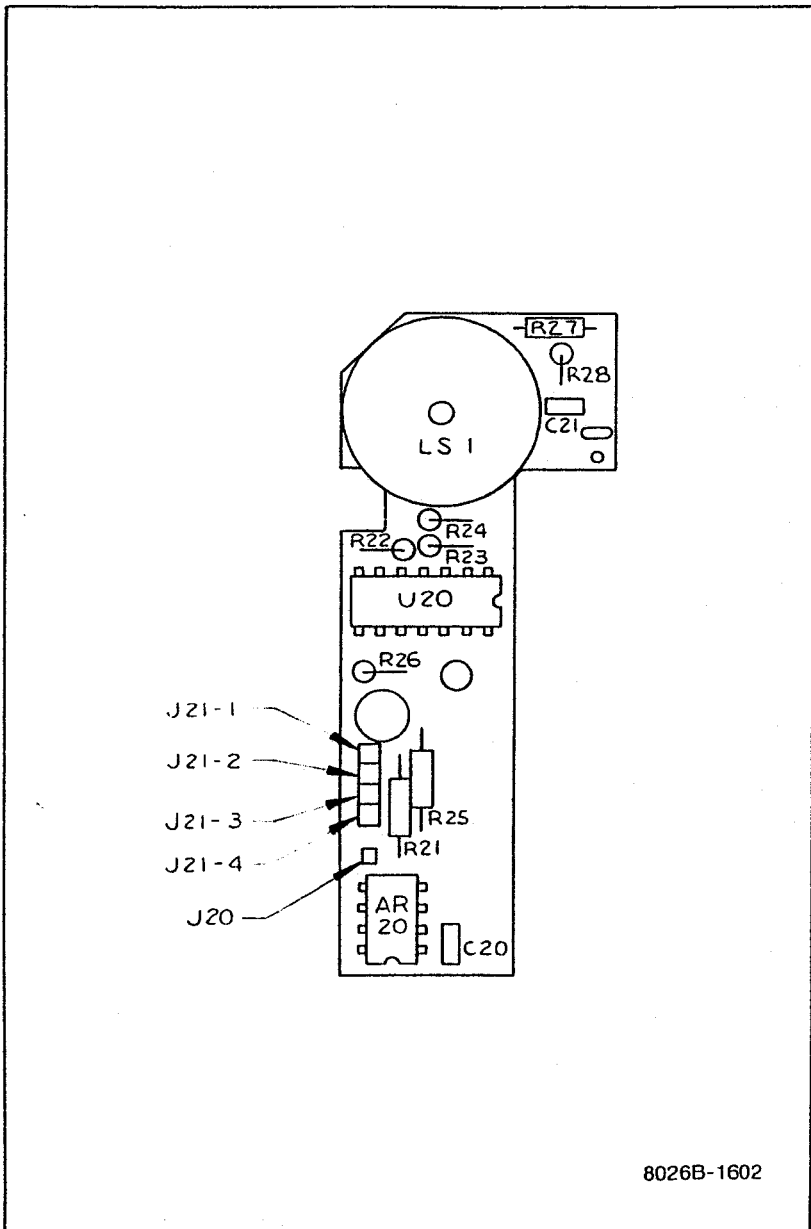


Figure 5-3. A2 Annunciator PCB Assembly

Table 5-4. Federal Supply Codes for Manufacturers

01121 Allen-Bradley Co. Milwaukee, Wisconsin	22526 DuPont, El DeNemours & Co. Inc. Berg Electronics Div. New Cumberland, Pennsylvania
02735 Replaces 18725 RCA - Solid State Div. Somerville, New Jersey	30035 Jol Industries Inc. Garden Grove, California
04713 Motorola Inc. Semiconductor Group Phoenix, Arizona	50157 Midwest Components Inc. Muskegon, Mississippi
05277 Westinghouse Electric Corp. Semiconductor Division Youngwood, Pennsylvania	51404 Corning Glass Works Medical & Scientific Instruments Medfield, Maryland
07263 Fairchild Camera & Instrument Corp. Semiconductor Division Mountain View, California	51406 Murata Corporation of America Marietta, Georgia
07910 Replaced by 15818	52763 Stettner-Trush Inc. Cazenovia, New York
09214 General Electric Co. Semiconductor Products Power Component Operation Auburn, New York	56289 Sprague Electric Co. North Adams, Massachusetts
09922 Burndy Corp. Norwalk, Connecticut	71400 Bussman Manufacturing Div. of McGraw-Edison Co. St. Louis, Missouri
12040 National Semiconductor Corp. Danbury, Connecticut	71590 Centrelab Electronics Div. of Globe Union Inc. Milwaukee, Wisconsin
14099 Semtech Corp. Newbury Park, California	72136 Electro Motive Mfg. Co. Florence, South Carolina
15818 Teledyne Semiconductors Formerly Amelco Semiconductor Mountain View, California	72982 Erie Technical Products Inc. Erie, Pennsylvania
18736 Voltronics Corp. Hanover, New Jersey	73445 Amperex Electronic Corp. Hicksville, New York
19647 Caddock Electronics Inc. Riverside, California	75915 Littlefuse Inc. Des Plaines, Illinois

Table 5-4. Federal Supply Codes for Manufacturers (cont)

79727
C - W Industries
Warminster, Pennsylvania

80031
Mepco/Electra Corp.
Morristown, New Jersey

84411
TRW Electronic Components
TRW Capacitors
Ogallala, Nebraska

89536
John Fluke Manufacturing Co., Inc.
Everett, Washington

Section 6

Accessory Information

6-1. INTRODUCTION

6-2. This section of the manual contains information concerning the accessories available for use with the Model 8026B Digital Multimeter. Each accessory, as shown in Figure 6-1, is described in general terms under a separate major heading containing the accessory model number. The depth of detail is intended to give the prospective user an adequate first acquaintance with the features and capabilities of each accessory. Additional information, when necessary, is supplied with the accessory.

6-3. DELUXE CARRYING CASE (C90)

6-4. The C90 Deluxe Carrying Case is a pliable, vinyl, zipper-closed pouch that provides in-field-transport protection for the 8026B as well as convenient storage locations for test leads, operator guide and other small accessories. A finger- or belt-loop is included on the case as a carrying convenience.

6-5. TEMPERATURE PROBES (80T-150C and 80T-150F)

6-6. Introduction

6-7. The 80T-150 Temperature Probe converts the instrument into a direct-reading (1 mV dc/°) °C (80T-150C) or °F (80T-150F) thermometer. It is ideally suited for surface, ambient, and liquid measurements and lends itself easily to a wide range of design, troubleshooting, and evaluation applications. A rugged, fast-responding probe-tip with a 350V dc standoff makes the 80T-150 one of the most versatile and easy-to-use temperature probes available.

6-8. Specifications

RANGE (°C/°F) (field selectable by internal jumpers)	-50°C to +150°C or -58°F to 302°F
ACCURACY	±1°C (1.8°F) from 0°C to 100°C, decreasing linearly to ±3°C (5.4°F) at -50°C and +150°C
RESOLUTION	0.1°C on 200 mV range
VOLTAGE STANDOFF	350V dc or peak ac
POWER	Internal disposable battery; 1,000 hours of continuous use

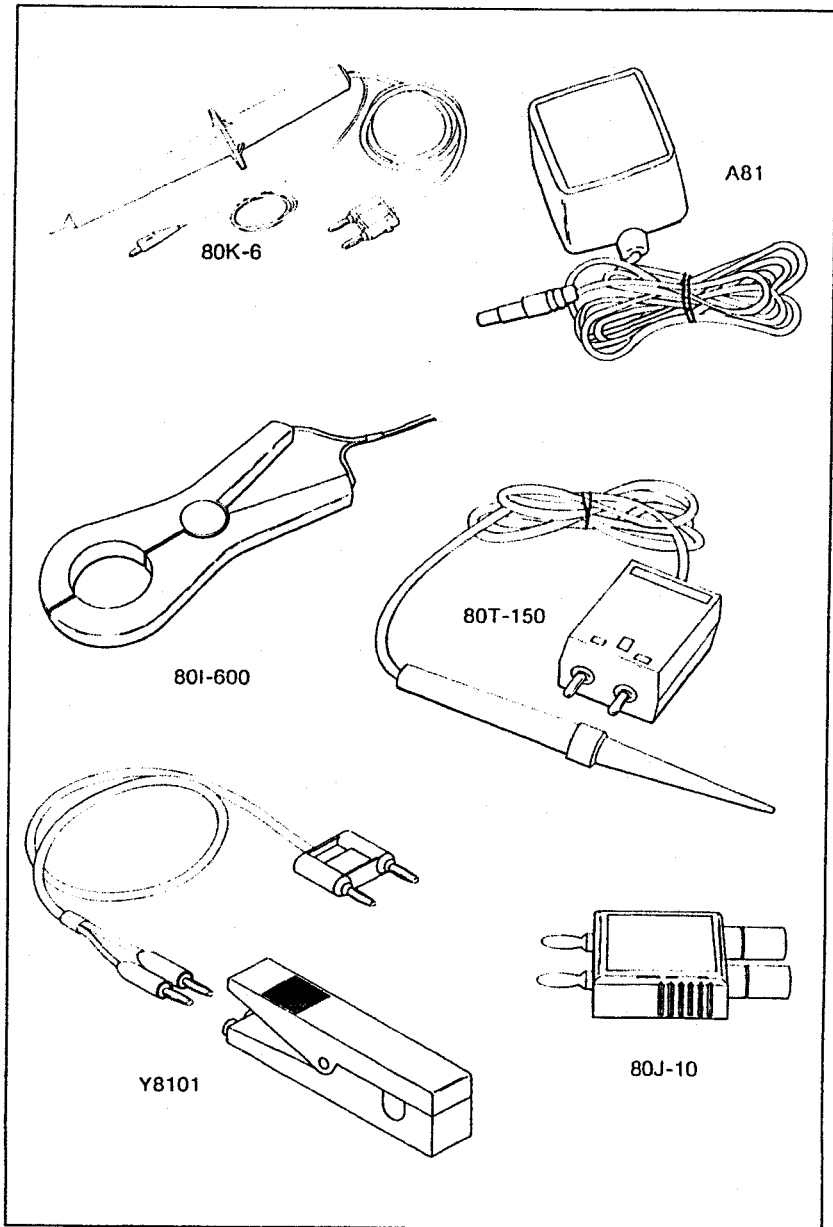


Figure 6-1. 8026B Accessories

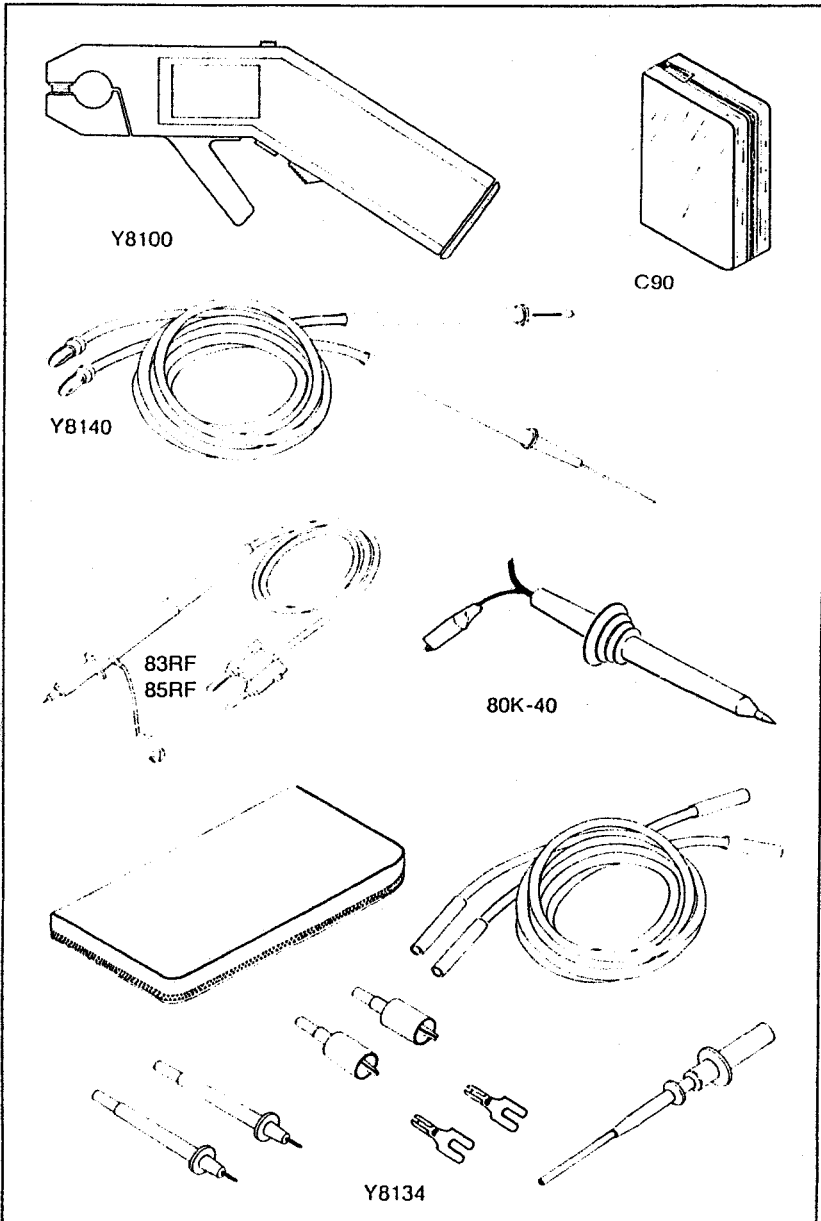


Figure 6-1. 8026B Accessories (cont)

6-9. CURRENT TRANSFORMER (801-600)**6-10. Introduction**

6-11. The Model 801-600 extends the maximum 2A ac current measuring capability of the instrument up to a maximum of 600 amps. A clamp-on transformer designed into the probe allows measurements to be made without breaking the circuit under test. In use, the current carrying conductor being measured serves as the transformer's primary, while the 801-600 serves as the secondary. Because of a high efficiency, quadrature type of winding, wire size and location of the conductor within the transformer jaws do not affect the accuracy of the current measurement.

6-12. Specifications

RANGE	1 to 600A ac
ACCURACY	±3%
FREQUENCY RESPONSE	30 Hz to 1 kHz, 10 kHz typical
DIVISION RATIO	1000:1
INSULATION	5 kV
MAXIMUM CONDUCTOR SIZE	2-inch diameter

6-13. HIGH VOLTAGE PROBE (80K-6)**6-14. Introduction**

6-15. The 80K-6 is a high voltage probe designed to extend the voltage measuring capability of an ac dc voltmeter to 6000 volts. A 1000:1 voltage divider provides the probe with a high input impedance. The divider also provides high accuracy when used with a voltmeter having a 10 megohm input impedance. A molded plastic body houses the divider and protects the user from the voltage being measured.

6-16. Specifications

VOLTAGE RANGE	0 to 6 kV, dc or peak ac
INPUT IMPEDANCE	75 megohms nominal
DIVISION RATIO	1000:1
ACCURACY	
DC to 500 Hz	±1%
500 Hz to 1 kHz	±2%
Above 1 kHz	Output reading falls. Typically, -30% at 10 kHz.

6-17. HIGH VOLTAGE PROBE (80K-40)**6-18. Introduction**

6-19. The Model 80K-40 extends the voltage measurement capability of the instrument up to 40 kV. Internally, the probe contains a special 1000:1 resistive divider. Metal-film resistors with matched temperature coefficients comprise the divider, and provide the probe with its excellent accuracy and stability characteristics. Also, an unusually high input impedance (1000 M Ω) minimizes circuit loading, and thereby contributes to measurement accuracy.

6-20. Specifications

VOLTAGE RANGE	1 kV to 40 kV dc or peak ac, 28 kV rms ac
INPUT RESISTANCE	1000 M Ω
DIVISION RATIO	1000:1
ACCURACY DC (OVERALL) ..	20 kV to 30 kV ±2% (calibrated at 25 kV)
UPPER LIMIT	Changes linearly from 2% at 30 kV to 4% at 40 kV

LOWER LIMITChanges linearly from 2% at 20 kV to 4% at 1 kV
 ACCURACY AC (OVERALL)±5% at 60 Hz

6-21. HIGH FREQUENCY PROBE (83RF)

6-22. Introduction

6-23. The 83RF Probe extends the frequency range of the DMMs voltage measurement capability to include 100 kHz to 100 MHz inputs from 0.25 to 30V rms. The probe operates in conjunction with the 8026B dc voltage ranges, and provides a dc output that is calibrated to be equivalent to the rms value of a sinewave input.

6-24. Specifications

FREQUENCY RESPONSE ±1 dB from 100 kHz to 100 MHz (relative to ac/dc transfer ratio)

AC-TO-DC TRANSFER RATIO

(23 ±5°C).....	RMS Input (100 kHz)	DC Output
	0.25 - 0.5V	0.25 - 0.5V ±1.5 dB
	0.5 - 2.0V	0.5 - 2.0V ±0.5 dB
	2.0 - 30V	2.0 - 30V ±1.0 dB

EXTENDED FREQUENCY

RESPONSE Useful for relative readings from 20 kHz to 250 MHz.

RESPONSE Responds to peak value of input; calibrated to read the rms value of a sine wave.

VOLTAGE RANGE 0.25 to 30V dc

MAXIMUM DC INPUT 200V dc

TEMPERATURE COEFFICIENT
 (0 to 18°C, 28 to 50°F) ±0.1 of ac-to-dc transfer ratio specifications per °C

INPUT CAPACITANCE <5 pF

6-25. HIGH FREQUENCY PROBE (85RF)

6-26. Introduction

6-27. The Model 85RF High Frequency Probe allows measurements over a frequency range of 100 kHz to 500 MHz from .25V to 30V rms. It operates in conjunction with the instruments dc voltage ranges and provides a dc output that is calibrated to be equivalent to the rms value of a sinewave input.

6-28. Specifications

FREQUENCY RESPONSE

100 kHz to 100 MHz ±0.5 dB

100 MHz to 200 MHz ±1.0 dB

200 MHz to 500 MHz ±3.0 dB

EXTENDED FREQUENCY

RESPONSE Useful for relative readings from 20 kHz to 700 MHz.

RESPONSE Responds to peak value of input; calibrated to read rms value of a sine wave.

VOLTAGE RANGE 0.25V dc to 30V rms

MAXIMUM DC INPUT 200V dc
 INPUT CAPACITANCE <5 pF
 AC-TO-DC TRANSFER RATIO . 1:1
 RATIO ACCURACY 0.5 dB at 10 MHz

6-29. BATTERY ELIMINATOR (A81-115)

6-30. The A81 Battery Eliminator converts the 8026B from battery to ac-line operation. It is available in a variety of line-power configurations, as shown in Table 6-1. When connected to the 8026B it effectively removes and replaces the output of the battery. The battery does not need to be removed from the circuit.

WARNING

DO NOT SUBSTITUTE A CALCULATOR TYPE BATTERY ELIMINATOR FOR THE A81. THESE UNITS DO NOT PROVIDE THE PROTECTION NECESSARY FOR COMMON MODE MEASUREMENTS UP TO 500V DC. ALWAYS USE THE MODEL A81 FOR AC-LINE OPERATION.

NOTE

The "BT" indicator may come on when using the A81. This does not affect the operation of the 8026B.

6-31. CURRENT SHUNT (80J-10)

6-32. Introduction

6-33. The Model 80J-10 Current Shunt extends the current measuring capability of the DMM to 10 amps continuous (20 amps for periods not exceeding one minute) dc to 10 kHz at an accuracy of $\pm 0.25\%$ in excess of the voltmeter accuracy.

Table 6-1. A81 Model Numbers and Input Power

MODEL NO.	INPUT POWER
A81-100	100V ac $\pm 10\%$, 48 to 62 Hz
A81-115	115V ac $\pm 10\%$, 48 to 62 Hz
A81-230-1	230V ac $\pm 10\%$, 48 to 62 Hz (U.S. type plug)
A81-230	230V ac $\pm 10\%$, 48 to 62 Hz (European type plug)

6-34. Specifications

SHUNT	10 amps at 100 mV
ACCURACY (18°C to 28°C)	
DC to 10 kHz	±0.25%
10 kHz-100 kHz	Rising to 1 dB at 100 kHz typical
TEMPERATURE COEFFICIENT	0.005%/°C
INDUCTANCE	8.3 nH in series w/0.01Ω shunt
OVERLOAD	Up to one minute at 20A with a 1/4 duty cycle for recovery after currents between 10A and 20A
CONNECTS TO	3/4 inch center banana jacks
CONNECTORS	5-way binding posts (red and black)

6-35. AC/DC CURRENT PROBE (Y8100)**6-36. Introduction**

6-37. The Fluke Y8100 AC/DC Current Probe is a clamp-on probe that is used with a voltmeter, multimeter, or oscilloscope to read dc, ac, or composite (ac on dc) current measurements. The jaws on the Y8100 are designed to clamp around conductors up to 3/4 inch in diameter. The pistol shape allows safe, easy, one-hand operation when making current measurements.

6-38. The Model Y8100 probe is battery powered with size AA cells. It measures current to 200A dc or ac rms using most any voltmeter. Two ranges, 20A and 200A, produce a 2V output at full-range current.

6-39. Specifications

RANGES	20A ac or dc 200A ac or dc
RATED OUTPUT	2V at full range
ACCURACY	
DC to 200 Hz	±2% of range
200 Hz to 1 kHz	<100A add ±3% reading >100A add ±6% reading
CALIBRATION CYCLE	1 year
FREQUENCY RESPONSE	dc to 1.0 kHz
RECOMMENDED LOAD	≥3.0 kΩ
TEMPERATURE RANGE	+15°C to +35°C; for specified accuracy -10°C to +50°C; storage and operation at reduced accuracy.
HEATING LIMITATION	Prolonged operation above 200A ac or 1 kHz can cause damage to the Y8100.
WORKING VOLTAGE RATING	Core to output; 600V dc or 480V ac maximum output to ground; 42V dc or 30V ac
APERTURE SIZE	3/4" (19 mm) diameter
SIZE-OVERALL	9" x 4-1/2" x 1-7/16" (230 mm x 115 mm x 37 mm)
WEIGHT	14 ounces (0.4 kg), with batteries
POWER	Battery, four AA cells
BATTERY LIFE	Alkaline-20 hours continuous

6-40. AC CURRENT TRANSFORMER (Y8101)**6-41. Introduction**

6-42. The Model Y8101 (Figure 6-1) is a small clamp-on current transformer designed to extend the current measuring capability of an ac current meter up to 150 amperes. A clamp-on coil designed into the probe allows measurements to be made without breaking the circuit under test. This coil serves as the secondary of a 1:1000 transformer. The current-carrying conductor being measured serves as the primary.

6-43. Specifications

CURRENT RANGE	2A to 150A
	±2%, 10A to 150A
ACCURACY, (48 Hz TO 10 kHz) .	±8%, 2A to 10A
DIVISION RATIO	1000:1
WORKING VOLTAGE	300V ac rms maximum
INSULATION DIELECTRIC	
WITHSTAND VOLTAGE	3 kV rms
MAXIMUM CONDUCTOR SIZE	7/16" (1.11 cm)

6-44. SAFETY DESIGNED TEST LEAD SET (Y8132)

6-45. This test lead set is equivalent to the set originally supplied with the 8026B multimeter. The set includes one red and one black test lead. Each probe has an anti-slip shoulder near the test tip and is connected to the multimeter via a safety-designed shrouded banana connector. This set will fit John Fluke instruments with safety-designed input jacks.

6-46. DELUXE TEST LEAD SET (Y8134)

6-47. The Y8134 is a deluxe test lead set. The attachments provided allow interconnection with a wide variety of leads and electronic components. Included in the kit are:

1. Two test leads (one red and one black). The Y8134 leads have a shrouded banana connectors on each end.
2. Two test probes
3. Two insulated alligator clips
4. Two spade lugs
5. One squeeze hook
6. One test lead pouch
7. One instruction sheet

6-48. SLIM FLEX TEST LEAD SET (Y8140)

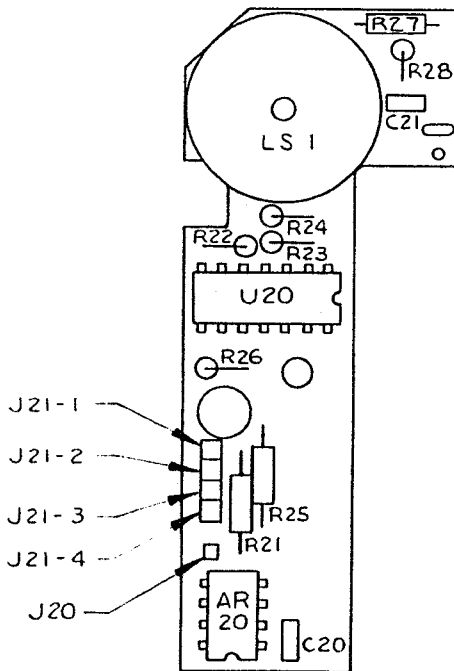
6-49. The Y8140 Test Lead Set (Figure 6-1) consists of one red and one black 60-inch (1.52 meter) test lead, each with a standard banana plug on one end and an extendable tip probe on the other end. This flexible metallic tip conductor may be extended up to 2.5 inches and is insulated to within 0.1 inch of its tip. This insulation reduces the chance of creating an inadvertent short circuit while using the probes in their extended configuration. Intended primarily for measuring voltages, the Y8140 leads may also be used for measuring modest currents.

Section 7

Schematic Diagrams

TABLE OF CONTENTS

FIGURE	TITLE	PAGE
7-1.	8026B	7-2
7-2.	U1 and U3, A/D Converter and Display	7-6
7-3.	AC Converter	7-7

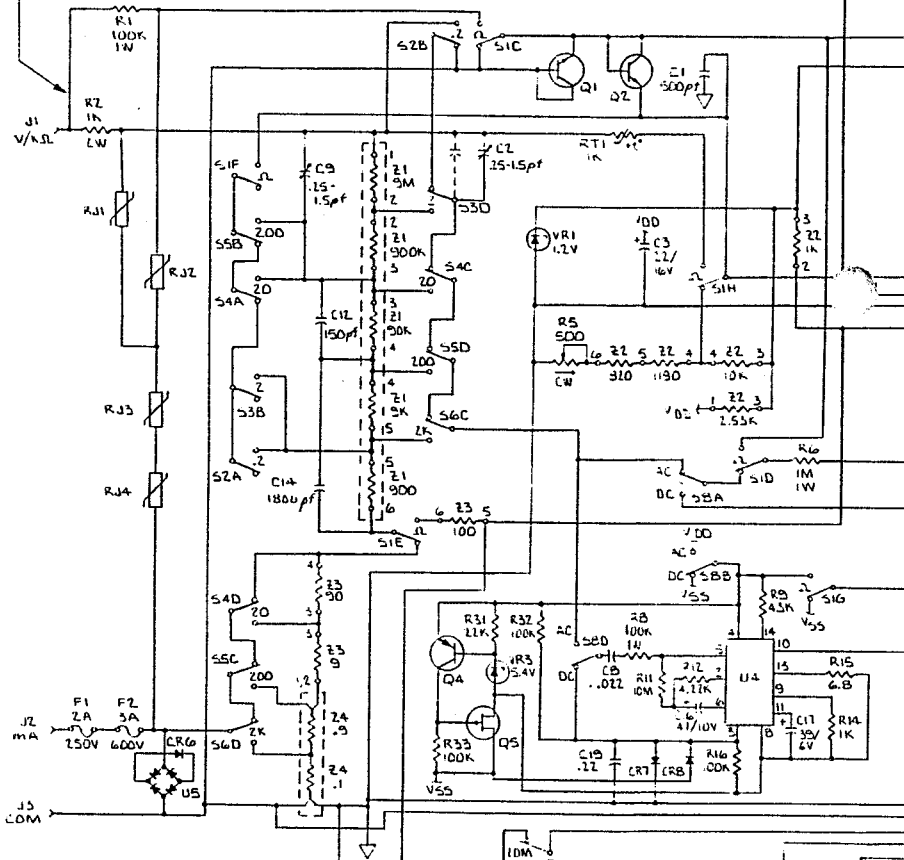


8026B-1602

A2 Annunciator PCB Assembly

Figure 7-1. 8026B (cont)

WARNING: RZ IS A FUSIBLE RESISTOR. EXACT REPLACEMENT ONLY.



L.A.21 NO. 105LD	
AK10	L51 59
BT1	PS U20
CL1	Q5 VK3
CR8	R55 Y1
F2	T1A Z60
JL1	X11 W1

NO.5. NOT USED	
AK1-19	K18, 20
CL10, 11, 15	K19, 50
CK1-5	L11
JL6-19	T5

NOTES: UNLESS OTHERWISE SPECIFIED:
 1. ALL RESISTOR VALUES ARE IN OHMS
 2. ALL CAPACITOR VALUES ARE IN MICROFARADS.
 3. S1 - K-A S6 - 2K
 S2 - Z S7 - 20MEG
 S3 - Z S8 - AC-DC
 S4 - ZD S9 - POWER ON-OFF
 S5 - 700

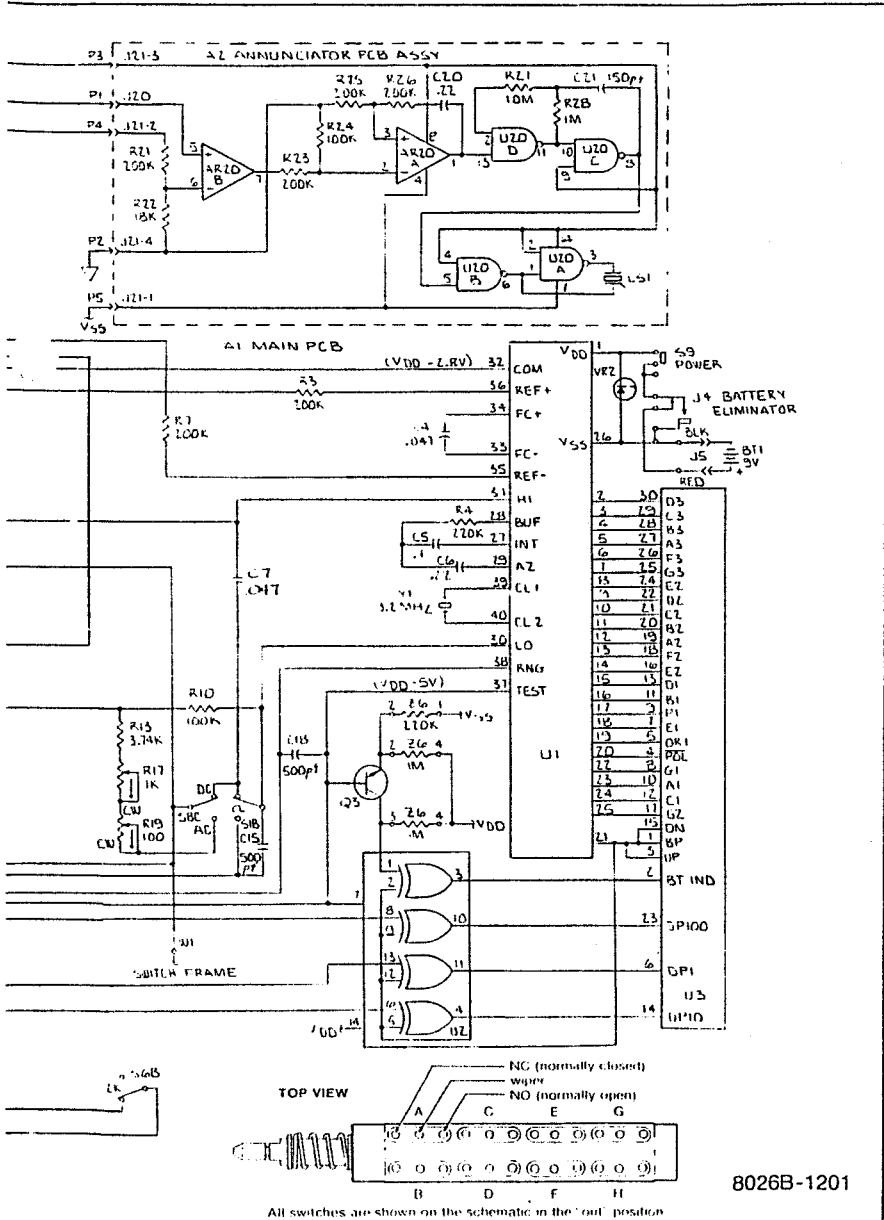
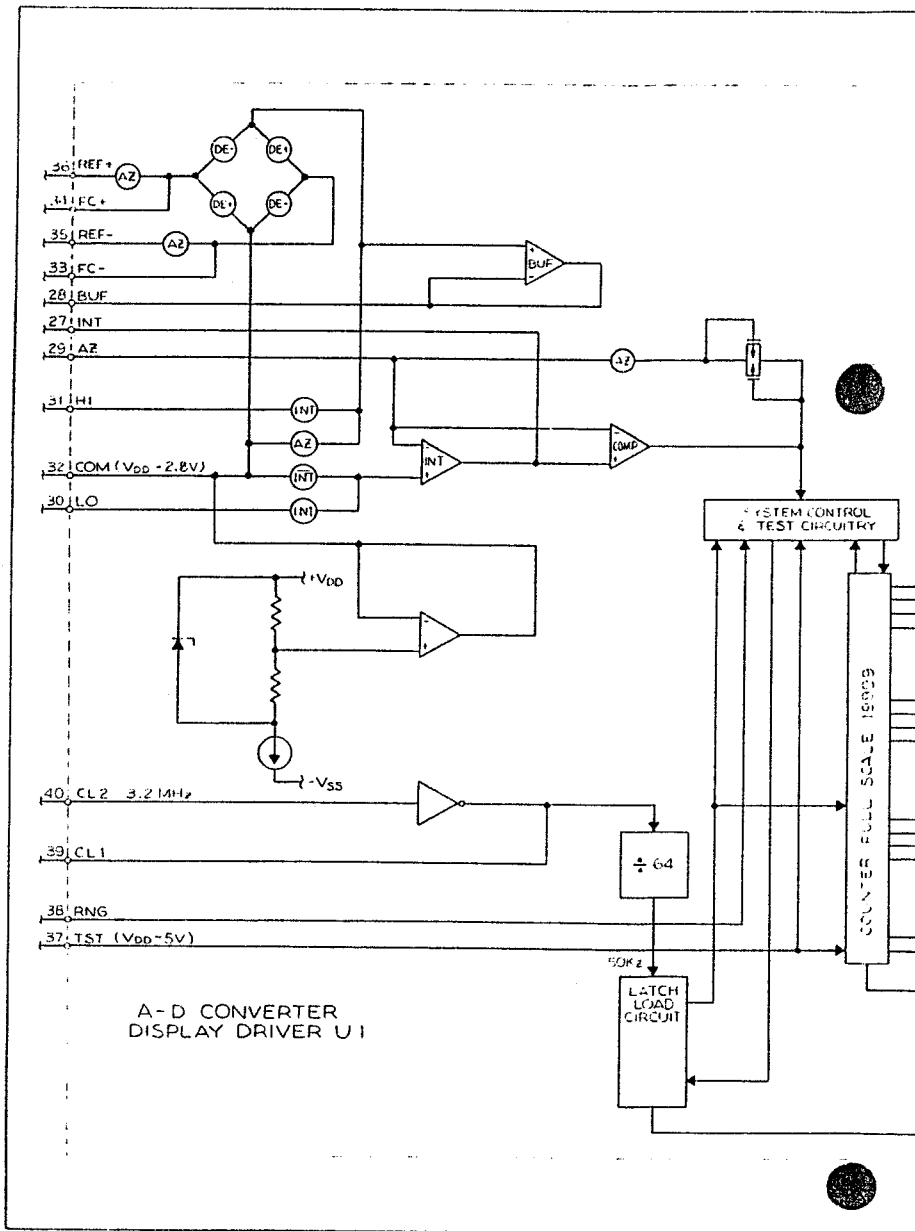


Figure 7-1. 8026B (cont)



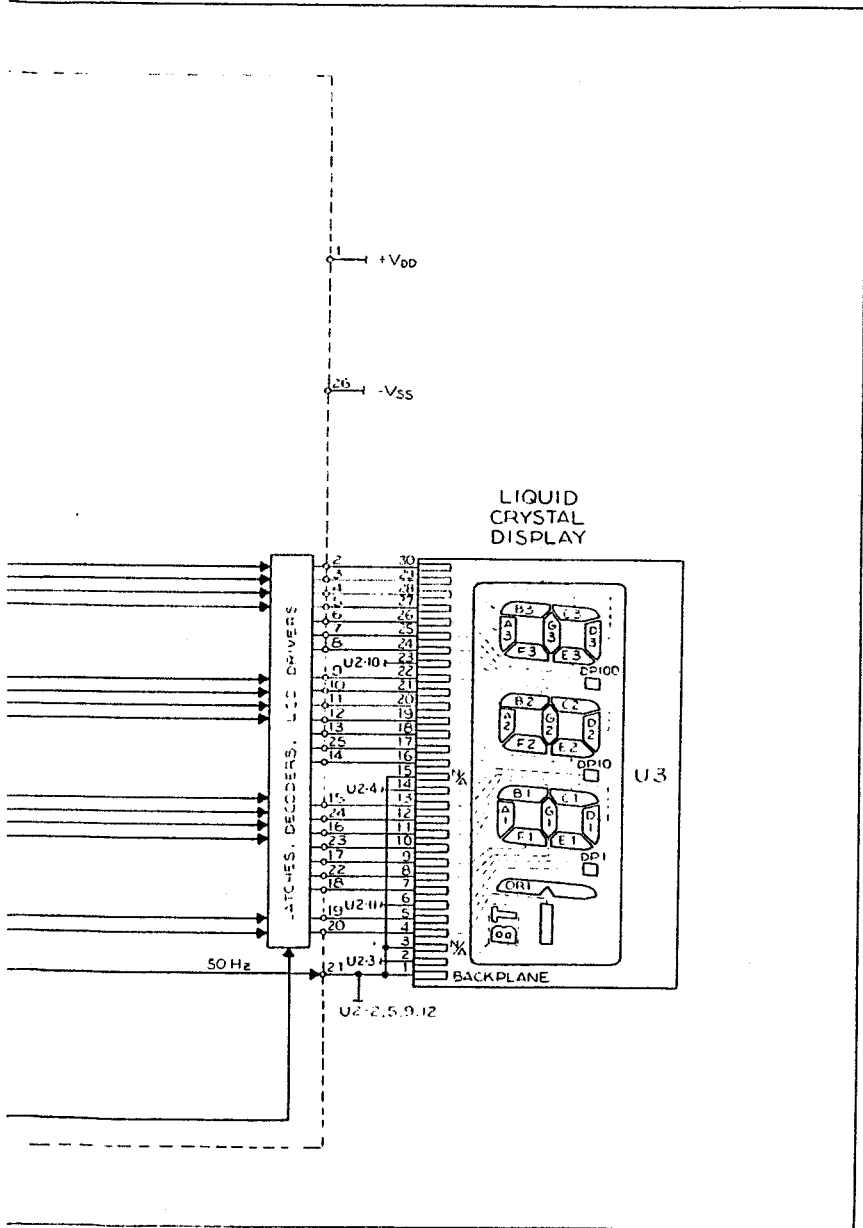


Figure 7-2. U1 and U3, A/D Converter and Display

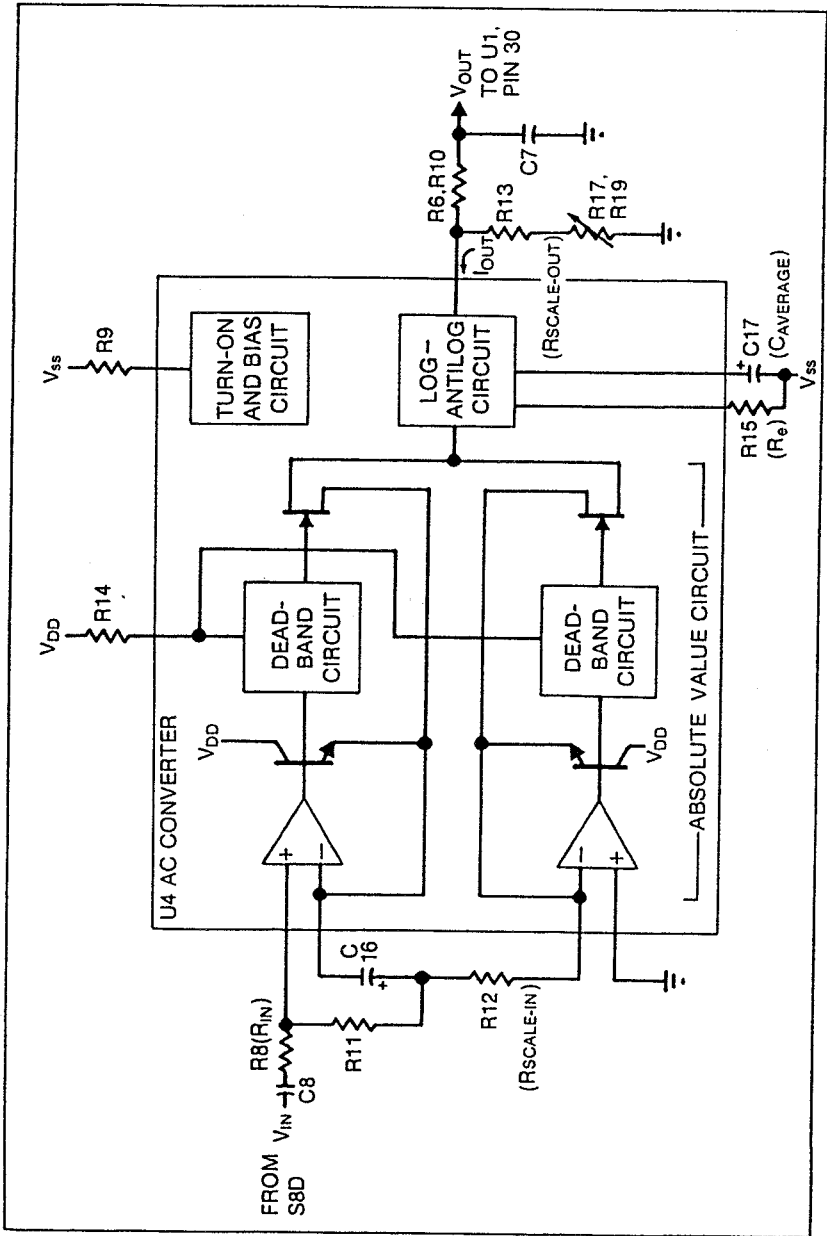


Figure 7-3. AC Converter

Appendix A

Manual Change and Backdating Information

INTRODUCTION

This appendix contains information necessary to backdate the manual to conform with earlier pcb configurations. To identify the configuration of the pcbs used in your instrument, refer to the revision letter (marked in ink) on the component side of each pcb assembly. Table A-1 defines the assembly revision levels documented in this manual.

NEWER INSTRUMENTS

As changes and improvements are made to the instrument, they are identified by incrementing the revision letter marked on the affected pcb assembly. These changes are documented on a supplemental change/errata sheet which, when applicable, is inserted at the front of the manual.

OLDER INSTRUMENTS

To backdate this manual to conform with an earlier assembly revision level, perform the changes indicated in Table A-1.

CHANGES

There are no backdating changes at this printing. All pcb assemblies are documented at their original revision level.

Table A-1. Manual Status and Backdating Information

Ref Or Option No.	Assembly Name	Fluke Part No.	* To adapt manual to earlier rev configurations perform changes in descending order (by no.), ending with change under desired rev letter																	
			A	B	C	D	E	F	G	H	J	K	L	M	N	P				
A1	MAIN PCB ASSEMBLY	646406	-	●	●	●	X													
A2	ANNUNCIATOR PCB ASSEMBLY	613943	-	●	●	X														

* X - The PCB revision levels documented in this manual.
 ● - These revision letters were never used in the instrument.
 - No revision letter on the PCB.

WARRANTY

Notwithstanding any provision of any agreement the following warranty is exclusive.

The JOHN FLUKE MFG. CO. INC., warrants each instrument it manufactures to be free from defects in material and workmanship under normal use and service for the period of 2 years from date of purchase. This warranty extends only to the original purchaser. This warranty shall not apply to fuses, disposable batteries (rechargeable type batteries are warranted for 90 days), or any product or parts which have been subject to misuse, neglect, accident, or abnormal conditions of operations.

In the event of failure of a product covered by this warranty, John Fluke Mfg. Co. Inc., will repair and calibrate an instrument returned to an authorized Service Facility within 2 years from date of purchase, provided the warrantor's examination discloses to its satisfaction that the product was defective. The warrantor may, at its option, replace the product in lieu of repair. With regard to any instrument returned within 2 years of the original purchase, said repairs or replacement will be made without charge. If the failure has been caused by misuse, neglect, accident, or abnormal conditions of operations, repairs will be billed at a nominal cost. In such case, an estimate will be substituted before work is started, if requested.

THE FOREGOING WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTY OF MERCHANTABILITY, FITNESS, OR ADEQUACY FOR ANY PARTICULAR PURPOSE OR USE. JOHN FLUKE MFG. CO. INC. SHALL NOT BE LIABLE FOR ANY SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, WHETHER IN CONTRACT, TORT, OR OTHERWISE.

If any failure occurs, the following steps should be taken:

1. Notify the JOHN FLUKE MFG. CO. INC., or nearest Service Facility, giving full details of the difficulty, and include the model number, type number, and serial number. On receipt of this information, service data, or shipping instructions will be forwarded to you.
2. On receipt of the shipping instructions, forward the instrument, transportation prepaid. Repairs will be made at the Service Facility and the instrument returned, transportation prepaid.

SHIPPING TO MANUFACTURER FOR REPAIR OR ADJUSTMENT

All shipments of JOHN FLUKE MFG. CO. INC., instruments should be made via United Parcel Service or "Best Way" prepaid. The instrument should be shipped in the original packing carton; or if it is not available, use any suitable container that is rigid and of adequate size, and surrounded with at least four inches of excelsior or similar shock-absorbing material.

CLAIM FOR DAMAGE IN SHIPMENT TO ORIGINAL PURCHASER

The instrument should be thoroughly inspected immediately upon original delivery to purchaser. All material in the container should be checked against the enclosed packing list. The manufacturer will not be responsible for shortages against the packing sheet unless notified immediately. If the instrument is damaged in any way, a claim should be filed with the carrier immediately. (To obtain a quotation to repair shipment damage, contact the nearest Fluke Technical Center.) Final claim and negotiations with the carrier must be completed by the customer.

The JOHN FLUKE MFG. CO. INC., will be happy to answer all applications or use questions, which will enhance your use of this instrument. Please address your requests or correspondence to JOHN FLUKE MFG. CO. INC., P. O. BOX C9090, EVERETT, WASHINGTON 98206, ATTN: Sales Dept. For European Customers, Fluke (Holland) B.V., P. O. Box 5053, 5004 ED, Tilburg, The Netherlands.

*For European customers, Air Freight prepaid.

John Fluke Mfg. Co. Inc., P.O. Box C9090, Everett, Washington 98206

Rev. 6/81

TECHNICAL SERVICE CENTERS

U.S. & Canada

CA, Burbank
Fluke Technical Center
(213) 849-4641

CA, Santa Clara
Fluke Technical Center
(408) 727-8121

CO, Denver
Fluke Technical Center
(303) 750-1228

FL, Orlando
Fluke Technical Center
(305) 886-2296

IL, Rolling Meadows
Fluke Technical Center
(312) 398-5800

MA, Burlington
Fluke Technical Center
(617) 273-4678

MO, Rockville
Fluke Technical Center
(314) 770-1576

NJ, Paramus
Fluke Technical Center
(201) 262-9500

TX, Dallas
Fluke Technical Center
(214) 233-9945

WA, Everett
Fluke Technical Center
(206) 356-5660

ALB, Calgary
Allan Crawford Assoc. Ltd
#14 1935 34th Ave N.E.
Calgary, Alberta T2E 6Z5
(403) 230-1341

ONT, Mississauga
Allan Crawford Assoc. Ltd
6503 Northern Drive
Mississauga, Ontario L4Y 1J2
(416) 678-1500

QUE, Montreal
Allan Crawford Assoc. Ltd
7018 Cote de Lasse
Montreal, Quebec H4T 1E7
(514) 731-8564

B.C., Burnaby
Allan Crawford Assoc. Ltd
3795 William St
Burnaby, B.C. V5C 3J3
(604) 294-1326

Other Areas

Argentina
Cosum S.A.
Venez del Puma 4071
Buenos Aires Argentina
Tel 522-5248

Ecuador
Proteco Cousins Cia. Ltda
Edificio Jerico
Ave. 12 de Octubre #2295 y
Ave. Orosiana (Planta Baja)
Quito Ecuador
Tel 526759

Egypt and Sudan
Electronic Engineering Liaison Office
11 Ahmed Khushaba Street
Hemak Square
Heliopolis, Cairo Egypt
Tel 691586

Finland
Oy Finpod AB
Teulissuute 7
02700 Kaunainen
Finland
Tel 09-356 0-502255

Australia
Elinvacco Instruments Pty Ltd
P.O. Box 81
Crows Nest N.S.W.
Australia 2137
Tel (02) 176-2888

Australia
Elinvacco Instruments Pty Ltd
P.O. Box 107
Mt Waverley VIC 3149
Australia
Tel (03) 234044

Australia
Elinvacco Instruments Pty Ltd
GPO Box 2360
Brisbane Queensland 4001
Australia
Tel (07) 229-3161

Austria
Elektronische Geräte GmbH & Co
Vertriebs KG, Obachgasse 28
A 1220 Vienna Austria
Tel (0222) 235555

Belgium
Fluke (Belgium) S.A. N.V.
6 Rue de Geneve
1140 Brussels Belgium
Tel 09-32 2-2164096

Brazil
Fluke Brazil Industria e Comercio Ltda
At. Amazonas 422 Alphonse Bardeu
CEP 06400 Sao Paulo Brazil
Tel (011) 421-3603

Chile
Intronica Chile Ltda
Casilla 16228
Santiago 9 Chile
Tel 42840

China, Peoples Republic of
Beijing Radio Research Institute
Dianmei East Avenue 89
Beijing China
Tel 445612

Colombia
Sistemas E Instrumentacion Ltda
Carrera 13 No 37-43 Of 401
Ap. Aereo 29483
Bogota DE, Colombia S.A.
Tel 242-45-32

Denmark
Tage Ulson A/S
Ballerup Byvej 272
DK-2750 Ballerup
Denmark
Tel 09-45-2 698111

Ecuador
Proteco Cousins Cia. Ltda
Edificio Jerico
Ave. 12 de Octubre #2295 y
Ave. Orosiana (Planta Baja)
Quito Ecuador
Tel 526759

Egypt and Sudan
Electronic Engineering Liaison Office
11 Ahmed Khushaba Street
Hemak Square
Heliopolis, Cairo Egypt
Tel 691586

Finland
Oy Finpod AB
Teulissuute 7
02700 Kaunainen
Finland
Tel 09-356 0-502255

France
M.H. Electronique P.A.
Rue Eclairie
ZAC de BUC
B.P. No 31
78530 BUC France
Tel 09 33 1-9568133

Greece
Hellenic Scientific
Representations Ltd
11 Vrassida Street
Athens 612 Greece
Tel 09 30 1-711140

Hong Kong
Schmidt & Co (HK) Ltd
29th Fl Wing On Centre
111 Connaught Road
Central Hong Kong
Tel 5 452644

India
Hindustan Services Pvt Ltd
Field Service Centre
Bih Main Road
33/44 A Raj Market Vias E-6th
Bangalore 560 080 India
Tel 31339

India
Hindustan Services Pvt Ltd
69-A-1 Jagmohanias Marg
Bombay 400 086 India
Tel 811316

India
Hindustan Services Pvt Ltd
15 Community Centre
Panchsila Park
New Delhi, India 110 017
Tel 619118

Israel
R. D. J. Electronics Engineering Ltd
P.O. Box 75
46, Sukkot Street
Ramat Hasharon 47215
Israel
Tel 09 972-7-483211

Italy
Sistrel S.p.A.
Via Pelizza da Volpesso 59
20092 Cinisello Balsano
Milan Italy
Tel (2) 6181893

Italy
Sistrel S.p.A.
Via Giuseppe Armettoni No. 37
00143 Rome Italy
Tel 06-39-6-591554

Japan
John Fluke Mfg. Co. Inc
Japan Branch
1 Higashikata Inatsu
Midori-ku
Yokohama 226 Japan
Tel (045) 473-5478

Korea
Electro-Science Korea Co
C.P.O. Box 8446
Room 201, Binsan Bldg
46, 12, Changchung 1 Kw
Chung Kw
Seoul Korea
Tel 261-7702

Malaysia
Fluke O'Connor's (Malaysia) SDN BHD
P.O. Box 91
Petaling Jaya, Selangor
West Malaysia
Tel 566599

Mexico
Cintronum S.A.
Guillermo Heredia No. 404
Cajon San Rafael
Delegacion Cuauhtemoc
06470 Mexico D.F.
Tel 546-25-95

Netherlands
Fluke (Netherlands) B.V.
Zandvoort 39
3926 CH Maarssen The Netherlands
P.O. Box 205
3081 AE Maastricht The Netherlands
Tel 091 4 80514

New Zealand
McLean Information Technology Ltd
P.O. Box 18065
Glenn Innes
Auckland 6, New Zealand
Tel 587 037

Norway
Morgunstjerne & Co. A/S
Kongehellegat 3
P.O. Box 1688 Huset
Oslo 5, Norway
Tel 09 47 2-356110

Pakistan
PA International Operations
505, Muhammad House
11 Chundrigar Road
P.O. Box 5273
Karachi-2 Pakistan
Tel 221127 239852

Peru
Importaciones y Representaciones
Electronicas S.A.
Avenida Franklin D. Roosevelt 105
Lima 1 Peru
Tel 298650

Philippines
Spark Radio and Electronics Corp
P.O. Box 610 Greenhills
Metro Manila, Philippines 3113
Tel 78-78-16

Portugal
Equipamentos de Laboratorios Ltda
P.O. Box 1428
Lisbon 1000 Portugal
Tel 09 351-15-574984

Republic of Singapore
Fluke O'Connor's (PTE) Ltd
99 Pagar Panjang Road
Singapore 0511
Republic of Singapore
Tel 637844

Republic of South Africa
Fluke S.A. (Pty) Ltd
P.O. Box 39797
Bramley 2018
Republic of South Africa
Tel (011) 786-3170

Spain
Hispano Electronics S.A.
Apartado de Correos 48
Alicurion (Madrid)
Spain
Tel 09 14 1 6194108

Sweden
Teulissuute Aft
P.O. Box 4490
S 162 04 Vallingby 4
Sweden
Tel 09-46-8-380370

Switzerland
Traco Electronic AG
Jenatschstrasse 1
8002 Zurich
Switzerland
Tel 09 41-1-201011

France
M.H. Electronique P.A.
Rue Eclairie
ZAC de BUC
B.P. No 31
78530 BUC France
Tel 09 33 1-9568133

Greece
Hellenic Scientific
Representations Ltd
11 Vrassida Street
Athens 612 Greece
Tel 09 30 1-711140

Hong Kong
Schmidt & Co (HK) Ltd
29th Fl Wing On Centre
111 Connaught Road
Central Hong Kong
Tel 5 452644

India
Hindustan Services Pvt Ltd
Field Service Centre
Bih Main Road
33/44 A Raj Market Vias E-6th
Bangalore 560 080 India
Tel 31339

India
Hindustan Services Pvt Ltd
69-A-1 Jagmohanias Marg
Bombay 400 086 India
Tel 811316

India
Hindustan Services Pvt Ltd
15 Community Centre
Panchsila Park
New Delhi, India 110 017
Tel 619118

Israel
R. D. J. Electronics Engineering Ltd
P.O. Box 75
46, Sukkot Street
Ramat Hasharon 47215
Israel
Tel 09 972-7-483211

Italy
Sistrel S.p.A.
Via Pelizza da Volpesso 59
20092 Cinisello Balsano
Milan Italy
Tel (2) 6181893

Italy
Sistrel S.p.A.
Via Giuseppe Armettoni No. 37
00143 Rome Italy
Tel 06-39-6-591554

Japan
John Fluke Mfg. Co. Inc
Japan Branch
1 Higashikata Inatsu
Midori-ku
Yokohama 226 Japan
Tel (045) 473-5478

Korea
Electro-Science Korea Co
C.P.O. Box 8446
Room 201, Binsan Bldg
46, 12, Changchung 1 Kw
Chung Kw
Seoul Korea
Tel 261-7702

Malaysia
Fluke O'Connor's (Malaysia) SDN BHD
P.O. Box 91
Petaling Jaya, Selangor
West Malaysia
Tel 566599

Mexico
Cintronum S.A.
Guillermo Heredia No. 404
Cajon San Rafael
Delegacion Cuauhtemoc
06470 Mexico D.F.
Tel 546-25-95

Netherlands
Fluke (Netherlands) B.V.
Zandvoort 39
3926 CH Maarssen The Netherlands
P.O. Box 205
3081 AE Maastricht The Netherlands
Tel 091 4 80514

New Zealand
McLean Information Technology Ltd
P.O. Box 18065
Glenn Innes
Auckland 6, New Zealand
Tel 587 037

Norway
Morgunstjerne & Co. A/S
Kongehellegat 3
P.O. Box 1688 Huset
Oslo 5, Norway
Tel 09 47 2-356110

Pakistan
PA International Operations
505, Muhammad House
11 Chundrigar Road
P.O. Box 5273
Karachi-2 Pakistan
Tel 221127 239852

Peru
Importaciones y Representaciones
Electronicas S.A.
Avenida Franklin D. Roosevelt 105
Lima 1 Peru
Tel 298650

Philippines
Spark Radio and Electronics Corp
P.O. Box 610 Greenhills
Metro Manila, Philippines 3113
Tel 78-78-16

Portugal
Equipamentos de Laboratorios Ltda
P.O. Box 1428
Lisbon 1000 Portugal
Tel 09 351-15-574984

Republic of Singapore
Fluke O'Connor's (PTE) Ltd
99 Pagar Panjang Road
Singapore 0511
Republic of Singapore
Tel 637844

Republic of South Africa
Fluke S.A. (Pty) Ltd
P.O. Box 39797
Bramley 2018
Republic of South Africa
Tel (011) 786-3170

Spain
Hispano Electronics S.A.
Apartado de Correos 48
Alicurion (Madrid)
Spain
Tel 09 14 1 6194108

Sweden
Teulissuute Aft
P.O. Box 4490
S 162 04 Vallingby 4
Sweden
Tel 09-46-8-380370

Switzerland
Traco Electronic AG
Jenatschstrasse 1
8002 Zurich
Switzerland
Tel 09 41-1-201011



John Fluke Mfg. Co., Inc., P.O. Box C9090, Everett, WA 98206. Phone (206) 342-8300
Fluke (Holland) B.V., P.O. Box 5053, 5004 EB, Tilburg, The Netherlands. Phone (013) 673973
Liho in U.S.A. 12/81

Italy *
Sistele S.p.A.
Via Giugiaro Armadori No. 37
00143 Rome, Italy
Tel: (06) 5815551. TLX 68196
Sistele S.p.A.
Via Pizzardi 55
20092 Cinisello Balsamo
Milan, Italy
Tel: (02) 6181893. TLX 334643
Sistele S.p.A.
Via Costa Parco S. Paolo 35
80126 Naples, Italy
Tel: (081) 767920

Japan *
Johny Eiga-Miy Co. Inc.
Japan House
192, Board, Foster City
1 Higashi-Ara-machi
Miyoshi-ku
Yokohama 226, Japan
Tel: (045) 871-5429
TLX 3821 666 F.K.J.F.J.
Tokyo Electron Ltd
38-11, Shingaku Nemura Bldg
1-26-2, Nishi-Shinjuku
Shinjuku-ku
Tokyo 160, Japan
Tel: 03 3411 4411. TLX 2322220

Kenya *
ADCOM Ltd
P.O. Box 30070
Nairobi, Kenya East Africa
Tel: 331955. TLX 22630

Korea *
Electro-Science Korea Co
P.O. Box 8446
Room 201, Honam Bldg
56-12 Jangchung Ika
Jung-ku
Seoul, Korea
Tel: 261-7102. TLX 874,181

Kuwait *
Iaraq Company
P.O. Box Safat 20506
Kuwait, Arabian Gulf
Tel: 436103/436045
TLX 23155

Lebanon and Jordan *
Mabea (Electronic Division)
P.O. Box 13 5657
Beirut, Lebanon
Tel: 812523 812538
TLX 22489

Libya *
Elek (Electronic) BV
P.O. Box 5053, 5004 EB Tilburg
Zusammenhangung 53, 5048 AN Tilburg
The Netherlands
Tel: (013) 673973. TLX 52237

Malaysia *
Rank O'Connor (PTE) Limited
P.O. Box 91, Persing Jaya
Selangor, West Malaysia
Tel: 566599
TLX OCONOR MA37649

Malaysia *
Rank O'Connor (PTE) Limited
Tel No. 5, Taman Mera
Main 1, Jalan Pagarang
Kuala Kemuning, East Malaysia
Tel: 55322. TLX MARI286

Mexico *
Fuerabuenas S.A.
Callehuetlan 76-104
Cof. San Rafael
Orizaba van Cuahuahuac
Orizaba, Mexico, D.F.
Tel: 546-25-35/546-29-55
TLX 012 25A12

Morocco *
Maurinet
Hemilic and Murray Tunnel, Hat. C.
12, Place du Marabout
Rabat, Morocco
Tel: (21) 23990. TLX 31036

Nepal *
Associated Enterprises
(PVT) Bldg 793, Physical Town
Kathmandu, Nepal
Tel: 1068

Netherlands *
Elek (Electronic) BV
Zonhoven 36
3656 CW Maarssen, The Netherlands
P.O. Box 225
3601 AE Maarssen, The Netherlands
Tel: (030) 439514. TLX 47128

New Zealand *
McLean Information Technology
P.O. Box 18 066, Glen Innes
Auckland, New Zealand
Tel: 547 017. TLX NZ 2761
P.O. Box 496
Wellington, New Zealand
Tel: 851-450

Nigeria *
Molal Engineering Co. Ltd
P.O. Box 6324
Lagos, Nigeria
Tel: 860444. TLX 21070

Norway *
Kongsberg S. & A.S.
Kongsberg 1
P.O. Box 6848, Hellebakk
Oslo S, Norway
Tel: (2) 356110. TLX 71219

Pakistan *
Pak International Operations
505 Muhammad House
11, Gundargar Road
P.O. Box 5323, Karachi, Pakistan
Tel: 229127. TLX 24494

PDR Yemen *
Elek (Electronic) BV
P.O. Box 5053, 5004 EB Tilburg
Zusammenhangung 53, 5048 AN Tilburg
The Netherlands
Tel: (013) 673973. TLX 52237

Peru *
Importaciones Y Representaciones
Electronicas S.A.
Avila Franklin D Roosevelt 105
Lima 1, Peru
Tel: 286500. TLX 3742563

Philippines *
Spark Radio & Electric Supply
P.O. Box 810, Greenhills, San Juan
Mt. Manila, Philippines
Tel: 78-78-36
TLX 27901 HU A 194

Poland *
Amint Associates Ltd
P.O. Box 56
Addlesden, Surrey KT15 1DU
United Kingdom
Tel: Weybridge (932) 52121
TLX 928055

Portugal *
Dinada Equipamentos de
Electronica, Lda
Rua Pedro Nunes, 47-C
1090 Lisboa
P.O. Box 1128, 1003 Lisboa Codes
Tel: (49) 574984. TLX 18469

Qatar *
Im binahy, Organisation
P.O. Box 541, Doha, Qatar
Tel: 321441. TLX 4581

Romania *
Amint Associates Ltd
P.O. Box 56
Addlesden, Surrey KT15 1DU
United Kingdom
Tel: Weybridge (932) 52121
TLX 928055

Saudi Arabia *
Electronic Equipment Marketing Co. Ltd
P.O. Box 1549
Riyadh, Saudi Arabia
Tel: (1) 403264. TLX 20120

Singapore *
Rank O'Connor (PTE) Limited
90, Pagar Panjang Road
Singapore 051
Telephone of Singapore
Tel: 673944
TLX OCONOR H21021

Somalia *
Elek (Electronic) BV
P.O. Box 5053, 5004 EB Tilburg
Zusammenhangung 53, 5048 AN Tilburg
The Netherlands
Tel: (013) 673973. TLX 52237

South Africa *
Elek S.A. (Pty) Ltd
P.O. Box 39197, Bramley, 2018
Republic of South Africa
Tel: (011) 286-4120. TLX 424126

Spain *
Espagna Electronica S.A.
Poligon Industrial Utrera
Avenida de Europa 48
Arroya de Espina, Spain
Tel: (1) 6794108
TLX 27414 42634

Sri Lanka *
Jay L. Electronics
165, Pinnacola Mawatha
Colombo 5, Sri Lanka
Tel: 073 2393

Sweden *
Teleinstrument AB
P.O. Box 4550
162 04 Vallerby, Sweden
Tel: (8) 80170. TLX 11147

Switzerland *
Traco Electronic AG
Jurastrasse 1
8002 Zurich, Switzerland
Tel: (1) 201371. TLX 54318

Syria *
Mabea (Electronic Division)
P.O. Box 4238
Damascus, Syria

Taiwan *
Schmitt Scientific Far East Ltd
906, Chia Hwa Bldg
96, Chung Shan Rd. 1st. Smc. 2
Taipei, Taiwan
Tel: 5817393/5814976
TLX 11111

Thailand *
MEASUREMENTS Ltd
1829, 10, Riamchalong Rd
Hua-mek, Bangkok, Thailand
Tel: 3143369. TLX B1443

Turkey *
Simpac S.A. TL
6, Rue de Sparte
Tunis - 1000 RP, Tunisia
Tel: (1) 248053. TLX 13030

Turkey *
Elekman Elektronik A.S.
Ticaret Anonim Sektör
Necatliye Cad 92-3
Karakoy, Istanbul, Turkey
Tel: (1) 5461
TLX 23253

United Arab Emirates *
Al-Sarraf Co. Ltd
P.O. Box 7187
Abu Dhabi, United Arab Emirates
Tel: (02) 823476/821121
TLX 27085

United Kingdom *
Elek (Great Britain) Ltd
Criswell Way
Waltham, Herts, WD9 4TF
United Kingdom
Tel: (0923) 40511. TLX 834583
Hadden, (0923) 25067

Uruguay *
Correa Uruguaya S.R.L.
Calle 2195
Cajapita de Correa, 1400
Correa Central
Montevideo, Uruguay
Tel: 29 31 95. TLX 8195674

U.S.S.R. *
Amint Associates Ltd
P.O. Box 56
Addlesden, Surrey KT15 1DU
United Kingdom
Tel: Weybridge (932) 52121
TLX 928055

Venezuela *
Eaton, C.A.
Calle 9 con Calle A, Edif. Edmundo
Dato 3, La Urbina
Aparicio De Caracciolo
RD 10, 100 Los Andes
Caracas 1000A, Venezuela
Tel: (01) 842. TLX 21027 (Eaton Vn)

Yemen *
Elek (Electronic) BV
P.O. Box 5053, 5004 EB Tilburg
Zusammenhangung 53, 5048 AN Tilburg
The Netherlands
Tel: (013) 673973. TLX 52237

Yugoslavia *
Amint Associates Ltd
P.O. Box 56
Addlesden, Surrey KT15 1DU
United Kingdom
Tel: Weybridge (932) 52121
TLX 928055

Supplied and Supported by -
Elek (Electronic) BV
P.O. Box 5053, Zusammenhangung 53
5004 EB Tilburg, Netherlands
Tel: (013) 673973. TLX 52237

Supplied and Supported by -
Elek International Corporation
P.O. Box 6280
Lynch, WA 58006-115 A
Tel: (206) 356, 5940
TLX 326262 30944 11101 LV1

INTERNATIONAL SALES OFFICES

Argentina •

Gusen SA
Verity del Pava 4973
Buenos Aires, Argentina
Tel 562386, TeL 39022208

Australia •

Emmag's Instruments Pty Ltd
P.O. Box 811, Concorde NSW
Australia 2757
Tel 02/736-2888, TeL AX/2887

Emmag's Instruments Pty Ltd
P.O. Box 107
Mt Waverley VIC 3149
Australia
Tel 233-4044
TeL AX/679, ELL/1003

Emmag's Instruments Pty Ltd
Professional Suite's Bldg
G.P.O. Box 2769
Brisbane 4001 Australia
Tel 071-239-1161

Emmag's Instruments Pty Ltd
P.O. Box 1240
G.P.O. Adelaide 5001
South Australia
Emmag's Instruments Pty Ltd
P.O. Box 95, Crowsville
West Australia 6150
Tel 08/1-448-5362

Austria •
Walser Research
Elektronische Geräte GmbH & Co
Verkehrstr. 12-14, Engasse 28
A-1220 Vienna, Austria
Tel 02221-23555, TeL X/14759

Bahamas •
AL Hamdyya
P.O. Box 26074
Nassau, Bahamas
Tel 259528, TeL X 8895

Bangladesh •
Multinational Corporation
24 Falgata Rd, Lakshmi
Dacca 3, Bangladesh
Tel 257249, 257175

Belgium •
Fluke (Belgium) S.A. NV
8 Rue de Costerne
1140 Brussels, Belgium
Tel 021-261089, TeL X/2612

Bolivia •
Cosam Bolivia SRI
Casilla 7295, La Paz, Bolivia
Tel 40962, TeL X 5255

Brazil •
Fluke Brasil Indústria E
Comércio LTDA
Al Amazonas 422
Alpha-10, Barroco
C.P. 186400, São Paulo, Brazil
Tel 011-421-9923

Brunel •
Higgs O'Connor & (PTE) Limited
No. 8, BIK 1
Suite 22, South Bay Complex
Main 1, Jaling Jaling
Bangsar Seri, Singapore, Brunel
Tel 26859

Bulgaria •
Amnest Associates Ltd
P.O. Box 55
Aldershot, Surrey KT15 1EU
United Kingdom
Tel Weybridge 9321 52121
TeL X 928655

Canada •
Alan Crawford Assoc. Ltd
#14 1915, 38th Ave N.E.
Calgary, Alberta T2L 6Z5
Tel 403/280-1341, TeL 91-671-886

Alan Crawford Assoc. Ltd
Suite 1, Box 60
Edmonton, Alberta T6A 4H6
Tel 403/451-4891

Alan Crawford Assoc. Ltd
1250 William Street
Burnaby, British Columbia V5C 3H3
Tel 604/294-1326, TeL 94-54247

Alan Crawford Assoc. Ltd
1200 Joseph, Palmira Dr
Suite 4
Burnaby, British Columbia V5C 3H3
Tel 604/463-8640, TeL 01631604

Alan Crawford Assoc. Ltd
881 Lady Brook Place
Ottawa, Ontario K1Z 5L3
Tel 613/722-7682, TeL 0533800

Alan Crawford Assoc. Ltd
5693 Northam Drive
Edmonton, Alberta T6V 1Z5
Tel 416/478-1580, TeL 06263709

Alan Crawford Assoc. Ltd
2918 rue de Lessie
St Laurent, Quebec H4L 1E7
Tel 0514/731-8564, TeL 05624984

Chad •
Fluke (Holland) BV
P.O. Box 5053, 5004 EH Tilburg
Zeeuwensteinweg 53, 5048 AN Tilburg
The Netherlands
Tel 013/673972, TeL X 52227

China, People's Republic of •
Fluke International Corporation
P.O. Box C29080
Everett, WA 98206, U.S.A.
Tel 0206-336-5511
TeL X 126262, 3188711 (INTL 1VT)

Colombia •
Solomon E Instrumentacion Ltda
Carrera 13, No. 37-43, Of. 401
Av. Arona 29583
Bogota DE, Colombia SA
Tel 225-4532, TeL X 45767

Cyprus •
Chris Hatzivayanos Ltd
P.O. Box 1989, Nicosia, Cyprus
Tel 66121, TeL X 3495

Czechoslovakia •
Amnest Associates Ltd
P.O. Box 55
Aldershot, Surrey KT15 1EU
United Kingdom
Tel Weybridge 9321 52121
TeL X 928655

Denmark •
Ejge Olsen A/S
Baltweg Byvej 222
DK - 2550 Haldager, Denmark
Tel 491-50811, TeL X 35214

Ecuador •
Profesor Caspar Cia. Ltda
Educación, Loja
Ave. 12 de Octubre #2255 y
Avenida Bolivar (Plaza Bolívar)
Quito, Ecuador
Tel 529604, TeL X 2865, Telex 613

Professor Caspar Cia. Ltda
Casimiro 49738
Quito, Ecuador
Tel 529693

Egypt and Sudan •
Electronic Engineering Liaison Office
P.O. Box 2891, Heliopolis
11 Ahmed Riad Street
Heliopolis, Cairo, Egypt
Tel 691588, TeL X 92540

Ethiopia •
Fluke (Holland) BV
P.O. Box 5053, 5004 EH Tilburg
Zeeuwensteinweg 53, 5048 AN Tilburg
The Netherlands
Tel 013/673972, TeL X 52227

FIN •
AWA FLU
P.O. Box 856
471 Oosterhout, Wals, Bay
South Fin
Tel 310797, TeL X 132447

Finland •
Oly Finland AB, Tuusula/Finland
02101 Nuansalmi Finland
P.O. Box 505295
TeL X 32129

France •
NB Electronics S.A.
Rue Fourier 606, ZI Genestre
78530 BUC
B.P. No. 21
78530 BUC, France
Tel 13/954831, TeL X 695414

German Democratic Republic •
Amnest Associates Ltd
P.O. Box 26
Aldershot, Surrey KT15 1EU
United Kingdom
Tel Weybridge 9321 52121
TeL X 928655

German Federal Republic •
Fluke (Deutschland) GmbH
Max-Huthel-Strasse 6
8045 Ismaning, West Germany
Tel 089/92511, TeL X 522472
Happel, (089) 964716

Fluke (Deutschland) GmbH
Monchkestrasse 53
4080 Hessefelden 20, West Germany
Tel 06731/958011, TeL X 699576

Fluke (Deutschland) GmbH
Oberer Kirchhofdamm 130
7060 Stuttgart 1, West Germany
Tel 0711/694891, TeL X 725716

Fluke (Deutschland) GmbH
Hahnenstraße 46
10881 Berlin 10, West Germany
Tel 030/9131091
TeL X 0143978

Greece •
Helleas Scientific Representatives Ltd
11, Vasilissa Street
Athens 812, Greece
Tel 41/31140, TeL X 219130

Hong Kong •
Schmitt & Co. (HK) Ltd
20th Fl., Wing Lok Centre
111 Canton Road
Central Hong Kong
Tel X 455664
TeL X 7476, 561102 (HA)

Hungary •
Amnest Associates Ltd
P.O. Box 55
Aldershot, Surrey, KT15 1EU
United Kingdom
Tel Weybridge 9321 52121
TeL X 928655

Iceland •
Kjartan O. Skarphedinn Ltd
P.O. Box 296
Reykjavik, Iceland
Tel 24120, TeL X 2133

India •
Emmag's Services Pvt Ltd
69-A I, Jagmataridas Marg
Bombay 400 006 India
Tel 11230, Hgd 10
Emmag's Services Pvt Ltd
33-44 A, N.M. Main Road
Bq. Malviya Ex. Extension
Bangalore 560 003 India
Tel 33159
TeL X 0845/41

Emmag's Services Pvt Ltd
Shankarankar Office, No. 4
6th Floor, B. E. House, 60-62
Cantonment, Pondicherry, India
Tel 434842, 44744

Emmag's Services Pvt Ltd
15 Community Centre, Panvel/India Park
New Delhi 110 017, India
Tel 051397

Emmag's Services Pvt Ltd
110 South Colborne, 301 House
1 58 10 to 1 58 11
Surat, West India
Surat/Emmag 580 093, India
Tel 6376

Indonesia •
P.T. Dua Tunggal Jaya Nekt
Sempang Buana III/3, 1511 House 11
Sempang Buana 44, P.O. Box 4426
Jember, Indonesia
Tel 367999, TeL X 46624

Iran •
Fluke (Holland) BV
P.O. Box 5053, 5004 EH Tilburg
Zeeuwensteinweg 53, 5048 AN Tilburg
The Netherlands
Tel 013/673972, TeL X 52227

Iraq •
Fluke (Holland) BV
P.O. Box 5053, 5004 EH Tilburg
Zeeuwensteinweg 53, 5048 AN Tilburg
The Netherlands
Tel 013/673972, TeL X 52227

Ireland •
Low E Electronics
42 Hayes Hill
Drogheda County, Dublin, Ireland
Tel 046/23677, TeL X 1392

Israel •
P.O. Electronic Engineering Ltd
P.O. Box 75
46, Yehoshua Street
Ramat Hashikma 45715, Israel
Tel 15-46376, TeL X 16314



John Fluke Mfg. Co., Inc., P.O. Box C9090, Everett, WA 98206. Phone (206) 342-6300.
Fluke (Holland) B.V., P.O. Box 5053, 5004 EH, Tilburg, The Netherlands. Phone (013) 673973
Litho in U.S.A

JOORJT-00R112/5E EN

U.S. SALES AREAS

AK, Anchorage

Harry Lang & Associates
1371 Hillcrest Drive #303
Anchorage, AK 99503
(907) 279-5741

AL, Huntsville

John Fluke Mfg Co., Inc.
3322 S Memorial Parkway
Suite 96
Huntsville, AL 35801
(205) 881-6220
(404) 396-3224 (Atlanta)

AZ, Tempe

John Fluke Mfg Co., Inc.
2125 S 48th Street
Suite 104
Tempe, AZ 85282
(602) 967-8724
(602) 790-9881 (Tucson)

CA, Los Angeles

John Fluke Mfg Co., Inc.
20932 South Bonita St.
Carson, CA 90746
(213) 538-3900 or
(714) 761-2449

CA, Santa Clara

John Fluke Mfg Co., Inc.
2300 Walsh Ave., Bldg K
Santa Clara, CA 95051
(408) 727-0513

CA, Tustin

John Fluke Mfg Co., Inc.
15445 Red Hill Ave., Suite F
Tustin, CA 92680
(714) 838-8863
(714) 226-1254 (San Diego)

CO, Denver

John Fluke Mfg Co., Inc.
1980 South Quebec St #4
Denver, CO 80231
(303) 750-1222

CT, Hartford

John Fluke Mfg Co., Inc.
124 Hexton Ave
Glastonbury, CT 06033
(203) 633-0777

FL, Orlando

John Fluke Mfg Co., Inc.
940 N Fern Creek Ave
Orlando, FL 32803
(305) 896-4891

GA, Atlanta

(404) 396-3224

HI, Honolulu

EMC Corporation
2979 Uialena St
Honolulu, HI 96819
(808) 836-1136

IA, Iowa City

(319) 354-2811

IL, Chicago

John Fluke Mfg Co., Inc.
1400 Hicks Road
Rolling Meadows, IL 60008
(312) 398-0650

IN, Indianapolis

John Fluke Mfg Co., Inc.
5610 Crawfordsville Rd
Corporate Square West
Suite 802
Indianapolis, IN 46224
(317) 244-2456

KA, Kansas City

John Fluke Mfg Co., Inc.
4550 West 109th St
Suite 130
Shawnee Mission, KA 66211
(913) 381-9800

LA, New Orleans

(504) 455-0814

MA, Burlington

John Fluke Mfg Co., Inc.
25 "B" Street
Burlington, MA 01803
(617) 273-4674

MD, Rockville

John Fluke Mfg Co., Inc.
5640 Fishers Lane
Rockville, MD 20852
(301) 770-1570
(301) 792-7060 (Baltimore)

MI, Detroit

John Fluke Mfg Co., Inc.
13955 Farmington Rd
Livonia, MI 48154
(313) 522-9140

MN, Minneapolis

John Fluke Mfg Co., Inc.
7373 West 147th St
Suite 196
Apple Valley, MN 55124
(612) 432-9400

MO, St. Louis

John Fluke Mfg Co., Inc.
300 Brooks Dr., Suite 100
Hazelwood, MO 63042
(314) 731-3388

NC, Greensboro

John Fluke Mfg Co., Inc.
1310 Beaman Place
Greensboro, NC 27408
(919) 273-1918

NJ, Paramus

John Fluke Mfg Co., Inc.
P O Box 930
West 75 Century Road
Paramus, NJ 07652
(201) 262-9550

NM, Albuquerque

John Fluke Mfg Co., Inc.
1108 Alvarado Drive N.E.
Albuquerque, NM 87110
(505) 265-8431

NY, Rochester

John Fluke Mfg Co., Inc.
4515 Culver Road
Rochester, NY 14622
(716) 266-1400

OH, Cleveland

John Fluke Mfg Co., Inc.
7830 Freeway Circle
Middleburg Heights, OH 44130
(216) 234-4540

OH, Dayton

John Fluke Mfg Co., Inc.
4156 Fishburg Rd
Dayton, OH 45424
(513) 213-2738
(614) 889-5715 (Columbus)

OR, Portland

John Fluke Mfg Co., Inc.
16360 S W Springfield Lane
Albina, OR 97007
(503) 642-1342

PA, Philadelphia

John Fluke Mfg Co., Inc.
1010 West 8th Ave., Suite H
King of Prussia, PA 19406
(215) 265-4040
(412) 261-5171 (Pittsburgh)

TX, Austin

John Fluke Mfg Co., Inc.
Creek Gardens, Suite 103
8705 Shoal Creek Blvd
Austin, TX 78758
(512) 459-3344

TX, Dallas

John Fluke Mfg Co., Inc.
14400 Midway Road
Dallas, TX 75234
(714) 233-9990

TX, Houston

John Fluke Mfg Co., Inc.
4249 Blue Bonnet Dr
Stafford, TX 77477
(713) 491-5995
(504) 455-0814 (New Orleans)

UT, Salt Lake City

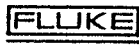
John Fluke Mfg Co., Inc.
5226 So. 300 West, Suite #2
Salt Lake City, UT 84107
(801) 268-9331

WA, Seattle

John Fluke Mfg Co., Inc.
975 Industry Drive
Seattle, WA 98188
(206) 575-3765

For more information on Fluke products or Sales Offices you may dial (800) 426-0361 toll-free in most of U.S.
From Alaska, Hawaii, or Washington phone (206) 356-5400. From other countries phone (206) 356-5500.

John Fluke Mfg Co., Inc., P O Box C9090, Everett, WA 98206 Phone (206) 342-6300
Fluke (Holland) B.V., P O Box 5053, 5004 ER, Tilburg, The Netherlands Phone (013) 6739/73



Litho in U.S.A. 12/81