

# Tektronix®

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**DM 501A  
DIGITAL  
MULTIMETER**

## INSTRUCTION MANUAL

Tektronix, Inc.  
P.O. Box 500  
Beaverton, Oregon 97077

Serial Number \_\_\_\_\_

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## WARNING

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

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# OPERATORS SAFETY SUMMARY

The general safety information in this part of the summary is for both operating and servicing personnel. Specific warnings and cautions will be found throughout the manual where they apply, but may not appear in this summary.

## TERMS

### In This Manual

CAUTION statements identify conditions or practices that could result in damage to the equipment or other property.

WARNING statements identify conditions or practices that could result in personal injury or loss of life.

### As Marked on Equipment

CAUTION indicates a personal injury hazard not immediately accessible as one reads the marking, or a hazard to property including the equipment itself.

DANGER indicates a personal injury hazard immediately accessible as one reads the marking.

## SYMBOLS

### In This Manual



This symbol indicates where applicable cautionary or other information is to be found.

### As Marked on Equipment



DANGER — High voltage.



Protective ground (earth) terminal.



ATTENTION — refer to manual.

### Power Source

This product is intended to operate from a power source that will not apply more than 250 volts rms between the supply conductors or between either supply conductor and ground. A protective ground connection by way of the grounding conductor in the power cord is essential for safe operation.



### **Grounding the Product**

This product is grounded through the grounding conductor of the power cord. To avoid electrical shock, plug the power cord into a properly wired receptacle before connecting to the product input or output terminals. A protective ground connection by way of the grounding conductor in the power cord is essential for safe operation.

### **Danger Arising From Loss of Ground**

Upon loss of the protective-ground connection, all accessible conductive parts (including knobs and controls that may appear to be insulating) can render an electric shock.

### **Use the Proper Power Cord**

Use only the power cord and connector specified for your product.

Use only a power cord that is in good condition.

For detailed information on power cords and connectors, see (page/fig. ref.).

Refer cord and connector changes to qualified service personnel.

### **Use the Proper Fuse**

To avoid fire hazard, use only the fuse specified in the parts list for your product, and which is identical in type, voltage rating, and current rating.

Refer fuse replacement to qualified service personnel.

### **Do Not Operate in Explosive Atmospheres**

To avoid explosion, do not operate this product in an atmosphere of explosive gases unless it has been specifically certified for such operation.

### **Do Not Remove Covers or Panels**

To avoid personal injury, do not remove the product covers or panels. Do not operate the product without the covers and panels properly installed.

### **Do Not Operate Without Covers (for TM 500 plug-ins only)**

To avoid personal injury, do not operate this product without covers or panels installed. Do not apply power to the plug-in via a plug-in extender.

# **SERVICING SAFETY SUMMARY**

## *FOR QUALIFIED SERVICE PERSONNEL ONLY*

*Refer also to the preceding Operators Safety Summary.*

### **Do Not Service Alone**

Do not perform internal service or adjustment of this product unless another person capable of rendering first aid and resuscitation is present.

### **Use Care When Servicing With Power On**

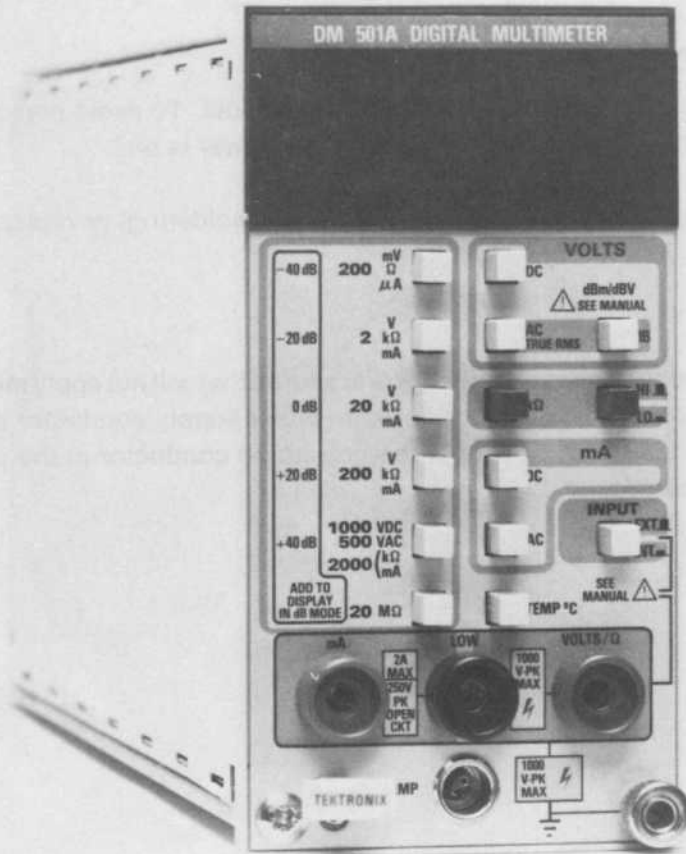
Dangerous voltages exist at several points in this product. To avoid personal injury, do not touch exposed connections and components while power is on.

Disconnect power before removing protective panels, soldering, or replacing components.

### **Power Source**

This product is intended to operate from a power source that will not apply more than 250 volts rms between the supply conductors or between either supply conductor and ground. A protective ground connection by way of the grounding conductor in the power cord is essential for safe operation.

SEARCHING SAFETY SUMMARY  
THIS QUALIFIED SERVICE PERSONNEL ONLY  
FROM KNOW THE OUTSIDE OPERATOR SAFETY SUMMARY



2749-1

DM 501A Digital Multimeter.

# SPECIFICATION

## Introduction

The DM 501A Digital Multimeter measures dc voltage and current, ac voltage and current, dBm, dBV, resistance, and temperature. The ac functions are ac coupled only, true rms responding. All the functions and ranges are front panel push button selected, including the rear interface connector input.

Readout in dBm or dBV is selected by an internal jumper. The unit is shipped with the internal jumper in the dBm position.

The readout is a 0.4" high, 4 1/2 digit display using seven segment LED. The decimal point is automatically positioned depending on the selected operating range of the instrument. Polarity indication is automatic.

## Accessories

Standard accessories include this instruction manual, a set of test leads and the TEKTRONIX P6601 temperature probe with its instruction manual.

The P6601 temperature probe and temperature measurement capabilities are deleted for Option 2 instruments.

## Performance Conditions

The electrical characteristics are valid only if the DM 501A has been calibrated at an ambient temperature between +21°C and +25°C and is operating at an ambient temperature between 0°C and +50°C, unless otherwise noted.

Items listed in the Performance Requirements column of the Electrical Characteristics are verified by completing the Performance Check in the Calibration section of this manual. These items are either explanatory notes or performance characteristics for which no limits are specified.

Table 1-1

ELECTRICAL CHARACTERISTICS (Front Panel)

Characteristics	Performance Requirements	Supplemental Information
DC VOLTMETER		
Accuracy for 200 mV, 2 V, 20 V 200 V and 1000 V ranges +18°C to +28°C		
200 mV range	$\pm(0.05\% \text{ of reading} + 0.015\% \text{ of full scale})$	
2 V to 200 V ranges	$\pm(0.05\% \text{ of reading} + 0.01\% \text{ of full scale})$	
1000 V range	$\pm(0.05\% \text{ of reading} + 0.02\% \text{ of full scale})$	
0°C to +18°C, +28°C to +50°C		
200 mV to 200 V range	$\pm(0.1\% \text{ of reading} + 0.025\% \text{ of full scale})$	
1000 V range	$\pm(0.1\% \text{ of reading} + 0.05\% \text{ of full scale})$	

Table 1-1 (cont)

Characteristics	Performance Requirements	Supplemental Information
DC VOLTMETER (cont)		
Common Mode Rejection Ratio	100 dB at dc. 80 dB at 50 and 60 Hz.	With a 1 kΩ unbalance.
Normal Mode Rejection Ratio	60 dB at 50 or 60 Hz +0.2 Hz.	
Maximum Resolution		10 μV.
Step Response Time		<1 second.
Input Resistance		10 MΩ ±0.5%.
Maximum Input Voltage		
VOLTS/Ω to LOW		1000 V peak.
VOLTS/Ω to ground		1000 V peak.
LOW to ground		1000 V peak.
Input Connectors		Front panel (EXT) or rear interface (INT)
AC VOLTMETER (TRUE RMS)		
Accuracy for 200 mV, 2 V, 20 V 200 V and 500 V ranges +18°C to +28°C		Input signal must be between 5% and 100% of full scale. The 500 V range requires a dynamic input signal between 500 V and 100 V rms.
200 mV to 200 V ranges		
40 Hz to 10 kHz	±(0.6% of reading + 0.05% of full scale)	
20 Hz to 40 Hz and 10 kHz to 20 kHz	±(1.0% of reading + 0.05% of full scale)	
500 V range		
40 Hz to 10 kHz	±(0.6% of reading + 0.2% of full scale)	
20 Hz to 40 Hz and 10 kHz to 20 kHz	±(1.0% of reading + 0.2% of full scale)	
0°C to +18°C, +28°C to +50°C		
200 mV to 200 V ranges		
40 Hz to 10 kHz	±(0.8% of reading + 0.075% of full scale)	
20 Hz to 40 Hz and 10 kHz to 20 kHz	±(1.3% of reading + 0.075% of full scale)	
500 V range		
40 Hz to 10 kHz	±(0.8% of reading + 0.3% of full scale)	
20 Hz to 40 Hz and 10 kHz to 20 kHz	±(1.3% of reading + 0.3% of full scale)	

Table 1-1 (cont)

Characteristics	Performance Requirements	Supplemental Information
AC VOLTMETER (TRUE RMS) (cont)		
Common Mode Rejection Ratio	$\geq 60$ dB at 50 and 60 Hz.	With a 1 k $\Omega$ unbalance.
Maximum Resolution		10 $\mu$ V.
Response Time		<2 seconds.
Input Impedance		10 M $\Omega$ $\pm$ 0.5% paralleled by 160 pF.
Input Connectors		Front panel (EXT) or rear interface (INT).
Maximum Input Voltage		500 V rms or 600 Vdc not to exceed 1000 V peak.
VOLTS/ $\Omega$ to LOW		
VOLTS/ $\Omega$ to ground		1000 V peak.
LOW to ground		1000 V peak.
Crest Factor		4 at full scale.
DECIBELS (dB)—TRUE RMS		
Accuracy for -40 dB, -20 dB, 0 dB, +20 dB and +40 dB ranges		
+18°C to +28°C		
+20 dB to -15 dB	$\pm 0.5$ dB 20 Hz to 20 kHz	
-15 dB to -20 dB	$\pm 0.5$ dB 20 Hz to 2 kHz $\pm 1.5$ dB 2 kHz to 10 kHz	Typically < $\pm 2.5$ dB 10 kHz to 20 kHz.
0°C to +18°C, +28°C to +50°C		
+20 dB to -15 dB	$\pm 1.1$ dB 20 Hz to 20 kHz	
-15 dB to -20 dB	$\pm 1.1$ dB 20 Hz to 2 kHz $\pm 2.1$ dB 2 kHz to 10 kHz	Typically < $\pm 3.1$ dB 10 kHz to 20 kHz.
Maximum Resolution		0.1 dB.
Response Time		<2 seconds.
Input Impedance		10 M $\Omega$ paralleled by 160 pF.
Maximum Input Voltage		500 v rms or 600 Vdc not to exceed 1000 V peak. <sup>a</sup>
VOLTS/ $\Omega$ to LOW		
VOLTS/ $\Omega$ to ground		1000 V peak.
LOW to ground		1000 V peak.

<sup>a</sup>Equivalent to 54 dBV or 56.2 dBm.

Table 1-1 (cont)

Characteristics	Performance Requirements	Supplemental Information		
Crest Factor		4 at full scale.		
Ref Voltage dBV dBm		1 V. 0.7746 V (1 mW dissipated into 600 Ω). Selected by internal jumper.		
Input Connectors		Front panel (EXT) or rear interface (INT).		
<b>OHMMETER</b>				
Accuracy for 200 Ω, 2 kΩ, 20 kΩ, 200 kΩ, 2000 kΩ and 20 MΩ ranges. +18°C to +28°C				
200 Ω to 200 kΩ LO Ω 2 kΩ to 2000 kΩ HI Ω	±(0.15% of reading + 0.015% of full scale)			
2000 kΩ LO	±(0.3% of reading + 0.015% of full scale)			
20 MΩ HI Ω	±(0.5% of reading + 0.015% of full scale)			
0°C to +18°C, +28°C to +50°C				
200 Ω to 200 kΩ LO Ω 2 kΩ to 2000 kΩ HI Ω	±(0.3% of reading + 0.025% of full scale)			
2000 kΩ LO Ω 20 MΩ HI Ω	±(1.2% of reading + 0.025% of full scale)			
Maximum Input Volts Any Range		250 V peak.		
Measuring Current and Full Scale Volts		<b>Range</b>	<b>Source Current</b>	<b>V Max at Full Scale</b>
HI Ω		200 Ω	1.0 mA	0.2 V
		2 kΩ	1.0 mA	2.0 V
		20 kΩ	0.1 mA	2.0 V
		200 kΩ	10.0 μA	2.0 V
		2000 kΩ	1.0 μA	2.0 V
		20 MΩ	0.1 μA	2.0 V
LO Ω		200 Ω	1.0 mA	0.2 V
		2 kΩ	0.1 mA	0.2 V
		20 kΩ	10.0 μA	0.2 V
		200 kΩ	1.0 μA	0.2 V
		2000 kΩ	0.1 μA	0.2 V
		20 MΩ	0.1 μA	2.0 V

Table 1-1 (cont)

Characteristics	Performance Requirements	Supplemental Information	
Maximum Resolution		10 m $\Omega$ .	
Response Time		<2 seconds, 200 $\Omega$ to 2000 k $\Omega$ . <10 seconds, 20 M $\Omega$ scale.	
Maximum Open Circuit Voltage		<6 V.	
Input Connectors		Front panel (EXT) or rear interface (INT).	
<b>DC AMMETER</b>			
Accuracy for 200 $\mu$ A, 2 mA, 20 mA, 200 mA and 2000 mA ranges.  +18°C to +28°C	$\pm(0.2\%$ of reading + 0.015% of full scale)		
0°C to +18°C, +28°C to +50°C	$\pm(0.3\%$ of reading + 0.025% of full scale)		
Response Time		<1 second.	
Input Resistance		<b>Range</b>	<b>Approximate Resistance</b>
		200 $\mu$ A	1.0 k $\Omega$
		2 mA	100.0 $\Omega$
		20 mA	10.2 $\Omega$
		200 mA	1.2 $\Omega$
		2000 mA	0.4 $\Omega$
Maximum Input Current		2 A any range.	
Maximum Open Circuit Input Voltage (mA to LOW)		250 V peak.	
Maximum Floating Voltage mA to ground		1000 V peak.	
LOW to ground		1000 V peak.	
Input Connectors		Front panel only.	
Maximum Resolution		10 nA.	
<b>AC AMMETER</b>			
Accuracy for 200 $\mu$ A, 2 mA, 20 mA, 200 mA and 2000 mA ranges.  20 Hz to 10 kHz (Sinewave)  +18°C to +28°C	$\pm(0.6\%$ of reading + 0.05% of full scale)	Input current must be between 5% and 100% of full scale.	
0°C to +18°C, +28°C to +50°C	$\pm(0.7\%$ of reading + 0.075% of full scale)	Usable to 20 kHz.	
Response Time		<2 seconds.	
Input Resistance		<b>Range</b>	<b>Approximate Resistance</b>
		200 $\mu$ A	1.0 k $\Omega$
		2 mA	100.0 $\Omega$
		20 mA	10.2 $\Omega$
		200 mA	1.2 $\Omega$
		2000 mA	0.4 $\Omega$



Table 1-1 (cont)

Characteristics	Performance Requirements	Supplemental Information
AC AMMETER (cont)		
Maximum Input Current		2 A any range.
Maximum Open Circuit Input Voltage (mA to LOW)		250 V peak.
Maximum Floating Voltage mA to ground		1000 V peak.
LOW to ground		1000 V peak
Input Connectors		Front panel only.
Maximum Resolution		10 nA
TEMPERATURE		
Accuracy for the $-62^{\circ}\text{C}$ to $+240^{\circ}\text{C}$ range.  +18°C to +28°C ambient  Probe calibrated to instrument	$\pm 2^{\circ}\text{C}$ from $-62^{\circ}\text{C}$ to $+150^{\circ}\text{C}$ . $+0^{\circ}\text{C}$ to $-6^{\circ}\text{C}$ from $+150^{\circ}\text{C}$ to $+240^{\circ}\text{C}$	
Any probe	$\pm 4^{\circ}\text{C}$ from $-62^{\circ}\text{C}$ to $+150^{\circ}\text{C}$ . $+2^{\circ}\text{C}$ to $-8^{\circ}\text{C}$ from $+150^{\circ}\text{C}$ to $+240^{\circ}\text{C}$ .	
0°C to +18°C, +28°C to +50°C	Add 1.5°C to the above tolerance in each direction.	
Input Connectors		Front panel (EXT) or rear interface (INT).

Table 1-1 (cont)

**ELECTRICAL CHARACTERISTICS (Rear Interface Inputs)**

<b>Characteristics</b>	<b>Performance Requirements</b>	<b>Supplemental Information</b>
Maximum Input Voltage (dc, ac, dB, and ohms) Pin 28B to 28A		200 V peak. Equivalent to 43 dBV or 45.2 dBm.
Pin 28B to ground		200 V peak.
Pin 28A to ground		200 V peak.

**DC VOLTMETER (REAR INTERFACE INPUTS)**

Accuracy for 200 mV, 2 V, 20 V, 200 V and 1000 V ranges. +18°C to +28°C 200 mV range	$\pm(0.05\% \text{ of reading} + 0.015\% \text{ of full scale})$	
2 V to 200 V range	$\pm(0.05\% \text{ of reading} + 0.01\% \text{ of full scale})$	
1000 V range	$\pm(0.05\% \text{ of reading} + 0.02\% \text{ of full scale})$	
0°C to +18°C, +28°C to +50°C 200 mV to 200 V range	$\pm(0.1\% \text{ of reading} + 0.025\% \text{ of full scale})$	
1000 V range	$\pm(0.1\% \text{ of reading} + 0.05\% \text{ of full scale})$	

Table 1-1 (cont)

Characteristics	Performance Requirements	Supplemental Information
<b>AC VOLTMETER (REAR INTERFACE INPUTS)</b>		
Accuracy for 200 mV, 2 V, 20 V, 200 V and 500 V ranges. +18°C to +28°C		Input signal must be between 5% and 100% of full scale input. The 500 V range is limited to between 200 V peak and 100 V rms.
200 mV to 200 V range 40 Hz to 10 kHz	$\pm(1.6\%$ of reading + 0.05% of full scale)	
20 Hz to 40 Hz and 10 kHz to 20 kHz	$\pm(2.0\%$ of reading + 0.05% of full scale)	
500 V range 40 Hz to 10 kHz	$\pm(1.6\%$ of reading + 0.2% of full scale)	
20 Hz to 40 Hz and 10 kHz to 20 kHz	$\pm(2.0\%$ of reading + 0.2% of full scale)	
0°C to +18°C, +28°C to +50°C		
200 mV to 200 V range 40 Hz to 10 kHz	$\pm(1.8\%$ of reading + 0.075% of full scale)	
20 Hz to 40 Hz and 10 kHz to 20 kHz	$\pm(2.3\%$ of reading + 0.075% of full scale)	
500 V range 40 Hz to 10 kHz	$\pm(1.8\%$ of reading + 0.3% of full scale)	
20 Hz to 40 Hz and 10 kHz to 20 kHz	$\pm(2.3\%$ of reading + 0.3% of full scale)	

**DECIBELS (dB)—TRUE RMS (REAR INTERFACE INPUTS)**

Accuracy for -40 dB, -20 dB, 0 dB, +20 dB and +40 dB ranges +18°C to +28°C		
+20 dB to -15 dB	$\pm 0.6$ dB 20 Hz to 20 kHz	
-15 dB to -20 dB	$\pm 0.6$ dB 20 Hz to 2 kHz $\pm 1.6$ dB 2 kHz to 10 kHz	Typically <2.6 dB 10 kHz to 20 kHz
0°C to +18°C, +28°C to +50°C		
+20 dB to -15 dB	$\pm 1.2$ dB 20 Hz to 20 kHz	
-15 dB to -20 dB	$\pm 1.2$ dB 20 Hz to 2 kHz $\pm 2.2$ dB 2 kHz to 10 kHz	Typically <3.2 dB 10 kHz to 20 kHz

Table 1-1 (cont)

Characteristics	Performance Requirements	Supplemental Information
OHMMETER (REAR INTERFACE INPUTS)		
Accuracy for 200 $\Omega$ , 2 k $\Omega$ , 20 k $\Omega$ , 200 k $\Omega$ , 2000 k $\Omega$ , and 20 M $\Omega$ ranges  +18°C to +28°C		
200 $\Omega$ to 200 k $\Omega$ LO $\Omega$ 2 k $\Omega$ to 2000 k $\Omega$ HI $\Omega$	$\pm(0.15\%$ of reading + 0.015% of full scale) + 0.02 $\Omega$	
2000 k $\Omega$ LO $\Omega$	$\pm(0.3\%$ of reading + 0.015% of full scale) + 0.02 $\Omega$	
20 M $\Omega$ HI $\Omega$	$\pm(0.5\%$ of reading + 0.015% of full scale) + 0.02 $\Omega$	
0°C to +18°C, +28°C to +50°C		
200 $\Omega$ to 200 k $\Omega$ LO $\Omega$ 2 k $\Omega$ to 2000 k $\Omega$ HI $\Omega$	$\pm(0.3\%$ of reading + 0.025% of full scale) + 0.02 $\Omega$	
2000 k $\Omega$ LO $\Omega$ 20 M $\Omega$ HI $\Omega$	$\pm(1.2\%$ of reading + 0.025% of full scale) + 0.02 $\Omega$	

Table 1-2  
MISCELLANEOUS

Characteristics	Description
Power Consumption	Approximately 9 watts.
Reading Rate	3 1/3 per second.
Over-range Indication	Flashing display except on 500 Vac and 1000 Vdc ranges.
Calibration Interval	1000 hours of operation or 6 months, whichever occurs first.
Warm-up Time	30 minutes (60 minutes after storage in high humidity environment).

**Table 1-3**  
**ENVIRONMENTAL<sup>a</sup>**

Characteristics	Description
Temperature	
Operating	0°C to +50°C <sup>b</sup> Meets or exceeds MIL-T-28800B, class 5 with exceptions. <sup>d</sup>
Non-operating	-55°C to +75°C
Humidity	95% to 100% for 5 days (derated above 25°C) Meets or exceeds MIL-T-28800B, class 5.
Altitude	
Operating	4.6 km (15,000 ft) Meets or exceeds MIL-T-28800B, class 3.
Non-operating	15 km (50,000 ft)
Vibration	0.64 mm (0.025") disp. Meets or exceeds MIL-T-28800B, class 3. 5-55-5 Hz <sup>a/c</sup> (sine wave). 75 min. total.
Shock	30 g's (half sine) Meets or exceeds MIL-T-28800B, class 3. 11 ms 18 shocks <sup>a/c</sup>
Bench Handling	
Operating	45° or 4" or equilibrium <sup>a/c</sup> , Meets or exceeds MIL-T-28800B, class 3. whichever occurs first.
E.M.C.	
Operating	30 Hz to 1 GHz <sup>b</sup> Meets or exceeds MIL-T-28800B, class 3.
Electrical Discharge	
Operating	20 kV max. <sup>b</sup> No MIL-T-28800 equivalent. Charge applied to each protruding area of the front panel except the input connectors.
Transportation	
Vibration	25 mm (1 inch at 270 rpm Meets or exceeds MIL-T-28800B, class 3. for 1 hr) <sup>c</sup> National Safe Transit Association Preshipment Test Procedures project: 1A-B-1 and 1A-B-2.
Package Drop	10 drops from 3 ft (91 cm) <sup>c</sup>

<sup>a</sup>See Table 1-4 for system modifiers.

<sup>b</sup>With power module.

<sup>c</sup>Without power module.

<sup>d</sup>Temperature: During low temperature test MIL-T-28800B paragraph 4.5.5.1.3 (b) for class 5, steps 4 and 5 shall be performed before step 2. Also, the instrument shall not be operating during step 6, paragraph 4.5.5.1.3 (e), class 5. While operating, condensed moisture shall not be present on class 5 instruments. Drying of the instrument for this class may be performed in a suitable chamber, if necessary.

**Table 1-4**  
**TM 500 SYSTEMS**  
**ENVIRONMENTAL SPECIFICATION**

Characteristics	TM 501	TM 503	TM 504	TM 506	TM 515
Temperature Operating Non-operating	Meets same test standards as plug-in.				
Humidity Operating Non-operating	Meets same test standards as plug-in.				
Altitude Operating Non-operating	Meets same test standards as plug-in.				
Vibration Operating	0.26 mm (0.010 in.) disp., 10-55 Hz (sine wave). 75 min. total.			0.38 mm (0.015 in.) disp. 10-55 Hz (sine wave) 75 min.	
Shock Operating	20 g's (1/2 sine) 11 ms, 18 shocks			30 g's (1/2 sine) 11 ms, 18 shocks.	
Bench Handling Operating	Meets same test standards as plug-in.				
Electric Discharge Operating	Meets same test standards as plug-in.				
Transportation Vibration Package Drop	Meets same test standards as plug-in.				

**Table 1-5**  
**PHYSICAL CHARACTERISTICS**

Characteristics	Description
Finish	Anodized aluminum panel and chassis.
Net Weight	≈2.5 lbs (1.13 kg).
Overall Dimensions	2.633 in. (66.8 mm) W x 11.240 in. (285.3 mm) D x 4.961 in. (125.9 mm) H.

# OPERATING INSTRUCTIONS

## Installation and Removal Instructions

The DM 501A is calibrated and ready to use when received. It operates in one compartment of a TM 500-Series power module. Refer to the power module instruction manual for line voltage requirements and power module operation.

### CAUTION

*Turn the power module off before inserting or removing the DM 501A; otherwise, arcing may occur at the rear interface connectors. Arcing reduces the connectors useful life and damage may be done to the plug-in circuitry.*

Check to see that the plastic barriers on the interconnecting jack of the selected power module compartment match the cut-outs in the DM 501A circuit board edge connector. If they don't match, do not insert the plug-in until proper identification is made. When the units are properly matched, align the DM 501A chassis with the upper and lower guides (see Fig. 2-1) of the selected compartment. Insert the DM 501A into the compartment and press firmly to seat the circuit board in the interconnecting jack. The LED display should be visible when the power module power switch is turned on.

To remove the DM 501A, pull the release latch (located on the lower left corner) until the interconnecting jack disengages. The DM 501A will now slide out.

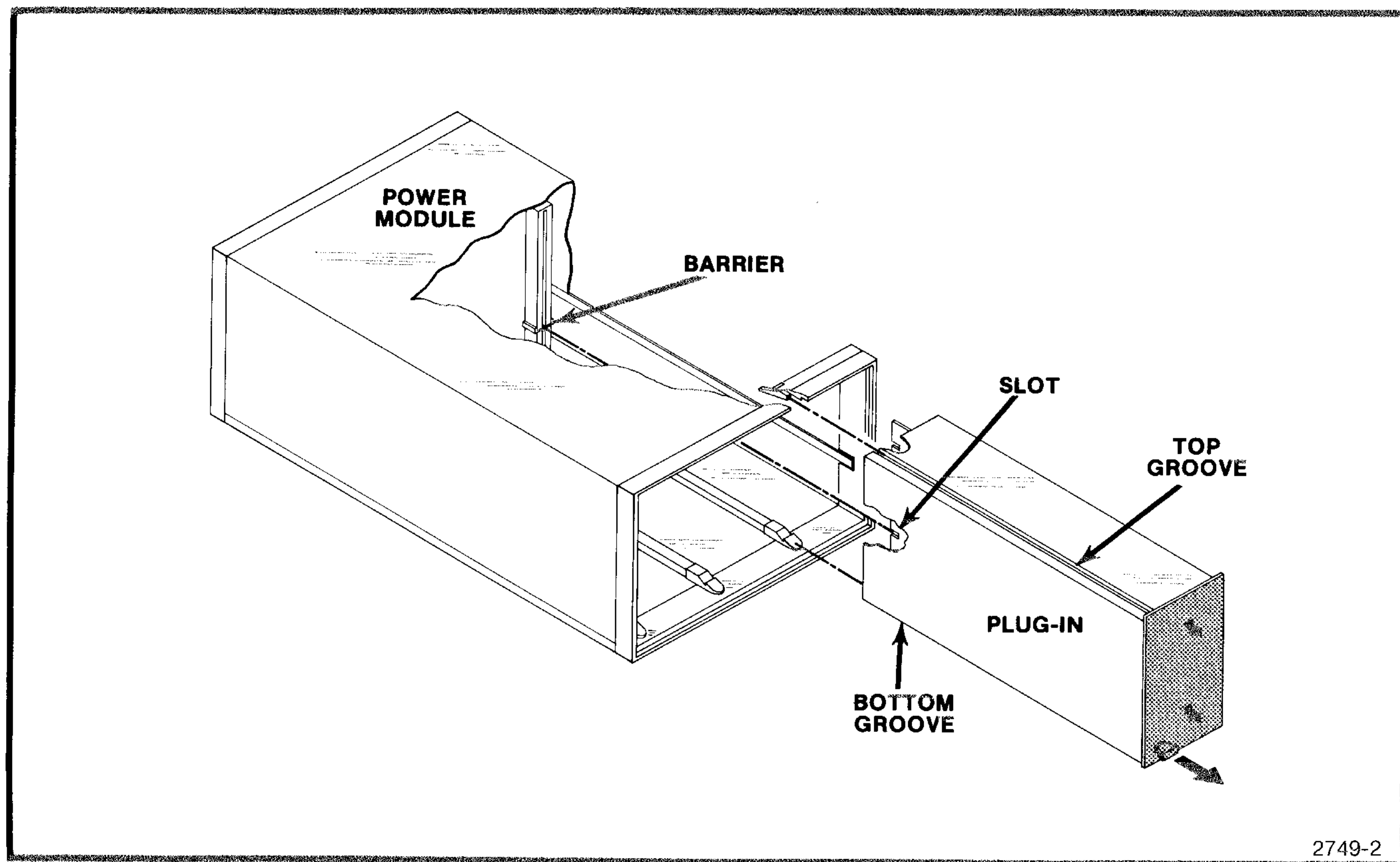




Fig. 2-1. Installation and removal.

## CONTROLS AND CONNECTORS

- ① 4-1/2 digit LED readout with decimal point positioned by the selected range push button switch.
- ② Range selector push button switches for volts, ohms, current or decibel measurement.
- ③ Front-panel mA input used in conjunction with the LOW input for current measurement.
- ④ Temperature probe input connector.
- ⑤ Chassis ground binding post.
- ⑥  Front-panel inputs for volts, ohms and decibel measurements.
- ⑦ Temperature input function push button.


### INPUT

- ⑧  Push button selects either rear interface inputs or front-panel inputs for measurement.

### mA

- ⑨ Ac current function push button.
- ⑩ Dc current function push button.
- ⑪ Push button selects HI or LO as probe tip voltage for measuring ohms.
- ⑫ Ohms function push button.

### VOLTS

- ⑬  Decibel function push button (used in conjunction with the AC volts push button).
- ⑭ Ac volts function push button.
- ⑮ Dc volts function push button.

- ⑯ Release latch. Pull to remove plug-in.



Refer to General Operating Information.

## General Operating Information

With the DM 501A properly installed in the power module and the power switch on, allow thirty minutes warm-up time for operation to specified accuracy. Select the desired measurement function and range. When the value of the quantity measured is unknown, select the highest range first. Decrease the range setting until the display reads between 10% and 100% of the full-scale reading. This particular range will give maximum resolution. When an input signal causes the display to read greater than 19999, an overrange blinking display occurs. This blinking indicates the input is greater than the full-scale reading on the particular range selected.

The 1000 Vdc and 500 Vac range will not cause a blinking display when the input signal exceeds the maximum allowable input on this range.

### CAUTION

*Instrument damage may occur if maximum input potential is exceeded.*

## Input Connections



Four input connectors provide front-panel measurement connections. The VOLTS/ $\Omega$  and LOW input connectors are used for dc voltage, ac voltage, dBV, dBm and ac and dc resistance measurements. The mA and LOW input connectors are used for ac or dc current measurements. The input EXT-INT push button selects front-panel or rear interface input. Rear interface pins 28A (LO) and 28B (HI) are used for rear interface voltage, dB and resistance measurements. The TEMP input connector is used for temperature measurements.

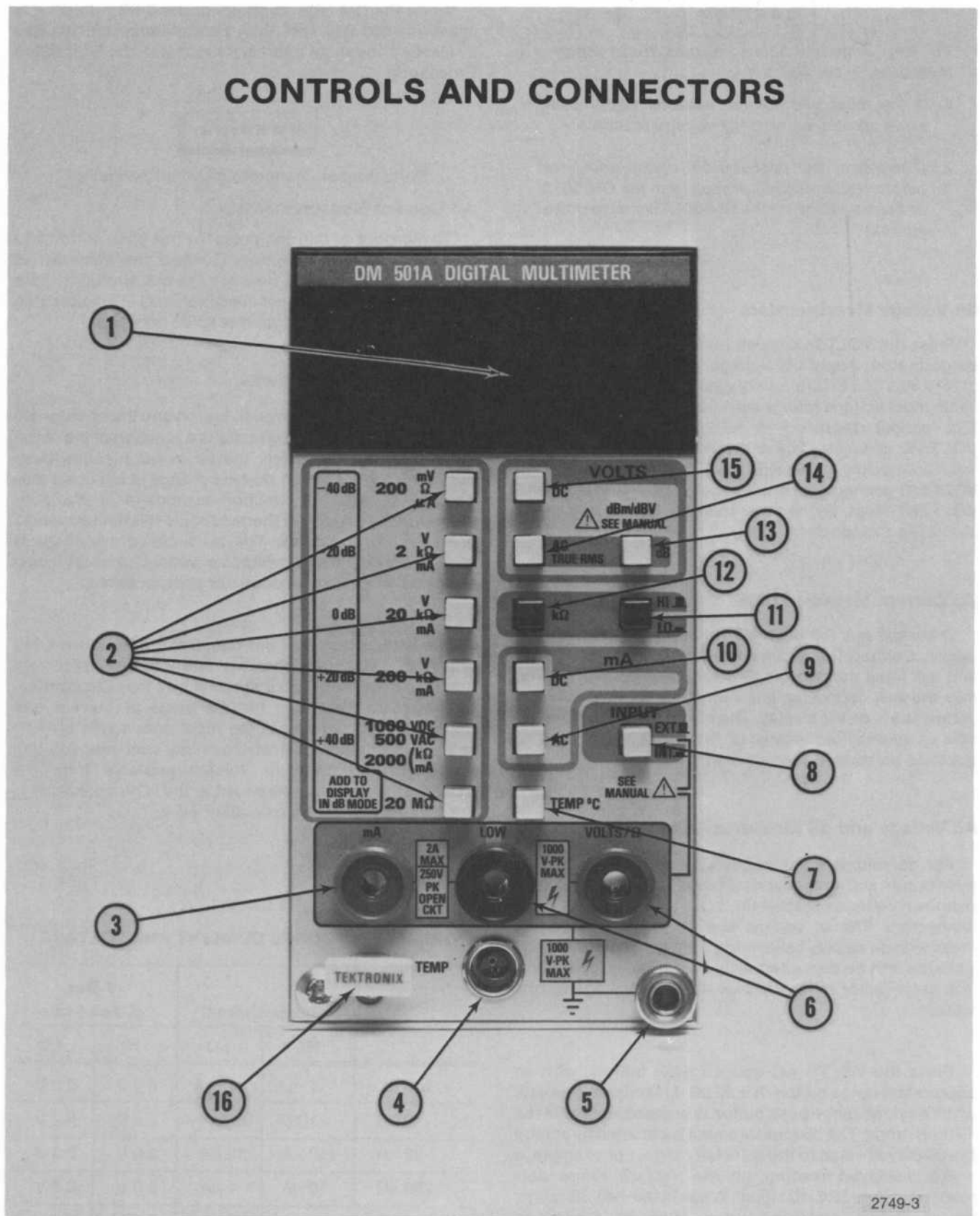
### CAUTION

*To avoid equipment damage, do not apply a voltage exceeding 200 V peak between pins 28A and 28B of the rear interface connector.*

Normal measurement conditions are with the LOW connector referenced to the device-under-test common. A connection between the LOW input connector and the ground terminal may be made to reference the input to the DM 501A chassis ground. Use caution as the LOW connector is connected to earth ground through the power module three-wire power cord.



## CONTROLS AND CONNECTORS



2749-3

Fig. 2-2. Controls and connectors.

**CAUTION**

To help eliminate shock hazard from voltages measured by the DM 501A:

1. If the measured voltage exceeds 42.5 V peak, avoid all contact with the voltage source.
2. Disconnect test probes from circuit-under-test before disconnecting probes from the DM 501A, or before removing the DM 501A from the power module.

**Dc Voltage Measurements**

Press the VOLTS DC push button and an appropriate range button. Apply the voltage to be measured to the LOW and VOLTS/ $\Omega$  input connectors. Observe the maximum input voltage ratings as indicated on the front panel. The readout displays a + reading if the input to the VOLTS/ $\Omega$  connector is positive with respect to the LOW input connector. A - reading is displayed if the input at the VOLTS/ $\Omega$  connector is more negative. With the LOW and VOLTS/ $\Omega$  input connectors shorted, the display reads zero as to the specifications.

**Dc Current Measurements**

Press the mA DC push button and appropriate range button. Connect the dc current to be measured to the LOW and mA input connectors. Conventional current flowing into the mA connector and out of the LOW connector indicates a + on the display. The current input is protected with an internal fuse located on the circuit board. Refer to qualified personnel when checking this fuse.

**Ac Voltage and dB Measurements**

For ac voltage measurements, press the VOLTS AC push button and an appropriate range button. Connect the unknown voltage between the LOW and VOLTS/ $\Omega$  input connectors. The ac voltage and dB measurements are made with an ac only calculating true rms to dc converter. Voltages can be measured with a crest factor up to four. The crest factor is the ratio of the peak voltage to rms voltage.

Press the VOLTS AC and dB push buttons with an appropriate range button. A  $\pm 20$  dB dynamic range exists when any one range push button is pressed, except in the +40 dB range. The dB measurement is obtained by adding the displayed value to the selected range. For example, a -15.6 displayed reading on the -20 dB range corresponds to a -35.6 dB signal. When in the +40 dB range, the maximum displayed value must be limited to +16.2 dBm or +14 dBV because of the 500 Vac maximum rating of the instrument.

When the DM 501A is shipped, the 0 dB reference is 1 mW into 600  $\Omega$  (0.7746 V). A 0 dB reference of 1 V is also available through an internal jumper (see the Calibration Procedure).

**WARNING**

*Refer jumper change to qualified personnel.*

**Ac Current Measurements**

To measure ac current, press the mA push button and an appropriate range button. Connect the unknown ac current to be measured between the mA and LOW input connectors. The ac current measurements are made using an ac only calculating true rms to dc converter.

**Resistance Measurements**

Press the k $\Omega$  function push button and the appropriate range button. The scaling factor is a function of the range push buttons only. Select the HI or LO function push button for the maximum desired voltage at full scale (see Table 2-1). The HI function advantage is its non-susceptibility to noise or thermocouple (dissimilar metals) generated error signals. The LO function advantage is allowing in-circuit measurements without forward biasing most silicon type semiconductor components.

The k $\Omega$  function provides constant current at the LOW and VOLTS/ $\Omega$  input connectors. The conventional current flows from the VOLTS/ $\Omega$  connector into the LOW connector. Refer to Table 2-1 for the value of current and maximum voltages across the input connectors for full-scale display readings (instrument not over-ranged). The maximum (open circuit) voltage available from the VOLTS/ $\Omega$  connector referenced to the LOW connector in the k $\Omega$  function is approximately +6 V.

**Table 2-1**

**OHMMETER SOURCE CURRENT AND VOLTAGE**

Range Scale	Source Current		V Max at Full Scale	
	HI	LO	HI	LO
200 $\Omega$	1 mA	1 mA	0.2 V	0.2 V
2 k $\Omega$	1 mA	100 $\mu$ A	2.0 V	0.2 V
20 k $\Omega$	100 $\mu$ A	10 $\mu$ A	2.0 V	0.2 V
200 k $\Omega$	10 $\mu$ A	1 $\mu$ A	2.0 V	0.2 V
2000 k $\Omega$	1 $\mu$ A	0.1 $\mu$ A	2.0 V	0.2 V
20 M $\Omega$	0.1 mA	0.1 $\mu$ A	2.0 V	2.0 V

### Temperature Measurements

Connect the P6601 temperature probe to the front-panel TEMP connector. Use care to align the connector pins. Press the TEMP °C push button. Apply the probe sensor tip to the device-under-test (DUT). Allow sufficient time for the probe tip to stabilize before taking a reading. The time to reach a stable reading is a function of the thermal mass of the probe and DUT, the thermal resistance of the probe and DUT, and the amount of heat being applied to the DUT.

Refer to the P6601 manual for more information on temperature measurements and probe use.

A list of standard accessories (and part numbers) is located in the Replaceable Mechanical Parts list.

### Repackaging Information

If this Tektronix instrument is to be shipped to a Tektronix Service Center for service or repair, attach a tag showing owner (with address) and the name of an

individual at your firm that can be contacted. Include the complete instrument serial number and a description of the service required.

Save and re-use the package in which the instrument was shipped. If the original packaging is unfit for use or not available, repackage the instrument as follows:

Surround the instrument with polyethylene sheeting to protect the finish of the instrument. Obtain a carton of corrugated cardboard of the correct carton strength and having inside dimensions of no less than 6 inches more than the instrument dimensions. Cushion the instrument by tightly packing 3 inches of dunnage or urethane foam between carton and instrument on all sides. Seal the carton with shipping tape or an industrial stapler.

The carton test strength for this instrument is 200 pounds per square inch.

## **WARNING**

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

# THEORY OF OPERATION

## Introduction

This section of the manual describes the circuits necessary to display in digital form, the value of an input voltage, current, resistance or temperature. Refer to the block diagram and the schematic diagrams (indicated by a diamond) in the diagram section for an overall view of the DM 501A operation, including typical input and output signal levels.

## Voltage Input Circuits 1

The internal-external (INT-EXT) front-panel switch (S4-A and S4-B, see Fig. 3-1) is used to select either front-panel inputs or rear-interface inputs. In all functions except temperature, the LOW input connects to the main board floating ground (LO) through switches S4-A and S1-M.

A dc voltage applied to the VOLTS/ $\Omega$  connector passes through switches S1-C and S1-E to the top of the attenuator resistor series network consisting of R1112A, R1104 (20 Vdc), R1112B, R1110 (200 Vdc), R1112C, R1114 (1000 Vdc), and R1112D. The bottom end (pin 8) of R1112D is connected to floating ground through switch S1-E and S1-M. The input signal attenuation is selected by pressing the desired range switch for either 200 mV, 2 V, 20 V, 200 V, or 1000 V. The attenuated signal couples through switches S1-F, S1-D, S1-J, S1-L, and S1-N. The signal flows through R1613 (located on Diagram 2) to the Analog Converter (U1601 pin 15). Resistor R1613 is a current limiting component that protects U1601 from overload.

In the ac voltage function (see Fig. 3-2), switch S1-C is open (depressed position) and capacitor C1100 ac couples the input signal to the attenuator. Capacitors

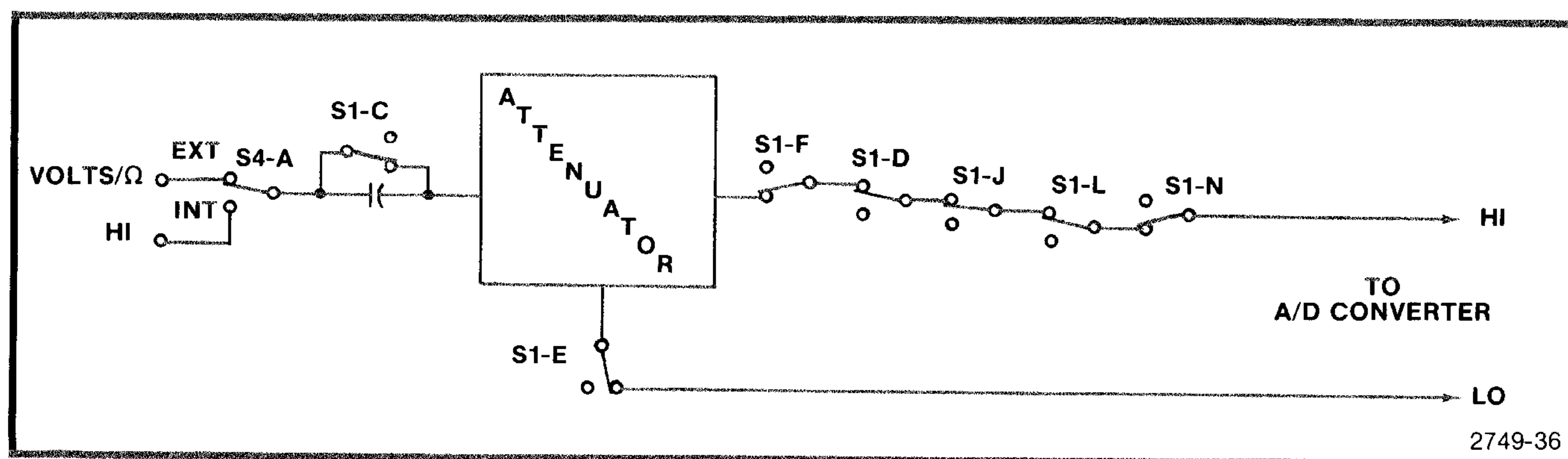


Fig. 3-1. Dc volts switching.

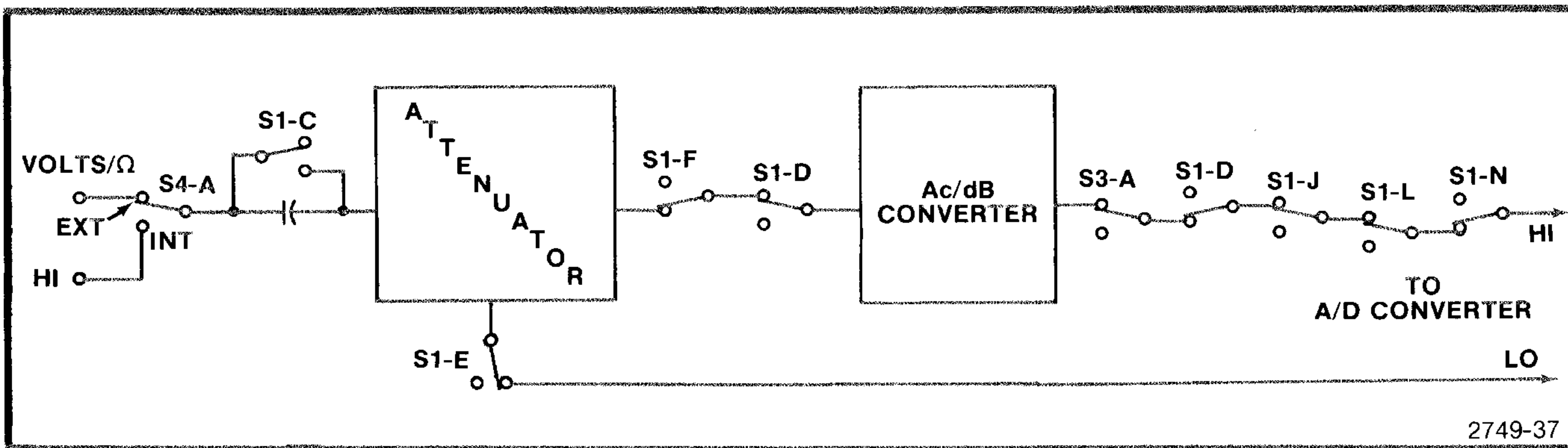


Fig. 3-2. Ac volts switching.

C1110, C1114 (20 Vac), and C1112 comprise the 20 Vac compensation. Capacitors C1120, C1128 (200 Vac), and C1122 comprise the 200 Vac compensation. The 500 Vac compensation consists of C1126, C1129 (500 Vac), and C1124. The attenuated signal passes through switches S1-F and S1-D (pin 3) and resistor RT1633 to the input of the AC Buffer (U1539). Simultaneously, the other half of switch S1-D (pin 5) couples the output of the dB Converter (U1429) through switch sections S3 and S1 to the Analog Converter, pin 15.

The resistor (RT1633) with diodes CR1631 and CR1632 protect U1539 from input voltage overloads. When an overload occurs, diodes CR1631 and CR1632 clamp the signal at 0.7 V above or below the power supply voltage causing RT1633 to heat. When reaching the trigger Temperature, RT1633 will effectively open or achieve a very high resistance, thus limiting the input current to U1539.

In the 200 mVac range position, switch S2-C activates relay K1528, which sets the AC Buffer (U1539) for X10 gain. Resistor R1539 and U1539 feedback resistor R1538 comprise the X1 and X10 gain setting network. The output of U1539 (pin 6) is coupled through capacitor C1539 and R1537 (2 Vac GAIN) to the input of U1429 (pin 1). The dB Converter (U1429) computes the rms level of the input ac signal and outputs the equivalent dc level on pin 8. This output signal (HI) is appropriately switch coupled through resistor R1613 (located on diagram 2) to the Analog Converter (U1601 pin 15).

**dB Input Circuitry 1 (Refer to Fig. 3-3)**

The dB Converter (U1429) also converts the ac signal input (pin 1) to a dc voltage proportional to dB at pin 5. This dc voltage is then coupled to pin 7, which has a resistor network to set the dB reference current and a jumper (J1435) that selects the dBm or dBV mode.

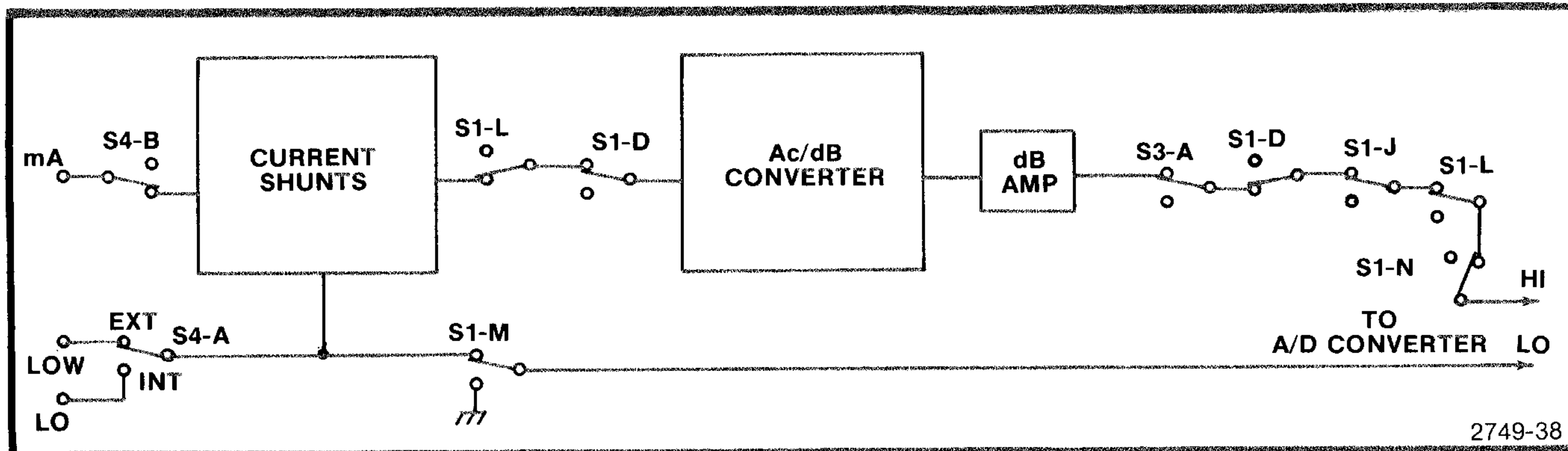


Fig. 3-3. dB switching.

With the jumper in the dBm mode, R1535 (dB $\emptyset$ ) is adjusted for  $\emptyset$  dBm when the  $\emptyset$  dB range switch is depressed and 0.7746 Vac is connected between the VOLTS/ $\Omega$  and LOW front-panel connectors.

When the jumper is in the dBV mode and the input signal is 1.000 Vac, the display readout is also  $\emptyset$  dB. The signal at U1429 (pin 7) is internally buffered and applied to pin 6 (dB BUF OUT). This signal changes approximately  $-3$  mV per 1 dB change. The positive temperature coefficient resistor (RT1525) is used to provide compensation for the 0.3% per degree C temperature drift in the dB converter of U1429.

Potentiometer R1528 (dB Gain) in combination with U1538 (dB AMP), RT1525, and feedback resistor R1536, is used to scale the dB buffer output signal to 100 mV per dB at the input of U1538 (pin 6). This output signal feeds through switch sections S3 and S1, to resistor R1613 (located on diagram 2), then into the Analog Converter (U1601 pin 15).

When dB is selected, the display is limited to 0.1 dB resolution. This reduced resolution occurs when dB switch S3-A (pin 3) connects +5 V to Digit Select Driver U1701 (pin 1). The output of U1701 (pin 16) turns on diodes CR1605 and CR1607, disabling the digit select lines for the two least significant digits in the display (DS1200 and DS1101). Simultaneously, +5 V is coupled through diode CR1711 turning on the SIGN (DS1000) in the display. This same high level disables integrated circuits U1703A, U1703B, and U1705B and enables U1705A. The decimal point is displayed after the second most significant digit ranges.

### Current Input Circuits 1 (Refer to Fig. 3-4 and Fig. 3-5)

The current input is only available through the front-panel mA and LOW connectors. Input current to the mA connector flows through fuse F1626 and the appropriate range switch and shunt resistors consisting of R1628A, B, and C and R1711 and R1713. In dc current function, with the mA dc front-panel switch (S1-J pin 4) closed, the voltage drop across the shunt resistors is directly coupled

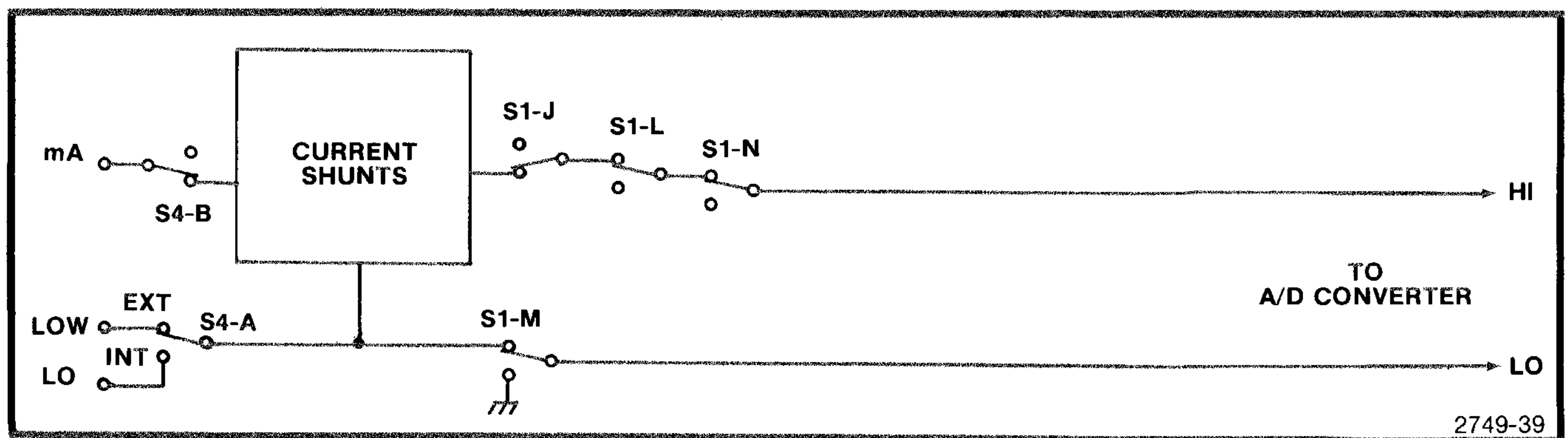


Fig. 3-4. Dc current switching.

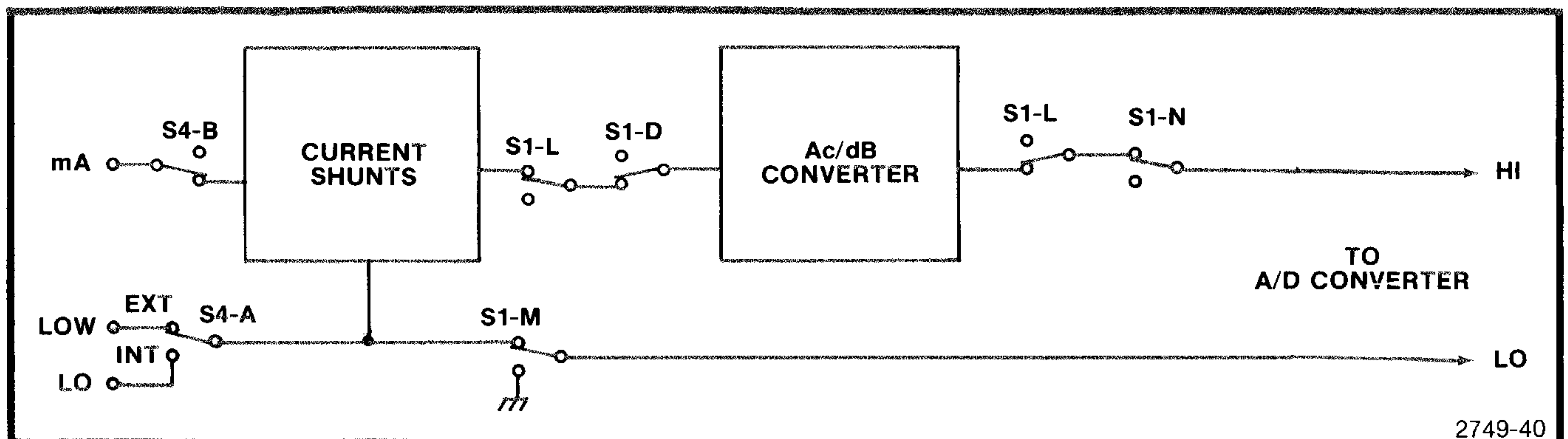


Fig. 3-5. Ac current switching.

to the Analog Converter (U1601 pin 15). In ac current function, the mA ac front-panel switch (S1-L pin 4) is closed. The voltage developed across the input current shunt is coupled to AC Buffer U1539, which is connected (by Relay K1528 energizer) as a X10 gain amplifier. The voltage at pin 6 of U1539 feed through R1537 to converter U1429 (pin 1) and outputs at pin 8 of U1429. Through appropriate switching, U1429 pin 8 output voltage couples to the Analog Converter, U1601 pin 15. Ac current is also measured as a true rms ac function.

### Ohms Converter 1 (Refer to Fig. 3-6)

The ohms converter circuitry generates a known current that flows out the front-panel VOLTS/ $\Omega$  connector through the unknown resistance. The voltage developed at the input connectors is proportional to the unknown resistance. This voltage is sensed by the a/d converter and displayed as an ohms value.

The Ohms Reference Current Source, Q1415 and associated circuitry, generates a  $100\ \mu\text{A}$  reference current. This current either flows through R1516 or R1516 in parallel with the series combination of R1515 and R1412 ( $\text{LO}\Omega$ ) depending on which ohms function and range is selected. This reference current develops either 1 V or 10 V across R1516. The Ohms Converter (U1515 and Q1525) applies 1 V or 10 V across the attenuator section selected by the range switches. The attenuator current, determined by the range switches, flows through ohms protection resistor RT1102 and out the VOLTS/ $\Omega$  front-panel connector or rear interface connector (pin 28B) through the unknown resistance to the LOW front-panel or rear interface connector (pin 28A). The output current from the VOLTS/ $\Omega$  or rear interface connector varies between  $100\ \mu\text{A}$  and 1 mA in decade steps, depending on the selected range.

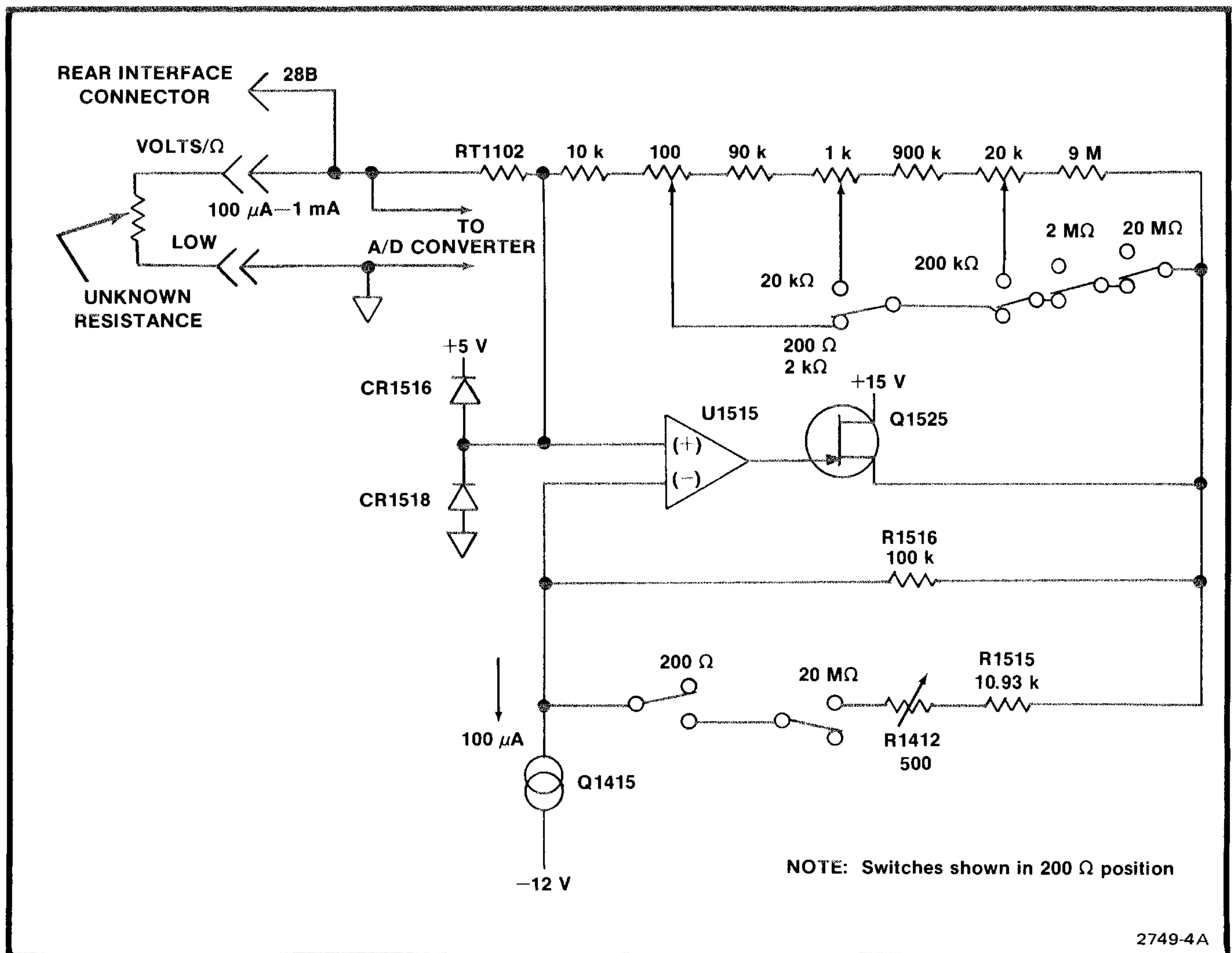


Fig. 3-6. Simplified ohms converter diagram.



Circuit protection to the ohmmeter function is provided by resistor RT1102 and clamping diodes CR1516 and CR1518. A voltage source inadvertently applied in the ohmmeter function will cause RT1102 to heat and effectively open.

### Temperature Measurement Circuitry

The temperature circuitry is designed to operate with the P6601 Temperature Probe. The temperature sensing element consists of a thin-film platinum resistor in the tip of the probe. The sensor resistance, which is a function of temperature, is:  $R = (R_0 + \alpha T + \beta T^2)$ , where  $R_0$  is 100  $\Omega$ ,  $\alpha$  is equal to 0.3738  $\Omega$  per degree C, and  $\beta$  is equal to  $-8.85 \times 10^{-5} \Omega/^\circ\text{C}^2$  (nominal coefficient).  $T$  is temperature in degrees Celsius.

A 1 mA current source from transistor Q1731, zener diode VR1636, and related circuitry flows through the temperature probe sensor. When the temperature changes, the sensor resistance changes, which causes the voltage developed across the sensor to change. This voltage is shifted and amplified by the Temperature Amplifier (U1737). The output of U1737 (pin 6) applies this temperature probe signal to a network consisting of components R1931, CR1935, R1935, R1932, R1933, CR1934, and R1934. This network helps compensate for the non-linear function of the temperature probe. With diode CR1935 setting a break point at an equivalent 75 $^\circ\text{C}$  and diode CR1934 setting a break point at approximately 125 $^\circ\text{C}$ , the output is somewhat linearized and equal to  $\approx 1 \text{ mV}/^\circ\text{C}$  times probe temperature.

When the front panel TEMP $^\circ\text{C}$  push button is depressed, switch S1-N couples this temperature output to Analog Converter U1601 (pin 15).

### Analog-to-Digital Converter

The analog-to-digital converter (a/d converter) in the DM 501A uses a Siliconix type LD120 analog converter (U1601) and a type LD121 digital converter (U1603) to convert the analog input voltage to a digital representation.

The Analog Converter (U1601) contains an input buffer-integrator-comparator and an auto-zero amplifier.

The Digital Converter (U1603) contains the necessary control logic for the analog converter as well as the buffers, multiplexers, latches, and counters needed to drive the display circuitry.

The basic sensitivity of the a/d converter is 2 V full scale indication, which is set by R1505 (2 Vdc). The 200 mV full scale input for the a/d converter is set by R1504 (200 mVdc) when the relay K1505 is energized through switches S1 and S2. The 2 Vdc  $\emptyset$  (R1405) is used to set the initial zero for the a/d converter when in the 2 V full scale mode. When the a/d converter input is set for 200 mV full scale mode, relays K1408 and K1505 are energized. The 200 mVdc  $\emptyset$  (R1415) is now in the circuit to adjust for the initial zero offset.

The a/d converter operates on a charge-balancing technique. The input voltage is converted to a current that charges integrator capacitor C1508. The converter counts the units of charge needed to keep the integrator output near zero. (See Fig. 8-2 in the Diagrams section.)

The conversion cycle is 49,152 clock pulses long of which 16,384 pulses are used in the AUTO-Zero (AZ) interval and 32,768 pulses are used in the measure interval.

#### Auto-Zero Period

The a/d converter system during the Auto-Zero period is represented by Fig. 3-7. In the A/Z period, the input buffer is connected to reference ground and the A/Z buffer input is connected through R1507 to the integrator output. Note the M/Z line is low. The U/D line is being toggled at a 50% duty cycle, which results in a current through R1605 and R1505 at one-half of  $V_{\text{ref}} \div R_1$ . The dynamics of the a/d converter system causes the voltage on capacitor C1505 ( $C_{\text{strg}}$ ) to attain the value required for the sum of the currents entering the integrator summing mode to be zero. The A/Z voltage on C1505 is approximately  $-2 \text{ V}$ , which is equivalent to the integrator output voltage.

#### Measure Interval

During the measure interval (see Fig. 3-8), the input buffer is connected to  $V_{\text{in}}$  and supplies the integrator with a current equal to  $V_{\text{in}} \div R_2$ . Capacitor C1505 ( $C_{\text{strg}}$ ) is disconnected from the integrator output. The current developed from  $V_{\text{in}}$  causes the integrator output voltage to move from  $V_{\text{AZ}}$ . Digital converter U1603 attempts to keep the integrator output voltage close to  $V_{\text{AZ}}$  by adding or subtracting units of charge to integrator capacitor C1508 ( $C_{\text{int}}$ ). With a unit of charge equal to 14 counts, the net amount of charge for correction is totaled by the BCD counters. The measure interval can only resolve multiples of 14 counts.

#### Override Period

The override period immediately follows the measure interval and resolves the last of the measurement. The input buffer now connects to the high quality ground and the  $C_{\text{AZ}}$  switch is left open. The LD121 (U1603) causes the

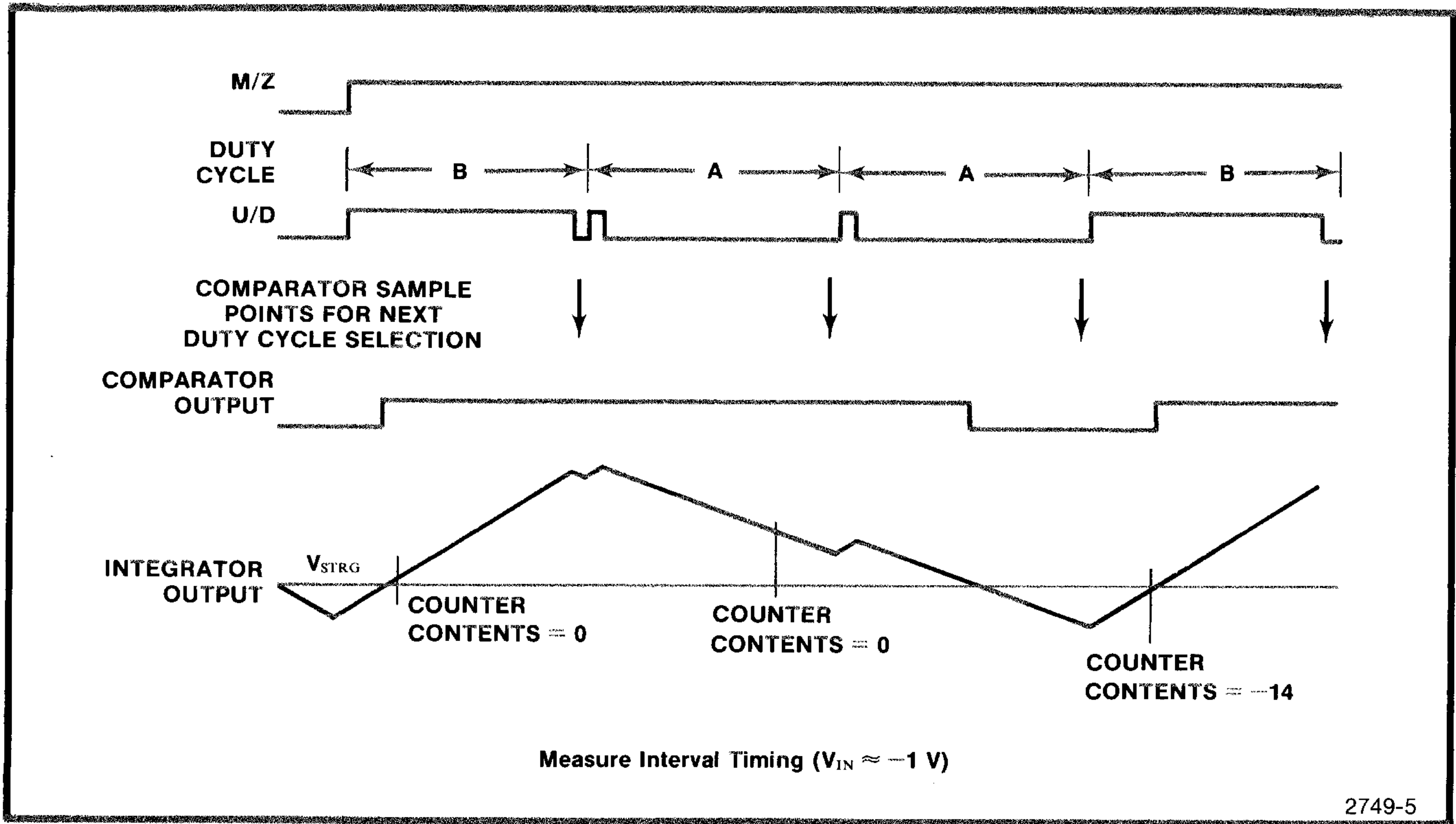


Fig. 3-7. Measure interval timing.

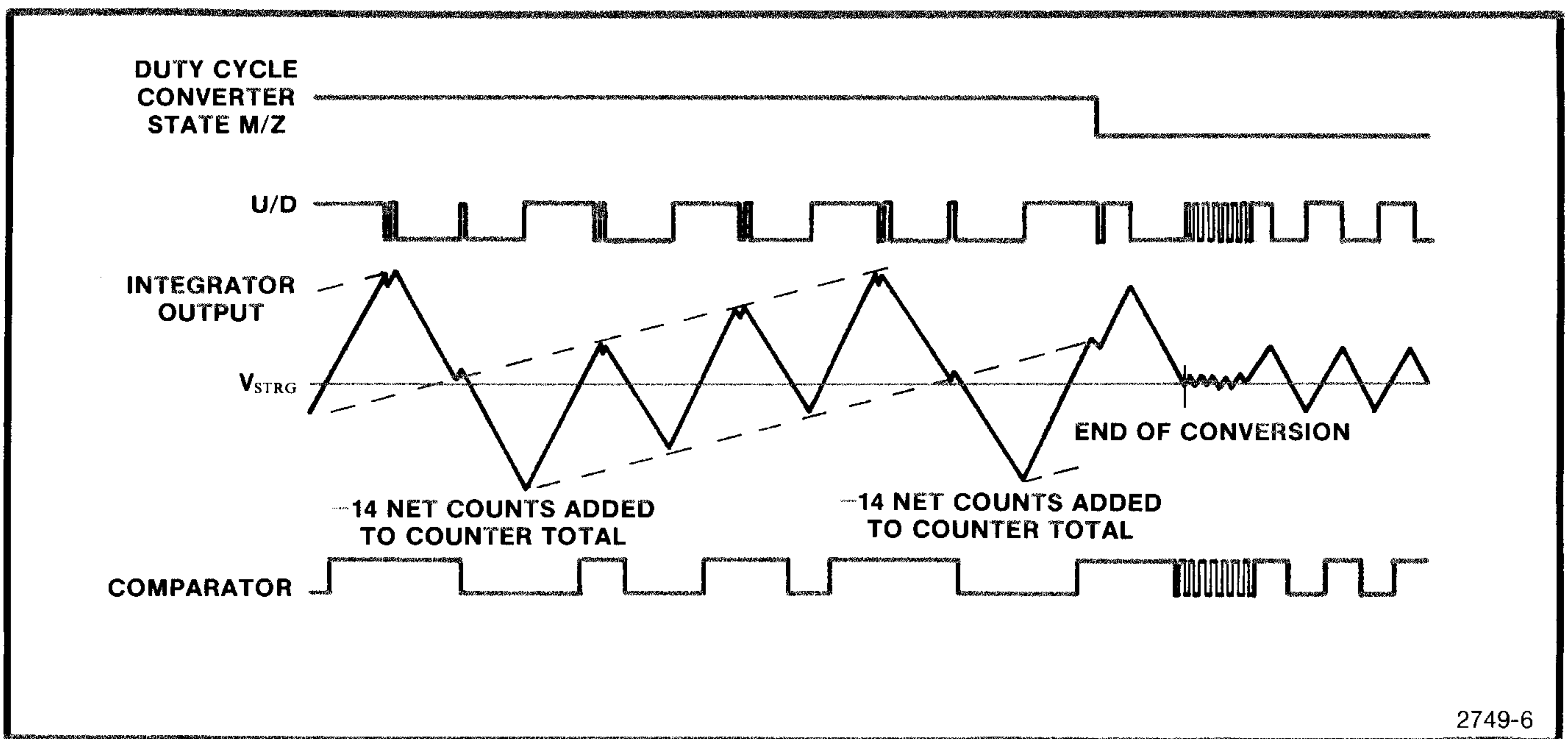


Fig. 3-8. Algorithm waveforms at end of measure interval.

integrator to go positive with respect to  $V_{AZ}$  (see Fig. 3-7), then returns it to  $V_{AZ}$  potential, stopping only when the LD120 (U1601) comparator changes state. The count is in single clock times.

The override period can exist a maximum of 56 clock times into the zero period, assuming the non-overload  $V_{in}$ . Since only 14 of the 16 counts in the U/D waveform (see Fig. 3-9) produce net counts, there are  $\pm 28,672$  counts maximum out of the measure period of 32,768 clock times available.

At the end of the measure period (after the last count cycle has accumulated its counts), the data in the counter is transferred to the data latches. The data is then multiplexed to the bcd outputs at the time the proper digit select line is enabled.

The digit select lines drive U1701, Digit Select Driver, which pulls down on the appropriate display common cathodes. During the time when each of the digit select lines on U1603 is enabled, the corresponding digit information is available at the bcd output.

## Display Driver 2

Display driver U1805 is a bcd to 7-segment decoder. The bcd digit information is decoded by U1805 and applied to the cathodes of 7-segment displays DS1000, DS1001, DS1100, DS1101, and DS1200. The output of U1805 is an active high that pulls up on the appropriate LED anodes. Figure 3-10 shows the waveforms available at the digit select lines and also the SIGN output. In addition to the sign information, the SIGN output also has the overrange and underrange information. The sign information is the only information used in this design.

## Clock 2

The clock for the LD121 (U1603) consists of Q1435, crystal Y1425, and associated circuitry. This clock circuit is a Pierce coupled oscillator that oscillates at 163.84 kHz.

## Decimal Point Circuitry 2

The decimal point circuit is composed of U1703, U1705, U1707, and associated circuitry. The decimal point line is only enabled when one of the range switches is selected and anded with a digit select line to turn on Q1805. The anded signal pulls the decimal point line high, turning on the appropriate decimal point at the correct time.

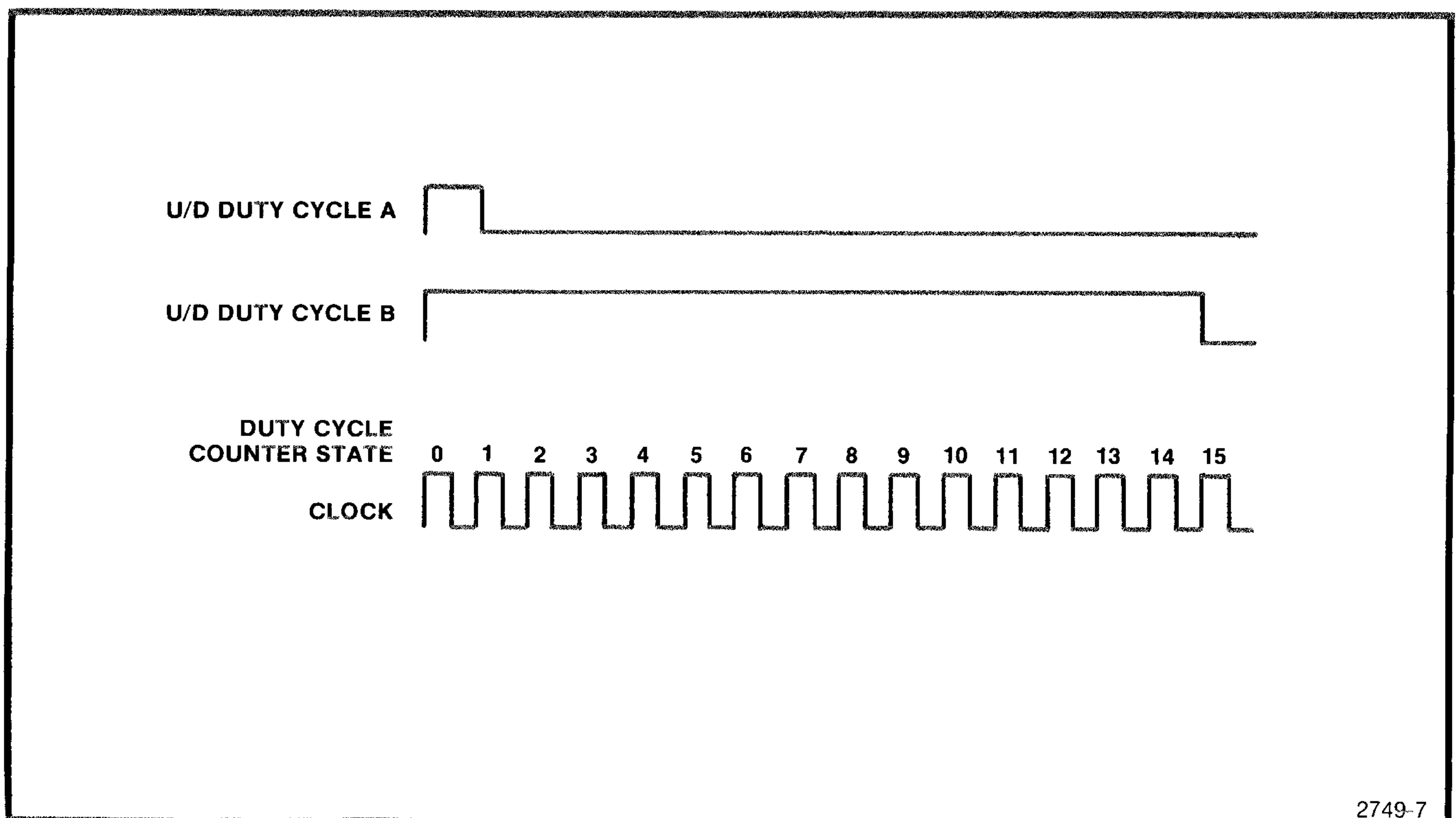


Fig. 3-9. Modulo 16 dual duty cycle counter waveforms.

**Power Supply** 3

The 25 Vac input to isolation transformer T1301 is supplied from the power module through rear interface pins 13A and 13B. The output voltage from pins 7 and 9 is rectified by CR1422 and applied to U1325 and U1335. These three-terminal regulators provide the +15 V source and -12 V source.

The output voltage from T1301, pins 10 and 12, is rectified by CR1424 and CR1426 and applied to U1431. This three-terminal regulator provides the +5 V source.

All three-terminal regulators are internally current limited.

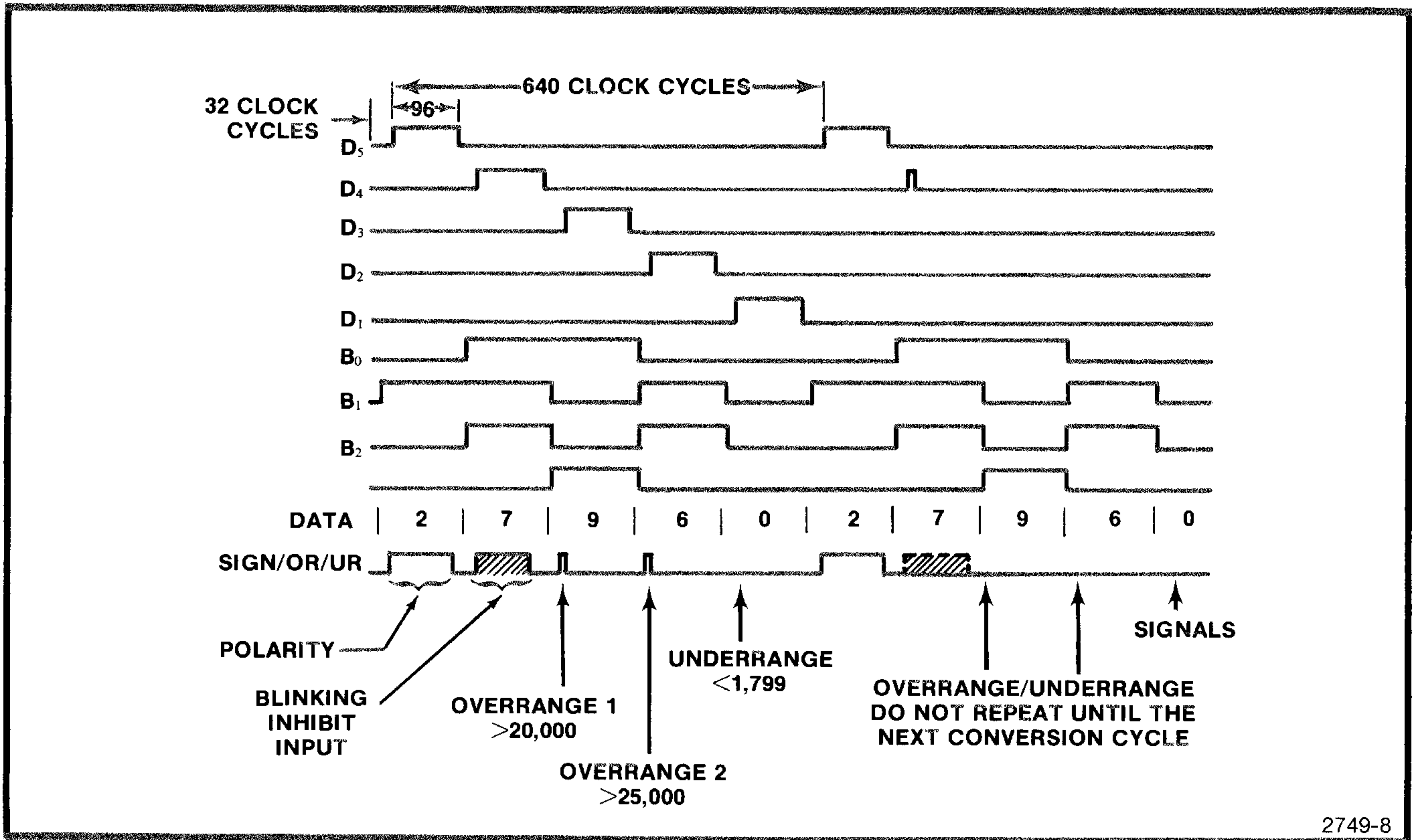


Fig. 3-10. LD121 data output waveforms.

# CALIBRATION PROCEDURE

## PERFORMANCE CHECK PROCEDURE

### Introduction

This procedure checks the electrical performance requirements as listed in the Specification section in this manual. Perform the Adjustment procedure if the instrument fails to meet these checks. In some cases, recalibration may not correct the discrepancy; circuit troubleshooting is then indicated. Also, use this procedure to determine acceptability of performance in an incoming inspection facility.

For convenience, many steps in this procedure check the performance of this instrument at only one value in the specified performance range. Any value within the specified range, within appropriate limits, may be substituted. Performance requirements for various temperature ranges are listed in this procedure; when performing the procedure, use only the Display Limits listed for the ambient temperature in which the instrument is operating.

To check the rear interface accuracy specifications, access the rear interface pins 28A (LO) and 28B (HI) with a TM 500-series Option 2 power module. Instructions and accuracy tables for rear interface performance checks are given following this procedure.

### Calibration Interval

To ensure instrument accuracy, check the calibration every 1000 hours of operation or at a minimum of every six months if used infrequently.

### Services Available

Tektronix, Inc. provides complete instrument repair and adjustment at local field service centers and at the factory service center. Contact your local Tektronix field office or representative for further information.

### Test Equipment Required

The following test equipment, or equivalent (refer to Table 4-1), is suggested to perform the Performance Check and Adjustment Procedure.

Table 4-1

LIST OF TEST EQUIPMENT REQUIREMENTS

Description	Performance Requirements	Applications	Example
Power Module		All tests.	TEKTRONIX TM 503 or TM 504.
Digital Voltmeter	Range, 0 to 50 V; accuracy, $\pm 0.1\%$ .	Voltage measurement.	TEKTRONIX DM 501A <sup>a</sup> , DM 502A <sup>a</sup> , DM 505 <sup>a</sup> .
Ac-Dc Current Source	Range, 0 to 2 A, sine-wave from 20 Hz to 10 kHz; accuracy, $\pm 0.06\%$ . Range, 0 to 2 A, dc accuracy, $\pm 0.02\%$ .	Ac-Dc ammeter accuracy check.	Valhalla Scientific Inc. 2500 Ac-Dc Current Calibrator.
Dc Voltage Source	Range, 0 to 1000 V; accuracy, $\pm 0.01\%$ .	Dc voltmeter accuracy check.	Fluke Model 343A or 341A Dc Voltage Calibrator.
Ac Voltage Source	Range, 0 to 500 V; accuracy, $\pm 0.05\%$ , 20 Hz to 20 kHz. Adjustable $\pm 0.2$ Hz at 50 Hz and 60 Hz.	Ac voltmeter accuracy check.	Fluke Model 5200A Ac Calibrator and Fluke Model 5215A Power Amplifier.

Table 4-1 (cont)

Description	Performance Requirements	Applications	Example
Resistance Standard	Range, 0 to 20 M $\Omega$ ; accuracy, $\pm 0.05\%$ .	Ohmmeter accuracy check.	Electro Scientific Industries, Inc. Model DB 62 Dekabox.
Temperature Bath	Range, $-62^{\circ}\text{C}$ to $+240^{\circ}\text{C}$ ; accuracy, $\pm 0.25^{\circ}\text{C}$ .	Temperature probe check and adjustment.	Neslab Instruments Inc., Model ULT-80 Bath Circulator with denatured ethyl alcohol coolant, Model TX-9 <sup>b</sup> Circulator with Dow Corning 710 fluid and necessary hoses and adapters.

<sup>a</sup>Requires a TM 500-series power module.

<sup>b</sup>Connect the TX-9 cooling coil to the cooling pump in the ULT-80 to obtain temperatures between  $+10^{\circ}\text{C}$  and  $+40^{\circ}\text{C}$ .

**WARNING**

*Dangerous voltages may be encountered in the following steps. Caution must be exercised. Do not contact the output connectors of the voltage calibrator, the input terminals of the DM 501A, or the internal circuitry of the DM 501A.*

**FRONT PANEL INPUT ACCURACY CHECKS**

**1. Check Dc Voltage Accuracy**

- a. Set the dc voltage calibrator for a minimum output voltage.
- b. Press the VOLTS DC function push button switch.
- c. Connect the dc voltage calibrator to the VOLTS/ $\Omega$  and LOW connectors through appropriate cables and adapters.
- d. Press the range push buttons and set the calibrator voltages as listed in Table 4-2.
- e. Check—that the DM 501A display reads within the display limits for the ambient temperature as listed in Table 4-2.
- f. Set the calibrator for a minimum output voltage.
- g. Remove all connections.

**2. Check Dc and Ac Common Mode Rejection Ratios**

- a. Connect a bnc female-to-dual banana connector to the VOLTS/ $\Omega$  and LOW connectors.
- b. Connect a dual-binding post with bnc male connector to the bnc female connector of the dual banana connector.
- c. Connect a 1 k $\Omega$  resistor between the binding posts.
- d. Connect the red lead of a clip lead adapter to female bnc connector to the red binding post (one side of the resistor).
- e. Connect the black lead of the clip lead adapter to the ground binding post of the DM 501A.
- f. Connect the bnc female connector through a coaxial cable to the dc voltage calibrator.
- g. Press the VOLTS DC function push button.

- h. Press the 200 mV range push button.
- i. Set the dc voltage calibrator for 10.00 V output.
- j. Check—the display for a reading of  $\leq 00.13$ .
- k. Move the red lead of the clip lead adapter to black binding post and repeat part j.
- l. Replace the dc voltage calibrator with an ac voltage calibrator.
- m. Set the ac calibrator for a 10 V ac rms output at either 50 or 60 Hz  $\pm 0.2$  Hz.
- n. Check—the display for a reading of  $\leq 01.44$ .
- o. Press the VOLTS AC TRUE RMS function push button.
- p. Check—the display for a reading of  $\leq 14.33$ .
- q. Move the red lead of the clip lead adapter back to the side of the resistor connected to the red binding post.
- r. Check as per part p.
- s. Press the VOLTS DC function push button.
- t. Check as per part n.
- u. Remove the connections to the DM 501A.

### 3. Check Dc Normal Mode Rejection (60 dB)

- a. Connect a bnc female-to-dual banana connector to the VOLTS/ $\Omega$  and LOW connectors.
- b. Connect the bnc female connector through a coaxial cable to the ac voltage calibrator.
- c. Press the VOLTS DC function push button.

- d. Press the 200 mV range push button.
- e. Set the ac calibrator for 1 V ac rms output at either 50 or 60 Hz,  $\pm 0.2$  Hz.
- f. Check—the display for a reading of  $\leq 01.41$ .

### 4. Check Ac Voltage Accuracy

- a. Connect the ac voltage calibrator to the VOLTS/ $\Omega$  and LOW connectors through appropriate cables and connectors.
- b. Press the VOLTS AC TRUE RMS function push button.
- c. Press the range push button and set the calibrator voltage as listed in Table 4-3.
- d. Check—that the DM 501A display reads within the display limits for the ambient temperatures and frequencies as listed in Table 4-3.
- e. Set the ac calibrator to a minimum voltage.

### 5. Check dBm Accuracy (Factory Shipped with internal jumper set for dBm readout)

- a. Press the VOLTS AC TRUE RMS and dB push buttons.
- b. Connect the ac voltage calibrator to the VOLTS/ $\Omega$  and LOW connectors through appropriate cables and connectors.
- c. Press the range push button and set the calibrator voltage and frequency as listed in Table 4-4.
- d. Check—that the DM 501A display readout is within the display limits for the ambient temperatures and frequencies as listed in Table 4-4.

Check dBV Mode limits. The check procedure is identical to the setup for the dBm Accuracy check with the exception of using the range push buttons and calibrator voltages as listed in Table 4-5.

**Calibration Procedure—DM 501A  
Performance Check Procedure**

**6. Check Ohms Accuracy**

- a. Connect a resistance standard to the VOLTS/ $\Omega$  and LOW connectors.
- b. Press the  $k\Omega$  function push button and the appropriate HI or LO push button as indicated in Table 4-6.
- c. Press the range push button and set the resistance standard as listed in Table 4-6.
- d. Check—that the DM 501A display reads within the display limits for the ambient temperature as listed in Table 4-6.
- e. Remove all connections.

**7. Check Dc Current Accuracy**

- a. Connect the dc current source to the mA and LOW connectors through appropriate cables and connectors with the positive source to the mA connector.
- b. Press the mA DC function push button.
- c. Press the range push button and set the current source as listed in Table 4-7.
- d. Check—that the DM 501A display readout is within the display limits for the ambient temperature as shown in Table 4-7.
- e. Remove the dc current source and all connections.

**8. Check Ac Current Accuracy**

- a. Connect the precision ac current source to the mA and LOW connectors through appropriate cables and connectors.
- b. Press the mA AC function push button.
- c. Press the range push button and set the current source as listed in Table 4-8.
- d. Check—that the DM 501A display reads within the display limits for the ambient temperature as listed in Table 4-8.

- e. Remove the AC current source and all connections.

**9. Check Temperature Accuracy**

- a. Connect the temperature probe to the TEMP connector located on the front panel.
- b. Press the TEMP $^{\circ}$ C push button.
- c. Set the temperature bath for the first temperatures shown in the Temperature column in Table 4-9.
- d. Insert the probe in the bath and allow the probe to stabilize at the selected temperature.
- e. Check—that the display limits are as listed in Table 4-9.
- f. Repeat parts c, d, and e for the subsequent temperatures listed in Table 4-9.
- g. This completes the front panel performance check.

**Rear Interface Accuracy Checks**

To verify the accuracy of the dc voltage, ac voltage and resistance modes via the DM 501A rear interface, follow the steps outlined in the Performance Check Procedure for the front panel input connectors, but apply the voltages and resistances to rear interface pins 28B (HI) and 28A (LO). Access to the rear interface pins is most easily made using a TM 500-series, Option 2 power module.

Press the front panel EXT-INT push button to select rear interface input and use Table 4-10, Table 4-11, Table 4-12, Table 4-13, or Table 4-14 for the appropriate input voltages, frequencies, and display limits.

**NOTE**

*The output cable fixture from the calibrating sources to the rear interface pins may have to be modified to accommodate accuracy checks via the rear interface.*



Table 4-2

FRONT PANEL DC VOLTAGE ACCURACY

Range	Dc Calibration Voltage	DISPLAY LIMITS	
		Ambient Temp. Range +18° C to +28° C	Ambient Temp. Range 0° C to +18° C, +28° C to +50° C
200 mV	190.00 mV	190.13 to 189.87	190.24 to 189.76
2 V	1.9000 V	1.9012 to 1.8988	1.9024 to 1.8976
20 V	19.000 V	19.012 to 18.988	19.024 to 18.976
200 V	190.00 V	190.12 to 189.88	190.24 to 189.76
1000 V	1000.0 V	1000.7 to 999.3	1001.5 to 998.5

Table 4-3

FRONT PANEL AC VOLTAGE ACCURACY

Range	Ac Calibration Voltage	DISPLAY LIMITS			
		Ambient Temp. Range +18° C to +28° C		Ambient Temp. Range 0° C to +18° C, +28° C to +50° C	
		40 Hz to 10 kHz	20 to 40 Hz, 10 to 20 kHz	40 Hz to 10 kHz	20 to 40 Hz, 10 to 20 kHz
200 mV	190.00 mV	191.24 to 188.76	192.00 to 188.00	191.67 to 188.33	192.62 to 187.38
2 V	1.9000 V	1.9124 to 1.8876	1.9200 to 1.8800	1.9167 to 1.8833	1.9262 to 1.8738
20 V	19.000 V	19.124 to 18.876	19.200 to 18.800	19.167 to 18.833	19.262 to 18.738
200 V	190.00 V	191.24 to 188.76	192.00 to 188.00	191.67 to 188.33	192.62 to 187.38
500 V	500.00 V	504.0 to 496.0	506.0 to 494.0	505.5 to 494.5	508.0 to 492.0

Table 4-4

FRONT PANEL dBm ACCURACY

Calibration Frequency, 20 Hz to 20 kHz, +20 dB to -15 dB  
20 Hz to 10 kHz, -15 dB to -20 dB

Range	Calibration Voltage	DISPLAY LIMITS	
		Ambient Temp. Range +18° C to +28° C	Ambient Temp. Range 0° C to +18° C, +28° C to +50° C
-40 dB	7.746 mV	-.5 to +.5	-1.1 to +1.1
-40 dB	77.46 mV	+19.5 to <sup>a</sup> +20.5	+18.9 to <sup>a</sup> +21.1
-40 dB	0.7746 mV	-19.5 to <sup>a</sup> -20.5 20 Hz to 2 kHz -18.5 to <sup>a</sup> -21.5 2 kHz to 10 kHz	-18.9 to <sup>a</sup> -21.1 20 Hz to 2 kHz -17.9 to <sup>a</sup> -22.1 2 kHz to 10 kHz
-20 dB	7.746 mV	-19.5 to -20.5 20 Hz to 2 kHz -18.5 to -21.5 2 kHz to 10 kHz	-18.9 to -21.1 20 Hz to 2 kHz -17.9 to -22.1 2 kHz to 10 kHz
-20 dB	77.46 mV	-.5 to +.5	-1.1 to +1.1
-20 dB	774.6 mV	+19.5 to <sup>a</sup> +20.5	+18.9 to <sup>a</sup> +21.1

<sup>a</sup>When a 2 is displayed, the DM 501A overranges (flashing display) and illuminates the upper segment of the 1 in the most significant digit.

Table 4-5

FRONT PANEL dBV ACCURACY

Calibration Frequency, 20 Hz to 20 kHz, +20 dB to -15 dB  
20 Hz to 10 kHz, -15 dB to -20 dB

Range	Calibration Voltage	DISPLAY LIMITS	
		Ambient Temp. Range +18° C to +28° C	Ambient Temp. Range 0° C to +18° C, +28° C to +50° C
-40 dB	10 mV	-.5 to +.5	-1.1 to +1.1
-40 dB	100 mV	+19.5 to <sup>a</sup> +20.5	+18.9 to <sup>a</sup> +21.1
-40 dB	1 mV	-19.5 to <sup>a</sup> -20.5 20 Hz to 2 kHz -18.5 to <sup>a</sup> -21.5 2 kHz to 10 kHz	-18.9 to <sup>a</sup> -21.1 20 Hz to 2 kHz -17.9 to <sup>a</sup> -22.1 2 kHz to 10 kHz
-20 dB	10 mV	-19.5 to -20.5 20 Hz to 2 kHz -18.5 to -21.5 2 kHz to 10 kHz	-18.9 to -21.1 20 Hz to 2 kHz -17.9 to -22.1 2 kHz to 10 kHz
-20 dB	100 mV	-.5 to +.5	-1.1 to +1.1
-20 dB	1 V	+19.5 to <sup>a</sup> +20.5	+18.9 to <sup>a</sup> +21.1

<sup>a</sup>When a 2 is displayed, the DM 501A overranges (flashing display) and illuminates only the upper segment of the 1 in the most significant digit.

Table 4-6

FRONT PANEL RESISTANCE ACCURACY

Range	Resistance	DISPLAY LIMITS			
		Ambient Temp. Range +18° C to +28° C		Ambient Temp. Range 0° C to +18° C, +28° C to +50° C	
		HI	LO	HI	LO
200 Ω	190.00 Ω		190.32 to 189.68		190.62 to 189.38
2 kΩ	1.9000 kΩ	1.9032 to 1.8968	1.9032 to 1.8968	1.9062 to 1.8938	1.9062 to 1.8938
20 kΩ	19.000 kΩ	19.032 to 18.968	19.032 to 18.968	19.062 to 18.938	19.062 to 18.938
200 kΩ	190.00 kΩ	190.32 to 189.68	190.32 to 189.68	190.62 to 189.38	190.62 to 189.38
2000 kΩ	1900.0 kΩ	1903.2 to 1896.8	1906.0 to 1894.0	1906.2 to 1893.8	1923.3 to 1876.7
20 MΩ	19.000 MΩ	19.098 to 18.902		19.233 to 18.767	

Table 4-7

FRONT PANEL DC CURRENT ACCURACY

Range	Current	DISPLAY LIMITS	
		Ambient Temp. Range +18° C to +28° C	Ambient Temp. Range 0° C to +18° C, +28° C to +50° C
200 μA	190.00 μA	190.41 to 189.59	190.62 to 189.38
2 mA	1.9000 mA	1.9041 to 1.8959	1.9062 to 1.8938
20 mA	19.000 mA	19.041 to 18.959	19.062 to 18.938
200 mA	190.00 mA	190.41 to 189.59	190.62 to 189.38
2000 mA	1900.0 mA	1904.1 to 1895.9	1906.2 to 1893.8

Table 4-8

FRONT PANEL AC CURRENT ACCURACY

Range	Current	DISPLAY LIMITS	
		Ambient Temp. Range +18° C to +28° C	Ambient Temp. Range 0° C to +18° C, +28° C to +50° C
200 $\mu$ A	190.00 $\mu$ A	191.24 to 188.76	191.48 to 188.52
2 mA	1.9000 mA	1.9124 to 1.8876	1.9148 to 1.8852
20 mA	19.000 mA	19.124 to 18.876	19.148 to 18.852
200 mA	190.00 mA	191.24 to 188.76	191.48 to 188.52
2000 mA	1900.0 mA	1912.4 to 1887.6	1914.8 to 1885.2

Table 4-9

TEMPERATURE LIMITS

Temperature	DISPLAY LIMITS			
	Probe Calibrated To Instrument		Any Probe	
	Ambient Temp. Range		Ambient Temp. Range	
	+18° C to +28° C	0° C to +18° C +28° C to +50° C	+18° C to +28° C	0° C to +18° C +28° C to +50° C
-62° C	-60 to -64	-58.5 to -65.5	-58 to -66	-56.5 to -67.5
+125° C	+123 to +127	+121.5 to +128.5	+121 to +129	+119.5 to +130.5
+200° C	+194 to +200	+192.5 to +201.5	+192 to +202	+190.5 to +203.5

Table 4-10

REAR INTERFACE DC VOLTAGE ACCURACY

Range	Dc Calibration Voltage	DISPLAY LIMITS	
		Ambient Temp. Range +18° C to +28° C	Ambient Temp. Range 0° C to +18° C, +28° C to +50° C
200 mV	190.00 mV	190.13 to 189.87	190.24 to 189.76
2 V	1.9000 V	1.9012 to 1.8988	1.9024 to 1.8976
20 V	19.000 V	19.012 to 18.988	19.024 to 18.976
200 V	190.00 V	190.12 to 189.88	190.24 to 189.76
1000 V	190.00 V	190.3 to 189.7	190.7 to 189.3

Table 4-11

REAR INTERFACE AC VOLTAGE ACCURACY

Range	Ac Calibration Voltage	DISPLAY LIMITS			
		Ambient Temp. Range +18° C to +28° C		Ambient Temp. Range 0° C to +18° C, +28° C to +50° C	
		40 Hz to 10 kHz	20 to 40 Hz, 10 to 20 kHz	40 Hz to 10 kHz	20 to 40 Hz, 10 to 20 kHz
200 mV	190.00 mV	193.14 to 186.86	193.90 to 186.10	193.57 to 186.43	194.52 to 185.48
2 V	1.9000 V	1.9314 to 1.8686	1.9390 to 1.8610	1.9357 to 1.8643	1.9452 to 1.8548
20 V	19.000 V	19.314 to 18.686	19.390 to 18.610	19.357 to 18.643	19.452 to 18.548
200 mV	190.00 V	193.14 to 186.86	193.90 to 186.10	193.57 to 186.43	194.52 to 185.48
500 V	190.00 V	194.0 to 186.0	194.8 to 185.2	194.9 to 185.1	195.9 to 184.1

Table 4-12

REAR INTERFACE RESISTANCE ACCURACY

Range	Resistance	DISPLAY LIMITS			
		Ambient Temp. Range +18° C to +28° C		Ambient Temp. Range 0° C to +18° C, +28° C to +50° C	
		HI	LO	HI	LO
200 Ω	190.00 Ω		190.34 to 189.70		190.64 to 189.40
2 kΩ	1.9000 kΩ	1.9032 to 1.8968	1.9032 to 1.8968	1.9062 to 1.8938	1.9062 to 1.8938
20 kΩ	19.000 kΩ	19.032 to 18.968	19.032 to 18.968	19.062 to 18.938	19.062 to 18.838
200 kΩ	190.00 kΩ	190.32 to 189.68	190.32 to 189.68	190.62 to 189.38	190.62 to 189.38
2000 kΩ	1900.0 kΩ	1903.2 to 1896.8	1906.0 to 1894.0	1906.2 to 1893.8	1923.3 to 1876.7
20 MΩ	19.000 MΩ	19.098 to 18.902		19.233 to 18.767	

Table 4-13

REAR INTERFACE dBm ACCURACY

Calibration Frequency, 20 Hz to 20 kHz, +20 dB to -15 dB  
20 Hz to 10 kHz, -15 dB to -20 dB

Range	Calibration Voltage	DISPLAY LIMITS	
		Ambient Temp. Range +18° C to +28° C	Ambient Temp. Range 0° C to +18° C, +28° C to +50° C
-40 dB	7.746 mV	-.6 to +.6	-1.2 to +1.2
-40 dB	77.46 mV	+19.4 to <sup>a</sup> +20.6	+18.8 to <sup>a</sup> +21.2
-40 dB	0.7746 mV	-19.4 to -20.6 20 Hz to 2 kHz -18.4 to -21.6 2 kHz to 10 kHz	-18.8 to -21.2 20 Hz to 2 kHz -17.8 to -22.2 2 kHz to 10 kHz
-20 dB	7.746 mV	-19.4 to -20.6 20 Hz to 2 kHz -18.4 to -21.6 2 kHz to 10 kHz	-18.8 to -21.2 20 Hz to 2 kHz -17.8 to -22.2 2 kHz to 10 kHz
-20 dB	77.46 mV	-.6 to +.6	-1.2 to +1.2
-20 dB	774.6 mV	+19.4 to <sup>a</sup> +20.6	+18.8 to <sup>a</sup> +21.2

<sup>a</sup>When a 2 is displayed, the DM 501A overranges (flashing display) and illuminates only the upper segment of the 1 in the most significant digit.

Table 4-14

REAR INTERFACE dBV ACCURACY

Calibration Frequency, 20 Hz to 20 kHz, +20 dB to -15 dB  
20 Hz to 10 kHz, -15 dB to -20 dB

Range	Calibration Voltage	DISPLAY LIMITS	
		Ambient Temp. Range +18° C to +28° C	Ambient Temp. Range 0° C to +18° C, +28° C to +50° C
-40 dB	10 mV	-.6 to +.6	-1.3 to +1.3
-40 dB	100 mV	+19.4 to <sup>a</sup> +20.6	+18.7 to <sup>a</sup> +21.3
-40 dB	1 mV	-19.4 to -20.6 20 Hz to 2 kHz -18.4 to -21.6 2 kHz to 10 kHz	-18.8 to -21.2 20 Hz to 2 kHz -17.8 to -22.2 2 kHz to 10 kHz
-20 dB	10 mV	-19.4 to -20.6 20 Hz to 2 kHz -18.4 to -21.6 2 kHz to 10 kHz	-18.8 to -21.2 20 Hz to 2 kHz -17.8 to -22.2 2 kHz to 10 kHz
-20 dB	100 mV	-.6 to +.6	-1.3 to +1.3
-20 dB	1 V	+19.4 to <sup>a</sup> +20.6	+18.7 to <sup>a</sup> +21.3

<sup>a</sup>When a 2 is displayed, the DM 501A overranges (flashing display) and illuminates the upper segment of the 1 in the most significant digit.

# ADJUSTMENT PROCEDURE

## Introduction

Use this Adjustment Procedure to restore the DM 501A to original performance requirements. This Adjustment Procedure need not be performed unless the instrument fails to meet the Performance Requirements of the electrical characteristics listed in the Specification section, or if the Performance Check procedure cannot be completed satisfactorily. If the instrument has undergone repairs, the Adjustment Procedure is recommended.

Satisfactory completion of all adjustment steps in this procedure ensures that the instrument will meet the Performance Requirements.

## Test Equipment Required

The test equipment (or equivalent) listed in Table 4-1 is required for adjustment of the DM 501A. Specifications given for the test equipment are the minimum necessary for accurate adjustment. All test equipment is assumed to be correctly calibrated and operating within specifications.

If other test equipment is substituted, calibration setup may need to be altered to meet the requirements of the equipment used.

## Preparation

Access to the internal adjustments is achieved most easily when the DM 501A is connected to the power module with a flexible plug-in extender. Remove the left side cover of the DM 501A to access the adjustments on the main and attenuator boards. The electrical shield must be removed to make temperature adjustments. See Fig. 8-3 in the Diagram section at the rear of this manual.

Remove the power module cabinet to make adjustments to the DM 501A inside the power module. Install the DM 501A in the right side compartment of the power module with its unused compartments on the left side. Make adjustments at an ambient temperature between 21°C and 25°C (70°F and 77°F).

### 1. Check Power Supplies

- a. Set the test voltmeter to the 20 V range.

- b. Connect one lead of the voltmeter to the +15 V point located on the Main board, and the other lead to the LOW test point.

- c. Check—for a +15 V reading,  $\pm 6\%$  (between +14.1 V and +15.9 V).

- d. Disconnect the voltmeter lead from the +15 V point and reconnect this lead to the -12 V point of the Main board.

- e. Check—for a -12 V reading,  $\pm 6\%$  (between +11.28 V and +12.72 V).

- f. Disconnect the voltmeter lead from the -12 V point and reconnect this lead to the +5 V point on the Main board.

- g. Check—for a +5 V reading,  $\pm 6\%$  (between +4.70 V and +5.30 V).

### 2. Adjust 2 Vdc $\emptyset$ and 200 mVdc $\emptyset$

- a. Press the VOLTS DC push button.

- b. Connect a shorting strap from the LOW connector to the VOLTS/ $\Omega$  connector on the front panel of the DM 501A.

- c. Press the 2 V range push button switch.

- d. Adjust—R1405 (2 Vdc  $\emptyset$ ) for a DM 501A display reading of  $\pm 0.0000$ .

- e. Press the 200 mV range push button.

- f. Adjust—R1415 (200 mVdc  $\emptyset$ ), located on the Main board, for a DM 501A display reading of -00.01 to +00.01.

- g. Remove the shorting strap between the LOW and VOLTS/ $\Omega$  front panel connectors.

### 3. Adjust Dc Voltage Ranges

- a. Select the range and required dc calibration voltage in the order listed in Table 4-15.

#### NOTE

*The adjustment of the 2 Vdc range interacts with the setting of the 200 mV range but not vice-versa.*

**Calibration Procedure—DM 501A  
Adjustment Procedure**

- b. Adjust the selected control for the required display.
- c. Return the calibrator to a minimum voltage.
- d. Remove connections.

**4. Adjust AC Converter and Attenuator Compensation**

- a. Press the VOLTS AC function push button.
- b. Press the 2 V range push button.
- c. Set the ac voltage source frequency to 10 kHz with an output of 0.1000 V rms.
- d. Connect the ac voltage source to the LOW connector and VOLTS/ $\Omega$  connector on the front panel.
- e. Adjust R1525 (LO Vac) for a display reading of .0997—.1002.
- f. Set the ac calibrator for a voltage of 1.9000 V rms at 10 kHz.
- g. Adjust R1537 (2 Vac) for a display reading of 1.8995—.1.9005.
- h. Interaction may occur in the adjustments of R1525 and R1537. Repeat step 2, part b through part g, as needed.
- i. Adjust 20 Vac, 200 Vac, and 500 Vac ranges.

**WARNING**

*Use an insulated shaft adjustment tool when adjusting capacitors C1114, C1128, and C1129. The input potential is connected to the metal top of these capacitors.*

- j. Using Table 4-16, set the range and the required ac calibration voltage. Adjust the selected control for the required display reading.
- k. Set the ac voltage calibrator to a minimum voltage.

- l. Remove connections.

**5. Adjust dB $\emptyset$  and dB Gain**

- a. Press the VOLTS AC push button.
- b. Check and note the position of the dBm/dBV internal jumper. Set the ac calibrator for 77.46 mV (dBm) or 100.00 mV (dBV) at a frequency of 10 kHz.
- c. Press the dB function push button.
- d. Press the -20 dB range push button.
- e. Adjust R1535 (dB $\emptyset$ ) for a display reading of -.1 to -.2.
- f. Set the ac calibrator for 774.6 mV (dBm) or 1.0000 V (dBV).
- g. Adjust R1528 (dB Gain) for a flashing display positive reading with the upper segment of the 1 in the most significant digit followed by the numerals 0.0.
- h. Set the ac calibrator for 7.746 mV (dBm) or 10.00 mV (dBV).
- i. Check for a flashing display negative reading with the upper segment of the 1 in the most significant digit followed by the numerals 0.0.
- j. The settings of R1535 (dB $\emptyset$ ) and R1528 (dB Gain) may need to be compromised for optimum operation within the limits specified. Refer to Tables 4-4 or 4-5.
- k. Remove the ac calibrator connections from the DM 501A.

**6. Adjust HI Ohms and LO Ohms**

- a. Press the k $\Omega$  function push button.
- b. Press the 20 k $\Omega$  range push button.
- c. Set all other push buttons to the out position.



- d. Set the resistance standard for 19.000 k $\Omega$ .
- e. Connect the resistance standard between the VOLTS/ $\Omega$  and LOW input connectors.
- f. With the HI-LO push button in the out position, adjust R1426 (HI  $\Omega$ ) for a display reading of 18.994 to 19.006.
- g. Press the HI-LO push button.
- h. Adjust R1412 (LO  $\Omega$ ) for a display reading of 18.994 to 19.006.
- i. Remove the resistance standard connections from the DM 501A.
- b. Connect the temperature probe to the front panel TEMP connector.
- c. Press the TEMP $^{\circ}$ C function push button.
- d. Place the temperature probe in a 0.0 $^{\circ}$ C (ice-bath) environment. Allow enough time for the display reading to stabilize.
- e. Adjust R1731 (TEMP  $\emptyset$ ) for a display reading of -000.2 to +000.2.
- f. Place the temperature probe in a 100.0 $^{\circ}$ C environment. Allow enough time for the display reading to stabilize.
- g. Adjust R1831 (TEMP Set) for a display reading of 99.7 to 100.3.
- h. Interaction may occur in TEMP  $\emptyset$  and TEMP Set adjustments. Repeat step 7 parts d through g, as needed.

**7. Adjust TEMP  $\emptyset$  and TEMP Set**

**Table 4-15**

**DC VOLTAGE RANGE ADJUSTMENTS**

Range	Calibration Voltage	Adjust	Component Location	Display Reading
2 V	1.9000 V	R1505 (2 Vdc)	Main	1.8997—1.9003
200 mV	190.00 mV	R1504 (200 mVdc)	Main	1.8996—1.9004
20 V	19.000 V	R1104 (20 Vdc)	Attenuator	18.997—19.003
200 V	190.00 V	R1110 (200 Vdc)	Attenuator	189.97—190.03
1000 V	1000.0 V	R1114 (1000 Vdc)	Attenuator	999.80—1000.2

**Table 4-16**

**AC VOLTAGE RANGE ADJUSTMENTS**

Range	Calibration Voltage at 10 kHz	Adjust	Component Location	Display Reading
20 V	19.000	C1114 (20 Vac)	Attenuator	18.990—19.010
200 V	190.00	C1128 (200 Vac)	Attenuator	189.90—190.10
500 V	500.00	C1129 (500 Vac)	Attenuator	499.50—500.50

# MAINTENANCE

## Recalibration

To ensure accurate measurements, check the calibration of this instrument after each 1000 hours of operation or very six months if used infrequently. In addition, replacement of components may necessitate recalibration of the affected circuits. Refer to the Adjustment Procedure in the Calibration section.

## Circuit Board Removal

To remove the circuit boards, remove the instrument snap-in side covers and electrical shield located under the side covers. To remove the Main board, carefully unsolder the connections to the front-panel connectors and remove the four screws that secure the Main board to the plug-in frame. Slide the Main board towards the rear of the instrument to clear the push button switch shafts.

The Display board, which attaches to the Main board through two connectors, can be removed with the Main board or through the front-panel display window. The display window is removed by pressing down on the two plastic tabs which are accessed through the rectangular holes at the top front of the plug-in frame.

The Attenuator board is removed by carefully unsoldering the connections from the range switch assembly and the wire strap located at the rear of the board.

## Switch Removal

The range switch assembly can be removed by carefully unsoldering the bottom connections from the Main board. Pull the switch assembly up and out until the push button switches clear the front panel.

The three switch assemblies comprising the function switches are located on the front and back sides of the Main board. All three switch assemblies are removed by carefully unsoldering the connections and pulling up and out on each assembly to clear the push buttons from the front panel.

## Heat Sink and Regulator Integrated Circuit Removal and Replacement

For heat sink removal, a special tool can be used to spread the heat sink tabs, releasing the heat sinks from the regulator integrated circuit. The special tool, assembly

No. 311, can be obtained from FAB TEK, INC. (17 Sugar Hollow Road; Danbury, CT 06810). If this tool is not available, a knife blade or thin-bladed tool can be used to spread the heat sink spring tabs. Use care not to spring the tabs beyond their elastic limit.

To remove the regulators, unsolder the three leads from each of the three regulator integrated circuits (U1325, U1335, and U1431), disconnecting them from the main board. Reverse this procedure to install the heat sink and regulator integrated circuit.

## Cleaning Instructions

This instrument should be cleaned as often as operating conditions require. Accumulation of dirt on components acts as an insulating blanket and prevents efficient heat dissipation that can cause overheating and component breakdown.

### CAUTION

*Avoid the use of chemical cleaning agents that might leave a film or damage the plastic material used in this instrument. Use a non-residue type of cleaner; preferably, isopropyl alcohol or totally denatured ethyl alcohol. Before using any other type of cleaner, consult your Tektronix Service Center or representative.*

## Exterior

Loose dust accumulated on the front panel can be removed with a soft cloth or a small brush. Dirt that remains can be removed with a soft cloth dampened with a mild detergent and water solution. Abrasive cleaners should not be used.

## Interior

### WARNING

*To avoid electrical shock, disconnect the instrument test leads from the circuit under test and turn off the power module before removing the instrument.*

Dust in the interior of the instrument should be removed occasionally due to its electrical conductivity under high humidity conditions. The best way to clean the interior is to blow off the accumulated dust with dry, low

## Maintenance—DM 501A

pressure air, then use a soft brush. If further cleaning is required, use a mild detergent and water solution, flushing well with clean water.



*Variable capacitors C1114, C1128, and C1129 should not be cleaned, as their electrical performances will be degraded. If the Attenuator board requires washing, remove C1114, C1128, and C1129 by carefully unsoldering the appropriate connections.*

If the push button switches are washed, all switches should be in the out position; otherwise, there is a possibility of switch malfunction.

Drying can be accomplished with dry, low-pressure air or by placing in an oven at 40° C to 60° C for approximately four hours.

After making minor board repairs, cleaning is best accomplished by carefully flaking or chipping the solder flux from the repaired area.

Isopropyl alcohol can be used to clean major repairs to the circuit board; however, flush the board well with clean, isopropyl alcohol. Make certain that resin or dirt is carefully removed from board areas of high impedance circuitry.

### Obtaining Replacement Parts

Most electrical and mechanical parts can be obtained through your local Tektronix Field Office or representative. However, you should be able to obtain many of the standard electronic components from a local commercial source in your area. Before you purchase or order a part from a source other than Tektronix, Inc., please check the Replaceable Electrical Parts list for the proper value, rating, tolerance, and description.

### Ordering Parts

When ordering replacement parts from Tektronix, Inc., it is important that all of the following information be included to ensure receiving the proper parts.

1. Instrument type (include modification or option numbers).
2. Instrument serial number.

3. A description of the part (if electrical, include the component number).

4. Tektronix part number.

### Troubleshooting Aids

**Troubleshooting Charts.** As an aid in locating problem areas, troubleshooting charts are provided for the DM 501A. They are located in the Diagram section in the rear of this manual.

### Static-Sensitive Components



*Static discharge can damage any semiconductor component in this instrument.*

This instrument contains electrical components that are susceptible to damage from static discharge. See Table 5-1 for relative susceptibility of various classes of semiconductors. Static voltages of 1 kV to 30 kV are common in unprotected environments.

Observe the following precautions to avoid damage:

1. Minimize handling of static-sensitive components.
2. Transport and store static-sensitive components or assemblies in their original containers, on a metal rail, or on conductive foam. Label any package that contains static-sensitive assemblies or components.
3. Discharge the static voltage from your body by wearing a wrist strap while handling these components. Servicing static-sensitive assemblies or components should be performed only at a static-free work station by qualified service personnel.
4. Nothing capable of generating or holding a static charge should be allowed on the work station surface.
5. Keep the component leads shorted together whenever possible.
6. Pick up components by the body, never by the leads.
7. Do not slide the components over any surface.

8. Avoid handling components in areas that have a floor or work surface covering capable of generating a static charge.
9. Use a soldering iron that is connected to earth ground.
10. Use only special antistatic suction type or wick type desoldering tools.

### Test Equipment

Before using any test equipment to make measurements on static-sensitive components or assemblies, be certain that any voltage or current supplied by the test equipment does not exceed the limits of the component to be tested.

**Table 5-1**  
**RELATIVE SUSCEPTIBILITY TO**  
**STATIC DISCHARGE DAMAGE**

Semiconductor Classes	Relative Susceptibility Levels <sup>a</sup>
MOS or CMOS microcircuits or discretes, or linear microcircuits with MOS inputs (Most Sensitive)	1
ECL	2
Schottky signal diodes	3
Schottky TTL	4
High-frequency bipolar transistors	5
JFETs	6
Linear microcircuits	7
Low-power Schottky TTL	8
TTL (Least Sensitive)	9

<sup>a</sup>Voltage equivalent for levels:

1 = 100 to 500 V	4 = 500 V	7 = 400 to 1000 V (est.)
2 = 200 to 500 V	5 = 400 to 600 V	8 = 900 V
3 = 250 V	6 = 600 to 800 V	9 = 1200 V

(Voltage discharged from a 100 pF capacitor through a resistance of 100 ohms.)

# OPTIONS

The standard instrument incorporates the temperature measuring capability using a TEKTRONIX P6601 probe or other suitable sensing device.

An Option 2 instrument deletes the temperature measurement function, P6601 temperature probe, and all internal circuits associated with this function.

Information concerning an Option 2 instrument can be found on schematic diagrams 1 and 2, in the Replaceable Electrical Parts list, and in the Calibration section of this manual. The factory will hardwire the deleted switch positions as shown on the diagrams. Information concerning the TEKTRONIX P6601 Temperature Probe can be found in the instruction manual for that accessory.

# REPLACEABLE ELECTRICAL PARTS

## PARTS ORDERING INFORMATION

Replacement parts are available from or through your local Tektronix, Inc. Field Office or representative.

Changes to Tektronix instruments are sometimes made to accommodate improved components as they become available, and to give you the benefit of the latest circuit improvements developed in our engineering department. It is therefore important, when ordering parts, to include the following information in your order: Part number, instrument type or number, serial number, and modification number if applicable.

If a part you have ordered has been replaced with a new or improved part, your local Tektronix, Inc. Field Office or representative will contact you concerning any change in part number.

Change information, if any, is located at the rear of this manual.

### LIST OF ASSEMBLIES

A list of assemblies can be found at the beginning of the Electrical Parts List. The assemblies are listed in numerical order. When the complete component number of a part is known, this list will identify the assembly in which the part is located.

### CROSS INDEX-MFR. CODE NUMBER TO MANUFACTURER

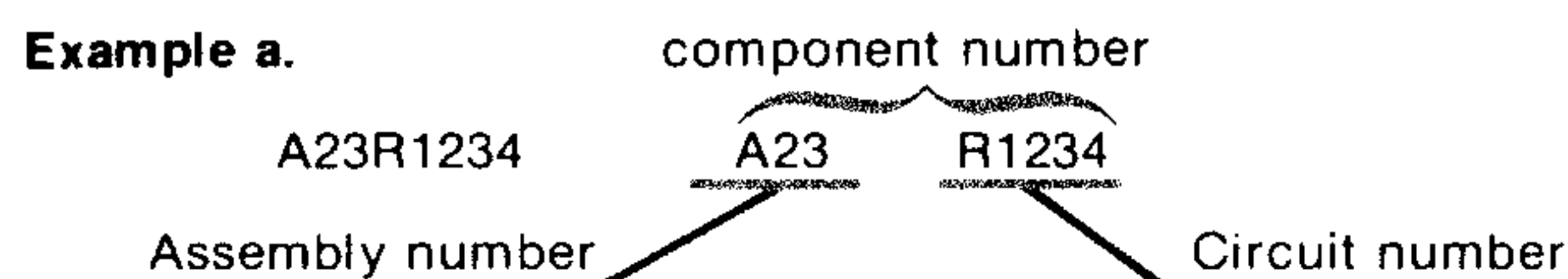
The Mfr. Code Number to Manufacturer index for the Electrical Parts List is located immediately after this page. The Cross Index provides codes, names and addresses of manufacturers of components listed in the Electrical Parts List.

### ABBREVIATIONS

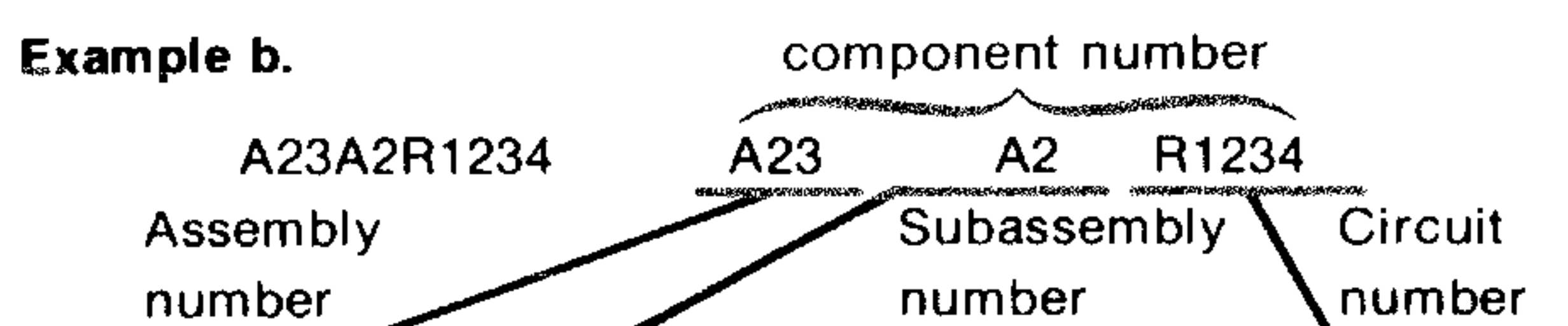
Abbreviations conform to American National Standard Y1.1.

### COMPONENT NUMBER (column one of the Electrical Parts List)

A numbering method has been used to identify assemblies, subassemblies and parts. Examples of this numbering method and typical expansions are illustrated by the following:



**Read: Resistor 1234 of Assembly 23**



**Read: Resistor 1234 of Subassembly 2 of Assembly 23**

Only the circuit number will appear on the diagrams and circuit board illustrations. Each diagram and circuit board illustration is clearly marked with the assembly number. Assembly numbers are also marked on the mechanical exploded views located in the Mechanical Parts List. The component number is obtained by adding the assembly number prefix to the circuit number.

The Electrical Parts List is divided and arranged by assemblies in numerical sequence (e.g., assembly A1 with its subassemblies and parts, precedes assembly A2 with its subassemblies and parts).

Chassis-mounted parts have no assembly number prefix and are located at the end of the Electrical Parts List.

### TEKTRONIX PART NO. (column two of the Electrical Parts List)

Indicates part number to be used when ordering replacement part from Tektronix.

### SERIAL/MODEL NO. (columns three and four of the Electrical Parts List)

Column three (3) indicates the serial number at which the part was first used. Column four (4) indicates the serial number at which the part was removed. No serial number entered indicates part is good for all serial numbers.

### NAME & DESCRIPTION (column five of the Electrical Parts List)

In the Parts List, an Item Name is separated from the description by a colon (:). Because of space limitations, an Item Name may sometimes appear as incomplete. For further Item Name identification, the U.S. Federal Cataloging Handbook H6-1 can be utilized where possible.

### MFR. CODE (column six of the Electrical Parts List)

Indicates the code number of the actual manufacturer of the part. (Code to name and address cross reference can be found immediately after this page.)

### MFR. PART NUMBER (column seven of the Electrical Parts List)

Indicates actual manufacturers part number.

CROSS INDEX—MFR. CODE NUMBER TO MANUFACTURER

Mfr. Code	Manufacturer	Address	City, State, Zip
S3013	LEMO SA ELEKTROTECHNIQUE	RTE DE LAUSANNE MORGES	SWITZERLAND
00779	AMP, INC.	P O BOX 3608	HARRISBURG, PA 17105
00815	NORTHERN ENG. LABS, INC.	357 BELIOT	BURLINGTON, WISCONSIN 59105
00853	SANGAMO ELECTRIC CO., S. CAROLINA DIV.	P O BOX 128	PICKENS, SC 29671
01121	ALLEN-BRADLEY COMPANY	1201 2ND STREET SOUTH	MILWAUKEE, WI 53204
01295	TEXAS INSTRUMENTS, INC., SEMICONDUCTOR GROUP	P O BOX 5012, 13500 N CENTRAL EXPRESSWAY	DALLAS, TX 75222
02735	RCA CORPORATION, SOLID STATE DIVISION	ROUTE 202	SOMERVILLE, NY 08876
03508	GENERAL ELECTRIC COMPANY, SEMI-CONDUCTOR PRODUCTS DEPARTMENT	ELECTRONICS PARK	SYRACUSE, NY 13201
04222	AVX CERAMICS, DIVISION OF AVX CORP.	P O BOX 867, 19TH AVE. SOUTH	MYRTLE BEACH, SC 29577
04713	MOTOROLA, INC., SEMICONDUCTOR PROD. DIV.	5005 E MCDOWELL RD, PO BOX 20923	PHOENIX, AZ 85036
07263	FAIRCHILD SEMICONDUCTOR, A DIV. OF FAIRCHILD CAMERA AND INSTRUMENT CORP.	464 ELLIS STREET	MOUNTAIN VIEW, CA 94042
14433	ITT SEMICONDUCTORS	3301 ELECTRONICS WAY P O BOX 3049	WEST PALM BEACH, FL 33402
14752	ELECTRO CUBE INC.	1710 S. DEL MAR AVE.	SAN GABRIEL, CA 91776
19396	ILLINOIS TOOL WORKS, INC. PAKTRON DIV.	900 FOLLIN LANE, SE	VIENNA, VA 22180
19647	CADDOCK ELECTRONICS INC.	3127 CHICAGO AVENUE	RIVERSIDE, CA 92507
21317	ELECTRONIC APPLICATIONS COMPANY	2213 EDWARDS AVENUE	SOUTH EL MONTE, CA 91733
22526	BERG ELECTRONICS, INC.	YOUK EXPRESSWAY	NEW CUMBERLAND, PA 17070
24546	CORNING GLASS WORKS, ELECTRONIC COMPONENTS DIVISION	550 HIGH STREET	BRADFORD, PA 16701
27014	NATIONAL SEMICONDUCTOR CORP.	2900 SEMICONDUCTOR DR.	SANTA CLARA, CA 95051
50157	MIDWEST COMPONENTS INC.	P. O. BOX 787 1981 PORT CITY BLVD.	MUSKEGON, MI 49443
50522	MONSANTO CO., ELECTRONIC SPECIAL PRODUCTS	3400 HILLVIEW AVENUE	PALO ALTO, CA 94304
50558	ELECTRONIC CONCEPTS, INC.	526 INDUSTRIAL WAY WEST	EATONTOWN, NJ 07724
54473	MATSUSHITA ELECTRIC, CORP. OF AMERICA	1 PANASONIC WAY	SECAUCUS, NJ 07094
55210	GETTIG ENG. AND MFG. COMPANY	PO BOX 85, OFF ROUTE 45	SPRING MILLS, PA 16875
55680	NICHICON/AMERICA/CORP.	6435 N PROESEL AVENUE	CHICAGO, IL 60645
56289	SPRAGUE ELECTRIC CO.		NORTH ADAMS, MA 01247
71400	BUSSMAN MFG., DIVISION OF MCGRAW-EDISON CO.	2536 W. UNIVERSITY ST.	ST. LOUIS, MO 63107
72982	ERIE TECHNOLOGICAL PRODUCTS, INC.	644 W. 12TH ST.	ERIE, PA 16512
73138	BECKMAN INSTRUMENTS, INC., HELIPOT DIV.	2500 HARBOR BLVD.	FULLERTON, CA 92634
80009	TEKTRONIX, INC.	P O BOX 500	BEAVERTON, OR 97077
90201	MALLORY CAPACITOR CO., DIV. OF P. R. MALLORY AND CO., INC.	3029 E. WASHINGTON STREET P. O. BOX 372	INDIANAPOLIS, IN 46206
91418	RADIO MATERIALS COMPANY, DIV. OF P.R. MALLORY AND COMPANY, INC.	4242 W BRYN MAWR	CHICAGO, IL 60646
91637	DALE ELECTRONICS, INC.	P. O. BOX 609	COLUMBUS, NE 68601

Component No.	Tektronix Part No.	Serial/Model No. Eff Dscnt	Name & Description	Mfr Code	Mfr Part Number
A10	670-6136-00		CKT BOARD ASSY:MAIN	80009	670-6136-00
A10	670-6178-00		CKT BOARD ASSY:MAIN (OPTION 2 ONLY)	80009	670-6178-00
A12	670-6139-00		CKT BOARD ASSY:SWITCH	80009	670-6139-00
A14	670-6138-00		CKT BOARD ASSY:ATTENUATOR		670-6138-00
A16	670-6137-00		CKT BOARD ASSY:DISPLAY	80009	670-6137-00
A10	-----		CKT BOARD ASSY:MAIN		
A10C1325	290-0804-00		CAP., FXD, ELCTLT: 10UF, +50-10%, 25V	55680	25ULA10V-T
A10C1326	290-0804-00		CAP., FXD, ELCTLT: 10UF, +50-10%, 25V	55680	25ULA10V-T
A10C1328	290-0844-00		CAP., FXD, ELCTLT: 100UF, -10+75%, 35 WVDC	54473	ECE-A35V100L
A10C1422	290-0845-00		CAP., FXD, ELCTLT: 330UF, 10+50%, 25 WVDC	55680	25ULA330
A10C1423	281-0788-00		CAP., FXD, CER DI: 470PF, 10%, 100V	72982	8005H9AADW5R471K
A10C1424	281-0775-00		CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8005D9AABZ5U104M
A10C1431	290-0804-00		CAP., FXD, ELCTLT: 10UF, +50-10%, 25V	55680	25ULA10V-T
A10C1432	290-0844-00		CAP., FXD, ELCTLT: 100UF, -10+75%, 35 WVDC	54473	ECE-A35V100L
A10C1433	281-0772-00		CAP., FXD, CER DI: 0.0047UF, 10%, 100V	72982	8005H9AADW5R472K
A10C1435	281-0826-00		CAP., FXD, CER DI: 2200PF, 5%, 100V	04222	GC101C222J
A10C1505	285-0809-00		CAP., FXD, PLSTC: 1UF, 10%, 50V	56289	LP66A1A105K
A10C1508	283-0623-00		CAP., FXD, MICA D: 1200PF, 1%, 100V	00853	D191F122F0
A10C1517	281-0773-00		CAP., FXD, CER DI: 0.01UF, 10%, 100V	72982	8005H9AADW5R103K
A10C1521	290-0534-00		CAP., FXD, ELCTLT: 1UF, 20%, 35V	56289	196D105X0035HA1
A10C1534	281-0812-00		CAP., FXD, CER DI: 1000PF, 10%, 100V	72982	8035D9AADX7R102K
A10C1539	290-0290-00		CAP., FXD, ELCTLT: 10UF, 20%, 25V	56289	30D472
A10C1601	290-0527-00		CAP., FXD, ELCTLT: 15UF, 20%, 20V	90201	TDC156M020FL
A10C1603	290-0536-00		CAP., FXD, ELCTLT: 10UF, 20%, 25V	90201	TDC106M025FL
A10C1605	290-0776-00		CAP., FXD, ELCTLT: 22UF, +50-10%, 10V	54473	ECE-A10V22L
A10C1611	285-1119-00		CAP., FXD, PLSTC: 0.082UF, 10%, 200V	19396	PP680C823K
A10C1834	281-0786-00		CAP., FXD, CER DI: 150PF, 10%, 100V (REMOVE FOR OPTION 2)	72982	8035D2AADX5P151K
A10CR1422	152-0585-00		SEMICONV DEVICE: SILICON, BRIDGE, 200V, 1A	80009	152-0585-00
A10CR1424	152-0066-00		SEMICONV DEVICE: SILICON, 400V, 750MA	14433	LG4016
A10CR1426	152-0066-00		SEMICONV DEVICE: SILICON, 400V, 750MA	14433	LG4016
A10CR1516	153-0057-00		SEMICONV DVC, SE: SILICON, 40 PIV, 200MA, SEL	80009	153-0057-00
A10CR1518	153-0057-00		SEMICONV DVC, SE: SILICON, 40 PIV, 200MA, SEL	80009	153-0057-00
A10CR1605	152-0141-02		SEMICONV DEVICE: SILICON, 30V, 50NA	01295	1N4152R
A10CR1607	152-0141-02		SEMICONV DEVICE: SILICON, 30V, 50NA	01295	1N4152R
A10CR1624	152-0488-00		SEMICONV DEVICE: SILICON, 200V, 1500MA	04713	3N55 FAMILY
A10CR1631	152-0246-00		SEMICONV DEVICE: SW, SI, 40V, 200MA	03508	DE140
A10CR1632	152-0246-00		SEMICONV DEVICE: SW, SI, 40V, 200MA	03508	DE140
A10CR1711	152-0141-02		SEMICONV DEVICE: SILICON, 30V, 50NA	01295	1N4152R
A10CR1934	152-0141-02		SEMICONV DEVICE: SILICON, 30V, 50NA (REMOVE FOR OPTION 2)	01295	1N4152R
A10CR1935	152-0141-02		SEMICONV DEVICE: SILICON, 30V, 50NA (REMOVE FOR OPTION 2)	01295	1N4152R
A10F1626	159-0021-00		FUSE, CARTRIDGE: 3AG, 2A, 250V, FAST-BLOW	71400	AGC 2
A10J1435	131-0993-00		BUS, CONDUCTOR: 2 WIRE BLACK	00779	530153-2
A10J1901	131-2371-00		CONN, RCPT, ELEC: CKT BD, 8 CONT, FEMALE	22526	65001-002
A10J1902	136-0632-00		SOCKET, PLUG-IN: 8 PIN, FEMALE	00779	1-380949-8
A10K1408	148-0126-00		RELAY REED: 5 VDC, 400 OHM COIL	21317	BEE-5
A10K1505	148-0126-00		RELAY REED: 5 VDC, 400 OHM COIL	21317	BEE-5
A10K1528	148-0126-00		RELAY REED: 5 VDC, 400 OHM COIL	21317	BEE-5
A10P1435	131-1857-00		TERM. SET, PIN: 36/0.025 SQ PIN, ON 0.1 CTRS	22526	65500136
A10Q1415	151-0232-00		TRANSISTOR: SILICON, NPN, DUAL	80009	151-0232-00
A10Q1435	151-0341-00		TRANSISTOR: SILICON, NPN	07263	S040065



Replaceable Electrical Parts—DM 501A

Component No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Name & Description	Mfr Code	Mfr Part Number
A10Q1525	151-1006-00		TRANSISTOR: SILICON, JFE, N-CHANNEL	80009	151-1006-00
A10Q1731	151-0232-00		TRANSISTOR: SILICON, NPN, DUAL (REMOVE FOR OPTION 2)	80009	151-0232-00
A10Q1805	151-0188-00		TRANSISTOR: SILICON, PNP	04713	SPS6868K
A10R1405	311-1557-00		RES., VAR, NONWIR: 25K OHM, 20%, 0.50W	73138	91A R24K
A10R1407	315-0331-00		RES., FXD, CMPSN: 330 OHM, 5%, 0.25W	01121	CB3315
A10R1408	321-0364-00		RES., FXD, FILM: 60.4K OHM, 1%, 0.125W	91637	MFF1816G60401F
A10R1412	311-1564-00		RES., VAR, NONWIR: TRMR, 500 OHM, 0.5W	73138	91-86-0
A10R1415	311-1557-00		RES., VAR, NONWIR: 25K OHM, 20%, 0.50W	73138	91A R24K
A10R1416	321-1601-04		RES., FXD, FILM: 58.59K OHM, 0.1%, 0.125W	91637	MFF1816D58591B
A10R1425	315-0222-00		RES., FXD, CMPSN: 2.2K OHM, 5%, 0.25W	01121	CB2225
A10R1426	311-1559-00		RES., VAR, NONWIR: 10K OHM, 20%, 0.50W	73138	91-81-0
A10R1435	321-0356-00		RES., FXD, FILM: 49.9K OHM, 1%, 0.125W	91637	MFF1816G49901F
A10R1501	321-0364-00		RES., FXD, FILM: 60.4K OHM, 1%, 0.125W	91637	MFF1816G60401F
A10R1502	321-0199-00		RES., FXD, FILM: 1.15K OHM, 1%, 0.125W	91637	MFF1816G11500F
A10R1503	315-0101-00		RES., FXD, CMPSN: 100 OHM, 5%, 0.25W	01121	CB1015
A10R1504	311-1564-00		RES., VAR, NONWIR: TRMR, 500 OHM, 0.5W	73138	91-86-0
A10R1505	311-1943-00		RES., VAR, NONWIR: 10K OHM, 10%, 0.50W	73138	MODEL 68W
A10R1506	321-0292-07		RES., FXD, FILM: 10.7K OHM, 0.1%, 0.125W	24546	NE55E1182B
A10R1507	315-0473-00		RES., FXD, CMPSN: 47K OHM, 5%, 0.25W	01121	CB4735
A10R1508	321-0385-07		RES., FXD, FILM: 100K OHM, 0.1%, 0.125W	91637	MFF1816C10002B
A10R1509	315-0472-00		RES., FXD, CMPSN: 4.7K OHM, 5%, 0.25W	01121	CB4725
A10R1511	307-0103-00		RES., FXD, CMPSN: 2.7 OHM, 5%, 0.25W	01121	CB27G5
A10R1512	321-0200-00		RES., FXD, FILM: 1.18K OHM, 1%, 0.125W	91637	MFF1816G11800F
A10R1514	321-0376-00		RES., FXD, FILM: 80.6K OHM, 1%, 0.125W	91637	MFF1816G80601F
A10R1515	321-1620-07		RES., FXD, FILM: 10.93K OHM, 0.1%, 0.125W	24546	NE55E 10.93KB
A10R1516	321-0385-07		RES., FXD, FILM: 100K OHM, 0.1%, 0.125W	91637	MFF1816C10002B
A10R1525	311-1556-00		RES., VAR, NONWIR: 50K OHM, 20%, 0.50W	73138	91-78-0
A10R1526	321-0450-00		RES., FXD, FILM: 475K OHM, 1%, 0.125W	91637	MFF1816G47502F
A10R1527	321-0135-00		RES., FXD, FILM: 249 OHM, 1%, 0.125W	91637	MFF1816G2490F
A10R1528	311-1564-00		RES., VAR, NONWIR: TRMR, 500 OHM, 0.5W	73138	91-86-0
A10R1531	321-1720-00		RES., FXD, FILM: 3.24M OHM, 1%, 0.125W	01121	CC3244FY
A10R1532	321-0807-00		RES., FXD, FILM: 900K OHM, 1%, 0.125W	91637	HFF1104F90002F
A10R1533	315-0364-00		RES., FXD, CMPSN: 360K OHM, 5%, 0.25W	01121	CB3645
A10R1535	311-1556-00		RES., VAR, NONWIR: 50K OHM, 20%, 0.50W	73138	91-78-0
A10R1536	321-0343-00		RES., FXD, FILM: 36.5K OHM, 1%, 0.125W	91637	MFF1816G36501F
A10R1537	311-1564-00		RES., VAR, NONWIR: TRMR, 500 OHM, 0.5W	73138	91-86-0
A10R1538	321-1289-07		RES., FXD, FILM: 10.1K OHM, 0.1%, 0.125W	91637	MFF1816C10101B
A10R1539	321-0763-07		RES., FXD, FILM: 1.12K OHM, 0.1%, 0.125W	91637	MFF1816C11200B
A10R1601	321-0382-07		RES., FXD, FILM: 93.1K OHM, 0.1%, 0.125W	24546	NE55E9312B
A10R1602	315-0623-00		RES., FXD, CMPSN: 62K OHM, 5%, 0.25W	01121	CB6235
A10R1605	315-0752-00		RES., FXD, CMPSN: 7.5K OHM, 5%, 0.25W	01121	CB7525
A10R1613	304-0564-00		RES., FXD, CMPSN: 560K OHM, 10%, 1W	01121	GB5641
A10R1615	321-0382-00		RES., FXD, FILM: 93.1K OHM, 1%, 0.125W	91637	MFF1816G93101F
A10R1628A, B, C	307-0400-00		RES., FXD, FILM: 10 OHM, 0.1%	80009	307-0400-00
A10R1634	321-0318-00		RES., FXD, FILM: 20K OHM, 1%, 0.125W (REMOVE FOR OPTION 2)	91637	MFF1816G20001F
A10R1636	321-0356-00		RES., FXD, FILM: 49.9K OHM, 1%, 0.125W (REMOVE FOR OPTION 2)	91637	MFF1816G49901F
A10R1637	315-0152-00		RES., FXD, CMPSN: 1.5K OHM, 5%, 0.25W (REMOVE FOR OPTION 2)	01121	CB1525
A10R1638	321-0261-00		RES., FXD, FILM: 5.11K OHM, 1%, 0.125W (REMOVE FOR OPTION 2)	91637	MFF1816G51100F
A10R1639	321-0269-00		RES., FXD, FILM: 6.19K OHM, 1%, 0.125W (REMOVE FOR OPTION 2)	91637	MFF1816G61900F
A10R1711	321-0895-07		RES., FXD, FILM: 90 OHM, 0.1%, 0.125W	01121	OBD
A10R1713	321-0754-07		RES., FXD, FILM: 900 OHM, 0.1%, 0.125W	91637	MFF1816C900ROB

Component No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Name & Description	Mfr Code	Mfr Part Number
A1OR1731	311-1560-00		RES., VAR, NONWIR: 5K OHM, 20%, 0.50W (REMOVE FOR OPTION 2)	73138	91-82-0
A1OR1733	321-0983-00		RES., FXD, FILM: 4.5M OHM, 1%, 0.125W (REMOVE FOR OPTION 2)	91637	CM110216G45003F
A1OR1735	315-0104-00		RES., FXD, CMPSN: 100K OHM, 5%, 0.25W (REMOVE FOR OPTION 2)	01121	CB1045
A1OR1801	315-0512-00		RES., FXD, CMPSN: 5.1K OHM, 5%, 0.25W	01121	CB5125
A1OR1803	315-0512-00		RES., FXD, CMPSN: 5.1K OHM, 5%, 0.25W	01121	CB5125
A1OR1805	315-0101-00		RES., FXD, CMPSN: 100 OHM, 5%, 0.25W	01121	CB1015
A1OR1831	311-1552-00		RES., VAR, NONWIR: 500K OHM, 20%, 0.50W (REMOVE FOR OPTION 2)	73138	91-74-0
A1OR1832	321-1516-01		RES., FXD, FILM: 2.34 OHM, 0.5%, 0.125W (REMOVE FOR OPTION 2)	91637	HFF188G23403D
A1OR1836	321-0385-00		RES., FXD, FILM: 100K OHM, 1%, 0.125W (REMOVE FOR OPTION 2)	91637	MFF1816G10002F
A1OR1901	315-0270-00		RES., FXD, CMPSN: 27 OHM, 5%, 0.25W	01121	CB2705
A1OR1902	315-0270-00		RES., FXD, CMPSN: 27 OHM, 5%, 0.25W	01121	CB2705
A1OR1903	315-0270-00		RES., FXD, CMPSN: 27 OHM, 5%, 0.25W	01121	CB2705
A1OR1904	315-0270-00		RES., FXD, CMPSN: 27 OHM, 5%, 0.25W	01121	CB2705
A1OR1906	315-0270-00		RES., FXD, CMPSN: 27 OHM, 5%, 0.25W	01121	CB2705
A1OR1907	315-0270-00		RES., FXD, CMPSN: 27 OHM, 5%, 0.25W	01121	CB2705
A1OR1908	315-0270-00		RES., FXD, CMPSN: 27 OHM, 5%, 0.25W	01121	CB2705
A1OR1909	315-0103-00		RES., FXD, CMPSN: 10K OHM, 5%, 0.25W (REMOVE FOR OPTION 2)	01121	CB1035
A1OR1931	315-0334-00		RES., FXD, CMPSN: 330K OHM, 5%, 0.25W (REMOVE FOR OPTION 2)	01121	CB3345
A1OR1932	321-0256-00		RES., FXD, FILM: 4.53K OHM, 1%, 0.125W (REMOVE FOR OPTION 2)	91637	MFF1816G45300F
A1OR1933	315-0393-00		RES., FXD, CMPSN: 39K OHM, 5%, 0.25W (REMOVE FOR OPTION 2)	01121	CB3935
A1OR1934	321-0251-00		RES., FXD, FILM: 4.02K OHM, 1%, 0.125W (REMOVE FOR OPTION 2)	91637	MFF1816G40200F
A1OR1935	321-0193-00		RES., FXD, FILM: 1K OHM, 1%, 0.125W (REMOVE FOR OPTION 2)	91637	MFF1816G10000F
A1OR1936	315-0101-00		RES., FXD, CMPSN: 100 OHM, 5%, 0.25W (REMOVE FOR OPTION 2)	01121	CB1015
A1OR1937	315-0273-00		RES., FXD, CMPSN: 27K OHM, 5%, 0.25W	01121	CB2735
A1ORT1525	308-0817-00		RES., FXD, WW: 1K OHM, 5%, 0.125W	91637	RS1A-144
A1ORT1633	307-0645-00		RES., THERMAL: 5K OHM, 40%	50157	180Q50201
A1OS1	260-1974-00		SWITCH, PUSH: 4 BUTTON, 4 POLE NO/TEMP (OPTION 2 ONLY)	80009	260-1974-00
A1OS1	260-1972-00		SWITCH, PUSH: 5 BUTTON, 4 POLE, FUNCTION (STANDARD ONLY)	80009	260-1972-00
A1OS2	260-1971-00		SWITCH, PUSH: 6 BUTTON, 6 POLE, RANGE	80009	260-1971-00
A1OS3	260-1973-00		SWITCH, PUSH: 2 BUTTON, 2 POLE, DB/HI-LO	80009	260-1973-00
A1OS4	260-1953-01		SWITCH, PUSH: 1 BUTTON, 4 POLE, INPUT	80009	260-1953-01
A1OT1301	120-1243-00		XFMR, PWR, STU:	80009	120-1243-00
A1OTP1608	214-0579-00		TERM, TEST POINT: BRS CD PL	80009	214-0579-00
A1OTP1615	214-0579-00		TERM, TEST POINT: BRS CD PL	80009	214-0579-00
A1OTP1631	214-0579-00		TERM, TEST POINT: BRS CD PL	80009	214-0579-00
A1OU1325	156-0312-00		MICROCIRCUIT, LI: VOLTAGE REGULATOR, 15V, 1A	27014	LM340T-15
A1OU1335	156-0872-00		MICROCIRCUIT, LI: VOLTAGE REGULATOR	04713	MC7912C
A1OU1429	156-1259-00		MICROCIRCUIT, LI: RMS/DC CONVERTER	80009	156-1259-00
A1OU1431	156-0277-00		MICROCIRCUIT, LI: VOLTAGE REGULATOR	07263	UA7805UC
A1OU1515	156-1134-00		MICROCIRCUIT, LI: OPERATIONAL AMPLIFIER	02735	CA3140EX
A1OU1538	156-0067-00		MICROCIRCUIT, LI: OPERATIONAL AMPLIFIER	02735	85145
A1OU1539	156-1156-00		MICROCIRCUIT, LI: OPERATIONAL AMPLIFIER	80009	156-1156-00

Replaceable Electrical Parts—DM 501A

Component No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Name & Description	Mfr Code	Mfr Part Number
A10U1601	156-1306-00		MICROCIRCUIT,LI:4.5 DIGIT A/D CONVERTER	80009	156-1306-00
A10U1603	156-1305-00		MICROCIRCUIT,LI:4.5 DIGIT A/D CONVERTER	80009	156-1305-00
A10U1701	156-1245-00		MICROCIRCUIT,LI:7 XSTR,HV/HIGH CURRENT	80009	156-1245-00
A10U1703	156-0793-00		MICROCIRCUIT,DI:DUAL 4-INP NAND GATE	04713	MC14012BCL
A10U1705	156-0524-00		MICROCIRCUIT,DI:TRIPLE 3-INPUT NAND GATES	80009	156-0524-00
A10U1707	156-0793-00		MICROCIRCUIT,DI:DUAL 4-INP NAND GATE	04713	MC14012BCL
A10U1737	156-0854-00		MICROCIRCUIT,LI:OPERATIONAL AMPLIFIER (REMOVE FOR OPTION 2)	27014	LM308AN
A10U1805	156-0886-00		MICROCIRCUIT,DI:BCD TO 7 SEGMENT DCDR	80009	156-0886-00
A10VR1415	152-0508-00		SEMICONV DEVICE:ZENER,0.4W,12.6V,5%	80009	152-0508-00
A10VR1512	152-0317-00		SEMICONV DEVICE:ZENER,0.25W,6.2V,5%	80009	152-0317-00
A10VR1513	152-0727-00		SEMICONV DEVICE:ZENER,SI,6.3V,2%,0.4W	80009	152-0727-00
A10VR1636	152-0486-00		SEMICONV DEVICE:ZENER,0.25W,6.2V,5% (REMOVE FOR OPTION 2)	80009	152-0486-00
A10W1720	131-0566-00		LINK,TERM.CONNE:0.086 DIA X 2.375 INCH L	55210	L-2007-1
A10Y1425	158-0195-00		XTAL UNIT,QTZ:163.84 KHZ,0.2%,PAR	00815	NE345D
A12			CKT BOARD ASSY:SWITCH		
A12CR1012	152-0141-02		SEMICONV DEVICE:SILICON,30V,50NA	01295	1N4152R
A14			CKT BOARD ASSY:ATTENUATOR		
A14C1100	285-1077-00		CAP.,FXD,PLSTC:0.10UF,20%,600V	14752	230B1F104
A14C1105	283-0317-00		CAP.,FXD,CER DI:1PF,+/-0.1PF,500V	72982	861-518-COK0109B
A14C1106	283-0317-00		CAP.,FXD,CER DI:1PF,+/-0.1PF,500V	72982	861-518-COK0109B
A14C1110	283-0431-00		CAP.,FXD,CER DI:28PF,1%,1000V	91418	CN0280F1021R0
A14C1112	283-0604-00		CAP.,FXD,MICA D:304PF,2%,300V	00853	D153F3040G0
A14C1114	281-0105-00		CAP.,VAR,GL DIE:0.8-8.5PF,750V	72982	562-013
A14C1120	283-0434-00		CAP.,FXD,CER DI:26.5 PF,2%,1000V	91418	OBD
A14C1122	283-0627-00		CAP.,FXD,MICA D:0.0033UF,5%,500V	00853	D195E332J0
A14C1124	285-1197-00		CAP.,FXD,PLSTC:0.033UF,5%,100V	50558	MC12D333J
A14C1126	283-0434-00		CAP.,FXD,CER DI:26.5 PF,2%,1000V	91418	OBD
A14C1128	281-0105-00		CAP.,VAR,GL DIE:0.8-8.5PF,750V	72982	562-013
A14C1129	281-0105-00		CAP.,VAR,GL DIE:0.8-8.5PF,750V	72982	562-013
A14R1100	315-0102-00		RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A14R1104	311-1558-00		RES.,VAR,NONWIR:20K OHM,20%,0.50W	73138	91-80-0
A14R1110	311-1563-00		RES.,VAR,NONWIR:1K OHM,20%,0.50W	73138	91-85-0
A14R1112A,B,C,D	307-1134-00		RES,NTWK,FXD,FI:1 EACH,9M OHM,900K OHM	19647	1776-10
A14R1114	311-1567-00		RES.,VAR,NONWIR:TRMR,100 OHM,0.50W	73138	91-89-0
A14R1220	315-0103-00		RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A14RT1102	307-0662-00		RES.,THERMAL:1K OHM,40%	50157	180Q10200

Component No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Name & Description	Mfr Code	Mfr Part Number
A16	-----		CKT BOARD ASSY:DISPLAY		
A16DS1000	150-1066-00		LAMP,LED RDOUT:ORANGE,6 SEG,+/-1	50522	MAN 4605
A16DS1001	150-1048-00		LAMP,LED,DSPL:ORANGE,7 SEG,0.4 DIGIT	50522	MAN4640A
A16DS1100	150-1048-00		LAMP,LED,DSPL:ORANGE,7 SEG,0.4 DIGIT	50522	MAN4640A
A16DS1101	150-1048-00		LAMP,LED,DSPL:ORANGE,7 SEG,0.4 DIGIT	50522	MAN4640A
A16DS1200	150-1048-00		LAMP,LED,DSPL:ORANGE,7 SEG,0.4 DIGIT	50522	MAN4640A
A16P1901	131-2372-00		CONN,RCPT,ELEC:CKT BD,8 CONT,MALE	22526	65645
A16P1902	131-1934-00		TERM. SET,PIN:1 X 36,0.1 CTR,0.9 L	22526	65539-001
A16R1000	315-0101-00		RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A16R1001	315-0561-00		RES.,FXD,CMPSN:560 OHM,5%,0.25W	01121	CB5615
A16R1100	315-0101-00		RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
CHASSIS PARTS					
J500	131-1652-00		CONN,RCPT,ELEC:'LEMO' TYPE,1MALE,1 FEMALE (STANDARD ONLY)	S3013	RA0302
J510	355-0170-00		STUD,SHOULDERED:6-32 X 0.40 INCH LONG	80009	355-0170-00
J520	136-0730-00		JACK,TIP:BLUE	80009	136-0730-00
J530	136-0732-00		JACK,TIP:RED	80009	136-0732-00
J540	136-0731-00		JACK,TIP:BLACK	80009	136-0731-00

# DIAGRAMS AND CIRCUIT BOARD ILLUSTRATIONS

## Symbols

Graphic symbols and class designation letters are based on ANSI Standard Y32.2-1975.

Logic symbology is based on ANSI Y32.14-1973 in terms of positive logic. Logic symbols depict the logic function performed and may differ from the manufacturer's data.

The overline on a signal name indicates that the signal performs its intended function when it is in the low state.

Abbreviations are based on ANSI Y1.1-1972.

Other ANSI standards that are used in the preparation of diagrams by Tektronix, Inc. are:

- Y14.15, 1966 Drafting Practices.
- Y14.2, 1973 Line Conventions and Lettering.
- Y10.5, 1968 Letter Symbols for Quantities Used in Electrical Science and Electrical Engineering.

American National Standard Institute  
1430 Broadway  
New York, New York 10018

## Component Values

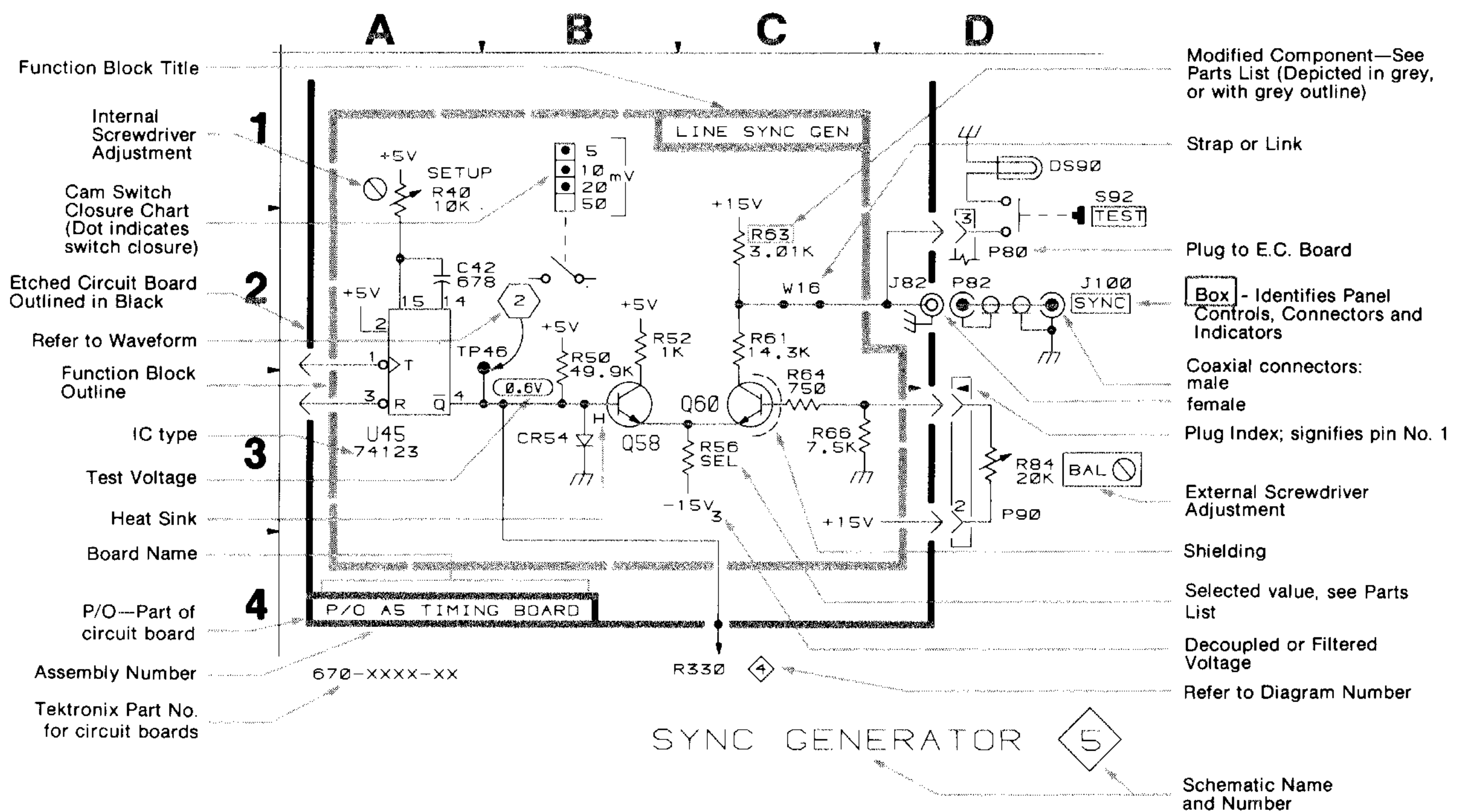
Electrical components shown on the diagrams are in the following units unless noted otherwise:

Capacitors = Values one or greater are in picofarads (pF).

Values less than one are in microfarads ( $\mu$ F).

Resistors = Ohms ( $\Omega$ ).

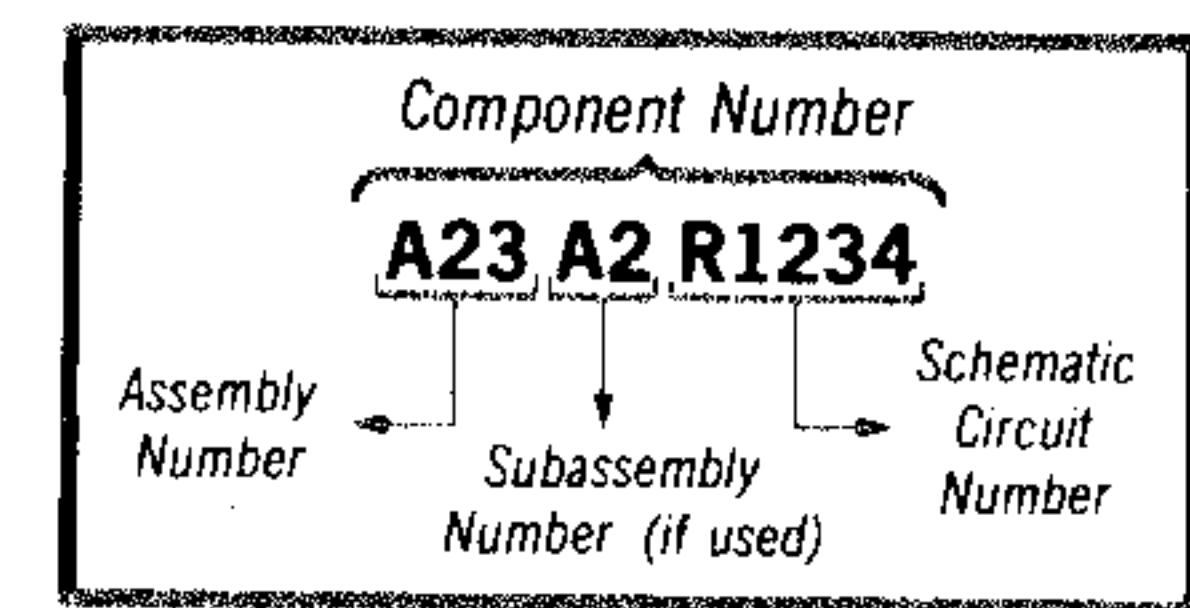
The following special symbols may appear on the diagrams:



## Assembly Numbers and Grid Coordinates

Each assembly in the instrument is assigned an assembly number (e.g., A20). The assembly number appears on the circuit board outline on the diagram, in the title for the circuit board component location illustration, and in the lookup table for the schematic diagram and corresponding component locator illustration. The Replaceable Electrical Parts list is arranged by assemblies in numerical sequence; the components are listed by component number (see following illustration for constructing a component number).

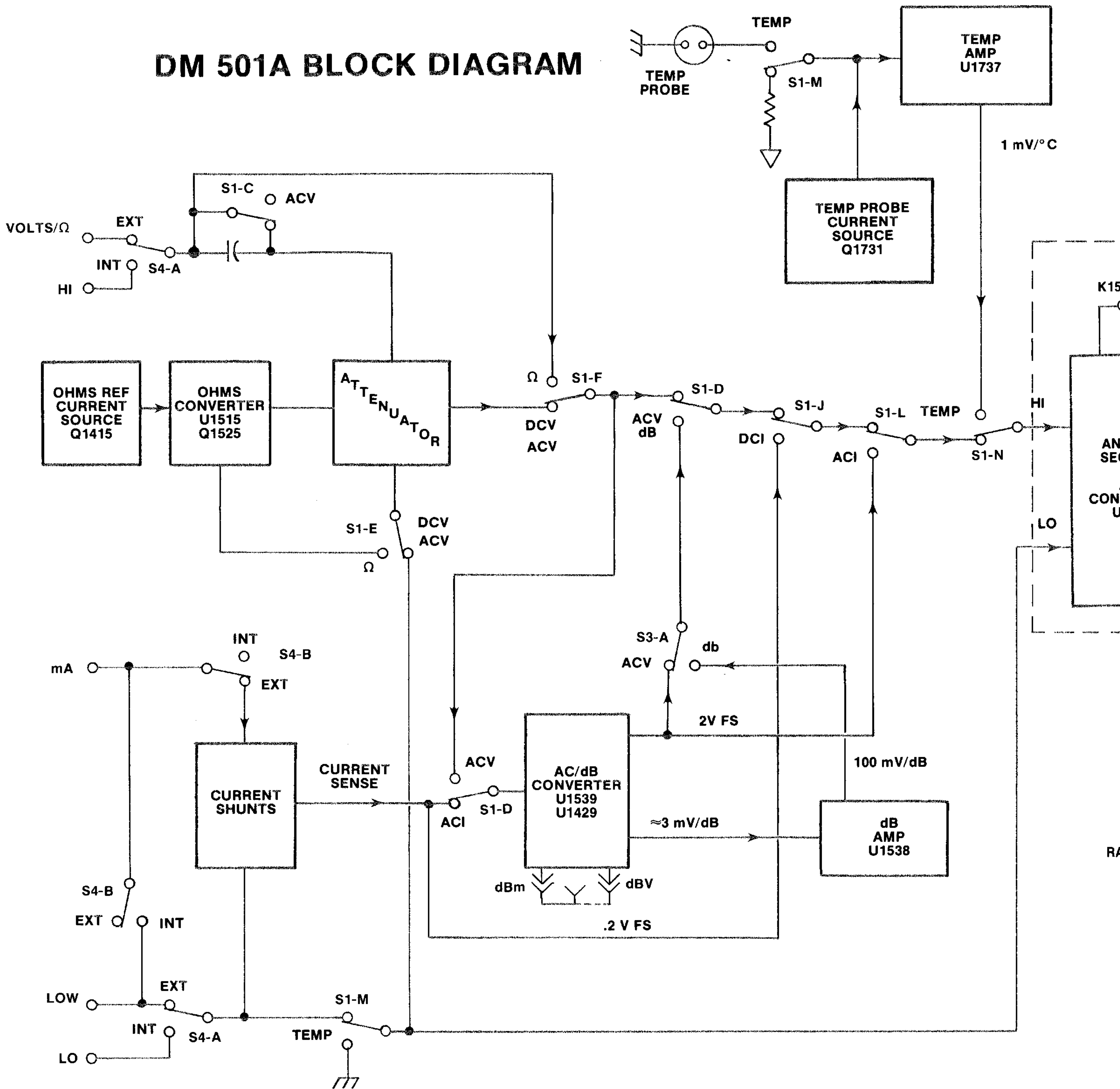
### COMPONENT NUMBER EXAMPLE



Chassis-mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List.

The schematic diagram and circuit board component location illustration have grids. A lookup table with the grid coordinates is provided for ease of locating the component. Only the components illustrated on the facing diagram are listed in the lookup table. When more than one schematic diagram is used to illustrate the circuitry on a circuit board, the circuit board illustration may only appear opposite the first diagram on which it was illustrated; the lookup table will list the diagram number of other diagrams that the circuitry of the circuit board appears on.

# DM 501A BLOCK DIAGRAM



Switches shown in 200 mV dc position.

Fig. 8-1.

@

Section 8—DM 501A

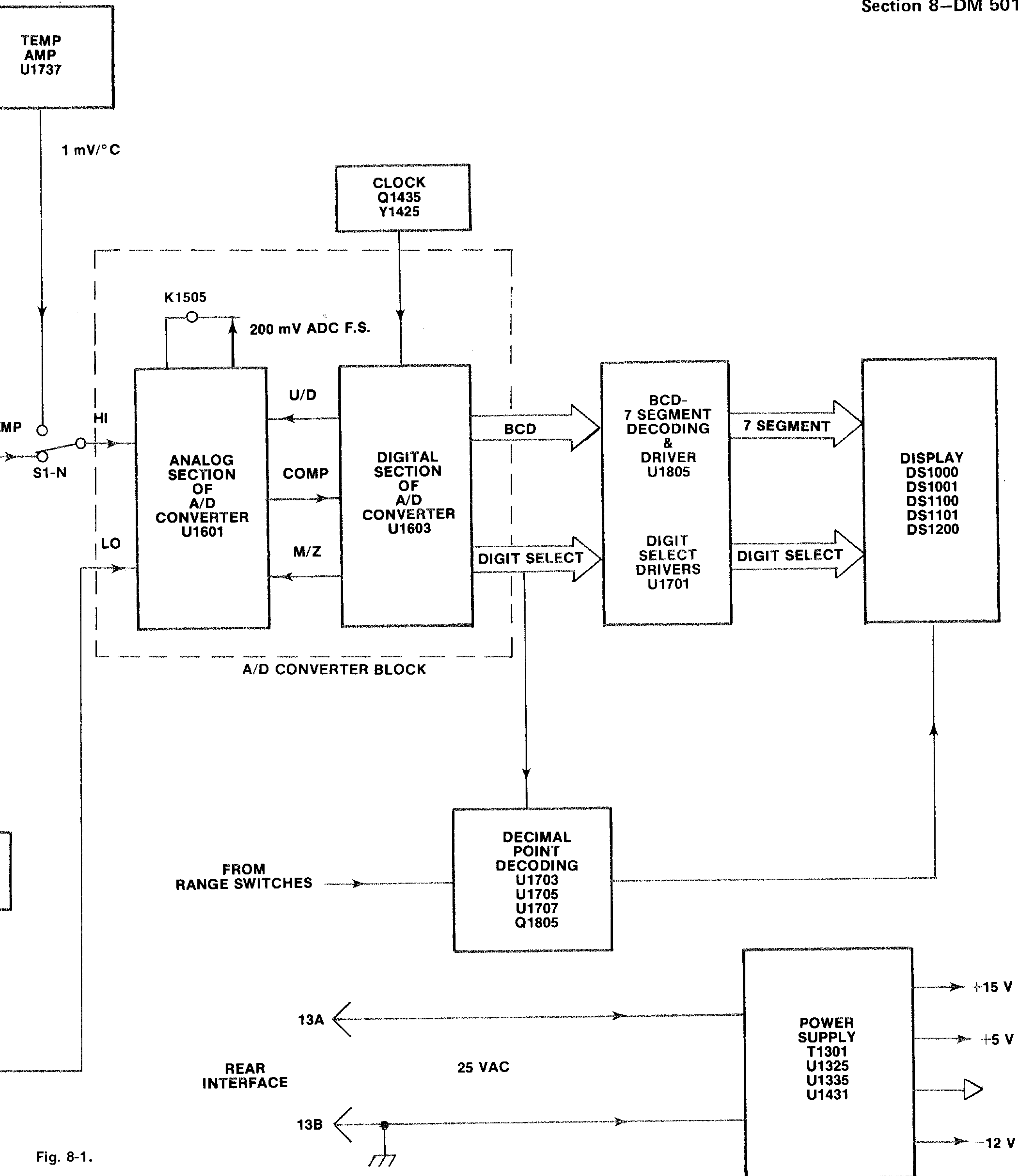
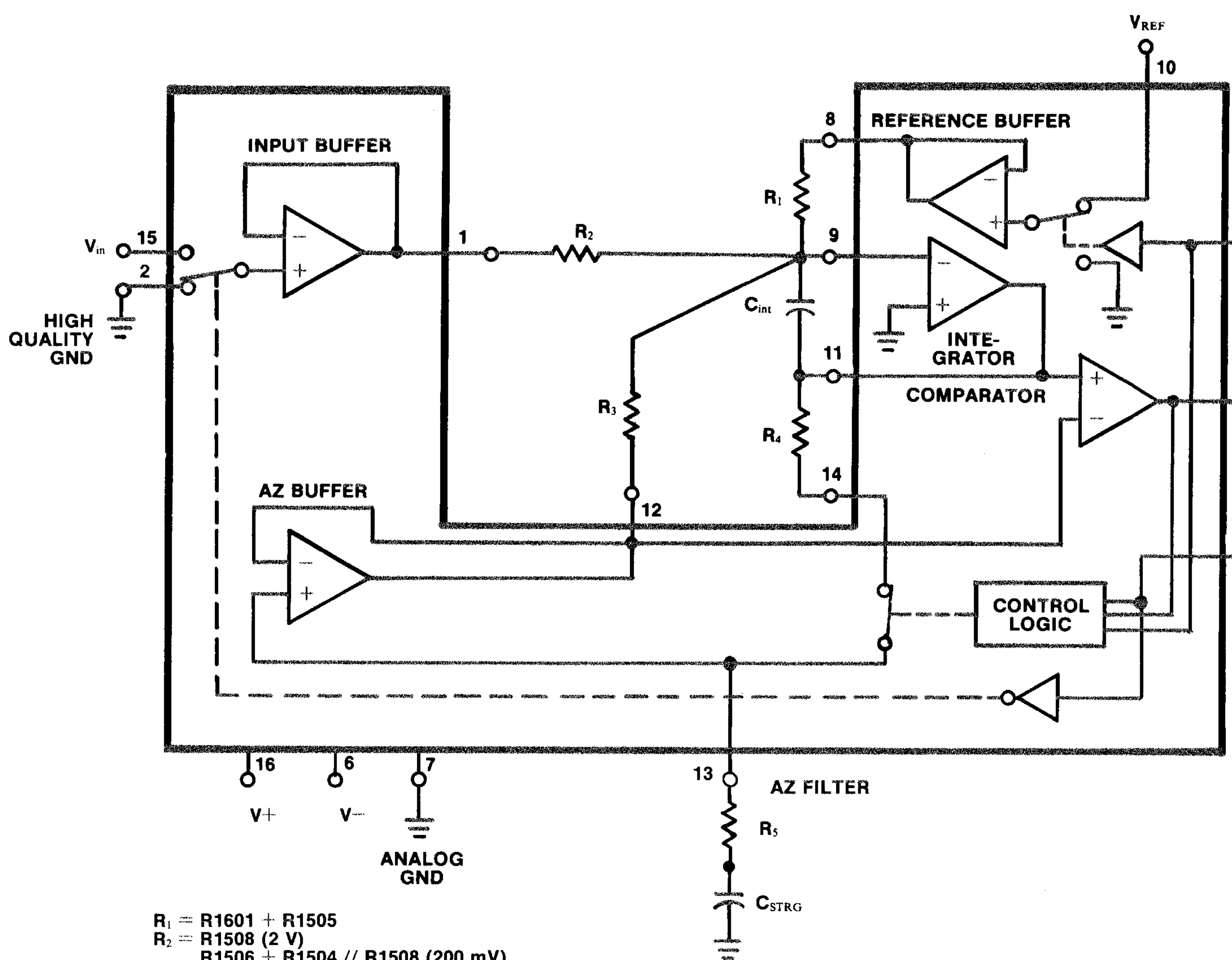


Fig. 8-1.

@

# ANALOG TO DIGITAL CONVERTER

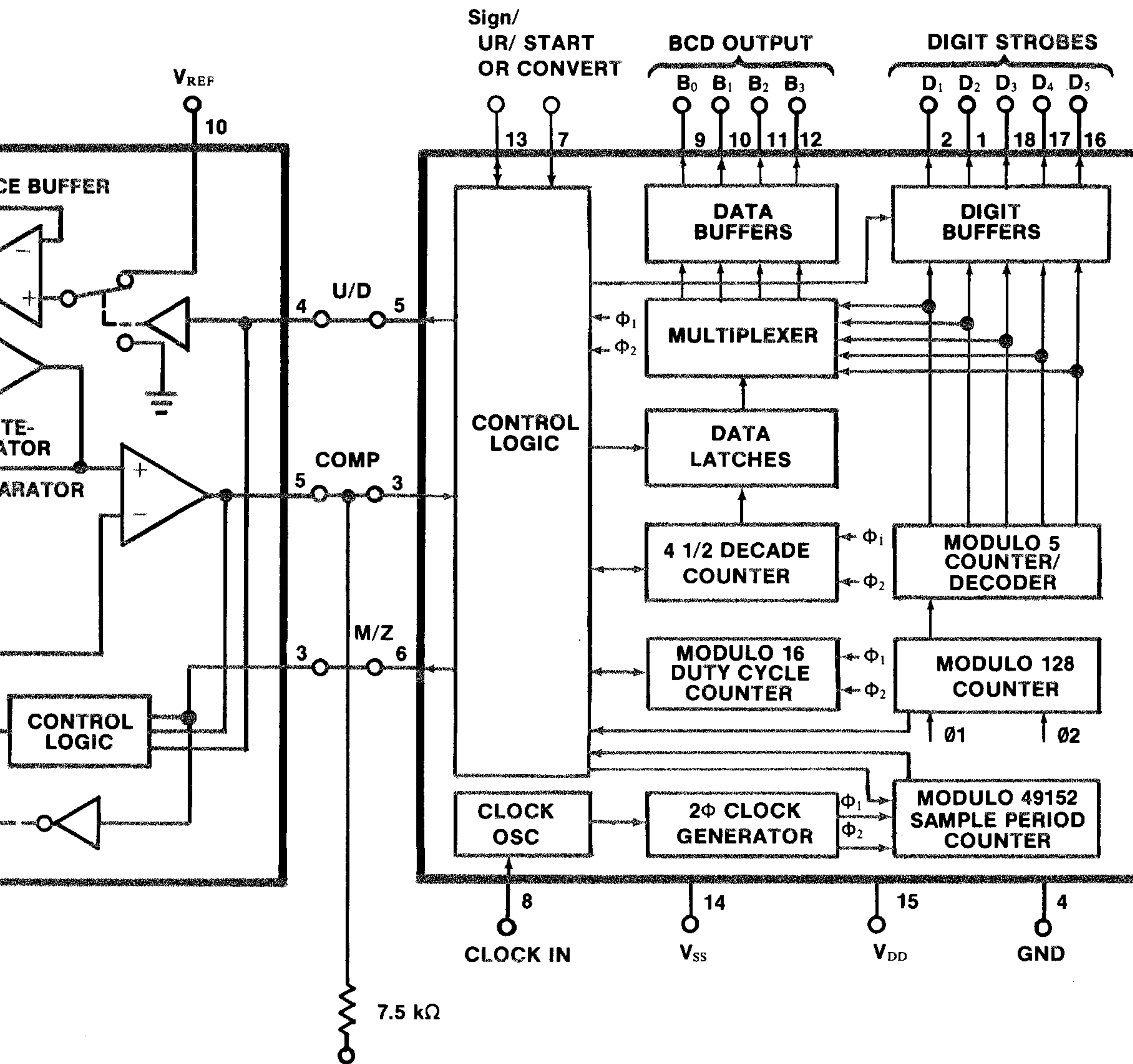


Connection Diagram

Fig. 8-2.



# DIGITAL CONVERTER BLOCK DIAGRAM



Connection Diagram

Fig. 8-2.

# ADJUSTMENTS & TEST LOCATION

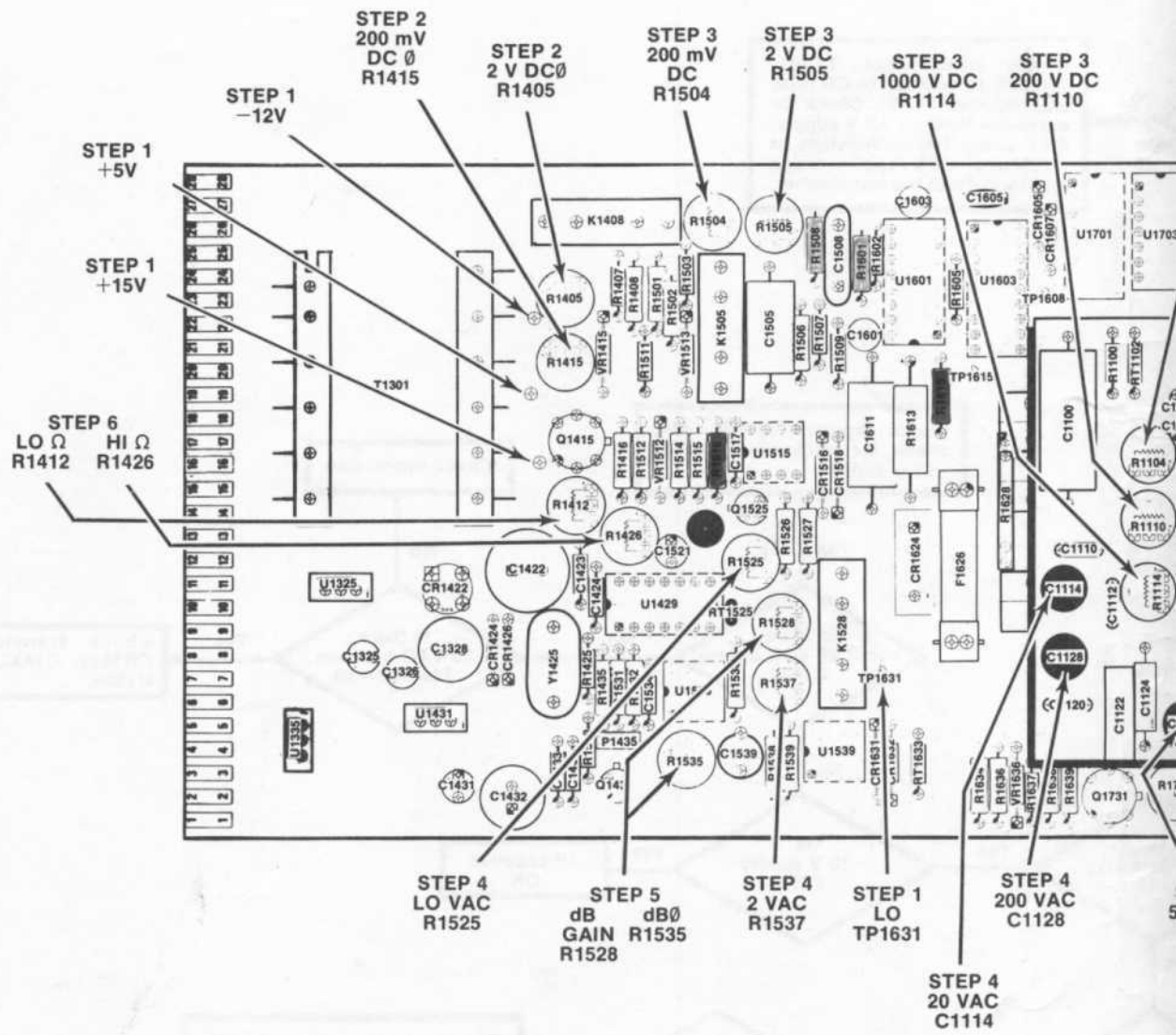
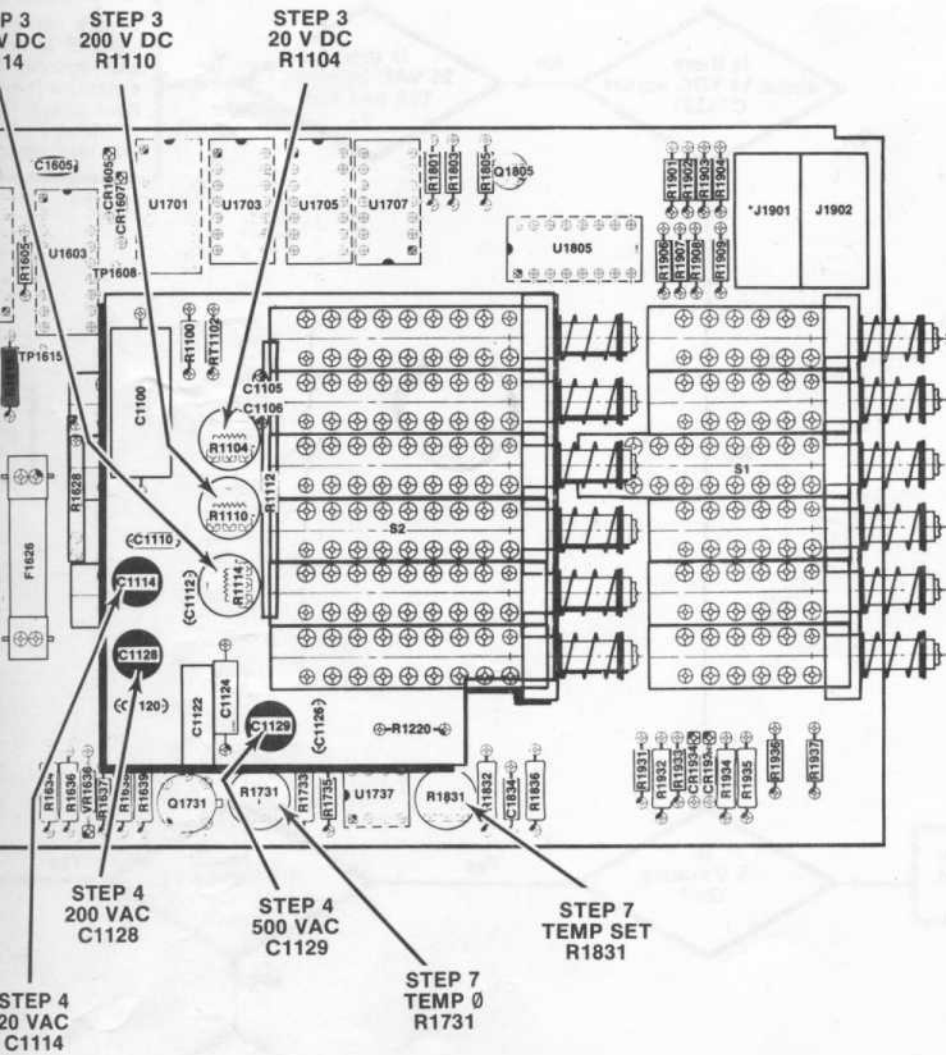


Fig. 8-3. Main & Attenuator Board

# TESTS & TEST POINTS LOCATION

ADJUSTMENT LOCATIONS



3. Main & Attenuator Board.

@

TROUBLESHOOTING FLOW CHART  
POWER SUPPLY

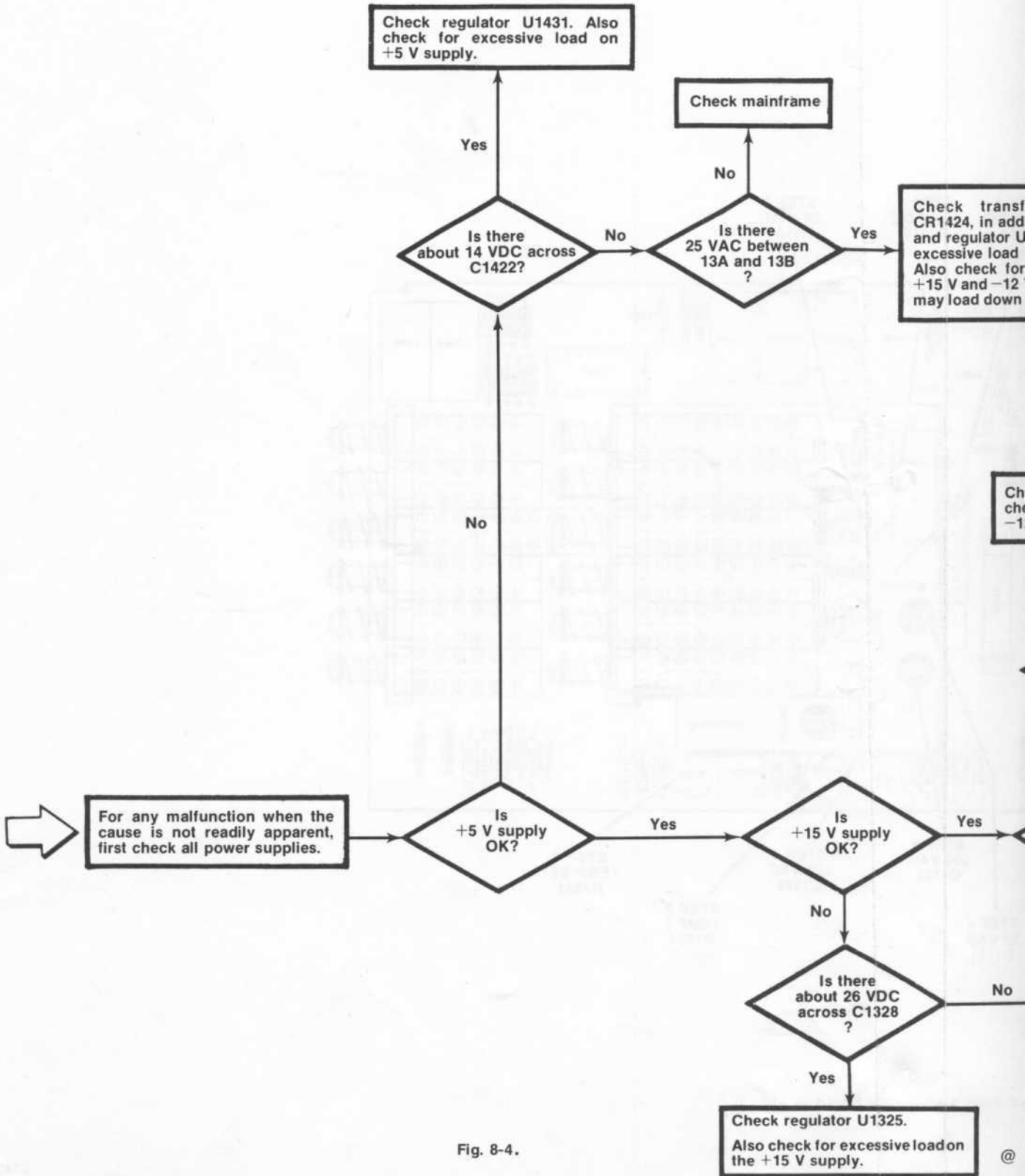
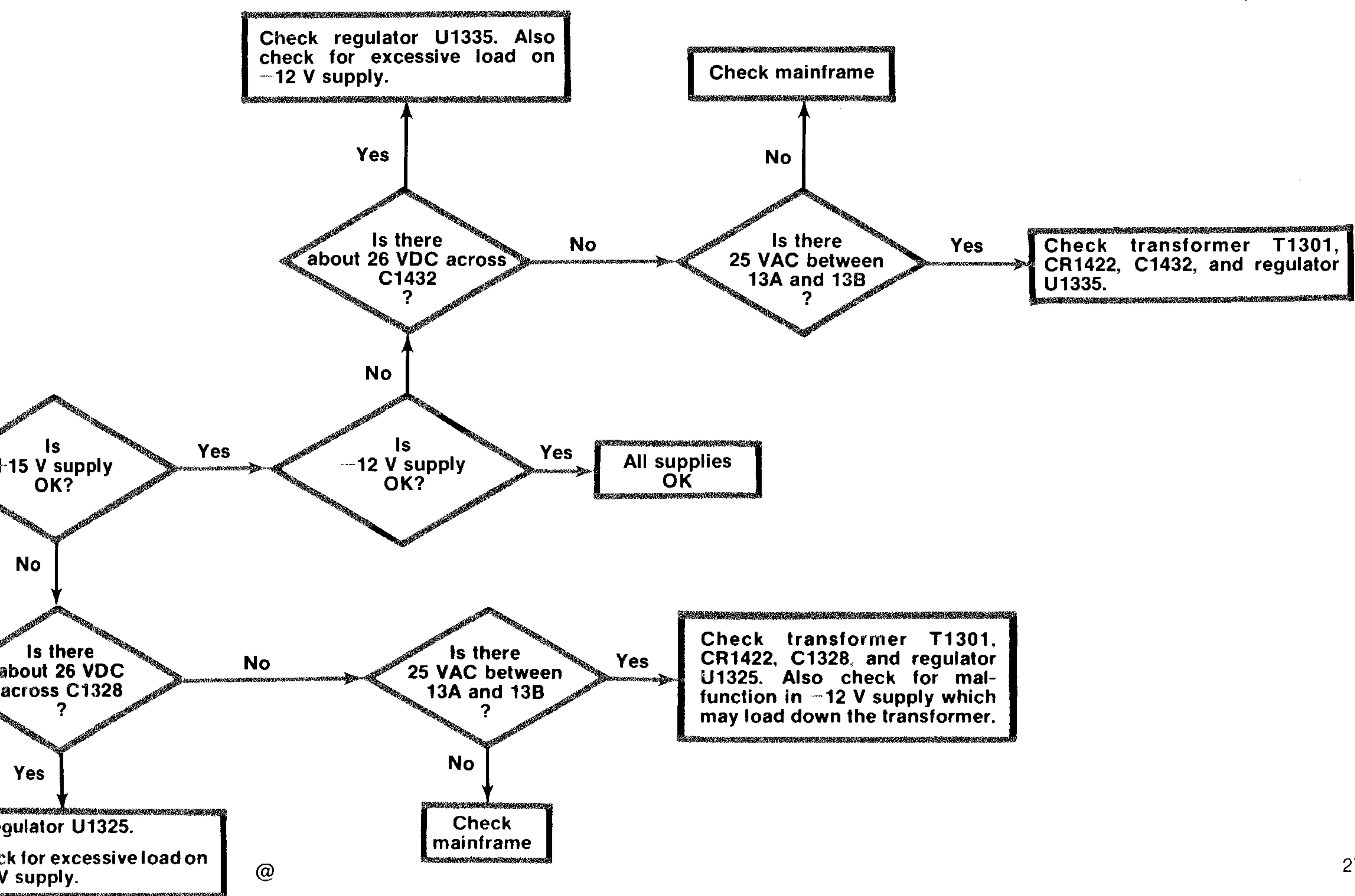
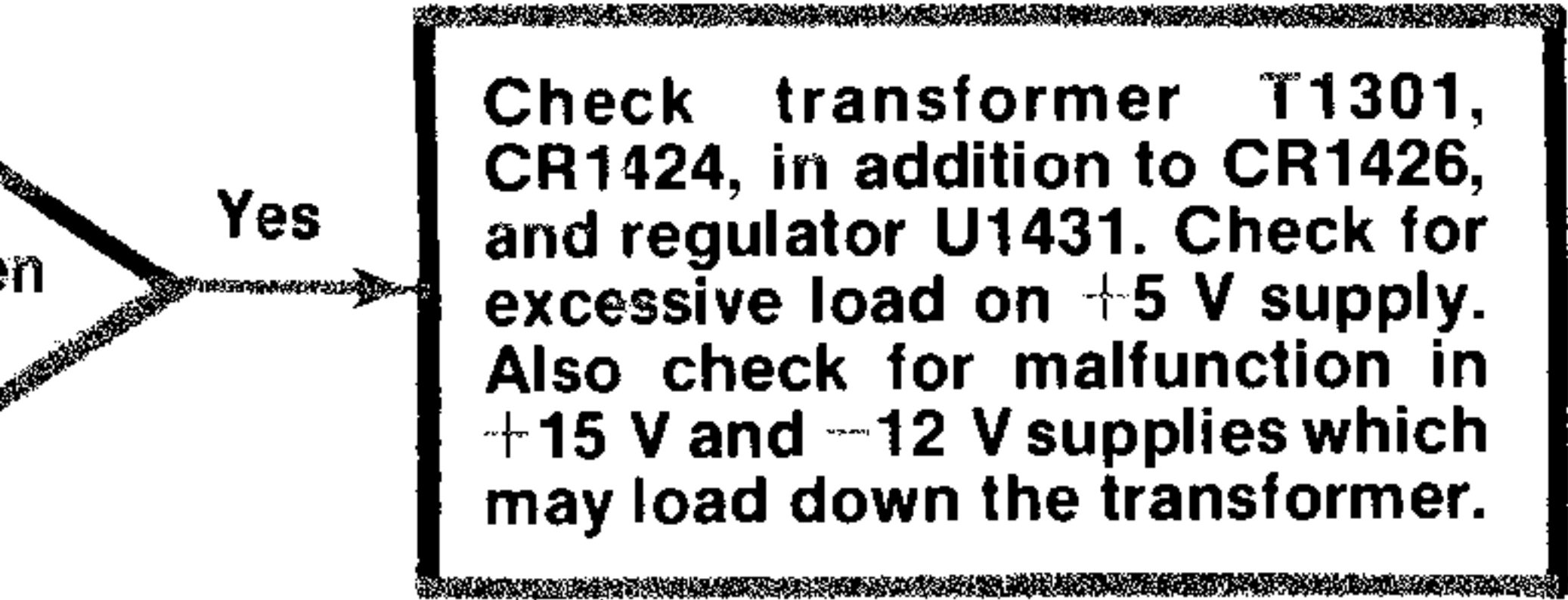


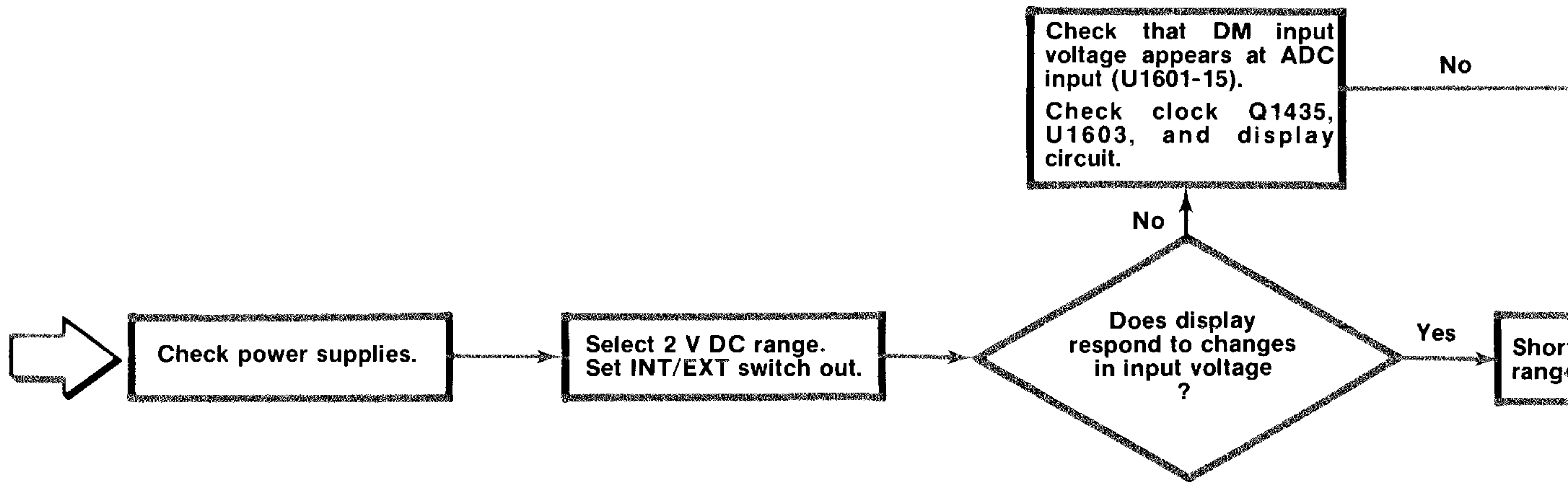
Fig. 8-4.

# POWER SUPPLY

me



@



# DC VOLTS

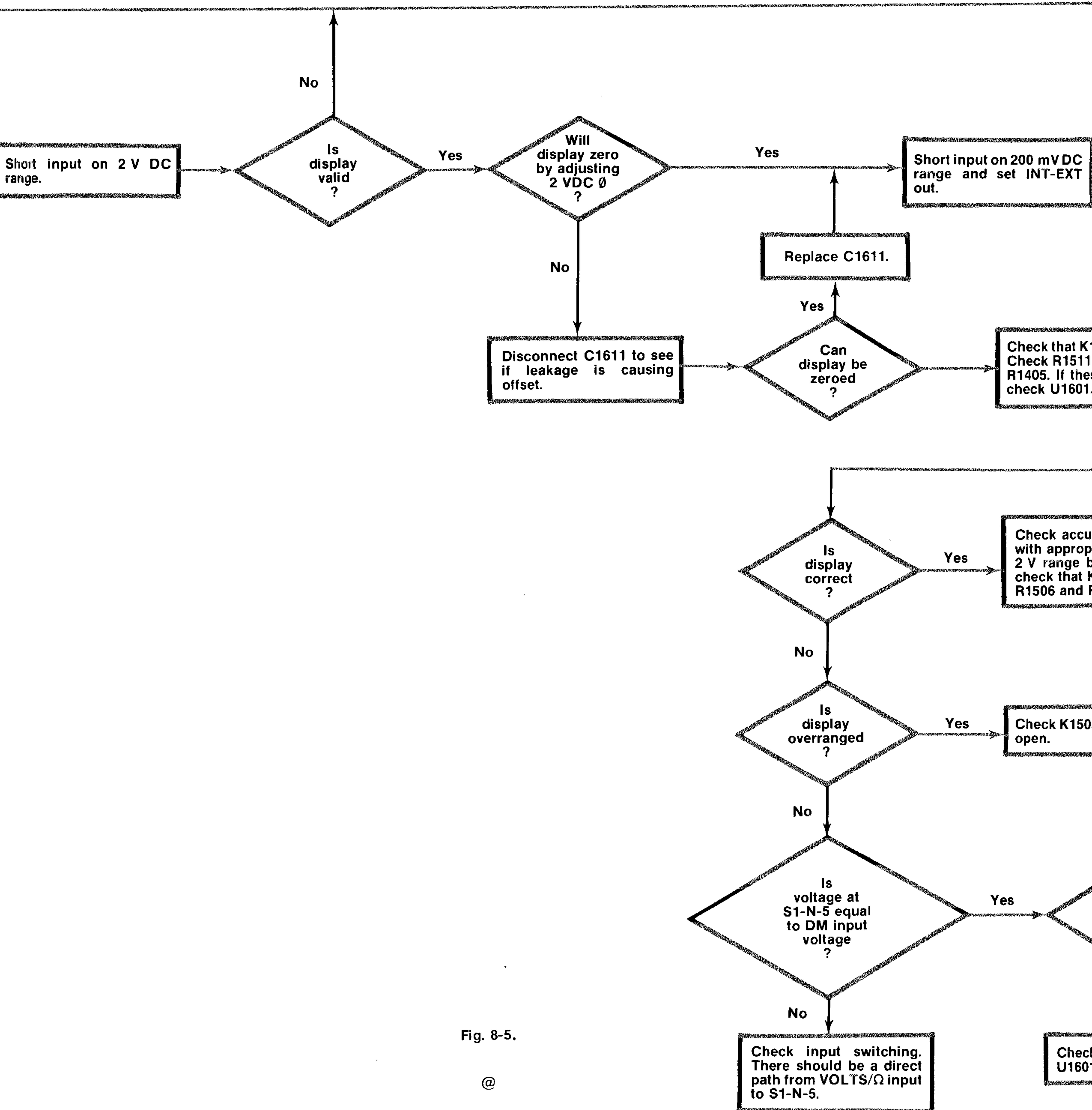
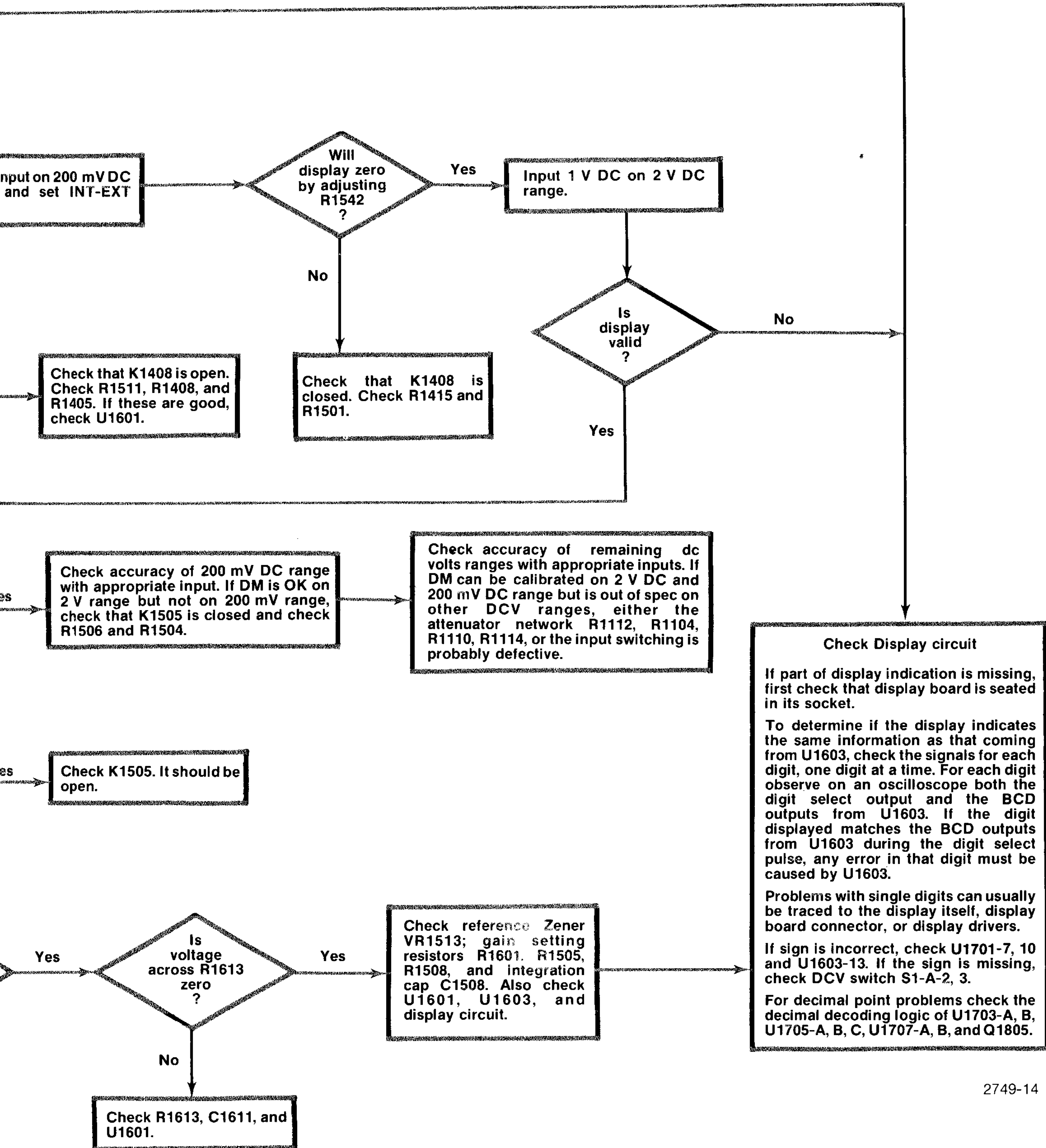


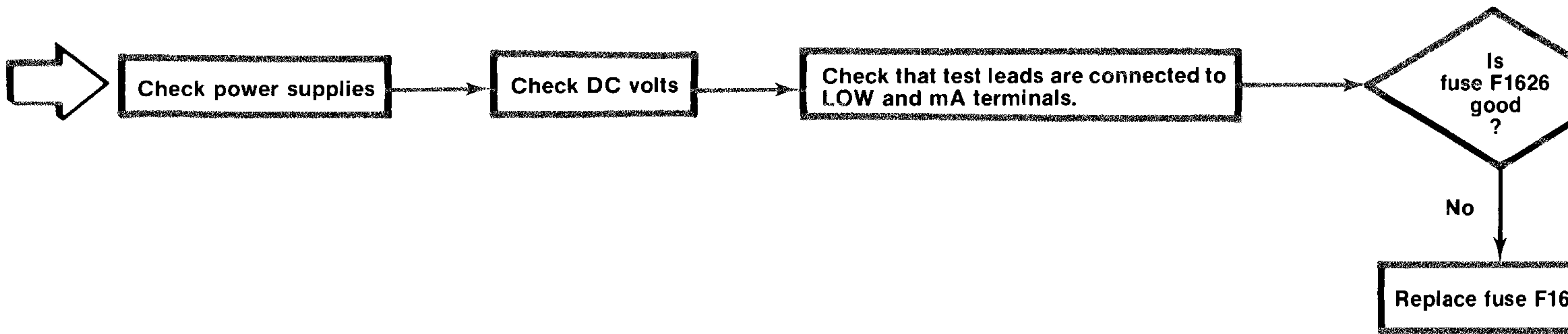
Fig. 8-5.

@



TROUBLE SHOOTING DC VOLTS





TROUBLESHOOTING FLOW CHART  
DC CURRENT

Fig. 8-6.

# DC CURRENT

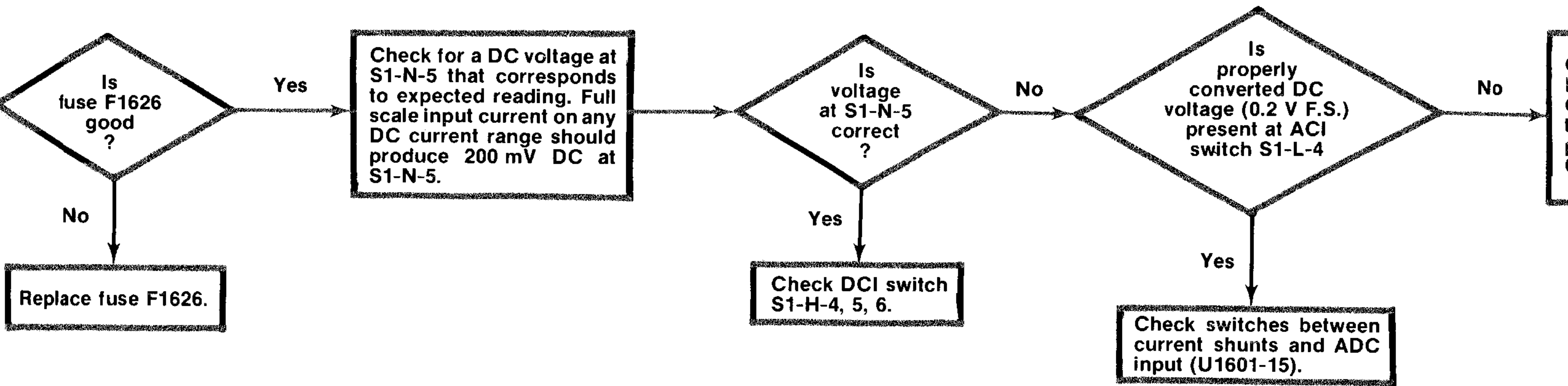


Fig. 8-6.

No

Check current shunts R1713, R1711 and R1628. Check input switching for the shunts. Also check protection bridge diodes CR1624.



**Check power supplies**

# OHMS

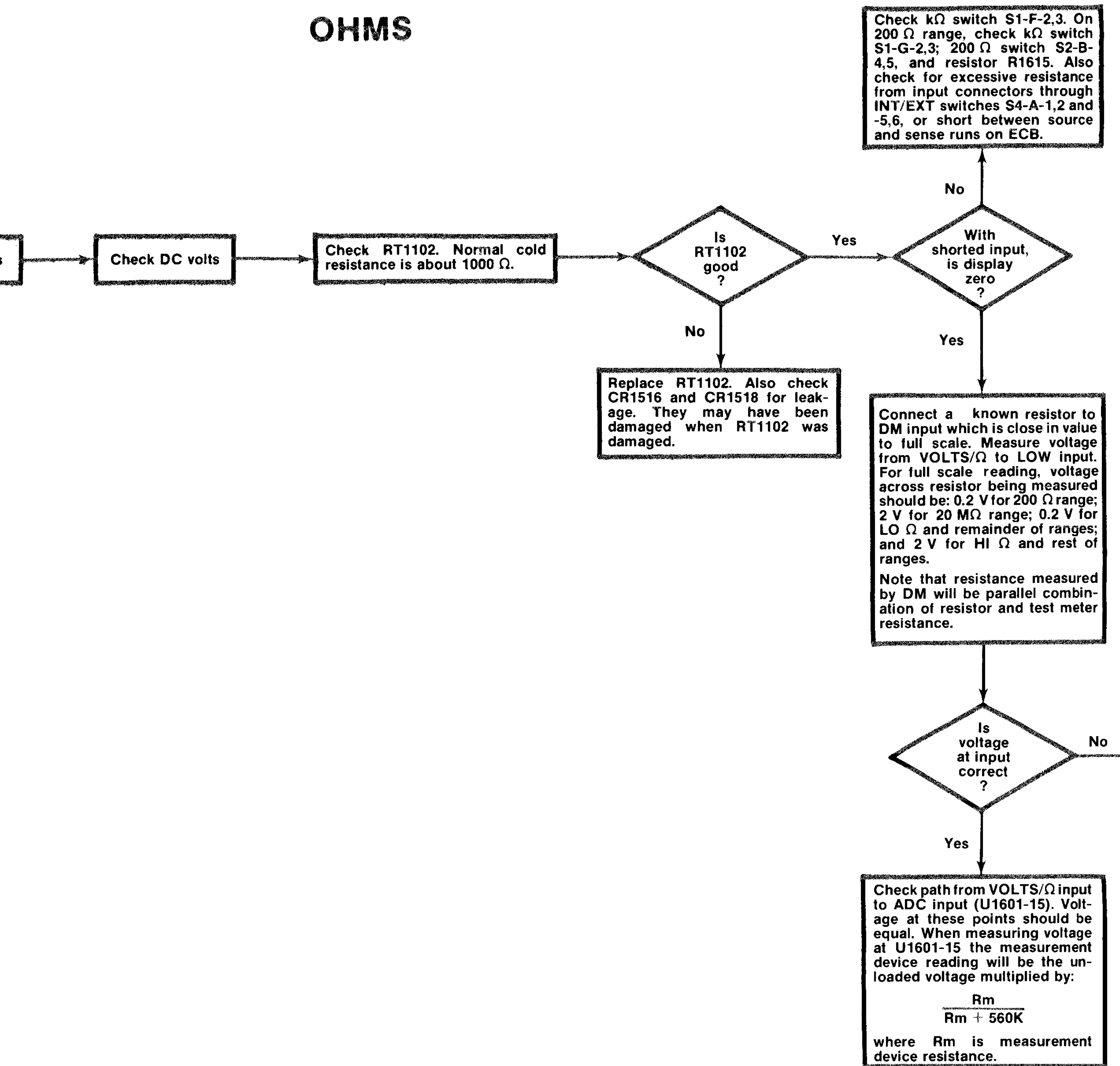


Fig. 8-7.

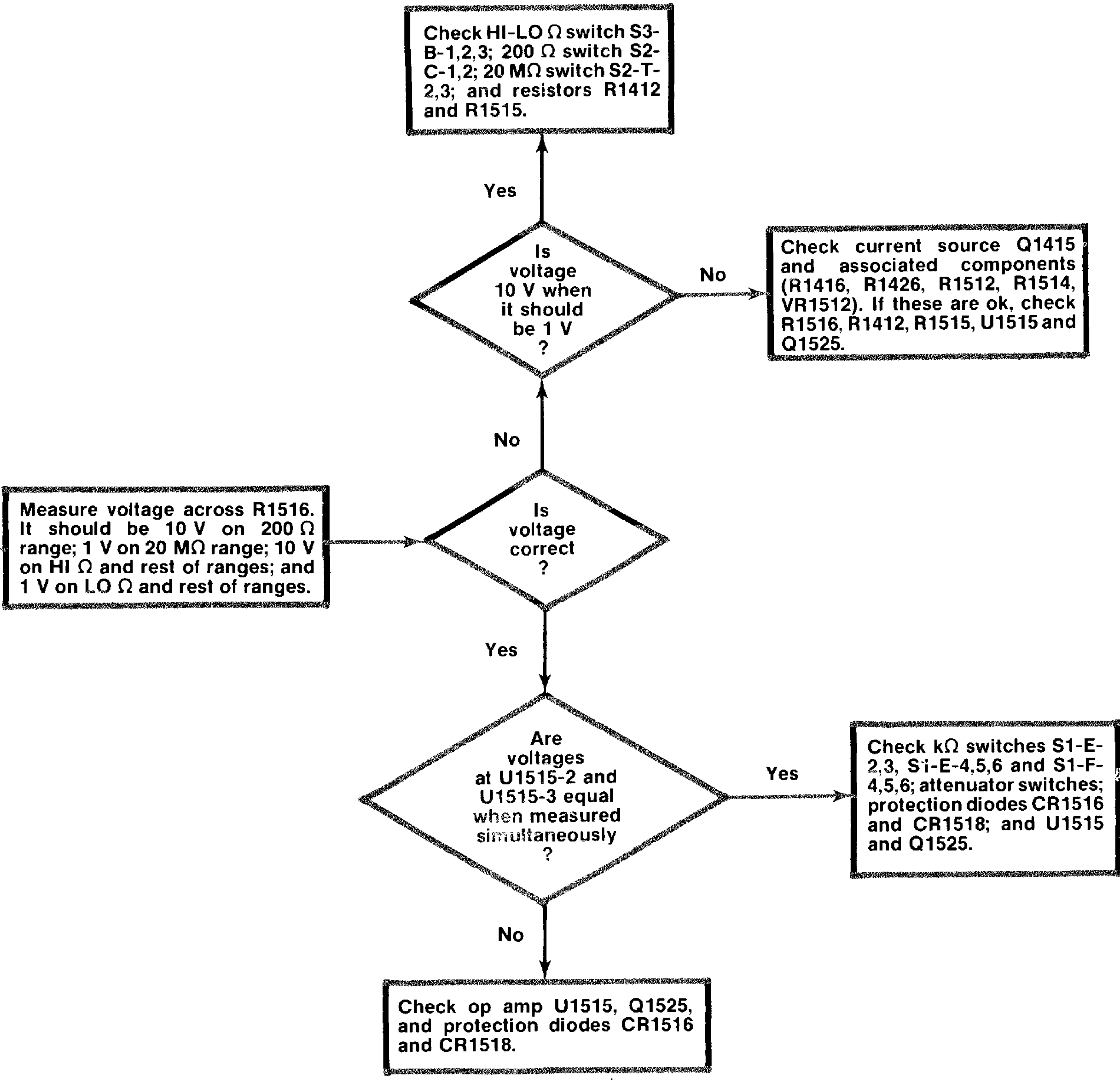
1-F-2,3. On  
kΩ switch  
S2-B-  
1615. Also  
resistance  
through  
4-A-1,2 and  
seen source  
ECB.

ut,

n resistor to  
close in value  
sure voltage  
LOW input.  
ling, voltage  
ng measured  
200 Ω range;  
ge; 0.2 V for  
er of ranges;  
and rest of  
ce measured  
allel combin-  
nd test meter

LTS/Ω input  
01-15). Volt-  
s should be  
ring voltage  
measurement  
be the un-  
plied by:  
OK  
measurement

7.



# AC VOLTS

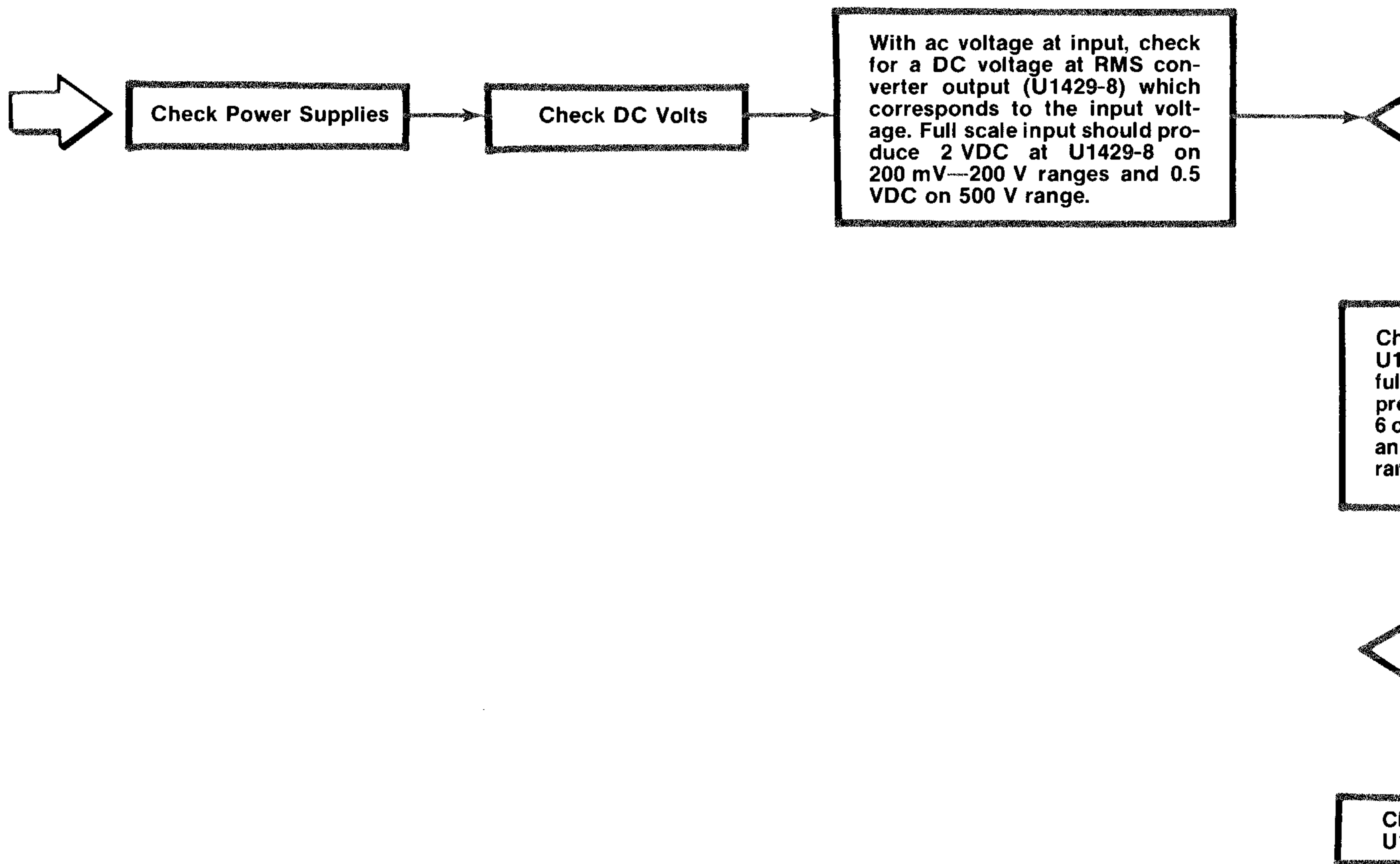


Fig. 8-8.

AC VOLTS

# AC VOLTS

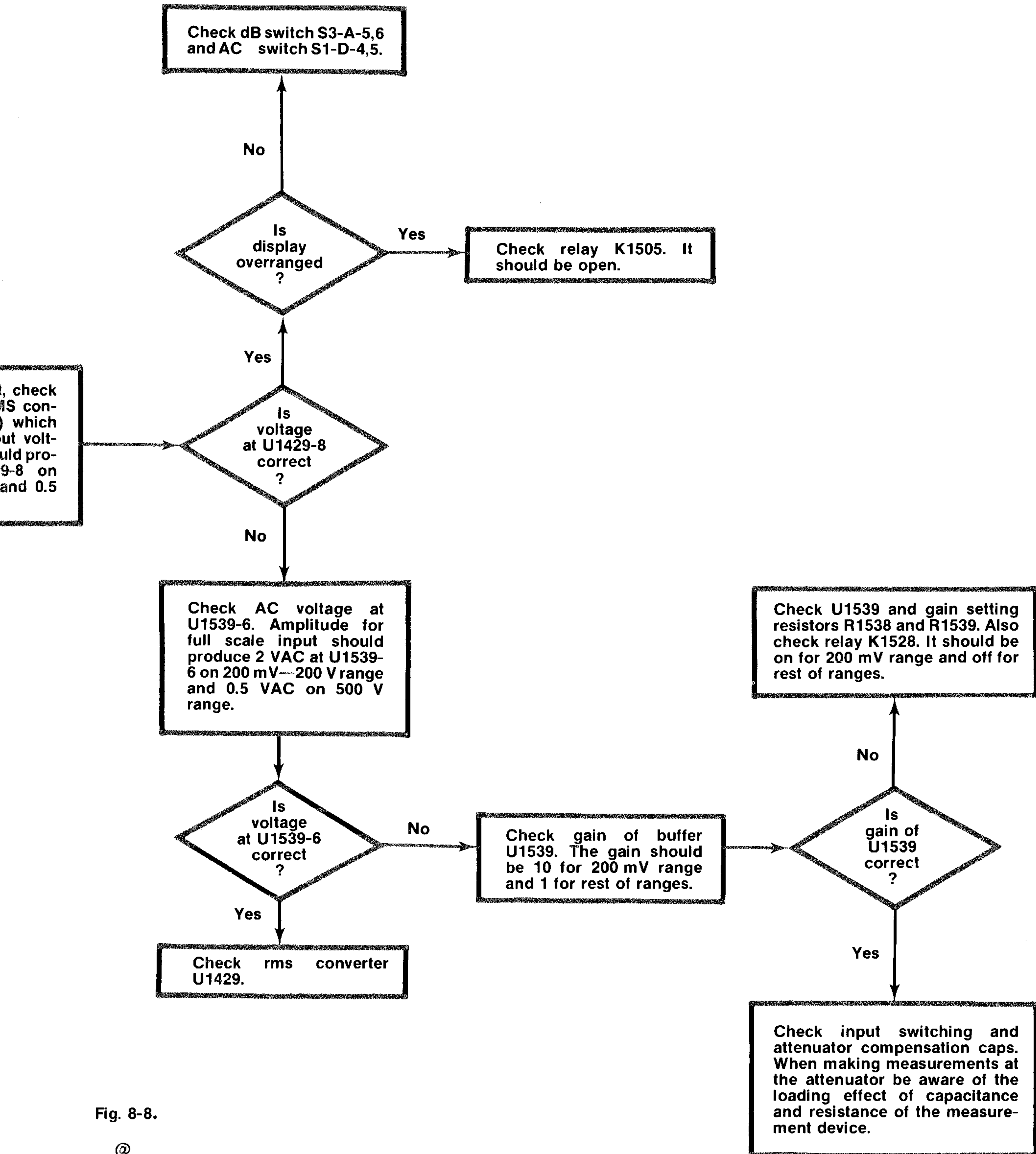


Fig. 8-8.

②



# AC CURRENT

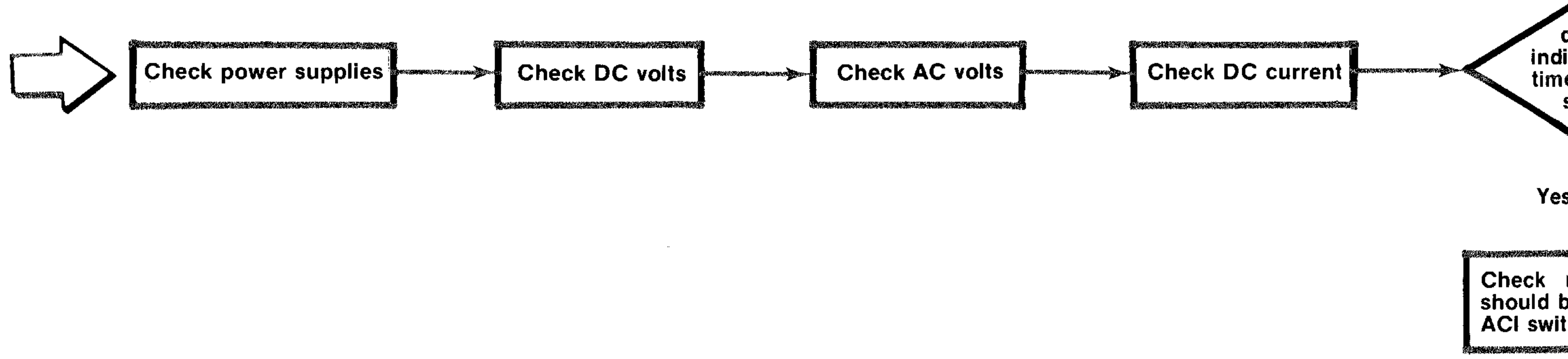


Fig. 8-9.

# CURRENT

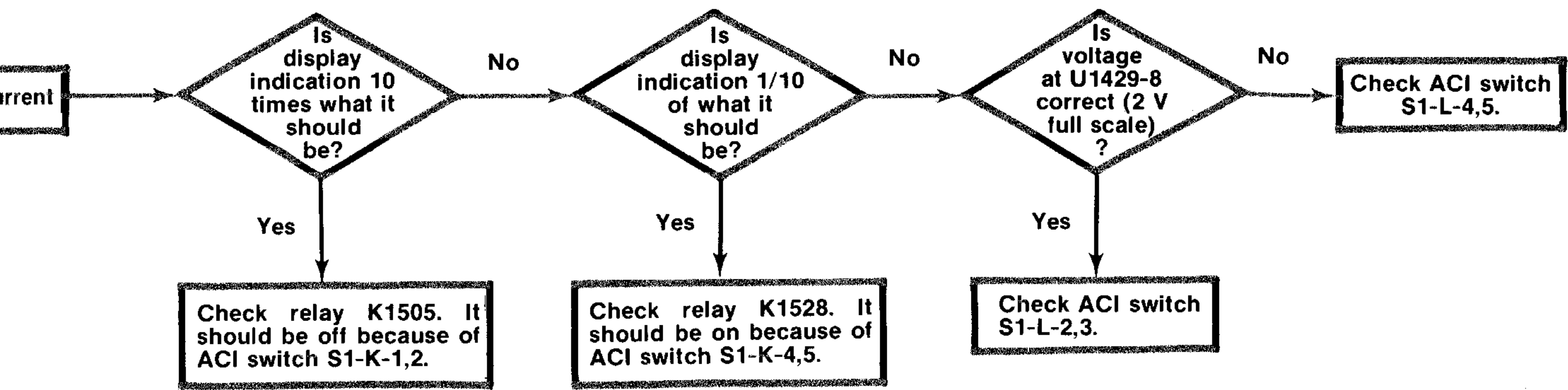


Fig. 8-9.

dB

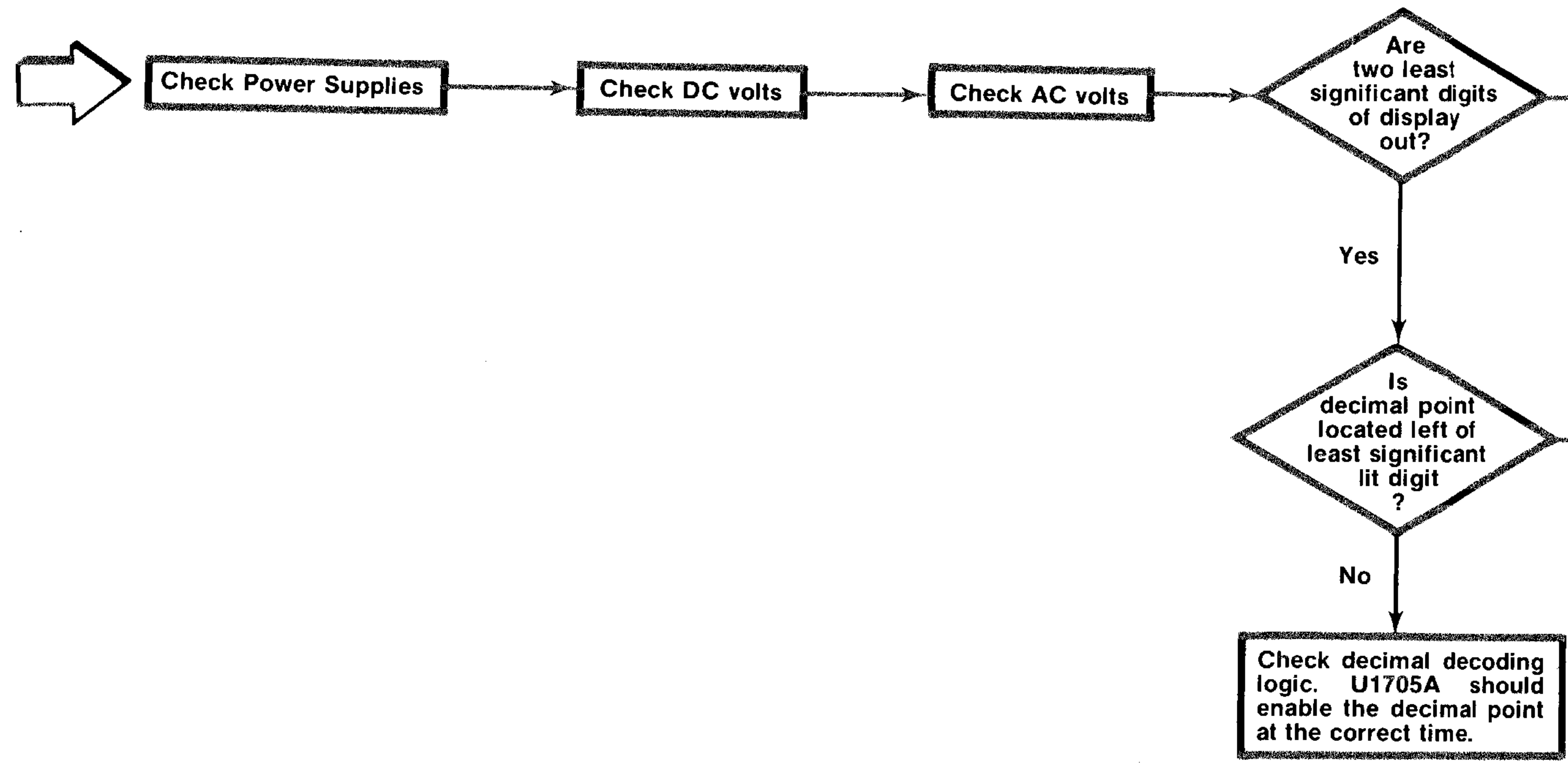


Fig. 8-10.

# dB

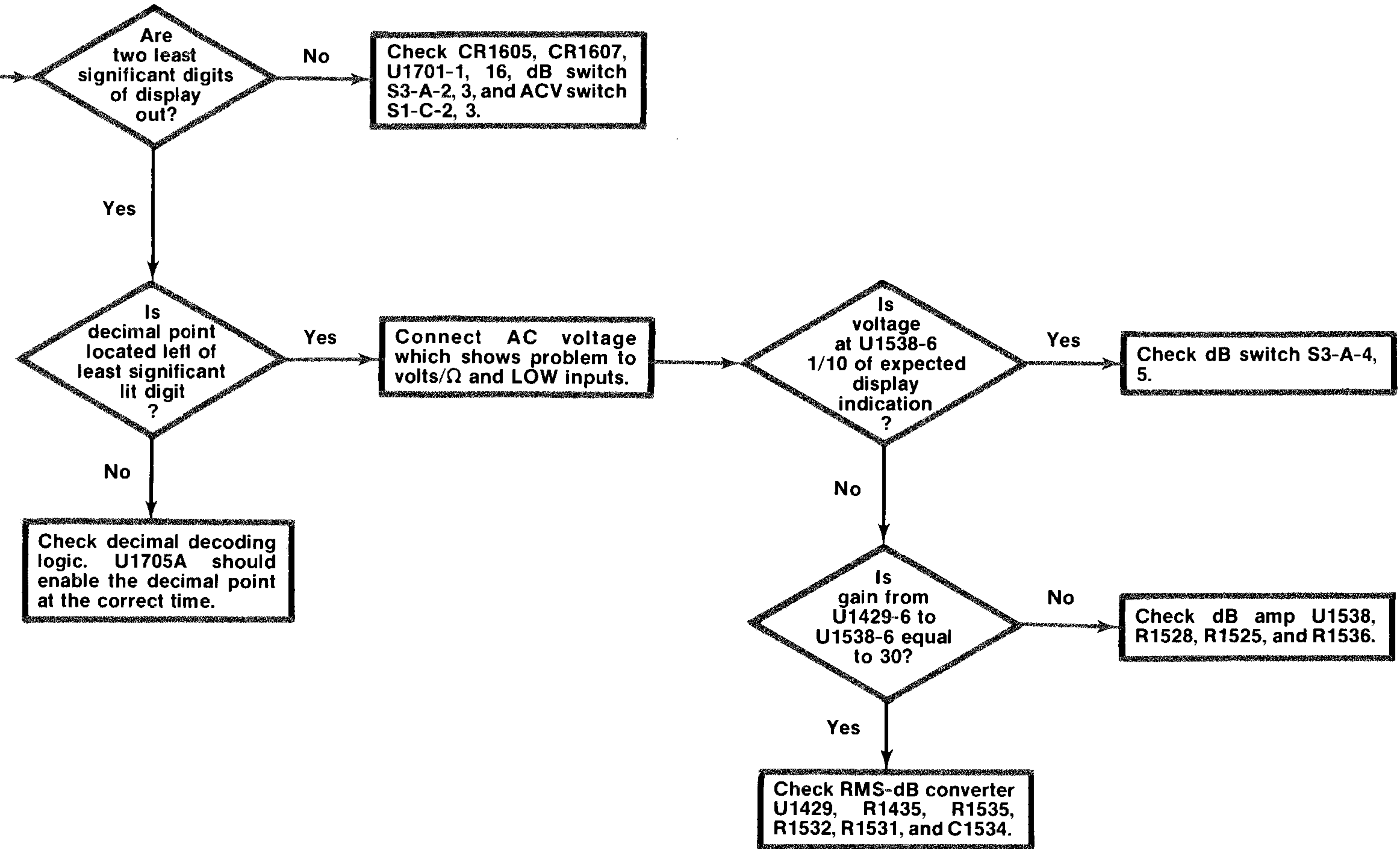
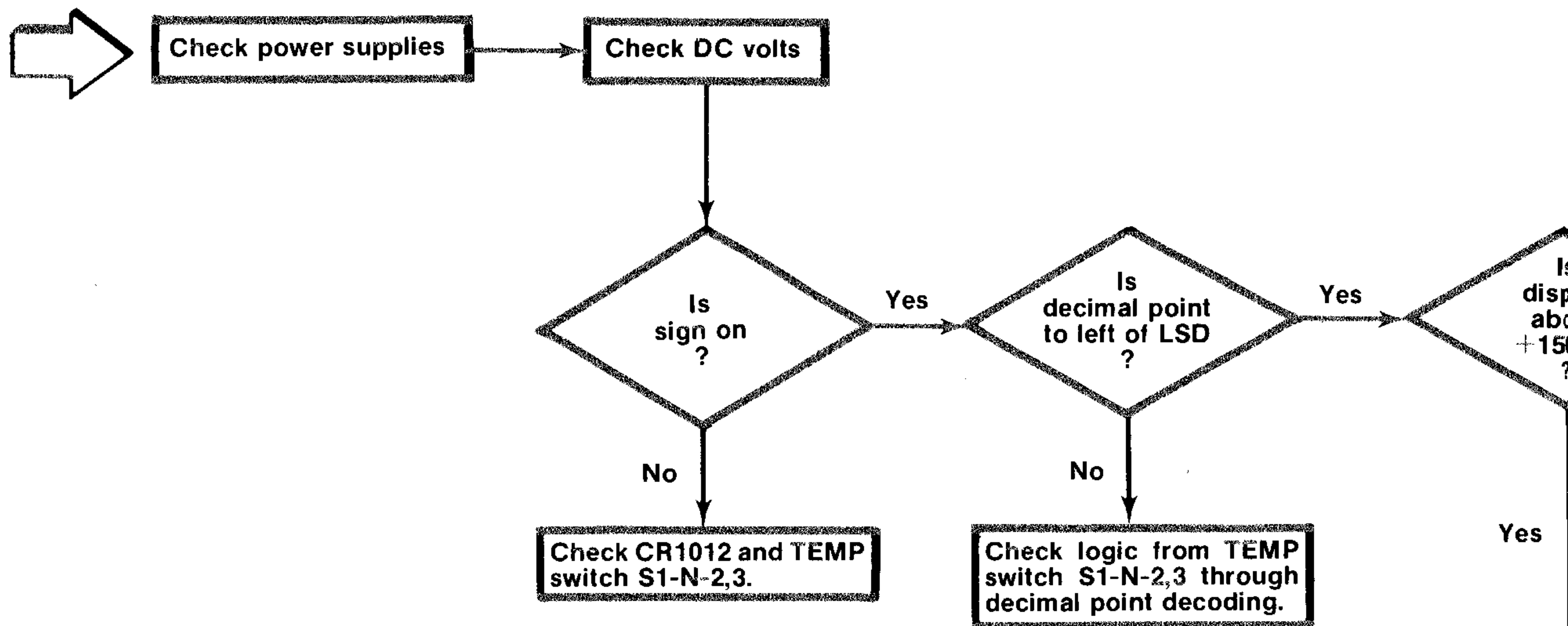
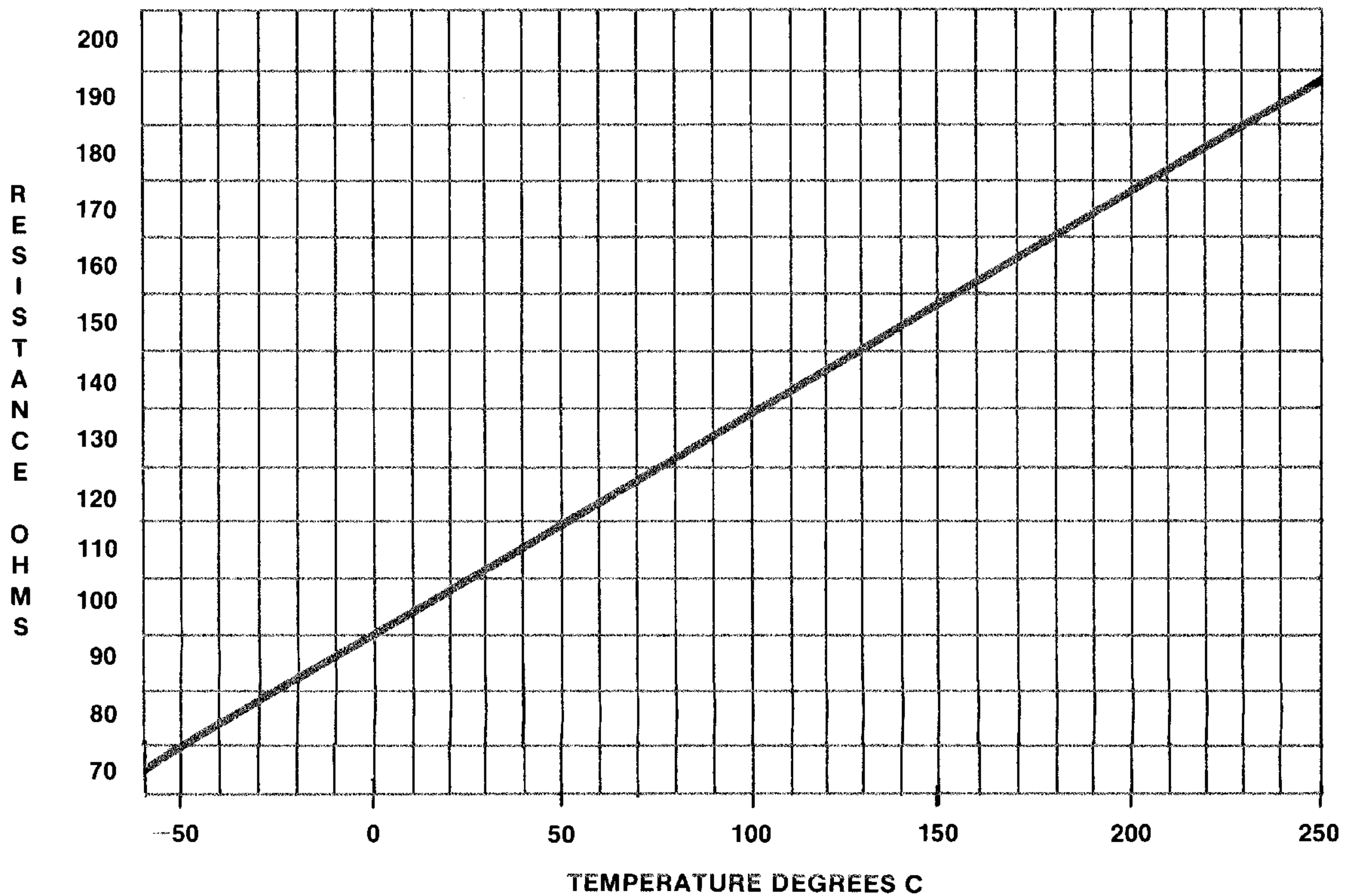


Fig. 8-10.



This would occur if connected. Check Refer to probe resi check probe conn switch from probe circuit, S1-M-4,5.

DM 501A PROBE RESISTANCE VS TEMPERATURE



# TEMPERATURE—GRAPH

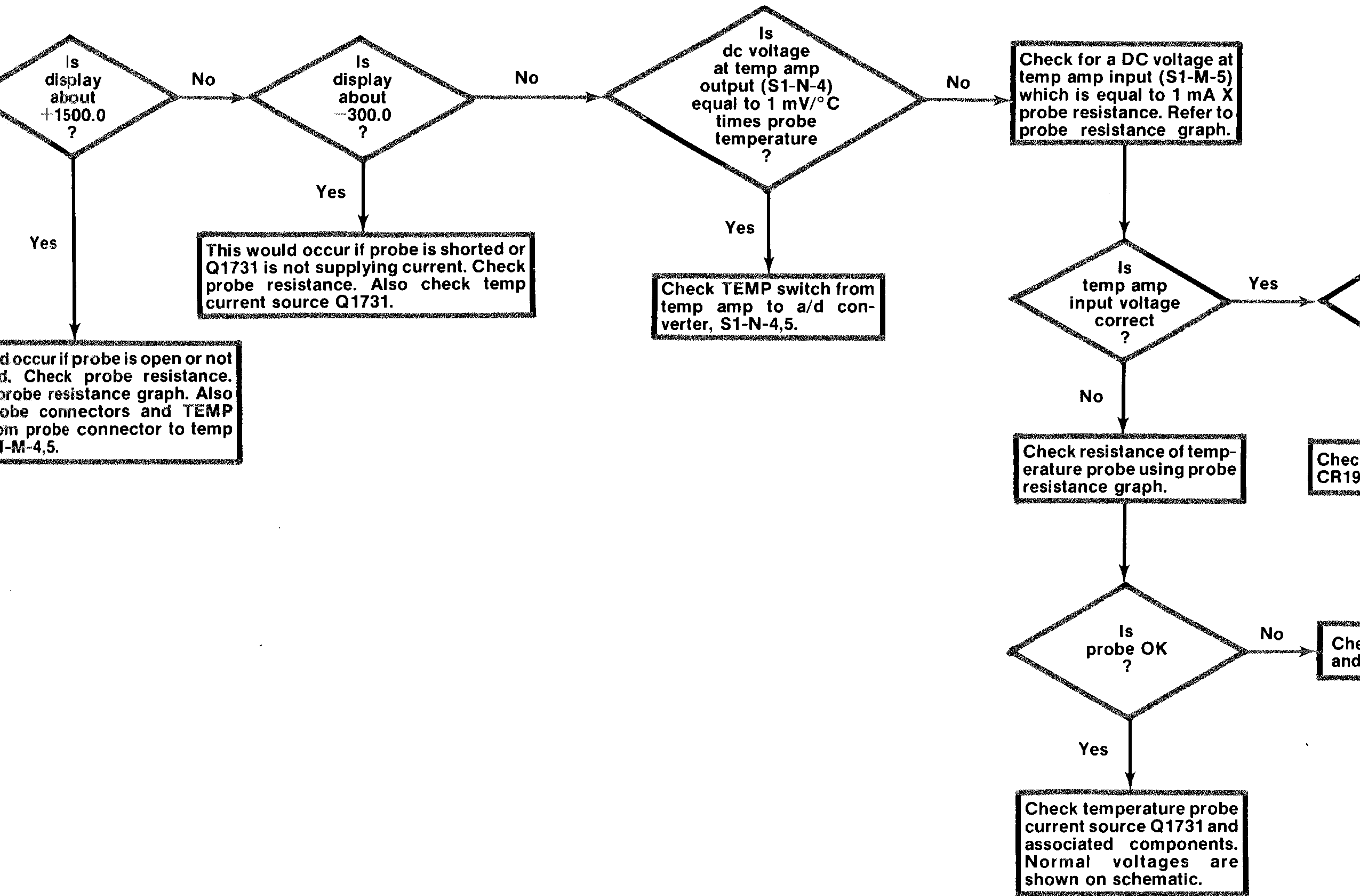
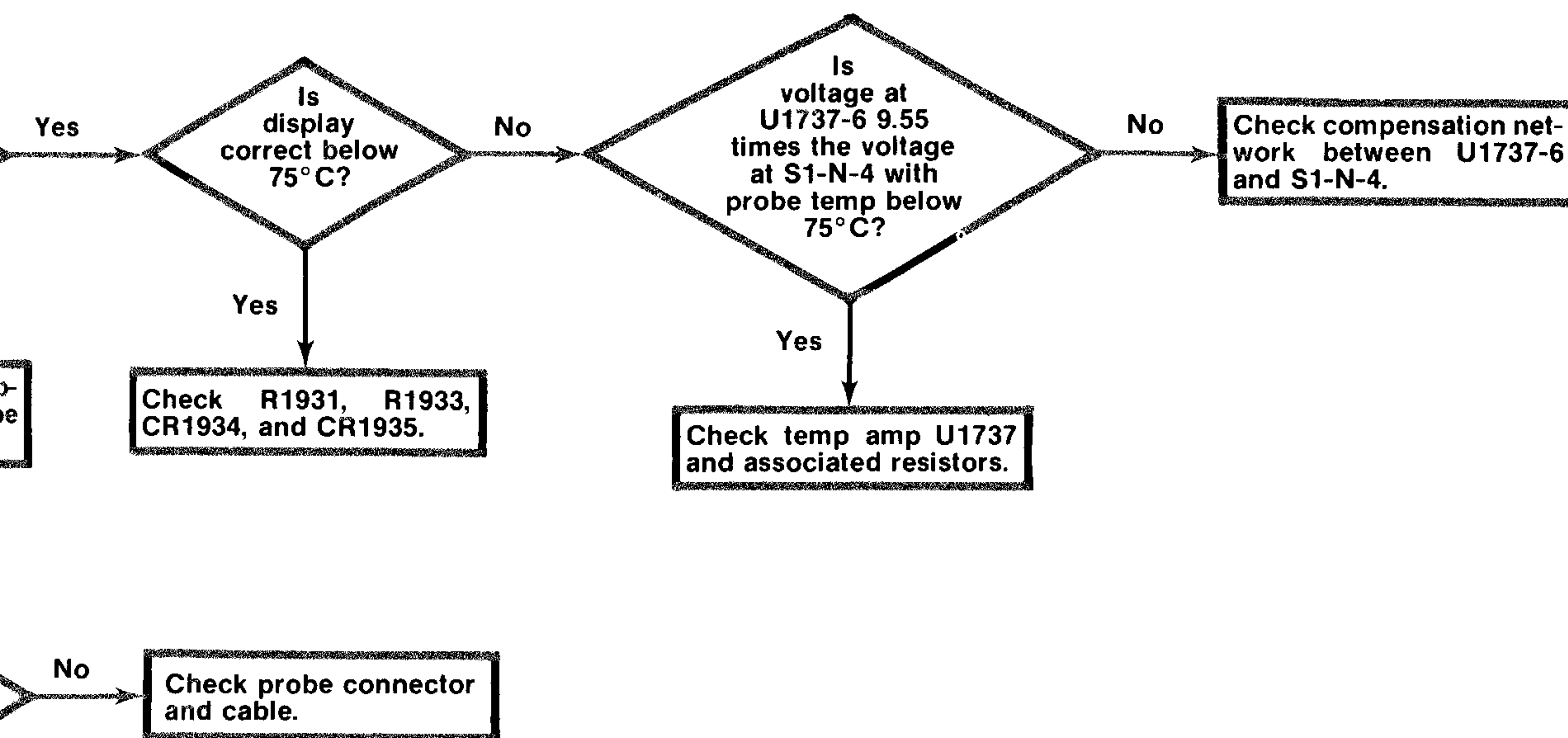


Fig. 8-11.



# REAR INTERFACE CONNECTOR SWITCH ASSIGNMENTS

## REAR INTERFACE CONNECTOR ASSIGNMENTS

Remarks	Maximum Recommended Loads	Active Level	Output or Input	Pin B		Pin A	Output Input	Active Level	Maximum Recommended Loads	Remarks	
			HI input	*28	DM barrier slot	28*	LO input				
				27		27					
				26		26					
				25		25					
				24		24					
				23		23					
				22		22					
				21		21					
				20		20					
				19		19					
				18		18					
				17		17					
				16		16					
				15		15					
				14	14						
			25 V ac winding	*13	TM 500 barrier slot	13*	25 V ac winding				
			+33.5 V filtered dc	12		12	+33.5 V filtered dc				
			Collector lead of pnp series-pass	11		11	Base lead of pnp series-pass				
			Transformer shield	10		10	Emitter lead of pnp series-pass				
			±33.5 V common return	*9		9*	±33.5 V common return				
			-33.5 V filtered dc	8		8	-33.5 V filtered dc				
			Collector lead of npn series-pass	7		7	Emitter lead of npn series-pass				
			No connection	6		6	Base lead of npn series-pass				
			17.5 V ac winding	5		5	17.5 V ac winding				
			+11.5 V common return	4		4	+11.5 V common return				
			+11.5 V common return	3		3	+11.5 V common return				
			+11.5 V filtered dc	2		2	+11.5 V filtered dc				
			25 V ac winding	1		1	25 V ac winding				
				B			A				

Rear view of plug-in

2749-21

Assignments listed for pins 1A--13A and 1B--13B are available in all power modules; however, only those pins marked with an asterisk (\*) are used in the DM 501A.

Fig. 8-12.





# Table 8-1

## COMPONENT REFERENCE CHART

P/O A10 ASSY			Input Signal Conditioning <span style="border: 1px solid black; padding: 2px;">1</span>		
Circuit Number	Schematic Location	Board Location	Circuit Number	Schematic Location	Board Location
C1517	D3	E3	RT1525	L5	E4
C1521	J6	E4	RT1633	F5	G6
C1534	K7	E5	S1-B	H2	B1
C1539	J5	E6	S1-C	C1	C2
CR1516	C3	F3	S1-D	E5	L3
CR1518	C3	F3	S1-D	M6	L3
CR1624	C7	G4	S1-E	F4	C2
CR1631	H4	F6	S1-F	M1	L3
CR1632	F5	F6	S1-K	J6	M4
F1626	B7	G4	S1-L	E5	L4
J1435	H7	D5	S1-J	M7	B3
K1528	H5	F4	S1-L	M7	L4
P1435	H7	D5	S1-M	E8	M5
Q1415	C5	D3	S1-N	M8	B4
Q1525	D3	E4	S2-C	D4	C1
R1412	C5	D4	S2-C	H5	C1
R1416	C6	D3	S2-E	D5	C2
R1426	C5	D4	S2-H	D6	C2
R1435	H7	D5	S2-M	D6	C3
R1512	B5	D3	S2-Q	C7	C3
R1514	B4	E3	S2-Q	C6	C3
R1515	D4	E3	S2-T	C4	I5
R1516	C4	E3	S3-A	M6	H3
R1526	K6	F4	S3-B	D4	H3
R1525	J6	F4	S4-A	B1	H4
R1528	L5	F5	S4-A	D8	H4
R1531	J7	D5	S4-B	C7	H4
R1532	J7	E5	S4-B	B7	H4
R1535	H7	E6	TP1631	F8	F5
R1536	M5	E5	U1429	K4	E4
R1537	K5	F5	U1515	C3	F3
R1538	J5	F6	U1538	M5	E5
R1539	H5	F6	U1539	J5	F6
R1628	E6	G4	VR1512	B6	E3
R1711	E5	I3	W1720	E8	H4
R1713	E5	I3			

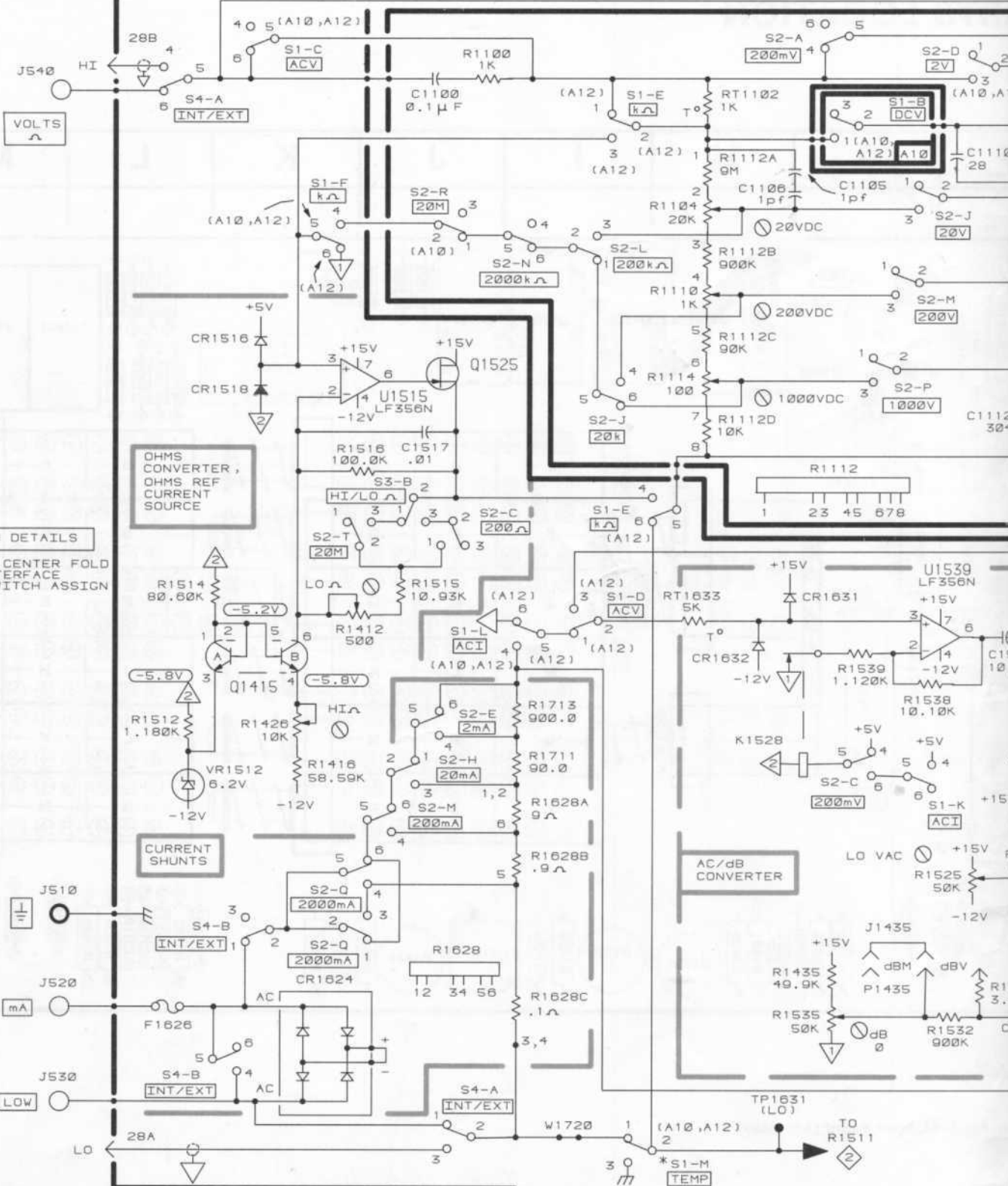
P/O A10 ASSY also shown on 2 & 3

P/O A14 ASSY			Input Signal Conditioning		
Circuit Number	Schematic Location	Board Location	Circuit Number	Schematic Location	Board Location
C1100	D1	A2	RT1102	F1	B1
C1105	H2	B2	S1-E	E2	C2
C1106	H2	B2	S2-A	H1	D1
C1110	J2	A3	S2-D	J1	D2
C1112	J3	B3	S2-H	L2	C2
C1114	J2	A3	S2-J	E3	C2
C1120	K2	A4	S2-J	J2	C2
C1122	K3	B4	S2-L	E2	J4
C1124	L3	B4	S2-L	L3	J4
C1126	M2	C4	S2-M	H3	C3
C1128	K2	A4	S2-N	E2	J4
C1129	L2	B4	S2-P	L3	C3
R1100	D1	C2	S2-P	H3	C3
R1104	F2	B2	S2-R	D2	J5
R1110	F3	B3	J510	A6	Chassis
R1112	F2	B2	J520	A7	Chassis
R1114	F3	B3	J530	A8	Chassis
			J540	A1	Chassis

P/O A14 ASSY also shown on 2

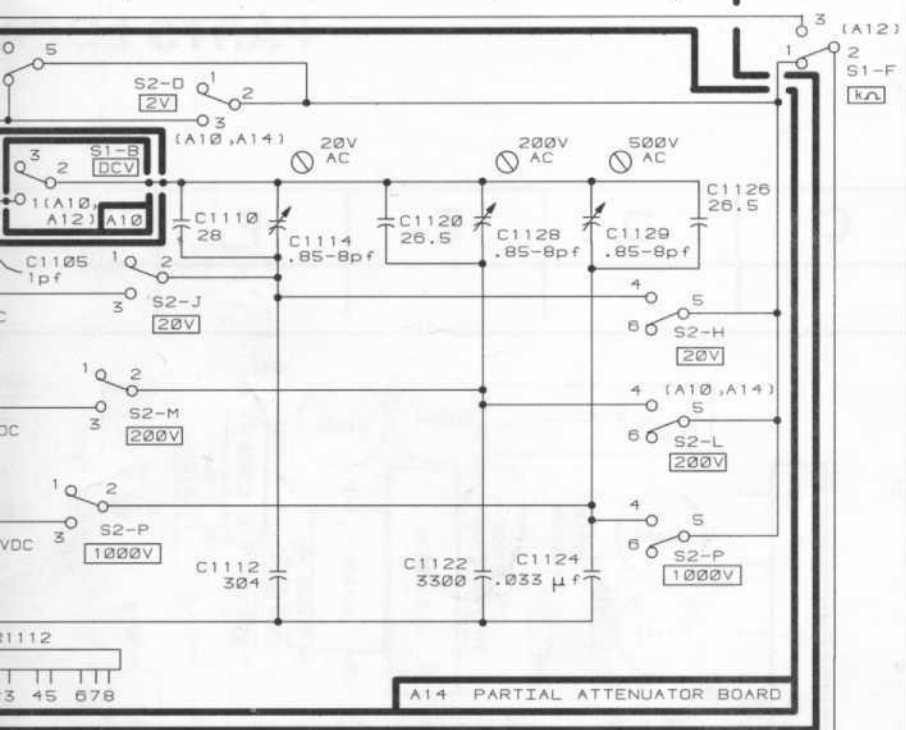
A | B | C | D | E | F | H | J

1  
2  
3  
4  
5  
6  
7  
8

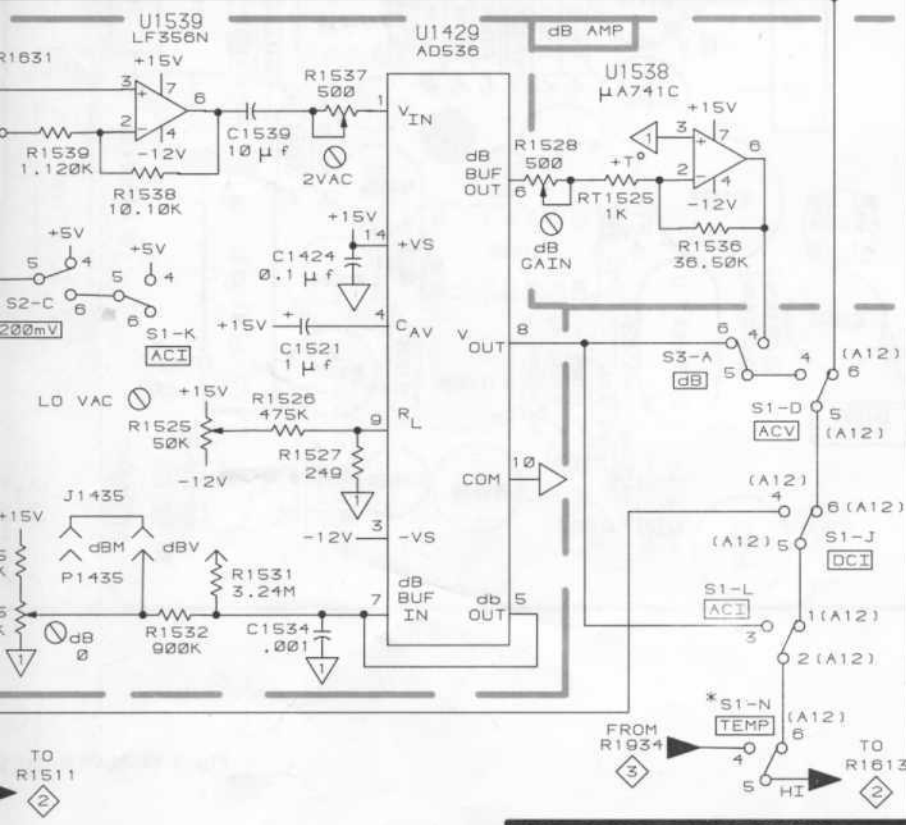


4 SWITCH DETAILS  
LOCATED ON CENTER FOLD  
OF REAR INTERFACE  
CONNECTOR SWITCH ASSIGN

H | J | K | L | M



A14 PARTIAL ATTENUATOR BOARD



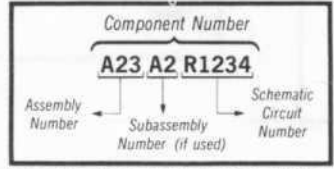
A10 PARTIAL MAIN BOARD

INPUT SIGNAL CONDITIONING

NOTES: ALL PINS USED ON SWITCHES ARE SOLDERED TO BOARD SHOWN, UNLESS OTHERWISE NOTED. SWITCH PINS SOLDERED TO MORE THAN ONE BOARD WILL SHOW ALL BOARD NUMBERS. COMPONENTS MARKED WITH \* ARE DELETED IN OPT. 2. SWITCH S1 SHOWN IN DCV POSITION, SWITCH S2 SHOWN IN 200mV POSITION, SWITCH S3 A&B, AND SWITCH S4 SHOWN IN BUTTON OUT POSITION.

Static Sensitive Devices  
See Maintenance Section

COMPONENT NUMBER EXAMPLE

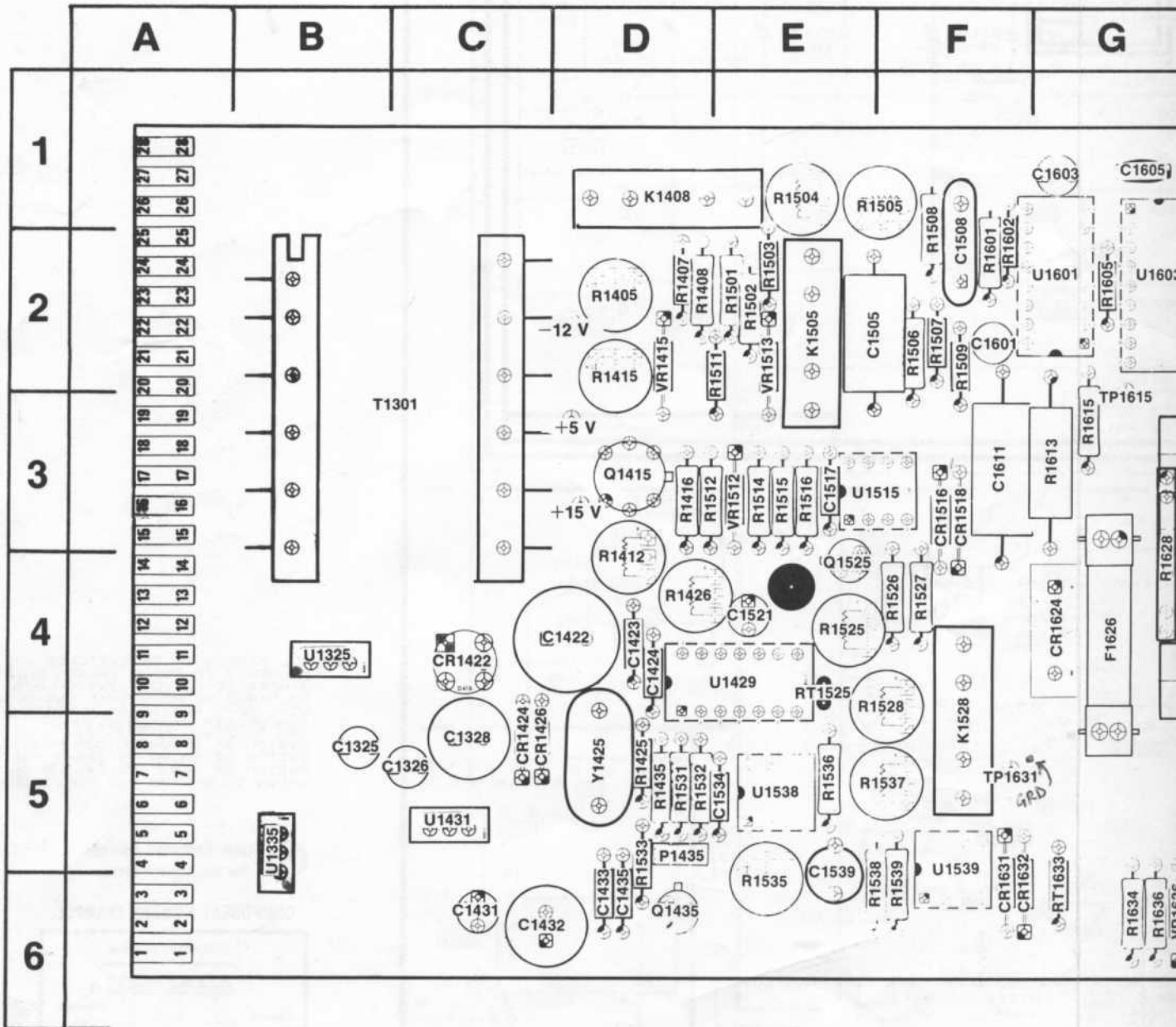


Chassis-mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List.

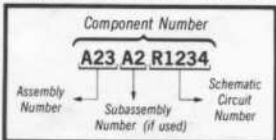
INPUT SIG. CONDITIONING 1

PARTS LOCAT

MAIN BOARD (A10 ASSY)



COMPONENT NUMBER EXAMPLE



Chassis-mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List.

Static Sensitive Devices  
See Maintenance Section

Fig. 8-14. Main Board (A

# PARTS LOCATION

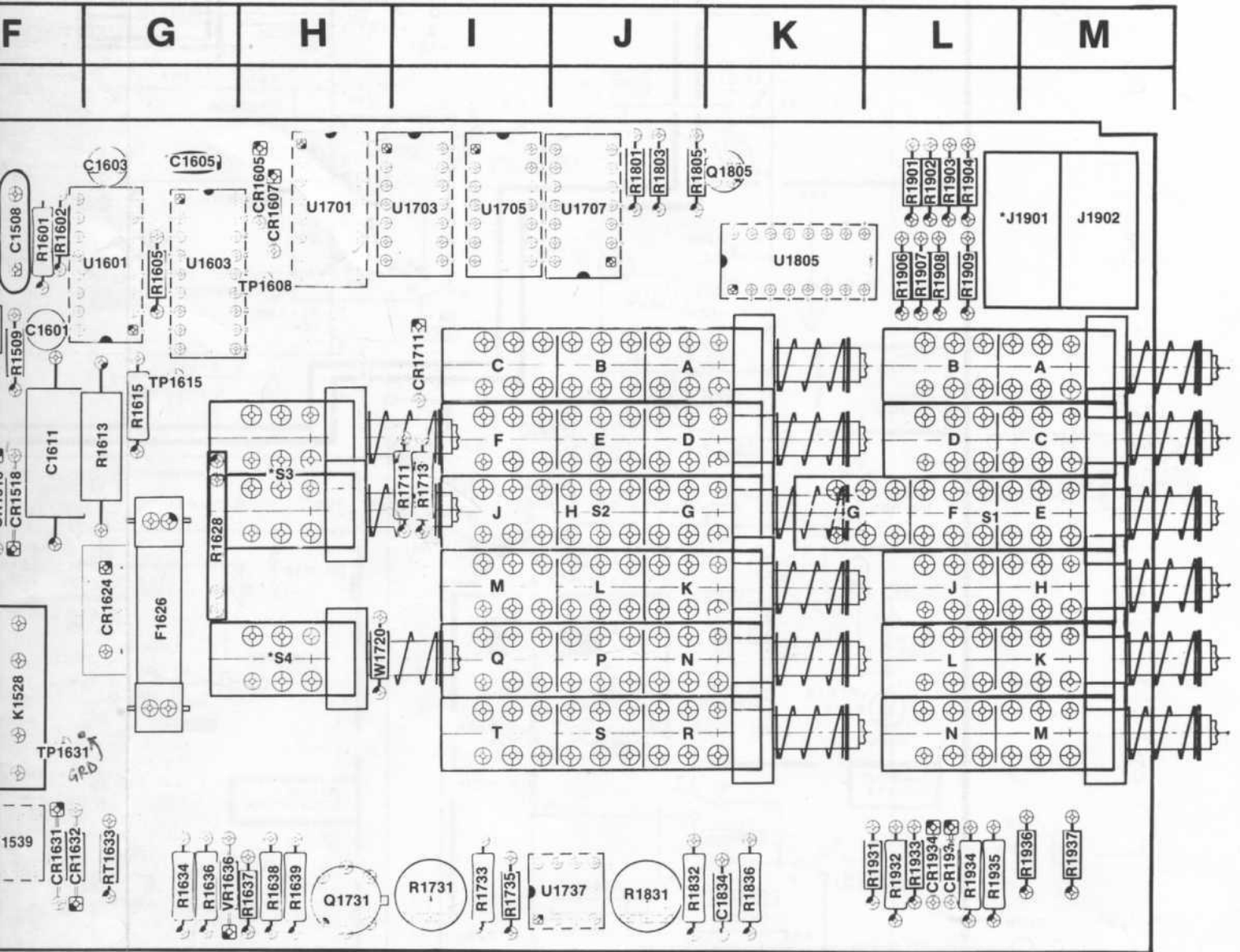


Fig. 8-14. Main Board (A10 Assy).

@

## Table 8-2

# COMPONENT REFERENCE CHART

P/O A10 ASSY			A/D Converter and Display Drivers <span style="border: 1px solid black; padding: 2px;">2</span>		
Circuit Number	Schematic Location	Board Location	Circuit Number	Schematic Location	Board Location
C1423	F1	D4	R1901	M4	L1
C1433	E2	D6	R1902	M4	L1
C1435	E2	D6	R1903	M5	L1
C1505	C4	E2	R1904	M5	L1
C1508	E5	F2	R1906	M4	L2
C1601	C3	F2	R1907	M5	L2
C1603	D6	G1	R1908	M5	L2
C1605	F3	G1	R1909	F7	L2
C1611	B4	F3	R1937	D8	M6
CR1605	K2	H1	S1-A	K5	C1
CR1607	K1	H1	S1-B	D7	B1
CR1711	J4	I2	S1-G	C4	K3
K1408	B7	D1	S1-H	E7	M4
K1505	E6	E2	S1-J	H5	B3
Q1435	E2	D6	S1-N	F8	B4
Q1805	L6	K1	S2-B	E7	J2
R1405	C5	D2	S2-B	C4	J2
R1407	C2	D2	S2-E	K5	C2
R1408	C5	D2	S2-G	H6	D2
R1415	B5	D2	S2-N	H8	J4
R1425	E1	D5	S2-R	C7	J5
R1501	C5	E2	S2-S	H6	C4
R1502	C6	E2	S3-A	F6	H3
R1503	C6	E2	S3-B	D7	H3
R1504	F5	E1	TP1608	J2	H2
R1505	F5	F1	TP1615	E3	G3
R1506	E6	F2	U1601	D2	G2
R1507	E5	F2	U1603	H1	G2
R1508	E5	F1	U1701	L1	H1
R1509	C4	F2	U1703A	J5	I1
R1511	B4	E2	U1703B	J7	I1
R1533	E2	D6	U1705A	J6	I1
R1601	F4	F2	U1705B	J7	I1
R1602	E4	F2	U1705C	J7	I1
R1605	E3	G2	U1707A	L6	J1
R1613	B4	G3	U1707B	K6	J1
R1615	C4	G3	U1805	L6	K2
R1801	L4	J1	VR1415	C3	D2
R1803	L6	J1	VR1513	C6	E2
R1805	M6	J1	Y1425	D2	D5

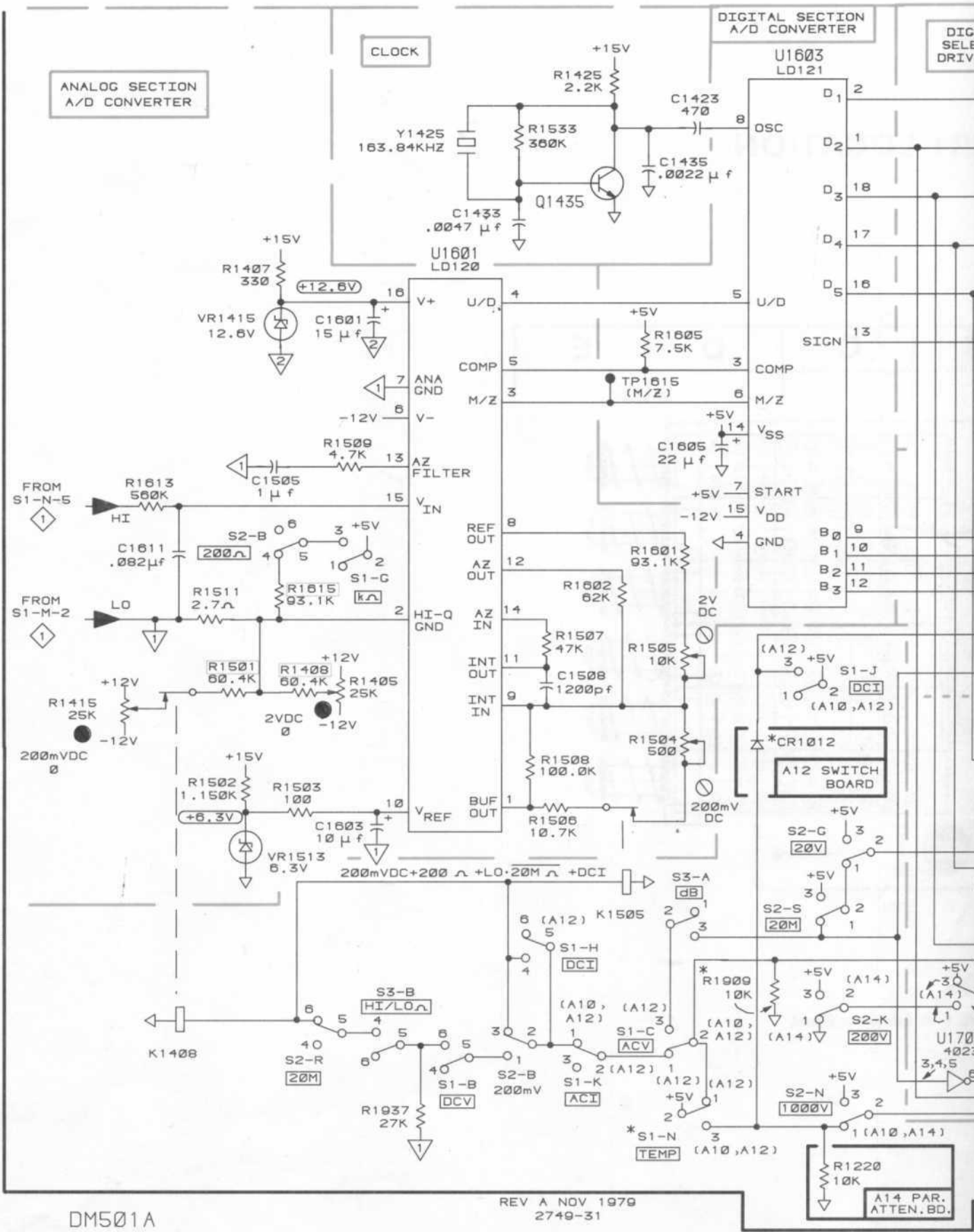
P/O A10 ASSY also shown on 1 & 3

P/O A14 ASSY			A/D Converter and Display Drivers		
CR1012	F5	B4	S1-C	F7	B4
R1220	H8	C4	S1-K	E7	C2
			S2-A	J7	D1
			S2-K	H7	D3

P/O A14 ASSY also shown on 1

A | B | C | D | E | F | H

1  
2  
3  
4  
5  
6  
7  
8

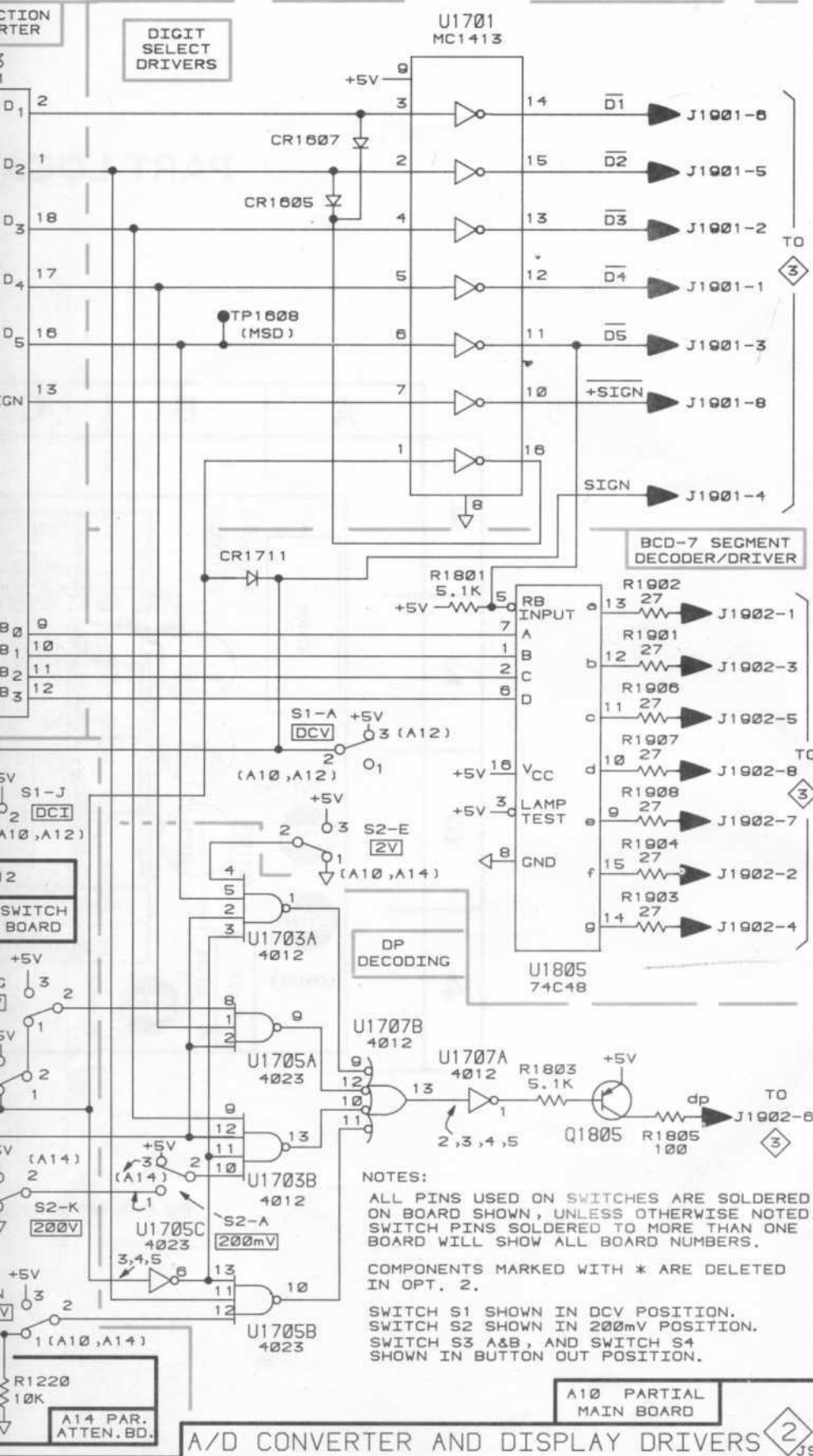


DM501A

REV A NOV 1979  
2749-31



H | J | K | L | M



**NOTES:**

ALL PINS USED ON SWITCHES ARE SOLDERED ON BOARD SHOWN, UNLESS OTHERWISE NOTED. SWITCH PINS SOLDERED TO MORE THAN ONE BOARD WILL SHOW ALL BOARD NUMBERS.

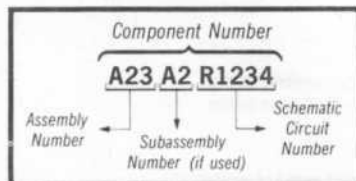
COMPONENTS MARKED WITH \* ARE DELETED IN OPT. 2.

SWITCH S1 SHOWN IN DCV POSITION. SWITCH S2 SHOWN IN 200mV POSITION. SWITCH S3 A&B, AND SWITCH S4 SHOWN IN BUTTON OUT POSITION.

156-0886-02 S, 25  
156-0886-00  
u1805

**Static Sensitive Devices**  
See Maintenance Section

**COMPONENT NUMBER EXAMPLE**



Chassis-mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List.

A/D CONVERTER AND DISPLAY DRIVERS 2 JS

A/D CONVERTER AND DISPLAY DRIVERS

2

# PART LOCATION

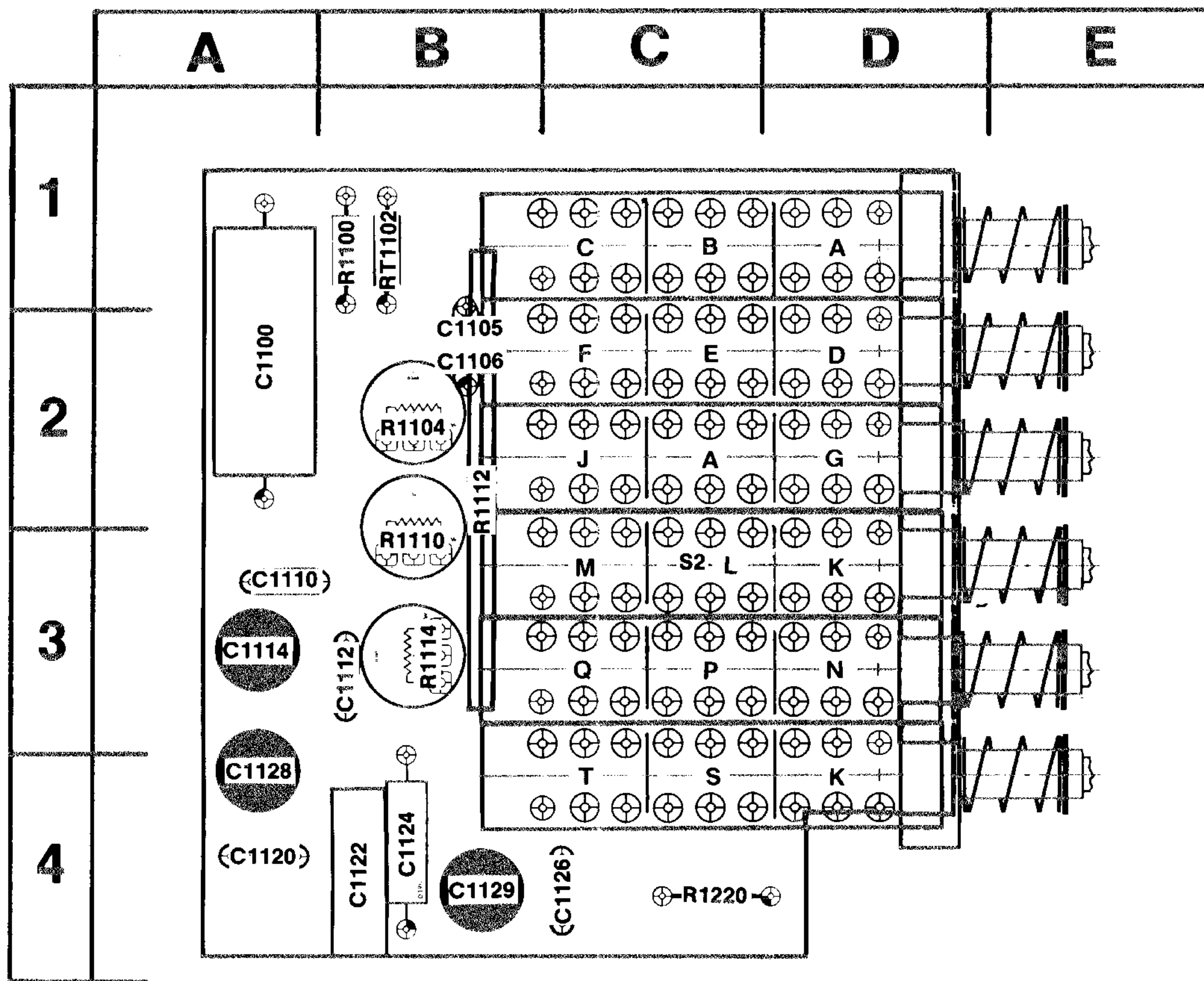





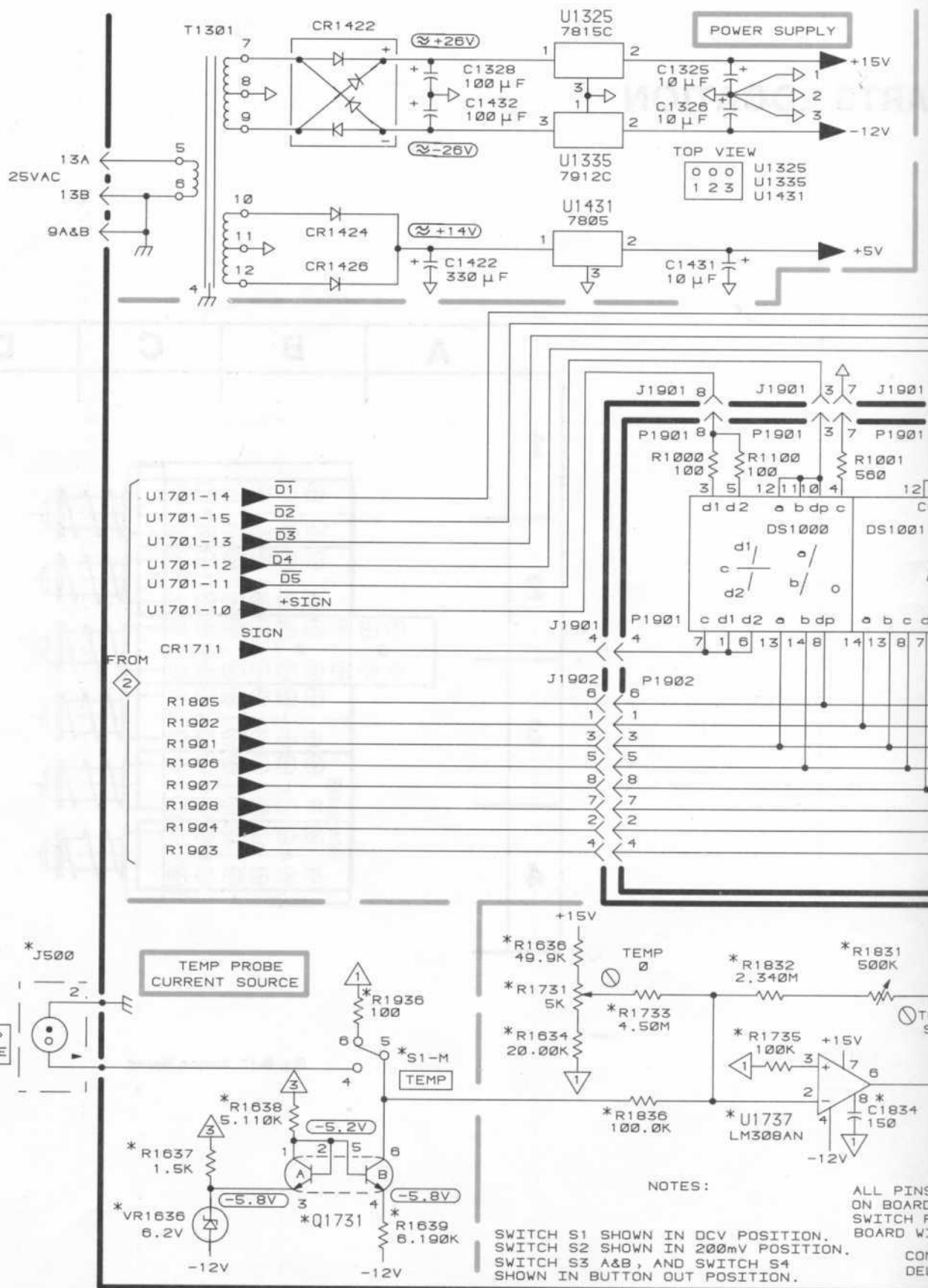
Fig. 8-15. Attenuator Board.

**Table 8-3**  
**COMPONENT REFERENCE CHART**

P/O A10 ASSY			Pwr Supply, Display and Temp Circuitry 		
Circuit Number	Schematic Location	Board Location	Circuit Number	Schematic Location	Board Location
C1325	F1	B5	R1731	E6	I6
C1326	F1	C5	R1733	E6	I6
C1328	D1	C5	R1735	F7	I6
C1422	D2	D4	R1831	H6	J6
C1431	F2	C6	R1832	F6	J6
C1432	D1	C6	R1836	E7	K6
C1834	H7	J6	R1931	J7	K6
CR1422	C1	C4	R1932	K7	L6
CR1424	C2	C5	R1933	K6	L6
CR1426	C2	C5	R1934	K7	L6
CR1934	K6	L6	R1935	K7	L6
CR1935	J7	L6	R1936	C6	L6
J1901	F3	M2	S1-M	C7	M5
J1902	E5	M2	T1301	C1	B3
Q1731	C7	H6	U1325	E1	B4
R1634	E7	G6	U1335	E1	B5
R1636	E6	G6	U1431	E2	C5
R1637	B7	H6	U1737	H7	I6
R1638	C7	H6	VR1636	B8	G6
R1639	D8	H6			
P/O A10 ASSY also shown on  & 					
A16 ASSY			Pwr Supply and Temp Circuitry		
DS1000	F4	A1	P1902	E5	M2
DS1001	H4	B1	R1000	F3	A2
DS1100	J4	B1	R1001	H3	B2
DS1101	K4	C1	R1100	F3	C2
DS1200	M4	C1	J500	A7	Chassis
P1901	F3	M2			

A | B | C | D | E | F | H

1  
2  
3  
4  
5  
6  
7  
8



POWER SUPPLY

TOP VIEW



TEMP PROBE CURRENT SOURCE

NOTES:

SWITCH S1 SHOWN IN DCV POSITION.  
SWITCH S2 SHOWN IN 200mV POSITION.  
SWITCH S3 A&B, AND SWITCH S4 SHOWN IN BUTTON OUT POSITION.

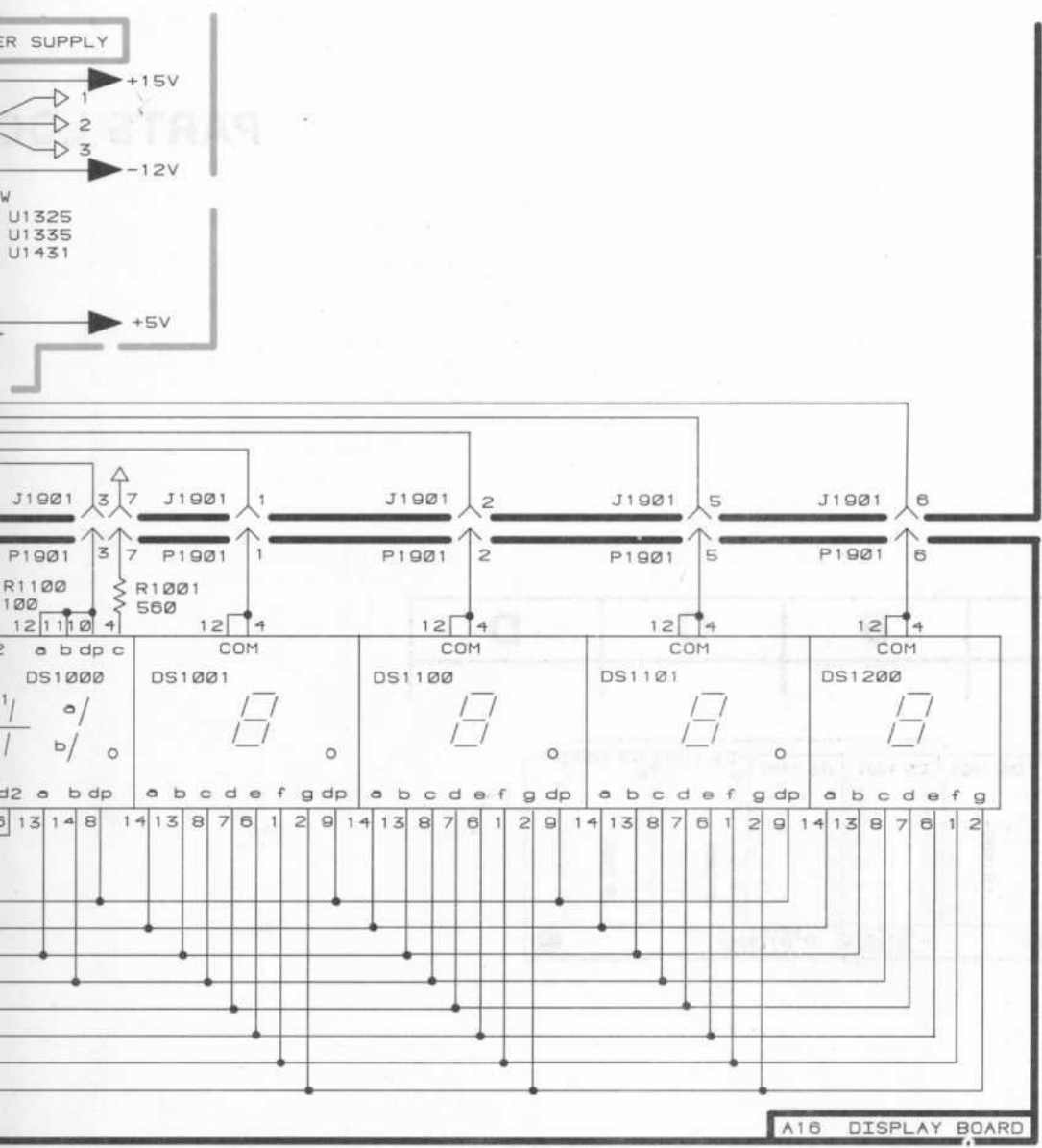
ALL PINS ON BOARD SWITCH P. BOARD WI COM DEL

DM501A

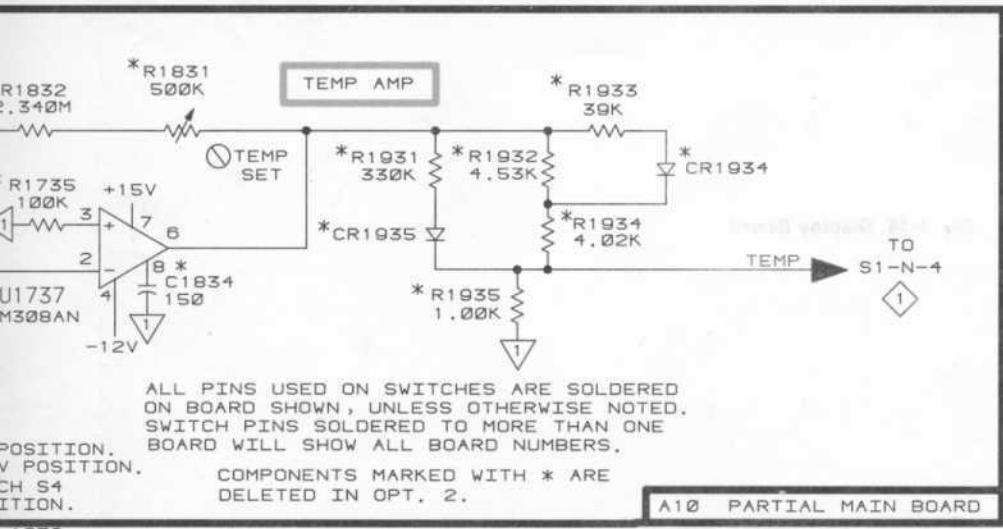
REV A NOV 1979  
2749-32

POWER

| H | J | K | L | M



A16 DISPLAY BOARD



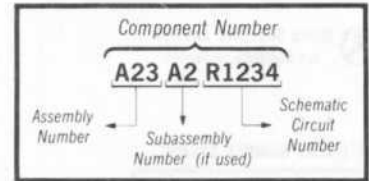
ALL PINS USED ON SWITCHES ARE SOLDERED ON BOARD SHOWN, UNLESS OTHERWISE NOTED. SWITCH PINS SOLDERED TO MORE THAN ONE BOARD WILL SHOW ALL BOARD NUMBERS.

COMPONENTS MARKED WITH \* ARE DELETED IN OPT. 2.

A10 PARTIAL MAIN BOARD

Static Sensitive Devices  
See Maintenance Section

COMPONENT NUMBER EXAMPLE



Chassis-mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List.

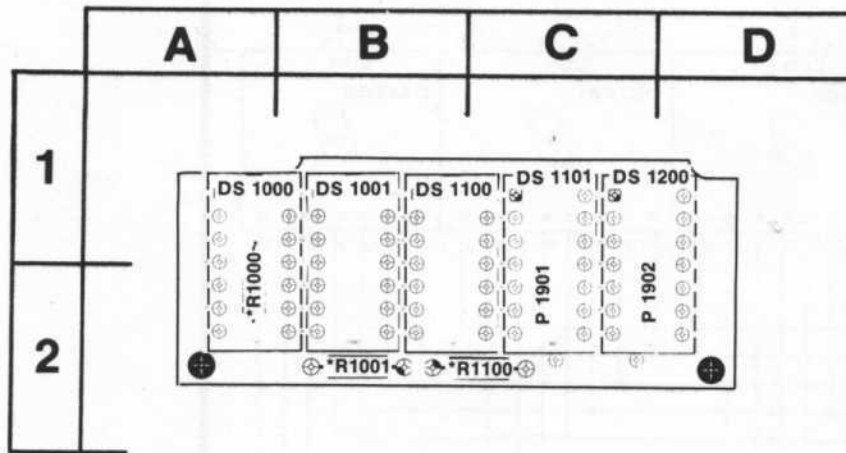
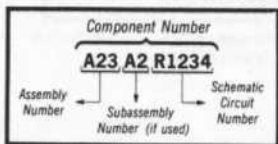


Fig. 8-16. Display Board.

 Static Sensitive Devices  
See Maintenance Section

COMPONENT NUMBER EXAMPLE



Chassis-mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List.

# PARTS LOCATION

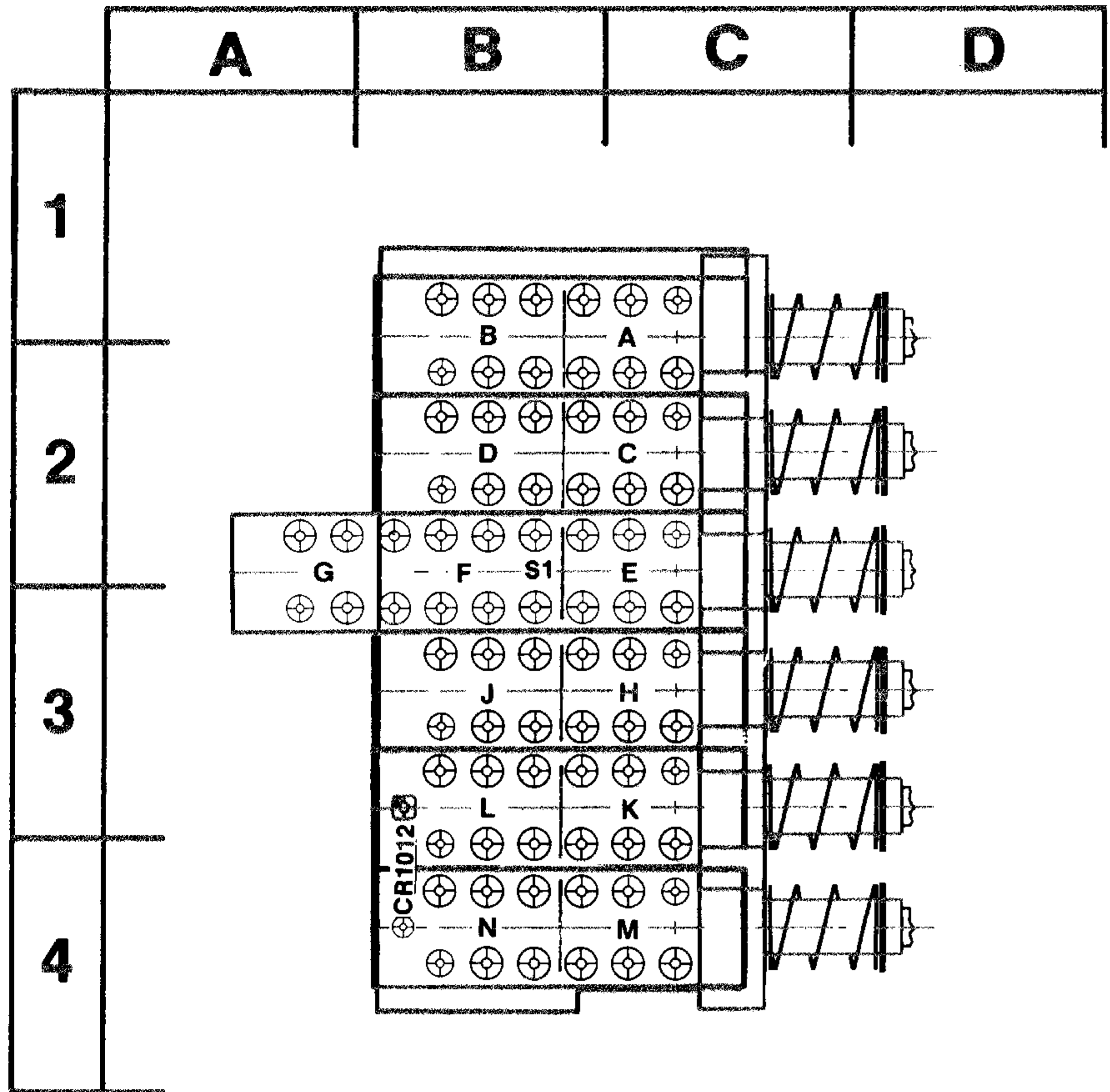


Fig. 8-17. Switch Board.

# REPLACEABLE MECHANICAL PARTS

## PARTS ORDERING INFORMATION

Replacement parts are available from or through your local Tektronix, Inc. Field Office or representative.

Changes to Tektronix instruments are sometimes made to accommodate improved components as they become available, and to give you the benefit of the latest circuit improvements developed in our engineering department. It is therefore important, when ordering parts, to include the following information in your order: Part number, instrument type or number, serial number, and modification number if applicable.

If a part you have ordered has been replaced with a new or improved part, your local Tektronix, Inc. Field Office or representative will contact you concerning any change in part number.

Change information, if any, is located at the rear of this manual.

## SPECIAL NOTES AND SYMBOLS

X000 Part first added at this serial number  
00X Part removed after this serial number

## FIGURE AND INDEX NUMBERS

Items in this section are referenced by figure and index numbers to the illustrations.

## INDENTATION SYSTEM

This mechanical parts list is indented to indicate item relationships. Following is an example of the indentation system used in the description column.

1	2	3	4	5	Name & Description
					<i>Assembly and/or Component</i>
					<i>Attaching parts for Assembly and/or Component</i>
					---*---
					<i>Detail Part of Assembly and/or Component</i>
					<i>Attaching parts for Detail Part</i>
					---*---
					<i>Parts of Detail Part</i>
					<i>Attaching parts for Parts of Detail Part</i>
					---*---

Attaching Parts always appear in the same indentation as the item it mounts, while the detail parts are indented to the right. Indented items are part of, and included with, the next higher indentation. The separation symbol ---\*--- indicates the end of attaching parts.

**Attaching parts must be purchased separately, unless otherwise specified.**

## ITEM NAME

In the Parts List, an Item Name is separated from the description by a colon (:). Because of space limitations, an Item Name may sometimes appear as incomplete. For further Item Name identification, the U.S. Federal Cataloging Handbook H6-1 can be utilized where possible.

## ABBREVIATIONS

"	INCH	ELCTRN	ELECTRON	IN	INCH	SE	SINGLE END
#	NUMBER SIZE	ELEC	ELECTRICAL	INCAND	INCANDESCENT	SECT	SECTION
ACTR	ACTUATOR	ELCTLT	ELECTROLYTIC	INSUL	INSULATOR	SEMICOND	SEMICONDUCTOR
ADPTR	ADAPTER	ELEM	ELEMENT	INTL	INTERNAL	SHLD	SHIELD
ALIGN	ALIGNMENT	EPL	ELECTRICAL PARTS LIST	LPHLDR	LAMPHOLDER	SHLDR	SHOULDERED
AL	ALUMINUM	EQPT	EQUIPMENT	MACH	MACHINE	SKT	SOCKET
ASSEM	ASSEMBLED	EXT	EXTERNAL	MECH	MECHANICAL	SL	SLIDE
ASSY	ASSEMBLY	FIL	FILLISTER HEAD	MTG	MOUNTING	SLFLKG	SELF-LOCKING
ATTEN	ATTENUATOR	FLEX	FLEXIBLE	NIP	NIPPLE	SLVG	SLEEVING
AWG	AMERICAN WIRE GAGE	FLH	FLAT HEAD	NON WIRE	NOT WIRE WOUND	SPR	SPRING
BD	BOARD	FLTR	FILTER	OBD	ORDER BY DESCRIPTION	SQ	SQUARE
BRKT	BRACKET	FR	FRAME or FRONT	OD	OUTSIDE DIAMETER	SST	STAINLESS STEEL
BRS	BRASS	FSTNR	FASTENER	OVH	OVAL HEAD	STL	STEEL
BRZ	BRONZE	FT	FOOT	PH BRZ	PHOSPHOR BRONZE	SW	SWITCH
BSHG	BUSHING	FXD	FIXED	PL	PLAIN or PLATE	T	TUBE
CAB	CABINET	GSKT	GASKET	PLSTC	PLASTIC	TERM	TERMINAL
CAP	CAPACITOR	HDL	HANDLE	PN	PART NUMBER	THD	THREAD
CER	CERAMIC	HEX	HEXAGON	PNH	PAN HEAD	THK	THICK
CHAS	CHASSIS	HEX HD	HEXAGONAL HEAD	PWR	POWER	TNSN	TENSION
CKT	CIRCUIT	HEX SOC	HEXAGONAL SOCKET	RCPT	RECEPTACLE	TPG	TAPPING
COMP	COMPOSITION	HLCPS	HELICAL COMPRESSION	RES	RESISTOR	TRH	TRUSS HEAD
CONN	CONNECTOR	HLEXT	HELICAL EXTENSION	RGD	RIGID	V	VOLTAGE
COV	COVER	HV	HIGH VOLTAGE	RLF	RELIEF	VAR	VARIABLE
CPLG	COUPLING	IC	INTEGRATED CIRCUIT	RTNR	RETAINER	W/	WITH
CRT	CATHODE RAY TUBE	ID	INSIDE DIAMETER	SCH	SOCKET HEAD	WSHR	WASHER
DEG	DEGREE	IDENT	IDENTIFICATION	SCOPE	OSCILLOSCOPE	XFMR	TRANSFORMER
DWR	DRAWER	IMPLR	IMPELLER	SCR	SCREW	XSTR	TRANSISTOR



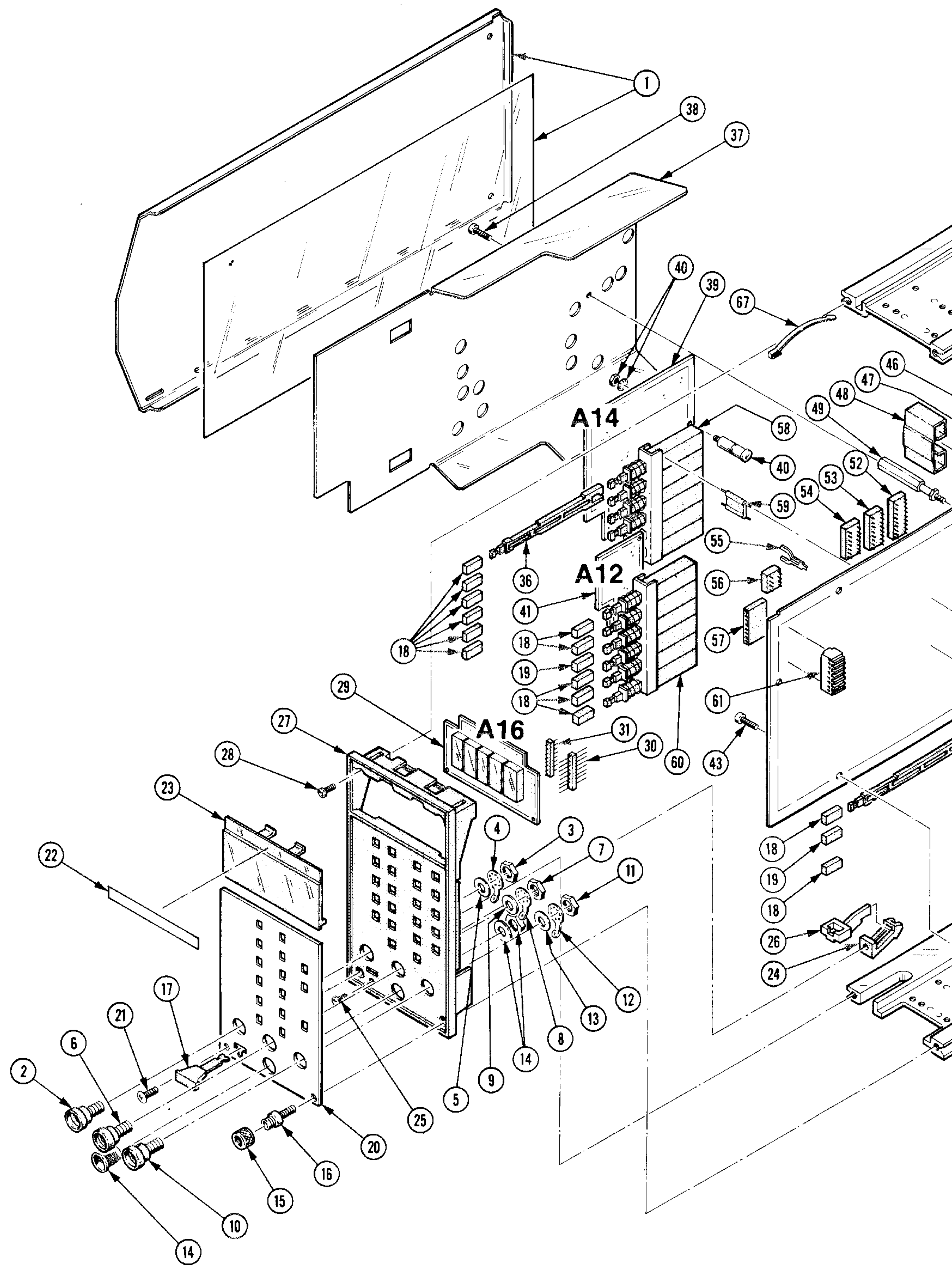
CROSS INDEX—MFR. CODE NUMBER TO MANUFACTURER

Mfr. Code	Manufacturer	Address	City, State, Zip
000BH	FAB-TEK	17 SUGAR HALLOW ROAD	DANBURY, CT 06810
71590	CENTRALAB ELECTRONICS, DIV. OF GLOBE-UNION, INC.	P O BOX 858	FORT DODGE, IA 50501
71785	TRW, CINCH CONNECTORS	1501 MORSE AVENUE	ELK GROVE VILLAGE, IL 60007
73743	FISCHER SPECIAL MFG. CO.	446 MORGAN ST.	CINCINNATI, OH 45206
73803	TEXAS INSTRUMENTS, INC., METALLURGICAL MATERIALS DIV.	34 FOREST STREET	ATTLEBORO, MA 02703
78189	ILLINOIS TOOL WORKS, INC. SHAKEPROOF DIVISION	ST. CHARLES ROAD	ELGIN, IL 60120
80009	TEKTRONIX, INC.	P O BOX 500	BEAVERTON, OR 97077
83385	CENTRAL SCREW CO.	2530 CRESCENT DR.	BROADVIEW, IL 60153
86928	SEASTROM MFG. COMPANY, INC.	701 SONORA AVENUE	GLENDALE, CA 91201
93907	CAMCAR SCREW AND MFG. CO.	600 18TH AVE.	ROCKFORD, IL 61101
98159	RUBBER TECK, INC.	19115 HAMILTON AVE., P O BOX 389	GARDENA, CA 90247

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
1-1	337-1399-07		2		SHIELD,ELEC:SIDE	80009	337-1399-07
-2	-----		1		JACK,TIP:BLUE(SEE J520 EPL) (ATTACHING PARTS)		
-3	210-0465-00		1		NUT,PLAIN,HEX.:0.25-32 X 0.375 INCH BRS	73743	3095-402
-4	210-0223-00		1		TERMINAL,LUG:0.25 INCH DIA,SE	86928	A313-136
-5	210-0905-00		1		WASHER,FLAT:0.256 ID X 0.438 INCH OD,BRS	83385	OBD
					- - - * - - -		
-6	-----		1		JACK,TIP:BLACK(SEE J540 EPL) (ATTACHING PARTS)		
-7	210-0465-00		1		NUT,PLAIN,HEX.:0.25-32 X 0.375 INCH BRS	73743	3095-402
-8	210-0223-00		1		TERMINAL,LUG:0.25 INCH DIA,SE	86928	A313-136
-9	210-0905-00		1		WASHER,FLAT:0.256 ID X 0.438 INCH OD,BRS	83385	OBD
					- - - * - - -		
-10	-----		1		JACK,TIP:RED(SEE J530 EPL) (ATTACHING PARTS)		
-11	210-0465-00		1		NUT,PLAIN,HEX.:0.25-32 X 0.375 INCH BRS	73743	3095-402
-12	210-0223-00		1		TERMINAL,LUG:0.25 INCH DIA,SE	86928	A313-136
-13	210-0905-00		1		WASHER,FLAT:0.256 ID X 0.438 INCH OD,BRS	83385	OBD
					- - - * - - -		
-14	-----		1		CONNECTOR:(SEE J500 EPL) (STANDARD ONLY)		
-15	220-0633-00		1		NUT,PLAIN,KNURL:0.25-28 X 0.25 INCH L,BRS	80009	220-0633-00
-16	-----		1		STUD:(SEE J510 EPL)		
-17	366-1690-00		1		KNOB,LATCH:SIL GY,0.53 X0.23 X 1.059	80009	366-1690-00
-18	366-1559-00		13		PUSH BUTTON:SIL GY,0.18 SQ X 0.43	80009	366-1559-00
-19	366-1559-05		2		PUSH BUTTON:CHARCOAL,GRAY,0.18 SQ X 0.4	80009	366-1559-05
-20	333-2551-00		1		FRONT PANEL:	80009	333-2551-00
	333-2550-00		1		PANEL,FRONT: (ATTACHING PARTS)	80009	333-2550-00
-21	211-0537-00		1		SCREW,MACHINE:6-32 X 0.375 INCH,TRH STL	83385	OBD
					- - - * - - -		
-22	334-3580-00		1		MARKER,IDENT:	80009	334-3580-00
-23	378-2030-00		1		LENS,LED DSPL:RED	80009	378-2030-00
-24	105-0719-00		1		LATCH,RETAINING:PLUG-IN (ATTACHING PARTS)	80009	105-0719-00
-25	213-0113-00		1		SCR,TPG,THD FOR:2-32 X 0.312 INCH,PNH STL	93907	OBD
					- - - * - - -		
-26	105-0718-01		1		BAR,LATCH RLSE:	80009	105-0718-01
-27	386-4115-00		1		SUBPANEL,FRONT: (ATTACHING PARTS)	80009	386-4115-00
-28	213-0868-00		2		SCREW,TPG,TF:6-32 X 0.375 L,FILH,STEEL	93907	OBD
					- - - * - - -		
-29	-----		1		CKT BOARD ASSY:DISPLAY(SEE A16 EPL)		
-30	-----		1		. CONNECTOR ASSY:(SEE P1902 EPL)		
-31	-----		1		. CONNECTOR ASSY:(SEE P1901 EPL)		
-32	337-2636-00		1		SHIELD,ELEC:CIRCUIT BOARD (ATTACHING PARTS)	80009	337-2636-00
-33	211-0007-00		1		SCREW,MACHINE:4-40 X 0.188 INCH,PNH STL	83385	OBD
					- - - * - - -		
-34	407-2285-00		2		BRACKET,SHIELD:POLYCARBONATE	80009	407-2285-00
-35	384-1061-00		3		EXTENSION SHAFT:3.981 INCH LONG	80009	384-1061-00
-36	384-1341-00		6		EXTENSION SHAFT:2.183 INCH LONG,OFFSET	80009	384-1341-00
-37	337-2637-00		1		SHIELD,ELEC:CIRCUIT BOARD (ATTACHING PARTS)	80009	337-2637-00
-38	211-0007-00		1		SCREW,MACHINE:4-40 X 0.188 INCH,PNH STL	83385	OBD
					- - - * - - -		
-39	-----		1		CKT BOARD ASSY:ATTENUATOR(SEE A14 EPL)		
-40	-----		3		. CAPACITOR,VAR:(SEE C1128,C1129,C1114 EPL)		
-41	-----		1		CKT BOARD ASSY:SWITCH(SEE A12 EPL)		
-42	-----		1		CKT BOARD ASSY:MAIN(SEE A10 EPL) (ATTACHING PARTS)		
-43	213-0146-00		4		SCR,TPG,THD FOR:6-20 X 0.313 INCH,PNH STL	83385	OBD
					- - - * - - -		

# Replaceable Mechanical Parts—DM 501A

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Qty	1	2	3	4	5	Name & Description	Mfr Code	Mfr Part Number
1-	-----	-----	-	.	.	.	.	.	CKT BOARD INCLUDES:		
-44	-----	-----	1	.	.	.	.	.	TERMINAL, PIN:(SEE P1435 EPL)		
-45	-----	-----	1	.	.	.	.	.	LINK, TERM CONN:(SEE J1435 EPL)		
-46	-----	-----	3	.	.	.	.	.	TERM., TEST PT:(SEE TP1608, TP1615, TP1631 EPL)		
-47	-----	-----	1	.	.	.	.	.	LINK, TERM. CONN:(SEE W1720 EPL)		
-48	214-2518-01		3	.	.	.	.	.	HEAT SINK, XSTR:AL W/O TABS	000BH	332012
-49	129-0573-00		1	.	.	.	.	.	SPACER, POST:0.188" HEX 1.627" L, AL (ATTACHING PARTS)	80009	129-0573-00
-50	220-0449-00		1	.	.	.	.	.	NUT, SLEEVE:4-40 X 0.188 X 0.50" LONG	80009	220-0449-00
-51	210-0004-00		1	.	.	.	.	.	WASHER, LOCK:#4 INTL, 0.015THK, STL CD PL	78189	1204-00-00-0541C
				-	-	-	-	-	* - - -		
-52	136-0670-00		1	.	.	.	.	.	SKT, PL-IN ELEK:MICROCKT, 18 PIN, LOW PROFILE	73803	CS9002-18
-53	136-0260-02		3	.	.	.	.	.	SKT, PL-IN ELEK:MICROCIRCUIT, 16 DIP, LOW CLE	71785	133-51-92-008
-54	136-0269-02		4	.	.	.	.	.	SKT, PL-IN ELEK:MICROCIRCUIT, 14 DIP, LOW CLE	73803	CS9002-14
-55	344-0154-00		2	.	.	.	.	.	CLIP, ELECTRICAL:FUSE, CKT BD MT	80009	344-0154-00
-56	136-0514-00		4	.	.	.	.	.	SKT, PL-IN ELEC:MICROCIRCUIT, 8 DIP	73803	CS9002-8
-57	-----	-----	1	.	.	.	.	.	SOCKET, PLUG-IN:(SEE J1902 EPL)		
-58	-----	-----	1	.	.	.	.	.	SWITCH, PUSH:RANGE(SEE S2 EPL)		
-59	361-0382-00		8	.	.	.	.	.	SPACER, PB SW:BROWN, 0.275 INCH LONG	80009	361-0382-00
-60	-----	-----	1	.	.	.	.	.	SWITCH, PUSH:FUNCTION(SEE S1 EPL)		
-61	-----	-----	1	.	.	.	.	.	CONN, RCPT, ELEC:(SEE J1901 EPL)		
-62	-----	-----	1	.	.	.	.	.	SWITCH, PUSH:HI/LO(SEE S3 EPL)		
-63	-----	-----	1	.	.	.	.	.	SWITCH, PUSH:INPUT(SEE S4 EPL)		
-64	361-0542-00		6	.	.	.	.	.	SPACER, SWITCH:PLASTIC	71590	J-64281
-65	346-0032-00		1	.	.	.	.	.	STRAP, RETAINING:0.075 DIA X 4.0 L, MLD RBR	98159	2859-75-4
-66	351-0612-00		2	.	.	.	.	.	GUIDE, CKT BD:NYLON, 1.0 L	80009	351-0612-00
-67	214-1061-00		1	.	.	.	.	.	SPRING, GROUND:FLAT	80009	214-1061-00
-68	426-1515-00		1	.	.	.	.	.	FR SECT, PLUG-IN:TOP	80009	426-1515-00
-69	426-0724-19		1	.	.	.	.	.	FR SECT, PLUG-IN:BOTTOM	80009	426-0724-19
-70	386-3657-01		2	.	.	.	.	.	SUPPORT, PLUG IN:	93907	OBD
-71	210-1270-00		2	.	.	.	.	.	WASHER, FLAT:0.141 ID X 0.04 THK, AL	80009	210-1270-00
-72	179-2734-00		1	.	.	.	.	.	WIRING HARNESS:INPUT COUPLING	80009	179-2734-00
-73	175-2651-00		1	.	.	.	.	.	CA ASSY, SP, ELEC:2.24 AWG, 7.5 L	80009	175-2651-00



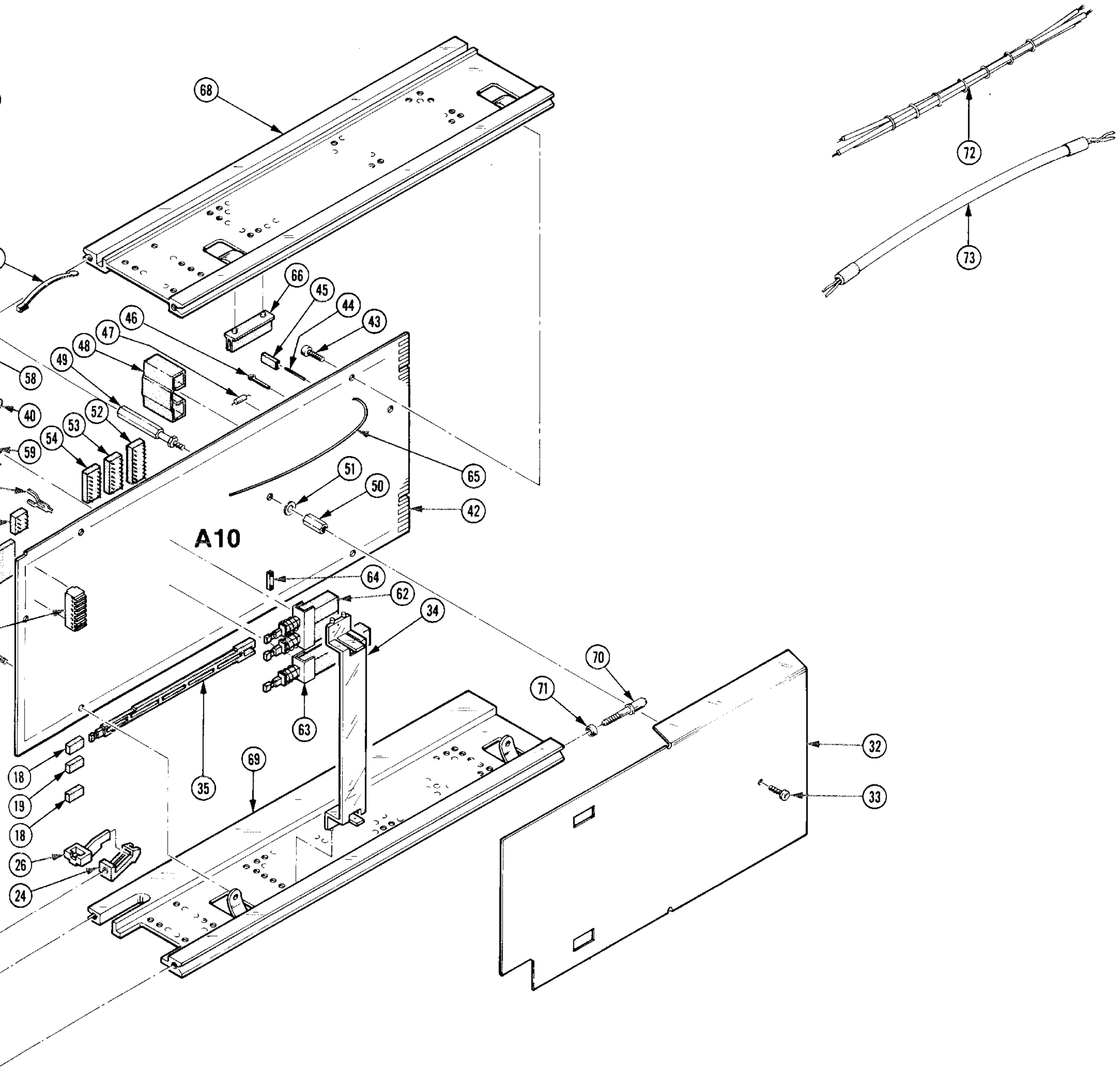


Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff      Dscont	Qty	1	2	3	4	5	Name & Description	Mfr Code	Mfr Part Number
------------------------	-----------------------	-------------------------------------	-----	---	---	---	---	---	--------------------	-------------	-----------------

STANDARD ACCESSORIES

	003-0120-00		1						LEAD, TEST: PAIR	80009	003-0120-00
	010-6601-01		1						PROBE, TEMP:	80009	010-6601-01
	070-2749-00		1						MANUAL, TECH: INSTRUCTION	80009	070-2749-00

ACCESSORIES

## **MANUAL CHANGE INFORMATION**

At Tektronix, we continually strive to keep up with latest electronic developments by adding circuit and component improvements to our instruments as soon as they are developed and tested.

Sometimes, due to printing and shipping requirements, we can't get these changes immediately into printed manuals. Hence, your manual may contain new change information on following pages.

A single change may affect several sections. Since the change information sheets are carried in the manual until all changes are permanently entered, some duplication may occur. If no such change pages appear following this page, your manual is correct as printed.

## **SERVICE NOTE**

Because of the universal parts procurement problem, some electrical parts in your instrument may be different from those described in the Replaceable Electrical Parts List. The parts used will in no way alter or compromise the performance or reliability of this instrument. They are installed when necessary to ensure prompt delivery to the customer. Order replacement parts from the Replaceable Electrical Parts List.

# CALIBRATION TEST EQUIPMENT REPLACEMENT

## Calibration Test Equipment Chart

This chart compares TM 500 product performance to that of older Tektronix equipment. Only those characteristics where significant specification differences occur, are listed. In some cases the new instrument may not be a total functional replacement. Additional support instrumentation may be needed or a change in calibration procedure may be necessary.

### Comparison of Main Characteristics

DM 501 replaces 7D13		
PG 501 replaces 107 108	PG 501 - Risetime less than 3.5 ns into 50 $\Omega$ . PG 501 - 5 V output pulse; 3.5 ns Risetime	107 - Risetime less than 3.0 ns into 50 $\Omega$ . 108 - 10 V output pulse 1 ns Risetime
PG 502 replaces 107 108 111	PG 502 - 5 V output PG 502 - Risetime less than 1 ns; 10 ns Pretrigger pulse delay	108 - 10 V output 111 - Risetime 0.5 ns; 30 to 250 ns Pretrigger pulse delay
PG 508 replaces 114 115 2101	Performance of replacement equipment is the same or better than equipment being replaced.	
PG 506 replaces 106 067-0502-01	PG 506 - Positive-going trigger output signal at least 1 V; High Amplitude output, 60 V. PG 506 - Does not have chopped feature.	106 - Positive and Negative-going trigger output signal, 50 ns and 1 V; High Amplitude output, 100 V. 0502-01 - Comparator output can be alternately chopped to a reference voltage.
SG 503 replaces 190, 190A, 190B 191 067-0532-01	SG 503 - Amplitude range 5 mV to 5.5 V p-p. SG 503 - Frequency range 250 kHz to 250 MHz.	190B - Amplitude range 40 mV to 10 V p-p. 0532-01 - Frequency range 65 MHz to 500 MHz.
SG 504 replaces 067-0532-01 067-0650-00	SG 504 - Frequency range 245 MHz to 1050 MHz.	0532-01 - Frequency range 65 MHz to 500 MHz.
TG 501 replaces 180, 180A 181 184 2901	TG 501 - Trigger output-slaved to marker output from 5 sec through 100 ns. One time-mark can be generated at a time. TG 501 - Trigger output-slaved to market output from 5 sec through 100 ns. One time-mark can be generated at a time. TG 501 - Trigger output-slaved to marker output from 5 sec through 100 ns. One time-mark can be generated at a time.	180A - Trigger pulses 1, 10, 100 Hz; 1, 10, and 100 kHz. Multiple time-marks can be generated simultaneously. 181 - Multiple time-marks 184 - Separate trigger pulses of 1 and 0.1 sec; 10, 1, and 0.1 ms; 10 and 1 $\mu$ s. 2901 - Separate trigger pulses, from 5 sec to 0.1 $\mu$ s. Multiple time-marks can be generated simultaneously.

**NOTE: All TM 500 generator outputs are short-proof. All TM 500 plug-in instruments require TM 500-Series Power Module.**



Date: 3-17-80

Change Reference: M39913

Product: DM 501A DIGITAL MULTIMETER

Manual Part No.: 070-2749-00

DESCRIPTION

EFF SN B021460 (STANDARD)

EFF SN B022069 (OPTION 2)

REPLACEABLE ELECTRICAL PARTS AND SCHEMATIC CHANGES

CHANGE TO:

A10                    670-6136-01            CKT BOARD ASSY:MAIN

A10                    670-6178-01            CKT BOARD ASSY:MAIN (OPTION 2 ONLY)

A10C1521            290-0523-00            CAP.,FXD,ELCTLT:2.2UF,20%,20V

C1521 is located on the MAIN circuit board assembly and shown on  
diagram 1 INPUT SIG CONDITIONING.