TEKTRONIX®

DM 501
DIGITAL MULTIMETER

INSTRUCTION MANUAL

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OPERATING INSTRUCTIONS

INTRODUCTION

Instrument Description

The DM 501 Digital Multimeter measures DC and AC voltage and current, resistance and temperature. The AC functions respond to average values, and display RMS values. A single front-panel control selects all functions and ranges. A push button selects front panel input or rear interface connector input. Temperature measurements are made using a TEKTRONIX P6058 Probe (Part No. 010-0260-00) or other suitable sensing devices. Option 1 instruments are shipped without the P6058 probe. Front-panel pin jacks provide external temperature readout, independent of the function being displayed. An internal switch selects degrees calibration in either Centigrade or Fahrenheit. Option 2 instruments delete the temperature measuring capability.

The readout is a 4 1/2-digit stored display using seven-segment LED's. The decimal point is automatically positioned by the RANGE/FUNCTION switch and leading zeros (those to the left of the decimal point or most significant digit) are blanked. Polarity indication is automatic. A blinking display indicates overrange. Serial BCD output is available at the rear interface connector.

Installation and Removal

The DM 501 is calibrated and ready for use when received. It operates in any compartment of a TM 500 Series Power Module. See the Power Module instruction manual for line voltage requirements and Power Module operation. Fig. 1-1 shows the DM 501 installation and removal procedure.

CAUTION

Turn the Power Module off before inserting the plug-in; otherwise, damage may occur to the plug-in circuitry. Check that the DM 501 is fully inserted in the Power Module. Pull the PWR switch on the Power Module. One or more characters in the LED display should now be visible.

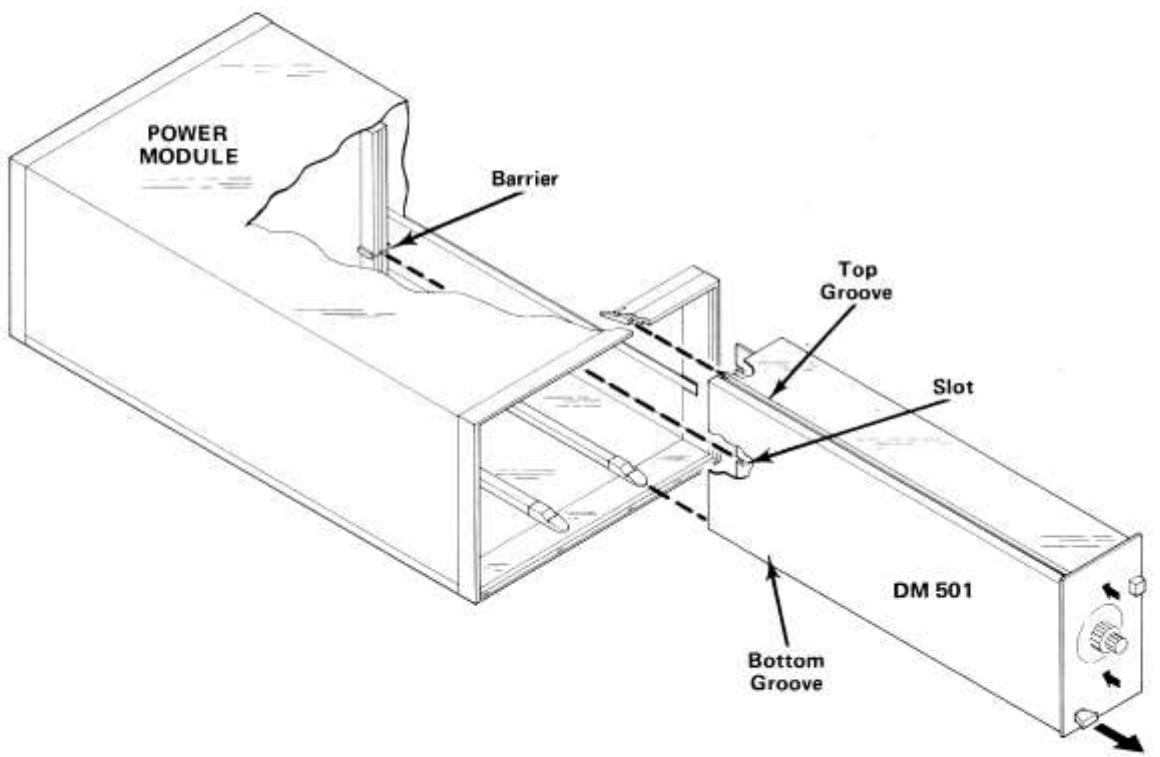


Fig. 1-1. DM 501 Installation and Removal.

Temperature Measurements

Connect the P6058 (or other sensing device) to the connector marked TEMP PROBE. Use care to align the connector pins properly. Two front-panel pin jacks labeled TEMP OUT provide continuous output at 10 mV per degree, into loads ≥2 kΩ, for input to external recorders or other readout devices. Select calibration in °F or °C with switch S125 shown on the Controls, Connectors and Adjustments foldout page.

MAKING MEASUREMENTS

With the DM 501 properly installed in the Power Module, allow twenty minutes warmup time for operation to specified accuracy. When the value of the quantity being measured is unknown, select the highest range first. Decrease the range setting until the display blinks indicating over-range. Increase the range switch to the next higher position. This method obtains maximum resolution. Resolution of the DM 501 is 0.005% of full scale setting, except temperature, which is 0.1°. Do not exceed the maximum voltage ratings. With the RANGE/FUNCTION switch in the 1 K DC VOLTS or 500 AC VOLTS positions, internal damage may result before overrange is indicated.

DC Voltage Measurements

Select an appropriate full range DC voltage position on the RANGE/FUNCTION switch. Apply the voltage to be measured to the INPUT binding posts. Observe the maximum voltage ratings as indicated on the front panel. The readout displays a + if the HI input is positive with respect to the LO input. A − is displayed if the LO input is more positive. With the input shorted, the display reads zero, ±1 count.

DC Current Measurements

Select an appropriate full scale DC mA position on the RANGE/FUNCTION switch. Apply the DC current to be measured to the INPUT binding posts. A current (electron flow) into the LO connector and out of the HI connector indicates + on the display. For opposite current flow, a − will be displayed.

AC Voltage, Current, and Resistance Measurements

Select an appropriate full scale AC VOLTS, AC mA, or OHMS position on the RANGE/FUNCTION switch. Connect the unknown voltage, current, or resistance to the INPUT binding posts.

Temperature Measurements

With the P6058 Probe connected to the front panel connector labeled TEMP PROBE, set the RANGE/FUNCTION switch to the TEMP position. Apply the probe sensor tip to the device being measured. For optimum temperature transfer, coat the surface of the device being measured with silicon grease and apply the probe tip squarely to the surface. Allow sufficient time for the probe tip to stabilize before taking a reading. The time required depends upon several factors. Generally, when the tip is first applied to the device under test, the readings change rapidly. As the probe tip temperature approaches the temperature of the device under test, the readings change less rapidly, and finally stabilize. The readings are in °C or °F, depending on the position of the internal S125. See the P6058 Probe manual for more information on temperature measurements and probe use.

Using a Transistor as a Temperature-Sensing Device

Certain NPN transistors such as a 2N2484 can be used as separate sensors in place of the probe with little or no selection of the transistor. Connect the temperature-sensing transistor to the DM 501 through the TEMP PROBE connector as shown in Fig. 1-3. Accuracy without recalibration of the DM 501 is within ±5°C for measurements from −55°C to 125°C. If the measurement to be made requires greater accuracy, check the calibration of the DM 501. Place the sensing device in an environment having a known ambient temperature. Use any difference between the known temperature and the DM 501 readout as a correction factor throughout the entire measurement range.

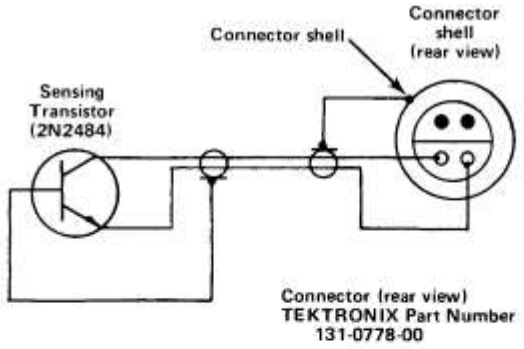


Fig. 1-3. Schematic diagram of temperature-sensing transistor connected to probe connector.

MEASUREMENT CURRENT:

$$\frac{2\ V}{\text{Range Setting}}$$

RESPONSE TIME:

2 kΩ, 20 kΩ, 200 kΩ, 2 MΩ Ranges, ≤1 s.
20 MΩ Range, ≤5 s.

DC AMMETER

RANGES:

2 mA, 20 mA, 200 mA, 2000 mA.

ACCURACY:

±0.2% of reading, ±10 counts.

RESPONSE TIME:

<1 s.

INPUT IMPEDANCE:

$$\frac{0.2\ V}{\text{Range Setting}} \pm 0.1\Omega.$$

AC AMMETER

RANGES:

2 mA, 20 mA, 200 mA, 2000 mA.

ACCURACY:

±0.6% of reading, ±2 counts, 40 Hz to 1 kHz.
±0.6% of reading, ±10 counts, 1 kHz to 10 kHz.

RESPONSE TIME:

<10 s.

INPUT IMPEDANCE:

$$\frac{0.2\ V}{\text{Range Setting}} \pm 0.1\Omega.$$

THERMOMETER

RANGES:

−55°C to +150°C or −67°F to +302°F

ACCURACY:

(With P6058 probe) −55°C (−67°F) to +125°C (257°F), ±1.5°C (2.7°F). +125°C (257°F) to +150°C (302°F), ±2.5°C (4.5°F).

ENVIRONMENTAL

TEMPERATURE:

Operating: +15°C to +35°C.
Non-operating: −40°C to +75°C.

POWER CONSUMPTION:

12 Watts.

Current Amplifier

U30B is an operational amplifier with negative AC feedback, producing 10X gain. It is used in all AC and DC current modes. A full scale display readout requires 0.2 V into U30B, developed across the current sampling resistors, for 2.0 V into the integrator input. R50 adjusts for input offset in U30B. With the HI and LO binding posts shorted, and the RANGE/FUNCTION switch in the DC mA position, pin 7 of U30B is at 0 V when R50 is properly adjusted.

AC Converter

In the AC measurement modes, the AC signal is applied to FET Q60. CR60 protects Q60 from negative overvoltage. CR61 protects Q60 from overvoltage in the positive direction. Q62, connected from the source to the drain of Q60, provides positive feedback. The positive feedback serves as a bootstrap to improve the frequency response.

The output of Q60 is fed to the negative input of U70, an operational amplifier. R72, C73, and R73 provide negative DC feedback for stabilizing purposes. The gain of U70 is extremely high until CR72 and CR73 conduct and provide feedback, thus enabling rectification of extremely small signals. The positive half cycle is applied through CR73 to the filter network. The DC voltage from the filter output is switched to the integrator input in the AC measurement modes. Although a half-wave rectifier responds to the average value of a sine wave, the gain of U70 is set by R70 to produce an output equivalent to the RMS value of a sine-wave input.

Ohms Converter

Q20 and U30A, form an operational amplifier. Q35 and Q38 are constant current sources. The known resistance (appropriate values of R10) is connected across the source, from the output of U30A to R20. The unknown resistance is connected from R20 to ground. Q20A, U30A, and Q38 maintain one volt across R10, which is set at a value equal to one half the full scale measurement value shown on the RANGE/FUNCTION switch. When the unknown resistance changes, the voltage at the gate of Q20 changes. This varies the output voltage at U30A, and across the known resistance R10, until the voltage across R10 is again one volt and the current is constant. Since the current stays constant, a change in the unknown resistance causes the voltage across the unknown resistance to vary. This voltage change is connected to the integrator input. CR20 and CR21 are protective diodes. R35 sets the constant current value. Q35 and Q38 base voltages are set by R38 and Q36. Q36 provides temperature compensation for the base voltage. See Fig. 2-2.

Integrator

The analog to digital converter in the DM 501 operates on the modified dual slope principle. Dual slope integration provides accuracy independent of supply voltage changes, component changes, and line voltage effects. Modified means the measured voltage is applied at all times and not switched off during capacitor discharge. A current directly related to the unknown voltage is applied to a capacitor, causing a ramp. At a given time during the ramp, the capacitor is discharged by a known current of opposite

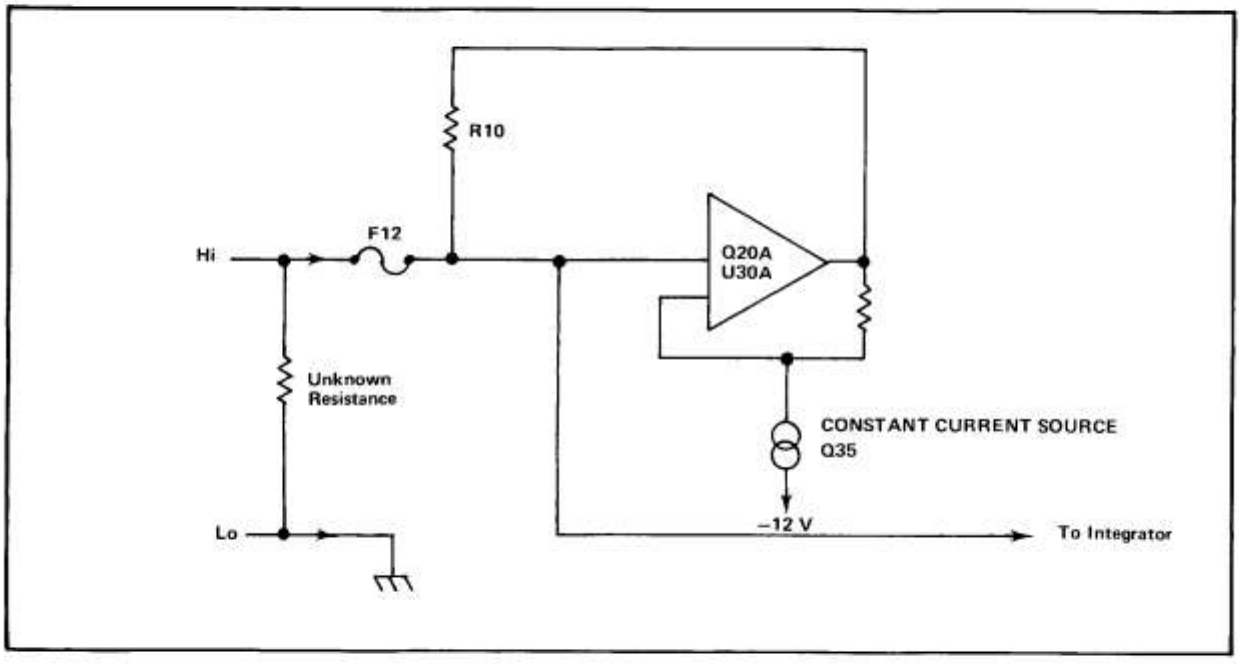


Fig. 2-2. Simplified diagram of Ohms Converter.

from the integrator is positive, the output of U175 is low. This low is applied to the AND gates U220C and U230A. The output of U220C goes high, turning on Q185. This action turns Q180B on, which supplies discharge current for C170. The discharge current amplitude is set at four times the full scale unknown current. As the ramp passes through zero, the output of U175 goes high, turning off the discharge current. If the ramp increases in the negative direction, the logic of U235A, U230A and U175 places two lows at the input of U230A, and Q200A supplies the discharge current. R182 and R202 set the proper value of discharge current. VR180, VR200, Q180, and Q200 provide temperature compensation and act as constant current sources for the discharge currents.

Zero Crossing Detector

After C170 (at the output of U170) is discharged and passes through zero, the output of U175 goes high. This positive pulse is differentiated by C224 and R224, and applied to U230B, an OR gate. Pin 5 and 6 of U230B are already high. The same pulse is inverted by U220B, differentiated by C220 and R220 and applied to the other input of U230B. With a low on either input, U230B's output goes high, U220A inverts that pulse and applies it to pin 1 of U235A. Pin 5 goes low, pin 6 goes high and both current discharges are turned off. Latch U235A disables the discharge current sources. The positive pulse at pin 6 of U235A is inverted by Q245 and applied to U330 as the Latch pulse. This Latch pulse effectively holds the number of counts in U330 that accumulate after the Full pulse arrives at the base of Q250. This count represents the value of the quantity being measured.

Integrator Offset Current

A slight offset current is always applied through R198 and R199 to charge capacitor C170. If no offset current was applied, the output of U170 would float around zero when the quantity being measured is zero, and U175 would operate in a random manner, giving false displays.

The offset current causes a ramp equal to 10 counts at the same polarity as the last voltage measured. If a voltage measured is less than ten counts, and opposite in polarity to the offset current ramp, one-shot multivibrator U238 prevents the Latch pulse from reaching U330 for one integration. If the zero crossing takes place within ten counts of the Full pulse, U238 also causes the polarity of the offset current to shift in the direction of the applied voltage. See Fig. 2-4. The Full pulse arrives at pin 3 of U238, causing pin 1 to go low for 10 counts. Pin 6 goes high, disabling Q245 and preventing the Latch pulse from passing to U330. The 10 count delay is caused by R238 and C238.

Assume the offset current causes a ramp of 10 count duration in the positive direction and a voltage equal to 5 counts in the negative direction is being measured. For the first cycle, the positive discharge current is turned on and zero crossing takes place 5 counts after the Full pulse. Q245 is disabled for 10 counts and the Latch pulse to U330 is not transmitted. During this 10 count delay, pin 1 of U238 is low. At zero crossing, pin 12 of U220D is also low. Both lows cause a high at the output of U220D, an

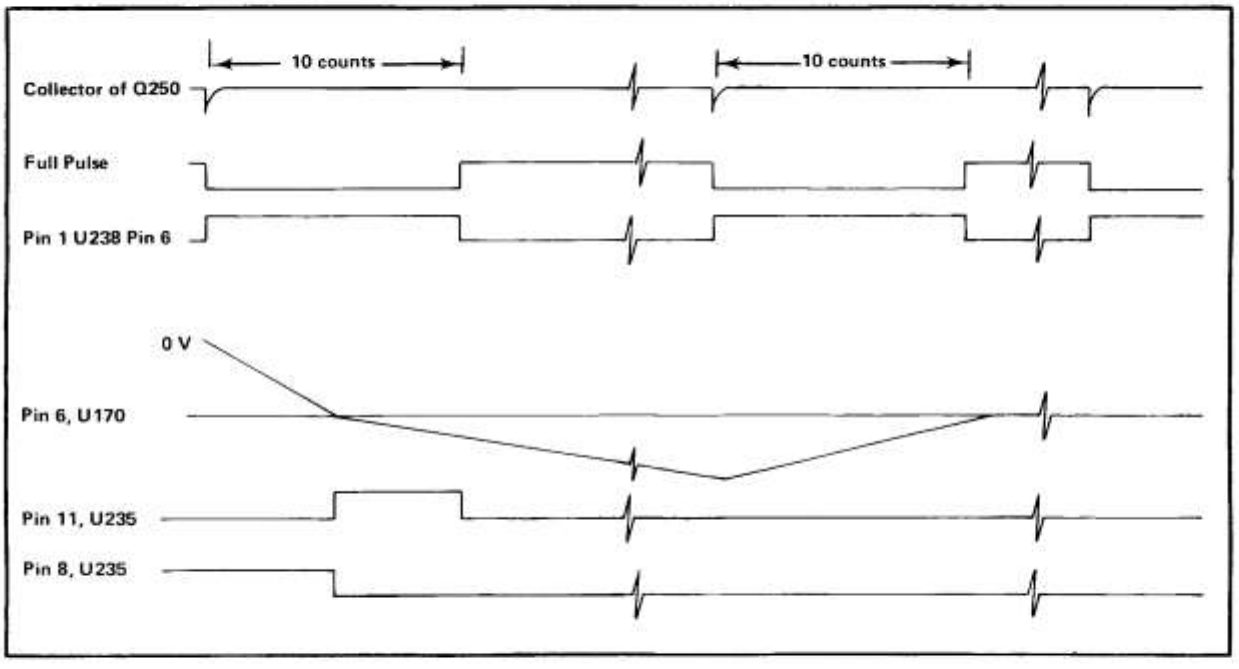
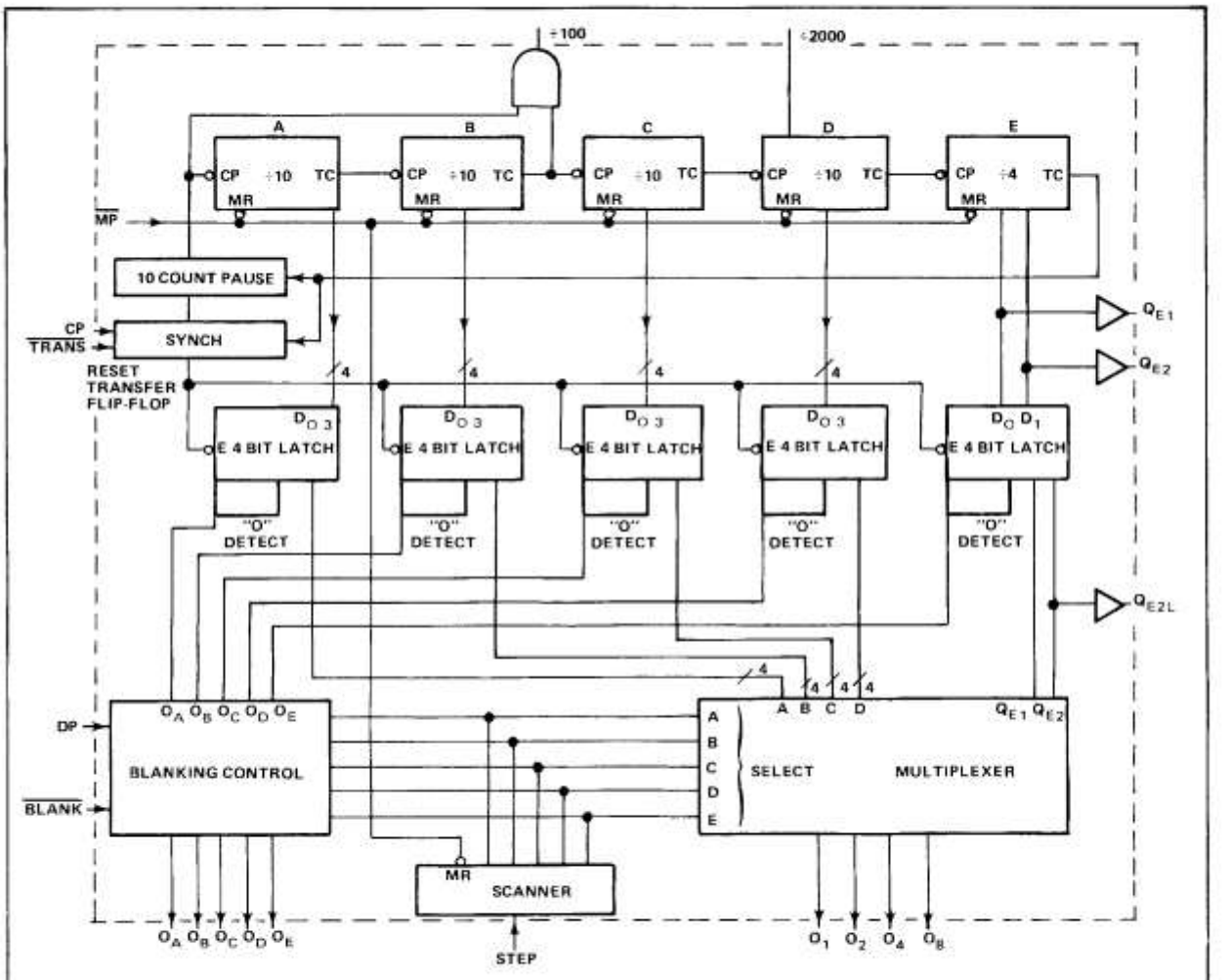


Fig. 2-4. Timing Diagram showing change in offset current polarity with less than 1 mV applied to integrator input.



CP–Clock Pulse in.

$\overline{MP}$–Not used, connected to +5 V.

$\overline{TRANS}$–Activated by Latch Pulse to transfer accumulated count into Latches.

DP–Provides information to Blanking Control on location of decimal point for leading zero blanking.

$\overline{BLANK}$–Blanks entire display.

O_A O_B O_C O_D O_E–Digit display lines, O_E not used. Indicates the digit selected from the Latches by the Multiplexer.

STEP–Causes Multiplexer and Blanking Control to switch to next digit through the Scanner.

QE2L–Anded with +80,000 count to cause display blanking if in the high state.

QE2–Not used.

QE1–Drives external latch for most significant digit indication.

÷2000–Not used.

÷100–Drives step input.

O_1 O_2 O_4 O_8–BCD output to display modules.

Fig. 2-5. Block diagram of U330 listing functional use in DM 501. Reprinted by permission of Fairchild Semiconductor.

SERVICE INFORMATION

SYMBOLS AND REFERENCE DESIGNATORS

Symbols and Reference Designators

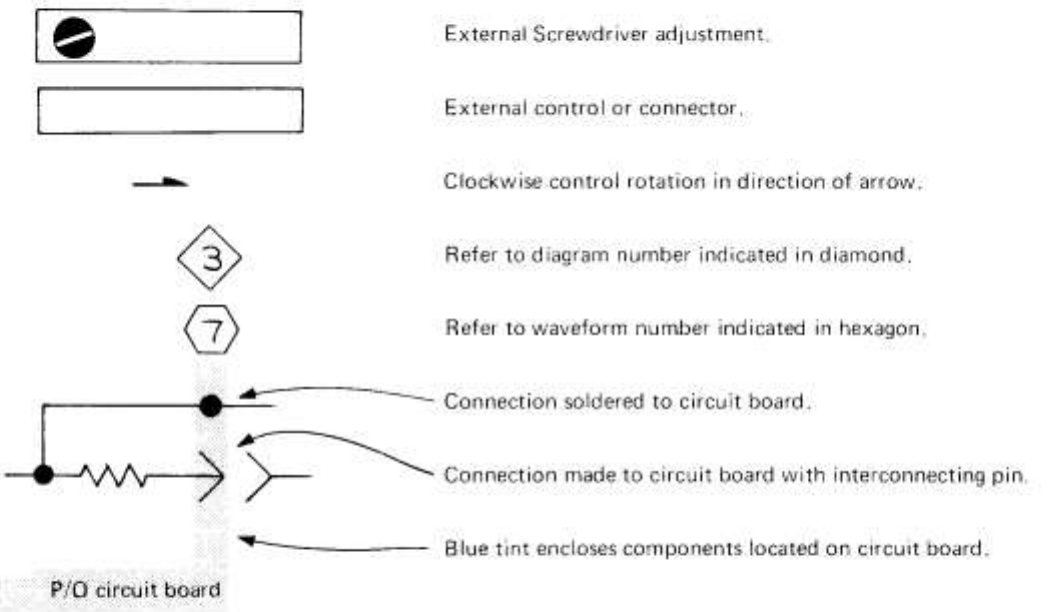
Electrical components shown on the diagrams are in the following units unless noted otherwise:

Capacitors =	Values one or greater are in picofarads (pF). Values less than one are in microfarads (μF).
Resistors =	Ohms (Ω)

Symbols used on the diagrams are based on ANSI Y32.2 – 1970.

Logic symbology is based on MIL-STD-806B in terms of positive logic. Logic symbols depict the logic function performed and may differ from the manufacturer's data.

The following special symbols are used on the diagrams:



External Screwdriver adjustment.

External control or connector.

Clockwise control rotation in direction of arrow.

Refer to diagram number indicated in diamond.

Refer to waveform number indicated in hexagon.

Connection soldered to circuit board.

Connection made to circuit board with interconnecting pin.

Blue tint encloses components located on circuit board.

CROSS INDEX MFR. CODE NUMBER TO MANUFACTURER

MFR.CODE	MANUFACTURER	ADDRESS	CITY,STATE,ZIP
0000A	LEMO USA	2015 2ND ST.	BERKLEY, CA 94710
00853	SANGAMO ELECTRIC CO., S. CAROLINA DIV.	P. O. BOX 128	PICKENS, SC 29671
01002	GENERAL ELECTRIC CO., INDUSTRIAL AND POWER CAPACITOR PRODUCTS DEPT.	JOHN ST.	HUDSON FALLS, NY 12839
01121	ALLEN-BRADLEY CO.	1201 2ND ST. SOUTH	MILWAUKEE, WI 53204
01295	TEXAS INSTRUMENTS, INC., SEMICONDUCTOR GROUP	P. O. BOX 5012	DALLAS, TX 75222
04222	AVX CERAMIC CORP.	P.O. BOX 867	MURTLE BEACH, SC 29577
04713	MOTOROLA, INC., SEMICONDUCTOR PRODUCTS DIV.	5005 E. MCDOWELL RD.	PHOENIX, AZ 85036
07263	FAIRCHILD SEMICONDUCTOR, A DIV. OF FAIRCHILD CAMERA AND INSTRUMENT CORP.	464 ELLIS ST.	MOUNTAIN VIEW, CA 94042
07910	TELEDYNE SEMICONDUCTOR	12515 CHADRON AVE.	HAWTHORNE, CA 90250
10389	CHICAGO SWITCH, INC.	2035 WABANSIA AVE.	CHICAGO, IL 60647
15818	TELEDYNE SEMICONDUCTOR	1300 TERRA BELLA AVE.	MOUNTAIN VIEW, CA 94040
18324	SIGNETICS CORP.	811 E. ARQUES	SUNNYVALE, CA 94086
27014	NATIONAL SEMICONDUCTOR CORP.	2900 SAN YSIDRO WAY	SANTA CLARA, CA 95051
28480	HEWLETT-PACKARD CO., CORPORATE HQ.	1501 PAGE MILL RD.	PALO ALTO, CA 94304
32293	INTERSIL, INC.	10900 N. TANTAU AVE.	CUPERTINO, CA 95014
56289	SPRAGUE ELECTRIC CO.		NORTH ADAMS, MA 01247
58474	SUPERIOR ELECTRIC CO., THE	383 MIDDLE ST.	BRISTOL, CT 06010
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
74970	JOHNSON, E. F., CO.	299 10TH AVE. S. W.	WASECA, MN 56093
75042	TRW ELECTRONIC COMPONENTS, IRC FIXED RESISTORS, PHILADELPHIA DIVISION	401 N. BROAD ST.	PHILADELPHIA, PA 19108
76493	BELL INDUSTRIES, INC., MILLER, J. W., DIV.	19070 REYES AVE.	COMPTON, CA 90224
80009	TEKTRONIX, INC.	P. O. BOX 500	BEAVERTON, OR 97077
80294	BOURNS, INC., INSTRUMENT DIV.	6135 MAGNOLIA AVE.	RIVERSIDE, CA 92506
80740	BECKMAN INSTRUMENTS, INC.	2500 HARBOR BLVD.	FULLERTON, CA 92634
81483	INTERNATIONAL RECTIFIER CORP.	9220 SUNSET BLVD.	LOS ANGELES, CA 90069
90201	MALLORY CAPACITOR CO., DIV. OF P. R. MALLORY CO., INC.	3029 E. WASHINGTON ST.	INDIANAPOLIS, IN 46206
91637	DALE ELECTRONICS, INC.	P. O. BOX 609	COLUMBUS, NB 68601

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
C49	285-0598-00	B010100	B049999	CAP.,FXD,PLSTC:0.01UF,5%,100V	01002	61F10AC103
C49	285-0916-00	B050000		CAP.,FXD,PLSTC:0.01UF,5%,100V	56289	LP66A1B103J002
C50	281-0576-00	B010100	B049999X	CAP.,FXD,CER DI:11PF,5%,500V	72982	301-000C0G0110J
C51	281-0576-00	XB010260	B049999	CAP.,FXD,CER DI:11PF,5%,500V	72982	301-000C0G0110J
C51	283-0342-00	B050000		CAP.,FXD,CER DI:6.5PF,+/-5PF,200V	72982	808-536A759D
C52	281-0576-00	XB010260	B049999X	CAP.,FXD,CER DI:11PF,5%,500V	72982	301-000C0G0110J
C53[1]	281-0544-00	XB127400		CAP.,FXD,CER DI:5.6PF,(NOM VALUE),SEL	72982	301-000C0H0569D
C53[2]	281-0544-00	XB127410		CAP.,FXD,CER DI:5.6PF,(NOM VALUE),SEL	72982	301-000C0H0569D
C53[3]	281-0544-00	XB127240		CAP.,FXD,CER DI:5.6PF,(NOM VALUE),SEL	72982	301-000C0H0569D
C54[1]	281-0540-00	XB127400		CAP.,FXD,CER DI:51PF,(NOM VALUE),SEL	72982	301-000U2J0510J
C54[2]	281-0540-00	XB127410		CAP.,FXD,CER DI:51PF,(NOM VALUE),SEL	72982	301-000U2J0510J
C54[3]	281-0540-00	XB127240		CAP.,FXD,CER DI:51PF,(NOM VALUE),SEL	72982	301-000U2J0510J
C56	281-0638-00	XB130000		CAP.,FXD,CER DI:240PF,5%,500V	72982	301000Z5D241J
C65	290-0527-00			CAP.,FXD,ELCTLT:15UF,20%,20V	90201	TDC156M020NLF
C69	283-0010-00			CAP.,FXD,CER DI:0.05UF,+100-20%,50V	56289	273C20
C70	281-0661-00			CAP.,FXD,CER DI:0.8PF,+/-0.1PF,500V	72982	301-000C0K0808B
C71	283-0010-00			CAP.,FXD,CER DI:0.05UF,+100-20%,50V	56289	273C20
C72	290-0527-00			CAP.,FXD,ELCTLT:15UF,20%,20V	90201	TDC156M020NLF
C73	290-0527-00			CAP.,FXD,ELCTLT:15UF,20%,20V	90201	TDC156M020NLF
C78	283-0203-00			CAP.,FXD,CER DI:0.47UF,20%,50V	72982	8131N075651474M
C80	290-0534-00			CAP.,FXD,ELCTLT:1UF,20%,35V	56289	196D105X0035HA1
C82	290-0523-00			CAP.,FXD,ELCTLT:2.2UF,20%,20V	56289	196D225X0025HA1
C100[4]	283-0065-00			CAP.,FXD,CER DI:0.001UF,5%,100V	72982	805-505B102J
C101[4]	285-0808-00			CAP.,FXD,PLSTC:0.1UF,10%,50V	56289	LP66A1A104K004
C102[1]	283-0114-00	XB116230		CAP.,FXD,CER DI:0.0015UF,5%,200V	72982	805-509B152J
C102[2]	283-0114-00	XB116330		CAP.,FXD,CER DI:0.0015UF,5%,200V	72982	805-509B152J
C102[3]	283-0114-00	XB116350		CAP.,FXD,CER DI:0.0015UF,5%,200V	72982	805-509B152J
C103[4]	281-0546-00			CAP.,FXD,CER DI:330PF,10%,500V	04222	7001-1380
C104[1]	283-0114-00	XB116230		CAP.,FXD,CER DI:0.0015UF,5%,200V	72982	805-509B152J
C104[2]	283-0114-00	XB116330		CAP.,FXD,CER DI:0.0015UF,5%,200V	72982	805-509B152J
C104[3]	283-0114-00	XB126350		CAP.,FXD,CER DI:0.0015UF,5%,200V	72982	805-509B152J
C105[1]	290-0340-00			CAP.,FXD,ELCTLT:10UF,10%,50V	56289	109D106X9050C2
C110[4]	283-0065-00			CAP.,FXD,CER DI:0.001UF,5%,100V	72982	805-505B102J
C111[4]	283-0000-00			CAP.,FXD,CER DI:0.001UF,+100-0%,500V	72982	831-516E102P
C112[4]	283-0001-00			CAP.,FXD,CER DI:0.005UF,+100-0%,500V	72982	831-559E502P
C125[4]	290-0415-00			CAP.,FXD,ELCTLT:5.6UF,10%,35V	56289	150D565X9035B2
C148	285-0566-00			CAP.,FXD,PLSTC:0.022UF,10%,200V	56289	410P1000
C150	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8131N075651104M
C165	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8131N075651104M
C168	281-0592-00	B010100	B029999	CAP.,FXD,CER DI:4.7PF,+/-0.5PF,500V	72982	301-023C0H0479D
C168	281-0651-00	B030000		CAP.,FXD,CER DI:47PF,5%,200V	72982	374-001T2H0470J
C170	285-0913-00			CAP.,FXD,PLSTC:3UF,5%,50V	56289	LP66A 1A305J
C172	283-0067-00			CAP.,FXD,CER DI:0.001UF,10%,200V	72982	835-515B102K
C175[1]	283-0067-00	B010100	B116229	CAP.,FXD,CER DI:0.001UF,10%,200V	72982	835-515B102K
C175[1]	283-0051-00	B116230	B149599	CAP.,FXD,CER DI:0.0033UF,5%,100V	72982	8131N145C0G332J
C175[1]	283-0067-00	B149600		CAP.,FXD,CER DI:0.001UF,10%,200V	72982	835-515B102K
C175[2]	283-0067-00	B010100	B116329	CAP.,FXD,CER DI:0.001UF,10%,200V	72982	835-515B102K
C175[2]	283-0051-00	B116630	B149379	CAP.,FXD,CER DI:0.0033UF,5%,100V	72982	8131N145C0G332J
C175[2]	283-0067-00	B149380		CAP.,FXD,CER DI:0.001UF,10%,200V	72982	835-515B102K
C175[3]	283-0067-00	B010100	B116349	CAP.,FXD,CER DI:0.001UF,10%,200V	72982	835-515B102K
C175[3]	283-0051-00	B116350	B148279	CAP.,FXD,CER DI:0.0033UF,5%,100V	72982	8131N145C0G332J
C175[3]	283-0067-00	B148280		CAP.,FXD,CER DI:0.001UF,10%,200V	72982	835-515B102K
C178	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-547E103Z
C220	283-0067-00			CAP.,FXD,CER DI:0.001UF,10%,200V	72982	835-515B102K
C224	283-0067-00			CAP.,FXD,CER DI:0.001UF,10%,200V	72982	835-515B102K
C230	281-0638-00	B010100	B139999X	CAP.,FXD,CER DI:240PF,5%,500V	72982	301000Z5D241J

[1]Standard only.
[2]Option 1 only.
[3]Option 2 only.
[4]Standard and Option 1 only.

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
CR290	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR292	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR310	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR315	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR432	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
DS340	150-1002-00	B010100	B099999X	NUMERICAL DSPL:SEVEN SEGMENT,RED	50579	DATA LIT 8-518
DS340	150-1037-00	XB130000		NUMERICAL DSPL:SEVEN SEGMENT,ORANGE		
DS350	150-1002-00	B010100	B099999X	NUMERICAL DSPL:SEVEN SEGMENT,RED	50579	DATA LIT 8-518
DS350	150-1037-00	XB130000		NUMERICAL DSPL:SEVEN SEGMENT,ORANGE		
DS360	150-1002-00	B010100	B099999X	NUMERICAL DSPL:SEVEN SEGMENT,RED	50579	DATA LIT 8-518
DS360	150-1037-00	XB130000		NUMERICAL DSPL:SEVEN SEGMENT,ORANGE		
DS370	150-1002-00	B010100	B099999	NUMERICAL DSPL:SEVEN SEGMENT,RED	50579	DATA LIT 8-518
DS370	150-1025-00	B100000	B129999	IND,DGTL DSPL:3 DIGIT,7 SEGMENT	50579	DL883
DS370	150-1037-00	B130000		NUMERICAL DSPL:SEVEN SEGMENT,ORANGE		
DS380	150-1003-00	B010100	B099999	NUMERICAL DSPL:PLUG-MINUS-ONE,RED,GAASP	50579	DL-81-700
DS380	150-1023-00	B100000	B129999	IND,DGTL DSPL:1.5 DIGIT,7 SEGMENT	50579	DL881
DS380	150-1038-00	B130000		NUMERICAL DSPL:SEVEN SEGMENT,ORANGE,0.5 DIGIT		
F10	159-0015-00			FUSE,CARTRIDGE:3AG,3A,250V,FAST-BLOW	71400	AGC 3
F12	159-0024-00			FUSE,CARTRIDGE:3AG,0.06A,250V,FAST BLOW	71400	AGC 1/16
J10	129-0064-01			POST,BDG,ELEC:RED,5-WAY MINIATURE	58474	BB10167G2BX
J12	129-0064-00			POST,BDG,ELEC:CHARCOAL,5-WAY MINIATURE	58474	BINP BB10167G13T
J15	129-0103-00			POST,BDG,ELEC:ASSEMBLY	80009	129-0103-00
J100	131-1011-00			CONNECTOR,RCPT,:4 CONTACT,FEMALE	0000A	RA 1304 TPX
L290	120-0382-00			XFMR,TOROID:14 TURNS,SINGLE	80009	120-0382-00
L330	108-0240-00			COIL,RF:820UH	76493	108-0240-00
Q20A,B	151-1044-00			TRANSISTOR:SILICON,JFE,N-CHANNEL	15818	2N3955
Q35	151-0190-00			TRANSISTOR:SILICON,NPN	80009	151-0190-00
Q36	151-0190-00			TRANSISTOR:SILICON,NPN	80009	151-0190-00
Q38	151-0190-00			TRANSISTOR:SILICON,NPN	80009	151-0190-00
Q60	151-1004-00			TRANSISTOR:SILICON,JFE,N-CHANNEL	15818	U1489
Q62	151-0188-00			TRANSISTOR:SILICON,PNP	01295	2N3906
Q90[1]	151-0188-00			TRANSISTOR:SILICON,PNP	01295	2N3906
Q92[1]	151-0188-00			TRANSISTOR:SILICON,PNP	01295	2N3906
Q98[1]	151-1025-00			TRANSISTOR:SILICON,JFE,N-CHANNEL	01295	SBA8129
Q104[1]	151-1025-00			TRANSISTOR:SILICON,JFE,N-CHANNEL	01295	SBA8129
Q106[1]	151-1025-00			TRANSISTOR:SILICON,JFE,N-CHANNEL	01295	SBA8129
Q150	151-0216-00	B010100	B010259	TRANSISTOR:SILICON,PNP	04713	MPS6523
Q150	151-0410-00	B010260		TRANSISTOR:SILICON,PNP	04713	SPS6765
Q152	151-0192-00			TRANSISTOR:SILICON,NPN,SEL FROM MPS6521	80009	151-0192-00
Q154A,B	151-1047-00			TRANSISTOR:SILICON,JFE	80009	151-1047-00
Q160	151-0188-00			TRANSISTOR:SILICON,PNP	01295	2N3906
Q180A,B	151-0354-00			TRANSISTOR:SILICON,PNP,DUAL	32293	ITS1200A
Q185	151-0190-00			TRANSISTOR:SILICON,NPN	80009	151-0190-00
Q190	151-0190-00			TRANSISTOR:SILICON,NPN	80009	151-0190-00
Q200A,B	151-0353-00			TRANSISTOR:SILICON,NPN,DUAL MONOLITH	80009	151-0353-00
Q208	151-0188-00			TRANSISTOR:SILICON,PNP	01295	2N3906
Q245	151-0190-00			TRANSISTOR:SILICON,NPN	80009	151-0190-00
Q250	151-0190-00			TRANSISTOR:SILICON,NPN	80009	151-0190-00
Q270	151-0190-00			TRANSISTOR:SILICON,NPN	80009	151-0190-00
Q272[2]	151-0301-00	XB127400		TRANSISTOR:SILICON,PNP	04713	2N2907A
Q272[3]	151-0301-00	XB127410		TRANSISTOR:SILICON,PNP	04713	2N2907A

[1]Standard and Option 1 only.
[2]Standard only.
[3]Option 1 only.

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R51[1]	315-0474-00	B030000	B127399	RES.,FXD,CMPSN:470K OHM,(NOM VALUE),SEL	01121	CB4745
R51[1]	315-0244-00	B127400		RES.,FXD,CMPSN:240K OHM,(NOM VALUE),SEL	01121	CB2445
R51[2]	315-0184-00	B010100	B029999	RES.,FXD,CMPSN:180K OHM,5%,0.25W	01121	CB1845
R51[2]	315-0474-00	B030000	B127409	RES.,FXD,CMPSN:470K OHM,(NOM VALUE),SEL	01121	CB4745
R51[2]	315-0244-00	B127410		RES.,FXD,CMPSN:240K OHM,(NOM VALUE),SEL	01121	CB2445
R51[3]	315-0184-00	B010100	B029999	RES.,FXD,CMPSN:180K OHM,5%,0.25W	01121	CB1845
R51[3]	315-0474-00	B030000	B127349	RES.,FXD,CMPSN:470K OHM,(NOM VALUE),SEL	01121	CB4745
R51[3]	315-0244-00	B127240		RES.,FXD,CMPSN:240K OHM,(NOM VALUE),SEL	01121	CB2445
R52[1]	321-0385-00	XB127400		RES.,FXD,FILM:100K OHM,1%,0.125W	75042	CEAT0-1003F
R52[2]	321-0385-00	XB127410		RES.,FXD,FILM:100K OHM,1%,0.125W	75042	CEAT0-1003F
R52[3]	321-0385-00	XB127240		RES.,FXD,FILM:100K OHM,1%,0.125W	75042	CEAT0-1003F
R53[1]	321-0084-00	B010100	B039999	RES.,FXD,FILM:73.2 OHM,1%,0.125W	75042	CEAT0-73R20F
R53[1]	321-0082-00	B040000	B127399	RES.,FXD,FILM:69.8 OHM,(NOM VALUE),SEL	75042	CEAT0-69R80F
R53[1]	321-0054-00	B127400		RES.,FXD,FILM:35.7 OHM,(NOM VALUE),SEL	75042	CEAT0-35R70F
R53[2]	321-0084-00	B010100	B039999	RES.,FXD,FILM:73.2 OHM,1%,0.125W	75042	CEAT0-73R20F
R53[2]	321-0082-00	B040000	B127409	RES.,FXD,FILM:69.8 OHM,(NOM VALUE),SEL	75042	CEAT0-69R80F
R53[2]	321-0054-00	B127410		RES.,FXD,FILM:35.7 OHM,(NOM VALUE),SEL	75042	CEAT0-35R70F
R53[3]	321-0084-00	B010100	B039999	RES.,FXD,FILM:73.2 OHM,1%,0.125W	75042	CEAT0-73R20F
R53[3]	321-0082-00	B040000	B127239	RES.,FXD,FILM:69.8 OHM,(NOM VALUE),SEL	75042	CEAT0-69R80F
R53[3]	321-0054-00	B127240		RES.,FXD,FILM:35.7 OHM(NOM VALUE),SEL	75042	CEAT0-35R70F
R55	321-0666-07			RES.,FXD,FILM:3.04K OHM,0.1%,0.125W	75042	CEAT9-3041B
R56	321-0332-07			RES.,FXD,FILM:28K OHM,0.1%,0.125W	75042	CEAT9-2802B
R59	315-0272-00	B010100	B010259	RES.,FXD,CMPSN:2.7K OHM,5%,0.25W	01121	CB2725
R59	315-0182-00	B010260		RES.,FXD,CMPSN:1.8K OHM,5%,0.25W	01121	CB1825
R60	306-0333-00			RES.,FXD,CMPSN:33K OHM,10%,2W	01121	HB3331
R62	315-0223-00			RES.,FXD,CMPSN:22K OHM,5%,0.25W	01121	CB2235
R63	315-0682-00			RES.,FXD,CMPSN:6.8K OHM,5%,0.25W	01121	CB6825
R65	321-0385-00			RES.,FXD,FILM:100K OHM,1%,0.125W	75042	CEAT0-1003F
R67	321-0289-00			RES.,FXD,FILM:10K OHM,1%,0.125W	75042	CEAT0-1002F
R68	321-0162-00			RES.,FXD,FILM:475 OHM,1%,0.125W	75042	CEAT0-4750F
R70	311-1258-00			RES.,VAR,NONWIR:50 OHM,10%,0.50W	73138	62PT-342-0
R72	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
R73	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
R75	321-0289-00			RES.,FXD,FILM:10K OHM,1%,0.125W	75042	CEAT0-1002F
R76	321-0289-00			RES.,FXD,FILM:10K OHM,1%,0.125W	75042	CEAT0-1002F
R78	315-0753-00			RES.,FXD,CMPSN:75K OHM,5%,0.25W	01121	CB7535
R80	315-0303-00			RES.,FXD,CMPSN:30K OHM,5%,0.25W	01121	CB3035
R82	315-0303-00			RES.,FXD,CMPSN:30K OHM,5%,0.25W	01121	CB3035
R90	315-0272-00			RES.,FXD,CMPSN:2.7K OHM,5%,0.25W	01121	CB2725
R91	315-0392-00			RES.,FXD,CMPSN:3.9K OHM,5%,0.25W	01121	CB3925
R93	315-0392-00			RES.,FXD,CMPSN:3.9K OHM,5%,0.25W	01121	CB3925
R94	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R96	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
R98	321-0365-02			RES.,FXD,FILM:61.9K OHM,0.5%,0.125W	75042	CEAT2-6192D
R99	321-0117-00			RES.,FXD,FILM:162 OHM,1%,0.125W	75042	CEAT0-1620F
R101[4]	322-0643-01			RES.,FXD,FILM:600K OHM,0.5%,0.25W	75042	CEBT0-6003D
R103[4]	321-0222-00			RES.,FXD,FILM:2K OHM,1%,0.125W	75042	CEAT0-2001F
R104[4]	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R106[4]	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
R110[4]	315-0683-00			RES.,FXD,CMPSN:68K OHM,5%,0.25W	01121	CB6835
R112[4]	321-1331-02			RES.,FXD,FILM:27.7K OHM,0.5%,0.125W	75042	CEAT2-2722D
R113[4]	321-0240-01			RES.,FXD,FILM:3.09K OHM,0.5%,0.125W	75042	CEAT0-3901D
R115[4]	311-0605-00			RES.,VAR,NONWIR:200 OHM,10%,0.50W	80740	62-54-3

[1]Standard only.
[2]Option 1 only.
[3]Option 2 only.
[4]Standard and Option 1 only.

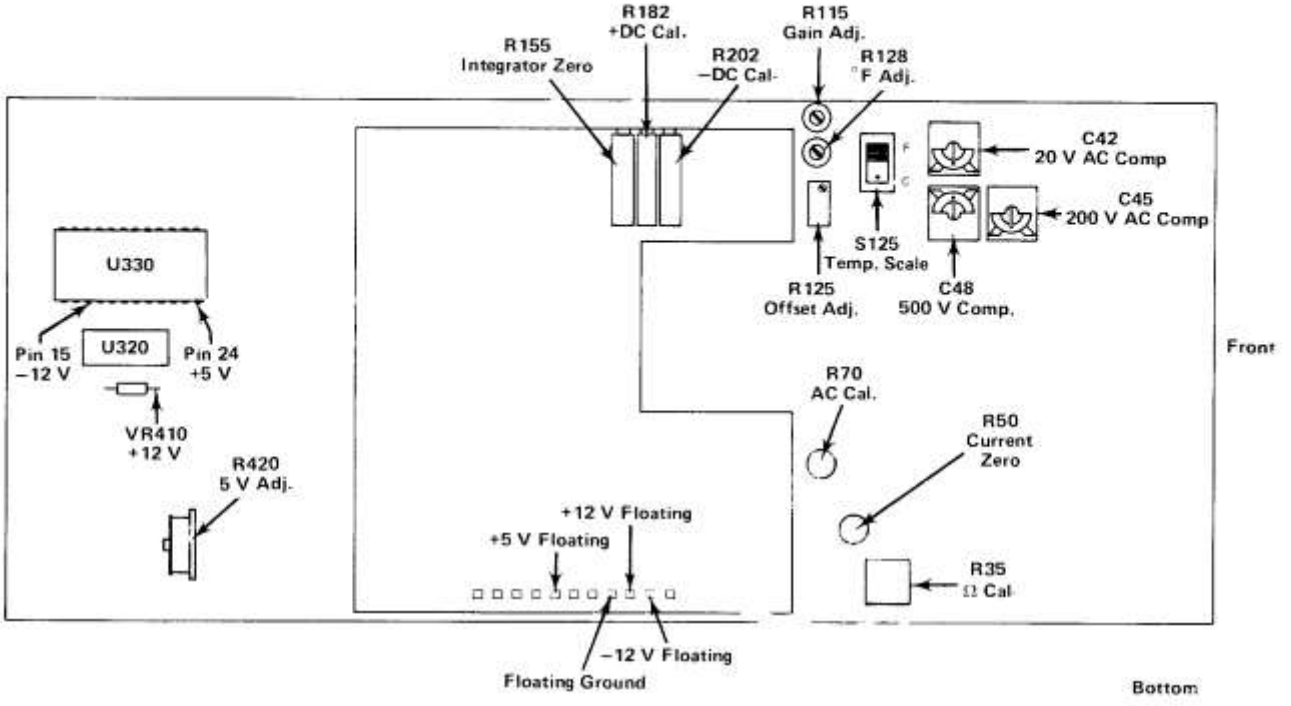
Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R230	315-0202-00			RES.,FXD,CMPSN:2K OHM,5%,0.25W	01121	CB2025
R234	315-0752-00	XB140000		RES.,FXD,CMPSN:7.5K OHM,5%,0.25W	01121	CB7525
R236	315-0473-00	XB140000		RES.,FXD,CMPSN:47K OHM,5%,0.25W	01121	CB4735
R237	321-0346-00	XB140000		RES.,FXD,FILM:39.2K OHM,(NOM VALUE),SEL	75042	CEATO-3922F
R238	315-0333-00	B010100	B049999	RES.,FXD,CMPSN:33K OHM,5%,0.25W	01121	CB3335
R238	321-0340-00	B050000	B139999X	RES.,FXD,FILM:34K OHM,1%,0.125W	75042	CEATO-3402F
R240	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R243	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R244	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R246	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R250	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
R252	315-0222-00			RES.,FXD,CMPSN:2.2K OHM,5%,0.25W	01121	CB2225
R270	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005
R272	315-0331-00			RES.,FXD,CMPSN:330 OHM,5%,0.25W	01121	CB3315
R275	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005
R277	315-0331-00			RES.,FXD,CMPSN:330 OHM,5%,0.25W	01121	CB3315
R290	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R292	315-0302-00			RES.,FXD,CMPSN:3K OHM,5%,0.25W	01121	CB3025
R293[1]	315-0122-00			RES.,FXD,CMPSN:1.2K OHM,5%,0.25W	01121	CB1225
R294[1]	315-0273-00	XB149380		RES.,FXD,CMPSN:27K OHM,5%,0.25W	01121	CB2735
R294[2]	315-0273-00	XB148280		RES.,FXD,CMPSN:27K OHM,5%,0.25W	01121	CB2735
R295	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R297	315-0561-00			RES.,FXD,CMPSN:560 OHM,5%,0.25W	01121	CB5615
R298	315-0222-00			RES.,FXD,CMPSN:2.2K OHM,5%,0.25W	01121	CB2225
R299	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
R310	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R315	315-0222-00			RES.,FXD,CMPSN:2.2K OHM,5%,0.25W	01121	CB2225
R317	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R318	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
R320	315-0222-00			RES.,FXD,CMPSN:2.2K OHM,5%,0.25W	01121	CB2225
R322	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R325	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
R335	315-0223-00			RES.,FXD,CMPSN:22K OHM,5%,0.25W	01121	CB2235
R337	315-0301-00	B010100	B129999	RES.,FXD,CMPSN:300 OHM,5%,0.25W	01121	CB3015
R337	315-0131-00	B130000		RES.,FXD,CMPSN:130 OHM,5%,0.25W	01121	CB1315
R339	315-0222-00			RES.,FXD,CMPSN:2.2K OHM,5%,0.25W	01121	CB2225
R340	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R342	315-0223-00			RES.,FXD,CMPSN:22K OHM,5%,0.25W	01121	CB2235
R344	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R345	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R348	315-0223-00			RES.,FXD,CMPSN:22K OHM,5%,0.25W	01121	CB2235
R350	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R351	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R352	315-0223-00			RES.,FXD,CMPSN:22K OHM,5%,0.25W	01121	CB2235
R354	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R335	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R358	315-0223-00			RES.,FXD,CMPSN:22K OHM,5%,0.25W	01121	CB2235
R360	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R361	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R381	315-0511-00	B010100	B069999	RES.,FXD,CMPSN:510 OHM,5%,0.25W	01121	CB5115
R381	315-0391-00	B070000	B099999	RES.,FXD,CMPSN:390 OHM,5%,0.25W	01121	CB3915
R381	315-0181-00	B100000	B129999	RES.,FXD,CMPSN:180 OHM,5%,0.25W	01121	CB1815
R381	315-0391-00	B130000		RES.,FXD,CMPSN:390 OHM,5%,0.25W	01121	CB3915
R382	315-0511-00	B010100	B069999	RES.,FXD,CMPSN:510 OHM,5%,0.25W	01121	CB5115
R382	315-0391-00	B070000	B099999X	RES.,FXD,CMPSN:390 OHM,5%,0.25W	01121	CB3915

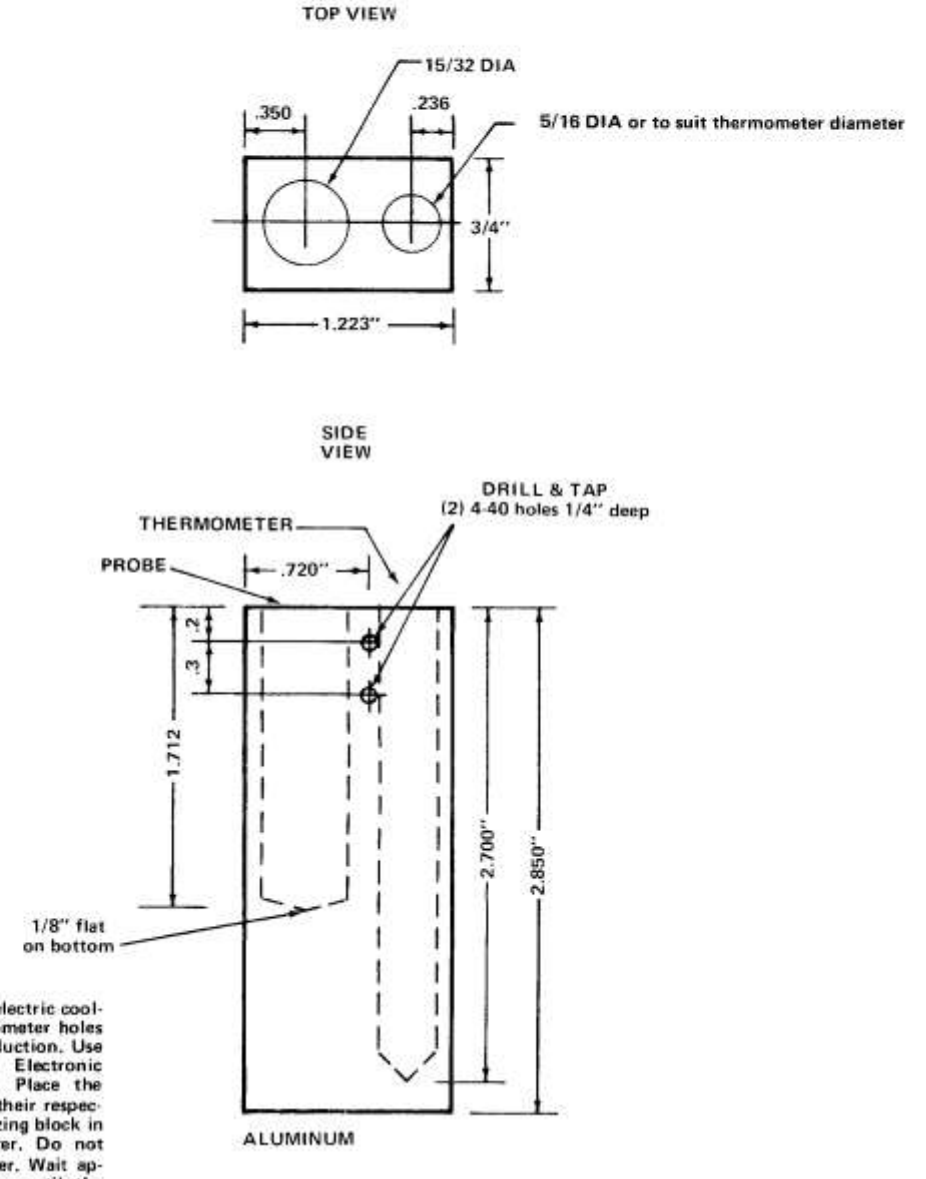
[1]Option 1 only
[2]Option 2 only

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
T300	120-0697-00			XFMR,TOROID:TWO 20 TURN WINDINGS	80009	120-0697-00
T315	120-0697-00			XFMR,TOROID:TWO 20 TURN WINDINGS	80009	120-0697-00
T320	120-0697-00			XFMR,TOROID:TWO 20 TURN WINDINGS	80009	120-0697-00
U30	156-0158-00			MICROCIRCUIT,LI:DUAL OPERATIONAL AMPLIFIER	80009	156-0158-00
U70	156-0122-00			MICROCIRCUIT,LI:OPERATIONAL AMPLIFIER	18324	NE531T
U100[1]	156-0158-00			MICROCIRCUIT,LI:DUAL OPERATIONAL AMPLIFIER	80009	156-0158-00
U170	156-0067-00			MICROCIRCUIT,LI:OPERATIONAL AMPLIFIER	80009	156-0067-00
U175	156-0134-00			MICROCIRCUIT,LI:SINGLE DIFFERENTIAL COMPARATOR	18324	NS710V
U220	156-0043-00			MICROCIRCUIT,DI:2-INPUT NOR GATE	80009	156-0043-00
U230	156-0030-00			MICROCIRCUIT,DI:QUAD 2-INPUT POS NAND GATE	01295	SN7400N
U235	156-0041-00			MICROCIRCUIT,DI:DUAL D-TYPE FLIP-FLOP	27014	DM7474N
U236A,B	156-0405-00	XB140000		MICROCIRCUIT,DI:DUAL RETRIG MONOSTABLE MV	07263	9602FC
U238	156-0072-00	B010100	B139999X	MICROCIRCUIT,DI:MONOSTABLE MV,TTL	27014	DM74121N
U295	156-0079-00			MICROCIRCUIT,DI:DECADE COUNTER,TTL	07263	9390PC
U310	156-0039-00			MICROCIRCUIT,DI:DUAL J-K FLIP FLOP	01295	SN7473N
U315	156-0041-00			MICROCIRCUIT,DI:DUAL D-TYPE FLIP-FLOP	27014	DM7474N
U320	156-0041-00			MICROCIRCUIT,DI:DUAL D-TYPE FLIP-FLOP	27014	DM7474N
U325	156-0030-00			MICROCIRCUIT,DI:QUAD 2-INPUT POS NAND GATE	01295	SN7400N
U330	156-0306-00			MICROCIRCUIT,DI:4.5 DECADE CTR,MOS	07263	3814DC
U390	156-0128-00			MICROCIRCUIT,DI:SGL BCD TO 7-SEG DCDR/DRVR	01295	SN7447AN
U420	156-0071-00			MICROCIRCUIT,LI:VOLTAGE REGULATOR	07263	723DC
VR125[1]	152-0486-00			SEMICOND DEVICE:ZENER,0.25W,6.2V,5%	07910	1N3497
VR150	152-0195-00			SEMICOND DEVICE:ZENER,0.4W,5.1V,5%	81483	69-6512
VR180	152-0486-00			SEMICOND DEVICE:ZENER,0.25W,6.2V,5%	07910	1N3497
VR200	152-0486-00			SEMICOND DEVICE:ZENER,0.25W,6.2V,5%	07910	1N3497
VR270	152-0508-00			SEMICOND DEVICE:ZENER,0.4W,12.5V,5%	80009	152-0508-00
VR275	152-0508-00			SEMICOND DEVICE:ZENER,0.4W,12.5V,5%	80009	152-0508-00
VR410	152-0168-00			SEMICOND DEVICE:ZENER,0.4W,12V,5%	04713	1N963B
Y330	158-0082-00			XTAL UNIT,QTZ:400KHZ,0.02%	18853	OBD

[1]Standard and Option 1 only.

INTERNAL ADJUSTMENT PROCEDURE



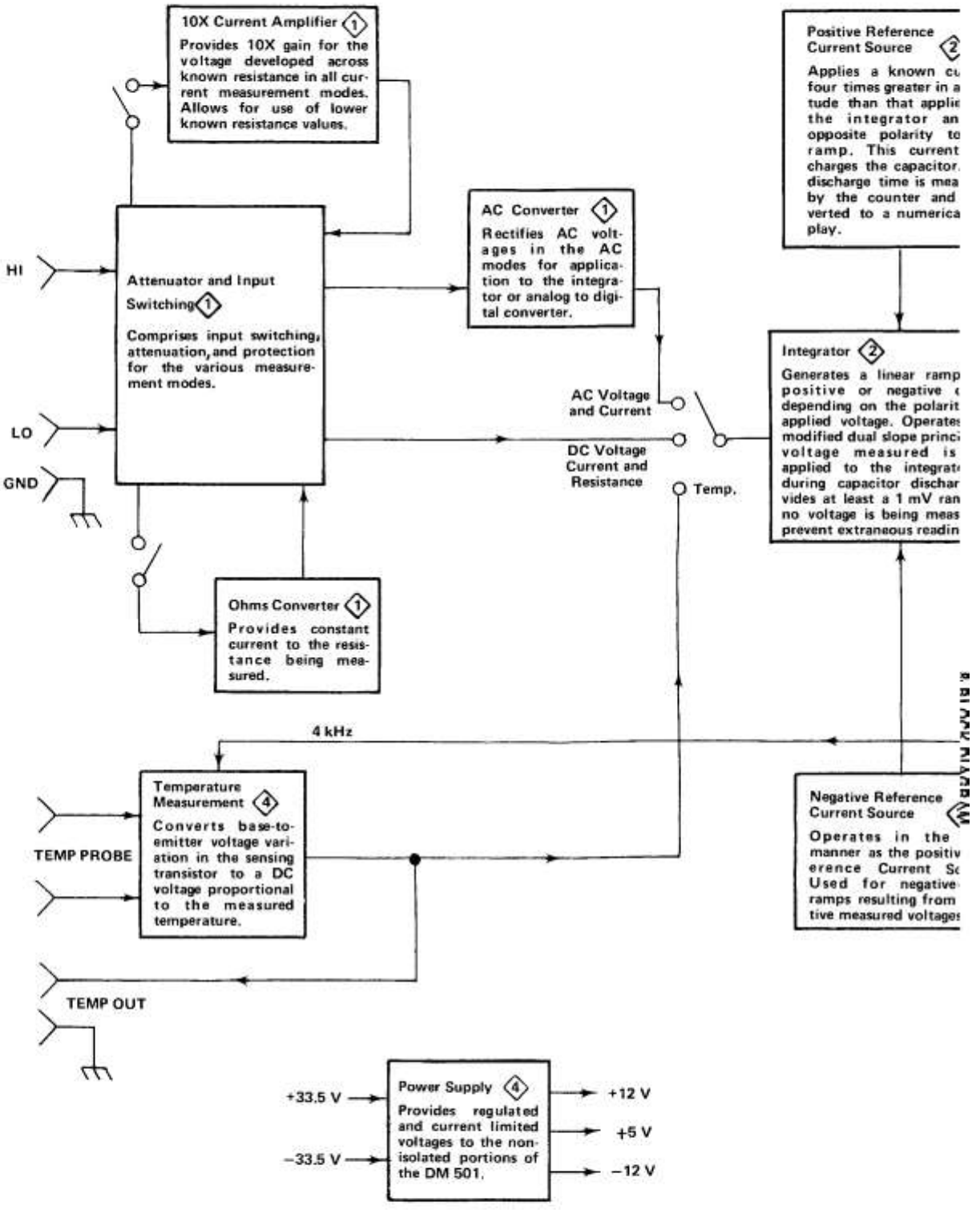


Place a small quantity of dielectric coolant in the probe and thermometer holes to insure good thermal conduction. Use FC 40 Fluorinert Brand Electronic Liquid or similar coolant. Place the probe and thermometer in their respective holes and set the equalizing block in chipped ice or boiling water. Do not submerge the probe in water. Wait approximately 20 minutes or until the thermometer indicates the equalizing block has temperature-stabilized. To shorten the time required for stabilization, use two equalizing blocks in separate containers of iced and boiling water. Transfer the probe from the low and high temperature containers when called for in the adjustment procedure.

Fig. 3-1A. Temperature Probe Equalizing Block.

Ⓐ

BLOCK D

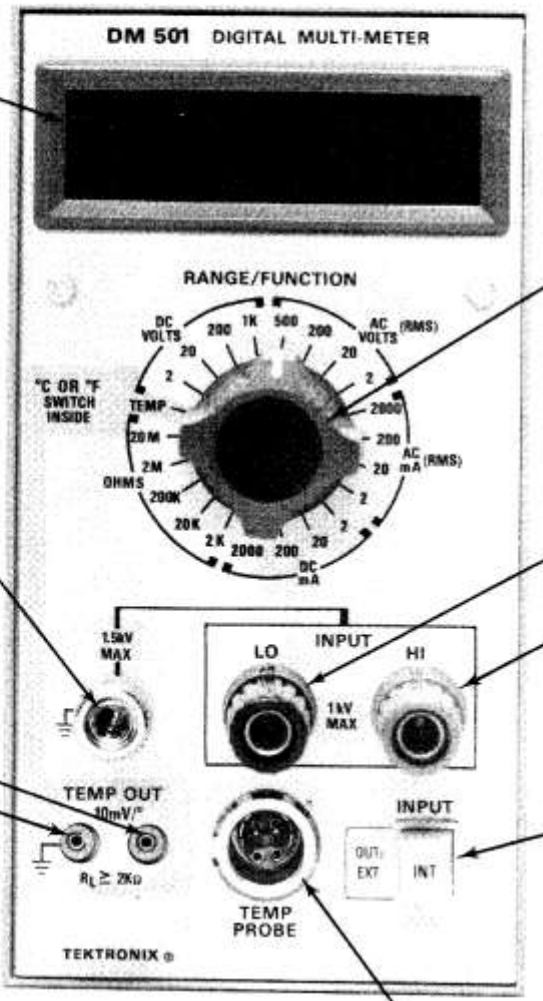


Numbers in diamonds refer to appropriate schematics pages.

CONTROLS AND CONNECTORS

Display Readout

4 1/2 digit LED readout with decimal point positioned by RANGE/FUNCTION switch. Resolution is 0.005% of range except temperature which is 0.1°.



RANGE/FUNCTION Switch

Selects all ranges and functions.

Ground Binding Post

Chassis ground.

INPUT Binding Posts

Binding posts for application of unknown voltage, current, or resistance. May be floated 1.5 kV above ground.

TEMP OUT Pin Jacks

Output available irrespective of RANGE/FUNCTION switch setting. Center terminal ground.

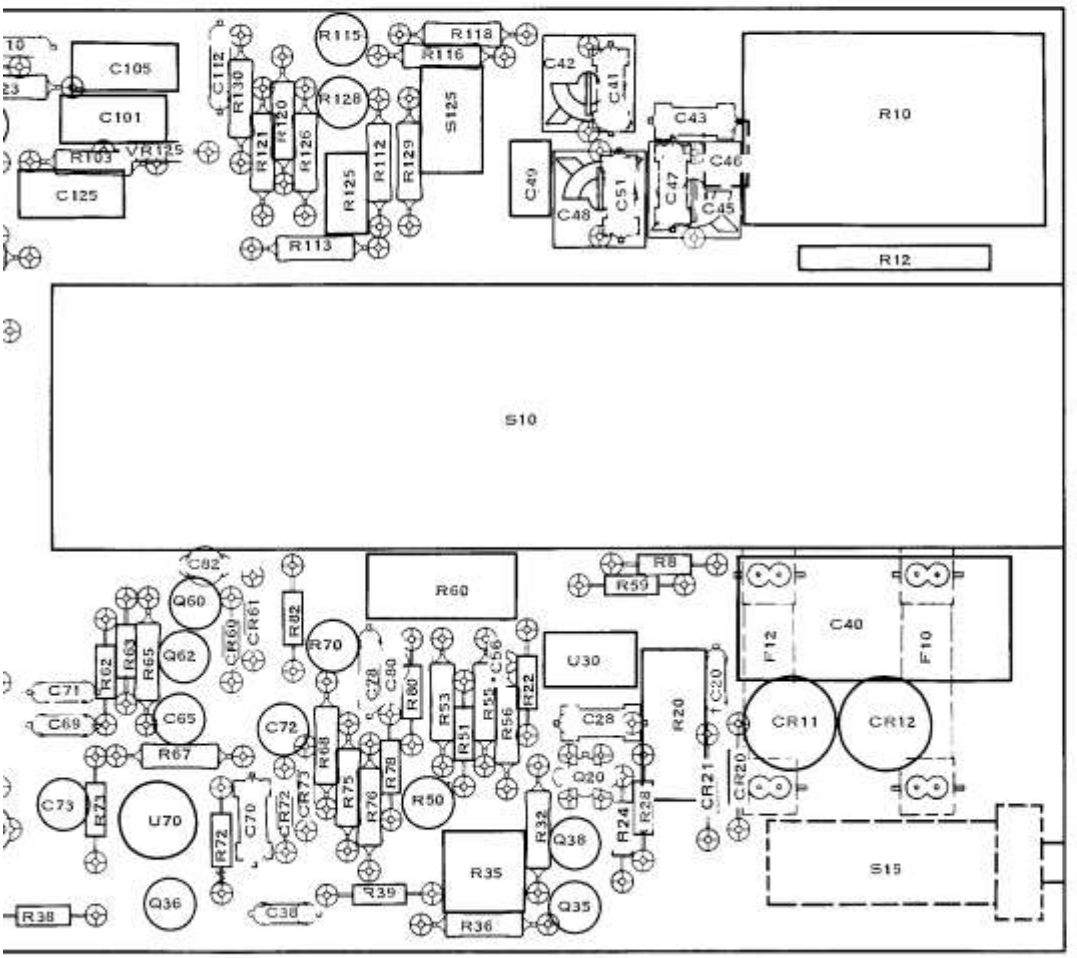
INPUT Pushbutton

Button OUT transfers input to front panel. Button in rear interface connector. Does not switch TEMP input.

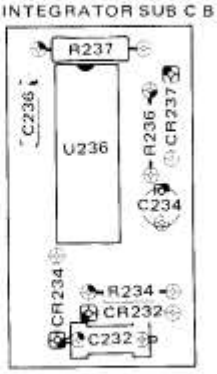
TEMP PROBE Connector

Mates with P6058 probe connector. Also used with other temperature sensing devices.

PARTS LOCATION GRID



(SN B140000 & UP)
INTEGRATOR SUB C B

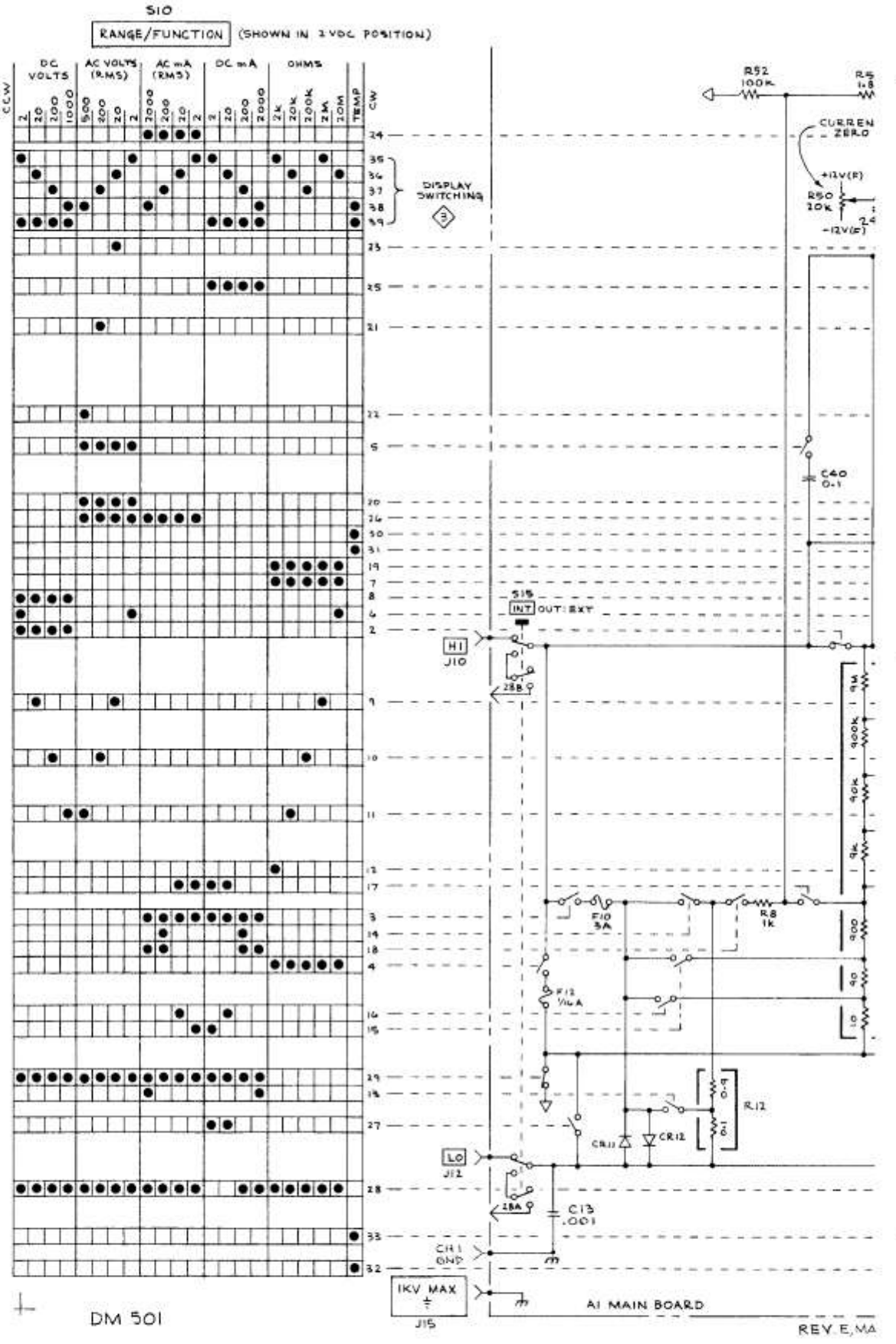


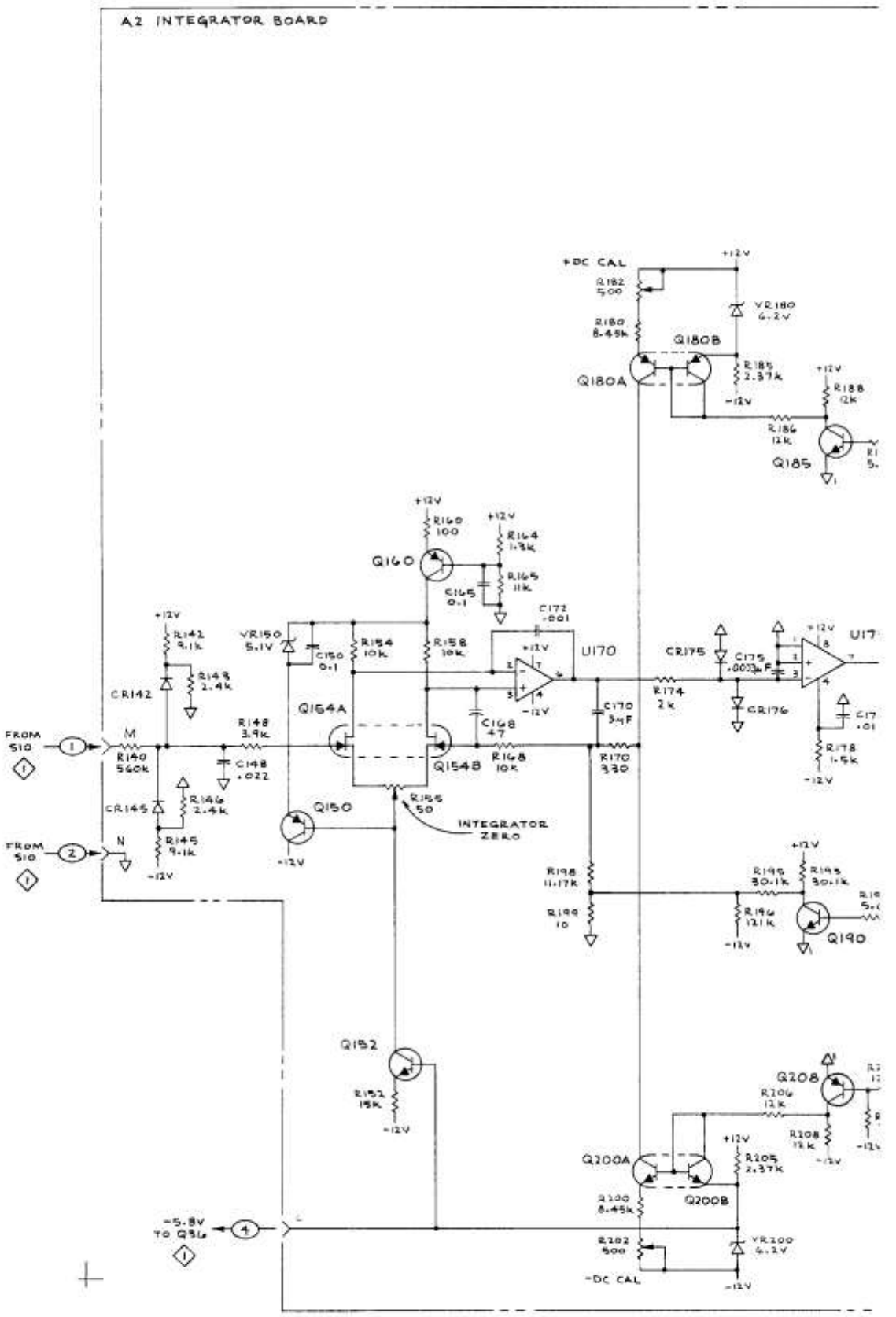
CONTROLS & CONNECTORS

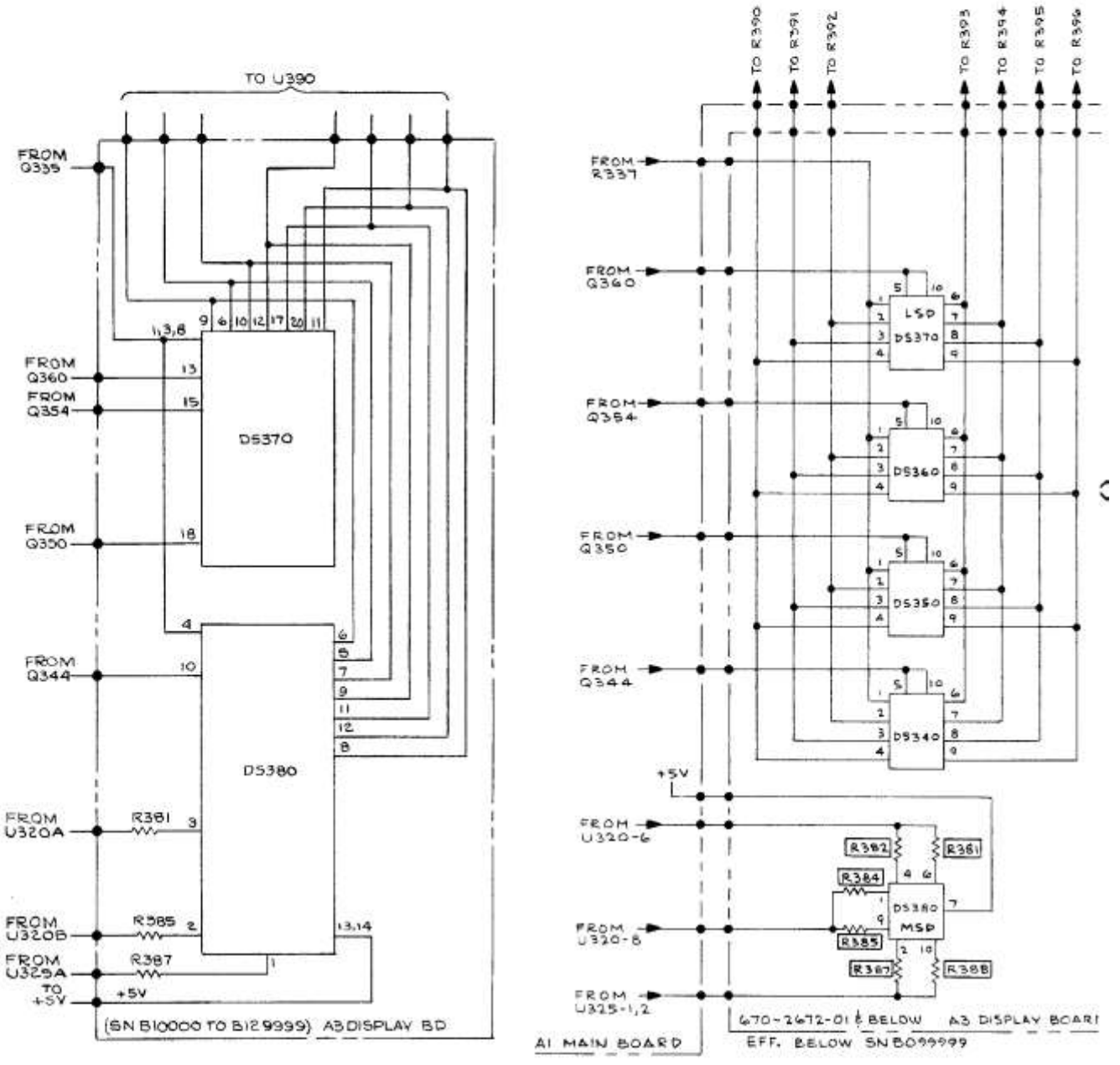
cated on back of board
24

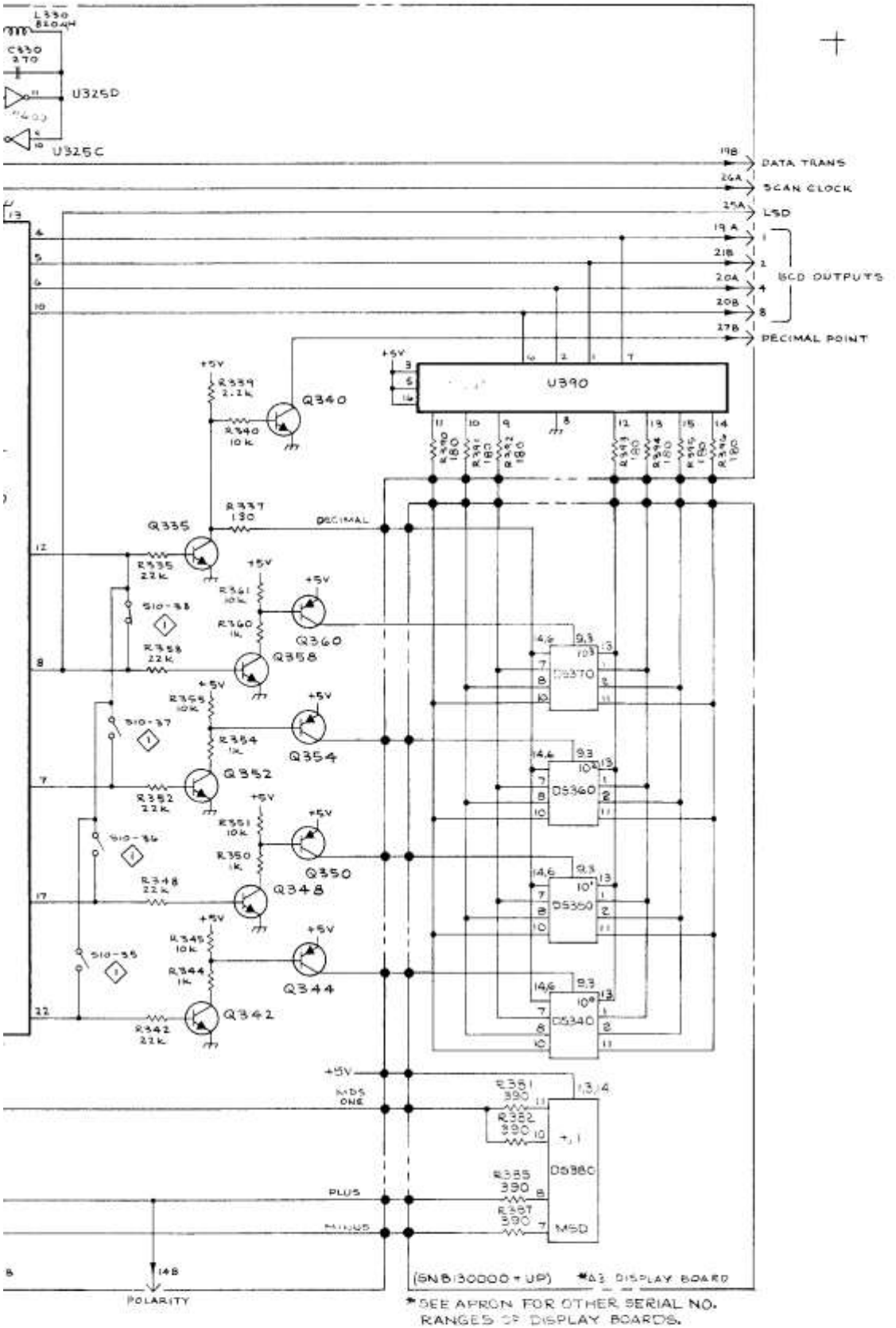
†C20 (Relocated from back to front eff. SN B127400)

	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO
4	Q2	Q335	D3	R12	L2	R60	J4	R93	F2	R121	I2	R158	Q3	R195
0	Q3	Q340	E1	R20	K5	R62	H5	R94	F2	R123	G1	R160	Q3	R196
0	Q1	Q342	D3	R22	J5	R63	H4	R96	G2	R125	I2	R164	Q3	R198
5	O1	Q344	E2	R24	K5	R65	H5	R98	F2	R126	I2	R165	Q4	R199
0	P3	Q348	C2	R28	K5	R67	H5	R99	G2	R128	I1	R168	Q3	R200
0	Q2	Q350	E3	R32	J5	R68	I5	R101	G2	R129	I2	R170	Q1	R202
8	O1	Q352	D2	R35	J6	R70	I4	R103	H2	R130	H1	R174	P2	R205
5	Q5	Q354	E2	R36	J6	R72	H6	R104	G3	R140	R4	R178	P2	R206
0	Q4	Q358	D2	R38	G6	R73	H5	R106	F2	R142	R4	R180	R1	R208
0	S5	Q360	E2	R39	I6	R75	I5	R110	G1	R143	S4	R182	R1	R209
5	R5	Q432	B5	R50	I5	R76	I5	R112	I2	R145	R5	R185	S2	R210
0	D5	Q438	A4	R51	J5	R78	I5	R113	I2	R146	S4	R186	P1	R220
2	C5	Q440	A4	R53	J5	R80	I5	R115	I1	R148	Q3	R188	P1	R222
4	E6			R55	J5	R82	I4	R116	J1	R152	R3	R189	O2	R224
5	C5	R8	K4	R56	J5	R90	F2	R118	J1	R154	Q3	R192	P3	R226
0	C5	R10	L1	R59	K4	R91	F3	R120	I1	R155	R1	R193	Q4	R228

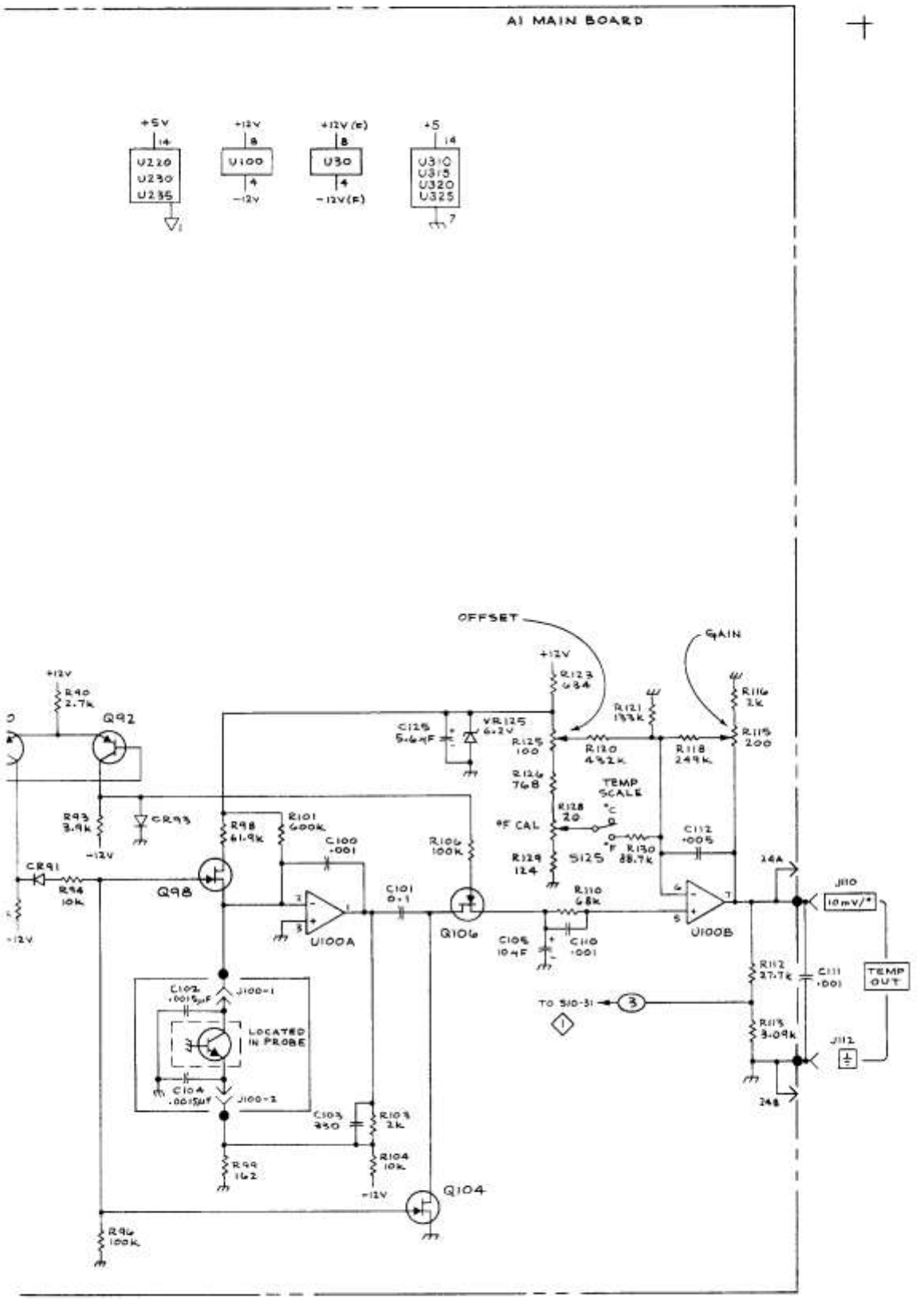

S10
RANGE/FUNCTION
(SHOWN IN 2 VDC POSITION)
CCW
CW
DC VOLTS
AC VOLTS (RMS)
AC mA (RMS)
DC mA
OHMS
TEMP
DISPLAY SWITCHING
S15
INT
OUT
EXT
HI
J10
LO
J12
CH 1 GND
J15
1KV MAX
C40 0.1
C13 .001
F10 3A
F12 1/16A
R8 1K
R12
CR11
CR12
R52 100K
R50 20K
CURREN ZERO
+12V(R)
-12V(R)
AI MAIN BOARD
REV E, MA
DM 501


A2 INTEGRATOR BOARD
+DC CAL
+12V
R182 500
VR180 6.2V
R180 8.45k
Q180B
Q180A
R185 2.37k
-12V
R188 12k
R186 12k
Q185
R160 100
R164 1.3k
Q160
R165 11k
C165 0.1
C172 .001
VR150 5.1V
C150 0.1
R154 10k
R158 10k
U170
R142 9.1k
R143 2.4k
CR142
Q164A
Q164B
C168 47
R168 10K
C170 3pF
R174 2k
CR175
C175 .0033μF
CR176
R178 1.5k
FROM S10
M
R140 560k
R148 3.9k
C148 .022
CR145
R146 2.4k
R145 9.1k
N
Q150
R155 50
INTEGRATOR ZERO
R170 330
R198 11.17k
R199 10
R195 30.1k
R196 12.1k
Q190
Q152
R151 15k
Q208
R106 12k
R108 12k
Q200A
Q200B
R205 2.37k
R200 8.45k
R202 500
VR200 6.2V
-DC CAL
-5.8V TO Q56


TO U390
FROM Q335
FROM Q360
FROM Q354
FROM Q350
FROM Q344
FROM U320A
FROM U320B
FROM U325A
TO +5V
R381
R385
R387
+5V
D5370
D5380
(SN B10000 TO B12999) A3 DISPLAY BD
TO R390
TO R391
TO R392
TO R393
TO R394
TO R395
TO R396
FROM R337
FROM Q360
FROM Q354
FROM Q350
FROM Q344
+5V
FROM U320-6
FROM U320-8
FROM U325-1,2
LSP
D5370
D5360
D5350
D5340
R382
R381
R384
D5380
MSP
R385
R387
R388
A1 MAIN BOARD
670-2672-01 & BELOW A3 DISPLAY BOARD
EFF. BELOW SN B099999



COUNTERS AND DISPLAY ◇3 dah 0472



POWER SUPPLY AND TEMPERATURE MEASUREMENT 4 deh 0972

CROSS INDEX MFR. CODE NUMBER TO MANUFACTURER

MFR.CODE	MANUFACTURER	ADDRESS	CITY,STATE,ZIP
0000A	LEMO USA	2015 2ND ST.	BERKLEY, CA 94710
00779	AMP, INC.	P. O. BOX 3608	HARRISBURG, PA 17105
01295	TEXAS INSTRUMENTS, INC., SEMICONDUCTOR GROUP	P. O. BOX 5012	DALLAS, TX 75222
10389	CHICAGO SWITCH, INC.	2035 WABANSIA AVE.	CHICAGO, IL 60647
12360	ALBANY PRODUCTS CO., DIV. OF PNEUMO DYNAMICS CORP.	351 CONNECTICUT AVE.	SOUTH NORWALK, CT 06856
22526	BERG ELECTRONICS, INC.	YOUK EXPRESSWAY	NEW CUMBERLAND, PA 17070
23499	GAVITT WIRE AND CABLE, DIVISION OF RSC INDUSTRIES, INC.	455 N. QUINCE ST.	ESCONDIDO, CA 92025
45722	USM CORP., PARKER-KALON FASTENER DIV.		CAMPBELLSVILLE, KY 42718
58474	SUPERIOR ELECTRIC CO., THE	383 MIDDLE ST.	BRISTOL, CT 06010
71279	CAMBRIDGE THERMIONIC CORP.	445 CONCORD AVE.	CAMBRIDGE, MA 02138
73743	FISCHER SPECIAL MFG. CO.	446 MORGAN ST.	CINCINNATI, OH 45206
74445	HOLO-KROME CO.	31 BROOK ST. WEST	HARTFORD, CT 06110
78189	ILLINOIS TOOL WORKS, INC. SHAKEPROOF DIVISION	ST. CHARLES ROAD	ELGIN, IL 60120
78471	TILLEY MFG. CO.	900 INDUSTRIAL RD.	SAN CARLOS, CA 94070
80009	TEKTRONIX, INC.	P. O. BOX 500	BEAVERTON, OR 97005
82647	TEXAS INSTRUMENTS, INC., CONTROL PRODUCTS DIV.	34 FOREST ST.	ATTLEBORO, MA 02703
83385	CENTRAL SCREW CO.	2530 CRESCENT DR.	BROADVIEW, IL 60153
83501	GAVITT WIRE AND CABLE, DIVISION OF RSC INDUSTRIES, INC.	CENTRAL ST.	BROOKFIELD, MA 01506
97464	INDUSTRIAL RETAINING RING CO.	57 CORDIER ST.	IRVINGTON, NJ 07111

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5 Name & Description	Mfr Code	Mfr Part Number
1-35	260-0960-01			1	. SWITCH,SLIDE:0.5A,120VDC,CKT BD MT	10389	23-021-043
-36	351-0186-00			3	. GUIDE-POST,LOCK:0.84 INCH LONG	80009	351-0186-00
	105-0440-00			1	. ACTR ASSY,CAM,S:	80009	105-0440-00
-37	200-1519-00			1	. . COVER CAM SW:	80009	200-1519-00
					(ATTACHING PARTS)		
-38	211-0008-00			6	. . SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OBD
-39	210-0004-00			6	. . WASHER,LOCK:INTL,0.12 ID X 0.26"OD,STL	78189	1204-00-00-0541C
					- - - * - - -		
-40	210-0406-00			12	. . NUT,PLAIN,HEX.:4-40 X 0.188 INCH,BRS	73743	2X12161-402
-41	401-0146-00			1	. . BEARING,CAM SW:REAR	80009	401-0146-00
-42	407-1199-00			1	. . BRACKET,COVER:	80009	407-1199-00
-43	401-0081-02			1	. . BEARING,CAM SW:FRONT	80009	401-0081-02
-44	214-1139-00 [1]			-	. . SPRING,FLAT:GOLD COLORED	80009	214-1139-00
	214-1139-02 [1]			-	. . SPRING,FLAT:GREEN COLORED	80009	214-1139-02
	214-1139-03 [1]			-	. . SPRING,FLAT:RED COLORED	80009	214-1139-03
-45	214-1127-00			2	. . ROLLER,DETENT:0.125 DIA X 0.125 INCH L	80009	214-1127-00
-46	354-0391-00			1	. . RING,RETAINING:0.395"FREE ID X 0.025" STL	97464	3100-43-CD
-47	105-0439-00			1	. . DRUM,CAM SWITCH:	80009	105-0439-00
					(ATTACHING PARTS)		
-48	211-0116-00			6	. SCR,ASSEM WSHR:4-40 X 0.312 INCH,PNH BRS	83385	OBD
					- - - * - - -		
-49	----- -----			1	. SWITCH,PUSH:4POT(SEE S15 EPL)		
-50	361-0384-00			2	. SPACER,PB SW:0.133 INCH LONG	80009	361-0384-00
-51	344-0154-00			4	. CLIP,ELECTRICAL:FOR 0.25 INCH DIA FUSE	80009	344-0154-00
					(ATTACHING PARTS FOR CKT BD)		
-52	213-0146-00	B010100	B062014	4	SCR,TPG,THD FOR:6-20 X 0.313 INCH,PNH STL	83385	OBD
	213-0146-00	B060215		3	SCR,TPG,THD FOR:6-20 X 0.313 INCH,PNH STL	83385	OBD
	213-0336-00	B062105		1	SCR,TPG,THD FOR:6-32 X 1.25 INCH,PNH STL	83385	OBD
	166-0209-00	XB062015		1	SPACER,SLEEVE:0.938 L X 0.18 ID ALUMINUM	80009	166-0209-00
					- - - * - - -		
	337-2030-00			1	SHIELD,ELEC:	80009	337-2030-00
-53	358-0029-00			1	BSHG,MACH.THD:HEX,0.375-32 X 0.438"LONG	80009	358-0029-00
-54	426-0724-00			1	FR SECT,PLUG-IN:BOTTOM	80009	407-0724-00
					(ATTACHING PARTS)		
-55	213-0229-00			2	SCR,TPG,THD FOR:6-20 X0.375"100 DEG,FLH STL	83385	OBD
					- - - * - - -		
-56	426-1014-00			1	FR SECT,PLUG-IN:	80009	426-1014-00
					(ATTACHING PARTS)		
-57	213-0227-00			2	SCR,TPG,THD FOR:6-32 X 0.50 100 DEG,FLH ST	83385	OBD
					- - - * - - -		
-58	214-1061-00			1	SPRING,GROUND:FLAT	80009	214-1061-00
-59	----- -----			1	CKT BOARD ASSY:DISPLAY(SEE A3 EPL)		
	198-3083-00	B130000		1	. WIRE SET,ELEC:	80009	198-3083-00
	131-0707-00	B130000		16	. . CONTACT,ELEC:0.48"L,22-26 AWG WIRE	22526	47439
	352-0164-00	B130000		1	. . CONN BODY,PL,EL:6 WIRE BLACK	80009	352-0164-00
	352-0168-00	B130000		1	. . CONN BODY,PL,EL:10 WIRE BLACK	80009	352-0168-00
	175-0829-00	B130000		FT	. . WIRE,ELECTRICAL:6 WIRE RIBBON	83501	TEK-175-0829-00
	175-0833-00	B130000		FT	. . WIRE,ELECTRICAL:10 WIRE RIBBON	23499	TEK-175-0833-00
-60	337-1761-00			1	SHIELD,ELEC:	80009	337-1761-00
-61	386-2476-01	B010100	B090000	1	SUBPANEL,FRONT:	80009	386-2476-01
	386-2476-03	B100000		1	SUBPANEL,FRONT:	80009	386-2476-03
-62	136-0387-00			2	. JACK,TIP:GRAY	71279	4352-1-0318
	386-2476-00	B010100	B090000	1	SUBPANEL,FRONT:(OPTION 2 ONLY)	80009	386-2476-00
	386-2476-02	B100000		1	SUBPANEL,FRONT:(OPTION 2 ONLY)	80009	386-2476-02
	136-0387-00			2	. JACK,TIP:GRAY	71279	4352-1-0318
-63	179-1889-00	B010100	B089999	1	WIRING HARNESS:DISPLAY	80009	179-1889-00
	179-1889-01	B090000	B127399	1	WIRING HARNESS:DISPLAY	80009	179-1889-01
	179-1889-02	B127400	B129999	1	WIRING HARNESS:DISPLAY	80009	179-1889-02
	179-1889-03	B130000		1	WIRING HARNESS:DISPLAY	80009	179-1889-03
	131-0707-00	XB090000	B127399	23	. .CONTACT,ELEC:0.48"L,22-26 AWG WIRE	22526	47439
	131-0707-00	B127400	B129999	26	. CONTACT,ELEC:0.48"L,22-26 AWG WIRE	22526	47439
	131-0707-00	B130000		10	. CONTACT,ELEC:0.48"L,22-26 AWG WIRE	22526	47439

[1]Replace only with part bearing the color code as the original part in your instrument.

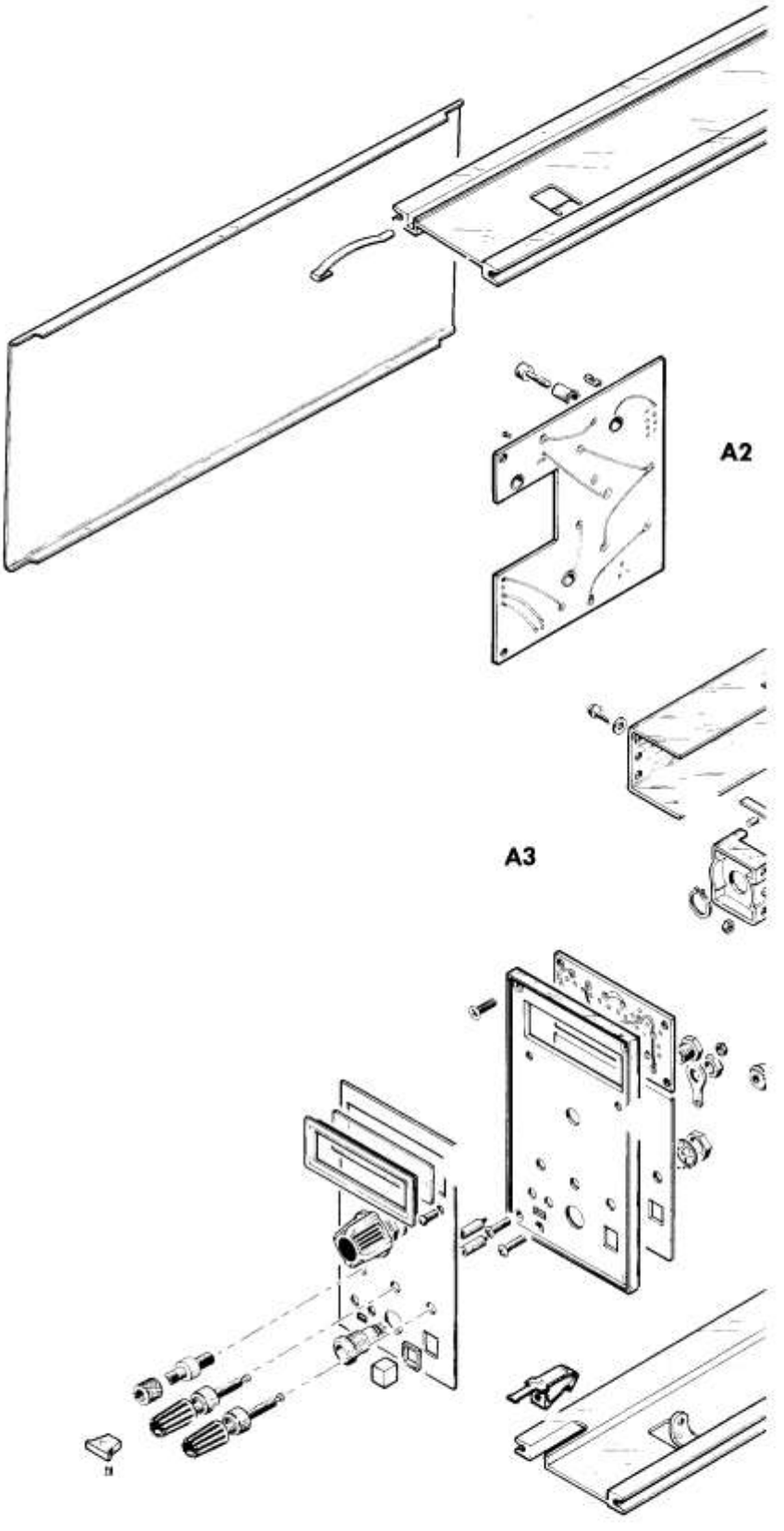

A2
A3

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
2-1	010-0259-00	[1]		1		LEAD,TEST:PROBE,V/TEMP	80009	010-0259-00
	003-0120-00	XB010260		1		LEAD,TEST:PAIR(NOT SHOWN)	000AD	Z5274
	070-1446-00			1		MANUAL,TECH:INSTRUCTION	80009	070-1446-00

[1]Not furnished with Option 1 or Option 2.

TEKTRONIX®
committed to technical excellence

MANUAL CHANGE INFORMATION

PRODUCT DM 501
EFF SN B130000-up

CHANGE REFERENCE M24,315
DATE 7-19-76 REV. #2

CHANGE:	DESCRIPTION

070-1446-00

SCHEMATIC CORRECTION

DIAGRAM 3 COUNTERS & DISPLAY - Partial