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User's Guide

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DP2000-M

RTD Process Monitor

with 1° Resolution



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It is the policy of OMEGA to comply with all worldwide safety and EMC/EMI regulations that apply. OMEGA is constantly pursuing certification of its products to the European New Approach Directives. OMEGA will add the CE mark to every appropriate device upon certification.

The information contained in this document is believed to be correct but OMEGA Engineering, Inc. accepts no liability for any errors it contains, and reserves the right to alter specifications without notice.

WARNING: These products are not designed for use in, and should not be used for, patient connected applications.



This device is marked with the international hazard symbol. It is important to read the Setup Guide before installing or commissioning this device as it contains important information relating to safety and EMC.

 *
 * OMEGAROMETER™ SERIES *
 * DP2000M 1⁰ RESOLUTION RESISTANCE TEMPERATURE DETECTOR *
 * PROCESS MONITOR *

OPERATOR'S MANUAL

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1.0 MAIN ASSEMBLY SPECIFICATIONS

1.1 GENERAL

OMEGAROMETER DP2000M main assemblies are identified by an initial designator (DP2) plus a power/display option numeral, zero through nine (0-9).

The following table identifies the main assembly types:

Display Type	120 V ac	240 V ac	9-32 V dc	5 V ac	24 V ac
LED	DP20	DP22	DP24	DP26	DP28
LCD	DP21	DP23	DP25	DP27	DP29

The OMEGAROMETER Process Monitor consists of a main assembly, signal conditioner and interface options (if ordered) all housed in a 1/8 DIN case.

The main assembly consists of a main board and a display board which is permanently attached to it at a 90 degree angle.

The main board provides mounting for the power supply, circuit components, and connectors for plugging in the signal conditioner, optional analog card, and optional controller/communications interface card (requires removal of a bypass push-on jumper).

The display board includes the analog-to-digital converter, the LED or LCD display and the push-on jumper for programming the decimal points. Decimal point programming may also be done from the main board connector (J1).

1.2 POWER

AC Models: 24/120/240 V +10-15% 47-63 Hz.
Common Mode Voltage: 1500 Vp test (354 Vp per IEC spacing).
DC Models: 5 V \pm 5% (5 V return common to signal LO).
9-32 V (300 V isolation from 9-32 V return to signal LO).
Power Consumption: 5 watts maximum.

1.3 DISPLAY

LED: 14.2 mm (0.56"), 7-segment light emitting diode.
Lens color: Red.
LCD: 12.7 mm (0.50"), 7-segment liquid crystal.
Lens color: Clear.
Range: 0 to \pm 1999.
Overload Indication: Three least significant digits blanked, "1" or "-1" displayed.

1.4 CONVERSION

Technique: Auto-zero, dual slope, average value.
Signal
Integration Period: 100 ms, nominal.
Reading Rate: 2.5/second, nominal.

1.5 ENVIRONMENTAL

Operating Temp.
(Ambient): 0-60°C.
Storage Temp.: -40 to 85°C.
Humidity: To 95% RH, non-condensing, 0-40°C.

1.6 MECHANICAL

Case Material: UL-rated 94V-0, polycarbonate.
Weight: 0.57 kg (with interface board).

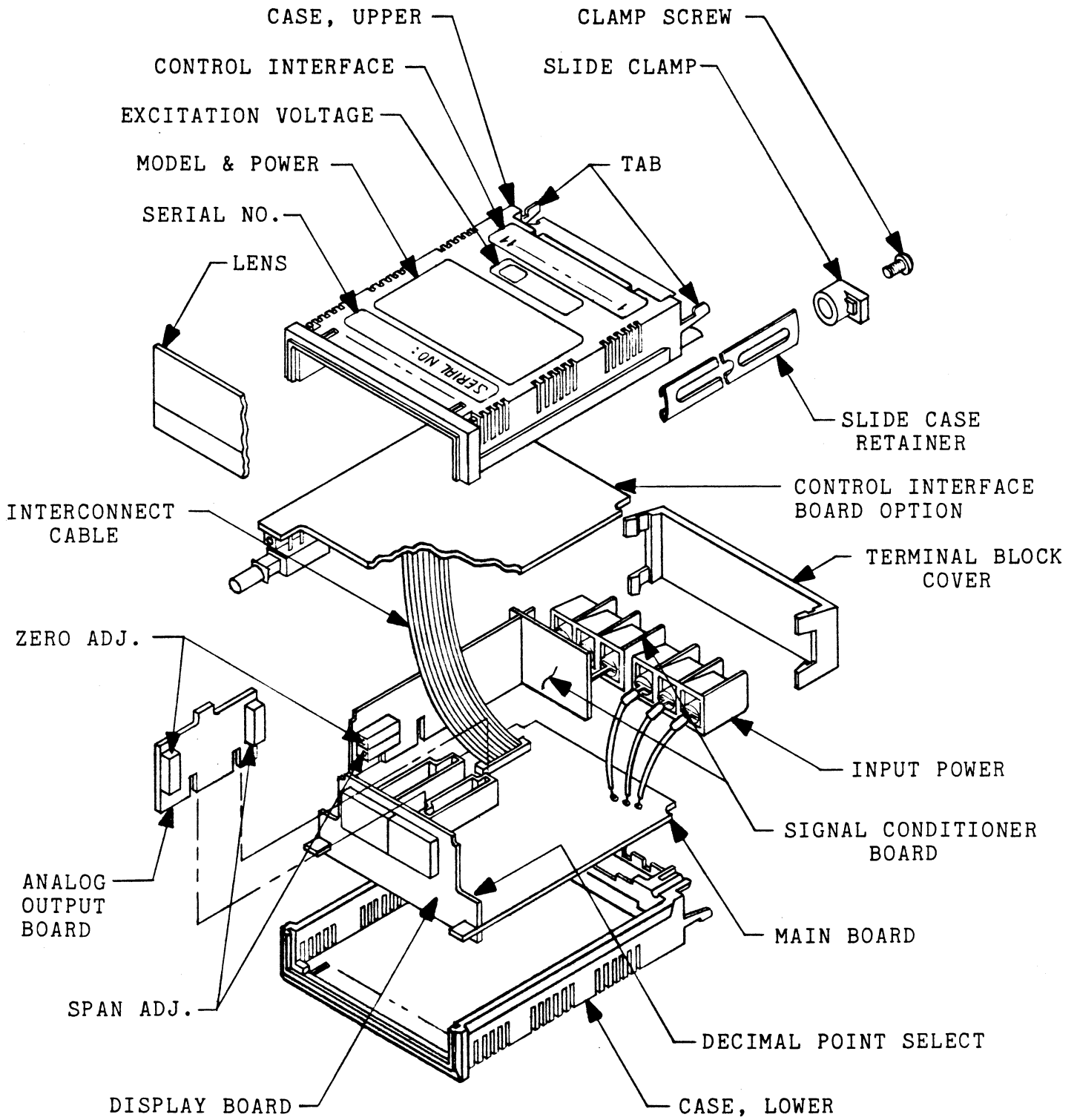


FIGURE 1 OMEGAROMETER EXPLODED VIEW

2.0 MECHANICAL ASSEMBLY & INSTALLATION

2.1 PANEL MOUNTING PROCEDURE (SEE FIGURE 1)

Remove the main board edge connector (J1), if installed.

Remove the interface board connector (J2), if installed.

Loosen two clamp screws on the rear of the case enough to rotate the two slide clamps.

Slide the two slide retainers toward the rear of the case and remove them.

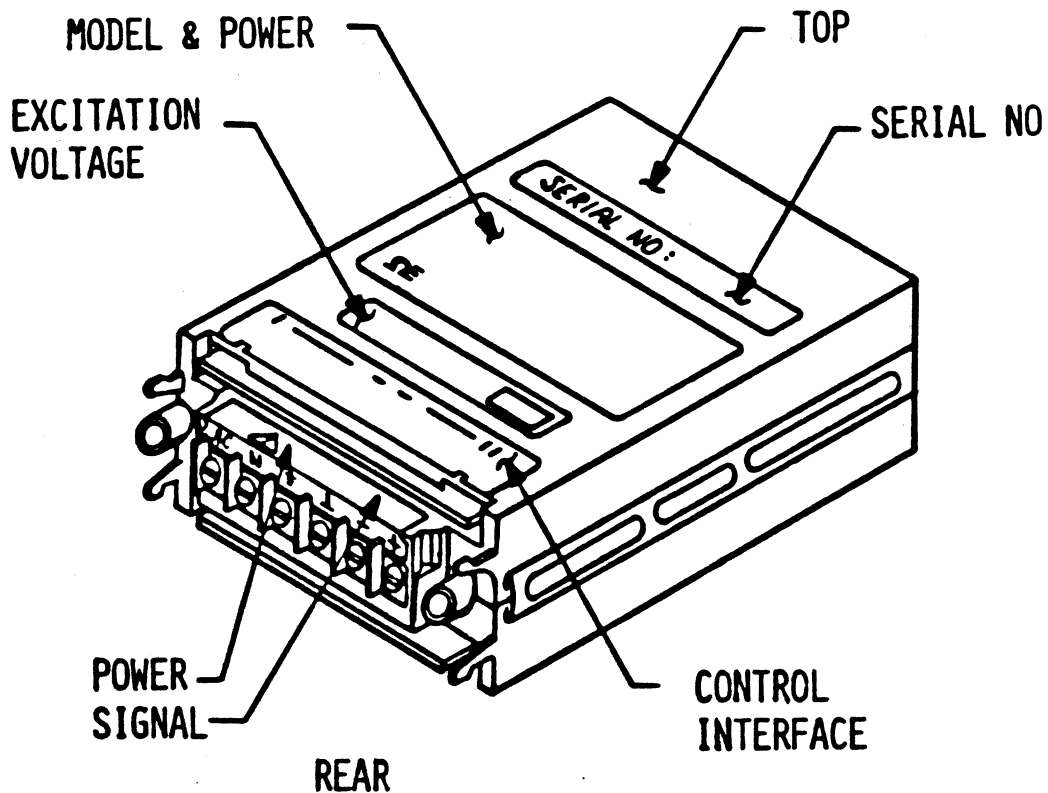
From the front of the panel, insert the meter into the panel cutout.

Slide the slide retainers back onto the case and push up tightly against the rear of the panel.

Rotate the slide clamps back into their original position and tighten enough to hold the case in place. Overtightening can break the clamps.

Install any connectors removed.

2.2 LABELS (SEE FIGURE 2 FOR PLACEMENT)



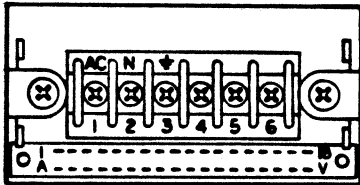
LABELS TO BE READ FROM THE REAR

FIGURE 2 LABEL PLACEMENT

3.0 POWER & SIGNAL INPUT CONNECTIONS

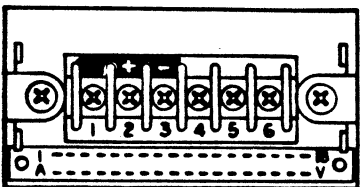
WARNING: Incorrect power input can damage your OMEGAROMETER PROCESS MONITOR

3.1 POWER CONNECTIONS



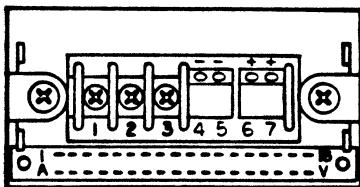
REAR TERMINAL VIEW

Terminal Connection	AC Versions	Wire Color
1	AC power HI	Black
2	AC power LO (neutral)	White
3	AC power ground	Green



Terminal Connection	DC Versions
1	No connection
2	DC power +
3	DC power - (return)

3.2 SIGNAL INPUT CONNECTIONS



REAR TERMINAL VIEW

Terminal Connection	7 Terminal Versions Signal
4	-E (Excitation return)
5	-S (Signal LO input)
6	+S (Signal HI input)
7	+E (Excitation output)

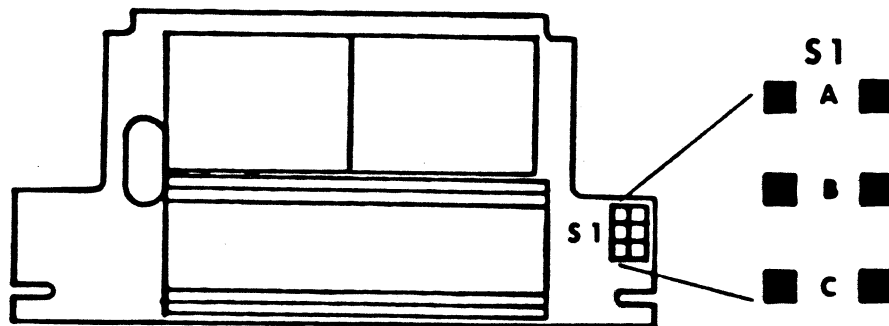
4.0 CONFIGURATION PROCEDURE

This procedure is used to set the decimal point of the display and interface board signal bypass selections for the configuration of the OMEGAROMETER DP2000X display and power options (DP20 through DP29).

The main assembly can be configured using the push-on jumpers provided or already positioned on the pin forests. Pin forest designations are shown at the top of every page of the configuration charts.

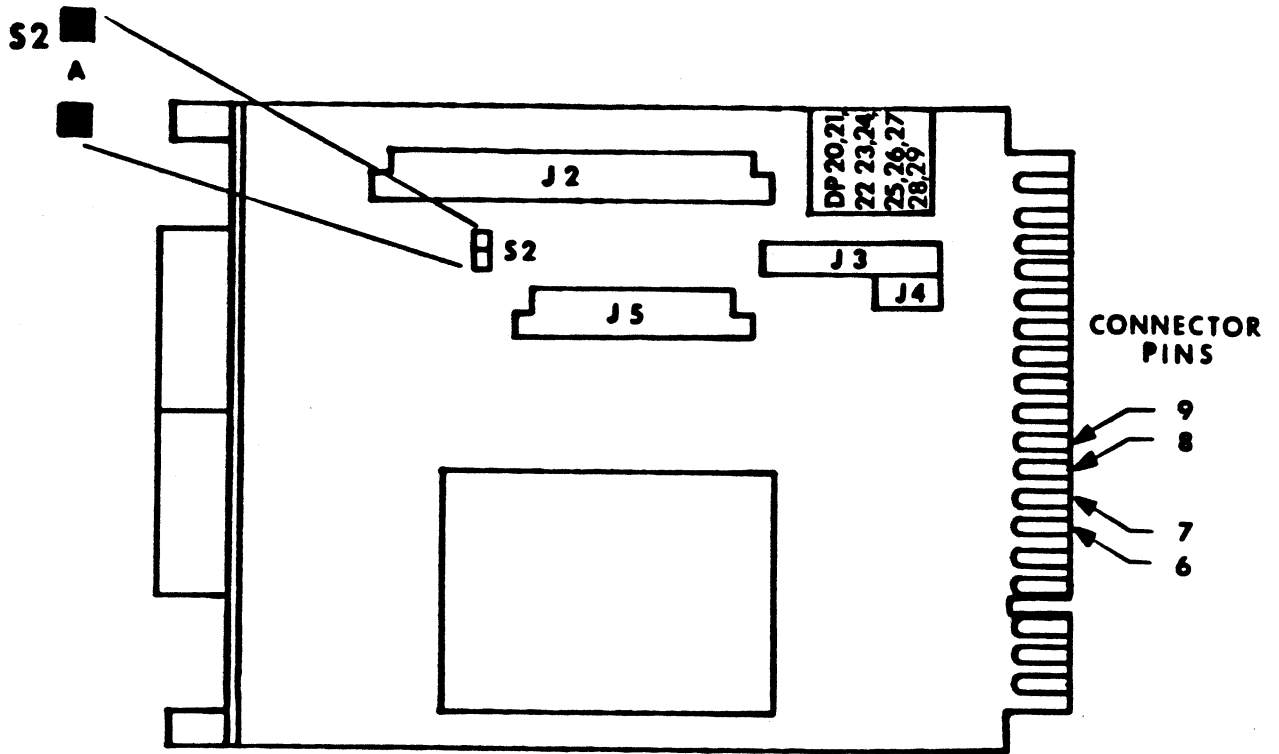
5.0 CONFIGURATION CHARTS

DECIMAL POINT SELECTION



STEP 1: Remove all push-on jumpers not called out for the configuration(s) desired.		
STEP 2: Select the desired configuration from the chart below and install the push-on jumpers indicated.		
Decimal Point Selection	S1	Alternate Decimal Point Selection Using Main Assembly Board (J1) Connector
Decimal Point (1.999)	A	Connect J1-K/9 to J1-6
Decimal Point (19.99)	B	Connect J1-J/8 to J1-6
Decimal Point (199.9)	C	Connect J1-H/7 to J1-6

INTERFACE BOARD SIGNAL BYPASS SELECTION



<p>STEP 1: Check your OMEGAROMETER part number for a zero (0) in the following position; DP2XX0X. If there is a zero (0) in that position, interface board signal bypass is required.</p>	
<p>STEP 2: Remove all push-on jumpers not called out for the configuration(s) desired.</p>	
<p>STEP 3: Select the desired configuration from the chart below and install the push-on jumpers indicated.</p>	
<p>Interface Board Signal Configuration</p>	<p>S2</p>
<p>Interface Board Signal Bypass</p>	<p>A</p>

6.0 TESTS & DIAGNOSTICS

6.1 TEST CONFIGURATION REQUIREMENTS

The OMEGAROMETER main assembly is designed to function with a signal conditioner board as a minimum configuration. There is no provision for testing a main assembly alone.

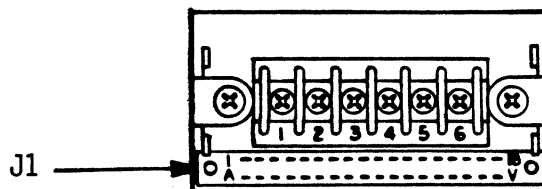
6.2 SIGNAL INPUT REQUIREMENTS

Signal input requirements for your configuration are identified in the signal conditioner section of this manual.

7.0 MAIN BOARD CONNECTOR PINOUTS (J1)

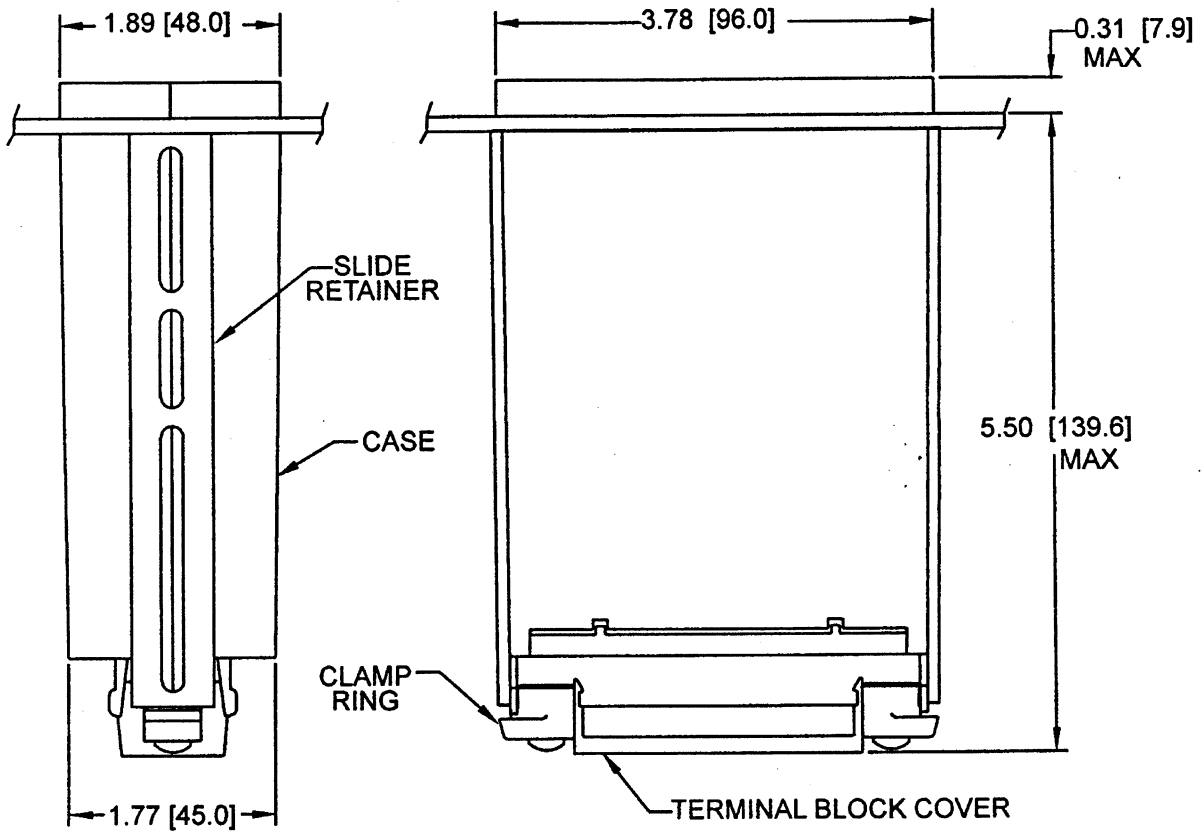
(Left to right, looking at rear of case)

Connection	Function	
A - 1	Spare	
B	Oscillator	40 kHz
2	-8.2 V dc	Analog power
C - 3	Spare	
D	+ Pol (sign)	+ Polarity sign
4	<u>HOLD</u>	LED version only
E - 5	Spare	
F	Buffer	Integrator output
6	Digital Ground	
H - 7	199.9 (Decimal point)	Use with pin 6
J - 8	19.99 (Decimal point)	Use with pin 6
K - 9	1.999 (Decimal point)	Use with pin 6
L - 10	Test (LED version only)	Use with pin M/11
M - 11	+5 V dc	Analog & digital power
N - 12	Analog output	Standard 1 mV/count
P - 13	Spare	
R - 14	Spare	Used with H & S options - Excitation sense
S - 15	Analog Ground	
T - 16	Analog Option - Return	Used with analog option
U	Analog Option - Out	Used with analog option
17	+30 V dc	Unregulated power
V - 18	Spare	Used with S option + Excitation sense
-	Indicates common pin.	
	50 mA maximum power available from all internal sources.	



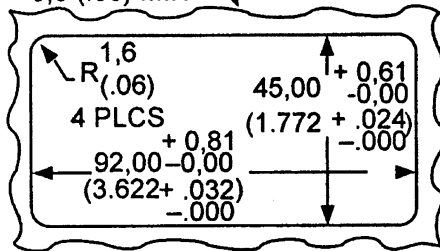
REAR TERMINAL VIEW

8.0 DRAWINGS

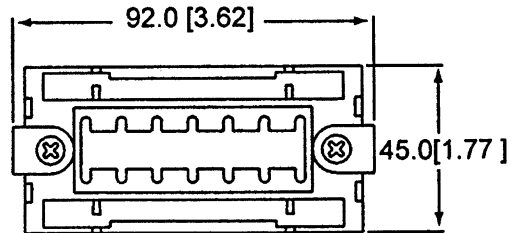


Notes: Dimensions are in inches ± 0.01 "
with millimeters in [] ± 0.25 mm.

PANEL THICKNESS
6,4 (.25) MAX
0,8 (.03) MIN

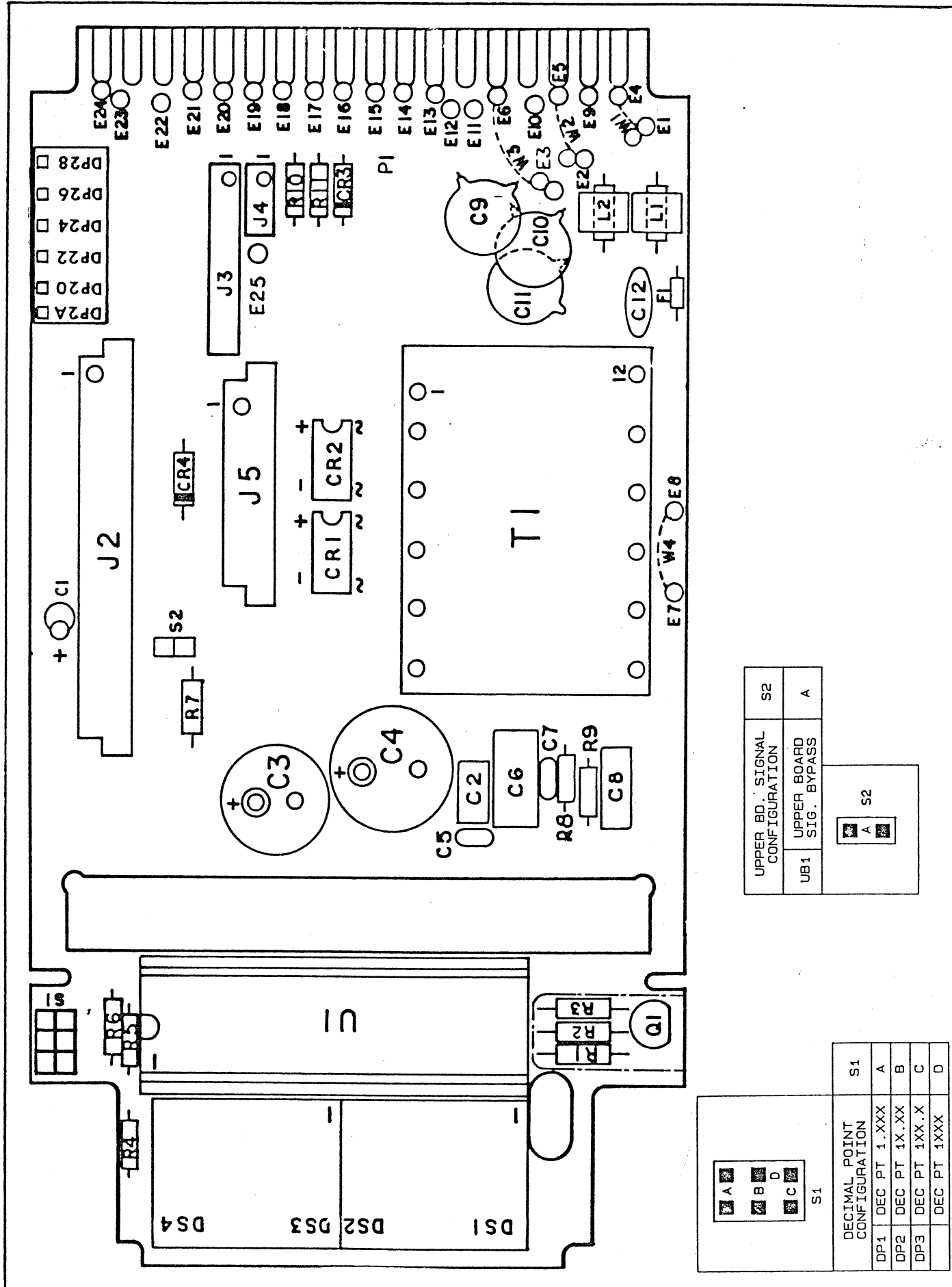


NOTE: Dimensions in Millimeters (Inches)
PANEL CUTOUT

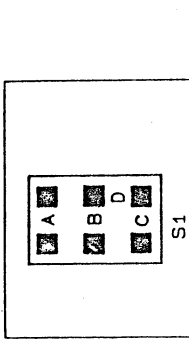
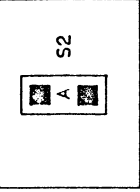


REAR VIEW

(TERMINAL BLOCK COVER AND
BEZEL NOT SHOWN FOR CLARITY)
SLIDE CLAMPS ROTATED AND SLIDE RETAINERS
REMOVED AS SHOWN FOR INSTALLATION.

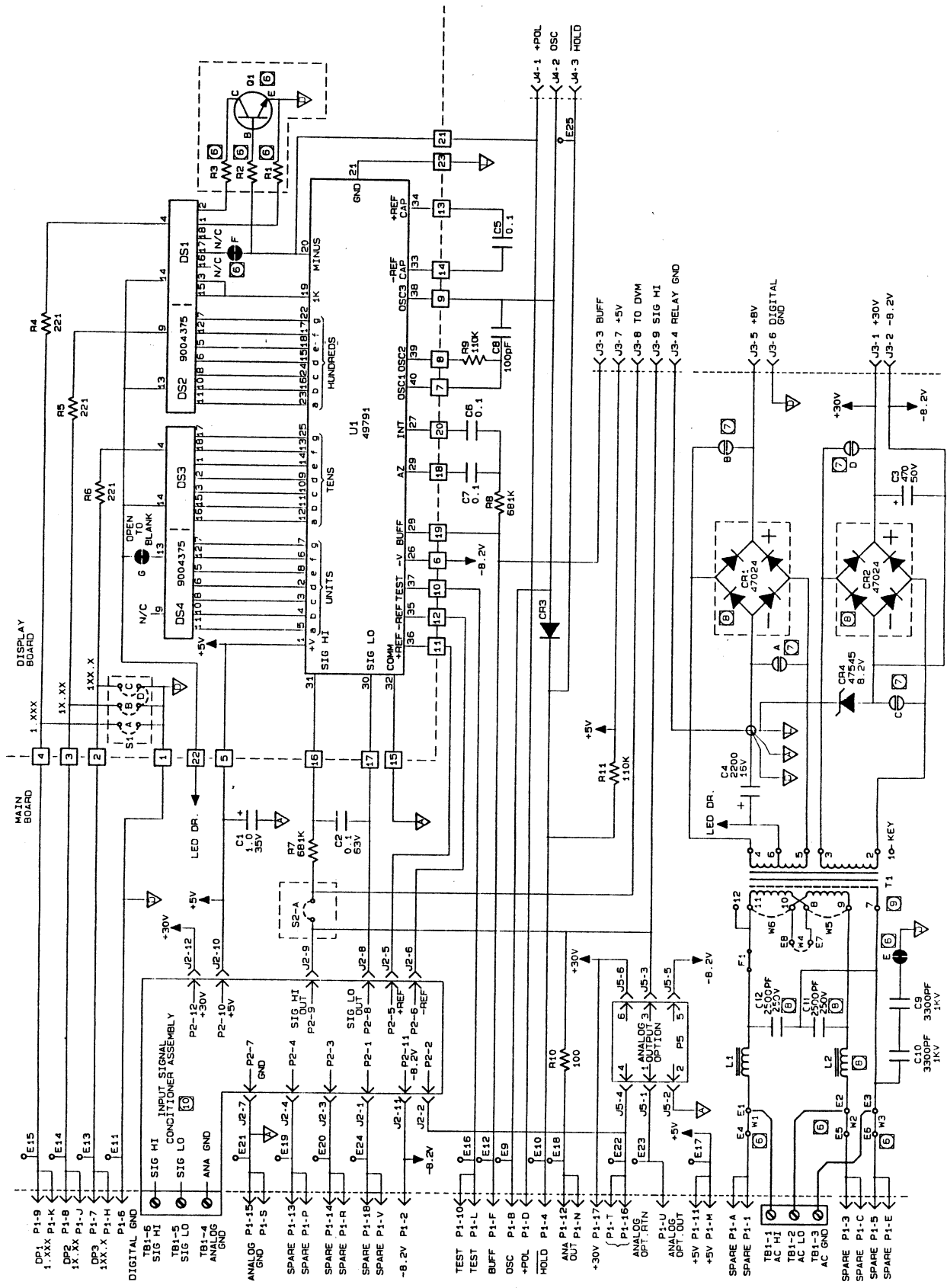


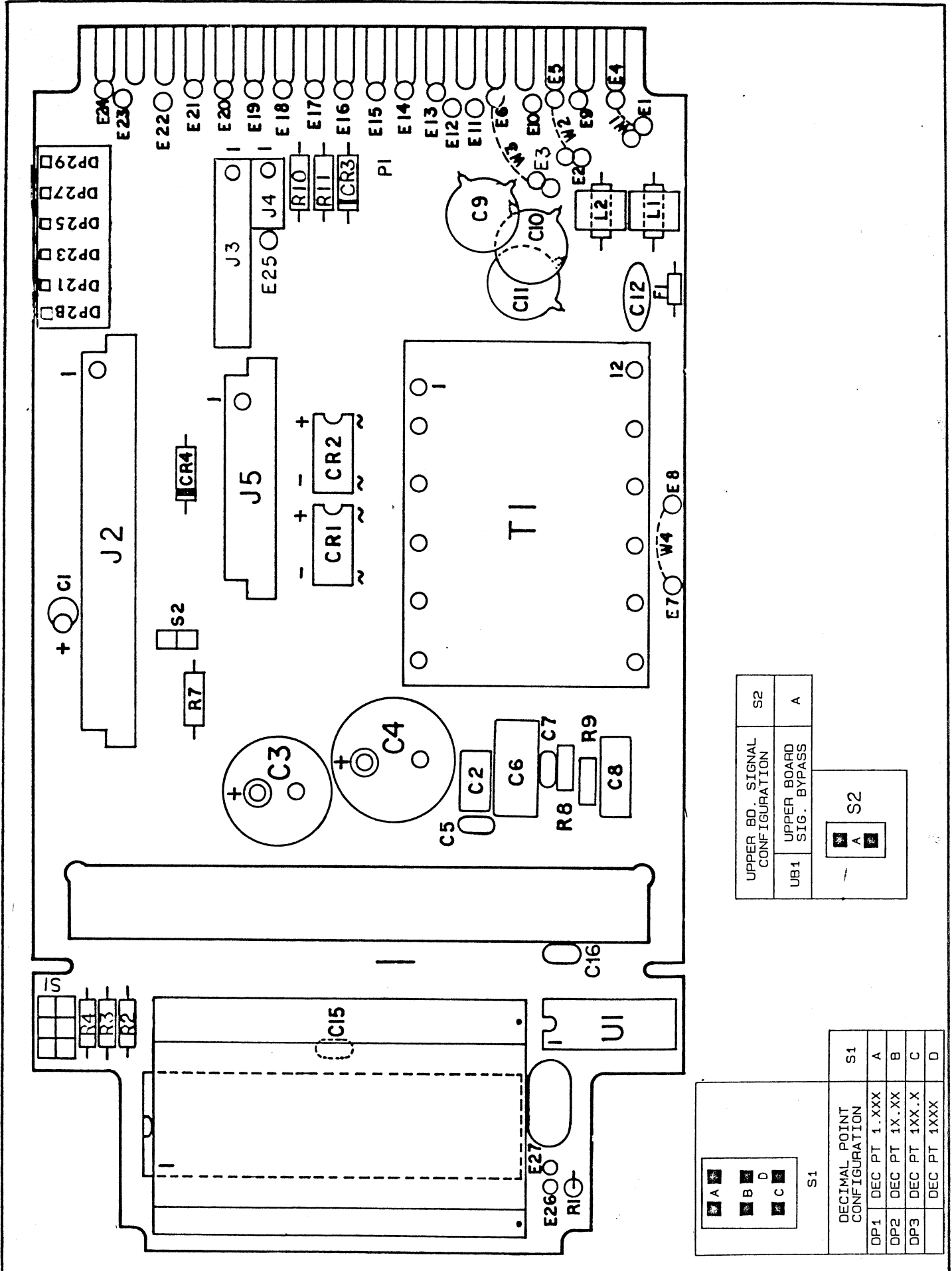
UPPER BD. SIGNAL CONFIGURATION		S2
UB1	UPPER BOARD SIG. BYPASS	A



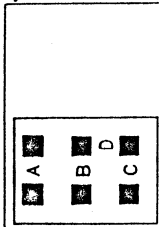
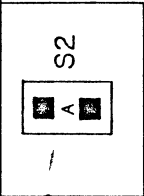
DECIMAL POINT CONFIGURATION		S1
DP1	DEC PT 1.XXX	A
DP2	DEC PT 1X.XX	B
DP3	DEC PT 1XX.X	C
	DEC PT 1XXX	D

SCHEMATIC DIAGRAM LED MAIN ASSEMBLY USED ON DP20, DP22, DP24, DP26 AND DP28



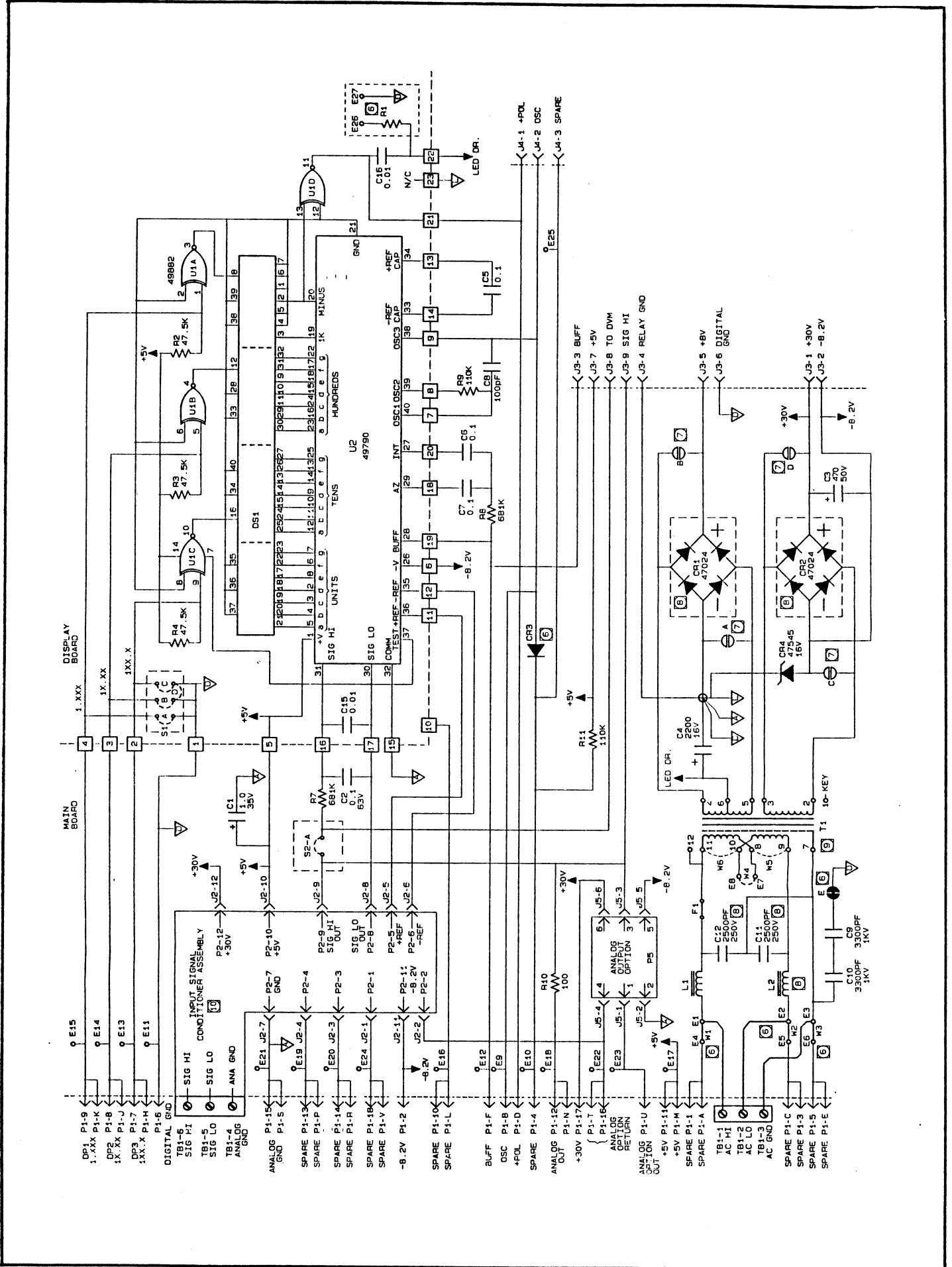


UPPER BD. SIGNAL CONFIGURATION		S2
UB1	UPPER BOARD SIG. BYPASS	A



DECIMAL POINT CONFIGURATION	S1
DP1 DEC PT 1.XXX	A
DP2 DEC PT 1X.XX	B
DP3 DEC PT 1XX.X	C
DEC PT 1XXX	D

SCHEMATIC DIAGRAM LCD MAIN ASSEMBLY USED ON DP21, DP23, DP25, DP27 AND DP29



NOTES:

9.0 SPECIFICATIONS: BSCM (DP2000M) RESISTANCE TEMPERATURE DETECTOR (RTD)

9.1 GENERAL

The BSCM (DP2000M) measures the output of 2-, 3-, or 4-wire 100 Ohm platinum RTD sensors with open-sensor detection.

The BSCM (DP2000M) is available with 1⁰ resolution (⁰C or ⁰F). Temperature ranges available are from -200⁰C to 830⁰C/-328⁰F to +1526⁰F (1⁰/count).

9.2 TEMPERATURE SENSOR (CUSTOMER SUPPLIED)

Type	Resistance Temperature
Material	Platinum
Resistance	100 Ohm @ 0 ⁰ C
Calibration	DIN 43760 Oct. 1980 Table
Temperature Coefficient (Alpha)	0.00385 Ohm/Ohm/ ⁰ C
Tolerance	
For Class 1	±0.15 ⁰ C ±0.002 T with T = -200 to +650 ⁰ C
For Class 2	±0.30 ⁰ C ±0.005 T with T = -200 to +850 ⁰ C
Connection Standard	2-, 3-, or 4-wire configuration
Lead Resistance	20 Ohm max. for 3- or 4-wire input, within specified error. For 2-wire input, add 2.6 ⁰ C or 4.7 ⁰ F per Ohm change to specified error.

9.3 INPUT SIGNAL CONDITIONER

Configuration	Differential
Polarity	Bipolar
Zero	Adjustable ±5 ⁰ C (±10 ⁰ F)
Overvoltage Protection (differential)	15 Vp
Sensor Break Detection	3 least-significant digits blanked
Sensor Excitation	0.42 mA
NMR @ 50/60 Hz	50 dB
Common Mode	
Analog ground to ac power ground	
GMV @ dc to 60 Hz	120 dB
GMV @ dc to 60 Hz	±1500 Vp per high voltage test ±354 Vp per IEC spacing

Linearization POLYLOG II

Accuracy @ 25°C

Temperature Scale Selection

°F or °C (internally selectable by push-on jumpers).

MODEL	RANGE	OVERALL ERROR ±1/2 LSD	RESOLUTION
BSCM °C (DP2000M)	-200 to +830°C	±0.3°C ±0.2% R	1°C
BSCM °F (DP2000M)	-328 to +1526°F	±0.5°F ±0.2% R	1°F

Zero Tempco 0.05 degree/degree
 Span Tempco 0.006% R/°C
 Warmup to Rated Accuracy Less than 1 minute

10.0 SIGNAL INPUT CONNECTIONS (TB1) (SEE FIGURE 1)

The signal input connections for the BSCM (DP2000M) resistance temperature detector signal conditioner are made at the 4-terminal barrier strip:

Input connections for BSCM (DP2000M) 4-wire RTD

Terminal Connection	Signal	Input	
4	-E (Excitation return)		4-wire * RTD
5	-S (Signal LO input)		
6	+S (Signal HI input)		
7	+E (Excitation output)		

Input connections for BSCM (DP2000M) 3-wire RTD

Terminal Connection	Signal	Input	
4	-E (Excitation return)		3-wire ** RTD
5	-S (Signal LO input)		
6	+S (Signal HI input)		
7	no connection		

Input connections for BSCM (DP2000M) 2-wire RTD

Terminal Connection	Signal	Input	
4	-E (Excitation return)		2-wire RTD
5	-S (Signal LO input)		
6	+S (Signal HI input)		
7	+E (Excitation output)		

* If using 4-wire, remove S2A and S2H on signal conditioner board.

** Unit is shipped as 3-wire (S2A and S2H factory-installed).

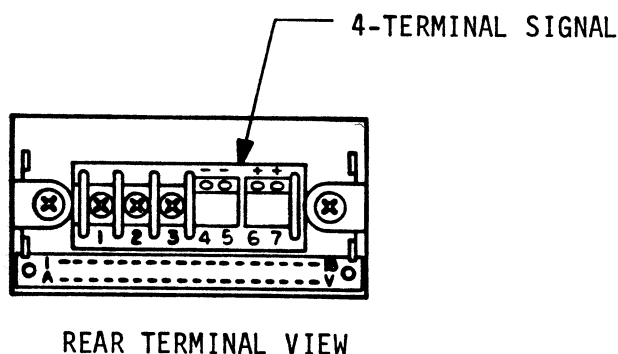


FIGURE 1 SIGNAL INPUT CONNECTIONS

11.0 TESTS AND DIAGNOSTICS

The signal conditioner board BSCM (DP2000M) is designed to function with a main assembly as a minimum configuration. There is no provision for testing a signal conditioner board alone.

Signal input requirements for your configuration are identified in the specifications for the BSCM (DP2000M) signal conditioner.

Operating power and connections for your configuration are identified in the Main Assembly Section DP20/DP29 of this manual.

Inspect the OMEGAROMETER Process Monitor for physical damage. If damage is apparent, contact OMEGA Engineering Customer Service Department at (203) 359-1660. Save all packing material!

Functional electrical testing:

Connect RTD probe as shown in the Signal Input Section 10.0. Apply proper power for your configuration to terminals 1, 2 and 3 on barrier strip (TB1). Display will read approximately ambient room temperature.

12.0 CONFIGURATION PROCEDURE

12.1 GENERAL

This procedure is used to determine the configuration of the OMEGAROMETER DP2000M-1⁰ resolution resistance temperature detector (RTD) BSCM.

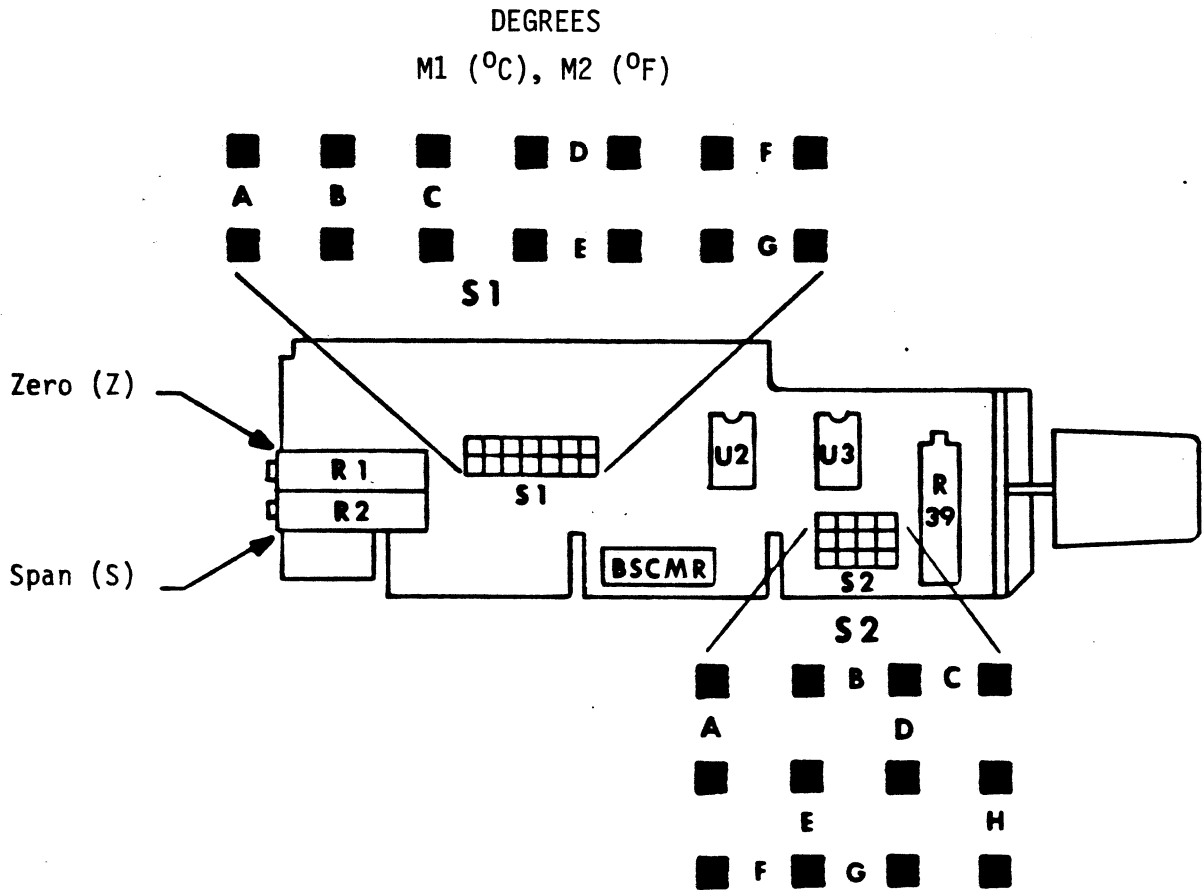
The unit can be configured using the push-on jumpers provided separately or already positioned on the pin forests. Pin forest designations are shown at the top of every page of the configuration charts.

12.2 INSTALLATION

Select the Degrees Range M1 (⁰C) and M2 (⁰F) and install the push-on jumpers per Section 13.0, depending upon which range is required.

If a decimal point is required, refer to the Main Assembly Section DP20/DP29 for location and configuration procedure.

13.0 CONFIGURATION CHART



Step 1: Remove all push-on jumpers not called out for the configuration(s) desired.

Step 2: Select the desired configuration from the chart below and install the push-on jumpers indicated.

Degrees Configuration		S1		S2		Used On
M1	Degrees "C" (1° Resolution)	F	G	D	E	DP2000M
M2	Degrees "F" (1° Resolution)	D	E	D	E	DP2000M

NOTE: The BSCM signal conditioner board is shipped in the 3-wire configuration (S2A and S2H installed). If you are not using the BSCM in this configuration, jumpers S2A and S2H must be removed. See Section 10.0.

14.0 CALIBRATION

14.1 DEGREES "C" (M1)

Apply an input of 100.00 Ohm and adjust R1 (zero) for a reading of ± 000 .

Remove push-on jumper S1-F.

Apply an input of 351.30 Ohm and adjust R2 (span) for a reading of 614.

Install push-on jumper S1-F.

Adjust R39 for a reading of 720.

14.2 DEGREES "F" (M2)

Apply an input of 93.03 Ohm and adjust R1 (zero) for a reading of ± 000 .

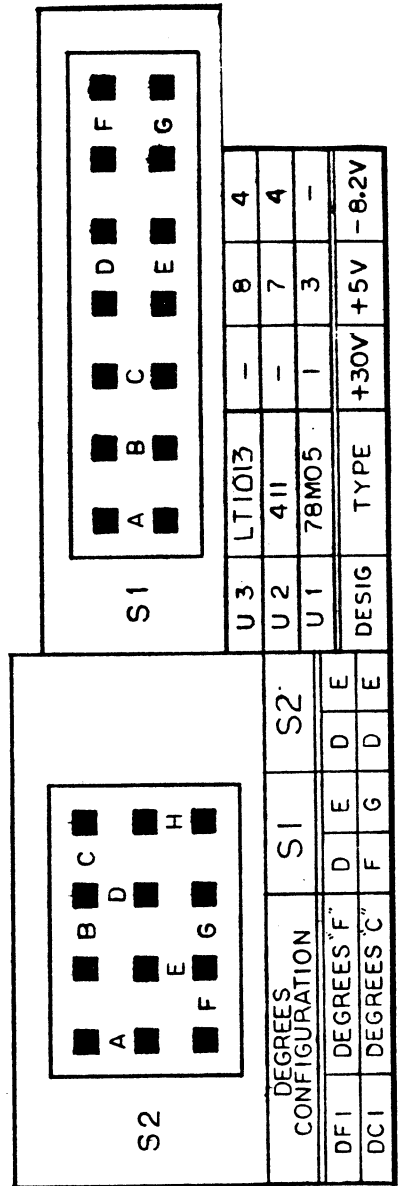
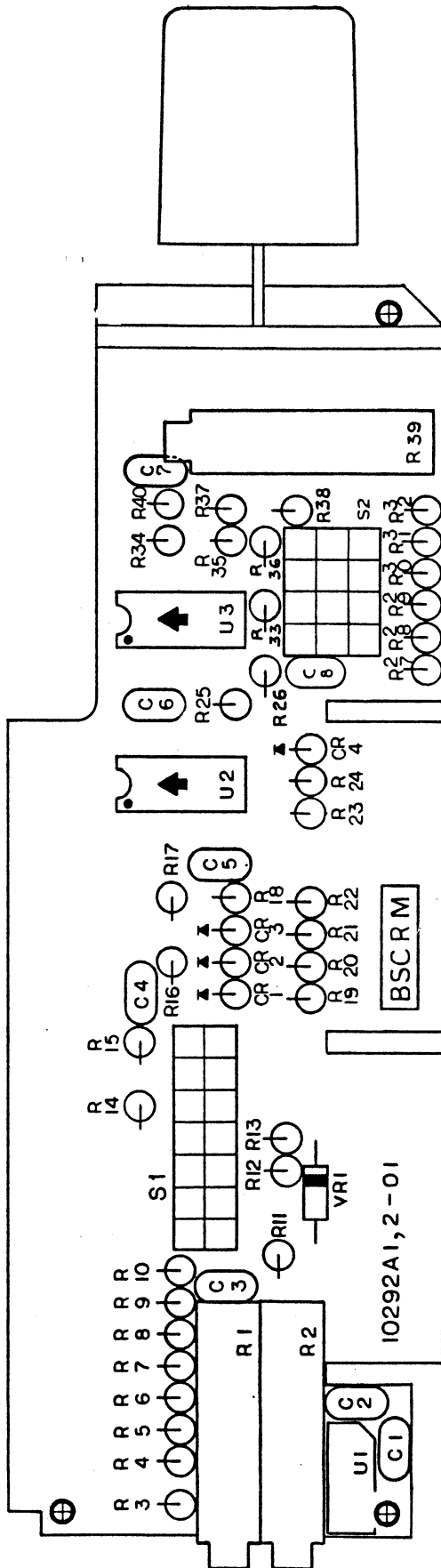
Remove push-on jumper S1-D.

Apply an input of 351.30 Ohm and adjust R2 (span) for a reading of 1132.

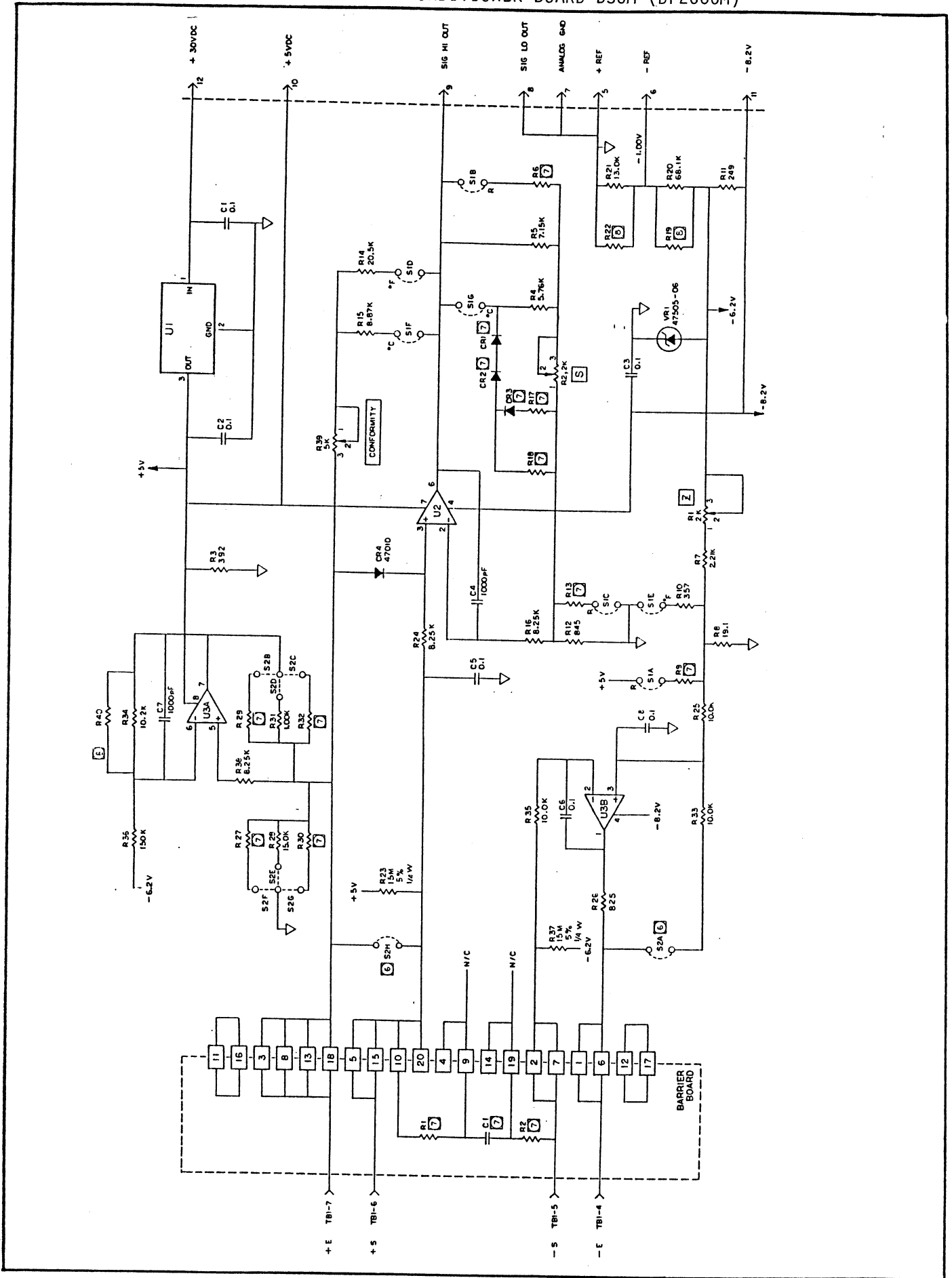
Install push-on jumper S1-D.

Adjust R39 for a reading of 1328.

15.0 DRAWINGS ASSEMBLY DIAGRAM USED ON SIGNAL CONDITIONER BOARD BSCM (DP2000M)



SCHEMATIC DIAGRAM USED ON SIGNAL CONDITIONER BOARD BSCM (DP2000M)



NOTES:

```

*****
*                                     *
*   INSTALLATION INSTRUCTIONS FOR YOUR   *
*   OMEGAROMETER PROCESS MONITOR         *
*                                     *
*****

```

IMPORTANT:

For proper installation electrical connections must be made according to the model number on the meter label. Write the model number in the following space and use the appropriate instructions for **your** model number.

- ```

 .--- Power requirement (Section 16.3)
 :
 : .--- Analog output (see Analog Output Manual)
 : :
 : : .--- Control output (see Control Interface Manual)
 : : :
 : : : .--- Signal input (Section 16.4)
 : : : :

```

Model number DP2 \_\_\_\_\_

=====

### 16.1 UNPACKING & INSPECTION

Your OMEGAROMETER Process Monitor was systematically inspected and tested, then carefully packed before shipment.

Unpack the instrument and inspect for obvious shipping damage. Notify the freight carrier immediately upon discovery of any shipping damage.

## 16.2 MECHANICAL INSTALLATION

Insure that the panel cutout dimensions are as shown on figure 1.

Remove the lower printed circuit board edge connector, (if installed) J1, by pushing two molded plastic tabs away from the connector body and pulling the connector off the printed circuit board. Remove the printed circuit board edge connector, J2, if upper board output option was ordered.

Loosen two clamp screws on the rear of the case enough to rotate the two slide clamps.

Slide the two slide retainers toward the rear of the case and remove them.

From the front of the panel, insert the meter into the panel cutout.

Slide the slide retainers back onto the case and push up tightly against the rear of the panel.

Rotate the slide clamps back into their original position and tighten enough to hold the case in place. Overtightening can break the clamps.

Install the lower printed circuit board edge connector, if supplied, by pushing it on to the printed circuit board connections. Install the upper printed circuit board edge connector, if used.

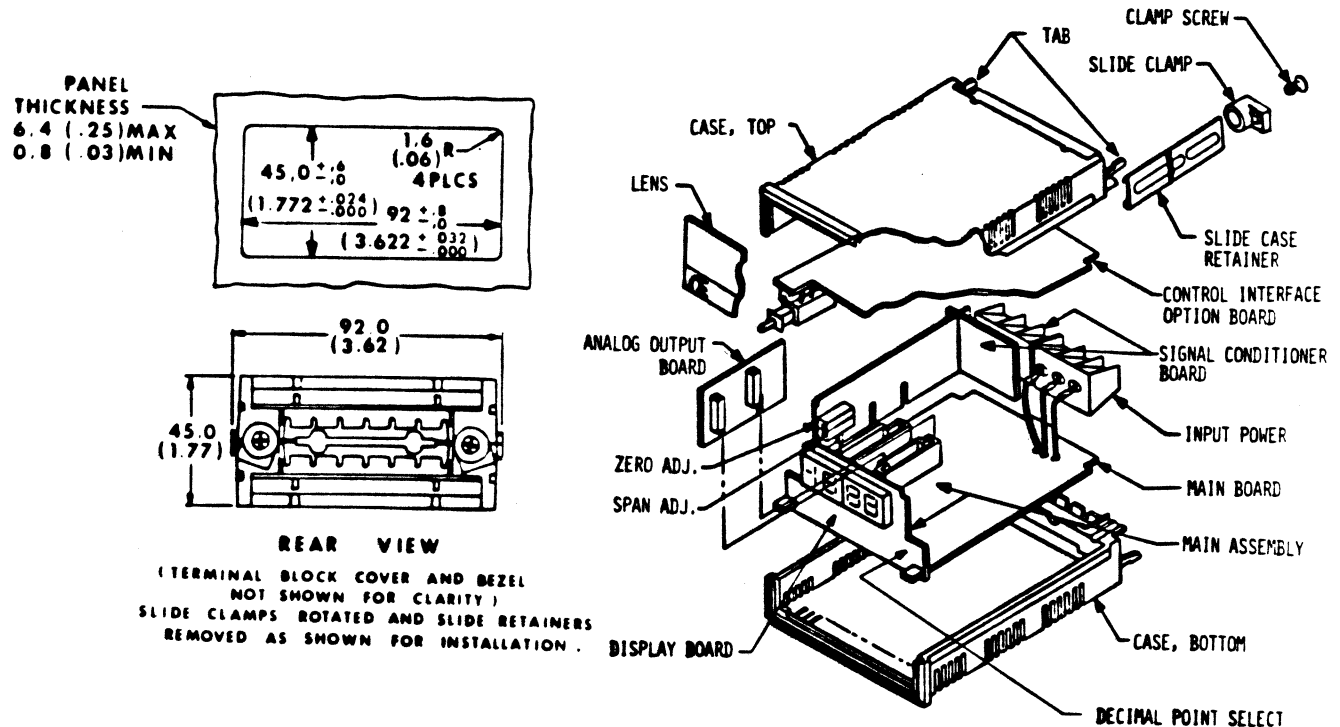


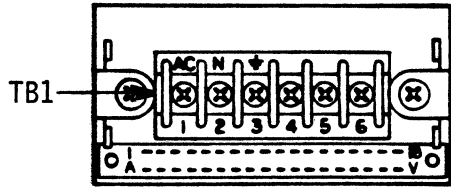
FIGURE 1 PANEL CUTOUT DIMENSIONS AND INSTALLATION

### 16.3 POWER REQUIREMENTS AND CONNECTIONS (TB1)

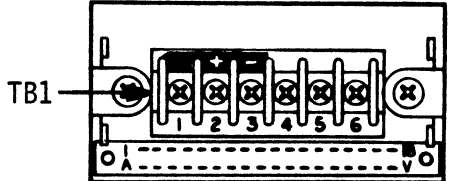
16.3.1 The standard meter is wired to operate from one of five power sources.

| <u>Models</u>       | <u>Power Requirements</u> |
|---------------------|---------------------------|
| DP20XXX and DP21XXX | 120 V ac (50-60 Hz)       |
| DP22XXX and DP23XXX | 240 V ac (50-60 Hz)       |
| DP24XXX and DP25XXX | 9-32 V dc                 |
| DP26XXX and DP27XXX | 5 V dc                    |
| DP28XXX and DP29XXX | 24 V ac (50-60 Hz)        |

16.3.2 Regardless of the power source used, connections are made to the same terminal barrier strip, TB1, as follows:

|  | <u>TB1 Terminal Connection</u> | <u>AC Operation</u><br>24 V, 120 V, 240 V | <u>Wire Color</u> |
|-----------------------------------------------------------------------------------|--------------------------------|-------------------------------------------|-------------------|
|                                                                                   | 1                              | AC power HI                               | Black             |
| 2                                                                                 | AC power LO (neutral)          | White                                     |                   |
| 3                                                                                 | AC power ground                | Green                                     |                   |

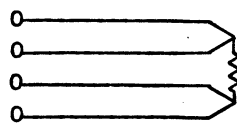
REAR TERMINAL VIEW

|  | <u>TB1 Terminal Connection</u> | <u>DC Operation</u><br>5 V or 9-32 V |
|-------------------------------------------------------------------------------------|--------------------------------|--------------------------------------|
|                                                                                     | 1                              | No Connection                        |
| 2                                                                                   | DC power +                     |                                      |
| 3                                                                                   | DC power - (return)            |                                      |

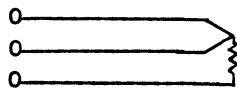
## 16.4 SIGNAL INPUT CONNECTIONS (TB1)

The signal input connections for the BSCM (DP2000M) resistance temperature detector signal conditioner are made at the standard 4-terminal barrier strip:

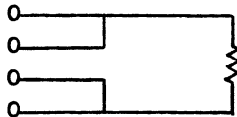
Input connections for BSCM (DP2000M) 4-wire RTD

| <u>Terminal Connection</u> | <u>Signal</u>          | <u>Input</u>                                                                        |               |
|----------------------------|------------------------|-------------------------------------------------------------------------------------|---------------|
| 4                          | -E (Excitation return) |  | 4-WIRE<br>RTD |
| 5                          | -S (Signal LO input)   |                                                                                     |               |
| 6                          | +S (Signal HI input)   |                                                                                     |               |
| 7                          | +E (Excitation output) |                                                                                     |               |

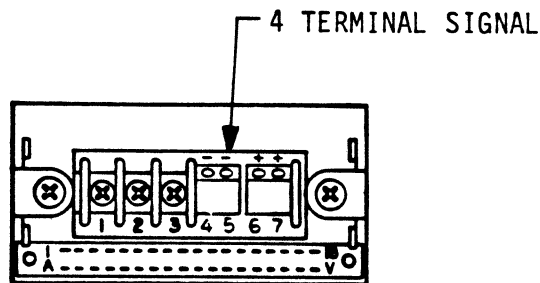
Input connections for BSCM (DP2000M) 3-wire RTD

| <u>Terminal Connection</u> | <u>Signal</u>          | <u>Input</u>                                                                        |                |
|----------------------------|------------------------|-------------------------------------------------------------------------------------|----------------|
| 4                          | -E (Excitation return) |  | 3-WIRE*<br>RTD |
| 5                          | -S (Signal LO input)   |                                                                                     |                |
| 6                          | +S (Signal HI input)   |                                                                                     |                |
| 7                          | no connection          |                                                                                     |                |

Input connections for BSCM (DP2000M) 2-wire RTD

| <u>Terminal Connection</u> | <u>Signal</u>          | <u>Input</u>                                                                          |               |
|----------------------------|------------------------|---------------------------------------------------------------------------------------|---------------|
| 4                          | -E (Excitation return) |  | 2-WIRE<br>RTD |
| 5                          | -S (Signal LO input)   |                                                                                       |               |
| 6                          | +S (Signal HI input)   |                                                                                       |               |
| 7                          | +E (Excitation output) |                                                                                       |               |

\*Install S2A and S2H on signal conditioner board.



REAR TERMINAL VIEW

FIGURE 1 SIGNAL INPUT CONNECTIONS



## WARRANTY/DISCLAIMER

OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of **13 months** from date of purchase. OMEGA Warranty adds an additional one (1) month grace period to the normal **one (1) year product warranty** to cover handling and shipping time. This ensures that OMEGA's customers receive maximum coverage on each product.

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The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

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2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

FOR **NON-WARRANTY** REPAIRS, consult OMEGA for current repair charges. Have the following information available BEFORE contacting OMEGA:

1. P.O. number to cover the COST of the repair,
2. Model and serial number of product, and
3. Repair instructions and/or specific problems relative to the product.

OMEGA's policy is to make running changes, not model changes, whenever an improvement is possible. This affords our customers the latest in technology and engineering.

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