

RoHS 2 Compliant

User's Guide

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DP2000-R
0.1° Resolution RTD
Process Monitor



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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 caution symbol. It is important to read the Setup Guide before installing or commissioning this device as the guide contains important information relating to safety and EMC.

TABLE OF CONTENTS

MAIN ASSEMBLY

1.0	Specifications	1
2.0	Mechanical Assembly and Installation	4
3.0	Power & Signal Input Connections	5
4.0	Configuration Procedure	6
5.0	Configuration Charts	6
6.0	Tests and Diagnostics	8
7.0	Main Board Connector Pin Assignments	8
8.0	Drawings	9

SIGNAL CONDITIONER INPUT

9.0	Specifications	14
10.0	Signal Input Requirements	16
11.0	Tests and Diagnostics	17
12.0	Configuration Procedure	17
13.0	Configuration Chart	19
14.0	Calibration	20
15.0	Drawings	21

INSTALLATION INSTRUCTIONS	23
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Unpacking

Remove the Packing List and verify that you have received all equipment. If you have any questions about the shipment, please call the OMEGA Customer Service Department at 1-800-622-2378 or (203) 359-1660.

When you receive the shipment, inspect the container and equipment for any signs of damage. Note any evidence of rough handling in transit. Immediately report any damage to the shipping agent.

NOTE

The carrier will not honor any claims unless all shipping material is saved for their examination. After examining and removing contents, save packing material in event reshipment if necessary.

1.0 MAIN ASSEMBLY SPECIFICATIONS

1.1 GENERAL

OMEGAROMETER DP2000X 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

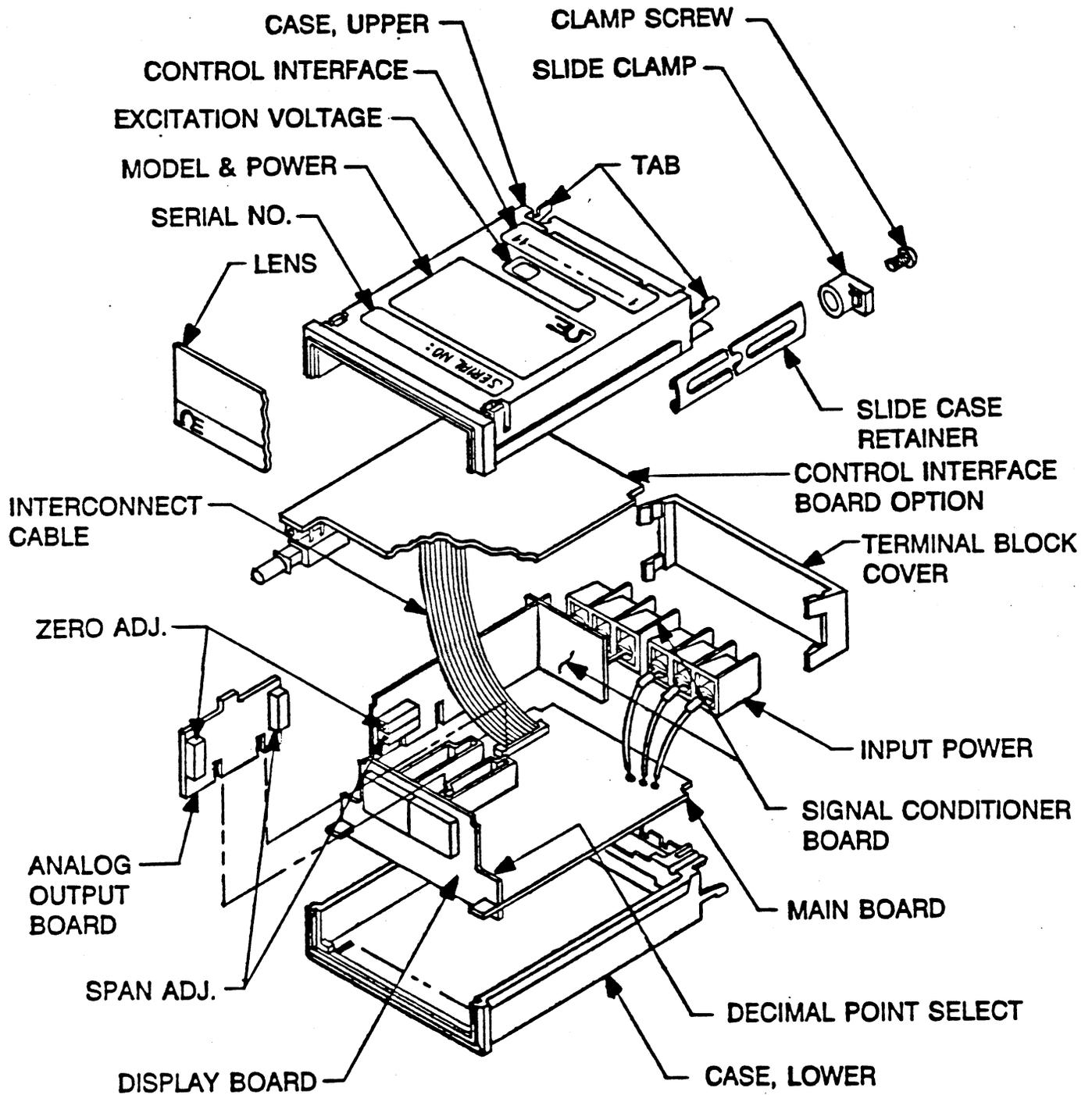
Technique: Auto-zero, dual slope, average value.
Signal
Integration Period: 100 ms, nominal.
Reading Rate: 2.5/second, nominal.

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).



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.

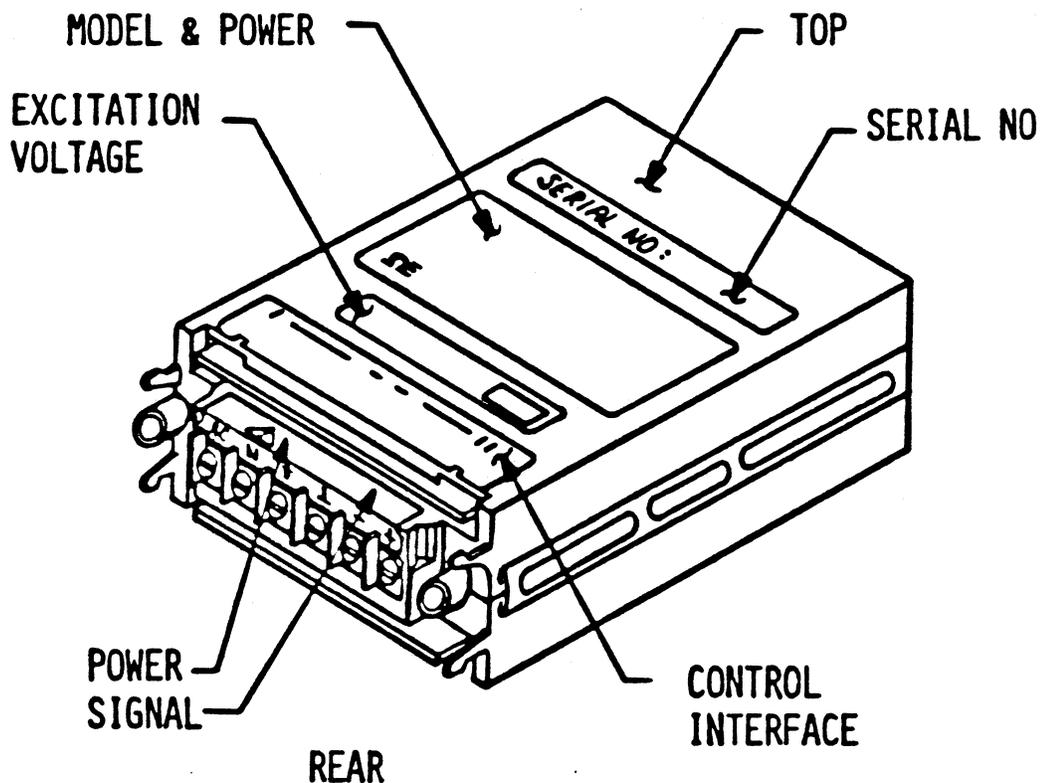
From the front of the panel, insert the meter into the panel cutout.

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)



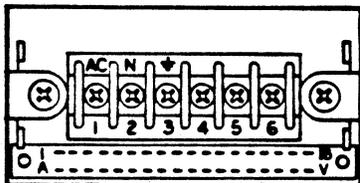
LABELS TO BE READ FROM THE REAR

FIGURE 2 LABEL PLACEMENT

3.0 POWER & SIGNAL INPUT CONNECTIONS

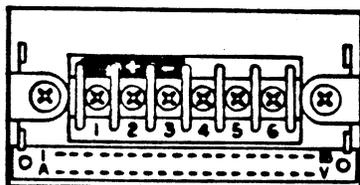
WARNING: Incorrect power input can damage your OMEGAROMETER PROCESS MONITOR

3.1 POWER CONNECTIONS



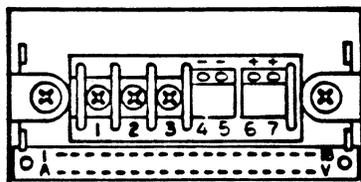
REAR TERMINAL VIEW

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)

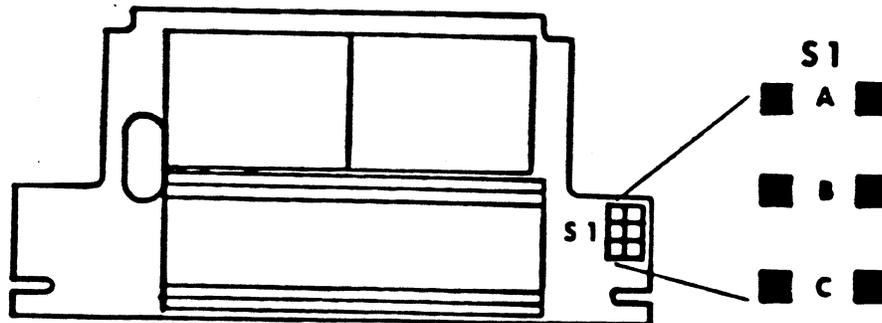
4.0 CONFIGURATION PROCEDURE

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.

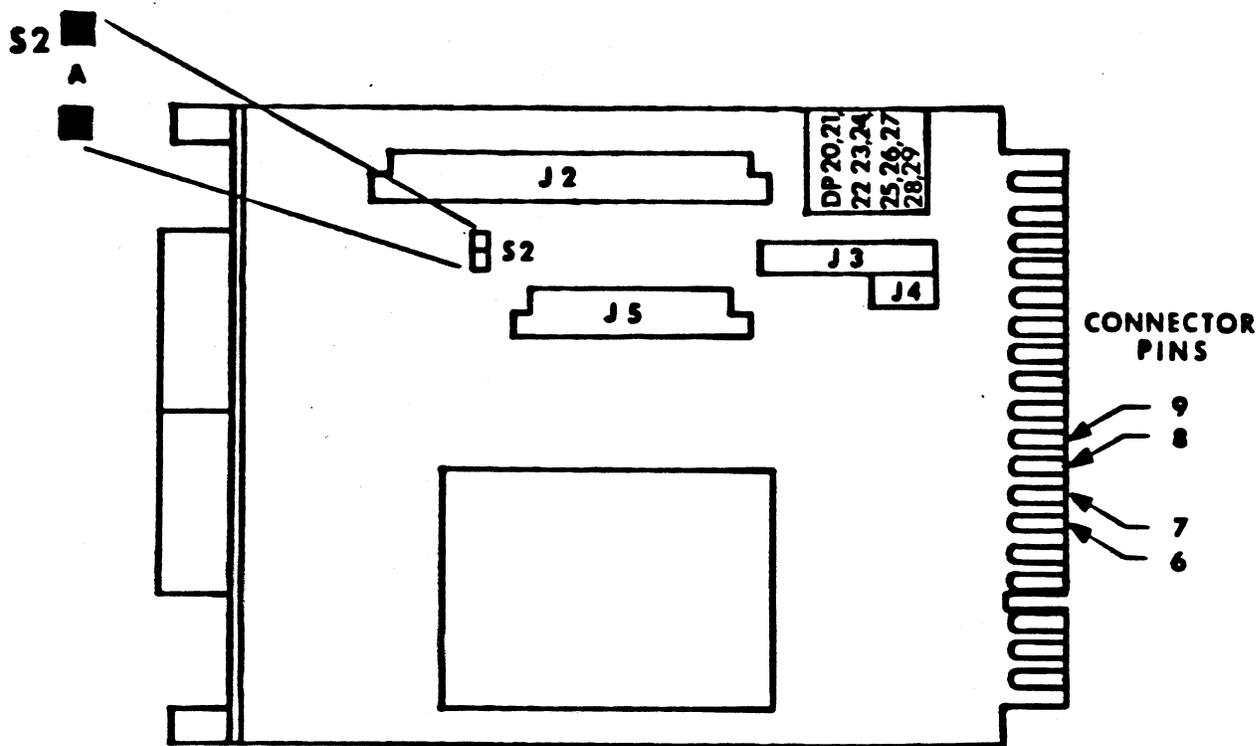
5.0 CONFIGURATION CHARTS

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>	
Interface Board Signal Configuration	S2
Interface Board Signal Bypass	A

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.

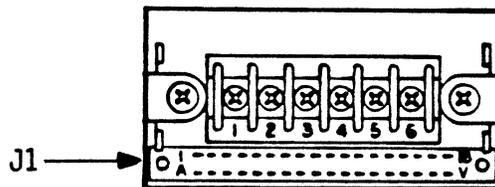
6.2 SIGNAL INPUT REQUIREMENTS

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)

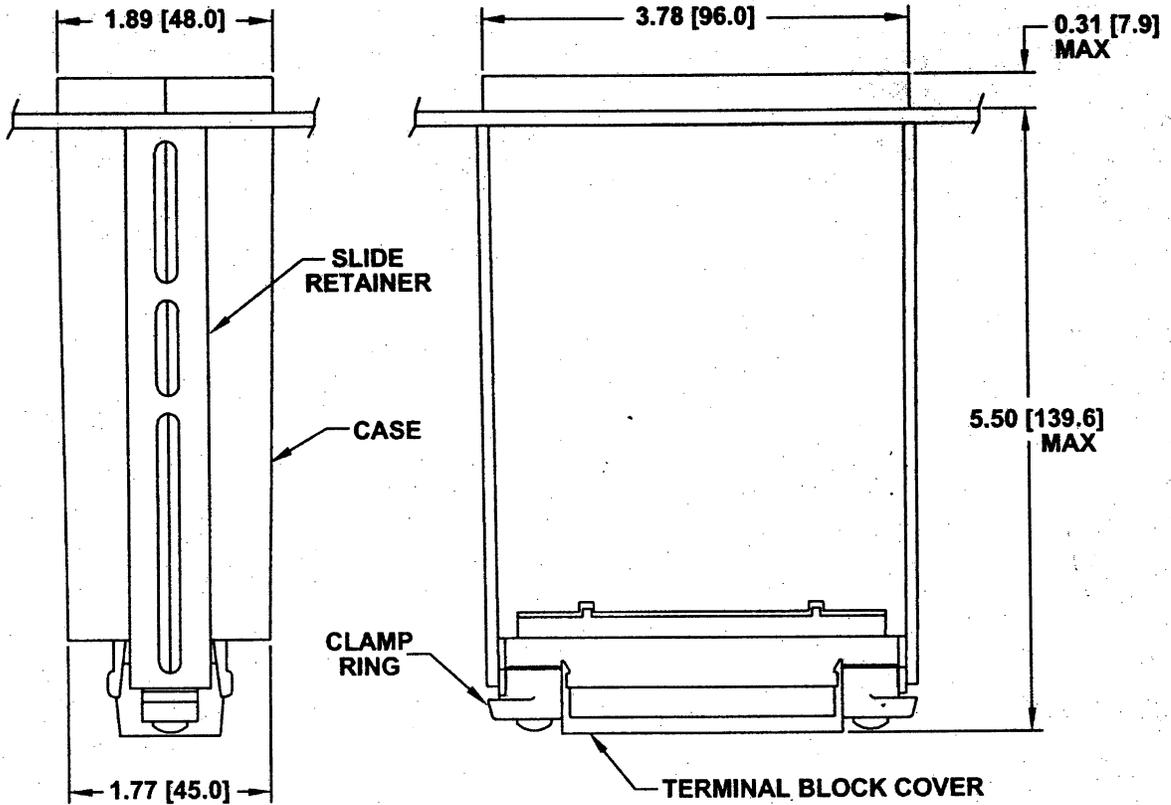
Connection	Function	
A - 1	Spare	
B	Oscillator	40 kHz
2	-8.2 V dc	Analog power
C - 3	Spare	
D	+ Pol (sign)	+ Polarity sign
4	HOLD	LED version only
E - 5	Spare	
F	Buffer	Integrator output
6	Digital Ground	
H - 7	199.9 (Decimal point)	Use with pin 6
J - 8	19.99 (Decimal point)	Use with pin 6
K - 9	1.999 (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.	



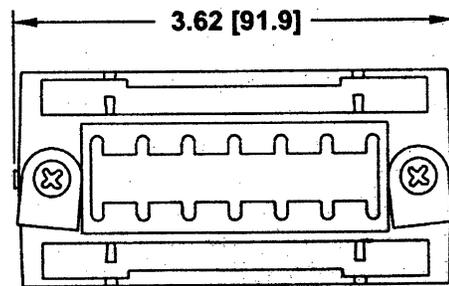
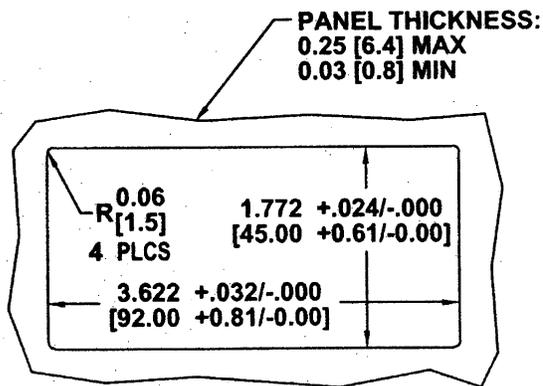
REAR TERMINAL VIEW

8.0 DRAWINGS

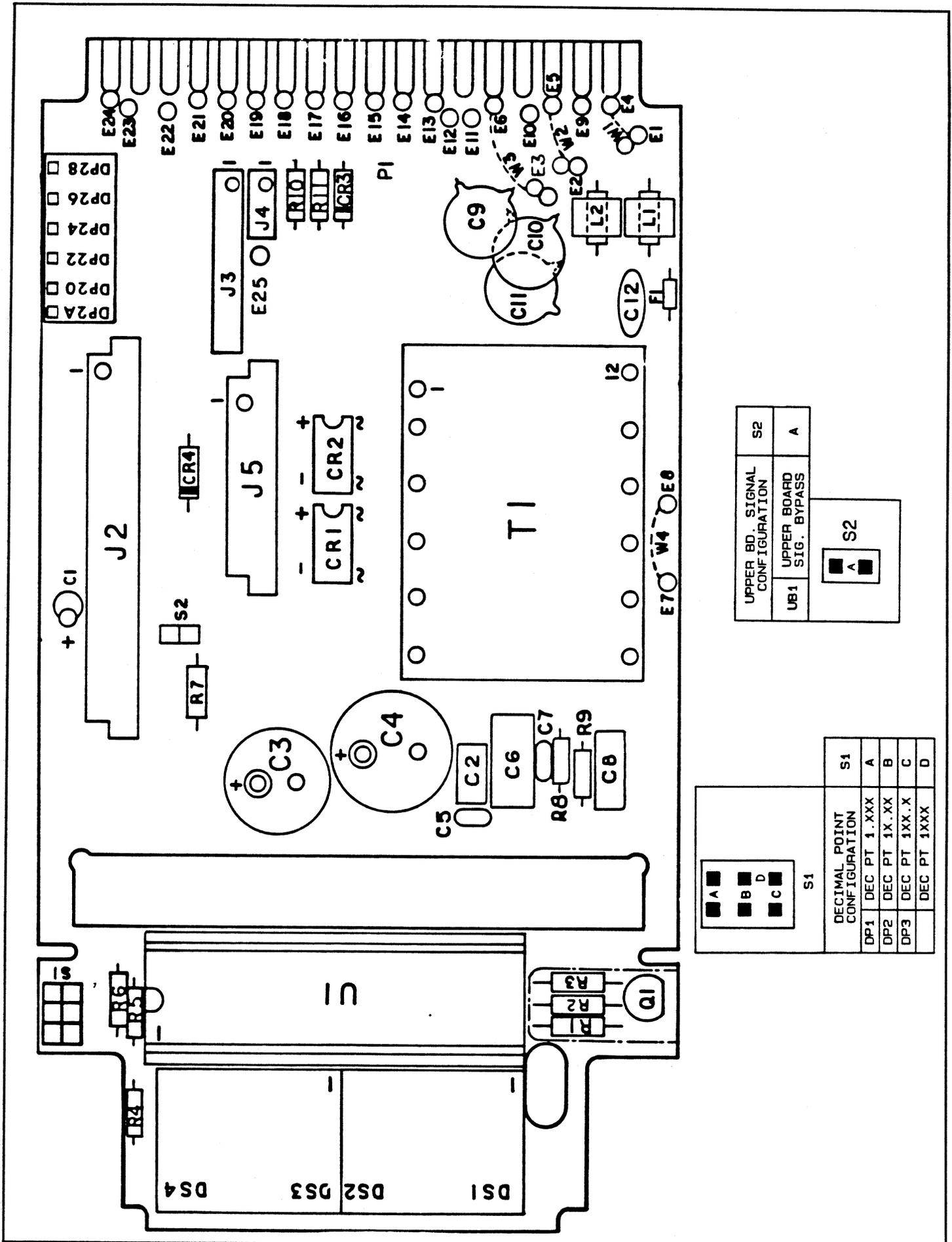
8.1 DIMENSIONS



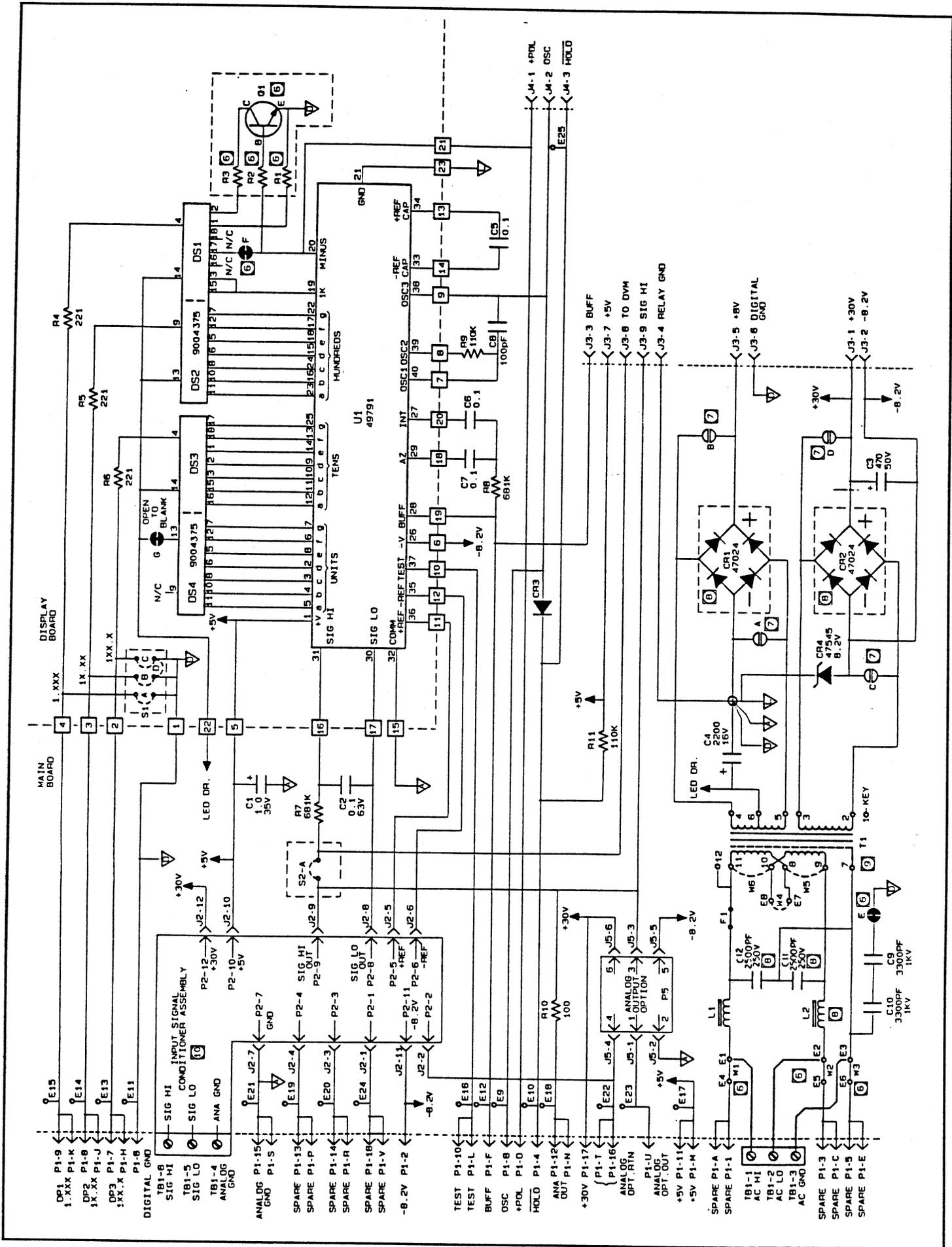
Notes: Dimensions are in inches $\pm 0.01^*$ with millimeters in [] ± 0.25 mm.



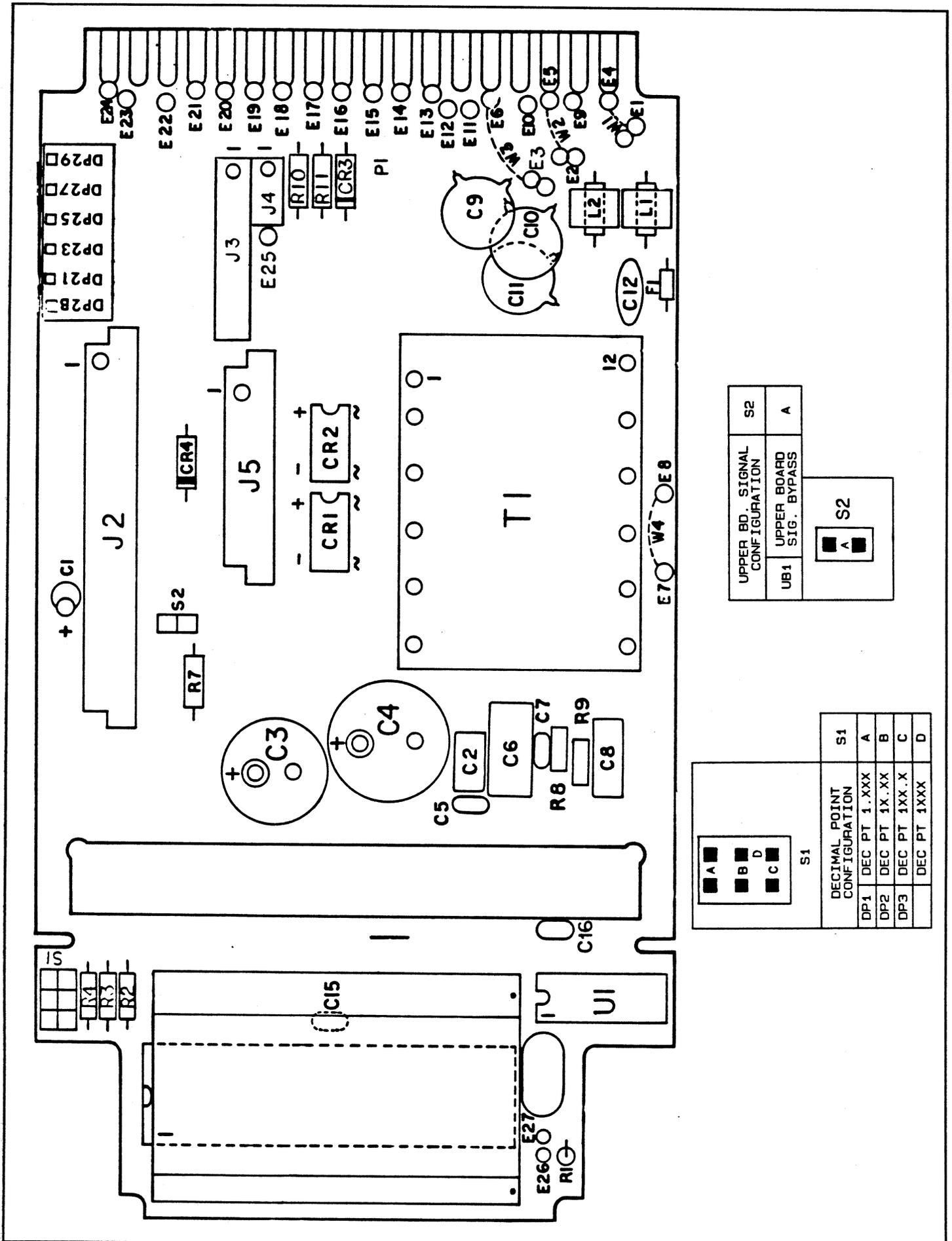
Terminal block cover and bezel not shown for clarity. Clamp rings rotated and slide retainers removed as shown for installation.



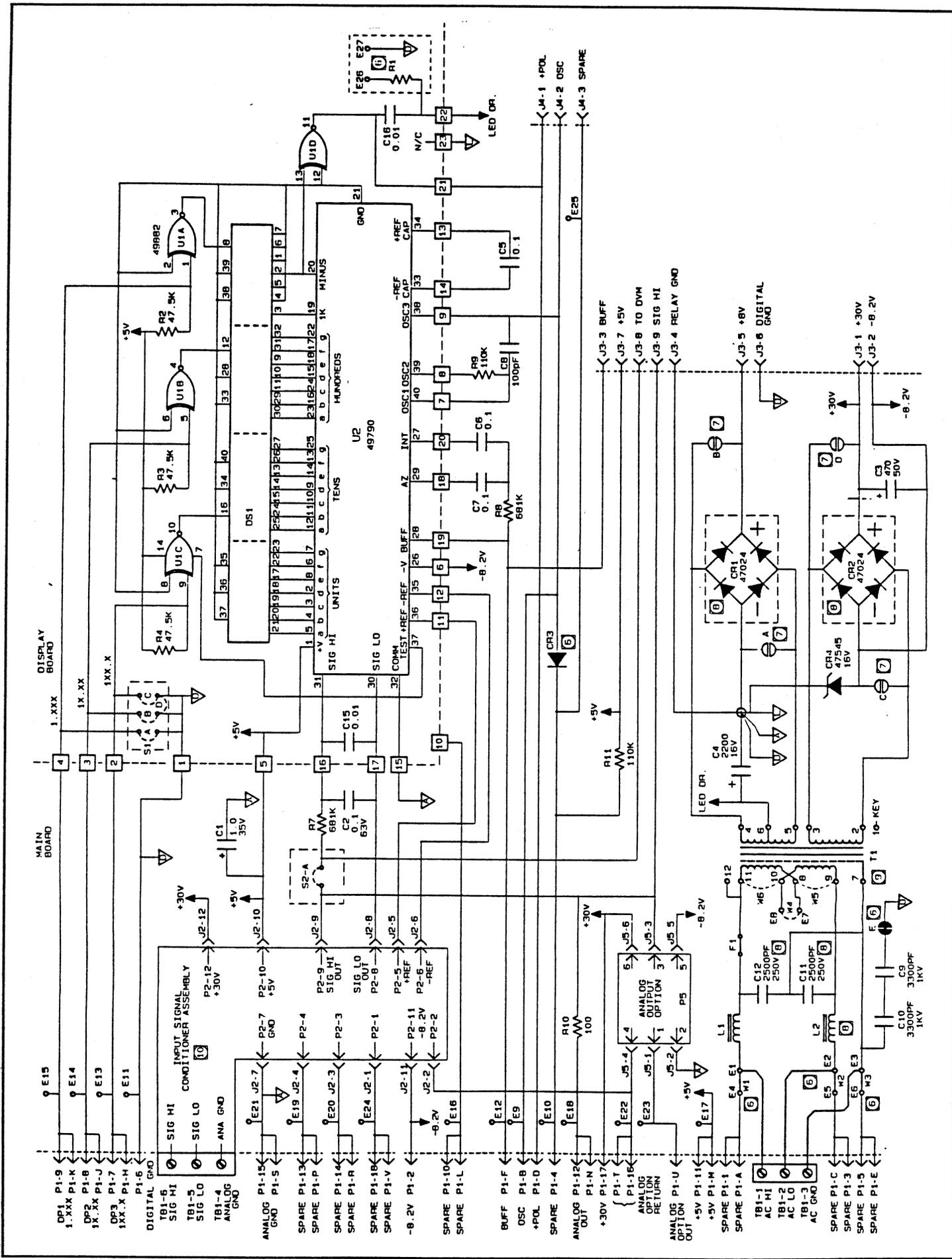
ASSEMBLY DIAGRAM LED DISPLAY USED ON DP20, DP22, DP24, DP26, AND DP28.



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



ASSEMBLY DIAGRAM LCD DISPLAY USED ON DP21, DP23, DP25, DP27, AND DP29.



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

9.0 SPECIFICATIONS: BSCR (DP2000R) RESISTANCE TEMPERATURE DETECTOR (0.1°)

9.1 GENERAL

The basic signal conditioner board is identified as a BSCR (DP2000R) for resistance temperature detection (0.1° resolution).

RESISTANCE TEMPERATURE DETECTOR (RTD) SIGNAL CONDITIONER BSCR (DP2000R)

The BSCR (DP2000R) measures the output of 2-, 3-, or 4-wire 100 Ohm platinum RTD sensors with open-sensor detection.

The BSCR (DP2000R) is available with 0.1° resolution (°C or °F). Temperature ranges available are from -200.0°C to +200.0°C./-200.0 °F to +200.0°F (0.1°/count).

9.2 BSCR (DP2000R): RESISTANCE TEMPERATURE DETECTOR INPUT SPECIFICATIONS

Temperature Sensor (customer supplied)

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

Input Signal Conditioner

Configuration	Differential
Polarity	Bipolar
Zero	Adjustable $\pm 5^{\circ}\text{C} \pm 10^{\circ}\text{F}$
Overvoltage Protection (Differential)	15 Vp
Sensor Break Detection NMR @ 50/60 Hz	3 least-significant digits blanked 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
BSCR (DP2000R) °C	-199.9 to +199.9°C	±0.1°C ±0.05% R	0.1°C
BSCR (DP2000R) °F	-199.9 to +199.9°F	±0.2°F ±0.05% R	0.1°F

Zero Tempco

0.005 deg/deg

Span Tempco

0.006% R/°C

Warm-up to Rated Accuracy

Less than 1 minute

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

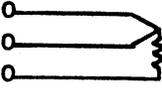
The signal input connections for the BSCR (DP2000R) resistance temperature detector (RTD) signal conditioner are made at the 4-terminal barrier strip:

Input connections for BSCR (DP2000R) 4-wire RTD

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

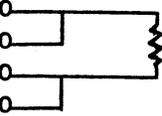
4-wire *
RTD

Input connections for BSCR (DP2000R) 3-wire RTD

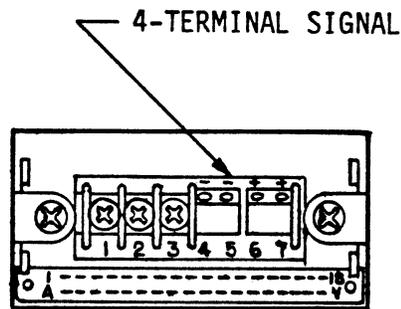
Terminal Connection	Signal	Input
4	-E (Excitation return)	
5	-S (Signal LO input)	
6	+S (Signal HI input)	
7	no connection	

3-wire **
RTD

Input connections for BSCR (DP2000R) 2-wire RTD

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

2-wire
RTD



REAR TERMINAL VIEW

FIGURE 1 SIGNAL INPUT CONNECTIONS

- * If using 4-wire, remove S2A and S2H on signal conditioner board.
- ** Unit is shipped as 3-wire (S2A and S2H factory-installed).

11.0 TESTS AND DIAGNOSTICS

The signal conditioner board BSCR (DP2000R) is designed to function with a main board 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 BSCR (DP2000R) signal conditioner.

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

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

Functional electrical testing:

For DP2000R, 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 DP2000-0.1 RTD Pyrometer (BSCR).

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

12.2 GLOSSARY

The following terms and their definitions appear throughout this procedure:

- R1 Degrees "C" (0.1)
- R2 Degrees "F" (0.1)

12.3 DEGREES SELECTION (R1, R2)

Select the required units from the following:

R1 = Degrees "C"

R2 = Degrees "F"

Degrees = _____

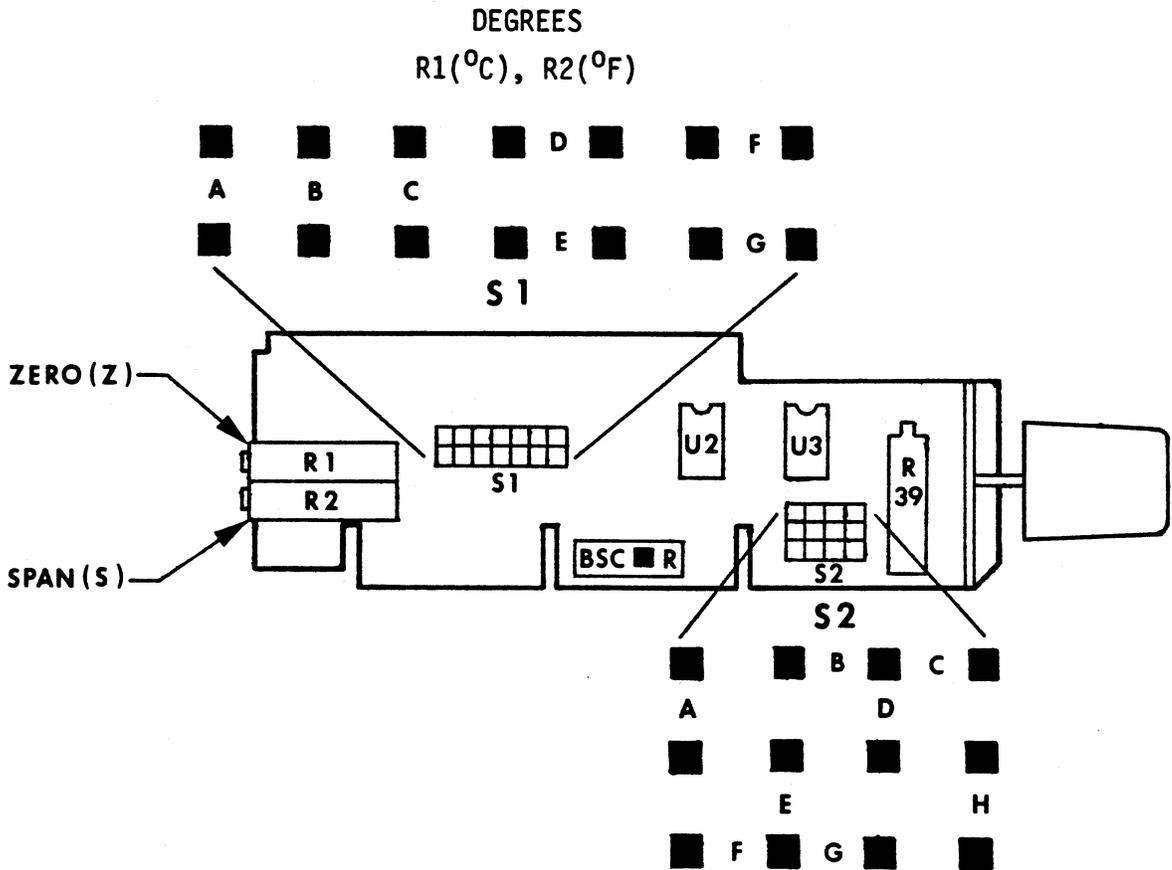
Proceed to Installation (Section 12.4)

12.4 INSTALLATION

Select the Degrees range (R1, R2) 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 CHARTS



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
R1	Degrees "C" (1.0)	F	G	C	G	DP2000R
R2	Degrees "F" (1.0)	D	E	C	G	DP2000R

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

14.0 CALIBRATION

14.1 DEGREES "C" (R1)

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 151.70 Ohm and adjust R2 (span) for a reading of 1273.

Install push-on jumper S1-F.

Adjust R39 for a reading of 1350.

14.2 DEGREES "F" (R2)

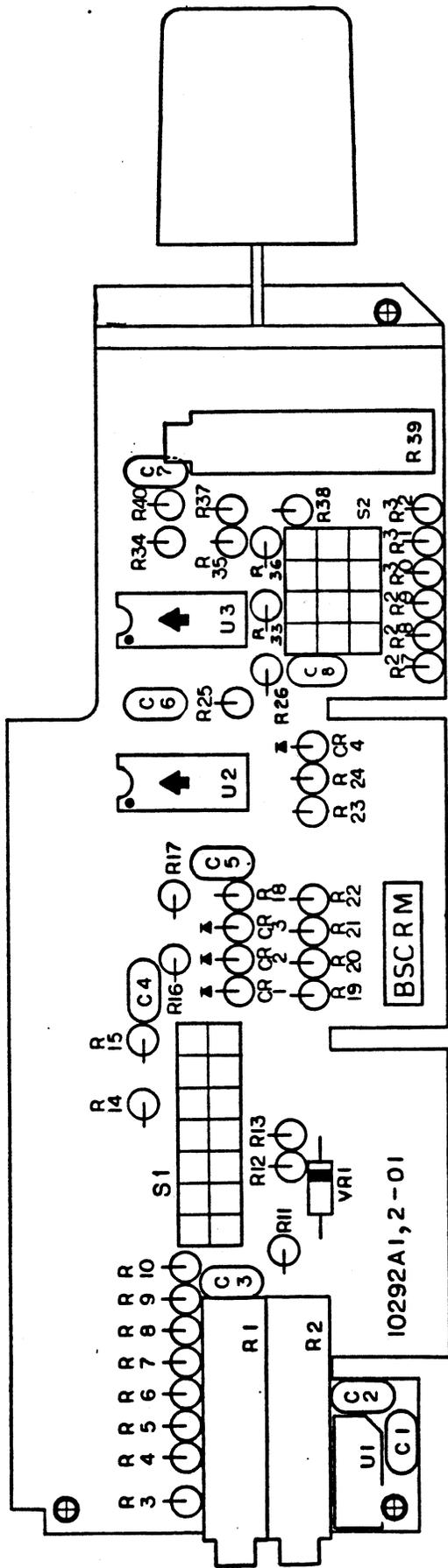
Apply an input of 93.03 Ohm and adjust R1 (zero) for a reading of ± 000 .

Remove push-on jumper S1-D.

Apply an input of 116.83 Ohm and adjust R2 (span) for a reading of 1047.

Install push-on jumper S1-D.

Adjust R39 for a reading of 1100.



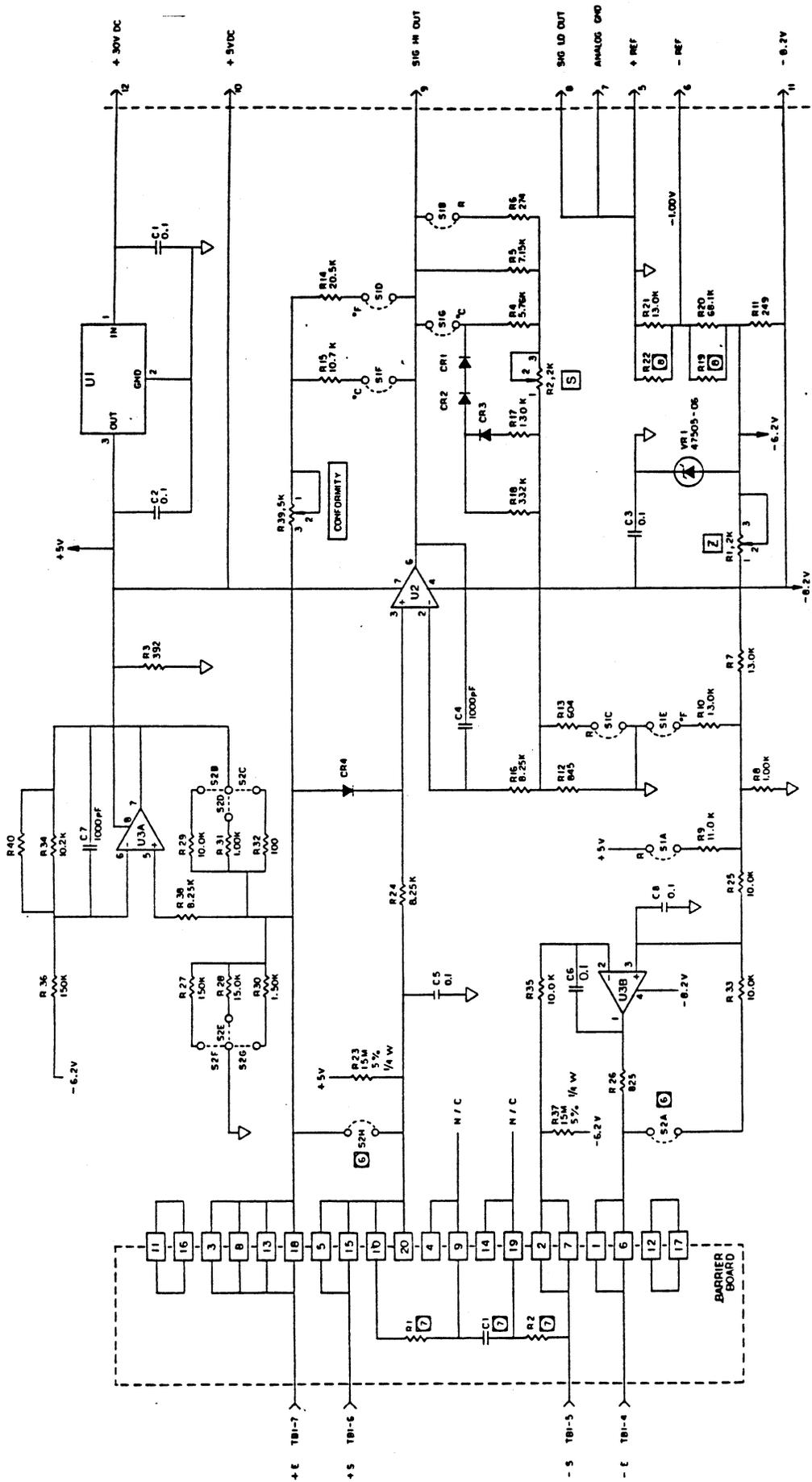
DEGREES CONFIGURATION		S1		S2	
DF 1	DEGREES °F	D	E	C	G
DC 1	DEGREES °C	F	G	C	G
OHMS RANGE CONFIGURATION		S1		S2	
OR 1	0/20 OHMS	A	C	C	G
OR 2	0/200 OHMS	A	B	C	G
OR 3	0/2 K OHMS	A	B	D	E
OR 4	0/20K OHMS	A	B	B	F

DESIG	TYPE	+30V	+5V	-8.2V
U3	LT1013	-	0	4
U2	411	-	7	4
U1	78M05	1	3	-

S1		S2	
A	B	C	D
E	F	G	H

S2	
A	B
C	D
E	F
G	H

ASSEMBLY DIAGRAM USED ON SIGNAL CONDITIONER BOARD BSCR (DP2000R).



SCHEMATIC DIAGRAM USED ON SIGNAL CONDITIONER BOARD BSCR (DP2000R).

 *
 * 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 _____



16.2 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.

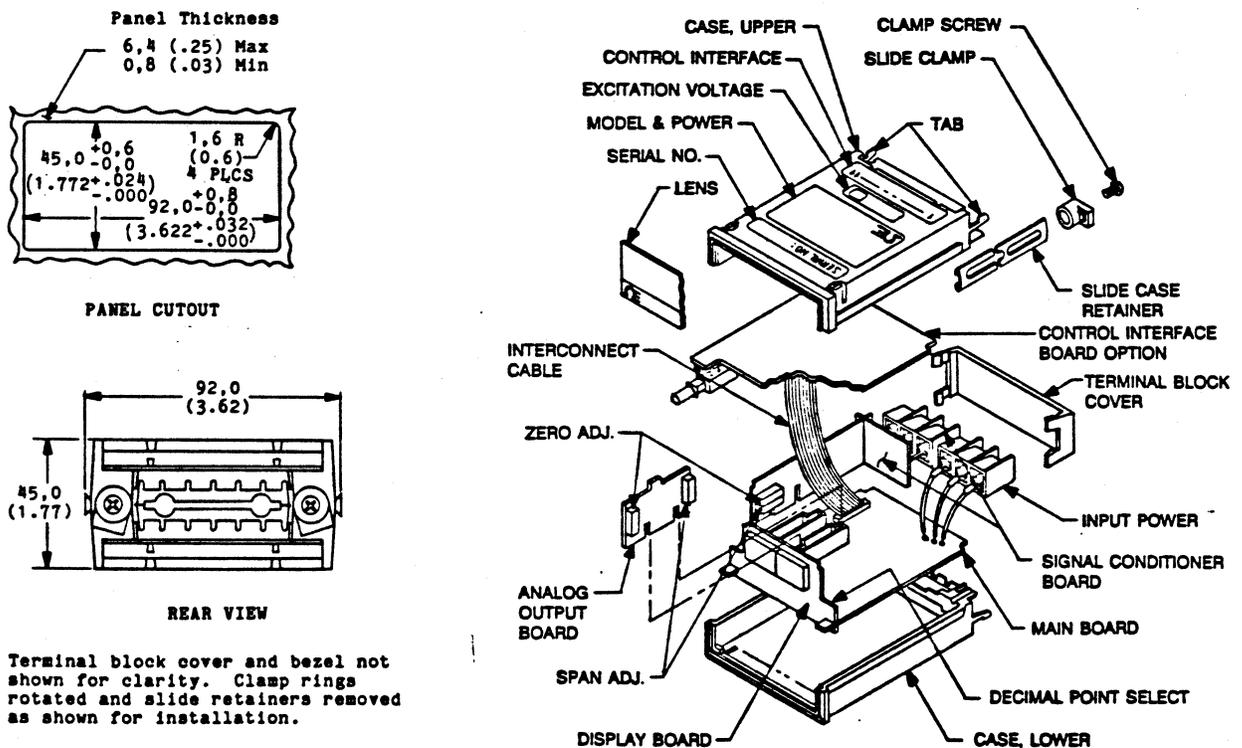


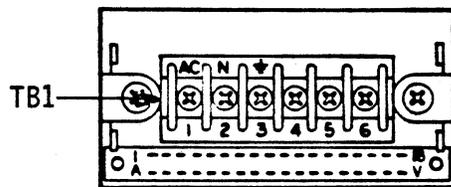
FIGURE 1 PANEL CUTOUT DIMENSIONS AND INSTALLATION

16.3 POWER REQUIREMENTS AND CONNECTIONS (TB1)

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

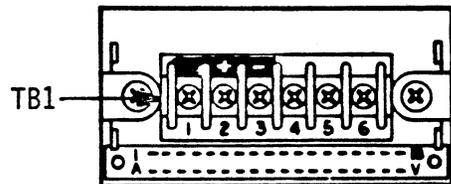
<u>Models</u>	<u>Power Requirements</u>
DP20XXX and DP21XXX	120 V ac (50-60 Hz)
DP22XXX and DP23XXX	240 V ac (50-60 Hz)
DP24XXX and DP25XXX	9-32 V dc
DP26XXX and DP27XXX	5 V dc
DP28XXX and DP29XXX	24 V ac (50-60 Hz)

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



REAR TERMINAL VIEW

<u>TB1 Terminal Connection</u>	<u>AC Operation</u> 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

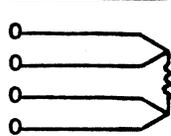


<u>TB1 Terminal Connection</u>	<u>DC Operation</u> 5 V or 9-32 V
1	No Connection
2	DC power +
3	DC power - (return)

16.4 SIGNAL INPUT CONNECTIONS (TB1)

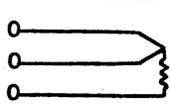
The signal input connections for the BSCR (DP2000R) Resistance Temperature Detector (RTD) signal conditioner are made at the 4-terminal barrier strip:

Input connections for BSCR (DP2000R) 4-wire RTD

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

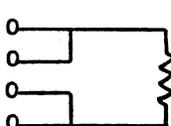
4-WIRE RTD

Input connections for BSCR (DP2000R) 3-wire RTD

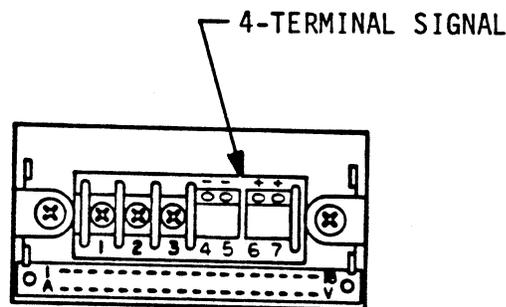
Terminal Connection	Signal	Input
4	-E (Excitation return)	
5	-S (Signal LO input)	
6	+S (Signal HI input)	
7	no connection	

3-wire* RTD

Input connections for BSCR (DP2000R) 2-wire RTD

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

2-wire RTD



REAR TERMINAL VIEW

FIGURE 1 SIGNAL INPUT CONNECTIONS

*Install S2A and S2H on signal conditioner board.



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.

If the unit should malfunction, it must be returned to the factory for evaluation. OMEGA's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective it will be repaired or replaced at no charge. OMEGA's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of being damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components which wear are not warranted, including but not limited to contact points, fuses, and triacs.

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Direct all warranty and repair requests/inquiries to the OMEGA Customer Service Department. BEFORE RETURNING ANY PRODUCT(S) TO OMEGA, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OMEGA'S CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned AR number should then be marked on the outside of the return package and on any correspondence.

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

FOR **WARRANTY** RETURNS, please have the following information available BEFORE contacting OMEGA:

1. P.O. number under which the product was PURCHASED,
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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