

**RoHS 2 Compliant**



**DP3002**  
**Digital Panel Meter for**  
**Process or Strain Gage Inputs**

# User's Guide

***Shop on line at***

***omega.com***<sup>®</sup>

***Ω OMEGA***<sup>®</sup>

***www.omega.com***

***e-mail: info@omega.com***



**OMEGAnet® On-Line Service**  
**www.omega.com**

**Internet e-mail**  
**info@omega.com**

### **Servicing North America:**

**USA:**  
ISO 9001 Certified

One Omega Drive, P.O. Box 4047  
Stamford CT 06907-0047  
TEL: (203) 359-1660 FAX: (203) 359-7700  
e-mail: info@omega.com

**Canada:**

976 Bergar  
Laval (Quebec) H7L 5A1  
TEL: (514) 856-6928 FAX: (514) 856-6886  
e-mail: info@omega.ca

### **For immediate technical or application assistance:**

**USA and Canada:**

Sales Service: 1-800-826-6342 / 1-800-TC-OMEGA®  
Customer Service: 1-800-622-2378 / 1-800-622-BEST®  
Engineering Service: 1-800-872-9436 / 1-800-USA-WHEN®

**Mexico and  
Latin America:**

TEL: (001)800-TC-OMEGA® FAX: (001) 203-359-7807  
En Español: (001) 203-359-7803  
e-mail: espanol@omega.com

### **Servicing Europe:**

**Benelux:**

Postbus 8034, 1180 LA Amstelveen, The Netherlands  
TEL: +31 20 3472121 FAX: +31 20 6434643  
Toll Free in Benelux: 0800 0993344  
e-mail: sales@omegaeng.nl

**Czech Republic:**

Frystatska 184, 733 01 Karviná  
TEL: +420 59 6311899 FAX: +420 59 6311114  
e-mail: info@omegashop.cz

**France:**

11, rue Jacques Cartier, 78280 Guyancourt  
TEL: +33 1 61 37 29 00 FAX: +33 1 30 57 54 27  
Toll Free in France: 0800 466 342  
e-mail: sales@omega.fr

**Germany/Austria:**

Daimlerstrasse 26, D-75392 Deckenpfronn, Germany  
TEL: +49 7056 9398-0 FAX: +49 7056 9398-29  
Toll Free in Germany: 0800 639 7678  
e-mail: info@omega.de

**United Kingdom:**  
ISO 9002 Certified

One Omega Drive  
River Bend Technology Centre  
Northbank, Irlam Manchester M44 5BD United Kingdom  
TEL: +44 161 777 6611 FAX: +44 161 777 6622  
Toll Free in England: 0800 488 488  
e-mail: sales@omega.co.uk

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 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.

CHG	ECO NO	DATE	BY	CHK
B	9261	14 JAN 98	ML	

## TABLE OF CONTENTS

1.0	GENERAL INFORMATION .....	1
	1.1 Model DP3002-P .....	1
	1.2 Model DP3002-E .....	1
	1.3 Model DP3002-S .....	1
2.0	SPECIFICATIONS .....	2
	2.1 Analog Input.....	2
	2.2 Accuracy at 25°C .....	3
	2.3 Noise Rejection.....	3
	2.4 Excitation Supply .....	3
	2.5 Analog-to-Digital Conversion .....	4
	2.6 Digital Inputs .....	4
	2.7 Display .....	4
	2.8 Power.....	5
	2.9 Environmental.....	5
	2.10 Mechanical.....	5
3.0	MECHANICAL ASSEMBLY AND INSTALLATION .....	6
	3.1 Safety Considerations.....	6
	3.2 Panel Mounting.....	7

	PAGE
4.0 POWER & SIGNAL INPUT CONNECTIONS (TB1) .....	9
4.1 Installing Option C1 .....	9
4.2 Power Connections .....	10
4.3 Signal Connections .....	10
4.4 Main Board Connector Pin Assignments (J1) .....	11
5.0 MAIN BOARD CONFIGURATION .....	12
5.1 Decimal Point Selection .....	12
5.2 Model DP3002-P .....	13
5.3 Models DP3002-E and DP3002-S .....	14
6.0 PLUG-IN CARD CONFIGURATION .....	15
6.1 Model DP3002-P .....	15
6.2 Model DP3002-E .....	16
6.3 Model DP3002-S .....	17
7.0 CALIBRATION .....	18
8.0 DRAWINGS .....	20
9.0 APPLICATION NOTES .....	26
9.1 Excitation Supply/Current Transmitter Interface .....	26

ILLUSTRATIONS	PAGE
<b>Figure 3-1</b>	DIN Case Dimensions . . . . . 7
<b>Figure 3-2</b>	Exploded View . . . . . 8
<b>Figure 4-1</b>	Changing Operating Voltage . . . . . 9
<b>Figure 4-2</b>	Rear View of Case with Connectors . . . . .10
<b>Figure 5-1</b>	Display Board Jumper Locations . . . . .12
<b>Figure 5-2</b>	Main Board Jumper Locations . . . . .13
<b>Figure 6-1</b>	-P Card Jumper Locations . . . . .15
<b>Figure 6-2</b>	-E Card Jumper Locations . . . . .16
<b>Figure 6-3</b>	-S Card Jumper Locations . . . . .17
<b>Figure 8-1</b>	Main Board Assembly Diagram . . . . .20
<b>Figure 8-2</b>	Main Board Schematic Diagram . . . . .21
<b>Figure 8-3</b>	Plug-in Card Assembly -E or -P Diagram . . . . .22
<b>Figure 8-4</b>	Plug-in Card Schematic -E or -P Diagram . . . . .23
<b>Figure 8-5</b>	Plug-in Card Assembly -S Diagram . . . . .24
<b>Figure 8-6</b>	Plug-in Card Schematic -S Diagram . . . . .25
<b>Figure 9-1</b>	Two-wire Connection . . . . .26
<b>Figure 9-2</b>	Four-wire Connection . . . . .26



## **1.0 GENERAL INFORMATION**

The DP3002 series provides several versions of a low-cost, four and one-half digit panel meter for a wide range of applications that require accurate DC measurement with zero and span adjustments.

### **1.1 MODEL DP3002-P**

The DP3002-P consists of a main assembly and a plug-in process receiver board.

Model DP3002-P is a process receiver with adjustments of 40,000 counts of zero and 20,000 counts of span for transmitter signals such as 4-20 mA, 1-5 V, and 0-10 V. The meter can be scaled to display readings directly in engineering units.

Model DP3002-P can also be used in ratiometric pot-follower applications, to determine such things as liquid level or valve setting from the position of a potentiometer wiper. The required external reference voltage can be derived from the meter's 4.7 V dc supply.

### **1.2 MODEL DP3002-E**

The DP3002-E consists of a main assembly and a process receiver with excitation board.

In addition to all Model DP3002-P features, Model DP3002-E offers an electrically-floating supply for powering transmitters, active transducers, and bridges. Supply voltage is adjustable from 10 to 24 V dc up to a maximum output current of 50 mA. (See Section 9.1)

### **1.3 MODEL DP3002-S**

The DP3002-S consists of a main assembly and a preamplifier with excitation board.

In addition to most DP3002-E features (with the exception that excitation maximum output current decreases from 30 mA at 10 V dc to 20 mA at 24 V dc), Model DP3002-S offers a high-impedance, precision preamplifier with programmable gains of 1, 3, 10, 30, and 100. Gains provide resolutions of 100, 30, 10, 3, and  $1\mu\text{V}/\text{count}$ , respectively. Typical offset drift is only  $0.3\ \mu\text{V}/^\circ\text{C}$ . The preamplifier is ideal for metal-foil, strain-gauge applications that require microvolt resolution.

## 2.0 SPECIFICATIONS

### 2.1 ANALOG INPUT

#### Models DP3002-P and DP3002-E

Range	4-20 mA	1-5 V	0-10 V
Resolution	0.8 $\mu$ A	0.2 mV	0.5 mV
Input resistance	130	1 M	1 M
Bias current	50 pA	10 pA	5 pA
Maximum input	55 mA	250 V	250 V
Configuration	Differential with respect to AC earth ground, bipolar		
Zero range	-20,000 to +20,000 counts with multiturn pots		
Span range	0 to 20,000 counts with multiturn pots		
NMR	70 dB at 50/60 Hz		
Reference:			
Internal (standard)	1.0 V dc $\pm$ 5% with 12 k source resistance		
External (ratiometric)	0.5 - 2.0 V, 680 k input resistance		

#### Model DP3002-S

Range	$\pm$ 19.999 mV, 10 $\mu$ V resolution
Most-sensitive scaling	
Least-sensitive scaling	$\pm$ 2.5 V, 1 mV resolution (limited by CMV)
Input resistance	1 G min without bridge balance
Bias current	1 nA typ, 5 nA max
Maximum input	50 V
Configuration	Differential with respect to AC earth ground, bipolar
Coarse preamplifier gains	1, 3, 10, 30, 100
Bridge balance adj.	$\pm$ 1.5 mV with 350 bridge
Zero range	-20,000 to +20,000 counts with multiturn pots
Span range	0 - 20,000 counts with multiturn pots
NMR	80 dB at 50/60 Hz for 20 mV range; 66 dB at 50/60 Hz for 0.2 and 2.0 V ranges
Reference:	
Internal (from excitation supply)	1.0 V dc with 9.5 k source resistance at 10 V dc excitation
External (opt)	1.0 V dc -50%/+100% with 680 k input resistance

## 2.2 ACCURACY AT 25°C

### Models DP3002-P, DP3002-E, and DP3002-S

Step response	1 second
Warmup to rated accuracy	10 minutes

### Models DP3002-P and DP3002-E

Maximum error	$\pm 0.01\%$ of span $\pm 2$ counts
Span tempco	$\pm 0.01\%$ of span/ $^{\circ}\text{C}$
Zero tempco	$\pm 0.5$ counts/ $^{\circ}\text{C}$

### Model DP3002-S

Reference	Internal	External
Maximum error	$\pm 0.01\%$ S	$\pm 2$ counts
Span tempco	$\pm 0.005\%$ S/ $^{\circ}\text{C}$	$\pm 0.01\%$ S/ $^{\circ}\text{C}$
Zero tempco	$\pm 0.5 \mu\text{V}/^{\circ}\text{C}$	$\pm 1.0$ counts/ $^{\circ}\text{C}$
Bridge balance tempco	$\pm 0.5 \mu\text{V}/^{\circ}\text{C}$	$\pm 0.2 \mu\text{V}/^{\circ}\text{C}$

## 2.3 NOISE REJECTION

CMR, SIG GND to PWR GND	120 dB from DC to 60 Hz
CMV, SIG GND to PWR GND	1500 Vp per HV test; 354 Vp per IEC spacing

## 2.4 EXCITATION SUPPLY

### Models DP3002-E and DP3002-S

Output voltage	Adjustable from 10 to 24 V dc with multiturn pot 50 mA max for -E; 30 mA max at 10 V decreasing to 12 mA max at 24 V for -S
Output current	
Load regulation*	0.15% typ, 0.5% max from zero to max load
Line regulation*	0.01% typ, 0.04% max for 10% change of AC power voltage
Tempco*	0.02%/ $^{\circ}\text{C}$ max
Ripple at 50/60 Hz	0.01%

\* In Model DP3002-S, the meter's internal reference (e.g., 1 V at 10 V excitation) is derived from the excitation voltage for ratiometric operation which eliminates load and line regulation errors and reduces other errors.

## 2.5 ANALOG-TO-DIGITAL CONVERSION

Technique	Dual-slope, average-value
Input integration period	100 milliseconds
Read rate	2.5/seconds

## 2.6 DIGITAL INPUTS

(Positive true referenced to DIG GND)

DESCRIPTION	"0" LEVEL VOLTS	"1" LEVEL VOLTS	SINK mA	SOURCE $\mu$ A
<u>METER HOLD</u>	0 to 1.0	2.5 to 5.0	0.1	10
<u>LAMP TEST</u>	0 to 0.6	2.0 to 5.0	1.3	20
<u>DISPLAY BLANKING</u>	0 to 0.6	2.0 to 5.0	1.3	20

## 2.7 DISPLAY

Type	7 segment, red LED
Digit height	14.2 mm (0.56 in)
Symbols	-1.8.8.8.8
Decimal Points	4 positions programmed internally or at connector, source 0.3 mA from digit drive
Overrange indication	4 least-significant digits flash

## 2.8 POWER

Standard AC input voltage	115 V ac $\pm$ 15%
Optional AC input voltage	230 V ac $\pm$ 15%
AC frequency range	47 to 400 Hz
Optional DC input voltage	9-32 V dc, isolated to 300 V dc 26-56 V dc, isolated to 300 V dc
Power consumption, DP3002-P	2.4 watts
Power consumption, DP3002-E or DP3002-S	3.7 watts
Output voltages	+4.7 V dc $\pm$ 5% at 10 mA max -4.7 V dc $\pm$ 5% at 10 mA max

## 2.9 ENVIRONMENTAL

Operating temperature	0 to 60°C
Storage temperature	-40 to +85°C
Humidity	95% RH to 40°C (non-condensing)

## 2.10 MECHANICAL

Bezel	96 x 48 x 8.0 mm (3.78 x 1.89 x 0.31 inches)
Depth behind bezel with connector	104,2 mm (4.10 inches)
Panel cutout	92 x 45 mm (3.62 x 1.77 inches)
Weight	425 g (15 ounces)
Case material	94V-0 UL-rated polycarbonate
D1 connector (Optional)	PCB edge connector with double row of 18 pins; 3.96 mm (0.156 inches) between pins
Screw Terminals	Barrier strip with #6 screw terminals for power and signal inputs

## 3.0 MECHANICAL ASSEMBLY AND INSTALLATION

### 3.1 SAFETY CONSIDERATIONS



This device is marked with the international Caution symbol. It is important to read this manual before installing or commissioning this device as it contains important information relating to Safety and EMC (Electromagnetic Compatibility).

#### Unpacking & Inspection



Unpack the instrument and inspect for obvious shipping damage. Do not attempt to operate the unit if damage is found.

This instrument is a panel mount device protected in accordance with Class I of EN 61010 (115/230 AC power connections). Installation of this instrument should be done by Qualified personnel. In order to ensure safe operation, the following instructions should be followed.

This instrument has no power-on switch. An external switch or circuit-breaker shall be included in the building installation as a disconnecting device. It shall be marked to indicate this function, and it shall be in close proximity to the equipment within easy reach of the operator. The switch or circuit-breaker shall not interrupt the Protective Conductor (Earth wire), and it shall meet the relevant requirements of IEC 947-1 and IEC 947-3 (International Electrotechnical Commission). The switch shall not be incorporated in the mains supply cord.

Furthermore, to provide protection against excessive energy being drawn from the mains supply in case of a fault in the equipment, an overcurrent protection device shall be installed.



- The **Protective Conductor** must be connected for safety reasons. Check that the power cable has the proper Earth wire, and it is properly connected. It is not safe to operate this unit without the Protective Conductor Terminal connected.



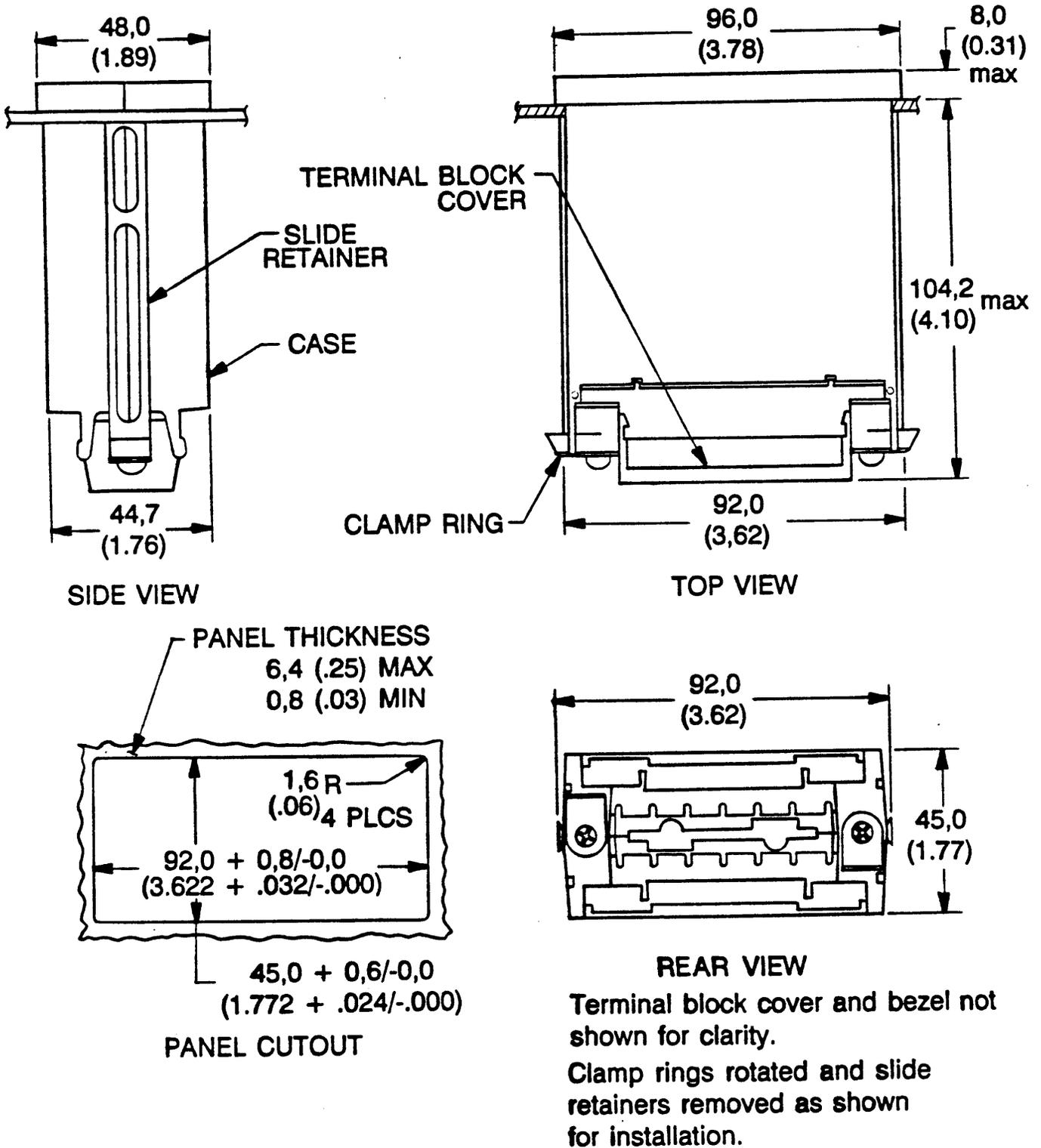
- Do not exceed voltage rating on the label located on the top of the instrument housing.
- Always disconnect power before changing signal and power connections.
- Do not use this instrument on a work bench without its case for safety reasons.
- Do not operate this instrument in flammable or explosive atmospheres.
- Do not expose this instrument to rain or moisture.

#### EMC Considerations

- Whenever EMC is an issue, always use shielded cables.
- Never run signal and power wires in the same conduit.
- Use signal wire connections with twisted-pair cables.
- Install Ferrite Bead(s) on signal wires close to the instrument if EMC problems persist.

### 3.2 PANEL MOUNTING

NOTE: Dimensions are in millimeters  $\pm 0,25$  mm and inches are in ( )  $\pm 0.01$  in.



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

Figure 3-1 DIN Case Dimensions

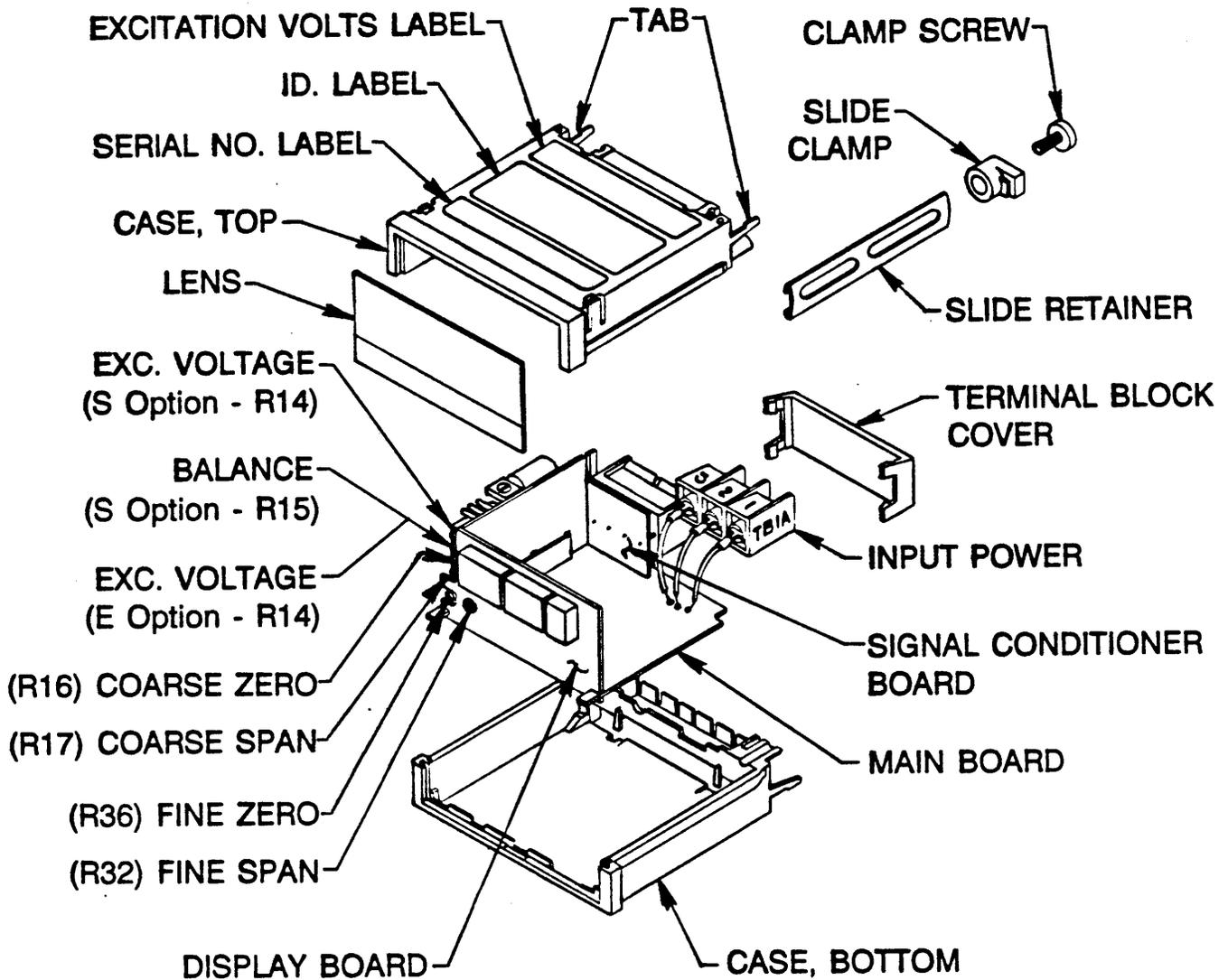


Figure 3-2 Exploded View

1. Remove main board edge connector J1, if installed.
2. Loosen the two clamp screws on rear of case until slide clamps can be rotated. Push the two slide retainers toward the rear of the case, and remove them.
3. Working from the front of the panel, insert the meter into the panel cutout.
4. Insert slide retainers back onto the case, and push them up tightly against the rear of the panel.
5. Rotate slide clamps back into original position and tighten clamp screws just enough to hold the case in place. **NEVER OVERTIGHTEN CLAMP SCREWS.**
6. Install any connectors that have been removed.

## 4.0 POWER AND SIGNAL INPUT CONNECTIONS (TB1)

**CAUTION:** Incorrect power input can damage your panel meter.

### 4.1 INSTALLING OPTION C1 (230 V ac)

If this option is to be used, it must be installed prior to any power and signal connections. Option C1 is 230 V ac  $\pm 15\%$ , 47-400 Hz operation. To change the meter in the field from 115 V ac operation, follow this procedure:

1. Refer to Figures 4-1 and 4-2. Remove power lines from the meter, then remove the meter from the case.
2. Remove jumpers W5 and W6 on the transformer.
3. Add jumper W4 on the printed circuit board. The meter is now wired for 230 V ac operation.

**NOTE:** To change the meter from 230 V ac to 115 V ac operation, reverse the above procedure.

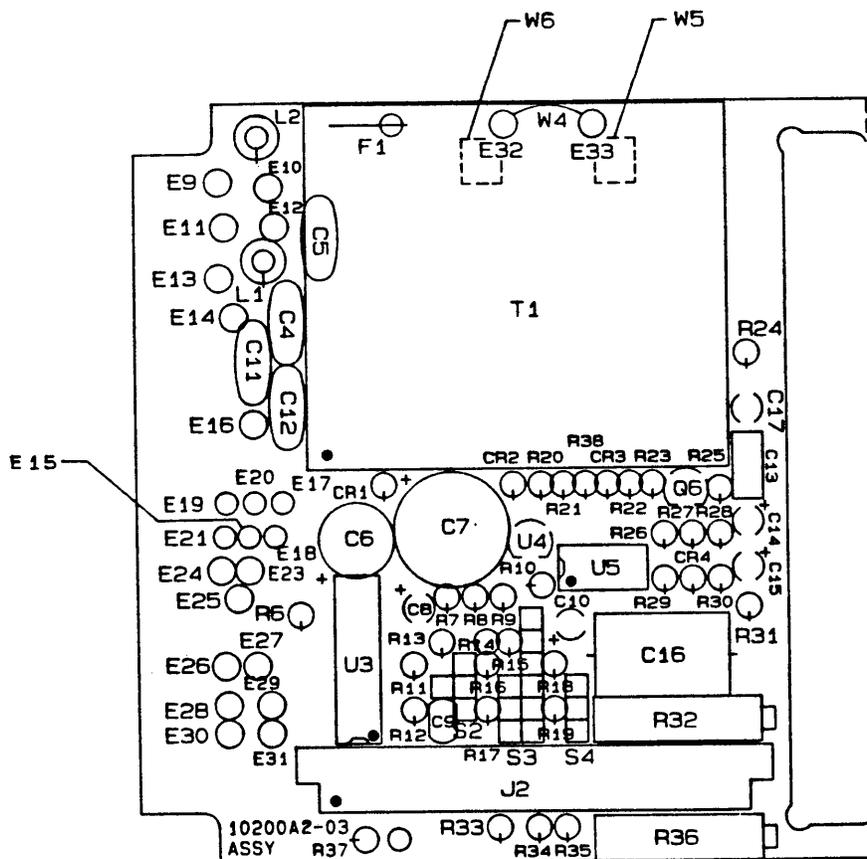


Figure 4-1 Changing Operating Voltage

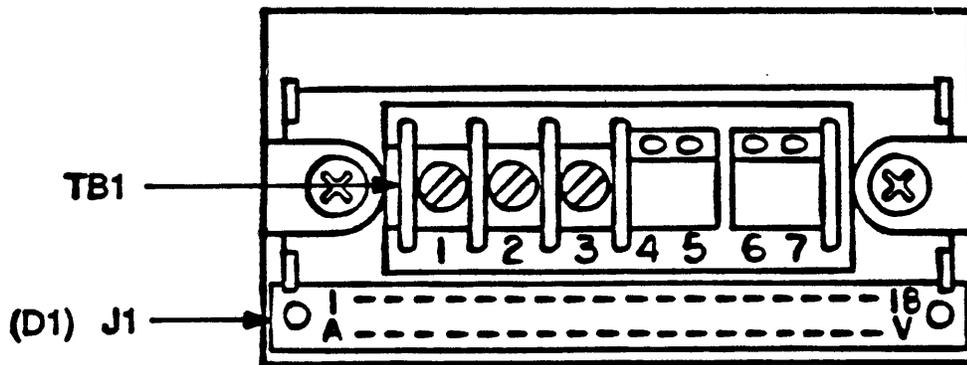


Figure 4-2 Rear View of Case with Connectors

#### 4.2 POWER CONNECTIONS

TB1 Connection			AC Power Operation	Wire Color		DC Power Operation
DP3002-P	DP3002-E	DP3002-S		USA	Other	
1	1	1	AC HI	Black	Brown	No Connection + DC Power DC Power RET
2	2	2	AC LO	White	Blue	
3	3	3	AC GND	Green	Green/Yellow	

#### 4.3 SIGNAL INPUT CONNECTIONS

TB1 Connection			Signal Input
DP3002-P	DP3002-E	DP3002-S	
N/C	4	4	- EXC
5	5	5	SIG LO
6	6	6	SIG HI
N/C	7	7	+ EXC

#### 4.4 MAIN BOARD CONNECTOR PIN ASSIGNMENTS (J1)

(Left to right, looking at rear of case)

CONNECTION		FUNCTION	EXPLANATION
A		Spare (E9)	
	1	No connection	
B		No connection	
	2	Spare (E11)	
C		Spare (E13)	
	3	No connection	
D		No connection	
	4	No connection	
E		Spare (E15)	
	5	No connection	
F		1999.9 DP	
	6	Spare (E16)	
H		199.99 DP	
	7	Spare (E17)	
J		19.999 DP	
	8	Spare (E20)	
K		1.9999 DP	
	9	Spare (E19)	
L		DP Return	
	10	Spare (E18)	
M		Spare (E21)	
	11	-4.7 V dc	Analog and Digital Power
N		Spare (E25)	
	12	+4.7 V dc	Analog and Digital Power
P		-EXC	Excitation Voltage
	13	+REF	Reference Voltage
R		<u>LAMP TEST</u>	Lights All Display Segments
	14	+EXC	Excitation Voltage
S		DIG GND	Digital Ground
	15	<u>HOLD</u>	Hold Last Display Reading
T		ANA GND	Analog Ground
	16	<u>SIG LO</u>	Signal Input
U		<u>BLANKING</u>	Blanks Four LSDs
	17	SIG HI	Signal Input
V		OSC	100 kHz Out
	18	ANA OUT	

## 5.0 MAIN BOARD CONFIGURATION

The following procedures are used to select the various configurations of the main board for use as a DP3002-P, DP3002-E, or DP3002-S in conjunction with a plug-in signal conditioning card.

### 5.1 DECIMAL POINT SELECTION

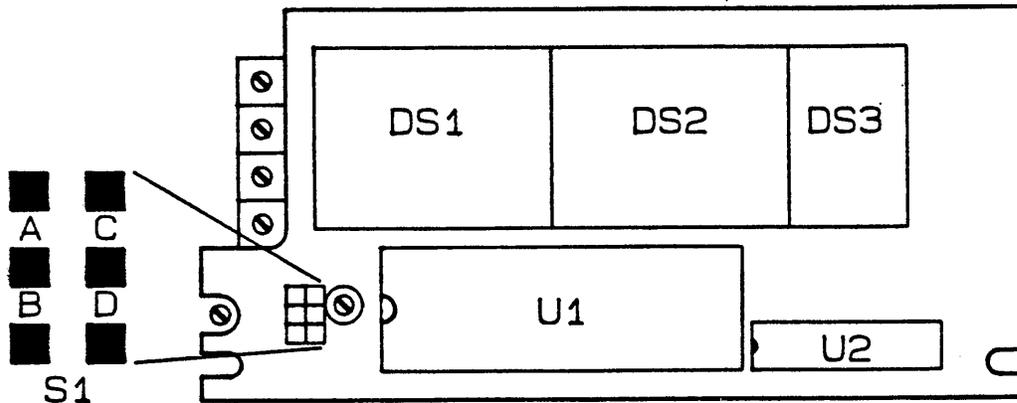


Figure 5-1 Display Board Jumper Locations

The DP3002 has four decimal point locations which can be displayed. They may be programmed by installing push-on jumpers on S1 of the display board or by connecting pins on the optional rear connector, J1.

Remove all push-on jumpers not used in the desired configuration. Install appropriate jumpers as indicated in the chart below.

Decimal point	S1	Alternate decimal point selection using main board connector J1.
1.9999 DP	A	Connect K to L
19.999 DP	B	Connect J to L
199.99 DP	C	Connect H to L
1999.9 DP	D	Connect F to L

## 5.2 MODEL DP3002-P

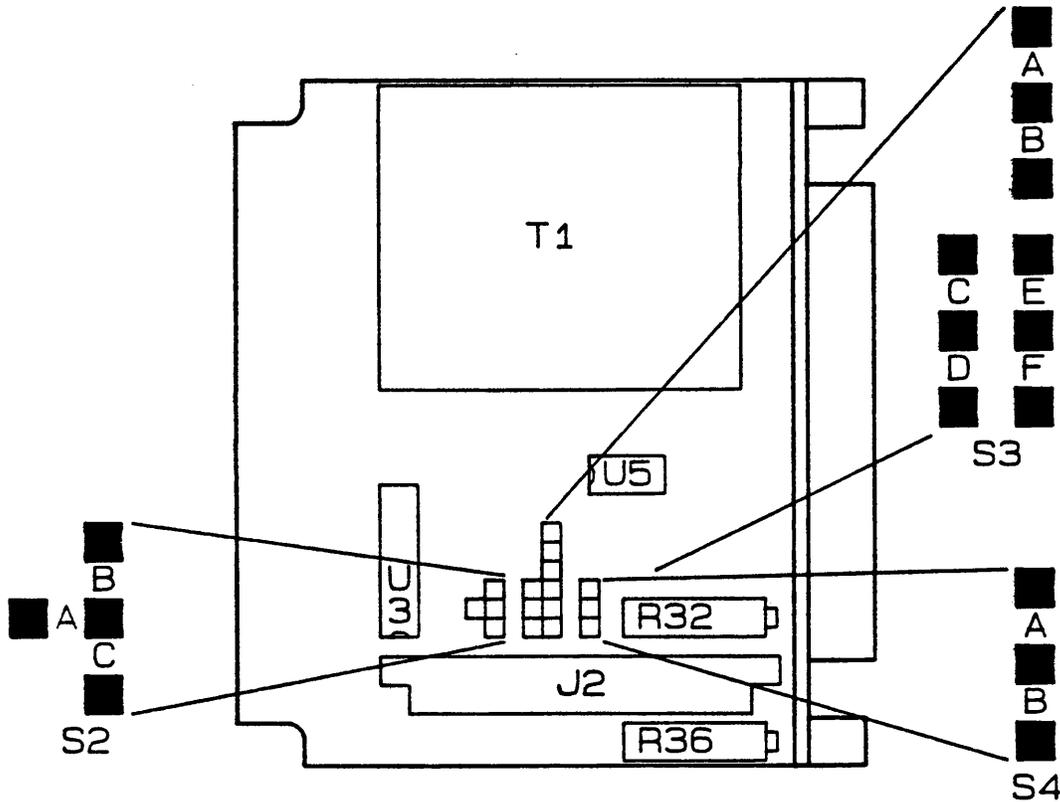


Figure 5-2 Main Board Jumper Locations

The DP3002-P main board is generally configured to use the internal absolute reference rather than an external ratiometric one. The three input ranges for this are listed in the chart below.

Input Ranges	S2	S3	S4
4-20 mA	A	A,F,C	B
1-5 V dc	B	A,F,D	B
0-10 V dc	C	A,F,D	B

### 5.3 MODELS DP3002-E AND DP3002-S

The DP3002-E main board may be configured to use one of three input ranges.

Input Ranges	S2	S3
4-20 mA	A	C
1-5 V dc	B	D
0-10 V dc	C	D

The DP3002-E and DP3002-S may also be configured to use one of three reference sources:

#### Internal Absolute Reference

This reference mode uses the meter's own internal reference to perform the analog-to-digital conversion. Use this mode when measuring an absolute voltage or current where you do not require measurement of the input signal to be relative to (ratiometric with) another signal such as an external transducer excitation supply.

#### Internal Ratiometric Reference

This reference mode will use the meter's own excitation supply voltage as a reference in performing the analog-to-digital conversion. Use this reference with a load cell or applications where it is desired to have the measurement of the input signal relative to (ratiometric with) the meter's internal excitation supply.

## External Ratiometric Reference

This reference mode will use a signal which you will provide on the rear connector (J1-13) as a reference in performing the analog-to-digital conversion. Use this reference with a load cell or applications where it is desired to have the measurement of the input signal relative to (ratiometric with) some external signal.

Reference Voltage Source	S3	S4
Internal Absolute (as shipped)	A,F	B
Internal Ratiometric	B,E	A
External Ratiometric	-	-

**NOTE:** If your application requires the use of an external ratiometric reference, remove all push-on jumpers from S4. This reference signal must then be provided at the rear connector on J1-13.

## 6.0 PLUG-IN CARD CONFIGURATION

### 6.1 Model DP3002-P

Remove all push-on jumpers not used in the desired configuration. Install appropriate jumpers as indicated.

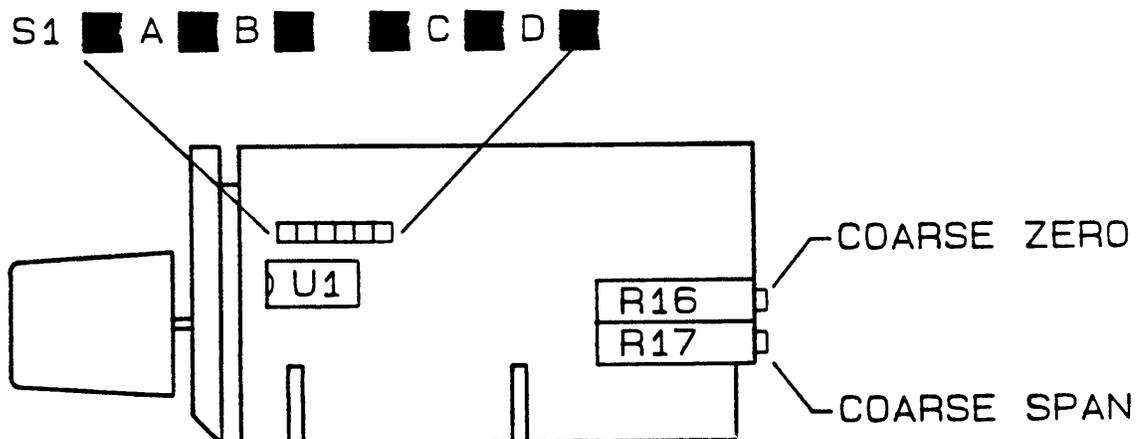


Figure 6-1 -P Card Jumper Locations

The DP3002-P plug-in card should have push-on jumpers installed on positions S1-A and S1-C.

## 6.2 Model DP3002-E

Remove all push-on jumpers not used in the desired configuration. Install appropriate jumpers as indicated.

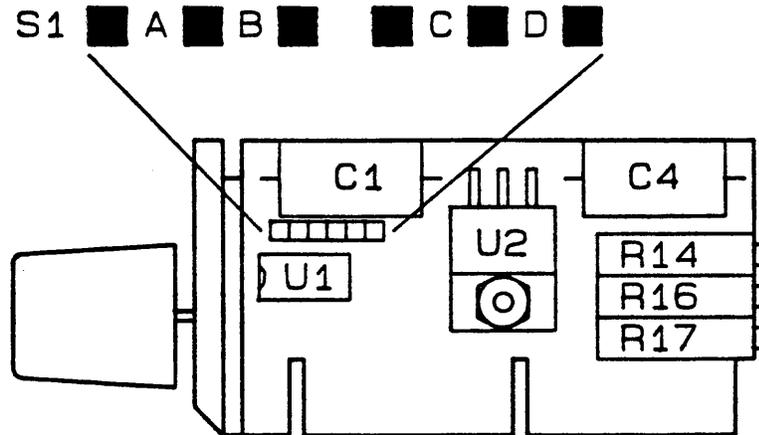


Figure 6-2 -E Card Jumper Locations

The DP3002-E plug-in card should be configured according to the type of reference for which the main board was configured.

* Reference Voltage Source	S1
Internal Absolute	A,C
Internal Ratiometric	B,D
External Ratiometric	A,C

\* Zero Offset is derived from this reference.

### 6.3 Model DP3002-S

Remove all push-on jumpers not used in the desired configuration. Install appropriate jumpers as indicated.

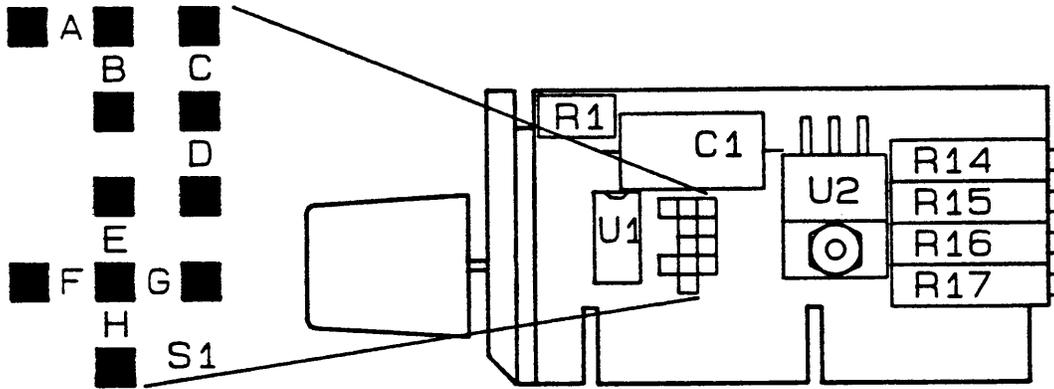


Figure 6-3 -S Card Jumper Locations

The DP3002-S plug-in card should be configured according to the type of reference for which the main board was configured.

* Reference Voltage Source	S1
Internal Absolute (as shipped)	A,C
Internal Ratiometric	B,D
External Ratiometric	A,C

Gain Ranges	$\mu\text{V}/\text{Count}$	S1
X1	0 to 100	G
X3	0 to 30	F
X10	0 to 10	E
X30	0 to 3	H
X100	0 to 1	-

\* Zero Offset is derived from this reference.

## 7.0 CALIBRATION

Using the upper and lower signals as well as the upper and lower display readings required by your application, calculate the slope factor (S):

Upper Input (UI) \_\_\_\_\_

Upper Display (UD) \_\_\_\_\_

Lower Input (LI) \_\_\_\_\_

Lower Display (LD) \_\_\_\_\_

$$S = \frac{UD - LD}{UI - LI}$$

Then calculate the Top Calibration Point (TCP):

$$TCP = S \times UI$$

Example: If you wanted an input of 4 to 20 mA to produce display readings of 1000 to 10000:

$$\begin{array}{ll} UI = 20 & UD = 10000 \\ LI = 4 & LD = 1000 \end{array}$$

$$S = \frac{10000 - 1000}{20 - 4} = 562.5$$

$$TCP = 562.5 \times 20 = 11250$$

After determining LI, UI, LD, UD, S, and TCP for your application, you will be ready to commence with the following procedure. Refer to Figure 3-1 to locate the calibration potentiometers.

1. If you are using a DP3002-E or a DP3002-S, adjust Excitation Voltage (R14) as required for your application.
2. Center the position of the Fine Span (R32) and Fine Zero (R36) by turning them 20 turns clockwise and then about 8 to 10 turns counter-clockwise.
3. Apply an input of zero volts or milliamperes (depending on your configuration). Adjust Coarse Zero (R16) until the meter displays 0000.
4. Apply the Upper Input signal and adjust the Coarse Span (R17) until the meter displays the TCP reading.
5. Apply the Lower Input signal and adjust the Coarse Zero (R16) until the meter displays the Lower Display reading.
6. Apply the Upper Input signal and adjust Fine Span (R32) until the meter displays the Upper Display reading.
7. Apply the Lower Input signal and adjust Fine Zero (R36) until the meter displays the Lower Display reading.

**NOTE:** If you are using a DP3002-S, a bridge balance adjustment (R15) is available to null any errors which may exist in your load cell bridge. A resistor may be installed at R5 on the plug-in board if R15 does not provide enough adjustment.

# 8.0 DRAWINGS

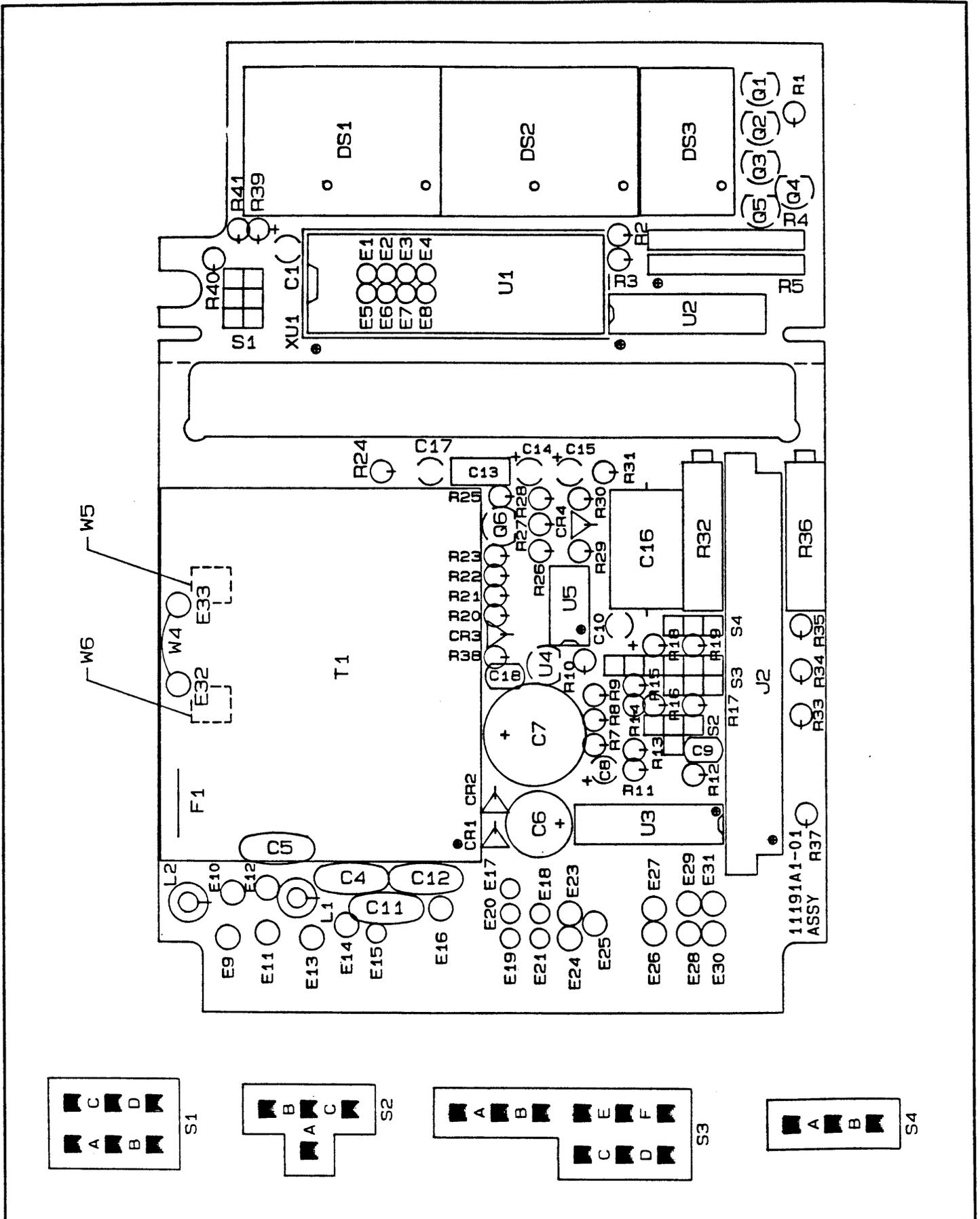
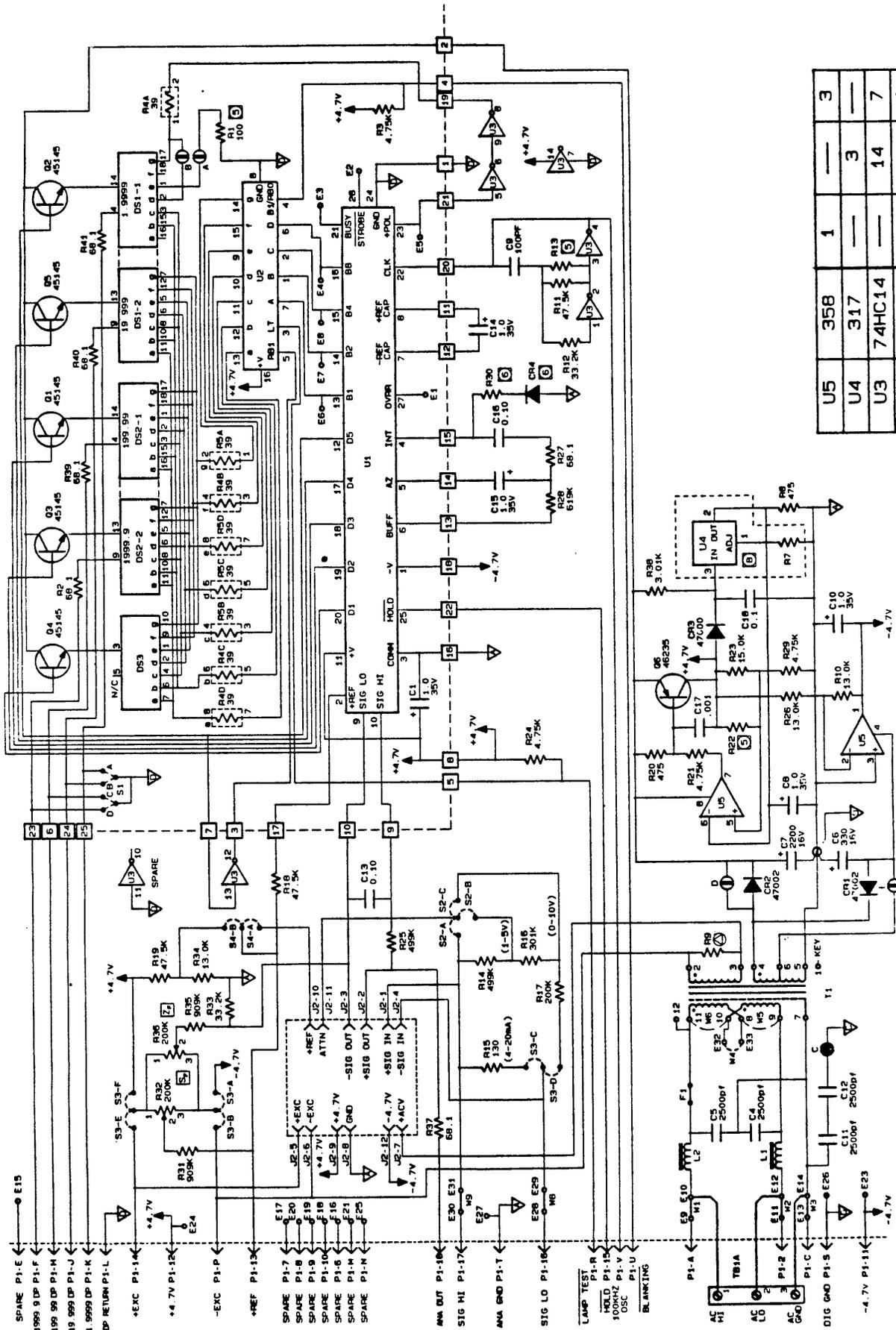


Figure 8-1 Main Board Assembly Diagram



U5	358	1	—	3
U4	317	—	3	—
U3	74HC14	—	14	7
U2	74LS247	—	16	8
U1	7135	1	11	24
DESIG	TYPE	-4.7V	+4.7V	GND

Figure 8-2 Main Board Schematic Diagram

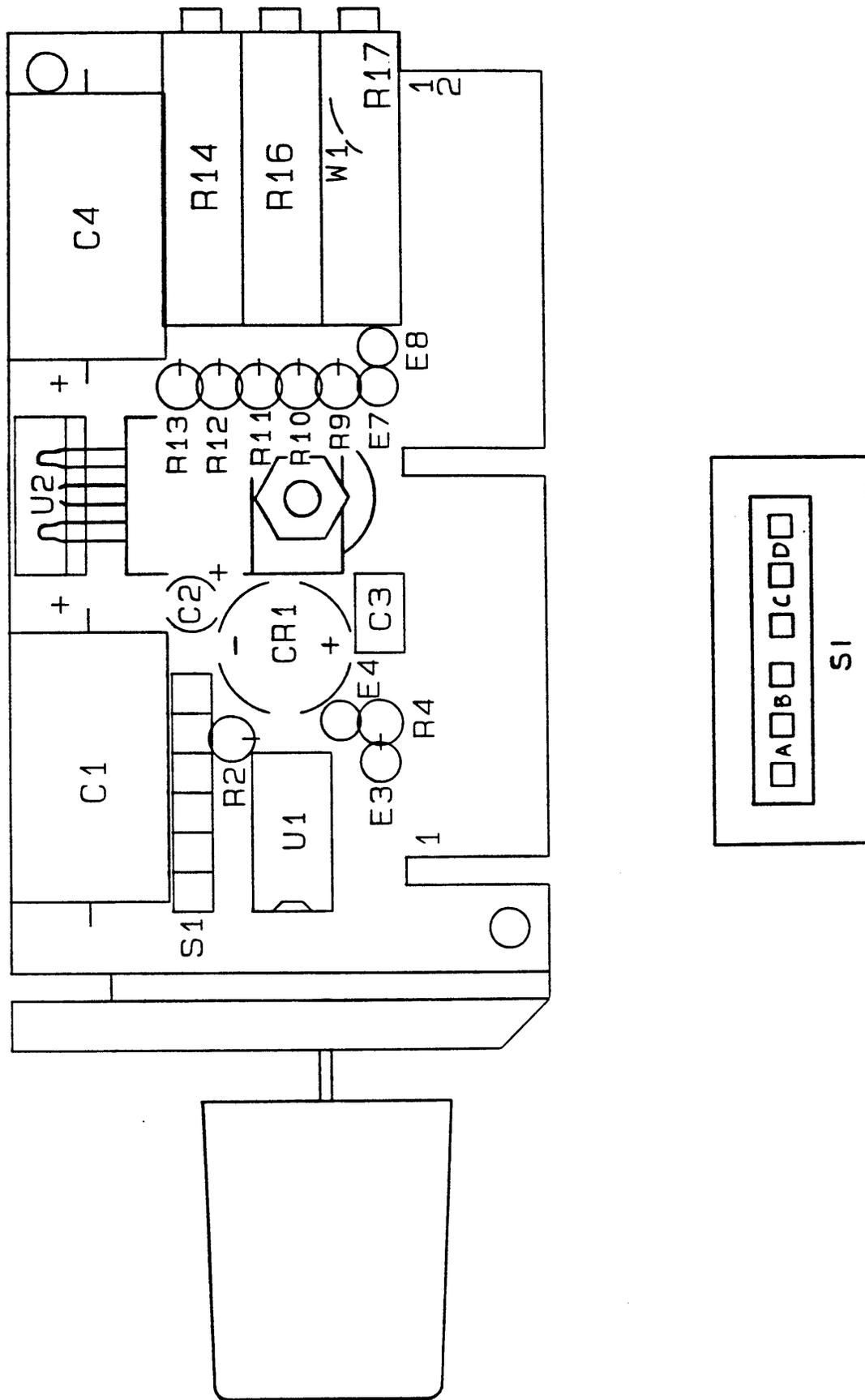
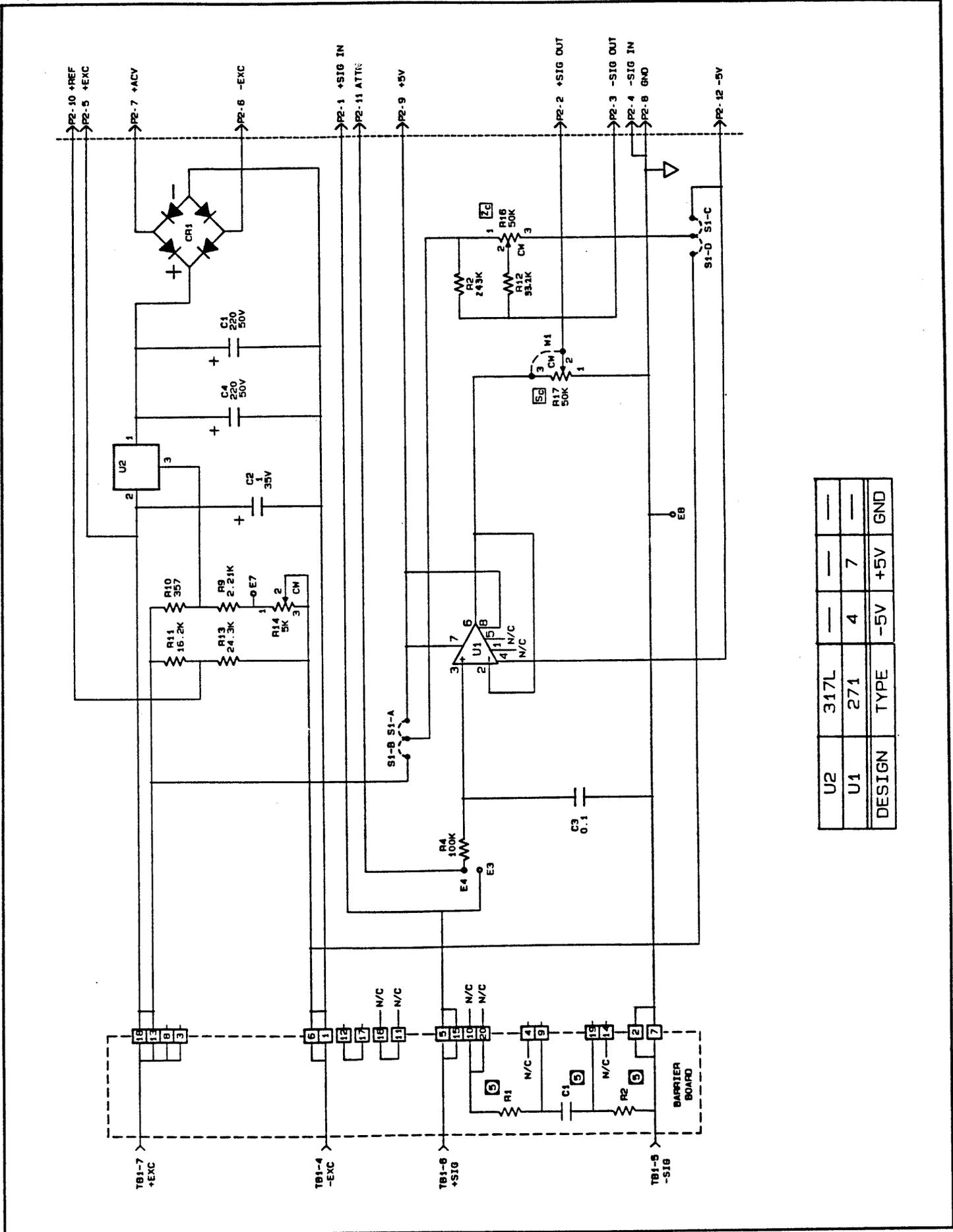


Figure 8-3 Plug-in Card Assembly -E or -P Diagram



U2	317L	—	—	—
U1	271	4	7	—
DESIGN	TYPE	-5V	+5V	GND

Figure 8-4 Plug-in Card Schematic -E or -P Diagram

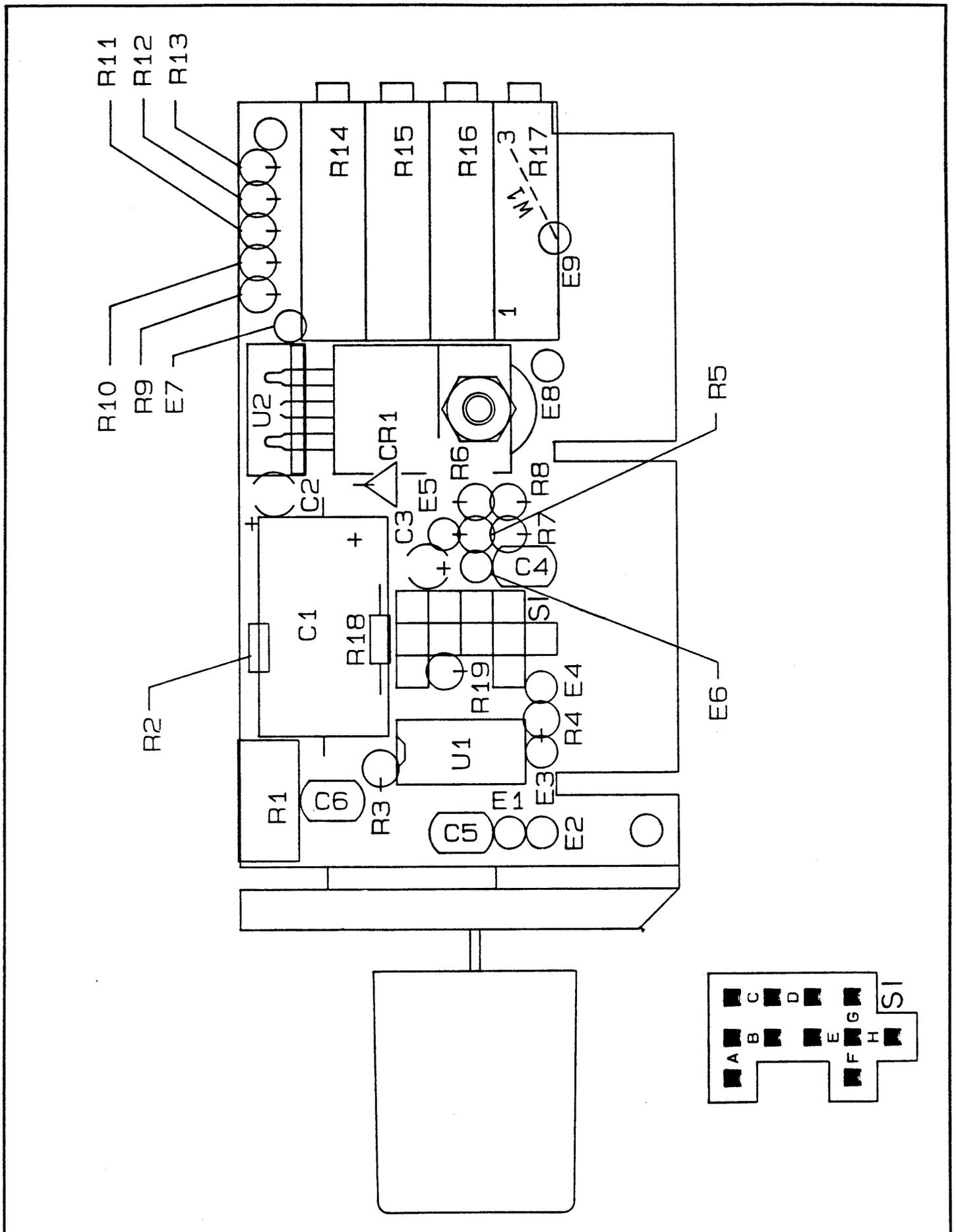
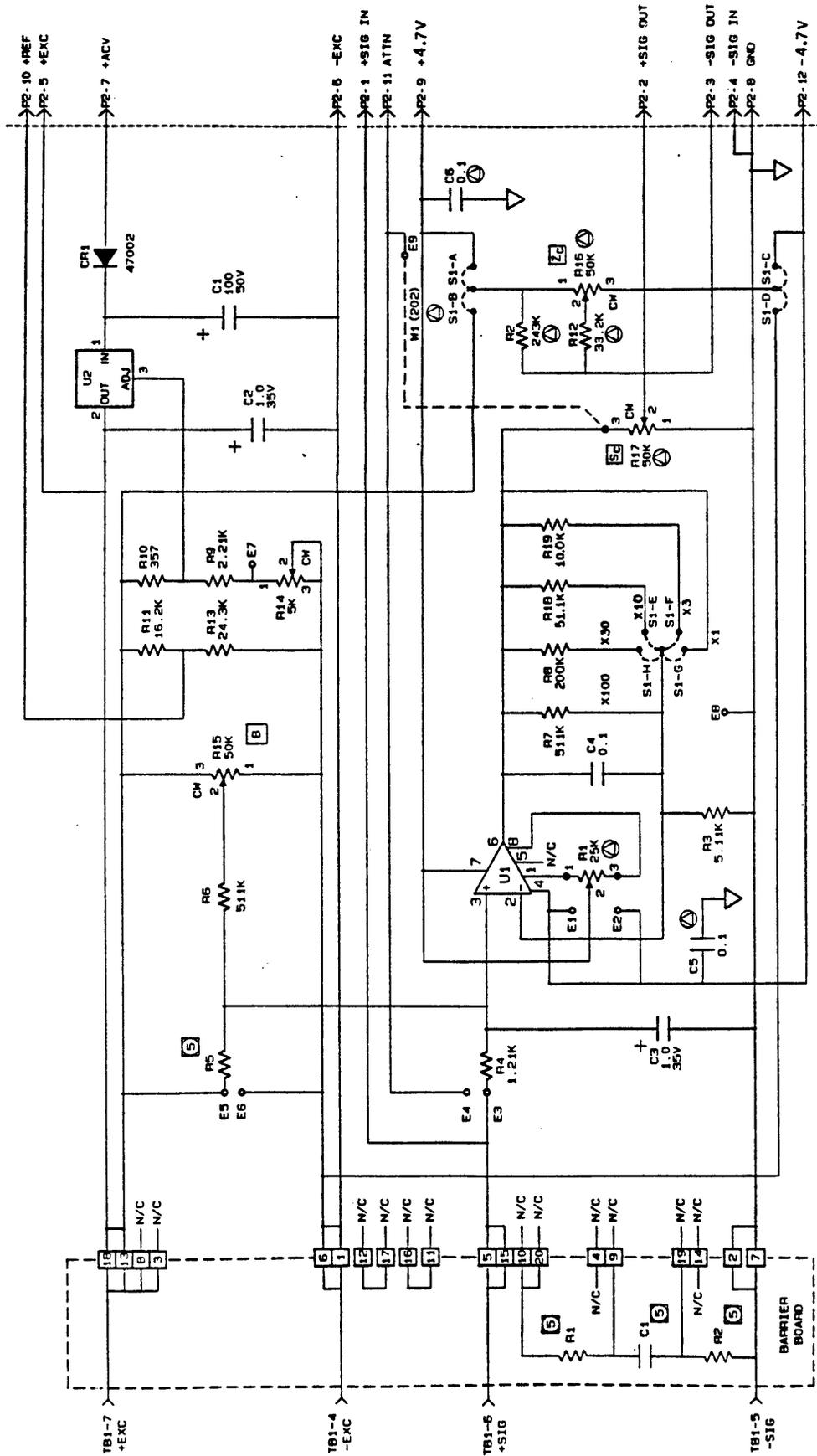


Figure 8-5 Plug-in Card Assembly -S Diagram



U2	317T	—	—	—
U1	1001	4	7	—
DESIGN	TYPE	-5V	+5V	GND

Figure 8-6 Plug-in Card Schematic -S Diagram

## 9.0 APPLICATION NOTES

### 9.1 Excitation Supply/Current Transmitter Interface

The following block diagrams show the proper hookup for interfacing an electrically-floating excitation supply with either a 2-wire or a 4-wire current transmitter (4-20 mA loop-powered).

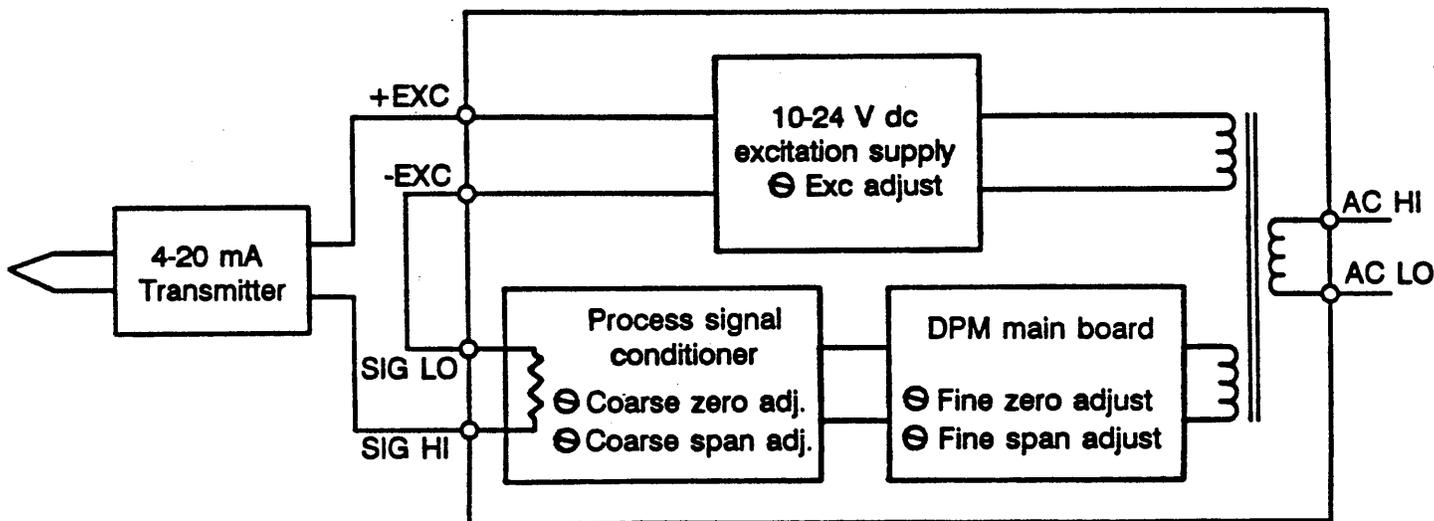
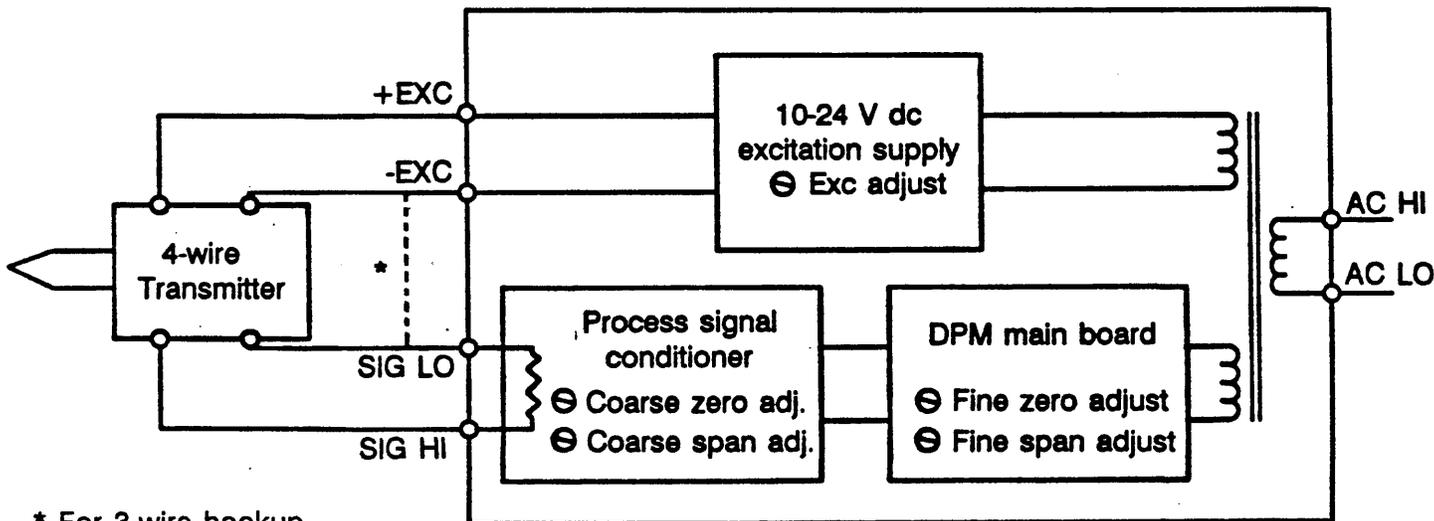


Figure 9-1 Two-wire Connection



\* For 3-wire hookup, connect -EXC to SIG LO.

Figure 9-2 Four-wire Connection

**NOTE:** For proper operation the unit must be configured for an internal absolute reference. (See Section 5.3)







## 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.

**OMEGA is pleased to offer suggestions on the use of its various products. However, OMEGA neither assumes responsibility for any omissions or errors nor assumes liability for any damages that result from the use of its products in accordance with information provided by OMEGA, either verbal or written. OMEGA warrants only that the parts manufactured by it will be as specified and free of defects. OMEGA MAKES NO OTHER WARRANTIES OR REPRESENTATIONS OF ANY KIND WHATSOEVER, EXPRESSED OR IMPLIED, EXCEPT THAT OF TITLE, AND ALL IMPLIED WARRANTIES INCLUDING ANY WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED. LIMITATION OF LIABILITY: The remedies of purchaser set forth herein are exclusive and the total liability of OMEGA with respect to this order, whether based on contract, warranty, negligence, indemnification, strict liability or otherwise, shall not exceed the purchase price of the component upon which liability is based. In no event shall OMEGA be liable for consequential, incidental or special damages.**

CONDITIONS: Equipment sold by OMEGA is not intended to be used, nor shall it be used: (1) as a "Basic Component" under 10 CFR 21 (NRC), used in or with any nuclear installation or activity; or (2) in medical applications or used on humans. Should any Product(s) be used in or with any nuclear installation or activity, medical application, used on humans, or misused in any way, OMEGA assumes no responsibility as set forth in our basic WARRANTY/DISCLAIMER language, and additionally, purchaser will indemnify OMEGA and hold OMEGA harmless from any liability or damage whatsoever arising out of the use of the Product(s) in such a manner.

## RETURN REQUESTS / INQUIRIES

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.

OMEGA is a registered trademark of OMEGA ENGINEERING, INC.

© Copyright 2003 OMEGA ENGINEERING, INC. All rights reserved. This document may not be copied, photocopied, reproduced, translated, or reduced to any electronic medium or machine-readable form, in whole or in part, without prior written consent of OMEGA ENGINEERING, INC.

# Where Do I Find Everything I Need for Process Measurement and Control? **OMEGA...Of Course!** *Shop on line at [www.omega.com](http://www.omega.com)*

## **TEMPERATURE**

- ☑ Thermocouple, RTD & Thermistor Probes, Connectors, Panels & Assemblies
- ☑ Wire: Thermocouple, RTD & Thermistor
- ☑ Calibrators & Ice Point References
- ☑ Recorders, Controllers & Process Monitors
- ☑ Infrared Pyrometers

## **PRESSURE, STRAIN AND FORCE**

- ☑ Transducers & Strain Gauges
- ☑ Load Cells & Pressure Gauges
- ☑ Displacement Transducers
- ☑ Instrumentation & Accessories

## **FLOW/LEVEL**

- ☑ Rotameters, Gas Mass Flowmeters & Flow Computers
- ☑ Air Velocity Indicators
- ☑ Turbine/Paddlewheel Systems
- ☑ Totalizers & Batch Controllers

## **pH/CONDUCTIVITY**

- ☑ pH Electrodes, Testers & Accessories
- ☑ Benchtop/Laboratory Meters
- ☑ Controllers, Calibrators, Simulators & Pumps
- ☑ Industrial pH & Conductivity Equipment

## **DATA ACQUISITION**

- ☑ Data Acquisition & Engineering Software
- ☑ Communications-Based Acquisition Systems
- ☑ Plug-in Cards for Apple, IBM & Compatibles
- ☑ Datalogging Systems
- ☑ Recorders, Printers & Plotters

## **HEATERS**

- ☑ Heating Cable
- ☑ Cartridge & Strip Heaters
- ☑ Immersion & Band Heaters
- ☑ Flexible Heaters
- ☑ Laboratory Heaters

## **ENVIRONMENTAL MONITORING AND CONTROL**

- ☑ Metering & Control Instrumentation
- ☑ Refractometers
- ☑ Pumps & Tubing
- ☑ Air, Soil & Water Monitors
- ☑ Industrial Water & Wastewater Treatment
- ☑ pH, Conductivity & Dissolved Oxygen Instruments