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WARRANTY

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and Rate Meter 1/8 DIN



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 ** OMEGAROMETER™ SERIES **
 ** DP2000H FREQUENCY/RATE **
 ** PROCESS MONITOR **

OPERATOR'S MANUAL

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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).

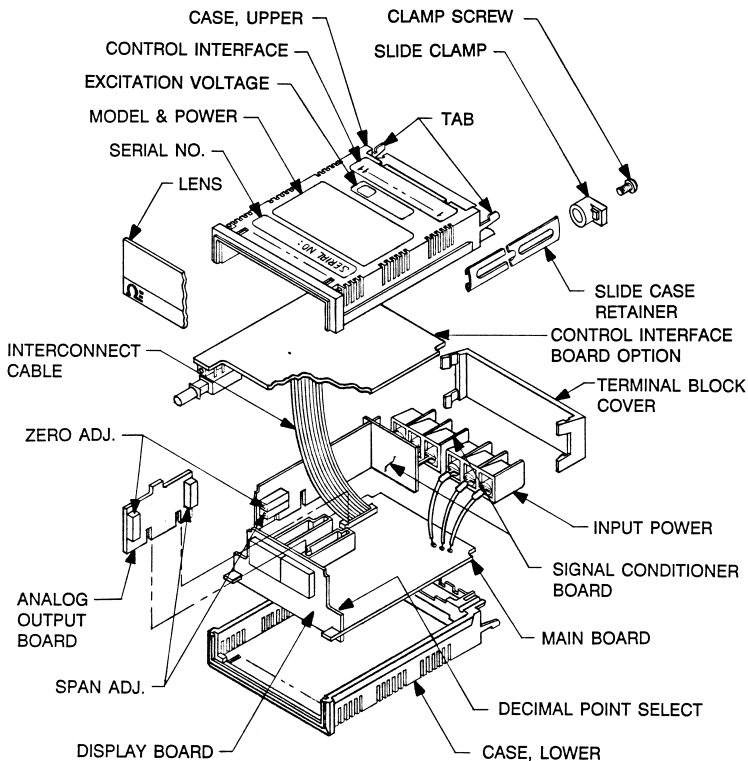


FIGURE 1 OMEGAROMETER EXPLODED VIEW

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.

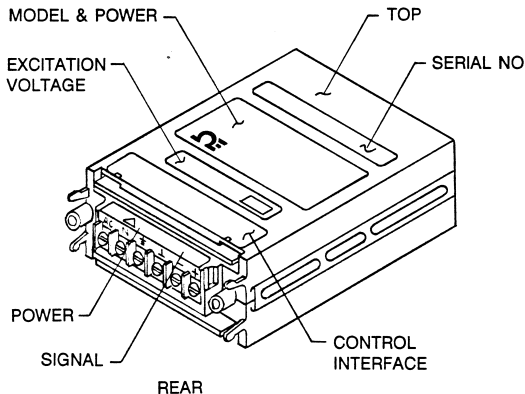
From the front of the panel, insert the meter into the panel cutout.

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)



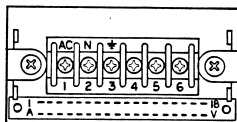
LABELS TO BE READ FROM THE REAR

FIGURE 2 LABEL PLACEMENT

3.0 POWER & SIGNAL INPUT CONNECTIONS

WARNING: Incorrect power input can damage
OMEGAROMETER PROCESS MONITOR

3.1 POWER CONNECTIONS



REAR TERMINAL VIEW

Terminal Connection

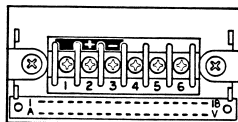
1
2
3

AC Versions

AC power HI
AC power LO (neutral)
AC power ground

Wire Color

Black
White
Green



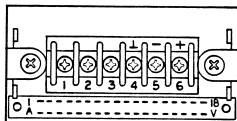
Terminal Connection

1
2
3

DC Versions

No connection
DC power +
DC power - (return)

3.2 SIGNAL INPUT CONNECTIONS



REAR TERMINAL VIEW

Terminal Connection

4
5
6

6 Terminal Versions Signal

Signal HI (ac coupled)
Signal LO
Signal HI (dc coupled)

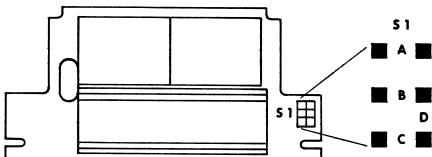
4.0 CONFIGURATION PROCEDURE

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.

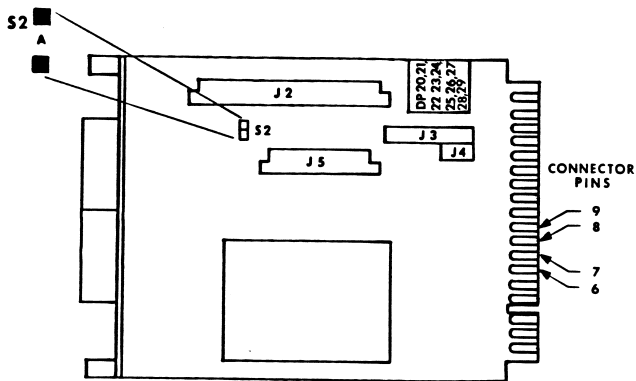
5.0 CONFIGURATION CHARTS

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



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.	
STEP 2: Remove all push-on jumpers not called out for the configuration(s) desired.	
STEP 3: Select the desired configuration from the chart below and install the push-on jumpers indicated.	
Interface Board Signal Configuration	S2
Interface Board Signal Bypass	A

6.0 TESTS & DIAGNOSTICS

6.1 TEST CONFIGURATION REQUIREMENTS

The OMEGAROMETER DP2000X 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.

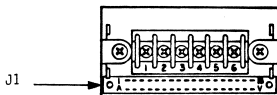
6.2 SIGNAL INPUT REQUIREMENTS

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)

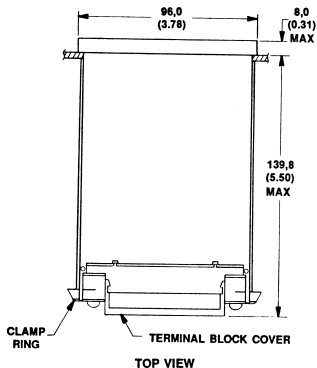
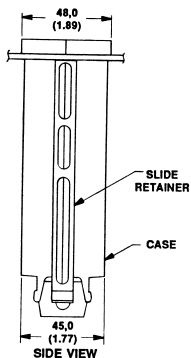
Connection	Function	
A - 1	Spare	
B	Oscillator	40 kHz
2	-8.2 V dc	Analog power
C - 3	Spare	
D	+ Pol (sign)	+ Polarity sign
4	HOLD	LED version only
E - 5	Spare	
F	Buffer	Integrator output
6	Digital Ground	
H - 7	199.9 (Decimal point)	Use with pin 6
J - 8	19.99 (Decimal point)	Use with pin 6
K - 9	1.999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



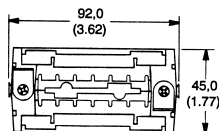
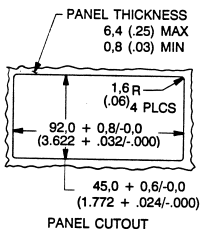
REAR TERMINAL VIEW

8.0 DRAWINGS

DIMENSIONS



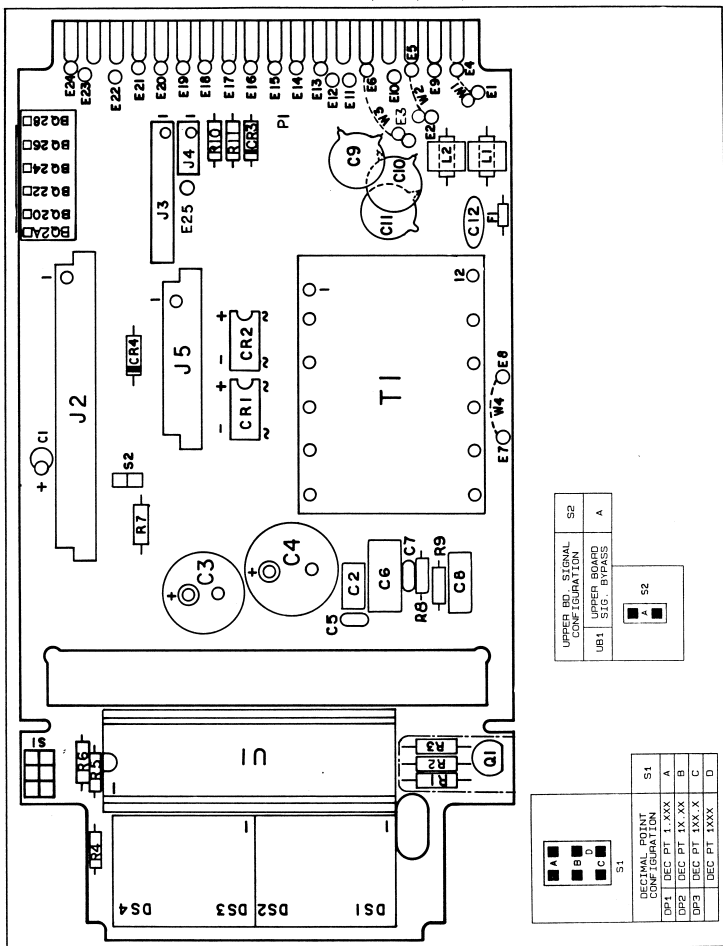
Note: Dimensions are in millimeters
 $\pm 0,25$ mm with inches in () ± 0.01 in.



REAR VIEW

Terminal block cover and bezel not shown for clarity.

Clamp rings rotated and slide retainers removed as shown for installation.

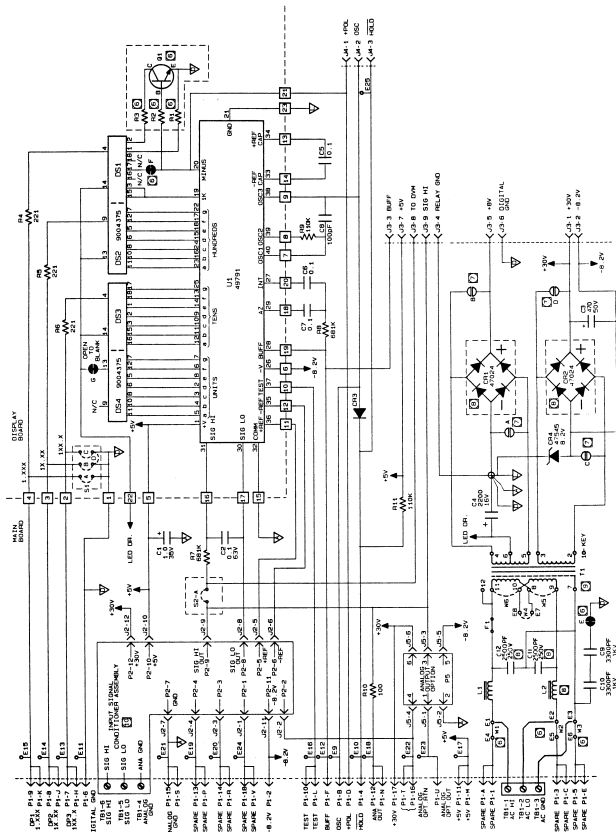


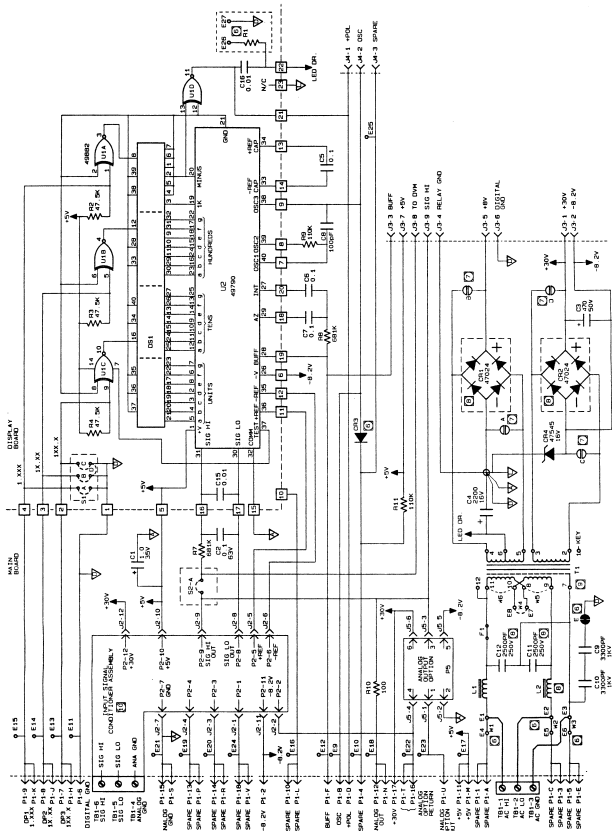
UPPER BD. SIGNAL CONFIGURATION		S2
UB1	UPPER BOARD SIG. BYPASS	A



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







9.0 SPECIFICATIONS: BSCH (DP2000H), FREQUENCY/RATE

9.1 GENERAL

This option provides scaling capability to permit a 2000 count readout for an input frequency span from 100 Hz to 20 kHz in 9 ranges: 100 to 200 Hz, 200 to 400 Hz, 400 to 800 Hz, 500 to 1000 Hz, 1000 to 2000 Hz, 2000 to 4000 Hz, 2500 to 5000 Hz, 5000 to 10,000 Hz and 10,000 to 20,000 Hz.

Formulae are given for determination of the proper input range, based on the desired input values and readout values chosen.

9.2 BSCH (DP2000H): FREQUENCY INPUT SPECIFICATIONS

Configuration

Ac and dc inputs are single-ended, meter ground common to input L0

Maximum Input

130 V RMS

Input Impedance

150 kOhm

FREQUENCY/RATE INPUTS


ORDERING CODE	MINIMUM FREQUENCY FOR 1999 COUNT (MAX. DISPLAY)	MINIMUM SIGNAL PEAK TO PEAK WITH:		DISPLAY GAIN	
		HIGH SENSITIVITY*	LOW SENSITIVITY*	MINIMUM GAIN	MAXIMUM GAIN
H1	100 to 200 Hz	15 mV P-P	125 mV P-P	10 Counts/Hz	20 Counts/Hz
H2	200 to 400 Hz			5 Counts/Hz	10 Counts/Hz
H3	400 to 800 Hz			2.5 Counts/Hz	5 Counts/Hz
H4	500 to 1000 Hz			2 Counts/Hz	2 Counts/Hz
H5	1000 to 2000 Hz			1 Count/Hz	2 Counts/Hz
H6	2000 to 4000 Hz	30 mV P-P		.5 Counts/Hz	1 Count/Hz
H7	2500 to 5000 Hz			.4 Counts/Hz	.8 Counts/Hz
H8	5000 to 10000 Hz	90 mV P-P	175 mV P-P	.2 Counts/Hz	.4 Counts/Hz
H9	10000 to 20000 Hz			.1 Counts/Hz	.2 Counts/Hz


* Sensitivity is rear-connector or internal push-on jumper selectable, high or low.

Full Scale Frequency Adjustment	Externally adjustable by potentiometer (internally by push-on jumpers)
Full Scale Frequency Range	100 Hz to 20 kHz
Common Mode	
Analog ground to ac power ground	
CMR @ dc to 60 Hz	120 dB
CMV @ dc to 60 Hz	±1500 Vp per HV test ±354 Vp per IEC spacing
Accuracy @ 25°C	
Maximum Error	±0.1% F.S. ±1 count
Reading Tempco	±0.01% R/°C
Zero Tempco	±0.1 count/°C
Warmup to Rated Accuracy	Less than 1 minute
Full Scale Step Response	3.0 seconds
Minimum Reading	100 counts (without display noise)

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

The signal input connections for the BSCH (DP2000H) Frequency/Rate Signal Conditioner are made at the standard 3-terminal barrier strip:

Terminal Connection	Signal	Input
4	Signal HI (ac coupled)	
5	Signal LO	
6	Signal HI (dc coupled)	

Terminal Connection	Signal	Input
4	Signal HI (ac coupled)	
5	Signal LO	
6	Signal HI (dc coupled)	

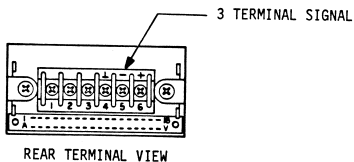


FIGURE 1 SIGNAL INPUT CONNECTIONS

11.0 TESTS AND DIAGNOSTICS

The signal conditioner board BSCH (DP2000H) 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 BSCH (DP2000H) signal conditioner.

Operating power and connections for your configuration are identified in the Main Assembly Section 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:

Short terminals 4, 5 and 6 on barrier strip (TB1). Apply proper power for your configuration to terminals 1, 2 and 3 on barrier strip (TB1). Display will read approximately zero (0000).

12.0 CONFIGURATION PROCEDURE

12.1 GENERAL

This procedure is used to determine the configuration of the OMEGAROMETER DP2000H-Frequency/Rate Option (BSCH).

The meter 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 configuration charts.

12.2 GLOSSARY

The following terms and their definitions appear throughout this procedure:

HS1 Low Sensitivity

HS2 High Sensitivity

H1 100/200 Hz

H2 200/400 Hz

H3 400/800 Hz

H4 500/1000 Hz

H5 1 k/2 kHz

H6 2 k/4 kHz

H7 2.5 k/5 kHz

H8 5 k/10 kHz

H9 10 k/20 kHz

12.3 SELECTION

12.3.1 Sensitivity Selection (HS1,2)

Standard units will be configured as a HS1 (Low Sensitivity). If high sensitivity is desired, then HS2 should be selected.

12.3.2 Full Scale Frequency Range Selection (H1-9)

Determine the customer's maximum input frequency (F) in Hertz.

F = _____

Determine the customer's desired display reading (R0) for the frequency given above.

R = _____

Determine the full-scale input frequency range number (RN).

$$RN = F \times \frac{2000}{R}$$

RN = _____

Select the required full-scale frequency range where the full-scale input frequency range number (RN) falls between the upper and lower limits of that range.

H1 = 100/200 Hz H6 = 2 kHz/4 kHz

H2 = 200/400 Hz H7 = 2.5 kHz/5 kHz

H3 = 400/800 Hz H8 = 5 kHz/10 kHz

H4 = 500 Hz/1 kHz H9 = 10 kHz/20 kHz

H5 = 1 kHz/2 kHz

Frequency/Rate Range = _____

Proceed to Installation (Section 12.4).

12.4 INSTALLATION

12.4.1 General

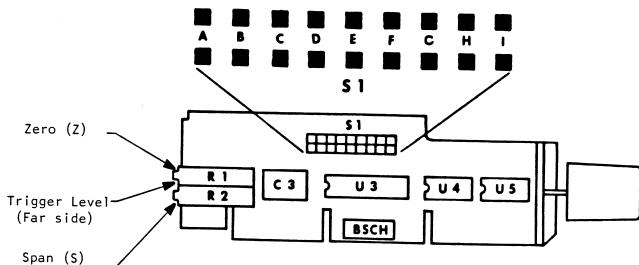
Select the sensitivity (HS1,2) and Frequency Range (H1-9), required and install the push-on jumpers per Section 13.0. depending upon which range is required.

12.4.2 Decimal Point

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

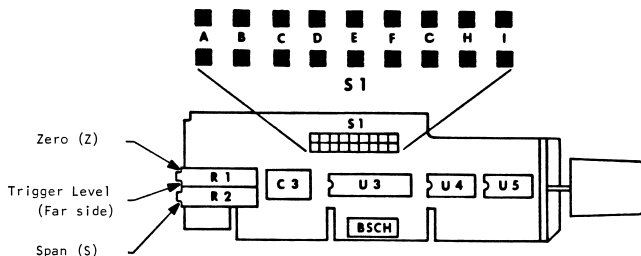
13.0 CONFIGURATION CHARTS

SENSITIVITY (HS1, 2)



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.			
Sensitivity Level		S1	Used On
HS1	100 mV (Low)	-	DP2000H
HS2	10 mV (High)	A	DP2000H

FREQUENCY RANGE
(H1-9)



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.

Frequency Range Configuration		S1		Used On
H1	100/200 Hz	B	I	DP2000H
H2	200/400 Hz	B	H	DP2000H
H3	400/800 Hz	C	H	DP2000H
H4	500/1 kHz	B	G	DP2000H
H5	1 k/2 kHz	B	F	DP2000H
H6	2 k/4 kHz	C	F	DP2000H
H7	2.5 k/5 kHz	D	G	DP2000H
H8	5 k/10 kHz	D	F	DP2000H
H9	10 k/20 kHz	E	F	DP2000H

14.0 CALIBRATION

14.1 FREQUENCY RANGES (H1-9)

Apply an input frequency equal to zero display reading and adjust R1 for zero display reading.

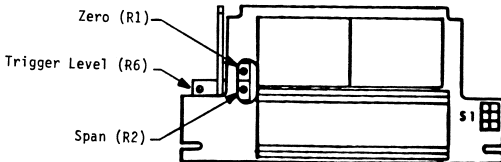
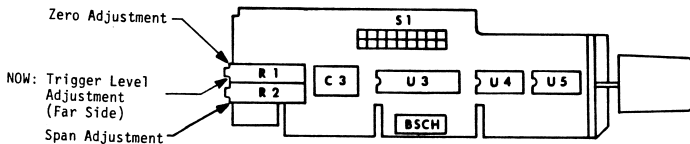
Apply an input frequency equal to the Full-Scale Frequency (F).

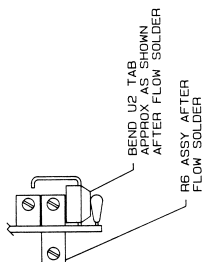
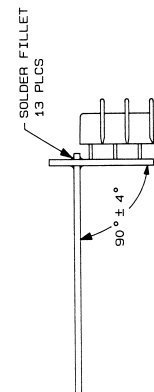
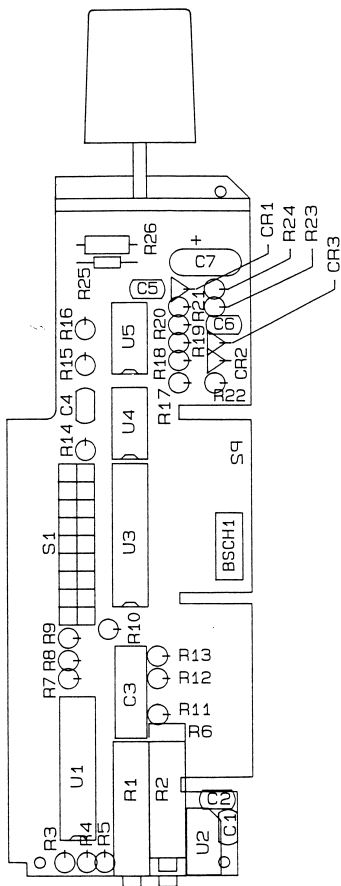
Adjust R2 to read the desired Display Reading (R) for the maximum input frequency ± 1 count.

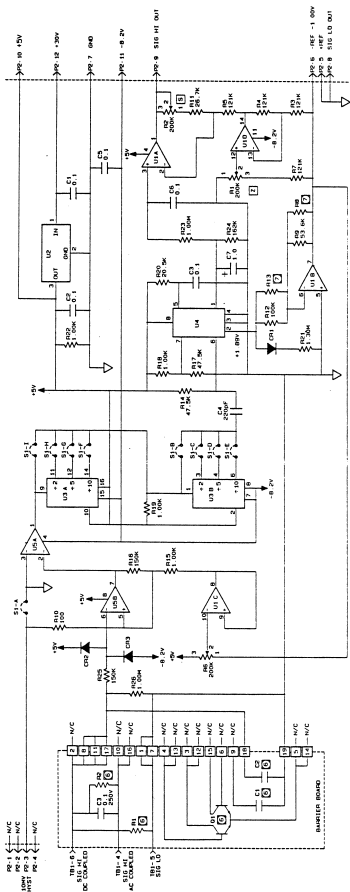
14.2 TRIGGER LEVEL ADJUSTMENT

Use only if input signal does not trigger display.

R1 front panel trigger level adjustment is now the zero adjustment. The trigger level adjustment (R1) is R6, which is available at the left of R2. The trigger level is preset to approximately zero V dc.







U5	353	8	4	3
U4	331	8	—	3, 4
U3	451B	10, 16	7, 8	—
U2	78M05	3	—	2
U1	444	4	11	5
DESIG	TYPE	+5V	-8, 2V	GND

INTERNAL HYSTERESIS CONF. CONFIGURATION		FREQUENCY RANGE CONFIGURATION		S1	
HS1	100mV HYSTERESIS	FR1	100-200 Hz	B	I
HS2	10mV HYSTERESIS	FR2	200-400 Hz	B	H
		FR3	400-800 Hz	C	H
		FR4	500-1K	B	G
		FR5	1K-2K	B	F
		FR6	2K-4K	HZ	C
		FR7	2.5K-5K	HZ	D
		FR8	5K-10K	HZ	D
		FR9	10K-20K	HZ	E

☐ I
☐ H
☐ G
☐ F
☐ E
☐ D
☒ C
☐ B
☐ A

```

*****
*                                     *
*  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.

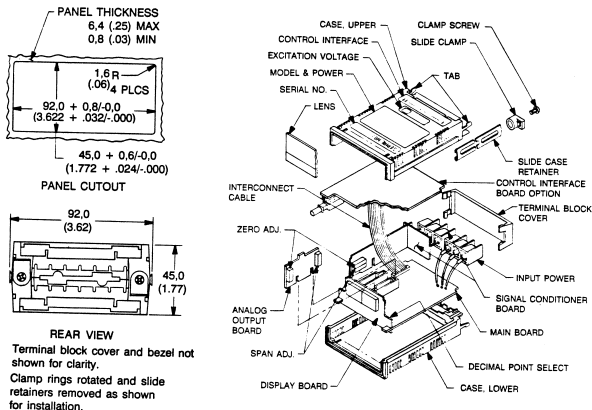


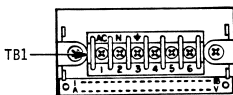
FIGURE 1 PANEL CUTOUT DIMENSIONS AND INSTALLATION

16.3 POWER REQUIREMENTS AND CONNECTIONS (TB1)

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

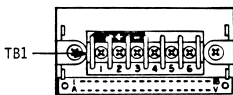
Models	Power Requirements
DP20XXX and DP21XXX	120 V ac (50-60 Hz)
DP22XXX and DP23XXX	240 V ac (50-60 Hz)
DP24XXX and DP25XXX	9-32 V dc
DP26XXX and DP27XXX	5 V dc
DP28XXX and DP29XXX	24 V ac (50-60 Hz)

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



REAR TERMINAL VIEW

TB1 Terminal Connection	AC Operation	
	24 V, 120 V, 240 V	Wire Color
1	AC power HI	Black
2	AC power LO (neutral)	White
3	AC power ground	Green



TB1 Terminal Connection	DC Operation	
	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 BSCH (DP2000H) Frequency/Rate Signal Conditioner are made at the standard 3-terminal barrier strip:

Terminal Connection	Signal	Input
4	Signal HI (ac coupled)	● ——— AC
5	Signal LO	● ——— COUPLED
6	Signal HI (dc coupled)	● ———

Terminal Connection	Signal	Input
4	Signal HI (ac coupled)	● ———
5	Signal LO	● ——— DC
6	Signal HI (dc coupled)	● ——— COUPLED

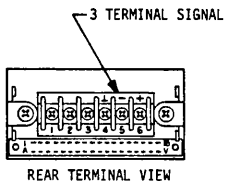


FIGURE 1 SIGNAL INPUT CONNECTIONS

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's 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 malfunctions, 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 having been 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 in which wear is not warranted, include but are 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 the company 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. Purchase Order 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. Purchase Order number to cover the COST of the repair,
2. Model and serial number of the 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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