LA1/LA2/LP1/LP2
LOAD CELL CONDITIONER OPTION

08229ML-01

CHG	ECO NO	DATE	BY	CHK
F	8198	16AUG94	MG	

TABLE OF CONTENTS

1.0 DESCRIPTION

1.1 GENERAL

The Load Cell Conditioner option, LA1, is available for the Models 204B, 2003B and 2004 digital panel voltmeters. A lower cost all metal film resistor version, LA2, is available for the Model 204B.

The Load Cell Conditioner option is contained on a 3.4" x 4.7" x 0.62" upper PCB which is powered by its own 115 V ac or 230 V ac regulated power supply. The Load Cell Conditioner option contains a bridge-excitation power supply which can be field-configured for 5 V, 10 V, or 15 V output. The reference voltage used to drive the host DPM is derived from a resistive divider connected to the ±sense inputs. The host DPM must have the HZ option installed and a range equal to 2 or 4 V.

The Load Cell Conditioner option contains a true-differential input preamplifier which can be field-configured for gains of 20 to 800 in 3% steps; one of 125 overlapping gain ranges through the use of shorting jumpers. The coarse-gain network contains ten 1% MF resistors and four 0.1% WW resistors; the fine-gain network contains three 1% MF resistors and five 0.1% WW resistors; upper/lower limits will change with the tolerances of these resistors. If the gain tempco must be less than 20 ppm/^{o}C, a ±0.1%, 1/8 W, 5 ppm/^{o}C WW resistor must be installed at R14 in lieu of jumpers W6-W15.

Fine-Deadload and Fine-Gain adjustments are easily accessible behind the front lens and a push-to-cal switch is provided.

The calibration shunt resistor is customer-supplied and can be installed at R4 on the PCB or connected from pins 9, 10, and K (-SENSE) to Pin 12 at the connector (RB).

The customer can accommodate $\leq$60% deadload by connecting the appropriate value 0.1%, 1/8 W, 5 ppm/^{o}C wirewound resistor from Pin 7 (SHIN) to Pins 9, 10, and K (-SENSE) at the connector.

An appropriate value 1%, 1/8W, 25 ppm/^{o}C metal film resistor (RN55E or equivalent) can be installed at R3 on the PCB or connected from Pin 7 (SHIN) to pin 8 at the connector (RC) to provide a ±3% fine deadload adjustment using R42.

In addition, the input-offset adjustment of the host DPM can be used as a fine zero adjustment.

A two-pole active filter is standard which can be factory-configured for an optional analog peak reader. If push-to-cal operation is not required, the switch may be used as the analog peak-reader reset by closing solder-switch 'A'.

Inputs and outputs to the Load Cell Conditioner option are made through J2, a 36-pin card-edge connector.

1.2 SPECIFICATIONS

1.2.1 Preamplifier

INPUT BIAS CURRENT [1]	11 nA typ (22 nA max)
INPUT OFFSET CURRENT (TYP) [2]	0.2 nA
COARSE GAIN RANGE [9] [3]	20-800
FINE GAIN ADJ. RANGE	±3% (R43-20t)
AMPLIFIER OUTPUT SWING [7]	-0.5 V to +4.0 V
DEADLOAD OFFSET-COARSE [4] [5]	$\leq$ 60%
DEADLOAD OFFSET-FINE [4] [6]	±3% (R42-20t)
RTI ZERO TEMPCO (TYP) [7]	±0.3 uV/^{o}C
RTO ZERO TEMPCO (TYP) [10] [8]	±0.6 uV/^{o}C
GAIN TEMPCO (TYP) [3]	±20 ppm/^{o}C
ACTIVE 2-POLE FILTER FREQ	2.1Hz @ 40 dB/DEC
WARM-UP TIME	1 hour
CMR, 50 Hz OR 60 Hz (MIN)	(Coarse Gain) x1000
NMR, 50 Hz or 60 Hz	50 dB min

[1] Typical LM394CH B when Ic = 2.5 uA is 230; min B when Ic = 2.5 uA = 115.

[2] Typical LM394CH B match is 1.7% when Ic = 2.5 uA.

[3] Provided by an internal coarse-gain configuration array using ten 1% 50 ppm/^{o}C MF resistors. Customer must eventually select a 0.1% 5 ppm/^{o}C WW resistor installed at R14 for rated tempco stability.

[4] Customer supplied.

[5] Connector mounted (RA).

[6] Internally installed at R3 or connector mounted (RC).

[7] Referred to SHOUTUNF, pin C.

[8] Referred to SHOUTF, pin 3.

[9] Gain is limited to 100 when used with the 2003B/2004.

[10] The preamplifier has been designed for use with balanced load cells. With this configuration, the common mode voltage (CMV)=0 The CMV is defined as the difference between the midpoint of the two signal input lines and the midpoint of the ±EXCITATION (or ± SENSE when IR losses are present). If an unbalanced load cell is used, this CMV is not zero and the RTO tempco specification may be significantly degraded. The following formula may be used to calculate RTO tempco as a function of CMV:

RTO tempco = ± (CMV x 5 uV) /^{o}C

1.2.2 Gain

The preamplifier may be configured for one of 125 overlapping gain ranges through the use of shorting jumpers. The jumper positions are silkscreened on the PCB and correspond to the following gain ranges:

Nominal Gain Range	W6	W7	W8	W9	W10	W11	W12	W13	W14	W15
19.0 - 20.2	0	0	1	0	1	0	0	0	0	0
19.8 - 21.0	1	0	1	0	1	0	0	0	0	0
20.6 - 21.8	0	1	1	0	1	0	0	0	0	0
21.3 - 22.6	1	1	1	0	1	0	0	0	0	0
22.1 - 23.4	0	0	0	1	1	0	0	0	0	0
22.8 - 24.2	1	0	0	1	1	0	0	0	0	0
23.6 - 25.0	0	1	0	1	1	0	0	0	0	0
24.3 - 25.8	1	1	0	1	1	0	0	0	0	0
25.1 - 26.7	0	0	1	1	1	0	0	0	0	0
25.9 - 27.5	1	0	1	1	1	0	0	0	0	0
26.6 - 28.3	0	1	1	1	1	0	0	0	0	0
27.4 - 29.1	1	1	1	1	1	0	0	0	0	0
28.1 - 29.9	0	0	0	0	0	1	0	0	0	0
28.9 - 30.7	1	0	0	0	0	1	0	0	0	0
29.6 - 31.5	0	1	0	0	0	1	0	0	0	0
30.4 - 32.3	1	1	0	0	0	1	0	0	0	0
31.2 - 33.1	0	0	1	0	0	1	0	0	0	0
31.9 - 33.9	1	0	1	0	0	1	0	0	0	0
32.7 - 34.7	0	1	1	0	0	1	0	0	0	0
33.4 - 35.5	1	1	1	0	0	1	0	0	0	0
34.2 - 36.3	0	0	0	1	0	1	0	0	0	0
35.0 - 37.1	1	0	0	1	0	1	0	0	0	0

Nominal Gain Range	W6	W7	W8	W9	W10	W11	W12	W13	W14	W15
35.7 - 37.9	0	1	0	1	0	1	0	0	0	0
36.5 - 38.7	1	1	0	1	0	1	0	0	0	0
37.2 - 39.5	0	0	1	1	0	1	0	0	0	0
38.0 - 40.3	1	0	1	1	0	1	0	0	0	0
38.7 - 41.1	0	1	1	1	0	1	0	0	0	0
40.3 - 42.7	0	0	0	0	1	1	0	0	0	0
41.8 - 44.4	0	1	0	0	1	1	0	0	0	0
43.3 - 46.0	0	0	1	0	1	1	0	0	0	0
44.0 - 46.8	1	0	1	0	1	1	0	0	0	0
45.6 - 48.4	1	1	1	0	1	1	0	0	0	0
47.1 - 50.0	1	0	0	1	1	1	0	0	0	0
48.6 - 51.6	1	1	0	1	1	1	0	0	0	0
50.1 - 53.2	1	0	1	1	1	1	0	0	0	0
51.6 - 54.8	1	1	1	1	1	1	0	0	0	0
53.1 - 56.4	1	0	0	0	0	0	1	0	0	0
54.7 - 58.0	1	1	0	0	0	0	1	0	0	0
56.2 - 59.6	1	0	1	0	0	0	1	0	0	0
58.4 - 62.1	0	0	0	1	0	0	1	0	0	0
60.0 - 63.7	0	1	0	1	0	0	1	0	0	0
62.2 - 66.1	1	0	1	1	0	0	1	0	0	0
63.7 - 67.7	1	1	1	1	0	0	1	0	0	0
66.0 - 70.1	0	1	0	0	1	0	1	0	0	0
67.5 - 71.7	0	0	1	0	1	0	1	0	0	0
69.8 - 74.1	1	1	1	0	1	0	1	0	0	0

Nominal Gain Range	W6	W7	W8	W9	W10	W11	W12	W13	W14	W15
72.1 - 76.5	0	1	0	1	1	0	1	0	0	0
74.4 - 79.0	1	0	1	1	1	0	1	0	0	0
76.6 - 81.4	0	0	0	0	0	1	1	0	0	0
78.9 - 83.8	1	1	0	0	0	1	1	0	0	0
81.2 - 86.2	0	1	1	0	0	1	1	0	0	0
84.2 - 89.4	0	1	0	1	0	1	1	0	0	0
86.5 - 91.8	1	0	1	1	0	1	1	0	0	0
89.5 - 95.0	1	0	0	0	1	1	1	0	0	0
91.8 - 97.5	0	0	1	0	1	1	1	0	0	0
94.8 - 100.7	0	0	0	1	1	1	1	0	0	0
97.8 - 103.9	0	0	1	1	1	1	1	0	0	0
100.9 - 107.1	0	0	0	0	0	0	0	1	0	0
103.9 - 110.3	0	0	1	0	0	0	0	1	0	0
106.9 - 113.6	0	0	0	1	0	0	0	1	0	0
110.7 - 117.6	1	0	1	1	0	0	0	1	0	0
113.8 - 120.8	1	0	0	0	1	0	0	1	0	0
117.6 - 124.8	0	1	1	0	1	0	0	1	0	0
121.3 - 128.8	1	1	0	1	1	0	0	1	0	0
125.1 - 132.9	0	0	0	0	0	1	0	1	0	0
128.9 - 136.9	1	0	1	0	0	1	0	1	0	0
132.7 - 140.9	0	1	0	1	0	1	0	1	0	0
136.5 - 144.9	1	1	1	1	0	1	0	1	0	0
141.0 - 149.8	1	0	1	0	1	1	0	1	0	0
145.6 - 154.6	1	1	0	1	1	1	0	1	0	0
150.1 - 159.4	1	0	0	0	0	0	1	1	0	0

Nominal Gain Range	W6	W7	W8	W9	W10	W11	W12	W13	W14	W15
154.7 - 164.3	1	1	1	0	0	0	1	1	0	0
159.2 - 169.1	1	0	1	1	0	0	1	1	0	0
163.8 - 173.9	1	1	0	0	1	0	1	1	0	0
169.1 - 179.5	0	1	0	1	1	0	1	1	0	0
174.4 - 185.2	1	0	0	0	0	1	1	1	0	0
179.7 - 190.8	0	0	0	1	0	1	1	1	0	0
185.8 - 197.2	0	0	0	0	1	1	1	1	0	0
191.1 - 202.9	1	1	1	0	1	1	1	1	0	0
197.1 - 209.3	1	1	1	1	1	1	1	1	0	0
203.2 - 215.8	1	1	1	0	0	0	0	0	1	0
209.2 - 222.2	1	1	1	1	0	0	0	0	1	0
216.1 - 229.4	0	0	0	1	1	0	0	0	1	0
222.9 - 236.7	1	0	0	0	0	1	0	0	1	0
229.7 - 243.9	0	1	0	1	0	1	0	0	1	0
236.5 - 251.2	1	1	0	0	1	1	0	0	1	0
244.1 - 259.2	1	0	1	1	1	1	0	0	1	0
251.7 - 267.3	1	1	1	0	0	0	1	0	1	0
259.3 - 275.3	1	0	0	0	1	0	1	0	1	0
266.8 - 283.3	1	1	0	1	1	0	1	0	1	0
275.2 - 292.2	0	1	1	0	0	1	1	0	1	0
284.3 - 301.9	0	1	0	0	1	1	1	0	1	0
292.6 - 310.7	1	0	1	1	1	1	1	0	1	0

Nominal Gain Range	W6	W7	W8	W9	W10	W11	W12	W13	W14	W15
301.7 - 320.4	1	0	0	1	0	0	0	1	1	0
311.6 - 330.8	0	1	1	0	1	0	0	1	1	0
320.6 - 340.5	0	1	0	0	0	1	0	1	1	0
330.5 - 350.9	1	1	1	1	0	1	0	1	1	0
341.1 - 362.2	1	0	1	1	1	1	0	1	1	0
351.7 - 373.5	1	1	0	1	0	0	1	1	1	0
362.3 - 384.7	1	0	0	1	1	0	1	1	1	0
373.7 - 396.8	0	0	0	1	0	1	1	1	1	0
385.1 - 408.9	1	1	1	0	1	1	1	1	1	0
397.2 - 421.8	1	1	1	0	0	0	0	0	0	1
409.3 - 434.6	1	1	1	0	1	0	0	0	0	1
422.2 - 448.3	0	0	0	1	0	1	0	0	0	1
435.1 - 462.0	1	0	0	1	1	1	0	0	0	1
448.7 - 476.5	1	1	0	1	0	0	1	0	0	1
462.4 - 491.0	1	0	1	1	1	0	1	0	0	1
476.8 - 506.2	0	0	0	0	1	1	1	0	0	1
491.2 - 521.5	1	1	0	0	0	0	0	1	0	1
506.3 - 537.6	1	1	1	0	1	0	0	1	0	1
522.2 - 554.5	0	0	1	1	0	1	0	1	0	1
538.1 - 571.4	1	0	0	0	0	0	1	1	0	1
555.6 - 589.9	0	0	0	1	1	0	1	1	0	1
572.2 - 607.6	0	1	1	1	0	1	1	1	0	1

Nominal Gain Range	W6	W7	W8	W9	W10	W11	W12	W13	W14	W15
589.7 - 626.1	1	0	1	0	0	0	0	0	1	1
607.9 - 645.5	1	0	1	1	1	0	0	0	1	1
626.8 - 665.6	0	1	1	0	1	1	0	0	1	1
646.5 - 686.5	0	0	0	0	1	0	1	0	1	1
666.2 - 707.4	0	1	0	1	0	1	1	0	1	1
687.4 - 729.9	0	1	1	0	0	0	0	1	1	1
707.9 - 751.7	1	0	0	0	0	1	0	1	1	1
729.9 - 775.0	0	1	1	1	1	1	0	1	1	1
752.6 - 799.2	0	0	1	1	1	0	1	1	1	1
776.1 - 824.1	1	1	0	1	1	1	1	1	1	1

0 = Jumper not installed.
1 = Jumper installed.

NOTE: The coarse-gain network contains ten 1% MF resistors and four 0.1% WW resistors; the fine-gain network contains three 1% MF resistors and five 0.1% WW resistors; upper/lower limits will change with the tolerances of these resistors.

The configuration of jumpers W15 through W6 correspond to a 10-bit binary word (where W15 = 2^9 through W6 = 2^0) equivalent to N, where N is a number from 20 to 1019. N can be determined from the following equation:

$$N = \text{integer } (1.28x(\text{required gain}-1)-3.82)$$

or

$$A = \frac{N+5.1}{1.28}$$

If the gain tempco must be less than 20 ppm/°C, a ±0.1%, 1/8W, 5ppm/°C WW resistor must be installed at R14 in lieu of jumpers W6-W15. The value of R14 can be determined from the following equation:

$$R14 = \frac{76,800}{1.28x(\text{required gain}-1)-3.82} = \frac{76,800}{N}$$

1.2.3 Excitation

The excitation voltage is provided by a three-terminal LM317T adjustable regulator. The following jumpers must be installed to configure the excitation voltage:

EXCITATION V	W4	W5
5 V	0	1
10 V	1	0
15 V	0	0

0 = Jumper not installed.
1 = Jumper installed.

NOMINAL SPECIFICATION VOLTAGE	5 V	10 V	15 V
NOMINAL DESIGN VOLTAGE (1)	5.029 V	9.975 V	15.118 V
WORST-CASE MAX VOLTAGE (1)	5.344 V	10.638 V	16.142
WORST-CASE MIN VOLTAGE (1)	4.758 V	9.415 V	14.256 V
ACCURACY	+6.9%,-4.8%	+6.4%,-5.9%	+7.6%,-5.0%
TEMPCO (TYP)	±0.01%/°C		
LINE REGULATION (TYP)	±0.01%/V		
SENSE LEAD CURRENT IN uA (TYP)	328	656	984
MINIMUM LOAD CELL RESISTANCE	40 Ω	85 Ω	225 Ω
BRIDGE CONNECTIONS	6-wire, remote sensing		

(1) Measured at the connector.

1.2.4 Reference

The reference voltage used to drive the host DPM is derived from a resistive divider connected to the ±SENSE inputs.

The nominal reference voltage (VREFOUT, Pin E) can be calculated using the following equation:

$$VREFOUT = \frac{(+SENSE)-(-SENSE) \times 6.8102}{34.051 \times K}$$

Where K is listed in the table below.

The following jumpers must be installed to configure the reference circuitry.

EXCITATION V	W16	W17	W18	VREFOUT	K	MODEL
5 V	0	0	1	1 V	1	2003B
10 V	0	1	0		2	2004
15 V	0	1	1		3	
5 V	1	0	1	2 V	.5	204B
10 V	1	1	0		1	
15 V	1	1	1		1.5	

0 = Jumper not installed
1 = Jumper installed

The host DPM must have the HZ option installed and a range of 2 or 4 V.

1.2.5 Deadload Compensation

The customer can accommodate $\leq 60\%$ deadload by connecting the appropriate value 0.1%, 1/8W, 5 ppm/°C wirewound resistor from Pin 7 (SHIN) to Pins 9, 10 and K (-SENSE) at the connector (RA).

An appropriate value 1%, 1/8W, 25 ppm/°C metal film resistor (RN55E or equivalent) can be installed at R3 on the PCB or connected from Pin 7 (SHIN) to Pin 8 at the connector (RC) to provide a ±3% fine deadload adjustment using R42.

In addition, the input-offset adjustment of the host DPM can be used as a fine zero adjustment.

1.2.6 Calibration Controls

1.2.6.1 Fine Gain Adjust (R43)

20 turn, accessible behind front lens, approximately ±3% of full scale range.

1.2.6.2 Fine Deadload Adjust (R42)

20 turn, accessible behind front lens, approximately ±3% of full scale range.

1.2.6.3 Zero Tempco Adjust (R17)

1 turn, factory adjustment only.

1.2.7 Power Requirements

1.2.7.1	Input Voltage	115 V ac ±10%
1.2.7.2	Frequency Range	50 to 60 Hz
1.2.7.3	Input Power	5W when excitation = 10 V with four 350 ohm load cells in parallel.
1.2.7.4	Optional Input Voltages	230 V ac ± 10%

1.2.8 Environmental

1.2.8.1	Operating Temperature	$0^{o}C$ to $50^{o}C$
1.2.8.2	Storage Temperature	$-40^{o}C$ to $85^{o}C$
1.2.8.3	Humidity	Up to 95% non-condensing at $\leq 40^{o}C$.

1.2.9 Mechanical

1.2.9.1	Weight	155 grams (5.5 oz)

2.0 RECEIVING AND INSTALLATION

2.1 UNPACKING AND INSPECTION

Your LA1/LA2 option was fully inspected and tested, then carefully packed before shipment. Unpack the option carefully and inspect it for obvious shipping damage.

2.2 STANDARD CONFIGURATION

The LA1/LA2 option is factory configured for a 350 ohm load cell with an output of 3 mV/V, 10 V excitation, preamplifier gain of 100, 2 V reference for the Model 204B and 115 V ac operation. Deadload is assumed to be zero and R3 has been selected for a ±3% fine deadload adjustment range (R3 = 976 k, ±1%, 1/8 W, metal film resistor). The jumpers installed for the standard configuration are shown in Figure 1.

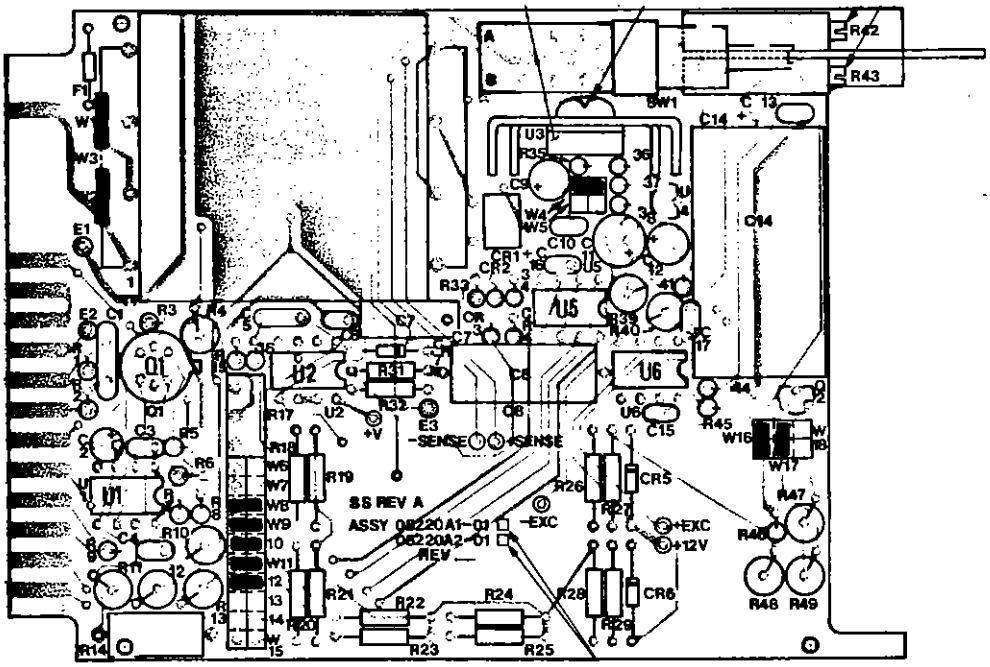


Figure 1. LA1/LA2 Standard Configuration
(W1, W2, W4, W8-W12, W16 and W17 installed)

CAUTION

The LA1/LA2 option is configured at the factory for 115 V ac. If 230 V ac operation is desired, the option must be re-configured per Figure 2. The LA1/LA2 option cannot operate with 24 or 100 V ac or 5 V dc power and hence is not compatible with a meter that is internally configured for 24 or 100 V ac or 5 V dc power operation. Check label on the meter to ensure that the meter is configured for 115 or 230 V ac power operation.

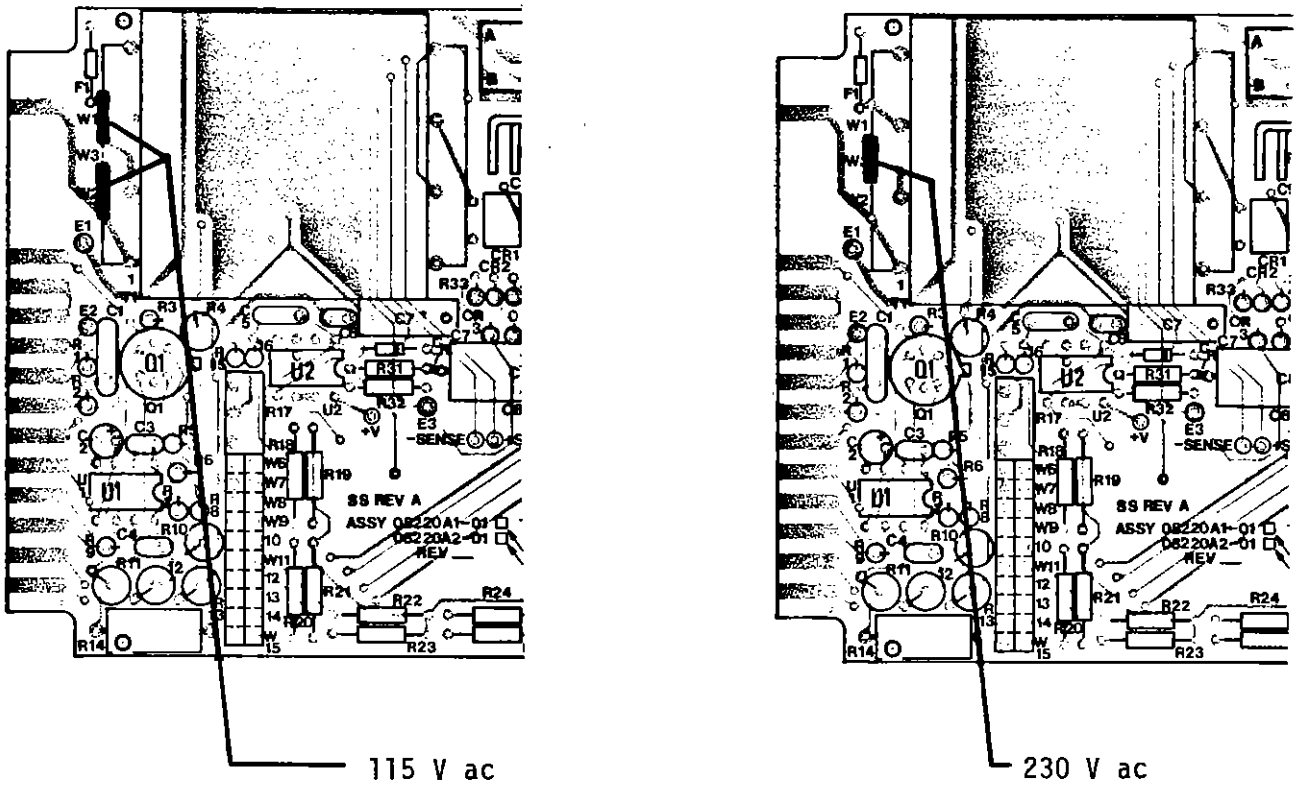


Figure 2. LA1/LA2 115 V ac/230 V ac Jumper Configurations

If the LA1/LA2 option is received assembled in a unit and the standard factory configuration is acceptable, proceed to Section 3.0 for connector wiring.

If the LA1/LA2 option is received assembled in a unit and the standard factory configuration is not acceptable, follow steps B through D of Section 2.3 removing the LA1/LA2 option from the top half of the instrument case and proceed to Section 2.4.

2.3 FIELD MODIFICATIONS - HOST DPM

A. Remove the ac power from the instrument (204B, 2003B or 2004) in which the LA1/LA2 option is to be installed.

Note: The LA2 option can only be installed in a 204B since metal film resistor stability is not compatible with the resolution of 4 1/2 or 4 3/4 digit DPVM's and there is no provision for a 1 V reference that is required for the 2003B or 2004.

B. Referring to Figure 3, loosen two #8 phillips-head screws on the rear of the instrument case and remove the two clamp rings.

C. Slide the two side rails towards the rear of the unit and remove them.

D. Remove the top half of the instrument case and the lens.

E. Carefully remove the DPVM from the bottom half of the instrument case.

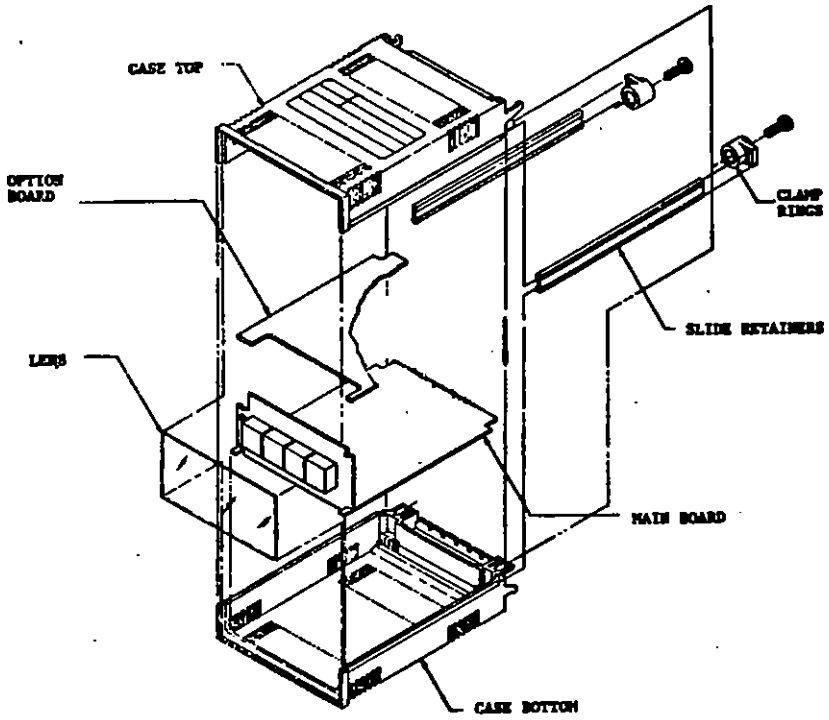


Figure 3. DPVM Exploded View

F. Modify the display board per Figure 4.

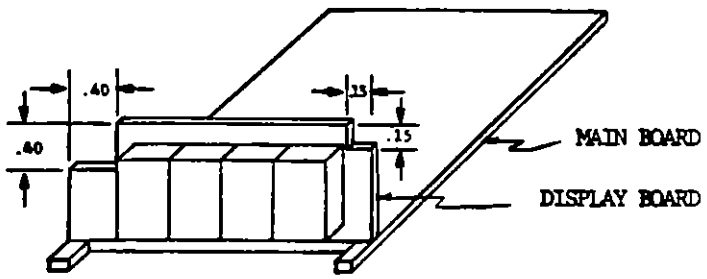


Figure 4. Display Board Modification

G. Add the HZ (high-impedance) ratio option by making the following changes to the DPVM main PCB:

204B
1. Open Solder-Switch M

2003B/2004, "B" Rev. or earlier PCB
1. Remove R36, R37, and R40
2. Close Solder-Switch U

2003B/2004, "C" Rev. or later PCB
1. Open solder-switches X and Y
2. Close solder-switch U

2.4 LOAD CELL CONFIGURATION

2.4.1 Enter the required system parameters.

A. Excitation voltage (5, 10 or 15 V): E = _____

B. Load Cell resistance in ohms: R = _____

C. Output of load cell in mV/V: VO = _____

D. Capacity of load cell in kg (lb): CAP = _____

E. Deadload in kg (lb): DL = _____

F. Maximum liveload in kg (lb): LL = _____

G. Reading in counts for LL kg (lb): FS = _____

2.4.2 Referring to Figure 5, configure the LA1/LA2 option for the required excitation voltage (reference sections 1.2.3 and 1.2.4).

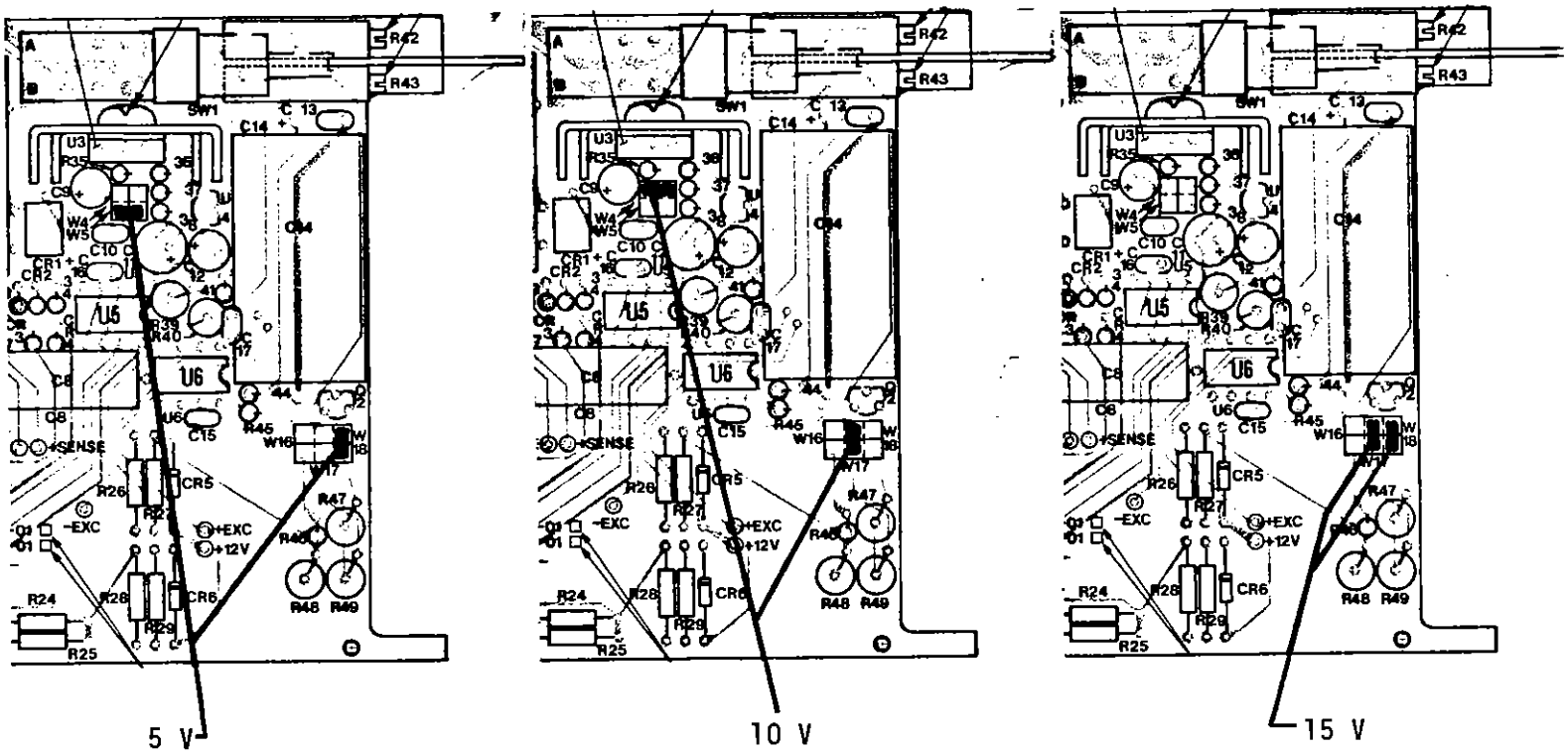


Figure 5

2.4.3 Referring to Figure 6, install W16 if the host DPVM is a 204B to obtain a 2 V reference (reference Section 1.2.4).

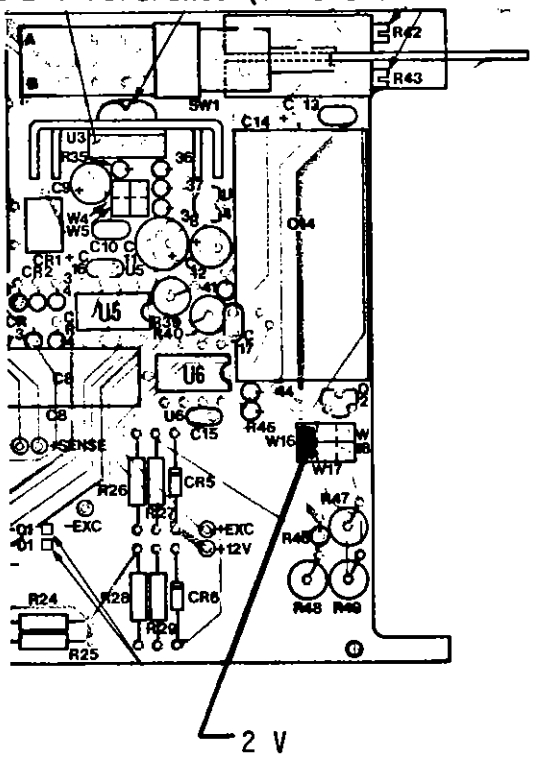


Figure 6

2.4.4 Determine the approximate preamplifier gain using the following formula:

$$GAIN = \frac{FSxCAP}{NxVOxExLL}$$

Where N = 1 if the host DPVM is a 204B or N = 10 if the host DPVM is a 2003B or 2004.

Referencing Section 1.2.2 and referring to Figure 7, install jumpers as required at locations W6-W15.

NOTE: The gain is limited to 100 if the host DPVM is a 2003B or 2004 (1uV/count).

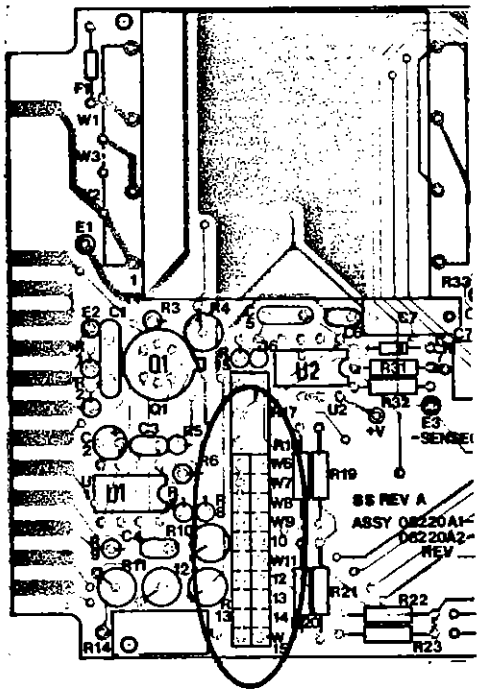


Figure 7

2.4.5 The value of R3 (or RC) in kΩ can be determined from the following formula:

$$R3 = \frac{RxCAPx8.33}{VOxLL} \quad \text{kilohms}$$

Select the closest value ±1%, 1/8 W, metal film resistor (RN55E or equivalent) and install at R3 on the PCB or connected from Pin 7 (SHIN) to Pin 8 at the connector (RC).

2.4.6 Deadload, typically the weight of the load receiving element (platform, hopper, tank, deck, etc.) is difficult to determine precisely since it also compensates for any small load cell offsets and preamplifier offsets.

The approximate value of deadload resistor RA in kΩ can be determined from the following formula:

$$\text{Deadload RA} = \frac{RxCAP}{4xVOxDL} \quad \text{kilohms}$$

Referencing Section 1.2.5, a decade resistance box or precision variable resistor should be connected at the connector so that the precise value required can be determined.

2.4.7 If a push-to-cal function is required, the approximate value of R4 (or RB) in kΩ can be determined from the following formula:

$$R4 = \frac{R \times CAP}{4xVOxLL} \quad \text{kilohms}$$

A decade resistance box or precision variable resistor should be connected at the connector so that the precise value required can be determined.

2.5 INSTALLATION

A. Reassemble the DPVM into the bottom half of the instrument case.

B. Install the LA1/LA2 option into the top half of the instrument case.

C. Replace lens, side rails, clamps and #8 screws.

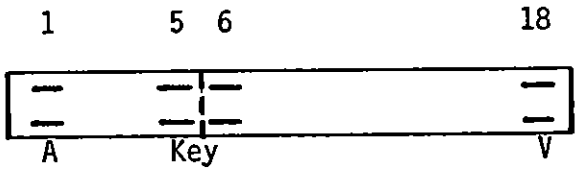
3.0 OPERATING INSTRUCTIONS

3.1 PIN ASSIGNMENTS

PIN	NAME	PIN	NAME
1	+4.75 V IN	A	DIGOUT 1
2	DIGITAL GND IN	B	DIGOUT 2
3	SHOUTF	C	SHOUTUNF
4	RESET (LP1/LP2 Option)	D	RECOUT
5	SLOUT	E	VREFOUT
6	+EXCITATION	F	-EXCITATION
7	SHIN	H	SLIN
8	R42 WIPER (Fine Deadload Adj)	J	RESET (LP1/LP2 Option)
9	-SENSE	K	-SENSE
10	-SENSE	L	+SENSE
11	+SENSE	M	+SENSE
12	EXTERNAL CAL SWITCH IN	N	EXTERNAL CALSWITCH IN
13	No Connection	P	No Connection
14	No Connection	R	No Connection
15	No Connection	S	No Connection
16	AC GND IN	T	No Connection
17	No Connection	U	AC LO IN
18	AC HI IN	V	No Connection

3.1.1 CONNECTOR TYPE

36 Pin
SAE SCC18D/1-2
ELCO 00-6007-036-450-012



J2

Connector pin orientation as viewed from the rear of the meter.

3.2 CONNECTOR WIRING

Wiring Diagram 08136WD-01 shows a typical hook-up of a load cell to a 204B, 2003B or 2004 with an LA1 or LA2 option.

A 6-wire cable with remote sensing is used to connect the load cell in a ratiometric configuration. The two wires that sense the true voltage at the load cell (±SENSE) provide the reference for the host DPVM. When the voltage at the load cell changes due to additional cable resistance or temperature, or due to changes in the excitation power suppy voltage, the reference circuit is automatically adjusted to compensate for this.

Use wire as heavy as is practical in connecting ±EXCITATION and ±SENSE. Shielded two-conductor cable should be used to connect SHIN and SLIN, the shield connected to SLOUT. Ac input wiring should be routed separately (i.e. do not tie-wrap to signal, etc. leads).

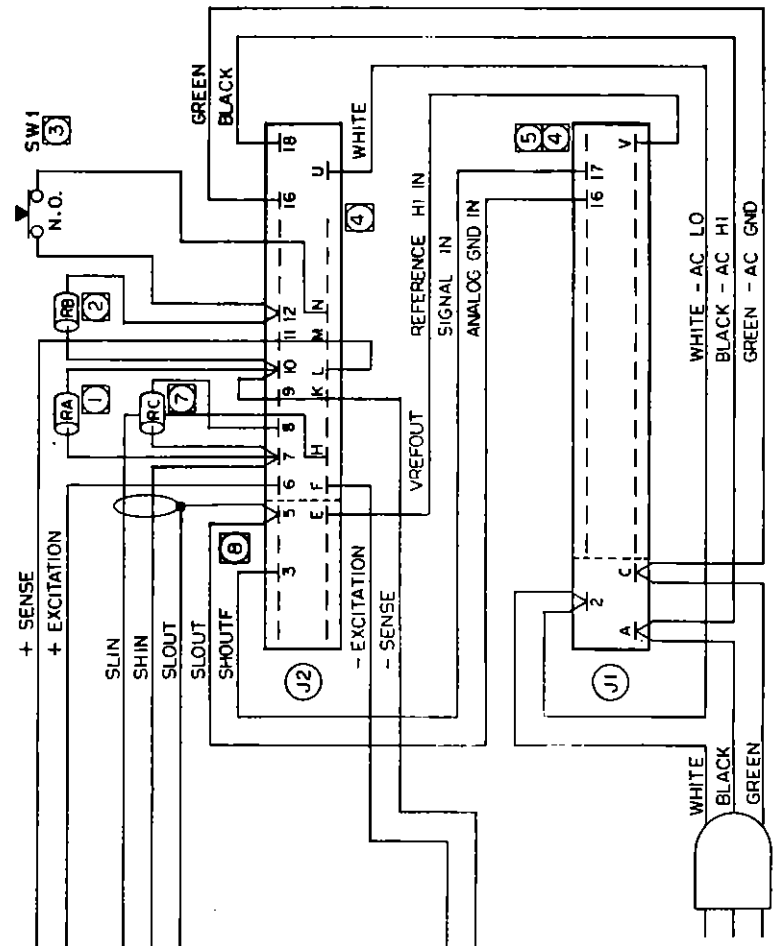
> Since the output swing of the preamplifier is -0.5 V to +4.0 V, the loadcell polarity indicated on Wiring Diagram 08136WD-01 must be observed for proper operation (i.e. SHIN (Pin 7) must be positive with respect to SLIN (Pin H).

After the precise value of deadload compensation resistor RA has been determined (reference sections 1.2.5 and 2.4.6), connect the appropriate value 0.1%, 1/8 W, 5 ppm/^{o}C wirewound resistor from Pin 7 (SHIN) to Pins 9, 10 and K (-SENSE) at the connector.

After the precise value of R4 (or RB) has been determined (reference section 2.4.7), install the appropriate value 0.1%, 1/8W, 5 ppm/^{o}C wirewound resistor at R4 on the PCB or connected from Pins 9, 10 and K (-SENSE) to Pin 12 (EXTERNAL CAL SWITCH IN) at the connector (RB).

If an external push-to-cal switch is required, connect the N/O (normally open) contacts to Pins N and 12 (EXTERNAL CAL SWITCH IN).

After the value of the fine deadload adjustment resistor R3 (or RC) has been determined (reference sections 1.2.5 and 2.4.5), install the appropriate value 1%, 1/8W, 25 ppm/^{o}C metal film resistor (RN55E or equivalent) at R3 on the PCB or connected from Pin 7 (SHIN) to Pin 8 at the connector (RC).



DWG NO. 08136WD-01 B

NOTES : UNLESS OTHERWISE SPECIFIED

1. RA = CUSTOMER SUPPLIED COARSE DEADLOAD TRIM RESISTOR. RESISTOR SHOULD BE A ±0.1%, 1/8W, 5 ppm/°C WIRE-WOUND FOR RATED TEMPCO STABILITY.
2. RB = CUSTOMER SUPPLIED CALIBRATION RESISTOR. RB MAY BE CONNECTOR MOUNTED AS SHOWN, OR INSTALLED INTERNALLY AT LOCATION R4. RESISTOR SHOULD BE A ±01%, 1/8W, 5ppm/°C WIRE-WOUND FOR RATED TEMPCO STABILITY.
3. REFERENCE SCHEMATIC DIAGRAM FOR ADDITIONAL DETAILS.
4. SW1 = OPTIONAL WIRING FOR REMOTELY MOUNTED 'PUSH TO CAL' SWITCH.
5. DPM MUST HAVE A 2V/4V FULL-SCALE RANGE AND AN HZ (HIGH IMPEDANCE REFERENCE INPUT) OPTION.
6. AC INPUT WIRING SHOULD BE ROUTED SEPARATELY. DO NOT TIE-WRAP TO SIGNAL, ETC, LEADS ....
7. RC = CUSTOMER SUPPLIED FINE DEADLOAD TRIM RESISTOR. RC MAY BE CONNECTOR MOUNTED AS SHOWN, OR INSTALLED INTERNALLY AT R3. RESISTOR SHOULD BE A ±1%, 1/8W, 25 ppm/°C METAL-FILM.
8. DO NOT CONNECT J2-PIN3 TO J1-PIN17 FOR LP1 OR LP2 CONFIGURATIONS. INSTEAD, CONNECT J2-PIN4 TO J1-PIN17. REFERENCE 08135WD-01 (2048)OR 08137WD-01 (2003B/2004) OR PAGE 23 OR 24 IN THE 08229ML-XX OWNERS MANUAL.

3.3 ANALOG PEAK READING OPTION

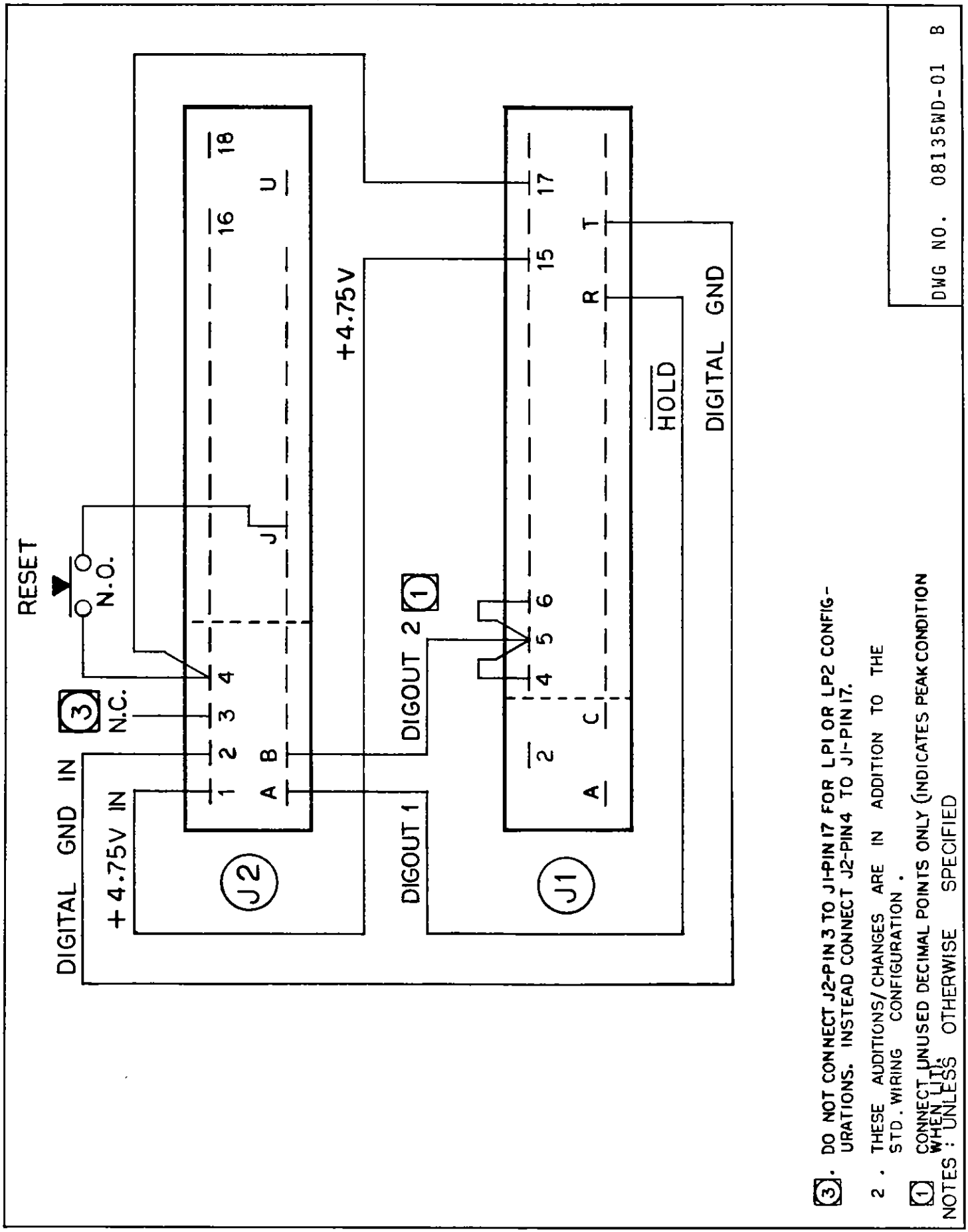
The LP1/LP2 option is the same as the LA1/LA2 option with one exception: the 2-pole active filter is replaced with an analog peak reading option. This option allows the host DPVM to track the output of the preamplifier as long as that signal is increasing but will cause the meter to hold on the last reading if the signal should decrease.

The period of time that the DPVM will remain in hold is a function of the magnitude and the rate of the signal's decrease. A step reduction of 1 mV will cause the DPVM to hold for a few seconds while a step reduction of 1 V will cause the DPVM to hold for several minutes.

If push-to-cal is not required and RB or R4 is not installed, SW1 on the LP1/LP2 option may be used to reset from a peak condition by closing solder-switch "A" on the circuit side of the LP1/LP2 option PCB. If an external reset switch is required, connect the N/O (normally open) contacts to Pin 4 (RESET) and Pin J.

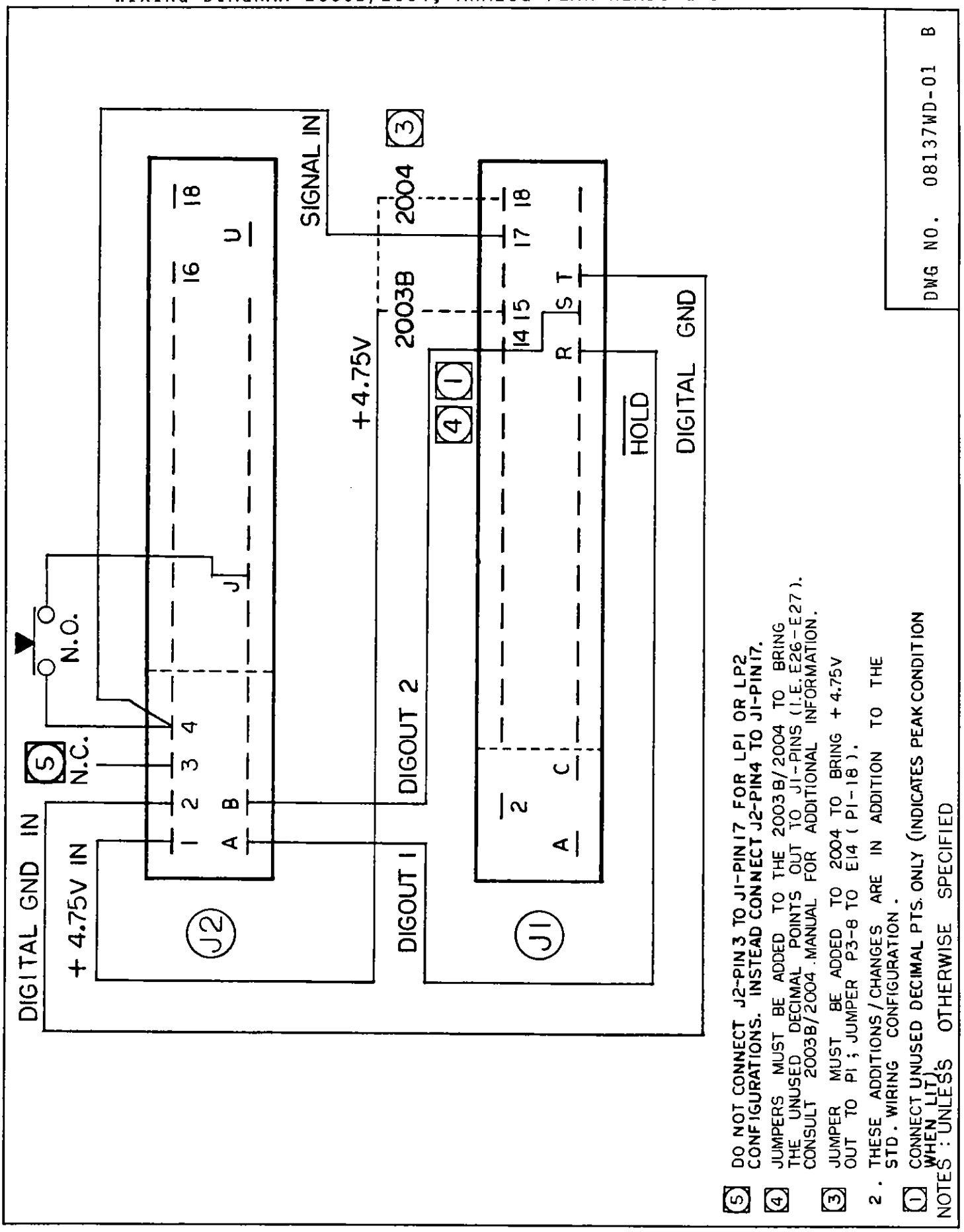
There are two digital outputs that indicate a peak condition, DIGOUT 1 (Pin A) and DIGOUT 2 (Pin B). Both of these outputs are open-collector capable of sinking 6 mA (min) and are low during a peak condition. One output must be connected to the DPVM's $\overline{\text{HOLD}}$ input (Pin R). The other can be used for operating an annunciator or similar device. Wiring Diagrams 08135WD-01 and 08137WD-01 show DIGOUT 2 connected to the DPVM's unused decimal points as one method of indicating a peak condition.

Referencing Wiring Diagram 08137WD-01, note that both the 2003B and 2004 require modification before using with the LP1 option. The LP2 option can only be installed in a 204B.



NOTES: UNLESS OTHERWISE SPECIFIED

1. CONNECT UNUSED DECIMAL POINTS ONLY (INDICATES PEAK CONDITION WHEN LIT).
2. THESE ADDITIONS/CHANGES ARE IN ADDITION TO THE STD. WIRING CONFIGURATION.
3. DO NOT CONNECT J2-PIN 3 TO J1-PIN 17 FOR LP1 OR LP2 CONFIGURATIONS. INSTEAD CONNECT J2-PIN 4 TO J1-PIN 17.



NOTES: UNLESS OTHERWISE SPECIFIED

1. CONNECT UNUSED DECIMAL PTS. ONLY (INDICATES PEAK CONDITION WHEN LIT).
2. THESE ADDITIONS/CHANGES ARE IN ADDITION TO THE STD. WIRING CONFIGURATION.

3. JUMPER MUST BE ADDED TO 2004 TO BRING +4.75V OUT TO P1; JUMPER P3-8 TO E14 (P1-18).

4. JUMPERS MUST BE ADDED TO THE 2003B/2004 TO BRING THE UNUSED DECIMAL POINTS OUT TO J1-PINS (I.E. E26-E27). CONSULT 2003B/2004 MANUAL FOR ADDITIONAL INFORMATION.

5. DO NOT CONNECT J2-PIN 3 TO J1-PIN 17 FOR LP1 OR LP2 CONFIGURATIONS. INSTEAD CONNECT J2-PIN 4 TO J1-PIN 17.

4.0 ADJUSTMENT AND CALIBRATION

A. Remove the lens from the DPVM.

B. With no load applied to the load cell, adjust FINE DEADLOAD (R42) until the DPVM dispay indicates zero (or the reading desired for no-load).

C. Apply a reference load, near full scale, to the load cell.

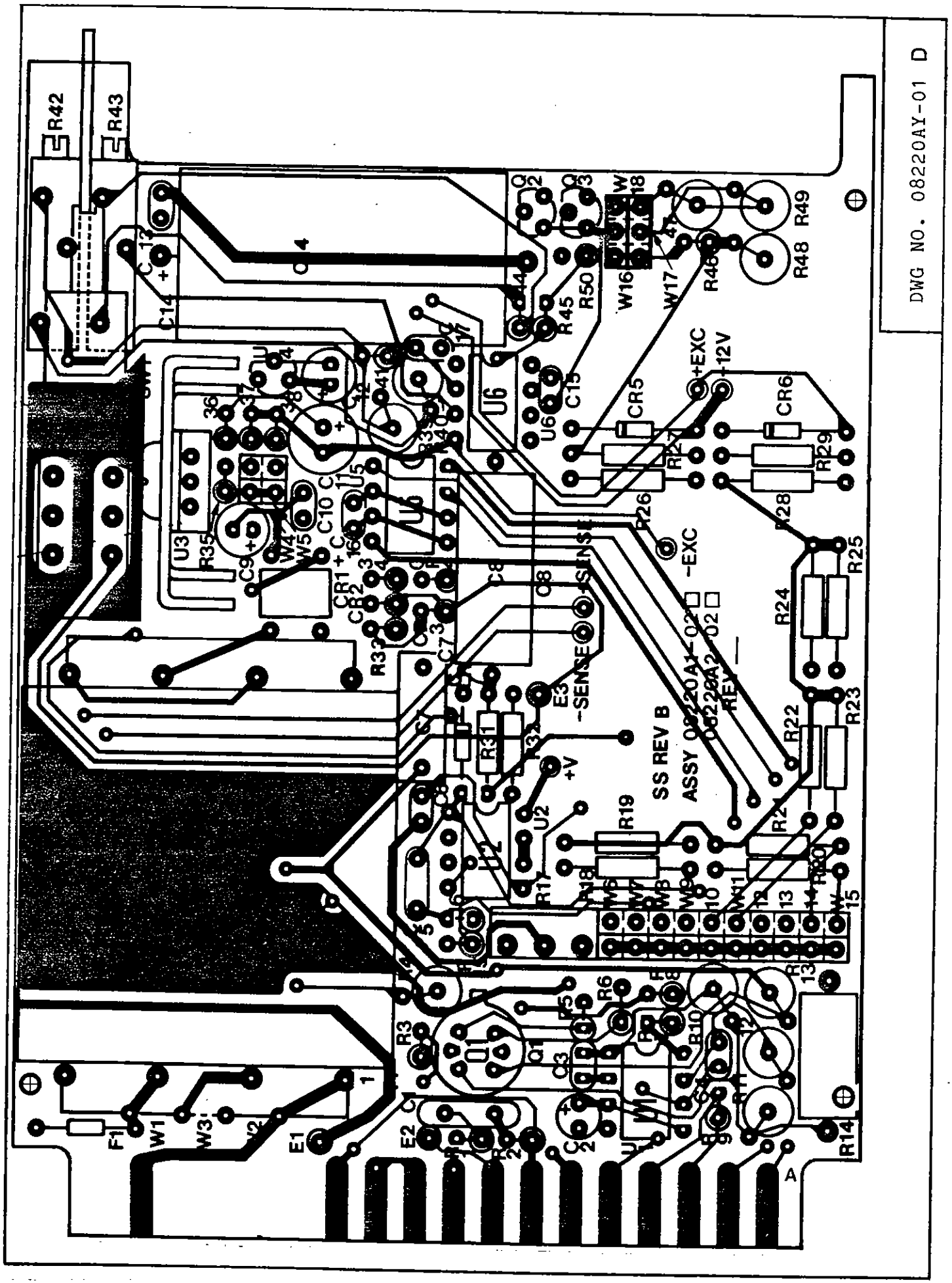
D. Adjust FINE GAIN (R43) until the DPVM display indicates the correct reading.

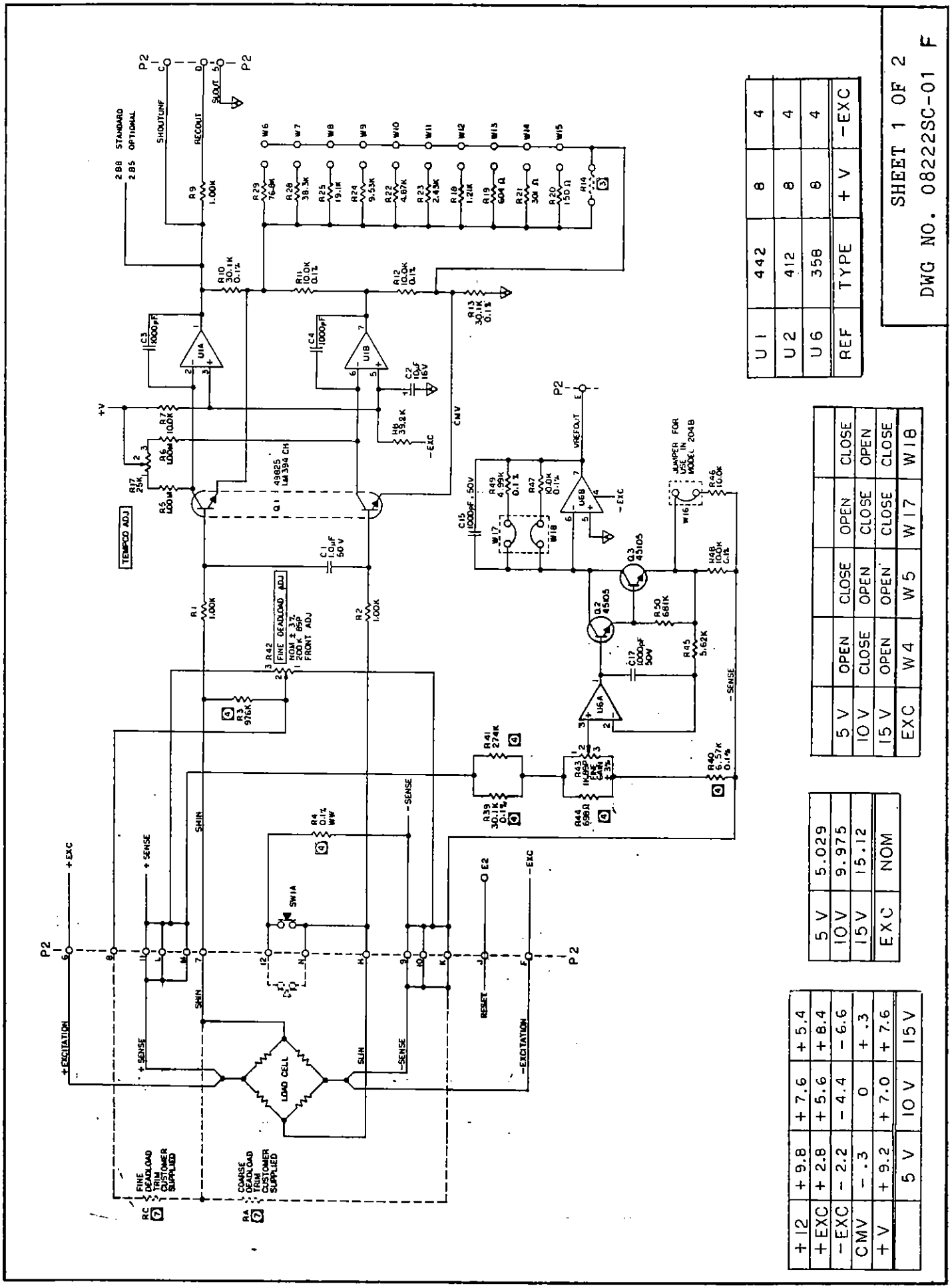
E. Repeat steps B through D.

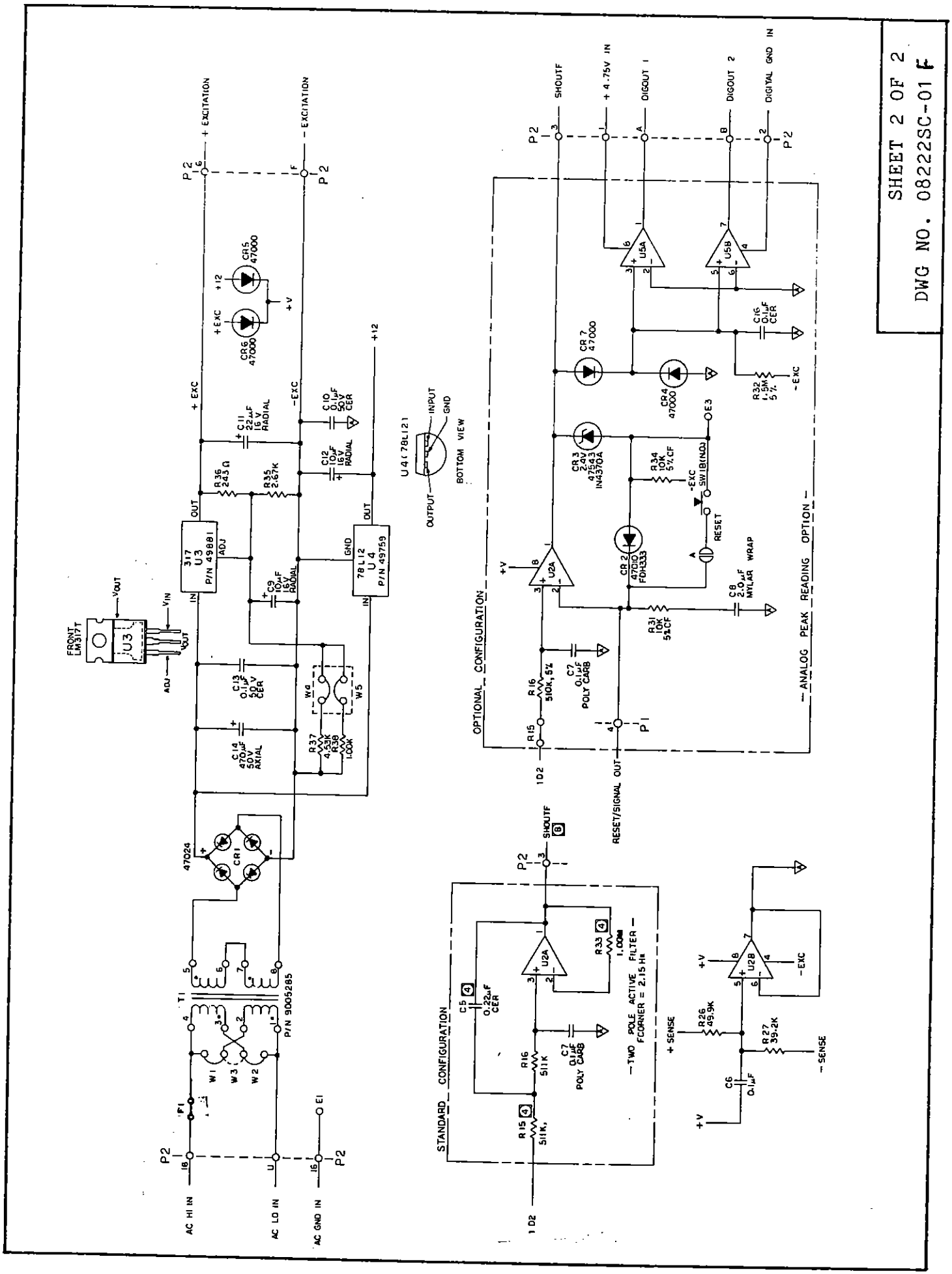
F. Install the lens.

G. Press push-to-cal and record the reading. Calibration can now be conveniently checked with the push-to-cal switch after the unit is zeroed.

ASSEMBLY DIAGRAM, LOAD CELL CONDITIONER OPTION




SHEET 1 OF 2
DWG NO. 08222SC-01 F
U1 442 8 4
U2 412 8 4
U6 358 8 4
REF TYPE +V -EXC
5V OPEN CLOSE OPEN OPEN CLOSE
10V CLOSE OPEN CLOSE OPEN
15V OPEN OPEN CLOSE CLOSE
EXC W4 W5 W17 W18
5V 5.029
10V 9.975
15V 15.12
EXC NOM
+12 +9.8 +7.6 +5.4
+EXC +2.8 +5.6 +8.4
-EXC -2.2 -4.4 -6.6
CMV -.3 0 +.3
+V +9.2 +7.0 +7.6
5V 10V 15V
STANDARD
OPTIONAL
SHOUTUNF
RECOUT
SLOUT
TEMPCO ADJ
FINE DEADLOAD ADJ
FRONT ADJ
JUMPER FOR USE IN MODEL 2048
LOAD CELL
+EXCITATION
-EXCITATION
+SENSE
-SENSE
SHIN
SWIA
RESET
FINE DEADLOAD TRIM CUSTOMER SUPPLIED
COARSE DEADLOAD TRIM CUSTOMER SUPPLIED


SHEET 2 OF 2
DWG NO. 08222SC-01 F
+ EXCITATION
- EXCITATION
+ EXC
-EXC
+12
+V
CR5 47000
CR6 47000
C11 22µF 16V RADIAL
C10 0.1µF 50V CER
C12 10µF 16V RADIAL
R36 243Ω
R35 2.67K
317 U3 P/N 49881 ADJ
78L12 U4 P/N 49759
C3 10µF 16V RADIAL
C13 0.1µF 50V CER
C14 470µF 50V AXIAL
R37 4.53K
R38 1.00K
W4
W5
FRONT LM317T
U3
VOUT
VIN
ADJ
47024
CR1
T1
P/N 9005285
W1
W2
W3
F1
E1
AC HI IN
AC LO IN
AC GND IN
U4 (78L12)
INPUT
GND
OUTPUT
BOTTOM VIEW
SHOUTF
+ 4.75V IN
DIGOUT 1
DIGOUT 2
DIGITAL GND IN
U5A
U5B
C16 0.1µF CER
CR7 47000
CR4 47000
R32 1.5M 5%
CR3 2.4V 47543 IN4370A
R34 10K 5%CF
SW1B(NO)
RESET
CR2 47000 FDH333
C8 2.0µF MYLAR WRAP
U2A
U2B
R31 10K 5%CF
C2 0.1µF POLY CARB
R16 510K, 5%
R15
OPTIONAL CONFIGURATION
ANALOG PEAK READING OPTION
RESET/SIGNAL OUT
STANDARD CONFIGURATION
C5 0.22µF CER
R33 1.00M
R16 511K
C7 0.1µF POLY CARB
R15 511K,
TWO POLE ACTIVE FILTER
FCORNER = 2.15 Hz
R26 49.9K
R27 39.2K
C6 0.1µF
+ SENSE
- SENSE