DEVAR Inc.
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Model 18-215A

2 WIRE mV or TC
SIGNAL CONVERTER

FM
APPROVED

REV B

Manual # 990601

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Interconnection Diagram to Intrinsically Safe Apparatus

SECTION I

GENERAL DESCRIPTION

1.1 The 18-215A two wire mV/TC isolated transmitter receives signals from thermocouples or other millivolt sources and provides a 4/20 mA output signal completely isolated from the input signal source. It is designed to connect with only two copper wire leads that will supply the voltage to operate the transmitter from a power supply, and also carry the output current. The output current is then used for recording, computing, or controlling.

1.2 The 18-215A has been designed to provide ease of calibration. It has the flexibility for thermocouple selection (J, K, T, R, S, and E) using a DIP switch. In addition, the DIP switch provides input offset selection in steps of 1 mV to 31 mV (positive or negative) and thermocouple break indication selection (upscale or downscale). Moreover, the 18-215A has a single turn SPAN set potentiometer that provides continuous span adjustment between 4 and 40 mV, eliminating the need for changing calibrating resistors. The fine SPAN and ZERO trimmers, as featured in Devar standards products remains unchanged. The input span can easily be modified from 4 to 40 mV to cover a new span of 1 to 10, 2 to 20, 8 to 80, or 16 to 160 mA by replacing two plug-in resistors.

1.3 The unit has reverse supply polarity protection, and will operate with a wide range of supply voltages (10 to 44 VDC). The transmitter provides an accurate thermocouple junction compensation and tracking. The 18-215A is designed for intrinsic safety when operated from an appropriate power supply and an approved barrier.

1.4 The unit is protected from Radio Frequency Interferences (RFI). It also is provided with a current monitor terminal where the output current can be measured without interrupting the power loop. An optional linearizing circuit can be provided to have an output signal proportional to the sensed temperature.

SECTION II

SPECIFICATIONS

2.1 GENERAL

Power Requirements	10-44 VDC at power terminals
Accuracy	0.1% of span (includes combined effects of hysteresis, repeatability, and linearity referred to mV input)
Ambient Temperature	-25°C to +85°C
Thermal Zero Shift	Less than 0.01%/°F of span (> 5mV span) Less than 0.02%/°F of span (1-5 mV span)
Thermal span shift	Less than 0.01%/°F of span (includes linearization error on linearized TC units)
Electrical Classifications	Circuit designed to meet requirements of intrinsic safety and ISARP 12.2
Common Mode Rejection	115 db at 60 Hz
Transverse Rejection	30 db at 60 Hz
3 db Frequency (Break Frequency)	9 Hz
Response Time	60 msec
Weight	5.5 oz.

2.2 INPUT

Sensor	Thermocouples J, K, T, R, S, and E are standard, and millivolt source
Input Span	4-40 mV (span can easily be changed to 1-10, 2-20, 8-80, or 16-160 mV)
Input Break Indication	Upscale or Downscale
Input Offset	0 to ±31 mV
Input Source Current	8 nA, max (upscale or downscale)
Thermocouple or mV Operation	grounded or ungrounded

2.3 OUTPUT

Current Output	4 to 20 mA
Current Output Limits	3.1 to 26 mA
Load Resistance	R_L (max) = (V supply -10)/20 (K-Ohms)
Load Resistance Effect	0.05% of span per 300 Ohms change
Power Supply Effect	0.01% of output span per Volt

2.4 OPTIONS

-E80:	A 10-50 mA current output can be provided.
-L:	A Linearizing circuit can be provided for TC units. The output current is proportional to the sensed temperature with a linearity of ±0.1% plus a 5:1 improvement in the thermocouple curve.
-M37A:	The 18-215A can be offered in an explosion proof housing.
-HV:	High voltage supply rating from 10 to 80 VDC (4-20 mA output only)
-E25:	The 18-215A can be offered with a fast response.
	Response time 10 ms
	3 db Frequency (Break Frequency) 60 Hz

SECTION III

INSTALLATION

3.1 The 18-215A mV/TC isolated transmitter can be mounted on our M31 bracket for surface mounting, or installed into a SnapTrack mounting rail. The 18-215A transmitter has been miniaturized to allow 10 units per foot length of a SnapTrack. In addition, the unit may be installed in different size racks, such as 34 units in a 5-1/4" × 19" rack, or 17 units in a 3-1/2" × 19" rack, or 16 units in a 5-1/4" × 10" rack. The 18-215A is also offered in an explosion proof housing (Option -M37A).

3.2 Connect appropriate DC power source in series with load to (+) and (-) PWR terminals. Also connect the thermocouple wire or the millivolt source to (+) and (-) terminals. Refer to fig. 3.1 for detailed wiring instructions.

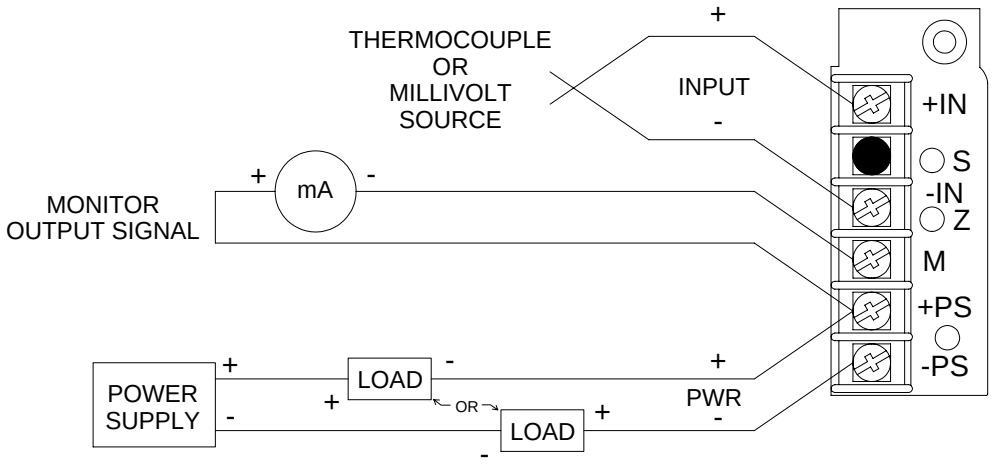


Fig. 3.1 Typical Wiring

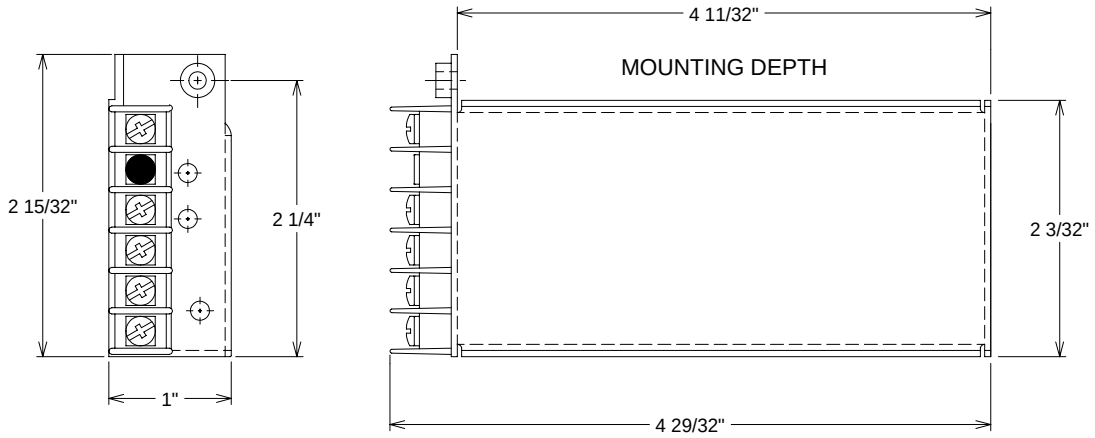


Fig 3.2 General Dimensions of 18-215A Case

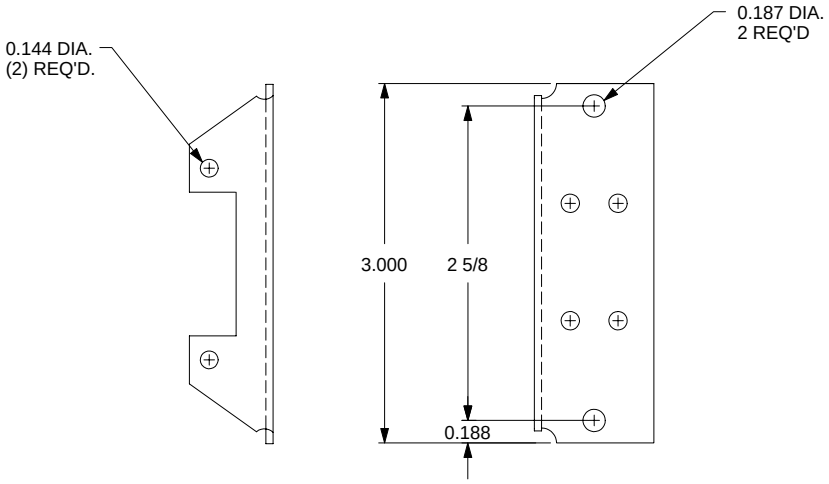


Fig. 3.3 General Dimensions of the M31 Bracket

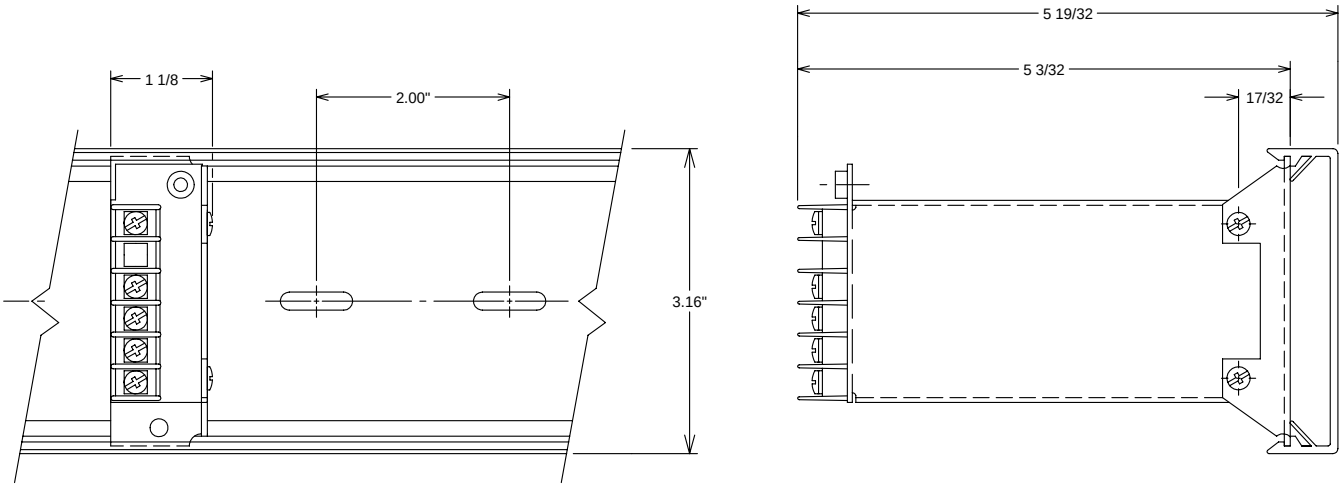


Fig. 3.4 Assembly of 18-215A in a SnapTrack Mounting Rail

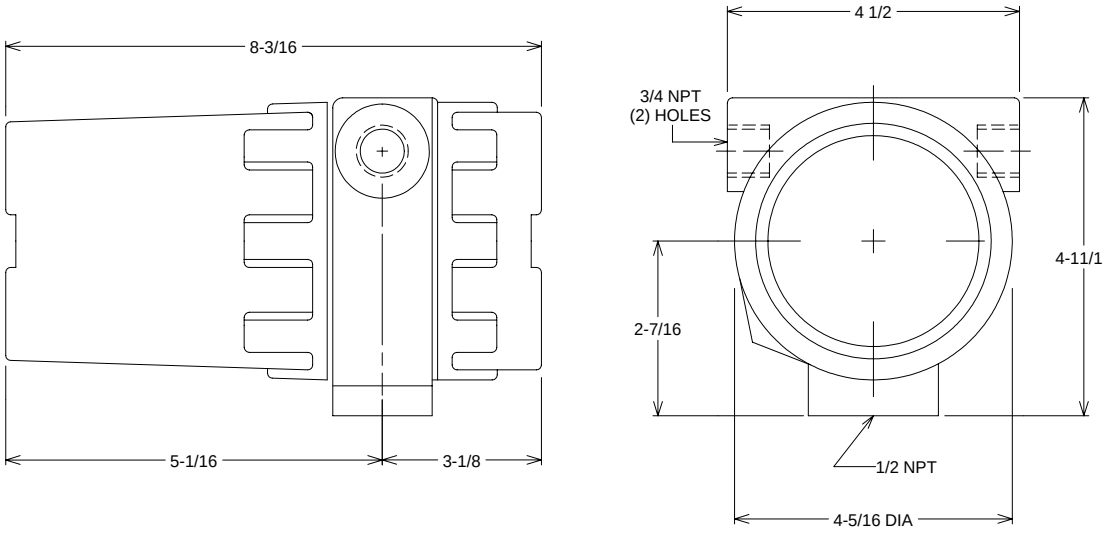


Fig 3.5 Assembly of 18-215A in an Explosion Proof Housing

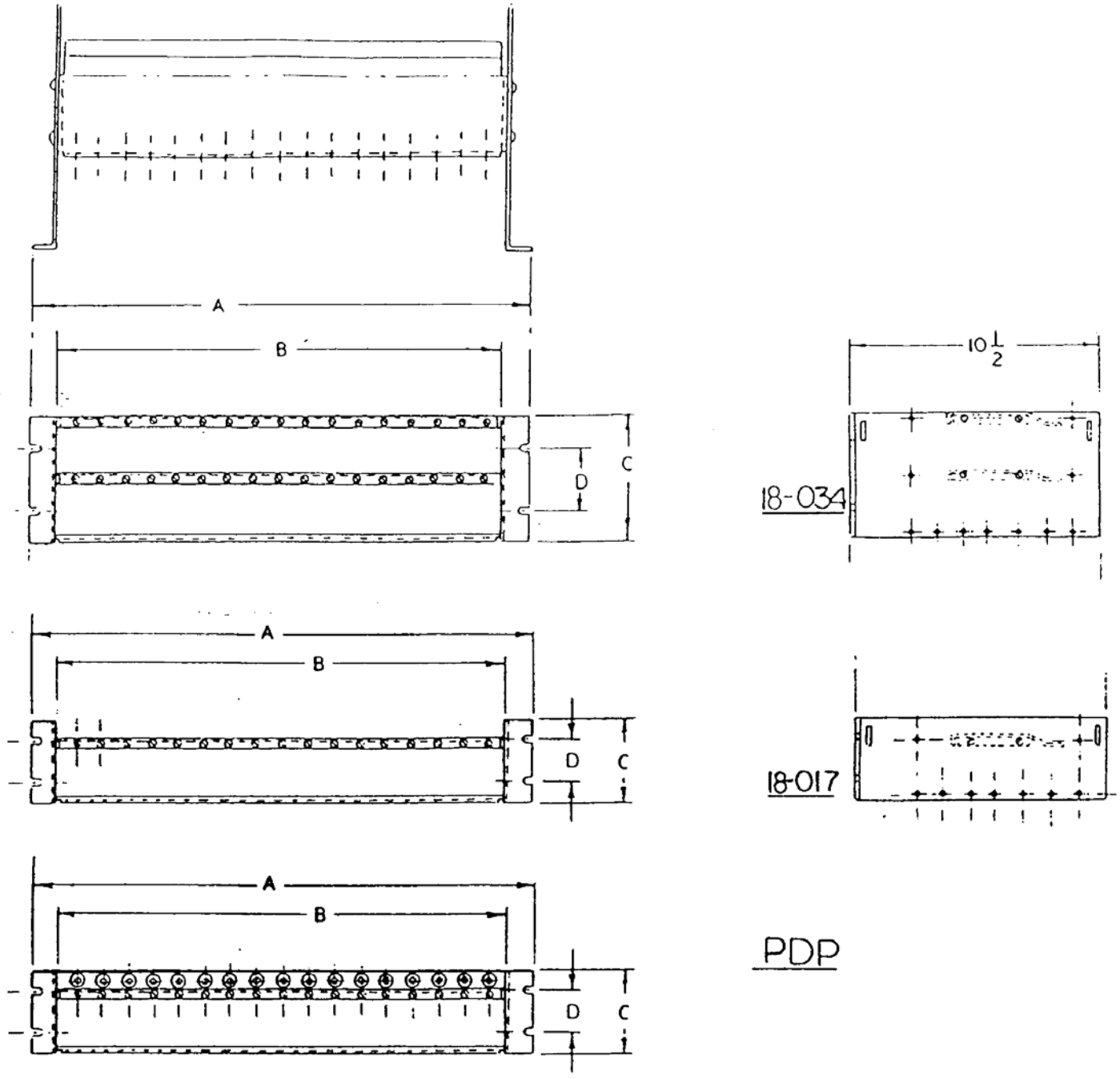
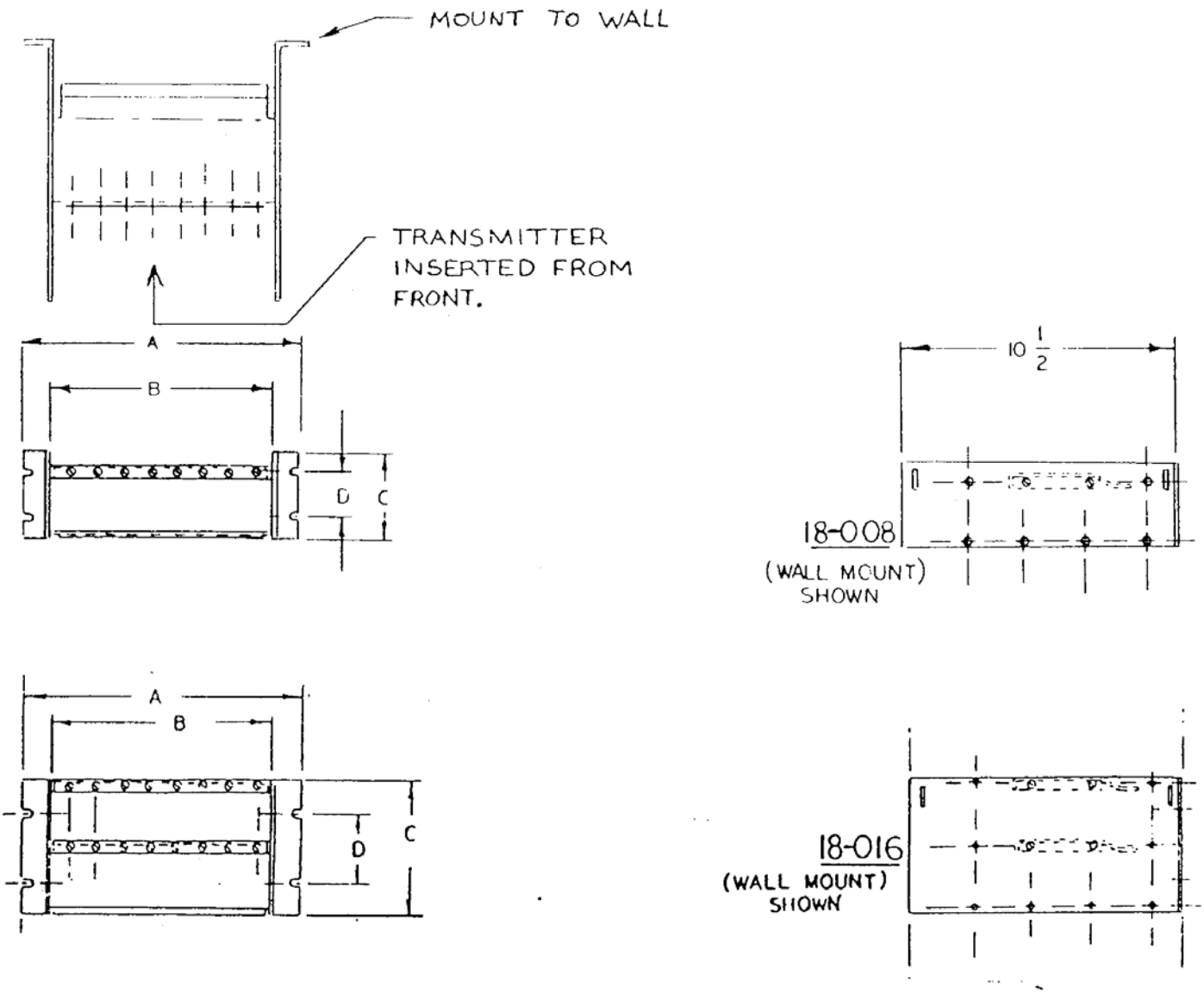


Fig. 3.6A General Dimensions of 18-034, 18-017 Racks, and Power Distribution Panel (PDP)



18-008	10"	8-1/8"	3-1/2'	1-3/4'
18-017	19'	17-7/32"	3-1/2"	1-3/4"
18-016	10"	8-1/8"	5-1/4"	2-1/4"
18-034	19"	17-7/32"	5-1/4'	2-1/4"
MODEL	A	B	C	D
	DIMENSION			

Fig. 3.6B General Dimension of 18-016 and 18-008 Racks

SECTION IV

RECALIBRATION

4.1 If a calibration, other than the one originally provided, is desired, changes of several percent can be made quickly by the fine ZERO and SPAN trimmers. Additional calibration changes can be made by the SPAN SET trimmers, provided that the input span is within the span limits indicated. For a major calibration change, refer to Fig. 4-1.

4.2 If the input span is between 4 and 40 mV, the coarse span pot may be set to the required input span, eliminating the need for changing the span resistor (R110), or the zero trim resistor (R113). The 4 to 40 mV span can easily be changed to 1-10, 2-20, 8-80, or 16-160 mV by changing the span resistor (R110) and the zero trim resistor (R113) as shown in Fig. 4-2.

STEPS	Condition Required	Amplifier Input	
		Millivolt	Thermocouple
1	Input Span	Span Set, R110 (Fig. 4-2)	
2	Zero Trim	R113 (Fig. 4-2)	
3	Input Offset	DIP Switches (Fig. 4-3, 4-4)	
4	Thermocouple Break Indication	Upscale or Downscale (Fig. 4-3)	
5	Thermocouple Junction Compensation	None (S1, pos 1-4 are OFF)	Direct or Reverse (Select TC on S1 pos. 1-4)
6	Linearization (Option -L)	RL1, RL2, RL3 = OPEN, RL4 = SHORT	RL1, RL2, RL3, RL4, RL5

Fig. 4-1 Summary of a major calibration change

mV Input Span	Span Resistor R110, Wirewound		Zero Trim Resistor R113, Metal film 1%	
	VALUE	PART NO.	VALUE	PART NO.
1 TO 10	137 K	223504-0065	357 K	223737-0247
2 TO 20	69 K	223504-0049	178 K	223737-0088
4 TO 40	34.6 K	223504-0040	88.7 K	223737-0221
8 TO 80	16.5 K	223504-0096	44.2 K	223737-0103
16 TO 160	8 K	221764-0025	22.1 K	223737-0202

Fig. 4-2 Span and Zero Trim Resistor Table

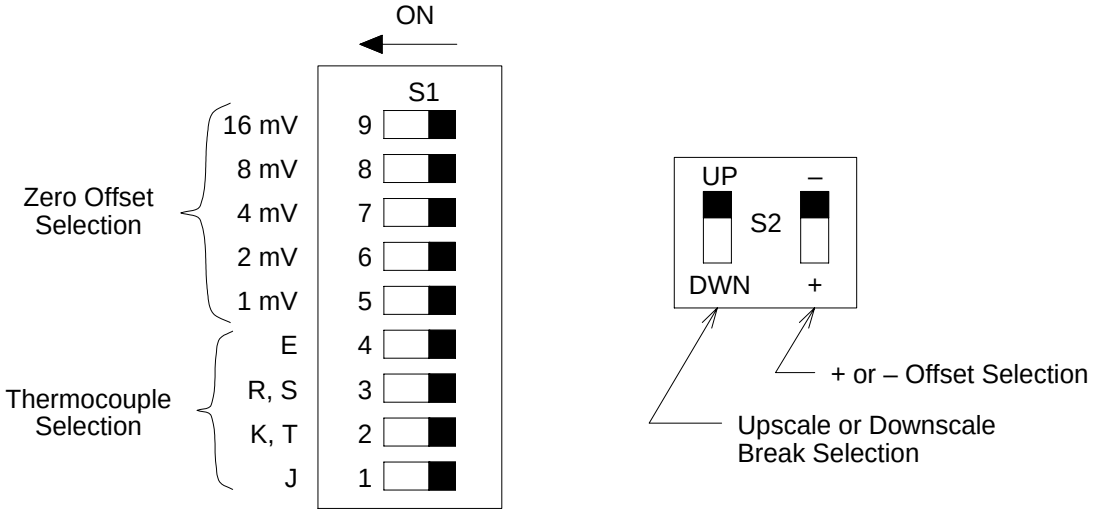


Fig. 4-3 Description of the DIP Switches S1 & S2

4.3 To determine the offset correction required to accommodate the start of output range for an input signal (thermocouple or millivolt), follow the steps outlined in Fig. 4-4

<table>
<tr><th rowspan="2">STEPS
REQUIRED</th><th colspan="2">Input Signal</th></tr>
<tr><th>Millivolt</th><th>TC Direct (J)</th></tr>
<tr><td>1 - Specify Input Range</td><td>5 to 15 mV</td><td>0 to 500° F</td></tr>
<tr><td>2 - Calculate the Millivolt input span</td><td>+15 - (+5) = 10 mV</td><td>+14.108 – (-0.885) = 14.993 mV</td></tr>
<tr><td>3 - Express the start of Input Range</td><td>+5</td><td>–0.885 (Ref 32°F)</td></tr>
<tr><td>4 - Express start of input range reference to the room temperature</td><td>+5</td><td>–0.885 – (+1.22) = –2.105 (75° F)</td></tr>
<tr><td>5 - Enter correction for the TC compensation
<table><tr><th>TC</th><th>DIR</th><th>REV</th></tr><tr><td>J</td><td>-14.2</td><td>14.2</td></tr><tr><td>K, T</td><td>-11.2</td><td>11.2</td></tr><tr><td>R, S</td><td>-1.67</td><td>1.67</td></tr><tr><td>E</td><td>-16.7</td><td>16.7</td></tr></table></td><td>---</td><td>–14.2</td></tr>
<tr><td>6 - Add steps 4 and 5. The total is the offset correction required.</td><td>+5</td><td>–14.2 + (–2.105) = –16.305</td></tr>
<tr><td>7 - Set switches S1 and S2</td><td>S1, positions 5 and 7 are ON. S2, set positive polarity. See Fig. 4.3</td><td>S1, positions 1 & 9 are ON. S2, set negative polarity. See Fig. 4.3</td></tr>
</table>

Fig. 4.4 Examples of Calculating the Offset Correction

SECTION V

TROUBLESHOOTING

5.1 If the transmitter is not working properly, the fault may be a loose connection or improper wiring to external terminals.

a. Check external connections and polarity to DC power source and the input signal (Thermocouple or millivolt source).

b. Measure the supply voltage at the power terminals. The voltage should be anywhere from 10 VDC to 44 VDC.

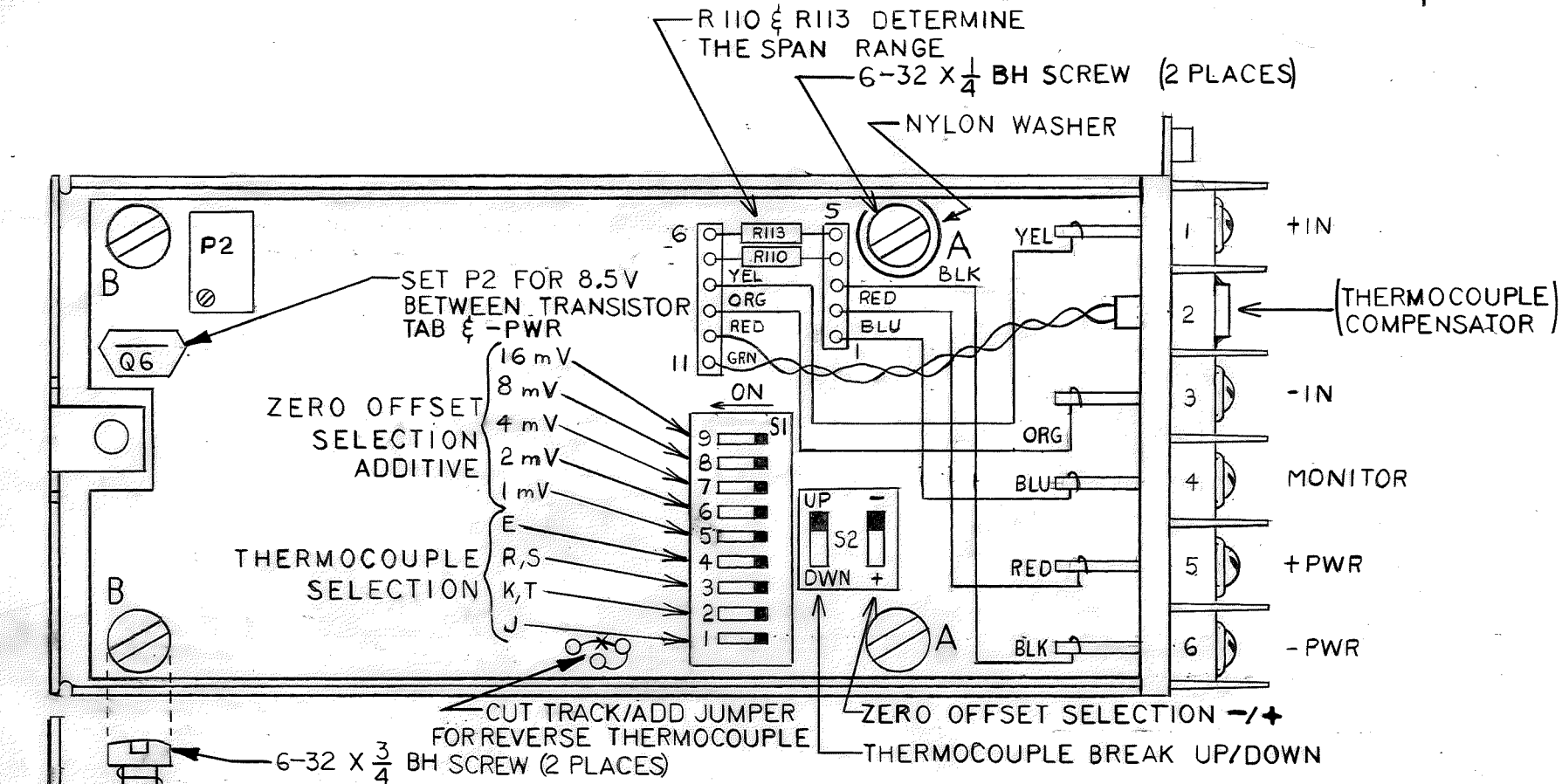
c. Operate with low input source resistance, preferably less than 1000 Ohms.

A final assembly drawing A514788 is included.

DWG NO 514788 SH

REVISIONS

REV	DESCRIPTION	DATE	APPROVED
A	RELEASE · ECN 2820B	3·19·87	a.r.
B	ADD NYLON WASHER · ECN 2820C	8·21·87	a.r.



TOLERANCES UNLESS SPECIFIED DECIMAL DIM. ± .005 FRACT. DIM. ± 1/64 ANGLES ± 1/2°	CONTRACT NO.	
MATERIAL	PREPARED	MF 3-19-87
	CHECKED	SHB 3·19·87
FINISH	MECH	
	ELEC	
NEXT ASS'Y NO. B/M 514787-01	DESIGN	
	APPROVED	a.r. 8-21-87
	APPROVED	

DEVAR Inc. 706 Bostwick Avenue, Bridgeport, Conn. 06605
CONTROL PRODUCTS DIVISION

FINAL ASSEMBLY
18-215A

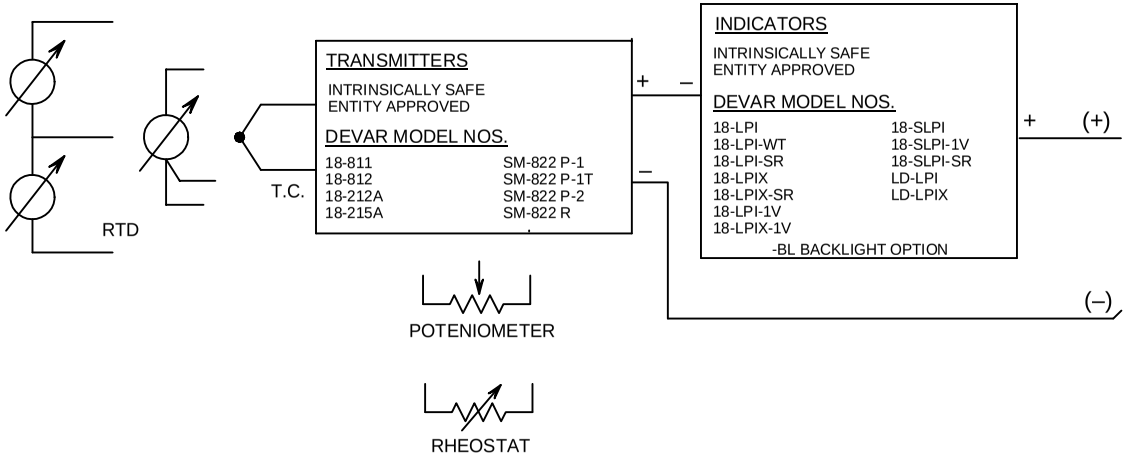
SIZE	DRAWING NO.	REV
A	514788	B
SCALE	WT	SHEET 1 OF 1

OGILVIE PRESS

DWG NO. 515107 SH 1

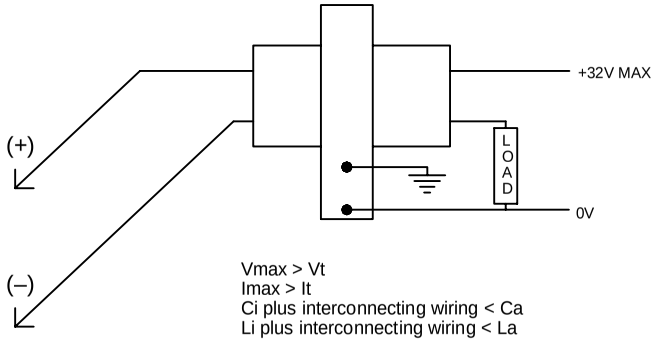
REV	DESCRIPTION	DATE	APPROVED
H	ADD 18-SLPI, 18-SLPI-IV AND 18-SLPI-SR, ECN 3081A	02-08-95	AG
I	ADD LD-LPI, ECN 3154	01-22-98	AG
J	ADD SM-822P-1, SM-822P-1T, SM-822P-2 & SM-822R, ECN 3208	09-09-99	AG
K	ADD LD-LPIX & -BL BACKLIGHT OPTION, ECN 3319	09-13-05	AG
E	RELEASE ECN 2826B	04-22-91	AG
F	ADD 18-LPI-WT, ECN 3027	02-26-92	AG
G	32V WAS 30V, ECN 3081	02-07-95	AG

HAZARDOUS LOCATION



NON-HAZARDOUS LOCATION

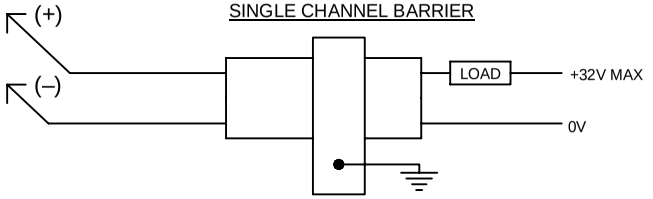
DUAL CHANNEL BARRIER



Vmax > Vt
Imax > It
Ci plus interconnecting wiring < Ca
Li plus interconnecting wiring < La

OR

SINGLE CHANNEL BARRIER



Vmax > Voc
Imax > Isc
Ci plus interconnecting wiring < Ca
Li plus interconnecting wiring < La

NOTES:

1. HAZARDOUS LOCATION RATINGS: CLASS I, DIVISION 1, GROUPS A, B, C, D
2. ENTITY PARAMETERS: Vmax = 32 V, Imax = 150 mA, Ci = 0 µf, Li = 0 mH
3. INSTALLATION OF THE SYSTEM MUST BE IN ACCORDANCE WITH ANSI/ISA RP12.6
4. CONTROL ROOM INSTRUMENTATION TO OPERATE AT LESS THAN 250V rms
5. DO NOT CONNECT mA METER TO TRANSMITTER MONITOR TERMINALS UNLESS AREA IS KNOWN TO BE SAFE
6. THE ABOVE UNITS ARE NONINCENDIVE FOR CLASS I, DIVISION 2, GROUPS A, B, C, D LOCATIONS WITH A Vmax OF 32V. BARRIERS ARE NOT REQUIRED FOR DIVISION 2 OPERATION.
7. NO REVISIONS WITHOUT PRIOR FACTORY MUTUAL APPROVAL

FM APPROVED

UNSPECIFIED DIMENSION TOLERANCE
DECIMAL +/- 0.005"
FRACTION +/- 1/64"
ANGLE +/- 1/2 DEGREE

MATERIAL -N/A-

FINISH -N/A-

NEXT ASSY NO. NONE

CONTRACT NO.

PREPARED	RNT	08-16-05
CHECKED		
MECH		
ELEC		
DESIGN		
APPROVED		
APPROVED		

DEVAR Inc. 706 Bostwick Avenue, Bridgeport, Conn. 06605 TEL: (203) 368-6751 FAX: (203) 368-3747

INTERCONNECTING DIAGRAM TO INTRINSICALLY SAFE APPARATUS

SIZE B | DRAWING NO. 515107 | REV K

SCALE NONE | WT | SHEET 1 OF 1