

DEVAR Inc.

706 Bostwick Avenue, Bridgeport, CT 06605
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Model 18-SLPI LOOP POWERED INDICATOR



The 18-SLPI consists of the internal circuitry of the 18-LPIX housed in a NEMA-4X Polycarbonate enclosure.

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Factory Mutual Research Corporation

A515107

PRODUCT DESCRIPTION
18-LPIX and 18-LPIX-SR
LOOP POWERED INDICATORS

General Description

The 18-LPIX and 18-LPIX-SR are two-wire, digital indicators, in explosion proof housings that provide local indication of the measured variable on a 3½ digit liquid crystal display. These indicators, with 1/2 inch high, easy to read characters, can be inserted at any point in a 4 to 20 mA current loop. They are powered directly from the loop and drop less than 3 volts across their input terminals.

The 18-LPIX provides a digital readout proportional to the input signal while the 18-LPIX-SR provides a digital readout proportional to the square root of the input signal. Both indicators are factory calibrated to read 0 to 100.0% for a 4 to 20mA input, however, they can be recalibrated in the field to read directly in engineering units, such as temperature or flow. Each indicator comes with a selection of stick-on-labels of commonly used engineering units. These labels can be attached to the display so that a user can immediately determine what the indicator is reading.

Recalibration of the 18-LPIX and 18-LPIX-SR is easily accomplished through the use of switches and trim pots. Information on switch positions for the various span and zero calibrations can be found printed on the inside wall of the indicator housing. The 18-LPIX can be calibrated to display any range of numbers between -1999 to +1999 and the 18-LPIX-SR can be calibrated to display any range of numbers between 0 and 1999.

On the 18-LPIX, the span adjustment of 0 to 3998 counts and the zero adjustment of -1999 to +1999 counts, are each divided into three switch selectable ranges. Fine adjustment of span and zero is made on two 15-turn, non-interactive trim pots, providing resolutions of better than one count. Negative polarity indication can be enabled or disabled and decimal point location can also be selected through the use of switches. Some sample display calibrations for a 4 to 20 milli-amp input are as follows:

0	to	1999	(forward acting)
1999	to	0	(reverse acting)
-1999	to	1999	(zero center)
230	to	1735	(positive offset)
-720	to	850	(negative offset)

C	3384	REDRAWN IN ELECTRONIC FORMAT		
B	3067	ADD GROUND LUG, SET SCREW, AND DIMENSION CHANGES (FIG X)	AG	03-14-94
A	3002	RELEASE	AG	08-19-90
REV.	ECN	DESCRIPTION	APPR.	DATE

DEVAR Inc.		706 Bostwick Ave. Bridgeport CT 06605 Tel: (203) 368 6751; Fax: (203) 368 3747		PRODUCT DESCRIPTION, 18-LPIX, 18-LPIX-SR				
				PREPARED	RNT	11-05-08	NEXT ASSY.	SCALE
				515258-0001	NONE	1 of 6	515259	C

Reverse action is achieved by disabling the negative sign and applying the appropriate negative offset. Note that when calibrating the 18-LPIX-SR the reading will always start at zero and will always be direct acting.

To gain access to the indicator assembly, unscrew the cover from the housing, remove the round plastic label from around the display, and then grasping two posts located at diagonal corners of the display, pull the indicator assembly out of the housing. The indicator is held in place by two banana plugs, which plug into the baseboard attached to the bottom of the housing. Field wiring connections are made to a three point, compression type, terminal block located on the baseboard.

The housing is ruggedly constructed of sand-cast, copper-free aluminum. Two ½” NPT hubs are provided for entrance into the housing which is rated NEMA-4 and NEMA-7, and is classified for use in Class I, Division 1, Groups B, C, and D and Class II, Division 1, Groups E, F, and G hazardous locations.

Specifications

1. Input

- a. Range: 4 to 20mA
- b. Voltage Drop: 3V @ 20mA
- c. Forward Current Over Range: 60mA Max.
- d. Reverse Current: 60mA Max.

2. Display

- a. Type: 3½ Digit LCD, ½ inch high digits
- b. Range: -1999 to 1999 counts
- c. Decimal Point: 3 Positions or absent, switch selectable
- d. Polarity Sign: negative polarity indication or none, switch selectable
- e. Action: direct acting (count increases with current), normal calibration; reverse acting (count decreases with current), obtained by appropriate zero setting
- f. Over Range Indication: display blanks except for most significant 1

3. Models

- a. 18-LPIX: linear
- b. 18-LPIX-SR: square root

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4. Calibration

- a. Span range (18-LPIX): 0 to 3998 counts, 3 ranges switch selectable, fine adjustment on 15 turn trim pot, non-interactive with zero pot
- b. Span range (18-LPIX-SR): 0 to 1999 counts, 3 ranges switch selectable, fine adjustment on 15 turn trim pot
- c. Offset range (18-LPIX): -1999 to +1999 counts, 3 ranges switch selectable, fine adjustment on 15 turn trim pot, non-interactive with span pot
- d. Resolution: better then 1 count

5. Performance

- a. Accuracy (linear): $\pm 0.1\%$ of span counts, ± 1 count
- b. Accuracy (square root): $\pm 0.15\%$ of span counts, ± 1 count; for input signals between 4.16 and 20mA
- c. Temperature effect (zero): ± 0.1 count per $^{\circ}\text{C}$
- d. Temperature effect (span): $\pm 0.01\%$ of span counts per $^{\circ}\text{C}$
- e. Operating Temperature: -20 to +70 $^{\circ}\text{C}$
- f. Ripple rejection: less then one count with 1 mA peak-to-peak, 60 Hz ripple at input
- g. Sample rate: 2 per second

6. Housing

- a. Material: Sand cast copper-free aluminum
- b. Access: Two 1/2 inch NPT ports
- c. Classification: Explosion Proof, NEMA-4 and NEMA-7 for use in Division 1, Hazardous areas, Class I, Groups B, C, & D and Class II, Groups E, F, & G
- d. Weight: 2.8 lbs

7. Options

- M36 2-inch pipe mounting bracket
- WT Wide temperature (-40 to 85 $^{\circ}\text{C}$)
- BL Backlight

Note: The backlight derives its power from the 4 to 20 mA signal and adds an additional 2 Volt burden to the loop

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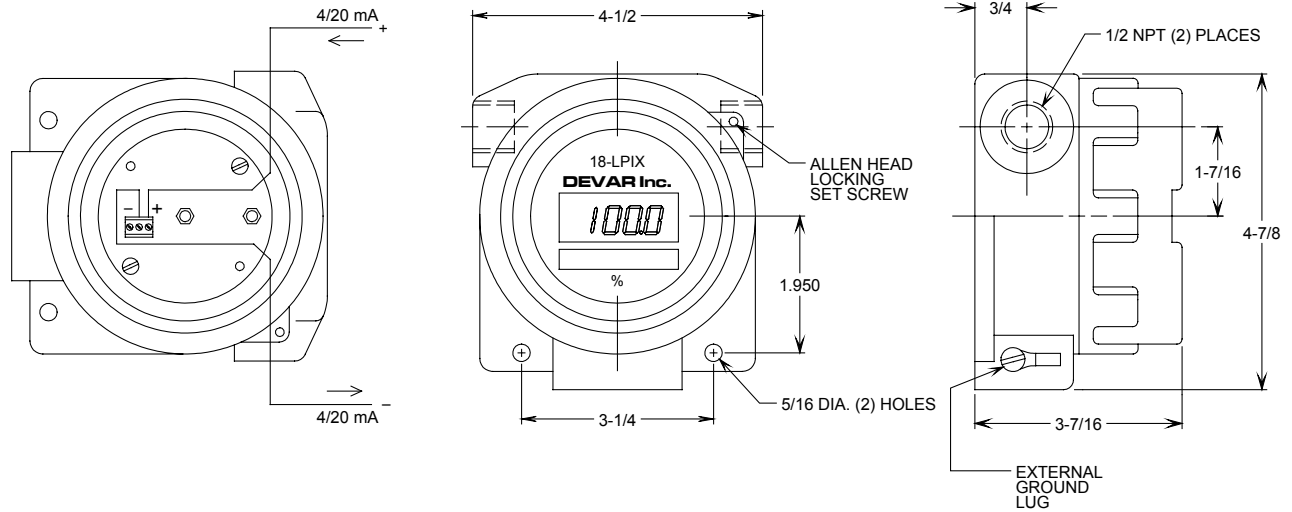


FIG. 1 GENERAL DIMENSIONS AND FIELD WIRING

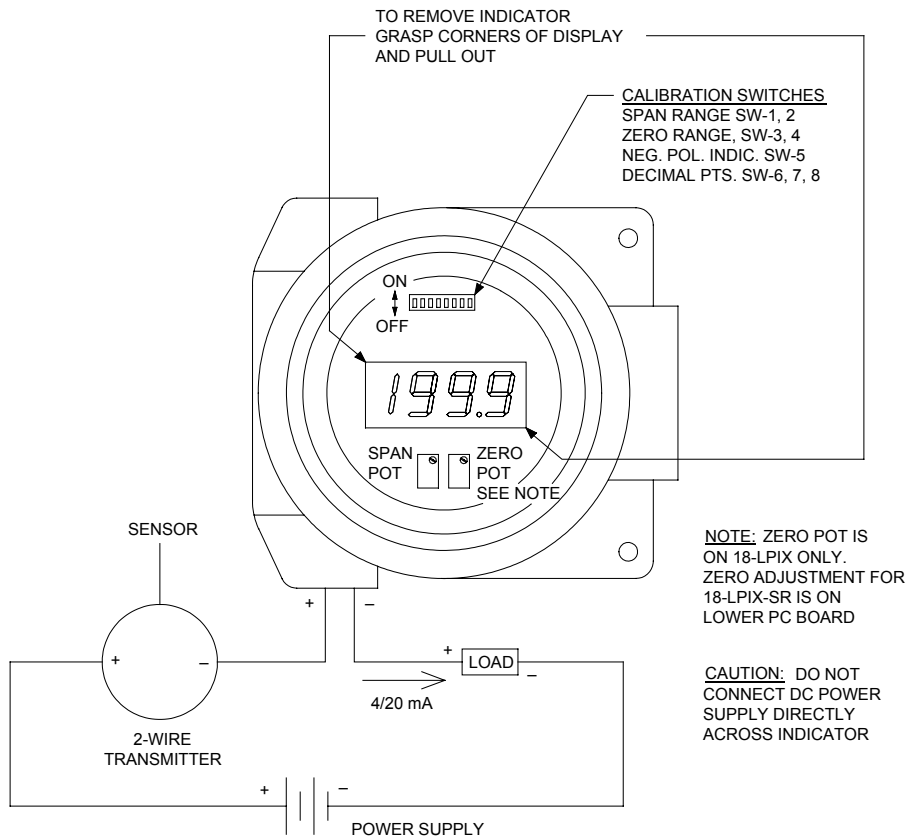


FIG. 2 TYPICAL FIELD WIRING CONNECTIONS AND LOCATION OF CALIBRATION SWITCHES AND POTS

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CALIBRATION SWITCH SETTING					
SPAN	S1	S2	ZERO	S3	S4
4000 to 2470	ON	OFF	2000 to 573	OFF	ON
2470 to 1530	OFF	OFF	573 to -573	OFF	OFF
1530 to 000	OFF	ON	-573 to -2000	ON	OFF
ENABLE DECIMAL POINT			TO ENABLE NEGATIVE POLARITY INDICATION		
1.999	S6	ON		S5	ON
19.99	S7	ON			
199.9	S8	ON			

FIG. 3 CALIBRATION SWITCH SETTINGS FOR SPAN, ZERO, DECIMAL POINT AND POLARITY

Calibration Procedure for Linear Operation

To calibrate the 18-LPIX, remove the front cover and label to expose the calibrating switches and the span, and zero pots (fig. 2). The trimpot, located on the lower PC board and identified as "P1", is to zero balance the circuit and has been set at the factory. The indicator is calibrated as follows:

- 1) Determine desired display for 4 to 20mA input.
EXAMPLE: -30.0 to 195.0 °F
- 2) Set span switches S1 and S2 for proper span range (fig. 3).
EXAMPLE: Span = 1950 - (-300) = 2250 counts; set S1-off, S2-off
- 3) Set zero switches S3 and S4 for proper zero range.
EXAMPLE: Zero = -300 counts; set S3-off, S4-off
- 4) Select decimal point.
EXAMPLE: Select P3 decimal point; set S8-on, S6-off, S7-off
- 5) Enable or disable negative polarity indication.
EXAMPLE: Enable negative sign; set S5-on
- 6) Input 4mA and set zero pot for bottom of range.
EXAMPLE: adjust zero pot to display -30.0
- 7) Input 20mA and set span pot for top of range.
EXAMPLE: adjust span pot to display 195.0
- 8) The indicator is now calibrated.

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Calibration Procedure For Square Root Operation

To calibrate the 18-LPIX-SR, remove the front cover and label to expose the calibrating switches and the span pot (fig. 2). Pull the indicator out of the housing and connect a current source directly to the banana plugs at the bottom of the indicator. Calibrate as follows:

1. Determine desired display for a 4 to 20mA input.
EXAMPLE: 0 to 2000 GPM

The 18-LPIX-SR is calibrated between 4.16mA (1% of input span) and 20mA. When extracting the square root, a 4.16mA input produces a reading equal to 10% of the full-scale reading. The 18-LPIX-SR solves the general equation:

$$\text{READING} = A \sqrt{\text{INPUT (mA)} - 4\text{mA}}$$

Where A is a constant determined by the full scale reading.

EXAMPLE: 4 to 20 mA represents 0 to 2000 GPM. For a full-scale reading of 2000 counts determine the constant A.

$$2000 = A \sqrt{20-4}$$

$$A = 500$$

To determine the display reading for any input, substitute the calculated value of A into the general equation.

EXAMPLE: determine the display reading for a 4.16 mA input.

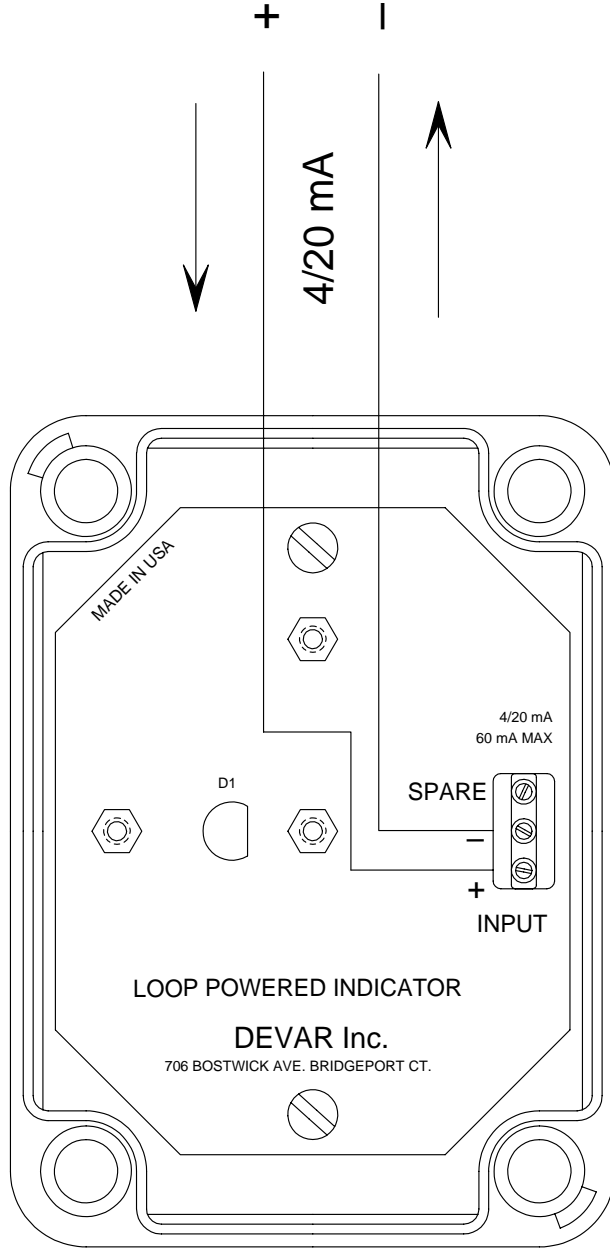
$$\text{READING} = 500 \sqrt{4.16 - 4}$$

$$\text{READING} = 200$$

2. Set span switches S1 and S2 for proper span range fig. 3).
EXAMPLE: span = 2000 counts; set S1-off, S2-off
3. Select decimal point.
EXAMPLE: no decimal point; set S6-off, S7-off, S8-off
4. Enable or disable negative polarity indication.
EXAMPLE: disable negative sign; set S5-off
5. Input 4.16mA and adjust pot P1 on lower PC-board for a 10% of full-scale reading.
EXAMPLE: adjust P1 to display 200
NOTE: The zero pot on the upper PC board has no effect in square root versions.
6. Input 20 mA and adjust span pot on upper PC board for the full-scale reading.
EXAMPLE: adjust span pot to display 2000
7. Repeat steps 5 and 6 as required.

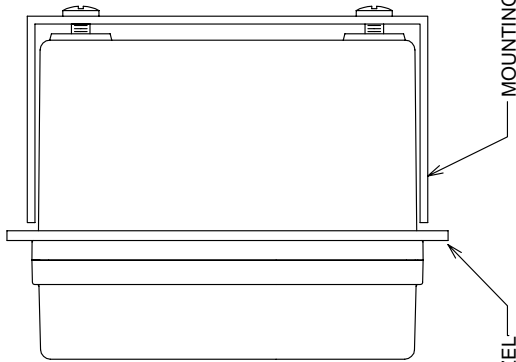
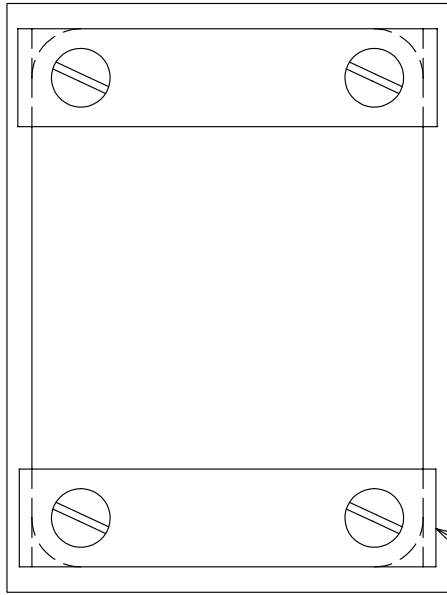
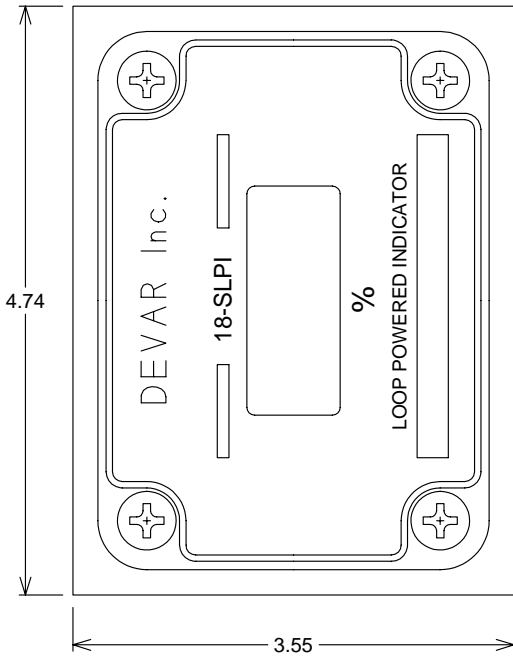
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REV	DESCRIPTION	DATE	APPROVED
A	RELEASE ECN 3047	11-16-92	AG
B	REDRAWN, ECN 3333		

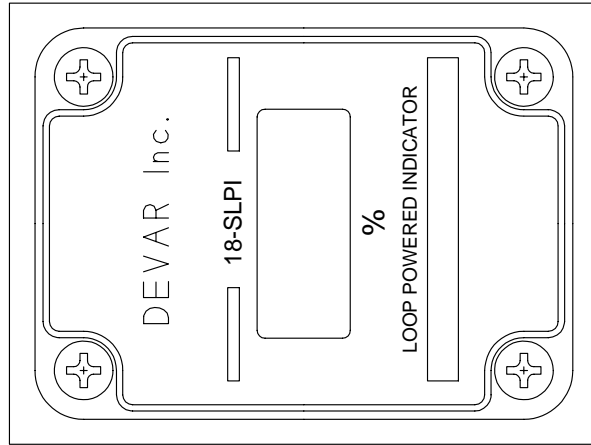


<p>This Drawing is the sole property of DEVAR Inc., and is submitted on the understanding that the contents hereof are not published and are not to be disclosed. to third persons without prior permission.</p>	UNSPECIFIED DIMENSION TOLERANCE		CONTRACT NO.		DEVAR Inc.		706 Bostwick Avenue, Bridgeport, Conn. 06805 TEL: (203) 368-6751 FAX: (203) 368-3747		
	DECIMAL +/- 0.005"	FRACTION +/- 1/64"	ANGLE +/- 1/2 DEGREE	PREPARED	CHECKED	MECH	ELEC	DESIGN	APPROVED
MATERIAL	-N/A-			RNT	04-13-05				
FINISH	-N/A-			FIELD WIRING					REV
NEXT ASSY NO.	BM 515532-0001			18-SLPI					B
				SIZE	DRAWING NO.		515558		
				SCALE	FULL	WT	1 OF 1		

DWG NO.	515550	SH	1
REV		DESCRIPTION	DATE
	SEE PAGE 1		APPROVED



PANEL CUTOUT ±0.015
4.25 x 3.06

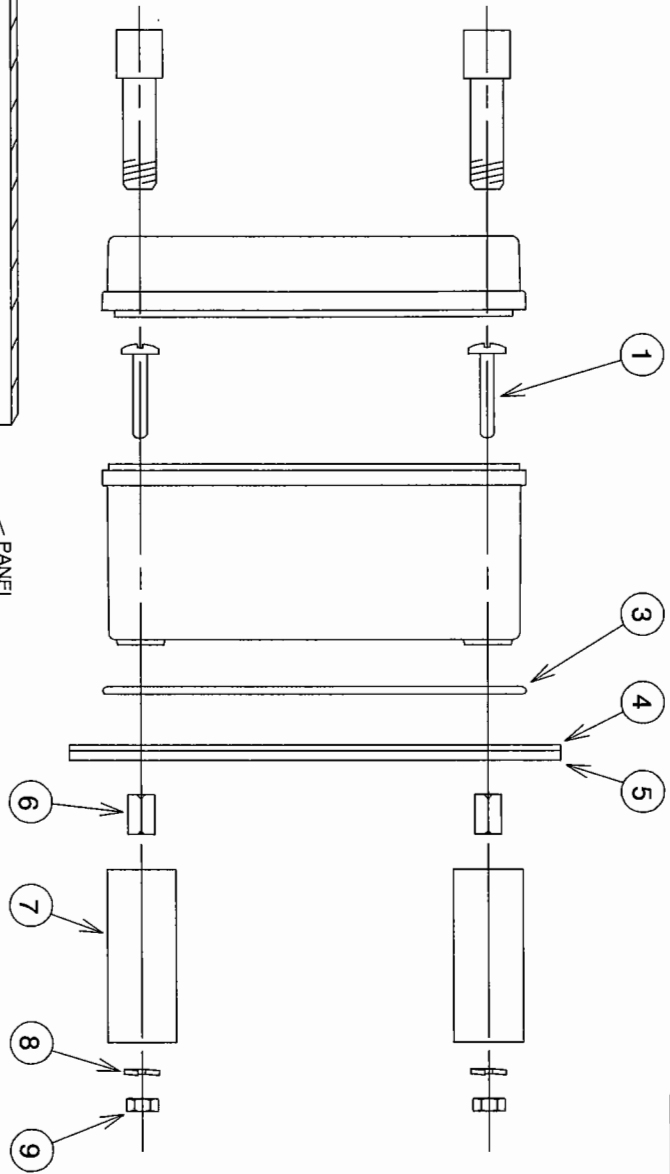


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<p>MATERIAL</p>		<p>-N/A-</p>		<p>PREPARED</p>		<p>11-18-08</p>	
<p>FINISH</p>		<p>-N/A-</p>		<p>CHECKED</p>		<p></p>	
				<p>MECH</p>			
				<p>ELEC</p>			
				<p>DESIGN</p>			
				<p>APPROVED</p>			
<p>NEXT ASSTY NO. BM515557-0001</p>		<p>SCALE FULL</p>		<p>DRAWING NO. 515550</p>		<p>REV. B</p>	
				<p>SHEET 2 OF 2</p>			

DWG NO. 515573

SH 1

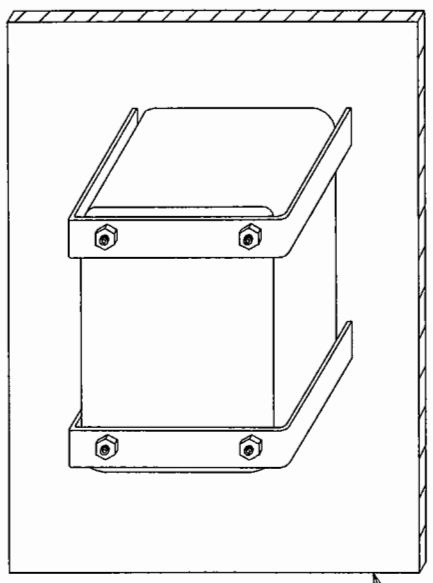
REV	DESCRIPTION	DATE	APPROVED
A	INITIAL RELEASE: ECN 3047A	04-13-93	AG
B	REDRAWN: ECN 3373		



- ① 6-32 x 1 BH SCREW
- ③ O-RING
- ④ BEZEL
- ⑤ GASKET
- ⑥ 6-32 x 3/8 HEX SPACER
- ⑦ MOUNTING STRAP
- ⑧ LOCK WASHER #6
- ⑨ 6-32 HEX NUT

PANEL CUTOUT (+0.015)

MODEL	DIMENSIONS (in.)
18-SLPI	4.25 x 3.07
LD-LPI	5.45 x 3.07



REAR VIEW

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UNRESERVED DIMENSION TOLERANCE		CONTRACT NO.	
DECIMAL	+/- .005"	PREPARED	RNT
FRACTION	+/- .100"	CHECKED	04-29-08
ANGLE	+/- 1/32 DEGREE	MESH	
MATERIAL	-N/A-	ELEC	
FINISH	-N/A-	DESIGN	
APPROVED		APPROVED	
TEST NO.	BMI615557-0001	SCALE	NONE
SIZE	B	DRAWING NO.	515573
WT		SHEET	1 OF 1
REV	B		

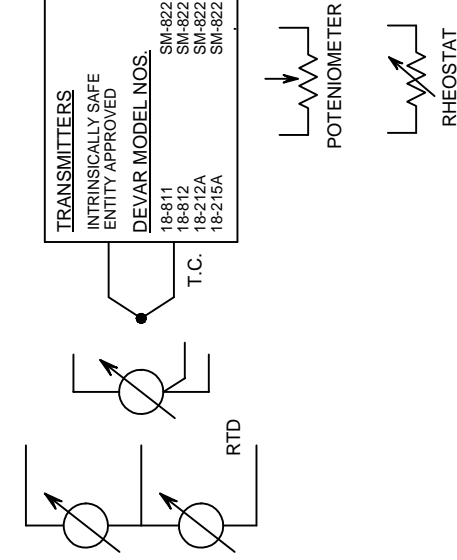
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**18-SLPI & LD-LPI,
 NEMA 4 MOUNTING KIT OPTION (-M46)**

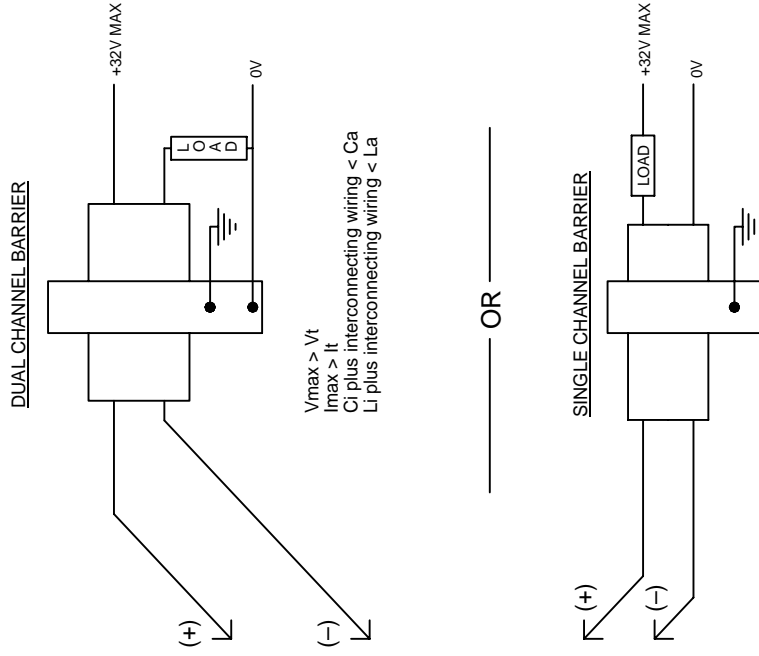
DWG NO. 515107 SH 1

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

HAZARDOUS LOCATION



NON-HAZARDOUS LOCATION



NOTES:

- HAZARDOUS LOCATION RATINGS: CLASS I, DIVISION 1, GROUPS A, B, C, D
- ENTITY PARAMETERS: $V_{max} = 32\text{ V}$, $I_{max} = 150\text{ mA}$, $C_i = 0\text{ }\mu\text{F}$, $L_i = 0\text{ mH}$
- INSTALLATION OF THE SYSTEM MUST BE IN ACCORDANCE WITH ANSI/ISA RP12.6
- CONTROL ROOM INSTRUMENTATION TO OPERATE AT LESS THAN 250V rms
- DO NOT CONNECT mA METER TO TRANSMITTER MONITOR TERMINALS UNLESS AREA IS KNOWN TO BE SAFE
- THE ABOVE UNITS ARE NONINCENDIVE FOR CLASS I, DIVISION 2, GROUPS A, B, C, D LOCATIONS WITH A V_{max} OF 32V. BARRIERS ARE NOT REQUIRED FOR DIVISION 2 OPERATION.
- NO REVISIONS WITHOUT PRIOR FACTORY MUTUAL APPROVAL

UNSPECIFIED DIMENSION TOLERANCE DECIMAL ± 0.005 FRACTION $\pm 1/16$ " ANGLE $\pm 1/2$ DEGREE		CONTRACT NO.	
MATERIAL	-N/A-	PREPARED	08-16-05
FINISH	-N/A-	CHECKED	
NEXT ASSTY NO.	NONE	MECH	
		ELEC	
		DESIGN	
		APPROVED	
		APPROVED	

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INTERCONNECTING DIAGRAM TO INTRINSICALLY SAFE APPARATUS

SIZE	DRAWING NO.	REV
B	515107	K
SCALE	NONE	WT
		SHEET 1 OF 1

