

# DEVAR Inc.

706 Bostwick Avenue, Bridgeport, CT 06605  
TEL: 203-368-6751 FAX: 203-368-3747  
1-800-566-6822 www.devarinc.com

## Model 18-SLPI-SR

LOOP POWERED  
INDICATOR  
SQUARE ROOT OUTPUT





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

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Factory Mutual Research Corporation

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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

<b>DEVAR Inc.</b>		706 Bostwick Ave. Bridgeport CT 06605 Tel: (203) 368 6751; Fax: (203) 368 3747		<b>PRODUCT DESCRIPTION, 18-LPIX, 18-LPIX-SR</b>						
				PREPARED	RNT	11-05-08	NEXT ASSY.	SCALE	PAGE	DRAWING NO.
CHECKED		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 than 1 count

5. Performance

- a. Accuracy (linear):  $\pm 0.1\%$  of span counts,  $\pm 1$  count
- b. Accuracy (square root):  $\pm 0.15\%$  of span counts,  $\pm 1$  count; for input signals between 4.16 and 20mA
- c. Temperature effect (zero):  $\pm 0.1$  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 than 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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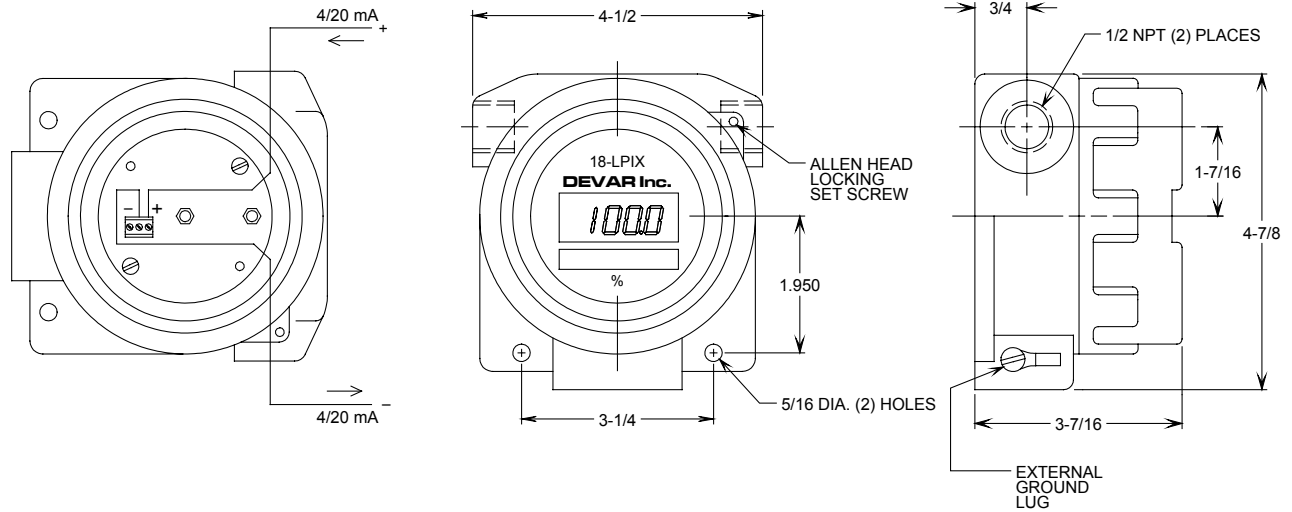


FIG. 1 GENERAL DIMENSIONS AND FIELD WIRING

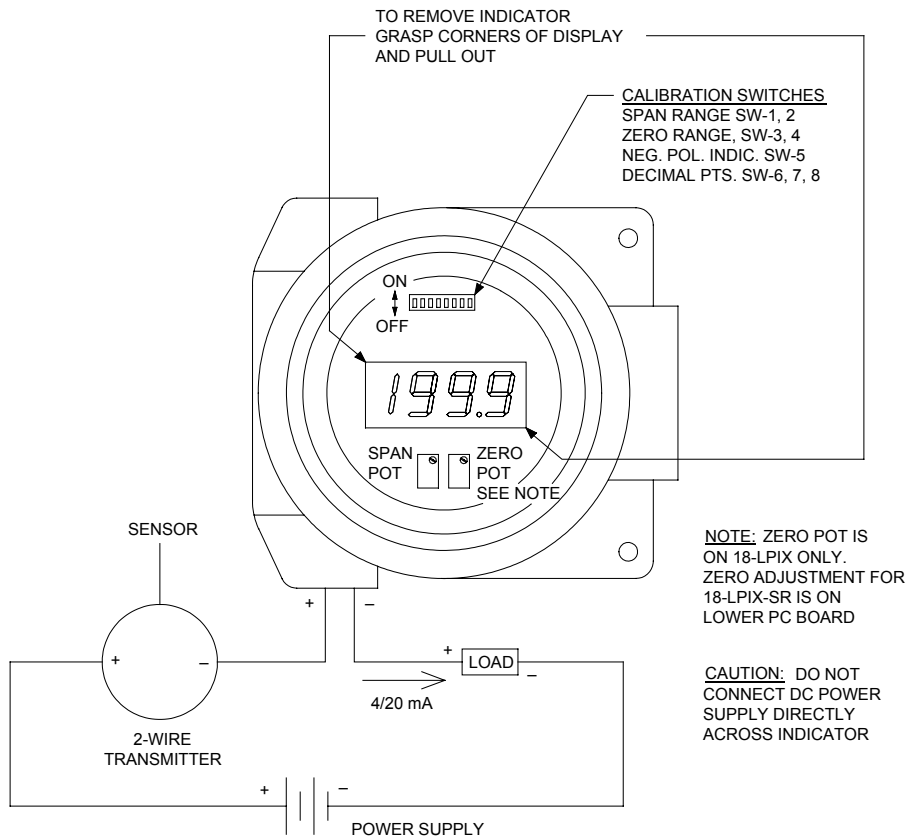


FIG. 2 TYPICAL FIELD WIRING CONNECTIONS AND LOCATION OF CALIBRATION SWITCHES AND POTS

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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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CHECKED			515258-0001	NONE	5 of 6	515259	C

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.

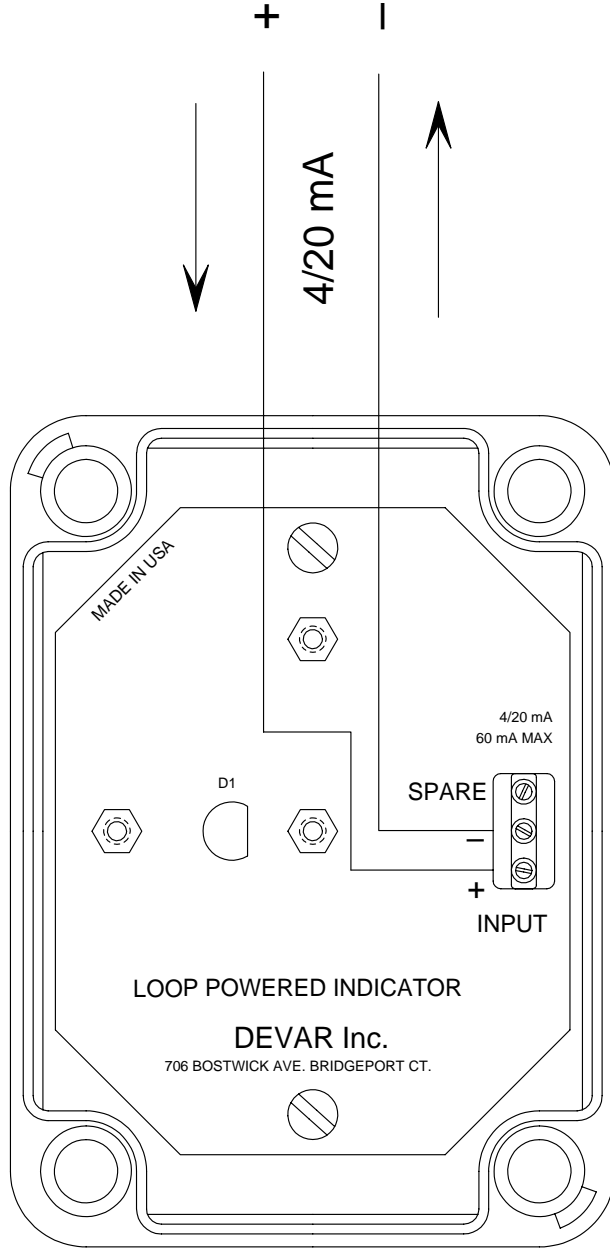
$$\text{READING} = 500 \sqrt{4.16 - 4}$$

$$\text{READING} = 200$$

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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PREPARED	RNT	11-05-08	NEXT ASSY.	SCALE	PAGE	DRAWING NO.	REV.
CHECKED			515258-0001	NONE	6 of 6	515259	C

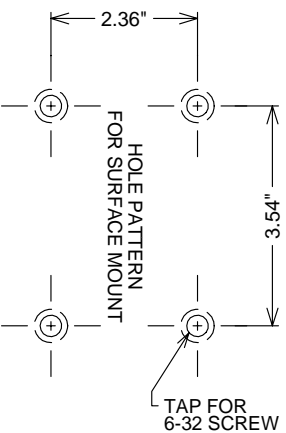
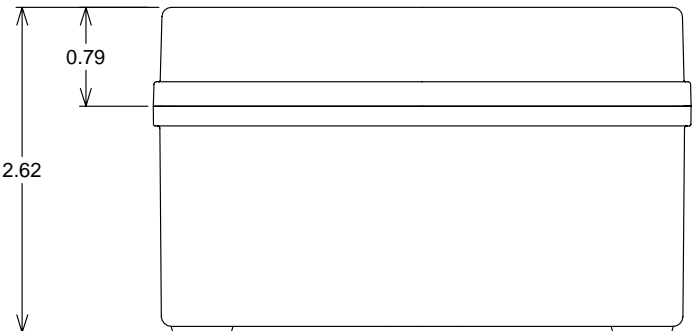
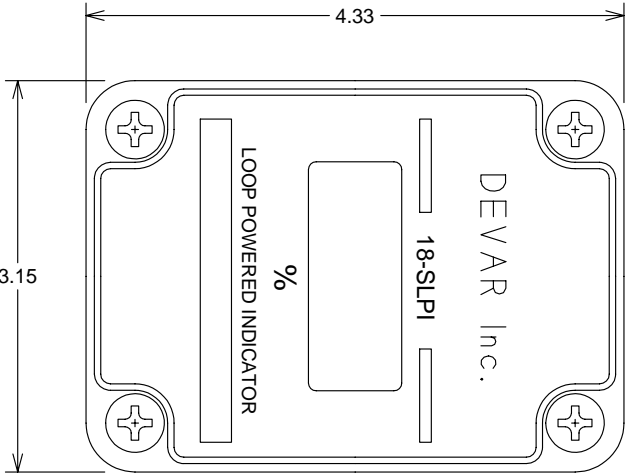
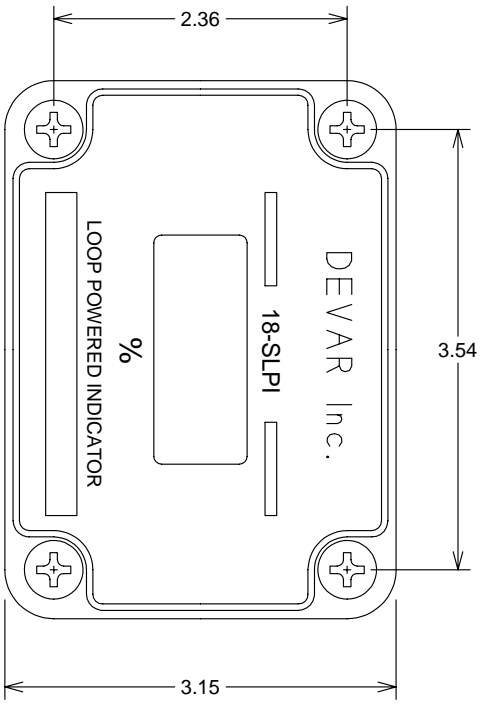
REV	DESCRIPTION	DATE	APPROVED
A	RELEASE ECN 3047	11-16-92	AG
B	REDRAWN, ECN 3333		



<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>	<p>UNSPECIFIED DIMENSION TOLERANCE          DECIMAL +/- 0.005"          FRACTION +/- 1/64"          ANGLE +/- 1/2 DEGREE</p>	CONTRACT NO.		<p><b>DEVAR Inc.</b>          706 Bostwick Avenue, Bridgeport, Conn. 06805          TEL: (203) 368-6751 FAX: (203) 368-3747</p>	
		PREPARED	RNT	04-13-05	<p><b>FIELD WIRING</b>  <b>18-SLPI</b></p>
	MATERIAL	-N/A-	CHECKED		
	FINISH	-N/A-	MECH		
			ELEC		
			DESIGN		
			APPROVED		
NEXT ASSY NO.	BM 515532-0001	SIZE	DRAWING NO.		REV
		A	515558		B
		SCALE	FULL	WT	SHEET
					1 OF 1

DWG NO. 515550

REV	DESCRIPTION	DATE	APPROVED
SH 1			
A	RELEASE ECN 3047	11-16-92	AG
B	REDRAWN ECN 3376		



- NOTES:
1. INDICATOR CAN BE MOUNTED IN HORIZONTAL OR VERTICAL POSITIONS.
  2. HOLES FOR FOUR #6 MOUNTING SCREWS ARE LOCATED DIRECTLY BELOW COVER SCREWS.
  3. OPENINGS FOR CONDUIT FITTINGS SHOULD BE DRILLED IN SHORT (3.15") SIDE OF CASE.

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MATERIAL	-N/A-	PREPARED	RNT	11-18-08	
FINISH	-N/A-	CHECKED			
		MECH			
		ELEC			
		DESIGN			
APPROVED		APPROVED			
NEXT ASSY NO.	BMS15532-0001	SCALE	FULL	WT	515550
		SHEET	1 OF 2		REV B

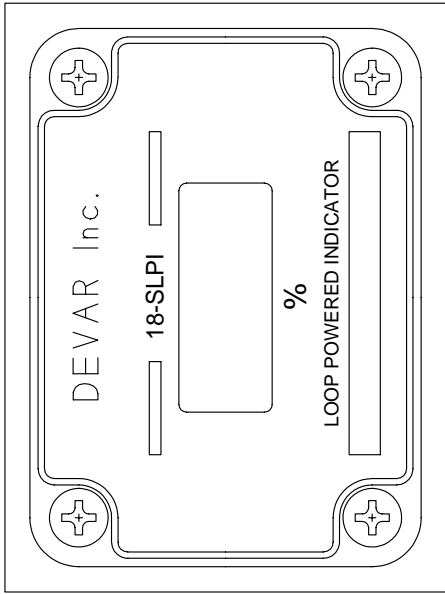
**DEVAR Inc.**  
 GENERAL DIMENSIONS,  
 18-SLPI -M46 (PANEL MOUNT)

DWG NO. 515550

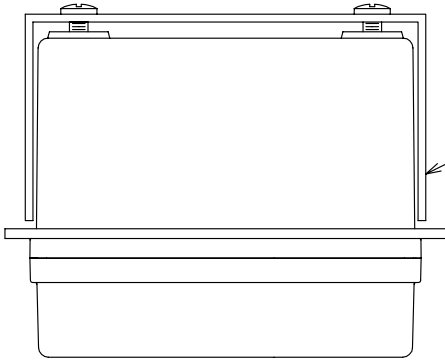
SH 1

REV	DESCRIPTION	DATE	APPROVED
	SEE PAGE 1		

4.74



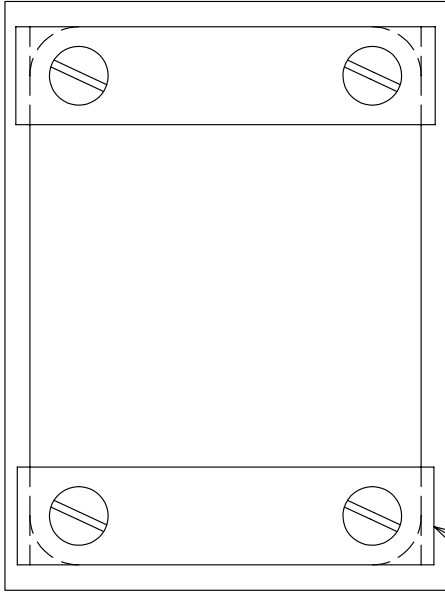
3.55



BEZEL

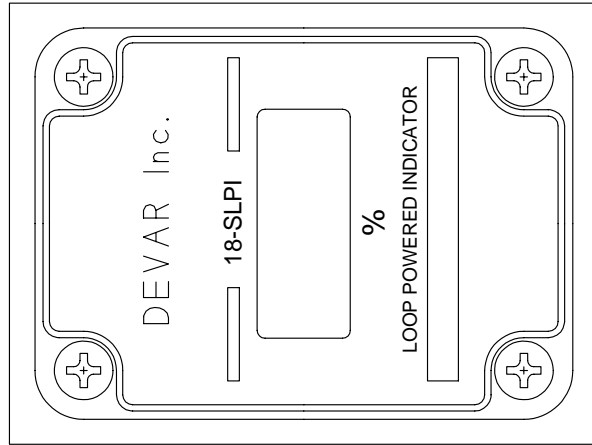
MOUNTING STRAP

REAR VIEW



PANEL CUTOUT ±0.015

4.25 x 3.06



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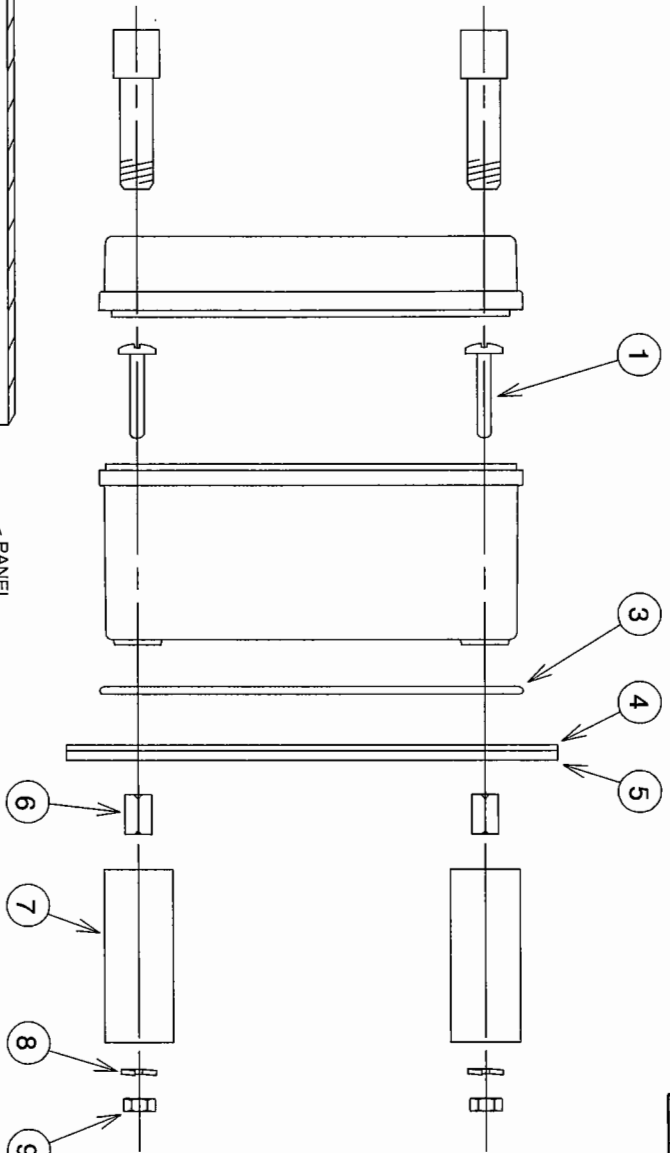
UNSPECIFIED DIMENSION TOLERANCE	CONTRACT NO.
FRACTION $\pm 0.005$	PREPARED
DECIMAL $\pm 0.005$	CHECKED
ANGLE $\pm 1/2$ DEGREE	MECH
	ELEC
	DESIGN
	APPROVED
	APPROVED
NEXT ASSTY NO. <b>BM515557-0001</b>	SCALE <b>FULL</b>

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GENERAL DIMENSIONS, 18-SLPI -M46 (PANEL MOUNT)	TEL: (203) 366-6751 FAX: (203) 366-3747
SIZE <b>B</b>	DRAWING NO. <b>515550</b>
SCALE <b>FULL</b>	WT
	SHEET <b>2 OF 2</b>
	REV <b>B</b>

CONTRACT NO.	11-18-08
PREPARED	
CHECKED	
MECH	
ELEC	
DESIGN	
APPROVED	

DWG NO. 515573

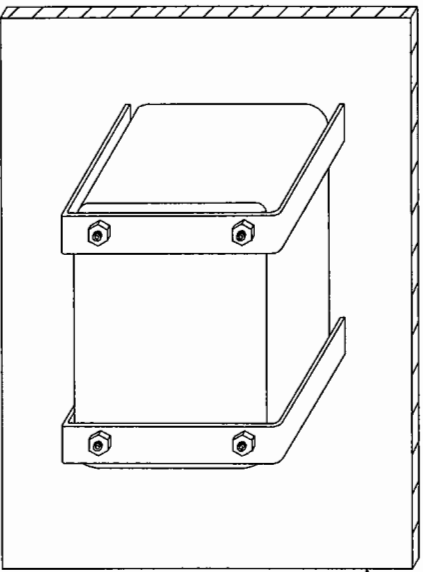
REV	DESCRIPTION	DATE	APPROVED
SH 1			
A	INITIAL RELEASE: ECN 3047A	04-13-93	AG
B	REDRAWN: ECN 3373		



- 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	
DECIMAL	+/- .005"
FRACTION	+/- .100"
ANGLE	+/- 1/32 DEGREE
MATERIAL	-N/A-
FINISH	-N/A-

CONTRACT NO.	
PREPARED	RNT
CHECKED	
MECH	
ELEC	
DESIGN	
APPROVED	

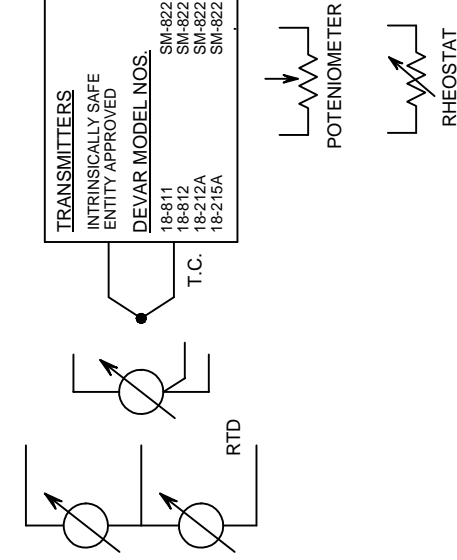
<b>DEVAR Inc.</b>		706 Bradwick Avenue, Bridgeport, Conn. 06605	
		TEL: (203) 368-8751 FAX: (203) 368-5747	
18-SLPI & LD-LPI, NEMA 4 MOUNTING KIT OPTION (-M46)		SIZE	DRAWING NO.
		B	515573
SCALE	NONE	WT	
		SHEET	1 OF 1
		REV	B

DEVT. NO. BM615557-0001

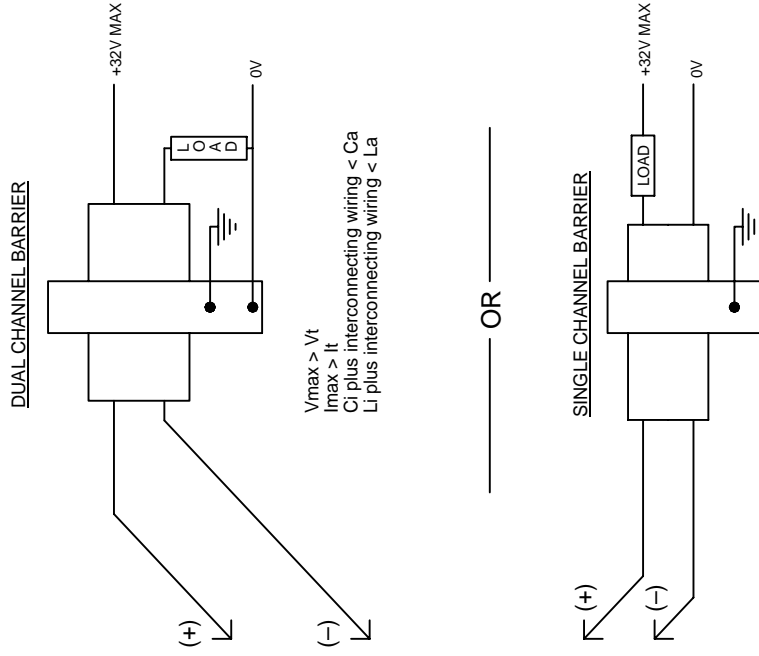
DWG NO. 515107 SH 1

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		CONTRACT NO.	
DECIMAL	+/- .0005"	PREPARED	08-16-05
FRACTION	+/- .0005"	CHECKED	
ANGLE	+/- .166°	MECH	
		ELEC	
MATERIAL	-N/A-	DESIGN	
FINISH	-N/A-	APPROVED	
NEXT ASSTY NO.	NONE	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

