

DEVAR Inc.

706 Bostwick Avenue, Bridgeport, CT 06605

TEL: 203-368-6751 FAX: 203-368-3747

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Model 18-LPI & 18-LPI-SR LOOP POWERED INDICATOR



Manual# 990612

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

General Description

The 18-LPI and 18-LPI-SR are two-wire, digital indicators that provide local, process indication on 3½ digit liquid crystal displays with ½ inch high easy to read digits. These indicators are powered directly from the 4-20 mA signal loop and drop less than 3 volts across their input terminals.

The 18-LPI provides a digital readout directly proportional to the current input. The 18-LPI-SR also provides a digital readout proportional to the current input, or by repositioning of the linear/square-root switch; it provides readout proportional to the square root of the current input. These indicators are calibrated at the factory to read 0 to 100.0% for 4 to 20mA, however both indicators can be field calibrated 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-LPI and 18-LPI-SR is easily accomplished through the use of switches and trimpots. Information on switch positions for the various span and zero calibrations can be found permanently printed on the inside of the front cover. The display span can be adjusted from 0 to 3998 counts in three switch selectable ranges and the zero offset can be adjusted from -1999 to +1999 counts also in three selectable ranges. Note; zero offset adjustment is available in the 18-LPI-SR only when being used in the linear mode. Fine adjustment of span and zero is made on two 15-turn trimpots. The span and zero pots are non-interactive and provide resolutions of better than one count. Some sample display calibrations for a 4 to 20 mA input are as follows:

0	to	1999	(forward acting)
1999	to	0	(reverse acting)
-1999	to	1999	(zero center)
230	to	1735	(elevated zero)
-720	to	850	(suppressed zero)

E	3359	REDRAWN, CHANGE HOUSING, DISCONTINUE OPTION -M43		
D	3067		AG	03-14-94
C	3015		AG	08-09-91
B	2784B		AG	07-15-88
A		RELEASE	AG	01-15-07
REV.	ECN	DESCRIPTION	APPR.	DATE

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CHECKED			N/A	NONE	1 of 7	514793	E

Negative Polarity indication is available when required. The negative sign is enabled or disabled through the use of a switch and can be used when displaying quantities such as -350 to 1000°F. Decimal point selection is also available. Three decimal point positions or no decimal point can be selected through the use of switches.

The 18-LPI and 18-LPI-SR are housed in rugged, indoor, outdoor NEMA-4X, polycarbonate housings. These housings are corrosion resistant and dust-tight, and will withstand direct water spray under hose pressure.

Options available include a 3-inch Snaptrack mounting bracket (-M31S), a DIN rail mounting bracket (-M31D), a 2-inch pipe mounting bracket (-M36), and a ½ inch NPT watertight conduit hub (-M42). There is also an explosive proof version, the model 18-LPIX suitable for use in Class I, Group D and Class II, Groups E, F, and G locations

Specifications

1. Input

- a. Range: 4 to 20mA
- b. Voltage Drop: 3V @ 20mA
- c. Forward Current Over Range: 40mA 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 absent, switch selectable
- e. Action: forward 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-LPI: linear
- b. 18-LPI-SR: linear or square root, switch selectable

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4. Calibration

- a. Span range: 0 to 3998 counts, 3 ranges switch selectable, fine adjustment on 15 turn trim pot, non-interactive with zero pot
- b. Offset range (linear operation only): -1999 to +1999 counts, 3 ranges switch selectable, fine adjustment on 15 turn trim pot, non-interactive with span pot
- c. Resolution: better than 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/ $^{\circ}\text{C}$
- d. Temperature effect (span): $\pm 0.01\%$ of span counts/ $^{\circ}\text{C}$
- 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. FM Approvals

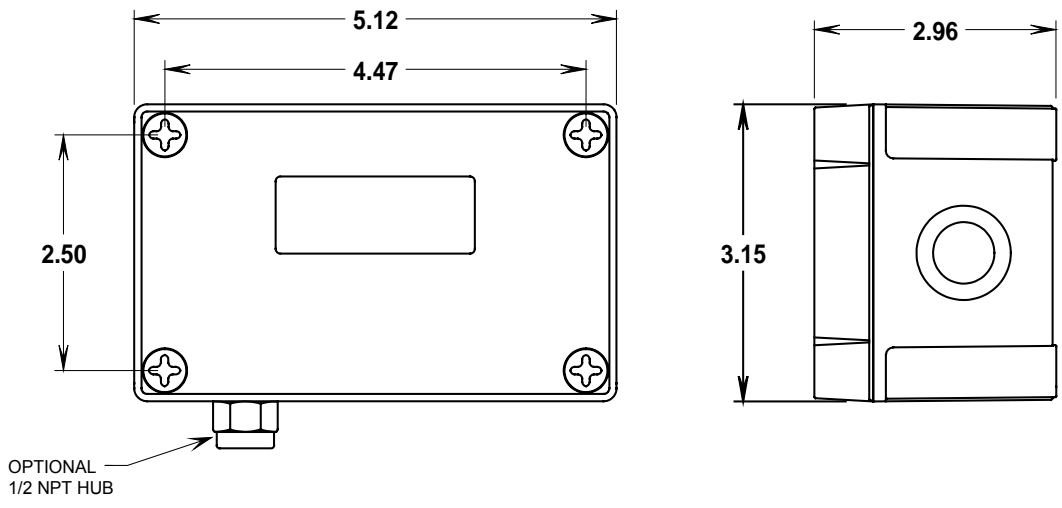
- a. Hazardous Location Ratings: Class 1, Division 1, Groups A, B, C, and D
- b. Entity Parameters: $V_{\text{MAX}} = 32\text{V}$, $I_{\text{MAX}} = 150\text{mA}$, $C_1 = 0\mu\text{f}$, and $L_1 = 0\text{mh}$
(Reference Devar drawing 515107 Interconnecting Diagram to Intrinsically Safe Apparatus)

7. Options

- M31S 3 inch Snaptrack mounting bracket
- M31D DIN rail mount
- M36 2-inch pipe mounting bracket
- M42 1/2 inch NPT watertight conduit hub
- 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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MOUNTING SCREW HOLES FOR NO. 6 SCREWS ARE LOCATED DIRECTLY BEHIND THE FOUR COVER SCREWS

FIG. 1 GENERAL DIMENSIONS

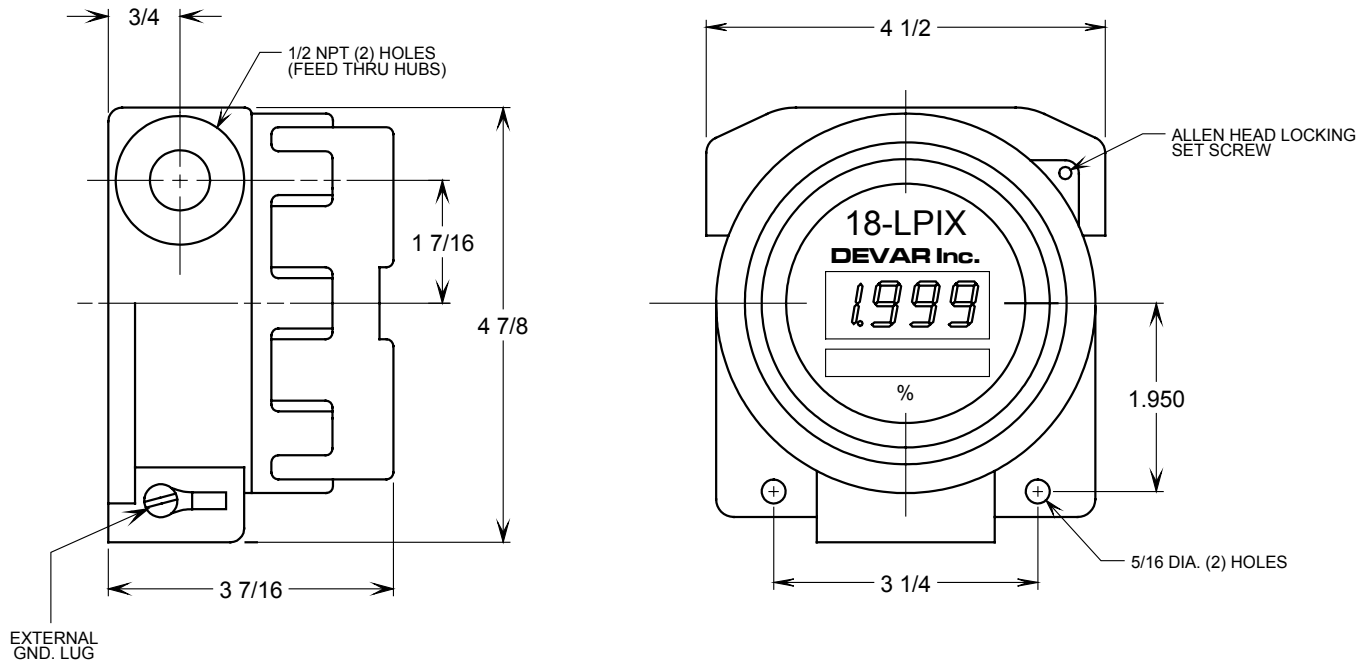


FIG. 2 EXPLOSION PROOF MODEL 18-LPIX

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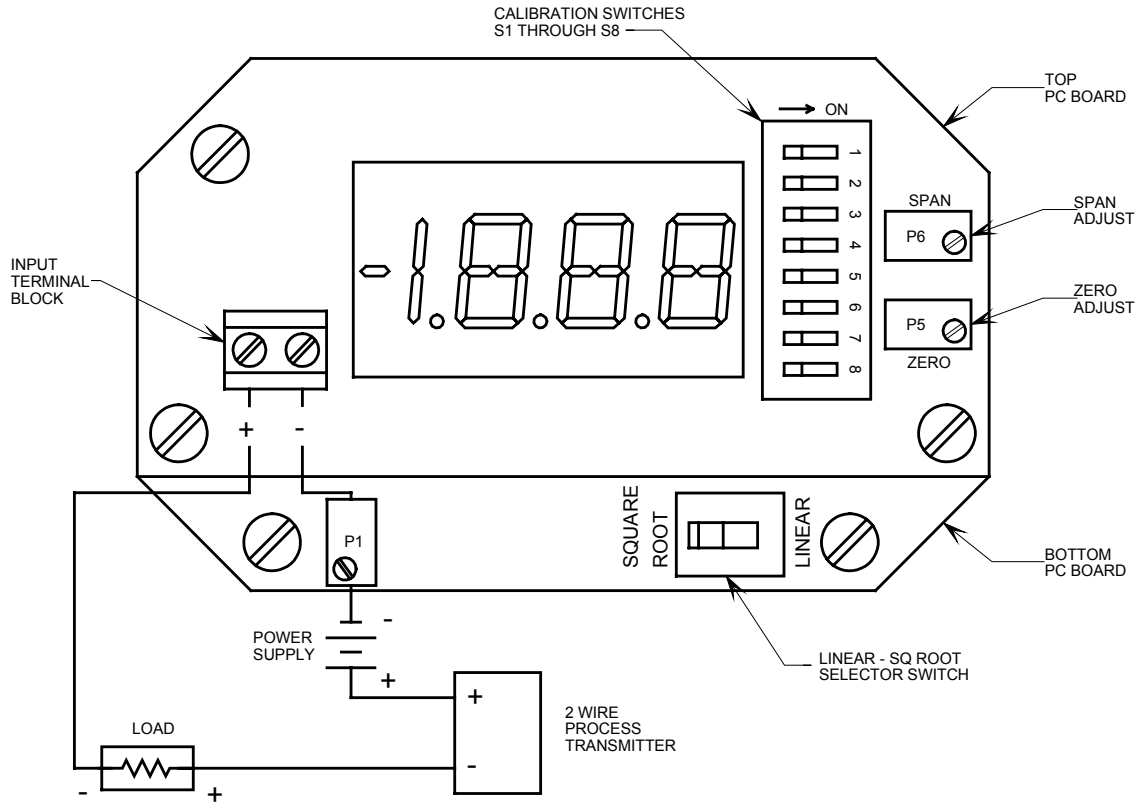


FIG. 3 TYPICAL FIELD WIRING CONNECTIONS AND LOCATION OF CALIBRATION SWITCHES AND POTS

CALIBRATION SWITCH SETTING					
SPAN	S1	S2	ZERO	S3	S4
4000/2470	ON	OFF	2000/573	OFF	ON
2470/1530	OFF	OFF	573/-573	OFF	OFF
1530/000	OFF	ON	-573/-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. 4 CALIBRATION SWITCH SETTINGS FOR SPAN, ZERO, DECIMAL POINT AND POLARITY

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Calibration Procedure for Linear Operation

To calibrate the 18-LPI or 18-LPI-SR, remove the front cover to expose the terminal block and calibrating switches (FIG. 3). If you have the 18-LPI-SR, switch the selector switch to the linear position. The P1 pot, located on the lower PC board is a zero balance pot and has been set at the factory and should not be moved. 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. 4).
EXAMPLE: Span = 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 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-LPI-SR, remove the front cover to expose the calibrating switches (FIG. 3), move the selector switch to the square root position (C2) and calibrate as follows:

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

The 18-LPI-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-LPI-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. 4).
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.

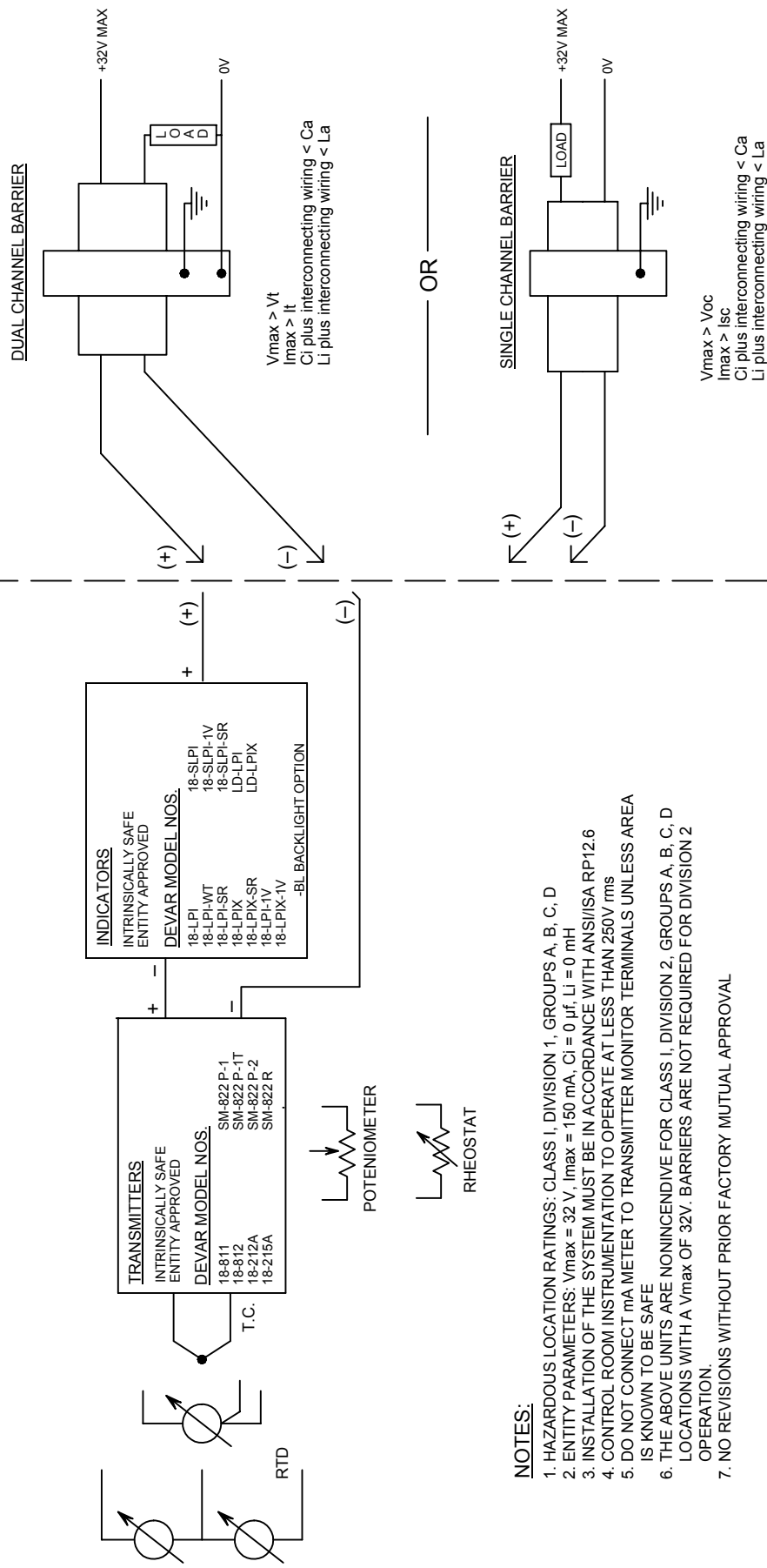
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DWG NO. 515107 SH 1

REV	DATE	DESCRIPTION	APPROVED
H	02-08-95	ADD 18-SLPI, 18-SLPI-V AND 18-SLPI-SR, ECN 3081A	AG
I	01-22-98	ADD LD-LPI, ECN 3154	AG
J	09-09-99	ADD SM-822P-1, SM-822P-1T, SM-822P-2 & SM-822R, ECN 3208	AG
K	09-13-05	ADD LD-LPIX & -BL BACKLIGHT OPTION, ECN 3319	AG
	04-22-91	RELEASE ECN 2826B	AG
	02-26-92	ADD 18-LPI-VT, ECN 3027	AG
	02-07-95	32V WAS 30V, ECN 3081	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.	DEVAR Inc.	706 Bostwick Avenue, Bridgeport, Conn. 06605
DECIMAL ± 0.005	PREPARED 08-16-05	INTERCONNECTING DIAGRAM TO	TEL (203) 368-6751 FAX: (203) 368-3747
ANGLE $\pm 1/16$ "	CHECKED	INTRINSICALLY SAFE APPARATUS	
MATERIAL -N/A-	MECH		
FINISH -N/A-	ELEC		
DESIGN	APPROVED		
NEXT ASSTY NO. NONE	SCALE NONE	DRAWING NO. 515107	REV K
		SIZE B	SHEET 1 OF 1

