DEVAR Inc.
706 Bostwick Avenue, Bridgeport, CT 06605
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http://www.devarinc.com e-mail: info@devarinc.com

Model 4265I

pH TRANSMITTER

MANUAL NO. 900634

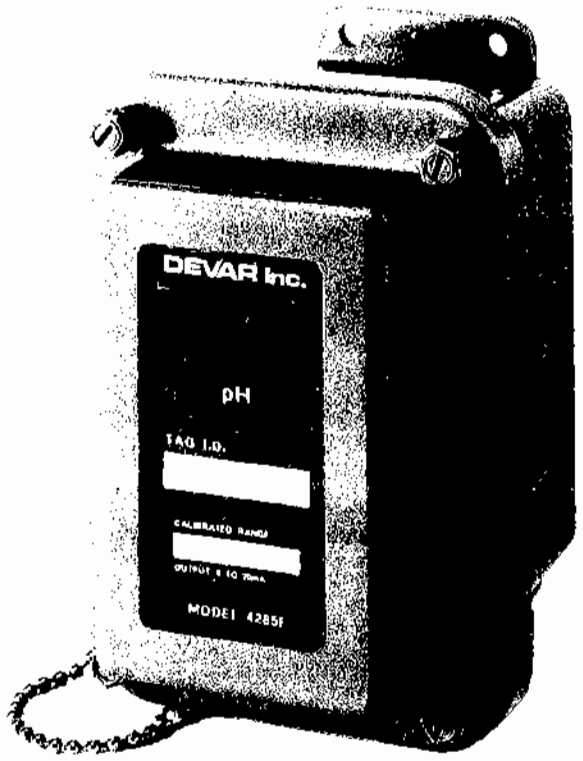
4265I
INSTRUCTION MANUAL

TABLE OF CONTENTS

DEVAR Inc.

INDICATING pH/ORP TWO WIRE TRANSMITTER MODEL 4265 I

- **10^{13} OHMS INPUT IMPEDANCE (EXTENDS ELECTRODE LIFE)**
- **pH, ORP, SELECTIVE ION MEASUREMENT**
- **3 1/2 DIGIT INDICATION (CONTINUALLY INDICATES pH)**
- **NEMA 4X ENCLOSURE**



MODEL 4265 I
INDICATING pH SIGNAL TRANSMITTER

Measurement of pH signals directly from standard measuring and reference electrodes is accomplished by DEVAR's Model 4265 I, 2 Wire pH Signal Transmitter. This instrument is designed to continually measure, indicate and transmit these signals for use in monitoring and controlling a wide variety of industrial processes. Its intrinsically safe design has found many applications in the chemical, pulp and paper, food and beverage, metals and minerals refining, biotech and environmental control industries. It is also available with automatic or manual temperature compensation (0 to 140°C), and features a NEMA 4x housing.

Extremely high input impedance of 10^{13} ohms provides a reduction of current draw from the measuring electrodes. This feature not only extends electrode life but enables trouble free use of various manufacturers sensors. Input/output isolation also enables use in grounded or ungrounded solutions. The electrically isolated output signal allows simple calibration via resistor sets and a precise infinite resolution span adjustor ranging from 1.5 to 14 pH span with offsets from 0 to 12.5 pH. To provide further reliability, conformal coating is applied to all electronic circuit boards.

The 4265 I operates as an indicating pH signal transmitter providing a continuous highly visible direct readout of the calibrated signal in pH (engineering) units.

Two wire operation is featured and 4 to 20 mA, proportional to the pH input signal is supplied. As little as 12.0 VDC is required to operate the unit and any power source within the range of 12 to 70 VDC may be utilized.

Signals from pH sensors typically operate in the reverse mode, i.e. for increasing pH the output signal decreases. The 4265 I may also receive inputs from ORP (Oxidation Reduction Potentials), Ion Selective Electrodes or other mV sources that operate in direct mode.

SPECIFICATIONS

FUNCTION:

INPUT SIGNAL: mVDC FROM pH ELECTRODES
INPUT RANGE: 0 TO 14 pH (MIN SPAN 1.5 pH)
ORP OR ION SELECTIVE: 100 mV TO 1000 mV SPAN
-400 mV TO +800 mV OFFSET
(1200 mV MAX COMBINED SPAN AND OFFSET)
INPUT IMPEDANCE: 10^{13} OHMS
SOURCE CURRENT: 1.0 PICO AMP @ 25°C
TEMP COMPENSATION: MANUAL, (0 TO 140°C) SPECIFY -M
AUTOMATIC, 3000 OHMS @25°C SPECIFY -B
TEMP- COEFF- .0045 OHMS/OHM/°C
OUTPUT SIGNAL: 4 TO 20 mA (600 OHMS @ 24 VDC SUPPLY)
2900 OHMS MAX
10 TO 50 mA (200 OHMS @ 24 VDC SUPPLY)
1100 OHMS MAX
POWER REQUIREMENTS: 4 TO 20 mA (12 VDC +R LOAD X .02)
10 TO 50 mA (14 VDC +R LOAD X .05)
NOTE: 70 VDC MAX. LIMIT SUPPLY TO 30 VDC FOR INTRINSICALLY SAFE OPERATION
INPUT/OUTPUT ISOLATION: 600VDC
STANDARDIZATION ADJ: ± 25% F.S.

PERFORMANCE:

CALIBRATED ACCURACY: ±0.1% F.S. (.01pH) (INCLUDES EFFECTS OF LINEARITY, HYSTERISIS AND REPEATABILITY)
STABILITY: ±.0017 pH/MONTH, NON-CUMULATIVE
AMBIENT TEMP RANGE: -25 TO +70°C
AMBIENT TEMP EFFECTS: .003 pH/°C

PHYSICAL:

ENCLOSURE: RATED NEMA 4X WEATHER PROOF WITH GASKET SEAL
MOUNTING: VIA (4) MOUNTING HOLES
OPTION: -M36. 2 IN. PIPE MOUNT
CONNECTIONS: #6-32 SCREW TERMINALS
WEIGHT: 2 LBS
DIGITAL DISPLAY: 3 1/2 DIGIT L.C.D.
SENSOR/TRANSMITTER SEPARATION: 50 FT (15M)
HUMIDITY LIMITS: 0/99% NON-CONDENSING

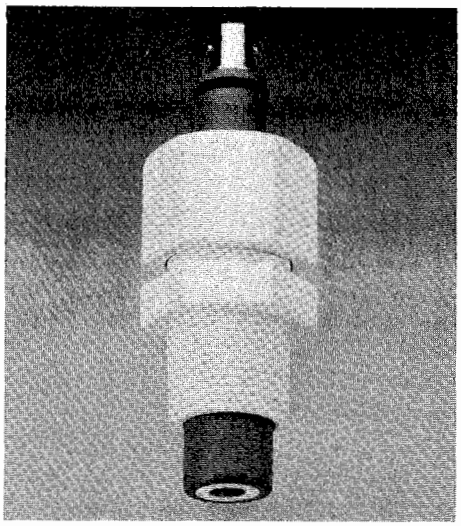
ORDERING INFORMATION:

MODEL 265A - SPECIFY INPUT RANGE (pH)

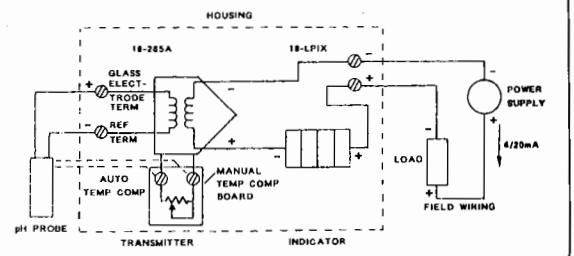
-1	4/20 mA OUTPUT
-2	10/50 mA OUTPUT
-M	MANUAL TEMP COMP
-B	AUTOMATIC TEMP COMP
-R	ORP, ION SELECTIVE OR OTHER mV SIGNAL (DIRECT)
-M36	2" PIPE MOUNTING BRACKET
-M14S	STAINLESS STEEL TAG

FEATURING ABRASION FREE pH ELECTRODES

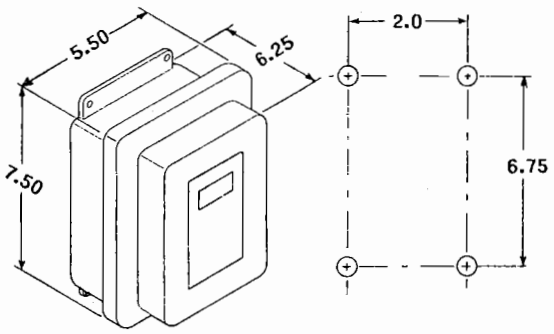
(SEE BULLETIN S600)



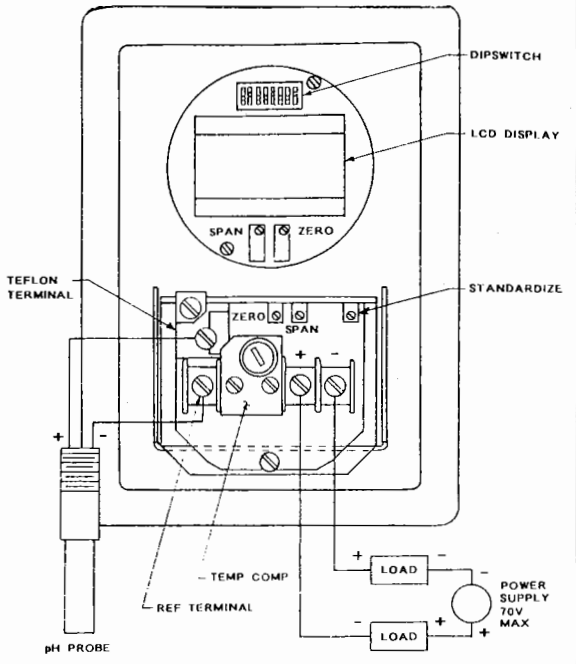
FUNCTIONAL DIAGRAM



GENERAL DIMENSIONS



FIELD WIRING



DEVAR Inc.
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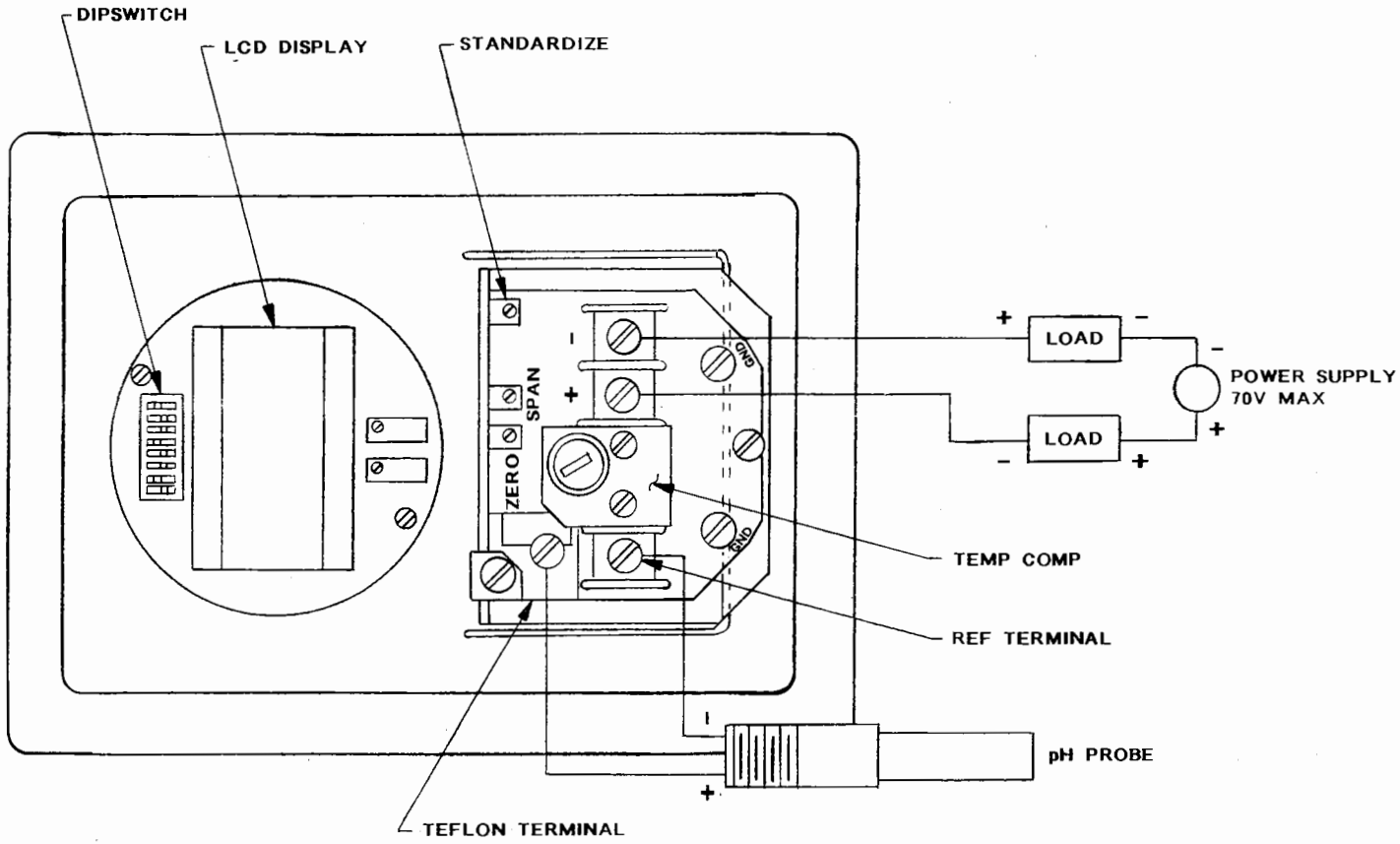
LOG ON via the Internet through the world wide web
use: http://www.devarinc.com

DWG NO. | SH

REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
A	RELEASE; ECN 3101	5-9-96	a.s.



TOLERANCES UNLESS SPECIFIED: DECIMAL DIM. ±.005; FRACT. DIM. ±1/64; ANGLES ±1/2°	CONTRACT NO.		
MATERIAL	PREPARED	LH	12-05-95
	CHECKED	LFG	5.7.96
	MECH		
FINISH	ELEC		
	DESIGN		
	APPROVED		
NEXT ASS'Y NO. B/M 515812-02	APPROVED		

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

FIELD WIRING

4265I pH TRANSMITTER

SIZE	DRAWING NO.	REV
B	515838	A

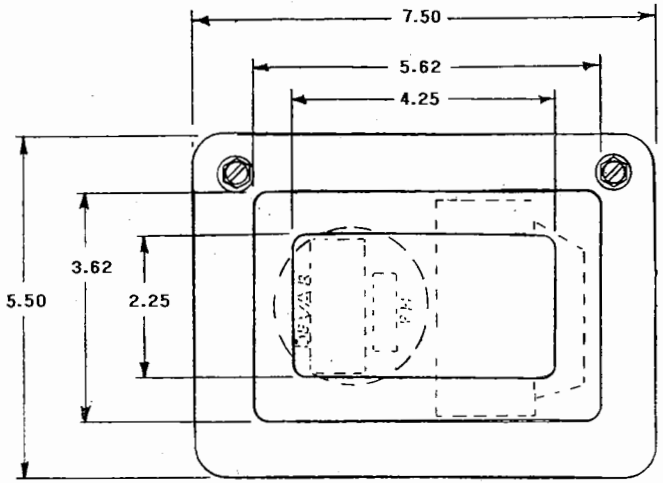
SCALE N.T.S. | WT | SHEET 1 OF 1

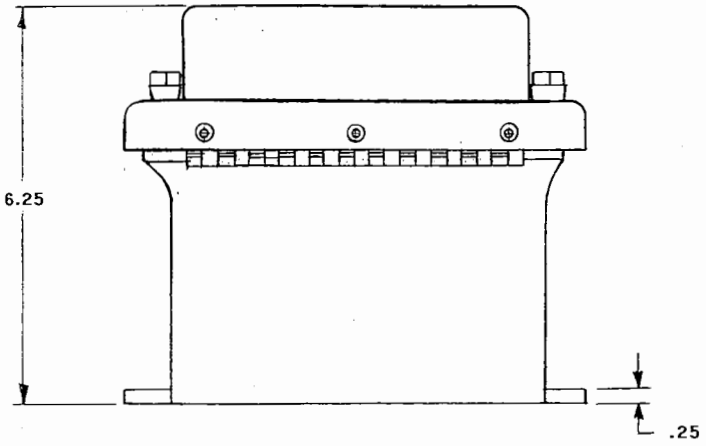
OGILVIE PRESS 054897

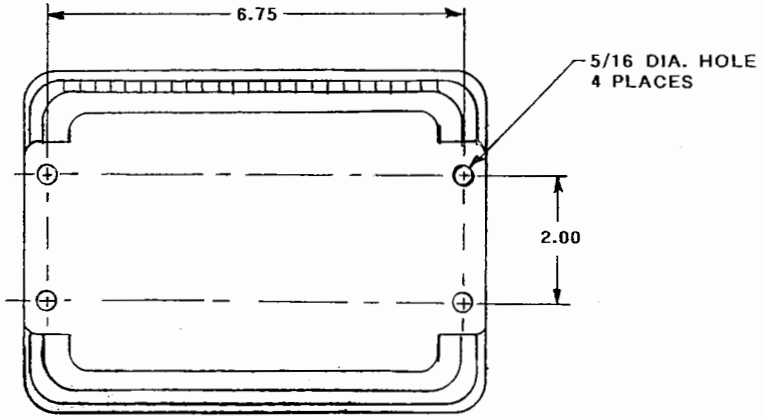
DWG NO. | SH

REVISIONS

REV	DESCRIPTION	DATE	APPROVED
A	RELEASE; ECN 3101	5-9-96	a.s.





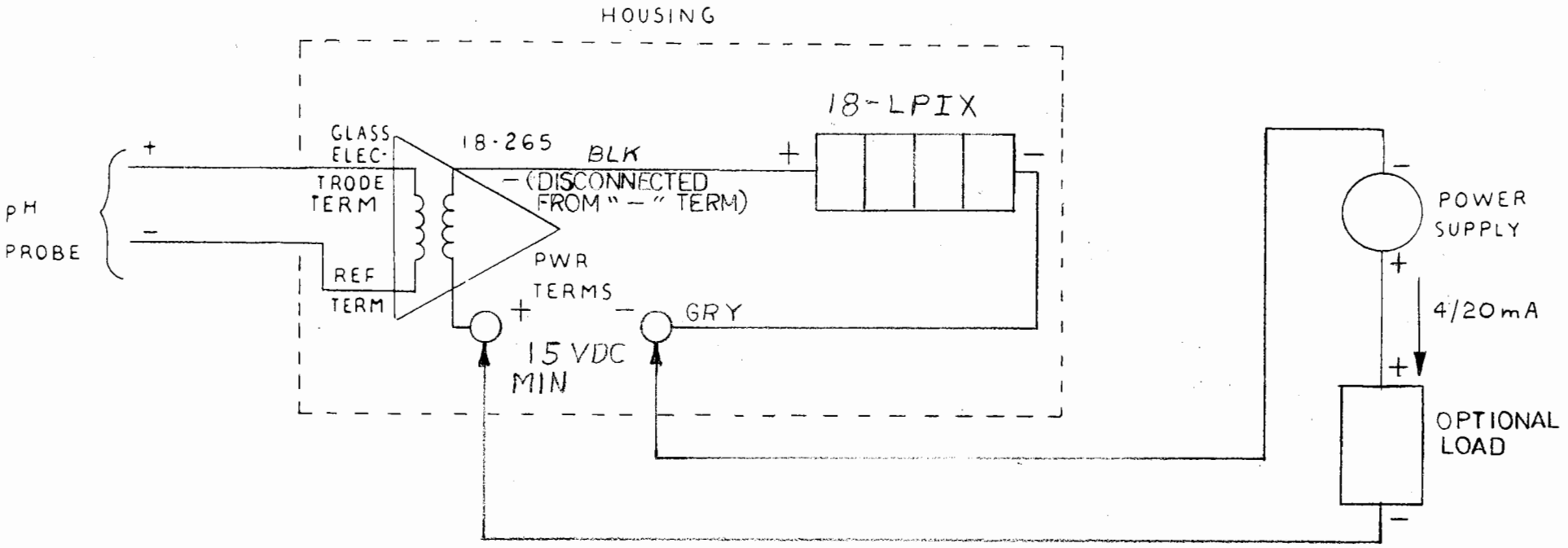


BOTTOM VIEW

NEMA 4X FIBERGLASS ENCLOSURE

TOLERANCES UNLESS SPECIFIED DECIMAL DIM. ± .005 FRACT. DIM. ± 1/64 ANGLES ± 1/2°	CONTRACT NO.		DEVAR Inc. 706 Bostwick Avenue, Bridgeport, Conn. 06605 CONTROL PRODUCTS DIVISION
MATERIAL	PREPARED L.H 5-8-96 CHECKED LFG 5-9-96 MECH ELEC DESIGN		GENERAL DIMENSIONS 4265, 4265I, 4165,4165I TRANSMITTERS
FINISH	APPROVED		SIZE B · DRAWING NO. 515814 · REV A
NEXT ASS'Y NO. B/M515812-01	APPROVED		SCALE 1/2 · WT · SHEET 1 OF 1

REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
A	RELEASE; CO-81351	6-2-93	a.j.



TOLERANCES UNLESS SPECIFIED DECIMAL DIM. ± .005 FRACT. DIM. ± 1/64 ANGLES ± 1/2°	CONTRACT NO.		
MATERIAL ~H	PREPARED	LH	6-1-93
	CHECKED	LSK	6-2-93
	MECH		
FINISH ~H	ELEC		
	DESIGN		
	APPROVED		
NEXT ASS'Y NO. B/M 512132-01	APPROVED		

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

SCHEMATIC, 4265I
ISOL. pH TRANSMITTER W/INDICATION

SIZE	DRAWING NO.	REV
A	512135	A

SCALE ~H WT ~H SHEET 1 OF 1

2 WIRE ISOLATED
ELECTRODE-TO-ELECTRIC TRANSMITTER
TYPE 18-265
PRODUCT DESCRIPTION

1.0 GENERAL DESCRIPTION

1.1 The Type 18-265 Electrode-to-Electric Transmitter has been designed to accept and amplify a millivolt DC signal from a high-impedance source, such as pH, REDOX, or ION-SELECTIVE electrodes, and to provide a current signal suitable for computation and control. It features compact size and consists of a two-section cast-aluminum housing. The output signal may be either 4/20mA or 10/50mA and is completely isolated from the signal source. It is also designed to operate with only two copper-wire leads between the control room and the field-mounted transmitter. These two leads carry the voltage necessary to operate the transmitter, as well as the transmitter's output current. The current output is inversely proportional (directly proportional for type 18-265R) to the electrode input mV signal and can be used for computation, control or monitoring.

1.2 The input pH or mV span is established by selection of fixed resistors and is set to a specified value by an infinite resolution span adjustor. The standarize adjustor allows offset setting of greater than ±10% of span. Various start of range offset values are accomplished by a fixed resistor and resetting of the standarize adjustor.

2.0 SPECIFICATIONS

2.1 General	±0.25% typical, ±0.5% max. 10/50 MA Io
a. Linearity	±0.1% typical, ± 0.25% max. 4/20 MA Io
b. Supply Voltage Effect on Io Output	0.01% per volt (maximum)
c. Load Resistance Effect on Io Output	0.05% per 300 ohm change (maximum)
d. Environmental Temperature Influence	
1. Recommended Temperature Limits	-25°C to 50°C
2. Amplifier Thermal Error	60uV/°C or 0.001 pH/°C with low Input R 72uV/°C @ 25°C, 100 Megohm Input R 84uV/°C @ 35°C, 100 Megohm Input R 100uV/°C @ 45°C, 100 Megohm Input R

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DEVAR INC.

DRAWN:	APPR	ORDER NO.	DRAWING NO.	REV.
5/6/77	A.R		513275	C

e. Amplifier Drift — Less than 100uV, or 0.0017pH per month, nonaccumulative

f. Electrical Classifications — Circuit designed to meet requirements of intrinsic-safety and ISA RP 12.2

g. Stray Rejections — Transverse: 20Db at 60Hz
Common-Mode At 120VAC,60Hz, less than 0.25% of Span Output Shift

2.2 POWER SUPPLY REQUIREMENTS

$E_{Min.}$	$E_{Max.}$	Output
12.0V + (^{R}Load x 20mA)	70V	4/20mA
14.0V + (^{R}Load x 50mA)	70V	10/50mA

2.3 INPUTS

a. Input Impedance — 10^{12} Ohms

b. Source Current — Less than 1.pA @ 25 C

c. Input from pH Electrodes

1. pH Span set with fixed resistors and trimmer adjustor. — Between 1.5 and 14 pH

2. Mid-range of 7pH, set with standarize trimmer adjustor. — Greater than ±10% of span

3. Elevate or suppress pH with fixed resistor and trimmer adjustor. — 0 to 12.5pH

4. pH Solution Temperature Compensation — Provided with manual temperature compensator (M) or for use with automatic thermo-compensator, such as Uni-Loc #2000150 (B) or Van London #160014 (B)

d. Input from Redox, Ion-Selective electrodes or other mV Input Source. — Output is directly proportional to input signal (18-265R)

1. Input Span, set with fixed resistors and trimmer adjustor. — Between 100 to 1000mV

2. Input signal can be suppressed with fixed resistor and trimmer adjustor. (Ex. Range 500 to 700mV.) — Suppression up to 1000mV
Elevation to (-)400mV.
Combined span & offset up to 1200mV.

2.4 OUTPUTS

a. Current Outputs with supply voltage not to exceed 70V DC	1. 4/20mA Requires 12.0V + (R Load x .02) 2. 10/50mA Requires 14.0V + (R Load x .05)

2.5 HOUSING

a. Rain-Tight Enclosure	1/4-20 Drain Plug 1/4-18 NPT Enclosure Purging Port
b. Outline Dimensions	Drawing No. C-381516

2.6 FIELD WIRING TERMINALS

Screw Size	6-32 Screw Terminals used for all field wiring.

2.7 PRODUCT CODING

Type 18-265- [-][-]	Specify Input Range
[1][-]	4/20mA Output Signal
[2][-]	10/50mA Output Signal
[M]	pH Input Manual Temperature Compensator
[B]	pH Input Automatic Temperature Compensator "B" rated for use of 3,000 Ohms @ 25°C probe with T.C. 0.0045 Ohms/Ohms/°C
[R]	Redox, Ion-Selective, or other mV signal source where output is directly proportional to input.

C - P.S. WAS 80V, 14.8+16.8V ECN 2583
B - LINEARITY WAS ±0.1% TYP. ECN
TO RELEASE ECN 1984 3/31/

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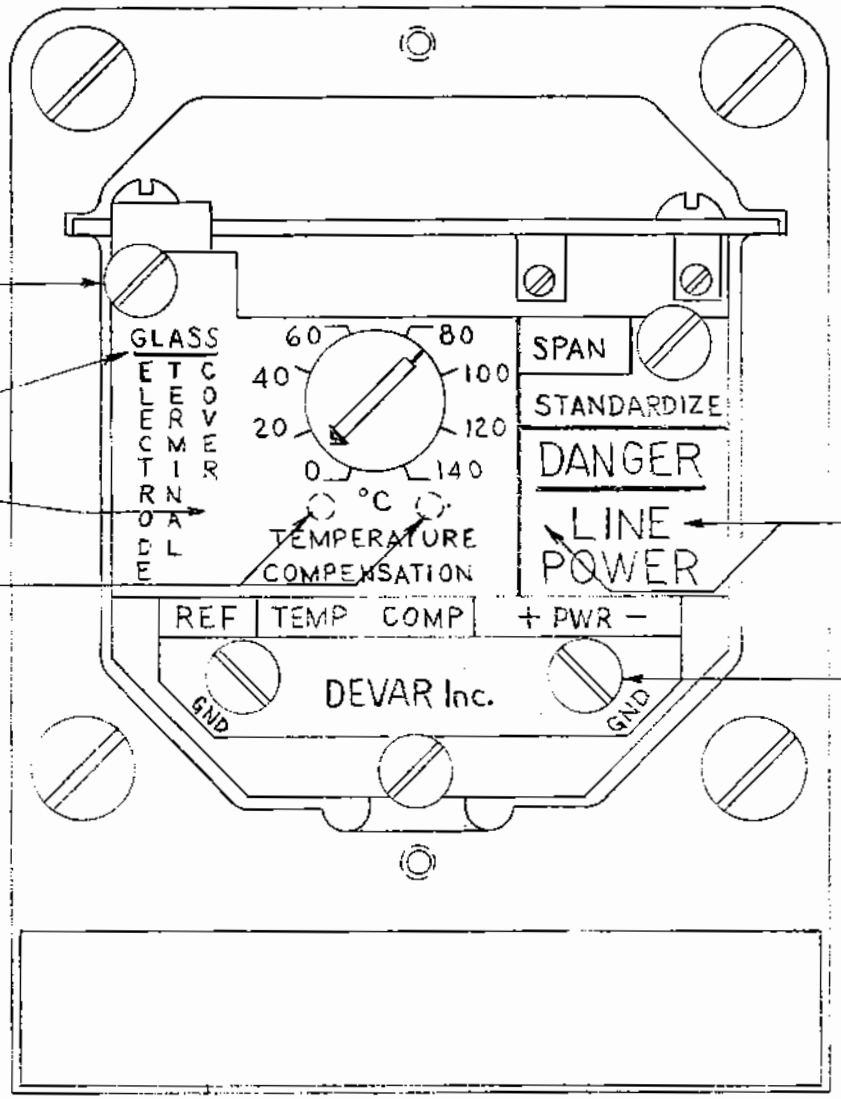
DRAWN	APPR	ORDER NO.	DRAWING NO.	REV.
			513275	C



LOOSEN TWO SCREWS & REMOVE PLASTIC COVER FOR ACCESS TO WIRING TERMINALS

GLASS ELECTRODE TEFLON TERMINAL

REFERENCE ELECTRODE & SHIELD OF ELECTRODES TO REF TERMINAL

CONNECT WIRES OF AUTOMATIC TEMPERATURE COMPENSATION PROBE. IF USED (REMOVE MANUAL TEMP. COMP. POTENTIOMETER PRINTED CIRCUIT BOARD). TERMINALS ARE JUMPERED FOR MODEL 18-265-R (REDOX AMPLIFIER).

WIRE DC LINE POWER LEADS THRU RIGHT CONDUIT OPENING TO "+" & "-" PWR TERMINALS

CONNECT HOUSING TO GROUND WIRE OR GROUND THRU ELECTRICAL FITTING

THREADED 1/2 CONDUIT OPENING FOR ELECTRODE WIRING

THREADED 1/2" CONDUIT FOR DC POWER WIRING

ENTER TOP ASM'L. #, 18-265

CONTROL PRODUCTS DIVISION
706 Bostwick Avenue Bridgeport, Conn. 06605

DEVAR Inc.

DRAWN: EJA 4-25-84	APPR	ORDER NO.	DRAWING NO. 51322	REV. B

51322

REV-B RELEASE S.N. 1954 4-31-84

INPUT SPAN		INPUT SPAN RESISTOR	
pH	mV	R110	DEVAR PART NO.
1.5/2.5	88.71/147.85	38.3K	223737-172
2.5/4	147.85/236.56	23.2K	223737-102
4/6	236.56/354.84	15K	223737-27
6/9	354.84/532.26	10K	221734-07
9/14	532.26/827.96	6.81K	223737-47

SELECTION OF R110 INPUT SPAN RESISTOR

START OF INPUT RANGE (INPUT OFFSET)		INPUT OFFSET NULLING RESISTOR		
pH	mV	R107A	R107B	DEVAR PART NO.
0	+413.98	——	28.7K	223737-173
1	+354.84	——	34.8K	223737-174
2	+295.70	——	45.3K	223737-85
3	+236.56	——	61.9K	223737-175
4	+177.42	——	100K	223737-135
5	+118.28	——	255K	223737-81
6	+59.14	2M	——	380019-02
7	0	499K	——	223737-133
8	-59.14	294K	——	223737-242
9	-118.28	205K	——	223737-89
10	-177.42	158K	——	223737-231
11	-236.56	127K	——	223737-107
12	-295.70	110K	——	223737-225

SELECTION OF R107A OR R107B INPUT OFFSET NULL RESISTORS

INPUT RANGE CALIBRATING RESISTORS FOR 18-265 ISOLATED 2-WIRE ELECTRODE TRANSMITTER

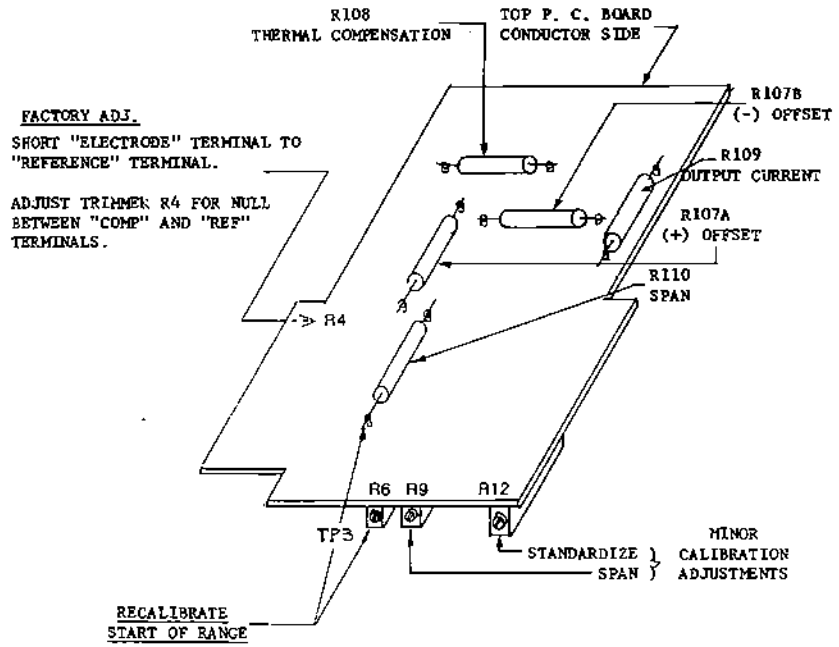
DEVAR Inc.

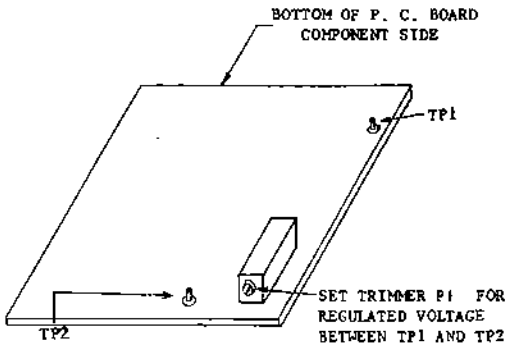
A513286

B CHANGE R107A ECN 2410 10-31-81

A RELEASE ECN 1084 [illegible]

REV B





1 APPLY MINIMUM RANGE SIGNAL BETWEEN "ELECTRODE" AND "REF" TERMINALS.

2 MEASURE VOLTAGE BETWEEN TP3 AND "REF" TERMINAL.

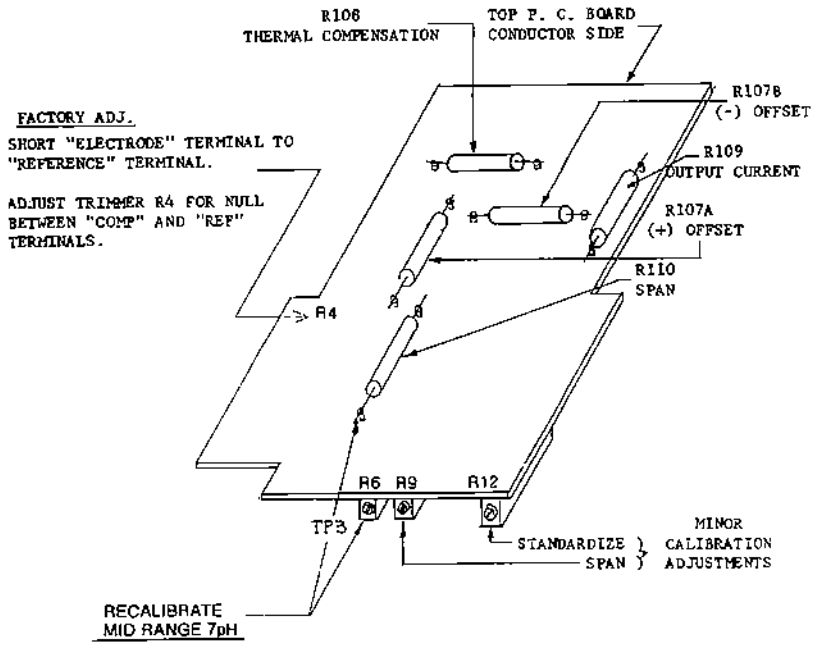
3 ADJUST TRIMMER R6 FOR NULL.

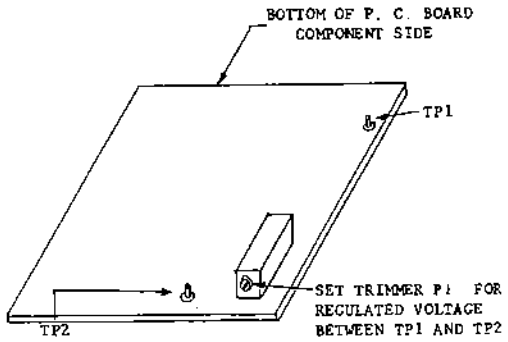
DEVAR INC.

18-265A LOCATION OF CALIBRATING RESISTORS AND POTENTIOMETERS

B-513422 REV C

REV C	ADD SHEET 2 ECN 25838
REV B	DELETE R109 ECN 2583 8-8-83 a.m.
REV A	RELEASE ECN 1984 3-31-78 a.m.





1 SHORT "ELECTRODE" TERMINAL TO "REFERENCE" TERMINAL.

2 MEASURE VOLTAGE BETWEEN TP3 AND "REF" TERMINAL.

3 ADJUST TRIMMER R6 FOR NULL.

ZERO COMPENSATED FOR NONINTERACTIVE SPAN AND STANDARDIZE POTS.

DEVAR INC.	
18-265A-7, LOCATION OF CALIBRATING RESISTORS AND POTENTIOMETERS	
B-513422	REV C.

SHEET 2 OF 2

FINAL CALIBRATION PROCEDURE

18-265 ISOLATED 2 WIRE ELECTRODE TRANSMITTER

1. Connect 24 V power supply and decade box (set to 250 ohms) in series, between output terminals (+) 4 and (-) 5.

2. Measure voltage across test points (+) TP1 and (-) TP2 on voltage regulator (bottom) board. Adjust POT R21 for 10.9V between the test points.

3. Short electrode terminal to input reference terminal.

4. Measure voltage between compensation terminal (+) 3 and input reference terminal (-) 1. Adjust null POT R4 (top board) for zero volts between terminals 3 and 1.

5. Apply minimum input signal between (+) electrode terminal and reference terminal (-) 1.

6. Measure voltage between test point (+) TP3 (top board) and reference terminal (-) 1. Adjust zero POT R6 (top board) for zero volts at TP3.

7. Adjust standardize POT R12 (top board) for 4 mA at the output.

8. Apply maximum input signal adjust span POT R9 (top board) for 20 mA out.

9. Repeat steps 7 and 8 until unit is calibrated.

10. Set input to midrange verify output equals 12 mA ±.04 mA.

11. Connect a 100 megohm resistor between the input voltage source and the electrode terminal. Verify that the output does not change by more than $\frac{.027}{\text{INPUT SPAN}}$ mA.

    EXAMPLE: For an input of 2 to 12 pH

    Δ OUTPUT = $\frac{.027}{10}$ = .0027 mA

12. Adjust the input for 20 mA at the output. Increase the resistance of the decade box from 250 to 600 ohms. Verify that output does not change by more than .008 mA.

14. With the output at 20 mA and the load at 600 ohms, momentarily break the output current loop then reconnect it. Verify that the output returns to 20 mA and that the transmitter does not begin to oscillate.

REFERENCE DRAWINGS:
SCHEMATIC C513273
CALIBRATION COMPONENT LOCATION B513422
ASS'Y AMPLYFIER (TOP) BOARD B513259
ASS'Y ISOLATION (CENTER) BOARD B513452
ASS'Y REGULATOR (BOTTOM) BOARD A514232

REVISIONS	B ECN 2874A 7-5-88 a.s. / A ECN 2874 3-18-88 a.s.		
PREPARED	L.F.G. 3-14-88	APPROVED	

DEVAR Inc.
706 Bostwick Avenue, Bridgeport, Conn. 06605

DRAWING NO. 514921 REV! B

SWITCH SELECTION PROCEDURE FOR THE CALIBRATION BOARD FOR THE 18-265 Ph TRANSMITTER

The calibration board for the Model 18-265A pH transmitter provides a means of calibrating the transmitter for various pH ranges without having to solder calibration resistors to the transmitters circuit board. All calibration components are mounted on the calibration board and are selected through the use of DIP switches.

The input span is selected by setting switch 1 positions 1 through 5. The span is defined as the bottom of the input range subtracted from the top of the input range. For example, if the input to produce a 4 to 20 mA output is 7 to 10 pH, the input span would be 3 pH units.

The start of range, or input offset, is selected by setting the remaining 13 DIP switch positions. The start of range is the input value which produces a 4 mA output.

Example: For an input range of 5 to 12 pH the span would be 7 pH and the start of range would be 5 pH. Switch 1 position 4 would be on for a span range of 6 to 9 pH and switch 2 position 5 would be on for a start of range of 5 pH. All other switches would be off.

SWITCH	RES.	RESIST.	INPUT SPAN pH	INPUT SPAN mV	START OF RANGE pH	START OF RANGE mV
SW1-1	R1	38.3K	1.5 / 2.5	88.7 / 147.8		
SW1-2	R2	23.2K	2.5 / 4	147.8 / 236.6		
SW1-3	R3	15K	4 / 6	236.6 / 354.8		
SW1-4	R4	10K	6 / 9	354.8 / 532.3		
SW1-5	R5	6.81K	9 / 14	532.3 / 828		
SW1-6	R6	28.7K			0	+ 413.98
SW2-1	R7	34.8K			1	+ 354.84
SW2-2	R8	45.3K			2	+ 295.70
SW2-3	R9	61.9K			3	+ 236.56
SW2-4	R10	100K			4	+ 177.42
SW2-5	R11	255K			5	+ 118.28
SW2-6	R12	2M			6	+ 59.14
SW3-1	R13	499K			7	.00
SW3-2	R14	294K			8	- 59.14
SW3-3	R15	205K			9	- 118.28
SW3-4	R16	158K			10	- 177.42
SW3-5	R17	127K			11	- 236.56
SW3-6	R18	11[illegible]K			12	-295.70

REV	ECN	PREPARED	APPROVED	NEXT ASSY	PAGE	DRAWING NO.	REV
A	3147	LFG	a.22, 11-11-97	B/M 5[illegible]058-C	1 OF 1	516063	A

DEVAR Inc.
706 BOSTWICK AVE.
BRIDGEPORT, CT. 0[illegible]605

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

General Description

The 18-LPIX and the 18-LPIX-SR are two-wire,digital indicators, in explosion proof housings,that provide local indication of the measured variable on a 3 1/2 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 milliamp current loop. They are powered directly from the loop and drop less than 2.8 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% for a 4 to 20 milliamp 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 trimpots. Information on switch positions for various span and zero ranges can be found printed on a label attached to the inside wall of the indicator housing. The 18-LPIX can be calibrated to display any range of numbers between -1999 and +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, noninteractive trimpots, 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 milliamp input are as follows:

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

Reverse action is achieved by disabling the negative sign and applying the appropriate negative offset. Note that when calibrating the 18-LPI-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 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 base board attached to the bottom of the housing. Field wiring connections are made to a two point, compression type, terminal block located on the base board.

The housing is ruggedly constructed of sand-cast, copper-free aluminum. Two 1/2 inch NPT hubs are provided for entrance into the housing which is rated NEMA 4 and Nema 7 and is classified for use in Division 1, Class I, Groups B, C and D, and Division 1, Class II, Groups E, F and G hazardous locations.

Specifications

1. Input

    a. Range: 4 to 20 mA
    b. Voltage drop: 2.8 V at 20 mA
    c. Forward current overrange: 60 mA max.
    d. Reverse current: 60 mA max.

2. Display

a. Type: 3 1/2 digit LCD, 1/2 inch high digits
b. Range: -1999 to 1999 counts
c. Decimal point: three positions or absent, switch selectable
d. Polarity sign: negative polarity indication or none, switch selectable
e. Action: direct acting (count increases with current), reverse acting (count decreases with current), obtained by appropriate zero setting
f. Overrange indication: display blanks except for most significant 1

3. Models

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

4. Calibration

a. Span range(18-LPIX): 0 to 3998 counts, 3 ranges switch selectable, fine adjustment on 15 turn trim pot, noninteractive 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, noninteractive with span pot
d. Resolution: better than 1 count

5. Performance

a. Accuracy (linear): ±.1% of span counts, ±1 count
b. Accuracy (square root): ±.15% of span counts, ±1 count; for input signals between 4.16 and 20 mA
c. Temperature effect (zero): ±.1 count /^{o}C
d. Temperature effect (span): ±.01% of span counts /^{o}C
e. Operating temperature: -20 to +70 ^{o}C
f. Ripple rejection: less than 1 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 for use in Division 1, hazardous areas Class I, Groups B,C & D; Class II, Groups E, F & G
   d. Weight: 2.8 lbs.

7. Options

   M36: 2 inch pipe mounting bracket

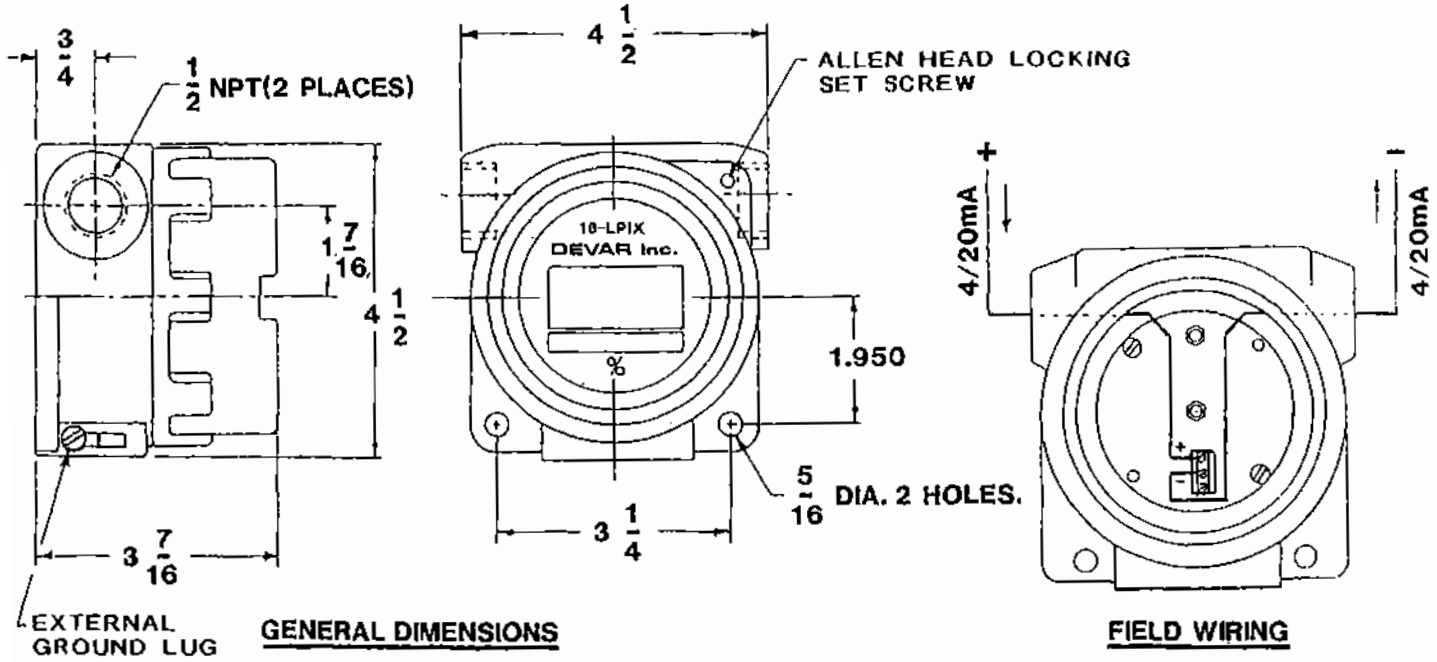


FIG. 1-GENERAL DIMENSIONS AND FIELD WIRING

APPROVED	DEVAR Inc. 706 Bostwick Avenue, Bridgeport, Conn. 06605 CONTROL PRODUCTS DIVISION			
APPROVED	PRODUCT DESCRIPTION, 18-LPIX, 18-LPIX-SR			
SHEET 4 OF 8	SIZE A	MF 8/9/90	DRAWING NO. 515259	REV B

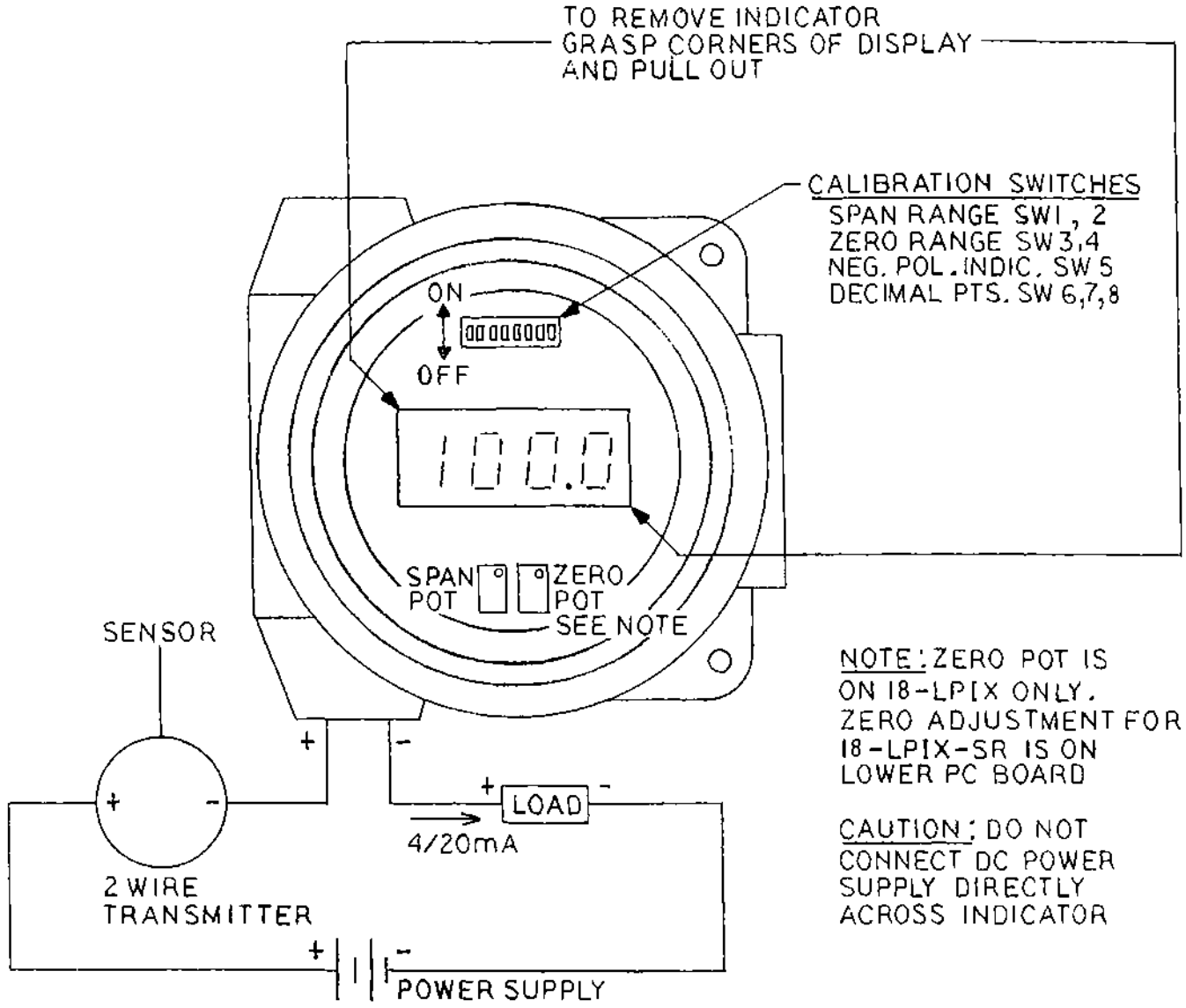


FIG. 2 - TYPICAL FIELD WIRING CONNECTIONS AND LOCATION OF CALIBRATION SWITCHES AND POTS

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APPROVED	PRODUCT DESCRIPTION, 18-LPIX, 18-LPIX-SR			
SHEET 5 OF 8	SIZE A	MF 8/9/90	DRAWING NO. 515259	REV B

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 S5 ON		
1.999	S6	ON			
19.99	S7	ON			
199.9	S8	ON			

FIG. 3 - TABLE OF CALIBRATION SWITCH SETTINGS FOR SPAN, ZERO, DECIMAL POINTS, 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. Proceed to calibrate the indicator as follows:

1. Determine desired display for 4 to 20 mA input.
   EXAMPLE: -30.0 to 195.0 °F

2. Set span switches S1 and S2 for proper span range, see Fig. 3
   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 4 mA and set zero pot for bottom of range.
   EXAMPLE: adjust zero pot to display - 30.0

7. Input 20 mA and set span pot for top of range.
   EXAMPLE: adjust span pot to display 195.0

8. The indicator is now calibrated.

Calibration Procedure For Square Root Operation

To calibrate the 18-LPIX-SR, remove the front cover and label exposing 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. Proceed to Calibrate the indicator as folows:

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

The 18-LPIX-SR is calibrated between 4.16 mA (1% of input span) and 20 mA. When extracting the square root, a 4.16 mA 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 and solve.
EXAMPLE: determine the display reading for a 4.16 mA input.

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

$$\text{READING} = 200$$

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APPROVED	PRODUCT DESCRIPTION, 18-LPIX, 18-LPIX-SR		
SHEET 7 OF 8	SIZE A	MF 8/9/90	DRAWING NO. 515259 REV B

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 4.16 mA and adjust pot P1 on lower PC-board for a 10% of full scale reading.
   EXAMPLE: adjust P1 to display 200

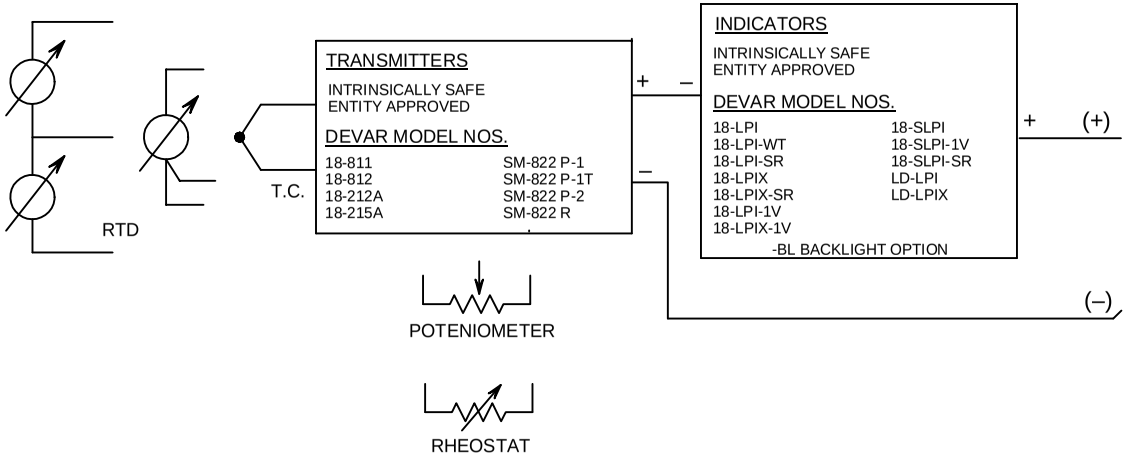
6. Input 20 mA and adjust span pot on upper PC board for the full scale reading.
   EXAMPLE: adjust span pot to display 2000

7. Repeat steps 5 and 6 as required.

DWG NO. 515107 SH 1

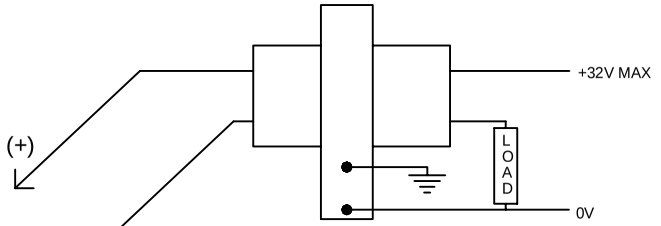
REV	DESCRIPTION	DATE	APPROVED
H	ADD 18-SLPI, 18-SLPI-IV AND 18-SLPI-SR, ECN 3081A	02-08-95	AG
I	ADD LD-LPI, ECN 3154	01-22-98	AG
J	ADD SM-822P-1, SM-822P-1T, SM-822P-2 & SM-822R, ECN 3208	09-09-99	AG
K	ADD LD-LPIX & -BL BACKLIGHT OPTION, ECN 3319	09-13-05	AG
E	RELEASE ECN 2826B	04-22-91	AG
F	ADD 18-LPI-WT,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

HAZARDOUS LOCATION



NON-HAZARDOUS LOCATION

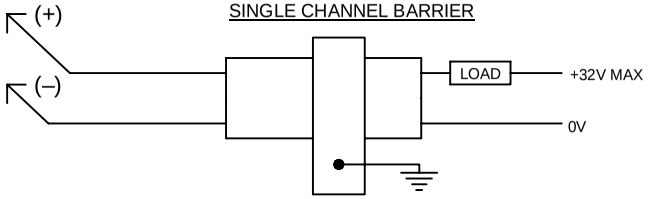
DUAL CHANNEL BARRIER



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