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Model 18-241

mV OR THERMOCOUPLE ALARM

Manual #990603

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SECTION I

GENERAL DESCRIPTION

1.1 The 18-241 temperature alarm receives signals from thermocouples or other millivolt sources and energizes a SPDT relay due to an alarm condition. The unit has reverse supply polarity protection, and will operate with a wide range of supply voltages (8 to 44 VDC). A self powered version of the 18-241 is offered as an option (-B). It is powered by two lithium batteries (3.5 VDC each, total 7 VDC) that under stand by condition last a year.

1.2 The 18-241 features an adjustable set point (0/100%), where the set point voltage (0/1.00 VDC) is brought out to a terminal block that can be measured and set to a predetermined alarm trip point. The unit has two LED lamp indicators, one turns on when the unit goes into the alarm condition and the other flashes when the battery voltage is low. (This feature comes only with battery powered temperature alarm, 18-241-B).

1.3 The 18-241 has input break indication option where by opening the thermocouple input wire, the unit goes into the alarm condition. The unit has a DIP switch where different deadbands (1.6% to 8% of span), ON or OFF alarm latching, and HI or LO alarm action may be selected. The 18-241 is also protected from Radio Frequency Interferences (RFI) by shielding and filtering.

SECTION II

SPECIFICATIONS

2.1 GENERAL

Power Requirements	
Standard	8 to 44 VDC
Battery Powered	185 uA at 7V standby (Typical), 3.5 mA at 7V alarm condition (Typical)
Accuracy	0.1% of span (Includes combined effects of repeatability, hysteresis and linearity referred to mV input)
Operating Temperature	-25° C to 75° C
Thermal Zero Shift	
Millivolt	Less than .01%/°F of span (Span $>$ 10 mV)
Thermocouple	Plus 1 uV/°C due to the thermocouple junction compensation
Thermal Span Shift	Less than .01%/°F of span
Alarm Set Point	Adjustable from 0 to 100% of span
Alarm Action	HI or LO (Set via DIP switch)
Alarm Latch	ON or OFF (Set via DIP switch)
Dead Band	2% of span, standard, 1.6%, 4%, 8% of span (Set via DIP switch)

2.2 INPUT

Sensor	All types of thermocouples and millivolt sources
Input Span	2 to 20 mV
Input Break Indication	Available, the unit goes into the alarm condition
Input Source Current	15 nA, max (without break indication) 70 nA, max (with break indication)

2.3 OUTPUT

Contacts	SPDT
Resistive Load	3 Amp max, 28 VDC or 117 VAC
Contact Material	Fine silver

2.4 OPTIONS

-B: The battery powered version is offered as an option. It is powered by two lithium batteries with the following characteristics:

Type	Lithium
Working Voltage	3.5 VDC
Capacity	1600 mAH
General Dimensions	1.44 L x .53 W x .53 T
Low Battery Indication	Flashing LED
Battery Life	
Standby	One Year
Alarm Condition	19 Days

-M37A: The 18-241 can be offered in an explosion proof housing.

SECTION III
INSTALLATION

3.1 The 18-241 temperature alarm can be surface mounted, or installed into a SNAPTRACK mounting rail. The 18-241 has been miniaturized to allow 7 units per foot length of a SNAPTRACK.

3.2 Connect appropriate DC power source to (+) and (-) power terminals. Also connect the thermocouple wire or the millivolt source to (+) and (-) input terminals. Refer to FIG 3.1 for detailed wiring instructions.

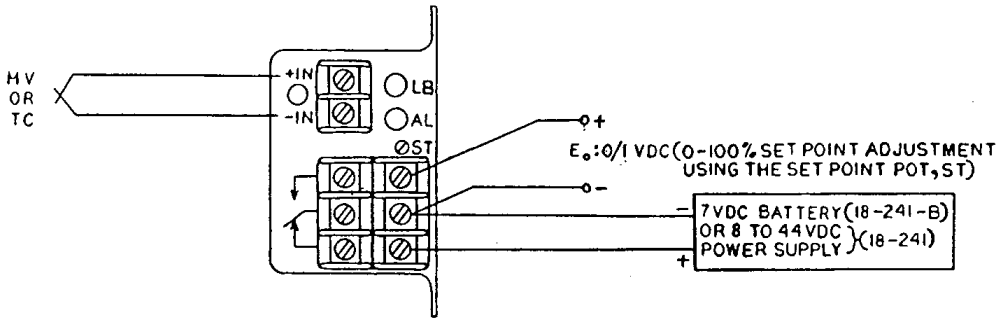


FIG 3.1 - Typical wiring diagram

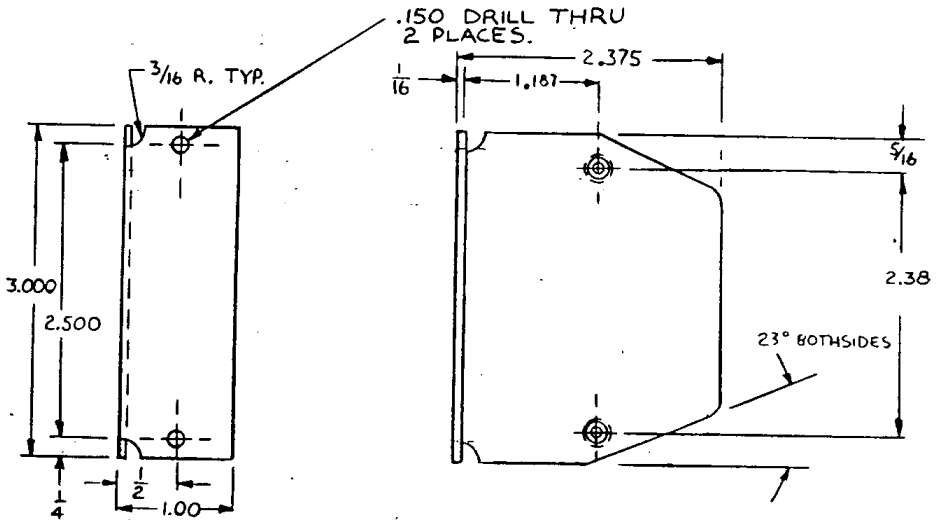


FIG 3.2 - General Dimensions of the mounting bracket

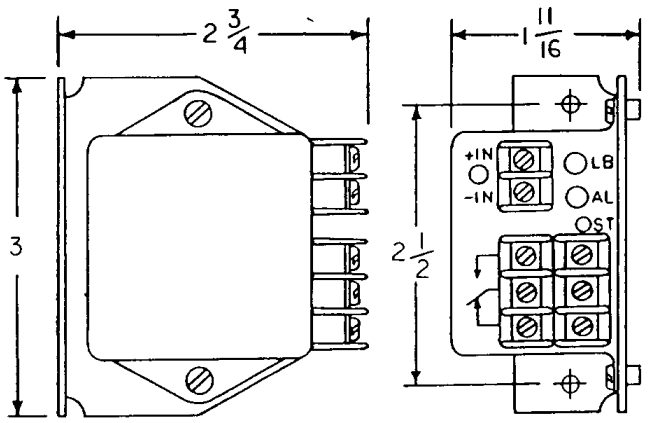


FIG 3.3 - General Dimensions of 18-241

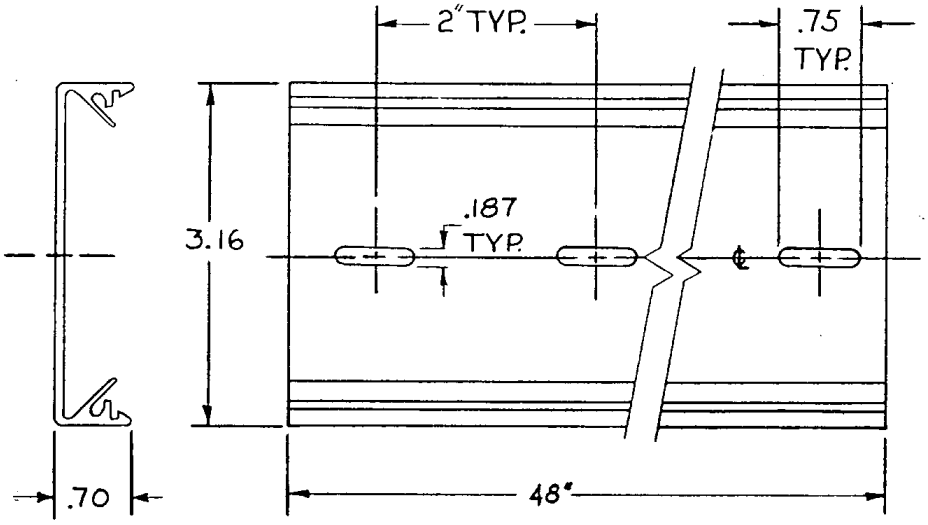


FIG 3.4 - General Dimensions of the SNAPTRACK mounting rail

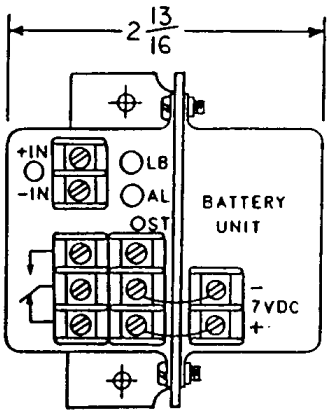


FIG 3.5 - The 18-241-B (Battery Powered)

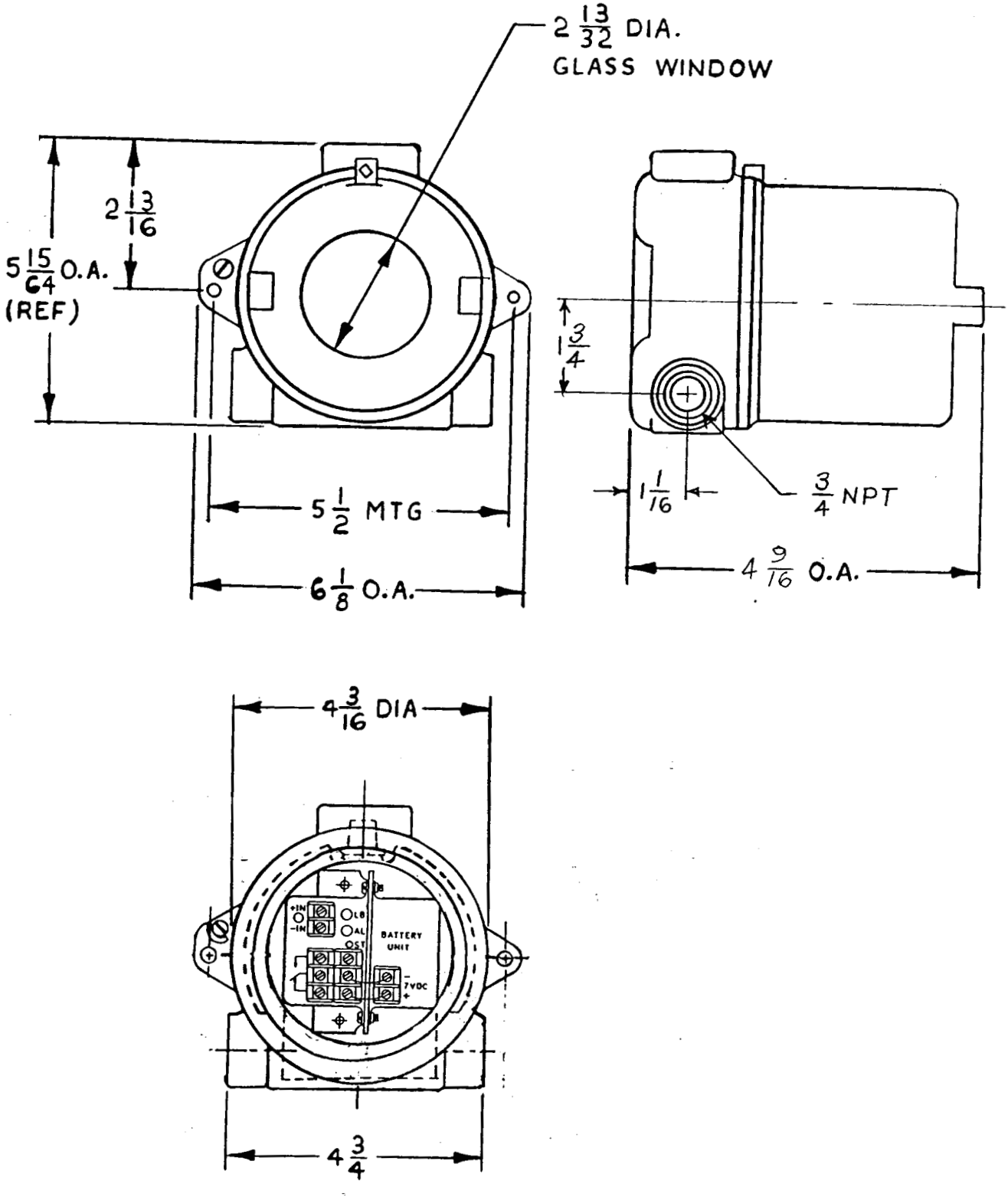


FIG 3.6 - Explosion proof housing 18-241-B-M37A

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. The two pots are located on the bottom board and can be reached by disconnecting the mounting bracket from the unit as shown in FIG. 4.3. For a major calibration change, refer to FIG. 4.1. Note that the following recalibration is valid if the input span is between 2 and 20 mV. For other input ranges a special calibration is required.

STEPS	CONDITION REQUIRED	INPUT	
		MILLIVOLT	THERMOCOUPLE
1	Input Span	R110, EQ. 4-A	
2	Zero Trim	R113, EQ. 4-B	
3	Input Offset	R107A, B FIG. 4.4	
4	HI or LO Alarm	Set Via DIP Switch, FIG. 4.3	
5	Set Deadband	Set Via DIP Switch, FIG. 4.3	
6	Thermocouple Junction Compensation	R118A, B = Open	R118A (Direct) R118B (Reverse) FIG. 4.2

FIG. 4.1 - Summary of a major calibration change

$R110 = .806\left(\frac{750}{S} - 1\right)$ where, EQ. 4-A

S is the input span in millivolts

R110 is the span resistor in K-Ohms.

$R113 = \frac{2000}{S}$ where, EQ. 4-B

S is the input span in millivolts

R113 is the zero trim resistor in K-Ohms

THERMOCOUPLE TYPE	R118A, B METAL FILM, 1%, T2	
	VALUE	PART NO.
J (I.C.)	33.2 K-ohms	223737-216
K (C.A.)	42.2 K-ohms	223737-209
T (C.C.)	41.2 K-ohms	223737-141
R (P-PR 13%)	280 K-ohms	223737-240
S (P-PR 10%)	280 K-ohms	223737-240
E (C.C.)	28 K-ohms	223737-206
B(PR 6%, PR 30%)	OPEN	

FIG. 4.2 - Thermocouple junction compensation resistor table.

4.2 To determine the offset correction required to accommodate the start of the input signal refer to FIG. 4.4.

4.3 After all the calibrating resistors are computed, they may be installed according to DWG. No. A514867.

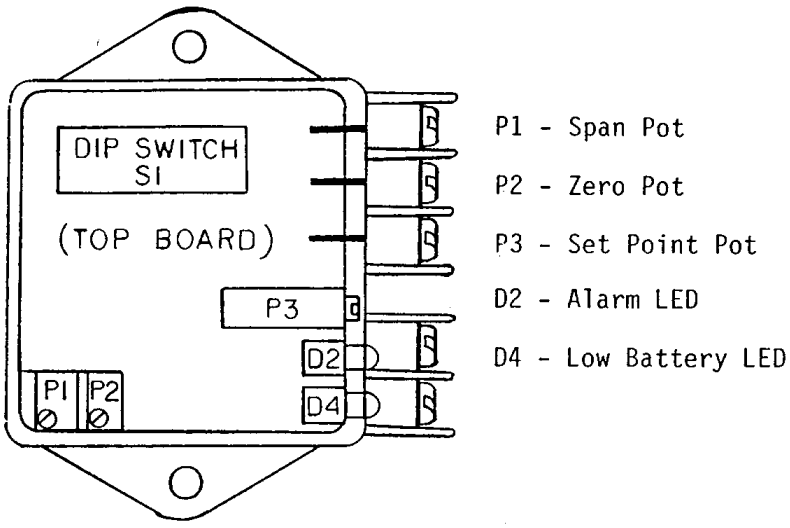


FIG. 4.3A - Location of the zero and span pots

CONDITION REQUIRED		DIP SWITCH S1 POSITIONS								
		1	2	3	4	5	6	7	8	9
ALARM ACTION	HI	1	1	0	0					
	LO	0	0	1	1					
LATCH	ON					1				
	OFF					0				
DEAD BAND %	1.6						1	1	1	1
	2						1	1	0	0
	4						0	0	1	1
	8						0	0	0	0

Note: Position "1" is ON and "0" is OFF.

FIG. 4.3B - DIP switch positions table

STEPS REQUIRED	INPUT SIGNAL	
	MILLIVOLT	T.C. DIRECT (J)
1 - SPECIFY INPUT RANGE	5 TO 15 mV	0 TO 500° F
2 - CALCULATE THE MILLIVOLT INPUT SPAN	15 - 5 = 10mV	14.108 - (-0.885) = 14.993 mV
3 - EXPRESS THE START OF INPUT RANGE	+5	-0.885 (REF. 32° F)
4 - EXPRESS START OF INPUT RANGE REFERENCE TO THE ROOM TEMPERATURE (75° F)	+5	-.885 - (1.22) = -2.105 (REF. 75° F)
5 - ENTER CORRECTION FOR THE ZERO TRIM -0.25 x mV SPAN	-0.25 x 10 = -2.5	-0.25 x 14.993 = -3.748
6 - ENTER CORRECTION FOR THE T.C. COMPENSATION	---	-14.2
7 - ADD STEPS 4, 5, AND 6. THIS IS THE TOTAL OFFSET CORRECTION	+5 - 2.5 = +2.5	-2.105 - 3.748 -14.2 = -20.053
8 - CALCULATE THE OFFSET RESISTOR. $R107\ (A,B) = \frac{1000}{\text{TOTAL OFFSET}}$	+OFFSET R107B = 400K	-OFFSET R107A = 49.9K

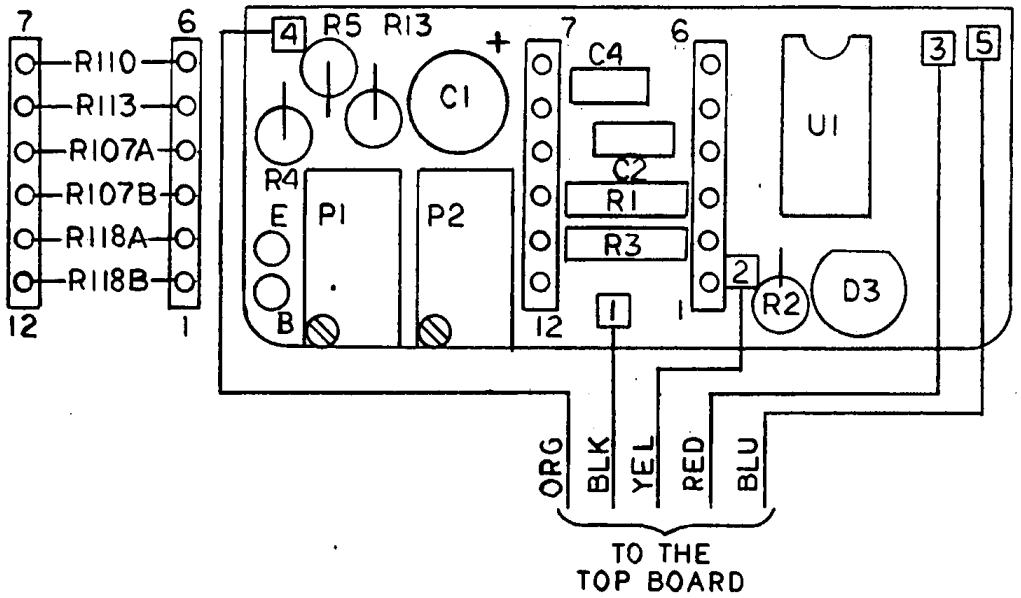
T.C.	DIR	REV
J	-14.2	14.2
K,T	-11.2	11.2
R,S	-1.67	1.67
E	-16.7	16.7

FIG 4.4 - EXAMPLES OF CALCULATING THE OFFSET CORRECTION

DWG NO 514867 SH

REVISIONS

REV	DESCRIPTION	DATE	APPROVED
A	RELEASE · ECN 2848A	8·31·87	



ASSEMBLY INFO

A-COMPONENT SPACING

COMPONENT(S)	LEAD SPACING
R2,R4,R5,R13	.150
R1,R3	.200

B-COMPONENT GROUPING

STEP	COMPONENT(S)
1	R1,R3,C2,C4
2	R2,R4,R5,R13
3	TERMINAL STRIP,C1,D3, U1
4	P1,P2,FIVE WIRES

TOLERANCES UNLESS SPECIFIED DECIMAL DIM. ± .005 FRACT. DIM. ± 1/64 ANGLES ± 1/2°	CONTRACT NO.		
	PREPARED	MF	8/22/87
MATERIAL	CHECKED	SHB	8·31·87
	MECH		
FINISH	ELEC		
	DESIGN		
	APPROVED		
NEXT ASS'Y NO. B/M 514843-01	APPROVED		

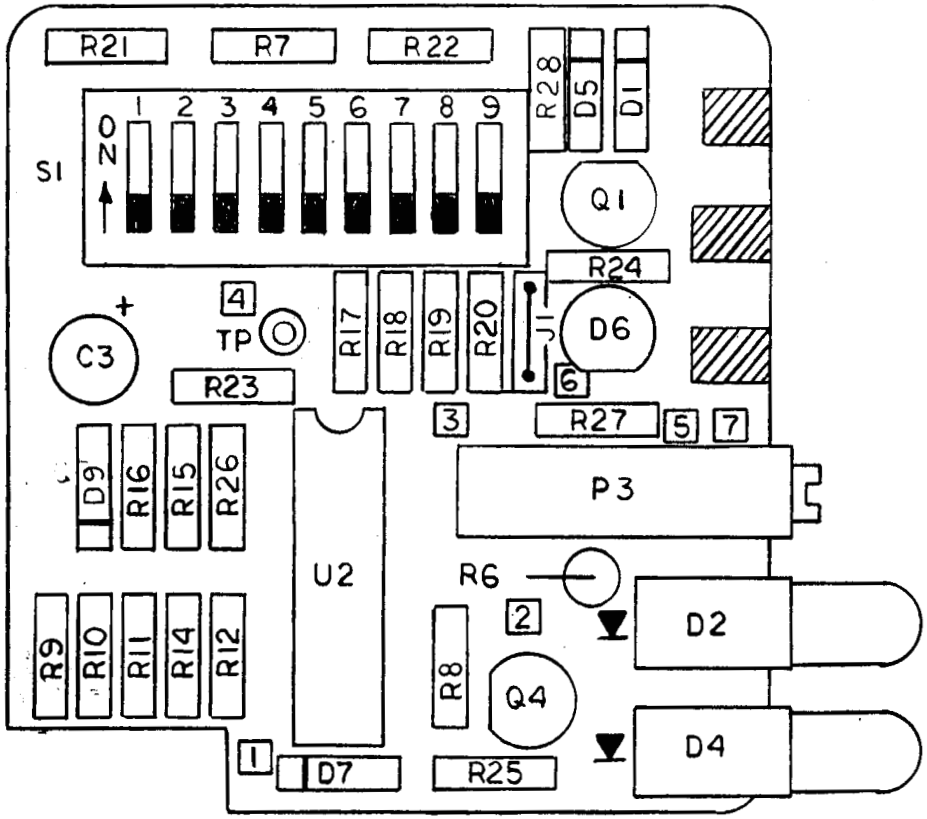
DEVAR Inc. 706 Bostwick Avenue, Bridgeport, Conn. 06605
CONTROL PRODUCTS DIVISION

P.C. BOARD ASSEMBLY
BOTTOM BOARD, 18-241

SIZE		DRAWING NO.	REV.
A		514867	A
SCALE	WT	SHEET	

OGILVIE PRESS

REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
A	RELEASE. ECN 2848A	8.31.87	
B	DELETE Q3. ADD R28, D9. ECN 2848C	12.10.87	



ASSEMBLY INFO.

A-COMPONENT SPACING

COMPONENT(S)	LEAD SPACING
R6	.150
R7→R12, R14→R28, D1, D5, D7	.200

B-COMPONENT GROUPING

STEP	COMPONENT(S)
1	R7→R12, R14→R28
2	R6, D1, D5, D7, TP, D9, J1
3	D2, D4, D6, C3, Q1, Q4
4	U2, P3
5	S1 AFTER CLEANING P.C.B.

NOTE: THE ORIENTATION OF Q1, Q4 IS REVERSE WHEN USING A SIEMENS PART NO. BSS98
FOR REV. A BOARD REFER TO DWG. No. A514898.

TOLERANCES UNLESS SPECIFIED DECIMAL DIM. ± .005 FRACT. DIM. ± 1/64 ANGLES ± 1/2°	CONTRACT NO.		
MATERIAL	PREPARED	MF	8.22.87
	CHECKED	SHB	8.31.87
FINISH	MECH		
	ELEC		
	DESIGN		
NEXT ASS'Y NO. B/M514843-02	APPROVED		
	APPROVED		

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

P.C. BOARD ASSEMBLY
TOP BOARD, 18-241-B

SIZE		DRAWING NO.	REV
A		514868	B
SCALE	WT	SHEET	

OGILVIE PRESS

PRECONDITIONING PROCEDURE
FOR BATTERIES USED IN
18-241-B TEMPERATURE ALARM
[EAGLE PICHER (LTC KEEPER II) BATTERY]

The LTC KEEPER II(3.5 VDC , 1600 mAH) series develops a passivation coating that protects against self discharge and provides very long shelf life . This passivation coating can cause voltage delay or low battery voltage after an open circuit stand period if a current load greater than one milliampere is required .

Preconditioning can be performed to eliminate the low voltage problem by one of the following procedures :

1 - Connect a load of 2.25K ohms to 2.5K ohms across the terminals of an individual cell for 12 to 15 hours .

2 - Connect a load of 100K ohms across an individual cell for 64 hours . Leaving the resistor in place will maintain preconditioning at a cost of 25 mAH of battery capacity per month .

Preconditioning can be performed on series connected cells by multiplying the above loads by the number of cells in series .

For example ,for 2 battery cells connected in series (7 VDC) use:

1 - A 5K ohms load for 15 hours ,or

2 - A 200K ohms load for 64 hours

Unconditioned batteries , when installed in the 18-241-B , will become conditioned after 56 hours .Batteries , installed at the factory , will always be preconditioned .

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REV. A - RELEASE ECN 2941. 12-20-89

	APPR	DRAWING NO.	REV.
		A515162	A