

UPDATE REPORT - PREVIOUS REPORT DATE 6/25/81
LICENSEE EVENT REPORT

U. S. NUCLEAR REGULATORY COMMISSION

CONTROL BLOCK: (PLEASE PRINT OR TYPE ALL REQUIRED INFORMATION)

01 A L B R F 2 2 0 0 - 0 0 0 0 0 0 - 0 0 3 4 1 1 1 1 4 5
7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100
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01 REPORT SOURCE L 6 0 5 0 0 0 2 6 0 7 0 6 1 1 8 1 3 0 7 2 4 8 1 9
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REPORT SOURCE DOCKET NUMBER EVENT DATE REPORT DATE

EVENT DESCRIPTION AND PROBABLE CONSEQUENCES (10)

02 During a maintenance outage, while performing routine surveillance test, SI 4.2.B.8,
03 reactor high-pressure switches PS 68-93 switch #2 and PS 68-94 switch #2 controlling
04 shutdown cooling valves of the RHR system were found above limits of T.S. Table 3.2.A.
05 The greatest out of tolerance was 6.5 percent. There was no danger to the health
06 or safety of the public. Previous similar events: BFR0-50-259/7816, 7908, 8058,
07 8129, 8132; 260/7802, 7917, 7924, 8022, 8057, 8123; 296/7907, 7912, 7928, 8022,
08 8030, 8045, 8052, 8107.
7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 10009 SYSTEM CODE CAUSE CODE CAUSE SUBCODE COMPONENT CODE COMP. SUBCODE VALVE SUBCODE
7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100
C F 11 E 12 E 13 I N S T R U 14 S 15 Z 16
17 LER/RO REPORT NUMBER 8 1 1 0 2 8 0 1 X 1
18 ACTION TAKEN 19 FUTURE ACTION 20 EFFECT ON PLANT 21 SHUTDOWN METHOD 22 HOURS 23 ATTACHMENT SUBMITTED 24 NPRD-4 FORM SUB. 25 PRIME COMP. SUPPLIER 26 COMPONENT MANUFACTURER
E 18 F 19 Z 20 Z 21 0 0 0 0 Y 23 N 24 L 25 B 0 6 9 26
33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100
CAUSE DESCRIPTION AND CORRECTIVE ACTIONS (27)10 Setpoint drift. Setpoints on the model B2T-M12SS pressure switches were reset to the
11 proper value, and the surveillance instruction was completed satisfactorily. Addi-
12 tionally, a design change request (DCR 1398) has been initiated to replace these
13 switches with an analog transmitter with a trip switch.
14
7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 10015 FACILITY STATUS % POWER OTHER STATUS 30 METHOD OF DISCOVERY DISCOVERY DESCRIPTION 32
7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100
G 28 0 0 0 29 NA B 31 Surveillance test
16 ACTIVITY CONTENT RELEASED OF RELEASE AMOUNT OF ACTIVITY 35 LOCATION OF RELEASE 36
7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100
Z 33 Z 34 NA
17 PERSONNEL EXPOSURES NUMBER TYPE DESCRIPTION 39
7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100
0 0 0 37 Z 38 NA
18 PERSONNEL INJURIES NUMBER DESCRIPTION 41
7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100
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19 LOSS OF OR DAMAGE TO FACILITY TYPE DESCRIPTION 43
7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100
Z 42 NA
20 PUBLICITY ISSUED DESCRIPTION 45
7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100
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21 PDR ADOCK 05000260 PDR
8108030384 810724
NRC USE ONLY
68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100
(205) 729-6134

NAME OF PREPARER Gene Holder

PHONE:

LER SUPPLEMENTAL INFORMATION

BFRO-50- 260 / 81028 R1 Technical Specification Involved Table 3.2.A

Reported Under Technical Specification 6.7.2.A(5) *Date due NRC: NA
0920
Date of Occurrence 6/11/81 Time of Occurrence 1115 Unit 2

Identification and Description of Occurrence:

During SI 4.2.B.8, reactor high pressure switches were found above T.S. limits. At 0920 PS 68-93 switch #2 was found at 124 psi; at 1115, PS 68-94 switch #2 was found at 131 psi. Test limit is 123 psi, which is the limit of 115 psi plus 8 psi water leg.

Conditions Prior to Occurrence:

Unit 1 refueling outage

Unit 2 maintenance outage.

Unit 3 at 100%.

Action specified in the Technical Specification Surveillance Requirements met due to inoperable equipment. Describe. _____

None

Apparent Cause of Occurrence:

Setpoint drift.

Analysis of Occurrence:

There was no danger to the health or safety of the public, no release of activity, no damage to the plant or equipment, and no resulting significant chain of events.

Corrective Action: Setpoints were reset to the proper value, and the surveillance instruction completed satisfactorily. Additionally, a design change request (DCR 1398) has been initiated to replace these switches with an analog transmitter with a trip switch. A study of the setpoint drift problem is attached.

Failure Data: BFRO 50-259/7816, 7908, 8058, 8129, 8132; 260/7802, 7917, 7924, 8022, 8057, 8123; 296/7907, 7912, 7928, 8022, 8030, 8045, 8052, 8107.

Retention: Period - Lifetime; Responsibility - Document Control Supervisor

*Revision: ALL

Subject: SETPOINT DRIFT - BARKSDALE PRESSURE SWITCHES

Recently there has been a number of LERs on Barksdale pressure switches; six during 1981, 21 since January 1978. Our commitment to training on these switches has been strong and continuous; therefore, we do not believe this is the problem.

Our attention was turned to the switch and the application to which it was being used. Attachment 1 plots the setpoint drift of 4 of these switches for a period of 4 years. It is readily obvious these switches are cyclic, being high in the warm months and low in the cold months. Attachments 2 and 3 provide the specifications for the Barksdale B2T-A12SS switch. The important characteristics for PS-1-81, 91 are:

Element type: Bourdon Tube
Proof Pressure: 1800 psig
Rated Accuracy: $\pm 1\%$ or 12 psig
Setpoint: 154 psig - recently changed from 160 psig
Adjustable Range: 77-1200 psig

It would appear based on Attachments 2 and 3, the switch would perform very reliably. However, the reason it does not becomes apparent when Attachment 4 is reviewed. The following conclusions can be drawn from Attachment 4:

1. For our application, a piston switch is better than a diaphragm or bourdon tube. Our experience indicates the piston type Static-O-Ring to be a very reliable and accurate switch.
2. Bourdon tube switches are extremely sensitive to process surges. In our application, snubbers have been installed to help alleviate this deficiency.
3. For greatest accuracy, the setpoint should fall in the upper 65% of the adjustable range. For the most favorable life factor the setpoint should be in the lower 65% of the adjustable range. For PS-1-81, 91:

$$\text{Span} = 1123 \text{ and Setpoint (\% Span)} = 13.7\%.$$

This places these switches in the lower portion of Zone C, which is FAIR accuracy and EXCELLENT life.

Our experience proves this correct. Other switches we have drift problems with are PS-68-93, 94. They have setpoints of 108 psig or setpoint (% span) is 9.6%.

In the final analysis, one can only conclude a misapplication of these switches, both in switch type and % of adjustable range. We recognized this years ago and DCR 1398 (12/7/77) was initiated. EN DES does not have an implementation date for DCR 1398 as it now is tied to 79-01B and environmental qualifications. In the interim we are investigating an improved switch and will keep you informed.

FIG. 312 80 DIVISION PER INCH LATH LAYER. 120 BY 300 BY 210 IN.

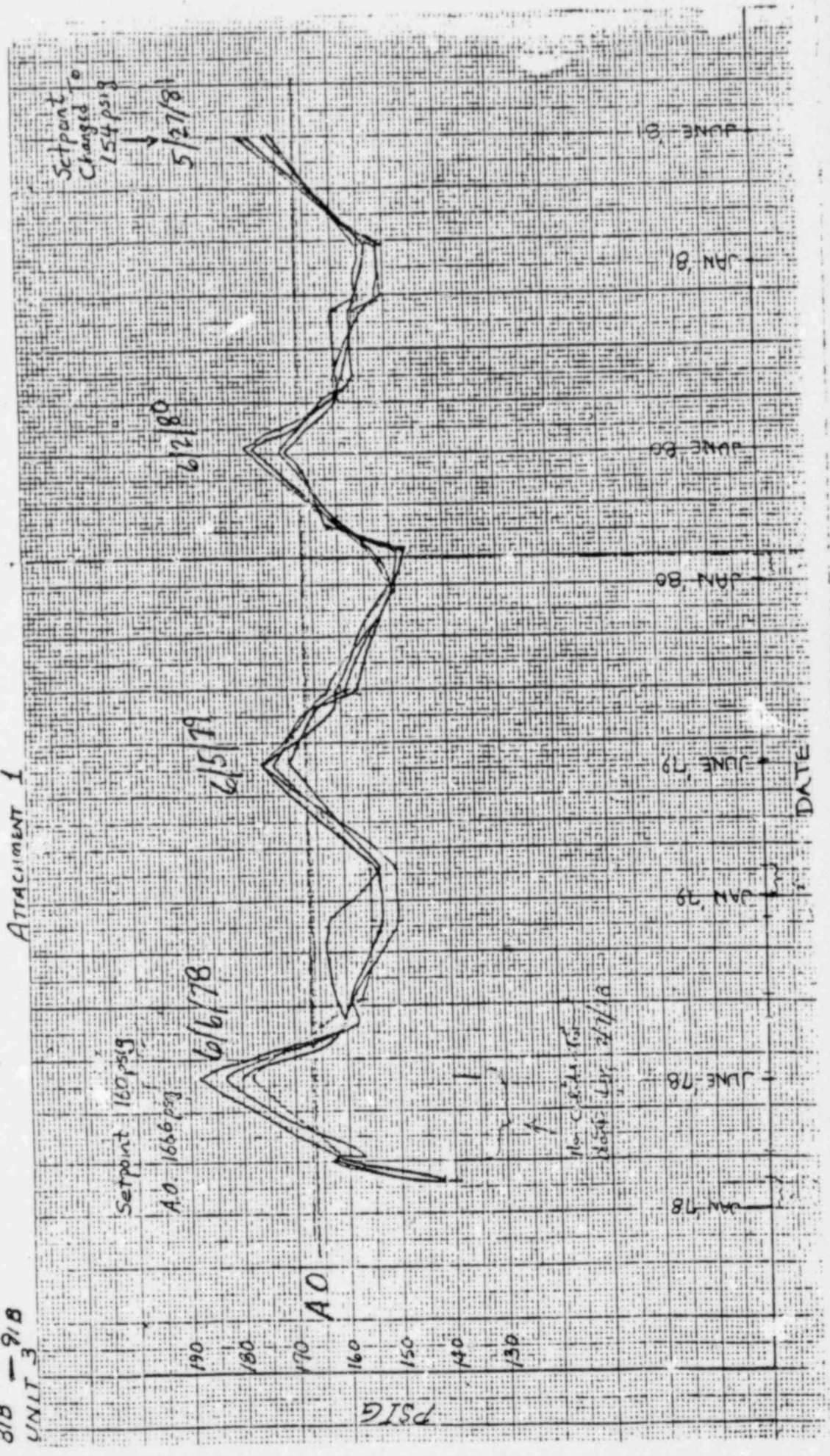
FIG. 313 80 BY 61

FIG. 314 100 BY 100 DIRECT FROM CONCRETE. 100 BY 100 BY 100. 100 BY 100 BY 100.

FIG. 315 100 BY 100 DIRECT FROM CONCRETE. 100 BY 100 BY 100. 100 BY 100 BY 100.

FIG. 316 100 BY 100 DIRECT FROM CONCRETE. 100 BY 100 BY 100. 100 BY 100 BY 100.

ATTACHMENT 1



ATTACHMENT 2

234A9300		TITLE INSTRUMENT DATA SHEET	
CONT ON SHEET 95 IN NO. 95		FIRST MADE FOR PRESSURE SWITCH	
		BROWNS FERRY 1,2,3	
* ITEM (TAG) NO	5-11A to D	5-12A to D	PS-1-81, -91 5-14 A to D
* QUANTITY / PLANT	4	4	4
* SERVICE	COND VAC SW	PRIM CONT PRES	TUBE 1st STAGE
ELEMENT: TYPE	DIAPHRAGM	DIAPHRAGM	BOURDON TUBE
MATERIAL	SS	BUNA N	SS
BODY MATERIAL			
CONNECTOR SIZE	1/4" NPT	1/4" NPT	1/4" NPT
SCALE RANGE/UNITS			
CONTACT: TYPE/FORM	1-SHAP ACTION, SPDT	SHAP ACTION DPDT	2-SHAP ACTION SPDT
RATING	10A @ 125 VAC	10A @ 250 VAC	10A @ 120 VAC
* RCD RANGE (ADJ)		0-5 psia	
* CONTACT #1 CPER AT	23.3 IN HG VAC DEC	-1.95 psia INC	154 psia INC
* CONTACT #2 CPER AT	SPARE	SPARE	SPARE
PURCHASE RANGE (ADJ)	2-29.2 IN HG	2-6 psia	50-1200 psia
RESET SPAN DIFF	4-.8 IN HG	15-.45 psia	11-27 psia
PROOF PRESS	60 psi	200 psia	1800 psia
* PROCESS FLUID			
* DESIGN TEMP			
* DESIGN PRESS			
* NORMAL TEMP			
* NORMAL PRESS	27-29 IN HG	.65-.85 psia	
* RCD ACCURACY	± 0.3 IN HG VAC	± 0.05 psia	± 20 psia
RATED ACCURACY	± 1%	± 1/2%	± 1% FS
PURCHASE SPEC	136B2013P001	200AS136P002	200A106B2001
VENDOR	BARKSDALE	STATIC-O-RING	BARKSDALE
CAT NO	DIT-H1355	B2N-AAA	B2T-A12SS
LOCATION	LOCAL	25-5 & 6	LOCAL
PSID	729E136	729E136	729E136
NOTES:			

* TO BE FILLED IN BY APD

D. DAVIS

B. W. R. S.

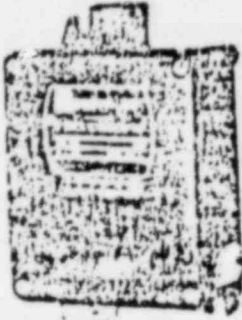
DIV. OF
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234A9300

SEE PAGE 95



Housed Bourdon Tube Models
Water-Tight Housing (NEMA 4)
and Terminal Strip
Tamper-proof External Adjustment



B1T SINGLE SETTING

B2T DUAL CONTROL

OPERATING CHARACTERISTICS • ORDERING DATA

PRESSURE SWITCHES — All values given in P.S.I. (Gauge)

Proof (Test) Pressure	Adjustable Range				Approx. Actuation Value (Differential)	Wetted Material*	B1T Catalog Number	B2T Catalog Number
	Decreasing		Increasing					
	Min.	Max.	Min.	Max.				
1800	50	1180	70	1200	10 to 20	Bronze	B1T-H12	B2T-H12
1800	50	1173	77	1200	11 to 27	316	B1T-A12SS	B2T-A12SS
4600	160	3170	190	3200	15 to 30	Bronze	B1T-H32	B2T-H32
4600	160	3161	199	3200	16 to 39	316	B1T-H32SS	B2T-H32SS
7200	240	4715	325	4800	40 to 85	316	B1T-A48SS	B2T-A48SS
**9750	325	6385	440	6500	54 to 115	316	B1T-A65SS	B2T-A65SS
**18000	600	11450	1150	12000	275 to 550	316	B1T-A120SS	B2T-A120SS
**24000	600	17450	1150	18000	275 to 550	316	B1T-A180SS	B2T-A180SS

*"Bronze" represents Phosphor Bronze Tube with SAE 88 Brass Socket

"316" represents 316 Stainless Steel Tube & Socket

**"AMINCO" female opening for 1/4" OD tube connection. To change -A65SS and -A120SS switches to 1/4" npt, add -P4 suffix to model number. Price addition required.

Approximate shipping weight 2.5 lbs.

DETAIL DATA

ELECTRICAL CHARACTERISTICS: All models incorporate Underwriters' Laboratories, Inc. listed single pole double throw snap-action switching elements. Electrical rating (continuous inductive) 10 amps 125 or 250 volts AC, 3 amps 480 volts AC. Automatically reset by snap-action of switch. For more details and other switch classes, see pages 33-35.

ELECTRICAL CONNECTION: To screw terminals on covered terminal strip through 1/2" nps conduit connector.

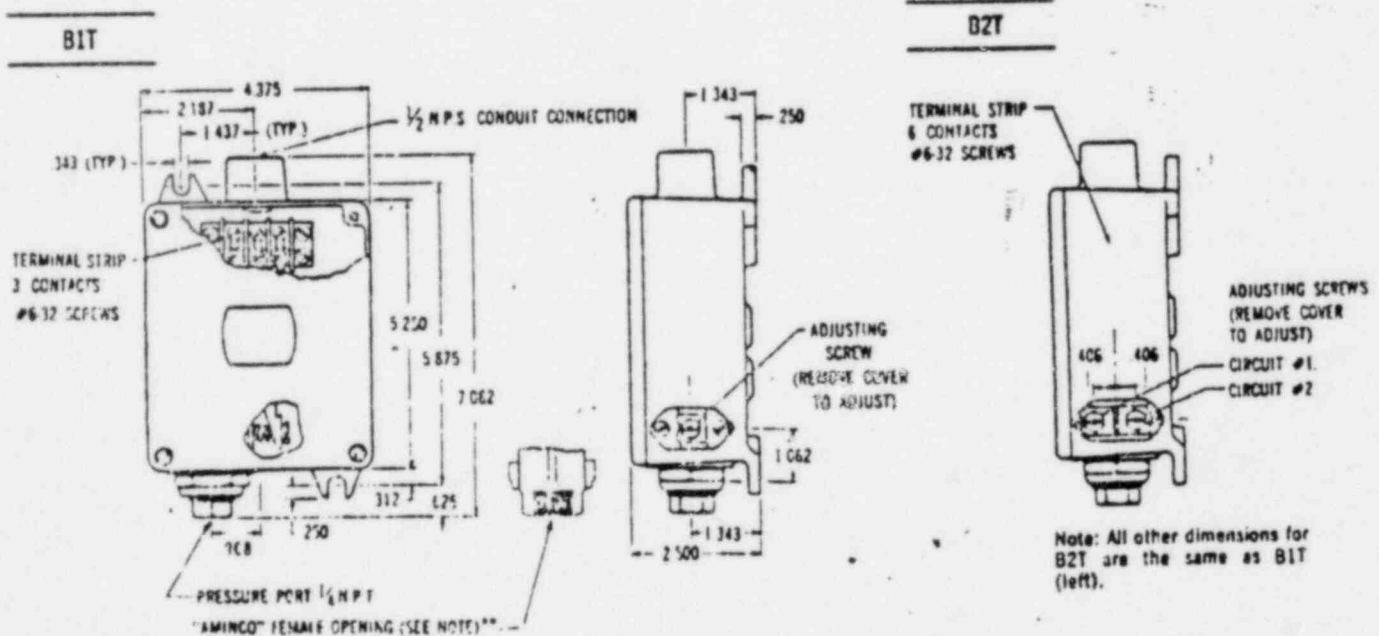
PRESSURE CONNECTION: 1/4" N.P.T. internal thread, except as noted**, models with Proof Pressures above 8,000 P.S.I. have "AMINCO" female opening for 1/4" O.D. tube connection.

ADJUSTMENT INSTRUCTIONS

Turn adjustment screw clockwise to lower actuation point (switch setting).

WIRE CODING — PRESSURE

Circuit #1: Common — Purple
Normally Closed — Blue
Normally Open — Red
Circuit #2: Common — Brown
Normally Closed — Orange
Normally Open — Yellow



HOW TO SELECT A PRESSURE SWITCH FOR YOUR APPLICATION

STEP 1

SERVICE LIFE OF THE SWITCH

Expected service life is the first consideration to be made in selecting a pressure switch, regardless of the pressure or sensitivity desired. If the service life (the number of cycles the switch is expected to operate) is one million or less, use of either a bourdon tube or diaphragm switch is indicated. If a service life of more than one million cycles is desired, a piston switch should be used. An exception to this rule may be made when pressure change in a system is very slight (20% or less of the adjustable range). Under such conditions a bourdon tube or diaphragm switch can be used up to 2.5 million cycles before metal fatigue.

A second consideration in choosing a pressure switch is the speed of cycling, regardless of the service life. If a switch is expected to cycle more than once every three seconds, a piston type switch should be specified. The metal of any bourdon tube or diaphragm acts as a spring which will heat and fatigue in extremely fast cycling operations, thus shortening the life of the switch.

The media to be controlled must always be considered when selecting a pressure switch and, to simplify selection, wetted materials for each type of switch are noted on applicable catalog pages.

STEP 2

PROOF PRESSURES

Choice of the type of pressure switch to be used — diaphragm, bourdon tube or piston — also must be governed by the proof pressure to which it will be subjected. (Proof pressure is the highest surge pressure that will ever be experienced in a system.) It must be remembered that, although a pressure gauge may register a constant operating pressure, there may be surges going through a system that are dampened out by the orifice in the gauge. Diaphragm and bourdon tube pressure switches are extremely sensitive and would be affected by those surges.

Barksdale diaphragm switches are available in an adjustable range from vacuum to 150 psi with proof pressures to 300 psi. Barksdale bourdon tube switches are adjustable to 18,000 psi with proof pressures of 24,000 psi. Barksdale piston switches have an adjustable range to 12,000 psi with a proof pressure of 20,000 psi.

STEP 3

FUNCTION OF THE SWITCH

The function of the switch is another determining factor in making a selection. Three types of Barksdale pressure switches, based on function, are described below:

- (1) Single setting pressure switches sense a single pressure source and open or close a single electrical circuit by means of one snap action electrical switch.
- (2) Pressure difference switches sense a change in relationship between two variable contained pressures and open or close a single electrical circuit by means of one snap action electrical switch.
- (3) Dual control pressure switches sense two pressure limits from a single pressure source and open or close two independent electrical circuits by means of two snap action electrical switches.

STEP 4

TYPES OF HOUSING AVAILABLE

Stripped pressure switches are basic Barksdale pressure switch units without housings. They may be used wherever electrical enclosures are already available and are favored by original equipment manufacturers for use in common cabinets. Naturally, stripped switches may be purchased at a lower cost.

Housed pressure switches are completely enclosed to avoid possible hazard from loose wires in exposed locations.

Terminal block pressure switches are housed and, in addition, are equipped with enclosed terminal blocks, thus eliminating the expense of buying and installing external junction boxes.

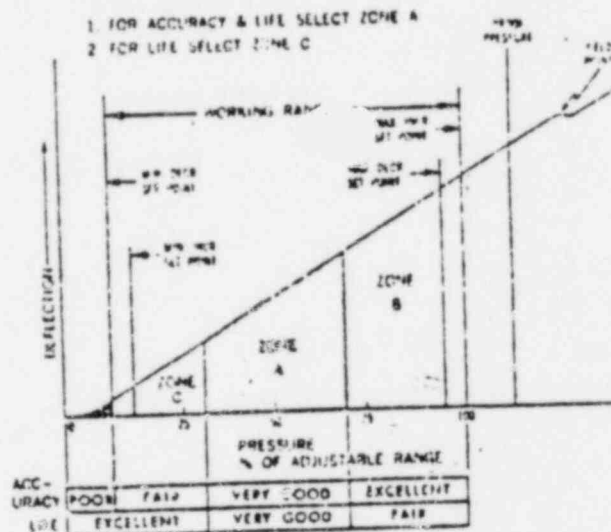
Explosion proof pressure switches are designed with heavy housings built to conform to accepted electrical standards in isolating the units from explosive atmosphere. All explosion proof models are equipped with terminal blocks for convenience in wiring.

STEP 5

SELECTION OF ADJUSTABLE RANGE

The term "working range" defines the pressure range a switch may see under normal working conditions. This is normally the adjustable range.

For greatest accuracy the set point should fall in the upper 65% of the adjustable range. For the most favorable life factor the set point should be in the lower 65% of the adjustable range. Therefore, the most favorable combination of accuracy and life factor lies in the middle 30% of the adjustable range (see diagram). This general rule applies both to diaphragm and bourdon tube pressure switches.



HOW TO READ CATALOG NUMBERS OF DIAPHRAGM BOURDON TUBE AND DIA-SEAL PISTON PRESSURE SWITCHES

TYPICAL CATALOG NUMBER
 Type of Sensing Element D = Diaphragm, B = Bourdon Tube, E or P = Piston
 Number of Settings 1 = Single Setting, 2 = Dual Control
 Type of Housing S = Stripped, H = Weathersealed Housing, T = Weathersealed Housing with Terminal Block, X = Explosion Proof
 Class of Sensing Element
 Rating Range
 Material Code for Sensing Element
 UL Listed

DIX-A1855-UL

The listed class of switch elements can be substituted in order to specify substitute class of desired switch element in the catalog number. Example: To obtain a Class 1 switch element in a DIT-H housing, specify "1" for "H" and order a DIT-H Class 1 switch element. For service and price and delivery.