NRC FORM 366 (7-77) UPDATE REPORT - PREVIOUS REPORT DATE 9/14/81 U.S. NUCLEAR REGULATORY COMMISSION

LICENSEE EVENT REPORT

CONTROL BLOCK: (1) (PLEASE PRINT OR TYPE ALL REQUIRED INFORMATION)

0 1 | A L B R E 3 (2) | 0 0 - 0 0 0 0 0 - 0 0 (3) | 4 1 1 1 1 (4) | (5)

LICENSEE CODE | LICENSE NUMBER | LICENSE TYPE | CAT

CON'T

0 1 | REPORT SOURCE L (6) | 0 5 0 0 0 2 9 6 (7) | 0 8 1 7 8 1 (8) | 1 1 1 3 8 1 (9)

DOCKET NUMBER | EVENT DATE | REPORT DATE

EVENT DESCRIPTION AND PROBABLE CONSEQUENCES (10)

0 2 | During normal operation, while performing SI 4.1.A-14, turbine first-stage

0 3 | permissive switch 3-PS-1-81A was found 3 percent above limit of T.S. table 3.1.A.

0 4 | There was no danger to the health or safety of the public. Previous similar events:

0 5 | BFRO-50-259/78016, 79008, 80058, 81029, 81032, 81038; 260/79016, 79017, 79024, 80020,

0 6 | 80057, 81030; 296/79007, 79012, 79028, 80022, 80045, 80052, 81007, 81032.

0 7 | Redundant systems were available and operable.

0 8 |

SYSTEM CODE | CAUSE CODE | CAUSE SUBCODE | COMPONENT CODE | COMP. SUBCODE | VALVE SUBCODE

0 9 | I A (11) | E (12) | E (13) | I N S T R U (14) | S (15) | Z (16)

(17) LER/RO REPORT NUMBER | EVENT YEAR | SEQUENTIAL REPORT NO. | OCCURRENCE CODE | REPORT TYPE | REVISION NO.

8 1 | — | 0 3 9 | / | 0 3 | X | — | 1

ACTION TAKEN | FUTURE ACTION | EFFECT ON PLANT | SHUTDOWN METHOD | HOURS (22) | ATTACHMENT SUBMITTED | NPRD-4 FORM SUB. | PRIME COMP. SUPPLIER | COMPONENT MANUFACTURER

A (18) | F (19) | Z (20) | Z (21) | 0 0 0 0 | Y (23) | Y (24) | L (25) | B 0 6 9 (26)

CAUSE DESCRIPTION AND CORRECTIVE ACTIONS (27)

1 0 | The Barksdale bourdon tube pressure switch model B2T-A12SS setpoint had drifted.

1 1 | Replaced switch with an identical replacement and functionally tested per SI 4.1.A-14

1 2 | on 10/9/81. Design change request 1398 has been initiated to replace this switch

1 3 | with an analog transmitter with a trip switch. A study of setpoint drift problems is

1 4 | attached.

FACILITY STATUS | % POWER | OTHER STATUS (30) | METHOD OF DISCOVERY | DISCOVERY DESCRIPTION (32)

1 5 | E (28) | 0 9 8 (29) | NA | B (31) | Surveillance test

ACTIVITY RELEASED | CONTENT OF RELEASE | AMOUNT OF ACTIVITY (35) | LOCATION OF RELEASE (36)

1 6 | Z (33) | Z (34) | NA | NA

PERSONNEL EXPOSURES: NUMBER | TYPE | DESCRIPTION (39)

1 7 | 0 0 0 (37) | Z (38) | NA

PERSONNEL INJURIES: NUMBER | DESCRIPTION (41)

1 8 | 0 0 0 (40) | NA

LOSS OF OR DAMAGE TO FACILITY: TYPE | DESCRIPTION (43)

1 9 | Z (42) | NA

PUBLICITY: ISSUED | DESCRIPTION (45) | NRC USE ONLY

2 0 | N (44) | NA

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Tennessee Valley Authority
Browns Ferry Nuclear Plant

Form BF-17
BF 15.2
6/04/81

LER SUPPLEMENTAL INFORMATION

BFRO-50- 296 / 81039 R1 Technical Specification Involved Table 3.1.A

Reported Under Technical Specification 6.7.2.b(2) *Date due NRC: NA

Date of Occurrence 8/17/81 Time of Occurrence 1330 Unit 3

Identification and Description of Occurrence:

While performing SI 4.1.A-14, turbine first stage permissive switch 3-PS-1-81A was found 3 percent above the limit of T.S. table 3.1.A.

Conditions Prior to Occurrence:

Unit 1 in refeuling outage.

Unit 2 at 36%.

Unit 3 at 98%.

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: Repleced switch with an identical replacement and functionally tested per SI 4.1.A-14 on 10/9/81. Design change request 1398 has been initiated to replace this switch with an analog transmitter with a trip switch. A study of setpoint drift problems is attached.

Failure Data: BFRO-50-259/78016, 79008, 80058, 81029, 81032, 81038; 260/79016, 79017, 79024, 80020, 80057, 81030; 296/79007, 79012, 79028, 80022, 80045, 80052, 81007, 81032.

*Retention: Period - Lifetime; Responsibility - Document Control Supervisor

*Revision:

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: ±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:

   Span = 1123 and Setpoint (% Span) = 13.7%.

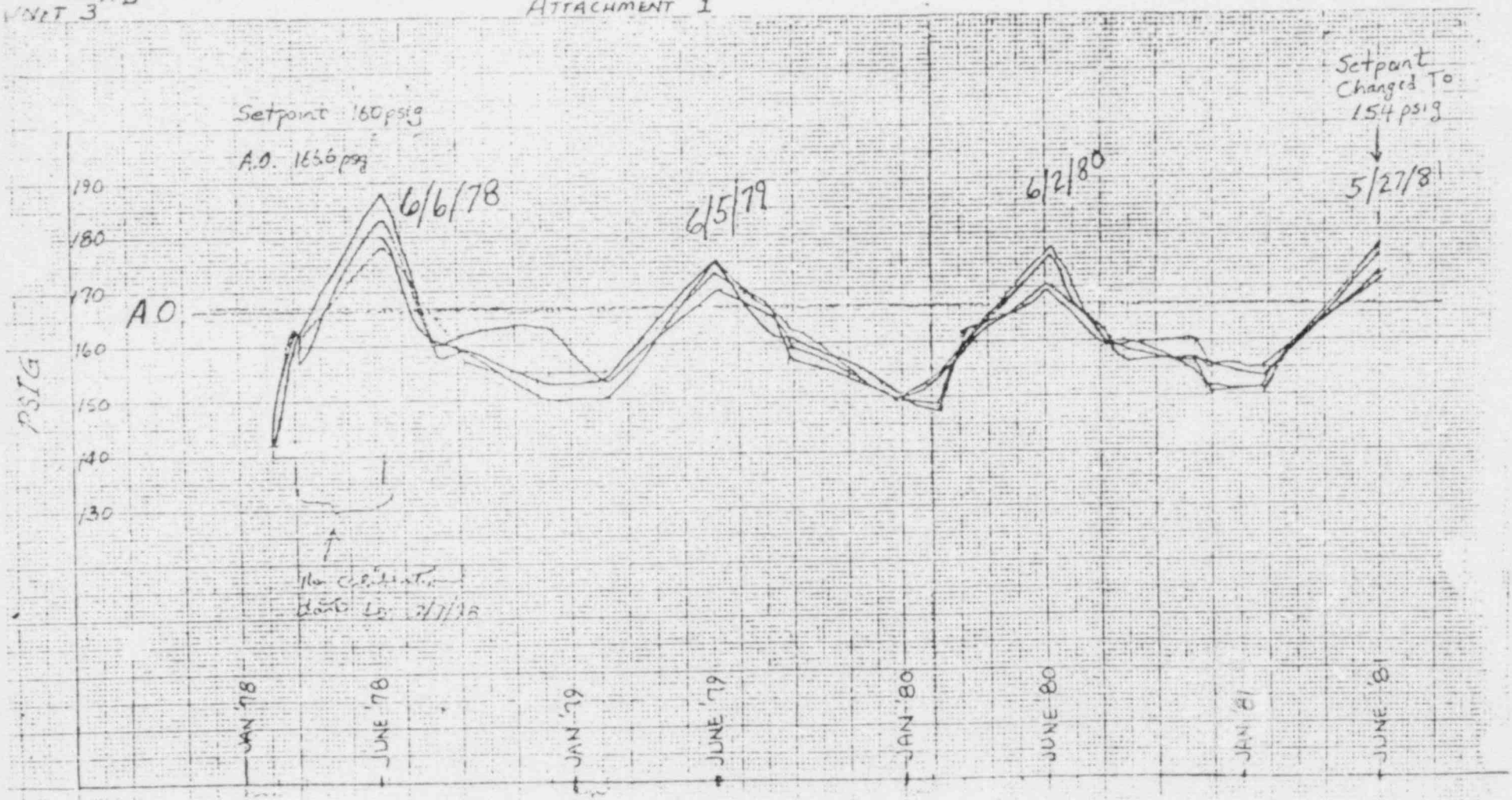
   This places these switches in the lower portion of Zone C, which is FAIR accuracy and EXCELLENT life.

   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.

91A — 91A
91B — 91B
SHEET 3

ATTACHMENT 1



ATTACHMENT 3

DELAVAL TURBINE INC. • BARKSDALE CONTROLS DIVISION • 5125 Alcoa Avenue • Los Angeles • Calif. 90058

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	1700	10 to 20	Bronze	B1T-H12	B2T-H12
1800	50	1173	77	1200	11 to 27	316	B1T-A12SS	B2T-A12SS
4800	160	3170	190	3200	15 to 30	Bronze	B1T-H32	B2T-H32
4800	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 ¼" OD tube connection. To change -A65SS and -A120SS switches to ¼" 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.

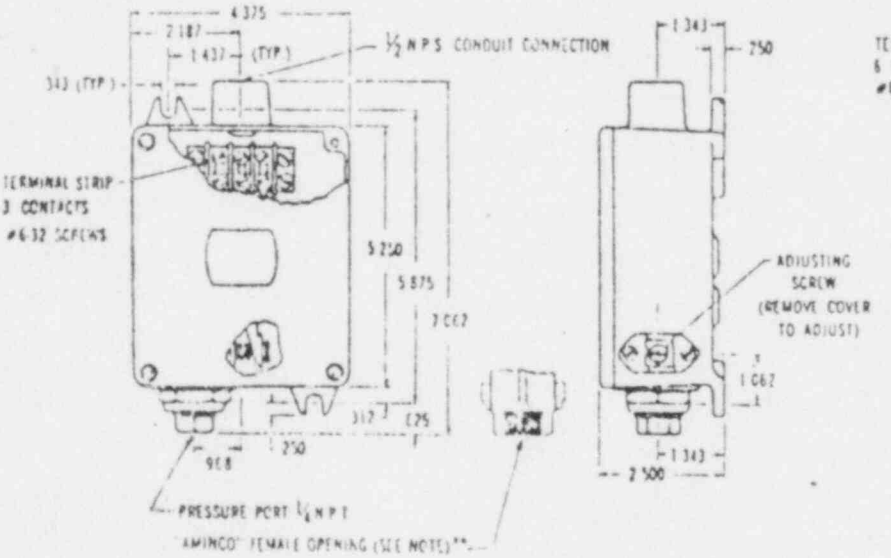
ELECTRICAL CONNECTION: To screw terminals on covered terminal strip through ½" nps conduit connector.

PRESSURE CONNECTION: ¼" N.P.T. internal thread, except as noted**, models with Proof Pressures above 8,000 P.S.I. have "AMINCO" female opening for ¼" O.D. tube connection.

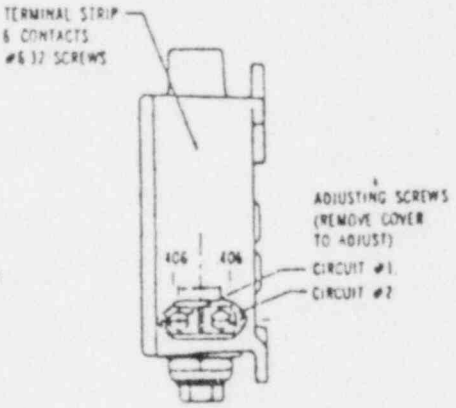
ADJUSTMENT INSTRUCTIONS
Turn adjustment screw clockwise to lower actuation point (switch setting).

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

B1T



B2T



Note: All other dimensions for B2T are the same as B1T (left).

ATTACHMENT 4

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 [illegible] pressure to which it will be subjected. (Proof pressure that will ever be [illegible] remembered that, although a pressure gauge may [illegible] 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.

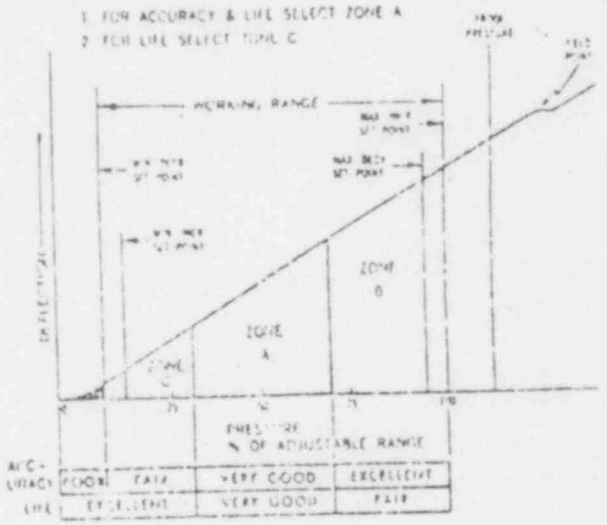
Terminal block pressure switches are housed and, in addition, are equipped with enclosed terminal blocks, thus eliminating the expense of buying and installing external junction boxes.

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.

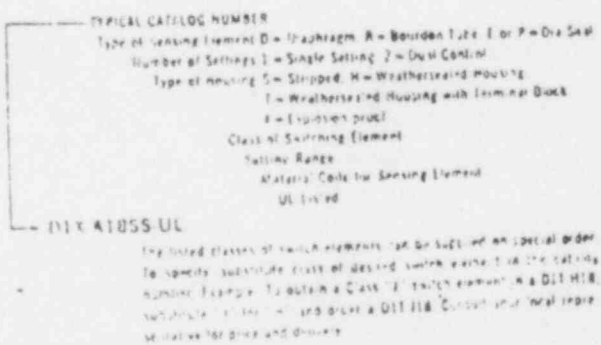
STEP 5 SELECTION OF ADJUSTABLE RANGE

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



The listed classes of switch elements can be supplied on special order to specify substitute types of desired switch ratings in the catalog number. Example: To obtain a Class "E" switch element in a D1T H18 [illegible] and order a D1T H18 [illegible] [illegible] [illegible] for price and delivery.