INSTRUMENTATION

ADDITIONAL CHANGES PREVIOUSLY PROPOSED BY LETTER
Serial No. 2405 Date 12/11/96

3/4.3.2 SAFETY SYSTEM INSTRUMENTATION

SAFETY FEATURES ACTUATION SYSTEM INSTRUMENTATION

LIMITING CONDITION FOR OPERATION

3.3.2.1 The Safety Features Actuation System (SFAS) functional units shown in Table 3.3-3 shall be OPERABLE with their trip setpoints set consistent with the values shown in the Trip Setpoint column of Table 3.3-4, with the exception of Instrument Strings Functional Units d and e and Interlock Channels Functional Unit a which shall be set consistent with the Allowable Value column of Table 3.3-4, and with RESPONSE TIMES as shown in Table 3.3-5.

APPLICABILITY: As shown in Table 3.3-3.

ACTION:

a. With a SFAS functional unit trip setpoint less conservative than the value shown in the Allowable Values column of Table 3.3-4, declare the functional unit inoperable and apply the applicable ACTION requirement of Table 3.3-3, until the functional unit is restored to OPERABLE status with the trip setpoint adjusted consistent with Table 3.3-4. ~~the Trip Setpoint value.~~

b. With a SFAS functional unit inoperable, take the action shown in Table 3.3-3.

SURVEILLANCE REQUIREMENTS

4.3.2.1.1 Each SFAS functional unit shall be demonstrated OPERABLE by the performance of the CHANNEL CHECK, CHANNEL CALIBRATION and CHANNEL FUNCTIONAL TEST during the MODES and at the frequencies shown in Table 4.3-2.

4.3.2.1.2 The logic for the bypasses shall be demonstrated OPERABLE during the at power CHANNEL FUNCTIONAL TEST of functional units affected by bypass operation. The total bypass function shall be demonstrated OPERABLE at least once per 18 months during CHANNEL CALIBRATION testing of each functional unit affected by bypass operation.

4.3.2.1.3 The SAFETY FEATURES RESPONSE TIME of each SFAS function shall be demonstrated to be within the limit at least once per 18 months. Each test shall include at least one functional unit per function such that all functional units are tested at least once every N times 18 months where N is the total number of redundant functional units in a specific SFAS function as shown in the "Total No. of Units" Column of Table 3.3-3.

TABLE 3.3-3

SAFETY FEATURES ACTUATION SYSTEM INSTRUMENTATION

FUNCTIONAL UNIT	TOTAL NO. OF UNITS	UNITS TO TRIP	MINIMUM UNITS OPERABLE	APPLICABLE MODES	ACTION
1. INSTRUMENT STRINGS					
a. Containment Radiation - High	4	2	3	1,2,3,4,6****	10#
b. Containment Pressure - High	4	2	3	1, 2, 3	10#
c. Containment Pressure - High-High	4	2	3	1, 2, 3	10#
d. RCS Pressure - Low	4	2	3	1, 2, 3*	10#
e. RCS Pressure - Low-Low	4	2	3	1, 2, 3**	10#
f. BWST Level - Low-Low	4	2	3	1, 2, 3	10#
2. OUTPUT LOGIC					
a. Incident Level #1: Containment Isolation	2	1	2	1,2,3,4,6****	11
b. Incident Level #2: High Pressure Injection and Starting Diesel Generators	2	1	2	1, 2, 3, 4	11
c. Incident Level #3: Low Pressure Injection	2	1	2	1, 2, 3, 4	11
d. Incident Level #4: Containment Spray	2	1	2	1, 2, 3, 4	11
e. Incident Level #5: Containment Sump Recirculation Permissive	2	1	2	1, 2, 3, 4	11

TABLE 3.3-3 (Continued)

SAFETY FEATURES ACTUATION SYSTEM INSTRUMENTATION

FUNCTIONAL UNIT	TOTAL NO. OF UNITS	UNITS TO TRIP	MINIMUM UNITS OPERABLE	APPLICABLE MODES	ACTION
3. MANUAL ACTUATION					
a. SFAS (except Containment Spray and Emergency Sump Recirculation)	2	2	2	1,2,3,4,6****	12
b. Containment Spray	2	2	2	1,2,3,4	12
4. SEQUENCE LOGIC CHANNELS					
a. Sequencer	4	2/BUS	2/BUS	1,2,3,4	15#
b. Essential Bus Feeder Breaker Trip (90%)	4*****	2/BUS	2/BUS	1,2,3,4	15#
c. Diesel Generator Start, Load shed on Essential Bus (59%)	4	2/BUS	2/BUS	1,2,3,4	15#
5. INTERLOCK CHANNELS					
a. Decay Heat Isolation Valve	1	1	1	1,2,3	13#
b. Pressurizer Heaters	2	2	2	3******	14

TABLE 3.3-3 (Continued)
TABLE NOTATION

*	Trip function may be bypassed in this MODE with RCS pressure below 1800 psig. Bypass shall be automatically removed when RCS pressure exceeds 1800 psig.
**	Trip function may be bypassed in this MODE with RCS pressure below 660 ~~600~~ psig. Bypass shall be automatically removed when RCS pressure exceeds 660 ~~600~~ psig.
***	DELETED
****	This instrumentation, or the containment purge and exhaust system noble gas monitor (with the containment purge and exhaust system in operation), must be OPERABLE during CORE ALTERATIONS or movement of irradiated fuel within containment to meet the requirements of Technical Specification 3.9.4. When using the containment purge and exhaust system noble gas monitor, SFAS is not required to be OPERABLE in MODE 6.
*****	All functional units may be bypassed for up to one minute when starting each Reactor Coolant Pump or Circulating Water Pump.
******	When either Decay Heat Isolation Valve is open.
#	The provisions of Specification 3.0.4 are not applicable.

ACTION STATEMENTS

ACTION 10 - With the number of OPERABLE functional units one less than the Total Number of Units, STARTUP and/or POWER OPERATION may proceed provided both of the following conditions are satisfied:

a. The inoperable functional unit is placed in the tripped condition within one hour.

b. The Minimum Units OPERABLE requirement is met; however, one additional functional unit may be bypassed for up to 2 hours for surveillance testing per Specification 4.3.2.1.1.

ACTION 11 - With any component in the Output Logic inoperable, trip the associated components within one hour or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

TABLE 3.3-3 (Continued)

ACTION STATEMENTS

ACTION 12 - With the number of OPERABLE Units one less than the Total Number of Units, restore the inoperable functional unit to OPERABLE status within 48 hours or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

ACTION 13 - a. With less than the Minimum Units OPERABLE and indicated reactor coolant pressure ≥ 328 ~~438~~ psig, both Decay Heat Isolation Valves (DH11 and DH12) shall be verified closed.

b. With Less than the Minimum Units OPERABLE and indicated reactor coolant pressure < 328 ~~438~~ psig operation may continue; however, the functional unit shall be OPERABLE prior to increasing indicated reactor coolant pressure above 328 ~~438~~ psig.

ACTION 14 - With less than the Minimum Units OPERABLE and indicated reactor coolant pressure < 328 ~~438~~ psig, operation may continue; however, the functional unit shall be OPERABLE prior to increasing indicated reactor coolant pressure above 328 ~~438~~ psig, or the inoperable functional unit shall be placed in the tripped state.

ACTION 15 - a. With the number of OPERABLE units one less than the Minimum Units Operable per Bus, place the inoperable unit in the tripped condition within one hour. For functional unit 4.a the sequencer shall be placed in the tripped condition by physical removal of the sequencer module. The inoperable functional unit may be bypassed for up to 2 hours for surveillance testing per Specification 4.3.2.1.1.

b. With the number of OPERABLE units two less than the Minimum Units Operable per Bus, declare inoperable the Emergency Diesel Generator associated with the functional units not meeting the required minimum units OPERABLE and take the ACTION required of Specification 3.8.1.1.

TABLE 3.3-4

SAFETY FEATURES ACTUATION SYSTEM INSTRUMENTATION TRIP SETPOINTS

FUNCTIONAL UNIT	TRIP SETPOINT	ALLOWABLE VALUES
INSTRUMENT STRINGS		
a. Containment Radiation	< 4 x Background at RATED THERMAL POWER	< 4 x Background at RATED THERMAL POWER#
b. Containment Pressure - High	≤ 18.4 psia	≤ 18.52 psia#
c. Containment Pressure - High-High	≤ 38.4 psia	≤ 38.52 psia#
d. RCS Pressure - Low	~~≥ 1620.75 psig~~ N.A.	≥ 1576.2 ~~1615.75~~ psig##
e. RCS Pressure - Low-Low	~~≥ 420.75 psig~~ N.A.	≥ 441.42 ~~415.75~~ psig##
f. BWST Level	≥ 89.5 and ≤ 100.5 in H_2O	≥ 88.3 and ≤ 101.7 in H_2O#
SEQUENCE LOGIC CHANNELS		
a. Essential Bus Feeder Breaker Trip (90%)	≥ 3744 volts for ≤ 7.8 sec	≥ 3558 volts ≤ 7.8 sec
b. Diesel Generator Start, Load Shed on Essential Bus (59%)	≥ 2071 and ≤ 2450 volts for 0.5 ± 0.1 sec	≥ 2071 and ≤ 2450 volts for 0.5 ± 0.1 sec#
INTERLOCK CHANNELS		
a. Decay Heat Isolation Valve and Pressurizer Heater	~~< 438 psig~~ N.A.	< 328 ~~443~~ psig##*

#Allowable Value for CHANNEL FUNCTIONAL TEST and CHANNEL CALIBRATION

*Referenced to the RCS Pressure instrumentation tap. ~~centerline of DH11 and DH12.~~

Allowable Value for CHANNEL FUNCTIONAL TEST

TABLE 3.3-5

SAFETY FEATURES SYSTEM REPONSE TIMES

INITIATING SIGNAL AND FUNCTION	RESPONSE TIME IN SECONDS
1. Manual	
a. Fans	
1. Emergency Vent Fan	NA
2. Containment Cooler Fan	NA
b. HV & AC Isolation Valves	
1. ECCS Room	NA
2. Emergency Ventilation	NA
3. Containment Air Sample	NA
4. Containment Purge	NA
5. Pentration Room Purge	NA
c. Control Room HV & AC Units	NA
d. High Pressure Injection	
1. High Pressure Injection Pumps	NA
2. High Pressure Injection Valves	NA
e. Component Cooling Water	
1. Component Cooling Water Pumps	NA
2. Component Cooling Aux. Equip. Inlet Valves	NA
3. Component Cooling to Air Compressor Valves	NA
f. Service Water System	
1. Service Water Pumps	NA
2. Service Water From Component Cooling Heat Exchanger Isolation Valves	NA
g. Containment Spray Isolation Valves	NA
h. Emergency Diesel Generator	NA
i. Containment Isolation Valves	
1. Vacuum Relief	NA
2. Normal Sump	NA
3. RCS Letdown Delay Coil Outlet	NA
4. RCS Letdown High Temperature	NA

TABLE 3.3-5 (Continued)

SAFETY FEATURES SYSTEM RESPONSE TIMES

INITIATING SIGNAL AND FUNCTION	RESPONSE TIME IN SECONDS
i. Containment Isolation Valves (cont'd)	
5. Pressurizer Sample	NA
6. Service Water to Cooling Water	NA
7. Vent Header	NA
8. Drain Tank	NA
9. Core Flood Tank Vent	NA
10. Core Flood Tank Fill	NA
11. Steam Generator Sample	NA
12. Quench Tank	NA
13. Emergency Sump	NA
14. RCP Seal Return	NA
15. Air Systems	NA
16. N_2 System	NA
17. Quench Tank Sample	NA
18. RCP Seal Inlet	NA
19. Core Flood Tank Sample	NA
20. RCP Standpipe Demin Water Supply	NA
21. Containment H_2 Dilution Inlet	NA
22. Containment H_2 Dilution Outlet	NA
j. BWST Outlet Valves	NA
k. Low Pressure Injection	
1. Decay Heat Pumps	NA
2. Low Pressure Injection Valves	NA
3. Decay Heat Pump Suction Valves	NA
4. Decay Heat Cooler Outlet Valves	NA
5. Decay Heat Cooler Bypass Valves	NA
l. Containment Spray Pump	NA
m. Component Cooling Isolation Valves	
1. Inlet to Containment	NA
2. Outlet from Containment	NA
3. Inlet to CRDM's	NA
4. CRDM Booster Pump Suction	NA
5. Component Cooling from Decay Heat Coolers	NA

TABLE 3.3-5 (Continued)

SAFETY FEATURES SYSTEM RESPONSE TIMES

INITIATING SIGNAL AND FUNCTION	RESPONSE TIME IN SECONDS
2. Containment Pressure - High	
a. Fans	
1. Emergency Vent Fans	≤ 25*
2. Containment Cooler Fans	≤ 45*
b. HV & AC Isolation Valves	
1. ECCS Room	≤ 75*
2. Emergency Ventilation	≤ 75*
3. Containment Air Sample	≤ 30*
4. Containment Purge	≤ 15*
5. Penetration Room Purge	≤ 75*
c. Control Room HV & AC Units	≤ 10*
d. High Pressure Injection	
1. High Pressure Injection Pumps	≤ 30*
2. High Pressure Injection Valves	≤ 30*
e. Component Cooling Water	
1. Component Cooling Water Pumps	≤ 180*
2. Component Cooling Aux. Equip. Inlet Valves	≤ 180*
3. Component Cooling to Air Compressor Valves	≤ 180*
f. Service Water System	
1. Service Water Pumps	≤ 45*
2. Service Water From Component Cooling Heat Exchanger Isolation Valves	≤ NA*
g. Containment Spray Isolation Valves	≤ 80*
h. Emergency Diesel Generator	≤ 15*

TABLE 3.3-5 (Continued)

SAFETY FEATURES SYSTEM RESPONSE TIMES

INITIATING SIGNAL AND FUNCTION	RESPONSE TIME IN SECONDS
2. Containment Pressure - High (Continued)	
i. Containment Isolation Valves	
1. Vacuum Relief	≤ 30*
2. Normal Sump	≤ 25*
3. RCS Letdown Delay Coil Outlet	≤ 30*
4. RCS Letdown High Temperature	≤ 30*
5. Pressurizer Sample	≤ 48*
6. Service Water to Cooling Water	≤ 45*
7. Vent Header	≤ 15*
8. Drain Tank	≤ 15*
9. Core Flood Tank Vent	≤ 15*
10. Core Flood Tank Fill	≤ 15*
11. Steam Generator Sample	≤ 15*
12. Quench Tank	≤ 15*
13. Emergency Sump	NA*
14. RCP Seal Return	≤ 45*
15. Air System	≤ 15*
16. N_2 System	≤ 15*
17. Quench Tank Sample	≤ 35*
18. RCP Seal Inlet	≤ 17*
19. Core Flood Tank Sample	≤ 15*
20. RCP Standpipe Demin Water Supply	≤ 15*
21. Containment H_2 Dilution Inlet	≤ 75*
22. Containment H_2 Dilution Outlet	≤ 75*
j. BWST Outlet Valves	NA*
k. Low Pressure Injection	
1. Decay Heat Pumps	≤ 30*
2. Low Pressure Injection Valves	≤ NA*
3. Decay Heat Pump Suction Valves	≤ NA
4. Decay Heat Cooler Outlet Valves	≤ NA*
5. Decay Heat Cooler Bypass Valves	≤ NA*
3. Containment Pressure--High-High	
a. Containment Spray Pump	≤ 80*
b. Component Cooling Isolation Valves	
1. Inlet to Containment	≤ 25*
2. Outlet from Containment	≤ 25*

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TABLE 3.3-5 (Continued)

SAFETY FEATURES SYSTEM RESPONSE TIMES

INITIATING SIGNAL AND FUNCTION	RESPONSE TIME IN SECONDS
b. Component Cooling Isolation Valves (Continued)	
3. Inlet to CRDM's	≤ 35*
4. CRDM Booster Pump Suction	≤ 35*
5. Component Cooling from Decay Heat Cooler	≤ NA*
4. RCS Pressure-Low	
a. Fans	
1. Emergency Vent Fans	≤ 25*
2. Containment Cooler Fans	≤ 45*
b. HV & AC Isolation Valves	
1. ECCS Room	≤ 75*
2. Emergency Ventilation	≤ 75*
3. Containment Air Sample	≤ 30*
4. Containment Purge	≤ 15*
5. Penetration Room Purge	≤ 75*
c. Control Room HV & AC Units	≤ 10*
d. High Pressure Injection	
1. High Pressure Injection Pumps	≤ 30*
2. High Pressure Injection Valves	≤ 30*
e. Component Cooling Water	
1. Component Cooling Water Pumps	≤ 180*
2. Component Cooling Aux. Equipment Inlet Valves	≤ 180*
3. Component Cooling to Air Compressor Valves	≤ 180*
f. Service Water System	
1. Service Water Pumps	≤ 45*
2. Service Water from Component Cooling Heat Exchanger Isolation Valves	≤ NA*
g. Containment Spray Isolation Valves	≤ 80*
h. Emergency Diesel Generator	≤ 15*

TABLE 3.3-5 (Continued)

SAFETY FEATURES SYSTEM RESPONSE TIMES

INITIATING SIGNAL AND FUNCTION	RESPONSE TIME IN SECONDS
4. RCS Pressure-Low (continued)	
i. Containment Isolation Valves	
1. Vacuum Relief	≤ 30*
2. Normal Sump	≤ 25*
3. RCS Letdown Delay Coil Outlet	≤ 30*
4. RCS Letdown High Temperature	≤ 30*
5. Pressurizer Sample	≤ 45*
6. Service Water to Cooling Water	≤ 45*
7. Vent Header	≤ 15*
8. Drain Tank	≤ 15*
9. Core Flood Tank Vent	≤ 15*
10. Core Flood Tank Fill	≤ 15*
11. Steam Generator Sample	≤ 15*
12. Quench Tank	≤ 15*
13. Emergency Sump	NA*
14. Air Systems	≤ 15*
15. N_2 System	≤ 15*
16. Quench Tank Sample	≤ 35*
17. Core Flood Tank Sample	≤ 15*
18. RCP Standpipe Demin Water Supply	≤ 15*
19. Containment H_2 Dilution Inlet	≤ 75*
20. Containment H_2 Dilution Outlet	≤ 75*
j. BWST Outlet Valves	NA*
5. RCS Pressure--Low-Low	
a. Low Pressure Injection	
1. Decay Heat Pumps	≤ 30*
2. Low Pressure Injection Valves	≤ NA*
3. Decay Heat Pump Suction Valves	≤ NA*
4. Decay Heat Cooler Outlet Valves	≤ NA*
5. Decay Heat Cooler Bypass Valves	≤ NA*
b. Component Cooling Isolation Valves	
1. Auxiliary Equipment Inlet	≤ 90*
2. Inlet to Air Compressor	≤ 90*
3. Component Cooling from Decay Heat Cooler	≤ NA*
c. Containment Isolation Valves	
1. RCP Seal Return	≤ 45*
2. RCP Seal Inlet	≤ 17*

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TABLE 3.3-5 (Continued)

SAFETY FEATURES SYSTEM RESPONSE TIMES

INITIATING SIGNAL AND FUNCTION	RESPONSE TIME IN SECONDS
6. Containment Radiation - High	
a. Emergency Vent Fans	≤ 25*
b. HV & AC Isolation Valves	
1. ECCS Room	≤ 75*
2. Emergency Ventilation	≤ 75*
3. Containment Air Sample	≤ 30*
4. Containment Purge	≤ 15*
5. Penetration Room Purge	≤ 75*
c. Control Room HV & AC Units	≤ 10*

TABLE NOTATION

* Diesel generator starting and sequence loading delays included when applicable. Response time limit includes movement of valves and attainment of pump or blower discharge pressure.

TABLE 4.3-2

SAFETY FEATURES ACTUATION SYSTEM INSTRUMENTATION SURVEILLANCE REQUIREMENTS

FUNCTIONAL UNIT	CHANNEL CHECK	CHANNEL CALIBRATION	CHANNEL FUNCTIONAL TEST	MODES IN WHICH SURVEILLANCE REQUIRED
1. INSTRUMENT STRINGS				
a. Containment Radiation - High	S	R	M	1,2,3,4,6#
b. Containment Pressure - High	S	R	M(2)	1, 2, 3
c. Containment Pressure - High-High	S	R	M(2)	1, 2, 3
d. RCS Pressure - Low	S	R	M	1, 2, 3
e. RCS Pressure - Low-Low	S	R	M	1, 2, 3
f. BWST Level - Low-Low	S	R	M	1, 2, 3
2. OUTPUT LOGIC				
a. Incident Level #1: Containment Isolation	S	R	M	1,2,3,4,6#
b. Incident Level #2: High Pressure Injection and Starting Diesel Generators	S	R	M	1, 2, 3, 4
c. Incident Level #3: Low Pressure Injection	S	R	M	1, 2, 3, 4
d. Incident Level #4: Containment Spray	S	R	M	1, 2, 3, 4
e. Incident Level #5: Containment Sump Recirculation Permissive	S	R	M	1, 2, 3, 4
3. MANUAL ACTUATION				
a. SFAS (Except Containment Spray and Emergency Sump Recirculation)	NA	NA	M(1)	1,2,3,4,6#
b. Containment Spray	NA	NA	M(1)	1, 2, 3
4. SEQUENCE LOGIC CHANNELS	S	NA	M	1, 2, 3, 4

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TABLE 4.3-2 (Continued)

SAFETY FEATURES ACTUATION SYSTEM INSTRUMENTATION SURVEILLANCE REQUIREMENTS

FUNCTIONAL UNIT	CHANNEL CHECK	CHANNEL CALIBRATION	CHANNEL FUNCTIONAL TEST	MODES IN WHICH SURVEILLANCE REQUIRED
5. INTERLOCK CHANNELS				
a. Decay Heat Isolation Valve	S	R	**	1, 2, 3
b. Pressurizer Heater	S	R	**	3 ##

**See Specification 4.5.2.d.1

TABLE NOTATION

(1) Manual actuation switches shall be tested at least once per 18 months during shutdown. All other circuitry associated with manual safeguards actuation shall receive a CHANNEL FUNCTIONAL TEST at least once per 31 days.

(2) The CHANNEL FUNCTIONAL TEST shall include exercising the transmitter by applying either vacuum or pressure to the appropriate side of the transmitter.

\# These surveillance requirements in conjunction with those of Section 4.9.4 apply during CORE ALTERATIONS or movement of irradiated fuel within the containment only if using the SFAS area radiation monitors listed in Table 3.3-3, Items 1a, 2a, and 3a, in lieu of the containment purge and exhaust system noble gas monitor.

\## When either Decay Heat Isolation Valve is open.

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EMERGENCY CORE COOLING SYSTEMS

ECCS SUBSYSTEMS - $T_{avg} \geq 280°F$

LIMITING CONDITION FOR OPERATION

3.5.2 Two independent ECCS subsystems shall be OPERABLE with each subsystem comprised of:

a. One OPERABLE high pressure injection (HPI) pump,

b. One OPERABLE low pressure injection (LPI) pump,

c. One OPERABLE decay heat cooler, and

d. An OPERABLE flow path capable of taking suction from the borated water storage tank (BWST) on a safety injection signal and manually transferring suction to the containment sump during the recirculation phase of operation.

APPLICABILITY: MODES 1, 2 and 3.

ACTION:

a. With one ECCS subsystem inoperable, restore the inoperable subsystem to OPERABLE status within 72 hours or be in HOT SHUTDOWN within the next 12 hours.

b. In the event the ECCS is actuated and injects water into the Reactor Coolant System, a Special Report shall be prepared and submitted to the Commission pursuant to Specification 6.9.2 within 90 days describing the circumstances of the actuation and the total accumulated actuation cycles to date.

SURVEILLANCE REQUIREMENTS

4.5.2 Each ECCS subsystem shall be demonstrated OPERABLE:

a. At least once per 31 days by verifying that each valve (manual, power operated or automatic) in the flow path that is not locked, sealed or otherwise secured in position, is in its correct position.

SURVEILLANCE REQUIREMENTS (Continued)

b. At least once each REFUELING INTERVAL, or prior to operation after ECCS piping has been drained by verifying that the ECCS piping is full of water by venting the ECCS pump casings and discharge piping high points.

c. By a visual inspection which verifies that no loose debris (rags, trash, clothing, etc.) is present in the containment which could be transported to the containment emergency sump and cause restriction of the pump suction during LOCA conditions. This visual inspection shall be performed:

1. For all accessible areas of the containment prior to establishing CONTAINMENT INTEGRITY, and

2. For all areas of containment affected by an entry, at least once daily while work is ongoing and again during the final exit after completion of work (containment closeout) when CONTAINMENT INTEGRITY is established.

d. At least once each REFUELING INTERVAL ~~per 18 months~~ by:

1. Verifying that the interlocks:

a) Close DH-11 and DH-12 and deenergize the pressurizer heaters, if either DH-11 or DH-12 is open and a simulated reactor coolant system pressure which is greater than the Allowable Value ~~trip setpoint~~ (≤328 ~~438~~ psig) is applied. The interlock to close DH-11 and/or DH-12 is not required if the valve is closed and 480 V AC power is disconnected from its motor operators.

b) Prevent the opening of DH-11 and DH-12 when a simulated or actual reactor coolant system pressure which is greater than the Allowable Value ~~trip setpoint~~ (≤328 ~~438~~ psig) is applied.

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2. a) A visual inspection of the containment emergency sump which verifies that the subsystem suction inlets are not restricted by debris and that the sump components (trash racks, screens, etc.) show no evidence of structural distress or corrosion.

b) Verifying that on a Borated Water Storage Tank (BWST) Low-Low Level interlock trip, with the motor operators for the BWST outlet isolation valves and the containment emergency sump recirculation valves energized, the BWST Outlet Valve HV-DH7A (HV-DH7B) automatically close in ≤75 seconds after the operator manually pushes the control switch to open the Containment Emergency Sump Valve HV-DH9A (HV-DH9B) which should be verified to open in ≤75 seconds.

3. Deleted

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4. Verifying that a minimum of 290 cubic feet of trisodium phosphate dodecahydrate (TSP) is contained within the TSP storage baskets.

5. Deleted

6. Deleted

e. At least once per 18 months, during shutdown, by

1. Verifying that each automatic valve in the flow path actuates to its correct position on a safety injection test signal.

2. Verifying that each HPI and LPI pump starts automatically upon receipt of a SFAS test signal.

f. By performing a vacuum leakage rate test of the watertight enclosure for valves DH-11 and DH-12 that assures the motor operators on valves DH-11 and DH-12 will not be flooded for at least 7 days following a LOCA:

1. At least once per 18 months.

2. After each opening of the watertight enclosure.

3. After any maintenance on or modification to the watertight enclosure which could affect its integrity.

g. By verifying the correct position of each mechanical position stop for valves DH-14A and DH-14B.

1. Within 4 hours following completion of the opening of the valves to their mechanical position stop or following completion of maintenance on the valve when the LPI system is required to be OPERABLE.

2. At least once per 18 months.

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EMERGENCY CORE COOLING SYSTEMS

SURVEILLANCE REQUIREMENTS (Continued)

h. By performing a flow balance test, during shutdown, following completion of modifications to the HPI or LPI subsystems that alter the subsystem flow characteristics and verifying the following flow rates:

HPI System - Single Pump

Injection Leg 1-1	$\geq$ 375 gpm at 400 psig*
Injection Leg 1-2	$\geq$ 375 gpm at 400 psig*
Injection Leg 2-1	$\geq$ 375 gpm at 400 psig*
Injection Leg 2-2	$\geq$ 375 gpm at 400 psig*

LPI System - Single Pump

Injection Leg 1	$\geq$ 2650 gpm at 100 psig**
Injection Leg 2	$\geq$ 2650 gpm at 100 psig**

* Reactor coolant pressure at the HPI nozzle in the reactor coolant pump discharge.

** Reactor coolant pressure at the core flood nozzle on the reactor vessel.

3/4.3.1 and 3/4.3.2 REACTOR PROTECTION SYSTEM AND SAFETY SYSTEM INSTRUMENTATION

The OPERABILITY of the RPS, SFAS and SFRCS instrumentation systems ensure that 1) the associated action and/or trip will be initiated when the parameter monitored by each channel or combination thereof exceeds its setpoint, 2) the specified coincidence logic is maintained, 3) sufficient redundancy is maintained to permit a channel to be out of service for testing or maintenance, and 4) sufficient system functional capability is available for RPS, SFAS and SFRCS purposes from diverse parameters.

The OPERABILITY of these systems is required to provide the overall reliability, redundance and diversity assumed available in the facility design for the protection and mitigation of accident and transient conditions. The integrated operation of each of these systems is consistent with the assumptions used in the accident analyses.

The surveillance requirements specified for these systems ensure that the overall system functional capability is maintained comparable to the original design standards. The periodic surveillance tests performed at the minimum frequencies are sufficient to demonstrate this capability.

For the RPS, SFAS Table3.3-4 Functional Unit Instrument Strings d and e and Interlock Channel a, and SFRCS Table 3.3-12 Functional Unit 2:

Only the Allowable Value is specified for each Function. Nominal trip setpoints are specified in the setpoint analysis. The nominal trip setpoints are selected to ensure the setpoints measured by CHANNEL FUNCTIONAL TESTS do not exceed the Allowable Value if the bistable is performing as required. Operation with a trip setpoint less conservative than the nominal trip setpoint, but within its Allowable Value, is acceptable provided that operation and testing are consistent with the assumptions of the specific setpoint calculations. Each Allowable Value specified is more conservative than the analytical limit assumed in the safety analysis to account for instrument uncertainties appropriate to the trip parameter. These uncertainties are defined in the specific setpoint analysis.

A CHANNEL FUNCTIONAL TEST is performed on each required channel to ensure that the entire channel will perform the intended function. Setpoints must be found within the specified Allowable Values. Any setpoint adjustment shall be consistent with the assumptions of the current specific setpoint analysis.

A CHANNEL CALIBRATION is a complete check of the instrument channel, including the sensor. The test verifies that the channel responds to the measured parameter within the necessary range and accuracy. CHANNEL CALIBRATION leaves the channel adjusted to account for instrument drift to ensure that the instrument channel remains operational between successive tests. CHANNEL CALIBRATION shall find that measurement errors and bistable setpoint errors are within the assumptions of the setpoint analysis. CHANNEL CALIBRATIONS must be performed consistent with the assumptions of the setpoint analysis.

The frequency is justified by the assumption of an 18 or 24 month calibration interval in the determination of the magnitude of equipment drift in the setpoint analysis.

ADDITIONAL CHANGES PREVIOUSLY PROPOSED BY LETTER
Serial No. 2428 Date 1/30/97

(Next page is B3/4 3-1a)

3/4.3 INSTRUMENTATION

BASES

3/4.3.1 and 3/4.3.2 REACTOR PROTECTION SYSTEM AND SAFETY SYSTEM INSTRUMENTATION (Continued)

The measurement of response time at the specified frequencies provides assurance that the RPS, SFAS, and SFRCS action function associated with each channel is completed within the time limit assumed in the safety analyses. No credit was taken in the analyses for those channels with response times indicated as not applicable.

Response time may be demonstrated by any series of sequential, overlapping or total channel test measurements provided that such tests demonstrate the total channel response time as defined. Sensor response time verification may be demonstrated by either 1) in place, onsite or offsite test measurements or 2) utilizing replacement sensors with certified response times.

The actuation logic for Functional Units 4.a., 4.b., and 4.c. of Table 3.3-3, Safety Features Actuation System Instrumentation, is designed to provide protection and actuation of a single train of safety features equipment, essential bus or emergency diesel generator. Collectively, Functional Units 4.a., 4.b., and 4.c. function to detect a degraded voltage condition on either of the two 4160 volt essential buses, shed connected loads, disconnect the affected bus(es) from the offsite power source and start the associated emergency diesel generator. In addition, if an SFAS actuation signal is present under these conditions, the sequencer channels for the two SFAS channels which actuate the train of safety features equipment powered by the affected bus will automatically sequence these loads onto the bus to prevent overloading of the emergency diesel generator. Functional Unit 4.a. has a total of four units, one associated with each SFAS channel (i.e., two for each essential bus). Functional Units 4.b. and 4.c. each have a total of four units, (two associated with each essential bus); each unit consisting of two undervoltage relays and an auxiliary relay.

An SFRCS channel consists of 1) the sensing device(s), 2) associated logic and output relays (including Isolation of Main Feedwater Non Essential Valves and Turbine Trip), and 3) power sources.

The SFRCS response time for the turbine stop valve closure is based on the combined response times of main steam line low pressure sensors, logic cabinet delay for main steam line low pressure signals and closure time of the turbine stop valves. This SFRCS response time ensures that the auxiliary feedwater to the unaffected steam generator will not be isolated due to a SFRCS low pressure trip during a main steam line break accident.

Safety-grade anticipatory reactor trip is initiated by a turbine trip (above 45 percent of RATED THERMAL POWER) or trip of both main feedwater pump turbines. This anticipatory trip will operate in advance of the reactor coolant system high pressure reactor trip to reduce the peak reactor coolant system pressure and thus reduce challenges to the pilot operated relief valve. This anticipatory reactor trip system was installed to satisfy Item II.K.2.10 of NUREG-0737. The justification for the ARTS turbine trip arming level of 45% is give in BAW-1893, October, 1985.

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3/4.5 EMERGENCY CORE COOLING SYSTEMS (ECCS)

BASES

3/4.5.1 CORE FLOODING TANKS

The OPERABILITY of each core flooding tank ensures that a sufficient volume of borated water will be immediately forced into the reactor vessel in the event the RCS pressure falls below the pressure of the tanks. This initial surge of water into the vessel provides the initial cooling mechanism during large RCS pipe ruptures.

The limits on volume, boron concentration and pressure ensure that the assumptions used for core flooding tank injection in the safety analysis are met.

The tank power operated isolation valves are considered to be "operating bypasses" in the context of IEEE Std. 279-1971, which requires that bypasses of a protective function be removed automatically whenever permissive conditions are not met. In addition, as these tank isolation valves fail to meet single failure criteria, removal of power to the valves is required.

The one hour limit for operation with a core flooding tank (CFT) inoperable for reasons other than boron concentration not within limits minimizes the time the plant is exposed to a possible LOCA event occurring with failure of a CFT, which may result in unacceptable peak cladding temperatures.

With boron concentration for one CFT not within limits, the condition must be corrected within 72 hours. The 72 hour limit was developed considering that the effects of reduced boron concentration on core subcriticality during reflood are minor. Boiling of the ECCS water in the core during reflood concentrates the boron in the saturated liquid that remains in the core. In addition, the volume of the CFTs is still available for injection. Since the boron requirements are based on the average boron concentration of the total volume of both CFTs, the consequences are less severe than they would be if the contents of a CFT were not available for injection.

The completion times to bring the plant to a MODE in which the Limiting Condition for Operation (LCO) does not apply are reasonable based on operating experience. The completion times allow plant conditions to be changed in an orderly manner and without challenging plant systems.

CFT boron concentration sampling within 6 hours after an 80 gallon volume increase will identify whether inleakage from the RCS has caused a reduction in boron concentration to below the required limit. It is not necessary to verify boron concentration if the added water inventory is from the borated water storage tank (BWST), because the water contained in the BWST is within CFT boron concentration requirements.

3/4.5.2 and 3/4.5.3 ECCS SUBSYSTEMS

The operability of two independent ECCS subsystems with RCS average temperature ≥ 280°F ensures that sufficient emergency core cooling capability will be available in the event of a LOCA assuming the loss of one subsystem through any single failure consideration. Either subsystem operating in conjunction with the core flooding tanks is capable of supplying sufficient core cooling to maintain the peak cladding temperatures within acceptable limits for all postulated break sizes ranging from the double ended break of the largest RCS cold leg pipe downward. In addition, each ECCS subsystem provides long term core cooling capability in the recirculation mode during the accident recovery period.

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With the RCS temperature below 280°F, one OPERABLE ECCS subsystem is acceptable without single failure consideration on the basis of the stable reactivity condition of the reactor and the limited core cooling requirements.

The Surveillance Requirements provided to ensure OPERABILITY of each component ensures that, at a minimum, the assumptions used in the safety analyses are met and that subsystem OPERABILITY is maintained.

The function of the trisodium phosphate dodecahydrate (TSP) contained in baskets located in the containment normal sump or on the 565' elevation of containment adjacent to the normal sump, is to neutralize the acidity of the post-LOCA borated water mixture during containment emergency sump recirculation. The borated water storage tank (BWST) borated water has a nominal pH value of approximately 5. Raising the borated water mixture to a pH value of 7 will ensure that chloride stress corrosion does not occur in austenitic stainless steels in the event that chloride levels increase as a result of contamination on the surfaces of the reactor containment building. Also, a pH of 7 is assumed for the containment emergency sump for iodine retention and removal post-LOCA by the containment spray system.

The Surveillance Requirement (SR) associated with TSP ensures that the minimum required volume of TSP is stored in the baskets. The minimum required volume of TSP is the volume that will achieve a post-LOCA borated water mixture pH of ≥ 7.0, conservatively considering the maximum possible sump water volume and the maximum possible boron concentration. The amount of TSP required is based on the mass of TSP needed to achieve the required pH. However, a required volume is verified by the SR, rather than the mass, since it is not feasible to weigh the entire amount of TSP in containment. The minimum required volume is based on the manufactured density of TSP (53 lb/ft^3). Since TSP can have a tendency to agglomerate from high humidity in the containment, the density may increase and the volume decrease during normal plant operation, however, solubility characteristics are not expected to change. Therefore, considering possible agglomeration and increase in density, verifying the minimum volume of TSP in containment is conservative with respect to ensuring the capability to achieve the minimum required pH. The minimum required volume of TSP to meet all analytical requirements is 250 ft^3. The surveillance requirement of 290 ft^3 includes 40 ft^3 of spare TSP as margin. Total basket capacity is 325 ft^3.

ADDITIONAL CHANGES PREVIOUSLY PROPOSED BY LETTER
Serial No. 2448 Date 2/14/97

Surveillance requirements for throttle valve position stops and flow balance testing provide assurance that proper ECCS flows will be maintained in the event of a LOCA. Maintenance of proper flow resistance and pressure drop in the piping system to each injection point is necessary to: (1) prevent total pump flow from exceeding runout conditions when the system is in its minimum resistance configuration, (2) provide the proper flow split between injection points in accordance with the assumptions used in the ECCS-LOCA analyses, and (3) provide an acceptable level of total ECCS flow to all injection points equal to or above that assumed in the ECCS-LOCA analyses.

EMERGENCY CORE COOLING SYSTEMS

BASES (Continued)

Containment Emergency Sump Recirculation Valves DH-9A and DH-9B are de-energized during MODES 1, 2, 3 and 4 to preclude postulated inadvertent opening of the valves in the event of a Control Room fire, which could result in draining the Borated Water Storage Tank to the Containment Emergency Sump and the loss of this water source for normal plant shutdown. Re-energization of DH-9A and DH-9B is permitted on an intermittent basis during MODES 1, 2, 3 and 4 under administrative controls. Station procedures identify the precautions which must be taken when re-energizing these valves under such controls.

Borated Water Storage Tank (BWST) outlet isolation valves DH-7A and DH-7B are de-energized during MODES 1, 2, 3, and 4 to preclude postulated inadvertent closure of the valves in the event of a fire, which could result in a loss of the availability of the BWST. Re-energization of valves DH-7A and DH-7B is permitted on an intermittent basis during MODES 1, 2, 3, and 4 under administrative controls. Station procedures identify the precautions which must be taken when re-energizing these valves under such controls.

The Decay Heat Isolation Valve and Pressurizer Heater Interlock setpoint is based on preventing over-pressurization of the Decay Heat Removal System normal suction line piping. The value stated is the RCS pressure at the sensing instrument's tap. It has been adjusted to reflect the elevation difference between the sensor's location and the pipe of concern.

3/4.5.4 BORATED WATER STORAGE TANK

The OPERABILITY of the borated water storage tank (BWST) as part of the ECCS ensures that a sufficient supply of borated water is available for injection by the ECCS in the event of a LOCA. The limits on the BWST minimum volume and boron concentration ensure that:

1) sufficient water is available within containment to permit recirculation cooling flow to the core following manual switchover to the recirculation mode, and

2) The reactor will remain at least 1% $\Delta k/k$ subcritical in the cold condition at 70°F, xenon free, while only crediting 50% of the control rods' worth following mixing of the BWST and the RCS water volumes.

These assumptions ensure that the reactor remains subcritical in the cold condition following mixing of the BWST and the RCS water volumes.

With either the BWST boron concentration or BWST borated water temperature not within limits, the condition must be corrected in eight hours. The eight hour limit to restore the temperature or boron concentration to within limits was developed considering the time required to change boron concentration or temperature and assuming that the contents of the BWST are still available for injection.

The bottom 4 inches of the BWST are not available, and the instrumentation is calibrated to reflect the available volume. The limits on water volume, and boron concentration ensure a pH value of between 7.0 and 11.0 of the solution sprayed within the containment after a design basis accident. The pH band minimizes the evolution of iodine and minimizes the effect of chloride and caustic stress corrosion cracking on mechanical systems and components.

Review Summary
for
Surveillance Requirement 4.3.2.1.1, Table 4.3-2, Functional Units 1.d and 1.e

1. A. Technical Specification (TS) 3/4.3.2.1, "Safety Features Actuation System Instrumentation," Surveillance Requirement (SR):

   4.3.2.1.1, Table 4.3-2, Instrument Strings:
   Functional Unit 1.d, RCS Pressure - Low
   Functional Unit 1.e, RCS Pressure - Low-Low

   Note: Channel Calibrations for Functional Units 1.a, 1.b, 1.c, 1.f, and 2.a through 2.e are proposed to remain on an 18 month surveillance interval, as discussed in License Amendment Request 95-0027 (DBNPS letter Serial Number 2405, dated December 11, 1996), and are not affected by this License Amendment Request.

   B. Systems or Components:

   Safety Features Actuation System Instrumentation

   C. Updated Safety Analysis Report (USAR) Sections:

   4.3.5.2 Safety Features Actuation System Instrumentation (SFAS)
   6.3.1.4 System Short- and Long-Term Capability
   7.3 Safety Features Actuation System (SFAS)

2. Licensing Basis Review:

   A. Technical Specification SR 4.3.2.1.1 requires that a Channel Calibration be performed for the Safety Features Actuation System (SFAS) functional units, at the frequencies shown in TS Table 4.3-2. TS Table 4.3-2 presently specifies a Channel Calibration frequency of at least once per 18 months for Functional Units 1.d and 1.e. Technical Specification 4.0.2 is applicable, which allows increasing the surveillance interval on a non-routine basis from 18 months to 22.5 months.

   It is proposed that a new definition for the "R" notation be applied in TS Table 4.3-2 for Functional Units 1.d, and 1.e. License Amendment Request (LAR) 95-0027 (DBNPS letter Serial Number 2405, dated December 11, 1996) proposes that the "R" notation be defined as "At least once per 24 months." This is consistent with the guidance provided by Generic Letter 91-04, "Changes in Technical Specification Surveillance Intervals to Accommodate a 24-Month Fuel Cycle," dated April 2, 1991. Technical Specification 4.0.2 would continue to apply which would allow increasing the new surveillance interval on a non-routine basis from 24 months to 30 months.

As described in the Safety Assessment and Significant Hazards Consideration (SASHC), and as shown on the attached marked-up Technical Specification pages, the Allowable Values for TS Table 3.3-4, "Safety Features Actuation System (SFAS) Instrumentation," Instrument String Functional Unit d (RCS Pressure - Low) and Instrument String Functional Unit e (RCS Pressure - Low-Low) are proposed for revision based on the results of the instrument drift study. The associated Trip Setpoints in TS Table 3.3-4 for these same functional units are also proposed for deletion. The new Allowable Values have been calculated in accordance with ISA S67.04, Part I - 1994 "Setpoints for Nuclear Safety-Related Instrumentation," and ISA RP67.04, Part II - 1994, "Methodologies for the Determination of Setpoints for Nuclear Safety-Related Instrumentation," and encompass the Channel Functional Test. The proposed Allowable Values are to be defined as applicable to the Channel Functional Test only by the application of a new "##" footnote in TS Table 3.3-4 which will read "Allowable Value for Channel Functional Test." These changes are consistent with NUREG-1430, Revision 1, "Standard Technical Specifications, Babcock and Wilcox Plants," dated April, 1995. In addition, related to this change, footnote "**" to TS Table 3.3-3, Safety Features Actuation System Instrumentation, which applies to Instrument String Functional Unit 1.e, RCS Pressure Low-Low, is proposed for revision. This footnote presently allows the trip function to be bypassed in Mode 3 (Hot Standby) with RCS pressure below 600 psig, and specifies that the bypass shall be automatically removed when RCS pressure exceeds 600 psig. The proposed change would revise the 600 psig value to 660 psig for both the bypass permissive and the reset.

As also described in the SASHC, and as shown on the attached marked-up Technical Specification pages, the TS 3.3.2.1 Limiting Condition for Operation (LCO) and Action Statement 3.3.2.1.a are proposed for revision to reflect the proposed changes to the SFAS Trip Setpoints and Allowable Values. In addition, TS Bases 3/4.3.1 and 3/4.3.2, "Reactor Protection System and Safety System Instrumentation," is proposed to be revised to reflect the proposed changes to the Trip Setpoints and Allowable Values.

B. The design goal of the Safety Features Actuation System (SFAS) is to automatically prevent or limit fission product and energy release from the core, to isolate the containment vessel and to initiate the operation of the Engineered Safety Features (ESF) equipment in the event of a loss-of-coolant accident (LOCA). The SFAS will automatically sequence the protective action by loading equipment in steps to the Emergency Diesel Generators (EDGs) if normal or reserve power is not available to the 4.16kV essential bus(es) coincident with an SFAS initiation signal. As described in the DBNPS Updated Safety Analysis Report (USAR) Section 6.3.1.4, "System Short- and Long-Term Capability," the Emergency Core Cooling System (ECCS) design basis assumes simultaneous loss of normal and reserve power with a LOCA.

The SFAS instrumentation and controls extend from the generating station variables to the input terminals of the safety features actuation control devices such as motor controllers and solenoid valves. The SFAS is divided into initiating or sensing channels, logic channels, and actuating channels.

The Safety Features Actuation System (SFAS) is described in DBNPS USAR, Section 7.3, "Safety Features Actuation System." The SFAS consists of four identical redundant sensing and logic channels and two identical redundant actuation channels. Each sensing channel includes analog circuits with analog isolation devices, and each logic channel includes trip bistable modules with digital isolation devices. The isolated output of the trip bistable module is used to comprise coincidence matrices with the terminating relays within the actuation channel of the SFAS. The trip bistables monitor the station variables and normally feed continuous electrical signals into two-out-of-four coincidence matrices. Should any of the station variables exceed their trip setpoints, the corresponding bistables in each of the four channels will trip and cease sending output signals. Should two of the four channel bistables monitoring the same station variable cease to send output signals, the corresponding normally energized terminating relays on all channels will trip. The terminating relays of sensing and logic Channels 1 and 3, must both be deenergized to activate safety actuation Channel 1. Similarly, sensing and logic Channels 2 and 4 are deenergized to activate actuation Channel 2. The terminating relays act on the actuation control devices such as motor controllers and solenoid valves.

Generating station conditions which require protective actions:

1. Loss of coolant accident (LOCA)

2. Steam line break

3. High radiation level inside the containment vessel

The current initiating circuits of the SFAS are the sensing circuits monitoring the following station variables:

1. Containment Vessel radiation level.

2. Containment Vessel pressure.

3. Reactor Coolant pressure.

4. Borated Water Storage Tank level.

The SFAS is a fail-safe (de-energize-to-trip) system. Therefore, if power supply is lost to a channel, that channel will trip, reducing the system coincidence matrices from two-out-of-four to one-out-of-three mode. In the event that a module which performs a protective function is removed from its cabinet, that SFAS channel will trip unless it is bypassed. No single failure can prevent the SFAS from performing its protective function.

Each sensing and logic channel of SFAS includes two operating bypasses, one for the Reactor Coolant System (RCS) Pressure - Low signal, and the other for the RCS Pressure Low-Low signal. These bypasses allow depressurization of the RCS without initiating the RCS pressure trips. The bypasses consist of eight push-buttons located at the main control console, two for each channel, and related sensing channel components. These bypasses can only be actuated manually and only when the RCS pressure is below 1800 psig or 600 psig respectively. The bypasses are automatically reset before the RCS pressure exceeds 1800 psig or 600 psig respectively. As noted above, this LAR proposes to revise the Low-Low bypass permissive and reset setpoints from 600 psig to 660 psig.

The SFAS is not an initiator, nor a contributor, to the initiation of an accident described in the Updated Safety Analysis Report.

C. The current surveillance interval of 18 months was based on the guidance of NUREG-0103, Revision 0, dated June 1, 1976, "Standard Technical Specifications for Babcock and Wilcox Pressurized Water Reactors," during the initial licensing of the DBNPS. As discussed above, the proposed change follows the guidance of Generic Letter 91-04, "Changes in Technical Specification Surveillance Intervals to Accommodate a 24-Month Fuel Cycle," dated April 2, 1991.

D. As a result of the above review, it is concluded that the licensing basis of the Safety Features Actuation System will not be invalidated by increasing the Technical Specification SR 4.3.2.1.1, Table 4.3-2, Functional Unit 1.d, RCS Pressure - Low, and Functional Unit 1.e, RCS Pressure - Low-Low, Channel Calibration surveillance interval from 18 months to 24 months and by continuing to allow application of Technical Specification 4.0.2 on a non-routine basis.

E. References:

i. Davis-Besse Nuclear Power Station (DBNPS) Unit No. 1, Operating License NPF-3, Appendix A, Technical Specifications, through Amendment 214.

ii. Generic Letter 91-04, "Changes in Technical Specifications Surveillance Intervals to Accommodate a 24-Month Fuel Cycle," dated April 2, 1991.

iii. "Standard Technical Specifications for Babcock and Wilcox Pressurized Water Reactors," NUREG-0103, Revision 0, dated June 1, 1976.

iv. NUREG-0136, Safety Evaluation Report for The Davis-Besse Nuclear Power Station, Unit 1, dated December 1976 and Supplement No. 1.

v. NUREG-1430, Revision 1, "Standard Technical Specifications, Babcock and Wilcox Plants," dated April, 1995.

vi. USAR Section 4.3.5.2, "Safety Features Actuation System Instrumentation (SFAS)," through Revision 19.

vii. USAR Section 6.3.1.4, "System Short- and Long-Term Capability," through Revision 19.

viii. USAR Section 7.3, "Safety Features Actuation System (SFAS)," through Revision 19.

3. Instrument Drift Study Analysis:

A. Enclosure 2 of Generic Letter 91-04, "Changes in Technical Specification Surveillance Intervals to Support a 24-Month Fuel Cycle", dated April 2, 1991, identifies seven issues to be addressed in justifying increased surveillance intervals to accommodate a 24 month fuel cycle.

The following sections address, by number, the first six of the seven issues, specified in Enclosure 2 of Generic Letter 91-04, necessary to justify a cycle extension from 18 to 24 months. The seventh issue is discussed in the main body of this license amendment application.

For the purposes of the Drift Study, each of the four SFAS RCS pressure channel strings, consisting of a transmitter, converter and bistables, was analyzed twice; once with the RCS Pressure Low bistable and once with the RCS Pressure Low-Low bistable. The strings are discussed separately below.

<u>SFAS RCS Pressure - Low</u>

1. A review of the as-found and as-left calibration data for the SFAS RCS pressure channels, was made from Technical Specification Surveillance Procedures, Maintenance Work Orders, Instrumentation and Controls Maintenance Shop Records, and the System Performance Book Chronological Logs. Review of the as-found data indicates that there were no occurrences where the data was outside the present Technical Specification Allowable Value.

2. Utilizing a one-sided tolerance factor and not taking credit for a conservative mean (since the drift data contained a conservative bias that may not always exist), the 95/95% historical drift value for the SFAS RCS Pressure - Low trip function was determined to be 28.806 psig of the 2500 psig instrument string span. This value was conservatively calculated as simply the tolerance factor times the standard deviation.

3. Although the conservative mean provided some evidence of a conservative drift with increasing time, the majority of the available data points were at the present refueling interval of approximately 18 months and adjustments interrupted what may have been poor data points over longer intervals. Based on this, time dependency was conservatively assumed, and the 30 month projected drift was determined to be 38.453 psig using linear extrapolation. Again, no credit was taken for the conservative mean.

4. The projected 30 month projected drift value of 38.453 psig was found to be larger than the previously assumed design basis/reference uncertainty used in the setpoint analysis, 27.857 psig. Based on this, and as discussed in the body of this LAR, the analytical value was acceptably lowered to maintain operating margin between the SFAS RCS low pressure block and low pressure trip setpoints. A new Allowable Value was determined and is proposed in this LAR.

5. This SFAS RCS Pressure - Low trip instrument string does not control any plant parameters in an analog fashion, but rather provides protective action signals to initiate operation of actuated equipment. Therefore, this question is not applicable.

6. The present revision of the setpoint analysis supports the analytical value necessary for the safety analysis, as discussed in the body of this LAR. During implementation of this LAR, procedure changes will be made to reflect a new field setpoint and a revised calibration method. Confirmation that the conditions and assumptions of the revised setpoint analysis are reflected in the surveillance procedures will be repeated as part of the LAR implementation process.

SFAS RCS Pressure Low-Low

1. A review of the as-found and as-left calibration data, for the SFAS RCS pressure channels, was made from Technical Specification Surveillance Procedures, Maintenance Work Orders, Instrumentation and Controls Maintenance Shop Records, and the System Performance Book Chronological Logs. Review of the as-found data indicates that there were no occurrences where the data was outside the existing Technical Specification Allowable Value.

2. Utilizing a one-sided tolerance factor and not taking credit for a conservative mean (since the drift data contained a conservative bias that may not always exist), the 95/95% historical drift value for the SFAS RCS Pressure - Low trip function was determined to be 27.353 psig of the 2500 psig instrument string span. This value was conservatively calculated as simply the tolerance factor times the standard deviation.

3. Although the conservative mean provided some evidence of a conservative drift with increasing time, the majority of the available data points were at the present refueling interval of approximately 18 months and adjustments interrupted what may have been poor data points over longer intervals. Based on this, time dependency was conservatively assumed, and the 30 month projected drift was determined to be 31.698 psig using linear extrapolation. Again, no credit was taken for the conservative mean.

4. The projected 30 month projected drift value of 31.698 psig was found to be larger than the previously assumed design basis/reference uncertainty used in the setpoint analysis, 27.857 psig. Based on this, and as discussed in the body of this LAR, maintaining the previously acceptable analytical value, the Allowable Value for the SFAS RCS Pressure Low-Low trip was raised and the SFAS RCS low-low pressure block was correspondingly raised to maintain operating margin between the low-low pressure block and the low-low pressure trip settings. The new Allowable Value and block setpoint were determined and are proposed in this LAR.

5. This SFAS RCS Pressure Low-Low trip instrument string does not control any plant parameters in an analog fashion, but rather provides protective action signals to initiate operation of actuated equipment. Therefore, this question is not applicable.

6. The present revision of the setpoint analysis supports the analytical value necessary for the safety analysis, as discussed in the body of this LAR. During implementation of this LAR, procedure changes will be made to reflect a new field setpoint and a revised calibration method. Confirmation that the conditions and assumptions of the setpoint analysis are reflected in the surveillance procedures will be performed as part of the LAR implementation process.

4. Surveillance Data and Maintenance Records Review:

Consistent with the guidance of Generic Letter 91-04, "Changes in Technical Specification Surveillance Intervals to Accomodate a 24-Month Fuel Cycle," dated April 2, 1991, a historical maintenance and surveillance data review is not required, given that instrumentation drift is evaluated for the applicable instrumentation.

Review Summary for Surveillance Requirement 4.3.2.1.1, Table 4.3-2, Functional Units 5.a and 5.b, and Surveillance Requirement 4.5.2.d.1

1. A. Technical Specification (TS) 3/4.3.2.1, "Safety Features Actuation System Instrumentation," Surveillance Requirement (SR):

   4.3.2.1.1, Table 4.3-2, Interlock Channels:
   Functional Unit 5.a, Decay Heat Isolation Valve
   Functional Unit 5.b, Pressurizer Heater

   Note: Channel Calibrations for Functional Units 1.a, 1.b, 1.c, 1.f, and 2.a through 2.e are proposed to remain on an 18 month surveillance interval, as discussed in License Amendment Request 95-0027 (DBNPS letter Serial Number 2405, dated December 11, 1996), and are not affected by this License Amendment Request.

   Technical Specification (TS) 3/4.5.2, "Emergency Core Cooling Systems - ECCS Subsystems - Tavg $\geq$ 280°F," Surveillance Requirement:

   4.5.2.d.1.a
   4.5.2.d.1.b

   Note: Several additional license amendment applications submitted to the NRC, also affect SR 4.5.2.d. This license amendment application (LAR 96-0014), affects only SR 4.5.2.d.1.

   B. Systems or Components:

   Safety Features Actuation System Instrumentation and RCS pressure switch PSHRC2B4, including Decay Heat Isolation Valve and Pressurizer Heater interlocks.

   C. Updated Safety Analysis Report (USAR) Sections:
   5.2.2.3 Overpressure Protection
   6.3.2.16 Decay Heat Removal System Valve Control Circuit
   7.6.1.1 Normal Decay Heat Removal Valve Control System
   7.6.2.1 Analysis - Normal Decay Heat Removal Valve Control System
   9.3.5 Decay Heat Removal System

2. Licensing Basis Review:

   A. Technical Specification SR 4.3.2.1.1 requires that a Channel Calibration be performed for the Safety Features Actuation System (SFAS) functional units at the frequency shown in TS Table 4.3-2. TS Table 4.3-2 presently specifies a Channel Calibration

frequency of at least once per 18 months for Functional Units 5.a and 5.b. Technical Specification 4.0.2 is applicable which allows increasing the surveillance interval on a non-routine basis from 18 months to 22.5 months.

It is proposed that a new definition for the "R" notation be applied in TS Table 4.3-2 for Functional Unit 5.a and 5.b. License Amendment Request (LAR) 95-0027 (DBNPS letter Serial Number 2405, dated December 11, 1996) proposes that the "R" notation be defined as "At least once per 24 months." This is consistent with the guidance provided by Generic Letter 91-04. Technical Specification 4.0.2 would continue to apply which would allow increasing the new surveillance interval on a non-routine basis from 24 months to 30 months.

Technical Specification SR 4.5.2.d.1, which is referenced by TS Table 4.3-2 Functional Units 5.a and 5.b for Channel Functional Test frequency, requires that at least once per 18 months a Channel Functional Test be performed to verify that the associated interlocks close DH-11 and DH-12 and deenergize the pressurizer heaters if either DH-11 or DH-12 is open and a simulated reactor coolant system pressure greater than the trip setpoint is applied.

Technical Specification SR 4.5.2.d.1 also requires that at least once per 18 months a test be performed to verify that the associated interlocks prevent the opening of DH-11 and DH-12 when a simulated or actual reactor coolant system pressure which is greater than the trip setpoint is applied.

Relative to TS SR 4.5.2.d.1.a and TS SR 4.5.2.d.1.b, it is proposed that in TS SR 4.5.2.d the words "At least once per 18 months" be replaced with "At least once each REFUELING INTERVAL." The term "Refueling Interval" is defined by TS Definition 1.42 as "a period of time $\leq$ 730 days." This is consistent with the guidance provided by Generic Letter 91-04, "Changes in Technical Specification Surveillance Intervals to Accommodate a 24-Month Fuel Cycle," dated April 2, 1991. Technical Specification 4.0.2 would continue to apply which would allow increasing the new surveillance interval on a non-routine basis from 24 months to 30 months.

As described in the Safety Assessment and Significant Hazards Consideration (SASHC), and as shown on the marked-up Technical Specification pages, the Allowable Value for TS Table 3.3-4, "Safety Features Actuation System (SFAS) Instrumentation" Interlock Channel Functional Unit a, "Decay Heat Isolation Valve and Pressurizer Heater," is proposed for revision based on the results of the instrument drift study and re-evaluation of the design basis. The associated Trip Setpoint in TS Table 3.3-4 for this same functional unit is also proposed for deletion. The new Allowable Value has been calculated in accordance with ISA S67.04, Part I - 1994 "Setpoints for Nuclear Safety-Related

Instrumentation," and ISA RP67.04, Part II - 1994, "Methodologies for the Determination of Setpoints for Nuclear Safety-Related Instrumentation," and encompass the Channel Functional Test, using a graded approach. The proposed Allowable Value is to be defined as applicable to the Channel Functional Test only, by the application of a new "##" footnote in TS Table 3.3-4 which will read "Allowable Value for Channel Functional Test." These changes are consistent with NUREG-1430, Revision 1, "Standard Technical Specifications, Babcock and Wilcox Plants," dated April, 1995.

As also described in the SASHC and as shown on the marked-up Technical Specification pages, the TS 3.3.2.1 Limiting Condition for Operation (LCO) and Action Statement 3.3.2.1.a are proposed for revision to reflect the proposed changes to the Trip Setpoints and Allowable Values. In addition, TS Bases 3/4.3.1 and 3/4.3.2, "Reactor Protection System and Safety System Instrumentation," is proposed to be revised to reflect the proposed changes to the Trip Setpoints and Allowable Values. Also, TS Table 3.3-3 Actions 13 and 14 are proposed for revision to reflect the change to the Allowable Value for the SFAS Interlock Channel Functional Unit a, and SR 4.5.2.d.1 is proposed for revision to reflect the change in Allowable Value.

B. The operability of the Decay Heat Removal (DHR) and Pressurizer Heater interlocks ensures that double valve protection is established between the Reactor Coolant System (RCS) and the DHR/Low Pressure Injection (LPI) system prior to raising the RCS pressure above the DHR system design pressure. These interlock channels prevent pressurizer heater operation if either DH-11 or DH-12 is off its closed seat while the RCS pressure is above the interlock setpoint and prevents DH-11 and DH-12 from being opened until RCS pressure is below the DHR system design pressure. The interlocks meet the guidance provided in Branch Technical Position EICSB 3, "Isolation of Low Pressure System from The High Pressure Reactor Coolant System."

The automatic closing signal to one of the valves (DH-12) is derived from an RCS pressure switch (PSHRC2B4) located in RCS loop 1. The automatic closing signal to the other valve (DH-11) is derived from a signal comparator located in the Safety Features Actuation System (SFAS) cabinet. The signal comparator receives its RCS pressure signal from the RCS loop 2 wide-range pressure transmitter (PTRC2A3) that supplies the signal to the SFAS.

The pressurizer heater trip interlocks are derived from the signal comparators located in the SFAS cabinets. The signal comparators receive their RCS pressure signal from the RCS loop 1 or 2 wide range pressure transmitters (PTRC2A3 and PTRC2B4) that supplies the signal for the corresponding SFAS cabinet.

The control circuits are designed such that any single failure will not prevent proper protective action when required. Failure to close one valve will not prevent the closure of the other valve. One closed valve is sufficient to ensure that the Decay Heat Removal System will not be subjected to pressure in excess of design conditions.

The Decay Heat Isolation Valve Interlocks provide overpressure protection of the Decay Heat Removal System. The Decay Heat Isolation Valve Interlocks are not an initiator, nor a contributor, to the initiation of an accident described in the Updated Safety Analysis Report.

C. The current surveillance interval of 18 months for the Decay Heat Isolation Valve Interlocks was based on the guidance of NUREG-0103, Revision 0, June 1, 1976, "Standard Technical Specifications for Babcock and Wilcox Pressurized Water Reactors," during the initial licensing of the DBNPS.

Requirements for the Pressurizer Heater Interlocks including the 18 month surveillance interval, were added by Amendment No. 28 to Facility Operating License No. NPF-3 for the Davis-Besse Nuclear Power Station, dated July 25, 1980. Amendment 28 also revised the interlock Allowable Value and trip setpoint to <443 psig and <438 psig respectively. The requirement for Decay Heat Isolation Valve and Pressurizer Heater interlocks to be operable in Modes 4 and 5 was removed by Amendment No. 159 to Facility Operating License No. NPF-3 for the Davis-Besse Nuclear Power Station, dated August 14, 1991.

As discussed above, the proposed changes follow the guidance of Generic Letter 91-04, "Changes in Technical Specification Surveillance Intervals to Accommodate a 24-Month Fuel Cycle," dated April 2, 1991.

D. As a result of the above review, it is concluded that the licensing basis of the Decay Heat Isolation Valve and Pressurizer Heater Interlock Channels will not be invalidated by increasing the Channel Calibration surveillance interval and the Channel Functional Test surveillance interval for SR 4.3.2.1.1, Table 4.3-2, Functional Unit 5.a and Functional Unit 5.b and SR 4.5.2.d.1 from 18 months to 24 months and by continuing to allow the application of TS 4.0.2 on a non-routine basis.

E. References:

i. Davis-Besse Nuclear Power Station (DBNPS) Unit No. 1, Operating License NPF-3, Appendix A, Technical Specifications, through Amendment 214.

ii. Generic Letter 91-04, "Changes in Technical Specifications Surveillance Intervals to Accommodate a 24-Month Fuel Cycle," dated April 2, 1991.

iii. "Standard Technical Specifications for Babcock and Wilcox Pressurized Water Reactors," NUREG-0103, Revision 0, dated June 1, 1976.

iv. USAR Section 5.2.2.3, "Overpressure Protection," through Revision 19.

v. USAR Section 6.3.2.16, "Decay Heat Removal System Valve Control Circuit," through Revision 19.

vi. USAR Section 7.6.1.1, "Normal Decay Heat Removal Valve Control System," through Revision 19.

vii. USAR Section 7.6.2.1, "Analysis - Normal Decay Heat Removal Valve Control System," through Revision 19.

viii. USAR Section 9.3.5, "Decay Heat Removal System," through Revision 19.

ix. Amendment No. 28 to Facility Operating License No. NPF-3 for the Davis-Besse Nuclear Power Station, dated July 25, 1980.

x. Amendment No. 159 to Facility Operating License No. NPF-3 for the Davis-Besse Nuclear Power Station, dated August 14, 1991.

xi. NUREG-1430, Revision 1, "Standard Technical Specifications, Babcock and Wilcox Plants," dated April, 1995.

3. Instrument Drift Study Analysis:

A. Enclosure 2 of Generic Letter 91-04, "Changes in Technical Specification Surveillance Intervals to Support a 24-Month Fuel Cycle", dated April 2, 1991, identifies seven issues to be addressed in justifying increased surveillance intervals to accommodate a 24 month fuel cycle.

The following sections address, by number, the first six of the seven issues, specified in Enclosure 2 of Generic Letter 91-04, necessary to justify a cycle extension from 18 to 24 months. The seventh issue is discussed in the main body of this license amendment application.

For purposes of the Drift Study performed on the SFAS instrument strings (first of two Drift Study Analyses discussed below), four SFAS RCS pressure channel strings, consisting of a transmitter,

converter and bistables, were analyzed, even though only two support the Decay Heat Isolation Valve / Pressurizer Heater functions. Justification for including the other two instrument strings are discussed in Attachment 3 of this LAR.

<u>SFAS RCS Pressure - Decay Heat Isolation Valve (DH-11) and Pressurizer Heaters Interlock</u>

1. A review of the as-found and as-left calibration data for the SFAS RCS pressure channels, was made from Technical Specification Surveillance Procedures, Maintenance Work Orders, Instrumentation and Controls Maintenance Shop Records, and the System Performance Book Chronological Logs. Review of the as-found data indicates that there were no occurrences where the data was outside the existing Technical Specification Allowable Value.

2. Utilizing a one-sided tolerance factor, the 95/95% historical drift value for the SFAS RCS Pressure Decay Heat Isolation Valve / Pressurizer Heater function was determined to be 39.098 psig of the 2500 psig instrument string span. Due to an existence of a non-conservative mean for this increasing pressure interlock, this value was calculated as the tolerance factor times the standard deviation, then added to the mean.

3. Since the non-conservative mean provided some evidence of a non-conservative drift with increasing time, the majority of the available data points were at the present refueling interval of approximately 18 months, and adjustments interrupted what may have been poor data points over longer intervals, time dependency was assumed. The 30 month projected drift was determined to be 51.280 psig using linear extrapolation.

4. The projected 30 month projected drift value of 51.280 psig was found to be slightly larger than the previously assumed design/basis reference uncertainty used in the previously existing setpoint documentation, 51.000 psig. Based on the 30 month projected drift value, and a reevaluation of the design basis for this function, as discussed in the body of this LAR, a new, lower Allowable Value was calculated within the setpoint analysis and is proposed in this LAR. Operating margin was maintained between the field setpoint and the operating limit (minimum NPSH for the Reactor Coolant Pumps).

5. These SFAS RCS Pressure Decay Heat Isolation Valve / Pressurizer Heater Interlock instrument strings do not control any plant parameters in an analog fashion, but rather provide protective action signals to initiate operation of actuated equipment (or for pressurizer heaters, deenergize them). Therefore, this question is not applicable.

6. The present revision of the setpoint analysis supports the analytical value necessary to support the safety function, as discussed in the body of this LAR. During implementation of this LAR, surveillance procedure changes will be made to reflect a new Allowable Value and revised calibration method. Confirmation that the conditions and assumptions of the setpoint analysis are reflected in the surveillance procedures will be performed as part of the LAR implementation process.

<u>RCS Pressure - Decay Heat Isolation Valve (DH-12) Interlock</u>

1. A review of the as-found and as-left calibration data, for this RCS pressure switch, was made from Technical Specification Surveillance Procedures, Maintenance Work Orders, Instrumentation and Controls Maintenance Shop Records, and the site records management database. This review indicates that there were no occurrences where the data was outside the existing Technical Specification trip setpoint value or the proposed (and more conservative) Technical Specification Allowable Value.

2. Utilizing a one-sided tolerance factor, the 95/95% historical drift value was determined to be 16.746 psig for this pressure switch with a range of 100 to 500 psig. This value was conservatively calculated as simply the tolerance factor times the standard deviation, then added to the mean.

3. With evidence that drift is time dependent but in a conservative direction, linear extrapolation was initially used to determine a 30 month projected drift value. Because of fairly large data points at short test intervals, the 95/95% maximum value was extraordinarily large and unacceptable for the function. Alternatively, based on the conservative drift with increasing time, and the typically nonconservative values at short intervals, it was decided to utilize the larger of the 95/95% historical drift value for all data points or the 95/95% historical drift value for all points under six months between tests. The 95/95% historical drift value for all points under six months was larger and became the 30 month projected drift value, 19.194 psig.

4. The projected 30 month projected drift value of 19.194 psig was found to be smaller than the design basis/reference uncertainty used in the previously existing setpoint

documentation, 51.000 psig. Based on this, no changes to existing settings or analyses was necessary. However, since this interlock function for valve DH-12 shares Technical Specification wording for the trip setpoint (and proposed Allowable Value in place of the trip setpoint), the value in the Technical Specifications is being changed for consistency with the SFAS RCS - Decay Heat Isolation Valve (DH-11) and Pressurizer Heaters Interlock Allowable Value described above. This proposed use of the Allowable Value derived from the SFAS RCS pressure channel uncertainties is conservative for this RCS pressure switch since the uncertainties for this RCS pressure switch are smaller.

5. This RCS pressure switch does not control any plant parameters in an analog fashion, but rather provides protective action signals to initiate operation of actuated equipment. Therefore, this question is not applicable.

6. The present revision of the setpoint analysis supports the analytical value necessary to support the safety function, as discussed in the body of this LAR. The assumptions in the present setpoint analysis, including the field setpoint (which did not require change even though the Technical Specification value was lowered), are presently reflected in the surveillance test.

4. Surveillance Data Review:

Technical Specification 4.5.2.d.1

A. The 18 month Technical Specification (TS) surveillance test results data for DH-11 and DH-12 interlock tests were reviewed for the period of the Fifth Refueling Outage (5RFO) through 9RFO. This time period was selected because it reflects the major plant improvements after June 1985, and covers five refueling outages and four operating cycles of test results.

The following components were evaluated: Decay Heat Isolation Valves DH-11 and DH-12, and RCS Pressurizer Heater Bundles WMB1, WMB2, and WMB3. Consistent with the guidance of Generic Letter 91-04, "Changes in Technical Specification Surveillance Intervals to Accomodate a 24-Month Fuel Cycle," dated April 2, 1991, a surveillance data review is not required for the RCS Loop 1 Hot Leg Narrow Range pressure switch (PSHRC2B4), and the RCS Loop 1 and Loop 2 Wide Range pressure transmitters (PTRC2A3 and PTRC2B4), given that instrument drift is evaluated for this instrumentation.

B. The test results indicated no actual TS failures over this time period for the components.

In 5RFO, testing was suspended because DH-11 would not open. The valve was declared inoperable but was closed with the plant in Mode 5 (Cold Shutdown). Decay Heat Isolation Bypass Valves DH-22

and DH-23 were open. The DH-11 and DH-12 interlock is not required in Mode 5. The failure was attributed to a loose L56 seal-in contact on breaker BF1130. The L56 seal-in was reseated and the valve performed as required. Test results were satisfactory. No root cause for the problem with the L56 seal-in was identified.

C. Based on the review of the 18 month surveillance test results data, no additional actions are necessary or recommended to support this increase in the present surveillance interval.

D. Based on no surveillance failures; the low potential for significant increases in failure rates of these components over an increased interval; and no known additional failure modes, it is concluded that the surveillance interval for TS 4.5.2.d.1 can be increased from 18 months to 24 months, and that there is no adverse effect on nuclear safety. Furthermore, it remains acceptable to allow the continued application of TS 4.0.5 on a non-routine basis.

E. References:

i. DBNPS Procedure DB-SP-03130, "Decay Heat Removal System Isolation Test" 5RFO through 9RFO (includes superseded procedures).

ii. Potential Condition Adverse to Quality (PCAQR) 88-0755.

iii. Maintenance Work Order (MWO) 7-88-0755-01.

5. Maintenance Records Review:

A. A review was performed on refueling maintenance records that could affect DH-11 or DH-12 interlock testing for the period of the Fifth Refueling Outage (5RFO) through 9RFO. This time period was selected because it reflects the major plant improvements after June 1985, and covers five refueling outages and four operating cycles of maintenance activities. Consistent with the guidance of Generic Letter 91-04, "Changes in Technical Specification Surveillance Intervals to Accomodate a 24-Month Fuel Cycle," dated April 2, 1991, a maintenance records review is not required for the RCS Loop 1 Hot Leg Narrow Range pressure switch (PSHRC2B4), and the RCS Loop 1 and Loop 2 Wide Range pressure transmitters (PTRC2A3 and PTRC2B4), given that instrument drift is evaluated for this instrumentation.

B. Review of current planned maintenance activities indicate that all 18 month planned maintenance activities are required to be performed in a refueling outage.

Decay Heat Isolation Valves DH-11 and DH-12

No failures were identified for DH-11 or DH-12 that would make the valves TS inoperable, although several system changes were made to improve system reliability and prevent adverse degradation. The motor heaters were disconnected for environmental qualification (EQ) reasons. In addition, live loaded packing was installed on DH-11 and DH-12 to reduce valve stem leakage. Some leakage has been identified since that time but has been minor in nature and would not adversely impact the interlock feature. Thrust range adjustments have been made as a result of Generic Letter 89-10 testing.

During 6RFO, DH-11 was inspected for an inservice inspection and several indications were found. A gouge was identified on the valve body and bonnet gasket seating surface. The upset metal was removed. In addition, the valve stem was replaced due to gouging and several studs were replaced due to galling. No new indications were observed during the 10RFO inservice inspection. None of these problems would have prevented the valve from performing its design function.

Plant Modification 93-016 was implemented in 10RFO to address a potential pressure locking concern for DH-11 and DH-12. Since pressure locking can prevent a closed valve from opening but is not a concern with respect to closing an open valve, a pressure locking condition would not have had an adverse impact on the DH-11 and DH-12 interlock function.

Pressurizer Heater Bundles

No failures were found that would affect the ability of the interlocks to trip the heaters as necessary.

C. Based on the review of 18 month maintenance records, no additional actions are necessary or recommended to support this increase in the present surveillance interval.

No conditions were identified which would have impacted the ability of the components to perform their design function.

D. Based on the historical good performance of the applicable components, the low potential for significant increases in failure rates of these components under a longer interval, and no known new failure modes, it is concluded that it is acceptable to increase the surveillance interval of SR 4.5.2.d.1 from 18 months to 24 months, and that there is no adverse effect on nuclear safety. Furthermore, it remains acceptable to allow the continued application of TS 4.0.2 on a non-routine basis.

E. References:

i. DBNPS Maintenance Work Order Records.

ATTACHMENT 1
FOR
LICENSE AMENDMENT REQUEST NUMBER 96-0014
(19 pages follow)

Title: Instrument Drift Data Analysis Methodology and Assumptions

Prepared by: David P. Horten — 4-26-96 Date

Reviewed by: Craig A. Gale — 4-26-96 Date

Approved by: Robert E. Donnellon — 4/28/96 Date
Manager - Plant Engineering

Approved by: JH Plesh — 5/8/96 Date
Director - Engineering and Services

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1. Select the Technical Specifications (TS) section to be evaluated using the list of affected instrument strings and the schedule (copy of each for phase I attached).

2. Identify all redundant channels associated with that TS section and any identical instrument strings not associated with that TS section.

3. Obtain surveillance test procedures, data packages, drawings, etc. as needed to create a block diagram, showing all components in the instrument string used to perform the TS required function, for each redundant channel. Identify the surveillance test procedure used for each component in the block diagram.

4. Verify that all individual components are identical (have the same make, model number, and range) to their counterparts in the redundant channels.

   a. If they are not all identical, then either the data from each channel has to be analyzed separately or a written justification must be prepared for combining the data from the non-identical channels.

5. Obtain historical as-found/as-left calibration data from Surveillance/Periodic Tests (STs/PTs), Maintenance Work Orders (MWOs), and I&C shop records. Enter applicable data into the spreadsheet.

   Note: The data is entered into an Excel spreadsheet. The spreadsheet template contains the algorithms that determine the values used for this evaluation. The general underlying algorithms and lookup tables were independently verified to be correct. This verification consisted of formula checks, checking basic statistics against an independent Lotus 123 version, and line by line verification of the lookup tables as well as checking against hand calculations.

   a. If a field change was performed (e.g., a transmitter was changed to one of a different make or model number), then only enter data obtained subsequent to the most recent field change for that group of redundant channels.

   b. If the channel performs an automatic protective action, then there will only be "trip" and/or "reset" data to record for each test. If the channel provides indication of a process variable (flow, pressure, temperature, etc.), then several (up to nine) different data points will be recorded for each test. Data taken at x% of span (increasing) and x% of span (decreasing) will be treated separately and not lumped together because they do not provide independent drift information when analyzed from one test to another.

c. String data (as opposed to component data) should be used in most cases. This is because Davis-Besse's calibration procedures are generally structured such that if the string check satisfies all acceptance criteria, then the surveillance test is considered complete, and no data is taken on individual components within the string.

d. Some channels are functionally tested at more frequent intervals than once every 18 months. These tests provide greater amounts of data on all non-sensor components than do the calibrations performed on the entire channel each refueling outage. For this reason, these strings may be analyzed using calibration data for the sensor by itself and channel functional test data for the rest of the string. This requires a sufficient amount of data to be available for the sensor alone. Sensors of the same make, model number, and range that are used in other applications with similar operating environments may be used to provide additional data. This approach should be used with caution because data may only be available for some sensors for instances when they are out of tolerance, and this would skew the results (making them worse than the actual sensor performance).

e. The percent(s) of span at which data was taken may have changed at some point(s) in time (e.g., data taken at 10, 30, 50, 70, and 90% of span previously is now taken at 5, 25, 50, 75, and 95% of span). In these cases, a data column may be "shifted" to align with another data column that is within ±10% of span in order to increase the sample size for that data point. If shifting of more than 10% of span is done, justification must be provided. When shifting data "up" use a ratio of percents of span (e.g., multiply drift values for 90% of span by (95/90) to obtain drift values for 95% of span). When shifting data "down" use a straight biasing approach (e.g., a drift value at 10% of span stays the same when shifted to 5% of span).

Note: After shifting data columns, as-found data from one test need not be compared with as-left data from another test when the two tests took data at different percents of span, however, it is acceptable to do so.

6. Calculate the drift that occurred between pairs of consecutive tests in either % span (typically) or process units (rarely). Segregate the results by data point for instrument strings providing process variable indication.

7. Calculate basic statistics for the drift values calculated in item 6 - sample mean (x), sample standard deviation (s), number of sample data points (n), 95/95% tolerance factor (k), and 95/95% tolerance interval (x±ks).

a. For instrument strings providing process variable indication there will be a set of basic statistics for each data point.

b. For some instrument strings, measurement uncertainty in only one direction is of concern (e.g., reactor coolant flow measurement uncertainty for input to RPS is only of

concern if measured flow is greater than actual flow because the RPS power/imbalance/flow trip occurs on a decreasing flow signal, therefore a higher measured flow than actual flow delays the trip). For these single side of interest strings a one-sided tolerance factor may be used to determine the 95/95% tolerance interval. Justification for use of a one-sided tolerance factor must be provided.

8. Identify any potential outliers among the data by performing the T-Test as described in ANSI/ASTM E178-1994, "Standard Practice for Dealing With Outlying Observations".

9. Send a copy of the spreadsheet, the block diagram, and a standard review form (copy attached) to the System Engineer.

   a. Resolve all comments resulting from the System Engineer's review.

   b. The standard review form must be signed by the System Engineer and kept with the file for that instrument string.

10. Utilizing the System Engineer's input, provide written justification for any outlying data point that is removed from the sample set. Unless clear evidence exists to demonstrate that the outlier is not representative of actual instrument drift (e.g., a failure or data entry error occurred), the outlier should be retained in the sample set.

11. Recalculate the basic statistics if any spreadsheet data was changed as a result of either the System Engineer's review or the analysis of outliers.

12. Verify that the assumption of drift data being normally distributed is not unreasonable by performing the W test (for sample sizes less than or equal to 50) or the D' test (for sample sizes greater than 50), as described in ANSI N15.15-1974, "Assessment of the Assumption of Normality (Employing Individual Observed Values)".

   a. When performing the W or D' test, use the 0.05 significance level. This means that if the sample data is randomly selected from a population that is normally distributed, there is less than a 5% probability that the test will reject the assumption of normality for that sample.

   b. To supplement the applicable normality test, create a histogram which plots number of drift data points versus the number of standard deviations from the mean. A group of "bins" will be defined, with each one including a range of values for number of standard deviations from the mean. Each bin will display two bars - one representing the actual number of drift data points contained in that bin and the other representing the number of data points that bin would contain if the sample distribution were perfectly normal.

Comparison of the two bars in each bin provides additional evidence as to whether or not the drift data is normally distributed. The smaller the sample size the fewer the number of bins. For example, with only ten data points, the bins are:

1. More than 2 standard deviations below the mean
2. Between 2/3 and 2 standard deviations below the mean
3. Within 2/3 standard deviations of the mean
4. Between 2/3 and 2 standard deviations above the mean
5. More than 2 standard deviations above the mean

c. If the applicable test indicates that the assumption of normality should be rejected, then the histogram should be used to verify that the drift data is bounded by a normal distribution. This requires that ~95% or more of the drift data be contained within 2 standard deviations of the mean. To facilitate making this comparison, the bin sizes and locations should be chosen carefully to ensure that a bin "boundary" exists at exactly 2 standard deviations above and below the mean. (It is expected that all samples of drift data will be normal or bounded by the assumption of normality).

d. For instrument strings which have data taken at multiple points, these normality assessment tools may be used on the sum of all data points and/or on individual data points. At a minimum, the worst case individual point should be assessed.

13. Evaluate time dependency of the drift data. No single test or technique can be used to determine whether or not an instrument string's drift will increase with time. A variety of tools must be used to build a case for or against a given instrument string's drift being time dependent. If the results are inconclusive, then default to the assumption that some time dependency exists. The various tools for performing this evaluation are described below.

a. Plot drift vs. time since last test for all data points. Plots may also be made for individual data points, if applicable.

b. Plot drift vs. time since last adjustment for all data points. Plots may also be made for individual points, if applicable. Drift vs. time since last adjustment plots must be interpreted carefully. Although they can provide drift information for intervals longer than the normal calibration interval, that data could be misleading if the instrument string was regularly adjusted. Adjustments "set the clock" back to "time=0", thereby preventing the creation of a possibly large drift value at a long time interval, i.e., only "good data" avoids adjustment long enough to achieve a long time interval. Adjustments must be relatively rare to justify this approach to support a claim of time-independence.

c. The plots generated for items 13a and 13b can be redone using absolute value of drift instead of drift.

d. The plots generated for items 13a and 13b can be used to evaluate sample mean and sample standard deviation at various calibration intervals. The data in a given plot is divided into several groups, each representing a range of calibration intervals. The mean and standard deviation are computed for each group and the results displayed in tabular form. 22.5 months is a helpful calibration interval to use as a boundary between groups since it is the maximum permitted by Tech Specs for instrument strings with a nominal calibration interval of 18 months.

e. Hypothesis testing can be used to help determine whether or not the variations in standard deviation observed among the different groups in item 13d are due to drift time-dependence. Sample standard deviations are used to evaluate the likelihood that two different samples were drawn from the same population. Results indicating that the same population produced all the samples constitute evidence that the drift is not time-dependent. To implement this, use the F statistic for testing the equality of two variances. The hypothesis to be tested is $\sigma_1^2 = \sigma_2^2$, and the alternative is $\sigma_1^2 > \sigma_2^2$, where σ_1^2 is the variance for the range of longer calibration intervals, and σ_2^2 is the variance for the range of shorter calibration intervals. The test statistic is s_1^2/s_2^2 and is an observed value of a random variable which has an F-distribution with (n_1-1, n_2-1) degrees of freedom, provided the hypothesis is true. The critical value is found from a table of values of a random variable, z, which has an F-distribution with (m,n) degrees of freedom for which the distribution function, F(z), has the value 0.95. This corresponds to a significance level of 0.05, which means that there is a 5% probability that a true hypothesis will be rejected. If the test statistic is less than or equal to the critical value, then the hypothesis is not rejected, but if the test statistic is greater than the critical value, then the hypothesis is rejected. See references 4 and 23 for further discussion of the F statistic.

f. Regression analysis can be performed on the plots generated for items 13a and 13b to see if a meaningful correlation exists. Based upon the results we've obtained on some actual drift data and those discussed in EPRI TR-103335, "Guidelines for Instrument Calibration Extension/Reduction Programs", it is expected that regression analysis will rarely, if ever, show a significant correlation between drift and calibration interval. If the R^2 correlation is close to 1, then a meaningful drift rate can be calculated. If the R^2 correlation is closer to 0, then the lack of correlation may be used as evidence that the drift is not time-dependent.

14. Determine the projected 95/95% tolerance interval for the expected 30 month drift.

a. If the drift has been determined to be time-independent, then the 95/95% tolerance interval previously calculated (see item 7 or item 11, as applicable) applies to a 30 month calibration interval.

b. If the drift could not be demonstrated to be time-independent, then extrapolate each individual drift data point that was calculated for a calibration interval of less than 30 months to 30 months. If the distribution is clearly time dependent or there is insufficient evidence to assess the time dependency, use linear extrapolation and multiply each drift since last test data point by $\left(\frac{30 \text{ months}}{\# \text{ months since last test}}\right)$.

c. If the drift could not be demonstrated to be time-independent, but the degree of time dependence is less than linear, then extrapolate as in item 14b, but multiply the drift since last test by $\left(\frac{30 \text{ months}}{\# \text{ months since last test}}\right)^{1/2}$.

Provide justification for using this method of extrapolation instead of the linear method.

d. Some data sets may contain several as-found vs. as-left drift values with short test-to-test intervals. When extrapolated, these data points may cause the results to be overly conservative and unacceptable. In such cases, these drift data points with short test-to-test intervals may be deleted from the extrapolation process. The "months since last test" value selected as the threshold for drift data deletion must be justified.

e. For each new, extrapolated data set (which includes drift data points calculated for calibration intervals greater than or equal to 30 months in addition to the extrapolated drift data points), perform the following:

1. Calculate the basic statistics
2. Identify and analyze potential outliers
3. Recalculate the basic statistics if any outliers were deleted
4. Verify that normality is not an unreasonable assumption

15. Evaluate the results (i.e., the 30 month drift 95/95% tolerance interval) against the design basis for the instrument string.

a. For instrument strings that perform an automatic protective action this requires an analysis of the calculation that establishes the setpoint. For instrument strings that provide process variable indication this requires verification that they can still be used to effect a safe plant shutdown. A calculation may not exist for these process variable indication instrument strings.

b. Since as-found vs. as-left calibration data includes several sources of uncertainty in addition to "true drift", these uncertainty terms are contained in the 95/95% tolerance intervals obtained through the analysis of as-found vs. as-left calibration data. For this project only three terms will be used when comparing design basis information with these 95/95% tolerance intervals. They are drift, reference accuracy, and M&TE uncertainty. Obtain values for these terms from the associated calculation, if one exists. If not, use either the equipment specification or vendor supplied information.

c. Combine the uncertainties obtained in item 15b for all components in the string that as-found/as-left data was collected for. These terms must be combined in the same manner as in the calculation (e.g., square-root-sum-of-the-squares, algebraic, etc.). If no calculation applies, then combine them as would be done if a calculation were being created.

d. Verify that the as-found minus as-left historical data has not exceeded the total uncertainty obtained in item 15c except on rare occasions. If applicable, also confirm that as-found data has not exceeded its Tech Spec Allowable Value on more than rare occasions. If this cannot be confirmed, then verify that corrective action has been taken to prevent future violations of the Allowable Value.

e. If the total uncertainty obtained in item 15c bounds the 30 month drift 95/95% tolerance interval, then extension of the surveillance interval for calibration from 18 to 24 months is justified. Typically, for process variable indication instrument strings and automatic protective action instrument strings for which the sensor is analyzed separately (see item 5d), the worst case data point should be chosen to represent the drift characteristic (i.e., to provide the 30 month drift 95/95% tolerance interval). In some cases, depending on the instrument string's function, a "critical" portion of the string's range may be identified that best represents the drift characteristic (e.g., those data points near a trip setpoint). Written justification must be provided when utilizing this concept of the "critical" portion of a string's range. Also, caution must be used because a setpoint could be changed such that the "critical" portion no longer envelops the setpoint. Therefore, "critical" portions must be chosen so they cover reasonably expected changes in setpoints.

f. If the 30 month drift 95/95% tolerance interval exceeds the total uncertainty obtained in item 15c, then further evaluation is required. When a calculation exists or needed to be created, send a Request For Assistance (RFA) to the supervisor of the unit responsible for the calculation. The RFA must provide the results of the instrument string's drift data analysis, including the comparison with design basis information. Ask the responsible organization to make whatever changes are necessary to the calculation so it adequately addresses the drift data analysis results. If they determine the calculation is acceptable as is, the basis for that conclusion must be documented thoroughly in the calculation. When

no calculation exists, contact Nuclear Engineering and Operations, providing the results of the drift data analysis and soliciting input regarding use of the subject instrument string(s) to effect a safe plant shutdown. Ask Nuclear Engineering to look at use of the instrument string(s) as described in the Updated Safety Analysis Report. Ask Operations to look at use of the instrument string(s) as directed by the Emergency Procedure (DB-OP-02000). The thrust of each organization's review should address the acceptability of the projected 30 month drift 95/95% tolerance interval for each decision or action that would be based on information provided by the instrument string(s). Use these responses and the expertise of the System Engineer to evaluate the acceptability of using instrument strings that provide control or indication only functions to safely shut down the plant.

g. Review existing surveillance test procedures (channel checks, channel functional tests, and channel calibrations) for the instrument string(s) to verify that their acceptance criteria appropriately reflect all applicable conditions and assumptions of any associated setpoint and safety analyses. If an instrument string is not addressed in any existing setpoint or safety analysis, then this review is not applicable.

   Note: Deficiencies found during this review should be brought to the drift study team's attention to be evaluated for possible initiation of a Potential Condition Adverse to Quality Report (PCAQR).

16. Prepare a written overall result summary that addresses the first six of the seven issues described in NRC Generic Letter 91-04, Enclosure 2.

   a. Any calculation revisions resulting from item 15f do not have to be complete before writing this result summary. Once the revisions are complete, those results will be incorporated into the appropriate License Amendment Request (LAR) submittal, and the overall result summary will be updated.

   b. All instrument string components not providing drift data (e.g., RTDs) must be qualitatively discussed as part of the justification for increasing the surveillance interval to 24 months.

   c. To provide consistency among the result summaries, the phrase "30 month projected drift" should be used to identify the drift study result for a particular instrument string, and the phrase "design basis/reference uncertainty" should be used to identify the appropriate combination of drift, reference accuracy, and M&TE uncertainty (see items 15b and 15c) to which the drift study result is compared (see items 15e and 15f).

   d. Each written overall result summary will be signed and dated by both the preparer and a reviewer.

e. The seventh issue from NRC Generic Letter 91-04, Enclosure 2 requires us to "provide a summary description of the program for monitoring and assessing the effects of increased calibration surveillance intervals on instrument drift and its effect on safety". This is being addressed under a separate document.

Instrument Drift Study References

1. Eisenhart, Hastay, and Wallis, *Techniques of Statistical Analysis*, McGraw-Hill, 1947.

2. Lieberman, Gerald J., *Tables for One-Sided Statistical Tolerance Limits*, Industrial Quality Control, April 1958

3. ANSI N15.15-1974, *Assessment of the Assumption of Normality (Employing Individual Observed Values).*

4. Kreyszig, Erwin, *Advanced Engineering Mathematics*, Fourth Edition, Wiley, 1979

5. Odeh, R.E. and Owen, D.B., *Tables for Normal Tolerance Limits, Sampling Plans, and Screening*, Marcel Dekker, Inc., 1980

6. Beggs, William J., *Statistics for Nuclear Engineers and Scientists, Part 1: Basic Statistical Inference*, DOE Research and Development Report No. WAPD-TM-1292, February 1981.

7. Regulatory Guide 1.97, *Instrumentation for Light-Water-Cooled Nuclear Power Plants to Assess Plant and Environs Condition During and Following an Accident*, Revision 3, May 1983.

8. NUREG/CR-5560, *Aging of Nuclear Plant Resistance Temperature Detectors*, June 1990.

9. NRC Generic Letter 91-04, *Changes in Technical Specification Surveillance Intervals to Accommodate a 24-Month Fuel Cycle*, dated April 2, 1991.

10. Letter from R. P. Zimmerman, NRC, to H. B. Ray, Southern California Edison Company, dated April 12, 1991.

11. Letter from D.F. Kirsch, NRC, to H.B. Ray, Southern California Edison Company, dated April 26, 1991.

12. Letter from H. B. Ray, Southern California Edison Company, to NRC, dated May 21, 1991.

13. Letter from R. P. Zimmerman, NRC, to H. B. Ray, Southern California Edison Company, dated June 14, 1991.

14. Toledo Edison Memorandum NEN-91-10459 from R. C. Zyduck to J. H. Lash, dated October 23, 1991.

15. Webb, R. C. and Beuchel, B. E., *A Graded Approach to Setpoint Calculation Programs*, Proceedings of the Thirty-fifth Power Instrumentation Symposium of the Instrument Society of America, 1992.

16. Letter from T. G. Broughton, GPU Nuclear Corporation, to NRC, dated June 24, 1992.

17. Letter from T. G. Broughton, GPU Nuclear Corporation, to NRC, dated May 28, 1993.

18. Letter from R. W. Hernan, NRC, to T. G. Broughton, GPU Nuclear Corporation, dated June 23, 1993.

19. EPRI TR-103457, *Non-Process Instrumentation Surveillance and Test Reduction*, December 1993.

20. ANSI/ASTM E 178-1994, *Standard Practice for Dealing with Outlying Observations*.

21. ISA-S67.04, Part I-1994, *Setpoints for Nuclear Safety-Related Instrumentation*.

22. ISA-RP67.04, Part II-1994, *Methodologies for the Determination of Setpoints for Nuclear Safety-Related Instrumentation*.

23. NUREG-1475, *Applying Statistics*, February 1994.

24. EPRI TR-103335, *Guidelines for Instrument Calibration Extension/Reduction Programs*, March 1994.

25. EPRI TR-103099, *Effects of Resistance Temperature Detector Aging on Cross-Calibration Techniques*, June 1994.

26. Toledo Edison Memorandum NED-95-40001 from J. H. Lash to R. C. Zyduck, dated January 18, 1995.

27. Letter from G. L. Boldt, Florida Power Corporation, to NRC, dated May 31, 1995.

Tech Spec Instrument Drift Study/24-Month Fuel Cycle

List of Affected Instrument Strings:
(Note: Only first component in string is listed.)

Phase I (Must do to implement 24-month fuel cycle.)

Instru #/Name		Tech Spec	Make/Model	Cal Test/PM
FT RC1A1	(RCS Flow)	4.3.1.1.1, Table 4.3-1, Item 4, Note 7	Rosemount 1153HD6	MI 3061
FT RC1A2	(RCS Flow)	4.3.1.1.1, Table 4.3-1, Item 4, Note 7	Rosemount 1153HD6	MI 3062
FT RC1A3	(RCS Flow)	4.3.1.1.1, Table 4.3-1, Item 4, Note 7	Rosemount 1153HD6	MI 3063
FT RC1A4	(RCS Flow)	4.3.1.1.1, Table 4.3-1, Item 4, Note 7	Rosemount 1153HD6	MI 3064
FT RC1B1	(RCS Flow)	4.3.1.1.1, Table 4.3-1, Item 4, Note 7	Rosemount 1153HD6	MI 3065
FT RC1B2	(RCS Flow)	4.3.1.1.1, Table 4.3-1, Item 4, Note 7	Rosemount 1153HD6	MI 3066
FT RC1B3	(RCS Flow)	4.3.1.1.1, Table 4.3-1, Item 4, Note 7	Rosemount 1153HD6	MI 3067
FT RC1B4	(RCS Flow)	4.3.1.1.1, Table 4.3-1, Item 4, Note 7	Rosemount 1153HD6	MI 3068
LIT 4617	(CTMT sump level)	4.3.3.6, Table 4.3-10, Item 15; 4.4.6.1.b	Transamerica Delaval TD/RE-36562	MI 3722
LIT 4618	(CTMT sump level)	4.3.3.6, Table 4.3-10, Item 15; 4.4.6.1.b	Transamerica Delaval XM-54852-48-2700	MI 3721
LT 4594	(CTMT wtr level)	4.3.3.6, Table 4.3-10, Item 16	Rosemount 1153AD7	MI 3726
LT 4595	(CTMT wtr level)	4.3.3.6, Table 4.3-10, Item 16	Rosemount 1153AD7	MI 3725
LT 5448A	(RCS hot leg level)	4.3.3.6, Table 4.3-10, Item 19	Rosemount 1153HD6	MI 3712
LT 5448B	(RCS hot leg level)	4.3.3.6, Table 4.3-10, Item 19	Rosemount 1153HD6	MI 3711
LT RC14-1	(pressurizer level)	4.3.3.5.1, Table 4.3-6, Item 4; 4.3.3.6, Table 4.3-10, Item 4	Rosemount 1153HD5	MI 3640
LT RC14-3	(pressurizer level)	4.3.3.5.1, Table 4.3-6, Item 4; 4.3.3.6, Table 4.3-10, Item 4	Rosemount 1153HD5	MI 3641
LTSP9A3	(SG level)	4.3.3.5.1, Table 4.3-6, Item 6; 4.3.3.6, Table 4.3-10, Item 5; 4.7.1.2.1.d	Rosemount 1153DD5	MI 3653, MI 3658
LTSP9A4	(SG level)	4.7.1.2.1.d	Rosemount 1153DD5	MI 3655, MI 3660 |
LTSP9A6	(SG level)	4.3.2.2.1, Table 4.3-11, Item 1b, 4.3.3.6, Table 4.3-10, Item 5	Rosemount 1152DP5	MI 3237
LTSP9A7	(SG level)	4.3.2.2.1, Table 4.3-11, Item 1b	Rosemount 1152DP5	MI 3238
LTSP9A8	(SG level)	4.3.2.2.1, Table 4.3-11, Item 1b	Rosemount 1152DP5	MI 3239
LTSP9A9	(SG level)	4.3.2.2.1, Table 4.3-11, Item 1b	Rosemount 1152DP5	MI 3240
LTSP9B3	(SG level)	4.3.3.5.1, Table 4.3-6, Item 6; 4.3.3.6, Table 4.3-10, Item 5; 4.7.1.2.1.d	Rosemount 1153DD5	MI 3654, MI 3659
LTSP9B4	(SG level)	4.7.1.2.1.d	Rosemount 1153DD5	MI 3656, MI 3661 |
LTSP9B6	(SG level)	4.3.2.2.1, Table 4.3-11, Item 1b 4.3.3.6 Table 4.3-10, Item 5	Rosemount 1152DP5	MI 3241
LTSP9B7	(SG level)	4.3.2.2.1, Table 4.3-11, Item 1b	Rosemount 1152DP5	MI 3242
LTSP9B8	(SG level)	4.3.2.2.1, Table 4.3-11, Item 1b	Rosemount 1152DP5	MI 3243
LTSP9B9	(SG level)	4.3.2.2.1, Table 4.3-11, Item 1b	Rosemount 1152DP5	MI 3244
PSH RC2B4	(RCS pressure)	4.5.2.d.1	SOR 9TA-B4-NX-C1A-JJTTX6	PM 2655, SP 3130
PSL 106A	(AFPT inlet st press)	4.7.1.2.2	SOR 6TA-B4-NX-C1A-JJTTX12	MI 3903
PSL 106B	(AFPT inlet st press)	4.7.1.2.2	SOR 6TA-B4-NX-C1A-JJTTX12	MI 3903
PSL 106C	(AFPT inlet st press)	4.7.1.2.2	SOR 6TA-B4-NX-C1A-JJTTX12	MI 3903
PSL 106D	(AFPT inlet st press)	4.7.1.2.2	SOR 6TA-B4-NX-C1A-JJTTX12	MI 3903
PSL 107A	(AFPT inlet st press)	4.7.1.2.2	SOR 6TA-B4-NX-C1A-JJTTX12	MI 3906
PSL 107B	(AFPT inlet st press)	4.7.1.2.2	SOR 6TA-B4-NX-C1A-JJTTX12	MI 3906
PSL 107C	(AFPT inlet st press)	4.7.1.2.2	SOR 6TA-B4-NX-C1A-JJTTX12	MI 3906
PSL 107D	(AFPT inlet st press)	4.7.1.2.2	SOR 6TA-B4-NX-C1A-JJTTX12	MI 3906

Instru #/Name		Tech Spec	Make/Model	Cal Test/PM
PSL 4928A	(AFP suction press)	4.7.1.2.1.e	SOR 12V2-E4-M2-C1A-LLTTX3	MI 3901
PSL 4928B	(AFP suction press)	4.7.1.2.1.e	SOR 12V7-E4-N4-B1A-TTLLX3	MI 3901
PSL 4929A	(AFP suction press)	4.7.1.2.1.e	SOR 12V2-E4-M2-C1A-LLTTX3	MI 3904
PSL 4929B	(AFP suction press)	4.7.1.2.1.e	SOR 12V2-E4-M2-C1A-LLTTX3	MI 3904
PSL 4930A	(AFP suction press)	4.7.1.2.1.e	SOR 12V2-E4-M2-C1A-LLTTX3	MI 3902
PSL 4930B	(AFP suction press)	4.7.1.2.1.e	SOR 12V2-E4-M2-C1A-LLTTX3	MI 3902
PSL 4931A	(AFP suction press)	4.7.1.2.1.e	SOR 12V2-E4-M2-C1A-LLTTX3	MI 3905
PSL 4931B	(AFP suction press)	4.7.1.2.1.e	SOR 12V2-E4-M2-C1A-LLTTX3	MI 3905
PT 4587	(CTMT pressure)	4.3.3.6, Table 4.3-10, Items 16 & 17	Rosemount 1153AD7	MI 3723
PT 4588	(CTMT pressure)	4.3.3.6, Table 4.3-10, Items 16 & 17	Rosemount 1153AD7	MI 3724
PT 6365A	(RCS pressure)	4.3.3.5.1, Table 4.3-6, Item 3; 4.3.3.6, Table 4.3-10, Item 3	Rosemount 1154GP9	MI 3733
PT 6365B	(RCS pressure)	4.3.3.5.1, Table 4.3-6, Item 3; 4.3.3.6, Table 4.3-10, Item 3	Rosemount 1154GP9	MI 3734
PT RC2A1	(RCS pressure)	4.3.1.1.1, Table 4.3-1, Items 5,6,7,14	Rosemount 1152GP9	MI 3054
PT RC2A2	(RCS pressure)	4.3.1.1.1, Table 4.3-1, Items 5,6,7,14; 4.4.3	Rosemount 1152GP9	MI 3052, MI 3742
PT RC2A3	(RCS pressure)	4.3.2.1.1, Table 4-3.2, Items 1d, 1e, 5a & 5b; 4.5.2.d.1	Foxboro NE11GH-IIM2	MI 3134
PT RC2A4	(RCS pressure)	4.3.2.1.1, Table 4-3.2, Items 1d, 1e 4.3.3.6, Table 4.3-10, Items 3, 10, and 19	Foxboro NE11GH-IIM2	MI 3132, MI 3702
PT RC2B1	(RCS pressure)	4.3.1.1.1, Table 4.3-1, Items 5,6,7,14	Rosemount 1152GP9	MI 3053
PT RC2B2	(RCS pressure)	4.3.1.1.1, Table 4.3-1, Items 5,6,7,14; 4.4.3	Rosemount 1152GP9	MI 3051, MI 3742
PT RC2B3	(RCS pressure)	4.3.2.1.1, Table 4-3.2, Items 1d, 1e, 5b	Foxboro NE11GH-IIM2	MI 3133
PT RC2B4	(RCS pressure)	4.3.2.1.1, Table 4-3.2, Items 1d, 1e, 5b 4.3.3.6, Table 4.3-10, Items 3, 10, and 19; 4.5.2.d.1	Foxboro NE11GH-IIM2	MI 3131, MI 3701
PT SP12A2	(SG outlet st press)	4.3.3.5.1, Table 4.3-6, Item 5; 4.3.3.6, Table 4.3-10, Item 1	Foxboro NE11GM-HIE2	MI 3651
PT SP12B1	(SG outlet st press)	4.3.3.5.1, Table 4.3-6, Item 5; 4.3.3.6, Table 4.3-10, Item 1	Foxboro NE11GM-HIE2	MI 3652
RE 4596A	(CTMT radiation)	4.3.3.6, Table 4.3-10, Item 6a	General Atomics RD-23 (0360-2062-01 Rev D)	MI 3407
RE 4596B	(CTMT radiation)	4.3.3.6, Table 4.3-10, Item 6a	General Atomics RD-23 (0360-2062-01 Rev D)	MI 3408
TE RC3A2	(RCS Temperature)	4.3.1.1.1, Table 4.3-1, Items 3 & 7	Rosemount 177HW	MI 3054, SC 4111
TE RC3A4	(RCS Temperature)	4.3.1.1.1, Table 4.3-1, Items 3 & 7; 4.3.3.5.1 Table 4.3-6, Item 2	Rosemount 177HW	MI 3052, SC 4111
TE RC3B2	(RCS Temperature)	4.3.1.1.1, Table 4.3-1, Items 3 & 7; 4.3.3.5.1 Table 4.3-6 Item 2	Rosemount 177HW	MI 3051, SC 4111
TE RC3B4	(RCS Temperature)	4.3.1.1.1, Table 4.3-1, Items 3 & 7	Rosemount 177HW	MI 3053, SC 4111
TTRC3A5	(RCS Temperature)	4.3.3.6, Table 4.3-10, Items 2, 10, & 19	Foxboro N-2AI-P2V	MI 3701
TTRC3A6	(RCS Temperature)	4.3.3.6, Table 4.3-10, Items 2, 10	Foxboro N-2AI-P2V	MI 3702
TTRC3B5	(RCS Temperature)	4.3.3.6, Table 4.3-10, Items 2, 10, & 19	Foxboro N-2AI-P2V	MI 3701
TTRC3B6	(RCS Temperature)	4.3.3.6, Table 4.3-10, Items 2, 10	Foxboro N-2AI-P2V	MI 3702
TT5449B	(RCS hot leg lev temp comp)	4.3.3.6, Table 4.3-10, Item 19	Alison Control A888-R103	MI 3712
TT5450B	(RCS hot leg lev temp comp)	4.3.3.6, Table 4.3-10, Item 19	Alison Control A888-R103	MI 3711
ZT 4263	(PORV position)	4.3.3.6, Table 4.3-10, Item 11	TEC 504A	MI 3743
ZT 4264	(PORV position)	4.3.3.6, Table 4.3-10, Item 11	TEC 504A	MI 3744
ZT 4265	(PRZR saf valve position)	4.3.3.6, Table 4.3-10, Item 13	TEC 504A	MI 3743
ZT 4266	(PRZR saf valve position)	4.3.3.6, Table 4.3-10, Item 13	TEC 504A	MI 3744
ZT 4267	(PRZR saf valve position)	4.3.3.6, Table 4.3-10, Item 13	TEC 504A	MI 3743
ZT 4268	(PRZR saf valve position)	4.3.3.6, Table 4.3-10, Item 13	TEC 504A	MI 3744

24-Month Fuel Cycle Instrument Drift Study Schedule (Phase I)

Tech Spec Surveillance Requirement	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	Due Date
4.3.1.1.1, Table 4.3-1, Item 3 (RPS RC High Temperature)												
4.3.1.1.1, Table 4.3-1, Item 4, Note 7 (RPS Flux-ΔFlux-Flow)												
4.3.1.1.1, Table 4.3-1, Item 5 (RPS RC Low Pressure)												
4.3.1.1.1, Table 4.3-1, Item 6 (RPS RC High Pressure)												
4.3.1.1.1, Table 4.3-1, Item 7 (RPS RC Pressure-Temperature)												
4.3.1.1.1, Table 4.3-1, Item 14 (RPS Shutdown Bypass High Pressure)												
4.3.2.1.1, Table 4.3-2, Item 1d (SFAS RCS Pressure - Low)												
4.3.2.1.1, Table 4.3-2, Item 1e (SFAS RCS Pressure - Low-Low)												
4.3.2.1.1, Table 4.3-2, Item 5a (SFAS DH Isolation Valve Interlock)												
4.3.2.1.1, Table 4.3-2, Item 5b (SFAS PZR Heater Interlock)												
4.3.2.2.1, Table 4.3-11, Item 1b (SFRCS SG Level - Low)												
4.3.3.5.1, Table 4.3-6, Item 2 (Remote S/D Monitoring RC Temp - Hot Leg)												
4.3.3.5.1, Table 4.3-6, Item 3 (Remote S/D Monitoring RCS Pressure)												
4.3.3.5.1, Table 4.3-6, Item 4 (Remote S/D Monitoring PZR Level)												
4.3.3.5.1, Table 4.3-6, Item 5 (Remote S/D Monitoring SG Outlet Stm Press)												
4.3.3.5.1, Table 4.3-6, Item 6 (Remote S/D Monitoring SG SU Range Level)												
4.3.3.6, Table 4.3-10, Item 1 (PAM SG Outlet Steam Pressure)												
4.3.3.6, Table 4.3-10, Item 2 (PAM RC Loop Outlet Temperature)												
4.3.3.6, Table 4.3-10, Item 3 (PAM RC Loop Pressure)												
4.3.3.6, Table 4.3-10, Item 4 (PAM PZR Level)												
4.3.3.6, Table 4.3-10, Item 5 (PAM SG SU Range Level)												
4.3.3.6, Table 4.3-10, Item 6a (PAM CTMT High Range Radiation)												
4.3.3.6, Table 4.3-10, Item 10 (PAM RCS SCM Monitor)												
4.3.3.6, Table 4.3-10, Item 11 (PAM PORV POS Indicator)												
4.3.3.6, Table 4.3-10, Item 13 (PAM PZR Safety Valve POS Indicator)												
4.3.3.6, Table 4.3-10, Item 15 (PAM CTMT Normal Sump Level)												
4.3.3.6, Table 4.3-10, Item 16 (PAM CTMT WR Water Level)												
4.3.3.6, Table 4.3-10, Item 17 (PAM CTMT WR Pressure)												
4.3.3.6, Table 4.3-10, Item 19 (PAM RC Hot Leg Level - WR)												
4.4.3 (PORV)												
4.4.6.1.b (CTMT Sump Level)												
4.5.2.d.1 (DH Isolation Valve and PZR Heater Interlocks)												
4.7.1.2.1.d (AFPT SG Level Control System)												
4.7.1.2.1.e (AFP Suction Pressure Interlocks)												
4.7.1.2.2 (AFPT Inlet Steam Pressure Interlocks)												

Milestones:

- I → Data collection started
- II → Data collection completed
- III → Data verified by system engineer
- IV → Basic statistics completed
- V → Outliers evaluated (if applicable)
- VI → Normality assumption verified
- VII → Time dependence evaluated
- VIII → 30-month drift projected
- IX → Results evaluated w.r.t. design basis
- X → Overall result summary written
- XI → Calculation revision requested (if applicable)

TO:

FROM: 24-Month Fuel Cycle Instrument Drift Study Team

DATE:

SUBJECT: Review and Verification of Data Collection Accuracy

Attached is a copy of the data collected pertaining to the following:

Tech Spec Surveillance Requirement(s):
Functional Unit(s):
Applicable Sensor(s):
Calibration Document(s):

The data has been entered into a spreadsheet and formatted to calculate drift in percent span (usually) or process units (rarely) using the "as-found minus as-left" approach. This data was obtained from STs/PTs, MWOs, and I&C shop records. A block diagram for each instrument string is also attached.

Please review all the attached information, in accordance with the criteria sheet, making any comments on a document review form. Once all comments have been resolved, sign and date the statement below.

I have reviewed the attached block diagram(s) and spreadsheet information in accordance with the criteria sheet and have fo ınd them to be correct.

System Engineer	Date

DPH/ljk

Attachment

Inst. ment Drift Study Data Review Criteria

1. Verify that a block diagram for all redundant instrument strings is attached. Identify any identical strings not included. If any non-identical ones are included, verify that either the data is analyzed seperately or written justification for combining data from the non-identical strings is included.

2. Verify that each block diagram is correct, showing all components in the instrument string used to perform the Tech Spec required function, and showing the correct procedure (or PM) used to calibrate each component. Components not used to comply with the Tech Spec requirment need not be included in the block diagram.

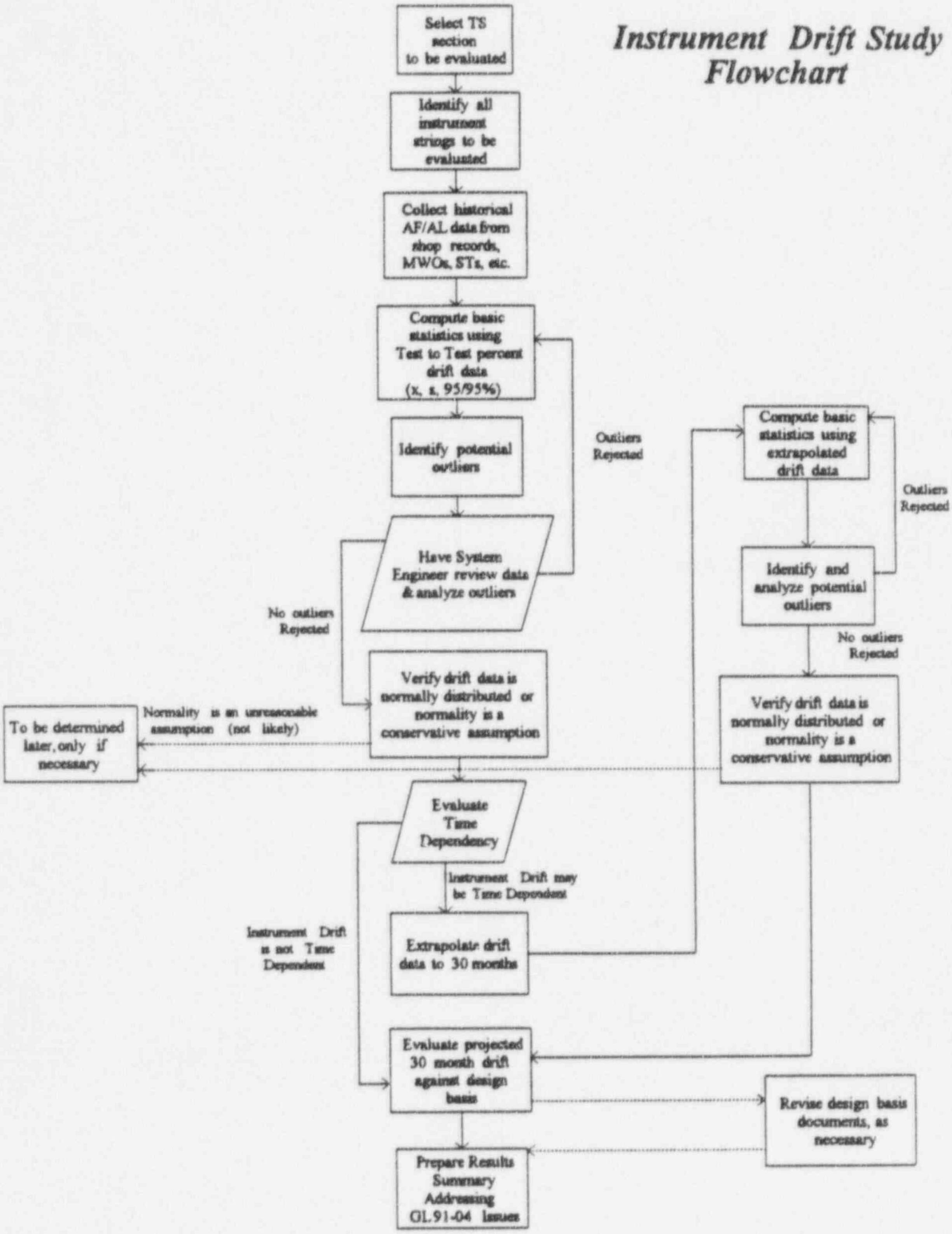
3. Verify completeness of the as-found/as-left calibration data. The drift study team reviewed STs/PTs, MWOs, and I&C shop record. At a minimum, please search the Nuclear Records Management database and the SPB to look for cases where calibration and maintenance activities were performed without the spreadsheet reflecting it. Consider the following during your review:

   a. If a field change (FCR, MOD, FPR, etc.) was performed on any component in the instrument string, then only data obtained subsequent to the most recent field change is relevant unless written justification for claiming the field change had no significant impact on drift characteristics of the affected component(s) is included.

   b. If an instrument string performs an automatic protective action, then only "trip" and/or "reset" data is recorded for each test. If an instrument string provides process variable indication, then several different data points are recorded for each test.

   c. If maintenance was performed on a component in the instrument string between complete string checks (e.g., a module in the Control Room was replaced, repaired, or adjusted with the plant on-line), then the spreadsheet will indicate "NA" for both as-found and as-left data and will indicate an adjustment was made. If a string check (including sensor) was performed as post maintenance testing, then the spreadsheet will indicate "NA" for as-found data, record as-left data, and indicate an adjustment was made. These practices prevent use of as-found data from the subsequent outage minus as-left data from the previousoutage as a meaningful measure of drift for that string (since the difference reflects the effects of the maintenance performed in addition to the drift occurring over time).

4. Verify accuracy of the as-found/as-left calibration data by spot checking a small sample if spreadsheet data points. Enough points should be checked to enable signing the cover sheet statement with confidence. It is not necessary to check each and every piece of data. Each outlier (a data point significantly different in value from the rest of the sample) identified on the spreadsheet should be checked for data entry error. If the outlier is not a data entry error, then maintenance records should be reviewed to see if the outlier can be explained.


Instrument Drift Study Flowchart
Select TS section to be evaluated
Identify all instrument strings to be evaluated
Collect historical AF/AL data from shop records, MWOs, STs, etc.
Compute basic statistics using Test to Test percent drift data (x, s, 95/95%)
Outliers Rejected
Identify potential outliers
Have System Engineer review data & analyze outliers
No outliers Rejected
Verify drift data is normally distributed or normality is a conservative assumption
Normality is an unreasonable assumption (not likely)
To be determined later, only if necessary
Evaluate Time Dependency
Instrument Drift may be Time Dependent
Instrument Drift is not Time Dependent
Extrapolate drift data to 30 months
Compute basic statistics using extrapolated drift data
Outliers Rejected
Identify and analyze potential outliers
No outliers Rejected
Verify drift data is normally distributed or normality is a conservative assumption
Evaluate projected 30 month drift against design basis
Revise design basis documents, as necessary
Prepare Results Summary Addressing GL 91-04 Issues

ATTACHMENT 2
FOR
LICENSE AMENDMENT REQUEST NUMBER 96-0014
(40 pages follow)

RPS RC FLOW

The following overall result summary of the drift study performed for the RPS differential pressure transmitters and I/E converters is applicable to Technical Specification Surveillance Requirement 4.3.1.1.1, Table 4.3-1, Item 4, Note 7 (RPS Flux - Δ Flux - Flow).

Block diagrams for these instrument strings are shown on Attachments 1 through 4. The differential pressure transmitters were analyzed separate from the rest of the string, as were the I/E converters. These components are both subject to testing activities that will be performed less frequently after switching to a 24-month fuel cycle. The other components in the string - the square root extractor, buffer amplifier, function generator, and bistable modules - are tested quarterly with the plant on-line. Since this test frequency is not affected by the increase in fuel cycle duration, these modules were not included in this drift study. They were, however, part of a previous drift study to support extending the on-line surveillance test interval from one to six-months. (See LAR 90-002, which resulted in License Amendment No. 185.)

Differential pressure transmitter data taken at approximately 25%, 50%, 75%, and 95% of span, in both the increasing and decreasing directions was utilized in this study. Data at the low end of the range was not utilized, as it is not relevant because the RPS flux- Δ flux- flow trip is not needed to show protection for loss of both reactor coolant pumps in the same loop. (The RPS high flux/number of reactor coolant pumps on trip will automatically trip the reactor if both RCPs in the same loop are lost.) Since flow is proportional to the square root of differential pressure, 25% of differential pressure span corresponds to 50% of flow span, which is adequate to cover the lower portion of the necessary range of the instrument string. Some minor data column "shifting," as described in item 5e of "Instrument Drift Data Analysis Methodology and Assumptions" (referred to as "the methodology document" henceforth), was performed because the static pressure effect on each transmitter was slightly different, resulting in calibration data being taken at percents of span that varied a little among transmitters.

All eight RPS differential pressure transmitters were replaced during 6RFO in response to the Rosemount transmitter loss of fill oil issue addressed by NRC Bulletin 90-01. The replacement transmitters all have serial numbers above 500000, signifying that they were manufactured after July 11, 1989. Since these transmitters were built using an improved manufacturing process, data from transmitters installed previously was not used in this drift study.

For all seven (after "shifting") test points, the sample mean (x) is less than 0.02% span, which can be considered to effectively be zero. The worst case 95/95% tolerance factor times sample standard deviation (k*s) is 0.95% span (random error). A one-sided tolerance factor was used because the RPS flux- Δ flux -flow trip occurs on a decreasing flow signal, so its uncertainty is of concern only if measured flow exceeds actual flow. The supporting details for these results are shown on Attachment 5. These results were obtained after the removal of one outlier from the FTRC1A3 data. The percentage drift between the as-left data on March 16, 1993, and the as-found data on October 15, 1994, was approximately -2% span for each test point and was affected by a sudden downward shift in transmitter output of about 1 mpph during the middle of 1993. Such a sudden shift in output

is not representative of transmitter drift, but is reflective of some sort of abnormal transmitter behavior, therefore, this test's drift data is considered an outlier for each test point.

The assumption that the data is normally distributed was tested by performing the D' test on the drift data for all test points and the W test on the drift data for test point #2, which was the worst case point. The assumption of normality was rejected by the D' test, with the D' value falling below the desired range of values. This indicates the distribution has a higher kurtosis than would be expected for a normal distribution (i.e., it's more sharply "peaked"). The assumption of normality was not rejected by the W test. Attachment 6 summarizes the D' and W test results. Histograms were created, plotting the number of drift data points versus drift (in number of standard deviations from the mean), for all test points and for test point #2. The histogram for all test points demonstrates that the data distribution is indeed slightly more sharply "peaked" than a normal distribution, with 94.8% of the drift data points within two standard deviations of the mean. The histogram for test point #2 shows that the data distribution is approximately normal, with 95.5% of the drift data-points within two standard deviations of the mean. The histograms and supporting detail are shown in Attachment 7. Taken together, these results support the assumption that the differential pressure transmitter drift data is normally distributed.

A drift versus time since last test plot for all points is shown in Attachment 8. Most of the drift data points are for test intervals between 15 and 20 months, so no strong evidence is provided to either support or refute the assertion that drift is independent of time. A drift versus time since last adjustment plot for all points is shown in Attachment 9. The drift data points for intervals longer than 30-months are all bounded by the worst case points for intervals between 15 and 20 months, however, there were many cases where the differential pressure transmitter was adjusted at an interval less than 20-months since its previous adjustment. Therefore, it cannot be concluded that drift is time independent for test intervals up to 30 months. On the other hand, it's also not clear that drift increases linearly with time. To gain additional insight into the time dependent characteristics of differential pressure transmitter drift, the data for all (drift versus time since last adjustment) points was divided into three groups representing various ranges of calibration intervals, and the mean and standard deviation were computed for each group. The results, shown in Attachment 10, indicate that the data for intervals greater than 30-months is more conservative, with respect to both mean and standard deviation, than the 15 to 20-month interval data. These results also indicate that the mean value decreases with time since last adjustment. For this reason, a regression line was fit to the drift versus time since last adjustment plot for all points, and it is shown in Attachment 9. Its slope is small in magnitude (-0.007% span per month), and the correlation is low ($R^2 = 0.03$). This provides further evidence that the transmitters exhibit very little time dependent drift.

Since there isn't strong evidence to support a conclusion of drift time dependency, but merely insufficient evidence to clearly demonstrate a lack thereof, the drift versus time since last test data was extrapolated to a 30-month interval using the square root method described in item 14c of the methodology document. The data for test intervals less than three months was excluded from the extrapolation because the drift experienced during those short intervals would likely not have been representative of the drift occurring over the next (at least) 9 intervals of equal length. This can be verified by referring again to Attachment 8 and observing that extrapolation of the short interval data to an 18-month interval would produce results worse than what was obtained for the actual data with

intervals between 15 and 20 months. For the extrapolated data, shown on Attachment 11, the sample mean (x) is slightly negative but close to zero (i.e., between 0 and -0.1% span). Since negative drift is conservative for these differential pressure transmitters, and because the magnitude is small, the mean will be considered zero. The worst case 95/95% tolerance factor times sample standard deviation (k*s) is 1.34% span (random error). No outliers were removed from the extrapolated data set.

The assumption that the extrapolated data is normally distributed was tested by performing the D' test on the drift data for all test points and the W test on the drift data for test point #2, which was again the worst case point. The assumption of normality was rejected by the D' test, with the D' value falling below the desired range of values once again. The assumption of normality was not rejected by the W test. Attachment 12 summarizes the D' and W test results. Histograms were created, plotting the number of drift data points versus drift (in number of standard deviations from the mean), for all test points and for test point #2. The histogram for all test points demonstrates that the data distribution is again slightly more sharply "peaked" than a normal distribution, with 93.2% of the drift data points within two standard deviations of the mean. The histogram for test point #2 shows that the data distribution is approximately normal, with 94.7% of the drift data points within two standard deviations of the mean. The histograms and supporting detail are shown in Attachment 13. Taken together, these results support the assumption that the differential pressure transmitter extrapolated drift data is normally distributed.

I/E converter data was taken at 0%, 25%, 50%, 75%, and 100% of span, in both the increasing and decreasing directions. For all nine test points, the sample mean (x) is less than 0.02% span, which can be considered to effectively be zero. Therefore, the entire error associated with the I/E converters is considered random. The worst case 95/95% tolerance interval maximum is 0.15% span. A one-sided tolerance factor was used for the same reason as in the differential pressure transmitter case. The supporting details for these results are shown on Attachment 14. No outlier candidates were identified by the T-Test.

The assumption that the data is normally distributed was tested by performing the W test on the drift data for test point #5, which was the worst case point. The assumption of normality was not rejected. Attachment 15 summarizes the W test results. A histogram was created, plotting the number of drift data points versus drift (in number of standard deviations from the mean), for test point #5. It demonstrates that the data distribution is approximately normal and shows that all the data is within two standard deviations of the mean. The histogram and supporting detail are shown in Attachment 16.

A drift versus time since last test plot for all points is shown in Attachment 17. Most of the drift data points are for test intervals between 15 and 20 months, so no strong evidence is provided to either support or refute the assertion that drift is independent of time. A drift versus time since last adjustment plot for all points is shown in Attachment 18. This plot contains plenty of data for intervals beyond 30-months, with some data at intervals as high as 70 months. The drift data points for intervals longer than 30 months are all bounded by the worst case points for intervals between 15 and 20 months. This demonstrates that I/E converter drift is not time dependent. To quantitatively support this observation, the data for all (drift versus time since last adjustment) points was divided

into three groups representing various ranges of calibration intervals, and the mean and standard deviation were computed for each group. The results, shown in Attachment 19, indicate that the data for intervals between 30 and 40 months is equal to, with respect to mean, or better than, with respect to standard deviation, the data for intervals between 15 and 20 months. Based on the evidence discussed above, it is reasonable to conclude that I/E converter drift is independent of time.

The design basis/reference uncertainty is obtained from B&W document 32-1172392-00, Reactor Protection System String Error Calculations, dated 6/13/88. It lists the differential pressure transmitter's accuracy as 0.25% span (random error) and its drift as 0.25% span (random error). It also lists the I/E converter's accuracy as 0.25% span (random error). Combining the transmitter's two random terms using the square-root-sum-of-squares technique results in an overall random error of 0.35% span. Comparing these errors with the transmitter's 30-month projected drift of 1.34% span reveals that the design basis/reference uncertainty does not bound the 30-month projected drift. Therefore, even though the converter's design basis/reference uncertainty (0.25% span) bounds its 30-month projected drift (0.15% span), B&W will be asked to revise the RPS string error calculation document to incorporate the 30-month projected drift determined for the differential pressure transmitter and for the I/E converter. They will also be asked to calculate revised RPS Technical Specification Allowable Values, if necessary. The following uncertainty terms must be accounted for by B&W:

Differential Pressure Transmitter Accuracy, Drift, and M&TE Uncertainty	±1.34% span
Differential Pressure Transmitter Calibration Tolerance (ref.: DB-MI-03061 through -03068)	±0.25% span
I/E Converter Accuracy, Drift, and M&TE Uncertainty	±0.15% span
I/E Converter Calibration Tolerance (ref.: DB-MI-03061 through -03068)	±0.25% span

Also, the other uncertainties accounted for in B&W document 32-1172392-00 that are not covered by the above list must continue to be accounted for in the revised RPS string error calculation document.

Historical differential pressure transmitter drift has exceeded its design basis/reference uncertainty in the non-conservative direction (greater than +0.35% span) during five of the 22 calibrations for which data is available. Historical drift exceeded the design basis/reference uncertainty in the conservative direction (less than -0.35% span) during five other calibrations. These results suggest that the design basis value for differential pressure transmitter drift, 0.25% span (random error), is not large enough to adequately characterize transmitter performance. PCAQR 96-0278 was initiated to address this condition. Of the ten cases where historical drift exceeded the design basis/reference uncertainty, none would have exceeded the 30-month projected drift. Furthermore, only one of the extrapolated drift data points exceeds the 30-month projected drift - and that in the conservative direction. Therefore, after the 30-month projected drift is incorporated into the RPS string error calculation document, it can reasonably be expected that differential pressure transmitter drift will rarely exceed acceptable limits. Historical I/E converter drift did not exceed its design basis/reference uncertainty (±0.25% span) in any of the 27 calibrations for which data was reviewed.

Conditions and assumptions of the setpoint and safety analysis were identified by reviewing the following documents:

Updated Safety Analysis Report
B&W document 32-1172392-00, Reactor Protection System String Error Calculations
Technical Specifications
Toledo Edison Calculation C-ICE-58.01-008, Revision 0

The following surveillance and periodic test procedures were reviewed and verified to appropriately reflect all applicable conditions and assumptions of the setpoint and safety analyses:

DB-MI-03061, Channel Calibration of FT-RC01A1, RCS Loop 2 Flow Transmitter to RPS Channel 1
DB-MI-03062, Channel Calibration of FT-RC01A2, RCS Loop 2 Flow Transmitter to RPS Channel 2
DB-MI-03063, Channel Calibration of FT-RC01A3, RCS Loop 2 Flow Transmitter to RPS Channel 3
DB-MI-03064, Channel Calibration of FT-RC01A4, RCS Loop 2 Flow Transmitter to RPS Channel 4
DB-MI-03065, Channel Calibration of FT-RC01B1, RCS Loop 1 Flow Transmitter to RPS Channel 1
DB-MI-03066, Channel Calibration of FT-RC01B2, RCS Loop 1 Flow Transmitter to RPS Channel 2
DB-MI-03067, Channel Calibration of FT-RC01B3, RCS Loop 1 Flow Transmitter to RPS Channel 3
DB-MI-03068, Channel Calibration of FT-RC01B4, RCS Loop 1 Flow Transmitter to RPS Channel 4
DB-MI-03057, RPS Channel 1 Calibration of Overpower, Power/Imbalance/Flow, and Power/Pumps Trip Functions
DB-MI-03058, RPS Channel 2 Calibration of Overpower, Power/Imbalance/Flow, and Power/Pumps Trip Functions
DB-MI-03059, RPS Channel 3 Calibration of Overpower, Power/Imbalance/Flow, and Power/Pumps Trip Functions
DB-MI-03060, RPS Channel 4 Calibration of Overpower, Power/Imbalance/Flow, and Power/Pumps Trip Functions
DB-SC-04117, RPS Channel 1 Flow Scaling Factor Determination
DB-SC-04118, RPS Channel 2 Flow Scaling Factor Determination
DB-SC-04119, RPS Channel 3 Flow Scaling Factor Determination
DB-SC-04120, RPS Channel 4 Flow Scaling Factor Determination
DB-OP-03006, Miscellaneous Instrument Shift Check

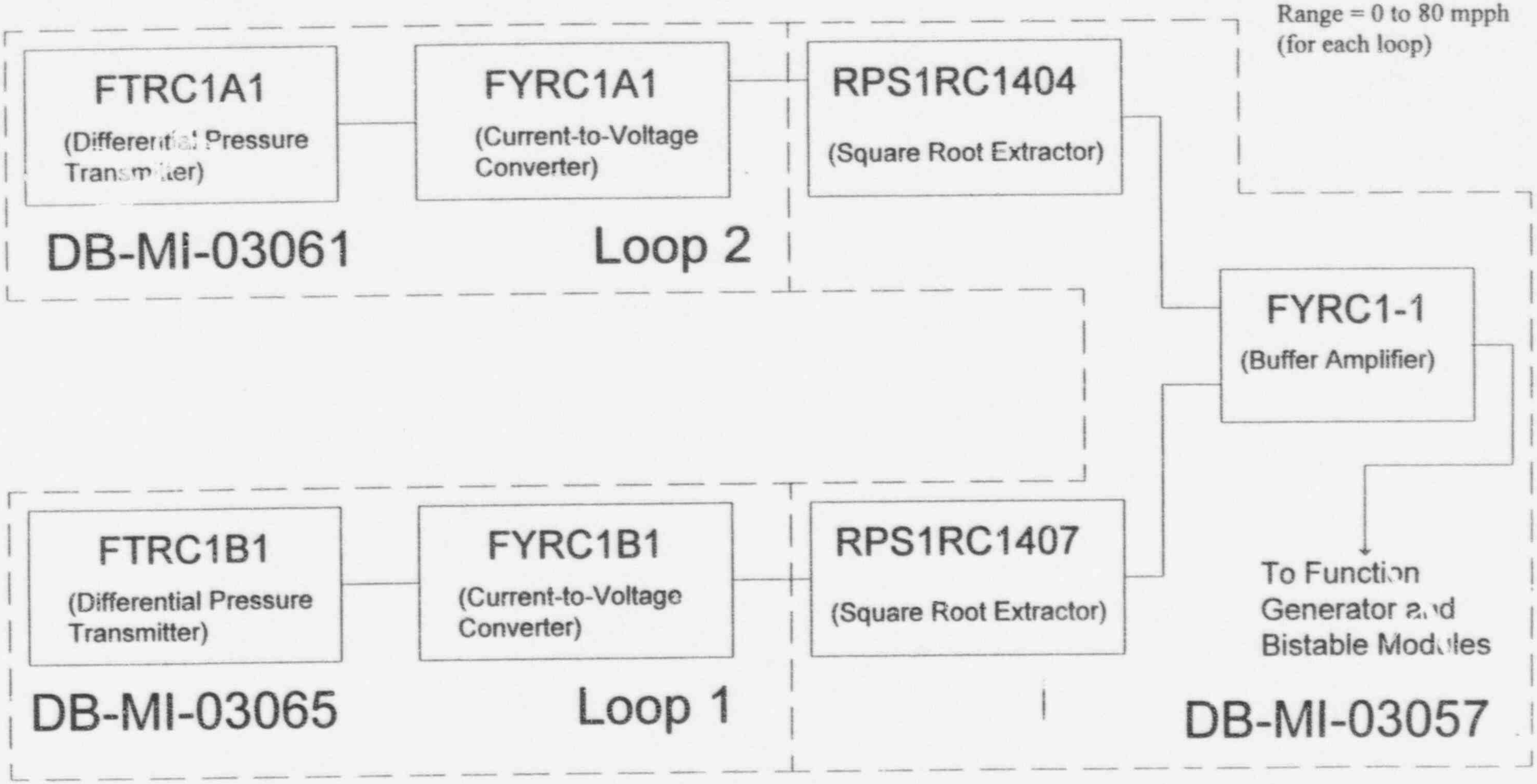
Some or all of these procedures may require alteration after the RPS string error calculation document is revised and any needed changes to RPS Technical Specification Allowable Values are determined.

Preparer: David Hooten, 3-15-96
Signature/Date

Reviewer: J. Eric Bennett 3-15-96
Signature/Date

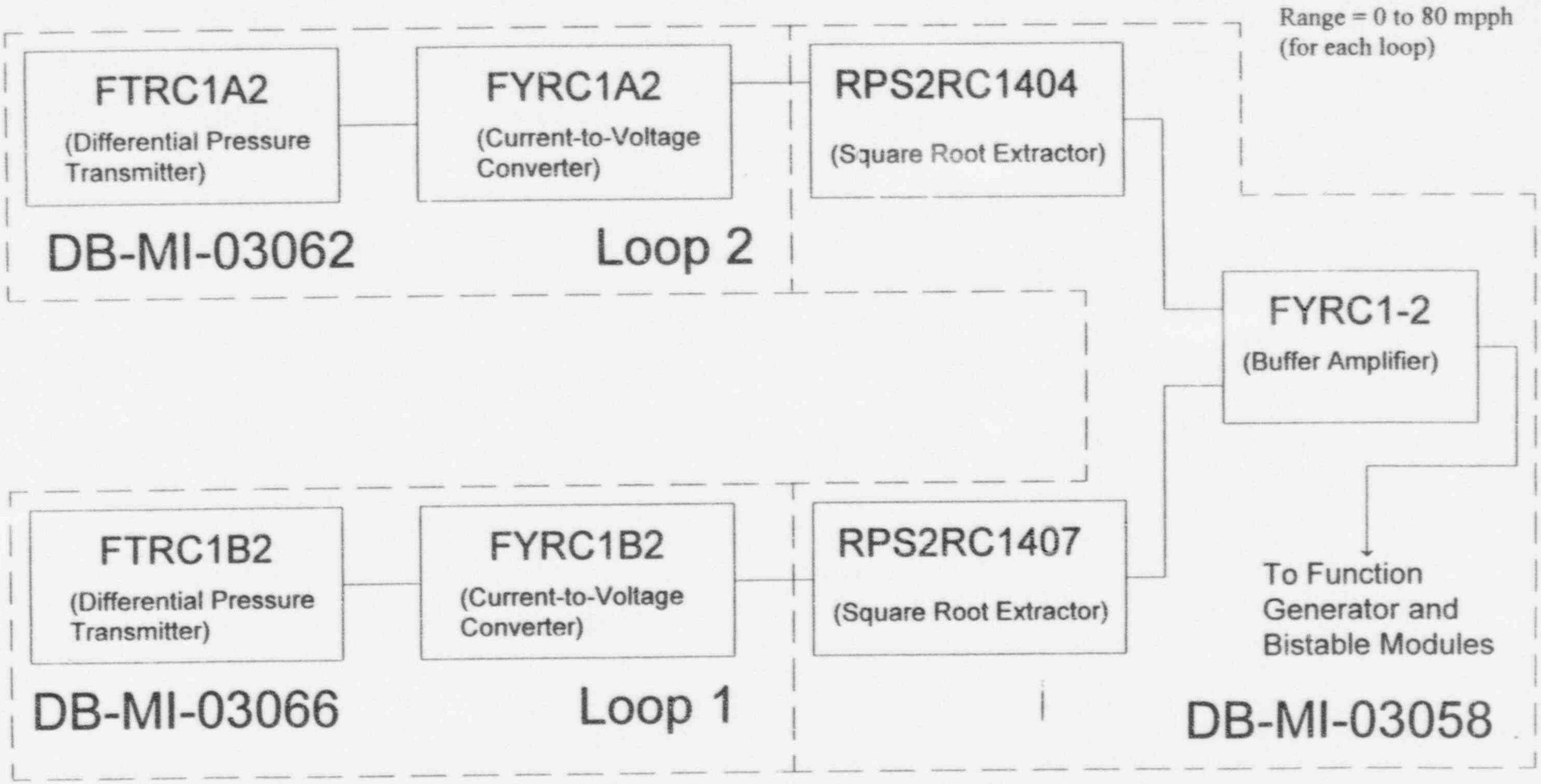
Attachment 1

Reactor Coolant Hot Leg Flow
Reactor Protection System Channel 1



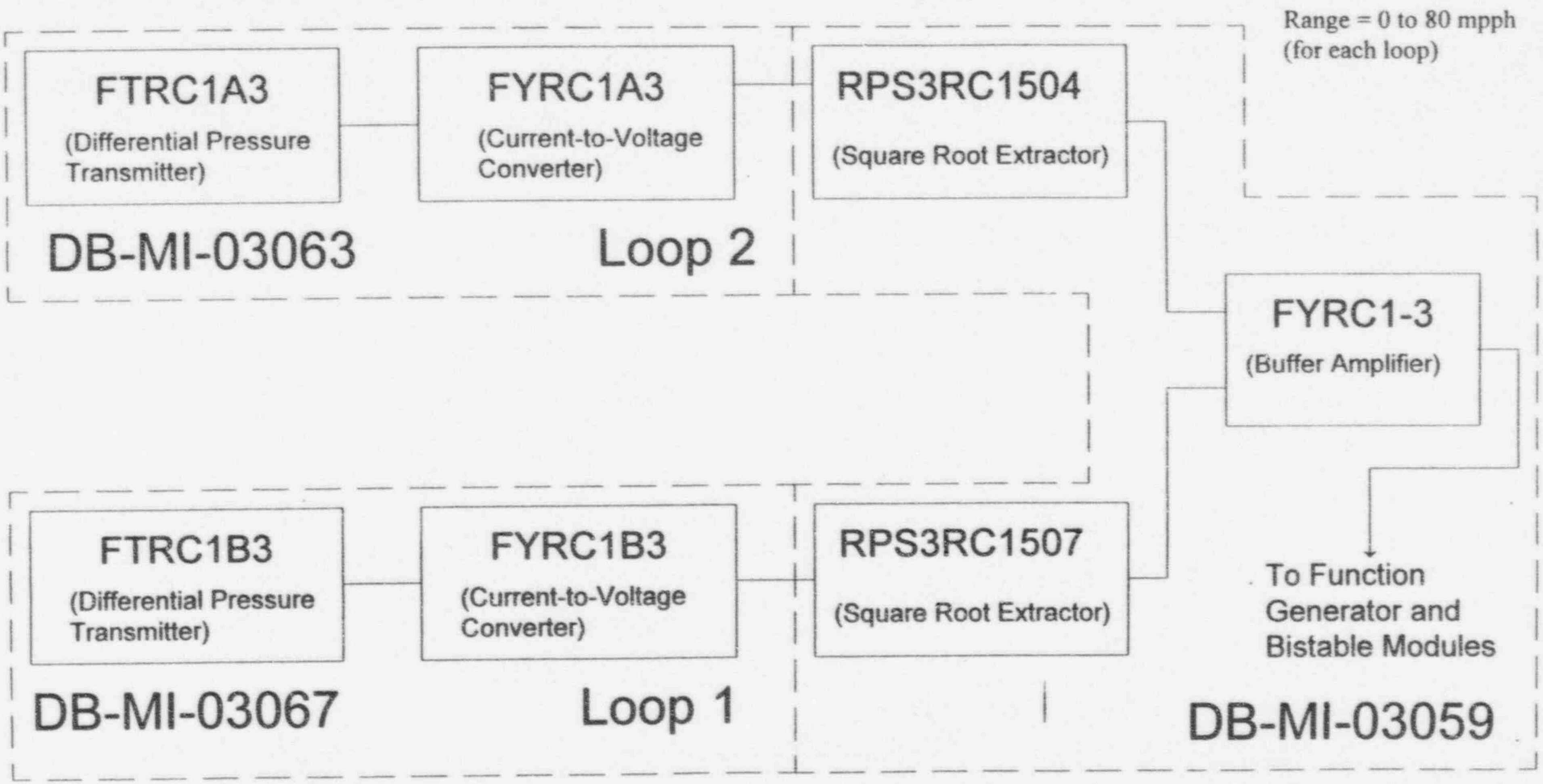
Attachment 2

Reactor Coolant Hot Leg Flow
Reactor Protection System Channel 2



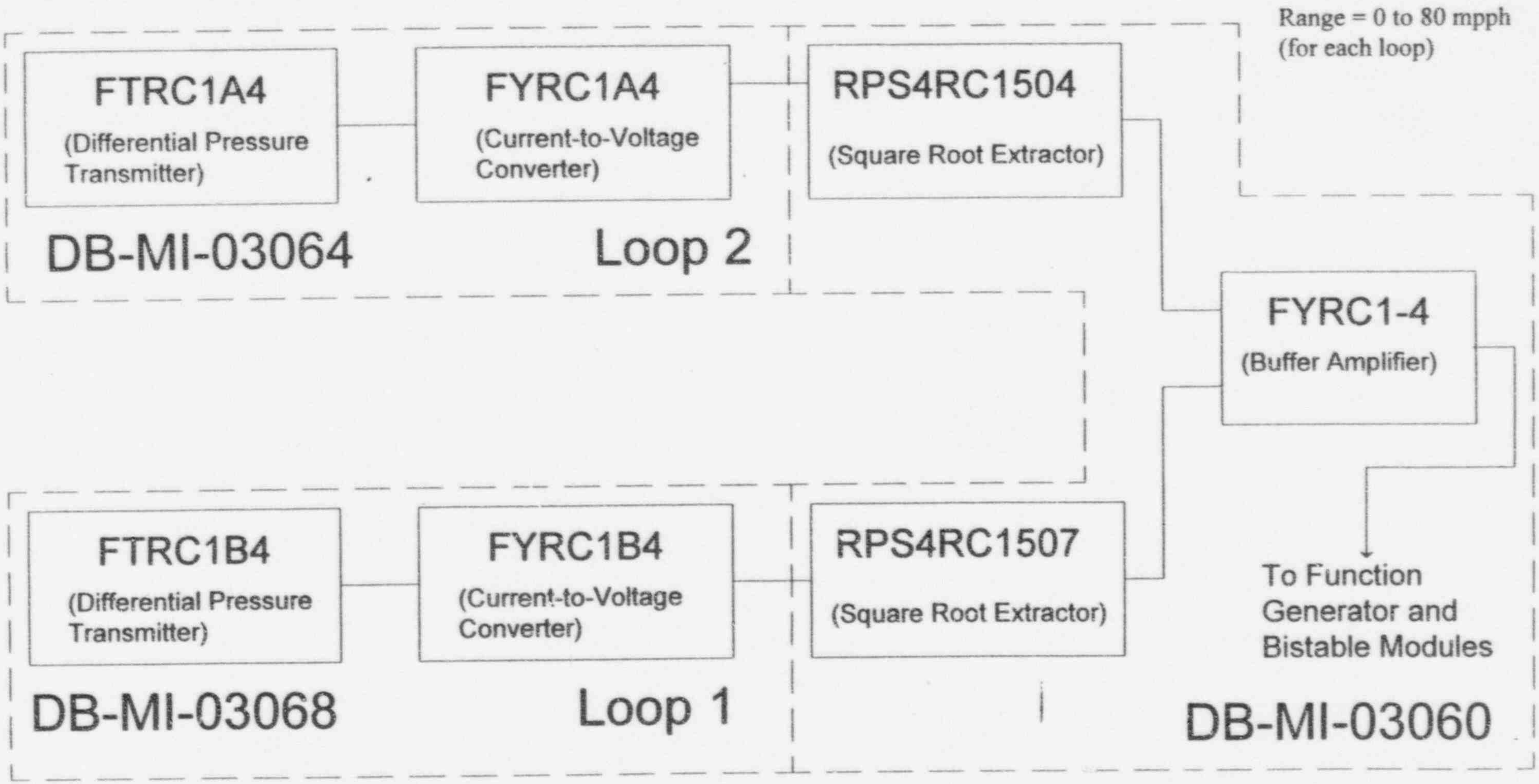
Attachment 3

Reactor Coolant Hot Leg Flow
Reactor Protection System Channel 3



Attachment 4

Reactor Coolant Hot Leg Flow Reactor Protection System Channel 4



Attachment 5

	A	B	C	P	Q	R	S	T	U	V	W	X	Y	Z	AA
1															
2															
3	Instrument Span:		1.6	Point #2			Point #3			Point #4			Point #5		
4				*Shifted Data*			*Shifted Data*			*Shifted Data*			*Shifted Data*		
5				0.8 volts			1.2 volts			1.6 volts			2.0 volts		
6	AF Date	AL Date	Instrument	As Found	As Left	Adjusted ?	As Found	As Left	Adjusted ?	As Found	As Left	Adjusted ?	As Found	As Left	Adjusted ?
7			FT-RC01A1												
8	na	3/24/90		na	0.7980	y	na	1.1990	y	na	1.6000	y	na	1.9210	y
9	4/25/90	4/25/90		0.8030	0.7990	y	1.2040	1.2010	y	1.6060	1.6020	y	1.9270	1.9230	y
10	9/11/91	9/11/91		0.8110	0.7990	y	1.2110	1.1990	y	1.6110	1.6000	y	1.9300	1.9200	y
11	3/16/93	3/16/93		0.8004	0.8004	n	1.2016	1.2016	n	1.6023	1.6023	n	1.9230	1.9230	n
12	10/13/94	10/13/94		0.8010	0.8000	y	1.2020	1.2000	y	1.6020	1.6000	y	1.9230	1.9200	y
13			FT-RC01B1												
14	na	3/23/90		na	0.7990	y	na	1.1990	y	na	1.5990	y	na	1.9190	y
15	5/24/90	5/24/90		0.8033	0.8007	y	1.2048	1.2024	y	1.6059	1.6024	y	1.9259	1.9226	y
16	9/12/91	9/12/91		0.7960	0.8020	y	1.1970	1.2030	y	1.5960	1.6030	y	1.9160	1.9230	y
17	3/18/93	3/18/93		0.8070	0.8000	y	1.2060	1.2000	y	1.6060	1.6010	y	1.9260	1.9200	y
18			FT-RC01A2												
19	na	3/15/90		na	0.7990	y	na	1.1990	y	na	1.5990	y	na	1.9190	y
20	9/17/91	9/17/91		0.8030	0.8000	y	1.2020	1.1990	y	1.6020	1.5990	y	1.9220	1.9190	y
21	3/15/93	3/15/93		0.8004	0.8004	n	1.2009	1.2009	n	1.6006	1.6006	n	1.9211	1.9211	n
22	10/13/94	10/13/94		0.7950	0.8000	y	1.1950	1.2000	y	1.5960	1.6010	y	1.9160	1.9210	y
23			FT-RC01B2												
24	na	5/23/90		na	0.7980	y	na	1.1980	y	na	1.5980	y	na	1.9190	y
25	3/27/90	5/27/90		0.7940	0.7990	y	1.1940	1.1990	y	1.5950	1.6000	y	1.9150	1.9210	y
26	9/13/91	9/13/91		0.7990	0.7990	n	1.2000	1.2000	n	1.6000	1.6000	n	1.9200	1.9200	n
27	3/18/93	3/18/93		0.7920	0.8000	y	1.1940	1.2010	y	1.5980	1.6000	y	1.9180	1.9210	y
28	10/11/94	10/11/94		0.8030	0.8010	y	1.2030	1.2010	y	1.6040	1.6020	y	1.9250	1.9230	y
29			FT-RC01A3												
30	na	3/29/90		na	*0.7990*	*y*	na	*1.1990*	*y*	na	*1.5980*	*y*	na	*1.9200*	*y*
31	9/18/91	9/18/91		*0.8020*	*0.8000*	*y*	*1.2020*	*1.1990*	*y*	*1.6030*	*1.5990*	*y*	*1.9240*	*1.9190*	*y*
32	3/16/93	3/16/93		*0.7977*	*0.7977*	*n*	*1.1961*	*1.1961*	*n*	*1.5965*	*1.5965*	*n*	*1.9169*	*1.9169*	*n*
33	10/15/94	10/15/94		*0.7660*	*0.7980*	*y*	*1.1650*	*1.1980*	*y*	*1.5640*	*1.5990*	*y*	*1.8840*	*1.9200*	*y*
34			FT-RC01B3												
35	na	3/30/90		na	*0.8000*	*y*	na	*1.1990*	*y*	na	*1.6000*	*y*	na	*1.9200*	*y*
36	9/16/91	9/16/91		*0.7840*	*0.8010*	*y*	*1.1840*	*1.2000*	*y*	*1.5840*	*1.6010*	*y*	*1.9030*	*1.9200*	*y*
37	3/17/93	3/17/93		*0.7978*	*0.7978*	*n*	*1.1974*	*1.1974*	*n*	*1.5988*	*1.5988*	*n*	*1.9171*	*1.9171*	*n*
38			FT-RC01A4												
39	na	3/31/90		na	*0.7990*	*y*	na	*1.1990*	*y*	na	*1.5990*	*y*	na	*1.9200*	*y*
40	9/17/91	9/17/91		*0.8090*	*0.8010*	*y*	*1.2070*	*1.2000*	*y*	*1.6060*	*1.6000*	*y*	*1.9260*	*1.9200*	*y*
41	3/15/93	3/15/93		*0.8001*	*0.8001*	*n*	*1.2008*	*1.2008*	*n*	*1.6018*	*1.6018*	*n*	*1.9234*	*1.9234*	*n*
42			FT-RC01B4												
43	na	3/31/90		na	*0.7990*	*y*	na	*1.1990*	*y*	na	*1.5990*	*y*	na	*1.9190*	*y*
44	9/14/91	9/14/91		*0.7870*	*0.8000*	*y*	*1.1880*	*1.2010*	*y*	*1.5890*	*1.6020*	*y*	*1.9090*	*1.9220*	*y*
45	3/17/93	3/17/93		*0.8015*	*0.7992*	*y*	*1.2041*	*1.1995*	*y*	*1.6060*	*1.6006*	*y*	*1.9278*	*1.9199*	*y*

	A	B	C	AB	AC	AD	AE	AF	AG	AH	AI	AJ
1												
2												
3	Instrument Span:		1.6	Point #6			Point #7			Point #8		
4				*Shifted Data*			*Shifted Data*			*Shifted Data*		
5				1.6 volts			1.2 volts			0.8 volts		
6	AF Date	AL Date	Instrument	As Found	As Left	Adjusted ?	As Found	As Left	Adjusted ?	As Found	As Left	Adjusted ?
7			FT-RC01A1									
8	na	3/24/90		na	1.6000	y	na	1.1990	y	na	0.7990	y
9	4/25/90	4/25/90		1.6060	1.6020	y	1.2050	1.2010	y	0.8030	0.7990	y
10	9/11/91	9/11/91		1.6120	1.6000	y	1.2120	1.1990	y	0.8120	0.7990	y
11	3/16/93	3/16/93		1.6031	1.6031	n	1.2016	1.2016	n	0.8004	0.8004	n
12	10/13/94	10/13/94		1.6020	1.6000	y	1.2020	1.2000	y	0.8010	0.8000	y
13			FT-RC01B1									
14	na	3/23/90		na	1.5990	y	na	1.1990	y	na	0.7990	y
15	5/24/90	5/24/90		1.6058	1.6027	y	1.2048	1.2020	y	0.8037	0.8009	y
16	9/12/91	9/12/91		1.5960	1.6030	y	1.1960	1.2030	y	0.7960	0.8020	y
17	3/18/93	3/18/93		1.6070	1.6010	y	1.2070	1.2000	y	0.8070	0.8000	y
18			FT-RC01A2									
19	na	3/15/90		na	1.6000	y	na	1.1990	y	na	0.7990	y
20	9/17/91	9/17/91		1.6020	1.5990	y	1.2020	1.1990	y	0.8030	0.8000	y
21	3/15/93	3/15/93		1.6010	1.6010	n	1.2002	1.2002	n	0.7999	0.7999	n
22	10/13/94	10/13/94		1.5960	1.6000	y	1.1950	1.2000	y	0.7950	0.8000	y
23			FT-RC01B2									
24	na	5/23/90		na	1.5980	y	na	1.1980	y	na	0.7980	y
25	5/27/90	5/27/90		1.5950	1.6000	y	1.1950	1.2000	y	0.7940	0.7995	y
26	9/13/91	9/13/91		1.5990	1.5990	n	1.1990	1.1990	n	0.7990	0.7990	n
27	3/18/93	3/18/93		1.5960	1.6020	y	1.1950	1.2010	y	0.7930	0.8000	y
28	10/11/94	10/11/94		1.6040	1.6020	y	1.2040	1.2020	y	0.8030	0.8010	y
29			FT-RC01A3									
30	na	3/29/90		na	*1.5990*	*y*	na	*1.1990*	*y*	na	*0.8000*	*y*
31	9/18/91	9/18/91		*1.6030*	*1.5990*	*y*	*1.2020*	*1.1990*	*y*	*0.8020*	*0.8000*	*y*
32	3/16/93	3/16/93		*1.5968*	*1.5968*	*n*	*1.1963*	*1.1963*	*n*	*0.7976*	*0.7976*	*n*
33	10/15/94	10/15/94		*1.5640*	*1.5990*	*y*	*1.1650*	*1.1990*	*y*	*0.7660*	*0.7980*	*y*
34			FT-RC01B3									
35	na	3/30/90		na	*1.6010*	*y*	na	*1.2000*	*y*	na	*0.8000*	*y*
36	9/16/91	9/16/91		*1.5840*	*1.6010*	*y*	*1.1840*	*1.2000*	*y*	*0.7840*	*0.8010*	*y*
37	3/17/93	3/17/93		*1.5987*	*1.5987*	*n*	*1.1981*	*1.1981*	*n*	*0.7979*	*0.7979*	*n*
38			FT-RC01A4									
39	na	3/31/90		na	*1.5980*	*y*	na	*1.1980*	*y*	na	*0.7990*	*y*
40	9/17/91	9/17/91		*1.6060*	*1.6000*	*y*	*1.2086*	*1.2000*	*y*	*0.8090*	*0.8010*	*y*
41	3/15/93	3/15/93		*1.6020*	*1.6020*	*n*	*1.2005*	*1.2005*	*n*	*0.8002*	*0.8002*	*n*
42			FT-RC01B4									
43	na	3/31/90		na	*1.5990*	*y*	na	*1.1990*	*y*	na	*0.7980*	*y*
44	9/14/91	9/14/91		*1.5890*	*1.6020*	*y*	*1.1880*	*1.2010*	*y*	*0.7870*	*0.8000*	*y*
45	3/17/93	3/17/93		*1.6066*	*1.6006*	*y*	*1.2049*	*1.2005*	*y*	*0.8020*	*0.7993*	*y*

	A	B	C	AO	AP	AQ	AR	AS	AT	AU
1				Months Since Last Test						
2										
3	Instrument Span:		1.6							
4										
5										
6	AF Date	AL Date	Instrument	Point #2	Point #3	Point #4	Point #5	Point #6	Point #7	Point #8
7			FT-RC01A1							
8	na	3/24/90								
9	4/25/90	4/25/90		1.051	1.051	1.051	1.051	1.051	1.051	1.051
10	9/11/91	9/11/91		16.559	16.559	16.559	16.559	16.559	16.559	16.559
11	3/16/93	3/16/93		18.136	18.136	18.136	18.136	18.136	18.136	18.136
12	10/13/94	10/13/94		18.924	18.924	18.924	18.924	18.924	18.924	18.924
13			FT-RC01B1							
14	na	3/23/90								
15	5/24/90	5/24/90		2.037	2.037	2.037	2.037	2.037	2.037	2.037
16	9/12/91	9/12/91		15.639	15.639	15.639	15.639	15.639	15.639	15.639
17	3/18/93	3/18/93		18.168	18.168	18.168	18.168	18.168	18.168	18.168
18			FT-RC01A2							
19	na	3/15/90								
20	9/17/91	9/17/91		18.103	18.103	18.103	18.103	18.103	18.103	18.103
21	3/15/93	3/15/93		17.906	17.906	17.906	17.906	17.906	17.906	17.906
22	10/13/94	10/13/94		18.957	18.957	18.957	18.957	18.957	18.957	18.957
23			FT-RC01B2							
24	na	5/23/90								
25	5/27/90	5/27/90		0.131	0.131	0.131	0.131	0.131	0.131	0.131
26	9/13/91	9/13/91		15.573	15.573	15.573	15.573	15.573	15.573	15.573
27	3/18/93	3/18/93		18.136	18.136	18.136	18.136	18.136	18.136	18.136
28	10/11/94	10/11/94		18.793	18.793	18.793	18.793	18.793	18.793	18.793
29			FT-RC01A3							
30	na	3/29/90								
31	9/18/91	9/18/91		17.676	17.676	17.676	17.676	17.676	17.676	17.676
32	3/16/93	3/16/93		17.906	17.906	17.906	17.906	17.906	17.906	17.906
33	10/15/94	10/15/94		18.990	18.990	18.990	18.990	18.990	18.990	18.990
34			FT-RC01B3							
35	na	3/30/90								
36	9/16/91	9/16/91		17.577	17.577	17.577	17.577	17.577	17.577	17.577
37	3/17/93	3/17/93		18.004	18.004	18.004	18.004	18.004	18.004	18.004
38			FT-RC01A4							
39	na	3/31/90								
40	9/17/91	9/17/91		17.577	17.577	17.577	17.577	17.577	17.577	17.577
41	3/15/93	3/15/93		17.906	17.906	17.906	17.906	17.906	17.906	17.906
42			FT-RC01B4							
43	na	3/31/90								
44	9/14/91	9/14/91		17.478	17.478	17.478	17.478	17.478	17.478	17.478
45	3/17/93	3/17/93		18.070	18.070	18.070	18.070	18.070	18.070	18.070

	BX	BY	BZ	CA	CB	CC	CD	CE	CF	CG
1				Percent Drift Since Last Test - one sided interval						
2										
3	Instrument Span:		1.6							
4										
5										
6	AF Date	AL Date	Instrument	Point #2	Point #3	Point #4	Point #5	Point #6	Point #7	Point #8
7			FT-RC01A1							
8	na	3/24/90								
9	4/25/90	4/25/90		0.3125	0.3125	0.375	0.375	0.375	0.375	0.25
10	9/11/91	9/11/91		0.75	0.625	0.5625	0.4375	0.625	0.6875	0.8125
11	3/16/93	3/16/93		0.0875	0.1625	0.14375	0.1875	0.19375	0.1625	0.0875
12	10/13/94	10/13/94		0.0375	0.025	-0.01875	0	-0.06875	0.025	0.0375
13			FT-RC01B1							
14	na	3/23/90								
15	5/24/90	5/24/90		0.26875	0.3625	0.43125	0.43125	0.425	0.3625	0.29375
16	9/12/91	9/12/91		-0.29375	-0.3375	-0.4	-0.4125	-0.41875	-0.375	-0.30625
17	3/18/93	3/18/93		0.3125	0.1875	0.1875	0.1875	0.25	0.25	0.3125
18			FT-RC01A2							
19	na	3/15/90								
20	9/17/91	9/17/91		0.25	0.1875	0.1875	0.1875	0.125	0.1875	0.25
21	3/15/93	3/15/93		0.025	0.11875	0.1	0.13125	0.125	0.075	-0.00625
22	10/13/94	10/13/94		-0.3375	-0.36875	-0.2875	-0.31875	-0.3125	-0.325	-0.30625
23			FT-RC01B2							
24	na	5/23/90								
25	5/27/90	5/27/90		-0.25	-0.25	-0.1875	-0.25	-0.1875	-0.1875	-0.25
26	9/13/91	9/13/91		0	0.0625	0	-0.0625	-0.0625	-0.0625	-0.03125
27	3/18/93	3/18/93		-0.4375	-0.375	-0.125	-0.125	-0.1875	-0.25	-0.375
28	10/11/94	10/11/94		0.1875	0.125	0.25	0.25	0.125	0.1875	0.1875
29			FT-RC01A3							
30	na	3/29/90								
31	9/18/91	9/18/91		0.1875	0.1875	0.3125	0.25	0.25	0.1875	0.125
32	3/16/93	3/16/93		-0.14375	-0.18125	-0.15625	-0.13125	-0.1375	-0.16875	-0.15
33	10/15/94	10/15/94		-1.98125	-1.94375	-2.03125	-2.05625	-2.05	-1.95625	-1.975
34			FT-RC01B3							
35	na	3/30/90								
36	9/16/91	9/16/91		-1	-0.9375	-1	-1.0625	-1.0625	-1	-1
37	3/17/93	3/17/93		-0.2	-0.1625	-0.1375	-0.18125	-0.14375	-0.11875	-0.19375
38			FT-RC01A4							
39	na	3/31/90								
40	9/17/91	9/17/91		0.625	0.5	0.4375	0.375	0.5	0.625	0.625
41	3/15/93	3/15/93		-0.05625	0.05	0.1125	0.2125	0.125	0.03125	-0.05
42			FT-RC01B4							
43	na	3/31/90								
44	9/14/91	9/14/91		-0.75	-0.6875	-0.625	-0.625	-0.625	-0.6875	-0.6875
45	3/17/93	3/17/93		0.09375	0.19375	0.25	0.3625	0.2875	0.24375	0.125
46										
47										
48										
49										
50			Mean	-0.101	-0.093	-0.070	-0.080	-0.080	-0.075	-0.097
51			Sstd	0.570	0.544	0.560	0.568	0.573	0.562	0.566
52			Count	23	23	23	23	23	23	23
53			k (one sided)	2.328	2.328	2.328	2.328	2.328	2.328	2.328
54			k*s	1.327	1.267	1.305	1.321	1.335	1.309	1.318
55			95/95 Max	1.226	1.174	1.234	1.241	1.255	1.234	1.221
56										
57										
58			Outlier Analysis							
59			T	2.62	2.62	2.62	2.62	2.62	2.62	2.62
60			x-Ts	-1.594	-1.519	-1.539	-1.567	-1.583	-1.548	-1.580
61			x+Ts	1.393	1.333	1.398	1.407	1.422	1.398	1.386
62			Outliers	1	1	1	1	1	1	1
63			Mean	-0.015	-0.009	0.019	0.010	0.009	0.010	-0.011
64			Sstd	0.405	0.374	0.371	0.378	0.389	0.394	0.400
65			Count	22	22	22	22	22	22	22
66			k (one sided)	2.349	2.349	2.349	2.349	2.349	2.349	2.349
67			k*s	0.952	0.879	0.872	0.888	0.914	0.925	0.939
68			95/95 Max	0.937	0.870	0.890	0.898	0.923	0.935	0.928
69										

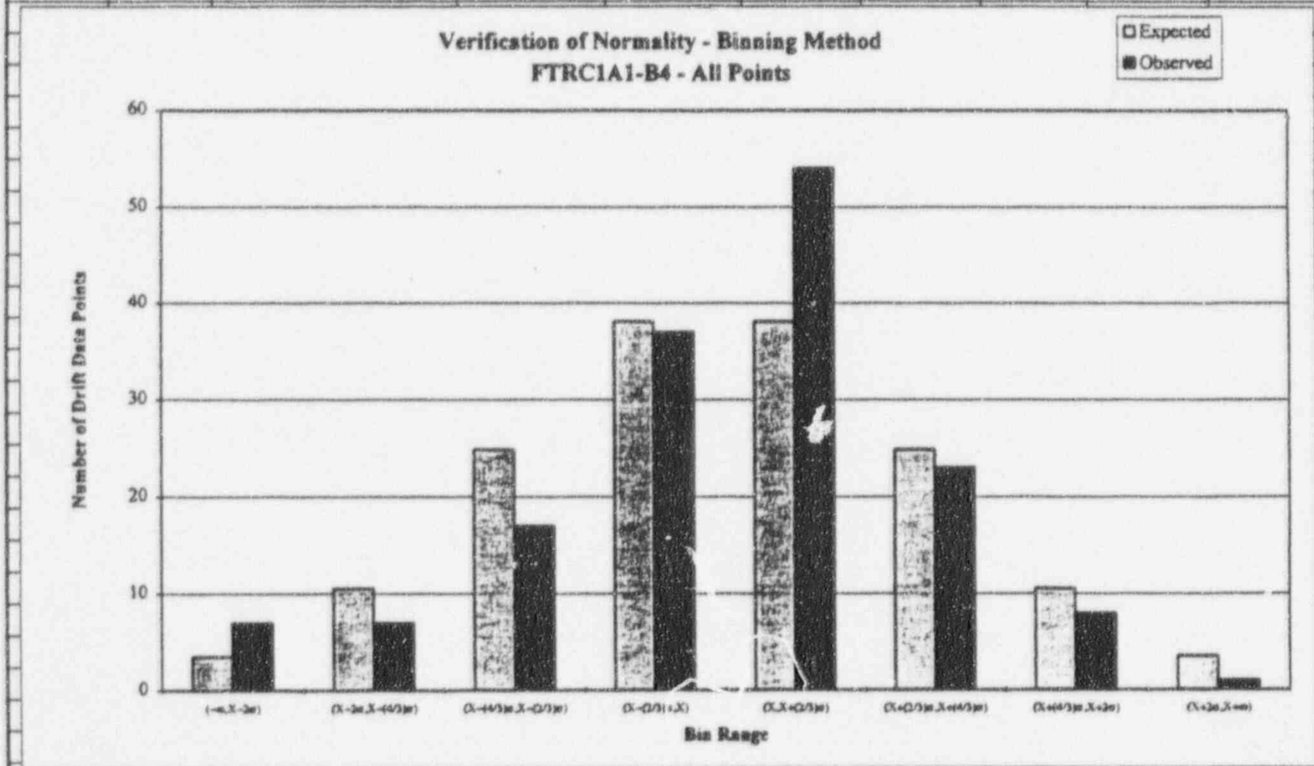
	A	B	C	BG	BH	BI	BJ	BK	BL	BM
1				Months Since Last Adjustment						
2										
3	Instrument Span:		1.6							
4										
5										
6	AF Date	AL Date	Instrument	Point #2	Point #3	Point #4	Point #5	Point #6	Point #7	Point #8
7			FT-RC01A1							
8	na	3/24/90								
9	4/25/90	4/25/90		1.051	1.051	1.051	1.051	1.051	1.051	1.051
10	9/11/91	9/11/91		16.559	16.559	16.559	16.559	16.559	16.559	16.559
11	3/16/93	3/16/93		18.136	18.136	18.136	18.136	18.136	18.136	18.136
12	10/13/94	10/13/94		37.060	37.060	37.060	37.060	37.060	37.060	37.060
13			FT-RC01B1							
14	na	3/23/90								
15	5/24/90	5/24/90		2.037	2.037	2.037	2.037	2.037	2.037	2.037
16	9/12/91	9/12/91		15.639	15.639	15.639	15.639	15.639	15.639	15.639
17	3/18/93	3/18/93		18.168	18.168	18.168	18.168	18.168	18.168	18.168
18			FT-RC01A2							
19	na	3/15/90								
20	9/17/91	9/17/91		18.103	18.103	18.103	18.103	18.103	18.103	18.103
21	3/15/93	3/15/93		17.906	17.906	17.906	17.906	17.906	17.906	17.906
22	10/13/94	10/13/94		36.862	36.862	36.862	36.862	36.862	36.862	36.862
23			FT-RC01B2							
24	na	5/23/90								
25	5/27/90	5/27/90		0.131	0.131	0.131	0.131	0.131	0.131	0.131
26	9/13/91	9/13/91		15.573	15.573	15.573	15.573	15.573	15.573	15.573
27	3/18/93	3/18/93		33.708	33.708	33.708	33.708	33.708	33.708	33.708
28	10/11/94	10/11/94		18.793	18.793	18.793	18.793	18.793	18.793	18.793
29			FT-RC01A3							
30	na	3/29/90								
31	9/18/91	9/18/91		17.676	17.676	17.676	17.676	17.676	17.676	17.676
32	3/16/93	3/16/93		17.906	17.906	17.906	17.906	17.906	17.906	17.906
33	10/15/94	10/15/94		36.895	36.895	36.895	36.895	36.895	36.895	36.895
34			FT-RC01B3							
35	na	3/30/90								
36	9/16/91	9/16/91		17.577	17.577	17.577	17.577	17.577	17.577	17.577
37	3/17/93	3/17/93		18.004	18.004	18.004	18.004	18.004	18.004	18.004
38			FT-RC01A4							
39	na	3/31/90								
40	9/17/91	9/17/91		17.577	17.577	17.577	17.577	17.577	17.577	17.577
41	3/15/93	3/15/93		17.906	17.906	17.906	17.906	17.906	17.906	17.906
42			FT-RC01B4							
43	na	3/31/90								
44	9/14/91	9/14/91		17.478	17.478	17.478	17.478	17.478	17.478	17.478
45	3/17/93	3/17/93		18.070	18.070	18.070	18.070	18.070	18.070	18.070

	A	B	C	BP	BQ	BR	BS	BT	BU	BV
1				Percent Drift Since Last Adjustment						
2										
3	Instrument Span:		1.6							
4										
5										
6	AF Date	AL Date	Instrument	Point #2	Point #3	Point #4	Point #5	Point #6	Point #7	Point #8
7			FT-RC01A1							
8	na	3/24/90								
9	4/25/90	4/25/90		0.3125	0.3125	0.3750	0.3750	0.3750	0.3750	0.2500
10	9/11/91	9/11/91		0.7500	0.6250	0.5625	0.4375	0.6250	0.6875	0.8125
11	3/16/93	3/16/93		0.0875	0.1625	0.1437	0.1875	0.1937	0.1625	0.0875
12	10/13/94	10/13/94		0.1250	0.1875	0.1250	0.1875	0.1250	0.1875	0.1250
13			FT-RC01B1							
14	na	3/23/90								
15	5/24/90	5/24/90		0.2687	0.3625	0.4313	0.4312	0.4250	0.3625	0.2937
16	9/12/91	9/12/91		-0.2937	-0.3375	-0.4000	-0.4125	-0.4187	-0.3750	-0.3062
17	3/18/93	3/18/93		0.3125	0.1875	0.1875	0.1875	0.2500	0.2500	0.3125
18			FT-RC01A2							
19	na	3/15/90								
20	9/17/91	9/17/91		0.2500	0.1875	0.1875	0.1875	0.1250	0.1875	0.2500
21	3/15/93	3/15/93		0.0250	0.1188	0.1000	0.1312	0.1250	0.0750	-0.0062
22	10/13/94	10/13/94		-0.3125	-0.2500	-0.1875	-0.1875	-0.1875	-0.2500	-0.3125
23			FT-RC01B2							
24	na	5/23/90								
25	5/27/90	5/27/90		-0.2500	-0.2500	-0.1875	-0.2500	-0.1875	-0.1875	-0.2500
26	9/13/91	9/13/91		0.0000	0.0625	0.0000	-0.0625	-0.0625	-0.0625	-0.0312
27	3/18/93	3/18/93		-0.4375	-0.3125	-0.1250	-0.1875	-0.2500	-0.3125	-0.4062
28	10/11/94	10/11/94		0.1875	0.1250	0.2500	0.2500	0.1250	0.1875	0.1875
29			FT-RC01A3							
30	na	3/29/90								
31	9/18/91	9/18/91		0.1875	0.1875	0.3125	0.2500	0.2500	0.1875	0.1250
32	3/16/93	3/16/93		-0.1437	-0.1812	-0.1562	-0.1313	-0.1375	-0.1687	-0.1500
33	10/15/94	10/15/94		-2.1250	-2.1250	-2.1875	-2.1875	-2.1875	-2.1250	-2.1250
34			FT-RC01B3							
35	na	3/30/90								
36	9/16/91	9/16/91		-1.0000	-0.9375	-1.0000	-1.0625	-1.0625	-1.0000	-1.0000
37	3/17/93	3/17/93		-0.2000	-0.1625	-0.1375	-0.1812	-0.1437	-0.1188	-0.1937
38			FT-RC01A4							
39	na	3/31/90								
40	9/17/91	9/17/91		0.6250	0.5000	0.4375	0.3750	0.5000	0.6250	0.6250
41	3/15/93	3/15/93		-0.0563	0.0500	0.1125	0.2125	0.1250	0.0312	-0.0500
42			FT-RC01B4							
43	na	3/31/90								
44	9/14/91	9/14/91		-0.7500	-0.6875	-0.6250	-0.6250	-0.6250	-0.6875	-0.6875
45	3/17/93	3/17/93		0.0938	0.1937	0.2500	0.3625	0.2875	0.2437	0.1250

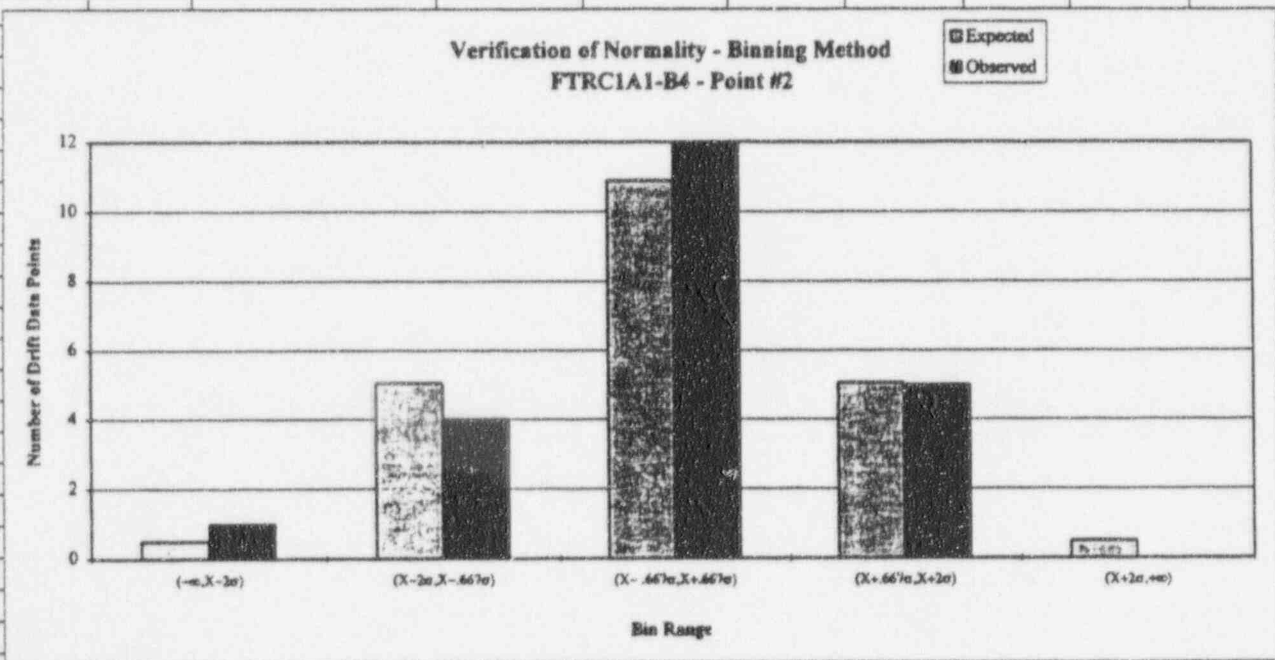
The D'=T/S value of 523.02 for a 0.05 significance level of normality should fall between approximately 529 and 546.							
The D' value for this test is less than the values it should fall in, which shows it has a high kurtosis.							
A high kurtosis says that the data came from a distribution that is more sharply "peaked" than the normal distribution.							
The assumption of normality is rejected at the 0.05 significance level.							
FTRC1A1 - B4 all points							
The D' Test							
	i	Ordered Xi	stdev's	count:	154		T - term
	1	-1.0625	-2.8004	S^2:	22.09842		81.2813
	2	-1.0625	-2.8004				80.2187
	3	-1	-2.6360	T:	2458.66250		74.5
	4	-1	-2.6360	D'=T/S:	523.02007		73.5
	5	-1	-2.6360				72.5
	6	-1	-2.6360	average:	0.0018		71.5
	7	-0.9375	-2.4715	stdev:	0.3800		66.0937
	8	-0.75	-1.9781				52.125
	9	-0.6875	-1.8137				47.0938

FTRC1A1 - B4							
W test for normality - FTRC1A1 - B4 point #2							
step #							
4.2.2	S^2=	3.447					
4.2.3							
	1		1.7500	*	0.4590	=	0.8033
	2		1.3750	*	0.3156	=	0.434
	3		0.7500	*	0.2571	=	0.1928
	4		0.6500	*	0.2131	=	0.1385
	5		0.5625	*	0.1764	=	0.0992
	6		0.5000	*	0.1443	=	0.0722
	7		0.3875	*	0.1150	=	0.0446
	8		0.3312	*	0.0878	=	0.0291
	9		0.1500	*	0.0618	=	0.0093
	10		0.0875	*	0.0368	=	0.0032
	11		0.0125	*	0.0122	=	0.0002
	12		0.0000	*		=	0
	13		0.0000	*		=	0
	14		0.0000	*		=	0
	15		0.0000	*		=	0
	16		0.0000	*		=	0
	17		0.0000	*		=	0
	18		0.0000	*		=	0
	19		0.0000	*		=	0
	20		0.0000	*		=	0
	21		0.0000	*		=	0
	22		0.0000	*		=	0
	23		0.0000	*		=	0
	24		0.0000	*		=	0
	25		0.0000	*		=	0
						b=	1.82620
4.2.4	b^2=	3.33502					
	W=b^2/S^2=		0.96740		(test statistic)		
	W critical value		0.9110				
	The assumption of normaility is NOT rejected at the .05 level.						

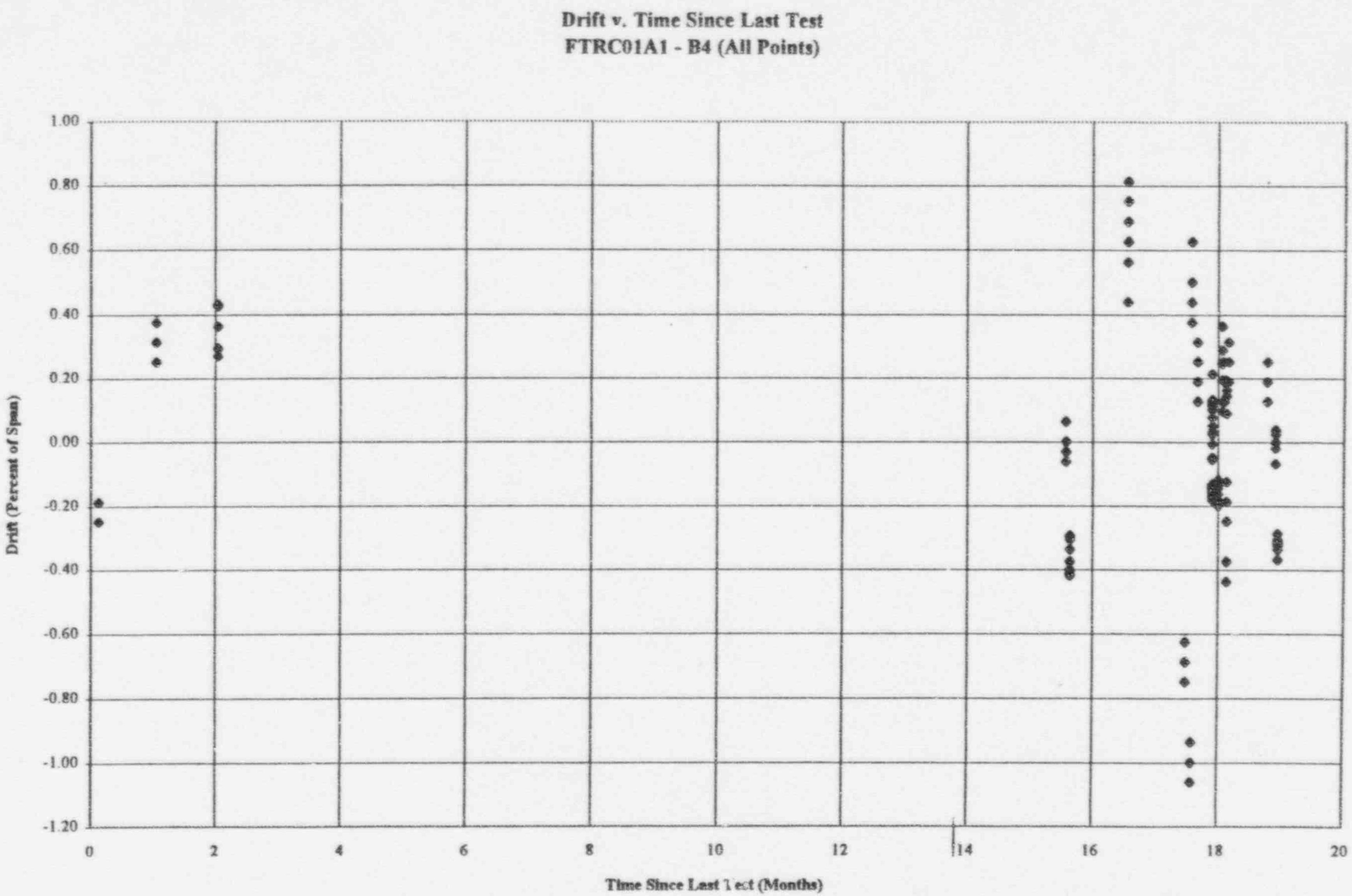
n	154			
average	0.002			
stdev	0.380			
Bin	Description	Upper Bound	Expected	Observed
1	$(-\infty, X-2\sigma)$	-0.76	3.50	7
2	$(X-2\sigma, X-(4/3)\sigma)$	-0.50	10.54	7
3	$(X-(4/3)\sigma, X-(2/3)\sigma)$	-0.25	24.84	17
4	$(X-(2/3)\sigma, X)$	0.00	38.12	37
5	$(X, X+(2/3)\sigma)$	0.26	38.12	54
6	$(X+(2/3)\sigma, X+(4/3)\sigma)$	0.51	24.84	23
7	$(X+(4/3)\sigma, X+2\sigma)$	0.76	10.54	8
8	$(X+2\sigma, X+\infty)$	9999.00	3.50	1



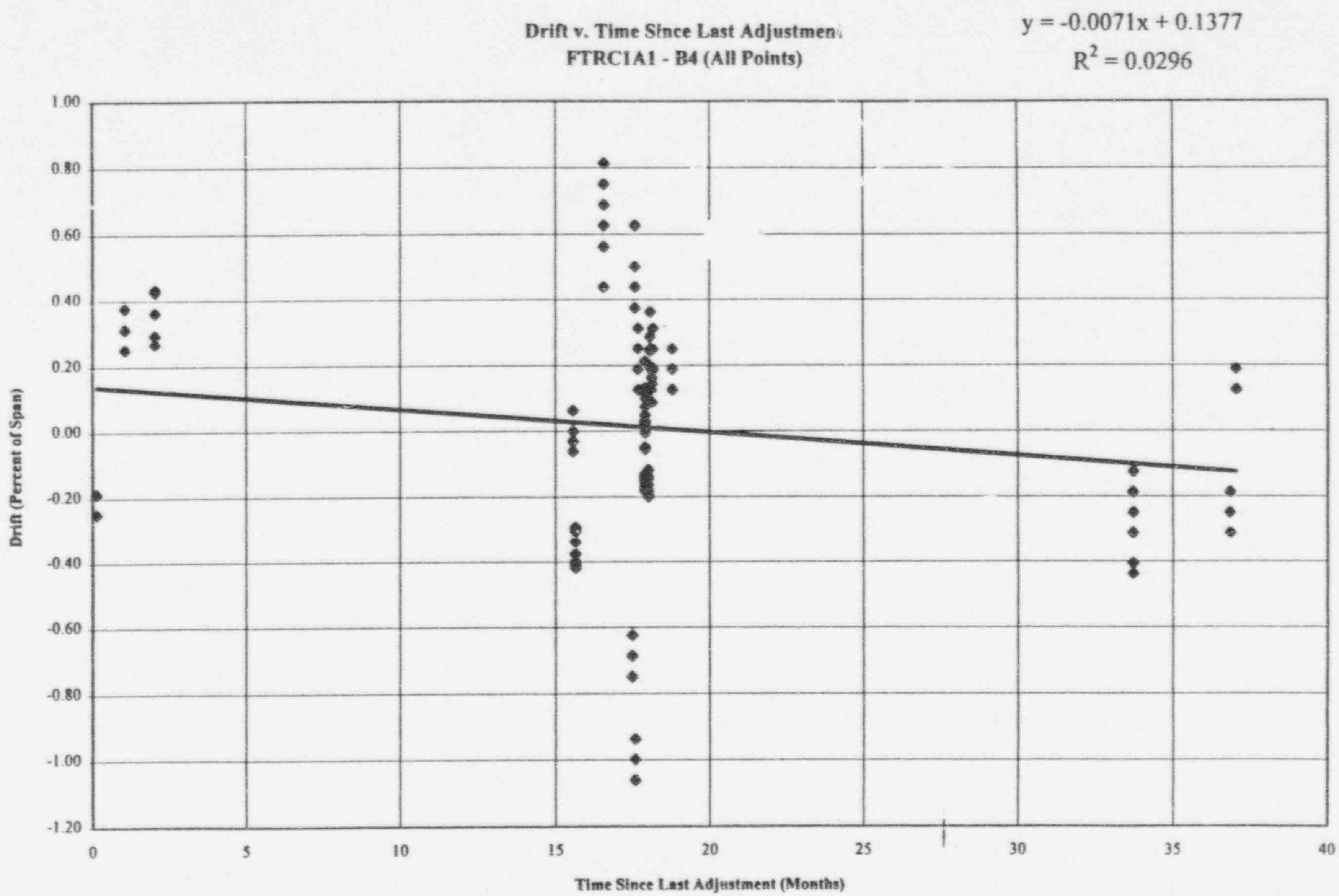
n	22			
average	-0.015			
stdev	0.405			
Bin	Description	Upper Bound	Expected	Observed
1	(−∞,X−2σ)	-0.83	0.50	1
2	(X−2σ,X−.667σ)	-0.29	5.05	4
3	(X− .667σ,X+.667σ)	0.26	10.90	12
4	(X+.667σ,X+2σ)	0.80	5.05	5
5	(X+2σ,+∞)	9999.00	0.50	0



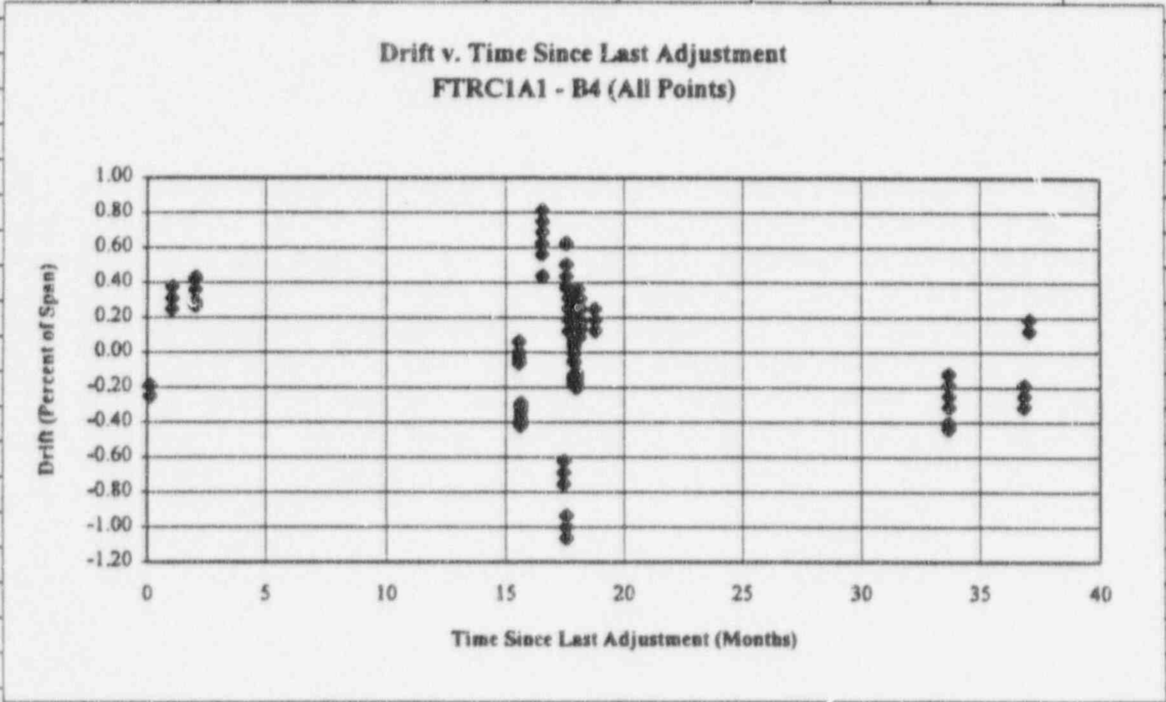
Attachment 8



Attachment 9



Binning Method - Percent Drift					
Bin	Months	Months	Count	Mean	Std
[0,10]	>0	<=3	21	0.16	0.28
	Months	Months			
[10,30]	>15	<=20	112	0.01	0.41
	Months	Months			
[30,50]	>30	<=40	21	-0.13	0.21



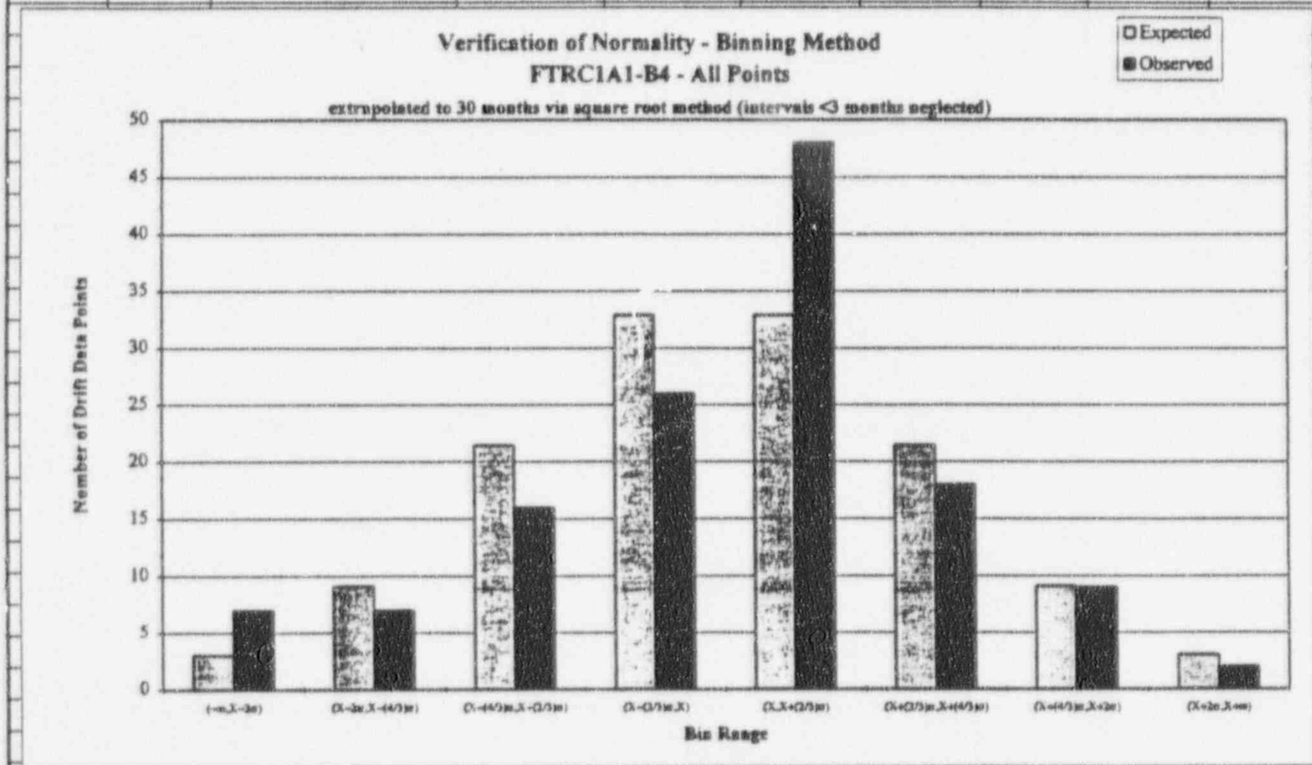
Attachment 11

	BX	BY	BZ	CH	CI	CJ	CK	CL	CM	CN
1				Percent Drift Since Last Test						
2				extrapolated to 30 months via square root method						
3	Instrument Span:		1.6	(all test-test intervals <3 months neglected)						
4										
5										
6	AF Date	AL Date	Instrument	Point #2	Point #3	Point #4	Point #5	Point #6	Point #7	Point #8
7			FT-RC01A1							
8	na	3/24/90								
9	4/25/90	4/25/90								
10	9/11/91	9/11/91		1.010	0.841	0.757	0.589	0.841	0.925	1.094
11	3/16/93	3/16/93		0.113	0.209	0.185	0.241	0.249	0.209	0.113
12	10/13/94	10/13/94		0.047	0.031	-0.024	0.000	-0.087	0.031	0.047
13			FT-RC01B1							
14	na	3/23/90								
15	5/24/90	5/24/90								
16	9/12/91	9/12/91		-0.407	-0.467	-0.554	-0.571	-0.580	-0.519	-0.424
17	3/18/93	3/18/93		0.402	0.241	0.241	0.241	0.321	0.321	0.402
18			FT-RC01A2							
19	na	3/15/90								—
20	9/17/91	9/17/91		0.322	0.241	0.241	0.241	0.161	0.241	0.322
21	3/15/93	3/15/93		0.032	0.154	0.129	0.170	0.162	0.097	-0.008
22	10/13/94	10/13/94		-0.425	-0.464	-0.362	-0.401	-0.393	-0.409	-0.385
23			FT-RC01B2							
24	na	5/23/90								
25	5/27/90	5/27/90								
26	9/13/91	9/13/91		0.000	0.087	0.000	-0.087	-0.087	-0.087	-0.043
27	3/18/93	3/18/93		-0.563	-0.482	-0.161	-0.161	-0.241	-0.322	-0.482
28	10/11/94	10/11/94		0.237	0.158	0.316	0.316	0.158	0.237	0.237
29			FT-RC01A3							
30	na	3/29/90								
31	9/18/91	9/18/91		0.244	0.244	0.407	0.326	0.326	0.244	0.163
32	3/16/93	3/16/93		-0.186	-0.235	-0.202	-0.170	-0.178	-0.218	-0.194
33	10/15/94	10/15/94								
34			FT-RC01B3							
35	na	3/30/90								
36	9/16/91	9/16/91		-1.306	-1.225	-1.306	-1.388	-1.388	-1.306	-1.306
37	3/17/93	3/17/93		-0.258	-0.210	-0.177	-0.234	-0.186	-0.153	-0.250
38			FT-RC01A4							
39	na	3/31/90								
40	9/17/91	9/17/91		0.817	0.653	0.572	0.490	0.653	0.817	0.817
41	3/15/93	3/15/93		-0.073	0.065	0.146	0.275	0.162	0.040	-0.065
42			FT-RC01B4							
43	na	3/31/90								
44	9/14/91	9/14/91		-0.983	-0.901	-0.819	-0.819	-0.819	-0.901	-0.901
45	3/17/93	3/17/93		0.121	0.250	0.322	0.467	0.370	0.314	0.161
46										
47										
48										
49										
50			Mean	-0.045	-0.043	-0.015	-0.025	-0.029	-0.023	-0.037
51			Sstd	0.553	0.501	0.493	0.499	0.519	0.531	0.548
52			Count	19	19	19	19	19	19	19
53			k (one sided)	2.423	2.423	2.423	2.423	2.423	2.423	2.423
54			k*s	1.339	1.214	1.193	1.209	1.259	1.287	1.328
55			95/95 Max	1.294	1.172	1.178	1.184	1.230	1.264	1.291
56										
57										
58			Outlier Analysis							
59			T	2.53	2.53	2.53	2.53	2.53	2.53	2.53
60			x-Ts	-1.444	-1.310	-1.261	-1.287	-1.343	-1.367	-1.424
61			x+Ts	1.353	1.225	1.231	1.237	1.285	1.321	1.350
62			Outliers	0	0	1	1	1	0	0
63			Mean	-0.045	-0.043	0.057	0.051	0.046	-0.023	-0.037
64			Sstd	0.553	0.501	0.392	0.385	0.414	0.531	0.548
65			Count	19	19	18	18	18	19	19
66			k (one sided)	2.423	2.423	2.453	2.453	2.453	2.423	2.423
67			k*s	1.340	1.214	0.961	0.944	1.015	1.287	1.329
68			95/95 Max	1.295	1.172	1.017	0.995	1.061	1.264	1.292
69										

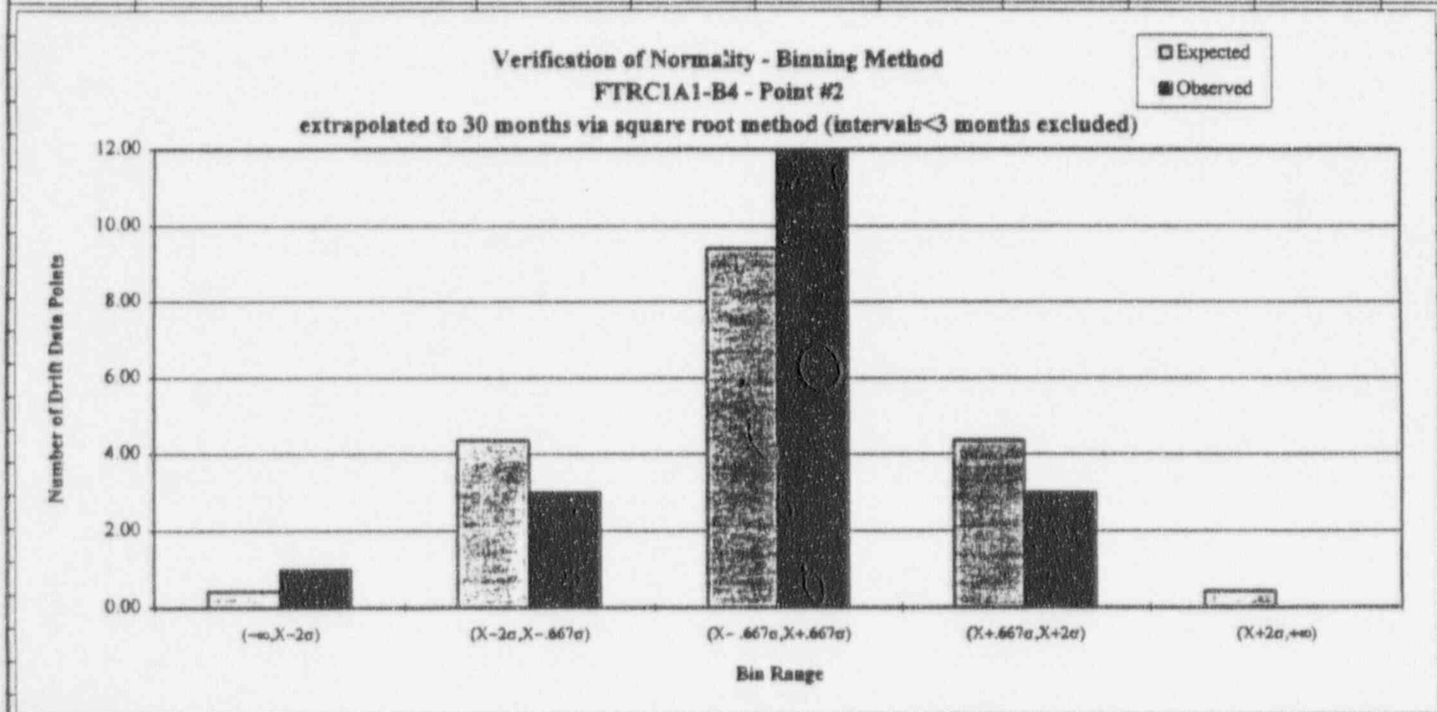
The D'=T/S value of 417.04 for a 0.05 significance level of normality should fall between approximately 423.6 and 439.1.						
The D' value for this test is less than the values it should fall in, which shows it has a high kurtosis.						
A high kurtosis says that the data came from a distribution that is more sharply "peaked" than the normal distribution.						
The assumption of normality is rejected at the 0.05 significance level.						
FTRC1A1 - B4 all points extrapolated to 30 months via square root method (all intervals < 3 months neglected)						
The D' Test						
	i	Ordered Xi	stdev's	count:	133	T - term
	1	-1.3880885	-2.6649	S^2:	34.22917	91.6138427
	2	-1.3880885	-2.6649			90.2257542
	3	-1.3064363	-2.5046	T:	2439.95627	83.6119206
	4	-1.3064363	-2.5046	D'=T/S:	417.04593	82.3054844
	5	-1.3064363	-2.5046			80.9990481
	6	-1.3064363	-2.5046	average:	-0.0310	79.6926118
	7	-1.224784	-2.3442	stdev:	0.5092	73.4870396
	8	-0.982586	-1.8686			57.9725729

FTRC1A1 - B4							
W test for normality - FTRC1A1 - B4 point #2 extrapolated to 30 months via square root method (intervals<3 months neglected)							
step #							
4.2.2	S^2=	5.500					
4.2.3							
	1		2.3159	*	0.4808	=	1.1135075
	2		1.7991	*	0.3232	=	0.5814719
	3		0.9643	*	0.2561	=	0.2469464
	4		0.7464	*	0.2059	=	0.1536845
	5		0.6511	*	0.1641	=	0.1068501
	6		0.4951	*	0.1271	=	0.0629236
	7		0.3069	*	0.0932	=	0.0285999
	8		0.1853	*	0.0612	=	0.0113434
	9		0.0472	*	0.0303	=	0.0014306
	10		0.0000	*		=	0
	11		0.0000	*		=	0
	12		0.0000	*		=	0
	13		0.0000	*		=	0
	14		0.0000	*		=	0
	15		0.0000	*		=	0
	16		0.0000	*		=	0
	17		0.0000	*		=	0
	18		0.0000	*		=	0
	19		0.0000	*		=	0
	20		0.0000	*		=	0
	21		0.0000	*		=	0
	22		0.0000	*		=	0
	23		0.0000	*		=	0
	24		0.0000	*		=	0
	25		0.0000	*		=	0
						b=	2.30676
4.2.4	b^2=	5.32113					
	W=b^2/S^2=		0.96755		(test statistic)		
	W critical value		0.9010				
	The assumption of normaility is NOT rejected at the .05 level.						

n	133				
average	-0.031				
stdev	0.509				
Bin	Description	Upper Bound	Expected	Observed	
1	(−∞,X−2σ)	-1.05	3.03	7	
2	(X−2σ,X−(4/3)σ)	-0.71	9.11	7	
3	(X−(4/3)σ,X−(2/3)σ)	-0.37	21.45	16	
4	(X−(2/3)σ,X)	-0.03	32.92	26	
5	(X,X+(2/3)σ)	0.31	32.92	48	
6	(X+(2/3)σ,X+(4/3)σ)	0.65	21.45	18	
7	(X+(4/3)σ,X+2σ)	0.99	9.11	9	
8	(X+2σ,X+∞)	9999.00	3.03	2	



n	19			
average	-0.045			
stdev	0.553			
Bin	Description	Upper Bound	Expected	Observed
1	(−∞,X−2σ)	-1.15	0.43	1
2	(X−2σ,X−.667σ)	-0.41	4.36	3
3	(X− .667σ,X+.667σ)	0.32	9.41	12
4	(X+.667σ,X+2σ)	1.06	4.36	3
5	(X+2σ,+∞)	9999.00	0.43	0



	A	B	C	M	N	O	P	Q	R	S	T	U
1												
2												
3	Instrument Span:		10									
4												
5		DATE		Point #1	0.00%		Point #2	25.00%		Point #3	50.00%	
6	As Found	As Left	Instrument	As Found	As Left	Adjusted	As Found	As Left	Adjusted	As Found	As Left	Adjusted
7			FY-RC01A1									
8	3/22/90	3/22/90		-0.001	0	y	2.496	2.492	y	5	4.988	y
9	5/25/90	5/25/90		0	0	n	2.492	2.492	n	4.988	4.988	n
10	9/11/91	9/11/91		0.003	0.003	n	2.497	2.497	n	4.997	4.997	n
11	3/16/93	3/16/93		0	0	n	2.492	2.492	n	4.994	4.994	n
12			FY-RC01B1									
13	3/22/90	3/22/90		0.003	0.003	n*	2.504	2.504	n*	5.007	5.007	n*
14	5/24/90	5/24/90		0.003	0.002	y	2.506	2.498	y	5.01	4.997	y
15	5/26/90	5/26/90		-0.001	-0.001	n	2.497	2.497	n	4.996	4.996	n
16	9/12/91	9/12/91		0.001	0.001	n	2.501	2.501	n	5.001	5.001	n
17	3/18/93	3/18/93		-0.002	-0.002	n	2.498	2.498	n	4.998	4.998	n
18			FY-RC01A2									
19	3/9/90	3/9/90		0	0	n*	2.496	2.496	n*	4.996	4.996	n*
20	6/1/90	6/1/90		0	0	n	2.496	2.496	n	4.996	4.996	n
21	9/17/91	9/17/91		-0.005	-0.005	n	2.497	2.497	n	4.997	4.997	n
22	3/15/93	3/15/93		0.0008	0.0008	n	2.4962	2.4962	n	4.9968	4.9968	n
23			FY-RC01B2									
24	10/15/88	10/15/88		0.008	0	y	2.51	2.495	y	5.015	4.993	y
25	3/10/90	3/10/90		0.001	0.001	n	2.498	2.498	n	4.998	4.998	n
26	6/1/90	6/1/90		0.001	0.001	n	2.499	2.499	n	4.998	4.998	n
27	9/13/91	9/13/91		0.002	0.002	n	2.499	2.499	n	5	5	n
28	3/18/93	3/18/93		0.002	0.002	n	2.499	2.499	n	5	5	n
29	10/11/94	10/11/94		0.002	0	y	2.5	2.496	y	5.001	4.994	y
30			FY-RC01A3									
31	3/28/90	3/28/90		0.001	0.001	n*	2.499	2.499	n*	4.997	4.997	n*
32	5/24/90	5/24/90		0	0	n	2.496	2.496	n	4.995	4.995	n
33	9/18/91	9/18/91		0	0	n	2.497	2.497	n	4.999	4.999	n
34	3/16/93	3/16/93		0	0	n	2.501	2.501	n	5	5	n
35			FY-RC01B3									
36	3/28/90	3/28/90		-0.002	-0.002	n*	2.496	2.496	n*	4.994	4.994	n*
37	5/24/90	5/24/90		0	0	n	2.496	2.496	n	4.995	4.995	n
38	9/16/91	9/16/91		-0.001	-0.001	n	2.497	2.497	n	4.998	4.998	n
39	3/17/93	3/17/93		-0.001	-0.001	n	2.496	2.496	n	4.996	4.996	n
40			FY-RC01A4									
41	3/30/90	3/30/90		-0.001	-0.001	n*	2.494	2.494	n*	4.992	4.992	n*
42	5/28/90	5/28/90		-0.002	-0.002	n	2.493	2.493	n	4.991	4.991	n
43	9/17/91	9/17/91		-0.005	0	y	2.489	2.497	y	4.988	4.997	y
44	3/15/93	3/15/93		0.003	0.003	n	2.503	2.503	n	5.004	5.004	n
45			FY-RC01B4									
46	3/30/90	3/30/90		0	0	n*	2.495	2.495	n*	4.994	4.994	n*
47	5/28/90	5/28/90		0	0	n	2.496	2.496	n	4.994	4.994	n
48	9/14/91	9/14/91		-0.001	-0.001	n	2.492	2.492	n	4.992	4.992	n
49	3/17/93	3/17/93		0	0	n	2.495	2.495	n	4.993	4.993	n
50												
51	n* indicates no adjustment was made,											
52	but the test is used as a 'last adjustment'											
53	point for calculation purposes											

	A	B	C	V	W	X	Y	Z	AA	AB	AC	AD
1												
2												
3	Instrument Span:		10									
4												
5		DATE		Point #4	75.00%		Point #5	100.00%		Point #6	75.00%	
6	As Found	As Left	Instrument	As Found	As Left	Adjusted	As Found	As Left	Adjusted	As Found	As Left	Adjusted
7			FY-RC01A1									
8	3/22/90	3/22/90		7.51	7.492	y	10.026	10	y	7.511	7.492	y
9	5/25/90	5/25/90		7.491	7.491	n	9.999	9.999	n	7.492	7.492	n
10	9/11/91	9/11/91		7.503	7.503	n	10.009	10.009	n	7.501	7.501	n
11	3/16/93	3/16/93		7.498	7.498	n	10.008	10.008	n	7.498	7.498	n
12			FY-RC01B1									
13	3/22/90	3/22/90		7.511	7.511	n*	10.013	10.013	n*	7.512	7.512	n*
14	5/24/90	5/24/90		7.514	7.5	y	10.025	10	y	7.514	7.498	y
15	5/26/90	5/26/90		7.498	7.498	n	9.996	9.996	n	7.498	7.498	n
16	9/12/91	9/12/91		7.503	7.503	n	10.007	10.007	n	7.503	7.503	n
17	3/18/93	3/18/93		7.499	7.499	n	10	10	n	7.5	7.5	n
18			FY-RC01A2									
19	3/9/90	3/9/90		7.498	7.498	n*	10.004	10.004	n*	7.499	7.499	n*
20	6/1/90	6/1/90		7.5	7.5	n	10.005	10.005	n	7.5	7.5	n
21	9/17/91	9/17/91		7.503	7.503	n	10.008	10.008	n	7.503	7.503	n
22	3/15/93	3/15/93		7.4994	7.4994	n	10.0094	10.0094	n	7.5008	7.5008	n
23			FY-RC01B2									
24	10/15/88	10/15/88		7.522	7.496	y	10.03	10	y	7.524	7.508	y
25	3/10/90	3/10/90		7.502	7.502	n	10.01	10.01	n	7.502	7.502	n
26	6/1/90	6/1/90		7.502	7.502	n	10.007	10.007	n	7.502	7.502	n
27	9/13/91	9/13/91		7.504	7.504	n	10.01	10.01	n	7.504	7.504	n
28	3/18/93	3/18/93		7.503	7.503	n	10.01	10.01	n	7.502	7.502	n
29	10/11/94	10/11/94		7.504	7.496	y	10.011	10	y	7.505	7.496	y
30			FY-RC01A3									
31	3/28/90	3/28/90		7.503	7.503	n*	10.009	10.009	n*	7.504	7.504	n*
32	5/24/90	5/24/90		7.498	7.498	n	10.002	10.002	n	7.497	7.497	n
33	9/18/91	9/18/91		7.503	7.503	n	10.009	10.009	n	7.504	7.504	n
34	3/16/93	3/16/93		7.504	7.504	n	10.012	10.012	n	7.505	7.505	n
35			FY-RC01B3									
36	3/28/90	3/28/90		7.499	7.499	n*	10.006	10.006	n*	7.499	7.499	n*
37	5/24/90	5/24/90		7.499	7.499	n	10.003	10.003	n	7.497	7.497	n
38	9/16/91	9/16/91		7.503	7.503	n	10.012	10.012	n	7.504	7.504	n
39	3/17/93	3/17/93		7.503	7.503	n	10.007	10.007	n	7.503	7.503	n
40			FY-RC01A4									
41	3/30/90	3/30/90		7.491	7.491	n*	9.992	9.992	n*	7.492	7.492	n*
42	5/28/90	5/28/90		7.491	7.491	n	9.991	9.991	n	7.491	7.491	n
43	9/17/91	9/17/91		7.485	7.498	y	9.987	9.999	y	7.487	7.498	y
44	3/15/93	3/15/93		7.507	7.507	n	10.009	10.009	n	7.507	7.507	n
45			FY-RC01B4									
46	3/30/90	3/30/90		7.495	7.495	n*	9.999	9.999	n*	7.496	7.496	n*
47	5/28/90	5/28/90		7.495	7.495	n	9.998	9.998	n	7.495	7.495	n
48	9/14/91	9/14/91		7.492	7.492	n	9.994	9.994	n	7.492	7.492	n
49	3/17/93	3/17/93		7.494	7.494	n	9.997	9.997	n	7.494	7.494	n
50												
51	n* indicates no adjustment was made,											
52	but the test is used as a 'last adjustment'											
53	point for calculation purposes											

	A	B	C	AE	AF	AG	AH	AI	AJ	AK	AL	AM
1												
2												
3	Instrument Span:		10									
4												
5		DATE		Point #7	50.00%		Point #8	25.00%		Point #9	0.00%	
6	As Found	As Left	Instrument	As Found	As Left	Adjusted	As Found	As Left	Adjusted	As Found	As Left	Adjusted
7			FY-RC01A1									
8	3/22/90	3/22/90		5.001	4.989	y	2.497	2.492	y	-0.001	0	y
9	5/25/90	5/25/90		4.989	4.989	n	2.493	2.493	n	0	0	n
10	9/11/91	9/11/91		4.997	4.997	n	2.497	2.497	n	0.003	0.003	n
11	3/16/93	3/16/93		4.994	4.994	n	2.494	2.494	n	0	0	n
12			FY-RC01B1									
13	3/22/90	3/22/90		5.008	5.008	n*	2.505	2.505	n*	0.003	0.003	n*
14	5/24/90	5/24/90		5.01	4.999	y	2.506	2.498	y	0.003	-0.001	y
15	5/26/90	5/26/90		4.997	4.997	n	2.497	2.497	n	-0.001	-0.001	n
16	9/12/91	9/12/91		5.001	5.001	n	2.501	2.501	n	0.001	0.001	n
17	3/18/93	3/18/93		5	5	n	2.498	2.498	n	-0.001	-0.001	n
18			FY-RC01A2									
19	3/9/90	3/9/90		4.995	4.995	n*	2.496	2.496	n*	0	0	n*
20	6/1/90	6/1/90		4.996	4.996	n	2.496	2.496	n	0	0	n
21	9/17/91	9/17/91		4.999	4.999	n	2.498	2.498	n	0	0	n
22	3/15/93	3/15/93		4.9981	4.9981	n	2.4983	2.4983	n	0.0005	0.0005	n
23			FY-RC01B2									
24	10/15/88	10/15/88		5.013	4.994	y	2.508	2.495	y	0.007	0.001	y
25	3/10/90	3/10/90		5.003	5.003	n	2.502	2.502	n	0.002	0.002	n
26	6/1/90	6/1/90		4.999	4.999	n	2.499	2.499	n	0.002	0.002	n
27	9/13/91	9/13/91		5.002	5.002	n	2.502	2.502	n	0.003	0.003	n
28	3/18/93	3/18/93		5	5	n	2.5	2.5	n	0.001	0.001	n
29	10/11/94	10/11/94		5.001	4.994	y	2.501	2.496	y	0.002	0	y
30			FY-RC01A3									
31	3/28/90	3/28/90		4.998	4.998	n*	2.499	2.499	n*	0	0	n*
32	5/24/90	5/24/90		4.994	4.994	n	2.496	2.496	n	0	0	n
33	9/18/91	9/18/91		4.999	4.999	n	2.498	2.498	n	-0.002	-0.002	n
34	3/16/93	3/16/93		4.999	4.999	n	2.499	2.499	n	0	0	n
35			FY-RC01B3									
36	3/28/90	3/28/90		4.994	4.994	n*	2.496	2.496	n*	-0.001	-0.001	n*
37	5/24/90	5/24/90		4.994	4.994	n	2.496	2.496	n	0	0	n
38	9/16/91	9/16/91		4.999	4.999	n	2.498	2.498	n	0	0	n
39	3/17/93	3/17/93		4.997	4.997	n	2.496	2.496	n	-0.001	-0.001	n
40			FY-RC01A4									
41	3/30/90	3/30/90		4.993	4.993	n*	2.494	2.494	n*	-0.001	-0.001	n*
42	5/28/90	5/28/90		4.992	4.992	n	2.494	2.494	n	-0.002	-0.002	n
43	9/17/91	9/17/91		4.989	4.997	y	2.491	2.498	y	-0.004	0	y
44	3/15/93	3/15/93		5.004	5.004	n	2.503	2.503	n	0.003	0.003	n
45			FY-RC01B4									
46	3/30/90	3/30/90		4.995	4.995	n*	2.496	2.496	n*	0	0	n*
47	5/28/90	5/28/90		4.994	4.994	n	2.496	2.496	n	0	0	n
48	9/14/91	9/14/91		4.992	4.992	n	2.493	2.493	n	-0.002	-0.002	n
49	3/17/93	3/17/93		4.993	4.993	n	2.495	2.495	n	0	0	n
50												
51	n* indicates no adjustment was made,											
52	but the test is used as a 'last adjustment'											
53	point for calculation purposes											

	A	B	C	AN	AO	AP	AQ	AR	AS	AT	AU	AV
1				Months Since Last Test								
2												
3	Instrument Span:		10									
4												
5		DATE										
6	As Found	As Left	Instrument	Point #1	Point #2	Point #3	Point #4	Point #5	Point #6	Point #7	Point #8	Point #9
7			FY-RC01A1									
8	3/22/90	3/22/90										
9	5/25/90	5/25/90		2.103	2.103	2.103	2.103	2.103	2.103	2.103	2.103	2.103
10	9/11/91	9/11/91		15.573	15.573	15.573	15.573	15.573	15.573	15.573	15.573	15.573
11	3/16/93	3/16/93		18.136	18.136	18.136	18.136	18.136	18.136	18.136	18.136	18.136
12			FY-RC01B1									
13	3/22/90	3/22/90										
14	5/24/90	5/24/90		2.070	2.070	2.070	2.070	2.070	2.070	2.070	2.070	2.070
15	5/26/90	5/26/90		0.066	0.066	0.066	0.066	0.066	0.066	0.066	0.066	0.066
16	9/12/91	9/12/91		15.573	15.573	15.573	15.573	15.573	15.573	15.573	15.573	15.573
17	3/18/93	3/18/93		18.168	18.168	18.168	18.168	18.168	18.168	18.168	18.168	18.168
18			FY-RC01A2									
19	3/9/90	3/9/90										
20	6/1/90	6/1/90		2.760	2.760	2.760	2.760	2.760	2.760	2.760	2.760	2.760
21	9/17/91	9/17/91		15.540	15.540	15.540	15.540	15.540	15.540	15.540	15.540	15.540
22	3/15/93	3/15/93		17.906	17.906	17.906	17.906	17.906	17.906	17.906	17.906	17.906
23			FY-RC01B2									
24	10/15/88	10/15/88										
25	3/10/90	3/10/90		16.789	16.789	16.789	16.789	16.789	16.789	16.789	16.789	16.789
26	6/1/90	6/1/90		2.727	2.727	2.727	2.727	2.727	2.727	2.727	2.727	2.727
27	9/13/91	9/13/91		15.409	15.409	15.409	15.409	15.409	15.409	15.409	15.409	15.409
28	3/18/93	3/18/93		18.136	18.136	18.136	18.136	18.136	18.136	18.136	18.136	18.136
29	10/11/94	10/11/94		18.793	18.793	18.793	18.793	18.793	18.793	18.793	18.793	18.793
30			FY-RC01A3									
31	3/28/90	3/28/90										
32	5/24/90	5/24/90		1.873	1.873	1.873	1.873	1.873	1.873	1.873	1.873	1.873
33	9/18/91	9/18/91		15.836	15.836	15.836	15.836	15.836	15.836	15.836	15.836	15.836
34	3/16/93	3/16/93		17.906	17.906	17.906	17.906	17.906	17.906	17.906	17.906	17.906
35			FY-RC01B3									
36	3/28/90	3/28/90										
37	5/24/90	5/24/90		1.873	1.873	1.873	1.873	1.873	1.873	1.873	1.873	1.873
38	9/16/91	9/16/91		15.770	15.770	15.770	15.770	15.770	15.770	15.770	15.770	15.770
39	3/17/93	3/17/93		18.004	18.004	18.004	18.004	18.004	18.004	18.004	18.004	18.004
40			FY-RC01A4									
41	3/30/90	3/30/90										
42	5/28/90	5/28/90		1.938	1.938	1.938	1.938	1.938	1.938	1.938	1.938	1.938
43	9/17/91	9/17/91		15.671	15.671	15.671	15.671	15.671	15.671	15.671	15.671	15.671
44	3/15/93	3/15/93		17.906	17.906	17.906	17.906	17.906	17.906	17.906	17.906	17.906
45			FY-RC01B4									
46	3/30/90	3/30/90										
47	5/28/90	5/28/90		1.938	1.938	1.938	1.938	1.938	1.938	1.938	1.938	1.938
48	9/14/91	9/14/91		15.573	15.573	15.573	15.573	15.573	15.573	15.573	15.573	15.573
49	3/17/93	3/17/93		18.070	18.070	18.070	18.070	18.070	18.070	18.070	18.070	18.070
50												

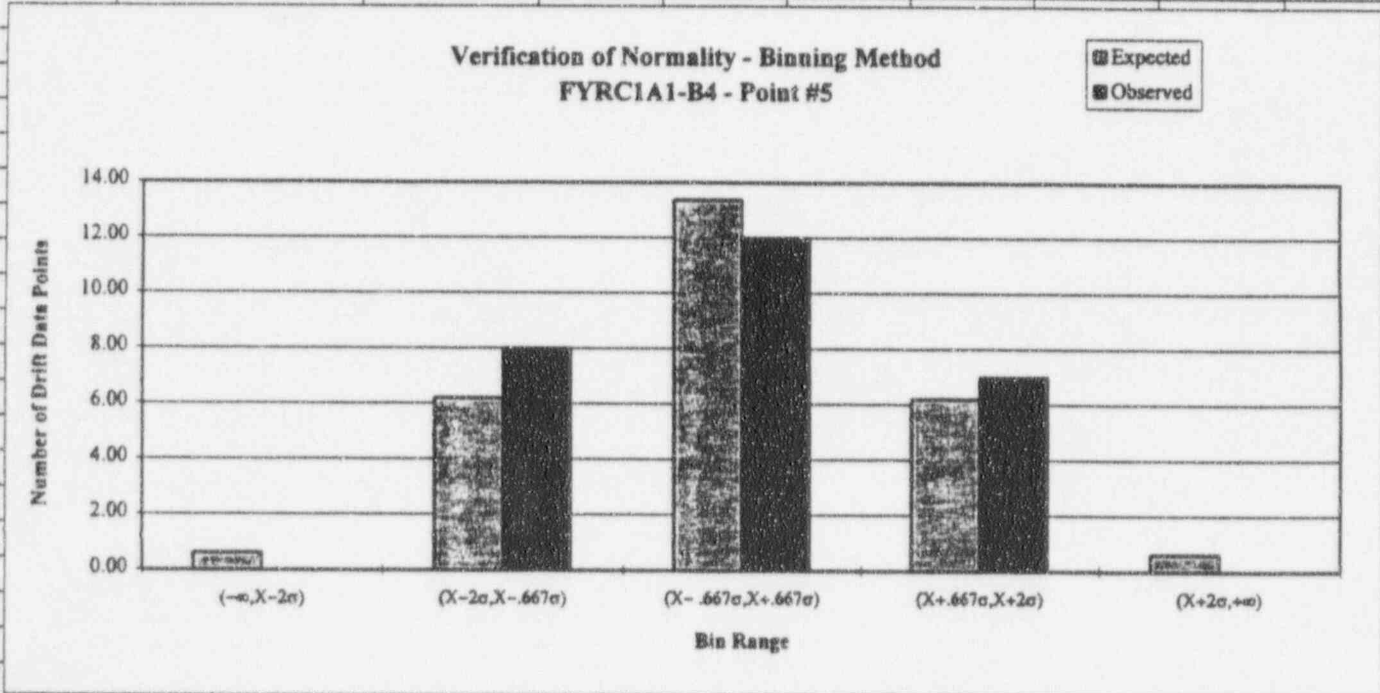
	BX	BY	BZ	CA	CB	CC	CD	CE	CF	CG	CH	CI
1				Percent Drift Since Last Test								
2				(One Sided Interval)								
3	Instrument Span:		10									
4												
5		DATE										
6	As Found	As Left	Instrument	Point #1	Point #2	Point #3	Point #4	Point #5	Point #6	Point #7	Point #8	Point #9
7			FY-RC01A1									
8	3/22/90	3/22/90										
9	5/25/90	5/25/90		0.0000	0.0000	0.0000	-0.0100	-0.0100	0.0000	0.0000	0.0100	0.0000
10	9/11/91	9/11/91		0.0300	0.0500	0.0900	0.1200	0.1000	0.0900	0.0800	0.0400	0.0300
11	3/16/93	3/16/93		-0.0300	-0.0500	-0.0300	-0.0500	-0.0100	-0.0300	-0.0300	-0.0300	-0.0300
12			FY-RC01B1									
13	3/22/90	3/22/90										
14	5/24/90	5/24/90		0.0000	0.0200	0.0300	0.0300	0.1200	0.0200	0.0200	0.0100	0.0000
15	5/26/90	5/26/90		-0.0300	-0.0100	-0.0100	-0.0200	-0.0400	0.0000	-0.0200	-0.0100	0.0000
16	9/12/91	9/12/91		0.0200	0.0400	0.0500	0.0500	0.1100	0.0500	0.0400	0.0400	0.0200
17	3/18/93	3/18/93		-0.0300	-0.0300	-0.0300	-0.0400	-0.0700	-0.0300	-0.0100	-0.0300	-0.0200
18			FY-RC01A2									
19	3/9/90	3/9/90										
20	6/1/90	6/1/90		0.0000	0.0000	0.0000	0.0200	0.0100	0.0100	0.0100	0.0000	0.0000
21	9/17/91	9/17/91		-0.0500	0.0100	0.0100	0.0300	0.0300	0.0300	0.0300	0.0200	0.0000
22	3/15/93	3/15/93		0.0580	-0.0080	-0.0020	-0.0360	0.0140	-0.0220	-0.0090	0.0030	0.0050
23			FY-RC01B2									
24	10/15/88	10/15/88										
25	3/10/90	3/10/90		0.0100	0.0300	0.0500	0.0600	0.1000	-0.0600	0.0900	0.0700	0.0100
26	6/1/90	6/1/90		0.0000	0.0100	0.0000	0.0000	-0.0300	0.0000	-0.0400	-0.0300	0.0000
27	9/13/91	9/13/91		0.0100	0.0000	0.0200	0.0200	0.0300	0.0200	0.0300	0.0300	0.0100
28	3/18/93	3/18/93		0.0000	0.0000	0.0000	-0.0100	0.0000	-0.0200	-0.0200	-0.0200	-0.0200
29	10/11/94	10/11/94		0.0000	[illegible]	0.0100	0.0100	0.0100	0.0300	0.0100	0.0100	0.0100
30			FY-RC01A3									
31	3/28/90	3/28/90										
32	5/24/90	5/24/90		-0.0100	-0.0300	-0.0200	-0.0500	-0.0700	-0.0700	-0.0400	-0.0300	0.0000
33	9/18/91	9/18/91		0.0000	0.0100	0.0400	0.0500	0.0700	0.0700	0.0500	0.0200	-0.0200
34	3/16/93	3/16/93		0.0000	0.0400	0.0100	0.0100	0.0300	0.0100	0.0000	0.0100	0.0200
35			FY-RC01B3									
36	3/28/90	3/28/90										
37	5/24/90	5/24/90		0.0200	0.0000	0.0100	0.0000	-0.0300	-0.0200	0.0000	0.0000	0.0100
38	9/16/91	9/16/91		-0.0100	0.0100	0.0300	0.0400	0.0900	0.0700	0.0500	0.0200	0.0000
39	3/17/93	3/17/93		0.0000	-0.0100	-0.0200	0.0000	-0.0500	-0.0100	-0.0200	-0.0200	-0.0100
40			FY-RC01A4									
41	3/30/90	3/30/90										
42	5/28/90	5/28/90		-0.0100	-0.0100	-0.0100	0.0000	-0.0100	-0.0100	-0.0100	0.0000	-0.0100
43	9/17/91	9/17/91		-0.0300	-0.0400	-0.0300	-0.0600	-0.0400	-0.0400	-0.0300	-0.0300	-0.0200
44	3/15/93	3/15/93		0.0300	0.0600	0.0700	0.0900	0.1000	0.0900	0.0700	0.0500	0.0300
45			FY-RC01B4									
46	3/30/90	3/30/90										
47	5/28/90	5/28/90		0.0000	0.0100	0.0000	0.0000	-0.0100	-0.0100	-0.0100	0.0000	0.0000
48	9/14/91	9/14/91		-0.0100	-0.0400	-0.0200	-0.0300	-0.0400	-0.0300	-0.0200	-0.0300	-0.0200
49	3/17/93	3/17/93		0.0100	0.0300	0.0100	0.0200	0.0300	0.0200	0.0100	0.0200	0.0200
50												
51												
52												
53			Mean	-0.001	0.004	0.010	0.009	0.016	0.006	0.009	0.005	0.001
54			Sstd	0.022	0.027	0.030	0.042	0.057	0.042	0.036	0.027	0.016
55			Count	27	27	27	27	27	27	27	27	27
56			k (one sided)	2.26	2.26	2.26	2.26	2.26	2.26	2.26	2.26	2.26
57			k*s	0.050	0.062	0.069	0.096	0.130	0.094	0.081	0.061	0.036
58			95/95 Max	0.049	0.066	0.078	0.105	0.146	0.100	0.090	0.066	0.036
59												
60												
61			Outlier Analysis									
62			T	2.66	2.66	2.66	2.66	2.66	2.66	2.66	2.66	2.66
63			x-Ts	-0.060	-0.069	-0.071	-0.104	-0.137	-0.105	-0.087	-0.068	-0.042
64			x+Ts	0.058	0.077	0.090	0.122	0.169	0.117	0.104	0.077	0.043
65			Outliers	0	0	0	0	0	0	0	0	0
66			Mean	-0.001	0.004	0.010	0.009	0.016	0.006	0.009	0.005	0.001
67			Sstd	0.022	0.027	0.030	0.042	0.057	0.042	0.036	0.027	0.016
68			Count	27	27	27	27	27	27	27	27	27
69			k (one sided)	2.26	2.26	2.26	2.26	2.26	2.26	2.26	2.26	2.26
70			k*s	0.050	0.062	0.069	0.096	0.130	0.094	0.081	0.061	0.036
71			95/95 Max	0.049	0.066	0.078	0.105	0.146	0.100	0.090	0.066	0.036
72												

	A	B	C	BF	BG	BH	BI	BJ	BK	BL	BM	BN
1				Months Since Last Adjustment								
2												
3	Instrument Span:		10									
4												
5		DATE										
6	As Found	As Left	Instrument	Point #1	Point #2	Point #3	Point #4	Point #5	Point #6	Point #7	Point #8	Point #9
7			FY-RC01A1									
8	3/22/90	3/22/90										
9	5/25/90	5/25/90		2.103	2.103	2.103	2.103	2.103	2.103	2.103	2.103	2.103
10	9/11/91	9/11/91		17.676	17.676	17.676	17.676	17.676	17.676	17.676	17.676	17.676
11	3/16/93	3/16/93		35.811	35.811	35.811	35.811	35.811	35.811	35.811	35.811	35.811
12			FY-RC01B1									
13	3/22/90	3/22/90										
14	5/24/90	5/24/90		2.070	2.070	2.070	2.070	2.070	2.070	2.070	2.070	2.070
15	5/26/90	5/26/90		0.066	0.066	0.066	0.066	0.066	0.066	0.066	0.066	0.066
16	9/12/91	9/12/91		15.639	15.639	15.639	15.639	15.639	15.639	15.639	15.639	15.639
17	3/18/93	3/18/93		33.807	33.807	33.807	33.807	33.807	33.807	33.807	33.807	33.807
18			FY-RC01A2									
19	3/9/90	3/9/90										
20	6/1/90	6/1/90		2.760	2.760	2.760	2.760	2.760	2.760	2.760	2.760	2.760
21	9/17/91	9/17/91		18.300	18.300	18.300	18.300	18.300	18.300	18.300	18.300	18.300
22	3/15/93	3/15/93		36.205	36.205	36.205	36.205	36.205	36.205	36.205	36.205	36.205
23			FY-RC01B2									
24	10/15/88	10/15/88										
25	3/10/90	3/10/90		16.789	16.789	16.789	16.789	16.789	16.789	16.789	16.789	16.789
26	6/1/90	6/1/90		19.515	19.515	19.515	19.515	19.515	19.515	19.515	19.515	19.515
27	9/13/91	9/13/91		34.924	34.924	34.924	34.924	34.924	34.924	34.924	34.924	34.924
28	3/18/93	3/18/93		53.060	53.060	53.060	53.060	53.060	53.060	53.060	53.060	53.060
29	10/11/94	10/11/94		71.852	71.852	71.852	71.852	71.852	71.852	71.852	71.852	71.852
30			FY-RC01A3									
31	3/28/90	3/28/90										
32	5/24/90	5/24/90		1.873	1.873	1.873	1.873	1.873	1.873	1.873	1.873	1.873
33	9/18/91	9/18/91		17.708	17.708	17.708	17.708	17.708	17.708	17.708	17.708	17.708
34	3/16/93	3/16/93		35.614	35.614	35.614	35.614	35.614	35.614	35.614	35.614	35.614
35			FY-RC01B3									
36	3/28/90	3/28/90										
37	5/24/90	5/24/90		1.873	1.873	1.873	1.873	1.873	1.873	1.873	1.873	1.873
38	9/16/91	9/16/91		17.643	17.643	17.643	17.643	17.643	17.643	17.643	17.643	17.643
39	3/17/93	3/17/93		35.647	35.647	35.647	35.647	35.647	35.647	35.647	35.647	35.647
40			FY-RC01A4									
41	3/30/90	3/30/90										
42	5/28/90	5/28/90		1.938	1.938	1.938	1.938	1.938	1.938	1.938	1.938	1.938
43	9/17/91	9/17/91		17.610	17.610	17.610	17.610	17.610	17.610	17.610	17.610	17.610
44	3/15/93	3/15/93		17.906	17.906	17.906	17.906	17.906	17.906	17.906	17.906	17.906
45			FY-RC01B4									
46	3/30/90	3/30/90										
47	5/28/90	5/28/90		1.938	1.938	1.938	1.938	1.938	1.938	1.938	1.938	1.938
48	9/14/91	9/14/91		17.511	17.511	17.511	17.511	17.511	17.511	17.511	17.511	17.511
49	3/17/93	3/17/93		35.581	35.581	35.581	35.581	35.581	35.581	35.581	35.581	35.581
50												

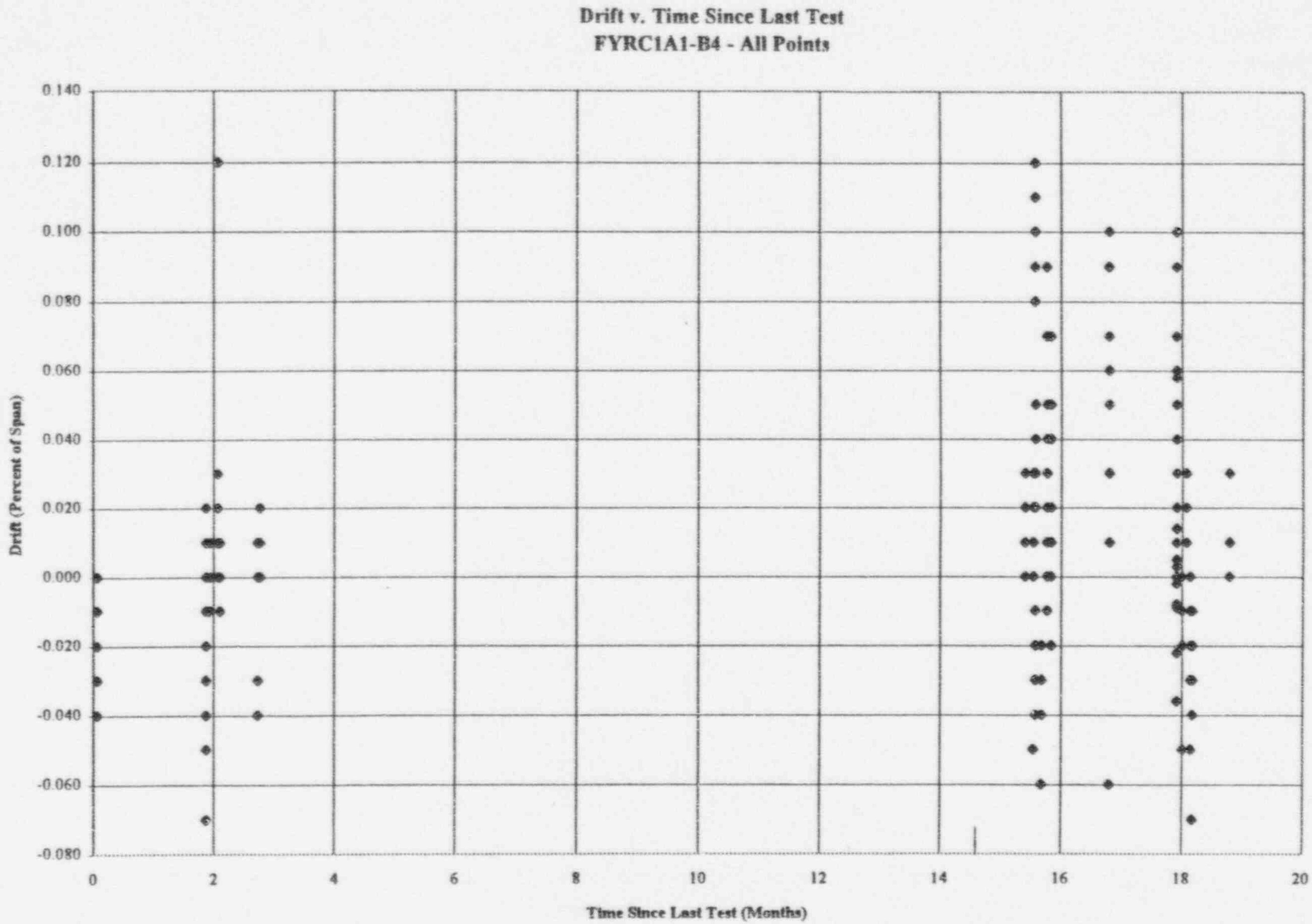
	A	B	C	BO	BP	BQ	BR	BS	BT	BU	BV	BW
1				Percent Drift Since Last Adjustment								
2												
3	Instrument Span:		10									
4												
5		DATE										
6	As Found	As Left	Instrument	Point #1	Point #2	Point #3	Point #4	Point #5	Point #6	Point #7	Point #8	Point #9
7			FY-RC01A1									
8	3/22/90	3/22/90										
9	5/25/90	5/25/90		0.0000	0.0000	0.0000	-0.0100	-0.0100	0.0000	0.0000	0.0100	0.0000
10	9/11/91	9/11/91		0.0300	0.0500	0.0900	0.1100	0.0900	0.0900	0.0800	0.0500	0.0300
11	3/16/93	3/16/93		0.0000	0.0000	0.0600	0.0600	0.0800	0.0600	0.0500	0.0200	0.0000
12			FY-RC01B1									
13	3/22/90	3/22/90										
14	5/24/90	5/24/90		0.0000	0.0200	0.0300	0.0300	0.1200	0.0200	0.0200	0.0100	0.0000
15	5/26/90	5/26/90		-0.0300	-0.0100	-0.0100	-0.0200	-0.0400	0.0000	-0.0200	-0.0100	0.0000
16	9/12/91	9/12/91		-0.0100	0.0300	0.0400	0.0300	0.0700	0.0500	0.0200	0.0300	0.0200
17	3/18/93	3/18/93		-0.0400	0.0000	0.0100	-0.0100	0.0000	0.0200	0.0100	0.0000	0.0000
18			FY-RC01A2									
19	3/9/90	3/9/90										
20	6/1/90	6/1/90		0.0000	0.0000	0.0000	0.0200	0.0100	0.0100	0.0100	0.0000	0.0000
21	9/17/91	9/17/91		-0.0500	0.0100	0.0100	0.0500	0.0400	0.0400	0.0400	0.0200	0.0000
22	3/15/93	3/15/93		0.0080	0.0020	0.0080	0.0140	0.0540	0.0180	0.0310	0.0230	0.0050
23			FY-RC01B2									
24	10/15/88	10/15/88										
25	3/10/90	3/10/90		0.0100	0.0300	0.0500	0.0600	0.1000	-0.0600	0.0900	0.0700	0.0100
26	6/1/90	6/1/90		0.0100	0.0400	0.0500	0.0600	0.0700	-0.0600	0.0500	0.0400	0.0100
27	9/13/91	9/13/91		0.0200	0.0400	0.0700	0.0800	0.1000	-0.0400	0.0800	0.0700	0.0200
28	3/18/93	3/18/93		0.0200	0.0400	0.0700	0.0700	0.1000	-0.0600	0.0600	0.0500	0.0000
29	10/11/94	10/11/94		0.0200	0.0500	0.0800	0.0800	0.1100	-0.0300	0.0700	0.0600	0.0100
30			FY-RC01A3									
31	3/28/90	3/28/90										
32	5/24/90	5/24/90		-0.0100	-0.0300	-0.0200	-0.0500	-0.0700	-0.0700	-0.0400	-0.0300	0.0000
33	9/18/91	9/18/91		-0.0100	-0.0200	0.0200	0.0000	0.0000	[illegible]	0.0100	-0.0100	-0.0200
34	3/16/93	3/16/93		-0.0100	0.0200	0.0300	0.0100	0.0300	[illegible]	0.0100	0.0000	0.0000
35			FY-RC01B3									
36	3/28/90	3/28/90										
37	5/24/90	5/24/90		0.0200	0.0000	0.0100	0.0000	-0.0300	-0.0200	0.0000	0.0000	0.0100
38	9/16/91	9/16/91		0.0100	0.0100	0.0400	0.0400	0.0600	0.0500	0.0500	0.0200	0.0100
39	3/17/93	3/17/93		0.0100	0.0000	0.0200	0.0400	0.0100	0.0400	0.0300	0.0000	0.0000
40			FY-RC01A4									
41	3/30/90	3/30/90										
42	5/28/90	5/28/90		-0.0100	-0.0100	-0.0100	0.0000	-0.0100	-0.0100	-0.0100	0.0000	-0.0100
43	9/17/91	9/17/91		-0.0400	-0.0500	-0.0400	-0.0600	-0.0500	-0.0500	-0.0400	-0.0300	-0.0300
44	3/15/93	3/15/93		0.0300	0.0600	0.0700	0.0900	0.1000	0.0900	0.0700	0.0500	0.0300
45			FY-RC01B4									
46	3/30/90	3/30/90										
47	5/28/90	5/28/90		0.0000	0.0100	0.0000	0.0000	-0.0100	-0.0100	-0.0100	0.0000	0.0000
48	9/14/91	9/14/91		-0.0100	-0.0300	-0.0200	-0.0300	-0.0500	-0.0400	-0.0300	-0.0300	-0.0200
49	3/17/93	3/17/93		0.0000	0.0000	-0.0100	-0.0100	-0.0200	-0.0200	-0.0200	-0.0100	0.0000
50												

FYRC1A1 - B4									
W test for normality - FYRC1A1 - B4 point #5									
step #									
4.2.2	S^2=	0.086							
4.2.3									
	1		0.1900	*	0.4366	=	0.082954		
	2		0.1800	*	0.3018	=	0.054324		
	3		0.1500	*	0.2522	=	0.03783		
	4		0.1400	*	0.2152	=	0.030128		
	5		0.1400	*	0.1848	=	0.025872		
	6		0.1300	*	0.1584	=	0.020592		
	7		0.1000	*	0.1346	=	0.01346		
	8		0.0600	*	0.1128	=	0.006768		
	9		0.0400	*	0.0923	=	0.003692		
	10		0.0400	*	0.0728	=	0.002912		
	11		0.0400	*	0.0540	=	0.00216		
	12		0.0240	*	0.0358	=	0.000859		
	13		0.0100	*	0.0178	=	0.000178		
	14		0.0000	*		=	0		
	15		0.0000	*		=	0		
	16		0.0000	*		=	0		
	17		0.0000	*		=	0		
	18		0.0000	*		=	0		
	19		0.0000	*		=	0		
	20		0.0000	*		=	0		
	21		0.0000	*		=	0		
	22		0.0000	*		=	0		
	23		0.0000	*		=	0		
	24		0.0000	*		=	0		
	25		0.0000	*		=	0		
						b=	0.28173		
4.2.4	b^2=	0.07937							
	W=b^2/S^2=		0.92486		(test statistic)				
	W critical value		0.9230						
	The assumption of normaility is NOT rejected at the .05 level.								

n	27			
average	0.016			
stdev	0.057			
Bin	Description	Upper Bound	Expected	Observed
1	(−∞,X−2σ)	-0.10	0.61	0
2	(X−2σ,X−.667σ)	-0.02	6.20	8
3	(X− .667σ,X+.667σ)	0.05	13.37	12
4	(X+.667σ,X+2σ)	0.13	6.20	7
5	(X+2σ,+∞)	9999.00	0.61	0

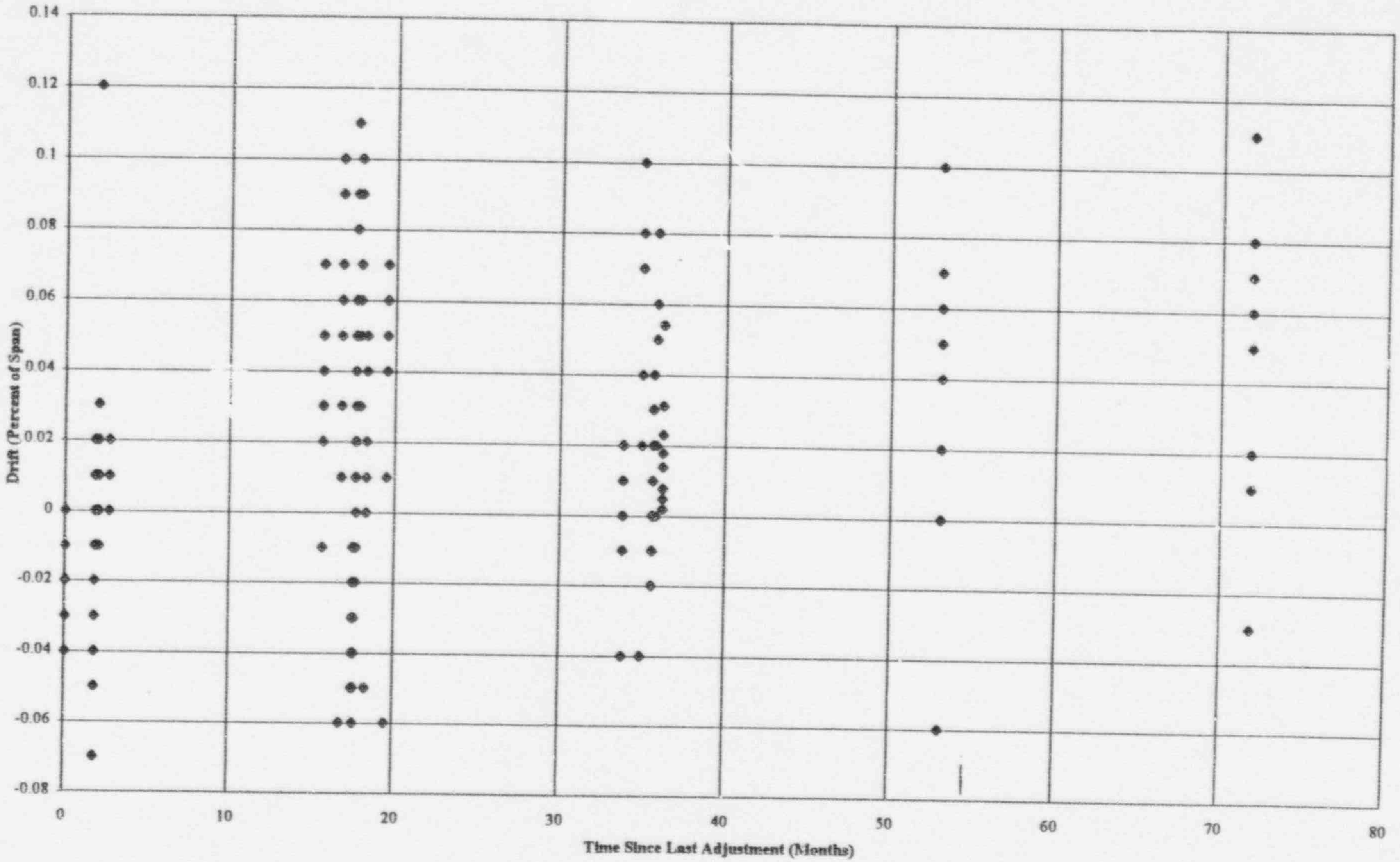


Attachment 17



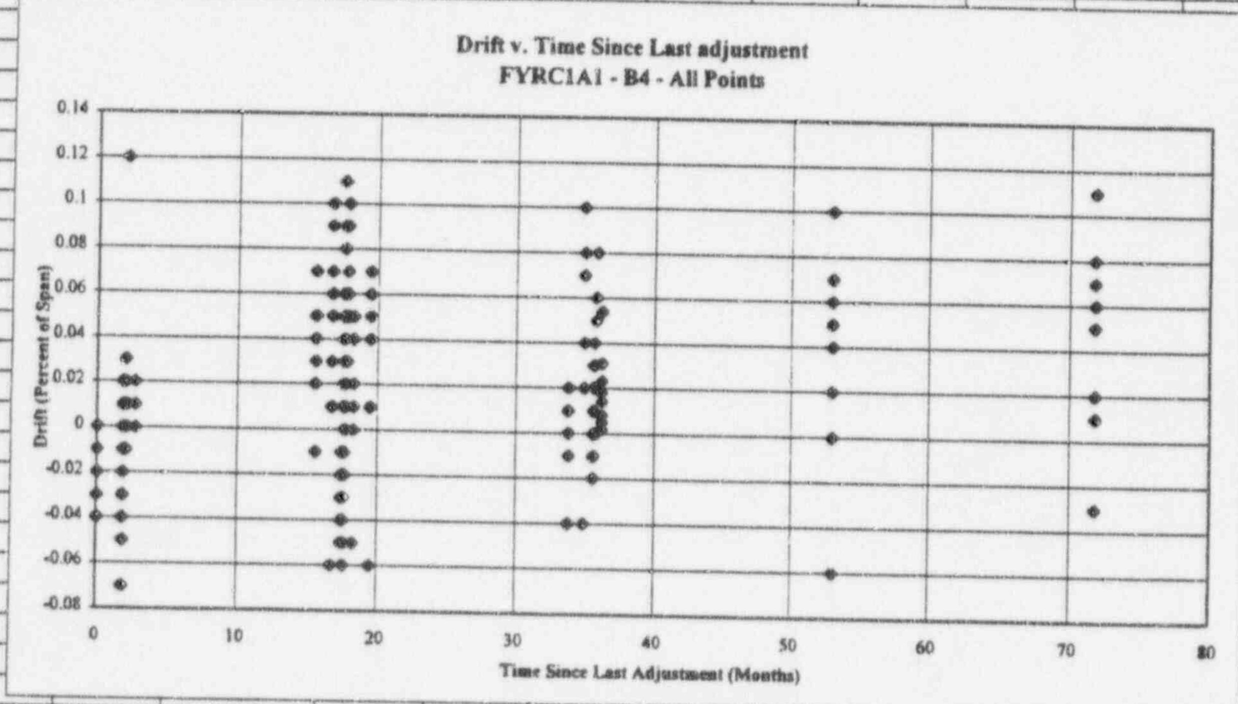
Attachment 18

Drift v. Time Since Last adjustment
FYRC1A1 - B4 - All Points



Binning Method - Percent Drift

	Months	Months	Count	Mean	Std
[0,3]	>0	<=3	72	0.00	0.02
	Months	Months			
[15,20]	>15	<=20	90	0.02	0.04
	Months	Months			
[30,40]	>30	<=40	63	0.02	0.03



ATTACHMENT 3
FOR
LICENSE AMENDMENT REQUEST NUMBER 96-0014
(11 pages follow)

Summary of Instrument Drift Study
for
Surveillance Requirement 4.3.2.1.1, Table 4.3-2, Functional Units 1.d and 1.e

Reactor Coolant Pressure - Low

(PT-RC2A3, PT-RC2A4, PT-RC2B3, PT-RC2B4)

The original Foxboro E11GH transmitters were replaced with Environmentally Qualified Foxboro NE11GH transmitters in May and June of 1986. Since the new transmitter's internal parts are different than the old transmitter's, and since the new transmitter has a performance uncertainty larger than the replaced transmitter, 0.65% of calibrated span vice 0.5%, it was conservatively decided to use only string test data obtained since the new transmitters were installed.

In order to document occurrences of string component adjustments that were not otherwise captured, the monthly functional tests were reviewed for dates from May 1986 through October 1991. Since provisions in these tests were removed in October 1991 for making adjustments without reliance on the calibration procedure, dates past October 1991 were not checked. Appropriate data from review of other historical information was also considered in the drift study analysis (i.e. Maintenance Work Orders, System Performance Book Chronological Logs). Review of the as-found data indicates that there have been no occurrences outside the present Technical Specification Allowable Value.

A single sided tolerance factor was utilized for the basic statistics since the function of the bistable is to trip on decreasing RCS pressure.

During the initial run of the basic statistics and plotting of drift vs. time for Time Dependence, a few outlier data points were identified as typographical errors of data entry and were corrected on the data base.

A T-Test was then run on the Percent Drift Since Last Test data (vice Since Last Adjustment data) with no outliers identified. Later, after the Time Dependence evaluation, the T-Test was run on the 30/18 Month Point by Point Extrapolated data. One data point for Channel 1 was identified as an outlier. Initially, it was thought that the point was out due the Test to Test interval being only 1.8 months and the extrapolation over amplified its drift. However, further investigation showed that, uncharacteristically, the data was taken during Plant Startup at the conclusion of a refueling outage. It is believed that the elevated ambient temperatures significantly affected the test results.

The W Test was performed on the eight Percent Drift Since Last Test data points. Since the test passed, there was no reason to reject the assumption of normality.

A supplemental check of plotting the number of data points versus the number of standard deviations from the mean was performed. A comparison to a normal distribution indicates that the data is approximately normal and bounded by two standard deviations. The center peak for the data is slightly larger than normal. However, this is considered conservative for the assumption of normality.

From the above two checks, it was concluded that the assumption of normality was acceptable.

The Percent Drift Since Last Test was plotted against the Months Since Last Test. There was one point sufficiently past the 18 month interval and it was visually obvious that it is substantially off of the mean of the other points, providing some evidence that drift may be time dependent. It was also determined that the mean is a positive value, representing an earlier than expected bistable trip on decreasing RCS Pressure. This positive mean is therefore conservative for this low pressure trip function.

Additionally, the Percent Drift Since Last Adjustment was plotted against Months Since Last Adjustment. This plot provided two points sufficiently past the 18 month interval. The data points were then divided into two bins, for Time Since Last Adjustment above and below 22.5 months. Statistics were calculated on each of the bins. Comparison of the two means reflected a conservative drift with time. Comparisons of the standard deviations indicated the random nature of the drift may decrease with time, although the significance of the standard deviation value for the two points past 22.5 months is minimal. Also, since the majority of the eight available data points were at the refueling interval value of approximately 18 months, the adjustments interrupted what may have been poor data points over longer intervals. With this evidence, it cannot be assumed that this Low RCS Pressure Trip is not time dependent.

Without clear indication that the drift is independent of time, each data point, Percent Drift Since Last Test, was linearly extrapolated to 30 months. Basic statistics were calculated and the 95/95 Min value generated based on the mean, standard deviation, and tolerance interval. The Max value was not calculated since a one-sided tolerance factor was utilized. Since the "bias" represented by the mean may not be present immediately after the calibration test is completed, it will, conservatively, not be taken credit for in the 30 month drift projection. Therefore, the projected drift becomes just the tolerance factor times the standard deviation and converts to 38.453 psig of the 2500 psig range.

The 30 month extrapolated data was checked for normality by the W test. Although the W Test failed by a small margin, the values fell within two standard deviations. Therefore, the assumption of normality for this 30 month extrapolated data was not rejected.

Toledo Edison Calculation C-ICE-48.01-002 Revision 4, "SFAS Reactor Coolant Pressure Actuation Setpoints," does not provide a calculational basis for the existing values for Technical Specification Trip Setpoints and Allowable Values, but rather provides Trip Setpoints and Allowable Values calculated using the guidance of ISA S67.04 - 1988 and RP67.04 Part II.

Since specific uncertainty terms are available within this calculation, the value projected for the 30 month drift was compared to the values given in the calculation. The design basis/reference uncertainty was determined by the sum of the squares of the calculation uncertainties to be 27.857 psig.

Since the projected 30 month drift of 38.453 psig is larger than the design basis/reference uncertainty the calculation was revised and the Allowable Value changed as proposed by this LAR. During implementation of this LAR, surveillance procedure changes will be made to reflect a new field setpoint, Allowable Value, and revised calibration method. Confirmation that the conditions and assumptions of the setpoint analysis are reflected in the surveillance procedures will be performed as part of the LAR implementation process.

Reactor Coolant System Pressure - Low-Low

(PT-RC2A3, PT-RC2A4, PT-RC2B3, PT-RC2B4)

The original Foxboro E11GH transmitters were replaced with Environmentally Qualified Foxboro NE11GH transmitters in May and June of 1986. Since the new transmitter's internal parts are different than the old transmitter's, and since the new transmitter has a "performance uncertainty" larger than the replaced transmitter, 0.65% of calibrated span vice 0.5%, it was conservatively decided to use only string test data obtained since the new transmitters were installed.

In order to document occurrences of string component adjustments that were not otherwise captured, the monthly functional tests were reviewed for dates from May 1986 through October 1991. Since provisions in these tests were removed in October 1991 for making adjustments without reliance on the calibration procedure, dates past October 1991 were not checked. Appropriate data from review of other historical information was also considered in the drift study analysis (i.e. Maintenance Work Orders, System Performance Book Chronological Logs). Review of the as-found data indicates that there have been no occurrences outside the present Technical Specification Allowable Value.

A single sided tolerance factor was utilized for the basic statistics since the function of the bistable is to trip on decreasing RCS pressure.

During the initial run of the basic statistics and plotting of drift vs. time for Time Dependence a few outlier data points were identified as typographical errors of data entry and were corrected on the data base.

Due to these RCS Pressure Low-Low strings sharing several components with the RCS Pressure-Low strings whose Drift Study was completed prior to this study, the outliers that may have been found via outlier analysis for this string were already corrected by the time this string's basic statistics were calculated. Regardless, a T-Test was run on the Percent Drift Since Last Test data (vice Since Last Adjustment data) with no outliers identified. Similarly, the T-Test was run on the 30/18 Month Point by Point Extrapolated data. Again, no outliers were identified.

The W Test was performed on the fourteen Percent Drift Since Last Test data points. Since the test passed, there was no reason to reject the assumption of normality.

A supplemental check of plotting the number of data points versus the number of standard deviations from the mean was performed. The comparison to a normal distribution indicated that the data is approximately normal and, with the exception of one data point, bounded by two standard deviations. The exception data point was at 2.0546 standard deviations from the mean. The center peak for the data is as close as possible with this limited set of data points. Overall, the plot of sample data appeared close to normal.

From the above two checks, it was concluded that the assumption of normality was acceptable.

The Percent Drift Since Last Test was plotted against the Months Since Last Test. Of the four points sufficiently past the 18 month interval, it was visually obvious that two were substantially off of the mean of the other points, providing some evidence that drift may be time dependent. It was also observed from the plot, as calculated in the basic statistics, that the mean is a positive value, representing an earlier than expected bistable trip on decreasing RCS Pressure. This positive mean is therefore conservative for the RCS Pressure Low-Low trip function.

Additionally, the Percent Drift Since Last Adjustment was plotted against Months Since Last Adjustment. This plot provided seven points sufficiently past the 18 month interval. The data points were then divided into two bins, for Time Since Last Adjustment above and below 22.5 months. Statistics were calculated on each of the bins. Comparison of the two means reflected a conservative drift with time. Comparisons of the two standard deviations indicated the random nature of the drift may increase with time. Also, since half of the fourteen available data points were at the present refueling interval value of approximately 18 months, the adjustments interrupted what may have been poor data points over longer intervals. With this evidence, it cannot be assumed that the RCS Pressure Low-Low trip is time independent.

Without clear indication that the drift is independent of time, each data point (Percent Drift Since Last Test) was linearly extrapolated to 30 months. Basic statistics were calculated and the 95/95 Min value generated based on the mean, standard deviation, and tolerance interval. The Max was not calculated since a one-sided tolerance factor was utilized. Since the "bias" represented by the mean may not be present immediately after the calibration test is completed, it will, conservatively, not be taken credit for in the 30 month drift projection. Therefore, the 30 month projected drift becomes just the tolerance factor times the standard deviation and converts to 31.698 psig of the 2500 psig range.

The 30 month extrapolated data was checked for normality. The W Test passed and the drift values fell within two standard deviations. Therefore, the assumption of normality for this 30 month extrapolated data was not rejected.

Calculation C-ICE-48.01-002 Revision 4, "SFAS Reactor Coolant Pressure Actuation Setpoints," does not provide a calculational basis for the existing values for Technical Specification Trip Setpoints and Allowable Values, but rather provides Trip Setpoints and Allowable Values calculated using the guidance of ISA S67.04 - 1988 and RP67.04 Part II. Since specific uncertainty terms are available within this calculation, the 30 month projected drift value was compared to the values given in the calculation. The design basis/reference uncertainty was determined by the sum of the squares of the calculation uncertainties to be 27.857 psig.

Since the design basis / reference uncertainty of 27.857 psig, is less than the projected 30 month drift of 31.698 psig the calculation was revised and the Allowable Value changed as proposed in this LAR. During implementation of this LAR, surveillance procedure changes will be made to reflect a new field setpoint, Allowable Value, and revised calibration method. Confirmation that the conditions and assumptions of the setpoint analysis are reflected in the surveillance procedures will be performed as part of the LAR implementation process.

Summary of Instrument Drift Study for Surveillance Requirement 4.3.2.1.1, Table 4.3-2, Functional Units 5.a and 5.b, and Surveillance Requirement 4.5.2.d.1.a and 4.5.2.d.1.b

SFAS RCS Pressure - Decay Heat Isolation Valve DH-11 and Pressurizer Heater Interlocks

(PT-RC2A3, PT-RC2B4)

The Safety Features Actuation System Decay Heat (DH) Isolation Valve and Pressurizer Heater Interlock Channel Functional Units consist of two similar instrument strings. The sole purpose of the bistable (BA113) associated with pressure transmitter PTRC2B4 in Safety Features Actuation System Channel 1 and one of the purposes of the bistable (BA413) associated with pressure transmitter PTRC2A3 in Channel 4 is, on increasing Reactor Coolant System pressure, to prevent DH system overpressurization by deenergizing pressurizer heaters if either DH Isolation valves (DH-11 and DH-12) are open. The second purpose of the bistable in Channel 4 is to close DH Isolation valve DH-11 and keep it from opening above the Technical Specification trip setpoint to prevent DH system overpressurization. A third purpose of the bistable in Channel 4 is to allow opening of DH Isolation valve DH-11 on decreasing RCS Pressure (bistable trips).

Since there are four similar channels of Safety Features Actuation System Reactor Coolant System Pressure string data taken during calibrations and only two of the four channels are utilized for fulfillment of the DH Isolation Valve and Pressurizer Heater Interlock Functional Units, it was decided to select a bistable from each of the two remaining SFAS channels whose data could be used to increase the number of sample points and decrease the projected 30 month drift value. The Safety Features Actuation System Reactor Coolant System Pressure Low Low Block Bistables, used to bypass the Low Low Trip function on a normal system depressurization, are the same type (Consolidated Controls model 6N82; trip bistables are 6N81) as those used for the DH Isolation Valve and Pressurizer Heaters Interlock Bistables. The remaining components in the strings are also the same types between channels.

The increasing setting (reset point of the bistable) of the DH Isolation Valve and Pressurizer Heater Interlock bistables (BA113 and BA413) is 301 PSIG. The increasing setting (reset point of the bistable) of the RCS Pressure Low Low Block bistables is 562 PSIG. The percent difference between these two settings is 10.44%. The DBNPS Instrument Drift Data Analysis Methodology and Assumptions document (DBNPS Methodology) created for the drift study program only describes how data may be shifted up (or down) by up to 10% of span. Since it is assumed that drift amplitudes may

increase but do not decrease at values further up in the instrument's span, utilizing the drift values for the Low Low Block bistables is conservative.

The original Foxboro E11GH transmitters were replaced with Environmentally Qualified Foxboro NE11GH transmitters in May and June of 1986. Since the new transmitter's internal parts are different than the former transmitter's and the new transmitter has a performance uncertainty larger than the former transmitter, 0.65% of calibrated span vice 0.5%, it was conservatively decided to use only string test data obtained since the new transmitters were installed.

In order to document occurrences of string component adjustments that were not otherwise captured, the monthly functional tests, which until October 1991 allowed adjustments within the test as it was performed, were reviewed for the period May 1986 through October 1991. Appropriate data from other sources (e.g. System Performance Book Chronological Log, Maintenance Work Orders) was also utilized. Review of as-found data indicates that there have been no occurrences outside the present Technical Specification Allowable Value.

A single sided tolerance factor was utilized for the basic statistics since the safety function of the bistables is to reset and automatically close DH-11 or deenergize the pressurizer heaters on increasing RCS pressure. On decreasing pressure, the deadband of approximately 50 psig ensures compliance with the same limiting Technical Specification value. The safety function of preventing DH-11 from opening when RCS pressure is above the Technical Specification trip setpoint is assured since the valve can only open when RCS pressure is lower than the bistable's reset point minus the deadband (i.e., the bistable trips).

Due to these Interlock and Low Low Block strings sharing several components with the Low Pressure strings whose Drift Study was already completed, the outliers that may have been found via outlier analysis for this string were already corrected by the time this string's basic statistics were calculated. Regardless, a T-Test was run on the Percent Drift Since Last Test data (vice Since Last Adjustment data) with no outliers identified. Similarly, the T-Test was run on the 30/18 Month Point by Point Extrapolated data. Again, no outliers were identified.

The W Test was performed on the nine data points for Percent Drift Since Last Test. Since the test passed, there was no reason to reject the assumption of normality.

A supplemental check was performed by plotting the number of data points versus the number of standard deviations from the mean. Comparison with a normal distribution indicated that the data is approximately normal and bounded by two standard deviations. From the above two checks, it was concluded that the assumption of normality was acceptable.

The Percent Drift Since Last Test was plotted against the Months Since Last Test. Only one point was sufficiently past the 18 month interval and it was substantially off of the mean of the other points, providing some evidence that drift may be time dependent. It was also observed from the

plot that the mean is a positive value, representing a later than expected bistable reset on increasing RCS Pressure. This is non-conservative for the Decay Heat (DH) Isolation Valve and Pressurizer Heaters Interlock function.

Additionally, the Percent Drift Since Last Adjustment was plotted against the Months Since Last Adjustment. This plot provided two points sufficiently past the 18 month interval. The data points were then divided into two bins, for Time Since Last Adjustment above and below 22.5 months. Statistics were calculated on each of the bins. Comparison of the two means indicates a nonconservative drift with time. Comparisons of the two standard deviations indicates the random nature of the drift may increase with time. Also, since seven of the available data points were at the present refueling interval value of approximately 18 months, the adjustments interrupted what may have been poor data points over longer intervals. With this evidence, it cannot be assumed that this Decay Heat (DH) Isolation Valve and Pressurizer Heaters Interlock is independent of time.

Without clear indication that the drift is independent of time, each data point, Percent Drift Since Last Test, was linearly extrapolated to 30 months. Basic statistics were calculated and the 95/95 Max value generated based on the mean, standard deviation, and tolerance interval. The Min was not calculated since a one-sided tolerance factor was utilized. The 30 month projected drift of 51.280 psig of the 2500 psig range is the (non-conservative) mean added to the product of the tolerance factor and the standard deviation.

The 30 month extrapolated data was checked for normality. The W Test passed and the drift values fell within two standard deviations. Therefore, the assumption of normality for this 30 month extrapolated data was not rejected.

The projected 30 month projected drift value of 51.280 psig was found to be slightly larger than the previously assumed design basis/reference uncertainty used in the previously existing setpoint documentation, 51.000 psig. Based on the 30 month projected drift value, and a reevaluation of the design basis for this function, as discussed in the body of this LAR, a new, lower Allowable Value was calculated within the setpoint analysis and is proposed in this LAR. Operating margin was maintained between the field setpoint and the operating limit (minimum NPSH for the Reactor Coolant Pumps). During implementation of this LAR, surveillance procedures changes will be made to reflect a new Allowable Value and revised calibration method. Confirmation that the conditions and assumptions of the setpoint analysis are reflected in the surveillance procedures will be performed as part of the LAR implementation process.

Reactor Coolant Pressure - Decay Heat Isolation Valve DH-12 Interlock

(PSHRC2B4)

The Decay Heat (DH) Isolation Valve DH-12 Interlock Function consists of one pressure switch (PSHRC2B4) supplying a contact to automatically close

DH Isolation valve DH-12 and keep it from opening above the Technical Specification trip setpoint to avoid overpressurizing the DH System. Subsequently, during normal plant shutdowns (i.e., decreasing RCS pressure; switch resets), the switch supplies a permissive to allow manual opening of DH-12 in order to operate the DH system.

The original Static-O-Ring model 8V2 pressure switch was replaced with an environmentally qualified Static-O-Ring model 9TA via FCR 82-168 on November 21, 1984. Since the new switch is sufficiently different than the old, it was conservatively decided to use only historical test data obtained since the new switch was installed

From a review of the test data, it became evident that each refueling outage, the surveillance test is performed in addition to a Preventive Maintenance (PM) Maintenance Work Order (MWO) which adjusts the switch if necessary. Although exceptions exist, the normal practice is to perform the calibration (PM) just prior to the surveillance test (DB-SP-3130 or ST-5051.02). Review of the as-found data indicates that there have been no occurrences outside the Technical Specification setpoint of <438 PSIG (approximately 418 PSIG at the pressure switch elevation).

A T-Test was run on the Drift Since Last Test data vice Drift Since Last Adjustment data with no outliers identified.

The W Test was performed on the sixteen Drift Since Last Test data points. Since the test passed, there was no reason to reject the assumption of normality.

A supplemental check was performed by plotting the number of data points versus the number of standard deviations from the mean. Comparison to normal distribution indicated that the data is approximately normal and, except for one point, bounded by two standard deviations. The one data point that was outside was very close to being within the two standard deviation limit. Possible explanations for this potentially bad data point were explored (such as test method or M&TE), but none were found. Therefore, the data point was conservatively included. Overall, the plot of sample data appeared close to normal.

From the above checks, it was concluded that the assumption of normality was acceptable.

Drift Since Last Test was plotted against the Months Since Last Test. A linear regression line was plotted on the data and the R^2 value determined. The data and linear regression clearly indicated that the drift tends to be more negative (resetpoint decreases) with increasing time since last test. A relatively high R^2 value reinforced this conclusion. This trend is conservative since the switch will reset earlier than expected for the increasing RCS Pressure function. The mean, however, at short test to test intervals, is non-conservative for the Decay Heat Isolation Valve Interlock function.

Additionally, the Drift Since Last Adjustment was plotted against the Months Since Last Adjustment. A linear regression line was plotted on the data and the R^2 value determined. The plot provided additional confidence to the decreasing trend discovered in the Drift vs. Time Since Last Test plot described above.

The Drift Since Last Adjustment data points were then divided into two bins, for times above and below 22.5 months. Statistics were calculated on each of the bins. Comparison of the two means reflects the decreasing drift with time. Comparisons of the two standard deviations indicated the random nature of the drift may be decreasing with time. Also, since majority of the available data points were at or below the present refueling interval value of approximately 18 months, the adjustments interrupted what may have been more data points exhibiting the decreasing trend. With this evidence it can be assumed that this Decay Heat Isolation Valve Interlock is time dependent but in a conservative direction for Technical Specification purposes.

With clear indication that the drift is time dependent each data point, Drift Since Last Test, was linearly extrapolated to 30 months. Basic statistics were calculated and the 95/95 Max value was generated based on the mean, standard deviation, and tolerance interval. The Min was not calculated since a one-sided tolerance factor was utilized. The 95 Max value was extraordinarily large due to the extrapolation of fairly large data points which occurred at short intervals. If a setpoint calculation used this 30 month extrapolated 95 Max value for representation of drift, the resulting setpoint would be outside the range of the instrument. Therefore, this value was considered unreasonable and not used for projecting the 30 Month Drift.

From the Drift Since Last Test plot, the data points naturally fall into two groupings, those occurring before 6 months (short test-to-test intervals) and after 15 months (long test-to-test intervals). The short interval data has a clearly positive (or nonconservative for the increasing pressure reset point) mean and the long interval data has a clearly negative (or conservative) mean and is more tightly grouped than the short interval data. Although deleting the short interval data might have been justified (since engineering judgment considers large As-Left minus As-Found values at short intervals to be mainly influenced by testing inconsistencies and not instrument drift) and the remaining long interval data extrapolated to 30 months as described in the Instrument Drift Data Analysis Methodology and Assumptions document, this was not performed. The reason for this is that extrapolation of all negative valued long interval data would have produced values even more negative, thus influencing the 95 Max in an overly nonconservative manner. Additionally, this 95 Max value would not be reflective of the nonconservative phenomena (which may be due to a repeatable characteristic in the pressure switch after calibration) seen in the short interval data.

Alternatively, since the trend of drift with increasing time was found to be more conservative for the increasing pressure resetpoint, using the 95 Max value (not projected to 30 months) was considered. This value was non-conservatively influenced by the decreasing mean as time increased but

conservatively influenced by a large standard deviation due to the same decreasing mean as time increased. Therefore, it was decided to compare this 95 Max value for all test to test points to a 95 Max value generated using only the points of short test intervals (chosen at less than 6 months, since this appeared to be a natural bin of the data). The highest value would then be used as the 30 Month Projected Drift. The basic statistics were calculated on the short test interval points and the 95 Max value of this short data was determined to be 19.194 psig. This value was utilized as the 30 Month Projected Drift value.

The projected 30 month projected drift value of 19.194 psig was found to be smaller than the design basis/reference uncertainty used in the previously existing setpoint documentation, 51.000 psig. Based on this, no changes to existing settings or analyses was necessary. However, since this interlock function for valve DH-12 shares Technical Specification wording for the trip setpoint (and proposed Allowable Value in place of the trip setpoint), the value in the Technical Specifications is being changed for consistency with the SFAS RCS - Decay Heat Isolation Valve (DH-11) and Pressurizer Heaters Interlock Allowable Value described above. This proposed use of the Allowable Value derived from the SFAS RCS pressure channel uncertainties is conservative for this RCS pressure switch since the uncertainties for this RCS pressure switch are smaller. The assumptions in the present setpoint analysis, including the field setpoint, are presently reflected in the surveillance test.