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BABCOCK & WILCOX
NUCLEAR POWER GENERATION DIVISION

TECHNICAL DOCUMENT

N4M-2-69

TVA APR 10 1978
PROJECT: BELLEFONTE 1 & 2
CONTRACT NO: 71C62-54114-2
TITLE: NUCLEAR STEAM SUPPLY SYS.

CHECKED:

OPERATING SPECIFICATION

68 - 1004243 - 00
Doc. ID — Serial No., Revision No.

for

PLANT SETPOINTS

OS-1102

ACCEPTED FOR SUBMITTAL
This document has been approved for submittal of official plans required by codes. This copy not for construction.
TENNESSEE VALLEY AUTHORITY
Date APR 11 1978
Mech. Engr. Br. Engr. D. R. Patterson
Acted By Ltr. : K-5015

(GPU) 513
Deft. Exh. For ID .....
Plf. Exh. In Ev .....
Robert E. Levy CSR RJ 4/30/92
Doyle Reporting Inc.

XC4C719

BWNP-20005 (6-76)

BABCOCK & WILCOX
NUCLEAR POWER GENERATION DIVISION

RECORD OF REVISION

NUMBER
68-1004243-00

REV. NO.	CHANGE SECT/PARA.	DESCRIPTION/CHANGE AUTHORIZATION
00		Original Issue - T. F. Scott, Nuclear Services

PREPARED BY _____ (NAME) Nuclear Service Engineer (TITLE) DATE 3/17/78

REVIEWED BY _____ (NAME) for HABAKER Mgr. PES (TITLE) DATE 3/17/78

REVIEWED BY _____ (NAME) P. I. (TITLE) DATE 3/17/78

APPROVED BY _____ (NAME) _____ (TITLE) DATE 3/17/78

XC4C720

DATE: 3-16-78

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XC40721

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BABCOCK & WILCOX
NUCLEAR POWER GENERATION DIVISION
TECHNICAL DOCUMENT

NUMBER
68-1004243-00

I. PURPOSE

This document lists the setpoints of alarms and interlocks applicable to the operation of equipment supplied by the Babcock and Wilcox (B&W) Company and its Vendors. This document in itself is not sufficient for operation of equipment and should therefore only be used in conjunction with the following:

A. Plant technical specifications.

B. NPGD Water Chemistry Manual/Guide Specification 2050.

C. Vendor technical manuals.

D. Plant Limits and Precautions, OS-1101.

NOTE: (1) Normal operating indication is for higher power ranges where applicable.

(2) Computer ID point numbers are listed under the service where applicable.

(3) Unless otherwise indicated, alarms apply to all pumps or components of a similar string (all four reactor coolant (RC) pumps, etc.).

(4) Rated power is the power level at which the unit is to be initially licensed. Rated power is 3600 megawatts thermal (MWt) core power or 3620 MWt nuclear steam system (NSS) power. Equivalent terms may be licensed power, full power, 100% power, or rated thermal power (RTP).

(5) Reactor protection system (RPS) and engineering safety features actuation system (ESFAS) setpoints are contained in plant technical specifications.

(6) Instrumentation inaccuracies are assumed in the determination of setpoints.

X040723

XCAL-724

1.0 REACTOR COOLANT SYSTEM DATA SHEET

SERVICE	INSTRUMENT NUMBER	ANNUNCIATOR ALARM		COMPUTER ALARM		NORMAL OPERATING INDICATION	CALIBRATION	
		HIGH	LOW	HIGH	LOW		RANGE	UNITS
RC Loop Flow C023, C024	RC-1		74.8			78.7 x 10^6	0-120 x 10^6	Lb/hr.
RC Total Flow C019 - C022	RC-1					157.4 x 10^6	0-240 x 10^6	Lb/hr.
RC Narrow Range Pressure	RC-2					2195	1500 - 2500	PSIG
First Pressurizer Heater Bank (Mod. Control)		2195-2175/2175-2195 PSIG						
Second Pressurizer Heater Bank (On/Off)		2175/2195 PSIG						
Third Pressurizer Heater Bank (On/Off)		2160/2180 PSIG						
Fourth Pressurizer Heater Bank (On/Off)		2145/2160 PSIG						
Electromatic Relief Valve Setpoint (Open/Close)		2295/2270 PSIG						
Pressurizer Spray Valve Setpoint (Open/Close)		2245/2195 PSIG						
RC Wide Range Pressure	RC-2					2195	0-2500	PSIG
RC Outlet Temperature T326, T327	RC-3	635		635		627.5	530-650	°F
RC Inlet Temperature Narrow Range T328, T329, T331, T332	RC-4					573.7	530-650	°F
RC Inlet Temperature Wide Range T330, T333	RC-4					573.7	50-650	°F
	Minimum Temperature for Starting 4th RC Pump 500°F							
RC Differential Temperature	RC-6					53.8	0-80	°F
Reactor Average Temperature	RC-7					600.6	530-650	°F

SERVICE	INSTRUMENT NUMBER	ANNUNCIATOR ALARM		COMPUTER ALARM		NORMAL OPERATING INDICATION	CALIBRATION	
		HIGH	LOW	HIGH	LOW		RANGE	UNITS
Reactor Unit Inlet Differential Temperature	EC-8	5				0	-10 to +10	°F
	NOTE: Indicator scale to be engraved "10B Hi to B to A Hi 10"							
Pressurizer Spray Line Temperature T338	RC-9				470	574	0-700	°F
Pressurizer Relief Valve Discharge Line Temperature T335 - T337	RC-12			600		120	0-700	°F
Pressurizer Level L076	RC-14 High-High Level Alarm and Heater Interlock	220	170 290 In. Low-Low Level Alarm 100 In.	220	170	195	0-400	In H_2
Pressurizer Temperature T325	RC-15			660		650	0-700	°F
Pressurizer Surge Line Temperature T334	RC-16					530	0-700	°F
Pressurizer Pressure Narrow Range P082	RC-17	2295	2095			2195	1500-2500	PSIG
Pressurizer Pressure Wide Range P083	RC-17					2195	0-2500	PSIG

Shutdown Bypass (Decreasing RCS Pressure) 1850 PSIG

Shutdown Bypass Auto Removal (Increasing RCS Pressure) 1850 PSIG

Bypass High Pressure Injection Warning Alarm 1895 PSIG

Pressurizer Safety Valve Setpoint 2500 PSIG

Decay Heat Dropline Valve Interlocks

Valve	Pressure Transmitter	Setpoint (PSIG)
HV-11A	PT-17-4	595
HV-11B	PT-17-3	595
HV-12A	PT-2A3	580
HV-12B	PT-2B3	625

XQ4C725

2.0 REACTOR COOLANT PUMP AND MOTOR DATA SHEET

SERVICE	INSTRUMENT NUMBER	ANNUNCIATOR ALARM		COMPUTER ALARM		NORMAL OPERATING INDICATION	CALIBRATION	
		HIGH	LOW	HIGH	LOW		RANGE	UNITS
RC Pump Cooling Water Inlet Temperature U281-U284	RC-500			105		60-105	0-400	°F
RC Pump Recirculation Outlet Temperature U285-U288	RC-501			185		70-185	0-400	°F
RC Pump Recirculation Inlet Temperature U289-U292	RC-502			185		70-185	0-400	°F
RC Pump #3 Seal Inlet Temperature U293-U296	RC-503			185		70-185	0-400	°F
RC Pump #3 Seal Outlet Temperature U297-U300	RC-504			185		70-185	0-400	°F
RC Pump Cooling Water Temperature Monitor	RC-505						0-400	°F
RC Pump #1 Seal Inlet Pressure P086-P089	RC-506			2250		2159	0-2500	PSIG
RC Pump #2 Seal Inlet Pressure P090-P093	RC-507			1800		1439	0-2500	PSIG
RC Pump #3 Seal Inlet Pressure P094-P097	RC-508			1080		719	0-2500	PSIG
RC Pump Seal Pressure Monitor	RC-509						0-2500	PSIG
RC Pump Seal Leakage L116-L119	RC-511			530		370	NA	GI/HR

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SERVICE	INSTRUMENT NUMBER	ANNUNCIATOR ALARM		COMPUTER ALARM		NORMAL OPERATING INDICATION	CALIBRATION	
		HIGH	LOW	HIGH	LOW		RANGE	UNITS
RC Pump Seal Leakage C700-C703	RC-552			0.25		<0.25	0-6	GPM
RC Pump Motor Stator Temperature T349-T352	RC-550			150		145	0-160	°C
RC Pump Motor Stator Temperature	RC-551	150				145	0-160	°C
RC Pump Motor Stator Temperature (Spare)	RC-552						0-160	°C
	RC-553						0-160	°C
	RC-554						0-160	°C
	RC-555						0-160	°C
Anti-Reverse Device Temperature T361-T364	RC-556			100		80	0-150	°C
Upper Radial Bearing Temperature T353-T356	RC-557			100		95	0-150	°C
Upthrust Bearing Temperature	RC-558	105				100	0-150	°C
Upthrust Bearing Temperature (Spare)	RC-559						0-150	°C
Downthrust Bearing Temperature	RC-560	105				100	0-150	°C
Downthrust Bearing Temperature	RC-561						0-150	°C
	RC-562						0-150	°C
(Spare)	RC-563						0-150	°C
Lower Radial Guide Bearing Temperature T357-T360	RC-564			100		95	0-150	°C

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SERVICE	INSTRUMENT NUMBER	ANNUNCIATOR ALARM		COMPUTER ALARM		NORMAL OPERATING INDICATION	CALIBRATION	
		HIGH	LOW	HIGH	LOW		RANGE	UNITS
Inlet Air Temperature #1 T365-T368	RC-565			55		50	0-160	°C
Inlet Air Temperature #2 T369-T372	RC-566			55		50	0-160	°C
RC Pump Motor Temperature Monitoring Panel	RC-567						0-400	°F
Cooler #1 Leakage Detector L108-L111	RC-569				0	No Water	NA	In.
Cooler #2 Leakage Detector L112-L115	RC-570				0	No Water	NA	In.
Oil Level-Low Reservoir High and Low Level L100-L107	RC-571			15.59	12.91	15.16	NA	In.
Vibration X086-X089	RC-573			-*0.06		<0.06	0-4.5	G
	*Corresponds to 0.003 Inch							
Current Differential	RC-574						600/5 Ratio	Amps
Upper Oil Reservoir Low Level L096-L099	RC-575				13.78	19.09	NA	In.
Upper Oil Reservoir High Level L092-L095	RC-576			19.57		19.09	NA	In.
Oil Lift System Filter #1A Pressure P115-P118	RC-577			50		NA	5-140	PSIG
Oil Lift System Filter #1 Pressure P119 P122	RC-578			50		NA	5-140	PSIG

SERVICE	INSTRUMENT NUMBER	ANNUNCIATOR ALARM		COMPUTER ALARM		NORMAL OPERATING INDICATION	CALIBRATION	
		HIGH	LOW	HIGH	LOW		RANGE	UNITS
Shaft Speed (Full)	BC-579					1193	0-1200	RPM
	Oil Lift Pump Circuit Setpoint 1100 RPM							
Shaft Speed (Zero)	BC-580						NA	RPM
	BC-581						NA	RPM
	BC-582						NA	RPM
	Oil Lift Pump Start Setpoint 0.05 RPM							
Oil Lift System Manifold Pressure	BC-583						160-3200	PSIG
	BC-584						160-3200	PSIG
	BC-585						160-3200	PSIG
	BCPH Start Interlock 800 PSIG							
#1 Oil Lift Pump Discharge Pressure P107-P110	BC-588				800		160-3200	PSIG
	Start Interlock for Opposite Pump 800 PSIG							
#1A Oil Lift Pump Discharge Pressure P111-P114	BC-589				800		160-3200	PSIG
	Start Interlock for Opposite Pump 800 PSIG							
#1 Oil Lift Pump Suction Pressure P099-P102	BC-590			7.7			0.8-30 VAC	In. Hg.
#1A Oil Lift Pump Suction Pressure P103-P106	BC-591			7.7			0.8-30 VAC	In. Hg.

XC4C729

3.0 SECONDARY PLANT SYSTEM DATA SHEET

SERVICE	INSTRUMENT NUMBER	ANNUNCIATOR ALARM		COMPUTER ALARM		NORMAL OPERATING INDICATION	CALIBRATION	
		HIGH	LOW	HIGH	LOW		RANGE	UNITS
Feedwater Temp. T429, T430	SP-1					488	0-600	°F
Main Feedwater Flow F141, F143	SP-2					8.0×10^6	$0-9 \times 10^6$	LB/HR
Startup Feedwater Flow F139, F140	SP-3					1.20×10^6	$0-2 \times 10^6$	LB/HR
Feedwater Flow (Full Range)	SP-4					8.0×10^6	$0-9 \times 10^6$	LB/HR
Feedwater Control Valve Differential Pressure P157, P158	SP-5					50	0-100	PSI
	NOTE: Auxiliary Feedwater Initiated - 815 PSIA Feedwater Pump Discharge Pressure							
Steam Generator Level (Full Range) L152, L153	SP-9					63	0-100	%
Steam Generator Level (Startup) L150, L151	SP-9	10			18	45	0-80	in. H_2O
	Auxiliary Feedwater Initiation (Either OTSG) 12 Inches Natural Circulation Level (No RCP Running) 48 Inches							
Steam Generator Shell Temperature T417-T426	SP-11						0-700	°F
Main Steam Pressure P154, P155	SP-12			1095	945	1045	0-1500	PSIG
	Isolation of Feedwater and Steam on Low Pressure 615 PSIA Auxiliary Feedwater Actuation on Low Pressure 615 PSIA OTSG Pressure Bypass Auto Removal 750 PSIG							
Main Steam Temperature T427, T428	SP-15				586.7	601.7	100-700	°F

SERVICE	INSTRUMENT NUMBER	ANNUNCIATOR ALARM		COMPUTER ALARM		NORMAL OPERATING INDICATION	CALIBRATION	
		HIGH	LOW	HIGH	LOW		RANGE	UNITS
Turbine Throttle Pressure PI56	SP-16	1070	970	1070	970	1020	800-1500	PSIG
Steam Temperature	SP-20			--		602	500-650	°F

PRESSURE SETTINGS (PSIA)

	TURBINE[1] TRIP	NORMAL	REACTOR[2] TRIP
Condenser Dump-Bank #1 (3 Second Modulating)	1035	1085	1200
Condenser Dump-Bank #2[3] (½ Second)	1070	1120	1225
Condenser Dump-Bank #3[3] (½ Second)	1085	1135	1225
Atmospheric Dump[3] (½ Second)	1100	1150	1235
Auxiliary Vent Valve (3 Second Modulating)	1220	1220	1220
Code Safety Bank #1 (56%)	1250	1250	1250
Code Safety Bank #2 (56%)	1280	1280	1280

(1) On turbine fast valving signal, bypass valves will be set to turbine trip settings for a time period which will be adjustable from ½ to 30 seconds, then reset to the normal settings.

(2) On reactor trip setpoints are initially set on the turbine trip settings for 15 seconds, then reset to reactor trip settings.

(3) The reset pressure setting for all ½ Second turbine bypass valves is 25 psi below their indicated pressure setpoints.

XQAC732

4.0 STEAM GENERATOR CIRCULATION SYSTEM DATA SHEET

SERVICE	INSTRUMENT NUMBER	ANNUNCIATOR ALARM		COMPUTER ALARM		NORMAL OPERATING INDICATION	CALIBRATION	
		HIGH	LOW	HIGH	LOW		RANGE	UNITS
Surge Tank Level	SC-1	•	•			25	0-50	In. H_2O
Surge Tank Pressure	SC-2	•	•			0-100	0-1500	PSIG
Circulation Pump Discharge Pressure	SC-3					120	0-1500	PSIG
Circulation Flow	SC-4		•			1200	0-1200	GPH

*To Be Supplied When Heatup Method is Confirmed

5.0 MAKEUP AND PURIFICATION SYSTEM DATA SHEET

SERVICE	INSTRUMENT NUMBER	ANNUNCIATOR ALARM		COMPUTER ALARM		NORMAL OPERATING INDICATION	CALIBRATION	
		HIGH	LOW	HIGH	LOW		RANGE	UNITS
Letdown Flow C003	MU-7					50	0-250	GPM
Letdown Temperature T235	MU-8	130				120	0-200	°F
	High Temperature Interlock 135°F							
Letdown Pressure P072	MU-9			145		100	0-200	PSIG
Purification Filters Differential Pressure	MU-13	20				5	0-30	PSI
Makeup Tank Temperature T286	MU-15			135	75	120	0-200	°F
Makeup Tank Level L065	MU-16	100,	54	100	54	88	0-120	In. H_2O
	Low Level Interlock 32 In.							
Demineralizer Prefilter Differential Pressure	MU-17	20				5	0-30	PSI
RC Pump Seal Differential Pressure P073	MU-19			950		340	0-1000	PSI
Makeup Tank Pressure	MU-21	75	15			35	0-100	PSIG
Makeup Pump Discharge Pressure	MU-25					3000	0-6000	PSIG
Makeup Pump Discharge Header Pressure	MU-26					3000	0-3500	PSIG
Purification Demineralizer Differential Pressure	MU-27	15				5	0-30	PSI
RC Pump Seal Inlet Flow	MU-30	12.5	4.0			9.5	0-15	GPM
	Low Flow Interlock To HV-37A/B/C/D			4.0 GPM				
	Low Flow Interlock To MU Pumps			4.0 GPM				
Makeup Flow	MU-31	240				18	0-250	GPM
RC Pump Seal Bleedoff Flow	MU-36	2.0				1.5	0-4	GPM

XOAL733

XCE-7134

SERVICE	INSTRUMENT NUMBER	ANNUNCIATOR ALARM		COMPUTER ALARM		NORMAL OPERATING INDICATION	CALIBRATION	
		HIGH	LOW	HIGH	LOW		RANGE	UNITS
HU System Feed and Bleed Flow	HU-39					0-200	0-300	GPM
Boric Acid Flow	HU-41	50	5			0-25	0-50	GPM
Trim Bleed Flow	HU-42					0-50	0-50	GPM
RC Pump Seal Inlet Header Pressure	HU-43					3000	0-3500	PSIG
Makeup Control Valve Bypass Flow	HU-44					1.0	0-4	GPM
Purif. Demineralizer Outlet Strainer Differential Pressure	HU-45	15				5	0-30	PSI
High Pressure Injection Flow	HU-50	365	250			350	0-400	GPM
	NOTE: Low Flow Alarm Only Enabled During ESFAS Signal.							
RCP Seal Injection Filter Differential Pressure	HU-56	20				5	0-30	PSI
RCP Seal Injection Temperature	HU-64					135	0-200	°F
HU Pump Motor Bearing Temperature Outboard End T290-T292	HU-500			185		150	0-250	°F
HU Pump Motor Bearing Temperature Drive End T293-T295	HU-501			185		150	0-250	°F
HU Pump Motor Stator Temperature T287-T289	HU-502			275		150	0-300	°F
Gear Lo Speed Drive End Bearing Temperature T302-T304	HU-503			200		160	0-250	°F

SERVICE	INSTRUMENT NUMBER	ANNUNCIATOR ALARM		COMPUTER ALARM		NORMAL OPERATING INDICATION	CALIBRATION	
		HIGH	LOW	HIGH	LOW		RANGE	UNITS
HU Pump Gear High Speed Drive End Bearing Temp. T305-T307	HU-504			200		160	0-250	°F
HU Pump Gear Low Speed Driven End Bearing Temp. T296-T298	HU-505			200		160	0-250	°F
HU Pump Gear High Speed Driven End Bearing Temp. T299-T301	HU-506			200		160	0-250	°F
Lube Oil Pressure Switch (HU Pump Motor Control)	HU-507 HU-PS507	Opens at 21 PSIG increasing to allow starting of HU Pump Motor.				25		PSIG
	HU-PS507	Closes at 12 PSIG decreasing to stop HU Pump Motor (Bypassed under ESF conditions).						
HU Pump Drive End Pump Bearing Temperature T308-T310	HU-508			200		160	0-250	°F
HU Pump Outboard End Pump Bearing Temperature T311-T313	HU-509			200		150	0-250	°F
HU Pump Thrust Bearing Oil Temp. T314-T316	HU-510			175		145	0-250	°F
Lube Oil Temp. Indicator	HU-511					120	NA	°F
Lube Oil Press. Indicator	HU-512					25	NA	PSIG

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SERVICE	INSTRUMENT NUMBER	ANNUNCIATOR ALARM		COMPUTER ALARM		NORMAL OPERATING INDICATION	CALIBRATION	
		HIGH	LOW	HIGH	LOW		RANGE	UNITS
Lube Oil Pressure Switch (Aux. L.O. Pump Control)	HU-513					25	NA	PSIG
	HU-PS513	Open at 29 PSIG increasing shutting off Aux. Lube Oil pump.						
	HU-PS513	Closes at 16 PSIG decreasing to start Aux. Lube Oil Pump.						
Lube Oil Pressure Switch (Alarm) PD74-PD76	HU-514				14	25	NA	PSIG
Lube Oil Inlet Temperature Switch T320-T322	HU-515			155		120	NA	°F

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6.0 DECAY HEAT REMOVAL SYSTEM DATA SHEET

SERVICE	INSTRUMENT NUMBER	ANNUNCIATOR ALARM		COMPUTER ALARM		NORMAL OPERATING INDICATION	CALIBRATION	
		HIGH	LOW	HIGH	LOW		RANGE	UNITS
Decay Heat Removal Injection Flow	DH-3	6000	4140			5000	0-7000	GPM
	NOTE: Low Flow Alarm Only Enabled During ESFAS Signal. Low Alarm (ESFAS) 1050 GPM							
Decay Heat Removal Cooler Outlet Temperature	DH-4	325	238			270-240	0-400	°F
Decay Heat Removal Pump Discharge Pressure	DH-5					450-150	0-1000	PSIG
Decay Heat Removal Cooler Inlet Temperature	DH-8	322,				305-340	0-400	°F
BWST Level	DH-15	50	11			44	0-55	Ft. H_2O
	Low Level Pretrip Alarm 32.5 Ft.							
DH Pump Outboard Motor Bearing Temperature T188, T189	DH-500			185		150	0-250	°F
DH Pump Drive End Motor Bearing Temperature T190, T191	DH-501			185		150	0-250	°F
DH Pump Motor Stator Temperature T186, T187	DH-502			248		212	0-300	°F
DH Pump Bearing Temperature Drive End T192, T193	DH-503			200		150	0-250	°F
DH Pump Bearing T194, T195	DH-504			200		80-190	0-250	°F
Pump Oil Temperature Indicator	DH-505						0-200	°F
Pump Oil Pressure Indicator	DH-506						0-50	PSIG

XQAC737

SERVICE	INSTRUMENT NUMBER	ANNUNCIATOR ALARM		COMPUTER ALARM		NORMAL OPERATING INDICATION	CALIBRATION	
		HIGH	LOW	HIGH	LOW		RANGE	UNITS
Pressure Switch - Aux. Pump Control P048, P049	PDI-507				7	12	0-50	PSIG
	Auxiliary L.O. Pump Start 7 PSIG Auxiliary L.O. Pump Stop 15 PSIG				--			
Pressure Switch - Main Motor Control	PDI-508					12	0-50	PSIG
	Motor Start - 0 PSIG Motor Trip - 5 PSIG							
Thrust Bearing Temperature T196, T197	TDI-509			175		145	0-250	°F

7.0 CORE FLOODING SYSTEM DATA SHEET

SERVICE	INSTRUMENT NUMBER	ANNUNCIATOR ALARM		COMPUTER ALARM		NOMINAL OPERATING INDICATION	CALIBRATION	
		HIGH	LOW	HIGH	LOW		* RANGE	UNITS
Core Flooding Tank Level 1023, 1024	CF-3	18	17	18 --		17.5	0-21	Ft. H_2O
Core Flooding Tank Pressure	CF-4	617	583			600	0-800	PSIG

CF-HV1A,B Automatically open when RCS pressure exceeds 750 PSIG

CF-HV1A,B Cannot be closed when RCS pressure exceeds 750 PSIG

CF-HV1A,B Position Alarms

(1) Valve not fully open and RCS pressure $\geq$ 750 PSIG
(2) Valve not fully closed and RCS pressure $\leq$ 650 PSIG

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X0407Z39

8.0 REACTOR BUILDING SPRAY SYSTEM DATA SHEET

SERVICE	INSTRUMENT NUMBER	ANNUNCIATOR ALARM		COMPUTER ALARM		NORMAL OPERATING INDICATION	CALIBRATION	
		HIGH	LOW	HIGH	LOW		RANGE	UNITS
Reactor Building Spray Flow	RBS-1	2400	1800			2000	0-3000	GPM
Reactor Building Spray Pump Discharge Pressure	RBS-2					250-350	0-400	PSIG
Reactor Building Pressure	RBS-5					0	-5 to +35	PSIG
Sodium Hydroxide Tank Level 1001, 1002	RBS-11	38.117	35.569		35.569	35	0-40	Ft.
	NaOH Isolation Valves (RBS-HV10A,B and RBS-HV14A,B) shut at 6.5 Feet in the NaOH Tank.							
Sodium Hydroxide Tank Temperature	RBS-12	85	50			70	0-200	°F
	Low Temperature Heater Interlock 55°F High Temperature Heater Interlock 80°F							
Sodium Hydroxide Tank Pressure	RBS-13					1	0-5	PSIG
Outboard Motor Bearing Temperature 1003, 1004	RBS-500			170		140	0-250	°F
Drive End Motor Bearing Temperature 1005, 1006	RBS-501			170		140	0-250	°F
Motor Stator Temperature 1001, 1002	RBS-502			266		212	0-300	°F
Pump Bearing Temperature-Drive End 1007, 1008	RBS-503			170		110	0-250	°F
Pump Bearing Temperature - Impeller End	RBS-504			170		110	0-250	°F

9.0 REACTOR BUILDING COOLING SYSTEM DATA SHEET

SERVICE	INSTRUMENT NUMBER	ANNUNCIATOR ALARM		COMPUTER ALARM		NORMAL OPERATING INDICATION	CALIBRATION	
		HIGH	LOW	HIGH	LOW		RANGE	UNITS
Cooling Unit Inlet/ Outlet Flow	RBC-1	50				0-500	0-3000	GPM

Alarm is high flow differential in/out of cooler.

10.0 CONTAINMENT COOLING WATER SYSTEM DATA SHEET

SERVICE	INSTRUMENT NUMBER	ANNUNCIATOR ALARM		COMPUTER ALARM		NORMAL OPERATING INDICATION	CALIBRATION	
		HIGH	LOW	HIGH	LOW		RANGE	UNITS
CRDH Outlet Temperature T021	CC-6			130		115	20-220	°F
CRD Cooling Water Flow F016	CC-7	Low Flow Interlock to CRD AC Breaker 195 GPM Low Flow Interlock to Start Standby Pump 195 GPM			195	203	0-300	GPH
CRDH Inlet Temperature T022	CC-8					105	0-200	°F
CCW Pressure to Inside RB Components	CC-10	Low Pressure Interlock to Start Standby Pump 40 PSIG				97 125	0-200	PSIG
CRD Cooling Water Surge Tank Level	CC-11	24	5			15	0-25	In. H_2O
CCW Flow to Inside RB Components F017	CC-12	Low Flow Interlock to HU-HV37A,B,C,D 2125 GPM		2389	2389	2492	0-3000	GPH
CCW Outlet Temperature T023, T024	CC-13					105	0-200	°F
CCW Filter Flow	CC-15					180	0-200	GPH
CCW Filter Differential Pressure	CC-16	25				5-25	0-30	PSI
CCW Pump Discharge Pressure	CC-17					65-140	0-300	PSIG
CCW Surge Tank Level	CC-20	115	70			75	0-120	In. H_2O
CCW Flow	CC-21	11,520	7740			8500	0-12000	GPH
CRDH Pump Discharge Pressure	CC-26					115	0-300	PSIG
RCP Seal Cooler CCW Outlet Temperature T035-T038	CC-30			120		117	0-700	°F

SERVICE	INSTRUMENT NUMBER	ANNUNCIATOR ALARM		COMPUTER ALARM		NORMAL OPERATING INDICATION	CALIBRATION	
		HIGH	LOW	HIGH	LOW		RANGE	UNITS
RH Cooler CCW Inlet Flow	CC-41	8250				7500	0-9000	GPH
Spent Fuel Cooling Heat Exchanger Outlet CCW Flow	CC-42	1815				1650	0-2000	GPH
CCW Flow to Outside NB Components	CC-43					1960-6970	0-7000	GPH
Outboard End Motor Bearing Temperature T052-T054	CC-500			170		140	0-250	°F
Drive End Motor Bearing Temperature T055-T057	CC-501			170		140	0-250	°F
Stator Temperature T049-T051	CC-502			266		212	0-300	°F
Pump Bearing Temperature-Drive End T058 - T060	CC-503			150		120	0-250	°F
Pump Bearing Temperature-Outboard End T061-T063	CC-504			150		140	0-250	°F

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11.0 CHEMICAL ADDITION AND BORON RECOVERY SYSTEM DATA SHEET

SERVICE	INSTRUMENT NUMBER	ANNUNCIATOR ALARM		COMPUTER ALARM		NORMAL OPERATING INDICATION	CALIBRATION	
		HIGH	LOW	HIGH	LOW		RANGE	UNITS
Deborating Demineralizer Differential Pressure	CA-2	11				5	0-30	PSI
Deborating Demineralizer Outlet Strainer Differential Pressure	CA-3	15				5	0-30	PSI
Distillate Storage Tank Level	CA-4	16.5	0.25			8	0-20	Ft. H_2O
	Low Level Interlock 0.25 Ft.							
Distillate Transfer Pump Discharge Pressure	CA-7					95-127	0-200	PSIG
Distillate Transfer Flow	CA-8					0-200	0-200	GPM
BC Bleed Transfer Flow	CA-10					0-35	0-100	GPM
BC Bleed Tank Level	CA-12	16.5	0.25			8	0-20	Ft. H_2O
	Low Level Interlock 0.25 Ft.							
BC Bleed Transfer Pump Discharge Pressure	CA-14					190	0-400	PSIG
BC Bleed Transfer Pump Recirculation Flow	CA-16					5-8	0-10	GPM
Hydrazine Pump Discharge Pressure	CA-76					100	0-200	PSIG
Lithium Hydroxide Pump Discharge Pressure	CA-80					100	0-200	PSIG
Boric Acid Flow	CA-83					0-50	0-50	GPM
Boric Acid Addition Filter Differential Pressure	CA-84	25				5	0-30	PSI
Boric Acid Pump Discharge Pressure	CA-85					80	0-160	PSIG

SERVICE	INSTRUMENT NUMBER	ANNUNCIATOR ALARM		COMPUTER ALARM		NORMAL OPERATING INDICATION	CALIBRATION	
		HIGH	LOW	HIGH	LOW		RANGE	UNITS
Boric Acid Addition Tank Level	CA-87		8			110	0-110	In. H_2O
	Low Level Interlock to de-energize heaters 8 Inches							
Boric Acid Addition Tank Temperature	CA-88	133	107			105-115	0-200	°F
	High Temperature Interlock 133°F Low Temperature Interlock 107°F							
Boric Acid Mix Tank Level	CA-89	68	10			0-80	0-80	In. H_2O
	Low Level Interlock to de-energize heaters 10 Inches							
Boric Acid Mix Tank Temperature	CA-90	133	107			107-115	0-200	°F
	High Temperature Interlock 133°F Low Temperature Interlock 107°F							
Concentrated Boric Acid Tank Level	CA-92	135	10			0-140	0-140	In. H_2O
	Low Level Interlock de-energize heaters 10 Inches							
Concentrated Boric Acid Storage Tank Temperature	CA-93	110	80			105-110	0-200	°F
	High Temperature Interlock 110°F Low Temperature Interlock 80°F							
Evaporator Distillate Test Tank Pump Discharge Pressure	CA-96					100	0-200	PSIG
Evaporator Distillate Test Tank Level	CA-98	145	7		10	0-150	In. H_2O	
	Low Level Interlock 7 In.							
Caustic Pump Discharge Pressure	CA-101					100	0-200	PSIG
MC Bleed Evaporator Demineralizer Outlet Strainer Differential Pressure	CA-102	15				5.5	0-30	PSI
Evaporator Distillate Demineralizer Differential Pressure	CA-103	11				5	0-30	PSI

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APPENDIX

SERVICE	INSTRUMENT NUMBER	ANNUNCIATOR ALARM		COMPUTER ALARM		NORMAL OPERATING INDICATION	CALIBRATION	
		HIGH	LOW	HIGH	LOW		RANGE	UNITS
Evaporator Distillate Demineralizer Outlet Strainer Differential Pressure	CA-104	15				5	0-30	PSI
RC Bleed Evaporator Demineralizer Differential Pressure	CA-105	11				5	0-30	PSI

12.0 SPENT FUEL COOLING SYSTEM DATA SHEET

SERVICE	INSTRUMENT NUMBER	ANNUNCIATOR ALARM		COMPUTER ALARM		NORMAL OPERATING INDICATION	CALIBRATION	
		HIGH	LOW	HIGH	LOW		RANGE	UNITS
SF Storage Pool Level	SFC-1	666 Ft. 6 In.	662 Ft. 8 In.			664 Ft.		Ft/In.
SF Storage Pool Purification Flow	SFC-2					200	0-250	GPH
SF Storage Pool Purification Filter Differential Pressure	SFC-3	25				5-25	0-30	PSI
SF Cooling Pump Discharge Pressure	SFC-4					100	0-200	PSIG
Borated Water Recirc. Pump Discharge Pressure	SFC-5					60	0-200	PSIG
SF Storage Pool Temperature	SFC-6	140				100	20-220	°F
SF Storage Pool Purif. Demin. Inlet Temperature T406	SFC-8			130		128	0-300	°F
Spent Fuel Coolant Flow F128	SFC-9				1300	1500-1650	0-4000	GPH
SF Purification Strainer Differential Pressure	SFC-10	10				5	0-30	PSI
SF Purification Demineralizer Differential Pressure	SFC-11	25				15	0-30	PSI
SF Coolant Pump Suction Strainer Differential Pressure	SFC-14	10				2-10	0-30	PSI
SF Storage Pool Skimmer Filter Differential Pressure	SFC-15	25				5-25	0-30	PSI

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SERVICE	INSTRUMENT NUMBER	ANNUNCIATOR ALARM		COMPUTER ALARM		NORMAL OPERATING INDICATION	CALIBRATION	
		HIGH	LOW	HIGH	LOW		RANGE	UNITS
SF Storage Pool Skimmer Pump Suction Strainer Differential Pressure	SFC-16	19			2-10		0-30	PSI
SF Storage Pool Skimmer Pump Discharge Pressure	SFC-17				65	0-160	PSIG	
Spent Fuel Cooling Pump Discharge Pressure	SFC-19				100		0-200	PSIG

13.0 WASTE DISPOSAL SYSTEM DATA SHEET

SERVICE	INSTRUMENT NUMBER	ANNUNCIATOR ALARM		COMPUTER ALARM		NORMAL OPERATING INDICATION	CALIBRATION	
		HIGH	LOW	HIGH	LOW		RANGE	UNITS
WD Hydrogen Percent A121	None Assigned					0	0-10	%
WD Oxygen Percent A122	None Assigned	2		2		0	0-5	%
WD H-O Analyzer Flow-F255	None Assigned		10		10	30	5-45	CFH
RB Normal Sump Tank Temperature - T441	WD-8			256		100	0-300	°F
RC Drain Tank Pressure	WD-9	5				0	0-100	PSIG
RC Drain Tank Level	WD-10	85	73			79	0-120	In. H_2O
	Low Level Interlock to Comp. Drain Pumps 73 In.							
Component Drain Pump Discharge Pressure	WD-12					45	0-200	PSIG
RC Drain Tank Temperature	WD-13	150				120	0-300	°F
RB Normal Sump Level	WD-14	4 Ft. 3 In.				Customer to Provide	0-6	Ft. H_2O
	Low Level Interlock to RB Sump Pumps 2 In.							
Component Drain Pump Discharge Header Pressure	WD-15					40	0-400	PSIG
Non-Tritiated Waste Holdup Tank Level	WD-16	125				70	0-140	In. H_2O
	Low Level Interlock to Non-Tritiated Waste Transfer Pump 8 In. Low Level Interlock to Spare Waste Transfer Pump 8 In.							
Tritiated Waste Holdup Tank Level	WD-17	125				70	0-140	In. H_2O
	Low Level Interlock to Tritiated Waste Transfer Pump 8 In. Low Level Interlock to Spare Waste Transfer Pump 8 In.							
Non-Tritiated Waste Transfer Pump Discharge Pressure	WD-19					160	0-300	PSIG

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SERVICE	INSTRUMENT NUMBER	ANNUNCIATOR ALARM		COMPUTER ALARM		NORMAL OPERATING INDICATION	CALIBRATION	
		HIGH	LOW	HIGH	LOW		RANGE	UNITS
Tritiated Waste Transfer Pump Discharge Pressure	WD-21					32	0-160	PSIG
Space Waste Transfer Pump Discharge Pressure	WD-23					180	0-300	PSIG
Non Tritiated Waste Header Discharge Pressure	WD-24					75	0-200	PSIG
Tritiated Waste Transfer Pump Discharge Pressure	WD-25					30	0-200	PSIG
Non-Tritiated Aux. Building Sump Tank Level	WD-26	75				40	0-80	In. H_2O
	Low Level Interlock to Sump Tank Pumps 7 In.							
Non-Tritiated Aux. Building Sump Tank Transfer Pump Discharge Pressure	WD-29					85	0-200	PSIG
Non-Tritiated Aux. Building Sump Tank Pump Discharge Pressure	WD-30 WD-31					80	0-160	PSIG
Tritiated Aux. Building Sump Tank Level	WD-32	55				40	0-60	In. H_2O
	Low Level Interlock to Sump Tank Pump 7 In.							
Tritiated Aux. Bldg. Sump Pump Discharge Pressure	WD-35					43	0-160	PSIG
Tritiated Aux. Bldg. Sump Pump Discharge Pressure	WD-36 WD-37					43	0-160	PSIG
Laundry and Hot Shower Drain Tank Level	WD-38	4 Ft. 2 In.				3	0-6	Ft. H_2O
	Low Level Interlock to Laundry and Hot Shower Drain Tank Pump 7 In.							
Laundry and Hot Shower Drain Tank Pump Discharge Pressure	WD-40					60	0-200	PSIG
Chemical Drain Tank Level	WD-41	32				20	0-40	In. H_2O
	Low Level Interlock to Chemical Drain Tank Pump 4 In.							
Chemical Drain Tank Pump Discharge Pressure	WD-43					63	0-200	PSIG

SERVICE	INSTRUMENT NUMBER	ANNUNCIATOR ALARM		COMPUTER ALARM		NORMAL OPERATING INDICATION	CALIBRATION	
		HIGH	LOW	HIGH	LOW		RANGE	UNITS
Plant Discharge Filter Differential Pressure	MD-44	20				5-10	0-30	PSI
Liquid Waste Discharge Flow	MD-45					0-50	0-100	GPM
Spent Resin Storage Tank Level	MD-47	93				75	0-100	in. H_2O
	Low Level Interlock to Spent Resin Transfer Pump and Spent Resin Liquid Sluicing Pump 7 in.							
Spent Resin Liquid Sluicing Pump Discharge Pressure	MD-50					80	0-160	PSIG
Spent Resin Liquid Sluicing Pump Discharge Flow	MD-51					50	0-70	GPM
Spent Resin Transfer Pump Discharge Pressure	MD-52					60	0-160	PSIG
Waste Evaporator Distillate Test Tank Level	MD-53	73	7			50	0-80	in. H_2O
	Low Level Interlock to Waste Evaporator Distillate Transfer Pump 7 in.							
Waste Evaporator Feed Tank Level	MD-54	68	7			40	0-80	in. H_2O
	Low Level Interlock to Waste Evaporator Feed Pump 7 in.							
Waste Evaporator Distillate Pump Discharge Pressure	MD-57					100	0-200	PSIG
Waste Evaporator Distillate Header Pressure	MD-59					10-90	0-200	PSIG
Waste Evaporator Distillate Test Tank Demineralizer Differential Pressure	MD-60	20				10	0-30	PSI
Waste Evaporator Distillate Test Tank Demineralizer Outlet Strainer Differential Pressure	MD-61	10				5	0-30	PSI
Tritiated Vent Header Pressure	MD-65	0.9	0.3			0	0-50	PSIG
	Controls to PV-66 0.4 PSIG							
Waste Gas Decay Tank Pressure	MD-68	87.5				0-85	0-100	PSIG

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SERVICE	INSTRUMENT NUMBER	ANNUNCIATOR ALARM		COMPUTER ALARM		NORMAL OPERATING INDICATION	CALIBRATION	
		HIGH	LOW	HIGH	LOW		RANGE	UNITS
Waste Gas Discharge Flow Control	WD-69					0-100	0-250	SCFH
Waste Gas Filter Differential Pressure	WD-73	12		--		<1	0-20	In. H_2O
Waste Gas Discharge Flow	WD-74					0-100	0-200	SCFH
WD Sump Pump Discharge Pressure	WD-82					25-50	0-100	PSIG
Aux. Waste Evaporator Distillate Test Tank Level	WD-83	**				0	0-72	In. H_2O
Low Level Interlock to Aux. Waste Evaporator Distillate Transfer Pumps ** In.								
Aux. Waste Evaporator Distillate Transfer Pump Outlet Pressure	RC-84					50	0-200	PSIG
H_2 Gas Compressor Inlet Pressure	RC-87	**	**			0	0-100	PSIG
Aux. Waste Evaporator Distillate Demineralizer Differential Pressure	WD-90	**				10	0-30	PSI
Aux. Waste Evaporator Strainer Differential Pressure	WD-91	**				0.5	0-30	PSI

** By Customer

14.0 BORON CONCENTRATION ANALYZER DATA SHEET

SERVICE	INSTRUMENT NUMBER	ANNUNCIATOR ALARM		COMPUTER ALARM		NORMAL OPERATING INDICATION	CALIBRATION	
		HIGH	LOW	HIGH	LOW		RANGE	UNITS
Boron Concentration	RIAE-46			2500	0	Variable	0-2500	PPM

NOTE: Alarms are initially set at the setpoints listed. They may be set to any value desired following instruction book procedures. Alarms are at boron concentration analyzer control console, not plant computer. (The above item is not a computer input.)

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15.0 FAILED FUEL DETECTION EQUIPMENT DATA SHEET

SERVICE	INSTRUMENT NUMBER	ANNUNCIATOR ALARM		CONVERTER ALARM		NORMAL OPERATING INDICATION	CALIBRATION	
		HIGH	LOW	HIGH	LOW		RANGE	UNITS
Recirculation Flow	NA		10	-- 20	2.4-36	GPM		
Radiation Level	NA	10^6*	*	Variable		10^1 - 10^6	CPM	

* High alarm set at 10^6 at the factory. It may be adjusted to the desired level following procedures in the instruction manual.

NOTE: Alarms are at the Failed Fuel Detection Equipment Control Console, not the plant annunciator.

16.0 CONTROL ROD DRIVE CONTROL SYSTEM DATA SHEET

SERVICE	INSTRUMENT READER	ANNUNCIATOR ALARM		COMPUTER ALARM		NORMAL OPERATING INDICATION	CALIBRATION	
		HIGH	LOW	HIGH	LOW		RANGE	UNITS
CRD Stator Temperature 1066-1165	NA			140	--	CRDCW Inlet Temp. +15 to 35°F	40-200	°F

Asymmetric Rod

Range: ±7 to ±120 inches
Repeatability: ±0.01 inches ± 2.5% setpoint (at calibration temperature)
±0.25 inches ± 2.5% setpoint (over temperature range of control)
Alarm Setpoint: 7 inches
Fault Setpoint: 9 inches

Out-Inhibit

2 Decade Per Minute - Source Range
3 Decade Per Minute - Intermediate Range

Feed and Bleed Control Outputs to ICS

GROUP	GROUP POSITION	ACTION
1-4	139 In. Withdraw (WD)	Contact Closure*
5	34.75 ± 2.25 In. WD	Contact Closure*
7	0-139 In. WD	0 to -5V Analog Signal

*Continuous feed and bleed enabled only if both contacts closed.

Automatic Group Sequencing

	GROUP	GROUP POSITION	ACTION
Withdrawal	1-4	139 In. WD	Enables Group 5
	5	104.25 ± 2.25 In. WD	Enables Group 6
	6	104.25 ± 2.25 In. WD	Enables Group 7
Inserting	7	34.75 ± 2.25 In. WD	Enables Group 6
	6	34.75 ± 2.25 In. WD	Enables Group 5

CRD Indicator Switches

In-Limit 0%	0.12 to 1.00 Inches above tripped position
	1.5 Inches above in-limit switch
Out-Limit 100%	139.75 to 140.25 Inches above tripped position
	1.5 Inches below out-limit switch
Zone Reference	(a) 34.75 ± 0.25 Inches - 25% WD (b) 69.50 ± 0.25 Inches - 50% WD (c) 104.25 ± 0.25 Inches - 75% WD

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17.0 INTEGRATED CONTROL SYSTEM DATA SHEET

SERVICE	LOGIC IDENT.	SETPOINT	UNITS
Load Limits			
A. Loss of Reactor Coolant Pump			
1. 4 RCP Running	UL.7.6	100	% Power
2. 3 RCP Running	UL.8.6	75	% Power
3. 2 RCP Running	UL.9.6	50	% Power
B. Loss of either main feedwater pump UL.8.3	70	% Power	
C. Asymmetric Rod Condition	UL.9.3	60	% Power
D. Low NPSH to main feedwater pumps	UL.11.3	65	% Power
E. Low NPSH to main feedwater pumps after runback to 65%	UL.12.3	40	% Power
Rate of Change Control			
A. Loads between 15 and 90% Power	UL.23.7	0.25 to 5	% Power/Minute
B. Above 90% Power			
1. Increase	UL.22.9	3	% Power/Minute
2. Decrease	UL.23.7	5	% Power/Minute
C. Limiting Conditions			
1. Loss of Reactor Coolant Pumps	UL.18.8	50	% Power/Minute
2. Loss of Feedwater Pump	UL.18.8	50	% Power/Minute
3. Loss of RCS Flow	UL.20.8	20	% Power/Minute
4. Low NPSH on Main Feedwater Pump	UL.18.8	50	% Power/Minute
5. Asymmetric Rod Condition	UL.19.8	30	% Power/Minute
6. Unit in Tracking	UL.20.8	20	% Power/Minute
7. Loss of External Load	UL.20.8	20	% Power/Minute
8. Turbine Trip	UL.20.8	20	% Power/Minute

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SERVICE	LOGIC IDENT.	SETPOINT	UNITS
Rod Withdrawal/Insertion	RC.19.8/19.9	±1.0	% Neutron Error
NOTE: +1% Neutron error exists when neutron power demand exceeds neutron power by 1%. Rod withdrawal/insertion continues until neutron error is less than 0.25%.			
CROSS LIMITS	FW.3.3	±5	% Neutron Error
Load Interlock for Starting Reactor Coolant Pumps	RC.16.5	22	% Power
Interlock to Prohibit Rod Withdrawal on CRD Runback Fault	RC.16.5	60	% Power
Low Main Feedwater Temperature Trip of Both Main Feedwater Pumps	FW.1.11 FW.2.13	340	°F
Low Superheat Temperature			
A. Feedwater Runback	FW.16.11/16.5	35	°F Superheat
B. Turbine Trip	FW.16.11/16.5	15	°F Superheat
C. Low Superheat Alarm		25	°F Superheat
OTSG Level			
A. Low Level Limit	FW.20.4/20.11	2	Feet
B. Natural Circulation Level	FW.19.5/19.12	4	Feet
Feedwater Valve Differential Pressure	FW.21.6	50	PSI
Boron Feed and Bleed Controller			
A. Enable Feed and Bleed on Group Withdrawal	BC.8.6	(Nominal Rod Position ±2.5) +10	In.
B. Terminate Feed and Bleed on Group Insertion	BC.8.5	(Nominal Rod Position ±2.5)	In.
C. Enable Feed and Bleed on Group Insertion	BC.8.6	(Nominal Rod Position ±2.5) -10	In.

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SERVICE	LOGIC IDENT.	SETPOINT	UNITS
Boron Feed and Bleed Controller (Cont'd)			
D. Terminate Feed and Bleed on Group Withdrawal	BC.8.5	(Nominal Rod Position ±2.5)	In.
E. Continuous Feed and Bleed Enable	BC.3.4	< 15	% Power

NOTE: (1) See Figure 1 for BTU Limits Setpoints

(2) See Figure 2 for ICS Boron Controller Transient and Long-Term Control Bands.

(3) In this section, Rod means control rod and Group means control rod group.

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