FINAL

SYSTEM DESCRIPTION
(INDEX NO. 50)

SAFETY FEATURES ACTUATION SYSTEM
(B&R Dwg. No. 3011, Rev. 7, Sheets 1 and 2)

JERSEY CENTRAL POWER & LIGHT COMPANY

THREE MILE ISLAND NUCLEAR STATION

UNIT NO. 2

Issue Date
October, 1977

Prepared by: A. D. Pullin

Burns and Roe, Inc.
700 Kinderkamack Road
Oradell, N.J.
07649

APPENDIX

TABLE OF CONTENTS

FOR

SAFETY FEATURES ACTUATION SYSTEM

SAFETY FEATURES ACTUATION SYSTEM

1.0 INTRODUCTION

1.1 System Functions

The function of the Safety Features Actuation System (SFAS) is to detect a loss-of-coolant accident (LOCA) and automatically actuate Engineered Safety Feature System and certain other supporting plant components to control the effects of a LOCA.

The SFAS system interfaces with the following systems (Drawing Numbers refer to B&R Flow Diagrams):

a.	Reactor Coolant, Make-up and Purification System	(Dwg. No. 2024)
b.	Chemical Addition System	(Dwg. No. 2025)
c.	Decay Heat Removal System	(Dwg. No. 2026)
d.	Radwaste Disposal, Reactor Coolant - Liquid System	(Dwg. No. 2027)
e.	Radwaste Disposal - Gas System	(Dwg. No. 2028)
f.	Intermediate Closed Cooling Water System	(Dwg. No. 2029)
g.	Nuclear Services Closed Cooling Water System	(Dwg. No. 2030)
h.	Reactor Building Penetrations - Air and Nitrogen Pressure System	(Dwg. No. 2032)
i.	Nuclear Services River Water System	(Dwg. No. 2033)
j.	Reactor Building Emergency Cooling System	(Dwg. No. 2033)
k.	Reactor Building Emergency Spray System	(Dwg. No. 2034)

l. Core Flooding System (Dwg. No. 2034)

m. Decay Heat Closed Cooling Water System (Dwg. No. 2035)

n. Nitrogen for Nuclear and Radwaste (Dwg. No. 2036)

o. Heating and Ventilation, Turbine and Control Bldg. Area (Dwg. No. 2040)

p. Reactor Bldg. Vent and Purge (Dwg. No. 2041)

q. Heating and Ventilation, Auxiliary Bldg. (Dwg. No. 2044)

r. Heating, Ventilation and Air Conditioning Control Bldg., Cable, Battery and Switchgear Rooms (Dwg. No. 2044)

s. Reactor Building Normal Cooling (Dwg. No. 2046)

t. Heating and Ventilation, Fuel Handling Bldg. (Dwg. No. 2343)

u. Reactor Building Penetrations Isolation Valve Seal Water System (Dwg. No. 2397)

v. Reactor Building Penetrations Forced Air Cooling System (Dwg. No. 2497)

w. Diesel Generators (Refer to B&R Electrical Elementary Dwg. 3073 Sheets 57, 59 and 60)

1.2 Summary Description of the System (Refer to B&R Dwg. No. 3011, Rev. 7, Sheets 1 and 2 and Dwg. 3091, Sheets 1 to 199)

The SFAS consists of three sections, which are reactor building spray actuation, reactor coolant safety injection (high and low pressure injection) actuation, and reactor building cooling and isolation actuation. Each section itself has two redundant actuations called Actuation A and Actuation B. The signal ultimately actuating each group of equipment in each section is called an ES Actuation

Signal and appears at each actuated piece of equipment on its respective B&R system flow diagrams.

The reactor building spray actuation section has six pressure switches that measure reactor building pressure. The pressure switches are located in the Fuel Handling and Auxiliary Buildings and are protected from internal missiles. The three sensing lines for the pressure switches pass through penetrations in the reactor building. Each sensing line has a manually operated isolation valve with indicating lights on Containment Isolation Panel 15. Each isolation valve has an alarm on Engineered Safety Features Panel 13 which annunciates when its respective valve is closed. All six pressure switches are set to actuate when the reactor building pressure rises to 30 psig. Three of the pressure switches are grouped for Actuation A and three are grouped for Actuation B. Each group has its three pressure switches electrically connected in a 2/3 logic matrix to the respective spray pump motor starting circuit. When 2 out of 3 pressure switches for Actuation A or B have actuated, the respective reactor building spray pump BS-P-1A or 1B is automatically started. The discharge valves for the reactor building spray pumps are actuated by the reactor building cooling and isolation actuation when the reactor building pressure reaches 4 psig. Refer to the Reactor Building Emergency Spray System Description Index No. 28A. Power for Reactor Building Spray Actuation and test is provided by the 125V DC Distribution Panels (Actuation A from DCC-1A & Actuation B from DCC-2A).

A manual block valve to isolate the line from the Reactor Building, a test switch, solenoid valve and a temporary "Test Air" connection are provided for each of the six pressure switches to test and calibrate each switch. The manual block valves are located inside locked cabinets (Racks 472,455 & 467) and are not instrumented to indicate

valve position. Administrative control will assure that the valves are in the OPEN position except when their respective pressure switches are being tested or calibrated.

The Reactor Coolant Safety Injection Actuation section has three pressure transmitters that measure reactor coolant pressure and are arranged in three channels. The output signal of each pressure transmitter is sent to a buffer amplifier. Each amplified signal is sent to two bistables, a trip bistable and a bypass bistable. Each bistable has two output signals. One output signal is for Actuation A and one for Actuation B. Power for safety injection channels 1, 2, & 3 is provided by the 120V vital BUSSES 2-1V, 2-2V, and 2-3V respectively for Actuation A and B.

The reactor coolant trip bistables are arranged to change state and de-energize the A and B channel output relays when the reactor coolant pressure is at or below 1600 psig. Each channel has the same number of output relays, and each relay has multiple sets of contacts. The channel output relays are located in the respective channel compartment of the A and B Actuation relay cabinets. Two sets of contacts of one output relay in each channel are wired to form a 2-out-of-3 matrix and are connected to the starting or energizing circuit of an individual piece of equipment to be actuated by an ES signal. When 2 of the 3 channels are tripped, the 2/3 logic is completed through the connected arrangement of channel output relay contacts and each group of equipment listed in Table 1 is automatically actuated.

The reactor coolant bypass bistables are set to change state at a reactor coolant pressure of 1820 psig. The

logic of the trip and bypass bistables allows the reactor coolant safety injection actuation to be bypassed during normal plant shutdown. This is accomplished by depressing the reactor coolant bypass push button switch in each Actuation channel when the reactor coolant pressure is between 1820 and 1600 psig. During plant start-up, when the reactor coolant pressure is between 1600 and 1820 psig, bypass reset push buttons are used to reset each Actuation channel. The trip bistable must have changed state at 1600 psig prior to manual or automatic bypass reset, otherwise trip actuation will occur.

Automatic trip protection will occur at 1820 psig when the bypass bistable changes state.

The trip bistables and bypass bistables are located in three bistable cabinets in the cable room of the control building.

Pressure test modules are provided to test the function of the analog trip logic circuitry of each channel separately. The reactor coolant pressure test modules are used to simulate a reactor coolant pressure transmitter signal to the buffer amplifiers in order to test the buffer amplifiers and bistables. A bistable trip test device is used to test the reactor coolant trip bistable trip contacts and the logic circuitry up to and including the channel output relays for Actuation A and B. The reactor coolant safety injection auto actuation 2/3 matrix group test devices, used in conjunction with the TS4 channel selector switch, are used to test the automatic actuation of each equipment group separately in Actuation A or B by simulating a tripped condition to the channel output relays for all three possible 2-out-of-3 channel combinations.

The reactor coolant safety injection manual actuation and test devices are used to test the manual trip actuation of each group of equipment individually in Actuation A or B by bypassing the logic circuitry including the channel output relays. Power for the safety injection test and manual actuation circuits is provided by 125V DC Distribution Panel DCC-1A and DCC-2A for Actuation A and B respectively.

Manual actuation actuates all three groups of equipment simultaneously in Actuation A or B.

The reactor building cooling and isolation actuation section has six pressure switches that measure the reactor building pressure. These are arranged in two groups of three channels for both Actuation A and B. These pressure switches are connected to the same sensing lines as the pressure switches for the reactor building spray actuation section and are located with these pressure switches also. All six pressure switches are set to actuate when the reactor building pressure rises to 4 psig. The output signal for each pressure switch causes its respective channel output relays to be de-energized to actuate the reactor building cooling and isolation Actuation A and B equipment listed in Table 2, as well as reactor coolant safety injection equipment listed in Table 1. Power for reactor building isolation and cooling channels 1, 2, & 3 is provided by the 120V vital BUSSES 2-1V, 2-2V, & 2-3V respectively for Actuation A & B. A manual block valve to isolate the line from the Reactor Building, a test switch, a solenoid valve and a temporary "Test Air" connections are provided for each of the six R.B. Pressure Switches (BS-PS-3259,60,61,BS-PS-3987,88 & 89) to test and calibrate each switch. The manual block valves are located inside locked cabinets (Racks 472,455 & 467) and are not instru-

mented to indicate valve position. Administrative control will assure that the valves are in the OPEN position except when their respective pressure switches are being tested or calibrated.

A defeat pushbutton in each channel of reactor building cooling and isolation Actuation A or B is provided to defeat a channel only after actuation has occurred. This will allow the actuated equipment to be returned to the condition they were in prior to being actuated. A defeat reset pushbutton is provided to manually reset a defeat signal in order to restore trip activiation if building pressure is still $\geq$4 psig. When building pressure drops below 4 psig, the pressure switch and logic circuit reset automatically. The output relays must be reset manually, using the Channel Reset push button.

Reactor building cooling and isolation test devices are provided to test the function of the trip logic circuitry of each channel. The auto actuation 2/3 matrix group test devices function in the reactor building cooling and isolation section the same way as in the reactor coolant safety injection section. The manual actuation and test devices also function the same and are powered from the same 125V DC Distribution Panel as in the reactor coolant safety injection section, but cause actuation of reactor building cooling and isolation equipment as well as reactor coolant safety injection equipment.

All manual actuation devices are located in the control room on Auxiliary Systems Control Panel 3. Test devices are located on Auxiliary Systems Control Panel 3 and Engineered Safety Features Panel 13. Status lights for each piece of equipment actuated by the SFAS are on Engineered Safety Features Panel 13. Lights, alarms and computer inputs are provided in each channel of all three actuation sections of the SFAS to provide indication of the status of each channel.

197 058

There are two 2/3 logic actuation relay cabinets which are located in the cable room of the control building. One cabinet is for Actuation A and one is for Actuation B. Each cabinet is separated into four compartments for channels 1, 2, 3 and manual actuation, with fire barriers. Wiring between compartments is accomplished through metal clad wire ways.

When groups of equipment containing valves designated as critical service are test actuated, the critical service test reset switch ES, on Engineers Safety Features Panel 13, are used to return the valves to their normal operating positions as indicated by action of their limit switches. This provides verification, by light indication, that these valves operate and return to their normal conditons after clearing the Engineered Safety (ES) signal. This minimizes the abnormal condition of these valves during the test period.

1.3 System Design Requirements

Channels 1, 2 and 3 for Actuation A and B in each actuation section are powered separately from the red, green and yellow vital power supplies respectively (2-1V, 2-2V, and 2-3V). In the reactor coolant safety injection actuation and reactor building cooling and isolation actuation sections, loss of power to any channel results in a channel trip which is its fail safe position. Since each of the channels is powered from a separate supply, loss of power to one channel will not result in equipment actuation. Tripping of another channel while one channel is without power will cause equipment actuation because the 2-out-of-3 logic is satisfied. Loss of power to a reactor building spray actuation pressure switch does not result in a channel trip. Since channels 1, 2, and 3 for each actuation section are powered from the same source, loss of power disables the actuation section.

197 059

Lights and alarms are DC powered or alternatively have vital AC power supply so that each channel status is indicated for all conditions.

Two different power sources from two DC buses (DCC-1A and DCC-2A) provide power for manual and test circuits.

Means are provided for automatic actuation of the reactor coolant safety injection, reactor building cooling and isolation, and reactor building spray sections of the SFAS. Means of manual actuation are also provided for the reactor coolant emergency injection and reactor building cooling and isolation sections from the control room. Manual actuation through the SFAS is not provided for the reactor building spray section because there are only two pumps requiring actuation. Therefore, manual starting of the reactor building spray pumps is accomplished by using their respective control switches in the control room. Actuation A or B in each of the three actuation sections of the SFAS requires 2-out-of-3 pressure sensing devices to be actuated in order to cause equipment actuation. This is to prevent equipment actuation from a power loss to only one channel. The failure of a single component or a faulty actuation signal in one channel will not prevent the system from fulfilling its actuation functions nor will it initiate unnecessary action of the system.

The SFAS seismic design classification is Class I. The seismic Class I equipment is designed for Zone I loads.

The 2/3 logic actuation relays are separated in Actuation A and Actuation B cabinets. Lights are provided on both cabinets to indicate the status of each channel.

The SFAS is designed to allow testing of each component of a channel by testing the component individually, by testing sections of a channel, or by testing the entire channel.

Testing devices are also designed to allow auto actuation of each group of equipment individually in the reactor coolant safety injection and reactor building cooling and isolation actuation sections. Auto actuation can be tested by all three combinations of 2-out-of-3 channels. Other testing devices are also designed to test manual actuation of each group of equipment individually.

There are three groups of equipment in each actuation section for Actuation A and three groups for Actuation B. This arrangment is made so that testing of the equipment actuation will not interfere with the normal operation of the plant. The SFAS is a redundant system in that it has Actuation A and Actuation B. Each channel is independent and is electrically and physically separated from the other channels.

2.0 DETAILED DESCRIPTION OF THE SYSTEM

2.1 Components

2.1.1 Reactor Coolant Pressure Transmitters RC-3A-PT3, RC-3B-PT3 and RC-3A-PT4

The three reactor coolant pressure transmitters are located inside the reactor building. They are Foxboro type E-11 GH force balance pressure transmitters with a range from 0 to 2500 psig and an electrical output of 10 to 50 ma DC. The transmitters are designed to withstand the reactor building atmosphere conditions following a LOCA.

197 061

2.1.2 Reactor Building Pressure Switches for Reactor Building Cooling and Isolation Actuation; BS-PS-3259, 3260, 3261, 3987, 3988 and 3989

For a description of these pressure switches, refer to Table 3 (Instrumentation and Controls) in the Reactor Building Emergency Spray System Description, Index No. 28A.

2.1.3 Reactor Building Pressure Switches for Reactor Building Spray Actuation; BS-PS-3253, 3254, 3255, 3256, 3257, 3258

For a description of these pressure switches, refer to Table 3 (Instrumentation and Controls) in the Reactor Building Emergency Spray System Description, Index No. 28A.

2.1.4 Reactor Coolant Trip Bistables BT1, BT2, BT3 and Reactor Coolant Bypass Bistables BT4, BT5, BT6

The reactor coolant trip and bypass bistables have two outputs each. One output is for Actuation A and one for Actuation B. These bistables are set at the minimum dead-band.

The bistables receive an electrical signal proportional to the reactor coolant pressure and are set to change state at a selected pressure.

The bypass bistables are set to change state when the reactor coolant has decreased to 1820 psig. The trip bistables are set for 1600 psig. The bistables reset automatically.

2.2 Instruments, Controls, Alarms and Protective Devices

2.2.1 Instrumentation and Controls

Major system instrumentation and controls are listed in Table 3.

197 062

2.2.2 Alarms and Computer Inputs

Panel mounted annunciators and computer inputs are listed in Table 4.

2.2.3 Protective Devices

There are no devices in the SFAS that are provided for the specific purpose of protecting the system itself.

3.0 PRINCIPAL MODES OF OPERATION

3.1 Startup

Before normal plant startup commences, the three manually operated isolation valves, in each of the three pressure sensing lines for the reactor building spray actuation pressure switches and the reactor building cooling and isolation actuation pressure switches, must be open.

As the plant is started up and the reactor coolant pressure reaches 1600 psig, the reactor coolant trip bistables reset. The bypass bistable manual reset pushbuttons PB2/RC1A, RC2A, RC3A, and PB2/RC1B, RC2B, RC3B on the Auxiliaries Systems Control Panel 3 should be actuated to obtain reactor coolant safety injection protection. If these pushbuttons are not utilized, the bistables BT4, BT5 and BT6 will automatically reset when the reactor coolant pressure rises above 1820 psig.

3.2 Normal Operation

During normal plant operation, the SFAS is in a passive mode. It detects a LOCA by sensing a decrease in reactor coolant pressure and/or increase in reactor building pressure which result when a LOCA occurs. The reactor coolant emergency injection actuated equipment listed in Table 1 is automati-

cally actuated by the reactor coolant emergency injection actuation section when the reactor coolant pressure is decreased to 1600 psig. When the reactor building pressure increases to 4 psig, the reactor building cooling and isolation actuation section automatically actuates the reactor building cooling and isolation equipment listed in Table 2. It also automatically actuates the reactor coolant emergency injection actuated equipment listed in Table 1 if it has not been actuated by a low reactor coolant pressure occurrence. The reactor building spray pumps are automatically actuated by the reactor building spray actuation section when the reactor building pressure increases to 30 psig.

3.3 Shutdown

During normal plant shutdown, the reactor coolant pressure decreases as it is cooled. When the reactor coolant pressure decreases to 1820 psig, the reactor coolant low pressure trip bypass permit light and cirucit will be actuated in each channel for reactor coolant safety injection Actuation A and B. The reactor coolant safety injection manual bypass pushbuttons PB2/RC1A, RC2A, RC3A, and PB2/RC1B, RC2B, RC3B must be actuated after the permit light and circuit are actuated, but before the reactor coolant pressure has decreased to 1600 psig. This action is required to prevent unnecessary actuation of the reactor coolant safety injection equipment during shutdown. An alarm on Control Panel 13 set at 1650 psig annunciates if the bypass has not been actuated.

The reactor building spray actuation and reactor building cooling and isolation sections maintain their passive mode of operation and provide continuous protection during and after shutdown.

3.4 Special or Infrequent Operation

Manual testing as discussed in Section 1.2 is provided for on-line-testing to prove operability and to demonstrate reliability.

3.5 Emergency

3.5.1 Manual Actuation by the SFAS during a LOCA

If a LOCA occurs and the SFAS has not automatically actuated the emergency equipment, manual actuation by the SFAS is available at all times and the manual actuation pushbuttons on the Auxiliaries Systems Control Panel 3 are utilized to actuate the emergency equipment.

4.0 HAZARDS AND PRECAUTION

The primary safety precaution to be observed in the operation of the SFAS is to make certain that all manually operated isolation valves, in the sensing lines for the reactor building pressure switches in the reactor building spray section and the reactor building cooling and isolation section, are open during plant operation.

TABLE I

REACTOR COOLANT SAFETY INJECTION (HP AND LP INJECTION) ACTUATED EQUIPMENT

ACTUATION A

GROUP 1	Group 2	Group 3
DC-P-1A	DH-V4A	DH-P-1A
DC-V96A	DH-V5A	MU-V16A
DF-X-1A	DH-V8A	MU-V16B
MU-P-1A	DH-V102A	MU-V36 (Critical Services Valve)
NR-P-1A	MU-P-1B	NR-P-1B
NS-P-1A	NR-V9A	NR-V42A
G2-12	NR-V40A	NS-V84B
T-1E-2E-2	NS-P-1C	Bus 2-1E (Auto Loading)
T3E-4E-2	T12E-22E-2	T31E-41E-2
T11E-21E-2		

197 066

TABLE I (Cont.)

REACTOR COOLANT SAFETY INJECTION (HP AND LP INJECTION) ACTUATED EQUIPMENT

ACTUATION B

Group 1	Group	Group 3
DC-P-1B	DH-V4B	DH-P-1B
DC-V96B	DH-V5B	MU-V16C
DF-X-1B	DH-V8B	MU-V16D
MU-P-1B	DH-V102B	MU-V37- (Critical Services Valve)
NR-P-1D	MU-P-1C	NR-P-1C
NS-P-1B	NR-V9B	NR-V42B
Bus 2-2E (Auto loading)	NR-V40B	NS-V32, NS-V67 (Critical Services Valves)
T2E-1E-2	NS-P-1C	
T4E-3E-2	T22E-12E-2	NS-V83A
T21E-11E-2		NS-V83B
		NS-V84A
		NS-V215
		NS-V216
		T41E-31E-2

197 067

TABLE 2

REACTOR BUILDING COOLING AND ISOLATION ACTUATED EQUIPMENT

Actuation A

Group 1	Group 2	Group 3
AH-V81	AH-E-4A	AH-C-8A
AH-V101	AH-E-11A	AH-E-11B
AH-V102	AH-E-25	AH-E-11C
AH-V105	AH-R-5244	AH-E-12A
AH-V107	AH-V125A	AH-E-12B
CF-V116	BS-V1A	AH-E-19A
CF-V144	BS-V4A	AH-E-19B
DC-V114	CA-V2	AH-P-1A
DH-V3	CA-V4A	AH-V1A
NM-V52	CA-V5B	AH-V1B
NR-V51A	CA-V9	AH-V4A
RB-Z-1A	CA-V10	AH-V4B
RR-V2A	DH-V3	AH-V5
RR-V2B	RB-Z-1B	AH-V60
RR-V5A	RR-P-1B	AH-V62
RR-V5B	RR-V25C	AH-V72
RR-V5C	WDG-V6	AH-V74
SV-V55	WDG-V199	IC-P-1A
WDL-V1095	WDG-V1126	IC-V2
	WDL-P-2A	IC-V5
	WDL-V22	MU-V2A } Critical
	WDL-V270	MU-V2B } Service
		MU-V18 } Valves
		MU-V377
		NR-P-2A
		NS-V72 } Critical
		NS-V81 } Serv. Vlvs
		RR-P-1A
		RR-V25A
		RR-V25B
		RR-V25C

197 068

TABLE 2 (Cont.)

REACTOR BUILDING COOLING AND ISOLATION ACTUATED EQUIPMENT

Actuation B

Group 1	Group 2	Group 3
AH-E-11D	AH-D-4073	AH-C-8B
AH-V80	AH-E-4B	AH-E-11E
AH-V103	AH-E-5	AH-E-12A
AH-V104	AH-E-11C	AH-E-12B
AH-V106	AH-EP-5246B	AH-E-19A
AH-V108	AH-V125B	AH-E-19B
CF-V115	BS-V1B	AH-P-1B
DC-V103	BS-V4B	AH-V2A
DC-V115	CA-V1	AH-V2B
DH-V2	CA-V3	AH-V3A
NM-V104	CA-V4B	AH-V3B
NR-V51B	CA-V6	AH-V6
RR-V2C	CA-V8	AH-V61
RR-V2D	RR-P-1D	AH-V63
RR-V6C	RR-V25C-S2	AH-V71
RR-V6D	WDG-V2	IC-P-1B
RR-V6E	WDL-P-2A	IC-V3 (Critical Service Valves)
SV-V54	WDL-P-2B	IC-V4 (Critical Service Valves)
WDL-V1092	WDL-V271	MU-V2B (Critical Service Valves)
	WDL-V1125	MU-V18 (Critical Service Valves)
		MU-V25 (Critical Service Valves)
		MU-V376 (Critical Service Valves)
		NR-P-2B
		NS-V100 (Critical Service Valve)
		RR-P-1C
		RR-V25D
		RR-V25E

197 069

TABLE 3

INSTRUMENTATION AND CONTROLS

Identification	Description	Function	Location	Type	Input Range	Output Range	Setpoint
TPS-3253,3254, 3255,3256,3257 & 3258	Test Switch	Energizes the solenoid valve in the pressure sensing line to reactor building pressure switch BS-PS-3253, 3254, 3255,3256,3257, 3258 for building spray pump BS-P-1A/ 1B in order to calibrate and test the pressure switch with a temporary air test connection.	Engineered Safety Features Panel 13	Pushbutton	N/A	N/A	N/A
TPS-3259,3260 & 3261	Test Switch	Energizes the solenoid valve in the pressure sensing line to reactor building pressure switch BS-PS-3259, 3260, 3261 for building cooling and isolation actuation A,B for channels 1,2, and 3 in order to calibrate and test the pressure switch with a temporary air test connection.	Bistable Cabinets A/B	Pushbutton	N/A	N/A	N/A
PB1/RCA,RCB	Switch	Provides manual actuation of all reactor coolant safety injection actuated equipment for actuation A,B or test actuation of any group of equipment for actuation A,B.	Auxiliaries Systems Control Panel 3	Pushbutton	N/A	N/A	N/A

TABLE 3 (Continued)

INSTRUMENTATION AND CONTROLS

Identification	Description	Function	Location	Type	Input Range	Output Range	Setpoint
PB1/RBA/RBB	Switch	Provides manual actuation of all reactor building cooling and isolation actuated equipment for actuation A,B or test actuation of any group of equipment for actuation A,B. (Actuation of all reactor building cooling and isolation actuated equipment includes reactor coolant safety injection equipment).	Auxiliaries Systems Control Panel 3	Pushbutton	N/A	N/A	N/A
PB2,PB3,PB4/ RCA and PB2, PB3, PB4/RCB	Switch	Provides a means of testing the manual actuation of a selected group or groups during test of reactor coolant safety injection actuation A,B.	Auxiliaries Systems Control Panel 3	Pushbutton	N/A	N/A	N/A
PB2,PB3,PB4/ RBA and PB2, PB3, PB4/RBB	Switch	Provides a means of testing the manual actuation of a selected group or groups during test of reactor building cooling and isolation actuation A and B.	Auxiliaries Systems Control Panel 3	Pushbutton	N/A	N/A	N/A
PB8/RCA,RCB	Switch	Provides a means of energizing the holding coils of groups 1,2,3 of the reactor coolant safety injection A,B equipment and the reactor building cooling and isolation A,B actuated equipment during test for actuation A,B.	Auxiliaries Systems Control Panel 3	Pushbutton	N/A	N/A	N/A

TABLE 3 (Continued)

INSTRUMENTATION AND CONTROLS

Identification	Description	Function	Location	Type	Input Range	Output Range	Setpoint
TS4/RCA,RCB	Selector Switch	Provides a means of lining up the auto actuation 2/3 matrix test to test the actuation of group 1,2,3 of the reactor coolant safety injection A,B equipment by causing actuation of each group with all three possible 2/3 matrices using test switches TS1, TS2, TS3/RCA/RCB.	Engineered Safety Features Panel 13	Manual Selector	N/A	N/A	N/A
TS1, TS2, TS3/RCA,RCB	Switch	Provides a means of testing the auto actuation of group 1,2,3 of the reactor coolant safety injection A,B equipment by causing actuation of the group.	Engineered Safety Features Panel 13	Pushbutton	N/A	N/A	N/A
TS4/RBA,RBB	Selector Switch	Provides a means of lining up the auto actuation 2/3 matrix test to test the actuation of group 1,2,3 of the reactor building cooling and isolation A,B equipment by causing actuation of each group with all three possible 2/3 matrices using test switches TS1, TS2, TS3/RBA,RBB.	Engineered Safety Features Panel 13	Manual Selector	N/A	N/A	N/A

TABLE 3 (Continued)

INSTRUMENTATION AND CONTROLS

Identification	Description	Function	Location	Type	Input Range	Output Range	Setpoint
TS1, TS2, TS3 RBA,RBB	Switch	Provides a means of testing the actuation of the group 1,2,3 of the reactor building cooling and isolation A,B equipment by causing actuation of the group (This test does not cause actuation of the reactor coolant safety injection equipment as occurs during test or manual actuation with switches PB1/RBA, RBB).	Engineered Safety Features Panel 13	Selector Switch	N/A	N/A	N/A
PB1/RC1A, RC2A, RC3A and PB1/ RC1B, RC2B, RC3B	Switch	Provides a means of manually bypassing the reactor coolant low pressure trip during shutdown between 1820 and 1600 psig to prevent reactor coolant safety injection A and B when the reactor coolant pressure decreases to 1600 psig.	Auxiliaries Systems Control Panel 3	Pushbutton	N/A	N/A	1820 psig
PB2/RC1A, RC2A, RC3A, and PB2/ RC1B, RC2B, RC3B	Switch	Provides a means of manually resetting the reactor coolant low pressure trip during start-up above 1600 psig to obtain trip protection between 1600 and 1820 psig.	Auxiliaries Systems Control Panel 3	Pushbutton	N/A	N/A	1600 psig

TABLE 3 (Continued)

INSTRUMENTATION AND CONTROLS

Identification	Description	Function	Location	Type	Input Range	Output Range	Setpoint
PB1/RB1A, RB2A RB3A and PB2/ RB1B, RB2B, RB3B	Switch	Provides a means of manually defeating a reactor building cooling and isolation actuation signal after actuation has occurred to allow the actuated equipment to be returned to their operating condition prior to being actuated.	Auxiliaries Systems Control Panel 3	Pushbutton	N/A	N/A	N/A
PB2/RB1A, RB2A, RB3A and PB2/ RB1B, RB2B, RB3B	Switch	Provides a means of manually resetting a defeat actuation signal to all reactor building cooling and isolation actuated equipment in order to restore trip protection.	Auxiliaries Systems Control Panel 3	Pushbutton	N/A	N/A	N/A
Reactor Coolant Pressure Test Units (3 Units) C124, C125, C126	Pressure Signal Simulator	Provides a means of simulating any reactor coolant pressure to test the output of the buffer amplifier and bistables in each channel	Bistable Cabinets No. 124, 125, 126	Manual Dial	Varied Manually	0-+10VDC	N/A
Reactor Coolant Bistable Trip Test Switch (3 switches) C124,C125, C126	Switch	Provides a means of testing each of the trip bistables to emit a trip actuation signal.	Bistable Cabinets No. 124,125,126	Key Switch	N/A	N/A	N/A

197 074

TABLE 3 (Continued)

INSTRUMENTATION AND CONTROLS

Identification	Description	Function	Location	Type	Input Range	Output Range	Setpoint
Critical service valve switches	Switch	By being held in the reset position it allows critical service valves to automatically return to their normally open position after being closed by test actuation.	Engineered Safety Features Panel 13	Normal-Reset with Spring Return to Normal	N/A	N/A	N/A
YM-FHS-4330	Test Reset Switch	Test reset switch for RB Isol. "A" Group 3 IC-V2, IC-V5, MU-V2A, MU-V2B, MU-V377, NS-V72 & NS-V81.					
YM-FHS-4331	Test Reset Switch	Test reset switch for RB Isol. "B" Group 3 IC-V3, IC-V4, MU-V376, MU-V18, MU-V25 & NS-V100.					
YM-FHS-4332	Test Reset Switch	Test reset switch for SI Act. "B" Group 3 MU-V37, NS-V32 & NS-V67.					
YM-FHS-4377	Test Reset Switch	Test reset switch for SI Act. "A" Group 3 MU-V36.					

TABLE 4

PANEL MOUNTED ANNUNCIATORS AND COMPUTER INPUT LISTING

PANEL MOUNTED ANNUNCIATORS:

Identification	Measured Variable, units	Alarm Setpoints High	Alarm Setpoints Low	Input Source	Variable Range	Panel Name and Number
BS-KA-3839,3840, 3841,3842	Each of the four isolation valves closed in the reactor building pressure sensing lines	Valve closed		Closed position limit switches of 4 valves	open/closed	Engineered Safety Features Panel 13
A2, A8	Any of the reactor building spray actuation A/B pressure switches BS-PS-3253,3254,3255/3256,3257, 3258 closed	30 psig	N/A	pressure BS-PS-3253,3254, 3255/3256,3257 3258	0-100 psig	Panel 13
A2, A8	Reactor coolant emergency injection channel 1,2,3 tripped for actuation A/B	N/A	N/A	reactor coolant safety injection channel logic trip signal.	logic incomplete/ logic complete	Panel 13
A2, A8	Reactor building cooling and isoloation channel 1,2,3 tripped for actuation A/B.	N/A	N/A	reactor building cooling and isolation channel logic trip signal.	logic incomplete/ logic complete	Panel 13
A3	Safety Injection not bypassed Ann. A.	N/A	1650 psig	RC-PS-7360	500-3000 psig	Panel 13
A9	Safety Injection not bypassed Ann. B.	N/A	1650 psig	PC-PS-7361	500-300 psig	Panel 13

TABLE 4 (Continued)

PANEL MOUNTED ANNUNCIATORS AND COMPUTER INPUT LISTING

COMPUTER INPUTS:

Identification	Measured Variable, units	Alarm Setpoints High	Alarm Setpoints Low	Input Source	Variable Range
"A"-2836,2837,2838 "B"-3281,3264,3265	Reactor building spray pressure switches A/B actuated.	30 psig	N/A	Pressure switches BS-PS-3253,3254,3255/ 3256,3257,3258	0-100 psig
2839,3050	Reactor building spray 2/3 logic complete actuation A/B.	N/A	N/A	2 out of 3 channel output relays for actuation A/B.	energized/ deenergized
"A"-2821,2822,2823 "B"-2846,2847,2848	Reactor coolant emergency injection actuation A/B bypass permitted in channel 1,2,3.	N/A	1820 psig	Reactor coolant bypass bistable BT4, BT5, BT3	not triggered/ triggered
"A"-3161,3162,3163 "B"-3164,3165,3166	Reactor coolant pressure below 1600 psig in channel 1,2,3 for actuation A/B.	N/A	1600 psig	reactor coolant trip bistable BT1,BT2,BT3	not triggered/ triggered
"A"-2815,2816,2817 "B"-2840,2841,2842	Reactor coolant emergency injection manual actuation or test of equipment group 1,2,3 for actuation A/B.	N/A	N/A	manual actuation and test logic relay	deenergized/ energized
"A"-2818,2819,2820 "B"-2843,2844,2845	Reactor coolant emergency injection 2/3 logic complete in equipment group 1,2,3 for actuation A/B.	N/A	N/A	2 out of 3 channel output relays for actuaction A/B.	energized/ deenergized
"A"-2833,2834,2835 "B"-3278,3279,3280	Reactor building cooling and isolation pressure switches A/B actuated.	4 psig	N/A	pressure switches BS-PS-3259,3260,3261, BS-PS-3987,3988,3989	unactuated/ actuated

TABLE 4 (Continued)

PANEL MOUNTED ANNUNCIATORS AND COMPUTER INPUT LISTING

COMPUTER INPUTS:

Identification	Measured Variable, units	Alarm Setpoints High	Alarm Setpoints Low	Input Source	Variable Range
"A"-2824,2825,2826 "B"-2849,2850,2851	Reactor building cooling and isolation manual actuation or test of equipment group 1,2,3 for actuation	N/A	N/A	manual actuation and test logic relay	deenergized/ energized
"A"-2827,2828,2829 "B"-2852,2853,2854	Reactor building cooling and isolation 2/3 logic complete in equipment group 1,2,3 for actuation A/B.	N/A	N/A	2 out of 3 channel output relays for actuation A/B.	energized/ deenergized
"A"- 2830,2831,2832 "B"-3047,3048,3049	Reactor building cooling and isolation defeated for equipment group 1,2,3 in actuation A/B.	N/A	N/A	Relays 43X and 43Y for channels 1,2,3 (Actuation A and B).	energized/ deenergized

TMI DOCUMENTS

DOCUMENT NO: TM-C3r 1

COPY MADE ON 5/8/79 OF DOCUMENT PROVIDED BY METROPOLITAN EDISON COMPANY.

Wilda R. Mullinix, NRC

7906140392

197 048