

T 11.0 LOSS OF FUNCTION DIAGRAMS

A. Purpose

Loss of Function Diagrams (LFDs) provide a means for evaluating the affects of the loss of one or more instrument channels on the capability of the associated instrument logic to perform its intended safety function. In fulfilling this purpose, the LFDs provide the following:

- The number of channels associated with a given instrument function.
- The configuration of the instrument channels in the trip systems.
- The number and combinations of channels required to be operable in order for instrument function capability to be maintained.

B. General Rules for Use:

- LFDs are “channel-based,” that is, they are designed to be used to determine instrument function capability given a loss of one or more channels. For the purposes of determining loss of function, the LFDs show what constitutes a channel. However, in identifying the beginning and end of a channel for the purpose of determining channel functional test scope, the LFD should not be used for this purpose; instead, the TRM definition “Channel Functional Test Scope” should be used.
- As in typical elementary logic, the energy trace is from the sensor to the actuated device. Consequently, inoperability of a component in the energy trace can directly or indirectly affect the ability of a downstream component in the trace to function. However, the opposite is not always true; that is, the downstream component since it does not provide input to the upstream component does not affect the ability of the upstream component to function. As such, loss of a component anywhere other than in the channel cannot in all cases be traced back to evaluate the affect of the loss on a channel(s). Consequently, since the LFDs are “channel-based,” in such cases, the LFD cannot be used to determine instrument function capability. Instead, the elementary logic must be consulted to determine the affect of the loss on the supported system.
- LFDs are designed to be used with the instrumentation specifications found in the Technical Specifications, the TRM, and the ODCM. Typically, an LFD is provided for each instrumentation specification line item. However, some instruments provide more than one instrument function and an LFD may not provide sufficient information to ascertain all of the functions provided by the instrument. In order to identify all instrument functions performed by a particular instrument, Table 10.1-1, Master Equipment Cross Reference, Sorted by MPL, must be consulted. For a given MPL, this sort will identify all LFDs for the instrument functions that are served by the instrument.
- The complete logic from sensor to the actuation logic/actuated device is not reflected in the LFDs. A dashed line is used to denote cases where the logic

was not included. Elementary diagrams used to develop the LFD are referenced on the LFD in the event information on the omitted logic is needed.

- The drawings show the channels and the trip logics associated with a particular instrument function and how the channels and the trip logics are related in the trip systems.
- The LFDs are ordered alphabetically by the system abbreviation and then sequentially by the sketch number.
- The LFD sketches are condensed elementaries and, therefore, the same rules of use that apply to elementaries also apply to the LFDs.
- The loss of function statement typically found at the bottom of the LFD identifies the channel combinations required to be operable in order for instrument function capability as defined in the instrumentation specification to be maintained. In some cases, the associated instrument specification contains an action statement that requires tripping the inoperable channel within a prescribed period of time. The LFD takes credit for this requirement in that it specifies for these cases that in order for instrument function to be maintained, the prescribed combinations of channels must be either operable or maintained in the tripped condition.
- The following is a list of abbreviations and their meanings used in the drawings that may be unfamiliar to the user:

AU - Alarm Unit
EPM - RPS Electric Power Monitoring
ITU - Indicating Trip Unit
LRM - Log Radiation Monitor
MTU - Master Trip Unit
PRM - Process Radiation Monitoring
PS - Pressure Switch
RWLH - Reactor Water Level High
RIS - Radiation Indicating Switch
SAU - Single Alarm Unit
STU - Slave Trip Unit

T 11.0 LOSS OF FUNCTION DIAGRAMS

LIST OF DIAGRAMS

<u>Diagram No.</u>	<u>Title</u>	<u>Revision No.</u>
LFD-1-CRB-01 (1 sheet)	TS 3.3.2.1-1, Item 1.a, Control Rod Block, Rod Block Monitor, Low Power Range - Upscale	12
LFD-1-CRB-02 (1 sheet)	TS 3.3.2.1-1, Item 1.b, Control Rod Block, Rod Block Monitor, Intermediate Power Range - Upscale	12
LFD-1-CRB-03 (1 sheet)	TS 3.3.2.1-1, Item 1.c, Control Rod Block, Rod Block Monitor, High Power Range - Upscale	12
LFD-1-CRB-04 (1 sheet)	TS 3.3.2.1-1, Item 1.d, Control Rod Block, Rod Block Monitor - Inop	12
LFD-1-CRB-05 (1 sheet)	TS 3.3.2.1-1, Item 1.e, Control Rod Block, Rod Block Monitor - Downscale	12
LFD-1-CRB-06 (1 sheet)	N/A	12
LFD-1-CRB-07 (1 sheet)	TS 3.3.2.1-1, Item 2, Control Rod Block, Rod Worth Minimizer	
LFD-1-CRB-08 (1 sheet)	TS 3.3.2.1-1, Item 3, Control Rod Block, Reactor Mode Switch - Shutdown Position	
LFD-1-CRB-09 (1 sheet)	TRM T3.3.2-1, Item 1.a, Control Rod Block Instrumentation, SRM - Detector Not Full In	60
LFD-1-CRB-10 (1 sheet)	TRM T3.3.2-1, Item 1.b, Control Rod Block Instrumentation, SRM - Upscale	60
LFD-1-CRB-11 (1 sheet)	TRM T3.3.2-1, Item 1.c, Control Rod Block Instrumentation, SRM - Inoperative	60
LFD-1-CRB-12 (1 sheet)	TRM T3.3.2-1, Item 1.d, Control Rod Block Instrumentation, SRM - Downscale	60
LFD-1-CRB-13 (1 sheet)	TRM T3.3.2-1, Item 2.a, Control Rod Block Instrumentation, IRM - Detector Not Full In	60
LFD-1-CRB-14 (1 sheet)	TRM T3.3.2-1, Item 2.b, Control Rod Block Instrumentation, IRM - Upscale	60
LFD-1-CRB-15 (1 sheet)	TRM T3.3.2-1, Item 2.c, Control Rod Block Instrumentation, IRM - Inoperative	60

List of Diagrams (Continued)

<u>Diagram No.</u>	<u>Title</u>	<u>Revision No.</u>
LFD-1-CRB-16 (1 sheet)	TRM T3.3.2-1, Item 2.d, Control Rod Block Instrumentation, IRM - Downscale	60
LFD-1-CRB-17 (1 sheet)	TRM T3.3.2-1, Item 3.a, Control Rod Block Instrumentation, APRM - Simulated Thermal Power - Upscale	60
LFD-1-CRB-18 (1 sheet)	TRM T3.3.2-1, Item 3.b, Control Rod Block Instrumentation, APRM - Simulated Thermal Power - Upscale (Setdown)	60
LFD-1-CRB-19 (1 sheet)	TRM T3.3.2-1, Item 3.c, Control Rod Block Instrumentation, APRM - Inoperative	60
LFD-1-CRB-20 (1 sheet)	TRM T3.3.2-1, Item 3.d, Control Rod Block Instrumentation, APRM - Neutron Flux - Downscale	60
LFD-1-CRB-21 (1 sheet)	TRM T3.3.2-1, Item 3.e, Control Rod Block Instrumentation, APRM - Low LPRM Count	60
LFD-1-CRB-22 (1 sheet)	TRM T3.3.2-1, Item 3.f, Control Rod Block Instrumentation, APRM - Reactor Recirculation Flow - Upscale	60
LFD-1-CRB-23 (1 sheet)	TRM T3.3.2-1, Item 4, Control Rod Block Instrumentation, SDV Level - High	60
LFD-1-ECCS-01 (1 sheet)	TS 3.3.5.1-1, Item 1.a, Core Spray System RWL - Low Low Low, Level 1	6
LFD-1-ECCS-02 (1 sheet)	TS 3.3.5.1-1, Item 1.b, Core Spray System Drywell Pressure - High	93
LFD-1-ECCS-03 (1 sheet)	TS 3.3.5.1-1, Item 1.c, Core Spray System Reactor Steam Dome Pressure - Low	132
LFD-1-ECCS-04 (1 sheet)	TS 3.3.5.1-1, Item 1.d, Core Spray System Core Spray Pump Discharge Flow - Low	132
LFD-1-ECCS-05 (1 sheet)	TS 3.3.5.1-1, Item 2.a, LPCI System RWL - Low Low Low, Level 1	6
LFD-1-ECCS-06 (1 sheet)	TS 3.3.5.1-1, Item 2.b, LPCI System Drywell Pressure - High	93

List of Diagrams (Continued)

<u>Diagram No.</u>	<u>Title</u>	<u>Revision No.</u>
LFD-1-ECCS-07 (1 sheet)	TS 3.3.5.1-1, Item 2.c, LPCI System Reactor Steam Dome Pressure - Low	132
LFD-1-ECCS-08 (1 sheet)	TS 3.3.5.1-1, Item 2.d, LPCI System Reactor Steam Dome Pressure - Low Recirc Disch Valve Permissive	
LFD-1-ECCS-09 (1 sheet)	TS 3.3.5.1-1, Item 2.e, LPCI System Reactor Vessel Shroud, Level 0	
LFD-1-ECCS-10 (1 sheet)	TS 3.3.5.1-1, Item 2.f, LPCI System LPCI Pump Start - Time Delay Relay	
LFD-1-ECCS-11 (1 sheet)	TS 3.3.5.1-1, Item 2.g, LPCI System LPCI Pump Discharge Flow - Low (Bypass)	132
LFD-1-ECCS-12 (1 sheet)	TS 3.3.5.1-1, Item 3.a, HPCI System RWL - Low Low, Level 2	6
LFD-1-ECCS-13 (1 sheet)	TS 3.3.5.1-1, Item 3.b, HPCI Initiation Drywell Pressure - High	93
LFD-1-ECCS-14 (1 sheet)	TS 3.3.5.1-1, Item 3.c, HPCI System Reactor Vessel Water Level - High, Level 8	
LFD-1-ECCS-15 (1 sheet)	TS 3.3.5.1-1, Item 3.d, HPCI System Condensate Storage Tank Level - Low	
LFD-1-ECCS-16 (1 sheet)	TS 3.3.5.1-1, Item 3.e, HPCI System Suppression Pool Water Level - High	
LFD-1-ECCS-17 (1 sheet)	TS 3.3.5.1-1, Item 3.f, HPCI System HPCI Pump Disch Flow - Low (Bypass)	
LFD-1-ECCS-18 (1 sheet)	TS 3.3.5.1-1, Item 4.a/5.a, ADS Trip System RWL - Low, Low, Low - Level 1	6
LFD-1-ECCS-19 (1 sheet)	TS 3.3.5.1-1, Item 4.b/5.b, ADS Trip System Drywell Pressure - High	93
LFD-1-ECCS-20 (1 sheet)	TS 3.3.5.1-1, Item 4.c/5.c, ADS Trip System ADS Initiation Timer	
LFD-1-ECCS-21 (1 sheet)	TS 3.3.5.1-1, Item 4.d/5.d, ADS Trip System RWL - Low, Level 3 (Confirmatory)	

List of Diagrams (Continued)

<u>Diagram No.</u>	<u>Title</u>	<u>Revision No.</u>
LFD-1-ECCS-22 (1 sheet)	TS 3.3.5.1-1, Item 4.e/5.e, ADS Trip System Core Spray Pump Discharge Press - High	
LFD-1-ECCS-23 (1 sheet)	TS 3.3.5.1-1, Item 4.f/5.f, ADS Trip System LPCI Pump Discharge Pressure - High	
LFD-1-ECCS-24 (1 sheet)	TS 3.3.5.1-1, Item 4.g/5.g, ADS Trip System ADS Low Water LVL Actuation Timer	
LFD-1-ECCS-25 (1 sheet)	TRM T3.3.5-1, Item 2, HPCI Turbine Trip HPCI Turbine Exhaust Pressure - High	60
LFD-1-ECCS-26 (1 sheet)	TRM T3.3.5-1, Item 3, HPCI Turbine Trip HPCI Pump Suction Pressure - Low	60
LFD-1-ECCS-27 (1 sheet)	TRM T3.3.5-1, Item 5, RCIC Turbine Trip RCIC Turbine Exhaust Pressure - High	104
LFD-1-ECCS-28 (1 sheet)	TRM T3.3.5-1, Item 6, RCIC Turbine Trip RCIC Pump Suction Pressure - Low	60
LFD-1-ECCS-29 (1 sheet)	TRM T3.3.5-1, Items 7.a and 7.b, RCIC Pump Discharge Flow - High, Low	82
LFD-1-EPM-01 (1 sheet)	TS 3.3.8.2, RPS Electric Power Monitor Trips	33
LFD-1-LLS-01 (2 sheets)	TS 3.3.6.3-1, Item 1, Low-Low Set Instrumentation - Reactor Steam Dome Pressure - High	103
LFD-1-LLS-02 (2 sheets)	TS 3.3.6.3-1, Item 2, Low-Low Set Instrumentation - Low-Low Set Pressure Setpoints	103
LFD-1-LLS-03 (2 sheets)	TS 3.3.6.3-1, Item 3, Low-Low Set Instrumentation - Tailpipe Pressure Switch	103
LFD-1-LOP-01 (3 sheets)	TS 3.3.8.1-1, Items 1.a and 1.b, 4.16 kV Emergency Bus, Loss of Voltage and Time Delay	116
LFD-1-LOP-02 (3 sheets)	TS 3.3.8.1-1, Items 2.a and 2.b, 4.16 kV Emergency Bus, Degraded Voltage and Time Delay	116

List of Diagrams (Continued)

<u>Diagram No.</u>	<u>Title</u>	<u>Revision No.</u>
LFD-1-LOP-03 (1 sheet)	DELETED	116
LFD-1-MCREC-01 (1 sheet)	TS 3.3.7.1, MCREC System Initiation Control Room Air Inlet Radiation - High	
LFD-1-MCREC-02 (1 sheet)	TRM T3.3.7-1, Item 1, MCREC System Instrumentation, Reactor Vessel Water Level - Low Low Low, Level 1	60
LFD-1-MCREC-03 (1 sheet)	TRM T3.3.7-1, Item 2, MCREC System Instrumentation, Drywell Pressure - High	93
LFD-1-MCREC-04 (1 sheet)	TRM T3.3.7-1, Item 3, MCREC System Instrumentation, Main Steam Line Flow - High	60
LFD-1-MCREC-05 (1 sheet)	TRM T3.3.7-1, Item 4, MCREC System Instrumentation, Refueling Floor Area Radiation - High	60
LFD-1-MCREC-06 (1 sheet)	TRM T3.3.7-1, Item 5, MCREC System Instrumentation, Main Control Room Intake Radiation - Downscale	
LFD-1-MSLR-01 (2 sheets)	TRM T3.3.11, Main Steam Line Radiation High - High	0/60
LFD-1-PCIS-01 (2 sheets)	TS 3.3.6.1-1, Item 1.a, Main Steam Line Isolation - Reactor Vessel Water Level - Low Low Low, Level 1	
LFD-1-PCIS-02 (2 sheets)	TS 3.3.6.1-1, Item 1.b, Main Steam Line Isolation - Main Steam Line Pressure - Low	
LFD-1-PCIS-03 (2 sheets)	TS 3.3.6.1-1, Item 1.c, Main Steam Line Isolation - Main Steam Line Flow - High	
LFD-1-PCIS-04 (2 sheets)	TS 3.3.6.1-1, Item 1.d, Main Steam Line Isolation - Condenser Vacuum - Low	
LFD-1-PCIS-05 (2 sheets)	TS 3.3.6.1-1, Item 1.e, Main Steam Line Isolation - Main Steam Tunnel Temperature - High	

List of Diagrams (Continued)

<u>Diagram No.</u>	<u>Title</u>	<u>Revision No.</u>
LFD-1-PCIS-07 (1 sheet)	TS 3.3.6.1-1, Item 2.a, Primary Containment Isolation, Reactor Vessel Water Level - Low, Level 3	20
LFD-1-PCIS-08 (1 sheet)	TS 3.3.6.1-1, Item 2.b, Primary Containment Isolation, Drywell Pressure - High	33
LFD-1-PCIS-09 (1 sheet)	TS 3.3.6.1-1, Item 2.c, Primary Containment Isolation, Drywell Radiation - High	
LFD-1-PCIS-10 (1 sheet)	TS 3.3.6.1-1, Item 2.d, Primary Containment Isolation, Reactor Building Exhaust Radiation - High	24
LFD-1-PCIS-11 (1 sheet)	TS 3.3.6.1-1, Item 2.e, Primary Containment Isolation, Refueling Floor Exhaust Radiation - High	53
LFD-1-PCIS-12 (1 sheet)	TS 3.3.6.1-1, Item 3.a, HPCI System Isolation - HPCI Steam Line Flow - High	
LFD-1-PCIS-13 (1 sheet)	TS 3.3.6.1-1, Item 3.b, HPCI System Isolation - HPCI Steam Supply Line Pressure - Low	
LFD-1-PCIS-14 (1 sheet)	TS 3.3.6.1-1, Item 3.c, HPCI System Isolation - HPCI Turbine Exhaust Diaphragm Pressure - High	
LFD-1-PCIS-15 (1 sheet)	TS 3.3.6.1-1, Item 3.d, HPCI System Isolation - Drywell Pressure - High	93
LFD-1-PCIS-16 (1 sheet)	TS 3.3.6.1-1, Item 3.e, HPCI System Isolation - HPCI Pipe Penetration Room Temperature - High	
LFD-1-PCIS-17 (1 sheet)	TS 3.3.6.1-1, Items 3.f and 3.g, HPCI System Isolation - Suppression Pool Area Ambient Temperature - High, <u>and</u> Suppression Pool Area Temperature - Time Delay Relays	
LFD-1-PCIS-18	N/A	
LFD-1-PCIS-19 (1 sheet)	TS 3.3.6.1-1, Items 3.h and 3.g, HPCI System Isolation - Suppression Pool Area Differential Temperature - High, <u>and</u> Suppression Pool Area Temperature - Time Delay Relays	

List of Diagrams (Continued)

<u>Diagram No.</u>	<u>Title</u>	<u>Revision No.</u>
LFD-1-PCIS-20 (1 sheet)	TS 3.3.6.1-1, Item 3.i, HPCI System Isolation - Emergency Area Cooler Temperature - High	
LFD-1-PCIS-21 (1 sheet)	TS 3.3.6.1-1, Item 4.a, RCIC System Isolation RCIC Steam Line Flow - High	
LFD-1-PCIS-22 (1 sheet)	TS 3.3.6.1-1, Item 4.b, RCIC System Isolation RCIC Steam Supply Line Pressure - Low	
LFD-1-PCIS-23 (1 sheet)	TS 3.3.6.1-1, Item 4.c, RCIC System Isolation RCIC Turbine Exhaust Diaphragm Pressure - High	
LFD-1-PCIS-24 (1 sheet)	TS 3.3.6.1-1, Item 4.d, RCIC System Isolation Drywell Pressure - High	
LFD-1-PCIS-25 (1 sheet)	TS 3.3.6.1-1, Items 4.e and f, RCIC System Isolation RCIC Suppression Pool Ambient Area Temperature - High, and Suppression Pool Area Temperature - Time Delay Relays	
LFD-1-PCIS-26	N/A	
LFD-1-PCIS-27 (1 sheet)	TS 3.3.6.1-1, Items 4.f and g, RCIC System Isolation Suppression Pool Area Temperature Time Delay Relays, and RCIC Suppression Pool Area Differential Temperature - High	
LFD-1-PCIS-28 (1 sheet)	TS 3.3.6.1-1, Item 4.h, RCIC System Isolation Emergency Area Cooler Temperature - High	
LFD-1-PCIS-29 (1 sheet)	TS 3.3.6.1-1, Item 5.a, RWCU System Isolation Area Temperature - High	
LFD-1-PCIS-30 (2 sheets)	TS 3.3.6.1-1, Item 5.b, RWCU System Isolation Area Ventilation Differential Temperature - High	
LFD-1-PCIS-31 (1 sheet)	TS 3.3.6.1-1, Item 5.c, RWCU System Isolation SLC System Initiation	
LFD-1-PCIS-32 (1 sheet)	TS 3.3.6.1-1, Item 5.d & TS 3.3.5.2-1, Item 2.a, RWCU System Isolation Reactor Vessel Water Level - Low Low, Level 2	132
LFD-1-PCIS-33 (1 sheet)	TS 3.3.6.1-1, Item 6.a, RHR SDC System Isolation, Reactor Steam Dome Pressure - High	

List of Diagrams (Continued)

<u>Diagram No.</u>	<u>Title</u>	<u>Revision No.</u>
LFD-1-PCIS-34 (1 sheet)	TS 3.3.6.1-1, Item 6.b & TS 3.3.5.2-1, Item 1.a, RHR SDC System Isolation, Reactor Vessel Water Level - Low, Level 3	132
LFD-1-PRM-01 (1 sheet)	ODCM 2-1, Item 1, Liquid Radwaste Effluent Line Radiation High	
LFD-1-PRM-02 (1 sheet)	ODCM 3-1, Item 1.a, Reactor Building Vent Stack Monitoring System, Radiation High	
LFD-1-PRM-03 (1 sheet)	TRM T3.3.8-1, Item 1, Offgas System Isolation Post-Treatment Radiation Upscale	60
LFD-1-PRM-04 (1 sheet)	TRM T3.3.8-1, Item 2, Offgas System Isolation Post-Treatment Radiation Monitor Downscale	60
LFD-1-PRM-05 (1 sheet)	ODCM 3-1, Item 3.a, Main Stack Monitoring System, Noble Gas Activity Monitor	104
LFD-1-RCIC-01 (1 sheet)	TS 3.3.5.3-1, Item 1, RCIC System Reactor Vessel Water Level - Low Low, Level 2	113
LFD-1-RCIC-02 (1 sheet)	TS 3.3.5.3-1, Item 2, RCIC System Reactor Vessel Water Level - High, Level 8	113
LFD-1-RCIC-03 (1 sheet)	TS 3.3.5.3-1, Item 3, RCIC System Condensate Storage Tank Level - Low	113
LFD-1-RCIC-04 (1 sheet)	TS 3.3.5.3-1, Item 4, RCIC System Suppression Pool Water Level - High	113
LFD-1-RPS-01 (1 sheet)	TS 3.3.1.1-1, Item 1.a, Reactor Protection System Instrumentation - IRM Neutron Flux - High	
LFD-1-RPS-02 (1 sheet)	TS 3.3.1.1-1, Item 1.b, Reactor Protection System Instrumentation - IRM Inop	
LFD-1-RPS-03 (1 sheet)	TS 3.3.1.1-1, Item 2.a, Reactor Protection System Instrumentation - APRM Neutron Flux - High (Setdown)	12

List of Diagrams (Continued)

<u>Diagram No.</u>	<u>Title</u>	<u>Revision No.</u>
LFD-1-RPS-04 (1 sheet)	TS 3.3.1.1-1, Item 2.b, Reactor Protection System Instrumentation - Simulated Thermal Power -High	12
LFD-1-RPS-05 (1 sheet)	TS 3.3.1.1-1, Item 2.c, Reactor Protection System Instrumentation - Neutron Flux - High	12
LFD-1-RPS-06 (1 sheet)	TS 3.3.1.1-1, Item 2.d, Reactor Protection System Instrumentation - APRM Inop	12
LFD-1-RPS-07 (1 sheet)	TS 3.3.1.1-1, Item 2.e, Reactor Protection System Instrumentation - APRM Two-out-of-Four Voter Circuit	12
LFD-1-RPS-07a (1 sheet)	TS 3.3.1.1-1, Item 2.f, Reactor Protection System Instrumentation - OPRM Upscale	26
LFD-1-RPS-08 (1 sheet)	TS 3.3.1.1-1, Item 3, Reactor Protection System Instrumentation - Reactor Vessel Steam Dome Pressure - High	
LFD-1-RPS-09 (1 sheet)	TS 3.3.1.1-1, Item 4, Reactor Protection System Instrumentation - Reactor Vessel Water Level - Low, Level 3	
LFD-1-RPS-10 (1 sheet)	TS 3.3.1.1-1, Item 5, Reactor Protection System Instrumentation - Main Steam Isolation Valve - Closure	
LFD-1-RPS-11 (1 sheet)	TS 3.3.1.1-1, Item 6, Reactor Protection System Instrumentation, Drywell Pressure - High	
LFD-1-RPS-12 (1 sheet)	TS 3.3.1.1-1, Item 7.a, Reactor Protection System Instrumentation - Scram Discharge Volume Water Level - High, Resistance Temperature Detector	
LFD-1-RPS-13 (1 sheet)	TS 3.3.1.1-1, Item 7.b, Reactor Protection System Instrumentation - Scram Discharge Volume Water Level - High, Float Switch	
LFD-1-RPS-14 (1 sheet)	TS 3.3.1.1-1, Item 8, Reactor Protection System Instrumentation - Turbine Stop Valve - Closure	66
LFD-1-RPS-15 (1 sheet)	TS 3.3.1.1-1, Item 9, Reactor Protection System Instrumentation - Turbine Control Valve Fast Closure, Trip Oil Pressure - Low	33

List of Diagrams (Continued)

<u>Diagram No.</u>	<u>Title</u>	<u>Revision No.</u>
LFD-1-RPS-16 (1 sheet)	TS 3.3.1.1-1, Item 10, Reactor Protection System Instrumentation, Reactor Mode Switch - Shutdown Position	
LFD-1-RPS-17 (1 sheet)	TS 3.3.1.1-1, Item 11, Reactor Protection System Instrumentation, Manual Scram	
LFD-1-RPS-18 (1 sheet)	TS SR 3.3.1.1.11, Reactor Protection System Instrumentation Bypass, Items 8 and 9	33
LFD-1-RPT-01 (1 sheet)	TS 3.3.4.1.a.1, EOC-RPT, TSV Closure	
LFD-1-RPT-02 (1 sheet)	TS 3.3.4.1.a.2, EOC-RPT, TCV Fast Closure	
LFD-1-RPT-03 (1 sheet)	TS 3.3.4.2.a, Reactor Vessel Water Level - ATWS-RPT Level	6
LFD-1-RPT-04 (1 sheet)	TS 3.3.4.2.b, ATWS-RPT, Reactor Steam Dome Pressure - High	
LFD-1-RPT-05 (1 sheet)	TS SR 3.3.4.1.2, EOC-RPT Instrumentation Bypass Below 28 Percent Power	33
LFD-1-RWLH-01 (1 sheet)	TS 3.3.2.2, Feedwater and Main Turbine Trip High Water Level Instrumentation	
LFD-1-SCIS-01 (1 sheet)	TS 3.3.6.2-1, Item 1, Reactor Vessel Water Level - Low Low, Level 2	
LFD-1-SCIS-02 (1 sheet)	TS 3.3.6.2-1, Item 2, Drywell Pressure - High	
LFD-1-SCIS-03 (1 sheet)	TS 3.3.6.2-1, Item 3, Secondary Containment Isolation Reactor Building Exhaust Radiation - High	
LFD-1-SCIS-04 (1 sheet)	TS 3.3.6.2-1, Item 4, R/F Exhaust Radiation - High	

TRIP SYSTEM "A"

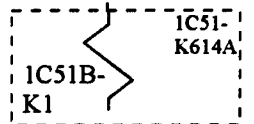
TRIP SYSTEM "B"

Channel

Channel

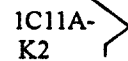
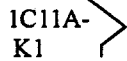
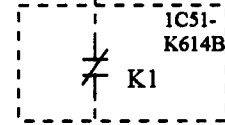
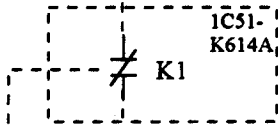
A

B



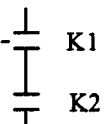
Trip Logic

Trip Logic



Actuation Logic

Contacts Open to Actuate Control Rod Withdrawal Block (Typical of 4)



Activates a Control Rod Withdrawal Block

Minimum Channel Requirements for System Initiation Capability:

In order to maintain Control Rod Withdrawal Block capability on an RBM Low Power Range - Upscale condition, one channel must be operable or maintained in the tripped condition.

- Elem. Ref.
- H-17828
- I-17831
- H-44709
- H-44710
- H-44713

LFD-1-CRB-01
TS 3.3.2.1-1, Item 1.a Control Rod Block, Rod Block Monitor Low Power Range - Upscale
TRM Rev. 12

Prepared By: *[Signature]*
 Reviewed By: *[Signature]*

TRIP SYSTEM "A"

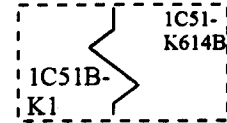
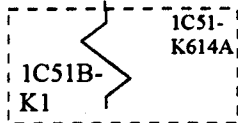
TRIP SYSTEM "B"

Channel

Channel

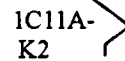
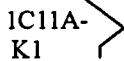
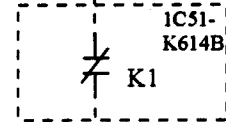
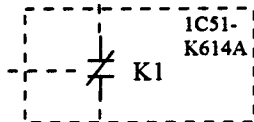
A

B



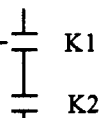
Trip Logic

Trip Logic



Actuation Logic

Contacts Open to Actuate Control Rod Withdrawal Block (Typical of 4)



Activates a Control Rod Withdrawal Block

Minimum Channel Requirements for System Initiation Capability:

In order to maintain Control Rod Withdrawal Block capability on an RBM Intermediate Power Range - Upscale condition, one channel must be operable or maintained in the tripped condition.

Elem. Ref.
H-17828
H-17831
H-44709
H-44710
H-44713

LFD-1-CRB-02
TS 3.3.2.1-1, Item 1.b Control Rod Block, Rod Block Monitor Intermediate Power Range - Upscale
TRM Rev. 12

Prepared By: *[Signature]*
 Reviewed By: *[Signature]*

TRIP SYSTEM "A"

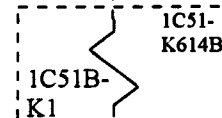
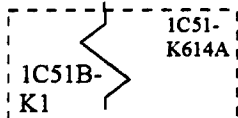
TRIP SYSTEM "B"

Channel

Channel

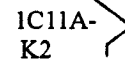
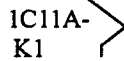
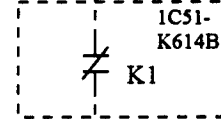
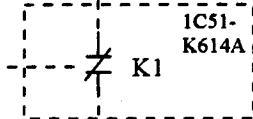
A

B



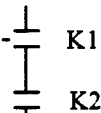
Trip Logic

Trip Logic



Actuation Logic

Contacts Open to Actuate Control Rod Withdrawal Block (Typical of 4)



Activates a Control Rod Withdrawal Block

Minimum Channel Requirements for System Initiation Capability:

In order to maintain Control Rod Withdrawal Block capability on an RBM High Power Range - Upscale condition, one channel must be operable or maintained in the tripped condition.

Elem. Ref.

- 17828
- 17831
- H-44709
- H-44710
- H-44713

LFD-1-CRB-03

TS 3.3.2.1-1, Item 1.c
Control Rod Block,
Rod Block Monitor
High Power
Range - Upscale

Prepared By: *W. Payne*

Reviewed By: *C. Lorenson*

TRM Rev. 12

TRIP SYSTEM "A"

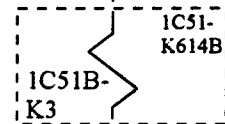
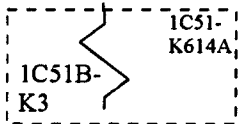
TRIP SYSTEM "B"

Channel

Channel

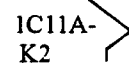
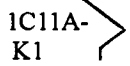
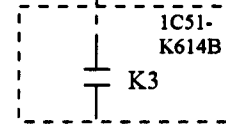
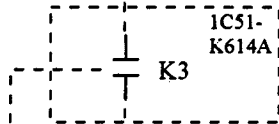
A

B



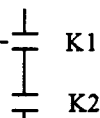
Trip Logic

Trip Logic



Actuation Logic

Contacts Open to Actuate Control Rod Withdrawal Block (Typical of 4)



Activates a Control Rod Withdrawal Block

Minimum Channel Requirements for System Initiation Capability:

In order to maintain Control Rod Withdrawal Block capability on an RBM Inoperable condition, one channel must be operable or maintained in the tripped condition.

Elem. Ref.
 4-17828
 1-17831
 H-44709
 H-44710
 H-44713

LFD-1-CRB-04
 TS 3.3.2.1-1, Item 1.d
 Control Rod Block,
 Rod Block Monitor
 Inop

Prepared By: *Hayne*
 Reviewed By: *Chermon*

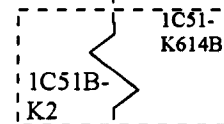
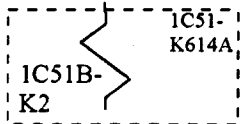
TRM Rev. 12

TRIP SYSTEM "A"

TRIP SYSTEM "B"

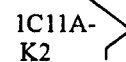
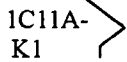
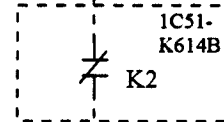
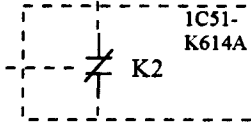
Channel
A

Channel
B



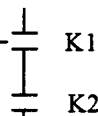
Trip Logic

Trip Logic



Actuation Logic

Contacts Open to Actuate Control Rod Withdrawal Block (Typical of 4)



Activates a Control Rod Withdrawal Block

Minimum Channel Requirements for System Initiation Capability:

In order to maintain Control Rod Withdrawal Block capability on an RBM Downscale condition, one channel must be operable or maintained in the tripped condition.

Elem. Ref.
 V-17828
 A-17831
 H-44709
 H-44710
 H-44713

LFD-1-CRB-05
 TS 3.3.2.1-1, Item 1.e
 Control Rod Block,
 Rod Block Monitor -
 Downscale

Prepared By: *W. Payne*

Reviewed By: *C. Brown*

TRM Rev. 12

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LFD-1-CRB-06
N/A
TRM Rev. 12

Prepared By:	N/A
Reviewed By:	N/A

TRIP SYSTEM

Channel

Rod
Worth
Minimizer
1C11-J600

1C11-
J601-K1

Actuation Logic

K1

Activates a Control Rod
Withdrawal Block

Minimum Channel Requirements for System Initiation Capability:

In order to maintain Control Rod Withdrawal Block capability associated with the Rod Worth Minimizer, one channel must be operable or maintained in the tripped condition.

Elem. Ref.

H-17831
H-17117

Prepared By: *Royce Clark*

Reviewed By: *J. P. Gunn*

LFD-1-CRB-07

TS 3.3.2.1-1, Item 2
Control Rod Block,
Rod Worth Minimizer

Rev. 0

12/8/94

TRIP SYSTEM "A"

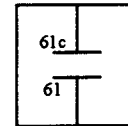
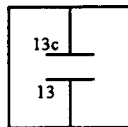
TRIP SYSTEM "B"

Channel A

Channel B

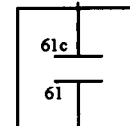
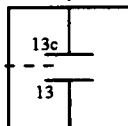
Reactor Mode Switch
1C71A-S1

Reactor Mode Switch
1C71A-S1



Trip Logic

Trip Logic

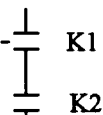


1C11-
K1

1C11-
K2

Actuation Logic

Contacts Open to
Actuate Control Rod
Withdrawal Block
(Typical of 4)



Activates a Control Rod
Withdrawal Block

Minimum Channel Requirements for System Initiation Capability:

In order to maintain Control Rod Withdrawal Block capability on Reactor Mode Switch in Shutdown, one channel must be operable or maintained in the tripped condition.

LFD-1-CRB-08

TS 3.3.2.1-1, Item 3
Control Rod Block,
Reactor Mode Switch -
Shutdown Position

Elem. Ref.

H-17828

H-17831

Prepared By:

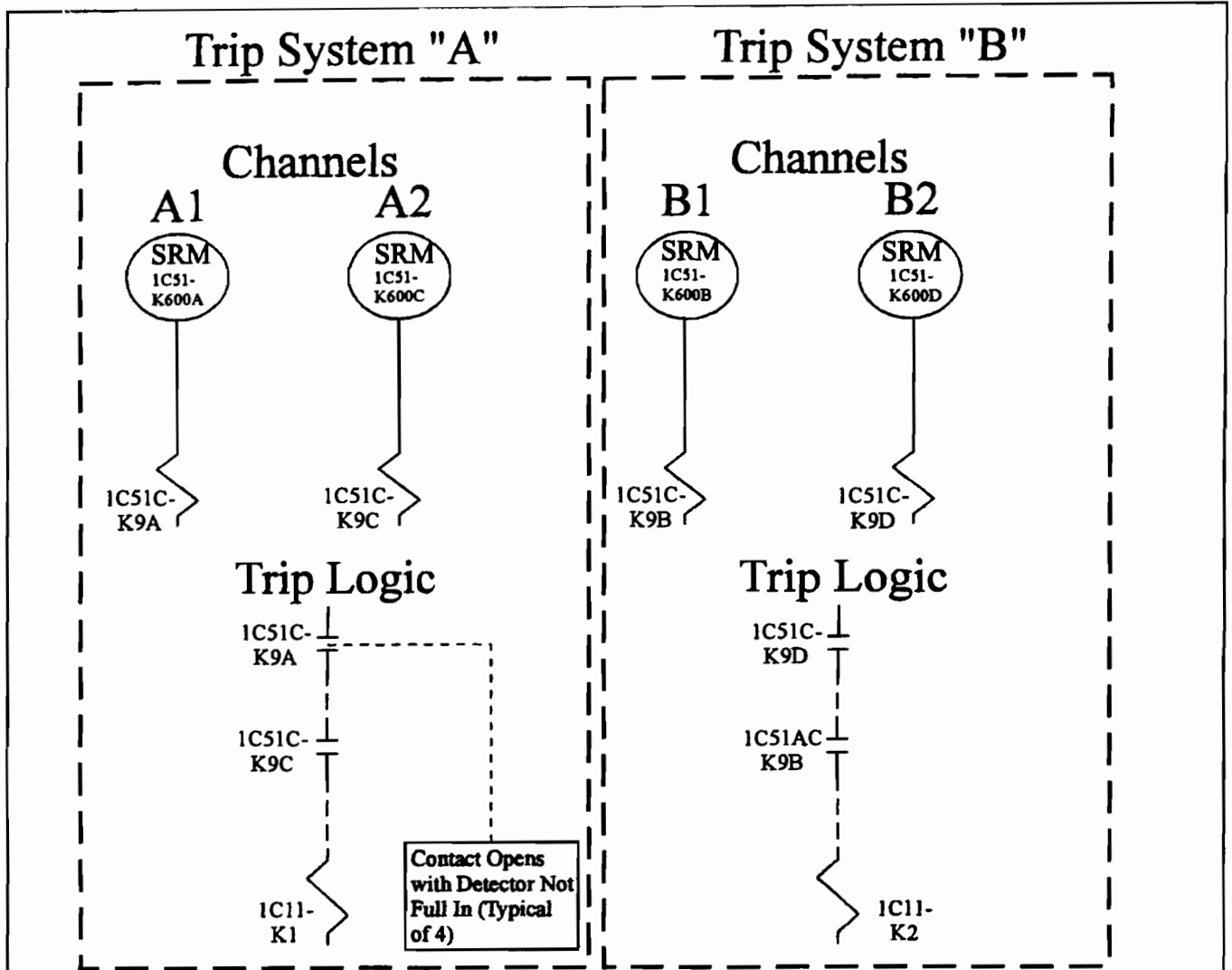
Royce Clark

Reviewed By:

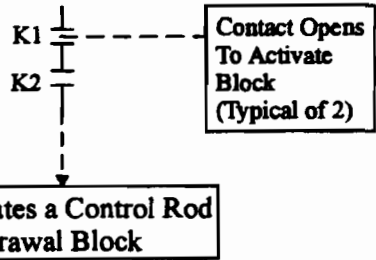
S.P. Brown

Rev. 0

12/8/94



Actuation Logic



Minimum Channel Requirements for System Initiation Capability

In order to maintain Control Rod Withdrawal Block capability on an SRM detector-not-full-in condition, one channel must be functional or maintained in the tripped condition.

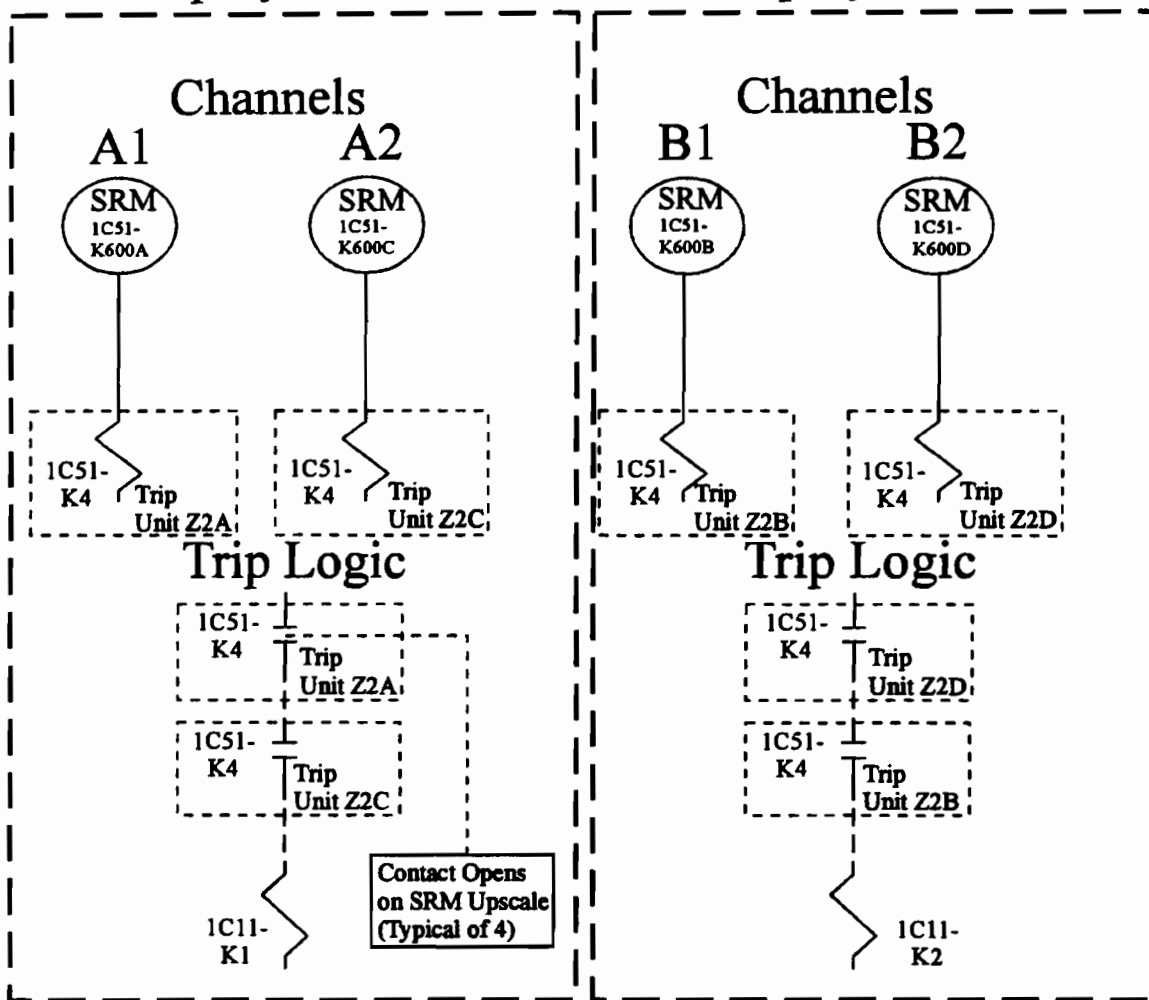
Elem. Ref.
H-17122
H-17123
H-17175
H-17828
H-17831

Prepared By: <i>RLC</i>
Reviewed By: <i>[Signature]</i>

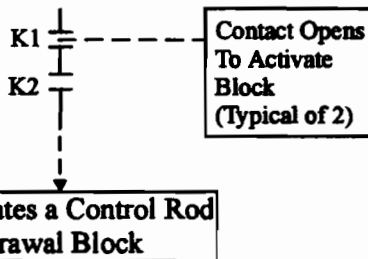
LFD-1-CRB-09
TRM T3.3.2-1, Item 1.a
Control Rod Block
Instrumentation, SRM -
Detector Not Full In
TRM REV. 60

Trip System "A"

Trip System "B"



Actuation Logic



Minimum Channel Requirements for System Initiation Capability

In order to maintain Control Rod Withdrawal Block capability on an SRM upscale condition, one channel must be functional or maintained in the tripped condition.

Elem. Ref.
H-17167
H-17175
H-17828
H-17831

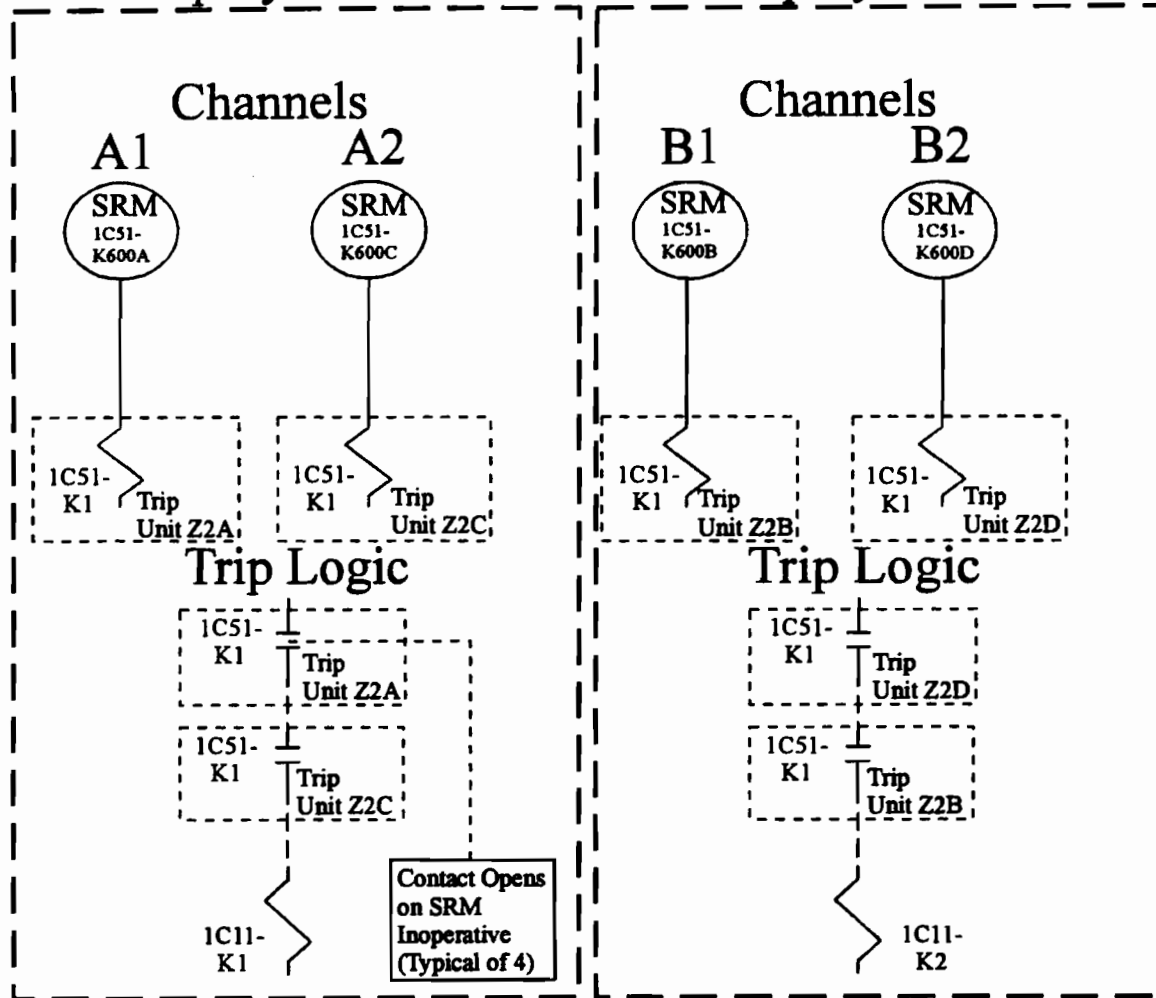
Prepared By: *DLC*

Reviewed By: *[Signature]*

LFD-1-CRB-10
TRM T3.3.2-1, Item 1.b
Control Rod Block
Instrumentation,
SRM - Upscale
TRM REV. 60

Trip System "A"

Trip System "B"



Minimum Channel Requirements for System Initiation Capability

In order to maintain Control Rod Withdrawal Block capability on an SRM inoperative condition, one channel must be functional or maintained in the tripped condition.

Elem. Ref.
H-17167
H-17175
H-17828
H-17831

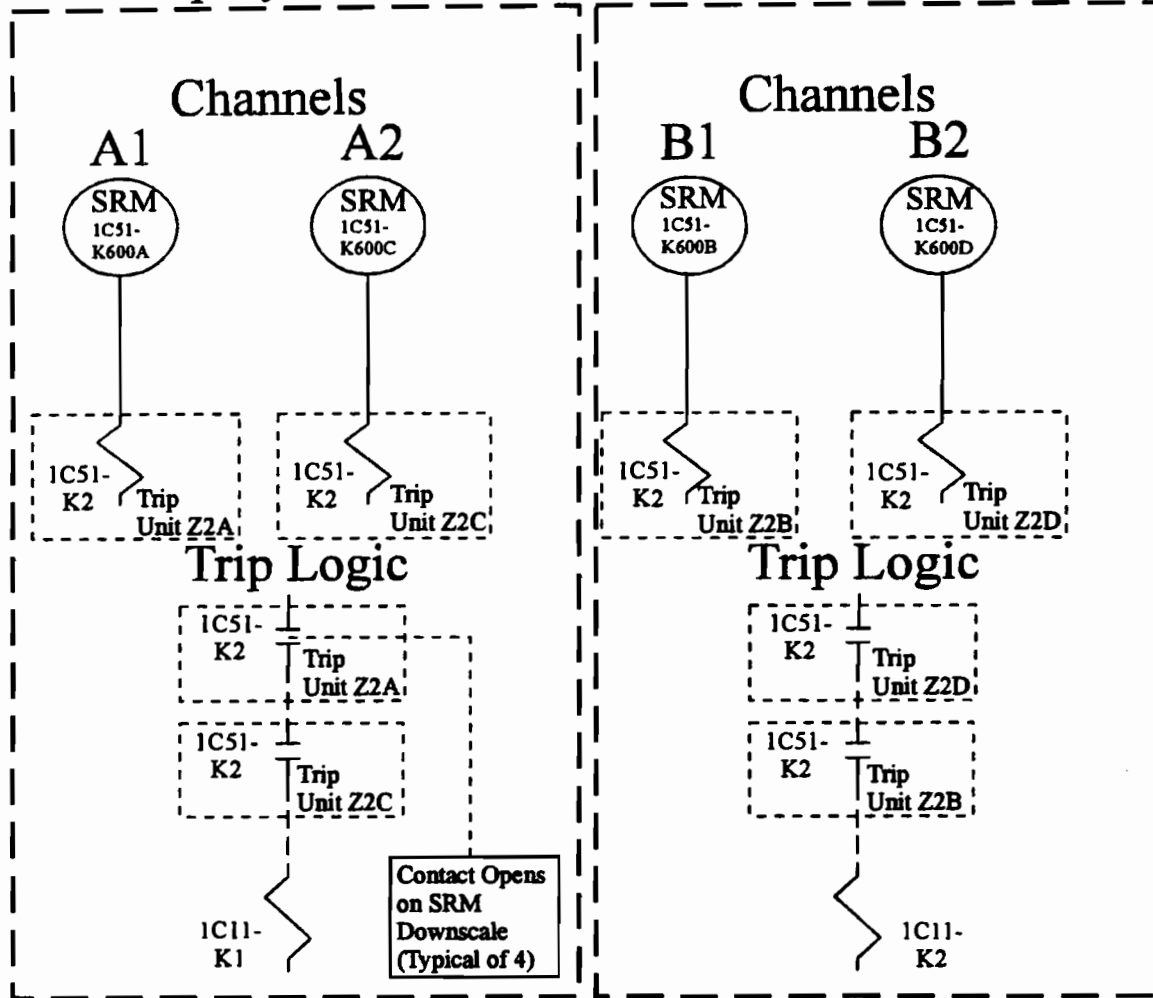
Prepared By: *DLC*
Reviewed By: *[Signature]*

LFD-1-CRB-11
TRM T3.3.2-1, Item 1.c
Control Rod Block
Instrumentation, SRM -
Inoperative

TRM REV. 60

Trip System "A"

Trip System "B"



Minimum Channel Requirements for System Initiation Capability

In order to maintain Control Rod Withdrawal Block capability on an SRM downscale condition, one channel must be functional or maintained in the tripped condition.

Elem. Ref.
 H-17167
 H-17175
 H-17828
 H-17831

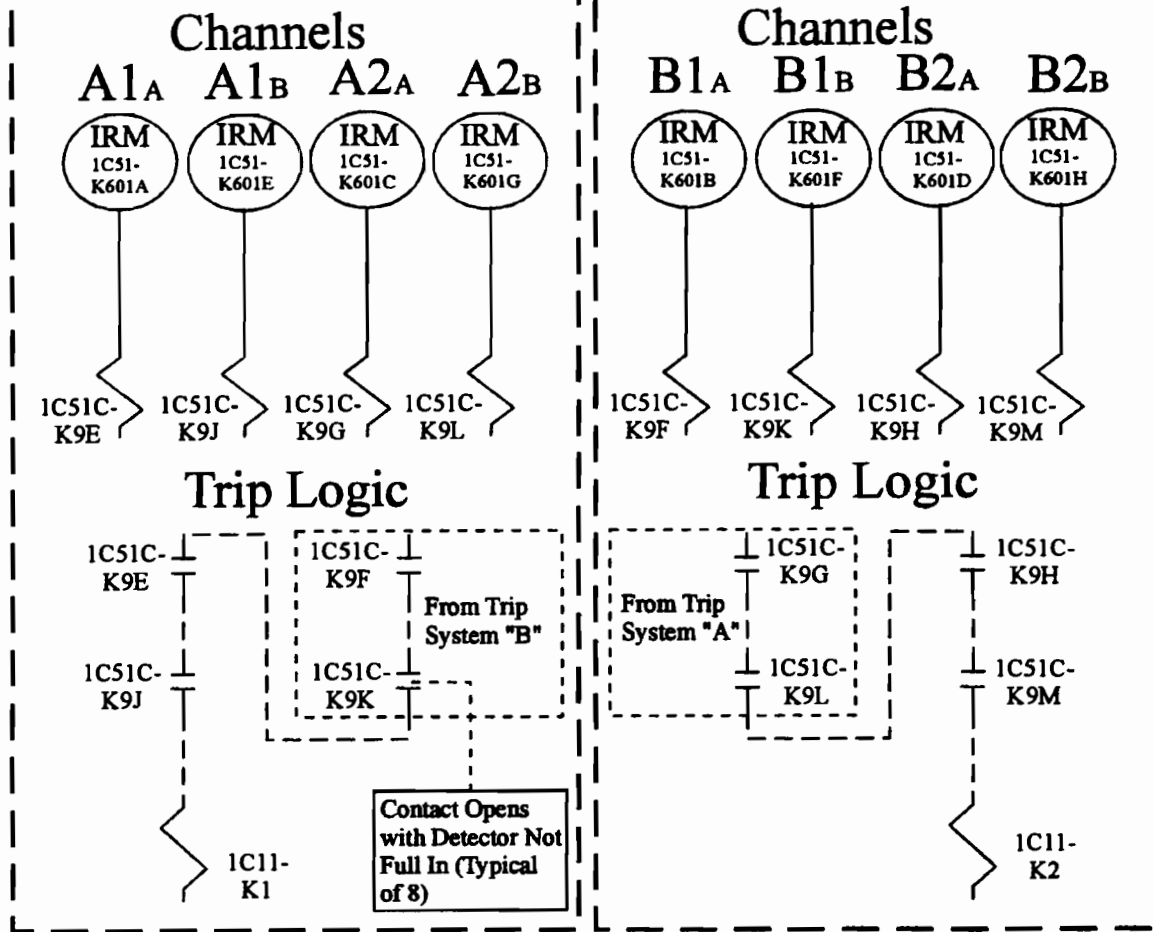
Prepared By: *[Signature]*
 Reviewed By: *[Signature]*

LFD-1-CRB-12
 TRM T3.3.2-1, Item 1.d
 Control Rod Block
 Instrumentation, SRM -
 Downscale

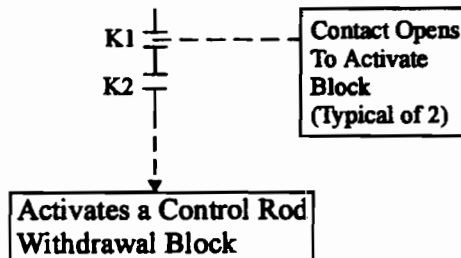
TRM REV. 60

Trip System "A"

Trip System "B"



Actuation Logic



Minimum Channel Requirements for System Initiation Capability

In order to maintain Control Rod Withdrawal Block capability on an IRM not full in condition, one channel must be functional or maintained in the tripped condition.

Elem. Ref.
H-17124
H-17125
H-17175
H-17828
H-17831

Prepared By: *RLC*

Reviewed By: *R. Will*

LFD-1-CRB-13

TRM T3.3.2-1, Item 2.a

Control Rod Block

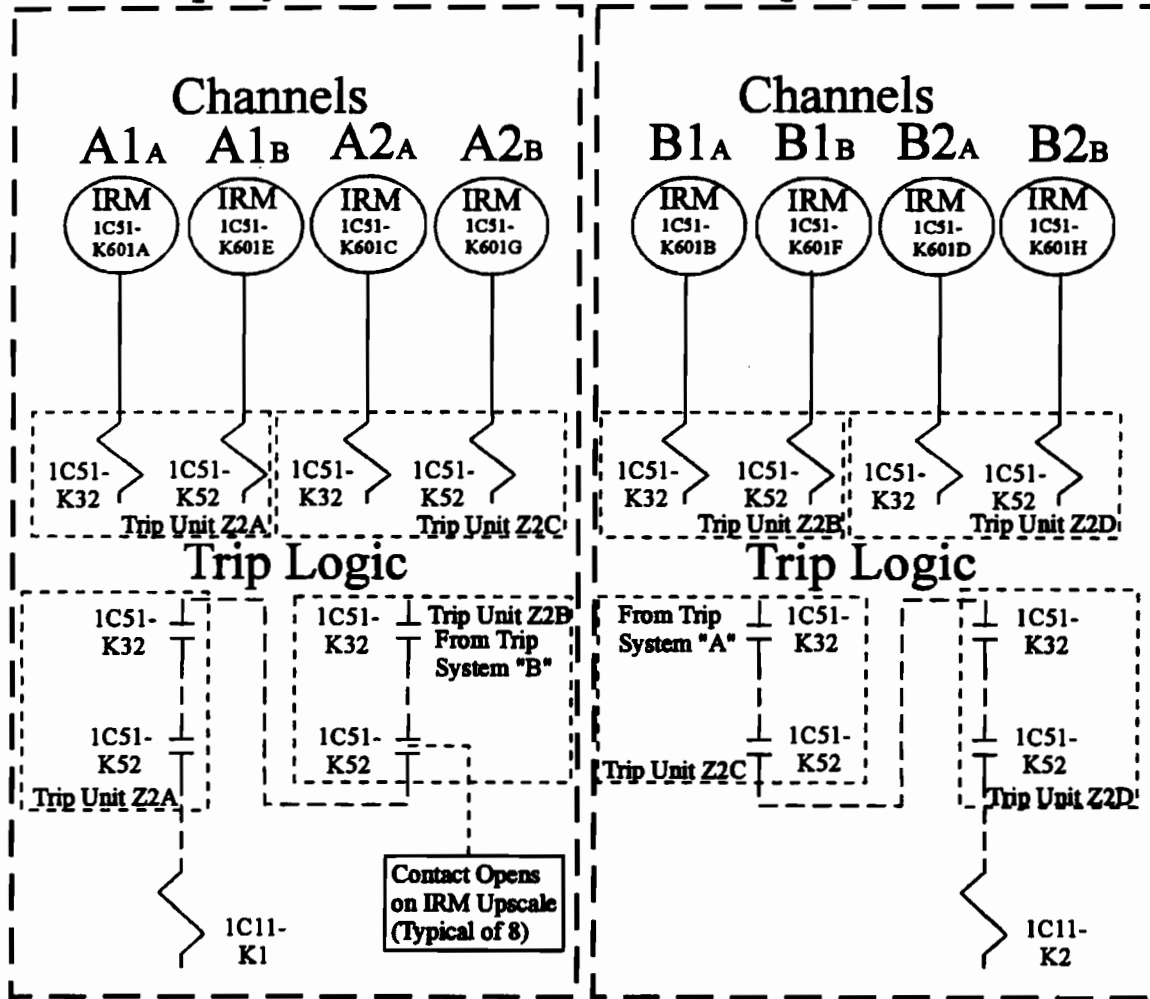
Instrumentation, IRM -

Detector Not Full In

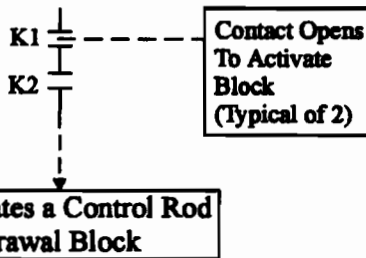
TRM REV. 60

Trip System "A"

Trip System "B"



Actuation Logic



Minimum Channel Requirements for System Initiation Capability

In order to maintain Control Rod Withdrawal Block capability on an IRM upscale condition, one channel must be functional or maintained in the tripped condition.

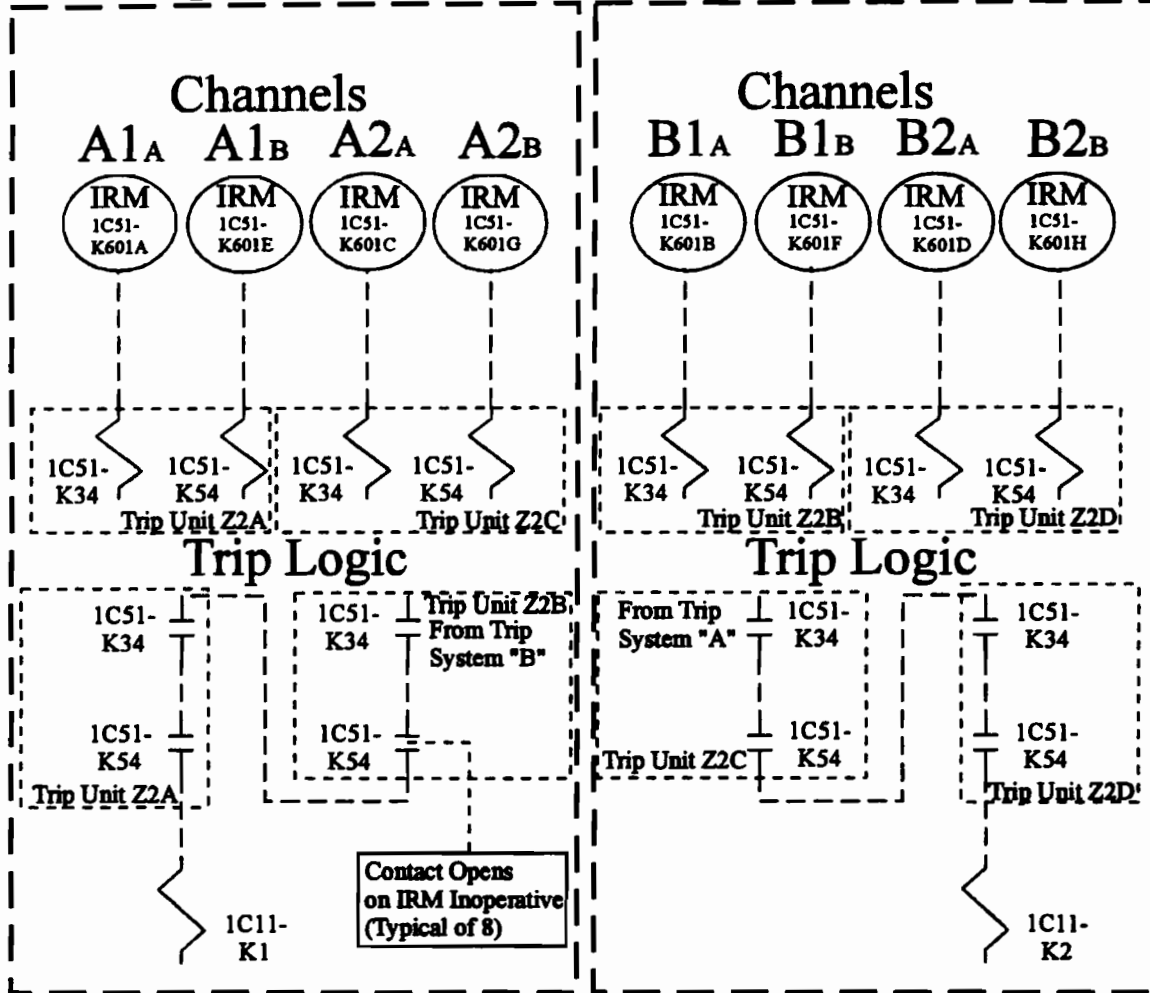
Elem. Ref.
H-17169
H-17170
H-17175
H-17828
H-17831

Prepared By: *RCC*
Reviewed By: *[Signature]*

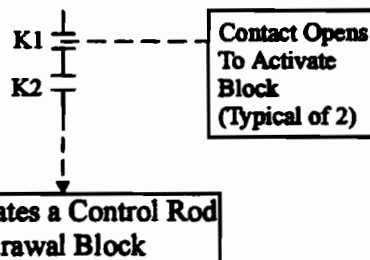
LFD-1-CRB-14
TRM T3.3.2-1, Item 2.b
Control Rod Block
Instrumentation,
IRM - Upscale
TRM REV. 60

Trip System "A"

Trip System "B"



Actuation Logic



Minimum Channel Requirements for System Initiation Capability

In order to maintain Control Rod Withdrawal Block capability on an IRM inoperative condition, one channel must be functional or maintained in the tripped condition.

Elem. Ref.

H-17169 H-17175
 H-17170 H-17828
 H-17171 H-17831
 H-17172

Prepared By: *ZLC*

Reviewed By: *[Signature]*

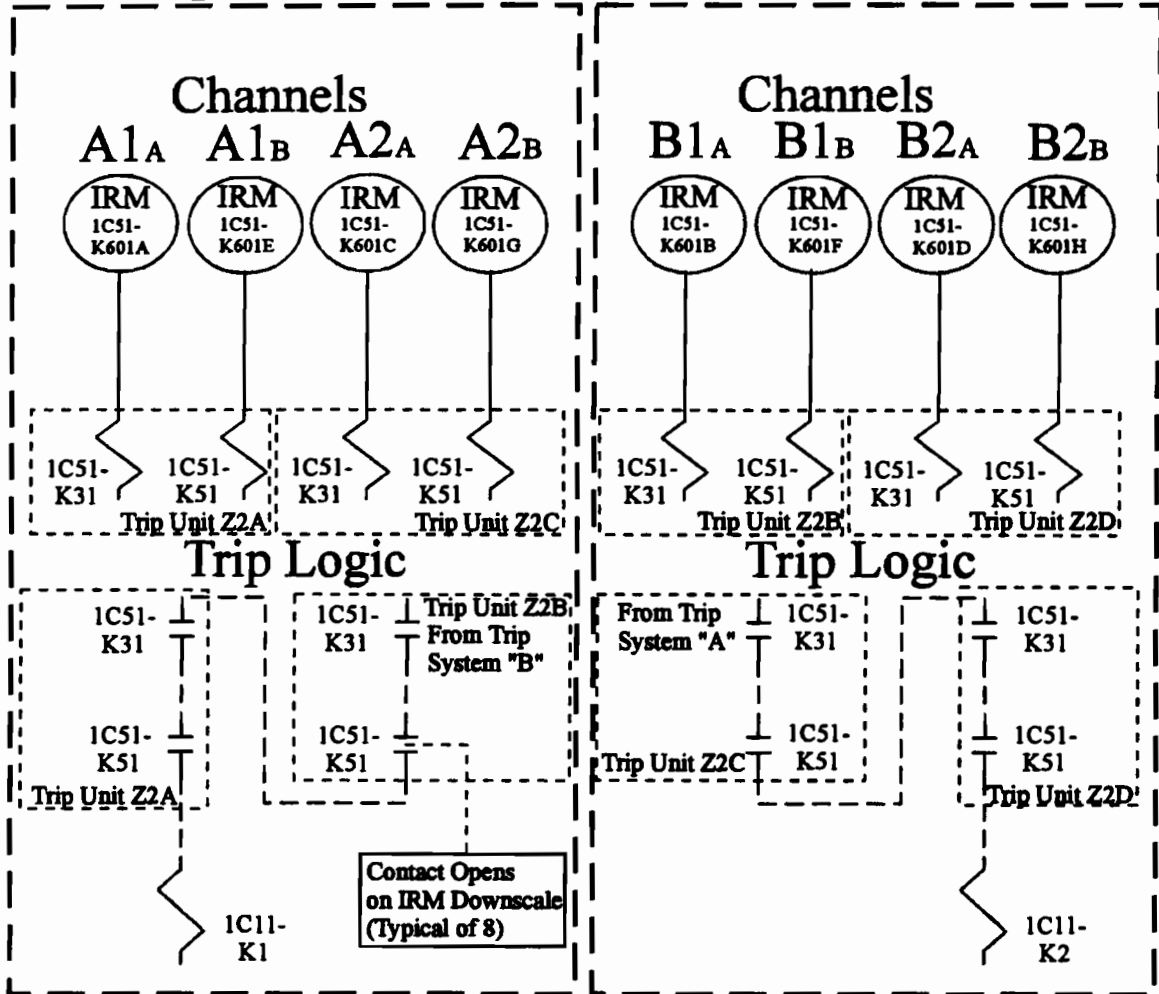
LFD-1-CRB-15

TRM T3.3.2-1, Item 2.c
 Control Rod Block
 Instrumentation, IRM -
 Inoperative

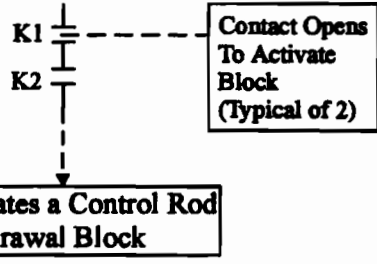
TRM REV. 60

Trip System "A"

Trip System "B"



Actuation Logic



Minimum Channel Requirements for System Initiation Capability

In order to maintain Control Rod Withdrawal Block capability on an IRM downscale condition, one channel must be functional or maintained in the tripped condition.

Elem. Ref.
H-17169
H-17170
H-17175
H-17828
H-17831

Prepared By: *TLC*
Reviewed By: *ADP*

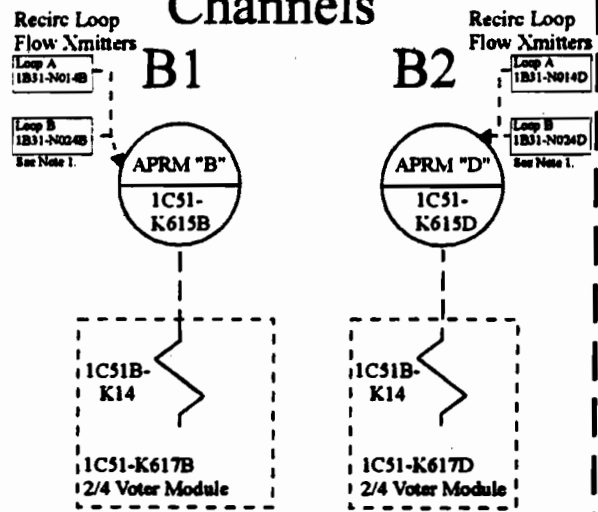
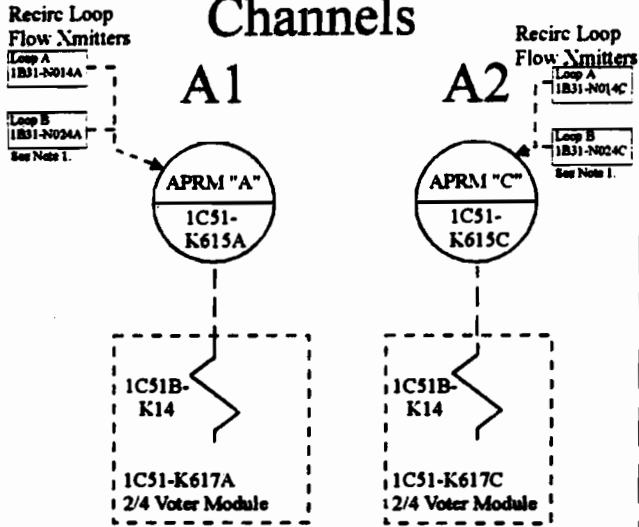
LFD-1-CRB-16
TRM T3.3.2-1, Item 2.d
Control Rod Block
Instrumentation, IRM -
Downscale
TRM REV. 60

Trip System "A"

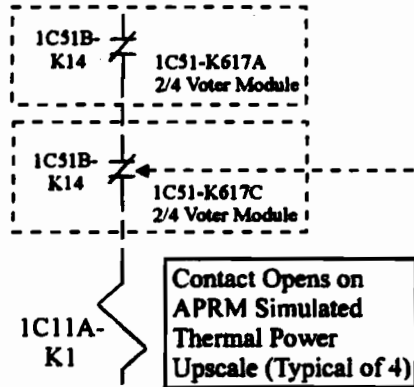
Trip System "B"

Channels

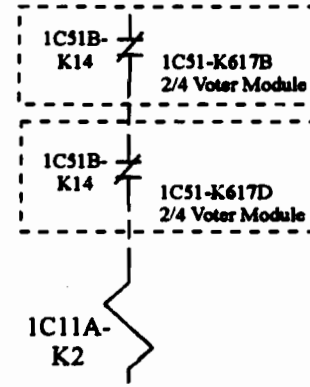
Channels



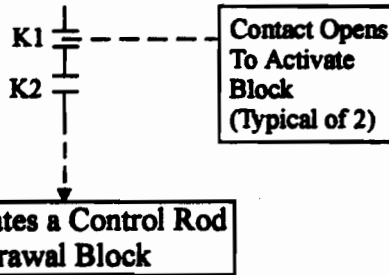
Trip Logic



Trip Logic



Actuation Logic



Minimum Channel Requirements for System Initiation Capability:

In order to maintain Control Rod Withdrawal Block capability on an APRM Simulated Thermal Power Upscale condition, one channel must be functional or maintained in the tripped condition.

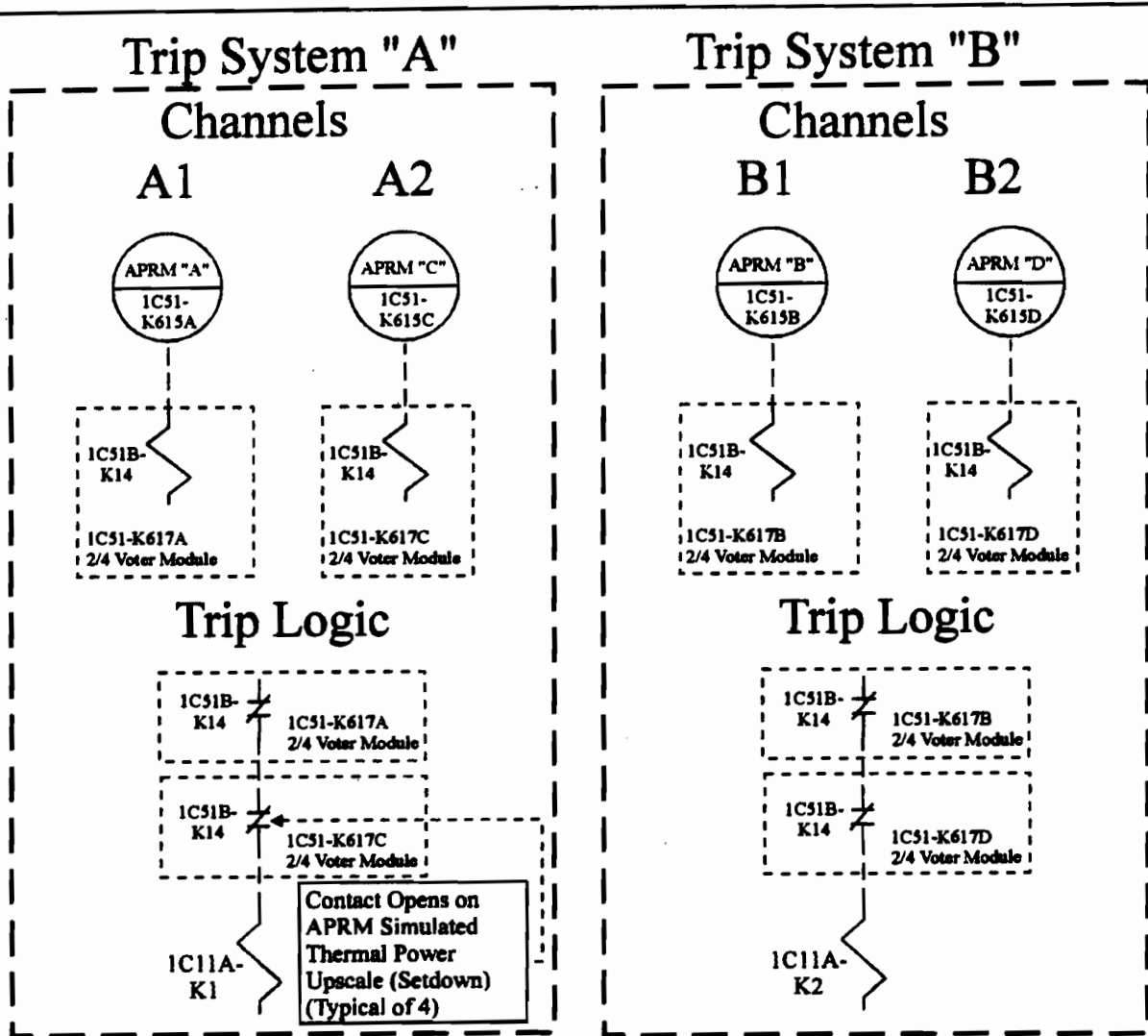
Elem. Ref.	
H-17828	H-44707
H-17831	H-44708
H-44705	H-44713
H-44706	

Note 1: For the STP Upscale function of an APRM to be considered operable, both of the associated Recirc Flow transmitters must be operable.

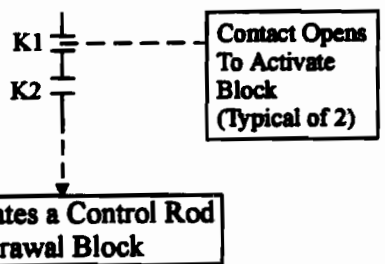
Prepared By: *TRC*
 Reviewed By: *RDH*

LFD-1-CRB-17
 TRM T3.3.2-1, Item 3.a
 Control Rod Block
 Instrumentation, APRM -
 Simulated Thermal
 Power Upscale

TRM REV. 60



Actuation Logic



Minimum Channel Requirements for System Initiation Capability:

In order to maintain Control Rod Withdrawal Block capability on an APRM Simulated Thermal Power Upscale (Setdown) condition, one channel must be functional or maintained in the tripped condition.

Elem. Ref.	
A-17828	H-44707
H-17831	H-44708
H-44705	H-44713
H-44706	

Prepared By: *JLC*

Reviewed By: *AW:lf*

LFD-1-CRB-18

TRM T3.3.2-1, Item 3.b

Control Rod Block Instrumentation, APRM-Simulated Thermal Power Upscale (Setdown)

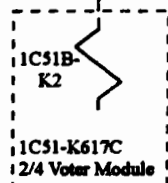
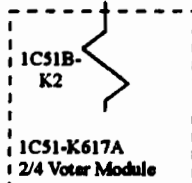
TRM REV. 60

Trip System "A"

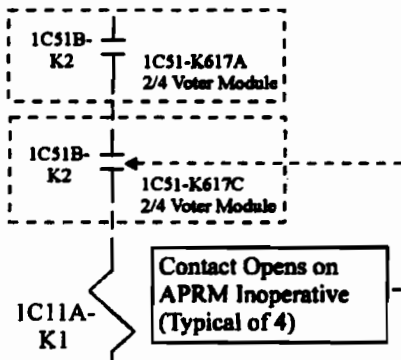
Channels

A1

A2



Trip Logic

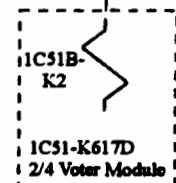
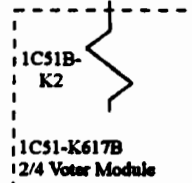


Trip System "B"

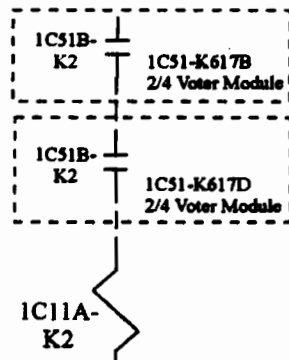
Channels

B1

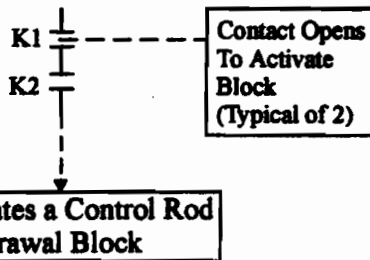
B2



Trip Logic



Actuation Logic



Minimum Channel Requirements for System Initiation Capability:

In order to maintain Control Rod Withdrawal Block capability on an APRM Inoperative condition, one channel must be functional or maintained in the tripped condition.

Elem. Ref.

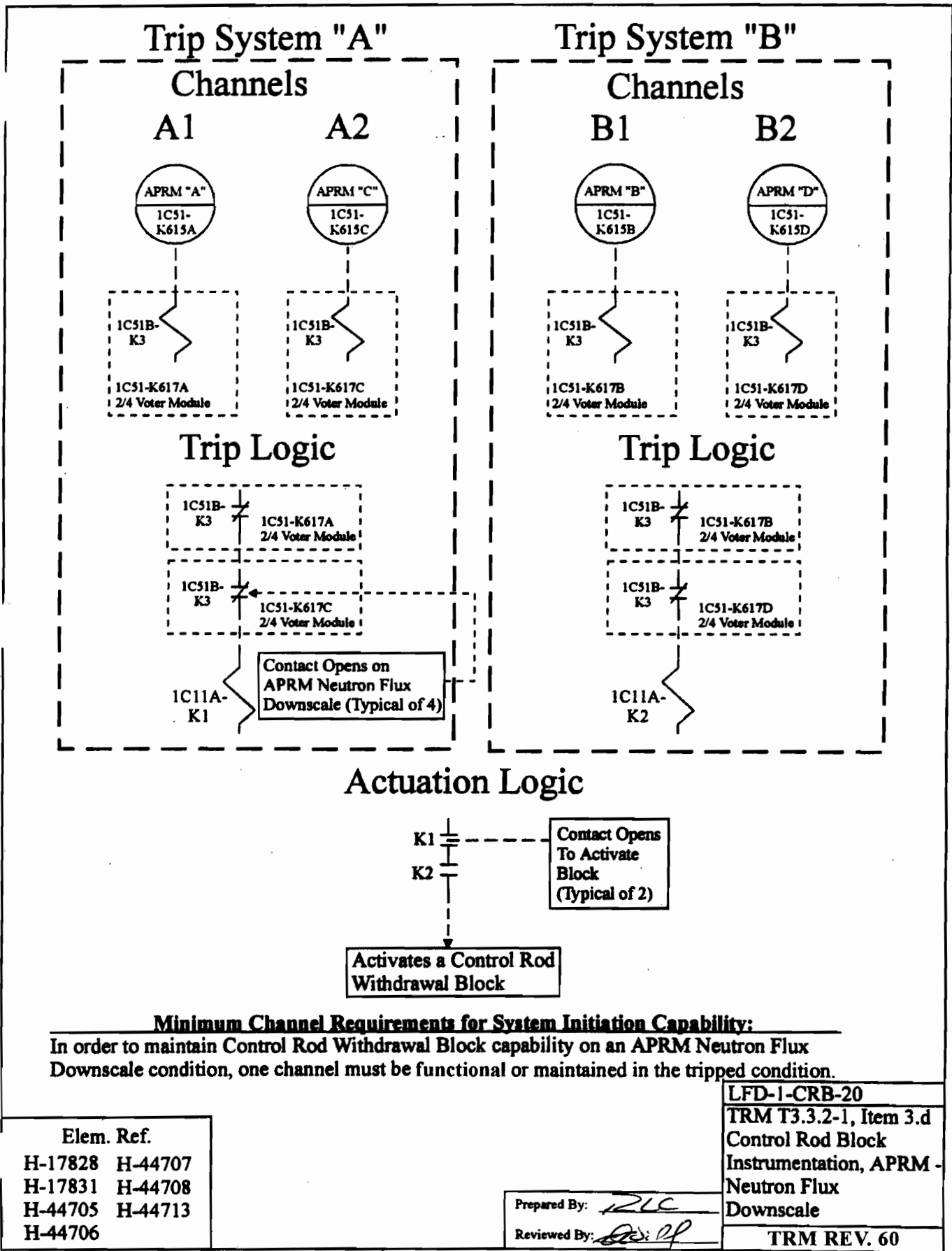
H-17828 H-44707
H-17831 H-44708
H-44705 H-44713
H-44706

Prepared By: *RLL*
Reviewed By: *...*

LFD-1-CRB-19

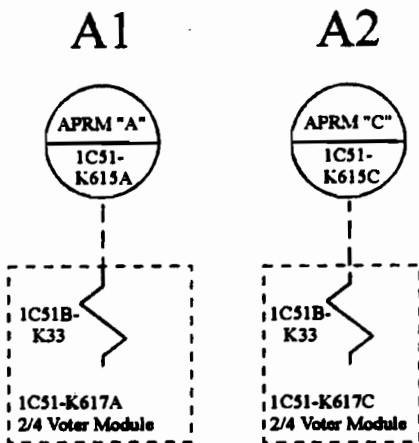
TRM T3.3.2-1, Item 3.c
Control Rod Block
Instrumentation, APRM -
Inoperative

TRM REV. 60

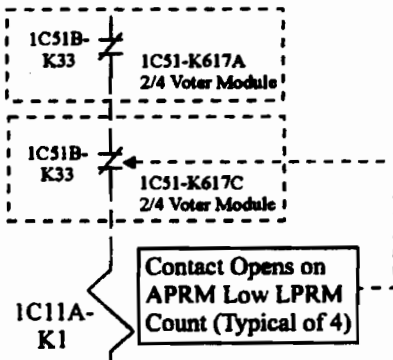


Trip System "A"

Channels

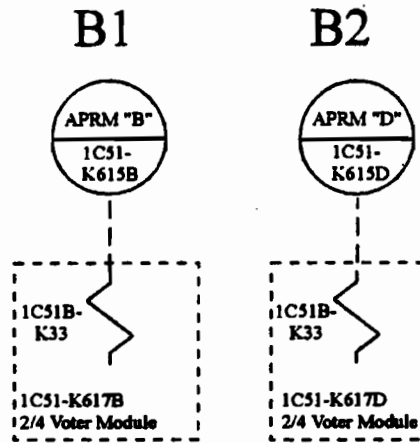


Trip Logic

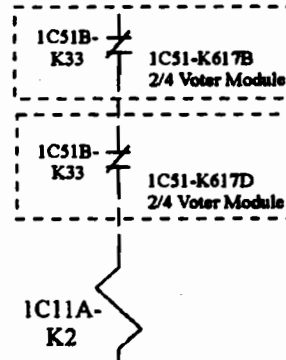


Trip System "B"

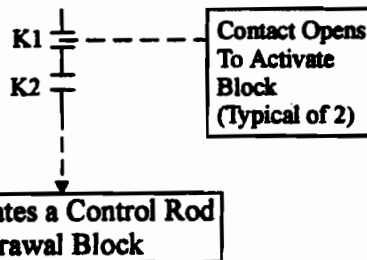
Channels



Trip Logic



Actuation Logic



Minimum Channel Requirements for System Initiation Capability:

In order to maintain Control Rod Withdrawal Block capability on an APRM Low LPRM Count condition, one channel must be functional or maintained in the tripped condition.

Elem. Ref.

H-17828 H-44707
 H-17831 H-44708
 H-44705 H-44713
 H-44706

Prepared By: *DLC*

Reviewed By: *[Signature]*

LFD-1-CRB-21

TRM T3.3.2-1, Item 3.e
 Control Rod Block
 Instrumentation, APRM -
 Low LPRM Count

TRM REV. 60

Trip System "A"

Trip System "B"

Channels

Channels

Recirc Loop Flow Xmitters

Loop A
1B31-N014A

Loop B
1B31-N024A
See Note 1.

A1



1C51B-K31

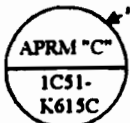
1C51-K617A
2/4 Voter Module

Recirc Loop Flow Xmitters

Loop A
1B31-N014C

Loop B
1B31-N024C
See Note 1.

A2



1C51B-K31

1C51-K617C
2/4 Voter Module

Recirc Loop Flow Xmitters

Loop A
1B31-N014B

Loop B
1B31-N024B
See Note 1.

B1



1C51B-K31

1C51-K617B
2/4 Voter Module

Recirc Loop Flow Xmitters

Loop A
1B31-N014D

Loop B
1B31-N024D
See Note 1.

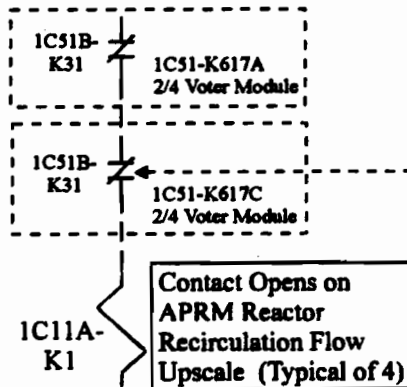
B2



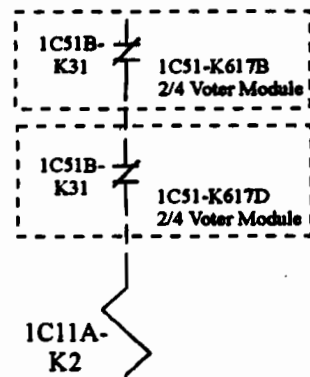
1C51B-K31

1C51-K617D
2/4 Voter Module

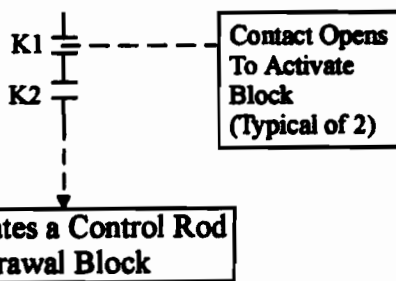
Trip Logic



Trip Logic



Actuation Logic



Minimum Channel Requirements for System Initiation Capability:

In order to maintain Control Rod Withdrawal Block capability on an APRM Reactor Recirculation Flow Upscale condition, one channel must be functional or maintained in the tripped condition.

Elem. Ref.

H-17828 H-44707
H-17831 H-44708
H-44705 H-44713
H-44706

Note 1: For the Reactor Recirculation Flow Upscale function of an APRM to be considered operable, both of the associated Recirc Flow transmitters must be operable.

Prepared By: *TJC*

Reviewed By: *[Signature]*

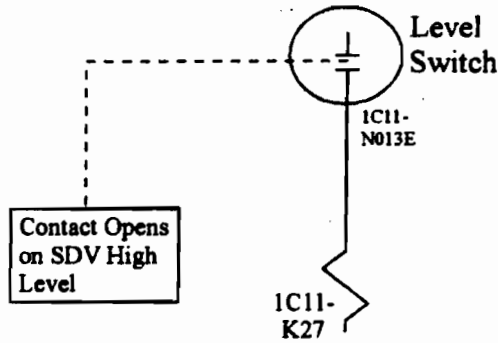
LFD-1-CRB-22

TRM T3.3.2-1, Item 3.f
Control Rod Block
Instrumentation, APRM-
Reactor Recirculation
Flow Upscale

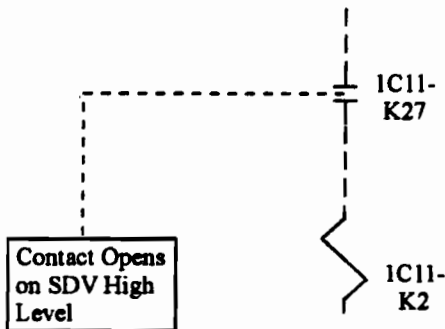
TRM REV. 60

Trip System

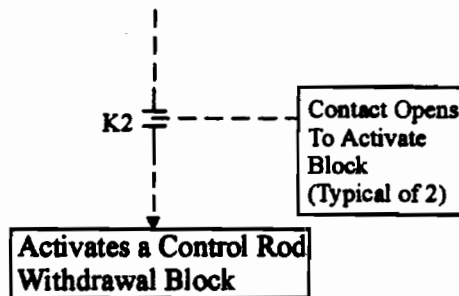
Channel



Trip Logic



Actuation Logic



Minimum Channel Requirements for System Initiation Capability:

In order to maintain Control Rod Withdrawal Block capability on a Scram Discharge Volume high level condition, the one channel must be functional or maintained in the tripped condition.

Elem. Ref.

H-17828
H-17831
H-17832

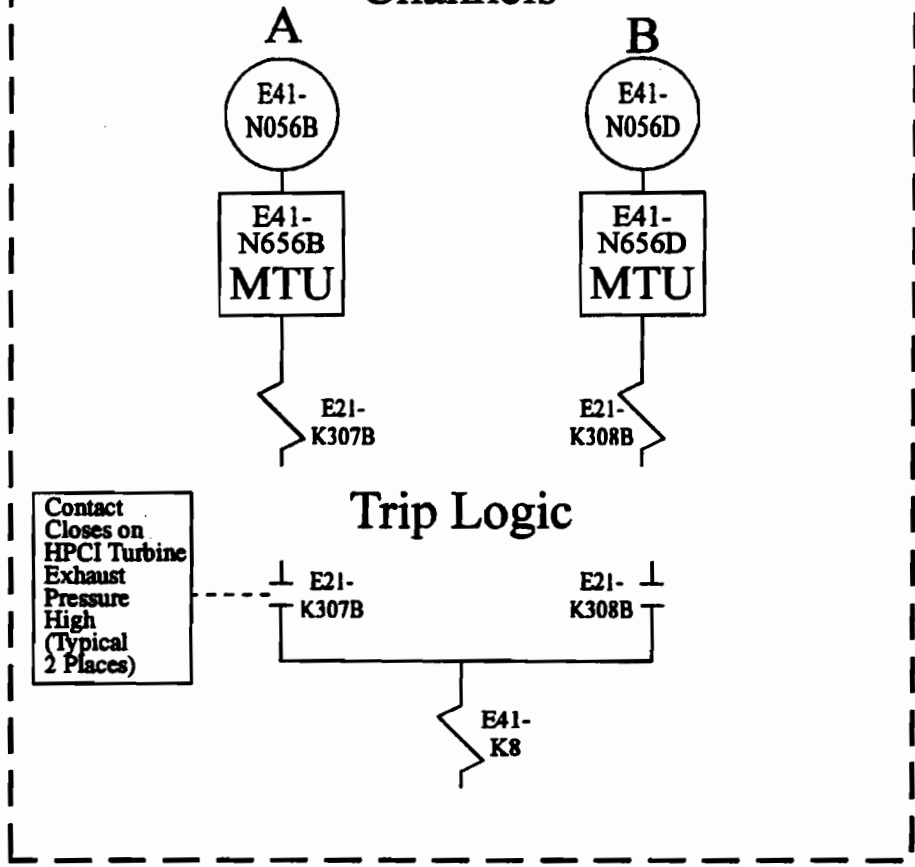
Prepared By: *DLC*
Reviewed By: *D. J.*

LFD-1-CRB-23
TRM T3.3.2-1, Item 4
Control Rod Block
Instrumentation, SDV
Level - High

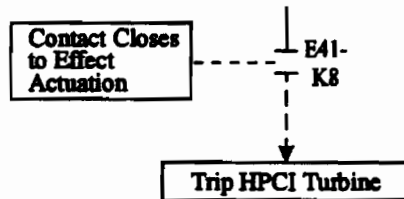
TRM REV. 60

Trip System

Channels



Actuation Logic



Minimum Channel Requirements for System Trip Capability:

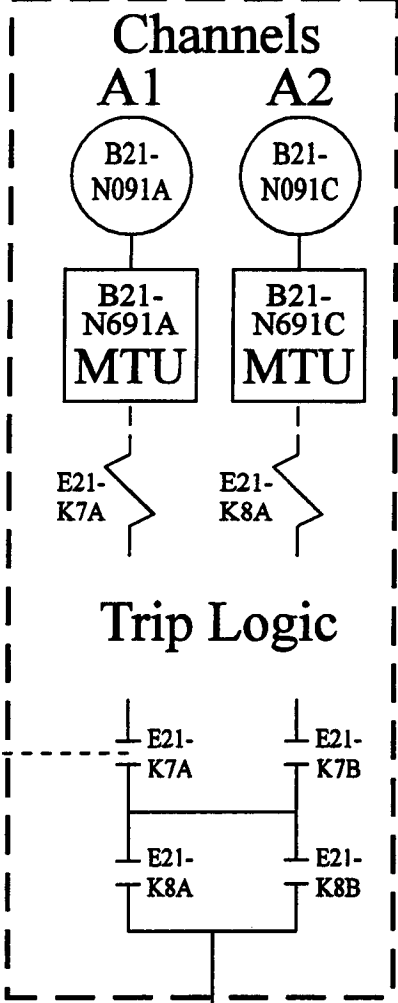
In order to maintain HPCI turbine trip capability with regard to a HPCI turbine exhaust pressure-high signal, at least one channel must be functional.

Elem. Ref. H-17159 H-17160 H-19824

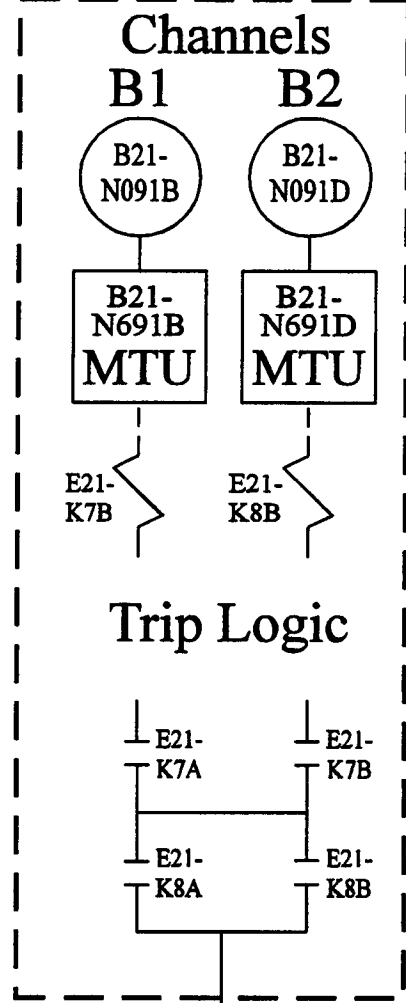
Prepared By: <i>DLC</i>
Reviewed By: <i>[Signature]</i>

LFD-1-ECCS-25
TRM T3.3.5-1, Item 2 HPCI Turbine Trip HPCI Turbine Exhaust Pressure-High
TRM REV. 60

Trip System "A"



Trip System "B"



Contacts Close on RWL Low-Lvl 1 (Typical 8 Places)

Initiation of CS Subsystems "A" and "B" (Except Valve 1E21-F004B Does Not Receive an Open Signal and Valve 1E21-F015B Does Not Receive a Closed Signal); EDG's 1A, 1C, 1B; PSW P41-F310A,B,C,D Valves; Lock-out Auto-start of Cond. and Cond. Booster Pumps for 50 secs.; Trip of CRD Pump "A"; Trip of D/W Cooling System; Trip of T/B Chiller "A"; Trip of Cooling Tower ACB 135313.

Initiation of CS Subsystems "A" and "B" (Except Valve 1E21-F004A Does Not Receive an Open Signal and Valve 1E21-F015A Does Not Receive a Closed Signal); EDG's 1A, 1C, 1B; PSW P41-F310A,B,C,D Valves; Lock-out Auto-start of Cond. and Cond. Booster Pumps for 50 secs.; Trip of CRD Pump "B"; Trip of D/W Cooling System; Trip of T/B Chiller "B"; Trip of Cooling Tower ACB 135312.

Minimum Channel Requirements for System Initiation Capability:

In order to maintain initiation capability for Core Spray, the EDG's, the PSW turbine building isolation valves, and the above noted load shed and sequence logic on a RWL-Level 1 signal, channels in one of the following combinations must be either operable or maintained in the tripped condition.

Elem. Ref.		
H-13380	H-17102	H-19826
H-13385	H-17109	H-19829
H-17047	H-17114	H-19830
H-17101	H-19823	

- A1 & A2
- A1 & B2
- B1 & A2
- B1 & B2

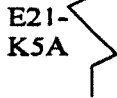
LFD-1-ECCS-01
TS 3.3.5.1-1, Item 1.a
Core Spray System
RWL-Low Low Low, Level 1

Prepared By: *S. L. Gannon*
 Reviewed By: *William J. Walker*

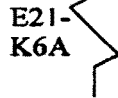
Trip System "A"

Channels

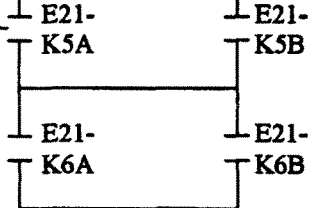
A1



A2



Trip Logic

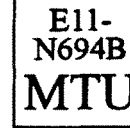


Actuation Logic "A"

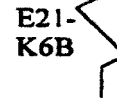
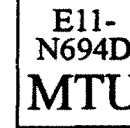
Trip System "B"

Channels

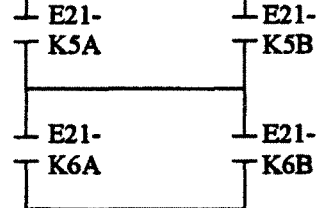
B1



B2



Trip Logic



Actuation Logic "B"

Contact Closes on High Drywell Press (Typical 8 Places)

Initiation of CS Subsystems "A" and "B" (Except Valve 1E21-F004B Does Not Receive an Open Signal and Valve 1E21-F015B Does Not Receive a Closed Signal); EDG's 1A, 1C, 1B; PSW P41-F310A,B,C,D Valves; Lock-out Auto-start of Cond. and Cond. Booster Pumps for 50 secs.; Trip of CRD Pump "A"; Trip of D/W Cooling System; Trip of T/B Chiller "A"; Trip of Cooling Tower ACB 135313.

Initiation of CS Subsystems "A" and "B" (Except Valve 1E21-F004A Does Not Receive an Open Signal and Valve 1E21-F015A Does Not Receive a Closed Signal); EDG's 1A, 1C, 1B; PSW P41-F310A,B,C,D Valves; Lock-out Auto-start of Cond. and Cond. Booster Pumps for 50 secs.; Trip of CRD Pump "B"; Trip of D/W Cooling System; Trip of T/B Chiller "B"; Trip of Cooling Tower ACB 135312.

Minimum Channel Requirements for System Initiation Capability:

In order to maintain initiation capability for Core Spray, the EDG'S, the PSW turbine building isolation valves, and the above noted load shed and sequence logic on a Drywell Pressure-High signal, channels in one of the following combinations must be either operable or maintained in the tripped condition.

Elem. Ref.

H-13380 H-17102 H-19826
 H-13385 H-17109 **H-19827**
 H-17047 H-17114 H-19830
 H-17101 H-19823

A1 & A2
 A1 & B2
 B1 & A2
 B1 & B2

LFD-1-ECCS-02

TS 3.3.5.1-1, Item 1.b
 Core Spray System
 Drywell Pressure-High

Prepared By: B.G. Thigpin *B.G. Thigpin*
 Reviewed By: **S.B. Tippe** *S.B. Tippe*
 printed signature

TRM Rev. 93

Trip System "A"

Channels

A1

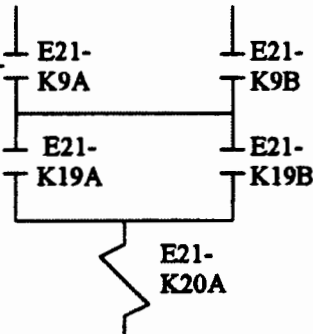
A2



E21-K9A

E21-K19A

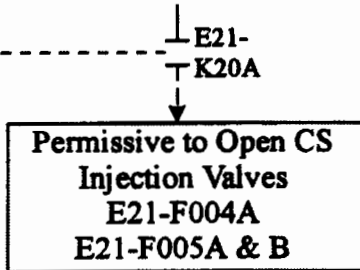
Trip Logic



Contact Closes on Reactor Steam Dome Pressure Low (Typical 8 Places)

Actuation Logic "A"

Contact Closes to Effect Actuation (Typical 2 Places)



Trip System "B"

Channels

B1

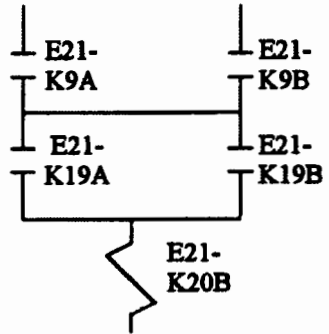
B2



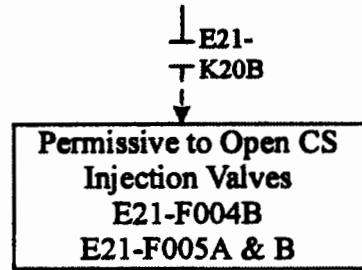
E21-K9B

E21-K19B

Trip Logic



Actuation Logic "B"



Minimum Channel Requirements for System Initiation Capability:

In order to maintain Core Spray system initiation capability on a Reactor Steam Dome Pressure-Low signal, channels in one of the following combinations must be either operable or maintained in the tripped condition for modes 4 and 5 only. Credit cannot be taken for tripped channels in modes 1, 2, and 3.

Elem. Ref.
H-17109
H-19827
H-19830

A1 & A2
A1 & B2
B1 & A2
B1 & B2

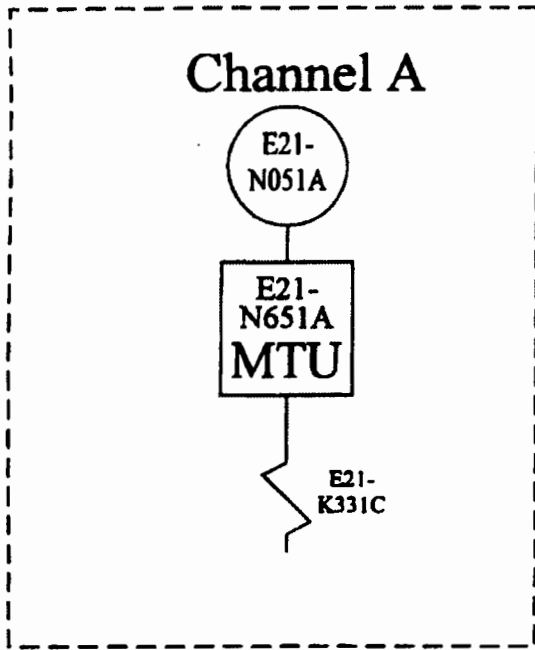
Prepared By: *JDB*
Reviewed By: *CCR*

LFD-1-ECCS-03

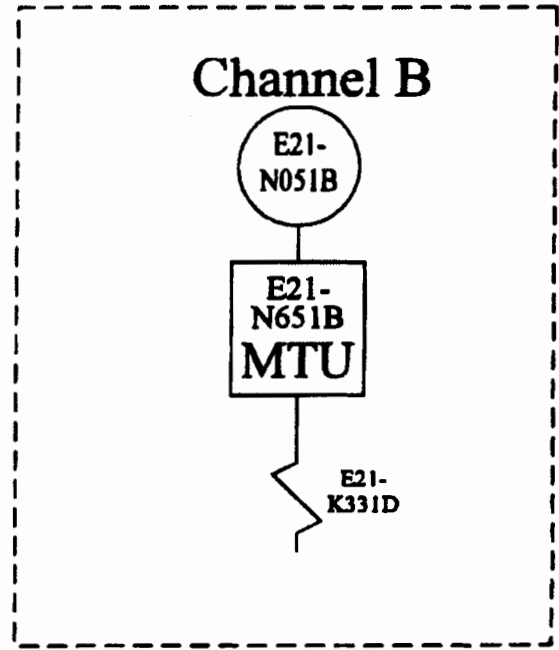
TS 3.3.5.1-1, Item 1.c

Core Spray System
Reactor Steam Dome
Pressure-Low
TRM Revision 132

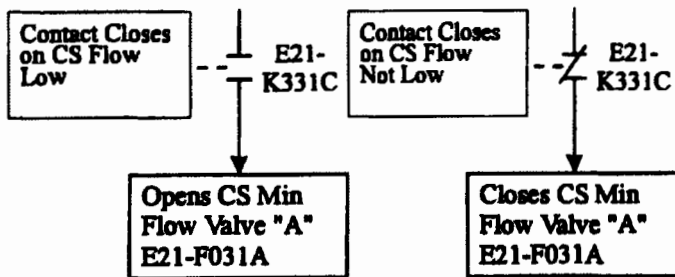
Trip System "A"



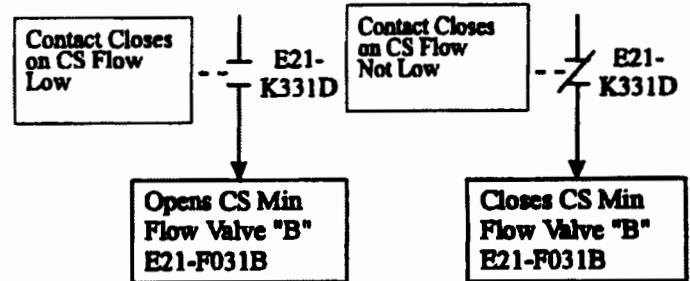
Trip System "B"



Actuation Logic "A"



Actuation Logic "B"



Minimum Channel Requirements for System Initiation Capabilities:

In order to maintain Core Spray system initiation capability with regard to minimum flow valve operability, channel A or B must be operable.

Elem. Ref.
H-19828
H-19831
H-17111

Prepared By: *DPC*

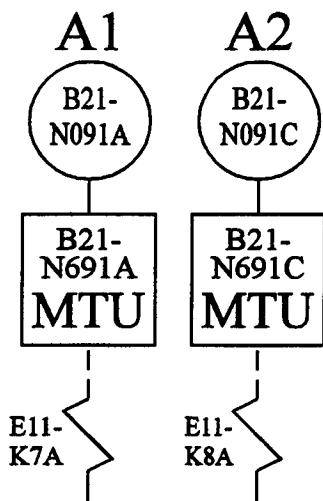
Reviewed By: *LLA*

LFD-1-ECCS-04

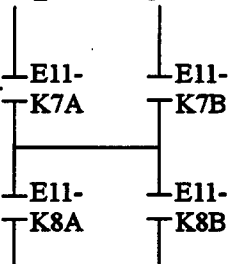
TS 3.3.5.1-1, Item 1.d
TS 3.3.5.2-1, Item 1.b
Core Spray System
Core Spray Pump
Discharge Flow-Low
Rev. 1 12/06/18

Trip System "A"

Channels



Trip Logic

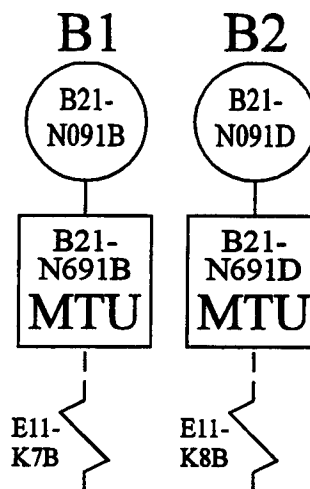


Actuation Logic "A"

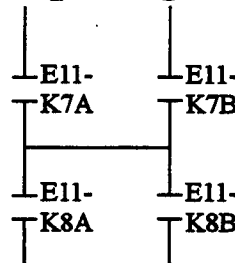
Initiation of LPCI Subsystems "A" and "B" (Except Valves 1E11-F017B and 1E11-F048B Do Not Receive an Open Signal and Containment Spray Valves, Steam Condensing Mode Valves and the Test Return Line Valve of the "B" Subsystem Do Not Receive a Close Signal)

Trip System "B"

Channels



Trip Logic



Actuation Logic "B"

Initiation of LPCI Subsystems "A" and "B" (Except Valves 1E11-F017A and 1E11-F048A Do Not Receive an Open Signal and Containment Spray Valves, Steam Condensing Mode Valves and the Test Return Line Valve of the "A" Subsystem Do Not Receive a Close Signal)

E11-K125A
"10 Sec" Timer

E11-K70A
"10 Sec" Timer

E11-K75A
"10 Sec" Timer

(Ref Dwg LFD-1-ECCS-10)

E11-K125B
"10 Sec" Timer

E11-K126
"10 Sec" Timer

E11-K70B
"10 Sec" Timer

E11-K75B
"0.2 Sec" Timer

(Ref Dwg LFD-1-ECCS-10)

Minimum Channel Requirements for System Initiation Capability:

In order to maintain initiation capability for the LPCI system on a RWL-Level 1 signal, channels in one of the following combinations must be either operable or maintained in the tripped condition.

- A1 & A2
- A1 & B2
- B1 & A2
- B1 & B2

Elem. Ref.

H-17763	H-19826
H-17766	H-19829
H-19823	H-19830

Prepared By: *J. L. G... ..*

Reviewed By: *W. W. W...*

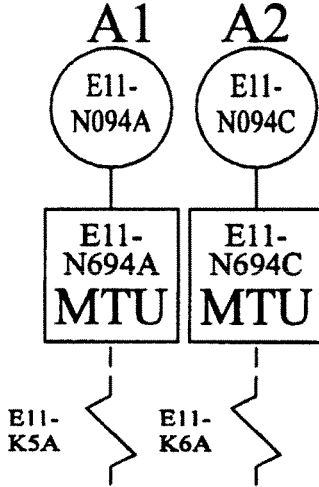
LFD-1-ECCS-05

TS 3.3.5.1-1, Item 2.a
LPCI System
RWL- Low Low Low,
Level 1

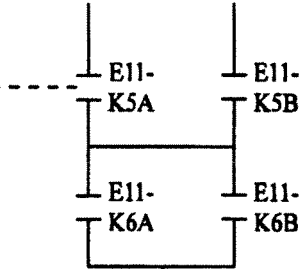
TRM Rev. 6

Trip System "A"

Channels



Trip Logic



Contact Closes on High Drywell Pressure (Typical 8 Places)

Actuation Logic "A"

E11-K125A
"10 Sec" Timer

E11-K70A
"10 Sec" Timer

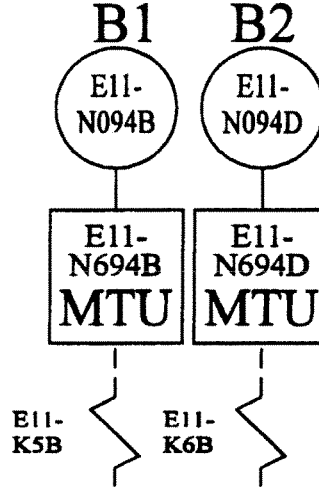
E11-K75A
"10 Sec" Timer

(Ref Dwg LFD-1-ECCS-10)

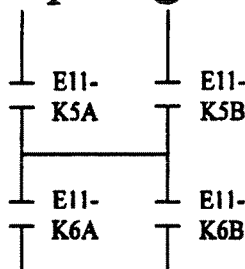
Initiation of LPCI Subsystems "A" and "B" (Except Valves 1E11-F017B and 1E11-F048B Do Not Receive an Open Signal and Containment Spray Valves, Steam Condensing Mode Valves and the Test Return Line Valve of the "B" Subsystem Do Not Receive a Close Signal)

Trip System "B"

Channels



Trip Logic



Actuation Logic "B"

E11-K125B
"10 Sec" Timer

E11-K126
"10 Sec" Timer

E11-K70B
"10 Sec" Timer

E11-K75B
"0.2 Sec" Timer

(Ref Dwg LFD-1-ECCS-10)

Initiation of LPCI Subsystems "A" and "B" (Except Valves 1E11-F017A and 1E11-F048A Do Not Receive an Open Signal and Containment Spray Valves, Steam Condensing Mode Valves and the Test Return Line Valve of the "A" Subsystem Do Not Receive a Close Signal)

Minimum Channel Requirements for System Initiation Capability:

In order to maintain initiation capability for the LPCI system on a Drywell Pressure-High signal, channels in one of the following combinations must be either operable or maintained in the tripped condition.

A1 & A2
A1 & B2
B1 & A2
B1 & B2

LFD-1-ECCS-06

TS 3.3.5.1-1, Item 2.b
LPCI System
Drywell Pressure-High

Elem. Ref.

H-17763 H-19827
H-17766 H-19830
H-19823
H-19826

Prepared By: B.G. Thigpin

Reviewed By: S.B. Tipps

printed

B.G. Thigpin
S.B. Tipps
signature

TRM Rev. 93

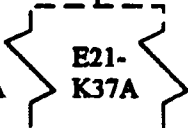
Trip System "A"

Channels

A1



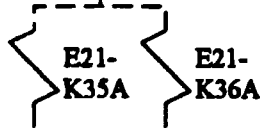
E21-K34A



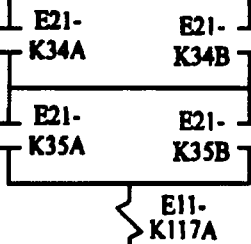
A2



E21-K35A



Trip Logic



Contact Closes On Reactor Steam Dome Press Low (Typical 8 Places)

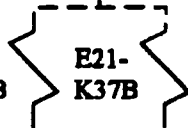
Trip System "B"

Channels

B1



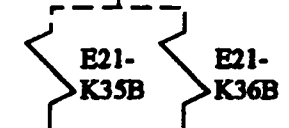
E21-K34B



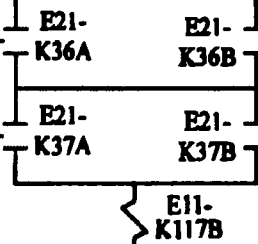
B2



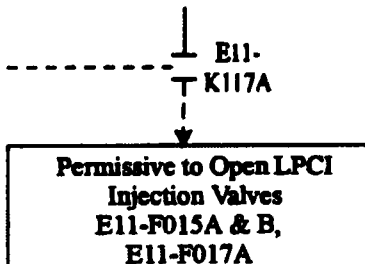
E21-K35B



Trip Logic

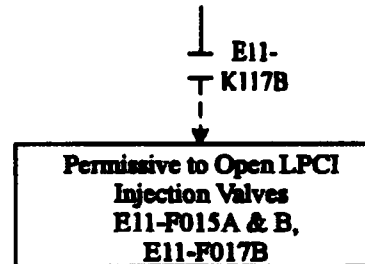


Actuation Logic "A"



Contact Closes to Effect Actuation (Typical 2 Places)

Actuation Logic "B"



Minimum Channel Requirements for System Initiation Capability:

In order to maintain LPCI system initiation capability on a Reactor Steam Dome Pressure-Low signal, channels in one of the following combinations must be either operable or maintained in the tripped condition for modes 4 and 5. Credit cannot be taken for tripped channels in modes 1, 2, and 3.

- A1 & A2
- A1 & B2
- B1 & A2
- B1 & B2

Elem. Ref.
H-19827
H-19830
H-17109
H-17763
H-17766

Prepared By: *JJB*

Reviewed By: *RAK*

LFD-1-ECCS-07

TS 3.3.5.1-1, Item 2.c

LPCI System
Reactor Steam Dome
Pressure-Low
TRM Revision 132

Trip System "A"

Trip System "B"

Channels

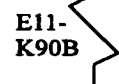
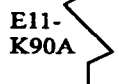
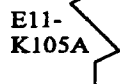
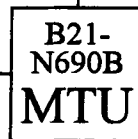
Channels

A1

A2

B1

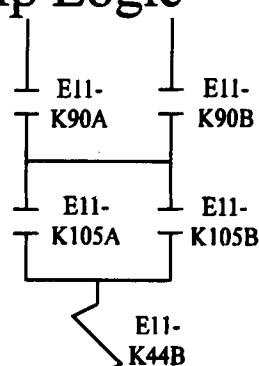
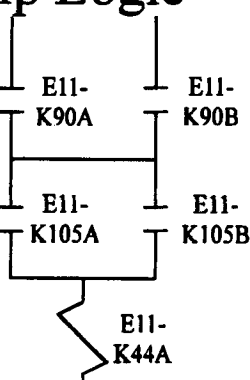
B2



Trip Logic

Trip Logic

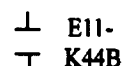
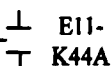
Contact Closes on Reactor Steam Dome Press Low (Typical 8 Places)



Actuation Logic "A"

Actuation Logic "B"

Contact Closes to Effect Actuation (Typical 2 Places)



Permissive to Close Recirc Pump Discharge Valves B31-F031A & B

Permissive to Close Recirc Pump Discharge Valves B31-F031A & B

Minimum Channel Requirements for System Initiation Capability:

In order for a Recirc Pump Disch Valve close permissive to be capable of initiating on a Reactor Steam Dome Pressure Low signal, channels in one of the following combinations must be operable.

- A1 & A2
- A1 & B1
- B2 & A2
- B1 & B2

Elem. Ref.
H-19827
H-19830
H-17765
H-17768

Prepared By: *JOB*

Reviewed By: *JDR*

LFD-1-ECCS-08

TS 3.3.5.1-1, Item 2.d
LPCI System
Reactor Steam Dome
Pressure-Low
Recirc Disch Valve
Permissive

Rev. 0

11/16/94

Trip System "A"

Channel A

B21-
N085A

B21-
N685A
MTU

E21-
K368A

Trip Logic

Contact Closes
on Reactor
Vessel Shroud \geq
Level "0"
(Typical 2
Places)

E21-
K368A

E11-
K14A

Trip System "B"

Channel B

B21-
N085B

B21-
N685B
MTU

E21-
K368B

Trip Logic

E21-
K368B

E11-
K14B

Actuation Logic "A"

Contact Closes
to Effect
Actuation
(Typical 2 Places)

E11-
K14A

Permissive to Open RHR
Full Flow Test, Containment
Spray, and Torus Spray
"A" Valves

Actuation Logic "B"

E11-
K14B

Permissive to Open RHR
Full Flow Test, Containment
Spray, and Torus Spray
"B" Valves

Minimum Channel Requirements for System Initiation Capability:

In order to maintain LPCI mode initiation capability (i.e., automatically securing other modes of RHR) with Reactor Water Level at or below Level-0, at least one channel must be operable or maintained in the tripped condition.

Elem. Ref.
H-19823
H-19826
H-17763
H-17766
H-17772
H-17774

Prepared By: *JJB*

Reviewed By: *SJR*

LFD-1-ECCS-09

TS 3.3.5.1-1, Item 2.e
LPCI System
Reactor Vessel Shroud
Level-0

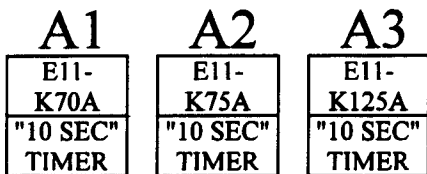
Rev. 0

11/16/94

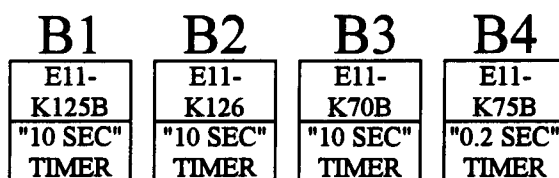
Trip System "A"

Trip System "B"

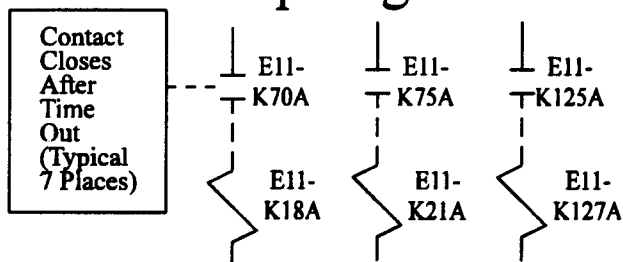
Channels



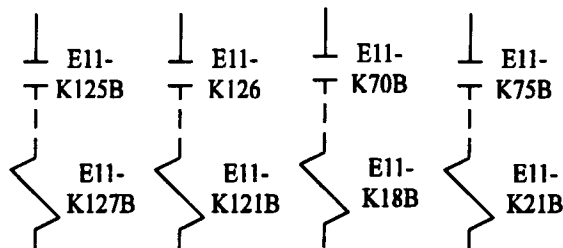
Channels



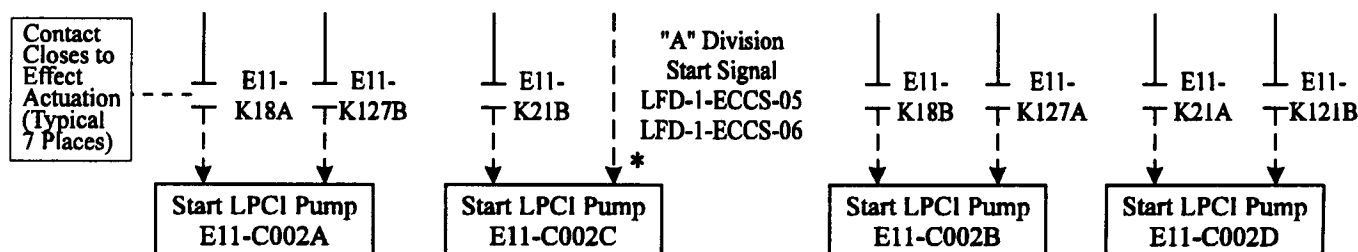
Trip Logic



Trip Logic



Actuation Logics



* No timer is associated with the "A" division start signal for pump E11-C002C, consequently, even if channel "B4" is inoperable, pump E11-C002C is still capable of being started provided the "A" division initiation logic is operable.

Minimum Channel Requirements for System Initiation Capability:

In order to maintain LPCI initiation capability with regard to the LPCI Pump Start Timers, one of the following combinations of channels is required to be operable:

- (A1 or B1) and (* or B4)
or
(A2 or B2) and (A3 or B3)

It is noted that when a timer fails such that it would actuate faster than required, the possibility exists of the pump associated with the failed timer overloading the associated Emergency Diesel Generator thereby affecting two low pressure ECCS pumps unless the pump is prevented from starting.

Elem. Ref.
H-17764
H-17765
H-17767
H-17768
H-17782

Prepared By: *J. L. Bruner*
Reviewed By: *W. Wayne*

LFD-1-ECCS-10

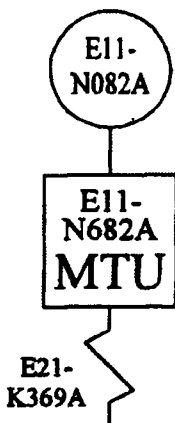
TS 3.3.5.1-1, Item 2.f
LPCI System
LPCI Pump Start-Time
Delay Relay

Rev. 0

3/30/95

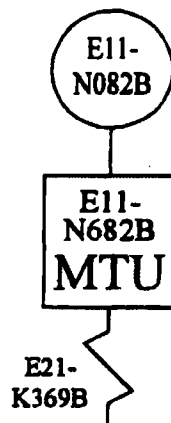
Trip System "A"

Channel A

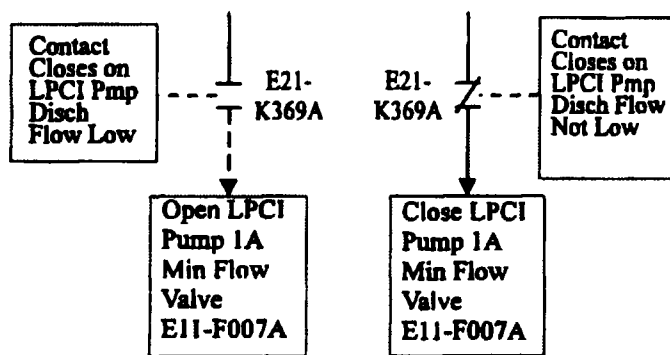


Trip System "B"

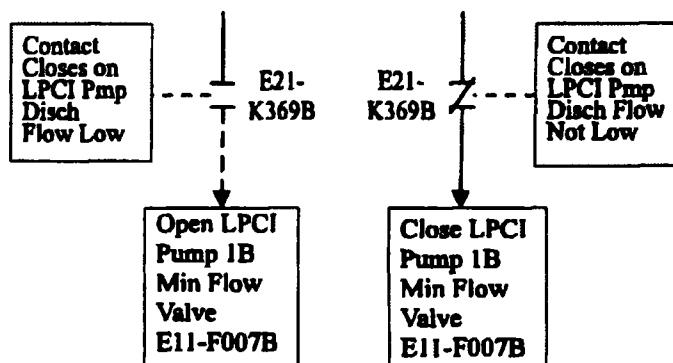
Channel B



Actuation Logic "A"



Actuation Logic "B"



Minimum Channel Requirements for System Initiation Capability:

In order to maintain LPCI initiation capability regarding minimum flow protection, at least one of the two channels must be operable.

Elem. Ref.
 H-19823
 H-19826
 H-17763
 H-17766
 H-17773
 H-17775

Prepared By: *GPC*
 Reviewed By: *RLR*

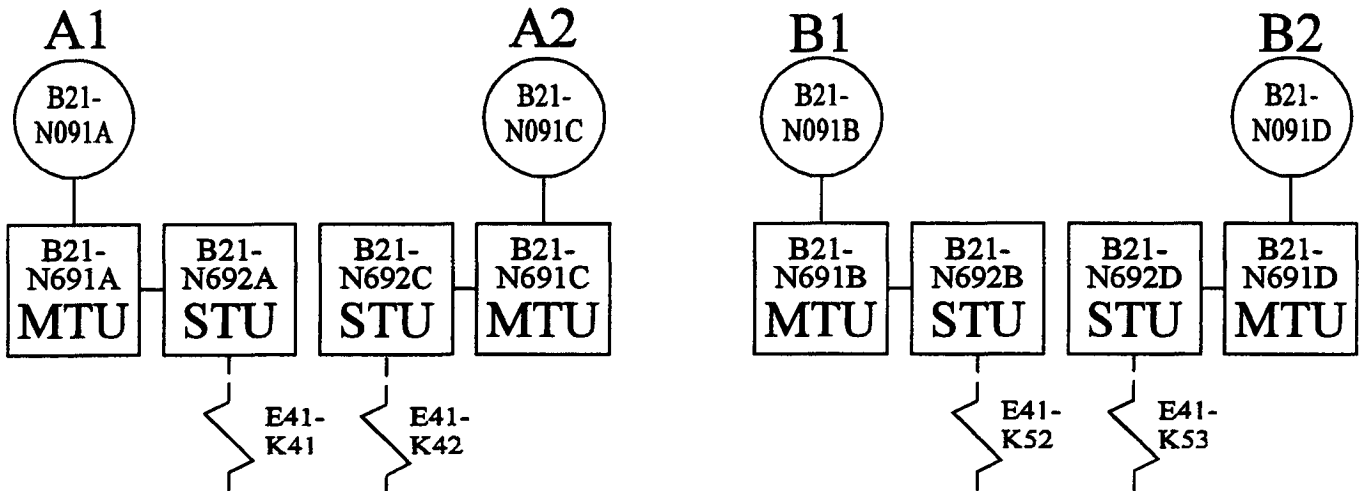
LFD-1-ECCS-11

TS 3.3.5.1-1, Item 2.g

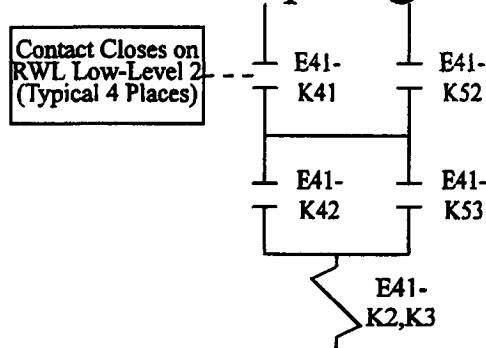
LPCI System
 LPCI Pump Discharge
 Flow-Low (Bypass)
 TRM Revision 132

Trip System

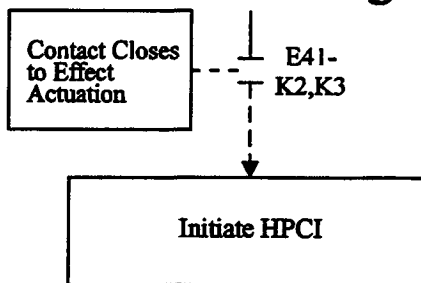
Channels



Trip Logic



Actuation Logic



Minimum Channel Requirements for System Initiation Capability:

In order to maintain HPCI Initiation capability on Reactor Water Low Level-2, channels in one of the following combinations must be either operable or maintained in the tripped condition.

- A1 & A2
- A1 & B2
- B1 & A2
- B1 & B2

Elem. Ref.

H-17159	H-19826
H-17160	H-19829
H-19823	H-19830

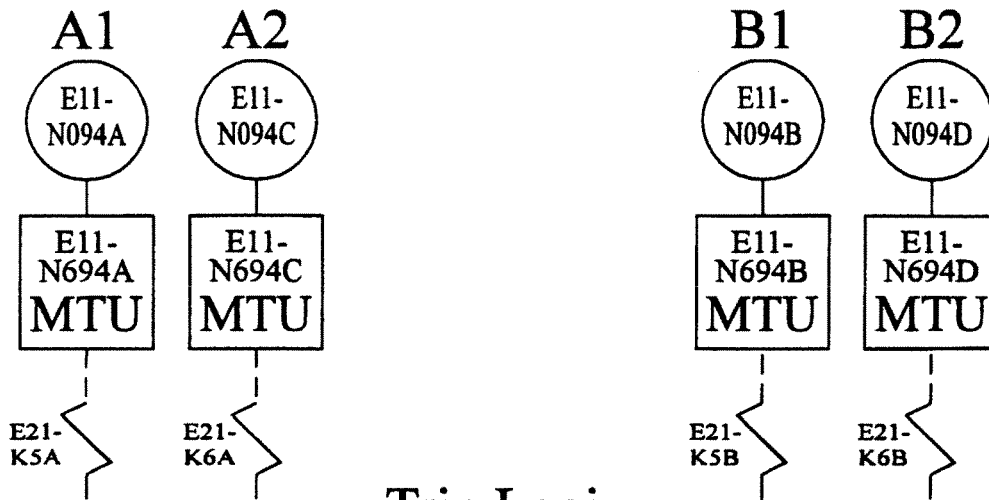
Prepared By: *J. F. Brown*
 Reviewed By: *Anthony Williams*

LFD-1-ECCS-12
 TS 3.3.5.1-1, Item 3.a
 HPCI System
 RWL-Low Low,
 Level 2

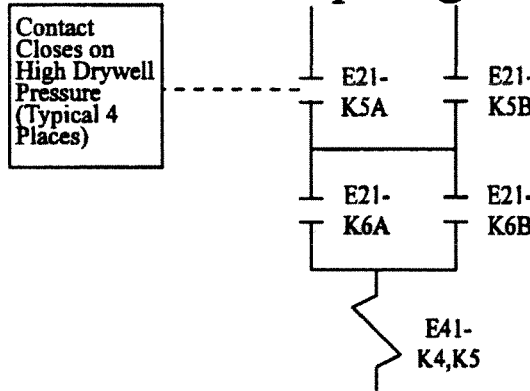
TRM Rev. 6

Trip System

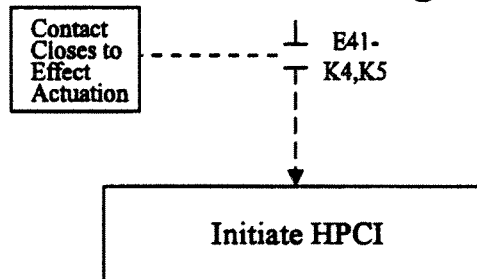
Channels



Trip Logic



Actuation Logic



Minimum Channel Requirement for System Initiation Capability:

In order to maintain HPCI initiation capability on High Drywell Pressure, channels in one of the following combinations must be either operable or maintained in the tripped condition.

- A1 & A2
- A1 & B2
- B1 & A2
- B1 & B2

LFD-1-ECCS-13

TS 3.3.5.1-1, Item 3.b
HPCI Initiation
Drywell Pressure-High

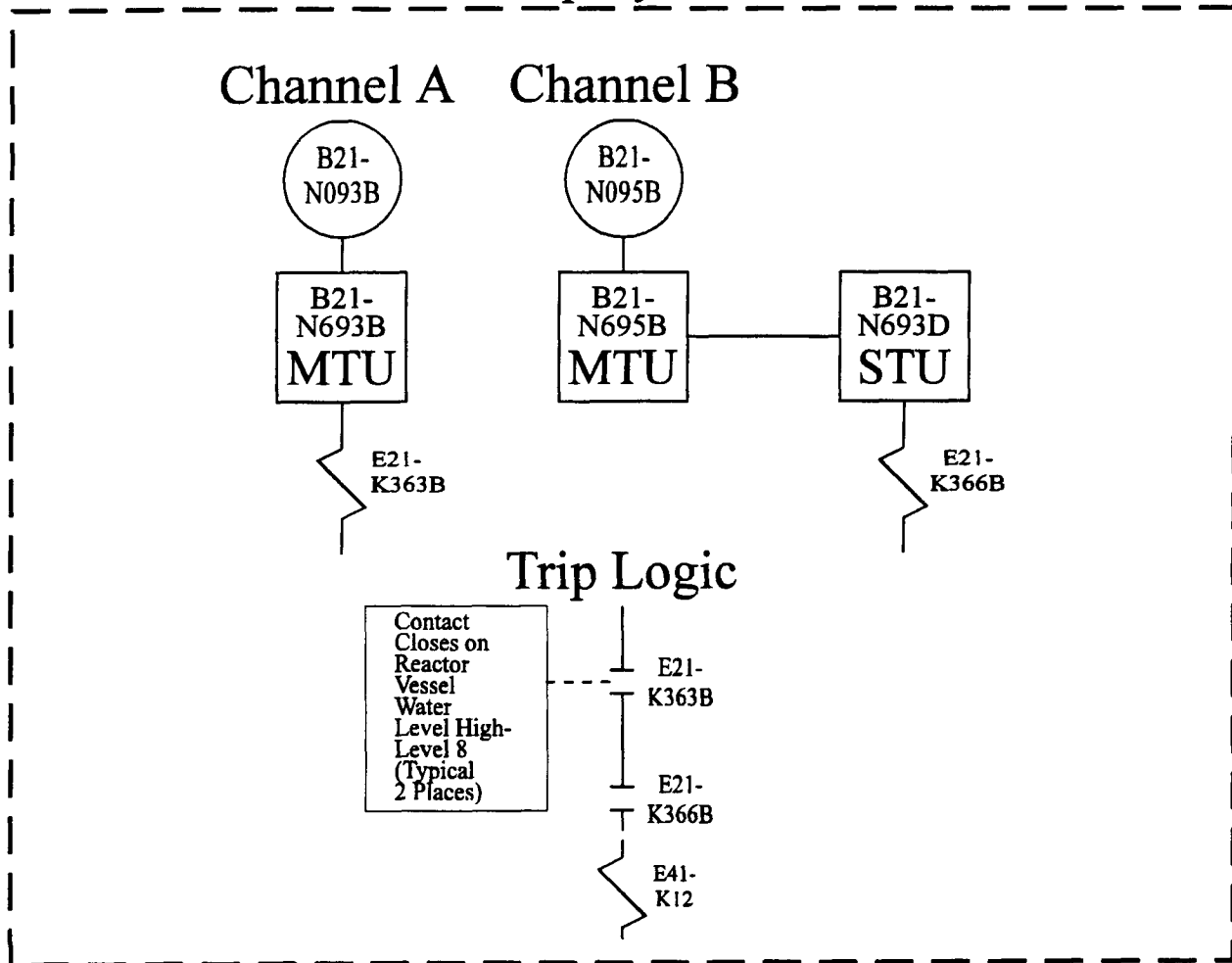
TRM Rev. 93

Elem. Ref.

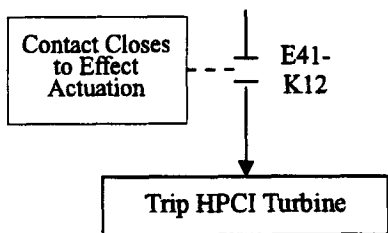
H-17109 H-19827
H-17159 H-19830
H-19823
H-19826

Prepared By: B.G. Thigpin *B.G. Thigpin*
Reviewed By: S.B. Tipps *S.B. Tipps*
printed signature

Trip System



Actuation Logic



Minimum Channel Requirements for System Initiation Capability:

In order to ensure a HPCI turbine trip on a RPV Water Level High-Level 8 signal, both channels must be operable.

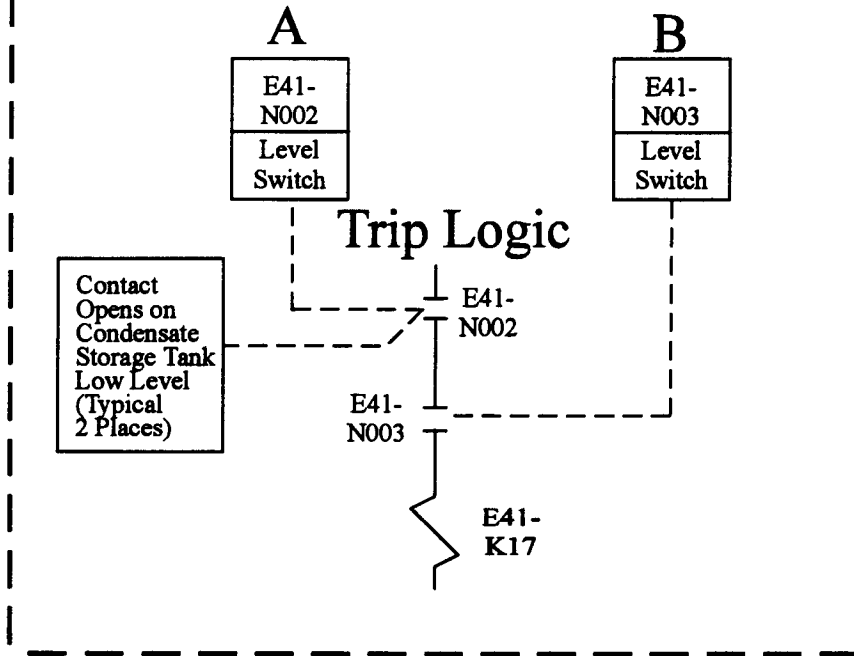
Elem. Ref. H-17159 H-17160 H-19826

Prepared By: <i>OPC</i>
Reviewed By: <i>LAR</i>

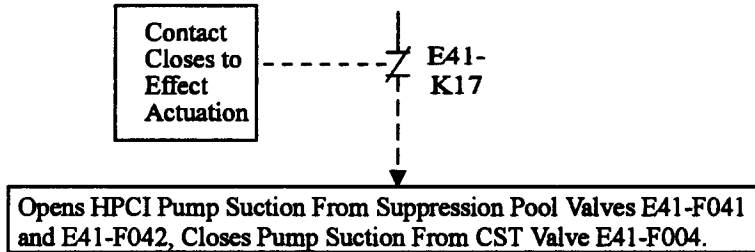
LFD-1-ECCS-14
TS 3.3.5.1-1, Item 3.c HPCI System Reactor Vessel Water Level-High, Level 8
Rev. 0 11/16/94

Trip System

Channels



Actuation Logic



Minimum Channel Requirements for System Initiation Capability:

In order to maintain the ability to automatically transfer the HPCI pump suction from the CST to the Suppression Pool on a Low Condensate Storage Tank Water Level signal, one of the channels must be either operable or maintained in the tripped condition.

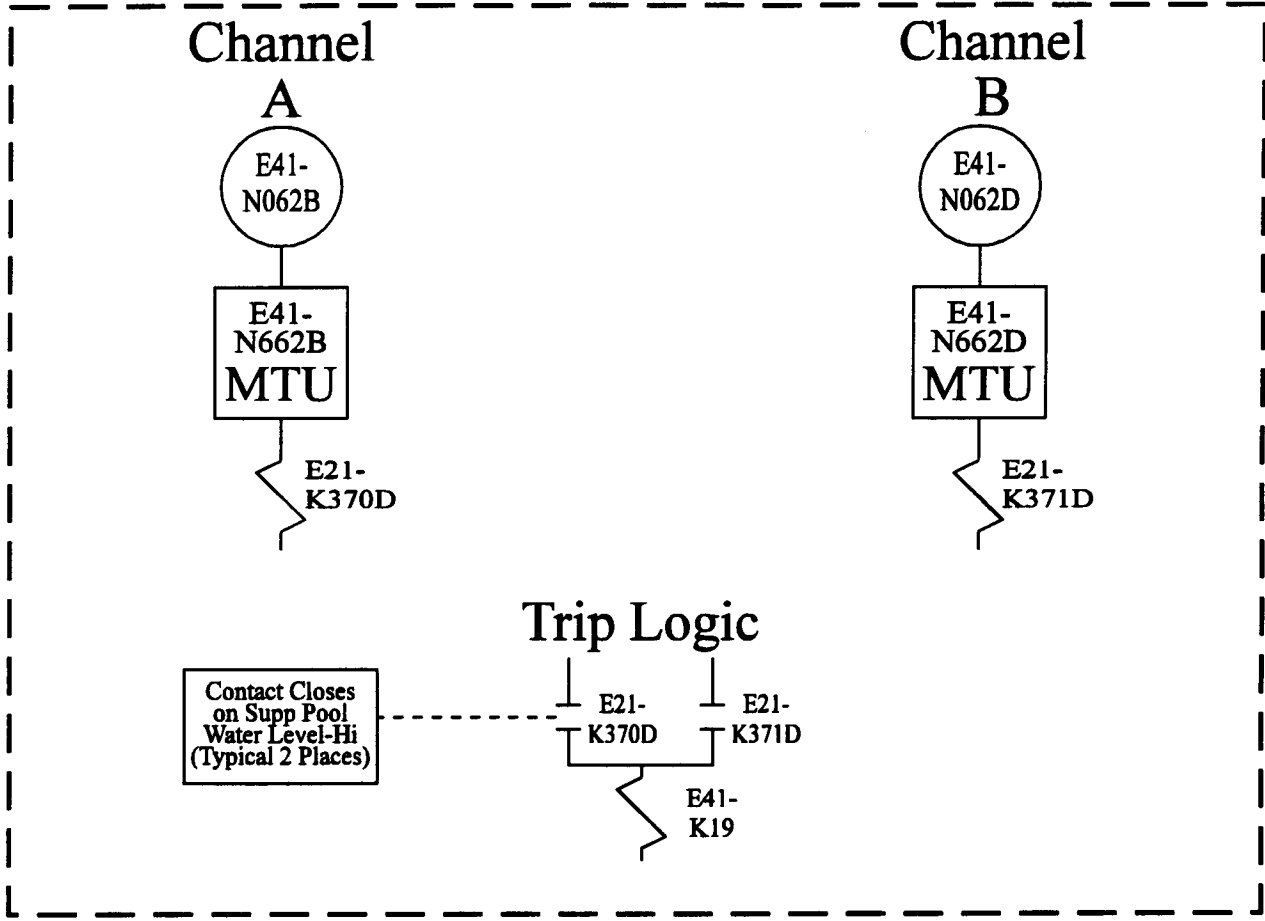
Elem. Ref.
H-17159
H-17163
H-17164

Prepared By: *JDB*
Reviewed By: *J.R.K.*

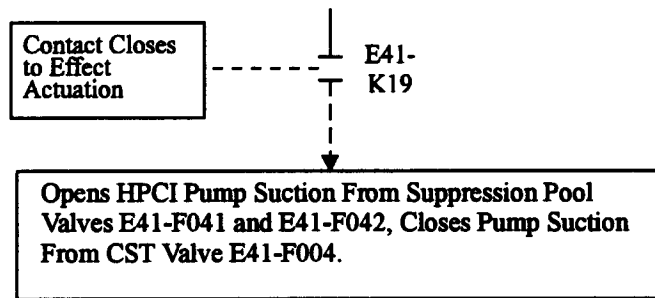
LFD-1-ECCS-15
TS 3.3.5.1-1, Item 3.d
HPCI System
Condensate Storage Tank
Level-Low

Rev. 0 11/16/94

Trip System



Actuation Logic



Minimum Channel Requirements for System Initiation Capability:

In order to maintain the ability to automatically transfer the HPCI pump suction from the CST to the Suppression Pool on a Suppression Pool Water Level-High signal, at least one channel must be operable or maintained in the tripped condition.

Elem. Ref.
H-19832
H-17159
H-17163
H-17164

Prepared By: *JSB*

Reviewed By: *CSR*

LFD-1-ECCS-16

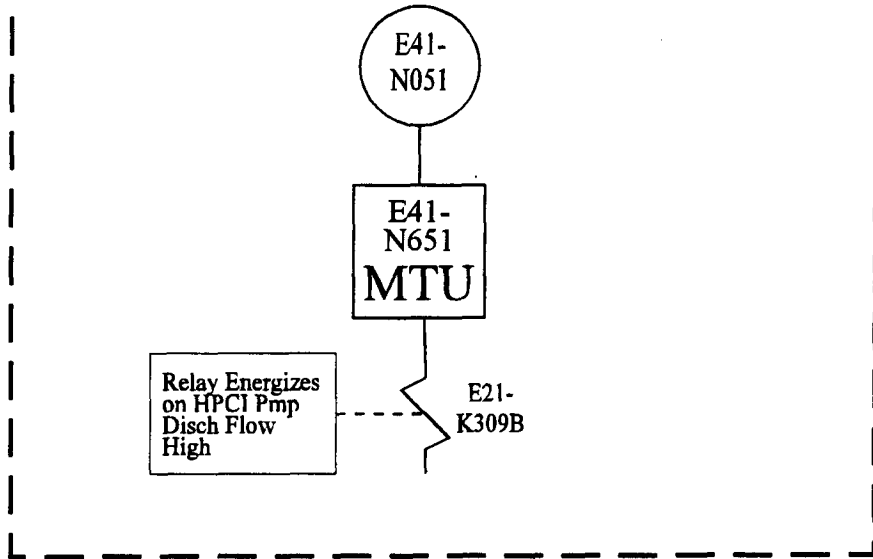
TS 3.3.5.1-1, Item 3.e
HPCI System
Suppression Pool
Water Level-High

Rev. 0

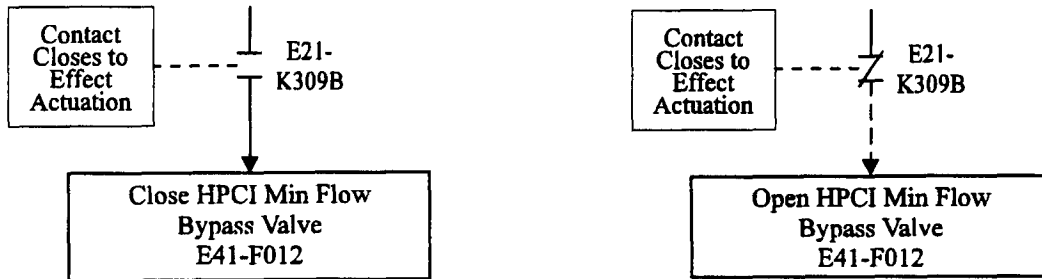
11/16/94

Trip System

Channel A



Trip Logic



Minimum Channel Requirements for System Initiation Capability:

In order to maintain HPCI Initiation capability regarding minimum flow protection, this channel must be operable.

Elem. Ref. H-19824 H-17159 H-17163

LFD-1-ECCS-17

TS 3.3.5.1-1, Item 3.f HPCI System HPCI Pump Disch Flow-Low (Bypass)

Prepared By: <i>OPC</i>

Reviewed By: <i>OPC</i>

Rev. 0

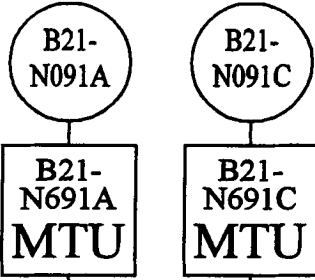
11/16/94

Trip System "A"

Trip System "B"

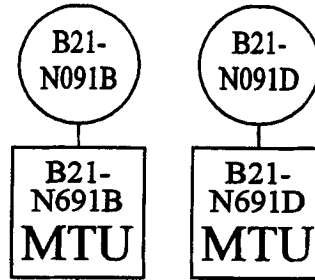
Channels

A1 A2

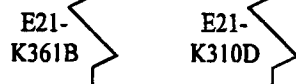
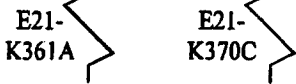


Channels

B1 B2

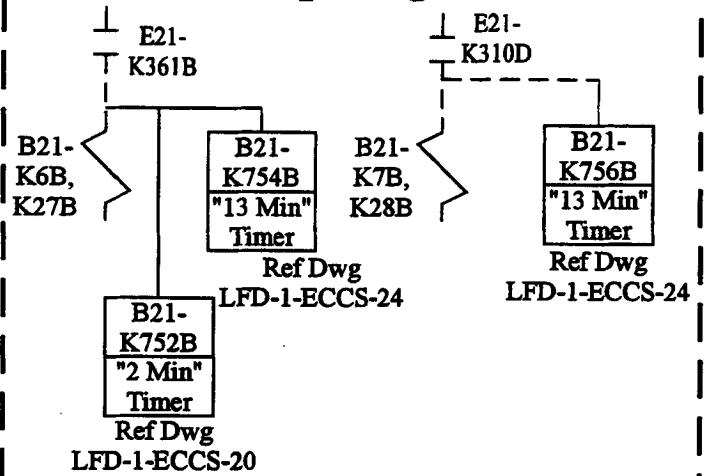
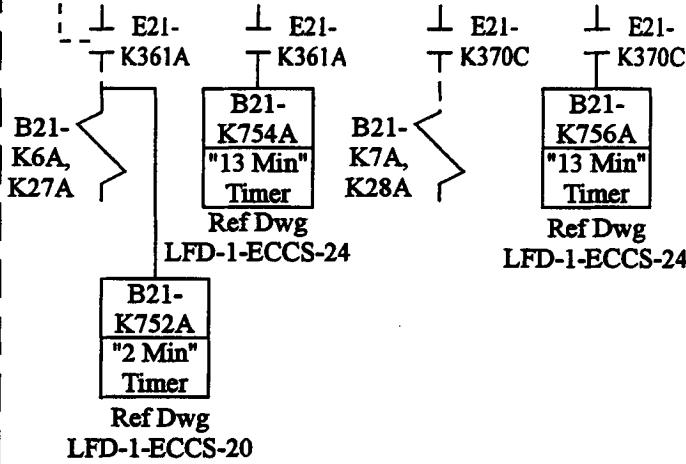


Contact Closes on RWL Low-Level 1 (Typical 6 Places)



Trip Logic

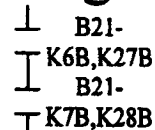
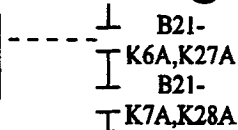
Trip Logic



Actuation Logic "A"

Actuation Logic "B"

Contact closes to effect actuation (Typical 4 Places)



Initiate ADS Valves
B21-F013B,D,E,F,J,K & L

Initiate ADS Valves
B21-F013B,D,E,F,J,K & L

Minimum Channel Requirements for System Initiation Capability:

In order to maintain ADS initiation capability on a RWL-Level 1 signal, channels in one of the following combinations must be either operable or maintained in the tripped condition.

A1 and A2
B1 and B2

Elem. Ref.	
H-17754	H-19826
H-17755	H-19829
H-17759	H-19830
H-19823	

Prepared By: *J.P. Brown*

Reviewed By: *Timothy W.D. Res*

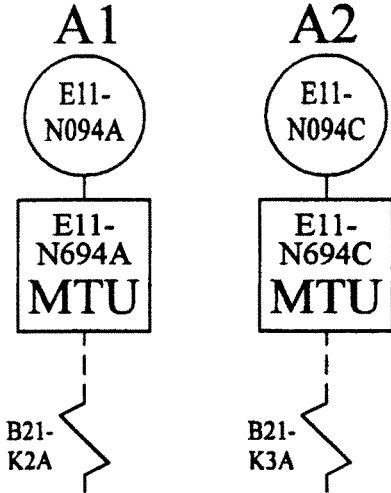
LFD-1-ECCS-18

TS 3.3.5.1-1, Item 4.a/5.a
ADS Trip system
RWL- Low, Low, Low
Level 1

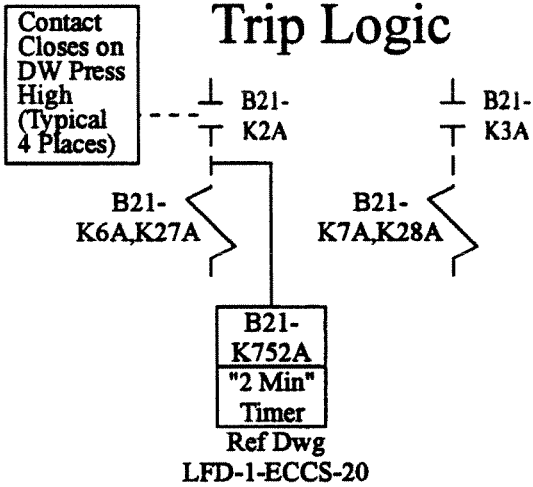
TRM Rev. 6

Trip System "A"

Channels

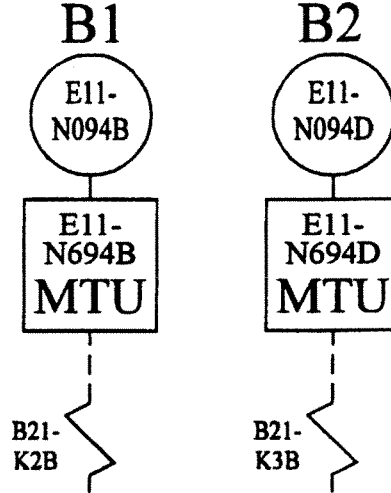


Trip Logic

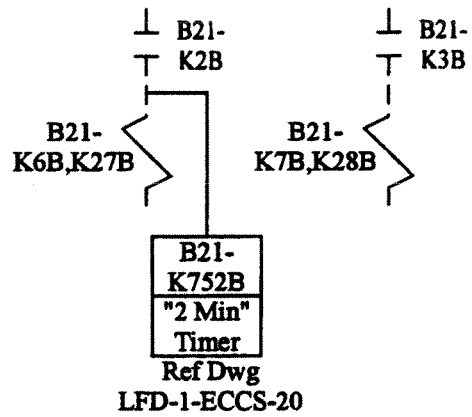


Trip System "B"

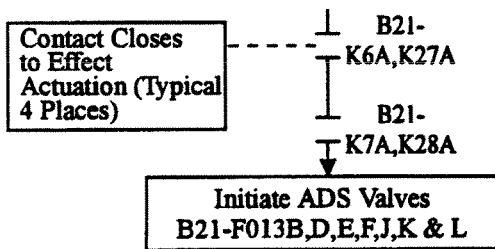
Channels



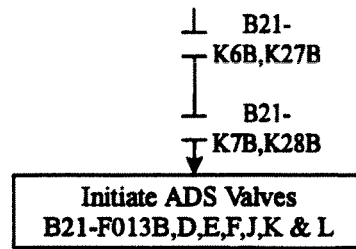
Trip Logic



Actuation Logic "A"



Actuation Logic "B"



Minimum Channel Requirements for System Initiation Capability:

In order to maintain ADS initiation on a Drywell Pressure - High signal, channels in one of the following combinations must be either operable or maintained in the tripped condition.

A1 and A2
B1 and B2

LFD-1-ECCS-19

TS 3.3.5.1-1, Item 4.b/5.b
ADS Trip System
Drywell Pressure-High

Elem. Ref.

H-17754 H-19827
H-17755 H-19830
H-19823
H-19826

Prepared By: B.G. Thigpin

Reviewed By: S.B. Tigps
printed

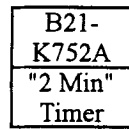
B.G. Thigpin
S.B. Tigps
signature

TRM Rev. 93

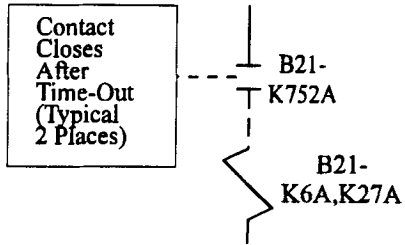
Trip System "A"

Channel

A



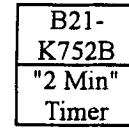
Trip Logic



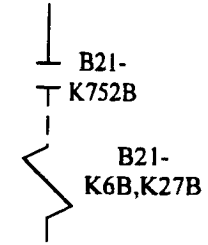
Trip System "B"

Channel

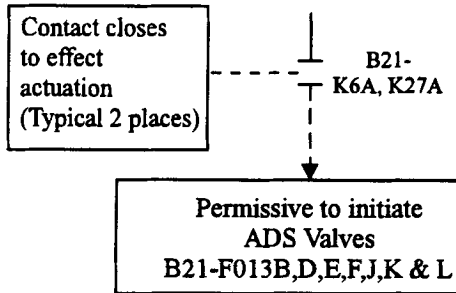
B



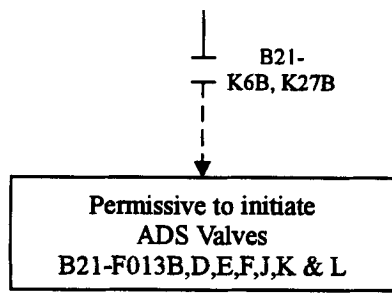
Trip Logic



Actuation Logic



Actuation Logic



Minimum Channel Requirements for System Initiation Capability:

In order to maintain ADS initiation capability on a "2 Minute" Timer Permissive signal, either channel A or B and its associated logic must be operable.

Elem. Ref.
H-17754
H-17755

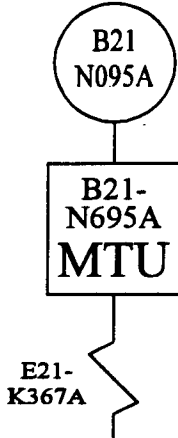
LFD-1-ECCS-20
TS 3.3.5.1-1, Item 4.c/5.c
ADS Trip System
ADS Initiation Timer

Prepared By: *JSB*
Reviewed By: *llt*

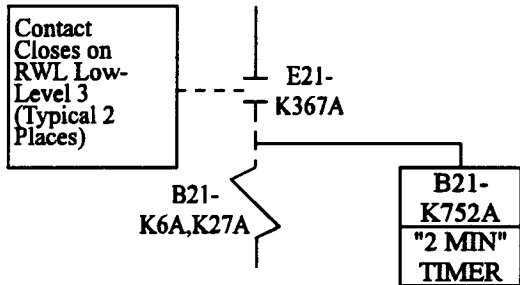
Rev. 0 11/16/94

Trip System "A"

Channel A



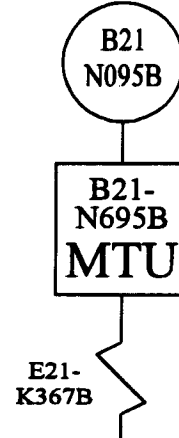
Trip Logic



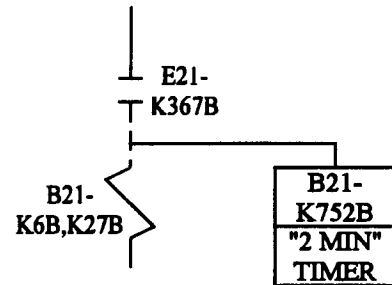
Ref. dwg
LFD-1-ECCS-20

Trip System "B"

Channel B

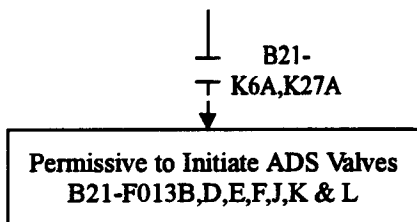


Trip Logic

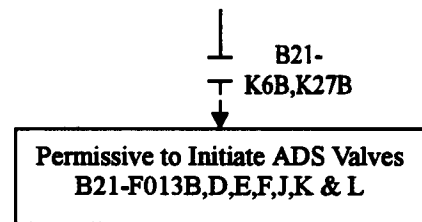


Ref. dwg
LFD-1-ECCS-20

Actuation Logic "A"



Actuation Logic "B"



Minimum Channel Requirements for System Initiation Capability:

In order to maintain ADS initiation capability due to a RWL-Level 3 Confirmation signal, either channel A or B must be operable or maintained in the tripped condition.

Elem. Ref.
H-17754
H-17755
H-19823
H-19826

Prepared By: JDS
Reviewed By: JCR

LFD-1-ECCS-21

TS 3.3.5.1-1, Item 4.d/5.d
ADS Trip System
RWL-Low Level 3
(Confirmatory)

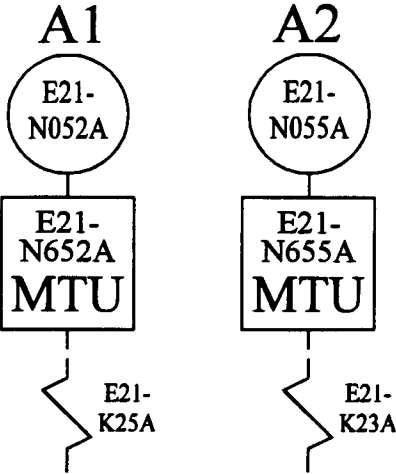
Rev. 0

11/16/94

Trip System "A"

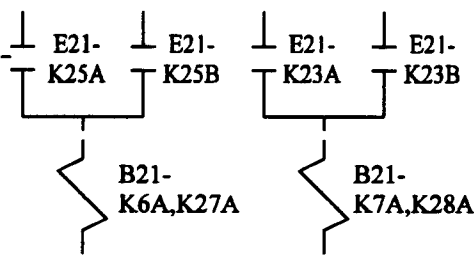
Trip System "B"

Channels

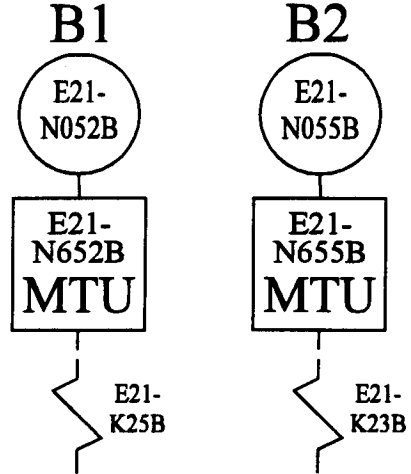


Contact Closes on CS Pump Discharge Press Hi (Typical 8 Places)

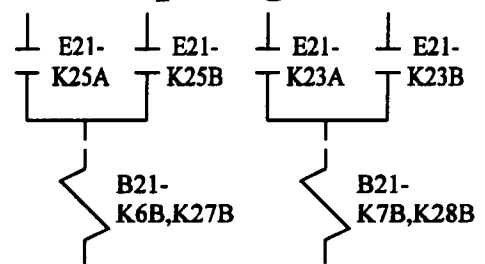
Trip Logic



Channels



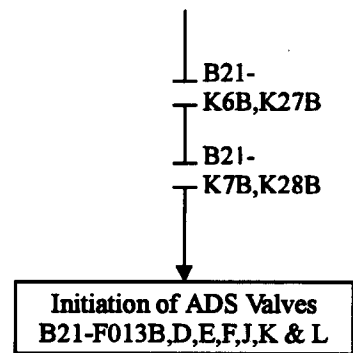
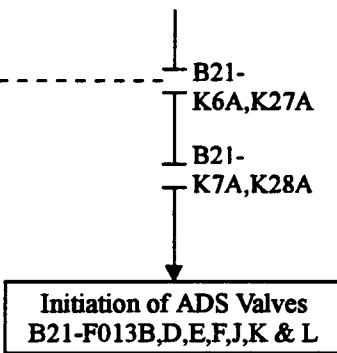
Trip Logic



Actuation Logic "A"

Actuation Logic "B"

Contact Closes to Effect Actuation (Typical 4 Places)



Minimum Channel Requirements for System Initiation Capability:

In order to maintain ADS initiation capability for a Core Spray Pump Discharge Pressure-High permissive, channels in one of the following combinations must be operable.

Elem. Ref.
H-19828
H-19831
H-17109
H-17754
H-17755

A1 and A2
A1 and B2
B1 and A2
B1 and B2

Prepared By: *JDB*

Reviewed By: *JLR*

LFD-1-ECCS-22

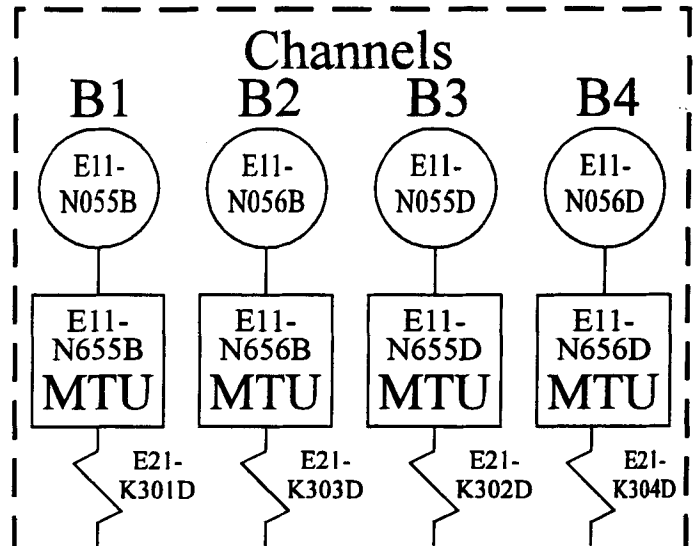
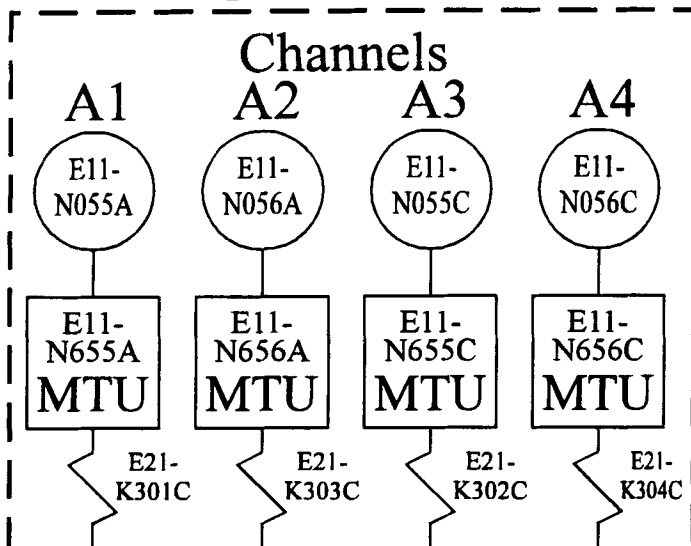
TS 3.3.5.1-1, Item 4.e/5.e
ADS Trip System
Core Spray Pump Discharge
Press-High

Rev. 0

11/16/94

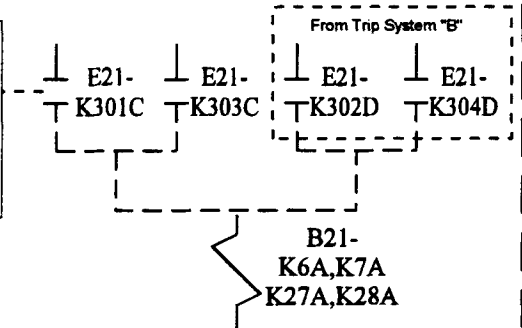
Trip System "A"

Trip System "B"

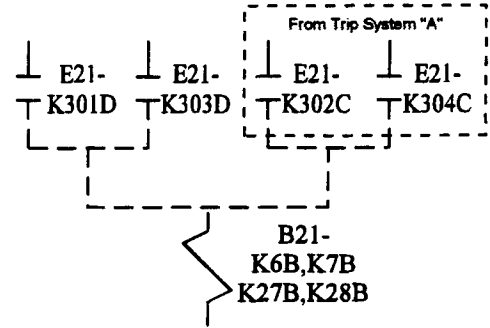


Trip Logic

Contact Closes on LPCI Pump Discharge Press Hi (Typical 8 Places)

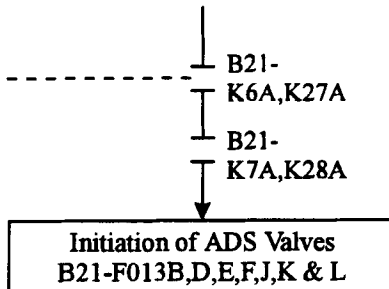


Trip Logic

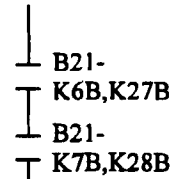


Actuation Logic "A"

Contact Closes to Effect Actuation (Typical 4 Places)



Actuation Logic "B"



Minimum Channel Requirements for System Initiation Capability:

In order to maintain ADS initiation capability for a LPCI Pump Discharge Pressure-High signal, at least one channel must be operable.

Elem. Ref.
H-17754
H-17755
H-17764
H-17767
H-19827
H-19830

LFD-1-ECCS-23

TS 3.3.5.1-1, Item 4.f/5.f
ADS Trip system
LPCI Pump Discharge
Pressure-High

Prepared By: JSC

Reviewed By: GBR

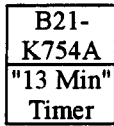
Rev. 0

11/16/94

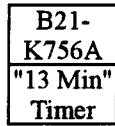
Trip System "A"

Channels

A1

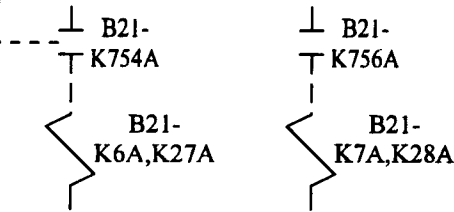


A2



Trip Logic

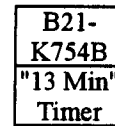
Contact Closes After Time Out (Typical 4 Places)



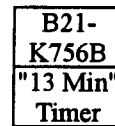
Trip System "B"

Channels

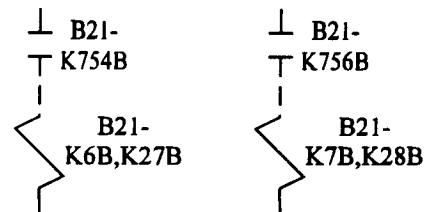
B1



B2

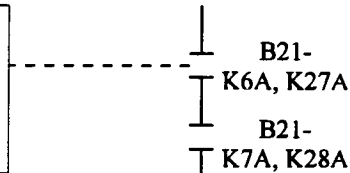


Trip Logic



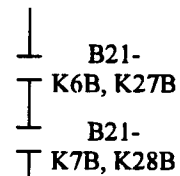
Actuation Logic "A"

Contact Closes to Effect Actuation (Typical 4 Places)



Initiation of ADS Valves
B21-F013B,D,E,F,J,K & L

Actuation Logic "B"



Initiation of ADS Valves
B21-F013B,D,E,F,J,K & L

Minimum Channel Requirements for System Initiation Capability:

In order to maintain ADS initiation capability with regard to the ADS low water level timers, one of the following channel combinations must be operable:

A1 and A2
B1 and B2

Elem. Ref.
H-17754
H-17755
H-17759

Prepared By: *JDB*

Reviewed By: *[Signature]*

LFD-1-ECCS-24

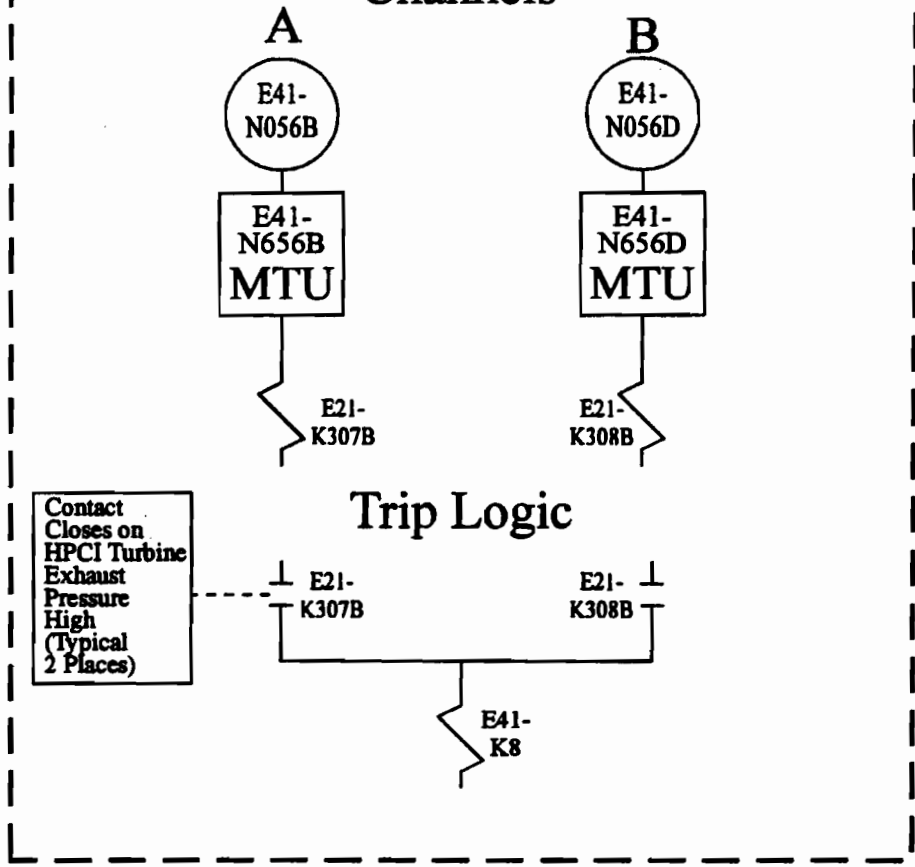
TS 3.3.5.1-1, Item 4.g/5.g
ADS Trip System
ADS Low Water LVL
Actuation Timer

Rev. 0

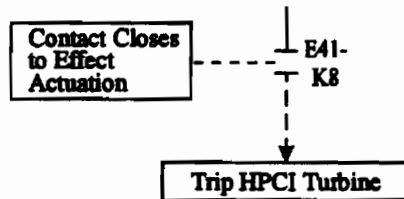
11/16/94

Trip System

Channels



Actuation Logic



Minimum Channel Requirements for System Trip Capability:

In order to maintain HPCI turbine trip capability with regard to a HPCI turbine exhaust pressure-high signal, at least one channel must be functional.

Elem. Ref.
H-17159
H-17160
H-19824

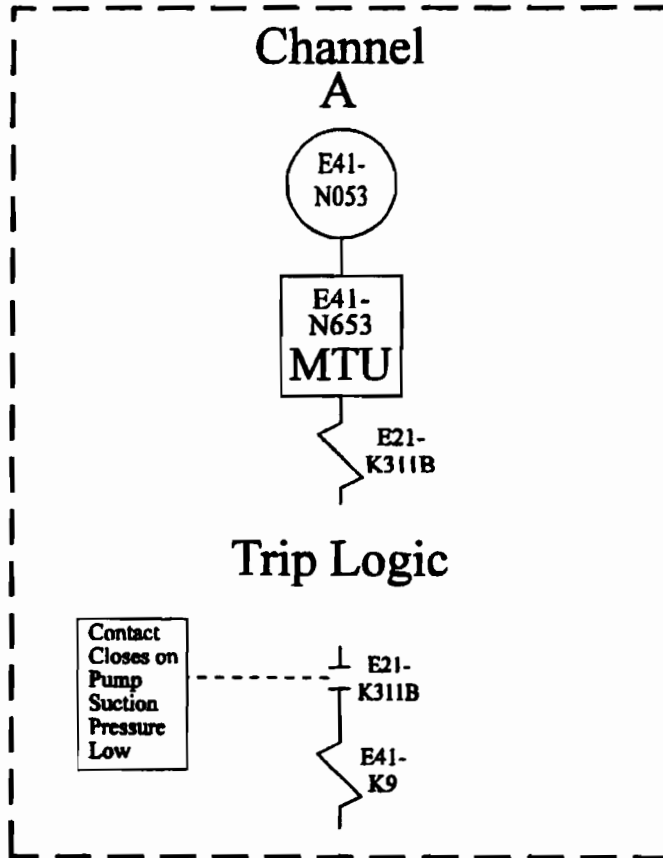
Prepared By: *DLC*
Reviewed By: *[Signature]*

LFD-1-ECCS-25

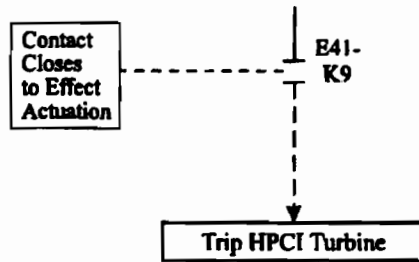
TRM T3.3.5-1, Item 2
HPCI Turbine Trip
HPCI Turbine Exhaust
Pressure-High

TRM REV. 60

Trip System



Actuation Logic



Minimum Channel Requirements for System Trip Capability:

In order to maintain HPCI turbine trip capability with regard to a HPCI pump suction pressure-low signal, this channel must functional.

Elem. Ref.
H-17159
H-17160
H-19824

Prepared By: *TLC*

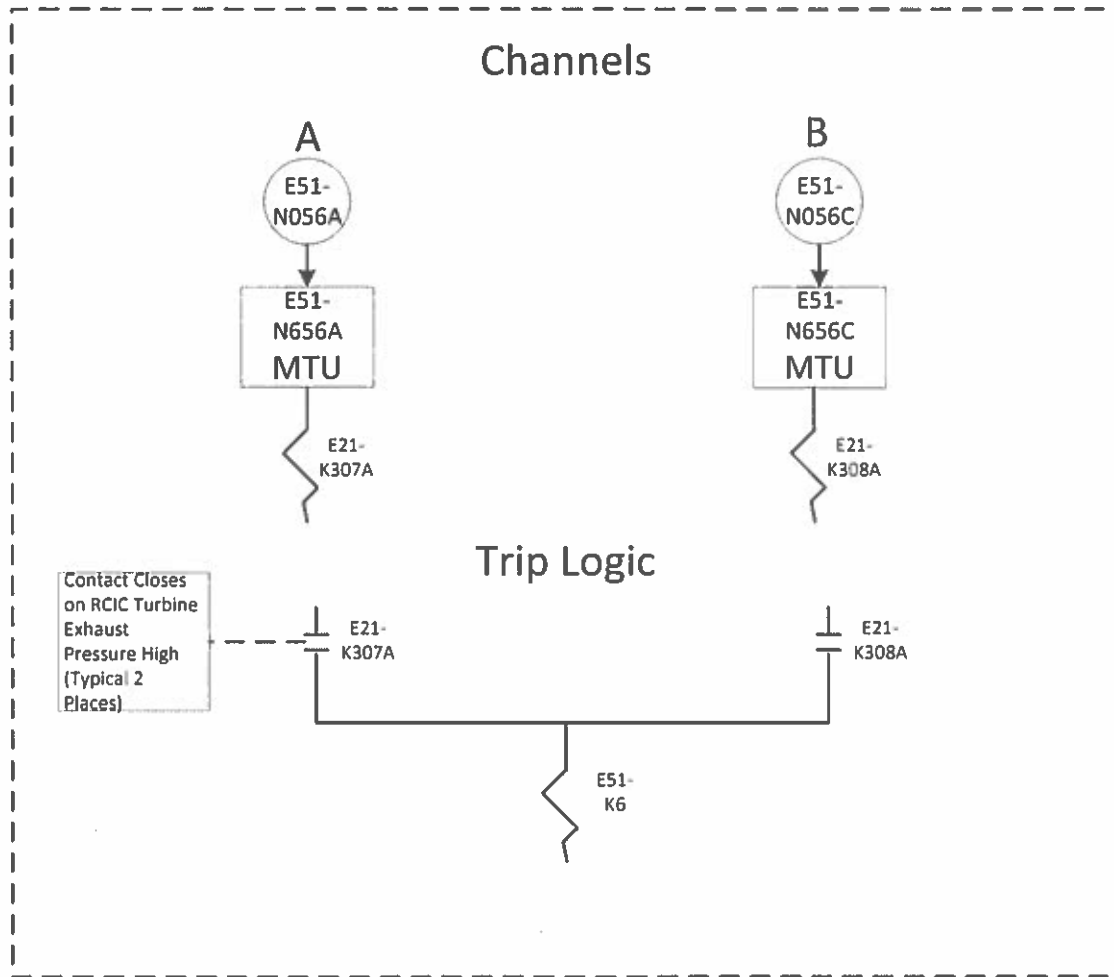
Reviewed By: *Will*

LFD-1-ECCS-26

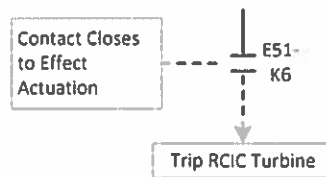
TRM T3.3.5-1, Item 3
HPCI Turbine Trip
HPCI Pump Suction
Pressure-Low

TRM REV. 60

Trip System



Actuation Logic



Minimum Channel Requirements for System Trip Capability:

In order to maintain RCIC turbine trip capability with regard to a RCIC turbine exhaust pressure-high signal, at least one channel must be functional.

Elem. Ref.
H-17148
H-17153
H-19821

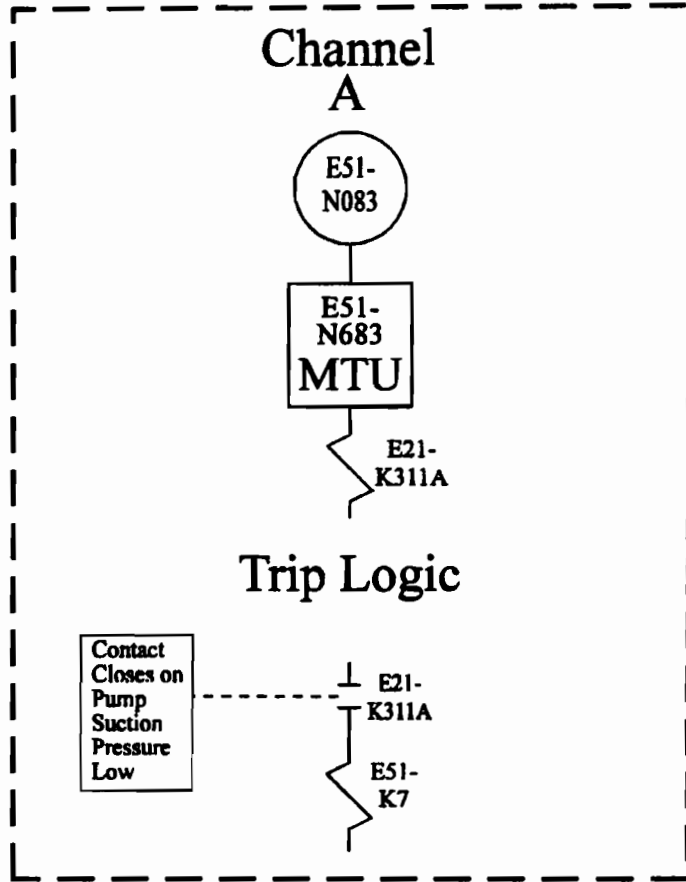
Prepared by: *Janette Bader/HSD*
Reviewed by: *Jimmy Glin*

LFD-1-ECCS-27

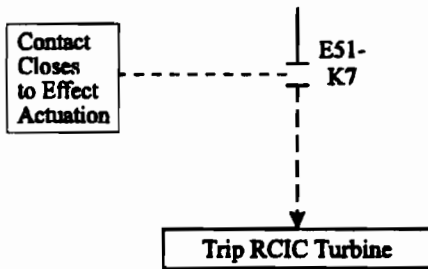
TRM T3.3.5-1, Item 5
RCIC Turbine Trip
RCIC Turbine Exhaust
Pressure-High

TRM REV. 104

Trip System



Actuation Logic



Minimum Channel Requirements for System Trip Capability:

In order to maintain RCIC turbine trip capability with regard to a RCIC pump suction pressure-low signal, this channel must be functional.

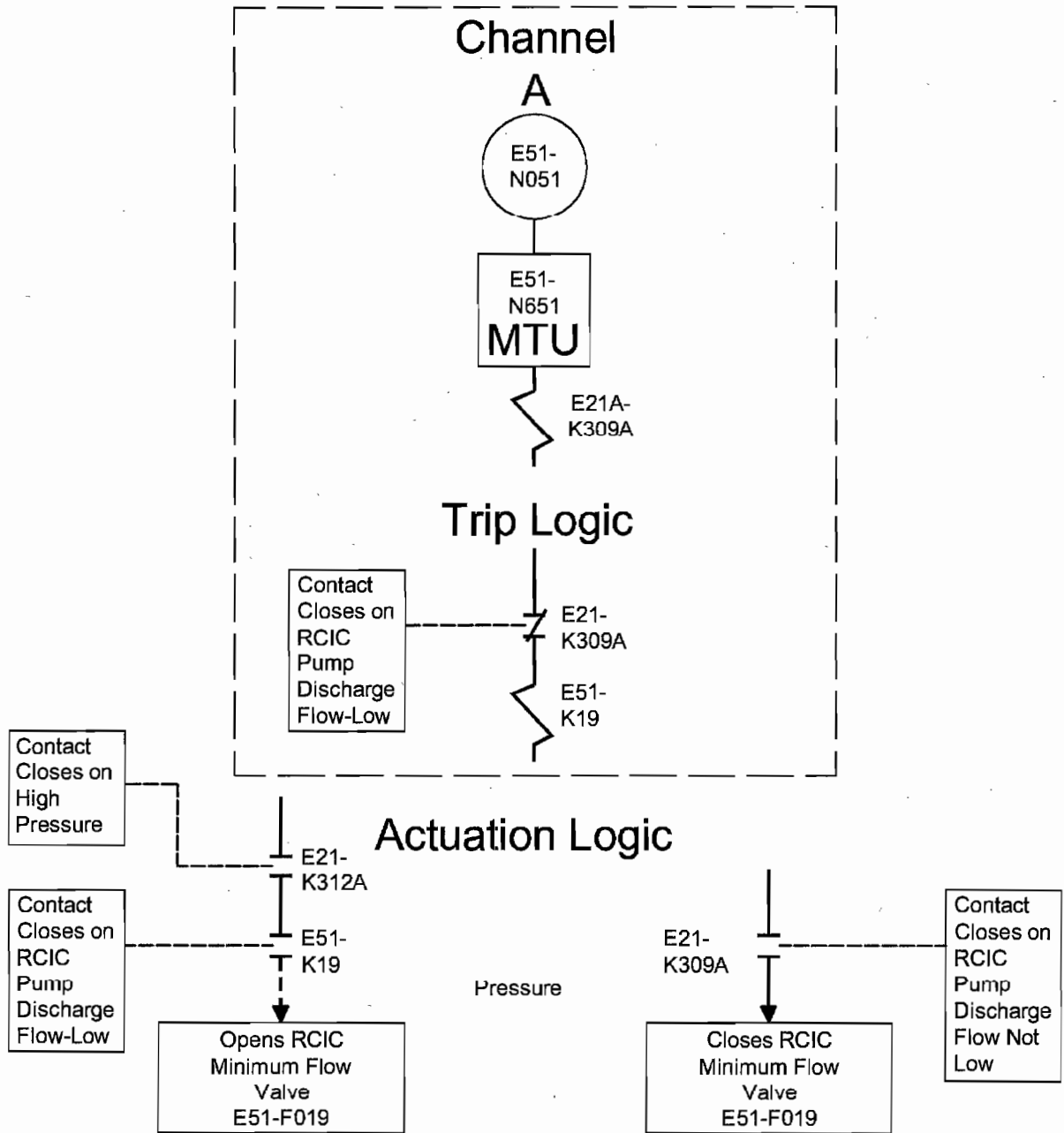
<p>Elem. Ref. H-17148 H-17153 H-19821</p>

<p>Prepared By: <i>RLC</i></p> <p>Reviewed By: <i>Reid</i></p>
--

<p>LFD-1-ECCS-28</p> <p>TRM T3.3.5-1, Item 6</p> <p>RCIC Turbine Trip,</p> <p>RCIC Pump Suction</p> <p>Pressure-Low</p>

TRM REV. 60

Trip System



Minimum Channel Requirements for System Initiation Capability:

In order to maintain RCIC initiation capability with regard to minimum flow functionality, this channel must be functional.

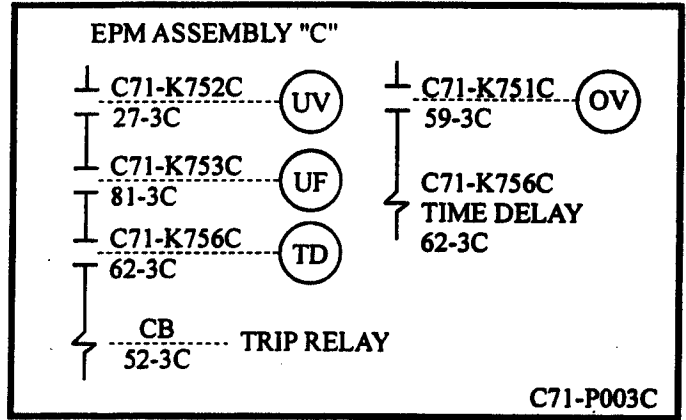
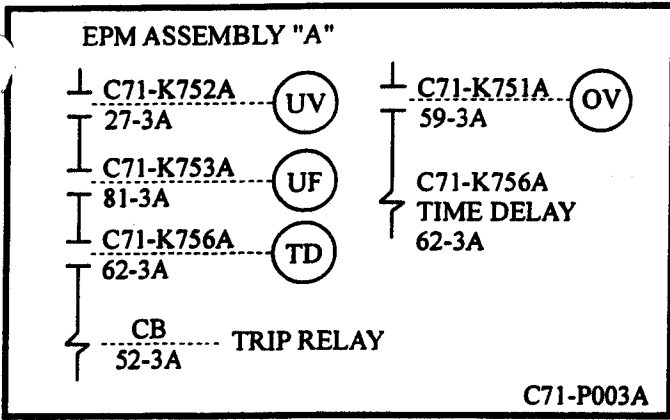
Elem. Ref.
H-17148
H-17152
H-19821

LFD-1-ECCS-29

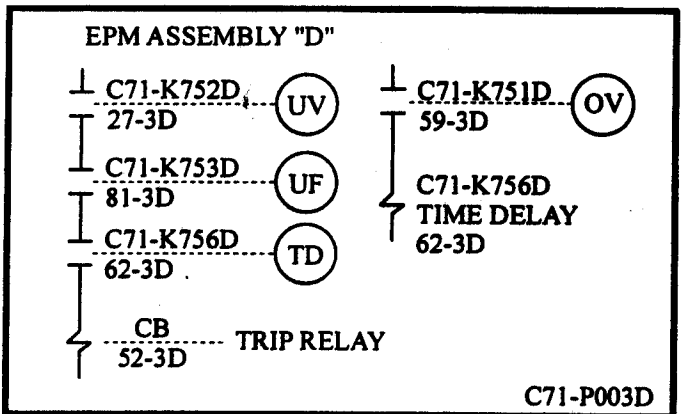
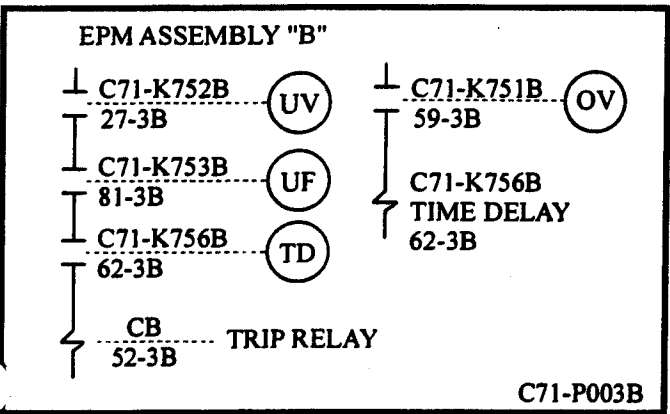
TRM T3.3.5-1,
Items 7.a and 7.b,
RCIC Pump Discharge
Flow-High, Low

TRM REV. 82

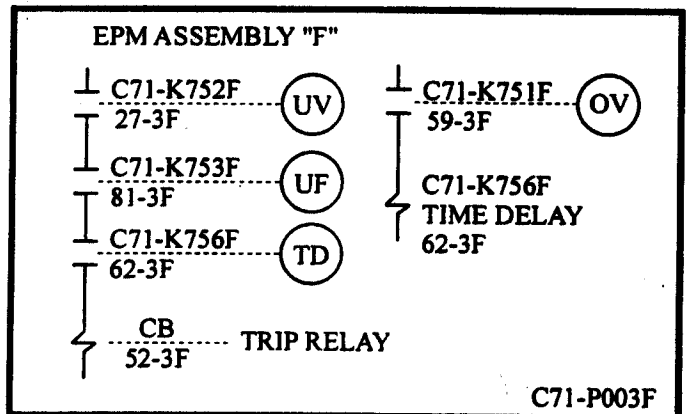
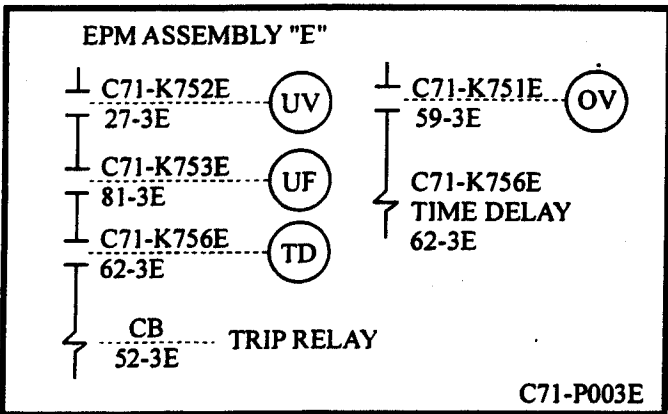
RPS MG SET "A"



RPS MG SET "B"



RPS ALTERNATE POWER



Minimum Channel Requirements for System Initiation Capability:

In order to maintain RPS-EPM trip capability, one EPM assembly for each of the inservice power supplies must be operable.

Elem. Ref.
H-17197
H-17499

LFD-1-EPM-01

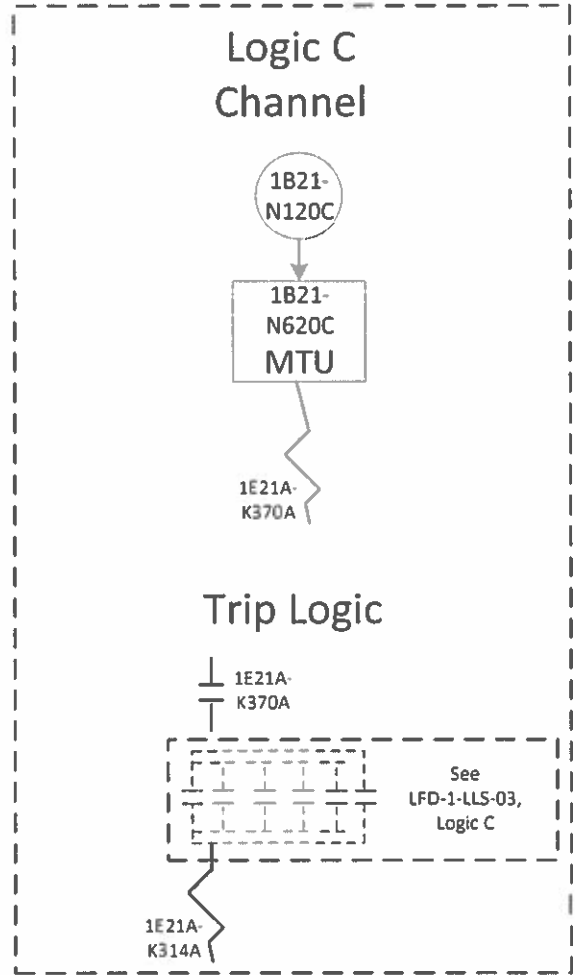
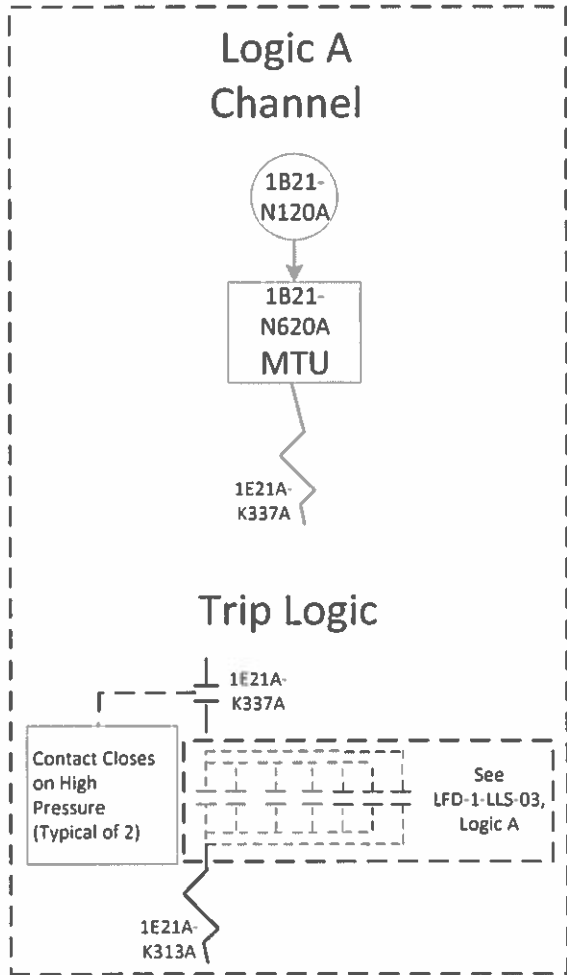
TS 3.3.8.2
RPS Electric Power
Monitor Trips

Prepared By: *[Signature]*

Reviewed By: *[Signature]*

TRM Rev. 33

Division I



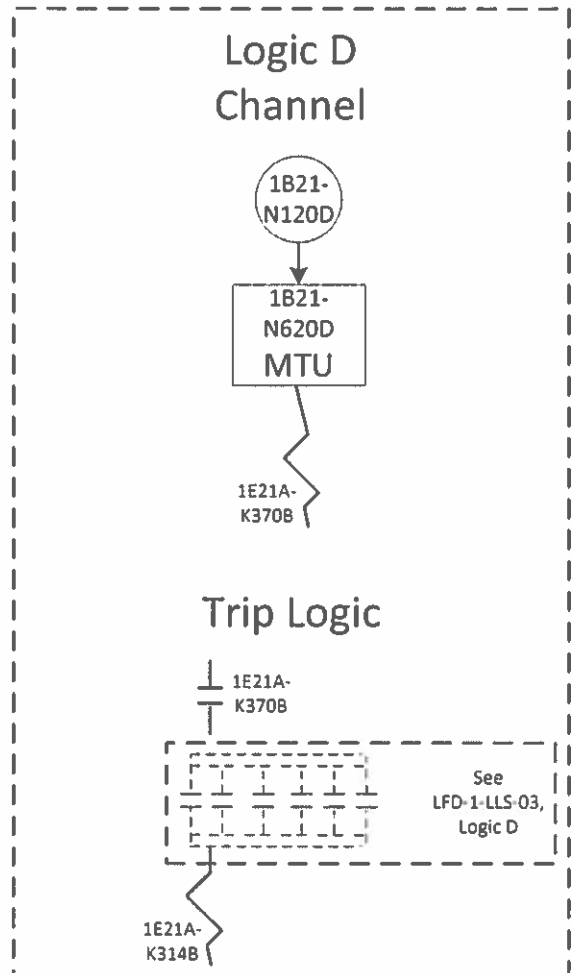
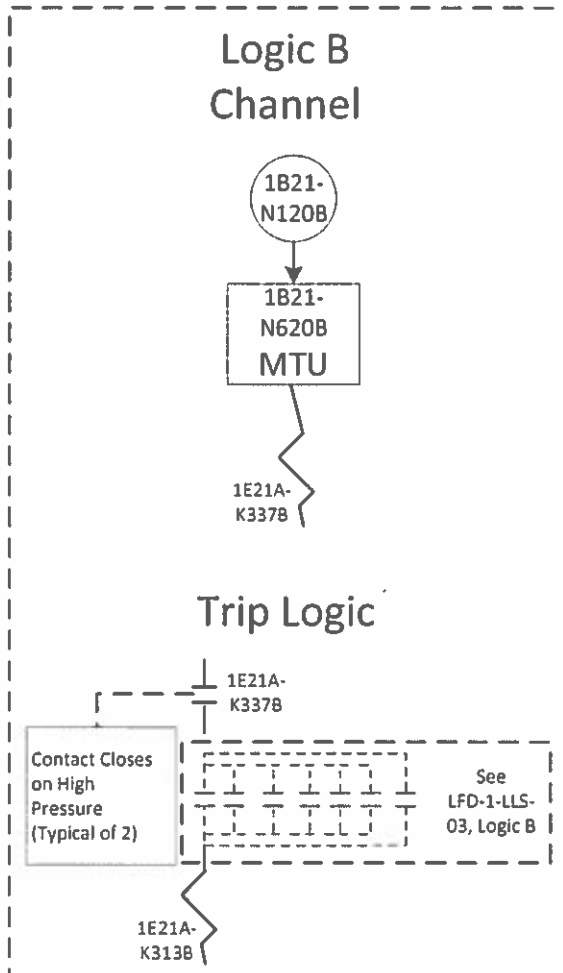
Minimum Channel Requirements for System Initiation Capability:
See Sheet 2 of 2.

Elem. Ref.
H-17755 H-19823
H-19822 H19833

Prepared by: *J. Bailey 7/26/16*
Reviewed by: *[Signature]*

LFD-1-LLS-01
Sheet 1 of 2
TS 3.3.6.3-1, Item 1
Low-Low Set Instrumentation
Reactor Steam Dome
Pressure-High
Rev. 1
05/11/2016

Division II



Initiation of opening of LLS S/RV
1B21-F013A

Minimum Channel Requirements for System Initiation Capability:
In order to maintain the capability to initiate a LLS S/RV, its associated reactor steam dome pressure Logic AND its associated Logic from LFD-1-LLS-02 AND LFD-1-LLS-03 must be operable.

Initiation of opening of LLS S/RV
1B21-F013C

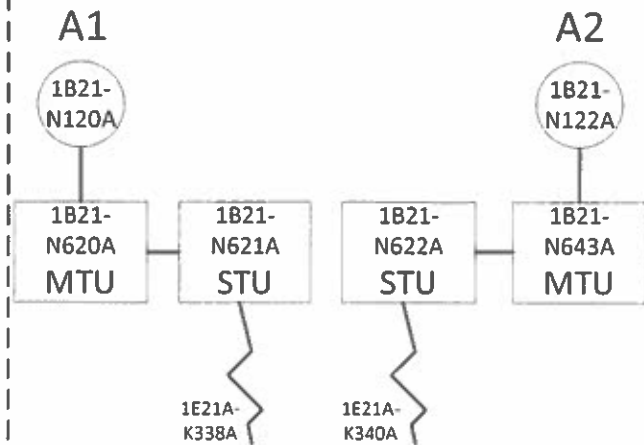
Elem. Ref.
H-17755 H-19826
H-19825 H19834

Prepared by: *[Signature]* 7/6/16
Reviewed by: *[Signature]*

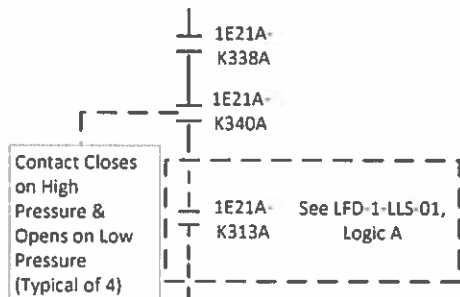
LFD-1-LLS-01
Sheet 2 of 2
TS 3.3.6.3-1, Item 1
Low-Low Set Instrumentation
Reactor Steam Dome
Pressure-High
Rev. 1 05/11/2016

Division I

Logic A Channels

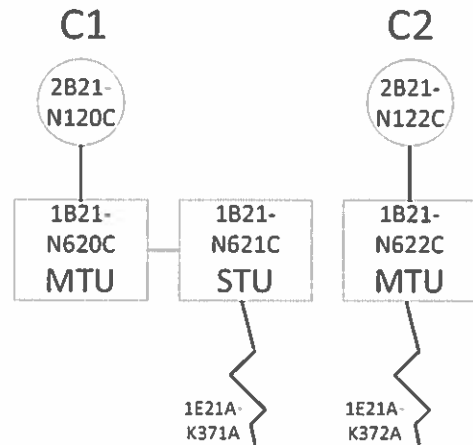


Trip Logic

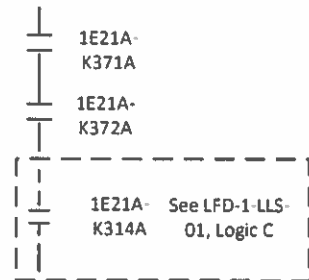


Initiation of opening of LLS S/RV
 1B21-F013H

Logic C Channels



Trip Logic



Initiation of opening of LLS S/RV
 1B21-F013G

Minimum Channel Requirements for System Initiation Capability:
 See Sheet 2 of 2.

Elem. Ref.
 H-17755 H-19823
 H-19822 H19833

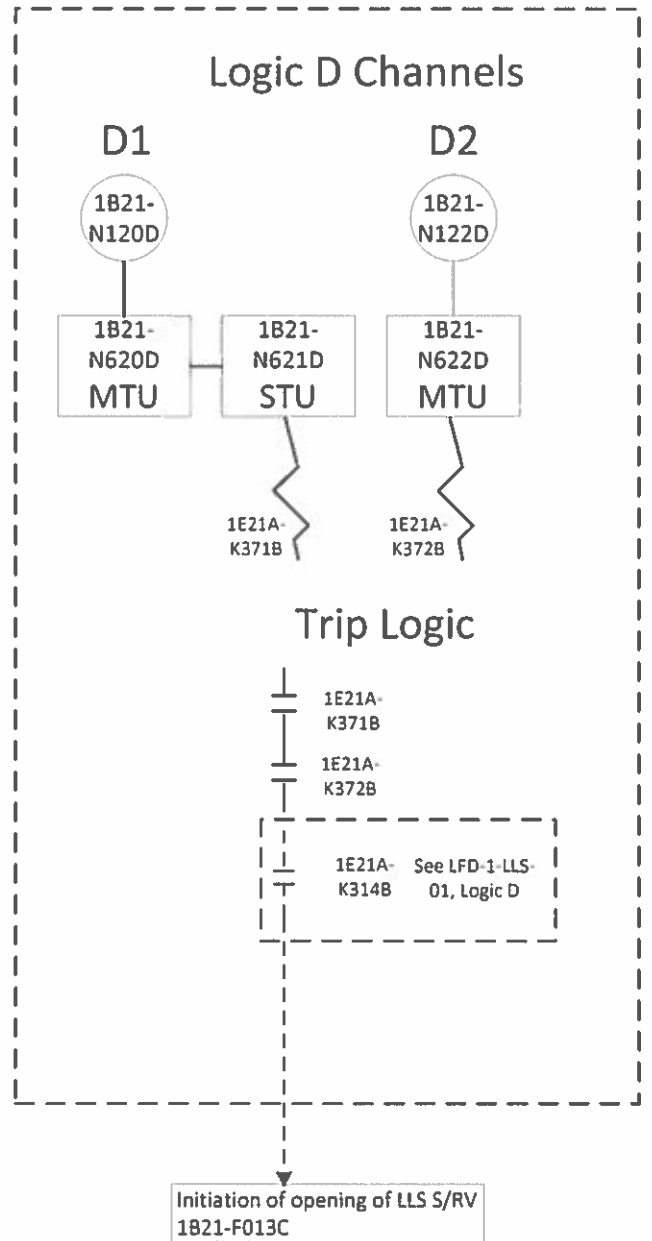
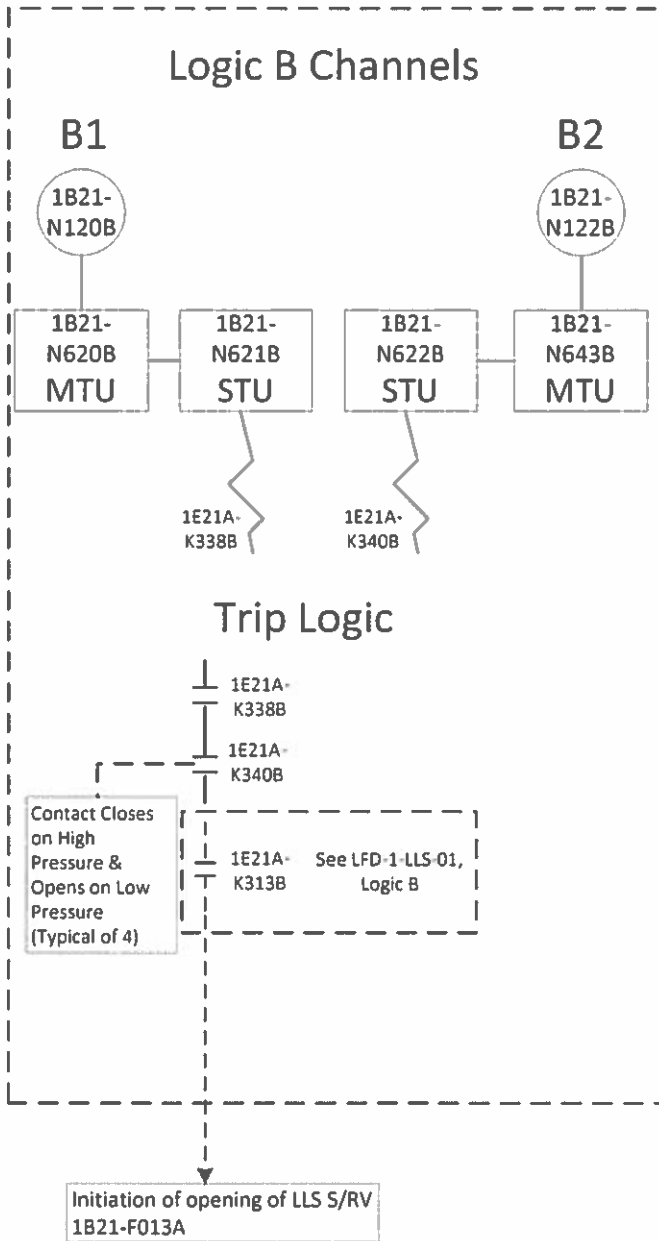
Prepared by: *[Signature]*
 Reviewed by: *[Signature]*

LFD-1-LLS-02
 Sheet 1 of 2
 TS 3.3.6.3-1, Item 2
 Low-Low Set Instrumentation –
 Low-Low Set
 Pressure Setpoints

Rev. 1

05/11/2016

Division II



Minimum Channel Requirements for System Initiation Capability:
 In order to maintain the capability to initiate a LLS S/RV, its associated low set pressure setpoint Logic AND its associated Logic from LFD-1-LLS-01 AND LFD-1-LLS-03 must be operable.

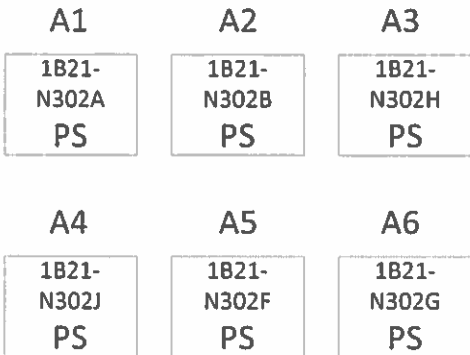
Elem. Ref.
 H-17755 H-19826
 H-19825 H19834

Prepared by: *[Signature]* 7/26/16
 Reviewed by: *[Signature]*

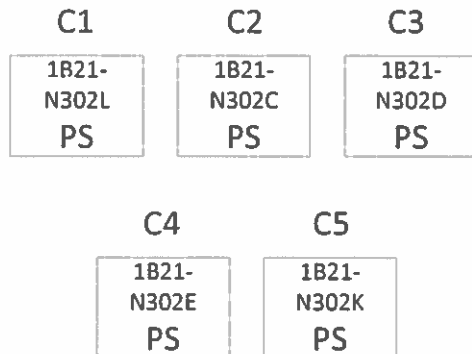
LFD-1-LLS-02
 Sheet 2 of 2
 TS 3.3.6.3-1, Item 2
 Low-Low Set Instrumentation --
 Low-Low Set
 Pressure Setpoints
 Rev. 1 05/11/2016

Division I

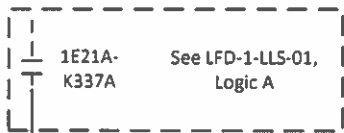
Logic A Channels



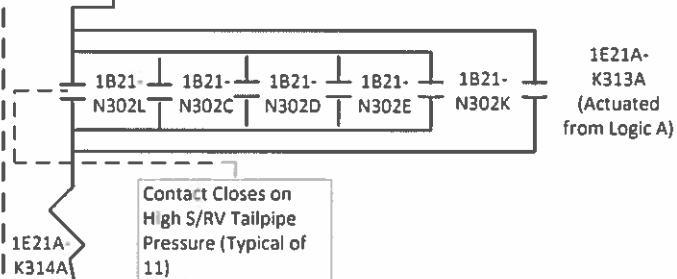
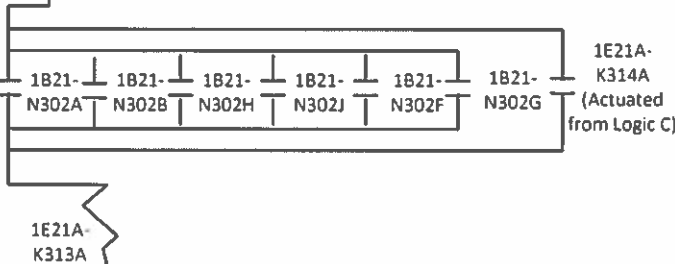
Logic C Channels



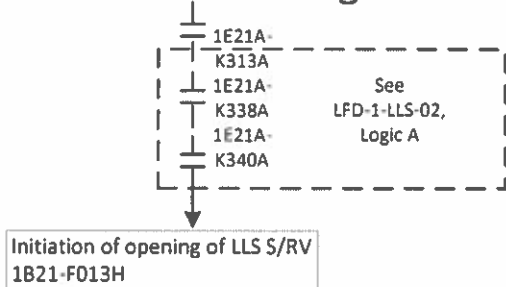
Trip Logic



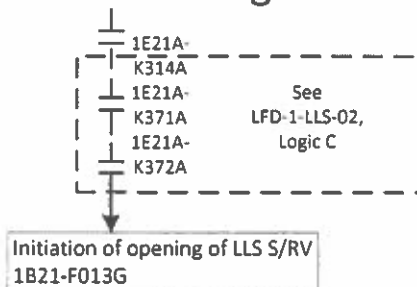
Trip Logic



Actuation Logic



Actuation Logic



Minimum Channel Requirements for LLS S/RV Initiation Capability:

See Sheet 2 of 2.

Elem. Ref.
H-17755
H-19833

Prepared by: *John Bailey 7/26/16*
Reviewed by: *[Signature]*

LFD-1-LLS-03
Sheet 1 of 2

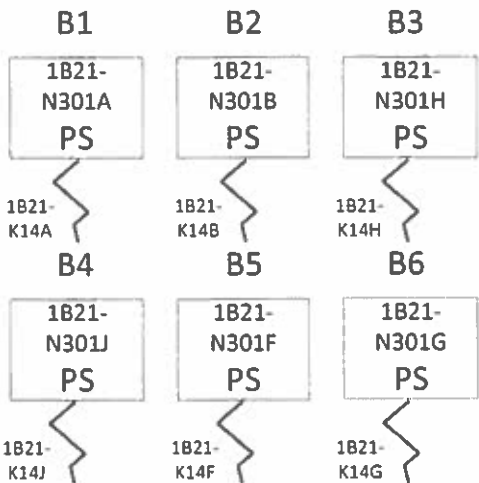
TS 3.3.6.3-1, Item 3
Low-Low Set Instrumentation
Tailpipe Pressure Switch

Rev. 1

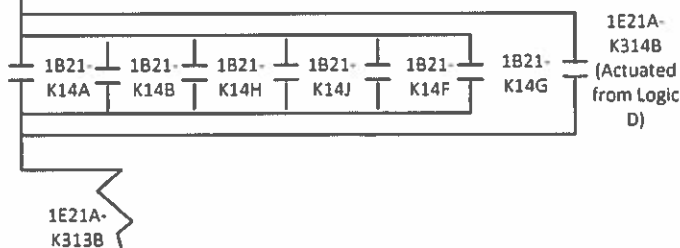
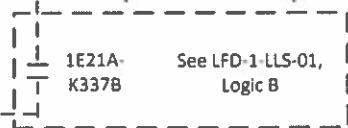
05/11/2016

Division II

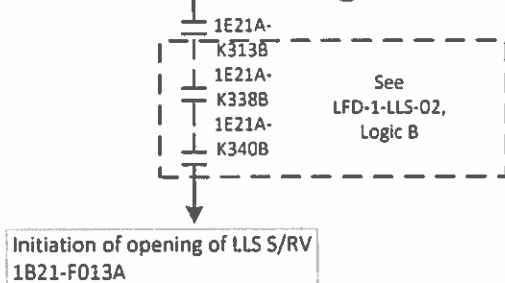
Logic B Channels



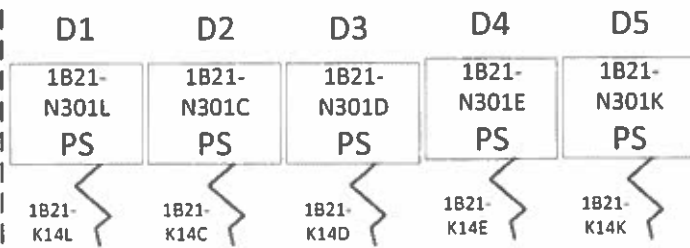
Trip Logic



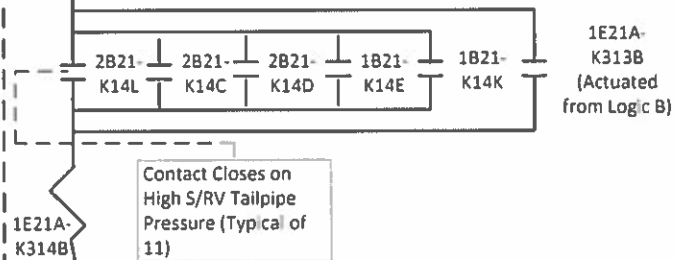
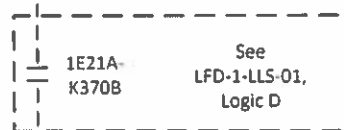
Actuation Logic



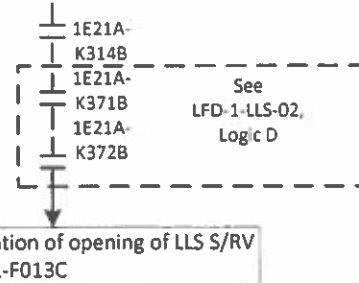
Logic D Channels



Trip Logic



Actuation Logic



Minimum Channel Requirements for LLS S/RV Initiation Capability:

In order to maintain the capability to initiate a LLS S/RV, its associated tailpipe pressure switch Logic AND its associated Logic from LFD-1-LLS-01 AND LFD-1-LLS-02 must be operable. The tailpipe pressure switch Logic is operable if at least one pressure switch is operable OR at least one pressure switch AND Reactor Steam Dome Pressure-High channel in the opposite Logic in the same Division are operable.

LFD-1-LLS-03
Sheet 2 of 2

TS 3.3.6.3-1, Item 3
Low-Low Set Instrumentation
Tailpipe Pressure Switch

Elem. Ref.
H-17755
H-19606
H-19834

Prepared by: *[Signature]*
Reviewed by: *[Signature]*

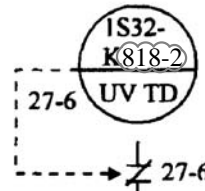
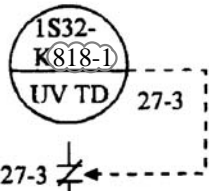
Rev. 1

05/11/2016

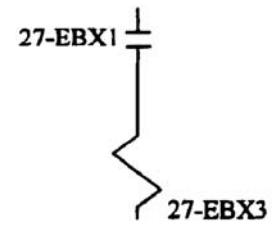
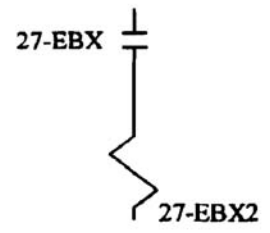
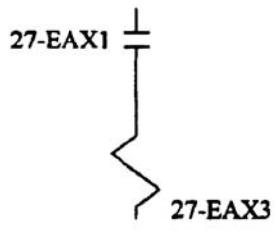
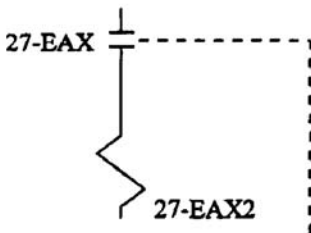
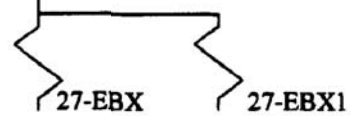
Trip System: 1E 4.16KV Bus Channels

A

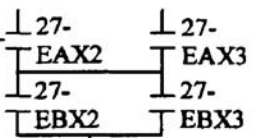
B



Contacts Close on Loss of Voltage (Typical of 2)



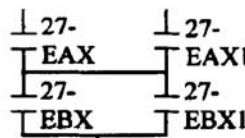
Contacts Close on Loss of Voltage (Typical of 14)



Actuation Logic

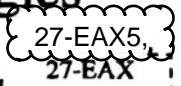
Initiates Load Shedding, Load Sequencing, EDG 1A Supply Breaker Closure, and 1E Bus Normal and Alternate Supply Breaker Lockout

Trip Logics



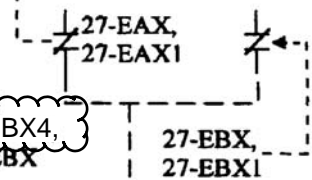
Actuation Logic

Initiates Trip of the 1E Bus Normal Supply Breaker and Closure of the Alternate Supply Breaker



Actuation Logic

Initiates the EDG 1A



Actuation Logic

Prevents Start of CS A and RHR A Pumps Until Voltage is Restored

Contacts Open on Loss of Voltage (Typical of 2)

Minimum Channel Requirements for System Initiation Capability
See Sheet 3 for minimum channel requirements.

LFD-1-LOP-01
Sheet 1 of 3
TS 3.3.8.1-1, Items 1.a and 1.b, 4.16KV Emergency Bus, Loss of Voltage and Time Delay

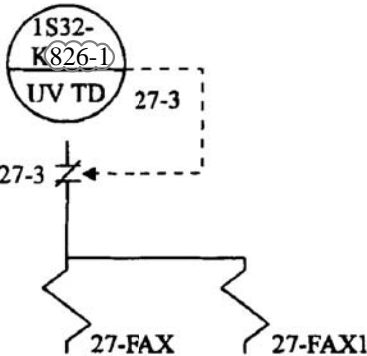
Elem. Ref.		
H-13382	H-17111	H-17768
H-13412	H-17763	H-17776
H-17109	H-17764	H-53343

Prepared By: *J. J. Berman*
Reviewed By: *M. Wayne*

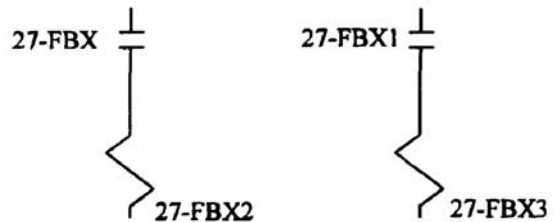
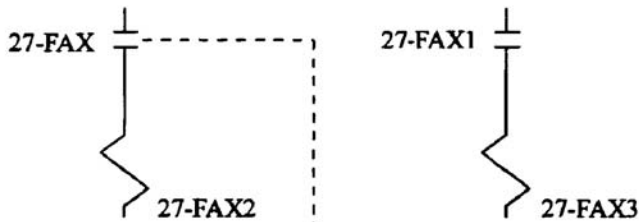
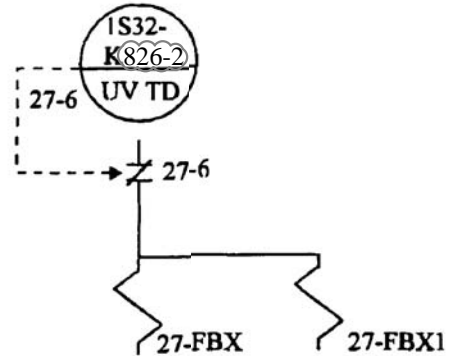
Rev. 116 3/5/2020

Trip System: 1F 4.16KV Bus Channels

A



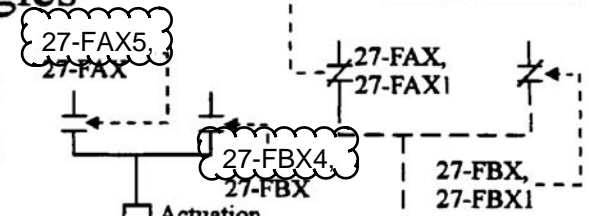
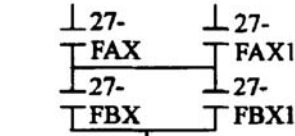
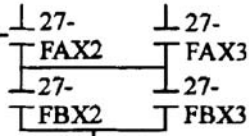
B



Contacts Close on Loss of Voltage (Typical of 14)

Contacts Open on Loss of Voltage (Typical of 2)

Trip Logics



Initiates Load Shedding, Load Sequencing, EDG 1B Supply Breaker Closure, and 1F Bus Normal and Alternate Supply Breaker Lockout

Initiates Trip of the 1F Bus Normal Supply Breaker and Closure of the Alternate Supply Breaker

Initiates the EDG 1B

Prevents Start of RHR C and D Pumps Until Voltage is Restored

Minimum Channel Requirements for System Initiation Capability

See Sheet 3 for minimum channel requirements.

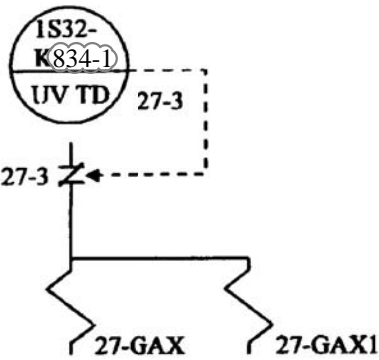
LFD-1-LOP-01
Sheet 2 of 3
TS 3.3.8.1-1, Items 1.a and 1.b, 4.16KV
Emergency Bus, Loss of Voltage and Time Delay

Rev. 116 3/5/2020

Elem. Ref.
H-13413 H-17768
H-17764 H-53344
H-17765

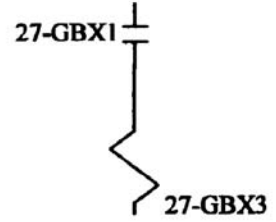
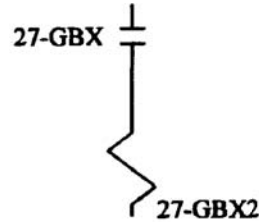
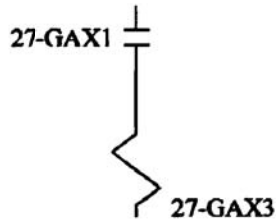
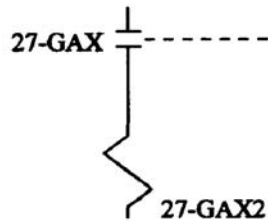
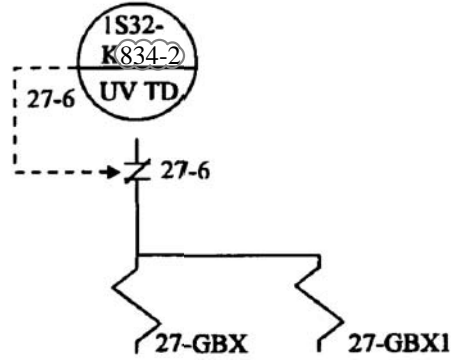
Trip System: 1G 4.16KV Bus Channels

A



Contacts Close on Loss of Voltage (Typical of 2)

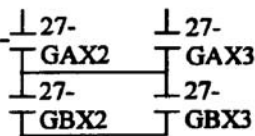
B



Contacts Close on Loss of Voltage (Typical of 14)

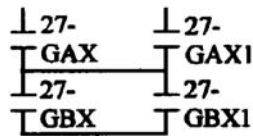
Contacts Open on Loss of Voltage (Typical of 2)

Trip Logics



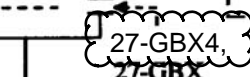
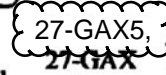
Actuation Logic

Initiates Load Shedding, Load Sequencing, EDG 1C Supply Breaker Closure, and 1G Bus Normal and Alternate Supply Breaker Lockout



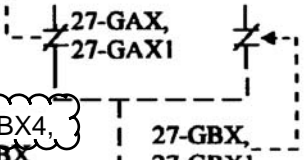
Actuation Logic

Initiates Trip of the 1G Bus Normal Supply Breaker and Closure of the Alternate Supply Breaker



Actuation Logic

Initiates the EDG 1C



Actuation Logic

Prevents Start of CS B and RHR B Pumps Until Voltage is Restored

Minimum Channel Requirements for System Initiation Capability:

In order to maintain Diesel Generator function initiation capability on a loss of voltage condition, both channels associated with each of two emergency busses are required to be operable.

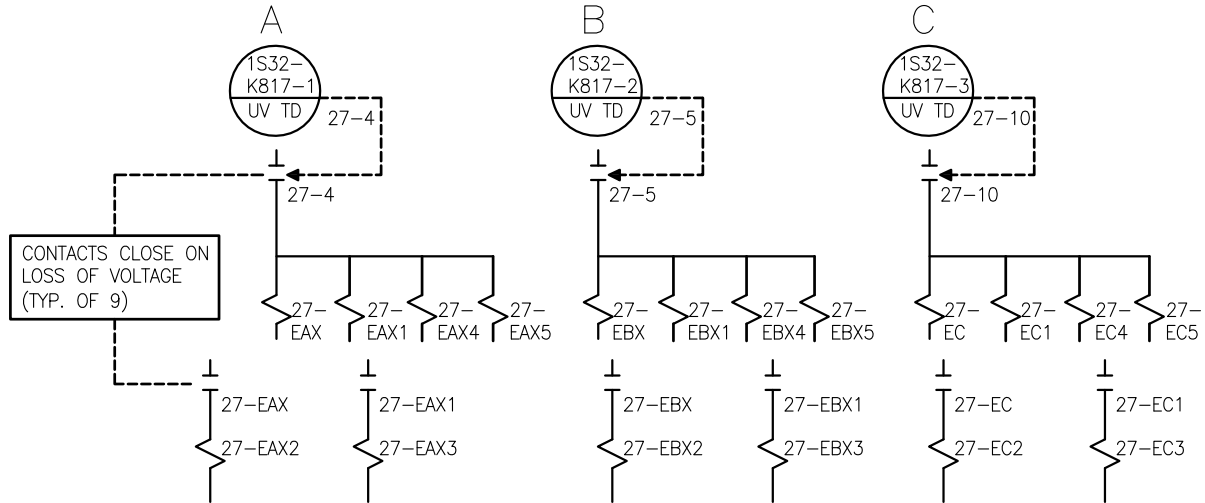
LFD-1-LOP-01
Sheet 3 of 3
TS 3.3.8.1-1, Items 1.a and 1.b, 4.16KV Emergency Bus, Loss of Voltage and Time Delay

Rev. 116 3/5/2020

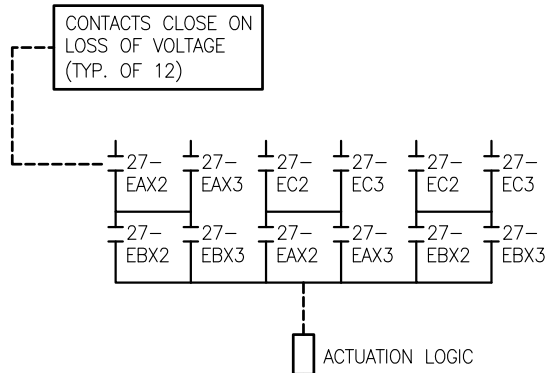
Elem. Ref.

H-13382 H-17111 H-17767
H-13414 H-17765 H-53345
H-17109 H-17766

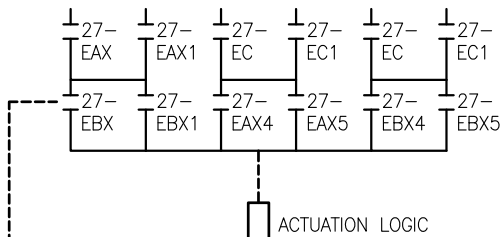
TRIP SYSTEM: 1E 4.16KV BUS CHANNELS



TRIP LOGICS

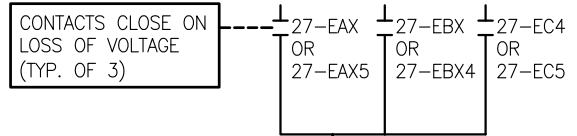


INITIATES LOAD SHEDDING, LOAD SEQUENCING, REG. TRANSFER. IF ALTERNATE OFFSITE SUPPLY IS UNAVAILABLE, THIS SIGNAL WILL ALSO CLOSE EDG 1A SUPPLY BREAKER AND LOCK OUT THE NORMAL AND ALTERNATE SUPPLY BREAKERS.



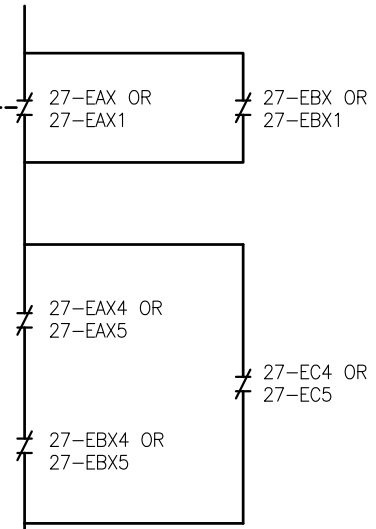
CONTACTS CLOSE ON LOSS OF VOLTAGE (TYP. OF 12)

INITIATES TRIP OF THE 1E BUS NORMAL SUPPLY BREAKER AND CLOSURE OF THE ALTERNATE SUPPLY BREAKER



INITIATES START OF EDG 1A

CONTACTS OPEN ON LOSS OF VOLTAGE (TYP. OF 5)



MINIMUM CHANNEL REQUIREMENTS FOR SYSTEM INITIATION CAPABILITY

IN ORDER TO MAINTAIN EDG FUNCTION INITIATION CAPABILITY DURING A DEGRADED VOLTAGE CONDITION, TWO OUT OF THREE CHANNELS ASSOCIATED WITH EMERGENCY BUS 1E ARE REQUIRED.

PREVENTS START OF CS A AND RHR A PUMPS UNTIL VOLTAGE IS RESTORED

LFD-1-LOP-02
SHEET 1 OF 3

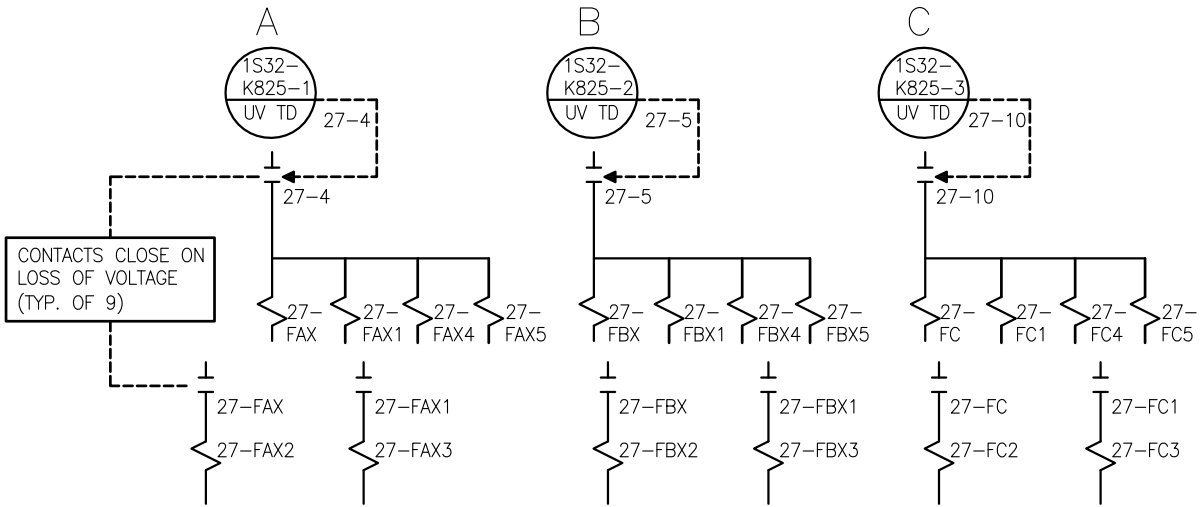
TS 3.3.8.1-1, ITEMS 2.A AND 2.B, 4.16KV EMERGENCY BUS, DEGRADED VOLTAGE AND TIME DELAY

REV.116 3/5/2020

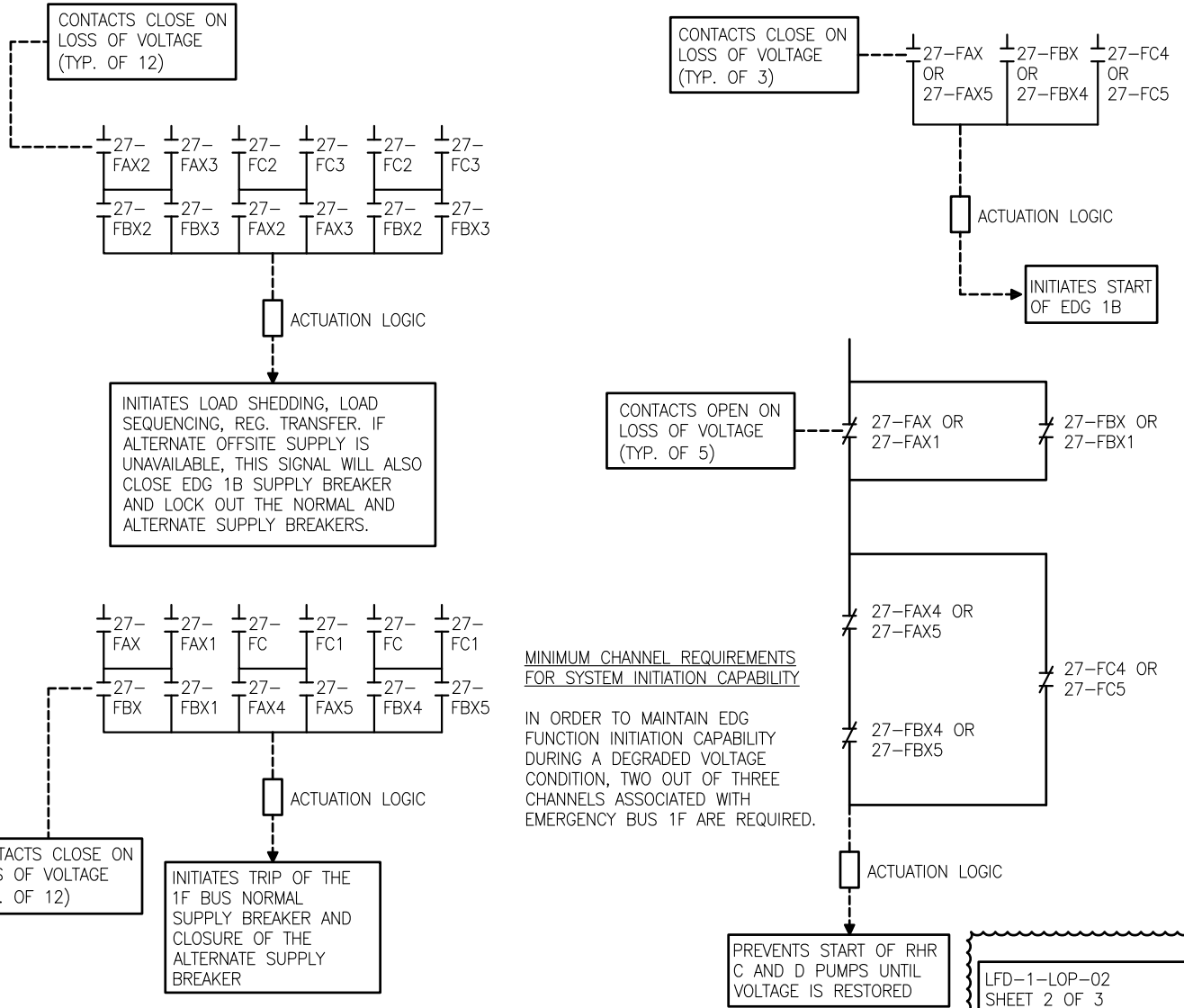
ELEM. REF.			
H-13382	H-17111	H-17768	H-13412
H-17763	H-17776	H-17109	H-17764

H-53343

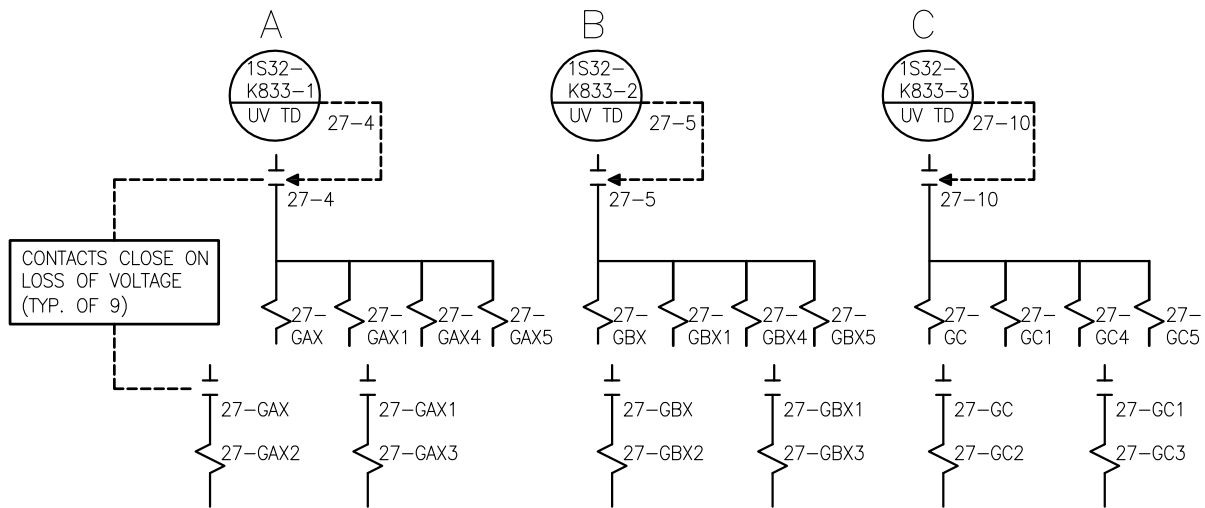
TRIP SYSTEM: 1F 4.16KV BUS CHANNELS



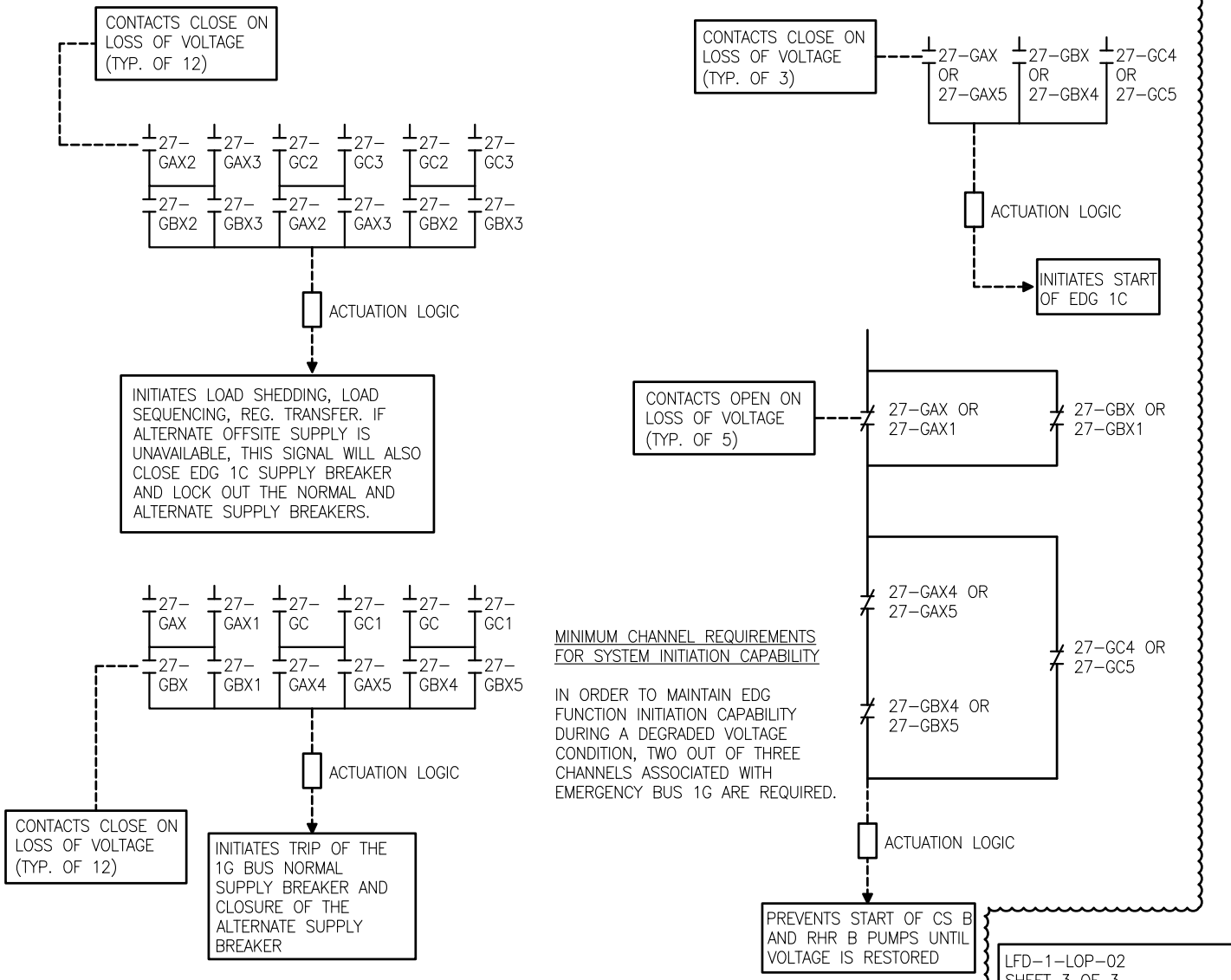
TRIP LOGICS



TRIP SYSTEM: 1G 4.16KV BUS CHANNELS



TRIP LOGICS



ELEM. REF.
 H-13382 H-17111 H-17767 H-13414
 H-17765 H-53345 H-17109 H-17766

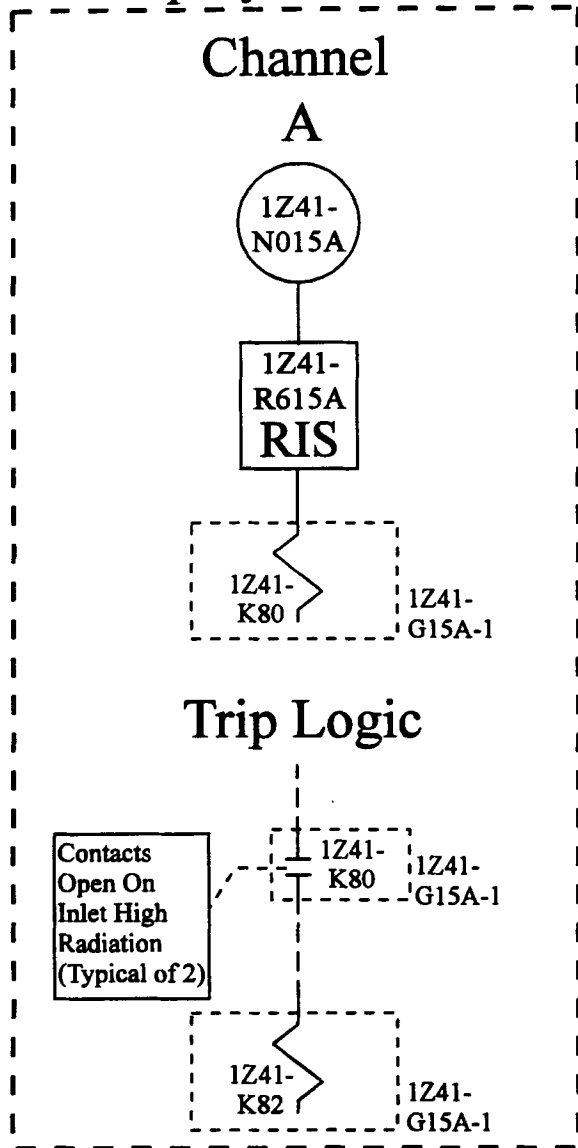
LFD-1-LOP-02
 SHEET 3 OF 3

TS 3.3.8.1-1, ITEMS 2.A AND 2.B, 4.16KV EMERGENCY BUS, DEGRADED VOLTAGE AND TIME DELAY

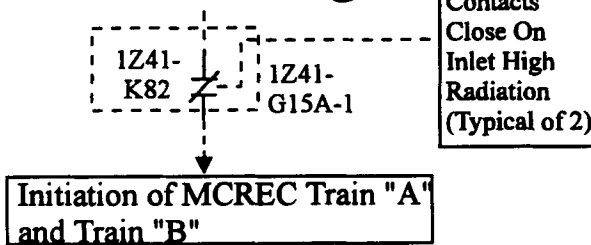
REV. 116 3/5/2020

LFD-1-LOP-03 - DELETED

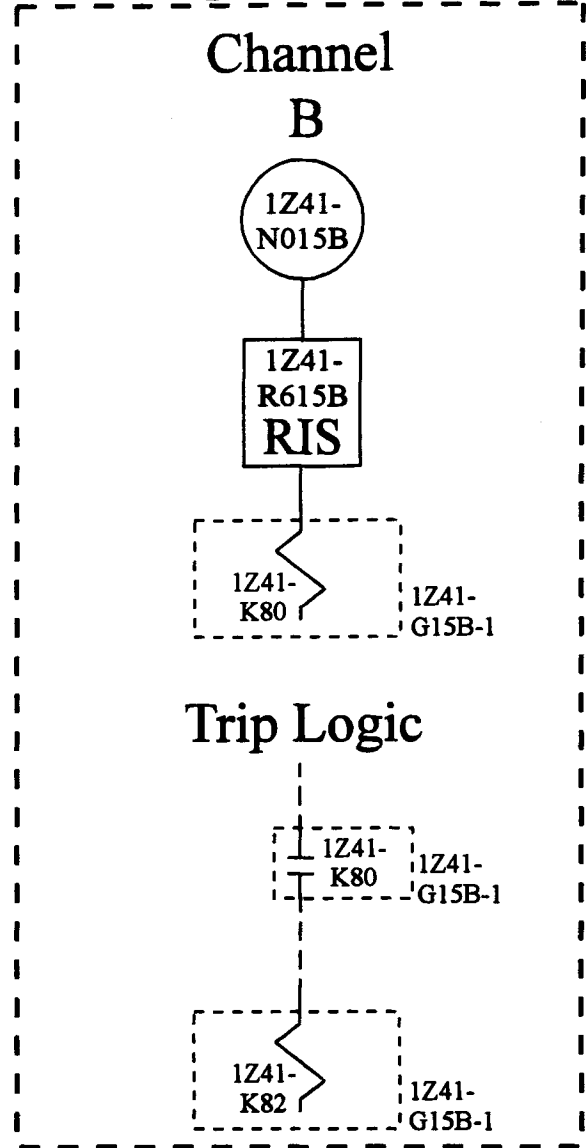
Trip System "A"



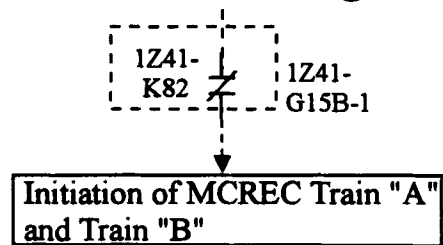
Actuation Logic



Trip System "B"



Actuation Logic



Minimum Channel Requirements for System Initiation Capability:

In order to maintain MCREC System initiation capability for the pressurization mode on Control Room air inlet high radiation, at least one channel is required to be operable or maintained in the tripped condition.

Elem. Ref.

H-17069 H-17073
H-17070 H-17121
H-17071 H-17142

Prepared By: *J. H. Bruner*

Reviewed By: *Stephen W. Head*

LFD-1-MCREC-01

TS 3.3.7.1

MCREC System

Initiation Control Room

Air Inlet Radiation - High

Rev. 0

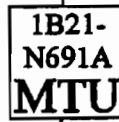
1/12/95

Trip System "A"

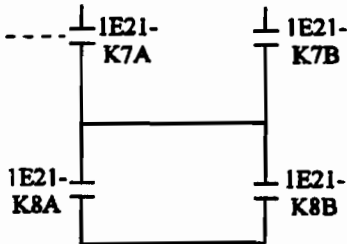
Channels

A1

A2



Trip Logic



Contact Closes
On Low Reactor
Water Level
(Typical of 8)

Actuation
Logic "A"

Initiation of MCREC Train
"A" and Train "B"

Trip System "B"

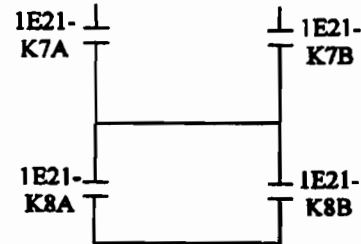
Channels

B1

B2



Trip Logic



Actuation
Logic "B"

Initiation of MCREC Train
"A" and Train "B"

Minimum Channel Requirements for System Initiation Capability:

In order to maintain MCREC System initiation capability on Reactor Water Level - Low Low Low (Level 1), channels in one of the following combinations must be either functional or maintained in the tripped condition.

- A1 and A2
- A1 and B2
- B1 and A2
- B1 and B2

Elem. Ref.

H-17109	H-19826
H-17121	H-19829
H-19823	H-19830

LFD-1-MCREC-02

TRM T3.3.7-1, Item 1
MCREC System
Instrumentation,
Reactor Vessel Water
Level - Low Low Low,
Level 1

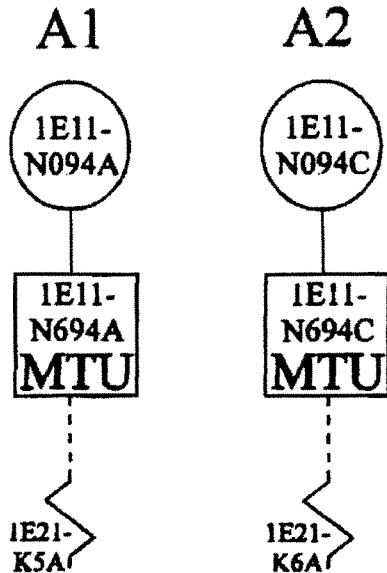
Prepared By: *TLC*

Reviewed By: *[Signature]*

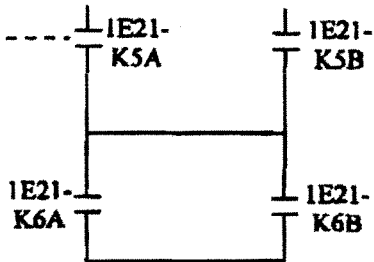
TRM REV. 60

Trip System "A"

Channels



Trip Logic



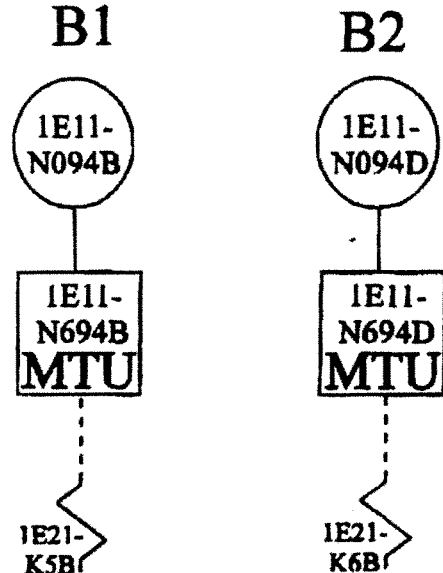
Contact Closes
On High Drywell
Pressure (Typical
of 8)

Actuation Logic "A"

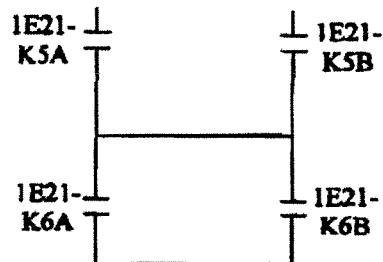
Initiation of MCREC Train
"A" and Train "B"

Trip System "B"

Channels



Trip Logic



Actuation Logic "B"

Initiation of MCREC Train
"A" and Train "B"

Minimum Channel Requirements for System Initiation Capability:

In order to maintain MCREC System initiation capability on high Drywell pressure, channels in one of the following combinations must be either functional or maintained in the tripped condition.

A1 and A2

A1 and B2

B1 and A2

B1 and B2

Elem. Ref.

H-17109 H-19827

H-17121 H-19830

H-19823

H-19826

Prepared By: B.G. Thigpin

Reviewed By: S.B. Tipps

B.G. Thigpin
S.B. Tipps
signature

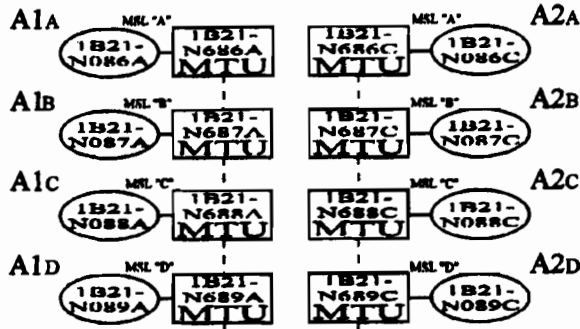
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LFD-1-MCREC-03

TRM T3.3.7-1, Item 2
MCREC System
Instrumentation,
Drywell Pressure-High

TRM Rev. 93

Trip System "A" Channels

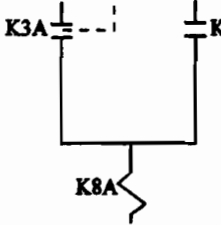


1A71-
K3A

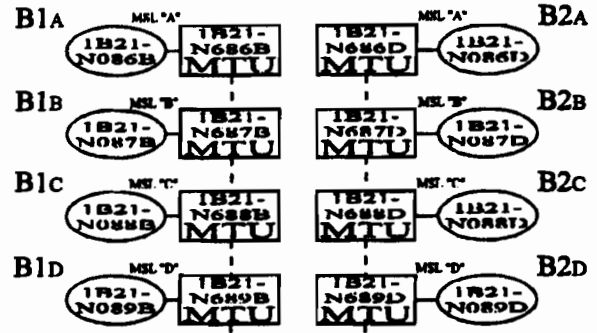
1A71-
K3C

Contact Opens
To Cause
Actuation
(Typical of 4)

Trip Logic "A"



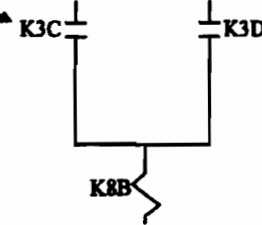
Trip System "B" Channels



1A71-
K3B

1A71-
K3D

Trip Logic "B"



Actuation Logic

Contact Closes
To Cause
Actuation
(Typical of 2)

K8A

Initiation of MCREC Train "A"
and Train "B"

Actuation Logic

K8B

Initiation of MCREC Train "A"
and Train "B"

Minimum Channel Requirements for System Initiation Capability:

In order to maintain MCREC System initiation capability on Main Steam Line high flow, channels in one of the following combinations must be either functional or maintained in the tripped condition.

One A1 and One B1 Channel for Each Main Steam Line

OR

One A2 and One B2 Channel for Each Main Steam Line

Elem. References

H-19809 H-17810
H-19812 H-17811
H-19815 H-17818
H-19818 H-17121

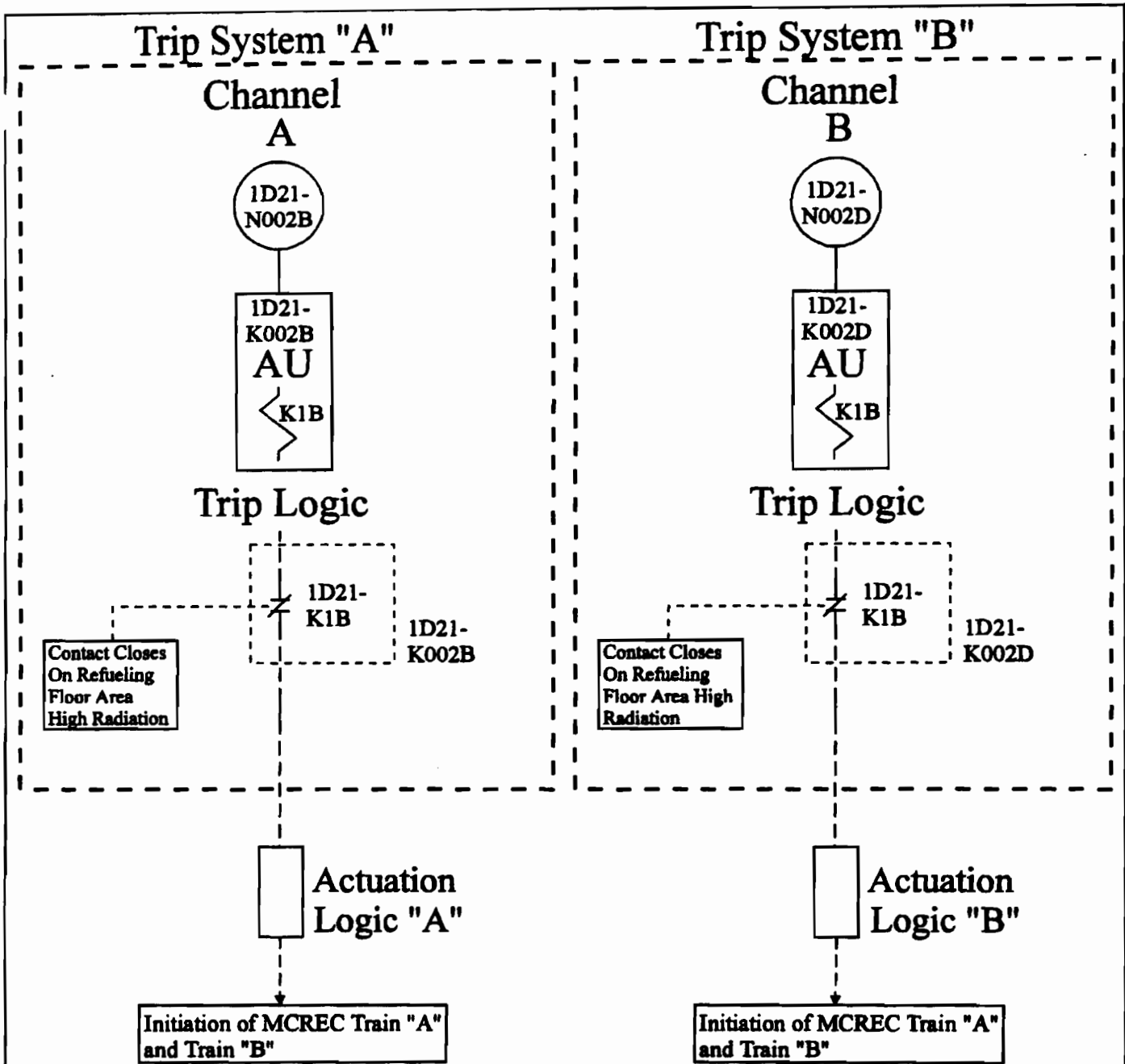
Prepared By: *TDL*

Reviewed By: *DLR*

LFD-1-MCREC-04

TRM T3.3.7-1, Item 3
MCREC System
Instrumentation, Main
Steam Line Flow - High

TRM REV. 60



Minimum Channel Requirements for System Initiation Capability:

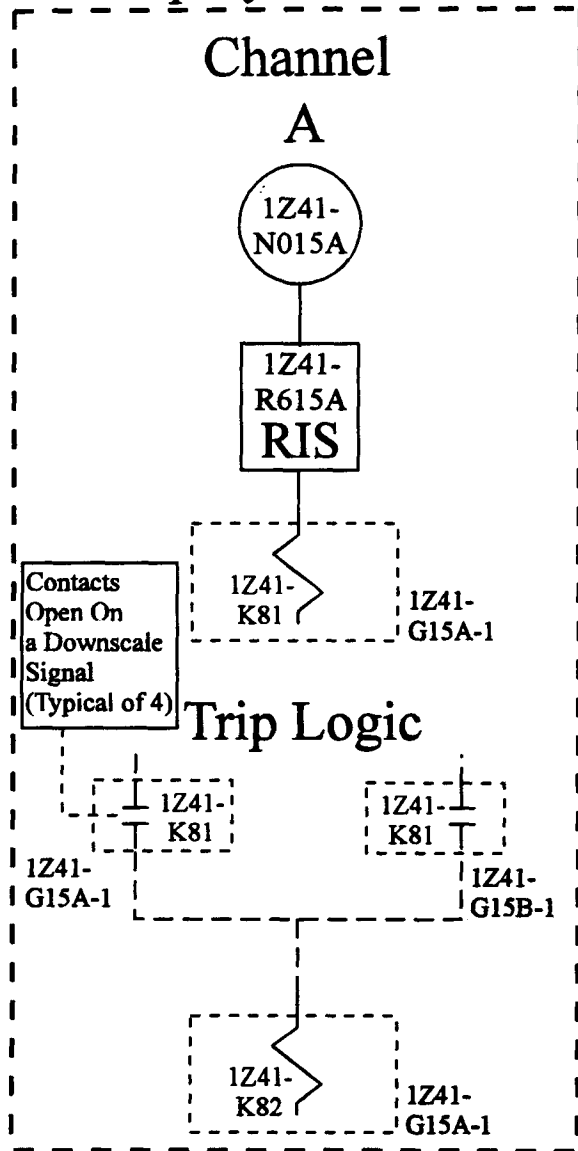
In order to maintain MCREC System initiation capability on Unit 1 Refueling Floor area high radiation, either channel A or channel B must be functional or maintained in the tripped condition.

Elem. Ref.
H-17854
H-17121

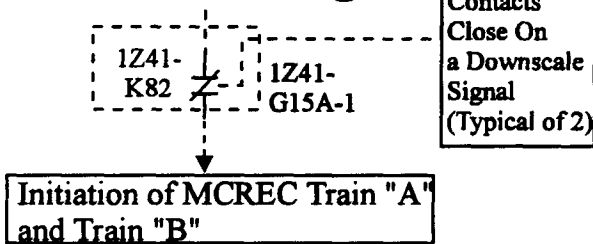
Prepared By: *TZLC*
Reviewed By: *Devil*

LFD-1-MCREC-05
TRM T3.3.7-1, Item 4
MCREC System
Instrumentation,
Refueling Floor Area
Radiation - High
TRM REV. 60

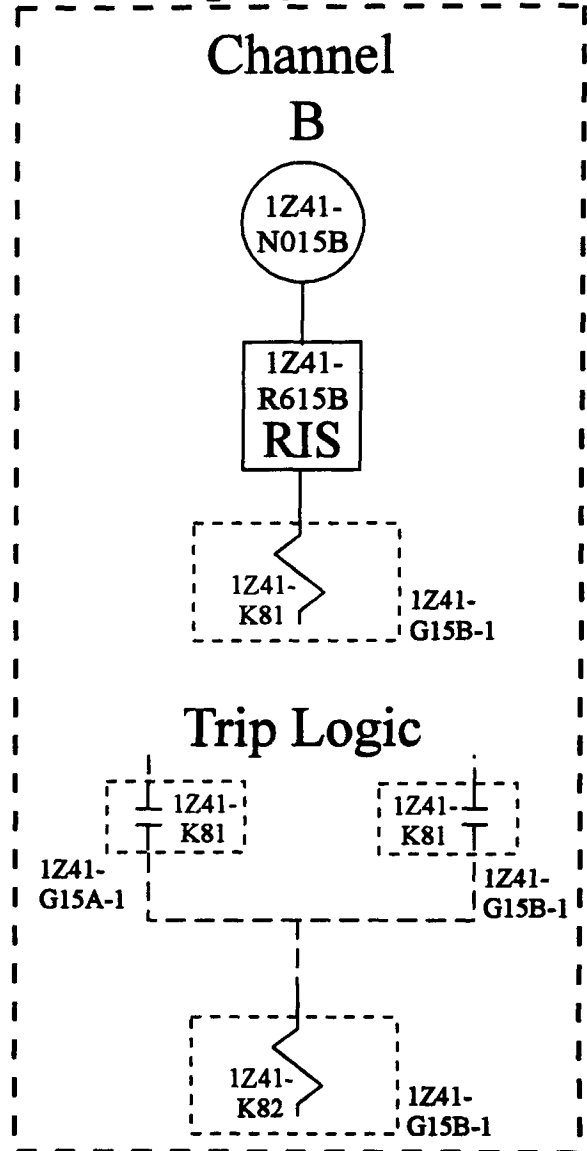
Trip System "A"



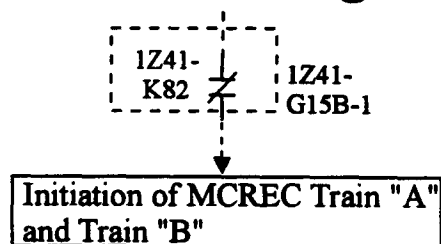
Actuation Logic



Trip System "B"



Actuation Logic



Minimum Channel Requirements for System Initiation Capability:

In order to maintain MCREC System initiation capability for the pressurization mode on a Main Control Room Intake Radiation Monitor downscale signal, each channel must be operable or maintained in the tripped condition.

Elem. Ref.
H-17121
H-17142

Prepared By: *J. L. Burton*

Reviewed By: *W. R. Rigney*

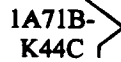
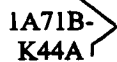
LFD-I-MCREC-06
TRM T3.3.7-1, Item 5
MCREC System
Instrumentation, Main
Control Room Intake
Radiation - Downscale
Rev. 0 1/13/95

Trip System "A"

Channels

A1

A2

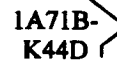


Trip System "B"

Channels

B1

B2



Refer to sheet 2 of 2 for the trip logic, actuation logic and the minimum channels required to maintain functional capability regarding isolation of the Reactor Water Sample line and tripping of the Steam Packing Exhausters and the Mechanical Vacuum Pump. Both functions must be considered in determining the channel minimum requirements.

Elem. Ref.

H-13377 H-17790 H-17811
 H-17076 H-17804 H-17812
 H-17077 H-17805 H-17814
 H-17789 H-17810 H-19556

Prepared By: *J. P. Sumner*

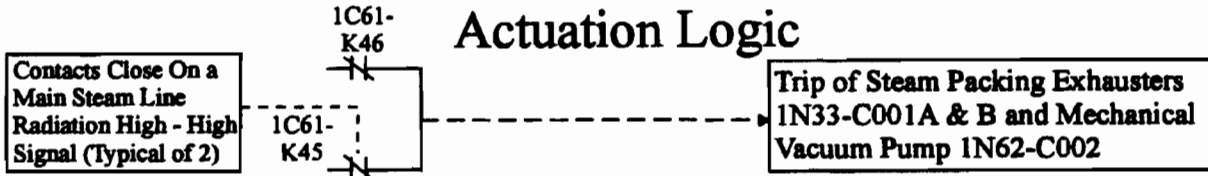
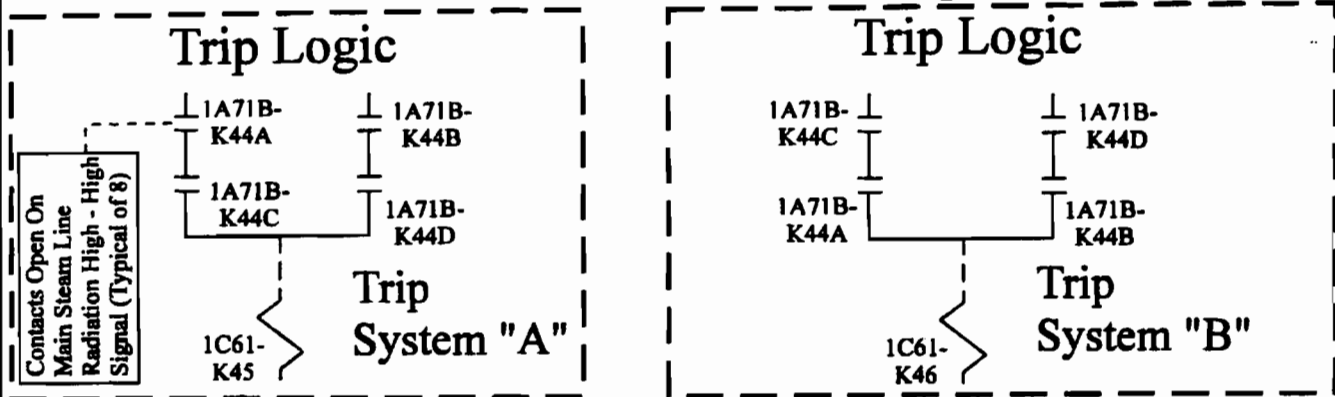
Reviewed By: *W. Ryne*

LFD-1-MSLR-01
 Sheet 1 of 2

TRM T3.3.11
 Main Steam Line
 Radiation High - High

Rev. 0 3/30/95

Trip of Steam Packing Exhausters and Mechanical Vacuum Pump

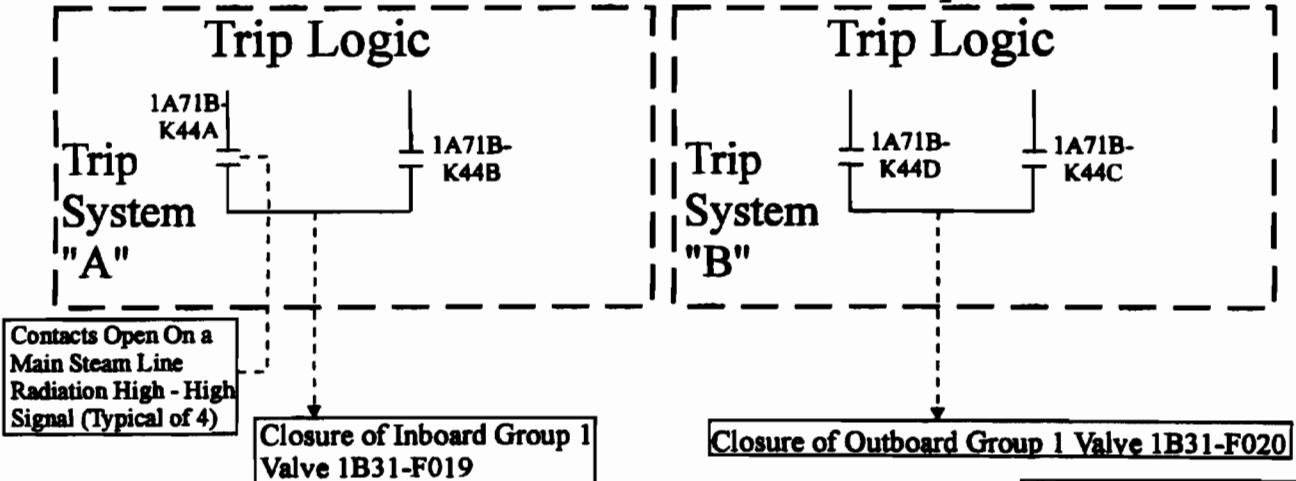


Minimum Channel Requirements for System Initiation Capability:

In order to maintain trip capability of the Steam Packing Exhausters and the Mechanical Vacuum Pump on a Main Steam Line Radiation high - high condition, channels in one of the following combinations must either be functional or maintained in the tripped condition.

- A1 or A2
and
B1 or B2

Closure of the Reactor Water Sample Valves



Minimum Channel Requirements for System Isolation Capability:

In order to maintain isolation capability of the Reactor Water Sample line on a Main Steam Line Radiation high - high condition, channels in one of the following combinations must either be functional or maintained in the tripped condition.

- A1 and B1
OR
A2 and B2

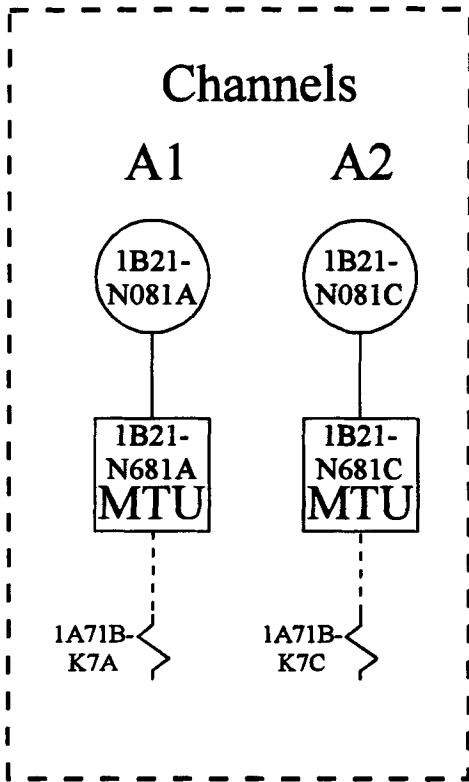
LFD-1-MSLR-01
Sheet 2 of 2
TRM T3.3.11
Main Steam Line
Radiation High - High

Elem. Ref.: See sheet 1.

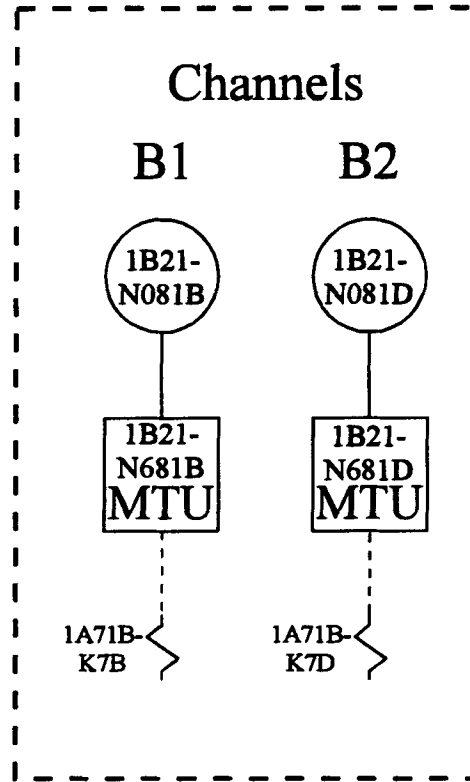
Prepared By: *DLC*
Reviewed By: *[Signature]*

TRM REV. 60

Trip System "A"



Trip System "B"



Minimum Channel Requirements for System Isolation Capability:

See Sheet 2 of 2.

Elem. Ref.

H-17810	H-17816
H-17811	H-19809
H-17812	H-19812
H-17813	H-19815
H-17814	H-19818
H-17815	

Prepared By: *[Signature]*

Reviewed By: *Stephan W. Reed*

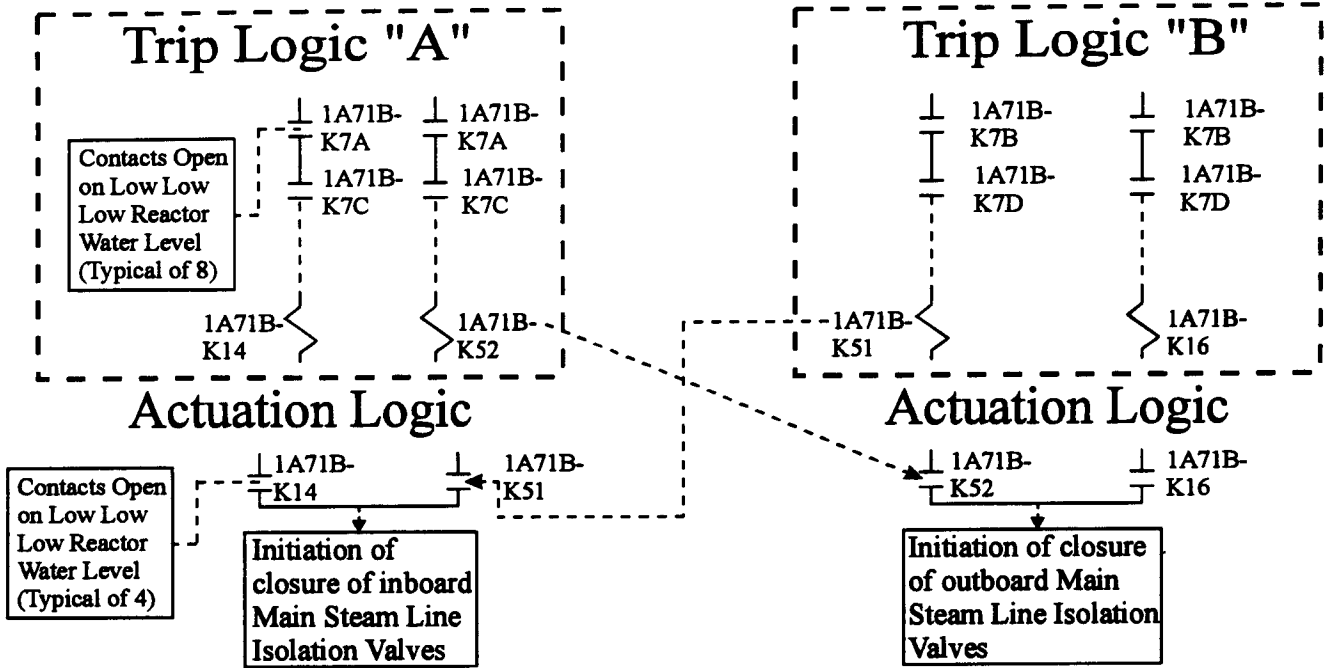
LFD-1-PCIS-01
Sheet 1 of 2

TS 3.3.6.1-1, Item 1.a
Main Steam Line Isolation -
Reactor Vessel Water Level -
Low Low Low, Level 1

Rev. 0

1/13/95

Main Steam Line Isolation Valve Isolation Function

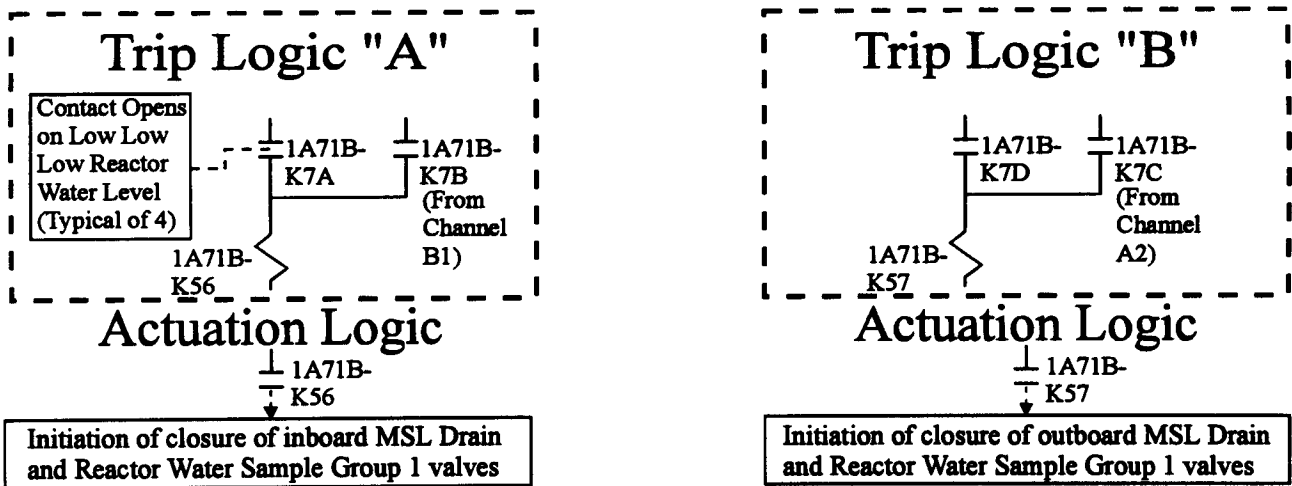


Minimum Channel Requirements for System Isolation Capability:

In order to maintain the capability to isolate the main steam lines on low low low reactor vessel water level, channels in one of the following combinations must be either operable or maintained in the tripped condition.

- A1 or A2
- AND
- B1 or B2

Drain Line and Reactor Water Sample Line Valve Isolation Function



Minimum Channel Requirements for System Isolation Capability:

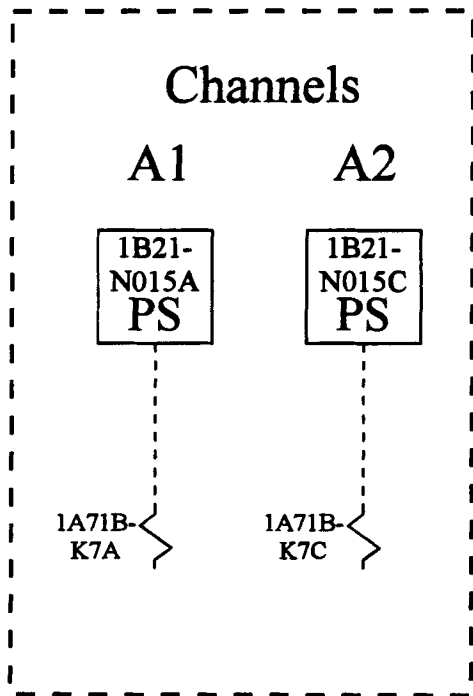
In order to maintain the capability to isolate the main steam line drain and reactor water sample lines on low low low reactor vessel water level, channels in one of the following combinations must be either operable or maintained in the tripped condition.

- A1 and B1
- OR
- A2 and B2

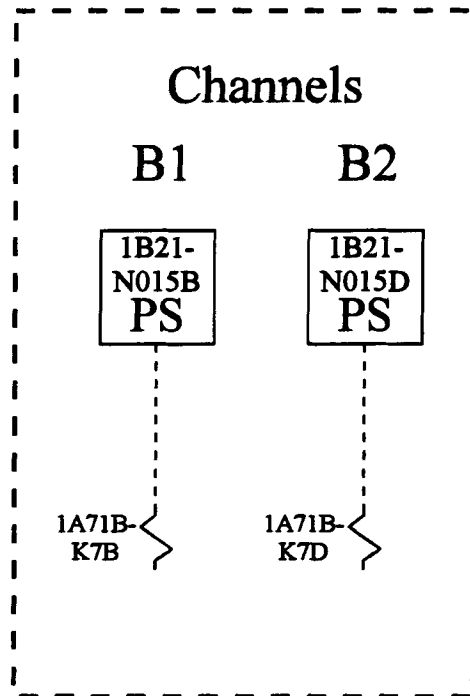
Elem. Ref.	
H-17810	H-17816
H-17811	H-19809
H-17812	H-19812
H-17813	H-19815
H-17814	H-19818
H-17815	

LFD-1-PCIS-01
Sheet 2 of 2
TS 3.3.6.1-1, Item 1.a
Main Steam Line Isolation -
Reactor Vessel Water Level -
Low Low Low, Level 1
Rev. 0
1/13/95

Trip System "A"



Trip System "B"



Minimum Channel Requirements for System Isolation Capability:

See Sheet 2 of 2.

Elem. Ref.

H-17810 H-17814
 H-17811 H-17815
 H-17812 H-17816
 H-17813

Prepared By: *[Signature]*

Reviewed By: *[Signature]*

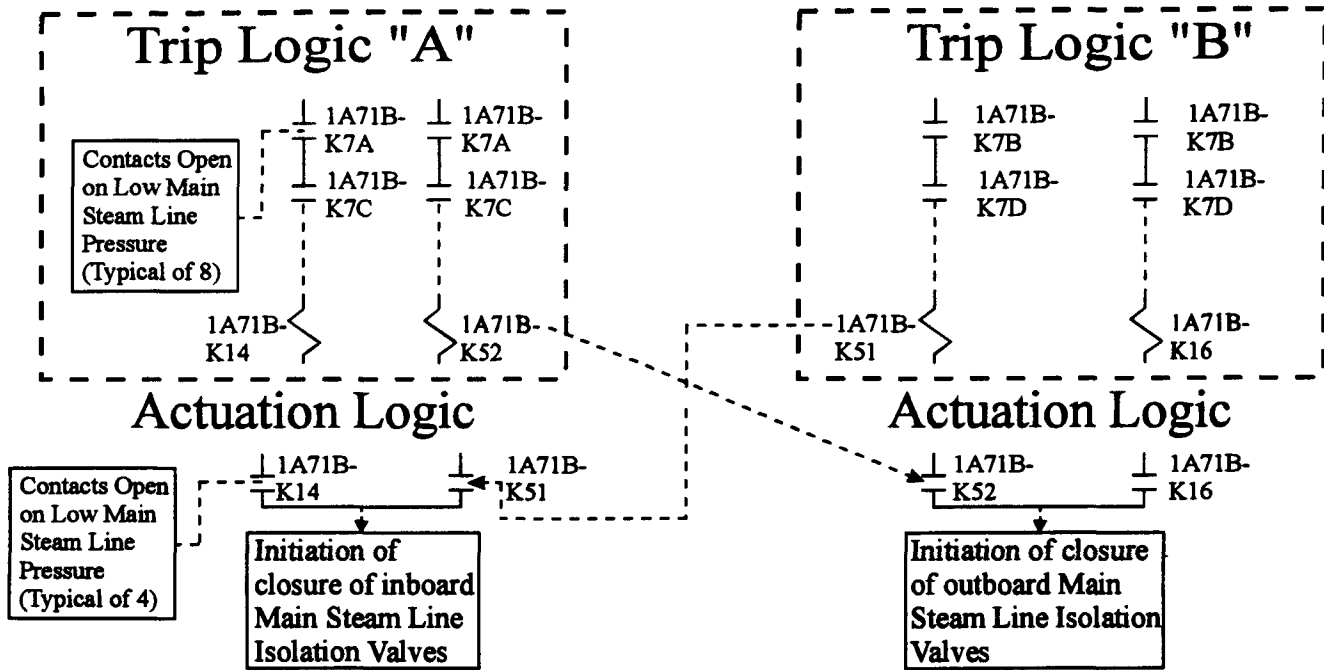
LFD-1-PCIS-02
 Sheet 1 of 2

TS 3.3.6.1-1, Item 1.b
 Main Steam Line Isolation -
 Main Steam Line
 Pressure - Low

Rev. 0

1/13/95

Main Steam Line Isolation Valve Isolation Function

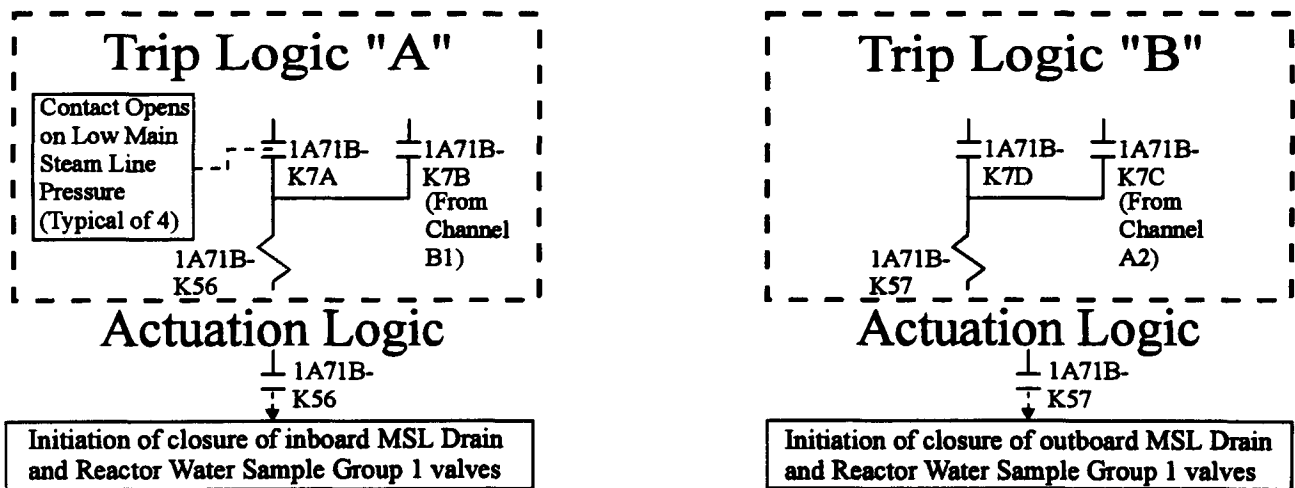


Minimum Channel Requirements for System Isolation Capability:

In order to maintain the capability to isolate the main steam lines on low main steam line pressure, channels in one of the following combinations must be either operable or maintained in the tripped condition.

- A1 or A2
- AND
- B1 or B2

Drain Line and Reactor Water Sample Line Valve Isolation Function



Minimum Channel Requirements for System Isolation Capability:

In order to maintain the capability to isolate the main steam line drain and reactor water sample lines on low main steam line pressure, channels in one of the following combinations must be either operable or maintained in the tripped condition.

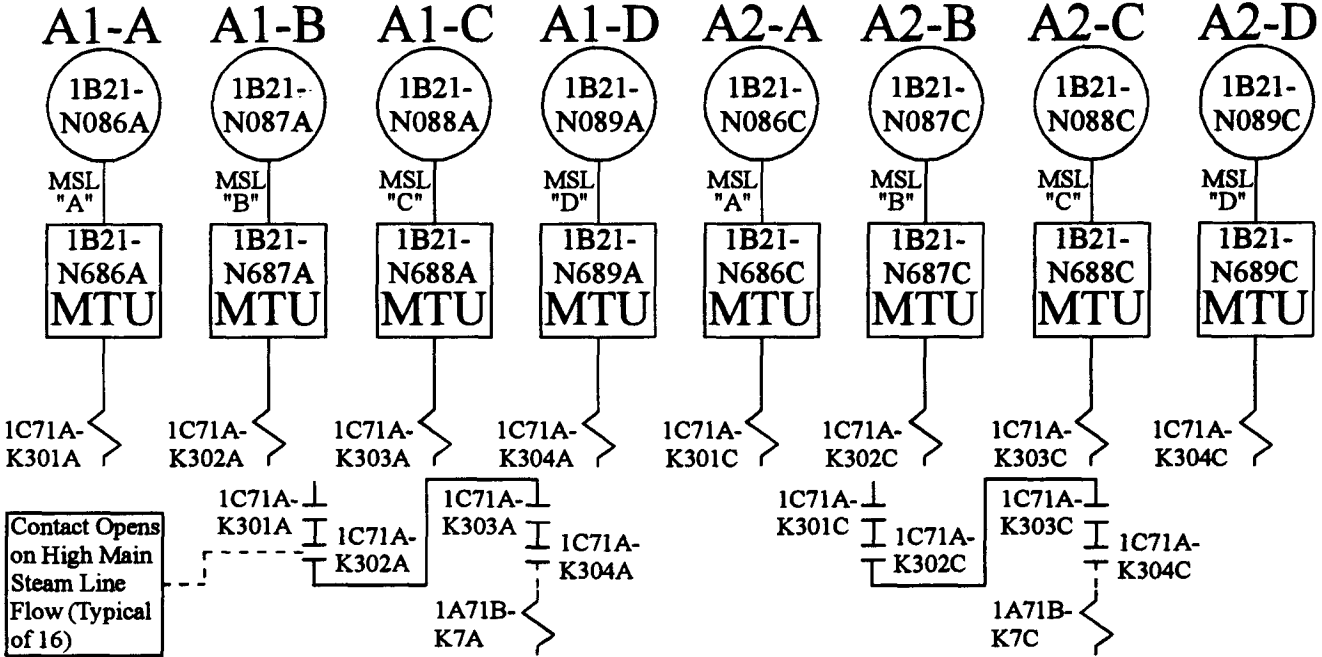
Elem. Ref.	
H-17810	H-17814
H-17811	H-17815
H-17812	H-17816
H-17813	

- A1 and B1
- OR
- A2 and B2

LFD-1-PCIS-02
Sheet 2 of 2
TS 3.3.6.1-1, Item 1.b
Main Steam Line Isolation -
Main Steam Line
Pressure - Low
Rev. 0
1/13/95

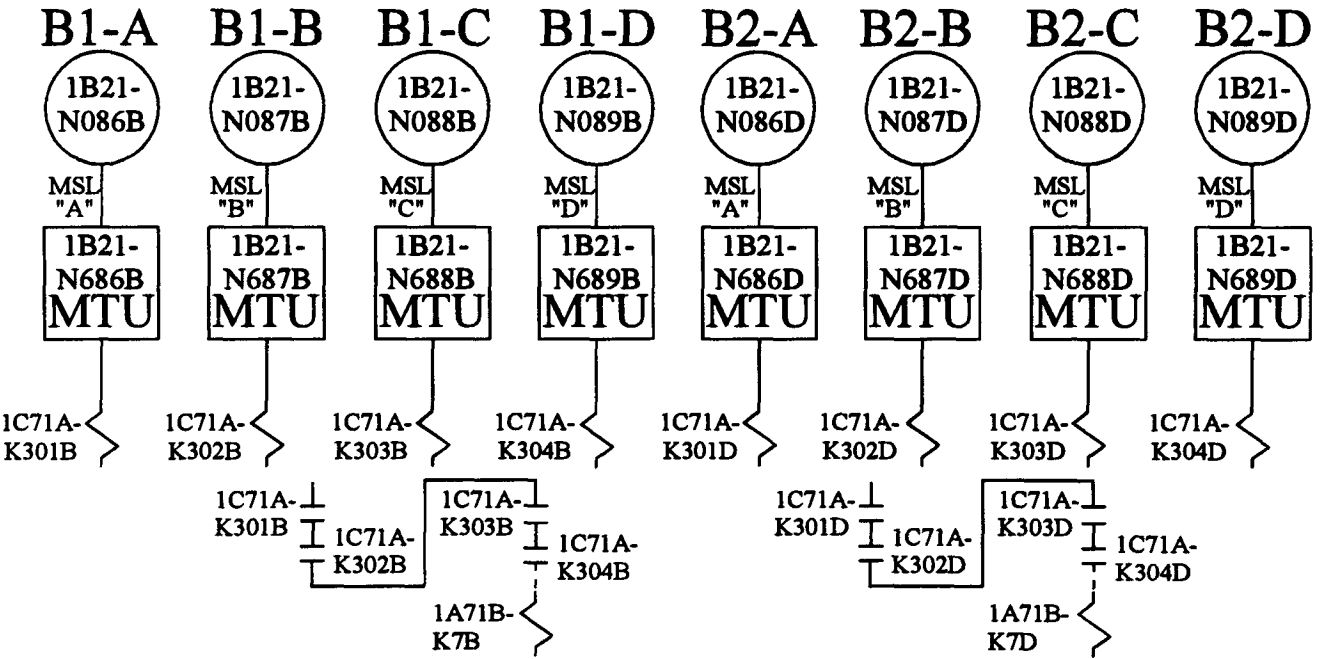
Trip System "A"

Channels



Trip System "B"

Channels



Minimum Channel Requirements for System Isolation Capability:

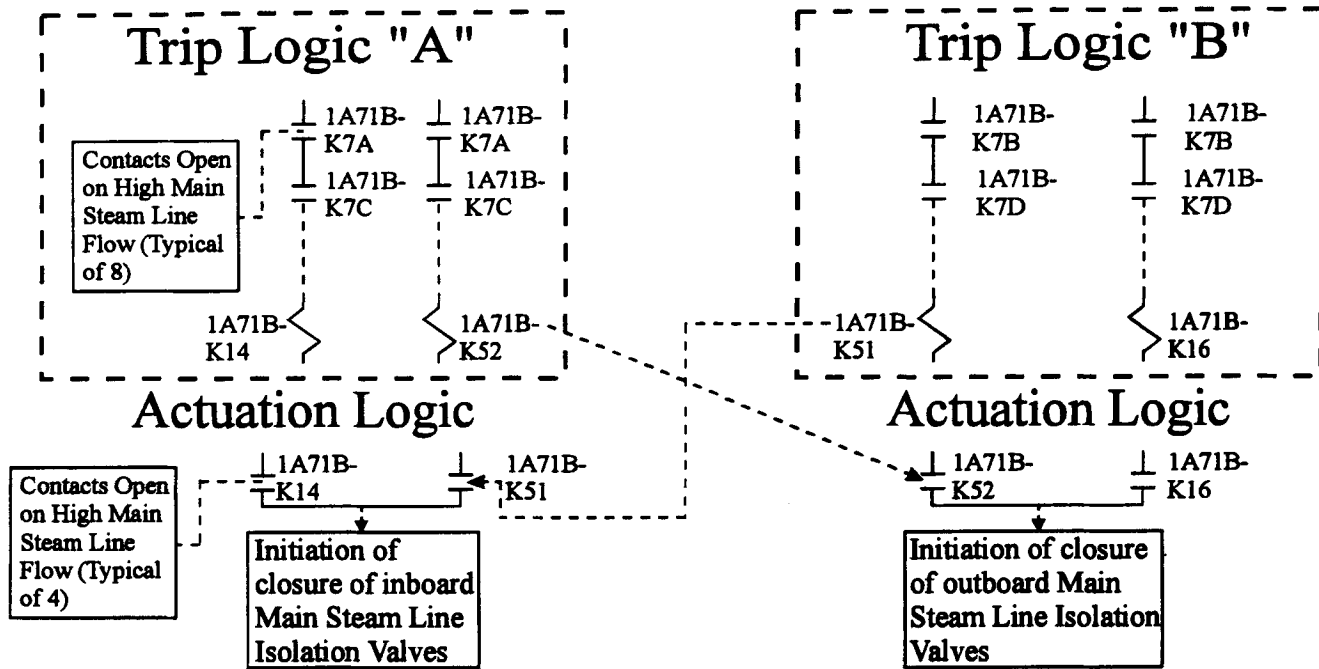
Elem. Ref.	
H-17810	H-17816
H-17811	H-19809
H-17812	H-19812
H-17814	H-19815
H-17815	H-19818

See Sheet 2 of 2.

Prepared By: *[Signature]*
 Reviewed By: *[Signature]*

LFD-1-PCIS-03
 Sheet 1 of 2
 TS 3.3.6.1-1, Item 1.c
 Main Steam Line Isolation -
 Main Steam Line
 Flow - High
 Rev. 0 1/13/95

Main Steam Line Isolation Valve Isolation Function

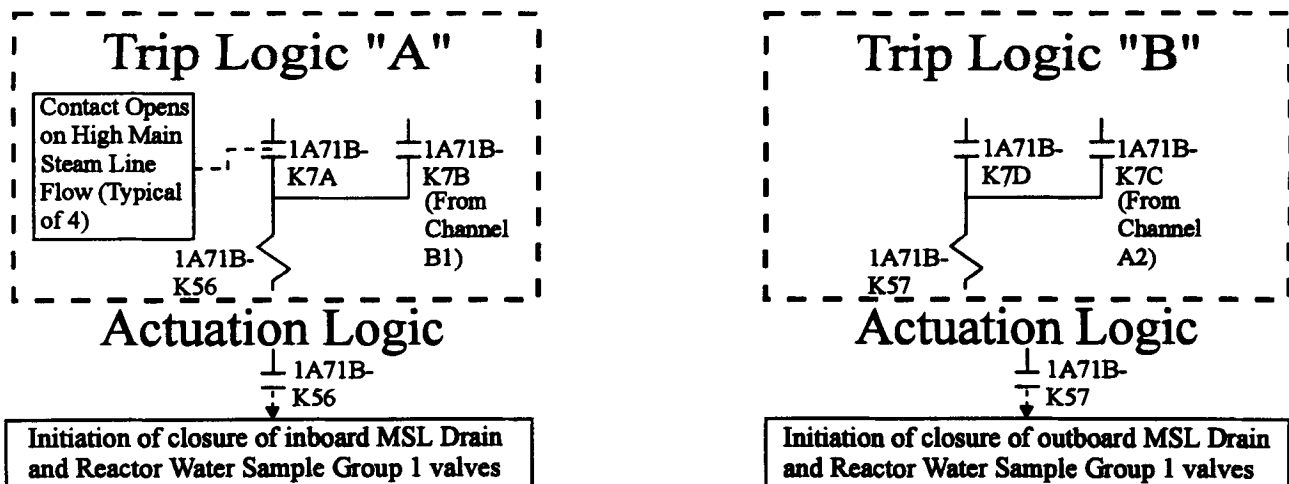


Minimum Channel Requirements for System Isolation Capability:

In order to maintain the capability to isolate a main steam line on high main steam line flow, channels in one of the following combinations must be either operable or maintained in the tripped condition.

One A channel AND one B channel for EACH main steam line

Drain Line and Reactor Water Sample Line Valve Isolation Function

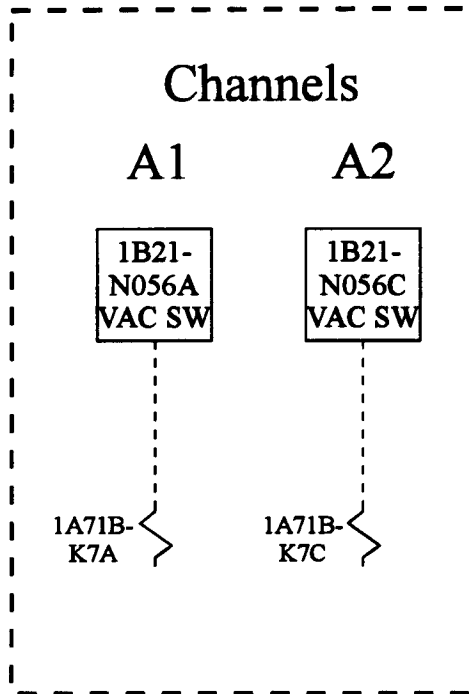


Minimum Channel Requirements for System Isolation Capability:

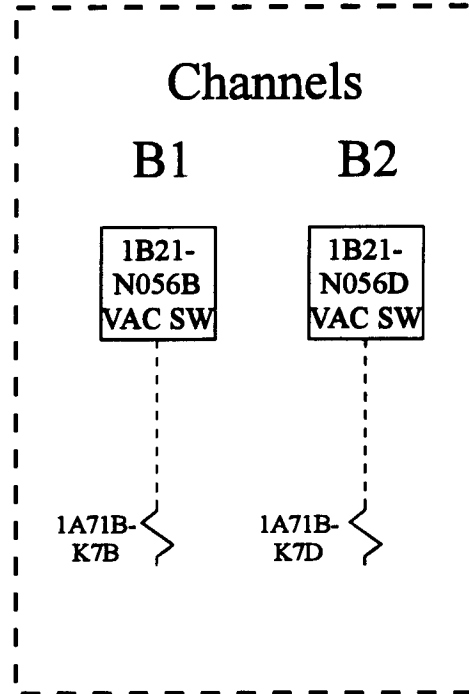
In order to maintain the capability to isolate the main steam line drain and reactor water sample lines on high main steam line flow, channels in one of the following combinations must be either operable or maintained in the tripped condition.

Elem. Ref.			LFD-1-PCIS-03 Sheet 2 of 2
H-17810 H-17816	One A1 channel and one B1 channel for EACH main steam line		TS 3.3.6.1-1, Item 1.c Main Steam Line Isolation - Main Steam Line Flow - High
H-17811 H-19809	OR		
H-17812 H-19812	One A2 channel and one B2 channel for EACH main steam line		
H-17814 H-19815			
H-17815 H-19818			
			Rev. 0 1/13/95

Trip System "A"



Trip System "B"



Minimum Channel Requirements for System Isolation Capability:

See Sheet 2 of 2.

Elem. Ref.

H-17810 H-17814
H-17811 H-17815
H-17812 H-17816
H-17813

Prepared By: *[Signature]*

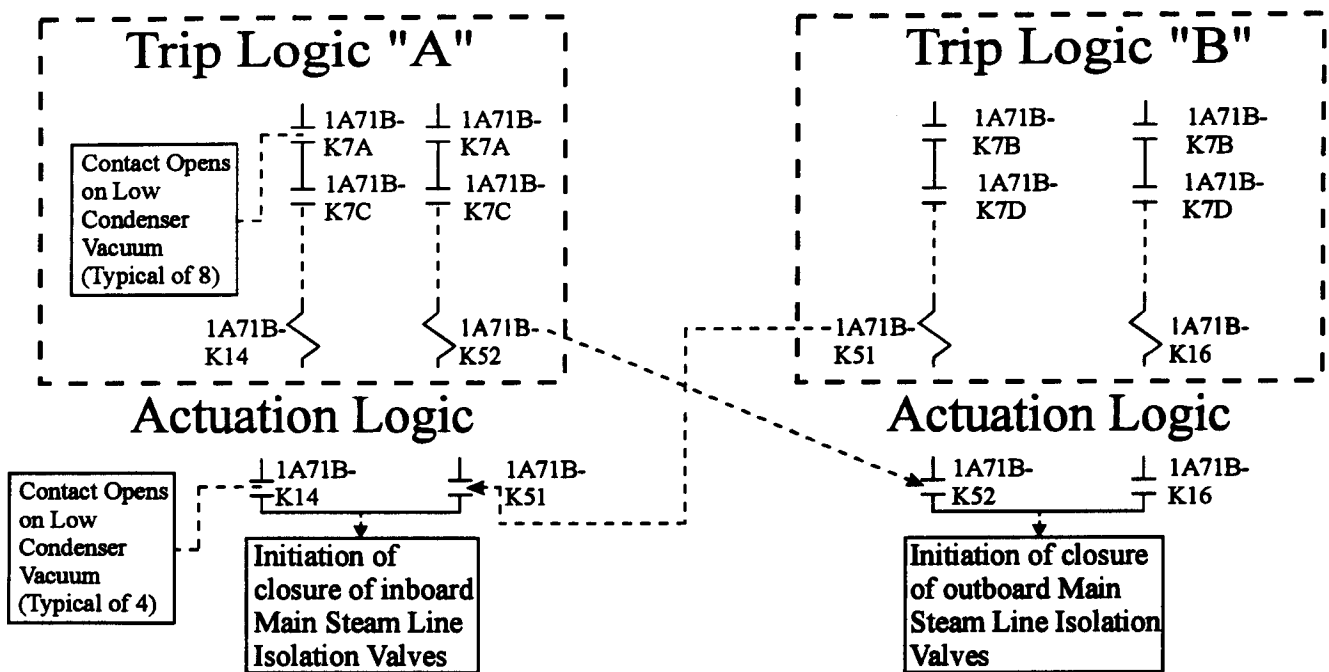
Reviewed By: *[Signature]*

LFD-1-PCIS-04
Sheet 1 of 2

TS 3.3.6.1-1, Item 1.d
Main Steam Line Isolation -
Condenser Vacuum - Low

Rev. 0 1/13/95

Main Steam Line Isolation Valve Isolation Function

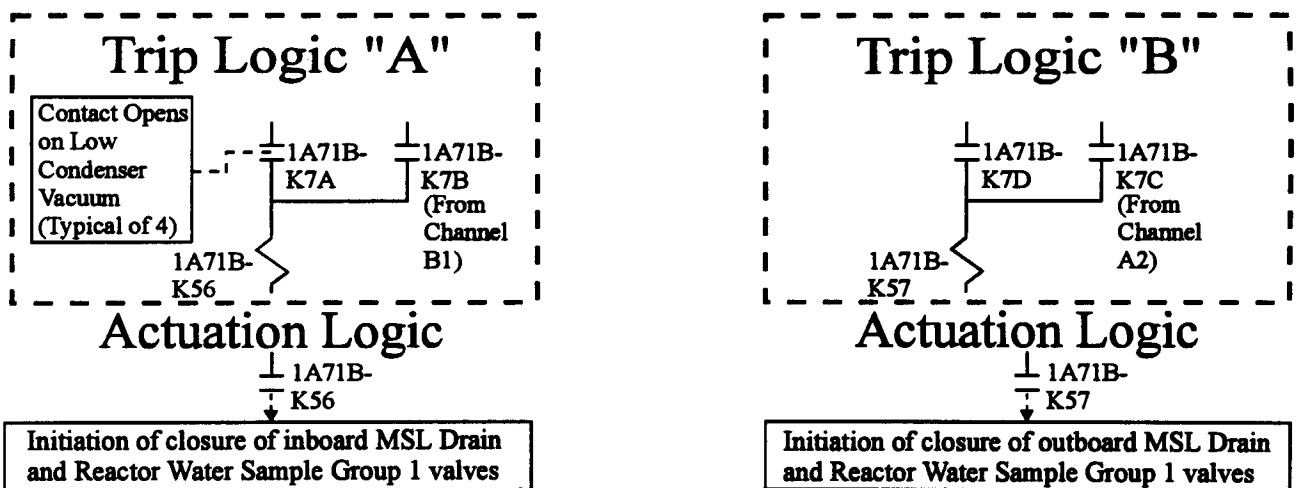


Minimum Channel Requirements for System Isolation Capability:

In order to maintain the capability to isolate the main steam lines on low condenser vacuum, channels in one of the following combinations must be either operable or maintained in the tripped condition.

A1 or A2
AND
B1 or B2

Drain Line and Reactor Water Sample Line Valve Isolation Function



Minimum Channel Requirements for System Isolation Capability:

In order to maintain the capability to isolate the main steam line drain and reactor water sample lines on low condenser vacuum, channels in one of the following combinations must be either operable or maintained in the tripped condition.

Elem. Ref.

H-17810 H-17814
H-17811 H-17815
H-17812 H-17816
H-17813

A1 and B1
OR
A2 and B2

LFD-1-PCIS-04

Sheet 2 of 2

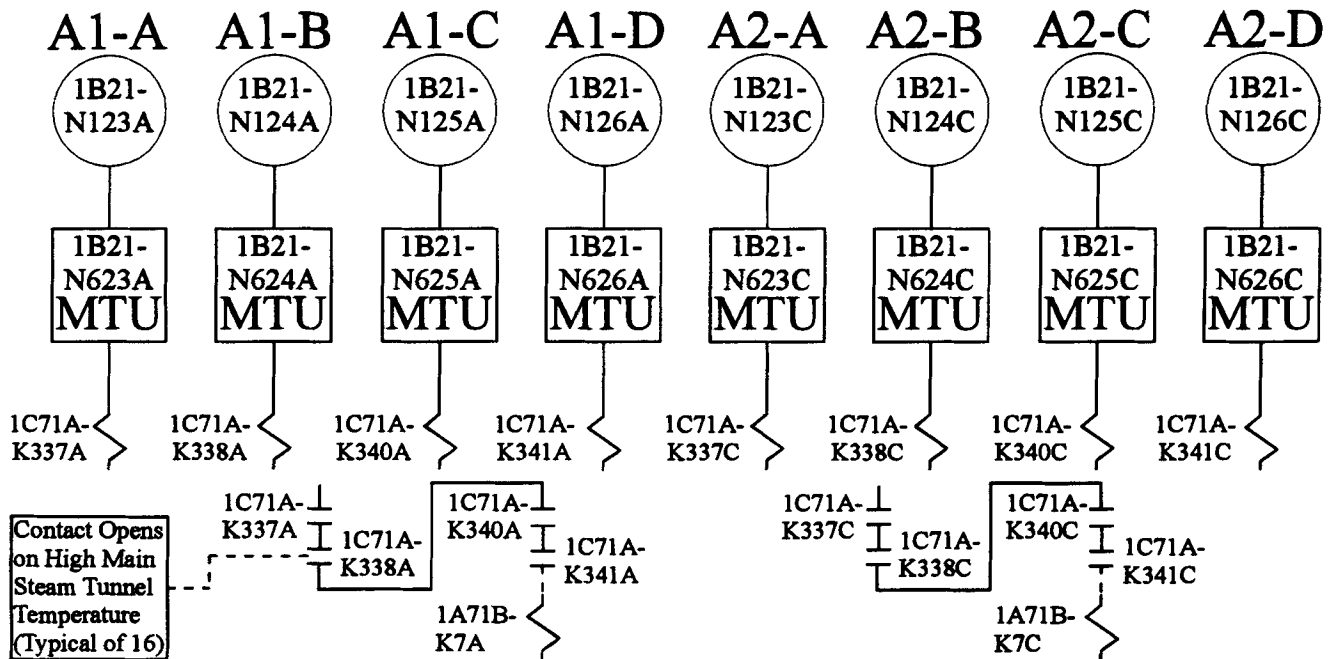
TS 3.3.6.1-1, Item 1.d
Main Steam Line Isolation -
Condenser Vacuum - Low

Rev. 0

1/13/95

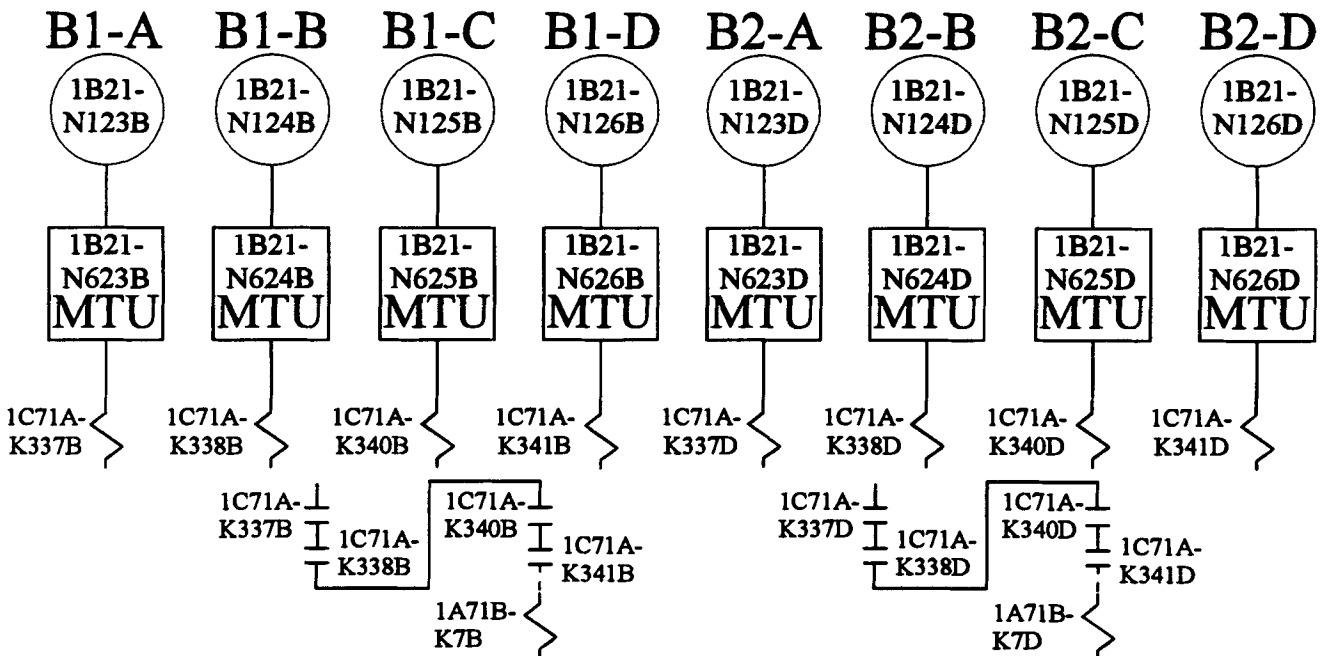
Trip System "A"

Channels



Trip System "B"

Channels



Minimum Channel Requirements for System Isolation Capability:

Elem. Ref.
H-17810 H-17816
H-17811 H-19810
H-17812 H-19813
H-17813 H-19816
H-17814 H-19819
H-17815

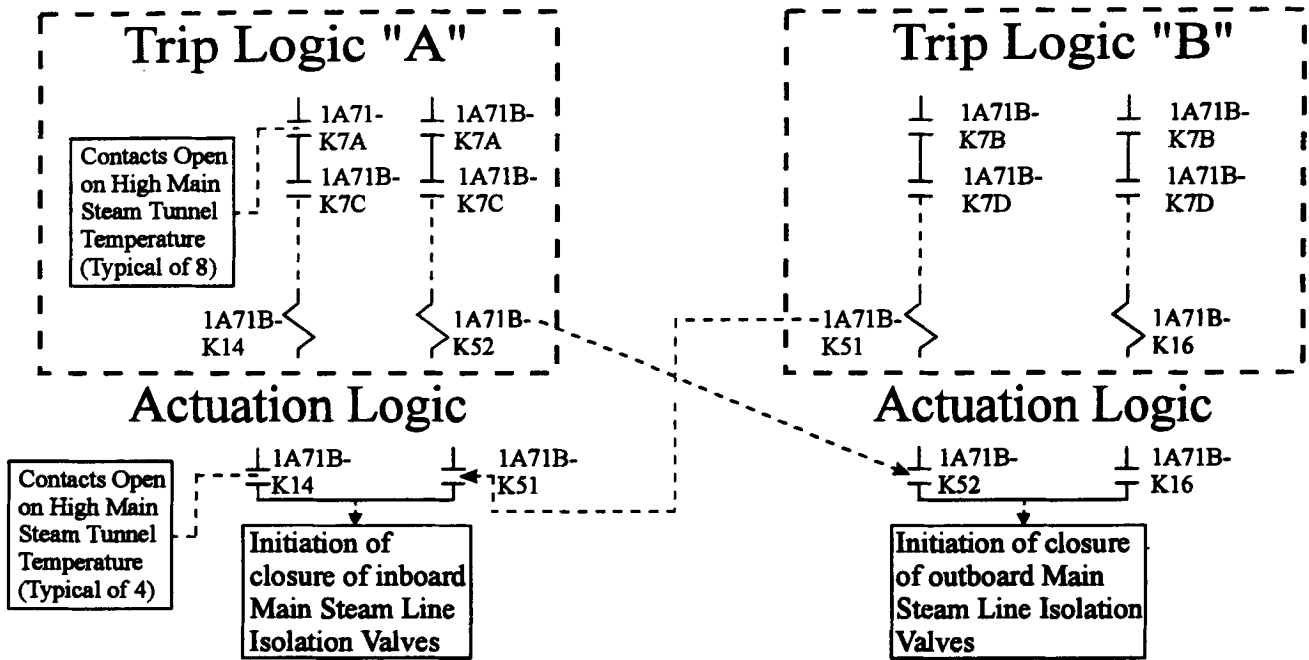
See Sheet 2 of 2.

Prepared By: *[Signature]*

Reviewed By: *[Signature]*

LFD-1-PCIS-05
 Sheet 1 of 2
 TS 3.3.6.1-1, Item 1.e
 Main Steam Line Isolation -
 Main Steam Tunnel
 Temperature - High
 Rev. 0 1/13/95

Main Steam Line Isolation Valve Isolation Function



Minimum Channel Requirements for System Isolation Capability:

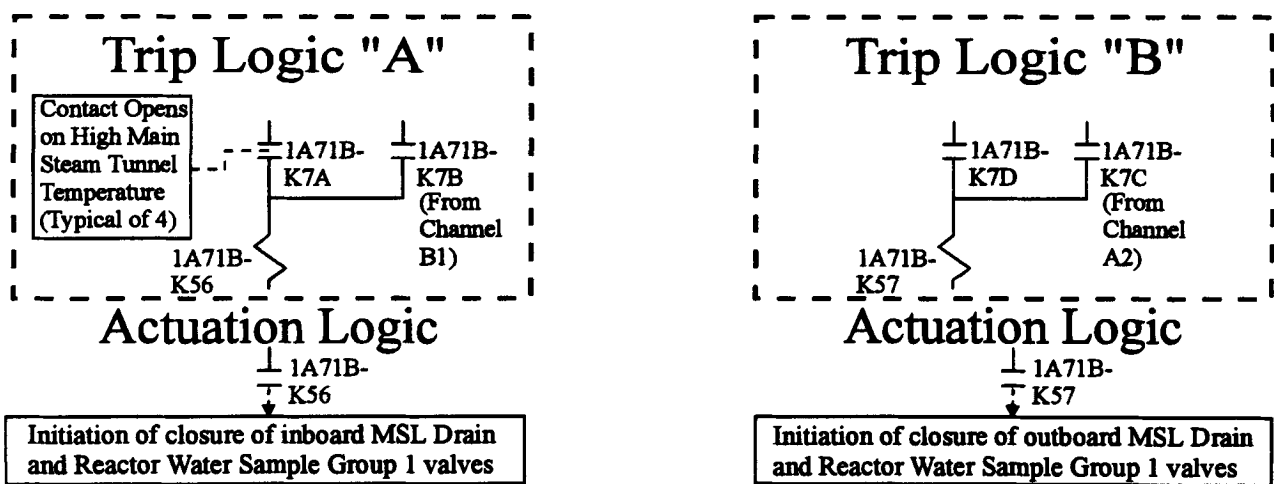
In order to maintain the capability to isolate the main steam lines on high main steam tunnel temperature, channels in one of the following combinations must be either operable or maintained in the tripped condition.

One A1 channel or one A2 channel

AND

One B1 channel or one B2 channel

Drain Line and Reactor Water Sample Line Valve Isolation Function



Minimum Channel Requirements for System Isolation Capability:

In order to maintain the capability to isolate the main steam line drain and reactor water sample lines on high main steam tunnel temperature, channels in one of the following combinations must be either operable or maintained in the tripped condition.

Elem. Ref.

H-17810 H-17816
 H-17811 H-19810
 H-17812 H-19813
 H-17813 H-19816
 H-17814 H-19819
 H-17815

One A1 channel and one B1 channel

OR

One A2 channel and one B2 channel

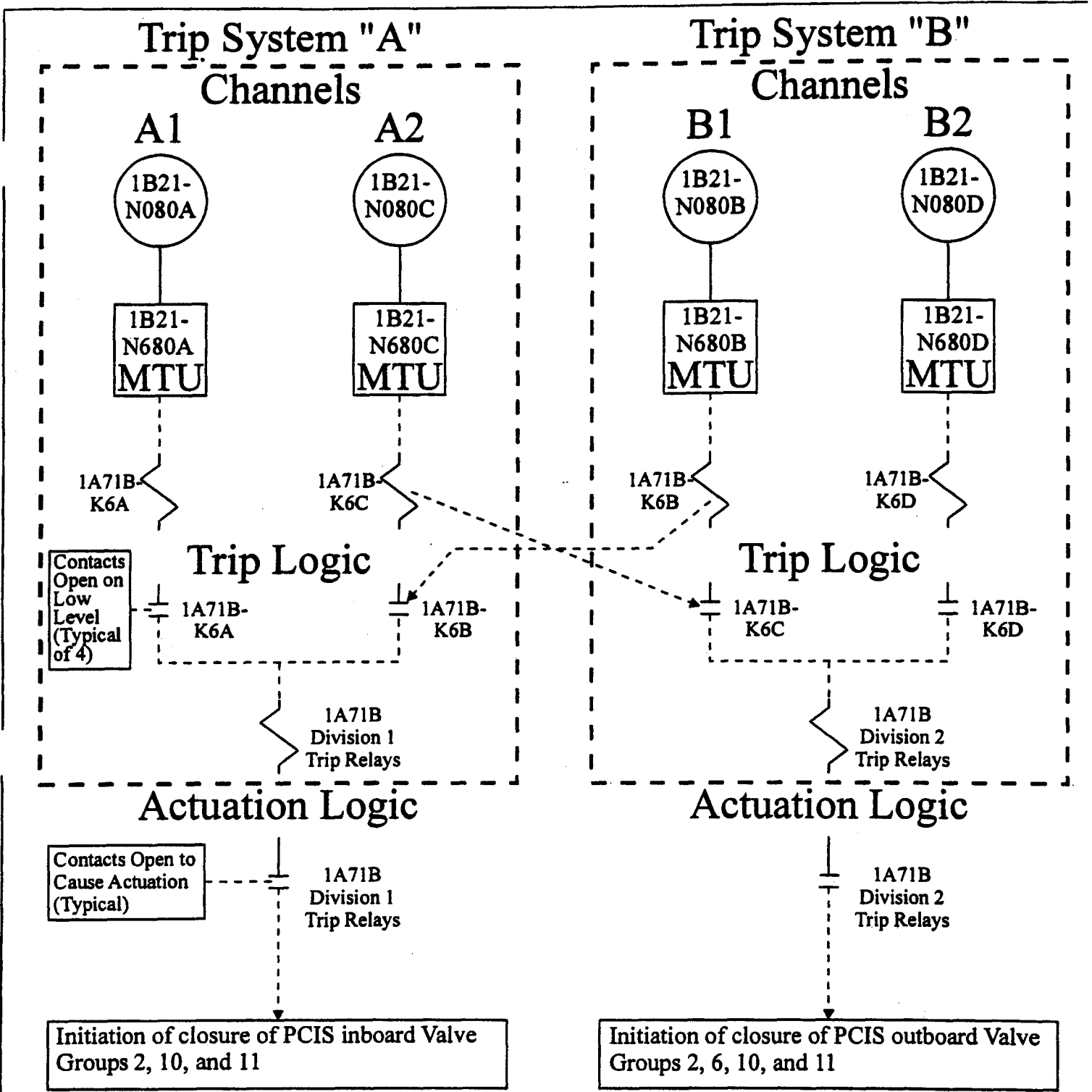
LFD-1-PCIS-05

Sheet 2 of 2

TS 3.3.6.1-1, Item 1.e
 Main Steam Line Isolation -
 Main Steam Tunnel
 Temperature - High

Rev. 0

1/13/95



Minimum Channel Requirements for System Isolation Capability:

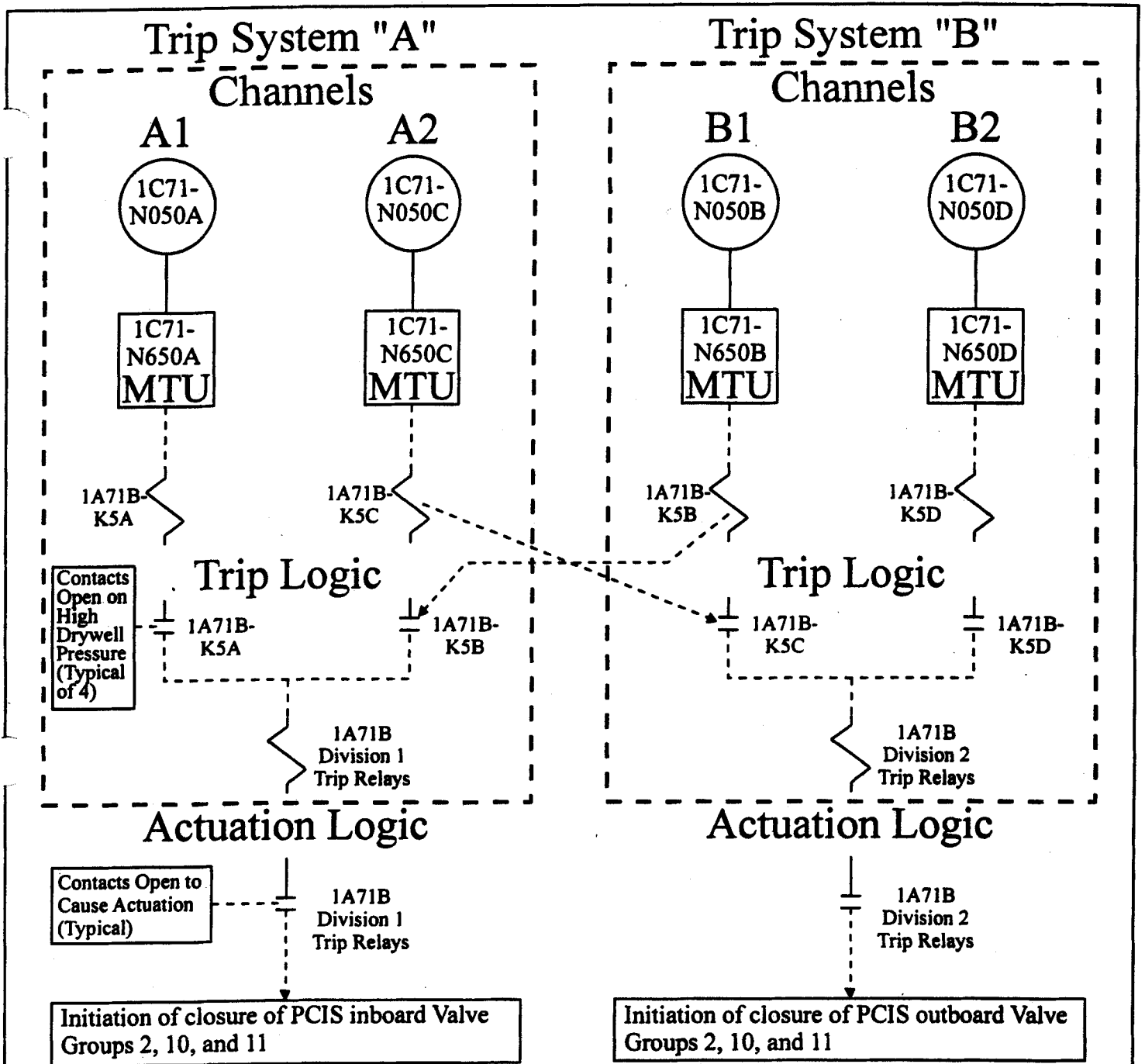
In order to maintain the capability to isolate Valve Groups 2, 6, 10, and 11 on low reactor water level (Level 3), channels in one of the following combinations must be either operable or maintained in the tripped condition.

A1 and B1
OR
A2 and B2

Elem. Ref.	
H-17810	H-19809
H-17811	H-19812
H-17812	H-19815
H-17814	H-19818

Prepared By: *[Signature]*
Reviewed By: *[Signature]*

LFD-1-PCIS-07
TS 3.3.6.1-1, Item 2.a
Primary Containment
Isolation,
Reactor Vessel Water
Level - Low, Level 3
TRM Rev. 30



Minimum Channel Requirements for System Isolation Capability:

In order to maintain the capability to isolate Valve Groups 2, 10, and 11 on high drywell pressure, channels in one of the following combinations must be either operable or maintained in the tripped condition.

A1 and B1
OR
A2 and B2

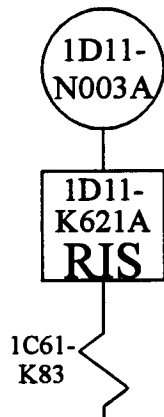
Elem. Ref.
H-17810 H-19809
H-17811 H-19812
H-17812 H-19815
H-17814 H-19818

Prepared By: *[Signature]*
Reviewed By: *[Signature]*

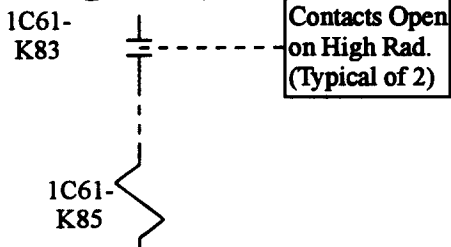
LFD-1-PCIS-08
TS 3.3.6.1-1, Item 2.b
Primary Containment
Isolation, Drywell
Pressure - High
TRM Rev. 33

Trip System "A"

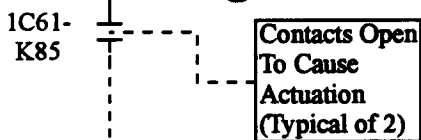
Channel A



Trip Logic



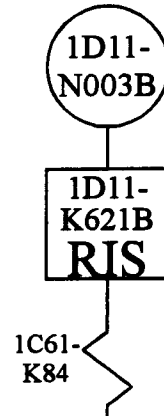
Actuation Logic



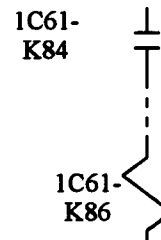
Closure of inboard Group 2 PCIS valves
(1T48 Vent and Purge valves only)

Trip System "B"

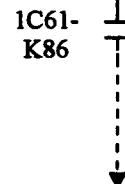
Channel B



Trip Logic



Actuation Logic



Closure of outboard Group 2 PCIS valves
(1T48 Vent and Purge valves only)

Minimum Channel Requirements for System Isolation Capability:

In order to maintain Group 2 PCIS isolation capability of the Vent and Purge Valves on drywell high radiation, at least one of the two channels must be either operable or maintained in the tripped condition.

Elem. Ref.
H-17802
H-17803
H-19643

LFD-1-PCIS-09

TS 3.3.6.1-1, Item 2.c
Primary Containment
Isolation

Drywell Radiation-High

Prepared By: *Stephen J. Reed*

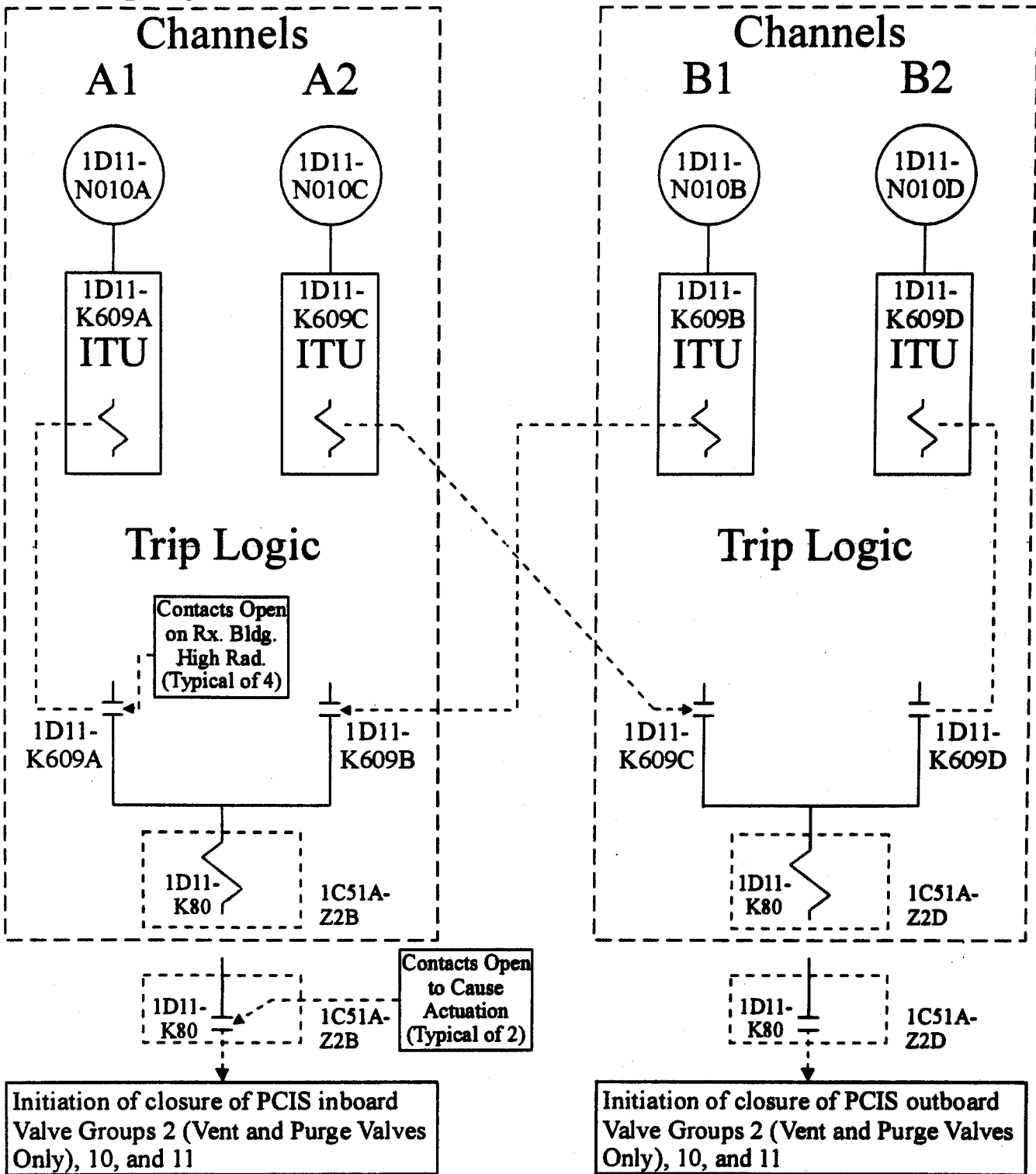
Reviewed By: *Roger Clark*

Rev. 0

1/13/95

Trip System "A"

Trip System "B"



Minimum Channel Requirements for System Isolation Capability:

In order to maintain the capability to isolate Valve Groups 2, 10, and 11 on Reactor Building Exhaust High Radiation, channels in one of the following combinations must be either operable or maintained in the tripped condition.

Elem. Ref.

A-17802 H-19563
H-17803 H-19564
H-19561 H-19566

A1 and B1
OR
A2 and B2

Prepared By: *[Signature]*

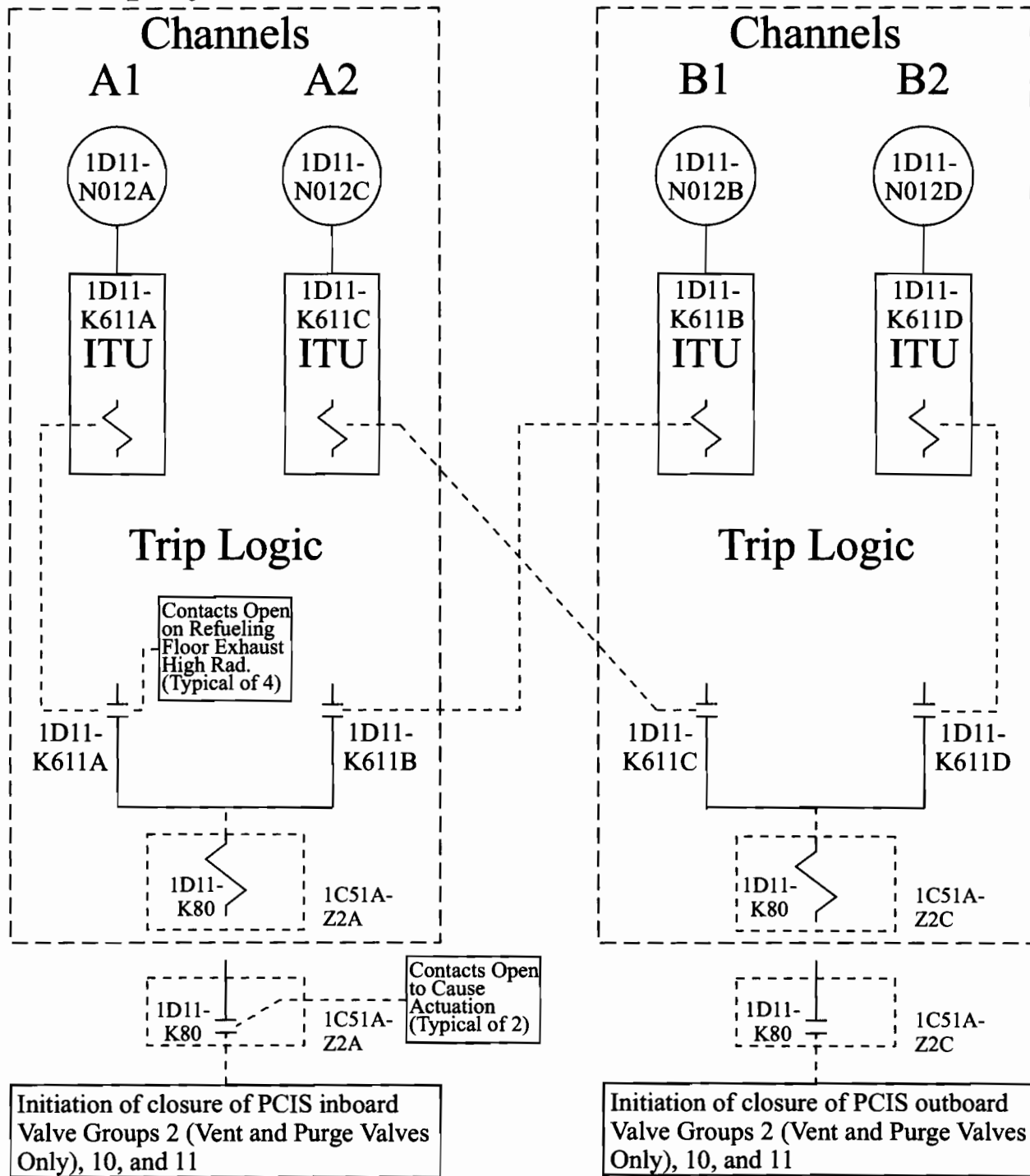
Reviewed By: *[Signature]*

LFD-1-PCIS-10
TS 3.3.6.1-1, Item 2.d
Primary Containment
Isolation
Reactor Building Exhaust
Radiation - High

TRM Rev. 24

Trip System "A"

Trip System "B"



Minimum Channel Requirements for System Isolation Capability:

In order to maintain the capability to isolate Valve Groups 2, 10, and 11 on Refueling Floor Exhaust High Radiation, channels in one of the following combinations must be either operable or maintained in the tripped condition.

Elem. Ref.
H-17802 H-19563
H-17803 H-19564
H-19561 H-19566

A1 and B1
OR
A2 and B2

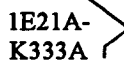
Prepared By: *[Signature]*
Reviewed By: *[Signature]*

LFD-1-PCIS-11
TS 3.3.6.1-1, Item 2.e Primary Containment Isolation Refueling Floor Exhaust Radiation - High
TRM Rev. 53

Trip System "A"

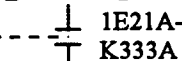
Channel

A



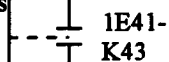
Trip Logic

Contact Closes on High Flow (Typical of 2)



Actuation Logic

Contact Closes on High Flow (Typical of 2)

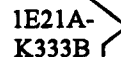


Initiation of closure of HPCI inboard Group 3 valves

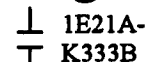
Trip System "B"

Channel

B



Trip Logic



Actuation Logic



Initiation of closure of HPCI outboard Group 3 valve and valve 1E41-F041

Minimum Channel Requirements for System Isolation Capability:

In order to maintain the capability to isolate the HPCI steam supply and torus suction lines on high flow, at least one channel is required to be operable or maintained in the tripped condition.

Elem. Ref.

H-17157 H-17163
H-17159 H-19822
H-17160 H-19825

LFD-1-PCIS-12

TS 3.3.6.1-1, Item 3.a

HPCI System Isolation-
HPCI Steam Line Flow - High

Prepared By: *John J. Payne*

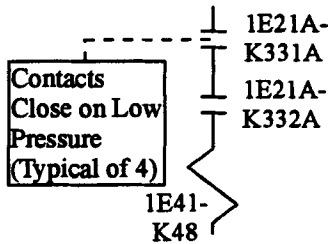
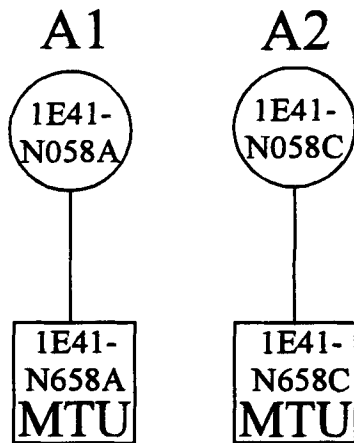
Reviewed By: *Stephen W. Reed*

Rev. 0

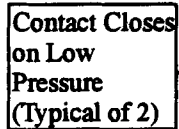
1/13/95

Trip System "A"

Channels



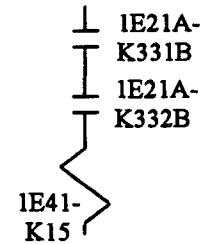
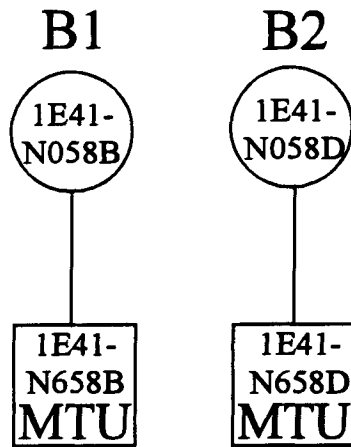
Actuation Logic



Initiation of closure of HPCI inboard Group 3 valves

Trip System "B"

Channels



Actuation Logic



Initiation of closure of HPCI outboard Group 3 valve and valve 1E41-F041

Minimum Channel Requirements for System Isolation Capability:

In order to maintain the capability to isolate the HPCI steam supply and torus suction lines on low pressure, channels in one of the following combinations must be either operable or maintained in the tripped condition.

Elem. Ref.

H-17157 H-17163
H-17159 H-19822
H-17160 H-19825

A1 and A2
OR
B1 and B2

Prepared By: John D. Ray

Reviewed By: [Signature]

LFD-1-PCIS-13

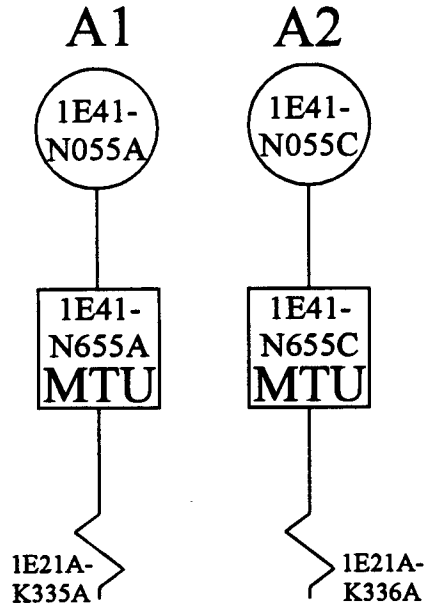
TS 3.3.6.1-1, Item 3.b
HPCI System Isolation-
HPCI Steam Supply Line
Pressure - Low

Rev. 0

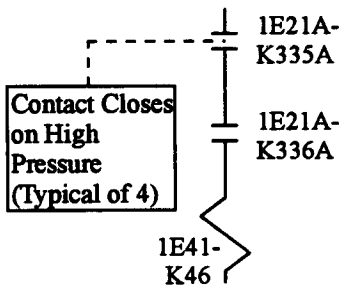
1/13/95

Trip System "A"

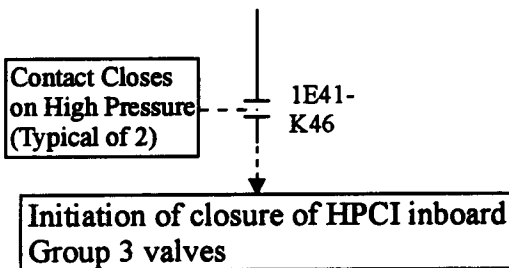
Channels



Trip Logic

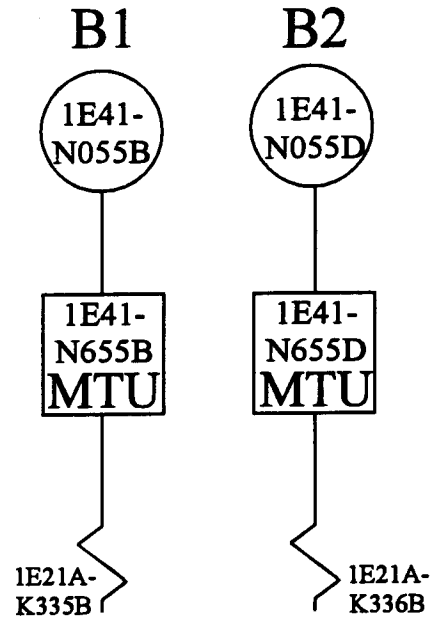


Actuation Logic

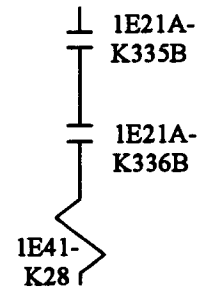


Trip System "B"

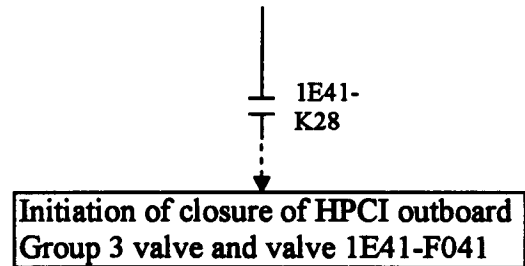
Channels



Trip Logic



Actuation Logic



Minimum Channel Requirements for System Isolation Capability:

In order to maintain the capability to isolate the HPCI steam supply and torus suction lines on high turbine exhaust diaphragm pressure, channels in one of the following combinations must be either operable or maintained in the tripped condition.

Elem. Ref.

H-17157 H-17163
H-17159 H-19822
H-17160 H-19825

A1 and A2
OR
B1 and B2

Prepared By: *John d. Byrne*

Reviewed By: *Steph W. Reed*

LFD-1-PCIS-14

TS 3.3.6.1-1, Item 3.c
HPCI System Isolation-
HPCI Turbine Exhaust
Diaphragm Pressure - High

Rev. 0

1/13/95

Trip System "A"

Trip System "B"

Channels

Channels

Drywell Pressure

HPCI Steam Line Pressure

Drywell Pressure

HPCI Steam Line Pressure

A1

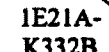
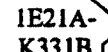
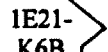
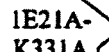
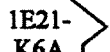
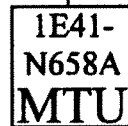
A2

A3

B1

B2

B3

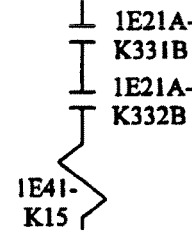
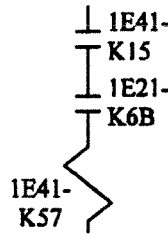
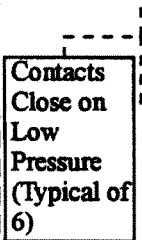
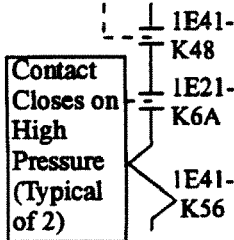


Trip Logic

Trip Logic

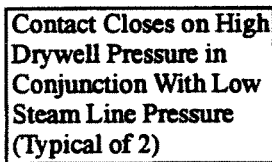
Trip Logic

Trip Logic

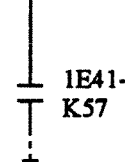


Actuation Logic

Actuation Logic



Initiation of closure of HPCI inboard Group 8 valve



Initiation of closure of HPCI outboard Group 8 valve

Minimum Channel Requirements for System Isolation Capability:

In order to maintain the capability to isolate the turbine exhaust line on high drywell pressure, channels in one of the following combinations must be either operable or maintained in the tripped condition.

Elem. Ref.

H-17109 H-19822
 H-17157 H-19823
 H-17159 H-19825
 H-17160 H-19826
 H-19586

A1 and A2 and A3
 OR
 B1 and B2 and B3

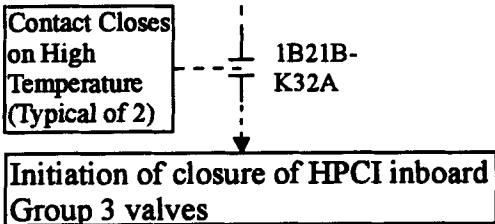
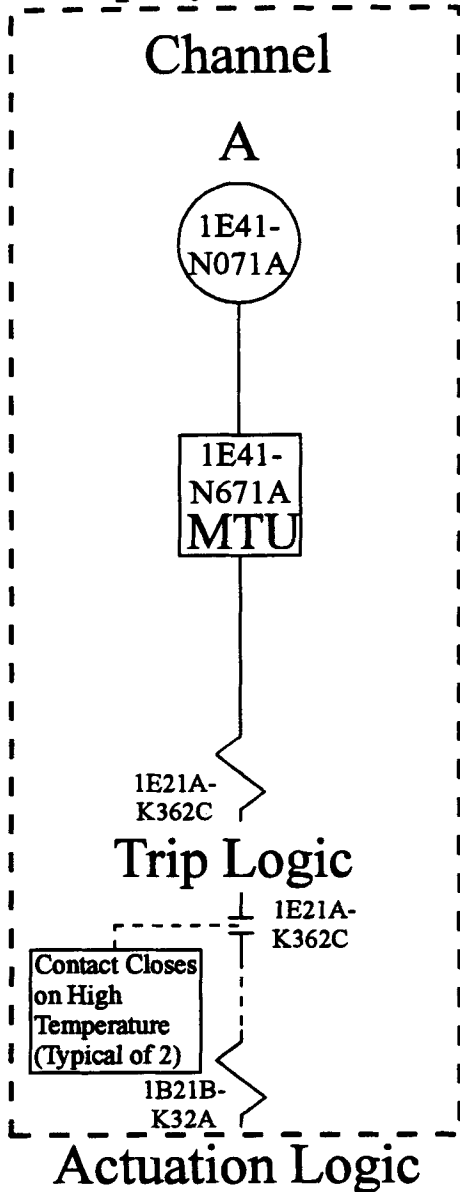
LFD-1-PCIS-15

TS 3.3.6.1-1, Item 3.d
 HPCI System Isolation -
 Drywell Pressure-High

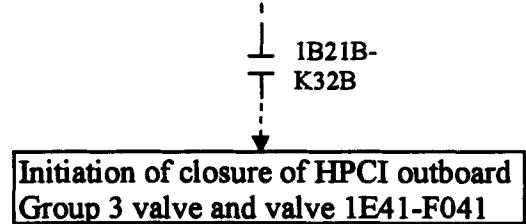
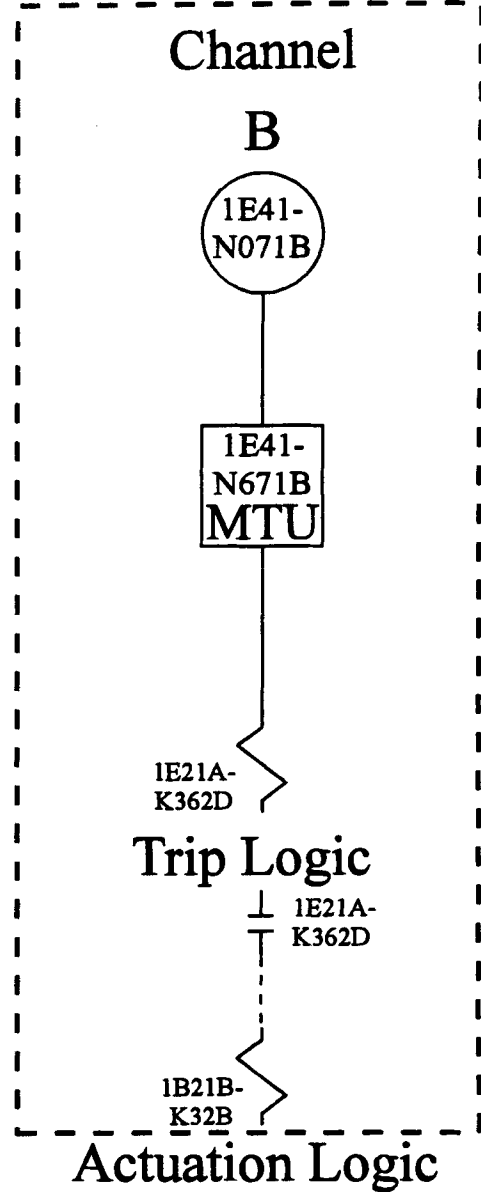
Prepared By: B.G. Thigpin *B.G. Thigpin*
 Reviewed By: S.B. Tippers *S.B. Tippers*
printed signature

TRM Rev. 93

Trip System "A"



Trip System "B"



Minimum Channel Requirements for System Isolation Capability:

In order to maintain the capability to isolate the HPCI steam supply and torus suction lines on high pipe penetration room temperature, at least one channel is required to be operable or maintained in the tripped condition.

Elem. Ref.

H-17157 H-17748
H-17160 H-19829
H-17163 H-19832
H-17746

Prepared By: *John J. Payne*

Reviewed By: *Stephen W. Reed*

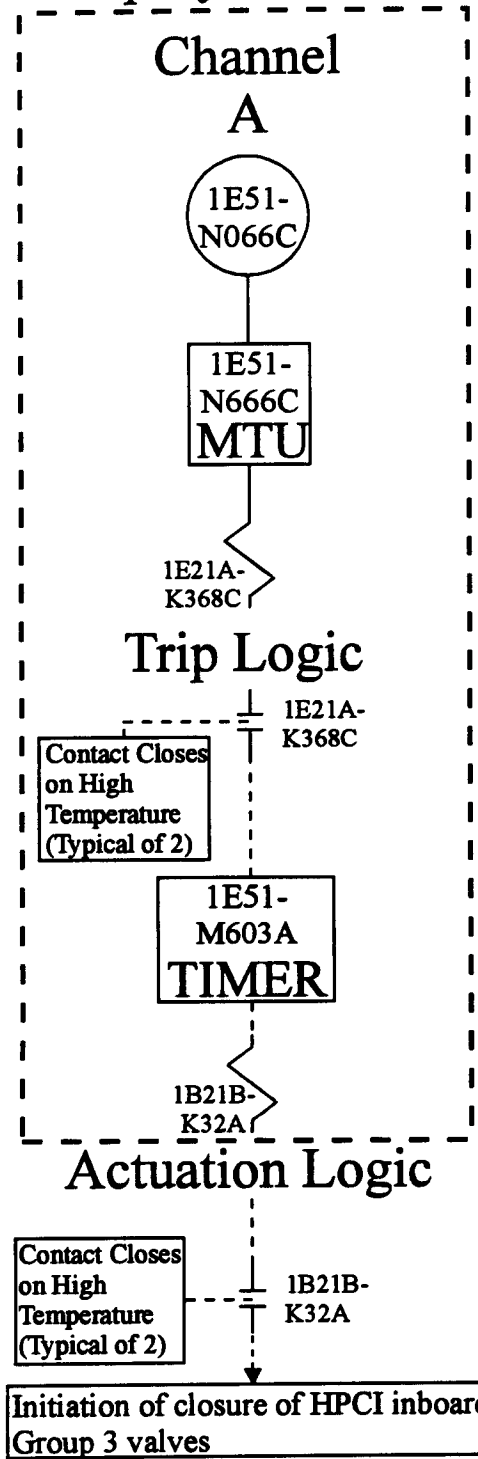
LFD-1-PCIS-16

TS 3.3.6.1-1, Item 3.e
HPCI System Isolation-
HPCI Pipe Penetration Room
Temperature - High

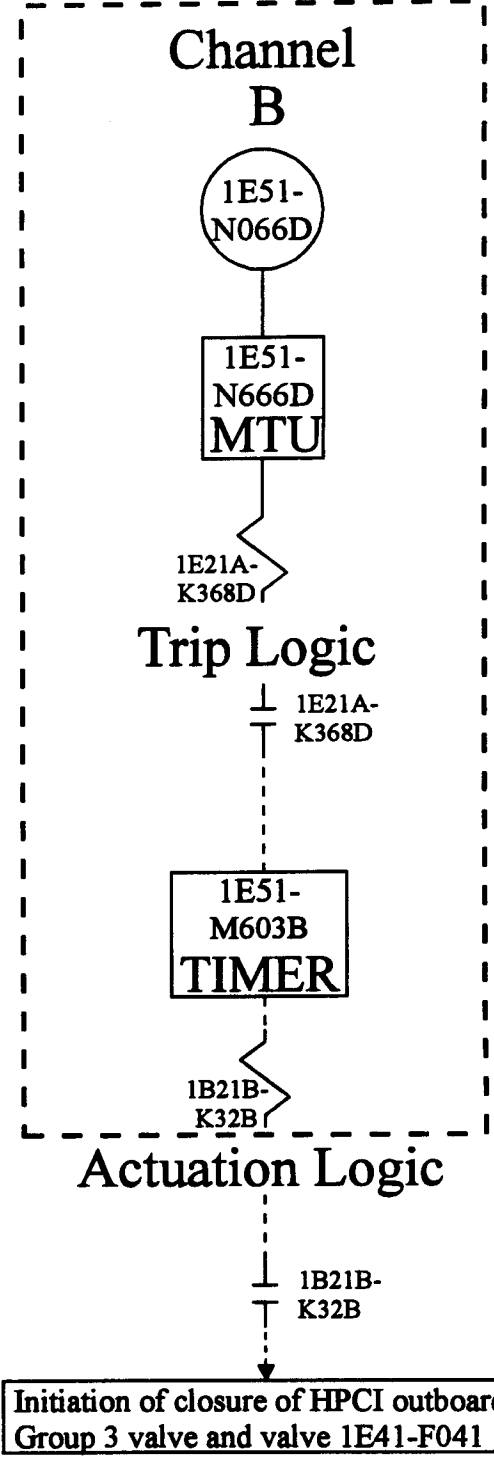
Rev. 0

1/13/95

Trip System "A"



Trip System "B"



Minimum Channel Requirements for System Isolation Capability:

In order to maintain the capability to isolate the HPCI steam supply and torus suction lines on high suppression pool area ambient temperature, at least one channel including its associated timer is required to be operable or maintained in the tripped condition.

Elem. Ref.

H-17157 H-17748
 H-17160 H-19829
 H-17163 H-19832
 H-17746

LFD-1-PCIS-17
 TS 3.3.6.1-1, Items 3.f and 3.g
 HPCI System Isolation -
 Suppression Pool Area
 Ambient Temperature - High, and
 Suppression Pool Area Temperature
 - Time Delay Relays

Prepared By: *John C. Byrne*

Reviewed By: *Stephen W. Neal*

Rev. 0

1/13/95

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LFD-1-PCIS-18

N/A

Prepared By: _____	N/A
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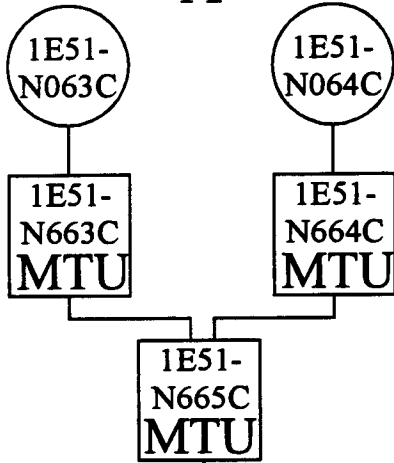
Reviewed By: _____	N/A
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Rev. 0

12/19/94

Trip System "A"

Channel A



1E21A-K342C

Trip Logic

Contact Closes on High Diff. Temperature (Typical of 2)

1E21A-K342C

1E51-M603A
TIMER

1B21B-K32A

Actuation Logic

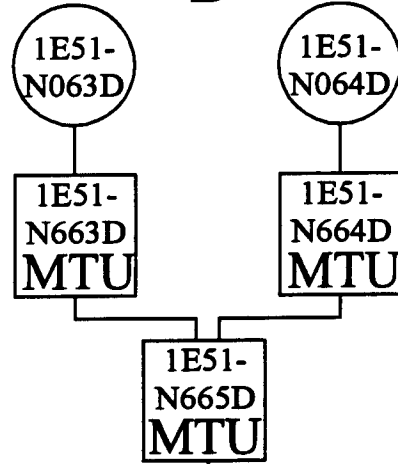
Contact Closes on High Diff. Temperature (Typical of 2)

1B21B-K32A

Initiation of closure of HPCI inboard Group 3 valves

Trip System "B"

Channel B



1E21A-K342D

Trip Logic

1E21A-K342D

1E51-M603B
TIMER

1B21B-K32B

Actuation Logic

1B21B-K32B

Initiation of closure of HPCI outboard Group 3 valve and valve 1E41-F041

Minimum Channel Requirements for System Isolation Capability:

In order to maintain the capability to isolate the HPCI steam supply and torus suction lines on high suppression pool area differential temperature, at least one channel including its associated timer is required to be operable or maintained in the tripped condition.

Elem. Ref.

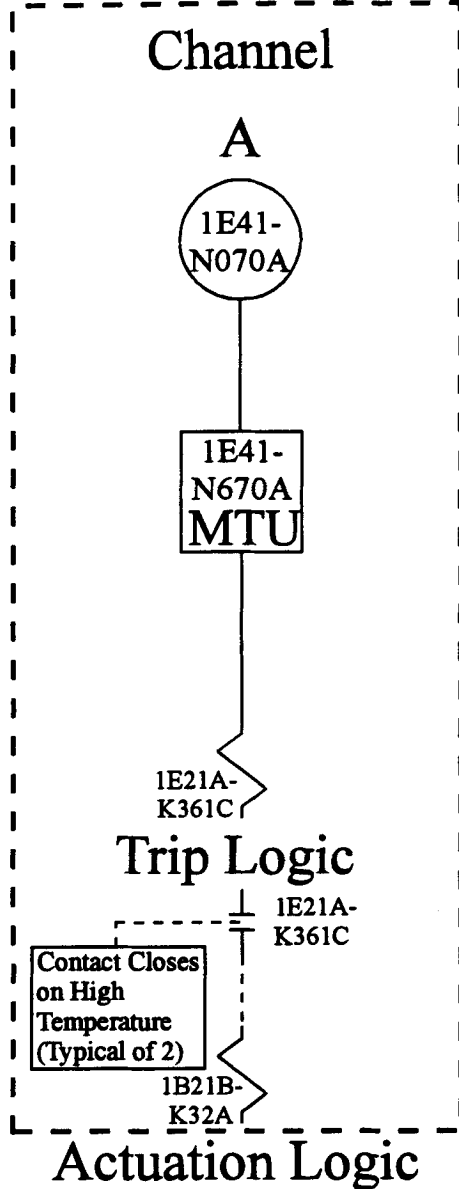
H-17157 H-17748
H-17160 H-19828
H-17163 H-19831
H-17746

Prepared By: *John J. Payne*

Reviewed By: *Steve W. Reed*

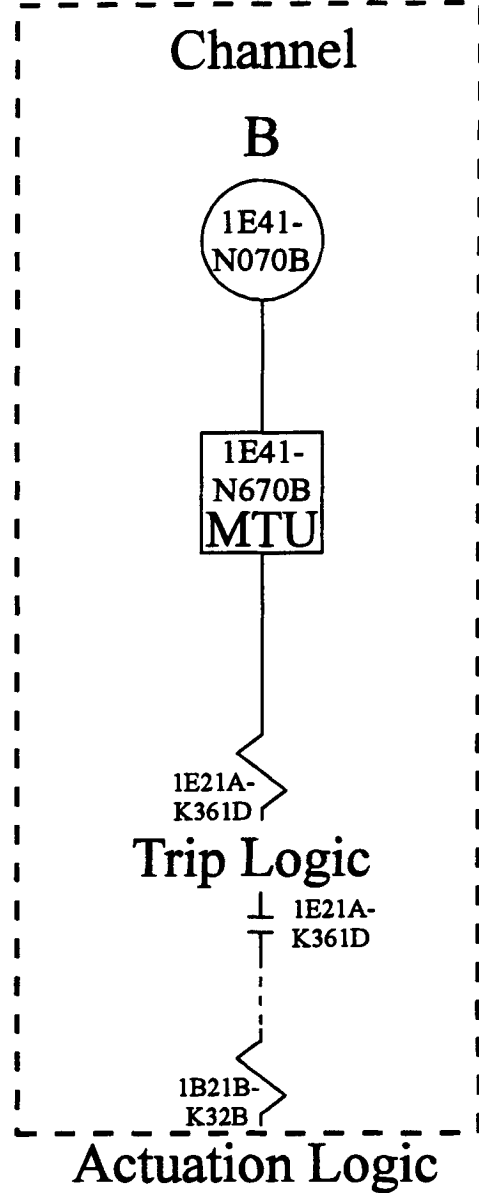
LFD-1-PCIS-19
TS 3.3.6.1-1, Items 3.h and 3.g
HPCI System Isolation -
Suppression Pool Area
Differential Temperature - High, and
Suppression Pool Area Temperature
- Time Delay Relays
Rev. 0 1/13/95

Trip System "A"



Initiation of closure of HPCI inboard Group 3 valves

Trip System "B"



Initiation of closure of HPCI outboard Group 3 valve and valve 1E41-F041

Minimum Channel Requirements for System Isolation Capability:

In order to maintain the capability to isolate the HPCI steam supply and torus suction lines on high emergency area cooler temperature, at least one channel is required to be operable or maintained in the tripped condition.

Elem. Ref.

H-17157 H-17748
H-17160 H-19829
H-17163 H-19832
H-17746

Prepared By: *John D. Payne*

Reviewed By: *Stephen W. Reed*

LFD-1-PCIS-20

TS 3.3.6.1-1, Item 3.1
HPCI System Isolation-

Emergency Area Cooler
Temperature - High

Rev. 0

1/13/95

Trip System "A"

Channel

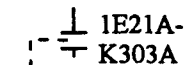
A



1E21A-K303A

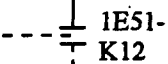
Trip Logic

Contacts Close on High Flow (Typical of 2)



Actuation Logic

Contacts Close to Cause Actuation (Typical of 2)



Initiation of closure of RCIC outboard Group 4 valve 1E51-F008

Trip System "B"

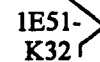
Channel

B

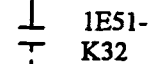


1E21A-K303B

Trip Logic



Actuation Logic



Initiation of closure of RCIC inboard Group 4 valve 1E51-F007

Minimum Channel Requirements for System Isolation Capability:

In order to maintain the capability to isolate the RCIC steam supply line on high flow, at least one channel is required to be operable or maintained in the tripped condition.

Elem. Ref.

H-19821 H-17149
H-19824 H-17151
H-17148

LFD-1-PCIS-21

TS 3.3.6.1-1, Item 4.a
RCIC System Isolation -
RCIC Steam Line Flow -
High

Prepared By: *Stephanie M...*

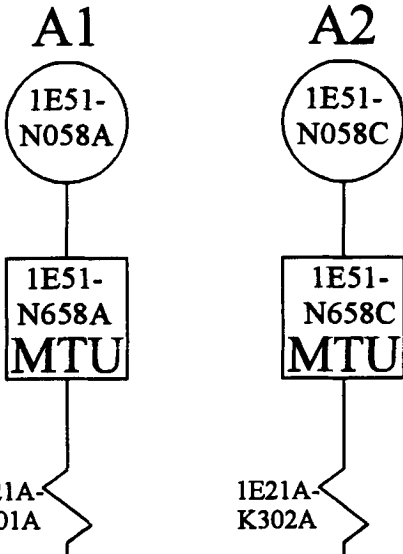
Reviewed By: *[Signature]*

Rev. 0

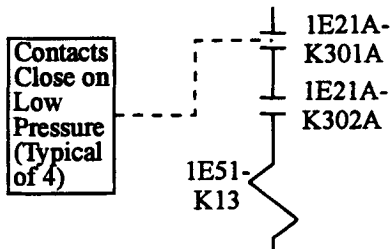
11/10/94

Trip System "A"

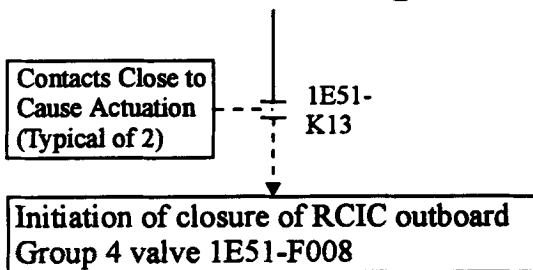
Channels



Trip Logic

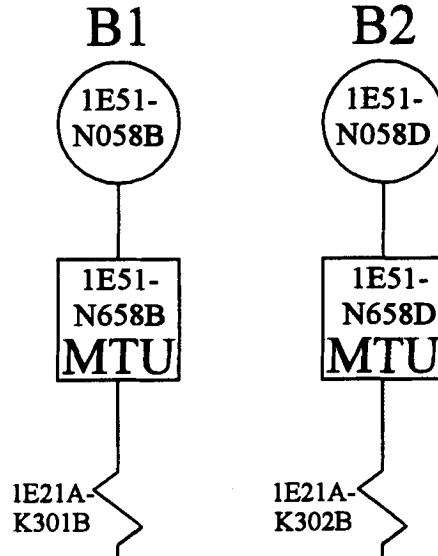


Actuation Logic

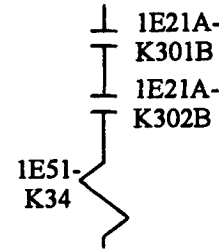


Trip System "B"

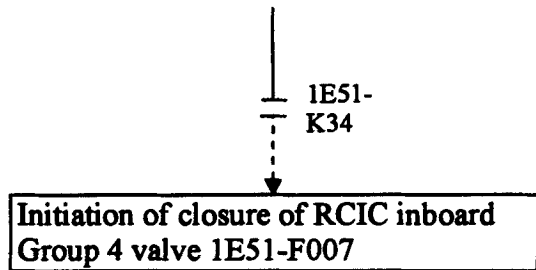
Channels



Trip Logic



Actuation Logic



Minimum Channel Requirements for System Isolation Capability:

In order to maintain the capability to isolate the RCIC steam supply line on RCIC steam supply line low pressure, channels in one of the following combinations must be either operable or maintained in the tripped condition.

A1 and A2
OR
B1 and B2

Elem. Ref.

H-19821 H-17149
H-19824 H-17151
H-17148

LFD-1-PCIS-22

TS 3.3.6.1-1, Item 4.b
RCIC System Isolation
RCIC Steam Supply Line
Pressure - Low

Prepared By: *Steve W. [Signature]*

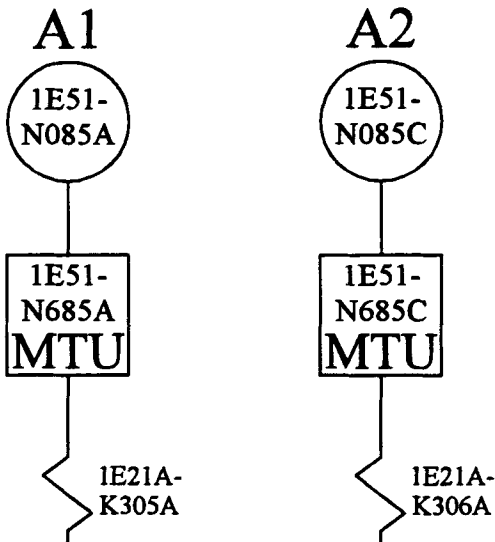
Reviewed: *[Signature]*

Rev. 0

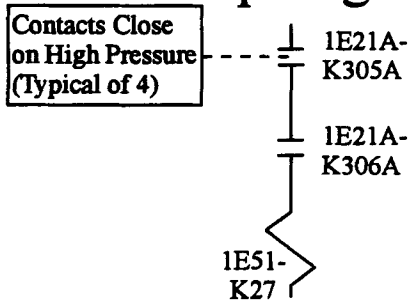
1/13/95

Trip System "A"

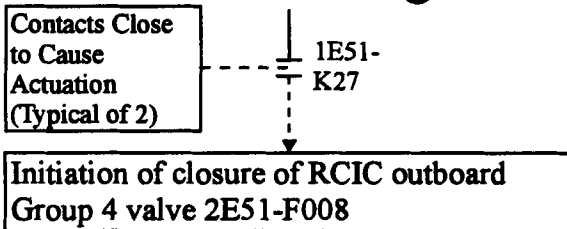
Channels



Trip Logic

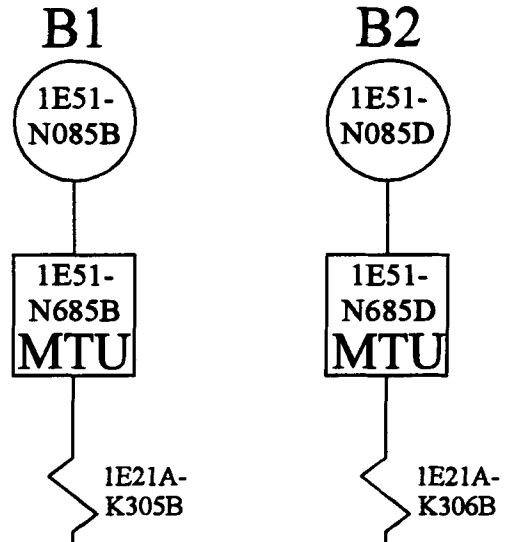


Actuation Logic

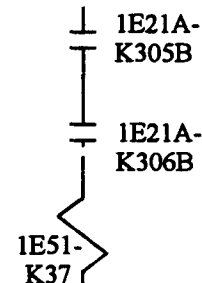


Trip System "B"

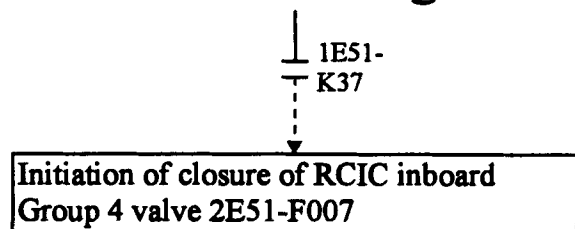
Channels



Trip Logic



Actuation Logic



Minimum Channel Requirements for System Isolation Capability:

In order to maintain the capability to isolate the RCIC steam supply line on high RCIC turbine exhaust pressure, channels in one of the following combinations must be either operable or maintained in the tripped condition.

A1 and A2
OR
B1 and B2

Elem. Ref.

H-19821 H-17149
H-19824 H-17151
H-17148

LFD-1-PCIS-23

TS 3.3.6.1-1, Item 4.c
RCIC System Isolation
RCIC Turbine Exhaust
Diaphragm Pressure -
High

Prepared By: *Stacy L. Healy*
Reviewed: *J. J. [Signature]*

Rev. 0

1/13/95

Trip System "A"

Trip System "B"

Channels

Channels

Drywell Pressure

RCIC Steam Line Pressure

Drywell Pressure

RCIC Steam Line Pressure

A1

A2

A3

B1

B2

B3

1E11-N094A

1E51-N058A

1E51-N058C

1E11-N094B

1E51-N058B

1E51-N058D

1E11-N694A
MTU

1E51-N658A
MTU

1E51-N658C
MTU

1E11-N694B
MTU

1E51-N658B
MTU

1E51-N658D
MTU

1E21-K5A

1E21A-K301A

1E21A-K302A

1E21-K5B

1E21A-K301B

1E21A-K302B

Trip Logic

Trip Logic

Trip Logic

Trip Logic

Contacts Close on High Pressure (Typical of 2)

Contacts Close on Low Pressure (Typical of 6)

1E51-K13

1E21A-K5A

1E51-K47

1E21A-K301A

1E21A-K302A

1E51-K13

1E51-K34

1E21A-K5B

1E51-K48

1E21A-K301B

1E21A-K302B

1E51-K34

1E51-K34

Actuation Logic

Actuation Logic

Contacts Close on High Drywell Pressure in Conjunction With Low Steam Line Pressure (Typical of 2)

1E51-K47

Initiation of closure of RCIC inboard Group 9 valve 1E51-F104

1E51-K48

Initiation of closure of RCIC outboard Group 9 valve 1E51-F105

Minimum Channel Requirements for System Isolation Capability:

In order to maintain the capability to isolate the RCIC exhaust vacuum breaker line on high drywell pressure, channels in one of the following combinations must be either operable or maintained in the tripped condition.

Elem. Ref.

H-17109 H-19821
H-17148 H-19824
H-17149 H-19827
H-17150 H-19830

A1 and A2 and A3
OR
B1 and B2 and B3

LFD-1-PCIS-24

TS 3.3.6.1-1, Item 4.d
RCIC System Isolation
Drywell Pressure - High

Prepared By: *Steph. W. Reed*

Reviewed By: *[Signature]*

Rev. 0

1/13/95

Trip System "A"

Channel A

1E51-N066A

1E51-N666A
MTU

1E21A-K367C

Trip Logic

Contacts Close on High Temperature (Typical of 2)

1E21A-K367C

1E51-M602A
TIMER

1B21B-K31A

Actuation Logic

Contacts Close on High Temperature (Typical of 2)

1B21B-K31A

Initiation of closure of RCIC outboard Group 4 valve 1E51-F008.

Trip System "B"

Channel B

1E51-N066B

1E51-N666B
MTU

1E21A-K367D

Trip Logic

1E21A-K367D

1E51-M602B
TIMER

1B21B-K31B

Actuation Logic

1B21B-K31B

Initiation of closure of RCIC inboard Group 4 valve 1E51-F007.

Minimum Channel Requirements for System Isolation Capability:

In order to maintain the capability to isolate the RCIC steam supply line on high suppression pool ambient area temperature, at least one channel including its associated timer is required to be operable or maintained in the tripped condition.

Elem. Ref.

H-17148 H-17748
H-17149 H-19829
H-17151 H-19832

LFD-1-PCIS-25

TS 3.3.6.1-1, Items 4.e and f
RCIC System Isolation
RCIC Suppression Pool
Ambient Area Temperature -
High and Suppression Pool
Area Temperature-Time Delay
Relays

Prepared By: *Stephan W. Neuh...*

Reviewed By: *J. H. ...*

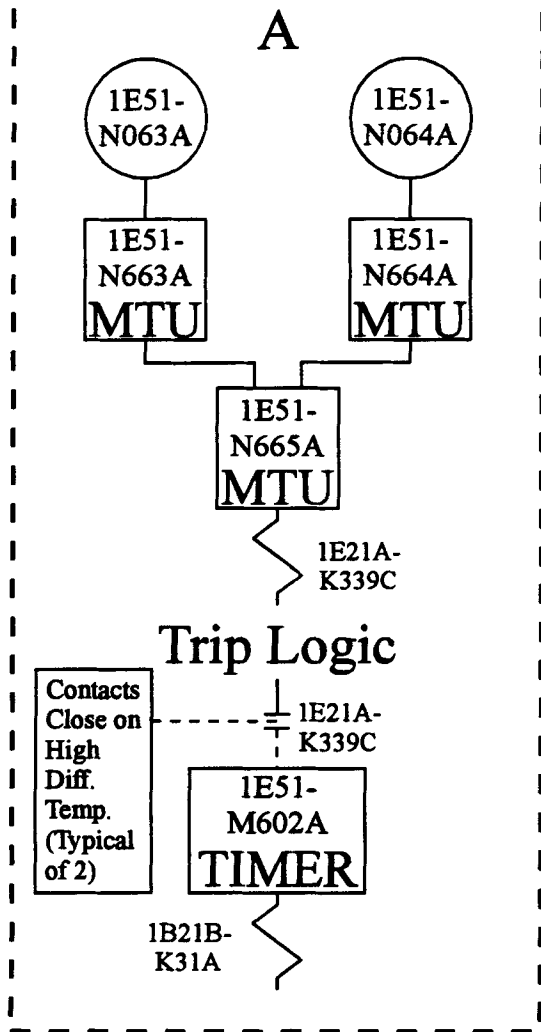
Rev. 0

1/13/95

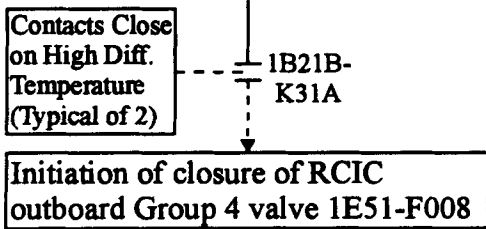
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		LFD-1-PCIS-26	
		N/A	
Prepared By:	N/A	Rev. 0	12/19/94
Reviewed By:	N/A		

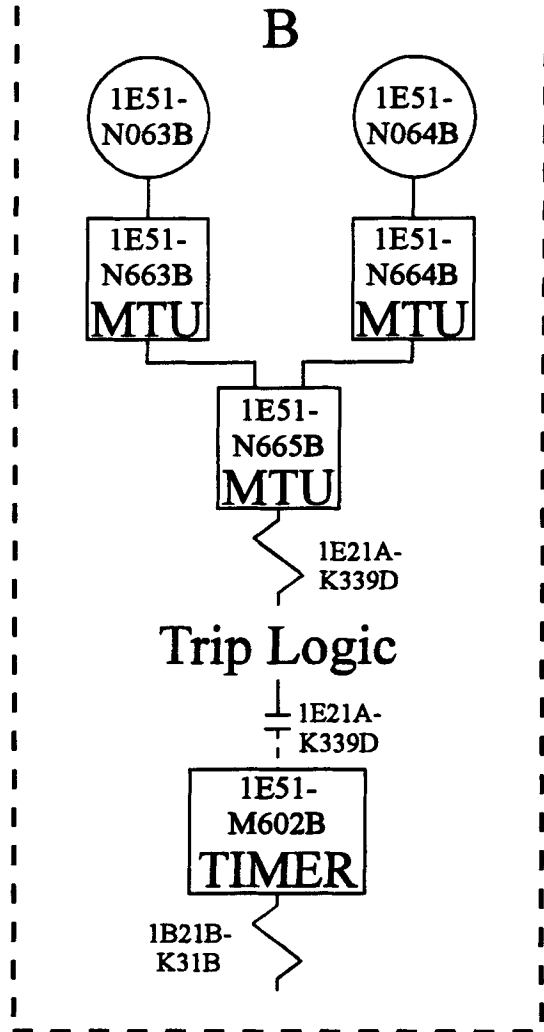
Trip System "A" Channel



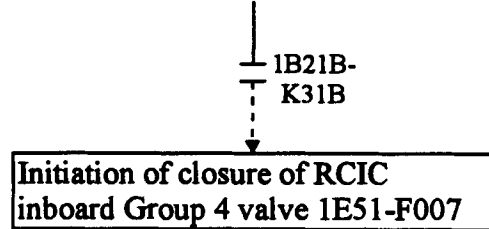
Actuation Logic



Trip System "B" Channel



Actuation Logic



Minimum Channel Requirements for System Isolation Capability:

In order to maintain the capability to isolate the RCIC steam supply line on high suppression pool area differential temperature, at least one channel including its associated timer is required to be operable or maintained in the tripped condition.

Elem. Ref.

H-17148 H-17748
H-17149 H-19828
H-17151 H-19831

LFD-1-PCIS-27

TS 3.3.6.1-1, Items 4.f and g
RCIC System Isolation
Suppression Pool Area
Temperature Time Delay
Relays and RCIC
Suppression Pool Area
Differential Temp. - High

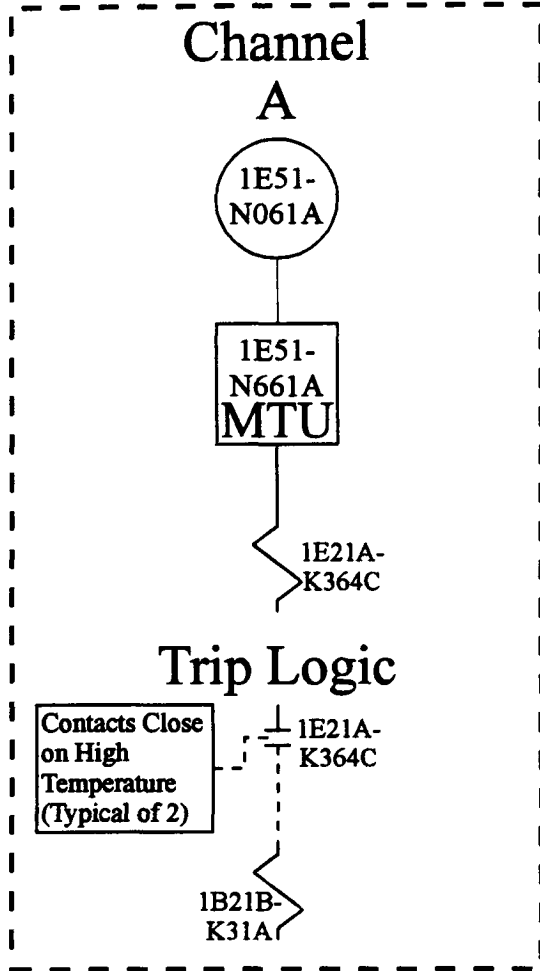
Prepared By: *Stanley W. Neal*

Reviewed By: *[Signature]*

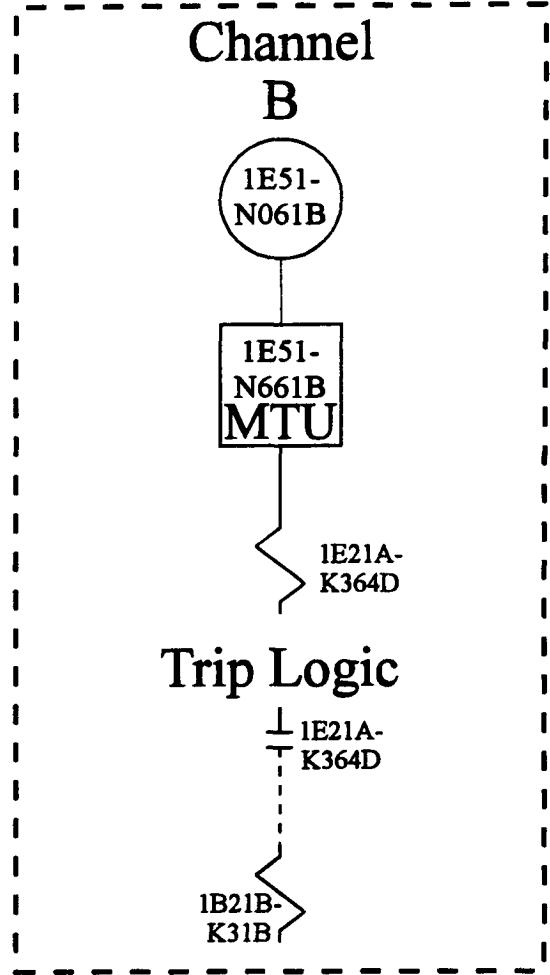
Rev. 0

1/13/95

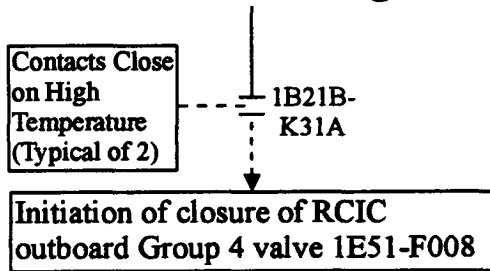
Trip System "A"



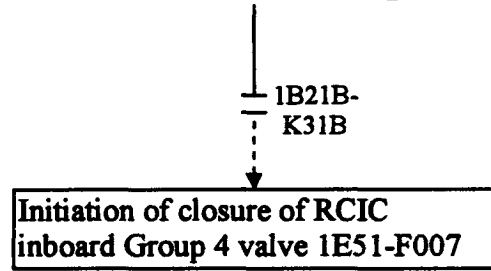
Trip System "B"



Actuation Logic



Actuation Logic



Minimum Channel Requirements for System Isolation Capability:

In order to maintain the capability to isolate the RCIC steam supply line on high emergency area equipment cooler temperature, at least one channel is required to be operable or maintained in the tripped condition.

Elem. Ref.

H-17148 H-17748
H-17149 H-19829
H-17151 H-19832

LFD-1-PCIS-28

TS 3.3.6.1-1, Item 4.h
RCIC System Isolation
Emergency Area Cooler
Temperature - High

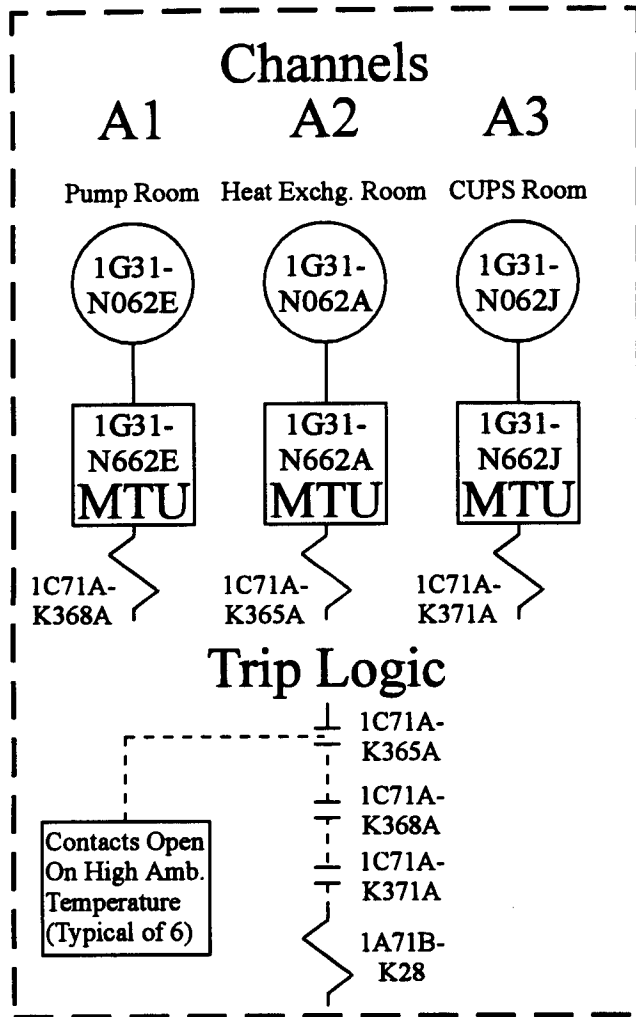
Prepared By: *Steph...*

Reviewed: *[Signature]*

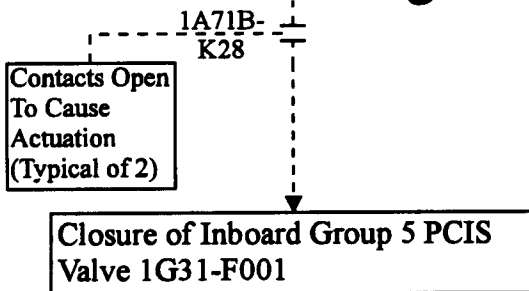
Rev. 0

1/13/95

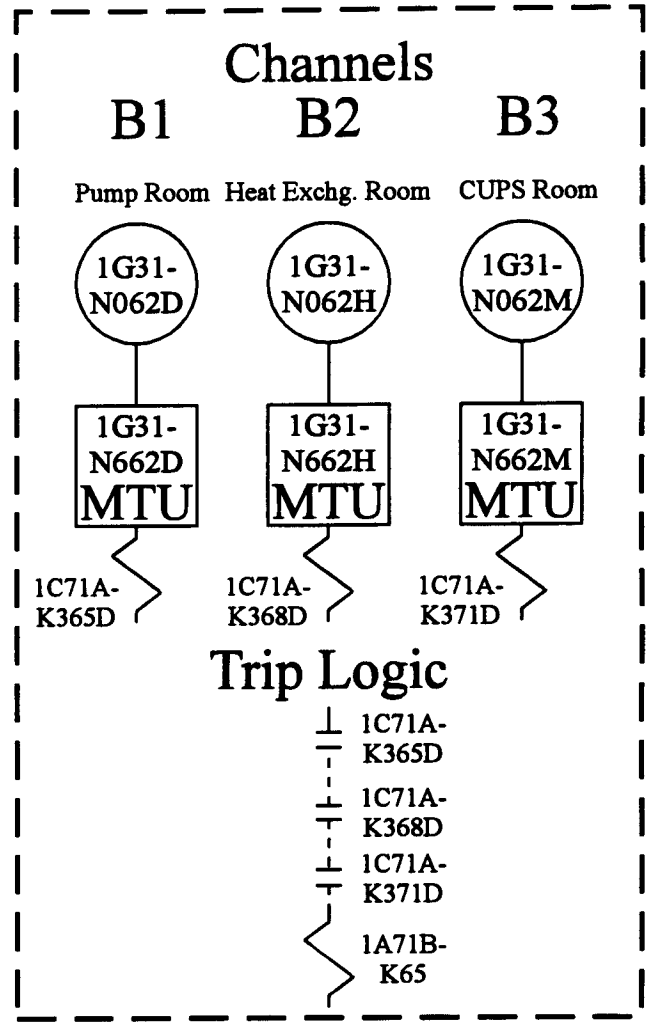
Trip System "A"



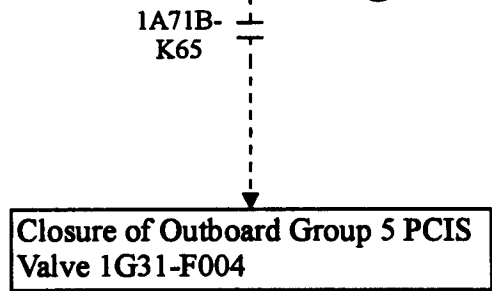
Actuation Logic



Trip System "B"



Actuation Logic



Minimum Channel Requirements for System Isolation Capability:

In order to maintain the capability to isolate the RWCU system on high area temperature, channels in one of the following combinations must be either operable or maintained in the tripped condition.

A1 or B1
AND
A2 or B2
AND
A3 or B3

Elem. Ref.
H-16231
H-17817
H-17818
H-19811
H-19820

LFD-1-PCIS-29
TS 3.3.6.1-1, Item 5.a
RWCU System Isolation
Area Temperature - High

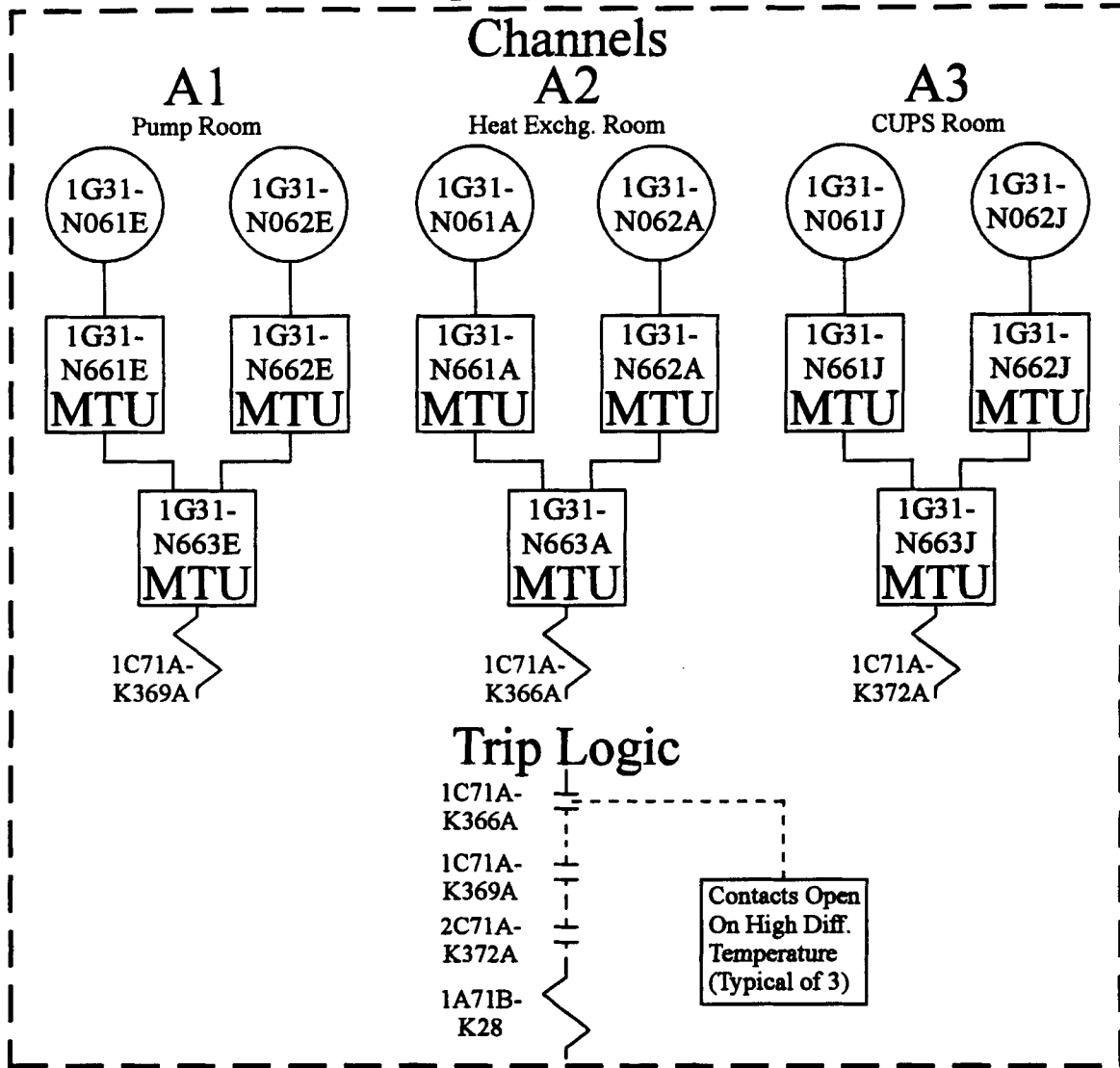
Prepared By: *Steph W. Reed*

Reviewed: *[Signature]*

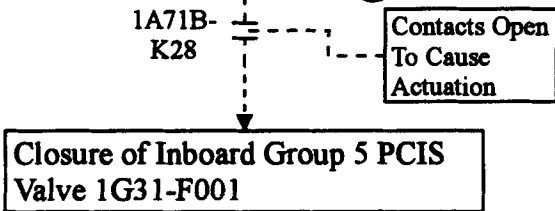
Rev. 0

1/13/95

Trip System "A"



Actuation Logic



Minimum Channel Requirements for System Isolation Capability:

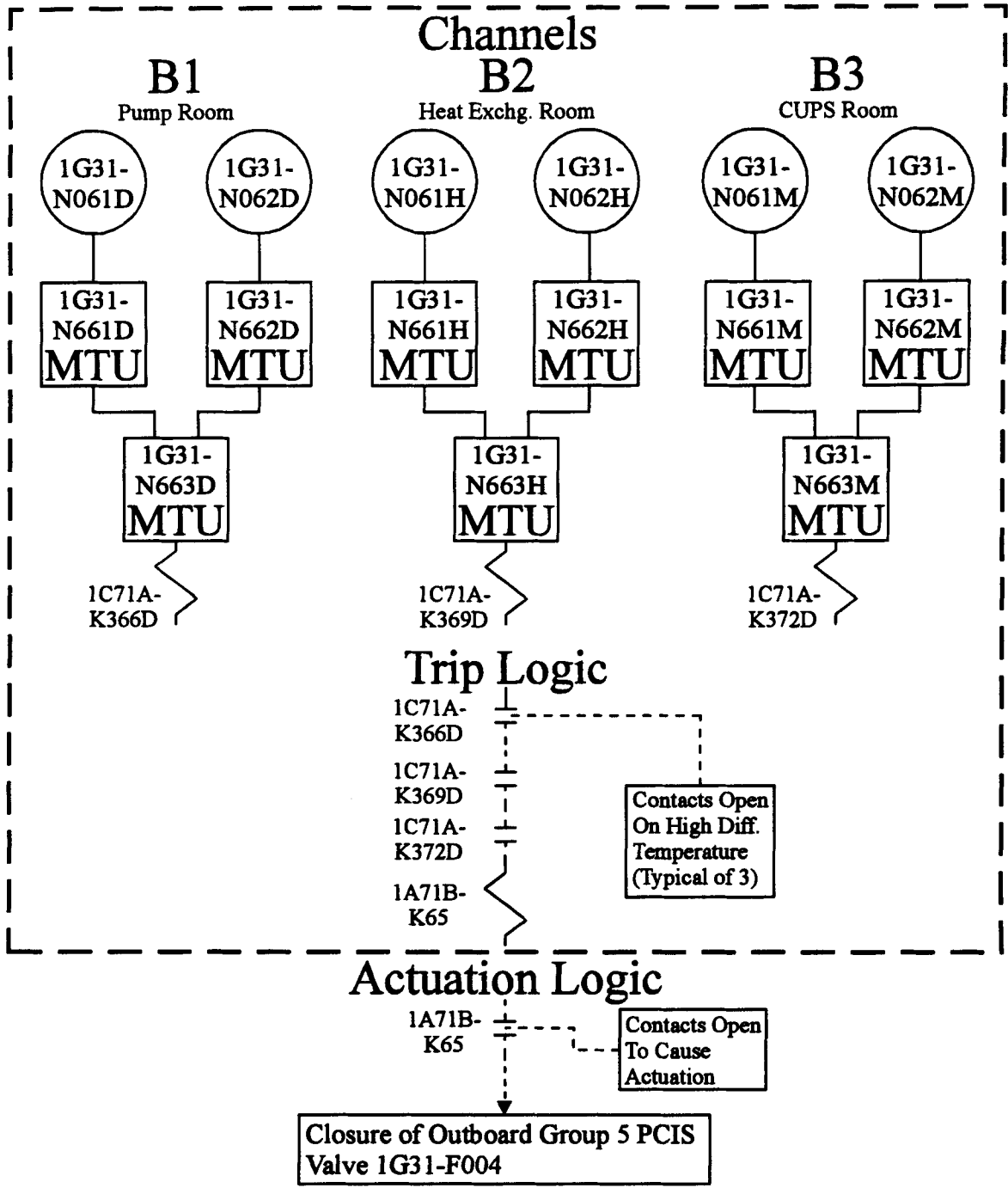
See Sheet 2 of 2 for statement of minimum channel requirements.

Elem. Ref.
H-16231
H-17817
H-17818
H-19811
H-19820

LFD-1-PCIS-30
Sheet 1 of 2
TS 3.3.6.1-1 Item 5.b
RWCU System Isolation
Area Ventilation Diff.
Temperature - High
Rev. 0
1/13/95

Prepared By: *Steph...*
 Review: *[Signature]*

Trip System "B"



Minimum Channel Requirements for System Isolation Capability:

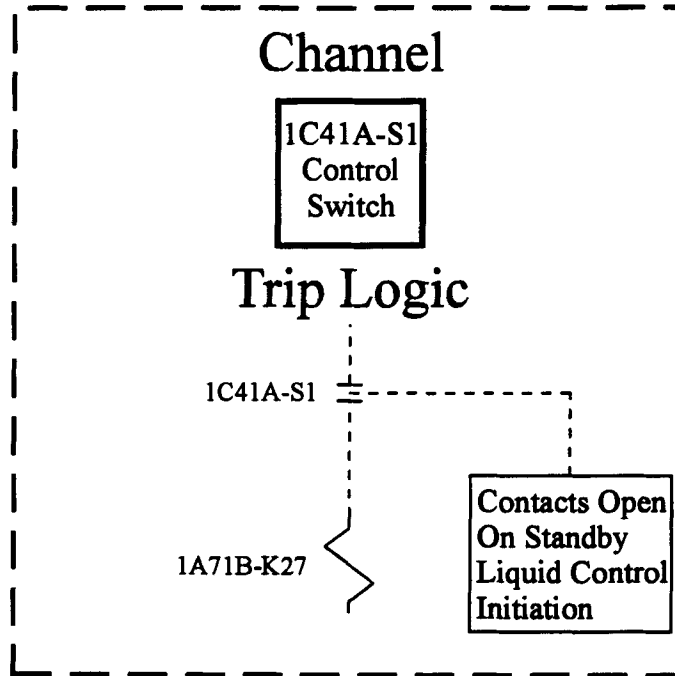
In order to maintain Group 5 PCIS isolation capability on high ventilation differential temperature, channels in one of the following combinations must be either operable or maintained in the tripped condition.

Elem. Ref.
H-16231
H-17817
H-17818
H-19811
H-19820

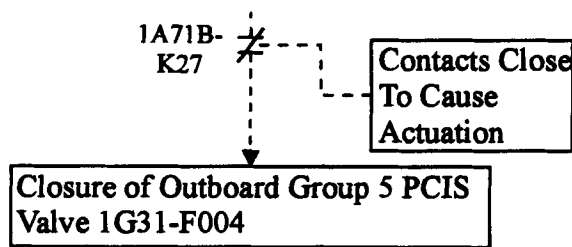
A1 or B1
AND
A2 or B2
AND
A3 or B3

LFD-1-PCIS-30
Sheet 2 of 2
TS 3.3.6.1-1 Item 5.b
RWCU System Isolation
Area Ventilation Diff.
Temperature - High
Rev. 0 1/13/95

Trip System



Actuation Logic



Minimum Channel Requirements for System Isolation Capability

In order to maintain the capability to isolate the RWCU system on Standby Liquid Control System initiation, this channel must be operable or maintained in the tripped condition.

Elem. Ref.
H-17120
H-17817
H-17818

LFD-1-PCIS-31

TS 3.3.6.1-1, Item 5.c
RWCU System Isolation
SLC System Initiation

Prepared By: *Stephen W. [Signature]*

Revised: *[Signature]*

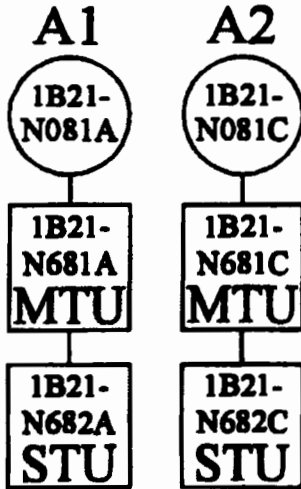
Rev. 0

1/13/95

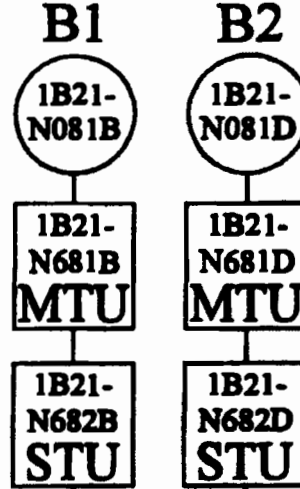
Trip System "A"

Trip System "B"

Channels



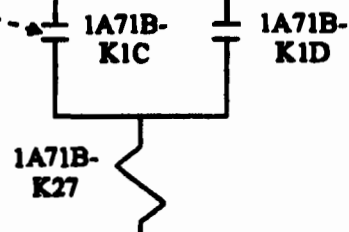
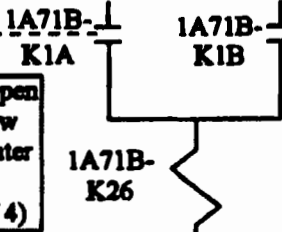
Channels



Trip Logic

Trip Logic

Contacts Open on Low Low Reactor Water Level (Typical of 4)



Actuation Logic

Actuation Logic

Contacts Close To Cause Actuation (Typical of 2)

Closure of Inboard Group 5 PCIS Valve 1G31-F001

Closure of Outboard Group 5 PCIS Valve 1G31-F004

Minimum Channel Requirements for System Isolation Capability:

In order to maintain the capability to isolate the RWCU system on low low reactor water level, channels in one of the following combinations must be either operable or maintained in the tripped condition.

A1 and B1
OR
A2 and B2

Elem. Ref.

H-17810 H-19809
H-17811 H-19812
H-17817 H-19815
H-17818 H-19818

Prepared By: *Steve W. Reed*
Reviewed: *[Signature]*

LFD-1-PCIS-32

TS 3.3.6.1-1, Item 5.d
TS 3.3.5.2-1, Item 2.a
RWCU System Isolation
Reactor Vessel Water
Level - Low Low,
Level 2
TRM Revision 132

Trip System "A"

Channel A

1B31-N079A

1B31-N679A
MTU

1A71-K29A

Trip Logic

1A71-K29A

Contact Opens On
Reactor Steam Dome
Pressure - High
(Typical of 2)

1A71-K29

Actuation Logic

Contact Closes
to Effect Actuation
(Typical of 2)

1A71-K29

Automatic Closure of SDC
Isolation Valve 1E11-F009

Trip System "B"

Channel B

1B31-N079D

1B31-N679D
MTU

1A71-K30A

Trip Logic

1A71-K30A

1A71-K30

Actuation Logic

1A71-K30

Automatic Closure of SDC
Isolation Valve 1E11-F008

Minimum Channel Requirements for System Initiation Capability:

In order to maintain RHR Shutdown Cooling System isolation capability on a Reactor Steam Dome Pressure - High signal, either channel "A" or "B" is required to be operable or maintained in the tripped condition.

Note: This is not a PCIS function; however, it is an SDC isolation function. Therefore, automatic isolation capability of 1E11-F009 is required even though it is not a PCIS valve.

LFD-1-PCIS-33
TS 3.3.6.1-1, Item 6.a
RHR SDC System
Isolation, Reactor
Steam Dome
Pressure - High

Rev. 0 1/15/95

Elem. Ref.

H-17817 H-19809
H-17818 H-19818

Prepared By: *J.R. Bruner*

Reviewed By: *Royce Clark*

Trip System "A"

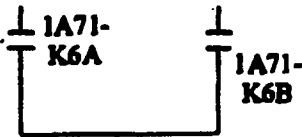
Channels

A1

B1



Trip Logic

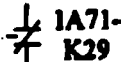


Contact Opens On Low Level - 3 Signal (Typical of 4)



Actuation Logic

Contact Closes to Effect Actuation (Typical of 2)



Automatic Closure of SDC Isolation Valve 1E11-F009

Trip System "B"

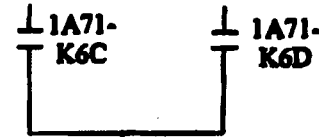
Channels

A2

B2



Trip Logic



Actuation Logic



Automatic Closure of SDC Isolation Valve 1E11-F008

Minimum Channel Requirements for System Initiation Capability:

In order to maintain RHR Shutdown Cooling System isolation capability on a Reactor Vessel Water Level - Low, Level 3 signal, channels in one of the following combinations must be either operable or maintained in the tripped condition.

A1 and B1
OR
A2 and B2

Note: This is not a PCIS function; however, it is an SDC isolation function. Therefore, automatic isolation capability of 1E11-F009 is required even though it is not a PCIS valve.

Prepared By: *[Signature]*

Reviewed By: *[Signature]*

Elem. Ref.

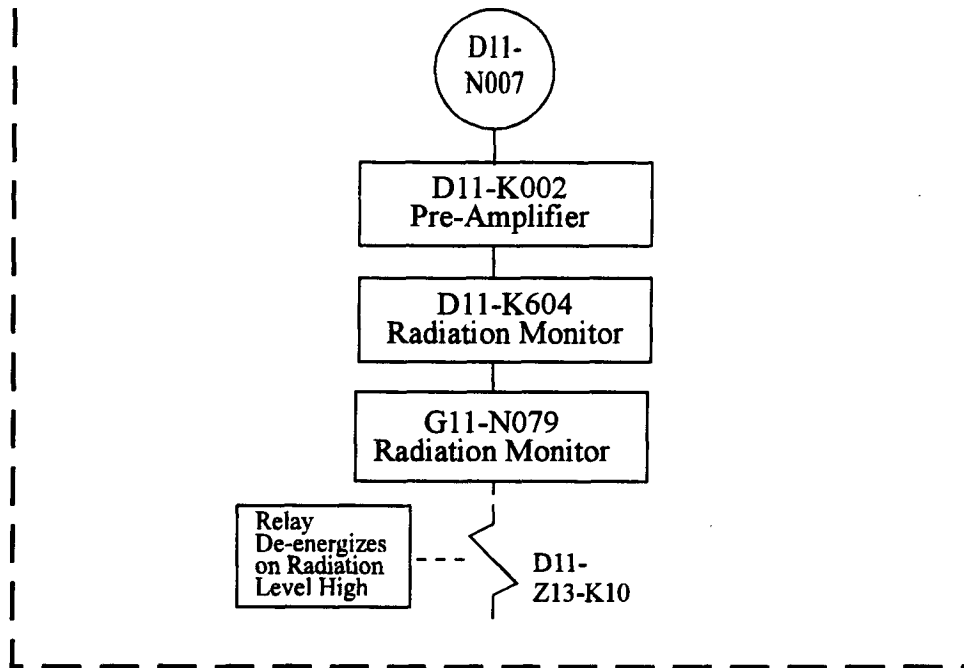
H-17789	H-17818
H-17790	H-19809
H-17810	H-19812
H-17811	H-19815
H-17817	H-19818

LFD-1-PCIS-34

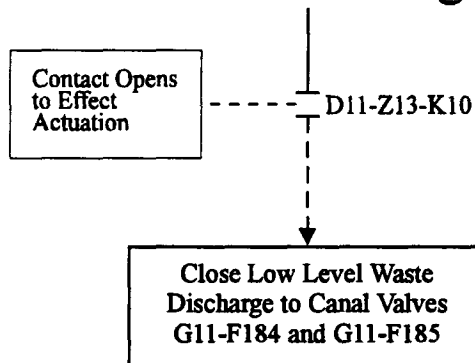
TS 3.3.6.1-1, Item 6.b
TS 3.3.5.2-1, Item 1.a
RHR SDC System Isolation, Reactor Vessel Water Level - Low, Level 3
TRM Revision 132

Trip System

Channel



Actuation Logic



Minimum Channel Requirements for System Initiation Capability:

In order to maintain automatic isolation capability of the liquid radwaste discharge line (to the river) on a Liquid Radwaste Effluent Line Radiation-High signal, this channel must be operable.

Elem. Ref.
H-19533
H-19560

Prepared By: RBR
Reviewed By: JOB

LFD-1-PRM-01	
ODCM 2-1, Item 1	
Liquid Radwaste Effluent Line Radiation High	
Rev. 0	11/16/94

Trip System

Channels

A

D11-
N020A

D11-K619A
Ratemeter

Relay Energizes
on Radiation
Level High
(Typical 2 Places)

D11-KN020A

B

D11-
N020B

D11-K619B
Ratemeter

D11-KN020B

Trip Logic

Contact Opens
to Effect
Actuation
(Typical 2 Places)

D11-KN020A

D11-KN020B

Deactivate Normal Range Reactor Building Vent Stack Radiation
Monitoring System. Initiate Reactor Building Vent Stack
Post-Accident Radiation Monitoring System.

Minimum Channel Requirements for System Initiation Capability:

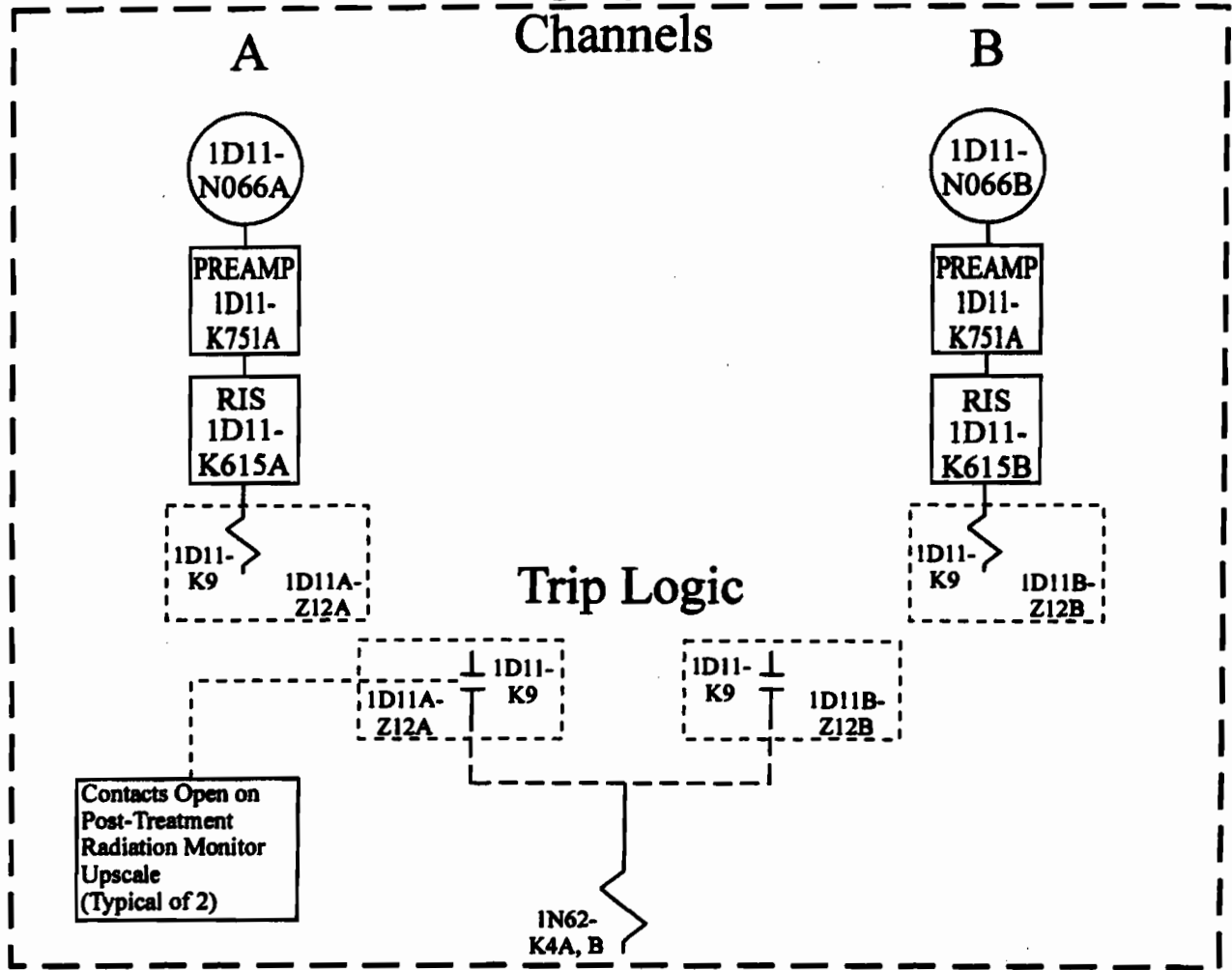
In order to maintain accident range monitoring automatic initiation capability due to a reactor building vent stack monitor high radiation signal, at least one channel must be operable.

Elem. Ref.
H-19559
H-19596
H-19661
H-19662

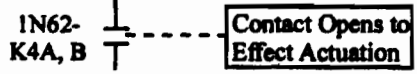
Prepared By: RBR
Reviewed By: JSB

LFD-1-PRM-02	
ODCM 3-1, Item 1.a Reactor Building Vent Stack Monitoring System Radiation High	
Rev. 0	11/16/94

Trip System Channels



Actuation Logic



Initiates Closure of Main Stack Isolation Valve 1N62-F527, Offgas Condenser and Separator Drain Valves 1N62-F030A and B, Prefilter Water Seal Drain Valves 1N62-F111A and B, and Holdup Line Drain Valve 1N62-F086

Minimum Channel Requirements for System Isolation Capability:

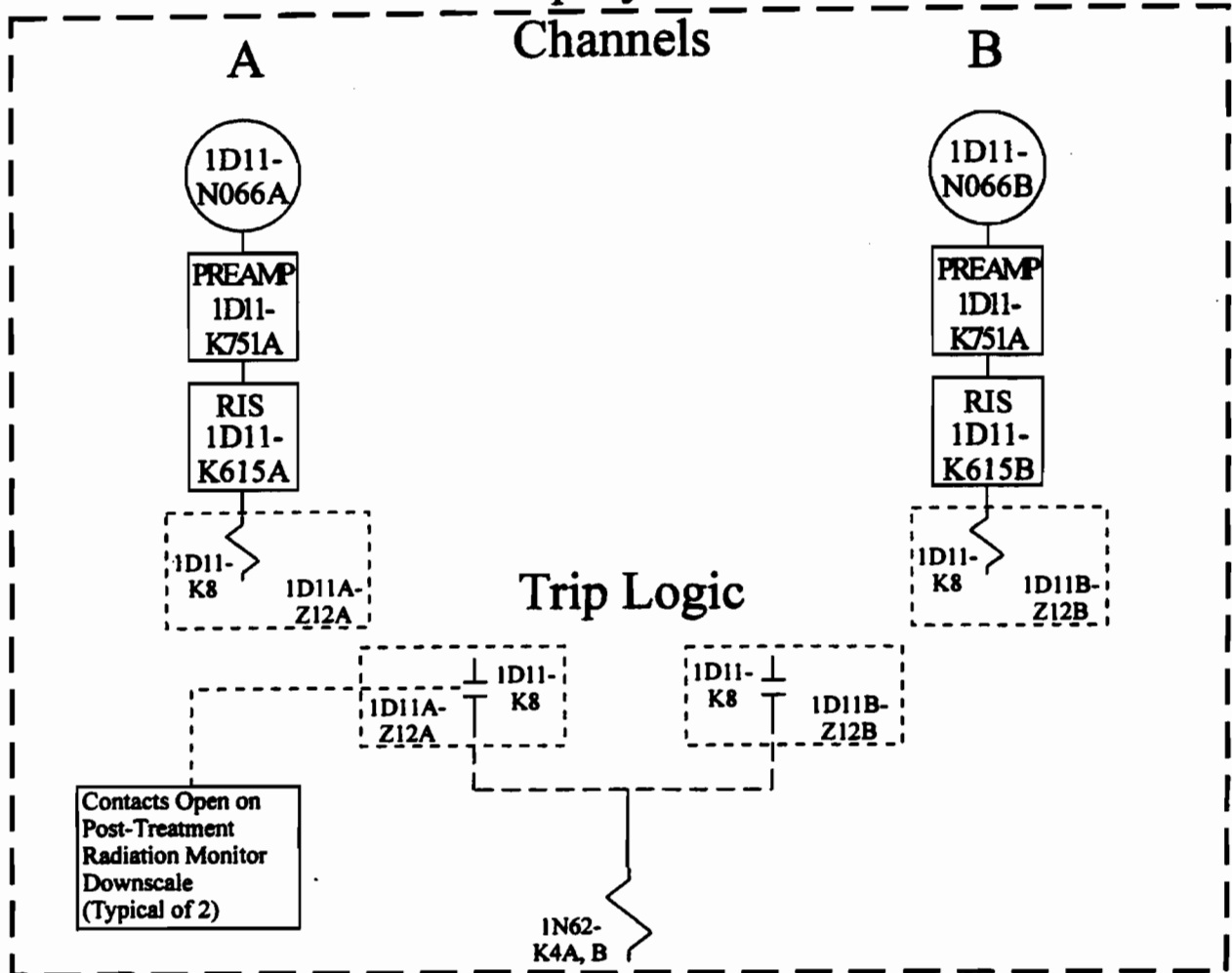
In order to maintain Offgas System isolation capability on a Post-Treatment Radiation Monitor upscale condition, each channel must be functional or maintained in the tripped condition.

Elem. Ref.	
H-17076	H-17133
H-17077	H-17134
H-17126	H-19558
H-17127	

Prepared By: *TRC*
 Reviewed By: *[Signature]*

LFD-1-PRM-03
 TRM T3.3.8-1, Item 1
 Offgas System Isolation
 Post-Treatment Radiation
 Monitor Upscale
 TRM REV. 60

Trip System Channels



Actuation Logic

1N62-K4A, B — Contact Opens to Effect Actuation

Initiates Closure of Main Stack Isolation Valve 1N62-F527, Offgas Condenser and Separator Drain Valves 1N62-F030A and B, Prefilter Water Seal Drain Valves 1N62-F111A and B, and Holdup Line Drain Valve 1N62-F086

Minimum Channel Requirements for System Isolation Capability:

In order to maintain Offgas System isolation capability on a Post-Treatment Radiation Monitor downscale condition, each channel must be functional or maintained in the tripped condition.

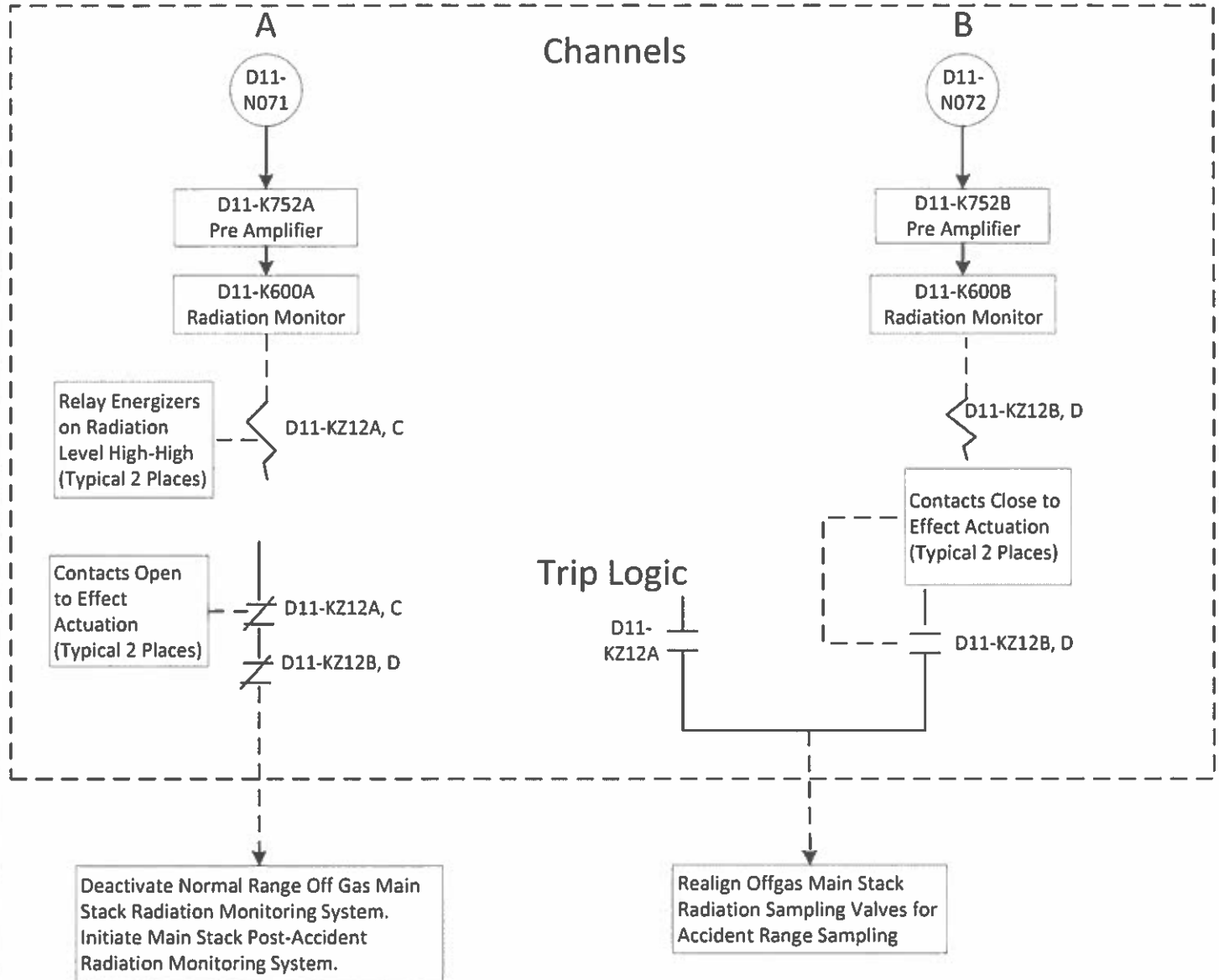
Elem. Ref.

H-17076 H-17133
 H-17077 H-17134
 H-17126 H-19558
 H-17127

Prepared By: *[Signature]*
 Reviewed By: *[Signature]*

LFD-1-PRM-04
 TRM T3.3.8-1, Item 2
 Offgas System Isolation
 Post-Treatment Radiation
 Monitor Downscale
 TRM REV. 60

Trip System



Minimum Channel Requirements for System Initiation Capability:

In order to maintain accident range monitoring automatic initiation capability due to a main stack monitor high-high radiation signal, at least one channel must be operable.

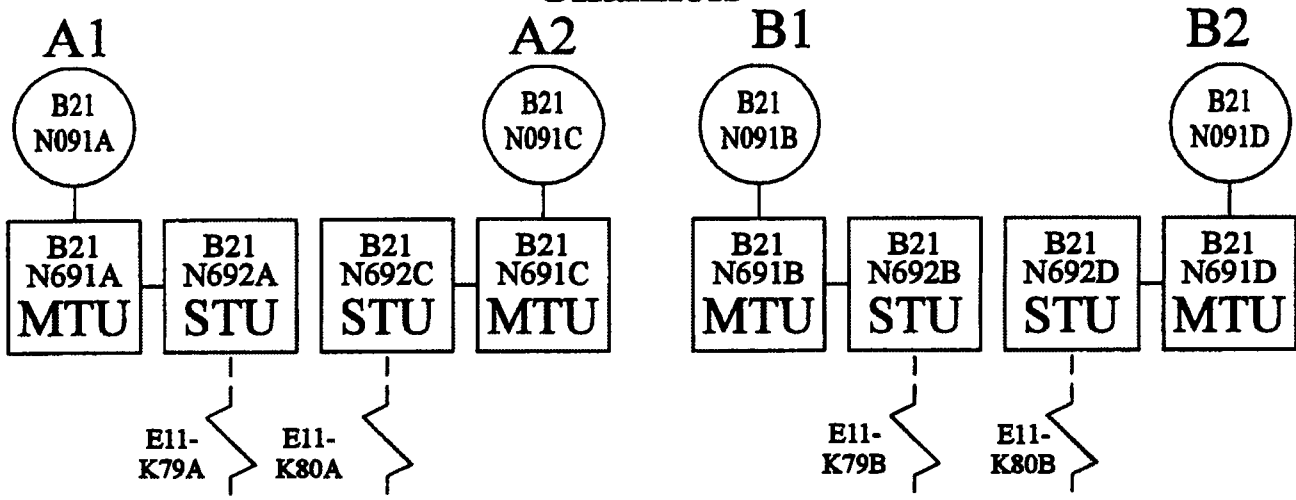
Elem. Ref.
H-19559
H-19596
H-19661

Prepared by: *Johnnie B. [Signature]*
Reviewed by: *Jimmy [Signature]*

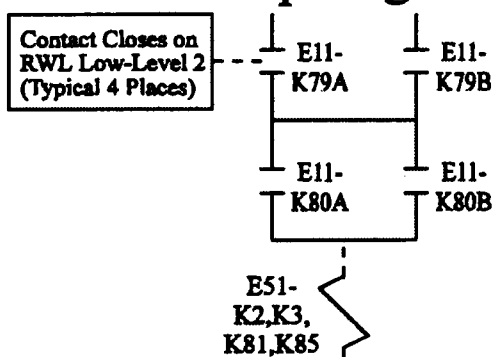
LFD-1-PRM-05
ODCM 3-1, Item 3.a Main Stack Monitoring System, Noble Gas Activity Monitor
Rev. 1 08/25/2016

Trip System

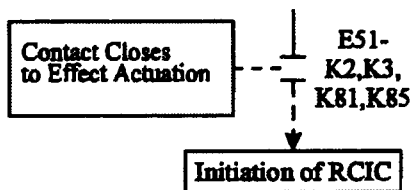
Channels



Trip Logic



Actuation Logic



Minimum Channel Requirements for System Initiation Capability:

In order to maintain RCIC initiation capability due to low reactor water level, channels in one of the following combinations must be either operable or maintained in the tripped condition.

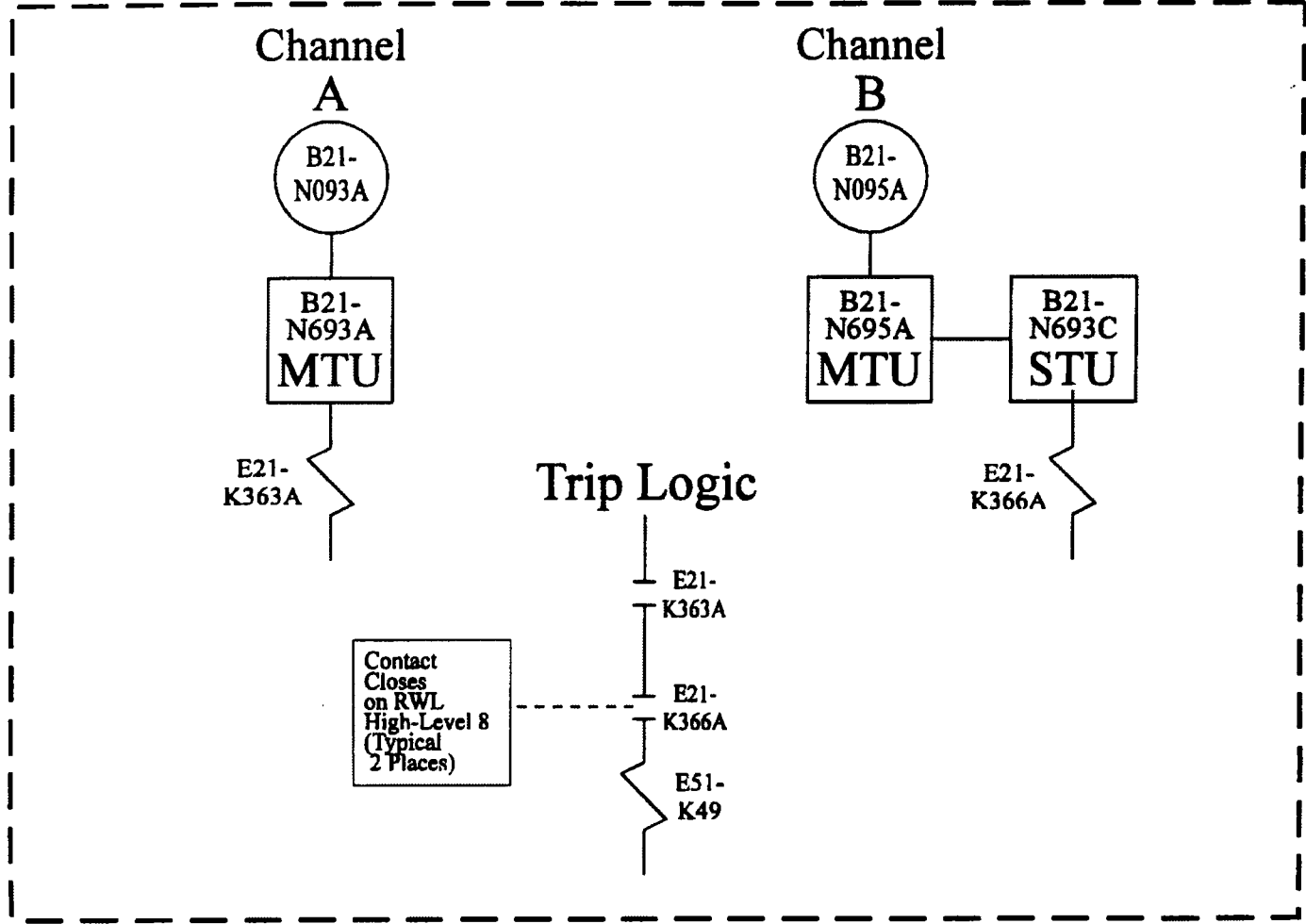
- A1 & A2
- A1 & B2
- B1 & A2
- B1 & B2

Elem. Ref.	
H-17148	H-19826
H-17763	H-19829
H-17766	H-19830
H-19823	

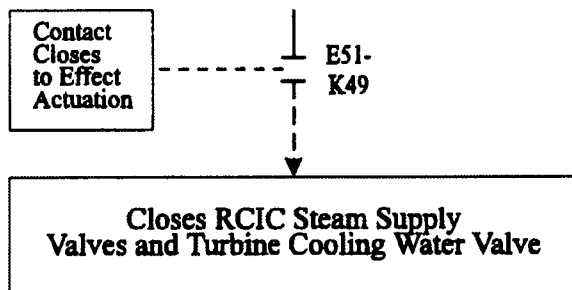
Prepared By: *S.P. Brown*
 Reviewed By: *Robyn Wilkins*

LFD-1-RCIC-01
TS 3.3.5.3-1, Item 1
RCIC system
Reactor Vessel
Water Level-
Low Low, Level 2
TRM Rev. 113

Trip System



Actuation Logic



Minimum Channel Requirements for System Trip Capability:

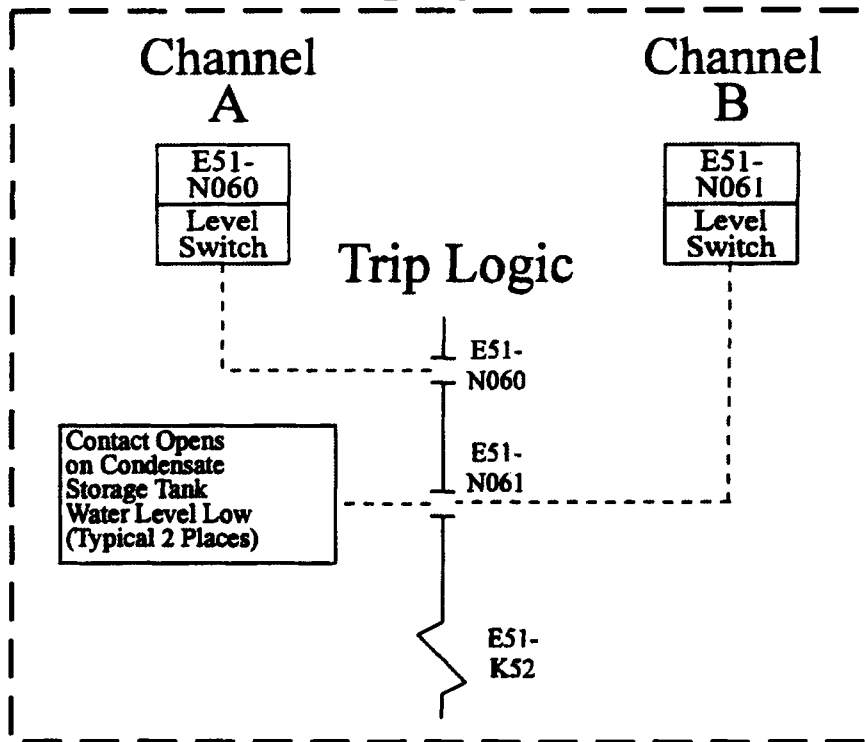
In order to ensure RCIC system trip capability on a RWL-HIGH- Level 8 signal, both channels must be operable.

Elem. Ref.
H-17148
H-17152
H-19823
H-44120

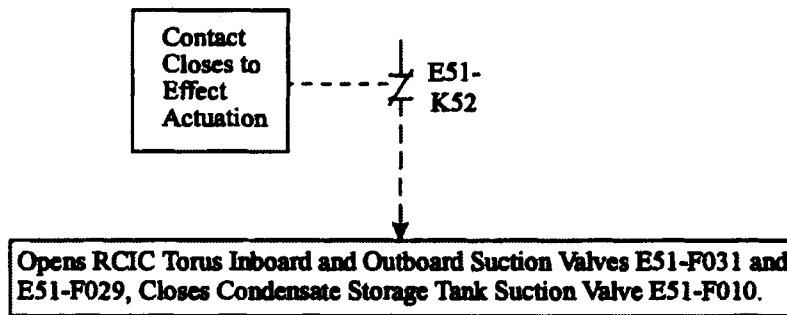
Prepared By: <i>RBR</i>
Reviewed By: <i>JSC</i>

LFD-1-RCIC-02
TS 3.3.5.3-1, Item 2
RCIC System
Reactor Vessel
Water Level - High, Level 8
Rev. 1 12/03/18

Trip System



Actuation Logic



Minimum Channel Requirements for System Initiation Capability:

In order to maintain the ability to automatically transfer the RCIC pump suction from the CST to the Suppression Pool on a CST low level signal, one of the two channels must be operable or maintained in the tripped condition.

Elem. Ref.

H-17148
H-17152

Prepared By: AGB

Reviewed By: JDB

LFD-1-RCIC-03

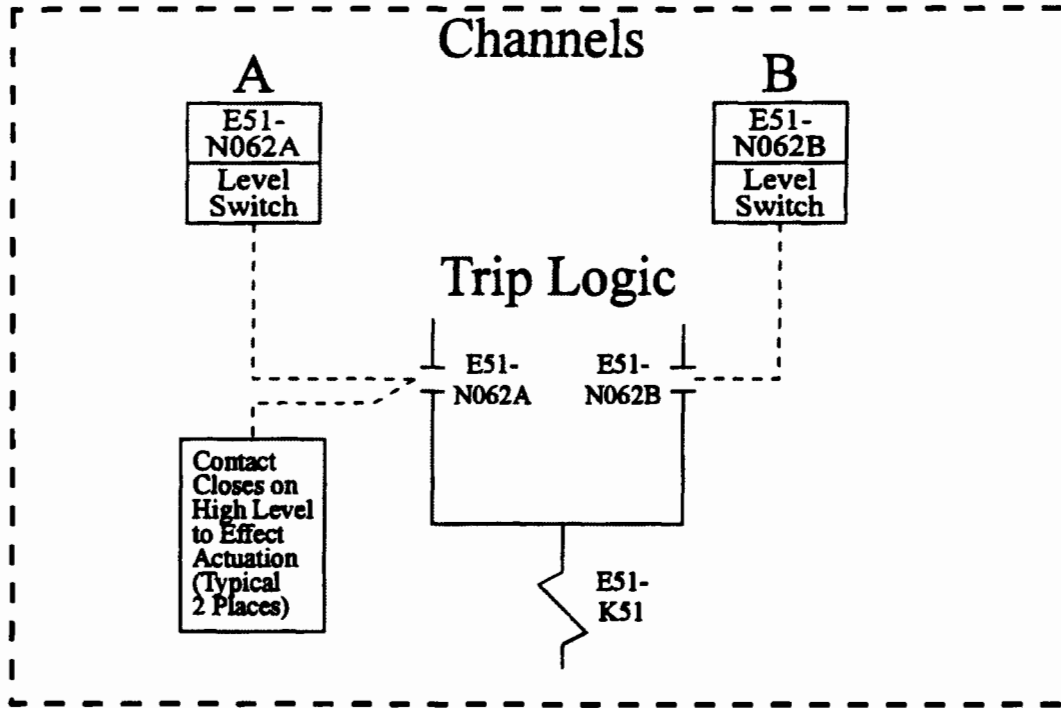
TS 3.3.5.3-1. Item 3
RCIC System
Condensate Storage
Tank Level-Low

Rev. 1

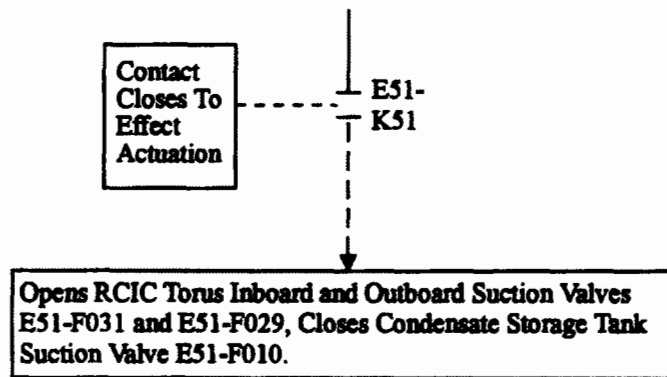
12/03/18

Trip System

Channels



Actuation Logic



Minimum Channel Requirements for System Initiation Capability:

In order to maintain the ability to automatically transfer the RCIC pump suction from the CST to the Suppression Pool on a high Suppression Pool water level signal, one of the two channels must be operable or maintained in the tripped condition.

Elem. Ref.

H-17148

H-17152

Prepared By: RSR

Reviewed By: JDB

LFD-1-RCIC-04

TS 3.3.5.3-1. Item 4

RCIC System

Suppression Pool

Water Level-High

Rev. 1

12/03/18

Trip System "A"

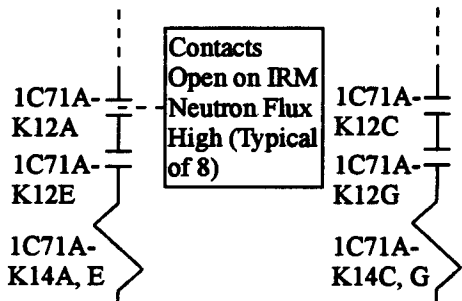
Trip System "B"

Channels

A1_A A1_B A2_A A2_B



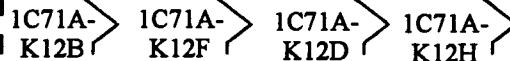
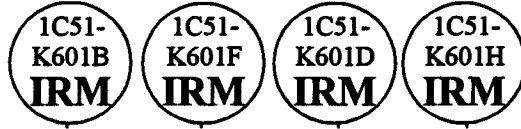
Trip Logic



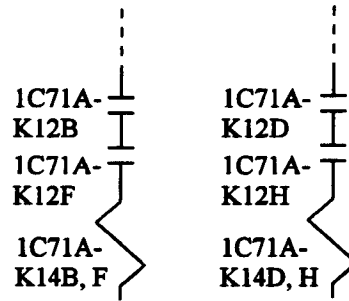
Contacts
Open on IRM
Neutron Flux
High (Typical
of 8)

Channels

B1_A B1_B B2_A B2_B

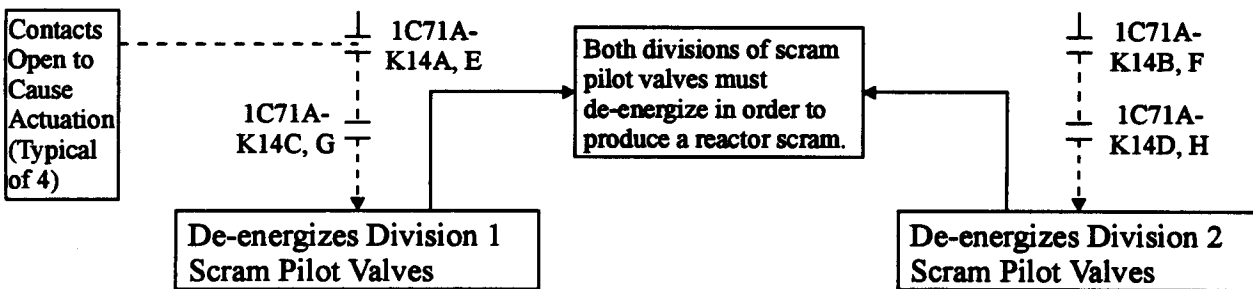


Trip Logic



Actuation Logic

Actuation Logic



Minimum Channel Requirements for System Initiation Capability:

In order to maintain the capability to scram the reactor on IRM neutron flux high, channels in one of the following combinations must be either operable or maintained in the tripped condition.

A1_A or A1_B or A2_A or A2_B

AND

B1_A or B1_B or B2_A or B2_B

Elem. Ref.

H-17789 H-17792
H-17790 H-17793
H-17791

Prepared By: *Royce Clark*

Reviewed By: *W. Byrnes*

LFD-1-RPS-01

TS 3.3.1.1-1, Item 1.a
Reactor Protection System
Instrumentation
IRM Neutron Flux - High

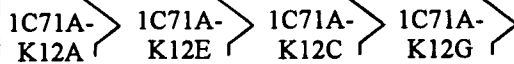
Rev. 0

1/16/95

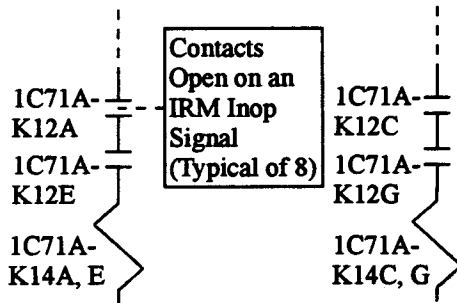
Trip System "A"

Trip System "B"

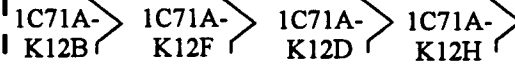
Channels



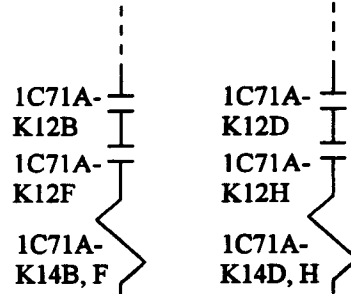
Trip Logic



Channels

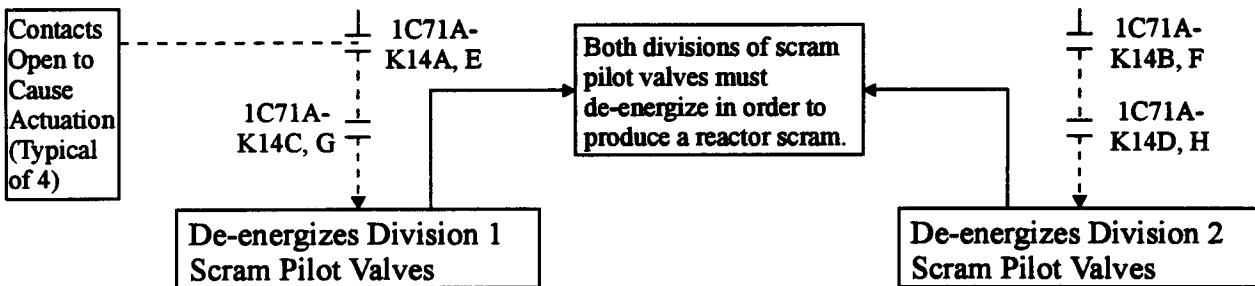


Trip Logic



Actuation Logic

Actuation Logic



Minimum Channel Requirements for System Initiation Capability:

In order to maintain the capability to scram the reactor on an IRM inop signal, channels in one of the following combinations must be either operable or maintained in the tripped condition.

A1A or A1B or A2A or A2B

AND

B1A or B1B or B2A or B2B

Elem. Ref.

H-17789 H-17792
H-17790 H-17793
H-17791

Prepared By: *Royce Clark*

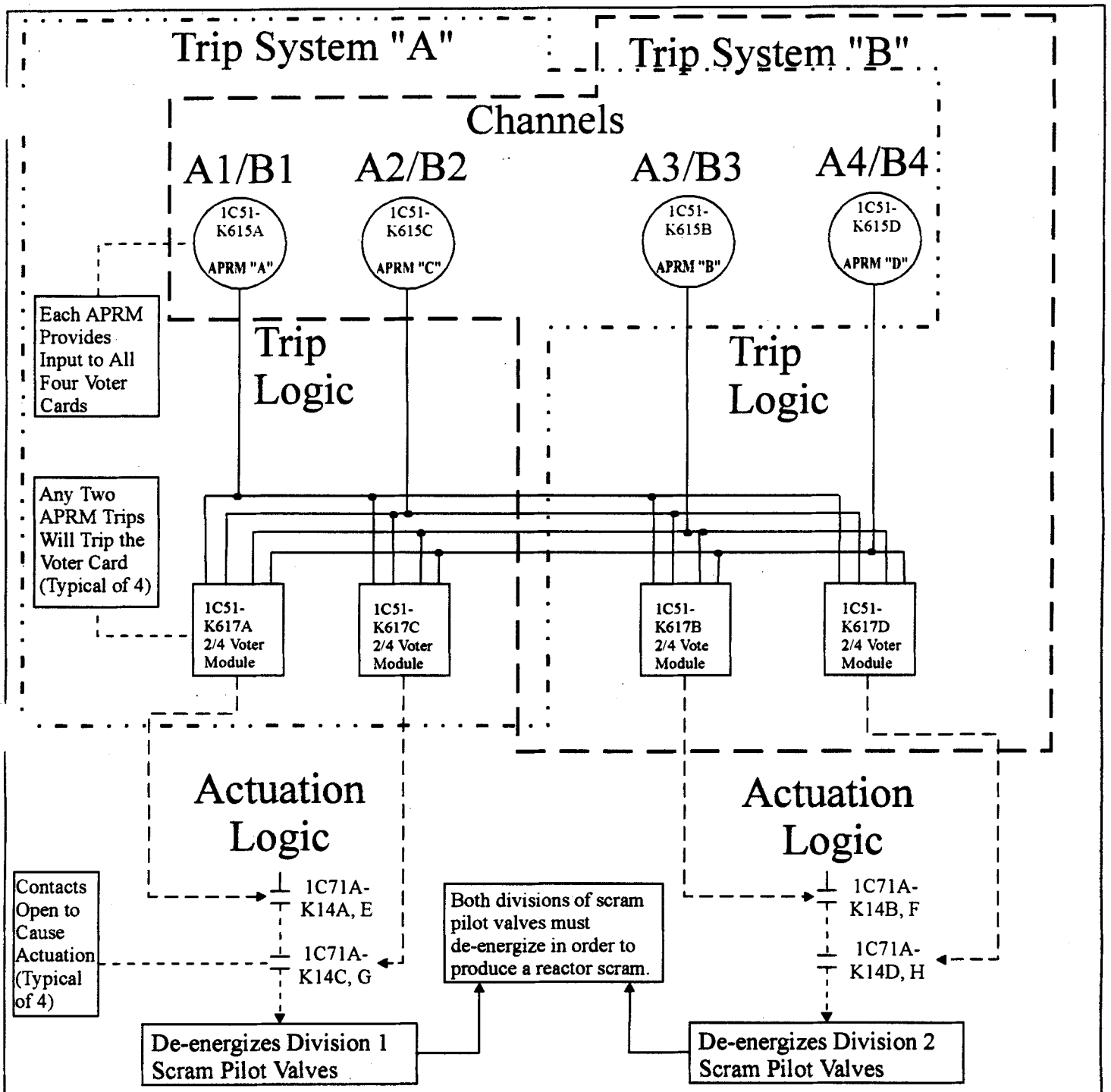
Reviewed By: *W. J. [Signature]*

LFD-1-RPS-02

TS 3.3.1.1-1, Item 1.b
Reactor Protection System
Instrumentation -
IRM Inop

Rev. 0

1/16/95



Minimum Channel Requirements for System Initiation Capability:

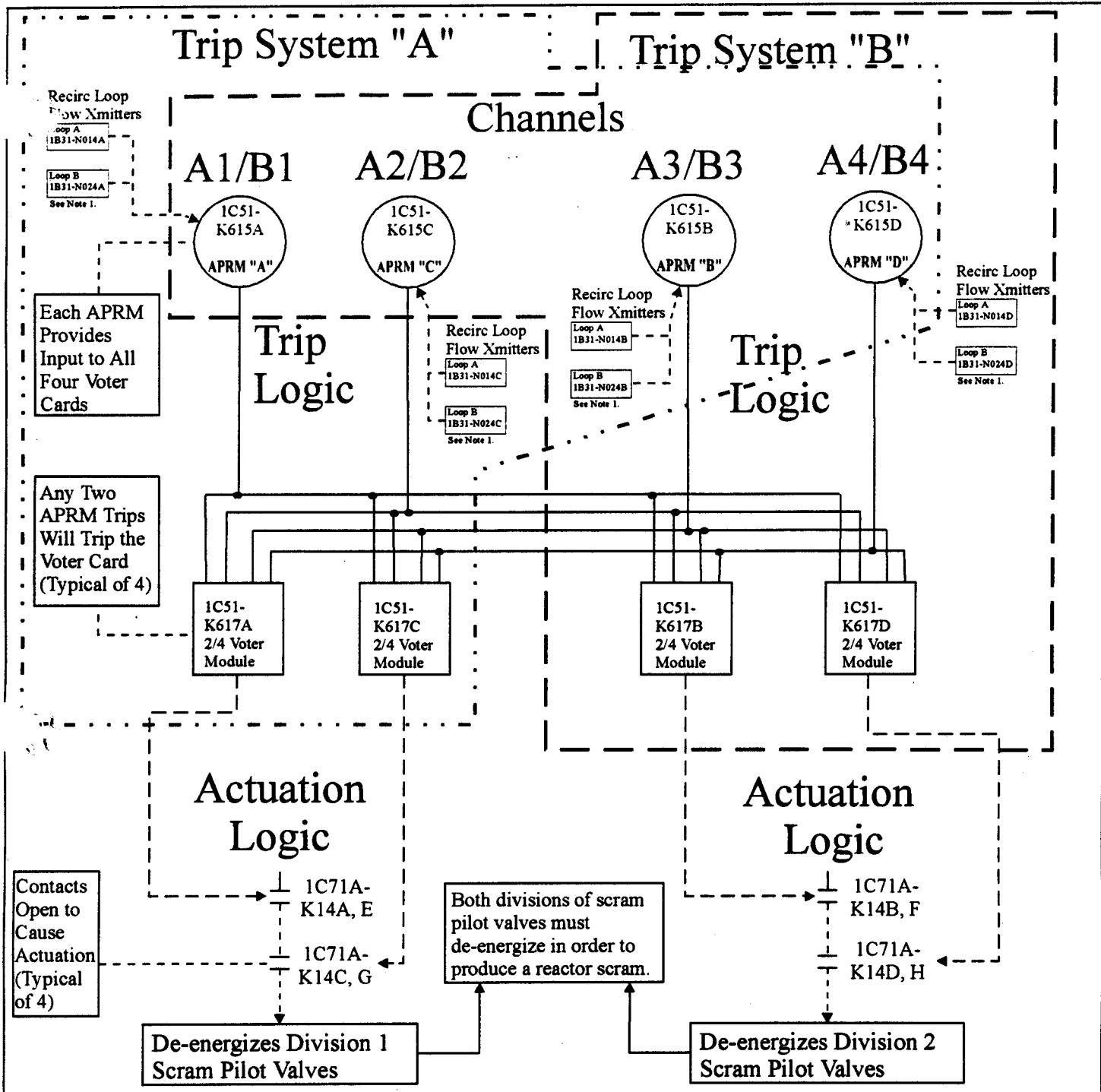
In order to maintain the capability to scram the reactor on APRM neutron flux high (setdown), channels in one of the following combinations must be either operable or maintained in the tripped condition.

- A1/B1 and A2/B2
- A1/B1 and A3/B3
- A1/B1 and A4/B4
- A2/B2 and A3/B3
- A2/B2 and A4/B4
- A3/B3 and A4/B4

Elem. Ref.	
H-17789	H-44705
H-17790	H-44706
H-17791	H-44707
H-17792	H-44708
H-17793	H-44712

Prepared By: *[Signature]*
 Reviewed By: *[Signature]*

LFD-1-RPS-03
TS 3.3.1.1-1, Item 2.a Reactor Protection System Instrumentation - APRM Neutron Flux - High (Setdown)
TRM Rev. 12



Minimum Channel Requirements for System Initiation Capability:

In order to maintain the capability to scram the reactor on APRM Simulated Thermal Power - High, channels in one of the following combinations must be either operable or maintained in the tripped condition.

- A1/B1 and A2/B2
- A1/B1 and A3/B3
- A1/B1 and A4/B4
- A2/B2 and A3/B3
- A2/B2 and A4/B4
- A3/B3 and A4/B4

Note 1: For the STP High function of an APRM to be considered operable, both of the associated Recirc Flow transmitters must be operable.

Elem. Ref.	
H-17789	H-44705
7790	H-44706
H-17791	H-44707
H-17792	H-44708
H-17793	H-44712

Prepared By: *Wayne*

Reviewed By: *Shaw*

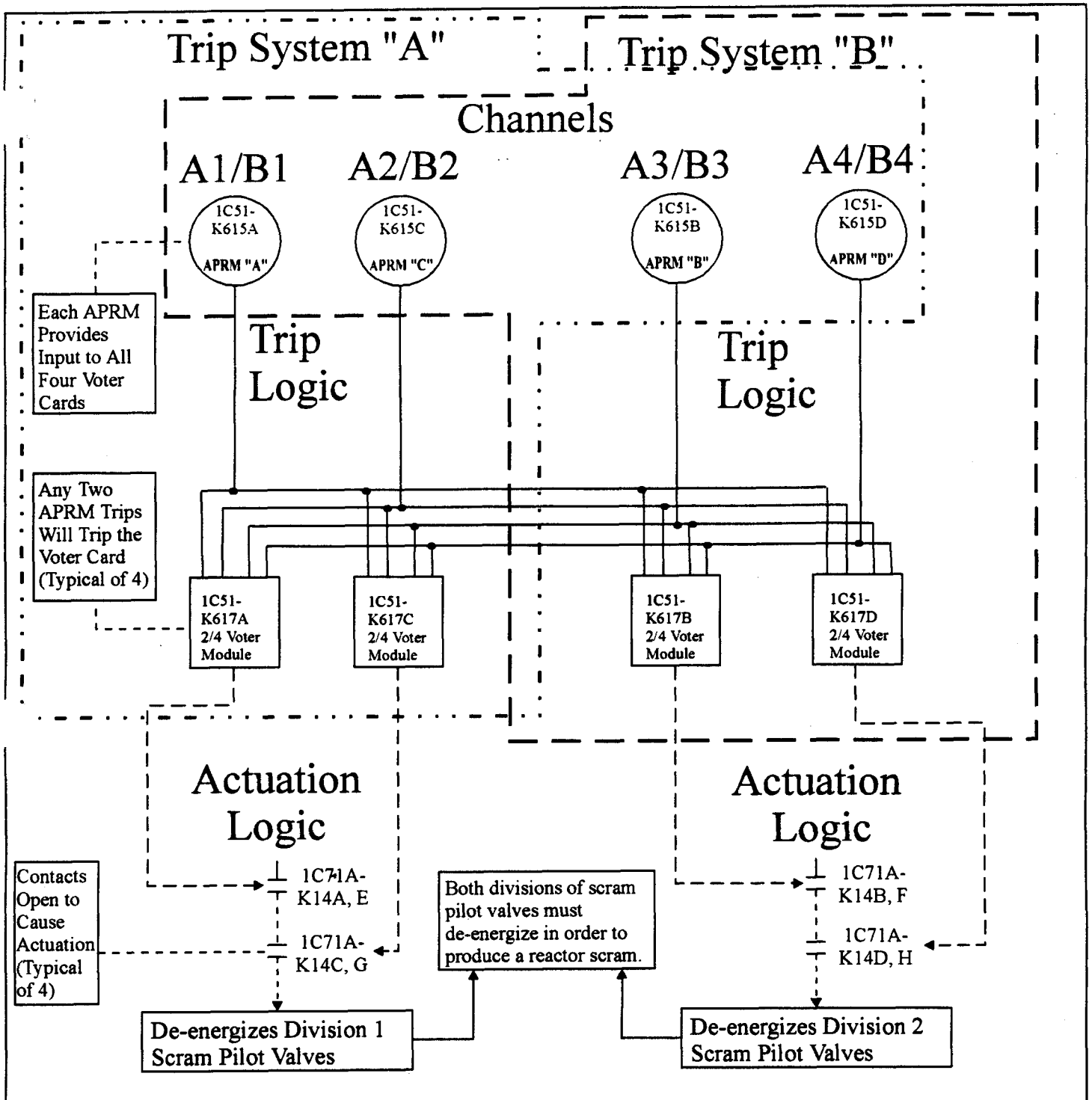
LFD-1-RPS-04

TS 3.3.1.1-1, Item 2.b

Reactor Protection System

Instrumentation - Simulated

Thermal Power - High



Each APRM Provides Input to All Four Voter Cards

Any Two APRM Trips Will Trip the Voter Card (Typical of 4)

Contacts Open to Cause Actuation (Typical of 4)

Both divisions of scram pilot valves must de-energize in order to produce a reactor scram.

Minimum Channel Requirements for System Initiation Capability:

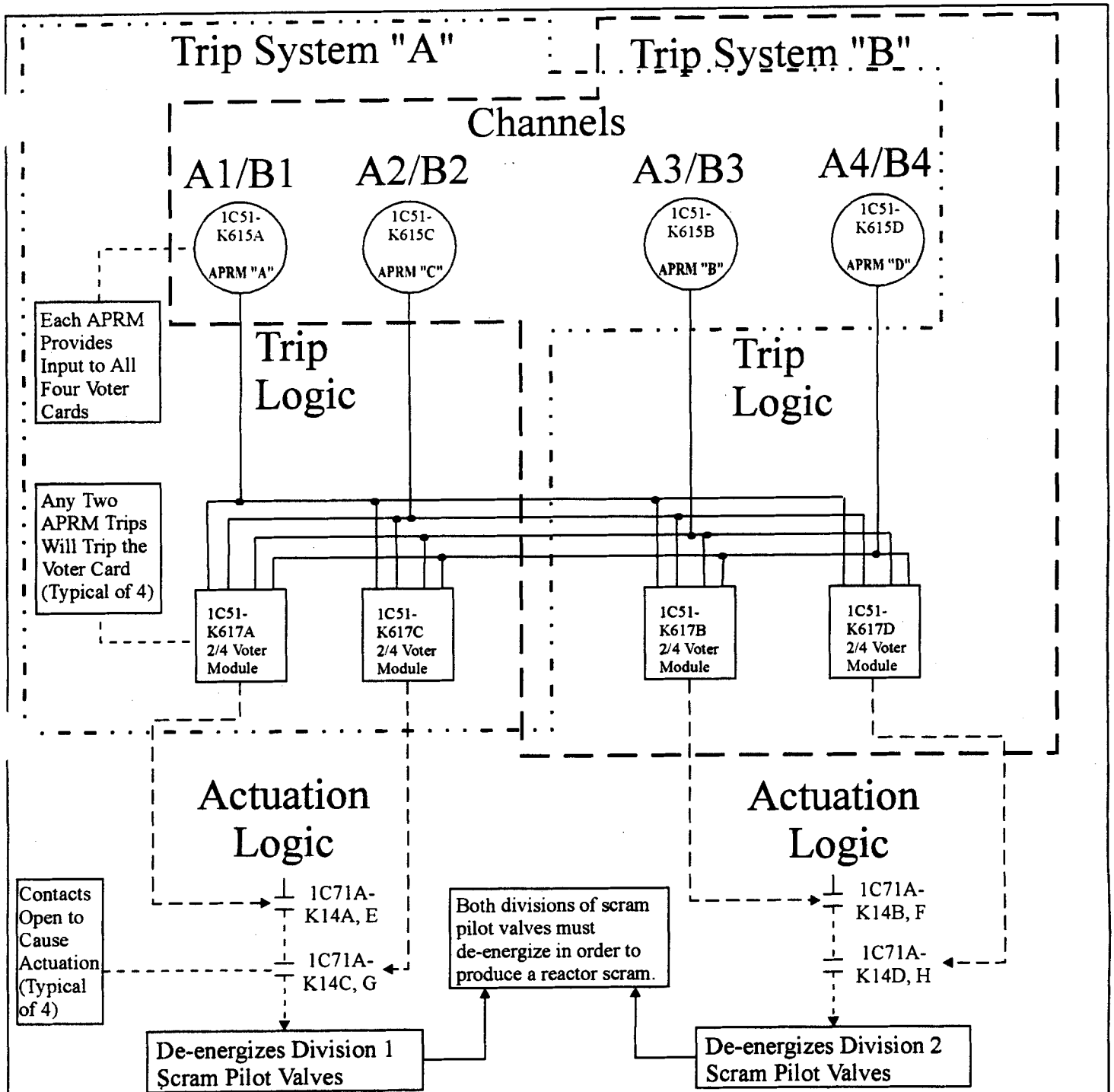
In order to maintain the capability to scram the reactor on APRM Neutron Flux - High, channels in one of the following combinations must be either operable or maintained in the tripped condition.

- A1/B1 and A2/B2
- A1/B1 and A3/B3
- A1/B1 and A4/B4
- A2/B2 and A3/B3
- A2/B2 and A4/B4
- A3/B3 and A4/B4

Elem. Ref.	
H-17789	H-44705
H-17790	H-44706
H-17791	H-44707
H-17792	H-44708
H-17793	H-44712

Prepared By: *[Signature]*
 Reviewed By: *[Signature]*

LFD-1-RPS-05
 TS 3.3.1.1-1, Item 2.c
 Reactor Protection System
 Instrumentation - Neutron
 Flux - High



Minimum Channel Requirements for System Initiation Capability:

In order to maintain the capability to scram the reactor on APRM Inop, channels in one of the following combinations must be either operable or maintained in the tripped condition.

Elem. Ref.	
H-17789	H-44705
H-17790	H-44706
H-17791	H-44707
H-17792	H-44708
H-17793	H-44712

- A1/B1 and A2/B2
- A1/B1 and A3/B3
- A1/B1 and A4/B4
- A2/B2 and A3/B3
- A2/B2 and A4/B4
- A3/B3 and A4/B4

Prepared By: *Wayne*
 Reviewed By: *Spur*

LFD-1-RPS-06
TS 3.3.1.1-1, Item 2.d Reactor Protection System Instrumentation - APRM Inop
TRM Rev. 12

Trip System "A"

Trip System "B"

Channels

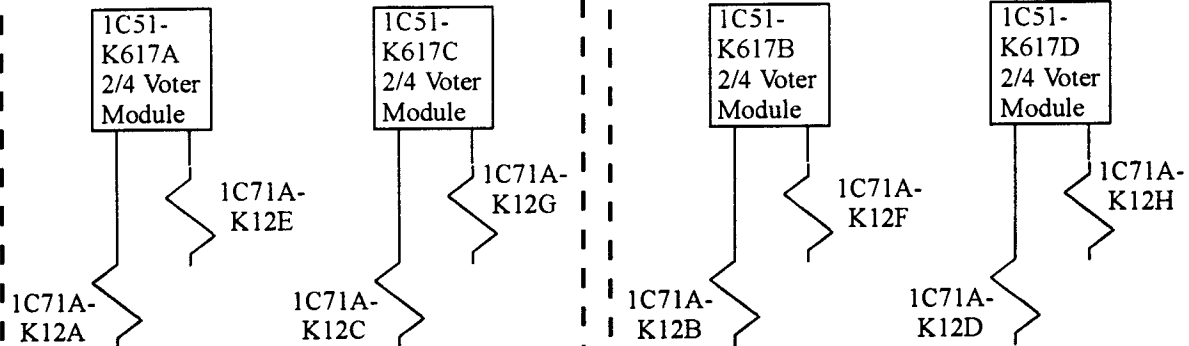
Channels

A1

A2

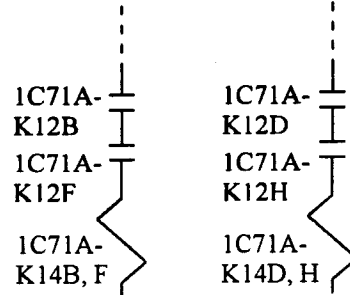
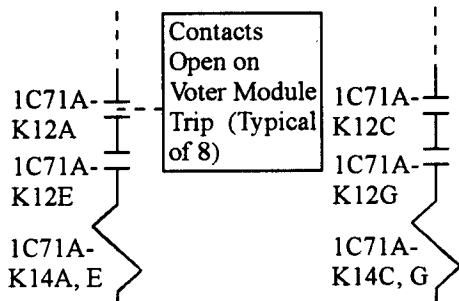
B1

B2



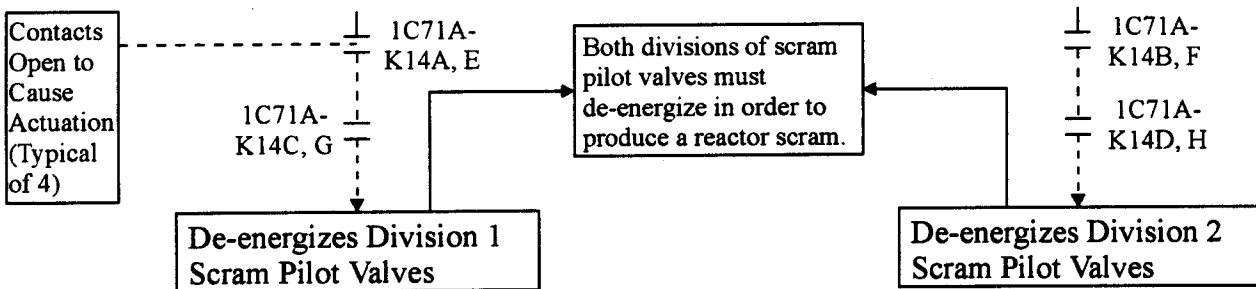
Trip Logic

Trip Logic



Actuation Logic

Actuation Logic



Minimum Channel Requirements for System Initiation Capability:

In order to maintain the capability to scram the reactor on APRM Voter Module circuit function, channels in one of the following combinations must be either operable or maintained in the tripped condition.

Elem. Ref.

H-17789 H-17792
H-17790 H-17793
H-17791 H-44712

A1 or A2
AND
B1 or B2

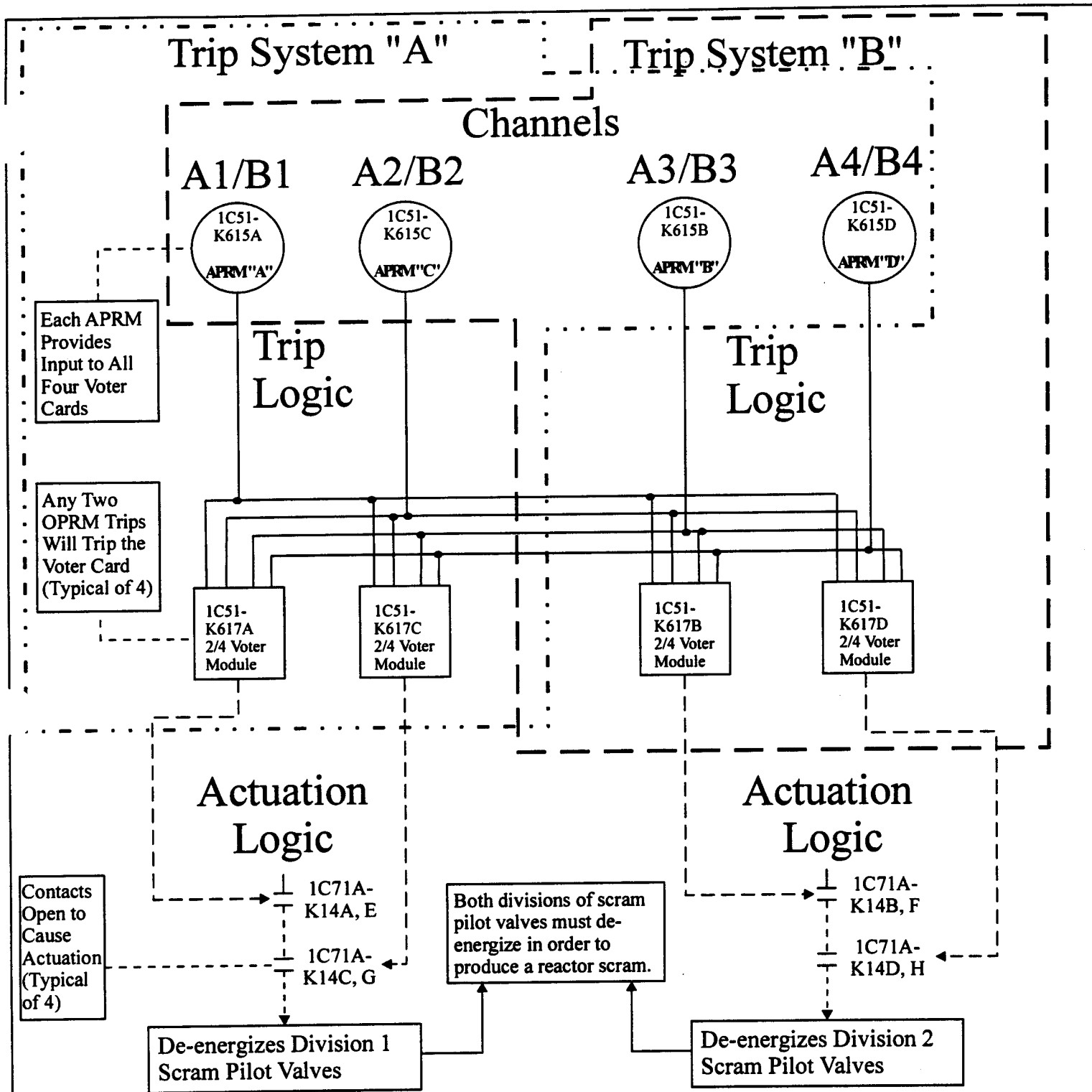
Prepared By: *[Signature]*

Reviewed By: *[Signature]*

LFD-1-RPS-07

TS 3.3.1.1-1, Item 2.e
Reactor Protection System
Instrumentation -
APRM Two-Out-of-Four
Voter Circuit

TRM Rev. 12



Each APRM Provides Input to All Four Voter Cards

Any Two OPRM Trips Will Trip the Voter Card (Typical of 4)

Contacts Open to Cause Actuation (Typical of 4)

Minimum Channel Requirements for System Initiation Capability:

In order to maintain the capability to scram the reactor on OPRM Upscale, channels in one of the following combinations must be either operable or maintained in the tripped condition.

Elem. Ref.	
H-17789	H-44705
H-17790	H-44706
H-17791	H-44707
H-17792	H-44708
H-17793	H-44712

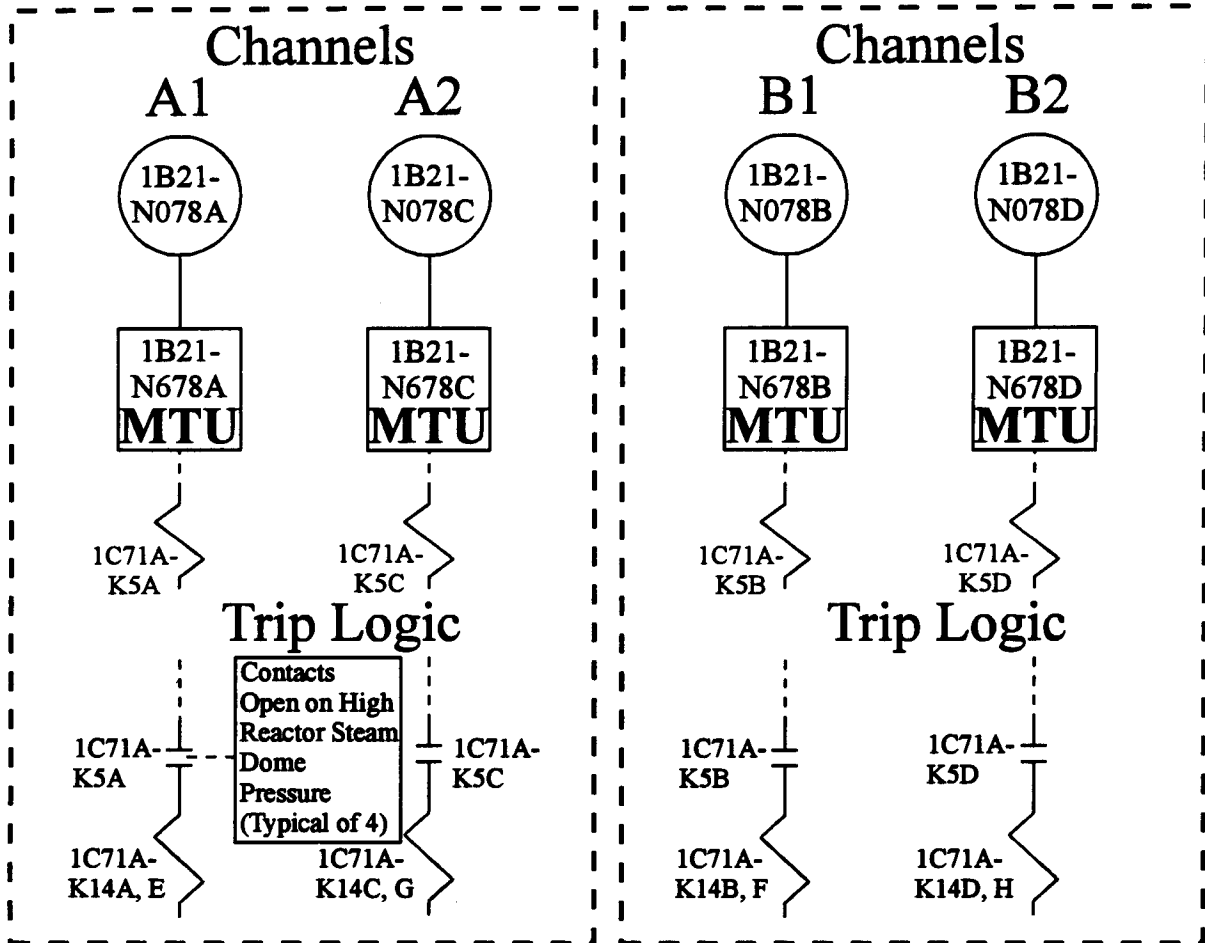
- A1/B1 and A2/B2
- A1/B1 and A3/B3
- A1/B1 and A4/B4
- A2/B2 and A3/B3
- A2/B2 and A4/B4
- A3/B3 and A4/B4

Prepared By: *[Signature]*
 Reviewed By: *[Signature]*

LFD-1-RPS-07a
 TS 3.3.1.1-1, Item 2.f
 Reactor Protection System
 Instrumentation - OPRM
 Upscale

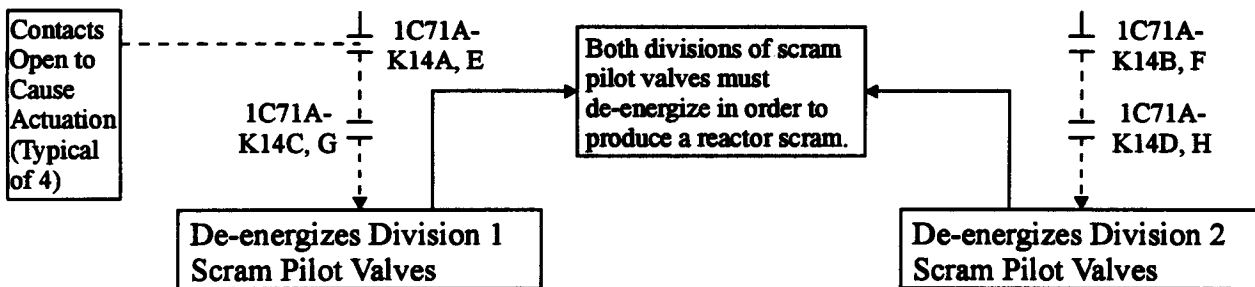
Trip System "A"

Trip System "B"



Actuation Logic

Actuation Logic



Minimum Channel Requirements for System Initiation Capability:

In order to maintain the capability to scram the reactor on high reactor vessel steam dome pressure, channels in one of the following combinations must be either operable or maintained in the tripped condition.

A1 or A2
AND
B1 or B2

Elem. Ref.

H-17789 H-19809
H-17790 H-19812
H-17791 H-19815
H-17792 H-19818
H-17793

Prepared By: *Royce Clark*

Reviewed By: *McRyne*

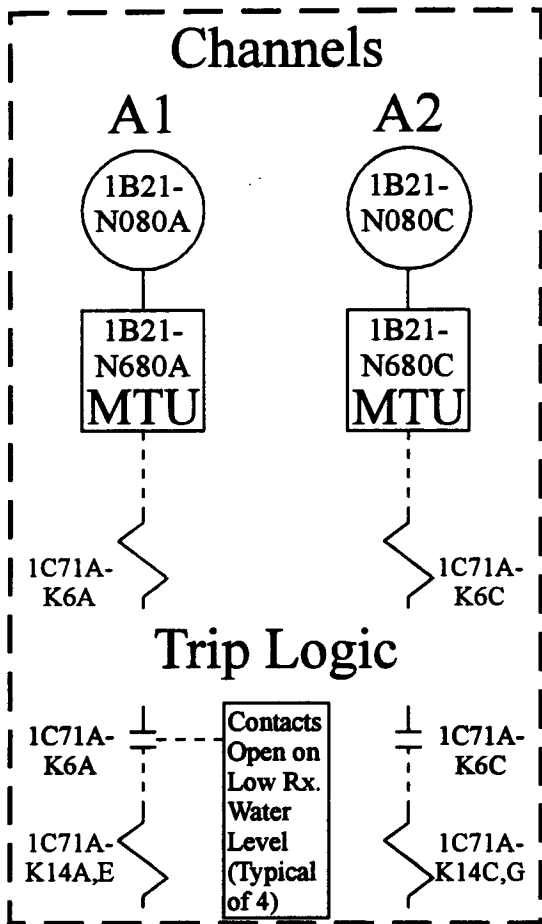
LFD-1-RPS-08

TS 3.3.1.1-1, Item 3
Reactor Protection System
Instrumentation - Reactor
Vessel Steam Dome Pressure
- High

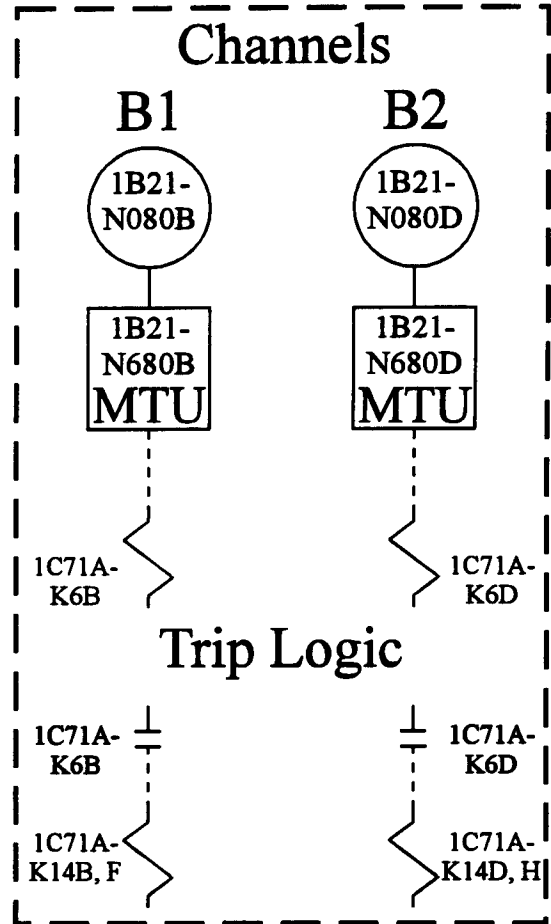
Rev. 0

1/16/95

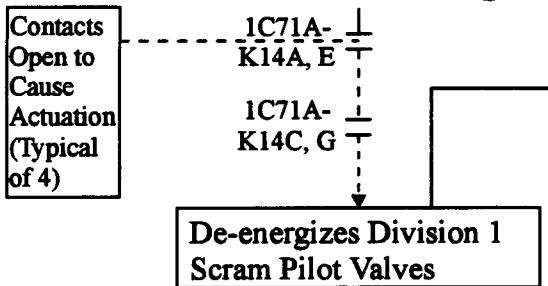
Trip System "A"



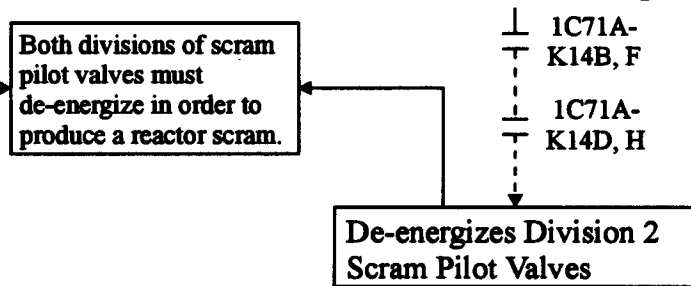
Trip System "B"



Actuation Logic



Actuation Logic



Minimum Channel Requirements for System Initiation Capability:

In order to maintain the capability to scram the reactor on low reactor water level (Level 3), channels in one of the following combinations must be either operable or maintained in the tripped condition.

A1 or A2
AND
B1 or B2

Elem. Ref.

H-17789 H-19809
H-17790 H-19812
H-17791 H-19815
H-17792 H-19818
H-17793

Prepared By:

Royce Clark

Reviewed By:

Steve W. Neal

LFD-1-RPS-09

TS 3.3.1.1-1, Item 4
Reactor Protection
System Instrumentation
Reactor Vessel Water
Level - Low, Level 3
Rev. 0 1/16/95

Trip System "A"

Trip System "B"

Channels

Channels

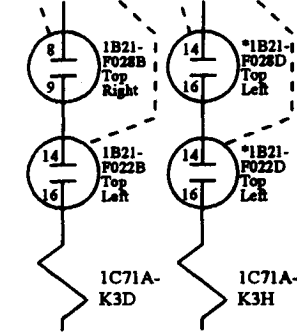
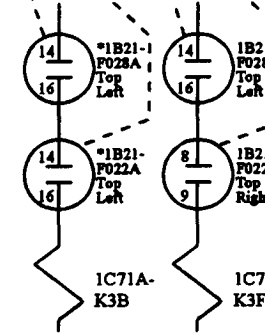
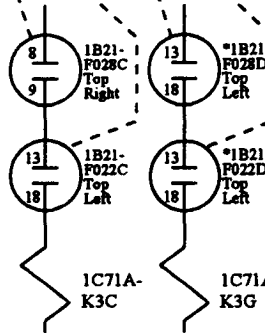
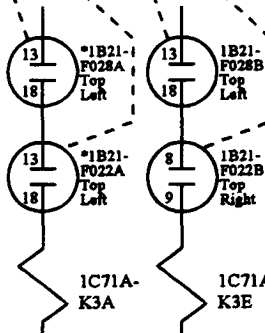
*The "Top Left" limit switch sets in all "A" and "D" MSIVs have switch contacts in both trip systems.

A1A A1B A1C A1D

A2A A2B A2C A2D

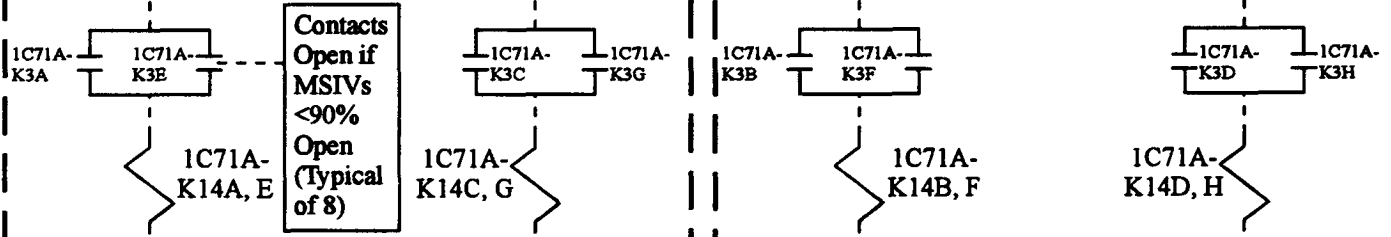
B1A B1B B1C B1D

B2A B2B B2C B2D



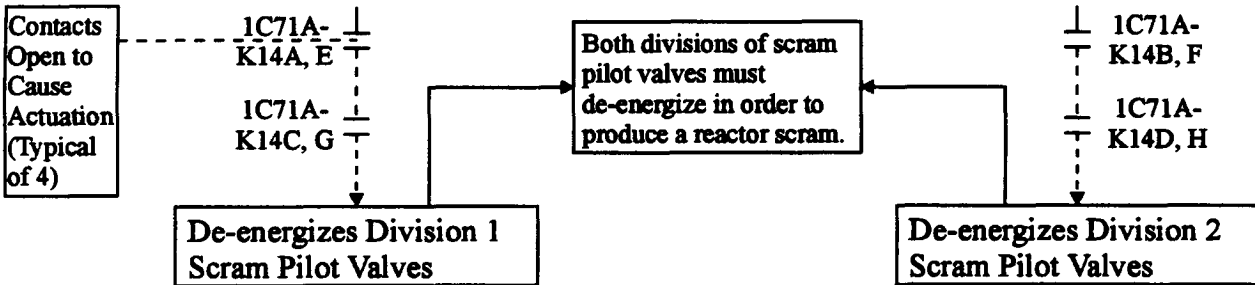
Trip Logic

Trip Logic



Actuation Logic

Actuation Logic



Minimum Channel Requirements for System Initiation Capability:

In order to maintain the capability to scram the reactor on Main Steam Isolation Valve closure, channels in one of the following combinations must be either operable or maintained in the tripped condition.

(A1A or A1B) and (A1C or A1D)
OR
(A2A or A2B) and (A2C or A2D)

AND

(B1A or B1B) and (B1C or B1D)
OR
(B2A or B2B) and (B2C or B2D)

Elem. Ref.

H-17789 H-17793
H-17790 H-17815
H-17791 H-17816
H-17792 H-17943

Prepared By: *Stephen W. Reed*

Reviewed By: *Royce Clark*

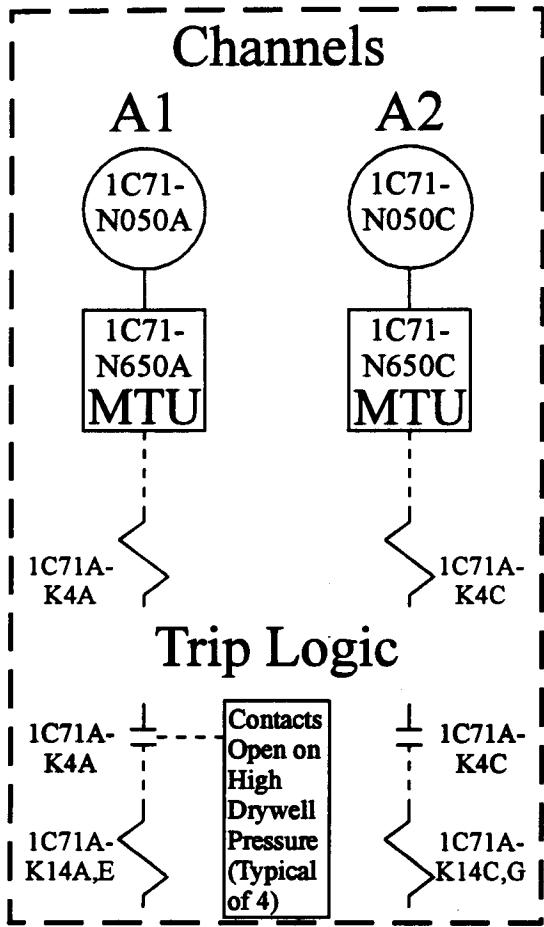
LFD-1-RPS-10

TS 3.3.1.1-1, Item 5
Reactor Protection
System Instrumentation -
Main Steam Isolation
Valve - Closure

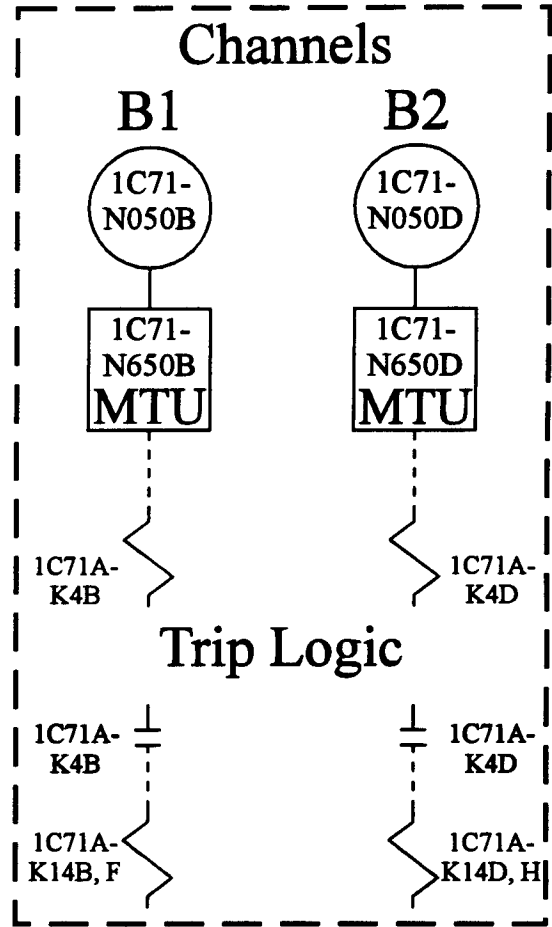
Rev. 0

1/16/95

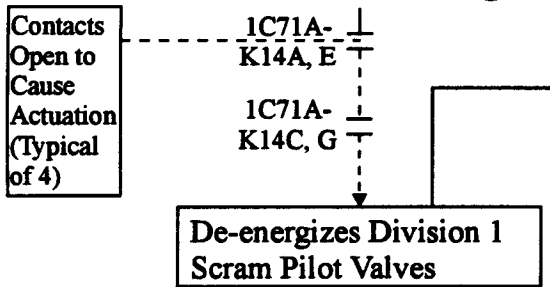
Trip System "A"



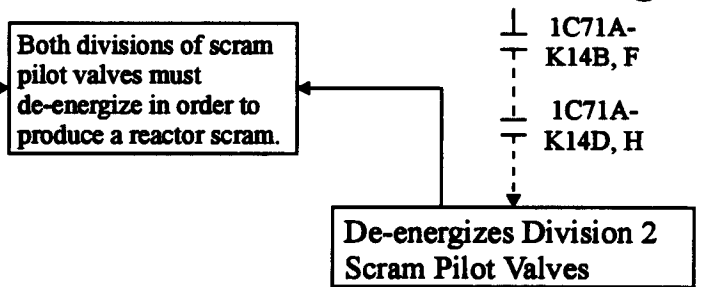
Trip System "B"



Actuation Logic



Actuation Logic



Minimum Channel Requirements for System Initiation Capability:

In order to maintain the capability to scram the reactor on high drywell pressure, channels in one of the following combinations must be either operable or maintained in the tripped condition.

A1 or A2
AND
B1 or B2

Elem. Ref.

H-17789 H-19809
H-17790 H-19812
H-17791 H-19815
H-17792 H-19818
H-17793

Prepared By: *Roger Clark*

Reviewed By: *Steph W. Reed*

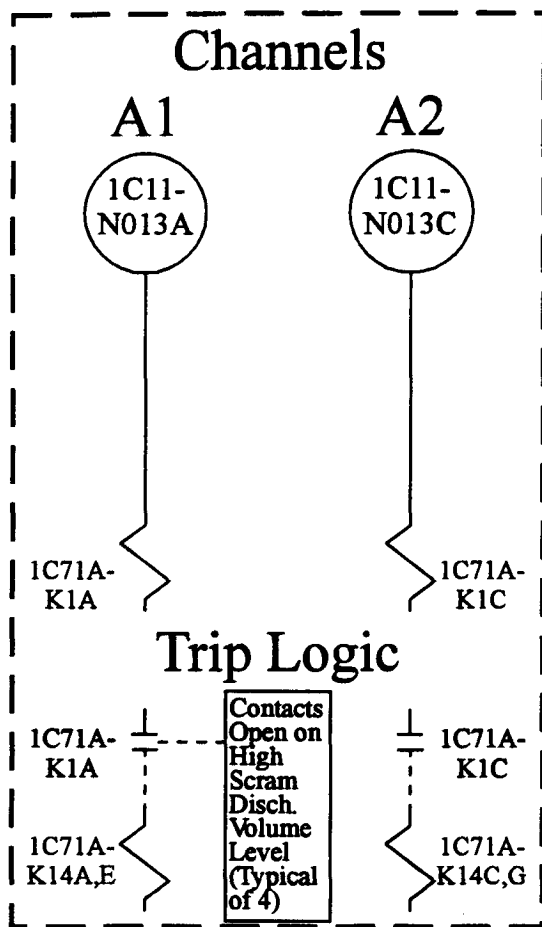
LFD-1-RPS-11

TS 3.3.1.1-1, Item 6
Reactor Protection
System Instrumentation
Drywell Pressure - High

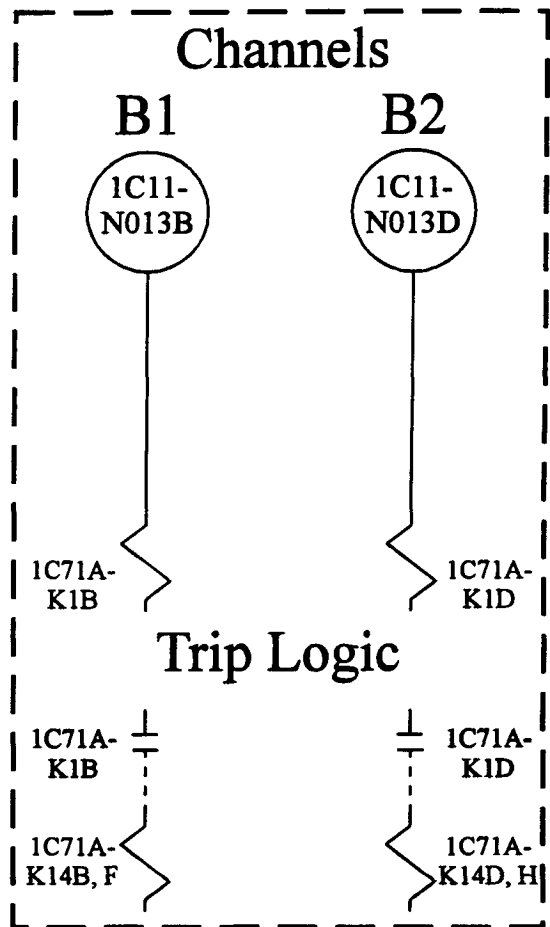
Rev. 0

1/16/95

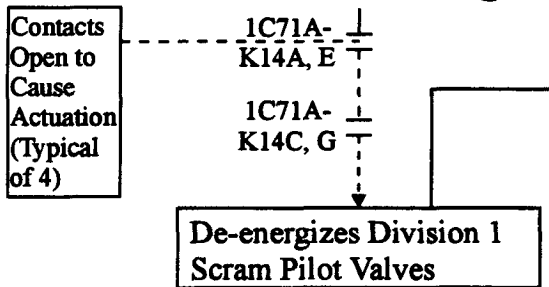
Trip System "A"



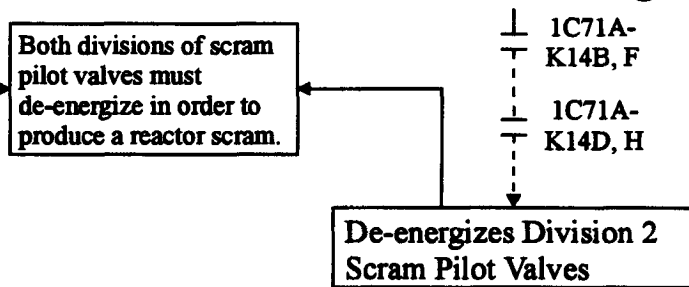
Trip System "B"



Actuation Logic



Actuation Logic



Minimum Channel Requirements for System Initiation Capability:

In order to maintain the capability to scram the reactor on scram discharge volume high level (float switches), channels in one of the following combinations must be either operable or maintained in the tripped condition.

A1 or A2
AND
B1 or B2

Elem. Ref.

H-17789 H-17792
H-17790 H-17793
H-17791

Prepared By: *Roger Clark*

Reviewed By: *Stephen W. Neal*

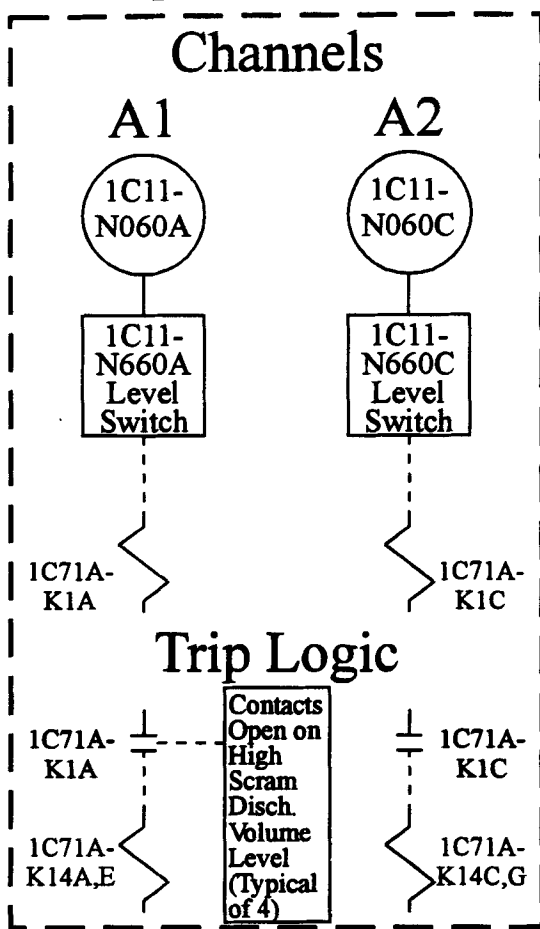
LFD-1-RPS-13

TS 3.3.1.1-1, Item 7.b
Reactor Protection System
Instrumentation - Scram
Discharge Volume Water
Level - High, Float Switch

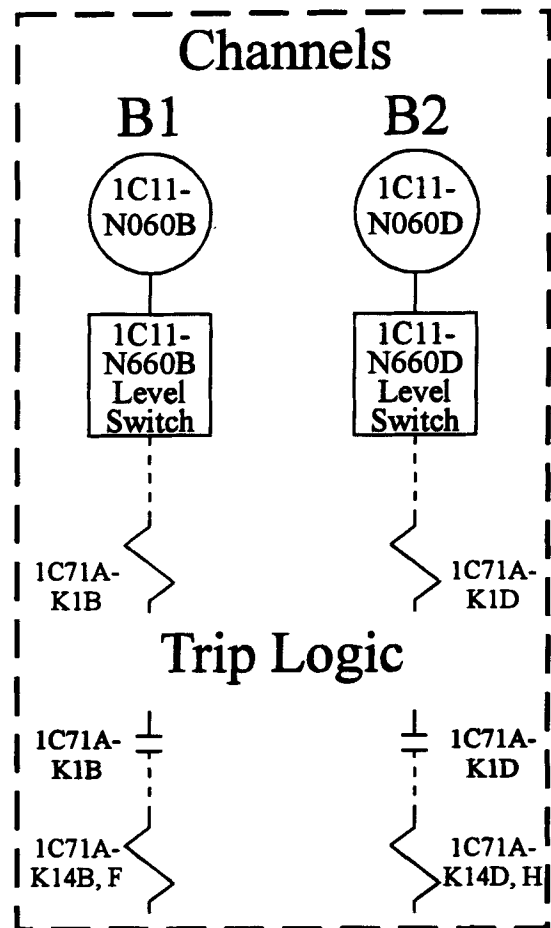
Rev. 0

1/16/95

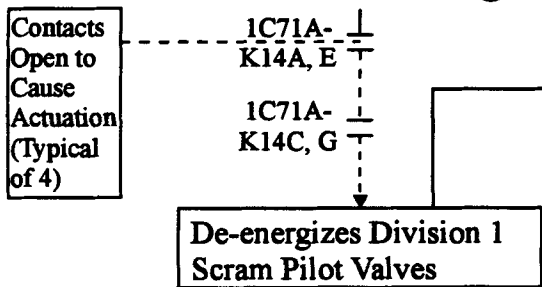
Trip System "A"



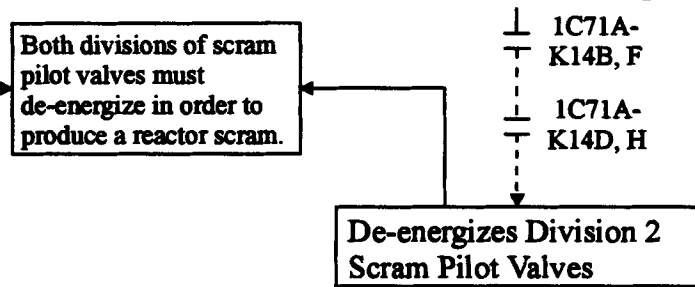
Trip System "B"



Actuation Logic



Actuation Logic



Minimum Channel Requirements for System Initiation Capability:

In order to maintain the capability to scram the reactor on scram discharge volume high level (resistance temperature detectors), channels in one of the following combinations must be either operable or maintained in the tripped condition.

A1 or A2
AND
B1 or B2

Elem. Ref.

H-17789 H-17792
H-17790 H-17793
H-17791 H-17796

Prepared By: *Roger Clark*

Reviewed By: *Stephen W. Reed*

LFD-1-RPS-12

TS 3.3.1.1-1, Item 7.a
Reactor Protection System
Instrumentation - Scram
Discharge Volume Water
Level - High, Resistance
Temperature Detector

Rev. 0

1/16/95

Trip System "A"

Trip System "B"

Channels

Each TSV limit switch has two sets of contacts with one set of contacts located in each trip system.

Channels

A1A
TSV #1
IN30-F005



A1B
TSV #2
IN30-F006



A2A
TSV #3
IN30-F007



A2B
TSV #4
IN30-F008



B1A
TSV #1
IN30-F005



B1B
TSV #3
IN31-F007



B2A
TSV #2
IN30-F006



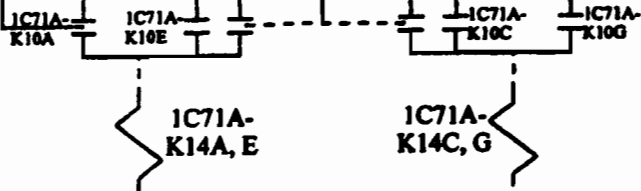
B2B
TSV #4
IN30-F008



Trip Logic

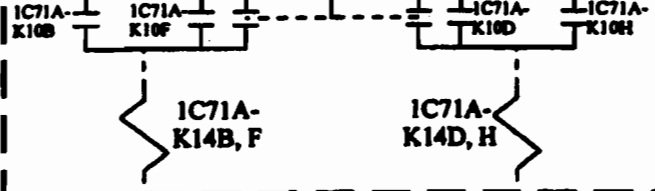
Contacts Open when TSVs <90% Open (Typical of 8)

Opens to enable scram on turbine trip when above 28% power. See LFD-1-RPS-18.



Trip Logic

Opens to enable scram on turbine trip when above 28% power. See LFD-1-RPS-18.



Actuation Logic

Contacts Open to Cause Actuation (Typical of 4)

1C71A-K14A, E
1C71A-K14C, G

De-energizes Division 1 Scram Pilot Valves

Both divisions of scram pilot valves must de-energize in order to produce a reactor scram.

1C71A-K14B, F
1C71A-K14D, H

De-energizes Division 2 Scram Pilot Valves

Minimum Channel Requirements for System Initiation Capability:

In order to maintain the capability to scram the reactor on Turbine Stop Valve closure, channels in one of the following combinations must be either operable or maintained in the tripped condition.

[A1A and A1B
OR
A2A and A2B]

AND

[B1A and B1B
OR
B2A and B2B]

Elem. Ref.

H-11470 H-17791
H-13445 H-17792
H-17789 H-17793
H-17790

Prepared By:

Reviewed By:

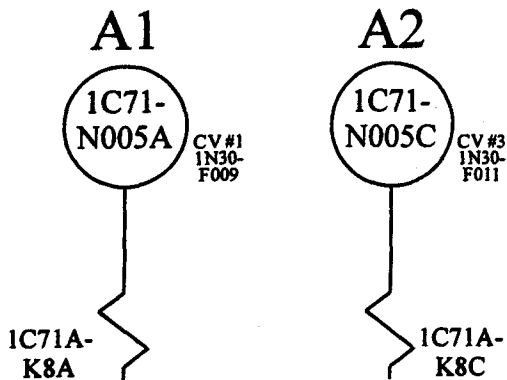
LFD-1-RPS-14

TS 3.3.1.1-1, Item 8
Reactor Protection
System Instrumentation -
Turbine Stop Valve -
Closure

TRM Rev. 66

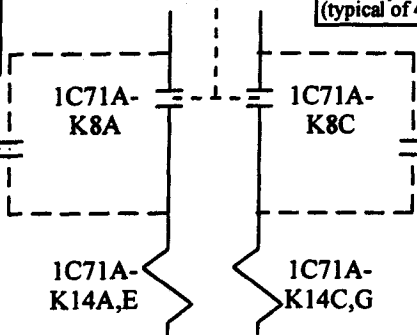
Trip System "A"

Channels



Trip Logic

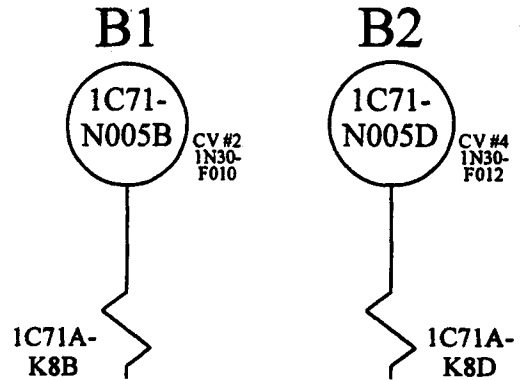
Opens when above 28% power to enable scram on turbine trip. See LFD-1-RPS-18. (Typical of 4.)



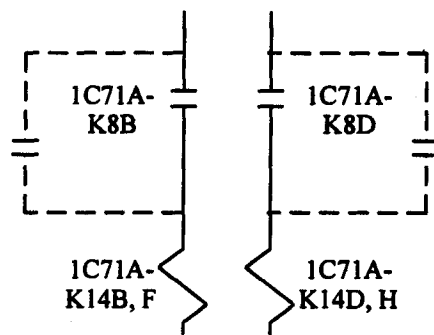
Contacts open on low TCV trip oil pressure (typical of 4).

Trip System "B"

Channels

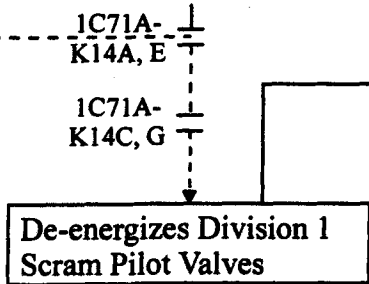


Trip Logic



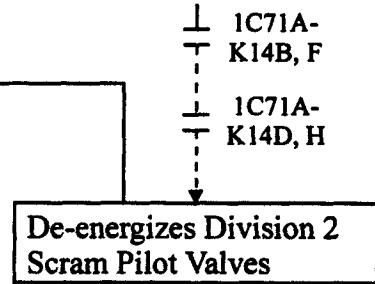
Actuation Logic

Contacts Open to Cause Actuation (Typical of 4)



Both divisions of scram pilot valves must de-energize in order to produce a reactor scram.

Actuation Logic



Minimum Channel Requirements for System Initiation Capability:

In order to maintain the capability to scram the reactor on Turbine Control Valve fast closure, channels in one of the following combinations must be either operable or maintained in the tripped condition.

A1 or A2
AND
B1 or B2

Elem. Ref.

H-11470 H-17791
H-17789 H-17792
H-17790 H-17793

Prepared By: *[Signature]*

Reviewed By: *[Signature]*

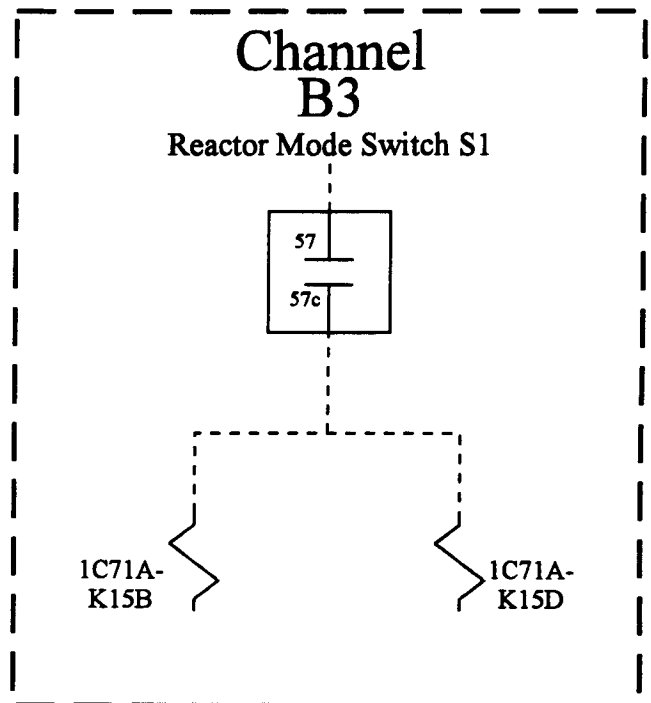
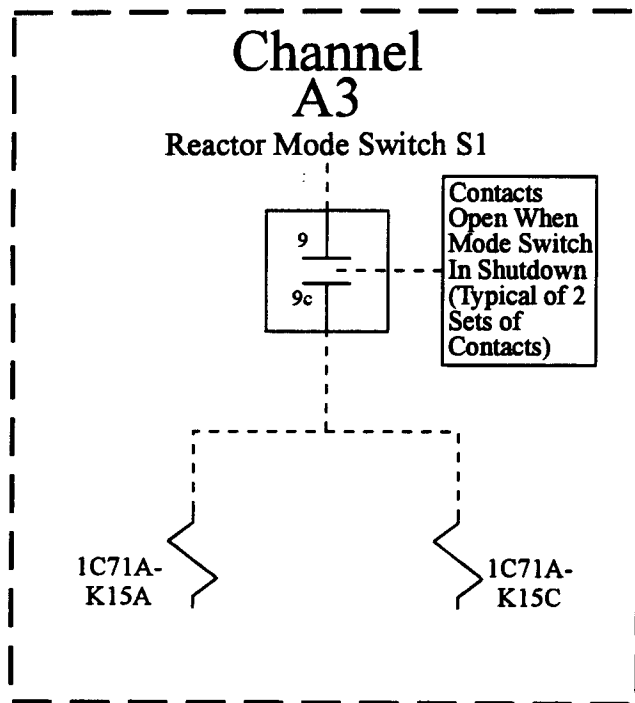
LFD-1-RPS-15

TS 3.3.1.1-1, Item 9
Reactor Protection System
Instrumentation - Turbine
Control Valve Fast Closure,
Trip Oil Pressure - Low

TRM Rev. 33

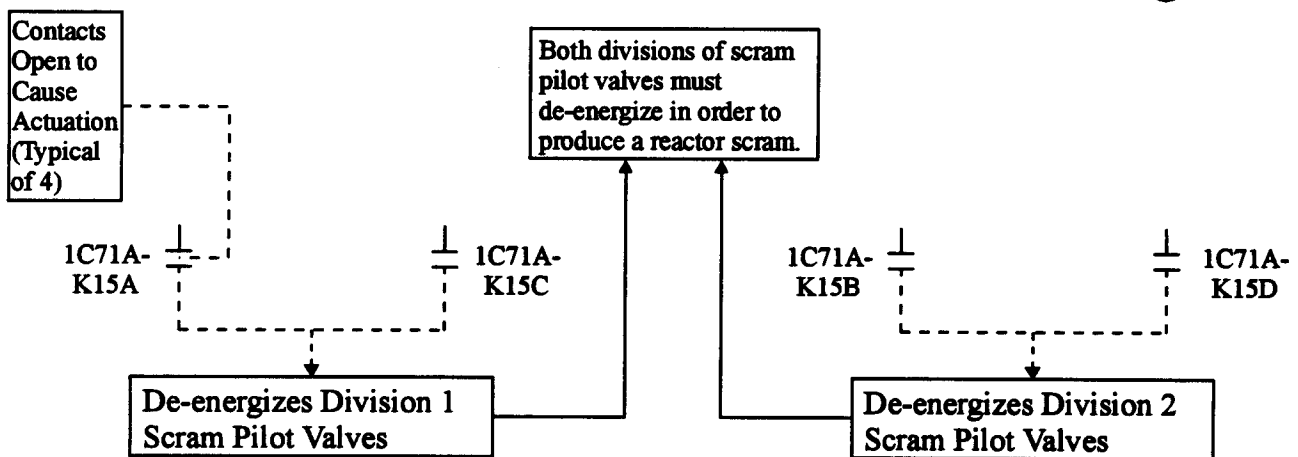
Trip System "A"

Trip System "B"



Actuation Logic

Actuation Logic



Minimum Channel Requirements for System Initiation Capability:

In order to maintain the capability to scram the reactor on Reactor Mode Switch position (Mode Switch in Shutdown), each channel must be either operable or maintained in the tripped condition.

Elem. Ref.

H-17786
H-17791
H-17792
H-17793

Prepared By:

Roger Clark

Reviewed By:

Styler W. Reed

LFD-1-RPS-16

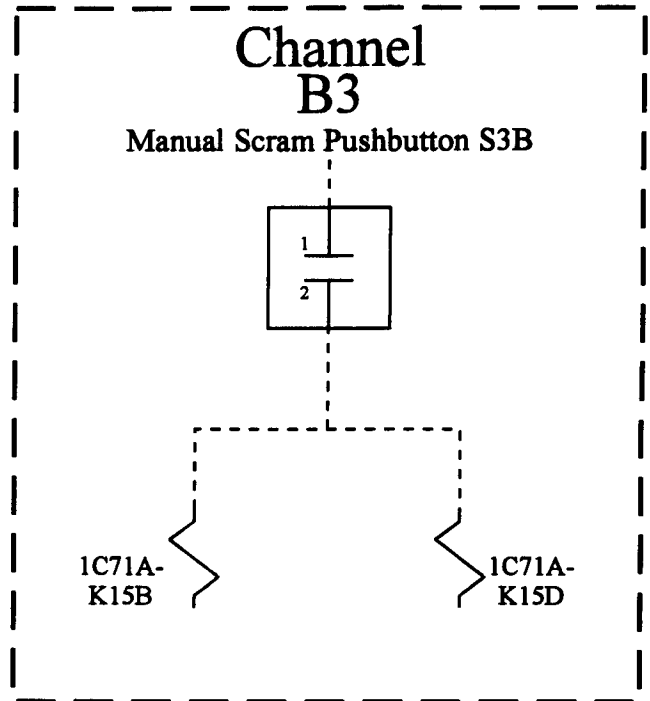
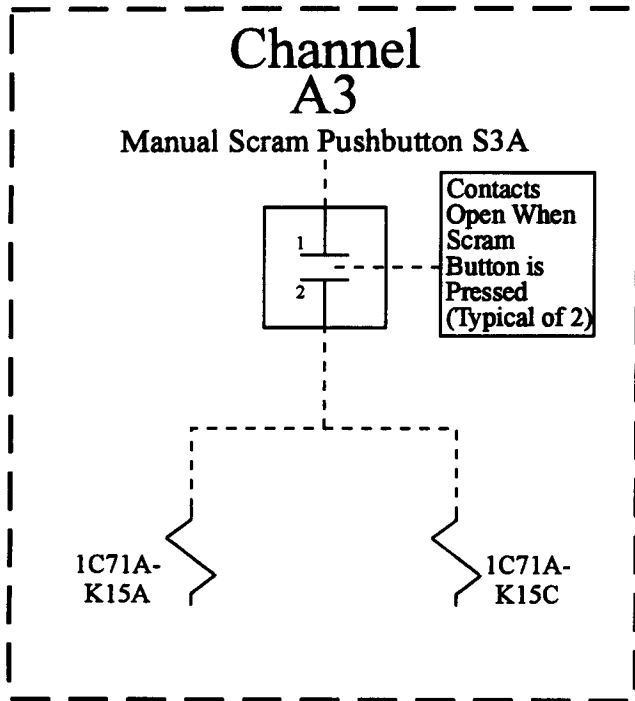
TS 3.3.1.1-1, Item 10
Reactor Protection
System Instrumentation
Reactor Mode Switch -
Shutdown Position

Rev. 0

1/16/95

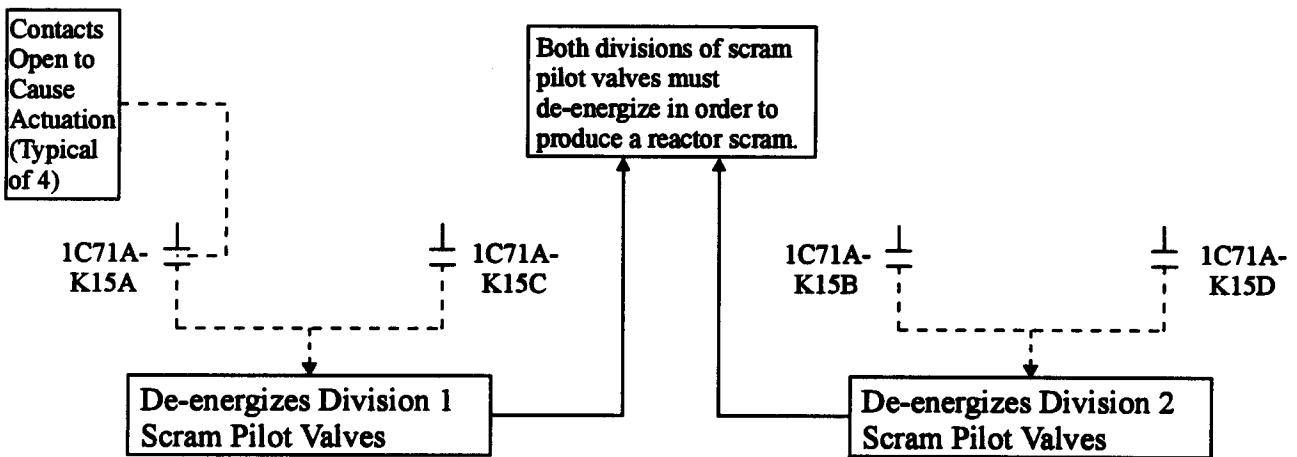
Trip System "A"

Trip System "B"



Actuation Logic

Actuation Logic



Minimum Channel Requirements for System Initiation Capability:

In order to maintain the capability to scram the reactor using the Manual Scram Pushbuttons, each channel must be either operable or maintained in the tripped condition.

Elem. Ref.

H-17786
H-17791
H-17792
H-17793

Prepared By:

Royce Clark

Reviewed By:

Stacy L. Reed

LFD-1-RPS-17

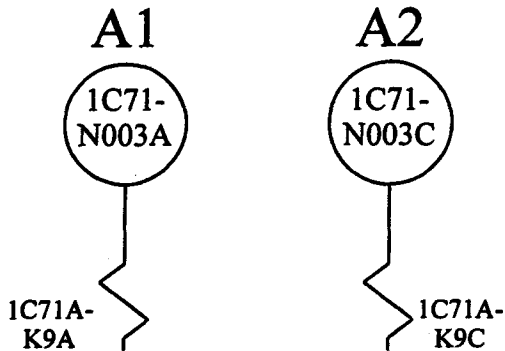
TS 3.3.1.1-1, Item 11
Reactor Protection
System Instrumentation
Manual Scram

Rev. 0

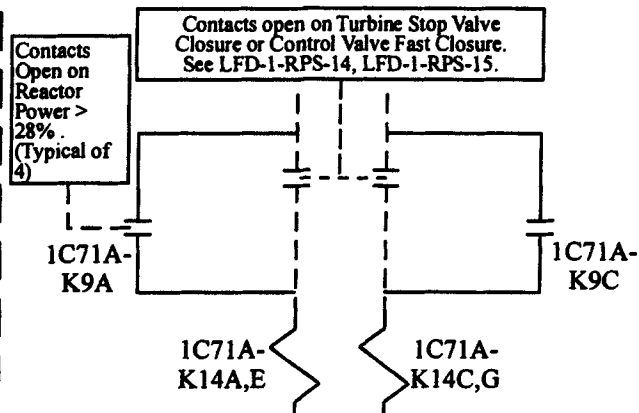
1/16/95

Trip System "A"

Channels

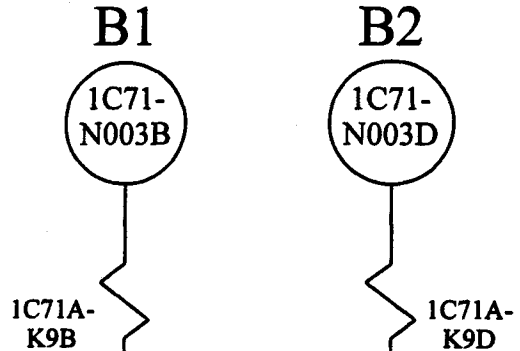


Bypass Logic

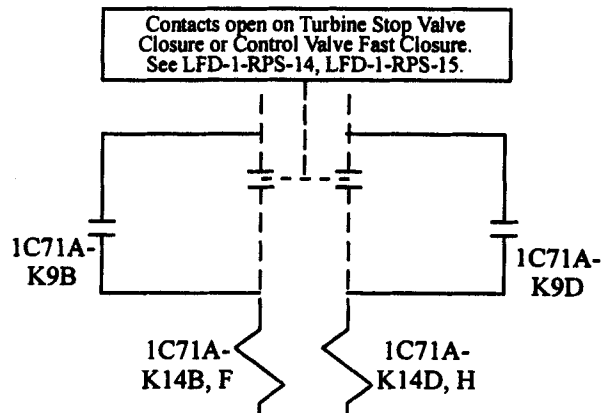


Trip System "B"

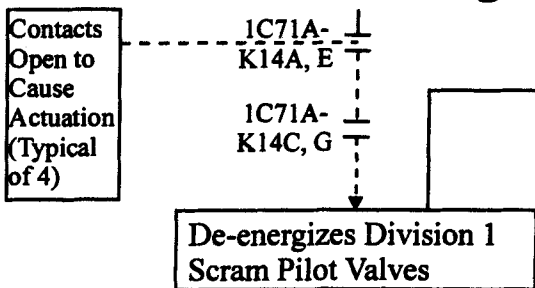
Channels



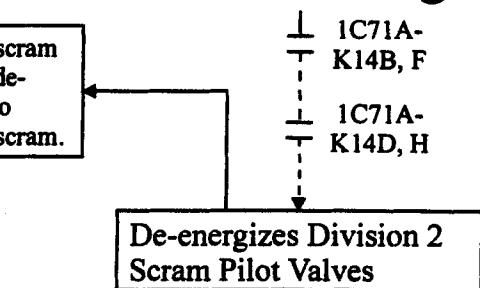
Bypass Logic



Actuation Logic



Actuation Logic



Both divisions of scram pilot valves must de-energize in order to produce a reactor scram.

Minimum Channel Requirements for System Initiation Capability:

In order to maintain the capability to scram the reactor above 28 percent power on Turbine Stop Valve closure or Turbine Control Valve fast closure, channels in one of the following combinations must be either operable or circuit continuity otherwise interrupted.

A1 or A2
AND
B1 or B2

Elem. Ref.

H-17789 H-17790
H-17791 H-17792
H-17793

Prepared By: *[Signature]*

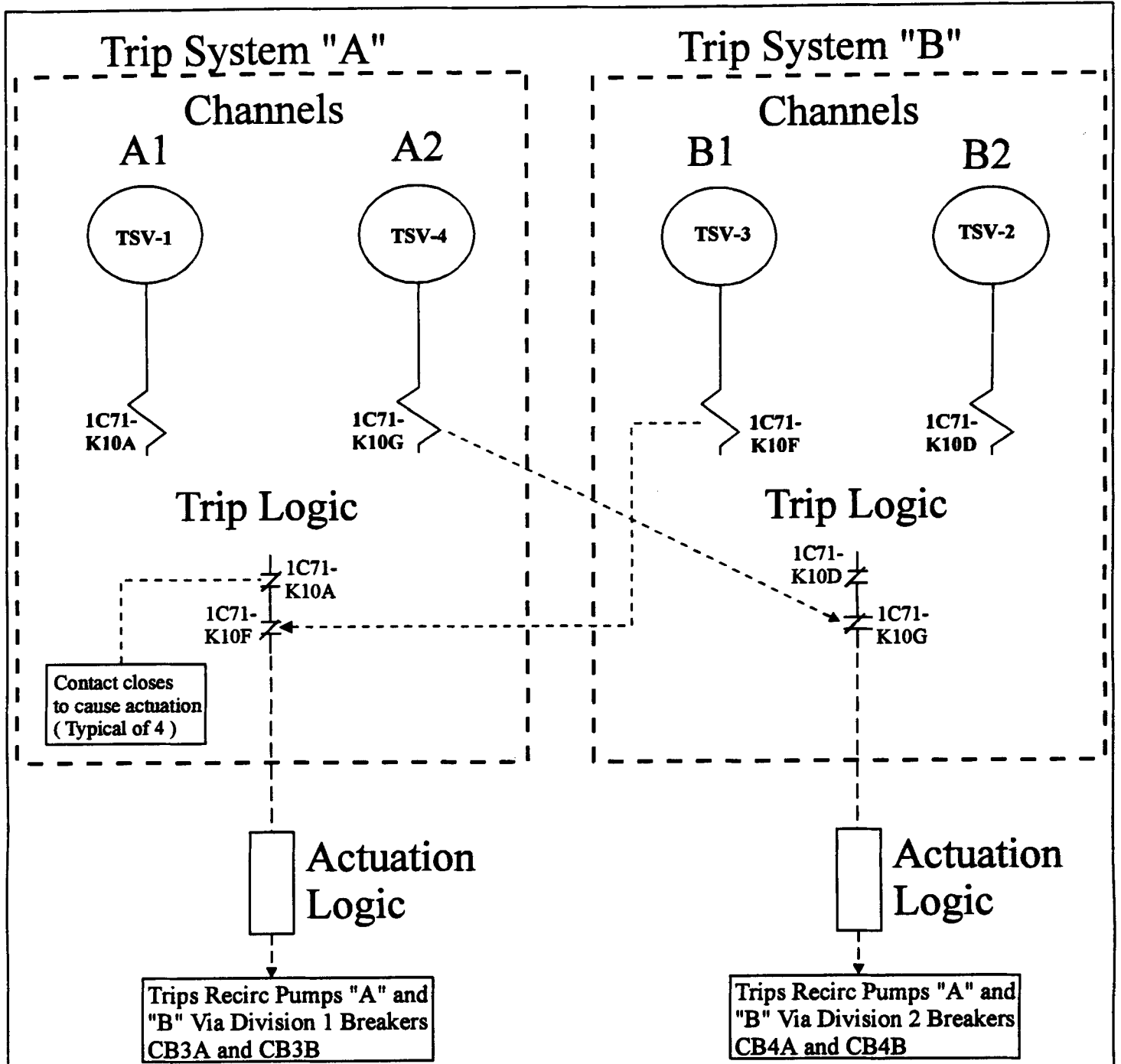
Reviewed By: *[Signature]*

LFD-1-RPS-18

TS SR 3.3.1.1.11

Reactor Protection
System Instrumentation
Bypass, Items 8 & 9

TRM Rev. 33



Minimum Channel Requirements to Maintain Trip Capability:

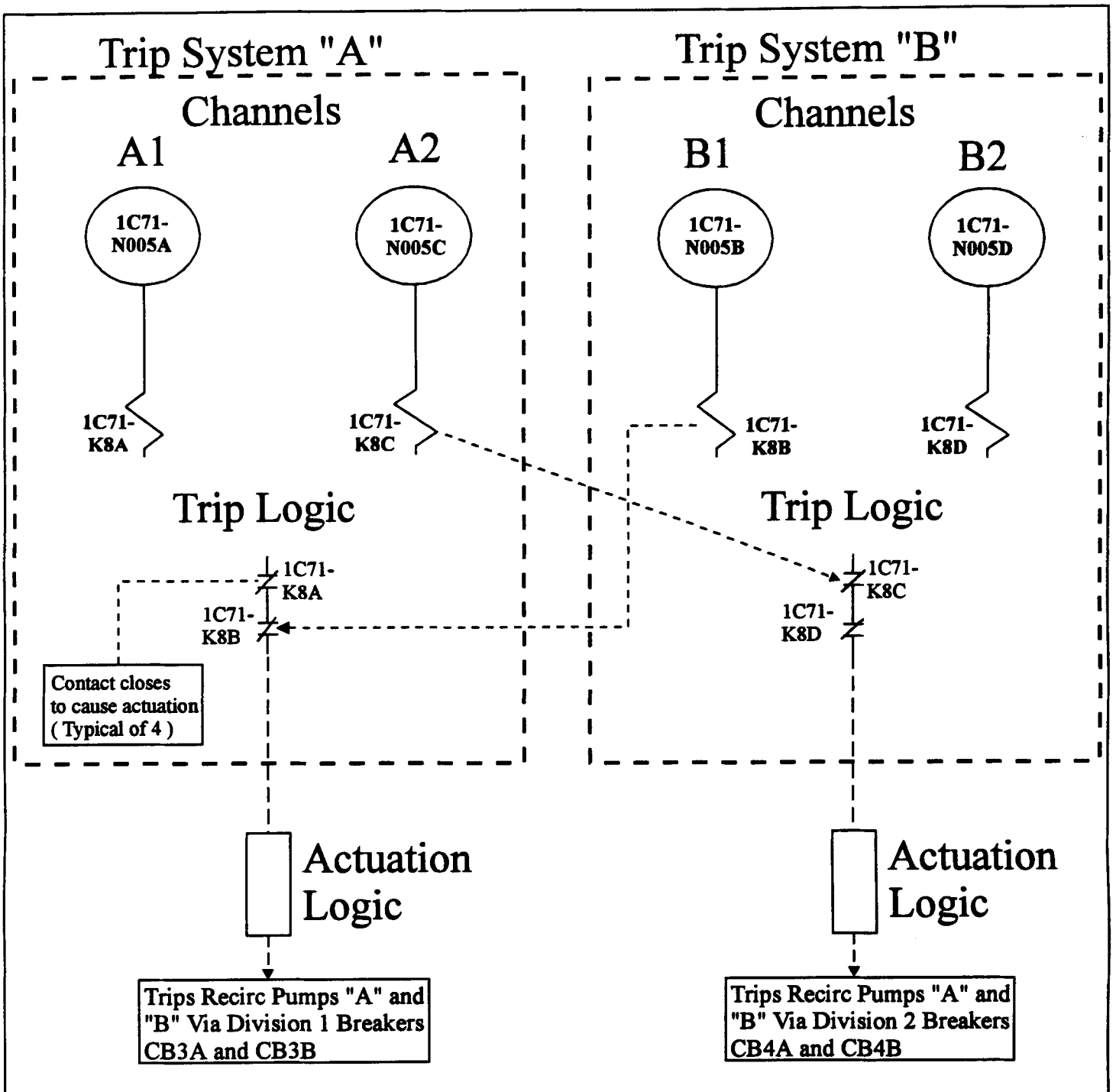
In order to maintain Recirc pump trip capability on a TSV Closure signal, channels in one of the following combinations must be either operable or maintained in the tripped condition.

A1 and B1
OR
A2 and B2

Elem. Ref.
H-13445
H-17789
H-17790
H-17822

Prepared By: *J.R. Quinn*
Review: *J. Williams*

LFD-1-RPT-01
TS 3.3.4.1.a.1
EOC-RPT, TSV CLOSURE
Rev. 0 1/16/95



Minimum Channel Requirements to Maintain Trip Capability:

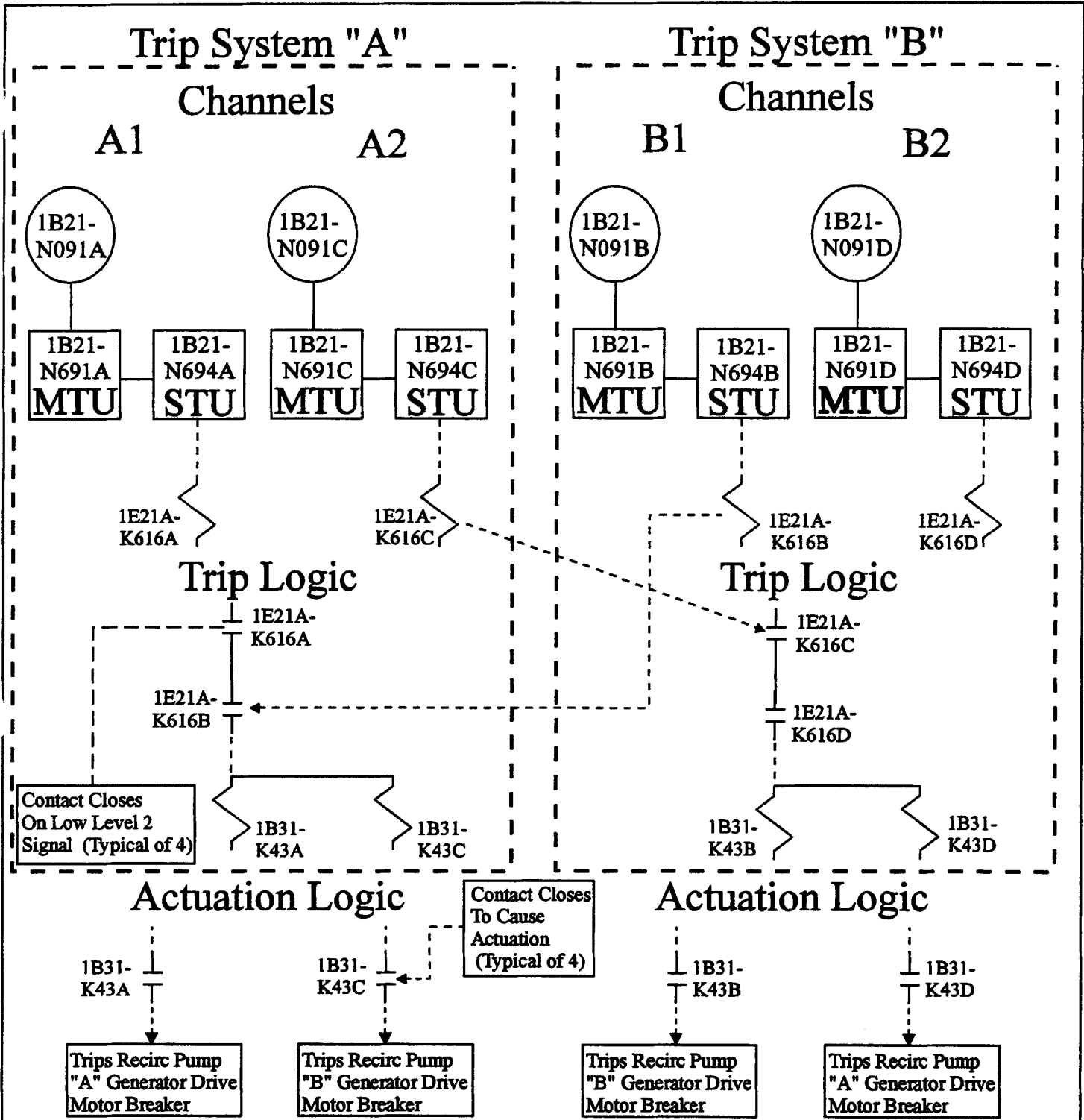
In order to maintain Recirc pump trip capability on a TCV Fast Closure signal, channels in one of the following combinations must be either operable or maintained in the tripped condition.

A1 and B1
OR
A2 and B2

Elem. Ref.
H-13444
H-17789
H-17790
H-17822

Prepared By: *J.R. Brunson*
Revised: *J.R. Brunson*

LFD-1-RPT-02
TS 3.3.4.1.a.2
EOC-RPT, TCV FAST
CLOSURE.
Rev. 0 1/16/95



Minimum Channel Requirements for System Trip Capability:

In order to maintain ATWS-RPT trip capability of the Recirc Pumps on a Reactor Vessel Water Level - ATWS-RPT Level signal, channels in one of the following combinations must be either operable or maintained in the tripped condition.

Elem. Ref.	
H-17860	H-19826
H-17861	H-19829
H-17902	H-19830
H-17903	H-42173
H-19823	

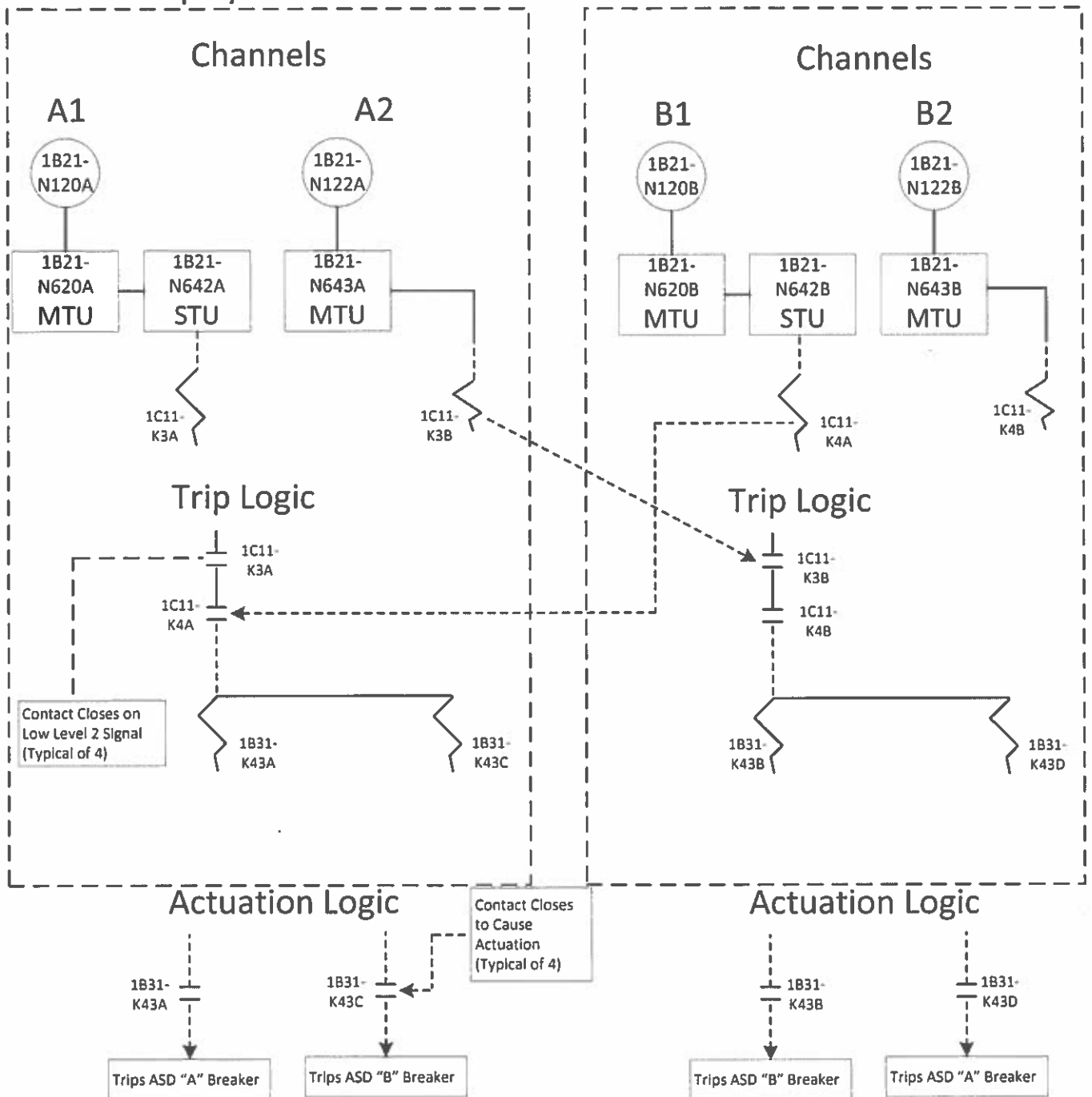
A1 and B1
OR
A2 and B2

Prepared By: *J. S. ...*
Reviewed By: *Kathryn ...*

LFD-1-RPT-03
TS 3.3.4.2.a,
Reactor Vessel Water
Level - ATWS-RPT
Level

Trip System "A"

Trip System "B"



Contact Closes on Low Level 2 Signal (Typical of 4)

Contact Closes to Cause Actuation (Typical of 4)

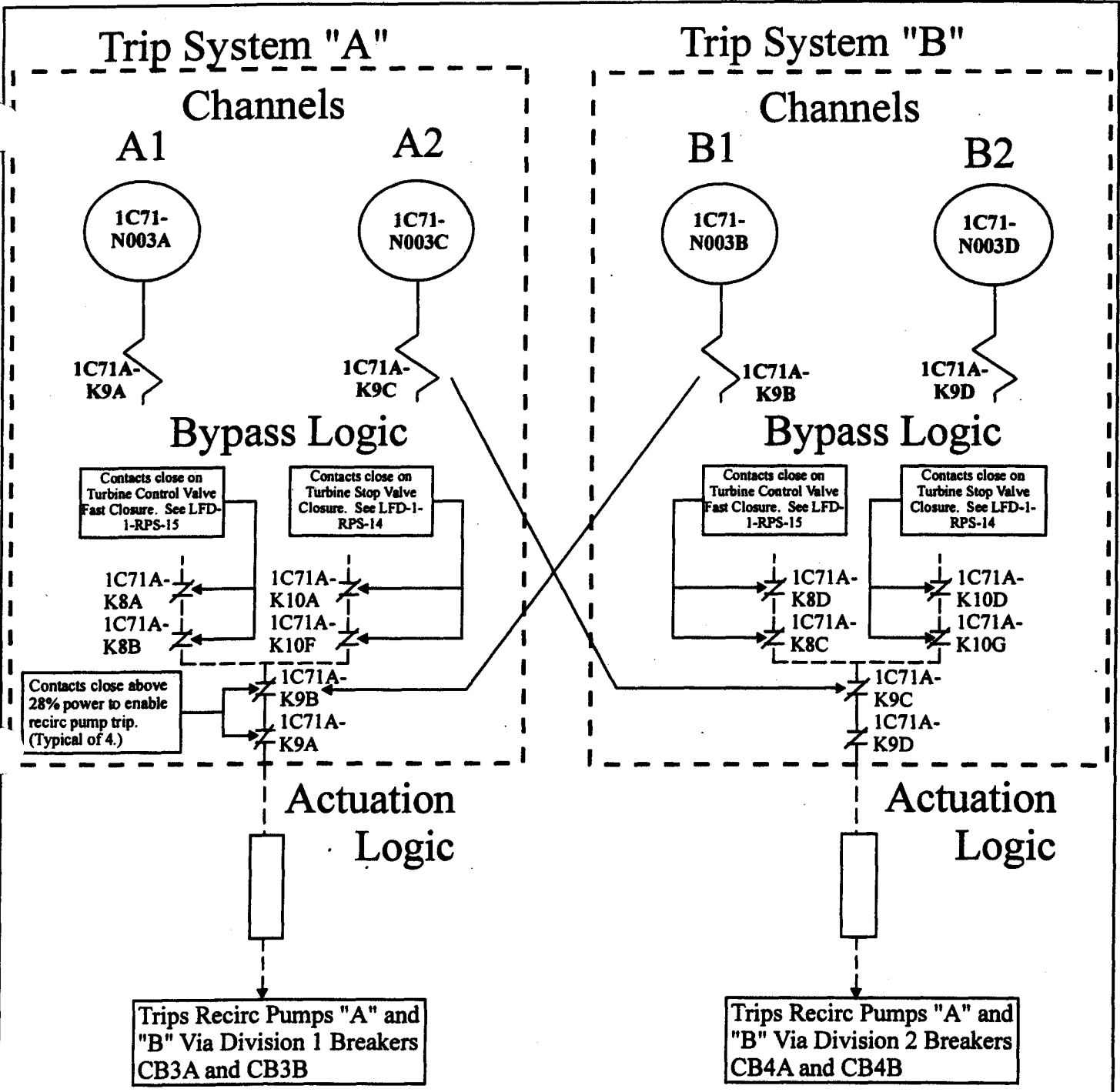
Minimum Channel Requirements for System Trip Capability:
 In order to maintain ATWS-RPT trip capability of the Recirc Pumps on a Reactor Steam Dome Pressure-High signal, channels in one of the following combinations must be either operable or maintained in the tripped condition.

A1 and B1
 OR
 A2 and B2

LFD-1-RPT-04
TS 3.3.4.2.b, ATWS-RPT, Reactor Steam Dome Pressure-High
Rev. 1
08/29/2016

Elem. Ref.
H-17860 H-19822
H-17861 H-19825
H-17902 H-42173
H-17903

Prepared by: *Janice S. Bailey/Model B*
 Reviewed by: *Timothy Collins*



Minimum Channel Requirements to Maintain Trip Capability:

In order to maintain the capability to trip the recirc pump breakers above 28 percent power on Turbine Stop Valve closure or Turbine Control Valve fast closure, channels in one of the following combinations must be either operable or circuit continuity otherwise maintained..

- A1 and B1
- OR
- A2 and B2

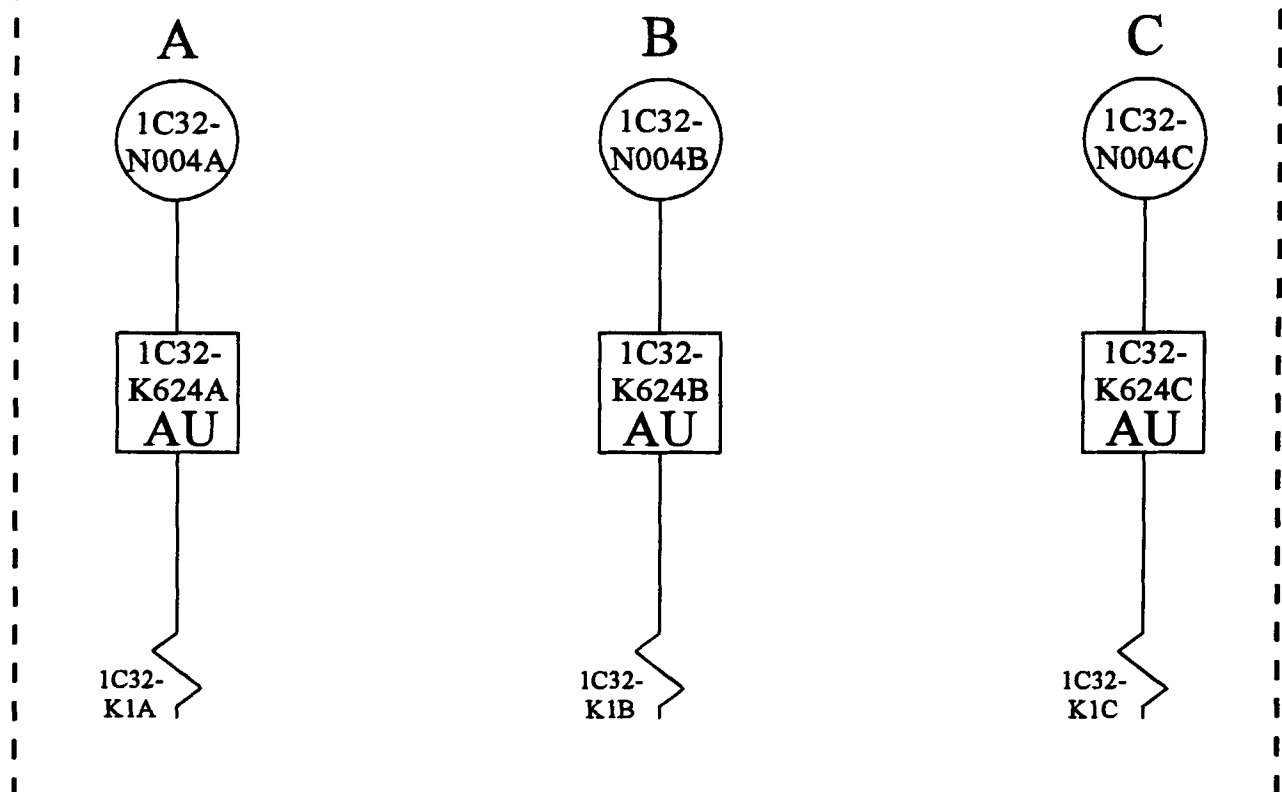
Elem. Ref.
H-13444 H-13445
H-17789 H-17790
H-17822

Prepared By: *[Signature]*
Reviewed By: *[Signature]*

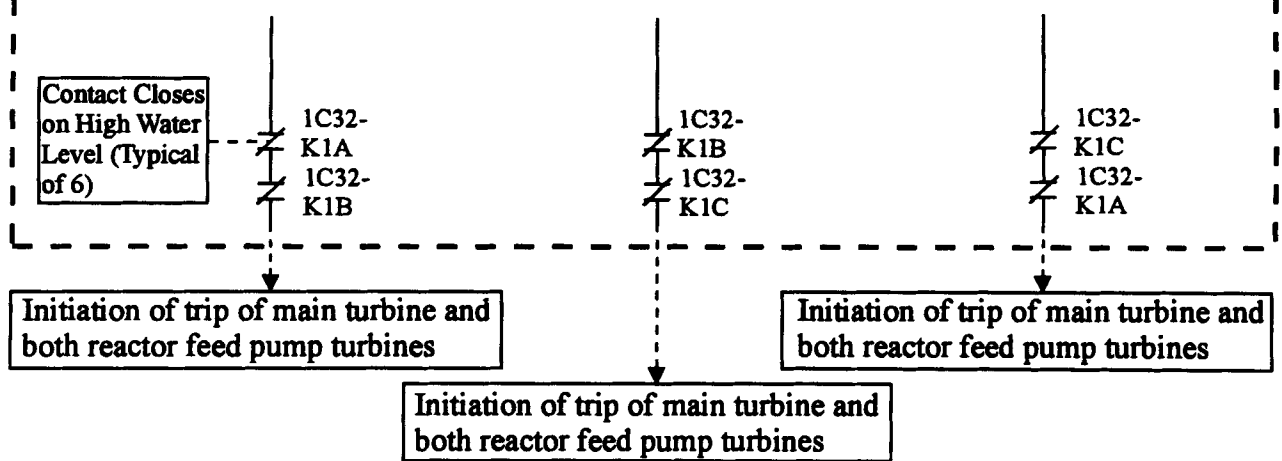
LFD-1-RPT-05
TS SR 3.3.4.1.2
EOC-RPT Instrumentation
Bypass Below 28 Percent Power
TRM Rev. 33

Trip System

Channels



Trip Logic



Minimum Channel Requirements for System Initiation Capability:

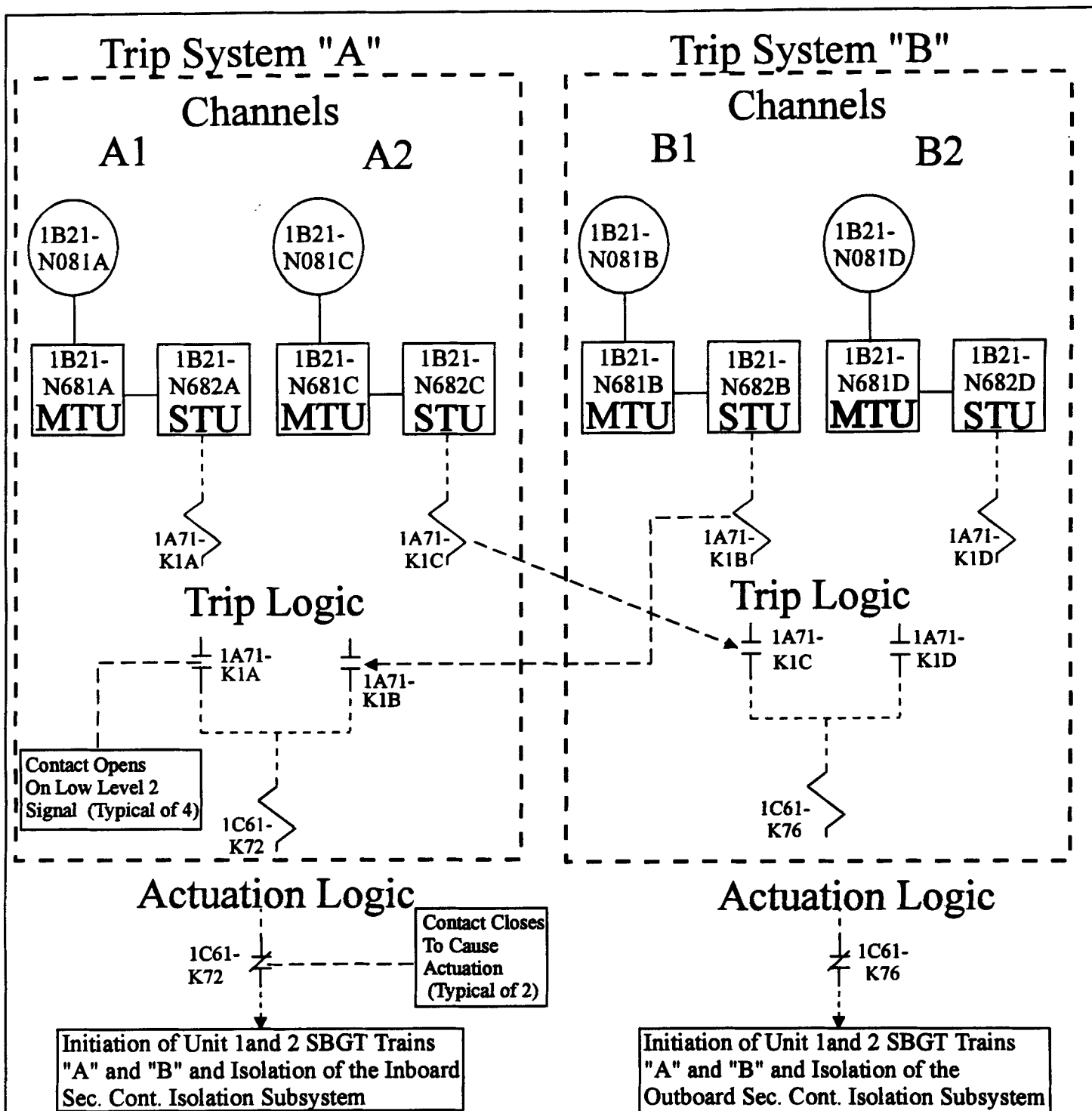
In order to maintain the capability to trip the main turbine and the reactor feed pump turbines on high reactor water level, channels in one of the following combinations must be either operable or maintained in the tripped condition.

Elem. Ref.
H-17842
H-17845

- A and B
- OR
- B and C
- OR
- A and C

Prepared By: *[Signature]*
 Reviewed By: *[Signature]*

LFD-1-RWLH-01
TS 3.3.2.2
Feedwater and Main Turbine
Trip High Water Level
Instrumentation
Rev. 0
1/16/95



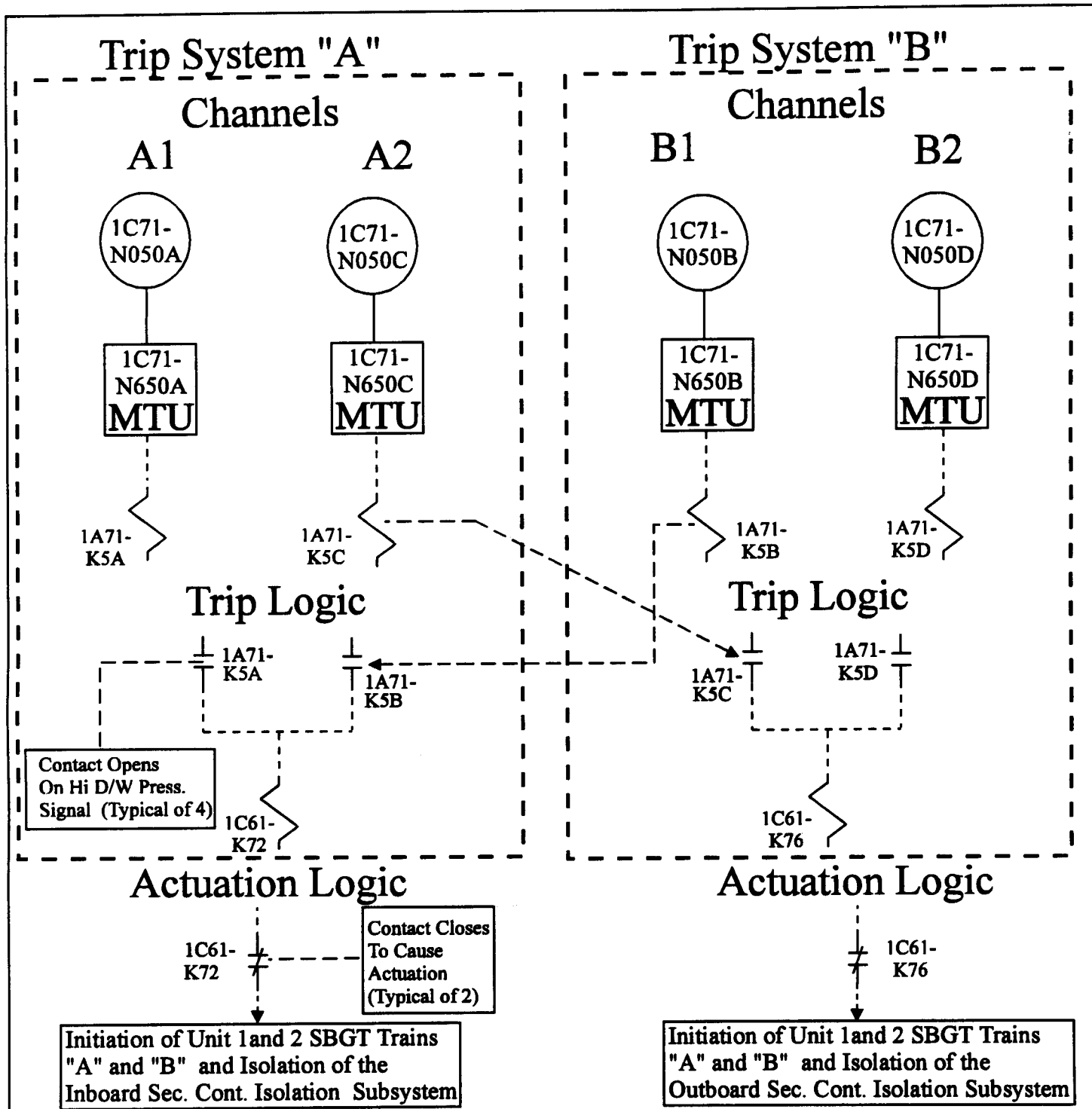
Minimum Channel Requirements for System Isolation/Initiation Capability:

In order to maintain Secondary Containment isolation capability and SGBT initiation capability on a Reactor Vessel Water Level-Low Low, Lvl. 2 signal, channels in one of the following combinations must be either operable or maintained in the tripped condition.

Elem. Ref.			A1 and B1 OR A2 and B2	LFD-1-SCIS-01
H-17053	H-17810	H-19815		TS 3.3.6.2-1, Item 1
H-17104	H-17811	H-19818		Reactor Vessel Water
H-17804	H-19809	H-27761		Level-Low Low, Lvl.2
H-17805	H-19812	H-27767		Rev. 0

Prepared By: *J.A. Bruno*
 Review: *[Signature]*

10/19/94



Minimum Channel Requirements for System Isolation/Initiation Capability:

In order to maintain Secondary Containment isolation capability and SBTG initiation capability on a Drywell Pressure - High signal, channels in one of the following combinations must be operable or maintained in the tripped condition.

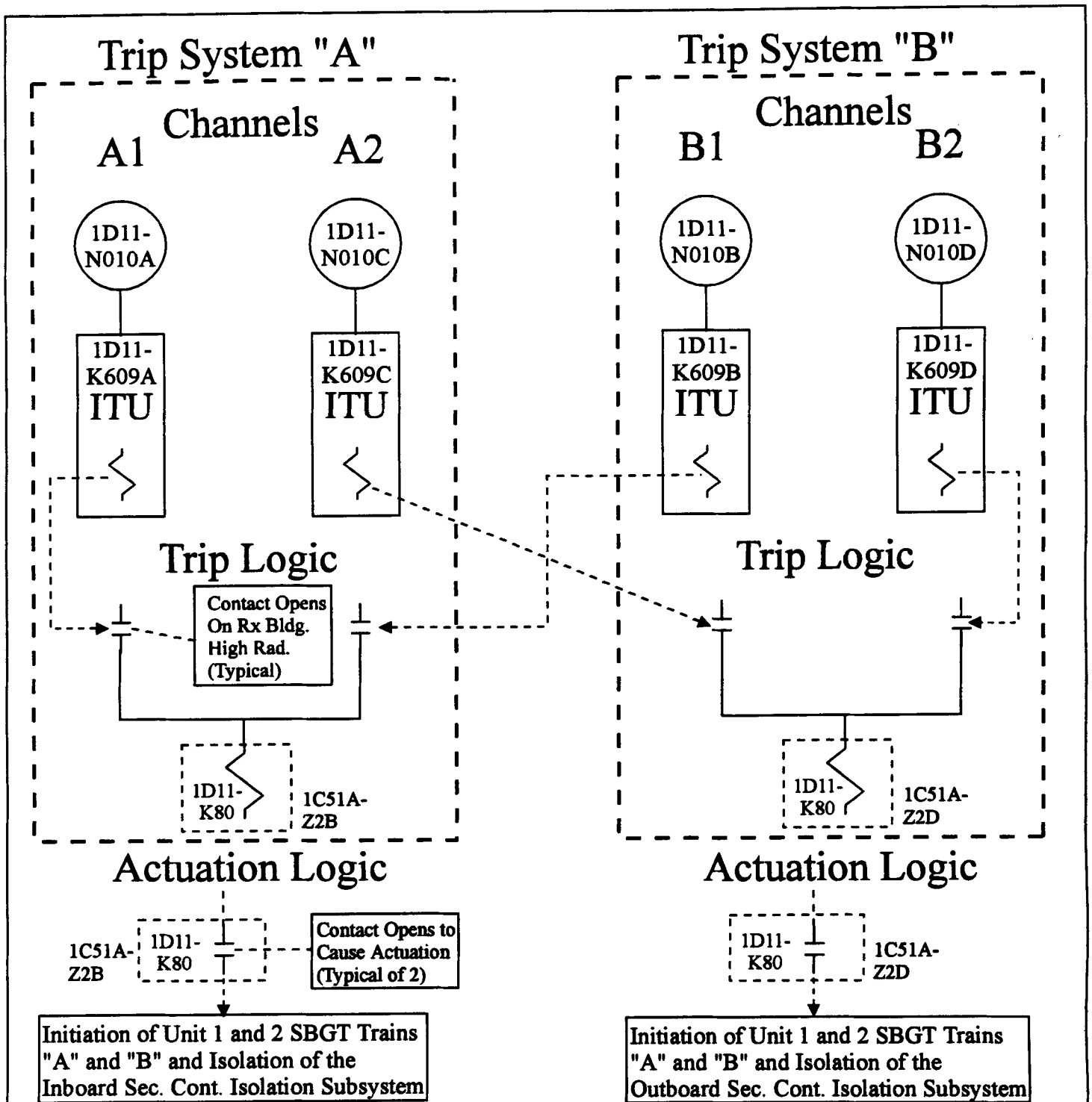
Elem. Ref.			
H-17053	H-17810	H-19809	H-27761
H-17104	H-17811	H-19812	H-27767
H-17804	H-17789	H-19815	
H-17805	H-17790	H-19818	

A1 and B1
OR
A2 and B2

Prepared By: *S.H. Gunn*
Reviewed By: *[Signature]*

LFD-1-SCIS-02
TS 3.3.6.2-1, Item 2
Drywell Pressure - High
Rev. 0

10/20/94



Minimum Channel Requirements for System Isolation/Initiation Capability:

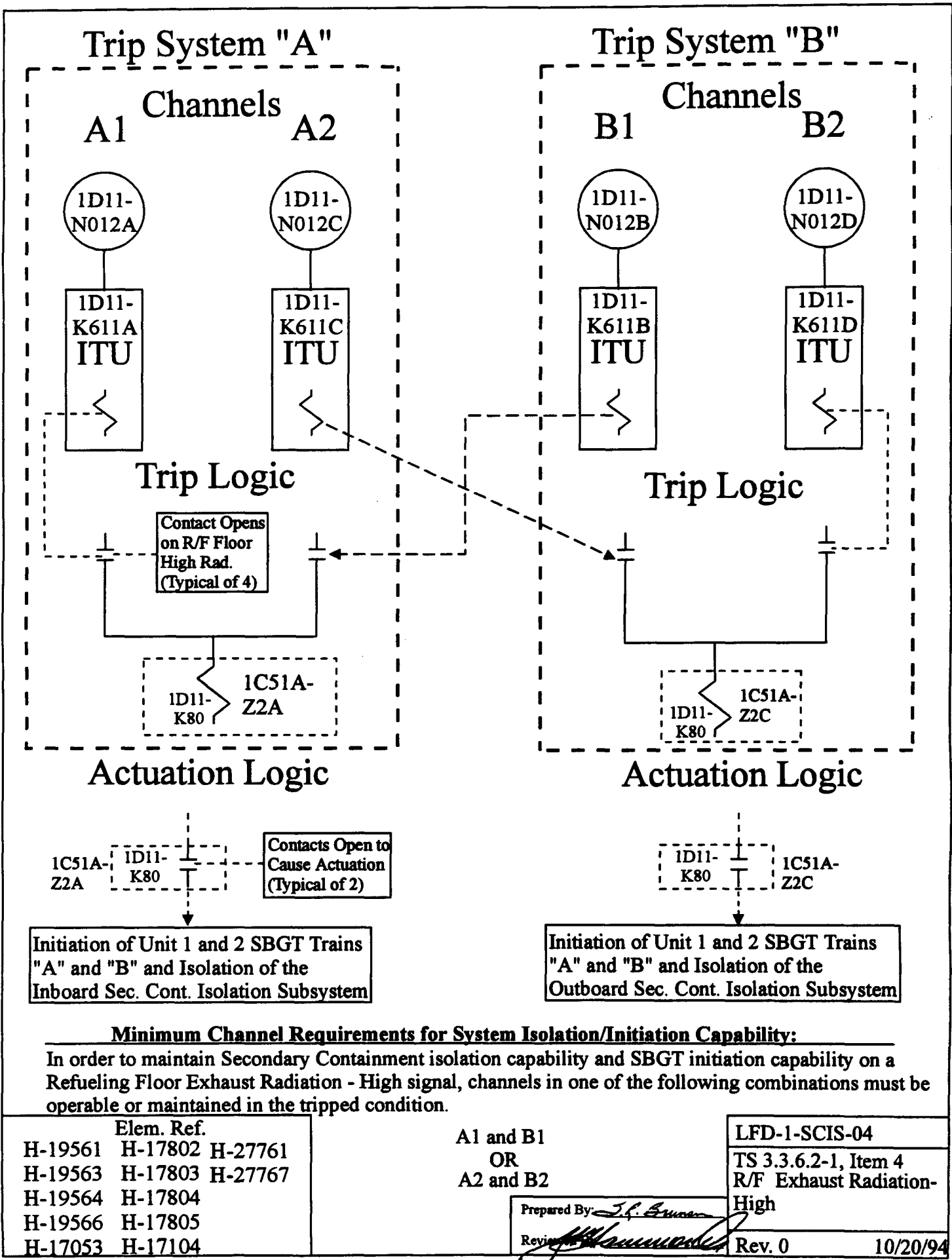
In order to maintain Secondary Containment isolation capability and SBTG initiation capability on a Reactor Building Exhaust Radiation - High signal, channels in one of the following combinations must be operable or maintained in the tripped condition.

Elem. Ref.		
H-19561	H-17053	H-17805
H-19563	H-17802	H-17104
H-19564	H-17803	H-27761
H-19566	H-17804	H-27767

A1 and B1
OR
A2 and B2

Prepared By: *S.R. Bruner*
Reviewed By: *[Signature]*

LFD-1-SCIS-03
TS 3.3.6.2-1, Item 3
Secondary Containment
Isolation, Rx. Building
Exhaust Radiation- High
Rev. 0
10/20/94



T 12.0 Safety Function Determination Program

1.0 Introduction

This document outlines the Plant Hatch Safety Function Determination Program (SFDP), provides guidance for evaluating the impact of failure to meet multiple Technical Specifications (TS) Limiting Conditions for Operation (LCOs), and gives appropriate actions for a loss of safety function. The SFDP is required by TS Section 5.5.10.

2.0 Loss of Safety Function

2.1 Background

LCO 3.0.2 directs that if an LCO is not met, its associated Required Actions shall be performed. LCO 3.0.6 provides exception to LCO 3.0.2 for a supported system, structure, or component (SSC) by allowing only the support SSC LCO Actions to be performed if the supported SSC is inoperable solely because its support SSC is inoperable.

If a support SSC is inoperable and a loss of safety function does not exist, the Required Actions for the support SSC address the Condition, and the supported SSC Required Actions do not have to be performed. This recognizes that the plant may no longer satisfy single failure criteria and that all of the supported SSC may not meet the definition of OPERABILITY. Appropriate compensation is made by performance of the support system Required Actions.

2.2 Use of LCO 3.0.6

Upon determination that a TS required support SSC is inoperable, the decision may be made to use LCO 3.0.6 for the supported SSCs. A loss of safety function determination shall be performed using the flow chart shown in **Attachment 1** as a guide. **Attachment 2** provides examples of appropriate determinations. The allowances given by LCO 3.0.6 can be taken only if **no loss of safety function exists**.

2.3 Actions for a Loss of Safety Function

If a loss of safety function is determined to exist by this program, the appropriate Conditions and Required Actions of the LCO in which the loss of safety function exists are required to be entered. These may be the Required Actions specified for the loss of safety function or LCO 3.0.3.

2.4 SSC OPERABILITY

OPERABILITY determinations precede entry into the SFDP and thus, are not a direct part of the SFDP. OPERABILITY of an SSC is determined using the definition given in TS 1.1, along with the guidance of SR 3.0.1. When equipment that is not addressed in TS is degraded or nonconforming, the impact on TS SSC OPERABILITY shall also be assessed.

3.0 Guidance for Safety Function Determination

TS 5.5.10 states that a loss of safety function exists when, assuming no concurrent single failure, a safety function assumed in the accident analyses cannot be performed. For the purpose of this program a “**graduated**” **approach** may be taken for determining the “safety function” of the supported SSC. This approach, detailed below, is graduated from most to least conservative. Even if the least conservative method is used, the requirements of TS 5.5.10 will be met. In determining whether a loss of safety function has occurred, **at least one** of these methods **must be used**.

- Method 1: Redundant Train^(a)

For this method, the safety function is assumed to be the system function. Confirm the OPERABILITY of the corresponding redundant supported SSC(s).

If one or more of the redundant SSCs are found to be inoperable, a loss of safety function may exist. The appropriate actions for a loss of function **may** be taken or alternatively, one of the following methods may be used.

- Method 2: LCO Function

In certain cases, multiple systems with diverse individual functions are specified under one LCO statement; i.e., in one TS. For these, the safety function may be considered to be broader than the individual system function--it is the TS LCO function, not the system function.

An example of this is the TS for “ECCS Operating,” in which four different systems are included. In this case, the function as stated in the Bases, “... to cool the core during a LOCA,” may be the safety function to be considered in the SFDP.

If a loss of LCO function is determined to exist, the appropriate actions for a loss of safety function **may** be taken. Alternatively, the following method may be used.

^(a) The term “train” may be interchanged with “subsystem” or “division.”

- Method 3: Safety Analysis

In this approach, the function of the SSC in the FSAR accident analyses is considered to be the safety function. If the SSC in question is not credited in the analyses, or if the accident function it performs is intact, then no loss of safety function exists. However, if the function is lost, then the actions for a loss of safety function **must** be taken.

4.0 Additional Requirements and Information

4.1 Non-TS SSCs

A situation may exist where a TS support SSC provides support to an SSC not addressed in TS, which may in turn support a supported SSC addressed in TS. The interrelationships between TS and non-TS support and supported SSCs shall be considered in the loss of safety function determination.

4.2 Subsequent Inoperabilities

While taking the Required Actions of the support SSC as allowed by LCO 3.0.6, the impact of subsequent additional SSC inoperabilities on previous SFDP evaluations shall be considered.

5.0 Extending Supported SCS Completion Times

5.1 Singular Support SSC Inoperability

When entering the supporting SSC Required Actions as allowed by LCO 3.0.6, the Completion Times for the supported SSCs might potentially be extended longer than their allowed Required Action Completion Times if they are shorter than those of the support SSC. If there is no loss of safety function, it is acceptable to extend the Completion Time of the supported SSC an amount equal to but not exceeding the Completion Time of its support SSC.

5.2 Multiple Support SSC Inoperabilities

Once a supported SSC LCO is not met solely based on a support SSC inoperability, subsequent support SSC inoperabilities have additional limitations. This is to ensure that the supported LCO will not be in a situation of not being met for an inappropriate amount of time.

Provided there is no loss of function, the Required Actions of the support SSC Condition(s) continue to apply to each additional failure, with Completion Times based on initial entry into the particular support SSC Condition. However, when a subsequent support SSC is discovered to be inoperable or not within limits, the overall time that the supported SSC LCO is not met shall be limited to the more restrictive of either:

- a. The first support SSC Completion Time, plus an additional 24 hours; or

- b. The subsequent support SSC Completion Time as measured from discovery of the subsequent inoperability.

To apply this Completion Time extension, two criteria must first be met. The subsequent support SSC inoperability.

- a. Must exist concurrently with the first inoperability; and
- b. Must remain inoperable or not within limits after the first inoperability is resolved.

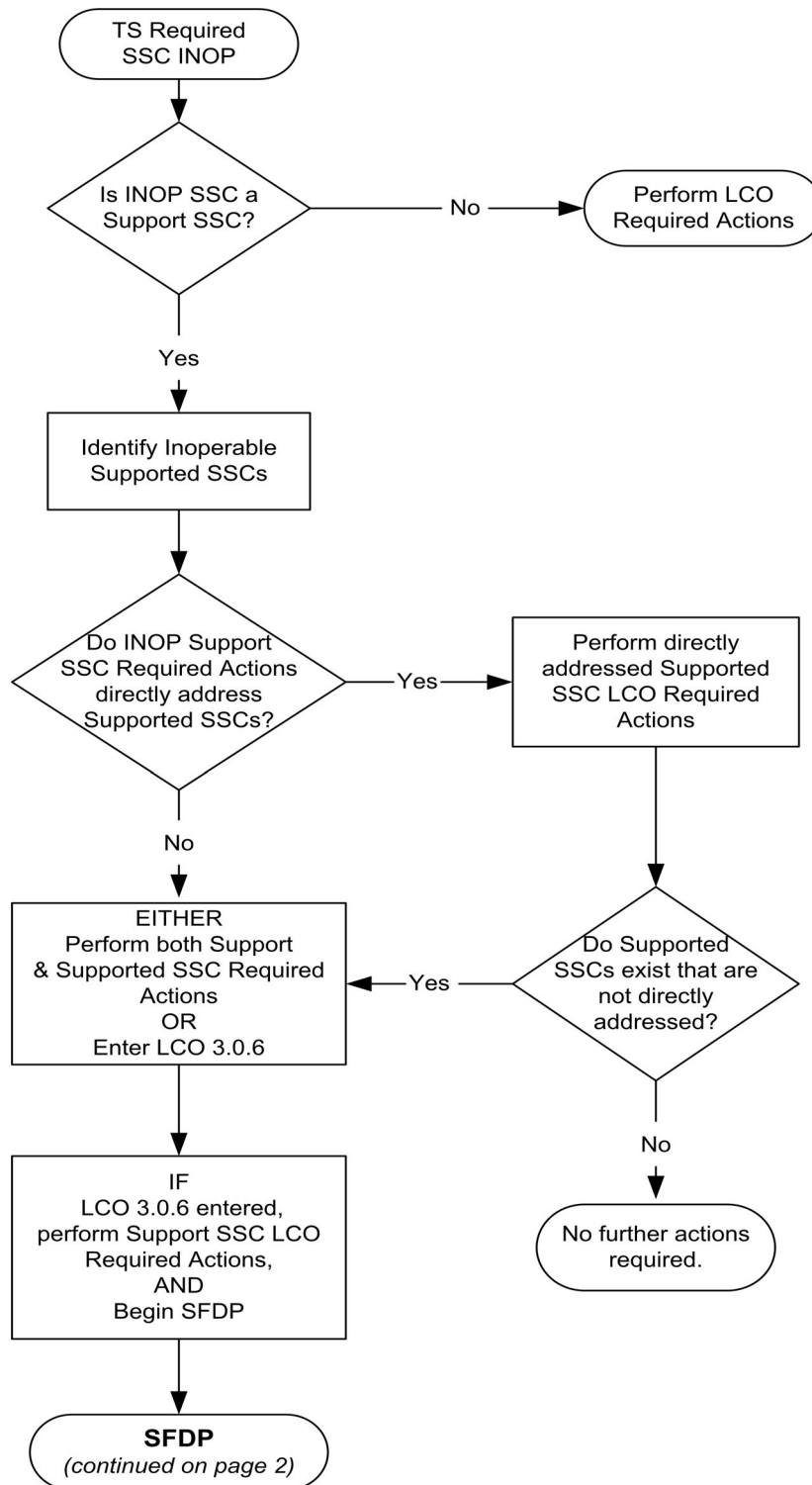
Should this extended Completion Time expire with the subsequent support SSC remaining inoperable or not within limits, the Completion Time for the subsequent support SSC inoperable Condition shall be considered expired. The Required Actions defined for that Condition shall be entered.

Examples regarding Completion Time tracking are included in **Attachment 2**.

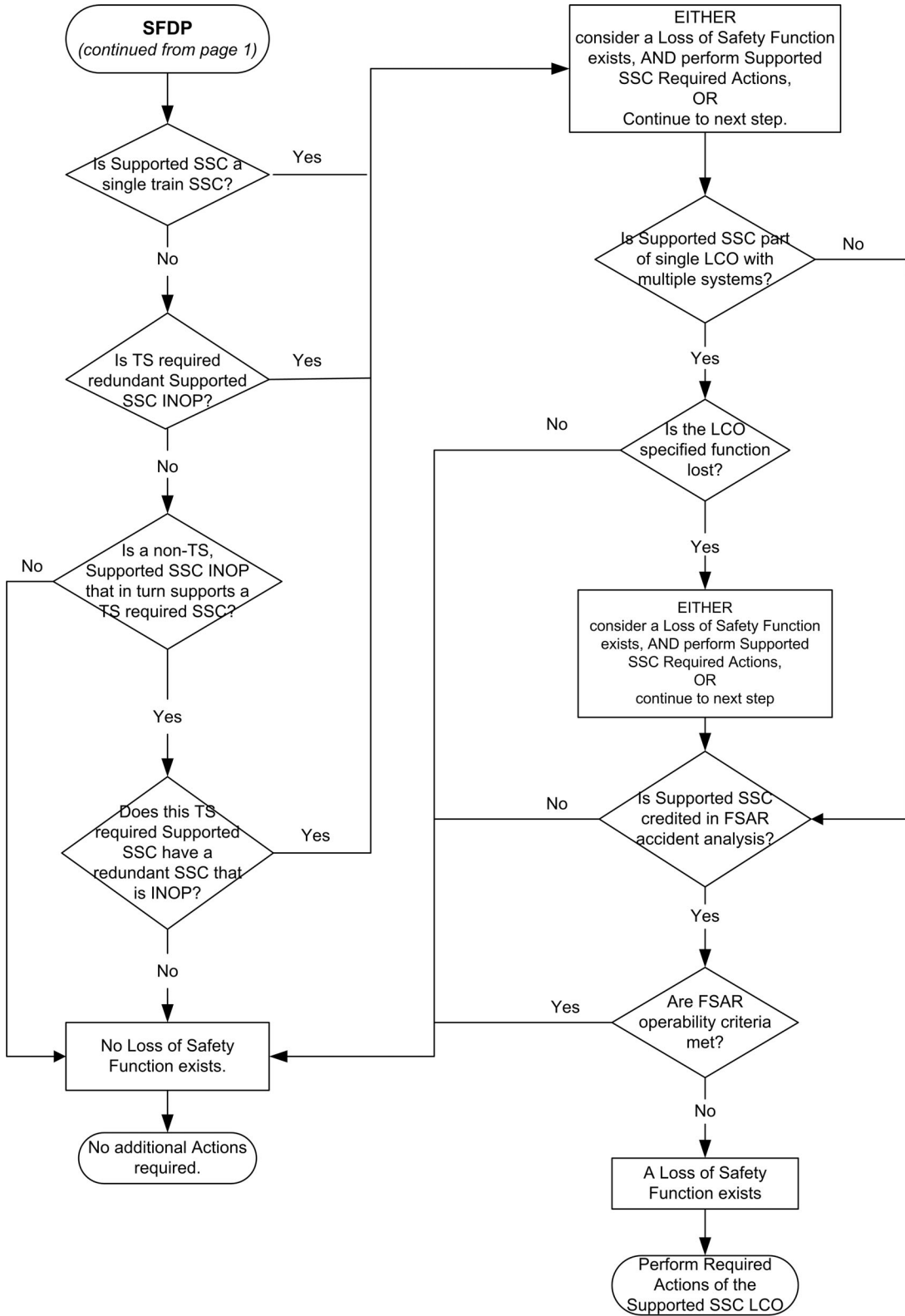
6.0 Conclusions Regarding the Use of LCO 3.0.6

The exception permitted by LCO 3.0.6 is justified as follows. The actions necessary to ensure safe operation of the plant are specified in the support SSC LCO Required Actions and the SFDP requires evaluation of loss of safety function. The SFDP directs that appropriate actions be taken if a loss of safety function exists. This approach eliminates the confusion and inconsistency associated with entry into multiple LCO Conditions and Required Actions.

ATTACHMENT 1 (Sheet 1 of 2)



ATTACHMENT 1 (Sheet 2 of 2)



ATTACHMENT 2

SCENARIO NO. 1: At 0100, with Unit 2 in RUN, the Unit 2 4160V "F" bus (a.k.a. swing bus) is determined to be inoperable. No other TS SSC inoperabilities exist.

The 4160V F bus is a support SSC, addressed by TS LCO 3.8.7. Required Action C requires restoring the bus to OPERABLE status within 8 hours.

The following is the loss of function determination for the supported systems:

- RHR Pumps 2C and 2D: For LCO 3.5.1, because Core Spray, ADS, and HPCI are OPERABLE, no loss of safety function exists.
- RHR Pumps 2C and 2D: For LCO 3.6.2.3, suppression pool cooling is not considered inoperable because only one pump per subsystem is required.
- RHR Pumps 2C and 2D: For LCO 3.6.2.4, suppression pool spray is not considered inoperable because only one pump per subsystem is required.
- RHR Pump 2C: For LCO 3.7.1, because the other subsystem is OPERABLE, no loss of safety function exists.
- PSW Pumps 2C and 2D: For LCO 3.7.2, because PSW can perform its safety function with one pump per subsystem, no loss of safety function exists.
- CRD Pump 2B: This is a non-TS SSC, but it supports control rods, TS LCO 3.1.3. With redundant CRD pumps operable, the safety function of the control rods is not affected.
- Diesel Bldg. MCC 1B (1R24S026): This is part of the 4160V F bus subsystem, addressed by TS 3.8.7. This supports distribution cabinet 1K (1R24S030) and ultimately the DG 1B. The DG 1B is inoperable, and LCO 3.8.1 Condition B required several different actions with Completion Times ranging from 1 hour to 7 days. With redundant DGs OPERABLE, no loss of safety function exists.

Conclusions: No loss of safety function exists. LCO 3.0.6 may be entered with a completion time of 8 hours to restore the inoperable bus to OPERABLE status, beginning at 0100.

SCENARIO NO. 2: At 0500, with Unit 2 in RUN, Reactor Vessel Water Level-Low Low Low (Level 1) channels A, B, and C are determined to be inoperable. This leaves only channel D operable.

This instrumentation supports ECCS by providing initiation for Core Spray, LPCI and ADS; and, also, supports initiation of the DGs and isolation of the PSW Turbine Building valves. Since all these supported functions require at least two channels, entry must be made into the Required Actions for LCO 3.3.5.1.

These Actions directly specify declaring supported features inoperable (due to loss of initiation capability in both Divisions). As stated in LCO 3.0.6, when the support SSC Required Actions provide direction for supported SSCs, the applicable supported SSC Conditions and Required Actions shall be entered. This effectively precludes the use of LCO 3.0.6 in determining the completion time for the supported SSCs.

Conclusions: The LCO 3.3.5.1 Required Actions should be performed, as well as those for all the inoperable supported systems. The SFDP will not be entered, because LCO 3.0.6 cannot be used.

SCENARIO NO. 4-A: At 0100, with Unit 2 in MODE 1, the Unit 2 RHRSW "A" Pump becomes inoperable. The RHRSW crosstie valves are tagged for maintenance. No other TS SSC inoperabilities exist.

The RHRSW system is a support SSC, addressed by TS LCO 3.7.1. Required Action A for one inoperable RHRSW pump is to restore the pump to OPERABLE status within 30 days. The bases for this specification state that an RHRSW subsystem is considered operable when 2 pumps are OPERABLE with an OPERABLE flow path. With the "A" pump inoperable, the "A" subsystem of RHRSW is inoperable.

The following is the loss of function determination for the supported systems:

RHR Suppression Pool Cooling: LCO 3.6.2.3 requires two subsystems to be OPERABLE for suppression pool cooling. The Bases for this LCO state that an RHR suppression pool cooling subsystem is OPERABLE with one RHR pump, the heat exchanger, and associated piping. Therefore, the inoperability of RHRSW subsystem "A" causes suppression pool cooling subsystem "A" to be inoperable. This is Condition A, with a Required Action Completion Time of 7 days. However, because suppression pool cooling subsystem "B" is OPERABLE, no loss of safety function exists. The Completion Time for suppression pool cooling may be extended to 30 days (from the time of discovery of RHRSW pump "A" being inoperable; i.e., 0100).

RHR Suppression Pool Spray: LCO 3.6.2.4 requires 2 subsystems to be OPERABLE for suppression pool spray. The Bases for this LCO state that an RHR suppression pool spray subsystem is OPERABLE with one RHR pump, the heat exchanger, and associated piping. Therefore, the inoperability of RHRSW subsystem "A" causes suppression pool spray subsystem "A" to be inoperable. This is Condition A, with a Required Action Completion Time of 7 days. However,

because subsystem “B” is operable, no loss of safety function exists. The Completion Time for suppression pool spray may be extended to 30 days.

SCENARIO 4-B: At 29 days, 2 hours after the initial inoperability of RHRSW pump “A,” with the pump remaining inoperable, RHRSW pump “C” is found to be inoperable. At 29 days 6 hours, RHR SW pump “A” is restored to OPERABLE status. RHRSW pump “C” remains inoperable.

With the second RHRSW pump inoperability, Condition C has been entered for LCO 3.7.1. Note that the Completion Time “clock” for Condition A is “still running.” Condition C requires that the RHRSW subsystem be restored to OPERABLE status within 7 days. The two SSCs supported by RHRSW continue to have their “B” subsystems OPERABLE, so no loss of safety function exists.

When the RHRSW pump “A” is restored to OPERABLE status, the LCO 3.7.1 Condition C is exited, but the Condition A clock is “still running” due to the inoperability of RHRSW pump “C”. Under the provisions of Section 1.3 of the Technical Specifications, the Completion Time for RHRSW pump “C” is 31 days from the initial inoperability, i.e., the inoperability of pump “A.” Therefore, the Completion Times for the supported SSCs may also be extended to 31 days measured from the same starting point.

TECHNICAL REQUIREMENTS MANUAL
APPENDIX C
HNP UNITS 1 AND 2
OFFSITE DOSE CALCULATION MANUAL SPECIFICATIONS

ACTIVE PAGE LIST

<u>Page</u>	<u>Version No.</u>
2-1	28
2-2	28
2-3	28
2-4	28
2-5	28
2-6	28
3-1	28
3-2	28
3-3	28
3-4	28
3-5	28
3-6	28
3-7	28
3-8	28
3-9	28
10-1	28
10-2	28
10-3	28
10-4	28
10-5	28
10-6	28
10-7	28

CHAPTER 2

LIQUID EFFLUENTS

2.1 LIMITS OF OPERATION

The following Liquid Effluent Controls implement requirements established by Technical Specifications Section 5.0. Terms printed in all capital letters are defined in Chapter 10.

2.1.1 Liquid Effluent Monitoring Instrumentation Control

In accordance with Technical Specification 5.5.4.a, the radioactive liquid effluent monitoring instrumentation channels shown in Table 2-1 shall be OPERABLE with their alarm/trip setpoints set to ensure that the limits specified in Section 2.1.2 are not exceeded. The alarm/trip setpoints of these channels shall be determined in accordance with Section 2.3.

2.1.1.1 Applicability

As shown in Table 2-1.

2.1.1.2 Actions

With a radioactive liquid effluent monitoring instrumentation channel alarm/trip setpoint less conservative than required by the above control, immediately suspend the release of radioactive liquid effluents monitored by the affected channel, declare the channel inoperable, or change the setpoint to a conservative value.

With less than the minimum number of radioactive liquid effluent monitoring instrumentation channels OPERABLE, take the ACTION shown in Table 2-1. NOTE: One instrument channel may be inoperable for up to 6 hours to perform required surveillances prior to entering other applicable ACTIONS. Otherwise, restore the inoperable instrumentation to OPERABLE status within 30 days and, if unsuccessful, explain in the next Radioactive Effluent Release Report, per Technical Specification 5.6.3, why this inoperability was not corrected in a timely manner.

Entry into an Operational Mode or other specified CONDITION shall be made if, as a minimum, the requirements of Technical Specifications LCO 3.0.4 are met.

2.1.1.3 Surveillance Requirements

Each radioactive liquid effluent monitoring instrumentation channel shall be demonstrated OPERABLE by performance of the CHANNEL CHECK, SOURCE CHECK, CHANNEL CALIBRATION, and CHANNEL FUNCTIONAL TEST operations at the frequencies shown in Table 2-2.

2.1.1.4 Basis

The radioactive liquid effluent instrumentation is provided to monitor and control, as applicable, the releases of radioactive materials in liquid effluents during actual or potential releases of liquid effluents. The Alarm/Trip Setpoints for these instruments shall be calculated and adjusted in accordance with the methodology and parameters in Section 2.3 to ensure that the alarm/trip will occur prior to exceeding the limits of Section 2.1.2. The OPERABILITY and use of this instrumentation is consistent with the requirements of General Design Criteria 60, 63, and 64 of Appendix A to 10 CFR Part 50.

Table 2-1 Radioactive Liquid Effluent Monitoring Instrumentation

Instrument	OPERABILITY Requirements ^a		
	Minimum Channels OPERABLE	Applicability ^b	ACTION
1. Gross Radioactivity Monitors Providing Automatic Termination of Release			
Liquid Radwaste Effluent Line	1	(1)	100
2. Gross Radioactivity Monitors not Providing Automatic Termination of Release			
Service Water System Effluent Line	1	(2)	101
3. Flowrate Measurement Devices^c			
a. Liquid Radwaste Effluent Line	1	(1)	102
b. Discharge Canal	1	(1), (2)	102
4. Differential Pressure Measurement Devices			
Service Water System to Closed Cooling Water System	1	At all times	103
5. Groundwater Outfall Instrumentation			
a. Auto Sampler at Y22N008A	1	At all times	104
b. Flow Totalizer at Y22N008A	1	At all times	105

- a. All requirements in this Table apply to each unit.
- b. Applicability of requirements is as follows:
 (1) Whenever the radwaste discharge valves are not locked closed.
 (2) Whenever the Service Water System pressure is below the Closed Cooling Water System pressure, or ΔP indication is not available.
- c. Pump curves may be used to estimate flow; in such cases, ACTION statement 102 is not required.

Table 2-1 (contd) Notation for Table 2-1 - ACTION Statements

ACTION 100 - With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases may continue provided that prior to initiating a release:

- a. At least two independent samples are analyzed in accordance with Section 2.1.2.3, and
- b. At least two technically qualified individuals independently verify the discharge line valving and verify the release rate calculations.

Otherwise, suspend release of radioactive effluents via this pathway. If the channel remains inoperable for over 30 days, an explanation of the circumstances must be included in the next Radioactive Effluent Release Report.

ACTION 101 - With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue, provided that once per shift grab samples are collected and analyzed for gross radioactivity at a MINIMUM DETECTABLE CONCENTRATION no higher than 1×10^{-7} $\mu\text{Ci}/\text{mL}$. If the channel remains inoperable for over 30 days, an explanation of the circumstances must be included in the next Radioactive Effluent Release Report.

ACTION 102 - With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue, provided that the flowrate is estimated at least once per 4 hours during actual releases. If the channel remains inoperable for over 30 days, an explanation of the circumstances must be included in the next Radioactive Effluent Release Report.

ACTION 103 - With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, assure that the Service Water System effluent monitor is OPERABLE.

ACTION 104 – With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, obtain daily grab samples and composite for weekly tritium, monthly gamma, and quarterly Sr 89/90 analyses.

ACTION 105 – With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, estimate outfall flow rate daily. If the channel remains inoperable for over 30 days, an explanation of the circumstances must be included in the next Radioactive Effluent Release Report.

Table 2-2 Radioactive Liquid Effluent Monitoring Instrumentation Surveillance Requirements

INSTRUMENT	Surveillance Requirements ^a			
	CHANNEL CHECK	SOURCE CHECK	CHANNEL CALIBRATION	CHANNEL FUNCTIONAL TEST
1. Gross Radioactivity Monitors Providing Automatic Termination of Release				
Liquid Radwaste Effluent Line	D ^b	P ^e	R	SA ^c
2. Gross Radioactivity Monitors not Providing Automatic Termination of Release				
Service Water System Effluent Line	D ^b	Q	R	SA ^f
3. Flowrate Measurement Devices				
a. Liquid Radwaste Effluent Line	D ^{b,d}	NA	18 M	SA
b. Discharge Canal	D ^{b,d}	NA	18 M	SA
4. Differential Pressure Measurement Devices				
Service Water System to Closed Cooling Water System	D	NA	R	NA
5. Groundwater Outfall Instrumentation				
a. Auto Sampler at Y22N008A	W ^g	NA	NA	NA
b. Flow Totalizer at Y22N008A	W ^g	NA	NA	NA

- a. All requirements in this Table apply to each unit.
- b. During releases via this pathway.
- c. In addition to the basic functions of a CHANNEL FUNCTIONAL TEST (Section 10.2), the CHANNEL FUNCTIONAL TEST shall also demonstrate that automatic isolation of this pathway and control room alarm annunciation occur if any of the following conditions exists:
 - (1) Instrument indicates measured levels above the alarm/trip setpoint;
 - (2) Instrument indicates an isolation on high alarm; or
 - (3) Instrument controls are not set in operate mode.
- d. CHANNEL CHECK shall consist of verifying indication of flow during periods of release. CHANNEL CHECK shall be made at least once daily on any day on which CONTINUOUS, periodic, or BATCH releases are made.
- e. The SOURCE CHECK shall consist of verifying that the instrument is reading on scale.

Table 2-2 (contd) Notation for Table 2-2 - Surveillance Requirements

- f. In addition to the basic functions of a CHANNEL FUNCTIONAL TEST (Section 10.2), the CHANNEL FUNCTIONAL TEST shall also demonstrate that control room alarm annunciation occurs if any of the following conditions exists:
- (1) Instrument indicates measured levels above the alarm setpoint;
 - (2) Instrument indicates a downscale failure; or
 - (3) Instrument controls are not set in operate mode.
- g. CHANNEL CHECK shall consist of verifying indication of operability at least once weekly during sample collection.

CHAPTER 3

GASEOUS EFFLUENTS

3.1 LIMITS OF OPERATION

The following Limits of Operation implement requirements established by Technical Specifications Section 5.0. Terms printed in all capital letters are defined in Chapter 10.

3.1.1 Gaseous Effluent Monitoring Instrumentation Control

In accordance with Technical Specification 5.5.4., the radioactive gaseous effluent monitoring instrumentation channels shown in Table 3-1 shall be OPERABLE with their alarm/trip setpoints set to ensure that the limits of Section 3.1.2.a are not exceeded. The alarm/trip setpoints of these channels shall be determined in accordance with Section 3.3.

3.1.1.1 Applicability

These limits apply as shown in Table 3-1.

3.1.1.2 Actions

With a radioactive gaseous effluent monitoring instrumentation channel alarm/trip setpoint less conservative than required by the above control, immediately suspend the release of radioactive gaseous effluents monitored by the affected channel, declare the channel inoperable, or restore the setpoint to a value that will ensure that the limits of Section 3.1.2.a are met.

With less than the minimum number of radioactive gaseous effluent monitoring instrumentation channels OPERABLE, take the ACTION shown in Table 3-1. NOTE: One instrument channel may be inoperable for up to 6 hours to perform required surveillances prior to entering other applicable ACTIONS. Otherwise, restore the inoperable instrumentation to OPERABLE status within 30 days and, if unsuccessful, explain in the next Radioactive Effluent Release Report, per Technical Specification 5.6.3, why this inoperability was not corrected in a timely manner.

Entry into an Operational Mode or other specified CONDITION shall be made if, as a minimum, the requirements of Technical Specifications LCO 3.0.4 are met.

3.1.1.3 Surveillance Requirements

Each radioactive gaseous effluent monitoring instrumentation channel shall be demonstrated OPERABLE by performance of the CHANNEL CHECK, SOURCE CHECK, CHANNEL CALIBRATION, and CHANNEL FUNCTIONAL TEST operations at the frequencies shown in Table 3-2.

3.1.1.4 Basis

The radioactive gaseous effluent instrumentation is provided to monitor and control, as applicable, the releases of radioactive materials in gaseous effluents during actual or potential releases of gaseous effluents. The Alarm/Trip Setpoints for these instruments shall be calculated and adjusted in accordance with the methodology and parameters in Section 3.3 to ensure that the alarm/trip will occur prior to exceeding the limits of Section 3.1.2.a. The OPERABILITY and use of this instrumentation is consistent with the requirements of General Design Criteria 60, 63, and 64 of Appendix A to 10 CFR Part 50.

Table 3-1 Radioactive Gaseous Effluent Monitoring Instrumentation

Instrument	Minimum Channels OPERABLE	Applicability	ACTION
1. Reactor Building Vent Stack Monitoring System (Each Unit)			
a. Noble Gas Activity Monitor ^c (1D11-K619 A & B / 2D11-K636 A & B)	1	(a)	105
b. Iodine Sampler Cartridge	1	(a)	107
c. Particulate Sampler Filter	1	(a)	107
d. Effluent System Flowrate Measurement Device	1	(a)	104
e. Sampler Flowrate Measurement Device	1	(a)	104
2. Recombiner Building Ventilation Monitoring System			
a. Noble Gas Activity Monitor ^c (1D11-R763 A & B)	1	(a)	105
b. Iodine Sampler Cartridge	1	(a)	107
c. Particulate Sampler Filter	1	(a)	107
d. Effluent System Flowrate Measurement Device	1	(a)	104
e. Sampler Flowrate Monitor	1	(a)	104
3. Main Stack Monitoring System			
a. Noble Gas Activity Monitor ^c (1D11-K600 A & B)	1	(a)	105
b. Iodine Sampler Cartridge	1	(a)	107
c. Particulate Sampler Filter	1	(a)	107
d. Effluent System Flowrate Measurement Device	1	(a)	104
e. Sampler Flowrate Measurement Device	1	(a)	104
4. Condenser Offgas Pretreatment Monitor (Each Unit)			
a. Noble Gas Activity Monitor (1D11-K601 & K602 / 2D11-K601 & K602)	1	(b)	108

- a. During radioactive releases via this pathway.
- b. During operation of the main condenser air ejector.

Table 3-1 (contd) Notation for Table 3-1.

- c. Monitor must be capable of responding to a MINIMUM DETECTABLE CONCENTRATION of 1×10^{-4} $\mu\text{Ci/mL}$.

ACTION 104 - With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue provided the flowrate is estimated at least once per 4 hours. If the number of channels OPERABLE remains less than required by the minimum channels OPERABLE requirement for over 30 days, an explanation of the circumstances shall be included in the next Radioactive Effluent Release Report.

ACTION 105 - With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue provided grab samples are taken at least once per 12 hours and these samples are analyzed for gross activity within 24 hours. With the number of main stack monitoring system channels OPERABLE less than required by the minimum channels OPERABLE requirement, immediately suspend drywell purge. If the number of channels OPERABLE remains less than required by the minimum channels OPERABLE requirement for over 30 days, an explanation of the circumstances shall be included in the next Radioactive Effluent Release Report.

ACTION 107 - With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue, provided samples are continuously collected with auxiliary equipment for periods on the order of 7 days and analyzed within 48 hours after the end of the sampling period. If the number of channels OPERABLE remains less than required by the minimum channels OPERABLE requirement for over 30 days, an explanation of the circumstances shall be included in the next Radioactive Effluent Release Report.

ACTION 108 - With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue provided:

- a. The offgas treatment system is not bypassed; and
- b. The offgas post-treatment monitor (D11-K615) or the main stack monitor (D11-K600) is OPERABLE; and
- c. Perform Technical Specification SR 3.7.6.1 every 4 hours.

Otherwise, enter Condition "A" of Technical Specification LCO 3.7.6.

If the number of channels OPERABLE remains less than required by the minimum channels OPERABLE requirement for over 30 days, an explanation of the circumstances shall be included in the next Radioactive Effluent Release Report.

Table 3-2 Radioactive Gaseous Effluent Monitoring Instrumentation Surveillance Requirements

INSTRUMENT	CHANNEL CHECK	SOURCE CHECK	CHANNEL CALIBRATION	CHANNEL FUNCTIONAL TEST
1. Reactor Building Vent Stack Monitoring System (Each Unit)				
a. Noble Gas Activity Monitor (1D11-K619 A & B / 2D11-K636 A & B)	D ^a	Q	R	SA ^c
b. Iodine Sampler Cartridge	W ^{a,d}	NA	NA	NA
c. Particulate Sampler Filter	W ^{a,d}	NA	NA	NA
d. Effluent System Flowrate Measuring Device	D ^a	NA	R	SA
e. Sampler Flowrate Measuring Device	D ^a	NA	R	SA
2. Recombiner Building Ventilation Monitoring System				
a. Noble Gas Activity Monitor (1D11-R763 A & B)	D ^a	Q	R	SA ^c
b. Iodine Sampler Cartridge	W ^{a,d}	NA	NA	NA
c. Particulate Sampler Filter	W ^{a,d}	NA	NA	NA
d. Effluent System Flowrate Measuring Device	D ^a	NA	R	SA
e. Sampler Flowrate Measuring Device	D ^a	NA	R	SA
3. Main Stack Monitoring System				
a. Noble Gas Activity Monitor (1D11-K600 A and B)	D ^a	Q	R	SA ^c
b. Iodine Sampler Cartridge	W ^{a,d}	NA	NA	NA
c. Particulate Sampler Filter	W ^{a,d}	NA	NA	NA
d. Effluent Flowrate Monitor	D ^a	NA	R	SA
e. Sampler Flowrate Monitor	D ^a	NA	R	SA
4. Condenser Offgas Pretreatment Monitor (Each Unit)				
a. Noble Gas Activity Monitor (1D11-K601 & K602 / 2D11-K601 & K602)	D ^b	Q	R	SA ^c

- a. Requirement applies during releases via this pathway.
- b. Requirement applies during operation of the main condenser air ejector.

Table 3-2 (contd) Notation for Table 3-2.

- c. In addition to the basic functions of a CHANNEL FUNCTIONAL TEST (Section 10.2), the CHANNEL FUNCTIONAL TEST shall also demonstrate that control room alarm annunciation occurs if any of the following conditions exists:
 - (1) Instrument indicates measured levels above the alarm/trip setpoint.
 - (2) Circuit failure occurs.
 - (3) Instrument indicates a downscale failure.

- d. The CHANNEL CHECK shall consist of verifying sampler flow and the presence of the collection device (i.e., particulate filter or charcoal cartridge, etc.) at the weekly changeout.

3.1.2 Gaseous Effluent Dose Rate Control

In accordance with Technical Specifications 5.5.4.c and 5.5.4.g, the licensee shall conduct operations so that the dose rates due to radioactive materials released in gaseous effluents from the site to areas at and beyond the SITE BOUNDARY (see Figure 10-1) are limited as follows:

- a. For noble gases: Less than or equal to a dose rate of 500 mrem/y to the total body and less than or equal to a dose rate of 3000 mrem/y to the skin, and
- b. For Iodine-131, Iodine-133, tritium, and for all radionuclides in particulate form with half-lives greater than 8 days: Less than or equal to a dose rate of 1500 mrem/y to any organ.

3.1.2.1 Applicability

This limit applies at all times.

3.1.2.2 Actions

With a dose rate due to radioactive material released in gaseous effluents exceeding the limit stated in Section 3.1.2, immediately decrease the release rate to within the stated limit.

Entry into an Operational Mode or other specified CONDITION shall be made if, as a minimum, the requirements of Technical Specifications LCO 3.0.4 are met.

3.1.2.3 Surveillance Requirements

The dose rates due to radioactive materials in areas at or beyond the SITE BOUNDARY due to releases of gaseous effluents shall be determined to be within the above limits, in accordance with the methods and procedures in Section 3.4.1, by obtaining representative samples and performing analyses in accordance with the sampling and analysis program specified in Table 3-3.

3.1.2.4 Basis

This control is provided to ensure that gaseous effluent dose rates will be maintained within the limits that historically have provided reasonable assurance that radioactive material discharged in gaseous effluents will not result in a dose to a MEMBER OF THE PUBLIC in an UNRESTRICTED AREA, either within or outside the SITE BOUNDARY, exceeding the limits specified in Appendix I of 10 CFR Part 50, while allowing operational flexibility for effluent releases. For MEMBERS OF THE PUBLIC who may at times be within the SITE BOUNDARY, the occupancy of the MEMBER OF THE PUBLIC will be sufficiently low to compensate for any increase in the atmospheric diffusion factor above that for the SITE BOUNDARY.

The dose rate limit for Iodine-131, Iodine-133, tritium, and radionuclides in particulate form with half-lives greater than 8 days specifically applies to dose rates to a child via the inhalation pathway.

This control applies to the release of gaseous effluents from all reactors at the site.

Table 3-3 Radioactive Gaseous Waste Sampling and Analysis Program

Gaseous Release Type	Sampling and Analysis Requirements ^a			
	Sampling FREQUENCY	Minimum Analysis FREQUENCY	Type of Activity Analysis	MINIMUM DETECTABLE CONCENTRATION (MDC) ($\mu\text{Ci/mL}$)
Environmental Release Points 1. Main Stack 2. Reactor Building Vent (Each Unit) 3. Recombiner Building Vent ^b	M ^c Grab Sample	M ^c	PRINCIPAL GAMMA EMITTERS H-3	1 E-4 1 E-6
	CONTINUOUS ^e	W ^d Charcoal or Silver Zeolite Sample	I-131 I-133	1 E-12 1 E-10
	CONTINUOUS ^e	W ^d Particulate Sample	PRINCIPAL GAMMA EMITTERS	1 E-11
	CONTINUOUS ^e	M COMPOSITE Particulate Sample	Gross Alpha	1 E-11
	CONTINUOUS ^e	Q COMPOSITE Particulate Sample	Sr-89, Sr-90	1 E-11

- a. Terms printed in all capital letters are defined in Chapter 10. When unusual circumstances result in a MINIMUM DETECTABLE CONCENTRATION higher than required, the reasons shall be documented in the next Radioactive Effluent Release Report.
- b. The Recombiner Building Vent serves Unit 1. Sample analysis results and associated source terms must be assigned to Unit 1 for the purpose of release accountability and dose calculations.
- c. Sampling and analyses for PRINCIPAL GAMMA EMITTERS shall also be performed following shutdown, startup, or a THERMAL POWER change exceeding 15% of the RATED THERMAL POWER within a one-hour period. The more frequent sampling and analysis requirement applies only if analysis shows that the DOSE EQUIVALENT I-131 concentration in the primary coolant and the Main Stack Noble Gas Activity Monitor reading have both increased by a factor of 3.

Table 3-3 (contd) Notation for Table 3-3

- d. Sampling shall be performed weekly, and analyses completed within 48 hours of changing (or after removal from sampler). Sampling shall also be performed once per 24 hours for 7 days following each shutdown, startup, or a THERMAL POWER change exceeding 15% of the RATED THERMAL POWER within a one-hour period, with analyses completed within 48 hours of changing. When samples collected for 24 hours are analyzed, the corresponding MINIMUM DETECTABLE CONCENTRATIONS may be increased by a factor of 10. The more frequent sampling and analysis requirement applies only if analysis shows that the DOSE EQUIVALENT I-131 concentration in the primary coolant and the Main Stack Noble Gas Activity Monitor reading have both increased by a factor of 3.
- e. The ratio of the sample flowrate to the sampled stream flowrate shall be known for the time period covered by each dose or dose rate calculation made in accordance with controls specified in Sections 3.1.2, 3.1.3, and 3.1.4.

CHAPTER 10

DEFINITIONS OF EFFLUENT CONTROL TERMS

The terms defined in this chapter are used in the presentation of the above chapters. These terms are shown in all capital letters to indicate that they are specifically defined.

10.1 TERMS SPECIFIC TO THE ODCM

The following terms are used in the ODCM, but are not found in the Technical Specifications:

BATCH RELEASE

A BATCH RELEASE is the discharge of wastes of a discrete volume. Prior to sampling for analyses, each liquid batch shall be isolated and then thoroughly mixed by a method described in the ODCM to assure representative sampling.

COMPOSITE SAMPLE

A COMPOSITE SAMPLE is one which contains material from multiple waste releases, in which the quantity of sample is proportional to the quantity of waste discharged, and in which the method of sampling employed results in a specimen that is representative of the wastes released. Prior to analyses, all liquid samples that are to be aliquotted for a COMPOSITE SAMPLE shall be mixed thoroughly, in order for the COMPOSITE SAMPLE to be representative of the effluent release.

When assessing the consequences of a waste release at the pre-release or post-release stage, the most recent available COMPOSITE SAMPLE results for the applicable release pathway may be used.

CONTINUOUS RELEASE

A CONTINUOUS RELEASE is the discharge of wastes of a non-discrete volume, e.g., from a volume within a system that has an input flow during the continuous release.

FREQUENCY NOTATION

The FREQUENCY NOTATION specified for the performance of surveillance requirements shall correspond to the intervals defined below, with a maximum allowable extension not to exceed 25% of the surveillance interval.

<u>NOTATION</u>	<u>FREQUENCY</u>
S (Once per shift)	At least once per 12 hours.
D (Daily)	At least once per 24 hours.
W (Weekly)	At least once per 7 days.
M (Monthly)	At least once per 31 days.
Q (Quarterly)	At least once per 92 days.
SA (Semi-annually)	At least once per 184 days.
18M	At least once per 18 months.
R (Refueling)	At least once per 24 months.
S/U (Startup)	Prior to each reactor startup.
NA	Not Applicable.
P (Prior)	Completed prior to each release.

GASEOUS RADWASTE TREATMENT SYSTEM

The GASEOUS RADWASTE TREATMENT SYSTEM is the offgas holdup system designed and installed to reduce radioactive gaseous effluents by collecting primary coolant system offgases from the primary system and providing for delay or holdup for the purpose of reducing the total radioactivity prior to release to the environment.

LIQUID RADWASTE TREATMENT SYSTEM

A LIQUID RADWASTE TREATMENT SYSTEM is any system designed and installed to reduce radioactive materials in liquid effluents by systematic collection, retention, and processing through filtration, evaporation, separation and/or ion exchange treatment. This system consists of at least one collection tank, one evaporator or demineralizer system, one post-treatment tank and associated components providing for treatment flow and functional control.

MAJOR CHANGES TO RADIOACTIVE WASTE TREATMENT SYSTEMS

For the purposes of the ODCM, MAJOR CHANGES TO RADIOACTIVE WASTE TREATMENT SYSTEMS include the following changes to such systems:

- (1) Major changes in process equipment, components, structures, or effluent monitoring instrumentation as described in the Final Safety Analysis Report (FSAR) or as evaluated in the Nuclear Regulatory Commission staff's Safety Evaluation Report (SER) (e.g., deletion of evaporators and installation of demineralizer);
- (2) Changes in the design of radwaste treatment systems that could significantly increase quantities of effluents released from those previously considered in the FSAR and SER;
- (3) Changes in system design which may invalidate the accident analysis as described in the SER (e.g., changes in tank capacity that would alter the curies released); or
- (4) Changes in system design that could potentially result in a significant increase in occupational exposure of operating personnel (e.g., use of temporary equipment without adequate shielding provisions).

MEMBER(S) OF THE PUBLIC¹

A MEMBER OF THE PUBLIC shall be an individual in a *controlled* area or an UNRESTRICTED AREA. However, an individual is not a MEMBER OF THE PUBLIC during any period in which the individual receives an *occupational dose*. This category may include persons who use portions of the site for recreational, occupational, or other purposes not associated with the plant.

MILK ANIMAL

A MILK ANIMAL is a cow or goat that is producing milk for human consumption.

¹ The italicized terms in this definition, which are not otherwise used in this ODCM, shall have the definitions assigned to them by 10 CFR 20.1003.

MINIMUM DETECTABLE CONCENTRATION

The MINIMUM DETECTABLE CONCENTRATION (MDC) is defined, for purposes of the controls in this ODCM, as the smallest concentration of radioactive material in a sample that will yield a net count above system background and that will be detected with 95-percent probability, with only 5-percent probability of falsely concluding that a blank observation represents a "real" signal.

For a particular measurement system, which may include radiochemical separation, the MDC for a given radionuclide is determined as follows (Reference 17):

$$MDC = \frac{\frac{2.71}{t_s} + 3.29 \sqrt{R_b \left(\frac{1}{t_s} + \frac{1}{t_b} \right)}}{E \cdot V \cdot 2.22 \times 10^6 \cdot Y \cdot e^{-\lambda \Delta t}} \quad (10.1)$$

where:

- MDC = the a priori MINIMUM DETECTABLE CONCENTRATION (μCi per unit mass or volume).
- R_b = the background counting rate, or the counting rate of a blank sample, as appropriate (counts per minute).
- t_s = the length of the sample counting period (minutes).
- t_b = the length of the background counting period (minutes).
- E = the counting efficiency (counts per disintegration)
- V = the sample size (units of mass or volume).
- 2.22×10^6 = the number of disintegrations per minute per μCi .
- Y = the fractional radiochemical yield, when applicable.
- λ = the radioactive decay constant for the given radionuclide (h^{-1}). Values of λ used in effluent calculations should be based on decay data from a recognized and current source, such as Reference 26.
- Δt = for effluent samples, the elapsed time between the midpoint of sample collection and the time of counting (h); for environmental samples, the elapsed time between the end of sample collection and the time of counting (h).

Typical values of E , V , Y , and Δt should be used in the calculation. It should be recognized that the MDC is defined as an *a priori* (before the fact) limit representing the capability of a measurement system, and not as an *a posteriori* (after the fact) limit for a particular measurement.

PRINCIPAL GAMMA EMITTERS

The PRINCIPAL GAMMA EMITTERS for which the MINIMUM DETECTABLE CONCENTRATION (MDC) limit applies include exclusively the following radionuclides:

For liquid radioactive effluents: Mn-54, Fe-59, Co-58, Co-60, Zn-65, Mo-99, Cs-134, Cs-137, and Ce-141. Ce-144 shall also be measured, but with an MDC of 5×10^{-6} $\mu\text{Ci/mL}$.

For gaseous radioactive effluents: In noble gas releases, Kr-87, Kr-88, Xe-133, Xe-133m, Xe-135, Xe-138; and in particulate releases, Mn-54, Fe-59, Co-58, Co-60, Zn-65, Mo-99, Cs-134, Cs-137, Ce-141, and Ce-144.

For environmental media: The gamma emitters specifically listed in Table 4-3.

These lists do not mean that only these nuclides are to be considered. Other gamma peaks that are identifiable, together with those of the above nuclides, shall also be analyzed and reported in the Radioactive Effluent Release Report, the Annual Radiological Environmental Operating Report, or other applicable report(s).

OPERATIONAL CONDITION

An OPERATIONAL CONDITION shall be any one inclusive combination of Mode Switch position and average reactor coolant temperature, as defined in Table 1.1-1 of the Technical Specifications.

REACTOR MODE

The REACTOR MODE is established by the Mode Switch position. The four Mode Switch positions are REFUEL, SHUTDOWN, START & HOT STANDBY, and RUN. (See Technical Specifications Table 1.1-1 for definitions of these MODES.)

SITE BOUNDARY

The SITE BOUNDARY shall be that line beyond which the land is not owned, leased or otherwise controlled by Georgia Power Company as shown in Figure 10-1.

SOURCE CHECK

A SOURCE CHECK shall be the qualitative assessment of channel response when the channel sensor is exposed to a source of increased radioactivity.

UNRESTRICTED AREA

The UNRESTRICTED AREA shall be any area access to which is neither limited nor controlled by the licensee, or any area within the SITE BOUNDARY used for residential quarters or for industrial, commercial, institutional, and/or recreational purposes.

10.2 TERMS DEFINED IN THE TECHNICAL SPECIFICATIONS

The following terms are defined in the Technical Specifications, Section 1.1. Because they are used throughout the Limits of Operation sections of the ODCM, they are presented here for convenience. In the event of discrepancies between the definitions below and those in the Technical Specifications, the Technical Specification definitions shall take precedence.

ACTIONS

ACTIONS shall be that part of a Specification that prescribes Required Actions to be taken under designated Conditions within specified Completion Times.

CHANNEL CALIBRATION

A CHANNEL CALIBRATION shall be the adjustment, as necessary, of the channel output, such that it responds within the necessary range and accuracy to known values of the parameter that the channel monitors. The CHANNEL CALIBRATION shall encompass the entire channel, including the required sensor, alarm, display, and trip functions, and shall include the CHANNEL FUNCTIONAL TEST. Calibration of instrument channels with resistance temperature detector (RTD) or thermocouple sensors may consist of an in-place qualitative assessment of sensor behavior and normal calibration of the remaining adjustable devices in the channel. The CHANNEL CALIBRATION may be performed by any means of any series of sequential, overlapping, or total channel steps so that the entire channel is calibrated.

CHANNEL CHECK

A CHANNEL CHECK shall be the qualitative assessment, by observation, of channel behavior during operation. This determination shall include, where possible, comparison of the channel indication and status to other indications or status derived from independent instrument channels measuring the same parameter.

CHANNEL FUNCTIONAL TEST

A CHANNEL FUNCTIONAL TEST shall be the injection of a simulated or actual signal into the channel as close to the sensor as practicable to verify OPERABILITY, including required alarm, interlock, display, and trip functions, and channel failure trips. The CHANNEL FUNCTIONAL TEST may be performed by means of any series of sequential, overlapping, or total channel steps so that the entire channel is tested.

DOSE EQUIVALENT I-131

DOSE EQUIVALENT I-131 shall be that concentration of I-131 EQUIVALENT (microcuries/gram) that alone would produce the same Committed I-131 Effective Dose Equivalent as the quantity and isotopic mixture of I-131, I-132, I-133, I-134, and I-135 actually present. The dose conversion factors used for this calculation shall be those listed in Federal Guidance Report (FGR) 11, "Limiting Values of Radionuclide Intake and Air Concentration and Dose Conversion Factors for Inhalation, Submersion, and Ingestion," 1988.

OPERABLE (or OPERABILITY)

A system, subsystem, division, component, or device shall be OPERABLE or have OPERABILITY when it is capable of performing its specified safety function(s) and when all necessary attendant instrumentation, controls, normal or emergency electrical power, cooling or seal water, lubrication or other auxiliary equipment that are required for the system, subsystem, division, component or device to perform its specified safety

function(s) are also capable of performing their related support function(s).

RATED THERMAL POWER

RATED THERMAL POWER shall be a total reactor core heat transfer rate to the reactor coolant of 2804 MWt.

THERMAL POWER

THERMAL POWER shall be the total reactor core heat transfer rate to the reactor coolant.

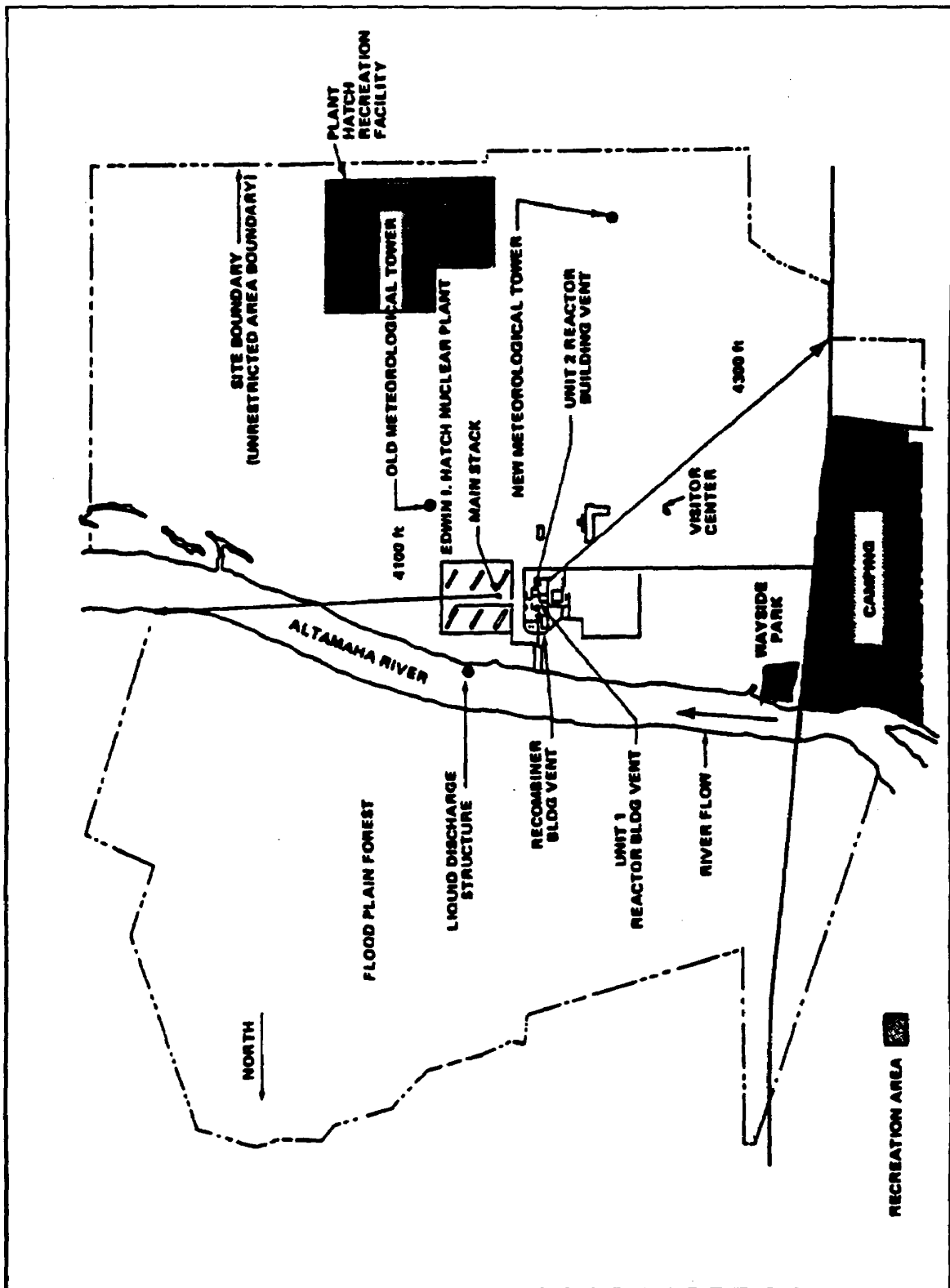


Figure 10-1 Site Map for Effluent Controls