

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

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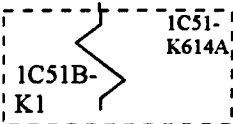
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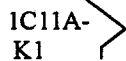
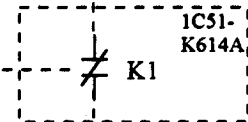
TRIP SYSTEM "A"

Channel

A



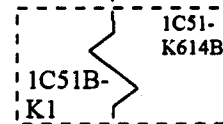
Trip Logic



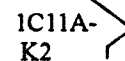
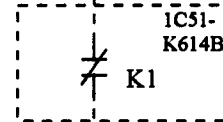
TRIP SYSTEM "B"

Channel

B

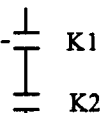


Trip Logic



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

Prepared By: *[Signature]*

Reviewed By: *[Signature]*

LFD-1-CRB-01

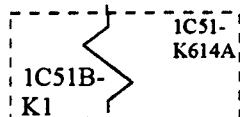
TS 3.3.2.1-1, Item 1.a
Control Rod Block,
Rod Block Monitor
Low Power
Range - Upscale

TRM Rev. 12

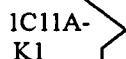
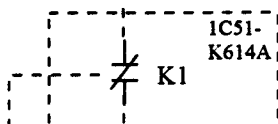
TRIP SYSTEM "A"

Channel

A



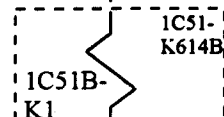
Trip Logic



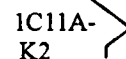
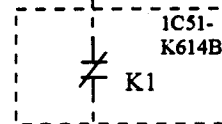
TRIP SYSTEM "B"

Channel

B

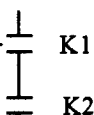


Trip Logic



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

Prepared By: *[Signature]*

Reviewed By: *[Signature]*

LFD-1-CRB-02

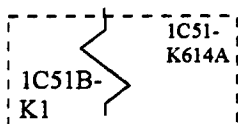
TS 3.3.2.1-1, Item 1.b
Control Rod Block,
Rod Block Monitor
Intermediate Power
Range - Upscale

TRM Rev. 12

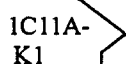
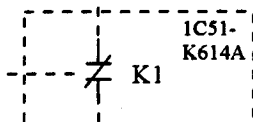
TRIP SYSTEM "A"

Channel

A



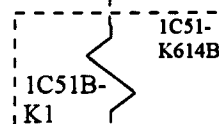
Trip Logic



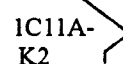
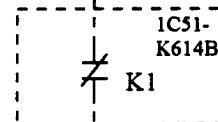
TRIP SYSTEM "B"

Channel

B

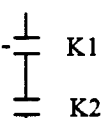


Trip Logic



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. R. R.*

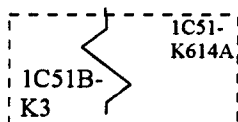
Reviewed By: *C. R. R.*

TRM Rev. 12

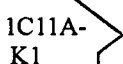
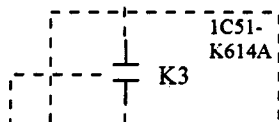
TRIP SYSTEM "A"

Channel

A



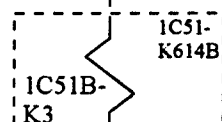
Trip Logic



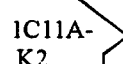
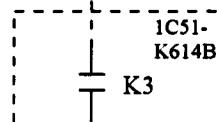
TRIP SYSTEM "B"

Channel

B

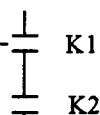


Trip Logic



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.
C-17828
I-17831
H-44709
H-44710
H-44713

Prepared By:

Reviewed By:

LFD-1-CRB-04

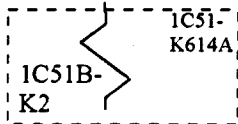
TS 3.3.2.1-1, Item 1.d
Control Rod Block,
Rod Block Monitor
Inop

TRM Rev. 12

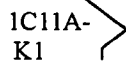
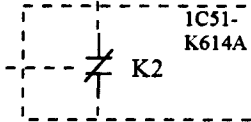
TRIP SYSTEM "A"

Channel

A



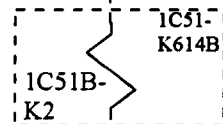
Trip Logic



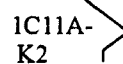
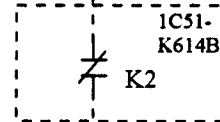
TRIP SYSTEM "B"

Channel

B

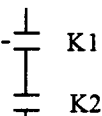


Trip Logic



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

Prepared By:

Reviewed By:

LFD-1-CRB-05

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

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:

Reyes Clark

Reviewed By:

J. P. Gunn

LFD-1-CRB-07

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

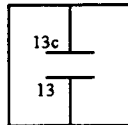
Rev. 0

12/8/94

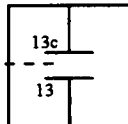
TRIP SYSTEM "A"

Channel A

Reactor Mode Switch
1C71A-S1



Trip Logic

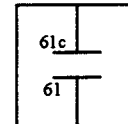


1C11-
K1

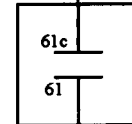
TRIP SYSTEM "B"

Channel B

Reactor Mode Switch
1C71A-S1



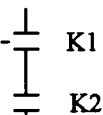
Trip Logic



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.

Elem. Ref.
H-17828
H-17831

Prepared By:

Royce Clark

Reviewed By:

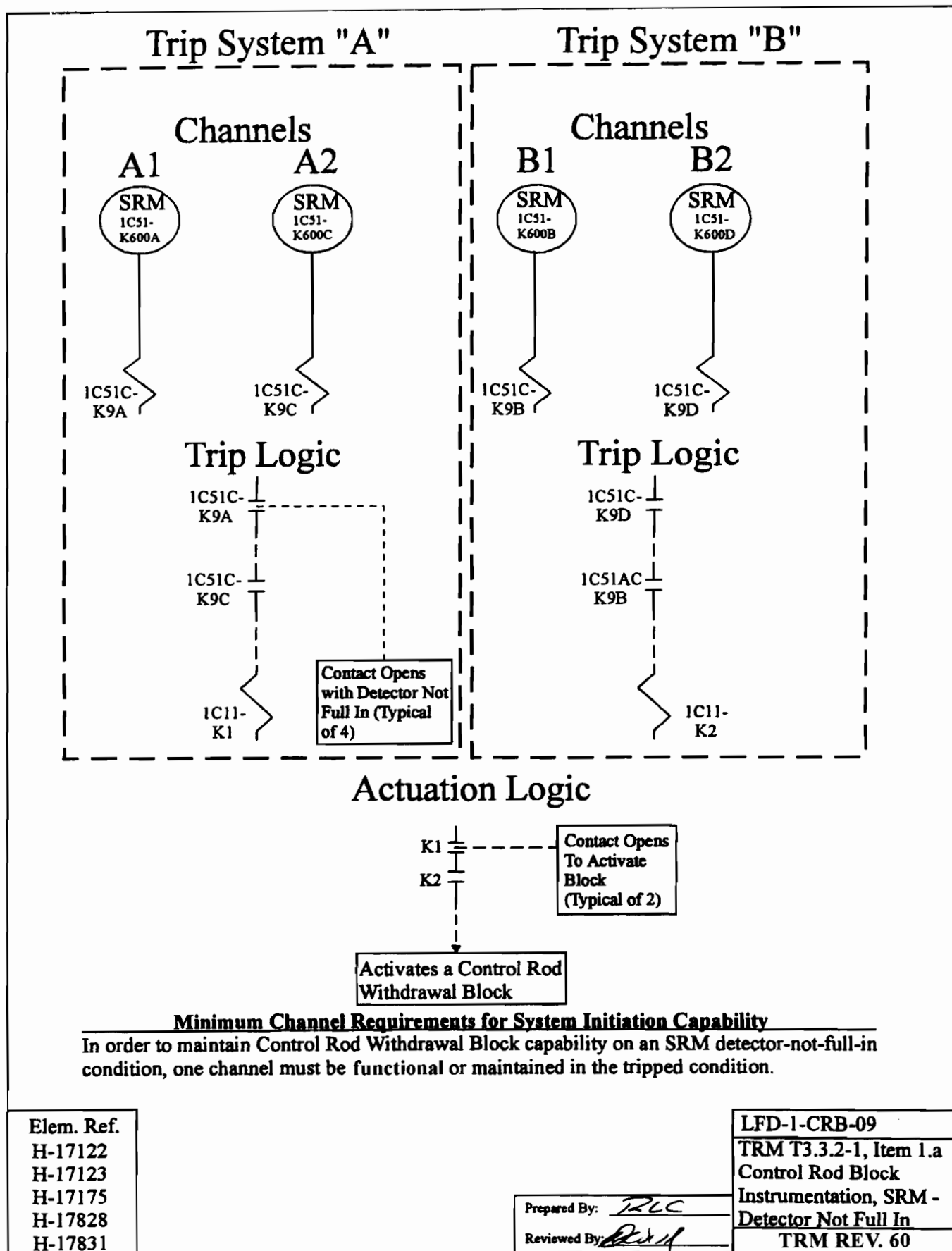
S. R. Brown

LFD-1-CRB-08

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

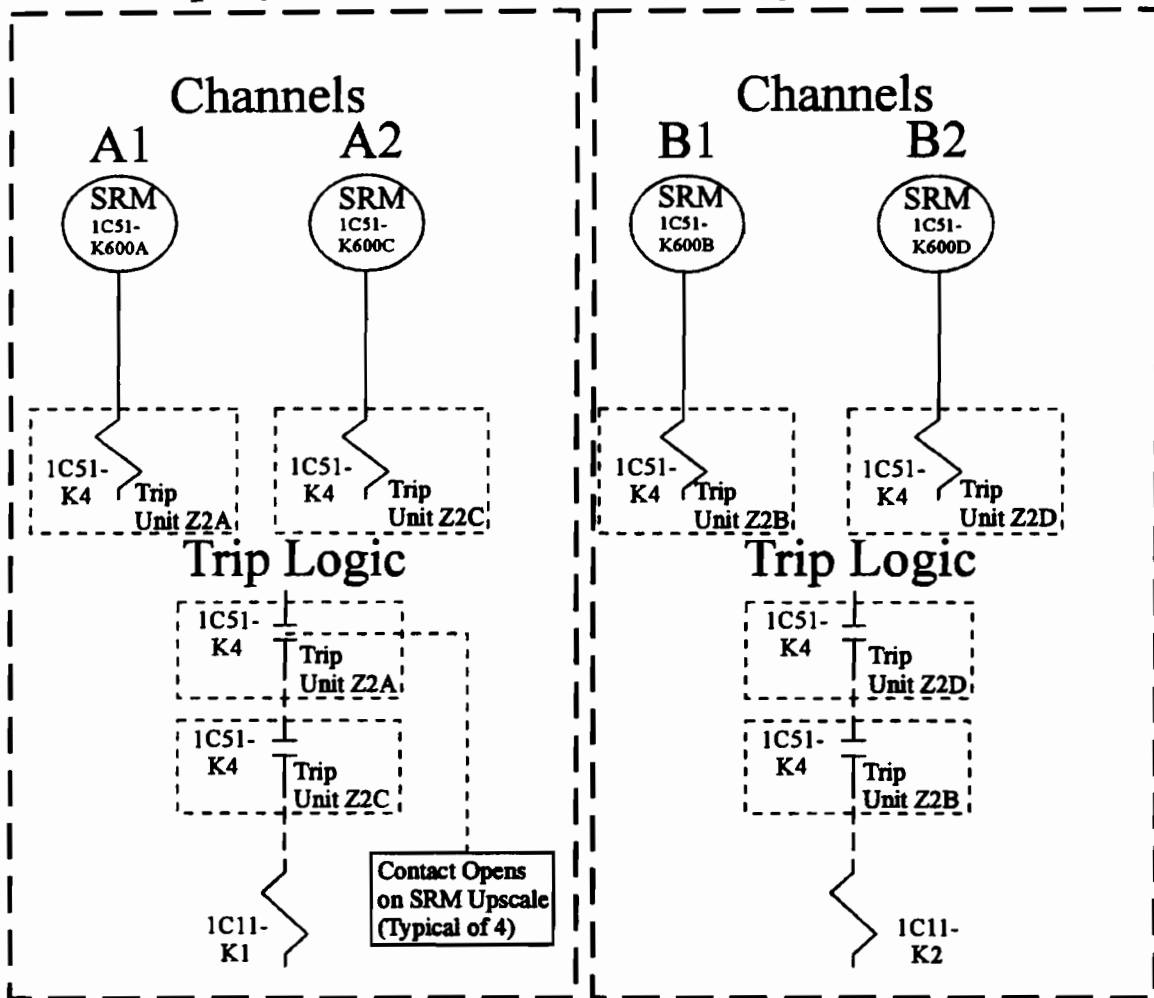
Rev. 0

12/8/94

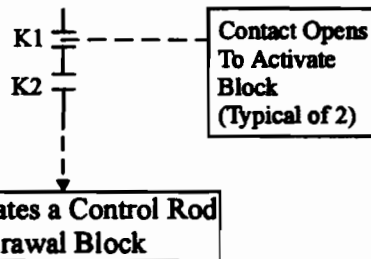


Trip System "A"

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

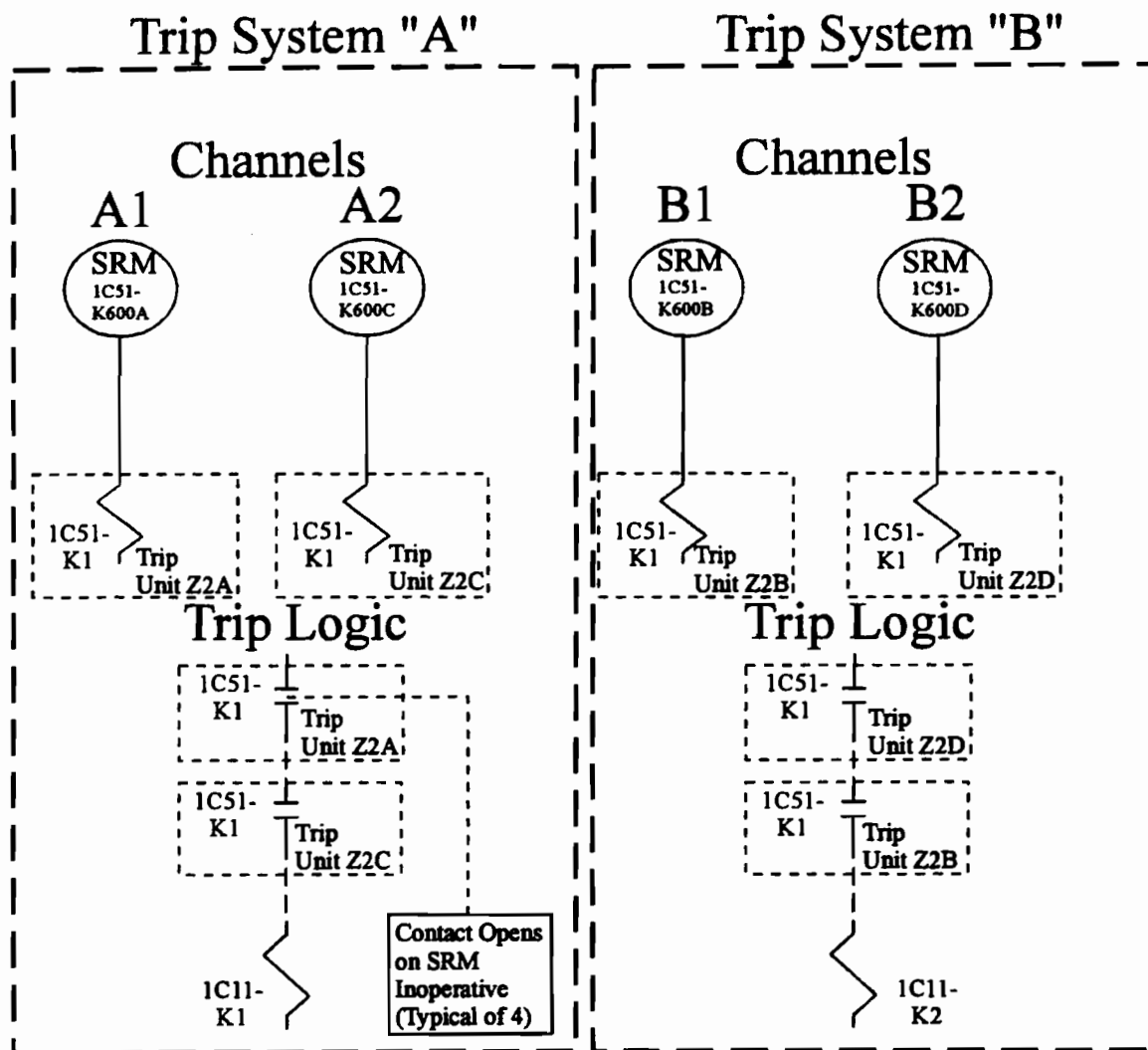
Prepared By: *RLC*

Reviewed By: *[Signature]*

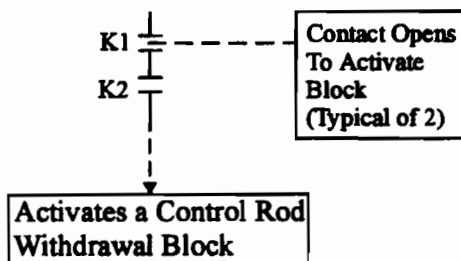
LFD-1-CRB-10

TRM T3.3.2-1, Item 1.b
Control Rod Block
Instrumentation,
SRM - Upscale

TRM REV. 60



Actuation Logic



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]*

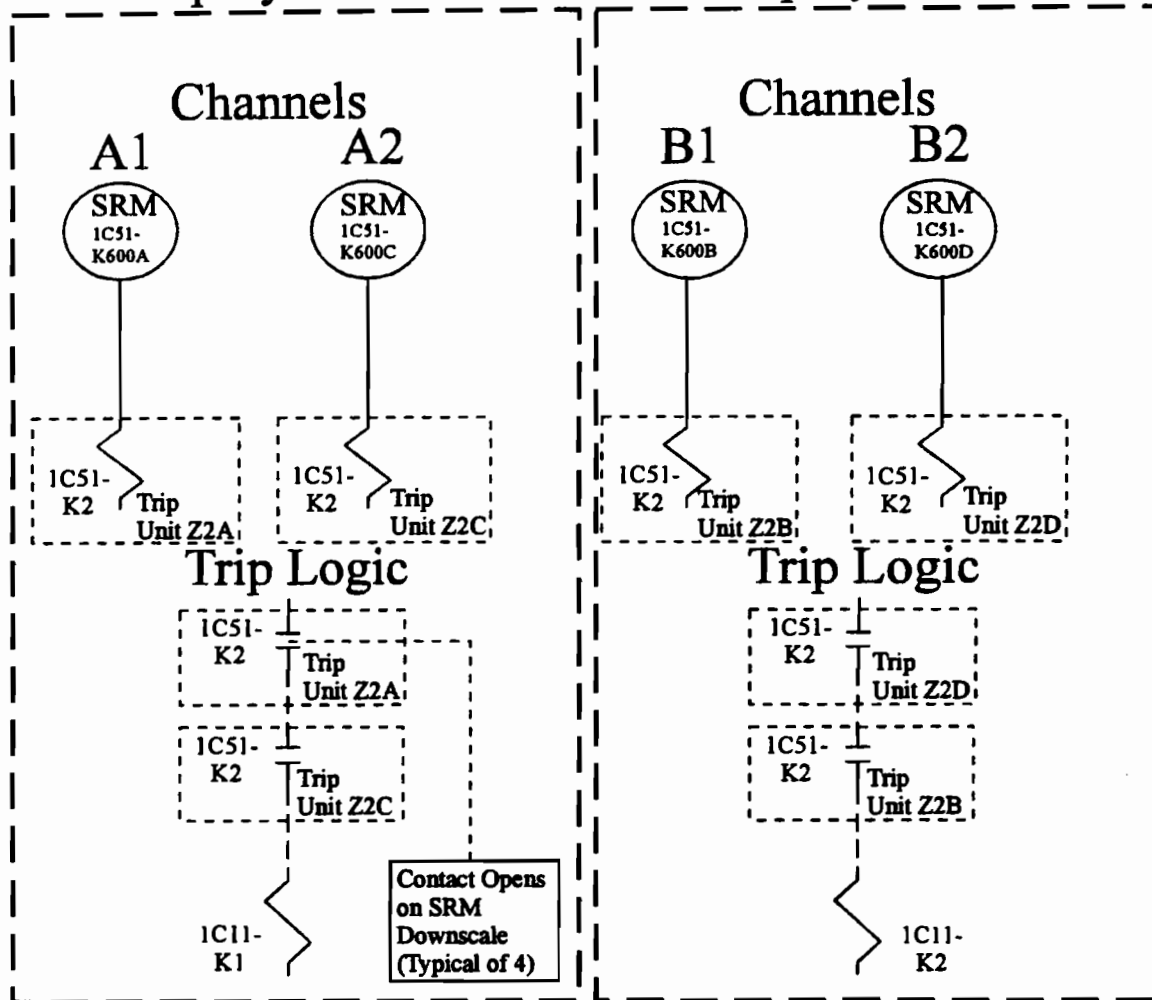
LFD-1-CRB-11

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

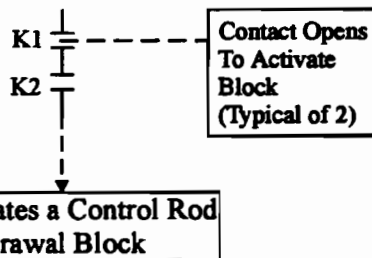
TRM REV. 60

Trip System "A"

Trip System "B"



Actuation Logic



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.

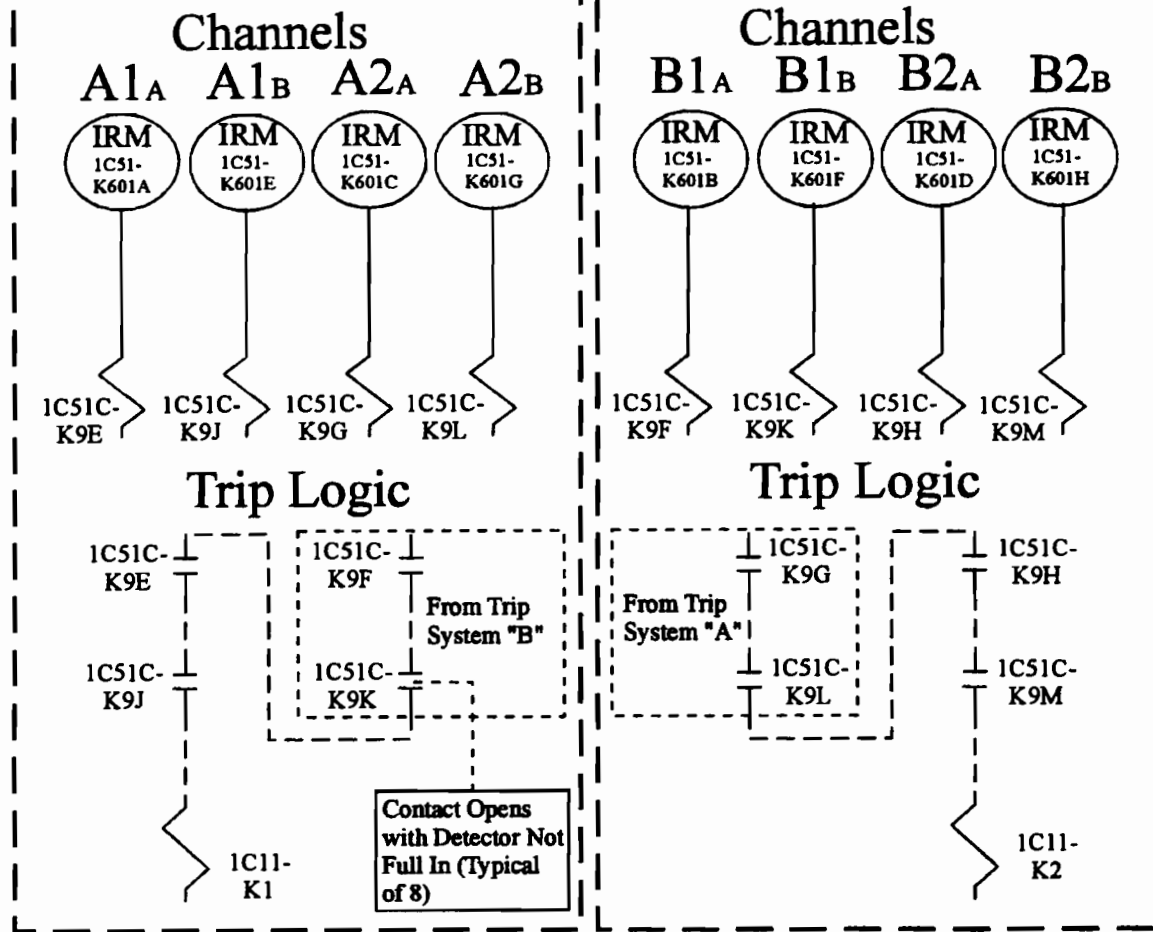
Elem. Ref.
H-17167
H-17175
H-17828
H-17831

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.

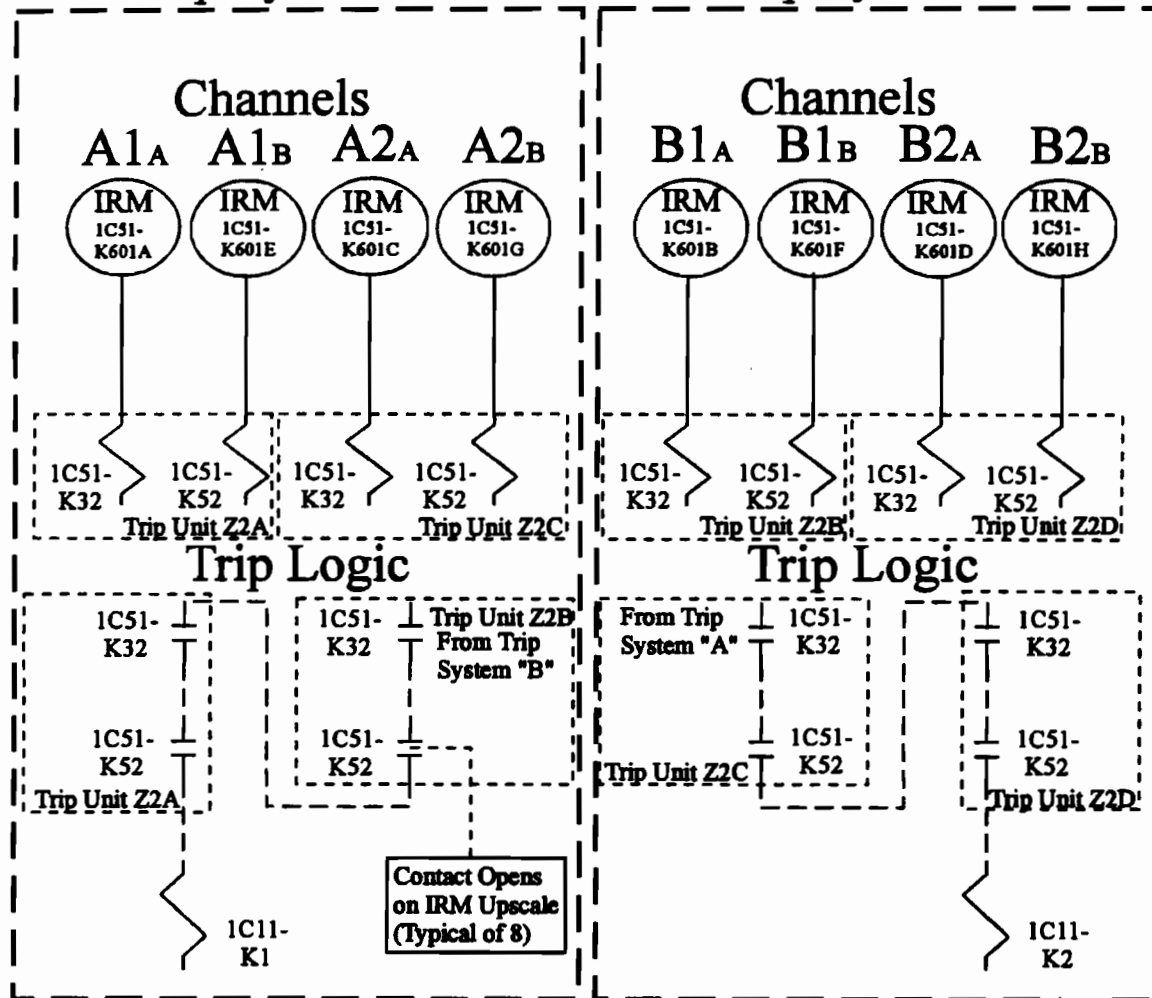
Elem. Ref.
H-17124
H-17125
H-17175
H-17828
H-17831

Prepared By: *RLC*
Reviewed By: *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"



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.

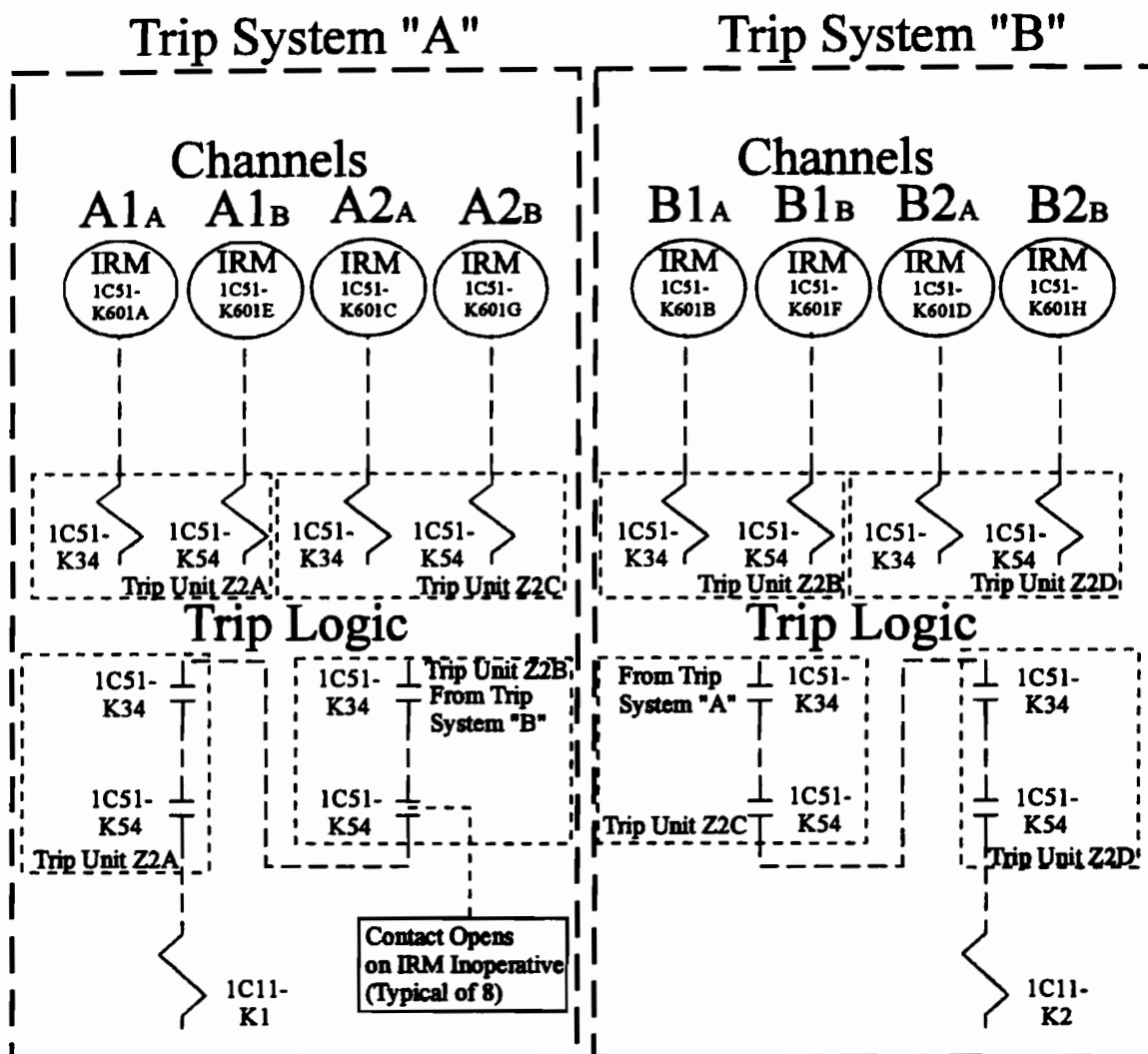
Elem. Ref.
H-17169
H-17170
H-17175
H-17828
H-17831

Prepared By: *RLC*
Reviewed By: *Boyle*

LFD-1-CRB-14

TRM T3.3.2-1, Item 2.b
Control Rod Block
Instrumentation,
IRM - Upscale

TRM REV. 60



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

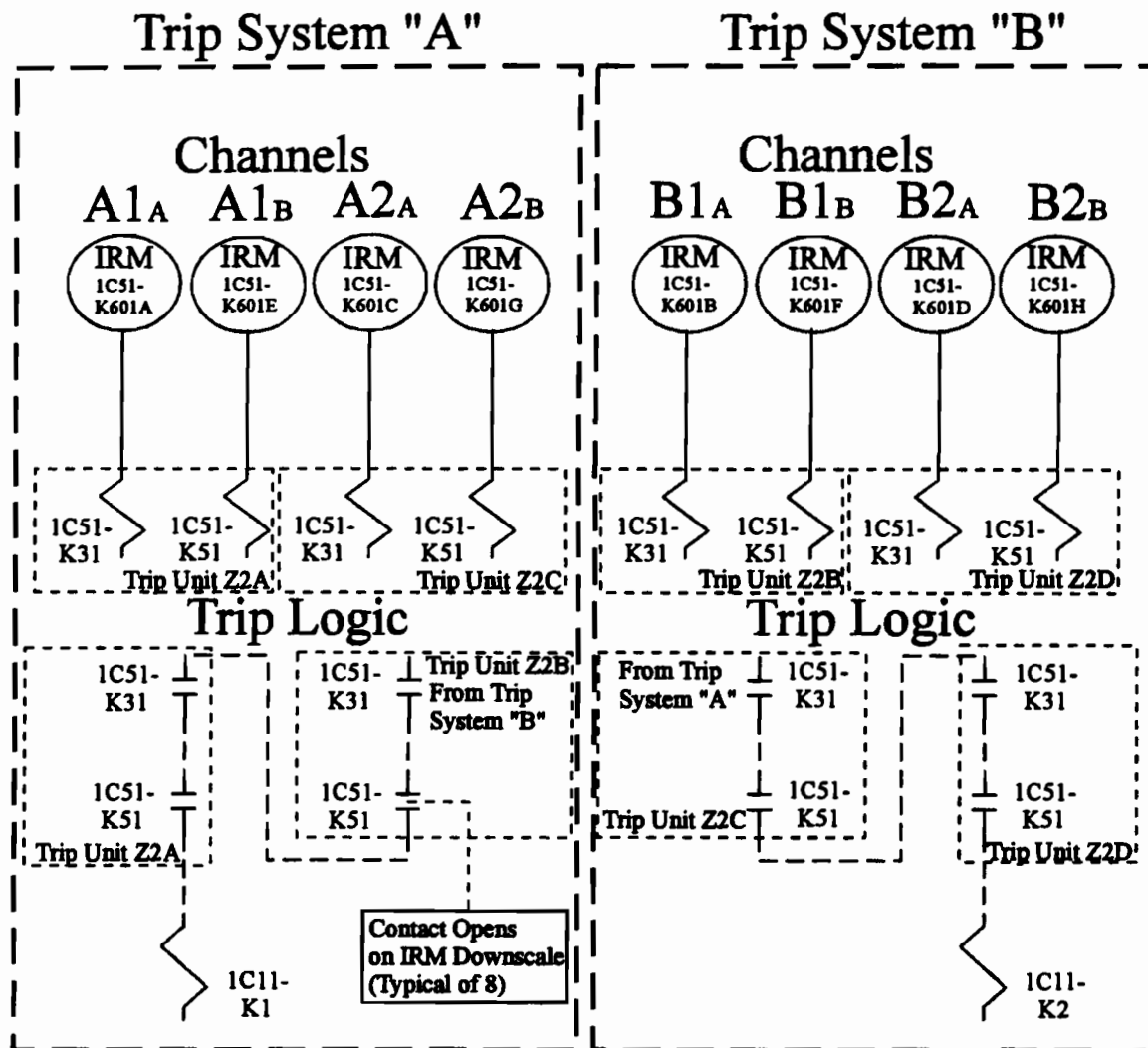
Prepared By: *RLC*

Reviewed By: *RLC*

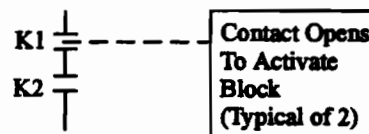
LFD-1-CRB-15

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

TRM REV. 60



Actuation Logic



Activates a Control Rod Withdrawal Block

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: *TRC*

Reviewed By: *RDH*

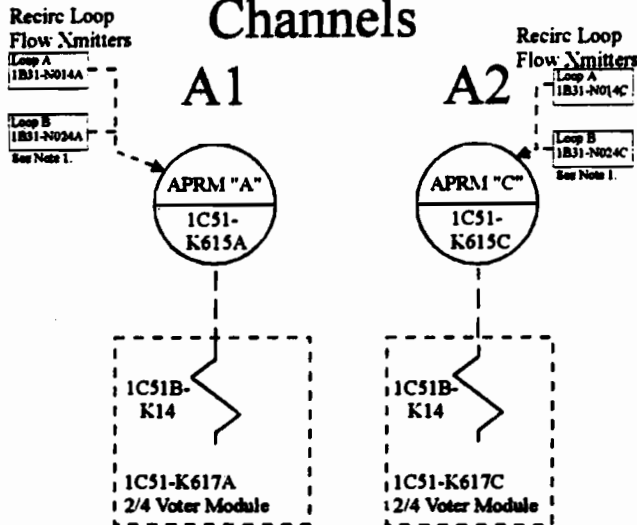
LFD-1-CRB-16

TRM T3.3.2-1, Item 2.d
Control Rod Block
Instrumentation, IRM -
Downscale

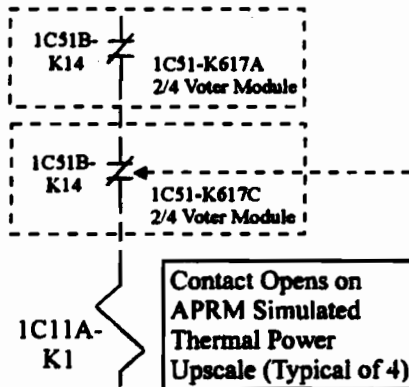
TRM REV. 60

Trip System "A"

Channels

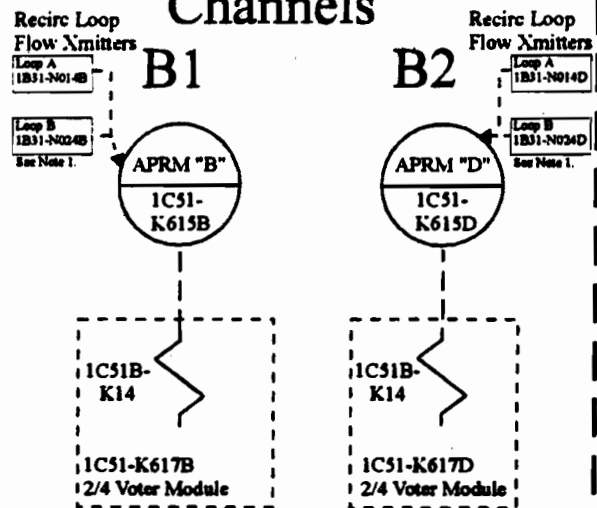


Trip Logic

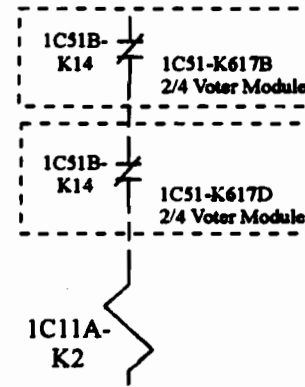


Trip System "B"

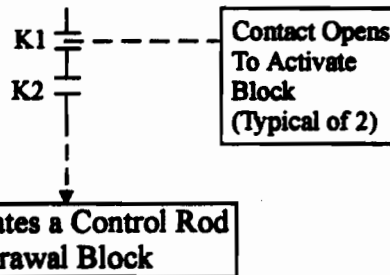
Channels



Trip Logic



Actuation Logic



Minimum Channel Requirements for System Initiation Capability:

In order to maintain Control Rod Withdrawal Block capability on an APRM 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.

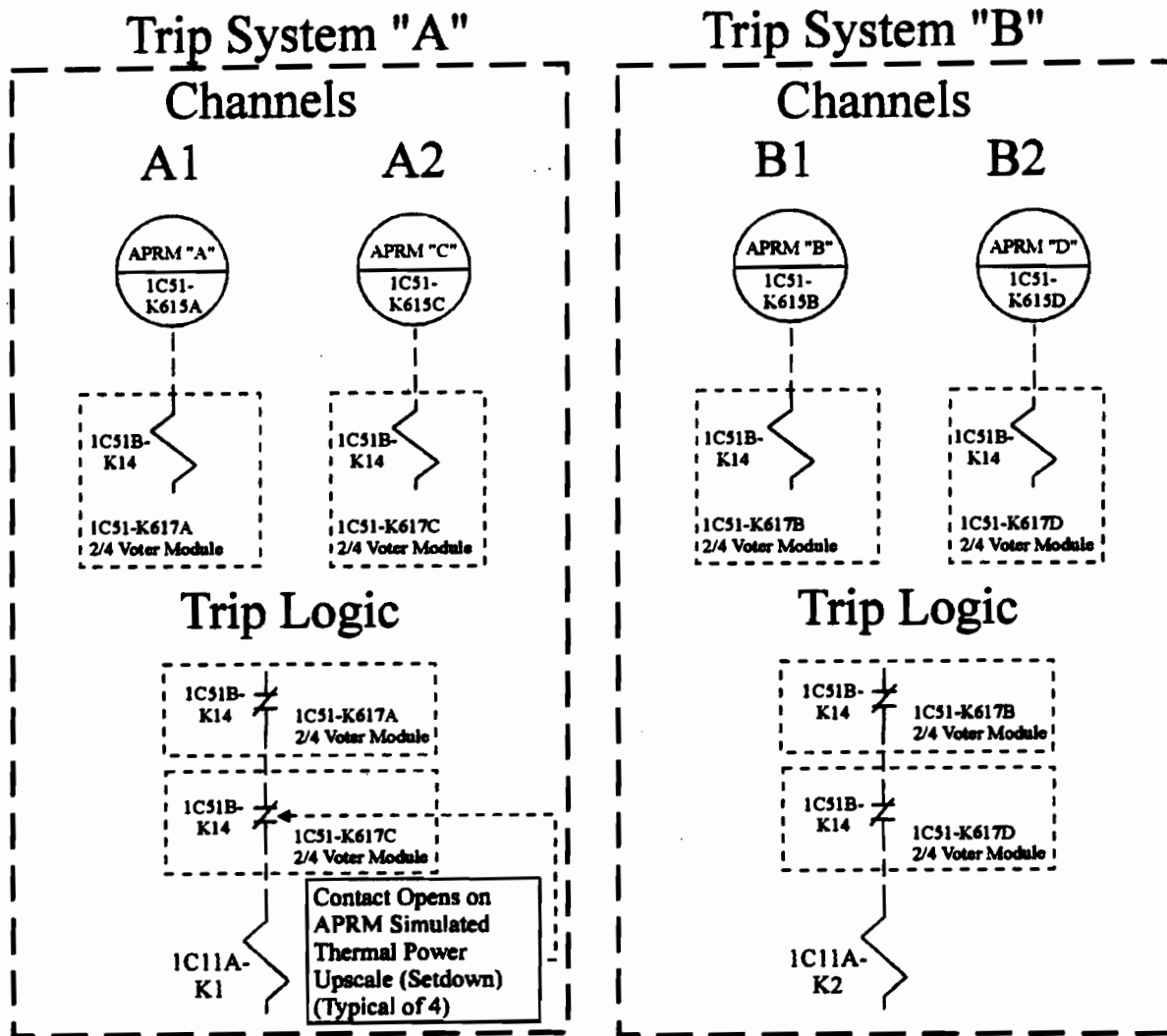
Prepared By: *TRC*

Reviewed By: *TRC*

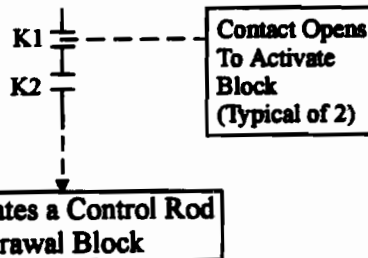
LFD-1-CRB-17

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: *W. J. P.*

LFD-1-CRB-18

TRM T3.3.2-1, Item 3.b
Control Rod Block
Instrumentation, APRM -
Simulated Thermal
Power Upscale (Setdown)

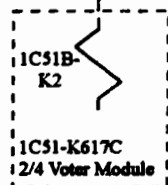
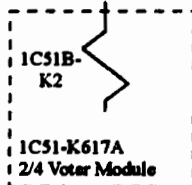
TRM REV. 60

Trip System "A"

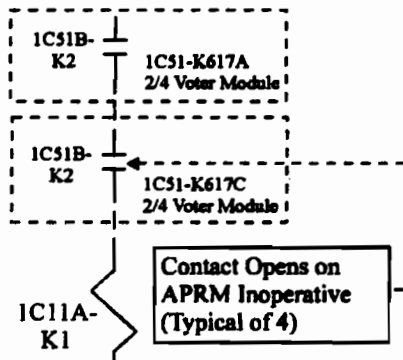
Channels

A1

A2



Trip Logic

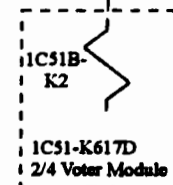
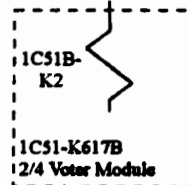


Trip System "B"

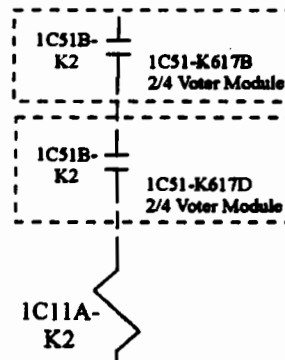
Channels

B1

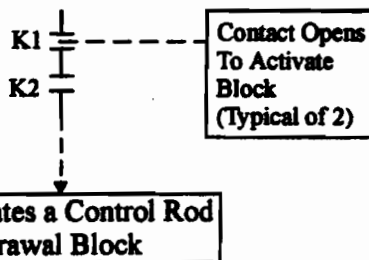
B2



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

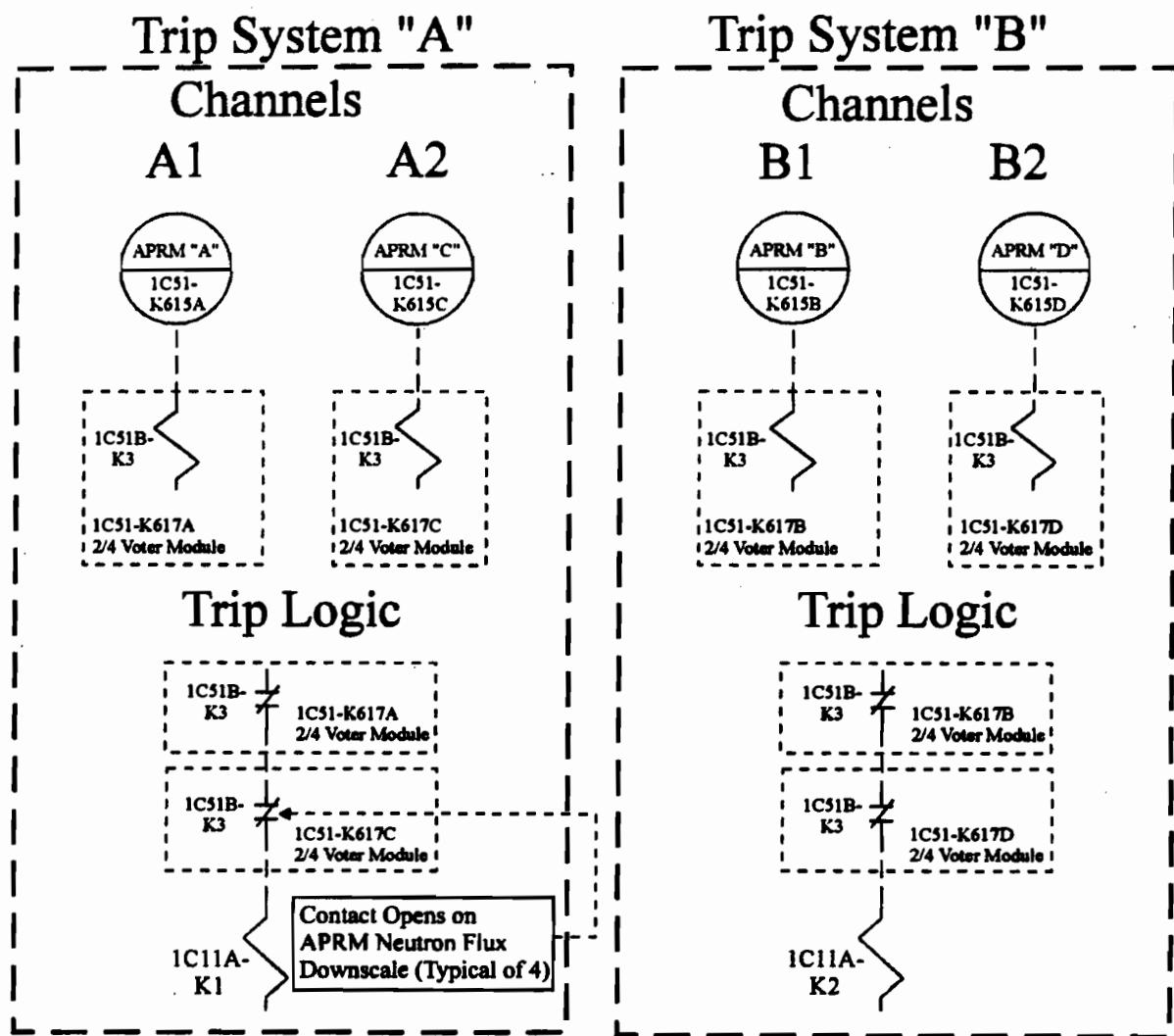
Prepared By: *RLC*

Reviewed By: *RLC*

LFD-1-CRB-19

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

TRM REV. 60



Minimum Channel Requirements for System Initiation Capability:

In order to maintain Control Rod Withdrawal Block capability on an APRM Neutron Flux Downscale 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: *RLC*

Reviewed By: *SWP*

LFD-1-CRB-20

TRM T3.3.2-1, Item 3.d
Control Rod Block
Instrumentation, APRM -
Neutron Flux
Downscale

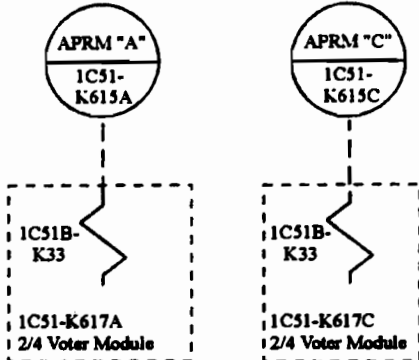
TRM REV. 60

Trip System "A"

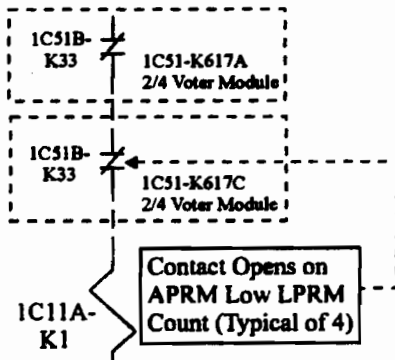
Channels

A1

A2



Trip Logic

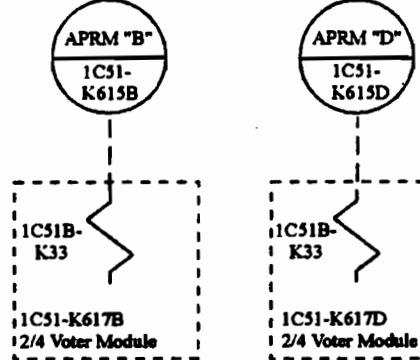


Trip System "B"

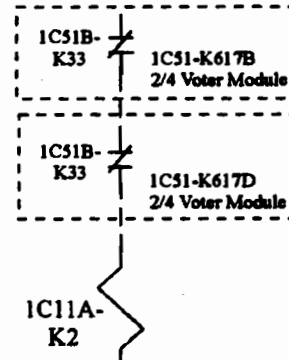
Channels

B1

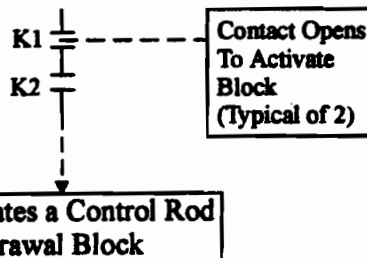
B2



Trip Logic



Actuation Logic



Minimum Channel Requirements for System Initiation Capability:

In order to maintain Control Rod Withdrawal Block capability on an APRM 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: *RLC*

Reviewed By: *SWI*

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"

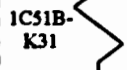
Channels

Recirc Loop
Flow Xmitters

Loop A
1B31-N014A

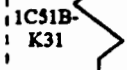
Loop B
1B31-N024A
See Note 1.

A1



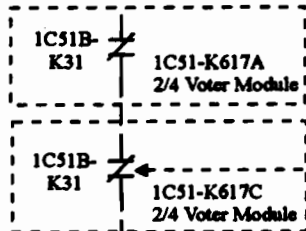
1C51-K617A
2/4 Voter Module

A2



1C51-K617C
2/4 Voter Module

Trip Logic



1C11A-K1

Contact Opens on
APRM Reactor
Recirculation Flow
Upscale (Typical of 4)

Trip System "B"

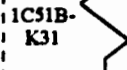
Channels

Recirc Loop
Flow Xmitters

Loop A
1B31-N014B

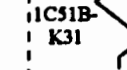
Loop B
1B31-N024B
See Note 1.

B1



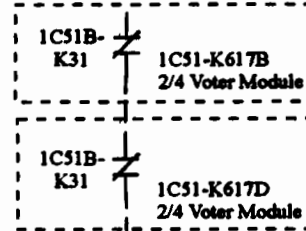
1C51-K617B
2/4 Voter Module

B2



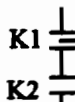
1C51-K617D
2/4 Voter Module

Trip Logic



1C11A-K2

Actuation Logic



Contact Opens
To Activate
Block
(Typical of 2)

Activates a Control Rod
Withdrawal Block

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: *TLC*

Reviewed By: *W. J. P.*

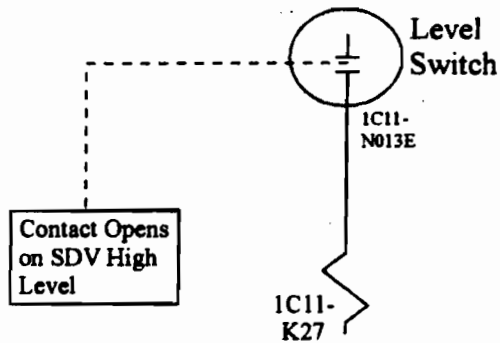
LFD-1-CRB-22

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

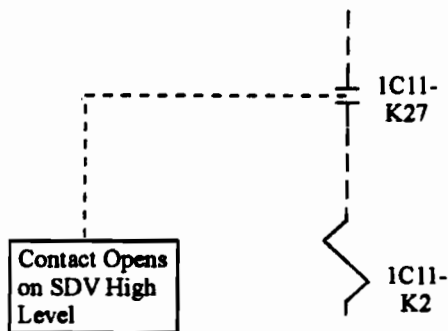
TRM REV. 60

Trip System

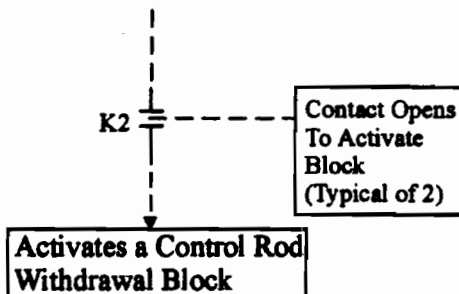
Channel



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: *W. J.*

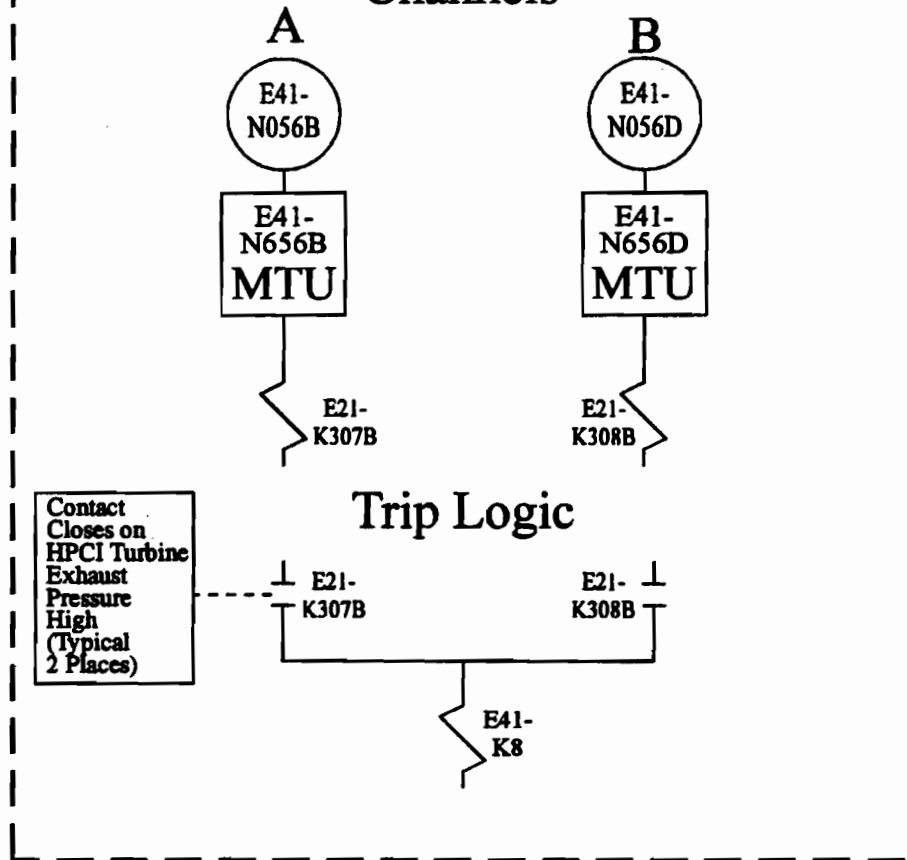
LFD-1-CRB-23

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

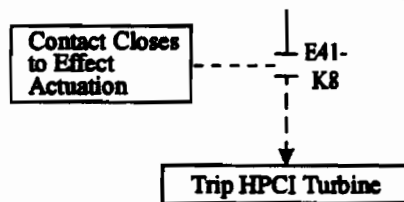
TRM REV. 60

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: *DLC*

Reviewed By: *[Signature]*

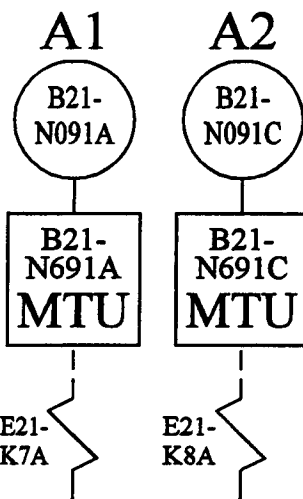
LFD-1-ECCS-25

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

TRM REV. 60

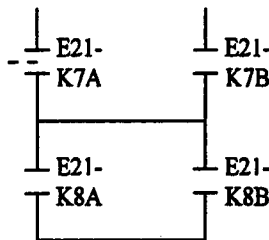
Trip System "A"

Channels



Trip Logic

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

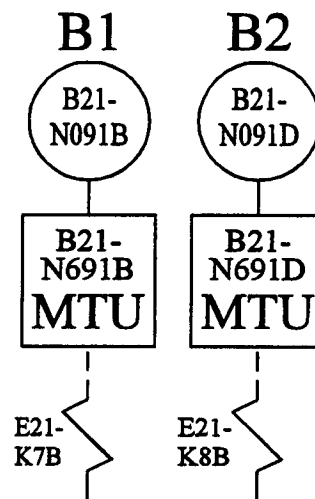


Actuation
Logic
"A"

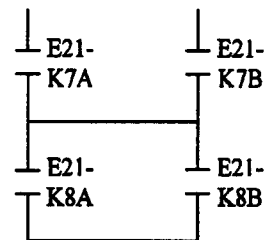
Initiation of CS Subsystems "A" and "B" (Except Valve 1E21-F004B Does Not Receive an Open Signal and Valve 1E21-F015B Does Not Receive a Closed Signal); EDG's 1A, 1C, 1B; PSW P41-F310A,B,C,D Valves; Lock-out Auto-start of Cond. and Cond. Booster Pumps for 50 secs.; Trip of CRD Pump "A"; Trip of D/W Cooling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

Trip System "B"

Channels



Trip Logic



Actuation
Logic
"B"

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.

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

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

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. Evers*

Reviewed By: *William T. Williams*

TRM Rev. 6

Trip System "A"

Channels

A1



A2



E21-K5A

E21-K6A

Trip Logic

E21-K5A

E21-K5B

E21-K6A

E21-K6B

Actuation Logic "A"

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.

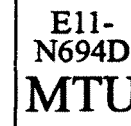
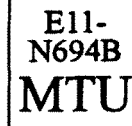
Trip System "B"

Channels

B1



B2



E21-K5B

E21-K6B

Trip Logic

E21-K5A

E21-K5B

E21-K6A

E21-K6B

Actuation Logic "B"

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

Reviewed By: S.B. Tippet

printed

signature

TRM Rev. 93

Trip System "A"

Channels

A1



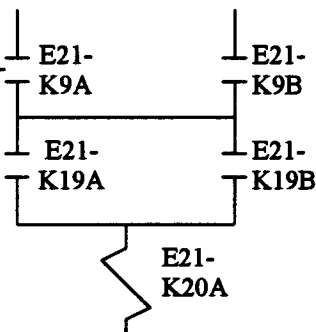
A2



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)

E21-K20A

Permissive to Open CS Injection Valves
E21-F004A
E21-F005A & B

Trip System "B"

Channels

B1



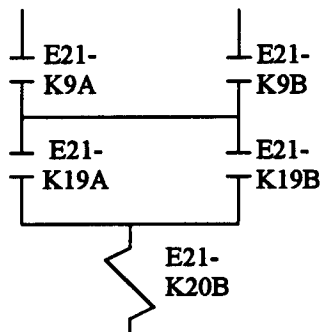
B2



E21-K9B

E21-K19B

Trip Logic



Actuation Logic "B"

E21-K20B

Permissive to Open CS Injection Valves
E21-F004B
E21-F005A & 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:

Reviewed By:

LFD-1-ECCS-03

TS 3.3.5.1-1, Item 1.c

Core Spray System

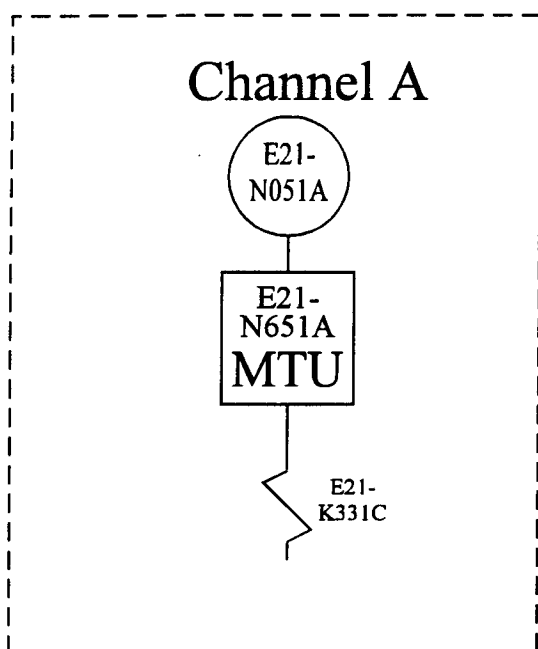
Reactor Steam Dome

Pressure-Low

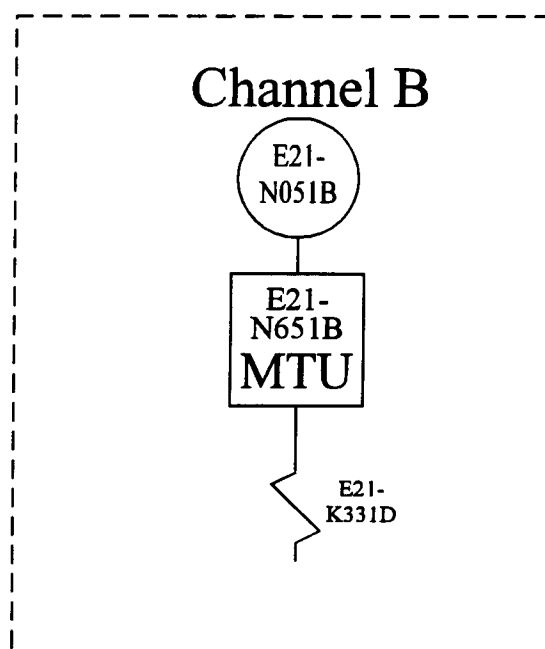
Rev. 0

11/16/94

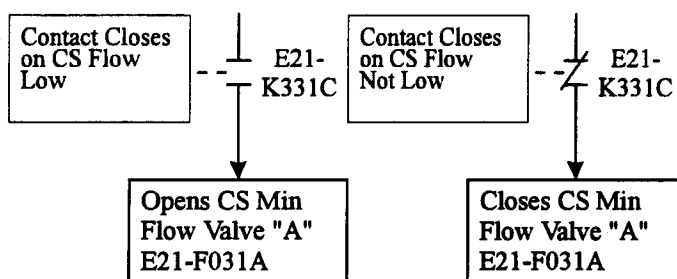
Trip System "A"



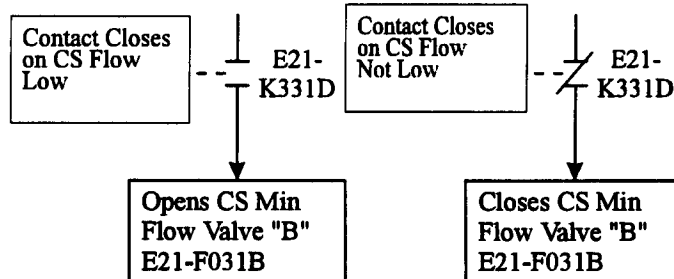
Trip System "B"



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: *ELR*

LFD-1-ECCS-04

TS 3.3.5.1-1, Item 1.d
Core Spray System
Core Spray Pump
Discharge Flow-Low

Rev. 0

11/16/94

Trip System "A"

Channels

A1

A2

B21-
N091A

B21-
N091C

B21-
N691A
MTU

B21-
N691C
MTU

E11-
K7A

E11-
K8A

Trip Logic

E11-
K7A

E11-
K7B

E11-
K8A

E11-
K8B

Actuation
Logic
"A"

Trip System "B"

Channels

B1

B2

B21-
N091B

B21-
N091D

B21-
N691B
MTU

B21-
N691D
MTU

E11-
K7B

E11-
K8B

Trip Logic

E11-
K7A

E11-
K7B

E11-
K8A

E11-
K8B

Actuation
Logic
"B"

Contact
Closes on
RWL Low
Level 1
(Typical
8 Places)

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)

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)

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 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. Bunker*

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

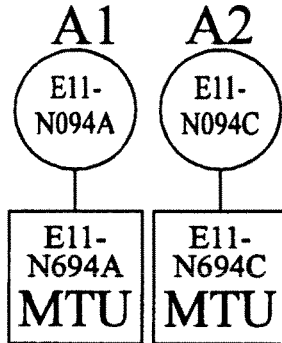
LFD-1-ECCS-05

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

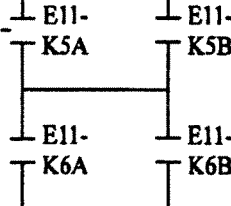
TRM Rev. 6

Trip System "A"

Channels

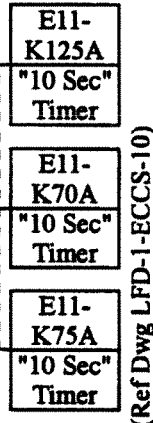


Trip Logic



Contact Closes on High Drywell Pressure (Typical 8 Places)

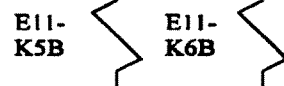
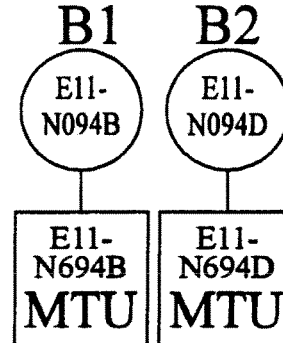
Actuation Logic "A"



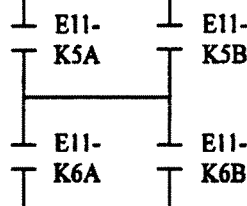
Initiation of LPCI Subsystems "A" and "B" (Except Valves 1E11-F017B and 1E11-F048B Do Not Receive an Open Signal and Containment Spray Valves, Steam Condensing Mode Valves and the Test Return Line Valve of the "B" Subsystem Do Not Receive a Close Signal)

Trip System "B"

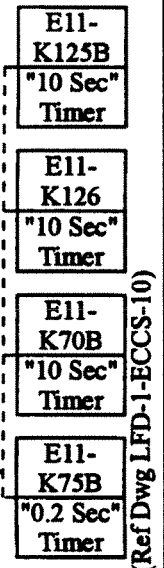
Channels



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)

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.

Elem. Ref.
H-17763 H-19827
H-17766 H-19830
H-19823
H-19826

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

Prepared By: B.G. Thigpin

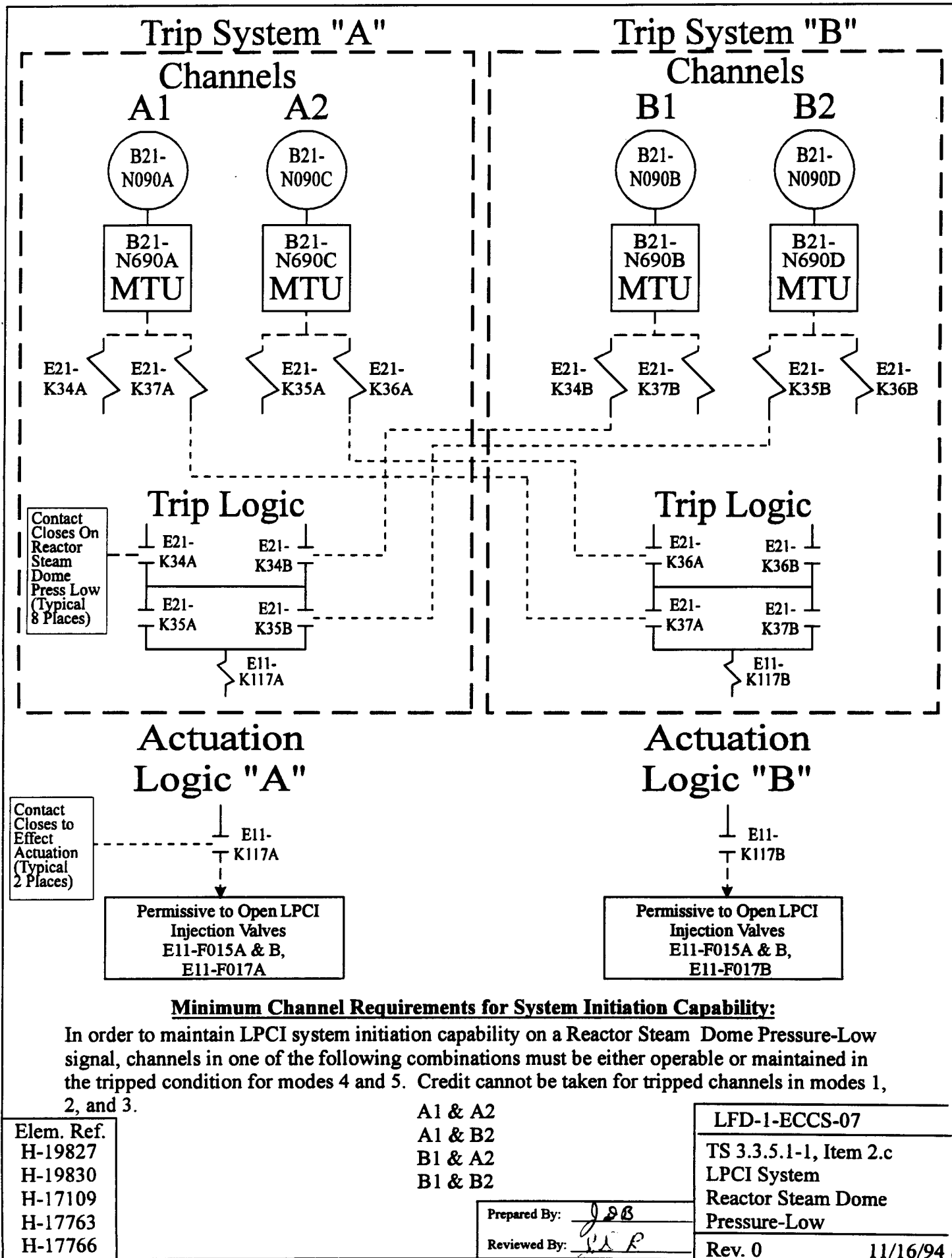
Reviewed By: S.B. Tipps

B.G. Thigpin
S.B. Tipps
signature

LFD-1-ECCS-06

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

TRM Rev. 93



Trip System "A"

Channels

A1

A2

B21-
N090C

B21-
N090E

B21-
N641C
STU

B21-
N690C
MTU

B21-
N690E
MTU

E11-
K105A

E11-
K90A

Trip Logic

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

E11-
K90A

E11-
K90B

E11-
K105A

E11-
K105B

E11-
K44A

Actuation Logic "A"

Contact Closes to
Effect Actuation
(Typical 2 Places)

E11-
K44A

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

Trip System "B"

Channels

B1

B2

B21-
N090B

B21-
N090F

B21-
N641B
STU

B21-
N690B
MTU

B21-
N690F
MTU

E11-
K105B

E11-
K90B

Trip Logic

E11-
K90A

E11-
K90B

E11-
K105A

E11-
K105B

E11-
K44B

Actuation Logic "B"

E11-
K44B

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.

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

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

Prepared By: *JSB*

Reviewed By: *JSB*

LFD-1-ECCS-08

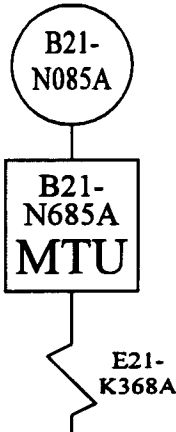
TS 3.3.5.1-1, Item 2.d
LPCI System
Reactor Steam Dome
Pressure-Low
Recirc Disch Valve
Permissive

Rev. 0

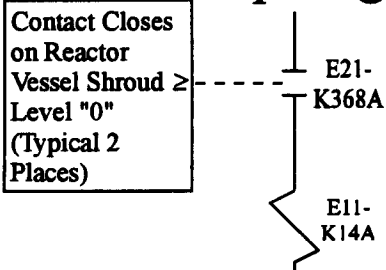
11/16/94

Trip System "A"

Channel A

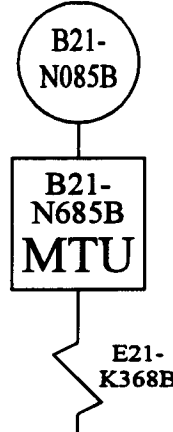


Trip Logic

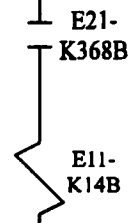


Trip System "B"

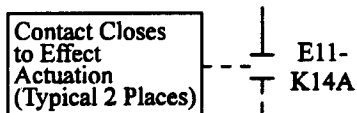
Channel B



Trip Logic

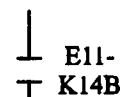


Actuation Logic "A"



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

Actuation Logic "B"



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

LFD-1-ECCS-09

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

Prepared By: *JJB*

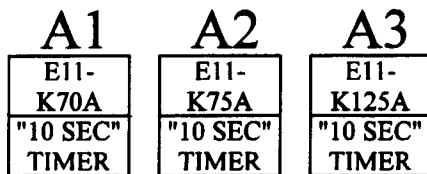
Reviewed By: *SLR*

Rev. 0

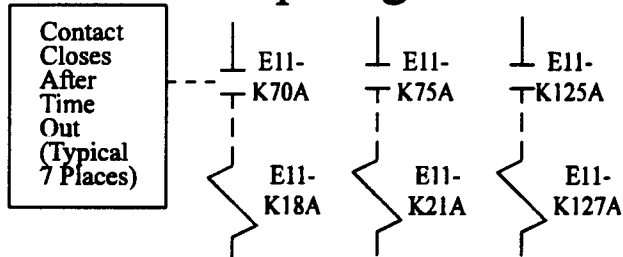
11/16/94

Trip System "A"

Channels

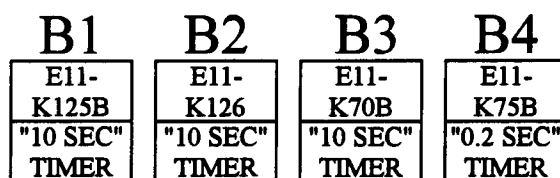


Trip Logic

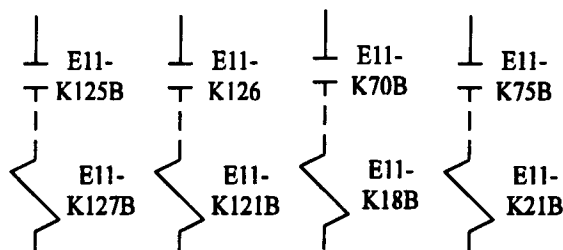


Trip System "B"

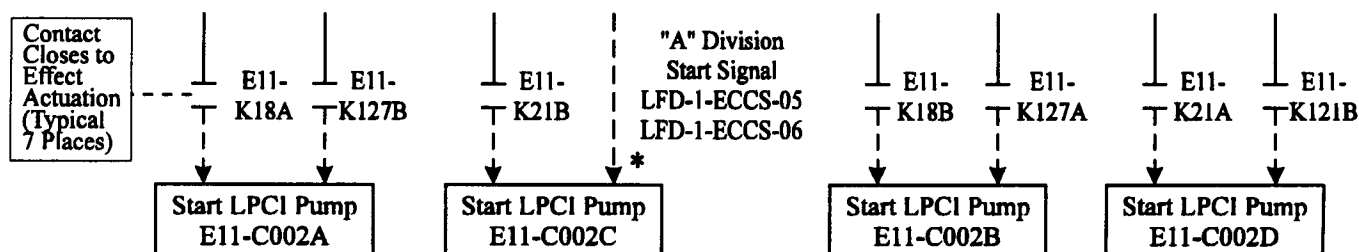
Channels



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

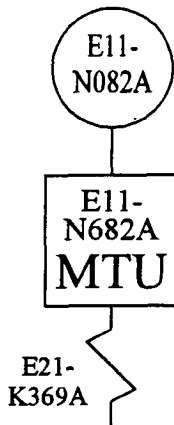
TS 3.3.5.1-1, Item 2.f
LPCI System
LPCI Pump Start-Time
Delay Relay

Rev. 0

3/30/95

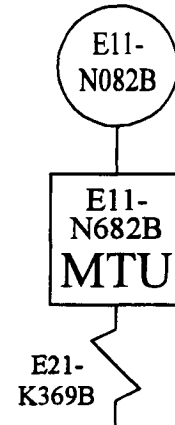
Trip System "A"

Channel A

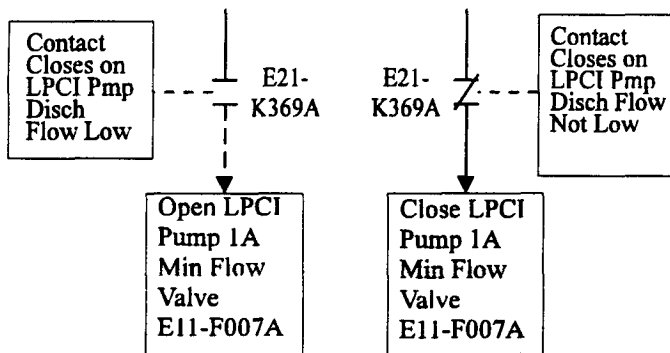


Trip System "B"

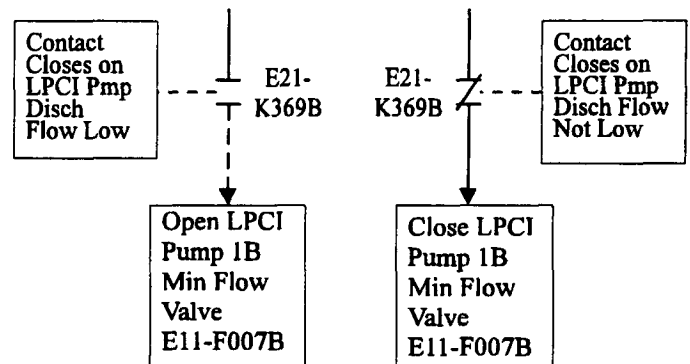
Channel B



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

LFD-1-ECCS-11

TS 3.3.5.1-1, Item 2.g
LPCI System
LPCI Pump Discharge
Flow-Low (Bypass)

Prepared By: *OPC*

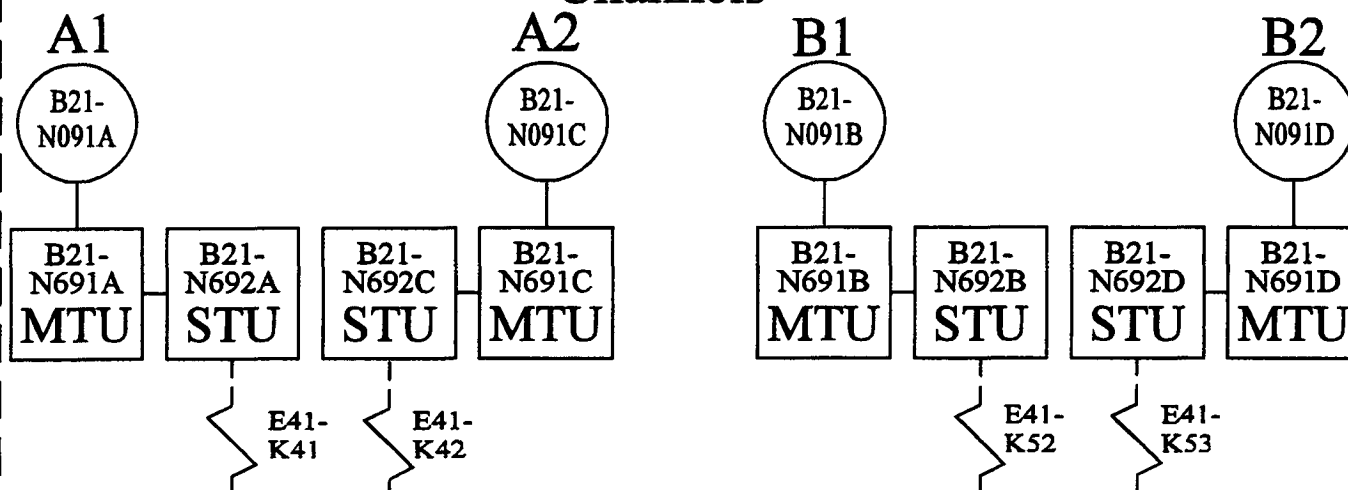
Reviewed By: *ELR*

Rev. 0

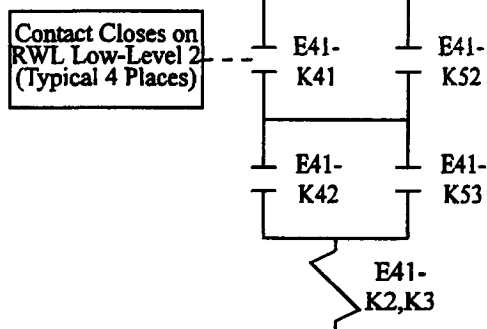
11/16/94

Trip System

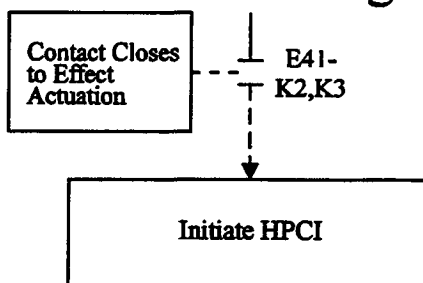
Channels



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. L. Brown*
Reviewed By: *William Wilkins*

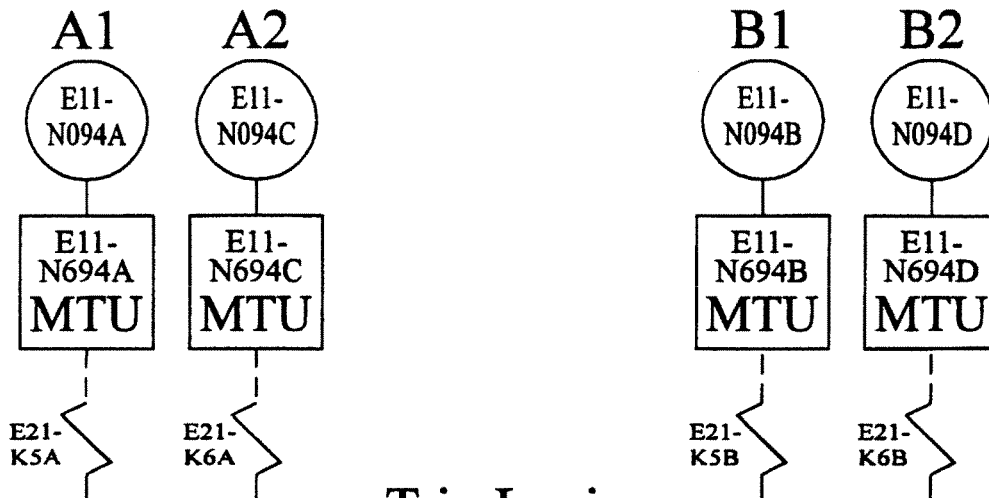
LFD-1-ECCS-12

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

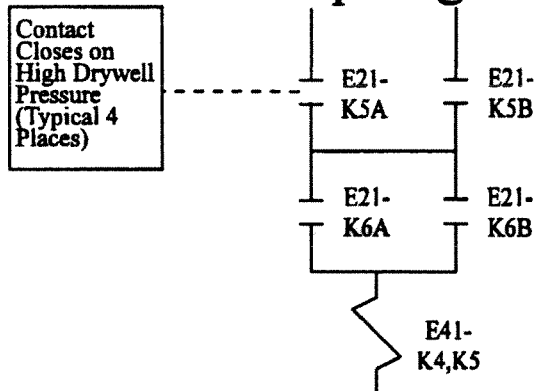
TRM Rev. 6

Trip System

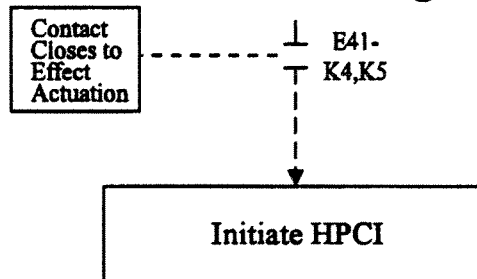
Channels



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

Elem. Ref.

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

Prepared By: B.G. Thigpin

Reviewed By: S.B. Tipps
printed

B.G. Thigpin
S.B. Tipps
signature

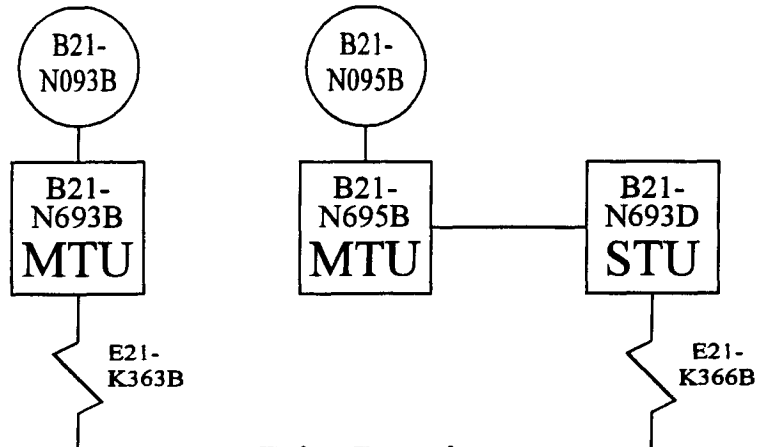
LFD-1-ECCS-13

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

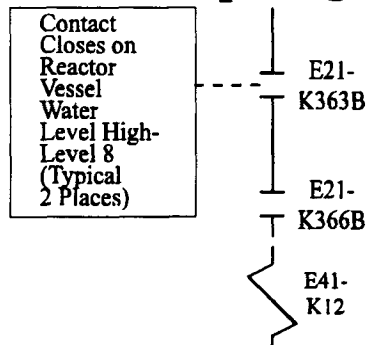
TRM Rev. 93

Trip System

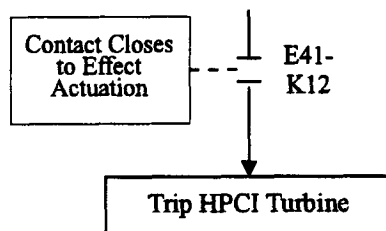
Channel A Channel B



Trip Logic



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: *OPC*

Reviewed By: *LAR*

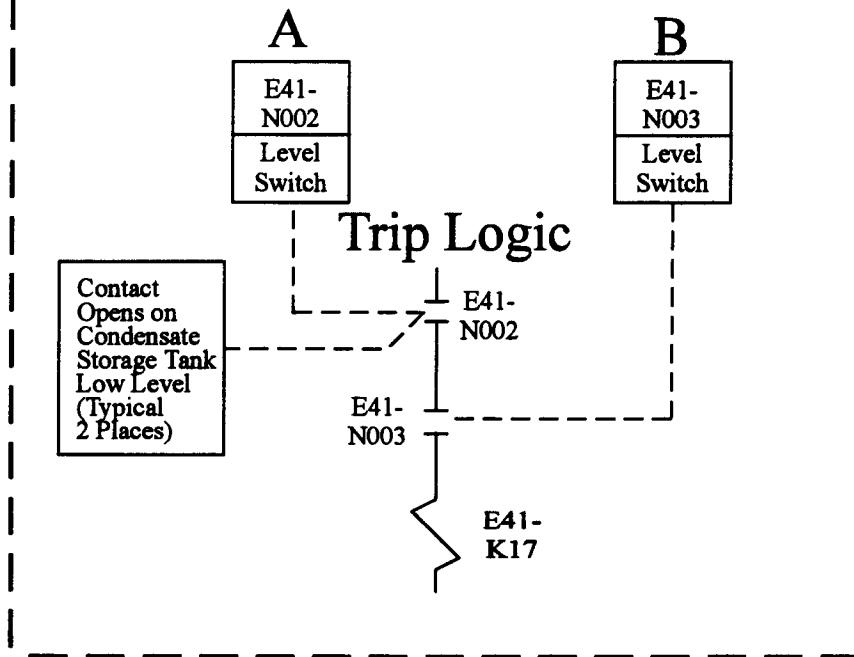
LFD-1-ECCS-14

TS 3.3.5.1-1, Item 3.c
HPCI System
Reactor Vessel Water
Level-High, Level 8

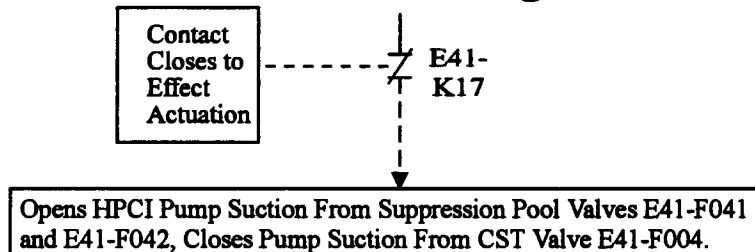
Rev. 0

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.*

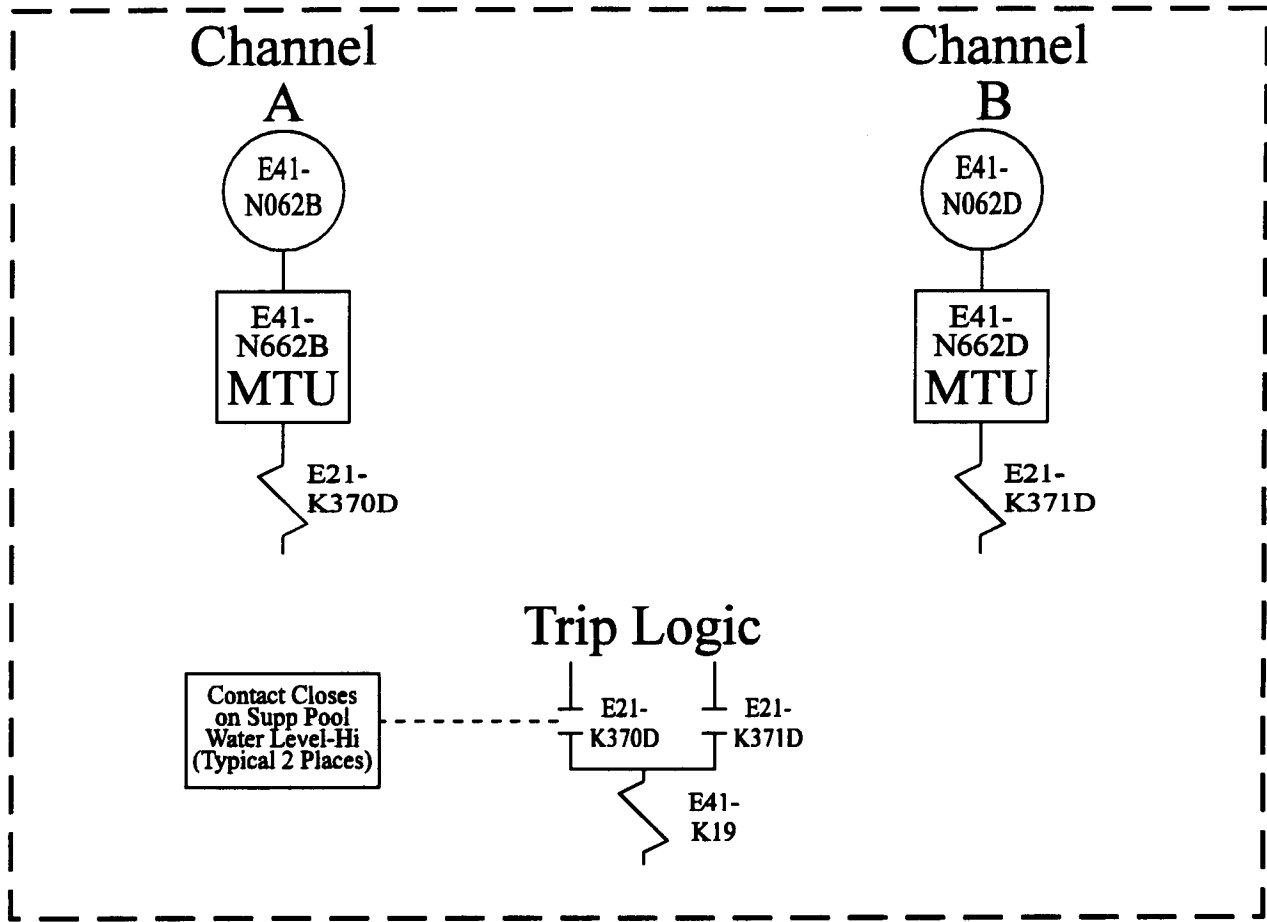
LFD-1-ECCS-15

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

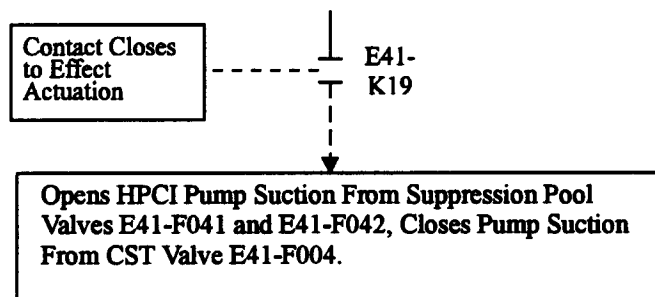
Rev. 0

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

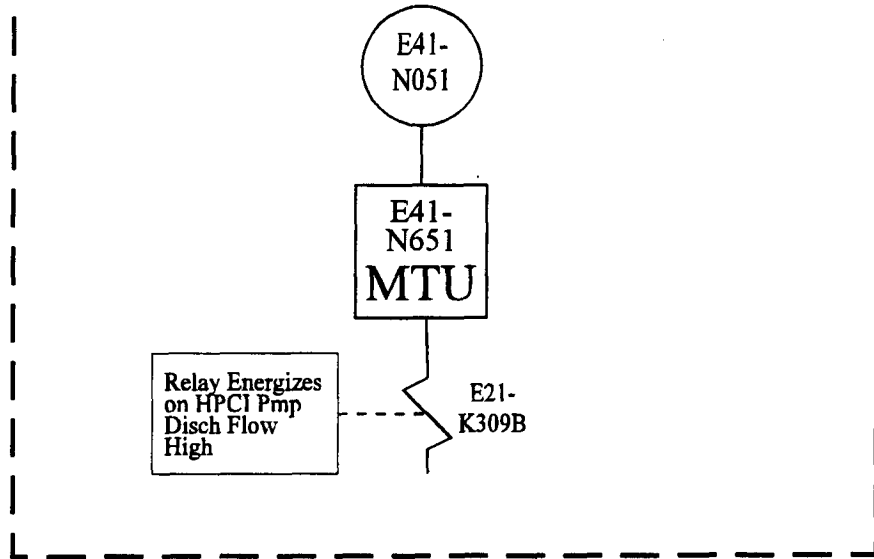
TS 3.3.5.1-1, Item 3.e
HPCI System
Suppression Pool
Water Level-High

Rev. 0

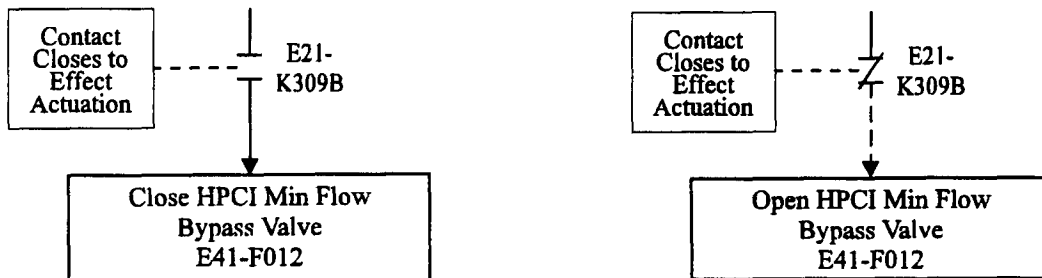
11/16/94

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

Prepared By: *OPC*

Reviewed By: *ACR*

LFD-1-ECCS-17

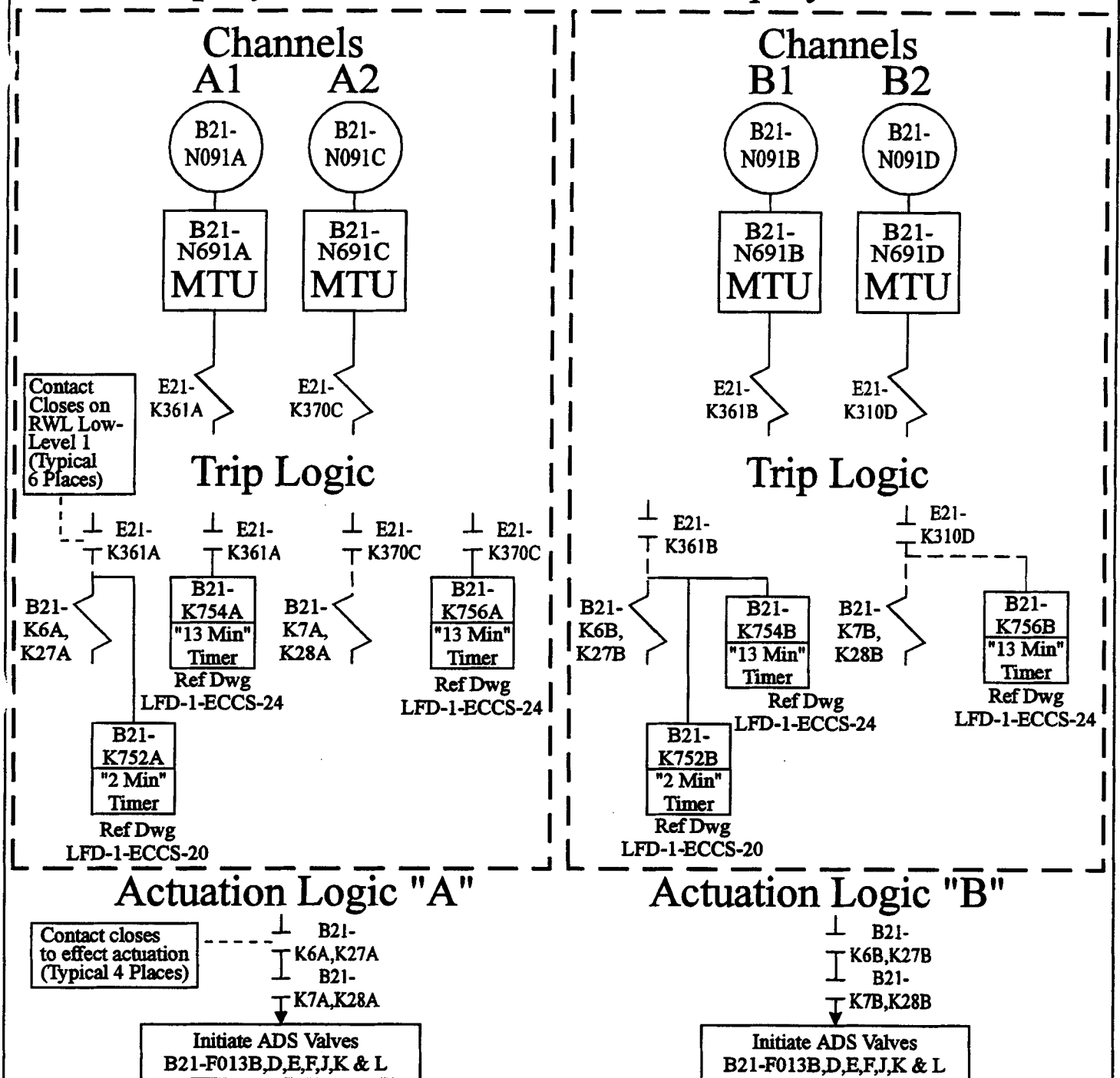
TS 3.3.5.1-1, Item 3.f
HPCI System
HPCI Pump Disch Flow-Low
(Bypass)

Rev. 0

11/16/94

Trip System "A"

Trip System "B"



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	

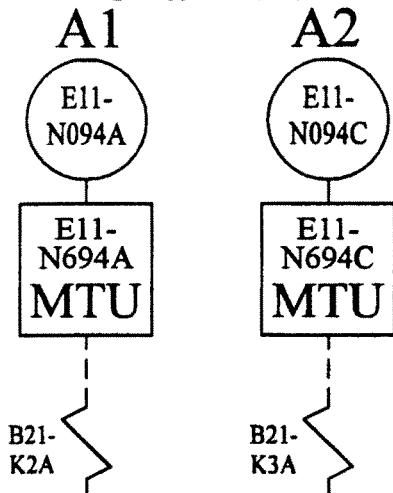
Prepared By: *J.P. Brown*
Reviewed By: *Harvey W.D. Res*

LFD-1-ECCS-18
TS 3.3.5.1-1, Item 4.a/5.a
ADS Trip system
RWL- Low, Low, Low
Level 1

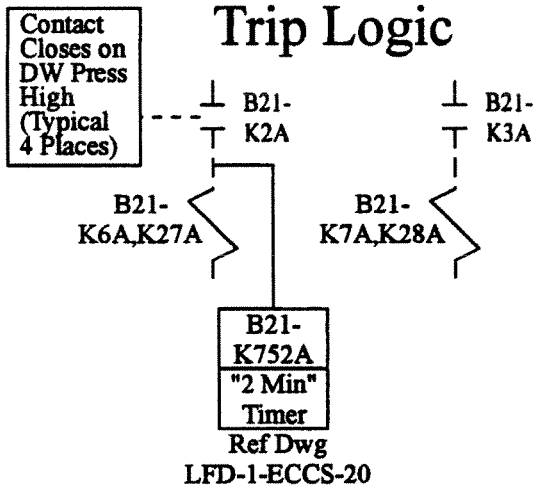
TRM Rev. 6

Trip System "A"

Channels

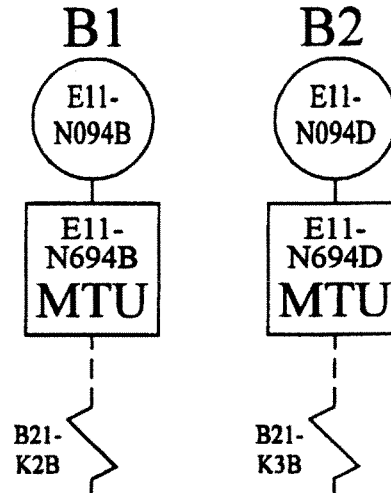


Trip Logic

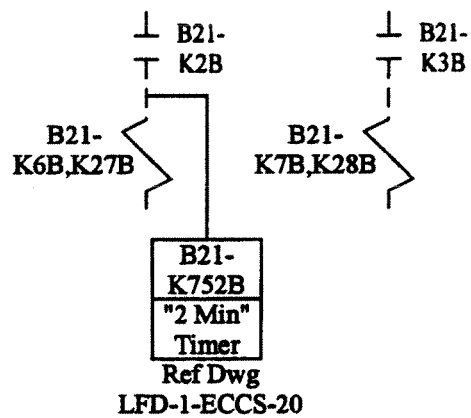


Trip System "B"

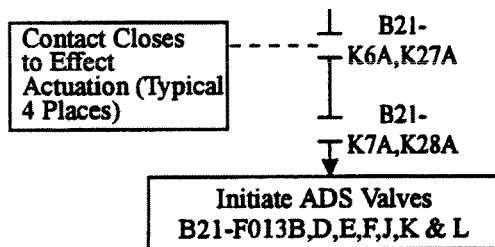
Channels



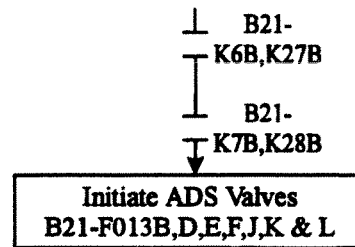
Trip Logic



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

Elem. Ref.

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

Prepared By: B.G. Thigpin

Reviewed By: S.B. Tipton

B.G. Thigpin
S.B. Tipton

LFD-1-ECCS-19

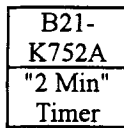
TS 3.3.5.1-1, Item 4.b/5.b
ADS Trip System
Drywell Pressure-High

TRM Rev. 93

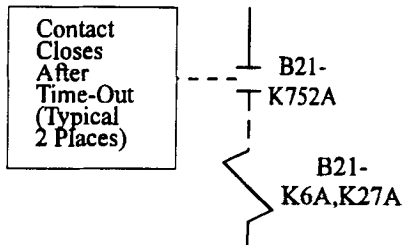
Trip System "A"

Channel

A



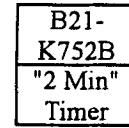
Trip Logic



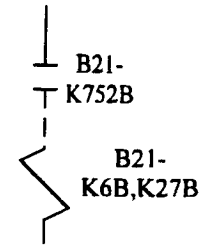
Trip System "B"

Channel

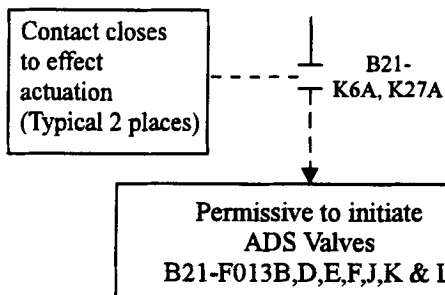
B



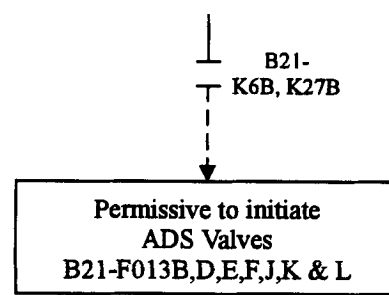
Trip Logic



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

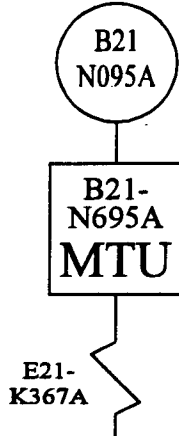
Reviewed By: JLT

Rev. 0

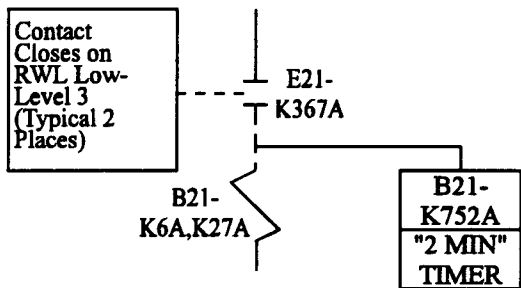
11/16/94

Trip System "A"

Channel A



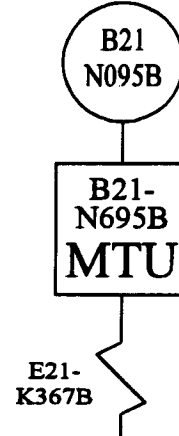
Trip Logic



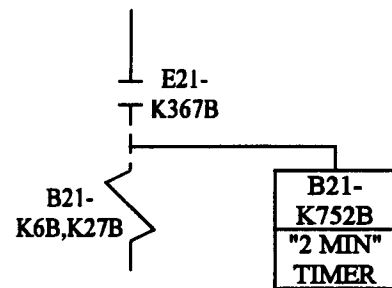
Ref. dwg
LFD-1-ECCS-20

Trip System "B"

Channel B

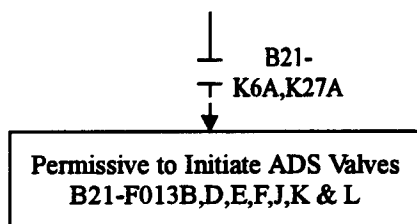


Trip Logic

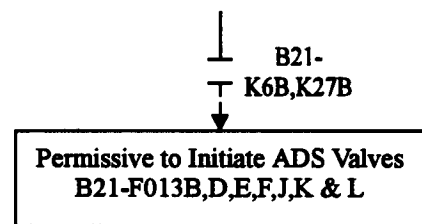


Ref. dwg
LFD-1-ECCS-20

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*

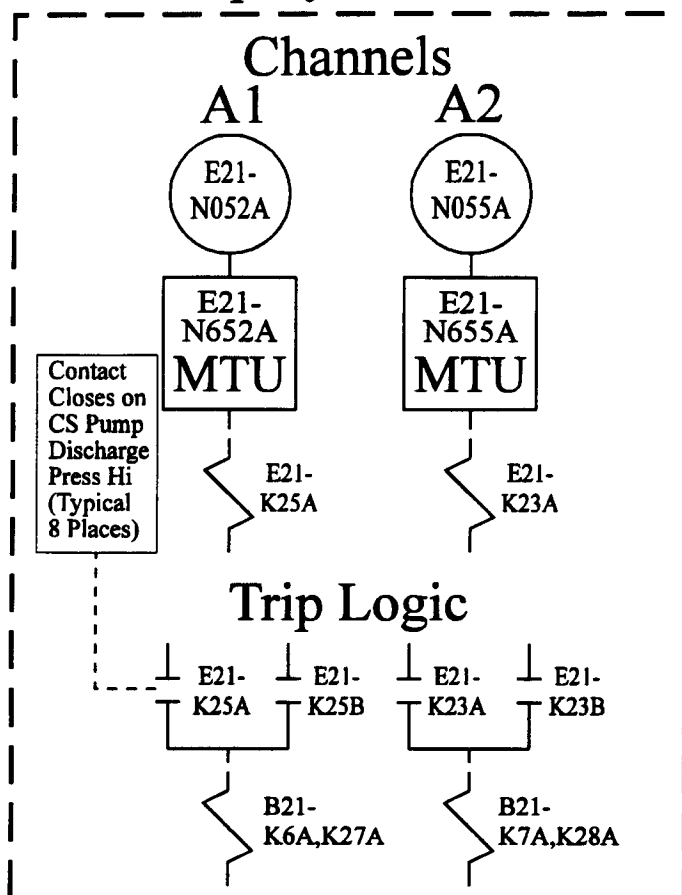
LFD-1-ECCS-21

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

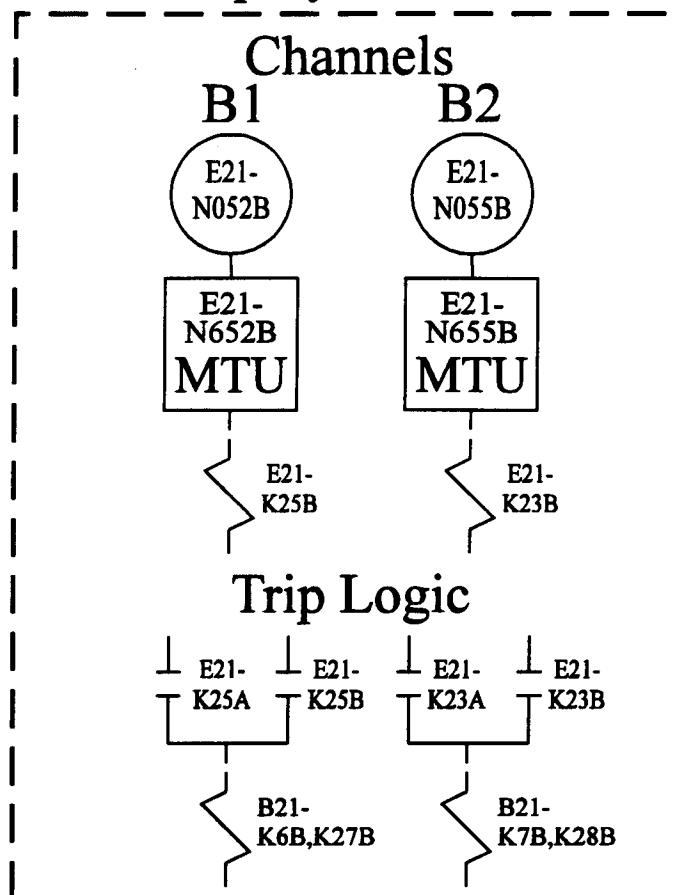
Rev. 0

11/16/94

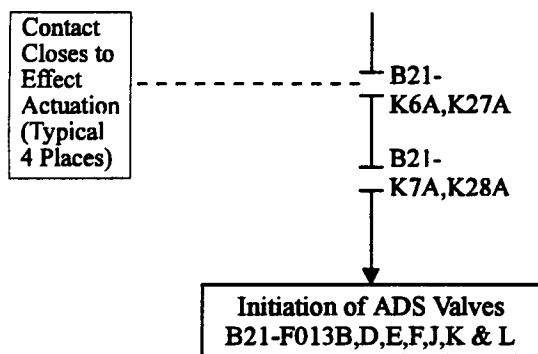
Trip System "A"



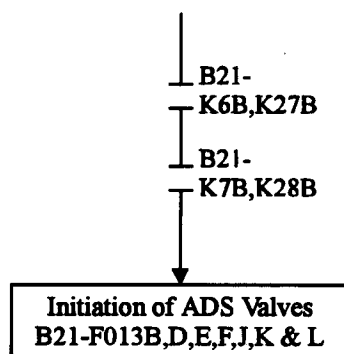
Trip System "B"



Actuation Logic "A"



Actuation Logic "B"



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

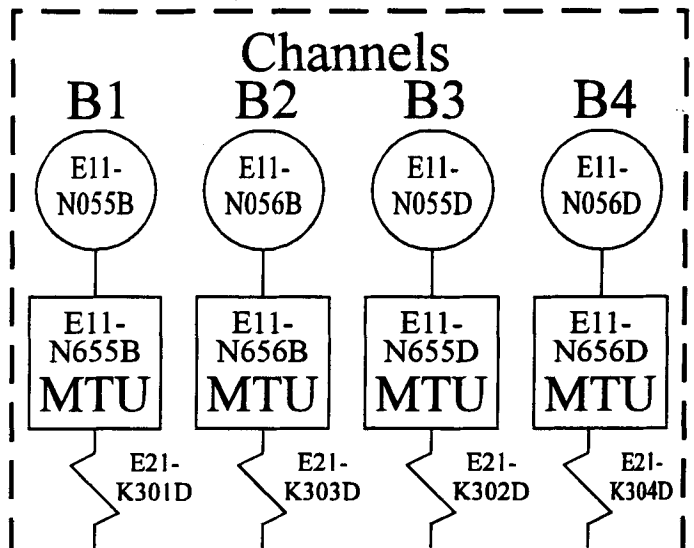
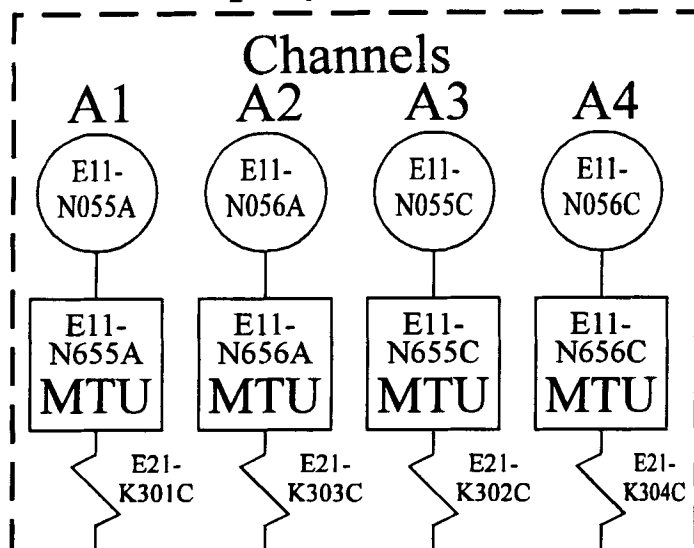
TS 3.3.5.1-1, Item 4.e/5.e
ADS Trip System
Core Spray Pump Discharge
Press-High

Rev. 0

11/16/94

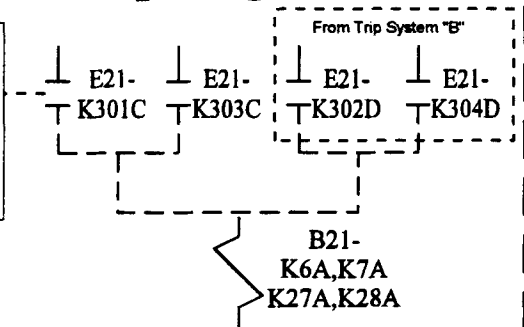
Trip System "A"

Trip System "B"

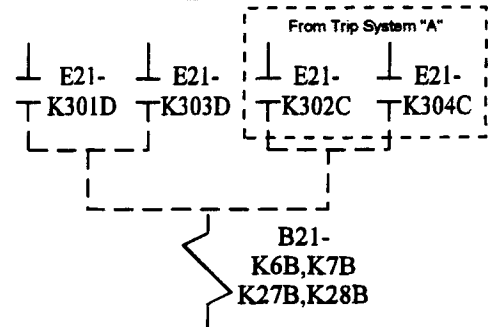


Trip Logic

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

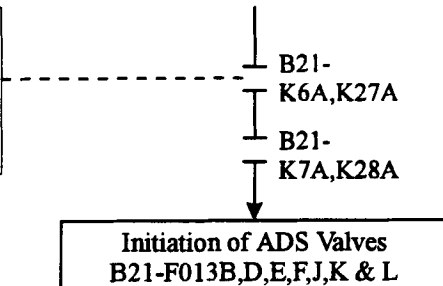


Trip Logic

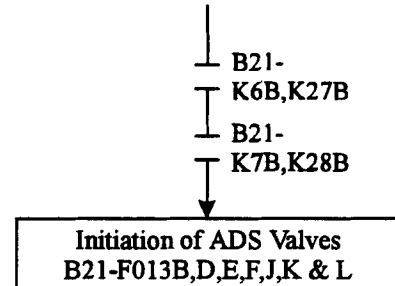


Actuation Logic "A"

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: L&R

Rev. 0

11/16/94

Trip System "A"

Channels

A1

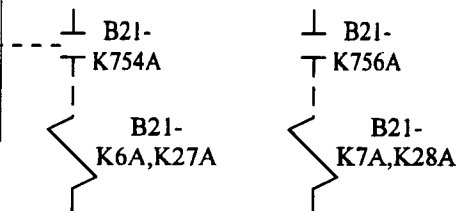
B21-
K754A
"13 Min"
Timer

A2

B21-
K756A
"13 Min"
Timer

Trip Logic

Contact
Closes
After
Time Out
(Typical
4 Places)



Trip System "B"

Channels

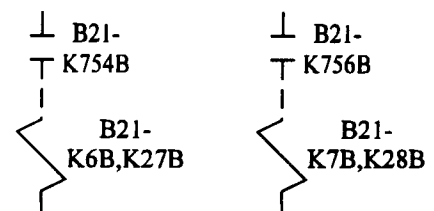
B1

B21-
K754B
"13 Min"
Timer

B2

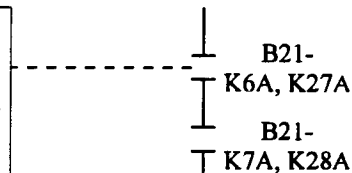
B21-
K756B
"13 Min"
Timer

Trip Logic



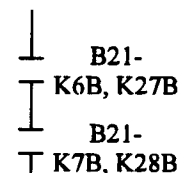
Actuation Logic "A"

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: *J 98*
Reviewed By: *2.5.8*

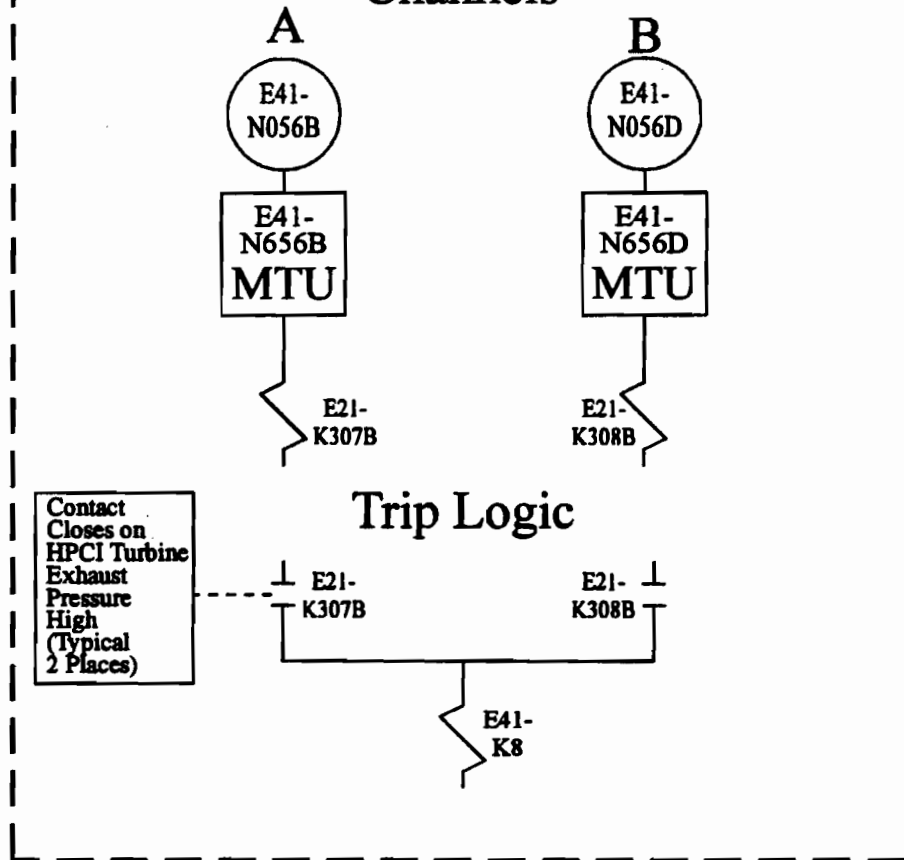
LFD-1-ECCS-24

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

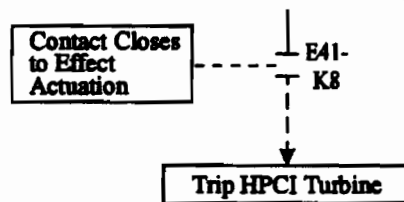
Rev. 0 11/16/94

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

Channel

A

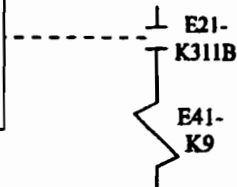
E41-
N053

E41-
N653
MTU

E21-
K311B

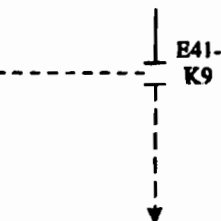
Trip Logic

Contact
Closes on
Pump
Suction
Pressure
Low



Actuation Logic

Contact
Closes
to Effect
Actuation



Trip HPCI Turbine

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: *TZC*

Reviewed By: *Q. J. P.*

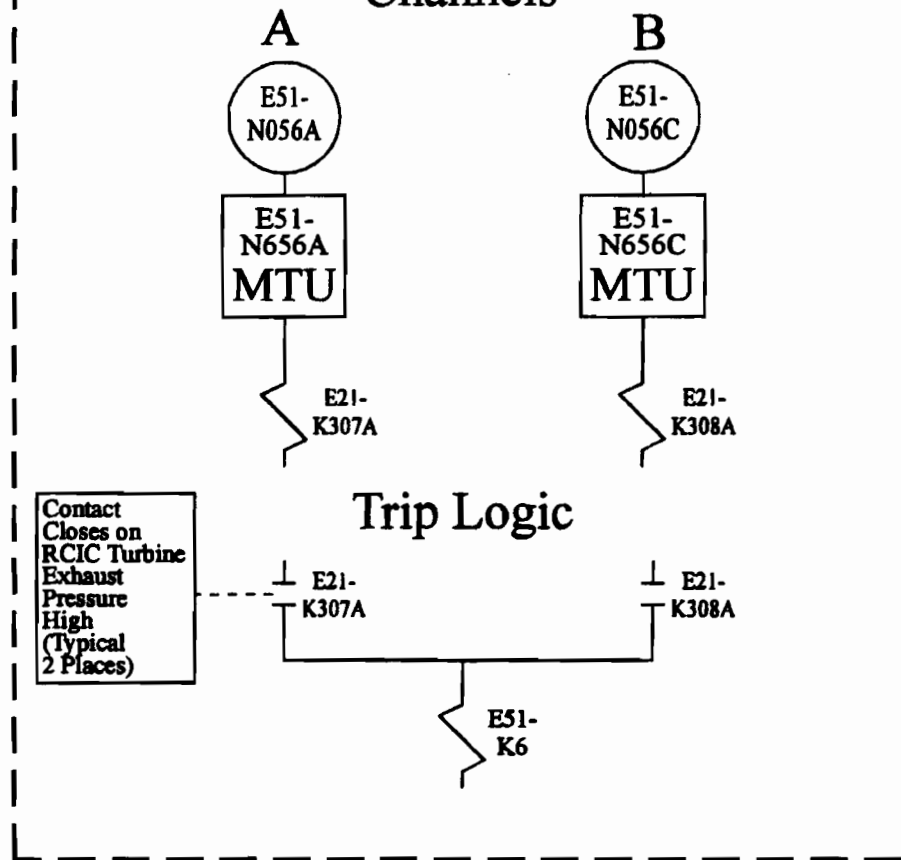
LFD-1-ECCS-26

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

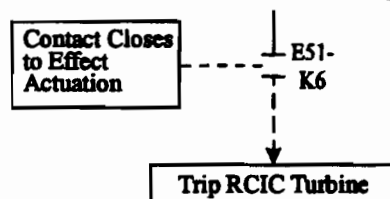
TRM REV. 60

Trip System "A"

Channels



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

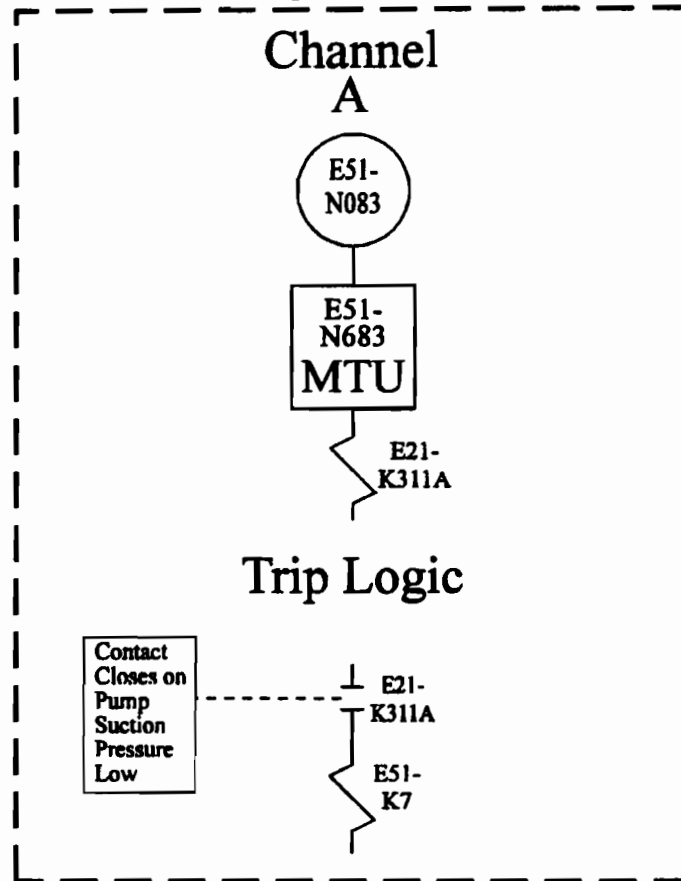
Prepared By: TZLC
Reviewed By: ERD

LFD-1-ECCS-27

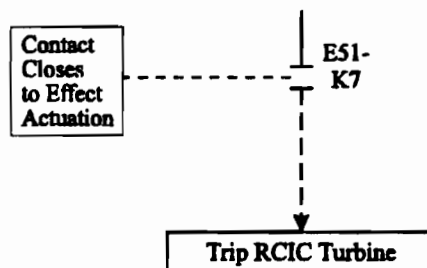
TRM T3.3.5-1, Item 5
RCIC Turbine Trip
RCIC Turbine Exhaust
Pressure-High

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 pump suction pressure-low signal, this channel must be functional.

Elem. Ref.

H-17148
H-17153
H-19821

Prepared By: RLC

Reviewed By: Revel

LFD-1-ECCS-28

TRM T3.3.5-1, Item 6
RCIC Turbine Trip,
RCIC Pump Suction
Pressure-Low

TRM REV. 60

Trip System

Channel

A

E51-
N051

E51-
N651
MTU

E21A-
K309A

Trip Logic

Contact
Closes on
RCIC
Pump
Discharge
Flow-Low

E21-
K309A

E51-
K19

Contact
Closes on
High
Pressure

Actuation Logic

E21-
K312A

Contact
Closes on
RCIC
Pump
Discharge
Flow-Low

E51-
K19

Opens RCIC
Minimum Flow
Valve
E51-F019

Pressure

E21-
K309A

Contact
Closes on
RCIC
Pump
Discharge
Flow Not
Low

Closes RCIC
Minimum Flow
Valve
E51-F019

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.

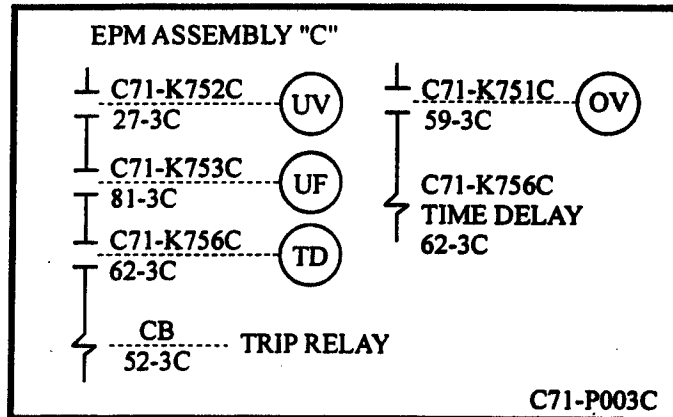
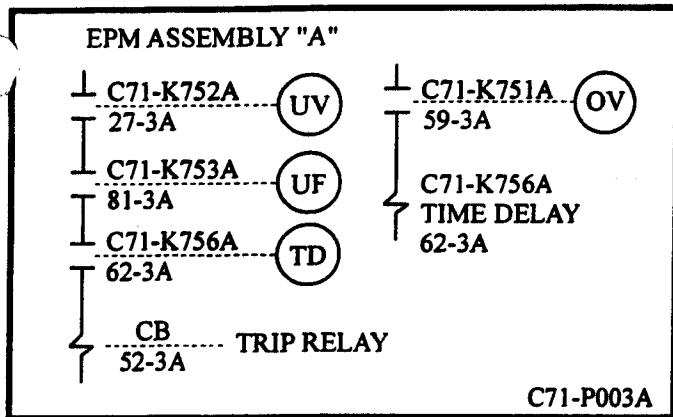
Elem. Ref.
H-17148
H-17152
H-19821

LFD-1-ECCS-29

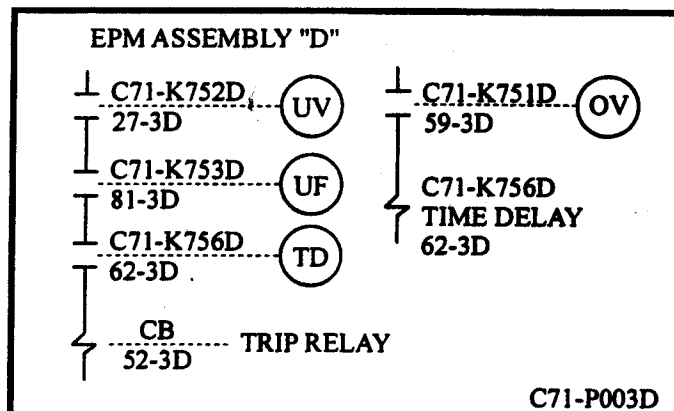
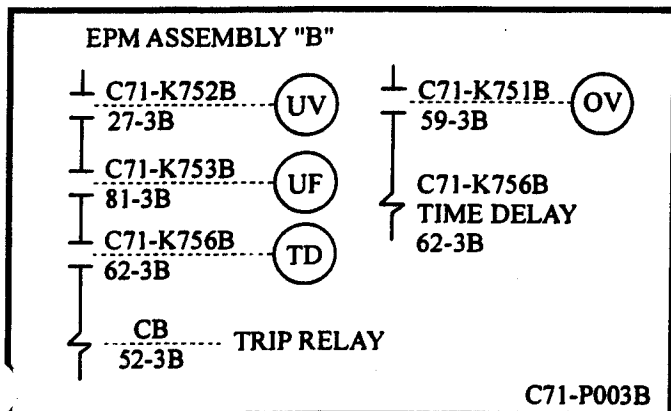
TRM T3.3.5-1,
Items 7.a and 7.b,
RCIC Pump Discharge
Flow-High, Low

TRM REV. 82

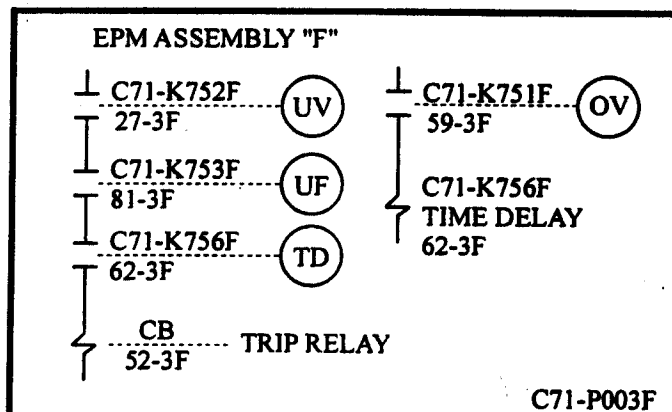
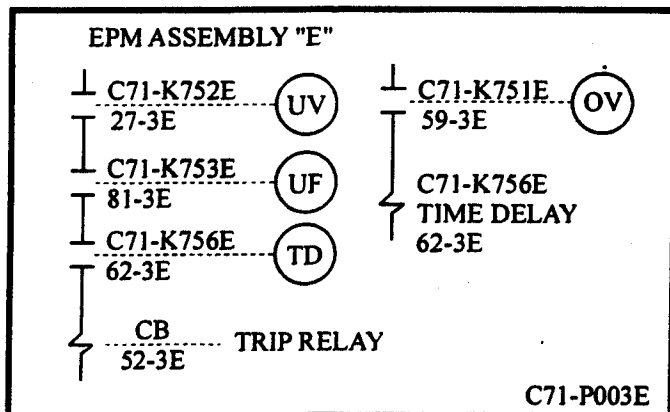
RPS MG SET "A"



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

Prepared By: *[Signature]*

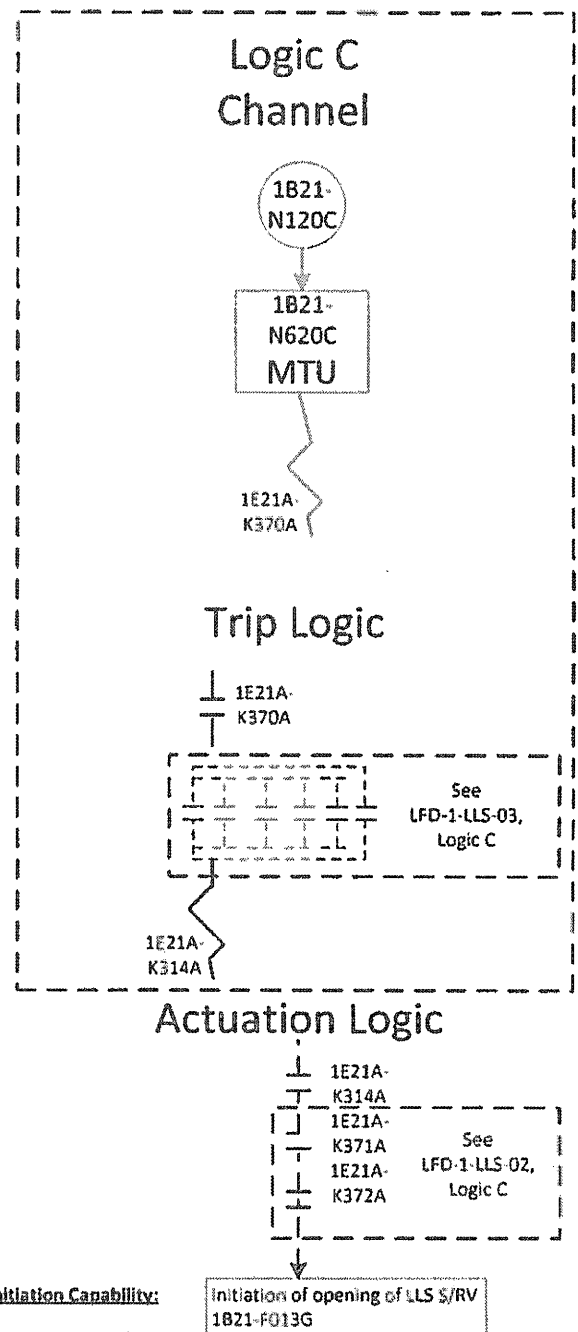
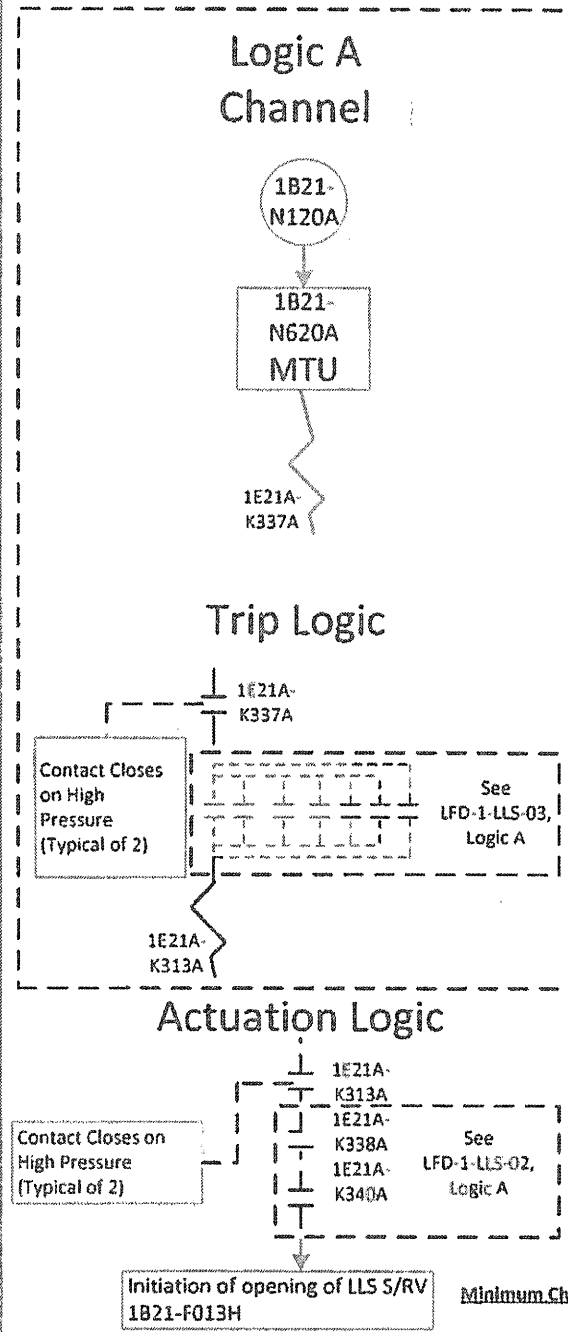
Reviewed By: *[Signature]*

LFD-1-EPM-01

TS 3.3.8.2
RPS Electric Power
Monitor Trips

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

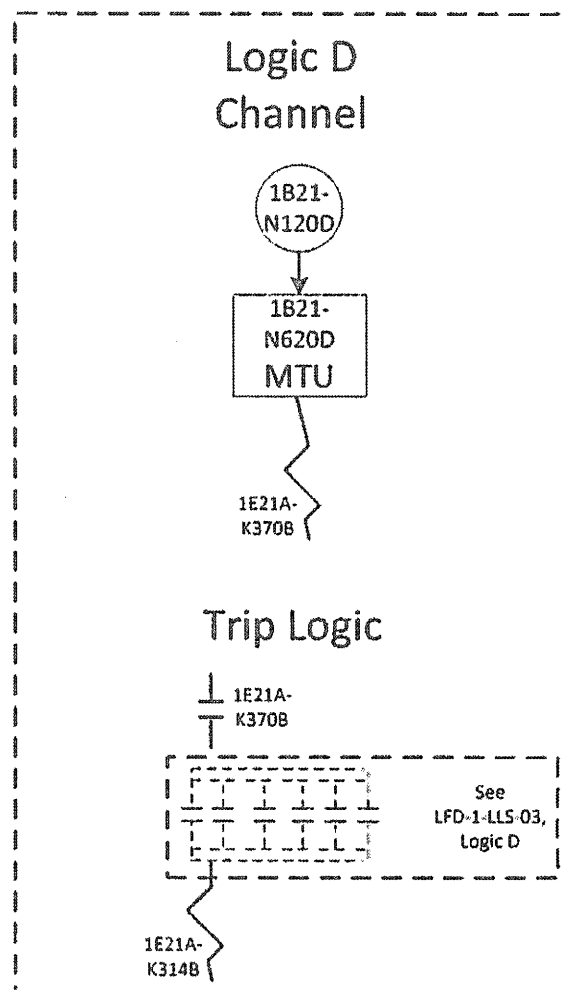
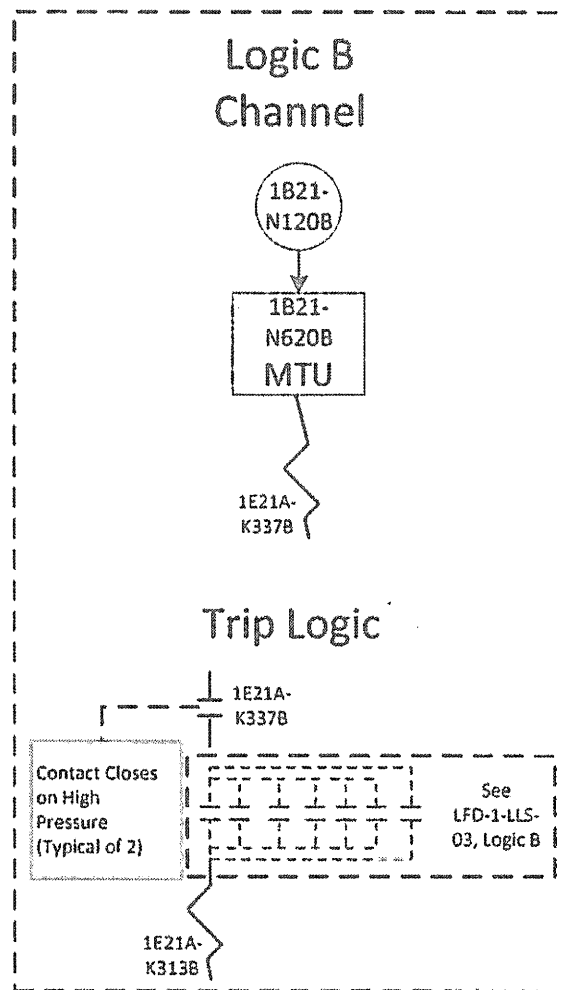
Prepared by: *Andy Bailey* 7/26/16
Reviewed by: *[Signature]*

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



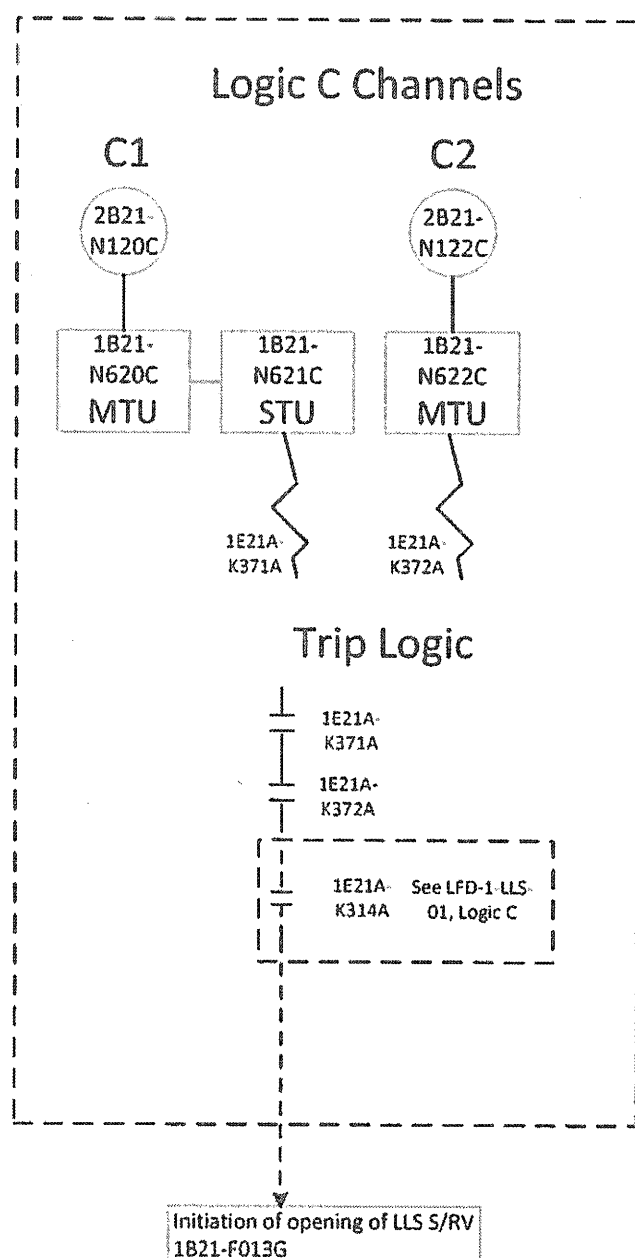
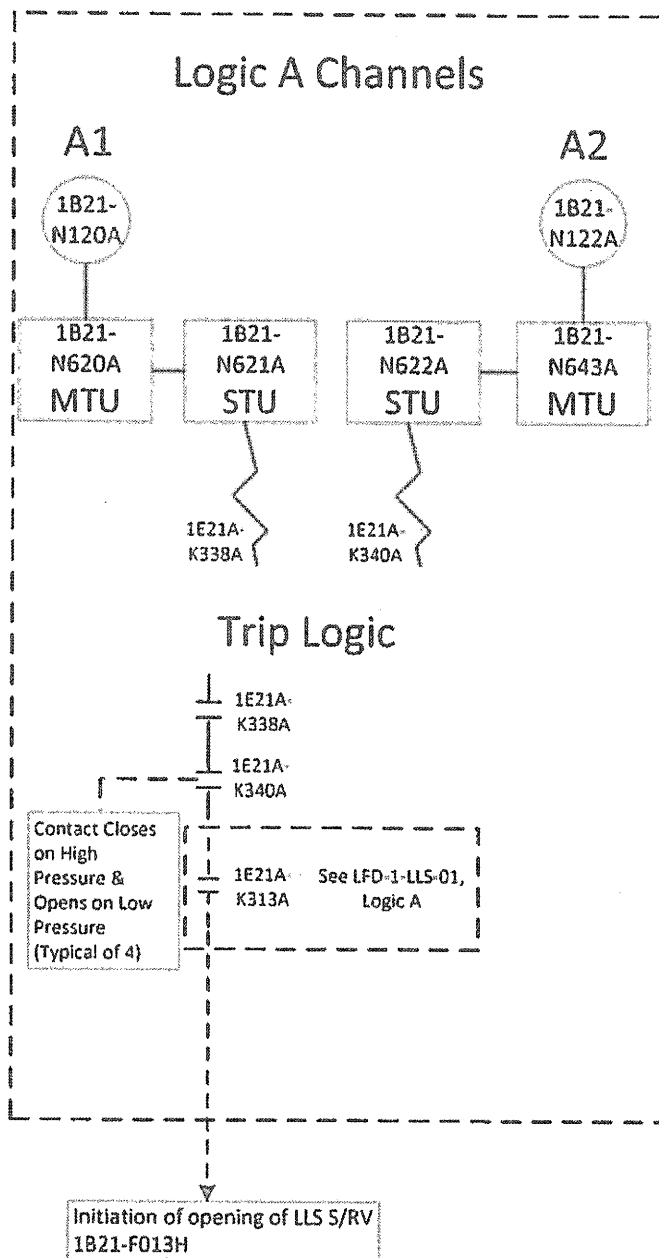
Minimum Channel Requirements for System Initiation Capability:
 In order to maintain the capability to initiate a LLS S/RV, its associated reactor steam dome pressure Logic AND its associated Logic from LFD-1-LLS-02 AND LFD-1-LLS-03 must be operable.

Elem. Ref.
 H-17755 H-19826
 H-19825 H-19834

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



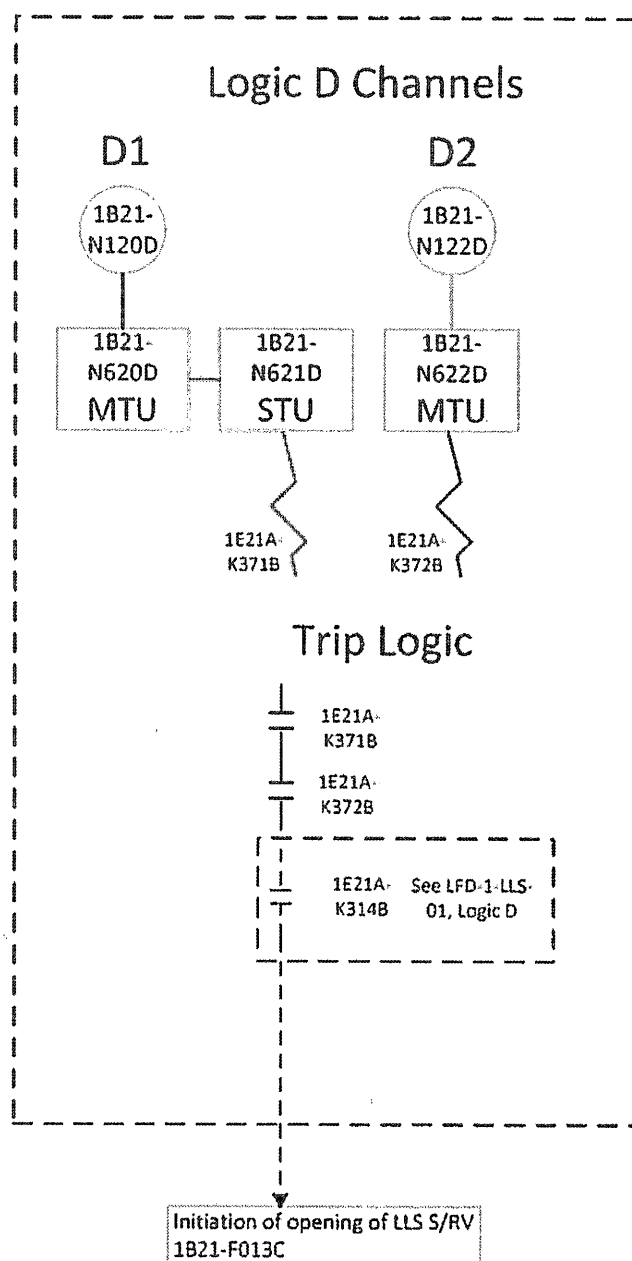
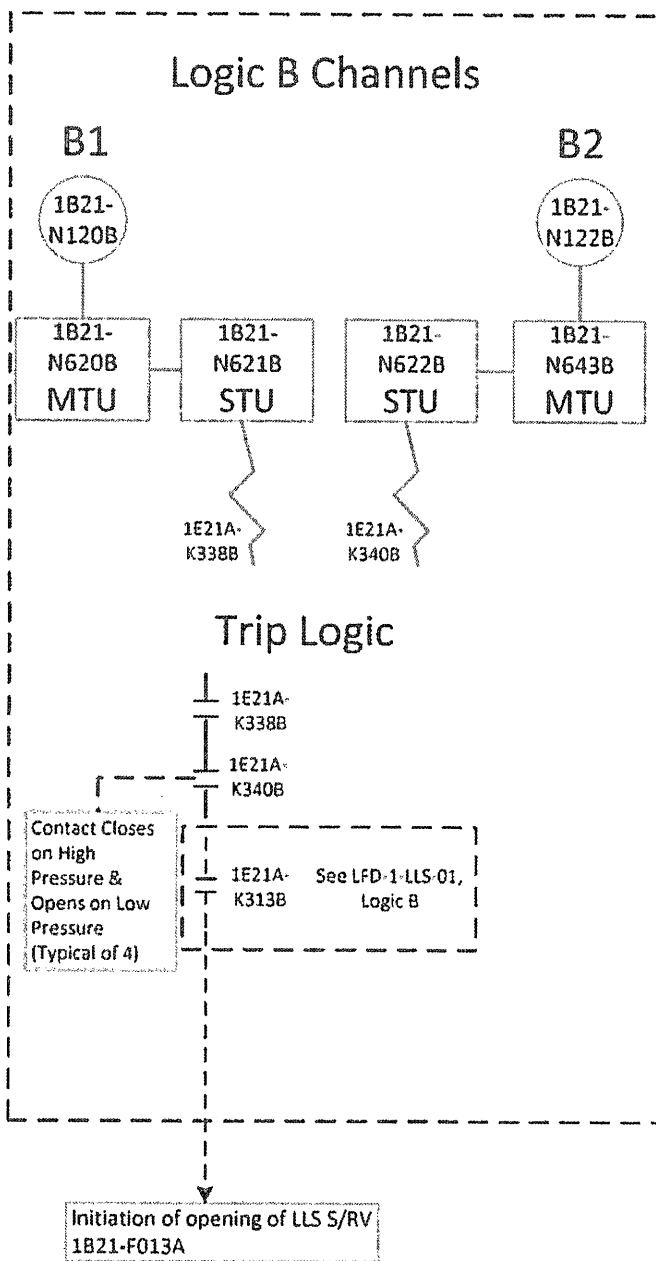
Minimum Channel Requirements for System Initiation Capability:
See Sheet 2 of 2.

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-low set pressure setpoint Logic AND its associated Logic from LFD-1-LLS-01 AND LFD-1-LLS-03 must be operable.

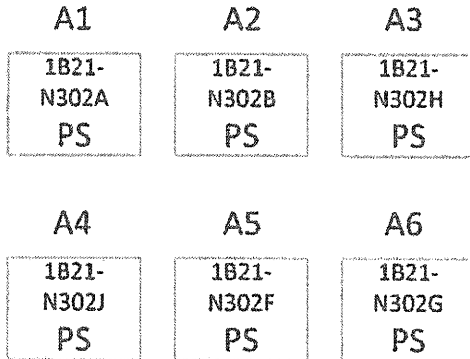
Elem. Ref.
 H-17755 H-19826
 H-19825 H19834

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

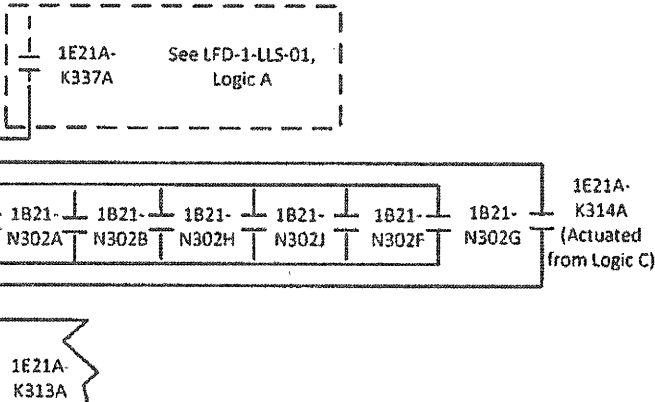
LFD-1-LLS-02
 Sheet 2 of 2
 TS 3.3.6.3-1, Item 2
 Low-Low Set Instrumentation -
 Low-Low Set
 Pressure Setpoints
 Rev. 1
 05/11/2016

Division I

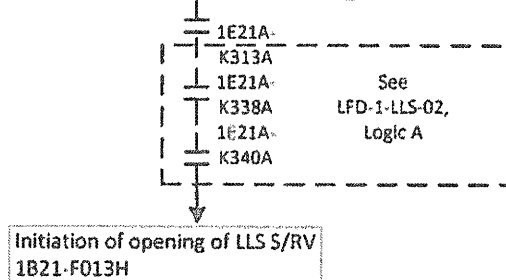
Logic A Channels



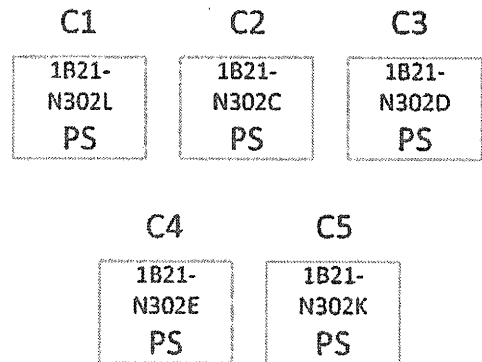
Trip Logic



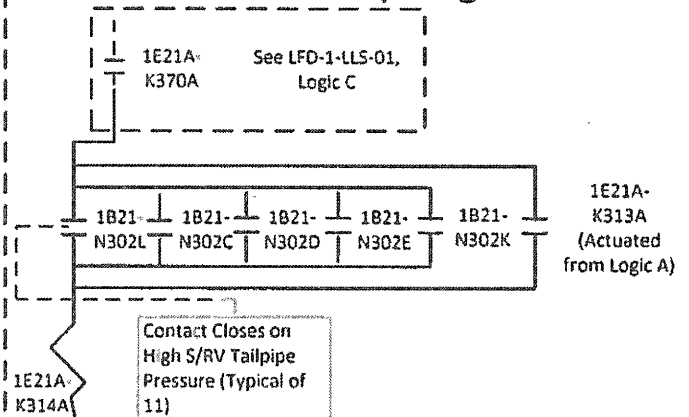
Actuation Logic



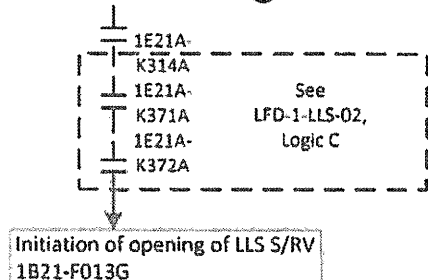
Logic C Channels



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

LFD-1-LLS-03
Sheet 1 of 2

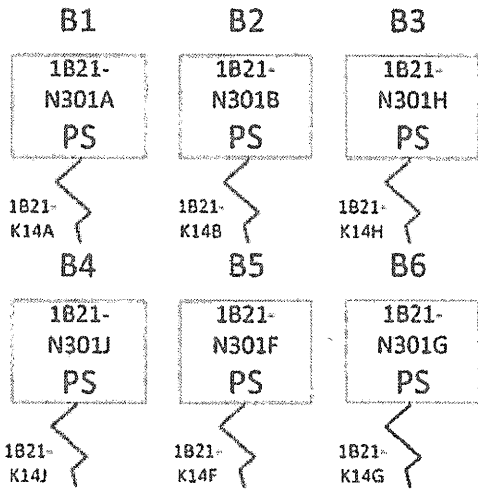
TS 3.3.6.3-1, Item 3
Low-Low Set Instrumentation
Tailpipe Pressure Switch

Rev. 1

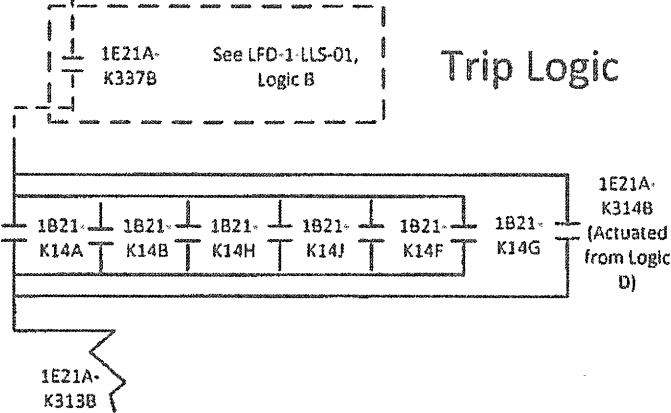
05/11/2016

Division II

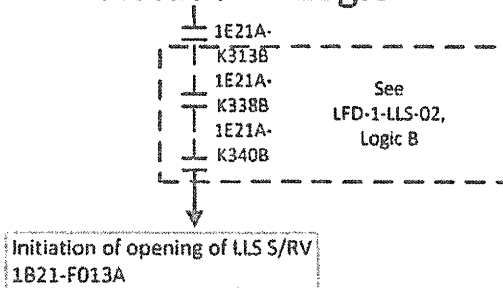
Logic B Channels



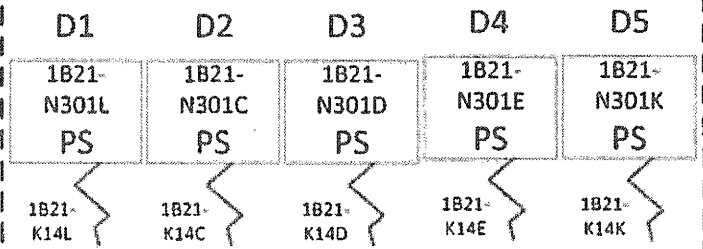
Trip Logic



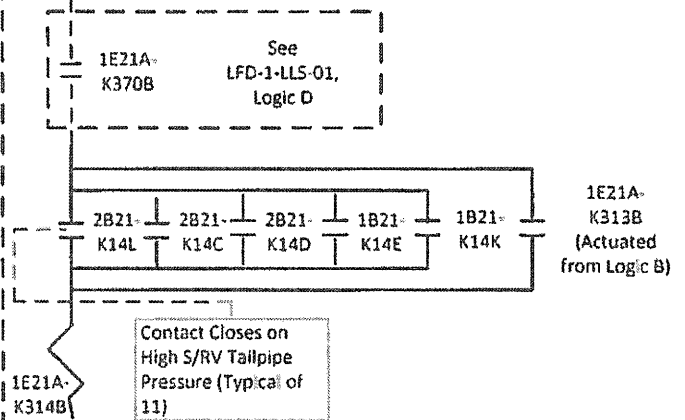
Actuation Logic



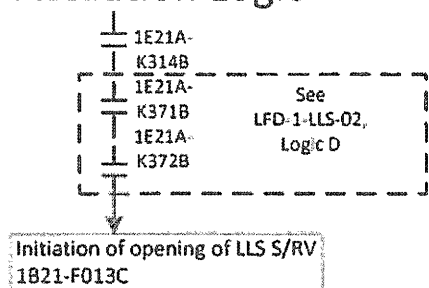
Logic D Channels



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

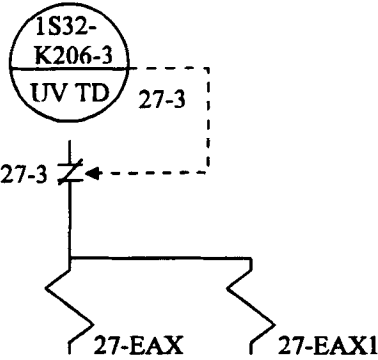
Prepared by: *[Signature]*
Reviewed by: *[Signature]*

Rev. 1

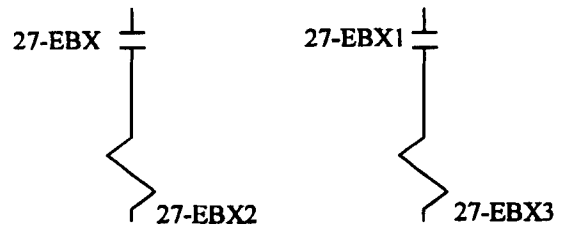
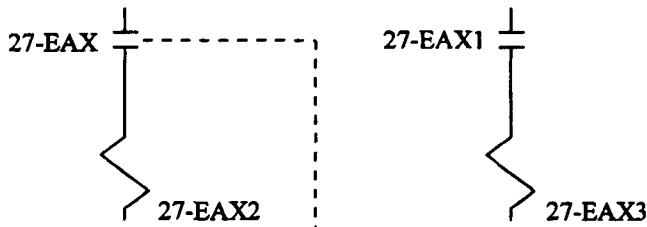
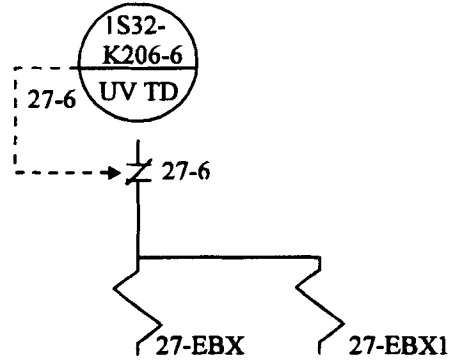
05/11/2016

Trip System: 1E 4.16KV Bus Channels

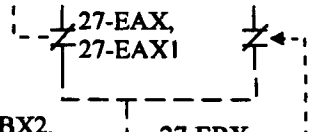
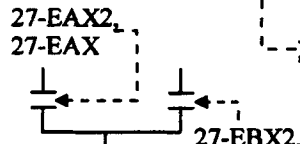
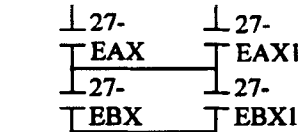
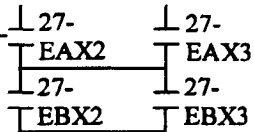
A



B



Trip Logics



Actuation
Logic

Actuation
Logic

Actuation
Logic

Actuation
Logic

Initiates the EDG 1A

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

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

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

Minimum Channel Requirements for System Initiation Capability

See Sheet 3 for minimum channel
requirements.

Elem. Ref.

H-13382 H-17111 H-17768
H-13412 H-17763 H-17776
H-17109 H-17764

Prepared By: *J. B. Bunn*

Reviewed By: *W. J. Bunn*

LFD-1-LOP-01
Sheet 1 of 3

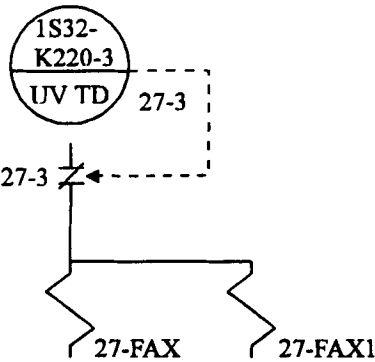
TS 3.3.8.1-1, Items 1.a
and 1.b, 4.16KV
Emergency Bus, Loss
of Voltage and Time
Delay

Rev. 0

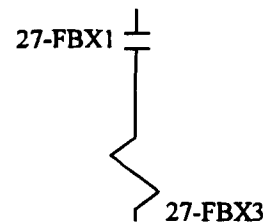
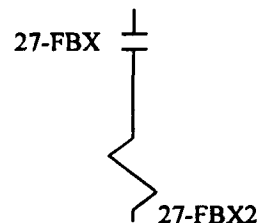
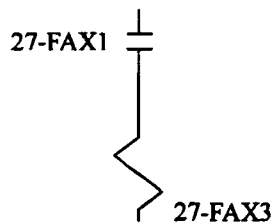
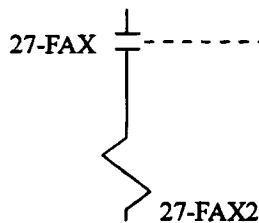
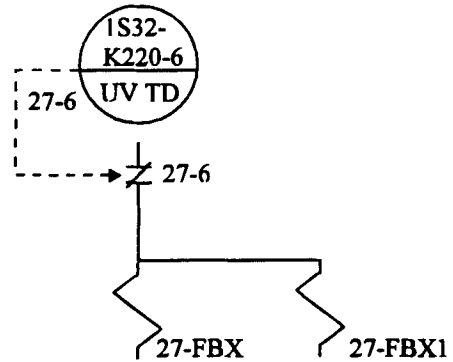
12/16/94

Trip System: 1F 4.16KV Bus Channels

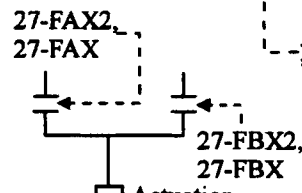
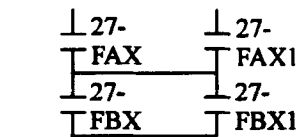
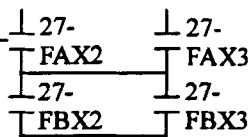
A



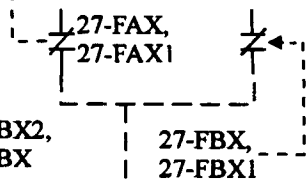
B



Trip Logics



Contacts Open on Loss of Voltage (Typical of 2)



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.

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

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. 0 12/16/94

Trip System: 1G 4.16KV Bus Channels

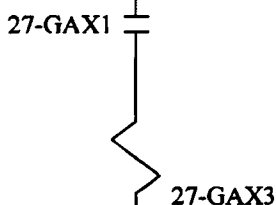
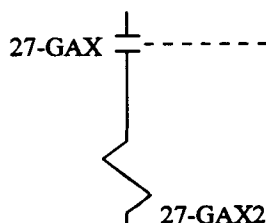
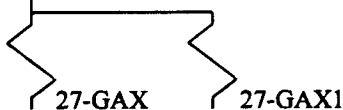
A

1S32-
K227-3
UV TD

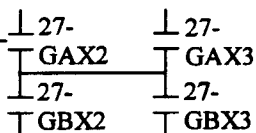
27-3

27-3

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 1C
Supply Breaker Closure, and
1G Bus Normal and
Alternate Supply Breaker
Lockout

Elem. Ref.

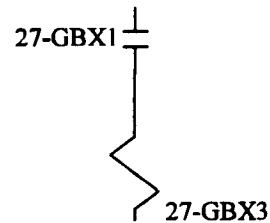
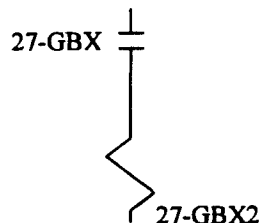
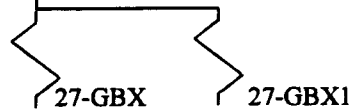
H-13382 H-17111 H-17767
H-13414 H-17765
H-17109 H-17766

B

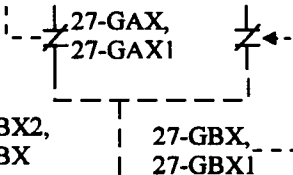
1S32-
K227-6
UV TD

27-6

27-6



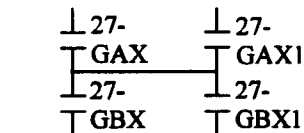
Contacts Open
on Loss of Voltage
(Typical of 2)



Actuation
Logic

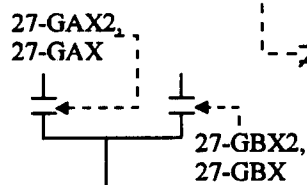
Prevents Start of CS B and
RHR B Pumps Until
Voltage is Restored

Trip Logics



Actuation
Logic

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



Actuation
Logic

Initiates the EDG 1C

Minimum Channel Requirements for System Initiation Capability:

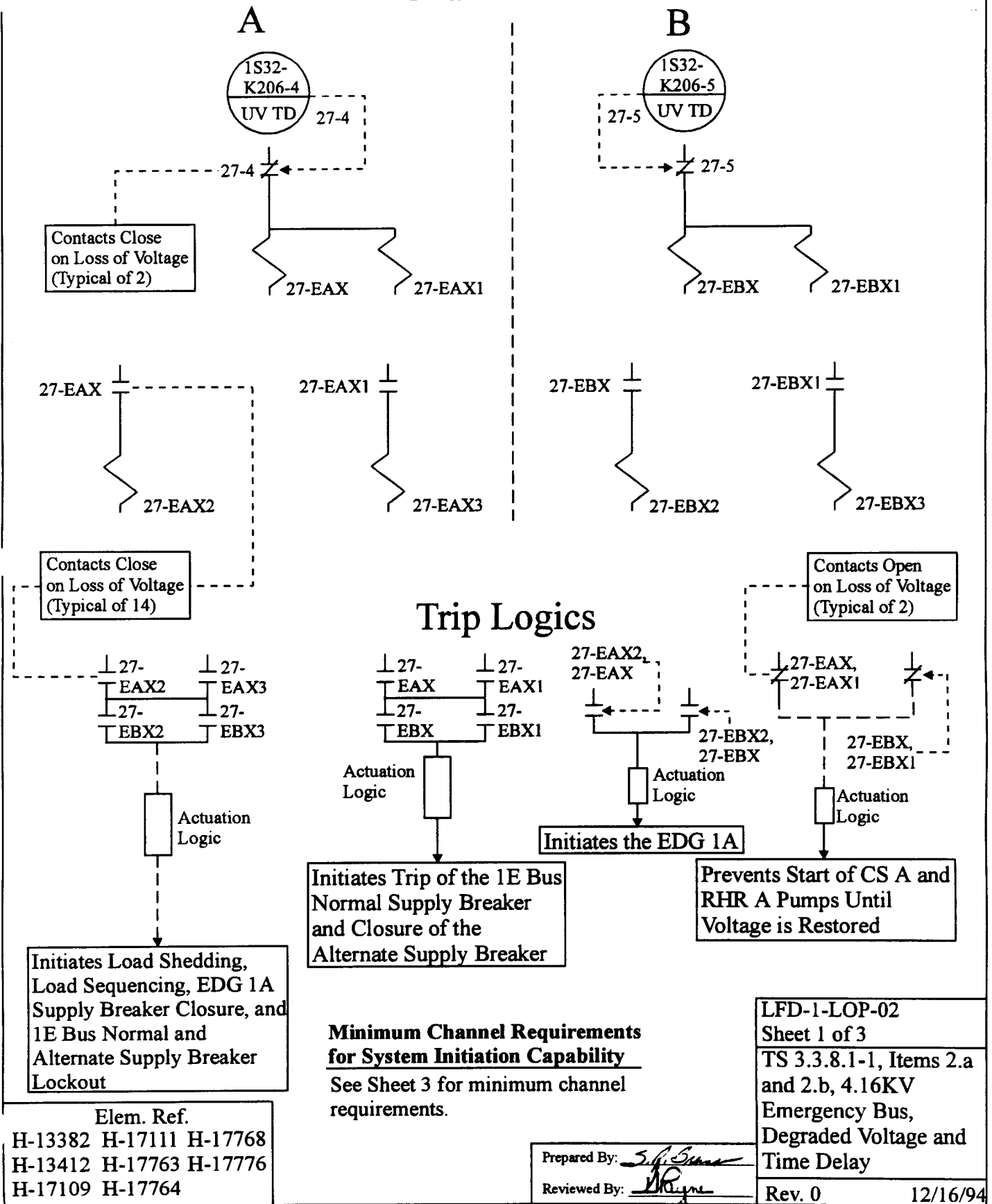
In order to maintain Diesel Generator function
initiation capability on a loss of voltage condition,
both channels associated with each of two
emergency busses are required to be operable.

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

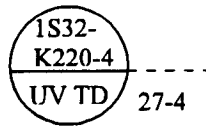
Rev. 0

12/16/94



Trip System: 1F 4.16KV Bus Channels

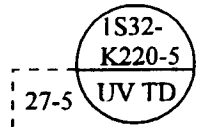
A



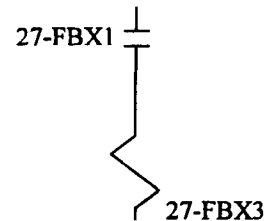
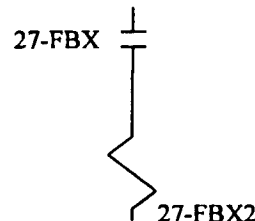
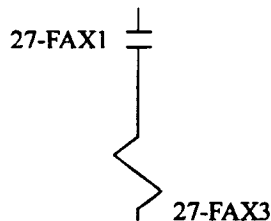
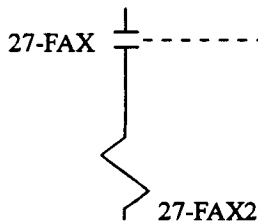
Contacts Close
on Loss of Voltage
(Typical of 2)

27-FAX 27-FAX1

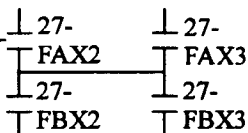
B



27-FBX 27-FBX1



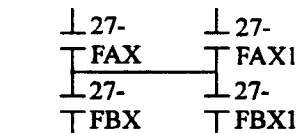
Contacts Close
on Loss of Voltage
(Typical of 14)



Actuation
Logic

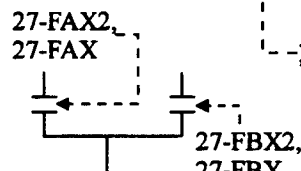
Initiates Load Shedding,
Load Sequencing, EDG 1B
Supply Breaker Closure, and
1F Bus Normal and
Alternate Supply Breaker
Lockout

Trip Logics



Actuation
Logic

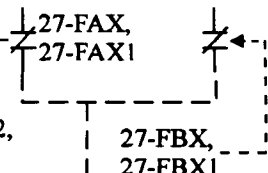
Initiates Trip of the 1F Bus
Normal Supply Breaker
and Closure of the
Alternate Supply Breaker



Actuation
Logic

Initiates the EDG 1B

Contacts Open
on Loss of Voltage
(Typical of 2)



Actuation
Logic

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

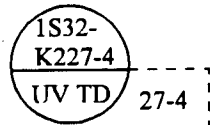
**Minimum Channel Requirements
for System Initiation Capability**
See Sheet 3 for minimum channel
requirements.

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

LFD-1-LOP-02
Sheet 2 of 3
TS 3.3.8.1-1, Items 2.a
and 2.b, 4.16KV
Emergency Bus,
Degraded Voltage and
Time Delay
Rev. 0 12/16/94

Trip System: 1G 4.16KV Bus Channels

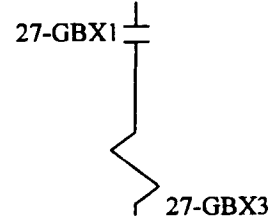
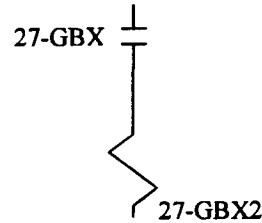
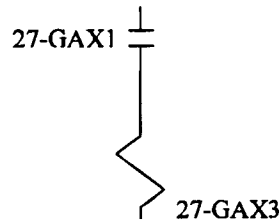
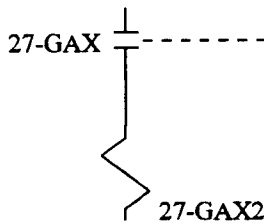
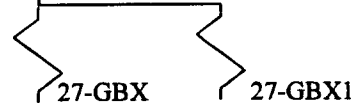
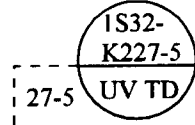
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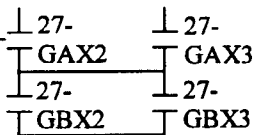
Contacts Close
on Loss of Voltage
(Typical of 2)



B



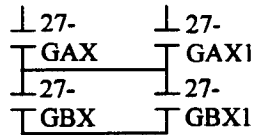
Contacts Close
on Loss of Voltage
(Typical of 14)



Actuation
Logic

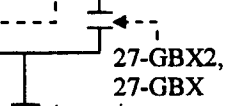
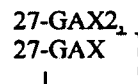
Initiates Load Shedding,
Load Sequencing, EDG 1C
Supply Breaker Closure, and
1G Bus Normal and
Alternate Supply Breaker
Lockout

Trip Logics



Actuation
Logic

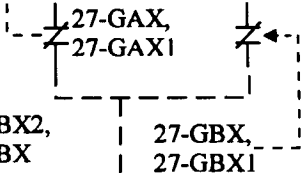
Initiates Trip of the 1G Bus
Normal Supply Breaker
and Closure of the
Alternate Supply Breaker



Actuation
Logic

Initiates the EDG 1C

Contacts Open
on Loss of Voltage
(Typical of 2)



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.

Elem. Ref.

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

LFD-1-LOP-02

Sheet 3 of 3

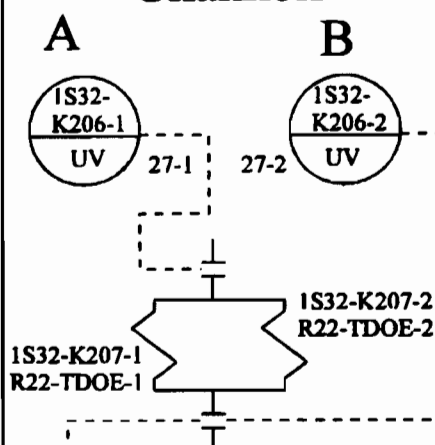
TS 3.3.8.1-1, Items 2.a
and 2.b, 4.16KV
Emergency Bus,
Degraded Voltage and
Time Delay

Rev. 0

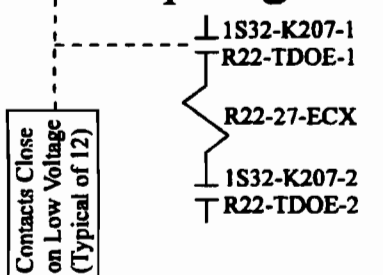
12/16/94

Trip System

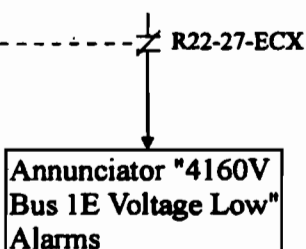
1E 4.16KV Bus
Channels



Trip Logic



Contacts Close
on Low Voltage
(Typical of 12)

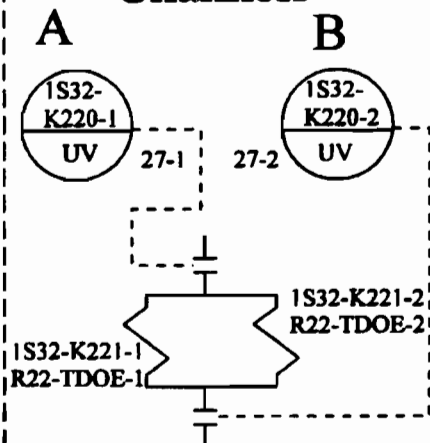


Annunciator "4160V
Bus 1E Voltage Low"
Alarms

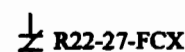
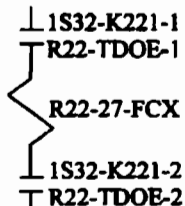
Contacts Open
on Low Voltage
(Typical of 3)

Trip System

1F 4.16KV Bus
Channels



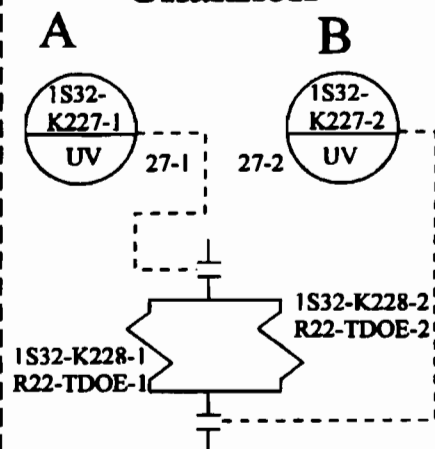
Trip Logic



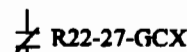
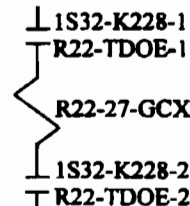
Annunciator "4160V
Bus 1F Voltage Low"
Alarms

Trip System

1G 4.16KV Bus
Channels



Trip Logic



Annunciator "4160V
Bus 1G Voltage Low"
Alarms

Minimum Channel Requirements for System Initiation Capability:

In order to maintain annunciation capability on a low voltage condition on the emergency busses, both channels including their associated time delay relays for each emergency bus must be operable.

Elem. Ref.
H-13412
H-13413
H-13414

Prepared By: *RKC*
Reviewed By: *DRJ*

LFD-1-LOP-03

TS 3.3.8.1-1, Items 3.a
and 3.b, 4.16KV
Emergency Bus,
Degraded Voltage
Annunciation and
Time Delay

TRM Rev. 63

Trip System "A"

Channel

A

1Z41-
N015A

1Z41-
R615A
RIS

1Z41-
K80

1Z41-
G15A-1

Trip Logic

Contacts
Open On
Inlet High
Radiation
(Typical of 2)

1Z41-
K80

1Z41-
G15A-1

1Z41-
K82

1Z41-
G15A-1

Actuation Logic

1Z41-
K82

1Z41-
G15A-1

Contacts
Close On
Inlet High
Radiation
(Typical of 2)

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

Trip System "B"

Channel

B

1Z41-
N015B

1Z41-
R615B
RIS

1Z41-
K80

1Z41-
G15B-1

Trip Logic

1Z41-
K80

1Z41-
G15B-1

1Z41-
K82

1Z41-
G15B-1

Actuation Logic

1Z41-
K82

1Z41-
G15B-1

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

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. P. Bruner*

Reviewed By: *Stephen W. Reed*

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

1B21-
N091A

1B21-
N091C

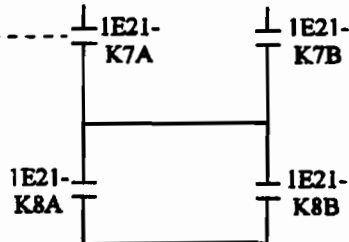
1B21-
N691A
MTU

1B21-
N691C
MTU

1E21-
K7A

1E21-
K8A

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

1B21-
N091B

1B21-
N091D

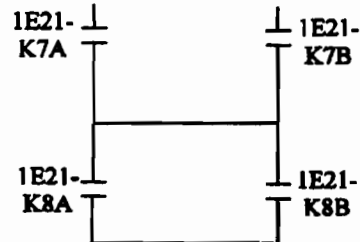
1B21-
N691B
MTU

1B21-
N691D
MTU

1E21-
K7B

1E21-
K8B

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.

Elem. Ref.

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

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

Prepared By: *TRC*

Reviewed By: *TRC*

LFD-1-MCREC-02

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

TRM REV. 60

Trip System "A"

Channels

A1

A2

1E11-
N094A

1E11-
N094C

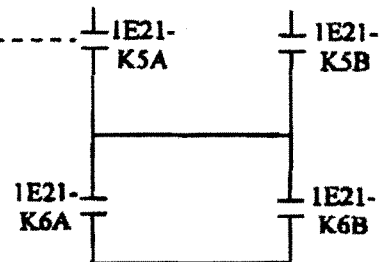
1E11-
N694A
MTU

1E11-
N694C
MTU

1E21-
K5A

1E21-
K6A

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

B1

B2

1E11-
N094B

1E11-
N094D

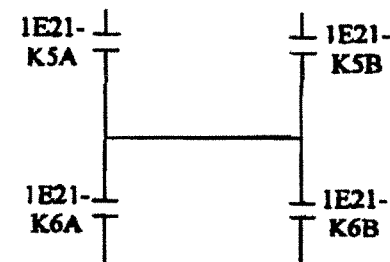
1E11-
N694B
MTU

1E11-
N694D
MTU

1E21-
K5B

1E21-
K6B

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
printed

B.G. Thigpin
S.B. Tipps
signature

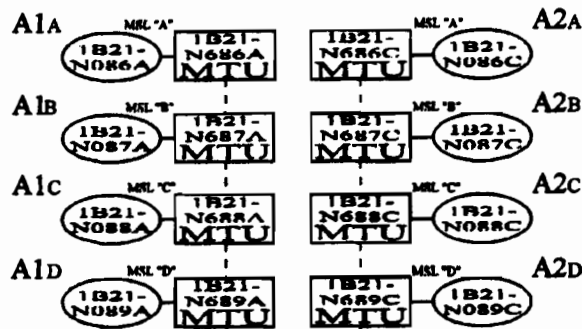
LFD-1-MCREC-03

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

TRM Rev. 93

Trip System "A"

Channels

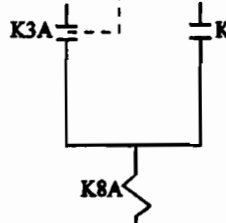


1A71-
K3A

1A71-
K3C

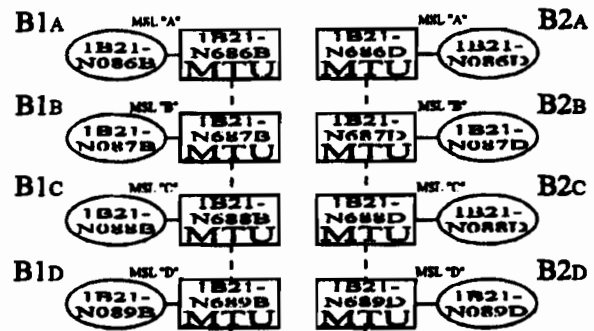
Contact Opens
To Cause
Actuation
(Typical of 4)

Trip Logic "A"



Trip System "B"

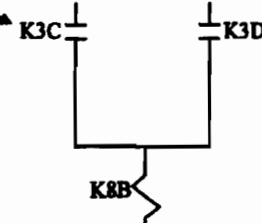
Channels



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

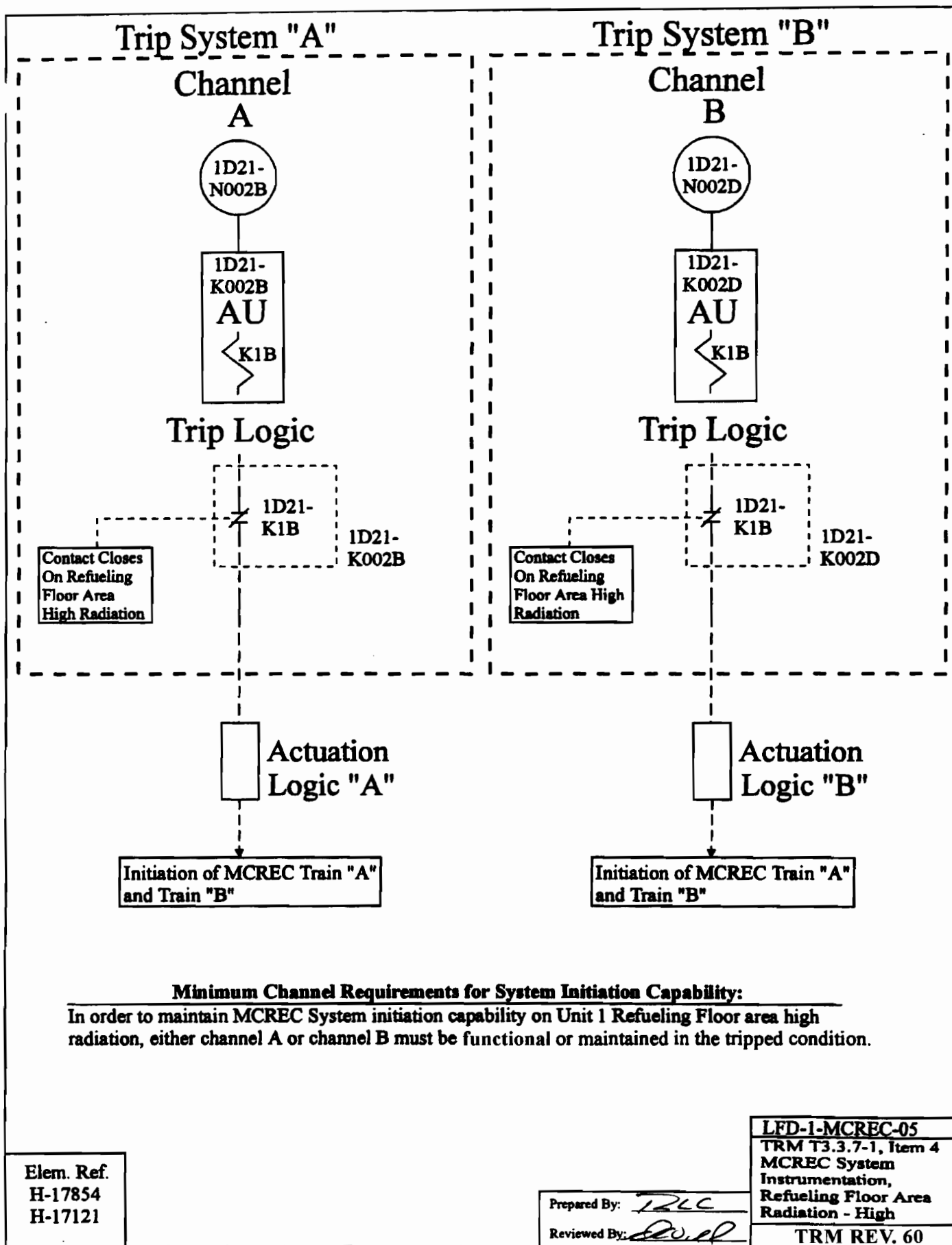
Prepared By: *DLC*

Reviewed By: *Rev. 1*

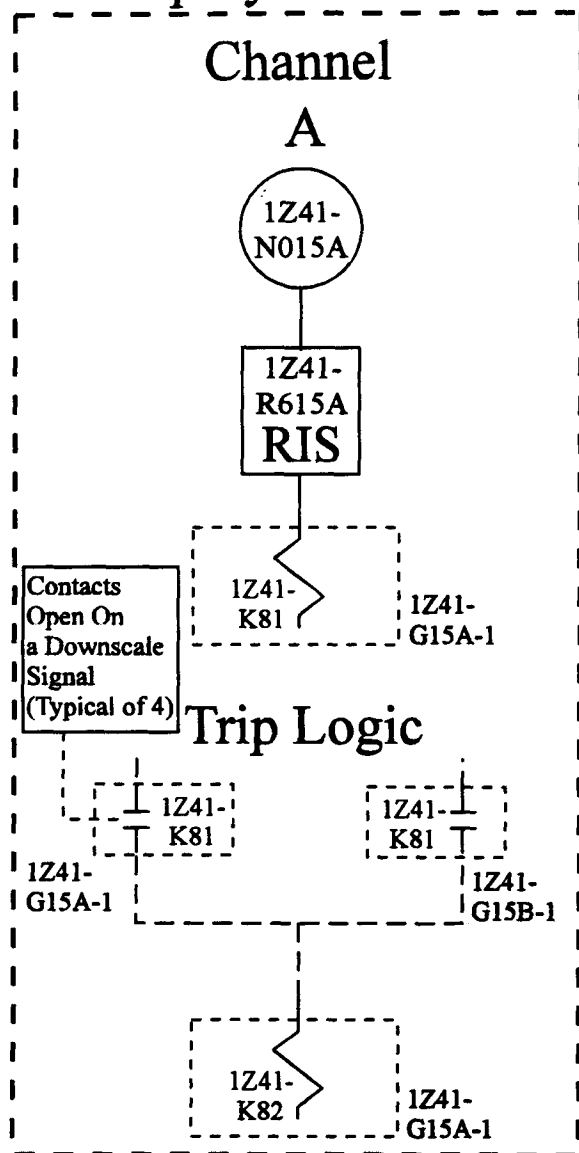
LFD-1-MCREC-04

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

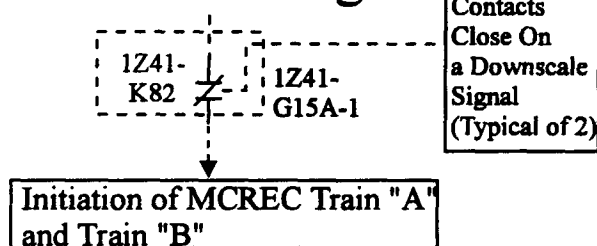
TRM REV. 60



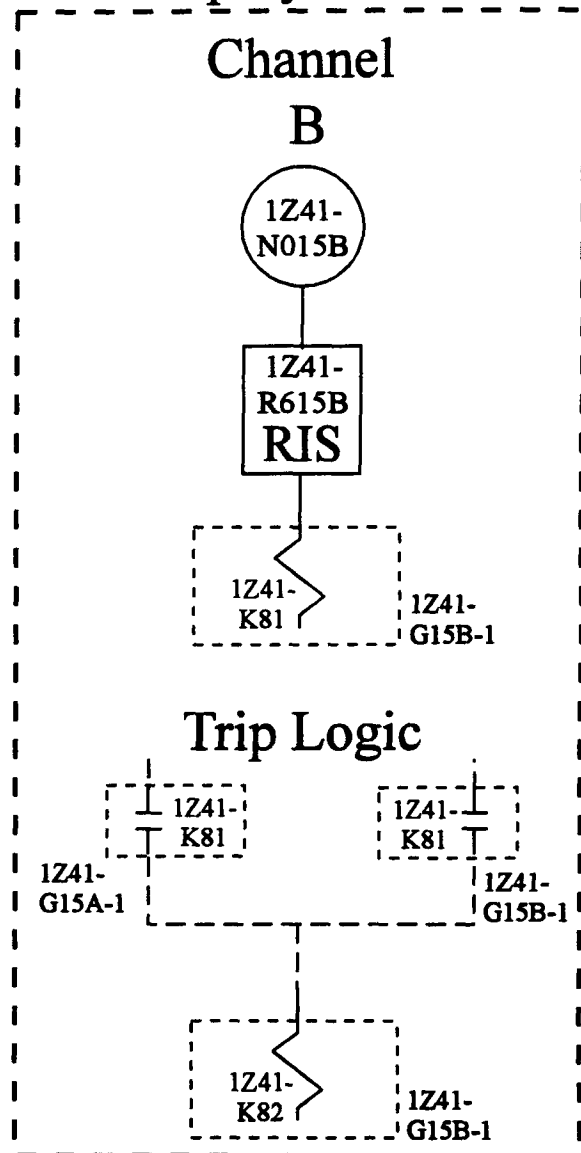
Trip System "A"



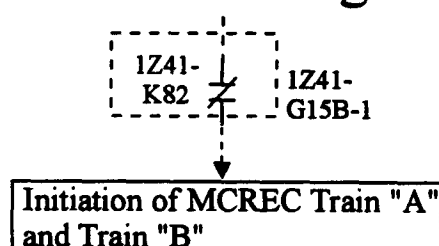
Actuation Logic



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: *SP. Burton*
Reviewed By: *JP. Sigme*

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



1A71B-
K44A

1A71B-
K44C

Trip System "B"

Channels

B1

B2



1A71B-
K44B

1A71B-
K44D

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. R. Ryne*

LFD-1-MSLR-01
Sheet 1 of 2

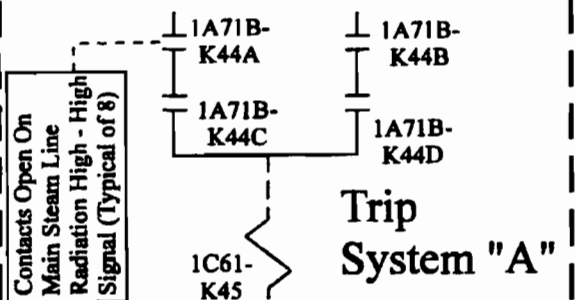
TRM T3.3.11
Main Steam Line
Radiation High - High

Rev. 0

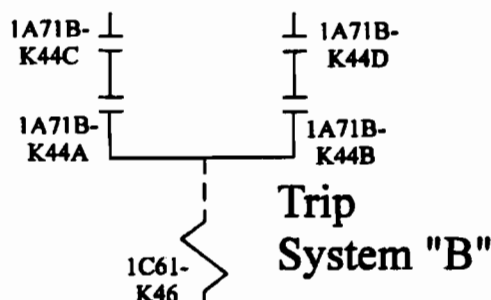
3/30/95

Trip of Steam Packing Exhausters and Mechanical Vacuum Pump

Trip Logic

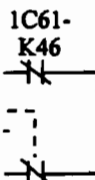


Trip Logic



Actuation Logic

Contacts Close On a Main Steam Line Radiation High - High Signal (Typical of 2)



Trip of Steam Packing Exhausters 1N33-C001A & B and Mechanical Vacuum Pump 1N62-C002

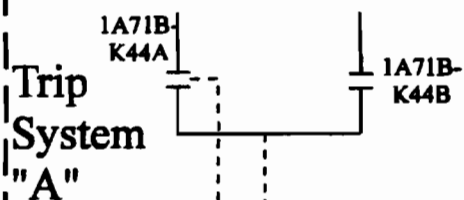
Minimum Channel Requirements for System Initiation Capability:

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.

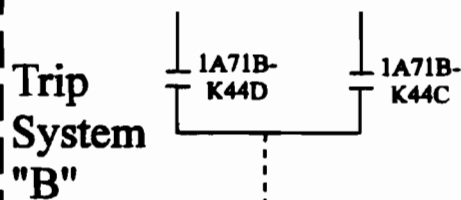
A1 or A2
and
B1 or B2

Closure of the Reactor Water Sample Valves

Trip Logic



Trip Logic



Contacts Open On a Main Steam Line Radiation High - High Signal (Typical of 4)

Closure of Inboard Group 1 Valve 1B31-F019

Closure of Outboard Group 1 Valve 1B31-F020

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

Elem. Ref.: See sheet 1.

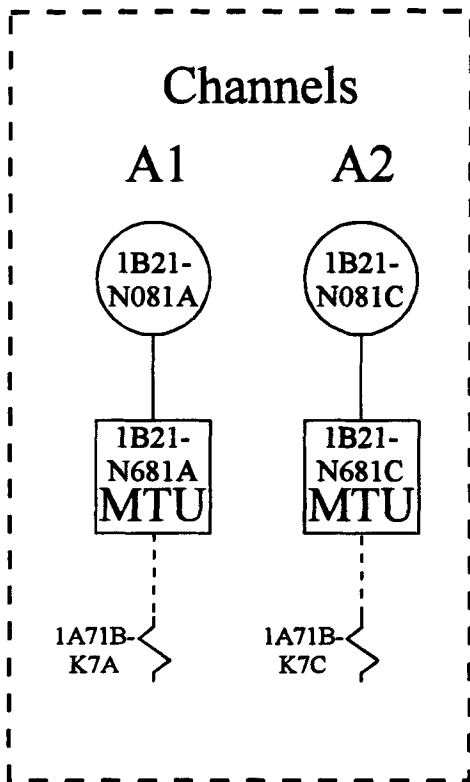
Prepared By: *TRC*
Reviewed By: *TRC*

LFD-1-MSLR-01
Sheet 2 of 2

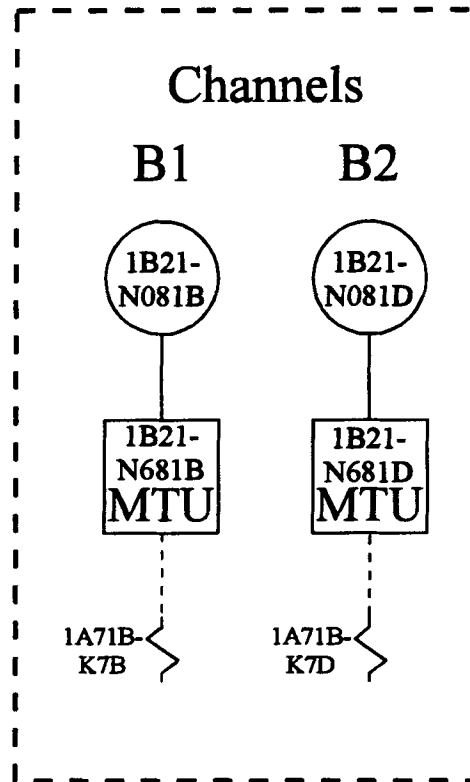
TRM T3.3.11
Main Steam Line
Radiation High - High

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: JK

Reviewed By: Stephen W. Reed

LFD-1-PCIS-01

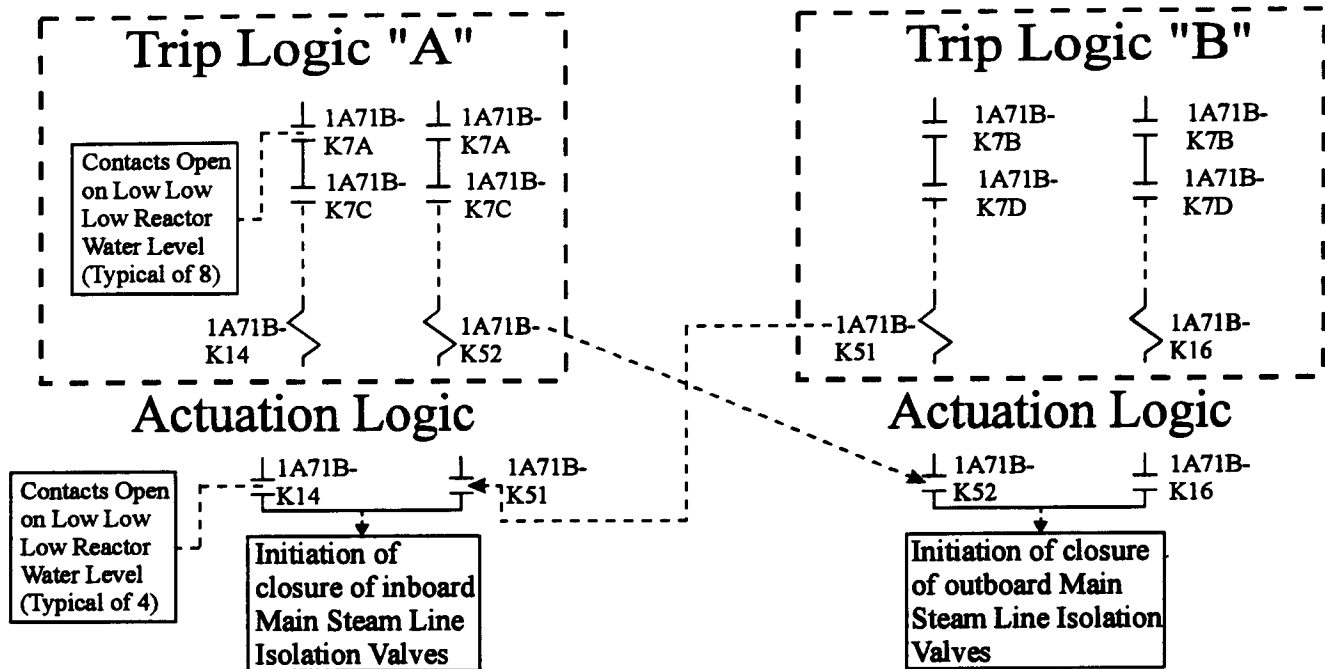
Sheet 1 of 2

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:

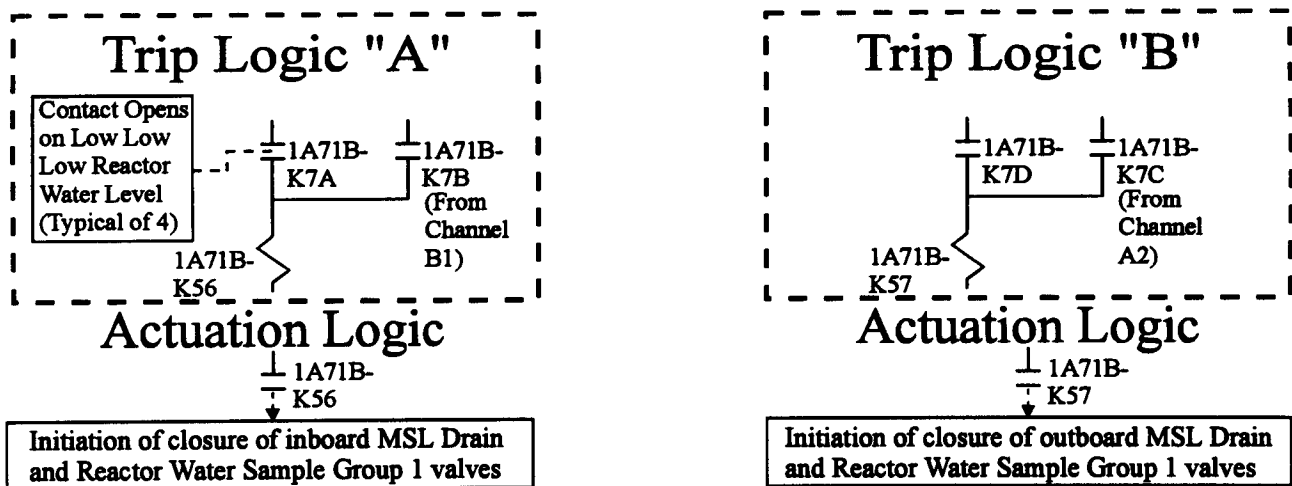
In order to maintain the capability to isolate the main steam lines on low low low reactor vessel water level, channels in one of the following combinations must be either operable or maintained in the tripped condition.

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.

Elem. Ref.

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

A1 and B1

OR

A2 and B2

LFD-1-PCIS-01

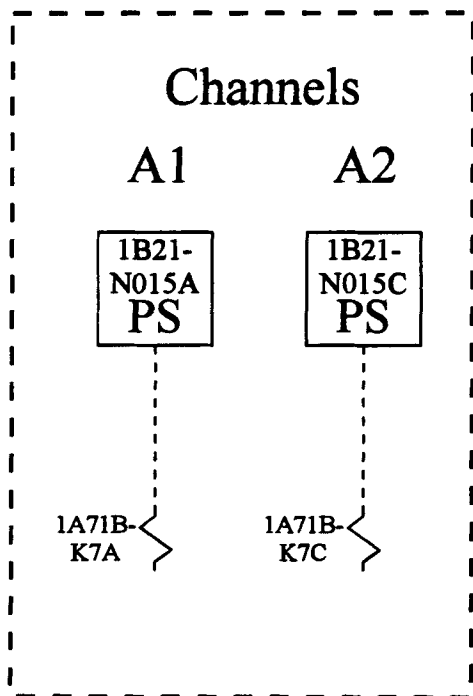
Sheet 2 of 2

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

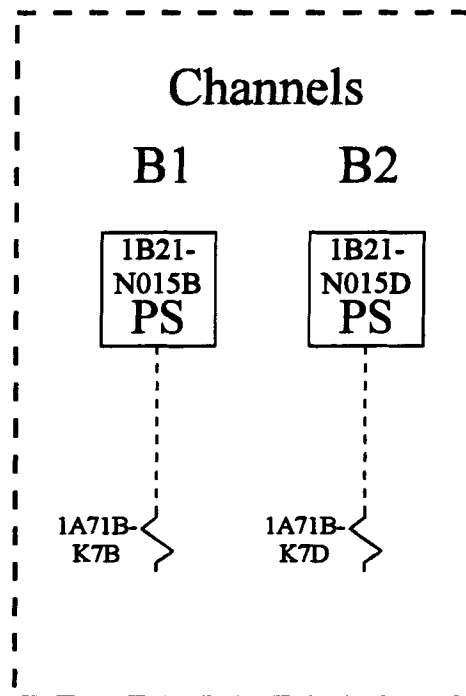
Rev. 0

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:

Reviewed By:

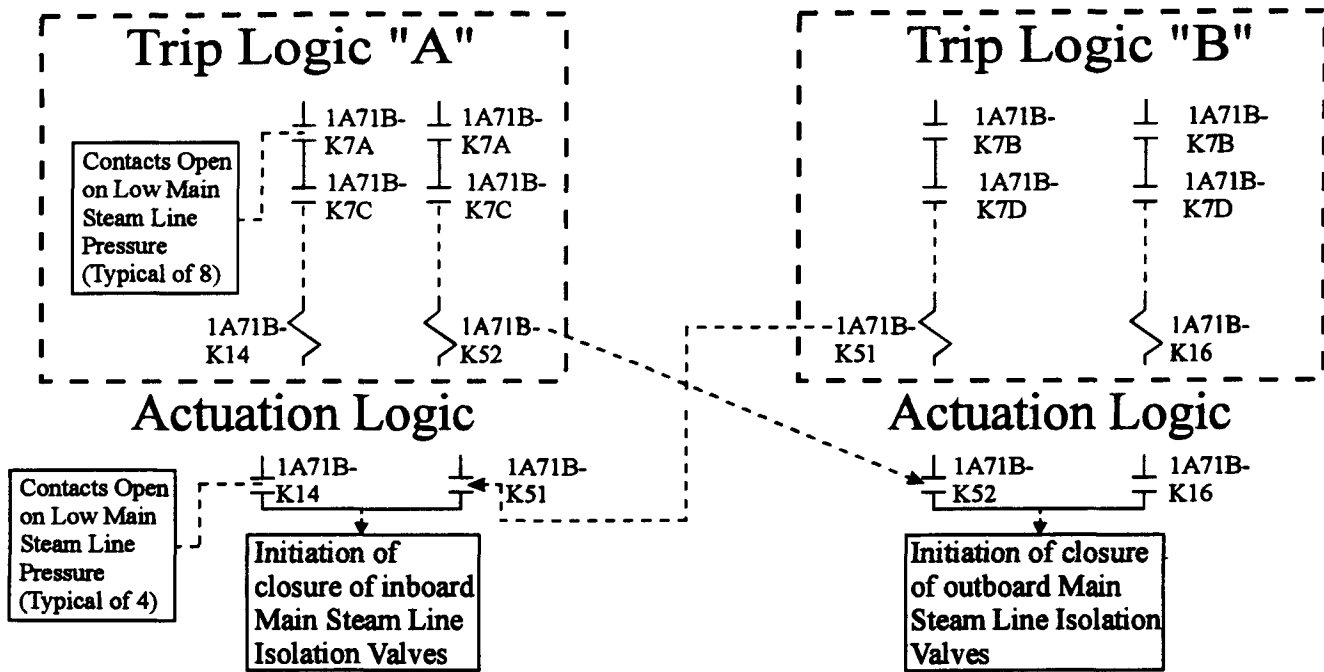
LFD-1-PCIS-02
Sheet 1 of 2

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

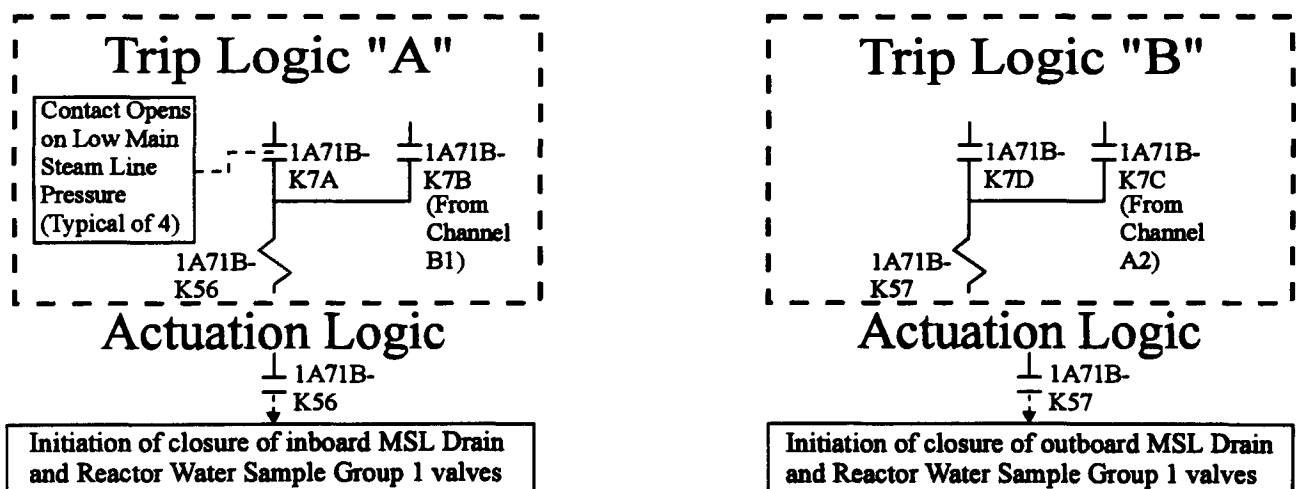


Minimum Channel Requirements for System Isolation Capability:

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

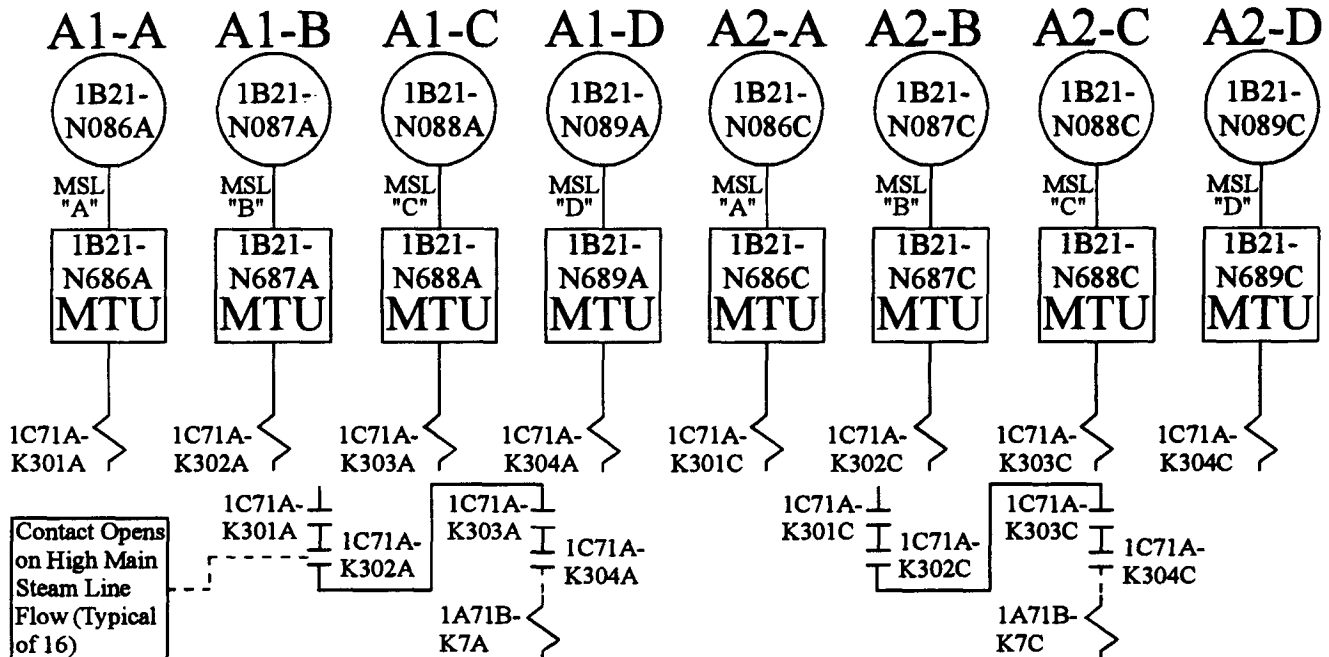
TS 3.3.6.1-1, Item 1.b
Main Steam Line Isolation -
Main Steam Line
Pressure - Low

Rev. 0

1/13/95

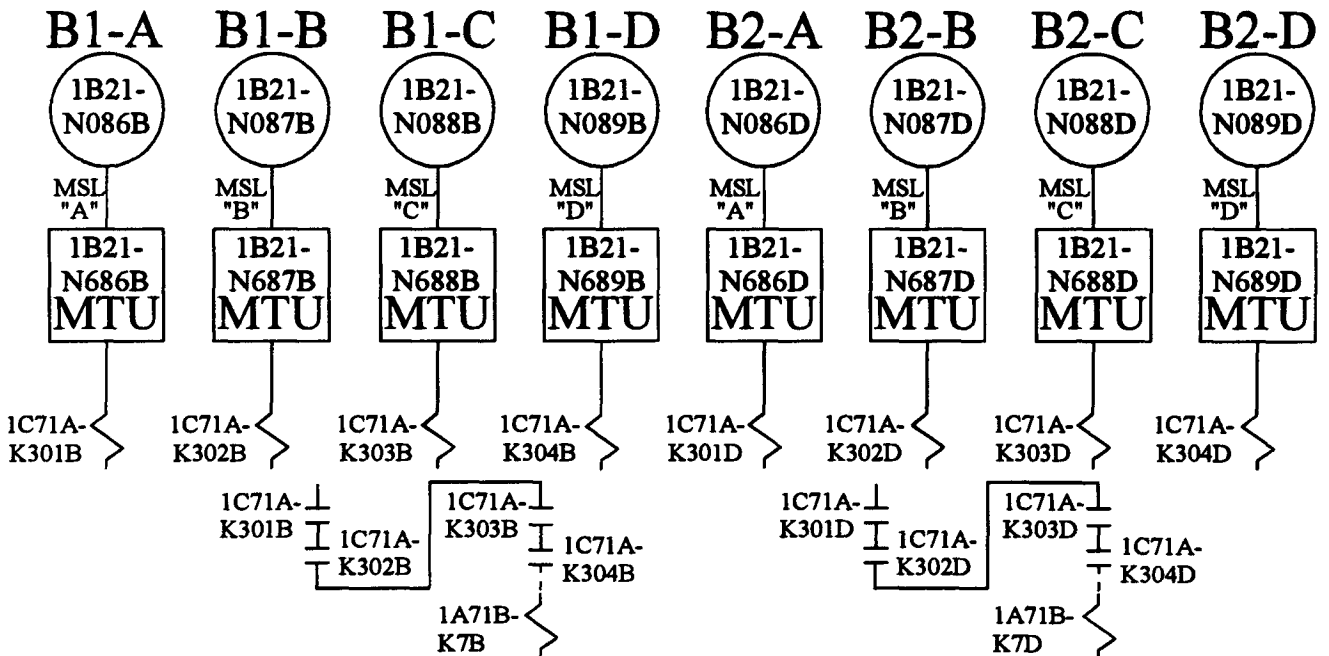
Trip System "A"

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]*

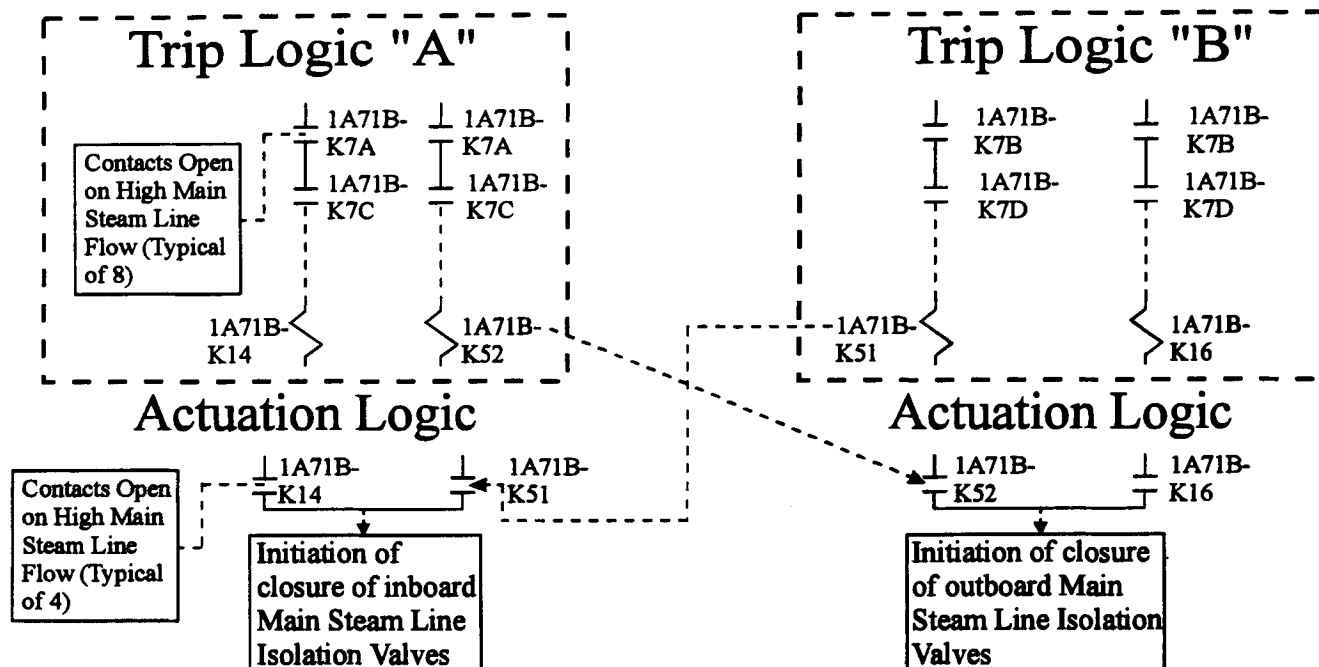
LFD-1-PCIS-03
Sheet 1 of 2

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

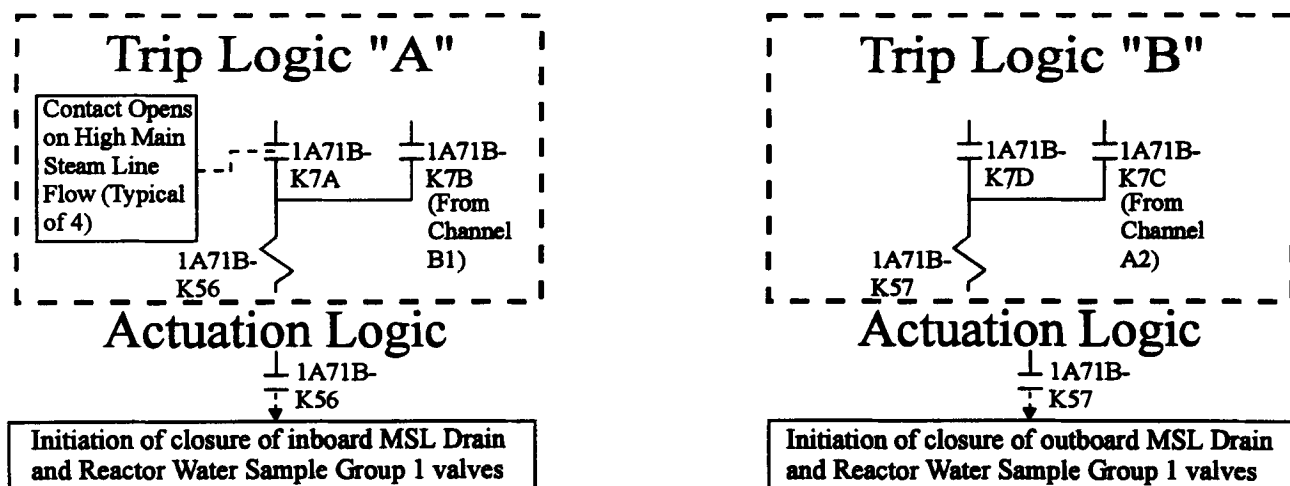


Minimum Channel Requirements for System Isolation Capability:

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

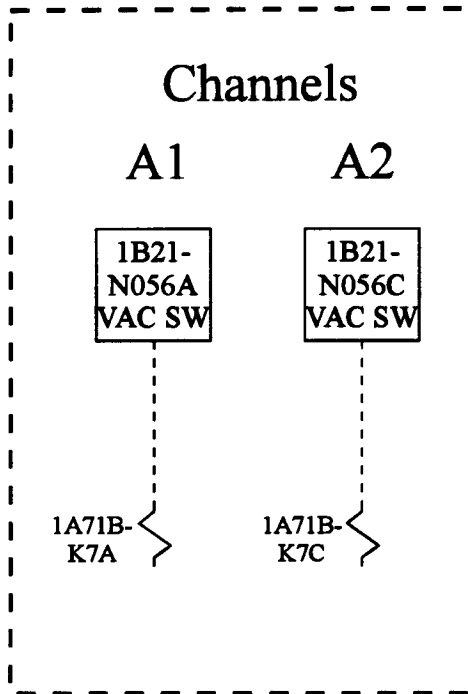


Minimum Channel Requirements for System Isolation Capability:

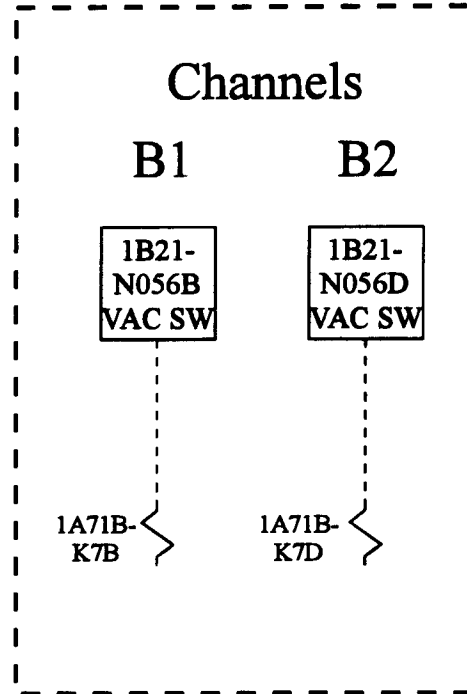
In order to maintain the capability to isolate the main steam line drain and reactor water sample lines on high main steam line flow, channels in one of the following combinations must be either operable or maintained in the tripped condition.

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
H-17811 H-19809	OR		Main Steam Line Isolation -
H-17812 H-19812	One A2 channel and one B2 channel for EACH main steam line		Main Steam Line
H-17814 H-19815			Flow - High
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: 

Reviewed By: 

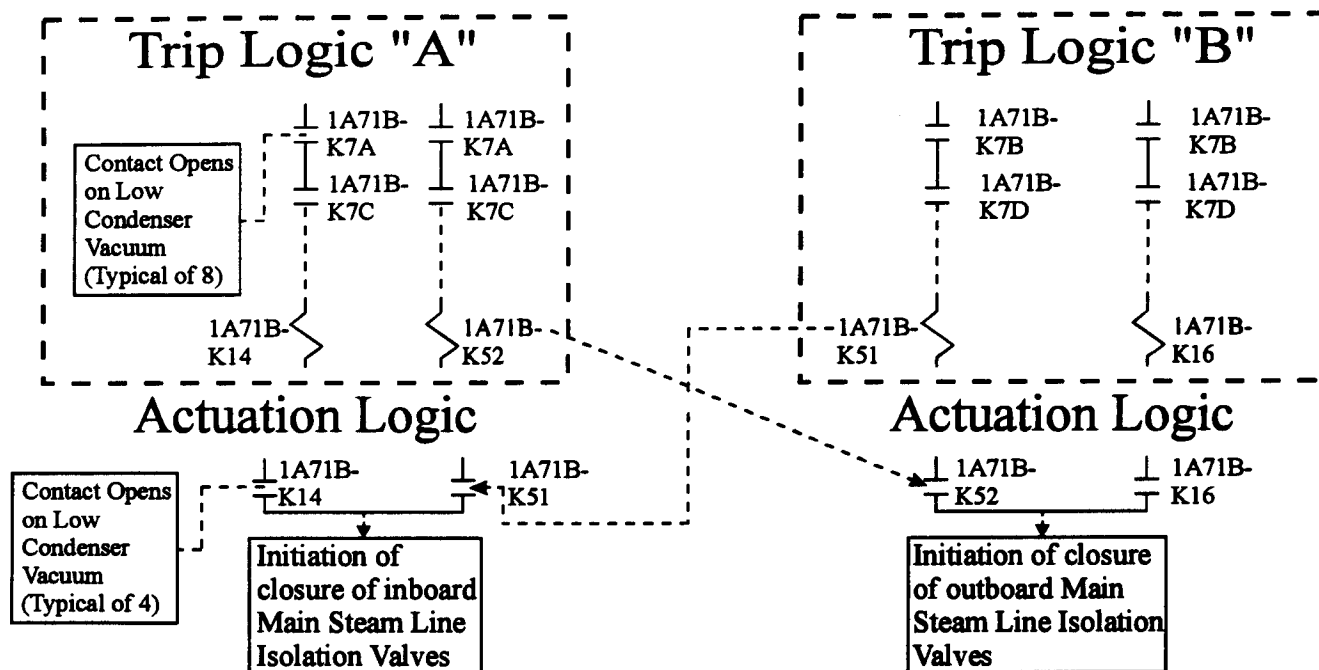
LFD-1-PCIS-04
Sheet 1 of 2

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

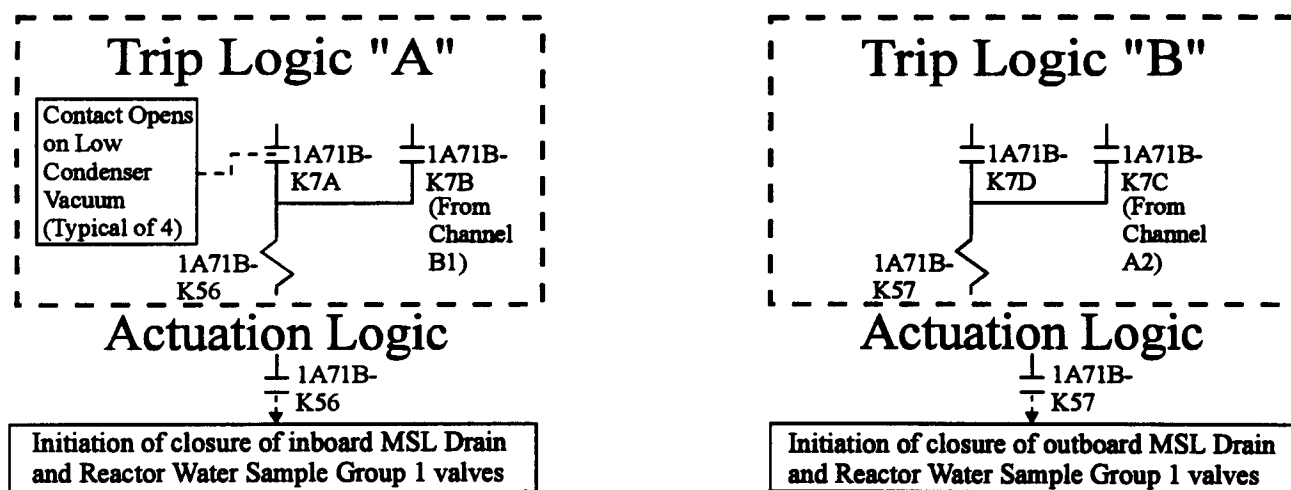


Minimum Channel Requirements for System Isolation Capability:

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

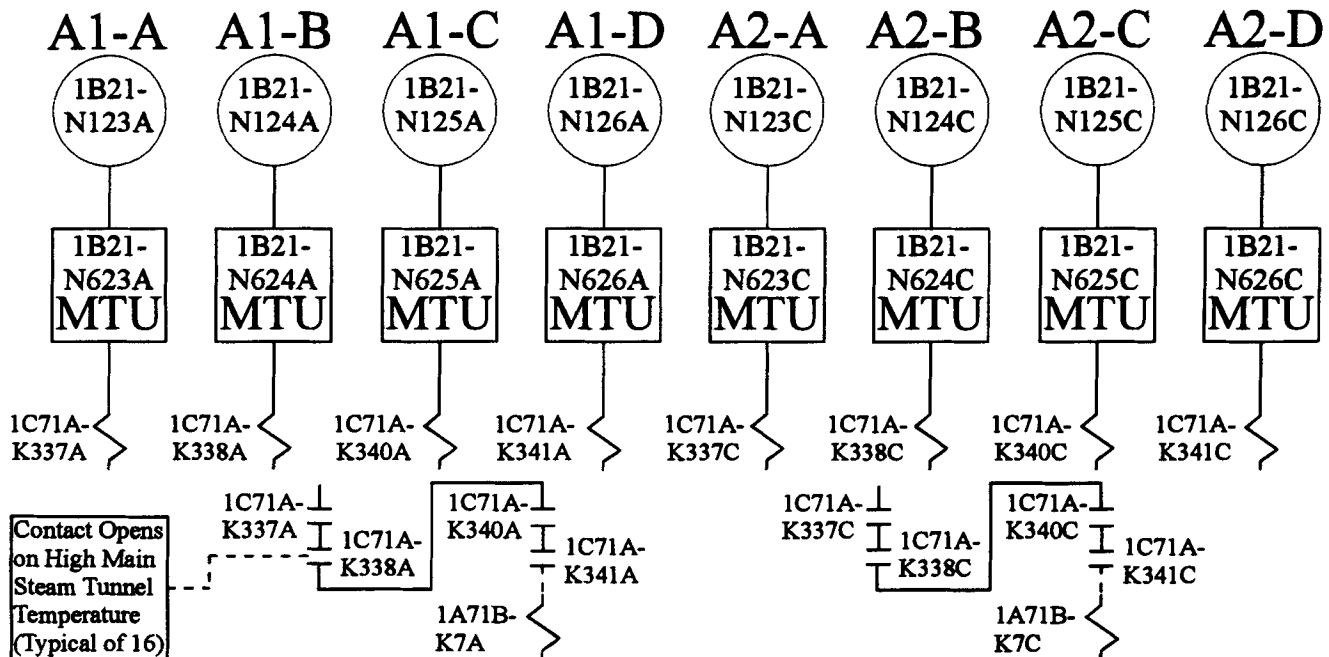
TS 3.3.6.1-1, Item 1.d
Main Steam Line Isolation -
Condenser Vacuum - Low

Rev. 0

1/13/95

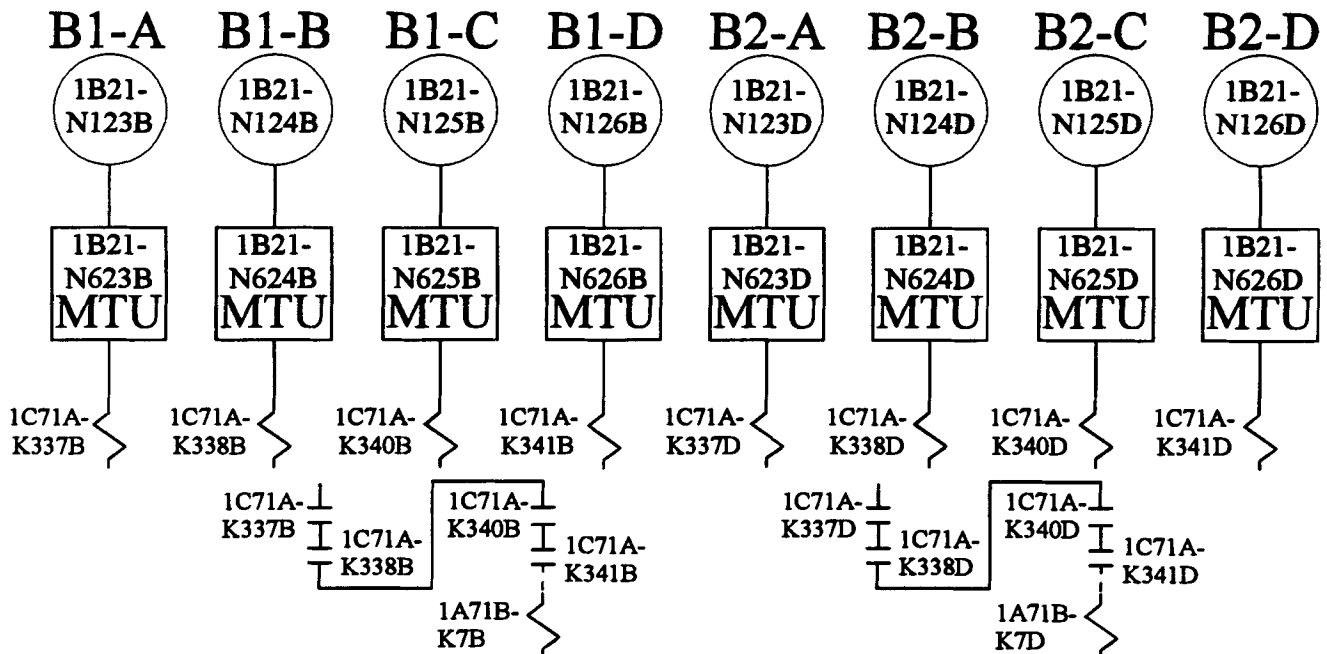
Trip System "A"

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

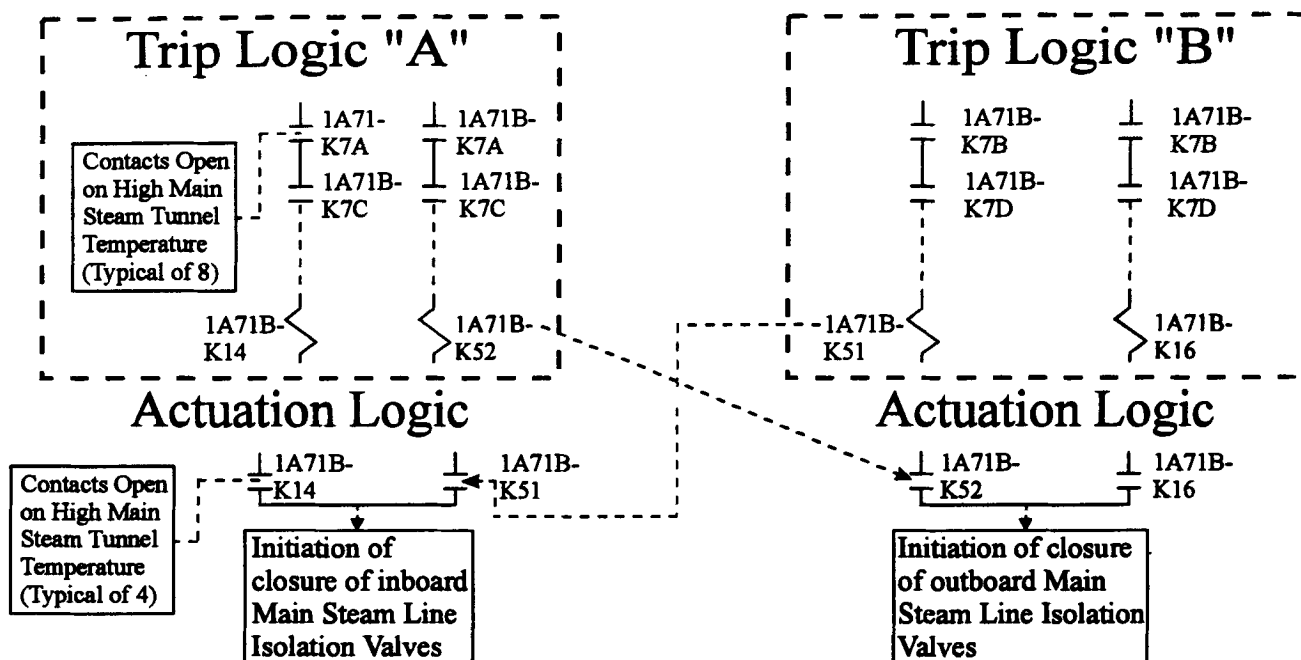
Sheet 1 of 2

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:

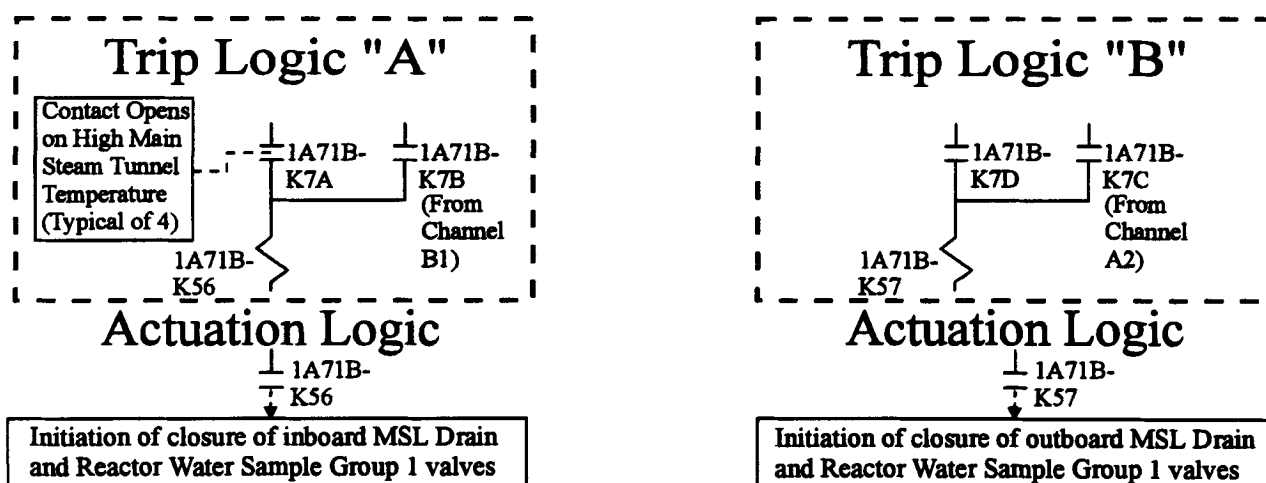
In order to maintain the capability to isolate the main steam lines on high main steam tunnel temperature, channels in one of the following combinations must be either operable or maintained in the tripped condition.

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

Trip System "A"

Channels

A1-A	1U61-N101A TS	A2-A	1U61-N101C TS
A1-B	1U61-N102A TS	A2-B	1U61-N102C TS
A1-C	1U61-N103A TS	A2-C	1U61-N103C TS
A1-D	1U61-N104A TS	A2-D	1U61-N104C TS
A1-E	1U61-N105A TS	A2-E	1U61-N105C TS
A1-F	1U61-N106A TS	A2-F	1U61-N106C TS
A1-G	1U61-N107A TS	A2-G	1U61-N107C TS
A1-H	1U61-N108A TS	A2-H	1U61-N108C TS
A1-I	1U61-N109A TS	A2-I	1U61-N109C TS
A1-J	1U61-N110A TS	A2-J	1U61-N110C TS
A1-K	1U61-N111A TS	A2-K	1U61-N111C TS
A1-L	1U61-N112A TS	A2-L	1U61-N112C TS
A1-M	1U61-N113A TS	A2-M	1U61-N113C TS
A1-N	1U61-N114A TS	A2-N	1U61-N114C TS
A1-O	1U61-N115A TS	A2-O	1U61-N115C TS
A1-P	1U61-N116A TS	A2-P	1U61-N116C TS

1A71B-
K7A

1A71B-
K7C

Trip System "B"

Channels

B1-A	1U61-N101B TS	B2-A	1U61-N101D TS
B1-B	1U61-N102B TS	B2-B	1U61-N102D TS
B1-C	1U61-N103B TS	B2-C	1U61-N103D TS
B1-D	1U61-N104B TS	B2-D	1U61-N104D TS
B1-E	1U61-N105B TS	B2-E	1U61-N105D TS
B1-F	1U61-N106B TS	B2-F	1U61-N106D TS
B1-G	1U61-N107B TS	B2-G	1U61-N107D TS
B1-H	1U61-N108B TS	B2-H	1U61-N108D TS
B1-I	1U61-N109B TS	B2-I	1U61-N109D TS
B1-J	1U61-N110B TS	B2-J	1U61-N110D TS
B1-K	1U61-N111B TS	B2-K	1U61-N111D TS
B1-L	1U61-N112B TS	B2-L	1U61-N112D TS
B1-M	1U61-N113B TS	B2-M	1U61-N113D TS
B1-N	1U61-N114B TS	B2-N	1U61-N114D TS
B1-O	1U61-N115B TS	B2-O	1U61-N115D TS
B1-P	1U61-N116B TS	B2-P	1U61-N116D TS

1A71B-
K7B

1A71B-
K7D

Minimum Channel Requirements for System Isolation Capability:

See Sheet 2 of 4.

Elem. Ref.

H-17810 H-17814
H-17811 H-17815
H-17812 H-17816
H-17813 H-16071

Prepared By:

Reviewed By:

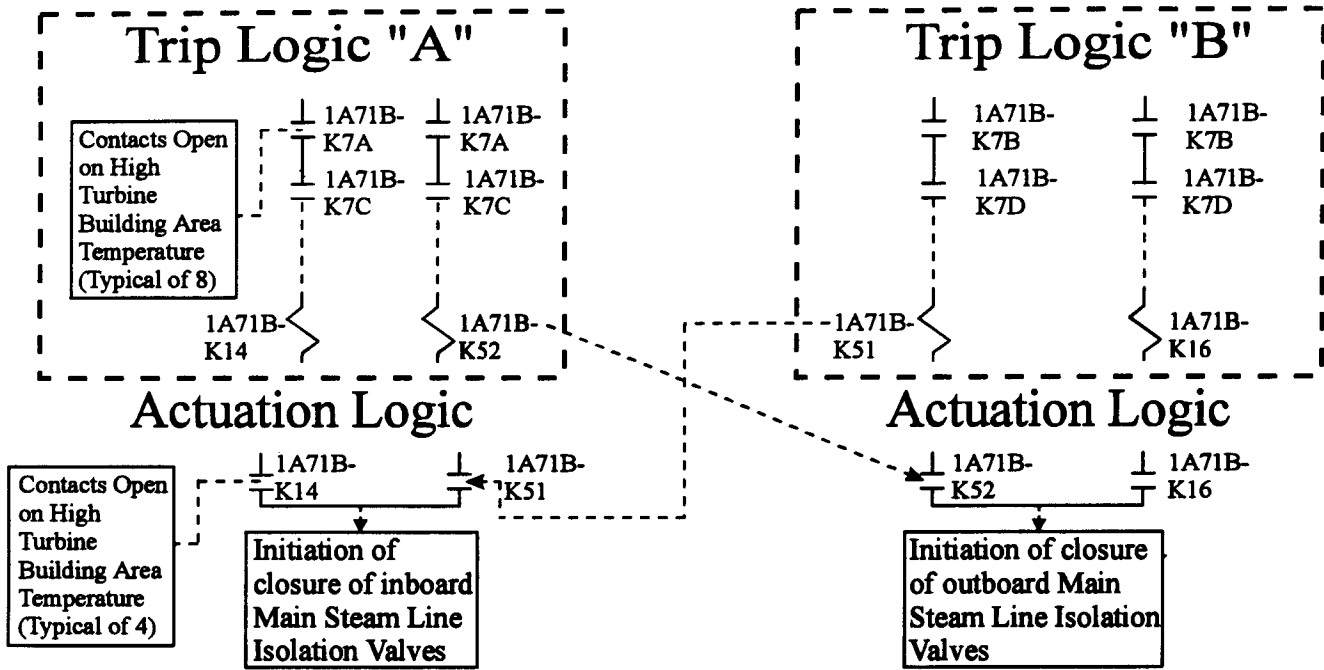
LFD-1-PCIS-06
Sheet 1 of 4

TS 3.3.6.1-1, Item 1.f
Main Steam Line Isolation -
Turbine Building Area
Temperature - High

Rev. 0

4/4/95

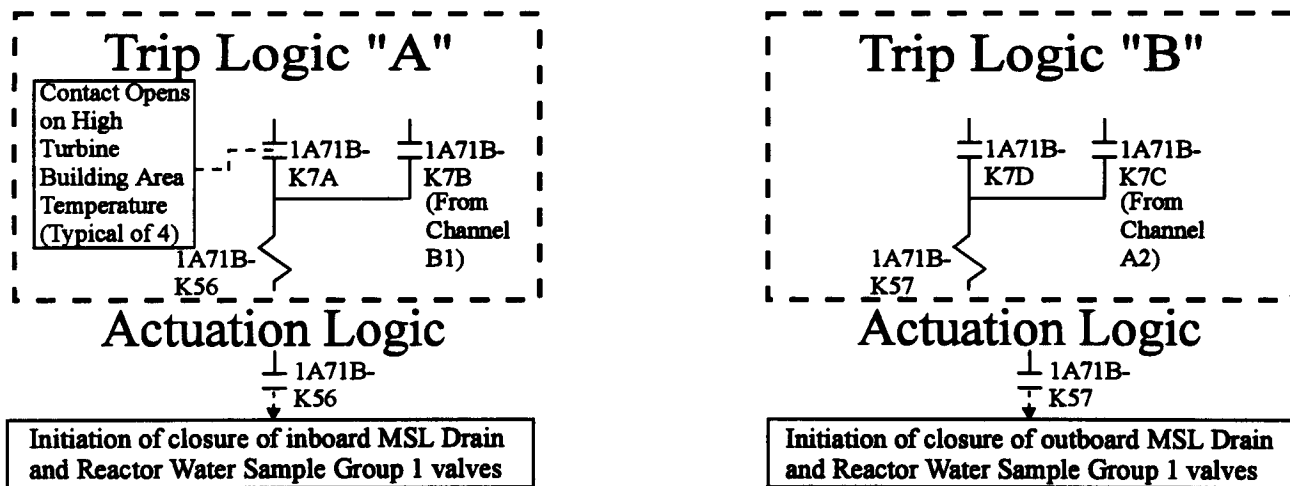
Main Steam Line Isolation Valve Isolation Function



Minimum Channel Requirements for System Isolation Capability:

In order to maintain the capability to isolate the main steam lines on high turbine building area temperature, channels in one of the combinations listed on Sheet 3 must be either operable or maintained in the tripped condition.

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 turbine building area temperature, channels in one of the combinations listed on Sheet 4 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	H-16071

LFD-1-PCIS-06

Sheet 2 of 4

TS 3.3.6.1-1, Item 1.f
Main Steam Line Isolation -
Turbine Building Area
Temperature - High

Rev. 0

4/4/95

Main Steam Line Isolation Valve Isolation Function

Any ONE of the following instruments:

N101A	N101C
N102A	N102C
N103A	N103C
N104A	N104C
N105A	N105C
N106A	N106C
N107A	N107C
N108A	N108C
N111A	

AND

Any ONE of the following instruments:

N101B	N101D
N102B	N102D
N103B	N103D
N104B	N104D
N105B	N105D
N106B	
N107B	N107D
N108B	N108D

AND

Any ONE of the following instruments:

N111C	
N112A	N112C
N113A	N113C
N114A	N114C
N115A	N115C
N116A	N116C

AND

Any ONE of the following instruments:

N110D	
N111B	N111D
N112B	N112D
N113B	N113D
N114B	N114D
N115B	N115D
N116B	N116D

Elem. Ref.

H-17810	H-17814
H-17811	H-17815
H-17812	H-17816
H-17813	H-16071

LFD-1-PCIS-06

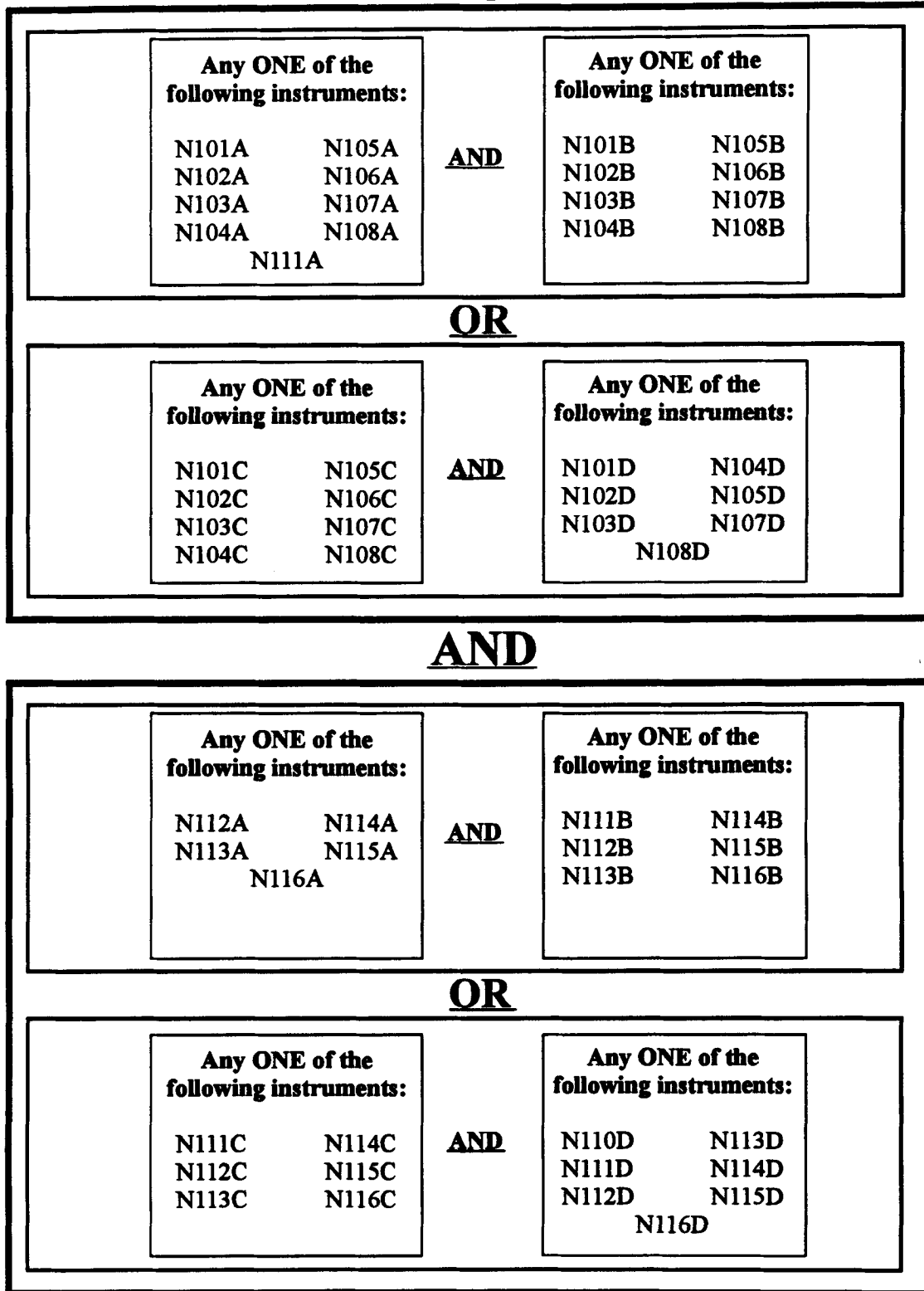
Sheet 3 of 4

TS 3.3.6.1-1, Item 1.f
Main Steam Line Isolation -
Turbine Building Area
Temperature - High

Rev. 0

4/4/95

Drain Line and Reactor Water Sample Line Valve Isolation Function



Elem. Ref.

H-17810	H-17814
H-17811	H-17815
H-17812	H-17816
H-17813	H-16071

LFD-1-PCIS-06

Sheet 4 of 4

TS 3.3.6.1-1, Item 1.f
Main Steam Line Isolation -
Turbine Building Area
Temperature - High

Rev. 0

4/4/95

Trip System "A"

Channels

A1

1B21-
N080A

1B21-
N680A
MTU

1A71B-
K6A

A2

1B21-
N080C

1B21-
N680C
MTU

1A71B-
K6C

Trip System "B"

Channels

B1

1B21-
N080B

1B21-
N680B
MTU

1A71B-
K6B

B2

1B21-
N080D

1B21-
N680D
MTU

1A71B-
K6D

Contacts
Open on
Low
Level
(Typical
of 4)

Trip Logic

1A71B-
K6A

1A71B-
K6B

1A71B
Division 1
Trip Relays

Trip Logic

1A71B-
K6C

1A71B-
K6D

1A71B
Division 2
Trip Relays

Actuation Logic

Contacts Open to
Cause Actuation
(Typical)

1A71B
Division 1
Trip Relays

Initiation of closure of PCIS inboard Valve
Groups 2, 10, and 11

Actuation Logic

1A71B
Division 2
Trip Relays

Initiation of closure of PCIS outboard Valve
Groups 2, 6, 10, and 11

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

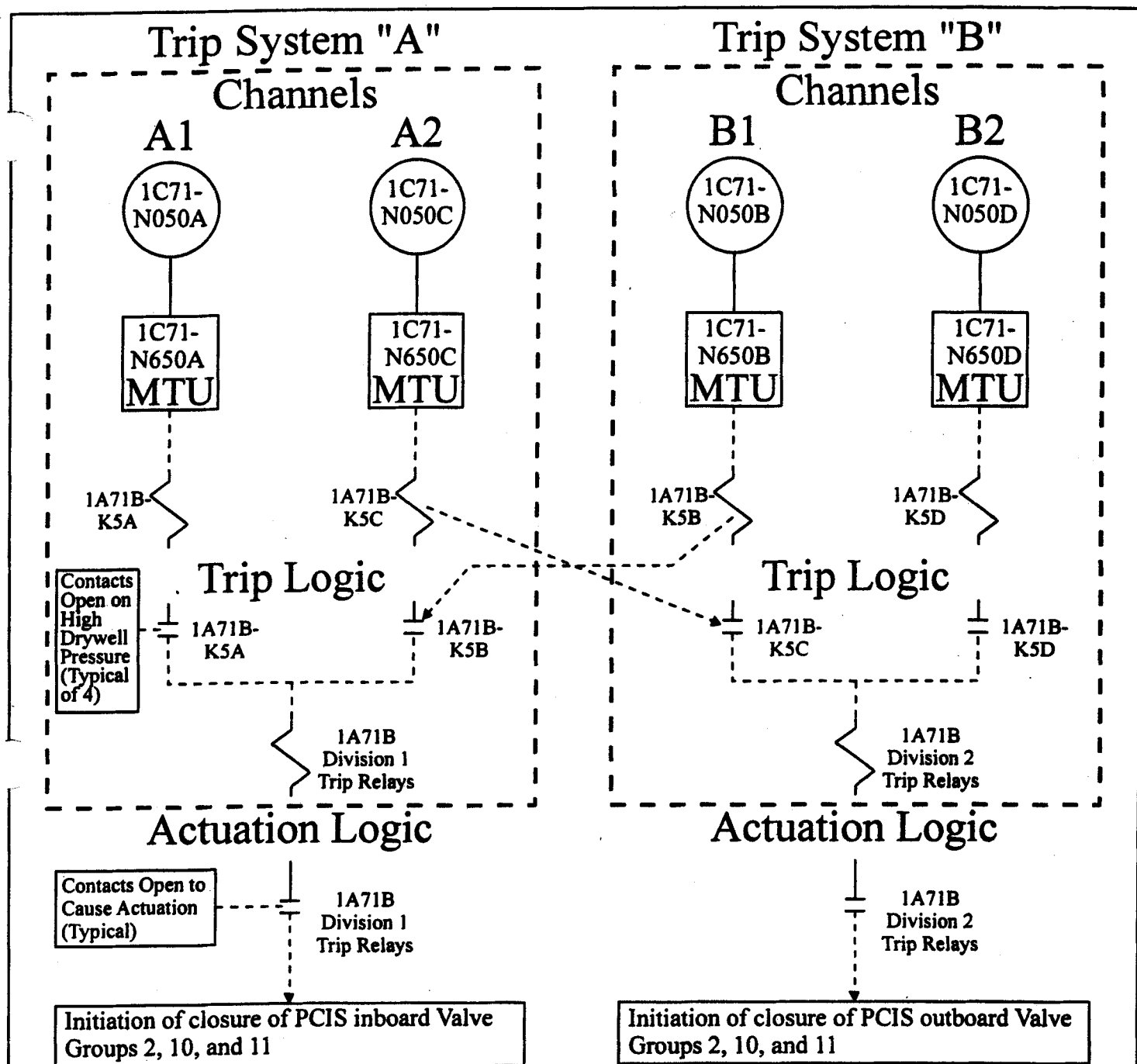
Prepared By:

Reviewed By:

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

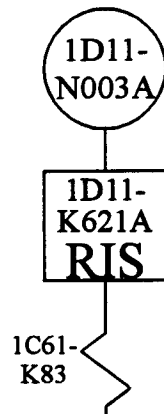
Elem. Ref.
H-17810 H-19809
H-17811 H-19812
H-17812 H-19815
H-17814 H-19818

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

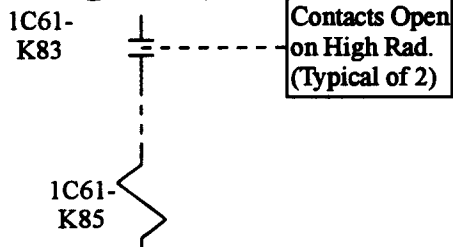
LFD-1-PCIS-08
TS 3.3.6.1-1, Item 2.b
Primary Containment
Isolation, Drywell
Pressure - High
TRM Rev. 33

Trip System "A"

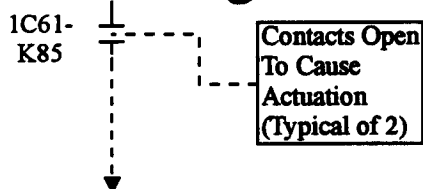
Channel A



Trip Logic



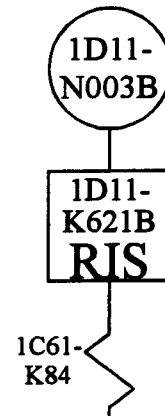
Actuation Logic



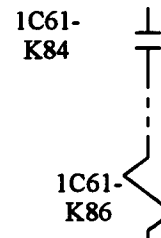
Closure of inboard Group 2 PCIS valves
(1T48 Vent and Purge valves only)

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 L. Need*

Reviewed By: *Royce Clark*

Rev. 0

1/13/95

Trip System "A"

Channels

A1

A2

1D11-
N010A

1D11-
N010C

1D11-
K609A
ITU

1D11-
K609C
ITU

Trip Logic

Contacts Open
on Rx. Bldg.
High Rad.
(Typical of 4)

1D11-
K609A

1D11-
K609B

1D11-
K80

1C51A-
Z2B

1D11-
K80

1C51A-
Z2B

Initiation of closure of PCIS inboard
Valve Groups 2 (Vent and Purge Valves
Only), 10, and 11

Trip System "B"

Channels

B1

B2

1D11-
N010B

1D11-
N010D

1D11-
K609B
ITU

1D11-
K609D
ITU

Trip Logic

1D11-
K609C

1D11-
K609D

1D11-
K80

1C51A-
Z2D

1D11-
K80

1C51A-
Z2D

Initiation of closure of PCIS outboard
Valve Groups 2 (Vent and Purge Valves
Only), 10, and 11

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"

Channels

A1

A2



Trip Logic

Contacts Open
on Refueling
Floor Exhaust
High Rad.
(Typical of 4)

1D11-
K611A

1D11-
K611B

1D11-
K80

1C51A-
Z2A

1D11-
K80

1C51A-
Z2A

Initiation of closure of PCIS inboard
Valve Groups 2 (Vent and Purge Valves
Only), 10, and 11

Trip System "B"

Channels

B1

B2



Trip Logic

1D11-
K611C

1D11-
K611D

1D11-
K80

1C51A-
Z2C

1D11-
K80

1C51A-
Z2C

Initiation of closure of PCIS outboard
Valve Groups 2 (Vent and Purge Valves
Only), 10, and 11

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

1E41-
N057A

1E41-
N657A
MTU

1E21A-
K333A

Trip Logic

Contact
Closes on
High Flow
(Typical of 2)

1E21A-
K333A

1E41-
K43

Actuation Logic

Contact Closes
on High Flow
(Typical of 2)

1E41-
K43

Initiation of closure of HPCI inboard
Group 3 valves

Trip System "B"

Channel

B

1E41-
N057B

1E41-
N657B
MTU

1E21A-
K333B

Trip Logic

1E21A-
K333B

1E41-
K33

Actuation Logic

1E41-
K33

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 D. Payne*

Reviewed By: *Stephen W. Reed*

Rev. 0

1/13/95

Trip System "A"

Channels

A1

1E41-
N058A

1E41-
N658A
MTU

1E21A-
K331A

A2

1E41-
N058C

1E41-
N658C
MTU

1E21A-
K332A

Trip Logic

Contacts
Close on Low
Pressure
(Typical of 4)

1E21A-
K331A
1E21A-
K332A

1E41-
K48

Actuation Logic

Contact Closes
on Low
Pressure
(Typical of 2)

1E41-
K48

Initiation of closure of HPCI inboard
Group 3 valves

Trip System "B"

Channels

B1

1E41-
N058B

1E41-
N658B
MTU

1E21A-
K331B

B2

1E41-
N058D

1E41-
N658D
MTU

1E21A-
K332B

Trip Logic

1E21A-
K331B
1E21A-
K332B

1E41-
K15

Actuation Logic

1E41-
K15

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

LFD-1-PCIS-13

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

Prepared By: John D. Ray

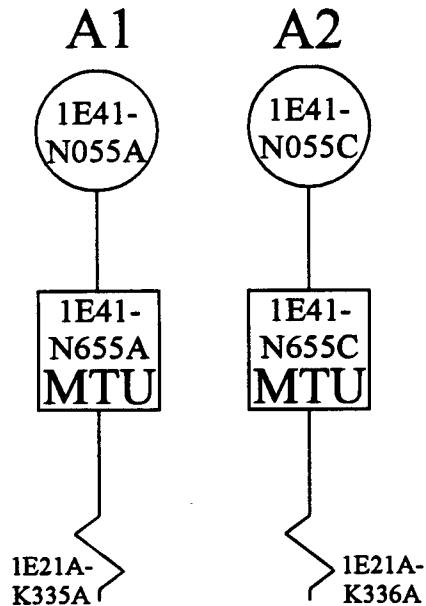
Reviewed By: [Signature]

Rev. 0

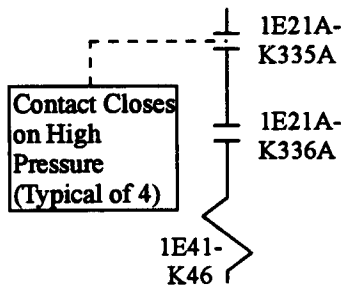
1/13/95

Trip System "A"

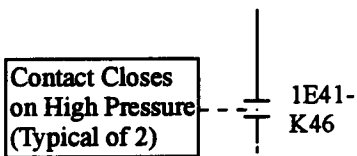
Channels



Trip Logic



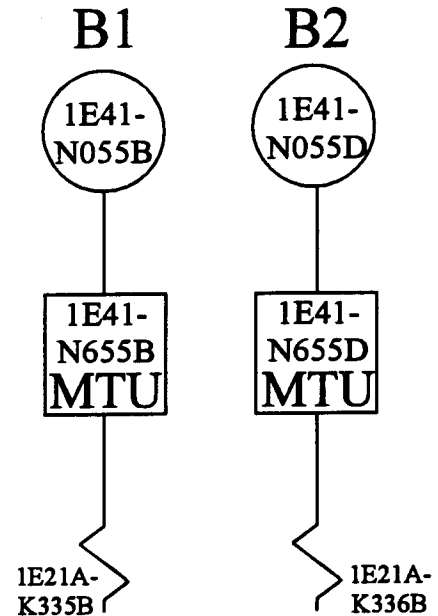
Actuation Logic



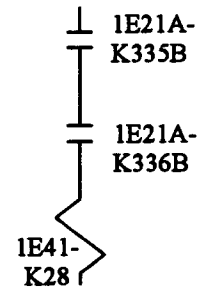
Initiation of closure of HPCI inboard Group 3 valves

Trip System "B"

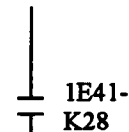
Channels



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 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

1E11-
N094C

1E41-
N058A

1E41-
N058C

1E11-
N094D

1E41-
N058B

1E41-
N058D

1E11-
N694C
MTU

1E41-
N658A
MTU

1E41-
N658C
MTU

1E11-
N694D
MTU

1E41-
N658B
MTU

1E41-
N658D
MTU

1E21-
K6A

1E21A-
K331A

1E21A-
K332A

1E21-
K6B

1E21A-
K331B

1E21A-
K332B

Trip Logic

Trip Logic

Trip Logic

Trip Logic

Contact
Closes on
High
Pressure
(Typical
of 2)

Contacts
Close on
Low
Pressure
(Typical
of 6)

1E41-
K48
1E21-
K6A
1E41-
K56

1E41-
K15
1E21-
K6B
1E41-
K57

1E21A-
K331B
1E21A-
K332B
1E41-
K15

Actuation Logic

Actuation Logic

Contact Closes on High
Drywell Pressure in
Conjunction With Low
Steam Line Pressure
(Typical of 2)

1E41-
K56

Initiation of closure of HPCI inboard
Group 8 valve

1E41-
K57

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

Prepared By: B.G. Thigpin

Reviewed By: S.B. Tupper

printed

signature

LFD-1-PCIS-15

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

TRM Rev. 93

Trip System "A"

Channel

A

1E41-
N071A

1E41-
N671A
MTU

1E21A-
K362C

Trip Logic

Contact Closes
on High
Temperature
(Typical of 2)

1B21B-
K32A

Actuation Logic

Contact Closes
on High
Temperature
(Typical of 2)

1B21B-
K32A

Initiation of closure of HPCI inboard
Group 3 valves

Trip System "B"

Channel

B

1E41-
N071B

1E41-
N671B
MTU

1E21A-
K362D

Trip Logic

1E21A-
K362D

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 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*

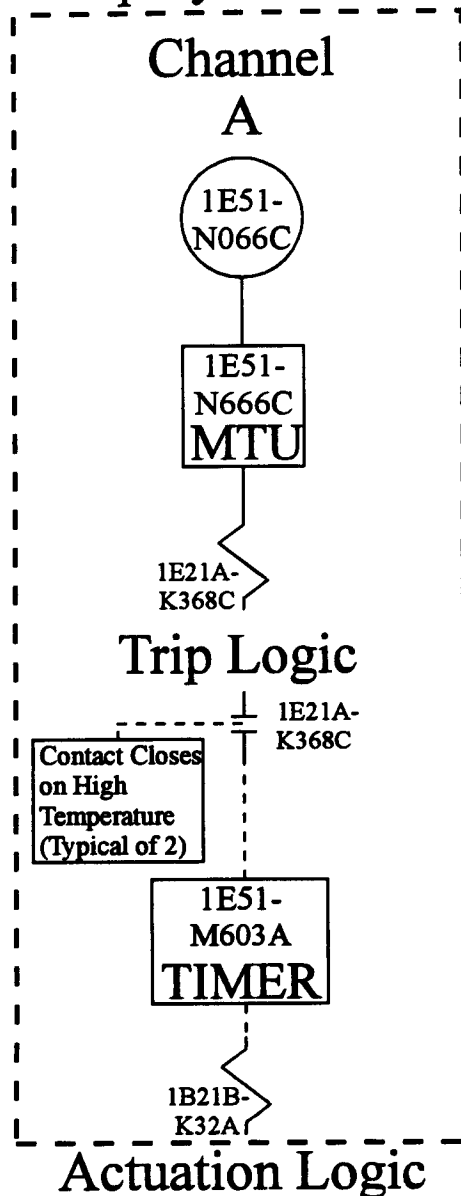
LFD-1-PCIS-16

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

Rev. 0

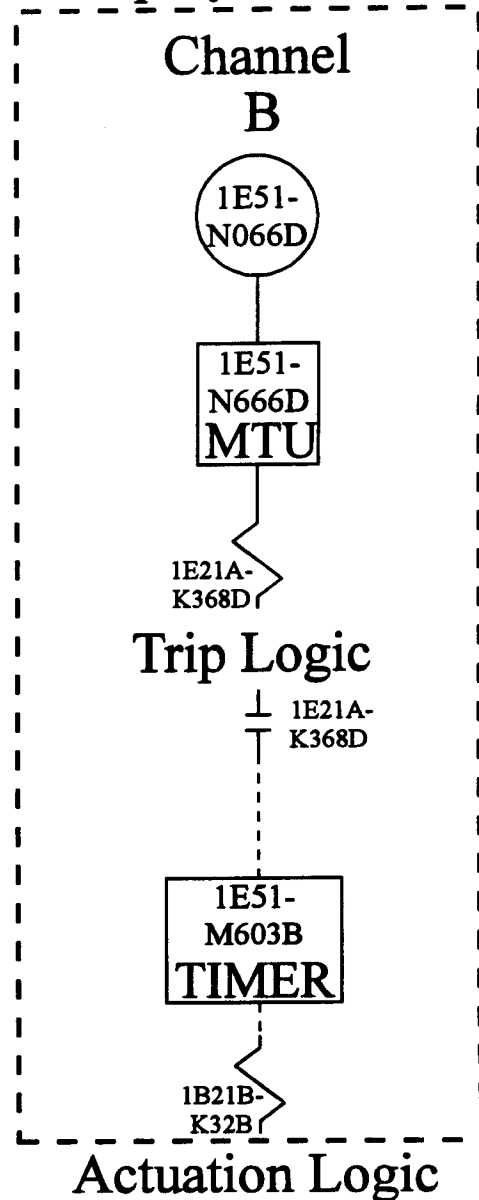
1/13/95

Trip System "A"



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 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

Prepared By: *John C. Byrne*

Reviewed By: *Stephen W. Reed*

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
Rev. 0 1/13/95

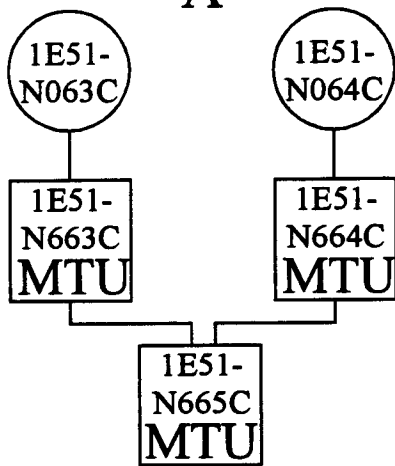
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Prepared By:	N/A
Reviewed By:	N/A

LFD-1-PCIS-18	
N/A	
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

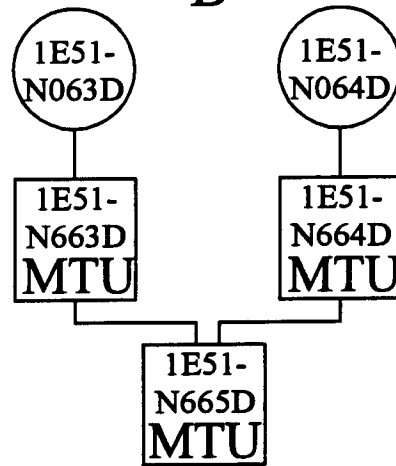
Contact Closes
on High Diff.
Temperature
(Typical of 2)

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: Stephen 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"

Channel

A

1E41-
N070A

1E41-
N670A
MTU

1E21A-
K361C

Trip Logic

Contact Closes
on High
Temperature
(Typical of 2)

1B21B-
K32A

Actuation Logic

Contact Closes
on High
Temperature
(Typical of 2)

1B21B-
K32A

Initiation of closure of HPCI inboard
Group 3 valves

Trip System "B"

Channel

B

1E41-
N070B

1E41-
N670B
MTU

1E21A-
K361D

Trip Logic

1E21A-
K361D

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 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 J. Byrne*

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

1E51-
N057A

1E51-
N657A
MTU

1E21A-
K303A

Trip Logic

Contacts Close
on High Flow
(Typical of 2)

1E21A-
K303A

1E51-
K12

Actuation Logic

Contacts Close
to Cause
Actuation
(Typical of 2)

1E51-
K12

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

Trip System "B"

Channel

B

1E51-
N057B

1E51-
N657B
MTU

1E21A-
K303B

Trip Logic

1E21A-
K303B

1E51-
K32

Actuation Logic

1E51-
K32

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: *Stephen M. Murphy*

Reviewed: *[Signature]*

Rev. 0

11/10/94

Trip System "A"

Channels

A1

1E51-
N058A

1E51-
N658A
MTU

1E21A-
K301A

A2

1E51-
N058C

1E51-
N658C
MTU

1E21A-
K302A

Trip Logic

Contacts
Close on
Low
Pressure
(Typical
of 4)

1E21A-
K301A
1E21A-
K302A

1E51-
K13

Actuation Logic

Contacts Close to
Cause Actuation
(Typical of 2)

1E51-
K13

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

Trip System "B"

Channels

B1

1E51-
N058B

1E51-
N658B
MTU

1E21A-
K301B

B2

1E51-
N058D

1E51-
N658D
MTU

1E21A-
K302B

Trip Logic

1E21A-
K301B
1E21A-
K302B

1E51-
K34

Actuation Logic

1E51-
K34

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 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. H. Lee*

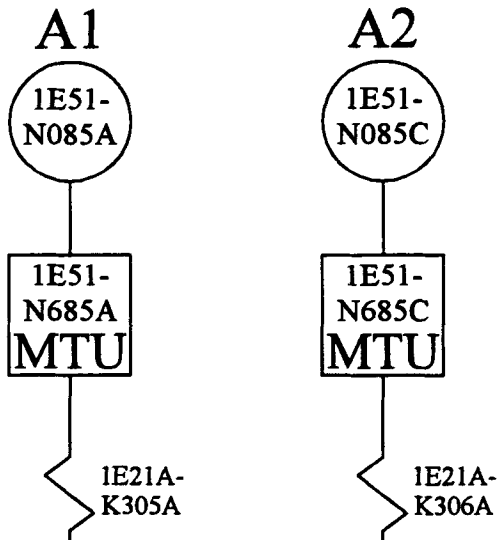
Reviewed: *John M. M. Lee*

Rev. 0

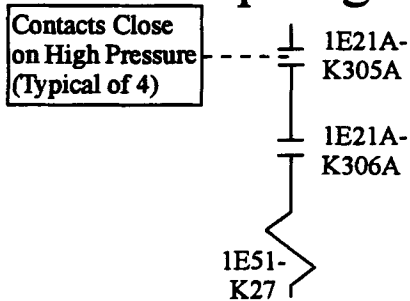
1/13/95

Trip System "A"

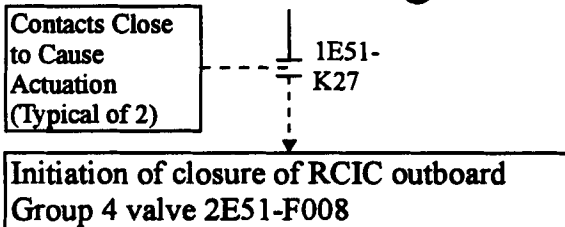
Channels



Trip Logic

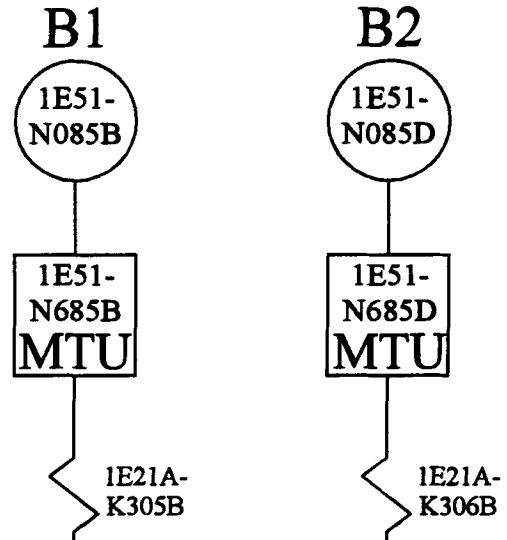


Actuation Logic

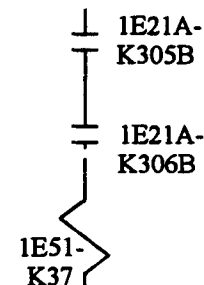


Trip System "B"

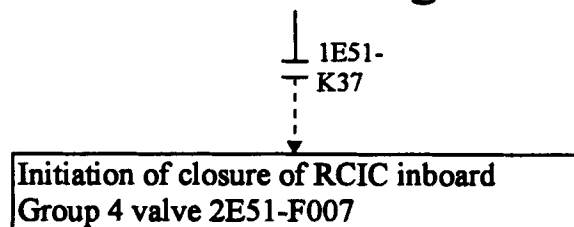
Channels



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. Hays*

Reviewed By: *[Signature]*

Rev. 0

1/13/95

Trip System "A"

Channels

Drywell Pressure

A1

1E11-
N094A

1E11-
N694A
MTU

1E21-
K5A

RCIC Steam Line Pressure

A2

1E51-
N058A

1E51-
N658A
MTU

A3

1E51-
N058C

1E51-
N658C
MTU

1E21A-
K301A

1E21A-
K302A

Trip Logic

Contacts
Close on
High
Pressure
(Typical
of 2)

1E51-
K13

1E21A-
K5A

1E51-
K47

Contacts
Close on
Low
Pressure
(Typical
of 6)

1E21A-
K301A

1E21A-
K302A

1E51-
K13

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

Trip System "B"

Channels

Drywell Pressure

B1

1E11-
N094B

1E11-
N694B
MTU

1E21-
K5B

RCIC Steam Line Pressure

B2

1E51-
N058B

1E51-
N658B
MTU

B3

1E51-
N058D

1E51-
N658D
MTU

1E21A-
K301B

1E21A-
K302B

Trip Logic

Trip Logic

1E21A-
K301B

1E21A-
K302B

1E51-
K34

1E51-
K34

1E21A-
K5B

1E51-
K48

Actuation Logic

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: *Stephen 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: *Stephen W. Nease*

Reviewed By: *John M. Munn*

Rev. 0

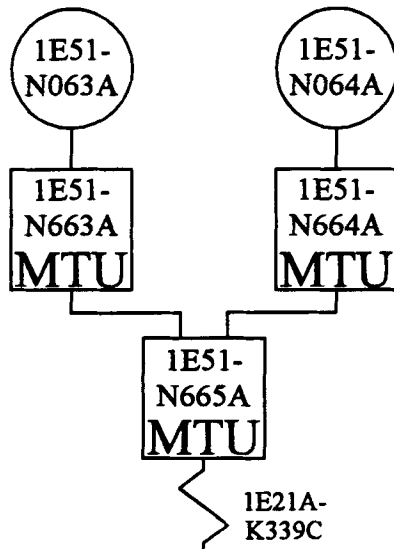
1/13/95

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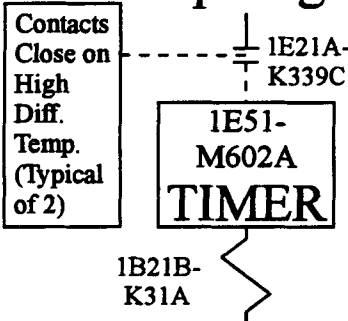
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N/A	
Prepared By: N/A	Rev. 0 12/19/94
Reviewed By: N/A	

Trip System "A" Channel

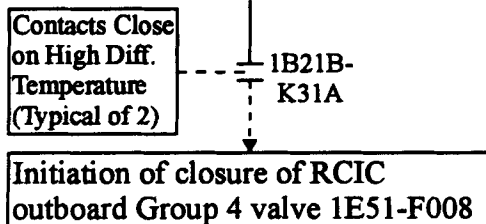
A



Trip Logic

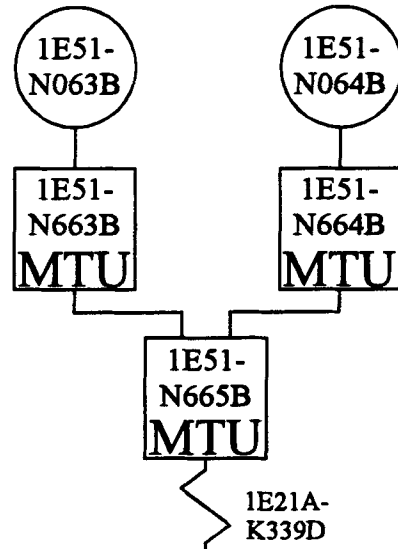


Actuation Logic

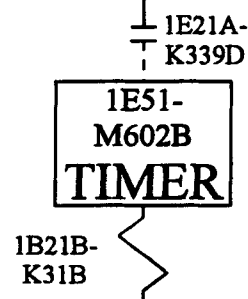


Trip System "B" Channel

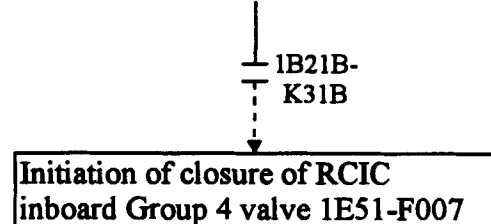
B



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 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

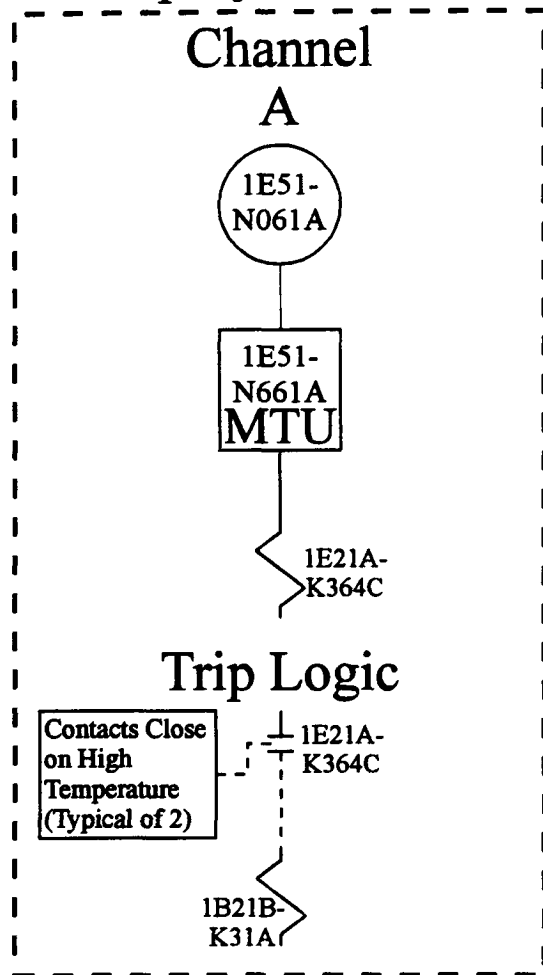
Prepared By: *Stanley W. Neal*

Reviewed: *[Signature]*

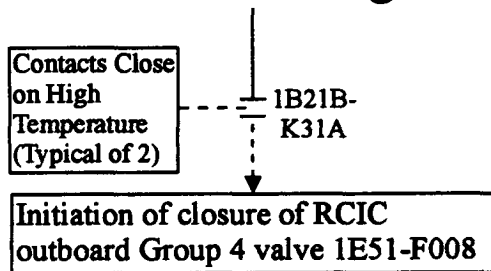
Rev. 0

1/13/95

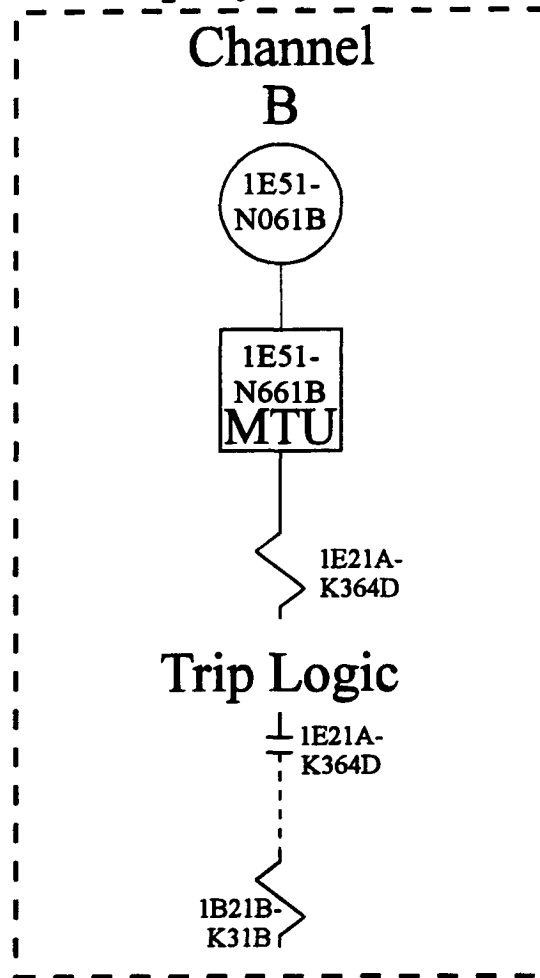
Trip System "A"



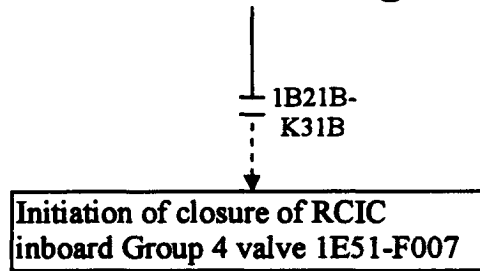
Actuation Logic



Trip System "B"



Actuation Logic



Minimum Channel Requirements for System Isolation Capability:

In order to maintain the capability to isolate the 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

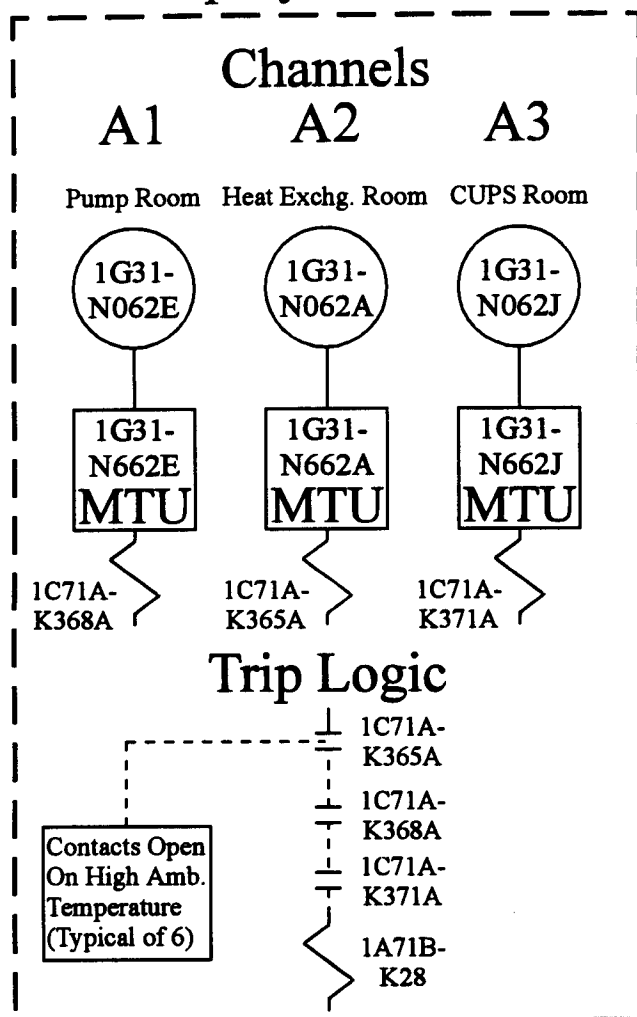
Prepared By: *Stefan W. Hoyer*

Reviewed: *[Signature]*

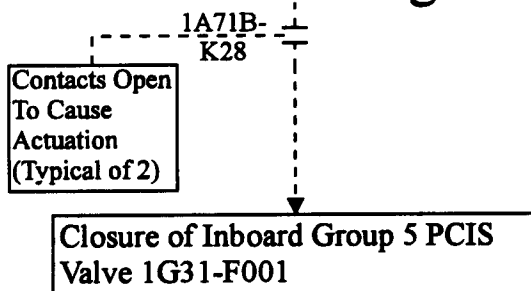
Rev. 0

1/13/95

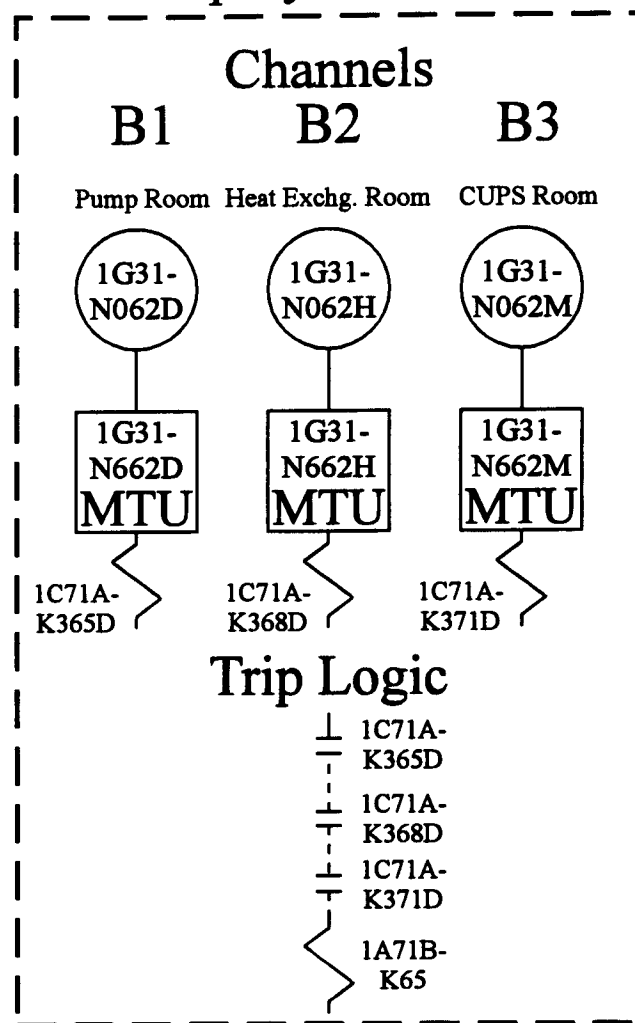
Trip System "A"



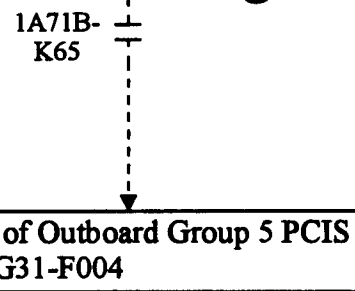
Actuation Logic



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: *Steve W. Reed*

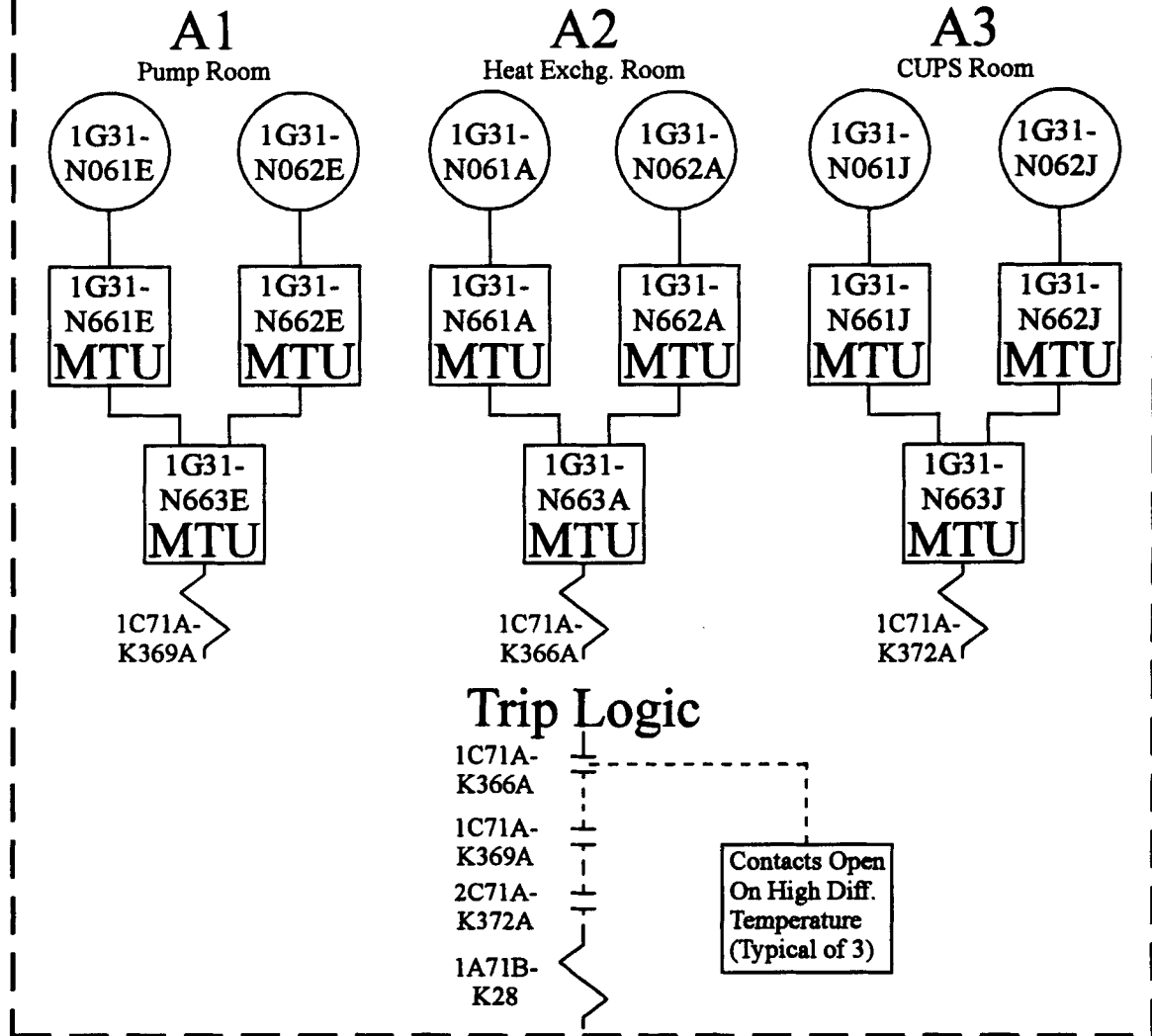
Reviewed: *[Signature]*

Rev. 0

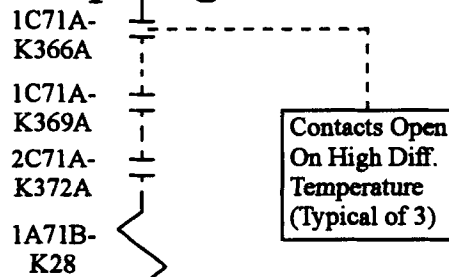
1/13/95

Trip System "A"

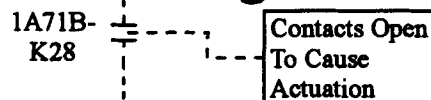
Channels



Trip Logic



Actuation Logic



Closure of Inboard Group 5 PCIS Valve 1G31-F001

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

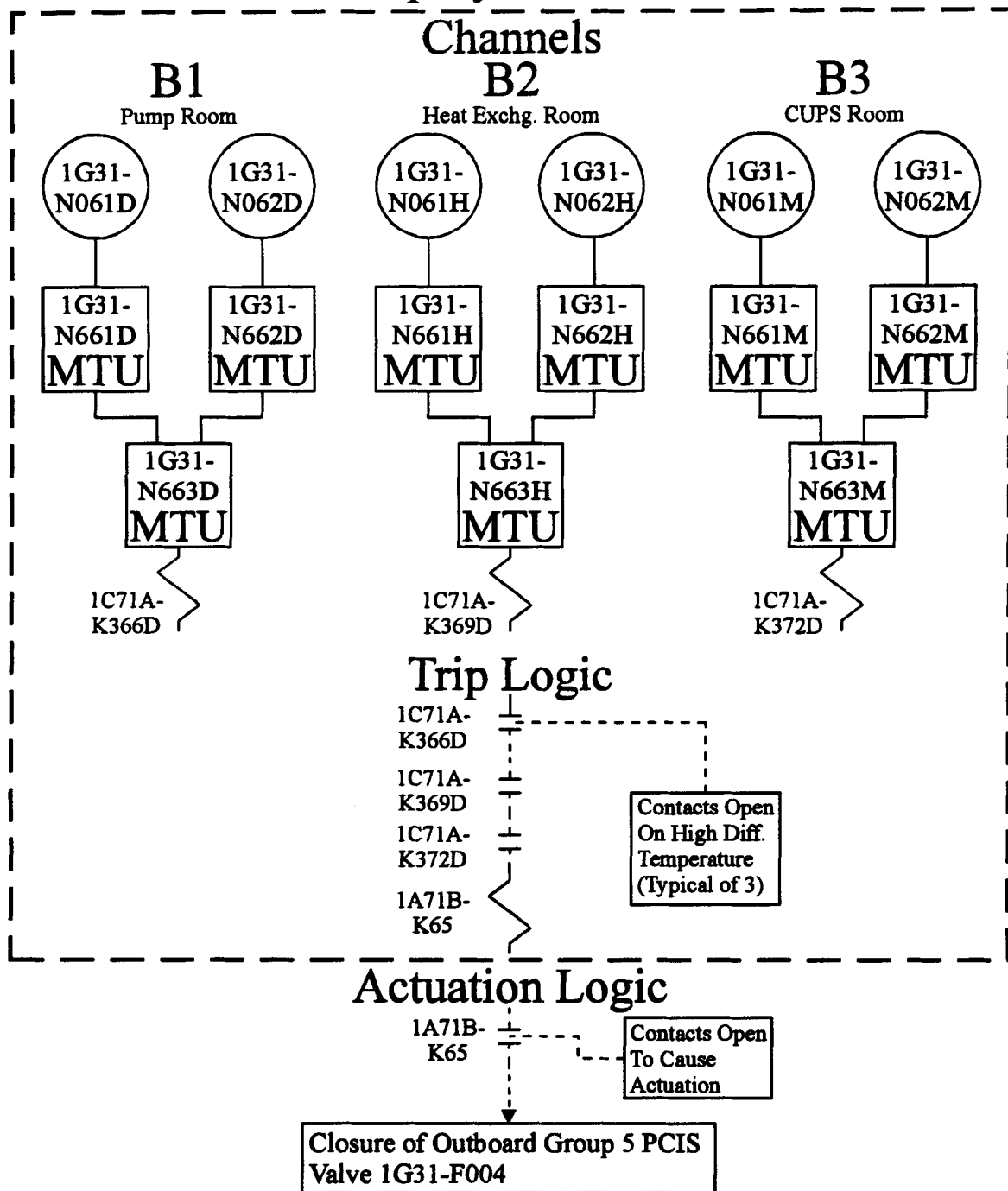
LFD-1-PCIS-30
Sheet 1 of 2

TS 3.3.6.1-1 Item 5.b
RWCU System Isolation
Area Ventilation Diff.
Temperature - High

Prepared By: *Steph in Rev*
Reviewed: *[Signature]*

Rev. 0 1/13/95

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

Channel

1C41A-S1
Control
Switch

Trip Logic

1C41A-S1

1A71B-K27

Contacts Open
On Standby
Liquid Control
Initiation

Actuation Logic

1A71B-
K27

Contacts Close
To Cause
Actuation

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 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. Hardy*

Reviewed By: *John J. Munn*

Rev. 0

1/13/95

Trip System "A"

Channels

A1

A2

1B21-
N081A

1B21-
N081C

1B21-
N681A
MTU

1B21-
N681C
MTU

1B21-
N682A
STU

1B21-
N682C
STU

1A71B-
K1A

1A71B-
K1C

Trip Logic

1A71B-
K1A

1A71B-
K1B

1A71B-
K26

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

Actuation Logic

1A71B-
K26

Contacts Close
To Cause
Actuation
(Typical of 2)

Closure of Inboard Group 5 PCIS
Valve 1G31-F001

Trip System "B"

Channels

B1

B2

1B21-
N081B

1B21-
N081D

1B21-
N681B
MTU

1B21-
N681D
MTU

1B21-
N682B
STU

1B21-
N682D
STU

1A71B-
K1B

1A71B-
K1D

Trip Logic

1A71B-
K1C

1A71B-
K1D

1A71B-
K27

Actuation Logic

1A71B-
K27

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

LFD-1-PCIS-32

TS 3.3.6.1-1, Item 5.d
RWCU System Isolation
Reactor Vessel Water

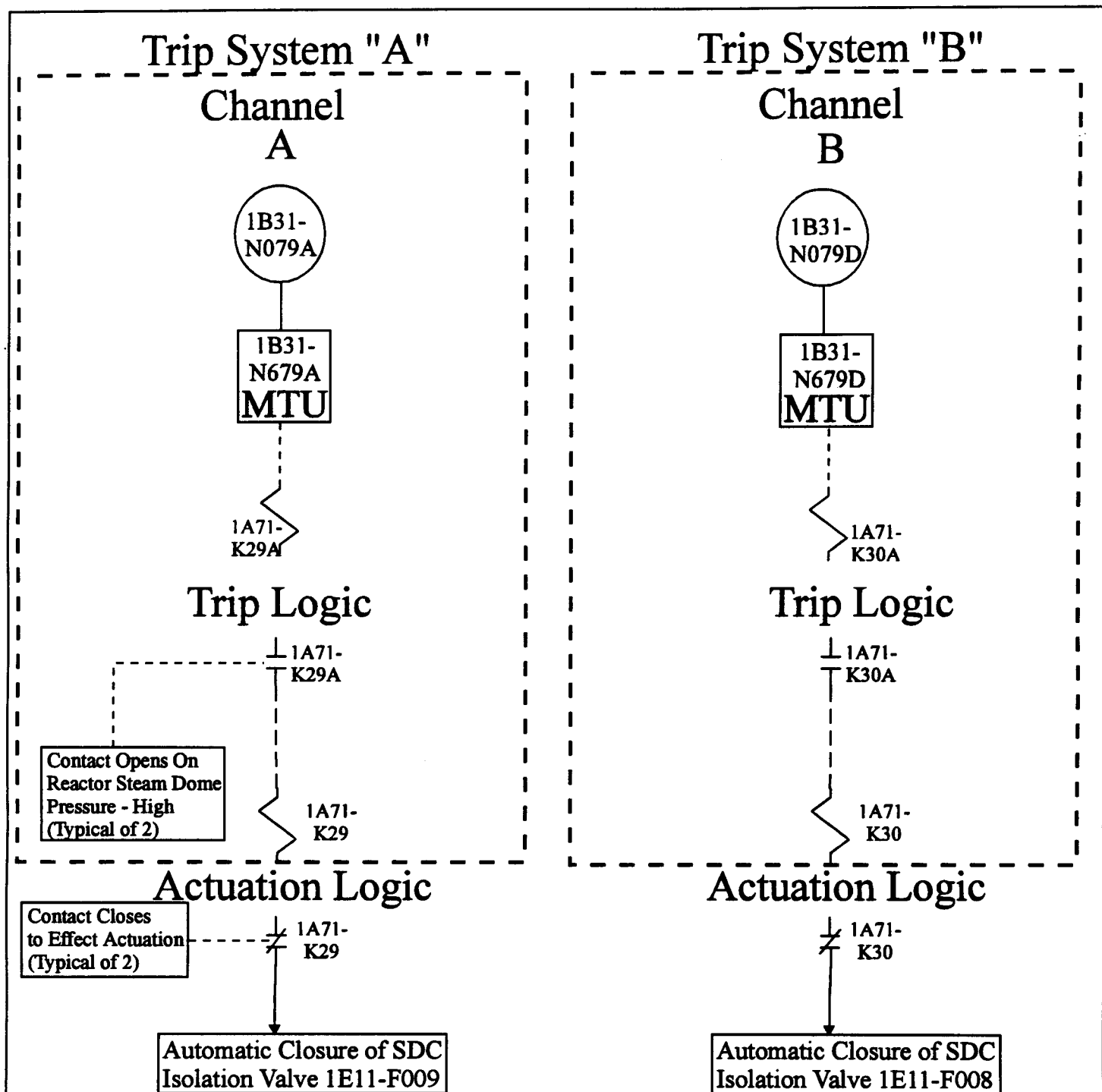
Level - Low Low,
Level 2

Prepared By: *Steve W. Reed*

Reviewed By: *[Signature]*

Rev. 0

1/16/95



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.

Elem. Ref.

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

Prepared By: *J.R. Bruner*

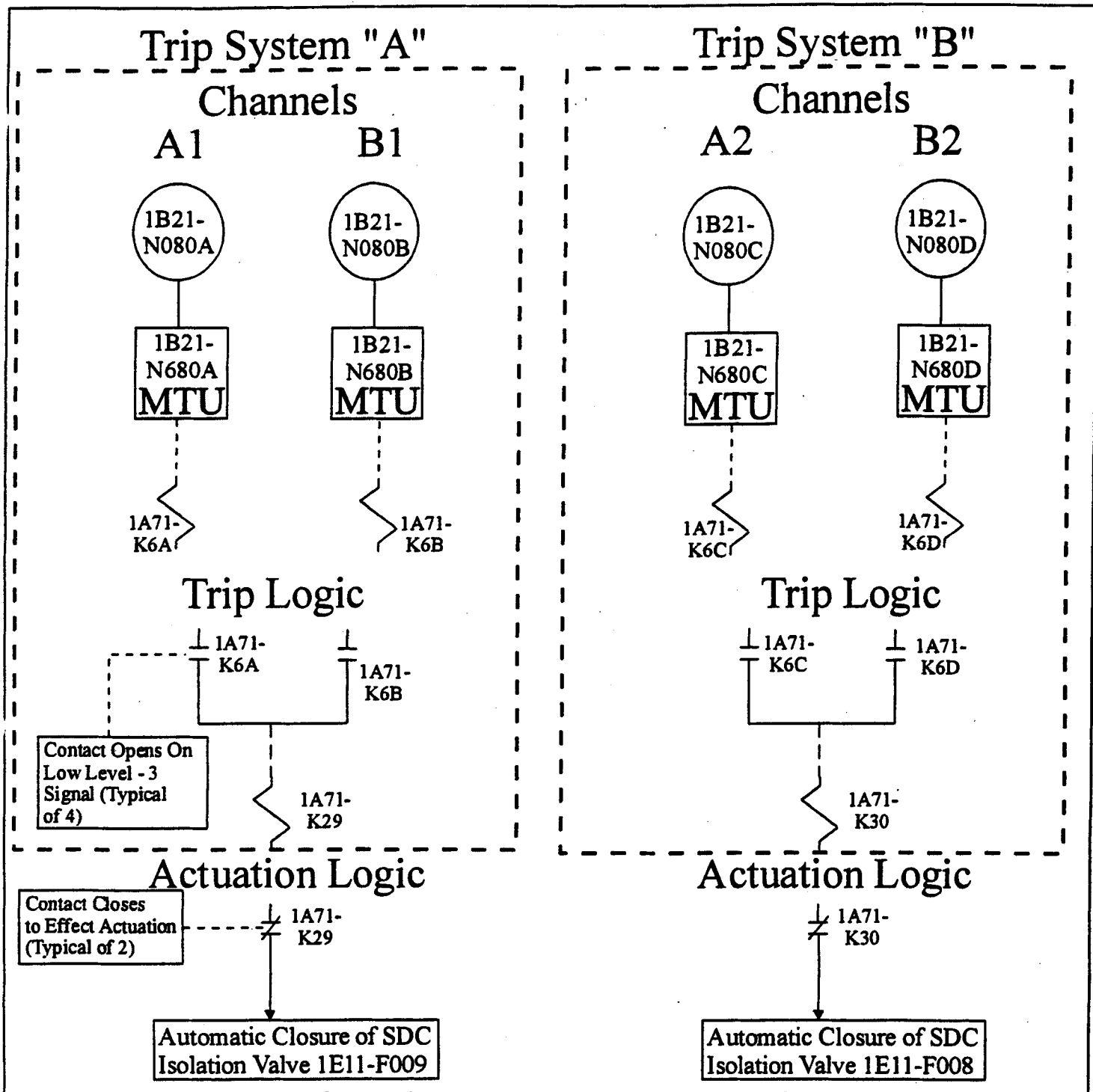
Reviewed By: *Royce Clark*

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



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]*

LFD-1-PCIS-34

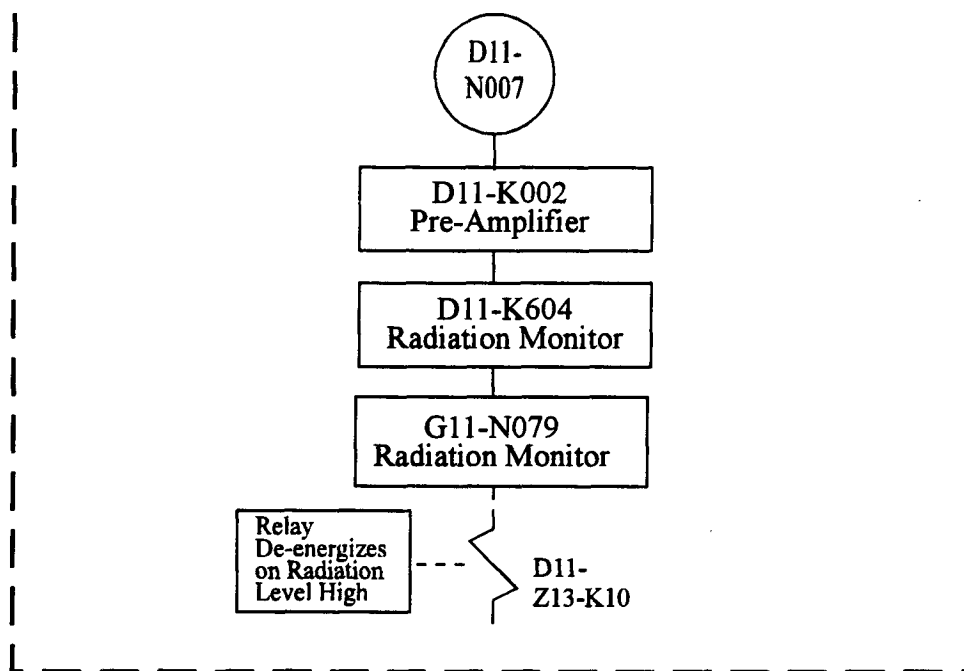
TS 3.3.6.1-1, Item 6.b
RHR SDC System
Isolation, Reactor
Vessel Water Level -
Low, Level 3

TRM Rev. 26

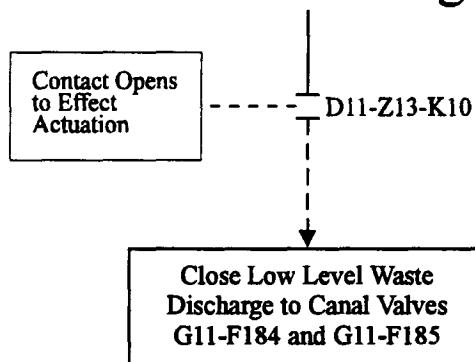
Elem. Ref.	
H-17789	H-17818
H-17790	H-19809
H-17810	H-19812
H-17811	H-19815
H-17817	H-19818

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

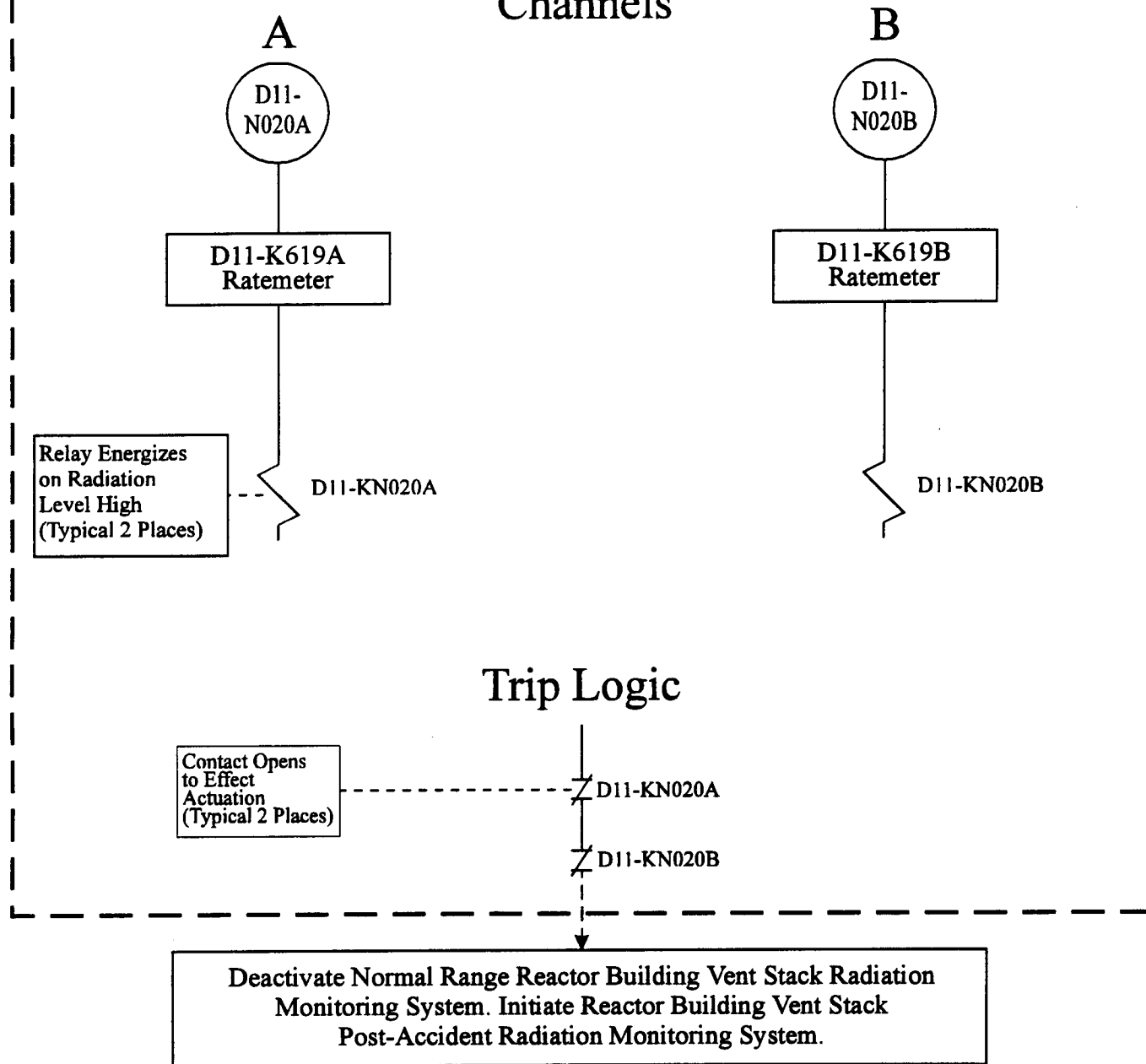
ODCM 2-1, Item 1

Liquid Radwaste
Effluent Line
Radiation High

Rev. 0

11/16/94

Trip System Channels



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: JGB

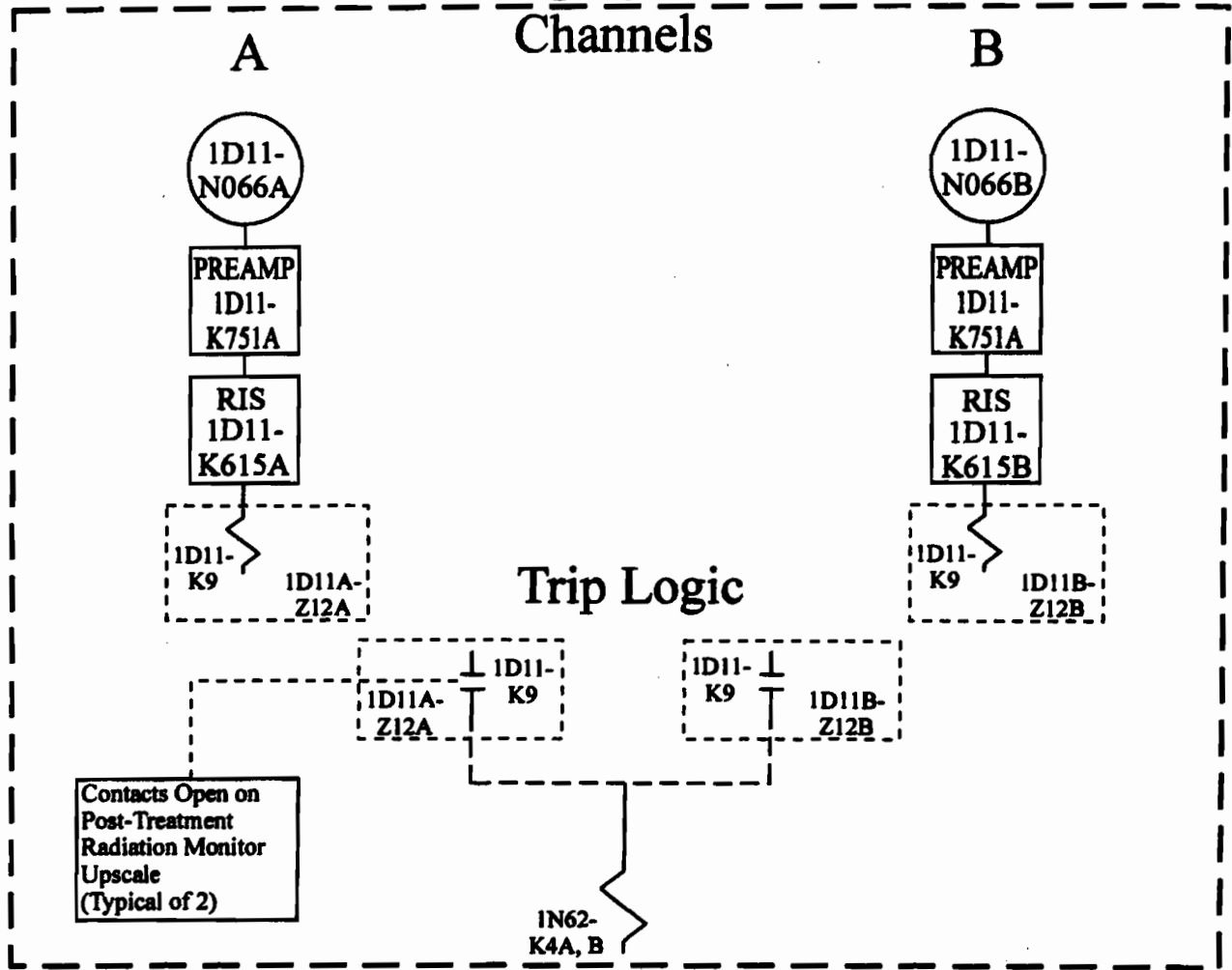
LFD-1-PRM-02

ODCM 3-1, Item 1.a
Reactor Building Vent Stack
Monitoring System
Radiation High

Rev. 0

11/16/94

Trip System Channels



Contacts Open on
Post-Treatment
Radiation Monitor
Upscale
(Typical of 2)

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:

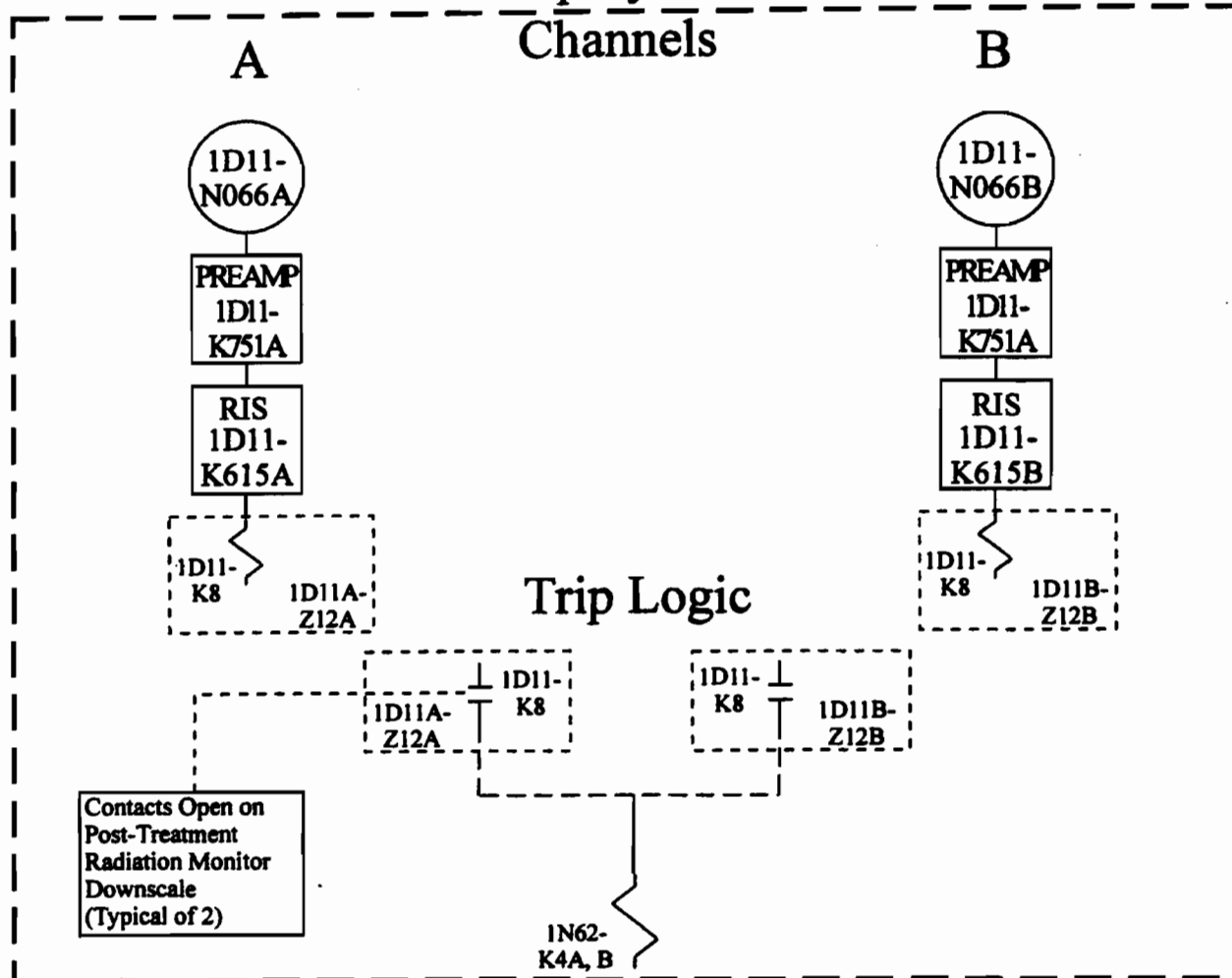
In order to maintain Offgas System isolation capability on a Post-Treatment Radiation Monitor upscale condition, each channel must be functional or maintained in the tripped condition.

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

Prepared By: *TRC*
Reviewed By: *WLF*

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: *TRC*

Reviewed By: *TRC*

LFD-1-PRM-04

TRM T3.3.8-1, Item 2
Offgas System Isolation
Post-Treatment Radiation
Monitor Downscale

TRM REV. 60

Trip System

Channels

A

D11-N071

D11-K752A
Pre Amplifier

D11-K600A
Radiation Monitor

Relay Energizes
on Radiation
Level High
(Typical 2 Places)

D11-KZ12A, C

B

D11-N072

D11-K752B
Pre Amplifier

D11-K600B
Radiation Monitor

D11-KZ12B

Trip Logic

Contacts Open
to Effect
Actuation
(Typical 2 Places)

D11-KZ12A, C

D11-KZ12B, D

D11-
KZ12A

Contacts Close
to Effect
Actuation
(Typical 2 Places)

D11-KZ12B, D

Deactivate Normal Range Off Gas
Main Stack Radiation Monitoring
System. Initiate Main Stack
Post-Accident Radiation Monitoring
System.

Realign Offgas Main Stack
Radiation Sampling Valves
for Accident Range Sampling

Minimum Channel Requirements for System Initiation Capability:

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

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

Prepared By: *S. J. Brown*
Reviewed By: *Stephen V. Reed*

LFD-1-PRM-05

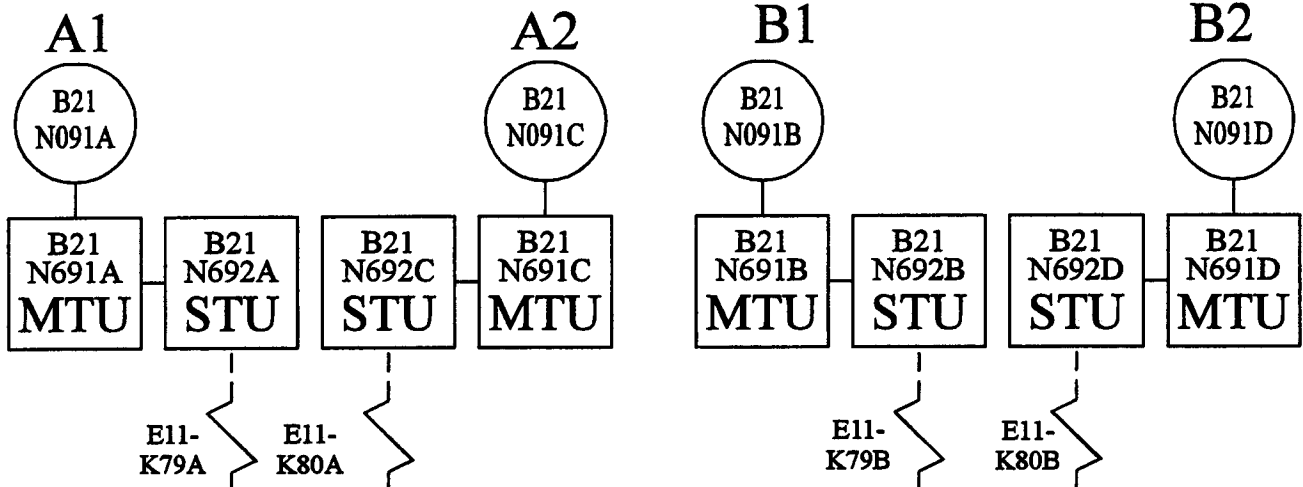
ODCM 3-1, Item 3.a
Main Stack Monitoring
System, Noble Gas Activity
Monitor

Rev. 0

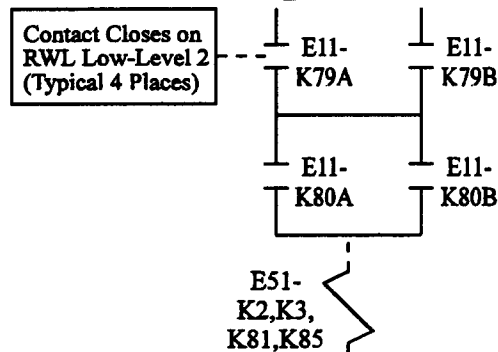
12/1/94

Trip System

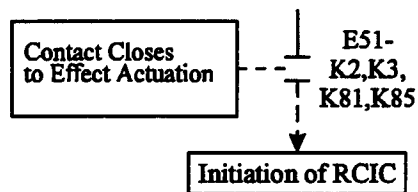
Channels



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

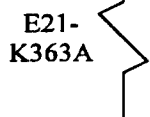
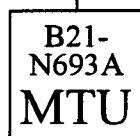
Prepared By: *F. R. Brown*
Reviewed By: *William Wilkins*

LFD-1-RCIC-01
TS 3.3.5.2-1, Item 1
RCIC system
Reactor Vessel
Water Level-
Low Low, Level 2
TRM Rev. 6

Trip System

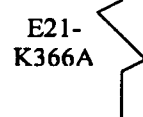
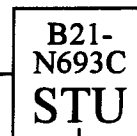
Channel

A



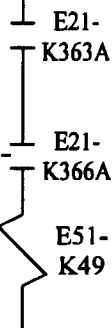
Channel

B



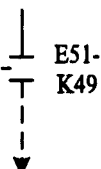
Trip Logic

Contact
Closes
on RWL
High-Level 8
(Typical
2 Places)



Actuation Logic

Contact
Closes
to Effect
Actuation



Closes RCIC Steam Supply
Valves and Turbine Cooling Water Valve

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: RBR

Reviewed By: JSC

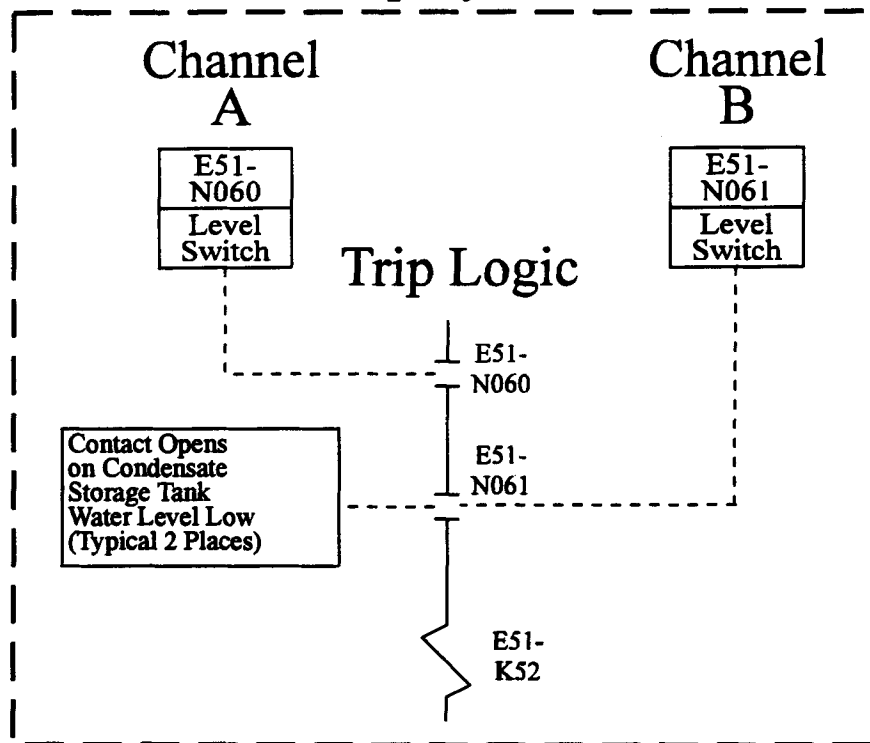
LFD-1-RCIC-02

TS 3.3.5.2-1, Item 2
RCIC System
Reactor Vessel
Water Level - High,
Level 8

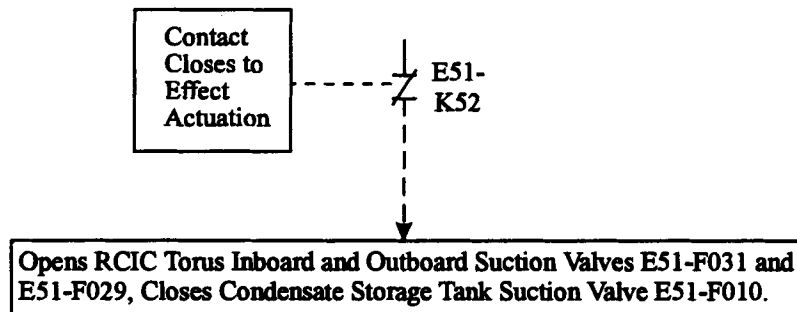
Rev. 0

11/16/94

Trip System



Actuation Logic



Minimum Channel Requirements for System Initiation Capability:

In order to maintain the ability to automatically transfer the 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: PBR

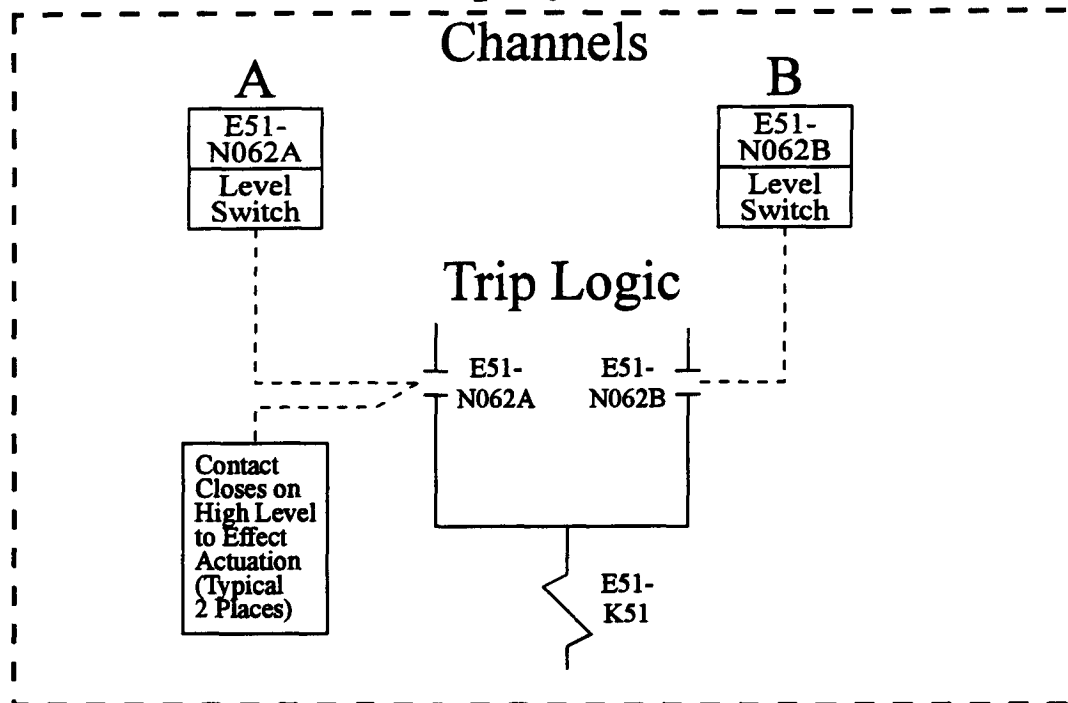
Reviewed By: JDB

LFD-1-RCIC-03

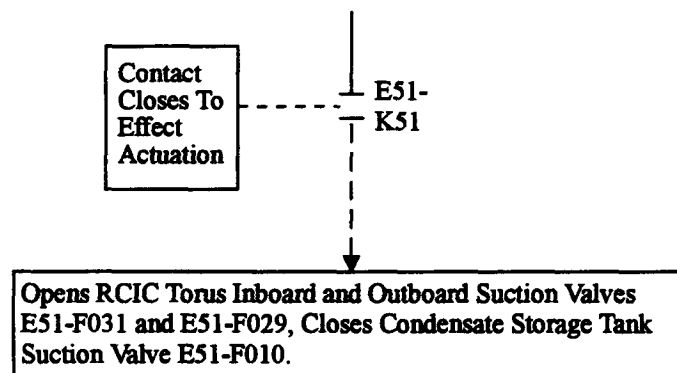
TS 3.3.5.2-1, Item 3
RCIC System
Condensate Storage
Tank Level-Low

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 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:

RBR

Reviewed By:

JDB

LFD-1-RCIC-04

TS 3.3.5.2-1, Item 4

RCIC System

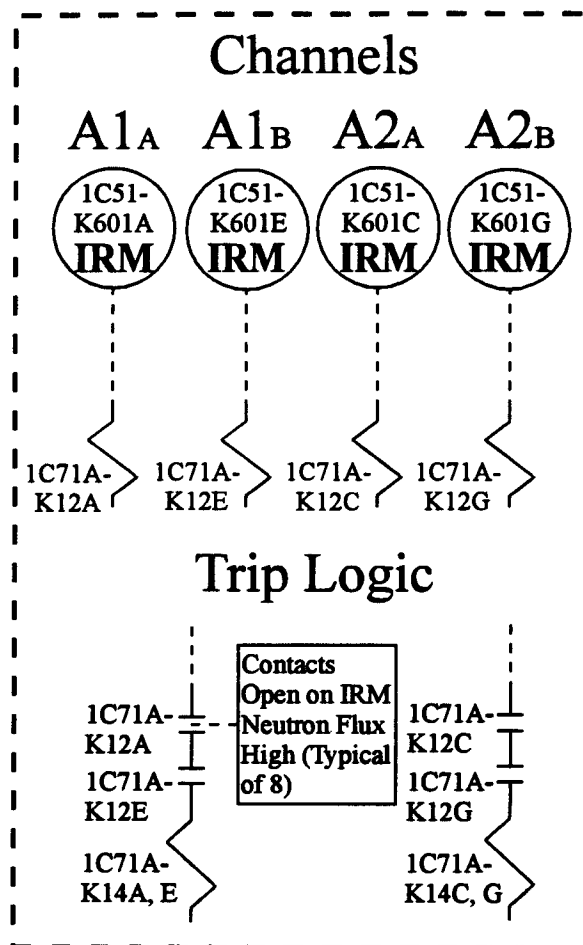
Suppression Pool

Water Level-High

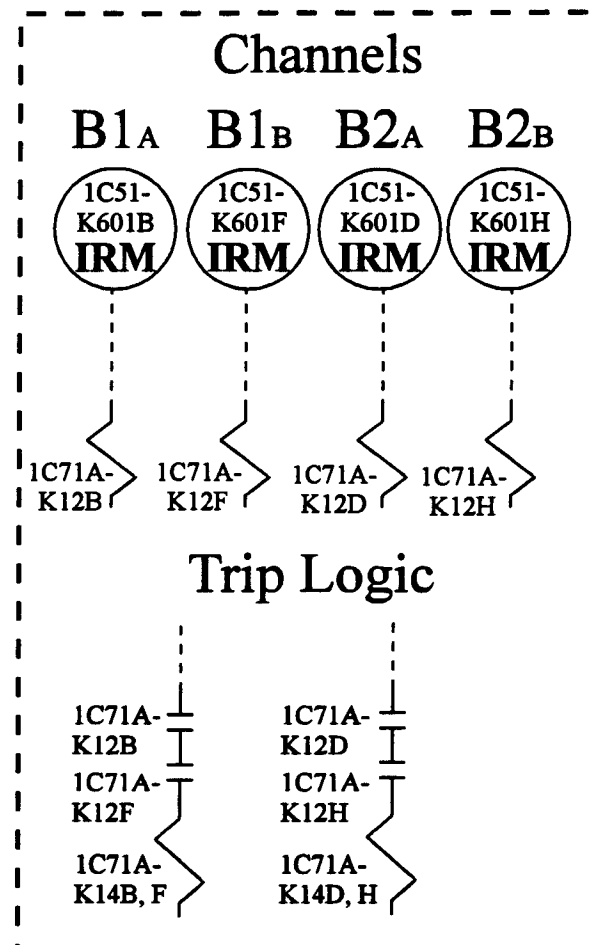
Rev. 0

11/16/94

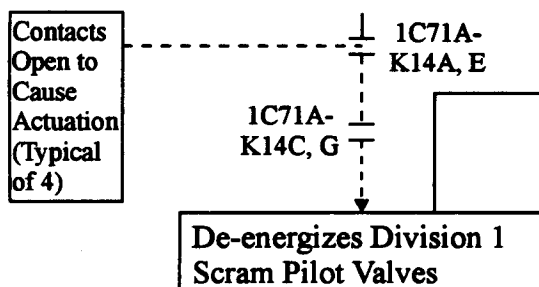
Trip System "A"



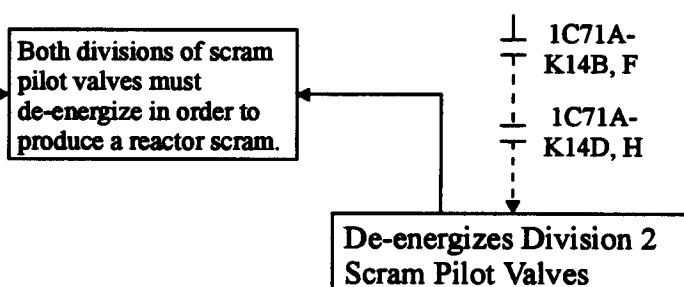
Trip System "B"



Actuation Logic



Actuation Logic



Minimum Channel Requirements for System Initiation Capability:

In order to maintain the capability to scram the reactor on 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. J. [Signature]

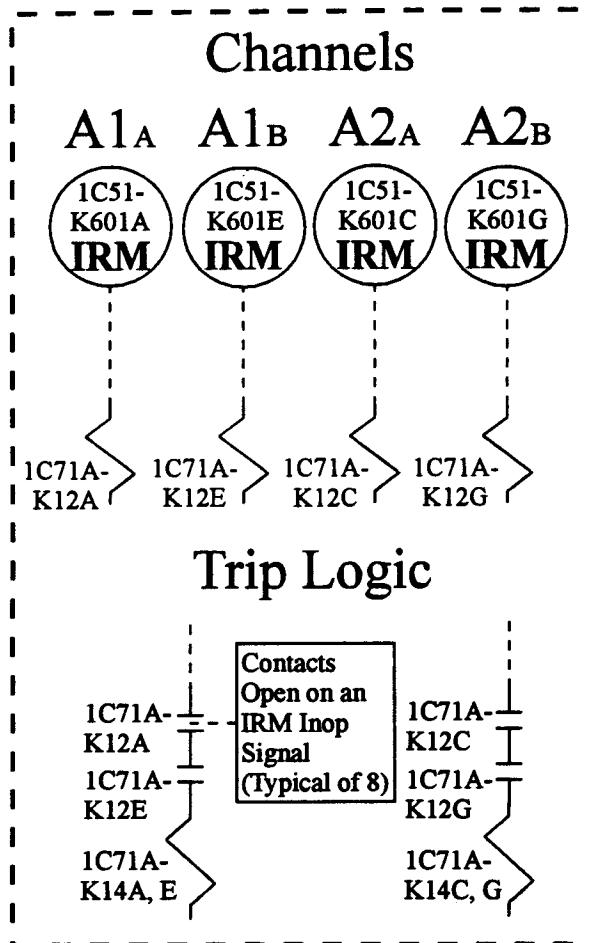
LFD-1-RPS-01

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

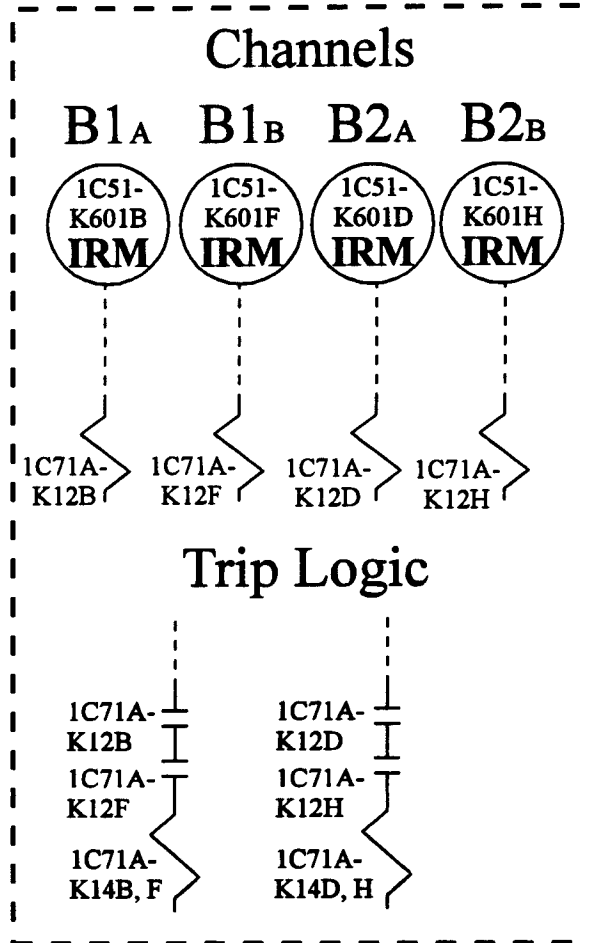
Rev. 0

1/16/95

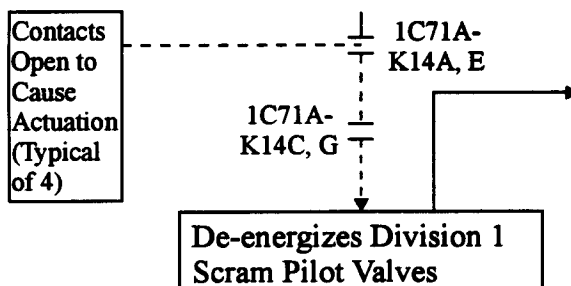
Trip System "A"



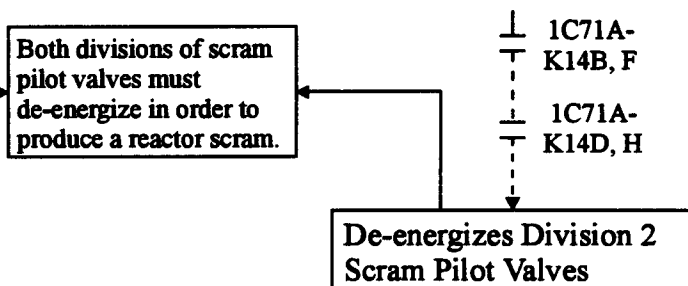
Trip System "B"



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:

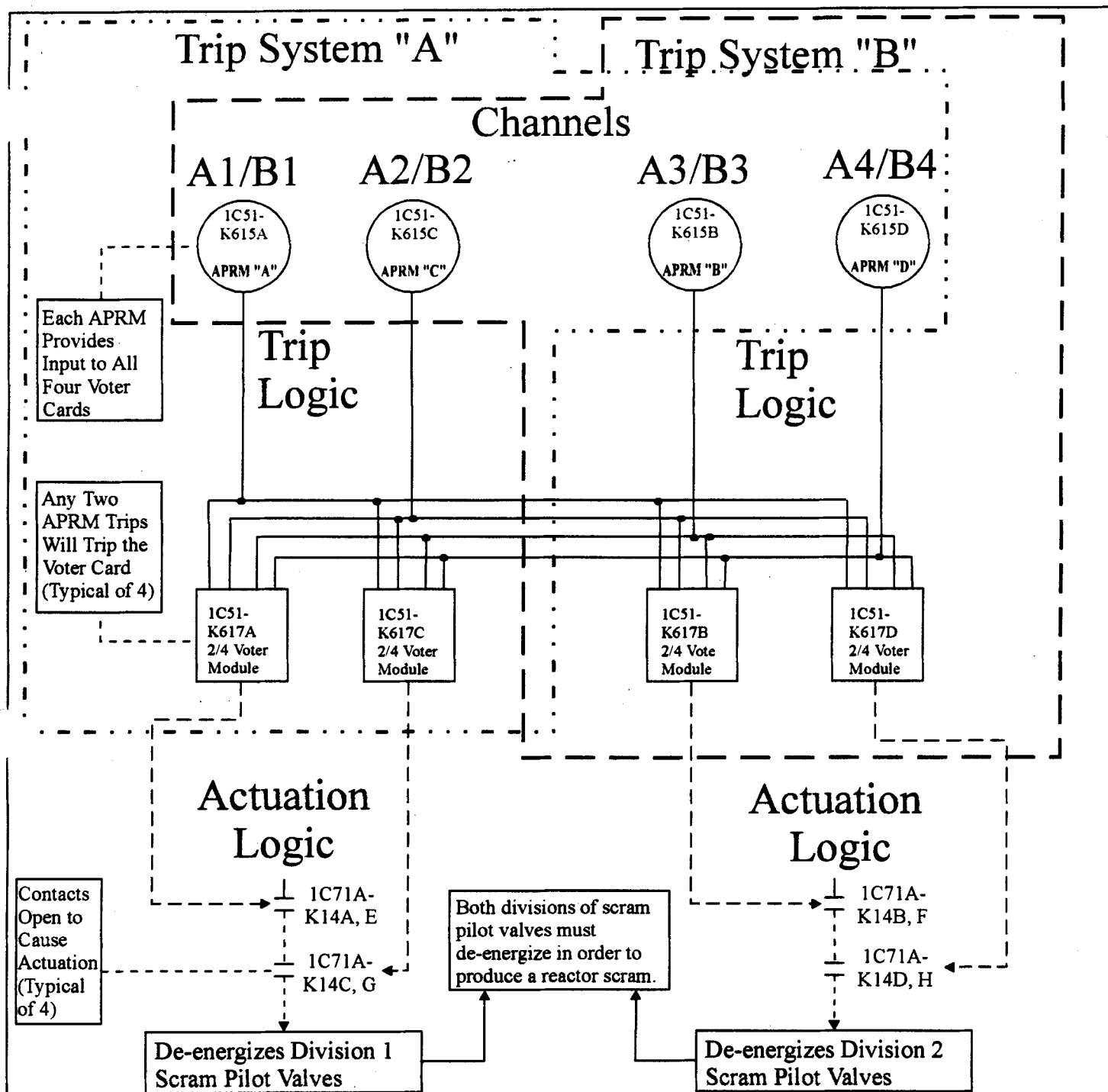
Reviewed By:

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

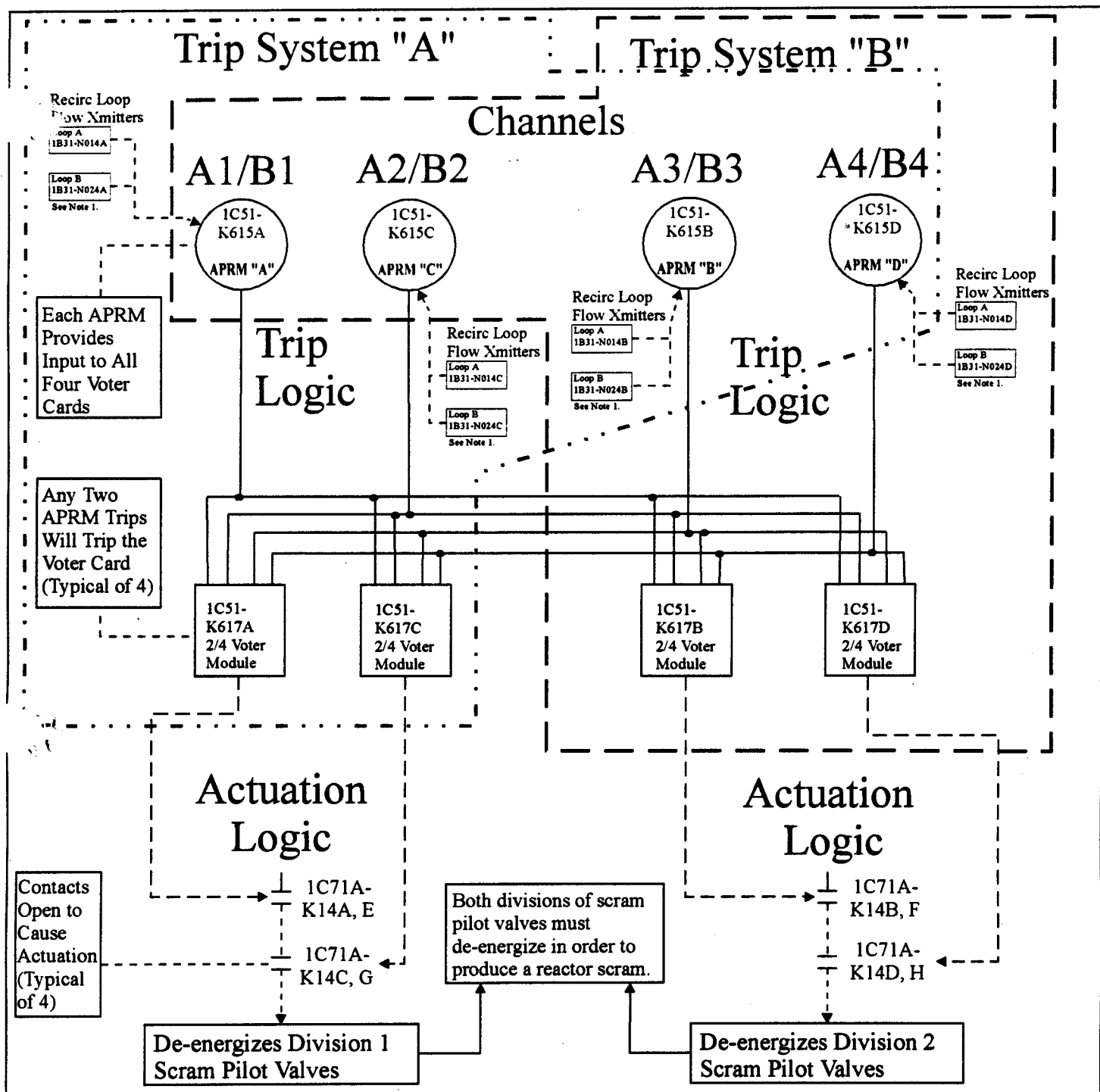
Prepared By: *[Signature]*

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

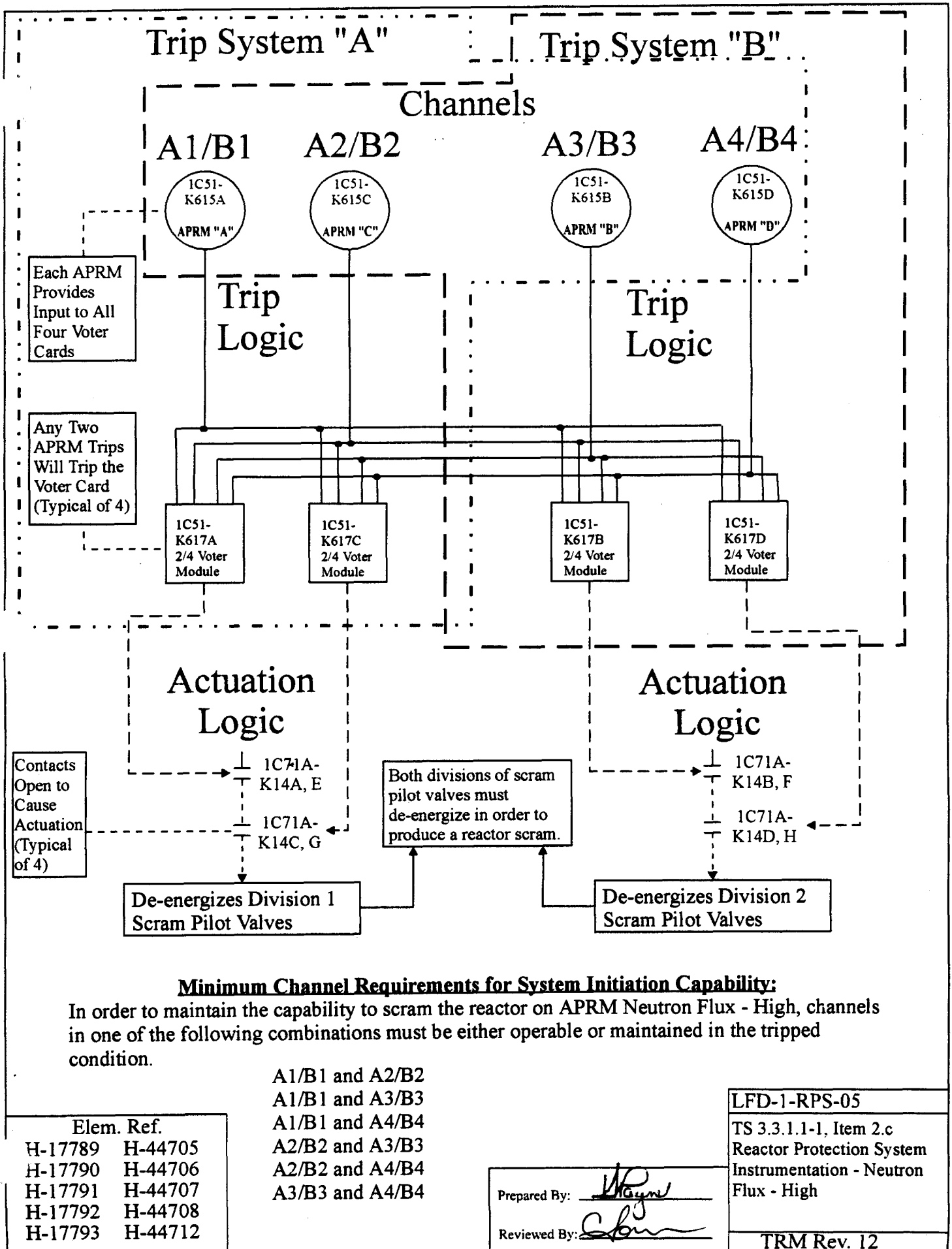
Prepared By: *W. Payne*

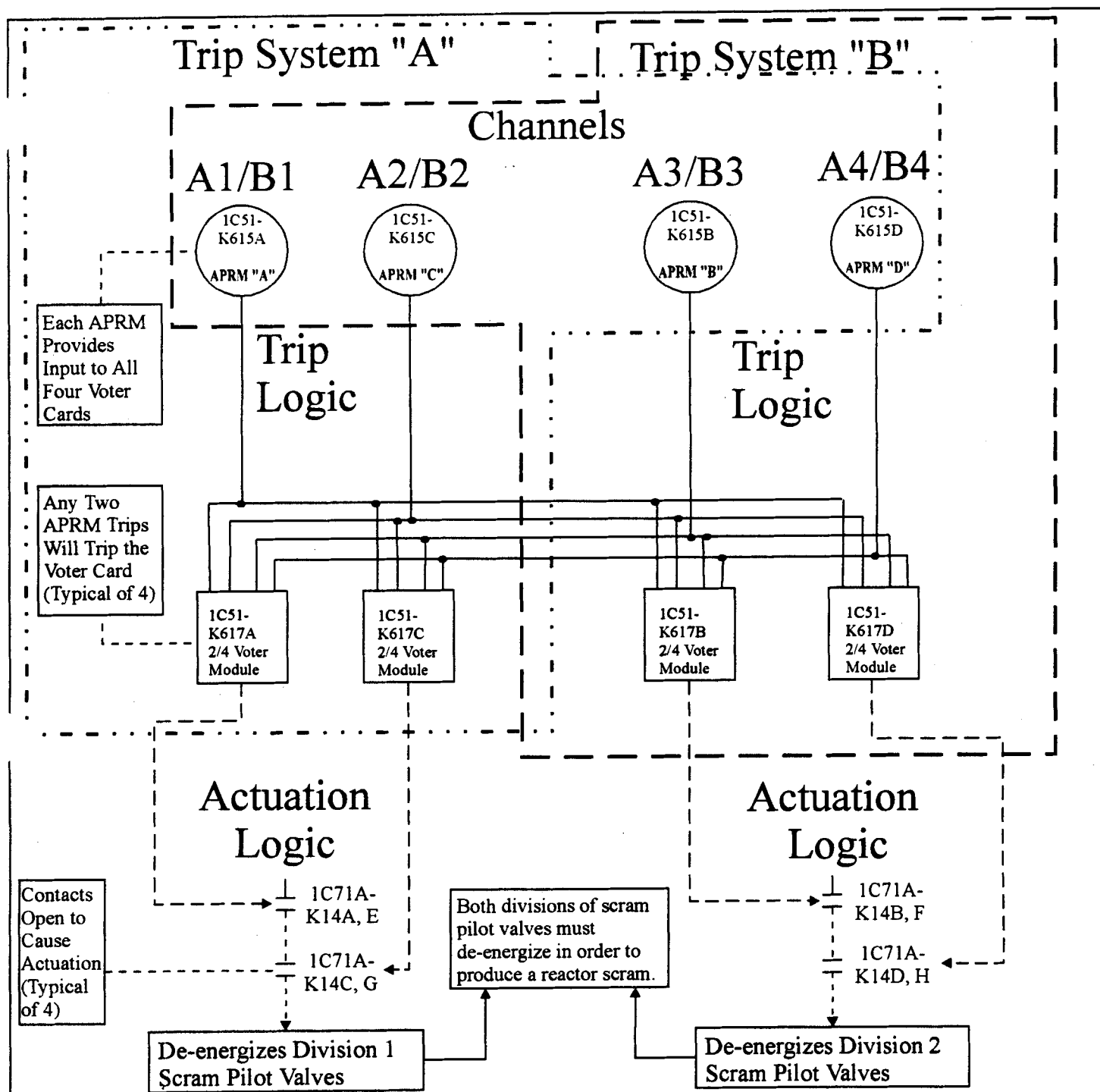
Reviewed By: *John*

LFD-1-RPS-04

TS 3.3.1.1-1, Item 2.b
Reactor Protection System
Instrumentation - Simulated
Thermal Power - High

TRM Rev. 12





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: *[Signature]*

Reviewed By: *[Signature]*

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

1C51-
K617A
2/4 Voter
Module

1C51-
K617C
2/4 Voter
Module

1C51-
K617B
2/4 Voter
Module

1C51-
K617D
2/4 Voter
Module

1C71A-
K12E

1C71A-
K12G

1C71A-
K12F

1C71A-
K12H

1C71A-
K12A

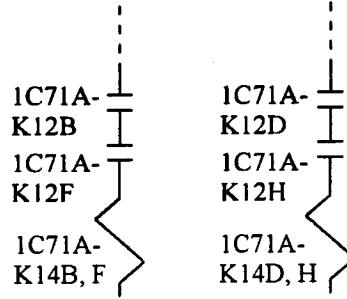
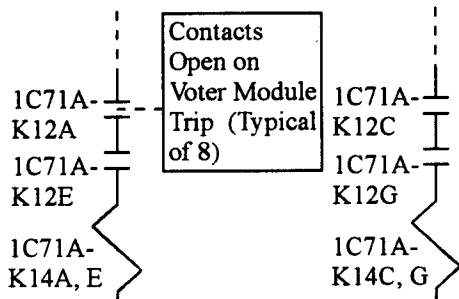
1C71A-
K12C

1C71A-
K12B

1C71A-
K12D

Trip Logic

Trip Logic



Actuation Logic

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 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

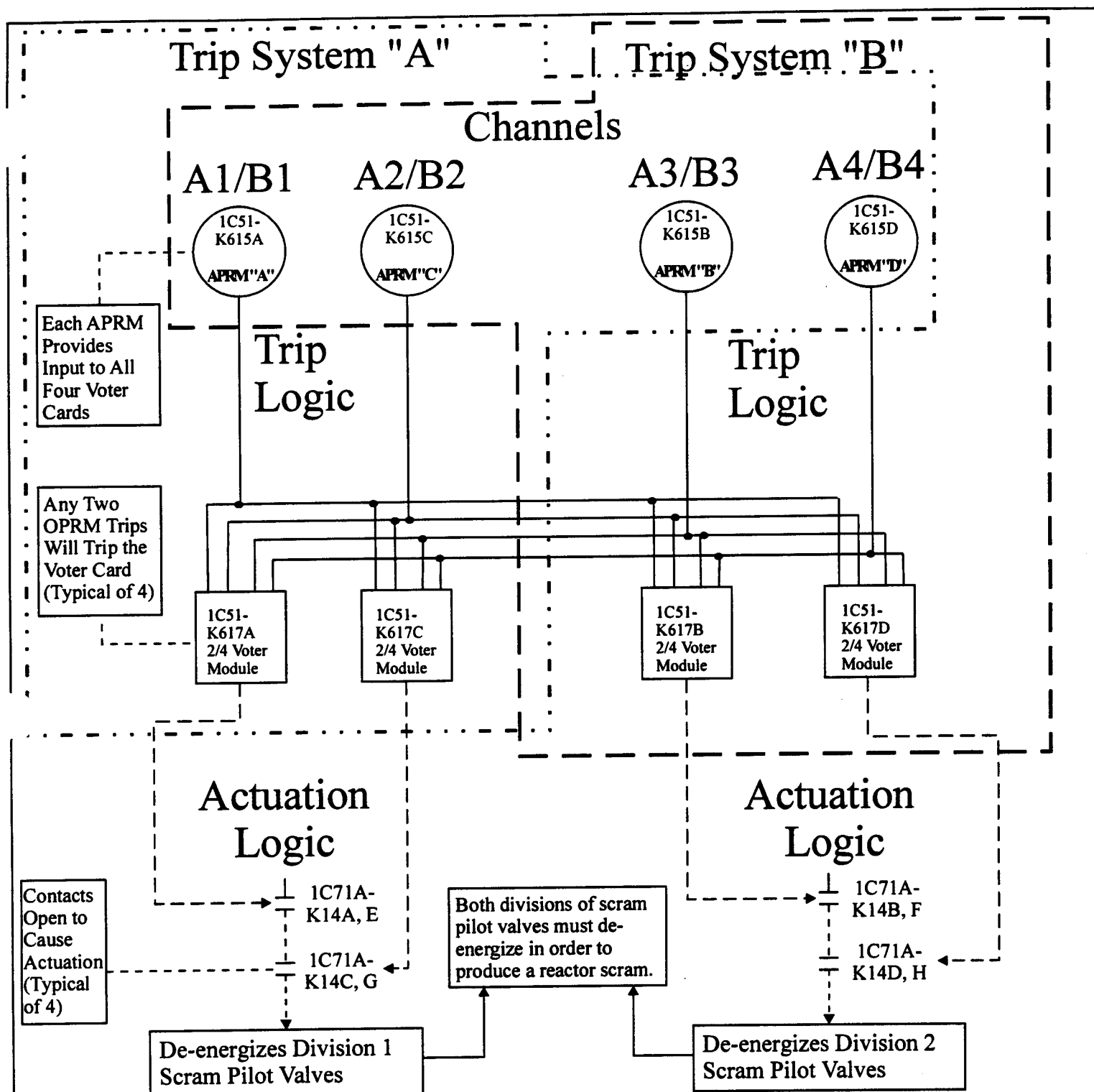
Prepared By:

Reviewed By:

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



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	A1/B1 and A2/B2
H-17790	H-44706	A1/B1 and A3/B3
H-17791	H-44707	A1/B1 and A4/B4
H-17792	H-44708	A2/B2 and A3/B3
H-17793	H-44712	A2/B2 and A4/B4
		A3/B3 and A4/B4

Prepared By: *[Signature]*

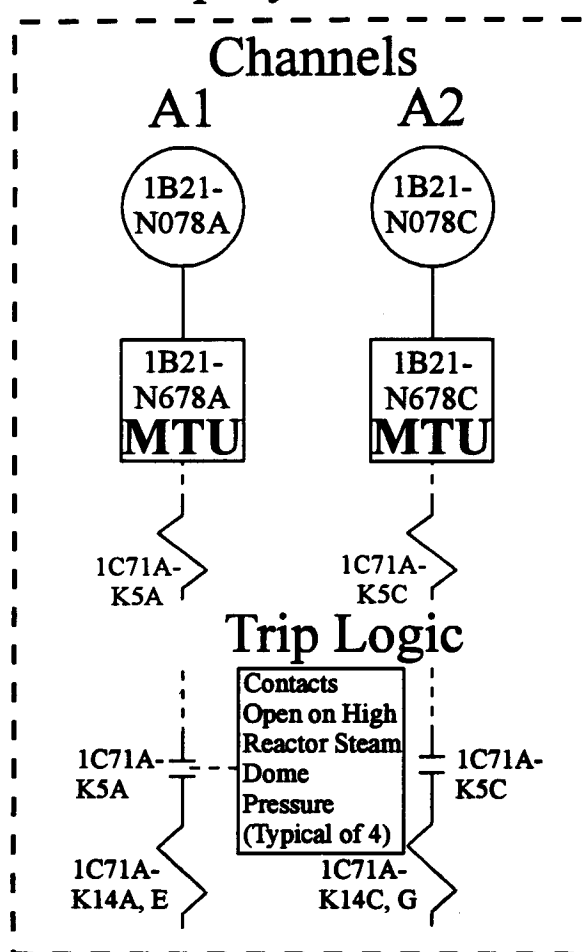
Reviewed By: *[Signature]*

LFD-1-RPS-07a

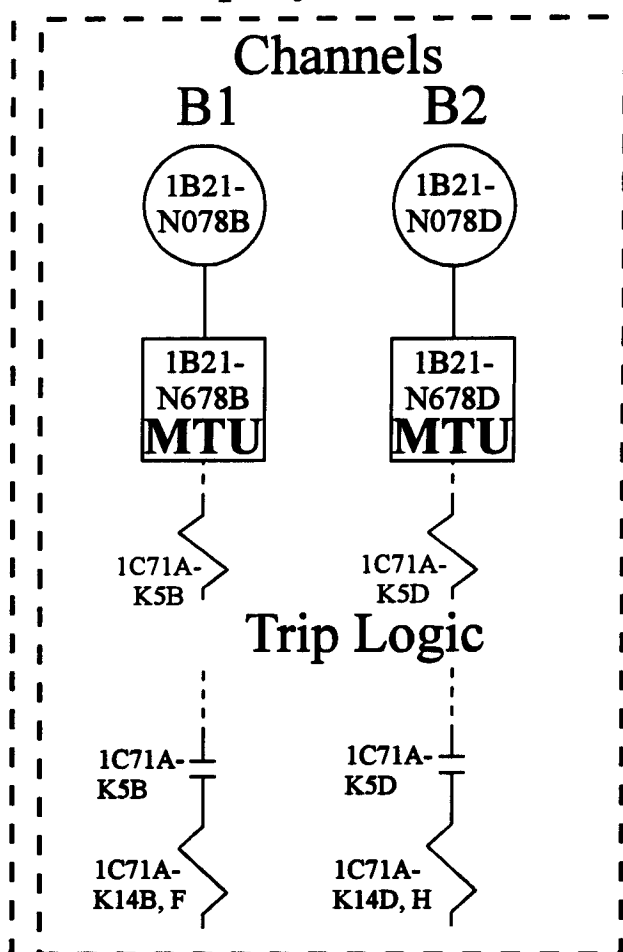
TS 3.3.1.1-1, Item 2.f
Reactor Protection System
Instrumentation - OPRM
Upscale

TRM Rev. *26*

Trip System "A"

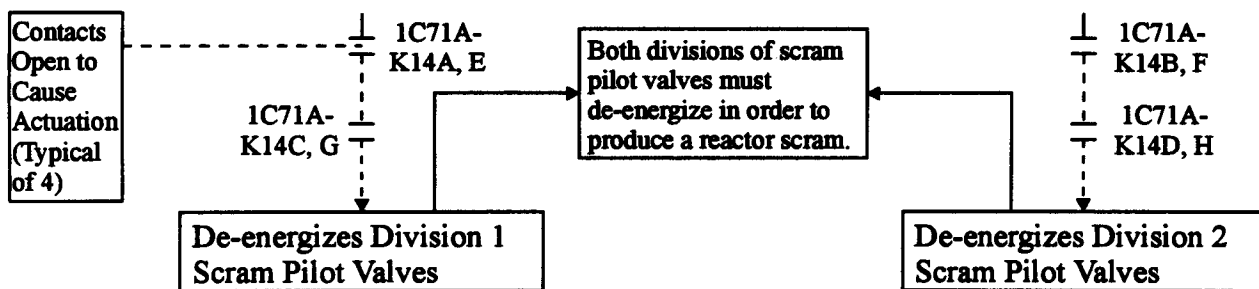


Trip System "B"



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:

Reviewed By:

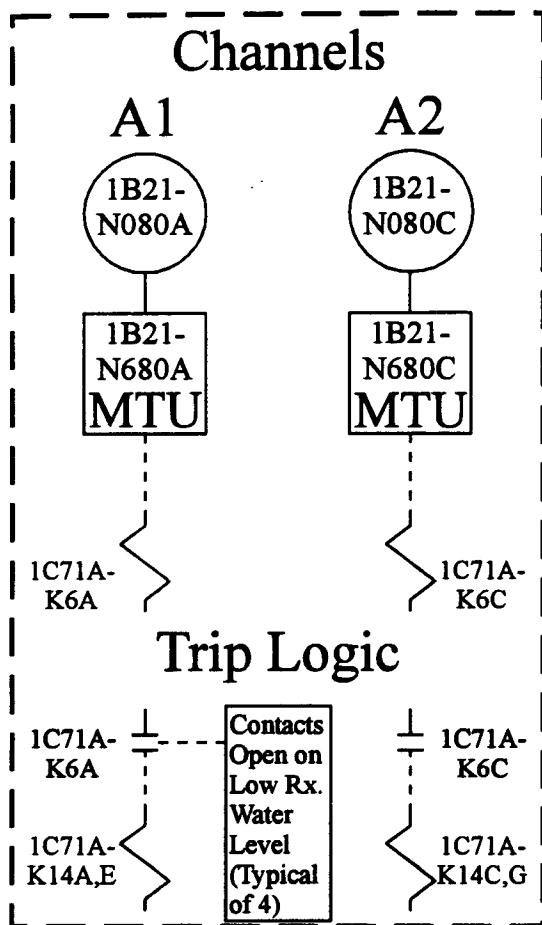
LFD-1-RPS-08

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

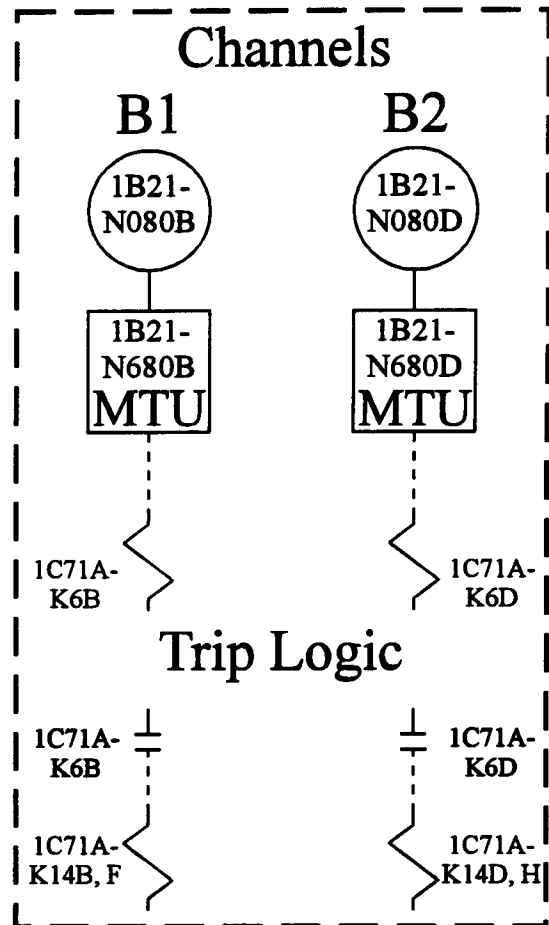
Rev. 0

1/16/95

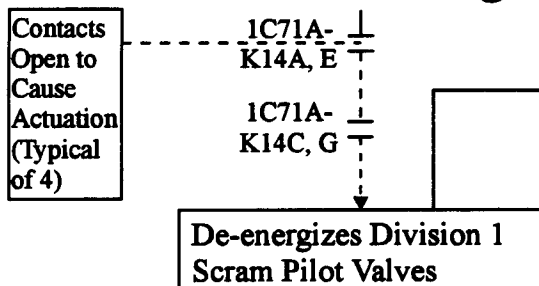
Trip System "A"



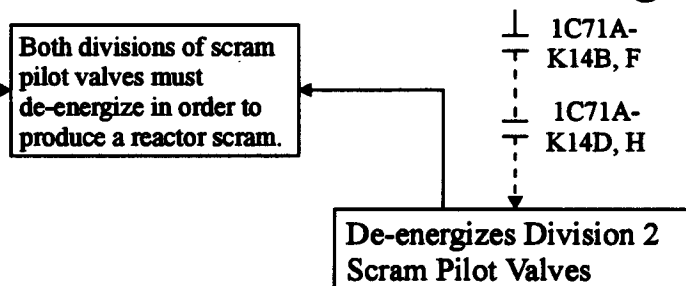
Trip System "B"



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:

Stephen 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

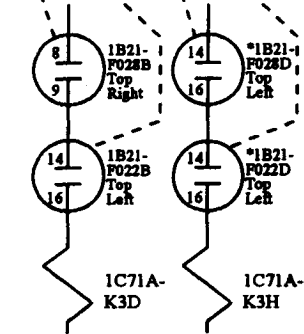
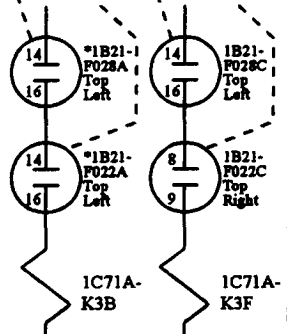
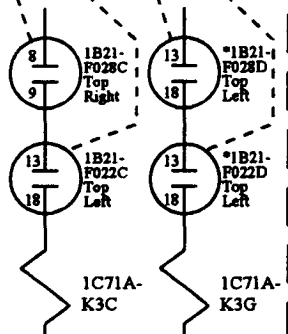
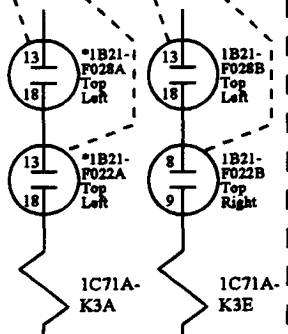
*The "Top Left" limit switch sets in all "A" and "D" MSIVs have switch contacts in both trip systems.

A1A A1B A1C A1D

A2A A2B A2C A2D

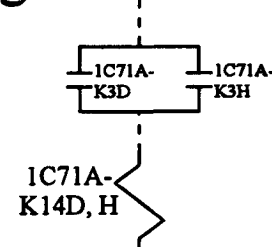
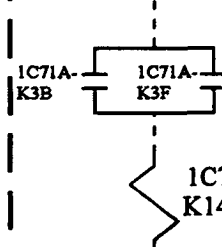
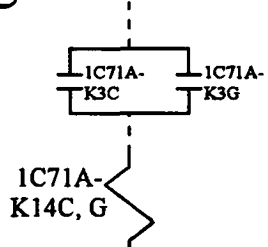
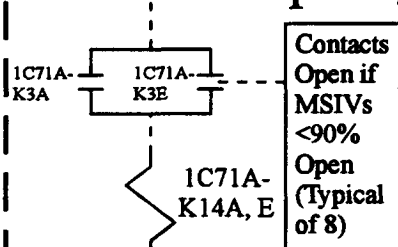
B1A B1B B1C B1D

B2A B2B B2C B2D



Trip Logic

Trip Logic



Actuation Logic

Actuation Logic

Contacts Open to Cause Actuation (Typical of 4)

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

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

De-energizes Division 1 Scram Pilot Valves

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 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*

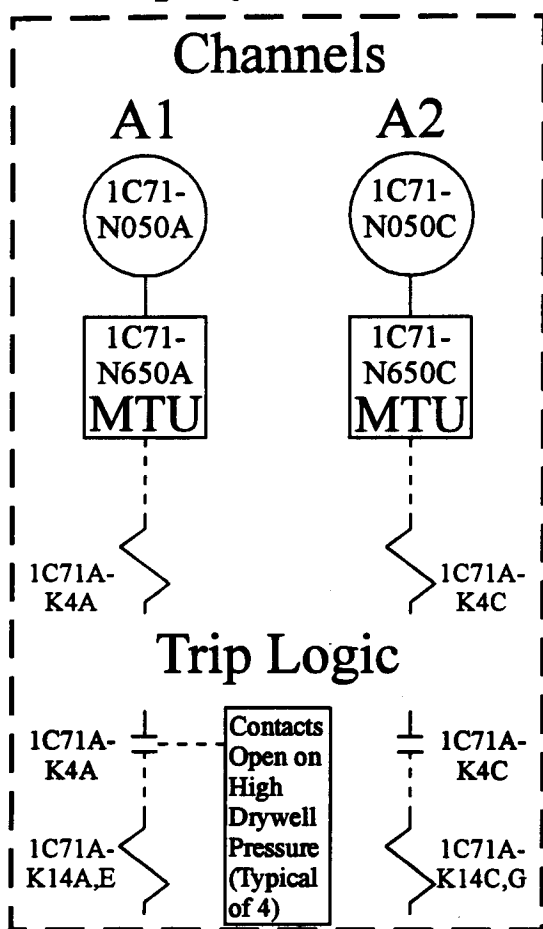
LFD-1-RPS-10

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

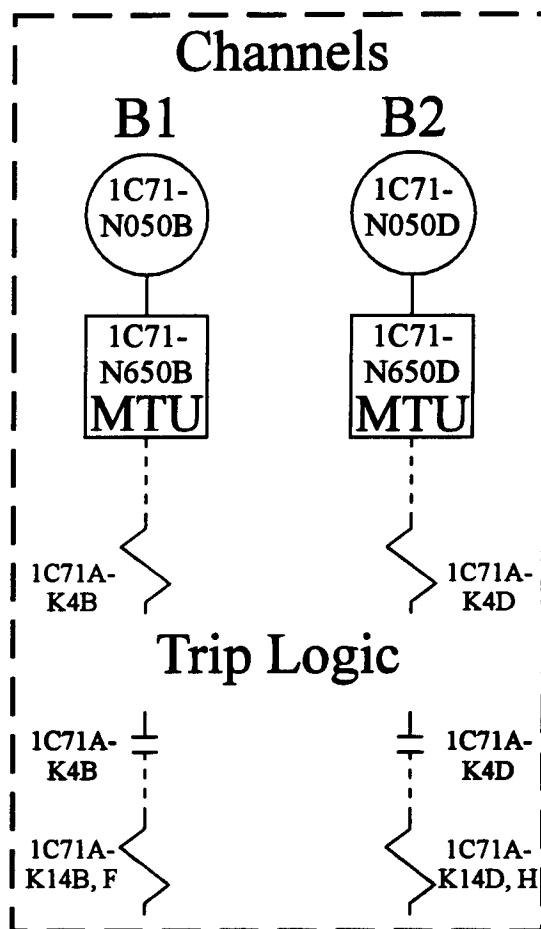
Rev. 0

1/16/95

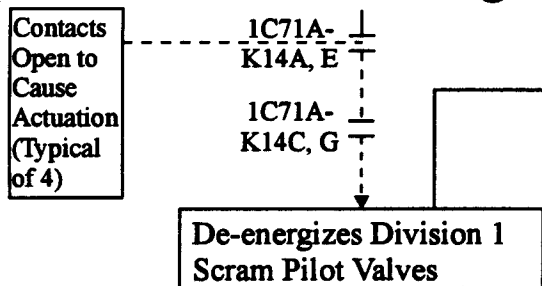
Trip System "A"



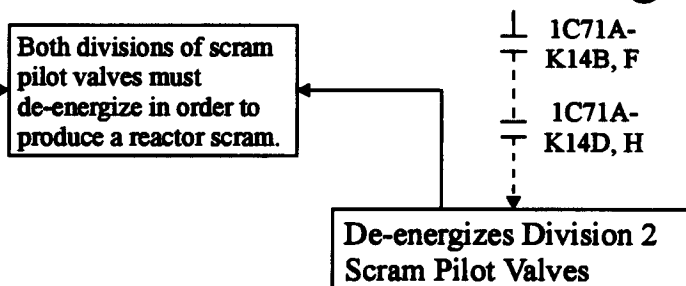
Trip System "B"



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: *Royce Clark*

Reviewed By: *Steph W. Reed*

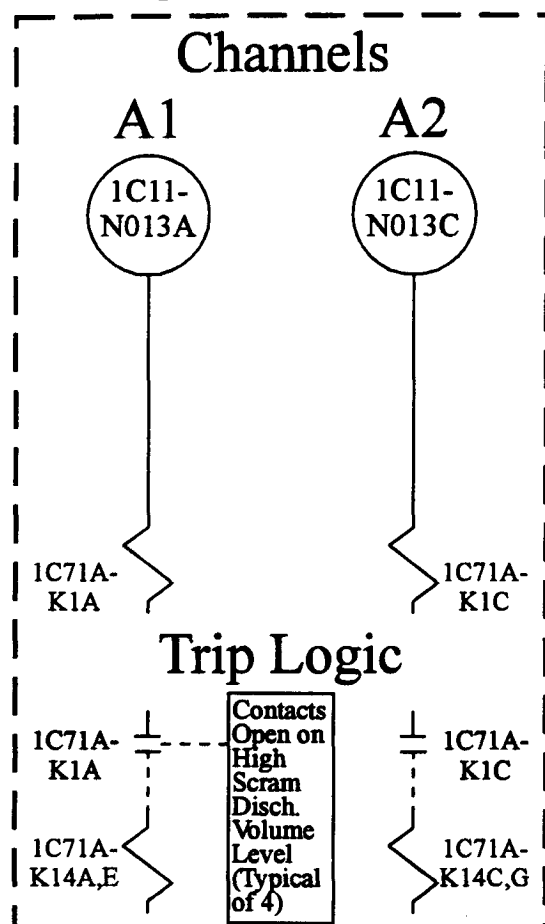
LFD-1-RPS-11

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

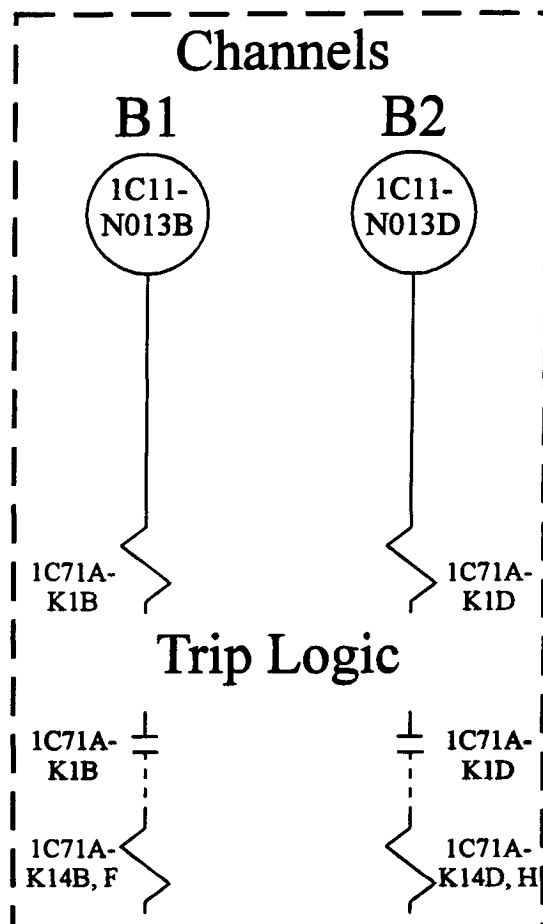
Rev. 0

1/16/95

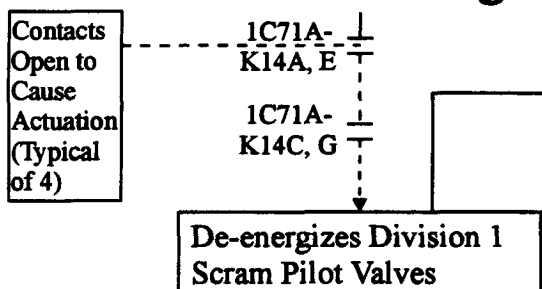
Trip System "A"



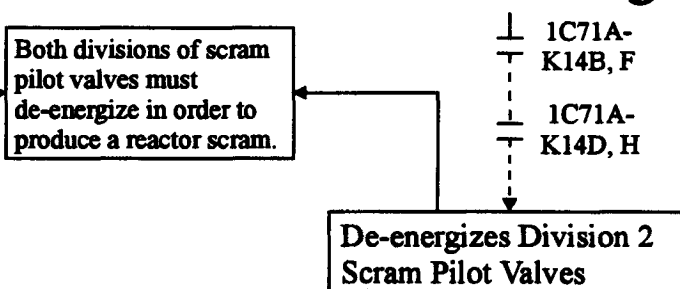
Trip System "B"



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*

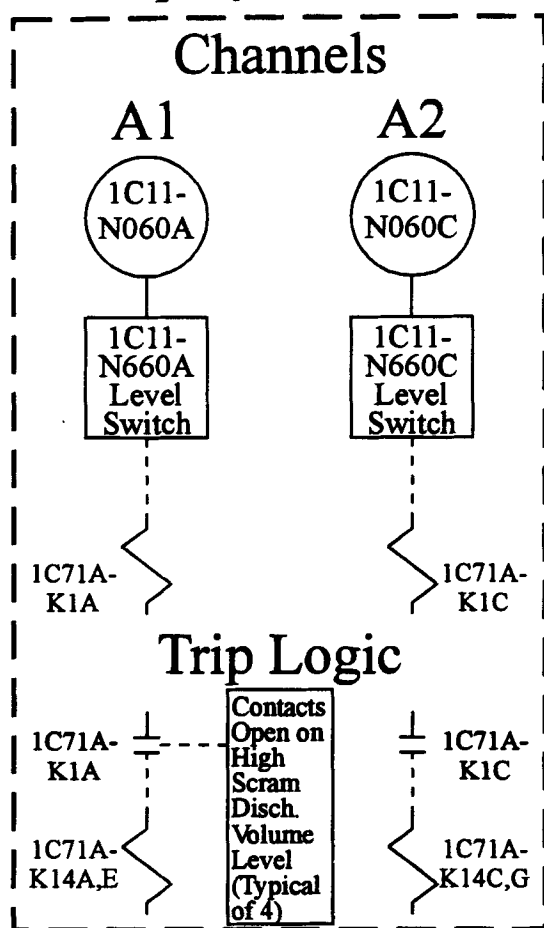
LFD-1-RPS-13

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

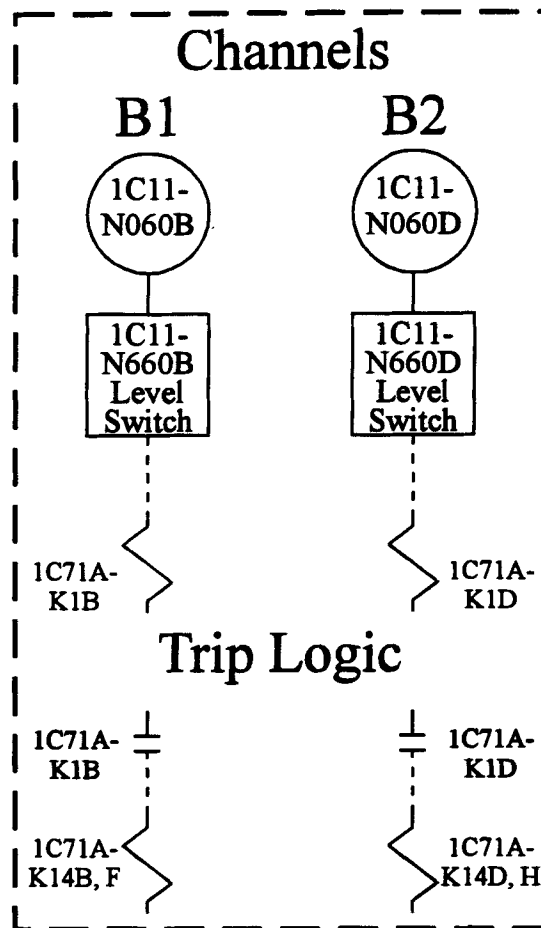
Rev. 0

1/16/95

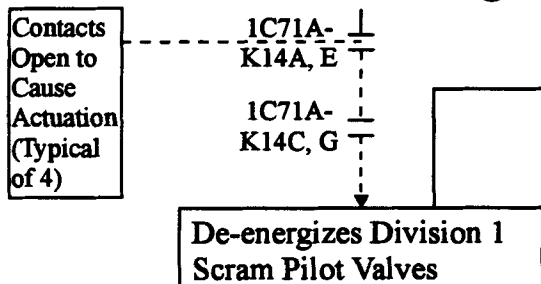
Trip System "A"



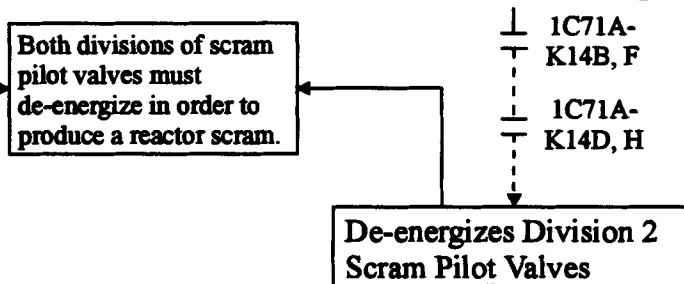
Trip System "B"



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:

Reviewed By:

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

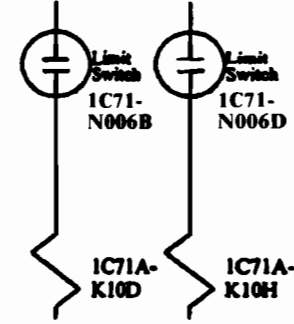
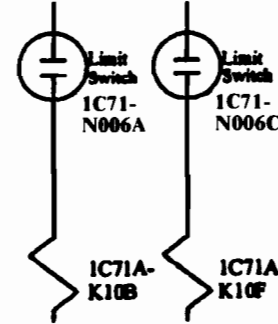
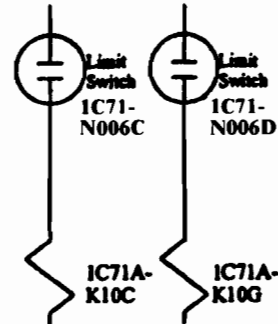
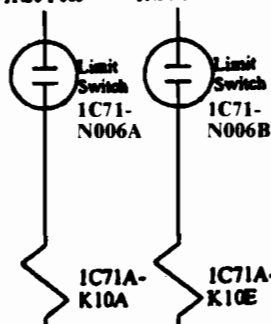
A2B
TSV #4
IN30-F008

B1A
TSV #1
IN30-F005

B1B
TSV #3
IN31-F007

B2A
TSV #2
IN30-F006

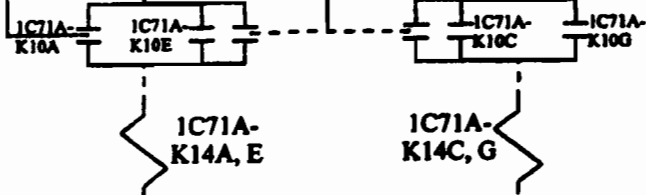
B2B
TSV #4
IN30-F008



Trip Logic

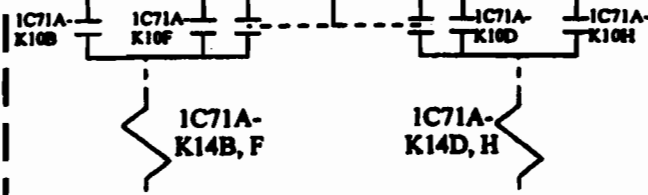
Contacts Open when TSVs
<90% Open (Typical of 8)

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:

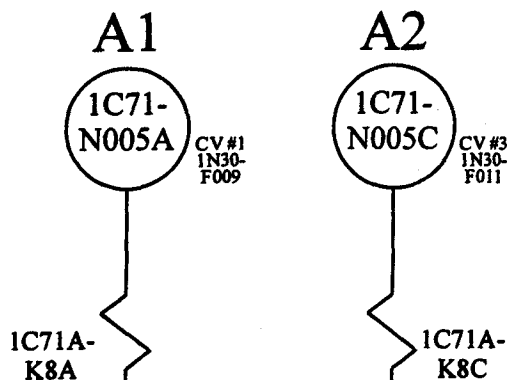
LFD-1-RPS-14

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

TRM Rev. 66

Trip System "A"

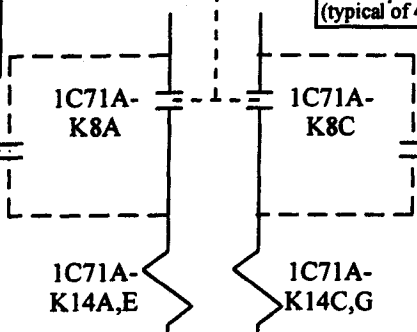
Channels



Trip Logic

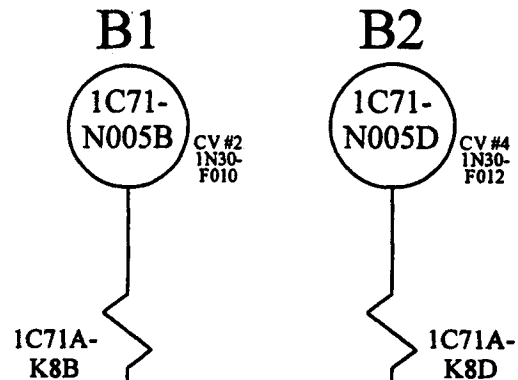
Opens when above 28% power to enable scram on turbine trip. See LFD-1-RPS-18. (Typical of 4.)

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

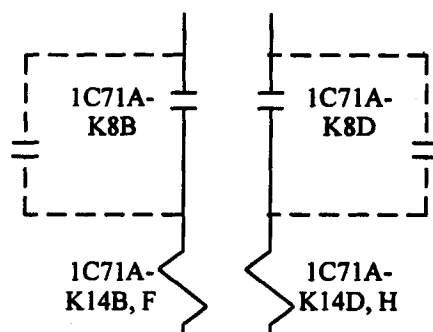


Trip System "B"

Channels



Trip Logic



Actuation Logic

Contacts Open to Cause Actuation (Typical of 4)

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 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]*

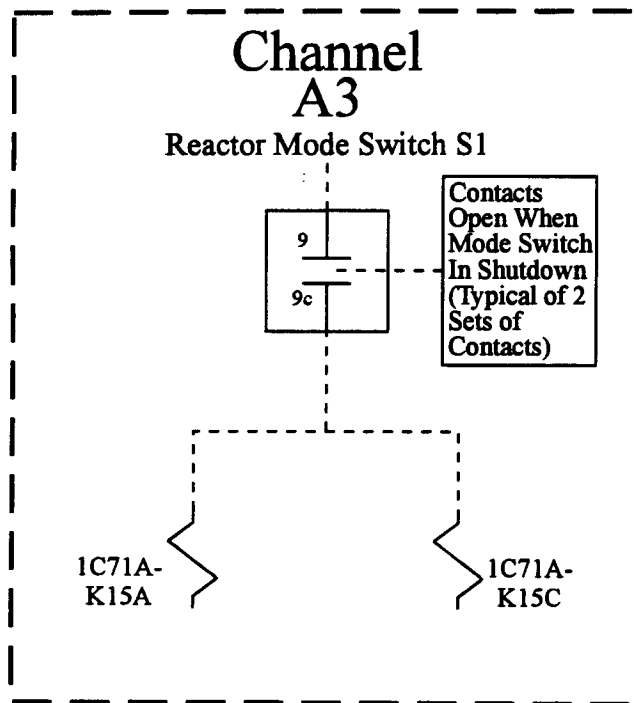
Reviewed By: *[Signature]*

LFD-1-RPS-15

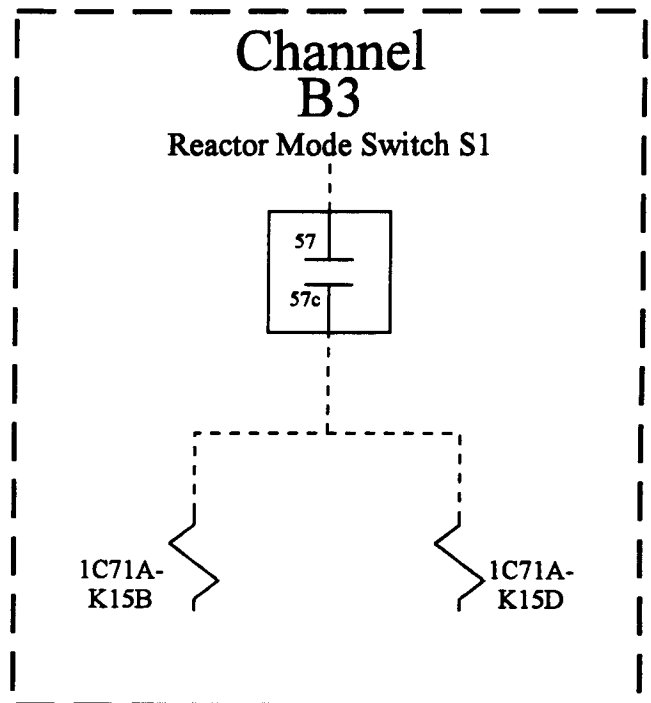
TS 3.3.1.1-1, Item 9
Reactor Protection System
Instrumentation - Turbine
Control Valve Fast Closure,
Trip Oil Pressure - Low

TRM Rev. 33

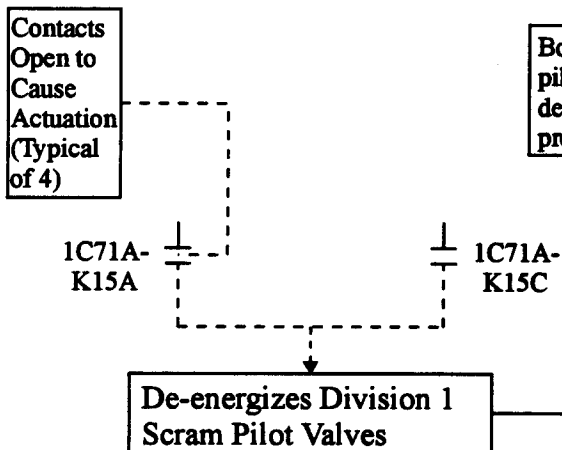
Trip System "A"



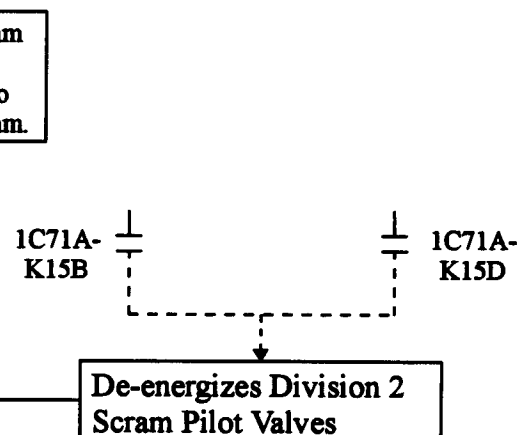
Trip System "B"



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:

Steve W. Need

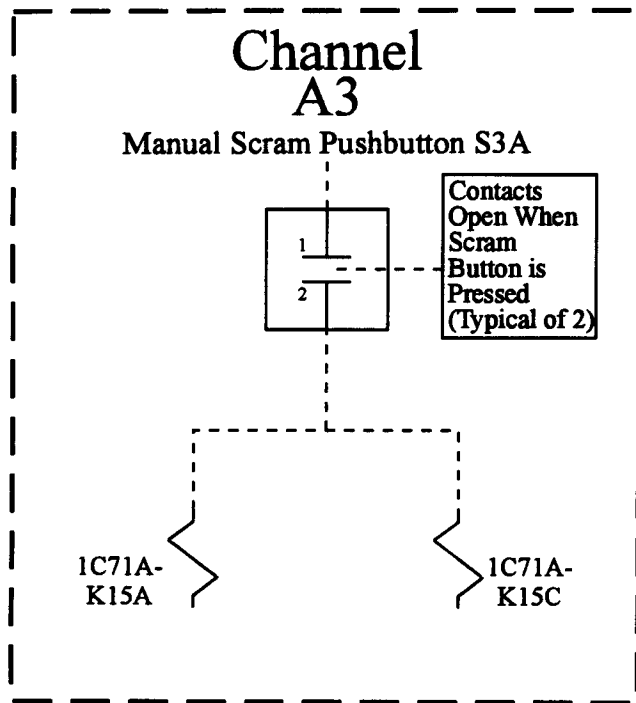
LFD-1-RPS-16

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

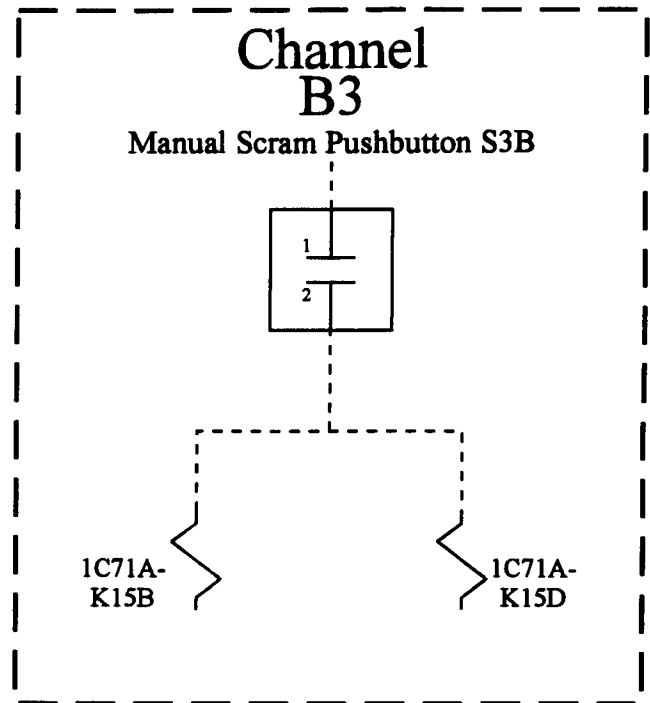
Rev. 0

1/16/95

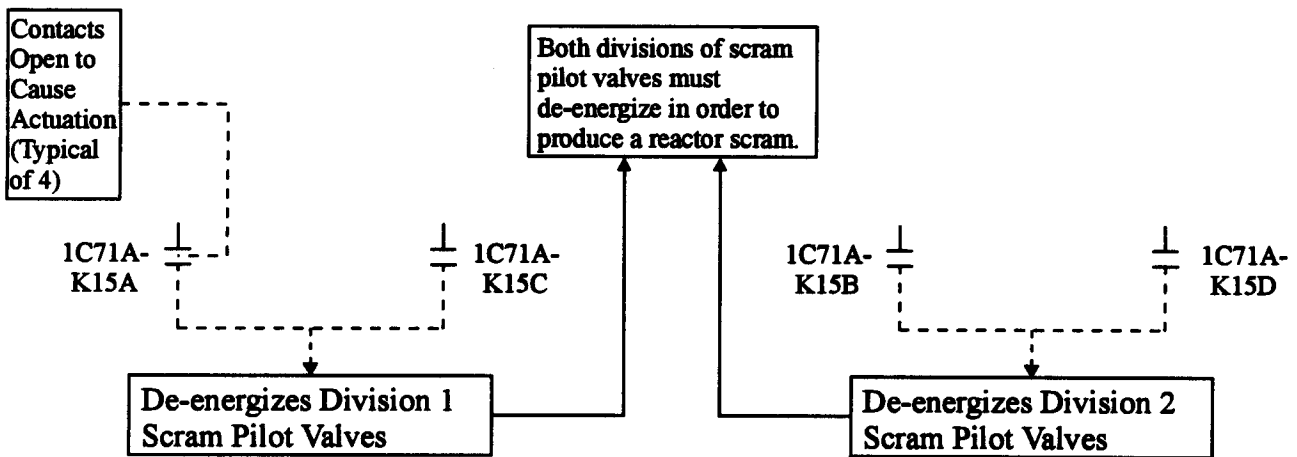
Trip System "A"



Trip System "B"



Actuation Logic



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:

Stephen L. Need

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

A1

1C71-N003A

1C71A-K9A

A2

1C71-N003C

1C71A-K9C

Bypass Logic

Contacts Open on Reactor Power > 28% (Typical of 4)

Contacts open on Turbine Stop Valve Closure or Control Valve Fast Closure. See LFD-1-RPS-14, LFD-1-RPS-15.

1C71A-K9A

1C71A-K14A,E

1C71A-K9C

1C71A-K14C,G

Trip System "B"

Channels

B1

1C71-N003B

1C71A-K9B

B2

1C71-N003D

1C71A-K9D

Bypass Logic

Contacts open on Turbine Stop Valve Closure or Control Valve Fast Closure. See LFD-1-RPS-14, LFD-1-RPS-15.

1C71A-K9B

1C71A-K14B,F

1C71A-K9D

1C71A-K14D,H

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.

Actuation Logic

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 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:

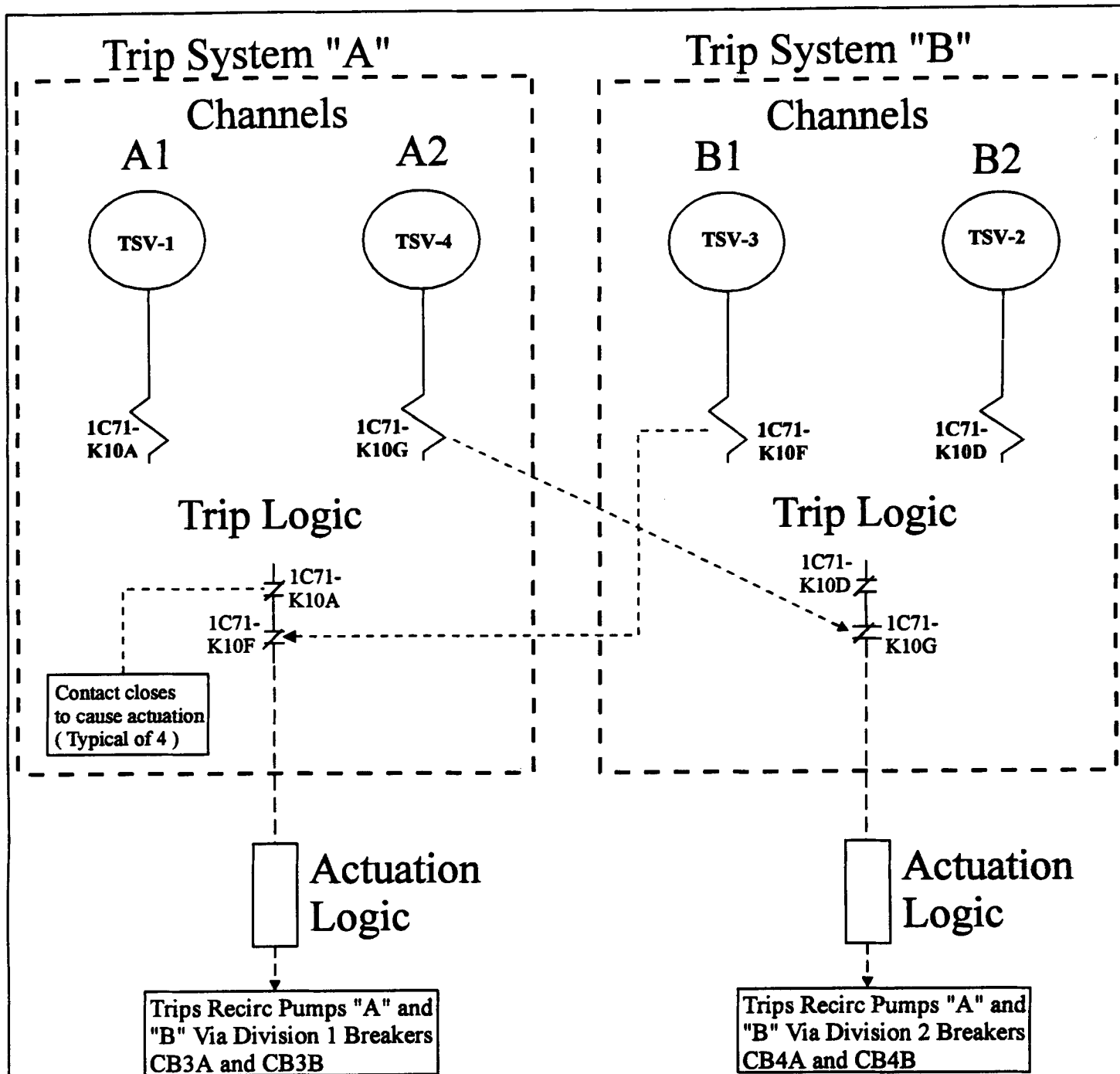
Reviewed By:

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.

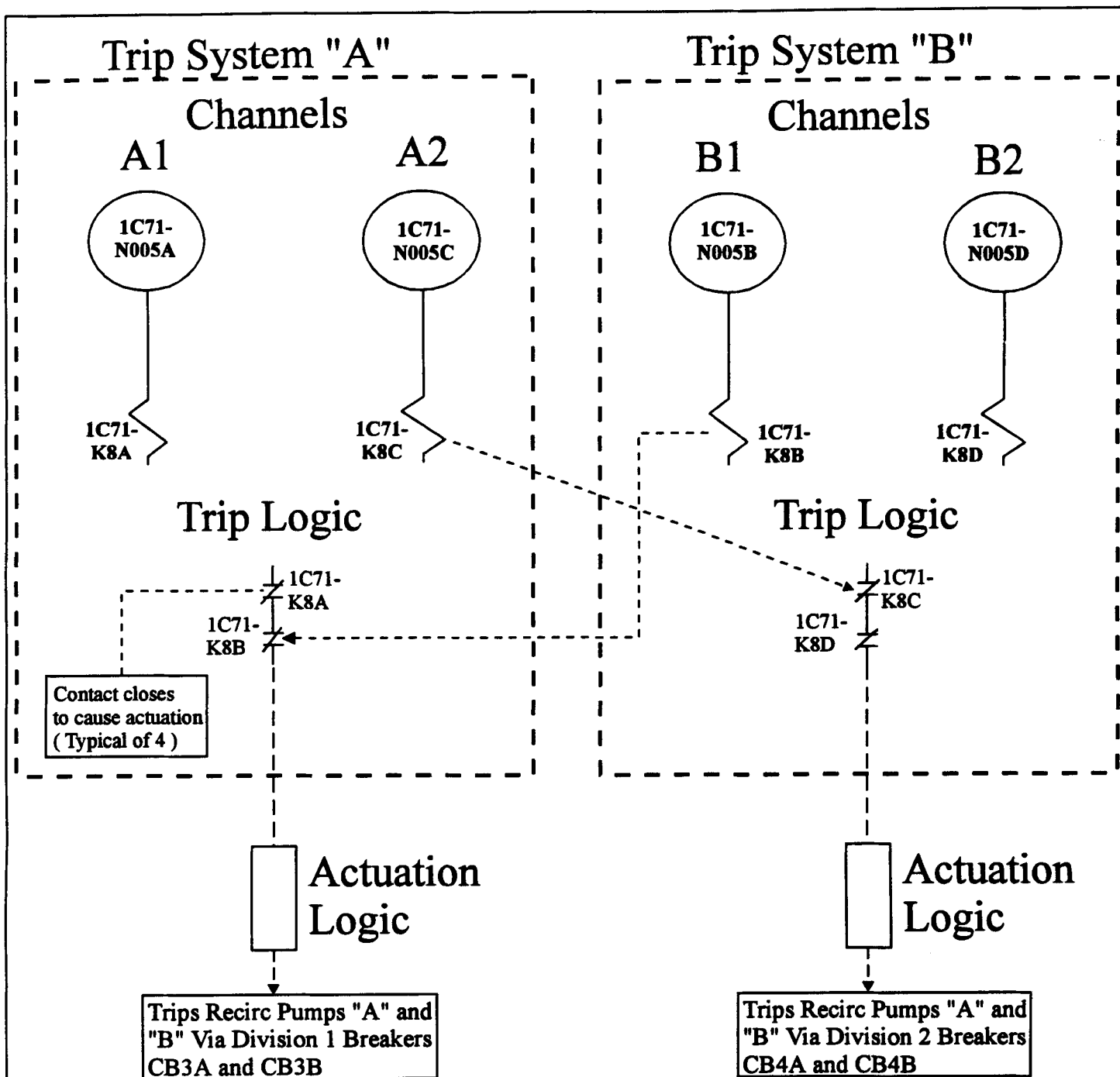
A1 and B1
OR
A2 and B2

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

Prepared By: *J.R. Gurney*
Review: *J.R. Gurney*

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:

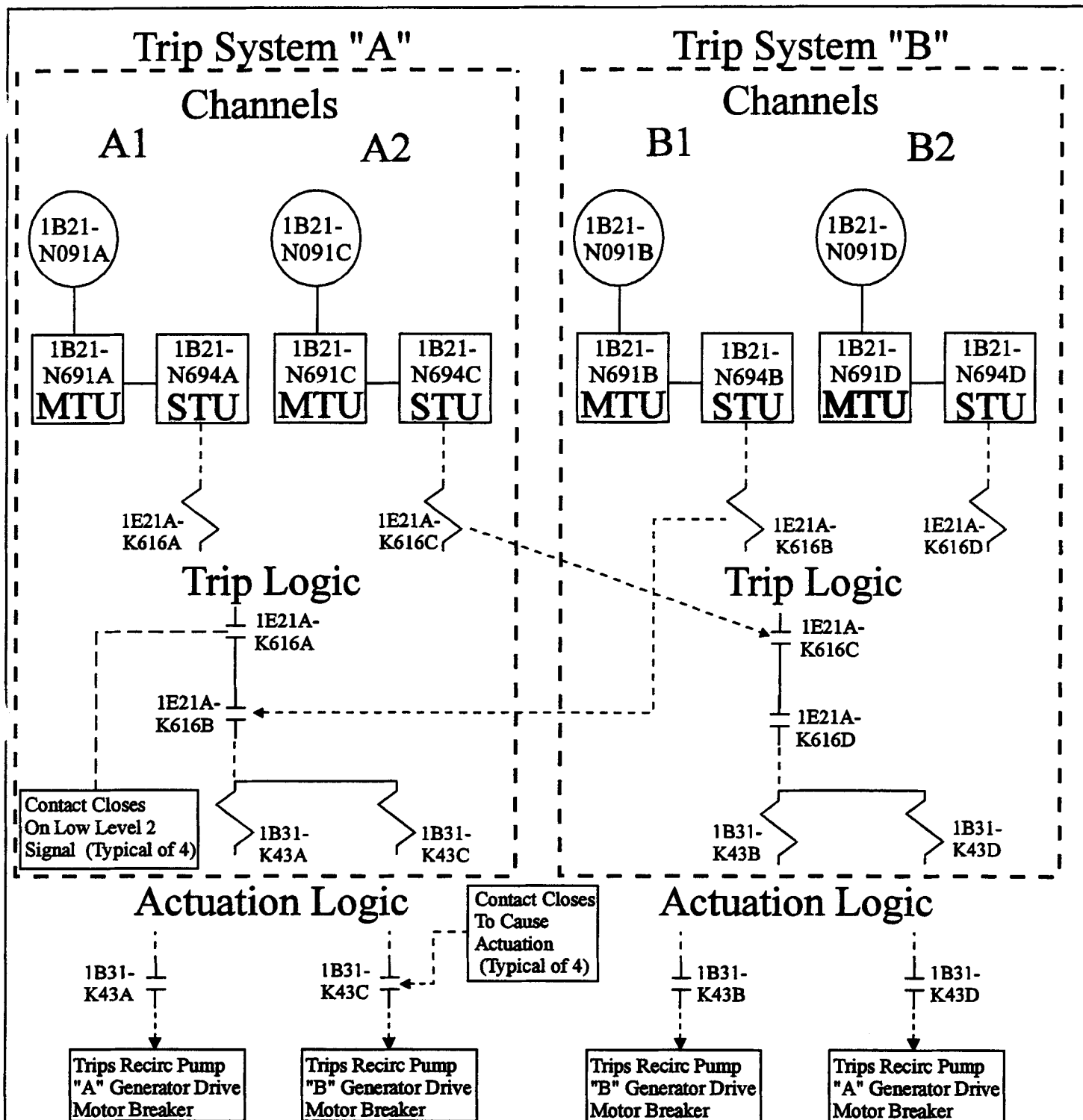
In order to maintain Recirc pump trip capability on a TCV Fast Closure signal, channels in one of the following combinations must be either operable or maintained in the tripped condition.

A1 and B1
OR
A2 and B2

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

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

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.

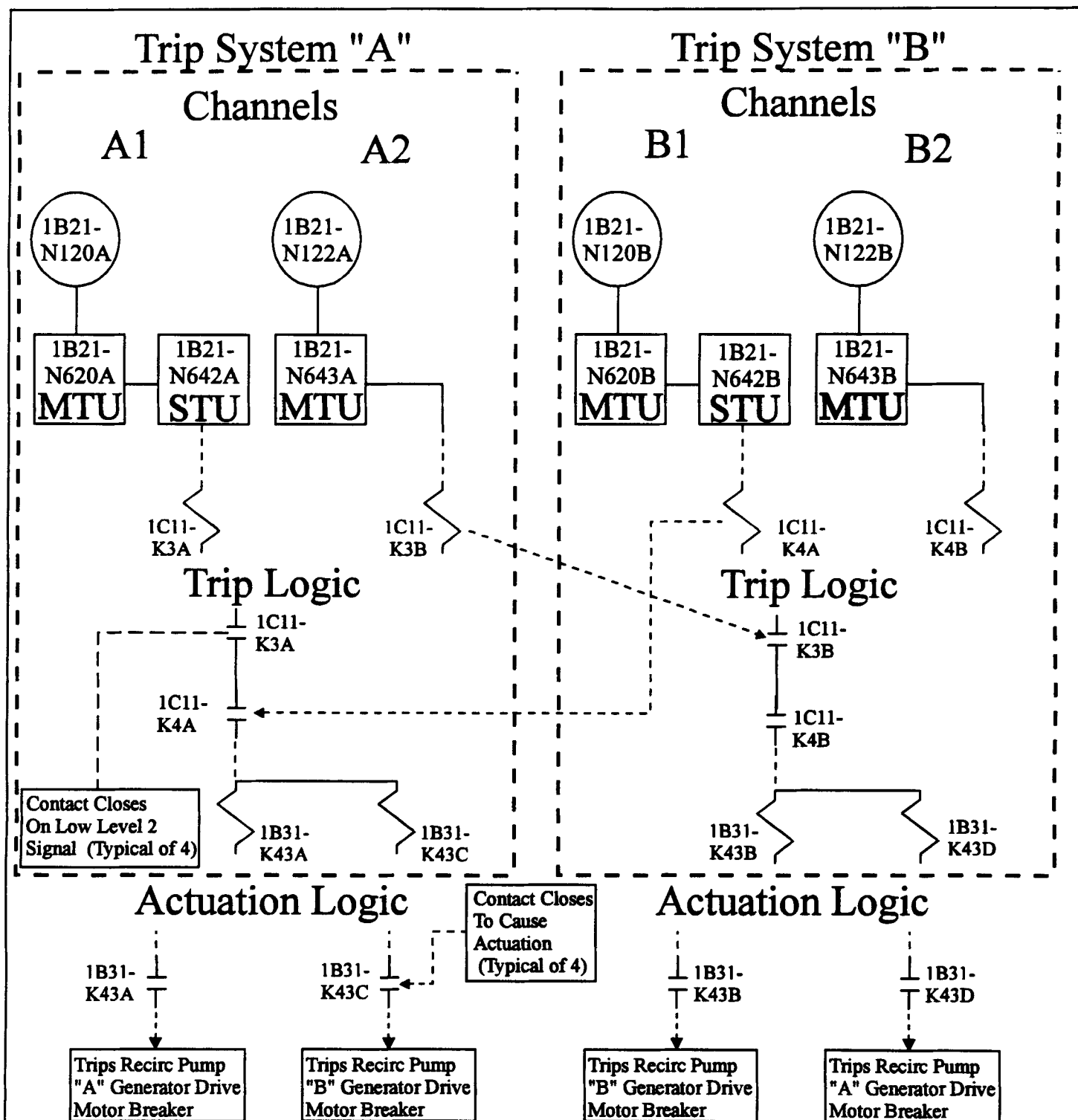
Elem. Ref.	
H-17860	H-19826
H-17861	H-19829
H-17902	H-19830
H-17903	H-42173
H-19823	

A1 and B1
OR
A2 and B2

Prepared By: *J. L. Brown*
Reviewed By: *Kathryn Wilkins*

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

TRM Rev. 6



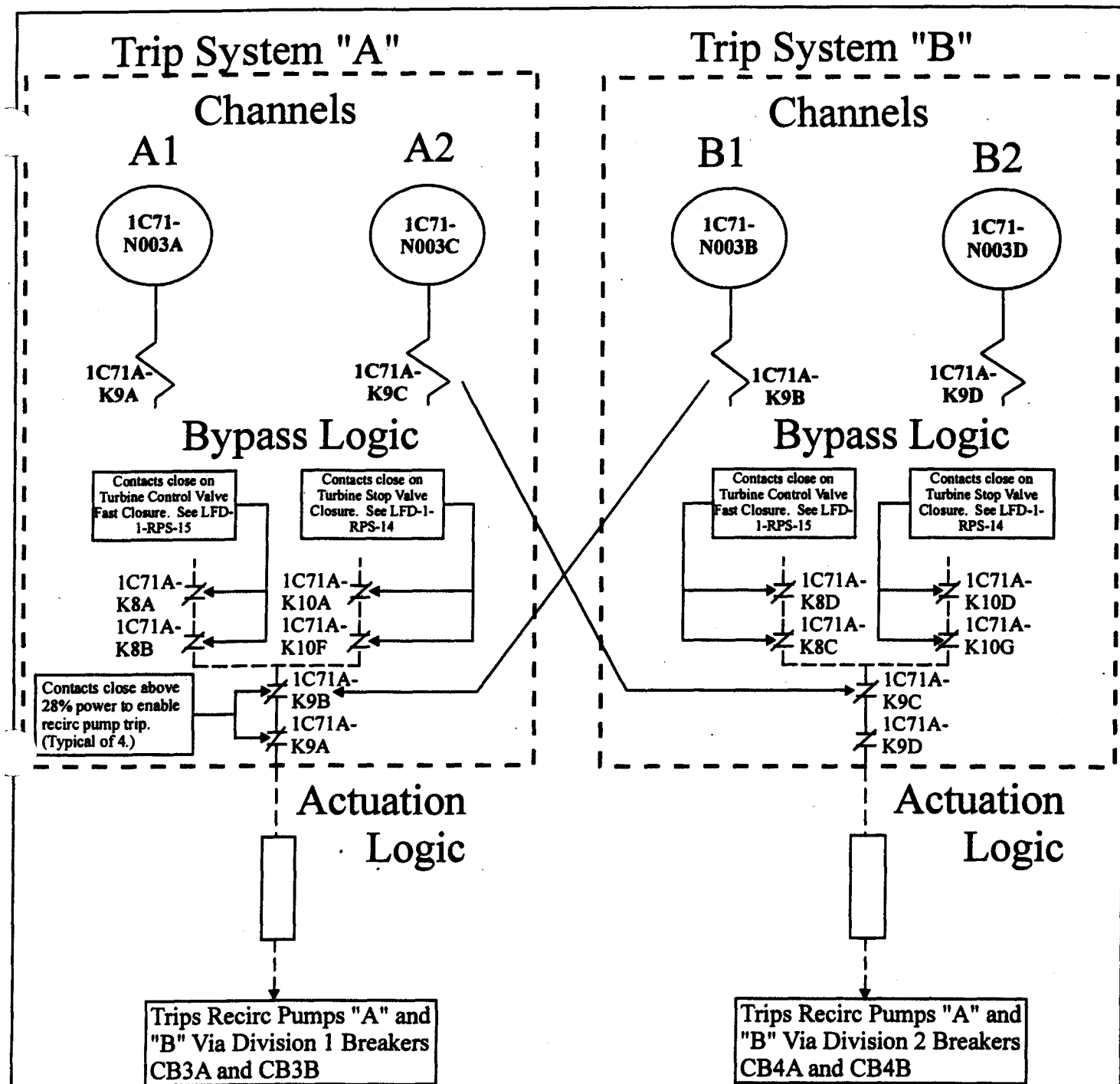
Minimum Channel Requirements for System Trip Capability:

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.

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

A1 and B1
OR
A2 and B2

LFD-1-RPT-04
TS 3.3.4.2.b, ATWS-RPT, Reactor Steam Dome Pressure - High
Prepared By: <i>J. E. Gurnea</i> Reviewed By: <i>[Signature]</i> Rev. 0
1/16/95



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]*

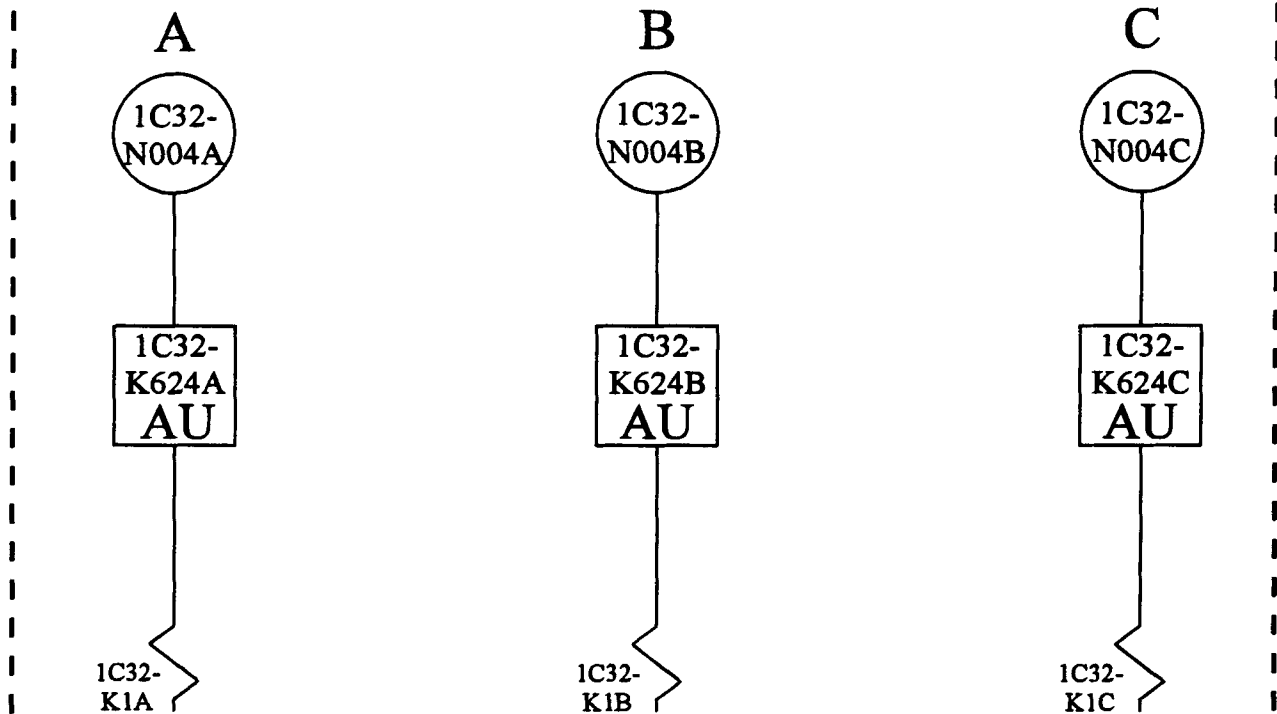
LFD-1-RPT-05

TS SR 3.3.4.1.2
EOC-RPT Instrumentation
Bypass Below 28 Percent
Power

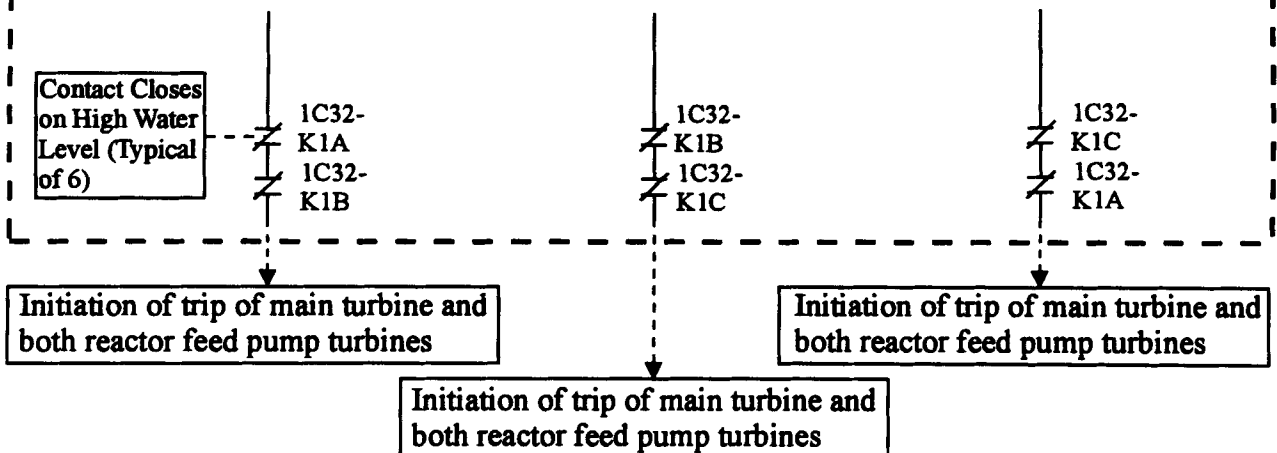
TRM Rev. 33

Trip System

Channels



Trip Logic



Minimum Channel Requirements for System Initiation Capability:

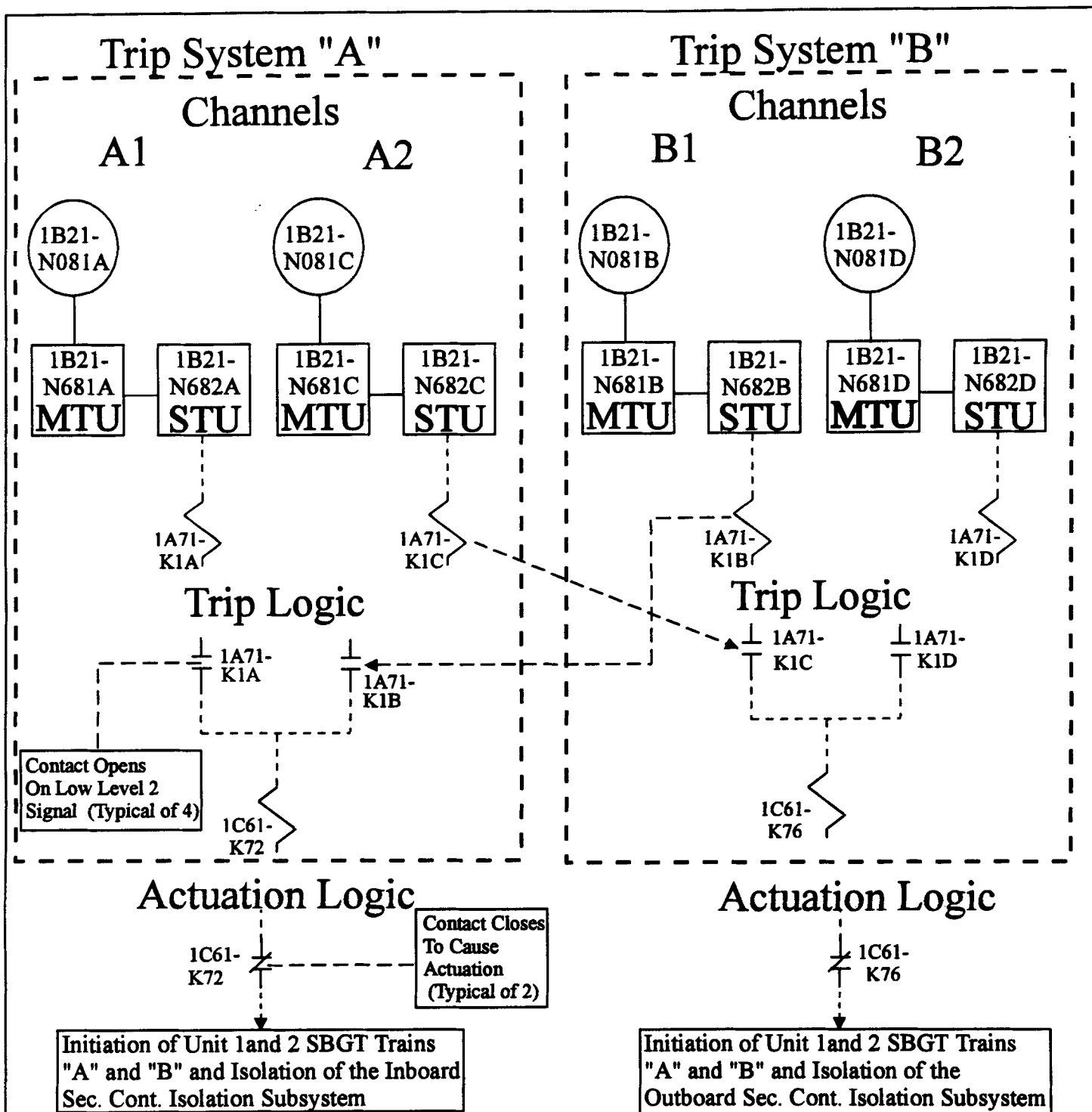
In order to maintain the capability to trip the main turbine and the reactor feed pump turbines on high reactor water level, channels in one of the following combinations must be either operable or maintained in the tripped condition.

Elem. Ref.	A and B
H-17842	OR
H-17845	B and C
	OR
	A and C

Prepared By: *[Signature]*

Reviewed By: *[Signature]*

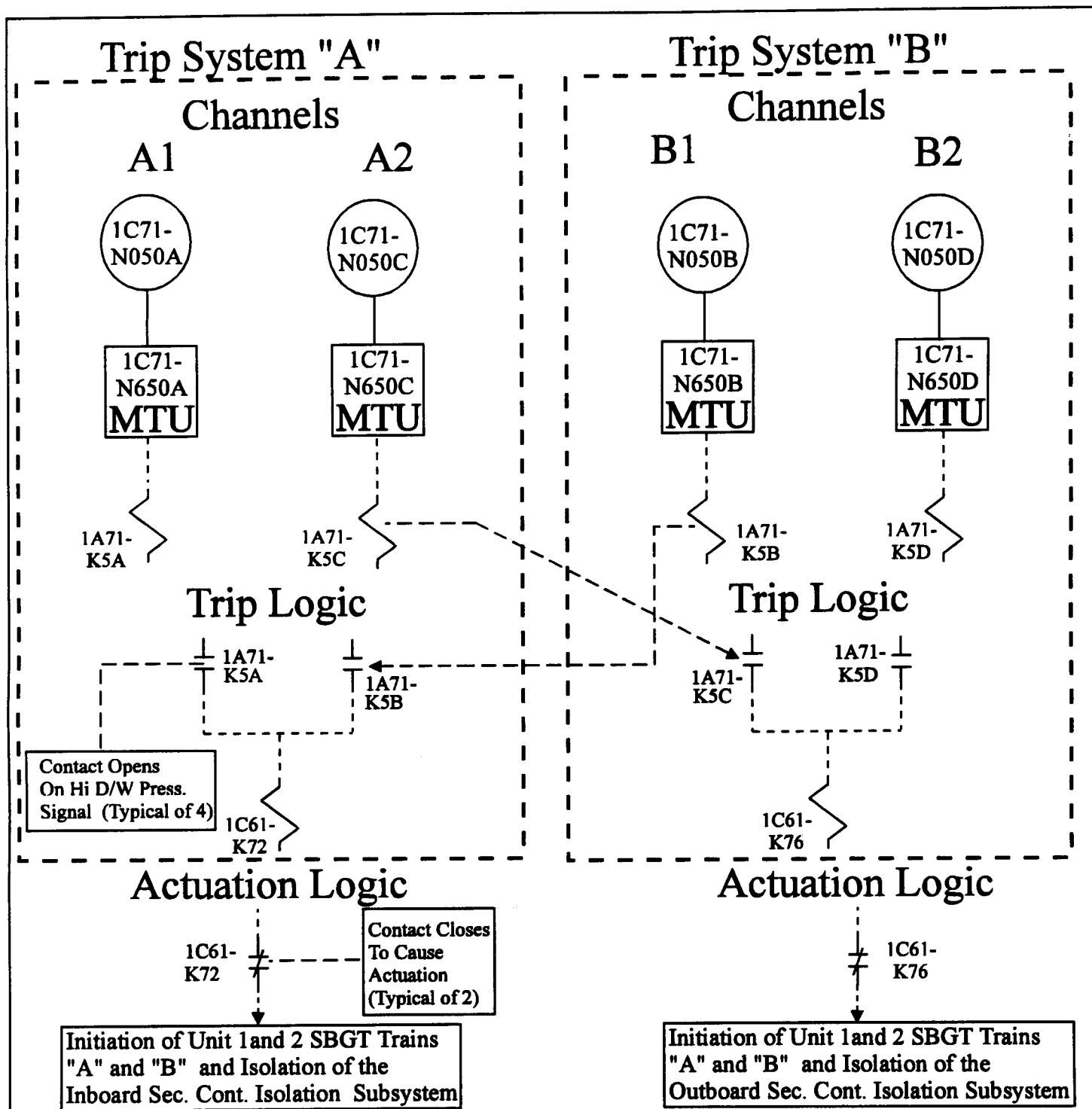
LFD-1-RWLH-01
TS 3.3.2.2
Feedwater and Main Turbine
Trip High Water Level
Instrumentation
Rev. 0
1/16/95



Minimum Channel Requirements for System Isolation/Initiation Capability:

In order to maintain Secondary Containment isolation capability and SBTG 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	Reactor Vessel Water Level-Low Low, Lvl.2
H-17104	H-17811	H-19818			
H-17804	H-19809	H-27761			
H-17805	H-19812	H-27767			
			Prepared By: <i>J. A. Bruno</i>	Rev. 0	10/19/94
			Reviewed: <i>[Signature]</i>		



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. Quinn*

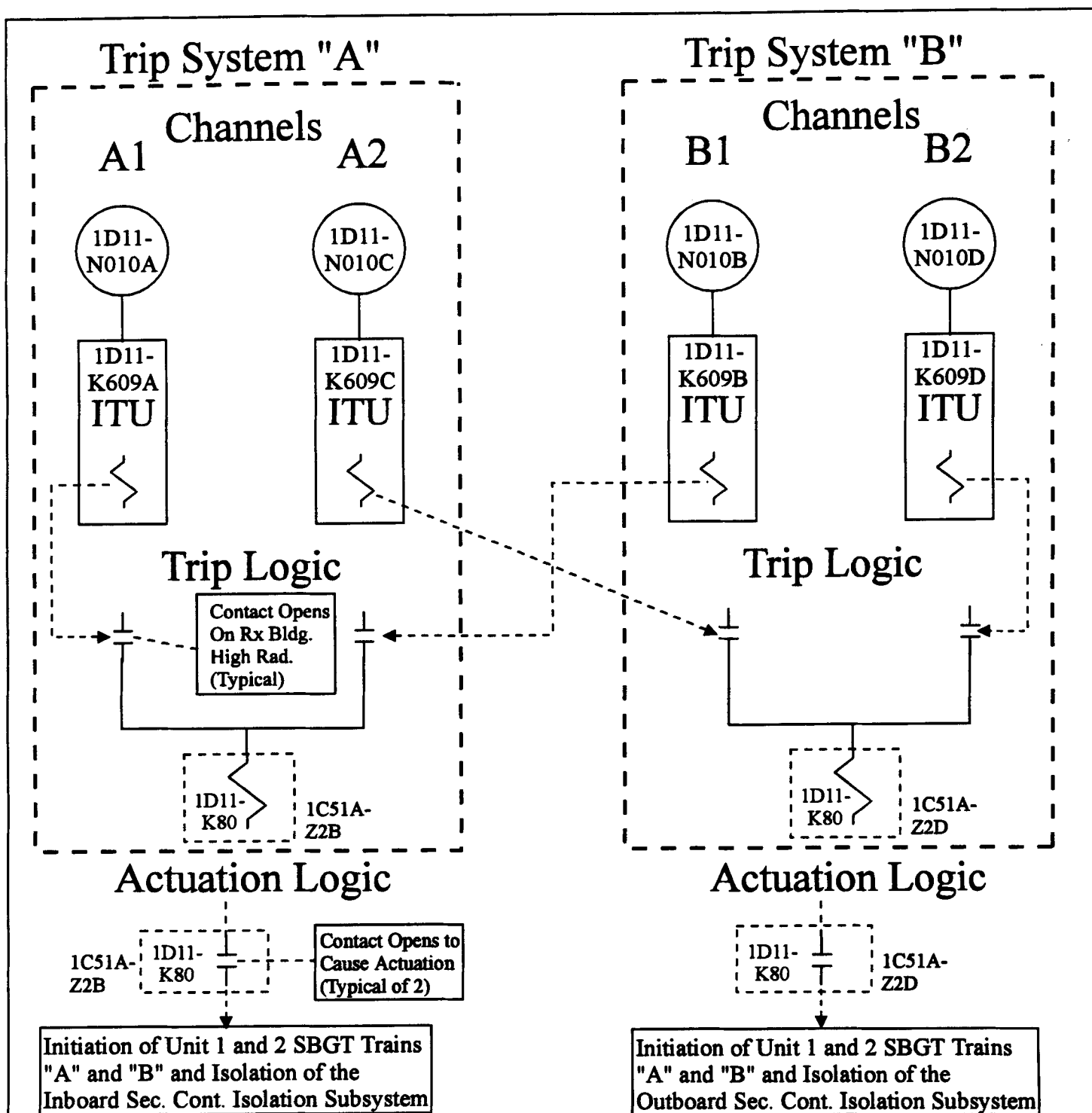
Reviewed By: *[Signature]*

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:

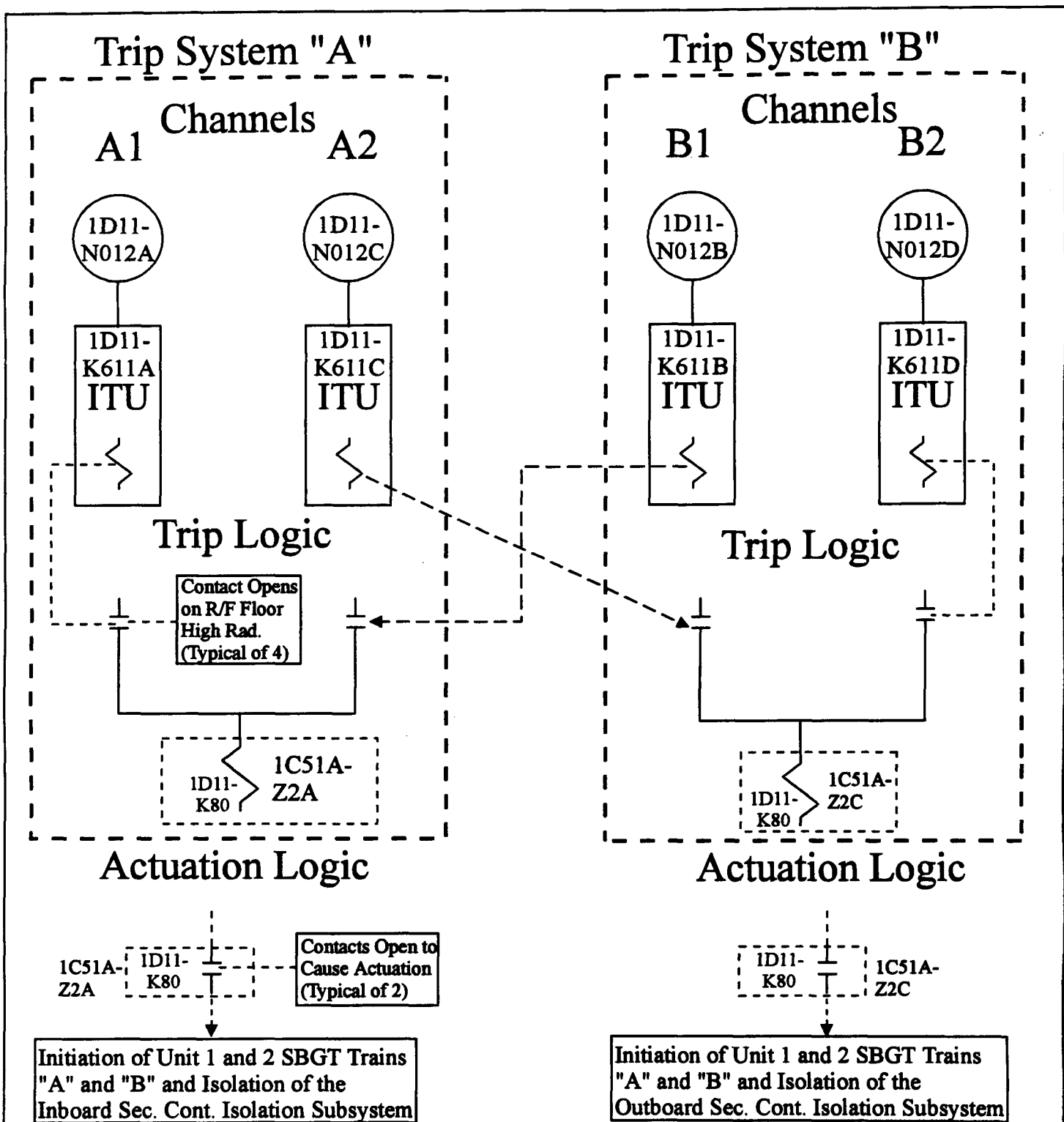
In order to maintain Secondary Containment isolation capability and SBTG initiation capability on a Reactor Building Exhaust Radiation - High signal, channels in one of the following combinations must be operable or maintained in the tripped condition.

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: *J. R. Bruner*
Reviewed By: *J. R. Bruner*

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



Minimum Channel Requirements for System Isolation/Initiation Capability:

In order to maintain Secondary Containment isolation capability and SGBT initiation capability on a Refueling Floor 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-17802	H-27761
H-19563	H-17803	H-27767
H-19564	H-17804	
H-19566	H-17805	
H-17053	H-17104	

A1 and B1
OR
A2 and B2

Prepared By: *J. F. Bunn*
Review: *[Signature]*

LFD-1-SCIS-04
TS 3.3.6.2-1, Item 4
R/F 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 SSC 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.

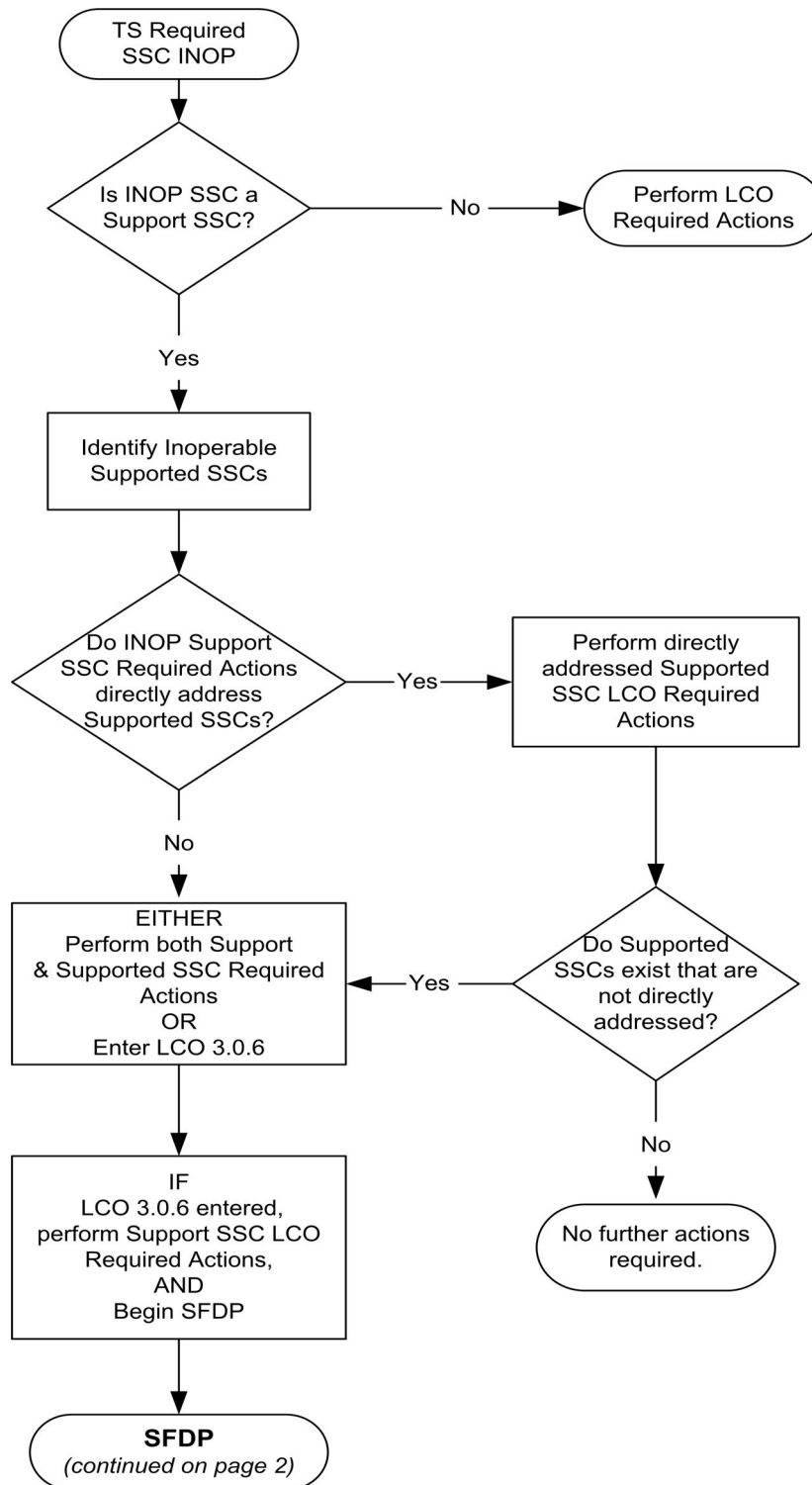
Should this extended Completion Time expire with the subsequent support SSC remaining inoperable or not within limits, the Completion Time for the subsequent support SSC inoperable Condition shall be considered expired. The Required Actions defined for that Condition shall be entered.

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

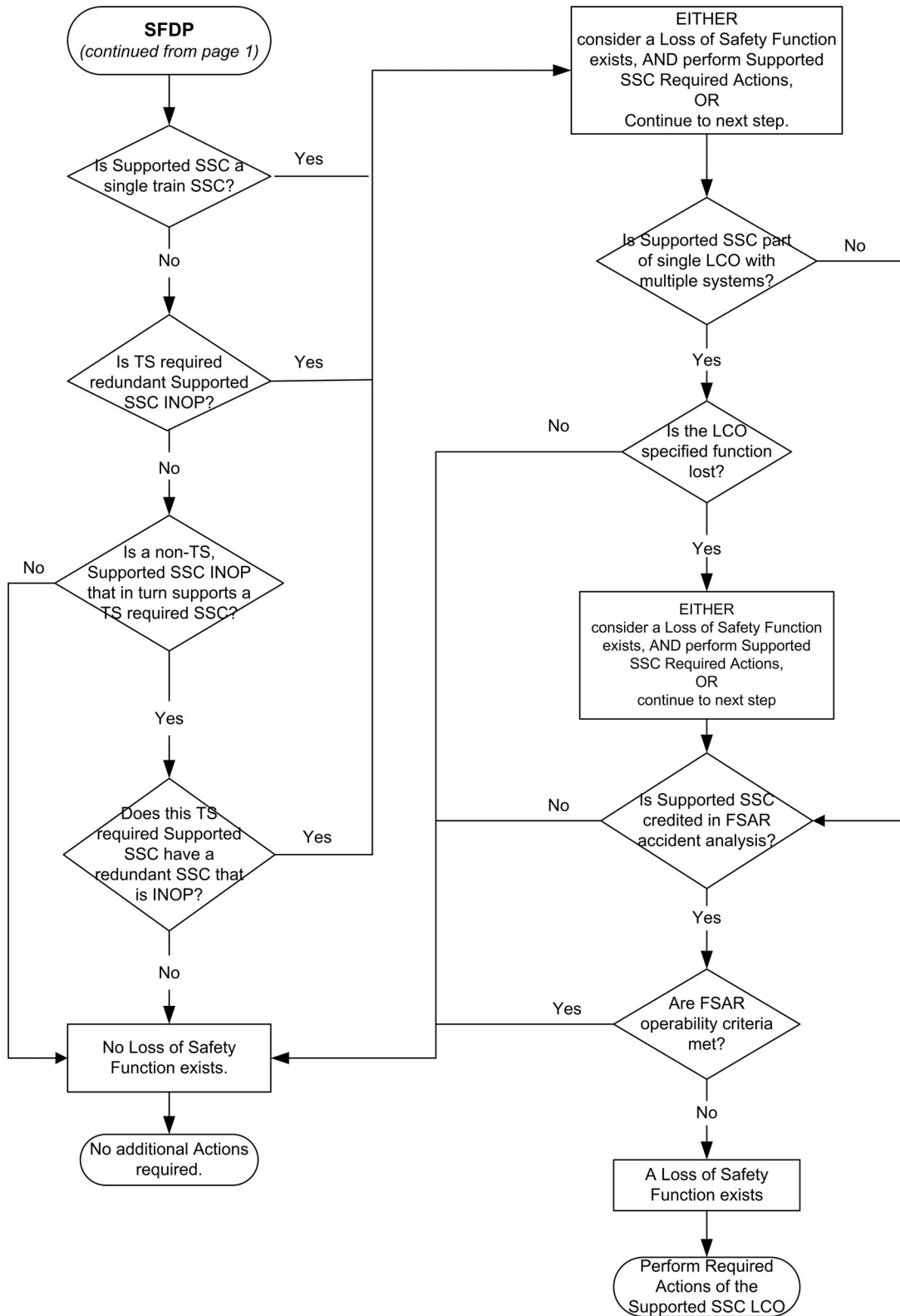
6.0 Conclusions Regarding the Use of LCO 3.0.6

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 (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.