Appendix 7B. Figures

Figure 7-1. Protection System Block Diagram

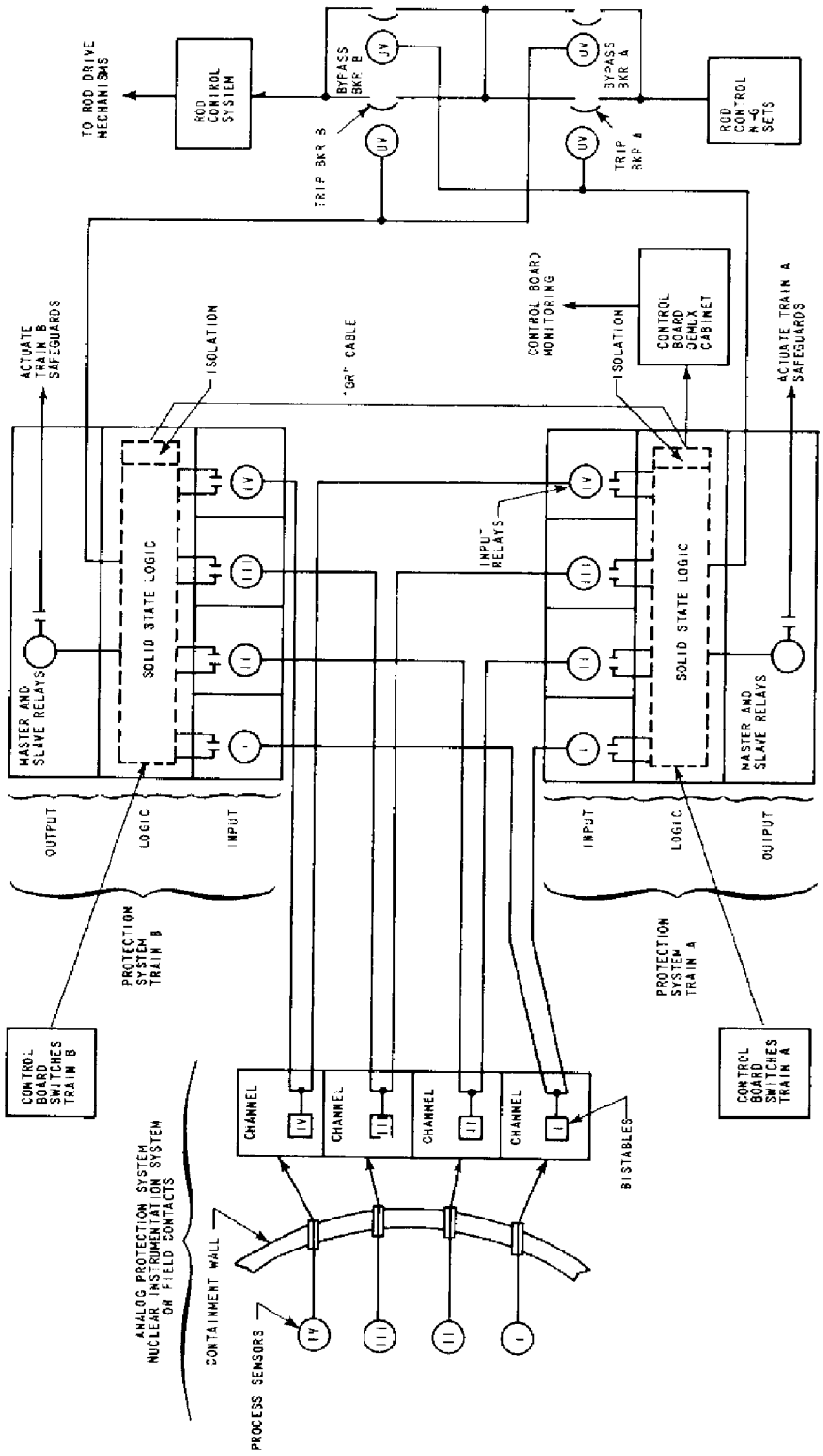
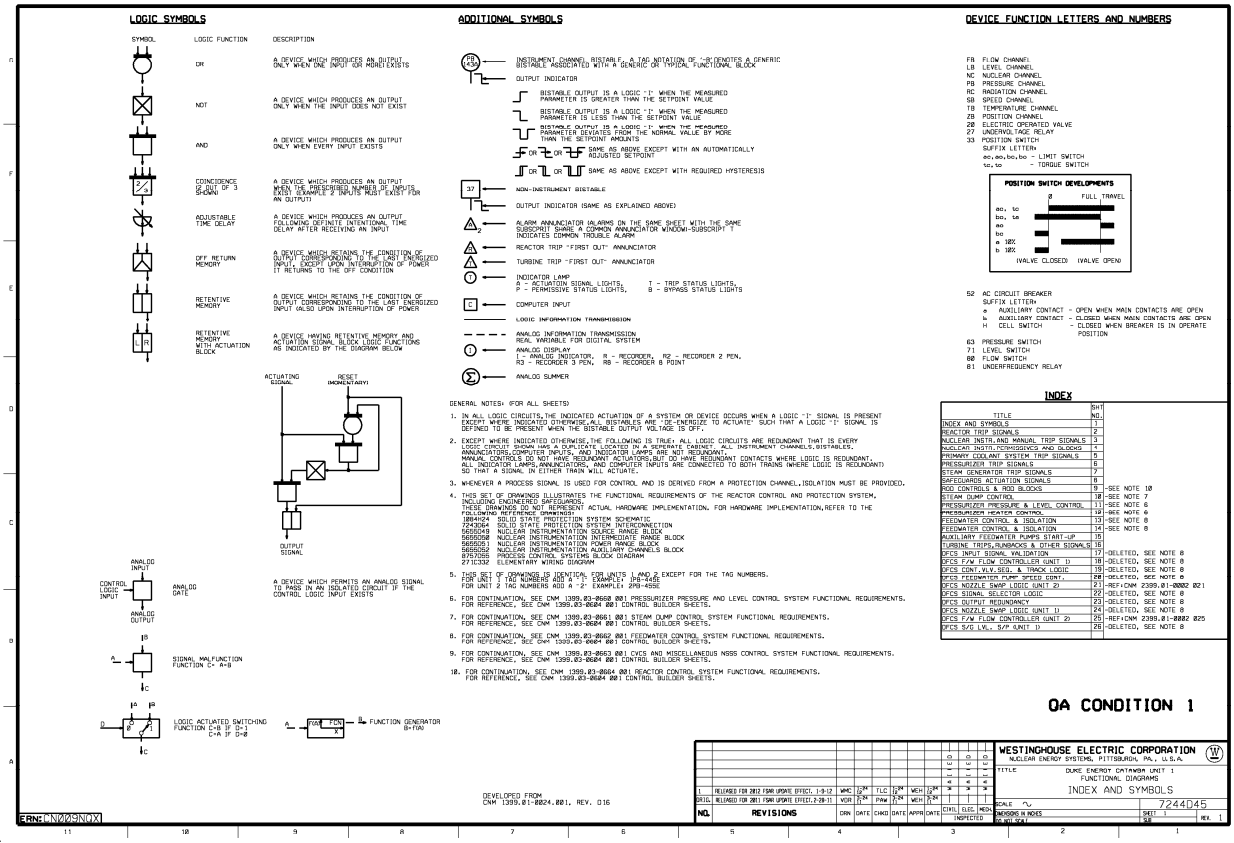
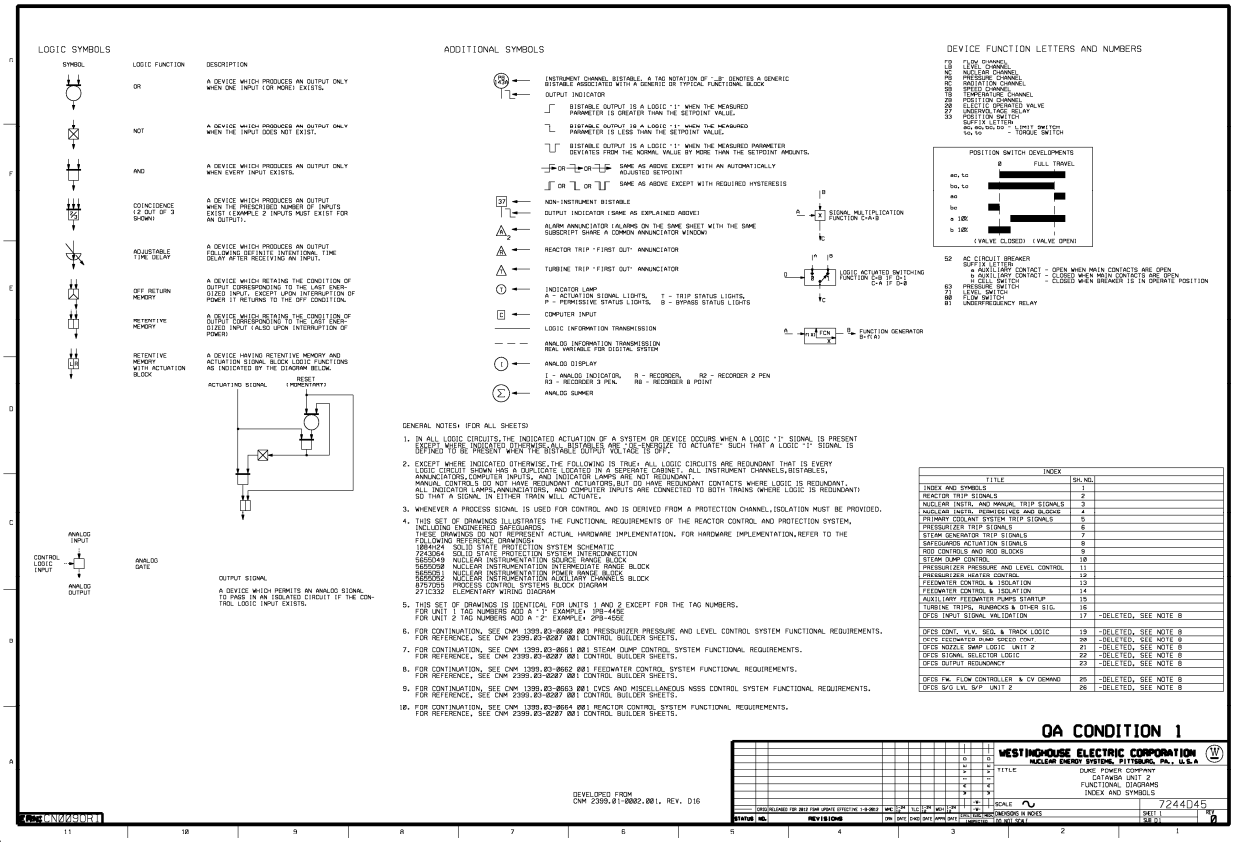


Figure 7-2. Instrumentation and Control System Diagrams - Index and Symbols

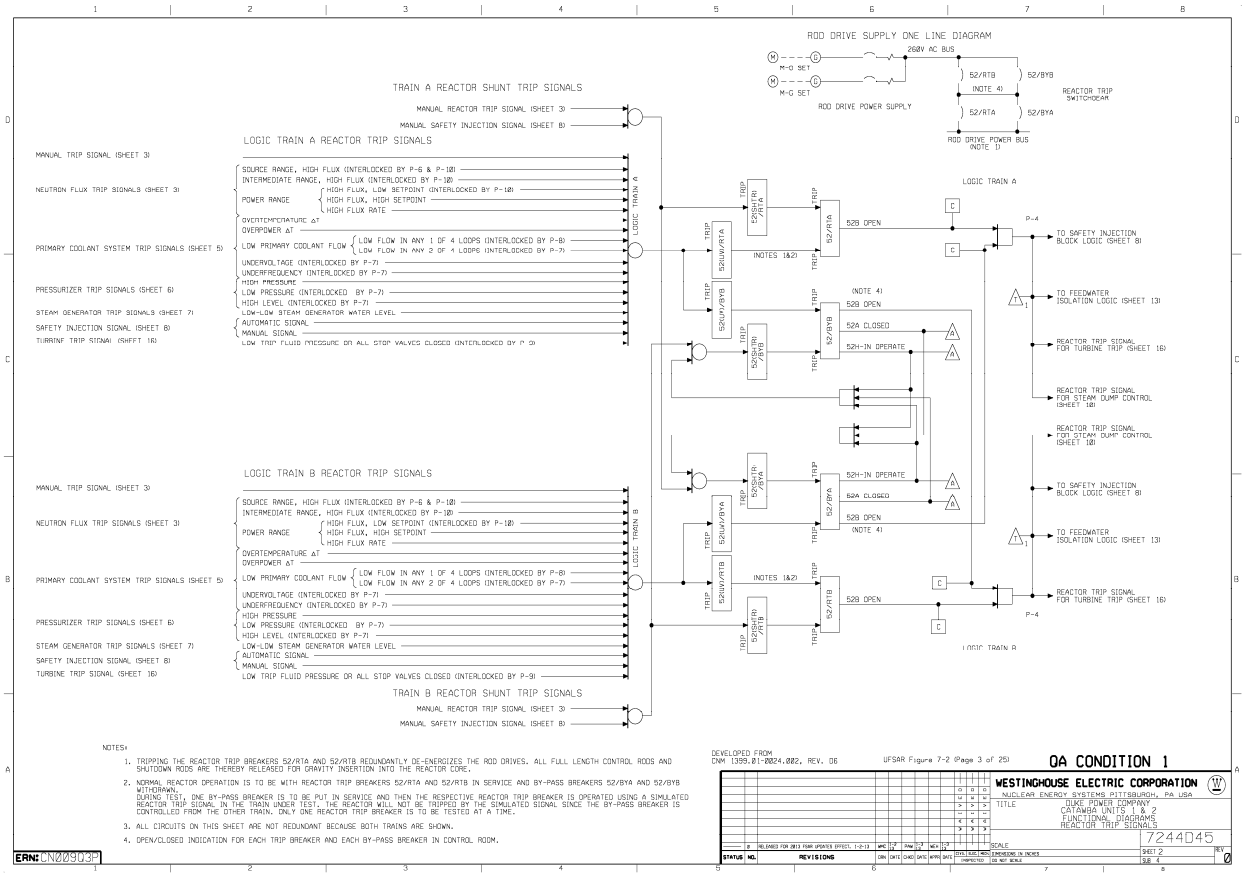


(17 OCT 2013)

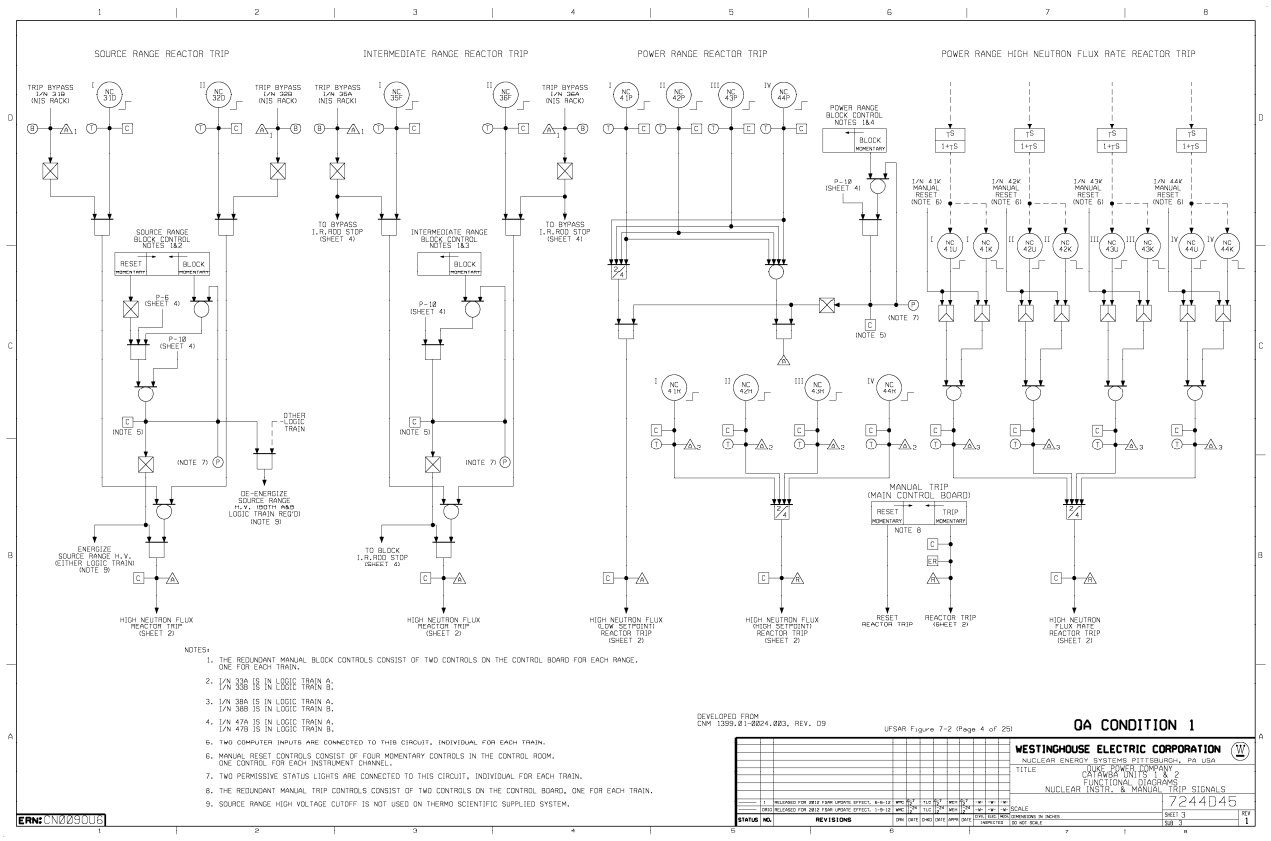
Instrumentation and Control System Diagrams - Index and Symbols



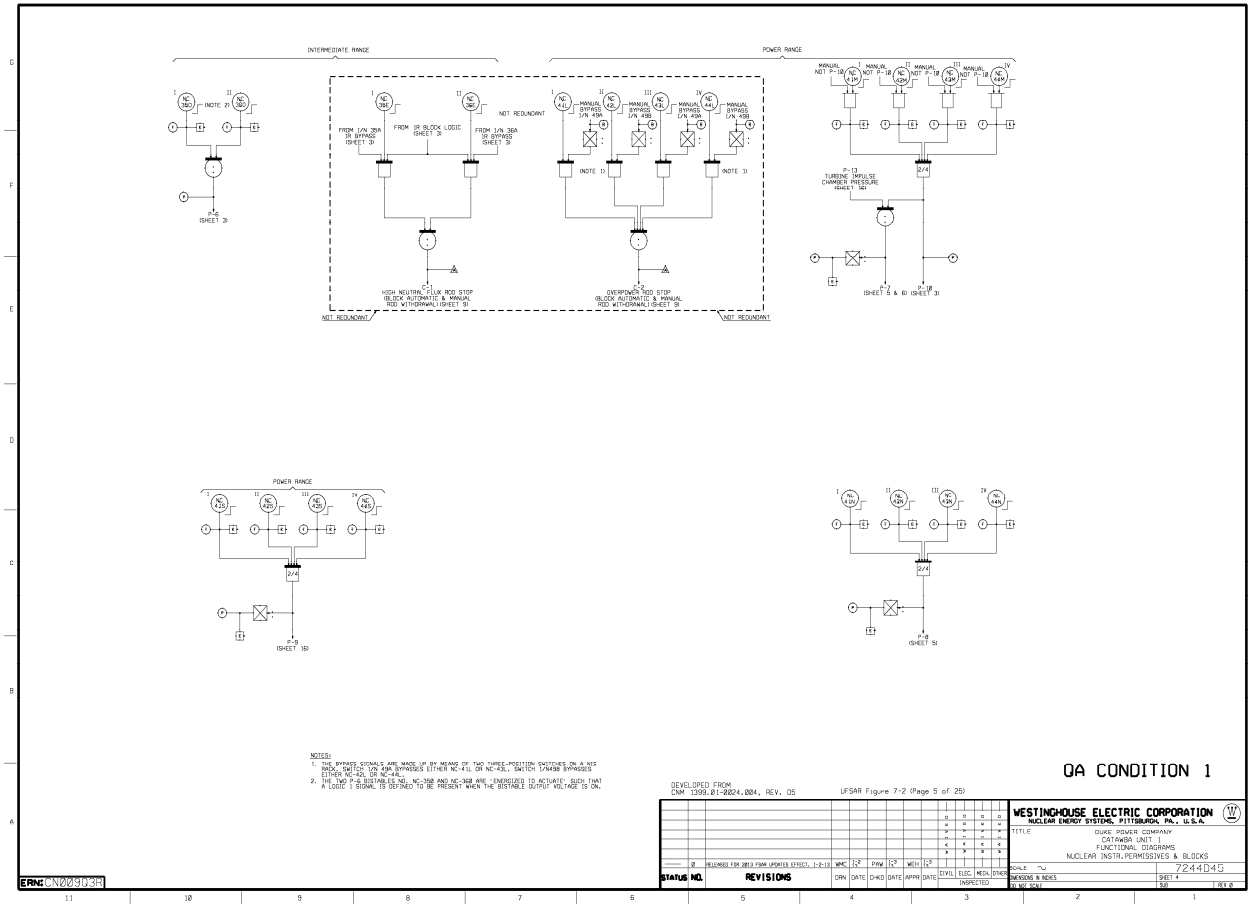
Instrumentation and Control System Diagrams - Index and Symbols



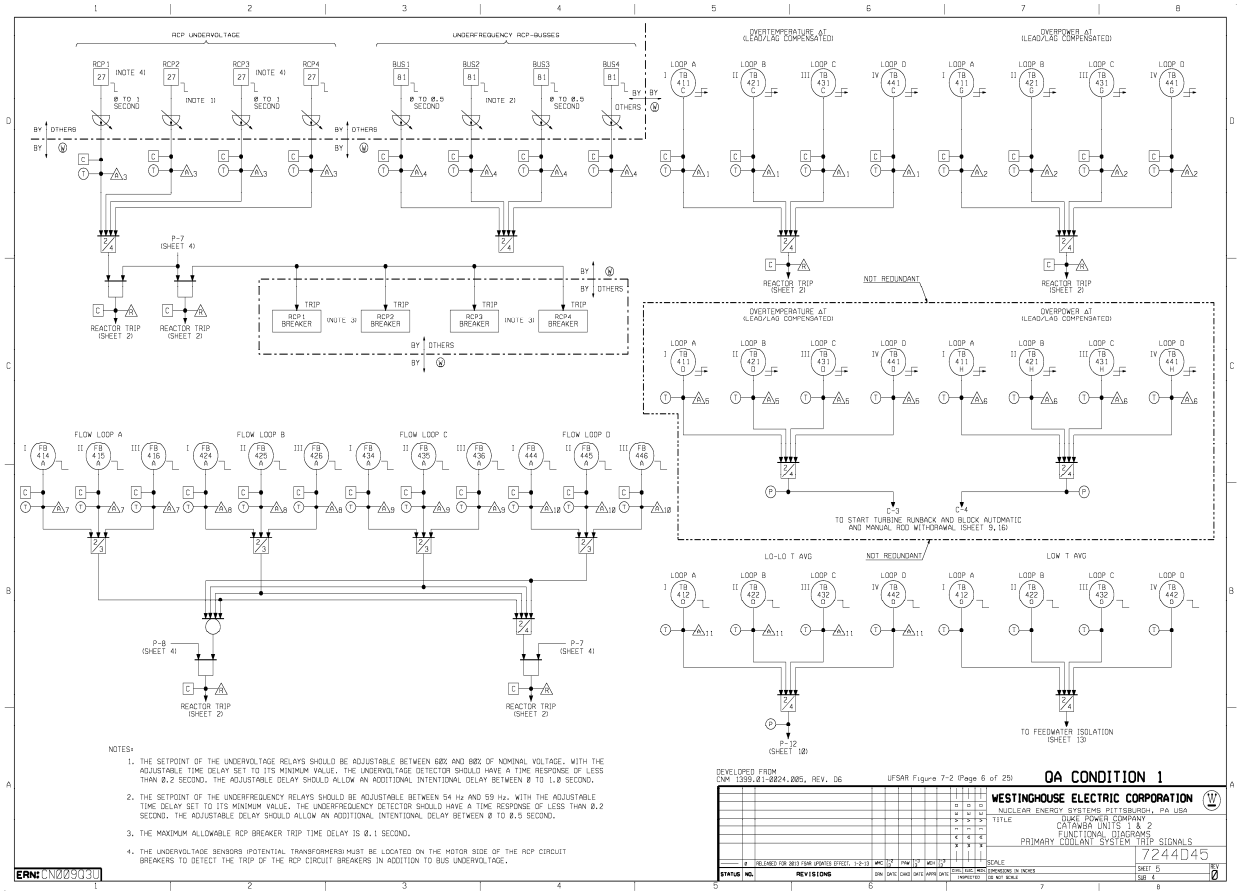
Instrumentation and Control System Diagrams - Index and Symbols

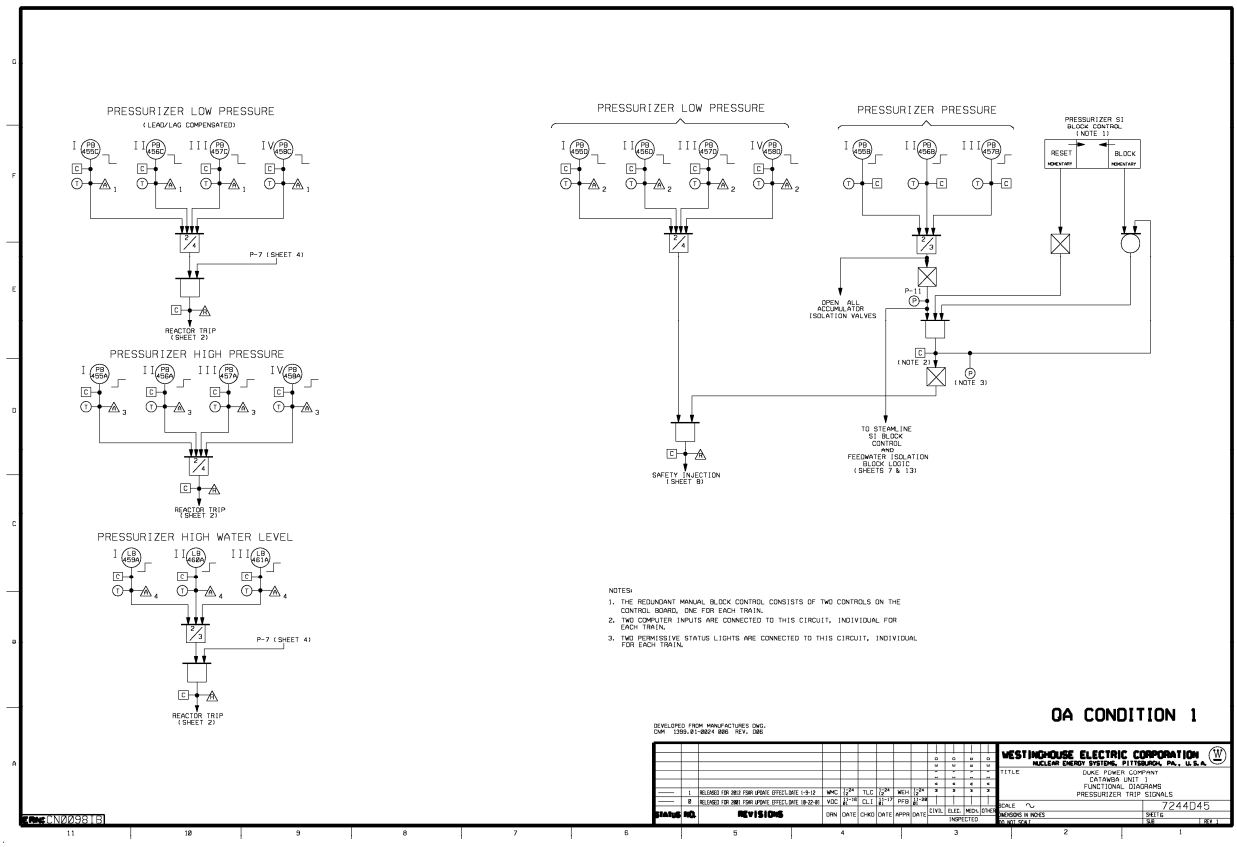


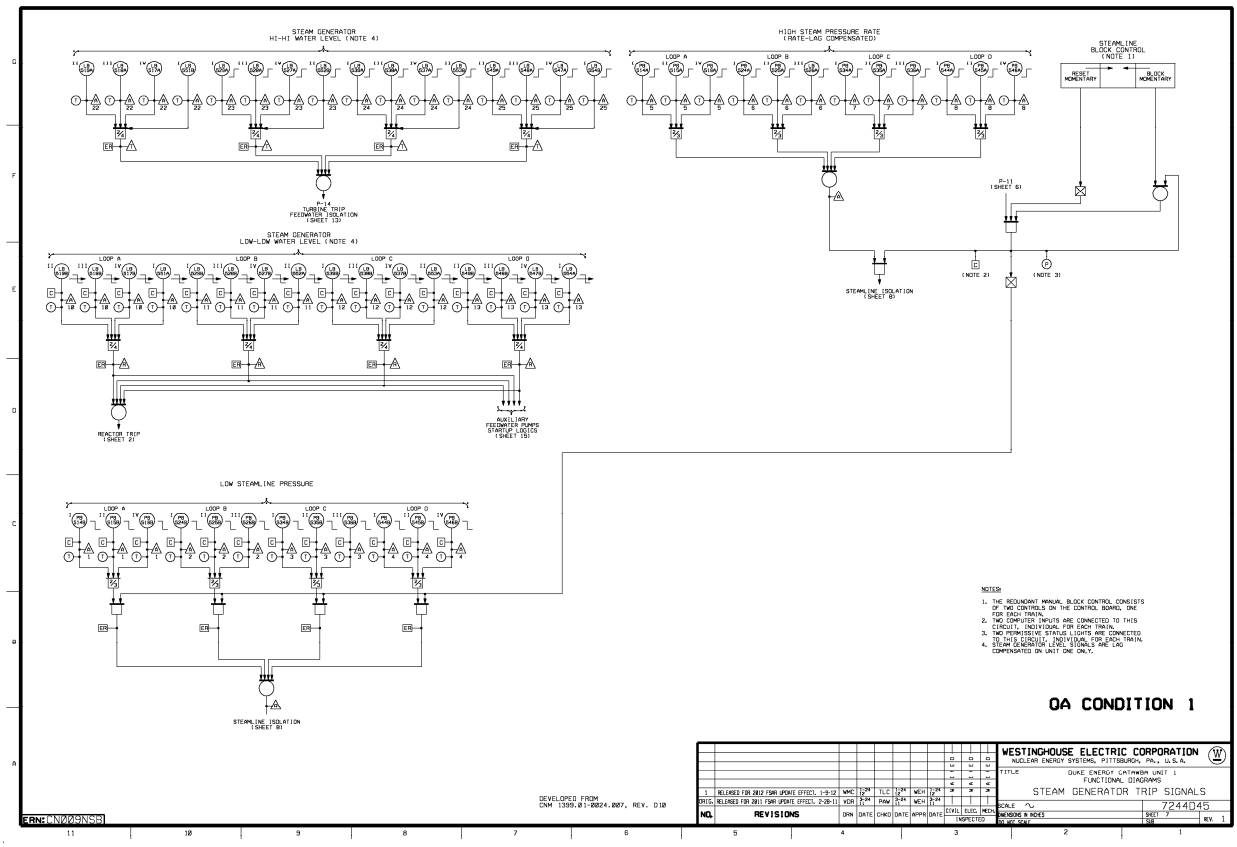
Instrumentation and Control System Diagrams - Index and Symbols

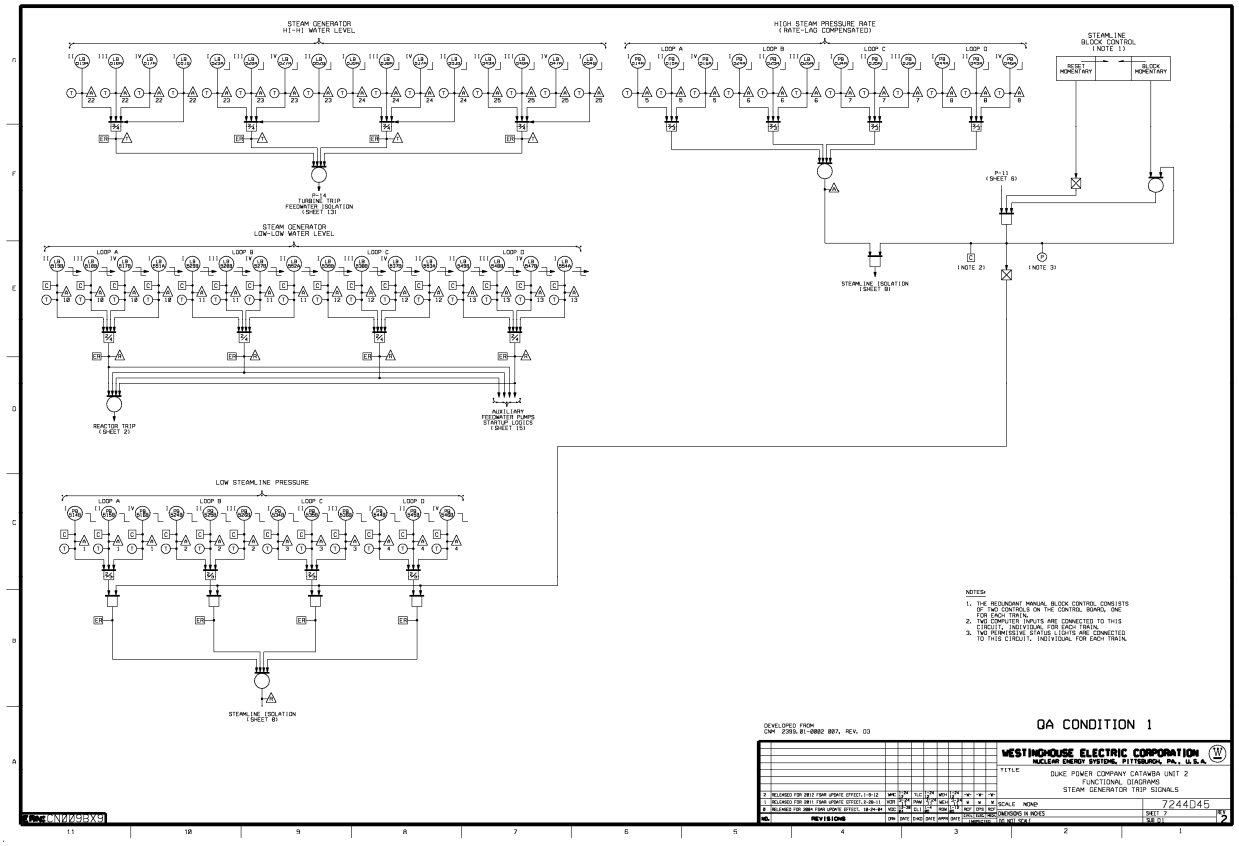


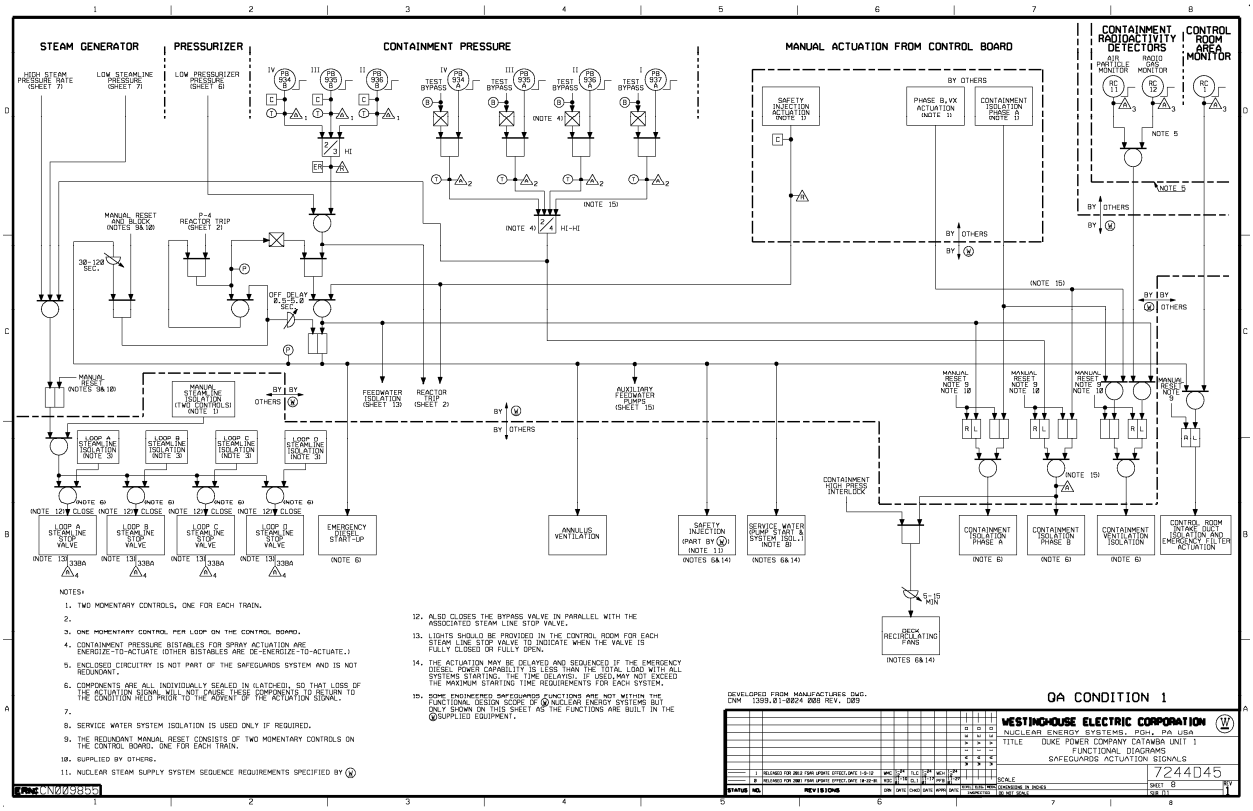
Instrumentation and Control System Diagrams - Index and Symbols

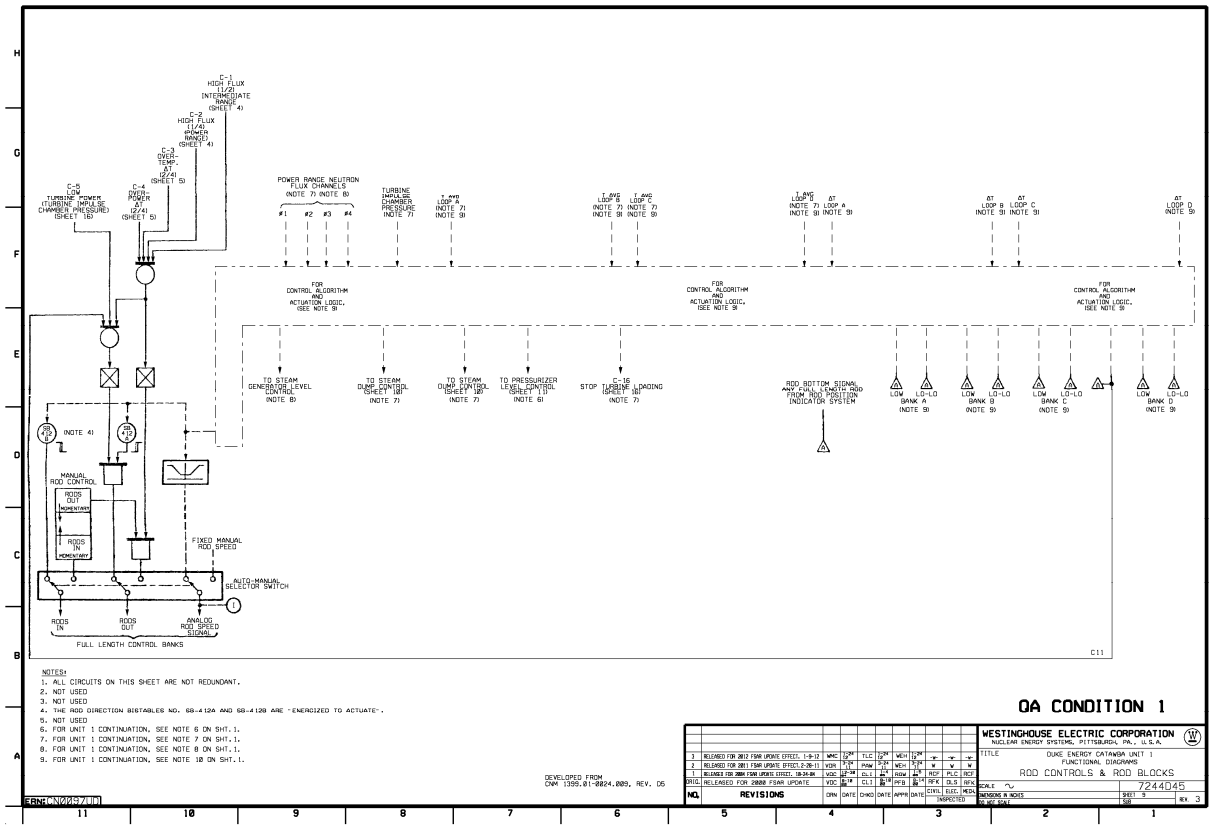


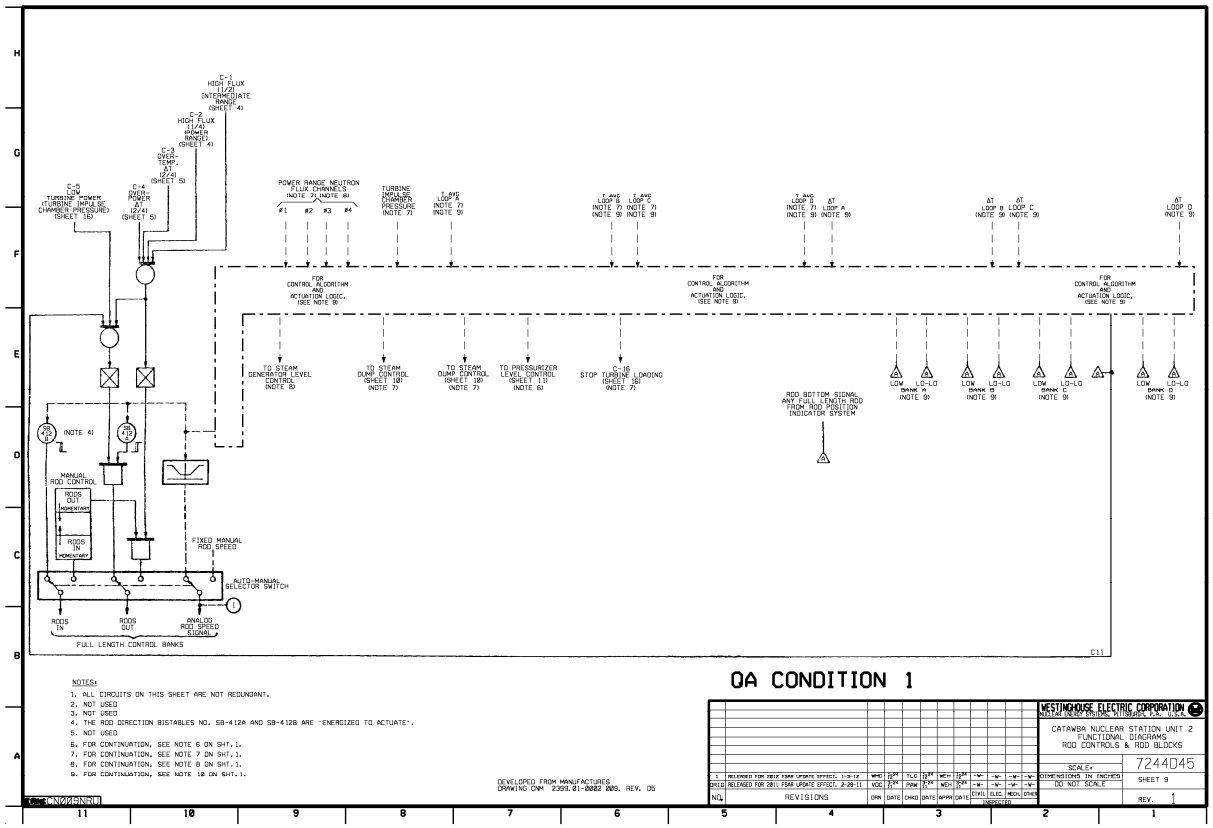

PRESSURIZER LOW PRESSURE
(LEAD/LAG COMPENSATED)
PRESSURIZER HIGH PRESSURE
PRESSURIZER HIGH WATER LEVEL
PRESSURIZER LOW PRESSURE
PRESSURIZER PRESSURE
PRESSURIZER SI BLOCK CONTROL (NOTE 1)
RESET
BLOCK
P-7 (SHEET 4)
REACTOR TRIP (SHEET 2)
OPEN ALL ACCUMULATOR ISOLATION VALVES
P-11
(NOTE 2)
(NOTE 3)
SAFETY INJECTION (SHEET 8)
TO STEAMLINE SI BLOCK CONTROL FEEDWATER ISOLATION BLOCK LOGIC (SHEETS 7 & 13)
NOTES:
1. THE REDUNDANT MANUAL BLOCK CONTROL CONSISTS OF TWO CONTROLS ON THE CONTROL BOARD, ONE FOR EACH TRAIN.
2. TWO COMPUTER INPUTS ARE CONNECTED TO THIS CIRCUIT, INDIVIDUAL FOR EACH TRAIN.
3. TWO PERMISSIVE STATUS LIGHTS ARE CONNECTED TO THIS CIRCUIT, INDIVIDUAL FOR EACH TRAIN.
OA CONDITION 1
DEVELOPED FROM MANUFACTURES DWG. CMP 1385.81-0024 000 REV. 080
WESTINGHOUSE ELECTRIC CORPORATION
NUCLEAR ENERGY SYSTEMS, PITTSBURGH, PA., U.S.A.
DUKE POWER COMPANY
CATAWBA UNIT 1
FUNCTIONAL DIAGRAMS
PRESSURIZER TRIP SIGNALS
REVISIONS
7244045

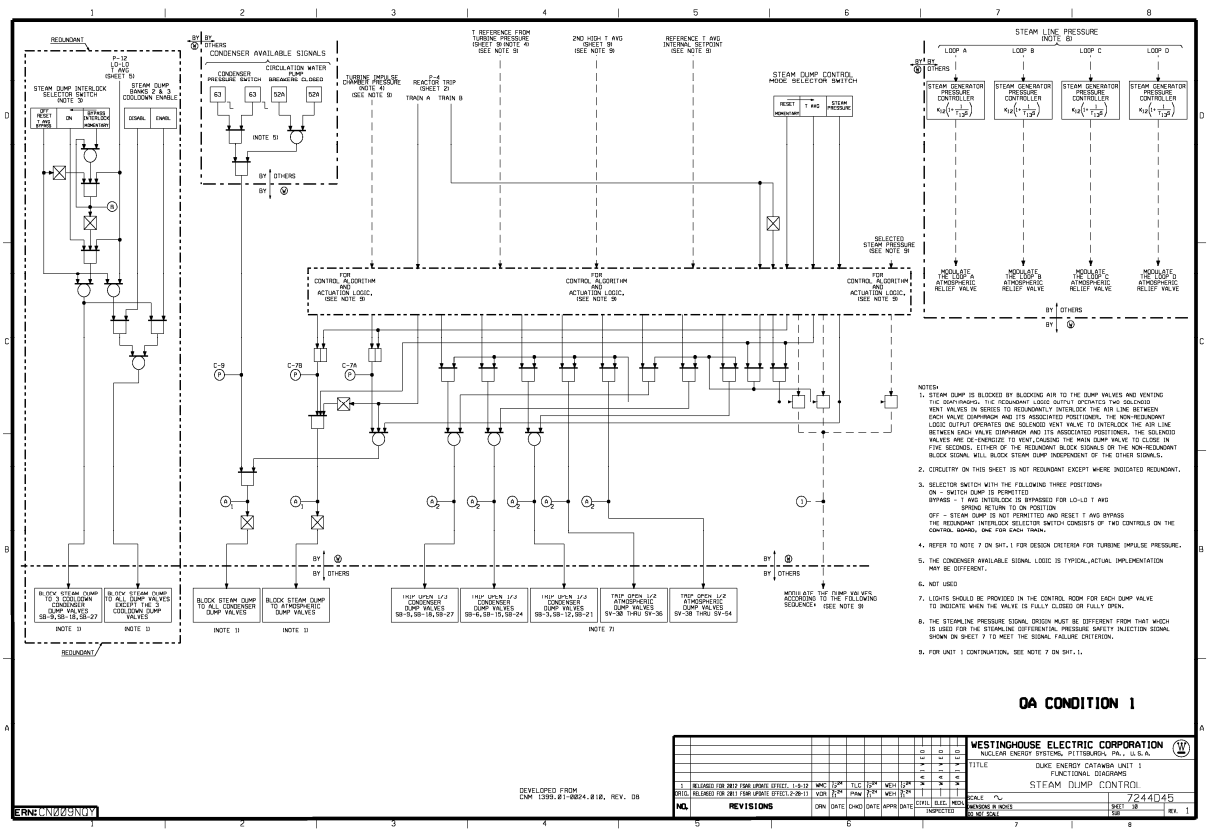

STEAM GENERATOR
HI-HI WATER LEVEL (NOTE 4)
HIGH STEAM PRESSURE RATE
(RATE-LAG COMPENSATED)
STEAMLINE
BLOCK CONTROL
(NOTE 1)
RESET MOMENTARY
BLOCK MOMENTARY
LOOP A
LOOP B
LOOP C
LOOP D
TURBINE TRIP
FEEDWATER ISOLATION
(SHEET 13)
STEAM GENERATOR
LOW-LOW WATER LEVEL (NOTE 4)
REACTOR TRIP
(SHEET 2)
AUXILIARY
FEEDWATER PUMPS
STARTUP LOGICS
(SHEET 15)
STEAMLINE ISOLATION
(SHEET 8)
(NOTE 2)
(NOTE 3)
LOW STEAMLINE PRESSURE
STEAMLINE ISOLATION
(SHEET 8)
NOTES:
1. THE REDUNDANT MANUAL BLOCK CONTROL CONSISTS OF TWO CONTROLS ON THE CONTROL BOARD, ONE FOR EACH TRAIN.
2. TWO COMPUTER INPUTS ARE CONNECTED TO THIS CIRCUIT, INDIVIDUAL FOR EACH TRAIN.
3. TWO PROGRESSIVE STATUS LIGHTS ARE CONNECTED TO THIS SENSOR, INDIVIDUAL FOR EACH TRAIN.
4. THE STEAM GENERATOR LEVEL SETPOINTS ARE LAG COMPENSATED ON UNIT ONE ONLY.
QA CONDITION 1
DEVELOPED FROM
CNM 1399.01-0824.007, REV. D10
WESTINGHOUSE ELECTRIC CORPORATION
NUCLEAR ENERGY SYSTEMS, PITTSBURGH, PA., U.S.A.
DUKE ENERGY CATAWBA UNIT 1
FUNCTIONAL DIAGRAMS
STEAM GENERATOR TRIP SIGNALS
7244045
REVISIONS
ERN: CN0009NSB

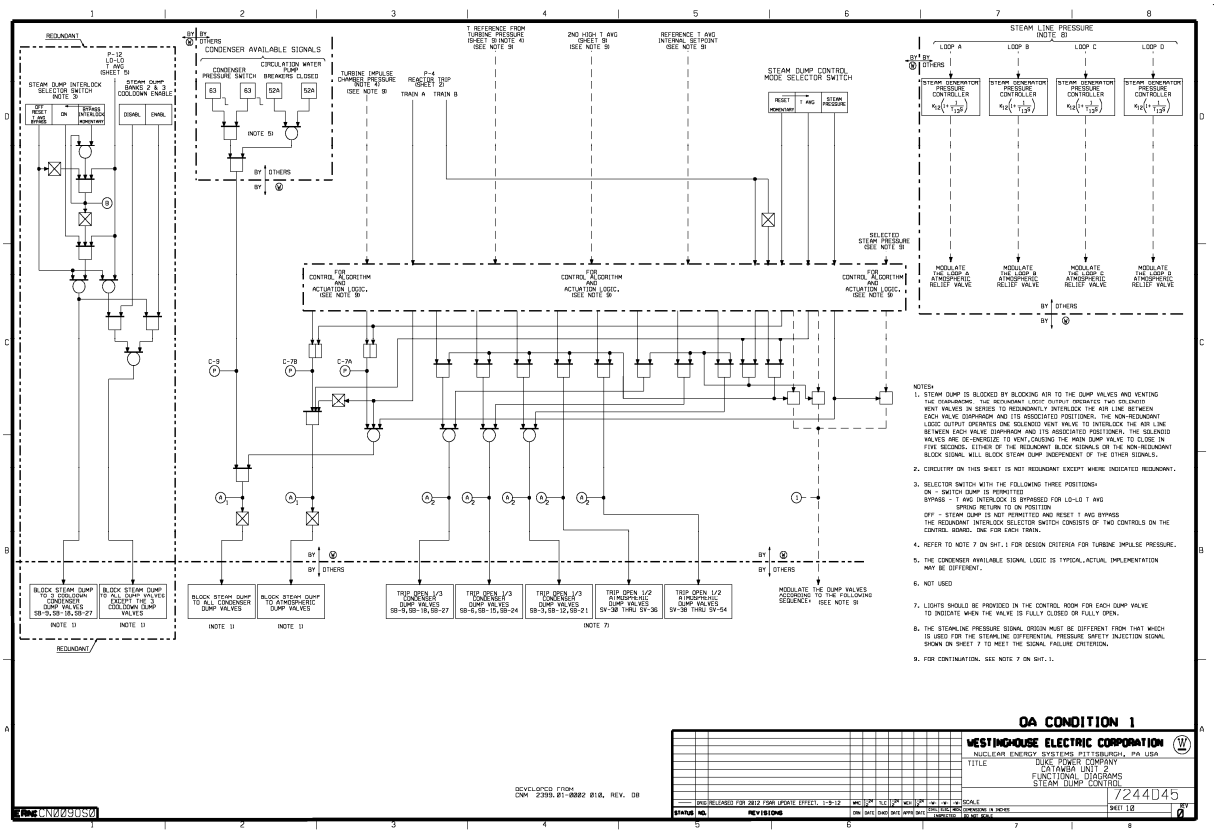

STEAM GENERATOR HI-HI WATER LEVEL
HIGH STEAM PRESSURE RATE (RATE-LAG COMPENSATED)
STEAMLINE BLOCK CONTROL (NOTE 1)
RESET MOMENTARY
BLOCK MOMENTARY
LOOP A
LOOP B
LOOP C
LOOP D
P-14 TURBINE TRIP FEEDWATER ISOLATION (SHEET 13)
P-12 (SHEET 6)
STEAM GENERATOR LOW-LOW WATER LEVEL
STEAMLINE ISOLATION (SHEET 8)
(NOTE 2)
(NOTE 3)
REACTOR TRIP (SHEET 2)
AUXILIARY FEEDWATER PUMPS STARTUP LOGICS (SHEET 15)
LOW STEAMLINE PRESSURE
STEAMLINE ISOLATION (SHEET 8)
NOTES:
1. THE REDUNDANT MANUAL BLOCK CONTROL CONSISTS OF TWO SWITCHES ON THE CONTROL BOARD, ONE FOR EACH TRAIN.
2. TWO COMPUTER INPUTS ARE CONNECTED TO THIS CIRCUITY, INDIVIDUAL FOR EACH TRAIN.
3. TWO PERMISSIVE STATUS LIGHTS ARE CONNECTED TO THIS CIRCUITY, INDIVIDUAL FOR EACH TRAIN.
DEVELOPED FROM CAM 2389.81-0882 887, REV. 03
QA CONDITION 1
WESTINGHOUSE ELECTRIC CORPORATION
NUCLEAR ENERGY SYSTEMS, PITTSBURGH, PA., U.S.A.
TITLE
DUKE POWER COMPANY CATAWBA UNIT 2
FUNCTIONAL DIAGRAMS
STEAM GENERATOR TRIP SIGNALS
SCALE NONE
7244D45
SHEET 7
REVISIONS

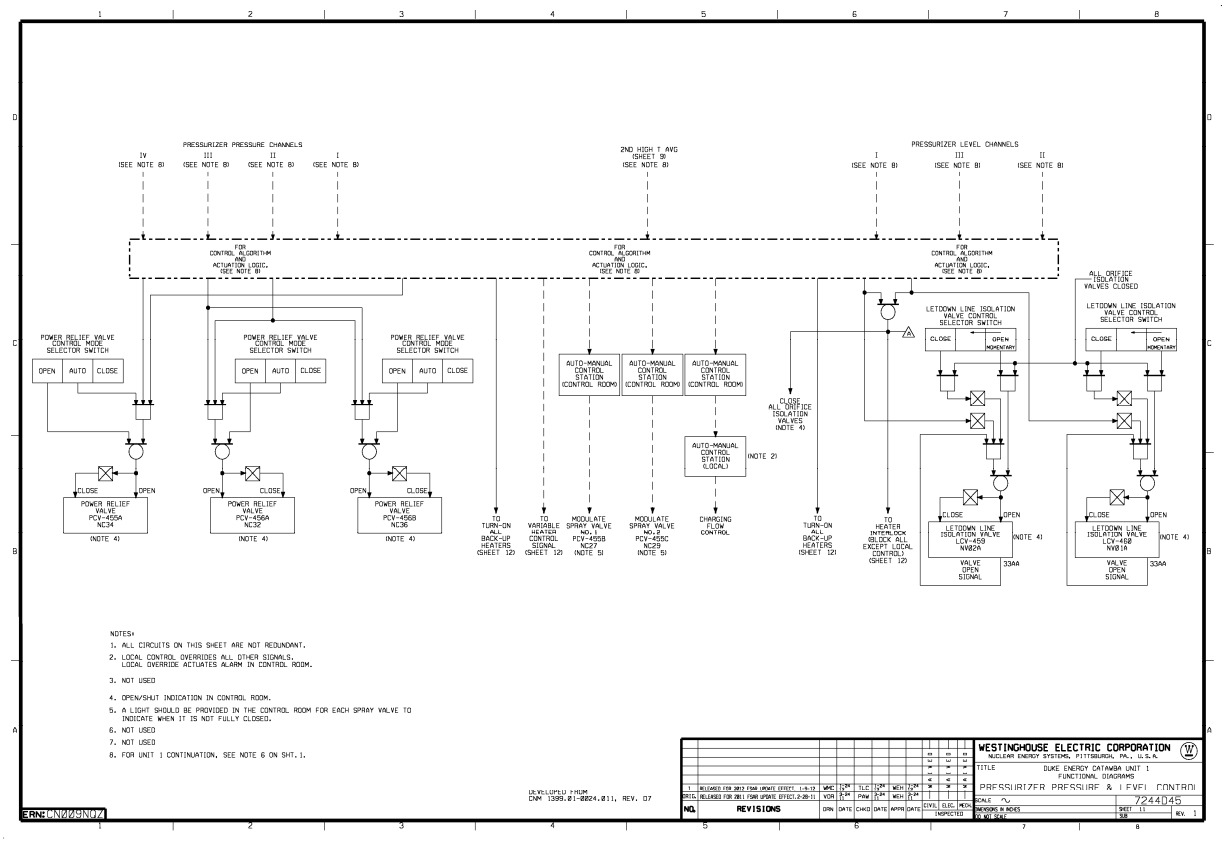

STEAM GENERATOR
PRESSURIZER
CONTAINMENT PRESSURE
MANUAL ACTUATION FROM CONTROL BOARD
CONTAINMENT RADIOACTIVITY DETECTORS
CONTROL ROOM AREA MONITOR
HIGH STEAM PRESSURE RATE (SHEET 7)
LOW STEAMLINE PRESSURE (SHEET 7)
LOW PRESSURIZER PRESSURE (SHEET 6)
AIR PARTICLE MONITOR
RADIO GAS MONITOR
SAFETY INJECTION ACTUATION (NOTE 11)
PHASE B,VX ACTUATION (NOTE 11)
CONTAINMENT ISOLATION PHASE A (NOTE 11)
MANUAL RESET AND BLOCK (NOTES 9&10)
P-4 REACTOR TRIP (SHEET 2)
30-120 SEC.
OFF DELAY 8.5-9.5 SEC.
MANUAL RESET (NOTES 9&10)
MANUAL STEAMLINE ISOLATION (TWO CONTROLS) (NOTE 1)
FEEDWATER ISOLATION (SHEET 13)
REACTOR TRIP (SHEET 2)
AUXILIARY FEEDWATER PUMPS (SHEET 15)
MANUAL RESET (NOTE 9 NOTE 12)
LOOP A STEAMLINE ISOLATION (NOTE 3)
LOOP B STEAMLINE ISOLATION (NOTE 3)
LOOP C STEAMLINE ISOLATION (NOTE 3)
LOOP D STEAMLINE ISOLATION (NOTE 3)
CONTAINMENT HIGH PRESS INTERLOCK
(NOTE 12) CLOSE
LOOP A STEAMLINE STOP VALVE
LOOP B STEAMLINE STOP VALVE
LOOP C STEAMLINE STOP VALVE
LOOP D STEAMLINE STOP VALVE
(NOTE 13)
338A
EMERGENCY DIESEL START-UP
(NOTE 6)
ANNULUS VENTILATION
SAFETY INJECTION (PART BY W) (NOTE 11)
(NOTES 6&14)
SERVICE WATER SYSTEM START & SYSTEM ISOL. (NOTE 8)
5-15 MIN
DECK RECIRCULATING FANS
CONTAINMENT ISOLATION PHASE A
CONTAINMENT ISOLATION PHASE B
CONTAINMENT VENTILATION ISOLATION
CONTROL ROOM INTAKE DUCT ISOLATION AND EMERGENCY FILTER ACTUATION
NOTES:
1. TWO MOMENTARY CONTROLS, ONE FOR EACH TRAIN.
3. ONE MOMENTARY CONTROL PER LOOP ON THE CONTROL BOARD.
4. CONTAINMENT PRESSURE BISTABLES FOR SPRAY ACTUATION ARE ENERGIZE-TO-ACTUATE (OTHER BISTABLES ARE DE-ENERGIZE-TO-ACTUATE.)
5. ENCLOSED CIRCUITRY IS NOT PART OF THE SAFEGUARDS SYSTEM AND IS NOT REDUNDANT.
6. COMPONENTS ARE ALL INDIVIDUALLY SEALED IN GLASTHEIN, SO THAT LOSS OF THE ACTUATION SIGNAL WILL NOT CAUSE THESE COMPONENTS TO RETURN TO THE CONDITION HELD PRIOR TO THE ADVENT OF THE ACTUATION SIGNAL.
8. SERVICE WATER SYSTEM ISOLATION IS USED ONLY IF REQUIRED.
9. THE REDUNDANT MANUAL RESET CONSISTS OF TWO MOMENTARY CONTROLS ON THE CONTROL BOARD, ONE FOR EACH TRAIN.
10. SUPPLIED BY OTHERS.
11. NUCLEAR STEAM SUPPLY SYSTEM SEQUENCE REQUIREMENTS SPECIFIED BY W
12. ALSO CLOSES THE BYPASS VALVE IN PARALLEL WITH THE ASSOCIATED STEAM LINE STOP VALVE.
13. LIGHTS SHOULD BE PROVIDED IN THE CONTROL ROOM FOR EACH STEAM LINE STOP VALVE TO INDICATE WHEN THE VALVE IS FULLY CLOSED OR FULLY OPEN.
14. THE ACTUATION MAY BE DELAYED AND SEQUENCED IF THE EMERGENCY DIESEL POWER CAPABILITY IS LESS THAN THE TOTAL LOAD WITH ALL SYSTEMS STARTING. THE TIME DELAY(S), IF USED, MAY NOT EXCEED THE MAXIMUM STARTING TIME REQUIREMENTS FOR EACH SYSTEM.
15. SOME ENGINEERED SAFEGUARDS FUNCTIONS ARE NOT WITHIN THE FUNCTIONAL DESIGN SCOPE OF W NUCLEAR ENERGY SYSTEMS BUT ONLY SHOWN ON THIS SHEET AS THE FUNCTIONS ARE BUILT IN THE W SUPPLIED EQUIPMENT.
DEVELOPED FROM MANUFACTURES DWG. CNM 1399.01-0024 000 REV. 009
QA CONDITION 1
WESTINGHOUSE ELECTRIC CORPORATION
NUCLEAR ENERGY SYSTEMS, PGH., PA USA
TITLE DUKE POWER COMPANY CATAWBA UNIT 1
FUNCTIONAL DIAGRAMS
SAFEGUARDS ACTUATION SIGNALS
7244D45
SHEET 8
REVISIONS


C-1 HIGH FLUX 1/2M INTERMEDIATE RANGE (SHEET 4)
C-2 HIGH FLUX 1/2M INTERMEDIATE RANGE (SHEET 4)
C-3 OVER-TEMP. ΔT (Z+I) (SHEET 5)
C-4 OVER-POWER ΔT (Z+I) (SHEET 5)
C-5 LOW TURBINE POWER (TURBINE IMPULSE CHAMBER PRESSURE) (SHEET 16)
POWER RANGE NEUTRON FLUX CHANNELS (NOTE 7) (NOTE 8)
#1 #2 #3 #4
TURBINE IMPULSE CHAMBER PRESSURE (NOTE 7)
T AVG LOOP A (NOTE 7) (NOTE 9)
T AVG LOOP B (NOTE 7) (NOTE 9)
T AVG LOOP C (NOTE 7) (NOTE 9)
T AVG LOOP D (NOTE 7) (NOTE 9)
ΔT LOOP A (NOTE 9)
ΔT LOOP B (NOTE 9)
ΔT LOOP C (NOTE 9)
ΔT LOOP D (NOTE 9)
FOR CONTROL ALGORITHM AND ACTUATION LOGIC, (SEE NOTE 9)
TO STEAM GENERATOR LEVEL CONTROL (NOTE 8)
TO STEAM DUMP CONTROL (SHEET 18) (NOTE 7)
TO STEAM DUMP CONTROL (SHEET 18) (NOTE 7)
TO PRESSURIZER LEVEL CONTROL (SHEET 17) (NOTE 6)
C-16 STOP TURBINE LOADING (SHEET 16) (NOTE 7)
ROD BOTTOM SIGNAL AND FULL LENGTH ROD FROM ROD POSITION INDICATOR SYSTEM
LOW
LO-LO
BANK A (NOTE 9)
BANK B (NOTE 9)
BANK C (NOTE 9)
BANK D (NOTE 9)
(NOTE 4)
MANUAL ROD CONTROL
RODS OUT MOMENTARY
RODS IN MOMENTARY
FIXED MANUAL ROD SPEED
AUTO-MANUAL SELECTOR SWITCH
RODS IN
RODS OUT
ANALOG ROD SPEED SIGNAL
FULL LENGTH CONTROL BANKS
C11
NOTES:
1. ALL CIRCUITS ON THIS SHEET ARE NOT REDUNDANT.
2. NOT USED
3. NOT USED
4. THE ROD DIRECTION BISTABLES NO. 68-412A AND 68-412B ARE "ENERGIZED TO ACTUATE".
5. NOT USED
6. FOR UNIT 1 CONTINUATION, SEE NOTE 6 ON SHT.1.
7. FOR UNIT 1 CONTINUATION, SEE NOTE 7 ON SHT.1.
8. FOR UNIT 1 CONTINUATION, SEE NOTE 8 ON SHT.1.
9. FOR UNIT 1 CONTINUATION, SEE NOTE 10 ON SHT.1.
QA CONDITION 1
DEVELOPED FROM CNM 1399.01-0824.009, REV. 05
REVISIONS
WESTINGHOUSE ELECTRIC CORPORATION
NUCLEAR ENERGY SYSTEMS, PITTSBURGH, PA., U.S.A.
DUKE ENERGY CATAWBA UNIT 1
FUNCTIONAL DIAGRAMS
ROD CONTROLS & ROD BLOCKS
7244045
UNRELEASED
ERN: CN02457/UD1

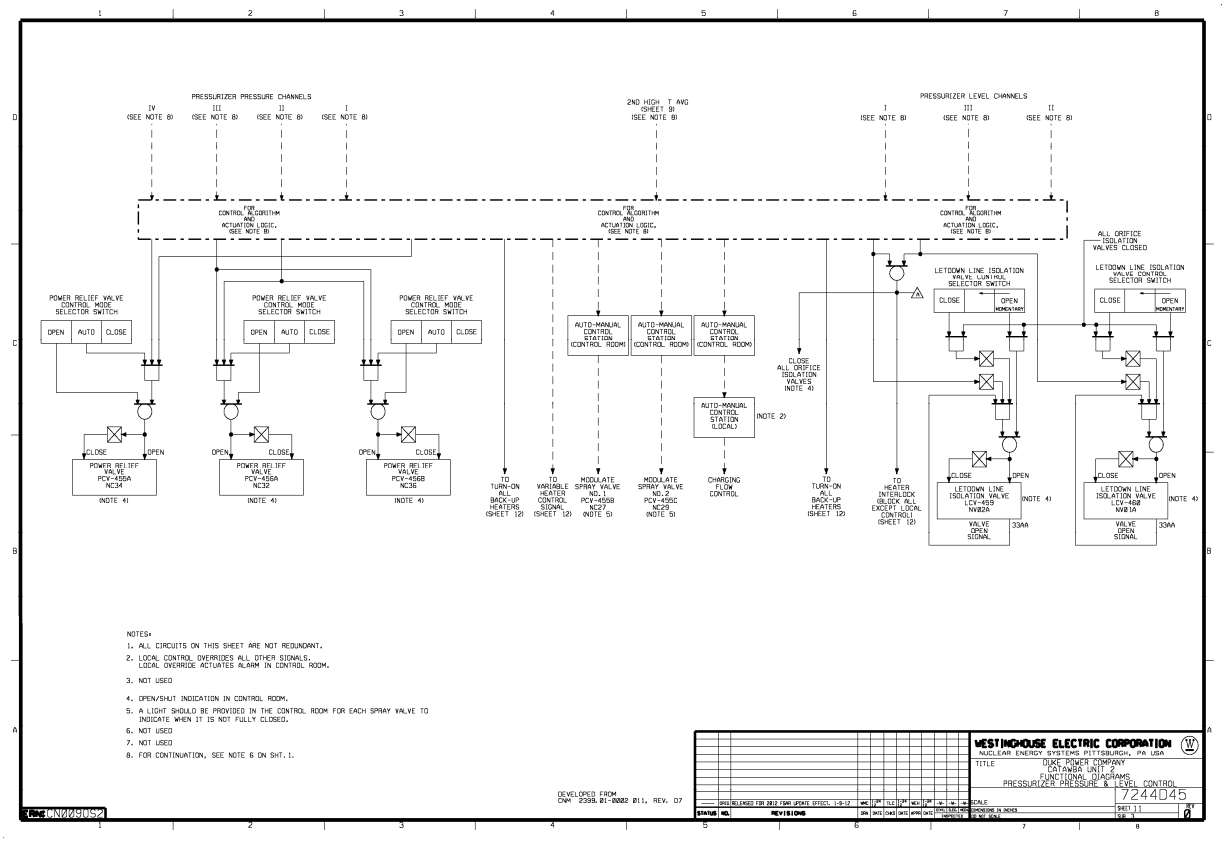

C-1 HIGH FLUX 1/2ΔI INTERMEDIATE RANGE (SHEET 4)
C-2 HIGH FLUX 1/2ΔI LOW RANGE (SHEET 4)
C-3 OVER-TEMP. ΔT (SHEET 5)
C-4 OVER-POWER ΔT (SHEET 5)
C-5 LOW TURBINE POWER (TURBINE IMPULSE CHAMBER PRESSURE) (SHEET 16)
POWER RANGE NEUTRON FLUX CHANNELS (NOTE 7) (NOTE 6)
#1 #2 #3 #4
TURBINE IMPULSE CHAMBER PRESSURE (NOTE 7)
T AVG LOOP A (NOTE 7) (NOTE 9)
T AVG LOOP B (NOTE 7) (NOTE 9)
T AVG LOOP C (NOTE 7) (NOTE 9)
T AVG LOOP D (NOTE 7) (NOTE 9)
ΔT LOOP A (NOTE 9)
ΔT LOOP B (NOTE 9)
ΔT LOOP C (NOTE 9)
ΔT LOOP D (NOTE 9)
FOR CONTROL ALGORITHM AND ACTUATION LOGIC, (SEE NOTE 9)
TO STEAM GENERATOR LEVEL CONTROL (NOTE 8)
TO STEAM DUMP CONTROL (SHEET 10) (NOTE 7)
TO STEAM DUMP CONTROL (SHEET 10) (NOTE 7)
TO PRESSURIZER LEVEL CONTROL (SHEET 13) (NOTE 6)
C-16 STOP TURBINE LOADING (SHEET 16) (NOTE 7)
ROD BOTTOM SIGNAL ANY FULL LENGTH ROD FROM ROD POSITION INDICATOR SYSTEM
LOW LO-LO BANK A (NOTE 9)
LOW LO-LO BANK B (NOTE 9)
LOW LO-LO BANK C (NOTE 9)
LOW LO-LO BANK D (NOTE 9)
(NOTE 4)
MANUAL ROD CONTROL
RODS OUT MOMENTARY
RODS IN MOMENTARY
FIXED MANUAL ROD SPEED
AUTO-MANUAL SELECTOR SWITCH
RODS IN
RODS OUT
ANALOG ROD SPEED SIGNAL
FULL LENGTH CONTROL BANKS
C11
NOTES:
1. ALL CIRCUITS ON THIS SHEET ARE NOT REDUNDANT.
2. NOT USED
3. NOT USED
4. THE ROD DIRECTION BISTABLES NO. SB-412A AND SB-412B ARE 'ENERGIZED TO ACTUATE'.
5. NOT USED
6. FOR CONTINUATION, SEE NOTE 6 ON SHT.1.
7. FOR CONTINUATION, SEE NOTE 7 ON SHT.1.
8. FOR CONTINUATION, SEE NOTE 8 ON SHT.1.
9. FOR CONTINUATION, SEE NOTE 12 ON SHT.1.
QA CONDITION 1
DEVELOPED FROM MANUFACTURES DRAWING CNM 2393.01-0002 005, REV. 05
WESTINGHOUSE ELECTRIC CORPORATION
NUCLEAR POWER SYSTEMS DIVISION
CATAWBA NUCLEAR STATION UNIT 2
FUNCTIONAL DIAGRAMS
ROD CONTROLS & ROD BLOCKS
7244D45
SCALE=
DIMENSIONS IN INCHES
DO NOT SCALE
SHEET 9
REV. 1
REVISIONS
CHECKED
CIVIL ELEC. MECH. OTHER

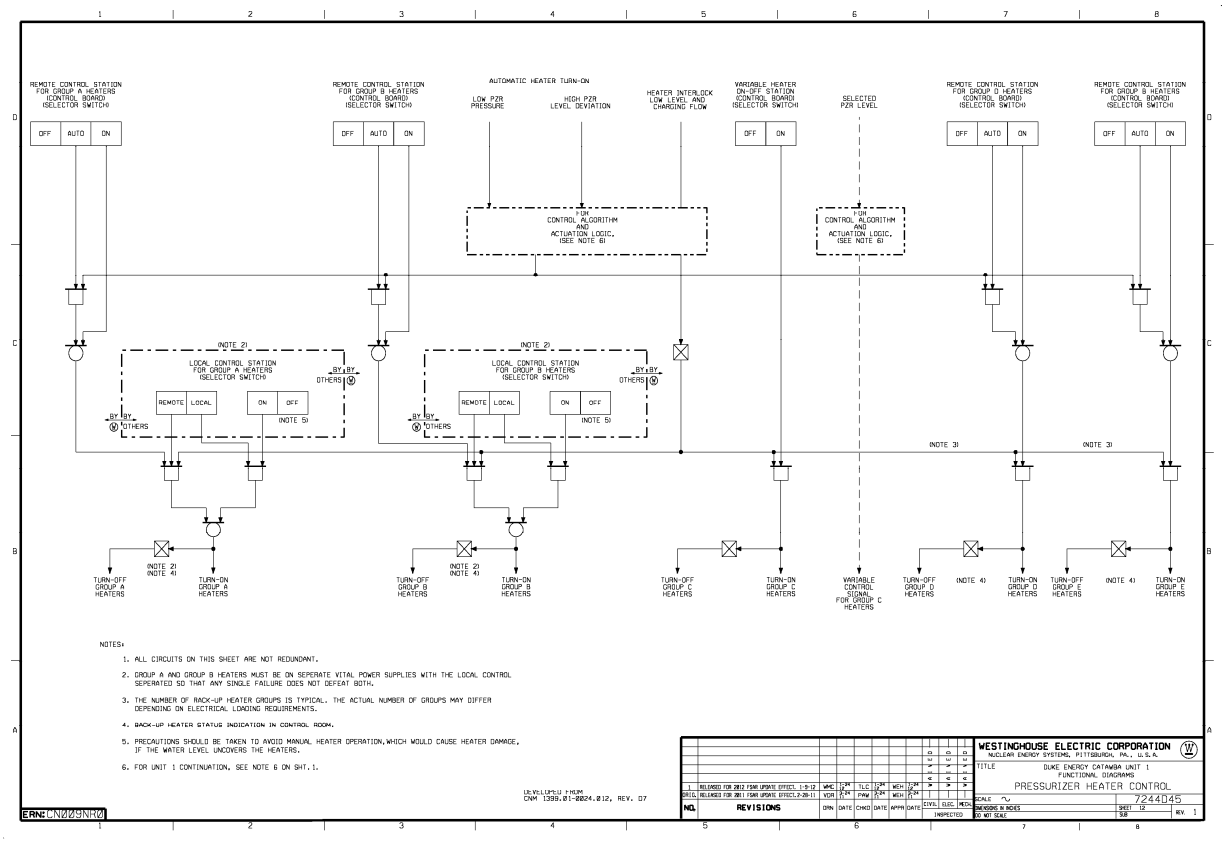

STEAM DUMP CONTROL
QA CONDITION 1
WESTINGHOUSE ELECTRIC CORPORATION
DUKE ENERGY CATAWBA UNIT 1
FUNCTIONAL DIAGRAMS
7244045
REVISIONS
DEVELOPED FROM CNM 1399.01-0024.010, REV. 08


QA CONDITION 1
WESTINGHOUSE ELECTRIC CORPORATION
NUCLEAR ENERGY SYSTEMS PITTSBURGH, PA USA
DUKE POWER COMPANY
CATAWBA UNIT 2
FUNCTIONAL DIAGRAMS
STEAM DUMP CONTROL
7244D45
SHT 12
REVISIONS
DEVELOPED FROM
CNM 2399.01-0002 010, REV. 08
CONDENSER AVAILABLE SIGNALS
STEAM LINE PRESSURE
STEAM DUMP CONTROL MODE SELECTOR SWITCH
NOTES:
1. STEAM DUMP IS BLOCKED BY BLOCKING AIR TO THE DUMP VALVES AND VENTING THE DIAPHRAGMS. THE REDUNDANT LOGIC OUTPUT PROVIDES TWO SOLENOID VENT VALVES IN SERIES TO REDUNDANTLY INTERLOCK THE AIR LINE BETWEEN EACH VALVE DIAPHRAGM AND ITS ASSOCIATED POSITIONER. THE NON-REDUNDANT LOGIC OUTPUT OPERATES ONE SOLENOID VENT VALVE TO INTERLOCK THE AIR LINE BETWEEN EACH VALVE DIAPHRAGM AND ITS ASSOCIATED POSITIONER. THE SOLENOID VALVES ARE DE-ENERGIZE TO VENT, CAUSING THE MAIN DUMP VALVE TO CLOSE IN FIVE SECONDS. EITHER OF THE REDUNDANT BLOCK SIGNALS ON THE NON-REDUNDANT BLOCK SIGNAL WILL BLOCK STEAM DUMP INDEPENDENT OF THE OTHER SIGNALS.
2. CIRCUITRY ON THIS SHEET IS NOT REDUNDANT EXCEPT WHERE INDICATED REDUNDANT.
3. SELECTOR SWITCH WITH THE FOLLOWING THREE POSITIONS:
ON - SWITCH DUMP IS PERMITTED
BYPASS - T AVG INTERLOCK IS BYPASSED FOR LO-LO T AVG
SPRING RETURN TO ON POSITION
OFF - STEAM DUMP IS NOT PERMITTED AND RESET T AVG BYPASS
THE REDUNDANT INTERLOCK SELECTOR SWITCH CONSISTS OF TWO CONTROLS ON THE CONTROL BOARD, ONE FOR EACH TRAIN.
4. REFER TO NOTE 7 ON SHT. 1 FOR DESIGN CRITERIA FOR TURBINE IMPULSE PRESSURE.
5. THE CONDENSER AVAILABLE SIGNAL LOGIC IS TYPICAL, ACTUAL IMPLEMENTATION MAY BE DIFFERENT.
6. NOT USED
7. LIGHTS SHOULD BE PROVIDED IN THE CONTROL ROOM FOR EACH DUMP VALVE TO INDICATE WHEN THE VALVE IS FULLY CLOSED OR FULLY OPEN.
8. THE STEAMLINE PRESSURE SIGNAL ORIGIN MUST BE DIFFERENT FROM THAT WHICH IS USED FOR THE STEAMLINE DIFFERENTIAL PRESSURE SAFETY INJECTION SIGNAL SHOWN ON SHEET 7 TO MEET THE SIGNAL FAILURE CRITERION.
9. FOR CONTINUATION, SEE NOTE 7 ON SHT. 1.

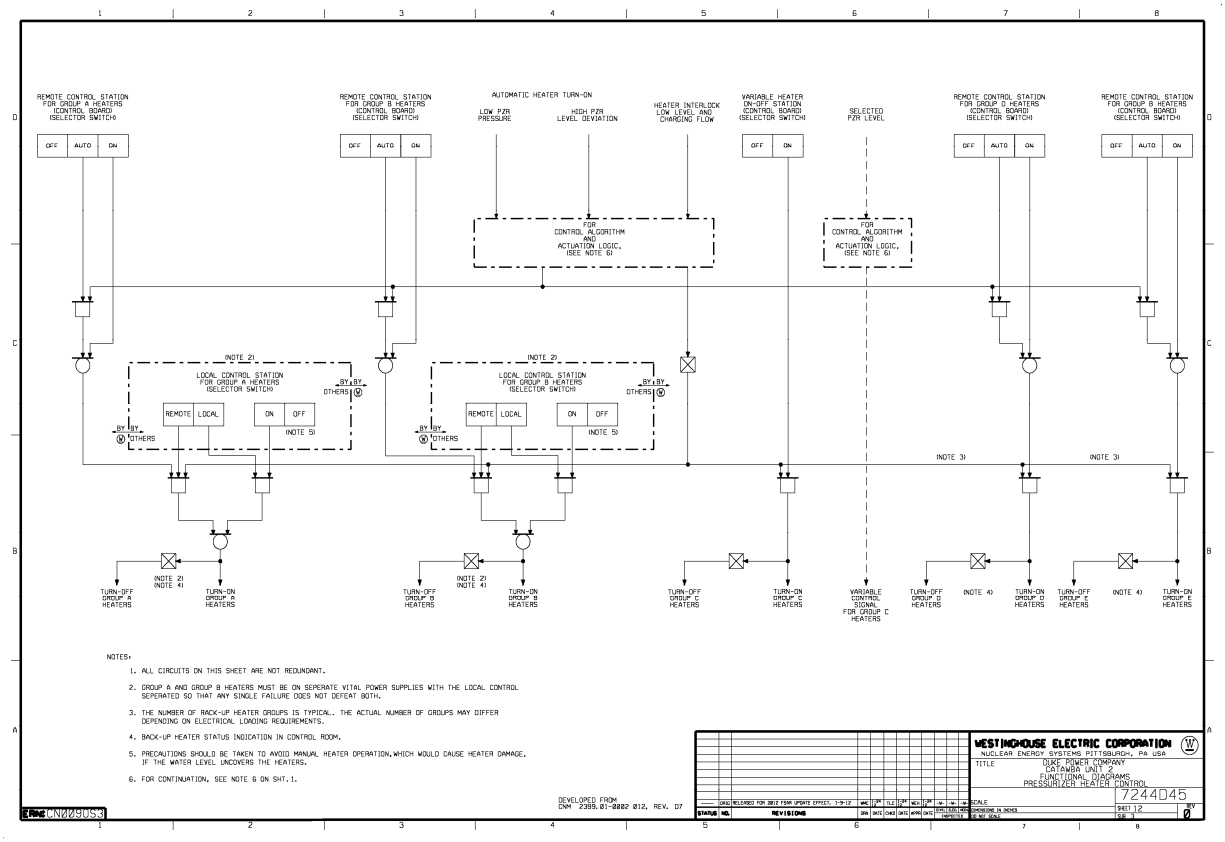

PRESSURIZER PRESSURE CHANNELS
IV (SEE NOTE 8)
III (SEE NOTE 8)
II (SEE NOTE 8)
I (SEE NOTE 8)
2ND HIGH T AVG (SHEET 9B (SEE NOTE 8)
PRESSURIZER LEVEL CHANNELS
I (SEE NOTE 8)
III (SEE NOTE 8)
II (SEE NOTE 8)
FOR CONTROL ALGORITHM ACTUATION LOGIC. (SEE NOTE 8)
POWER RELIEF VALVE CONTROL MODE SELECTOR SWITCH
OPEN
AUTO
CLOSE
POWER RELIEF VALVE PCV-455A NC24 (NOTE 4)
POWER RELIEF VALVE PCV-456A NC32 (NOTE 4)
POWER RELIEF VALVE PCV-456B NC36 (NOTE 4)
AUTO-MANUAL CONTROL STATION (CONTROL ROOM)
AUTO-MANUAL CONTROL STATION (LOCAL) (NOTE 2)
TO TURN-ON ALL BACK-UP HEATERS (SHEET 12)
TO VARIABLE HEATER CONTROL SIGNAL (SHEET 12)
MODULATE SPRAY VALVE PCV-455B NC27 (NOTE 5)
MODULATE SPRAY VALVE PCV-455C NC29 (NOTE 5)
CHARGING FLOW CONTROL
CLOSE ALL ORIFICE ISOLATION VALVES (NOTE 4)
TO TURN-ON ALL BACK-UP HEATERS (SHEET 12)
TO HEATER INTERLOCK TO BLOCK ALL EXCEPT LOCAL CONTROL (SHEET 12)
ALL ORIFICE ISOLATION VALVES CLOSED
LETDOWN LINE ISOLATION VALVE CONTROL SELECTOR SWITCH
CLOSE
OPEN
MOMENTARY
LETDOWN LINE ISOLATION VALVE LCV-459 NV02A (NOTE 4)
LETDOWN LINE ISOLATION VALVE LCV-460 NV01A (NOTE 4)
VALVE OPEN SIGNAL
33AA
NOTES:
1. ALL CIRCUITS ON THIS SHEET ARE NOT REDUNDANT.
2. LOCAL CONTROL OVERRIDES ALL OTHER SIGNALS. LOCAL OVERRIDE ACTUATES ALARM IN CONTROL ROOM.
3. NOT USED
4. OPEN/SHUT INDICATION IN CONTROL ROOM.
5. A LIGHT SHOULD BE PROVIDED IN THE CONTROL ROOM FOR EACH SPRAY VALVE TO INDICATE WHEN IT IS NOT FULLY CLOSED.
6. NOT USED
7. NOT USED
8. FOR UNIT 1 CONTINUATION, SEE NOTE 6 ON SHT. 1.
UNIT 1 CNM 1399.01-00Z4.011, REV. 07
WESTINGHOUSE ELECTRIC CORPORATION
NUCLEAR ENERGY SYSTEMS, PITTSBURGH, PA., U.S.A.
DUKE ENERGY CATAWBA UNIT 1
FUNCTIONAL DIAGRAMS
PRESSURIZER PRESSURE & LEVEL CONTROL
7244045
REVISIONS
ERN: CN00GN07

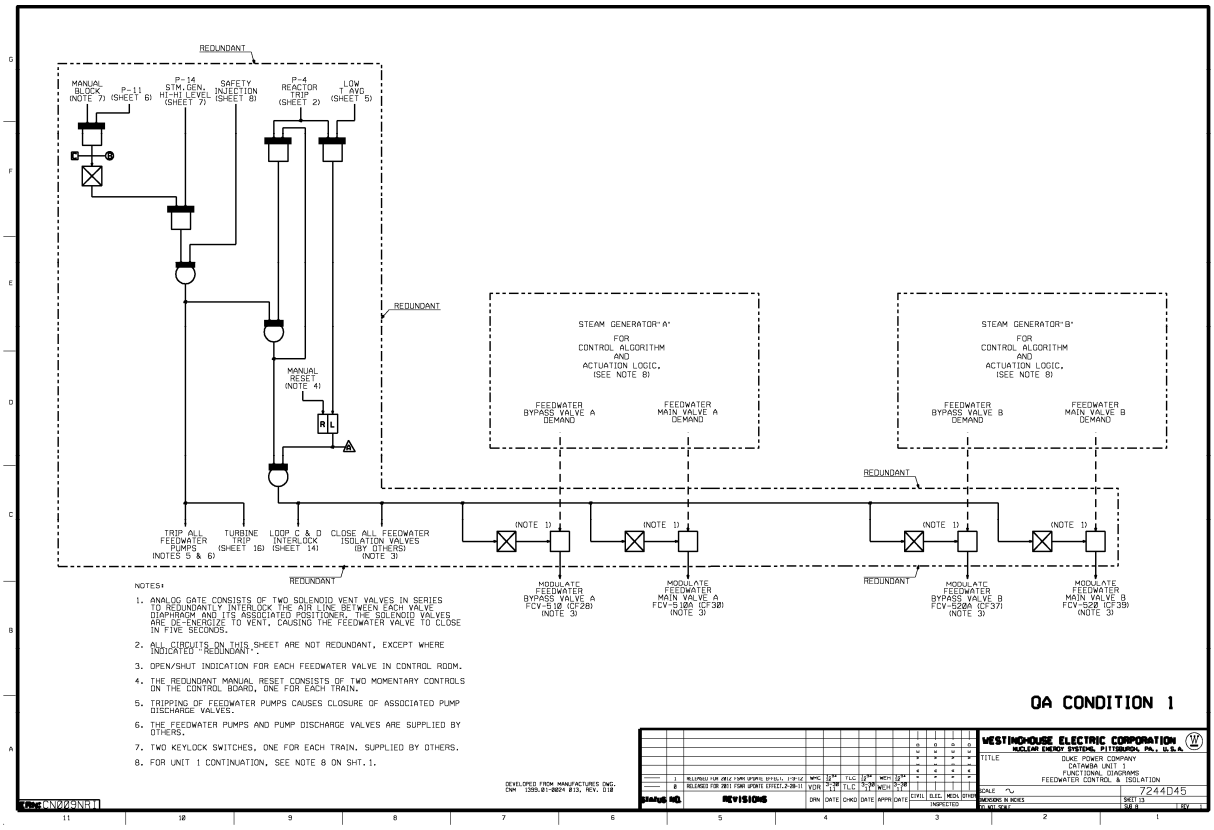
Pressurizer Heater Control

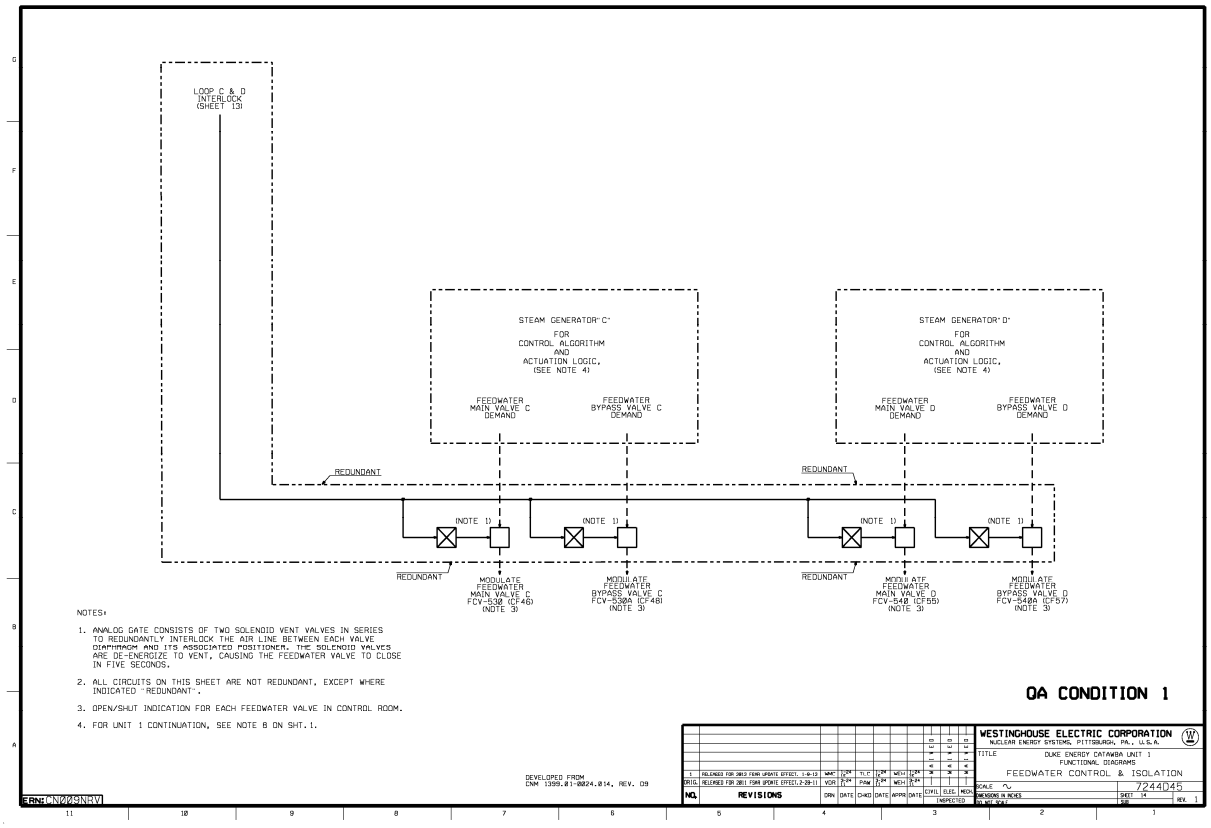


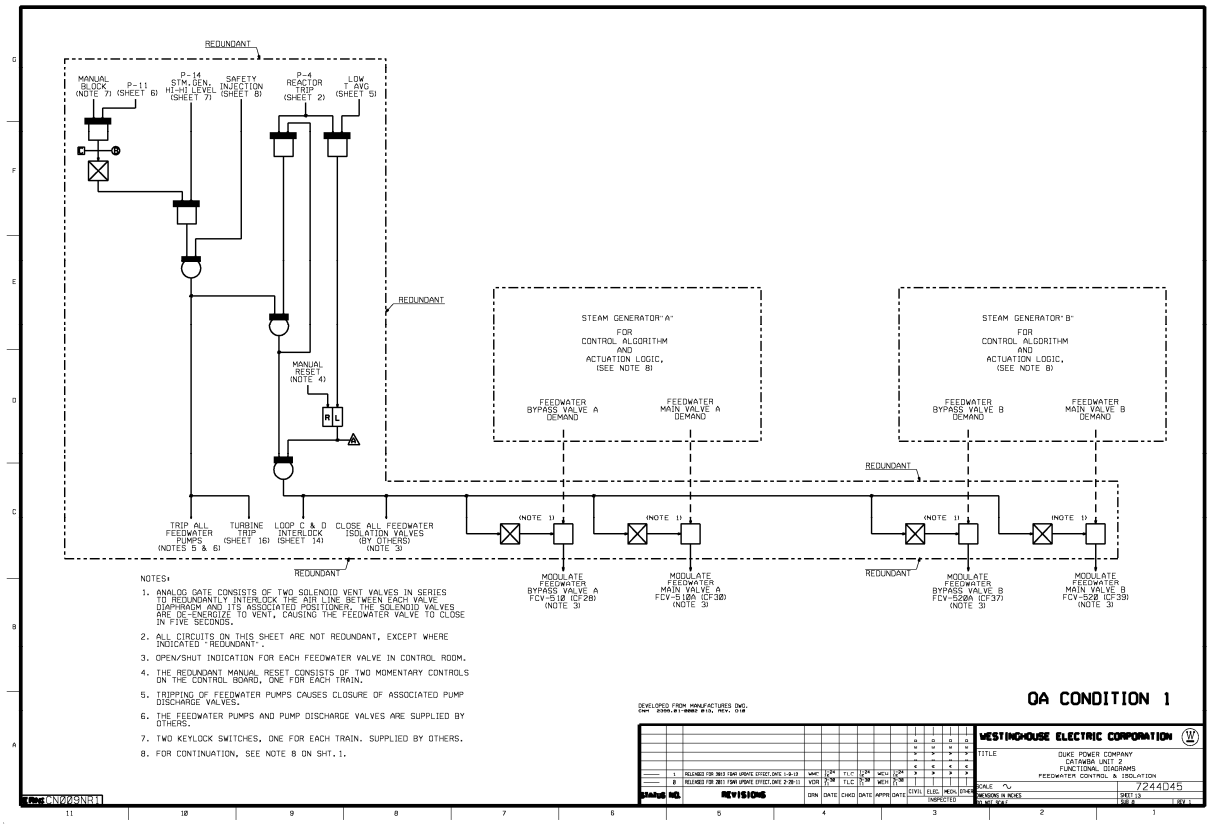

REMOTE CONTROL STATION FOR GROUP A HEATERS (CONTROL BOARD) (SELECTOR SWITCH)
OFF
AUTO
ON
REMOTE CONTROL STATION FOR GROUP B HEATERS (CONTROL BOARD) (SELECTOR SWITCH)
AUTOMATIC HEATER TURN-ON
LOW PZR PRESSURE
HIGH PZR LEVEL DEVIATION
HEATER INTERLOCK LOW LEVEL AND CHARGING FLOW
VARIABLE HEATER ON-OFF STATION (CONTROL BOARD) (SELECTOR SWITCH)
SELECTED PZR LEVEL
REMOTE CONTROL STATION FOR GROUP D HEATERS (CONTROL BOARD) (SELECTOR SWITCH)
REMOTE CONTROL STATION FOR GROUP E HEATERS (CONTROL BOARD) (SELECTOR SWITCH)
P/I/H CONTROL ALGORITHM AND ACTUATION LOGIC, (SEE NOTE 6)
(NOTE 2)
LOCAL CONTROL STATION FOR GROUP A HEATERS (SELECTOR SWITCH)
LOCAL CONTROL STATION FOR GROUP B HEATERS (SELECTOR SWITCH)
REMOTE
LOCAL
ON
OFF
(NOTE 5)
BY
OTHERS
(NOTE 3)
(NOTE 4)
TURN-OFF GROUP A HEATERS
TURN-ON GROUP A HEATERS
TURN-OFF GROUP B HEATERS
TURN-ON GROUP B HEATERS
TURN-OFF GROUP C HEATERS
TURN-ON GROUP C HEATERS
VARIABLE CONTROL SIGNAL FOR GROUP C HEATERS
TURN-OFF GROUP D HEATERS
TURN-ON GROUP D HEATERS
TURN-OFF GROUP E HEATERS
TURN-ON GROUP E HEATERS
NOTES:
1. ALL CIRCUITS ON THIS SHEET ARE NOT REDUNDANT.
2. GROUP A AND GROUP B HEATERS MUST BE ON SEPERATE VITAL POWER SUPPLIES WITH THE LOCAL CONTROL SEPERATED SO THAT ANY SINGLE FAILURE DOES NOT DEFEAT BOTH.
3. THE NUMBER OF BACK-UP HEATER GROUPS IS TYPICAL. THE ACTUAL NUMBER OF GROUPS MAY DIFFER DEPENDING ON ELECTRICAL LOADING REQUIREMENTS.
4. BACK-UP HEATER STATUS INDICATION IN CONTROL ROOM.
5. PRECAUTIONS SHOULD BE TAKEN TO AVOID MANUAL HEATER OPERATION, WHICH WOULD CAUSE HEATER DAMAGE, IF THE WATER LEVEL UNCOVERS THE HEATERS.
6. FOR UNIT 1 CONTINUATION, SEE NOTE 6 ON SHT. 1.
LEVEL UP U-MOM
CNM 1399.01-0024.012, REV. 07
ERN: CN009NR0
WESTINGHOUSE ELECTRIC CORPORATION
NUCLEAR ENERGY SYSTEMS, PITTSBURGH, PA., U.S.A.
TITLE
DUKE ENERGY CATAWBA UNIT 1
FUNCTIONAL DIAGRAMS
PRESSURIZER HEATER CONTROL
7244045
REVISIONS
DRAWING IN INCHES
DO NOT SCALE
SHEET 12
REV. 1

Pressurizer Heater Control

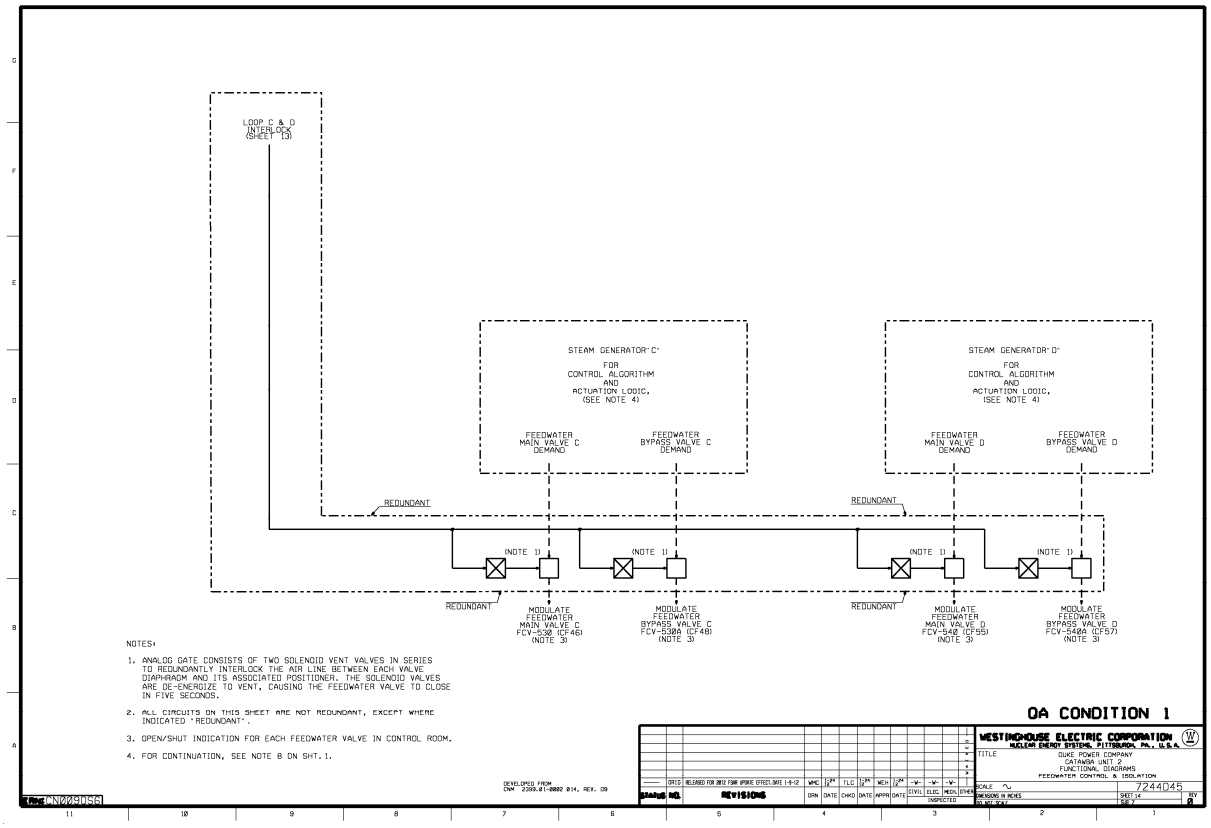


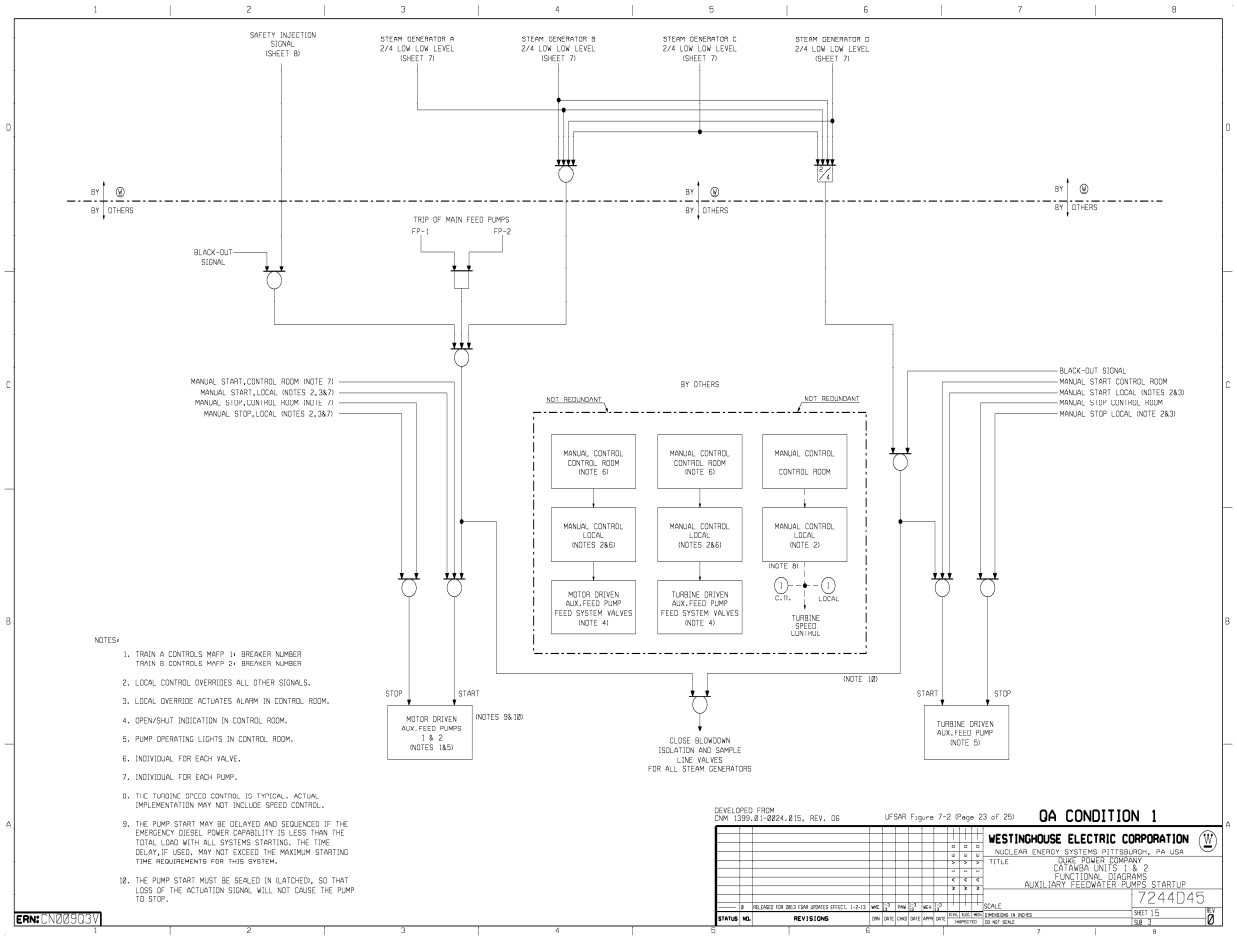

REDUNDANT
MANUAL BLOCK (NOTE 7)
P-11 (SHEET 6)
P-14 STM. GEN. HI-HI LEVEL (SHEET 7)
SAFETY INJECTION (SHEET 8)
P-4 REACTOR TRIP (SHEET 2)
LOW T AVG (SHEET 5)
MANUAL RESET (NOTE 4)
REDUNDANT
STEAM GENERATOR "A" FOR CONTROL ALGORITHM AND ACTUATION LOGIC, (SEE NOTE 8)
FEEDWATER BYPASS VALVE A DEMAND
FEEDWATER MAIN VALVE A DEMAND
STEAM GENERATOR "B" FOR CONTROL ALGORITHM AND ACTUATION LOGIC, (SEE NOTE 8)
FEEDWATER BYPASS VALVE B DEMAND
FEEDWATER MAIN VALVE B DEMAND
REDUNDANT
TRIP ALL FEEDWATER PUMPS (NOTES 5 & 6)
TURBINE TRIP (SHEET 16)
LOOP C & D INTERLOCK (SHEET 14)
CLOSE ALL FEEDWATER ISOLATION VALVES (BY OTHERS) (NOTE 3)
(NOTE 1)
(NOTE 1)
(NOTE 1)
(NOTE 1)
REDUNDANT
REDUNDANT
MODULATE FEEDWATER BYPASS VALVE A FCV-510 (CF28) (NOTE 3)
MODULATE FEEDWATER MAIN VALVE A FCV-510A (CF30) (NOTE 3)
MODULATE FEEDWATER BYPASS VALVE B FCV-520A (CF37) (NOTE 3)
MODULATE FEEDWATER MAIN VALVE B FCV-520 (CF39) (NOTE 3)
NOTES:
1. ANALOG GATE CONSISTS OF TWO SOLENOID VENT VALVES IN SERIES TO REDUNDANTLY INTERLOCK THE AIR LINE BETWEEN EACH VALVE DIAPHRAGM AND ITS ASSOCIATED POSITIONER. THE SOLENOID VALVES ARE DE-ENERGIZE TO VENT, CAUSING THE FEEDWATER VALVE TO CLOSE IN FIVE SECONDS.
2. ALL CIRCUITS ON THIS SHEET ARE NOT REDUNDANT, EXCEPT WHERE INDICATED "REDUNDANT".
3. OPEN/SHUT INDICATION FOR EACH FEEDWATER VALVE IN CONTROL ROOM.
4. THE REDUNDANT MANUAL RESET CONSISTS OF TWO MOMENTARY CONTROLS ON THE CONTROL BOARD, ONE FOR EACH TRAIN.
5. TRIPPING OF FEEDWATER PUMPS CAUSES CLOSURE OF ASSOCIATED PUMP DISCHARGE VALVES.
6. THE FEEDWATER PUMPS AND PUMP DISCHARGE VALVES ARE SUPPLIED BY OTHERS.
7. TWO KEYLOCK SWITCHES, ONE FOR EACH TRAIN. SUPPLIED BY OTHERS.
8. FOR UNIT 1 CONTINUATION, SEE NOTE 8 ON SHT. 1.
QA CONDITION 1
DEVELOPED FROM MANUFACTURES DWG. CNM 1399.01-0824 013, REV. 018
REVISIONS
WESTINGHOUSE ELECTRIC CORPORATION
NUCLEAR ENERGY SYSTEMS, PITTSBURGH, PA., U.S.A.
DUKE POWER COMPANY
CATAWBA UNIT 1
FUNCTIONAL DIAGRAMS
FEEDWATER CONTROL & ISOLATION
7244D45

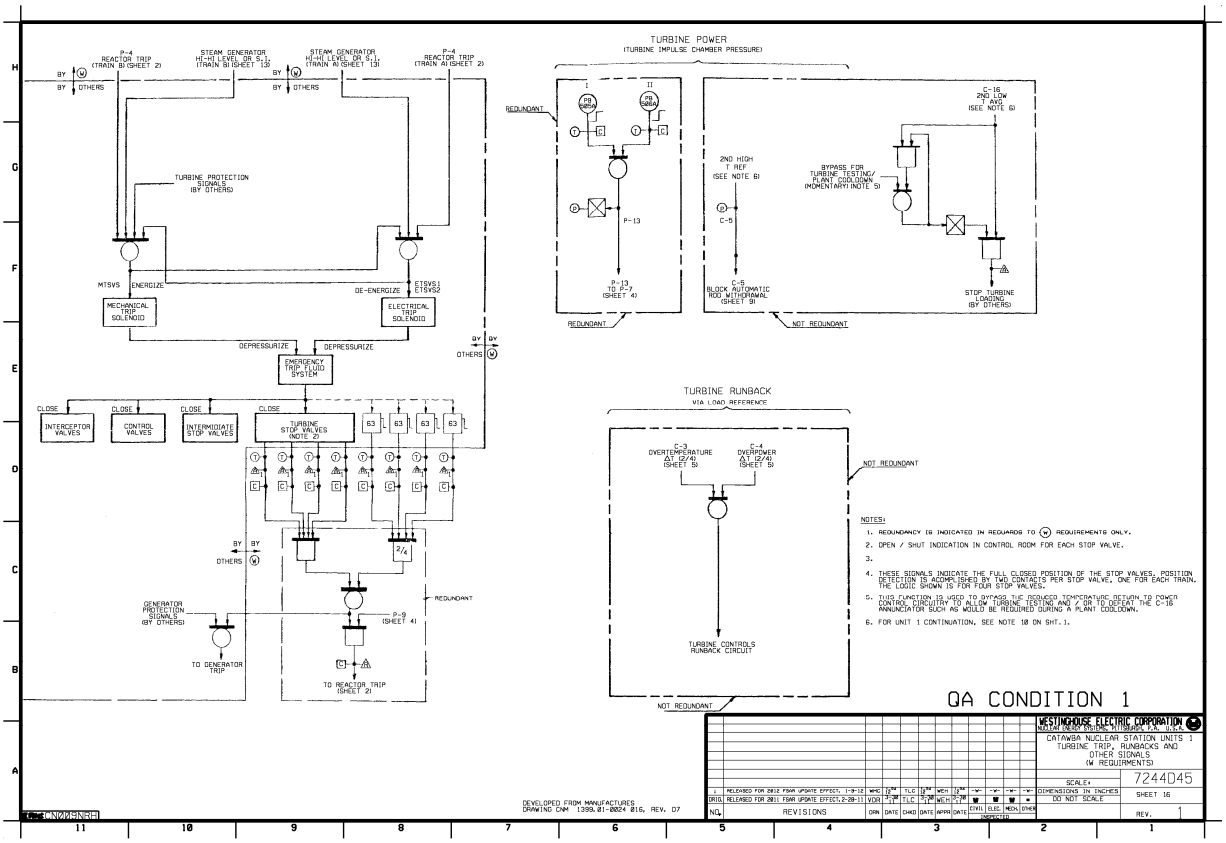

LOOP C & D INTERLOCK (SHEET 13)
STEAM GENERATOR "C" FOR CONTROL ALGORITHM AND ACTUATION LOGIC, (SEE NOTE 4)
FEEDWATER MAIN VALVE C DEMAND
FEEDWATER BYPASS VALVE C DEMAND
STEAM GENERATOR "D" FOR CONTROL ALGORITHM AND ACTUATION LOGIC, (SEE NOTE 4)
FEEDWATER MAIN VALVE D DEMAND
FEEDWATER BYPASS VALVE D DEMAND
REDUNDANT
REDUNDANT
REDUNDANT
REDUNDANT
(NOTE 1)
(NOTE 1)
(NOTE 1)
(NOTE 1)
MODULATE FEEDWATER MAIN VALVE C FCV-530 (CF46) (NOTE 3)
MODULATE FEEDWATER BYPASS VALVE C FCV-530A (CF48) (NOTE 3)
MODULATE FEEDWATER MAIN VALVE D FCV-540 (CF55) (NOTE 3)
MODULATE FEEDWATER BYPASS VALVE D FCV-540A (CF57) (NOTE 3)
NOTES:
1. ANALOG GATE CONSISTS OF TWO SOLENOID VENT VALVES IN SERIES TO REDUNDANTLY INTERLOCK THE AIR LINE BETWEEN EACH VALVE DIAPHRAGM AND ITS ASSOCIATED POSITIONER. THE SOLENOID VALVES ARE DE-ENERGIZE TO VENT, CAUSING THE FEEDWATER VALVE TO CLOSE IN FIVE SECONDS.
2. ALL CIRCUITS ON THIS SHEET ARE NOT REDUNDANT, EXCEPT WHERE INDICATED "REDUNDANT".
3. OPEN/SHUT INDICATION FOR EACH FEEDWATER VALVE IN CONTROL ROOM.
4. FOR UNIT 1 CONTINUATION, SEE NOTE B ON SHT. 1.
QA CONDITION 1
DEVELOPED FROM CNM 1399.01-0024.014, REV. 09
WESTINGHOUSE ELECTRIC CORPORATION
NUCLEAR ENERGY SYSTEMS, PITTSBURGH, PA., U.S.A.
TITLE
DUKE ENERGY CATAWBA UNIT 1
FUNCTIONAL DIAGRAMS
FEEDWATER CONTROL & ISOLATION
7244045
REVISIONS
1 RELEASED FOR 2012 FSAR UPDATE EFFECT. 1-6-12
2 RELEASED FOR 2013 FSAR UPDATE EFFECT. 2-28-13


REDUNDANT
MANUAL BLOCK (NOTE 7)
P-11 (SHEET 6)
P-14 STM. GEN. HI-HI LEVEL (SHEET 7)
SAFETY INJECTION (SHEET 8)
P-4 REACTOR TRIP (SHEET 2)
LOW T AVG (SHEET 5)
MANUAL RESET (NOTE 4)
REDUNDANT
STEAM GENERATOR "A" FOR CONTROL ALGORITHM AND ACTUATION LOGIC, (SEE NOTE 8)
FEEDWATER BYPASS VALVE A DEMAND
FEEDWATER MAIN VALVE A DEMAND
STEAM GENERATOR "B" FOR CONTROL ALGORITHM AND ACTUATION LOGIC, (SEE NOTE 8)
FEEDWATER BYPASS VALVE B DEMAND
FEEDWATER MAIN VALVE B DEMAND
REDUNDANT
TRIP ALL FEEDWATER PUMPS (NOTES 5 & 6)
TURBINE TRIP (SHEET 16)
LOOP C & D INTERLOCK (SHEET 14)
CLOSE ALL FEEDWATER ISOLATION VALVES (BY OTHERS) (NOTE 3)
(NOTE 1)
REDUNDANT
MODULATE FEEDWATER BYPASS VALVE A FCV-510 (CF28) (NOTE 3)
MODULATE FEEDWATER MAIN VALVE A FCV-510A (CF38) (NOTE 3)
REDUNDANT
MODULATE FEEDWATER BYPASS VALVE B FCV-520A (CF37) (NOTE 3)
MODULATE FEEDWATER MAIN VALVE B FCV-520 (CF39) (NOTE 3)
NOTES:
1. ANALOG GATE CONSISTS OF TWO SOLENOID VENT VALVES IN SERIES TO REDUNDANTLY INTERLOCK THE AIR LINE BETWEEN EACH VALVE DIAPHRAGM AND ITS ASSOCIATED POSITIONER. THE SOLENOID VALVES ARE DE-ENERGIZE TO VENT, CAUSING THE FEEDWATER VALVE TO CLOSE IN FIVE SECONDS.
2. ALL CIRCUITS ON THIS SHEET ARE NOT REDUNDANT, EXCEPT WHERE INDICATED "REDUNDANT".
3. OPEN/SHUT INDICATION FOR EACH FEEDWATER VALVE IN CONTROL ROOM.
4. THE REDUNDANT MANUAL RESET CONSISTS OF TWO MOMENTARY CONTROLS ON THE CONTROL BOARD, ONE FOR EACH TRAIN.
5. TRIPPING OF FEEDWATER PUMPS CAUSES CLOSURE OF ASSOCIATED PUMP DISCHARGE VALVES.
6. THE FEEDWATER PUMPS AND PUMP DISCHARGE VALVES ARE SUPPLIED BY OTHERS.
7. TWO KEYLOCK SWITCHES, ONE FOR EACH TRAIN. SUPPLIED BY OTHERS.
8. FOR CONTINUATION, SEE NOTE 8 ON SHT. 1.
QA CONDITION 1
WESTINGHOUSE ELECTRIC CORPORATION
DUKE POWER COMPANY
CATAWBA UNIT 2
FUNCTIONAL DIAGRAMS
FEEDWATER CONTROL & ISOLATION
7244045

Feedwater Control & Isolation




SAFETY INJECTION SIGNAL (SHEET 8)
STEAM GENERATOR A 2/4 LOW LOW LEVEL (SHEET 7)
STEAM GENERATOR B 2/4 LOW LOW LEVEL (SHEET 7)
STEAM GENERATOR C 2/4 LOW LOW LEVEL (SHEET 7)
STEAM GENERATOR D 2/4 LOW LOW LEVEL (SHEET 7)
BY OTHERS
TRIP OF MAIN FEED PUMPS
FP-1
FP-2
BLACK-OUT SIGNAL
MANUAL START,CONTROL ROOM (NOTE 7)
MANUAL START,LOCAL (NOTES 2,3&7)
MANUAL STOP,CONTROL ROOM (NOTE 7)
MANUAL STOP,LOCAL (NOTES 2,3&7)
NOT REDUNDANT
NOT REDUNDANT
MANUAL CONTROL CONTROL ROOM (NOTE 6)
MANUAL CONTROL CONTROL ROOM (NOTE 6)
MANUAL CONTROL CONTROL ROOM
MANUAL CONTROL LOCAL (NOTES 2&6)
MANUAL CONTROL LOCAL (NOTES 2&6)
MANUAL CONTROL LOCAL (NOTE 2)
(NOTE 8)
MOTOR DRIVEN AUX.FEED PUMP FEED SYSTEM VALVES (NOTE 4)
TURBINE DRIVEN AUX.FEED PUMP FEED SYSTEM VALVES (NOTE 4)
C.R.
LOCAL
TURBINE SPEED CONTROL
BLACK-OUT SIGNAL
MANUAL START CONTROL ROOM
MANUAL START LOCAL (NOTES 2&3)
MANUAL STOP CONTROL ROOM
MANUAL STOP LOCAL (NOTE 2&3)
(NOTE 10)
STOP
START
MOTOR DRIVEN AUX.FEED PUMPS 1 & 2 (NOTES 1&5)
(NOTES 9&10)
CLOSE BLOWDOWN ISOLATION AND SAMPLE LINE VALVES FOR ALL STEAM GENERATORS
START
STOP
TURBINE DRIVEN AUX.FEED PUMP (NOTE 5)
NOTES:
1. TRAIN A CONTROLS MAFP 1; BREAKER NUMBER
TRAIN B CONTROLS MAFP 2; BREAKER NUMBER
2. LOCAL CONTROL OVERRIDES ALL OTHER SIGNALS.
3. LOCAL OVERRIDE ACTUATES ALARM IN CONTROL ROOM.
4. OPEN/SHUT INDICATION IN CONTROL ROOM.
5. PUMP OPERATING LIGHTS IN CONTROL ROOM.
6. INDIVIDUAL FOR EACH VALVE.
7. INDIVIDUAL FOR EACH PUMP.
8. THE TURBINE SPEED CONTROL IS TYPICAL. ACTUAL IMPLEMENTATION MAY NOT INCLUDE SPEED CONTROL.
9. THE PUMP START MAY BE DELAYED AND SEQUENCED IF THE EMERGENCY DIESEL POWER CAPABILITY IS LESS THAN THE TOTAL LOAD WITH ALL SYSTEMS STARTING. THE TIME DELAY,IF USED, MAY NOT EXCEED THE MAXIMUM STARTING TIME REQUIREMENTS FOR THIS SYSTEM.
10. THE PUMP START MUST BE SEALED IN (LATCHED), SO THAT LOSS OF THE ACTUATION SIGNAL WILL NOT CAUSE THE PUMP TO STOP.
DEVELOPED FROM DWM 1399.81-0224.015, REV. 06
UFSAR Figure 7-2 (Page 23 of 25)
QA CONDITION 1
WESTINGHOUSE ELECTRIC CORPORATION
NUCLEAR ENERGY SYSTEMS PITTSBURGH, PA USA
DUKE POWER COMPANY
CATAWBA UNITS 1 & 2
FUNCTIONAL DIAGRAMS
AUXILIARY FEEDWATER PUMPS STARTUP
7244D45
REVISIONS
ERN: CN00903V


TURBINE POWER
(TURBINE IMPULSE CHAMBER PRESSURE)
REDUNDANT
P-13
TO P-7 (SHEET 4)
2ND HIGH T REF (SEE NOTE 6)
C-5
BLOCK AUTOMATIC ROD WITHDRAWAL (SHEET 9)
BYPASS FOR TURBINE TESTING/ PLANT COOLDOWN (MOMENTARY)(NOTE 5)
C-16 2ND LOW T AVG (SEE NOTE 6)
STOP TURBINE LOADING (BY OTHERS)
NOT REDUNDANT
TURBINE RUNBACK
VIA LOAD REFERENCE
C-3 OVERTEMPERATURE ΔT (ZA) (SHEET 5)
C-4 OVERPOWER ΔT (ZA) (SHEET 5)
TURBINE CONTROLS RUNBACK CIRCUIT
NOT REDUNDANT
P-4 REACTOR TRIP (TRAIN B)(SHEET 2)
STEAM GENERATOR HI-HI LEVEL OR S.I. (TRAIN B)(SHEET 13)
STEAM GENERATOR HI-HI LEVEL OR S.I. (TRAIN A)(SHEET 13)
P-4 REACTOR TRIP (TRAIN A)(SHEET 2)
BY OTHERS
TURBINE PROTECTION SIGNALS (BY OTHERS)
MTSVS ENERGIZE
ETSVS1 ETSVS2 DE-ENERGIZE
MECHANICAL TRIP SOLENOID
ELECTRICAL TRIP SOLENOID
DEPRESSURIZE
EMERGENCY TRIP FLUID SYSTEM
CLOSE
INTERCEPTOR VALVES
CONTROL VALVES
INTERMEDIATE STOP VALVES
TURBINE STOP VALVES (NOTE 2)
2/4
REDUNDANT
GENERATOR PROTECTION SIGNALS (BY OTHERS)
P-9 (SHEET 4)
TO GENERATOR TRIP
TO REACTOR TRIP (SHEET 2)
NOTES:
1. REDUNDANCY IS INDICATED IN REGARDS TO (W) REQUIREMENTS ONLY.
2. OPEN / SHUT INDICATION IN CONTROL ROOM FOR EACH STOP VALVE.
4. THESE SIGNALS INDICATE THE FULL CLOSED POSITION OF THE STOP VALVES. POSITION DETECTION IS ACCOMPLISHED BY TWO CONTACTS PER STOP VALVE, ONE FOR EACH TRAIN. THE LOGIC SHOWN IS FOR FOUR STOP VALVES.
5. THIS FUNCTION IS USED TO BYPASS THE REDUCED TEMPERATURE DEMAND TO POWER CONTROL CIRCUITRY TO ALLOW TURBINE TESTING AND / OR TO DEFEAT THE C-16 ANNUNCIATOR SUCH AS WOULD BE REQUIRED DURING A PLANT COOLDOWN.
6. FOR UNIT 1 CONTINUATION, SEE NOTE 10 ON SHT. 1.
QA CONDITION 1
DEVELOPED FROM MANUFACTURERS DRAWING CAW 1399.01-0024 #16, REV. 07
WESTINGHOUSE ELECTRIC CORPORATION
NUCLEAR AND DEFENSE, PITTSBURGH, PA., U.S.A.
CATAWBA NUCLEAR STATION UNITS 1
TURBINE TRIP, RUNBACKS AND
OTHER SIGNALS
(W REQUIRMENTS)
7244D45
SCALE:
DO NOT SCALE
SHEET 16
REV. 1
REVISIONS

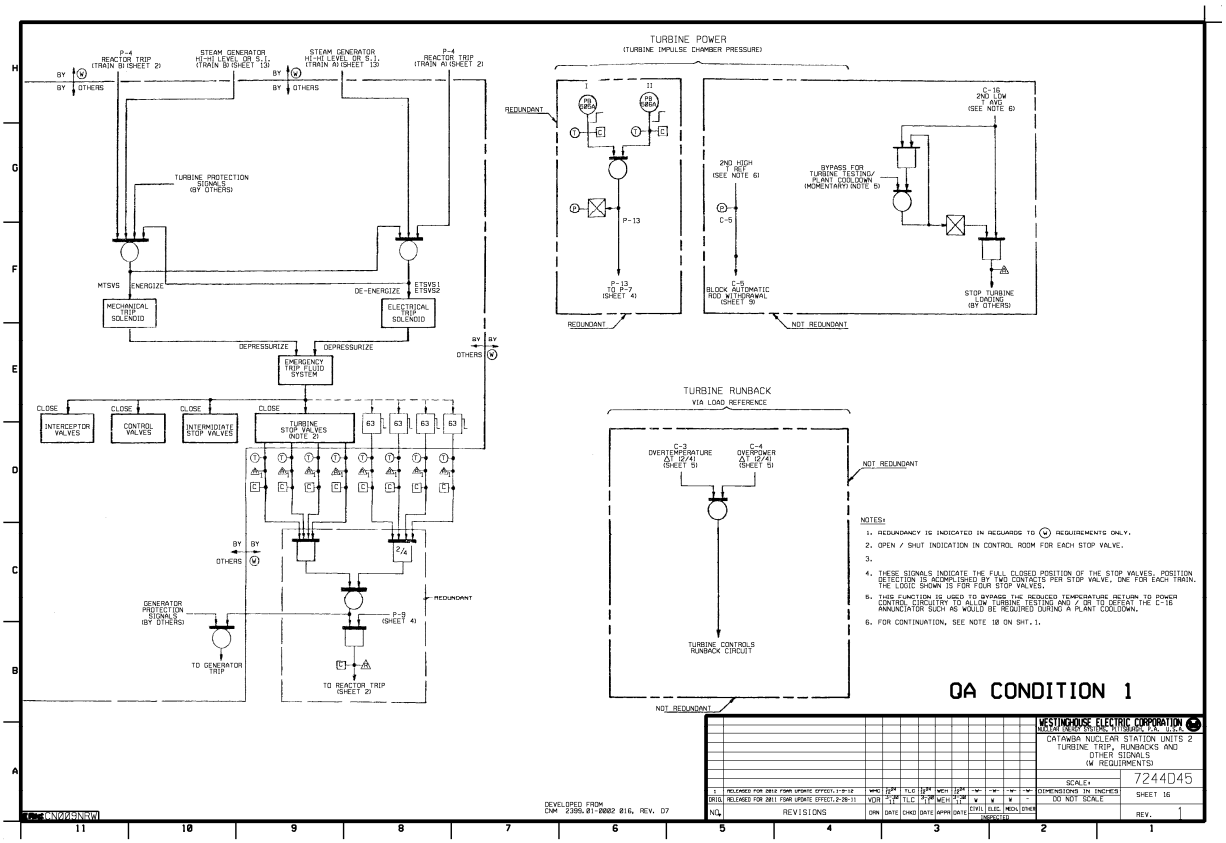

TURBINE POWER
(TURBINE IMPULSE CHAMBER PRESSURE)
TURBINE RUNBACK
VIA LOAD REFERENCE
QA CONDITION 1
NOTES:
1. REDUNDANCY IS INDICATED IN REGARDS TO (M) REQUIREMENTS ONLY.
2. OPEN / SHUT INDICATION IN CONTROL ROOM FOR EACH STOP VALVE.
4. THESE SIGNALS INDICATE THE FULL CLOSED POSITION OF THE STOP VALVES. POSITION DETECTION IS ACCOMPLISHED BY TWO CONTACTS PER STOP VALVE, ONE FOR EACH TRAIN. THE LOGIC SHOWN IS FOR FOUR STOP VALVES.
5. THIS FUNCTION IS USED TO BYPASS THE REDUCED TEMPERATURE RETURN TO POWER CONTROL CIRCUITRY TO ALLOW TURBINE TESTING AND / OR TO DEFEAT THE C-16 ANNUNCIATOR SUCH AS WOULD BE REQUIRED DURING A PLANT COOLDOWN.
6. FOR CONTINUATION, SEE NOTE 10 ON SHT. 1.
WESTINGHOUSE ELECTRIC CORPORATION
NUCLEAR ENERGY SYSTEMS, P.O. PITTSBURGH, PA.
CATAWBA NUCLEAR STATION UNITS 2
TURBINE TRIP, RUNBACKS AND
OTHER SIGNALS
(W REQUIRMENTS)
7244D45
SHEET 16
REVISIONS

Figure 7-3. Setpoint Reduction Function for Overpower and Overtemperature ΔT Trips

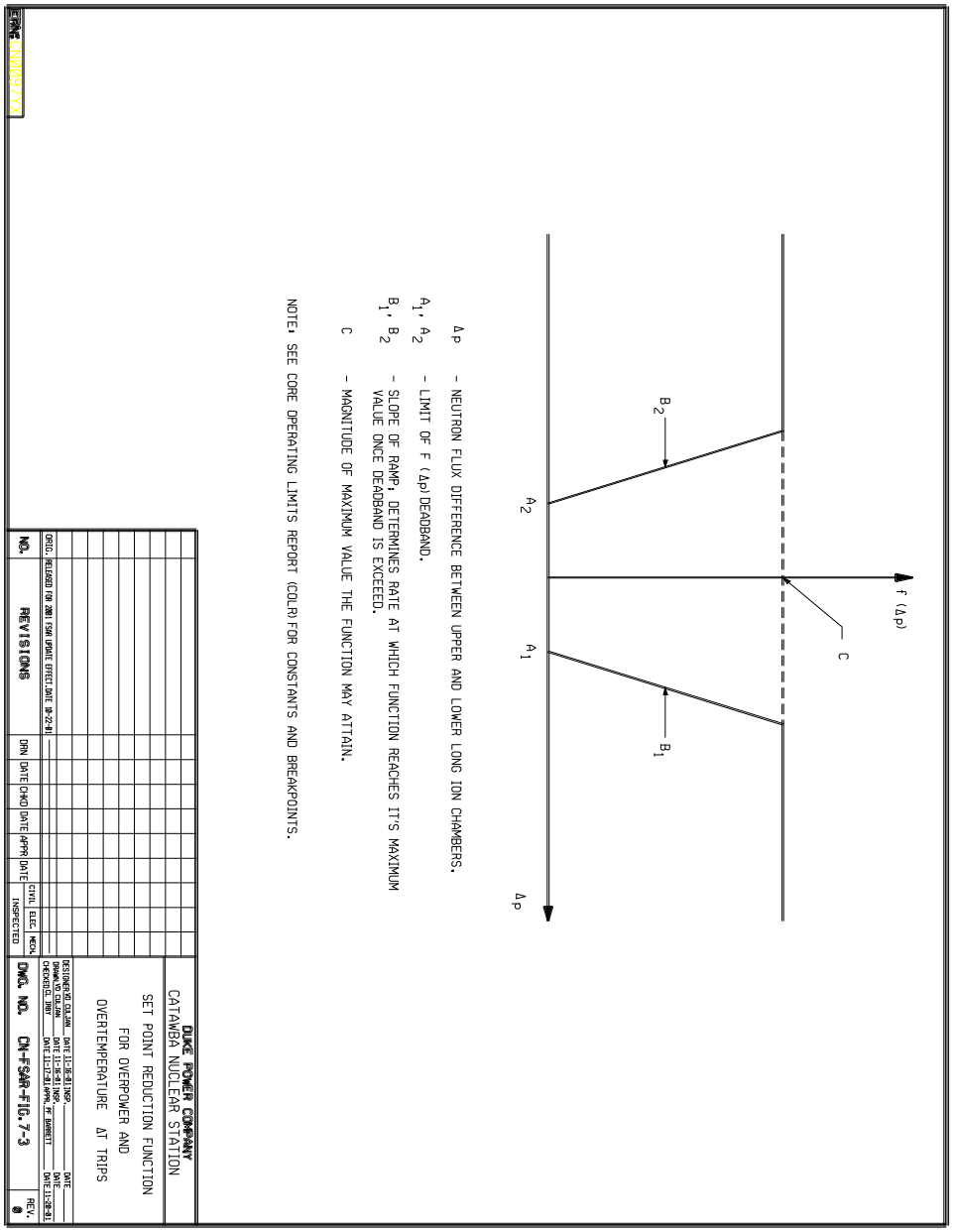


Figure 7-4. Typical ESF Test Circuits

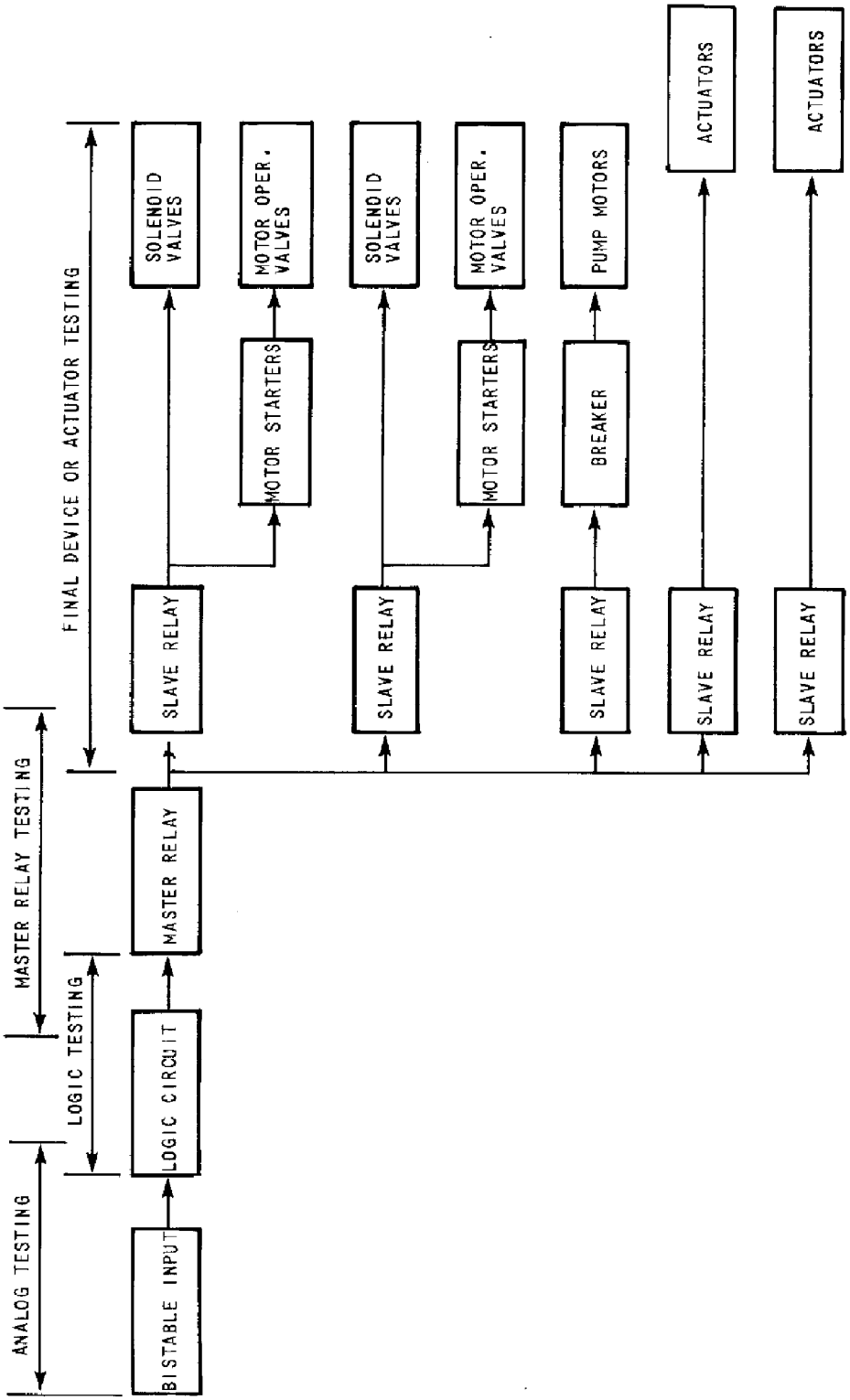
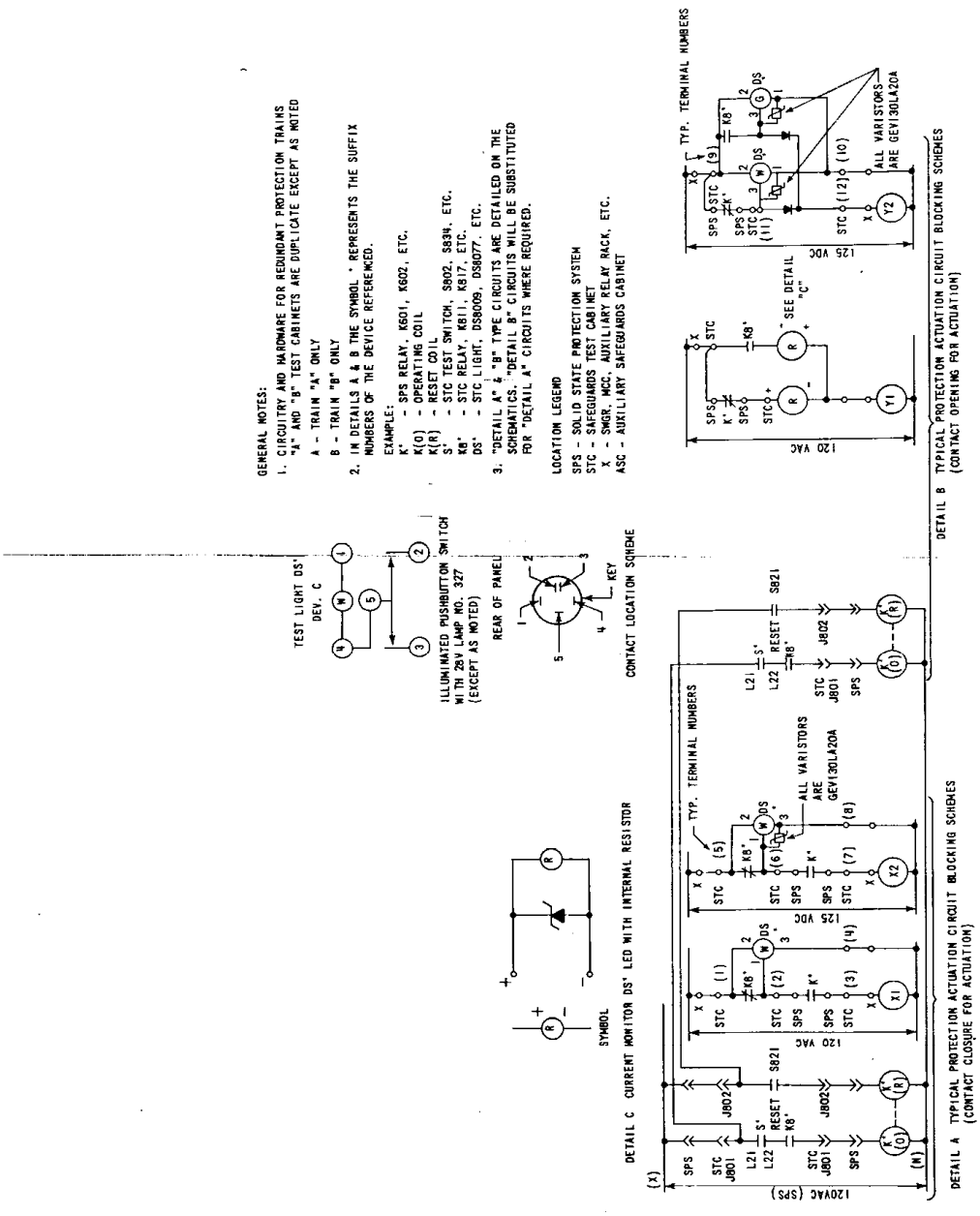


Figure 7-5. Engineered Safeguards Test Cabinet Index, Notes, and Legend



ENGINEERED SAFEGUARDS TEST CABINET
INDEX, NOTES, AND LEGEND
CATAWBA NUCLEAR STATION
Figure 7.3.2-2

Figure 7-6. Motor-Driven Auxiliary Feedwater Pump Alignment to NSW Logic Diagram

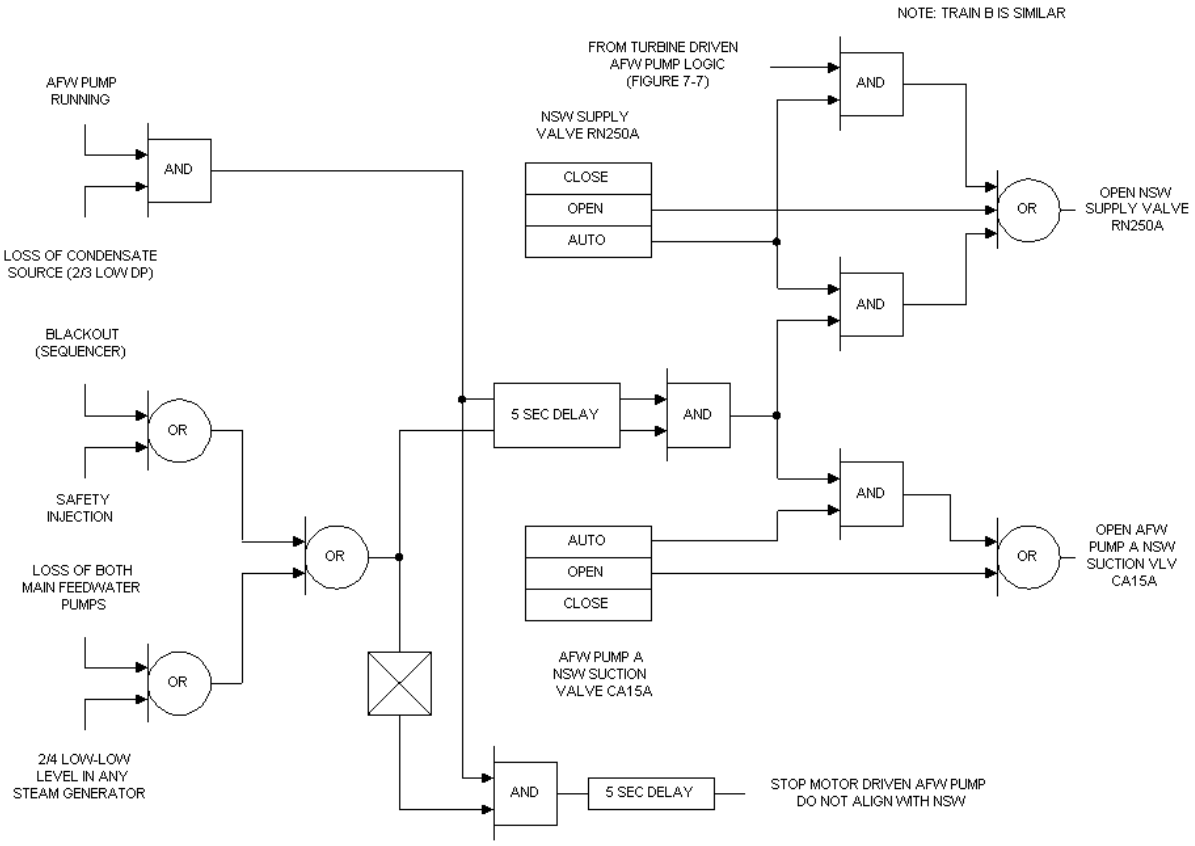


Figure 7-7. Turbine-Driven Auxiliary Feedwater Pump Alignment to NSW Logic Diagram

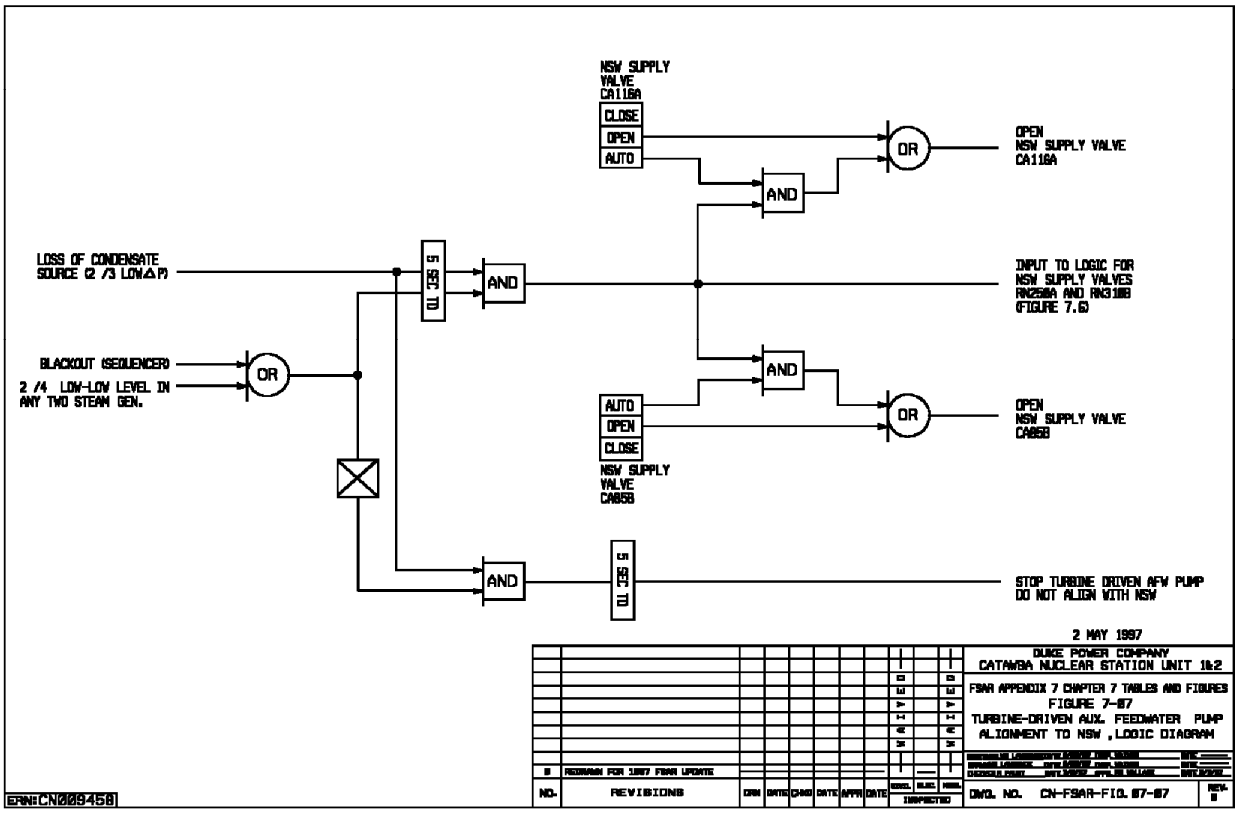
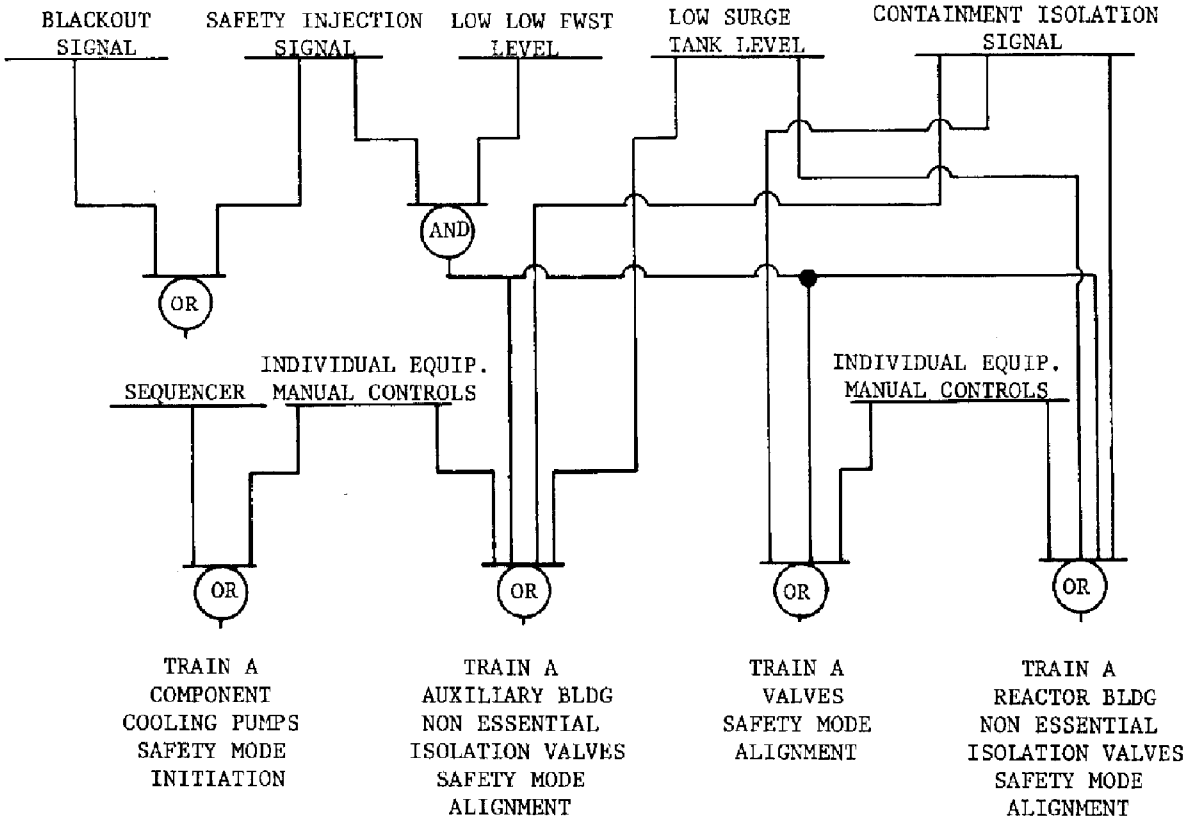


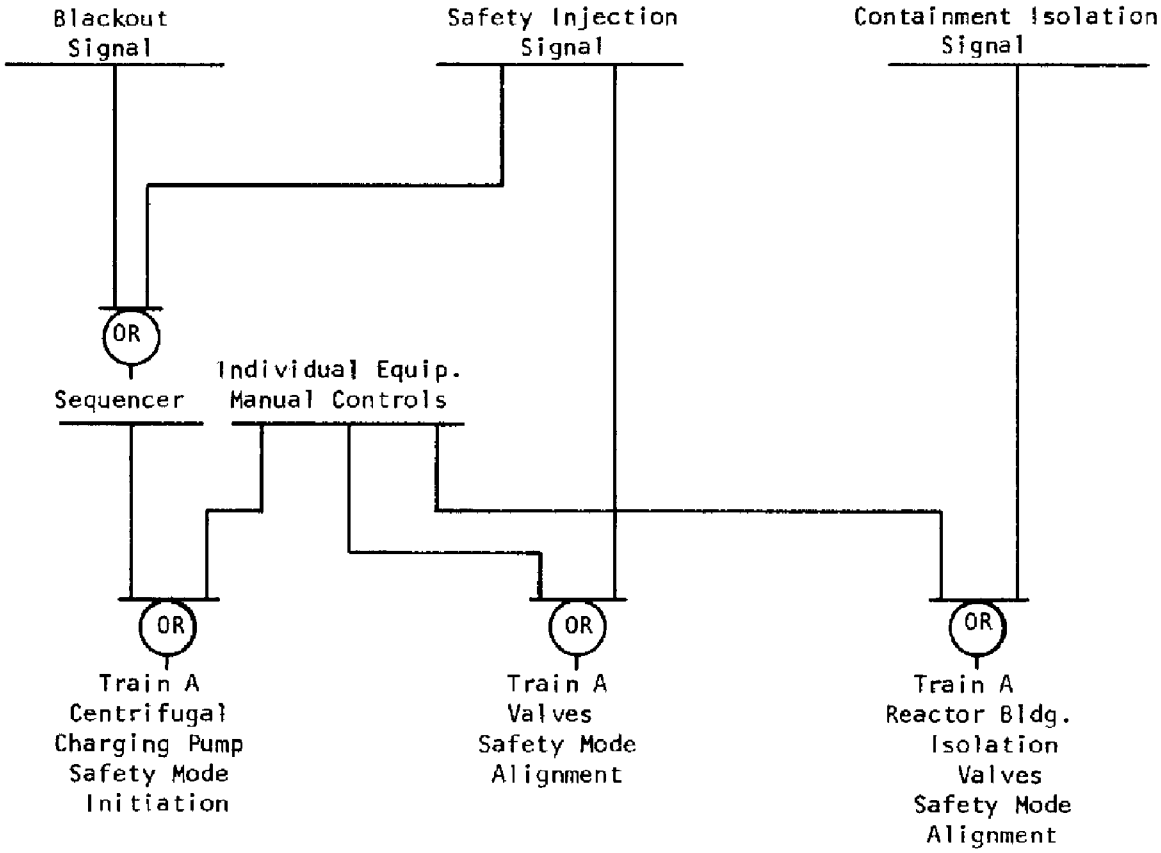
Figure 7-8. Component Cooling Water System Logic Diagram



(TRAIN B SIMILAR)

NOTE: A separate manual control switch is provided for each pump and valve which receives a safety injection or containment isolation signal. Each such device is controlled independently of any other in the manual mode. Capability for simultaneous manual actuation of all devices by a single control switch is not provided or implied.

Figure 7-9. Chemical and Volume Control System Logic Diagram



(Train B Similar)

NOTE: A separate manual control switch is provided for each pump and valve which receives a safety injection or containment isolation signal. Each such device is controlled independently of any others in the manual mode. Capability for simultaneous manual actuation of all devices by a single control switch is not provided or implied.

Figure 7-10. Residual Heat Removal Pump Logic Diagram

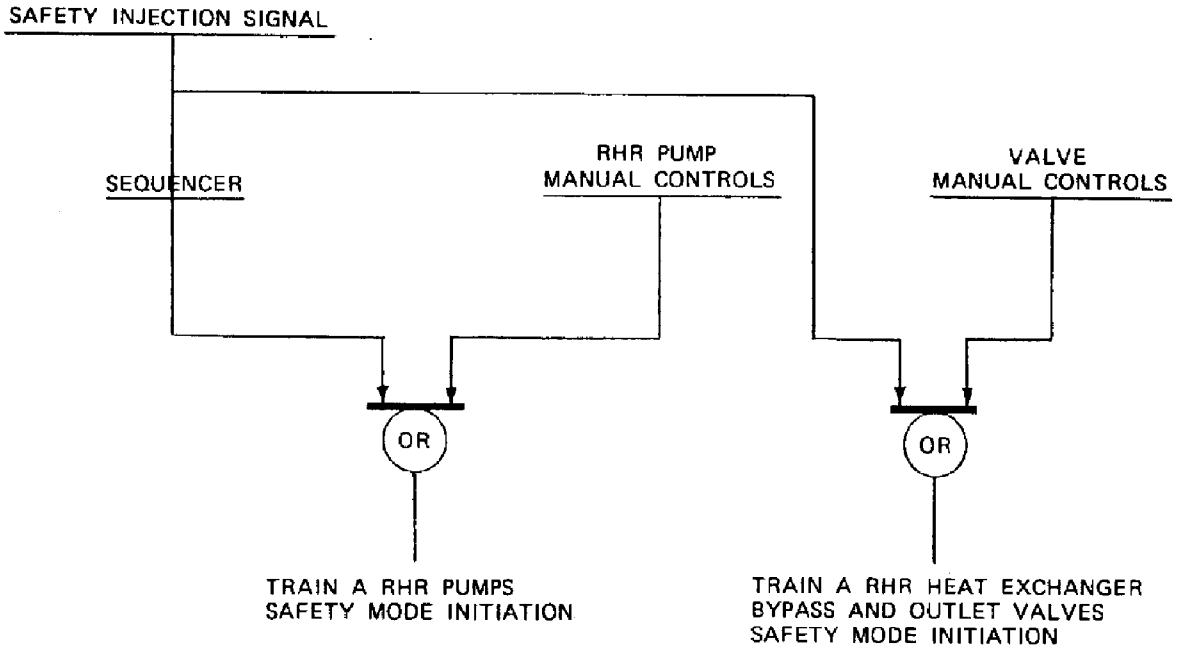


Figure 7-11. Deleted Per 1991 Update

Figure 7-12. Deleted Per 1993 Update

Figure 7-13. Cold Leg Accumulator Isolation Valves Control and Alarm Logic

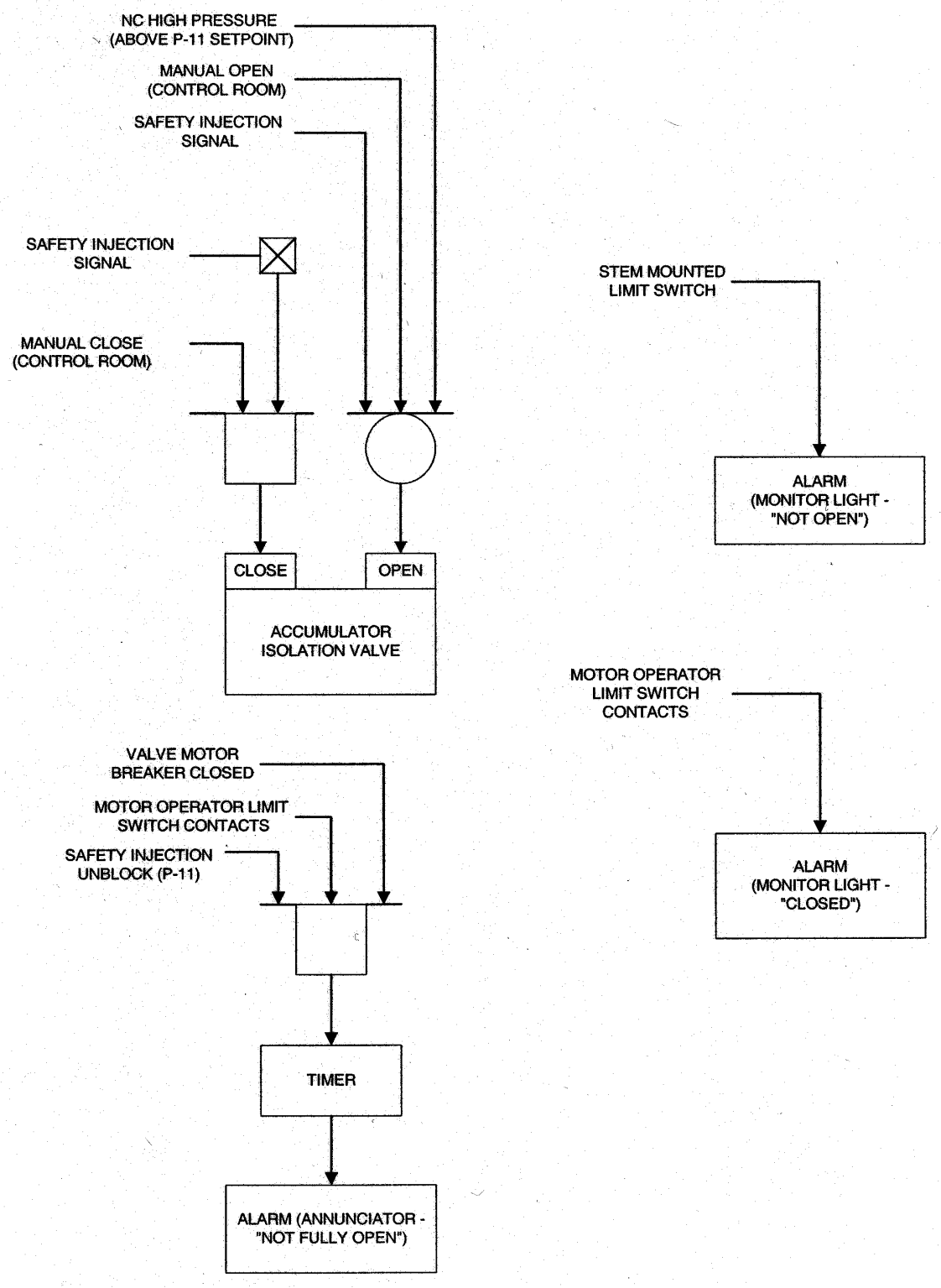


Figure 7-14. Containment Pressure Control System Logic

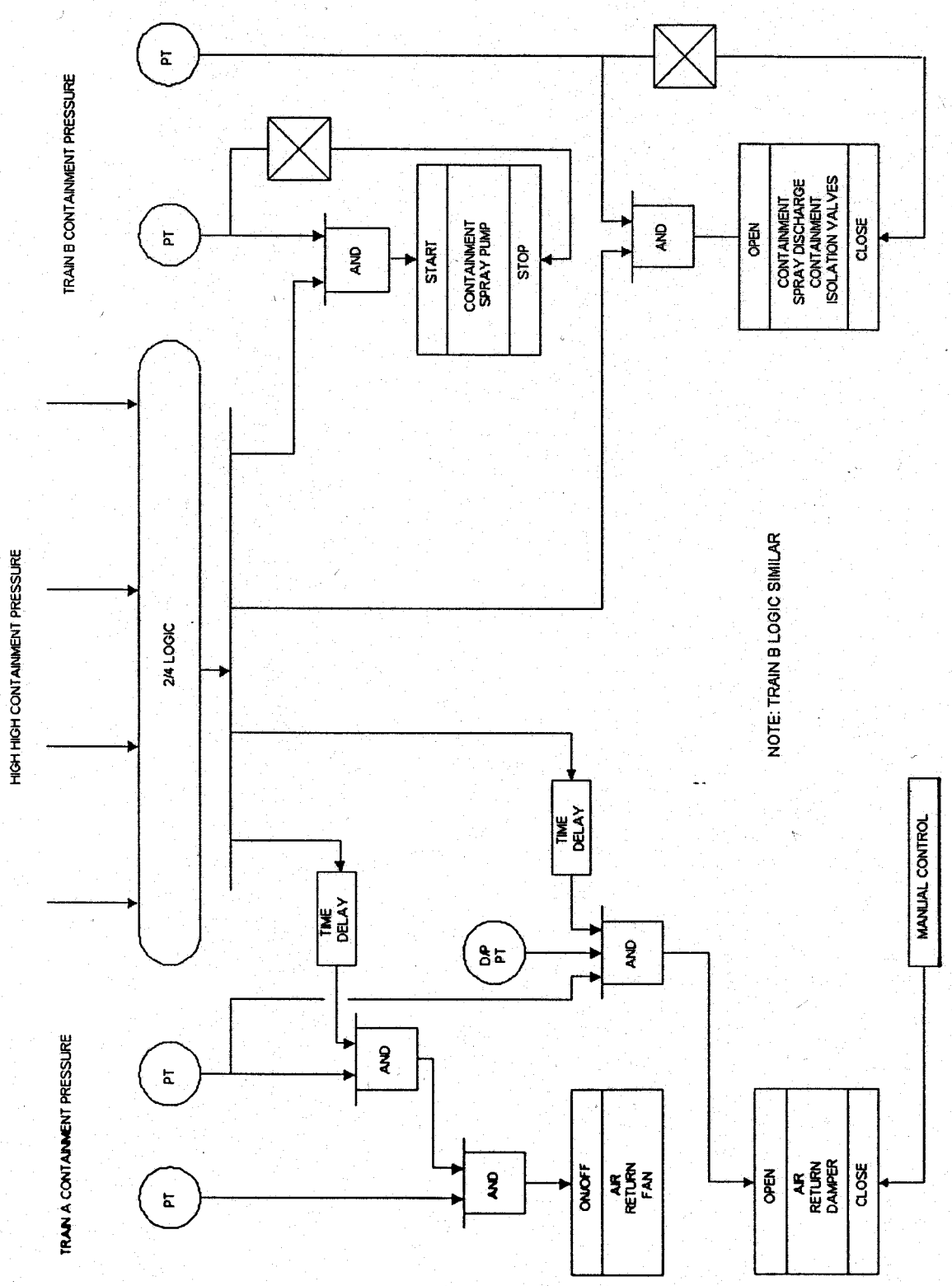


Figure 7-15. RWST Level Signal for Safety Injection System Recirculation Sump Isolation Valves

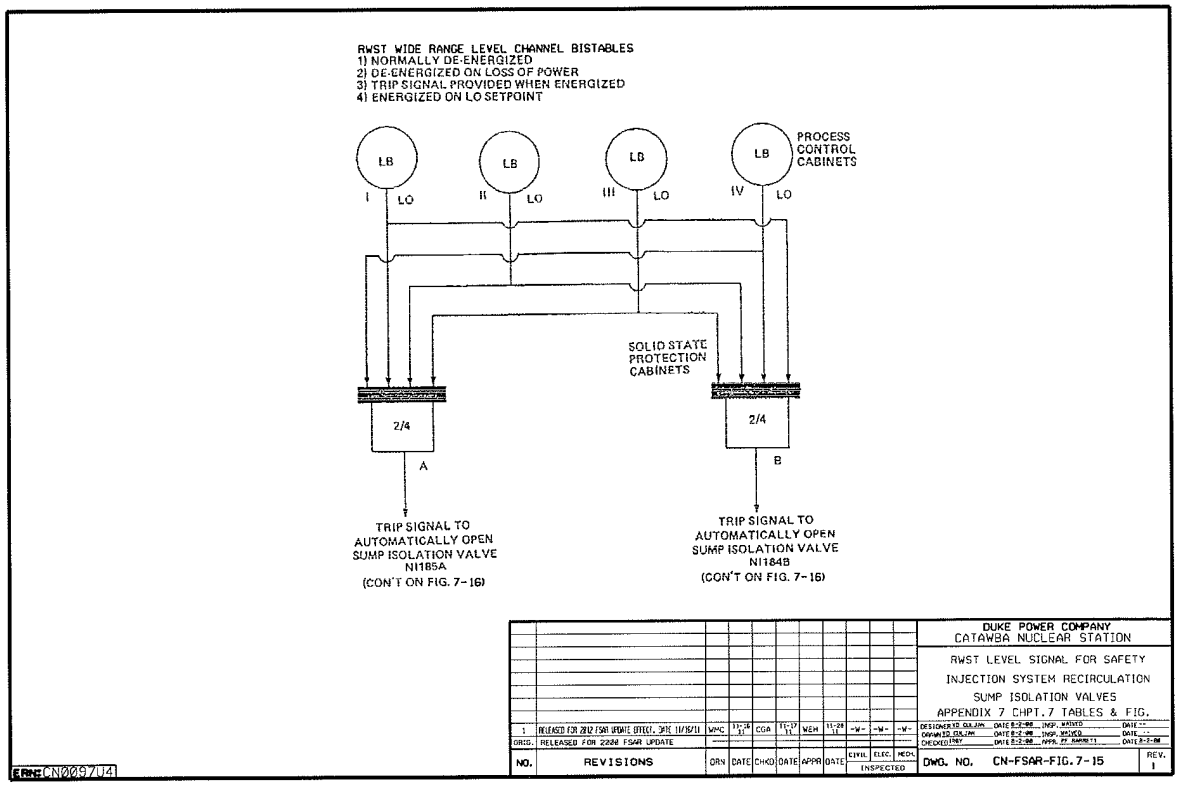
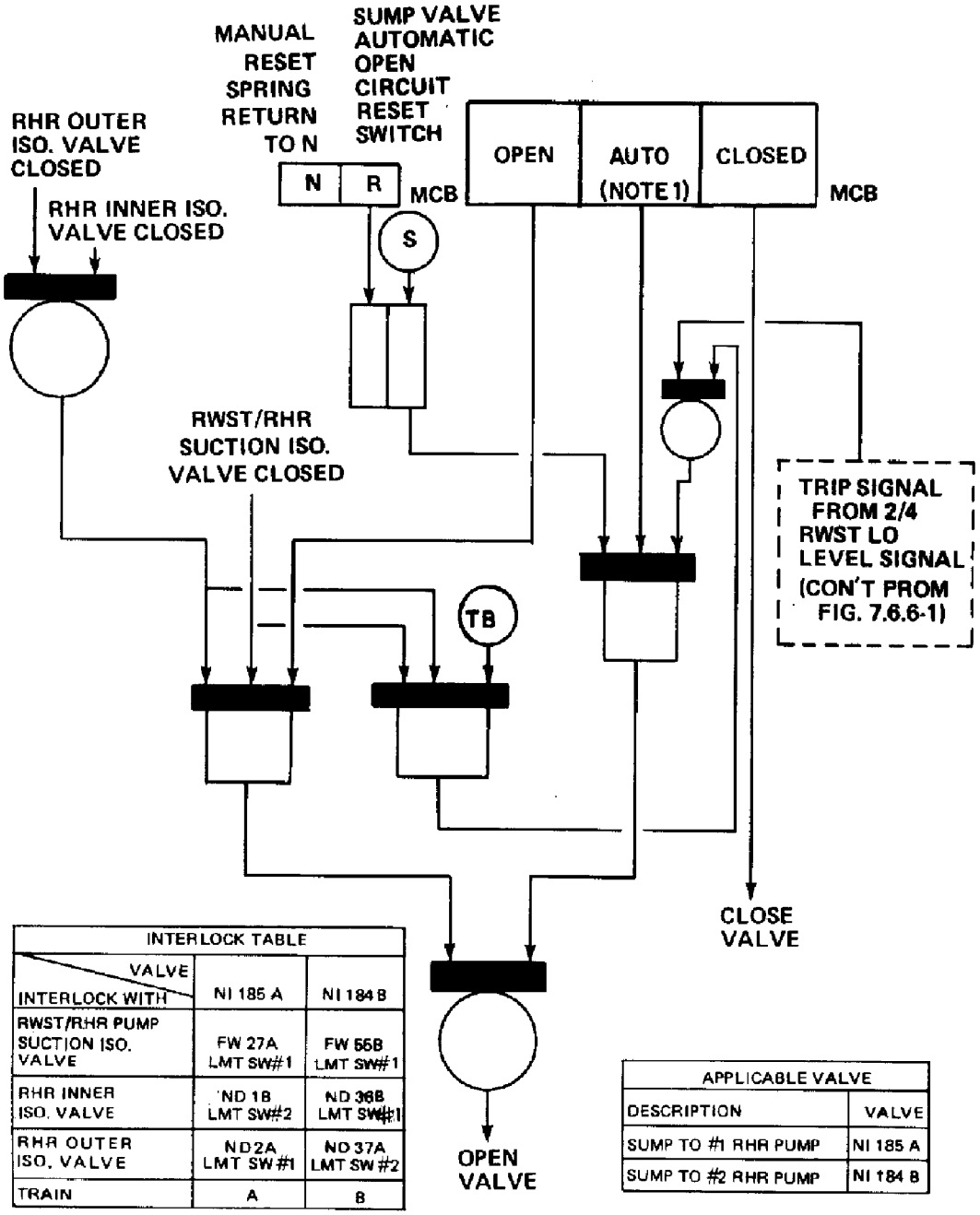


Figure 7-16. Safety Injection System Recirculation Sump Isolation Valves



INTERLOCK TABLE		
VALVE / INTERLOCK WITH	NI 185 A	NI 184 B
RWST/RHR PUMP SUCTION ISO. VALVE	FW 27A LMT SW#1	FW 56B LMT SW#1
RHR INNER ISO. VALVE	ND 1B LMT SW#2	ND 36B LMT SW#1
RHR OUTER ISO. VALVE	ND2A LMT SW#1	ND 37A LMT SW#2
TRAIN	A	B

APPLICABLE VALVE	
DESCRIPTION	VALVE
SUMP TO #1 RHR PUMP	NI 185 A
SUMP TO #2 RHR PUMP	NI 184 B

'LIMIT SWITCH #1 IS THE NORMAL POSITION SIGNAL AND IS USED FOR POSITION SIGNALS BETWEEN VALVES ASSIGNED TO THE SAME TRAIN.
LIMIT SWITCH #2 IS THE STEM MOUNTED POSITION SWITCH AND IT IS USED FOR POSITION SIGNALS BETWEEN VALVES ASSIGNED TO OPPOSITE TRAINS.
TB – TEST BUTTON (LOCATED ON WESTINGHOUSE SAFEGUARDS TEST CABINET)
S – SAFETY INJECTION SIGNAL
NOTE 1: THIS IS A TWO POSITION CUTLER-HAMMER (E30JY5) MOMENTARY OPEN/CLOSE PUSHBUTTON. THERE IS NOT AN AUTO BUTTON, BUT WHEN THE SWITCH IS NOT IN THE OPEN OR CLOSE STATE IT IS IN THE AUTO MODE.

Figure 7-17. Reactor Coolant System Overpressure Protection System for Low Pressure/Temperature Water Solid Conditions Logic Diagram

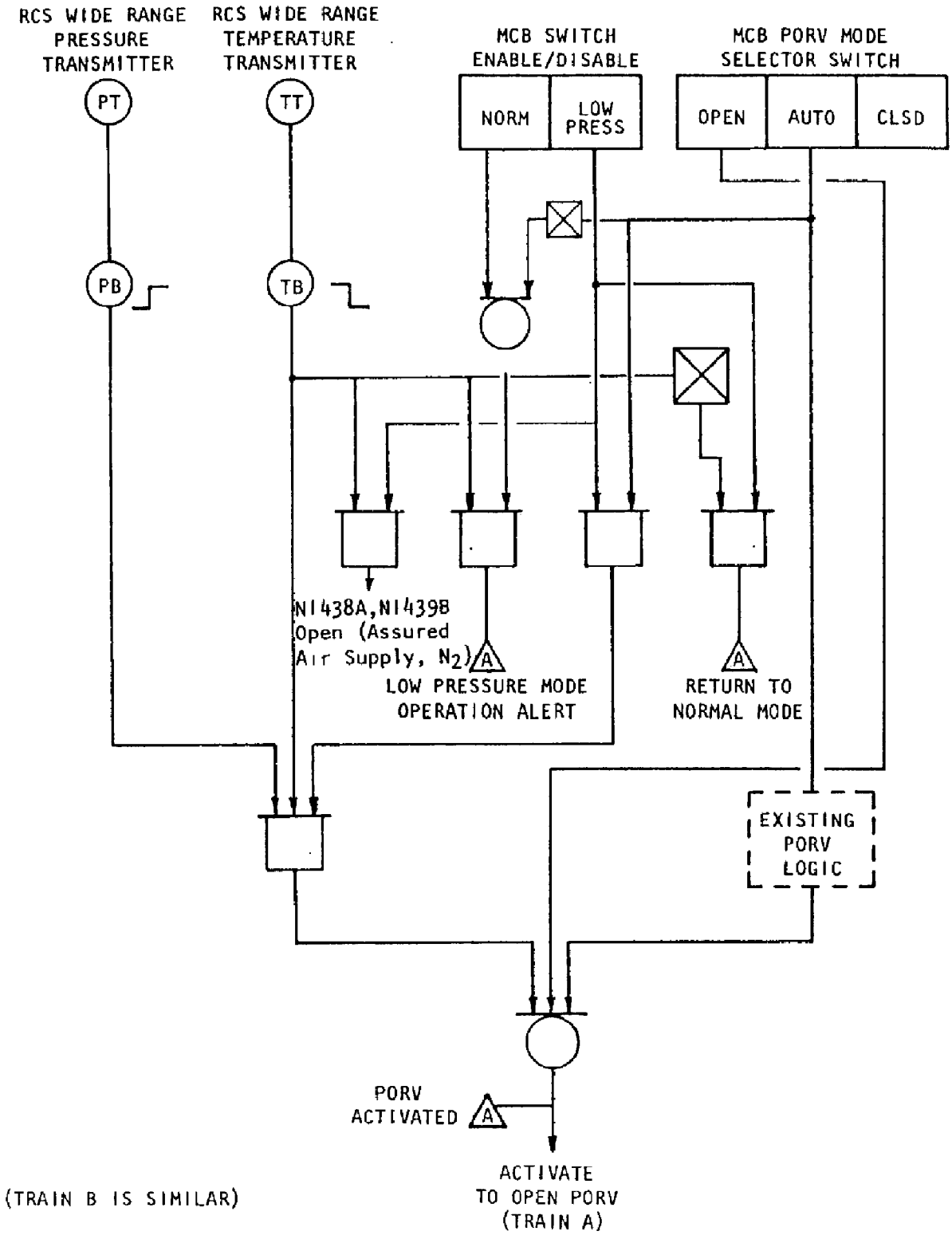


Figure 7-18. Rod Control System Block Diagram

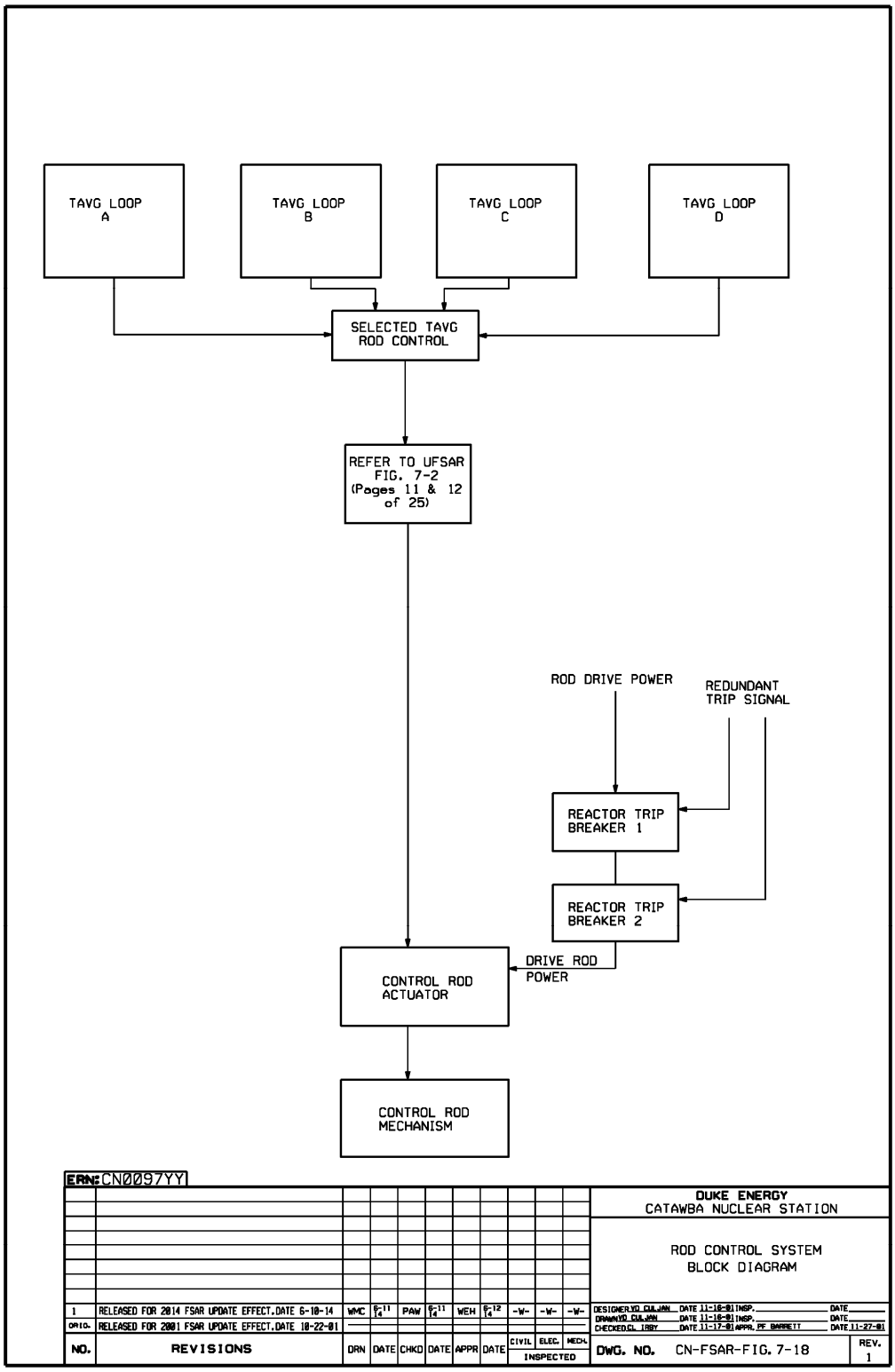
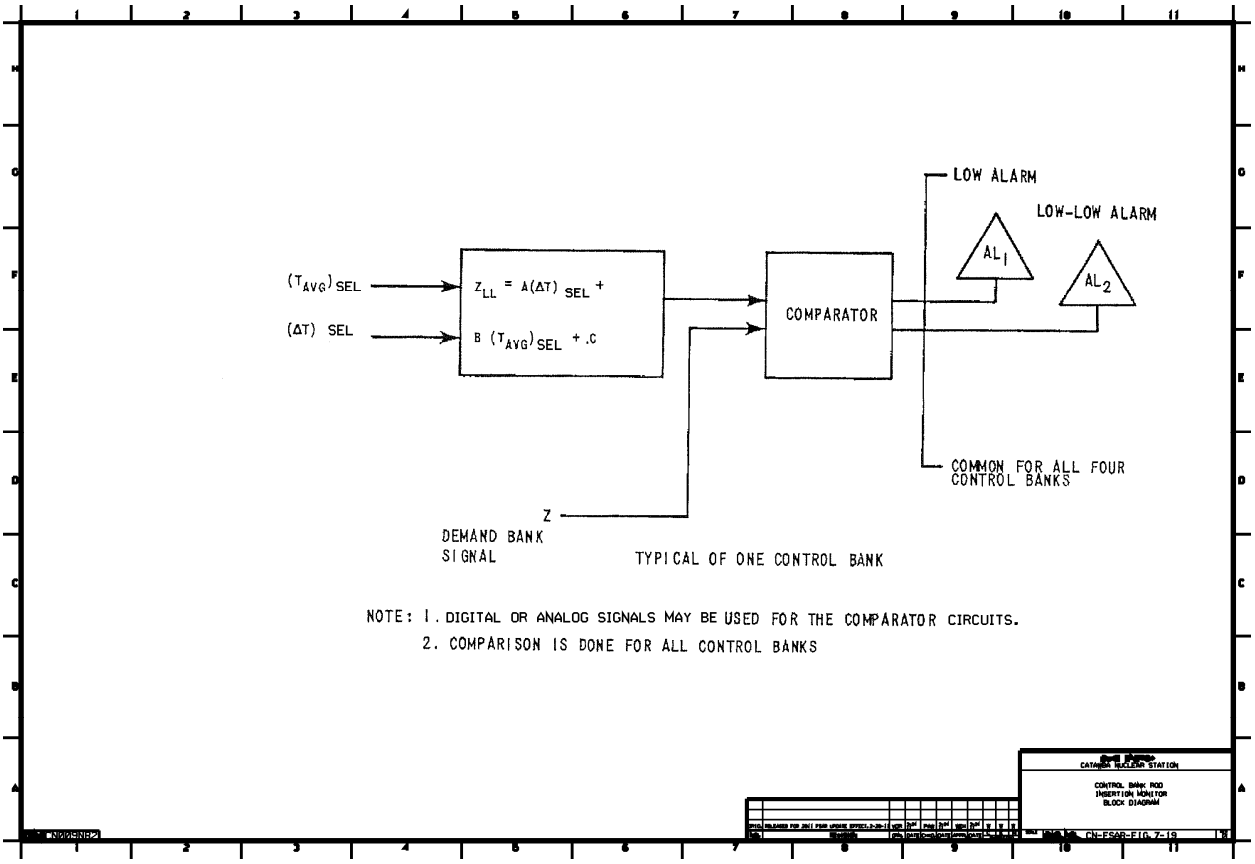
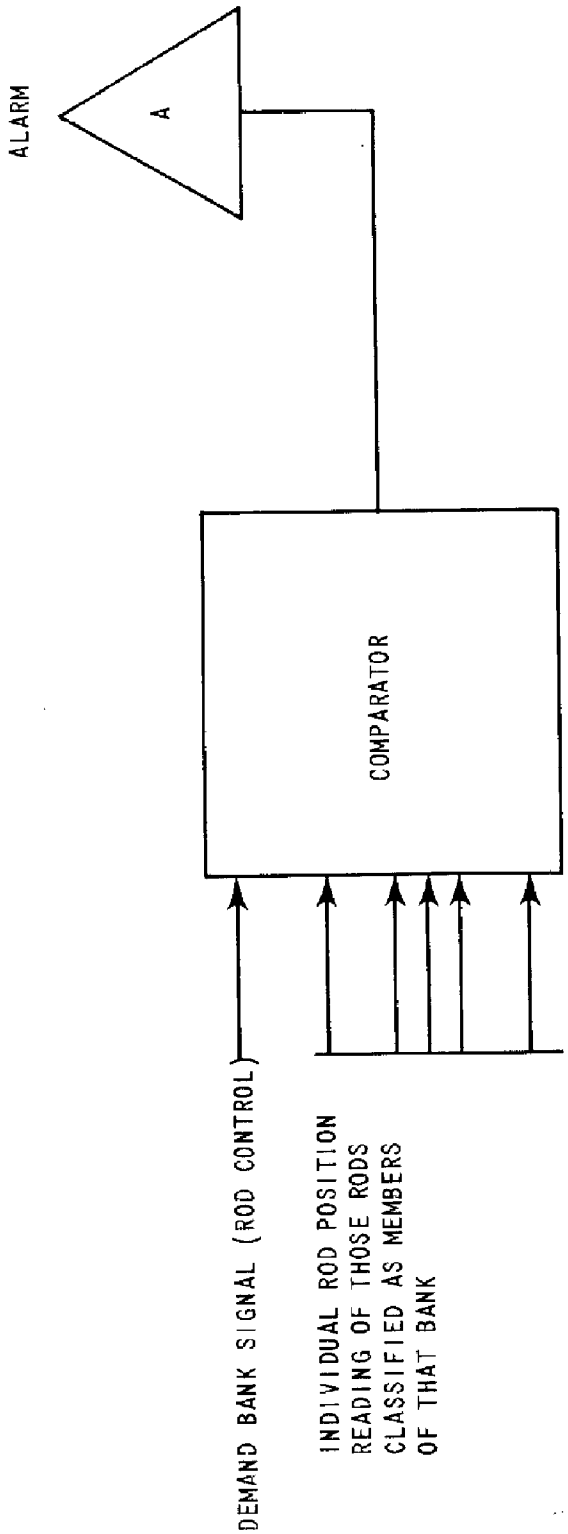


Figure 7-19. Control Bank Rod Insertion Monitor Block Diagram



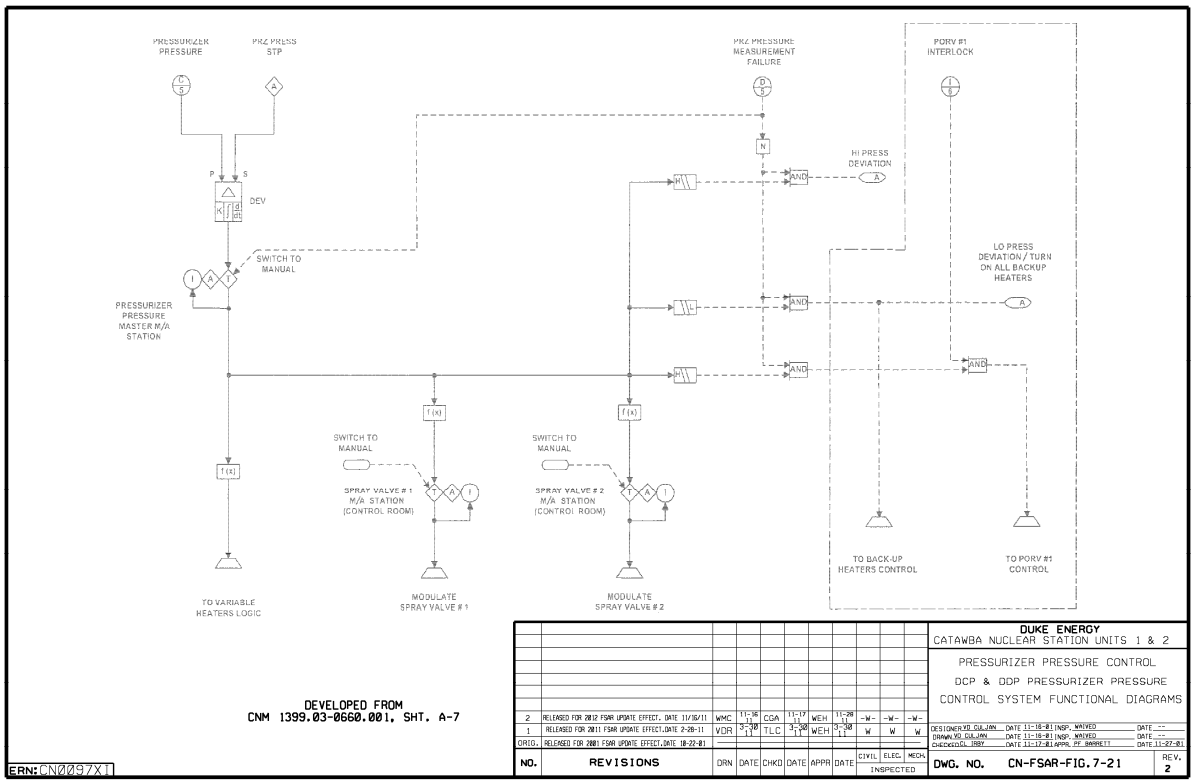
Deleted Per 2012 Update.

Figure 7-20. Rod Deviation Comparator



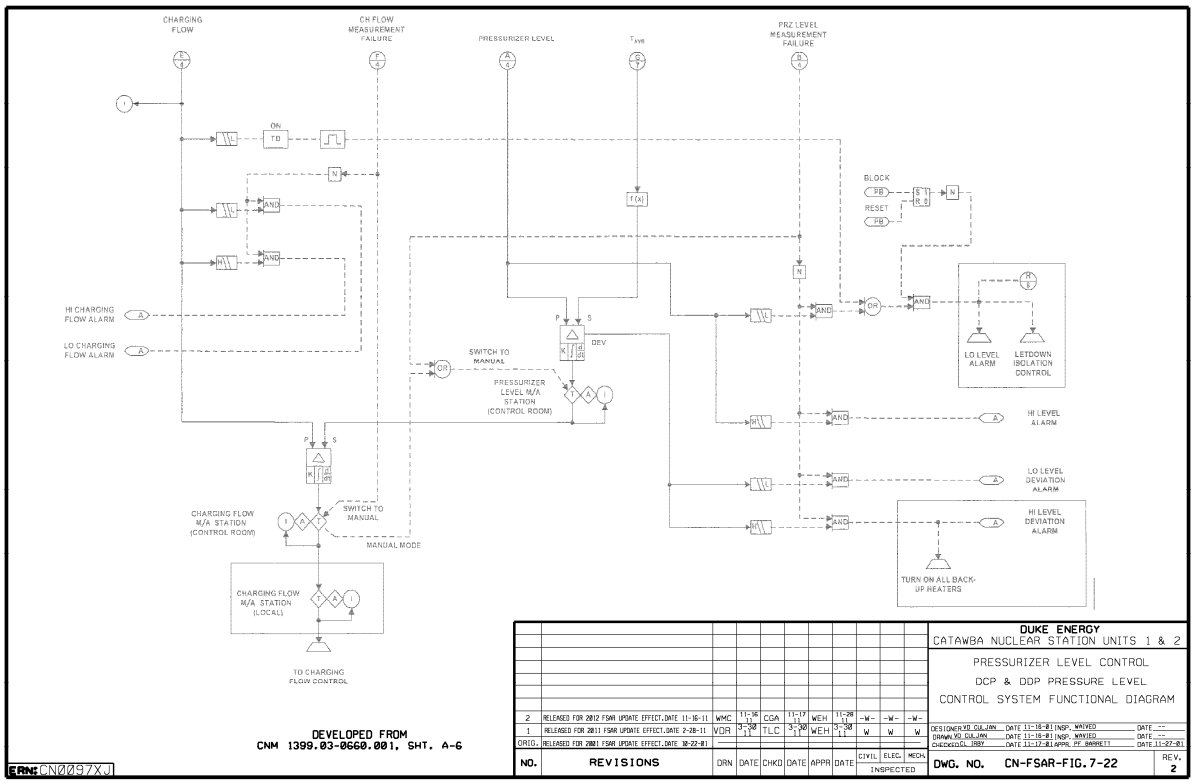
NOTE: 1. DIGITAL OR ANALOG SIGNALS MAY BE USED FOR THE COMPARATOR COMPUTER INPUTS.
2. THE COMPARATOR WILL ENERGIZE THE ALARM IF THERE EXISTS A POSITION DIFFERENCE GREATER THAN A PRESET LIMIT BETWEEN ANY INDIVIDUAL ROD AND THE DEMAND BANK SIGNAL.
3. COMPARISON IS INDIVIDUALLY DONE FOR ALL CONTROL BANKS.

Figure 7-21. Pressurizer Pressure Control



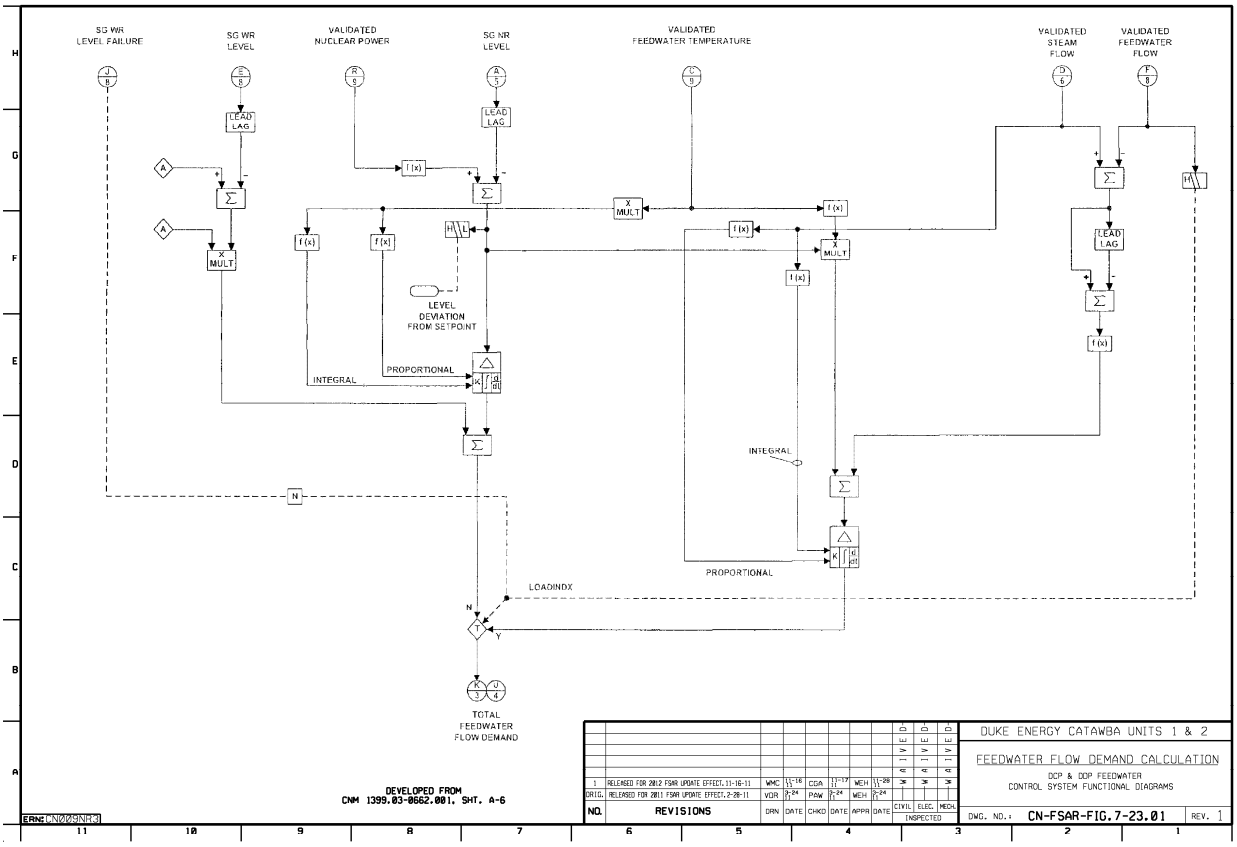
Deleted Per 2012 Update

Figure 7-22. Pressurizer Level Control System Block Diagram

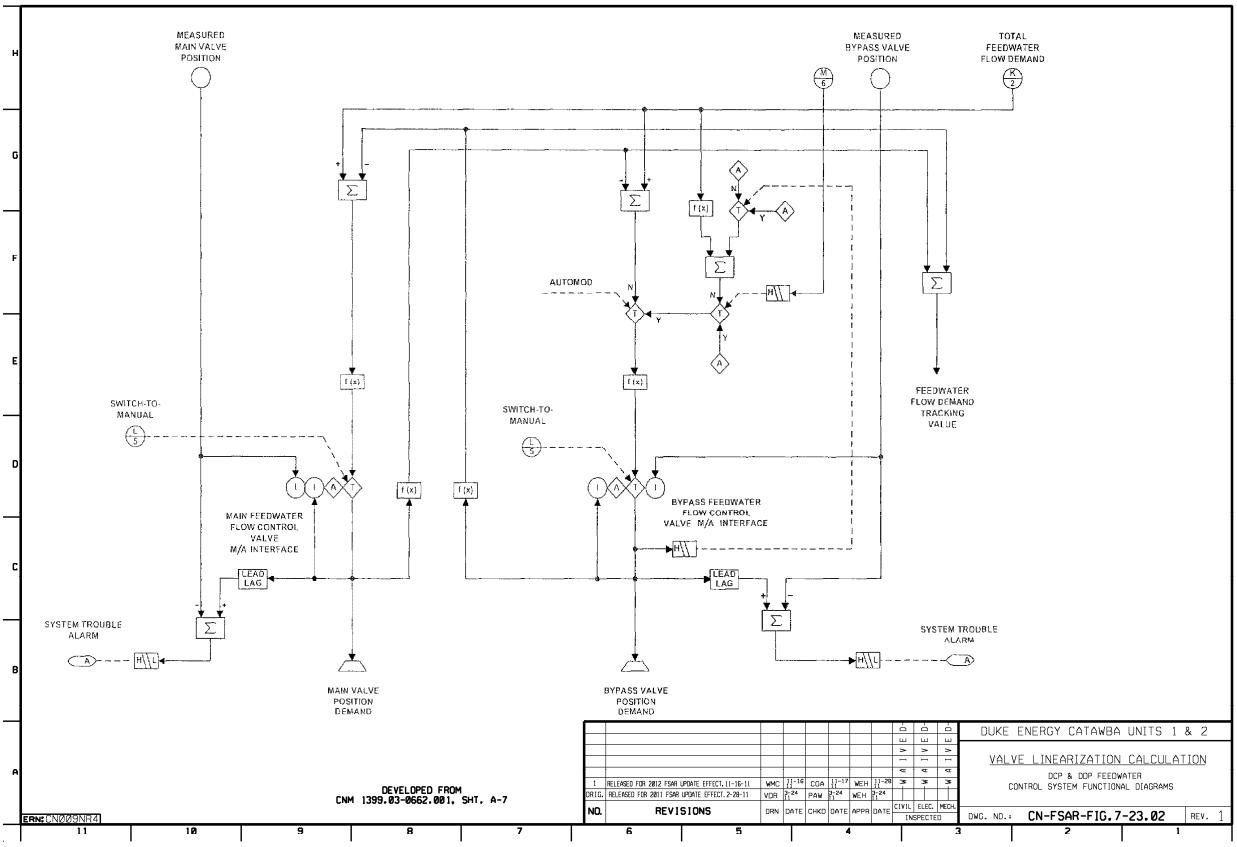


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Figure 7-23. Steam Generator Level Control

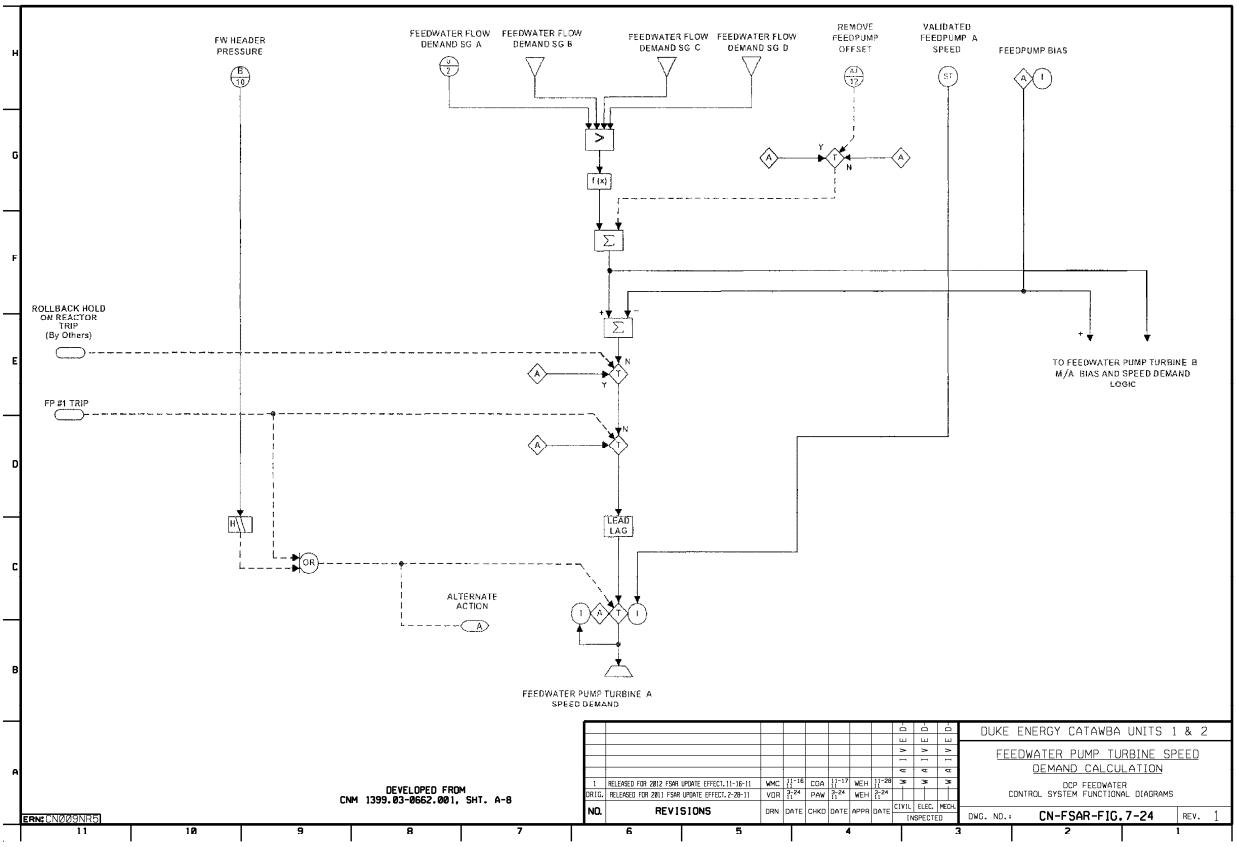


Steam Generator Level Control



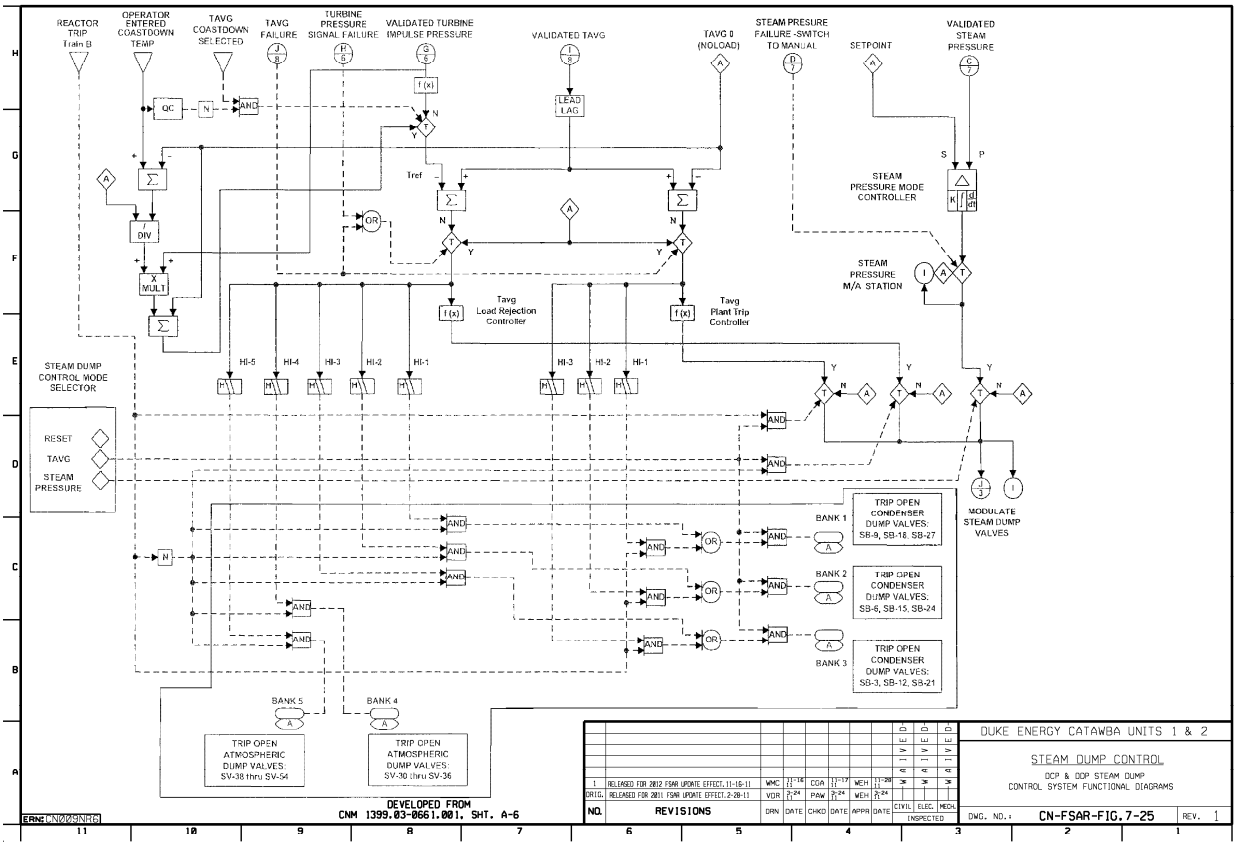
Deleted Per 2012 Update

Figure 7-24. Main Feedwater Pump Speed Control System Block Diagram



Deleted Per 2012 Update.

Figure 7-25. Steam Dump Control System



Deleted Per 2012 Update.

Figure 7-26. Basic Flux-Mapping System

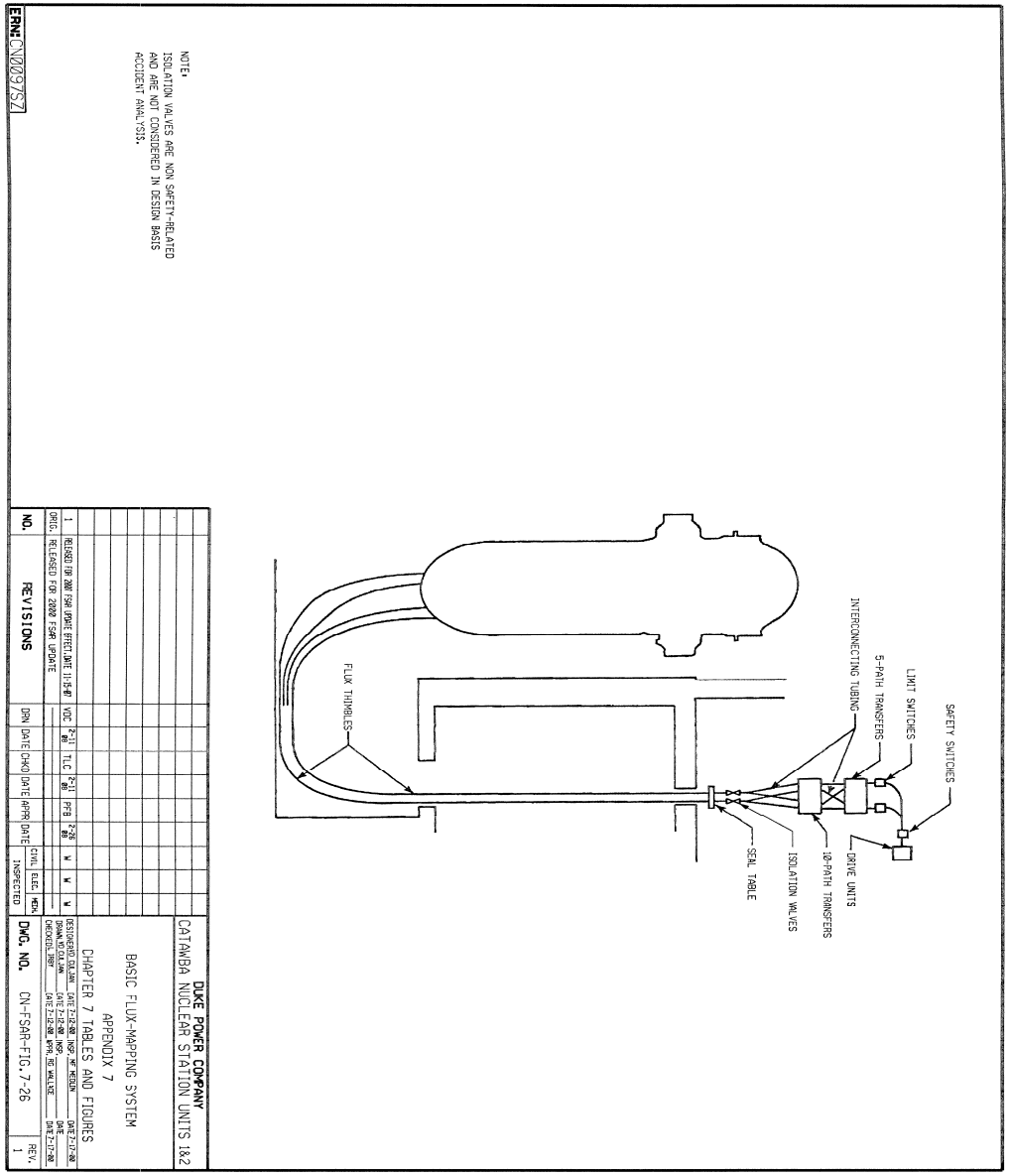


Figure 7-27. Deleted Per 1990 Update

Figure 7-28. Deleted Per 1990 Update

Figure 7-29. Deleted Per 1990 Update

Figure 7-30. Deleted Per 2000 Update

Figure 7-31. Rod Control System Simplified Block Diagram

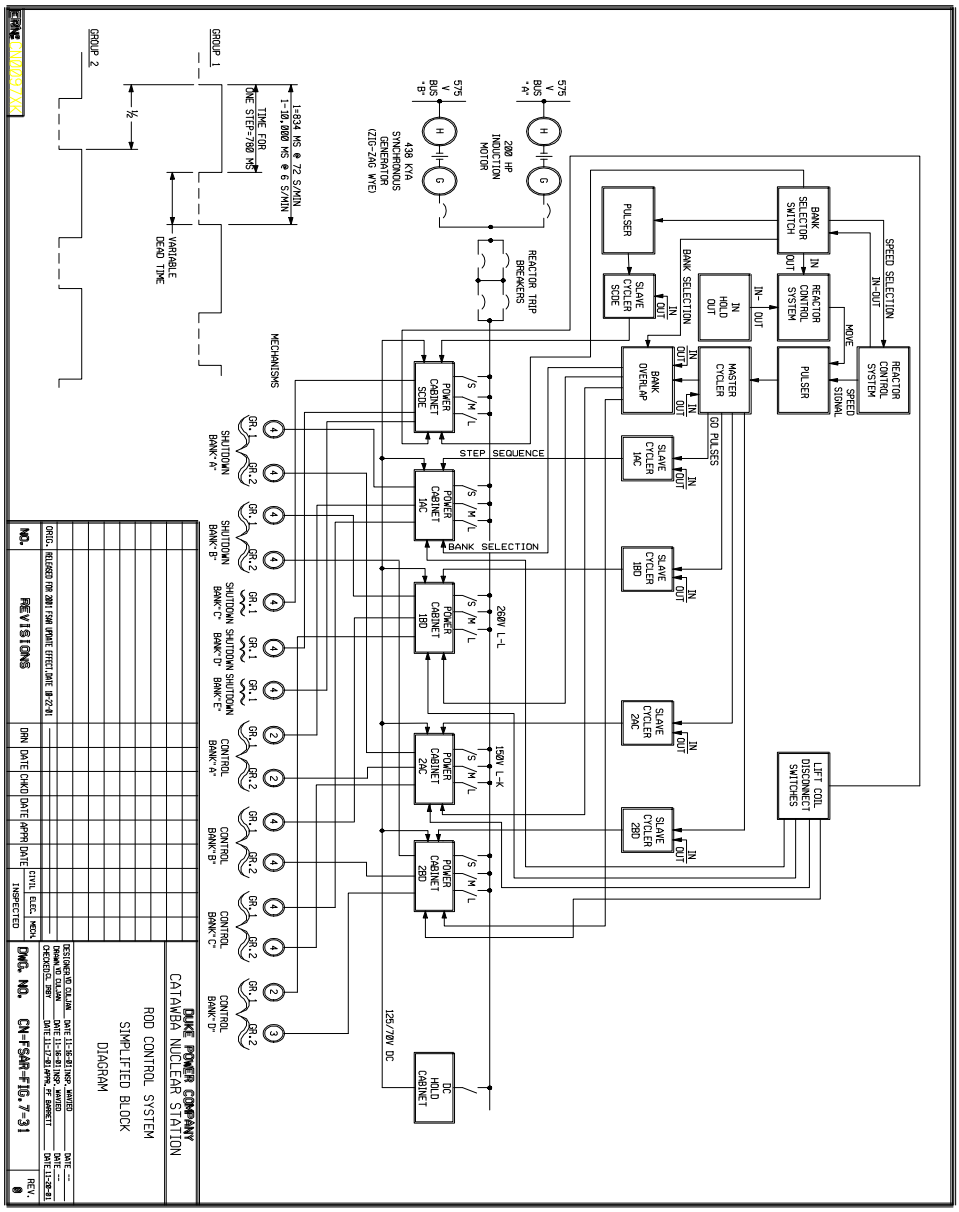


Figure 7-32. Control Bank D Power Cabinets 1BD and 2BD Partial Schematic Diagram

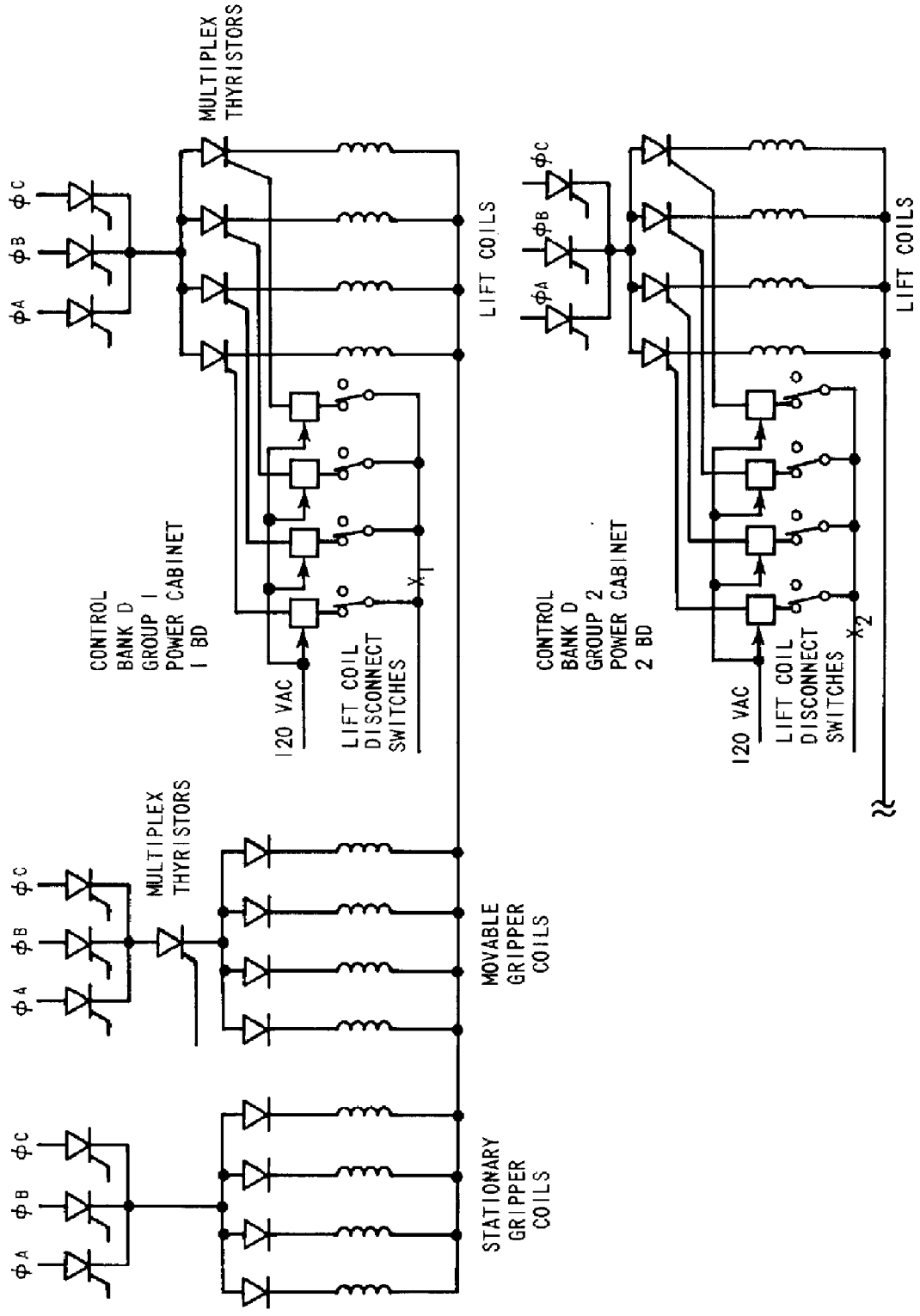


Figure 7-33. Deleted Per 1995 Update