

CALLAWAY PLANT

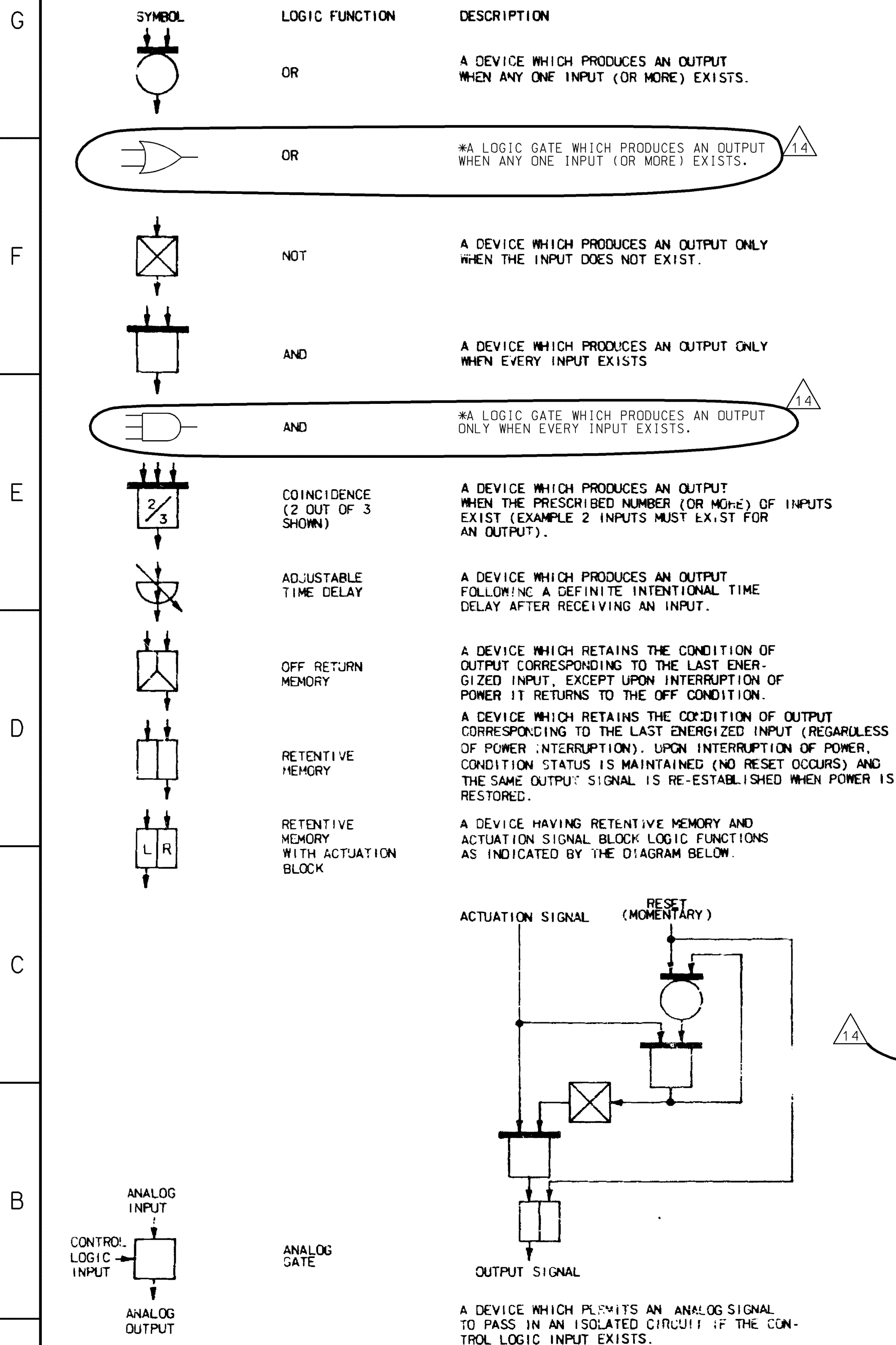
FIGURE 7.1-1

PROTECTION SYSTEM BLOCK DIAGRAM

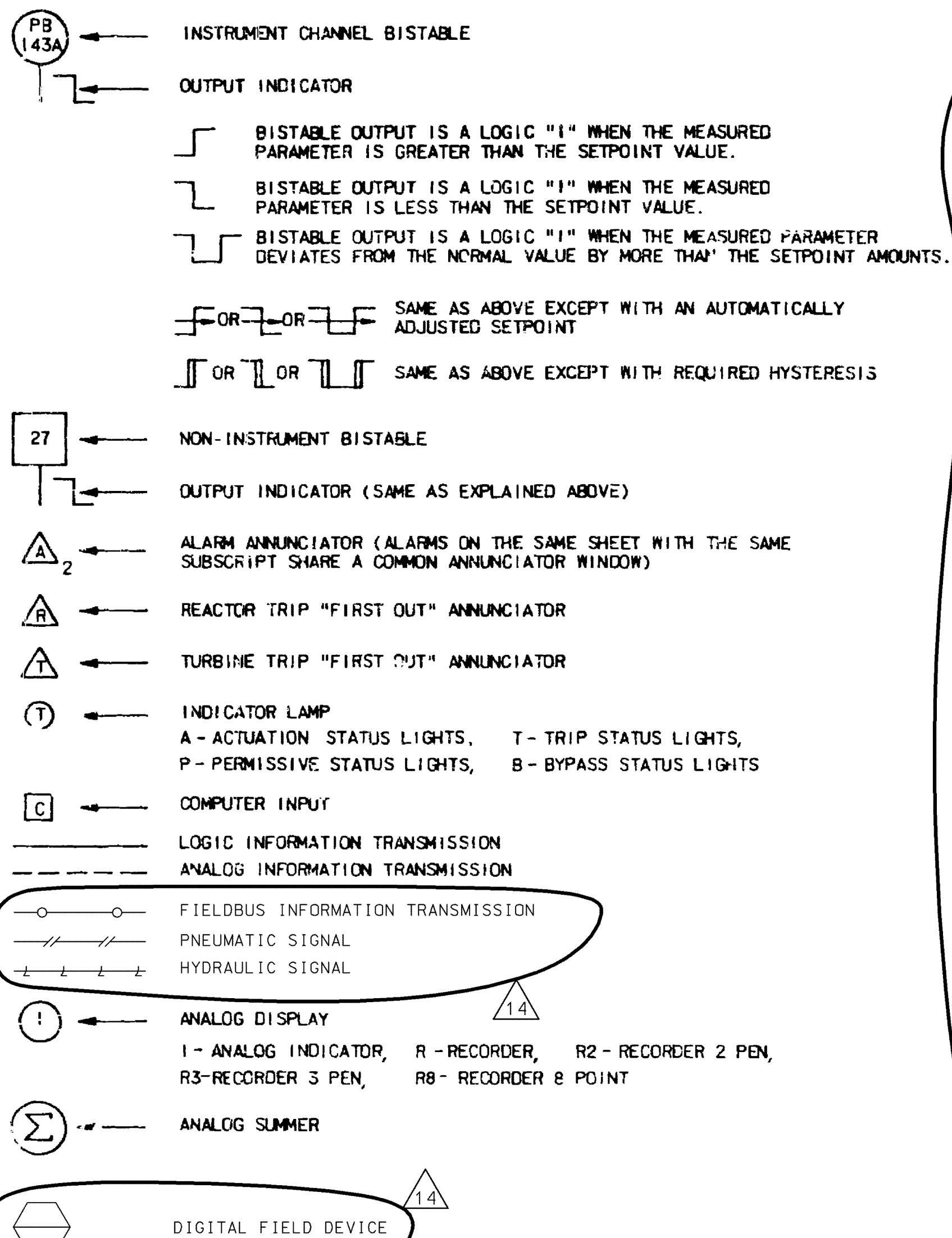
Rev. 01-0
6/86

7250D64
SHEET 1

LOGIC SYMBOLS



ADDITIONAL SYMBOLS

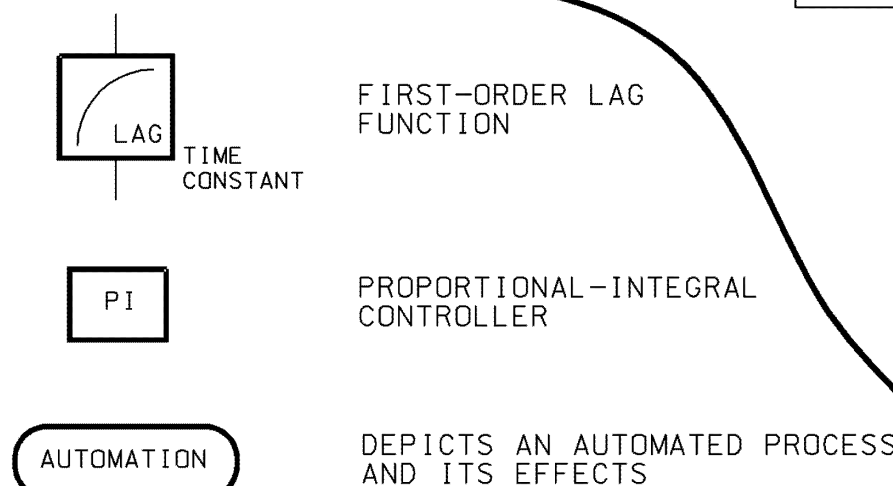
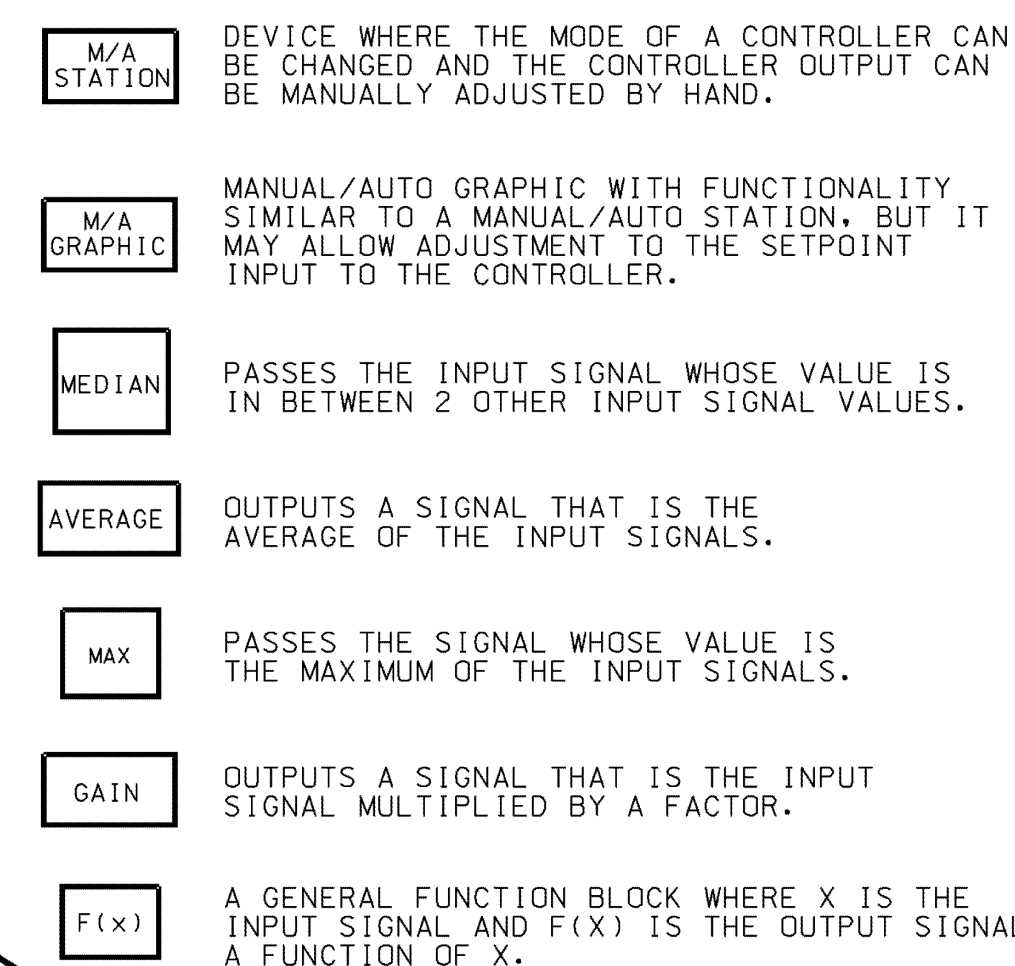
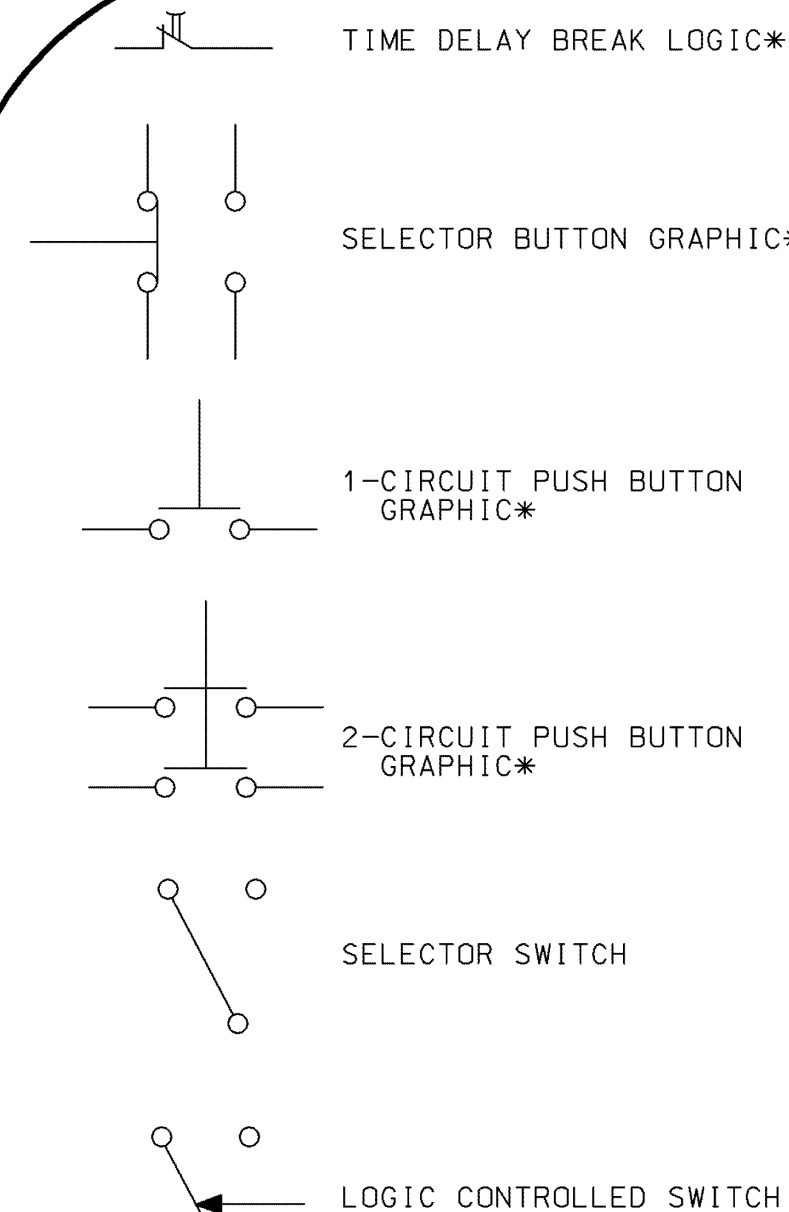


GENERAL NOTES: (FOR ALL SHEETS)

- IN ALL LOGIC CIRCUITS, THE INDICATED ACTUATION OF A SYSTEM OR DEVICE OCCURS WHEN A LOGIC "1" SIGNAL IS PRESENT. EXCEPT WHERE INDICATED OTHERWISE, ALL BISTABLES ARE "DC-ENERGIZE TO ACTUATE" SUCH THAT A LOGIC 1 SIGNAL IS DEFINED TO BE PRESENT WHEN THE BISTABLE OUTPUT VOLTAGE IS OFF.
- EXCEPT IN DIGITAL FEEDWATER CONTROL AND WHERE INDICATED OTHERWISE, THE FOLLOWING IS TRUE: ALL LOGIC CIRCUITS ARE REDUNDANT THAT IS EVERY LOGIC CIRCUIT SHOWN HAS A DUPLICATE LOCATED IN A SEPARATE CABINET. ALL BISTABLES, CIRCUIT BREAKERS, ANNUNCIATORS, COMPUTER INPUTS, AND INDICATOR LAMPS ARE NOT REDUNDANT. MANUAL CONTROLS DO NOT HAVE REDUNDANT ACTUATORS, BUT DO HAVE REDUNDANT CONTACTS WHERE LOGIC IS REDUNDANT. ALL INDICATOR LAMPS, ANNUNCIATORS, AND COMPUTER INPUTS ARE CONNECTED TO BOTH TRAINS (WHERE LOGIC IS REDUNDANT) SO THAT A SIGNAL IN EITHER TRAIN WILL ACTUATE.
- WHenever a PROCESS SIGNAL IS USED FOR CONTROL AND IS DERIVED FROM A PROTECTION CHANNEL, ISOLATION MUST BE PROVIDED.
- THIS SET OF DRAWINGS ILLUSTRATES THE FUNCTIONAL REQUIREMENTS OF THE REACTOR CONTROL AND PROTECTION SYSTEM, INCLUDING ENGINEERED SAFEGUARDS. THESE DRAWINGS DO NOT REPRESENT ACTUAL HARDWARE IMPLEMENTATION. FOR HARDWARE IMPLEMENTATION, REFER TO THE FOLLOWING LIST:
BLOCK OR WIRING DIAGRAM
DRAWING NUMBERS: 5655049, 5655050, 5655051, 8756037, 1189E15, 271C335, 7243D59, 1084H37
DRAWING NUMBERS: 5655052, 271C335, 8756037
- FOR THIS SET OF DRAWINGS ALL SWITCHES, PUSHBUTTONS, ANNUNCIATORS, AND INDICATORS (EXCEPT FOR THE M.E.S. PROCESS SYSTEMS INDICATORS, CONTROLLERS, AND MANUAL-AUTO STATIONS) WHICH ARE MOUNTED ON THE MAIN CONTROL BOARD ARE SUPPLIED BY OTHERS. IN ADDITION TO THE ABOVE, SCOPE BY OTHERS IS ALSO INDICATED DIRECTLY ON SHEETS WITHIN THIS SET.

DEVICE FUNCTION LETTERS AND NUMBERS

FB	FLOW CHANNEL
LB	LEVEL CHANNEL
NC	NUCLEAR CHANNEL
PB	PRESSURE CHANNEL
RC	RADIATION CHANNEL
SB	SPEED CHANNEL
TB	TEMPERATURE CHANNEL
ZB	POSITION CHANNEL
20	ELECTRIC OPERATED VALVE
27	UNDERVOLTAGE RELAY
33	POSITION SWITCH
52	AC CIRCUIT BREAKER
63	PRESSURE SWITCH
71	LEVEL SWITCH
80	FLOW SWITCH
81	UNDERFREQUENCY RELAY
ZC	POSITION CONTROLLER



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STANDARDIZED NUCLEAR UNIT POWER
PLANT SYSTEM PROJECTS

UNIT: SCP S.O.: 300
STATUS: TURNED OVER TO UE
SPIN: AASFD

DRAWING NO. REV.
7250D64-S001 014

DES. ENG. Daniel L. Patton 9-7-75	TITLE: SNUPPS PROJECTS FUNCTIONAL DIAGRAM INDEX AND SYMBOLS
APP. J. J. Gunnar 3-7-78	SCALE: 7250D64-SHEET 1
DO NOT SCALE	

7250D64 S003

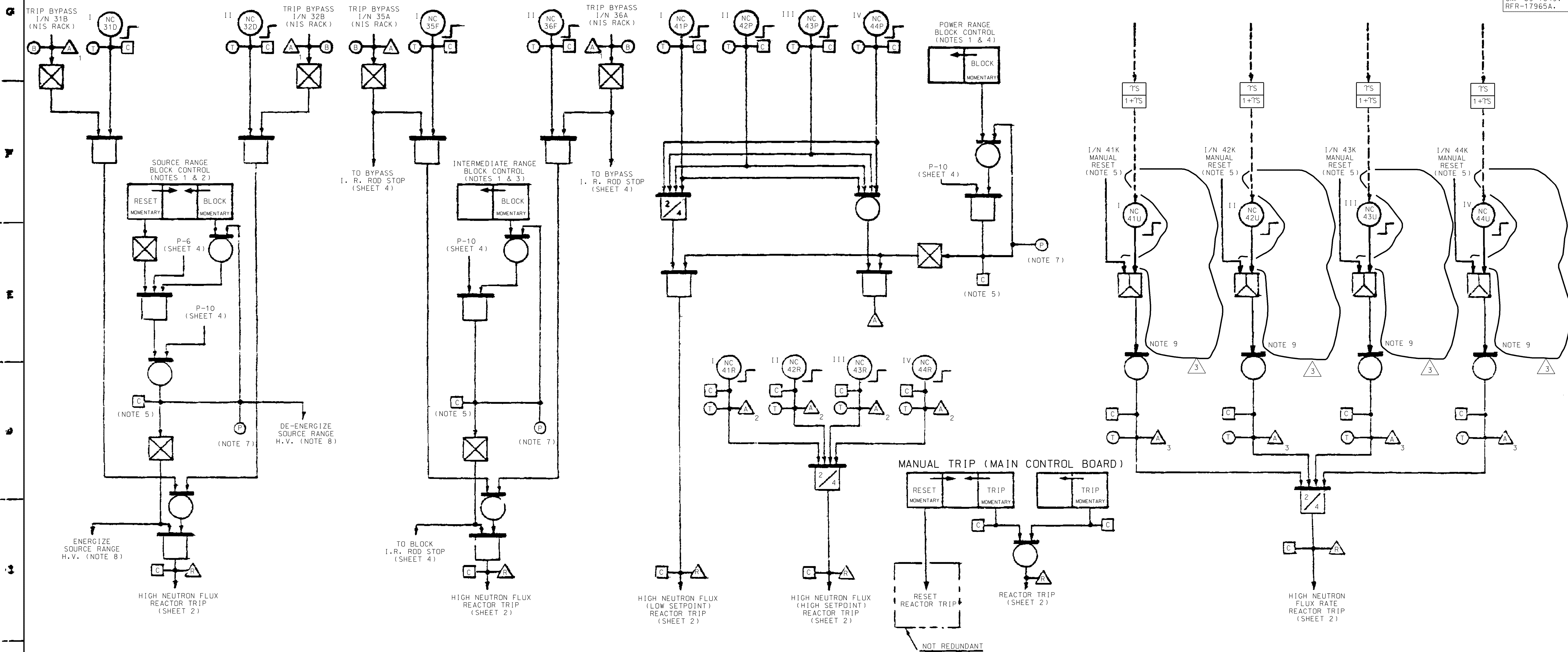
REV.	DATE	DRAWN
3	073091	RLW
CHKD.	SUPV.	APPD.
DLB	LAMR	IN/A
REFLECTS TURN- OVER TO U.E. INCORP. CMP 89-1049, RFR-17965A.		

SOURCE RANGE REACTOR TRIP

INTERMEDIATE RANGE REACTOR TRIP

POWER RANGE REACTOR TRIP

POWER RANGE HIGH NEUTRON FLUX RATE REACTOR TRIP



NOTES:

1. THE REDUNDANT MANUAL BLOCK CONTROLS CONSIST OF TWO CONTROLS ON THE CONTROL BOARD FOR EACH RANGE, ONE FOR EACH TRAIN.
2. I/N 33A IS IN LOGIC TRAIN A.
I/N 33B IS IN LOGIC TRAIN B.
3. I/N 38A IS IN LOGIC TRAIN A.
I/N 38B IS IN LOGIC TRAIN B.
4. I/N 47A IS IN LOGIC TRAIN A.
I/N 47B IS IN LOGIC TRAIN B.
5. TWO COMPUTER INPUTS ARE CONNECTED TO THIS CIRCUIT, INDIVIDUAL FOR EACH TRAIN.
6. MANUAL RESET CONTROLS CONSIST OF FOUR MOMENTARY CONTROLS IN THE CONTROL ROOM, ONE CONTROL FOR EACH INSTRUMENT CHANNEL.
7. TWO PERMISSIVE STATUS LIGHTS ARE CONNECTED TO THIS CIRCUIT, INDIVIDUAL FOR EACH TRAIN.
8. EACH SOURCE RANGE FLUX DETECTOR IS ENERGIZED AND DE-ENERGIZED BY LOGIC OUTPUT FROM A SINGLE TRAIN. THE TWO SOURCE RANGE FLUX DETECTORS (N-31 AND N-32) ARE ON SEPARATE TRAINS.
9. NEGATIVE RATE TRIP BISTABLES ARE ABANDONED IN PLACE AND CAN BE FOUND ON DWG. 6079D29, SHT. 4.
10. ANY INSTRUMENT NUMBER WITH A FUNCTION CODE OF NC IS EQUIVALENT TO THE SAME NUMBER WITH A FUNCTION CODE OF NB.

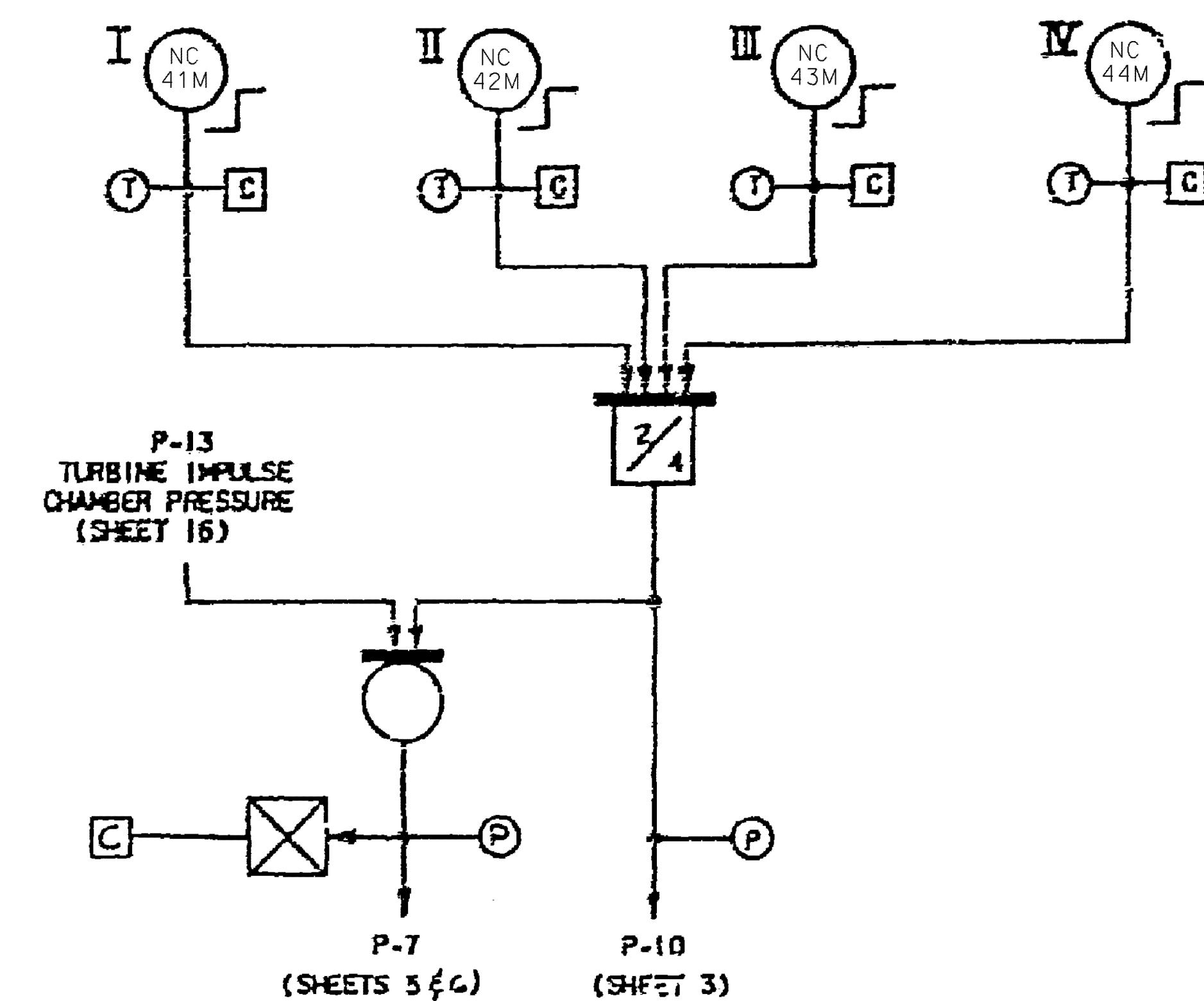
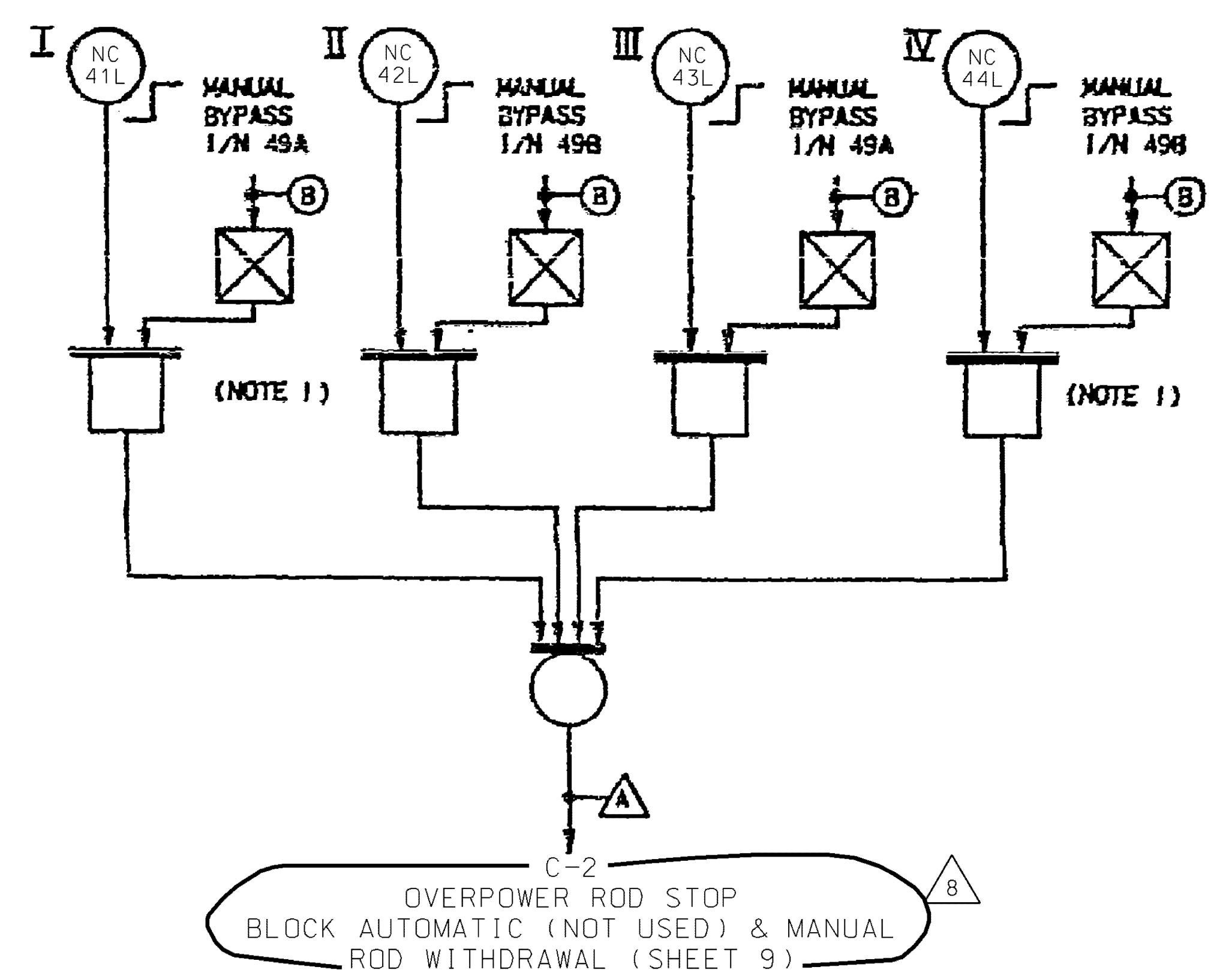
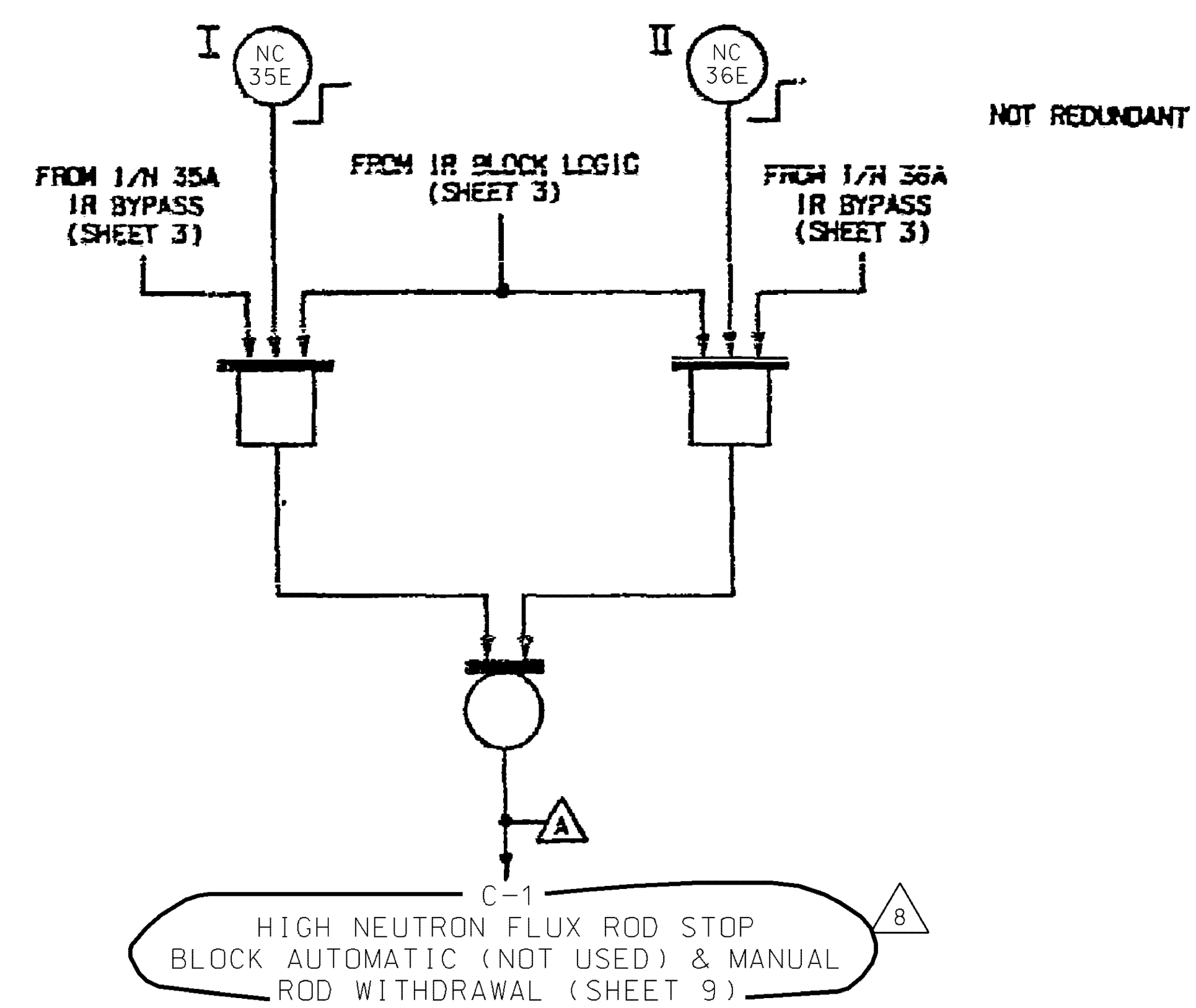
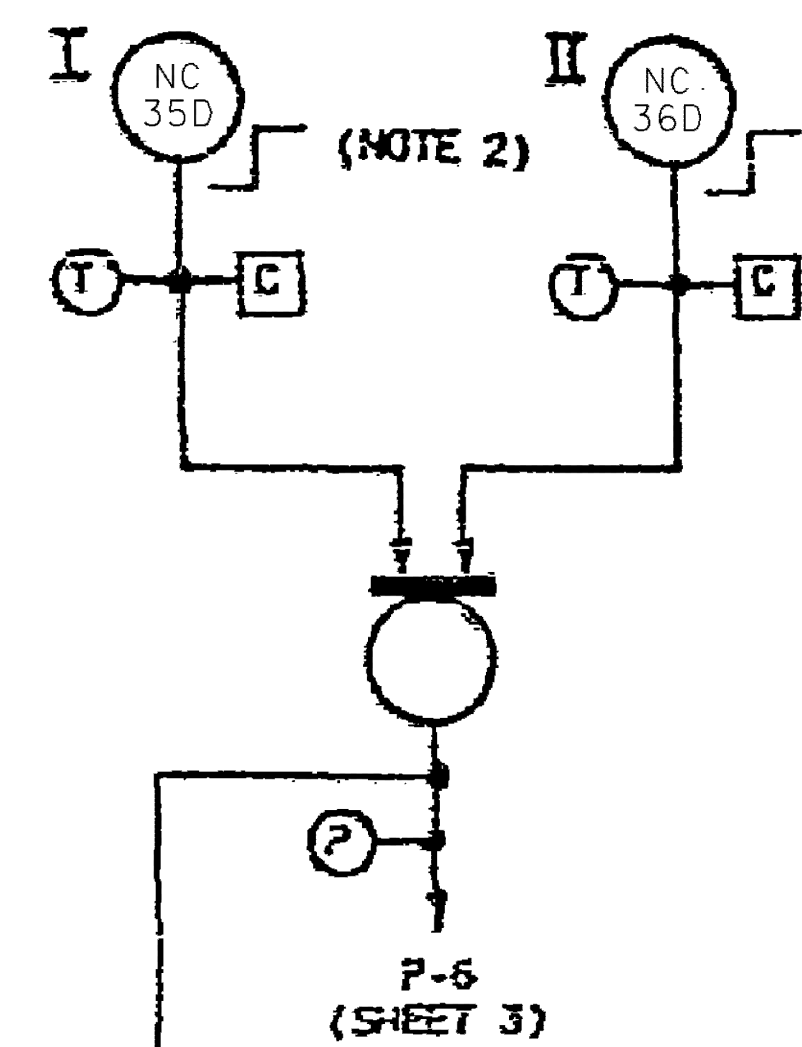
Westinghouse Electric Corporation	
NUCLEAR ENERGY SYSTEMS, PITTSBURGH, PA., U.S.A.	
SNUPPS PROJECT FUNCTIONAL DIAGRAM NUCLEAR INSTR. & MANUAL TRIP SIGNALS	
SCALE	7250D64
DIMENSIONS IN INCHES	3
DO NOT SCALE	

STANDARDIZED NUCLEAR UNIT POWER PLANT SYSTEM PROJECTS	
UNIT: SCP	SPIN: AASFED
STATUS: TURNED OVER TO U.E.	
S.O.: 300	ITEM-9-1
7250D64 S003	

7250D64 S004

INTERMEDIATE RANGE

POWER RANGE



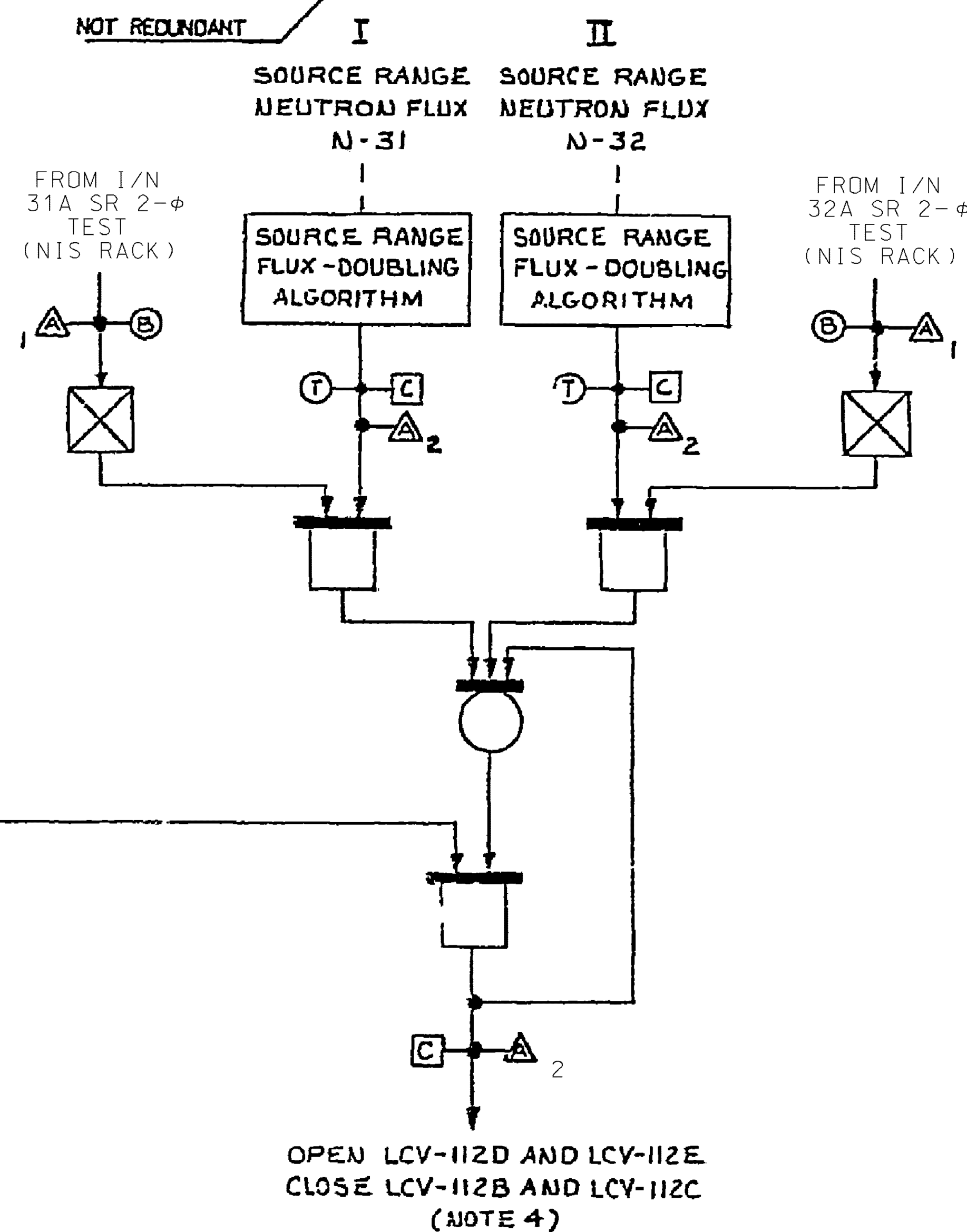
REV.	DATE	DRAWN
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CHKD.	SUPV.	APPD.
DJB	AMR	N/A
REFLECTS TURN-OVER TO U.E.		
INCORP.		
RFR-17193A.		
REV.	DATE	DRAWN
6	051397	RLW
CHKD.	SUPV.	APPD.
DJB	AMR	N/A
INCORP.		
DEC-1433.		
REV.	DATE	DRAWN
7	073097	RLW
CHKD.	SUPV.	APPD.
DJB	AMR	N/A
INCORP.		
RFR-17965A.		
REV.	DATE	DRAWN
8	122099	RLW
CHKD.	SUPV.	APPD.
DJB	AMR	N/A
INCORP.		
MP 95-1008.		

SOURCE RANGE
FLUX DOUBLING
BLOCK CONTROL

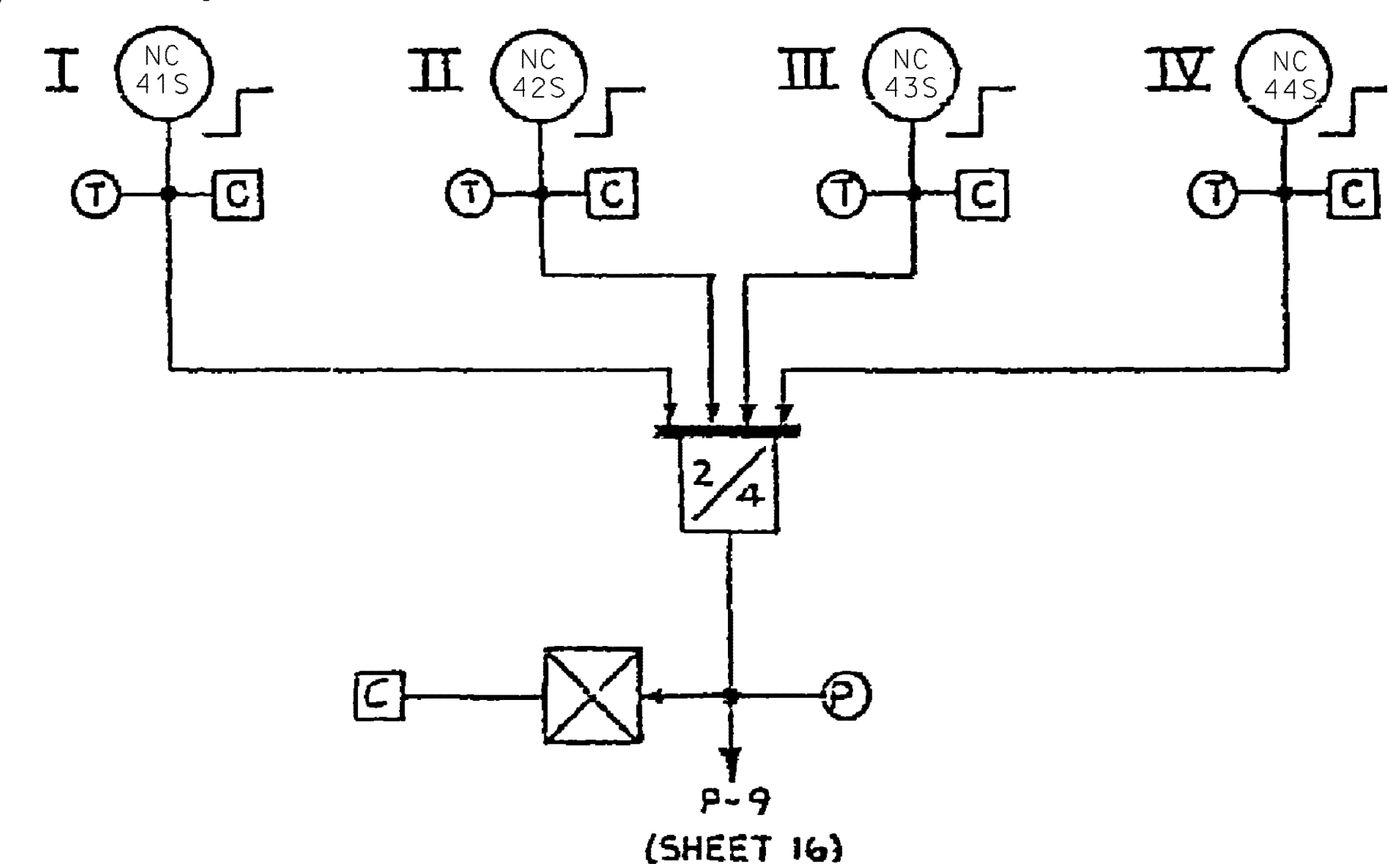
RESET (MOMENTARY)

BLOCK (MOMENTARY)

(NOTE 3)



POWER RANGE



NOTES:

1. THE BYPASS SIGNALS ARE MADE UP BY MEANS OF TWO THREE-POSITION SWITCHES ON A NIS RACK. SWITCH I/N 49A BYPASSES EITHER NC-41L OR NC-43L. SWITCH I/N 49B BYPASSES EITHER NC-42L OR NC-44L.
2. THE TWO P-6 BISTABLES NO. NC-35D AND NC-36D ARE "ENERGIZED TO ACTUATE" SUCH THAT A LOGIC 1 SIGNAL IS DEFINED TO BE PRESENT WHEN THE BISTABLE OUTPUT VOLTAGE IS ON.
3. THE REDUNDANT MANUAL BLOCK CONTROL CONSISTS OF TWO CONTROLS ON THE CONTROL BOARD, ONE FOR EACH TRAIN, SUPPLIED BY OTHERS.
4. LCV-112 D & E ARE IN PARALLEL FLOW PATHS, EACH VALVE RECEIVES AN ACTUATION SIGNAL FROM A SEPERATE TRAIN. LCV-112 B & C ARE IN SERIES IN THE SAME FLOW PATH, EACH VALVE RECEIVES AN ACTUATION SIGNAL FROM A SEPERATE TRAIN.
5. ANY INSTRUMENT NUMBER WITH A FUNCTION CODE OF NC IS EQUIVALENT TO THE SAME NUMBER WITH A FUNCTION CODE OF NB.

STANDARDIZED NUCLEAR UNIT POWER
PLANT SYSTEM PROJECTS

UNIT: SCP SPIN: AASFED

STATUS: TURNED OVER TO U.E.

S.O.: 300 SECT. 9-1

DRAWING NO. REV.

7250D64 S004 8

Westinghouse Electric Corporation

NUCLEAR POWER SYSTEMS, PITTSBURGH, PA., U.S.A.

TITLE: SNUPPS PROJECTS

FUNCTIONAL DIAGRAM

NUCLEAR INSTR. PERMISSIVES & BLOCKS

SCALE: N.T.S.

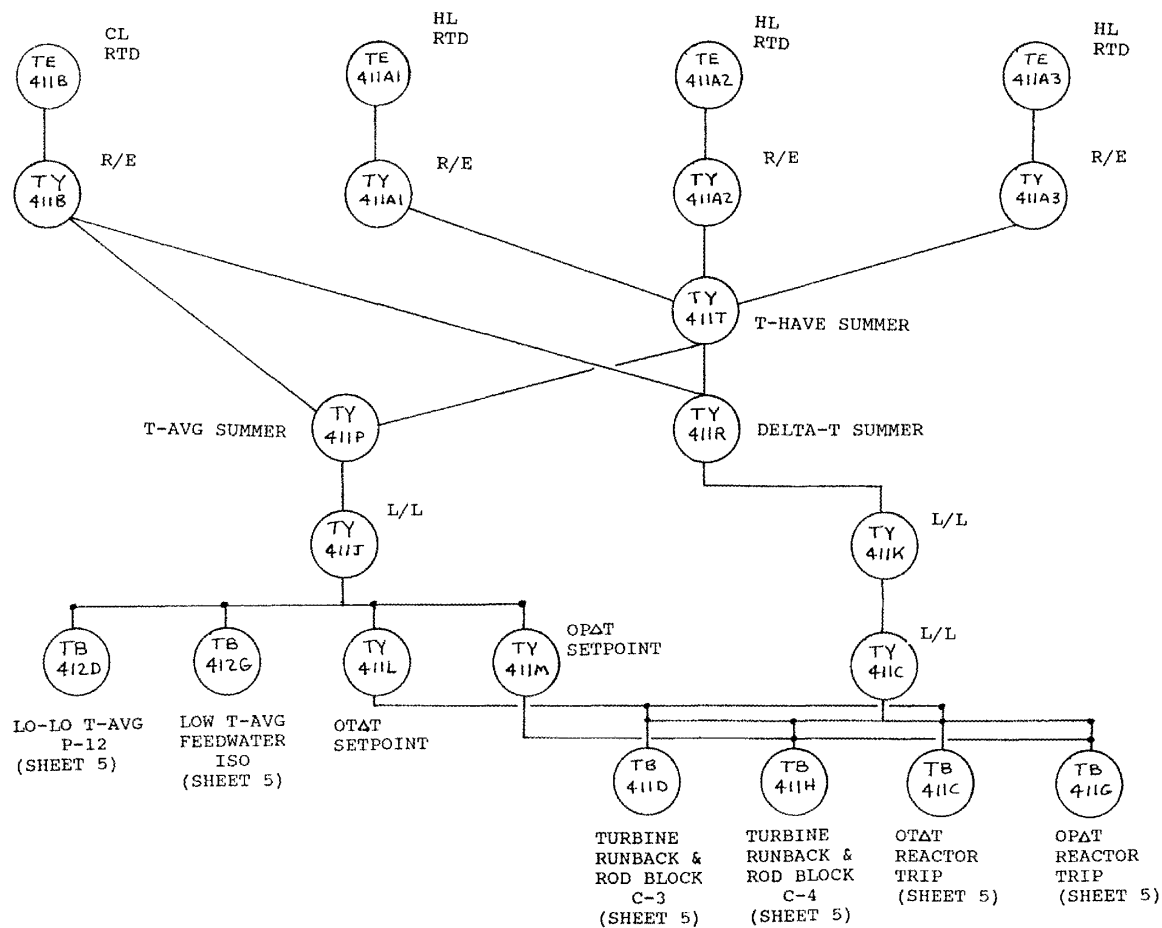
DIMENSIONS IN INCHES

DO NOT SCALE

7250D64

SHEET 4

11 10 9 8 7 6 5 4 3 2 1

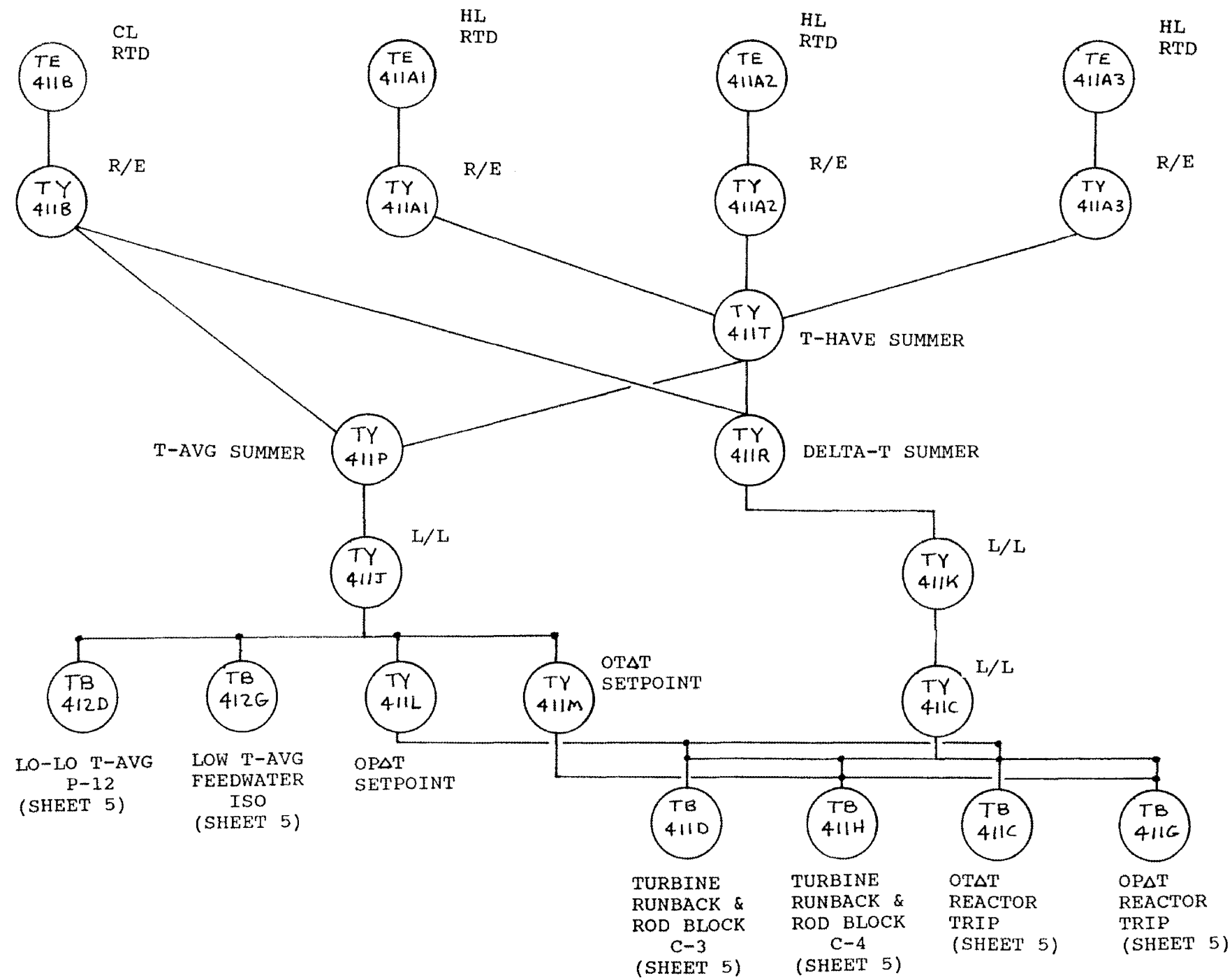


NOTES:

1. Typical for Loop 1, Protection Set I. Other loops are configured in the same manner, with the second digit in the instrument circuit identification corresponding to the RCS loop.
2. For further details of test points, computer inputs, indicators, annunciators, and control circuit interfaces, see drawing 8756D37 sheets 7-10.

CALLAWAY PLANT

FIGURE 7.2-1
FUNCTIONAL DIAGRAMS
(PRIMARY COOLANT SYSTEM
TRIP SIGNALS)
REV. 16 5/12 (SHEET 5A)



NOTES:

1. Typical for Loop 1, Protection Set I. Other loops are configured in the same manner, with the second digit in the instrument circuit identification corresponding to the RCS loop.
2. For further details of test points, computer inputs, indicators, annunciators, and control circuit interfaces, see drawing 8756D37 sheets 7-10.

REV. OL-15
5/06

CALLAWAY PLANT

FIGURE 7.2-1
FUNCTIONAL DIAGRAMS
(PRIMARY COOLANT SYSTEM
TRIP SIGNALS)

(SHEET 5A)

REV. 6	DATE 031403	REV. 5	DATE 051101	DRAWN 4	DATE 062200	DRAWN
DRAWN JHK	CHKD. MAL	SUPV. TWS	CHKD. MAL	SUPV. AMR	APPD. SKC	APPD. N/A
INCORP. DEC-1871.	INCORP. MP 00-1005A	REFLECTS TURNOVER TO UE.				

D

D

C

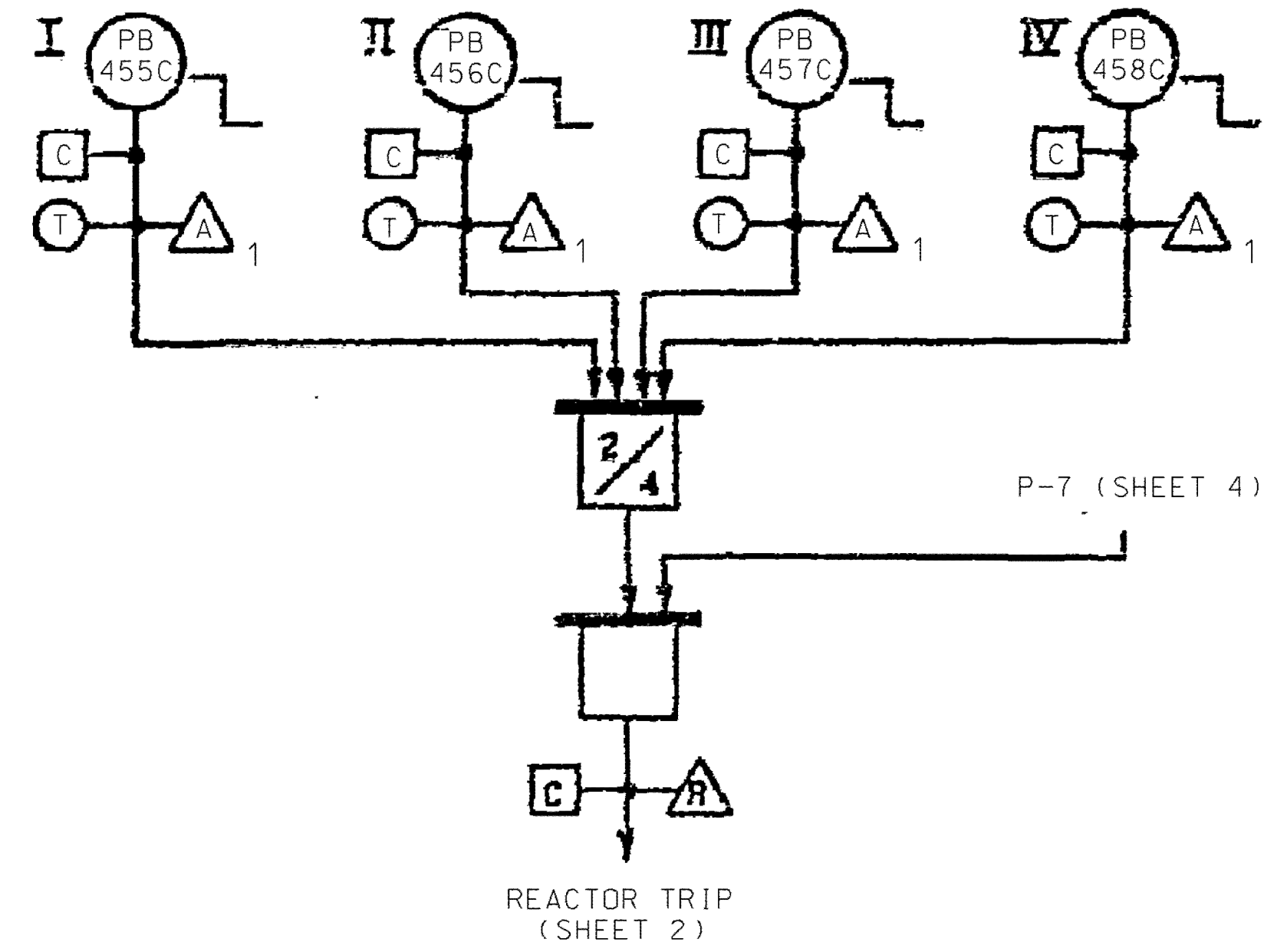
B

B

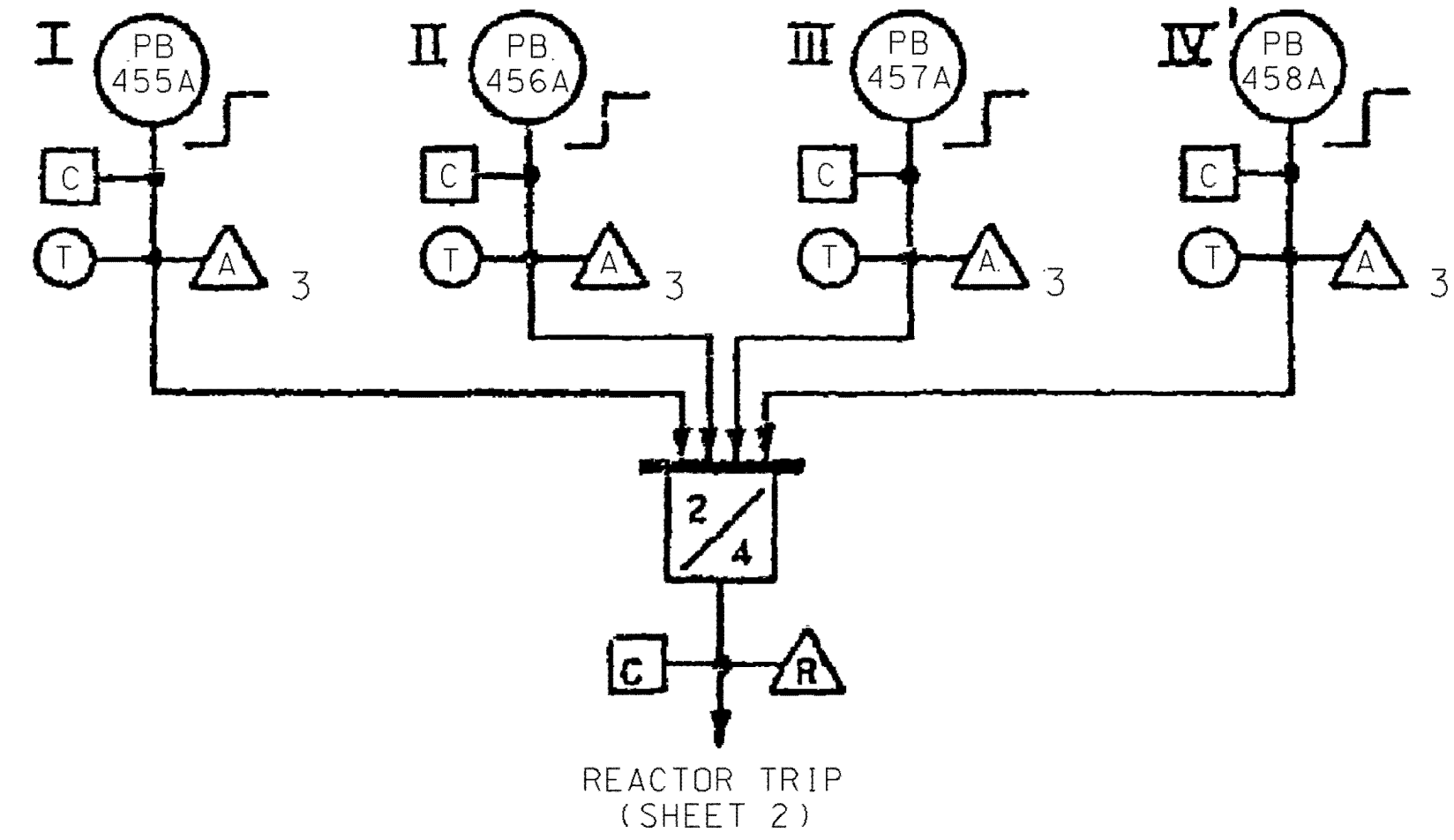
A

A

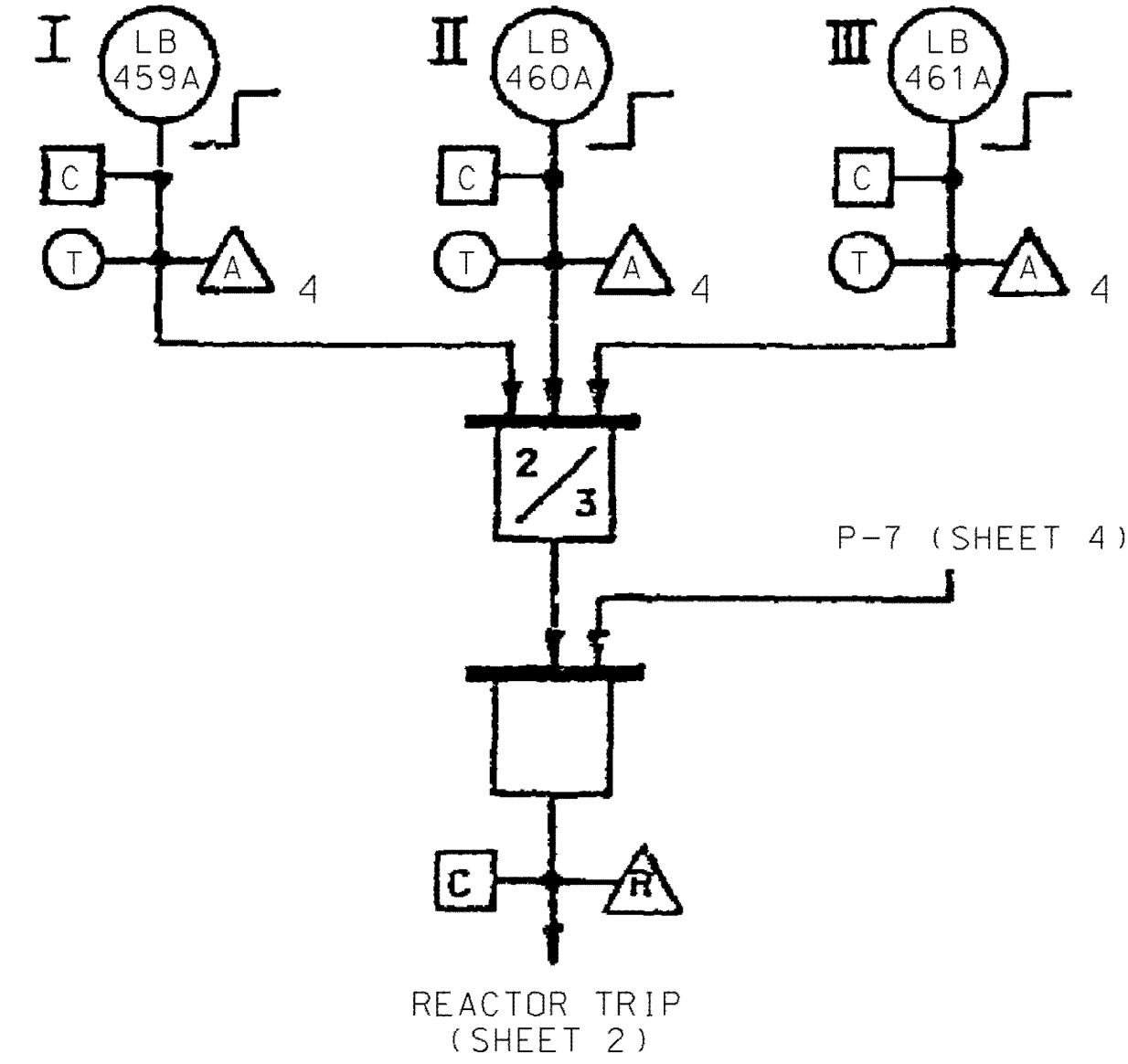
PRESSURIZER LOW PRESSURE (LEAD/LAG COMPENSATED)



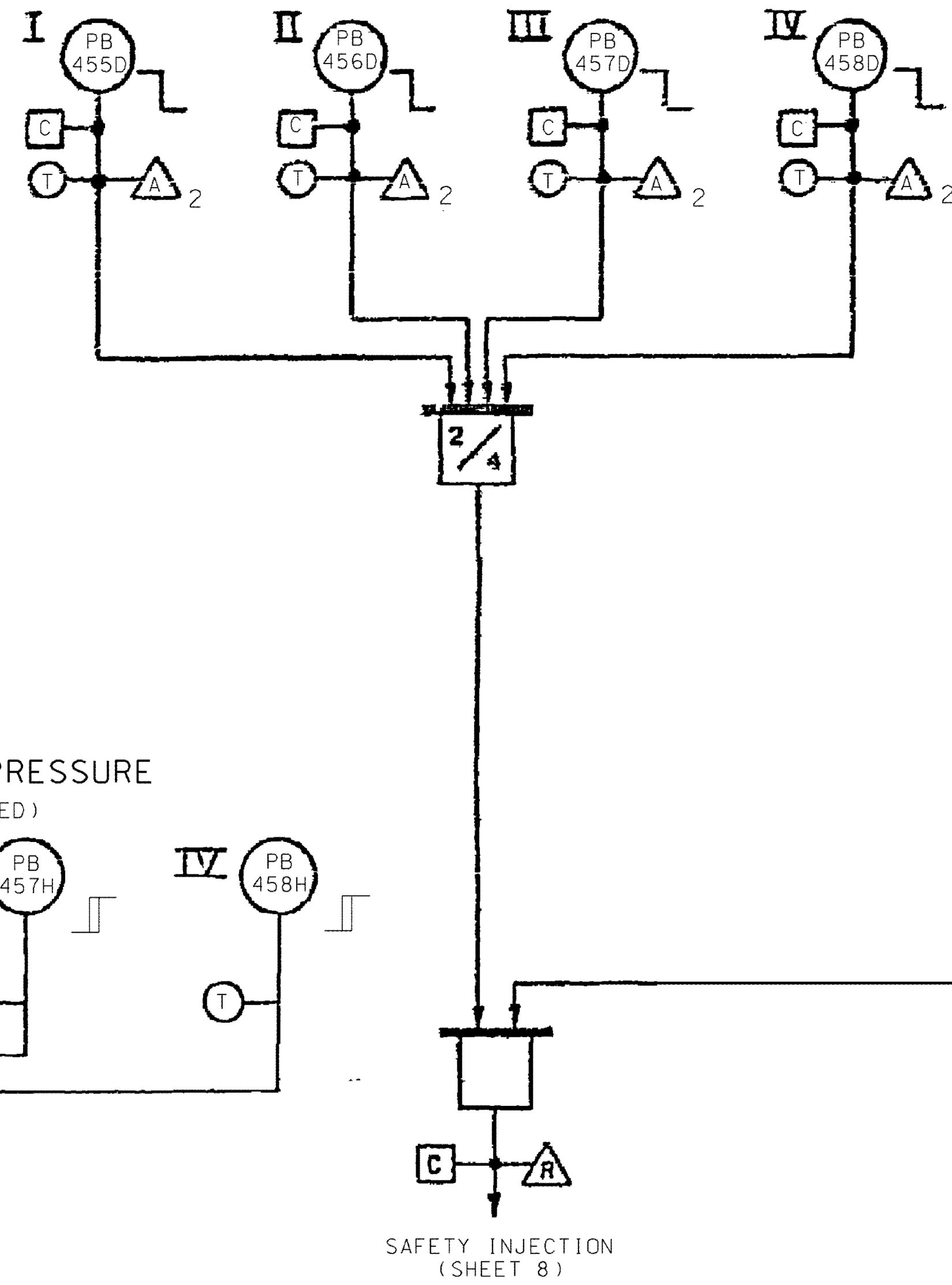
PRESSURIZER HIGH PRESSURE (LEAD/LAG COMPENSATED)



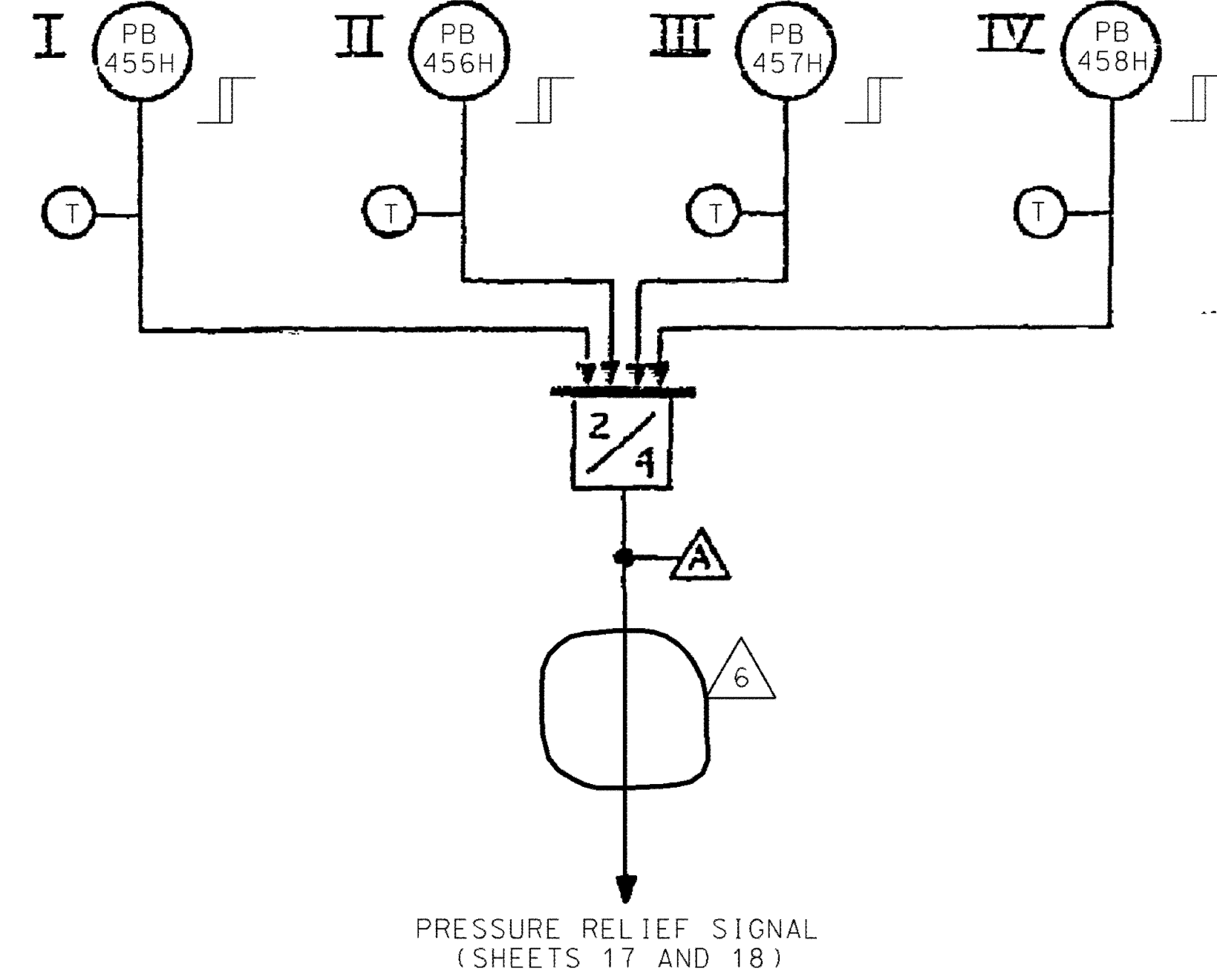
PRESSURIZER HIGH WATER LEVEL



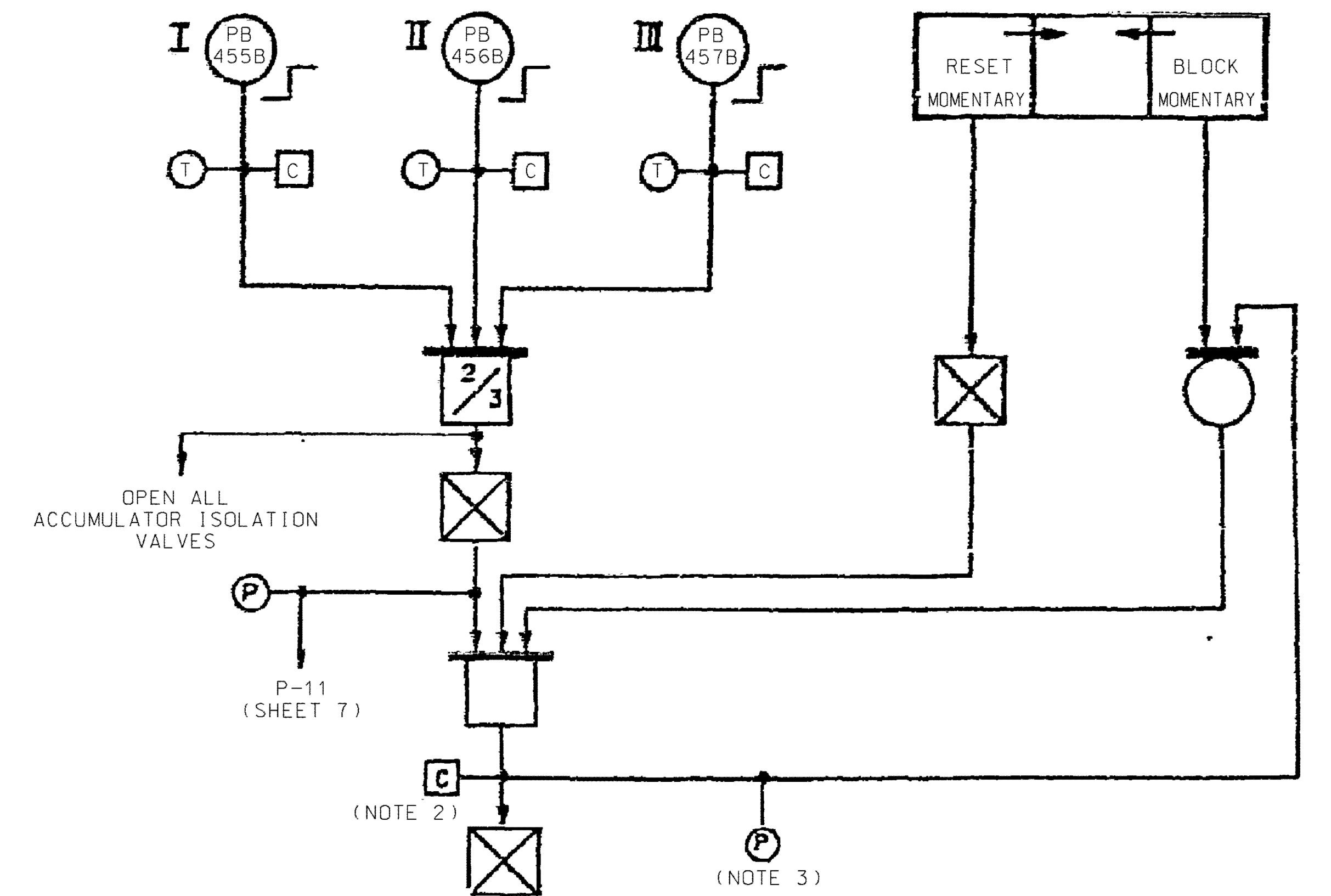
PRESSURIZER LOW PRESSURE



PRESSURIZER HIGH PRESSURE (LEAD/LAG COMPENSATED)



PRESSURIZER PRESSURE



PRESSURIZER S.I. BLOCK CONTROL (NOTE 1)

NOTES:

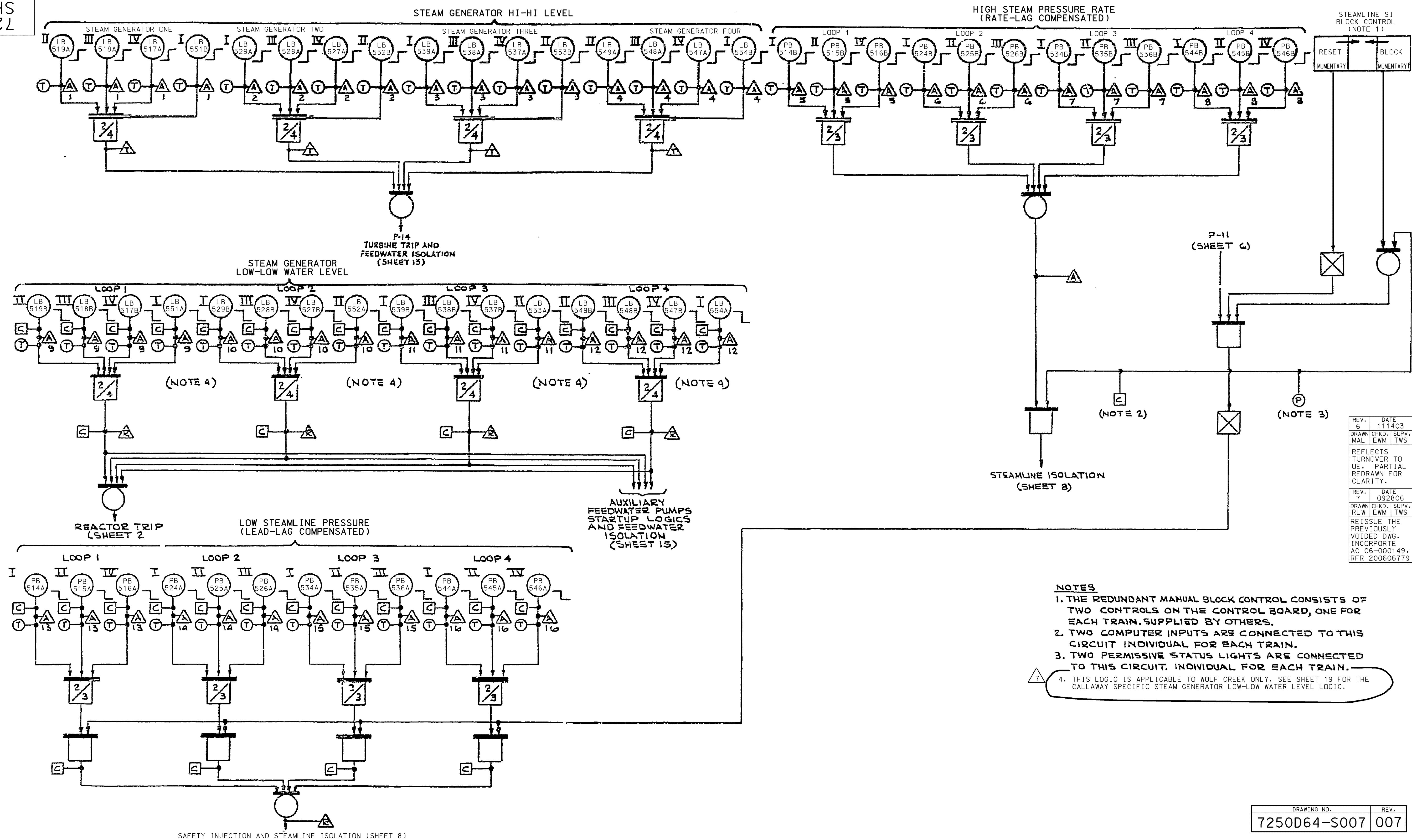
1. THE REDUNDANT MANUAL BLOCK CONTROL CONSISTS OF TWO CONTROLS ON THE CONTROL BOARD; ONE FOR EACH TRAIN.
2. TWO COMPUTER INPUTS ARE CONNECTED TO THIS CIRCUIT; INDIVIDUAL FOR EACH TRAIN.
3. TWO PERMISSIVE STATUS LIGHTS ARE CONNECTED TO THIS CIRCUIT; INDIVIDUAL FOR EACH TRAIN.

REFERENCE DWG:
WESTINGHOUSE ELECTRIC CORP.
DWG. NO. M-744-00023

STANDARDIZED NUCLEAR UNIT POWER
PLANT SYSTEM PROJECTS
UNIT: SCP SPIN: AASFED-04
STATUS: TURNED OVER TO U.E
SHOP ORDER: 300

DRAWN (DATE) N/A	FUNCTIONAL DIAGRAM PRESSURIZER TRIP SIGNALS			
CHKD. (DATE) N/A				
SUPV. (DATE) N/A				
APPD. (DATE) N/A				
LOCATION	CALLAWAY PLANT			CLASS
UNION ELECTRIC COMPANY ST. LOUIS, MO.		7250D64-S006		REV. 6

7250D64-S006



REV. 6	DATE 11/14/03
DRAWN MAL	CHKD. SUPV. EWM TWS
REFLECTS TURNOVER TO U.E. PARTIAL REDRAWN FOR CLARITY.	
REV. 7	DATE 09/28/06
DRAWN RLW	CHKD. SUPV. EWM TWS
REISSUE THE PREVIOUSLY VOIDED DWG. INCORPORATE AC 06-000149, RFR 200606779	

DRAWING NO.	REV.
7250D64-S007	007

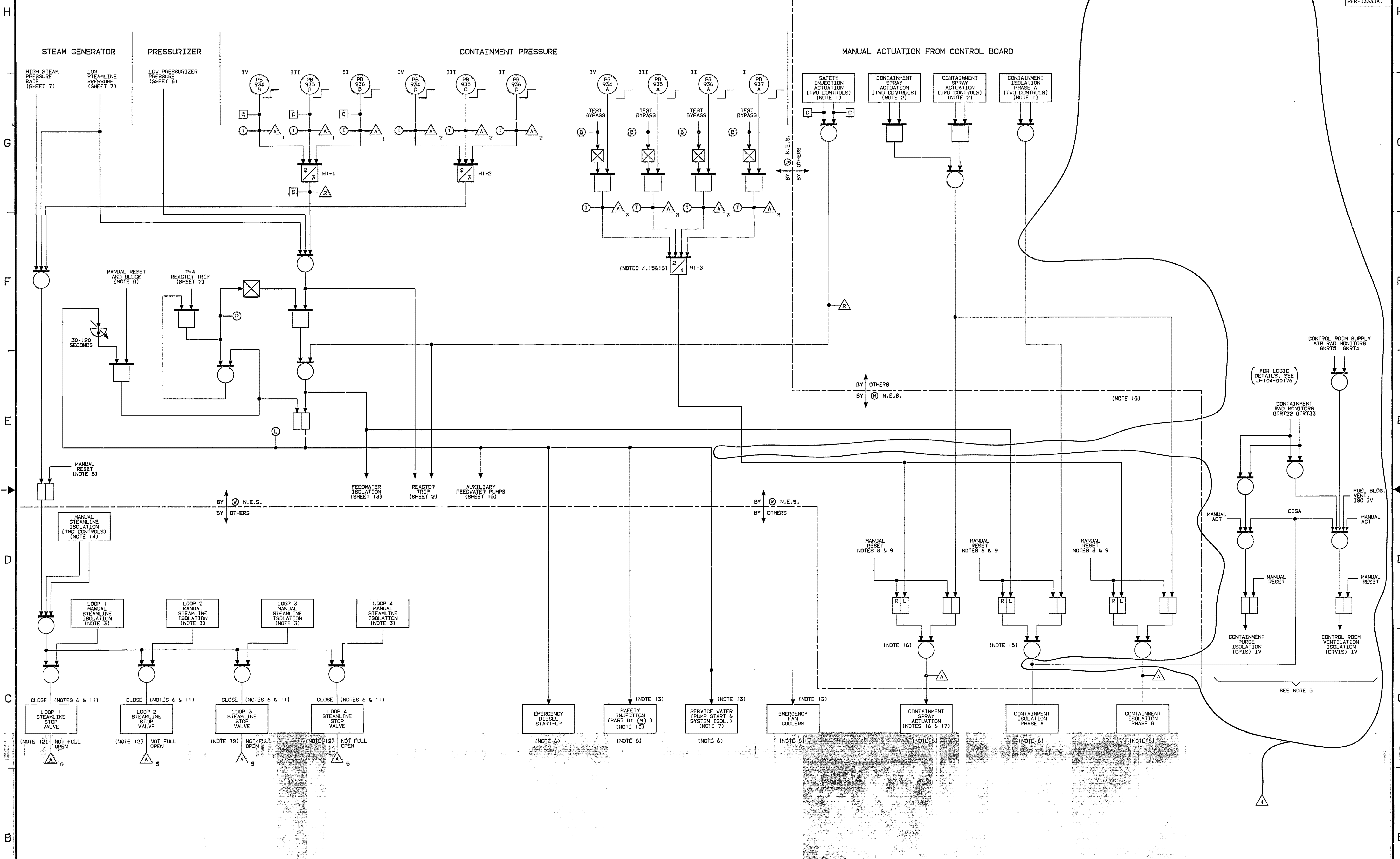
STANDARDIZED NUCLEAR UNIT POWER PLANT SYSTEM PROJECTS

UNIT: SCP S.O.: 300

STATUS: TURNED OVER TO U.E.

SPIN: AASFD

WESTINGHOUSE Electric Corporation	
Nuclear Energy Systems, Pittsburgh, PA, U.S.A.	
TITLE: SNUPPS PROJECTS FUNCTIONAL DIAGRAM STEAM GENERATOR TRIP SIGNALS	
7250D64	
SHEET 7	
DO NOT SCALE	



NOTES:

1. TWO MOMENTARY CONTROLS ON THE CONTROL BOARD, OPERATING EITHER CONTROL WILL ACTUATE.
2. THE MANUAL SPRAY ACTUATION CONSISTS OF FOUR MOMENTARY CONTROLS. ACTUATION WILL OCCUR ONLY IF TWO ASSOCIATED CONTROLS ARE OPERATED SIMULTANEOUSLY.
3. TWO CONTROLS PER VALVE ON THE CONTROL BOARD, ONE FOR EACH TRAIN.
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 (N.E.S.) SAFEGUARDS SYSTEM.
6. COMPONENTS ARE ALL INDIVIDUALLY SEALED IN (LATCHED), 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.
7. SERVICE WATER SYSTEM ISOLATION IS USED ONLY IF REQUIRED.
8. THE REDUNDANT MANUAL RESET CONSISTS OF TWO MOMENTARY CONTROLS ON THE CONTROL BOARD, ONE FOR EACH TRAIN.
9. SUPPLIED BY OTHERS.

10. SAFETY INJECTION SEQUENCE REQUIREMENTS (IF SEQUENCING IS NECESSARY) ARE SPECIFIED BY (N) NUCLEAR ENERGY SYSTEMS.
11. ALSO CLOSES THE BYPASS VALVE IN PARALLEL WITH THE ASSOCIATED STEAM LINE STOP VALVE.
12. 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.
13. 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.
14. TWO CONTROLS ON THE CONTROL BOARD, OPERATING EITHER CONTROL WILL ACTUATE.
15. SOME ENGINEERED SAFEGUARDS FUNCTIONS ARE NOT WITHIN THE FUNCTIONAL DESIGN SCOPE OF (N) NUCLEAR ENERGY SYSTEMS BUT ONLY SHOWN ON THIS SHEET AS THE FUNCTIONS ARE BUILT IN THE (N) SUPPLIED EQUIPMENT.

16. THE 2 OUT OF 4 COINCIDENCE, MEMORY, AND "OR" LOGIC ARE DUPLICATED WITHIN EACH TRAIN. SEPARATE OUTPUT RELAYS ARE ALSO PROVIDED IN EACH TRAIN. TO MINIMIZE FALSE CONTAINMENT SPRAY, ONE OUTPUT RELAY SHOULD START THE PUMPS WHILE ANOTHER SHOULD OPEN THE SYSTEM VALVES.
17. THE CONTAINMENT SPRAY SYSTEM SHOULD BE INDEPENDENT OF THE SAFETY INJECTION SYSTEM. IF THE CONDITIONS OF NOTE 13 APPLY, THE SEQUENCE INTERLOCK SHOULD BE SUCH THAT SPRAY WILL START WITHIN THE REQUIRED TIME INDEPENDENT OF THE SAFETY INJECTION SIGNAL STATUS.

STANDARDIZED NUCLEAR UNIT POWER
PLANT SYSTEM PROJECTS
UNIT: SCP
STATUS: TURNED OVER TO UE
CERTIFICATION LTR. NO. SCP-88-009
AUTHORITY: M.J. PARVIN
ENGR. LTR. NO. IRT-7108

I CERTIFY THAT THE IMAGE CONTAINED ON THIS FRAME WAS MADE IN THE NORMAL AND REGULAR COURSE OF BUSINESS, ON THE DATE STATED BELOW AND THAT IT IS AN ACCURATE REPRODUCTION OF THE DOCUMENT(S) SUBMITTED TO MICROGRAPHICS.

DATE: 5-20-73 OPERATOR: P. Powell SUPERVISOR: Bruce Charnley

30X

DRWN	N/A	DATE	
CHKD	N/A	DATE	
SUPV	N/A	DATE	
APPD	N/A	DATE	

FUNCTIONAL DIAGRAM
SAFEGUARDS
ACTUATION SIGNALS

CALLAWAY PLANT

UNION ELECTRIC COMPANY
ST. LOUIS, MO


7250D64 S008

REV. 4



1. ALL CIRCUITS ON THIS SHEET ARE NOT REDUNDANT.
2. KOT MAY VARY INVERSELY PROPORTIONAL TO LOAD WITH A FIXED LIMIT OR MAY VARY IN TWO DISCRETE STEPS WITH BREAK POINTS AT 30 TO 50% AND 60 TO 80% TURBINE LOAD.
3. THE SUMMER OUTPUTS HAVE FIXED MANUALLY ADJUSTABLE UPPER LIMITS.
4. THE ROD DIRECTION BISTABLES NO. SB-412A AND SB-412B ARE "ENERGIZED TO ACTUATE".
5. ALARM 1, ALARM 2, ALARM 3, AND ALARM 4 MUST HAVE REFRESH CAPABILITY.

STANDARDIZED NUCLEAR UNIT POWER PLANT SYSTEM PROJECTS		
UNIT: SCP	S.D.: 300	TAB: 9-
STATUS: TURNED OVER TO U.E.		

Westinghouse Electric Corporation 

NUCLEAR ENERGY DIVISION, PITTSBURGH, PA. U.S.A.

TITLE SNUPPS PROJECTS

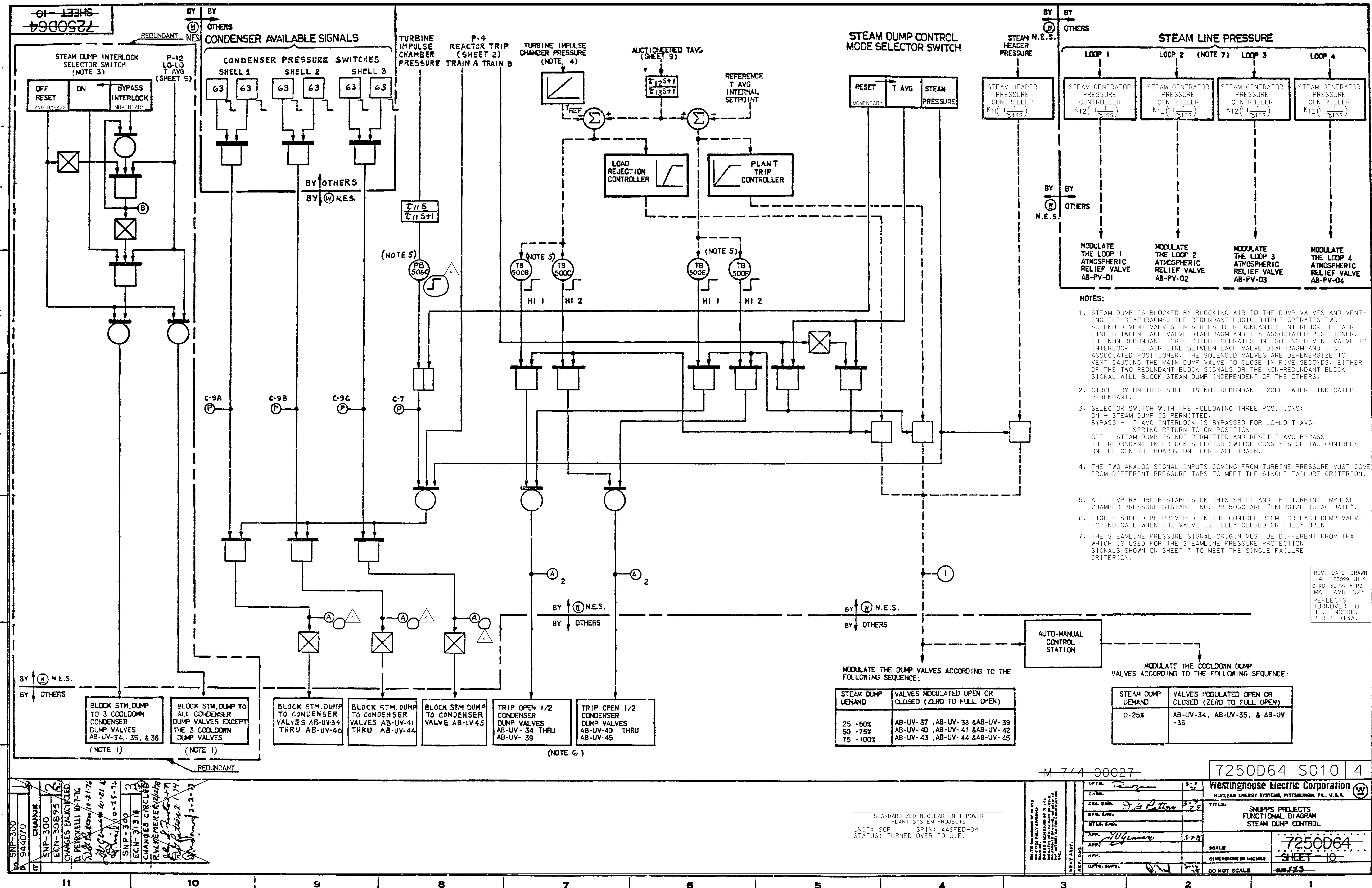
 FUNCTIONAL DIAGRAM

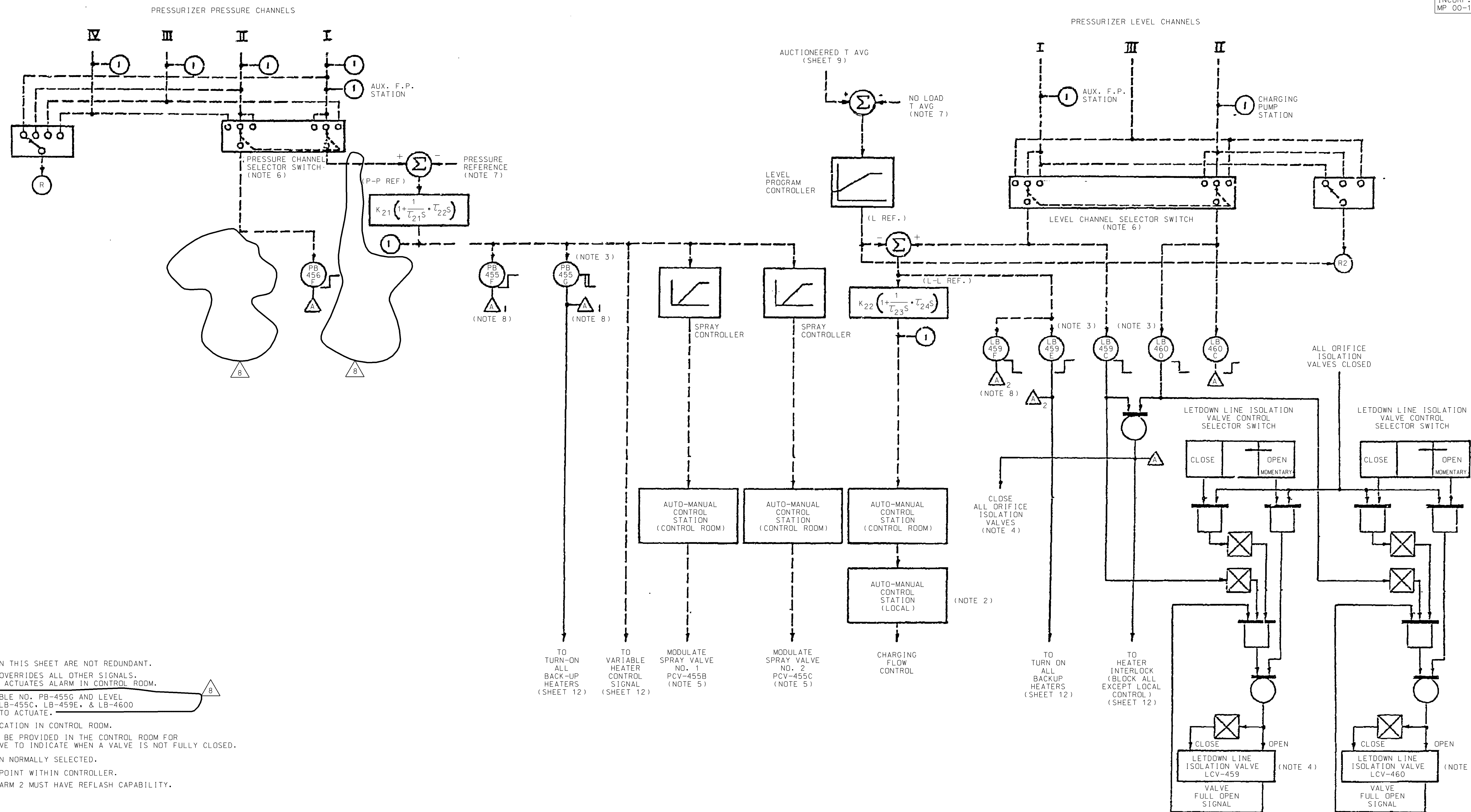
 ROD CONTROLS & ROD BLOCKS

SCALE N.T.S. -7250D64-

DIMENSIONING
IN INCHES SHEET 9-

DO NOT SCALE SUB 3-4-5





- 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. PRESSURE BISTABLE NO. PB-455G AND LEVEL BISTABLES NO. LB-455C, LB-459E, & LB-4600 ARE ENERGIZED TO ACTUATE.
 4. OPEN/SHUT INDICATION IN CONTROL ROOM.
 5. A LIGHT SHOULD BE PROVIDED IN THE CONTROL ROOM FOR EACH SPRAY VALVE TO INDICATE WHEN A VALVE IS NOT FULLY CLOSED.
 6. CENTER POSITION NORMALLY SELECTED.
 7. ADJUSTABLE SETPOINT WITHIN CONTROLLER.
 8. ALARM 1 AND ALARM 2 MUST HAVE REFLASH CAPABILITY.

REFERENCE DWG:
WESTINGHOUSE ELECTRIC CORP.
INDUSTRY SYSTEMS DIVISION
DWG. NO. M-744-00028

DRAWN (DATE) N/A		FUNCTIONAL DIAGRAM PRESSURIZER PRESSURE & LEVEL CONTROL		
CHKD. (DATE) N/A				
SUPV. (DATE) N/A				
APPD. (DATE) N/A				
STATUS: TURNED OVER TO U.E	SPIN: AASFED-04	LOCATION	CALLAWAY PLANT	CLASS
SHOP ORDER:	ITEM:	UNION ELECTRIC COMPANY ST. LOUIS, MO.		7250D64-S011
				REV. 8

7250D64
SHEET 3

G
F
E
D
C
B
A

REMOTE CONTROL STATION
FOR GROUP A HEATERS
(CONTROL BOARD)
(SELECTOR SWITCH)

REMOTE CONTROL STATION
FOR GROUP B HEATERS
(CONTROL BOARD)
(SELECTOR SWITCH)

VARIABLE HEATER
ON-OFF STATION
(CONTROL BOARD)
(SELECTOR SWITCH)

(NOTE 2)

BY OTHERS
BY (W) N.E.S.

BY OTHERS
BY (W) N.E.S.

AUTOMATIC HEATER TURN-ON
LOW PRESSURE FROM PB455G (SHEET 11)
HIGH LEVEL DEVIATION FROM LB459E (SHEET 11)

HEATER INTERLOCK
LOW LEVEL FROM LB 459C & LB 460D (SHEET 11)

COMPENSATED
PRESSURE
DEVIATION
FROM
(SHEET 11)

REV. 3 DATE 111303
DRAWN CHKD. SUPV. MAL EWM TWS
REFLECTS
TURN-TO
UE. PARTIAL
REDRAWN FOR
CLARITY.

(NOTE 2)
LOCAL CONTROL STATION
FOR GROUP A HEATERS
(SELECTOR SWITCH)

(NOTE 2)
LOCAL CONTROL STATION
FOR GROUP B HEATERS
(SELECTOR SWITCH)

(NOTE 3)

(NOTE 3)

TURN-OFF
GROUP A
HEATERS
(NOTE 2)
(NOTE 4)

TURN-ON
GROUP A
HEATERS

TURN-OFF
GROUP B
HEATERS
(NOTE 2)
(NOTE 4)

TURN-ON
GROUP B
HEATERS

TURN-OFF
GROUP C
HEATERS

TURN-ON
GROUP C
HEATERS

VARIABLE
CONTROL
SIGNAL
FOR GROUP C
HEATERS

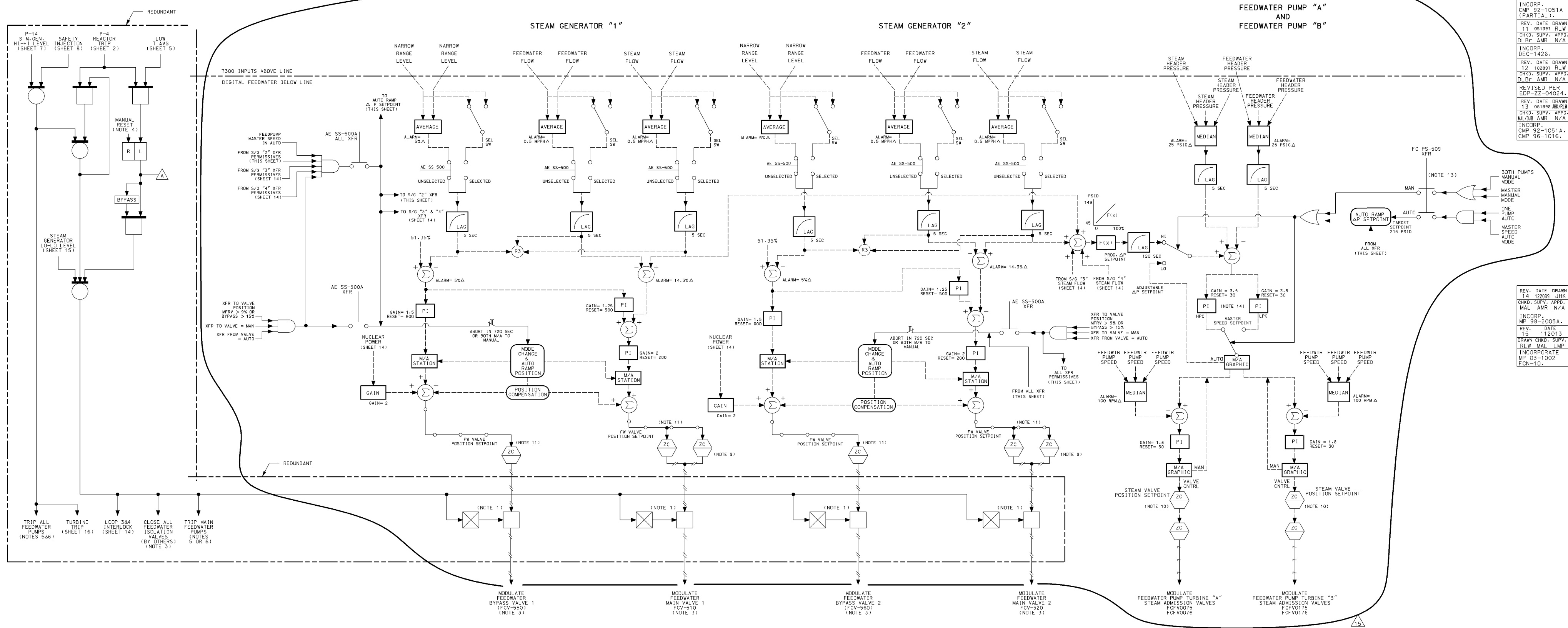
- NOTES:
1. ALL CIRCUITS ON THIS SHEET ARE NOT REDUNDANT.
 2. GROUP A AND GROUP B HEATERS MUST BE ON SEPARATE VITAL POWER SUPPLIES WITH THE LOCAL CONTROL SEPARATED SO THAT ANY SINGLE FAILURE DOES NOT DEFEAT BOTH.
 3. PRECAUTIONS SHOULD BE TAKEN TO AVOID MANUAL HEATER OPERATION, WHICH WOULD CAUSE HEATER DAMAGE, IF THE WATER LEVEL UNCOVERS THE HEATERS.
 4. BACK-UP HEATER STATUS INDICATION IN CONTROL ROOM.

DRAWING NO. 7250D64-S012 REV. 003

SNP-300
544070
CHANGES
ECN-30892
10-5-76
10-21-76
10-31-76

STANDARDIZED NUCLEAR UNIT POWER
PLANT SYSTEM PROJECTS
UNIT: SCP S.O.: 300
STATUS: TURNED OVER TO UE
SPIN: AASFD

WESTINGHOUSE Electric Corporation	
NUCLEAR CIRCUT SYSTEMS, PITTSBURGH, PA., U.S.A.	
TITLE: JNPPS PROJECTS FUNCTIONAL DIAGRAM PRESSURIZER HEATER CONTROL	
7250D64 SHEET 12	
SCALE: DO NOT SCALE	
SUB: 2	



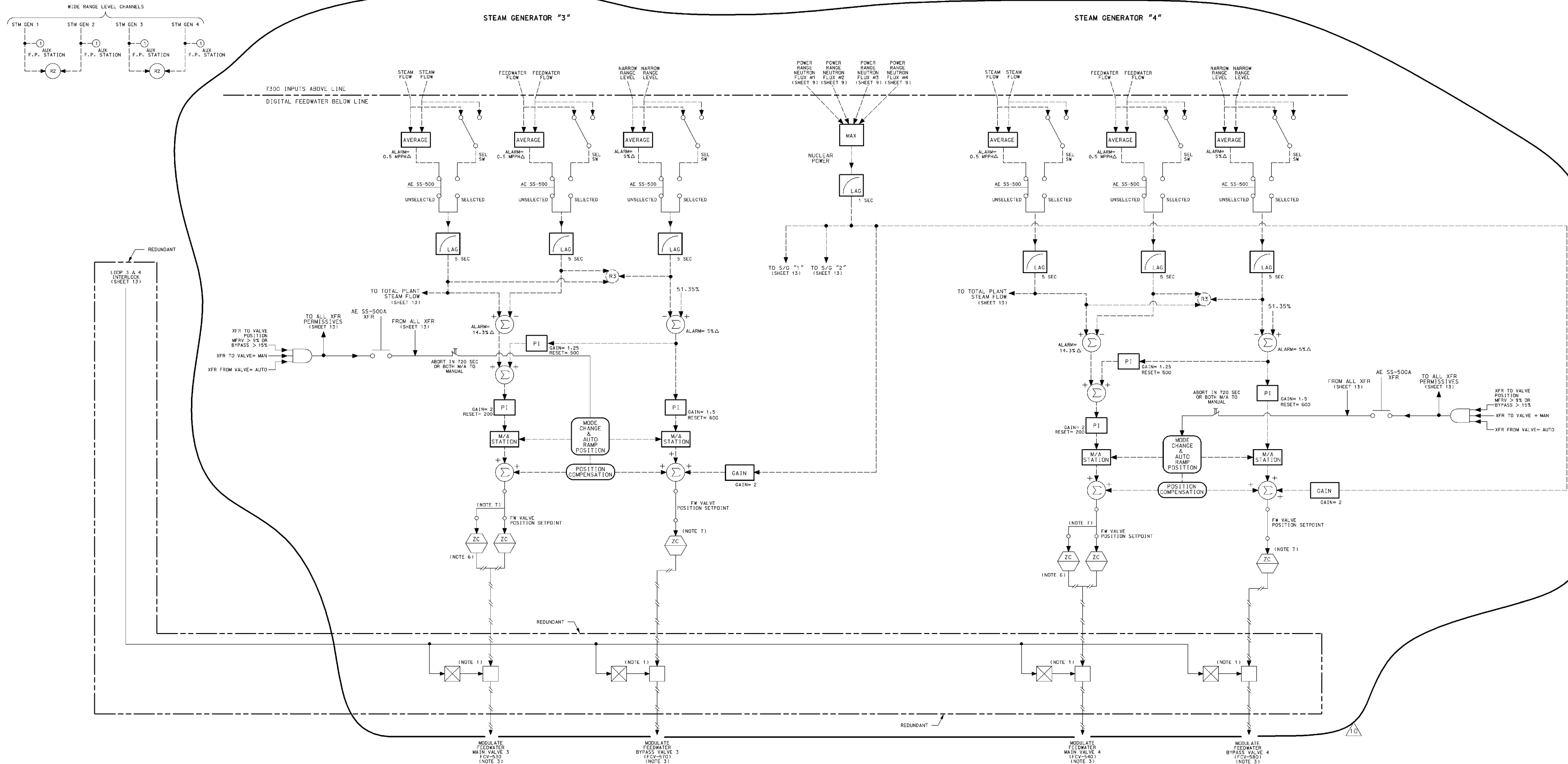
1. ANALOG GATE CONSISTS OF TWO SOLENOID VENT VALVES IN PARALLEL TO REDUNDANTLY INTERLOCK THE AIR LINE SUPPLYING EACH VALVE'S POSITIONER. THE SOLENOID VALVES ARE DE-ENERGIZED TO VENT. TO OPEN EACH FEEDWATER VALVE TO CLOSE IN FIVE SECONDS, BOTH REDUNDANT BLOCK SIGNALS ARE REQUIRED IN ORDER TO CLOSE THE ASSOCIATED VALVE.
2. ALL CIRCUITS ON THIS SHEET ARE NOT REDUNDANT, EXCEPT WHERE INDICATED REDUNDANT.
3. OPEN/CLOSE CONTROL AND 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. DELETED.
8. DELETED.

9. MAIN FEEDWATER REGULATING VALVES HAVE DUAL POSITIONERS IN MASTER/STANDBY CONFIGURATION. FAILOVER OPERATION REQUIRES MANUAL ISOLATION OF AIR LINES.
10. OPERATING CYLINDER SERVO POSITION CONTROLLER REMOTE SHUTDOWN COMMAND SHUTS DOWN POSITIONER WHEN PUMP IS TRIPPED TO PREVENT WIND-UP. REFER TO J-2017 VENDOR DRAWINGS FOR DETAILS.
11. CIRCUITS TO THE FEEDWATER VALVE POSITIONERS ARE FOR POWERING AND CONTROLLING. THE PROTOCOL IS PROFIBUS PA. REFER TO J-2017 VENDOR DRAWINGS FOR DETAILS.
12. AN OVERVIEW OF LOGIC IS SHOWN FOR FEEDWATER CONTROL. REFER TO J-2017 VENDOR SOFTWARE DESIGN DESCRIPTION (SDD) FOR DETAILS.
13. FC PS-509 XFB BUTTON INITIATES EITHER A MANUAL TRANSFER OR AUTOMATIC TRANSFER DEPENDING ON THE PERMISSIVES.
14. MASTER SPEED HIGH POWER CONTROLLER AND MASTER SPEED LOW POWER CONTROLLER.

STANDARDIZED NUCLEAR UNIT POWER PLANT SYSTEM PROJECTS	
UNIT: SCP	SPIN: AASFED
STATUS: TURNED OVER TO U.E	
S.O.: 300	ITEM:9-1

DRWN N/A	(DATE)	FUNCTIONAL DIAGRAM FEEDWATER CONTROL & ISOLATION			
CHKD N/A	(DATE)				
SUPV. N/A	(DATE)				
APPR. N/A	(DATE)				
LOCATION		CALLAWAY ENERGY CENTER	CLASS		
UNION ELECTRIC COMPANY ST. LOUIS, MO.			7250D64 S013	REV. 15	

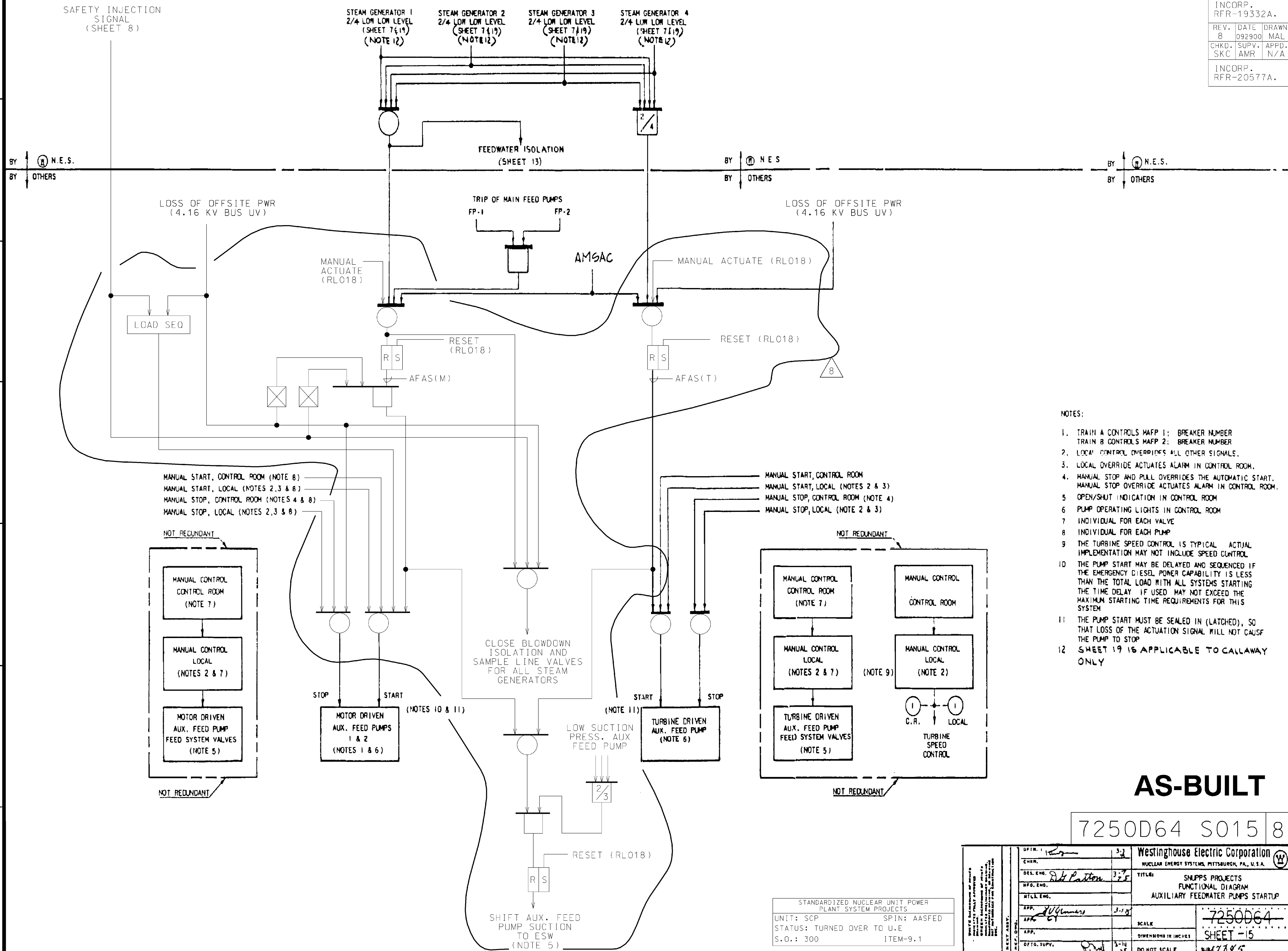
REV.	DATE	DRAWN	CHKD.	SUPV.	APPD.
6	091596	JHK	EW	AMR	N/A
REDRAWN FOR CLARITY. REFLECTS TURN-OVER TO UE.					
REV.	DATE	DRAWN	CHKD.	SUPV.	APPD.
6	021796	JHK	EW	AMR	N/A
ISSUE PER COP-22-04024.					
REV.	DATE	DRAWN	CHKD.	SUPV.	APPD.
7	120296	JHK	EW	AMR	N/A
INCORP. CMP 92-1051A (PARTIAL).					
REV.	DATE	DRAWN	CHKD.	SUPV.	APPD.
8	061898	JHK	EW	AMR	N/A
INCORP. CMP 92-1051A (PARTIAL).					
REV.	DATE	DRAWN	CHKD.	SUPV.	APPD.
9	120296	JHK	EW	AMR	N/A
INCORP. MP 98-2005A.					
REV.	DATE	DRAWN	CHKD.	SUPV.	APPD.
10	112013	JHK	EW	AMR	N/A
DRAWN CHD. SUPV. RLM MAL LMP INCORPORATE MP 03-1002 FCN-10.					



NOTES:

1. ANALOG GATE CONSISTS OF TWO SOLENOID VENT VALVES IN PARALLEL TO REDUNDANTLY INTERLOCK THE AIR LINE SUPPLYING EACH VALVE'S POSITIONER. THE SOLENOID VALVES ARE DE-ENERGIZED TO VENT, CAUSING EACH FEEDWATER VALVE TO CLOSE IN FIVE SECONDS. BOTH REDUNDANT BLOCK SIGNALS ARE REQUIRED IN ORDER TO CLOSE THE ASSOCIATED VALVE.
2. DELETED.
3. OPEN/CLOSE CONTROL AND INDICATION FOR EACH FEEDWATER VALVE IS IN CONTROL ROOM.
4. SWITCHING BETWEEN TWO PRESSURE SIGNALS IS PROVIDED ON THE CONTROL BOARD.
5. DELETED.
6. MAIN FEEDWATER REGULATING VALVES HAVE DUAL POSITIONERS IN MASTER/STANDBY CONFIGURATION. FAILOVER OPERATION REQUIRES MANUAL ISOLATION OF AIR LINES.
7. CIRCUITS TO THE FEEDWATER VALVE POSITIONERS ARE FOR POWERING AND CONTROLLING. THE PROTOCOL IS PROFIBUS PA. REFER TO J-2017 VENDOR DRAWINGS FOR DETAILS.
8. AN OVERVIEW OF LOGIC IS SHOWN FOR FEEDWATER CONTROL. REFER TO J-2017 VENDOR SOFTWARE DESIGN DESCRIPTION (SDD) FOR DETAILS.

STANDARDIZED NUCLEAR UNIT POWER PLANT SYSTEM PROJECTS		FUNCTIONAL DIAGRAM FEEDWATER CONTROL & ISOLATION	
UNIT: SOP	TURNED OVER TO UE	APPROVED BY W	UNION ELECTRIC COMPANY
CERTIFICATION LTR. NO. SCP-88-509	AUTHORITY: M.J. PARVIN	ENGR. LTR. NO. JRS7-7108	ST. LOUIS, MO
CLASS	CLASS	CLASS	CLASS
REV. 10	REV. 10	REV. 10	REV. 10



NOTES:

1. TRAIN A CONTROLS MAP 1: BREAKER NUMBER
TRAIN B CONTROLS MAP 2: BREAKER NUMBER
2. LOCAL CONTROL OVERRIDES ALL OTHER SIGNALS.
3. LOCAL OVERRIDE ACTUATES ALARM IN CONTROL ROOM.
4. MANUAL STOP AND PULL OVERRIDES THE AUTOMATIC START.
MANUAL STOP OVERRIDES ALARM IN CONTROL ROOM.
5. OPEN/SHUT INDICATION IN CONTROL ROOM
6. PUMP OPERATING LIGHTS IN CONTROL ROOM
7. INDIVIDUAL FOR EACH VALVE
8. INDIVIDUAL FOR EACH PUMP
9. THE TURBINE SPEED CONTROL IS TYPICAL ACTUAL
IMPLEMENTATION MAY NOT INCLUDE SPEED CONTROL
10. 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
11. THE PUMP START MUST BE SEALED IN (LATCHED), SO
THAT LOSS OF THE ACTUATION SIGNAL WILL NOT CAUSE
THE PUMP TO STOP
12. SHEET 19 IS APPLICABLE TO CALLAWAY
ONLY

AS-BUILT

7250D64 S015 8

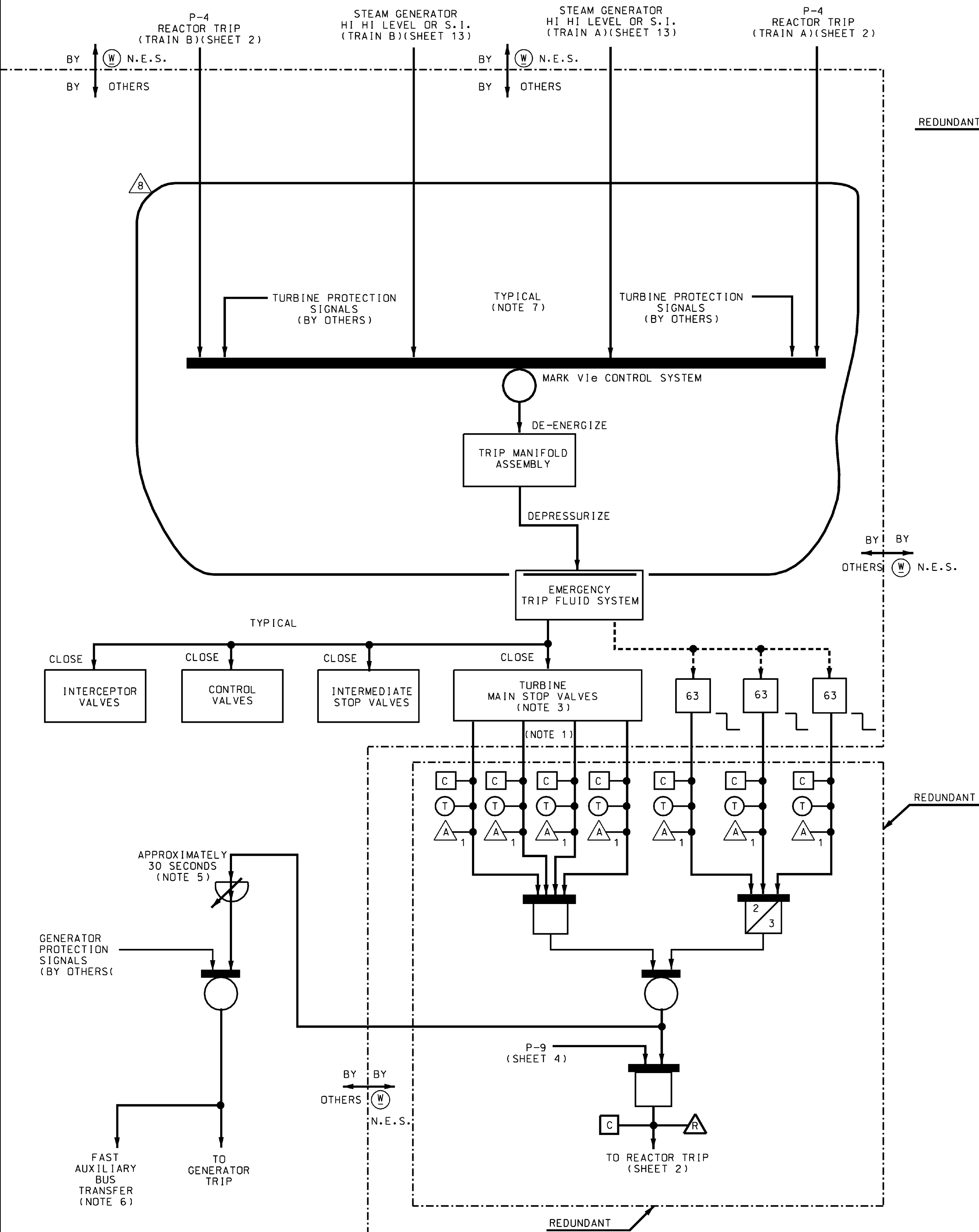
STANDARDIZED NUCLEAR UNIT POWER
PLANT SYSTEM PROJECTS

UNIT: SCP SPIN: AASFED

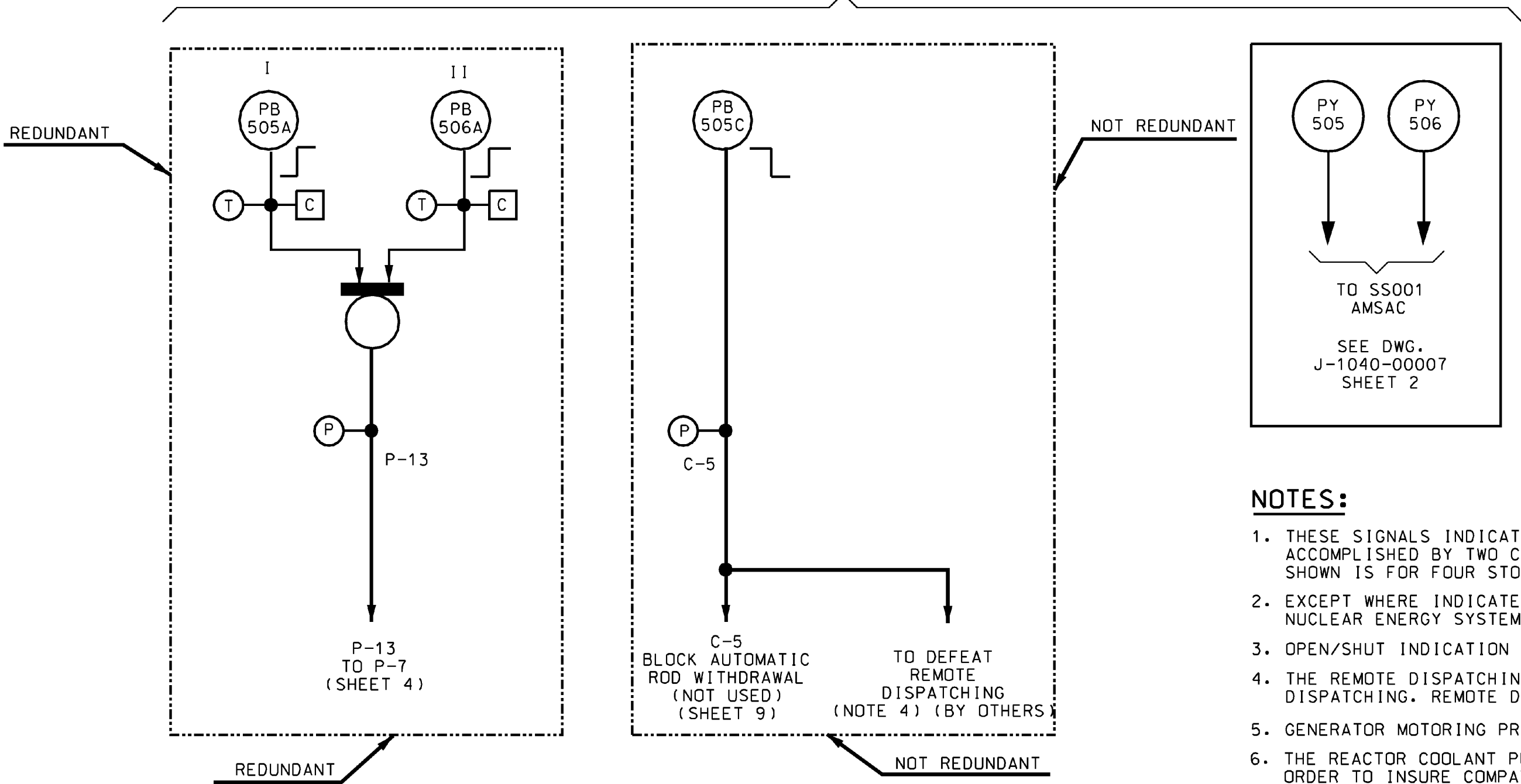
STATUS: TURNED OVER TO U.E

S.O.: 300 ITEM-9.1

DESIGN		3/2		Westinghouse Electric Corporation	
ENGR.		3/2		NUCLEAR ENERGY SYSTEMS, PITTSBURGH, PA, U.S.A.	
DES. ENG.		3/2		TITLE: SHUPPS PROJECTS	
MFG. ENG.		3/2		FUNCTIONAL DIAGRAM	
MFG. ENG.		3/2		AUXILIARY FEEDWATER PUMPS STARTUP	
APP.		3/2		SCALE	
APP.		3/2		DIMENSIONS IN INCHES	
OFFG. SUPV.		3/2		DO NOT SCALE	
NEXT ASSY.		3/2		7250D64	
NEXT ASSY.		3/2		SHEET -15	
NEXT ASSY.		3/2		SUB 2885	

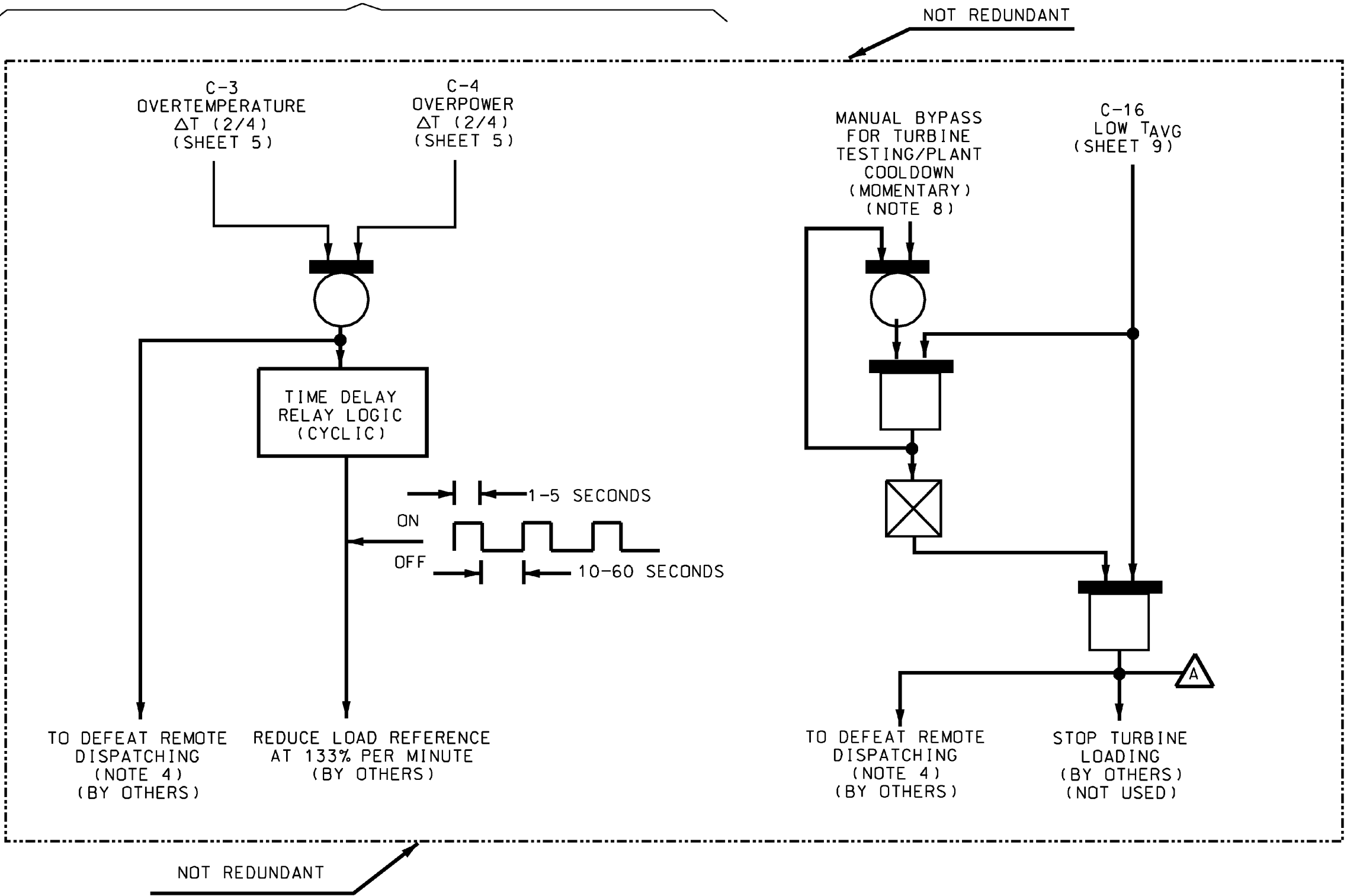


TURBINE POWER
(TURBINE IMPULSE CHAMBER PRESSURE)



- NOTES:**
1. THESE SIGNALS INDICATE THE CLOSING 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.
 2. EXCEPT WHERE INDICATED OTHERWISE, REDUNDANCY IS INDICATED IN REGARDS TO (W) NUCLEAR ENERGY SYSTEMS REQUIREMENTS ONLY.
 3. OPEN/SHUT INDICATION IN CONTROL ROOM FOR EACH STOP VALVE.
 4. THE REMOTE DISPATCHING IS TYPICAL. ACTUAL IMPLEMENTATION MAY NOT INCLUDE REMOTE DISPATCHING. REMOTE DISPATCHING IS NOT USED AT CALLAWAY.
 5. GENERATOR MOTORING PROTECTION SHOULD NOT DEFEAT THE THIRTY SECOND DELAY.
 6. THE REACTOR COOLANT PUMP BUS TRANSFER SHOULD BE COMPLETED WITHIN SIX CYCLES IN ORDER TO INSURE COMPATIBILITY WITH THE UNDERFREQUENCY TRIP OF THE REACTOR COOLANT PUMP CIRCUIT BREAKERS. THE TRANSFER TIME LIMIT MAY BE EXTENDED ANOTHER 4 CYCLES TO A TOTAL OF NOT GREATER THAN 10 CYCLES. IF THE SYSTEM DYNAMICS ARE SUCH THAT A RCP TRIP DOES NOT OCCUR, THE 10 CYCLE LIMIT IS FOR PUMP MOTOR PROTECTION.
 7. THE TURBINE-GENERATOR PROTECTION LOGIC IS ONLY TYPICAL OF THE ACTUAL HARDWARE DESIGN. SEE BECHTEL DRAWINGS FOR DETAILS.
 8. 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. THIS FUNCTION IS NOT USED AT CALLAWAY.

TURBINE RUNBACK
VIA LOAD REFERENCE



REV.	DATE	DRAWN
6	122099	RLW
CHKD.	SUPV.	APPD.
DJB	AMR	N/A
INCORP.	MP 95-1008.	
7	112702	
DRAWN	CHKD.	SUPV.
RLW	MAL	TWS
INCORPORATE	RFR-21998A	
8	052219	
DRAWN	CHKD.	SUPV.
EBH	JER	DME
INCORP.	MP 08-0027.	
	FCN-04.	

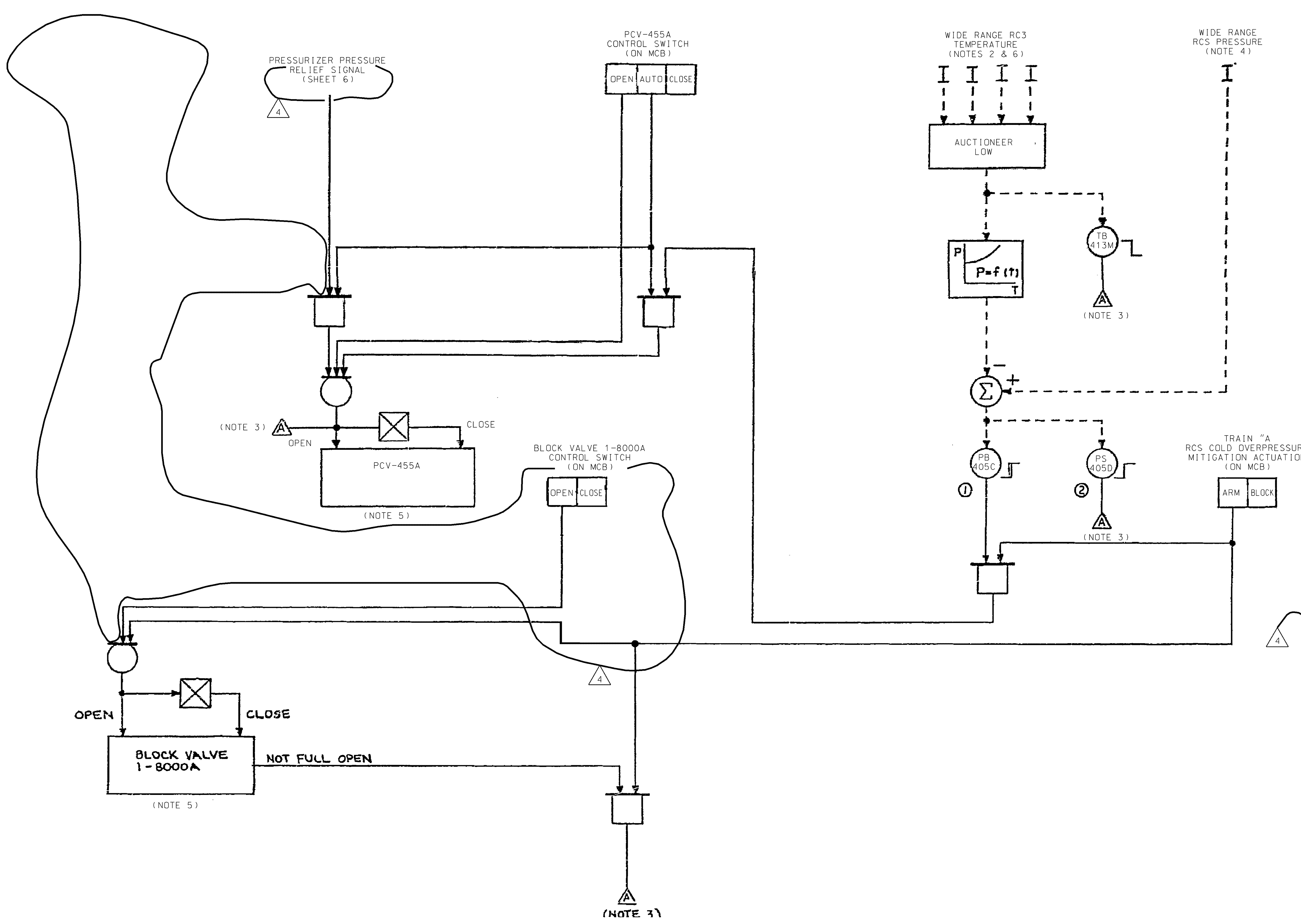
**TURBINE TRIP/RUNBACKS/OTHER SIGNALS
FUNCTIONAL DIAG (SPIN AASFED)**

STANDARDIZED NUCLEAR UNIT POWER PLANT SYSTEM PROJECTS	
UNIT: SCP	SPIN: AASFED
STATUS: TURNED OVER TO U.E	
S.O.: 300	TAB 9-1

AS-BUILT

DRAWING NO.	REV.
7250D64 S016	008

Westinghouse Electric Corporation NUCLEAR ENERGY DIVISION, PITTSBURGH, PA., U.S.A.	
TITLE: SNUPPS PROJECT FUNCTIONAL DIAGRAM TURBINE TRIP, RUNBACKS, AND OTHER SIGNALS (W REQUIREMENTS)	
DIMENSIONS IN INCHES	7250D64 SHEET 16
DO NOT SCALE	

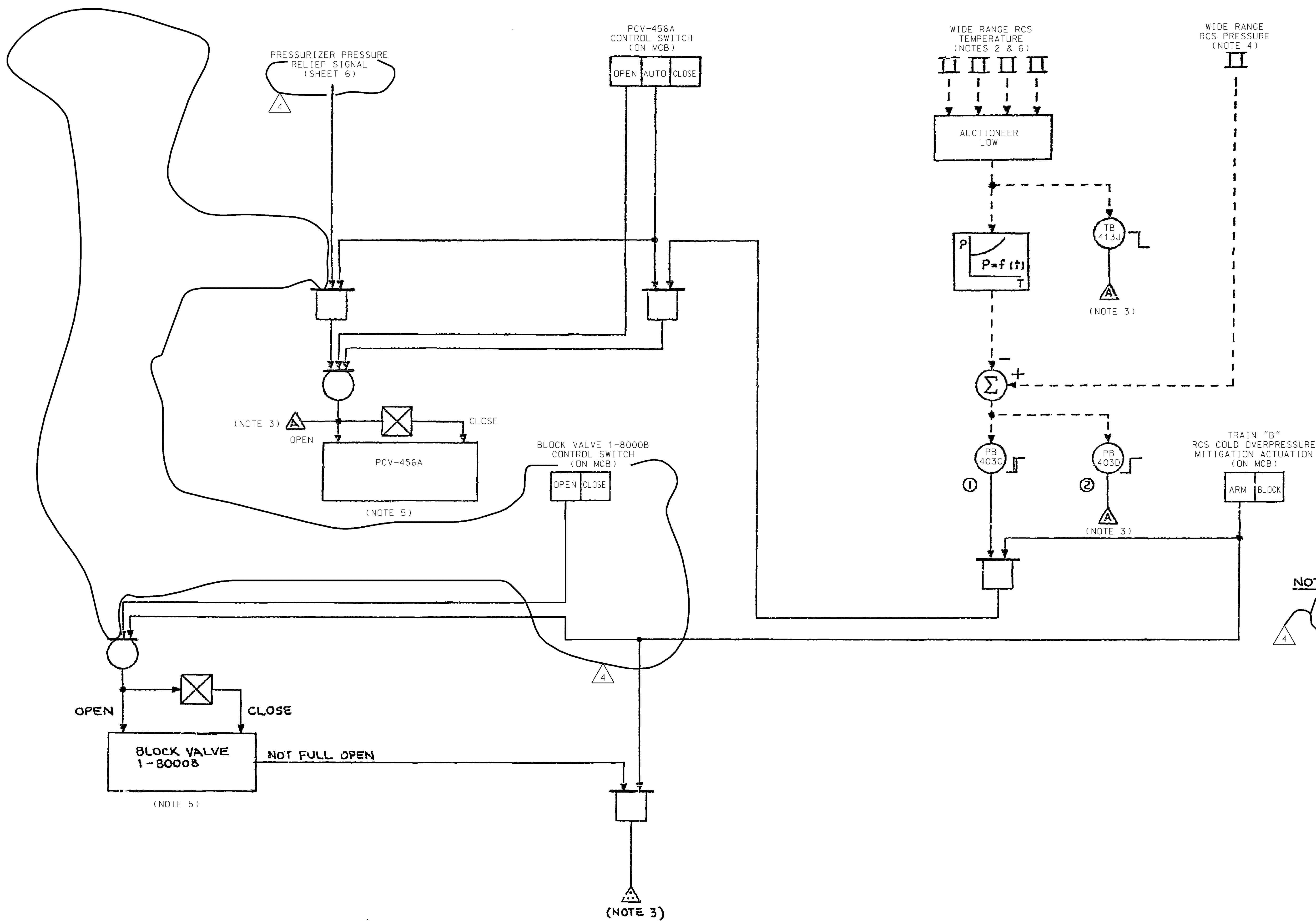


1. DELETED.
2. PROTECTION GRADE WIDE RANGE RCS TEMPERATURE SIGNALS FROM TRAIN "A" RELATED PROTECTION SETS.
3. ANNUNCIATION IN THE MAIN CONTROL ROOM IS REQUIRED TO BE VISIBLE TO THE OPERATOR AT THE MAIN CONTROL ROOM.
4. PROTECTION GRADE WIDE RANGE RCS PRESSURE SIGNAL FROM A TRAIN "A" RELATED PROTECTION SET.
5. STATUS LIGHTS MUST BE PROVIDED FOR EACH PORV AND EACH PORV BLOCK VALVE AT THE MAIN CONTROL BOARD TO INDICATE WHEN THE VALVE IS FULLY CLOSED OR FULLY OPEN.
6. THE RCS LOOP AND HOT LEG OR COLD LEG ASSIGNMENTS FOR THE WIDE RANGE RCS TEMPERATURE SIGNALS MUST BE CONSISTENT WITH THE REQUIREMENTS FOR RVLIS AND PAMS.

DRAWN (DATE) N/A	FUNCTIONAL DIAGRAM		
CHKD. (DATE) N/A	PRESSURIZER PRESSURE RELIEF		
SUPV. (DATE) N/A	SYSTEM (TRAIN A)		
APPD. (DATE) N/A	LOCATION	CALLAWAY PLANT	CLASS
UNION ELECTRIC COMPANY ST. LOUIS, MO.		7250D64-S017	REV 4

STANDARDIZED NUCLEAR UNIT POWER PLANT SYSTEM PROJECTS	
UNIT: SCP	SPIN: AASFED-04
STATUS: TURNED OVER TO U.E	
SHOP ORDER: 300	ITEM: 9-1

REV. 3	DATE 062200	DRAWN MAL
CHKD. SKC	SUPV. AMR	APPD. N/A
REFLECTS TURNOVER TO UE.		
REV. 4	DATE 051101	DRAWN RLW
CHKD. MAL	SUPV. AMR	APPD. N/A
INCORP. MP 00-1005A		



- NOTES:

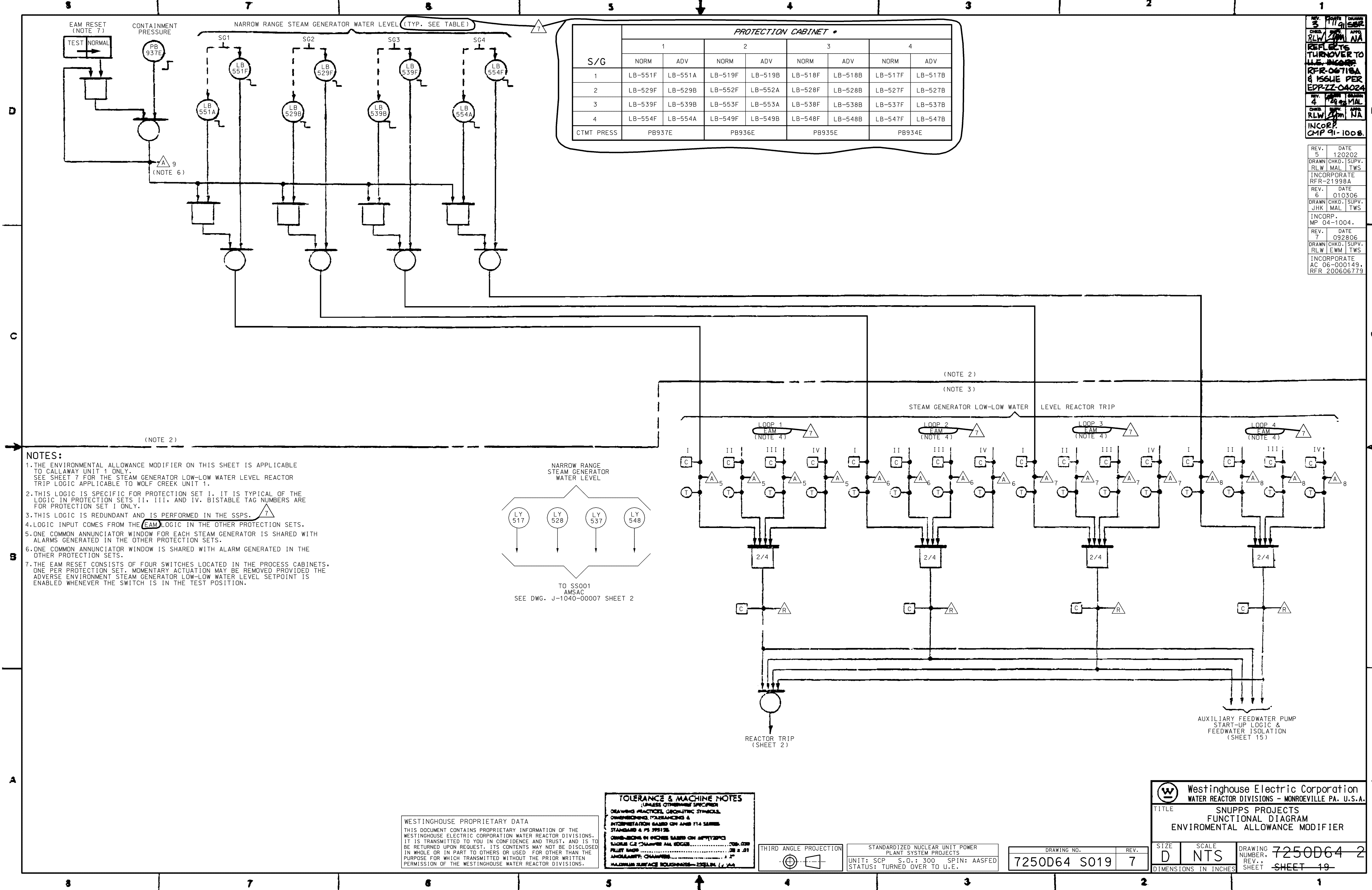
1. DELETED.

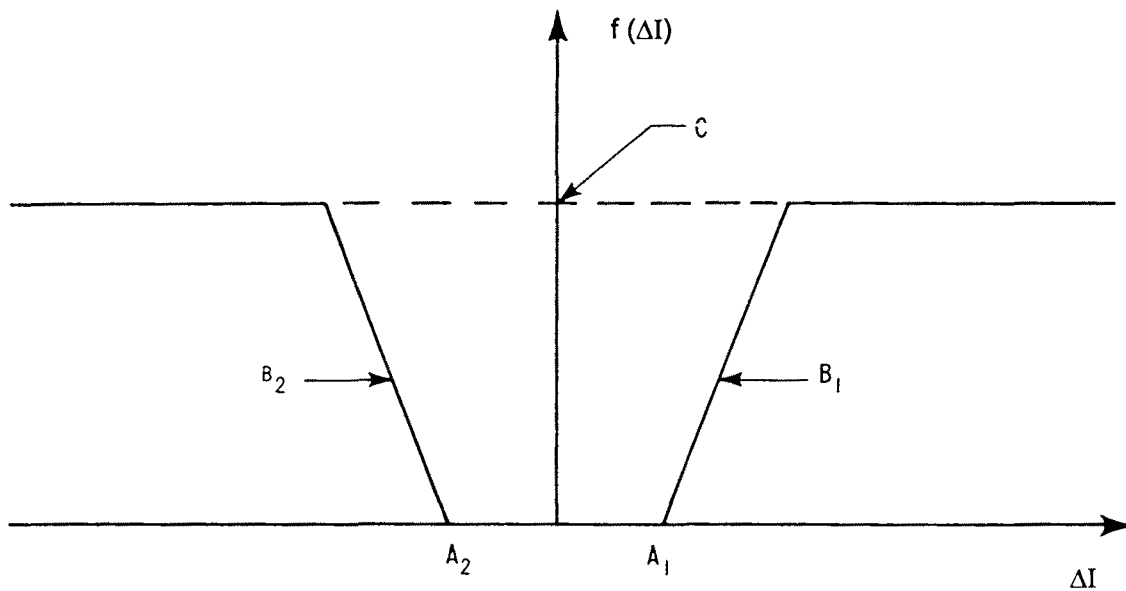
2. PROTECTION GRADE WIDE RANGE RCS TEMPERATURE SIGNALS FROM TRAIN "B" RELATED PROTECTION SETS.
3. ANNUNCIATION IN THE MAIN CONTROL ROOM IS REQUIRED TO BE VISIBLE TO THE OPERATOR AT THE MAIN CONTROL ROOM.
4. PROTECTION GRADE WIDE RANGE RCS PRESSURE SIGNAL FROM A TRAIN "B" RELATED PROTECTION SET.
5. STATUS LIGHTS MUST BE PROVIDED FOR EACH PORV AND EACH PORV BLOCK VALVE AT THE MAIN CONTROL BOARD TO INDICATE WHEN THE VALVE IS FULLY CLOSED OR FULLY OPEN.
6. THE RCS LOOP AND HOT LEG OR COLD LEG ASSIGNMENTS FOR THE WIDE RANGE RCS TEMPERATURE SIGNALS MUST BE CONSISTENT WITH THE REQUIREMENTS FOR RVLS AND PAMS.

REFERENCE DWG:
WESTINGHOUSE ELECTRIC CORP.
DWG. NO. 7250D64 SHEET 18

STANDARDIZED NUCLEAR UNIT POWER PLANT SYSTEM PROJECTS	
UNIT: SCP	SPIN: AASFED-04
STATUS: TURNED OVER TO U.E	
SHOP ORDER: 300	ITEM: 9-1

DRAWN (DATE) N/A	FUNCTIONAL DIAGRAM PRESSURIZER PRESSURE RELIEF SYSTEM (TRAIN B)		
CHKD. (DATE) N/A			
SUPV. (DATE) N/A			
APPD. (DATE) N/A	LOCATION	CALLAWAY PLANT	CLASS
UNION ELECTRIC COMPANY ST. LOUIS, MO.		7250D64-S018	REV. 4





- ΔI - NEUTRON FLUX DIFFERENCE BETWEEN UPPER AND LOWER LONG ION CHAMBERS
- A_1, A_2 - LIMIT OF $f(\Delta I)$ DEADBAND
- B_1, B_2 - SLOPE OF RAMP; DETERMINES RATE AT WHICH FUNCTION REACHES IT'S MAXIMUM VALUE ONCE DEADBAND IS EXCEEDED
- C - MAGNITUDE OF MAXIMUM VALUE THE FUNCTION MAY ATTAIN

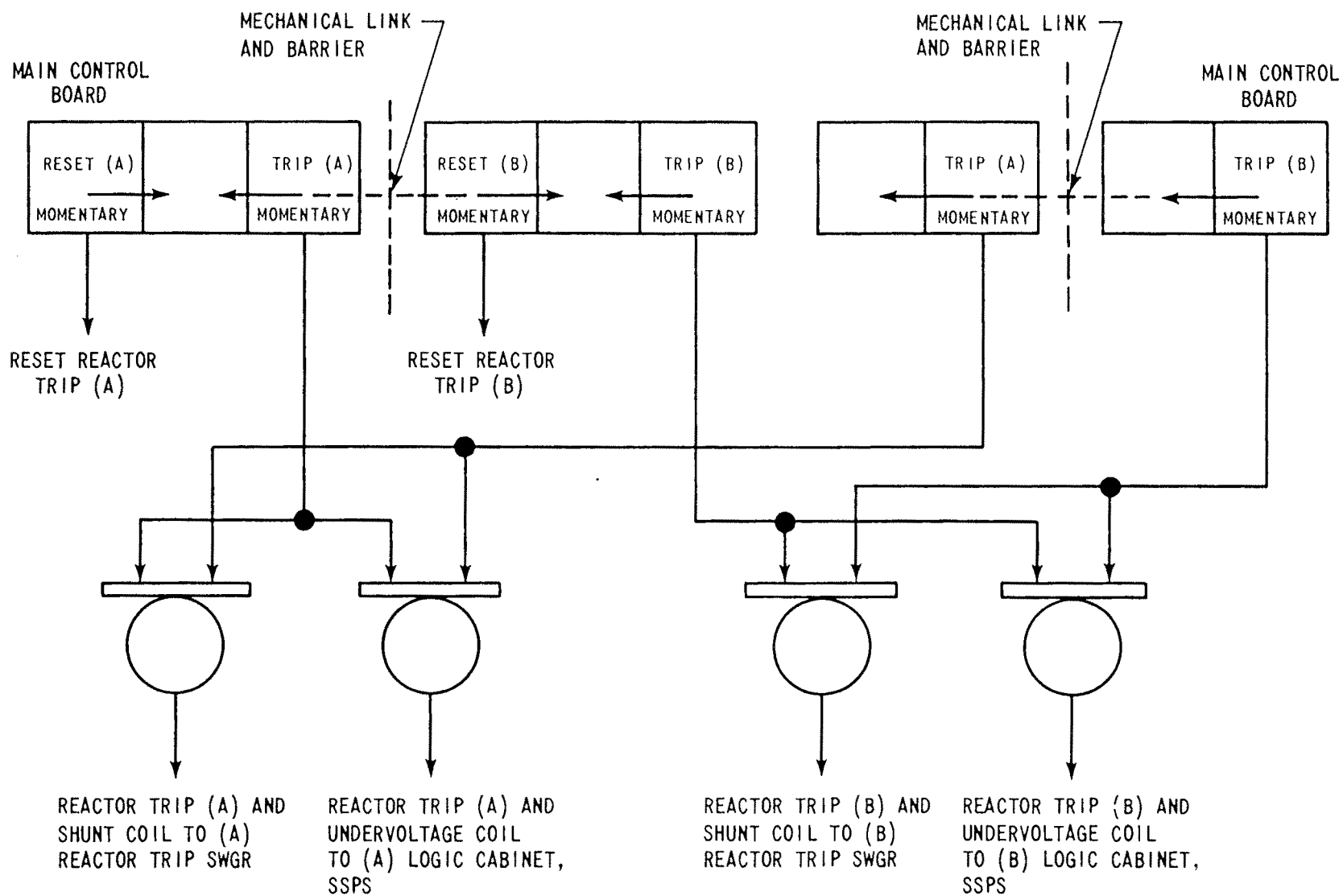
NOTE: $f(\Delta I) = 0$ FOR OPDT FOR ALL INPUT VALUES.

REV OL-12
11/01

CALLAWAY PLANT

FIGURE 7.2-2

SETPOINT REDUCTION FUNCTION
FOR OVERPOWER AND OVERTEMPERA-
TURE ΔT TRIPS



Rev. OL-0
6/86

CALLAWAY PLANT

FIGURE 7.2-3

REACTOR TRIP/ENGINEERED SAFETY
FEATURES ACTUATION MECHANICAL
LINKAGE

Definition	Function	Symbol
Hand Switch input to logic	MANUAL INPUT	
Process Switch input to logic	PROCESS INPUT	
Output exists only when all inputs are present	AND	
Output exists only when one or more inputs are present	OR	
Output exists only when input is not present	NOT	
Output exists only when input has been continuously present for a preset time and remains present	ON DELAY	
Output exists only when input is present and for a preset time after the input is not present	OFF DELAY (TIMED MEMORY)	
Set output exists when set input is present & continues until the reset input is present. Reset output exists only when set output is not present.	MEMORY	
Output exists only when at least A out of B inputs are present	COINCIDENCE MATRIX	
Output exists under special conditions not otherwise noted.	SPECIAL	
Digital output exists only when input is lower than setpoint	LOW BISTABLE	
Digital output exists only when input is higher than setpoint	HIGH BISTABLE	
Output is electrically isolated from input	ISOLATION	
Test signal can be inserted manually in place of normal signal	TEST DEVICE	
RED (R) - Operating GREEN (G) - Not operating AMBER (A) - Warning, take note WHITE (W) - Advisory information	LIGHT	
Input to annunciator	ANNUNCIATOR	
Input to computer	COMPUTER	
Resultant action initiated by logic	OUTPUT ACTION	
Logic continuation	CONTINUATION	

ref. J-0601

DRAWING NUMBERING

Numbering conforms to Bechtel Engineering Procedure 6-6. Sheet numbers correspond to instrument loop numbers.

General Notes

- Logic symbols represent system functions and do not necessarily duplicate circuit arrangement or devices. Logic diagrams do not inherently imply energized, de-energized, or other circuit operation states.
- Process equipment will change state when a change is initiated, and will remain in this state until a change to another state is initiated.
- Process equipment will remain in, or return to, the original state after a loss and restoration of power, unless otherwise noted.
- Inherent equipment interlocks such as circuit breaker trip free and reversing starting cross interlocks are not shown.
- Some protection actions are shown also as start premissives. Trip-free design prevents equipment operation when a protection action exists, even if a start permissive is not provided.
- Final instrument setpoints are shown elsewhere. Setpoints shown on control logic diagrams are approximate.
- See electrical drawings for details of equipment electrical overcurrent, short circuit, and differential protection and space heaters.
- The memory, reset, and start premissive logic associated with the operation of electrical protection devices is not shown. Electrical auxiliary system breakers are reset by operation of the control room switch to trip. Mechanical auxiliary system circuits are reset by operation of a switch at the switchgear or motor control center.
- The test control switches at the switchgear which function only when a circuit breaker is in the test position are not shown.
- All circuit controls, except interlocks with other equipment, function when a circuit breaker is in the test position to allow circuit testing.
- The logic to show that valve and damper position lights are both on when the equipment is in an intermediate position is not shown.
- Limit and torque switches to stop valve and damper motor actuators at the end of travel are not shown on the logic. The valve type and required actions will be noted on the diagram when available.
- Solenoid pilot operated valves are held in position by limit switches (or relays) unless otherwise noted.

LOCATION ABBREVIATIONS	000	- Local in main control room
	001-099	- Main control room panel (ref. dwg. 10466-J-0J3621)
	100	- Local in field
	101-899	- Field control panel (ref. dwg. 10466-J-0650)
	900-999	- Plant computer
	LC	- 480 V Load center
	MCC	- Motor control center
	SWGR	- Switchgear

Rev. OL-0
6/86

CALLAWAY PLANT

FIGURE 7.3-1
ENGINEERED SAFETY FEATURES
ACTUATION SYSTEM (BOP)
(SHEET 1)

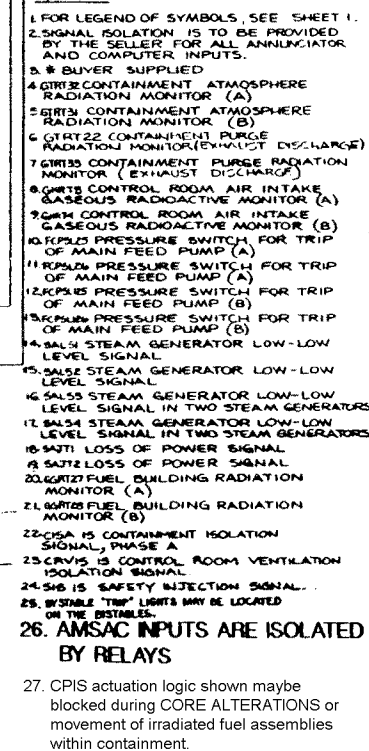
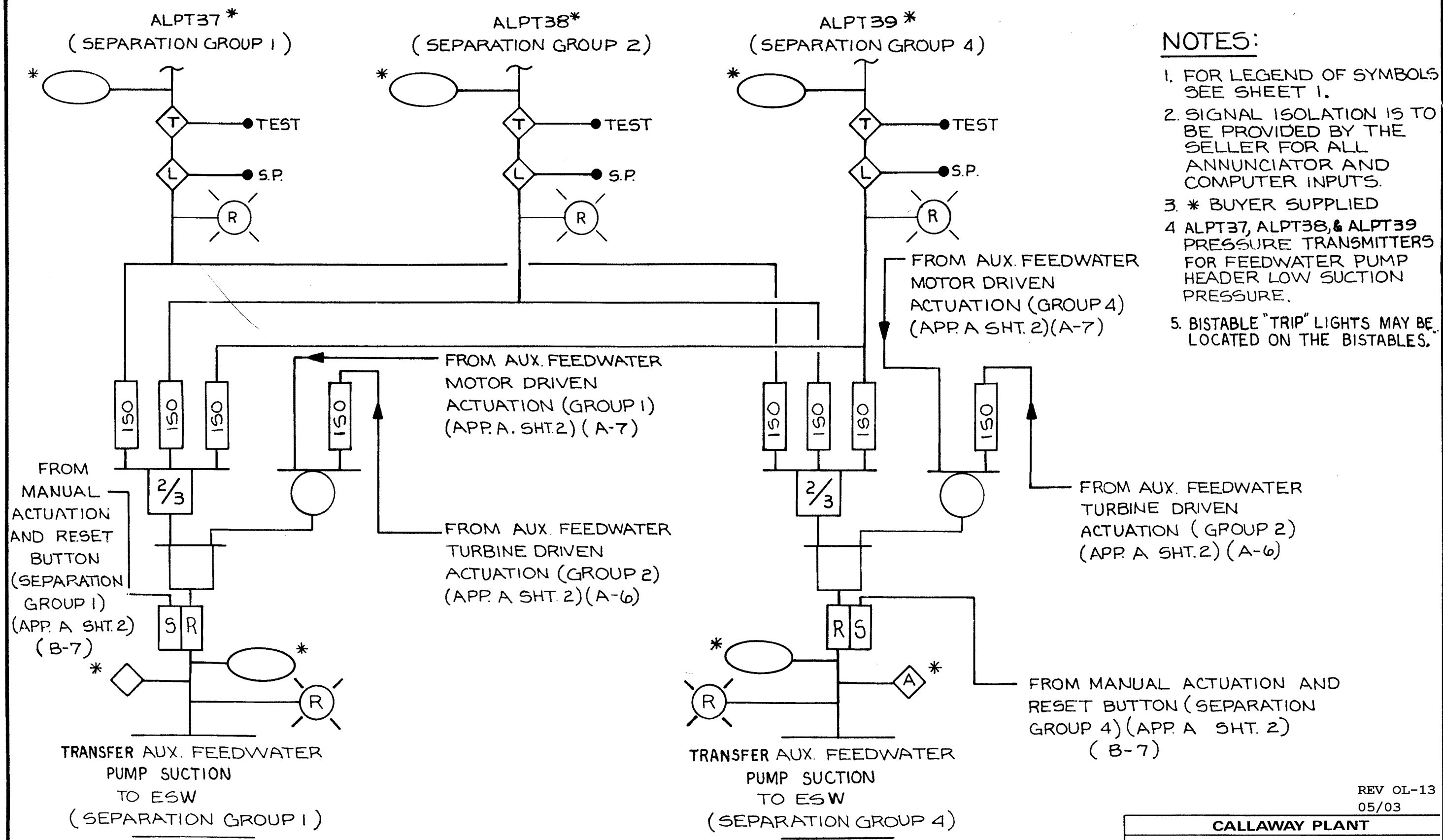


FIGURE 7.3-1
LOGIC DIAGRAM
ENGINEERED SAFETY
FEATURES ACTUATION
SYSTEM (BOP)
(SHEET 2)
REV. 14 5/12

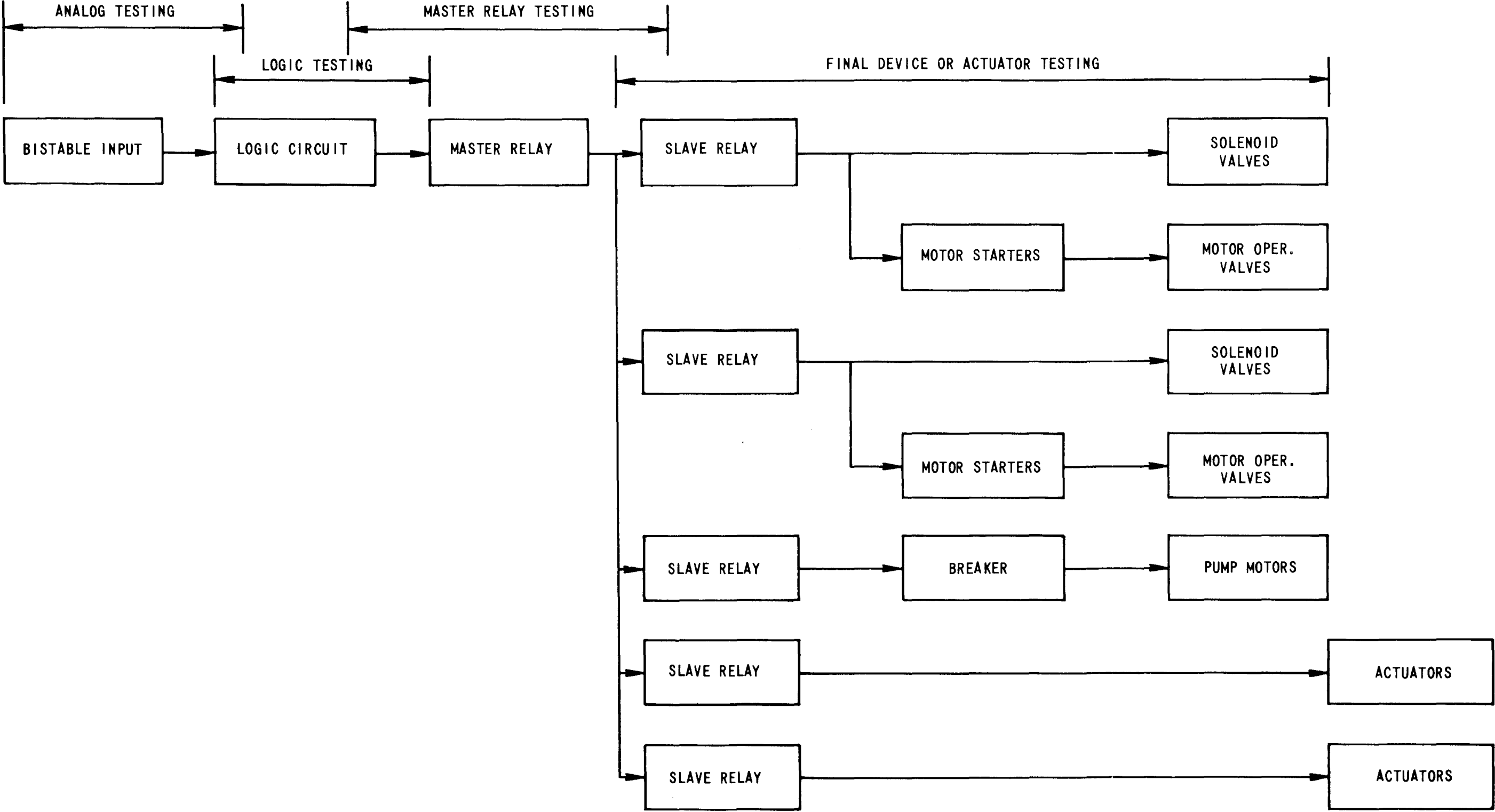


CLB

REV OL-13
05/03

CALLAWAY PLANT

FIGURE 7.3-1
LOGIC DIAGRAM
ENGINEERED SAFETY
FEATURES ACTUATION
SYSTEM (BOP)
(SHEET 3)

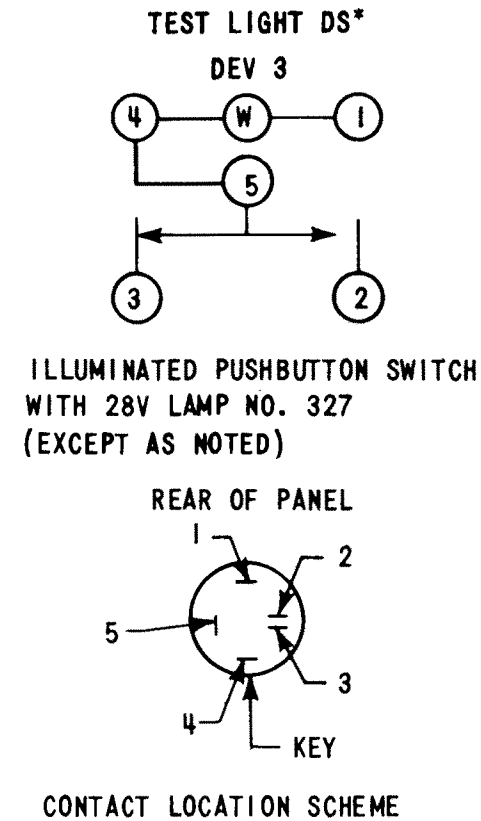


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6/86

CALLAWAY PLANT

FIGURE 7.3-2

TYPICAL ENGINEERED SAFETY
FEATURES TEST CIRCUITS

**GENERAL NOTES: ***

1. CIRCUITRY AND HARDWARE FOR REDUNDANT PROTECTION TRAINS "A" AND "B" TEST CABINETS ARE DUPLICATE EXCEPT AS NOTED
A - TRAIN "A" ONLY
B - TRAIN "B" ONLY

2. IN DETAILS A & B THE SYMBOL * REPRESENTS THE SUFFIX NUMBERS OF THE DEVICE REFERENCED.

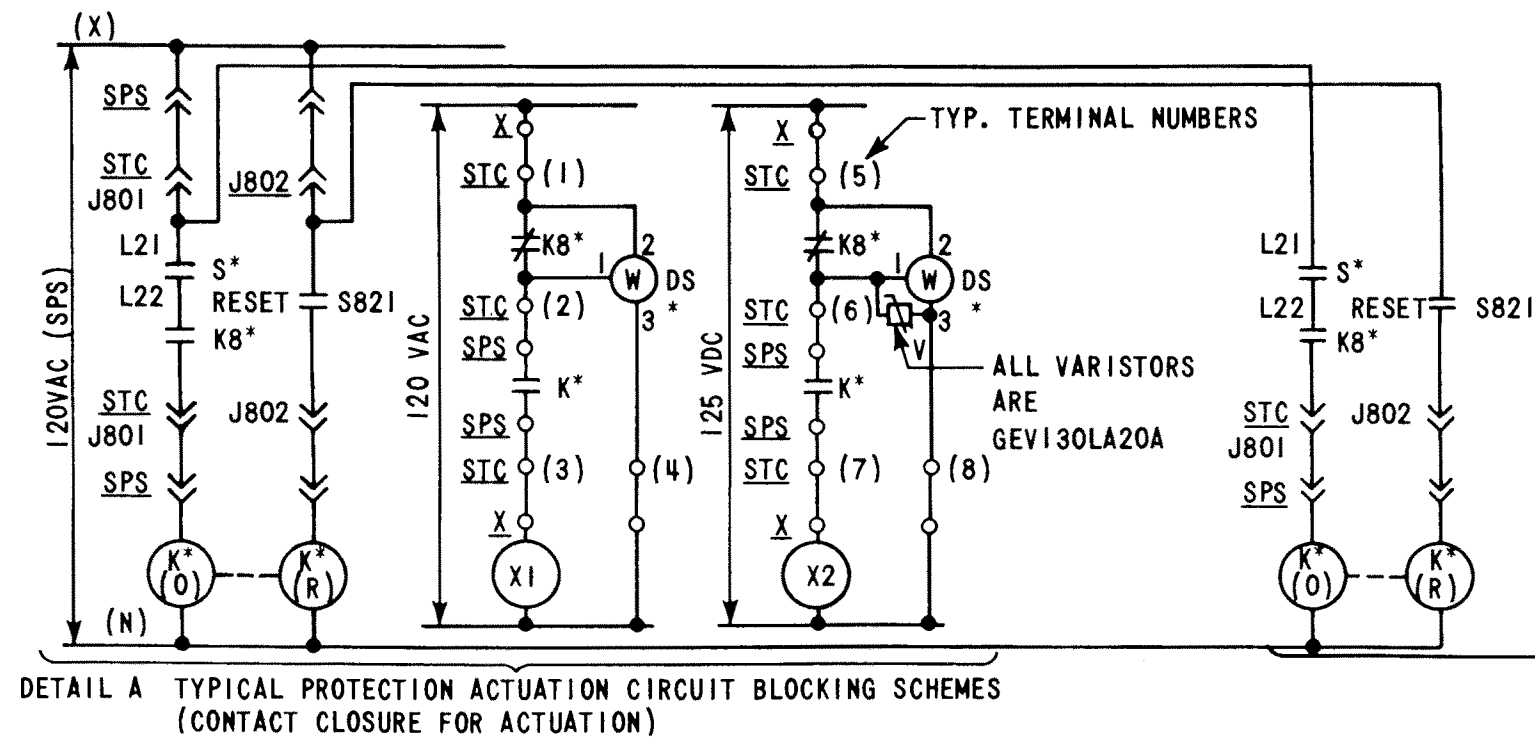
EXAMPLE:

K* - SPS RELAY, K601, K602, ETC.
K(O) - OPERATING COIL
K(R) - RESET COIL
S* - STC TEST SWITCH, S802, S834 ETC.
K8* - STC RELAY, K811, K817, ETC.
DS* - STC LIGHT, DS8009, DS8077, ETC.

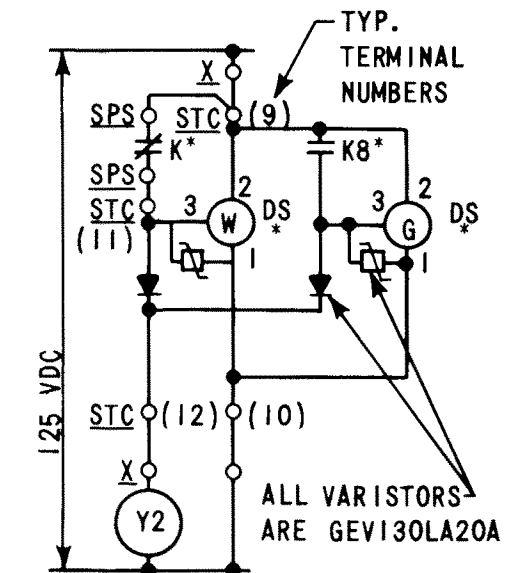
3. "DETAIL A" & "B" TYPE CIRCUITS ARE DETAILED ON THE SCHEMATICS. "DETAIL B" CIRCUITS WILL BE SUBSTITUTED FOR "DETAIL A" CIRCUITS WHERE REQUIRED.

LOCATION LEGEND

SPS - SOLID STATE PROTECTION SYSTEM
STC - SAFEGUARDS TEST CABINET
X - SWGR, MCC, AUXILIARY RELAY RACK, ETC.
ASC - AUXILIARY SAFEGUARDS CABINET



DETAIL B TYPICAL PROTECTION ACTUATION CIRCUIT BLOCKING SCHEMES
(CONTACT OPENING FOR ACTUATION)



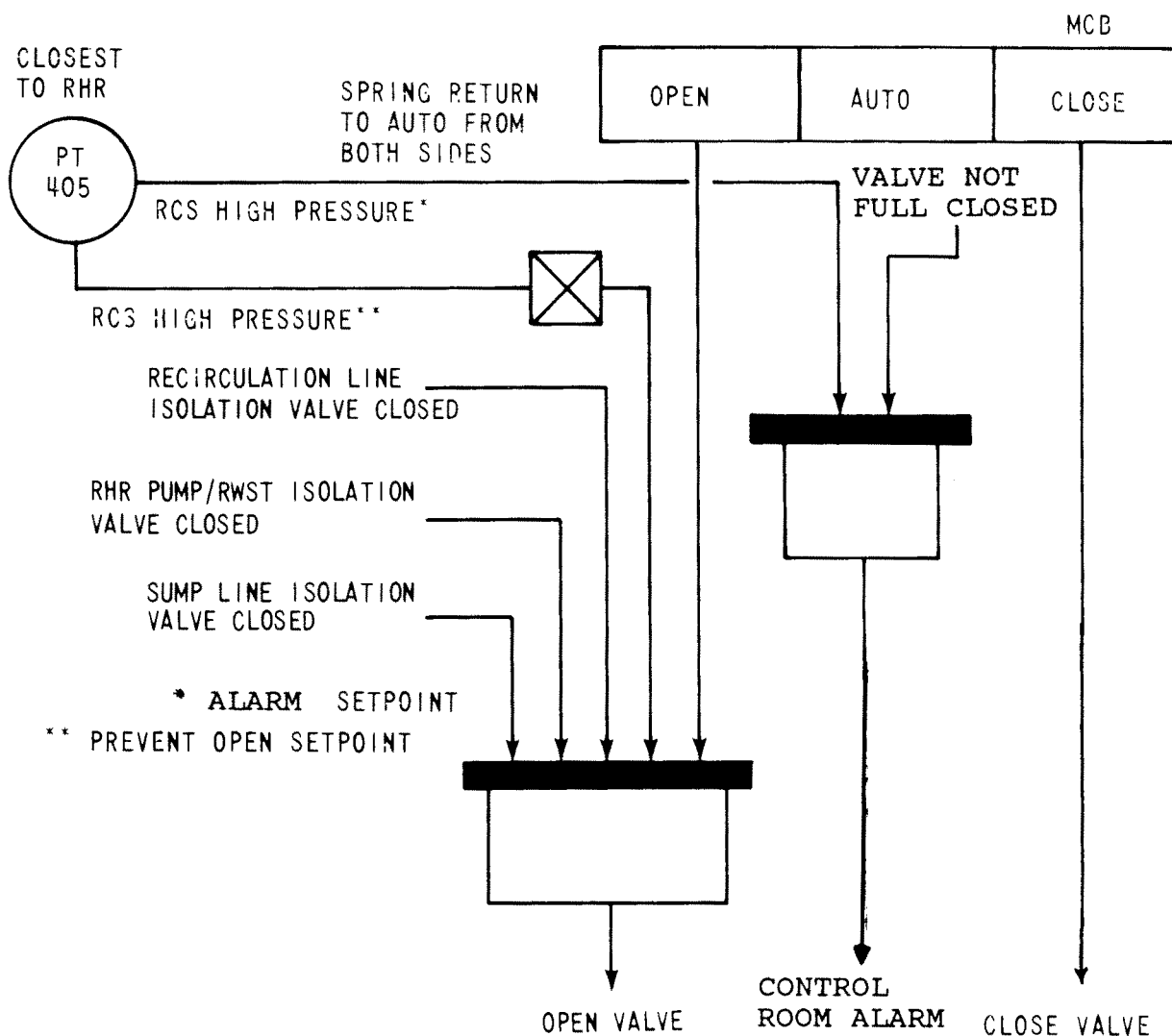
* DETAILS A AND B OF THIS FIGURE ARE NOT TO BE CONFUSED WITH ALPHA DESIGNATION OF LOGIC TRAINS A AND B.

Rev. OL-0
6/86

CALLAWAY PLANT

FIGURE 7.3- 3

ENGINEERED SAFEGUARDS TEST
CABINET (INDEX, NOTES AND
LEGEND)



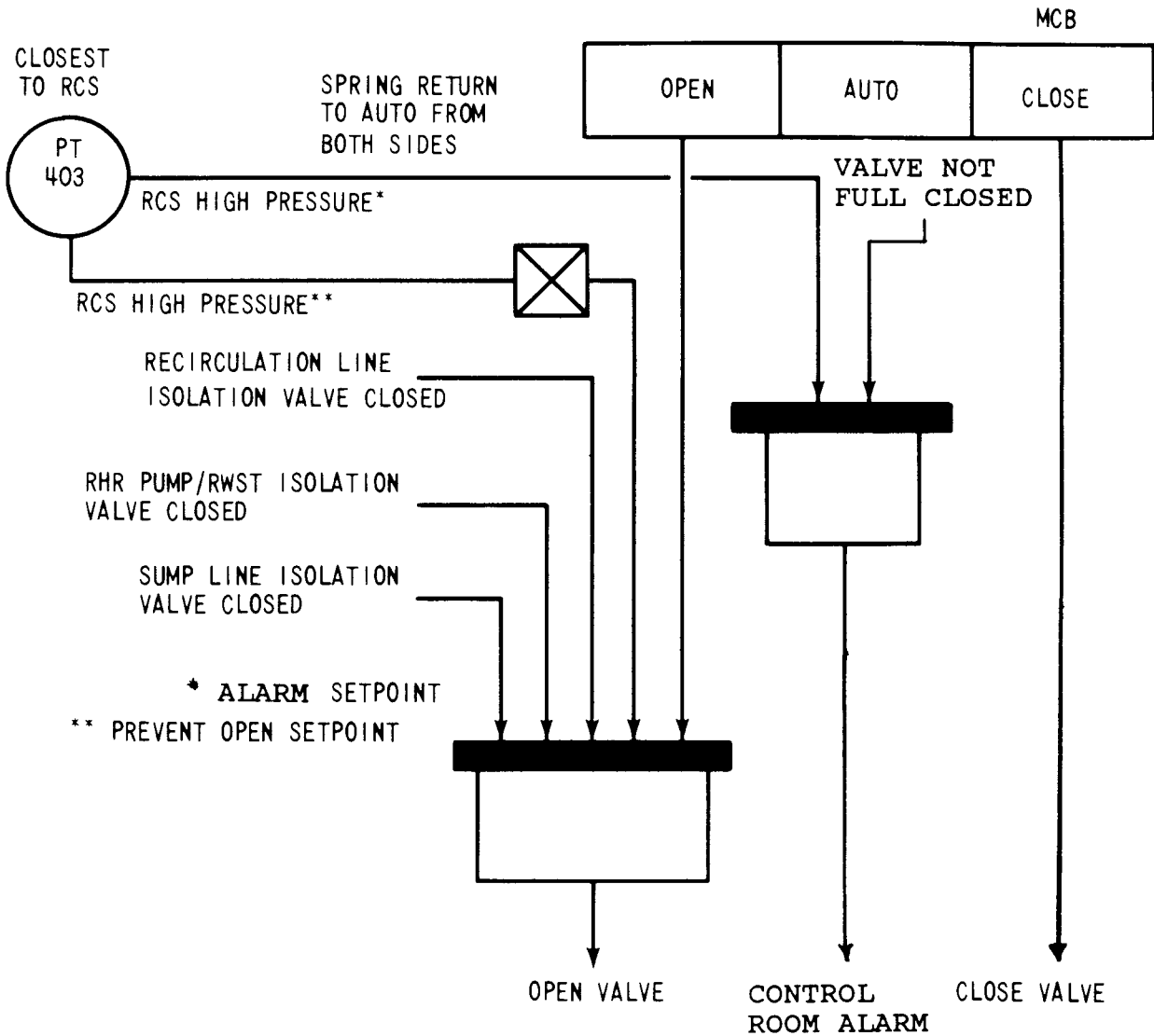
NOTE: LOGIC FOR VALVES IN EACH FLUID SYSTEM TRAIN IS IDENTICAL

Rev. OL-4
6/90

CALLAWAY PLANT

FIGURE 7.6-1 (SHEET 1)

LOGIC DIAGRAM FOR OUTER
RHRS ISOLATION VALVE



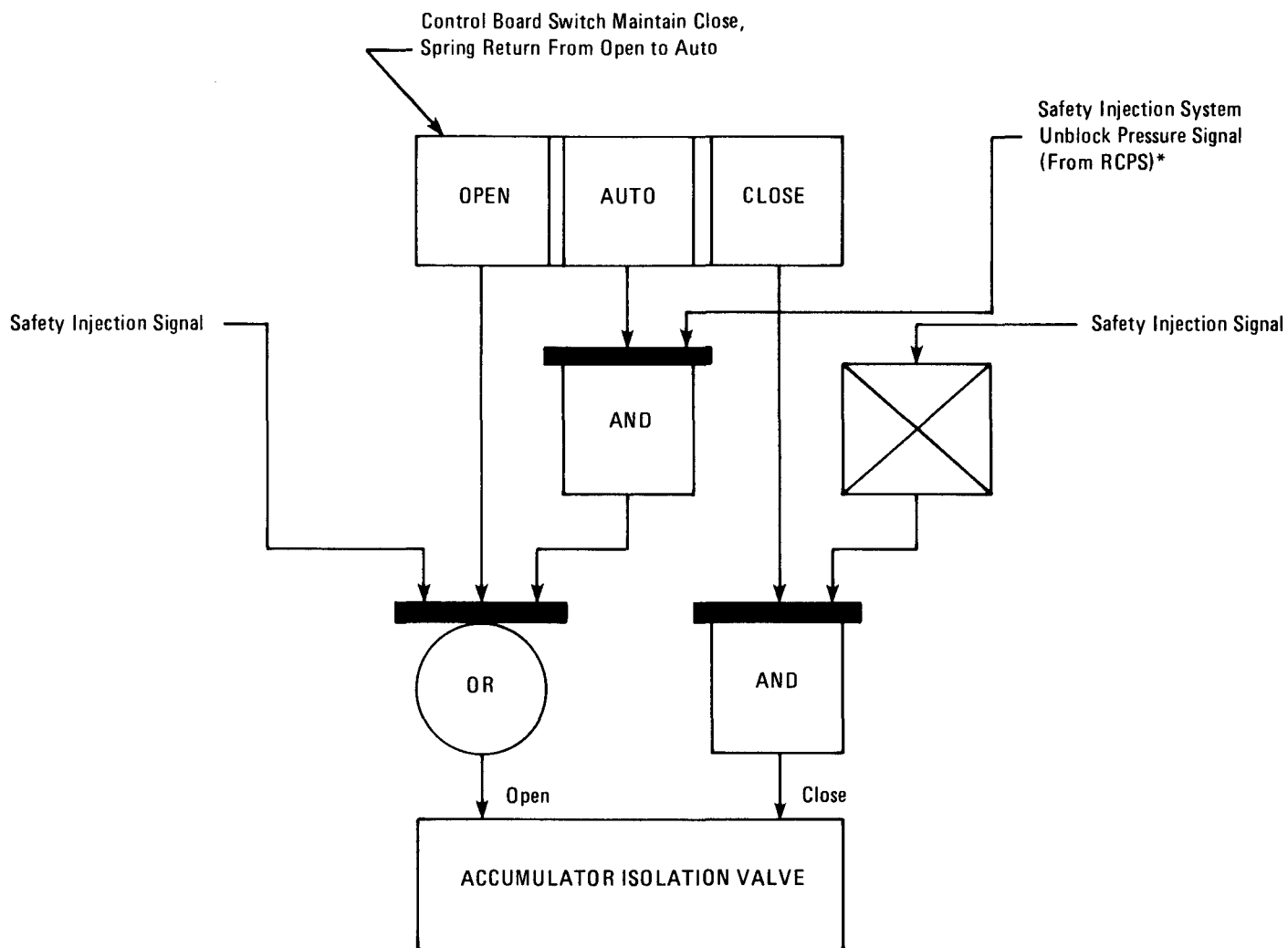
NOTE: LOGIC FOR VALVES IN EACH FLUID SYSTEM TRAIN IS IDENTICAL

Rev. OL-4
6/90

CALLAWAY PLANT

FIGURE 7.6-1 (SHEET 2)

LOGIC DIAGRAM FOR INNER
RHRS ISOLATION VALVE



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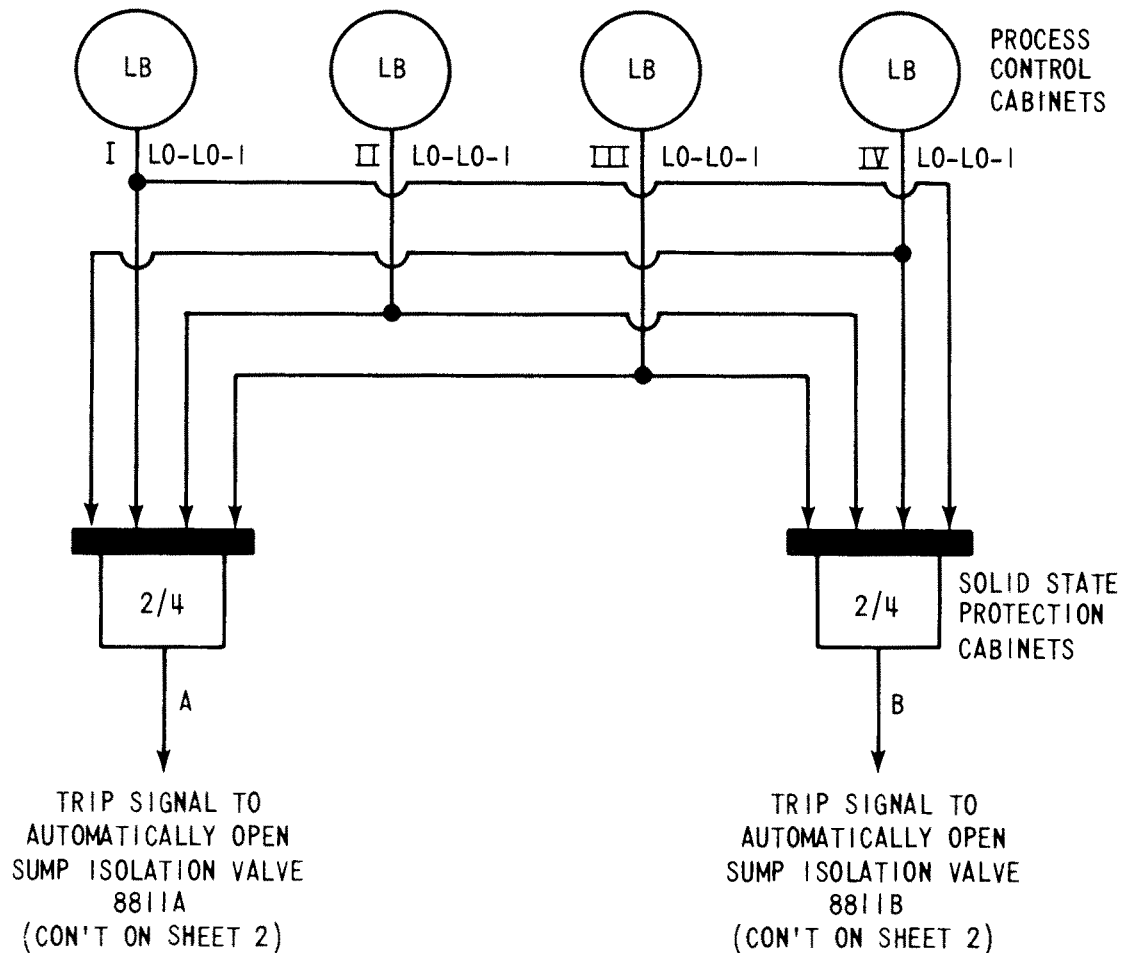
*This interlock indicates the method of applying automatic opening of the valve, whenever the RCS pressure exceeds a limit. This signal automatically occurs at RCS pressures above the SI unblock pressure used to derive P-11.

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FIGURE 7.6-2
FUNCTIONAL BLOCK DIAGRAM
OF ACCUMULATOR ISOLATION VALVE

RWST LEVEL CHANNEL BISTABLES

- 1) NORMALLY DE-ENERGIZED
- 2) DE-ENERGIZED ON LOSS OF POWER
- 3) TRIP SIGNAL PROVIDED WHEN ENERGIZED
- 4) ENERGIZED ON LO-LO-1 SETPOINT



NOTE: WHEN 8811A IS FULL
OPEN, RWST VALVE (TO
RHR PUMP) 8812A WILL
CLOSE (SEE SHEET 3)

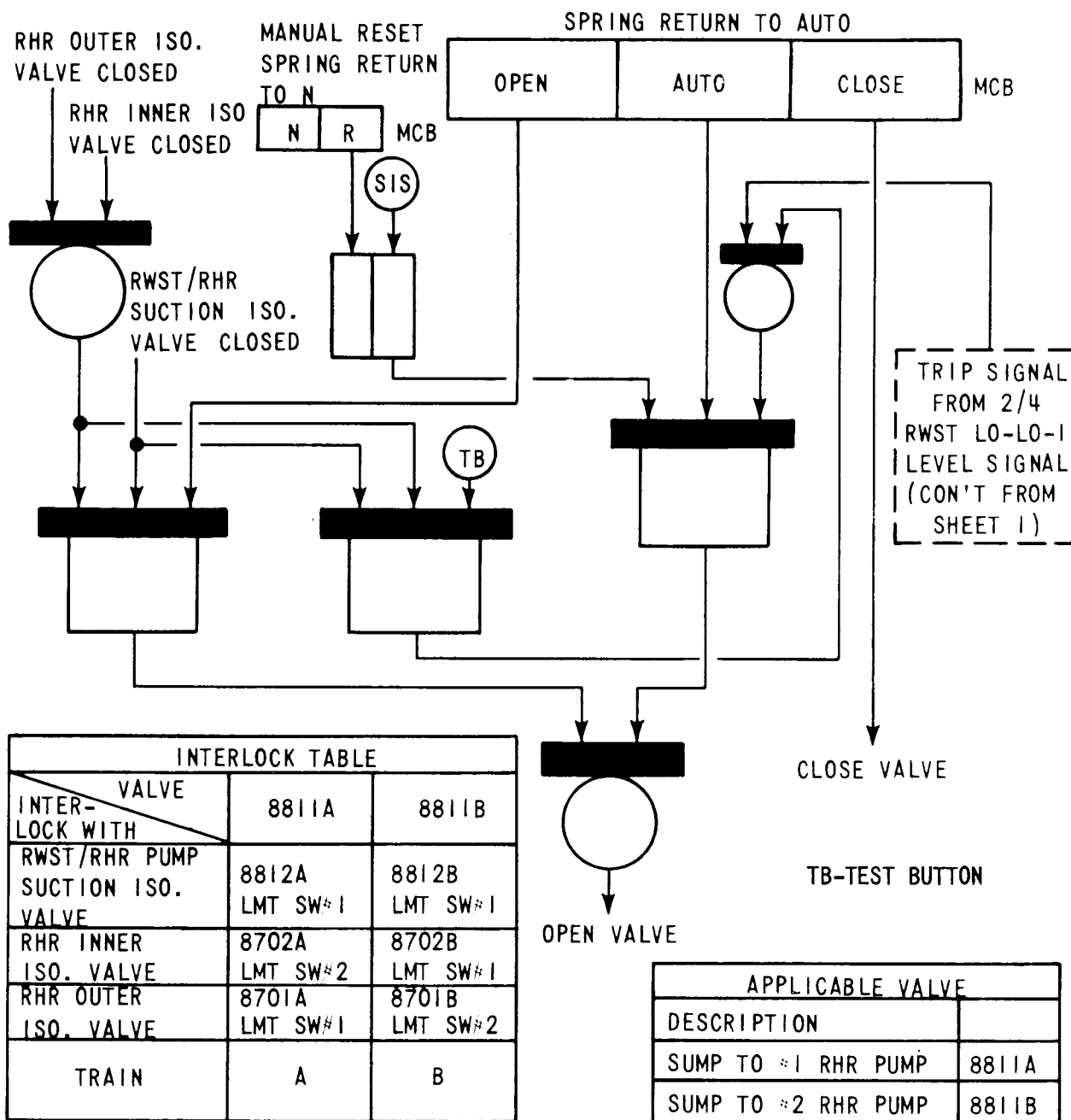
NOTE: WHEN 8811B IS FULL
OPEN, RWST VALVE (TO
RHR PUMP) 8812B WILL
CLOSE (SEE SHEET 3)

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FIGURE 7.6-3 (SHEET 1)

SAFETY INJECTION SYSTEM RECIR- CULATION SUMP AND RHR SUCTION ISOLATION VALVES



LIMIT SWITCH #1 IS THE NORMAL POSITION SIGNAL AND IS USED FOR POSITION SIGNALS BETWEEN VALVES ASSIGNED TO THE SAME TRAIN.

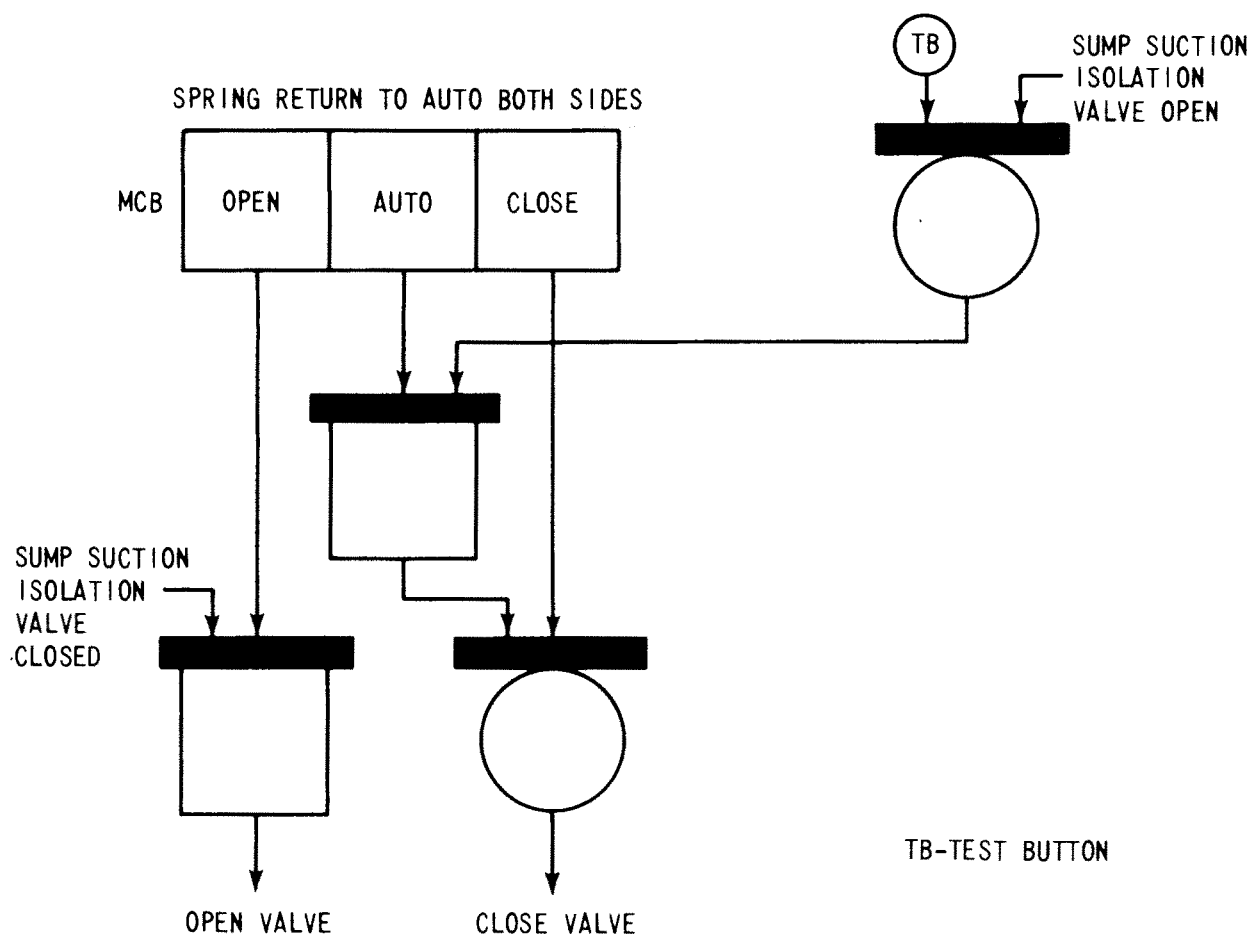
LIMIT SWITCH #2 IS THE STEM MOUNTED POSITION SWITCH AND IT IS USED FOR POSITION SIGNALS BETWEEN VALVES ASSIGNED TO OPPOSITE TRAINS.

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FIGURE 7.6-3 (SHEET 2)

SAFETY INJECTION SYSTEM
RECIRCULATION SUMP AND RHR
SUCTION ISOLATION VALVES



INTERLOCK TABLE		
VALVE INTER- LOCK WITH	8812A	8812B
SUMP ISOL. VAL.	8811A LMT SW #1	8811B LMT SW #1
TRAIN	A	B

APPLICABLE VALVE	
DESCRIPTION	
RWST TO #1 RHR PUMP	8812A
RWST TO #2 RHR PUMP	8812B

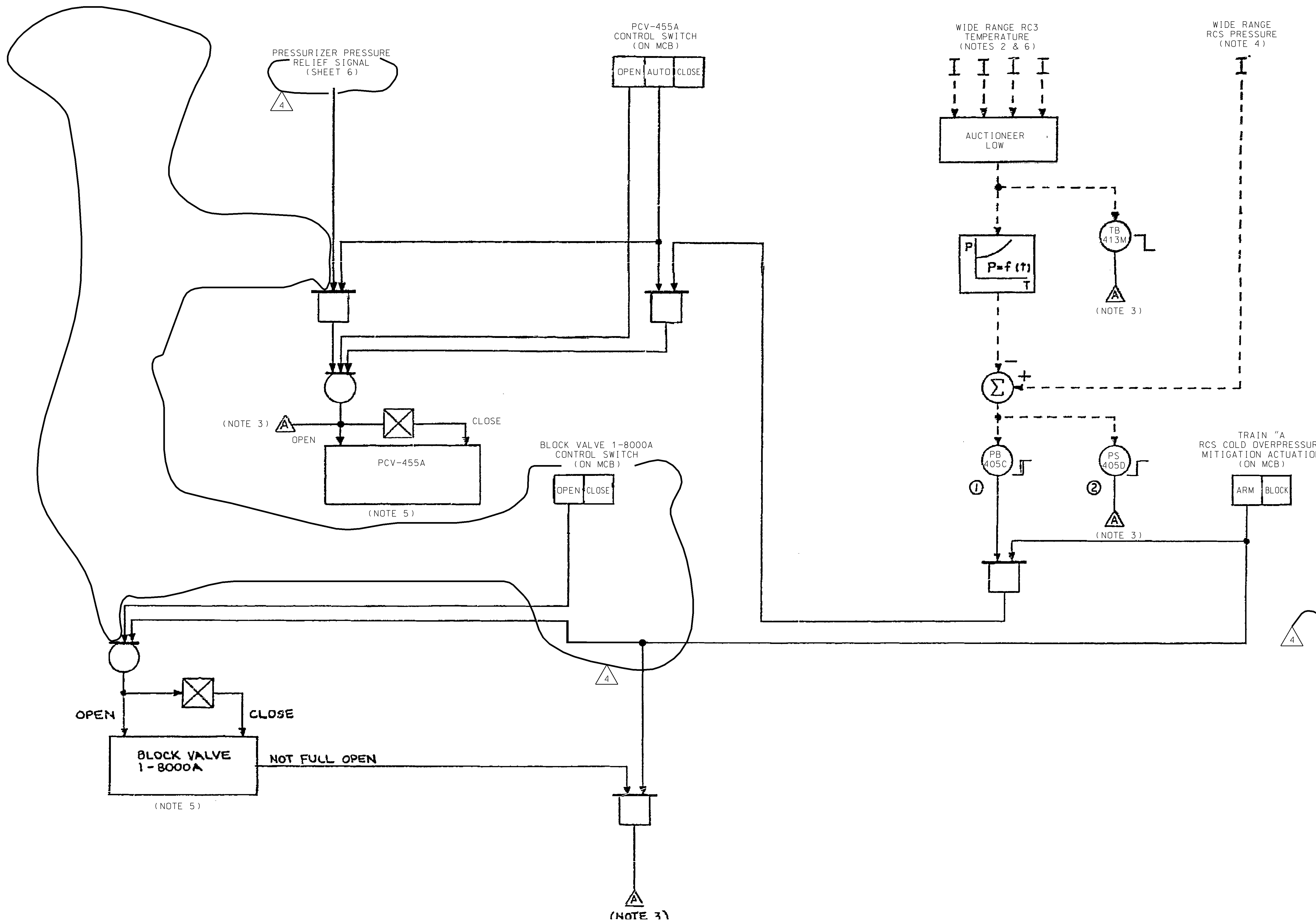
LIMIT SWITCH #1 IS THE NORMAL POSITION SIGNAL AND IS USED FOR POSITION SIGNALS BETWEEN VALVES ASSIGNED TO THE SAME TRAIN.

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FIGURE 7.6-3 (SHEET 3)

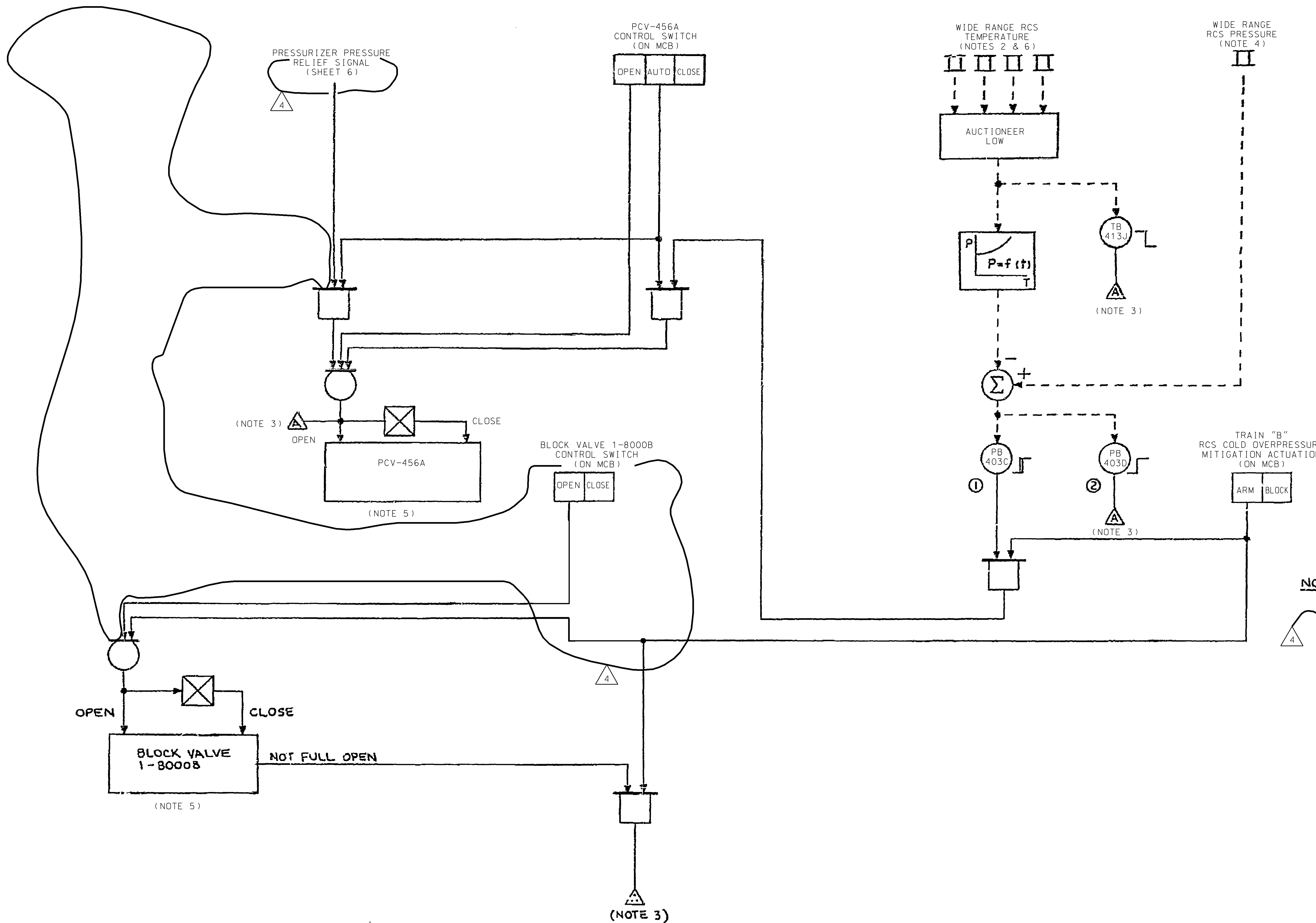
SAFETY INJECTION SYSTEM RECIR-
CULATION SUMP AND RHR SUCTION
ISOLATION VALVES



1. DELETED.
2. PROTECTION GRADE WIDE RANGE RCS TEMPERATURE SIGNALS FROM TRAIN "A" RELATED PROTECTION SETS.
3. ANNUNCIATION IN THE MAIN CONTROL ROOM IS REQUIRED TO BE VISIBLE TO THE OPERATOR AT THE MAIN CONTROL ROOM.
4. PROTECTION GRADE WIDE RANGE RCS PRESSURE SIGNAL FROM A TRAIN "A" RELATED PROTECTION SET.
5. STATUS LIGHTS MUST BE PROVIDED FOR EACH PORV AND EACH PORV BLOCK VALVE AT THE MAIN CONTROL BOARD TO INDICATE WHEN THE VALVE IS FULLY CLOSED OR FULLY OPEN.
6. THE RCS LOOP AND HOT LEG OR COLD LEG ASSIGNMENTS FOR THE WIDE RANGE RCS TEMPERATURE SIGNALS MUST BE CONSISTENT WITH THE REQUIREMENTS FOR RVLIS AND PAMS.

STANDARDIZED NUCLEAR UNIT POWER PLANT SYSTEM PROJECTS	
UNIT: SCP	SPIN: AASFED-04
STATUS: TURNED OVER TO U.E	
SHOP ORDER: 300	ITEM: 9-1

DRAWN (DATE) N/A	FUNCTIONAL DIAGRAM		
CHKD (DATE) N/A	PRESSURIZER PRESSURE RELIEF		
SUPV. (DATE) N/A	SYSTEM (TRAIN A)		
APPD. (DATE) N/A	LOCATION	CALLAWAY PLANT	CLASS
UNION ELECTRIC COMPANY ST. LOUIS, MO.		7250D64-S017	REV. 4



1. DELETED.
2. PROTECTION GRADE WIDE RANGE RCS TEMPERATURE SIGNALS FROM TRAIN "B" RELATED PROTECTION SETS.
3. ANNUNCIATION IN THE MAIN CONTROL ROOM IS REQUIRED TO BE VISIBLE TO THE OPERATOR AT THE MAIN CONTROL ROOM.
4. PROTECTION GRADE WIDE RANGE RCS PRESSURE SIGNAL FROM A TRAIN "B" RELATED PROTECTION SET.
5. STATUS LIGHTS MUST BE PROVIDED FOR EACH PORV AND EACH PORV BLOCK VALVE AT THE MAIN CONTROL BOARD TO INDICATE WHEN THE VALVE IS FULLY CLOSED OR FULLY OPEN.
6. THE RCS LOOP AND HOT LEG OR COLD LEG ASSIGNMENTS FOR THE WIDE RANGE RCS TEMPERATURE SIGNALS MUST BE CONSISTENT WITH THE REQUIREMENTS FOR RVLIS AND PAMS.

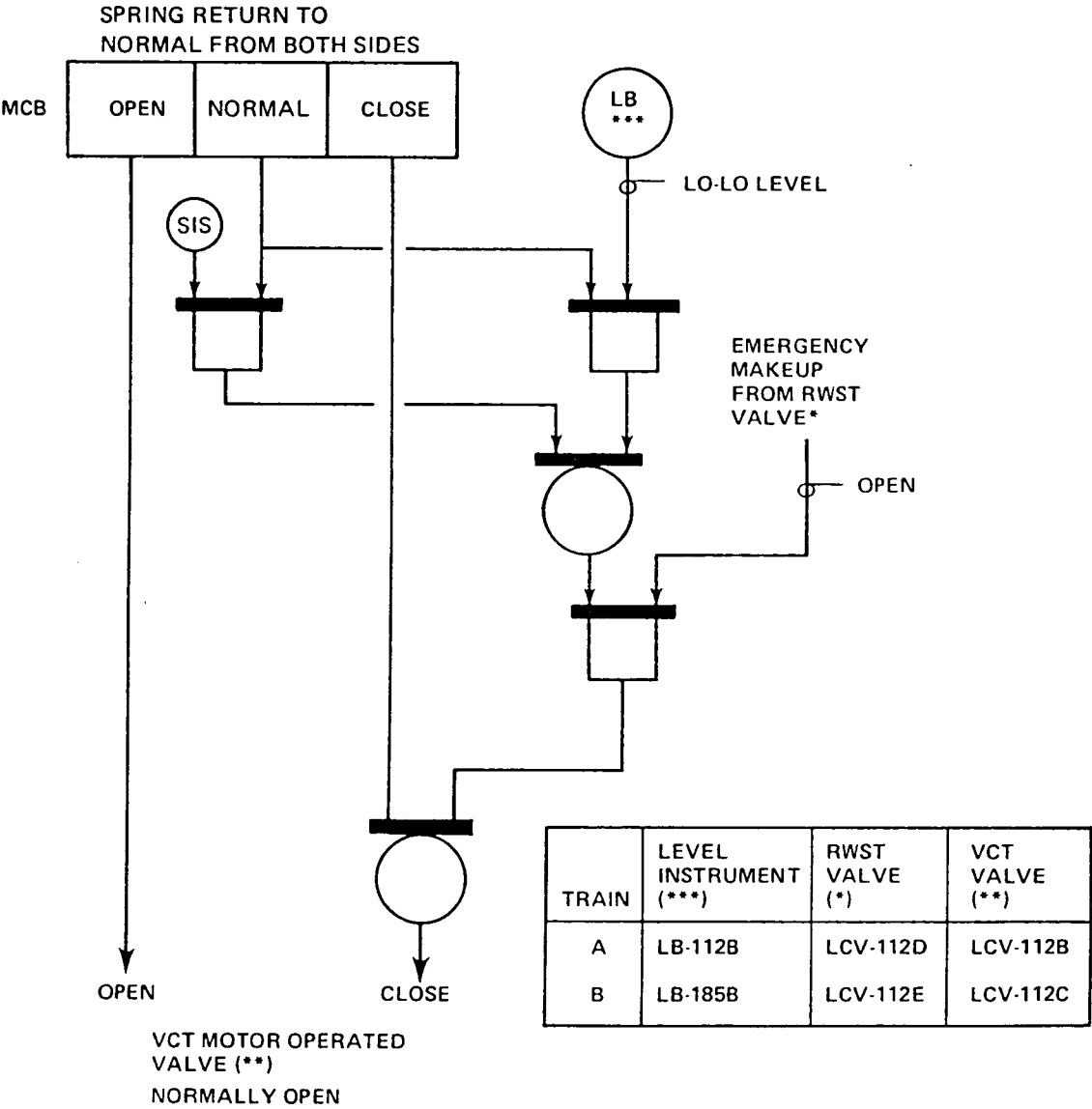
DRAWN (DATE) N/A	FUNCTIONAL DIAGRAM		
CHKD. (DATE) N/A	PRESSURIZER PRESSURE RELIEF		
SUPV. (DATE) N/A	SYSTEM (TRAIN B)		
APPD. (DATE) N/A	LOCATION	CALLAWAY PLANT	CLASS
UNION ELECTRIC COMPANY ST. LOUIS, MO.		7250D64-S018	REV. 4

STANDARDIZED NUCLEAR UNIT POWER PLANT SYSTEM PROJECTS	
UNIT: SCP	SPIN: AASFED-04
STATUS: TURNED OVER TO U.E	
SHOP ORDER: 300	ITEM: 9-1

CALLAWAY-SP

FIGURE 7.6-4 SHEET 3 HAS BEEN DELETED

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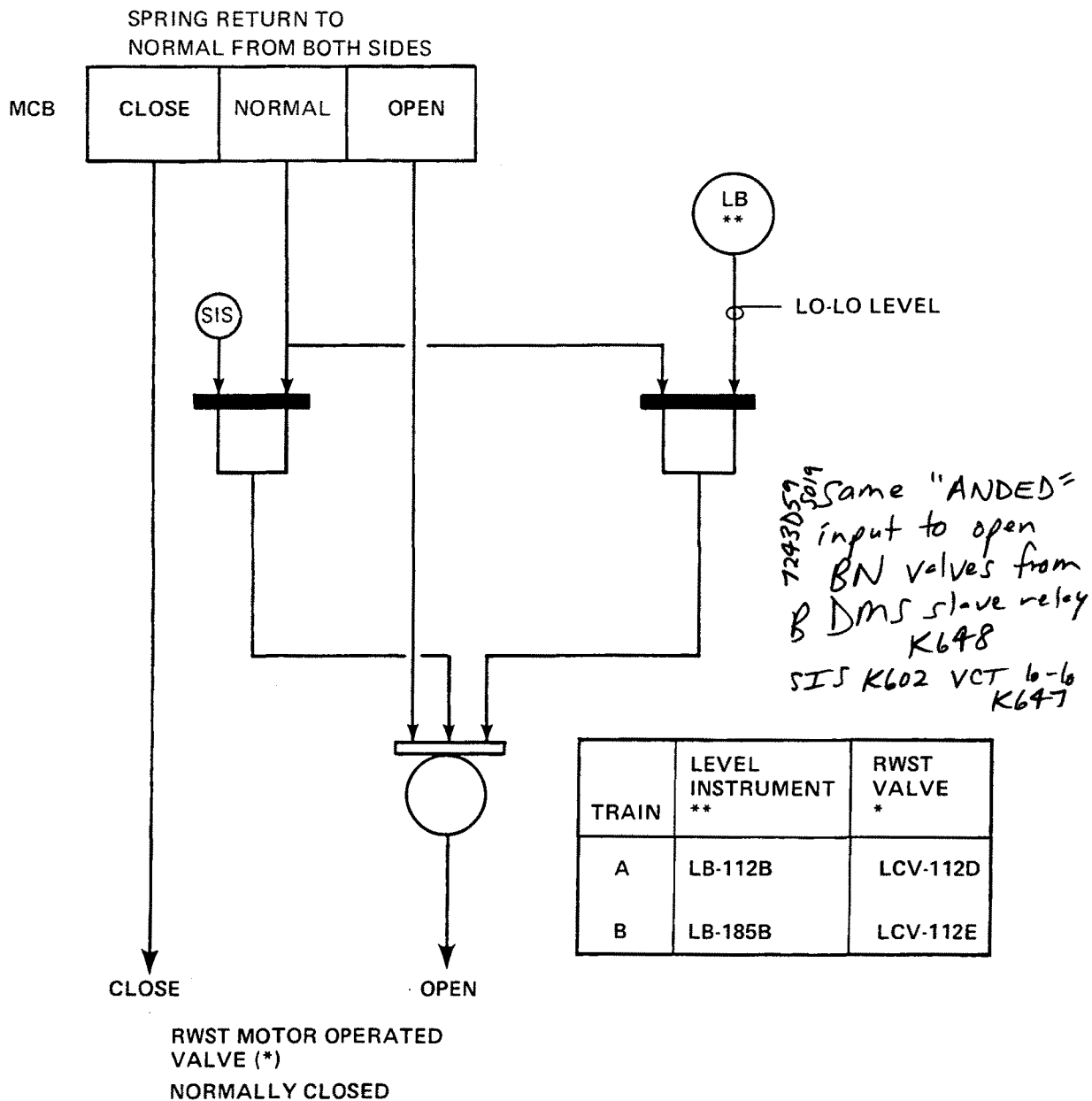


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Figure 7.6-5

Logic Diagram for VCT Outlet
Isolation Valves Interlocks on Switchover to RWST
(Sheet 1 of 2)



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Figure 7.6-5
Logic Diagram for RWST Valves
Interlocks on Switchover to RWST
(Sheet 2 of 2)

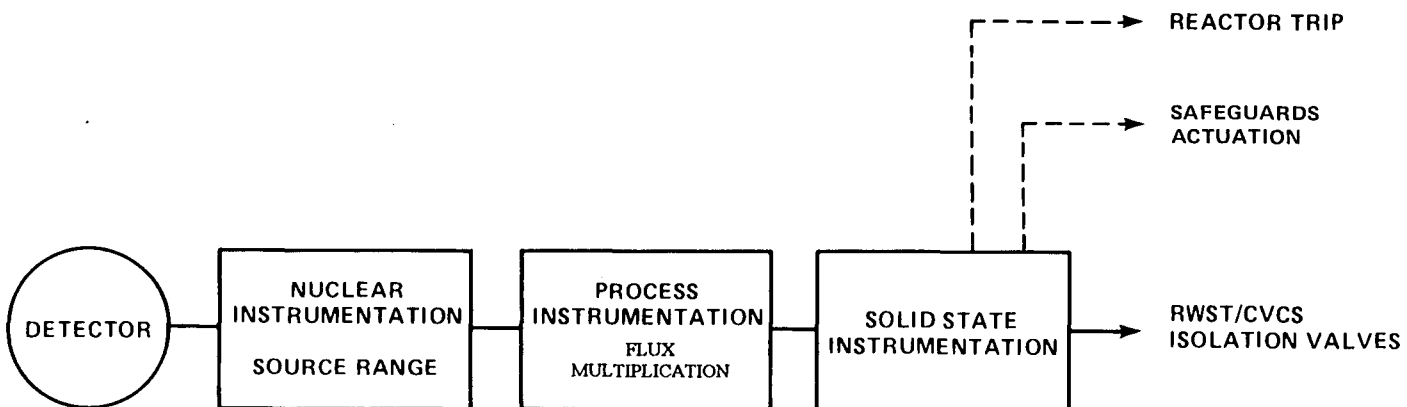
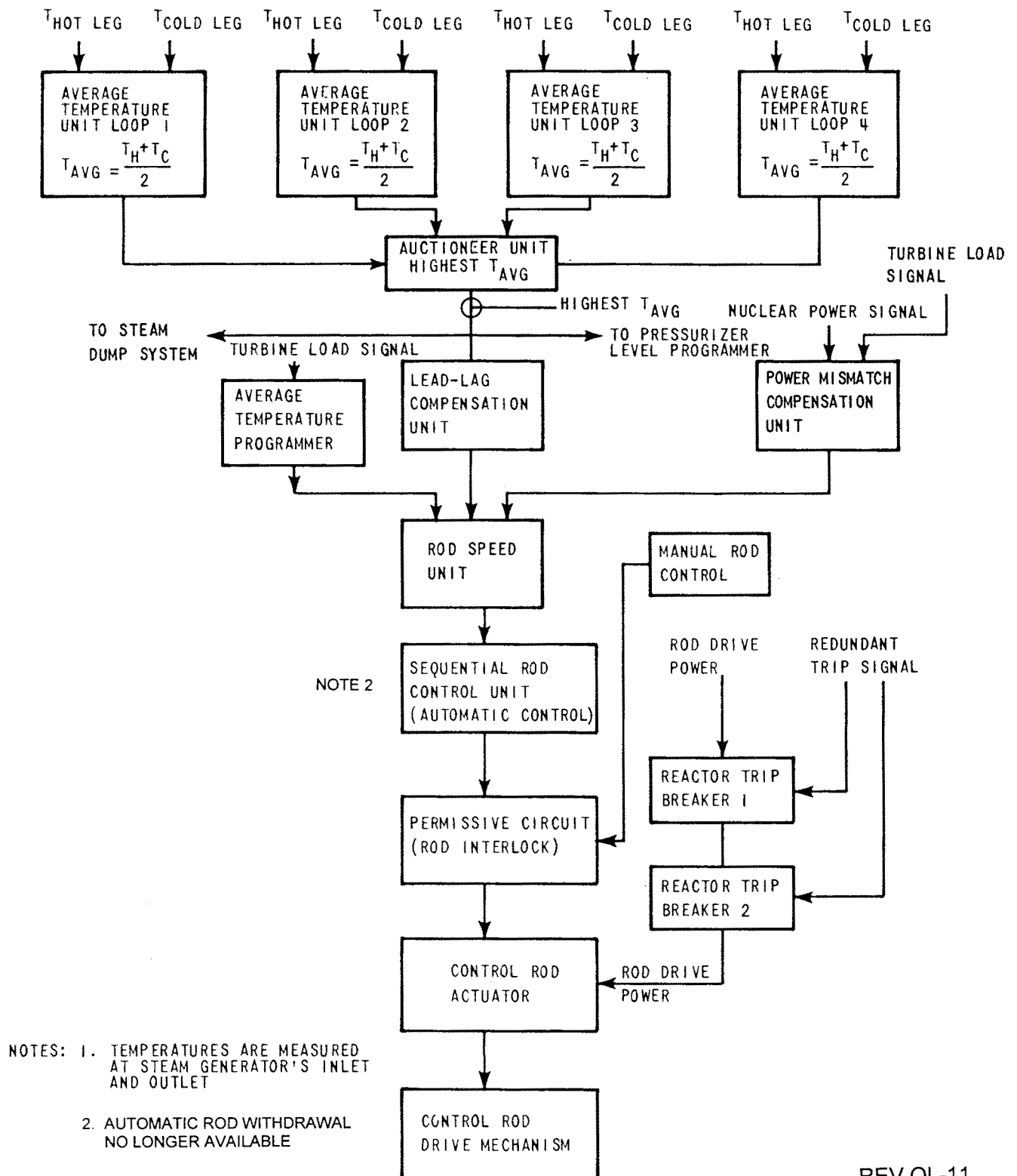
**CALLAWAY PLANT**

FIGURE 7.6-6
INSTRUMENTATION FOR PROTECTION
AGAINST INADVERTENT BORON
DILUTION

REV. OL-7
5/94

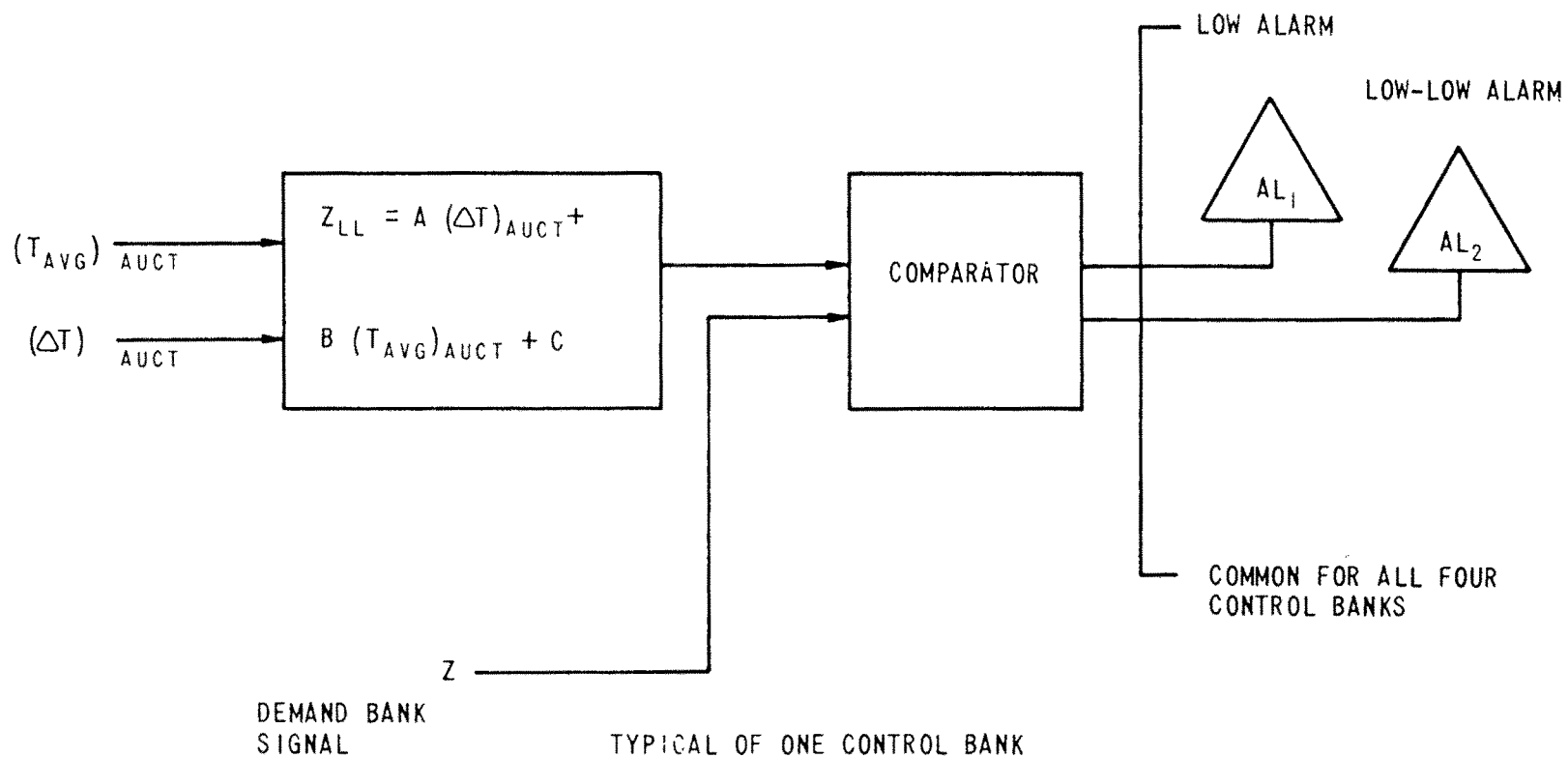


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5/00

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FIGURE 7.7-1

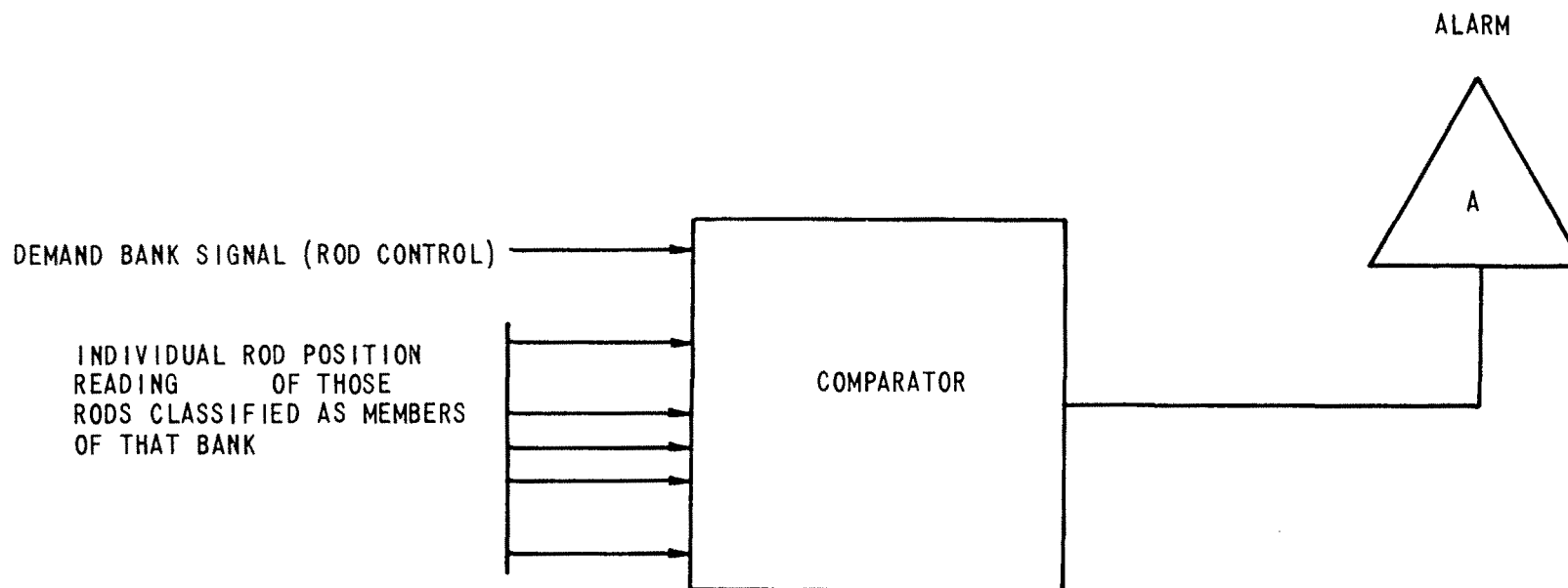
SIMPLIFIED BLOCK DIAGRAM OF
REACTOR CONTROL SYSTEM



- NOTE: 1. ANALOG CIRCUITRY IS USED FOR THE COMPARATOR NETWORK
 2. COMPARISON IS DONE FOR ALL CONTROL BANKS

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 6/86

CALLAWAY PLANT
FIGURE 7.7-2
CONTROL BANK ROD INSERTION MONITOR

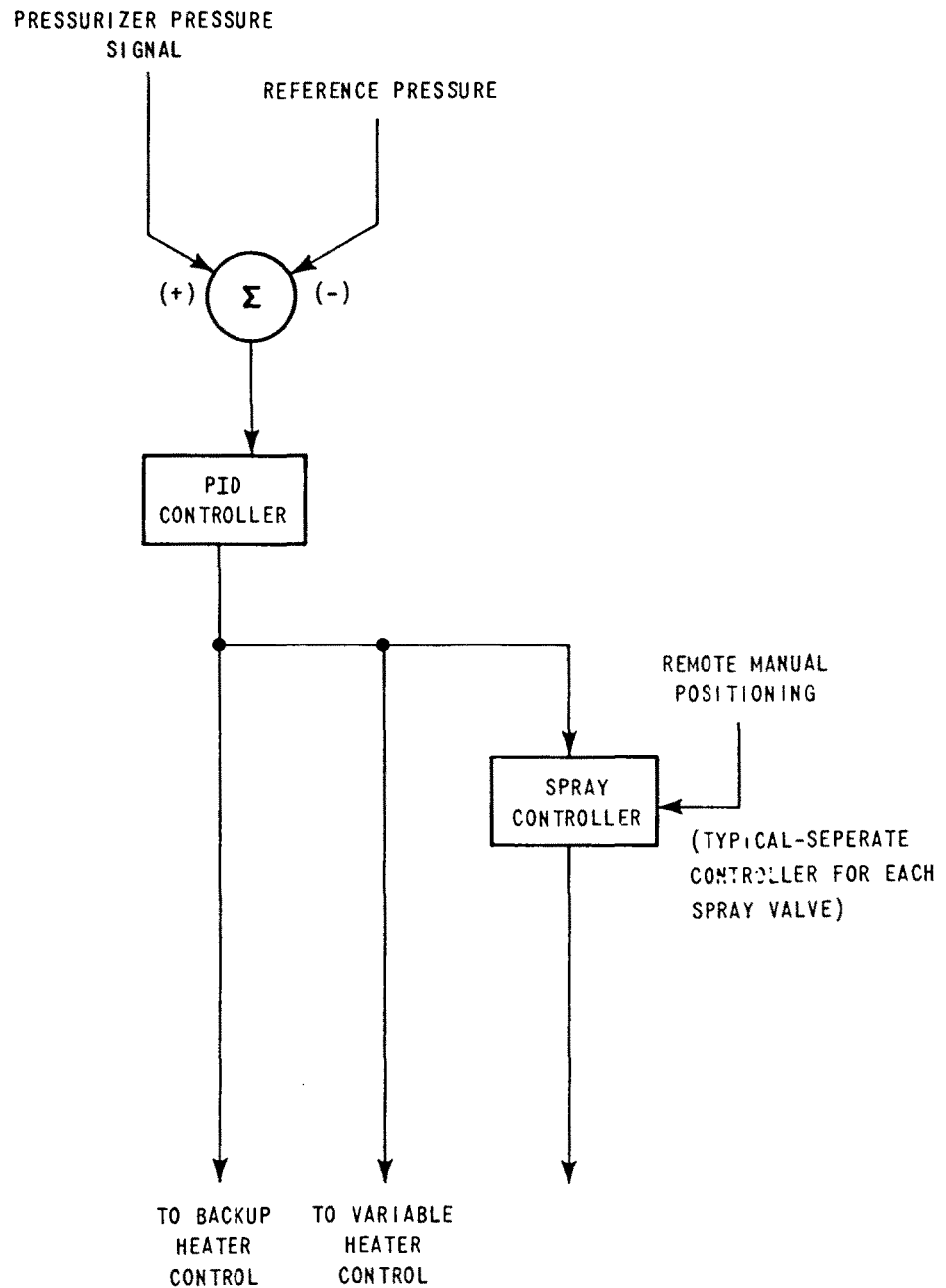


- NOTE:
1. DIGITAL OR ANALOG SIGNALS MAY BE USED FOR THE COMPARATOR COMPUTER INPUTS.
 2. THE COMPARATOR WILL ENERGIZE THE ALARM IF THERE EXISTS A POSITION DIFFERENCE GREATER THAN A PRESET LIMIT BETWEEN ANY INDIVIDUAL ROD AND THE DEMAND BANK SIGNAL.
 3. COMPARISON IS INDIVIDUALLY DONE FOR ALL CONTROL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

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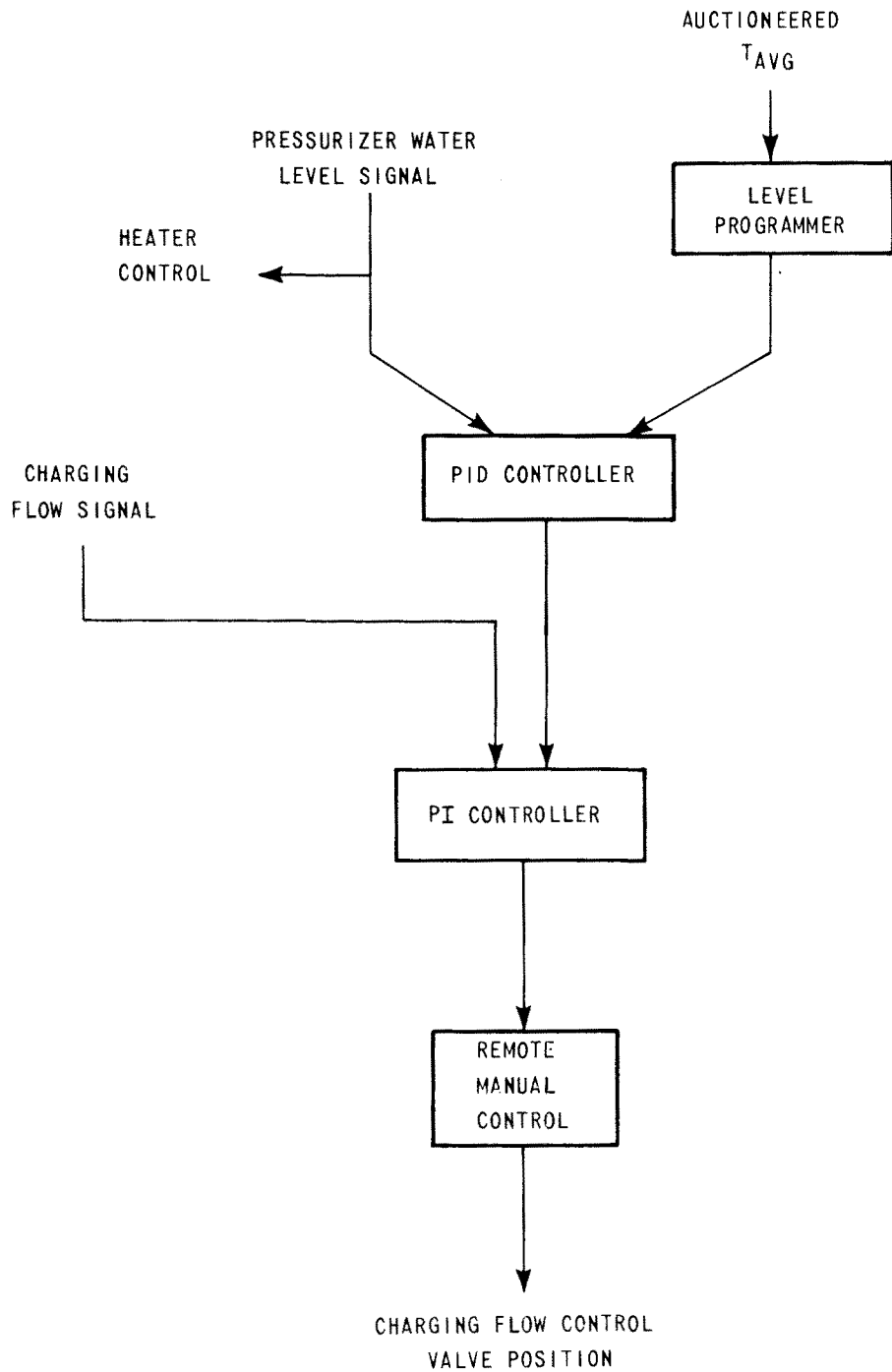
FIGURE 7.7-3
ROD DEVIATION COMPARATOR



PID - PROPORTIONAL + INTEGRAL + DERIVATIVE

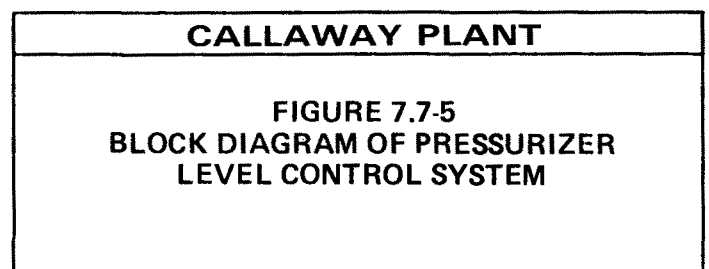
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11/01

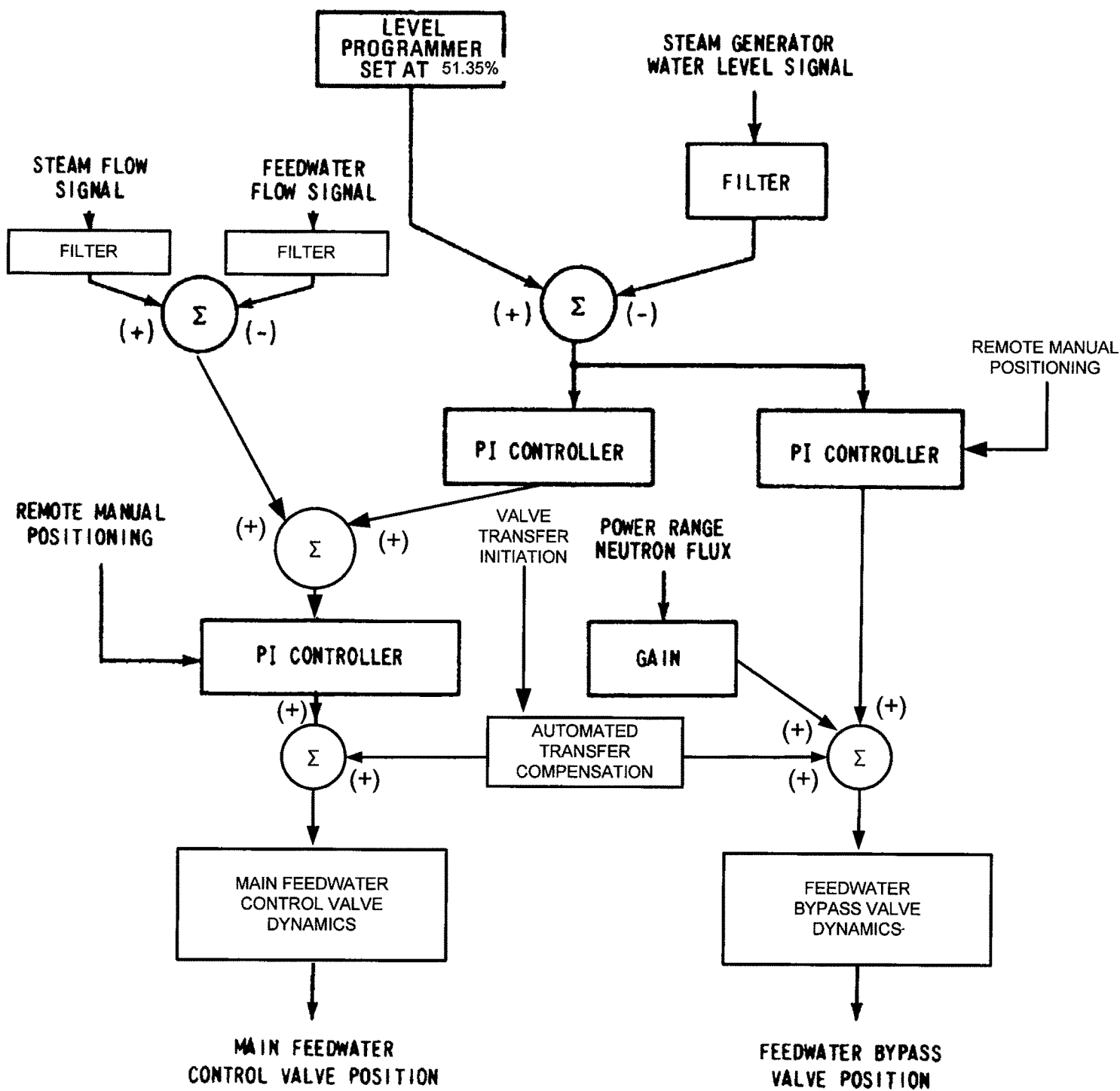
CALLAWAY PLANT
<p>FIGURE 7.7-4 BLOCK DIAGRAM OF PRESSURIZER PRESSURE CONTROL SYSTEM</p>



PID - SEE FIG. 7.7-4

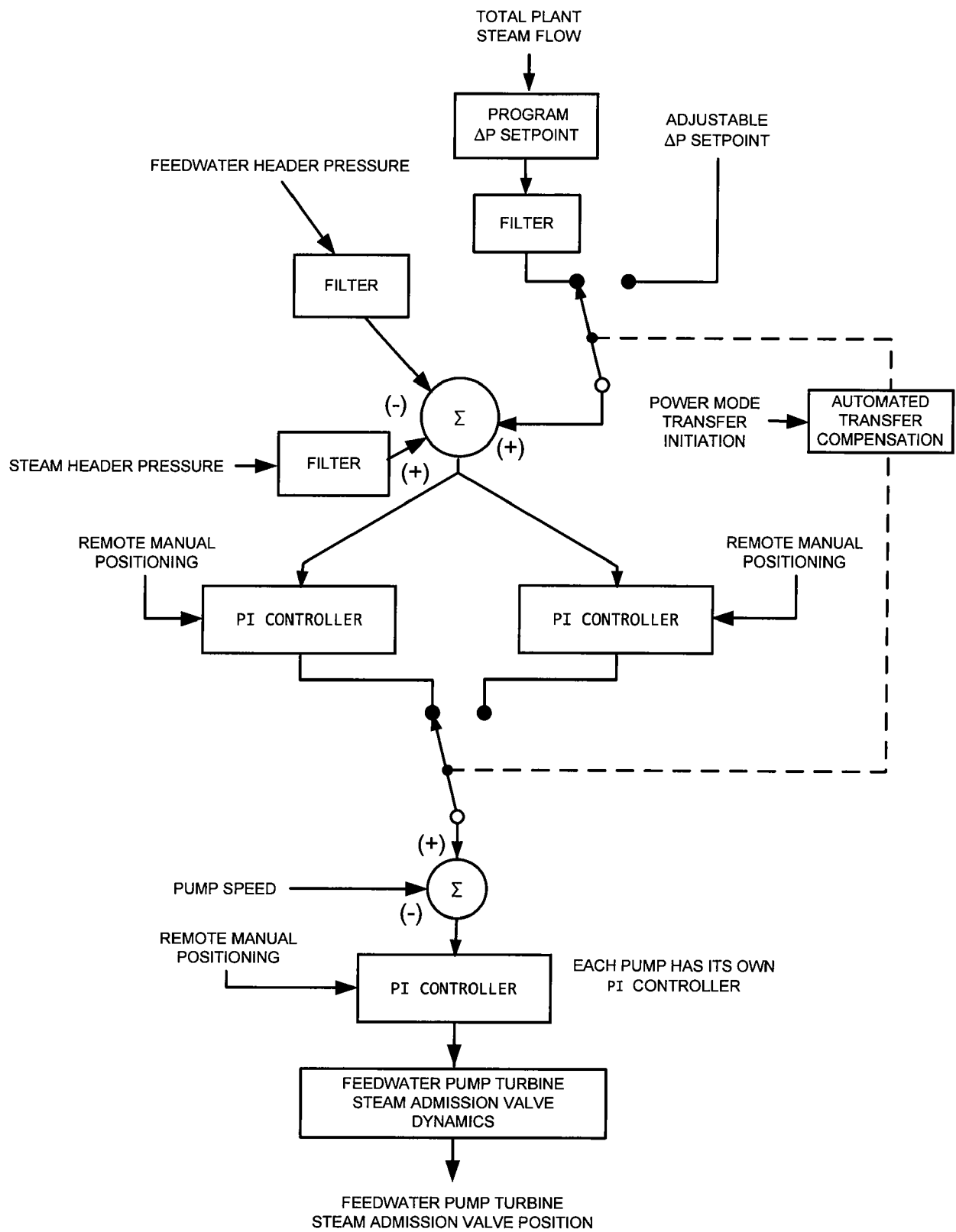
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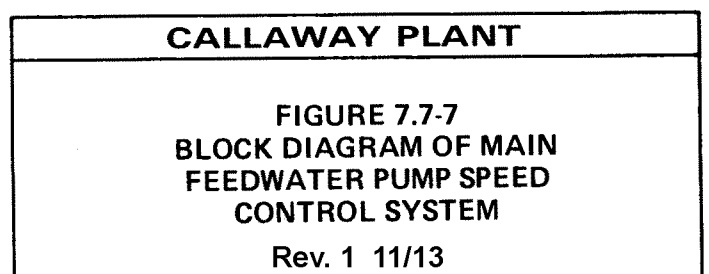


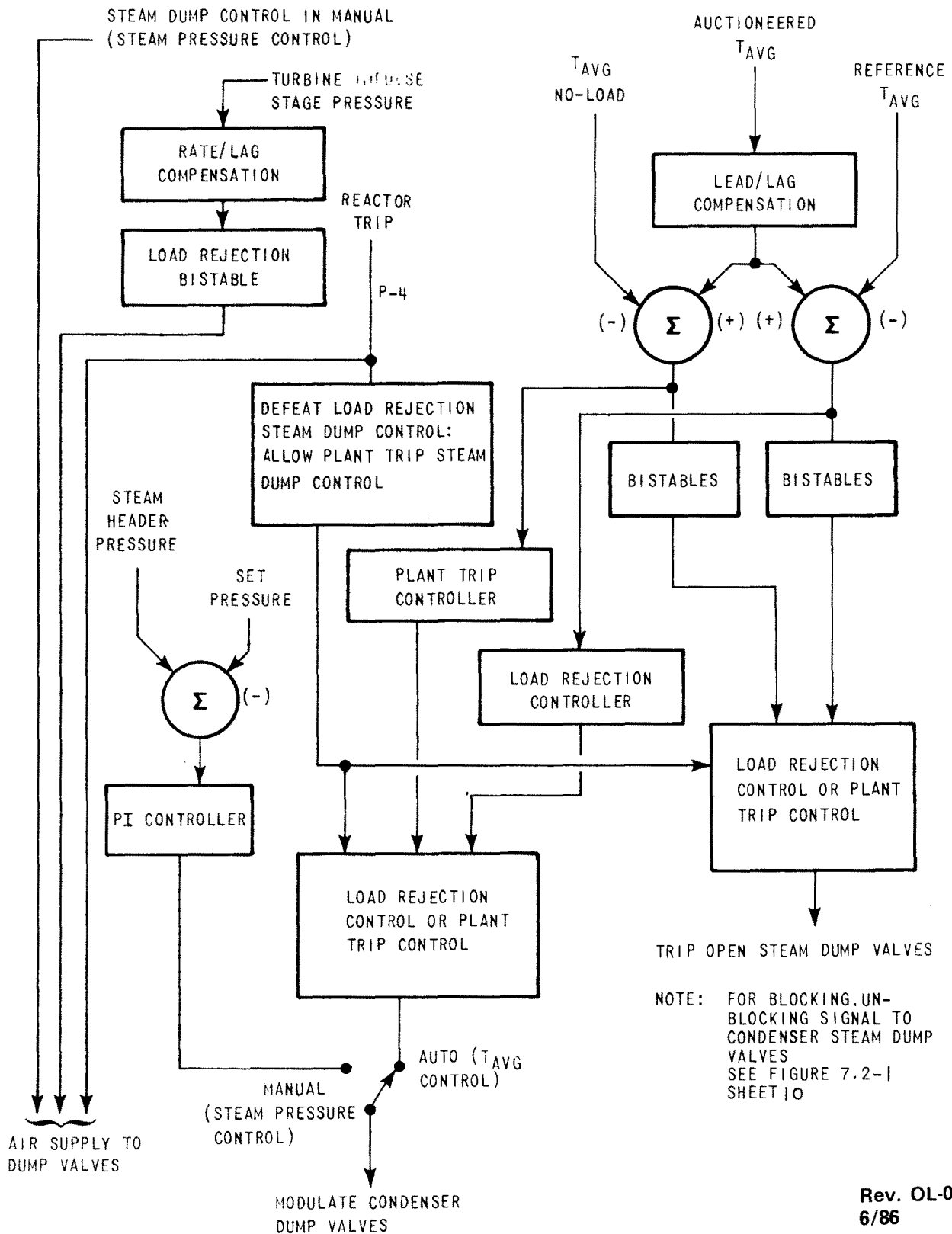
PI - PROPORTIONAL + INTEGRAL

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<p>FIGURE 7.7-6 BLOCK DIAGRAM OF STEAM GENERATOR WATER LEVEL CONTROL SYSTEM</p> <p>Rev. 1 11/13</p>



PI - SEE FIG. 7.7-6

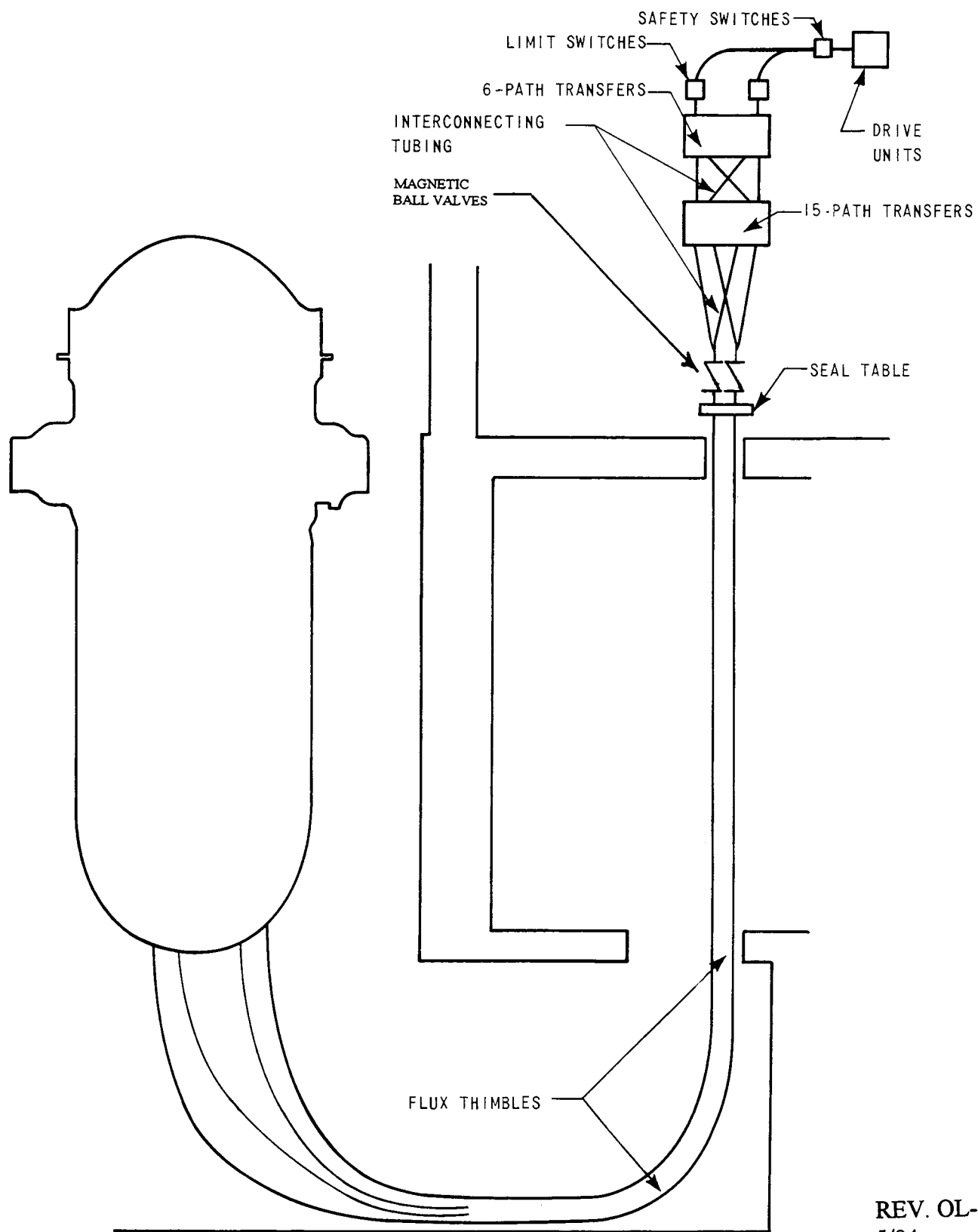




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FIGURE 7.7-8

BLOCK DIAGRAM OF STEAM DUMP
CONTROL SYSTEM



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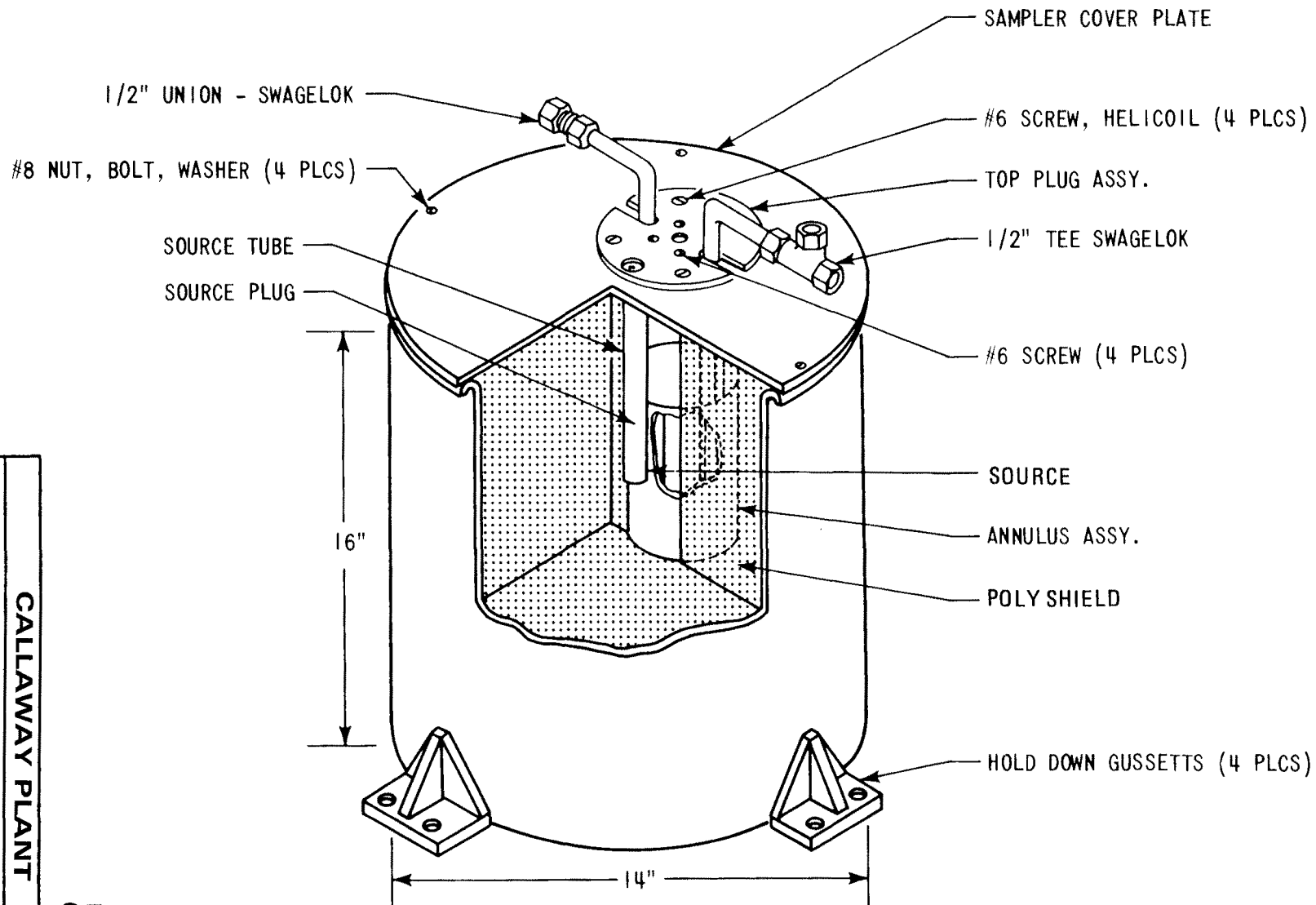
FIGURE 7.7-9

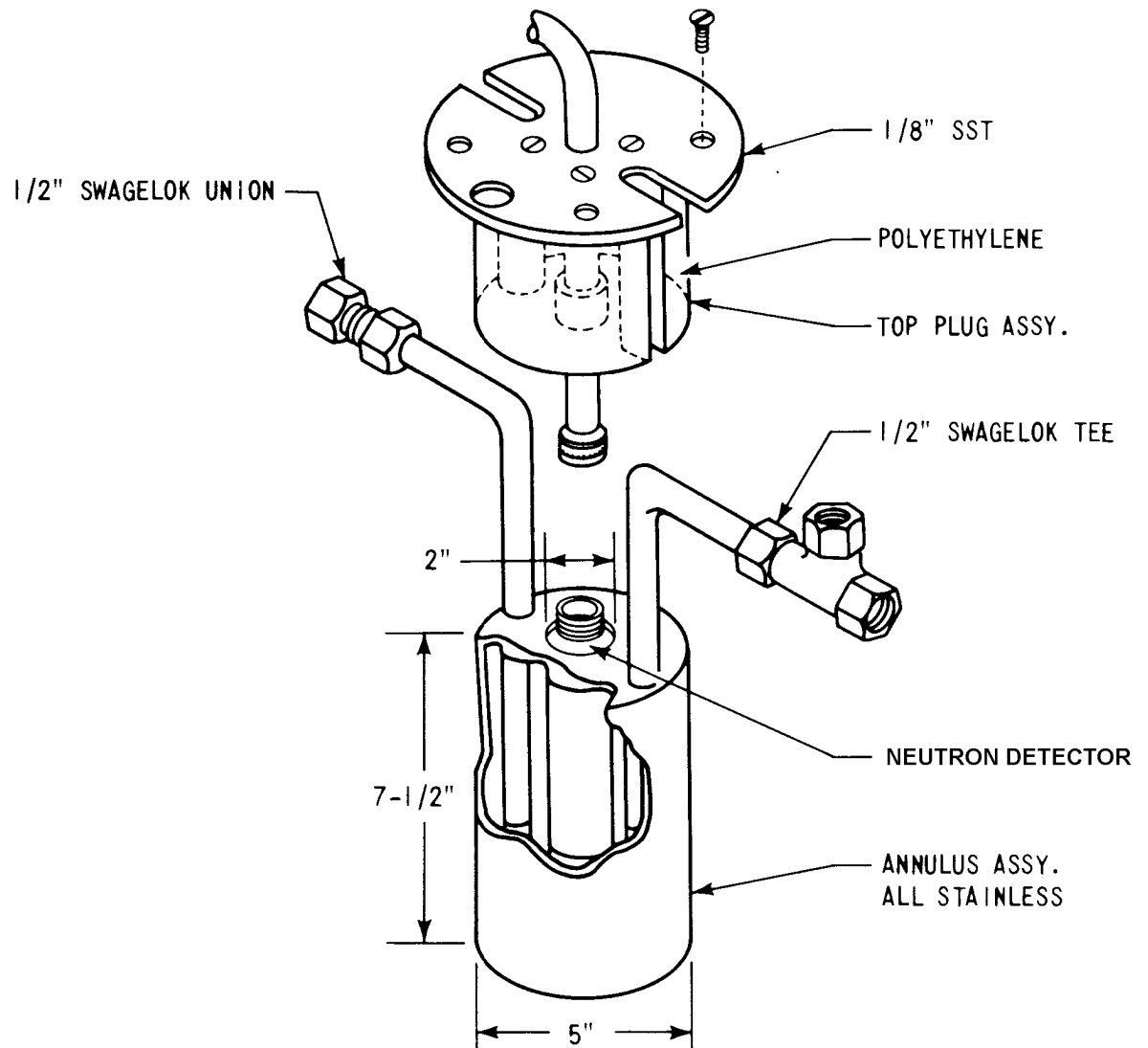
BASIC FLUX-MAPPING SYSTEM

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FIGURE 7.7-10
SAMPLER ASSEMBLY

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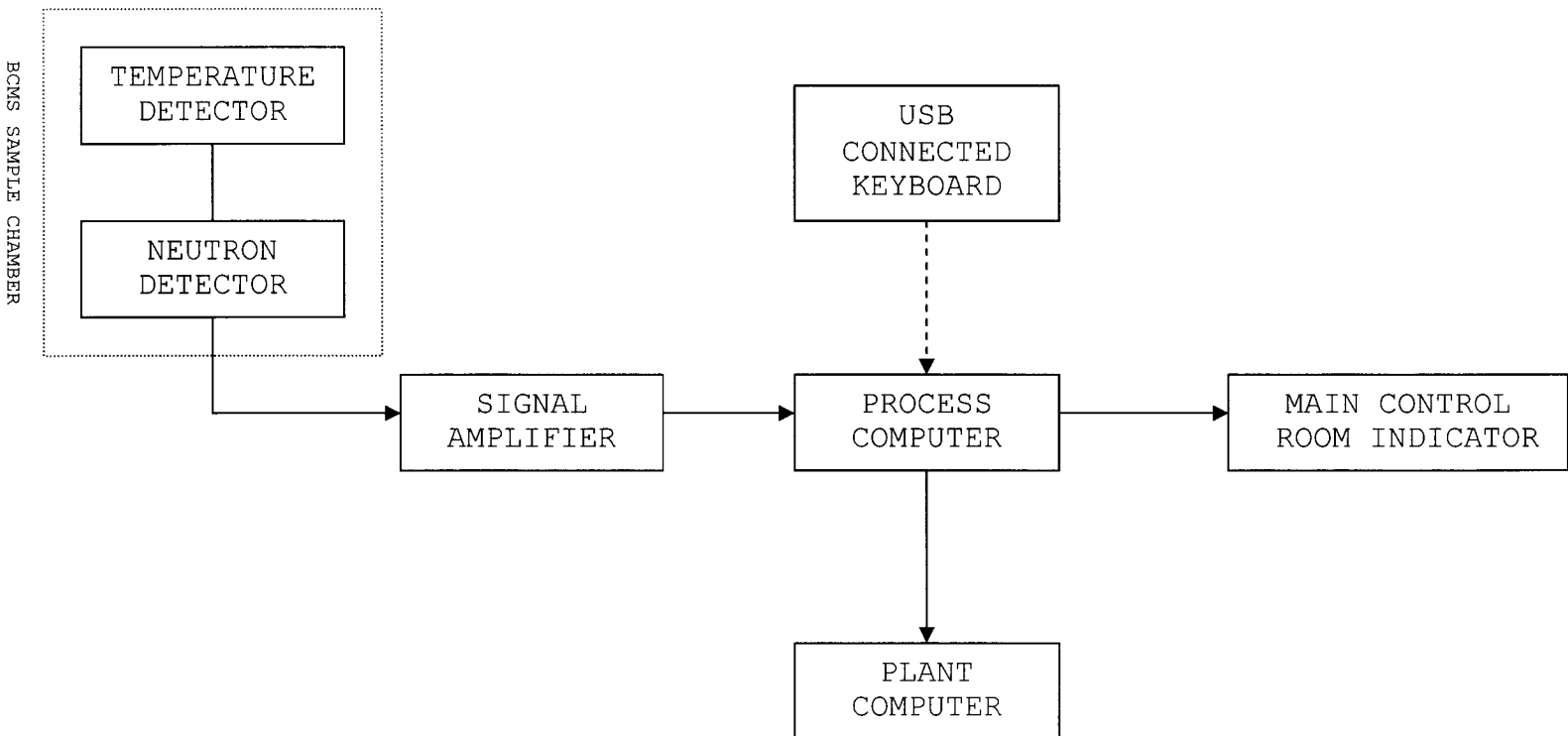


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12/04

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FIGURE 7.7-11

SAMPLER SUBASSEMBLY



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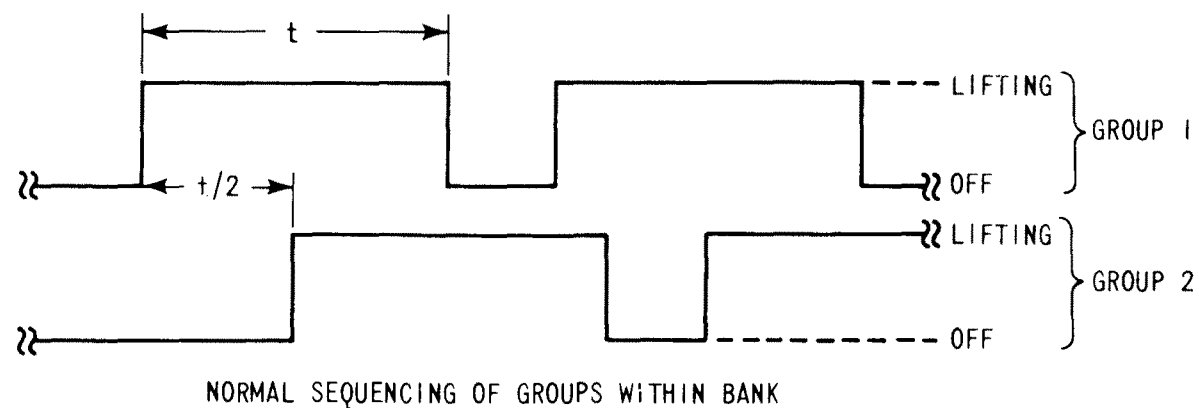
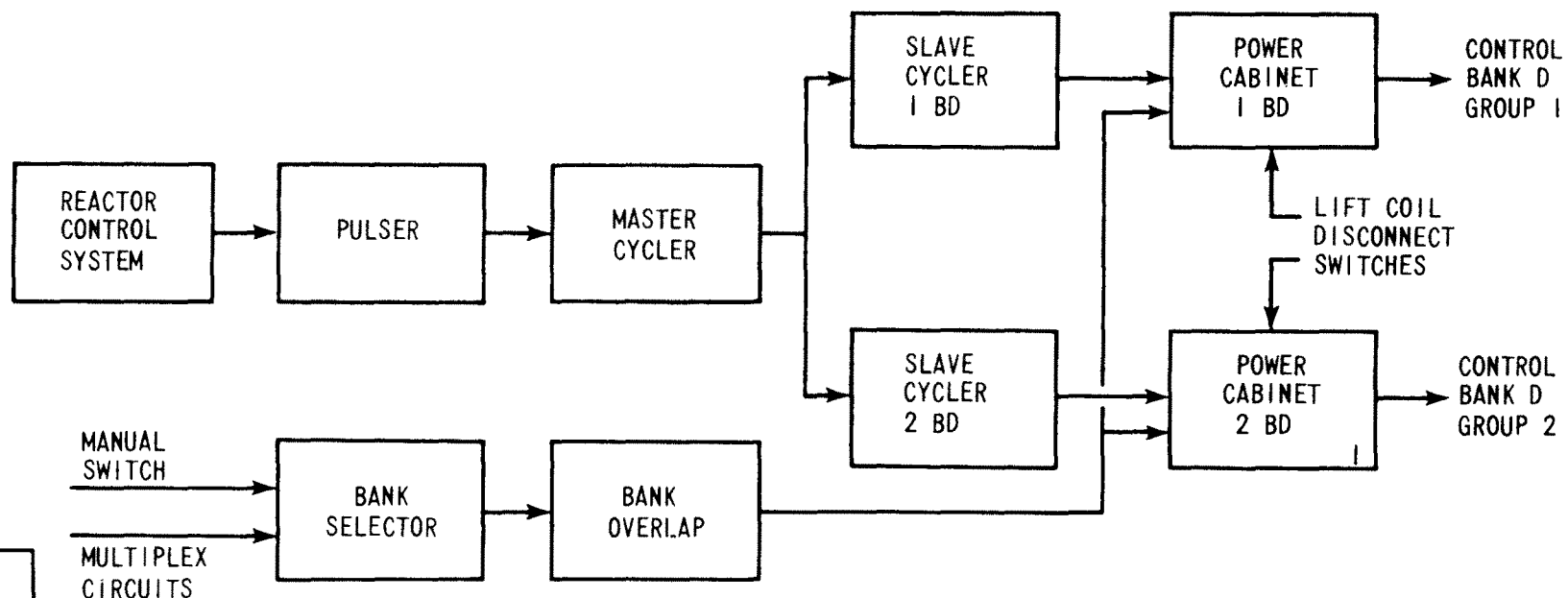
FIGURE 7.7-12

PROCESS ASSEMBLY BLOCK DIAGRAM

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12/04

CALLAWAY-SP

FIGURE 7.7-13 HAS BEEN DELETED (OL-14)



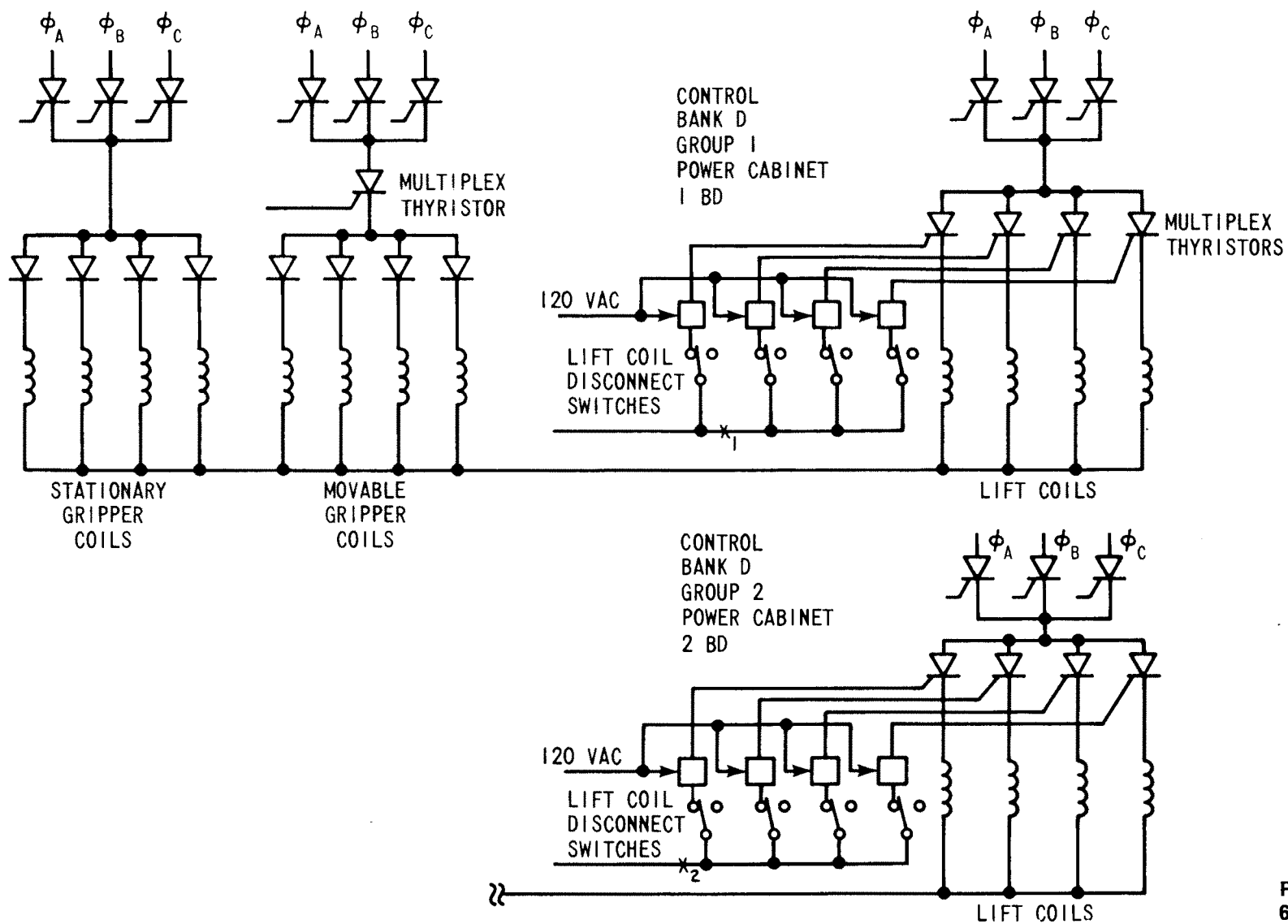
NOTE: ONLY CABINETS 1BD AND 2BD SHOWN. FOR MORE COMPLETE DIAGRAM INCLUDING POWER CABINETS 1AC, 2AC, SCDE, AND DC HOLD SCD, SEE REF. 1 IN SECTION 7.7.3

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SIMPLIFIED BLOCK DIAGRAM
OF ROD CONTROL SYSTEM

FIGURE 7.7-14

CALLAWAY PLANT

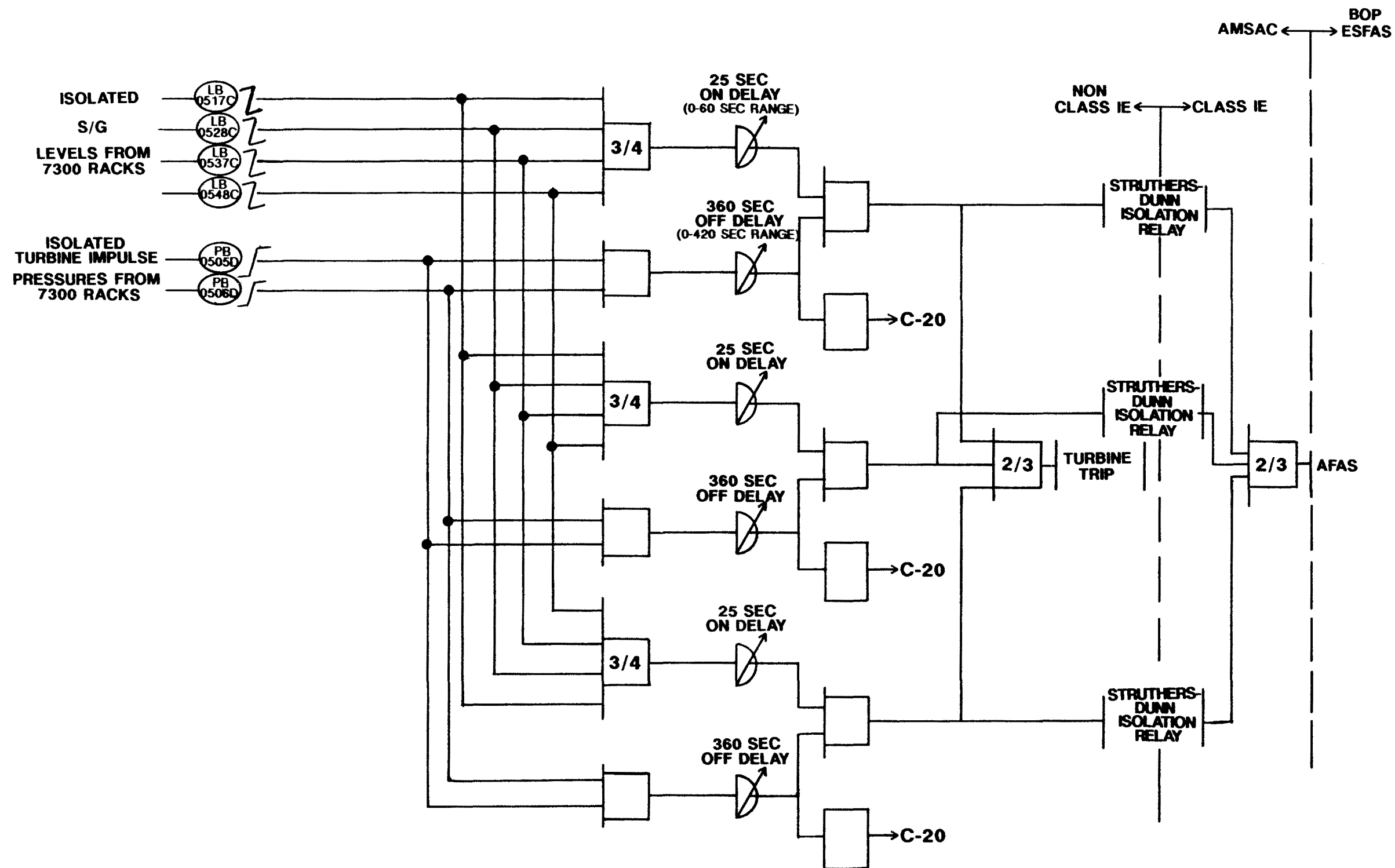


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CALLAWAY PLANT

FIGURE 7.7-15

CONTROL BANK D PARTIAL SIMPLIFIED SCHEMATIC DIAGRAM OF POWER CABINETS 1BD AND 2BD



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CALLAWAY PLANT

FIGURE 7.7-16

AMSAC LOGIC DIAGRAM