HITACHI

GE Hitachi Nuclear Energy

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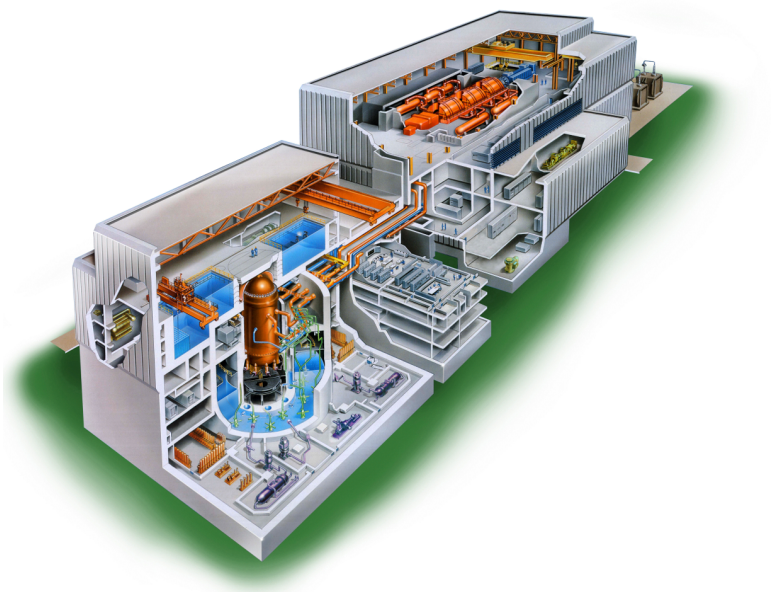
ABWR
Design Control Document
Tier 2



Chapter 21

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ABWR CERTIFICATION PROGRAM

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MPL NO. C11–1030

Figure 7.7-3 Rod Control and Information System IBD (Sheet 1 of 87)

NOMENCLATURE

1. EXCEPT WHERE SHOWN OTHERWISE, THIS IBD REPRESENTS THE LOGIC OF RAPI CHANNEL–A, RSPC–A, ATLM CHANNEL–A AND RWM CHANNEL–A.

2. ALL OUTPUTS ARE LOGIC "1" FOR THE STATED OUTPUT CONDITION IN THE "OUTPUT DESCRIPTION" COLUMN.

3. THE S–R FLIP–FLOPS ARE SET AND RESET BY POSITIVE LOGIC.

4. "A" – REPRESENTS AN ANALOG SIGNAL.

   "B" – REPRESENTS A SIGNAL INTERNAL TO RCIS.

   "D" – REPRESENT A SIGNAL COMING TO OR GOING FROM RCIS FROM/TO ANOTHER SYSTEM.

   "L" – REPRESENTS STATUS INFORMATION FOR THE OPERATOR.

   "ANN" – REPRESENTS INFORMATION THAT IS ANNUNCIATED.

5. MORE THAN ONE INPUT SIGNAL NUMBER IN THE SIGNAL ID COLUMN IMPLIES THE "OR" ING OF THOSE SIGNALS.

SUPPLEMENTAL DOCUMENTS UNDER THE FOLLOWING IDENTITIES ARE TO BE USED IN CONJUNCTION WITH THIS DRAWING.

		MPL NO.
1.	PROCESS COMPUTER SYSTEM IBD	C91–10.3.0
2.	CONTROL ROD DRIVE SYSTEM IBD	C12–10.3.0
3.	AUTOMATIC POWER REGULATOR SYSTEM IBD	C82–10.3.0
4.	REACTOR PROTECTION SYSTEM IBD	C71–10.3.0
5.	FEEDWATER CONTROL SYSTEM IBD	C31–10.3.0
6.	RECIRCULATION FLOW CONTROL SYSTEM IBD	C81–10.3.0
7.	NEUTRON MONITORING SYSTEM IBD	C51–10.3.0
8.	REFUELING PLATFORM CONTROL COMPUTER SYSTEM IBD	C9.3–10.3.0
9.	ESSENTIAL/NON–ESSENTIAL MULTIPLEXING SYSTEM IBD	H2.3–10.3.0
10.	ROD CONTROL & INFORMATION SYSTEM IED	C11–10.4.0

LEGENDS:

⟹ – STREAM OF BINARY BITS

⟶ – ANALOG SIGNALS AND DISCRETE SIGNALS
IN CASE OF AN ANALOG SIGNAL, "A" IS PLACED IN THE "CLASS" COLUMN.

NOMENCLATURE/REFERENCES

Figure 7.7-3 Rod Control and Information System IBD (Sheet 2 of 87)

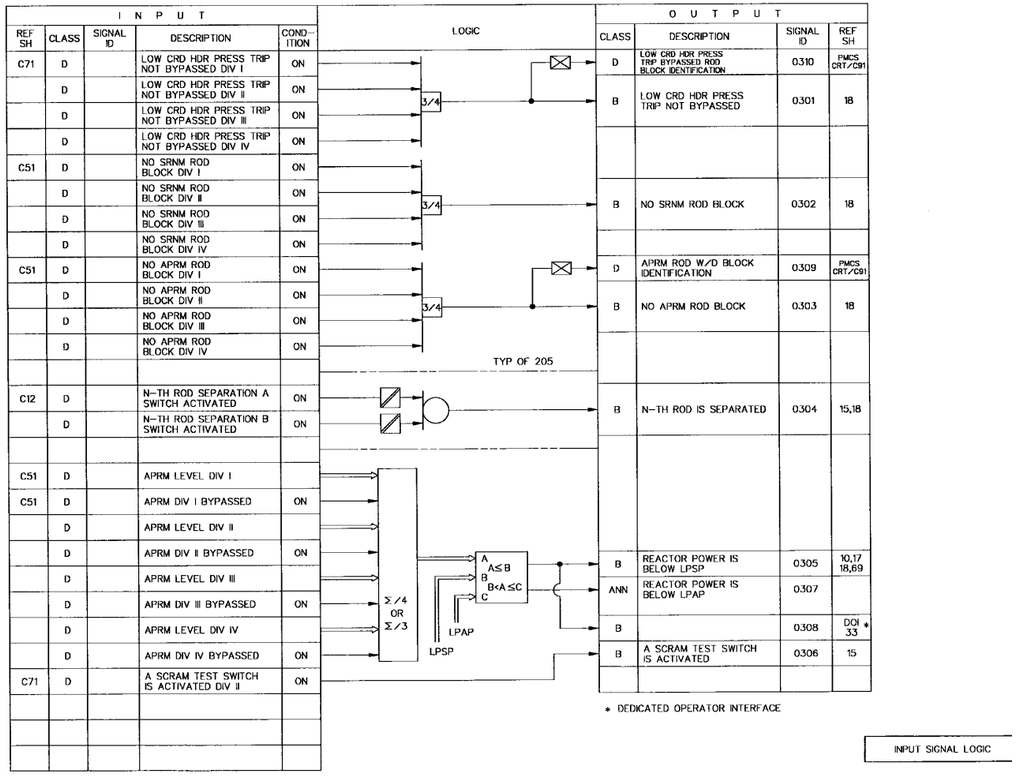


Figure 7.7-3 Rod Control and Information System IBD (Sheet 3 of 87)

INPUT					LOGIC	OUTPUT			
REF SH	CLASS	SIGNAL ID	DESCRIPTION	CONDITION		CLASS	DESCRIPTION	SIGNAL ID	REF SH
C71	D		SCRAM FOLLOW FROM RPS DIV I	ON		B		0408	DOI 33
	D		SCRAM FOLLOW FROM RPS DIV II	ON	2/4	B	SCRAM FOLLOW CONDITION EXIST	0401	10,18
	D		SCRAM FOLLOW FROM RPS DIV III	ON		D	SCRAM FOLLO CONDITION ROD WD BLOCK IDENTIFICATION	0409	PMCS CRT/C91
	D		SCRAM FOLLOW FROM RPS DIV IV	ON					
C71	D		REACTOR MODE SWITCH IN SHUTDOWN DIV I	ON					
	D		REACTOR MODE SWITCH IN SHUTDOWN DIV II	ON	2/4	B	REACTOR MODE SWITCH IN S/D	0402	18
	D		REACTOR MODE SWITCH IN SHUTDOWN DIV III	ON		D	REACTOR MODE SWITCH IN S/D ROD WD BLOCK IDENTIFICATION	0410	
	D		REACTOR MODE SWITCH IN SHUTDOWN DIV IV	ON					
C71	D		REACTOR MODE SWITCH IN REFUEL DIV I	ON					
	D		REACTOR MODE SWITCH IN REFUEL DIV II	ON	2/4	B	REACTOR MODE SWITCH IN REFUEL	0403	14,85, 30
	D		REACTOR MODE SWITCH IN REFUEL DIV III	ON					
	D		REACTOR MODE SWITCH IN REFUEL DIV IV	ON					
	D		REACTOR MODE SWITCH IN STARTUP DIV I	ON					
C71	D		REACTOR MODE SWITCH IN STARTUP DIV II	ON	2/4	B	REACTOR MODE SWITCH IN S/U	0404	69
	D		REACTOR MODE SWITCH IN STARTUP DIV III	ON					
	D		REACTOR MODE SWITCH IN STARTUP DIV IV	ON					
C71	D		REACTOR MODE SWITCH IN RUN DIV I	ON					
	D		REACTOR MODE SWITCH IN RUN DIV II	ON	2/4	B	REACTOR MODE SWITCH IN RUN	0405	17,18,69
	D		REACTOR MODE SWITCH IN RUN DIV III	ON					
	D		REACTOR MODE SWITCH IN RUN DIV IV	ON					
C51	D		MRBM-A ROD BLOCK	ON		B	MRBM-A ROD BLOCK	0406	18
C51	D		MRBM-B ROD BLOCK	ON		B	MRBM-B ROD BLOCK	0407	18

INPUT SIGNALS LOGIC

Figure 7.7-3 Rod Control and Information System IBD (Sheet 4 of 87)

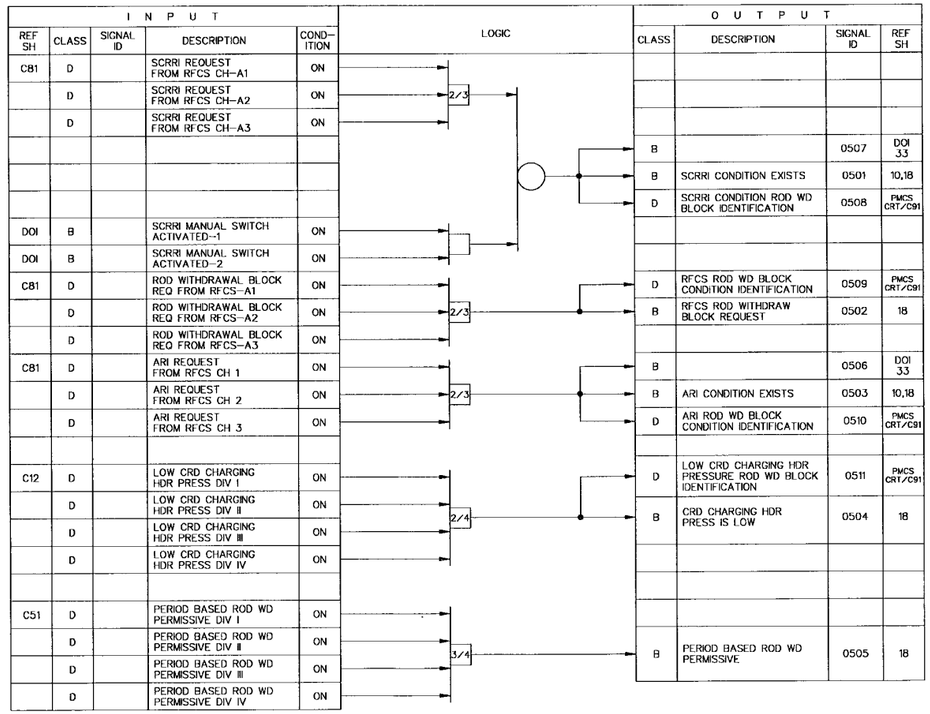
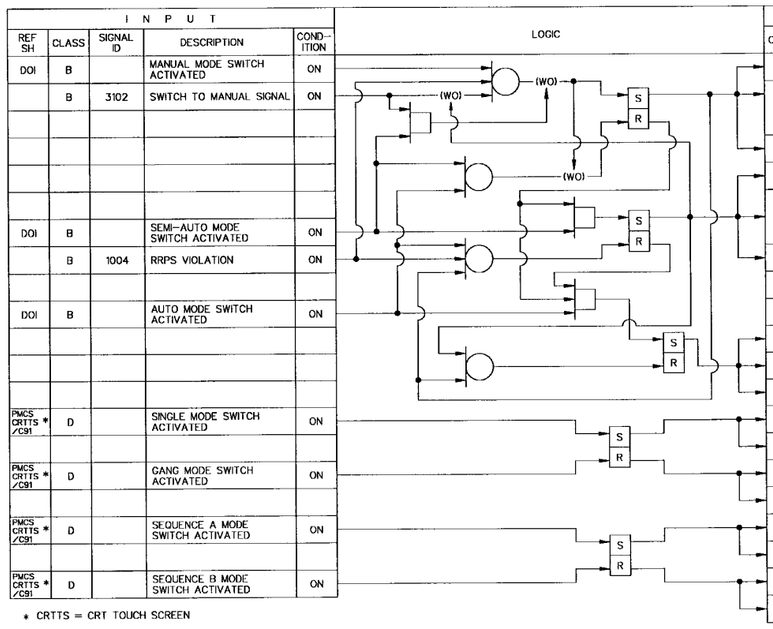


Figure 7.7-3 Rod Control and Information System IBD (Sheet 5 of 87)

INPUT				
REF SH	CLASS	SIGNAL ID	DESCRIPTION	CONDITION
DOI	B		MANUAL MODE SWITCH ACTIVATED	ON
	B	3102	SWITCH TO MANUAL SIGNAL	ON
DOI	B		SEMI-AUTO MODE SWITCH ACTIVATED	ON
	B	1004	RRPS VIOLATION	ON
DOI	B		AUTO MODE SWITCH ACTIVATED	ON
PMCS CRTTS * /C91	D		SINGLE MODE SWITCH ACTIVATED	ON
PMCS CRTTS * /C91	D		GANG MODE SWITCH ACTIVATED	ON
PMCS CRTTS * /C91	D		SEQUENCE A MODE SWITCH ACTIVATED	ON
PMCS CRTTS * /C91	D		SEQUENCE B MODE SWITCH ACTIVATED	ON

* CRTTS = CRT TOUCH SCREEN



OUTPUT			
CLASS	DESCRIPTION	SIGNAL ID	REF SH
B		0615	DOI 3.3
B	RCIS IN MANUAL MODE	0601	4,10,11 14,17 22,23
D		0608	PMCS CRT/C91
B		0616	DOI 3.3
B	RCIS IN SEMI-AUTO MODE	0602	10,12
D		0609	PMCS CRT/C91
B		0617	DOI 3.3
B	RCIS IN AUTO MODE	0603	10,13 26,27,28 29,30
D		0610	PMCS CRT/C91
B	RCIS IN SINGLE ROD DRIVE MODE	0604	9,10,11 14,15,26 69,71,85
D		0611	PMCS CRT/C91
B	RCIS IN GANG ROD DRIVE MODE	0605	10,11,12,13 14,15,17,26 69,71,85
D		0612	PMCS CRT/C91
B	SEQUENCE A SELECTED	0606	10,12 13,70
D		0613	PMCS CRT/C91
B	SEQUENCE B SELECTED	0607	10,12 13,70
D		0614	PMCS CRT/C91

MODE SELECTION LOGIC

Figure 7.7-3 Rod Control and Information System IBD (Sheet 6 of 87)

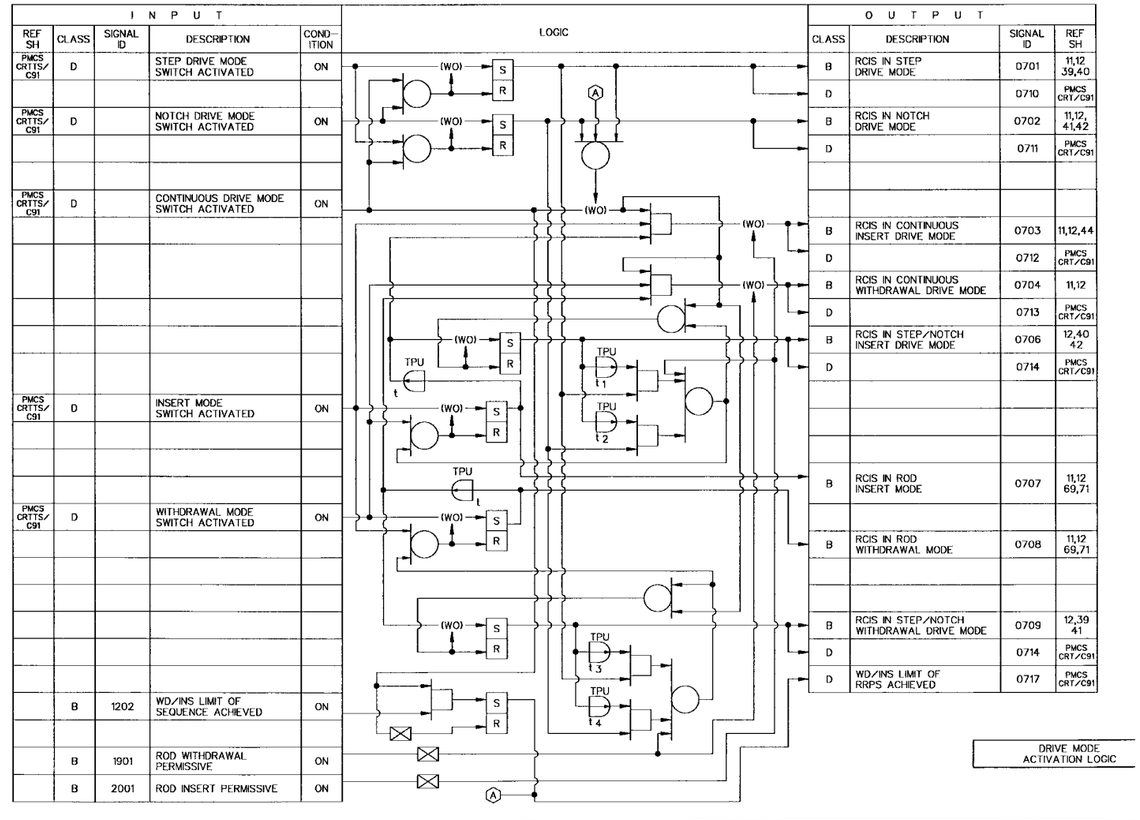


Figure 7.7-3 Rod Control and Information System IBD (Sheet 7 of 87)

INPUT					LOGIC	OUTPUT			
REF SH	CLASS	SIGNAL ID	DESCRIPTION	COND-ITION		CLASS	DESCRIPTION	SIGNAL ID	REF SH
DOI	B		CRDSTSS* PUT IN 1CRD/2CRD SCRAM TIME TEST POSITION	ON		B	CRDSTSS IN 1CRD/2CRD SCRAM TIME TEST	0801	14,15,85
						B		0812	DOI,34
						D		0813	PMCS CRT/C91
DOI	B		CRDSTSS PUT IN COUPLING CHECK POSITION	ON		B	CRDSTSS IN COUPLING CHECK	0802	14,15 85
						B		0814	DOI,34
						D		0815	PMCS CRT/C91
DOI	B		CRDSTSS PUT IN 2-NOTCH TEST POSITION	ON		B	CRDSTSS IN 2-NOTCH TEST	0804	17
						B		0818	DOI,34
						D		0819	PMCS CRT/C91
DOI	B		CRDSTSS PUT IN IDLE POSITION	ON		B	CRDSTSS IN IDLE	0805	19
						B		0820	DOI,34
						D		0821	PMCS CRT/C91
PMCS CRTTS/ C91	D		OVERTRAVEL PERMIT	ON		B	OVERTRAVEL PERMIT	0806	11,14 39,41,43
PMCS CRTTS/ C91	D		OVERTRAVEL PERMIT CLEAR	ON		D		0823	PMCS CRT/C91
DOI	B		CRDSTMS ** PUT IN AUTO MODE	ON		B	CRDSTMS IN AUTO	0807	14,17
						B		0824	DOI,34
						D		0825	PMCS CRT/C91
DOI	B		CRDSTMS PUT IN MANUAL MODE	ON		B		0826	DOI,34
						B	CRDSTMS IN IDLE	0811	PMCS CRT/C91
DOI	B		CRDSTMS PUT IN IDLE MODE	ON		B		0827	DOI,35
						B	CRDSTSMS IN MANUAL	0808	14
DOI	B		START CRD SURVEILLANCE TEST	ON		D		0828	PMCS CRT/C91
DOI	B		STOP CRD SURVEILLANCE TEST	ON		B		0829	DOI,35
						B	CRD SURVEILLANCE TEST STARTED	0809	14,17
						D		0830	PMCS CRT/C91
						B		0831	DOI,35
						B	CRD SURVEILLANCE TEST STOPPED	0810	10,14 17
						D		0832	PMCS CRT/C91

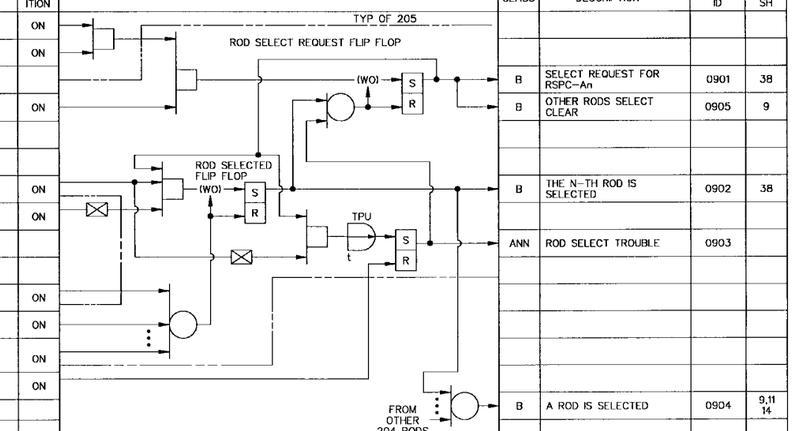
CRD SURVEILLANCE TEST SELECTION LOGIC

* CRD SURVEILLANCE TEST SELECTION SWITCH
** CRD SURVEILLANCE TEST MODE SWITCH

Figure 7.7-3 Rod Control and Information System IBD (Sheet 8 of 87)

I N P U T				
REF SH	CLASS	SIGNAL ID	DESCRIPTION	COND–ITION
	B	0601	RCIS IN MANUAL MODE	ON
	B	0604	RCIS IN SINGLE ROD DRIVE MODE	ON
PMCS CRTTS/ C91	D		SELECTION SWITCH OF N–TH ROD ACTIVATED	ON
	B	2415	RSPC–An SELECT ACK.	ON
		0904	A ROD IS SELECTED	ON
PMCS CRTTS/ C91	D	RC & IS	ROD SELECT CLEAR	ON
	B	0905	OTHER RODS SELECT CLEAR	ON
	B	0905	OTHER RODS SELECT CLEAR	ON
DOI	B		RCIS RESET	ON

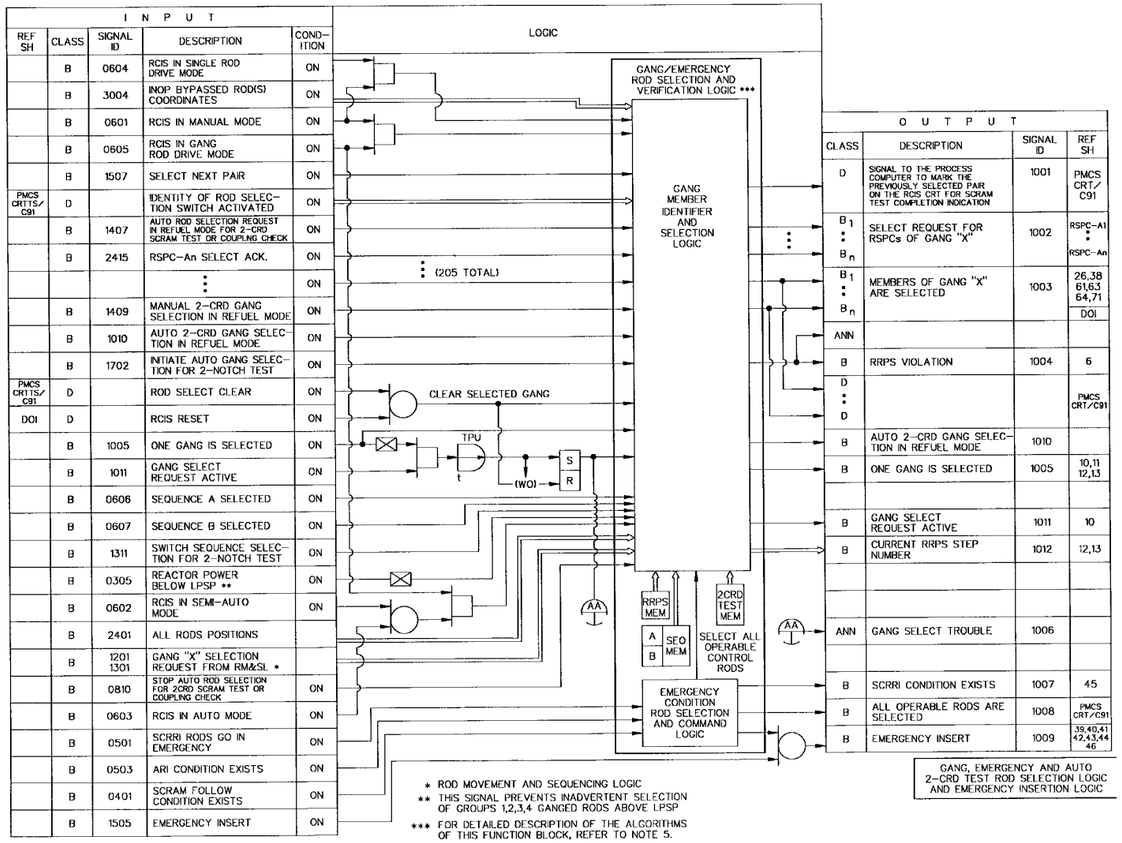
LOGIC



O U T P U T			
CLASS	DESCRIPTION	SIGNAL ID	REF SH
B	SELECT REQUEST FOR RSPC–An	0901	38
B	OTHER RODS SELECT CLEAR	0905	9
B	THE N–TH ROD IS SELECTED	0902	38
ANN	ROD SELECT TROUBLE	0903	
B	A ROD IS SELECTED	0904	9,11 14

SINGLE ROD SELECTION AND VERIFICATION LOGIC AND AUTOMATIC ROD SELECTION LOGIC FOR BRAKE TEST

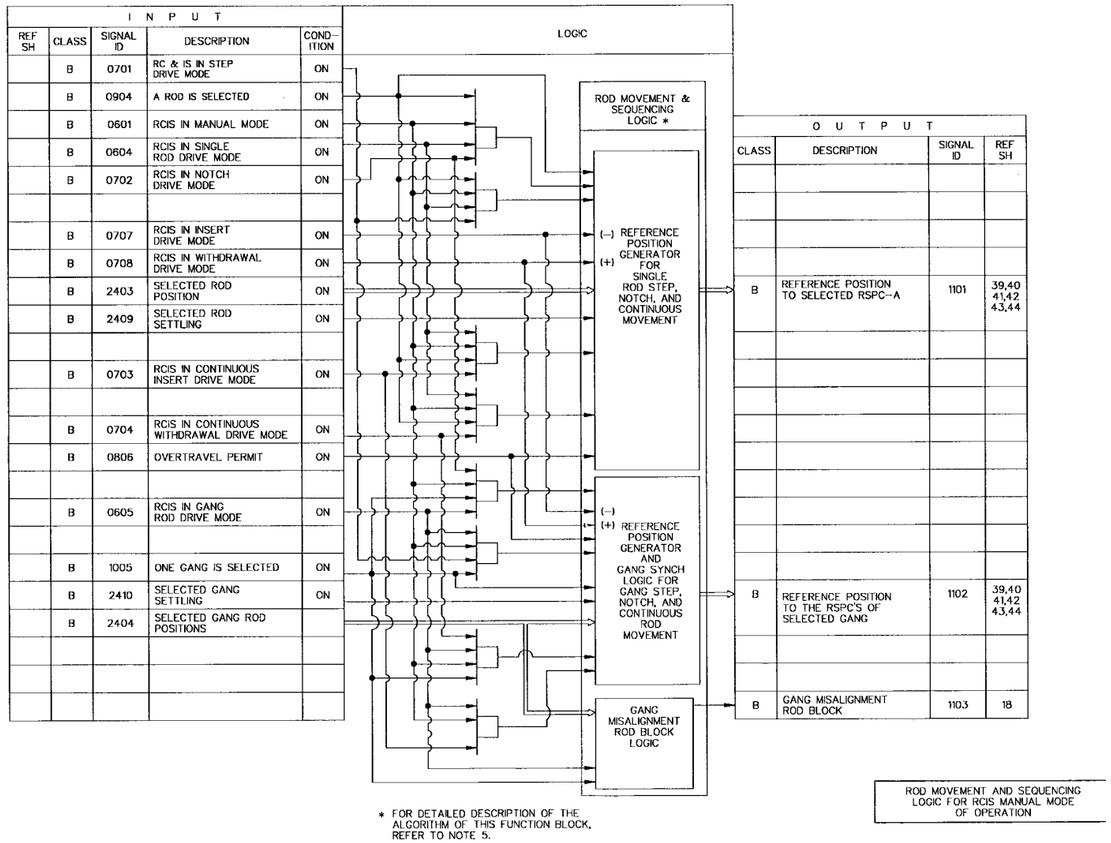
Figure 7.7-3 Rod Control and Information System IBD (Sheet 9 of 87)



INPUT				
REF SH	CLASS	SIGNAL ID	DESCRIPTION	CONDITION
	B	0604	RCIS IN SINGLE ROD DRIVE MODE	ON
	B	3004	INOP BYPASSED ROD(S) COORDINATES	ON
	B	0601	RCIS IN MANUAL MODE	ON
	B	0605	RCIS IN GANG ROD DRIVE MODE	ON
	B	1507	SELECT NEXT PAIR	ON
PMCS CRTTS/ C91	D		IDENTITY OF ROD SELECTION SWITCH ACTIVATED	ON
	B	1407	AUTO ROD SELECTION REQUEST IN REFUEL MODE FOR 2-CRD SCRAM TEST OR COUPLING CHECK	ON
	B	2415	RSPC-An SELECT ACK.	ON
			⋮	ON
	B	1409	MANUAL 2-CRD GANG SELECTION IN REFUEL MODE	ON
	B	1010	AUTO 2-CRD GANG SELECTION IN REFUEL MODE	ON
	B	1702	INITIATE AUTO GANG SELECTION FOR 2-NOTCH TEST	ON
PMCS CRTTS/ C91	D		ROD SELECT CLEAR	ON
DOI	D		RCIS RESET	ON
	B	1005	ONE GANG IS SELECTED	ON
	B	1011	GANG SELECT REQUEST ACTIVE	ON
	B	0606	SEQUENCE A SELECTED	ON
	B	0607	SEQUENCE B SELECTED	ON
	B	1311	SWITCH SEQUENCE SELECTION FOR 2-NOTCH TEST	ON
	B	0305	REACTOR POWER BELOW LPSP **	ON
	B	0602	RCIS IN SEMI-AUTO MODE	ON
	B	2401	ALL RODS POSITIONS	
	B	1201 1301	GANG "X" SELECTION REQUEST FROM RM&SL *	
	B	0810	STOP AUTO ROD SELECTION FOR 2CRD SCRAM TEST OR COUPLING CHECK	ON
	B	0603	RCIS IN AUTO MODE	ON
	B	0501	SCRRI RODS GO IN EMERGENCY	ON
	B	0503	ARI CONDITION EXISTS	ON
	B	0401	SCRAM FOLLOW CONDITION EXISTS	ON
	B	1505	EMERGENCY INSERT	ON

OUTPUT			
CLASS	DESCRIPTION	SIGNAL ID	REF SH
D	SIGNAL TO THE PROCESS COMPUTER TO MARK THE PREVIOUSLY SELECTED PAIR ON THE RCIS CRT FOR SCRAM TEST COMPLETION INDICATION	1001	PMCS CRT/ C91
B_1 ⋮ B_n	SELECT REQUEST FOR RSPCs OF GANG "X"	1002	RSPC-A1 ⋮ RSPC-An
B_1 ⋮ B_n	MEMBERS OF GANG "X" ARE SELECTED	1003	26,38 61,63 64,71 DOI
ANN			
B	RRPS VIOLATION	1004	6
D ⋮ D			PMCS CRT/C91
B	AUTO 2-CRD GANG SELECTION IN REFUEL MODE	1010	
B	ONE GANG IS SELECTED	1005	10,11 12,13
B	GANG SELECT REQUEST ACTIVE	1011	10
B	CURRENT RRPS STEP NUMBER	1012	12,13
ANN	GANG SELECT TROUBLE	1006	
B	SCRRI CONDITION EXISTS	1007	45
B	ALL OPERABLE RODS ARE SELECTED	1008	PMCS CRT/C91
B	EMERGENCY INSERT	1009	39,40,41 42,43,44 46

Figure 7.7-3 Rod Control and Information System IBD (Sheet 10 of 87)



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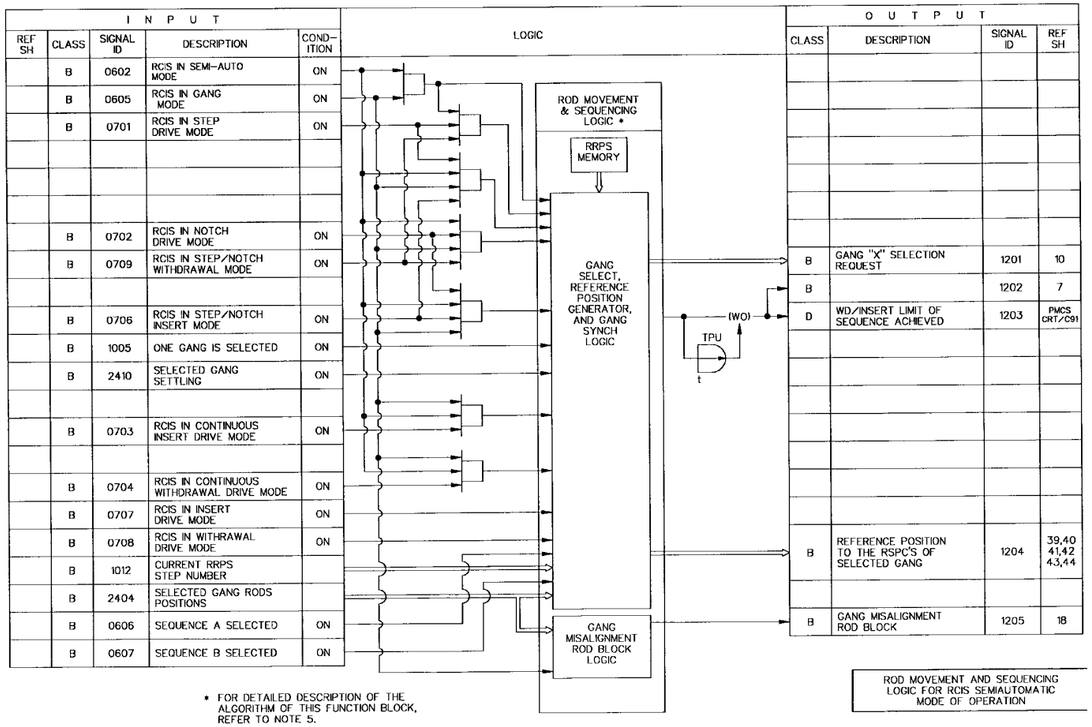

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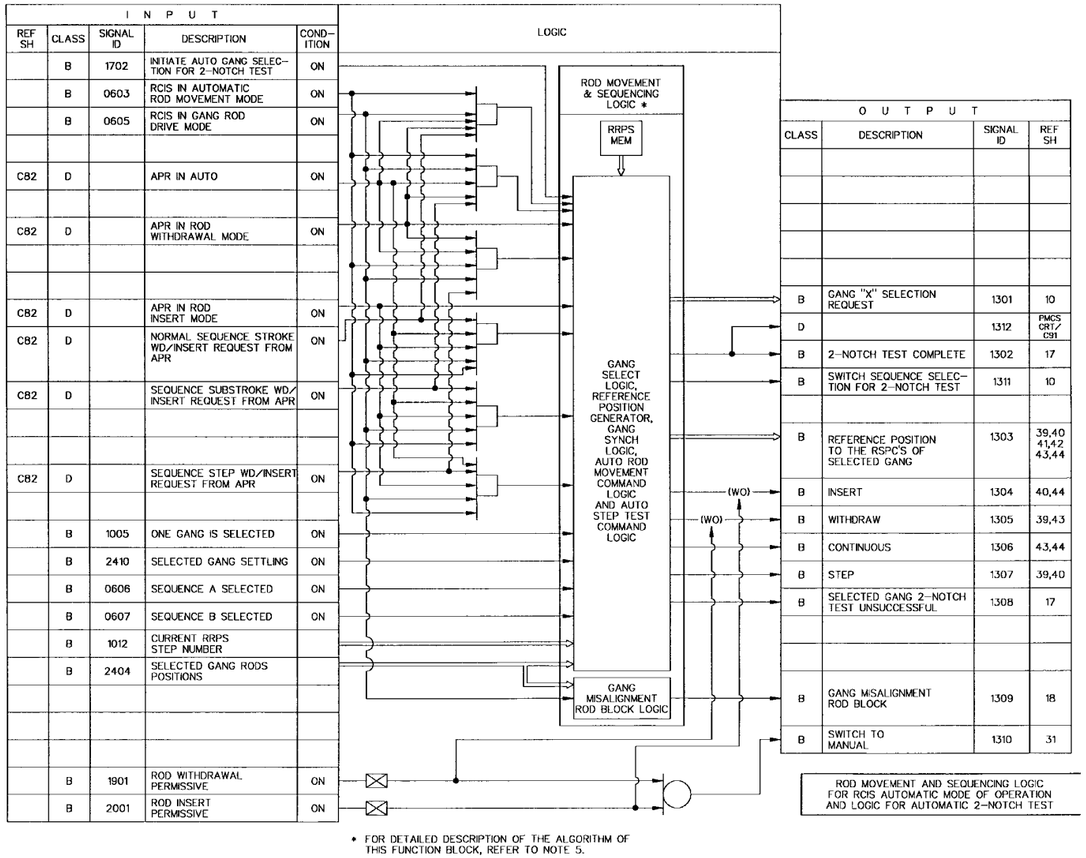


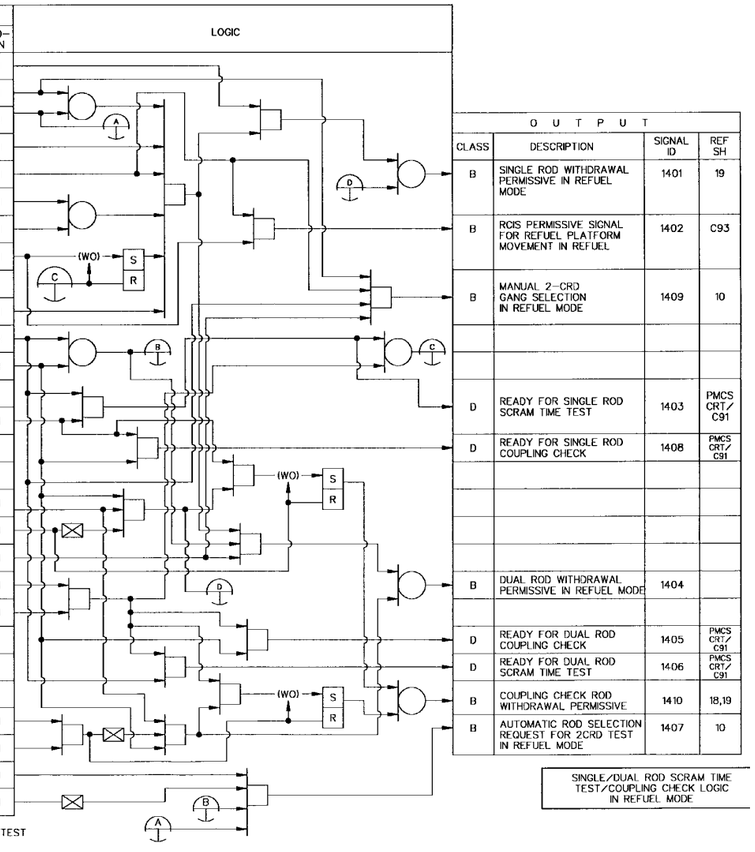
Figure 7.7-3 Rod Control and Information System IBD (Sheet 13 of 87)

INPUT				
REF SH	CLASS	SIGNAL ID	DESCRIPTION	CONDITION
	B	0604	RCIS IN SINGLE ROD DRIVE MODE	ON
	B	0808	CRD STMS IN MANUAL *	ON
	B	0807	CRD STMS IN AUTO	ON
	B	0601	RCIS IN MANUAL MODE	ON
	D	0403	REACTOR MODE SWITCH IN REFUEL	ON
C93	D		REFUEL PLATFORM NOT OVER THE CORE	ON
C93	D		REFUEL GRAPPLE NOT LOADED	ON
	B	2406	ALL RODS FULL-IN (SYNCHRO FULL-IN)	ON
	B	0904	A ROD IS SELECTED	ON
	B	0801	CRD STSS IN 2CRD/1CRD** SCRAM TIME TEST MODE	ON
	B	0802	CRD STSS IN COUPLING CHECK MODE	ON
	B	2407	SELECTED ROD IS FULL-OUT	ON
	B	0806	OVERTRAVEL PERMIT	ON
	B	2459	SELECTED ROD IS AT POSITION 3728 mm	ON
	B	0605	RCIS IN GANG ROD DRIVE MODE	ON
	B	2407	FIRST ROD OF SELECTED DUAL RODS FULL-OUT	ON
	B	2407	SECOND ROD OF SELECTED DUAL RODS FULL-OUT	ON
	B	2459	FIRST ROD OF SELECTED DUAL RODS AT POS 3728 mm	ON
	B	2459	FIRST ROD OF SELECTED DUAL RODS AT POS 3728 mm	ON
	B	0809	START	ON
	B	0810	STOP	ON

* CRD SURVEILLANCE TEST MODE SWITCH

** CRD SURVEILLANCE TEST SELECTION SWITCH

LOGIC



OUTPUT			
CLASS	DESCRIPTION	SIGNAL ID	REF SH
B	SINGLE ROD WITHDRAWAL PERMISSIVE IN REFUEL MODE	1401	19
B	RCIS PERMISSIVE SIGNAL FOR REFUEL PLATFORM MOVEMENT IN REFUEL	1402	C93
B	MANUAL 2-CRD GANG SELECTION IN REFUEL MODE	1409	10
D	READY FOR SINGLE ROD SCRAM TIME TEST	1403	PMCS CRT/ C91
D	READY FOR SINGLE ROD COUPLING CHECK	1408	PMCS CRT/ C91
B	DUAL ROD WITHDRAWAL PERMISSIVE IN REFUEL MODE	1404	
D	READY FOR DUAL ROD COUPLING CHECK	1405	PMCS CRT/ C91
D	READY FOR DUAL ROD SCRAM TIME TEST	1406	PMCS CRT/ C91
B	COUPLING CHECK ROD WITHDRAWAL PERMISSIVE	1410	18,19
B	AUTOMATIC ROD SELECTION REQUEST FOR 2CRD TEST IN REFUEL MODE	1407	10

SINGLE/DUAL ROD SCRAM TIME TEST/COUPLING CHECK LOGIC IN REFUEL MODE

Figure 7.7-3 Rod Control and Information System IBD (Sheet 14 of 87)

INPUT					LOGIC	OUTPUT			
REF SH	CLASS	SIGNAL ID	DESCRIPTION	COND-ITION		CLASS	DESCRIPTION	SIGNAL ID	REF SH
	B	0802	CRDSTSS IN COUPLING CHECK	ON	TYPICAL OF 205				
	B	0604	RC&IS IN SINGLE ROD DRIVE MODE	ON					
	B	0304	SELECTED ROD IS SEPARATED	ON		D	SELECTED SINGLE ROD COUPLING IS OK	1501	PMCS CRT/C91
	B	2459	SELECTED ROD AT POS 3728 mm	ON					
	B	2460	SELECTED ROD OVER-TRAVEL SWITCH ACTIVATED	ON		D	SELECTED ROD IS UNCOUPLED	1502	PMCS CRT/C91
	B	0801	CRDSTTSS IN 2CRD/1CRD SCRAM TIME TEST MODE	ON					
					TYPICAL OF 103				
	B	0304	THE FIRST OF THE SELECTED DUAL RODS IS SEPARATED	ON					
	B	0304	THE SECOND OF THE SELECTED DUAL RODS IS SEPARATED	ON					
	B	0605	RC&IS IN GANG ROD DRIVE MODE	ON		D	SELECTED DUAL RODS COUPLING IS OK	1503	PMCS CRT/C91
	B	2459	THE FIRST ROD OF THE DUAL SELECTED RODS IS AT POSITION 3728 mm	ON					
	B	3809	THE SECOND ROD OF THE DUAL SELECTED RODS IS AT POSITION 3728 mm	ON					
	B	2460	OVERTRAVEL SWITCH OF THE FIRST ROD OF THE DUAL SELECTED RODS ACTIVATED	ON		D	ONE OF THE SELECTED DUAL RODS IS UNCOUPLED	1504	PMCS CRT/C91
	B	2460	OVERTRAVEL SWITCH OF THE SECOND ROD OF THE DUAL SELECTED RODS ACTIVATED	ON					
	B	0306	A SCRAM TEST SWITCH IS ACTIVATED	ON	TPU t	B	EMERGENCY INSERT	1505	10
						B	SELECT NEXT PAIR	1507	10

SINGLE/DUAL ROD(S) COUPLING CHECK STATUS LOGIC AND SCRAM TIME TEST EMERGENCY INSERT LOGIC

Figure 7.7-3 Rod Control and Information System IBD (Sheet 15 of 87)

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Figure 7.7-3 Rod Control and Information System IBD (Sheet 16 of 87)

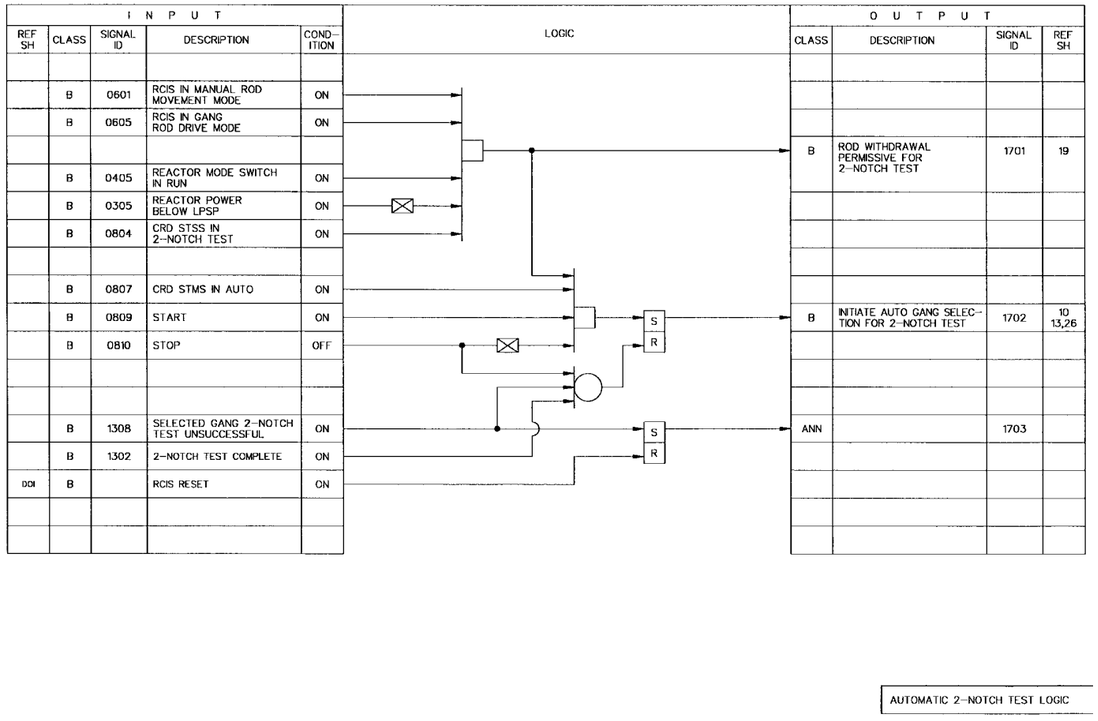


Figure 7.7-3 Rod Control and Information System IBD (Sheet 17 of 87)

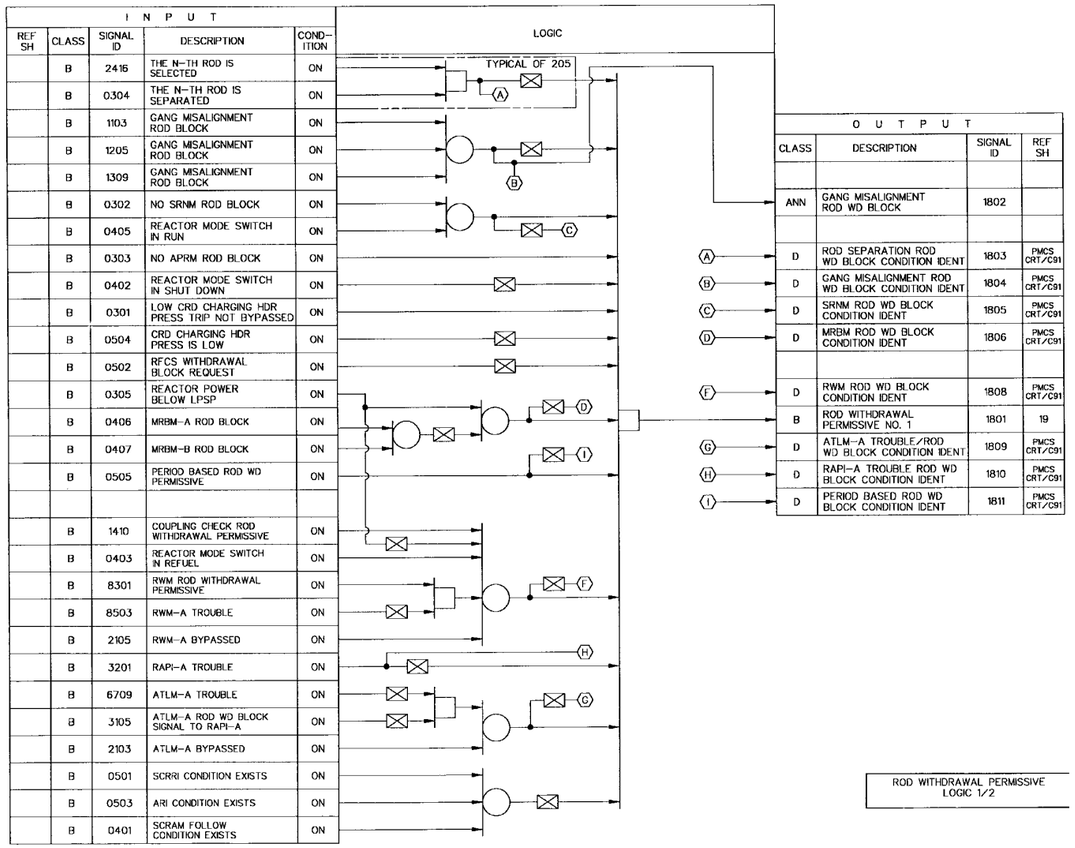


Figure 7.7-3 Rod Control and Information System IBD (Sheet 18 of 87)

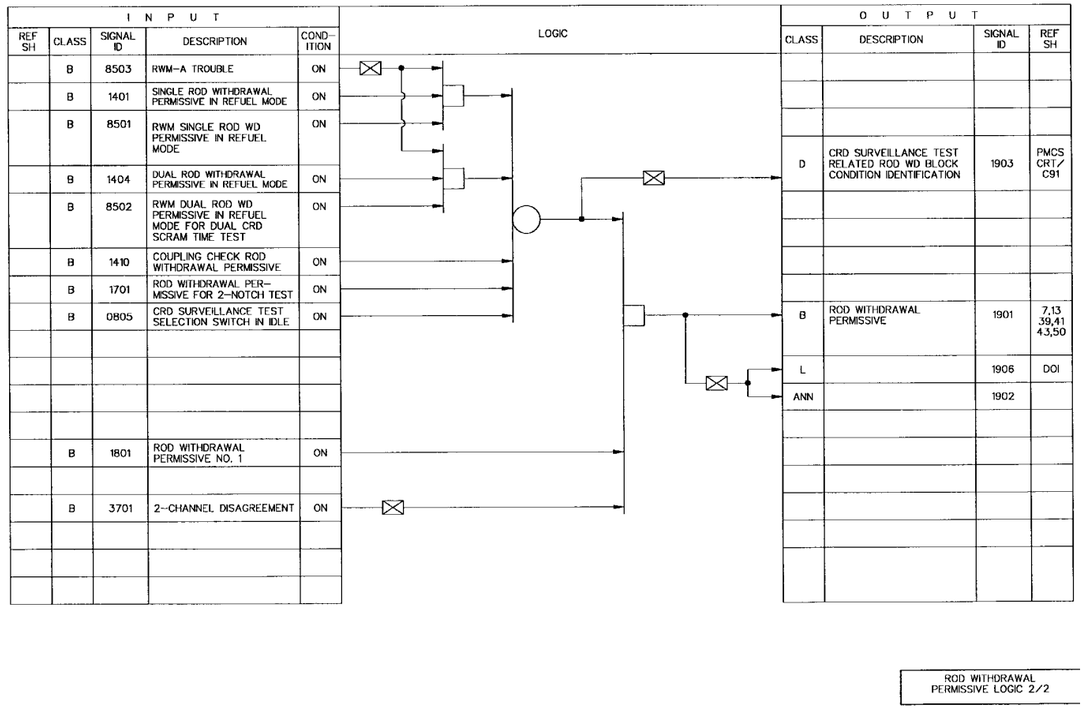


Figure 7.7-3 Rod Control and Information System IBD (Sheet 19 of 87)

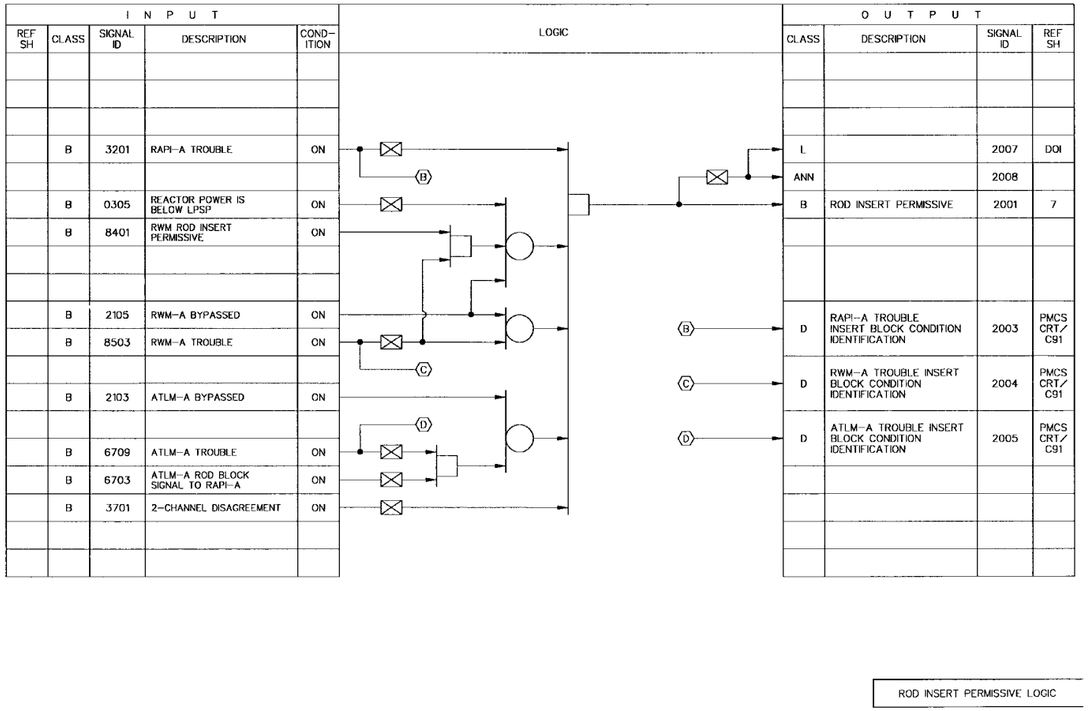


Figure 7.7-3 Rod Control and Information System IBD (Sheet 20 of 87)

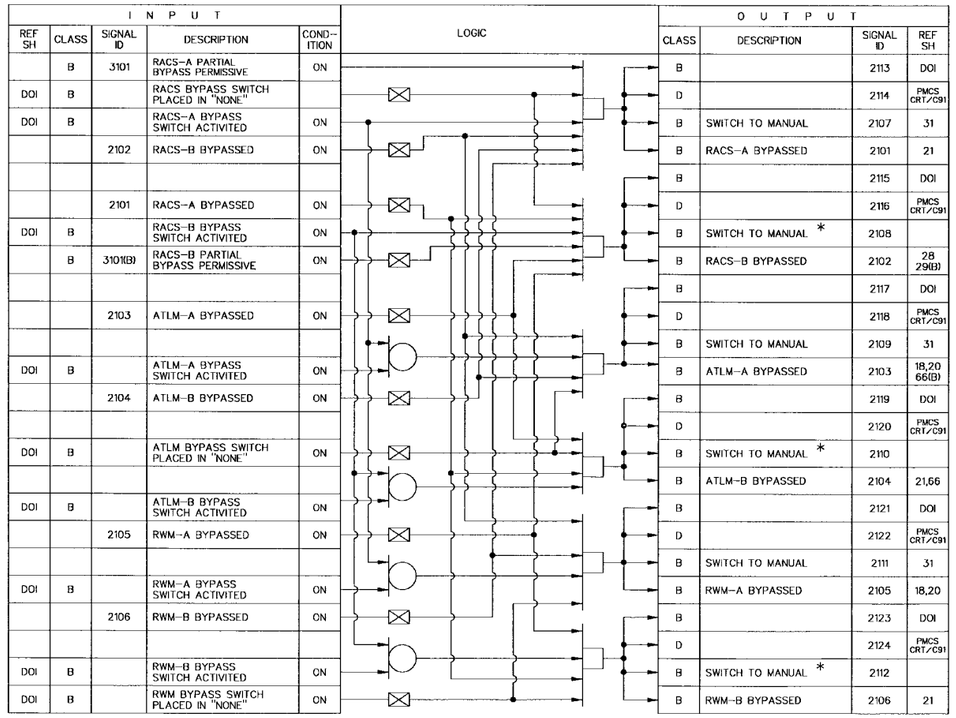


Figure 7.7-3 Rod Control and Information System IBD (Sheet 21 of 87)

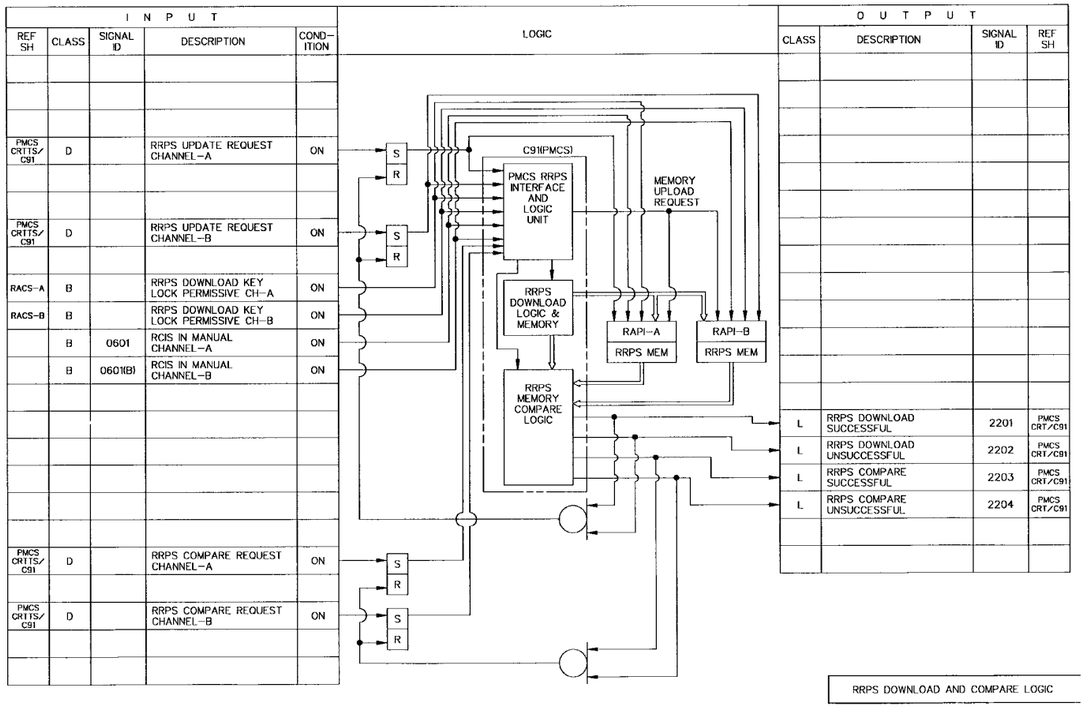


Figure 7.7-3 Rod Control and Information System IBD (Sheet 22 of 87)

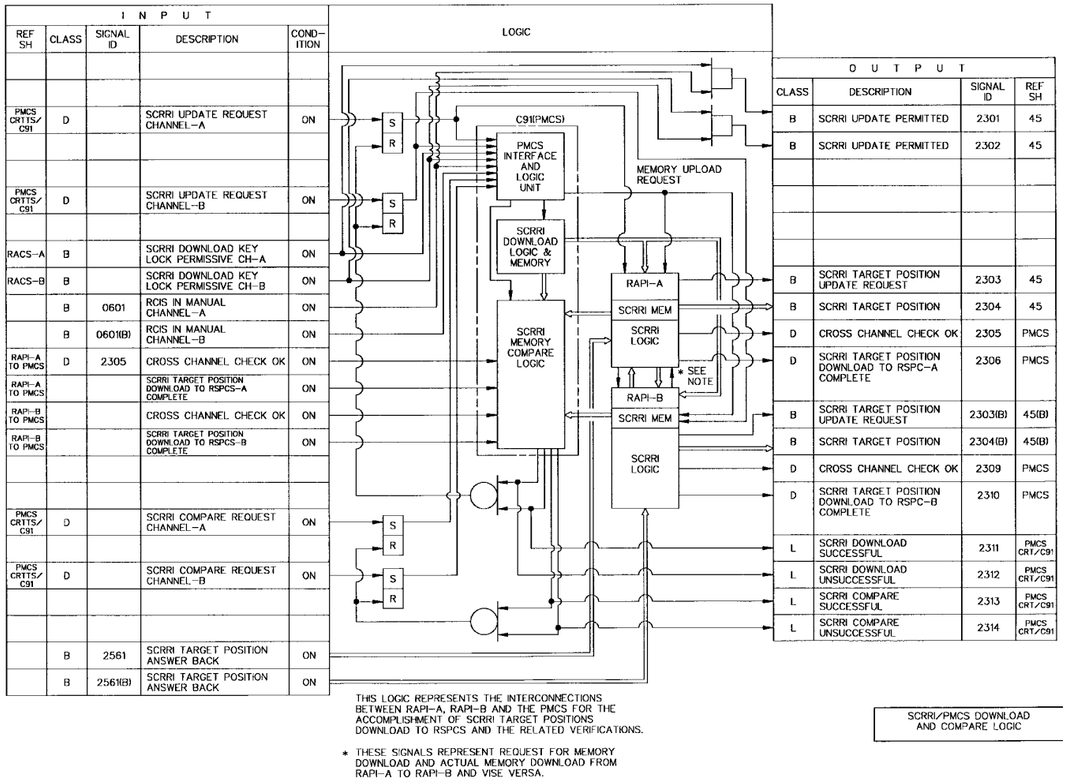


Figure 7.7-3 Rod Control and Information System IBD (Sheet 23 of 87)

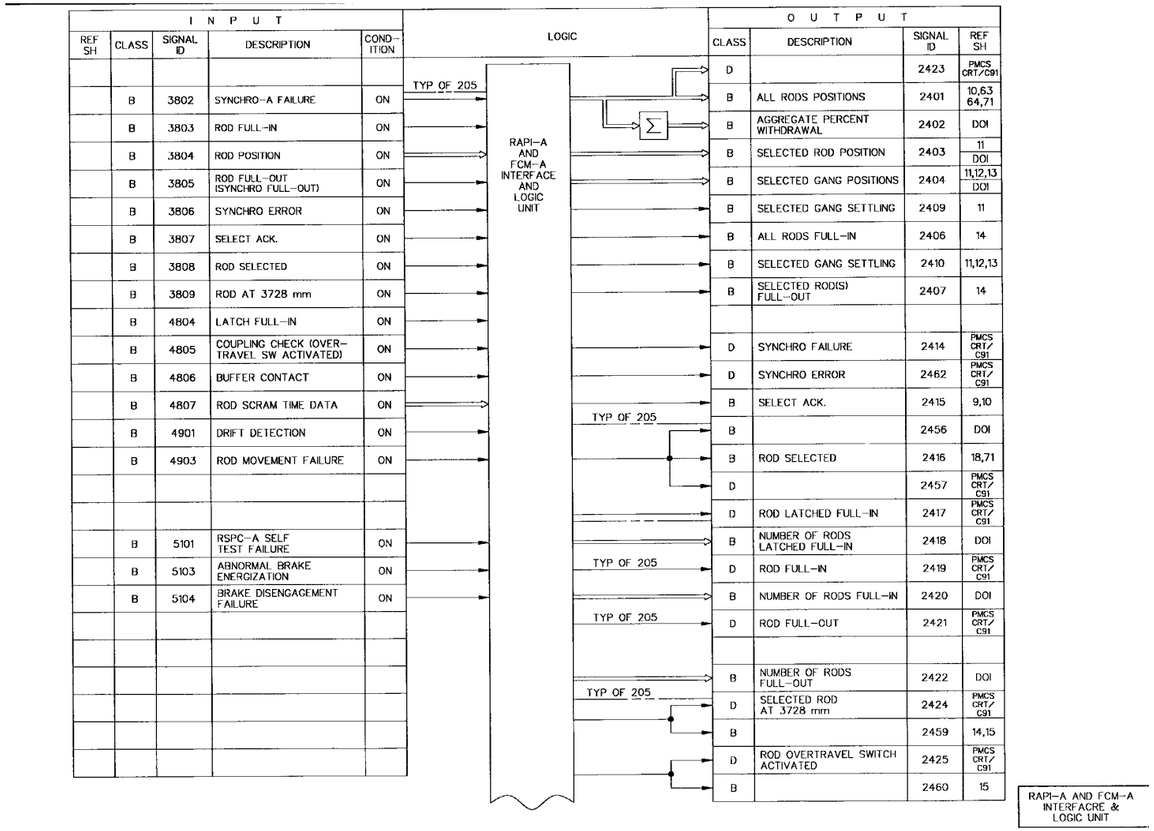


Figure 7.7-3 Rod Control and Information System IBD (Sheet 24 of 87)

INPUT					LOGIC	OUTPUT			
REF SH	CLASS	SIGNAL ID	DESCRIPTION	COND-ITION		CLASS	DESCRIPTION	SIGNAL ID	REF SH
	B	4509	SCRRI TARGET POSITION ANSWER BACK	ON	RAPI-A AND FCM-A INTERFACE & LOGIC UNIT	D	BUFFER CONTACT REED SWITCH ACTIVATED	2526	PMCS CRT/ C91
	B	5201	STEP	ON		D	ROD SCRAM TIME DATA	2527	PMCS CRT/ C91
	B	5202	NOTCH	ON		D	ROD IS DRIFTING	2528	PMCS CRT/ C91
	B	5203	CONTINUOUS	ON		B		2552	32
	B	5204	SETTLE	ON		D	ROD MOVEMENT FAILURE	2529	PMCS CRT/ C91
	B	5205	EMERGENCY INSERT	ON		B		2553	32
	B	5206	INSERT	ON					
	B	5207	WITHDRAW	ON					
	B	5208	STOP	ON		D	PSPC-A SELF TEST FAILURE	2532	PMCS CRT/ C91
	B	5209	INVERTER TROUBLE	ON		B		2533	32
	B	5210	INVERTER CONTROLLER TROUBLE	ON		D	ABNORMAL BRAKE ENERGIZATION	2534	PMCS CRT/C91
						B		2554	32
						D	BRAKE DISENGAGEMENT FAILURE	2535	PMCS CRT/C91
						B		2555	32
						B	SCRRI TARGET POSITION ANSWER BACK	2561	23
						D	STEP	2536	PMCS CRT/C91
						D	NOTCH	2537	PMCS CRT/C91
						D	CONTINUOUS	2538	PMCS CRT/C91
						D	SETTLE	2539	PMCS CRT/C91
						D	EMERGENCY INSERT	2540	PMCS CRT/C91
						D	INSERT	2541	PMCS CRT/C91
						D	WITHDRAW	2542	PMCS CRT/C91
							STOP	2543	PMCS CRT/C91

ROD POSITION INTERFACE LOGIC

Figure 7.7-3 Rod Control and Information System IBD (Sheet 25 of 87)

INPUT					LOGIC	OUTPUT			
REF SH	CLASS	SIGNAL ID	DESCRIPTION	COND-ITION		CLASS	DESCRIPTION	SIGNAL ID	REF SH
					TYP OF *				
	B	5211	A POWER SUPPLY IN FCM-Aj HAS FAILED	ON					
	B	5212	FCM-Aj IS OK	ON		D	INVERTER TROUBLE	2644	PMCS CRT/C91
						B		2645	32
	B	0604	RCIS IN SINGLE ROD DRIVE MODE	ON		D	INVERTER CONTROLLER TROUBLE	2646	PMCS CRT/C91
	B	0605	RCIS IN GANG ROD DRIVE MODE	ON		B		2647	32
	B	3004	INOP BYPASSED RODS) COORDINATES	ON					
	B	1003	COORDINATES OF SELECTED GANG	ON	TYP OF *	D	A POWER SUPPLY IN FCM-Aj HAS FAILED	2648	PMCS CRT/ C91
						B		2649	32
						D	FCM-Aj HAS FAILED	2650	PMCS CRT/C91
						B		2651	32
						D	SELECTED GANG MOVING	2611	PMCS CRT/C91
	B	0603	RCIS IN AUTOMATIC ROD MOVEMENT MODE	ON		D	NORMAL AUTO ROD MOVEMENT UNDERWAY	2612	APR
	B	1702	INITIATE AUTO GANG SELECTION FOR 2-NOTCH TEST	ON		D	AUTO 2-NOTCH TEST MOVEMENT UNDERWAY	2613	PMCS CRT/C91

RAPI-A AND FCM-A INTERFACE & LOGIC UNIT

* TYPICAL OF 205/# OF RSPCs PER FCM

ROD POSITION INTERFACE LOGIC

Figure 7.7-3 Rod Control and Information System IBD (Sheet 26 of 87)

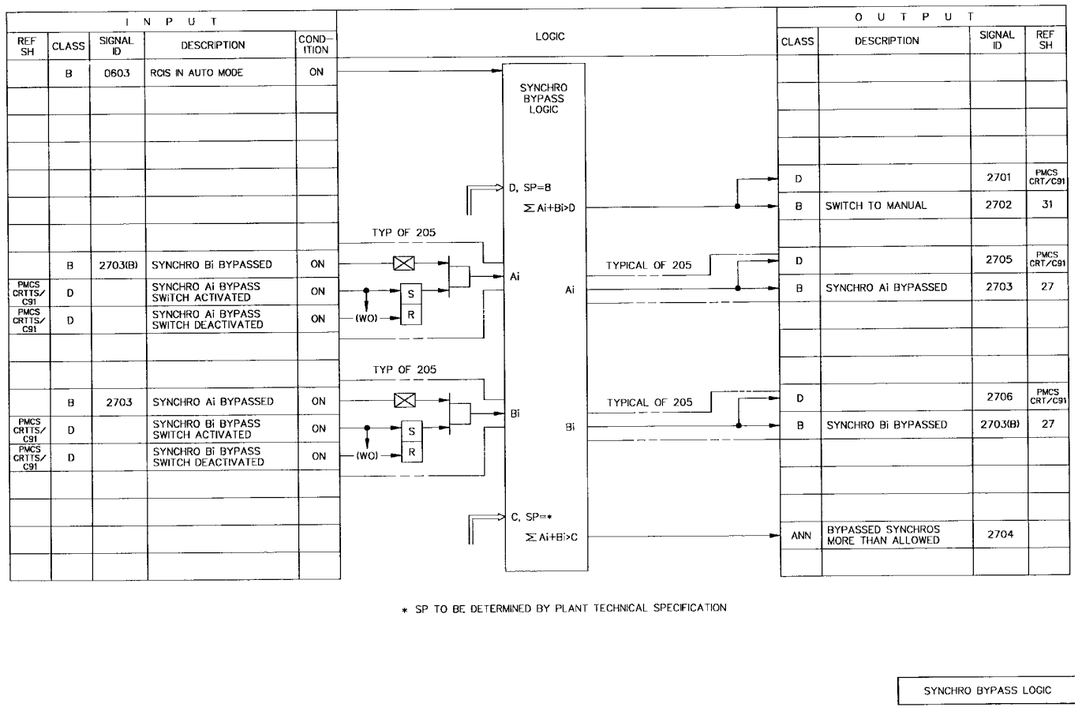


Figure 7.7-3 Rod Control and Information System IBD (Sheet 27 of 87)

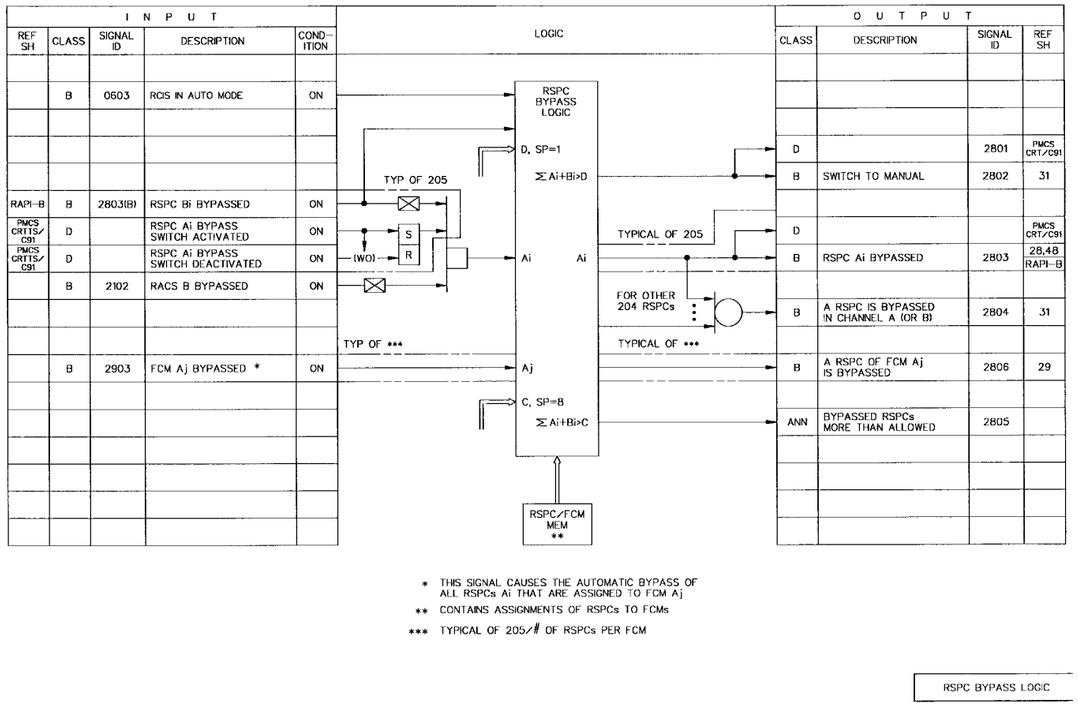


Figure 7.7-3 Rod Control and Information System IBD (Sheet 28 of 87)

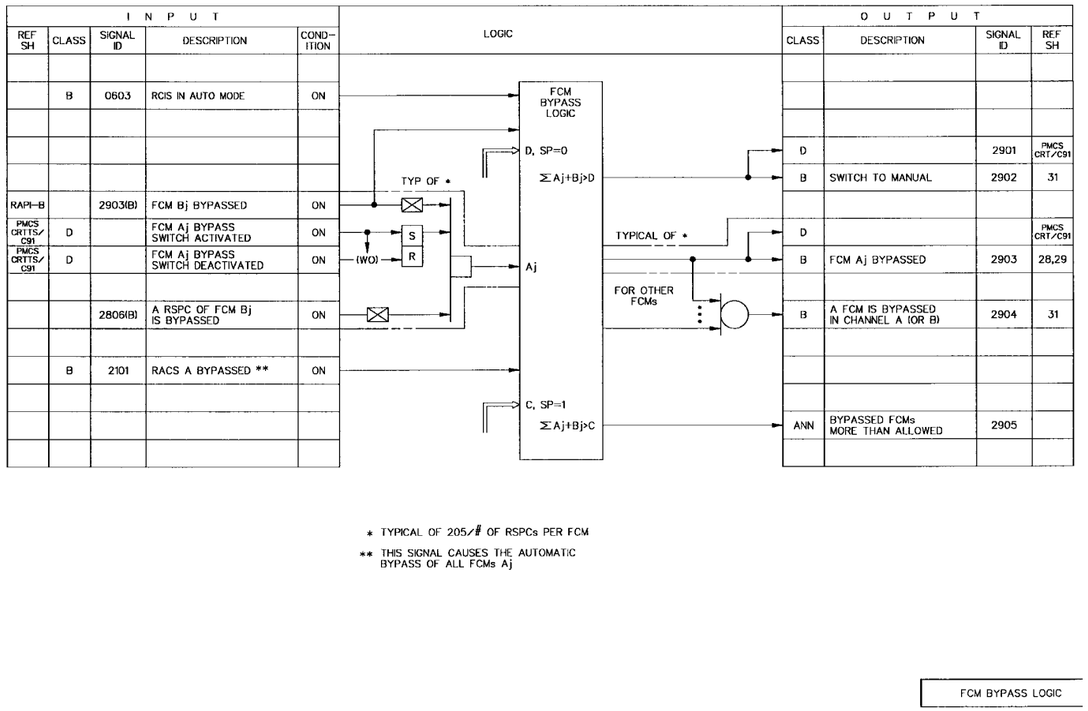


Figure 7.7-3 Rod Control and Information System IBD (Sheet 29 of 87)

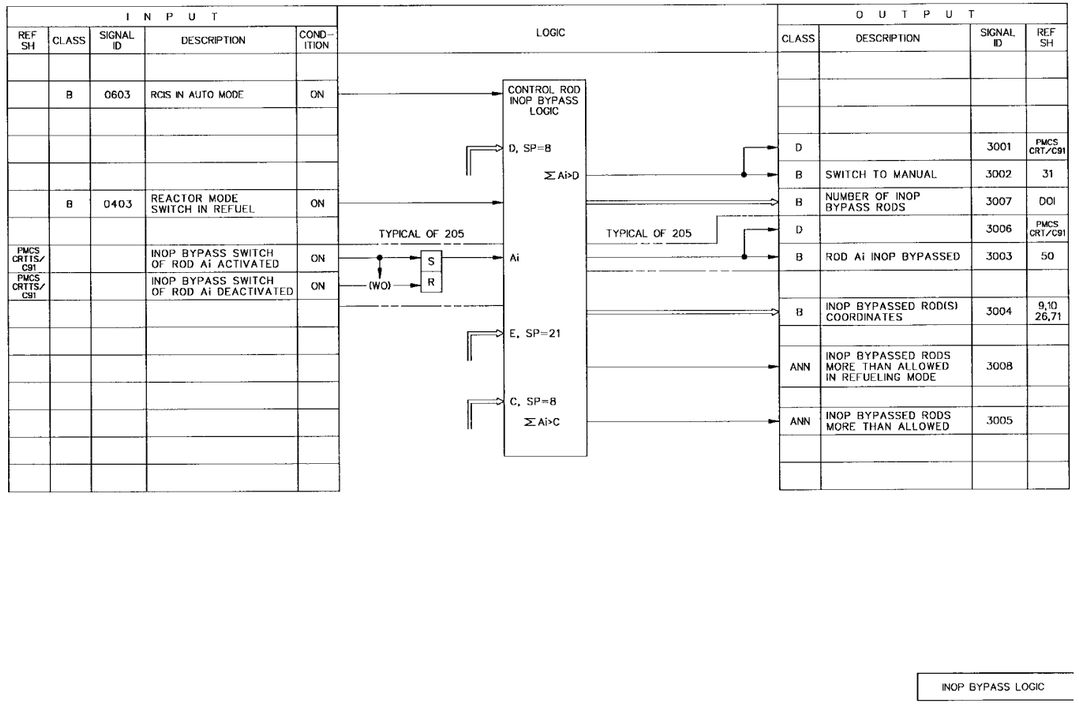


Figure 7.7-3 Rod Control and Information System IBD (Sheet 30 of 87)

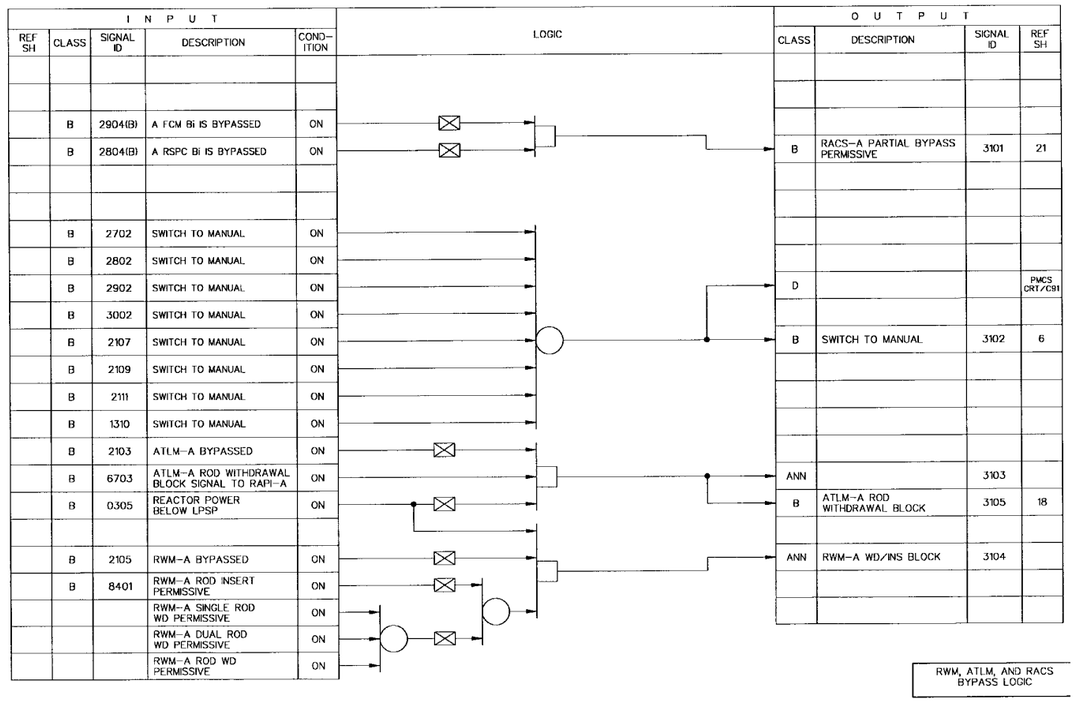


Figure 7.7-3 Rod Control and Information System IBD (Sheet 31 of 87)

INPUT					LOGIC	OUTPUT			
REF SH	CLASS	SIGNAL ID	DESCRIPTION	COND-ITION		CLASS	DESCRIPTION	SIGNAL ID	REF SH
					RAPI-A SELF TEST LOGIC	B	RAPI-A TROUBLE	3201	18,20
					TYPICAL OF 205				
	B	2552	ROD IS DRIFTING	ON					
	B	2553	ROD MOVEMENT FAILURE	ON					
	B	2533	RSPC-A SELF TEST FAILURE	ON					
	B	2554	ABNORMAL BRAKE ENERGIZATION	ON		B		3202	DOI
	B	2555	BRAKE DISENGAGEMENT FAILURE	ON					
	B	2645	INVERTER TROUBLE	ON	S (WO) R	ANN	RCIS TROUBLE	3203	
	B	2647	INVERTER CONTROLLER TROUBLE	ON					
	B	2649	A POWER SUPPLY IN FCM-Aj HAS FAILED	ON	TYPICAL OF *				
	B	2651	FCM-Aj HAS FAILED	ON					
DOI	B		RCIS RESET	ON					
					CHANNEL B				
RAPI-B	B	0501(B)	SCRRI RODS GO IN EMERGENCY	ON		B	RACS-A AUTO BYPASSED WITHIN CHANNEL B	3206(B)	48
RAPI-B	B	0503(B)	ARI CONDITION EXIST	ON		D		3205	PMCS CRT/C91
RAPI-B	B	0401(B)	SCRAM FOLLOW CONDITION EXISTS	ON		B		3204	DOI

* TYPICAL OF 205/# OF RSPCs PER FCM

RCIS AND RAPI TROUBLE LOGIC

Figure 7.7-3 Rod Control and Information System IBD (Sheet 32 of 87)

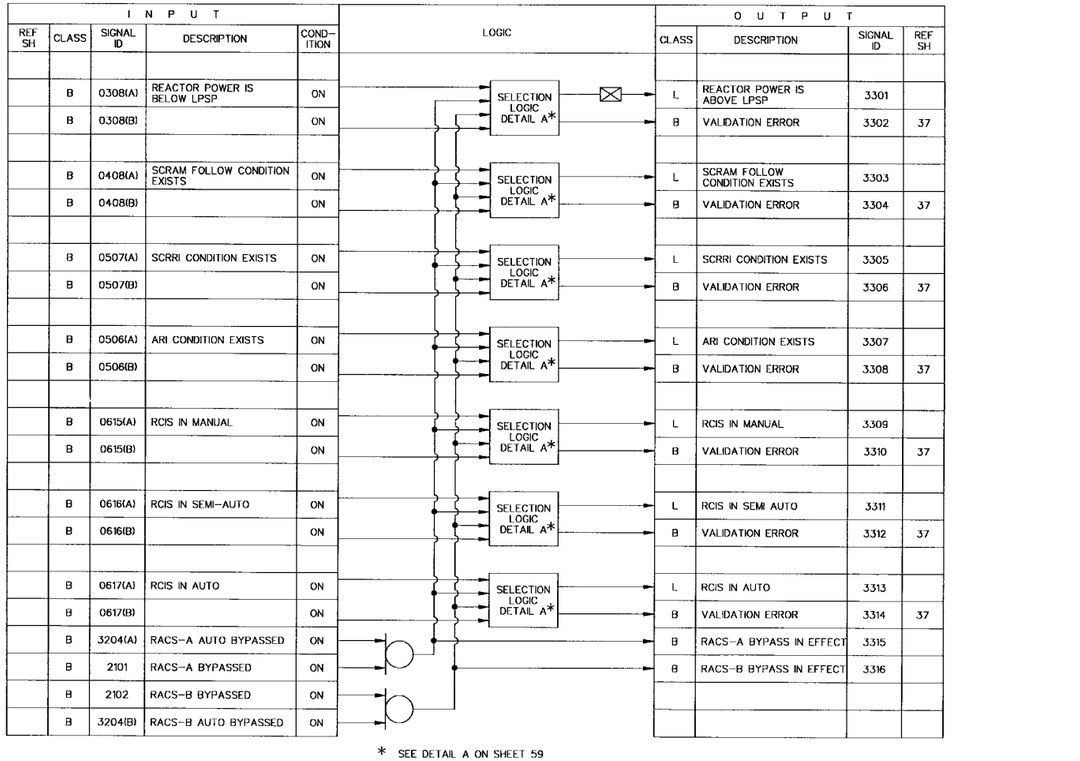


Figure 7.7-3 Rod Control and Information System IBD (Sheet 33 of 87)

INPUT					LOGIC	OUTPUT			
REF SH	CLASS	SIGNAL ID	DESCRIPTION	CONDITION		CLASS	DESCRIPTION	SIGNAL ID	REF SH
	B	0812(A)	CRDSTSS IN 1CRD/2CRD	ON	SELECTION LOGIC DETAIL A*	L	CRDSTSS IN 1CRD/2CRD	3401	
	B	0812(B)		ON		B	VALIDATION ERROR	3402	37
	B	0814(A)	CRDSTSS IN COUPLING TEST	ON	SELECTION LOGIC DETAIL A*	L	CRDSTSS IN COUPLING CHECK	3403	
	B	0814(B)		ON		B	VALIDATION ERROR	3404	37
	B	0818(A)	CRDSTSS IN 2-NOTCH TEST	ON	SELECTION LOGIC DETAIL A*	L	CRDSTSS IN STEP TEST	3407	
	B	0818(B)		ON		B	VALIDATION ERROR	3408	37
	B	0820(A)	CRDSTSS IN IDLE	ON	SELECTION LOGIC DETAIL A*	L	CRDSTSS IN IDLE	3409	
	B	0820(B)		ON		B	VALIDATION ERROR	3410	37
	B	0824(A)	CRDSTMS IN AUTO	ON	SELECTION LOGIC DETAIL A*	L	CRSTMS IN AUTO	3411	
	B	0824(B)		ON		B	VALIDATION ERROR	3412	37
	B	0826(A)	CRDSTMS IN IDLE	ON	SELECTION LOGIC DETAIL A*	L	CRSTMS IN IDLE	3413	
	B	0826(B)		ON		B	VALIDATION ERROR	3414	37
	B	3315	RACS-A BYPASS IN EFFECT	ON					
	B	3316	RACS-B BYPASS IN EFFECT	ON					

* SEE DETAIL A ON SHEET 59

DOI LOGIC

Figure 7.7-3 Rod Control and Information System IBD (Sheet 34 of 87)

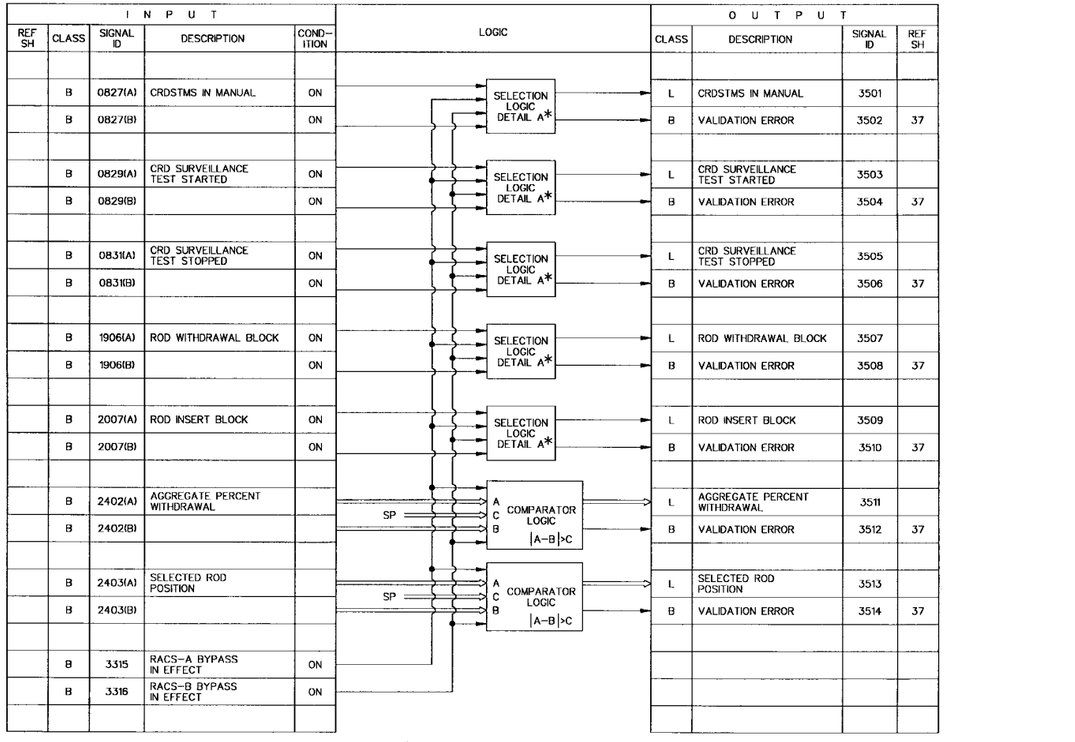


Figure 7.7-3 Rod Control and Information System IBD (Sheet 35 of 87)

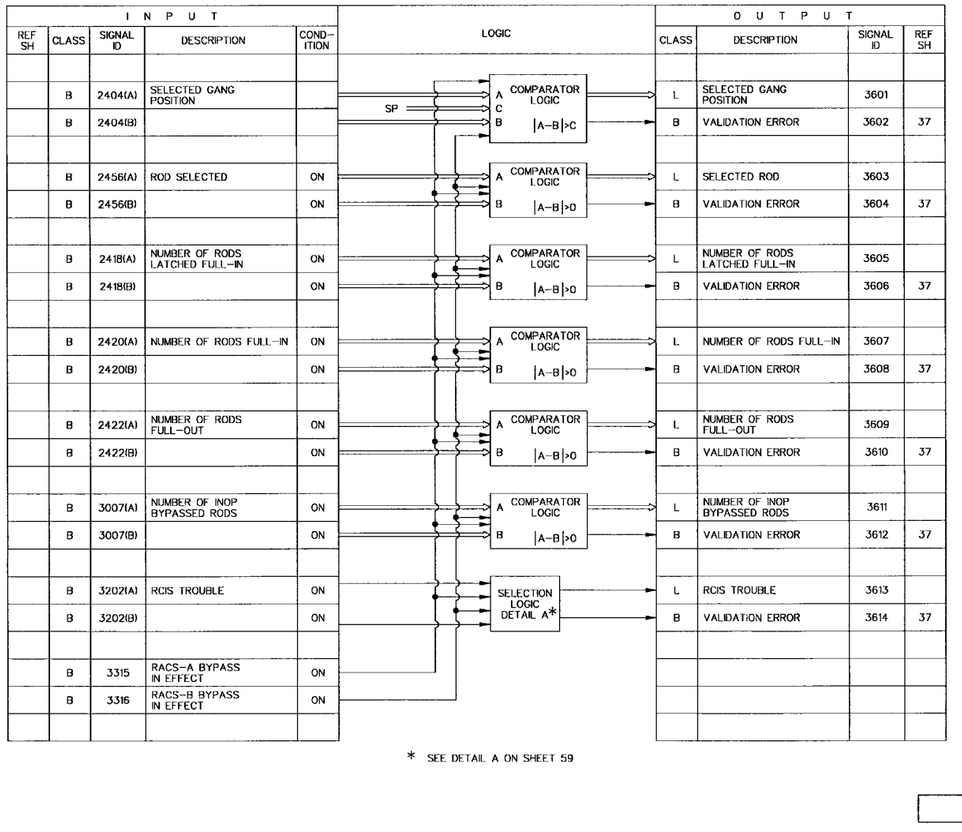
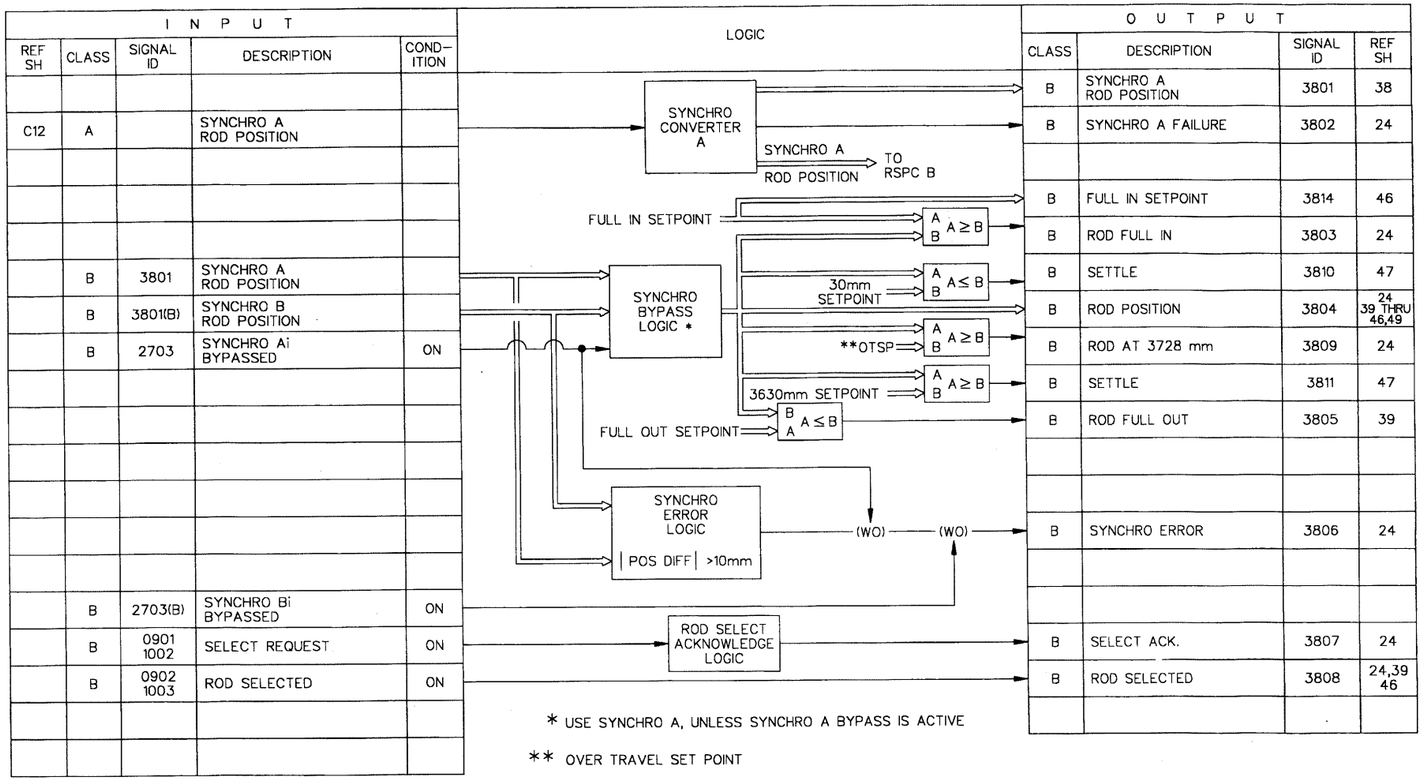


Figure 7.7-3 Rod Control and Information System IBD (Sheet 36 of 87)

INPUT					LOGIC	OUTPUT			
REF SH	CLASS	SIGNAL ID	DESCRIPTION	COND-ITION		CLASS	DESCRIPTION	SIGNAL ID	REF SH
	B	3302	VALIDATION ERROR	ON					
	B	3304	VALIDATION ERROR	ON					
	B	3306	VALIDATION ERROR	ON					
	B	3308	VALIDATION ERROR	ON					
	B	3310	VALIDATION ERROR	ON					
	B	3312	VALIDATION ERROR	ON					
	B	3314	VALIDATION ERROR	ON					
	B	3402	VALIDATION ERROR	ON					
	B	3404	VALIDATION ERROR	ON					
	B	3408	VALIDATION ERROR	ON					
	B	3410	VALIDATION ERROR	ON	DOI SELF TEST NOT FAILED	ANN	DOI SELF TEST FAILURE	3702	
	B	3412	VALIDATION ERROR	ON					
	B	3414	VALIDATION ERROR	ON	TPU t	B	2-CHANNEL DISAGREEMENT	3701	19,20
	B	3502	VALIDATION ERROR	ON		B		3703	PMCS CRT/C91
	B	3504	VALIDATION ERROR	ON		ANN		3704	
	B	3506	VALIDATION ERROR	ON					
	B	3508	VALIDATION ERROR	ON					
	B	3510	VALIDATION ERROR	ON					
	B	3512	VALIDATION ERROR	ON					
	B	3514	VALIDATION ERROR	ON					
	B	3602	VALIDATION ERROR	ON					
	B	3604	VALIDATION ERROR	ON					
	B	3606	VALIDATION ERROR	ON					
	B	3608	VALIDATION ERROR	ON					
	B	3610	VALIDATION ERROR	ON					
	B	3612	VALIDATION ERROR	ON					
	B	3614	VALIDATION ERROR	ON					

2-CHANNEL DISAGREEMENT LOGIC (PART OF DOI)

Figure 7.7-3 Rod Control and Information System IBD (Sheet 37 of 87)

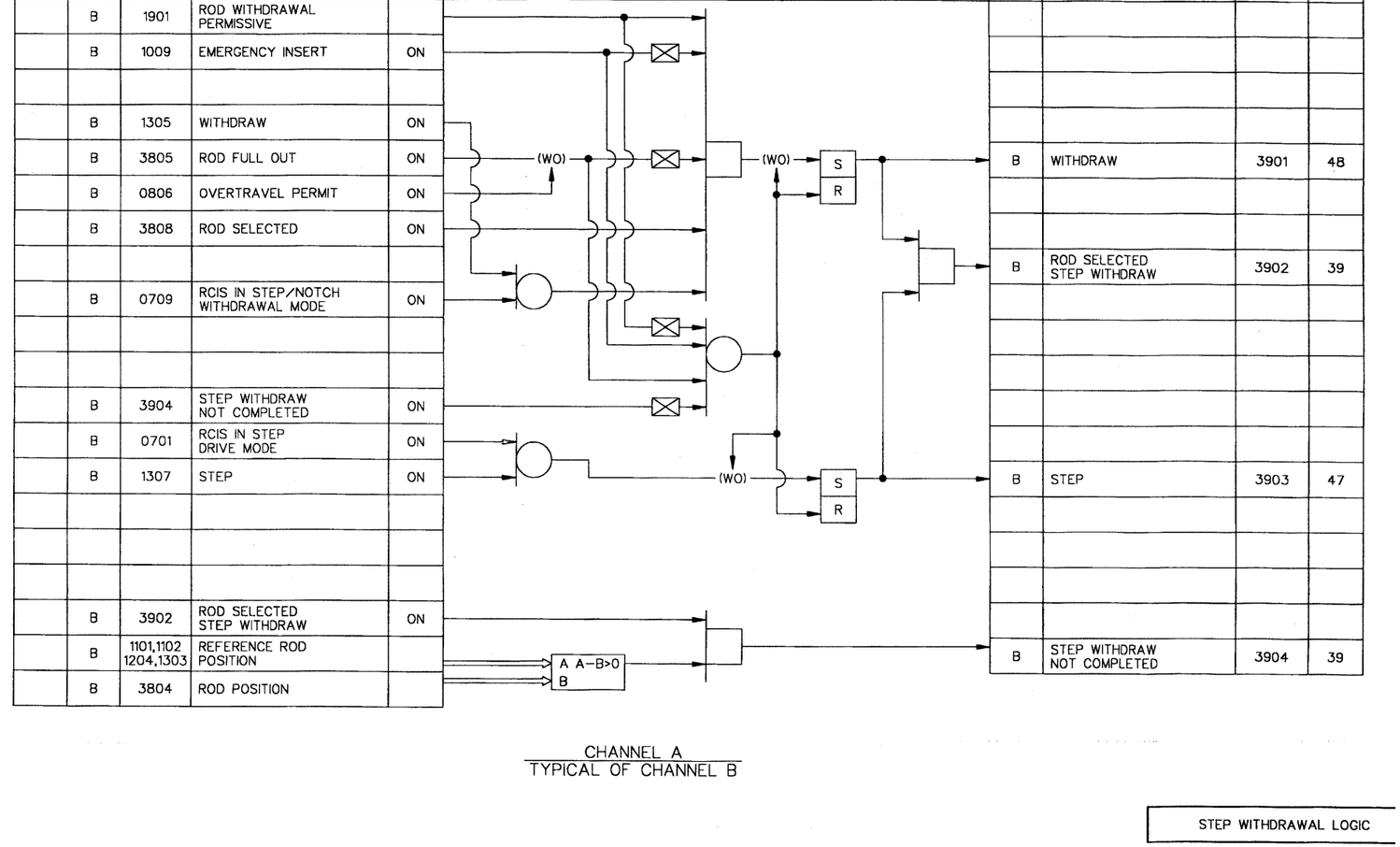


CHANNEL A
TYPICAL OF CHANNEL B

SYNCHRO SELECTION, ECHO, AND ROD POSITION LOGIC

Figure 7.7-3 Rod Control and Information System IBD (Sheet 38 of 87)

INPUT					LOGIC	OUTPUT			
REF SH	CLASS	SIGNAL ID	DESCRIPTION	COND-ITION		CLASS	DESCRIPTION	SIGNAL ID	REF SH
	B	1901	ROD WITHDRAWAL PERMISSIVE						
	B	1009	EMERGENCY INSERT	ON					
	B	1305	WITHDRAW	ON					
	B	3805	ROD FULL OUT	ON		B	WITHDRAW	3901	48
	B	0806	OVERTRAVEL PERMIT	ON					
	B	3808	ROD SELECTED	ON					
						B	ROD SELECTED STEP WITHDRAW	3902	39
	B	0709	RCIS IN STEP/NOTCH WITHDRAWAL MODE	ON					
	B	3904	STEP WITHDRAW NOT COMPLETED	ON					
	B	0701	RCIS IN STEP DRIVE MODE	ON					
	B	1307	STEP	ON		B	STEP	3903	47
	B	3902	ROD SELECTED STEP WITHDRAW	ON					
	B	1101,1102 1204,1303	REFERENCE ROD POSITION			B	STEP WITHDRAW NOT COMPLETED	3904	39
	B	3804	ROD POSITION						



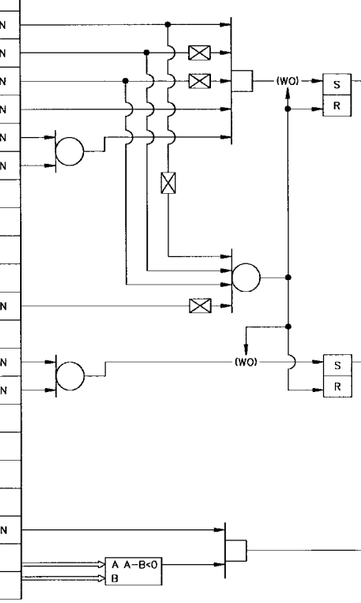
CHANNEL A
TYPICAL OF CHANNEL B

STEP WITHDRAWAL LOGIC

Figure 7.7-3 Rod Control and Information System IBD (Sheet 39 of 87)

INPUT				
REF SH	CLASS	SIGNAL ID	DESCRIPTION	CONDITION
	B	2001	ROD INSERT PERMISSIVE	ON
	B	1009	EMERGENCY INSERT	ON
	B	3803	ROD FULL IN	ON
	B	3808	ROD SELECTED	ON
	B	0706	RCIS IN STEP/NOTCH INSERT MODE	ON
	B	1304	INSERT	ON
	B	4004	STEP INSERT NOT COMPLETED	ON
	B	0701	RCIS IN STEP DRIVE MODE	ON
	B	1307	STEP	ON
	B	4002	ROD SELECTED STEP INSERT	ON
	B	1101,1102 1204,1303	REFERENCE ROD POSITION	
	B	3804	ROD POSITION	

LOGIC



OUTPUT			
CLASS	DESCRIPTION	SIGNAL ID	REF SH
B	INSERT	4001	48,50
B	ROD SELECTED STEP INSERT	4002	40
B	STEP	4003	47
B	STEP INSERT NOT COMPLETED	4004	40

CHANNEL A
TYPICAL OF CHANNEL B

STEP INSERT LOGIC

Figure 7.7-3 Rod Control and Information System IBD (Sheet 40 of 87)

INPUT					LOGIC	OUTPUT			
REF SH	CLASS	SIGNAL ID	DESCRIPTION	COND-ITION		CLASS	DESCRIPTION	SIGNAL ID	REF SH
	B	1901	ROD WITHDRAWAL PERMISSIVE	ON					
	B	1009	EMERGENCY INSERT	ON					
	B	3805	ROD FULL OUT	ON		B	WITHDRAW	4101	48
	B	0806	OVERTRAVEL PERMIT	ON					
	B	3808	ROD SELECTED	ON					
	B	0709	RCIS IN STEP/NOTCH WITHDRAWAL MODE	ON		B	ROD SELECTED NOTCH WITHDRAW	4102	41
	B	4106	NOTCH WITHDRAWAL NOT COMPLETED	ON					
	B	0702	RCIS IN NOTCH DRIVE MODE	ON		B	NOTCH	4103	47
	B	1101,1102, 1204,1303	REFERENCE ROD POSITION		A A–B B A=B				
	B	3804	ROD POSITION						
					A–B A–B ≥C C,SP=Ø mm (WO) S R	B	NOTCH WITHDRAWAL NOT COMPLETED	4106	41
	B	4102	ROD SELECTED NOTCH WITHDRAW	ON					
					A–B A–B ≤ D D,SP=25 mm (WO) S R	B	SETTLE	4107	47

CHANNEL A
TYPICAL OF CHANNEL B

NOTCH WITHDRAWAL LOGIC

Figure 7.7-3 Rod Control and Information System IBD (Sheet 41 of 87)

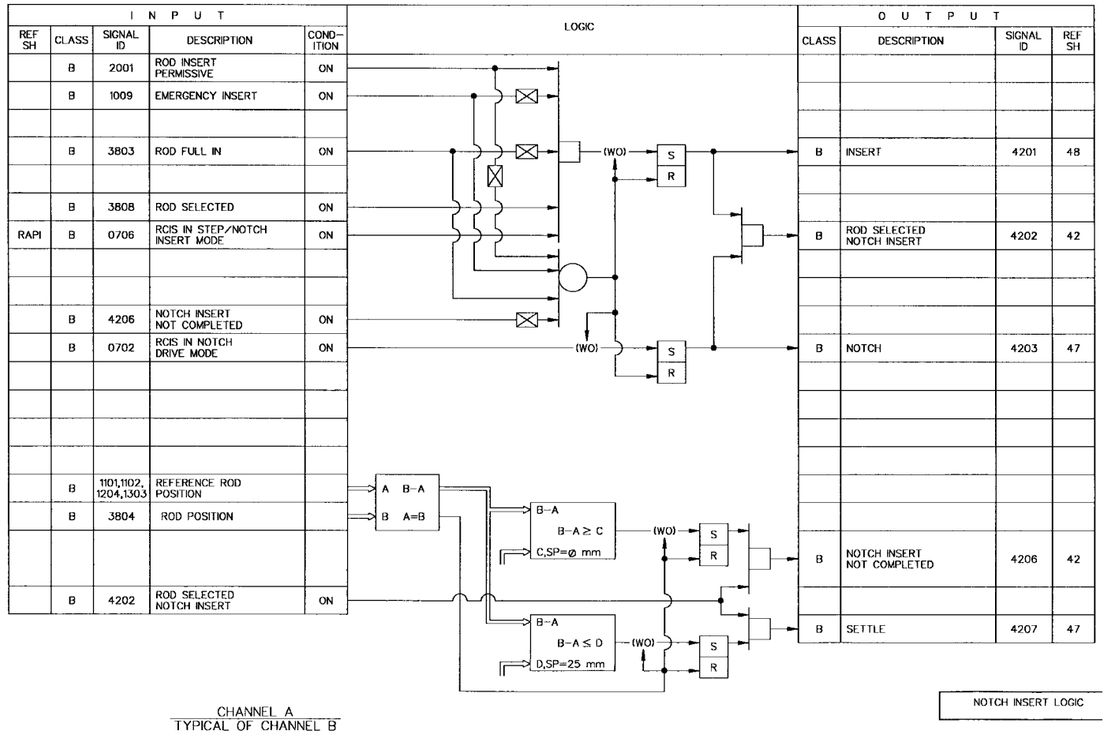


Figure 7.7-3 Rod Control and Information System IBD (Sheet 42 of 87)

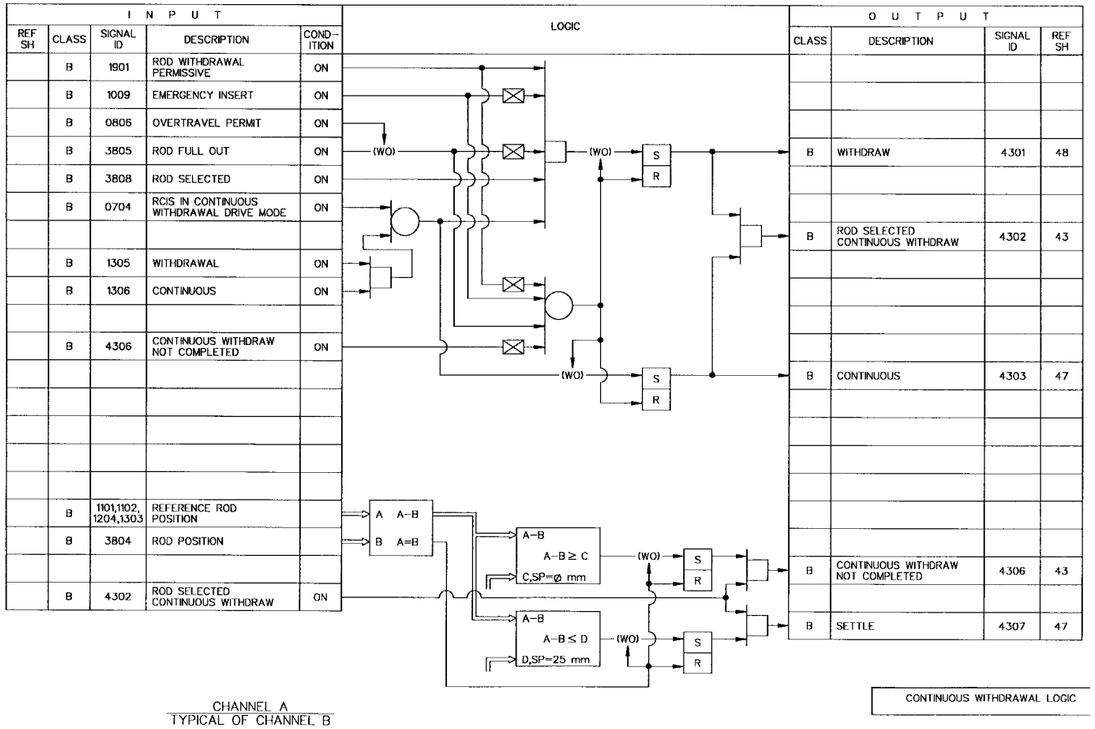


Figure 7.7-3 Rod Control and Information System IBD (Sheet 43 of 87)

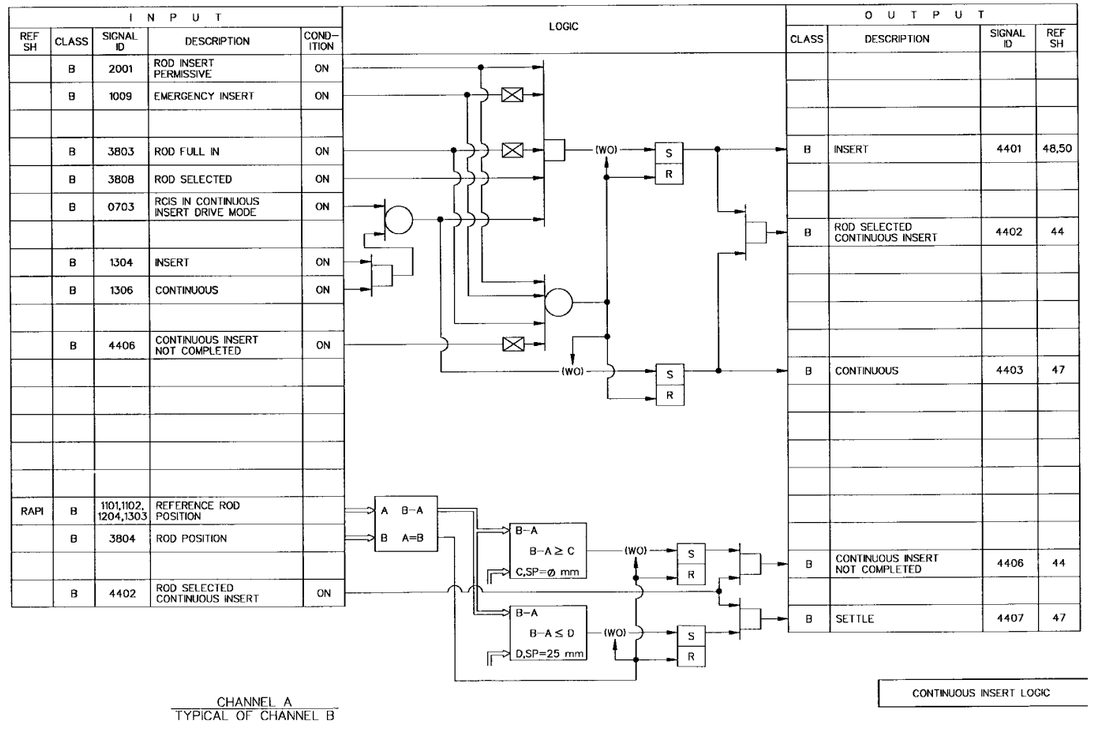


Figure 7.7-3 Rod Control and Information System IBD (Sheet 44 of 87)

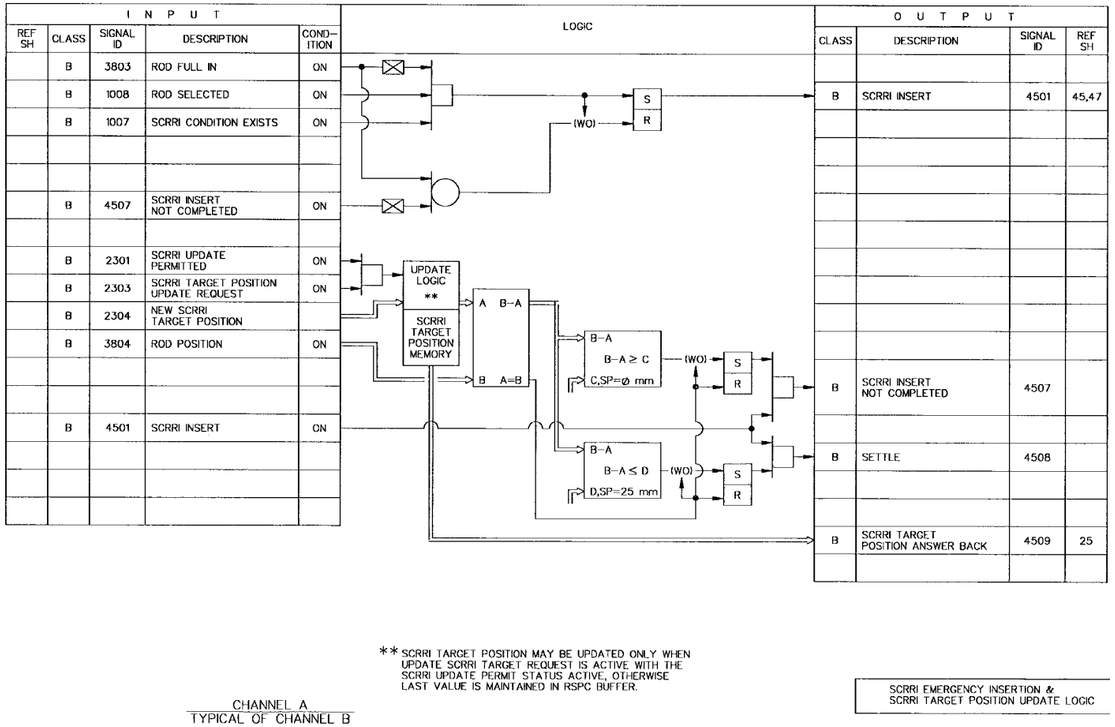


Figure 7.7-3 Rod Control and Information System IBD (Sheet 45 of 87)

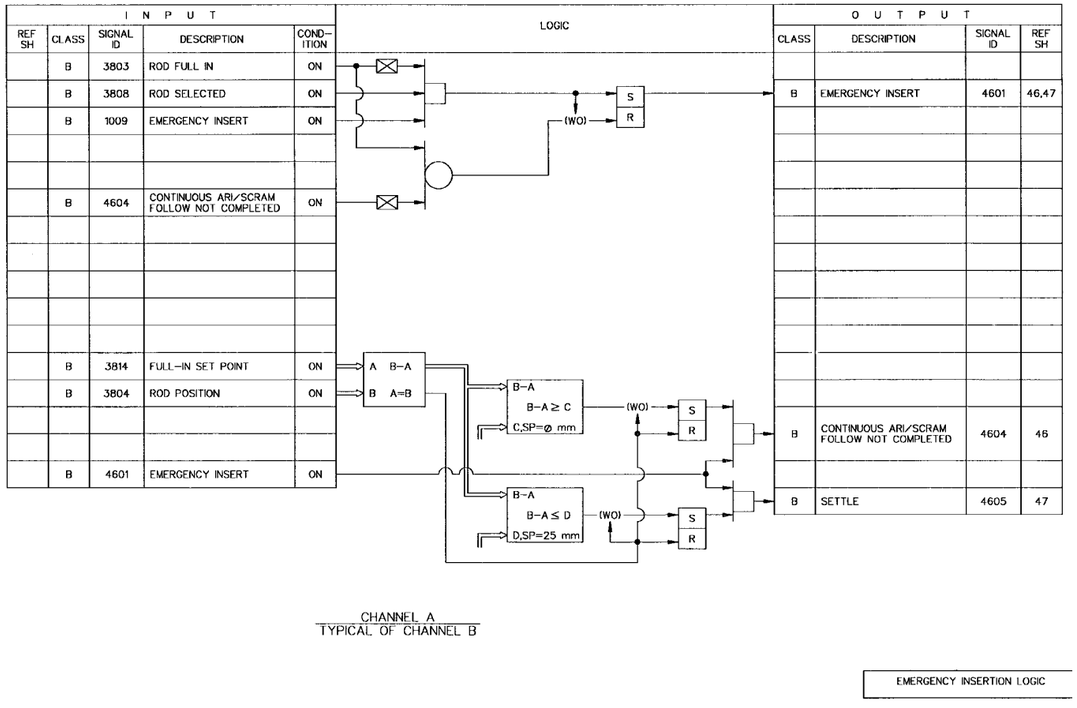


Figure 7.7-3 Rod Control and Information System IBD (Sheet 46 of 87)

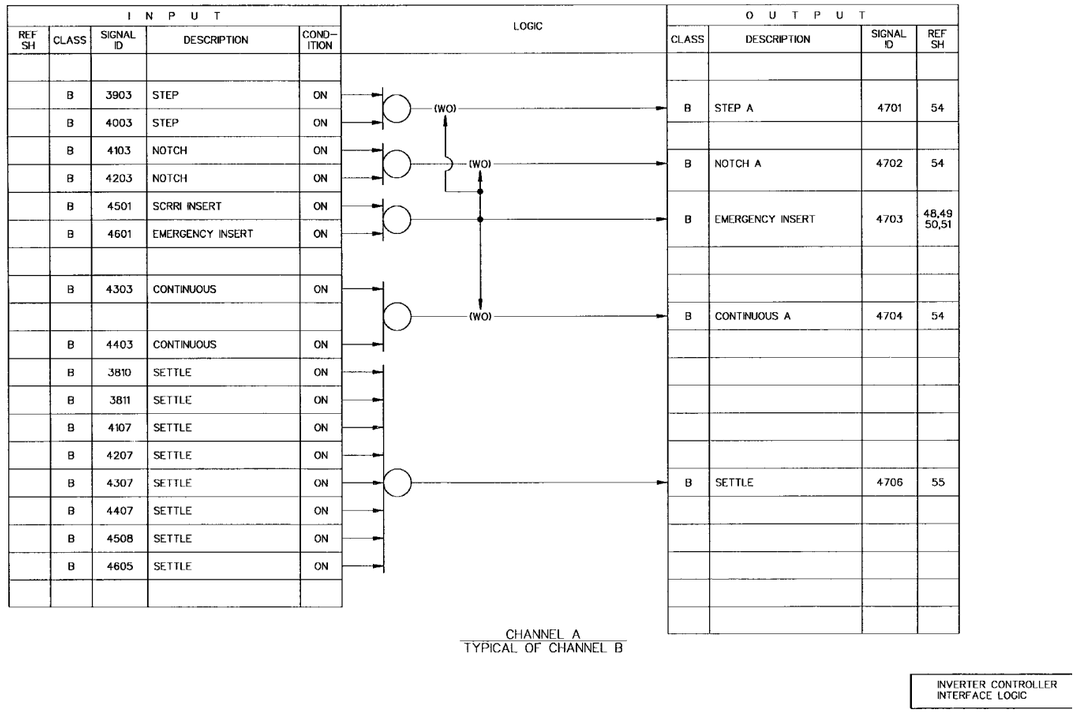


Figure 7.7-3 Rod Control and Information System IBD (Sheet 47 of 87)

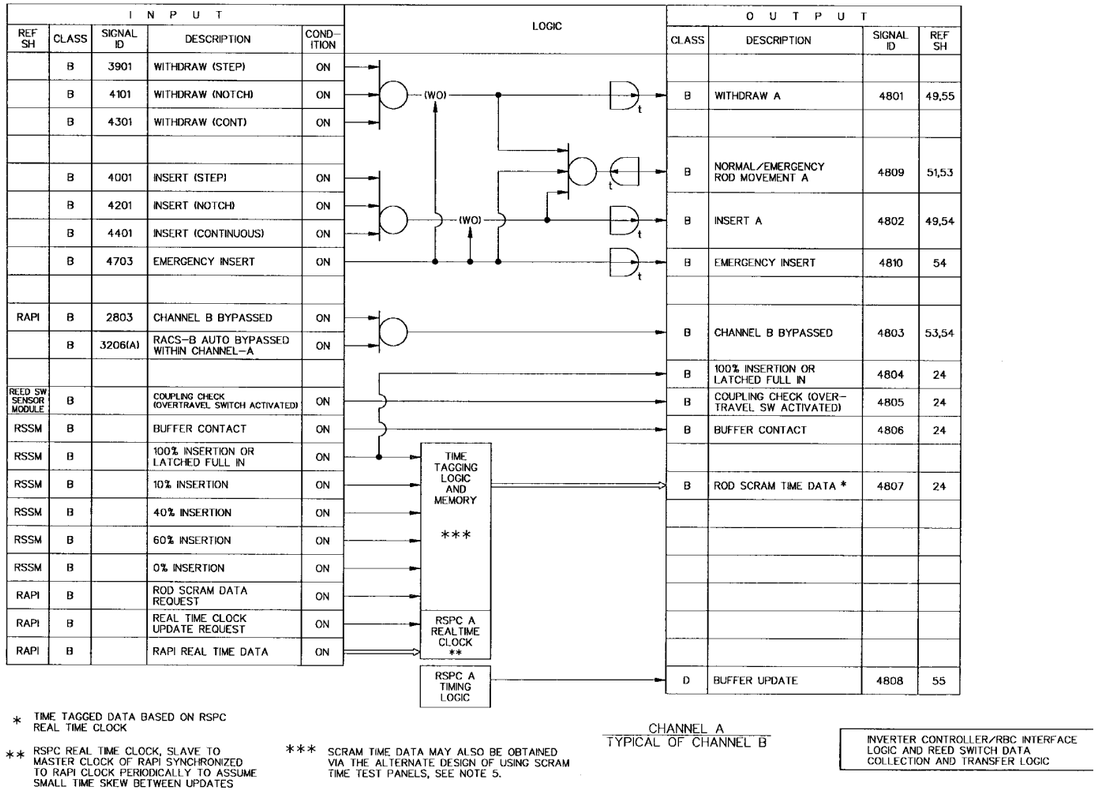


Figure 7.7-3 Rod Control and Information System IBD (Sheet 48 of 87)

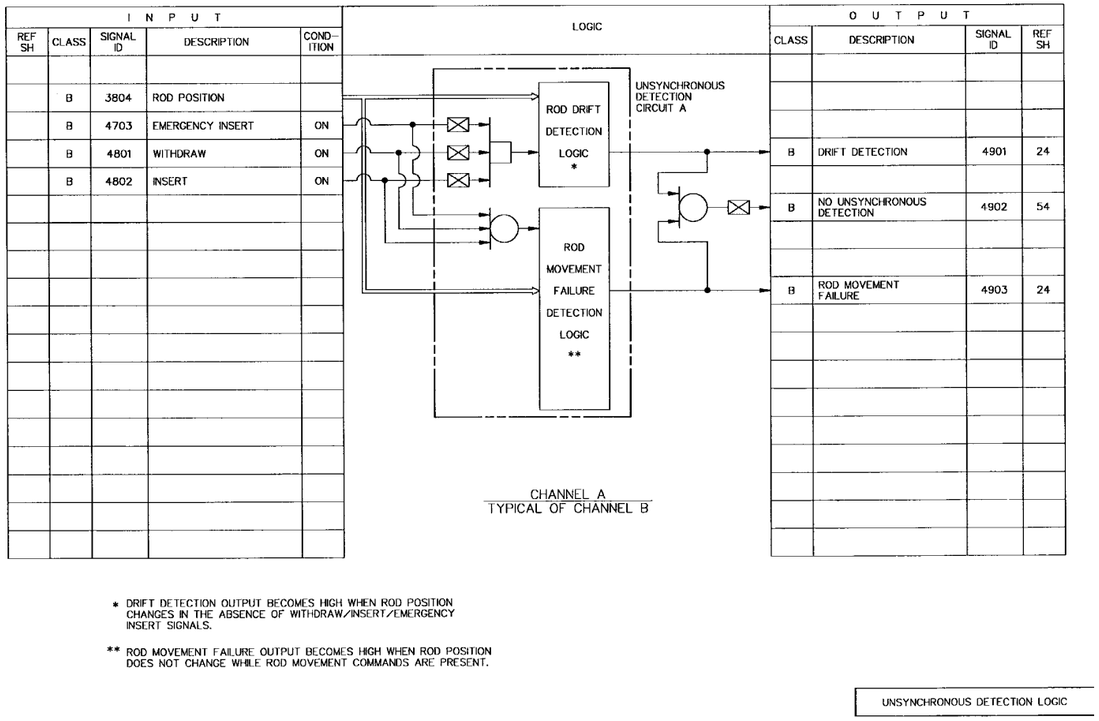
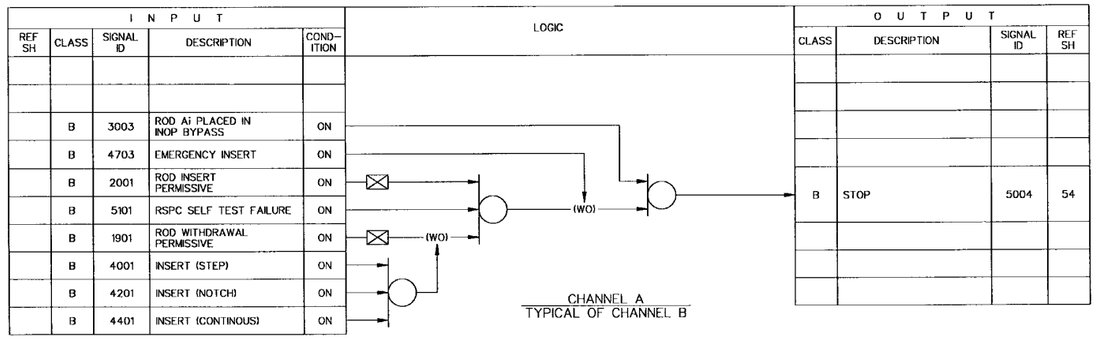


Figure 7.7-3 Rod Control and Information System IBD (Sheet 49 of 87)



NOTE: THE FEASIBILITY OF THIS METHOD FOR BRAKE TESTING HAS NOT BEEN EMPRICALLY CONFIRMED. IF THIS METHOD IS LATER DETERMINED NOT TO BE FEASIBLE, THIS IBD WILL BE MODIFIED ACCORDINGLY.

BRAKE TEST AND STOP LOGIC

Figure 7.7-3 Rod Control and Information System IBD (Sheet 50 of 87)

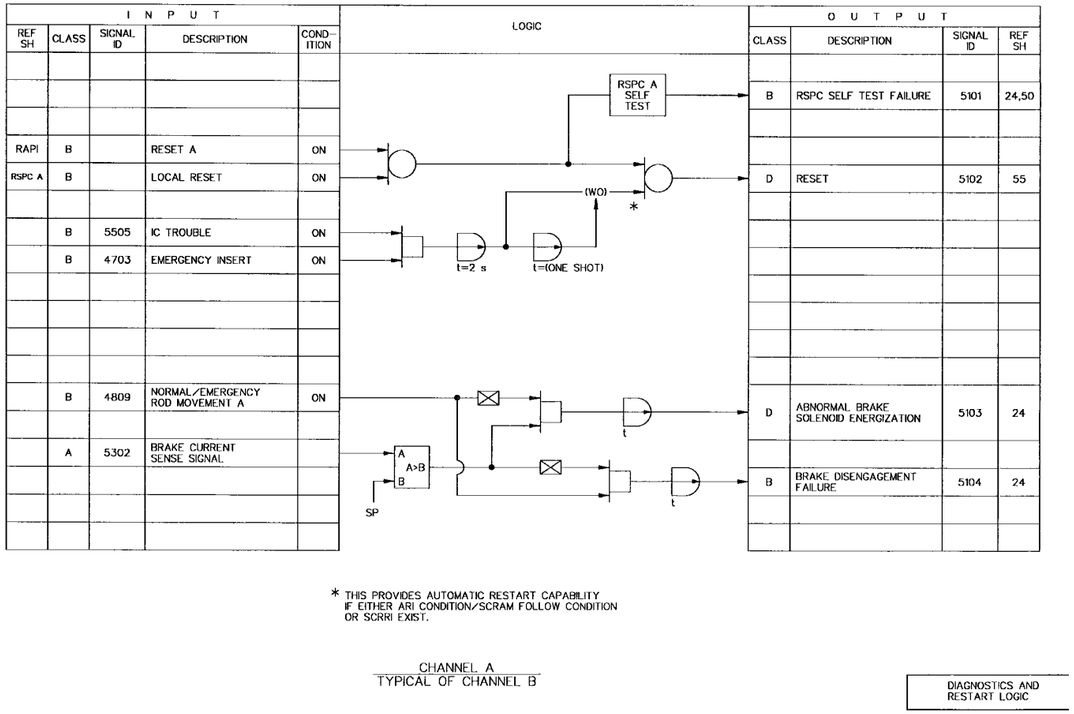


Figure 7.7-3 Rod Control and Information System IBD (Sheet 51 of 87)

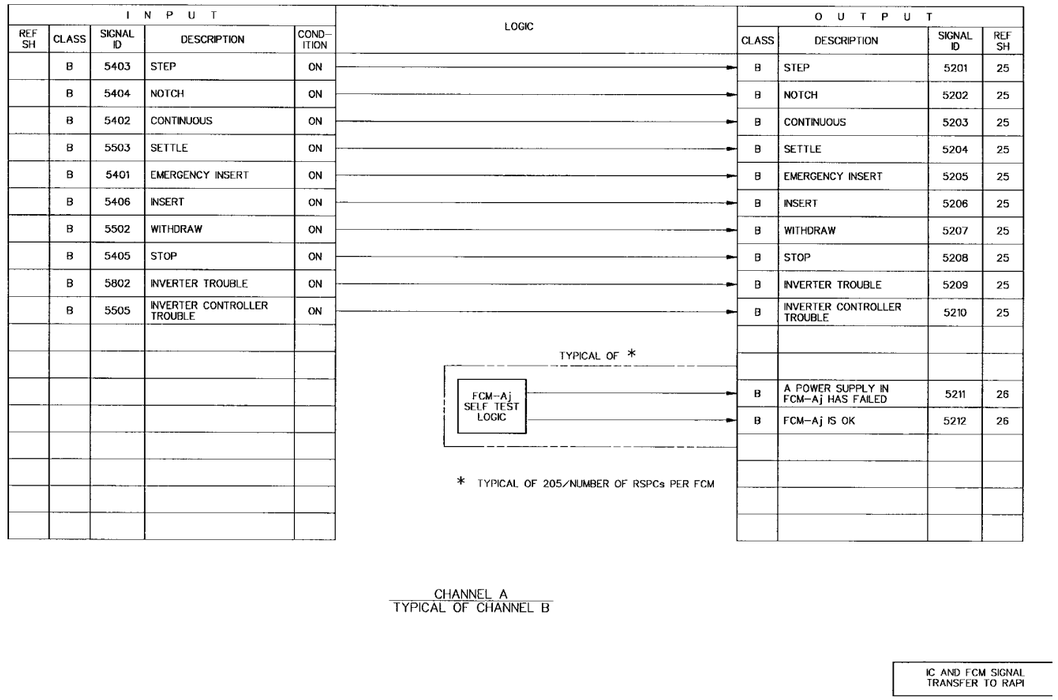
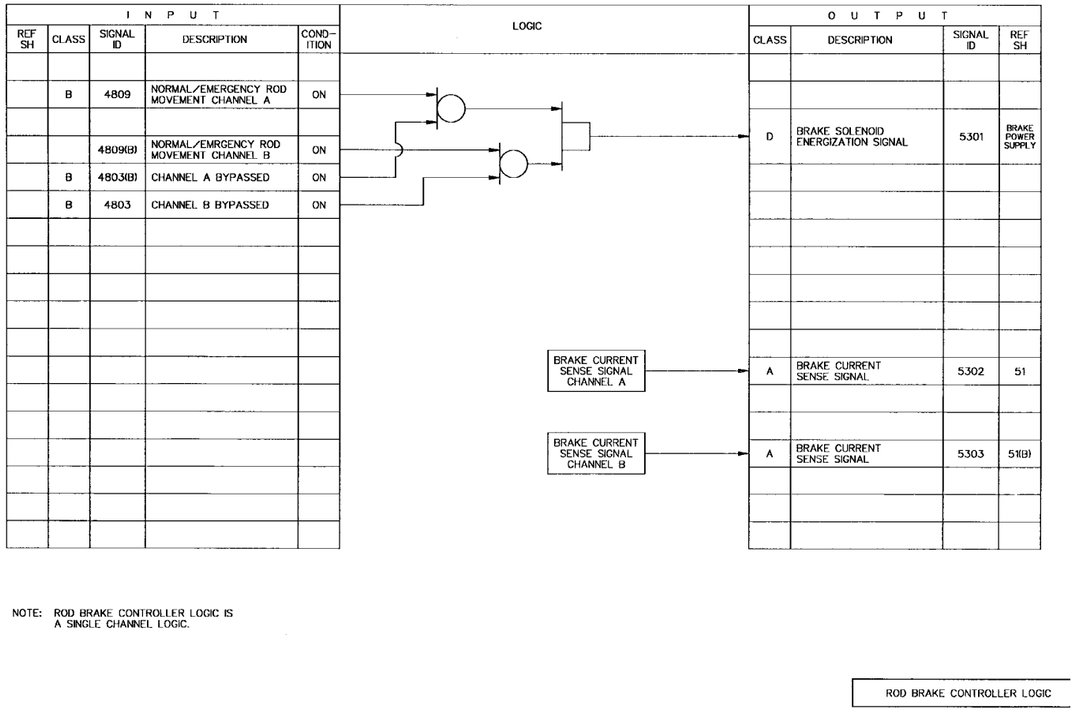


Figure 7.7-3 Rod Control and Information System IBD (Sheet 52 of 87)



NOTE: ROD BRAKE CONTROLLER LOGIC IS A SINGLE CHANNEL LOGIC.

Figure 7.7-3 Rod Control and Information System IBD (Sheet 53 of 87)

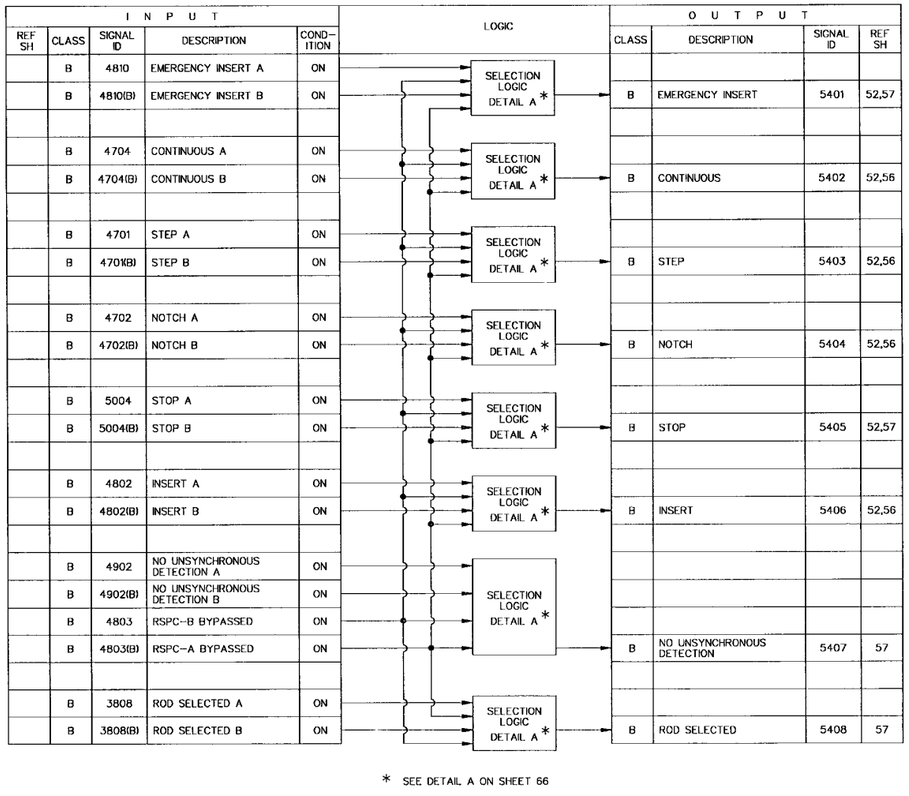


Figure 7.7-3 Rod Control and Information System IBD (Sheet 54 of 87)

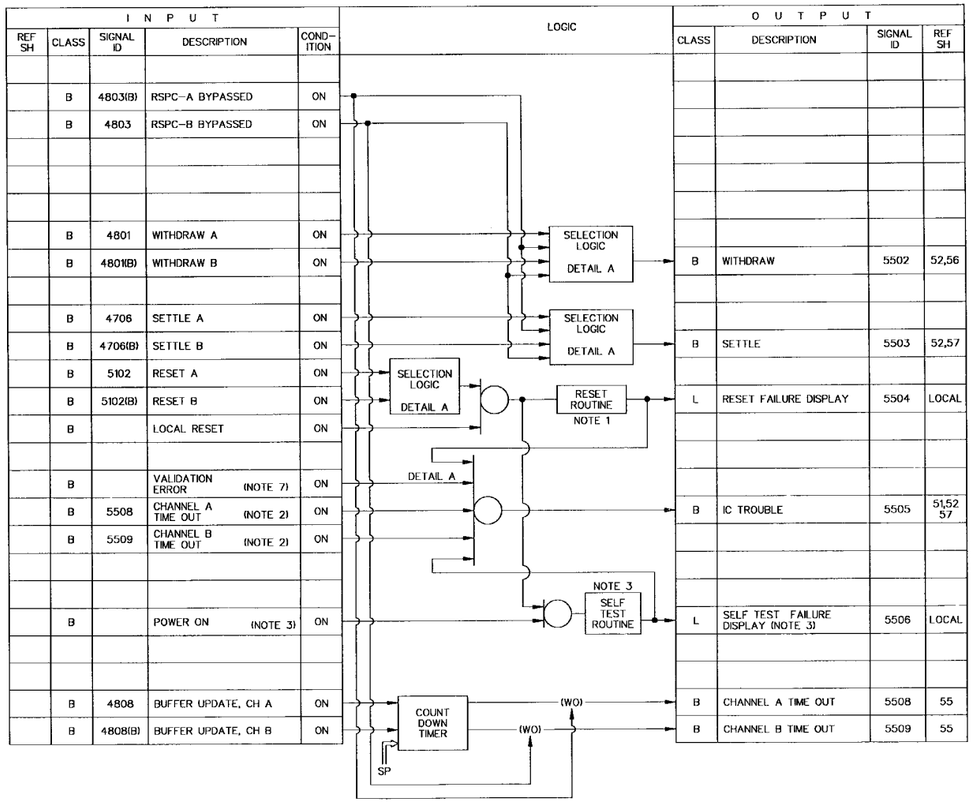


Figure 7.7-3 Rod Control and Information System IBD (Sheet 55 of 87)

INPUT					LOGIC	OUTPUT			
REF SH	CLASS	SIGNAL ID	DESCRIPTION	COND-ITION		CLASS	DESCRIPTION	SIGNAL ID	REF SH
	B	5502	WITHDRAW	ON					
						B	CONTINUOUS WITHDRAW	5601	57
	B	5402	CONTINUOUS	ON					
						B	CONTINUOUS INSERT	5602	57
						B	STEP WITHDRAW	5603	57
	B	5403	STEP	ON					
						B	STEP INSERT	5604	57
						B	NOTCH WITHDRAW	5605	57
	B	5404	NOTCH	ON					
						B	NOTCH INSERT	5606	57
	B	5406	INSERT	ON					

Figure 7.7-3 Rod Control and Information System IBD (Sheet 56 of 87)

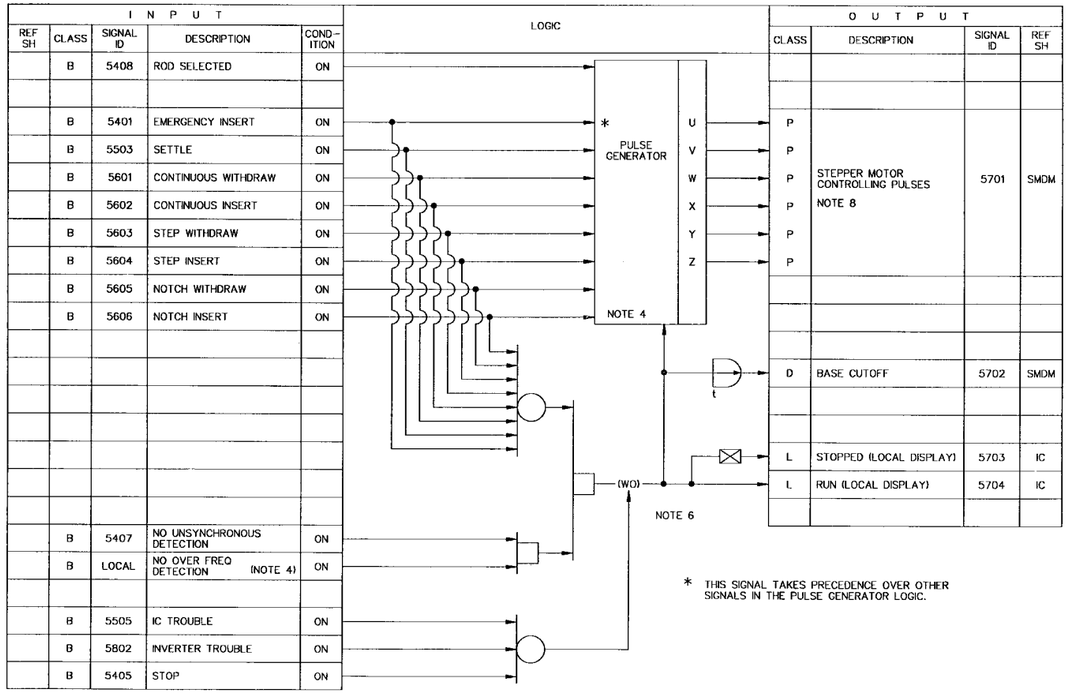


Figure 7.7-3 Rod Control and Information System IBD (Sheet 57 of 87)

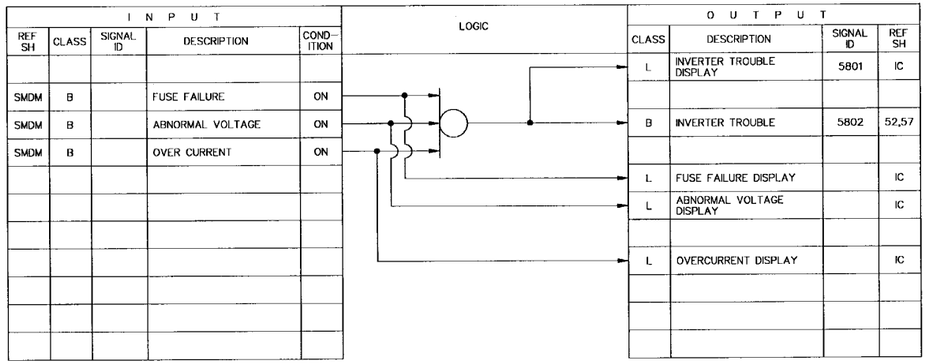
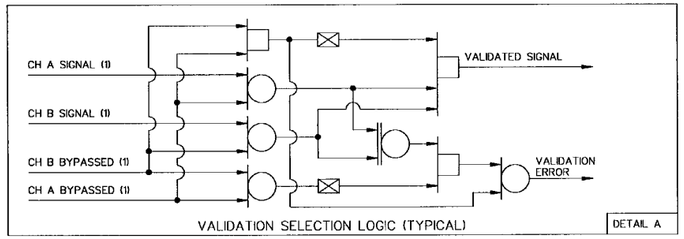


Figure 7.7-3 Rod Control and Information System IBD (Sheet 58 of 87)



NOTES:

1. RESET FAILURE SIGNAL IS ISSUED BY IC WHEN THE RESET ROUTINES TO BE COMPLETED BY THE MICROPROCESSOR ARE NOT SUCCESFULLY ACCOMPLISHED. GENERATION OF THIS SIGNAL SHALL BE AN INTEGRAL PART OF THE RESET ROUTINES OF THE HARDWARE. THE IC SHALL CONDUCT AUTOMATICALLY A RESET ROUTINE WHEN RECOVERING FROM A PRIOR FAILURE/TROUBLE CONDITION.

2. THE IC HARDWARE SHALL UTILIZE A WATCHDOG TIMER TO MONITOR THE UPDATES OF EACH SIGNAL FROM RSPC. THE TIMER SHALL COUNTDOWN FROM A PREDETERMINED AMOUNT OF TIME TO 0 AND RESET TO (TIME TO BE DETERMINED IN DETAILED DESIGN PHASE) ms AUTOMATICALLY ON EVERY UPDATE OF SIGNAL. WHEN TIMER COUNTS DOWN TO ZERO ON ANY INPUT SIGNAL FROM THE RSPC, IT SHALL PROVIDE A TIME OUT SIGNAL.

3. SELF TEST FEATURES SHALL INCLUDE THE ROUTINES OF CHECKING THE PROCESSOR RAM, ROM AND BUFFERS. WHEN THE SELF TEST IS NOT COMPLETED SUCCESFULLY, THE IC HARDWARE SHALL ISSUE A SELF TEST FAILURE SIGNAL. SELF TEST SHALL BE EXECUTED WHEN THE IC POWER IS TURNED ON. THE IC RECEIVES A RESET COMMAND FROM RSM, OR THE IC RECOVERS FROM A PRIOR FAILURE/TROUBLE, AND ON A CONTINUOUS BASIS FROM THEN ON.

4. PULSE GENERATOR COMPRISES OF FREQUENCY LIMITER, PULSE DISTRIBUTOR AND OTHER NECESSARY HARDWARE. IT GENERATES APPROPRIATE PULSES CORRESPONDING TO THE INPUT DRIVE COMMAND TO PRODUCE THE REQUIRED SPEED PATTERN OF THE STEPPING MOTOR (SM) TO MOVE THE ROD TO THE REQUIRED POSITION APPROPRIATELY. THE OUTPUT OF THE PULSE GENERATOR IS ENABLED BY ALLOWABLE CONDITIONS, AS SHOWN, TO DRIVE THE STEPPING MOTOR.

5. ALGORITHM FOR IDENTIFIED FUNCTIONS AND LOGICS ARE DESCRIBED IN C11--4020 AND SCRAM TIME DATA IN C11--4010.

6. DEDICATED DISPLAY INDICATION SHALL BE PROVIDED FOR RUN, STOPPED, IC TROUBLE, INVERTER TROUBLE AND RESET CONDITIONS. IN THE EVENT OF EITHER A IC TROUBLE OR INVERTER TROUBLE CONDITION, THE FAILURE CAUSING SUCH CONDITION SHALL BE DISPLAYED.

7. VALIDATION ERROR SIGNAL IS GENERATED WHEN CHANNEL A & B ARE NOT BYPASSED AND CHANNELS A & B SIGNALS DO NOT MATCH. TYPICAL OF THESE SIGNALS ARE "ORED" TO PRODUCE ONE VALIDATION ERROR SIGNAL TO INDICATE IC TROUBLE.

8. THE CHARACTERISTICS OF THE UVWXYZ PULSES ARE DETERMINED BY THE IC (PULSES GENERATOR) ARCHITECTURE, THE INVERTER DESIGN AND THE PERFORMANCE CHARACTERISTICS CURVES OF THE SM, TO ACCURATELY MOVE THE CONTROL ROD BY SPECIFIED DISTANCE AS DEFINED BY THE RC&IS DESIGN.

Figure 7.7-3 Rod Control and Information System IBD (Sheet 59 of 87)

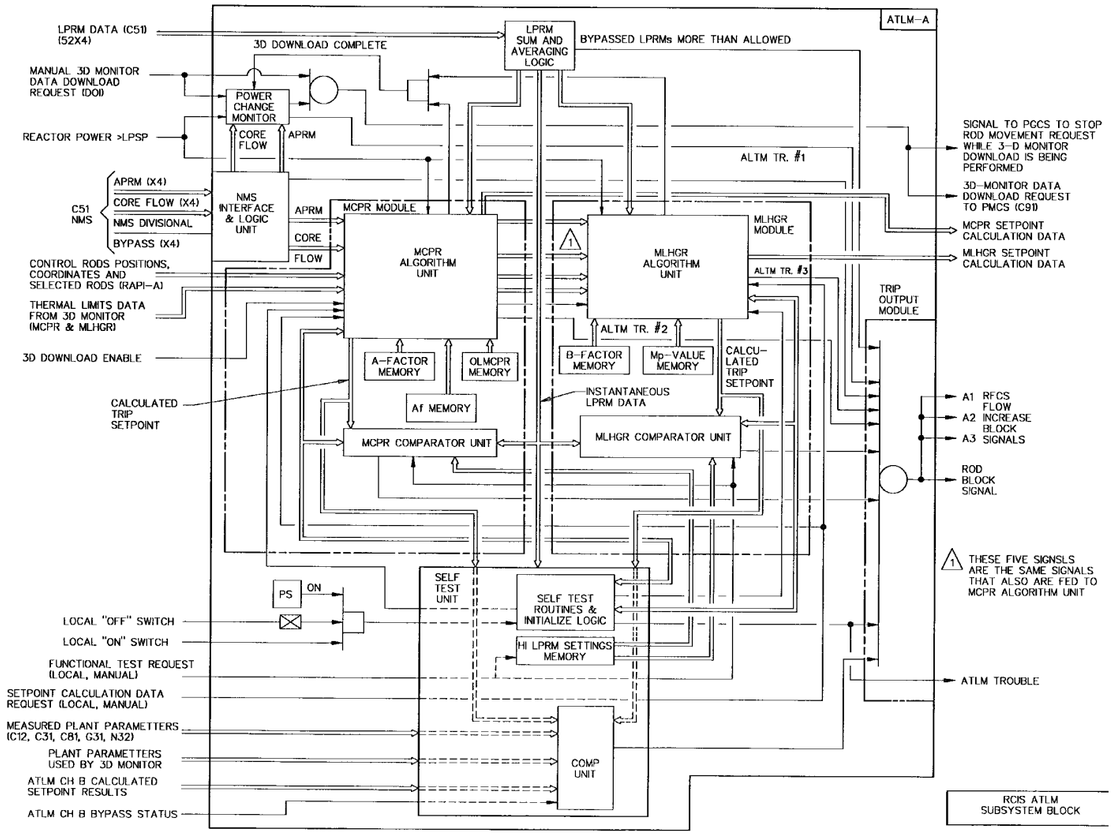


Figure 7.7-3 Rod Control and Information System IBD (Sheet 60 of 87)

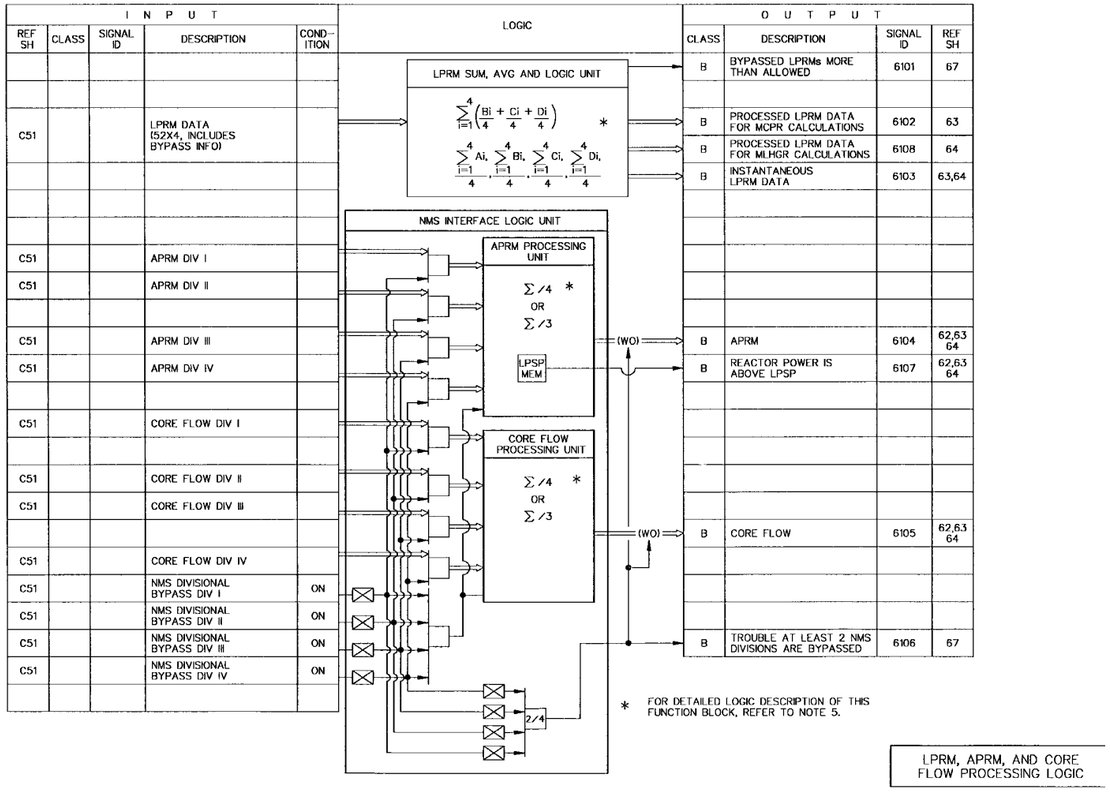


Figure 7.7-3 Rod Control and Information System IBD (Sheet 61 of 87)

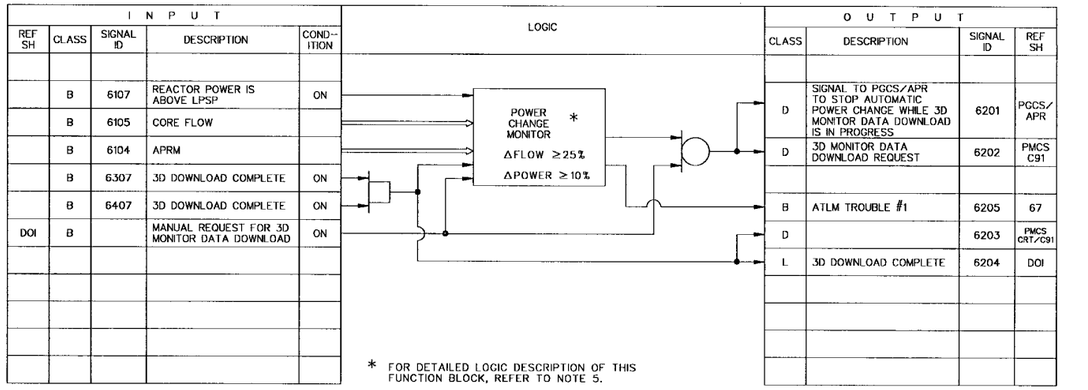


Figure 7.7-3 Rod Control and Information System IBD (Sheet 62 of 87)

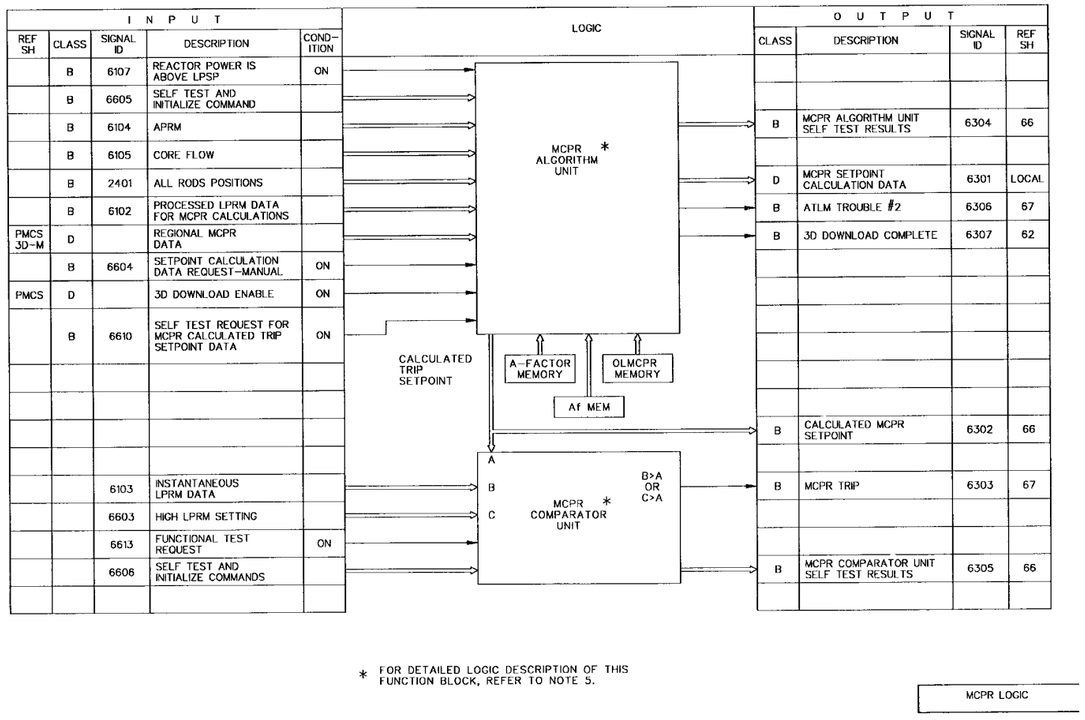
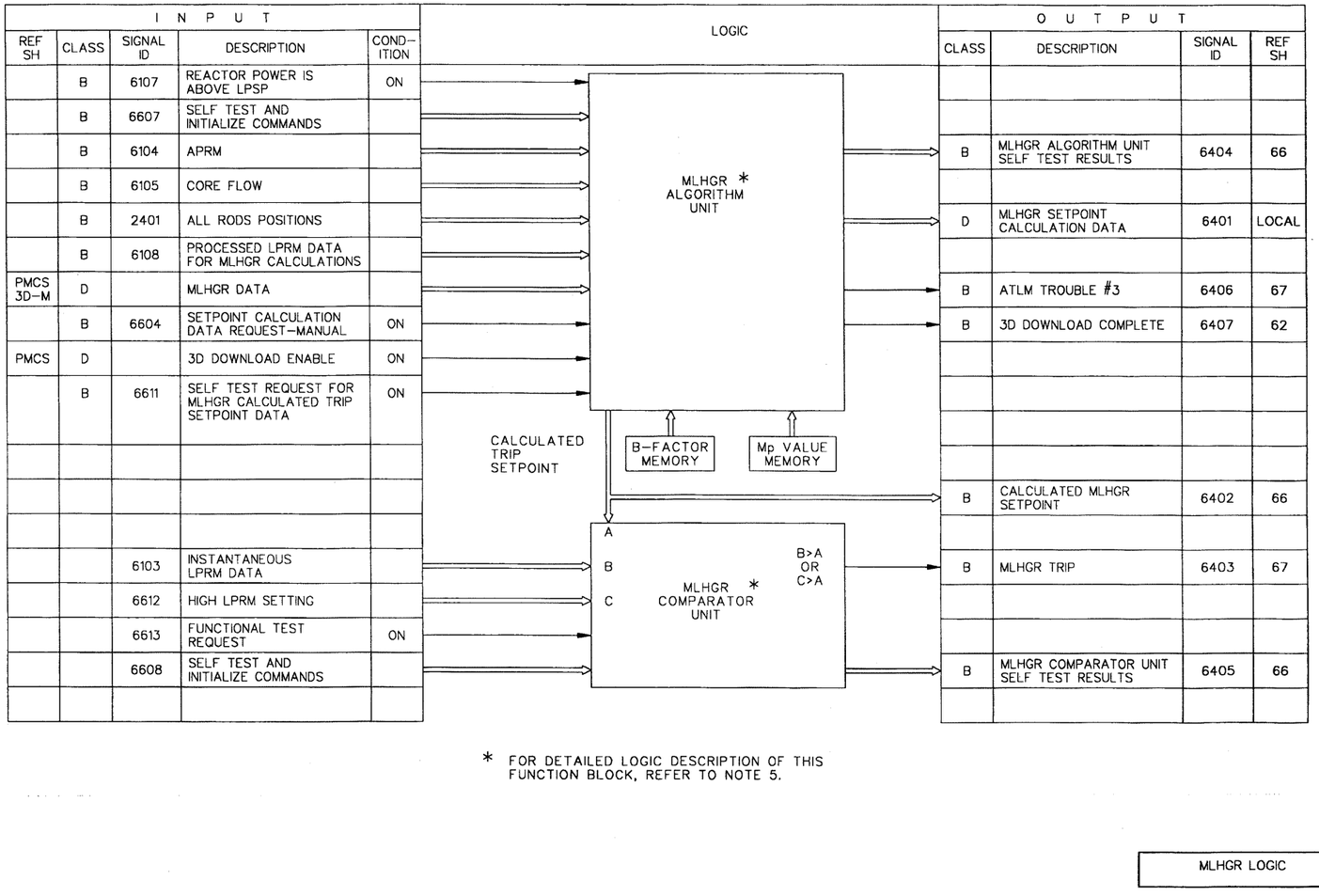


Figure 7.7-3 Rod Control and Information System IBD (Sheet 63 of 87)



* FOR DETAILED LOGIC DESCRIPTION OF THIS FUNCTION BLOCK, REFER TO NOTE 5.

MLHGR LOGIC

Figure 7.7-3 Rod Control and Information System IBD (Sheet 64 of 87)

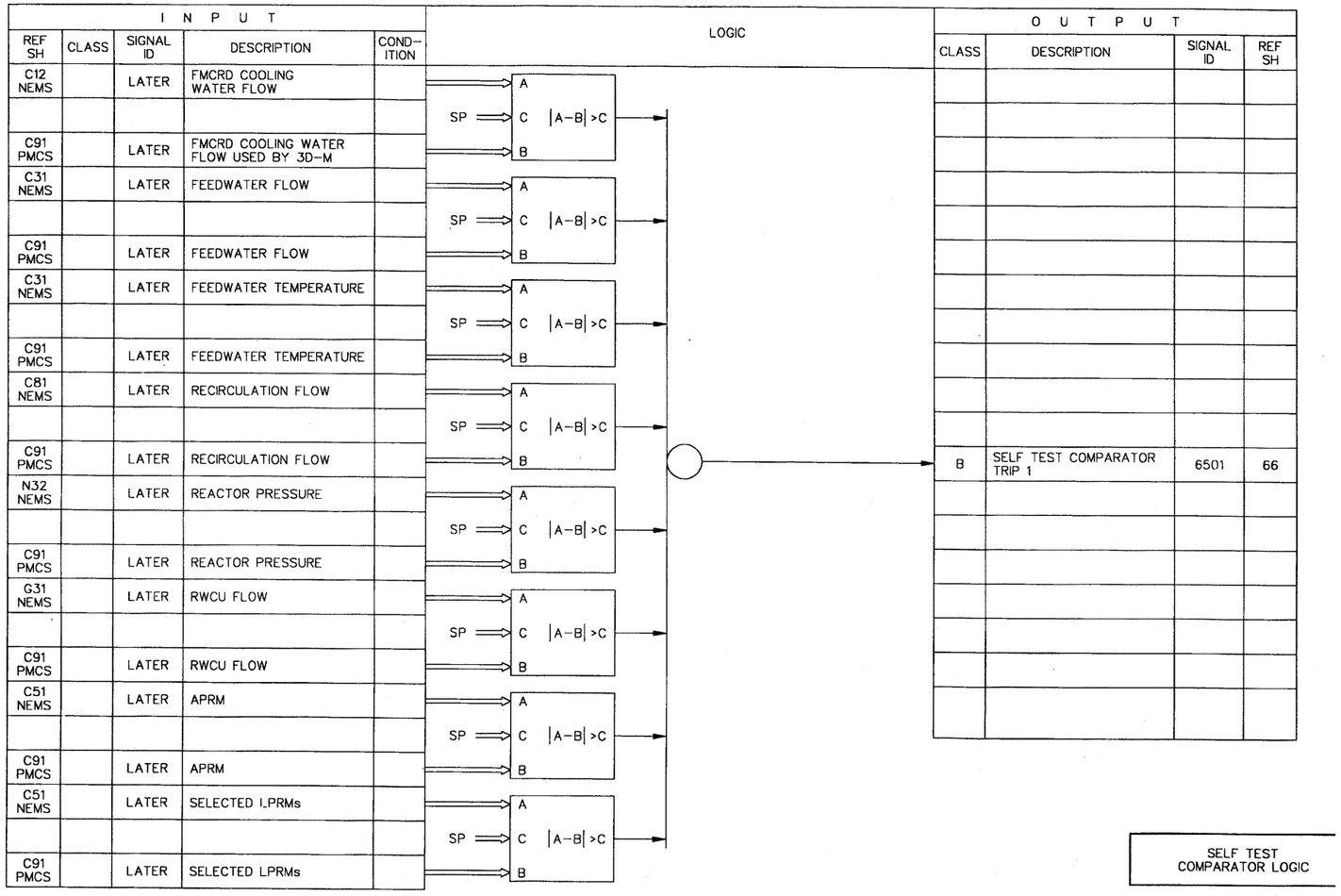


Figure 7.7-3 Rod Control and Information System IBD (Sheet 65 of 87)

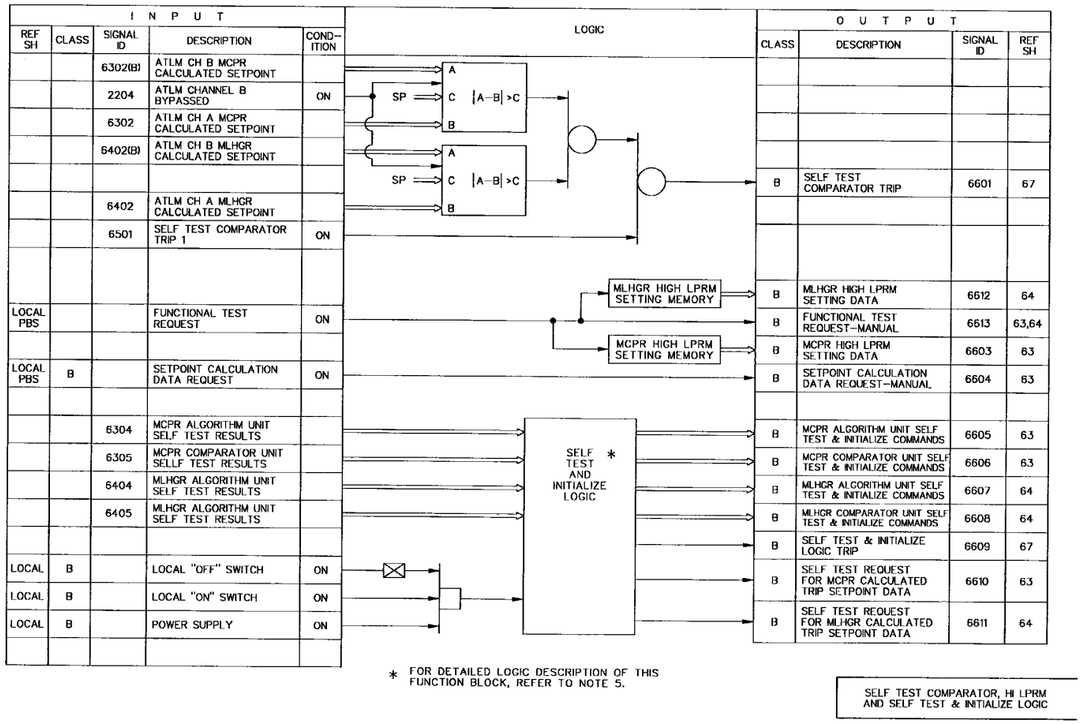


Figure 7.7-3 Rod Control and Information System IBD (Sheet 66 of 87)

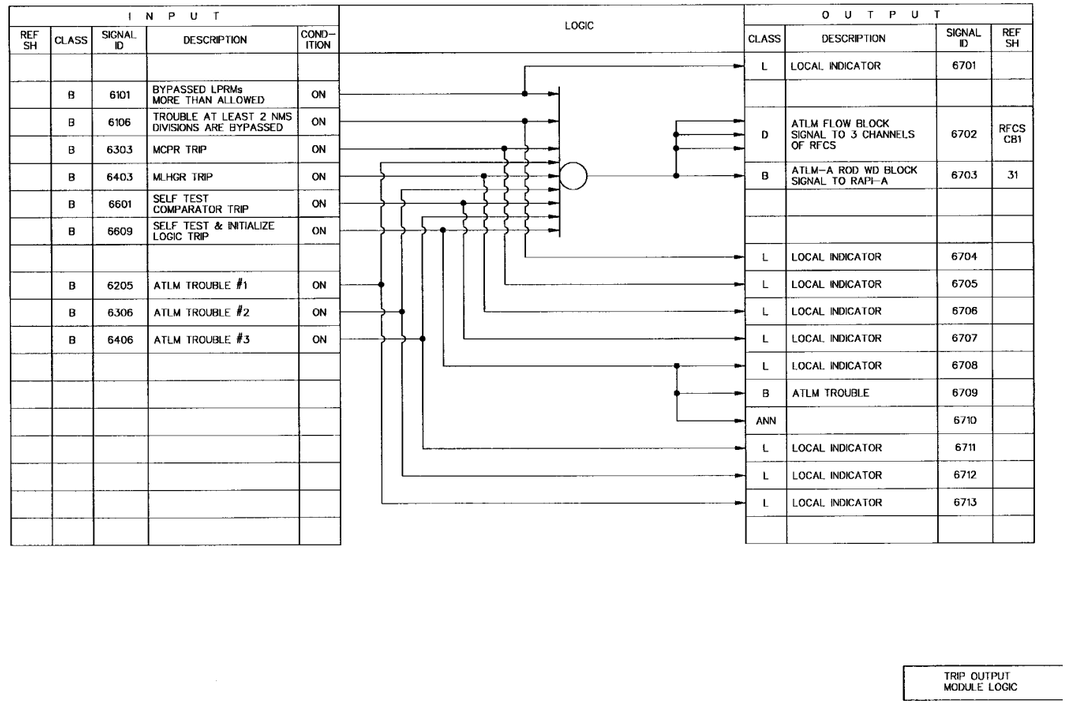
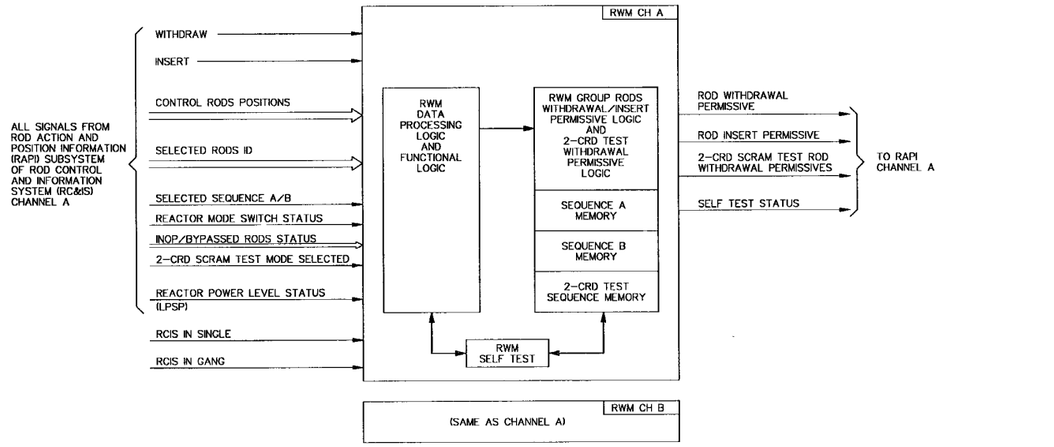


Figure 7.7-3 Rod Control and Information System IBD (Sheet 67 of 87)



RWM FUNCTIONAL BLOCK DIAGRAM

Figure 7.7-3 Rod Control and Information System IBD (Sheet 68 of 87)

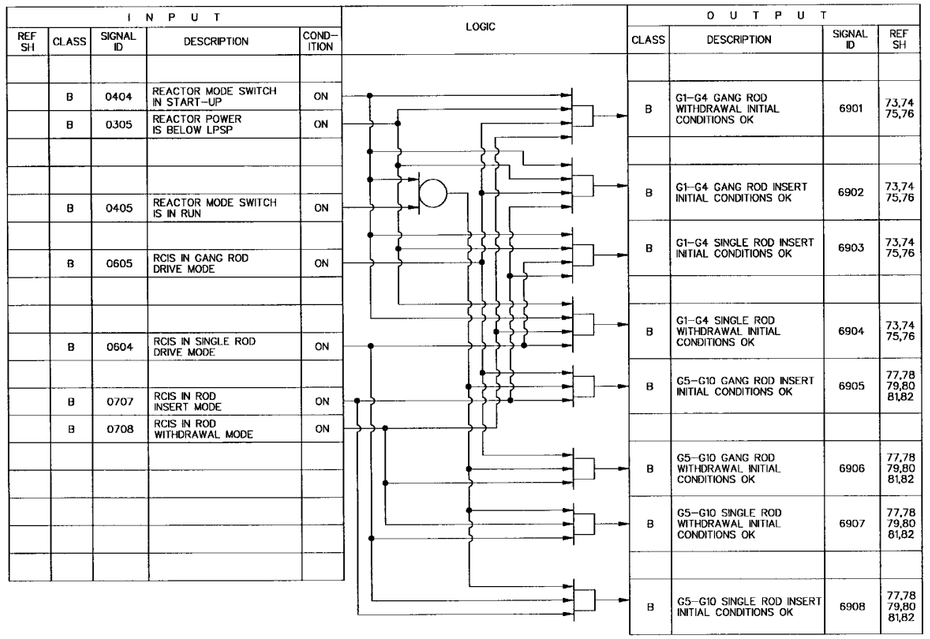


Figure 7.7-3 Rod Control and Information System IBD (Sheet 69 of 87)

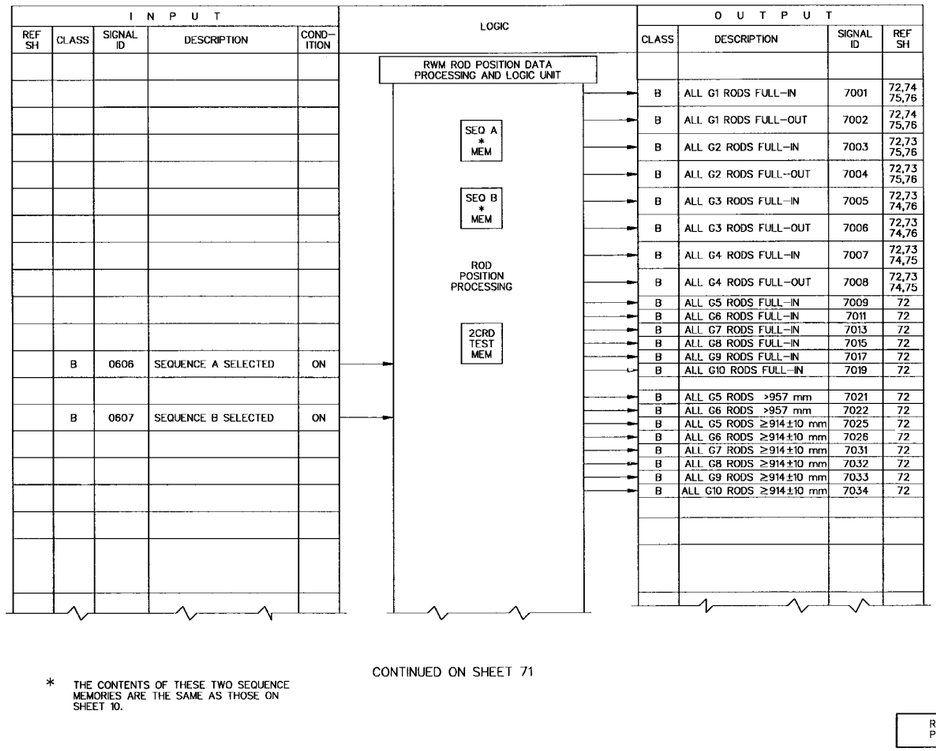


Figure 7.7-3 Rod Control and Information System IBD (Sheet 70 of 87)

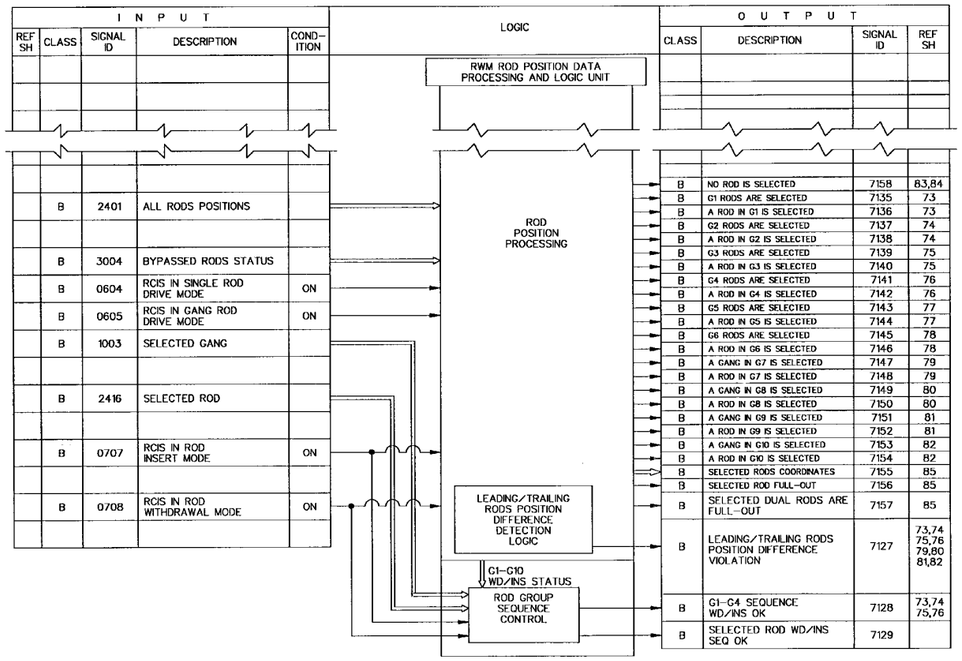


Figure 7.7-3 Rod Control and Information System IBD (Sheet 71 of 87)

INPUT					LOGIC	OUTPUT			
REF SH	CLASS	SIGNAL ID	DESCRIPTION	CONDITION		CLASS	DESCRIPTION	SIGNAL ID	REF SH
	B	7009	G5 RODS FULL-IN	OFF					
	B	7011	G6 RODS FULL-IN	ON					
	B	7013	G7 RODS FULL-IN	ON		B	G5-G10 RODS FULL-IN	7201	73,74 75,76
	B	7015	G8 RODS FULL-IN	ON					
	B	7017	G9 RODS FULL-IN	ON					
	B	7019	G10 RODS FULL-IN	ON					
						B	G5 RODS PARTIAL INSERT PERMISSIVE	7205	77
	B	7021	ALL G5 RODS >957 mm	ON					
	B	7022	ALL G6 RODS >957 mm	ON		B	G6 RODS PARTIAL INSERT PERMISSIVE	7206	78
	B	7025	G5 RODS ≥ 914±10 mm	ON		B	G9 & G10 ROD(S) WD/INS PERMISSIVE ENABLE	7202	81,82
	B	7026	G6 RODS ≥ 914±10 mm	ON					
	B	7031	G7 RODS ≥ 914±10 mm	ON					
	B	7032	G8 RODS ≥ 914±10 mm	ON					
						B	G7 & G8 ROD(S) WD/INS PERMISSIVE ENABLE	7204	79,80
	B	7033	G9 RODS ≥ 914±10 mm	ON					
	B	7034	G10 RODS ≥ 914±10 mm	ON					
	B	7002	G1 RODS FULL-OUT	ON					
	B	7004	G2 RODS FULL-OUT	ON					
	B	7006	G3 RODS FULL-OUT	ON		B	G1-G4 RODS FULL-OUT	7203	77,78 79,80 81,82
	B	7008	G4 RODS FULL-OUT	ON					
	B	7001	G1 RODS FULL-IN	ON					
	B	7003	G2 RODS FULL-IN	ON					
	B	7005	G3 RODS FULL-IN	ON		B	ALL RODS FULL-IN	7207	85
	B	7007	G4 RODS FULL-IN	ON					

ENABLE, FULL-IN, AND FULL-OUT LOGIC

Figure 7.7-3 Rod Control and Information System IBD (Sheet 72 of 87)

INPUT				
REF SH	CLASS	SIGNAL ID	DESCRIPTION	CONDITION
	B	6904	G1–G4 SINGLE ROD WD INITIAL CONDITIONS OK	ON
	B	7127	LEADING/TRAILING ROD POS DIFF VIOLATION	ON
	B	7136	A ROD IN G1 IS SELECTED	ON
	B	7135	G1 RODS ARE SELECTED	ON
	B	6901	G1–G4 GANG ROD WD INITIAL CONDITIONS OK	ON
	B	7128	G1–G4 SEQUENCE WD/INS OK	ON
	B	7005	ALL G3 RODS FULL–IN	ON
	B	7007	ALL G4 RODS FULL–IN	ON
	B	7003	ALL G2 RODS FULL–IN	ON
	B	7004	ALL G2 RODS FULL–OUT	ON
	B	7006	ALL G3 RODS FULL–OUT	ON
	B	7008	ALL G4 RODS FULL–OUT	ON
	B	7201	ALL G5–G10 RODS FULL–IN	ON
	B	6902	G1–G4 GANG ROD INS INITIAL CONDITIONS OK	ON
	B	6903	G1–G4 SINGLE ROD INS INITIAL CONDITIONS OK	ON

LOGIC

OUTPUT			
CLASS	DESCRIPTION	SIGNAL ID	REF SH
B	G1 SINGLE ROD WD PERMISSIVE	7301	83
B	G1 RODS GANG WD PERMISSIVE	7302	83
B	G1 RODS GANG INSERT PERMISSIVE	7303	84
B	G1 SINGLE ROD INSERT PERMISSIVE	7304	84

G1 ROD(S) WD/INS PERMISSIVE LOGIC

Figure 7.7-3 Rod Control and Information System IBD (Sheet 73 of 87)

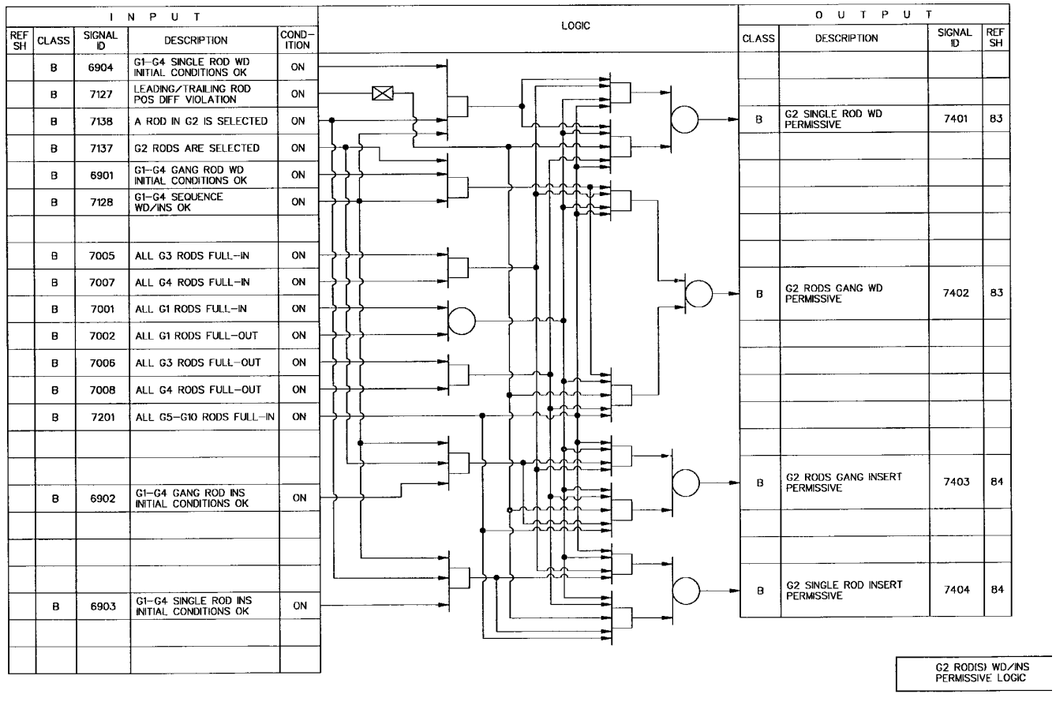


Figure 7.7-3 Rod Control and Information System IBD (Sheet 74 of 87)

INPUT					LOGIC	OUTPUT			
REF SH	CLASS	SIGNAL ID	DESCRIPTION	COND-ITION		CLASS	DESCRIPTION	SIGNAL ID	REF SH
	B	6904	G1-G4 SINGLE ROD WD INITIAL CONDITIONS OK	ON					
	B	7127	LEADING/TRAILING ROD POS DIFF VIOLATION	ON					
	B	7140	A ROD IN G3 IS SELECTED	ON		B	G3 SINGLE ROD WD PERMISSIVE	7501	83
	B	7139	G3 RODS ARE SELECTED	ON					
	B	6901	G1-G4 GANG ROD WD INITIAL CONDITIONS OK	ON					
	B	7128	G1-G4 SEQUENCE WD/INS OK	ON					
	B	7001	ALL G1 RODS FULL-IN	ON					
	B	7003	ALL G2 RODS FULL-IN	ON		B	G3 RODS GANG WD PERMISSIVE	7502	83
	B	7007	ALL G4 RODS FULL-IN	ON					
	B	7008	ALL G4 RODS FULL-OUT	ON					
	B	7002	ALL G1 RODS FULL-OUT	ON					
	B	7004	ALL G2 RODS FULL-OUT	ON					
	B	7201	ALL G5-G10 RODS FULL-IN	ON					
	B	6902	G1-G4 GANG ROD INS INITIAL CONDITIONS OK	ON		B	G3 RODS GANG INSERT PERMISSIVE	7503	84
	B	6903	G1-G4 SINGLE ROD INS INITIAL CONDITIONS OK	ON		B	G3 SINGLE ROD INSERT PERMISSIVE	7504	84

G3 ROD(S) WD/INS PERMISSIVE LOGIC

Figure 7.7-3 Rod Control and Information System IBD (Sheet 75 of 87)

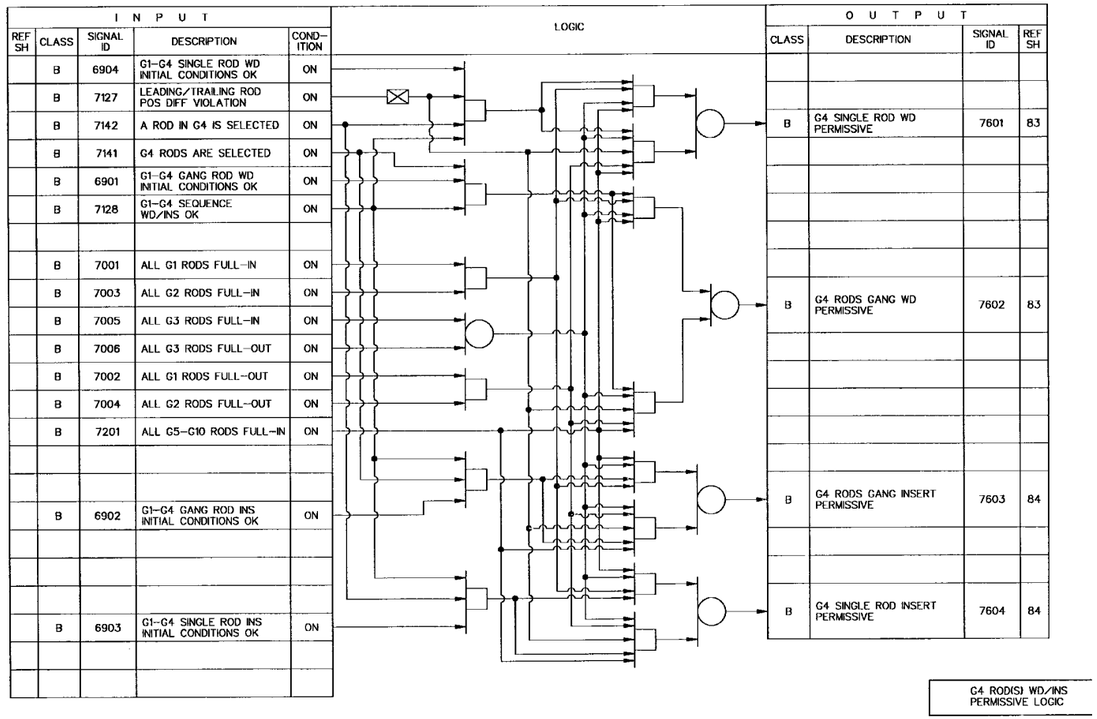


Figure 7.7-3 Rod Control and Information System IBD (Sheet 76 of 87)

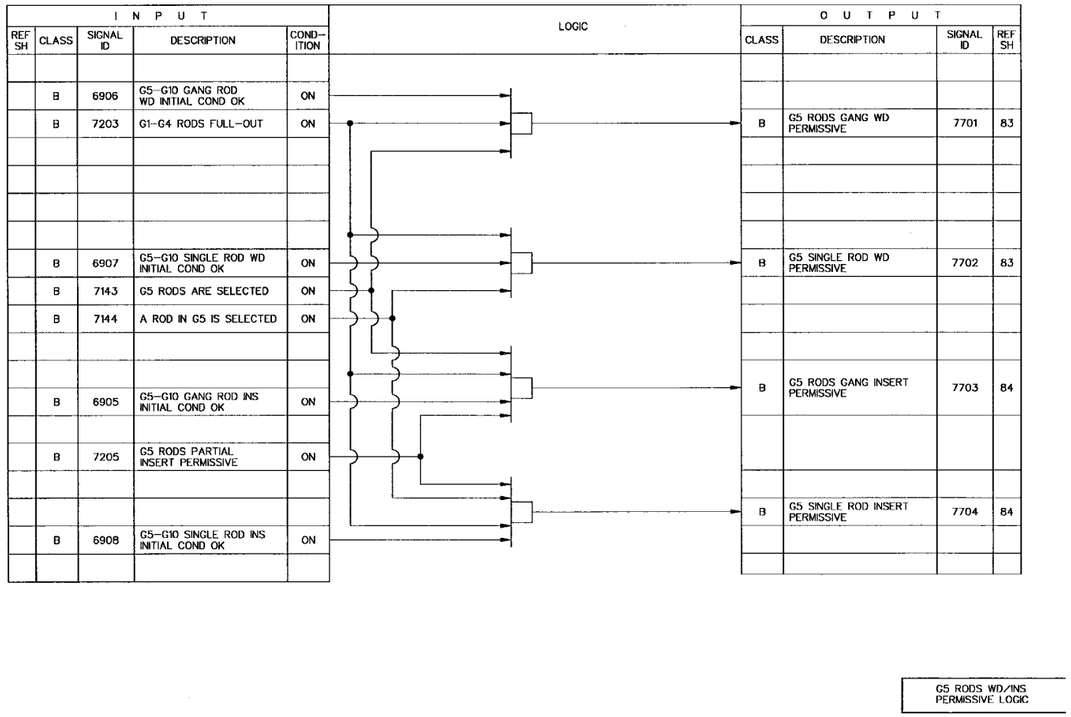


Figure 7.7-3 Rod Control and Information System IBD (Sheet 77 of 87)

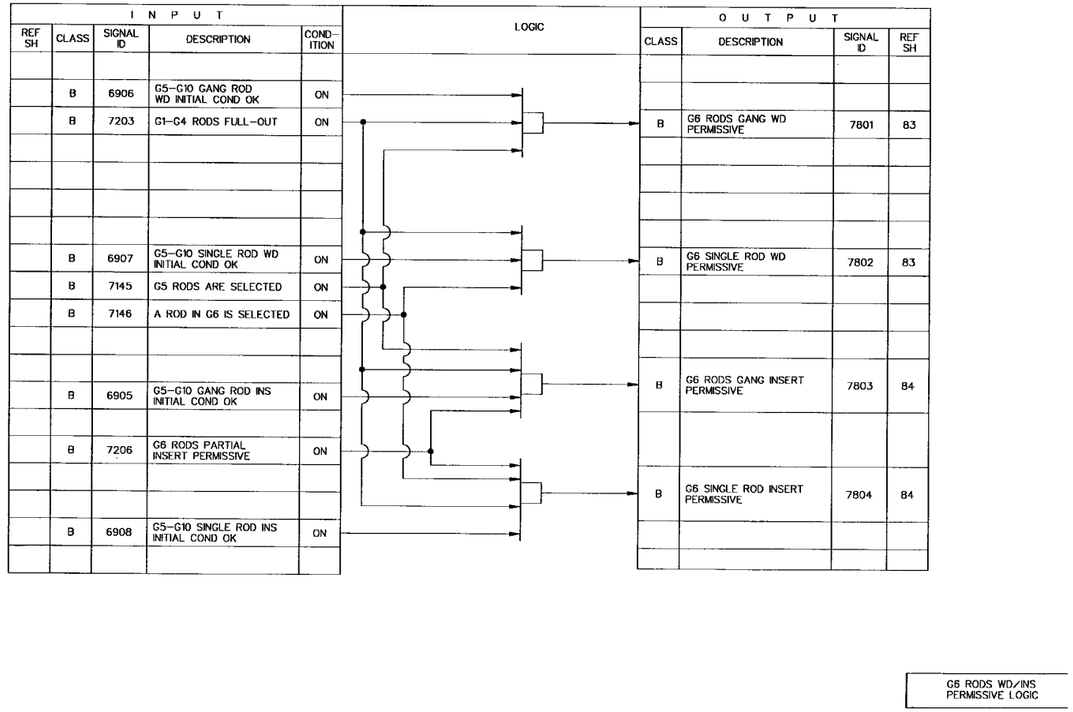


Figure 7.7-3 Rod Control and Information System IBD (Sheet 78 of 87)

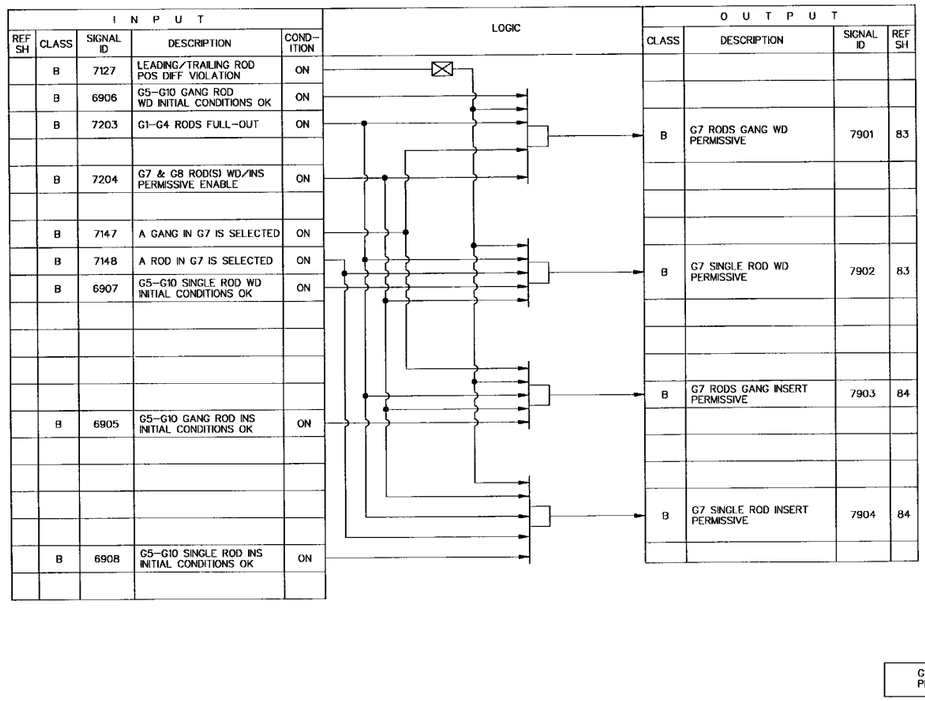


Figure 7.7-3 Rod Control and Information System IBD (Sheet 79 of 87)

INPUT					LOGIC	OUTPUT			
REF SH	CLASS	SIGNAL ID	DESCRIPTION	COND-ITION		CLASS	DESCRIPTION	SIGNAL ID	REF SH
	B	7127	LEADING/TRAILING ROD POS DIFF VIOLATION	ON					
	B	6906	G5-G10 GANG ROD WD INITIAL CONDITIONS OK	ON					
	B	7203	G1-G4 RODS FULL-OUT	ON		B	G8 RODS GANG WD PERMISSIVE	8001	83
	B	7204	G7 & G8 ROD(S) WD/INS PERMISSIVE ENABLE	ON					
	B	7149	A GANG IN G8 IS SELECTED	ON					
	B	7150	A ROD IN G8 IS SELECTED	ON		B	G8 SINGLE ROD WD PERMISSIVE	8002	83
	B	6907	G5-G10 SINGLE ROD WD INITIAL CONDITIONS OK	ON					
	B	6905	G5-G10 GANG ROD INS INITIAL CONDITIONS OK	ON		B	G8 RODS GANG INSERT PERMISSIVE	8003	84
	B	6908	G5-G10 SINGLE ROD INS INITIAL CONDITIONS OK	ON		B	G8 SINGLE ROD INSERT PERMISSIVE	8004	84

G8 RODS WD/INS PERMISSIVE LOGIC

Figure 7.7-3 Rod Control and Information System IBD (Sheet 80 of 87)

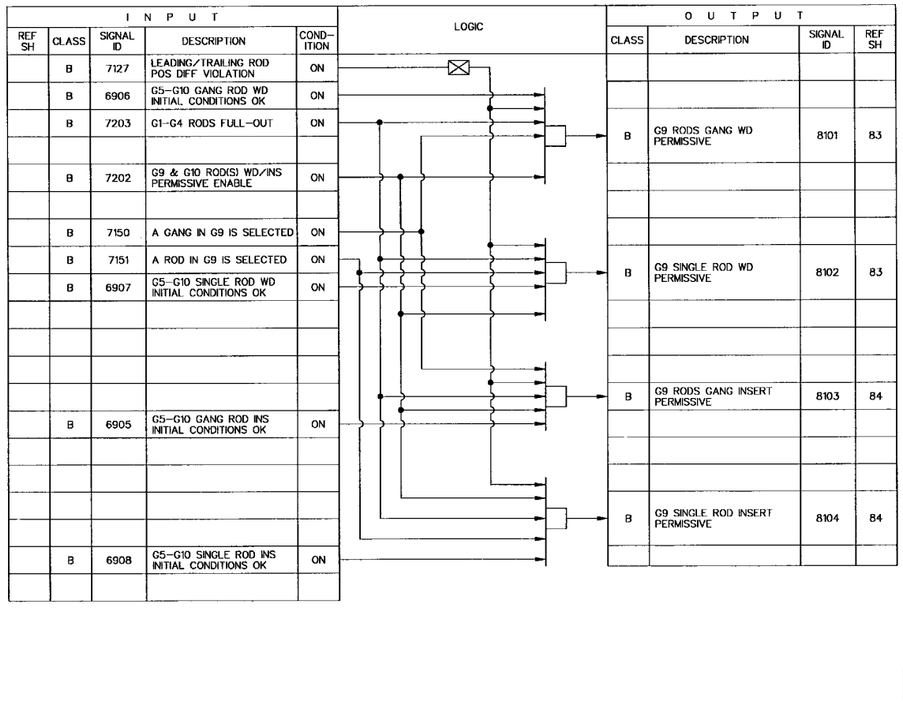


Figure 7.7-3 Rod Control and Information System IBD (Sheet 81 of 87)

INPUT					LOGIC	OUTPUT			
REF SH	CLASS	SIGNAL ID	DESCRIPTION	COND-ITION		CLASS	DESCRIPTION	SIGNAL ID	REF SH
	B	7127	LEADING/TRAILING ROD POS DIFF VIOLATION	ON					
	B	6906	G5–G10 GANG ROD WD INITIAL CONDITIONS OK	ON					
	B	7203	G1–G4 RODS FULL-OUT	ON		B	G10 RODS GANG WD PERMISSIVE	8201	83
	B	7202	G9 & G10 ROD(S) WD/INS PERMISSIVE ENABLE	ON					
	B	7153	A GANG IN G10 IS SELECTED	ON					
	B	7154	A ROD IN G10 IS SELECTED	ON		B	G10 SINGLE ROD WD PERMISSIVE	8202	83
	B	6907	G5–G10 SINGLE ROD WD INITIAL CONDITIONS OK	ON					
	B	6905	G5–G10 GANG ROD INS INITIAL CONDITIONS OK	ON		B	G10 RODS GANG INSERT PERMISSIVE	8203	84
	B	6908	G5–G10 SINGLE ROD INS INITIAL CONDITIONS OK	ON		B	G10 SINGLE ROD INSERT PERMISSIVE	8204	84

G10 RODS WD/INS PERMISSIVE LOGIC

Figure 7.7-3 Rod Control and Information System IBD (Sheet 82 of 87)

INPUT					LOGIC	OUTPUT			
REF SH	CLASS	SIGNAL ID	DESCRIPTION	COND-ITION		CLASS	DESCRIPTION	SIGNAL ID	REF SH
	B	7301	G1 SINGLE ROD WD PERMISSIVE	ON					
	B	7302	G1 RODS GANG WD PERMISSIVE	ON					
	B	7401	G2 SINGLE ROD WD PERMISSIVE	ON					
	B	7402	G2 RODS GANG WD PERMISSIVE	ON					
	B	7501	G3 SINGLE ROD WD PERMISSIVE	ON					
	B	7502	G3 RODS GANG WD PERMISSIVE	ON					
	B	7601	G4 SINGLE ROD WD PERMISSIVE	ON					
	B	7602	G4 RODS GANG WD PERMISSIVE	ON					
	B	7701	G5 RODS GANG WD PERMISSIVE	ON					
	B	7702	G5 SINGLE ROD WD PERMISSIVE	ON					
	B	7801	G6 RODS GANG WD PERMISSIVE	ON		B	RWM ROD WD PERMISSIVE	8301	18
	B	7802	G6 SINGLE ROD WD PERMISSIVE	ON					
	B	7901	G7 RODS GANG WD PERMISSIVE	ON					
	B	7902	G7 SINGLE ROD WD PERMISSIVE	ON					
	B	8001	G8 RODS GANG WD PERMISSIVE	ON					
	B	8002	G8 SINGLE ROD WD PERMISSIVE	ON					
	B	8101	G9 RODS GANG WD PERMISSIVE	ON					
	B	8102	G9 SINGLE ROD WD PERMISSIVE	ON					
	B	8201	G10 RODS GANG WD PERMISSIVE	ON					
	B	8202	G10 SINGLE ROD WD PERMISSIVE	ON					
	B	7158	NO ROD IS SELECTED	ON					

RWM ROD WD PERMISSIVE LOGIC

Figure 7.7-3 Rod Control and Information System IBD (Sheet 83 of 87)

INPUT					LOGIC	OUTPUT			
REF SH	CLASS	SIGNAL ID	DESCRIPTION	COND-ITION		CLASS	DESCRIPTION	SIGNAL ID	REF SH
	B	7303	G1 RODS GANG INS PERMISSIVE	ON					
	B	7304	G1 SINGLE ROD INS PERMISSIVE	ON					
	B	7403	G2 RODS GANG INS PERMISSIVE	ON					
	B	7404	G2 SINGLE ROD INS PERMISSIVE	ON					
	B	7503	G3 RODS GANG INS PERMISSIVE	ON					
	B	7504	G3 SINGLE ROD INS PERMISSIVE	ON					
	B	7603	G4 RODS GANG INS PERMISSIVE	ON					
	B	7604	G4 SINGLE ROD INS PERMISSIVE	ON					
	B	7703	G5 RODS GANG INS PERMISSIVE	ON					
	B	7704	G5 SINGLE ROD INS PERMISSIVE	ON					
	B	7803	G6 RODS GANG INS PERMISSIVE	ON					
	B	7804	G6 SINGLE ROD INS PERMISSIVE	ON					
	B	7903	G7 RODS GANG INS PERMISSIVE	ON					
	B	7904	G7 SINGLE ROD INS PERMISSIVE	ON					
	B	8003	G8 RODS GANG INS PERMISSIVE	ON					
	B	8004	G8 SINGLE ROD INS PERMISSIVE	ON					
	B	8103	G9 RODS GANG INS PERMISSIVE	ON					
	B	8104	G9 SINGLE ROD INS PERMISSIVE	ON					
	B	8203	G10 RODS GANG INS PERMISSIVE	ON					
	B	8204	G10 SINGLE ROD INS PERMISSIVE	ON					
	B	0403	REACTOR MODE SWITCH IN REFUEL	ON					
	B	7158	NO ROD IS SELECTED	ON		B	RWM ROD INS PERMISSIVE	8401	20

RWM ROD INS PERMISSIVE LOGIC

Figure 7.7-3 Rod Control and Information System IBD (Sheet 84 of 87)

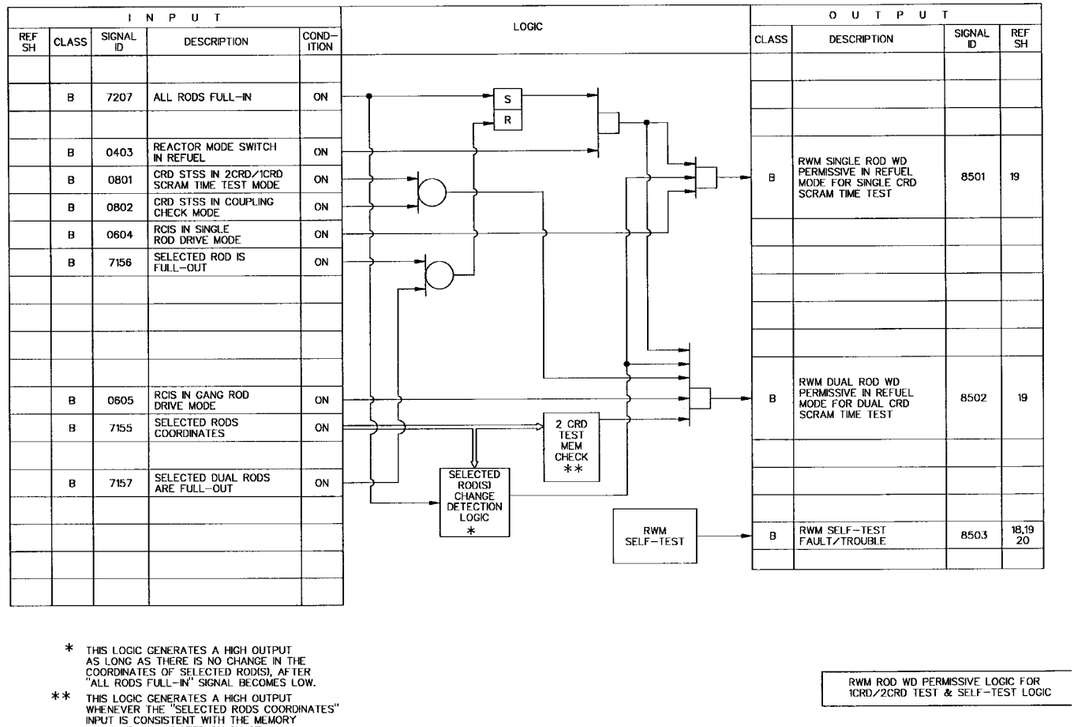


Figure 7.7-3 Rod Control and Information System IBD (Sheet 85 of 87)

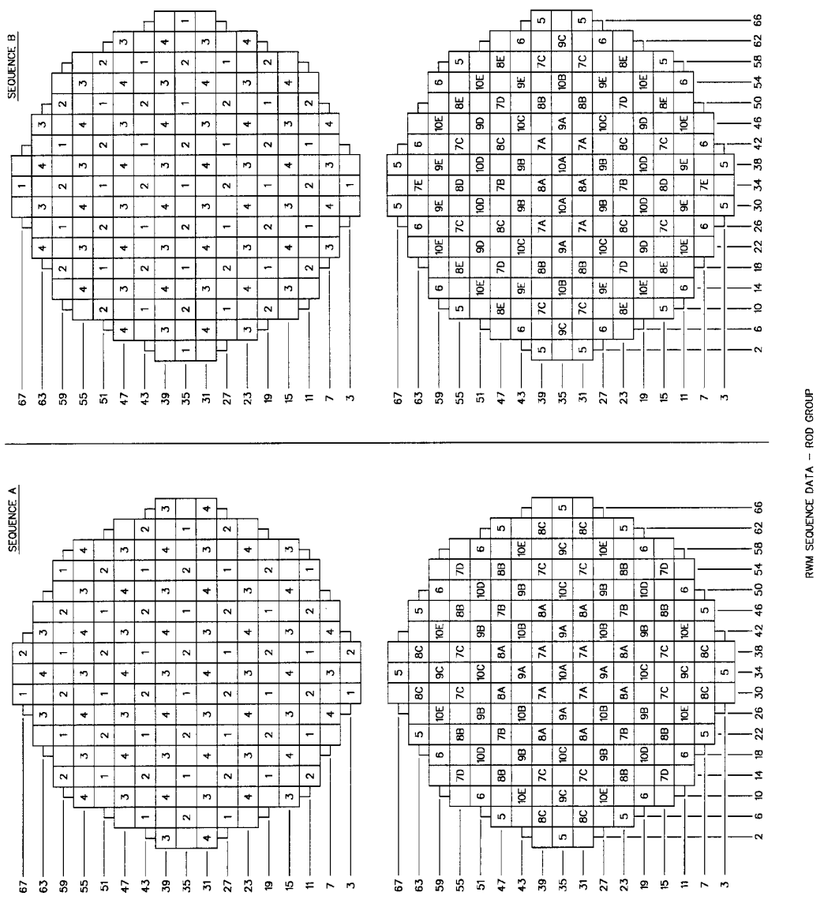
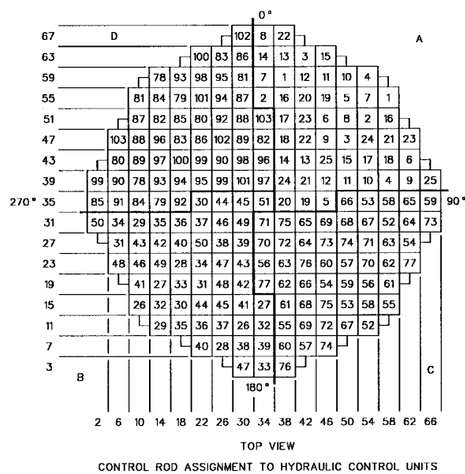


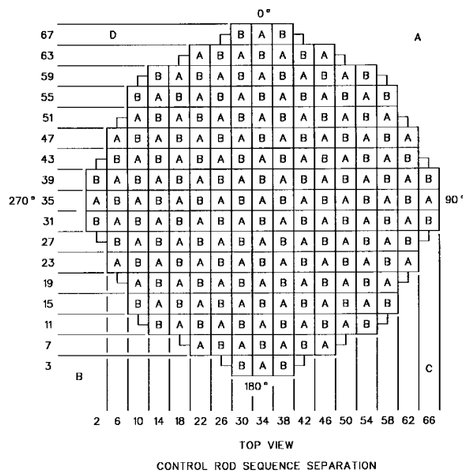
Figure 7.7-3 Rod Control and Information System IBD (Sheet 86 of 87)

DIVISION	HCU #	CR
A	1–25	50
B	26–51	51
C	52–77	52
D	78–103	52



CONTROL ROD ASSIGNMENT TO HYDRAULIC CONTROL UNITS

A – A–SEQUENCE ROD (101 CONTROL RODS)
B – B–SEQUENCE ROD (104 CONTROL RODS)



CONTROL ROD SEQUENCE SEPARATION

Figure 7.7-3 Rod Control and Information System IBD (Sheet 87 of 87)

NOTES:

1. ALL EQUIPMENT AND DEVICE NUMBERS SHOWN ON THIS DIAGRAM ARE PREFIXED BY C12- UNLESS OTHERWISE NOTED.
2. REFER TO THE RCIS IBD (C11-1030) FOR ROD MOVEMENT CONTROL LOGIC OTHER THAN HYDRAULIC SCRAM.
3. THE CRD SYSTEM SHALL BE DESIGNED IN ACCORDANCE WITH THE DESIGN SPECIFICATION C12-4010.
4. UNLESS OTHERWISE NOTED, ALL CONTROL SWITCHES SHALL BE THREE-POSITION SWITCHES WITH "CLOSE"-"NORMAL"-"OPEN" SPRING RETURN TO "NORMAL" FROM "CLOSE" OR "OPEN".
5. BOTH VALVE POSITION INDICATION LIGHTS SHALL BE "ON" WHEN VALVE IS NOT FULLY CLOSED OR NOT FULLY OPEN. RED LIGHT SHALL BE "ON" FOR FULLY OPEN VALVE AND GREEN LIGHT SHALL BE "ON" FOR FULLY CLOSED VALVED.
6. UNLESS NOTED OTHERWISE, THE STANDARD LOGIC CONVENTION (I.E., ENERGIZE TO TRIP) IS UTILIZED IN THIS DIAGRAM.
7. THE TOTAL NUMBER OF TRANSFER POINTS USED IN THIS DIAGRAM IS 4.
8. THE SCRAM CIRCUIT DIAGRAM IS SHOWN WITH NORMAL "NO TRIP" CONDITIONS OF OPERATION. TRIP CONDITIONS RESULT FROM LOGIC "LOW" STATES OR LOSS OF SIGNAL (FAIL SAFE) FROM THE REACTOR PROTECTION SYSTEM (C71).
9. FMCRD A AND FMCRD B ARE THE TWO DRIVES ASSOCIATED WITH THE SAME HCU.
10. THE LOGIC AND VALVE POSITION INDICATION LIGHTS SHOWN INSIDE THE DASHED LINES MAY BE LOCATED EITHER IN THE RCIS PANELS IN THE REACTOR BUILDING OR IN THE HCU ASSEMBLY.
11. AN ALTERNATE SWITCH DESIGN MAY BE SELECTED IF JUSTIFIED BY MAN-MACHINE INTERFACE CONSIDERATIONS.

SUPPLEMENTAL DOCUMENTS UNDER THE FOLLOWING IDENTITIES ARE TO BE USED IN CONJUNCTION WITH THIS DRAWING.

		MPL NO.
1.	CONTROL ROD DRIVE SYSTEM, P&ID	C12-1010
2.	CONTROL ROD DRIVE SYSTEM, DESIGN SPEC	C12-4010
3.	REACTOR PROTECTION SYSTEM, IBD	C71-1030
4.	ROD CONTROL AND INFORMATION SYS, IBD	C11-1030
5.	RECIRCULATION FLOW CONTROL SYS, IBD	C81-1030
6.	NON-ESSENTIAL MULTIPLEXING SYS, IBD	H23-1030
7.	ROD CONTROL AND INFORMATION SYS, IED	C11-1040

LEGEND:

(BL) - BLUE LIGHT

LOPP - LOSS OF PREFERRED POWER

SH NO.	TITLE
1	COVER/CONTENTS/NOTES
2	CONTROL ROD DRIVE PUMP C001A(B)
3	CRD PUMP C001A(B) AUXILIARY OIL PUMP
3	SCRAM CIRCUIT
4	AIR HEADER DUMP VALVES F041 AND F042
5	ANNUNCIATORS
6	FLOW CONTROL VALVE F010A(B)
7	CRD PURGE WATER MAKE-UP VALVE D004-143
8	ARI VALVES F043, F044, F047, F048A(B), F049A(B)

MPL NO. C12-1030

Figure 7.7-4 Control Rod Drive System IBD (Sheet 1 of 8)

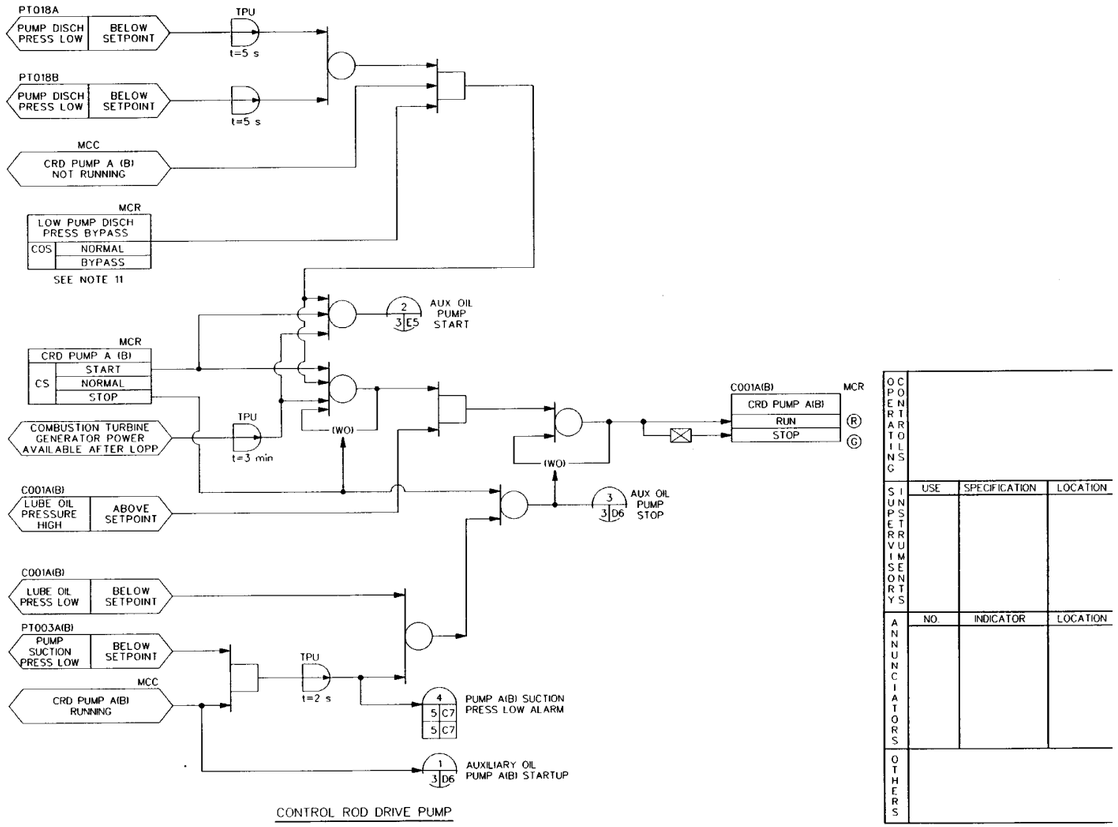
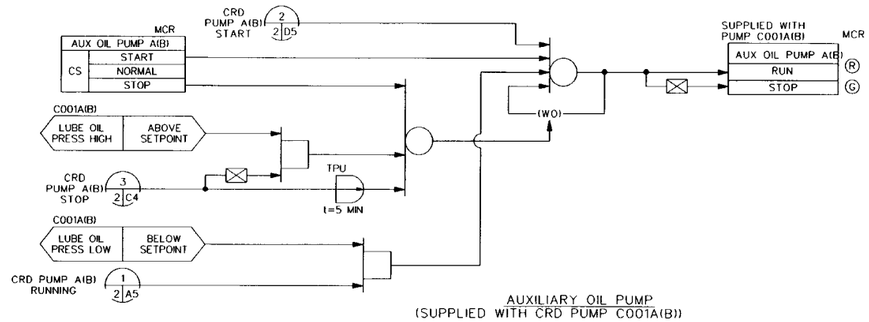
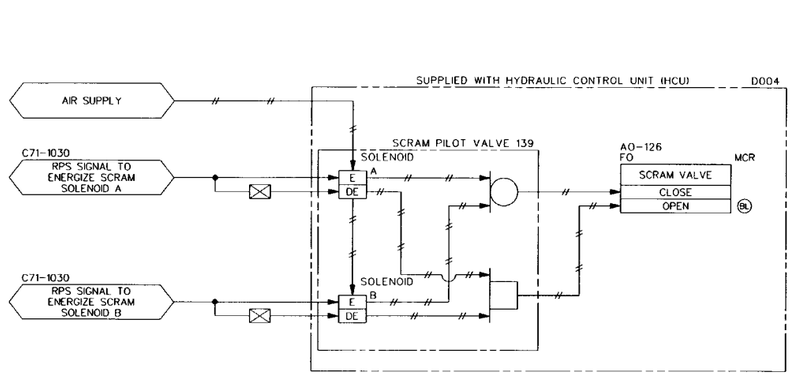


Figure 7.7-4 Control Rod Drive System IBD (Sheet 2 of 8)



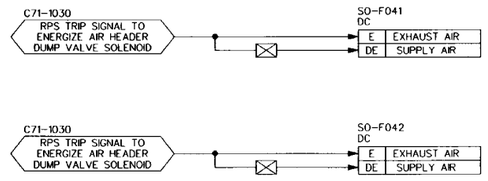
AUXILIARY OIL PUMP
(SUPPLIED WITH CRD PUMP C001A(B))



SCRAM CIRCUIT
(TYPICAL FOR SCRAM GROUPS A,B,C & D)
SEE NOTE 8

OPERATING CONTROLS			
SUPERVISORY INSTRUMENTS	USE	SPECIFICATION	LOCATION
ANNUNCIATORS	NO.	INDICATOR	LOCATION
OTHERS			

Figure 7.7-4 Control Rod Drive System IBD (Sheet 3 of 8)



AIR HEADER DUMP VALVES

OPERATING CONTROLS				
SUPERVISORY INSTRUMENTS		USE	SPECIFICATION	LOCATION
ANNUNCIATORS		NO.	INDICATOR	LOCATION
OTHERS				

Figure 7.7-4 Control Rod Drive System IBD (Sheet 4 of 8)

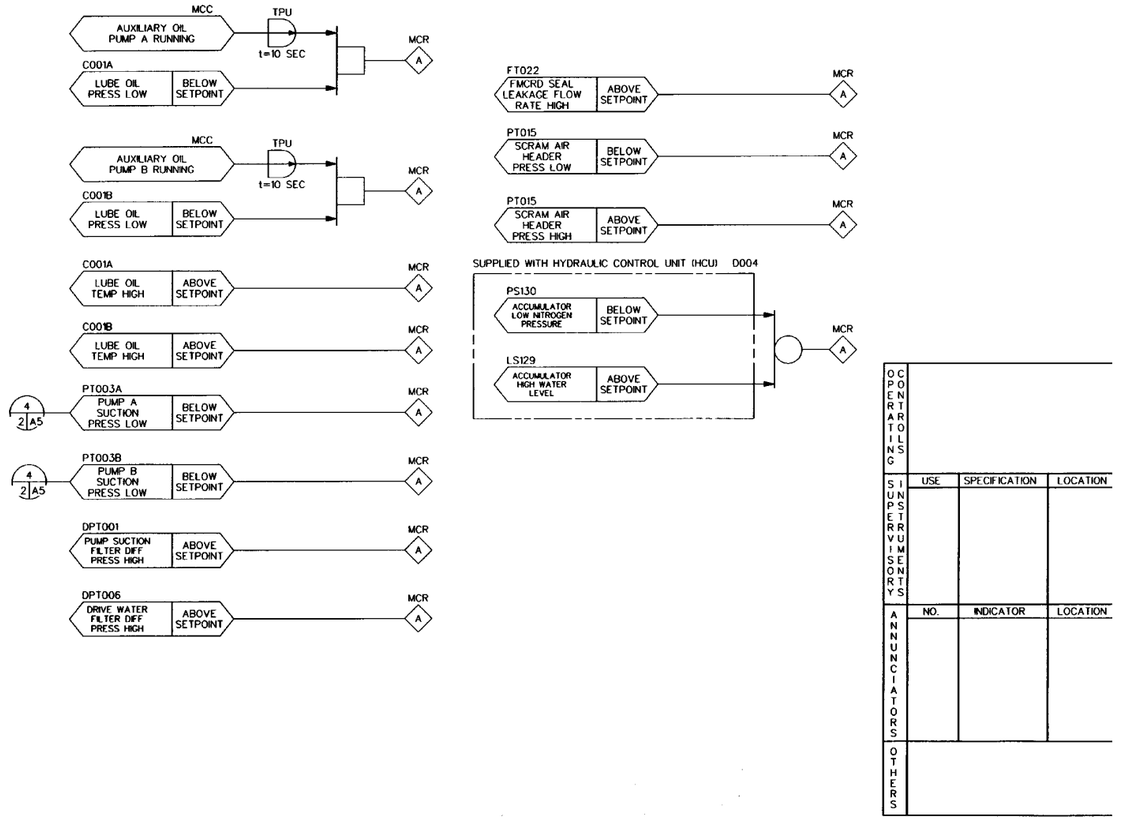
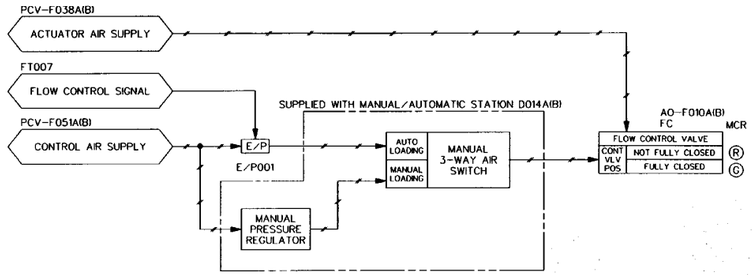


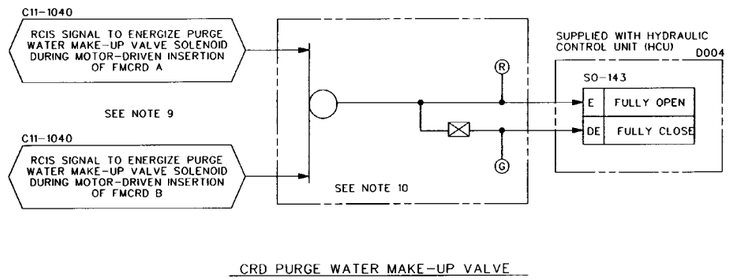
Figure 7.7-4 Control Rod Drive System IBD (Sheet 5 of 8)



FLOW CONTROL VALVE

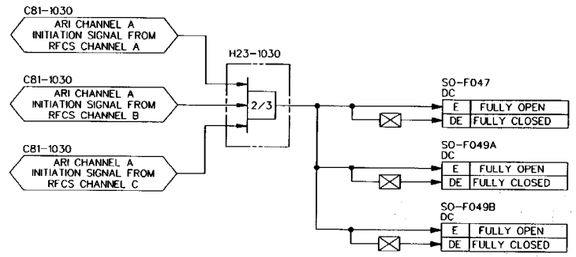
OPERATING CONTROLS			
SUPERVISORY INSTRUMENTS	USE	SPECIFICATION	LOCATION
ANNUNCIATORS	NO.	INDICATOR	LOCATION
OTHERS			

Figure 7.7-4 Control Rod Drive System IBD (Sheet 6 of 8)

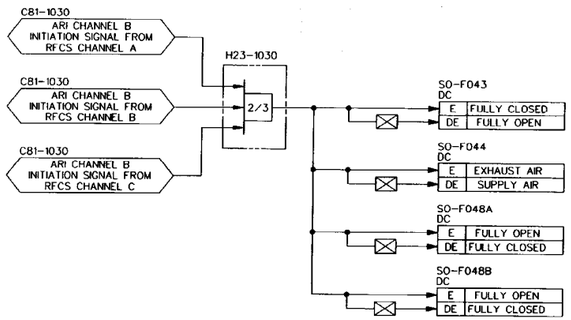


OPERATING CONTROLS			
SUPERVISORY INSTRUMENTS	USE	SPECIFICATION	LOCATION
ANNUNCIATORS	NO.	INDICATOR	LOCATION
OTHERS			

Figure 7.7-4 Control Rod Drive System IBD (Sheet 7 of 8)



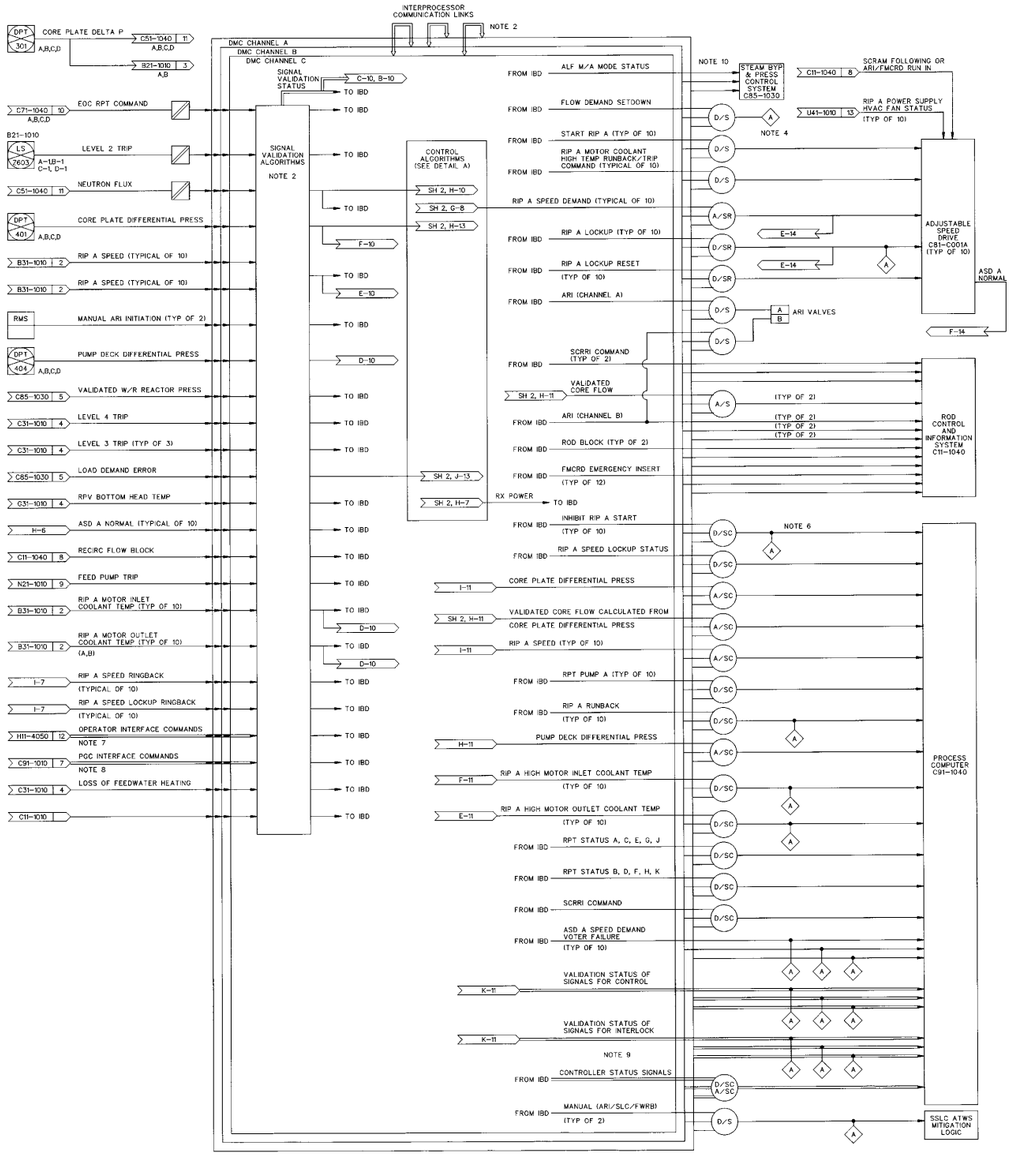
ALTERNATE ROD INSERTION (ARI) VALVES – CHANNEL A



ALTERNATE ROD INSERTION (ARI) VALVES – CHANNEL B

OPERATING CONTROLS			
SUPERVISORY INSTRUMENTS	USE	SPECIFICATION	LOCATION
ANNUNCIATORS	NO.	INDICATOR	LOCATION
OTHERS			

Figure 7.7-4 Control Rod Drive System IBD (Sheet 8 of 8)



NOTES:

1. SEE DETAIL B. EACH DIGITAL MEASUREMENT AND CONTROL CHANNEL (DMC) WILL RECEIVE THREE INPUTS (ONE FROM EACH MUX INTERFACE UNIT REPRESENTING EACH NEMS CHANNEL) FOR EACH SENSOR INPUT SIGNAL WHICH IS SHOWN ON THE IED. SOME INPUT SIGNAL TRAINS ON THE IED REPRESENTS SIGNAL FROM MORE THAN ONE SENSOR (EXAMPLE: CORE PLATE DIFFERENTIAL PRESSURE WHICH HAS FOUR PRESSURE TRANSMITTERS). IN THIS CASE, THE SINGLE IED INPUT TRAIN REPRESENTS ONE SIGNAL PER SENSOR FOR EACH DMC.

   EACH RFC SENSOR IS POWERED BY A REMOTE MUX UNIT (RMU) POWER SUPPLY. THE RMU'S ARE POWERED BY THE NON-DIVISIONAL UNINTERRUPTABLE POWER SUPPLIES (UPS) A AND B. THUS, THE RMU AND THE RFC SENSOR POWER SUPPLIES ARE SINGLE FAILURE PROOF.

2. SIGNAL VALIDATION ALGORITHMS INCLUDE REASONABILITY CHECKS OF ALL SIGNALS AND VOTING FOR MULTIPLE SIGNAL INPUTS. REASONABILITY CHECKS INCLUDE RANGE CHECKS, REDUNDANT SENSOR CROSS CHECKS AND ANY REQUIRED SIGNAL CONDITIONING SUCH AS SQUARE ROOT CONVERSION AND FILTERING. SEE RFC DESIGN SPECIFICATION C81-4010 FOR MORE DETAIL.

3. INTERCHANNEL COMMUNICATION LINKS ARE PROVIDED TO TRANSFER DATA BETWEEN PROCESSING CHANNELS. THESE ARE READ ONLY CONNECTIONS BETWEEN EACH PAIR OF DMCS. SEE THE RFC SYSTEM DESIGN SPECIFICATION C81-4010 FOR MORE DETAIL.

4. THE D/S AND A/S BUBBLES REPRESENT INDEPENDENT FIELD VOTER STATIONS WHICH ARE CONNECTED VIA MUX LINKS TO THE DMC CHANNELS. THE D/S STATIONS RECEIVE THREE DISCRETE INPUTS AND OUTPUT THE VOTED ON DISCRETE CONTACT CLOSURE OUTPUT. THE A/S STATIONS RECEIVE THREE DIGITAL REPRESENTATIONS OF ANALOG SIGNALS AND OUTPUT ONE VOTED ON ANALOG SIGNAL. SR IMPLIES RINGBACK FOR THAT SIGNAL.

5. THE ROD CONTROL and INFORMATION SYSTEM HAS TWO INPUT CHANNELS. THE FOUR D/S BUBBLES REPRESENT TWO INPUTS FOR EACH CHANNEL.

6. THE D/S AND A/S BUBBLES REPRESENT MULTIPLE FUNCIONS OF A SINGLE VOTER WHICH READS TRIPLICATED SIGNALS FROM THE MUX LINES AND VALIDATES A SINGLE INPUT SIGNAL FOR THE PROCESS COMPUTER. THE D/SC FUNCTIONS RECEIVE THREE DISCRETE INPUTS AND OUTPUT ONE VOTED-ON DISCRETE DIGITAL SIGNAL TO THE PROCESS COMPUTER. THE A/SC FUNCTIONS RECEIVE THREE DIGITIZED ANALOG SIGNALS AND OUTPUT ONE VOTED-ON DIGITIZED ANALOG SIGNAL.

7. OPERATOR INTERFACE COMMANDS INCLUDE MANUAL/AUTOMATIC MODE CHANGES, SETPOINT CHANGES AND MANUAL ADJUSTMEMT.
   - A. RFC LOCAL/PCC CONTROL SWITCH
   - B. MASTER MODE IN LOCAL
   - C. RIP A SPEED CONTROL – MANUAL (TYP OF 10 SIGNALS)
   - D. RIP A SPEED CONTROL – AUTOMATIC (TYP OF 10 SIGNALS)
   - E. INCREASE RIP A SPEED (TYP OF 10 SIGNALS)
   - F. DECREASE RIP A SPEED (TYP OF 10 SIGNALS)
   - G. GANG SPEED CONTROL – AUTO
   - H. GANG SPEED CONTROL – MANUAL
   - I. INCREASE RIP GANG SPEED
   - J. DECREASE RIP GANG SPEED
   - K. FLOW BYPASS FUNCTION ENABLED
   - L. ALF CONTROL – AUTO
   - M. ALF CONTROL – MANUAL
   - N. INCREASE CORE FLOW DEMAND
   - O. DECREASE CORE FLOW DEMAND
   - P. START PUMP A (TYP OF 10 SIGNALS)

8. PGC INTERFACE COMMANDS ARE SIGNALS FROM THE PGC FUNCTION OF THE PROCESS COMPUTER WHICH MAY CHANGE RFC SYSTEM OPERATING MODES. THESE COMMANDS INCLUDE MANUAL/AUTOMATIC MODE CHANGES, SETPOINT CHANGES AND MANUAL CHANGES.
   - A. PGCS FUNCTION OPERATIONAL
   - B. PGCS ENABLE GANG SPEED CONTROL OF ASD A (TYP OF 10 SIGNALS)
   - C. PGCS DISABLE GANG SPEED CONTROL OF ASD A (TYP OF 10 SIGNALS)
   - D. PGCS INCREASE RIP A SPEED (TYP OF 10 SIGNALS)
   - E. PGCS DECREASE RIP A SPEED (TYP OF 10 SIGNALS)
   - F. PGCS ENABLE AUTO CONTROL OF RIP GANG
   - G. PGCS DISABLE AUTO CONTROL OF RIP GANG
   - H. PGCS INCREASE RIP GANG SPEED DEMAND
   - I. PGCS DECREASE RIP GANG SPEED DEMAND
   - J. PGCS ENABLE ALF CONTROL
   - K. PGCS DISABLE ALF CONTROL
   - L. PGCS INCREASE CORE FLOW DEMAND
   - M. PGCS DECREASE CORE FLOW DEMAND

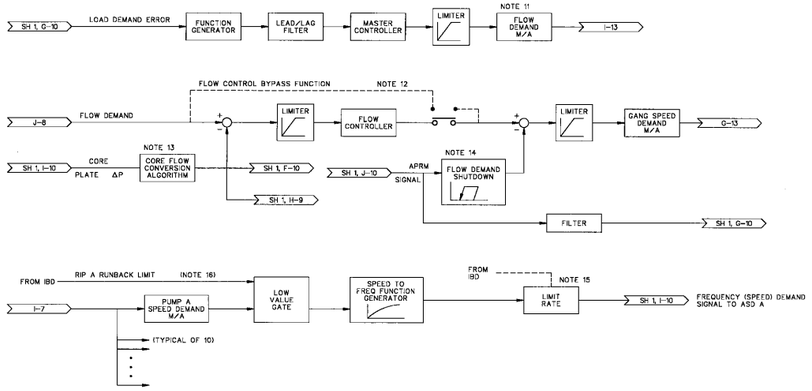
NOTES CONTINUED ON SHEET 2

SUPPLEMENTAL DOCUMENTS UNDER THE FOLLOWING IDENTITIES ARE TO BE USED IN CONJUNCTION WITH THIS DRAWING:

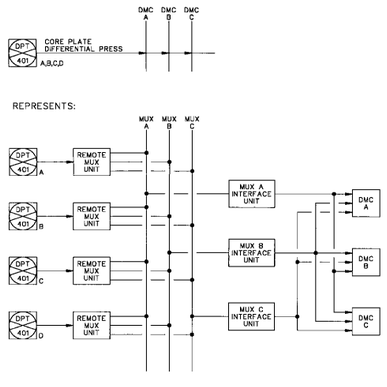
		MPL NO.
1.	RECIRC FLOW CONTROL SYSTEM IBD	C81-1030
2.	REACTOR RECIRC SYSTEM P&ID	B31-1010
3.	NUCLEAR BOILER SYSTEM P&ID	B21-1010
4.	FEEDWATER CONTROL SYSTEM IED	C31-1010
5.	STEAM BYPASS & PRESSURE CONTROL SYSTEM IED	C85-1010
6.	REACTOR WATER CLEANUP SYSTEM P&ID	G31-1010
7.	PROCESS COMPUTER SYSTEM IED	C91-1010
8.	ROD CONTROL AND INFORMATION SYS IED	C11-1040
9.	CONDENSATE, FEEDWATER & CONDENSATE AIR EXTRACTION SYSTEM P&ID	N21-1010
10.	REACTOR PROTECTION SYSTEM IED	C71-1040
11.	NEUTRON MONITORING SYSTEM IED	C51-1040
12.	MAIN CONTROL ROOM PANELS ARGMT	H11-4050
13.	HVAC SYSTEM P&ID	U41-1010

MPL NO. C81-1010

Figure 7.7-5 Recirculation Flow Control System IED (Sheet 1 of 2)



DETAIL A : RFC ALGORITHM STRUCTURE



DETAIL B : INPUT SIGNAL REPRESENTATION

NOTES CONTINUED:

9. MULTIPLE CONTROLLER STATUS SIGNALS ARE REPRESENTED BY THIS SIGNAL TRAIN. THESE SIGNALS INCLUDE CONTROL MODE, M/A AND T/A STATION AND LOCAL/PGC CONTROL STATUS.
   A. RFC SYSTEM IN LOCAL CONTROL
   B. RIP A RUNBACK LIMIT (TYP OF 10 SIGNALS)
   C. RIP A SPEED DEMAND IN GANG CONTROL (TYP OF 10 SIGNALS)
   D. RIP A SPEED DEMAND IN PGC CONTROL (TYP OF 10 SIGNALS)
   E. RIP A SPEED CONTROLLED BY LOCAL MANUAL (TYP OF 10 SIGNALS)
   F. GANG SPEED DEMAND IN AUTO FLOW CONTROL
   G. GANG SPEED DEMAND IN PGC CONTROL
   H. GANG SPEED DEMAND IN LOCAL MANUAL CONTROL
   I. FLOW DEMAND IN ALF CONTROL
   J. FLOW DEMAND IN PGC CONTROL
   K. FLOW DEMAND IN LOCAL MANUAL CONTROL
   L. GANG RIP RUNBACK LIMIT
   M. GANG SPEED DECREASING RATE LIMIT
   N. GANG SPEED DEMAND SETPOINT
   O. FLOW DEMAND SETPOINT

10. A COMMAND IS SENT TO THE STEAM BYPASS AND PRESSURE CONTROL SYSTEM TO ENABLE ALF CONTROL LOGIC WHEN MASTER CONTROL IS ENABLED.

11. ALL M/A STATION TRANSFERS ARE BUMPLESS. M/A STATION LOGIC IS CONTROL IN THE RFC SYSTEM I&D, C81-I030.

12. THE FLOW BYPASS FUNCTION WILL BE DELETED WHEN CORE FLOW MEASUREMENT UNCERTAINTY IS PROVEN TO BE ACCEPTABLE. SEE THE RFC SYSTEM DESIGN SPECIFICATION C81-4010 FOR MORE DETAIL.

13. THE CORE FLOW CONVERSION ALGORITHM WILL BE CALIBRATED USING THE PUMP DECK DELTA P CORE FLOW CALCULATION.

14. THE FLOW DEMAND SETDOWN MODIFIER HAS ADJUSTABLE SLOPES AND BREAKPOINTS FOR HIGH FLUX SCRAM AVOIDANCE. REFER TO RFC SYSTEM DESIGN SPECIFICATION, C81-4010 FOR SPECIFIC FUNCTION CHARACTERISTICS AND PARAMETERS.

15. THE RATE LIMIT FOR DECREASING RECIRCULATION FLOW WILL DEPEND ON LOGIC IN THE RFC SYSTEM I&D, C81-I030. THE RATE LIMIT FOR INCREASING FLOW IS ALWAYS ≤5.0 PERCENT PER SECOND.

16. RIP SPEED RUNBACK LIMIT COMES FROM EITHER THE OUTPUT OF LOW VALUE GATE 1 OF I&D (WHEN RIP RUNBACK IS ENABLED) OR THE 100 PERCENT SPEED DEMAND YWHEN RIP RUNBACK IS NOT ENABLED).

Figure 7.7-5 Recirculation Flow Control System IED (Sheet 2 of 2)

SH	TITLE
1	CONTENTS, NOTES AND SUPPLEMENTAL DOCUMENTS
2	LOCAL/PGC CONTROL LOGIC
2	MANUAL SIGNALS TO SSLC ATWS MITIGATION LOGIC
3	PUMP START INHIBIT LOGIC, STABILITY CONTROL AND PROTECTION LOGIC
4	REACTOR INTERNAL PUMP (RIP) TRIP LOGIC
5	RIP A SPEED DEMAND M/A STATION
6	GANG SPEED DEMAND M/A STATION
7	AUTO LOAD FOLLOWING (ALF) CONTROL M/A STATION
8	RECIRCULATION FLOW RUNBACK LOGIC
9	RATE DECREASE LIMIT LOGIC LOCK UP RINGBACK LOGIC DMC CONTROLLER FAILURE

SUPPLEMENTAL DOCUMENTS UNDER THE FOLLOWING IDENTITIES ARE TO BE USED IN CONJUNCTION WITH THIS DRAWING:

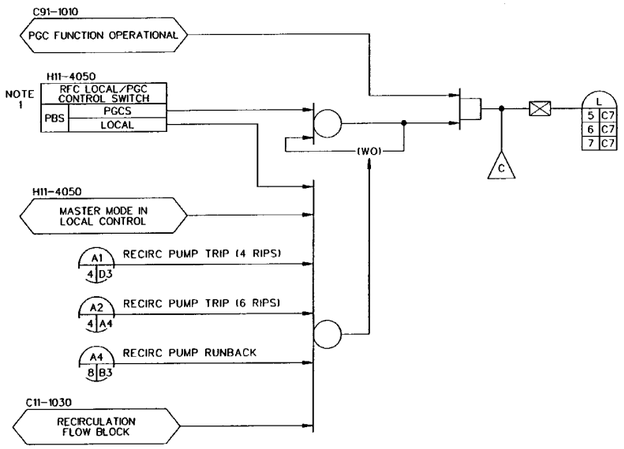
		MPL NO.
1.	RECIRCULATION FLOW CONTROL SYS IED	C81-1010
2.	PROCESS COMPUTER SYS IED	C91-1010
3.	MAIN CONTROL ROOM PANEL ARGMT	H11-4050
4.	REACTOR RECIRC SYS P&ID	B31-1010
5.	STEAM BYPASS & PRESSURE CONTROL SYS IBD	C85-1030
6.	REACTOR WATER CLEANUP SYS P&ID	G31-1010
7.	REACTOR PROTECTION SYS IBD	C71-1030
8.	NUCLEAR BOILER SYS P&ID	B21-1010
9.	NEUTRON MONITORING SYS IBD	C51-1030
10.	CONDENSATE, FEEDWATER, & CONDENSATE AIR EXTRACTION SYS P&ID	N21-1010
11.	FEEDWATER CONTROL SYS IBD	C31-1030
12.	ROD CONTROL & INFORMATION SYS IBD	C11-1030

NOTES:

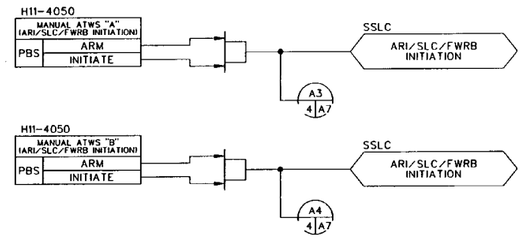
1. LOCAL CONTROL ALLOWS THE OPERATOR TO EITHER MANUALLY MANIPULATE DEMAND SIGNALS OR PLACE THEM IN AUTOMATIC CONTROL AT MANUAL STATIONS. PGC SYSTEM CONTROL MODE ALLOWS THE COMPUTER TO MANIPULATE DEMAND SIGNALS AT M/A STATIONS OR PLACE THEM IN AUTOMATIC CONTROL.
2. RIPS ARE INDIVIDUALLY RUNBACK AND THEN TRIPPED (AFTER MINIMUM SPEED IS REACHED) WHEN THIS CONDITION IS SATISFIED. THE INDIVIDUAL RIP RUNBACK LIMIT WHICH IS INVOKED HERE HAS PRECEDENT OVER THE GANG RUNBACK LIMIT ON SHEET 6.
3. THE PUSH BUTTON SWITCH (PBS) SENDS A LOGICAL "1" SIGNAL FOR AT LEAST ONE COMPLETE SAMPLING PERIOD.
4. THE WIDE RANGE DOME PRESSURE SIGNAL IS VALIDATED BY THE STEAM BYPASS AND PRESSURE CONTROL SYSTEM FROM THREE INDEPENDENT PRESSURE SENSOR INPUTS.
5. THE REMAINING FOUR OR SIX RIPS WILL BE RUNBACK TO MINIMUM SPEED AFTER A TRIP OF THE OTHER SIX OR FOUR. THIS WILL ENHANCE GANG RIP RESTART CAPABILITIES.
6. SATISFACTION OF THE RECIRC RUNBACK CONDITION WILL ENABLE THE APPROPIATE RECIRC RUNBACK LIMIT FROM THE LOW VALUE GATE. THIS LIMIT WILL BE SENT THROUGH LOW VALUE GATE 2 (SHOWN ON RFC IED C81-1010, SHEET 2, DETAIL "A") WHICH WILL SEND THE RUNBACK LIMIT TO THE GANG OF ASDS IF IT IS LOWER THAN THE CURRENT GANG SPEED DEMAND. AFTER A RECIRC RUNBACK, THE GANG SPEED DEMAND WILL BE UPDATED TO EQUAL THE OUTPUT OF LOW VALUE GATE 2. THUS IF THE RUNBACK LIMIT PASSES THROUGH LOW VALUE GATE 2, THE GANG SPEED DEMAND WILL REMAIN EQUAL TO THE RUNBACK LIMIT AFTER THE RUNBACK CONDITION IS DISABLED.
7. THIS BLOCK SYMBOL REPRESENTS THE MULTIPLICATION OF INPUT SIGNALS. IN THIS APPLICATION, THE ANALOG SPEED SIGNALS ARE MULTIPLIED BY THE DISCRETE SIGNALS. IF THE DISCRETE SIGNAL IS A LOGICAL "1", THE SPEED SIGNAL IS PASSED ON THE AVERAGING FUNCTION. IF THE DISCRETE SIGNAL IS LOW "0", THE SPEED SIGNAL IS NOT PASSED.

MPL NO. C81-1030

Figure 7.7-7 Recirculation Flow Control System IBD (Sheet 1 of 9)



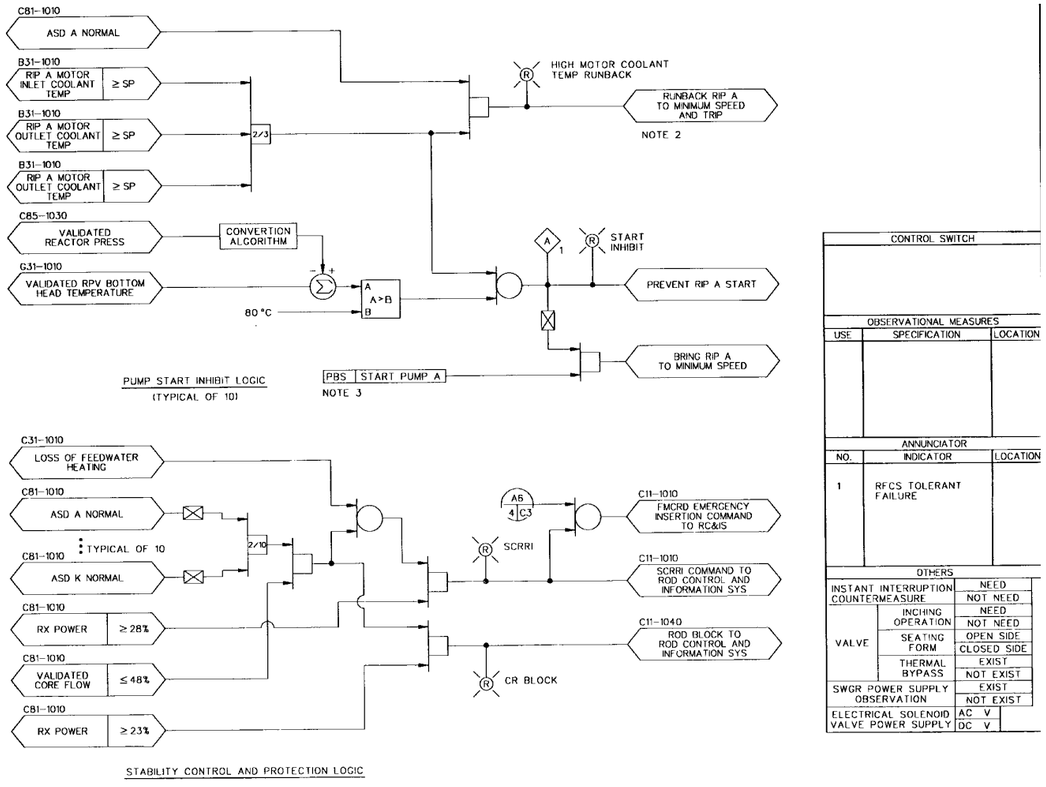
LOCAL/PGC CONTROL LOGIC



ATWS MITIGATION LOGIC (ARI/SLC/FWRB INITIATION)

CONTROL SWITCH			
RFC LOCAL/PGC CONTROL SWITCH			
PBS	PGCS	LOCAL	
OBSERVATIONAL MEASURES			
USE	SPECIFICATION		LOCATION
ANNUNCIATOR			
NO.	INDICATOR		LOCATION
OTHERS			
INSTANT INTERRUPTION COUNTERMEASURE		NEED	
		NOT NEED	
VALVE	INCHING OPERATION	NEED	
		NOT NEED	
	SEATING FORM	OPEN SIDE	
		CLOSED SIDE	
	THERMAL BYPASS	EXIST	
		NOT EXIST	
SWGR POWER SUPPLY OBSERVATION		EXIST	
		NOT EXIST	
ELECTRICAL SOLENOID VALVE POWER SUPPLY		AC V	
		DC V	

Figure 7.7-7 Recirculation Flow Control System IBD (Sheet 2 of 9)



CONTROL SWITCH

OBSERVATIONAL MEASURES		
USE	SPECIFICATION	LOCATION

ANNUNCIATOR		
NO.	INDICATOR	LOCATION
1	RFCS TOLERANT FAILURE	

OTHERS		
INSTANT INTERRUPTION COUNTERMEASURE		NEED
		NOT NEED
VALVE	INCHING OPERATION	NEED
		NOT NEED
	SEATING FORM	OPEN SIDE
		CLOSED SIDE
	THERMAL BYPASS	EXIST
		NOT EXIST
SWGR POWER SUPPLY OBSERVATION		EXIST
		NOT EXIST
ELECTRICAL SOLENOID VALVE POWER SUPPLY		AC V
		DC V

Figure 7.7-7 Recirculation Flow Control System IBD (Sheet 3 of 9)

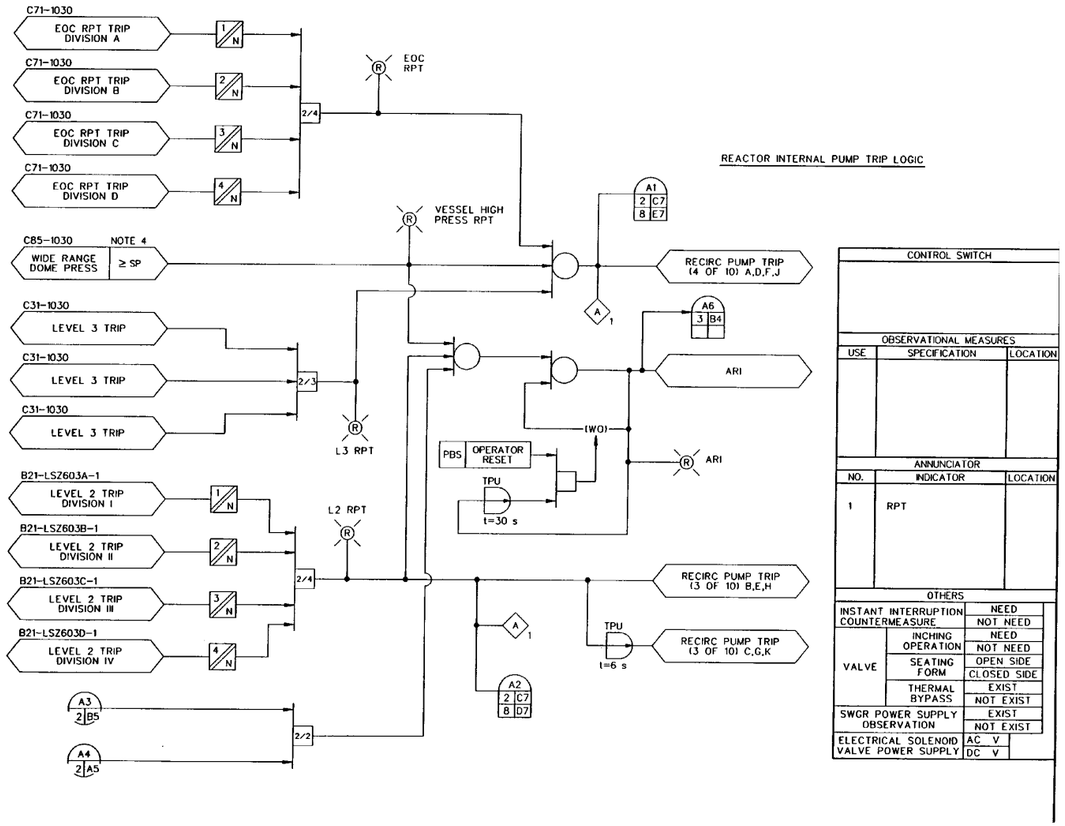
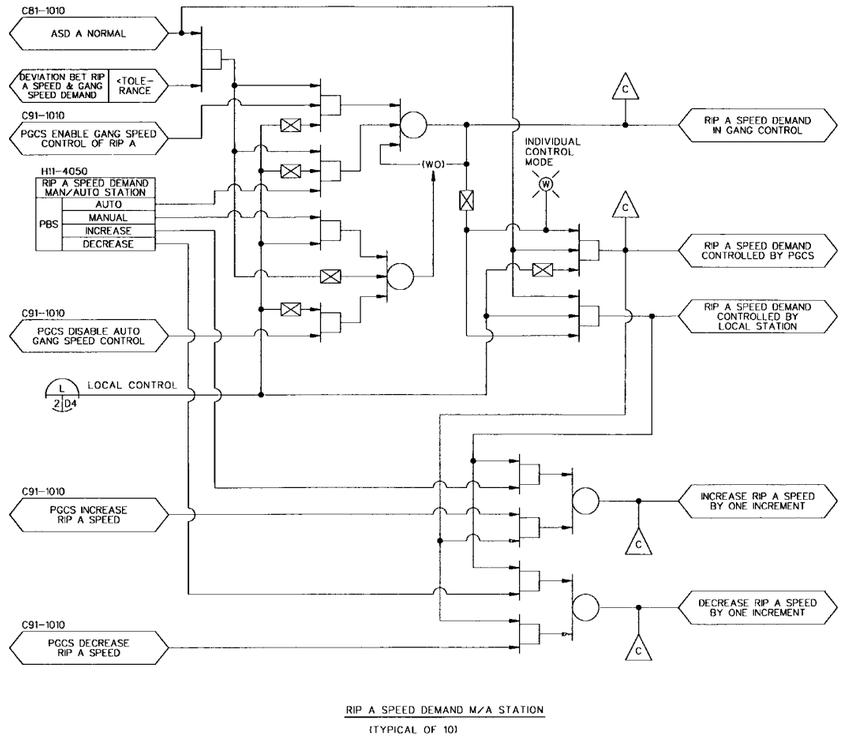


Figure 7.7-7 Recirculation Flow Control System IBD (Sheet 4 of 9)



CONTROL SWITCH					
RIP A SPEED DEMAND M/A STATION					
PBS	AUTO	MANUAL	IN-CREASE	DE-CREASE	

OBSERVATIONAL MEASURES		
USE	SPECIFICATION	LOCATION

ANNUNCIATOR		
NO.	INDICATOR	LOCATION

OTHERS		
INSTANT INTERRUPTION COUNTERMEASURE		NEED
		NOT NEED
VALVE	INCHING OPERATION	NEED
		NOT NEED
	SEATING FORM	OPEN SIDE
		CLOSED SIDE
	THERMAL BYPASS	EXIST
		NOT EXIST
SWGR POWER SUPPLY OBSERVATION		EXIST
		NOT EXIST
ELECTRICAL SOLENOID VALVE POWER SUPPLY		AC V
		DC V

Figure 7.7-7 Recirculation Flow Control System IBD (Sheet 5 of 9)

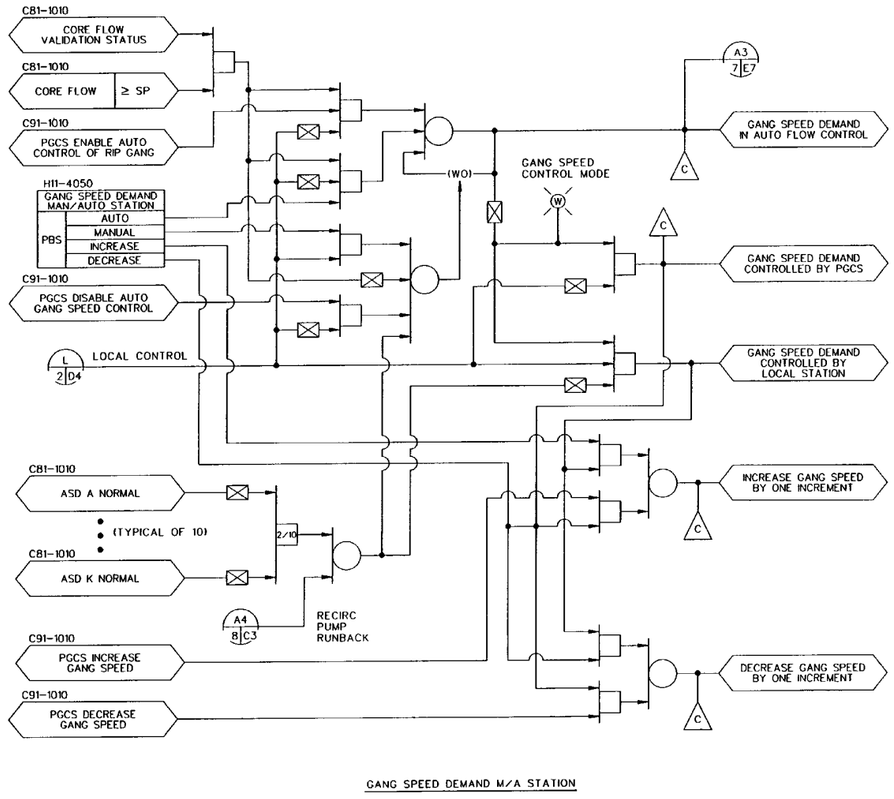


Figure 7.7-7 Recirculation Flow Control System IBD (Sheet 6 of 9)

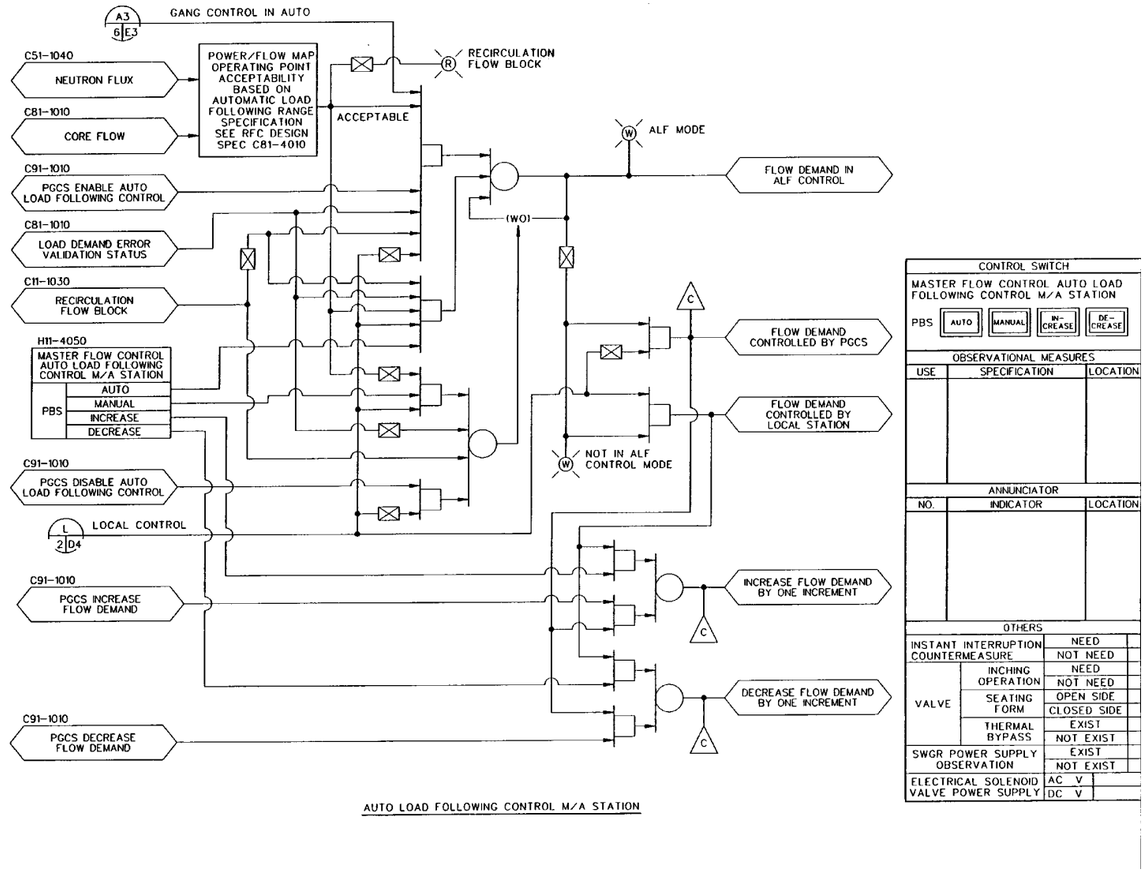
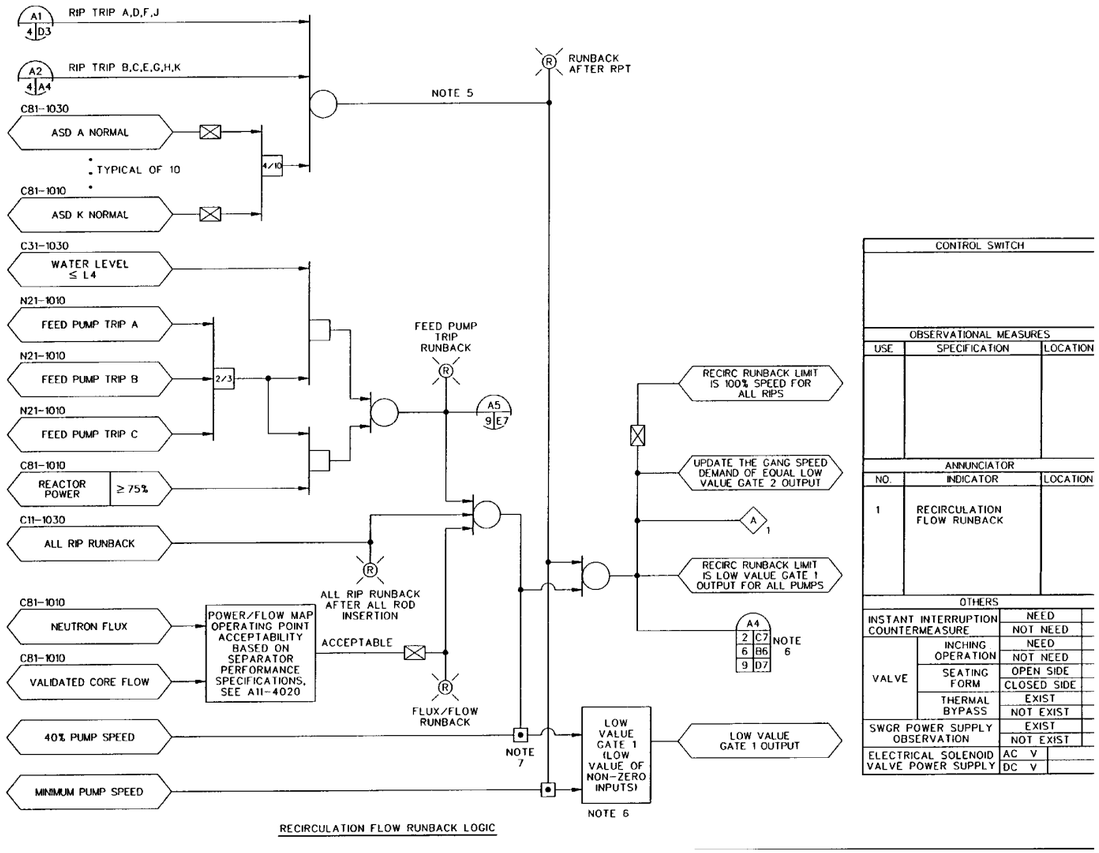
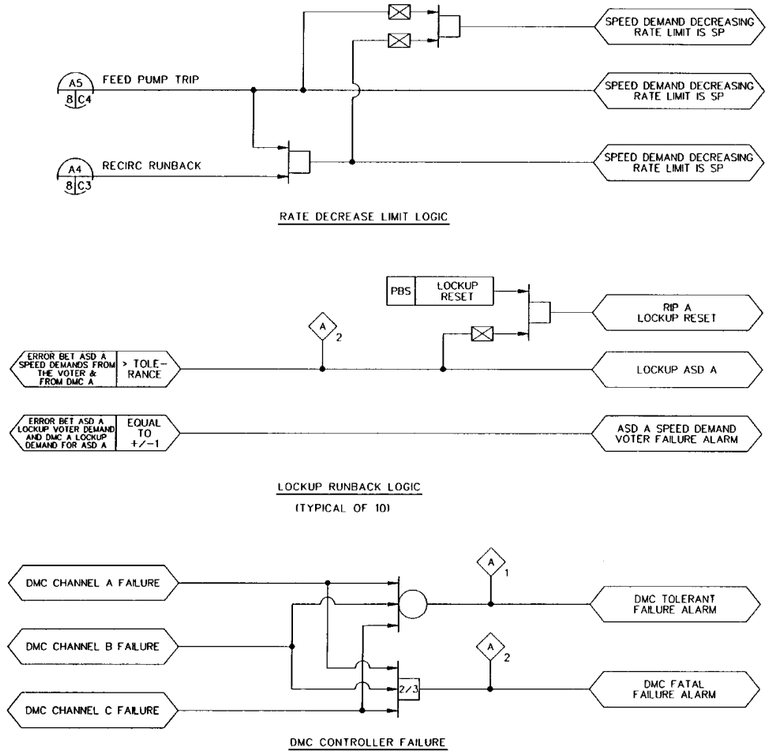


Figure 7.7-7 Recirculation Flow Control System IBD (Sheet 7 of 9)



RECIRCULATION FLOW RUNBACK LOGIC

Figure 7.7-7 Recirculation Flow Control System IBD (Sheet 8 of 9)



CONTROL SWITCH		
OBSERVATIONAL MEASURES		
USE	SPECIFICATION	LOCATION

ANNUNCIATOR		
NO.	INDICATOR	LOCATION
1	RFCS TOLERANT FAILURE	
2	RFCS FATAL FAILURE	

OTHERS			
INSTANT INTERRUPTION COUNTERMEASURE		NEED	
		NOT NEED	
VALVE	INCHING OPERATION	NEED	
		NOT NEED	
	SEATING FORM	OPEN SIDE	
		CLOSED SIDE	
	THERMAL BYPASS	EXIST	
		NOT EXIST	
SWGR POWER SUPPLY OBSERVATION		EXIST	
		NOT EXIST	
ELECTRICAL SOLENOID VALVE POWER SUPPLY		AC V	
		DC V	

Figure 7.7-7 Recirculation Flow Control System IBD (Sheet 9 of 9)

NOTES

1. EACH DIGITAL MEASUREMENT AND CONTROL (DMC) CHANNEL WILL RECEIVE THREE INPUTS (ONE FROM EACH MUX INTERFACE UNIT REPRESENTING EACH NEMS CHANNEL) FOR EACH INPUT SIGNAL WHICH IS SHOWN ON THE IED. SOME INPUT SIGNAL TRAINS ON THE IED REPRESENT SIGNALS FROM MORE THAN ONE SENSOR (i.e. THE NARROW RANGE WATER LEVEL WHICH HAS THREE SENSORS). IN THIS CASE, THE SINGLE IED INPUT TRAIN REPRESENTS ONE SIGNAL PER SENSOR TO EACH DMC CHANNEL. SEE DETAIL "B".

2. MULTIPLE OPERATOR INTERFACE COMMANDS ARE REPRESENTED BY THIS SIGNAL. THESE COMMANDS ARE LISTED BELOW. SEE THE FEEDWATER CONTROL SYSTEM IBD FOR MORE DETAIL.
   - A. FEEDWATER CONTROL LOCAL/PGC CONTROL SELECTION (2 SIGNALS)
   - B. 3E/1E MODE SELECTION (2 SIGNALS)
   - C. RFP A FLOW CONTROL MANUAL/AUTO SELECTION, INCREASE, DECREASE, FAST (5 SIGNALS)
   - D. RFP B FLOW CONTROL MANUAL/AUTO SELECTION, INCREASE, DECREASE, FAST (5 SIGNALS)
   - E. RFP C FLOW CONTROL MANUAL/AUTO SELECTION, INCREASE, DECREASE, FAST (5 SIGNALS)
   - F. LFCV FLOW CONTROL MANUAL/AUTO, SELECTION, INCREASE, DECREASE, FAST (5 SIGNALS)
   - G. CUW DUMP VALVE FLOW CONTROL MANUAL/AUTO SELECTION, INCREASE, DECREASE, FAST (5 SIGNALS)
   - H. CUW DUMP VALVE LEVEL CONTROL AUTO/MANUAL SELECTION, INCREASE, DECREASE, FAST (5 SIGNALS)
   - I. REACTOR WATER LEVEL SETPOINT INCREASE, DECREASE (2 SIGNALS)
   - J. REACTOR WATER LEVEL SETPOINT SETDOWN RESET LOGIC.

3. MULTIPLE PGCS SYSTEM INTERFACE COMMANDS ARE REPRESENTED BY THIS SIGNAL. THESE COMMANDS ARE LISTED BELOW. SEE THE FEEDWATER CONTROL SYSTEM IBD FOR MORE DETAIL.
   - A. PGCS FUNCTION OPERATIONAL (1 SIGNAL)
   - B. 3E/1E MODE SELECTION (2 SIGNALS)
   - C. ENABLE/DISABLE RFP A AUTOMATIC FLOW CONTROL, INCREASE, DECREASE, FAST (5 SIGNALS)
   - D. ENABLE/DISABLE RFP B AUTOMATIC FLOW CONTROL, INCREASE, DECREASE, FAST (5 SIGNALS)
   - E. ENABLE/DISABLE RFP C AUTOMATIC FLOW CONTROL, INCREASE, DECREASE, FAST (5 SIGNALS)
   - F. ENABLE/DISABLE LFCV FLOW CONTROL, INCREASE, DECREASE, FAST (5 SIGNALS)
   - G. ENABLE/DISABLE CUW DUMP VALVE AUTOMATIC FLOW CONTROL, INCREASE, DECREASE, FAST (5 SIGNALS)
   - H. ENABLE/DISABLE CUW DUMP VALVE AUTOMATIC LEVEL CONTROL, INCREASE, DECREASE, FAST (5 SIGNALS)

4. INTERCHANNEL COMMUNICATION LINKS ARE PROVIDED TO TRANSFER DATA BETWEEN PROCESSING CHANNELS. THESE ARE READ ONLY CONNECTIONS BETWEEN EACH PAIR OF DMC CHANNELS.

5. THE D/S AND A/S BUBBLES REPRESENT INDEPENDENT FIELD VOTER STATIONS WHICH ARE CONNECTED VIA MUX LINES TO THE DMC CHANNELS. THE D/S STATIONS RECEIVE THREE DISCRETE INPUTS AND OUTPUT ONE VOTED ON DISCRETE CONTACT CLOSURE OUTPUT. THE A/S STATIONS RECEIVE THREE DIGITAL REPRESENTATIONS OF ANALOG SIGNALS AND OUTPUT ONE VOTED ON ANALOG SIGNAL. SUFFIX R IN D/SR AND A/SR DENOTES THAT A RINGBACK SIGNAL IS SENT BACK TO THE PROCESS CONTROLLERS FOR VOTER FAILURE DETECTION.

6. THE D/SC AND A/SC BUBBLES REPRESENT MULTIPLE FUNCTIONS OF A SINGLE VOTER WHICH READS TRIPLICATED SIGNALS FROM THE MUX LINES AND VALIDATES A SINGLE INPUT SIGNAL FOR THE PROCESS COMPUTER. THE D/SC FUNCTIONS RECEIVE THREE DISCRETE INPUTS AND OUTPUT ONE VOTED ON DISCRETE DIGITAL SIGNAL TO THE PROCESS COMPUTER. THE A/SC FUNCTIONS RECEIVE THREE DIGITIZED ANALOG SIGNALS AND OUTPUT ONE VOTED ON DIGITIZED ANALOG SIGNAL.

7. MULTIPLE CONTROLLER STATUS SIGNALS ARE REPRESENTED BY THIS SIGNAL TRAIN, THESE STATUS SIGNALS ARE LISTED BELOW.
   - A. RFP A AUTO CONTROL ENABLED
   - B. RFP B AUTO CONTROL ENABLED
   - C. RFP C AUTO CONTROL ENABLED
   - D. RFP A CONTROL IN AUTO /MANUAL/PGC (3 SIGNALS)
   - E. RFP B CONTROL IN AUTO/MANUAL/PGC (3 SIGNALS)
   - F. RFP C CONTROL IN AUTO/MANUAL/PGC (3 SIGNALS)
   - G. LFCV CONTROL IN AUTO/MANUAL/PGC (3 SIGNALS)
   - H. CUW DUMP VALVE FLOW CONTROL IN AUTO/MANUAL/PGC (3 SIGNALS)
   - I. CUW DUMP VALVE LEVEL CONTROL IN AUTO/MANUAL/PGC (3 SIGNALS)

8. RFP OPERATING STATUS SIGNALS RECEIVED FROM N21-1010 SHALL BE TRUE WHEN PUMP IS RUNNING ABOVE MINIMUM SPEED.

9. ANNUNCIATOR (A) AND INDICATOR (I) TAKEOFFS GO TO THE MAIN CONTROL PANEL, H11-4050.

10. FEED PUMP FLOW LOOP M/A STATION LOGIC IS CONTAINED IN THE FEEDWATER CONTROL SYSTEM IBD, C31-1030.

11. MULTIPLE LOCKUP VOTER STATUS SIGNALS REPRESENTED BY THIS SIGNAL TRAIN.
    - A. RFP A LOCKUP VOTER STATUS
    - B. RFP B LOCKUP VOTER STATUS
    - C. RFP C LOCKUP VOTER STATUS
    - D. LFCV LOCKUP VOTER STATUS
    - E. CUW DUMP VALVE LOCKUP VOTER STATUS

12. FT TAG NUMBER SHOULD BE IN ACCORD WITH FE TAG NUMBER. IDENT NUMBERS OF FT ARE PRELIMINARY NUMBERS.

13. THE ADJUSTABLE SPEED DRIVES (ASDs) OUTPUT VARIABLE FREQUENCY AND VARIABLE VOLTAGE POWER TO THE RFP MOTORS. EACH ASD RECEIVES OPERATING STATUS SIGNALS DIRECTLY FROM THE OTHER ASDs. ASD OUTPUT IS MODULATED IN RESPONSE TO THE DEMAND SIGNAL FROM THE DMCs AND MAXIMUM OUTPUT IS LIMITED BASED ON THE NUMBER OF OPERATING ASDs. A LOCKUP SIGNAL RESULTS IN FIXED ASD OUTPUT AT THE FREQUENCY AND VOLTAGE AT THE TIME THE LOCKUP SIGNAL IS RECEIVED. A TRIP SIGNAL RESULTS IN THE REDUCTION OF ASD POWER OUTPUT TO ZERO. SEE THE FDWC SYSTEM DESIGN SPEC FOR DETAILS.

14. THE CUW DUMP VALVE CONTROL SCHEME CONSISTS OF TWO M/A STATIONS IN SERIES. THE FIRST M/A STATION PASSES THE MLC DEMAND WHEN IN AUTO OR GENERATES A FLOW DEMAND SIGNAL WHEN IN MANUAL MODE. THE SECOND M/A STATION PASSES THE CUW DUMP VALVE FLOW CONTROLLER DEMAND SIGNAL WHEN IN AUTO OR GENERATES A CUW DUMP VALVE POSITION DEMAND SIGNAL WHEN IN MANUAL MODE. THE FIRST M/A STATION IS IDENTIFIED AS THE "CUW DUMP VALVE LEVEL CONTROL M/A STATION" IN THE IBD. THE SECOND M/A STATION IS IDENTIFIED AS THE "CUW DUMP VALVE FLOW CONTROL M/A STATION" IN THE IBD. SEE DETAIL "C" AND THE IBD REF 1 FOR DETAILS.

SUPPLEMENTAL DOCUMENTS UNDER THE FOLLOWING IDENTITIES ARE TO BE USED IN CONJUNCTION WITH THIS DRAWING.

		REFERENCE DESIGNATOR
1.	FEEDWATER CONT SYS IBD	C31-1030
2.	NUCLEAR BOILER SYS P&ID	B21-1010
3.	REACTOR WATER CLEANUP SYSTEM P&ID	G31-1010
4.	TURBINE CONTROL SYSTEM IED	N32-1010
5.	PROCESS COMPUTER SYSTEM IED	C91-1010
6.	CONDENSATE, FEEDWATER AND CONDENSATE AIR EXTRACTION SYSTEM P&ID	N21-1010
7.	RECIRCULATION FLOW CONTROL SYSTEM IED	C81-1010
8.	MAIN CONTROL ROOM PANELS ARGMT	H11-4050
9.	NEUTRON MONITORING SYSTEM IED	C51-1010

MPL NO. C31-1010

Figure 7.7-8 Feedwater Control System IED (Sheet 1 of 3)

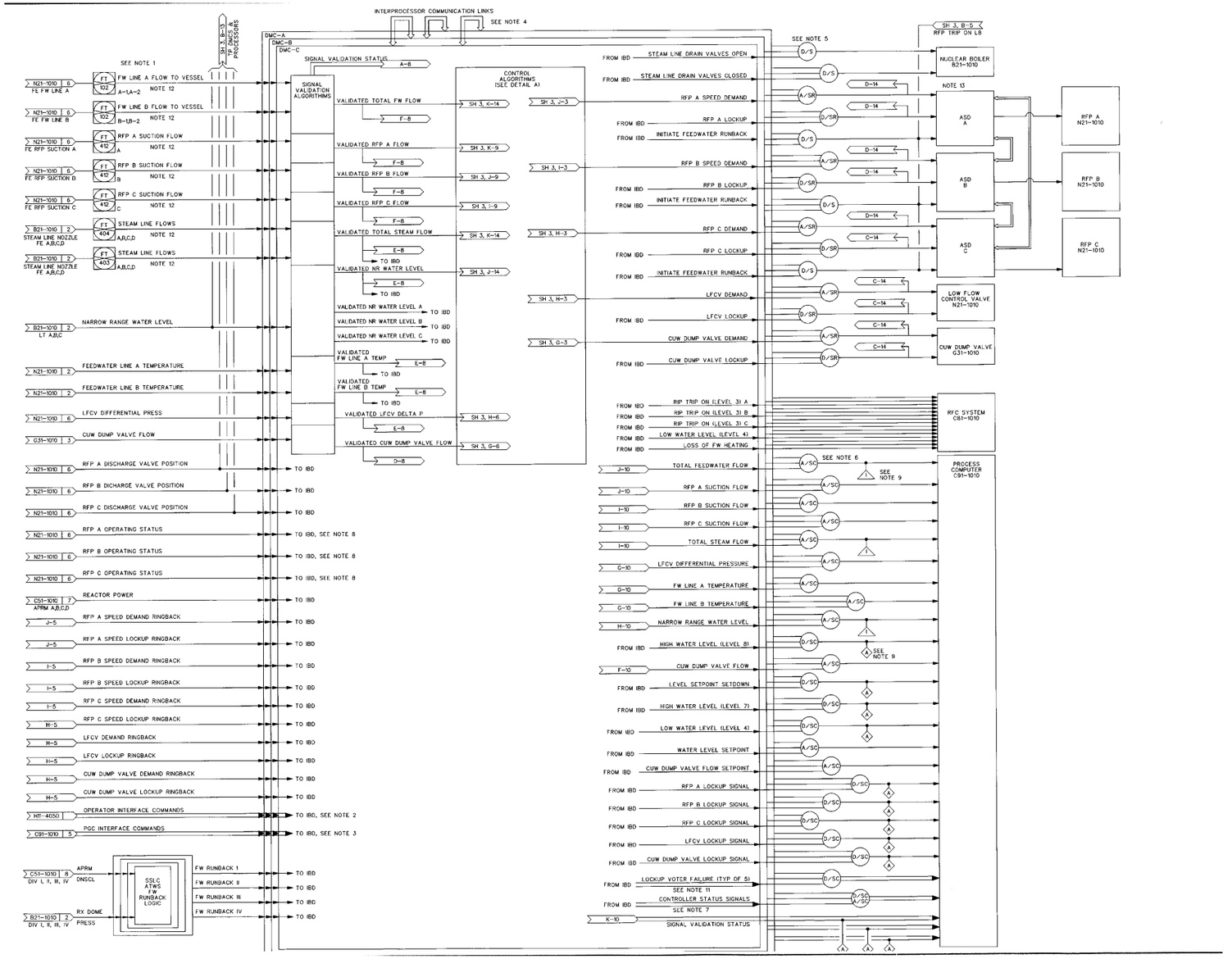


Figure 7.7-8 Feedwater Control System IED (Sheet 2 of 3)

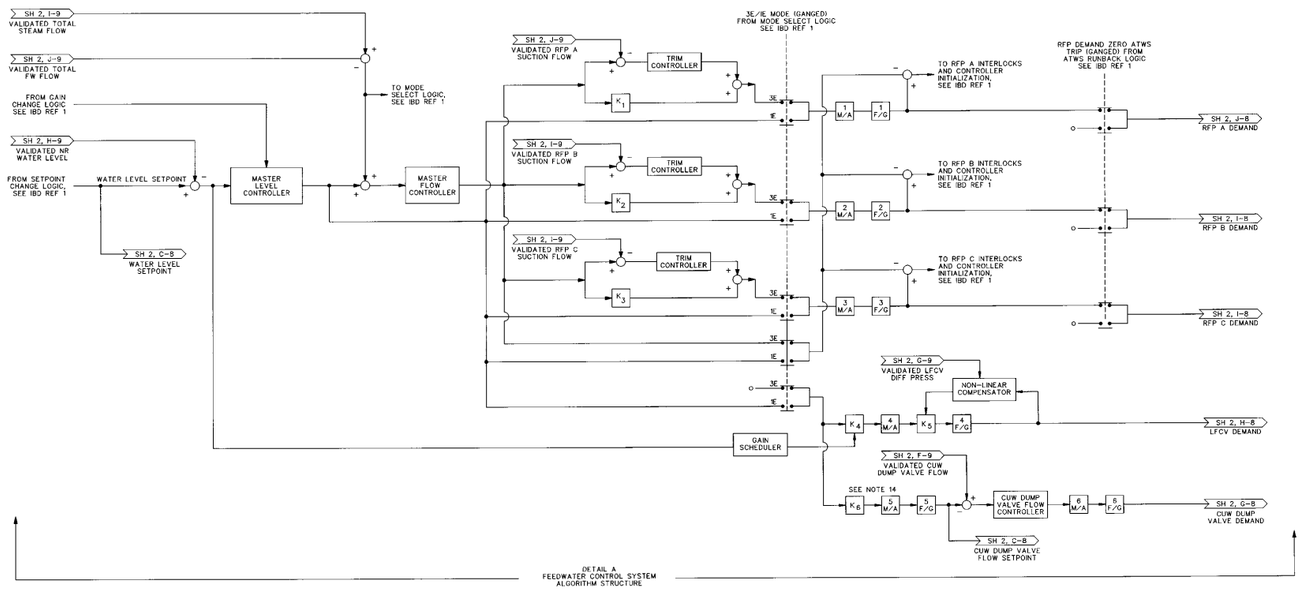


Figure 7.7-8 Feedwater Control System IED (Sheet 3 of 3)

NOTES:

1. LOCAL CONTROL ALLOWS THE OPERATOR TO EITHER MANUALLY MANIPULATE DEMAND SIGNALS OR PLACE THEM IN AUTOMATIC CONTROL AT MANUAL/AUTO STATIONS. POWER GENERATION CONTROL SYSTEM (PGC) CONTROL ALLOWS THE COMPUTER TO DIRECTLY MANIPULATE DEMAND SIGNALS AT THE M/A STATION OR PLACE THEM IN AUTOMATIC CONTROL.

2. MULTIPLE TRANSMITTER SIGNAL INPUTS FOR SIMILAR PROCESS SIGNALS ARE, IN GENERAL, COMBINED INTO SINGLE SIGNALS WITHIN EACH DMC CHANNEL BY THE SIGNAL VALIDATION ALGORITHMS. IN THE CASE OF FLOW RATES IN PARALLEL FLOW PATHS (SUCH AS INDIVIDUAL STEAM LINE FLOWS), THIS INVOLVES SUMMING THE FLOWS TO OBTAIN TOTAL FLOW. IN THE CASE OF REDUNDANT TRANSMITTER SIGNALS (SUCH AS REACTOR WATER LEVEL), THIS INVOLVES DETERMINATION OF A SINGLE VALID VALUE FOR THE PARAMETER. IN THIS DOCUMENT, THE COMBINED SINGLE VALIDATED SIGNAL IS SHOWN IN GENERAL. ONE EXCEPTION IS THE REACTOR WATER LEVEL SIGNALS USED FOR ATWS MITIGATION LEVEL 3 SIGNAL ISSUED TO THE RFCS SYSTEM (RPT). IN THIS CASE, ALL THREE LEVEL TRIP SIGNALS MUST BE SENT TO RFCS, AND RFCS COMBINES THE TRIP SIGNALS FOR THE ATWS RPT LOGIC. THEREFORE, ALL THREE LEVEL TRANSMITTER SIGNALS ARE SHOWN IN THE LOGIC DEPICTION.

3. THE PUSH BUTTON SWITCH (PBS) SENDS A HIGH SIGNAL FOR AT LEAST ONE COMPLETE SAMPLING PERIOD.

4. THE STATUS INDICATOR  IS DISPLAYED ON FDWC DEDICATED SOFTWARE FACED DISPLAY.

5. LOGIC FOR ONE DMC, TYPICAL OF ALL THREE DMCs, IS SHOWN. FOR REFERENCE PURPOSES ONLY, ANNUNCIATORS AND COMPUTER POINT SYMBOLS ARE SHOWN HERE. THESE OUTPUTS ARE ACTUALLY IMPLEMENTED BY VOTERS AS SHOWN IN REFERENCE C31-1010.

6. DELETED

7. TRIP FUNCTION SHOWN WITHIN DASH LINES ARE PERFORMED BY INDEPENDENT MICROPROCESSOR NUMBER 2. ALL OTHER FUNCTIONS ARE PERFORMED BY MICROPROCESSOR NUMBER 1.

8. LOGIC FOR ATWS FEEDWATER RUNBACK SHOWN WITHIN DASHED LINES IS PERFORMED BY SAFETY SYSTEM LOGIC AND CONTROL (SSLC). LOGIC IS FOR SSLC DIV I AND TYPICAL FOR DIVISIONS II, III AND IV.

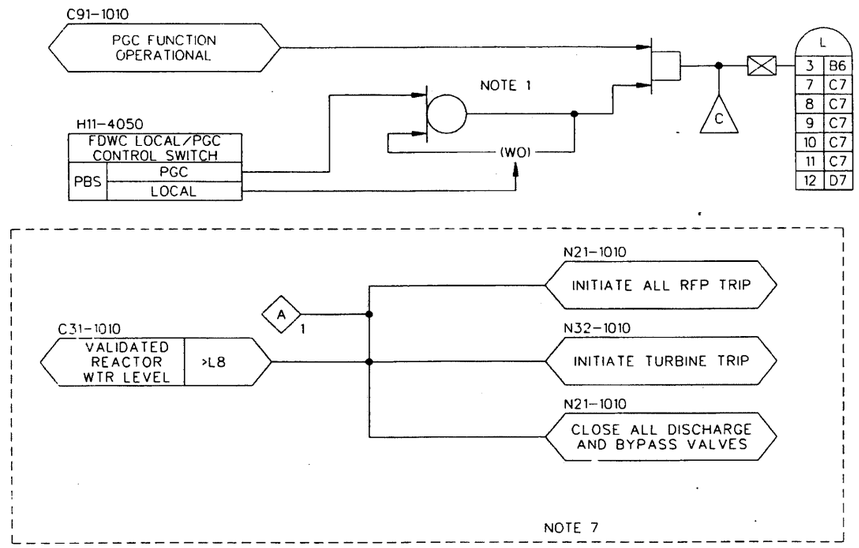
TABLE OF CONTENTS

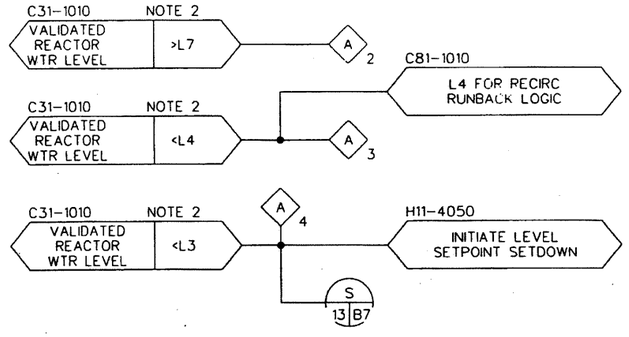
SUPPLEMENTAL DOCUMENTS UNDER THE FOLLOWING IDENTITIES ARE TO BE USED IN CONJUNCTION WITH THIS DRAWING.

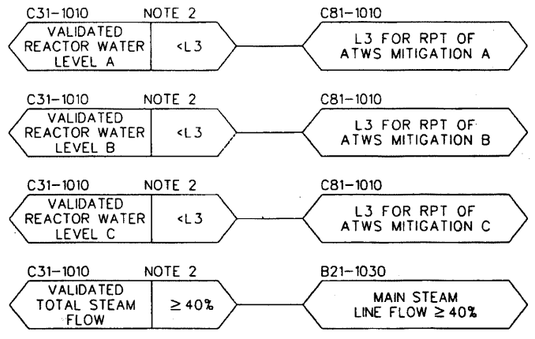
	REFERENCE DESIGNATOR
1. FEEDWATER CONTROL SYSTEM, IED	C31-1010
2. RECIRCULATION FLOW CONTROL SYSTEM, IED	C81-1010
3. CONDENSATE, FEEDWATER & CONDENSATE AIR EXTRACTION SYSTEM, P&ID	N21-1010
4. CONDENSATE, FEEDWATER & CONDENSATE AIR EXTRACTION SYSTEM, IBD	N21-1030
5. REACTOR WATER CLEANUP SYSTEM, P&ID	G31-1010
6. REACTOR WATER CLEANUP SYSTEM, IBD	G31-1030
7. NUCLEAR BOILER SYSTEM, P&ID	B21-1010
8. NUCLEAR BOILER SYSTEM, IBD	B21-1030
9. PROCESS COMPUTER, IED	C91-1010
10. RECIRCULATION FLOW CONTROL SYSTEM, IBD	C81-1030
11. MAIN CONTROL ROOM PANEL, ARGMT	H11-4050
12. TURBINE CONTROL SYSTEM, IED	N32-1010
13. TURBINE CONTROL SYSTEM, IBD	N32-1030
14. NEUTRON MONITORING SYSTEM, IED	C51-1010

MPL NO. C31-1030

Figure 7.7-9 Feedwater Control System IBD (Sheet 1 of 14)







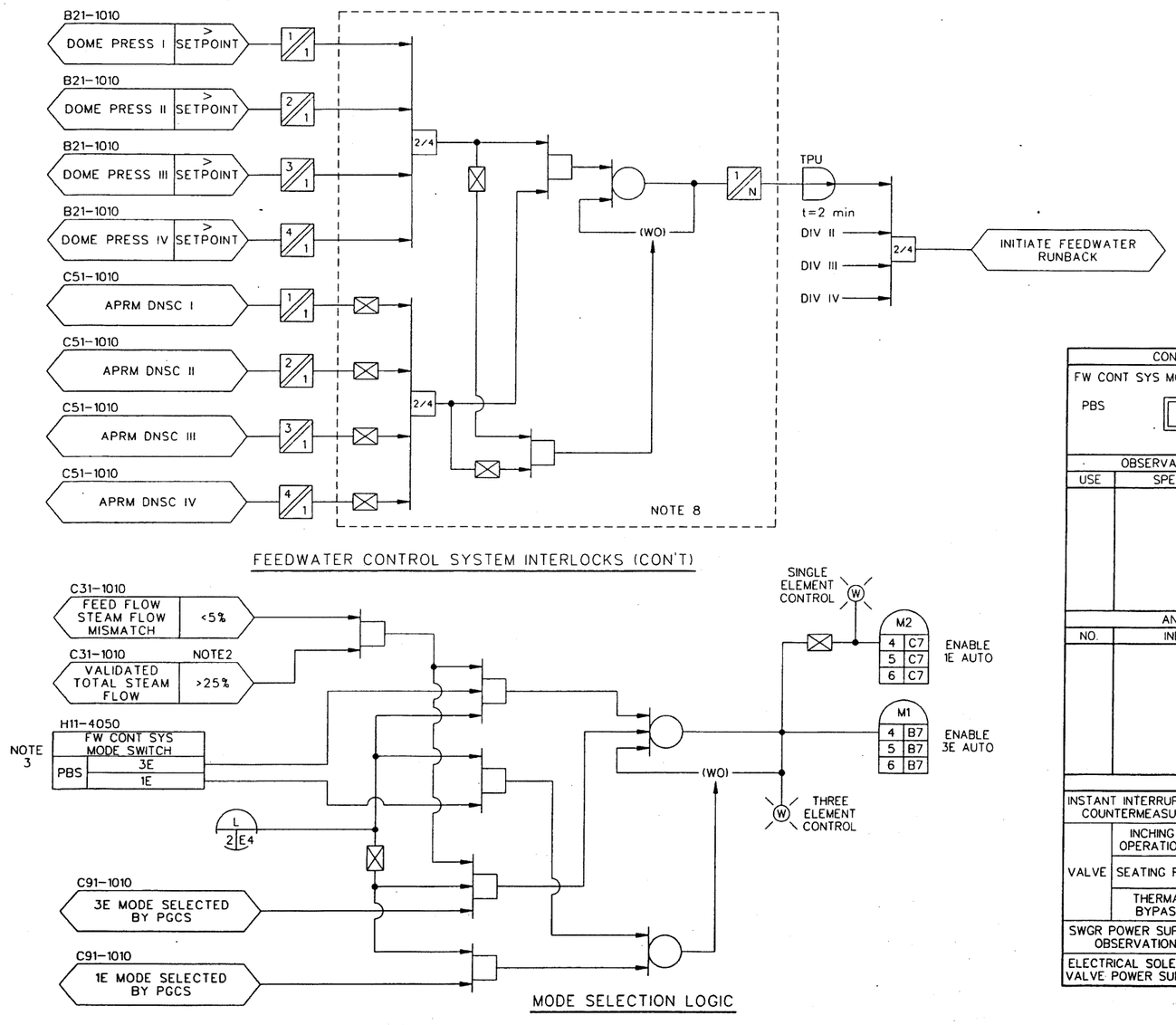
FEEDWATER CONTROL SYSTEM INTERLOCKS

CONTROL SWITCH			
FDWC LOCAL PGC CONTROL SWITCH			
PBS	PGC / LOCAL		
OBSERVATIONAL MEASURES			
USE	SPECIFICATION	LOCATION	
ANNUNCIATOR			
NO.	INDICATOR	LOCATION	
1	HIGH WATER LEVEL (8)	H11-4050	
2	HIGH WATER LEVEL (7)	H11-4050	
3	LOW WATER LEVEL (4)	H11-4050	
4	LEVEL SETPOINT SET DOWN	H11-4050	
OTHERS			
INSTANT INTERRUPTION COUNTERMEASURE		NEED	
		NOT NEED	
VALVE	INCHING OPERATION	NEED	
		NOT NEED	
	SEATING FORM	OPEN SIDE	
		CLOSED SIDE	
	THERMAL BYPASS	EXIST	
		NOT EXIST	
SWGR POWER SUPPLY OBSERVATION		EXIST	
		NOT EXIST	
ELECTRICAL SOLENOID VALVE POWER SUPPLY		AC V	
		DC V	

Figure 7.7-9 Feedwater Control System IBD (Sheet 2 of 14)

DELETED

Figure 7.7-9 Feedwater Control System IBD (Sheet 2a of 14)



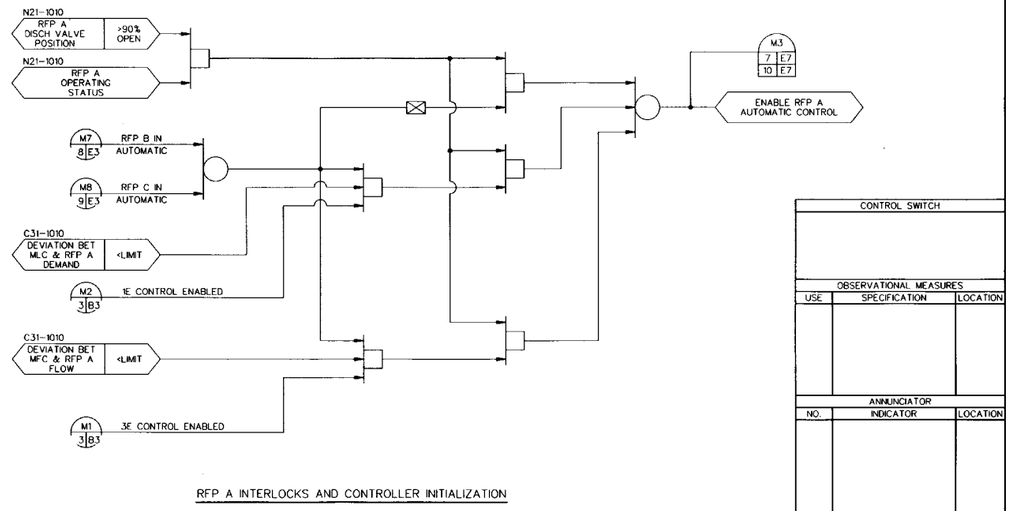
CONTROL SWITCH		
FW CONT SYS MODE SWITCH		
PBS	1E	3E

OBSERVATIONAL MEASURES		
USE	SPECIFICATION	LOCATION

ANNUNCIATOR		
NO.	INDICATOR	LOCATION

OTHERS			
INSTANT INTERRUPTION COUNTERMEASURE		NEED	
		NOT NEED	
VALVE	INCHING OPERATION	NEED	
		NOT NEED	
	SEATING FORM	OPEN SIDE	
		CLOSED SIDE	
	THERMAL BYPASS	EXIST	
		NOT EXIST	
SWGR POWER SUPPLY OBSERVATION		EXIST	
		NOT EXIST	
ELECTRICAL SOLENOID VALVE POWER SUPPLY		AC V	
		DC V	

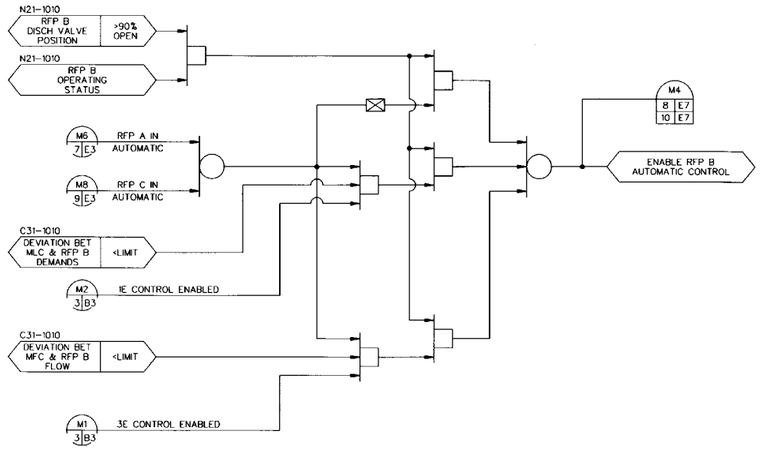
Figure 7.7-9 Feedwater Control System IBD (Sheet 3 of 14)



RFP A INTERLOCKS AND CONTROLLER INITIALIZATION

CONTROL SWITCH			
OBSERVATIONAL MEASURES			
USE	SPECIFICATION		LOCATION
ANNUNCIATOR			
NO.	INDICATOR		LOCATION
OTHERS			
INSTANT INTERRUPTION COUNTERMEASURE		NEED	
		NOT NEED	
VALVE	INCHING OPERATION	NEED	
		NOT NEED	
	SEATING FORM	OPEN SIDE	
		CLOSED SIDE	
	THERMAL BYPASS	EXIST	
		NOT EXIST	
SWGR POWER SUPPLY OBSERVATION		EXIST	
		NOT EXIST	
ELECTRICAL SOLENOID VALVE POWER SUPPLY		AC V	
		DC V	

Figure 7.7-9 Feedwater Control System IBD (Sheet 4 of 14)



RFP B INTERLOCKS AND CONTROLLER INITIALIZATION

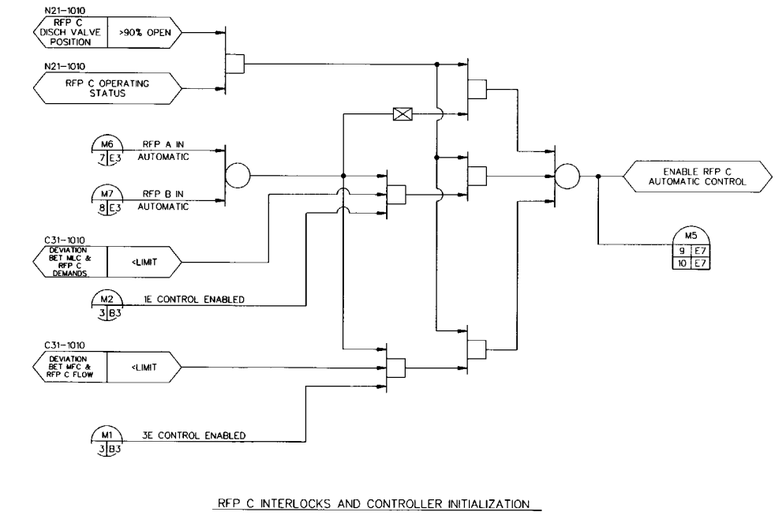
CONTROL SWITCH			

OBSERVATIONAL MEASURES		
USE	SPECIFICATION	LOCATION

ANNUNCIATOR		
NO.	INDICATOR	LOCATION

OTHERS			
INSTANT INTERRUPTION COUNTERMEASURE		NEED	
		NOT NEED	
VALVE	INCHING OPERATION	NEED	
		NOT NEED	
	SEATING FORM	OPEN SIDE	
		CLOSED SIDE	
	THERMAL BYPASS	EXIST	
		NOT EXIST	
SWGR POWER SUPPLY OBSERVATION		EXIST	
		NOT EXIST	
ELECTRICAL SOLENOID VALVE POWER SUPPLY		AC V	
		DC V	

Figure 7.7-9 Feedwater Control System IBD (Sheet 5 of 14)



RFP C INTERLOCKS AND CONTROLLER INITIALIZATION

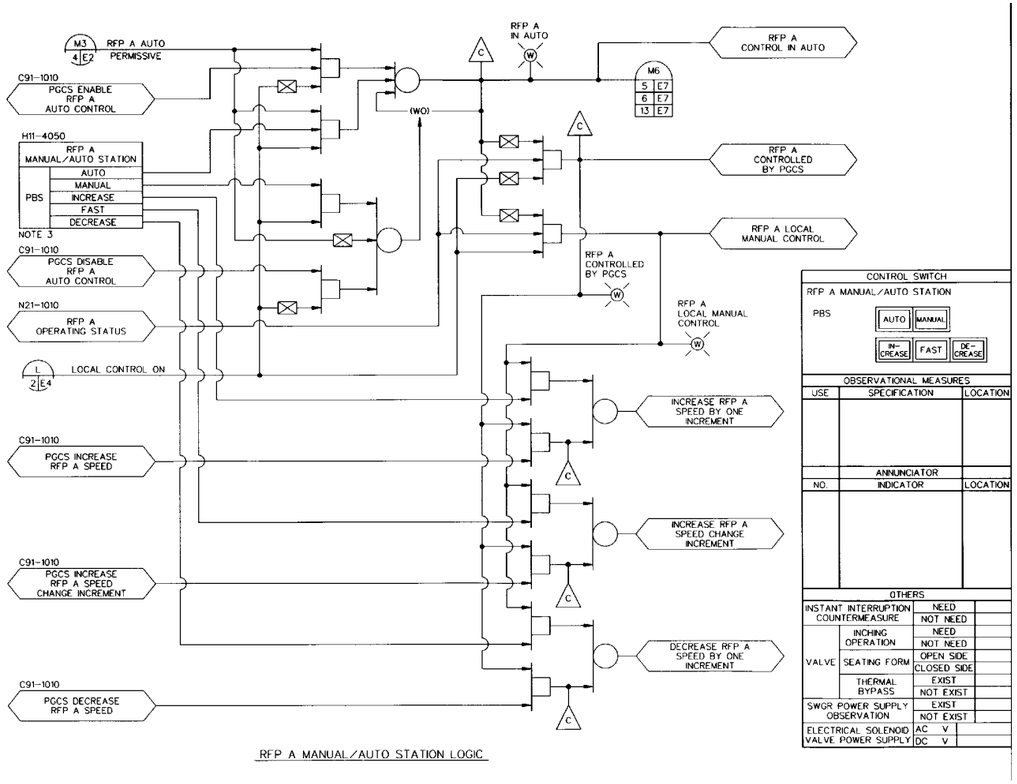
CONTROL SWITCH			

OBSERVATIONAL MEASURES		
USE	SPECIFICATION	LOCATION

ANNUNCIATOR		
NO.	INDICATOR	LOCATION

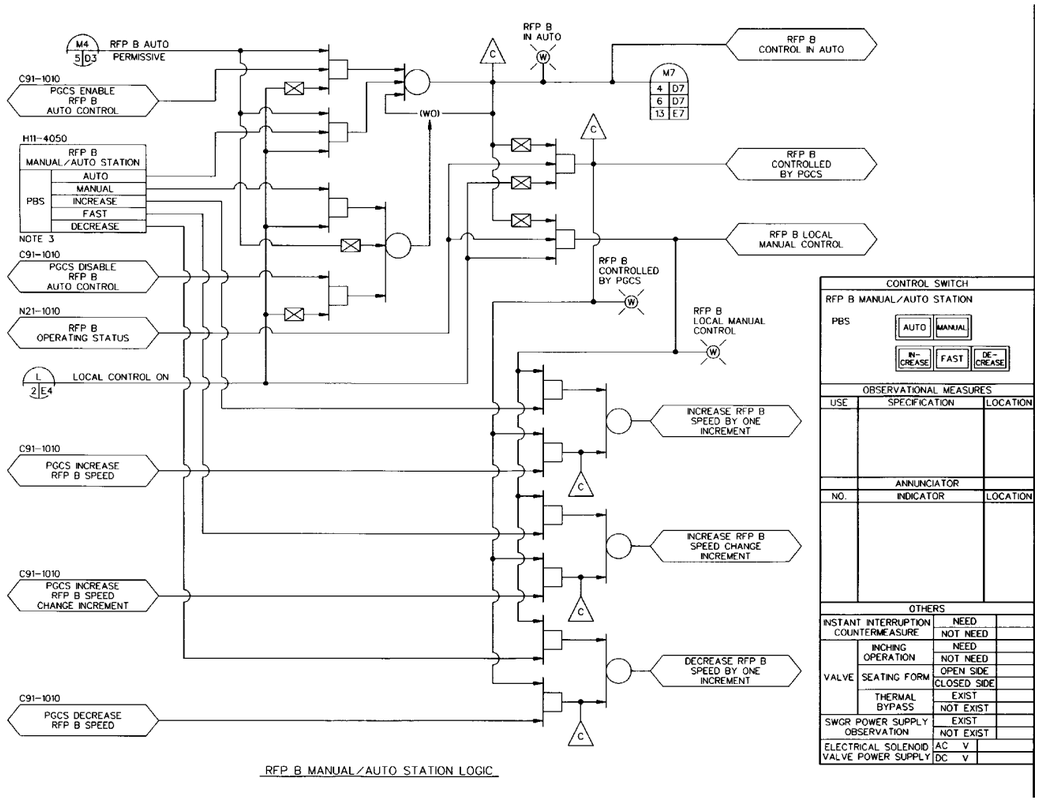
OTHERS			
INSTANT INTERRUPTION COUNTERMEASURE		NEED	
		NOT NEED	
VALVE	INCHING OPERATION	NEED	
		NOT NEED	
	SEATING FORM	OPEN SIDE	
		CLOSED SIDE	
	THERMAL BYPASS	EXIST	
		NOT EXIST	
SWGR POWER SUPPLY OBSERVATION		EXIST	
		NOT EXIST	
ELECTRICAL SOLENOID VALVE POWER SUPPLY		AC V	
		DC V	

Figure 7.7-9 Feedwater Control System IBD (Sheet 6 of 14)



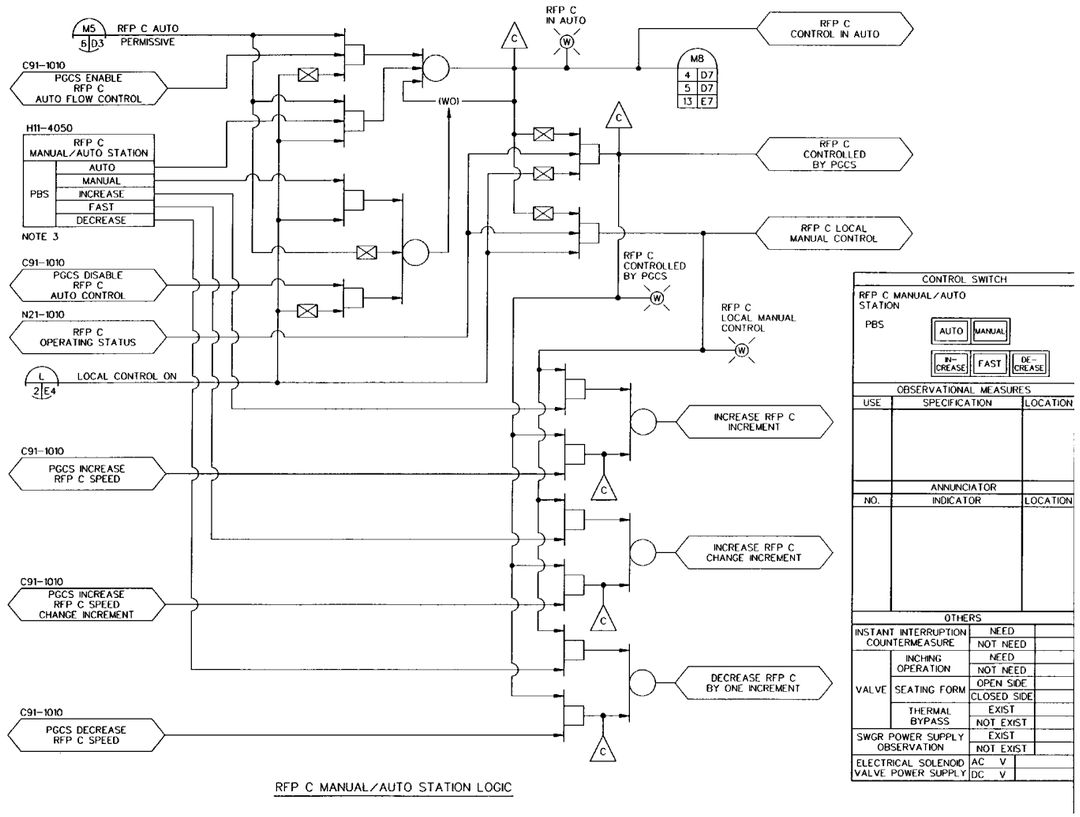
RFP A MANUAL/AUTO STATION LOGIC

Figure 7.7-9 Feedwater Control System IBD (Sheet 7 of 14)



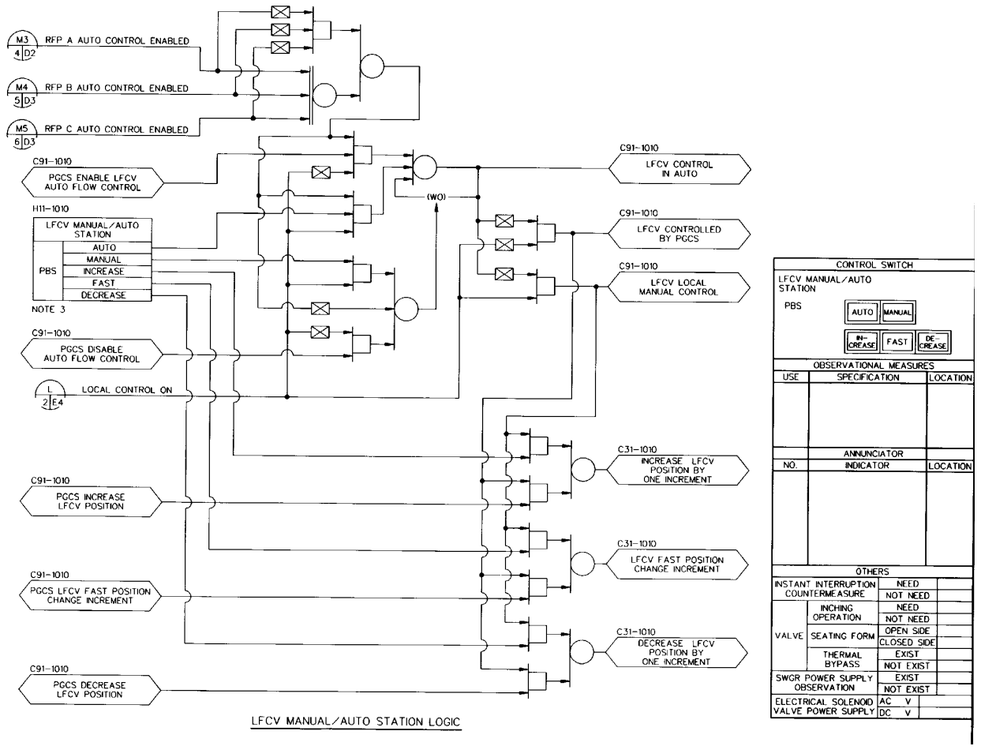
RFP B MANUAL/AUTO STATION LOGIC

Figure 7.7-9 Feedwater Control System IBD (Sheet 8 of 14)



RFP C MANUAL/AUTO STATION LOGIC

Figure 7.7-9 Feedwater Control System IBD (Sheet 9 of 14)



CONTROL SWITCH

LFCV MANUAL/AUTO STATION

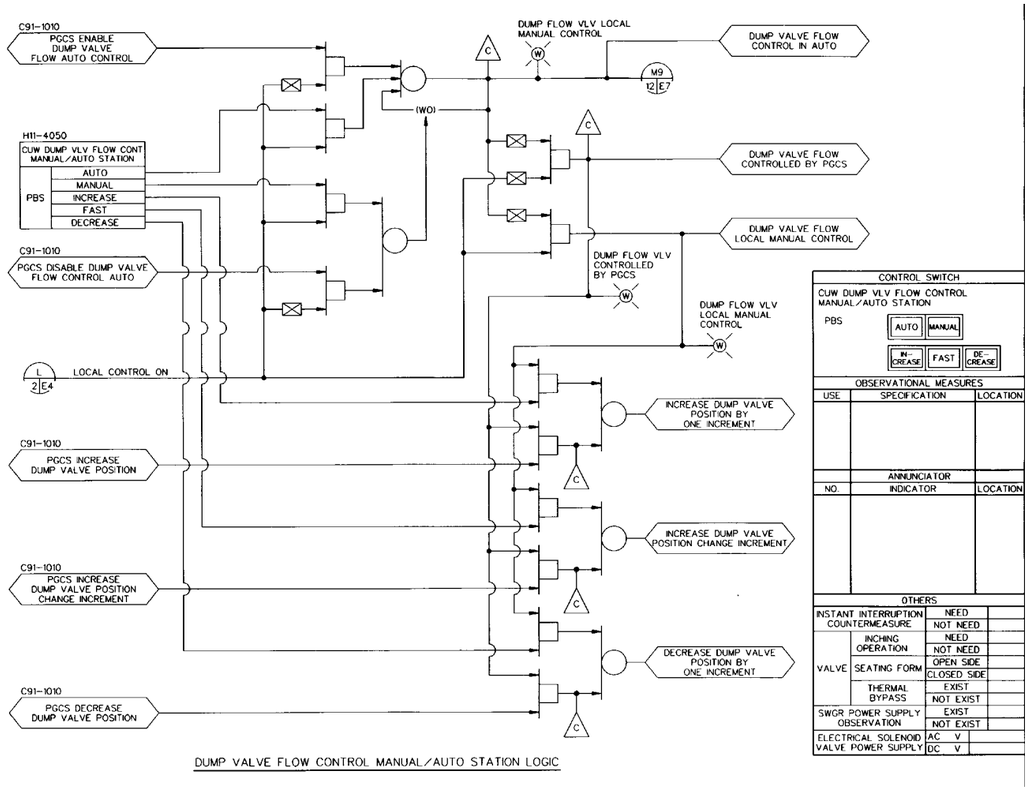
PBS: AUTO | MANUAL | INCREASE | FAST | DECREASE

OBSERVATIONAL MEASURES		
USE	SPECIFICATION	LOCATION

ANNUNCIATOR		
NO.	INDICATOR	LOCATION

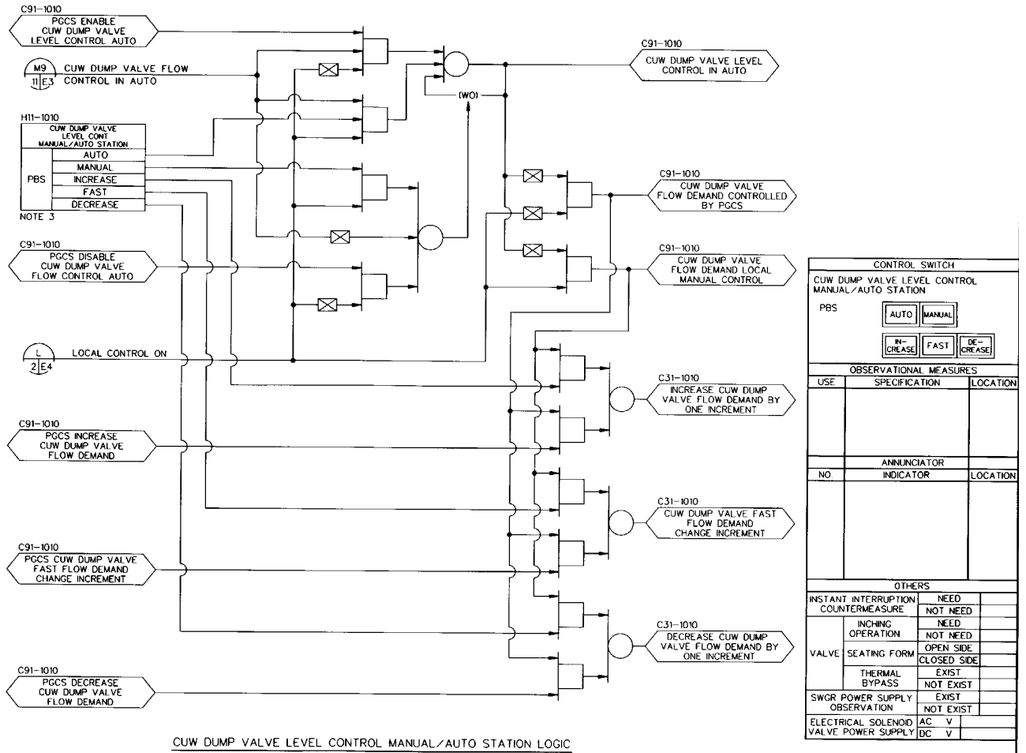
OTHERS			
INSTANT INTERRUPTION COUNTERMEASURE		NEED	
		NOT NEED	
VALVE	INCHING OPERATION	NEED	
		NOT NEED	
	SEATING FORM	OPEN SIDE	
		CLOSED SIDE	
	THERMAL BYPASS	EXIST	
		NOT EXIST	
SWGR POWER SUPPLY OBSERVATION		EXIST	
		NOT EXIST	
ELECTRICAL SOLENOID VALVE POWER SUPPLY		AC V	
		DC V	

Figure 7.7-9 Feedwater Control System IBD (Sheet 10 of 14)



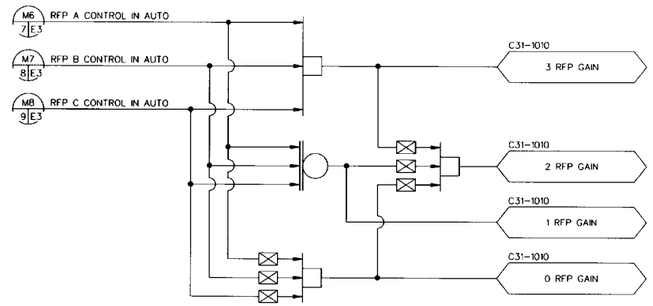
DUMP VALVE FLOW CONTROL MANUAL/AUTO STATION LOGIC

Figure 7.7-9 Feedwater Control System IBD (Sheet 11 of 14)

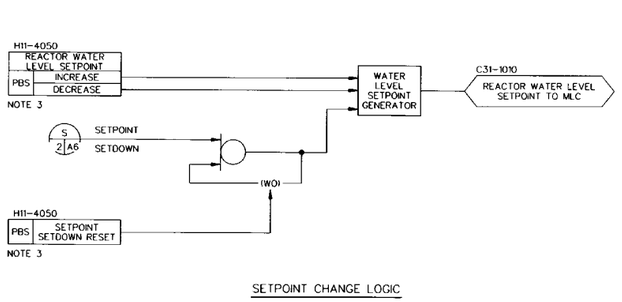


CUW DUMP VALVE LEVEL CONTROL MANUAL/AUTO STATION LOGIC

Figure 7.7-9 Feedwater Control System IBD (Sheet 12 of 14)



GAIN CHANGE LOGIC



SETPOINT CHANGE LOGIC

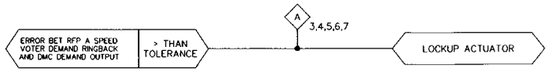
CONTROL SWITCH			
REACTOR WATER LEVEL SETPOINT			
PBS	INCREASE	DECREASE	
SETPOINT SETDOWN RESET			
PBS	RESET		

OBSERVATIONAL MEASURES		
USE	SPECIFICATION	LOCATION

ANNUNCIATOR		
NO.	INDICATOR	LOCATION

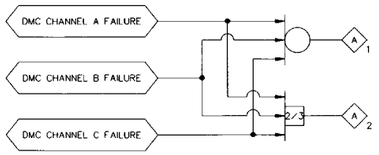
OTHERS		
INSTANT INTERRUPTION COUNTERMEASURE	NEED	
	NOT NEED	
VALVE	INCHING OPERATION	NEED
		NOT NEED
	SEATING FORM	OPEN SIDE
		CLOSED SIDE
	THERMAL BYPASS	EXIST
		NOT EXIST
SWGR POWER SUPPLY OBSERVATION	EXIST	
	NOT EXIST	
ELECTRICAL SOLENOID VALVE POWER SUPPLY	AC V	
	DC V	

Figure 7.7-9 Feedwater Control System IBD (Sheet 13 of 14)

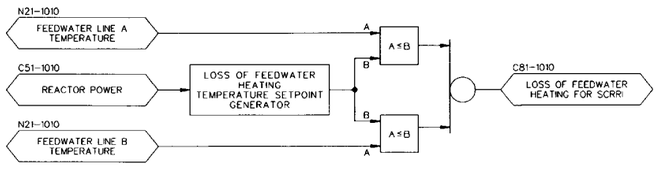


ACTUATOR LOCKUP LOGIC
(TYPICAL OF RFP A, B, C, LFCV, AND CUW DUMP VALVE LOCKUP SIGNALS)

LOCKUP RINGBACK LOGIC
(TYPICAL OF RFP A, B, C, LFCV, AND CUW DUMP VALVE VOTER FAILURE ALARMS)



DMC CONTROLLER FAILURE ALARMS



LOSS OF FEEDWATER HEATING LOGIC

CONTROL SWITCH		

OBSERVATIONAL MEASURES		
USE	SPECIFICATION	LOCATION

ANNUNCIATOR		
NO.	INDICATOR	LOCATION
1	FDWC DMC TOLERANT FAILURE	H11-4050
2	FDWC DMC FATAL FAILURE	H11-4050
3	RFP A LOCKUP	H11-4050
4	RFP B LOCKUP	H11-4050
5	RFP C LOCKUP	H11-4050
6	LFCV LOCKUP	H11-4050
7	CUW DUMP VLV LOCKUP	H11-4050

OTHERS		
INSTANT INTERRUPTION COUNTERMEASURE	NEED	
	NOT NEED	
VALVE	INCHING OPERATION	NEED
		NOT NEED
	SEATING FORM	OPEN SIDE
		CLOSED SIDE
	THERMAL BYPASS	EXIST
		NOT EXIST
SWGR POWER SUPPLY OBSERVATION	EXIST	
	NOT EXIST	
ELECTRICAL SOLENOID VALVE POWER SUPPLY	AC V	
	DC V	

Figure 7.7-9 Feedwater Control System IBD (Sheet 14 of 14)

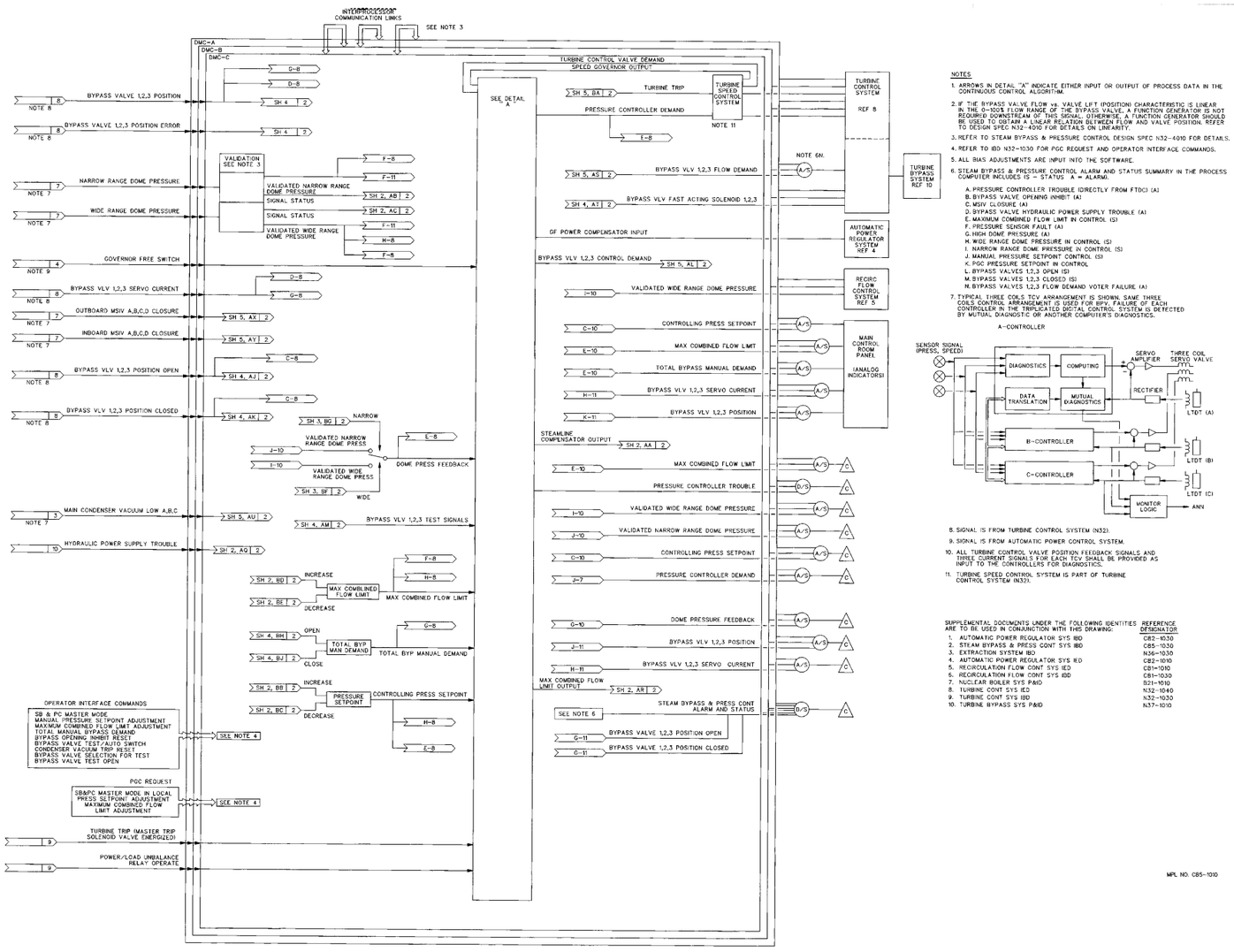
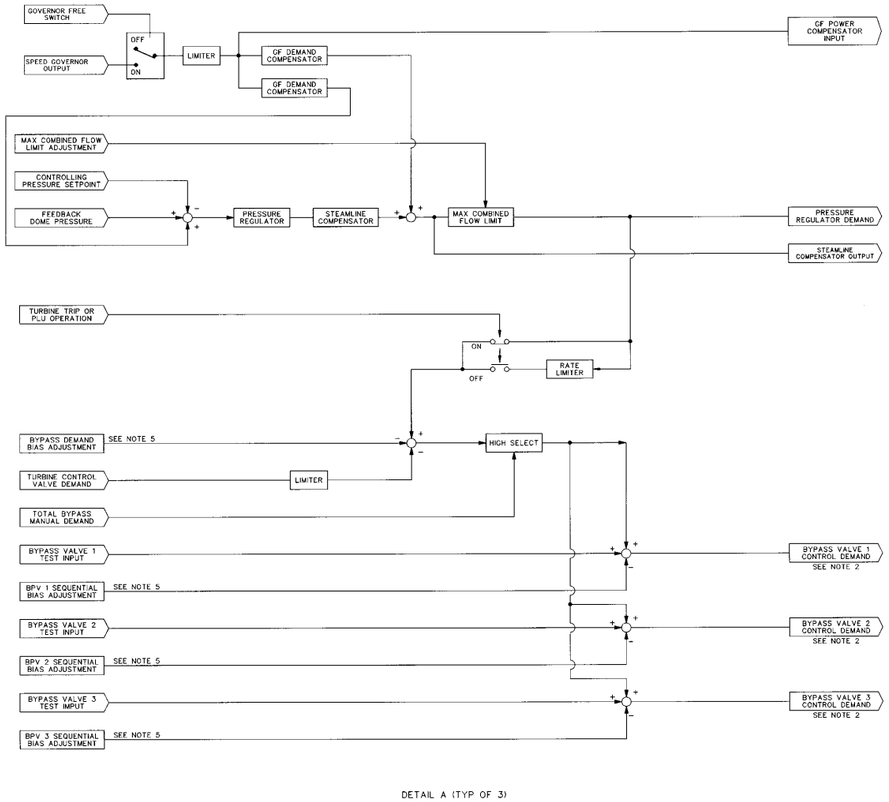


Figure 7.7-12 Steam Bypass and Pressure Control System IED (Sheet 1 of 2)



DETAIL A (TYP OF 3)

Figure 7.7-12 Steam Bypass and Pressure Control System IED (Sheet 2 of 2)

NOTES:

1. DELAY TIME IS TO BE DETERMINED BASED ON MSIV CLOSING TIME CHARACTERISTICS. REFER TO N32-4010 FOR RECOMMENDATION.
2. FOR THE SIGNAL SOURCE CHARACTERISTICS, REFER TO SB & PC DESIGN SPECIFICATION, N32-4010.
3. COMPLETION OF THE COLUMN OF THE OPERATING CONTROLS AND SUPERVISORY INSTRUMENTS ARE PENDING FOR THE DETAIL DESIGN.
4. EACH BPV POSITION FEEDBACK SIGNAL IS PROVIDED TO EACH CONTROLLER. A COMPARATOR TO INITIATE THE BPV POSITION ERROR "LARGE" SIGNAL IS INCLUDED IN EACH CONTROLLER. THEREFORE, THREE (3) BPV POSITION ERROR "LARGE" SIGNALS PER EACH BPV ARE PROVIDED TO TURBINE CONTROL SYSTEM. AFTER 2 OUT OF 3 LOGIC, EACH BPV FAST ACTING SOLENOID SHALL BE ENERGIZED. IF ONE OF THE THREE CONTROLLERS OR THREE COILS PER EACH BPV FAILS, THEN THE COMPARATOR SHALL INITIATE THE BPV POSITION ERROR "LARGE" SIGNAL BECAUSE OF AVOIDANCE FOR NO BPV AT TURBINE TRIP OR LOAD REJECTION.

SUPPLEMENTAL DOCUMENTS UNDER THE FOLLOWING IDENTITIES ARE TO BE USED IN CONJUNCTION WITH THIS DRAWING.

		REFERENCE DESIGNATOR
1.	STEAM BYPASS & PRESS CONTROL SYS IED	C85-1010
2.	RECIRCULATION FLOW CONT SYS IED	C81-1010
3.	RECIRCULATION FLOW CONT SYS IBD	C81-1030
4.	NUCLEAR BOILER SYS P&ID	B21-1010
5.	TURBINE CONTROL SYSTEM IED	N32-1010
6.	TURBINE CONTROL SYSTEM IBD	N32-1030
7.	TURBINE BYPASS SYS IED	N37-1010
8.	MAIN CONDENSER SYSTEM IBD	N61-1030

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MPL NO. C85-1030

Figure 7.7-13 Steam Bypass and Pressure Control System IBD (Sheet 1 of 5)

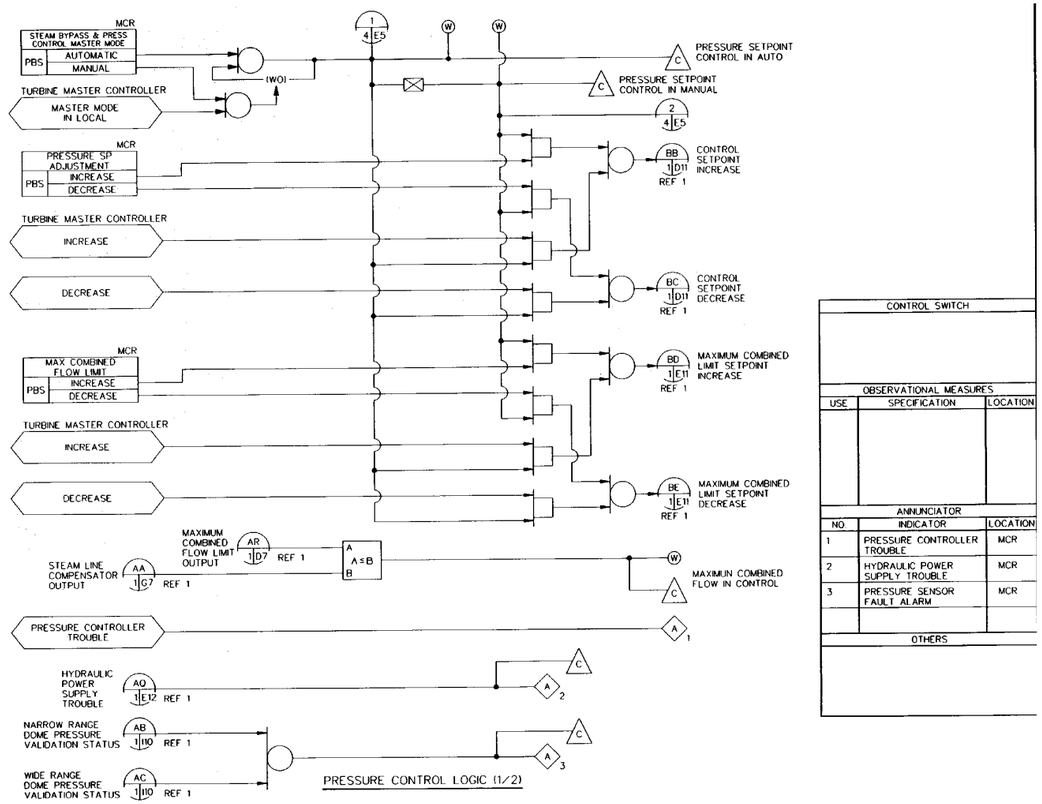
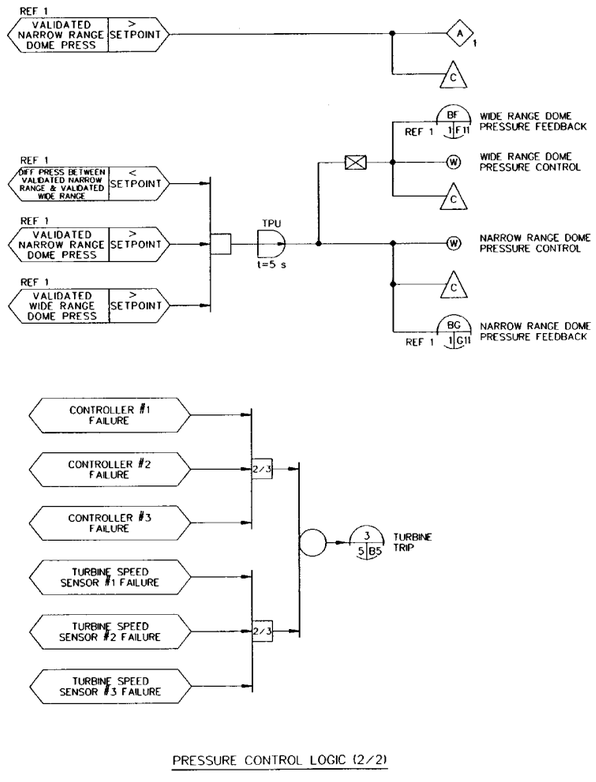


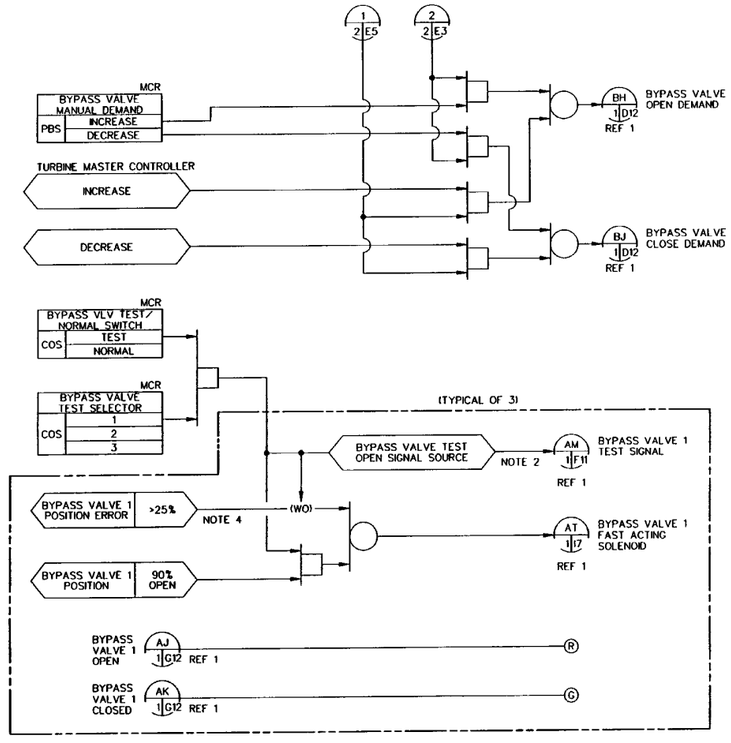
Figure 7.7-13 Steam Bypass and Pressure Control System IBD (Sheet 2 of 5)



CONTROL SWITCH		
OBSERVATIONAL MEASURES		
USE	SPECIFICATION	LOCATION
ANNUNCIATOR		
NO.	INDICATOR	LOCATION
1	HIGH DOME PRESSURE	MCR
OTHERS		

PRESSURE CONTROL LOGIC (2/2)

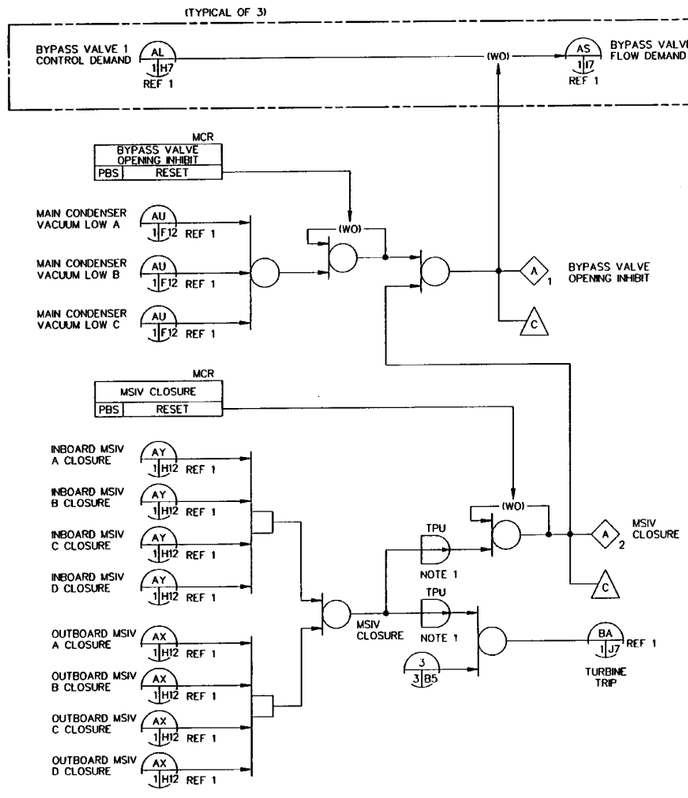
Figure 7.7-13 Steam Bypass and Pressure Control System IBD (Sheet 3 of 5)



BYPASS VALVE CONTROL LOGIC (1/2)

CONTROL SWITCH		
OBSERVATIONAL MEASURES		
USE	SPECIFICATION	LOCATION
ANNUNCIATOR		
NO.	INDICATOR	LOCATION
OTHERS		

Figure 7.7-13 Steam Bypass and Pressure Control System IBD (Sheet 4 of 5)



BPV CONTROL LOGIC (2/2)

CONTROL SWITCH

OBSERVATIONAL MEASURES		
USE	SPECIFICATION	LOCATION

ANNUNCIATOR		
NO.	INDICATOR	LOCATION
1	BYPASS VALVE OPENING INHIBIT	MCR
2	MSIV CLOSURE	MCR

OTHERS

Figure 7.7-13 Steam Bypass and Pressure Control System IBD (Sheet 5 of 5)

NOTES:

1. UNLESS OTHERWISE INDICATED, THE DEVICE NUMBERS SHOWN ON THIS DIAGRAMS ARE PREFIXED WITH G41.
2. FUEL POOL COOLING AND CLEANUP SYSTEM IS POWERED FROM NON-1E BUSSES.
3. "#" FIXED NUMBERS IN THIS DIAGRAMS INDICATE THE SWGR FUNCTION NUMBERS.

SUPPLEMENTAL DOCUMENTS UNDER THE FOLLOWING IDENTITIES ARE TO BE USED IN CONJUNCTION WITH THIS DRAWING.

		REFERENCE DOCUMENT
1.	FUEL POOL COOLING & CLEANUP SYS P&ID	G41-1010
2.	FUEL POOL COOLING & CLEANUP SYS PFD	G41-1020

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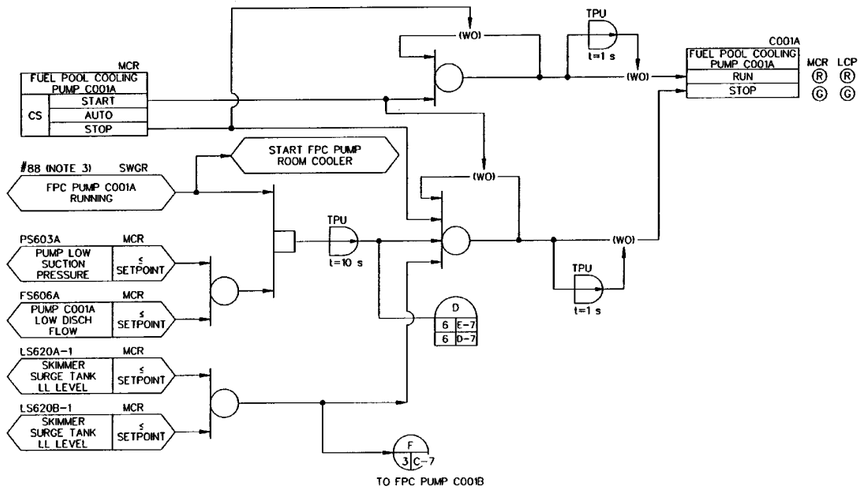
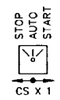
MPL NO. G41-1030

Figure 7.7-14 Fuel Pool Cooling and Cleanup System IBD (Sheet 1 of 8)



FPC PUMP C001A

CONTROL SWITCH



OBSERVATIONAL MEASURES		
USE	SPECIFICATION	LOCATION
STATUS INDICATOR	Ⓖ Ⓡ	MCR
	Ⓖ Ⓡ	LCP

ANNUNCIATOR		
NO.	INDICATOR	LOCATION

OTHERS			
INSTANT INTERRUPTION COUNTERMEASURE		NEED	
		NOT NEED	O
VALVE	INCHING OPERATION	NEED	
		NOT NEED	
	SEATING FORM	OPEN SIDE	
		CLOSED SIDE	
	THERMAL BYPASS	EXIST	
		NOT EXIST	O
SWGR POWER SUPPLY OBSERVATION		EXIST	
		NOT EXIST	O
ELECTRICAL SOLENOID VALVE POWER SUPPLY		AC V	
		DC V	

Figure 7.7-14 Fuel Pool Cooling and Cleanup System IBD (Sheet 2 of 8)

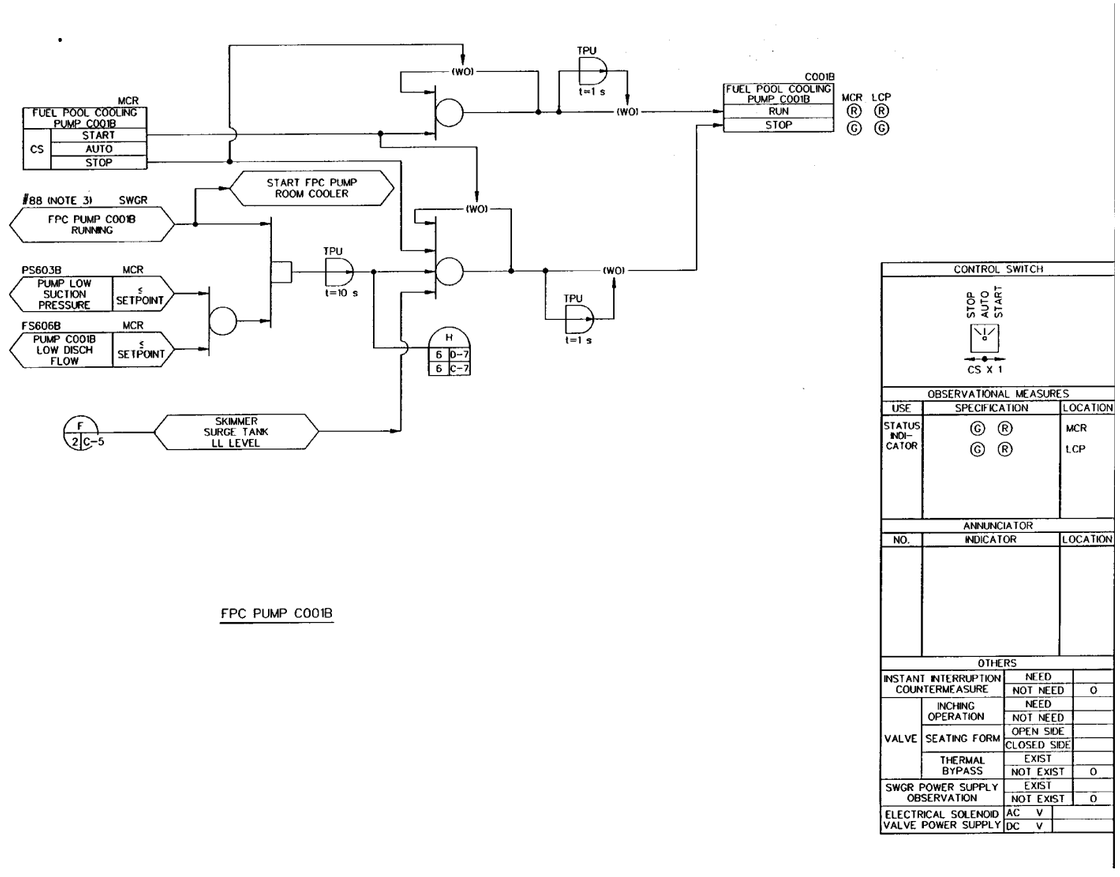
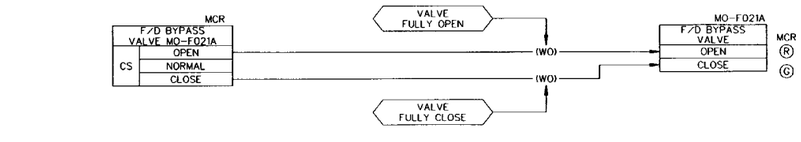
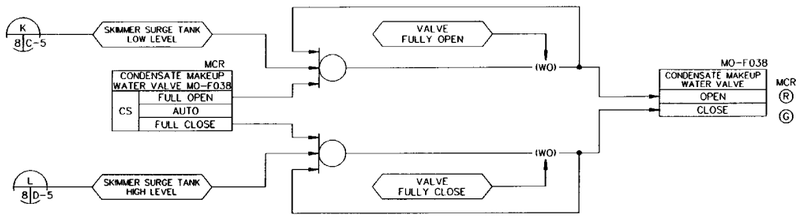


Figure 7.7-14 Fuel Pool Cooling and Cleanup System IBD (Sheet 3 of 8)



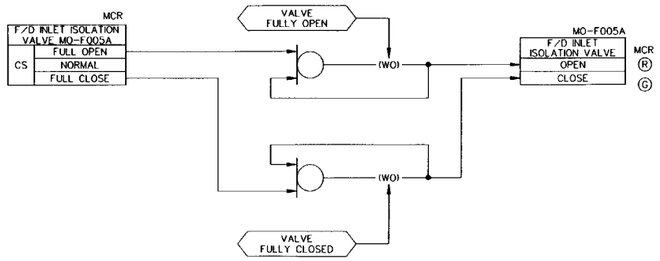
F/D BYPASS VALVE MO-F021A
(TYPICAL FOR F/D BYPASS VALVE MO-F021B)



CONDENSATE MAKEUP WATER VALVE MO-F038

CONTROL SWITCH			
CLOSE NORMAL OPEN — CS X 2		FULL CLOSE AUTO FULL OPEN — CS X 1	
OBSERVATIONAL MEASURES			
USE	SPECIFICATION		LOCATION
STATUS INDI-CATOR	Ⓖ Ⓡ		MCR
ANNUNCIATOR			
NO.	INDICATOR		LOCATION
OTHERS			
INSTANT INTERRUPTION COUNTERMEASURE	NEED		
	NOT NEED		
VALVE — INCHING OPERATION	NEED		
	NOT NEED		
VALVE — SEATING FORM	OPEN SIDE		T
	CLOSED SIDE		T
VALVE — THERMAL BYPASS	EXIST		
	NOT EXIST		O
SWGR POWER SUPPLY OBSERVATION	EXIST		
	NOT EXIST		O
ELECTRICAL SOLENOID VALVE POWER SUPPLY	AC V		
	DC V		

Figure 7.7-14 Fuel Pool Cooling and Cleanup System IBD (Sheet 4 of 8)



F/D INLET ISOLATION VALVE MO-F005A

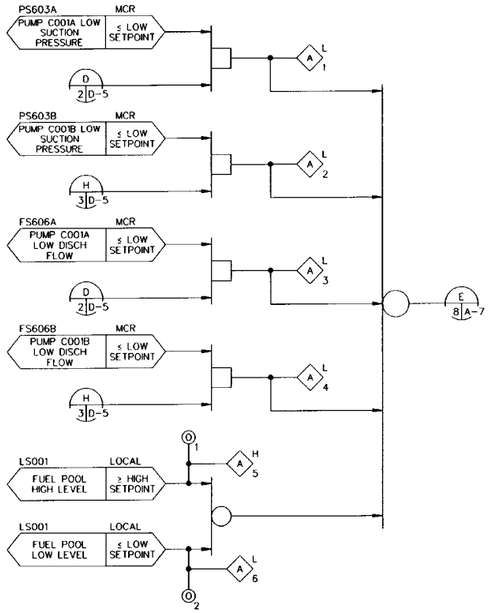
TYPICAL FOR THE FOLLOWING VALVES

VALVE DESIGNATION	VALVE NUMBER
F/D INLET ISOLATION VALVE	MO-F005B
F/D OUTLET ISOLATION VALVE	MO-F013

CONTROL SWITCH		
FULL CLOSE NORMAL FULL OPEN CS x 3		
OBSERVATIONAL MEASURES		
USE	SPECIFICATION	LOCATION
STATUS INDICATOR	G R	MCR
ANNUNCIATOR		
NO.	INDICATOR	LOCATION

OTHERS			
INSTANT INTERRUPTION COUNTERMEASURE		NEED	
		NOT NEED	
VALVE	INCHING OPERATION	NEED	
		NOT NEED	
	SEATING FORM	OPEN SIDE	T
		CLOSED SIDE	L(T)
	THERMAL BYPASS	EXIST	
		NOT EXIST	O
SWGR POWER SUPPLY OBSERVATION		EXIST	
		NOT EXIST	O
ELECTRICAL SOLENOID VALVE POWER SUPPLY		AC V	
		DC V	

Figure 7.7-14 Fuel Pool Cooling and Cleanup System IBD (Sheet 5 of 8)



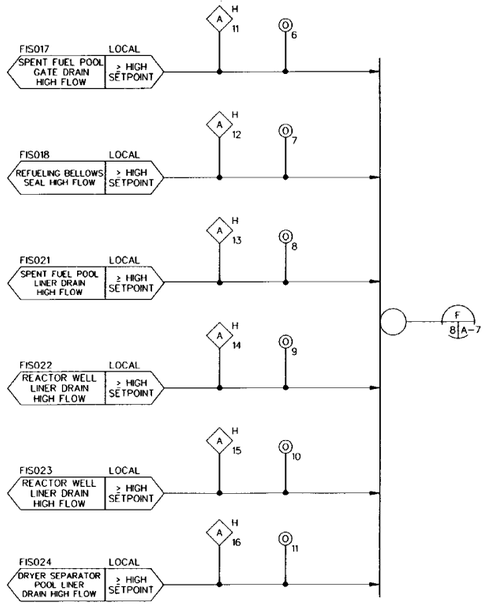
CONTROL SWITCH		

OBSERVATIONAL MEASURES		
USE	SPECIFICATION	LOCATION
STATUS INDI-CATOR	⓪1	LCP
	⓪2	LCP

ANNUNCIATOR		
NO.	INDICATOR	LOCATION
1	FPC PUMP C001A SUCTION PRESS LOW	MCR
2	FPC PUMP C001B SUCTION PRESS LOW	MCR
3	FPC PUMP C001A DISCH FLOW LOW	MCR
4	FPC PUMP C001B DISCH FLOW LOW	MCR
5	FUEL POOL LEVEL H	MCR
6	FUEL POOL LEVEL L	MCR

OTHERS			
INSTANT INTERRUPTION COUNTERMEASURE		NEED	
		NOT NEED	
VALVE	INCHING OPERATION	NEED	
		NOT NEED	
	SEATING FORM	OPEN SIDE	
		CLOSED SIDE	
	THERMAL BYPASS	EXIST	
		NOT EXIST	
SWGR POWER SUPPLY OBSERVATION		EXIST	
		NOT EXIST	
ELECTRICAL SOLENOID VALVE POWER SUPPLY		AC V	
		DC V	

Figure 7.7-14 Fuel Pool Cooling and Cleanup System IBD (Sheet 6 of 8)



ANNUNCIATORS

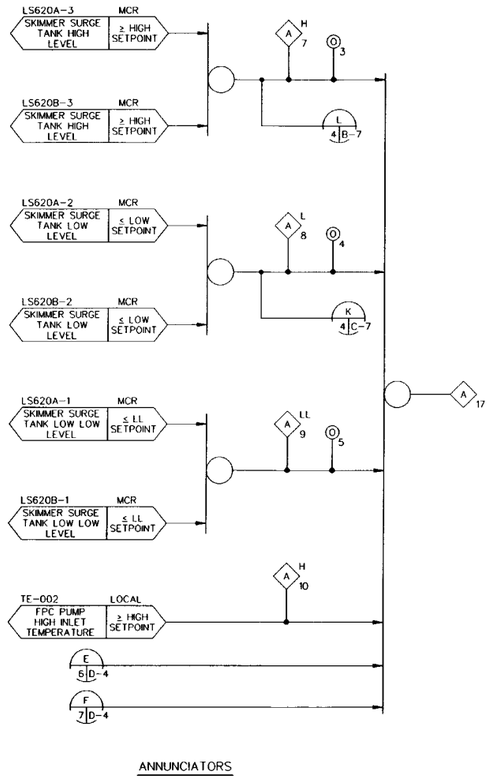
CONTROL SWITCH		

OBSERVATIONAL MEASURES		
USE	SPECIFICATION	LOCATION
STATUS INDICATOR	O 6	LCP
	O 7	LCP
	O 8	LCP
	O 9	LCP
	O 10	LCP
	O 11	LCP

ANNUNCIATOR		
NO.	INDICATOR	LOCATION
11	SPENT FUEL POOL GATE DRAIN HIGH FLOW	MCR
12	REFUELING BELLOWS SEAL HIGH FLOW	MCR
13	SPENT FUEL POOL LINER DRAIN HIGH FLOW	MCR
14	REACTOR WELL LINER DRAIN HIGH FLOW	MCR
15	REACTOR WELL LINER DRAIN HIGH FLOW	MCR
16	DRYER SEPARATOR POOL LINER DRAIN HIGH FLOW	MCR

OTHERS			
INSTANT INTERRUPTION COUNTERMEASURE		NEED	
		NOT NEED	
VALVE	INCHING OPERATION	NEED	
		NOT NEED	
	SEATING FORM	OPEN SIDE	
		CLOSED SIDE	
	THERMAL BYPASS	EXIST	
		NOT EXIST	
SWGR POWER SUPPLY OBSERVATION		EXIST	
		NOT EXIST	
ELECTRICAL SOLENOID VALVE POWER SUPPLY		AC V	
		DC V	

Figure 7.7-14 Fuel Pool Cooling and Cleanup System IBD (Sheet 7 of 8)



CONTROL SWITCH		

OBSERVATIONAL MEASURES		
USE	SPECIFICATION	LOCATION
STATUS INDICATOR	O 3	LCP
	O 4	LCP
	O 5	LCP

ANNUNCIATOR		
NO.	INDICATOR	LOCATION
7	SKIMMER SURGE TANK HIGH LEVEL	MCR
8	SKIMMER SURGE TANK LOW LEVEL	MCR
9	SKIMMER SURGE TANK LOW LOW LEVEL	MCR
10	FPC PUMP INLET TEMP HIGH	MCR
17	FPC MUWC CONTROL PANEL ABNORMAL	MCR

OTHERS			
INSTANT INTERRUPTION COUNTERMEASURE		NEED	
		NOT NEED	
VALVE	INCHING OPERATION	NEED	
		NOT NEED	
	SEATING FORM	OPEN SIDE	
		CLOSED SIDE	
	THERMAL BYPASS	EXIST	
		NOT EXIST	
SWGR POWER SUPPLY OBSERVATION		EXIST	
		NOT EXIST	
ELECTRICAL SOLENOID VALVE POWER SUPPLY		AC V	
		DC V	

Figure 7.7-14 Fuel Pool Cooling and Cleanup System IBD (Sheet 8 of 8)

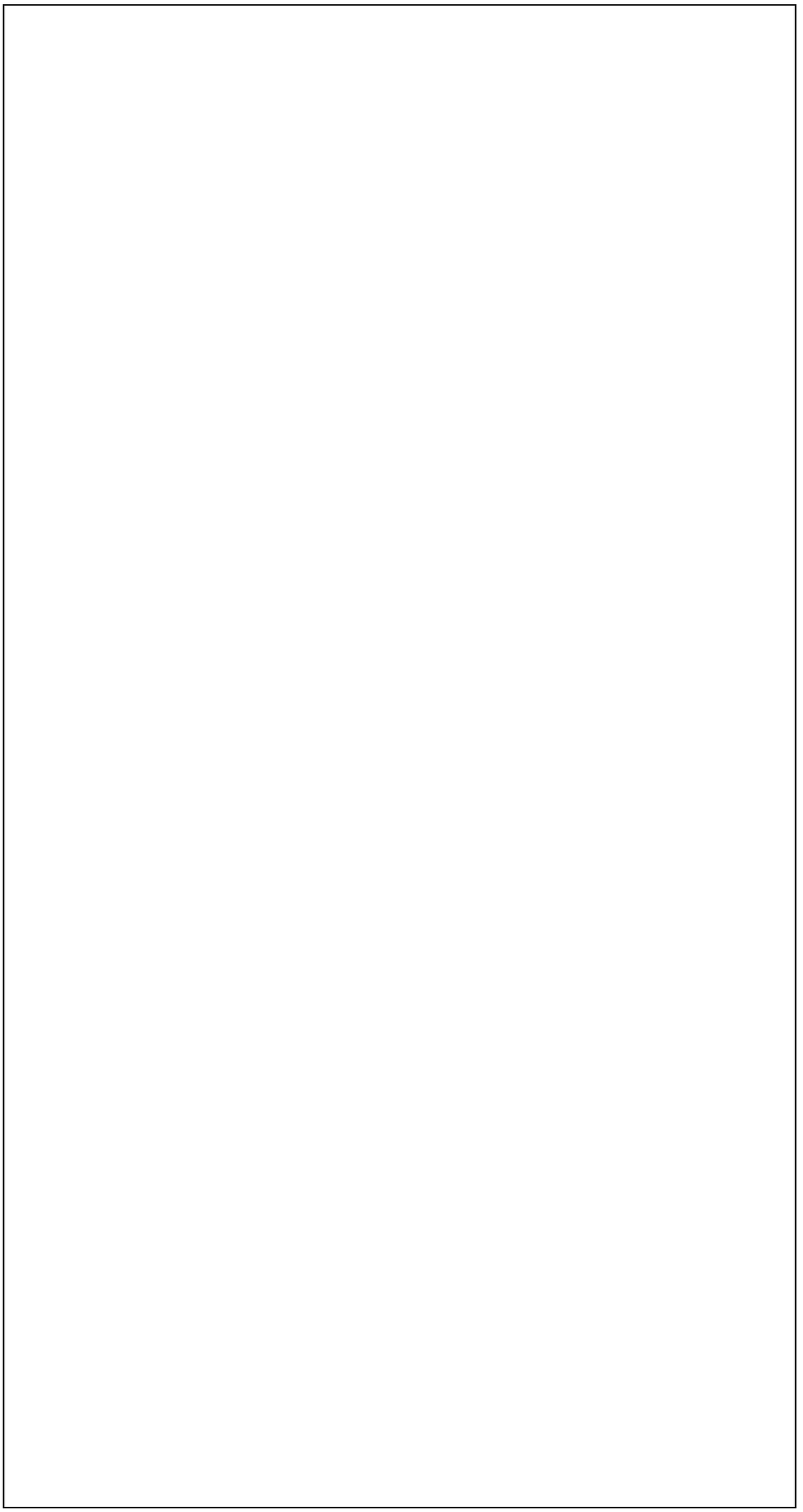


Figure 8.2-1 Power Distribution System Routing Diagram (Sheet 1 of 7)

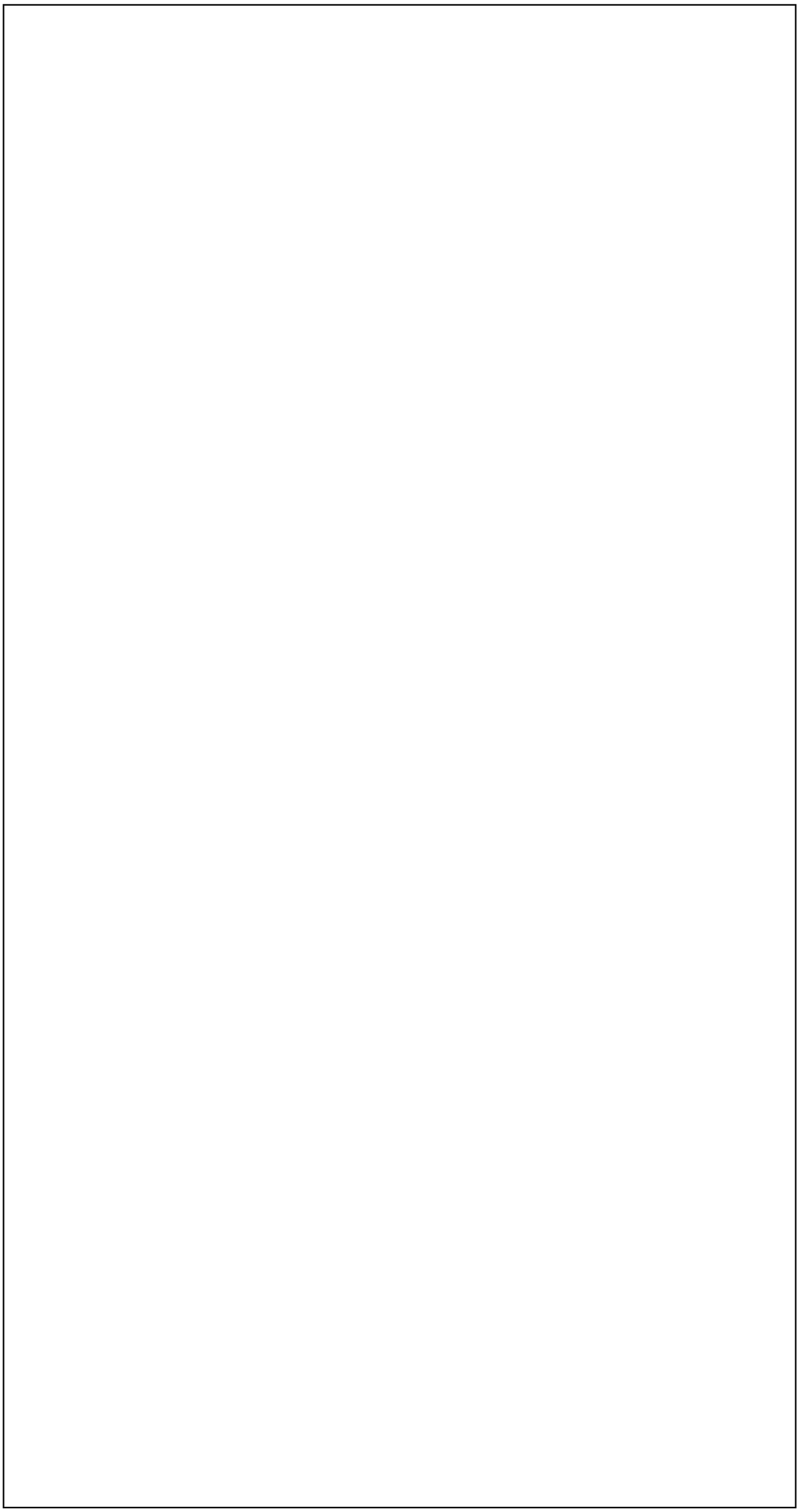


Figure 8.2-1 Power Distribution System Routing Diagram (Sheet 2 of 7)

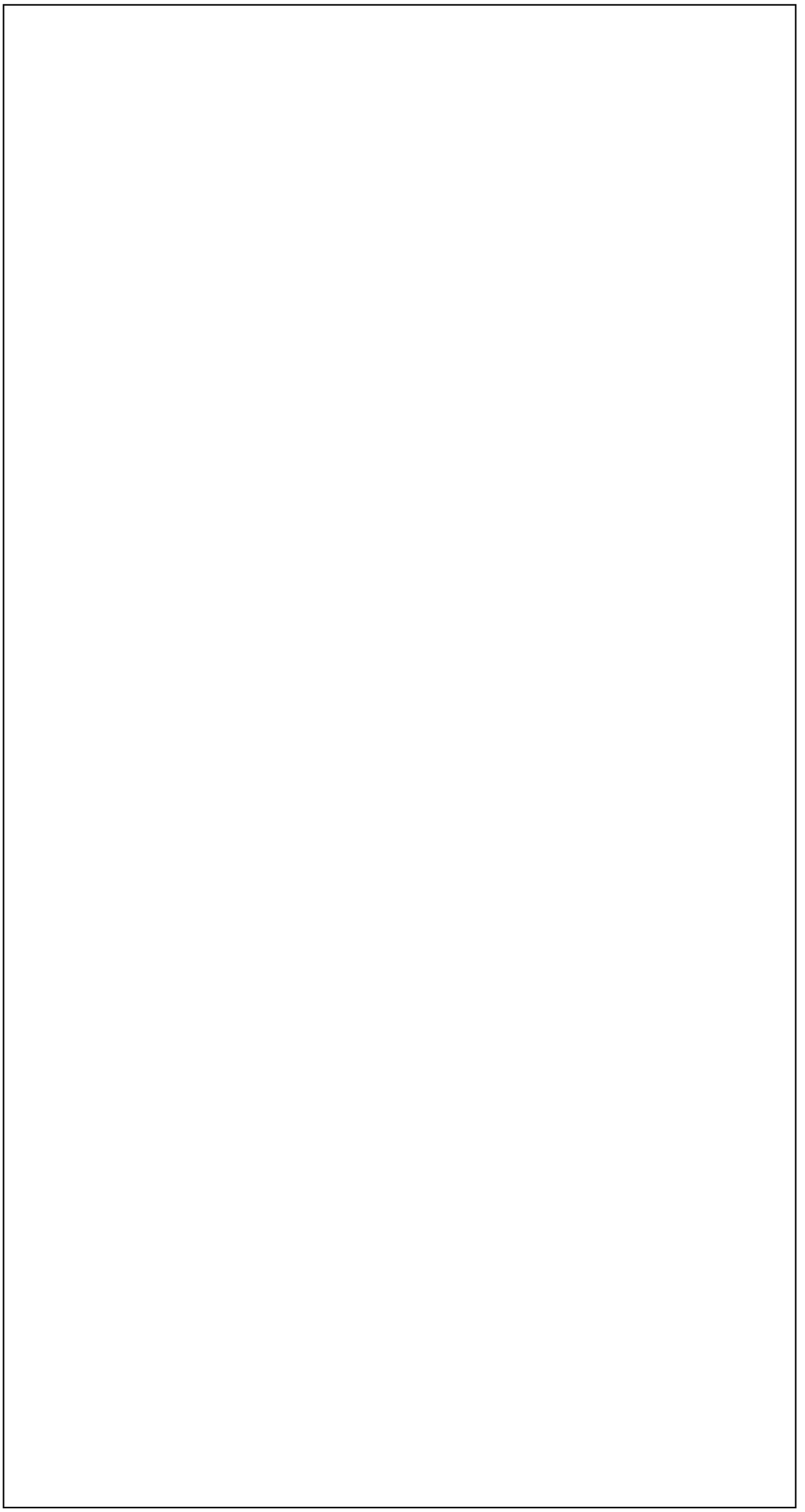


Figure 8.2-1 Power Distribution System Routing Diagram (Sheet 3 of 7)

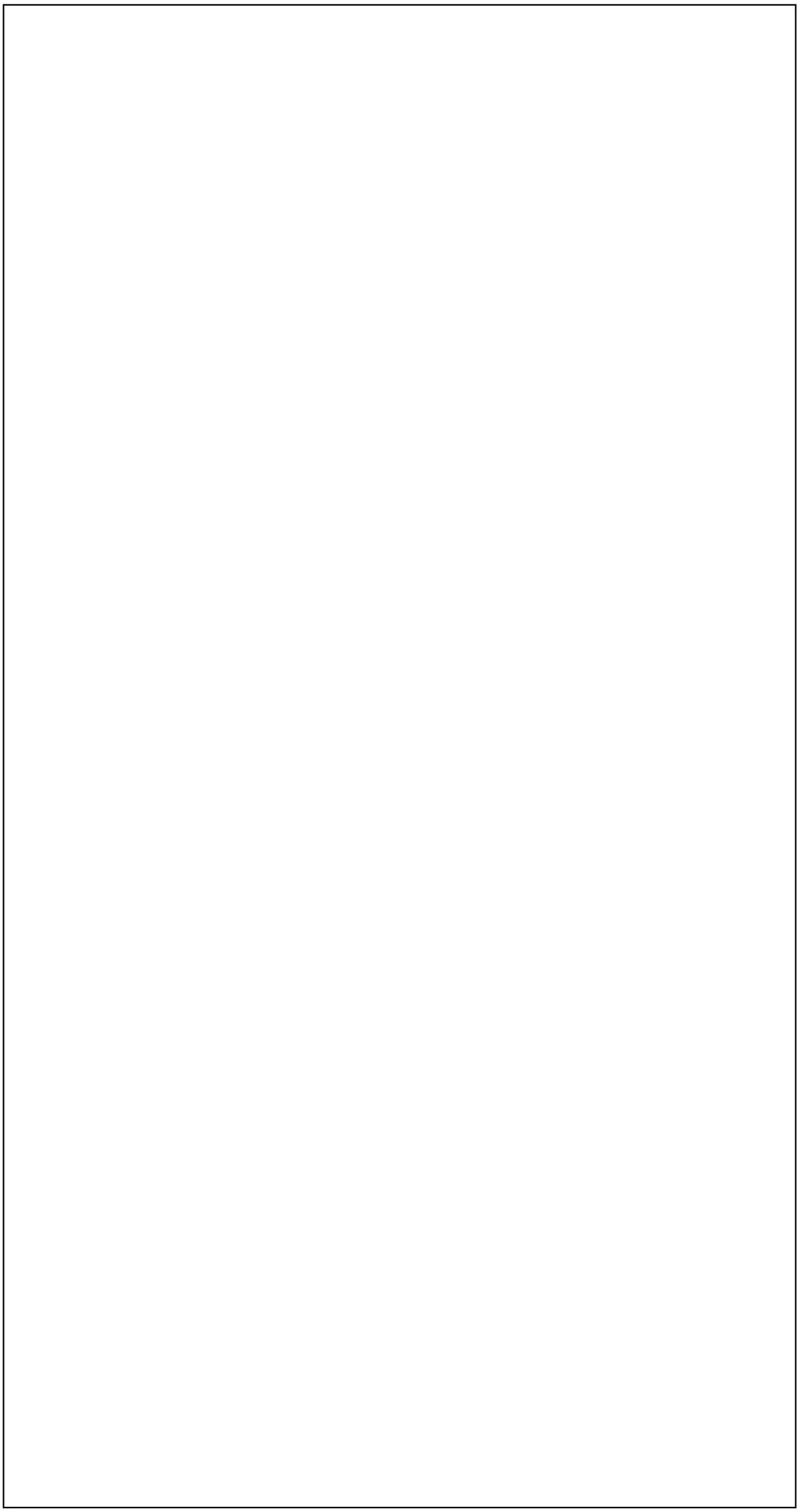


Figure 8.2-1 Power Distribution System Routing Diagram (Sheet 4 of 7)

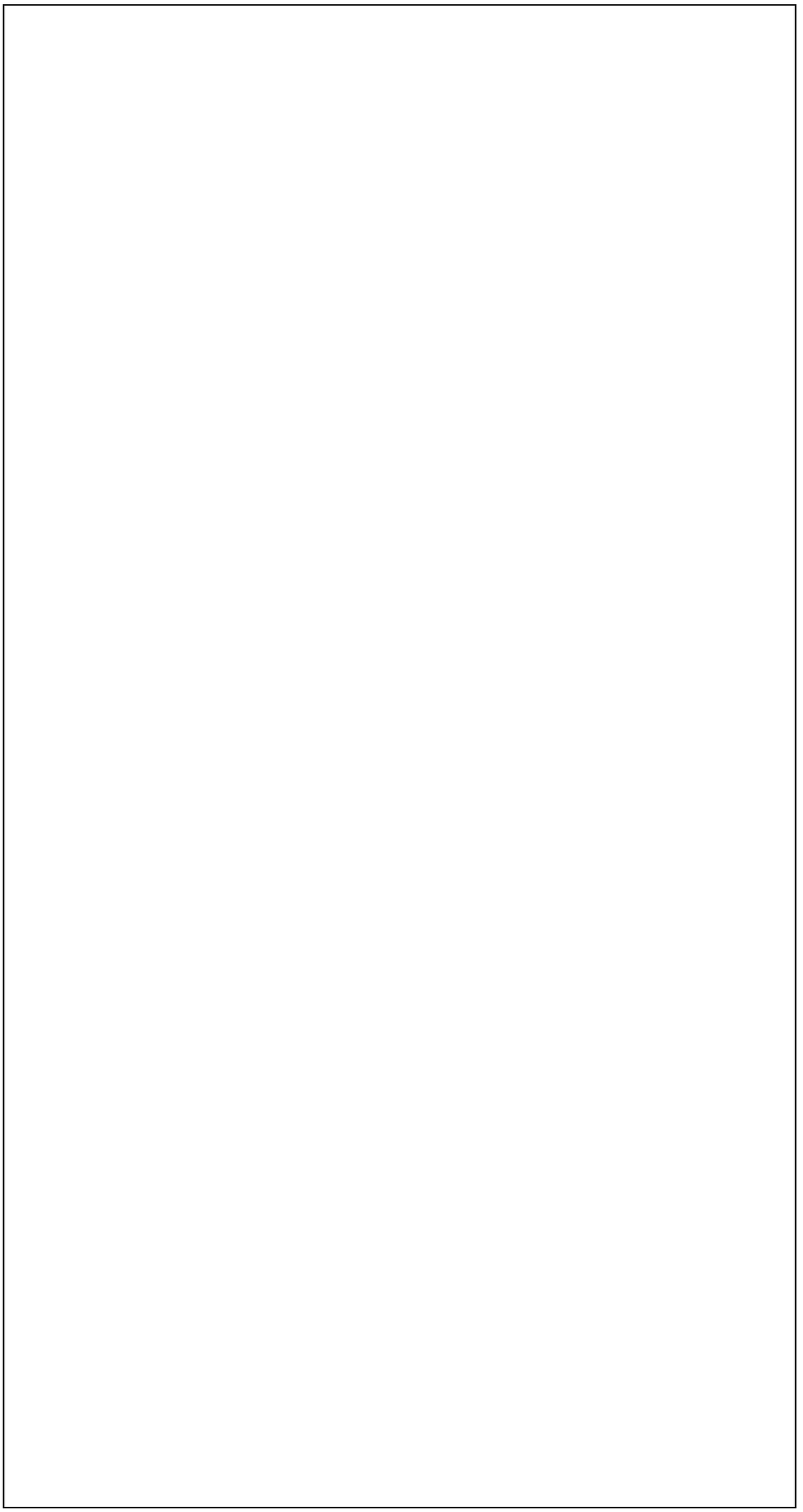


Figure 8.2-1 Power Distribution System Routing Diagram (Sheet 5 of 7)

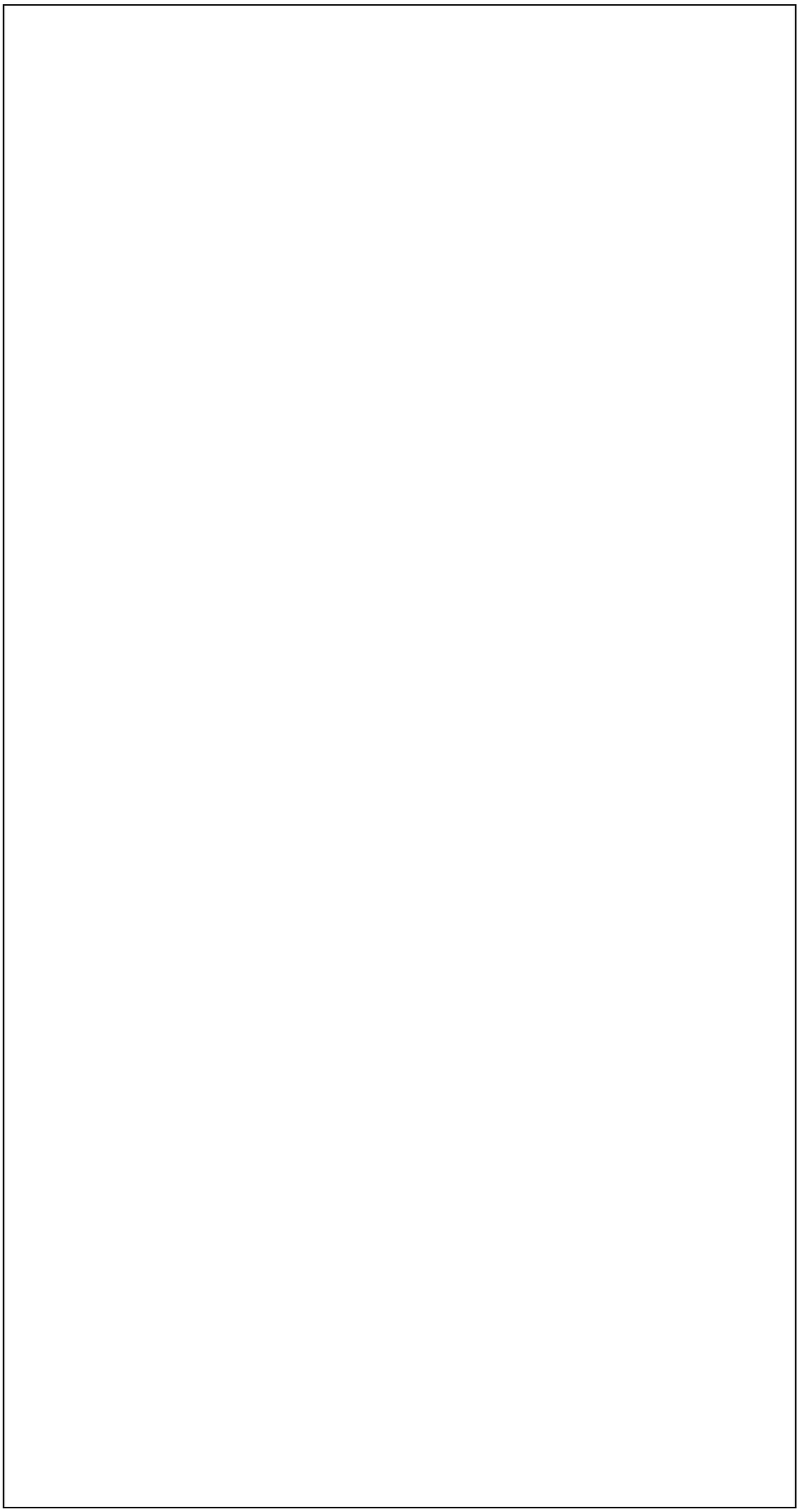


Figure 8.2-1 Power Distribution System Routing Diagram (Sheet 6 of 7)

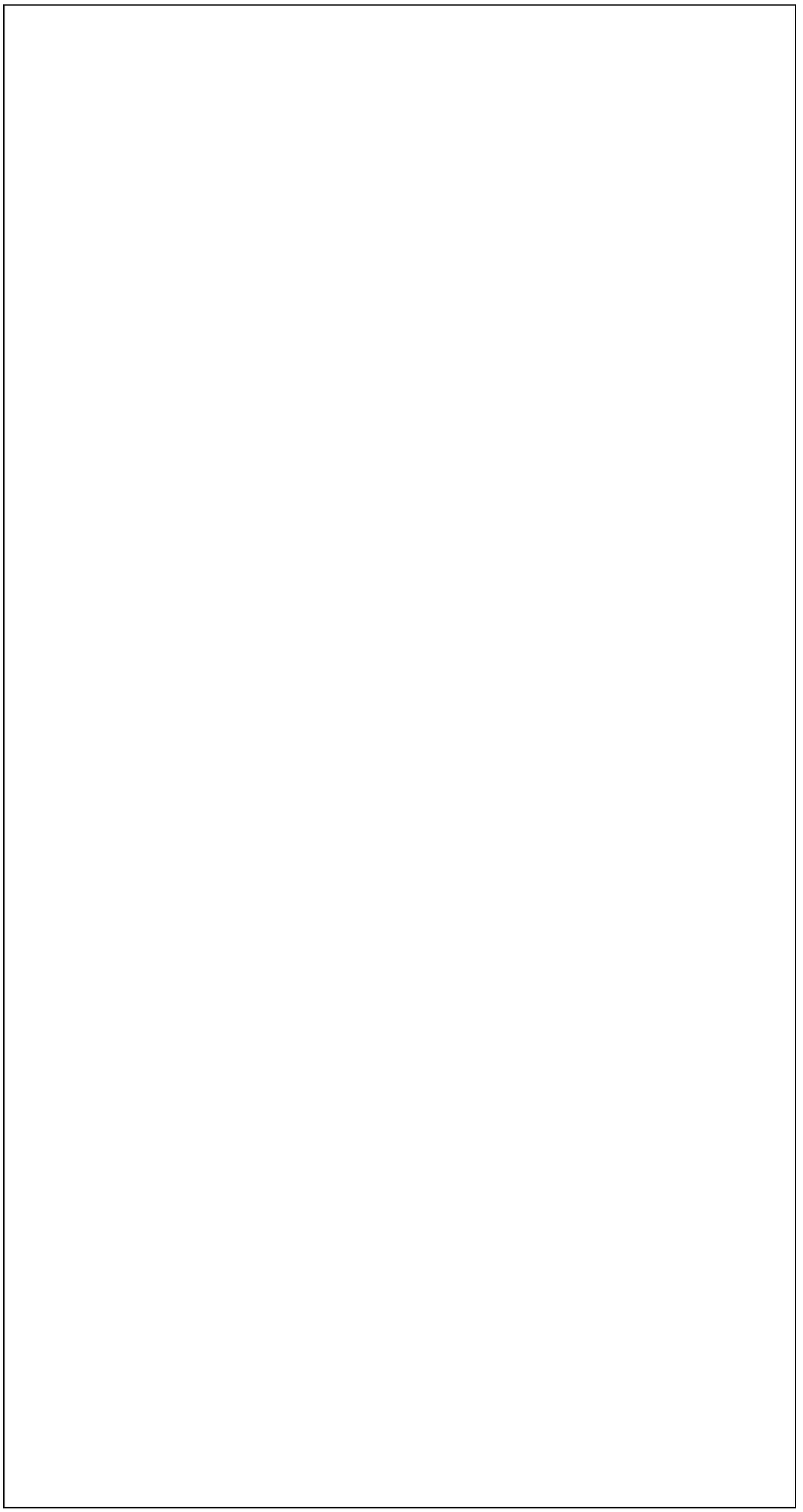


Figure 8.2-1 Power Distribution System Routing Diagram (Sheet 7 of 7)