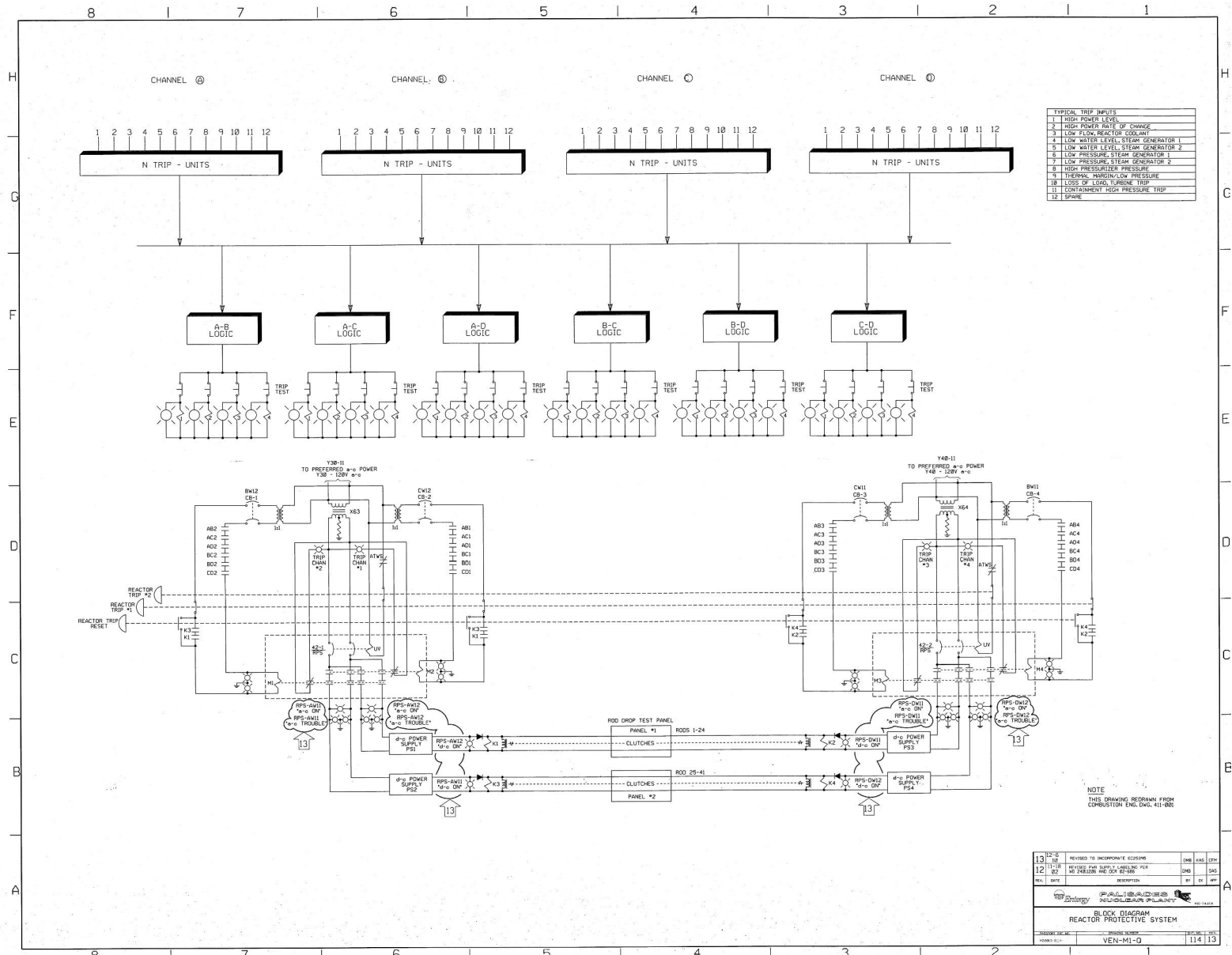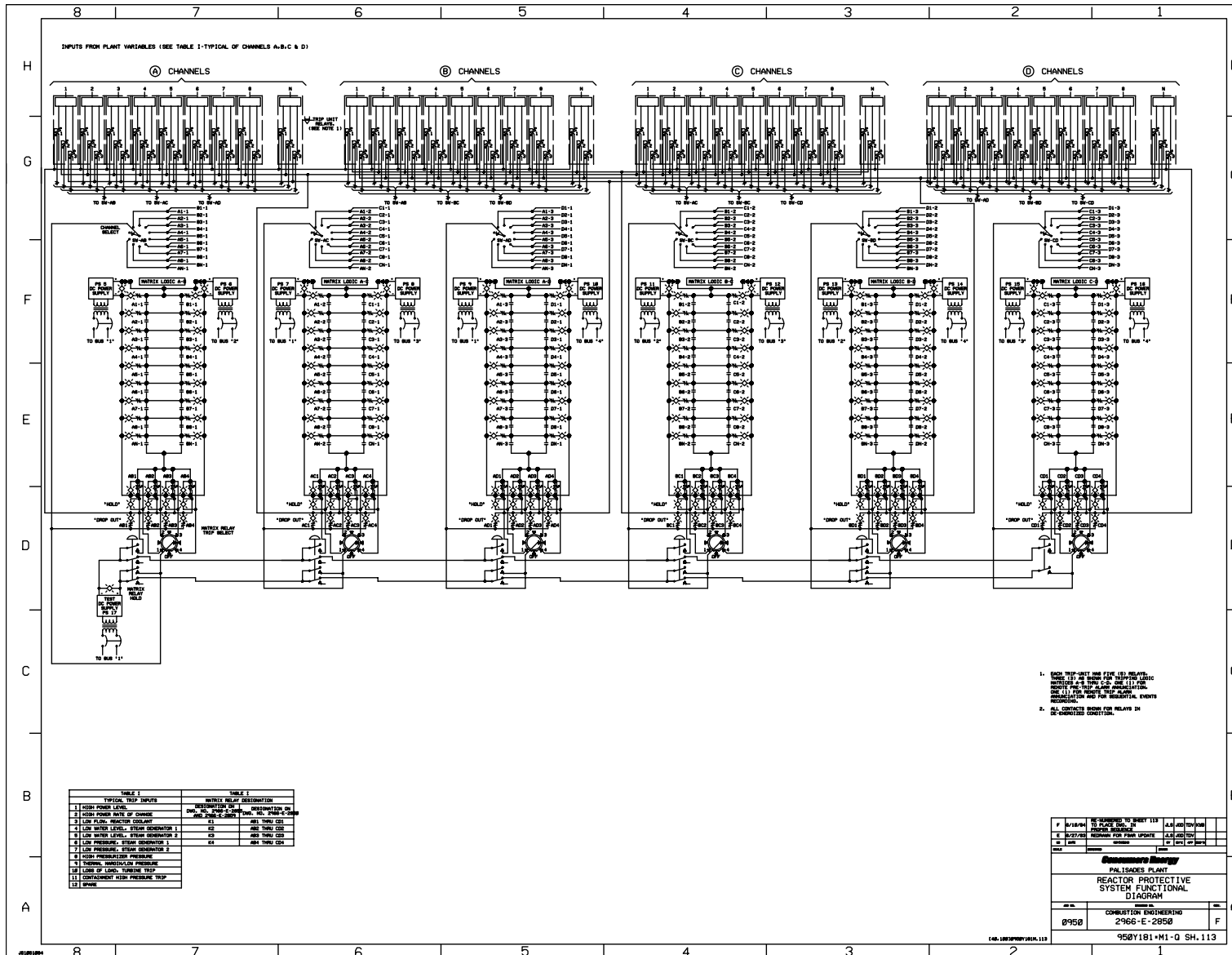# REACTOR PROTECTION SYSTEM BLOCK DIAGRAM

REACTOR PROTECTIVE SYSTEM FUNCTIONAL DIAGRAM

TYPICAL MEASUREMENT CHANNEL FUNCTIONAL DIAGRAM

SCHEMATIC DIAGRAM
PRESSURIZER PRESSURE ATWS

SCHEMATIC DIAGRAM
PRESSURIZER PRESSURE CONTROL & MEASUREMENT
CHANNEL INSTRUMENTATION CKT. No. 2

E-84

NOTES:
1. SEPARATE RACEWAY SYSTEM
2. BARRIER BETWEEN CHANNELS WITHIN RACEWAY
3. SHIELDED TWISTED PAIR (TYPICAL)
4. ▲ -INDICATES SPLICING USING RAYCHEM HEAT SHRINK
5. ALL SHIELDS ARE SHOWN ON WIRING DIAGRAMS.
6. SCHEMES IP33, IP35 AND IP36 REDRAWN TO E-84, SH. 2, 2B AND 2C, RESPECTIVELY.
7. SCHEME IP34 REDRAWN FROM E-84, SH. 2, REV. 24.

SCHEMATIC DIAGRAM
PRESSURIZER PRESSURE ATWS
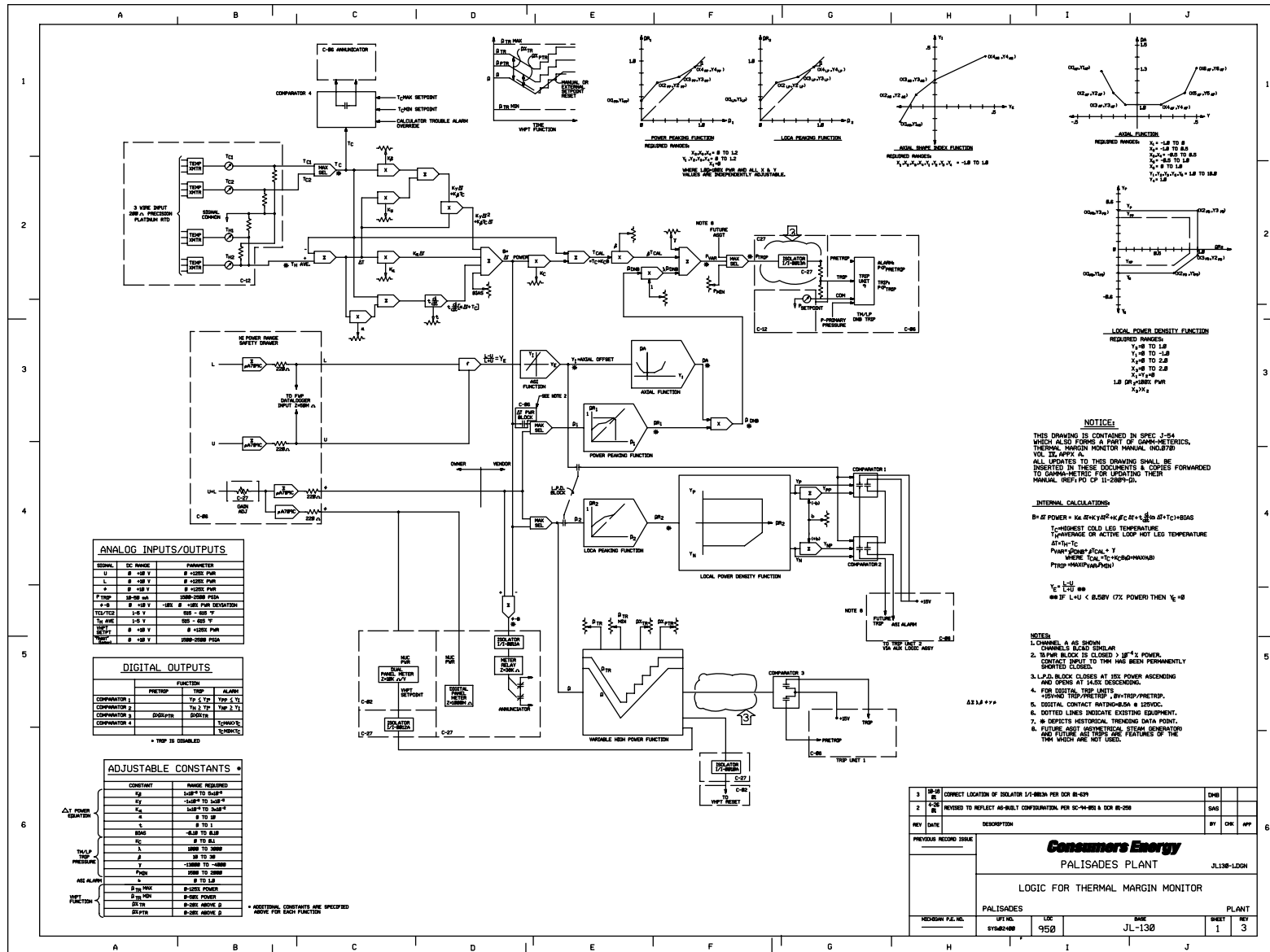

SCHEMATIC DIAGRAM
PRESSURIZER PRESSURE ATWS
E-212 — 3 1

LOW FLOW PROTECTIVE SYSTEM FUNCTIONAL DIAGRAM

LOGIC FOR THERMAL MARGIN MONITOR
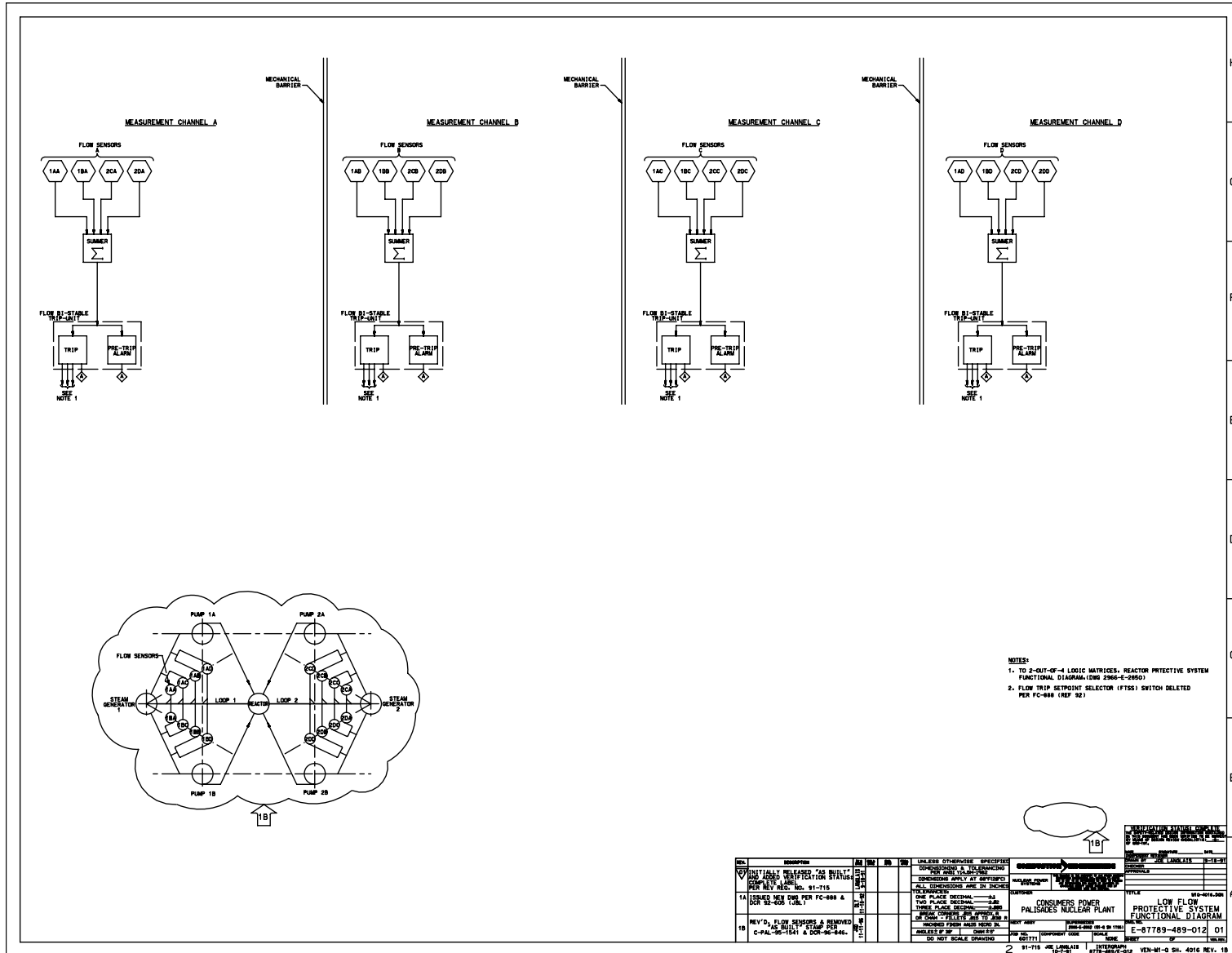
LOGIC FOR THERMAL MARGIN MONITOR

NEUTRON FLUX MONITORING SYSTEM
START-UP AND LOGARITHMIC RANGE CHANNELS

NEUTRON FLUX MONITORING SYSTEM
POWER RANGE CHANNELS
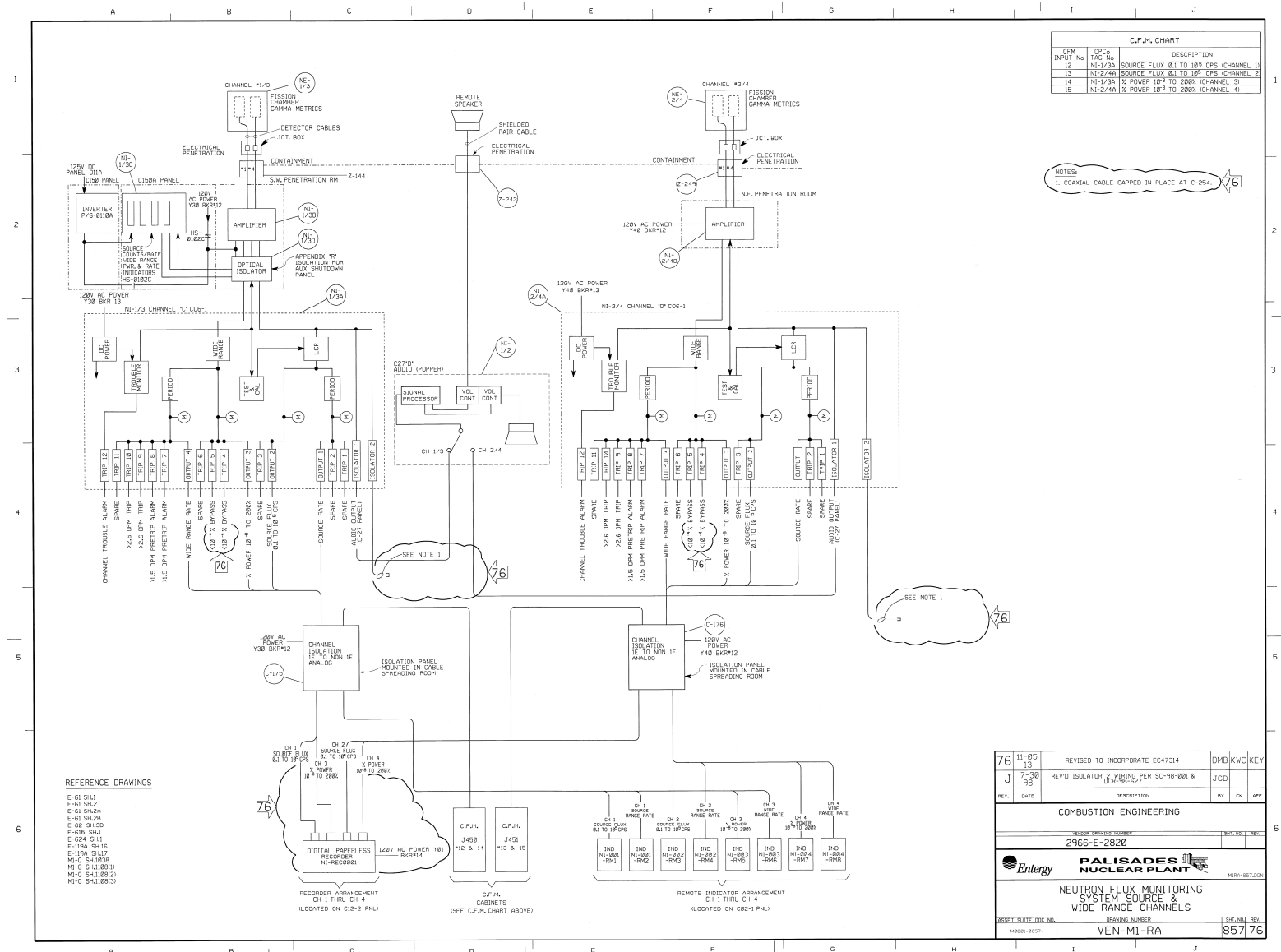
POWER RATE-OF-CHANGE TRIP AND PRETRIP INTERFACE WITH RPS
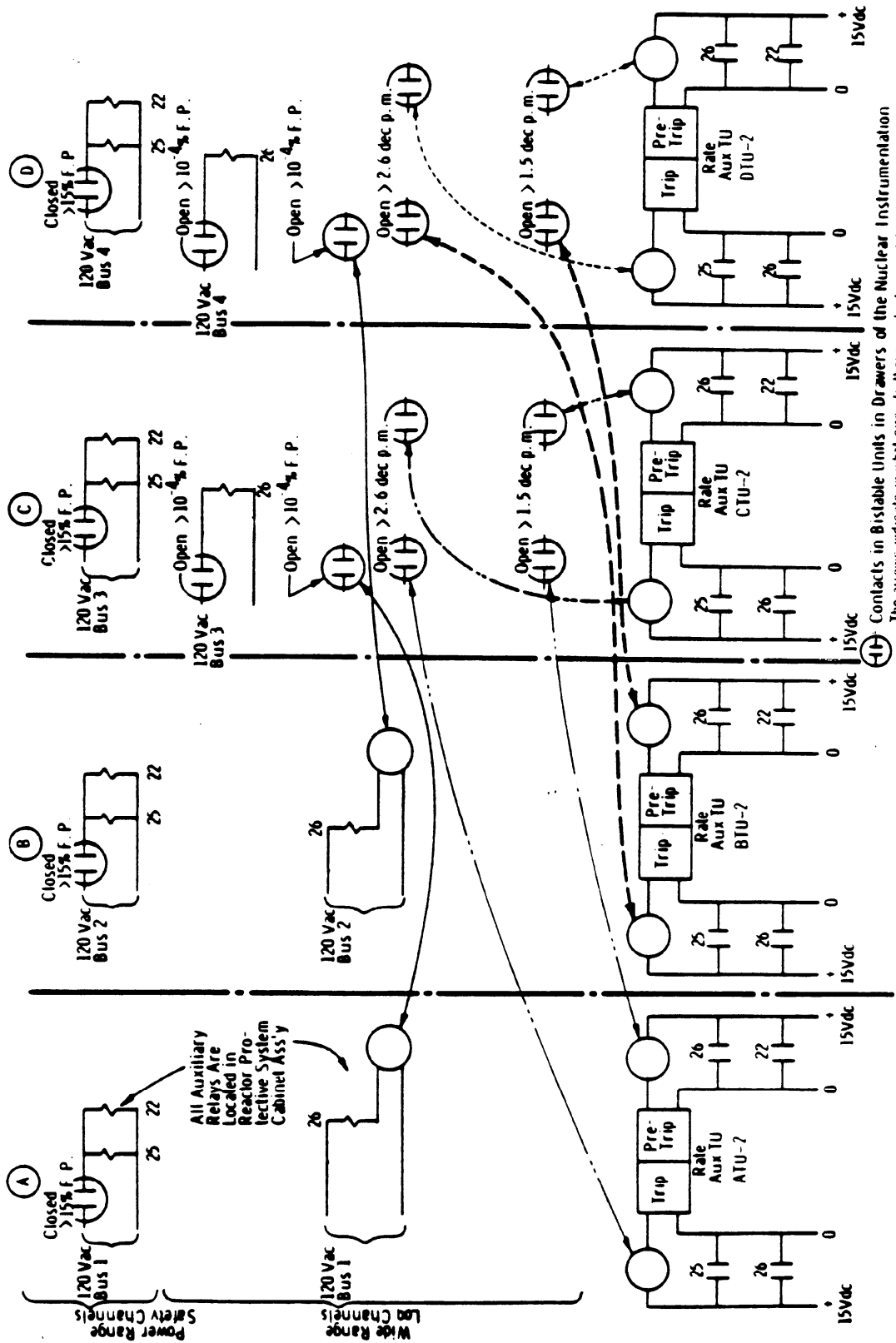
ZERO POWER MODE BYPASS

Relay Contacts for Automatic Removal of Zero Power Mode Trip Bypass (Open $>10^{-4}$ % Full Power and Operated by Power Level Trip Unit in Logarithmic Channel)

Closure Required for Bypass

Manual Switch Labeled "Zero Power Mode Trip Bypass"

+15V   +15V   +15V   +15V

Bistable Trip Units

| Low Reactor Coolant Flow | Low Steam Pressure SG 1 | Low Steam Pressure SG 2 | TM / Low Pressure |

X   X   X   X
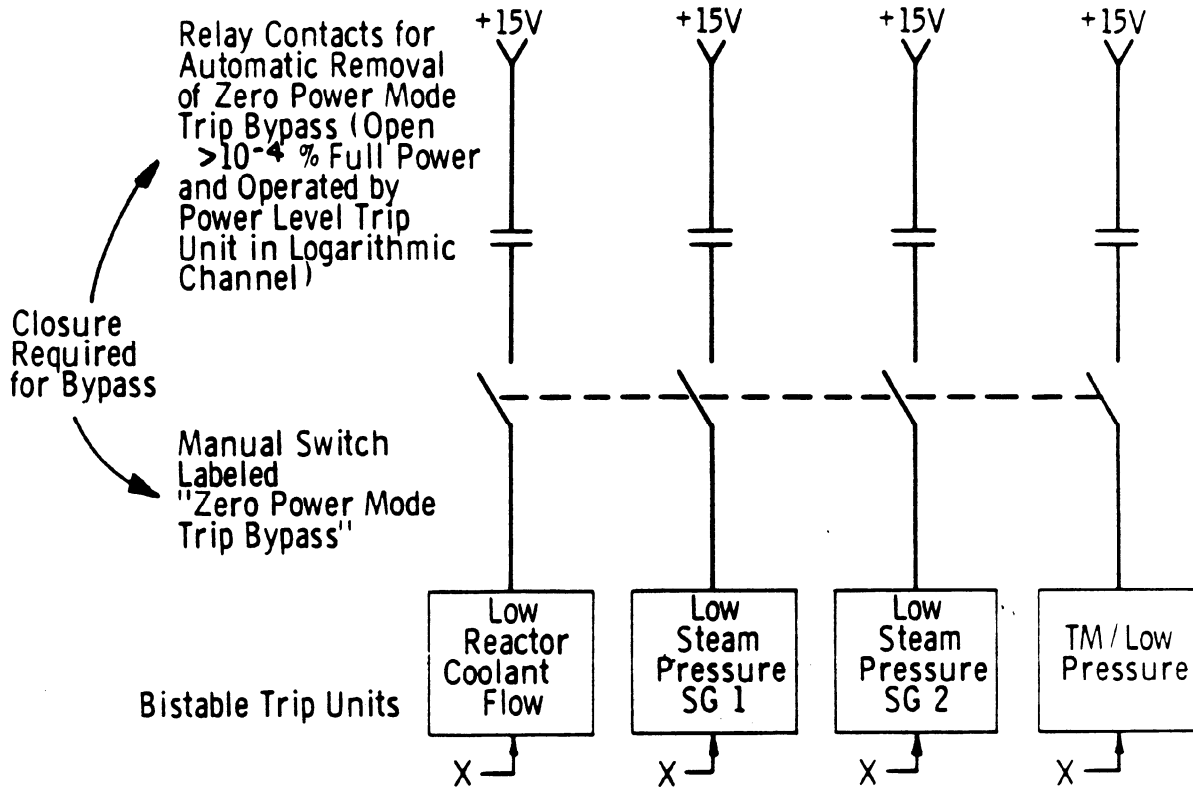
X = Analog Input Signal

With +15V Applied to Bistable Trip Unit: No Trip Regardless To Level of Input Analog Signal

Without +15V Applied to Bistable Trip Unit: Trip According to Level of Input Analog Signal

Same Arrangement for Other 3 Channels

REACTOR PROTECTIVE SYSTEM INTERFACES
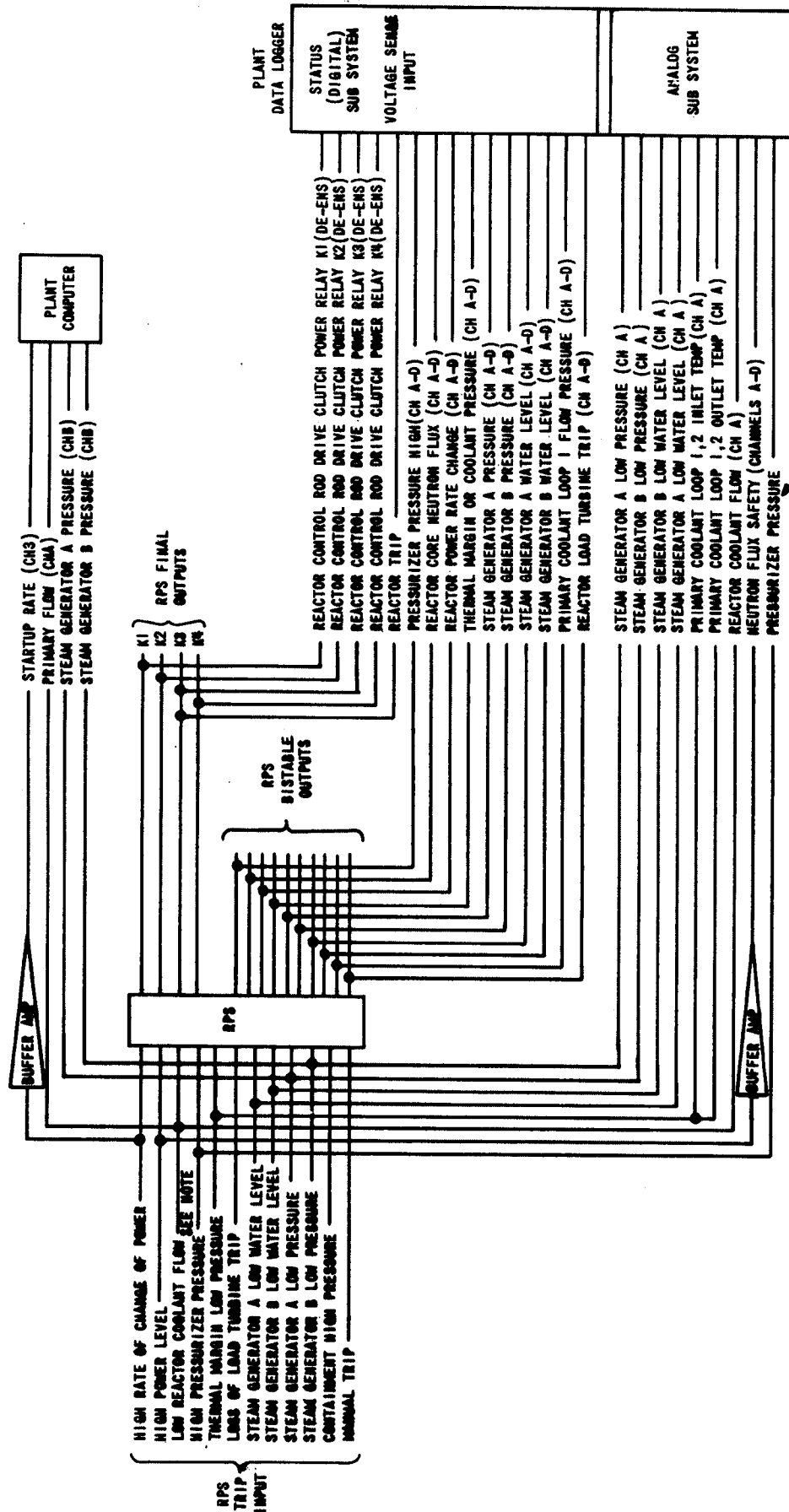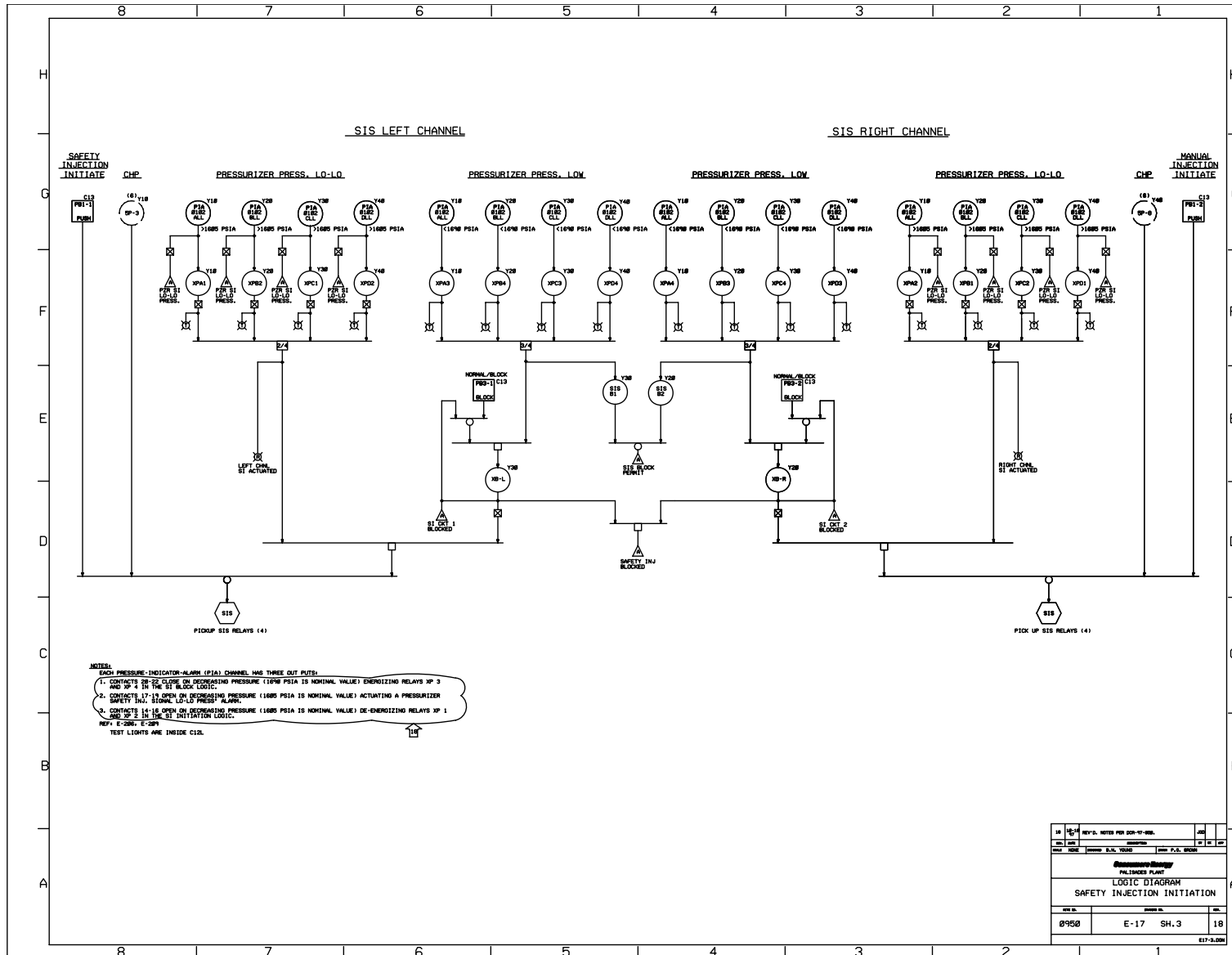
LOGIC DIAGRAM
SAFETY INJECTION INITIATION

LOGIC DIAGRAM
SAFETY INJECTION INITIATION

LOGIC DIAGRAM
MAIN GENERATOR PROTECTION

LOGIC DIAGRAM
TURBINE-GENERATOR TRIPS AND FAST TRANSFER

LOGIC DIAGRAM
TURBINE-GENERATOR TRIPS AND FAST TRANSFER
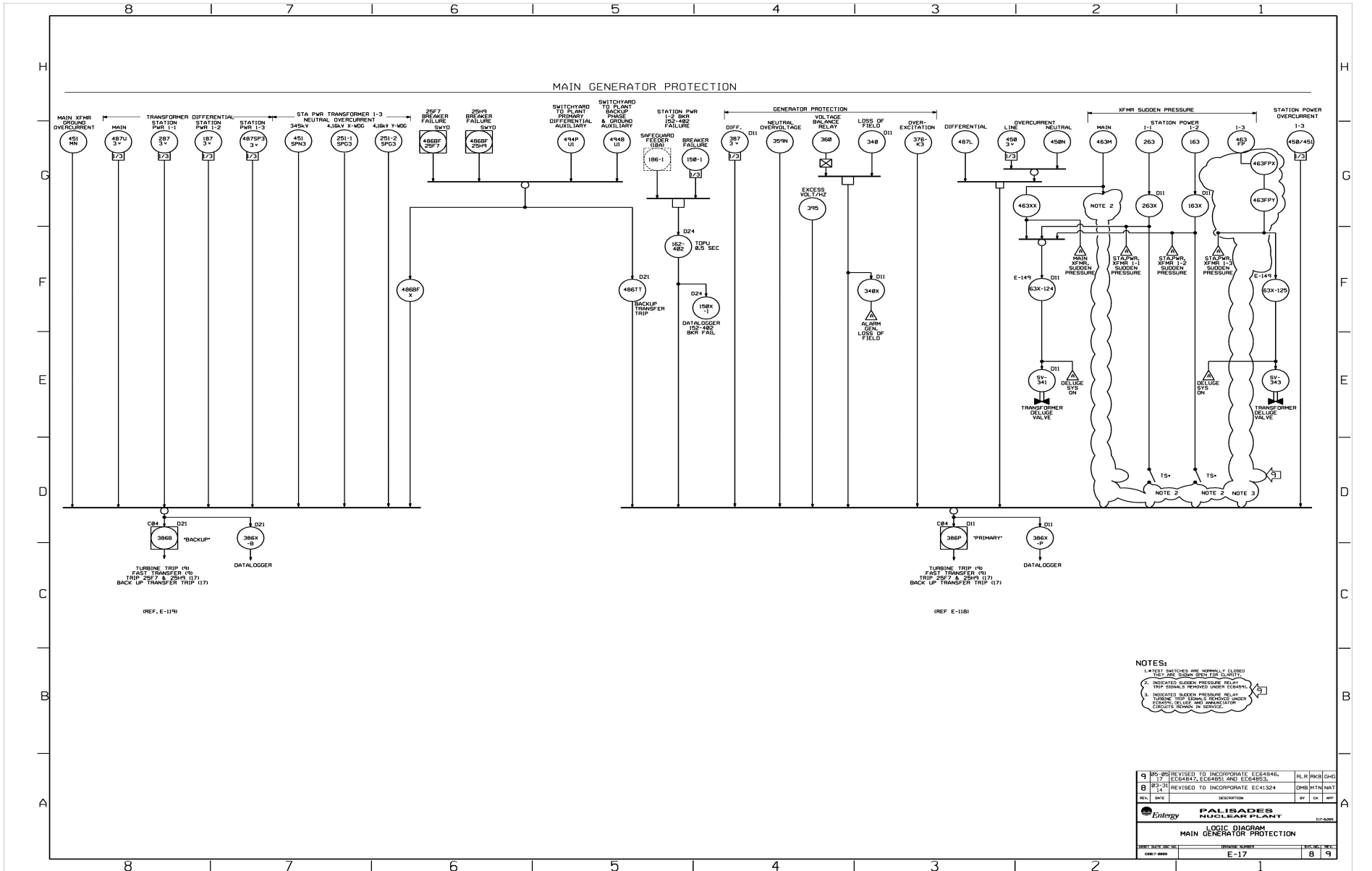
LOGIC DIAGRAM
2400 VOLT LOAD SHED
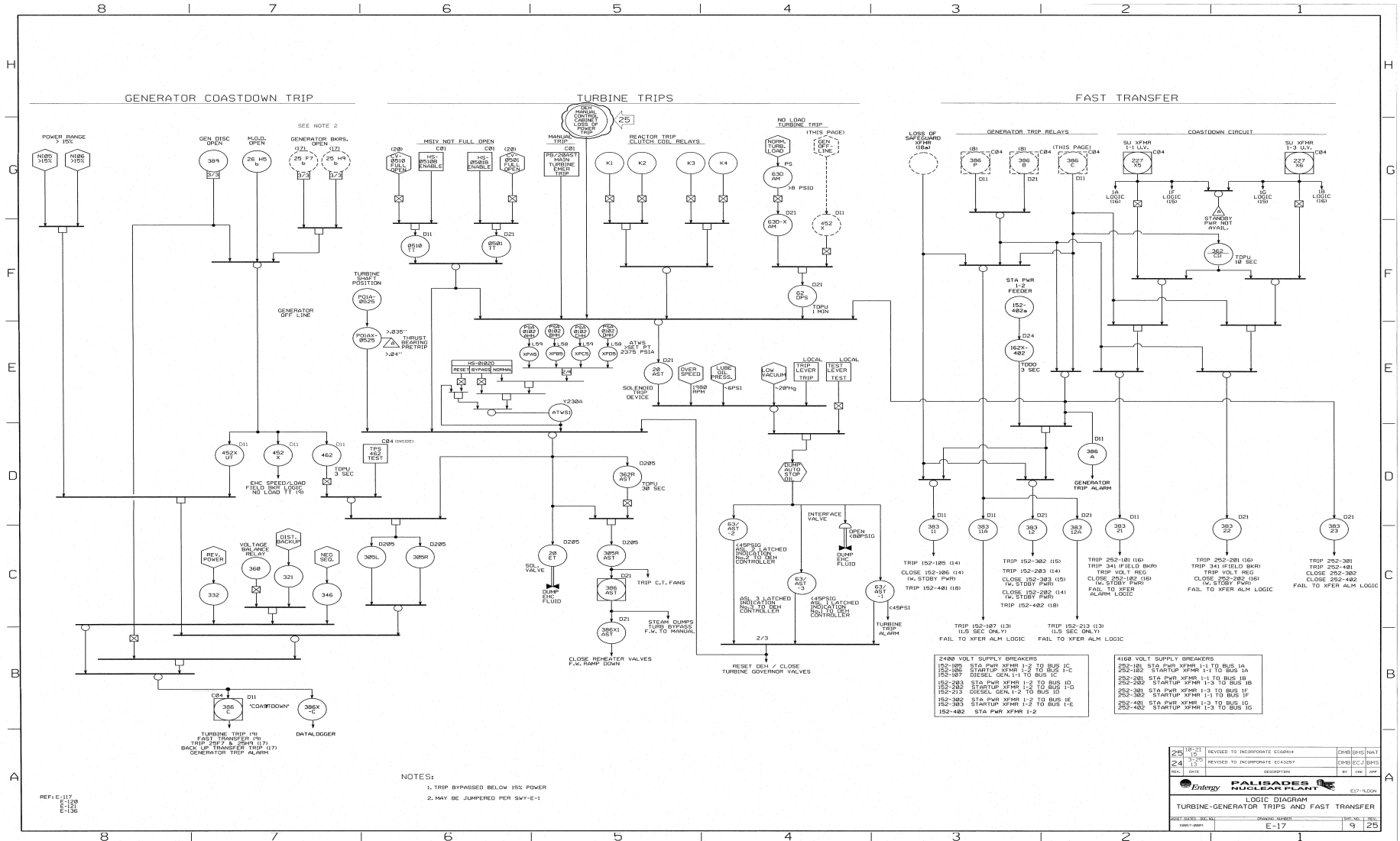
LOGIC DIAGRAM
DIESEL START
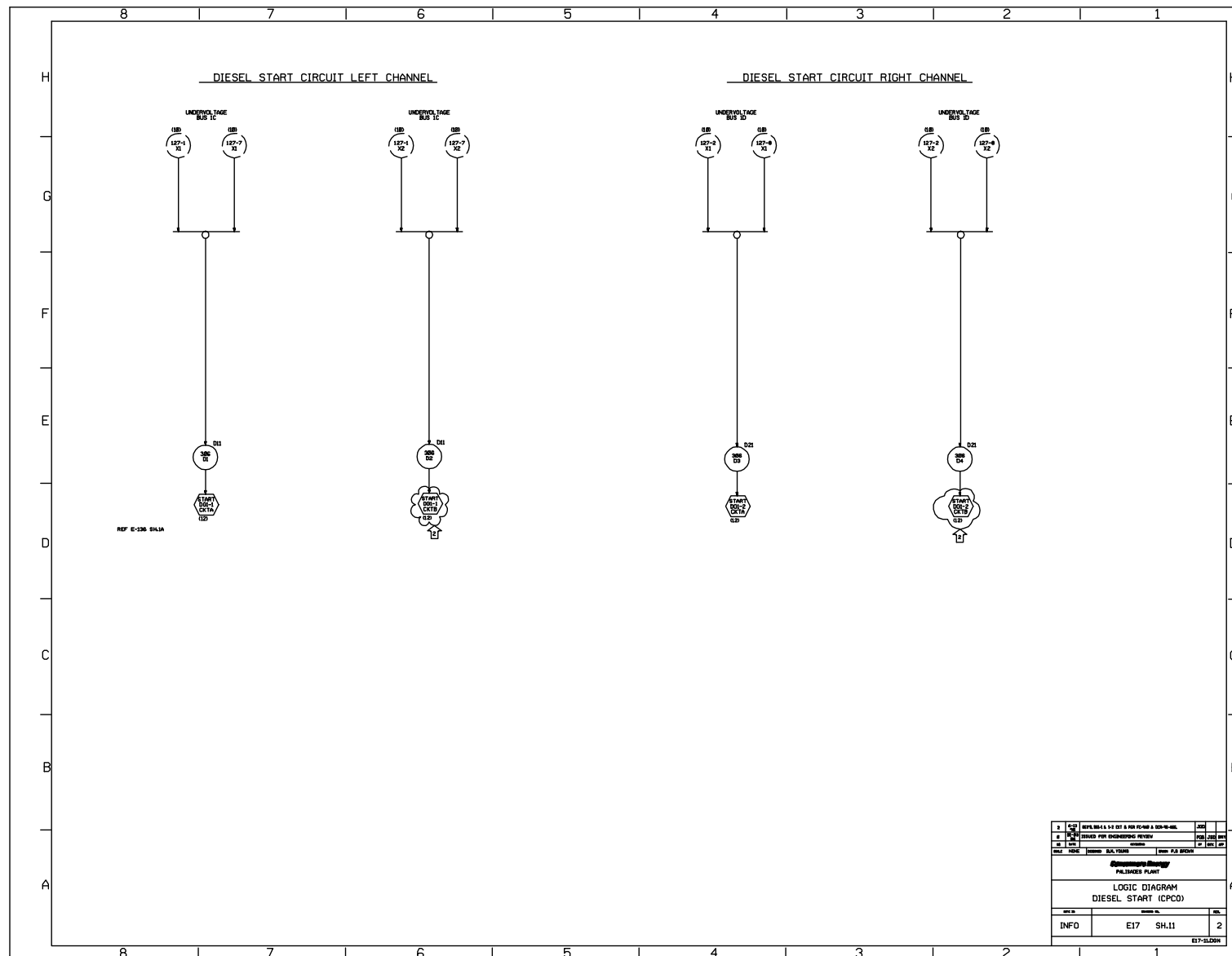
LOGIC DIAGRAM
DIESEL ENGINE CONTROL, TRIPS AND ALARMS

LOGIC DIAGRAM
DIESEL GENERATOR BREAKERS
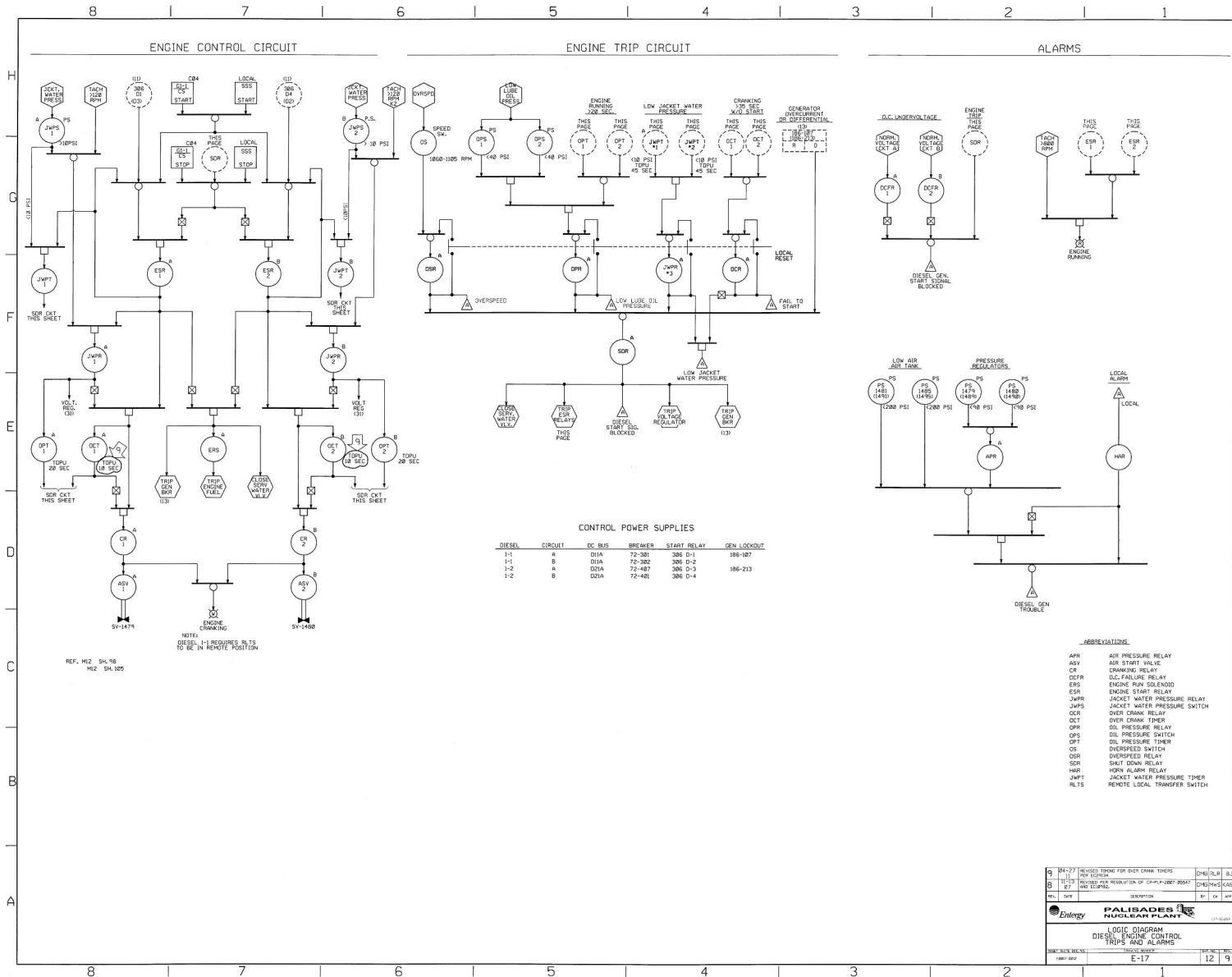
LOGIC DIAGRAM
DIESEL GENERATOR BREAKERS
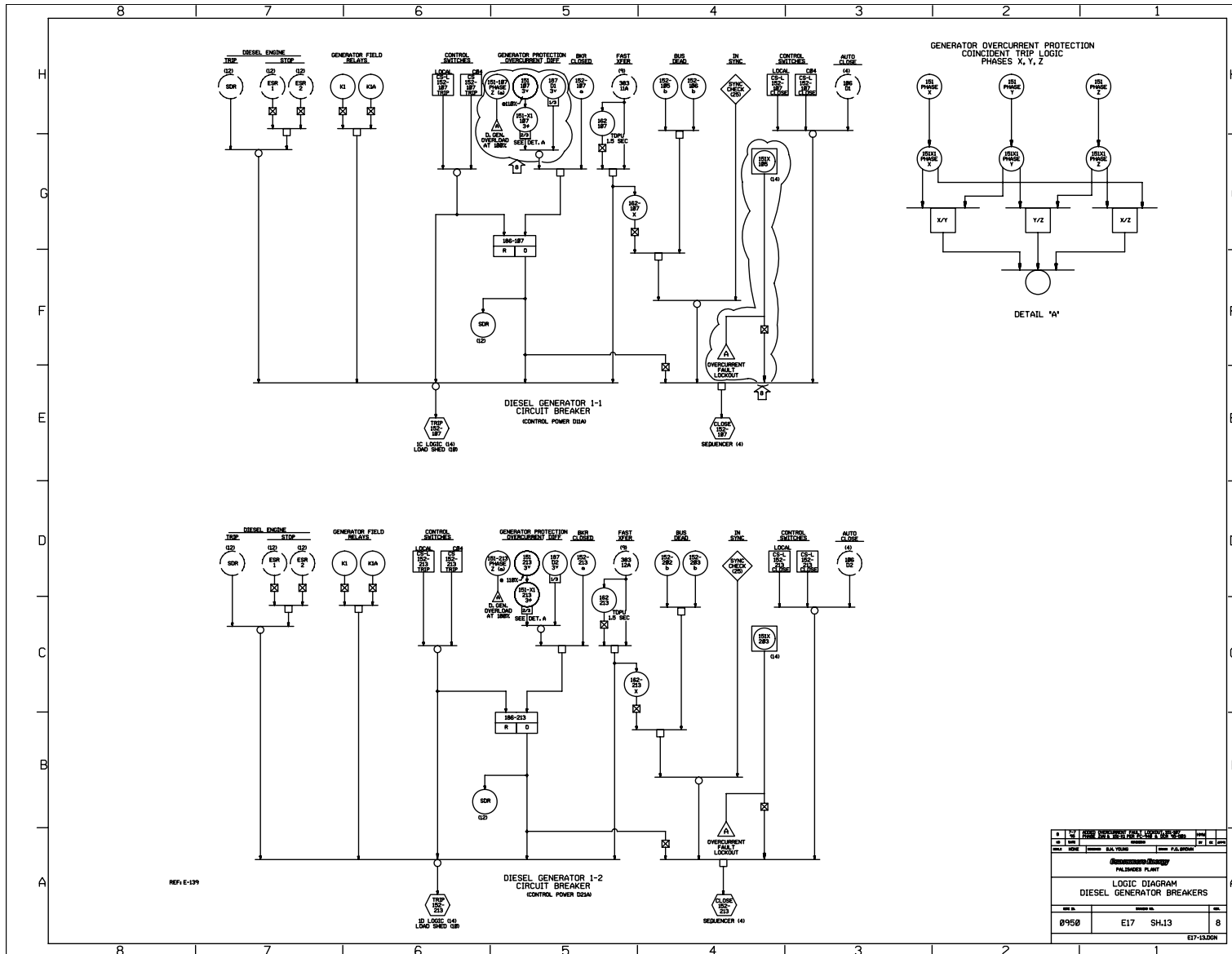
LOGIC DIAGRAM
BUS 1C AND 1D INCOMING BREAKERS

LOGIC DIAGRAM
POWER TO BUS 1E, 1F, AND 1G INCOMING BREAKERS
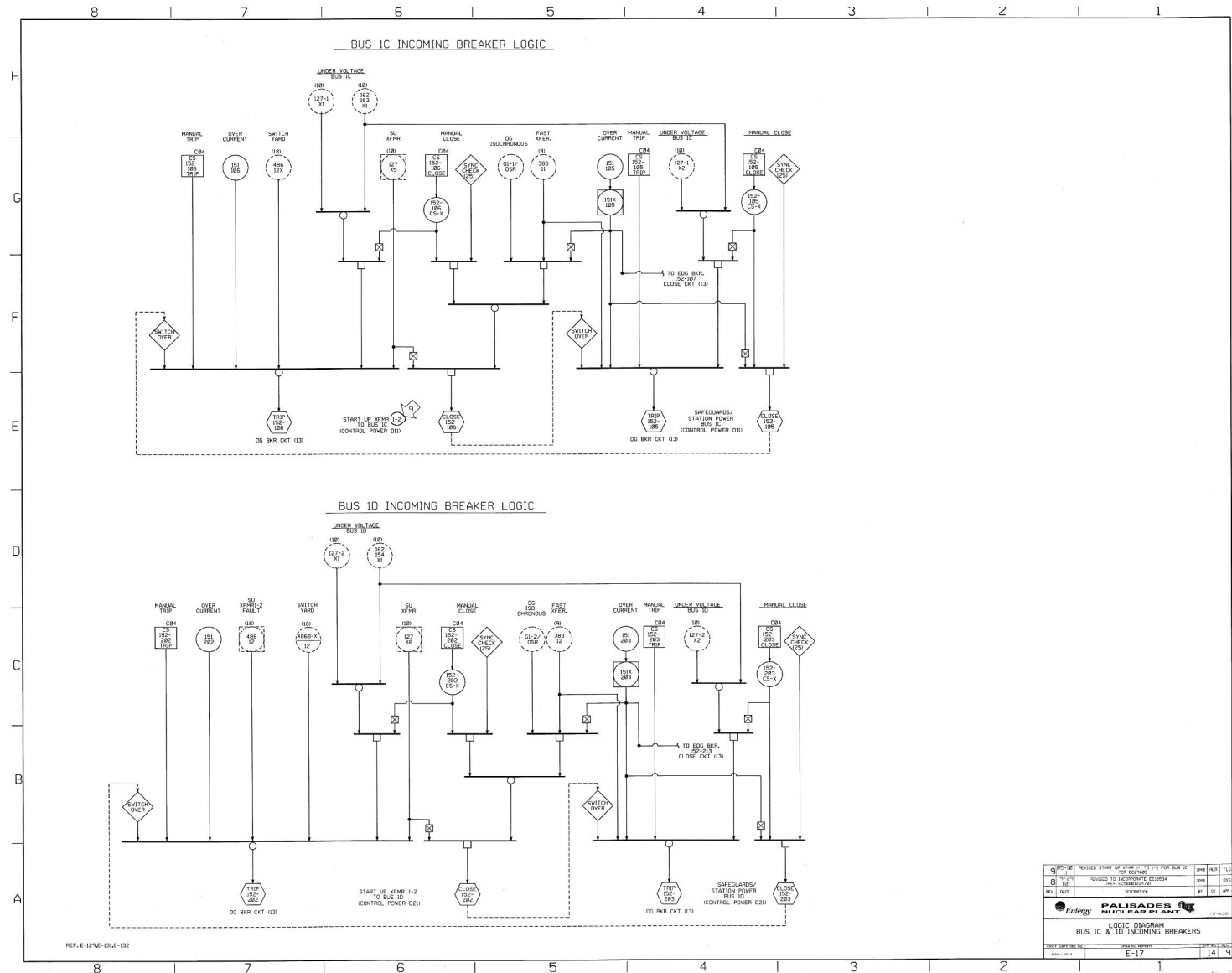
LOGIC DIAGRAM
BUS 1A & 1 B INCOMING BREAKERS
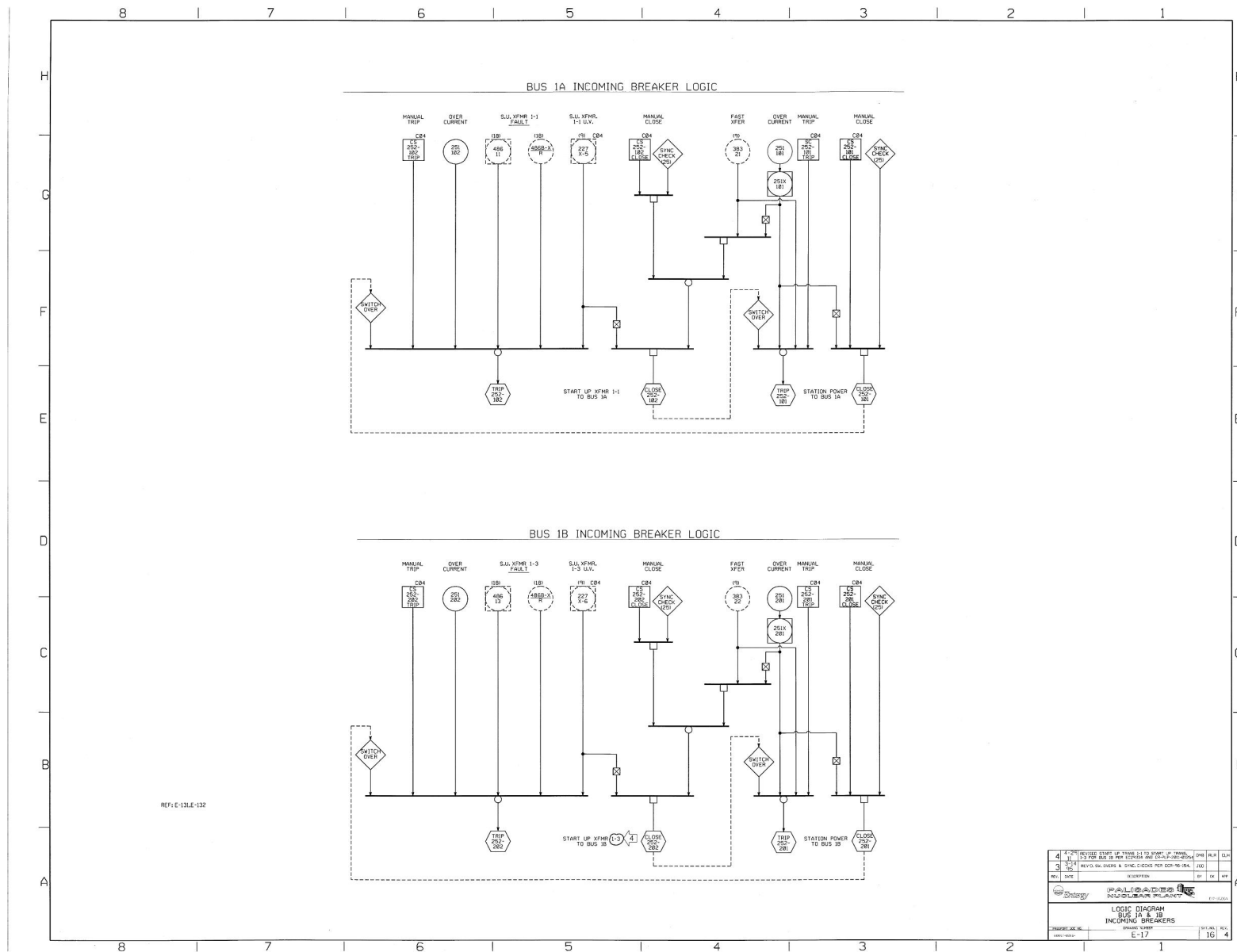
LOGIC DIAGRAM
GENERATOR BREAKER AND M.O.D. CONTROL

LOGIC DIAGRAM
START-UP XFMR PROTECTION

LOGIC DIAGRAM
START-UP XFMR, PROTECTION

E-17

LOGIC DIAGRAM
SAFEGUARD TRANSFORMER 1-1

LOGIC DIAGRAM
SAFEGUARD TRANSFORMER 1-1

NOTES:
1. LOCKOUT RELAY TRIPS DISCONNECTED FROM SUDDEN PRESSURE RELAY 463/SG AND LTC PRESSURE RELIEF DEVICE 63TR.
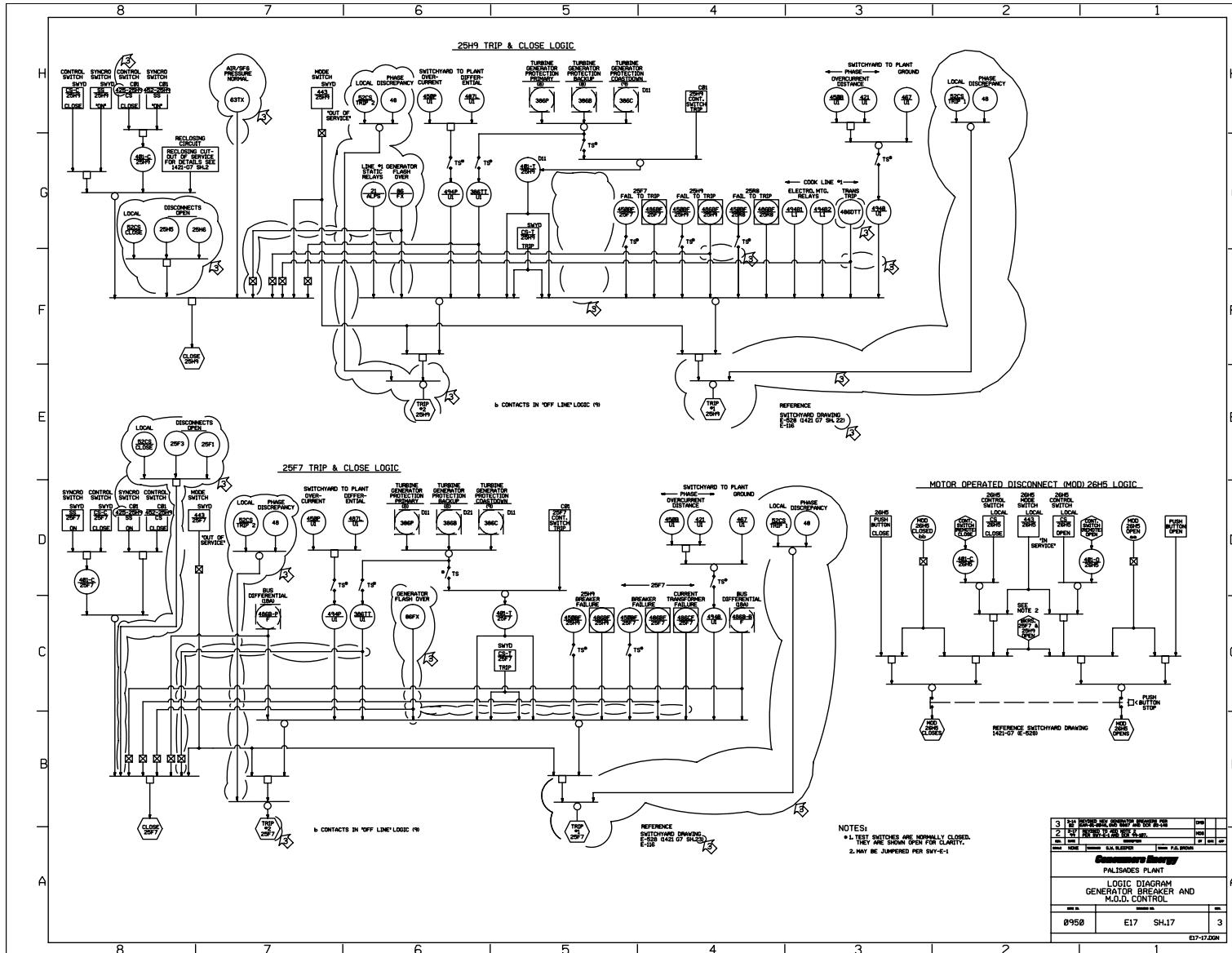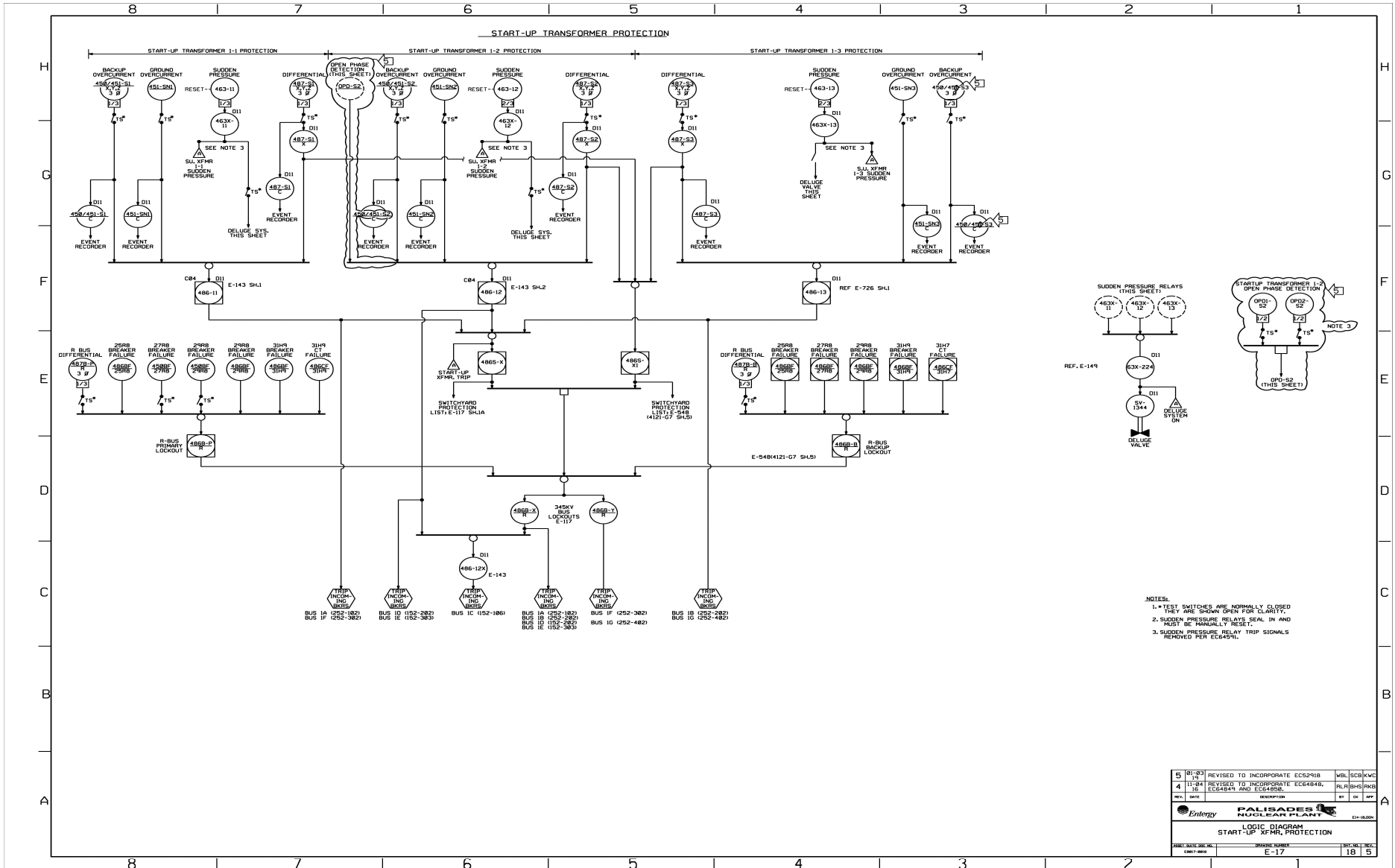
LOGIC DIAGRAM
CIRCUIT BREAKER OPERATION
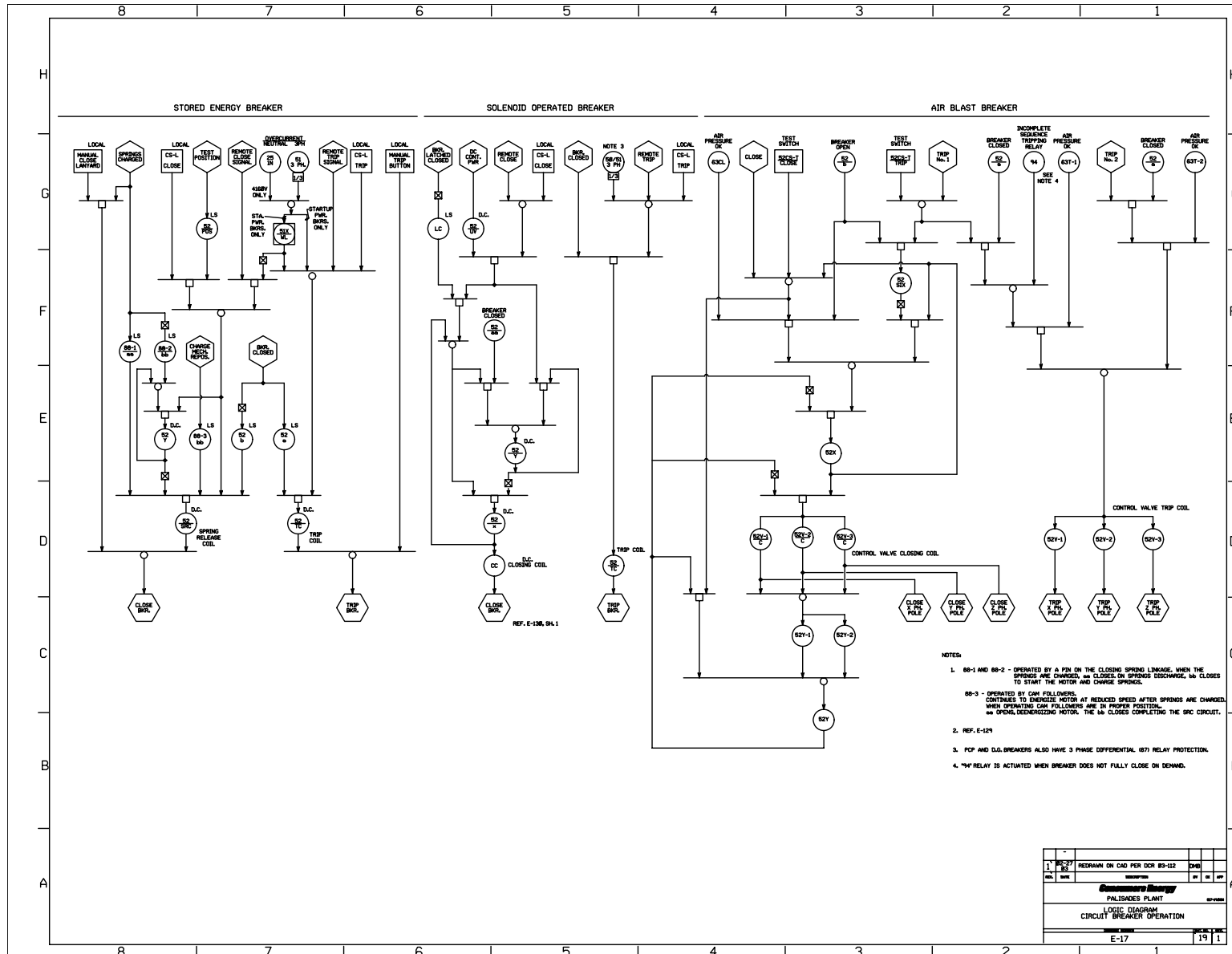
SCHEMATIC DIAGRAM
SAFETY INJECTION SIGNAL AUXILIARY CIRCUITS

SCHEMATIC DIAGRAM
SAFETY INJECTION SIGNAL AUXILIARY CIRCUITS

SAFETY INJECTION TEST INDICATING LAMPS
SCHEME NO. S36

SCHEMATIC DIAGRAM
SAFETY INJECTION AND SEQUENCE LOADING CIRCUITS

SCHEMATIC DIAGRAM
SAFETY INJECTION AND
SEQUENCE LOADING CIRCUIT No. 1

SCHEMATIC DIAGRAM
SAFETY INJECTION AND SEQUENCE LOADING CIRCUITS

SCHEMATIC DIAGRAM
SAFETY INJECTION AND SEQUENCE LOADING CIRCUITS

MC-34L102 (0817-116) SEQUENCER FUNCTIONS-LEFT CHANNEL

INPUT CONTACT NUMBER	INTER INPUT CONT NO	DESCRIPTION	DRAWING	TIME DBA	TIME NSD
1	10001	INPUT FOR DBA (10001)	E-209 SH.2	0(REF)	NA
2	10002	INPUT FOR NSD (10002)	E-209 SH.2	NA	0(REF)
3	10003	SPARE			
4	10004	SPARE			
5	10005	SPARE			
6	10006	SPARE			
7	10007	SPARE			
8	10008	SPARE			
9	10009	SPARE			
10	10010	SPARE			
11	10011	SPARE			
12	10012	SPARE			
13	10013	SPARE			
14	10014	SPARE			
15	10015	SPARE			
16	10016	SPARE			

MC-34R102 (0817-116) SEQUENCER FUNCTIONS-RIGHT CHANNEL

INPUT CONTACT NUMBER	INTER INPUT CONT NO	DESCRIPTION	DRAWING	TIME DBA	TIME NSD
1	10001	INPUT FOR DBA	E-209 SH.2	0(REF)	NA
2	10002	INPUT FOR NSD	E-209 SH.2	NA	0(REF)
3	10003	SPARE			
4	10004	SPARE			
5	10005	SPARE			
6	10006	SPARE			
7	10007	SPARE			
8	10008	SPARE			
9	10009	SPARE			
10	10010	SPARE			
11	10011	SPARE			
12	10012	SPARE			
13	10013	SPARE			
14	10014	SPARE			
15	10015	SPARE			
16	10016	SPARE			

MC-34L105 (0836-016) SEQUENCER FUNCTIONS-LEFT CHANNEL

OUTPUT CONTACT NUMBER	INTER OUTPUT CONT NO	DESCRIPTION	DRAWING	TIME DBA	TIME NSD
1	00017	START SERVICE WATER PUMP P-7B	E-154 SH.1	10±0.3	10±0.3
2	00018	✱START CCW PUMP P-52C	E-259	40±0.3	40±0.3
3	00019	START CHARGING PUMP P-55C	E-257 SH.2	2±0.3	2±0.3
4	00020	START LPSI PUMP P-67B	E-248	13±0.3	NA
5	00021	SPARE			
6	00022	SPARE			
7	00023	SPARE			
8	00024	SPARE			
9	00025	SPARE			
10	00026	SPARE			
11	00027	SPARE			
12	00028	SPARE			
13	00029	SPARE			
14	00030	SPARE			
15	00031	SPARE			
16	00032	SPARE			

MC-34R105 (0836-016) SEQUENCER FUNCTIONS-RIGHT CHANNEL

OUTPUT CONTACT NUMBER	INTER OUTPUT CONT NO	DESCRIPTION	DRAWING	TIME DBA	TIME NSD
1	00017	START SERVICE WATER PUMP P-7A	E-154 SH.1	10±0.3	10±0.3
2	00018	START CHARGING PUMP P-55B	E-257 SH.1	19±0.3	19±0.3
3	00019	START CHARGING PUMP P-55A	E-257 SH.1	2±0.3	2±0.3
4	00020	LPSI PUMP P-67A	E-247	13±0.3	NA
5	00021	SPARE			
6	00022	SPARE			
7	00023	SPARE			
8	00024	SPARE			
9	00025	SPARE			
10	00026	SPARE			
11	00027	SPARE			
12	00028	SPARE			
13	00029	SPARE			
14	00030	SPARE			
15	00031	SPARE			
16	00032	SPARE			

MC-34L103 (0810-008) SEQUENCER FUNCTIONS-LEFT CHANNEL

OUTPUT CONTACT NUMBER	INTER OUTPUT CONT NO	DESCRIPTION	DRAWING	TIME DBA	TIME NSD
1	00001	OPEN HPSI VOP-3009	E-244 SH.1	0±0.3-0	NA
2	00002	OPEN HPSI VOP-3011	E-244 SH.4	0±0.3-0	NA
3	00003	OPEN LPSI VOP-3010	E-244 SH.1	0±0.3-0	NA
4	00004	CLOSE VOL CONT TANK VOP-2007	E-242 SH.1	0±0.3-0	NA
5	00005	START BORIC ACID PUMP P-56B	E-203	2±0.3	NA
6	00006	SPARE			
7	00007	SPARE			
8	00008	SPARE			

MC-34R103 (0810-008) SEQUENCER FUNCTIONS-RIGHT CHANNEL

OUTPUT CONTACT NUMBER	INTER OUTPUT CONT NO	DESCRIPTION	DRAWING	TIME DBA	TIME NSD
1	00001	OPEN HPSI VOP-3064	E-244 SH.1	0±0.3-0	NA
2	00002	OPEN HPSI VOP-3066	E-244 SH.4	0±0.3-0	NA
3	00003	OPEN LPSI VOP-3012	E-244 SH.1	0±0.3-0	NA
4	00004	OPEN BORIC ACID FEED PP VOP-240	E-241	0±0.3-0	NA
5	00005	START BORIC ACID PUMP P-56A	E-203	2±0.3	NA
6	00006	SPARE			
7	00007	SPARE			
8	00008	SPARE			

MC-34L106 (0836-016) SEQUENCER FUNCTIONS-LEFT CHANNEL

OUTPUT CONTACT NUMBER	INTER OUTPUT CONT NO	DESCRIPTION	DRAWING	TIME DBA	TIME NSD
1	00033	START AUX FDWTR PUMP P-8A	E-196 SH.1	45±0.3	45±0.3
2	00034	START CCW PUMP P-52A	E-259	23±0.3	23±0.3
3	00035	START CONT SPRAY PUMP P-54C	E-251	19±0.3	NA
4	00036	START CONT SPRAY PUMP P-54B	E-251	2±0.3	NA
5	00037	SPARE			
6	00038	SPARE			
7	00039	SPARE			
8	00040	SPARE			
9	00041	SPARE			
10	00042	SPARE			
11	00043	SPARE			
12	00044	SPARE			
13	00045	SPARE			
14	00046	SPARE			
15	00047	SPARE			
16	00048	SPARE			

MC-34R106 (0836-016) SEQUENCER FUNCTIONS-RIGHT CHANNEL

OUTPUT CONTACT NUMBER	INTER OUTPUT CONT NO	DESCRIPTION	DRAWING	TIME DBA	TIME NSD
1	00033	START AUX FDWTR PUMP P-8C	E-196 SH.9	45±0.3	45±0.3
2	00034	START CC PUMP P-52B	E-259	23±0.3	23±0.3
3	00035	START SERVICE WTR PUMP P-7C	E-154 SH.2	26±0.3	NA
4	00036	START CONT SPRAY PUMP P-54A	E-251	2±0.3	NA
5	00037	SPARE			
6	00038	SPARE			
7	00039	SPARE			
8	00040	SPARE			
9	00041	SPARE			
10	00042	SPARE			
11	00043	SPARE			
12	00044	SPARE			
13	00045	SPARE			
14	00046	SPARE			
15	00047	SPARE			
16	00048	SPARE			

MC-34L104 (0810-008) SEQUENCER FUNCTIONS-LEFT CHANNEL

OUTPUT CONTACT NUMBER	INTER OUTPUT CONT NO	DESCRIPTION	DRAWING	TIME DBA	TIME NSD
1	00009	OPEN HPSI VOP-3007	E-244 SH.1	0±0.3-0	NA
2	00010	OPEN HPSI VOP-3013	E-244 SH.4	0±0.3-0	NA
3	00011	OPEN LPSI VOP-3008	E-244 SH.1	0±0.3-0	NA
4	00012	OPEN BORIC ACID TANK VOP-2069	E-241	0±0.3-0	NA
5	00013	OPEN BORIC ACID TANK VOP-2070	E-241	0±0.3-0	NA
6	00014	SPARE			
7	00015	SPARE			
8	00016	SPARE			

MC-34R104 (0810-008) SEQUENCER FUNCTIONS-RIGHT CHANNEL

OUTPUT CONTACT NUMBER	INTER OUTPUT CONT NO	DESCRIPTION	DRAWING	TIME DBA	TIME NSD
1	00009	OPEN HPSI VOP-3062	E-244 SH.1	0±0.3-0	NA
2	00010	OPEN HPSI VOP-3068	E-244 SH.4	0±0.3-0	NA
3	00011	OPEN LPSI VOP-3014	E-244 SH.1	0±0.3-0	NA
4	00012	SPARE			
5	00013	SPARE			
6	00014	SPARE			
7	00015	SPARE			
8	00016	SPARE			

NOTES:
1. THE FOLLOWING CONVENTION WAS USED FOR EQUIPMENT NUMBERS.

   MC- 3 4 X X XX

   CHANNEL (LEFT OR RIGHT)
   CHASSIS # (ALWAYS 1)
   SLOT # (01-07)

2. SEQUENCERS ARE GOULD MODEL 984-380 WITH 800 SERIES INPUT/OUTPUT MODULES.
3. FOR SEQUENCER INITIATION SCHEME SEE E-209 SH.2.

✱ IF PUMPS P-52A AND P-52B FAIL TO START.
✱✱ IF PUMPS P-55A AND P-55C FAIL TO START.

REV	DATE	DESCRIPTION	BY	CK	APP
25	11-1 '96	REV MC-34L&R103,104,105 & 106 PER 950-96-010.	JGD		

DR. R.M. SATTERELLI   CK. T.D. VOGT   4/18/83

SECTION HEAD: APP. C.J. MCDONALD 4/18/83
DIVISION HEAD: APP. P. LOLICH 4/18/83
DEPARTMENT HEAD: APP. D.C. TARSI 4/18/83

Consumers Energy
PALISADES PLANT
E209-3.DGN

SCHEMATIC DIAGRAM
SAFETY INJECTION & SEQUENCER
LOADING CIRCUITS
NO. E-209 SHEET 3   REV. 25

SCHEMATIC DIAGRAM
SAFETY INJECTION AND SEQUENCE LOADING CIRCUITS

SIS (SAFETY INJECTION SIGNAL) RELAY TABLE — FUNCTIONS OF SIS RELAYS
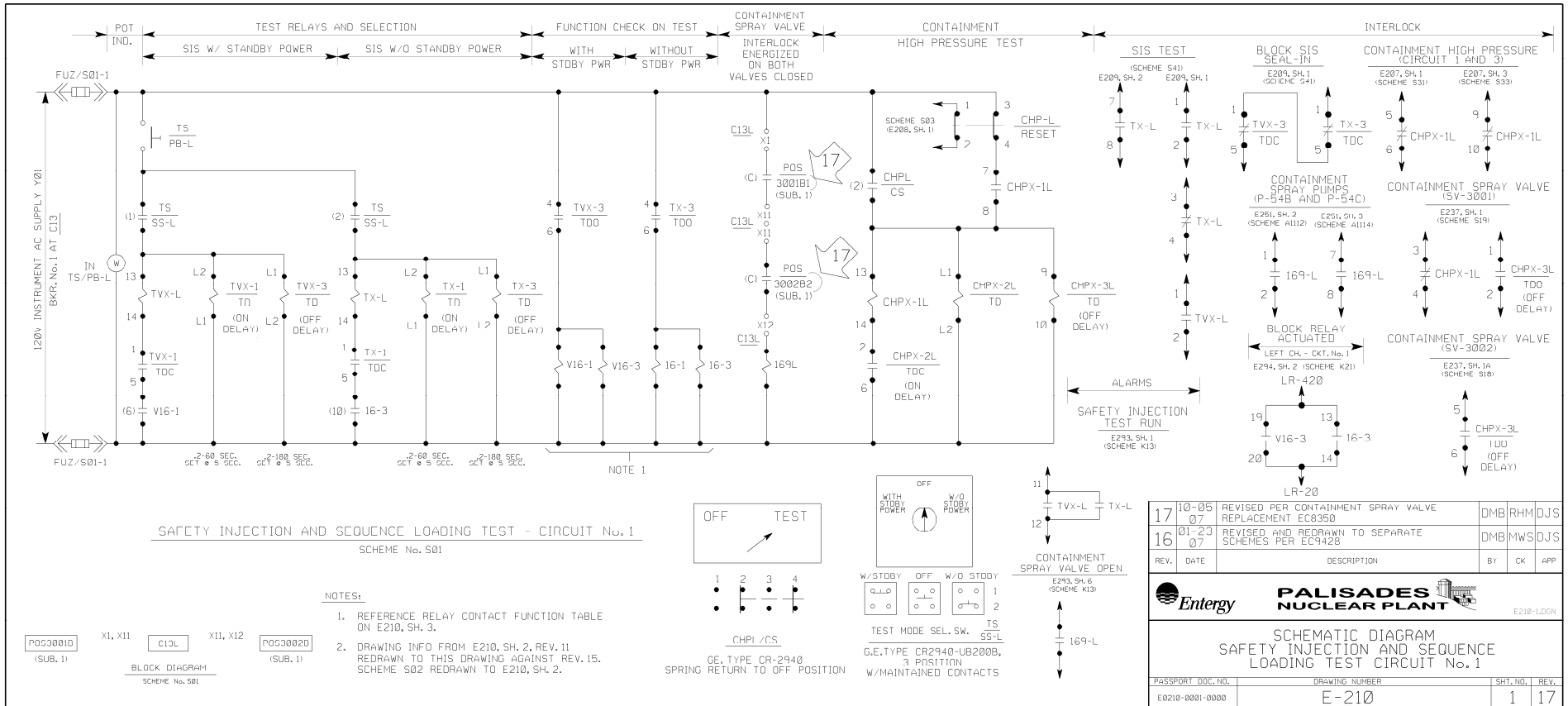
SIS RELAYS-LEFT (ODD NUMBERS)

CONTACTS	SIS-1	REF. DWG.	SIS-3	REF. DWG.	SIS-5 (SEE NOTE 4)	REF. DWG.
1	CLOSE CONT'MT SUMP DRAIN ISOL. SV1103 **	E-235 SH.1	SEAL-IN CONTACT	E-209 SH.1	SIS WITH STANDBY PWR. AVAILABLE CKT. NO.1	E-209 SH.1
2	CLOSE SERVICE WATER TO NON-CRITICAL ITEMS SV-1359 **	E-219 SH.3	CLOSE BORIC ACID RECIRC. VALVE POC2130	E-90	S.I. INITIATION ALARM * (SIGNAL A)	E-293 SH.4
3	TRIP BLOCK CHARGING PUMP P55C	E-257 SH.2	CLOSE BORIC ACID RECIRC. VALVE POC2130	E-90	CLOSE S.I. TANK RELIEF VALVE SV0347	E-245 SH.4
4	S.I. INITIATION ALARM *	E-293 SH.4	START DBA SEQUENCER	E-209 SH.2	CLOSE S.I. TANK RELIEF VALVE SV0338 **	E-245 SH.3
5	CLOSE BLOCK CHARGING PUMP P55C	E-257 SH.2	NO. SIS TO START NORMAL SHUT DN. SEQUENCER	E-209 SH.2	OPEN COMPONENT CLG. WTR. TO SHUT DN. HEAT EXCH. SV0438	E-239 SH.2
6	CLOSE S.I. TANK RELIEF VALVE SV0342	E-245 SH.3	CLOSE S.I. TANK RELIEF VALVE SV0346	E-245	CLOSE HPSI HOT-LEG PRESSURE LETDOWN VALVE CV3085	E-245
7					ENABLE OPENING COMP. CLG. WTR. TO FUEL POOL HEAT EXCH.	E-239 SH.2
8					CLOSE COMP. CLG. WTR. TO FUEL POOL HEAT EXCH. SV0944A	E-239 SH.2
9					CLOSE COMP. CLG. WTR. TO RDWST EVAPS SV0944, SV0977B	E-239 SH.2
10					SPARE	
11					SPARE	
12					SPARE	

CONTACTS	SIS-7	REF. DWG.
1	OPEN COMP. CLG. WTR. SEAL CLG. SUCTION VALVES SV0913	E-239 SH.2
2	OPEN COMP. CLG. WTR. DISCH. FROM SEAL CLG. SV0950	E-239 SH.2
3	OPEN SERV. WTR. DISCH. VALVE SV0867	E-217
4	CLOSE S.I. TANK LEAKAGE VALVE SV3069	E-245 SH.3
5	CLOSE SERV. WTR. SUPPLY VALVE SV0869	E-217
6	CFM INPUT *123	E-209 SH.1

SIS RELAYS-RIGHT (EVEN NUMBERS)

CONTACTS	SIS-2	REF. DWG.	SIS-4	REF. DWG.	SIS-6	REF. DWG.	SIS-8	REF. DWG.	SIS-10 (SEE NOTE 4)	REF. DWG.
1	CLOSE CONT'MT SUMP DRAIN ISOL. SV1104 **	E-235 SH.1	SEAL-IN CONTACT	E-209 SH.1A	SIS WITH STANDBY PWR. AVAILABLE CKT. NO.2	E-209 SH.1A	OPEN SERV. WTR. DISCH. VALVE SV0067	E-217	OPEN SERV. WTR. DISCH. SV0861 **	E-216
2	CLOSE SERVICE WTR. TO NON-CRITICAL ITEMS SV1359 **	E-219 SH.3	CLOSE BORIC ACID RECIRC. VALVE POC2136	E-90	OPEN COMP. CLG. WTR. TO SEAL CLG. SUCTION VA. SV0013	E-239 SH.2	OPEN SERV. WTR. SUPPLY VALVE SV0864	E-217	SPARE	*
3	OPEN SERV. WTR. DISCH. VALVE SV0867	E-217	CLOSE BORIC ACID RECIRC. VALVE POC2136	E-90	CLOSE COMP. CLG. WTR. TO FUEL POOL HEAT EXCH.	E-239 SH.2	TRIP BLOCK CHARGING PUMP P55B	E-257 SH.1	SPARE	*
4	CLOSE S.I. TANK LEAKAGE VALVE SV3069 **	E-245 SH.3	START DBA SEQUENCER	E-209 SH.2A	ENABLE OPENING COMP. CLG. WTR. TO FUEL POOL HEAT EXCH.	E-239 SH.2	CLOSE COMP. CLG. WTR. TO SHUTDN. HEAT EXCH. SV0437	E-239 SH.2	CLOSE COMP. CLG. WTR. TO RADWASTE EVAPS SV0944 **	E-239
5	CLOSE SERV. WTR. SUPPLY VALVE SV0869	E-217	NO. SIS TO START NORMAL SHUT DN. SEQ	E-209 SH.2A	S.I. INITIATION ALARM *	E-293 SH.2	CLOSE COMP. CLG. WTR. TO RADWASTE EVAPS SV0977B	E-239 SH.2	CLOSE COMP. CLG. WTR. TO RADWASTE EVAPS SV0977B	E-239
6	CLOSE S.I. TANK RELIEF VALVE SV0347	E-245 SH.3	CLOSE S.I. TANK RELIEF VALVE SV0338	E-245 SH.3	OPEN SERV. WTR. DISCH. SV0873	E-216 SH.1	CLOSE BLOCK CHARGING PUMP P55B	E-257 SH.1		
7							CFM INPUT *124	E-209 SH.1A		
8							CLOSE HPSI HOT-LEG PRESSURE LETDOWN VALVE CV3084	E-245		
9							LOCKOUT TURNING GEAR OIL PUMP P-26	E-185	31	
10							SPARE			
11							CLOSE S.I. TANK RELIEF VALVE SV0342	E-245 SH.3		
12							CLOSE S.I. TANK RELIEF VALVE SV0346	E-245 SH.3		

SIS-X (SAFETY INJECTION SIGNAL AUXILIARY) RELAY TABLE — FUNCTIONS WITH SIS & STANDBY POWER AVAILABLE

SIS-X RELAYS-LEFT (ODD NUMBERS)

CONTACTS	SIS-X1	REF. DWG.	SIS-X3	REF. DWG.	SIS-X5	REF. DWG.	SIS-X7	REF. DWG.
1	START L.P. INJ. PUMP P67B	E-248	OPEN H.P. INJ. LINE MOV 3011	E-244 SH.1	CLOSE VOLUME CONTROL TANK OUTLET MOV2007	E-242 SH.1	START SERV. WTR. PUMP P7B	E-154 SH.1
2	START L.P. INJ. PUMP P66B	E-249	OPEN L.P. INJ. LINE MOV 3008	E-244 SH.1	START BORIC ACID PUMP P56B	E-203	START COMP. CLG. PUMP P52A	E-259
3	CONT. SPRAY PUMP P54B ON STAND BY	E-251	OPEN H.P. INJ. LINE MOV 3010	E-244 SH.1	OPEN BORIC ACID GRAVITY FEED MOV2169	E-241	START COMP. CLG. PUMP P52B	E-259
4	OPEN H.P. INJ. LINE MOV 3007	E-244 SH.1	TRIP CONT. CLG. UNIT V4B **	E-218	OPEN BORIC ACID GRAVITY FEED MOV2170	E-241	SPARE	
5	OPEN H.P. INJ. LINE MOV 3009	E-244 SH.1	SPARE		SPARE		SPARE	
6	OPEN H.P. INJ. LINE MOV 3013	E-244 SH.1	CONT. SPRAY PUMP P54C ON STAND BY	E-251	START CHG. PUMP P55C	E-257 SH.4	INITIATE STARTUP POWER LOAD SHED SYSTEM	E-209 SH.2

SIS-X RELAYS-RIGHT (EVEN NUMBERS)

CONTACTS	SIS-X2	REF. DWG.	SIS-X4	REF. DWG.	SIS-X6	REF. DWG.	SIS-X8	REF. DWG.
1	START L.P. INJ. PUMP P67A	E-247	OPEN H.P. INJ. LINE MOV 3062	E-244	OPEN BORIC ACID PUMPED FEED MOV2140	E-241	START SERV. WTR. PUMP P7C	E-154 SH.2
2	START H.P. INJ. PUMP P66A	E-249	OPEN H.P. INJ. LINE MOV 3066	E-244 SH.1	START BORIC ACID PUMP P56A	E-203	START COMP. CLG. PUMP P52B	E-259 SH.1
3	SPARE		OPEN L.P. INJ. LINE MOV 3068	E-244 SH.1	START CHG. PUMP P55A	E-257 SH.1	SPARE	
4	CONT. SPRAY PUMP P54A ON STAND BY	E-251 SH.1	TRIP CONT. CLG. UNIT V2B **	E-218	START CHG. PUMP P55B	E-244 SH.1	SPARE	E-257 SH.1
5	TRIP CONT. CLG. UNIT V1B **	E-218	OPEN H.P. INJ. LINE MOV 3012	E-244 SH.1	START SERV. WTR PUMP P7A	E-154 SH.1	SPARE	
6	OPEN H.P. INJ. LINE MOV 3064	E-244 SH.1	OPEN H.P. INJ. LINE MOV 3014	E-244	TRIP CONT. CLG. UNIT V3B **	E-218	INITIATE STARTUP POWER LOAD SHED SYSTEM	E-209 SH.2A

REV.	DATE	DESCRIPTION	BY	CK	APP
31	10-26-10	REVISED TO INCORPORATE EC19665	RLR	DMK	ECJ
30	12-02-03	REVISED PER SC-95-090 AND DCR 98-340	DMB		RTD

Entergy — PALISADES NUCLEAR PLANT

SCHEMATIC DIAGRAM
SAFETY INJECTION & SEQUENCE
LOADING CIRCUITS

E209-4.DGN

DRAWING NUMBER	SHT. NO.	REV.
E-209	4	31

GWO 8428
SUBMERGED ELECT. EQUIP. MOD.

NOTES
1. * N.O. CONTACT
2. ** N.C. CONTACT-OPENS ON SIS
3. FOR RELAY CIRCUITS, SEE E-209, SH.1
4. SIS-10 & SIS-5 RELAYS HAVE 12 CONTACTS

SCHEMATIC DIAGRAM
SAFETY INJECTION AND SEQUENCE LOADING TEST CIRCUITS

SCHEMATIC DIAGRAM
SAFETY INJECTION AND SEQUENCE LOADING TEST CIRCUITS
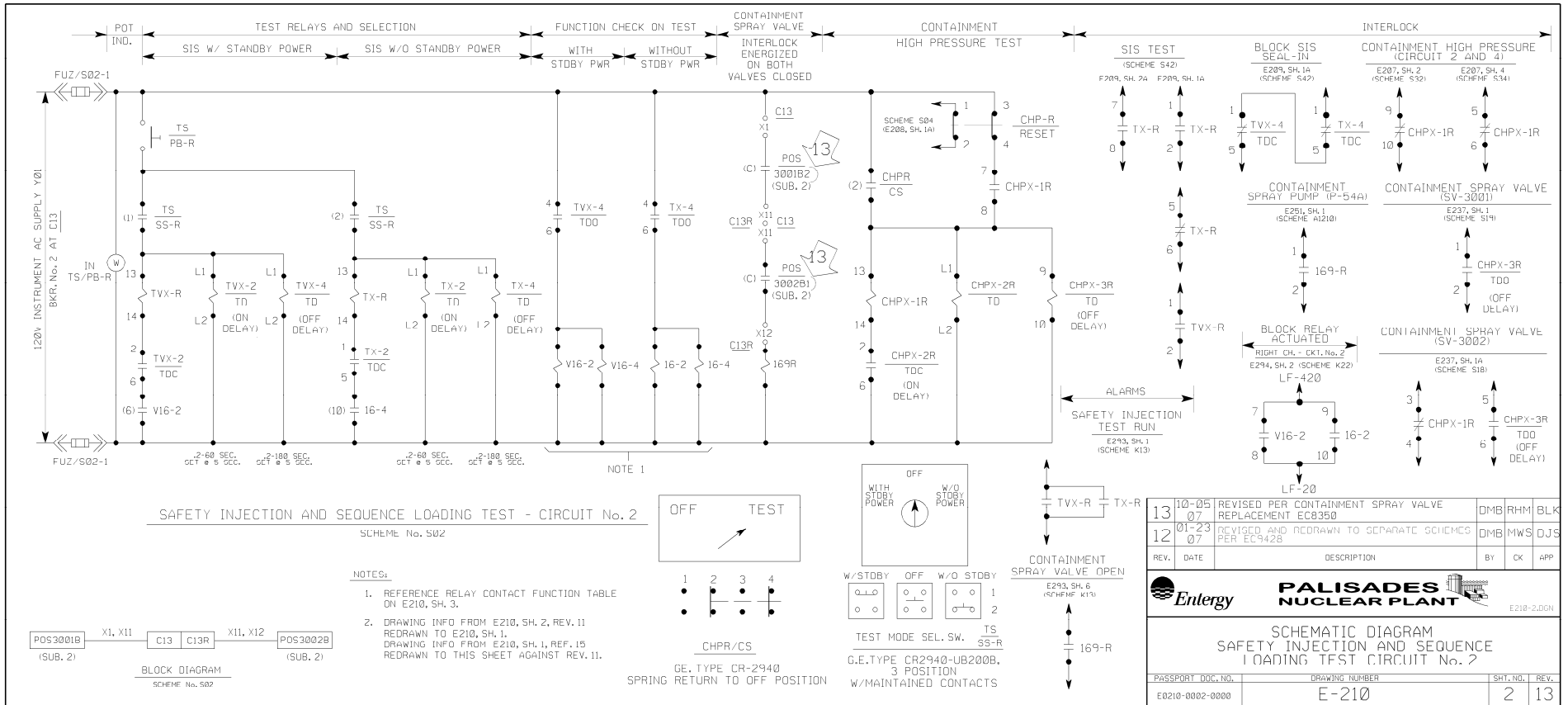
SCHEMATIC DIAGRAM
SAFETY INJECTION AND SEQUENCE LOADING TEST CIRCUITS

TEST RELAY TABLES

FUNCTION ON TEST WITH STAND-BY POWER

CONTACT NO.	CONTACT	LEFT (ODD NUMBERS) RELAY V16-1	REF. DWG.	RELAY V16-3	REF. DWG.	RIGHT (EVEN NUMBERS) RELAY V16-2	REF. DWG.	RELAY V16-4	REF. DWG.
1		LOW PRESSURE SAFETY INJECTION PUMP P67B	E-248	BLKS BKR 52-7804 ⊕	E-135 SH.1	LOW PRESSURE SAFETY INJECTION PUMP P67A	E-247	CHARGING PUMP P55A	E-257 SH 1
2				BLKS BKR 152-303 ⊕	E-132 SH.1			CHARGING PUMP P55B	E-257 SH 1
3		BORIC ACID GRAVITY FEED VALVE ⊕ MOV 2169	E-241	BLKS BKR 152-102 ⊕	E-151	BORIC ACID PUMPED FEED VALVE MOV 2140 ⊕	E-241	BLOCK 30-1359	E-219 SH 3
4		BORIC ACID GRAVITY FEED VALVE ⊕ MOV 2170	E-241	BLKS BKR 152-302 ⊕	E-131 SH.1	BLOCKING RELAYS ACTUATED SEE NOTE1	E-210 SH.2	MAINTAIN OPEN CV-1359 ⊕ SEE NOTE 2	E-219 SH.3
5		MAINTAIN OPEN VOLUME CONTROL TANK MOV 2087 ⊕	E-242	BLKS BKR 52-7701 ⊕	E-135 SH.1			BLKS BKR 152-302 ⊕	E-131 SH.1
6		TEST START CIRCUIT NO 1	E-210	BORIC ACID PUMP P56B	E-203	TEST START CIRCUIT NO 2	E-210	BLKS BKR 152-303 ⊕	E-132 SH.1
7		SERVICE WATER PUMP P7B	E-154 SH 1	HIGH PRESSURE INJECTION PUMP P66B	E-249	SERVICE WATER PUMP P7A	E-154 SH 1	HIGH PRESSURE INJECTION PUMP P66A	E-249
8		CHARGING PUMP P55C	E-257 SH 2	MAINTAIN OPEN CV-1359	E-219 SH.3	SERVICE WATER PUMP P7C	E-154 SH 2	BLKS BKR 52-7701 ⊕	E-135 SH.1
9		COMPONENT COOLING PUMP P52A	E-259	BLOCK 30-1359	E-219 SH.3	BORIC ACID PUMP P56A	E-203	BLKS BKR 52-7804 ⊕	E-135 SH.1
10		COMPONENT COOLING PUMP P52C	E-259	BLOCKING RELAYS ACTUATED	E-210 SH.2	COMPONENT COOLING PUMP P52B	E-259	BLKS BKR 152-102 ⊕	E-151

↑19

⊕ BLOCKS OPERATION ON TEST

FUNCTION ON TEST WITHOUT STAND-BY POWER

CONTACT NO.	CONTACT	LEFT (ODD NUMBERS) RELAY 16-1	REF. DWG.	RELAY 16-3	REF. DWG.	RIGHT (EVEN NUMBERS) RELAY 16-2	REF. DWG.	RELAY 16-4	REF. DWG.
1		LOW PRESSURE SAFETY INJECTION PUMP P67B	E-248	BORIC ACID PUMP P56B	E-203	LOW PRESSURE SAFETY INJECTION PUMP P67A	E-247	CHARGING PUMP P55A	E-257 SH 1
2		CONTAINMENT COOLER RECIRC. FAN V4A	E-217	HIGH PRESSURE SAFETY INJECTION PUMP P66B	E-249	HIGH PRESSURE SAFETY INJECTION PUMP P66A	E-249	MAINTAIN OPEN CV-1359 ⊕	E-219 SH.3
3		SERVICE WATER PUMP P7B	E-154 SH 1			SERVICE WATER PUMP P7A	E-154 SH 1	SERVICE WATER PUMP P7C	E-154 SH 2
4				BLOCK 30-1359	E-219 SH.3				
5		COMPONENT COOLING PUMP P52A	E-259	MAINTAIN OPEN CV-1359	E-219 SH.3	BLOCKING RELAYS ACTUATED	E-210 SH.2	CONTAINMENT COOLER RECIRC. FAN V2A	E-216
6		COMPONENT COOLING PUMP P52C	E-259	CHARGING PUMP P55C	E-257 SH 2	CONTAINMENT COOLER RECIRC. FAN V1A	E-216	CONTAINMENT COOLER RECIRC. FAN V3A	E-216
7				BLOCKING RELAYS ACTUATED	E-210 SH.2	BORIC ACID PUMP P56A	E-203	CHARGING PUMP P55B	E-257
8		MAINTAIN OPEN VOLUME CONTROL TANK MOV 2087 ⊕	E-242	BORIC ACID GRAVITY FEED VALVE MOV 2169	E-241	SPARE		BORIC ACID PUMPED FEED MOV 2140	E-241
9				BORIC ACID GRAVITY FEED VALVE MOV 2170	E-241	SPARE		BLOCK 30-1359	E-219 SH.3
10				TEST START CIRCUIT NO. 1	E-210 SH.1	COMPONENT COOLING PUMP P52B	E-259	TEST START CIRCUIT NO 2	E-210

NOTES:
1. RELAY V-16-2 CONTACT GROUP #4 IS CHANGED TO NORMALLY OPEN.
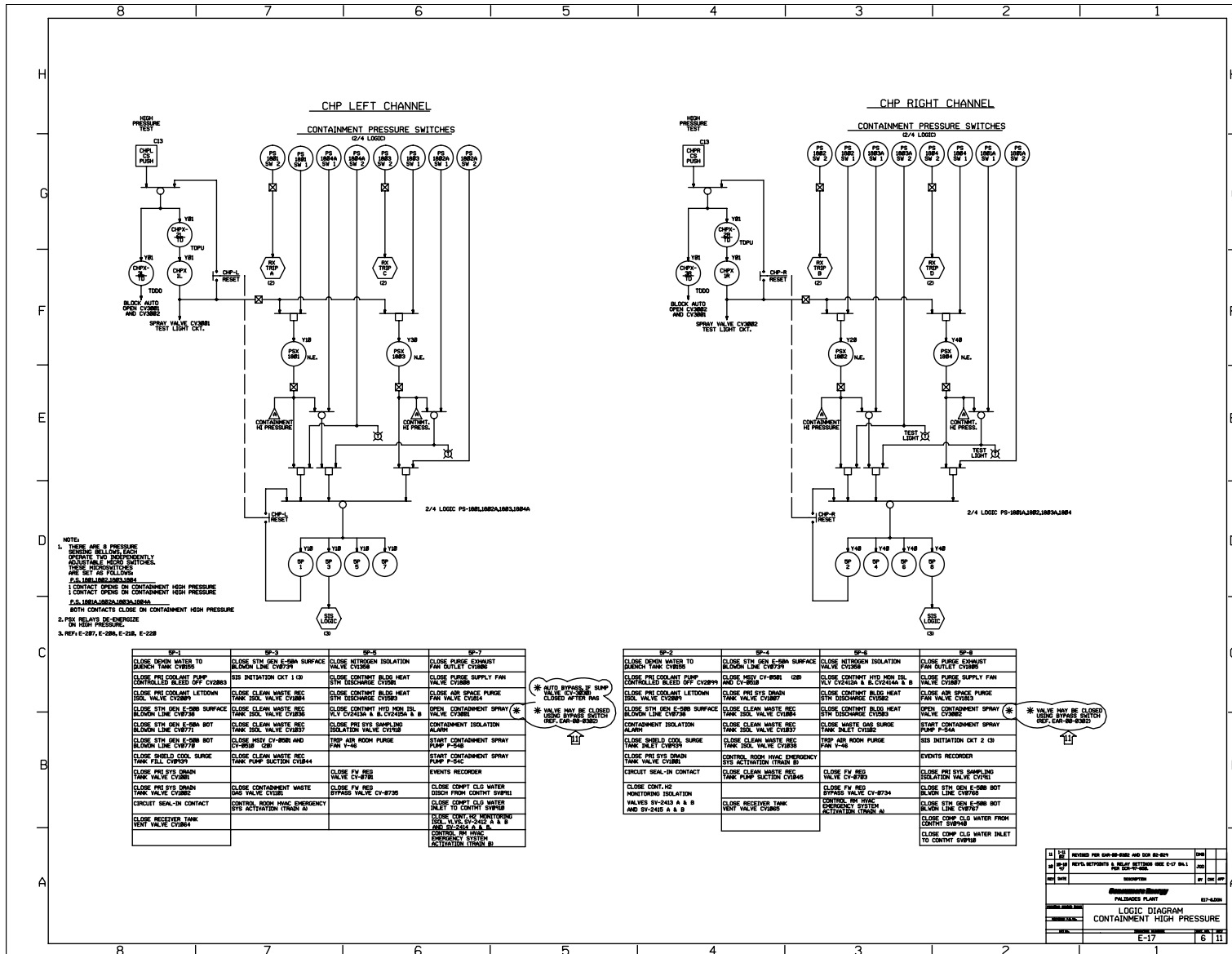2. CONTACTS CHANGED TO NORMALLY OPEN.

REV.	DATE	DESCRIPTION	BY	CK	APP
19	01-23-07	REVISED TO REFLECT AS-BUILT PER EC9428	DMB		DJS
18	11-4-93	REVISED RELAY V16-1 CONTACT 3 TO MOV 2169 PER DCR 93-1297	JFM	HE	

Consumers Energy

PALISADES PLANT   E210-3.DGN

SCEMATIC WIRING DIAGRAM
SAFETY INJECTION & SEQUENCE
LOADING TEST CIRCUIT

DRAWING NUMBER	SHT. NO.	REV.
E-210	3	19

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LOGIC DIAGRAM
CONTAINMENT HIGH PRESSURE SIGNAL

LOGIC DIAGRAM
CONTAINMENT HIGH RADIATION

LOGIC DIAGRAM
CONTAINMENT HIGH RADIATION

SCHEMATIC DIAGRAM
CONTAINMENT HIGH PRESSURE, HIGH RADIATION AND SIRW TANK LOW LEVEL

CONTAINMENT HIGH PRESSURE, HIGH RADIATION AND
SIRW TANK LOW LEVEL DETECTION - CHANNEL No. 1 CIRCUIT

SCHEME S31

NOTES:

1. TEST ONLY WHEN PLANT IS SHUTDOWN.
2. PS-1801 OPENS ON CONTAINMENT HIGH PRESSURE.
3. RIA-1805 OPEN ON CONTAINMENT HIGH RADIATION (DWG. E-227).
4. LS-0327 OPENS ON SIRW TANK LOW LEVEL.
5. CHRL/CS IS A MOMENTARY CONTACT, PUSHBUTTON OPERATOR WITH DOUBLE BLOCK CONTACT ARRANGEMENT. (G.E. TYPE CR2940)
6. PS-0918 CLOSES ON COMP. COOLING LOW PRESSURE
7. SIRWL/CS IS 3 POSITION SPRING RETURN FROM LEFT AND RIGHT TO NORMAL POSITION. (GE TYPE CR104P, WITH BAR OPERATOR)
8. RIA-1805 MAY HAVE INPUT TO CONTAINMENT HIGH RADIATION ½ LOGIC BYPASSED PER RIA-I-10.
9. CAPACITOR TO FILTER NOISE PER FC-888.

REV.	DATE	DESCRIPTION	BY	CK	APP
29	06-13-03	REVISED TO SEPARATE SCHEMES PER DCR 03-450	DMB		PFB
28	05-09-03	REVISED TO ADD 13TV15 LINK 120 REPAIRED PER WO24212550 AND DCR 03-354	DMB		TJS

Consumers Energy

PALISADES PLANT

SCHEMATIC DIAGRAM
CONTAINMENT HIGH PRESSURE-
HIGH RADIATION & SIRW TANK LOW LEVEL

| DRAWING NUMBER	SHT. NO.	REV.
E-207	1	29

SCHEMATIC DIAGRAM
CONTAINMENT HIGH PRESSURE, HIGH RADIATION AND SIRW TANK LOW LEVEL

SCHEMATIC DIAGRAM
CONTAINMENT HIGH PRESSURE, HIGH RADIATION AND SIRW TANK LOW LEVEL DETECTION CHANNEL No. 2 CIRCUIT
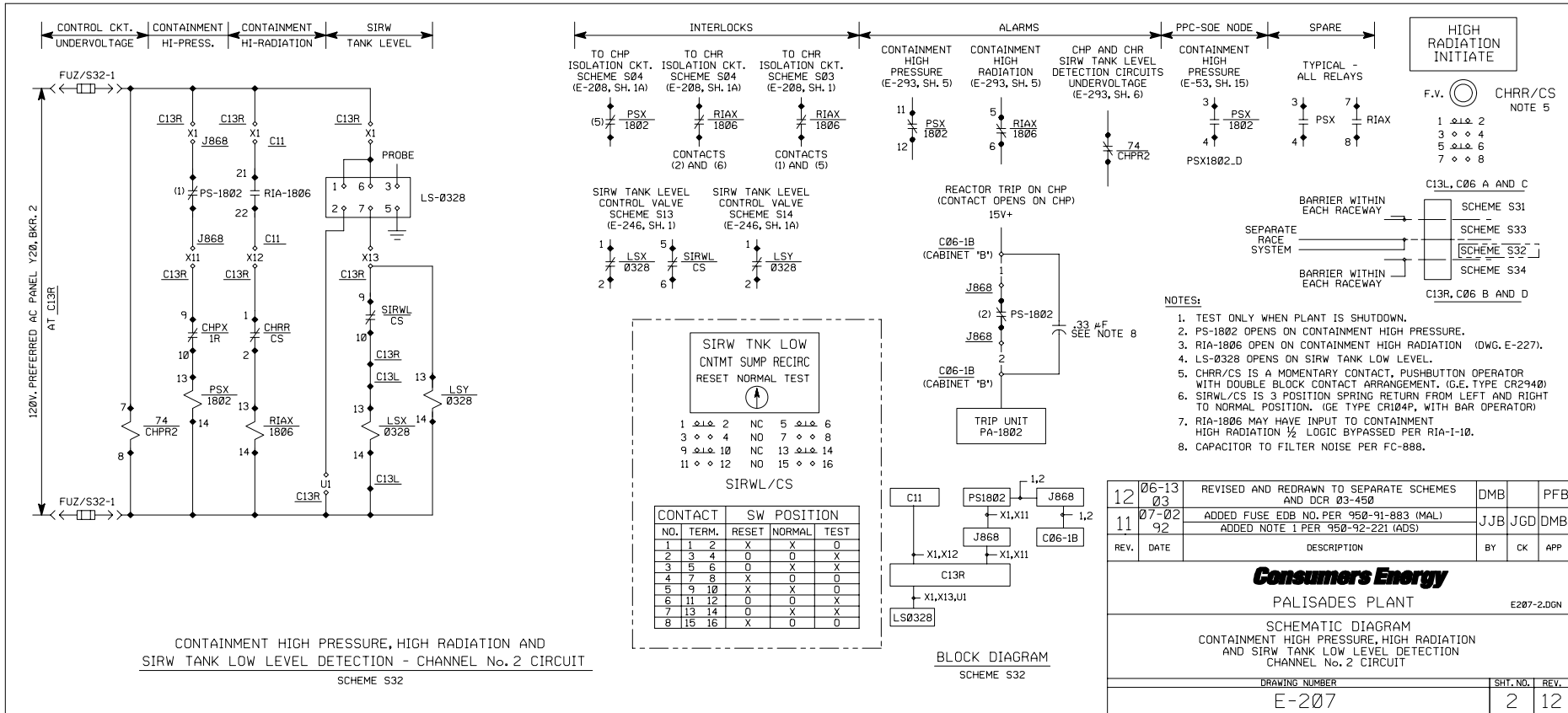
Consumers Energy
PALISADES PLANT

DRAWING NUMBER E-207   SHT. NO. 2   REV. 12

SCHEMATIC DIAGRAM
CONTAINMENT ISOLATION ON HIGH PRESSURE OR HIGH RADIATION

Schematic diagram — Containment Isolation on High Pressure or High Radiation, Circuit No. 1. Palisades Nuclear Plant, Entergy. Drawing Number E-208, Sht. No. 1, Rev. 20.
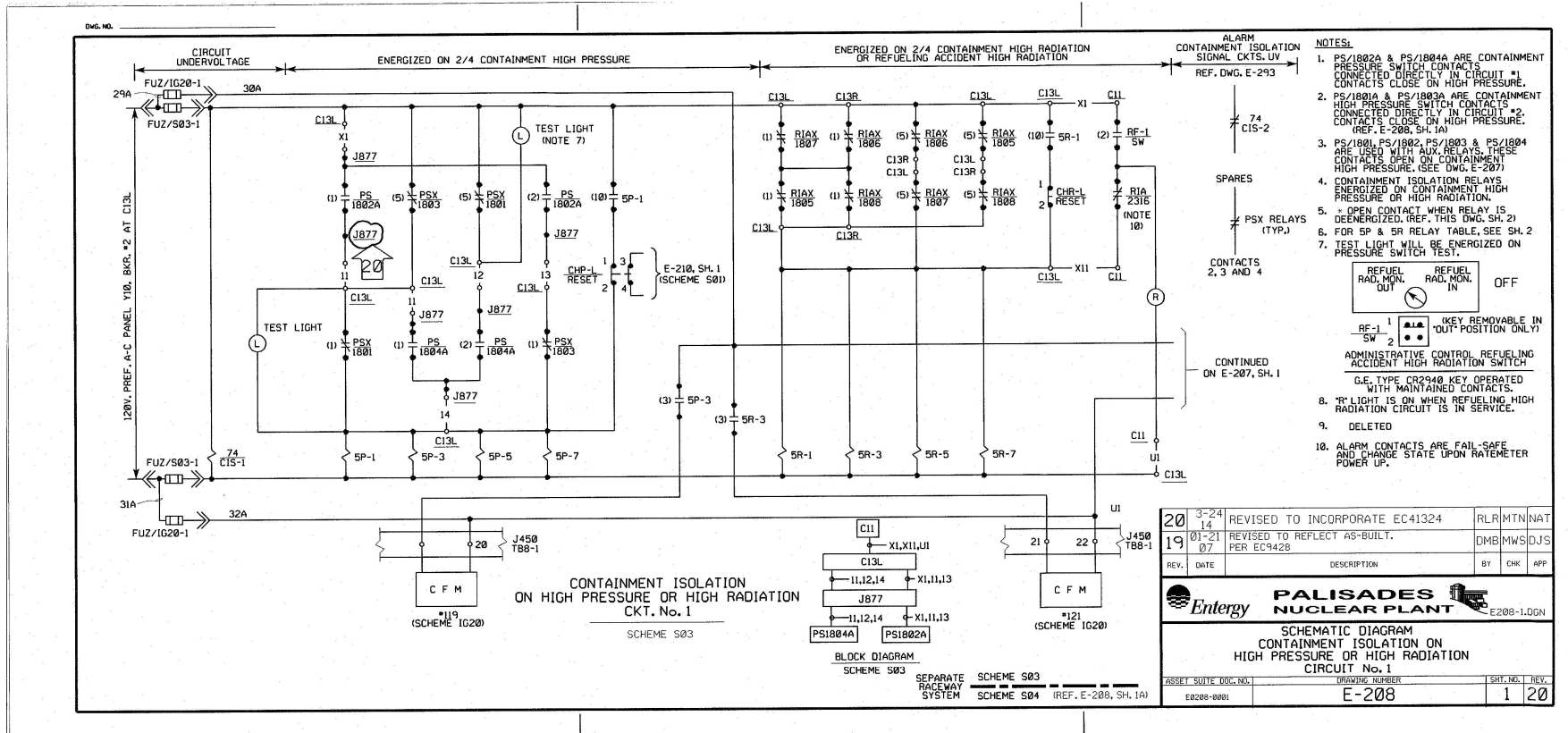
SCHEMATIC DIAGRAM
CONTAINMENT ISOLATION ON HIGH PRESSURE OR HIGH RADIATION

CONTAINMENT ISOLATION RELAY TABLE

CONTACTS	RELAYS 5P-1 & 5R-1	REF. DWG.	RELAYS 5P-3 & 5R-3	REF. DWG.	RELAYS 5P-5 & 5R-5	REF. DWG.	RELAYS 5P-7 & 5R-7	REF. DWG.
1	CLOSE DEMIN.WATER TO QUENCH TANK SV0155	E-235 SH.2	CLOSE STM.GEN.E-50A TOP BLOWDN.LINE SV0739	E-235 SH.3	DISABLE AUTO START OF ENG SFGRDS SUMP PUMP P-72B (5R-5 ONLY)	E-285	CLOSE PURGE EXHAUST FAN OUTLET SV1806	E-221
2	CLOSE PRI.COOLANT PUMP CONTROLLED BLEED OFF SV2083	E-235 SH.2	*SIS INITIATION CKT.1 (5P-3 ONLY)	E-209 SH.1	CLOSE NITROGEN ISOLATION VALVE SV1358	E-235 SH.3	CLOSE PURGE SUPPLY FAN VALVE SV1808	E-221
3	CLOSE PRI.COOLANT LETDOWN ISOL.VALVE SV2009	E-235 SH.2	*CRITICAL FUNCTION MON.INPUTS: *119 (FOR 5P-3, *121 (FOR 5R-3)	E-208 SH.1	CLOSE CONTAINMENT BLDG.HEAT STM.DISCHARGE SV1501	E-235 SH.1	CLOSE AIR SPACE PURGE FAN VALVE SV1814	E-221
4	CLOSE STM.GEN.E-50B TOP BLOWDN.LINE SV0738	E-235 SH.3	CLOSE CLEAN WASTE REC. TANK ISOL.VALVE SV1004	E-235 SH.3	*CLOSE CV-0701 FW REG VLV (5P-5 ONLY)	E-69 SH.1	OPEN CONTAINMENT SPRAY VALVE SV3001 (5P-7 ONLY)	E-237
5	CLOSE STM.GEN.E-50A BOT. BLOWDN.LINE SV0771	E-235 SH.4	CLOSE CLEAN WASTE REC. TANK ISOL.VALVE SV1036	E-235 SH.1	CLOSE CONTAINMENT BLDG.HEAT STM.INLET SV1503	E-235 SH.3	*CONTAINMENT ISOLATION ALARM K11 *26	E-292 SH.2
6	CLOSE STM.GEN.E-50A BOT. BLOWDN.LINE SV0770	E-235 SH.4	CLOSE CLEAN WASTE REC. TANK ISOL.VALVE SV1037	E-235 SH.1	CLOSE CONT.HYD.MON.ISL. VLV.SV-2413A & B, SV-2415A & B	E-916 SH.1	*START CONTAINMENT SPRAY PUMP P-54B (5P-7 ONLY)	E-251
7	CLOSE SHIELD COOL SURGE TANK INLET SV0939	E-235 SH.3	*CLOSE MSIV CV0501 & CV-0510 (5P-3 ONLY)	E-238	CLOSE CONTAINMENT SUMP DR. VALVE SV1103 (RELAYS 5R-5 ONLY)	E-235 SH.1	*START CONTAINMENT SPRAY PUMP P-54B (5P-7 ONLY)	E-251
8	CLOSE PRI.SYS.DRAIN TANK VALVE SV1001	E-235	CLOSE CLEAN WASTE REC. TANK PUMP SUCTION SV1044	E-235 SH.1	*CLOSE CV-735 FW REG BYPASS VLV (5P-5 ONLY)	E-69 SH.1	CLOSE CONT.H₂ MONT.ISOL.VLV. SV-2412A & B & SV-2414A & B	E-916 SH.1
9	CLOSE PRI.SYS.DRAIN TANK VALVE SV1002	E-235 SH.1	*SPARE		CLOSE PRI.SYS.SAMPLING ISOLATION VALVE SV1910	E-235 SH.1	CONTROL ROOM HVAC EMERGENCY SYSTEM ACTIVATION (TRAIN B)	E-271 SH.8
10	*CIRCUIT SEAL-IN CONTACT	E-208 SH.1	CLOSE CONTAINMENT WASTE GAS INLET VALVE SV1101	E-235	TRIP AIR ROOM PURGE FAN V-46	E-222	*CLOSE COMP CLG WTR DISCHE FROM CONT SV0911(5P-7ONLY)	E-235 SH.4
11	CLOSE RECEIVER TANK VENT VALVE SV1064	E-235 SH.1	CONTROL ROOM HVAC EMERGENCY SYS.ACTIVATION (TRAIN A)	E-271 SH.8	DISABLE AUTO START OF ENG SFGRDS SUMP PUMP P-73B (5R-5 ONLY)	E-285	*CLOSE COMP CLG WTR INLET TO CONT SV-0910(5P-7ONLY)	E-235 SH.4
12	SPARE		*SPARE		*SPARE		PPC-SOE NODE PT. ID. KS5P_5R_D	E-53 SH.8

CONTACTS	RELAYS 5P-2 & 5R-2	REF. DWG.	RELAYS 5P-4 & 5R-4	REF. DWG.	RELAYS 5P-6 & 5R-6	REF. DWG.	RELAYS 5P-8 & 5R-8	REF. DWG.	RELAY 5P-6 (CON'T)	REF. DWG.
1	CLOSE DEMIN.WATER TO QUENCH TANK SV0155	E-235 SH.2	CLOSE STM.GEN.E-50A TOP BLOWDN.LINE SV0739	E-235 SH.3	CLOSE CONTAINMENT SUMP DR. VALVE SV1104 (RELAYS 5R-6 ONLY)	E-235 SH.1	CLOSE PURGE EXHAUST FAN OUTLET SV1805	E-235 SH.1		
2	CLOSE PRI.COOLANT PUMP CONTROLLED BLEED OFF SV2099	E-235 SH.2	*CLOSE MSIV CV-0501 & CV-0510 (5P-4 ONLY)	E-238	CLOSE NITROGEN ISOLATION VALVE SV1358	E-235 SH.1	CLOSE PURGE SUPPLY FAN VALVE SV1807	E-221		
3	CLOSE PRI.COOLANT LETDOWN ISOL.VALVE SV2009	E-235 SH.2	CLOSE PRI.SYS.DRAIN TANK VALVE SV1007	E-235 SH.3	CLOSE CONT.HYD.MON.ISL. VLV.SV-2412A & B, SV-2414A & B	E-916 SH.1	CLOSE AIR SPACE PURGE FAN VALVE SV1813	E-221		
4	CLOSE STM.GEN.E-50B TOP BLOWDN.LINE SV0738	E-235 SH.3	CLOSE CLEAN WASTE REC. TANK ISOL.VALVE SV1004	E-235 SH.3	CLOSE CONTAINMENT BLDG.HEAT STM.DISCHARGE SV1502	E-235 SH.1	OPEN CONTAINMENT SPRAY VALVE SV3002 (5P-8 ONLY)	E-237		
5	*CONTAINMENT ISOLATION ALARM K11 *26	E-292 SH.1	*SPARE		CLOSE CONTAINMENT BLDG.HEAT STM.INLET SV1503	E-235 SH.1	*CLOSE COMP CLG WTR DISC CONMT SV-0940 (5P-8 ONLY)	E-235 SH.4A		
6	CLOSE CONT.H₂ MONT.ISOL.VLV. SV-2413A & B & SV-2415A & B	E-916 SH.1	CLOSE CLEAN WASTE REC. TANK ISOL.VALVE SV1037	E-235	CLOSE WASTE GAS SURGE TANK INLET SV1102	E-235 SH.1	*START CONTAINMENT SPRAY PUMP P-54A (5P-8 ONLY)	E-251		
7	CLOSE SHIELD COOL SURGE TANK INLET SV0939	E-235 SH.3	CLOSE CLEAN WASTE REC. TANK ISOL.VALVE SV1038	E-235	DISABLE AUTO START OF ENG SFGRDS SUMP PUMP P-72A (5R-6 ONLY)	E-285	*SIS INITIATION CKT.2 (RELAYS 5P-8 ONLY)	E-209 SH.1	*CLOSE FW REG VLVE CV-0703	E-69 SH.1
8	CLOSE PRI.SYS.DRAIN TANK VALVE SV1001	E-235 SH.3	CONTROL ROOM HVAC EMERGENCY SYS.ACTIVATION (TRAIN B)	E-271 SH.8	CONTROL ROOM HVAC EMERGENCY SYSTEM ACTIVATION (TRAIN A)	E-271 SH.8	*CLOSE COMP CLG WTR INLET CONMT SV-0910 (5P-8 ONLY)	E-235 SH.4		
9	*SPARE		CLOSE CLEAN WASTE REC. TANK PUMP SUCTION SV1045	E-235 SH.1C	*CRITICAL FUNCTION MON.INPUTS: *120 (FOR 5P-6, *122 (FOR 5R-6)	E-208 SH.1A	CLOSE PRI.SYS.SAMPLING ISOLATION VALVE SV1911	E-235 SH.1		
10	*CIRCUIT SEAL-IN CONTACT	E-208 SH.1(A)	*SPARE		TRIP AIR ROOM PURGE FAN V-46	E-222	CLOSE STM.GEN.E-50B BOT. BLOWDN.LINE SV0768	E-235 SH.4		
11	*SPARE		CLOSE RECEIVER TANK VENT VALVE SV1065	E-235 SH.1	*SPARE		CLOSE STM.GEN.E-50A BOT. BLOWDN.LINE SV0767	E-235 SH.4		
12	*SPARE		SPARE		DISABLE AUTO START OF ENG SFGRDS SUMP PUMP P-73A (5R-6 ONLY)	E-285	PPC-SOE NODE PT. ID. KS5P_5R_D	E-53 SH.8	*CLOSE FW REG BYPASS VALVE CV-0734	E-69 SH.1

NOTES:

1. RELAYS WITH 8 OR LESS NC CONTACTS SHALL UTILIZE COIL TB113-3.RELAYS WITH 9 OR MORE NC CONTACTS SHALL UTILIZE COIL TB113-61.

* -NORMALLY OPEN CONTACT

REFERENCE DWGS:

LOGIC DIAGRAM   JLG-121(Ω) SH.2
SCHEMATIC DIAGRAMS   E-271 SH.8
                       E-271 SH.1
                       E-223
                       E-224
                       E-916
                       E-69 SH.1

SPARE CONTACTS		
RELAY	NORMALLY OPEN	NORMALLY CLOSED
5R-1		* 12
5P-3	* 9,12	
5R-3	* 2, 7, 9, 12	
5P-5	*1,, 7, 11, 12	
5R-5	* 4, 8, 12	
5R-7	* 4, 6, 7, 10, 11	
5P-2	* 9, 11, 12	
5R-2	* 9, 11, 12	
5P-4	* 5, 10	* 12
5R-4	* 2, 5, 10	* 12
5P-6	* 11	* 1
5R-6	* 11	
5R-8	* 4, 5, 6, 7, 8	
5P-1		* 12

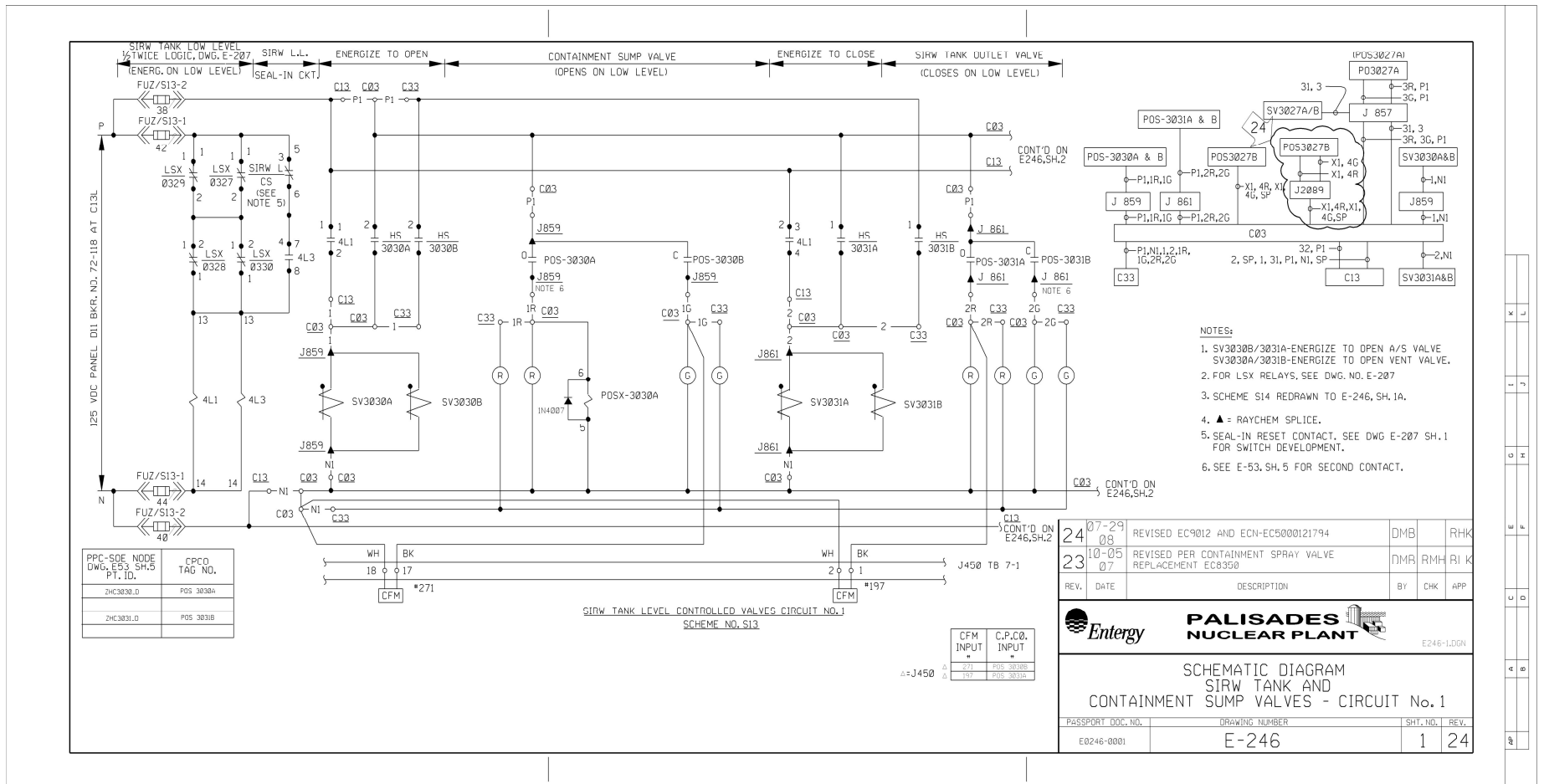| 30	06-13 03	REVISED TO SEPARATE SCHEMES PER DCR 03-450	DMB	PFB
		SPARED CONTACT NO.12,RELAYS 5P-1,5R-1,5P-5,5R-5 ,5P-4 & 5R-4 & CONTACT NO.11 RELAYS 5P-6 , 5R-6 PER FC-949 & DCR 95-608	DMB	
29	07-31 95	REMOVED EVENTS RECORDER, ADDED PPC-SOE NODE PER FC-933-06 AND DCR 95-520		FCM
REV.	DATE	DESCRIPTION	BY CK	APP

Consumers Energy

PALISADES PLANT

E208-2.DGN

SCHEMATIC DIAGRAM
CONTAINMENT ISOLATION ON
HIGH PRESSURE OR HIGH RADIATION

DRAWING NUMBER	SHT.NO.	REV.
E-208	2	30

LOGIC DIAGRAM
SIS TEST AND RAS

SCHEMATIC DIAGRAM
SIRW TANK AND CONTAINMENT SUMP VALVES

SCHEMATIC DIAGRAM
SIRW TANK AND
CONTAINMENT SUMP VALVES - CIRCUIT No. 1

E-246

SCHEMATIC DIAGRAM
SIRW TANK AND CONTAINMENT SUMP VALVES

SCHEMATIC DIAGRAM
SIRW TANK AND
CONTAINMENT SUMP VALVES - CIRCUIT No. 1

DRAWING NUMBER E-246 SHT. NO. 2 REV. 29
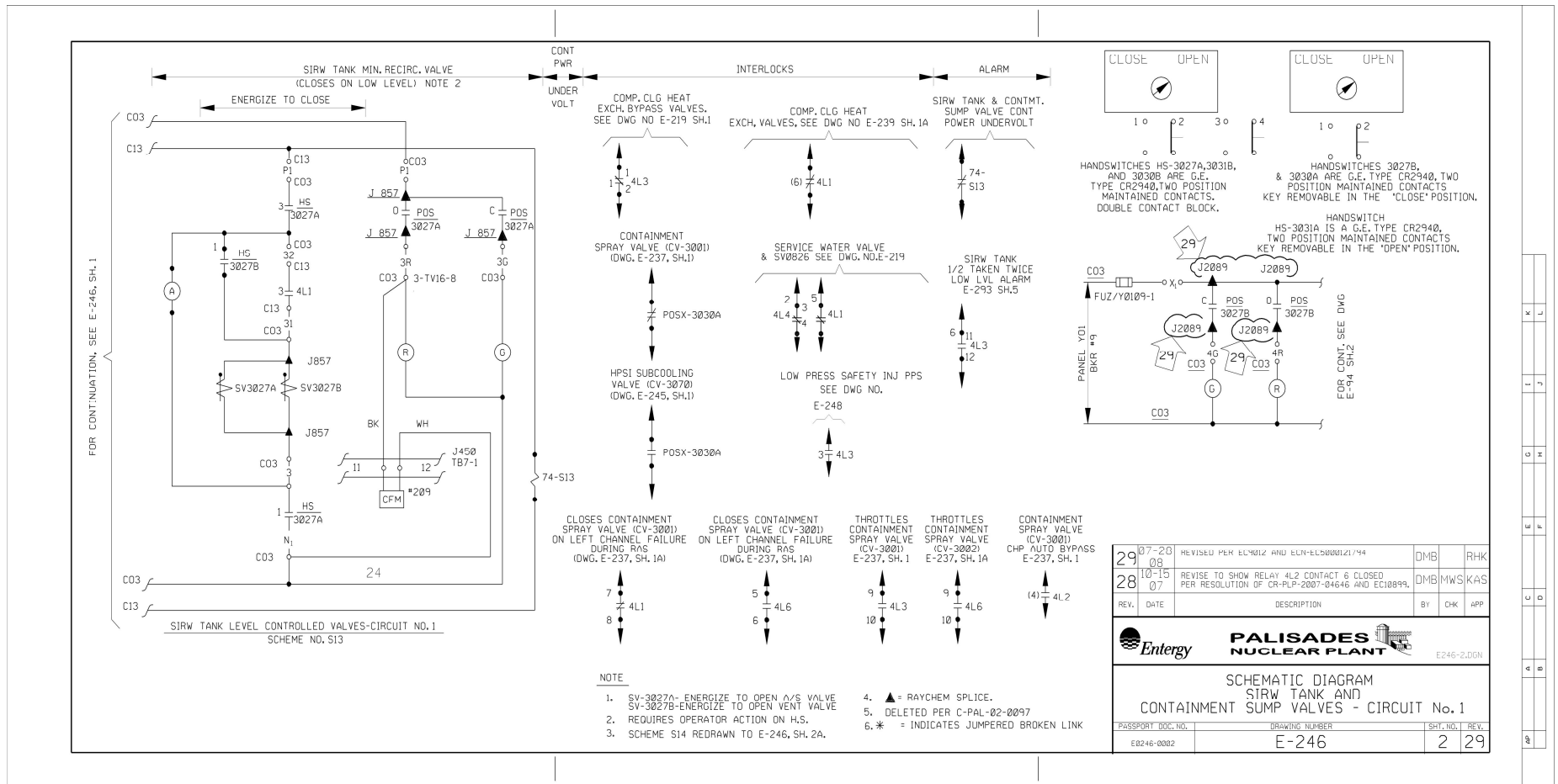
LOGIC DIAGRAM
LEGEND AND NOTES

FUNCTION	SYMBOL (INPUT / OUTPUT)	MEANING
AND		OUTPUT EXISTS WHEN ALL INPUTS EXIST.
OR		OUTPUT EXISTS WHEN ANY INPUT EXISTS.
COINCIDENCE MATRIX	A/B	OUTPUT EXISTS WHEN AT LEAST A OUT OF B INPUTS ARE PRESENT.
MEMORY	M / R	OUTPUT EXISTS WHEN MEMORY INPUT IS APPLIED AND IS RETAINED UNTIL RESET INPUT IS APPLIED. M AND R DENOTE MEMORY AND RESET RESPECTIVELY.
NOT		OUTPUT EXISTS WHEN INPUT DOES NOT EXIST.
ON TIME DELAY		OUTPUT EXISTS FOLLOWING A TIME DELAY AFTER THE INPUT IS CONTINUOUSLY APPLIED. OUTPUT CEASES WHEN THE INPUT IS NOT PRESENT.
OFF TIME DELAY		OUTPUT EXISTS WHEN THE INPUT IS PRESENT AND CONTINUES TO EXIST FOR A TIME AFTER THE INPUT CEASES.

FUNCTION	SYMBOL (INPUT / OUTPUT)	MEANING
CALIBRATION	CAL	CALIBRATING SET POINT INPUT TO PROVIDE A CALIBRATED SIGNAL.
LOW BISTABLE	L — S P	DIGITAL OUTPUT EXISTS ONLY WHEN ANALOG INPUT IS LOWER THAN SET POINT.
HIGH BISTABLE	H — S P	DIGITAL OUTPUT EXISTS ONLY WHEN ANALOG INPUT IS HIGHER THAN SET POINT.
TEST DEVICE	T — TEST	TEST SIGNAL CAN BE INSERTED AUTOMATICALLY IN PLACE OF NORMAL SIGNAL.
ISOLATION	ISO	OUTPUT IS ELECTRICALLY ISOLATED FROM INPUT.
STATUS ARRAY INDICATING LIGHT		INDICATES EQUIPMENT STATUS

BECHTEL
ANN ARBOR, MICHIGAN

PALISADES PLANT
CONSUMERS POWER COMPANY

LOGIC DIAGRAM
LEGEND AND NOTES

JOB No.	DRAWN B. NOVAK	CHECKED MCW-ooo	DRAWING No.	REV.
12447			JLG-102 SH. 1 of 3	2

LOGIC DIAGRAM
LEGEND AND NOTES

FUNCTION	SYMBOL (INPUT / OUTPUT)	MEANING
MANUAL INPUT		MOMENTARY HAND SWITCH INPUT TO LOGIC.
MANUAL INPUT		MAINTAINED HAND SWITCH INPUT TO LOGIC.
LOGIC CONTINUATION		DRAWING NUMBER CROSS REFERENCE, INDICATES SOURCE OF LOGIC INPUT OR DESTINATION OF LOGIC OUTPUT.
ALARM	(PANEL) (SCHEME/WINDOW)	ANNUNCIATOR WINDOW-WITH PANEL, SCHEME/WINDOW NUMBERS.
DATA LOGGER OR COMPUTER POINT	1-XXX	INPUT TO DATA LOGGER OR COMPUTER WITH IDENTIFYING NUMBER.
INDICATING LAMP	(R)	INDICATES EQUIPMENT OPERATION STATUS.
		R- RED OPERATING, FLOWING OR INCREASING.
		G- GREEN NOT OPERATING, NOT FLOWING OR DECREASING.
		W- WHITE CONDITION NORMAL, PERMISSIVE CONDITION REACHED OR CONTROL POWER AVAILABLE.
		A- AMBER BREAKER TRIPPED, REMOTE OVERLOAD, ABNORMAL CONDITION OR STANDBY STATUS.
		B- BLUE MOTOR THERMAL OVERLOAD
LOGIC OUTPUT ACTION	DEVICE CONTROLLED	INDICATES STATE OF CONTROLLED DEVICES GIVEN THE EXISTENCE OF THE LOGIC INPUT.

POSITION SWITCH DEVELOPMENT

VALVE CLOSED — VALVE OPEN

ac,tc
bo,to
ao
bc
a10%*
b10%*

| INDICATES CLOSED CONTACT.

tc   A NORMALLY CLOSED CONTACT THAT OPENS ON HIGH TORQUE IN THE CLOSING DIRECTION OF A MOTOR OPERATED VALVE.

to   A NORMALLY CLOSED CONTACT THAT OPENS ON HIGH TORQUE IN THE OPENING DIRECTION OF A MOTOR OPERATED VALVE.

*   % MAY BE ADJUSTED AS REQUIRED.

BECHTEL
ANN ARBOR MICHIGAN
PALISADES PLANT
CONSUMERS POWER COMPANY
LOGIC DIAGRAM
LEGEND AND NOTES

JOB No.	DRAWING No.	REV
12447	JLG-102 SH.2of3	2

ISSUED B.NOVAK DRAWN M.C.WOODS

LOGIC DIAGRAM
LEGEND AND NOTES

NOTES:

1. THESE LOGIC DIAGRAMS DESCRIBE EQUIPMENT/SYSTEM FUNCTIONS AND DO NOT NECESSARILY REFLECT THE ACTUAL HARDWARE IMPLEMENTATION.

2. THE STATE OF EQUIPMENT WILL NOT BE CHANGED BY A TRANSIENT OR LOSS OF POWER UNLESS OTHERWISE NOTED.

3. INHERENT EQUIPMENT INTERLOCKS, SUCH AS CIRCUIT BREAKER TRIP FREE AND REVERSING STARTER CROSS INTERLOCKS ARE NOT SHOWN UNLESS THE INTERLOCKS PERFORM A LOGICAL FUNCTION.

4. ANY SET POINTS SHOWN ON CONTROL LOGIC DIAGRAMS ARE APPROXIMATE. FOR EXACT VALUE REFER TO INSTRUMENT INDEX.

5. VALVE AND DAMPER RED AND GREEN LIGHTS ARE BOTH ON WHEN IN AN INTERMEDIATE POSITION.

6. REFER TO ELECTRICAL SCHEMATICS FOR DETAILS OF ELECTRICAL EQUIPMENT OVERCURRENT, SHORT CIRCUIT, AND DIFFERENTIAL PROTECTION.

7. EQUIPMENT WILL CHANGE STATE WHEN A CHANGE IS INITIATED AND WILL REMAIN IN THAT STATE UNTIL A CHANGE TO ANOTHER STATE IS INITIATED.
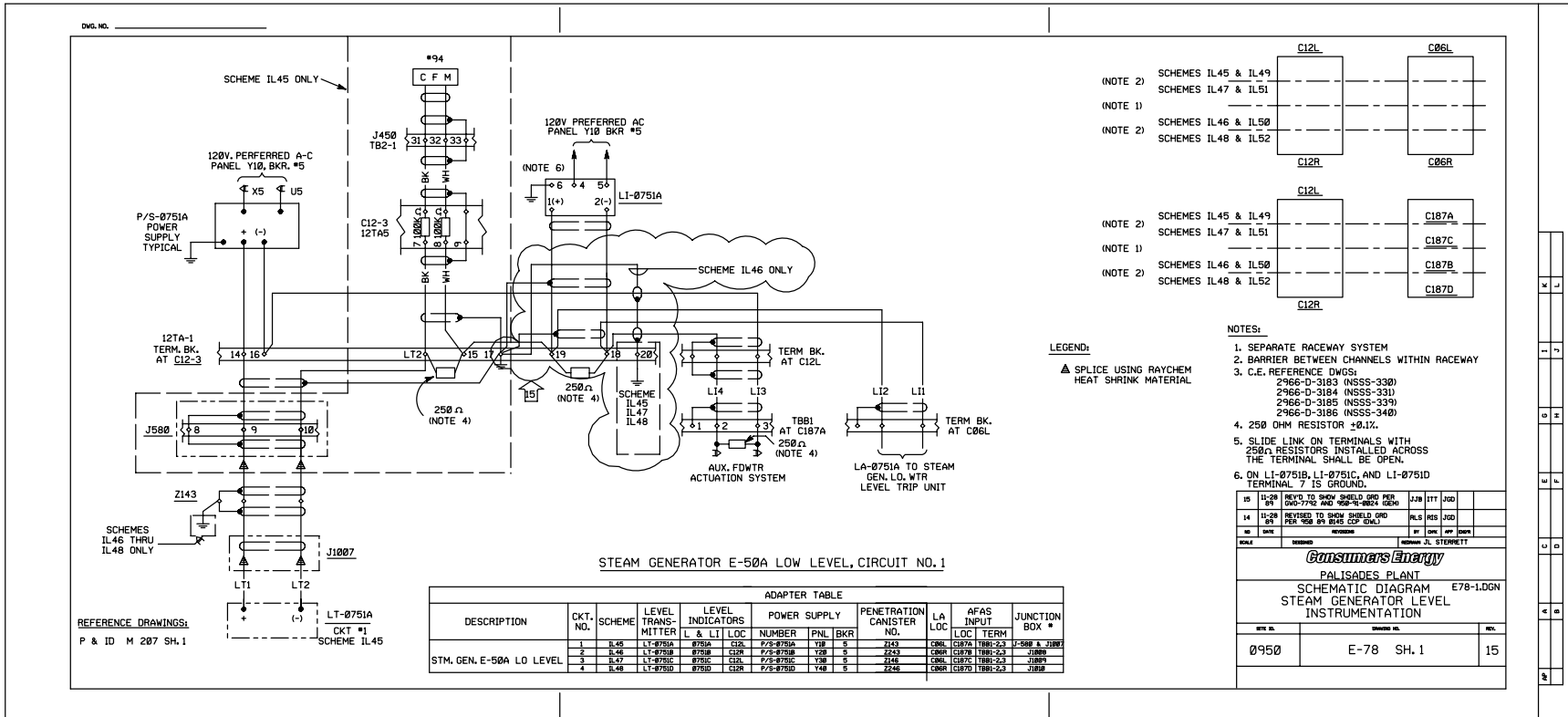
ABBREVIATIONS:

CR	- CONTROL ROOM
LCP	- LOCAL CONTROL PANEL
CS	- CONTROL SWITCH
HS	- HAND SWITCH
PB	- PUSH BUTTON
CHP	- CONTAINMENT HIGH PRESSURE
SR TO N	- SPRING RETURN TO NORMAL
CHR	- CONTAINMENT HIGH RADIATION
AFAS	- AUXILIARY FEEDWATER ACTUATION SYSTEM
FOGG A	- FEED ONLY GOOD STEAM GENERATOR A
	ISOLATE STEAM GENERATOR B
FOGG B	- FEED ONLY GOOD STEAM GENERATOR B
	ISOLATE STEAM GENERATOR A
SIS	- SAFETY INJECTION SIGNAL
HVAC	- HEATING, VENTILATION & AIR CONDITIONING
SS	- SELECTOR SWITCH
POS	- POSITION SWITCH
SV	- SOLENOID VALVE
CV	- CONTROL VALVE
MO	- MOTOR OPERATED
PO	- PNEUMATICALLY OPERATED
SP	- SET POINT

SCHEMATIC DIAGRAM
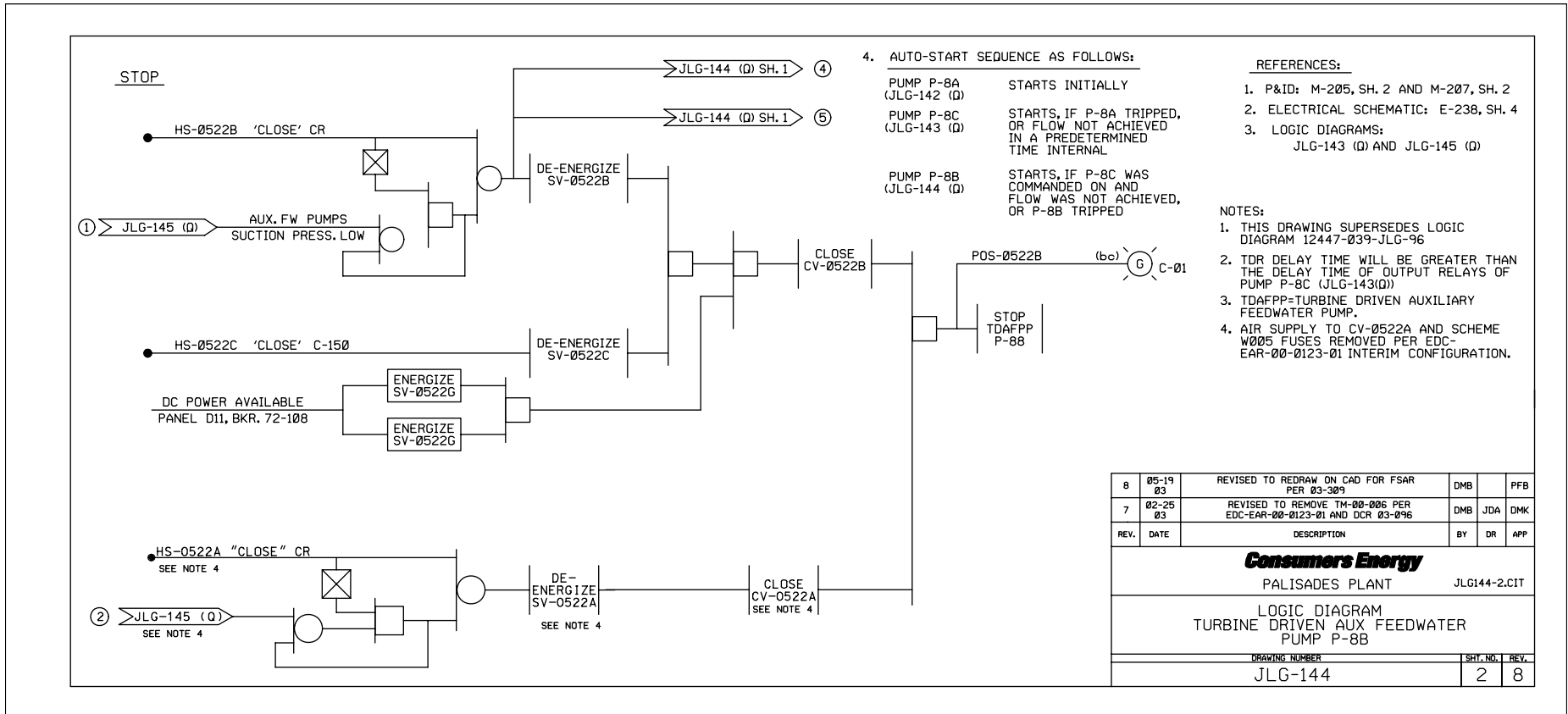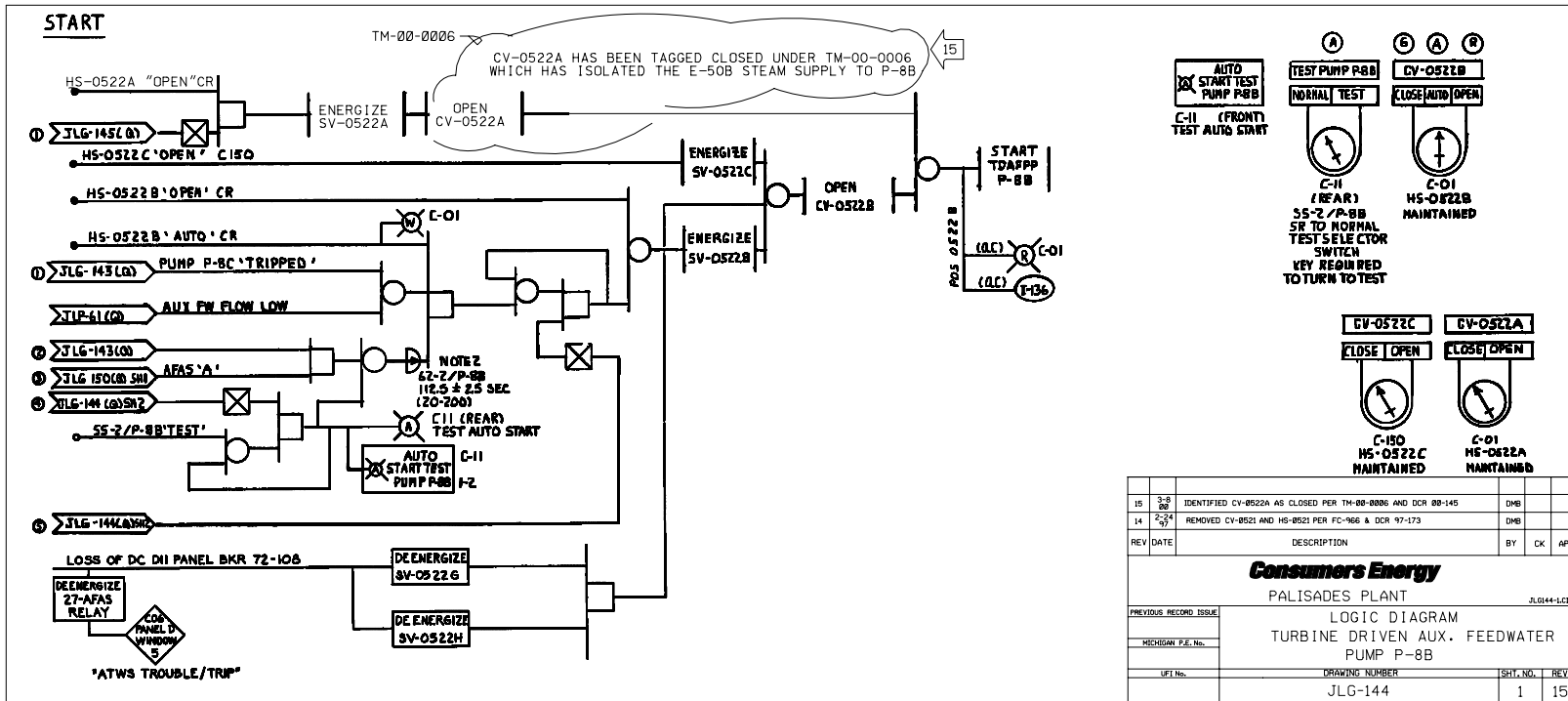## STEAM GENERATOR LEVEL INSTRUMENTATION

LOGIC DIAGRAM
AUXILIARY FEEDWATER ACTUATION SYSTEM

LOGIC DIAGRAM
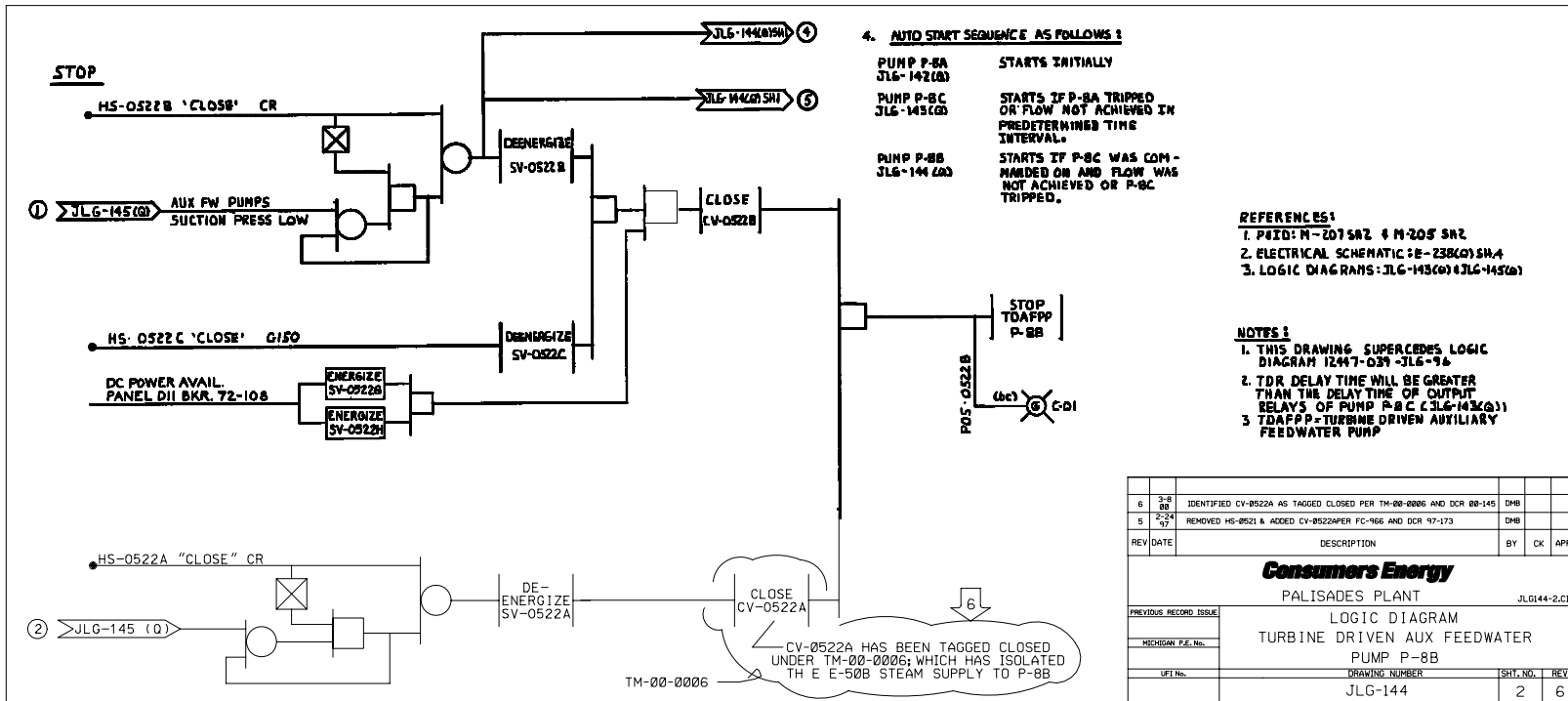## MOTOR DRIVEN AUXILIARY FEEDWATER PUMP P-8A

LOGIC DIAGRAM
MOTOR DRIVEN AUXILIARY FEEDWATER PUMP P-8C

LOGIC DIAGRAM
TURBINE DRIVEN AUXILIARY FEEDWATER PUMP P-8B

LOGIC DIAGRAM
TURBINE DRIVEN AUX. FEEDWATER
PUMP P-8B

DRAWING NUMBER: JLG-144   SHT. NO. 1   REV. 16

LOGIC DIAGRAM
TURBINE DRIVEN AUXILIARY FEEDWATER PUMP P-8B

4. AUTO-START SEQUENCE AS FOLLOWS:

PUMP P-8A (JLG-142 (Q))	STARTS INITIALLY
PUMP P-8C (JLG-143 (Q))	STARTS, IF P-8A TRIPPED, OR FLOW NOT ACHIEVED IN A PREDETERMINED TIME INTERNAL
PUMP P-8B (JLG-144 (Q))	STARTS, IF P-8C WAS COMMANDED ON AND FLOW WAS NOT ACHIEVED, OR P-8B TRIPPED

REFERENCES:

1. P&ID: M-205,SH. 2 AND M-207,SH. 2
2. ELECTRICAL SCHEMATIC: E-238,SH. 4
3. LOGIC DIAGRAMS:
   JLG-143 (Q) AND JLG-145 (Q)

NOTES:

1. THIS DRAWING SUPERSEDES LOGIC DIAGRAM 12447-039-JLG-96
2. TDR DELAY TIME WILL BE GREATER THAN THE DELAY TIME OF OUTPUT RELAYS OF PUMP P-8C (JLG-143(Q))
3. TDAFPP=TURBINE DRIVEN AUXILIARY FEEDWATER PUMP.
4. AIR SUPPLY TO CV-0522A AND SCHEME W005 FUSES REMOVED PER EDC-EAR-00-0123-01 INTERIM CONFIGURATION.

8	05-19 03	REVISED TO REDRAW ON CAD FOR FSAR PER 03-309	DMB		PFB
7	02-25 03	REVISED TO REMOVE TM-00-006 PER EDC-EAR-00-0123-01 AND DCR 03-096	DMB	JDA	DMK
REV.	DATE	DESCRIPTION	BY	DR	APP

Consumers Energy
PALISADES PLANT   JLG144-2.CIT

LOGIC DIAGRAM
TURBINE DRIVEN AUX FEEDWATER
PUMP P-8B

DRAWING NUMBER	SHT. NO.	REV.
JLG-144	2	8

INTERFACE LOOP DIAGRAM
PUMP LOW SUCTION PRESSURE TRIP

INTERFACE LOOP DIAGRAM
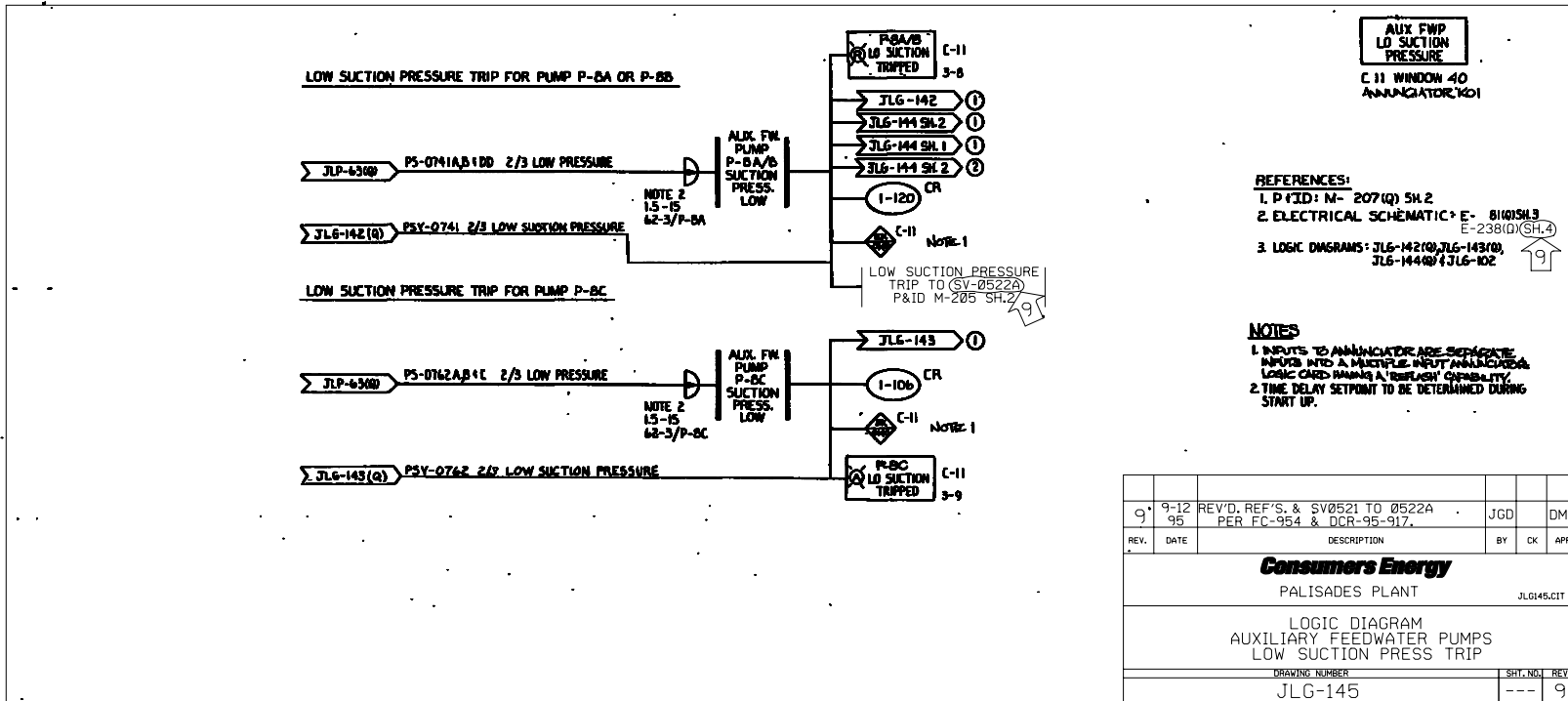PUMP LOW SUCTION PRESSURE TRIP
AUX. FEEDWATER MOD'S., PHASE II

LOGIC DIAGRAM
TURBINE DRIVEN AUXILIARY FEEDWATER PUMP P-8B

LOGIC DIAGRAM
TURBINE DRIVEN AUX. FEEDWATER
PUMP P-8B

REV	DATE	DESCRIPTION	BY	CK	APP
15	3-8 00	IDENTIFIED CV-0522A AS CLOSED PER TM-00-0006 AND DCR 00-145	DMB		
14	2-24 97	REMOVED CV-0521 AND HS-0521 PER FC-966 & DCR 97-173	DMB		

Consumers Energy

PALISADES PLANT

JLG144-1CIT

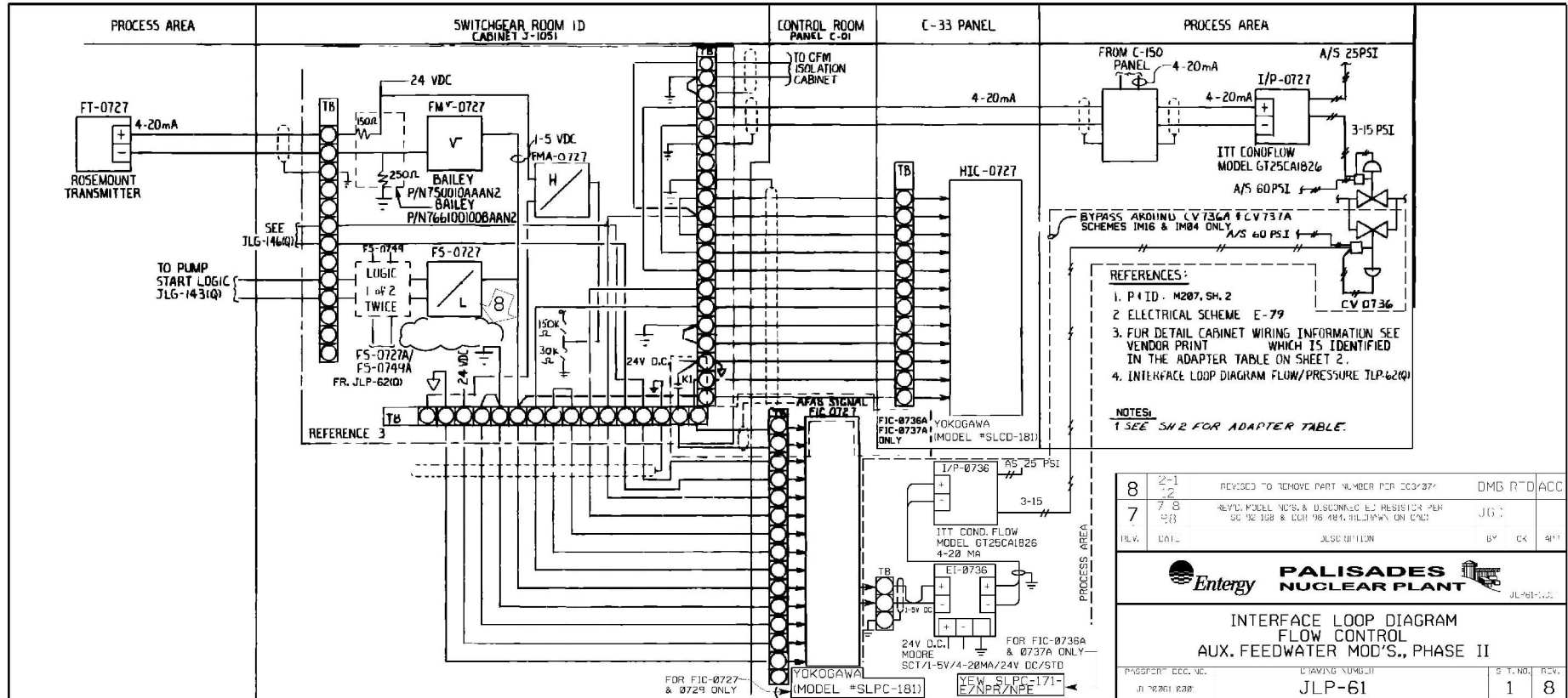| DRAWING NUMBER	SHT. NO.	REV
JLG-144	1	15

LOGIC DIAGRAM
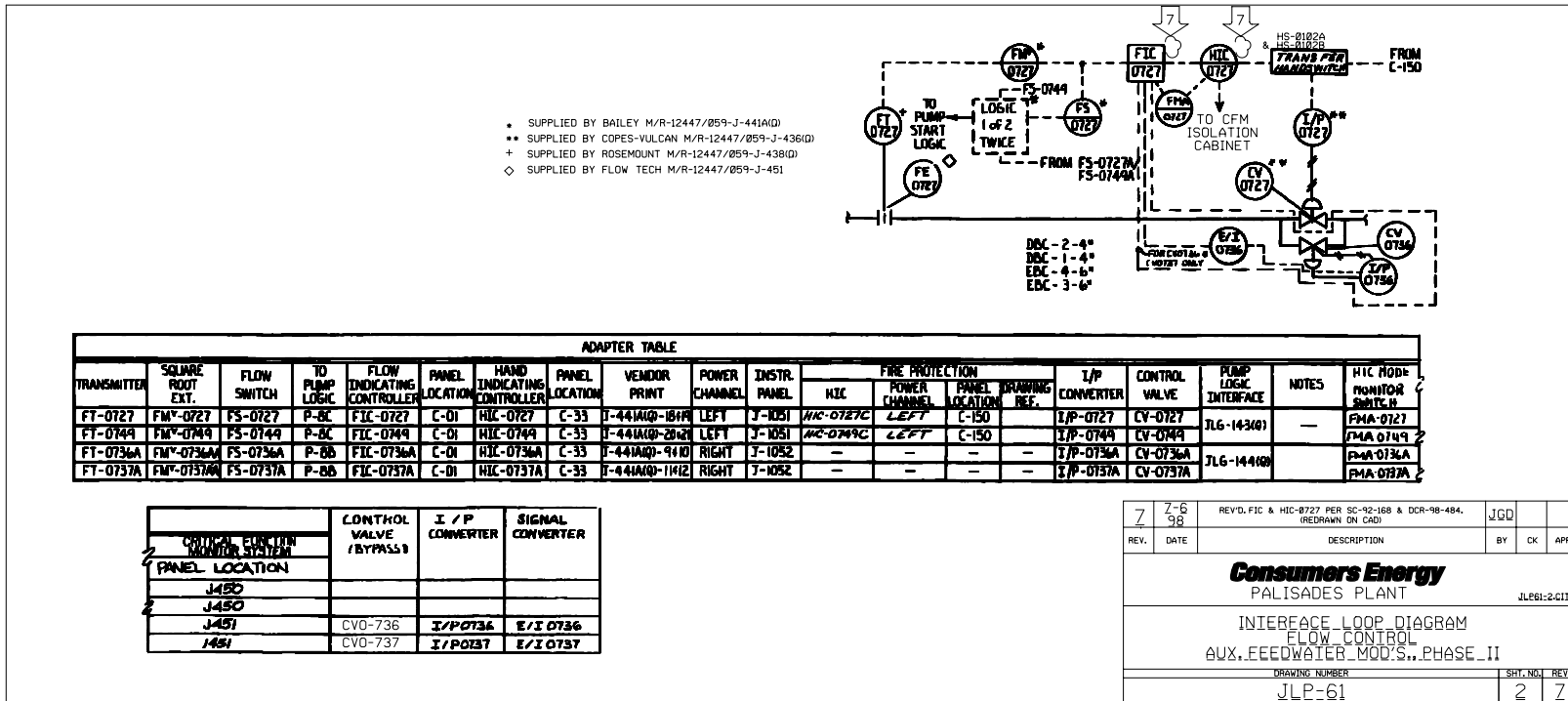## TURBINE DRIVEN AUXILIARY FEEDWATER PUMP P-8B

LOGIC DIAGRAM
AUXILIARY FEEDWATER PUMPS LOW SUCTION PRESSURE TRIP

INTERFACE LOOP DIAGRAM
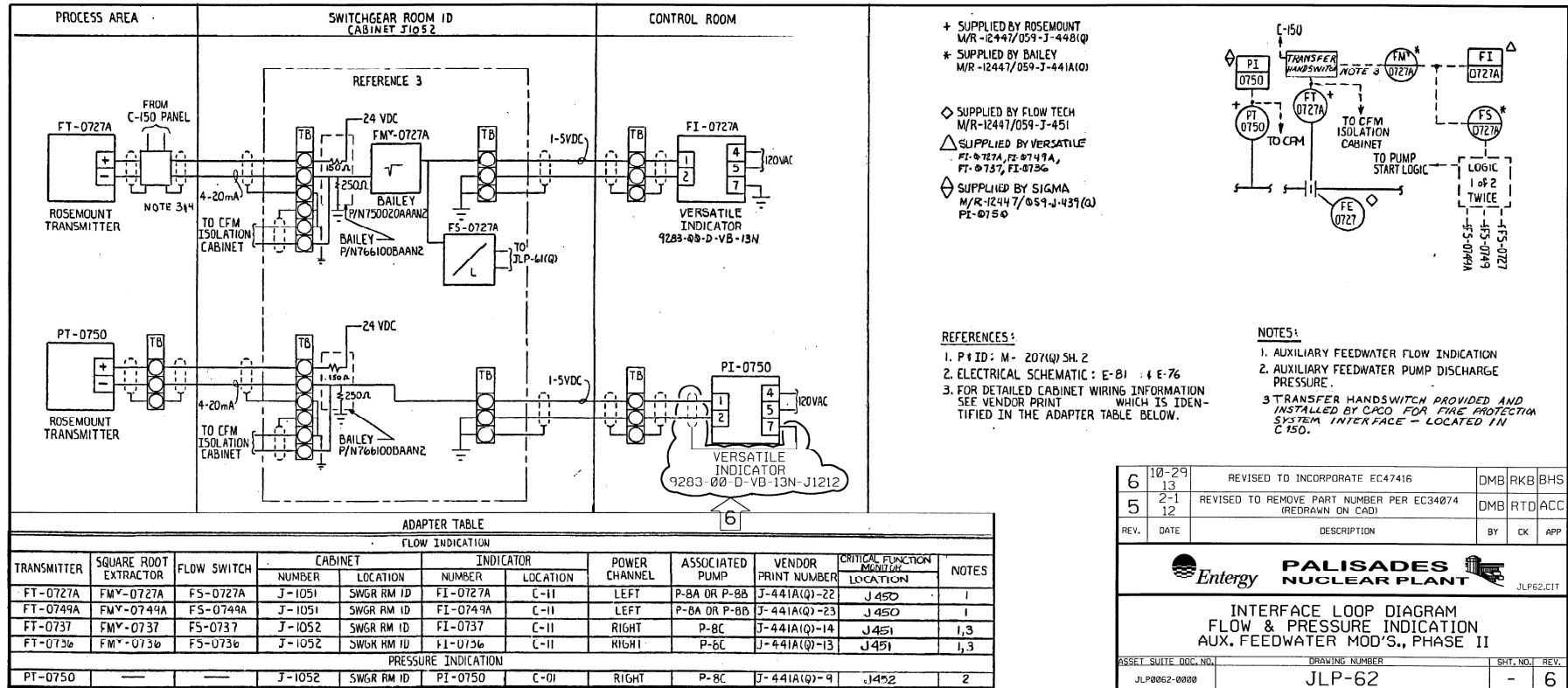## FLOW CONTROL

INTERFACE LOOP DIAGRAM
FLOW CONTROL

* SUPPLIED BY BAILEY M/R-12447/059-J-441A(Q)
** SUPPLIED BY COPES-VULCAN M/R-12447/059-J-436(Q)
+ SUPPLIED BY ROSEMOUNT M/R-12447/059-J-438(Q)
◇ SUPPLIED BY FLOW TECH M/R-12447/059-J-451

ADAPTER TABLE

TRANSMITTER	SQUARE ROOT EXT.	FLOW SWITCH	TO PUMP LOGIC	FLOW INDICATING CONTROLLER	PANEL LOCATION	HAND INDICATING CONTROLLER	PANEL LOCATION	VENDOR PRINT	POWER CHANNEL	INSTR. PANEL	FIRE PROTECTION				I/P CONVERTER	CONTROL VALVE	PUMP LOGIC INTERFACE	NOTES	HIC MODE MONITOR SWITCH
											HIC	POWER CHANNEL	PANEL LOCATION	DRAWING REF.					
FT-0727	FMT-0727	FS-0727	P-8C	FIC-0727	C-01	HIC-0727	C-33	J-441A(Q)-18(R)	LEFT	J-1051	HIC-0727C	LEFT	C-150		I/P-0727	CV-0727	JLG-143(Q)	—	FMA-0727
FT-0744	FMT-0744	FS-0744	P-8C	FIC-0744	C-01	HIC-0744	C-33	J-441A(Q)-20(R)	LEFT	J-1051	HIC-0744C	LEFT	C-150		I/P-0744	CV-0744			FMA-0744
FT-0736A	FMT-0736A	FS-0736A	P-8B	FIC-0736A	C-01	HIC-0736A	C-33	J-441A(Q)-9(R)	RIGHT	J-1052	—	—	—	—	I/P-0736A	CV-0736A	JLG-144(Q)		FMA-0736A
FT-0737A	FMT-0737A	FS-0737A	P-8B	FIC-0737A	C-01	HIC-0737A	C-33	J-441A(Q)-11(R)	RIGHT	J-1052	—	—	—	—	I/P-0737A	CV-0737A			FMA-0737A

CRITICAL FUNCTION MONITOR SYSTEM PANEL LOCATION	CONTROL VALVE (BYPASS)	I/P CONVERTER	SIGNAL CONVERTER
J450			
J450			
J451	CVO-736	I/PO736	E/I 0736
J451	CVO-737	I/PO737	E/I 0737

REV.	DATE	DESCRIPTION	BY	CK	APP
7	7-6-98	REV'D. FIC & HIC-0727 PER SC-92-168 & DCR-98-484. (REDRAWN ON CAD)	JGD		

Consumers Energy
PALISADES PLANT

JLP61-2.CII

INTERFACE LOOP DIAGRAM
FLOW CONTROL
AUX. FEEDWATER MOD'S., PHASE II

DRAWING NUMBER	SHT. NO.	REV.
JLP-61	2	7

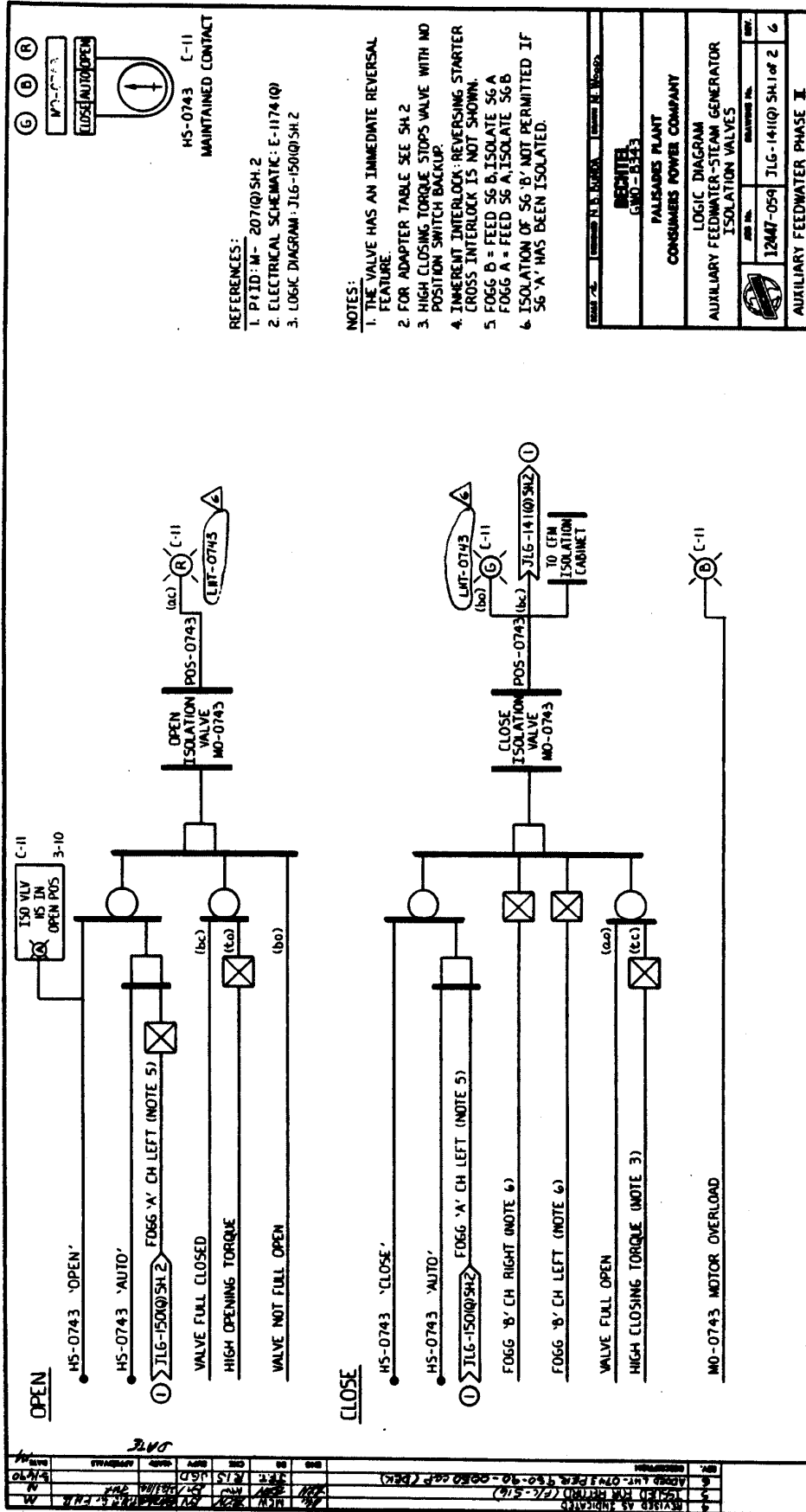## INTERFACE DIAGRAM
FLOW AND PRESSURE INDICATION

LOGIC DIAGRAM
AUX FEEDWATER FLOW CONTROL AND PUMP TEST LOGIC
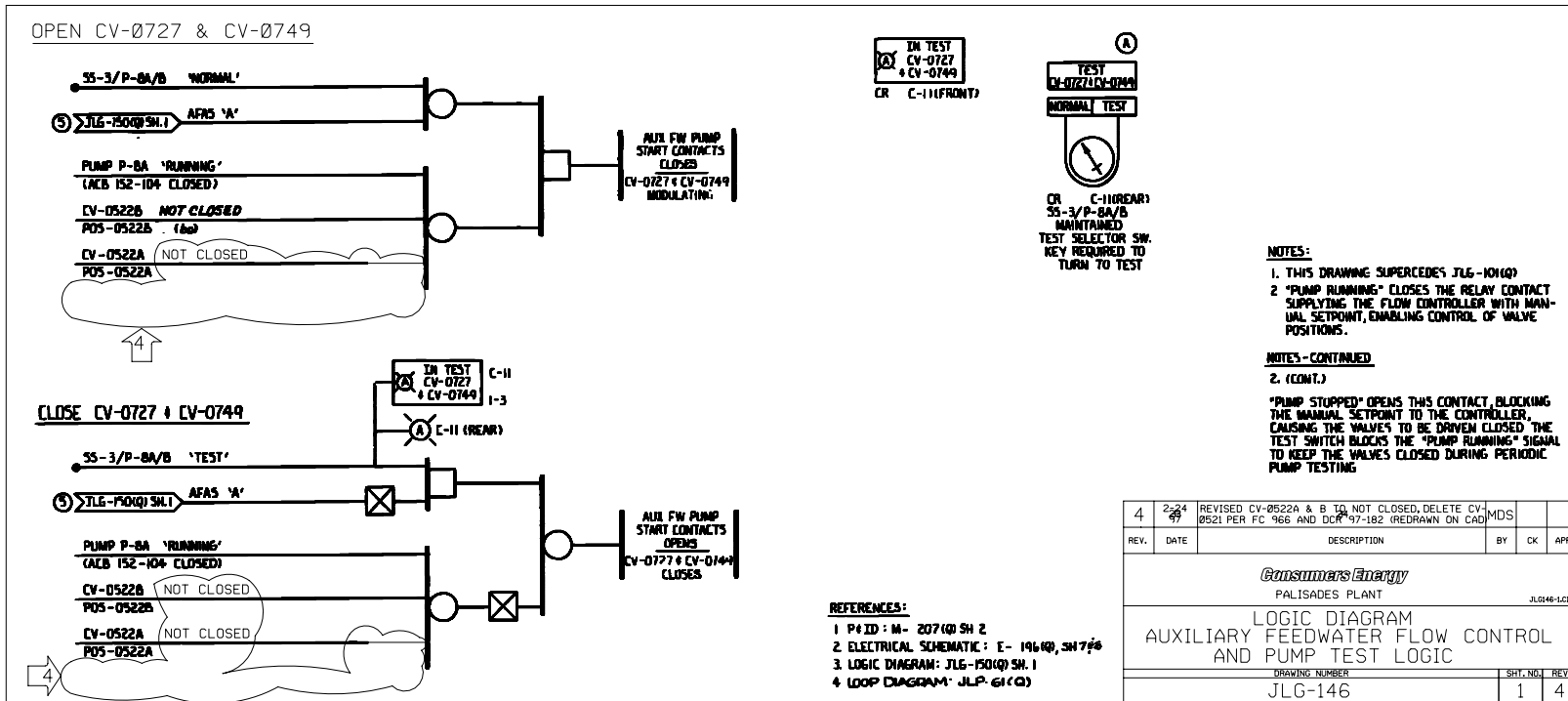
LOGIC DIAGRAM
AUXILIARY FEEDWATER FLOW CONTROL
AND PUMP TEST LOGIC

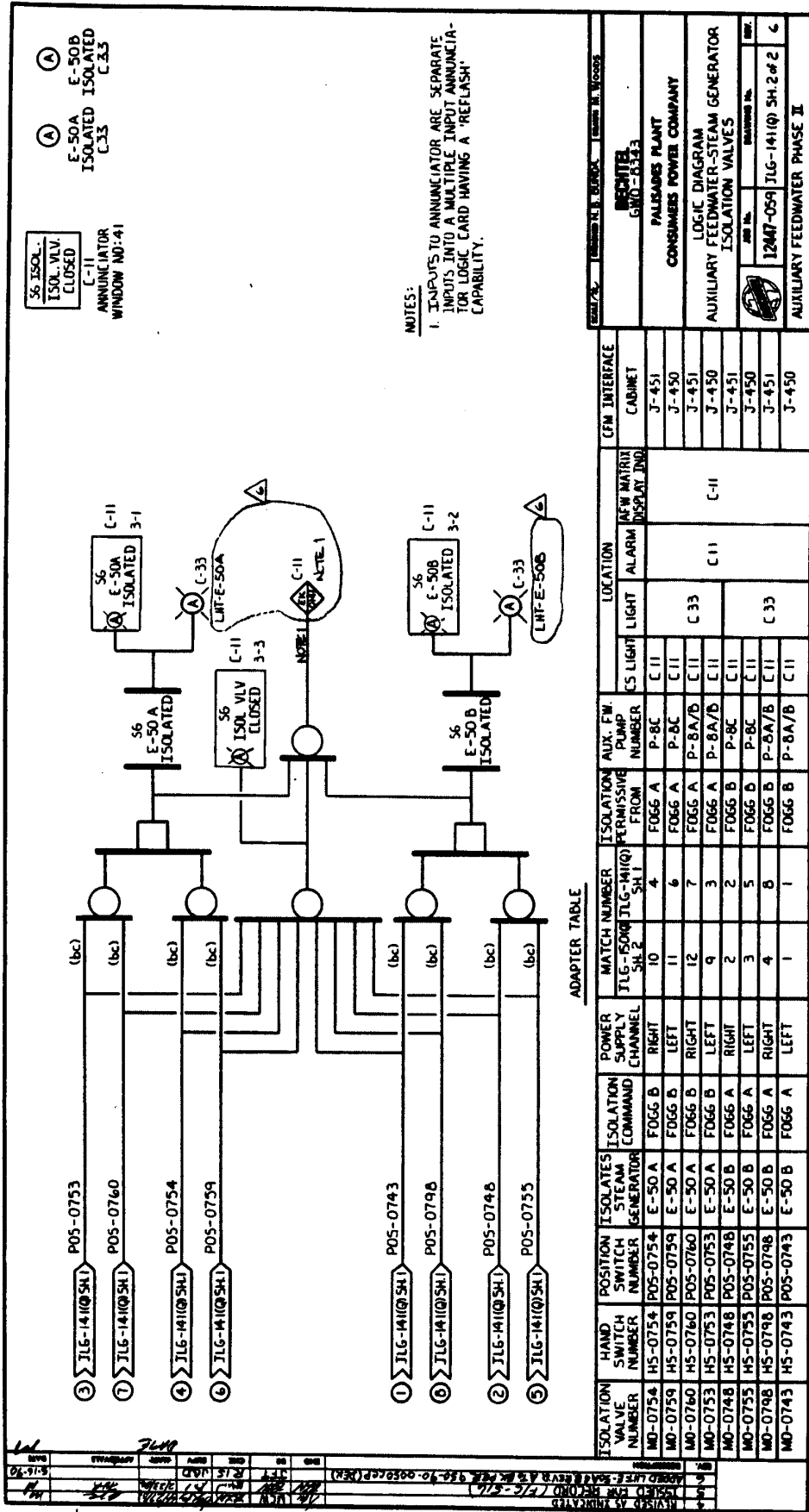## LOGIC DIAGRAM
AUXILIARY FEEDWATER FLOW CONTROL AND PUMP TEST LOGIC

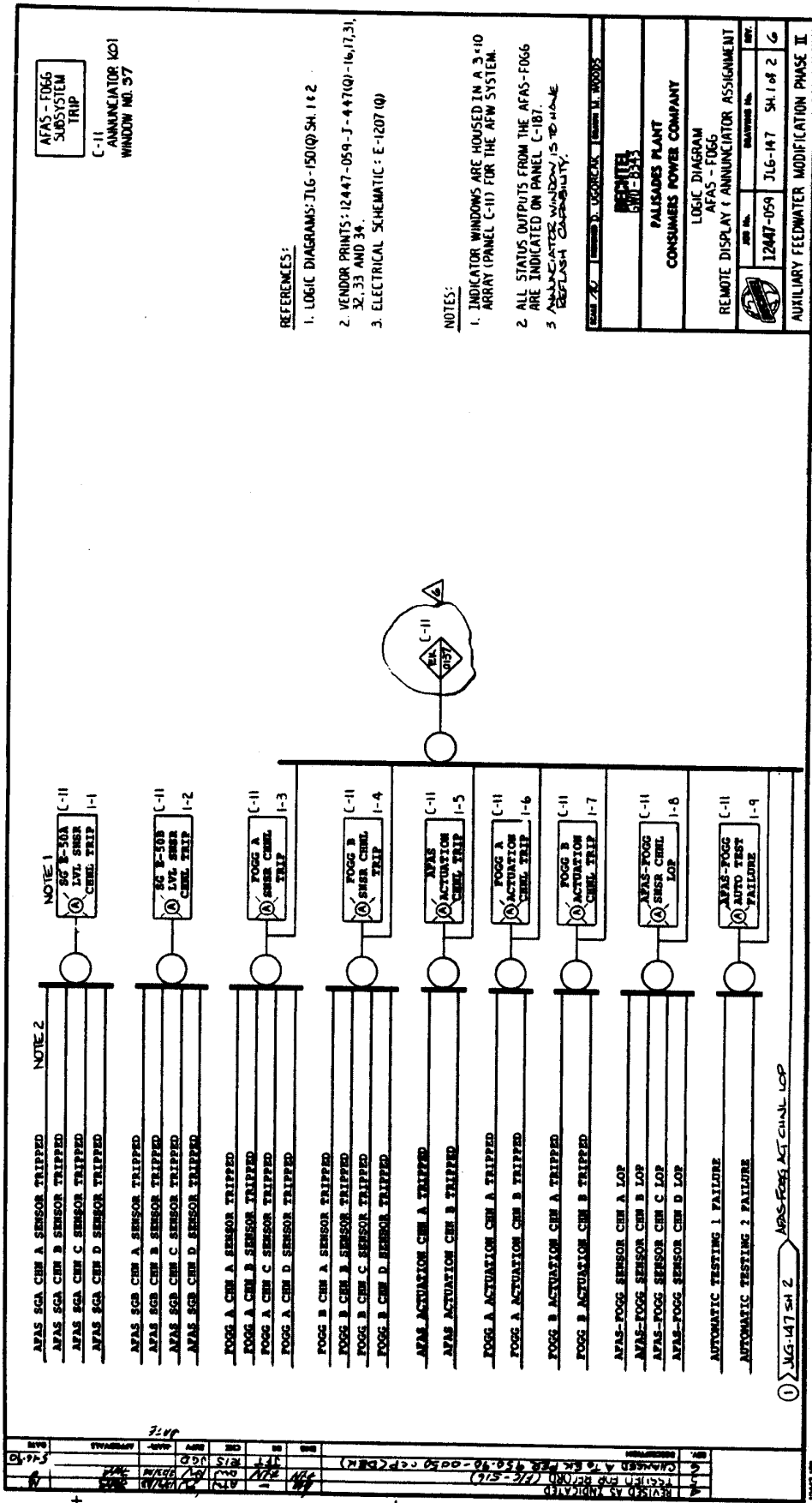# LOGIC DIAGRAM
AUXILIARY FEEDWATER ACTUATION SYSTEM
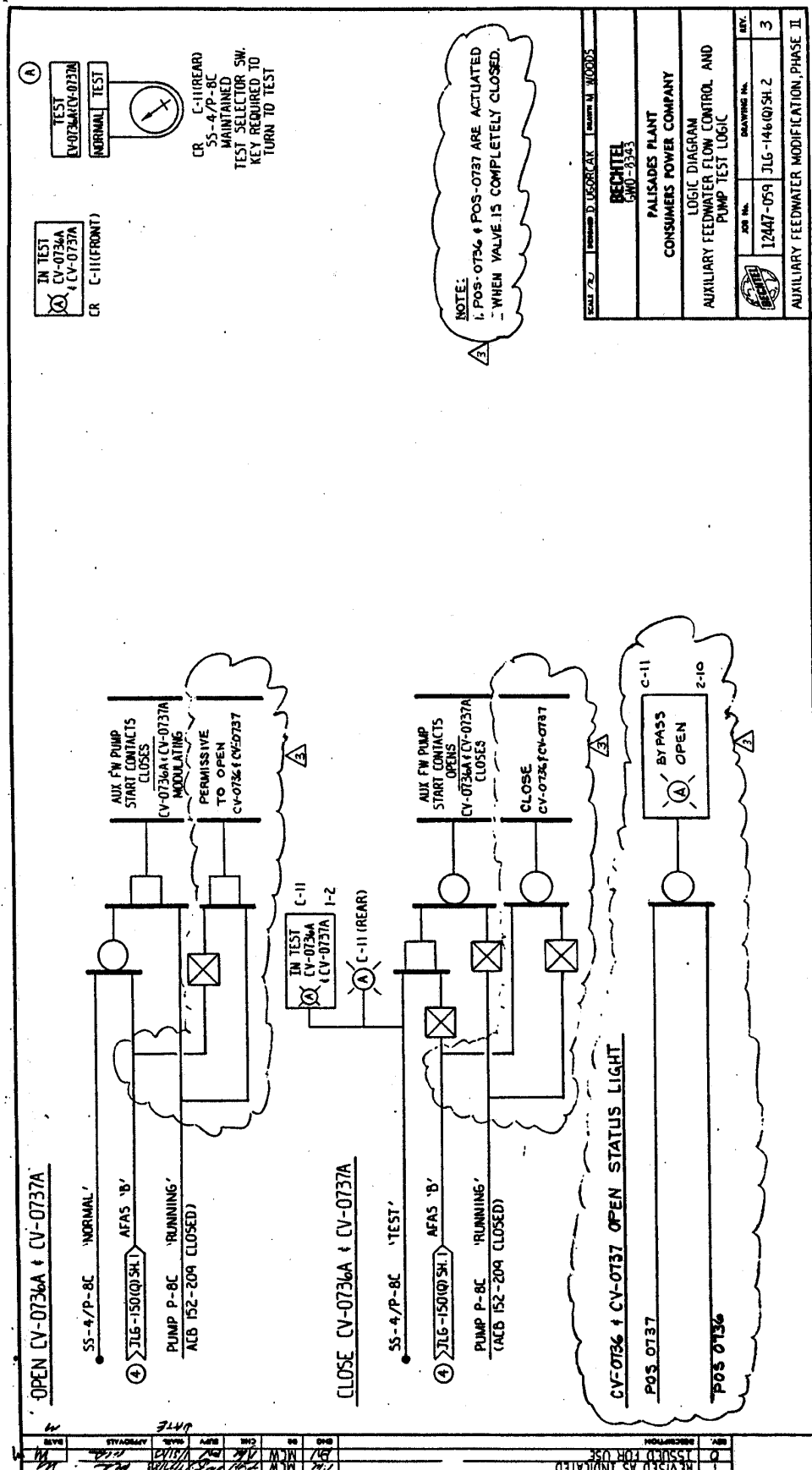
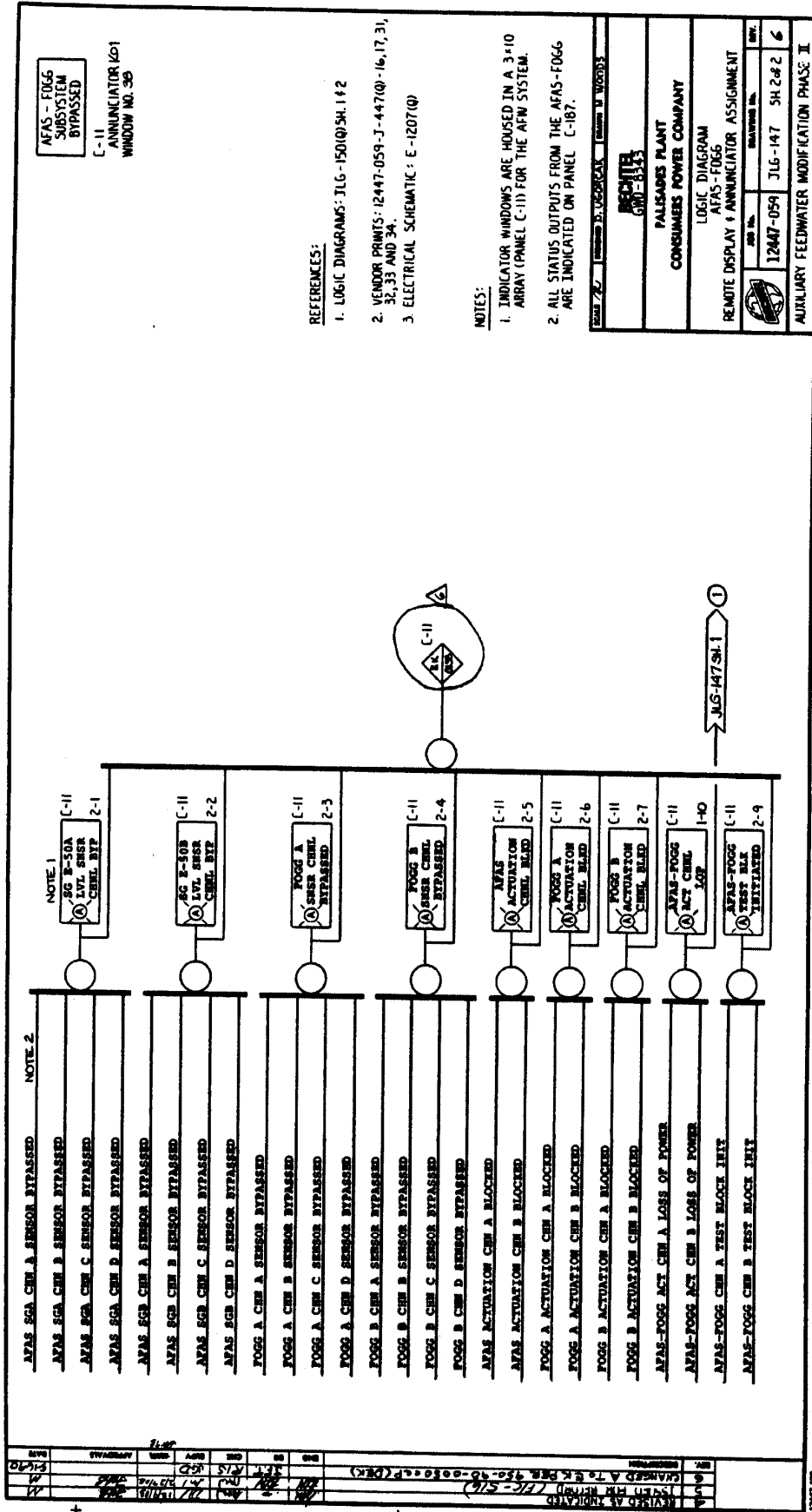## LOGIC DIAGRAM
AUXILIARY FEEDWATER – STEAM GENERATOR ISOLATION VALVES

LOGIC DIAGRAM
## AUXILIARY FEEDWATER – STEAM GENERATOR ISOLATION VALVES

NOTES:
1. INPUTS TO ANNUNCIATOR ARE SEPARATE INPUTS INTO A MULTIPLE INPUT ANNUNCIATOR LOGIC CARD HAVING A 'REFLASH' CAPABILITY.

ADAPTER TABLE

ISOLATION VALVE NUMBER	HAND SWITCH NUMBER	POSITION SWITCH NUMBER	ISOLATES STEAM GENERATOR	ISOLATION COMMAND	POWER SUPPLY CHANNEL	MATCH NUMBER JLG-150H(Q) SH.2	MATCH NUMBER JLG-141(Q) SH.1	ISOLATION PERMISSIVE FROM	AUX. FW PUMP NUMBER	LOCATION CS LIGHT	LOCATION LIGHT	LOCATION ALARM	LOCATION AFW MATRIX DISPLAY IND.	CFM INTERFACE CABINET
MO-0754	HS-0754	POS-0754	E-50 A	F066 B	RIGHT	10	4	F066 A	P-8C	C11				J-451
MO-0759	HS-0759	POS-0759	E-50 A	F066 B	LEFT	11	6	F066 A	P-8C	C11				J-450
MO-0760	HS-0760	POS-0760	E-50 A	F066 B	RIGHT	12	7	F066 A	P-8A/B	C11	C33	C11	C11	J-451
MO-0753	HS-0753	POS-0753	E-50 A	F066 A	LEFT	9	3	F066 A	P-8A/B	C11				J-450
MO-0748	HS-0748	POS-0748	E-50 B	F066 A	RIGHT	2	2	F066 B	P-8C	C11				J-451
MO-0755	HS-0755	POS-0755	E-50 B	F066 A	LEFT	3	5	F066 B	P-8C	C11	C33	C11	C11	J-450
MO-0798	HS-0798	POS-0798	E-50 B	F066 B	RIGHT	4	8	F066 B	P-8A/B	C11				J-451
MO-0743	HS-0743	POS-0743	E-50 B	F066 B	LEFT	1	1	F066 B	P-8A/B	C11				J-450

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LOGIC DIAGRAM
AUXILIARY FEEDWATER–STEAM GENERATOR
ISOLATION VALVES

12447-059 JLG-141(Q) SH. 2 of 2

AUXILIARY FEEDWATER PHASE II

LOGIC DIAGRAM
AFAS-FOGG REMOTE DISPLAY AND ANNUNCIATOR ASSIGNMENT

LOGIC DIAGRAM
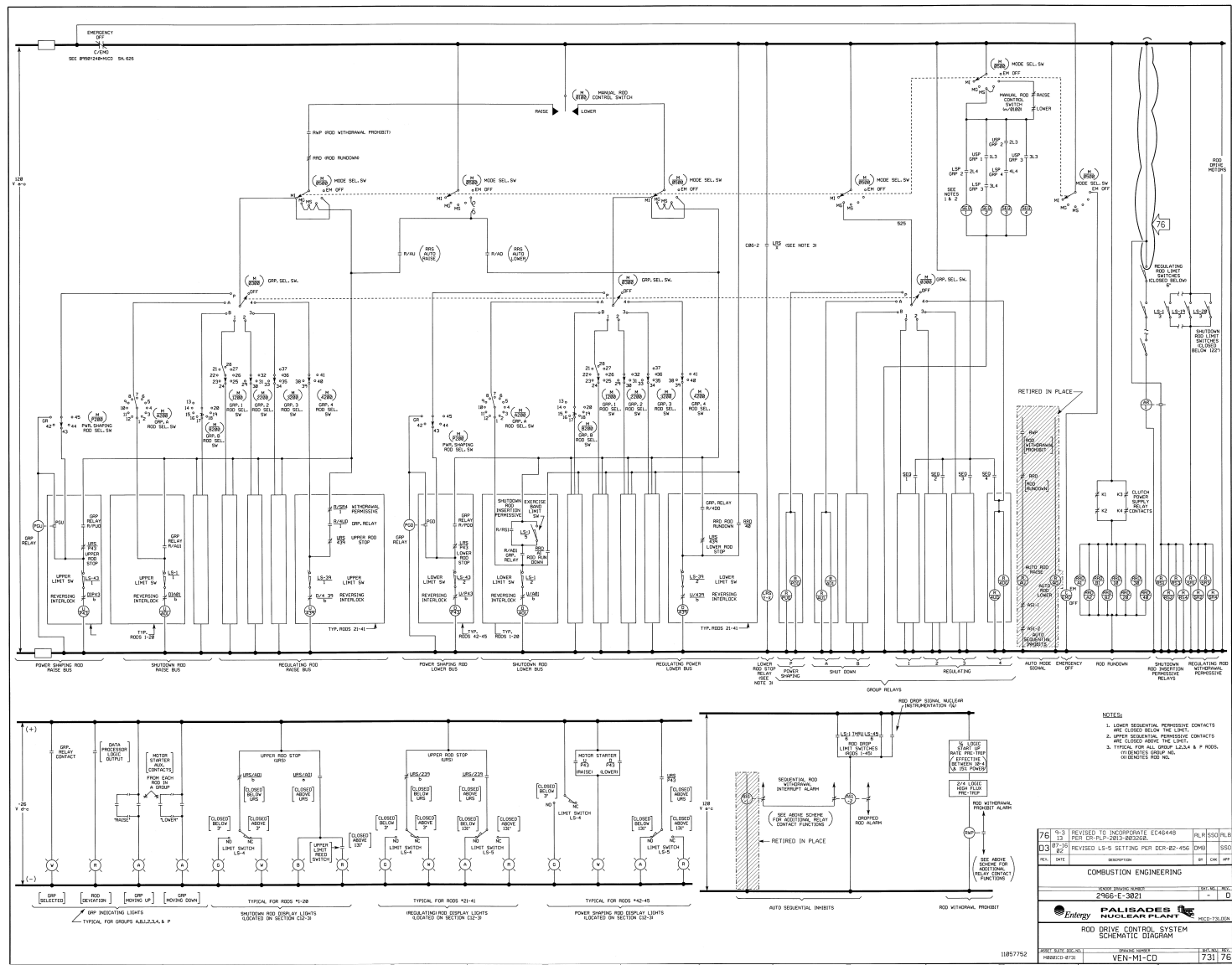## AFAS-FOGG REMOTE DISPLAY AND ANNUNCIATOR ASSIGNMENT
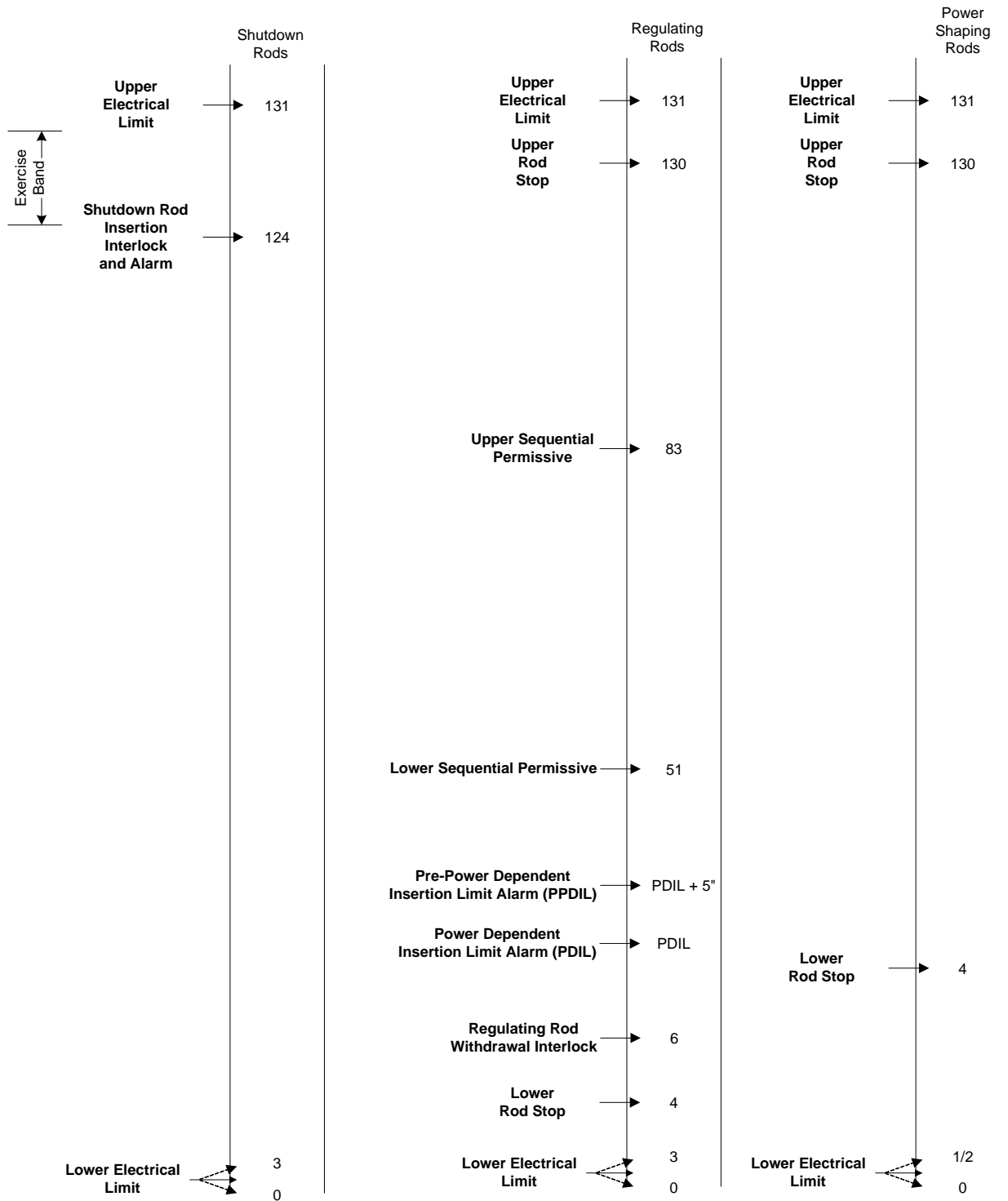
REACTOR SHUTDOWN CONTROLS

REACTOR SHUTDOWN CONTROLS
FIGURE NO. 7-53
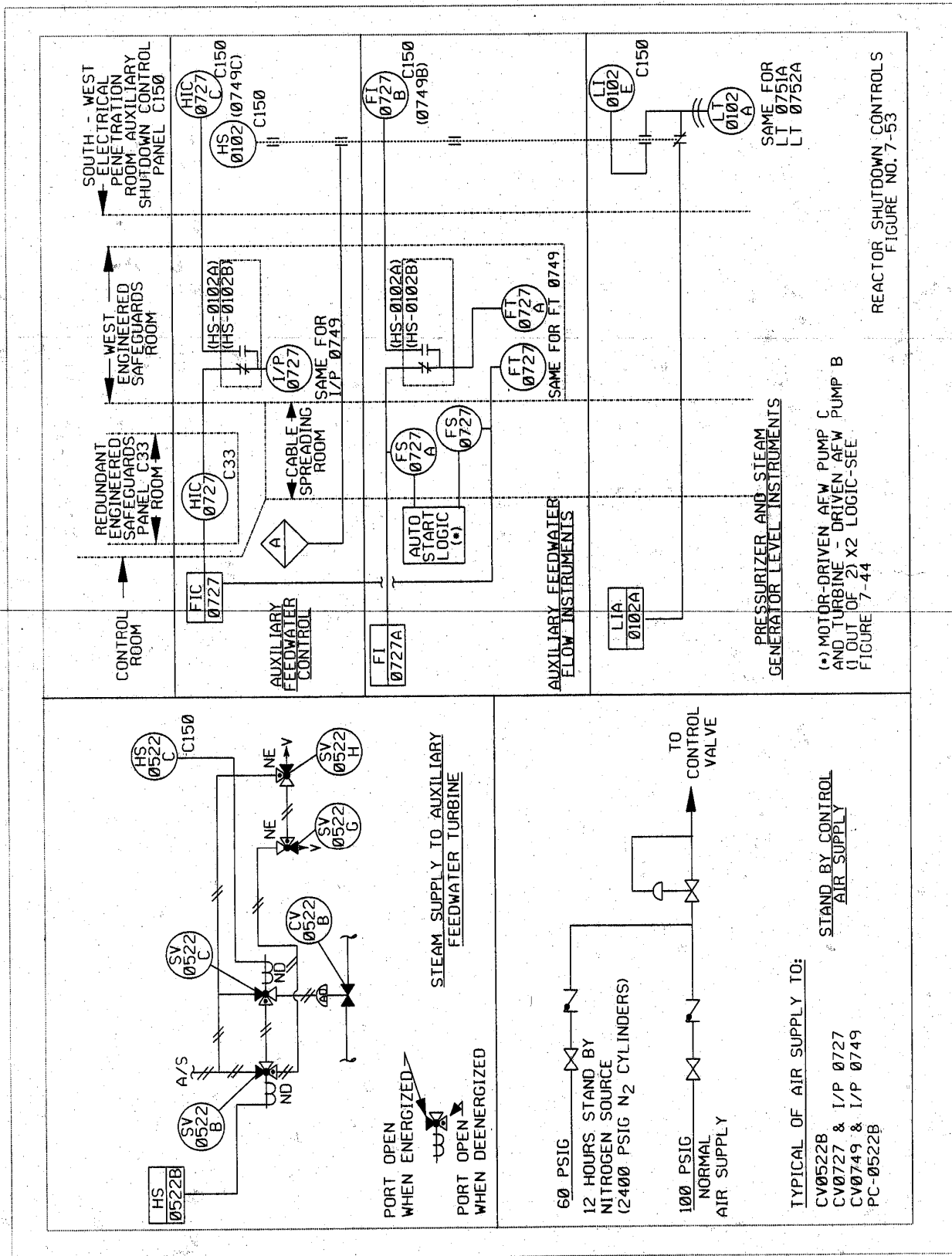
REACTOR REGULATING SYSTEM BLOCK DIAGRAM
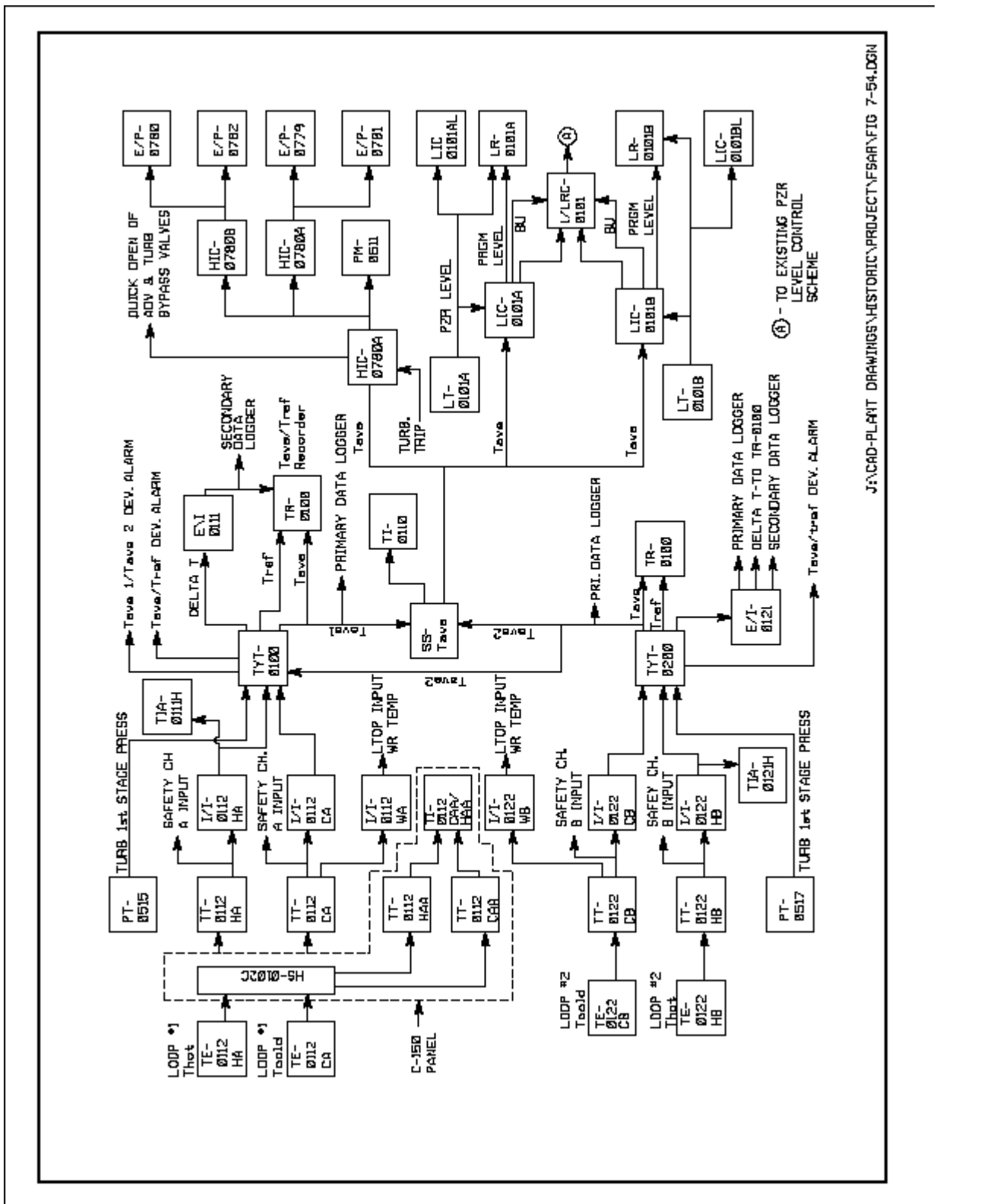
ROD DRIVE CONTROL SYSTEM SCHEMATIC DIAGRAM

ROD POSITION SETPOINTS

Shutdown
Rods

Regulating
Rods

Power
Shaping
Rods

**Upper
Electrical
Limit** → 131

**Upper
Electrical
Limit** → 131

**Upper
Electrical
Limit** → 131

**Upper
Rod
Stop** → 130

**Upper
Rod
Stop** → 130

Exercise Band

**Shutdown Rod
Insertion
Interlock
and Alarm** → 124

**Upper Sequential
Permissive** → 83

Lower Sequential Permissive → 51

**Pre-Power Dependent
Insertion Limit Alarm (PPDIL)** → PDIL + 5"

**Power Dependent
Insertion Limit Alarm (PDIL)** → PDIL

**Lower
Rod Stop** → 4

**Regulating Rod
Withdrawal Interlock** → 6

**Lower
Rod Stop** → 4

**Lower Electrical
Limit** → 3
0

**Lower Electrical
Limit** → 3
0

**Lower Electrical
Limit** → 1/2
0

NOTE: All Setpoint are in inches from bottom.

PRESSURE CONTROL PROGRAM

Pressurizer Steam Pressure, psia

Pressure (psia)	Description
2580	All Safety Valves Open
2540	Two Safety Valves Open
2500	One Safety Valve Opens
2375	ATWS Diverse Trip
2255	High Pressure Trip
2185	High Pressure Pre-Trip Alarm
2110	High Pressure Alarm
2075	All Backup Heaters "OFF" Above 2075 psia*
2060	All Backup Heaters "ON" Below 2060 psia*
1975	Low Pressure Alarm
	Thermal Margin/Low Pressure Trip Setpoint Will Vary Between 1750 and 2500 psia
1750	Thermal Margin/Low Pressure Trip Minimum Value
1593	Low-Low Pressure Alarm and Signal to Safety Injection Coincidence Logic

Pressurizer Normal Pressure Control	
Controller Output	Action
100%	Both Spray Valves Open
67%	Both Spray Valves Closed
33%	Proportional Heater "OFF"
0%	Proportional Heater "ON"

* Backup heaters normally operated in manual.

BLOCK DIAGRAM
STEAM DUMP AND BYPASS SYSTEM
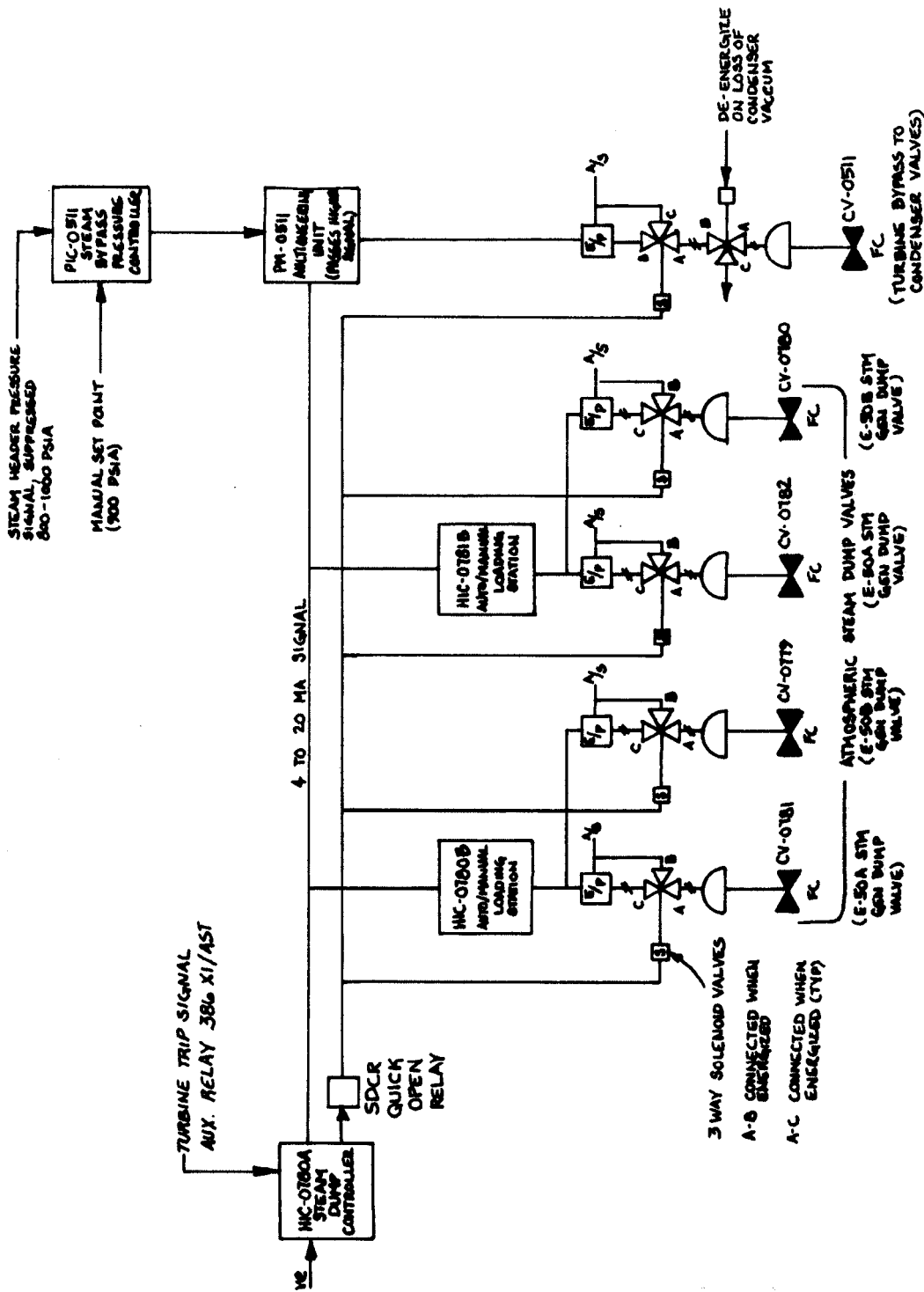
PRESSURIZER LEVEL CONTROL SYSTEM FAILURES STUDY
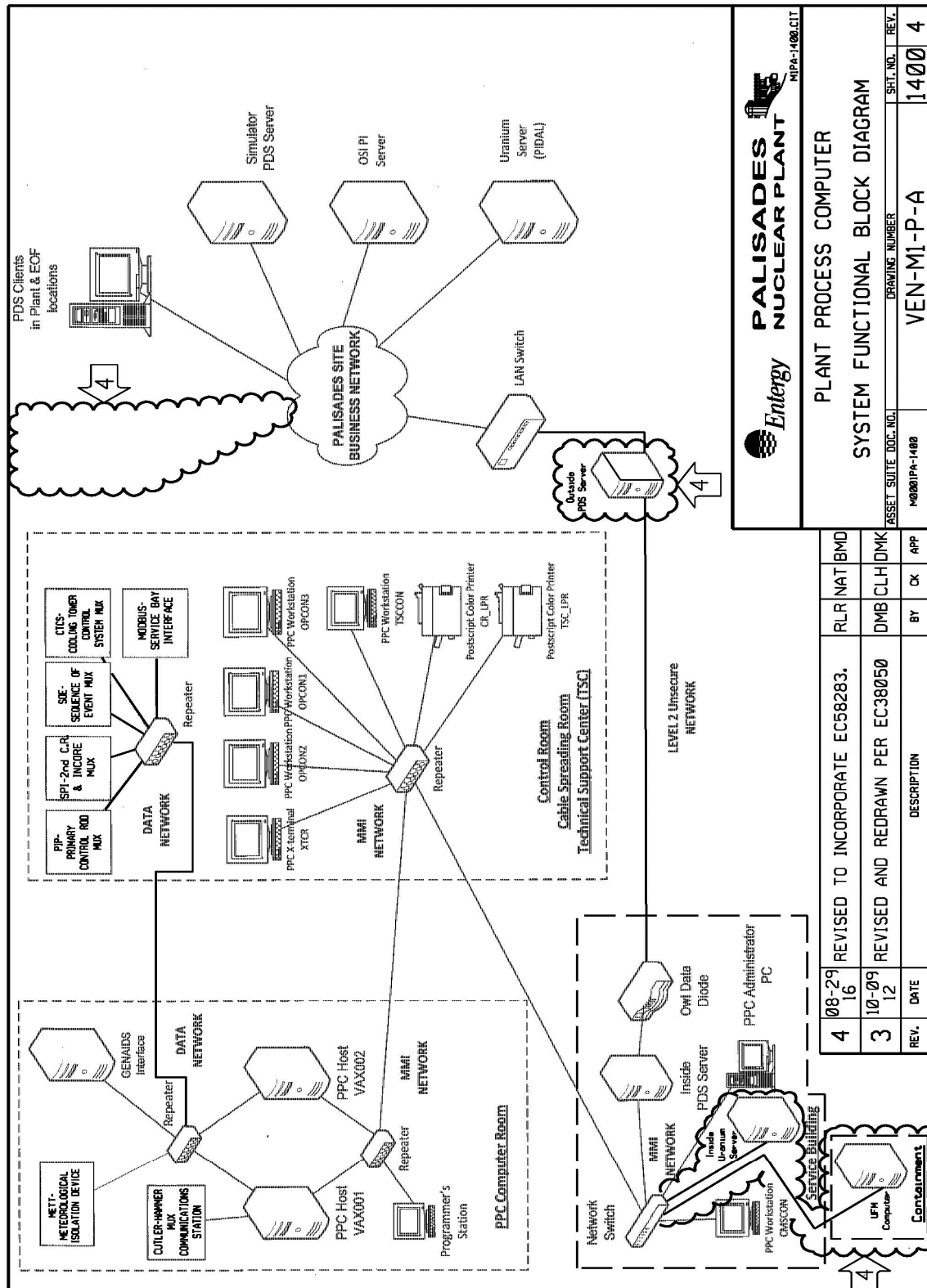**MODE "A" FAILURE**
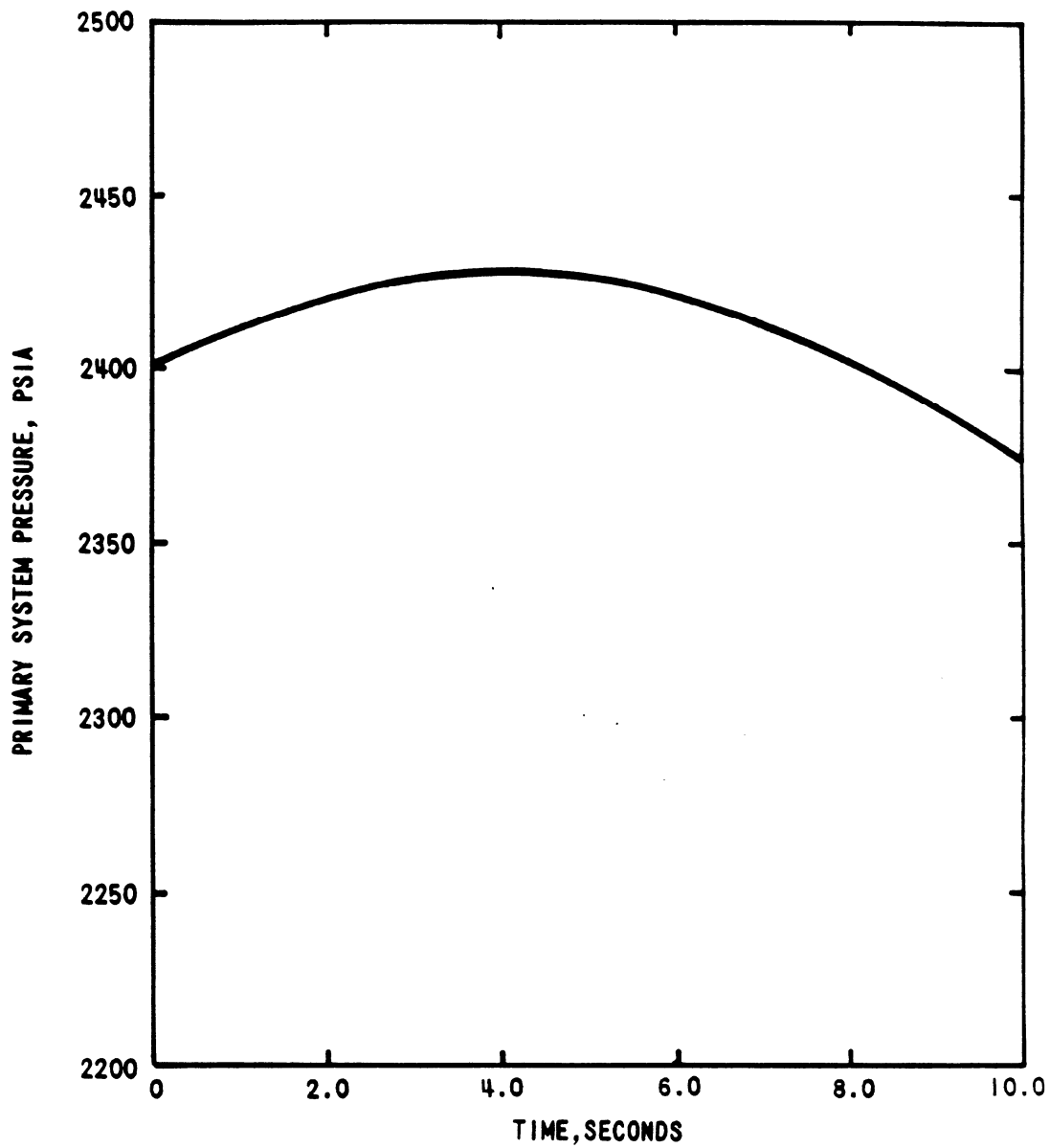
(REF P-ICE-900, 10/9/69)

PIPING DRAWING
NUCLEAR DETECTOR WELLS

Portions of this page have been
redacted per 10 CFR 2.390(d)(1).

BLOCK DIAGRAM
CRITICAL FUNCTIONS MONITOR SYSTEM