Design Control Document Table Of Contents

MISSING 13.2

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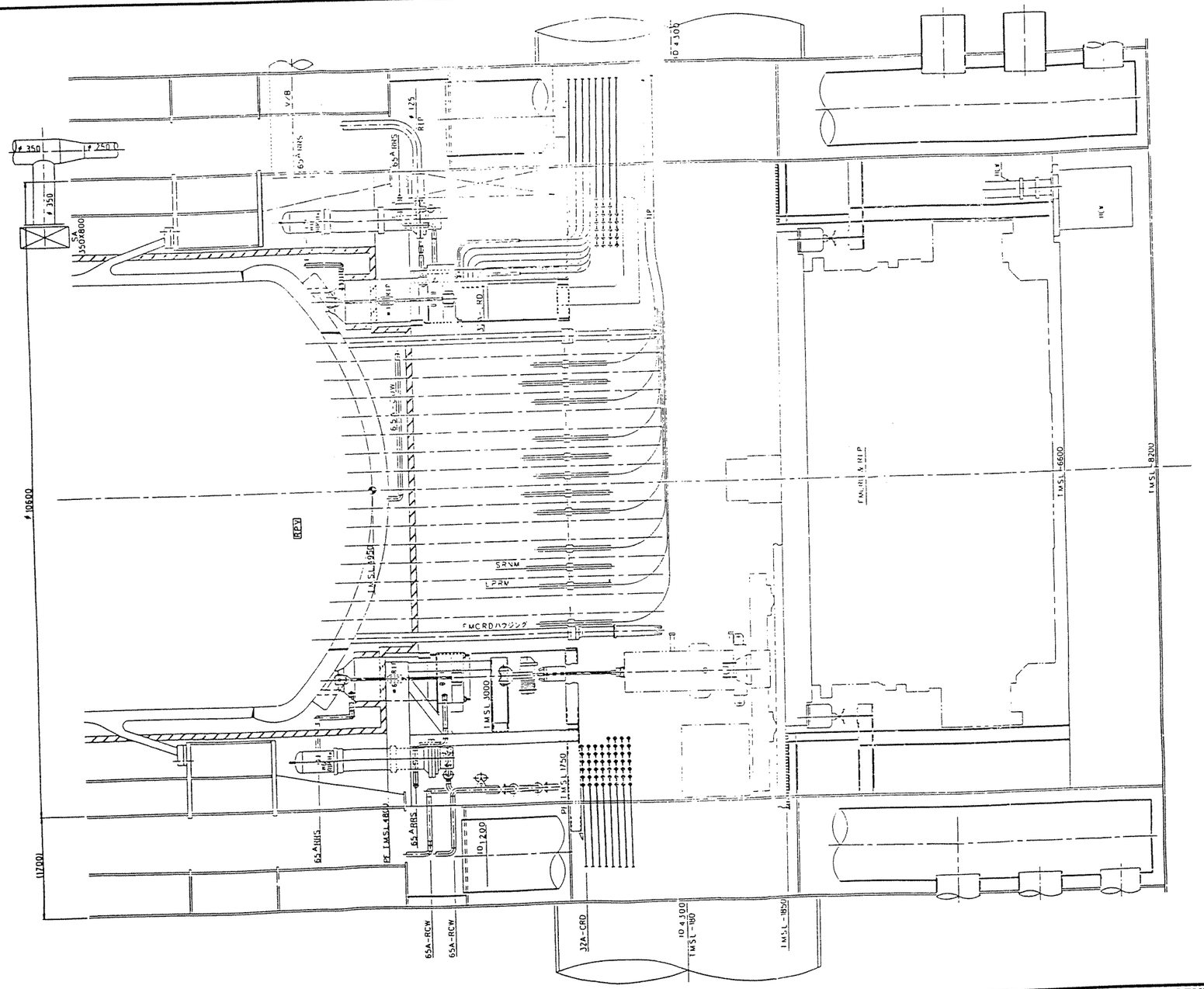
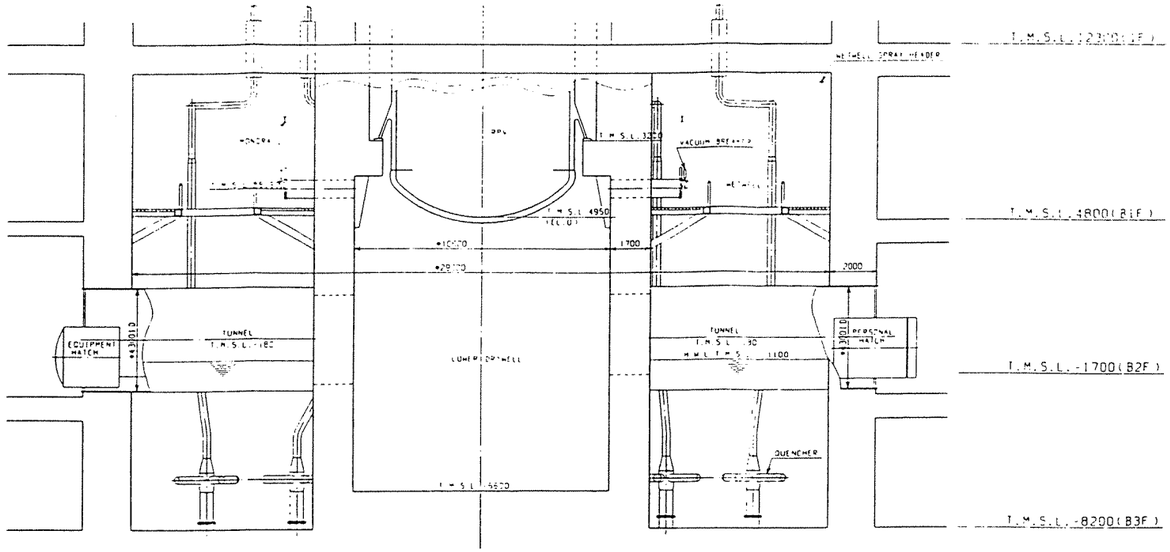
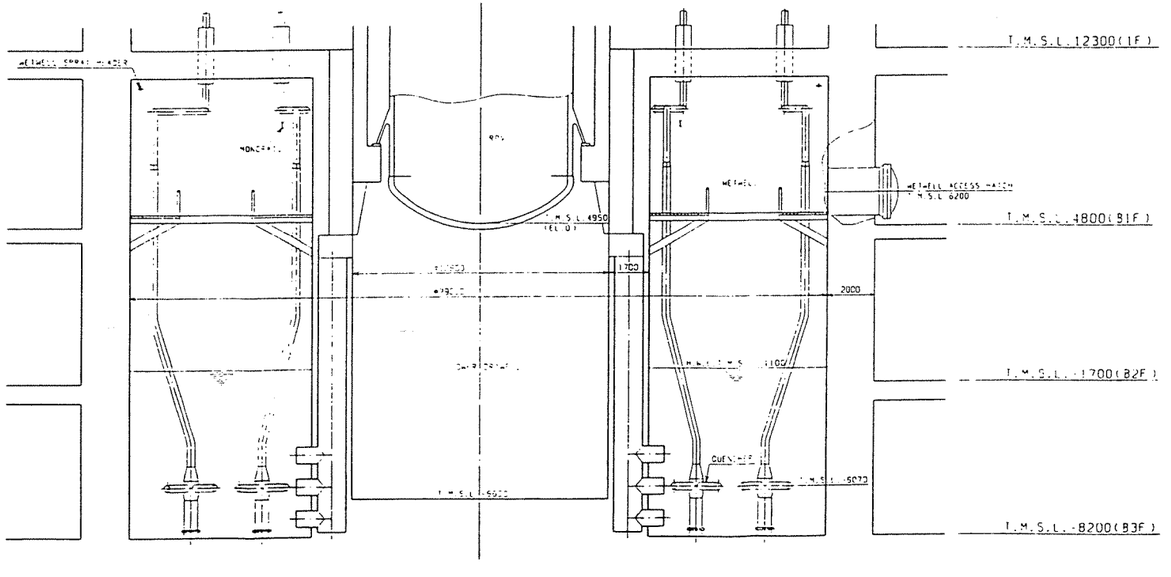


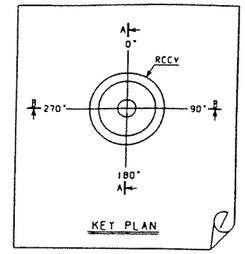
Figure 1.2-3b LOWER DRYWELL, ARRANGEMENT ELEVATION, SECTION A-A



A - A



B - B



REMARKS

EQUIPMENT
WETWELL
WETWELL SPRAY HEADER
VACUUM BREAKER
LOWER DRYWELL
TUNNEL
PERSONNEL HATCH
EQUIPMENT HATCH
QUENCHER

Figure 1.2-3c WETWELL, ARRANGEMENT ELEVATION SECTIONS A-A & B-B

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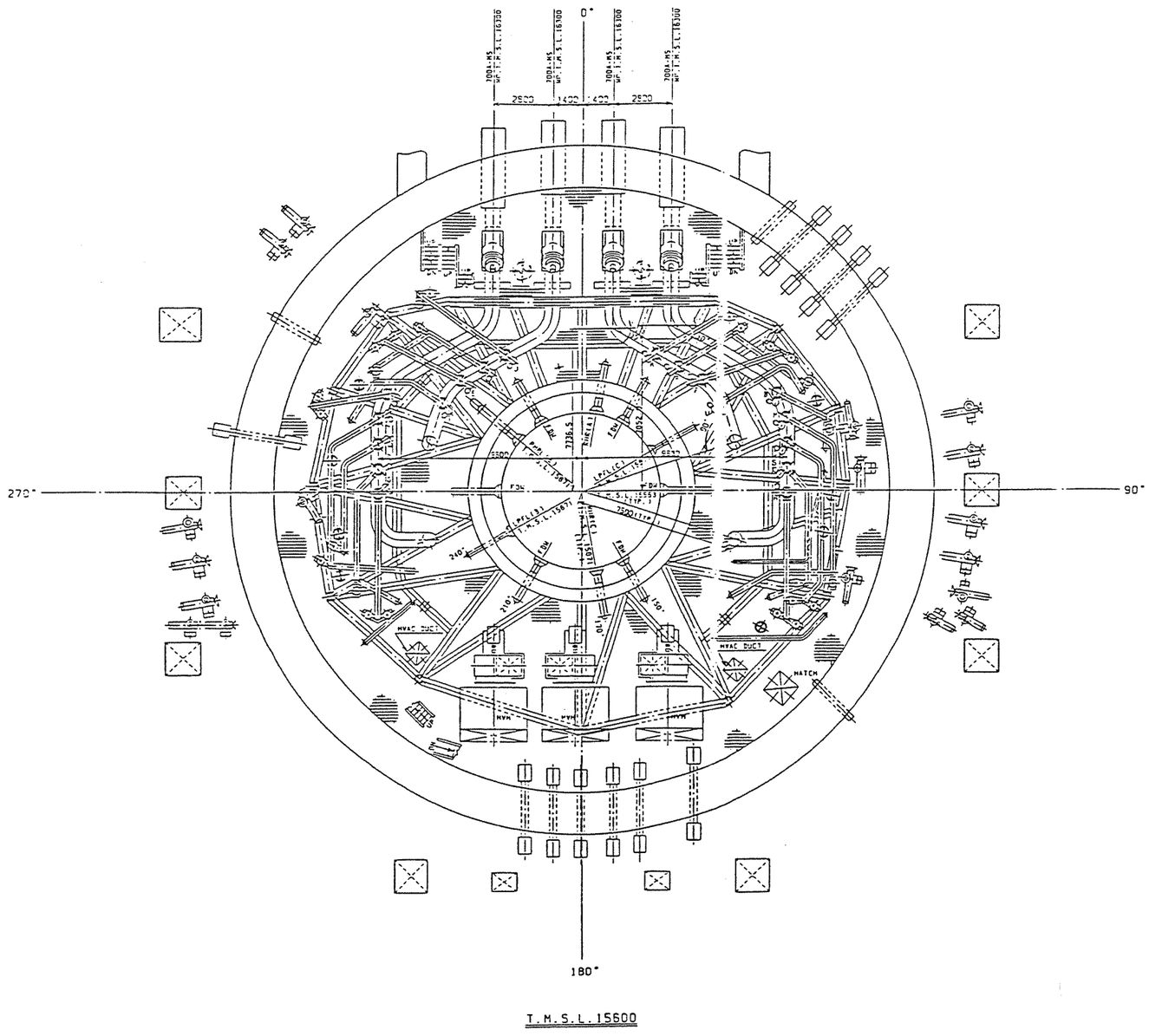
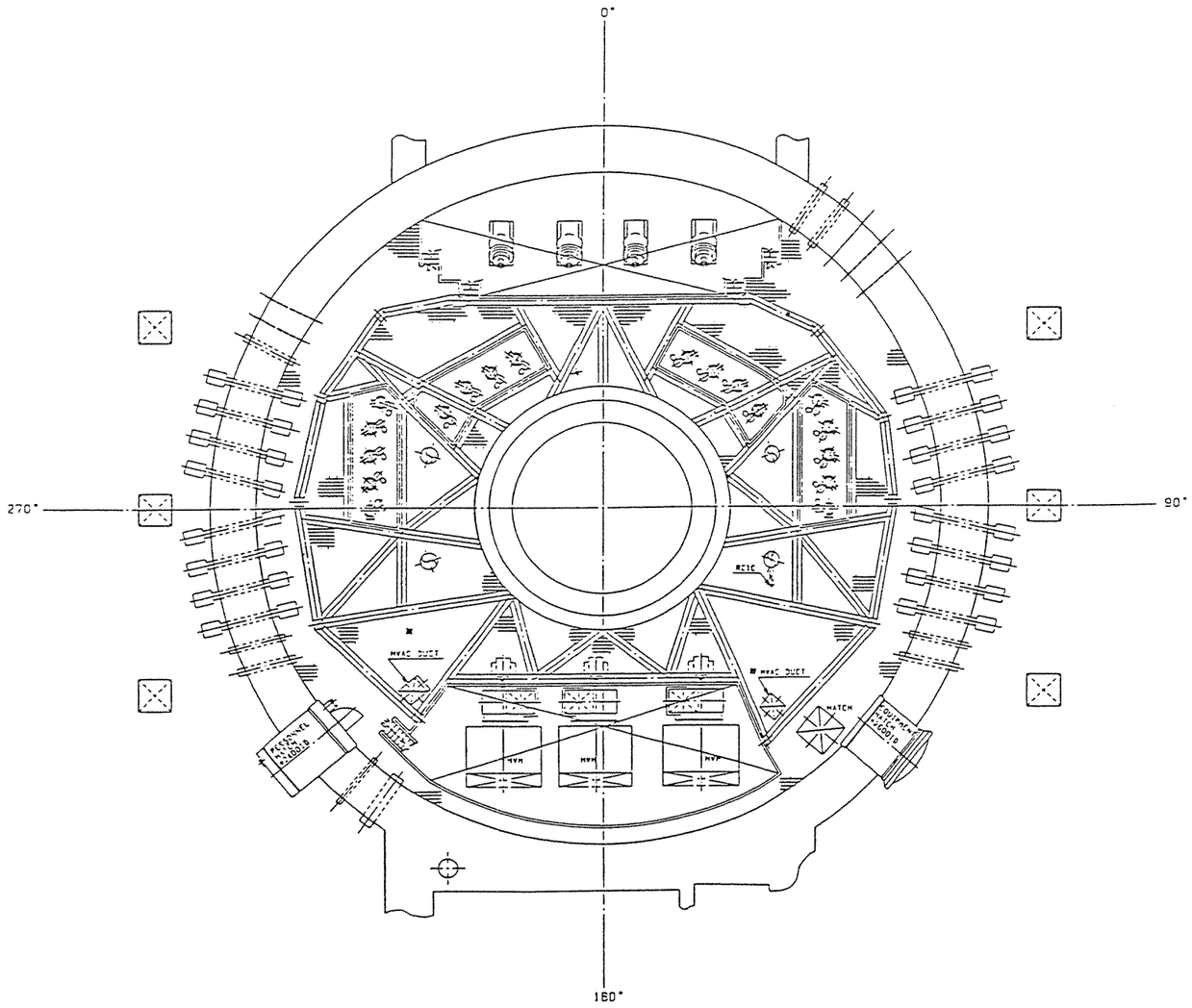
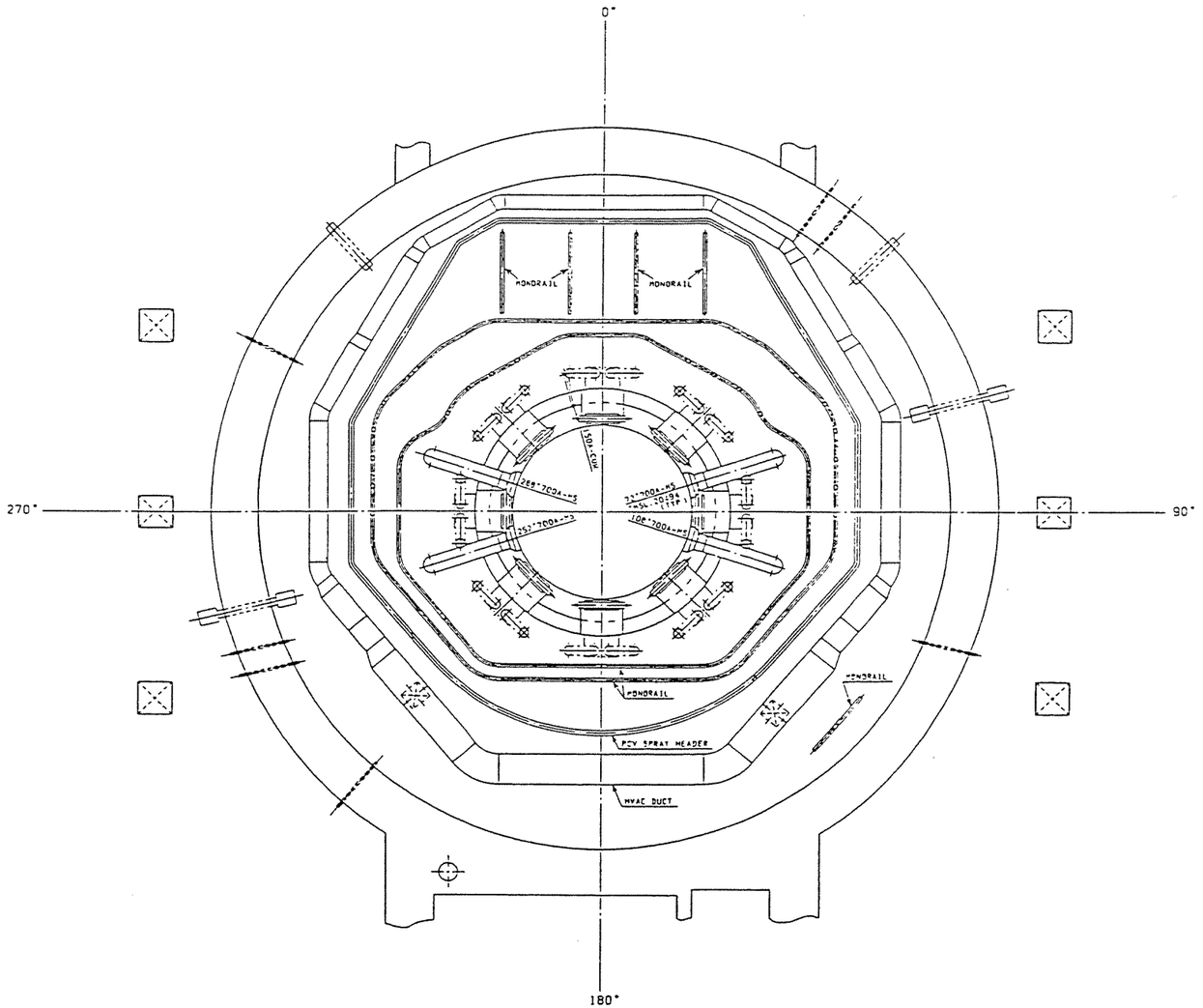


Figure 1.2–13b DRYWELL, ARRANGEMENT PLAN AT ELEVATION 15,600mm



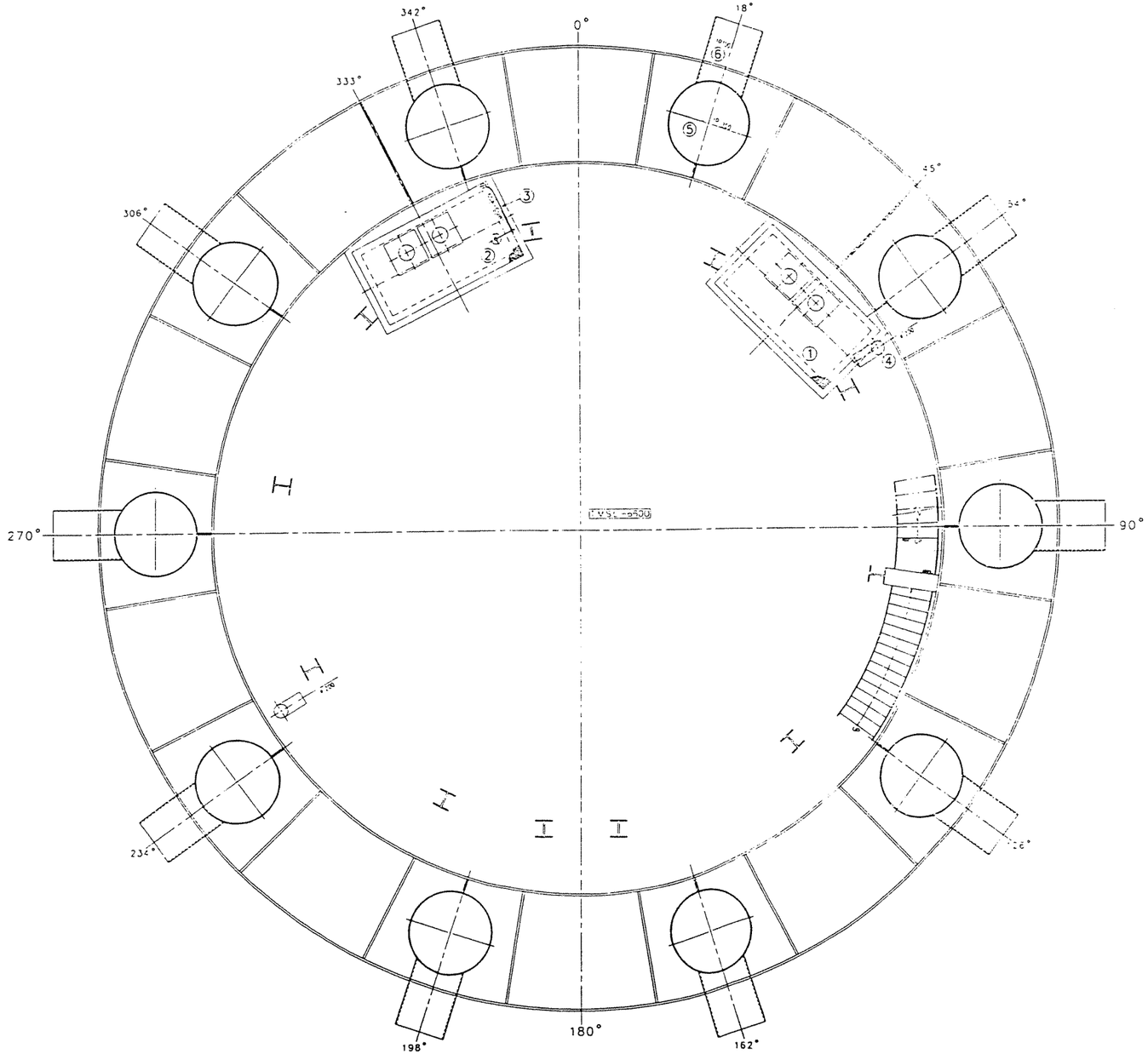
T.M.S.L.18100(1/2)

Figure 1.2–13c DRYWELL, ARRANGEMENT PLAN AT ELEVATION 18,100mm



T.M.S.L.18100(2/2)

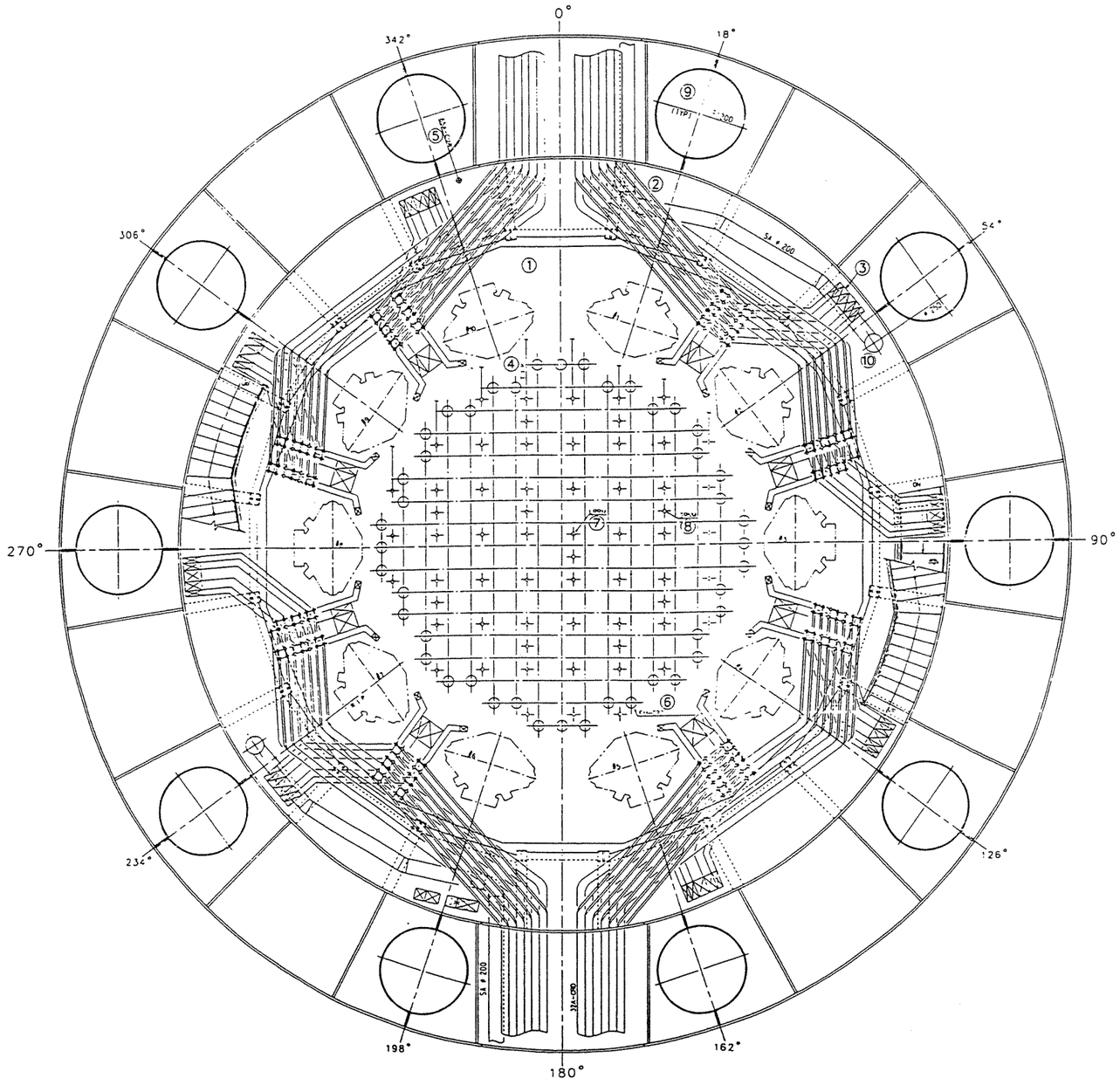
Figure 1.2-13d DRYWELL STEEL STRUCTURE AT EL. 18100 mm



REMARK

No.	EQUIPMENT
①	HCW SUMP & PUMP
②	LCW SUMP & PUMP
③	CUW PIPING (RPV BOTTOM DRAIN)
④	HVAC DUCT
⑤	VENT PIPE (VERTICAL PIPE)
⑥	VENT PIPE (HORIZONTAL PIPE)

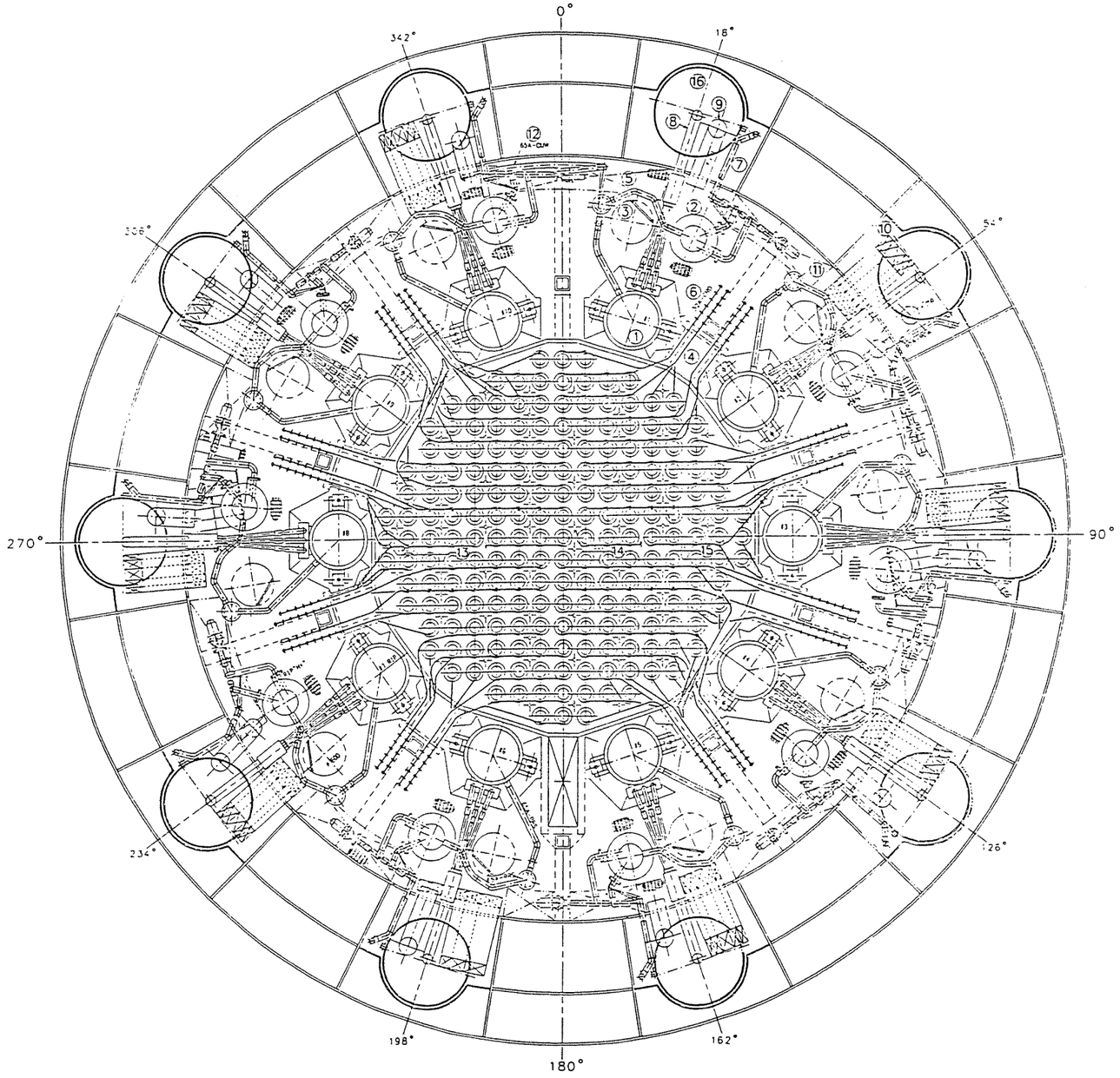
Figure 1.2-13e LOWER DRYWELL, ARRANGEMENT PLAN AT EL. -6600 TO -1850 mm



REMARK

No.	EQUIPMENT
①	FMCRD/RIP EQUIPMENT PLATFORM
②	CRD SCRAM PIPING
③	CABLE DUCT
④	TIP TUBING
⑤	CUW PIPING (RPV BOTTOM DRAIN)
⑥	FMCRD HOUSING
⑦	LOCAL POWER RANGE MONITOR
⑧	START-UP RANGE NEUTRON MONITOR
⑨	VENT PIPE (VERTICAL PIPE)
⑩	HVAC DUCT

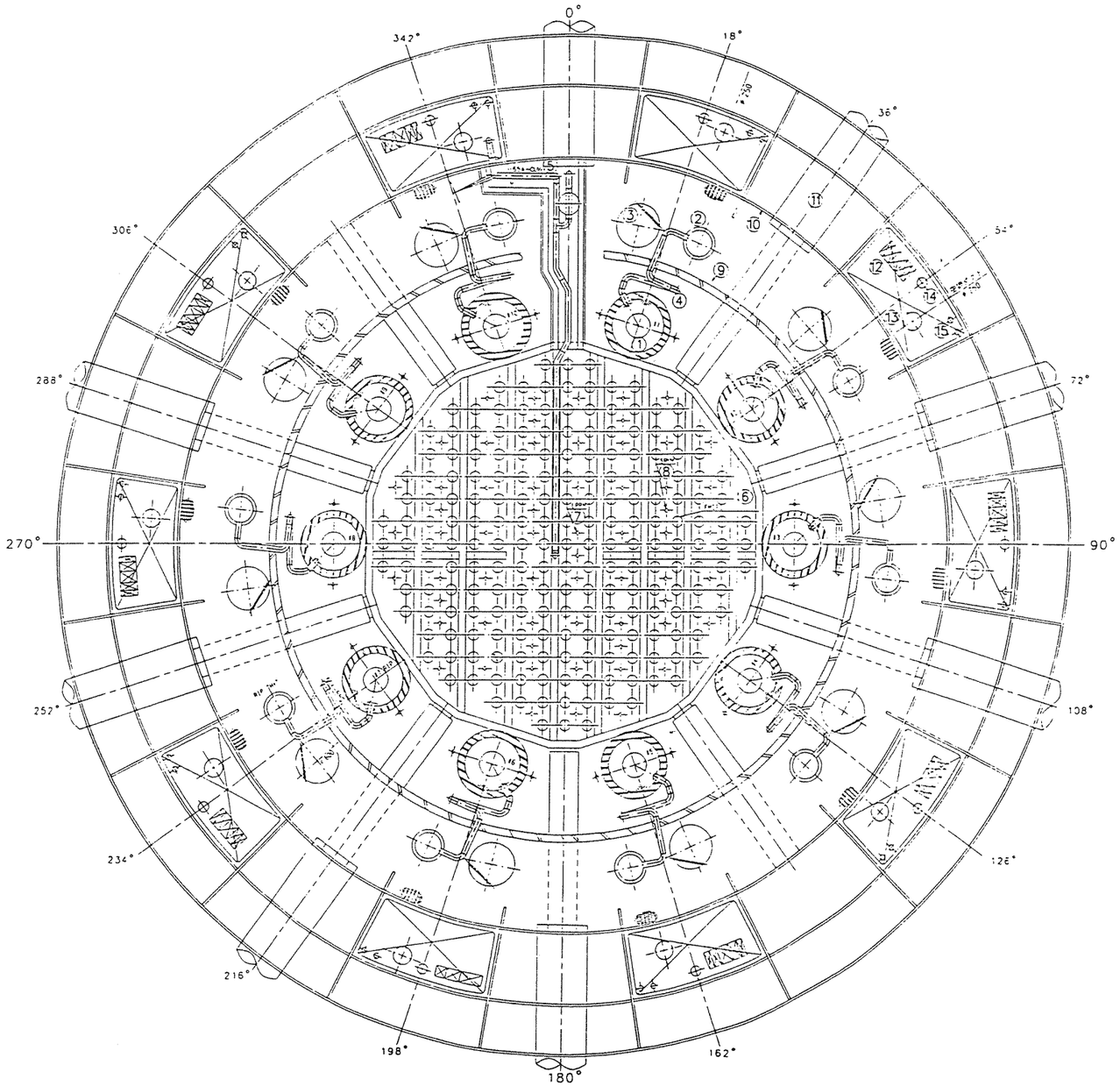
Figure 1.2-13f LOWER DRYWELL, ARRANGEMENT PLAN AT EL. -1850 TO 1750 mm



REMARK

No.	EQUIPMENT
①	REACTOR INTERNAL PUMP (RIP)
②	RIP HEAT EXCHANGER
③	LADDER
④	CABLE BOX
⑤	RRS PIPING (RIP MOTOR COOLING WATER)
⑥	CRD SCRAM PIPING
⑦	RCW PIPING (RIP HEAT EXCHANGE COOLING WATER)
⑧	RIP MOTOR CONDUIT
⑨	HVAC DUCT
⑩	CABLE DUCT
⑪	VALVE SPACE
⑫	CUW PIPING (RPV BOTTOM DRAIN)
⑬	FMCRD HOUSING
⑭	LOCAL POWER RANGE MONITOR
⑮	START-UP RANGE NEUTRON MONITOR
⑯	VENT PIPE (VERTICAL PIPE)

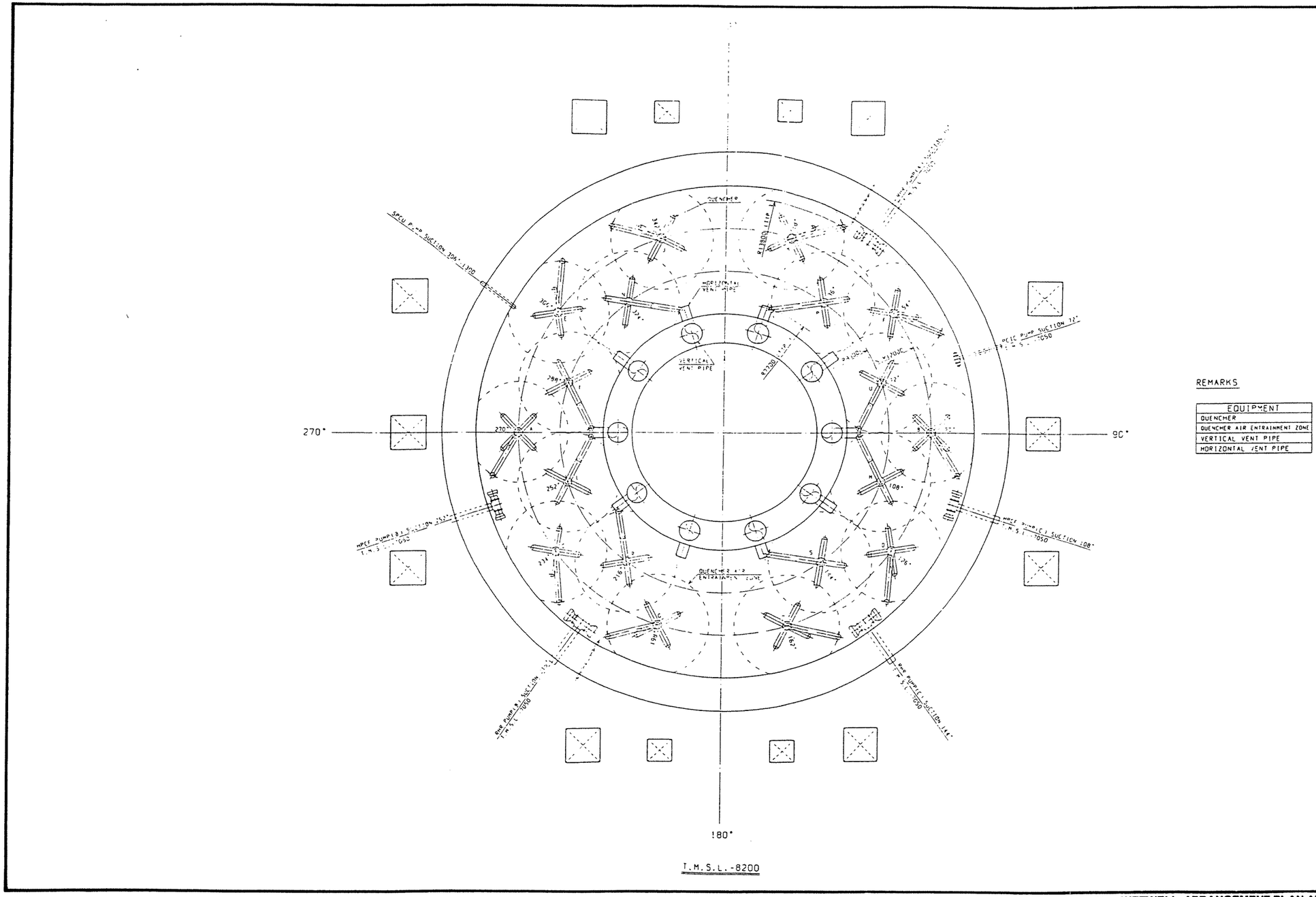
Figure 1.2-13g LOWER DRYWELL, ARRANGEMENT PLAN AT ELEVATION 1750 TO 4800mm



REMARK

No.	EQUIPMENT
①	REACTOR INTERNAL PUMP (RIP)
②	RIP HEAT EXCHANGER
③	ACCESS HATCH & LADDER
④	RIP PIPING (RIP MOTOR COOLING WATER)
⑤	CUW PIPING (RPV BOTTOM DRAIN)
⑥	FMCRD HOUSING
⑦	LOCAL POWER RANGE MONITOR
⑧	START-UP RANGE NEUTRON MONITOR
⑨	RPV INSULATION
⑩	RPV PEDESTAL
⑪	VACUUM BREAKER
⑫	CABLE DUCT
⑬	HVAC DUCT
⑬	RIP MOTOR CONDUIT
⑭	RCW PIPING (RIP HEAT EXCHANGE) COOLING WATER

Figure 1.2-13h LOWER DRYWELL, ARRANGEMENT PLAN AT ELEVATION 4800 TO 6700mm



REMARKS

EQUIPMENT
QUENCHER
QUENCHER AIR ENTRAINMENT ZONE
VERTICAL VENT PIPE
HORIZONTAL VENT PIPE

Figure 1.2-13i WETWELL, ARRANGEMENT PLAN AT EL. -8200 mm

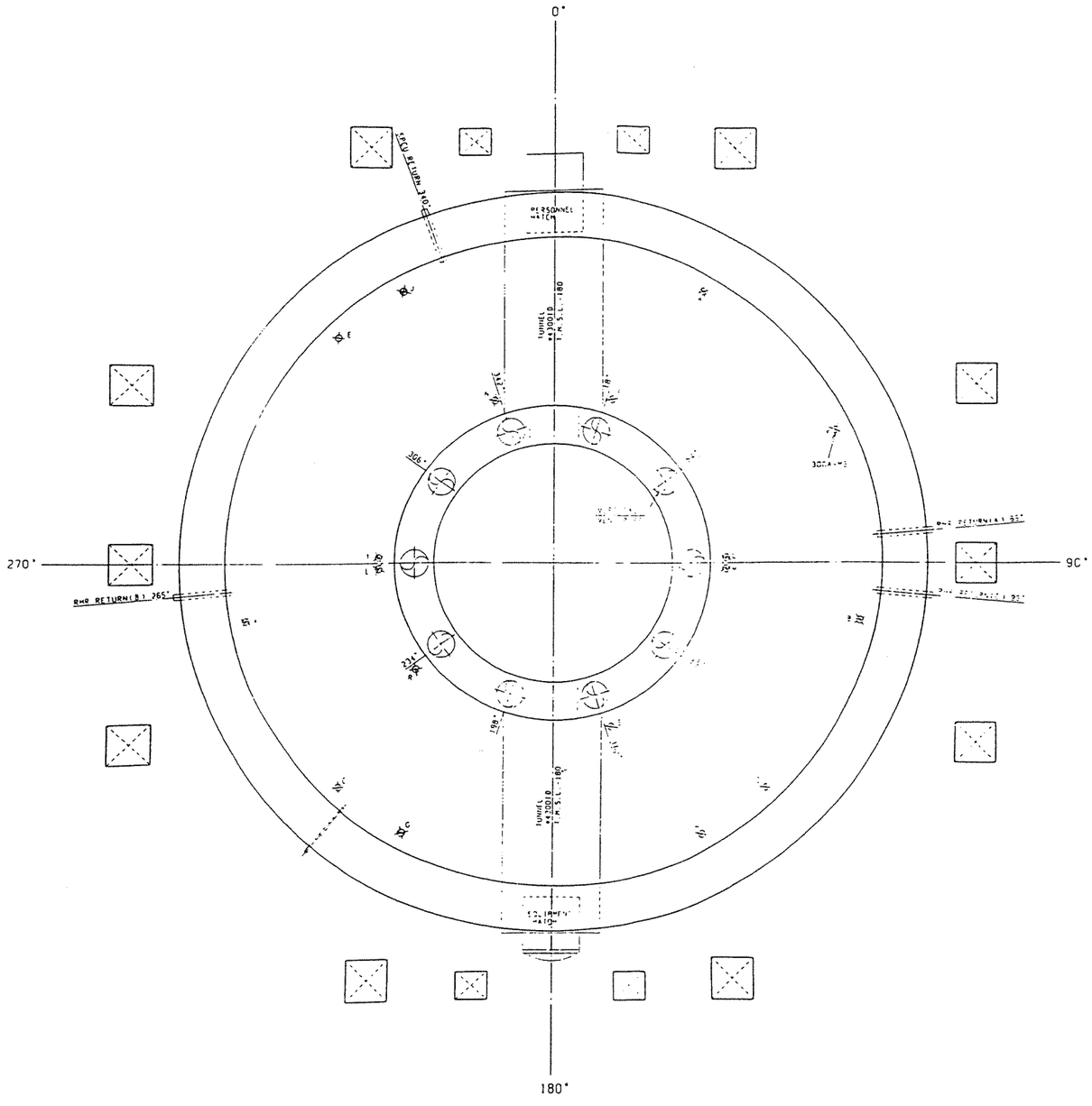
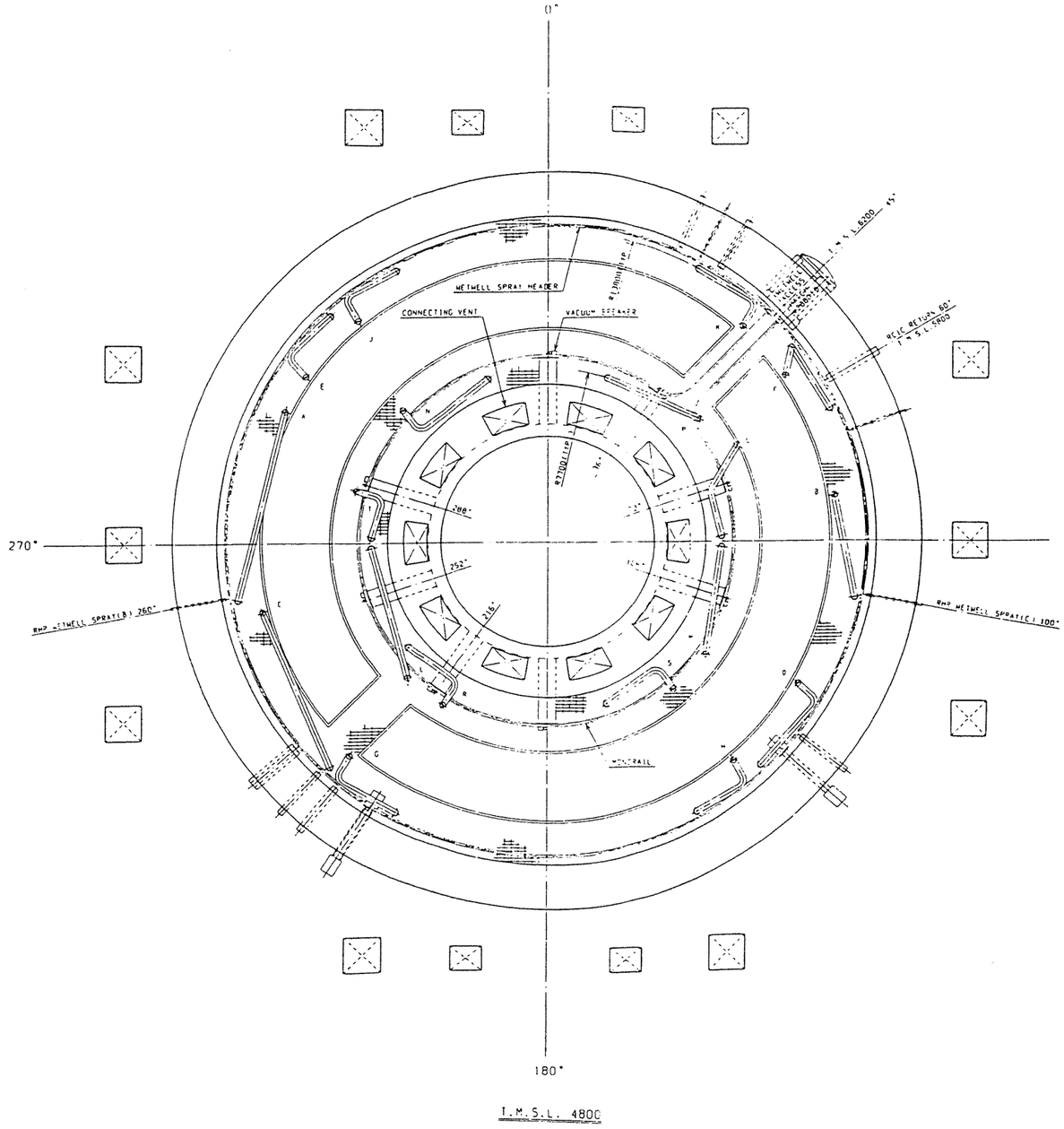


Figure 1.2-13j WETWELL, ARRANGEMENT PLAN AT EL. -1700 mm



REMARKS

EQUIPMENT
VACUUM BREAKER
CONNECTING VENT
WETWELL SPRAY HEADER
WETWELL ACCESS HATCH

Location of SRVDL D/F Penetration

NO	Azimuth(°)	Distance from RPV center(mm)
A	297	12850
B	81	12850
C	256	12850
D	120	12850
E	305	12850
F	55	12850
G	222	12850
H	140	12850
J	320	12850
K	42	12850
L	225	8650
M	126	8650
N	313	8650
P	51	8650
R	212	8650
S	140	8650
T	285.5	8650
U	63	9393

Figure 1.2-13k WETWELL, ARRANGEMENT PLAN AT ELEVATION 4800mm

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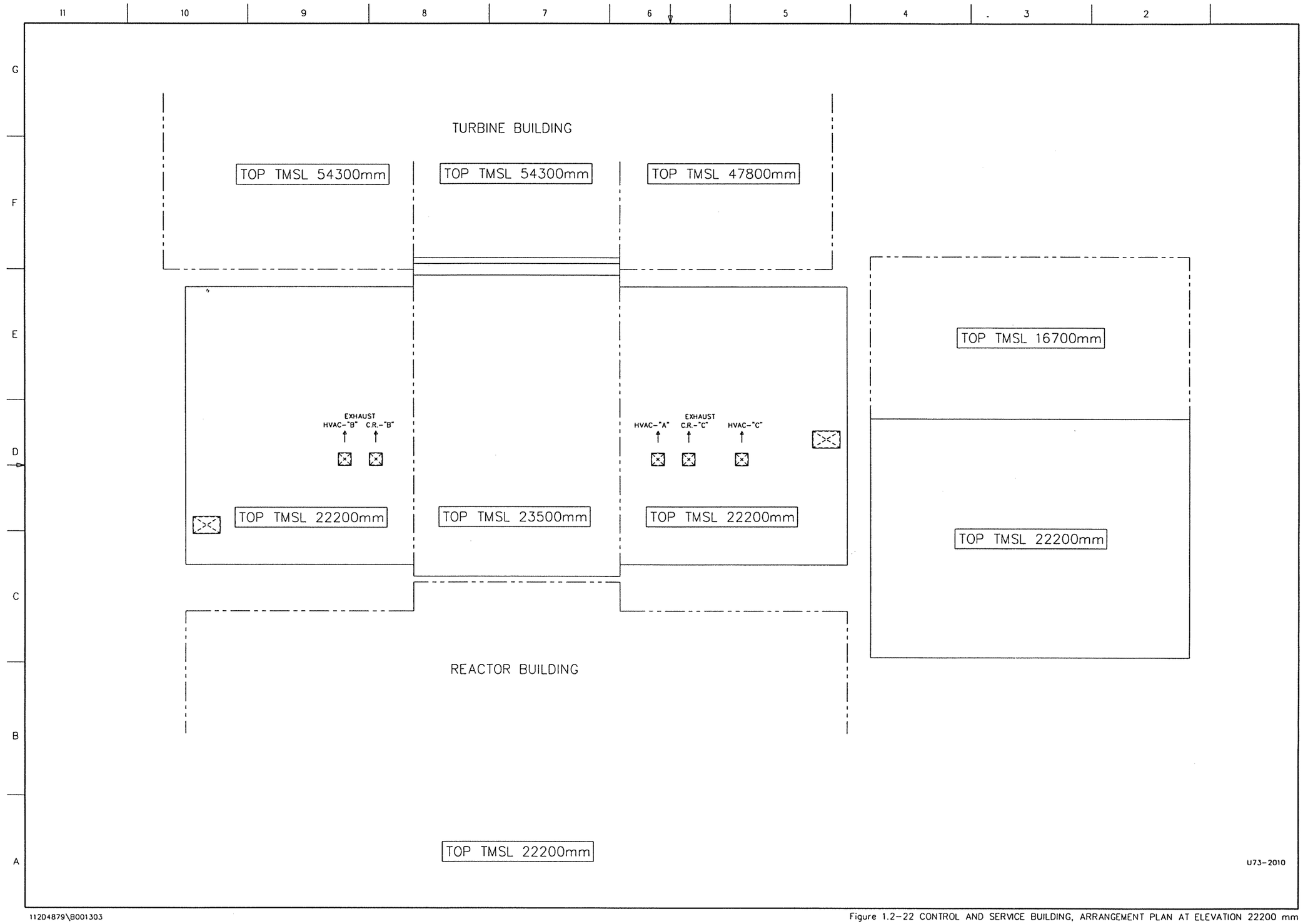

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Figure 1.2-22 CONTROL AND SERVICE BUILDING, ARRANGEMENT PLAN AT ELEVATION 22200 mm

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VALVES AND VALVE ACTUATORS

(SEE NOTE 6)

- DOUBLE DISK GATE VALVE
- GATE VALVE
- GLOBE VALVE OR ANTICAVITATION VALVE
- GLOBE STOP CHECK VALVE
- SWING CHECK VALVE
- LIFT CHECK VALVE
- TESTABLE CHECK VALVE
- EXCESS FLOW CHECK VALVE
- BUTTERFLY VALVE
- PLUG OR BALL VALVE
- NEEDLE VALVE
- VB — VACUUM BREAKER
- THREE WAY VALVE
  - NEXT PORT OF OPENING
  - NEXT PORT OF CLOSURE
- THREE WAY VALVE
  - NEXT PORT OF OPENING
- EXPLOSIVE VALVE
- FOUR WAY VALVE
- ANGLE VALVE
- ANGLE STOP CHECK VALVE
- SAFETY OR RELIEF VALVE
- SAUNDERS TYPE VALVE
- GLAND LEAK OFF
- GLAND SEAL WATER
- BELLOWS SEAL
- EXTRACT STEAM CHECK VALVE
- * — SUPPLIED WITH ASSOCIATED EQUIPMENT
- MO / FXXX — NOTE 5 — MOTOR OPERATED NOTE 3
- HO / FXXX — NOTE 5 — HYDRAULIC OPERATED PISTON NOTE 3
- AO / FXXX — NOTE 5 — AIR OPERATED PISTON NOTE 3
- NO / FXXX — NOTE 5 — NITROGEN OPERATED NOTE 3
- UH / FXXX — NOTE 5 — UNI-HANDLER NOTE 3
- SOLENOID (NOTE 3)
- MANUAL REMOTE NOTE 3
- DIAPHRAGM VALVE NOTE 3
- FLOAT VALVE NOTE 3
- (WITH POSITION) NOTE 3
- PCV / FXXX — CONTROL VALVE (PRESSURE)
- MO / FXXX / FCV — CONTROL VALVE (FLOW)
- SELF CONTAINED CONTROL (CONNECTED TO PIPE)
- SELF CONTAINED CONTROL (CONNECTED TO VALVE)

SPECIALITIES

- THREADED CAP
- QUICK CONNECTION OR HOSE CONNECTION
- WELD CAP
- BLIND FLANGE
- SPECTACLE FLANGE
- IF — INSULATING FLANGE
- INCREASER, REDUCER
- EXPANSION JOINT
- FLANGE CONNECTION
- FLEXIBLE CONNECTION
- RUPTURE DISC
- SPOOL PIECE
- TRAP
- UNION CONNECTION
- BOUNDARY

RW	MUW	SYSTEM MATERIAL
SS	CS	
150 MPa G	140 MPa G	MAXIMUM OPERATING (DESIGN) PRESSURE
60 °C	66 °C	MAXIMUM OPERATING (DESIGN) TEMPERATURE
3B(1A)	4D(3B)	DESIGN QUALITY CLASS (CONSTRUCTION PERMIT BASE (DESIGN BASE)) NOTE 11
As	B(S1,S2)	SEISMIC CLASS (CONSTRUCTION PERMIT BASE (DESIGN BASE)) NOTE 11
(EXAMPLE)		

- BASKET STRAINER (DOUBLE)
- BASKET STRAINER (SINGLE)
- CONE STRAINER
- PLATE STRAINER
- "Y" TYPE STRAINER
- FILTER
- EJECTOR
- EDUCTOR
- CONDENSING CHAMBER
- DRAIN FUNNEL
- X-200 — PRIMARY CONTAINMENT VESSEL PENETRATION (PENETRATION NUMBER TO BE SHOWN INSIDE BOX)

NOTES

1 SYMBOLS DEFINED IN THIS DOCUMENT SHALL BE USED IN ALL P&ID'S

2 ANY SYMBOL NOT DEFINED IN THE DOCUMENT IF USED, SHALL BE DESCRIBED NEXT TO THE SYMBOL IN THE P&ID OR A NOTE TO EXPLAIN THE SYMBOL SHALL BE ADDED IN THE P&ID

3 SYMBOL SHOWS ACTUATOR ON A GATE VALVE FOR DEMONSTRATION PURPOSES ONLY. FOR APPLICATION OF THE ACTUATOR TO OTHER VALVE TYPES, REPLACE THE GATE VALVE SYMBOL WITH THE APPROPRIATE VALVE SYMBOL

4 VALVE SYMBOL IN P&ID SHALL BE SHOWN IN ITS NORMAL CONDITION. FOR EXAMPLE NORMALLY OPEN IS REPRESENTED BY ▷◁ AND NORMALLY CLOSED IS REPRESENTED BY ▶◀

5 VALVE NUMBER TO WHICH THE ACTUATOR BELONGS

6 VALVE IDENTIFICATION AREA ON THE VALVE SYMBOL SHALL BE AS SHOWN.

7 LOCATION OF "PANEL NUMBER" FOR INSTRUMENTS IS ABOVE SYMBOL, POINT IDENTIFICATION (PID) NUMBER FOR COMPUTER INPUT IS BELOW SYMBOL. "H/L" DESCRIPTION FOR ANNUNCIATOR AND "O/C", "R/G" FOR INDICATION LIGHT IS AS INDICATED

8 ANNUNCIATOR SETPOINT FOR THIRD OR MORE LOW OR HIGH ALARM SHALL BE SHOWN WITH A DIGIT AND AN ALPHABETICAL LETTER. EXAMPLE "LOW LOW LOW=3L", HIGH HIGH HIGH HIGH=4H"

9 DELETED

10 (A) PIPING IDENTIFICATION SHALL FOLLOW THE FORMAT AS SHOWN

(B) IN THIS FORMAT, PIPE SCHEDULE, MATERIAL SPECIFICATION AND PROCESS FLUID MAY BE SUMMARIZED IN A NOTE ON P&ID AND MAY BE OMITTED FROM THE IDENTIFICATION FOR EXAMPLE – WHEN THE PIPE SCHEDULE IS SUMMARIZED IN NOTE, THE FORMAT MAY BE SHORTENED TO 100A-FDW-102-CS-W

(C) SYSTEM ACRONYM (MPL NUMBER) SHALL BE PER TABLE 3.2-1 OF 23A6100

(D) PIPE NUMBERING SHALL BE DONE USING THE FLOW DIRECTION NUMBERING METHOD SAME AS EQUIPMENT NUMBERING DESCRIBED IN TABLE 17-5 OF 23A6100. SEE TABLE 17-5 FOR PIPE NUMBERING AND NUMBER SERIES ASSIGNED TO DIFFERENT CATAGORIES OF PIPE

(E) PIPE NUMBER SHALL CHANGE AT BOUNDARY SYMBOL (SEE SPECIALITIES ITEMS IN THIS DRAWING) IE WHERE ANY OF THE PARAMETERS SHOWN AT THE BOUNDARY SYMBOL CHANGE

NOTES CONTINUED ON SHEET 2

INSTRUMENTS

(SEE NOTE 7)

- LOCALLY MOUNTED INSTRUMENT
- LOCAL PANEL OR RACK MOUNTED INSTRUMENT
- MAIN CONTROL ROOM INSTRUMENT
- LOCALLY MOUNTED TRANSMITTER
- LOCAL PANEL OR RACK MOUNTED TRANSMITTER
- ANNUNCIATOR (H=HIGH, L=LOW, HH=HIGH HIGH, LL=LOW LOW) NOTE 8
- PLANT COMPUTER INPUT SIGNAL
- INDICATION LIGHT: O – OPEN, C – CLOSED, R – RED, G – GREEN
- SOFTWARE FUNCTION
- FE — FLOW ELEMENT (ORIFICE TYPE)
- FE — FLOW ELEMENT (VENTURI AND FLOW NOZZLE TYPE)
- FG — SIGHT GLASS
- FI — IN-LINE FLOW INDICATOR
- FO — FLOW METER (POSITIVE DISPLACEMENT)
- RO — RESTRICTING ORIFICE
- RO — BREAKDOWN ORIFICE
- SAMPLE COOLER
- SP — SAMPLE POINT
- SAMPLE PROBE
- RO — DRAG ORIFICE
- RE — IN-LINE RADIATION MONITOR

PIPING AND INSTRUMENT ELECTRICAL LINE

- PRIMARY PROCESS LINE
- AUXILIARY PROCESS LINE OR INSTRUMENT LINE
- PNEUMATIC SUPPLY LINE
- INSTRUMENT ELECTRICAL WIRING
- CAPILLARY TUBING
- HEAT TRACED LINE
- STEAM HEATED PIPE
- PIPING CONNECTING POINT
- PIPING NON-CONNECTING POINT
- BRANCH
- BRANCH
- LINE CONTINUATION
- LINE FROM OTHER SYSTEM

LINE CONTINUATION SYMBOLS

*CONTINUATION ON SAME DRAWING

"TO" = (SH2, B-3)

"FROM" = (SH2, H-5) — SHEET & ZONE NUMBER

*CONTINUATION ON REFERENCE DRAWING

"TO" = (8 | SH2, B-3)

REFERENCE NUMBER

"FROM" = (SH2 H-5 | 8) — SHEET & ZONE NUMBER (OPTIONAL) — REFERENCE NUMBER

- ELECTRICAL CONNECTING POINT
- ELECTRICAL NON-CONNECTING POINT

PIPING IDENTIFICATION

(NOTE 10)

000A-□□□-000-XXXXXX-XXX-□

- PIPE MATERIAL SPECIFICATION
- PIPE SCHEDULE
- FLUID — W=WATER, S=STEAM, A=AIR, N=NITROGEN
- PIPE NUMBER
- SYSTEM ACRONYM
- NOMINAL DIAMETER (IN mm)

EXAMPLE 100A-FDW-102-CS-S80-W

MPL NO. A10-3030

FIGURE 1.7-1 PIPING AND INSTRUMENTATION DIAGRAM SYMBOLS (Sheet 1 of 2)

TABLE 1 INSTRUMENT LEGENDS

MEASURED VARIABLE / FUNCTION		AMPLIFIER	CONTROLLER	FUNCTION GENERATOR	PRIMARY ELEMENT	INDICATOR	INDICATING CONTROLLER	INDICATING RECORDER	INDICATING SWITCH	INTEGRATOR	RECORDER	RECORDER SWITCH	SAMPLER	SIGHT GLASS	SWITCH	TEST POINT	TRANSMITTER	TELEMETER
		AM	C	F	E	I	IC	IR	IS	Q	R	RS	SM	G	S	X	T	TL
CONCENTRATION	CN				CNE	CNI												
CASING ELONGATION	Sx				SXE	SXI					SXR				SXS		SXT	
DENSITY	D		DC		DE	DI			DIS		DR	DRS			DS	Dx	DT	
DEW POINT	DW				DWE	DWI					DWR				DWS		DWT	
DIFFERENTIAL ELONGATION	Dx	DXAM			DXE	DXI					DXR				DXS		DXT	
DIFFERENTIAL FLOW	DF					DFI			DFIS		DFR	DFRS			DFS		DFT	
DIFFERENTIAL PRESSURE	DP		DPC			DPI			DPIS		DPR	DPRS			DPS	DPx	DPT	
DIFFERENTIAL TEMPERATURE	DT		DTC			DTI			DTIS		DTR	DTRS			DTS		DTT	
ECCENTRICITY	E	EAM			EE	EI					ER						ET	
ELECTRICAL CONDUCTIVITY	C				CE	CI			CIS		CR		CSM		CS	CX	CT	
ELECTRICAL CURRENT	A					AI					AR						AT	ATL
ELECTRICAL FREQUENCY	HZ					HZI					HZR						HZT	HZTL
ELECTRICAL POWER	W					WI					WR						WT	WTL
ELECTRICAL POTENTIAL	V					VI					VR						VT	VTL
FLOW	F		FC	FF	FE	FI	FIC	FIR	FIS	FQ	FR	FRS		FG	FS	FX	FT	
HYDROGEN	H2				H2E	H2I		H2IR	H2IS		H2R	H2RS	H2SM		H2S		H2T	
HUMIDITY	M				ME	MI					MR						MT	
HYDROGEN ION DENSITY	PH	PHAM	PHC		PHE	PHI					PHR		PHSM			PHX		
LEVEL	L		LC		LE	LI			LIS		LR	LRS		LG	LS	LX	LT	
NEUTRON FLUX	N	NAM	NC		NE	NI				NQ	NR					Nx	NT	
OXYGEN	O2		O2C		O2E	O2I		O2IR	O2IS		O2R	O2RS			O2S			
PRESSURE	P		PC		PE	PI			PIS		PR	PRS			PS	Px	PT	
POSITION	PO		POC		POE	POI			POIS		POR	PORS			POS		POT	
RADIATION	R				RE	RI			RIS	RQ	RR	RRS	RSM		PS	Rx	RT	
REDUCTION OXIDATION POTENIAL DIFF	RO				ROE					ROQ	ROR				ROS		ROT	
SPEED OR ROTATION FREQUENCY	S	SAM	SC		SE	SI					SR				SS		ST	
SIGNAL MONITOR	OS														OSS			
SMOKE	SM				SME	SMI									SMS		SMT	
TEMPERATURE	T		TC		TE	TI			TIS		TR	TRS			TS	Tx	TT	
TIME	TM		TMC			TMI			TMIS	TMQ		TMRS						
TORQUE	TQ				TQE						TQR				TQS		TQT	
TURBIDITY	TU				TUE	TUI					TUR				TUS		TUT	
VIBRATION	VB		VBC		VBE	VBI			VBIS		VBR				VBS		VBT	
VIBRATION PHASE ANGLE	PA				PAE	PAI					PAR						PAT	
VOLT-AMPERE REACTIVE POWER HOUR	QH					QHI					QHR						QHT	QHTL
VOLT-AMPERE REACTIVE POWER	Q					QI					QR						QT	QTL
WATT-HOUR	WH					WHI					WHR						WHT	WHTL
WEIGHT	WF		WFC		WFE	WFI					WFR				WFS			

ABBREVIATIONS

MATERIAL
CS - CARBON STEEL
SS - STAINLESS STEEL

SERVICE SUPPLY SOURCES
AS - AIR SUPPLY
ES - ELECTRICAL POWER SUPPLY
NS - NITROGEN SUPPLY

FAILURE CONDITION
FAI - FAIL AS-IS
FAO - OPEN ON AIR OR ELECTRICAL FAILURE
FAC - CLOSE ON AIR OR ELECTRICAL FAILURE

VALVE CONDITION
LO - LOCKED OPEN
LC - LOCKED CLOSED
NO - NORMALLY OPEN
NC - NORMALLY CLOSED
NE - NORMALLY ENERGIZED
ND - NORMALLY DE-ENERGIZED

MISCELLEOUS
AC - ALTERNATING CURRENT
DC - DIRECT CURRENT

DRAINS
CWD - FLOW CONDUCTIVITY WASTE
HWD - HIGH CONDUCTIVITY WASTE
SD - STORM DRAIN
NRD - NON-RADIOACTIVE EQUIPMENT DRAIN
HSD - HOT SHOWER DRAIN

CONTROL VALVES
FCV - FLOW CONTROL VALVE
PCV - PRESSURE CONTROL VALVE
LCV - LEVEL CONTROL VALVE
TCV - TEMPERATURE CONTROL VALVE

PRESSURE UNIT
MPa - megapascal

NOTES (CONT)
11 DESIGN AND SAFETY CLASSIFICATION CORRELATION

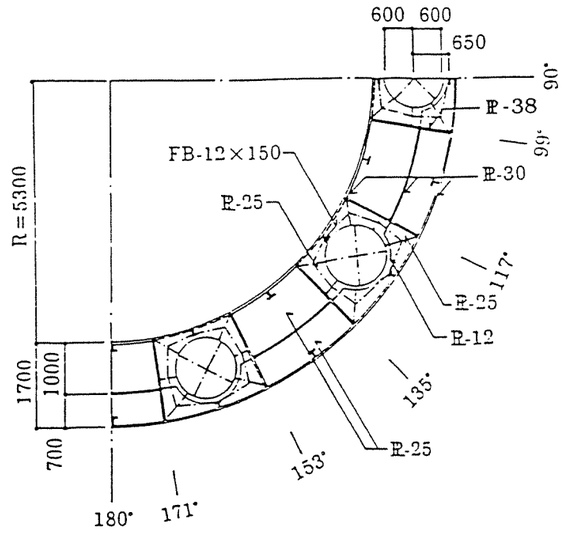
BOUNDARY SYMBOL		REFERENCE TABLE 3.2-2 OF 23A6100	
DESIGN CLASS	QUALITY CLASS	SAFETY DESIGNATION	QUALITY GROUP
1	A	SC-1	A
2	B	SC-2	B
3	A	SC-2	B
	B	SC-2	B
4	A	SC-2	B
	C	SC-3	C
	D	NNS	C
	F	NNS	-
5	B	SC-2	B
6	D	NNS	D
	F	NNS	-
7	C	NNS	-
	D	NNS	-
	F	NNS	-
	G	NNS	-

SEISMIC DESIGN CLASSIFICATION CORRELATION

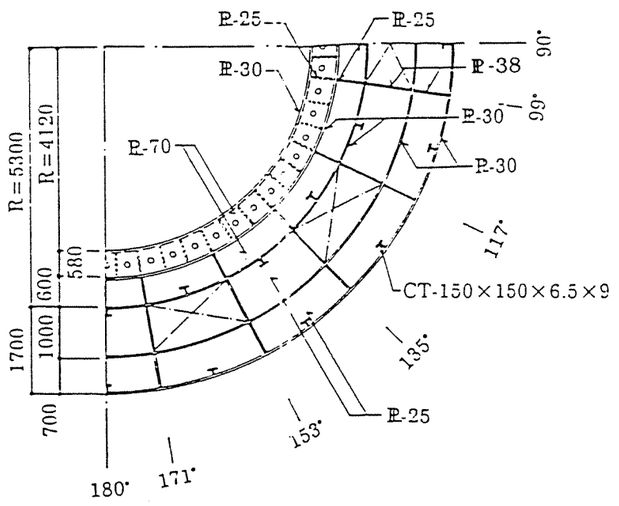
BOUNDARY SYMBOL	REFERENCE TABLE 3.2-2 OF 23A6100
SEISMIC CLASS	SEISMIC CATEGORY
As	I
A	I
B	I
C	NSC

NNS - NON NUCLEAR SAFETY
NSC - NON SEISMIC CATEGORY

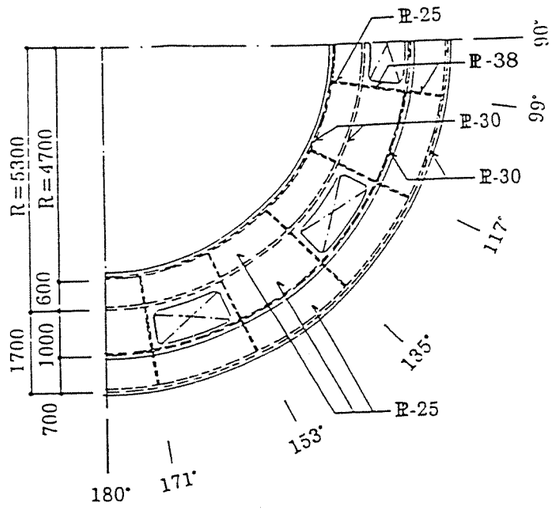
FIGURE 1.7-1 PIPING AND INSTRUMENTATION DIAGRAM SYMBOLS (Sheet 2 of 2)



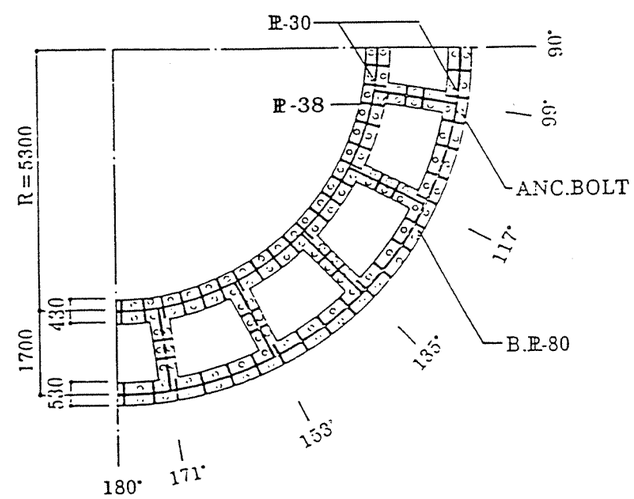
SECTION D



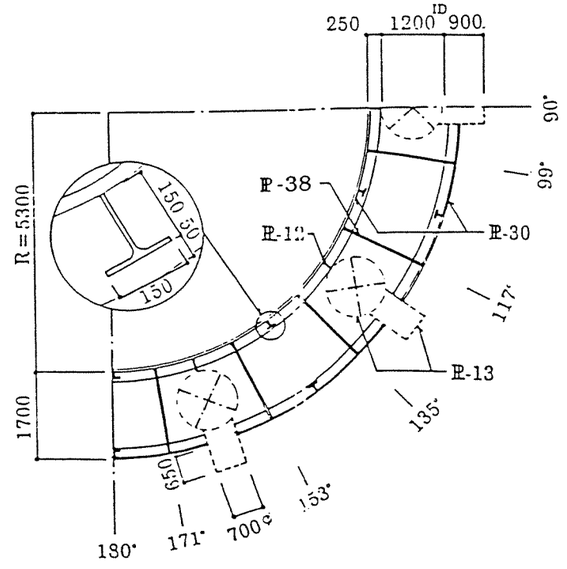
SECTION E



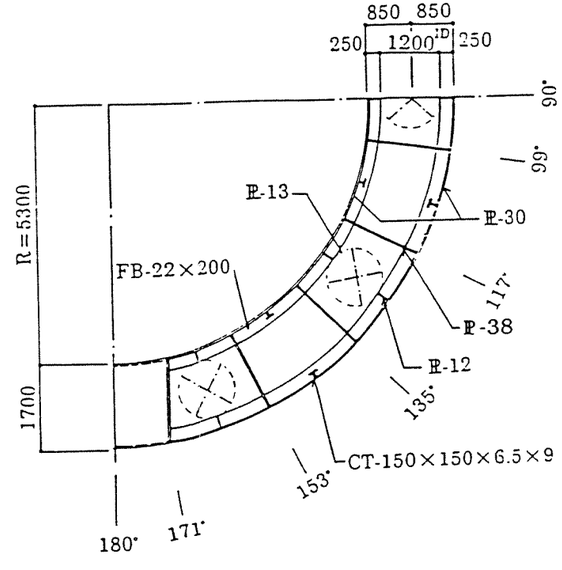
SECTION F



SECTION A



SECTION B



SECTION C

Figure 3H.1-28 CONFIGURATION OF RPV PEDESTAL

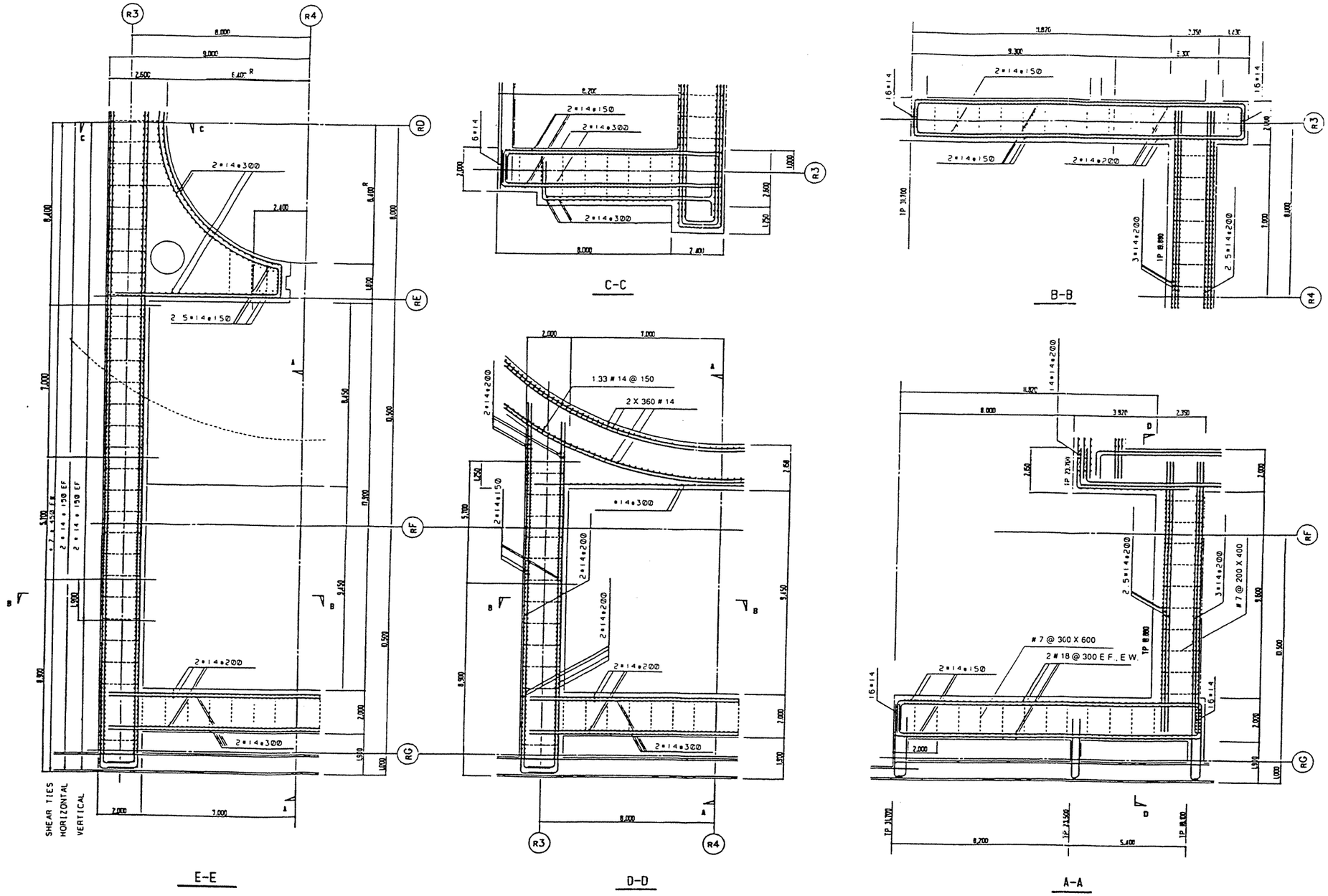


Figure 3H.1-29 REBAR ARRANGEMENT OF F/P GIRDER AND SLAB (1/2)

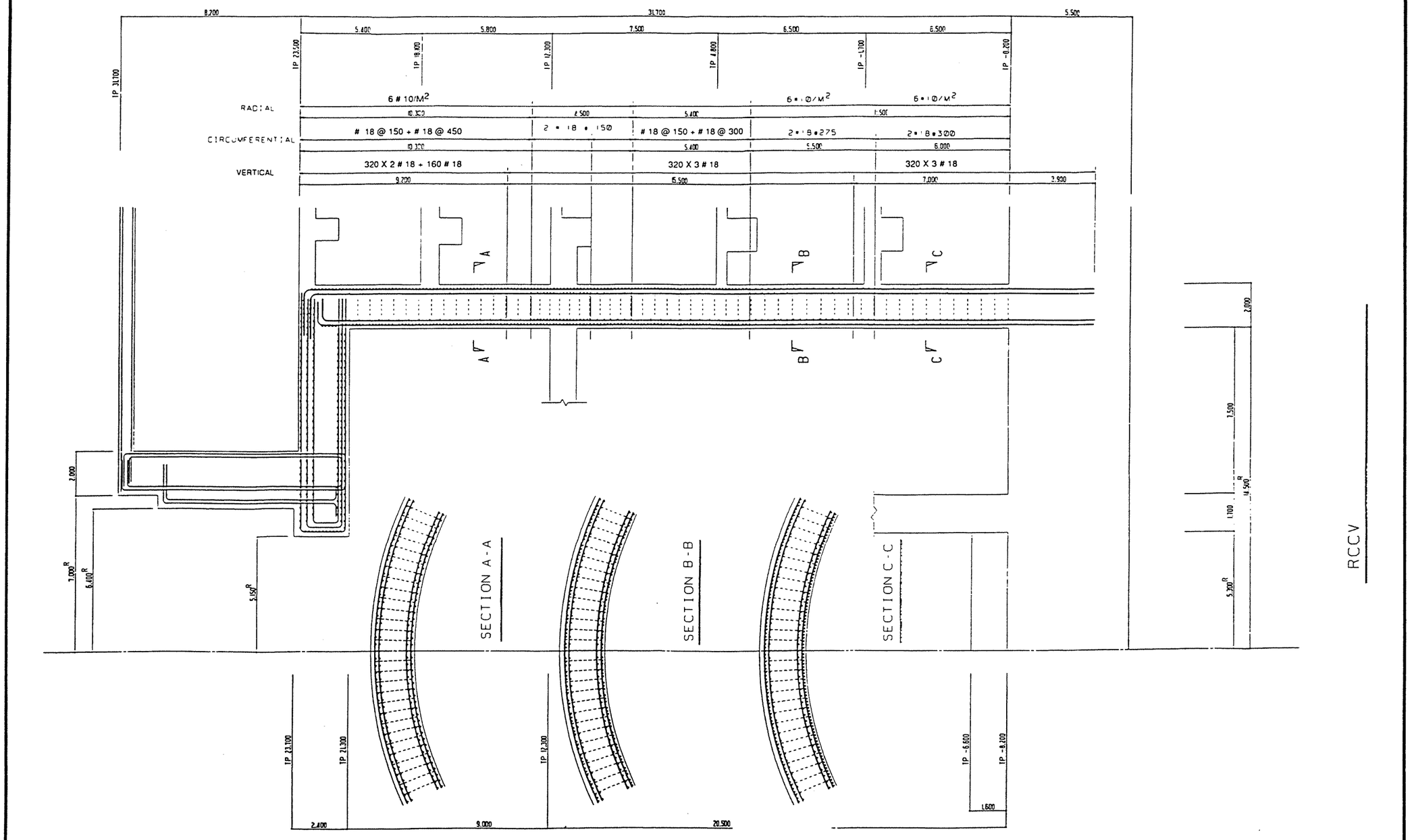


Figure 3H.1-30 CONTAINMENT STRUCTURE WALL REINFORCEMENT

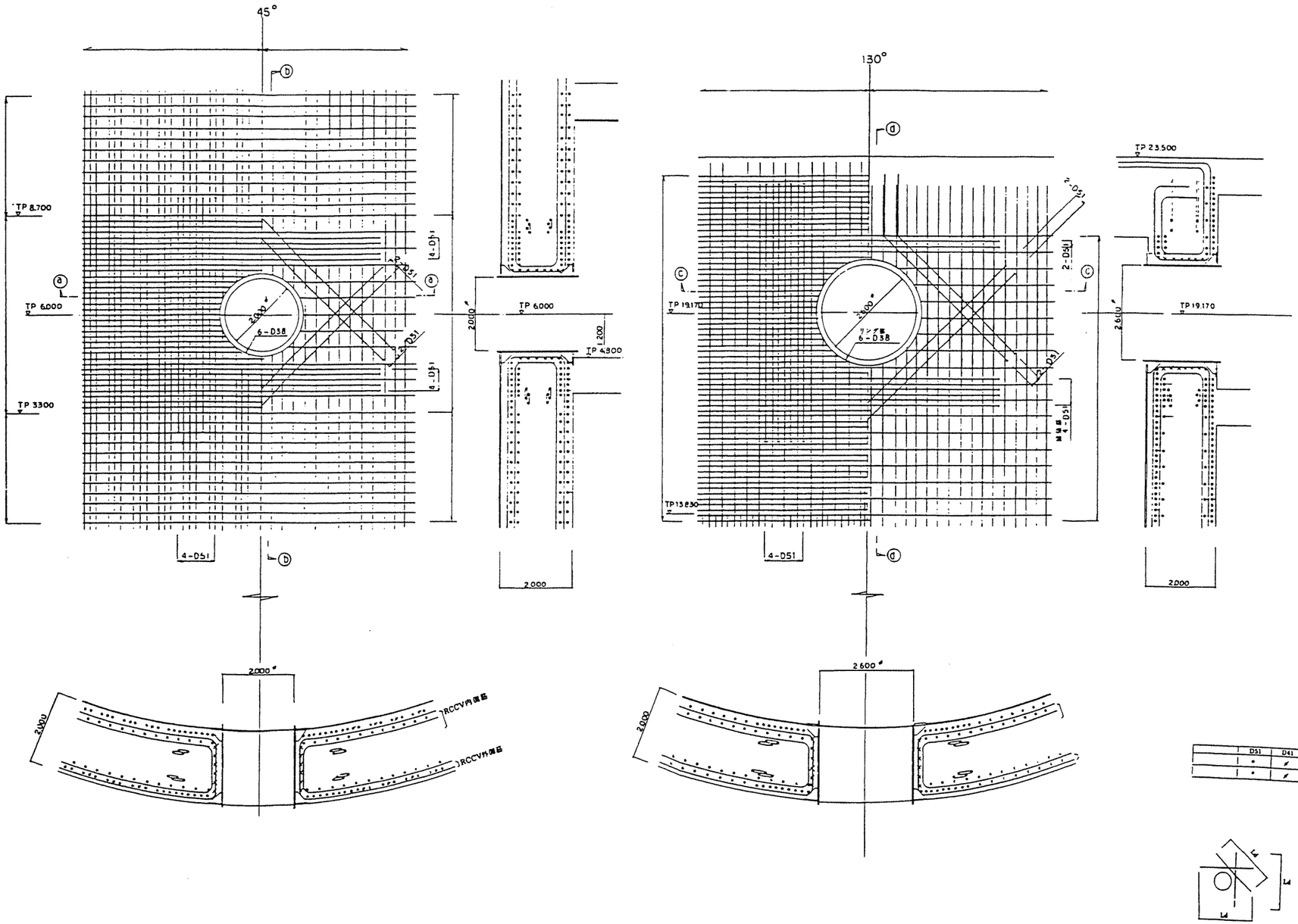


Figure 3H.1-31 CONTAINMENT STRUCTURE OPENING REINFORCEMENT

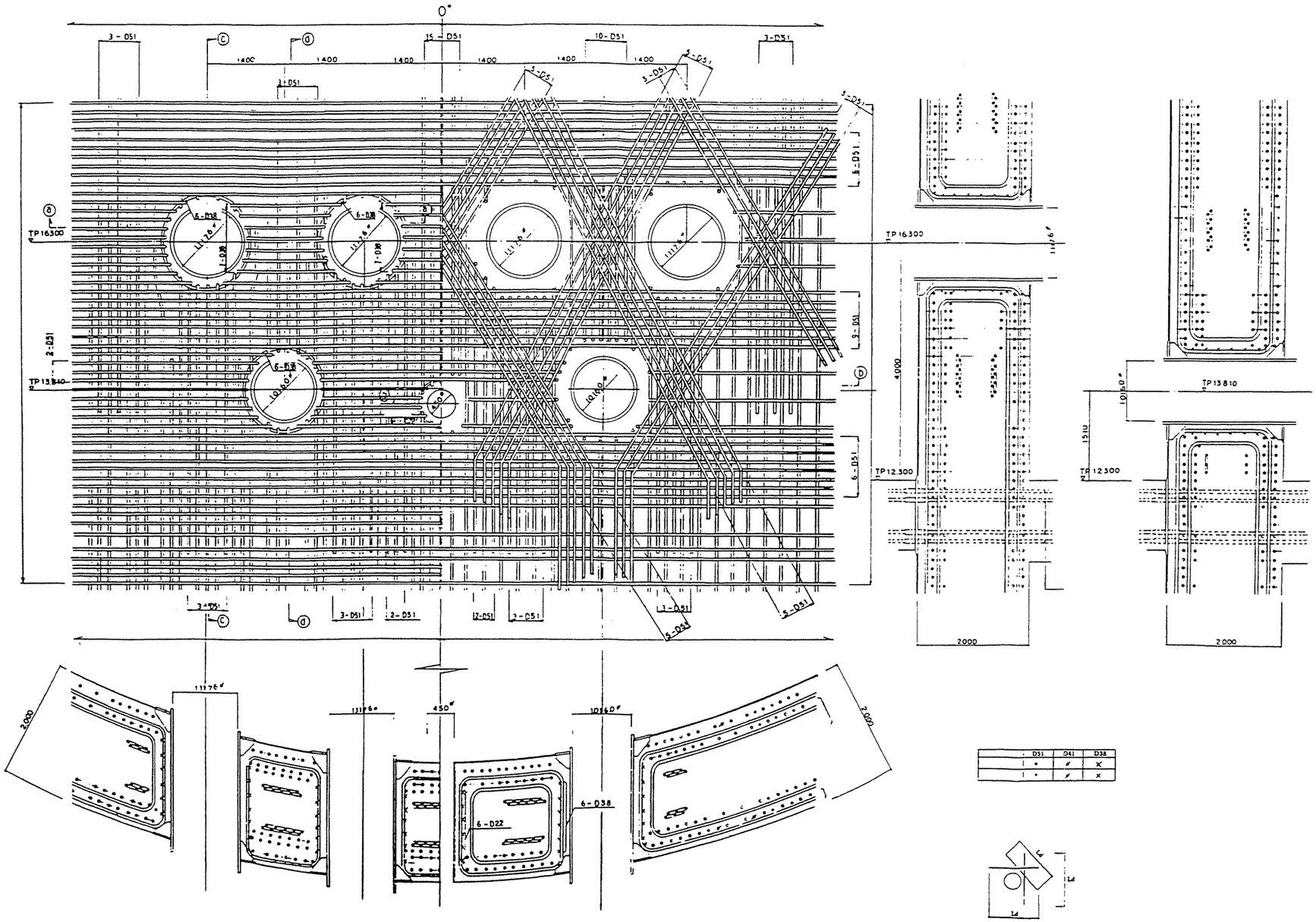


Figure 3H.1-32 CONTAINMENT STRUCTURE OPENING REINFORCEMENT

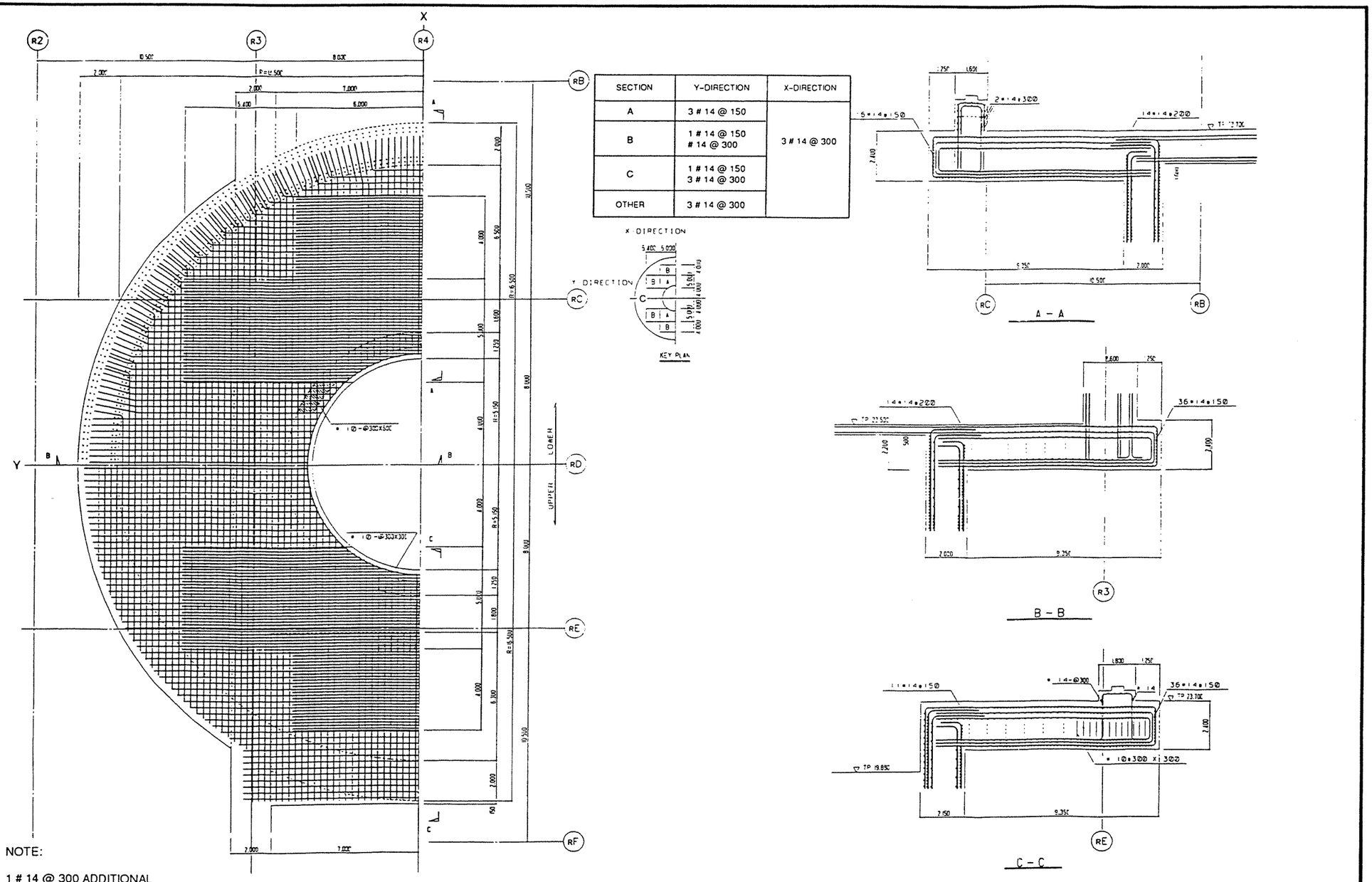
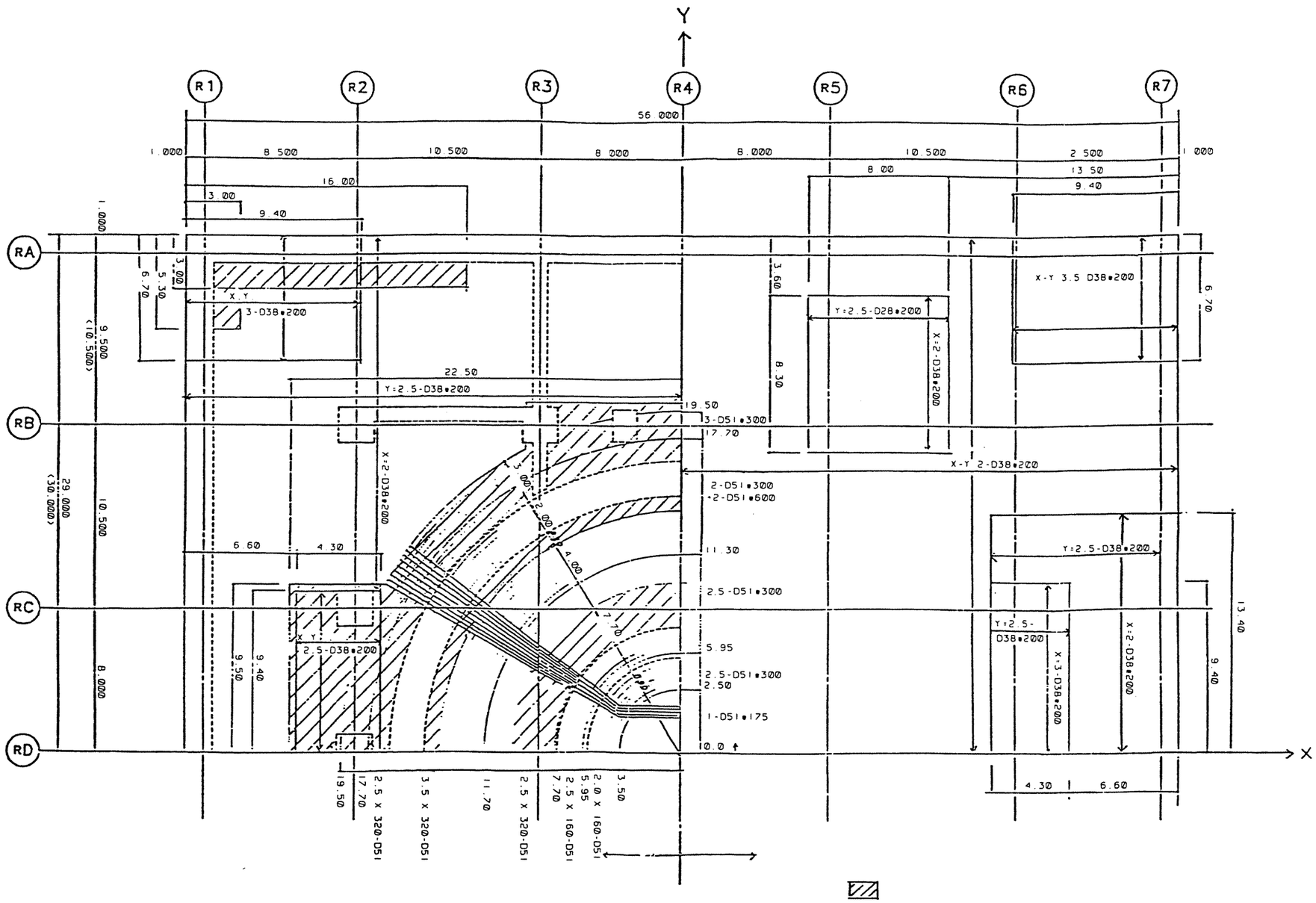
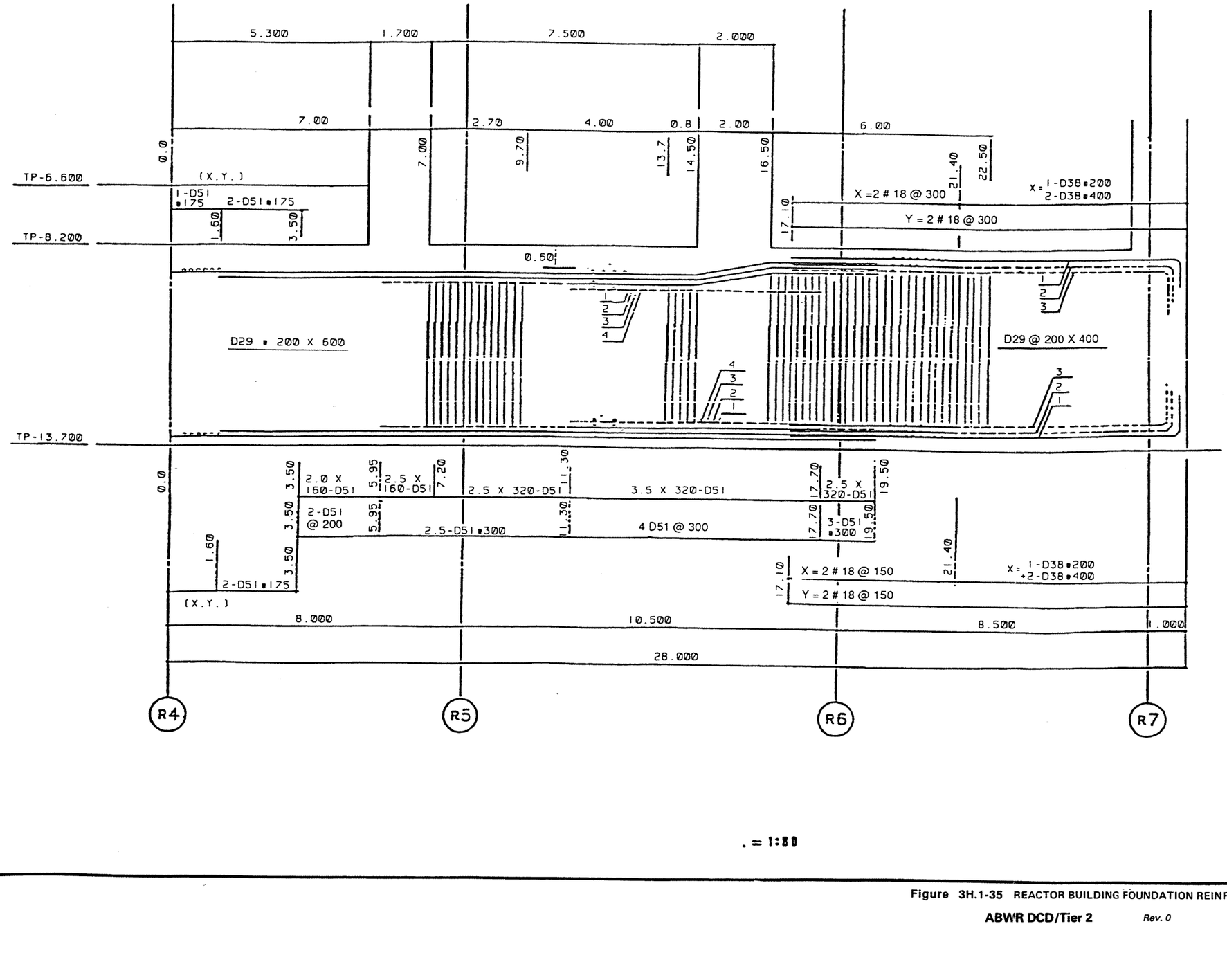


Figure 3H.1-33 CONTAINMENT STRUCTURE TOP SLAB REINFORCEMENT



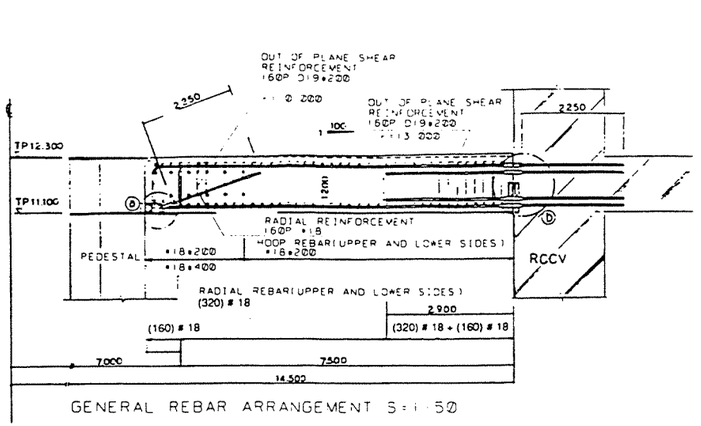
1:150

Figure 3H.1-34 REACTOR BUILDING FOUNDATION REINFORCEMENT – SHEET 1

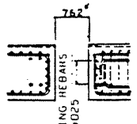


. = 1:80

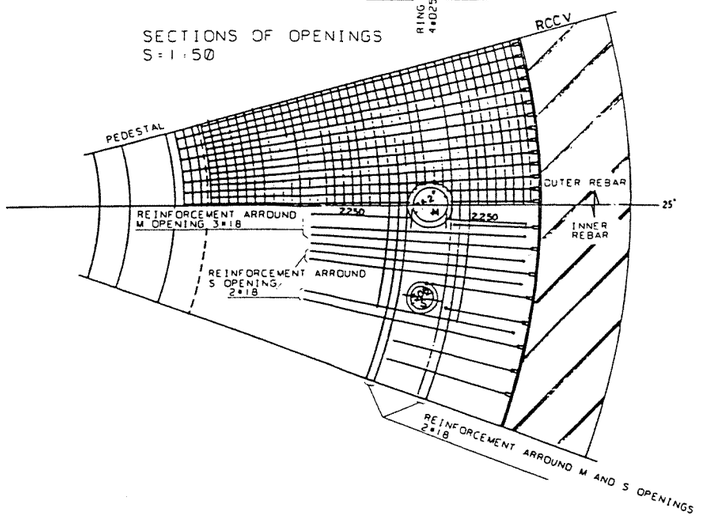
Figure 3H.1-35 REACTOR BUILDING FOUNDATION REINFORCEMENT – SHEET 2



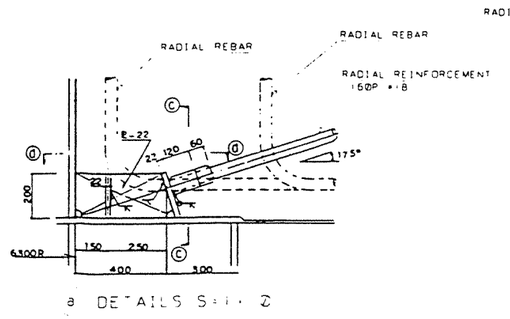
GENERAL REBAR ARRANGEMENT S=1:50



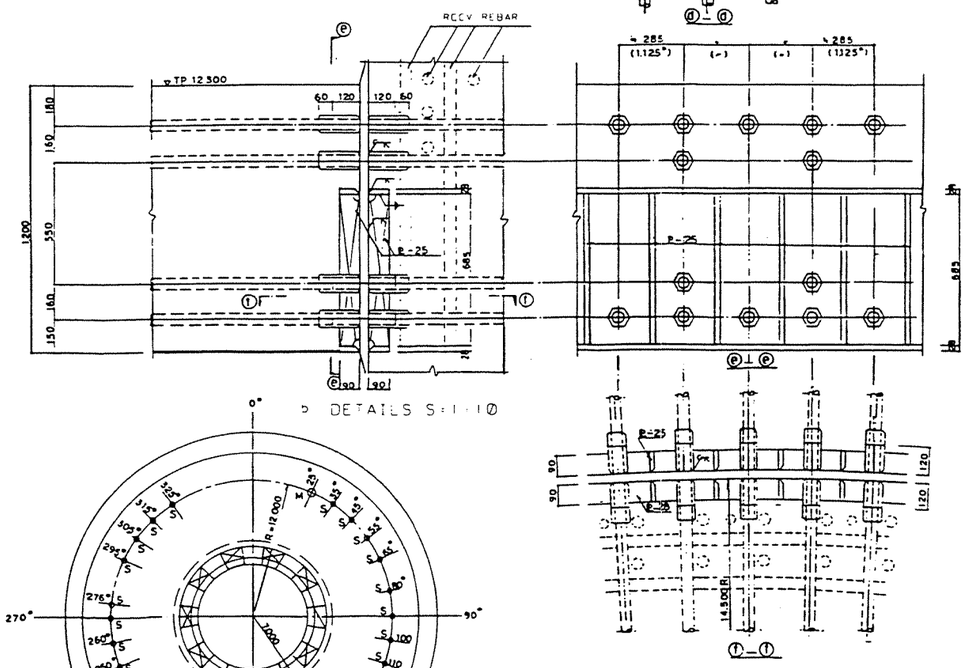
SECTIONS OF OPENINGS
S=1:50



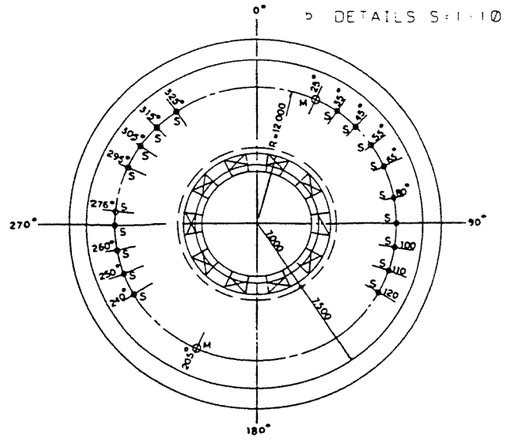
REBAR ARRANGEMENT AROUND OPENINGS S = 1 : 50



a DETAILS S=1:20

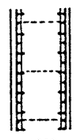
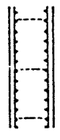


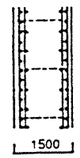
D DETAILS S=1:10

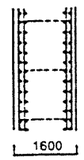
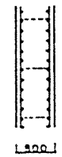


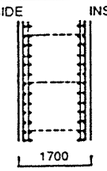
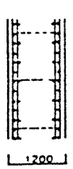
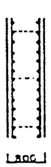
D/F ARRANGEMENT OF OPENINGS S=1:200
S: SRV PIPES
M: MAN HOLE

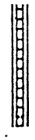
Figure 3H.1-36 DIAPHRAGM FLOOR REINFORCEMENT

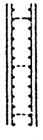
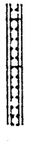
		1200	900	
TP12300		 1200	 900	
		2 # 18 @ 12" E.W., E.F.	D35@200	
		# 9 @ 12" x 24"	D35@200	

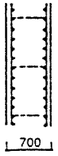
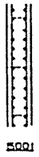
		1200		
TP 4800		 1500		
		2 # 18 @ 12" E.W., E.F.		
		# 9 @ 12" x 24"		

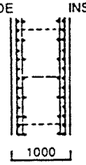
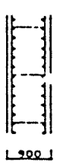
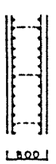
		1300	800	
TP -1700		 1600	 900	
		2 # 18 @ 12" E.W., E.F.	D29@200	
		# 9 @ 12" x 24"	D29@200	

		1500	1200	800
TP -8200		OUTSIDE INSIDE  1700	 1200	 800
		2 # 18 @ 12" E.W., E.F.	D29@200+D29@400	D32D29@200
		# 9 @ 12" x 24"	D29@200+D29@400	D32D29@200

		300
TP38200		 425
	VERT	2 # 9 @ 12" E.F.
	HORIZ	# 8 @ 12" E.F.

		600	300
TP31700		 425	 300
	VERT	2 # 9 @ 12" E.F.	D16@200
	HORIZ	# 8 @ 12" E.F.	D16@200

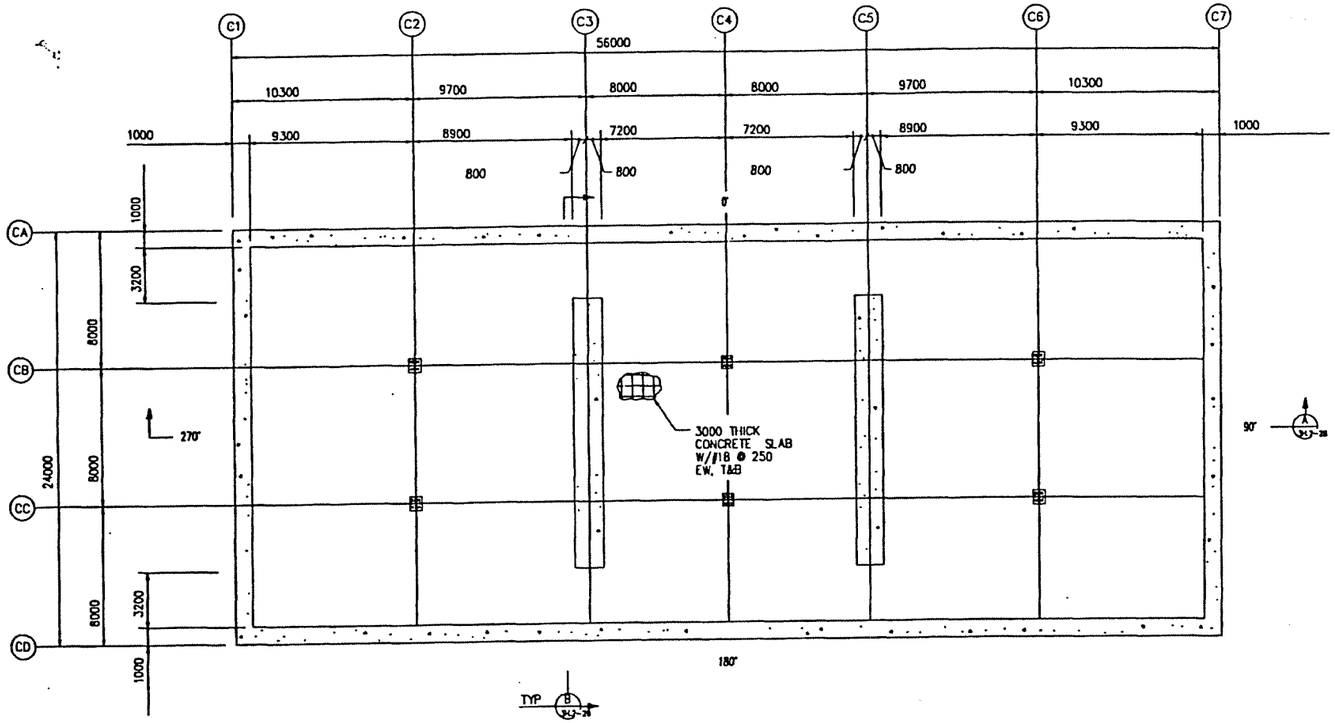
		900	500
TP 23500		 700	 500
		1.5 # 18 @ 12" E.W., E.F.	D22@200
		# 7 @ 24" x 24"	D22@200

		1200	900	800
TP 18100		OUTSIDE INSIDE  1000	 900	 800
		1.5 # 18 @ 12" E.W., E.F.	D32@200	D29@200
		# 7 @ 24" x 24"	D38@200	D29@200

NOTE:

FOR THE R/B EXTERIOR WALL FACING THE CONTROL BLDG, ADDITIONAL SHEAR TIES SHALL BE # 8 @ 300 mm X 300 mm FROM EL – 8200 to EL 12300

Figure 3H.1-37 LIST OF SEISMIC WALL SECTIONS



FLOOR PLAN AT EL -8200 TMSL

DESIGN LIVE LOAD : 11.96 kPa

SCALE 1:300

2000 1000 0 2000 4000

GENERAL NOTES

1. DIMENSIONS AND ELEVATIONS SHOWN ARE IN MILLIMETERS. FOOT AND INCH CONVERSIONS SHOWN IN PARENTHESES ARE APPROXIMATE.
2. CONSTRUCTION MATERIALS SHALL BE AS FOLLOWS:

CONCRETE: f'_c = 28 MPa

REINFORCING STEEL: CONFORMING TO ASTM A615, GRADE 60

STRUCTURAL STEEL: CONFORMING TO ASTM A572, GRADE 50

STEEL DECK: CONFORMING TO ASTM A446, GRADE A; GALVANIZED

ANCHOR BOLTS: CONFORMING TO ASTM A36

WELDED STUDS: CONFORMING TO ASTM A108

ABBREVIATIONS

A
- ANCHOR BOLT — AB
- AMERICAN SOCIETY FOR TESTING AND MATERIALS — ASTM

C
- CENTER LINE — ℄
- CENTER TO CENTER — C/C
- CLEAR — CLR
- COLUMN — COL
- CONCRETE — CONC
- CONSTRUCTION JOINT — CJ

D
- DETAIL — DET
- DIAMETER — DIA
- DITTO — DO

E
- EACH FACE — EF
- EACH WAY — EW
- ELEVATION — EL
- EQUAL — EQ

F
- FINISH — FIN

H
- HORIZONTAL — HOR

I
- INCLUDING — INCL

K
- KILOPASCAL — kPa

M
- MAXIMUM — Max
- METER — m
- MILLIMETER — mm
- MINIMUM — Min
- MEGAPASCAL — MPa

N
- NOT TO SCALE — NTS

O
- OPPOSITE — OPP

P
- PLATE — PL
- POUNDS PER SQUARE FOOT — PSF
- POUNDS PER SQUARE INCH — PSI

S
- SPACE — SP

T
- TYPICAL MEAN SEA LEVEL — TMSL
- TOP AND BOTTOM — T & B
- TOP OF CONCRETE — TOC
- TOP OF STEEL — TOS
- TYPICAL — TYP

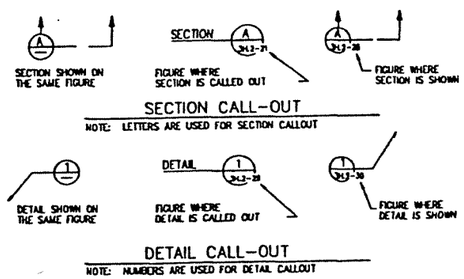
U
- UNLESS NOTED OTHERWISE — UNO

V
- VERTICAL — VERT

W
- WATER STOP — WS
- WITH — W/

SYMBOLS

- CONCRETE
- STEEL DECK
- OPENING
- GRADE
- CENTER LINE
- COLUMN AND GRID LINES (NUMERICAL AND ALPHABETICAL)



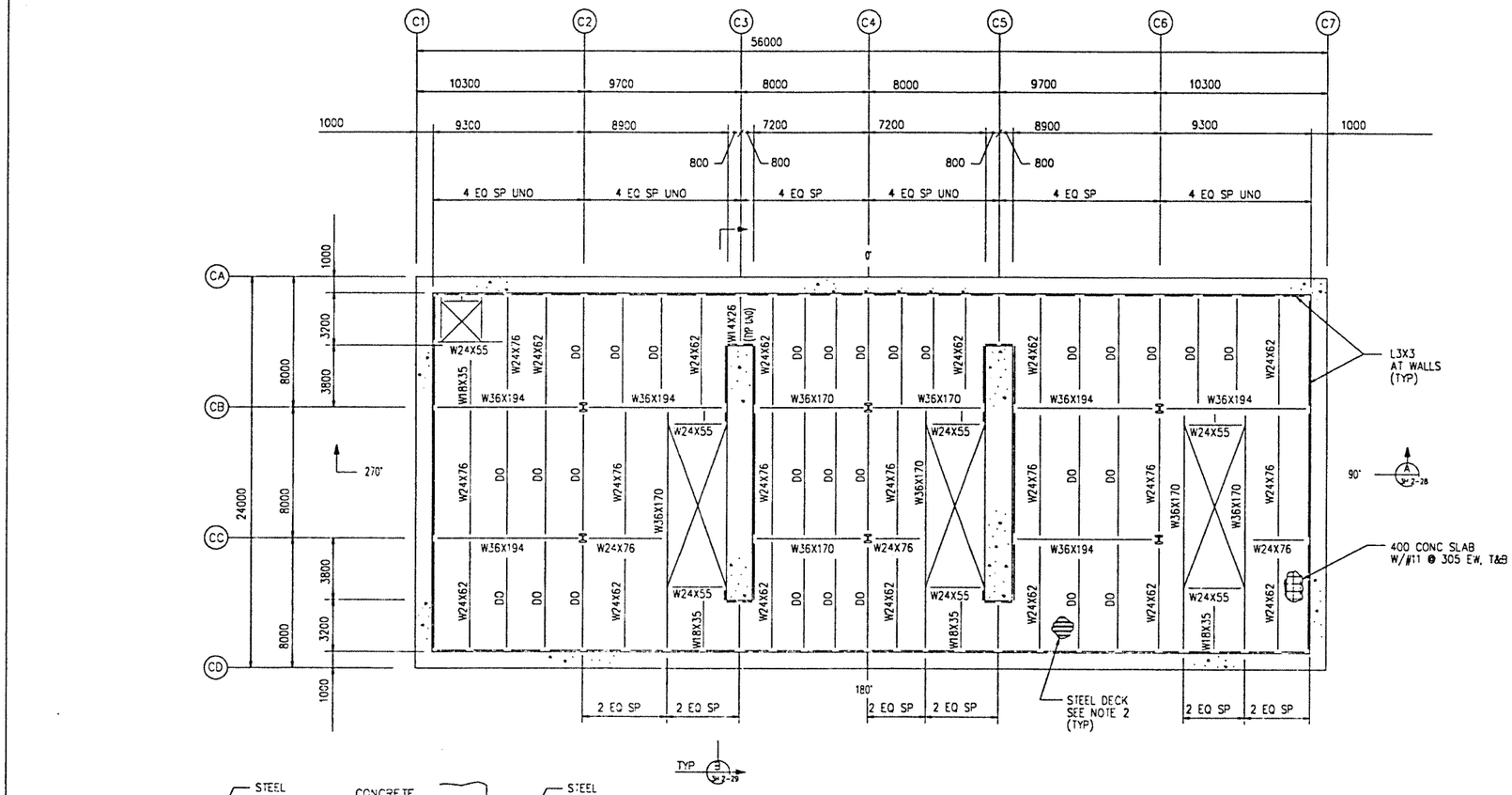
SECTION CALL-OUT

NOTE: LETTERS ARE USED FOR SECTION CALLOUT

DETAIL CALL-OUT

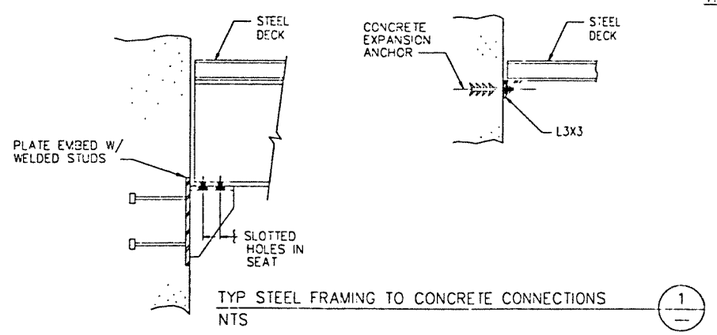
NOTE: NUMBERS ARE USED FOR DETAIL CALLOUT

Figure 3H.2-21 CONTROL BUILDING-FLOOR PLAN AT ELEVATION TMSL - 8200mm



FRAMING PLAN AT EL -2150 TMSL

TOS EL -2626



TYP STEEL FRAMING TO CONCRETE CONNECTIONS

NTS

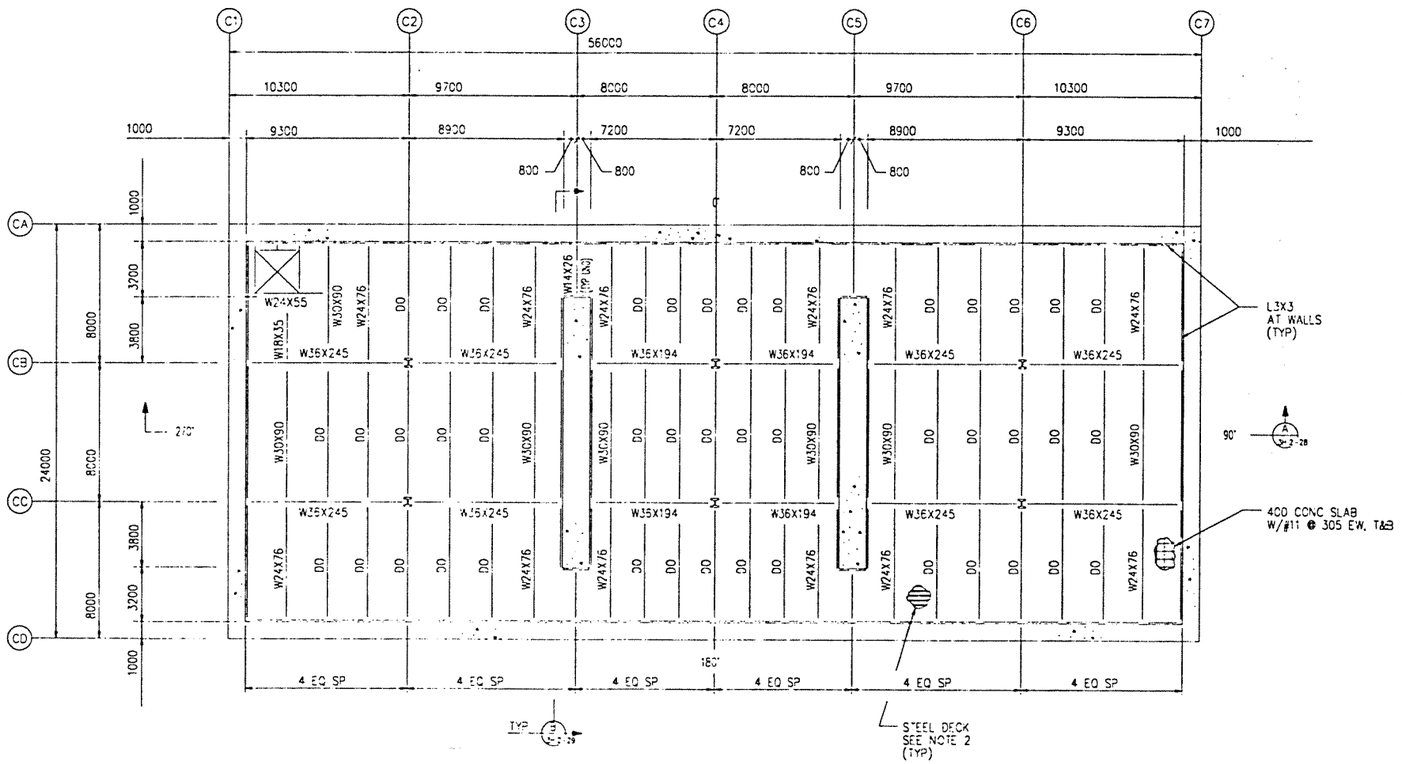
SCALE 1:300

2000 1000 0 2000 4000

NOTES:

1. FOR GENERAL NOTES, ABBREVIATIONS AND SYMBOLS, SEE FIGURE 3H.3-13.
2. STEEL DECK SHALL CONFORM TO TEPIC EP324-16/16" OR APPROVED EQUAL.
3. SLAB AND STEEL FRAMING ARE DESIGNED FOR AN OPERATING LIVE LOAD OF 11.96 kPa. STEEL DECK IS DESIGNED FOR A CONSTRUCTION LIVE LOAD OF 2.39 kPa.

Figure 3H.2-22 CONTROL BUILDING-FRAMING PLAN AT ELEVATION TMSL -2150 mm



FRAMING PLAN AT EL 3500 TMSL

TOS EL 3024

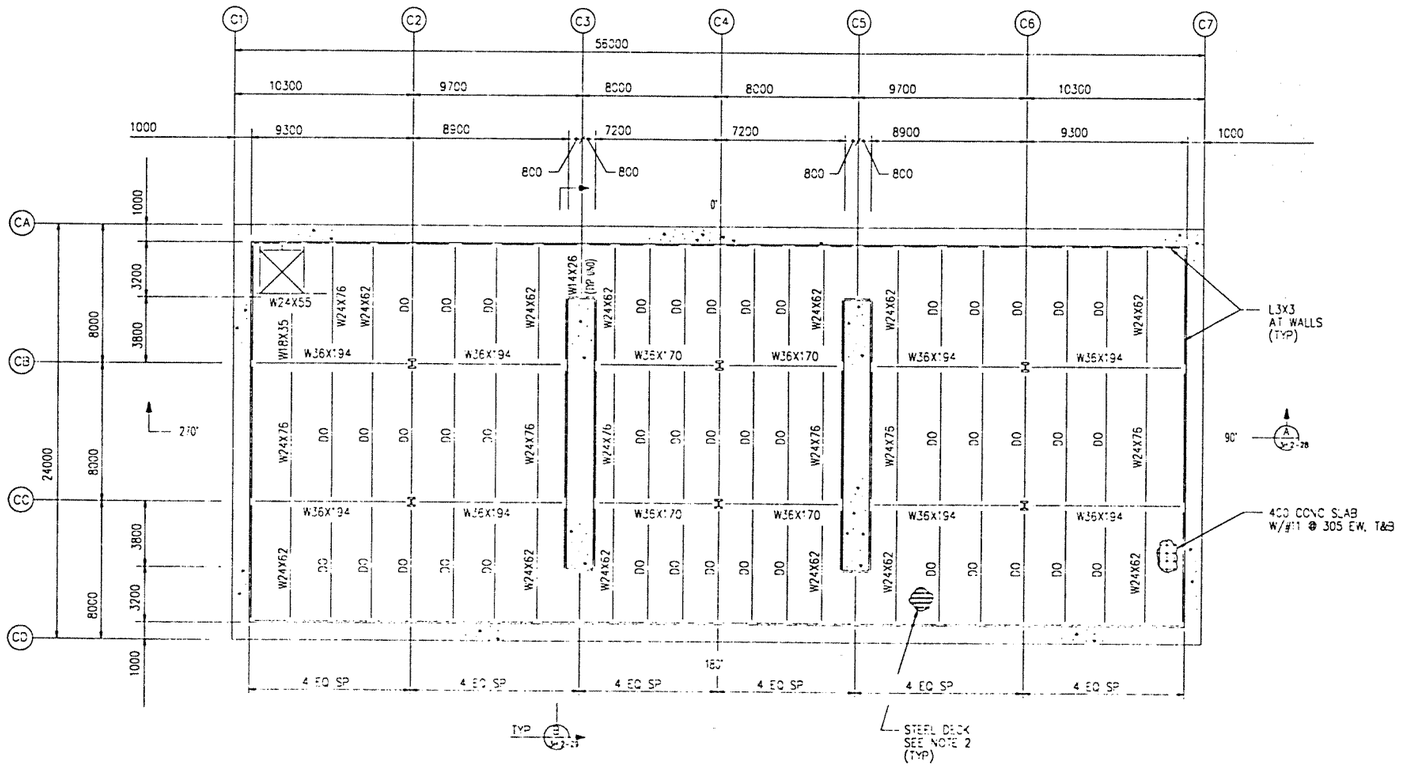
NOTES:

1. FOR GENERAL NOTES, ABBREVIATIONS AND SYMBOLS, SEE FIGURE 3H.2-29.
2. STEEL DECK SHALL CONFORM TO "EPIC EP324-16/16" OR APPROVED EQUAL.
3. SLAB AND STEEL FRAMING ARE DESIGNED FOR AN OPERATING LIVE LOAD OF 19.12 kPa. STEEL DECK IS DESIGNED FOR A CONSTRUCTION LIVE LOAD OF 2.39 kPa.
4. FOR TYPICAL STEEL FRAMING TO CONCRETE CONNECTIONS, SEE DETAIL 1, FIGURE 3H.2-30.

SCALE 1:300

2000 1000 0 2000 4000

Figure 3H.2-23 CONTROL BUILDING-FRAMING PLAN AT ELEVATION TMSL 3500 mm



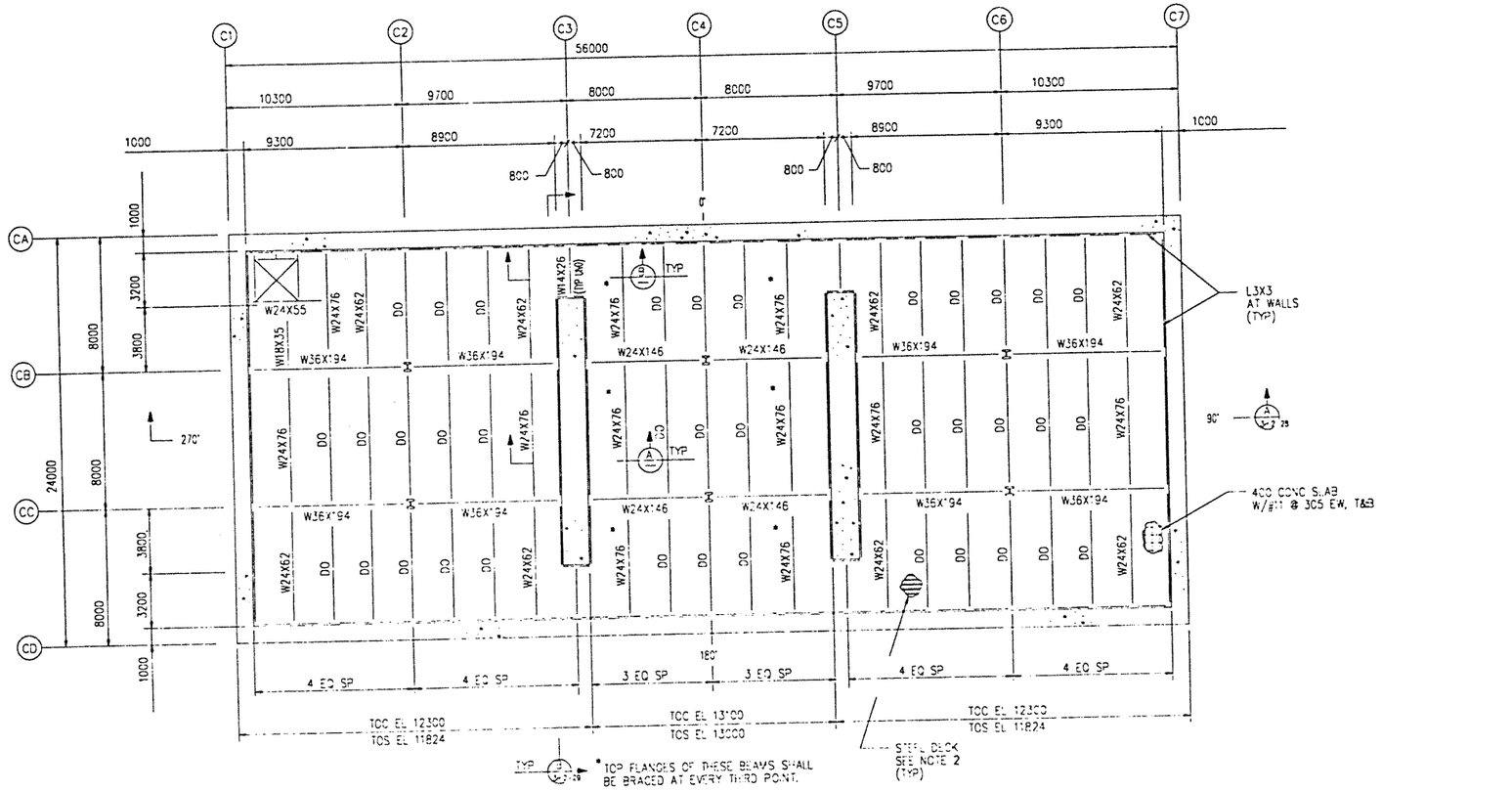
FRAMING PLAN AT EL 7900 TMSL
TCS EL 7424

SCALE 1:300
2000 1000 0 2000 4000

NOTES:

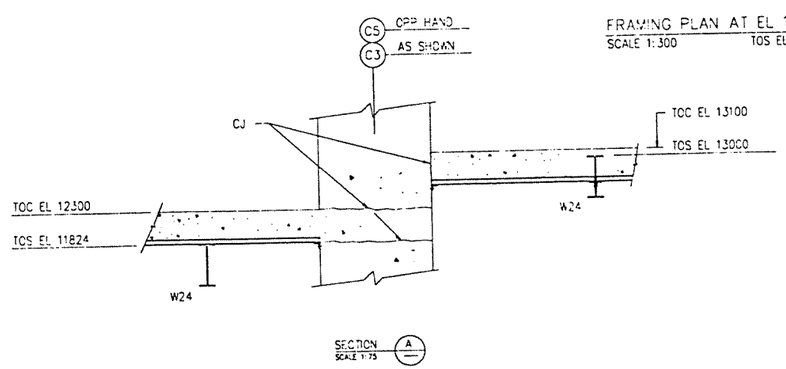
1. FOR GENERAL NOTES, ABBREVIATIONS AND SYMBOLS, SEE FIGURE 3H.2-29.
2. STEEL DECK SHALL CONFORM TO "EPIC EP324-16/16" OR APPROVED EQUAL.
3. SLAB AND STEEL FRAMING ARE DESIGNED FOR AN OPERATING LIVE LOAD OF 11.96 kPa. STEEL DECK IS DESIGNED FOR A CONSTRUCTION LIVE LOAD OF 2.39 kPa.
4. FOR TYPICAL STEEL FRAMING TO CONCRETE CONNECTIONS, SEE DETAIL 1, FIGURE 3H.2-30.

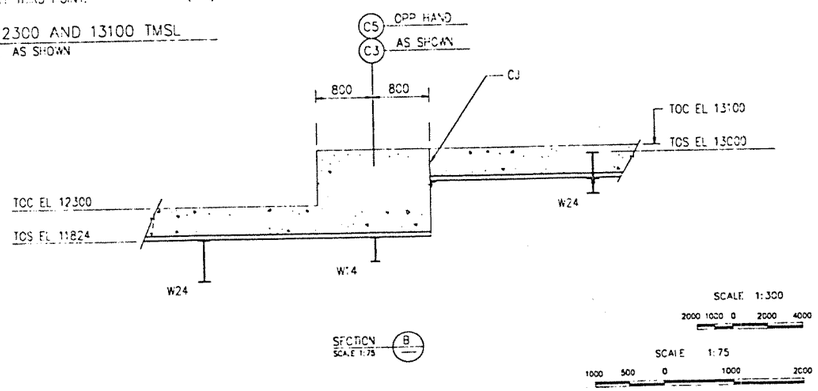
Figure 3H.2-24 CONTROL BUILDING--FRAMING PLAN AT ELEVATION TMSL 7900 mm



FRAMING PLAN AT EL 12300 AND 13100 TMSL

SCALE 1:300 TOS EL AS SHOWN





SCALE 1:300

2000 1000 0 2000 4000

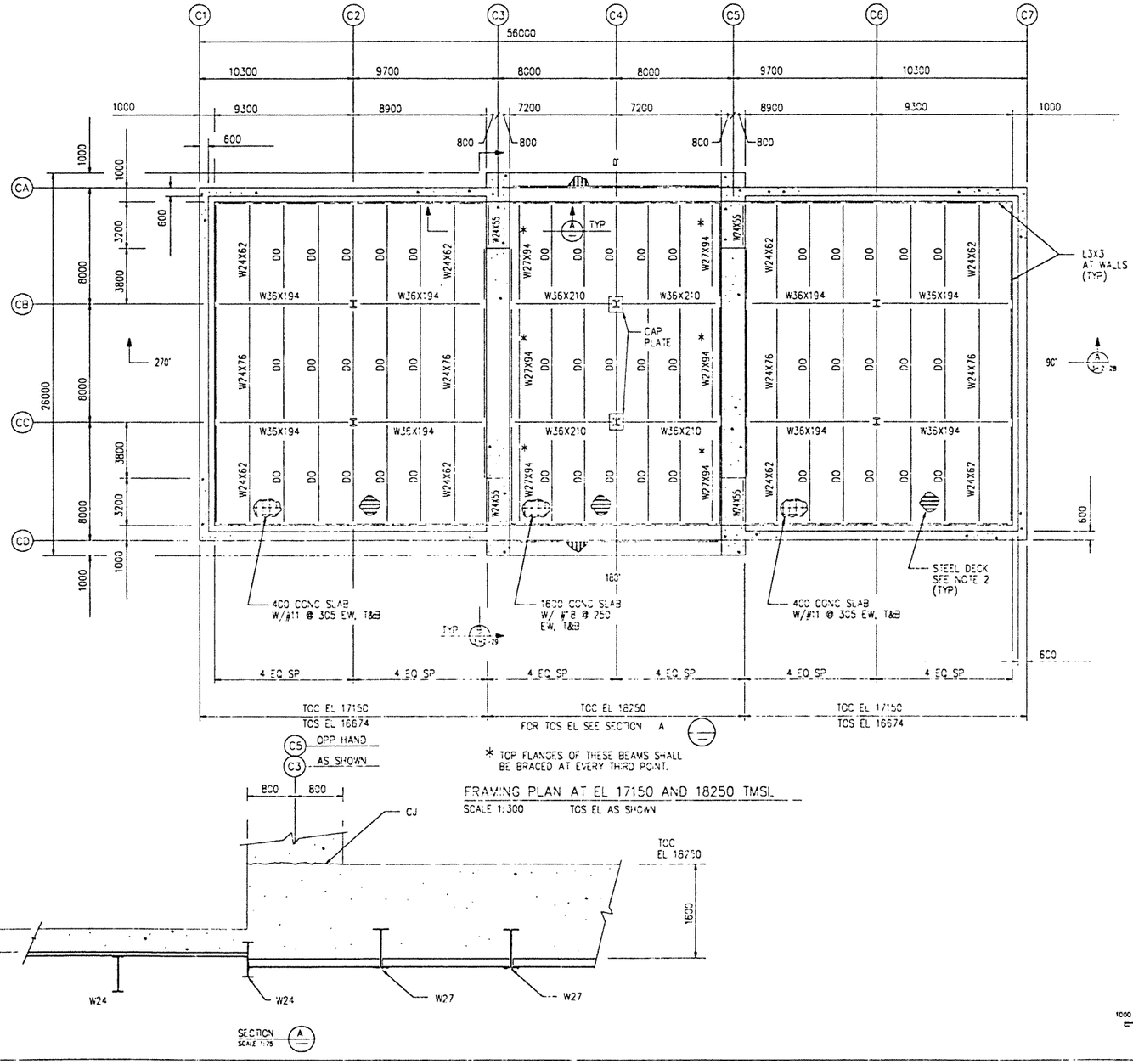
SCALE 1:75

1000 500 0 1000 2000

NOTES:

1. FOR GENERAL NOTES, ABBREVIATIONS AND SYMBOLS, SEE FIGURE 3H.2-29.
2. STEEL DECK SHALL CONFORM TO "EPIC EP324-16/16" OR APPROVED EQUAL.
3. SLAB AND STEEL FRAMING ARE DESIGNED FOR AN OPERATING LIVE LOAD OF 11.96 kPa. STEEL DECK IS DESIGNED FOR A CONSTRUCTION LIVE LOAD OF 2.39 kPa.
4. FOR TYPICAL STEEL FRAMING TO CONCRETE CONNECTIONS, SEE DETAIL 1, FIGURE 3H.2-30.

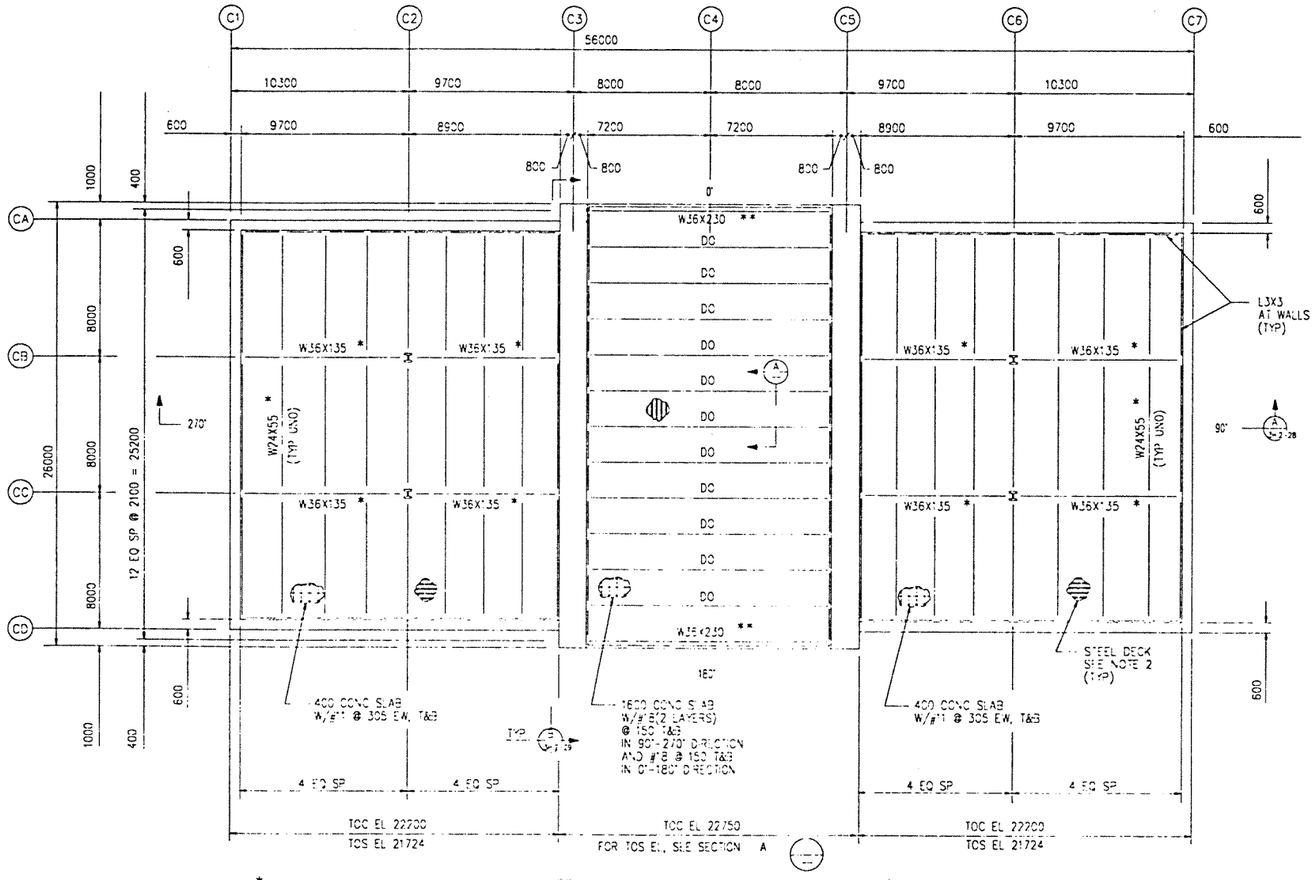
Figure 3H.2-25 CONTROL BUILDING-FRAMING PLAN AT ELEVATION TMSL 12300 AND 13100 mm



NOTES:

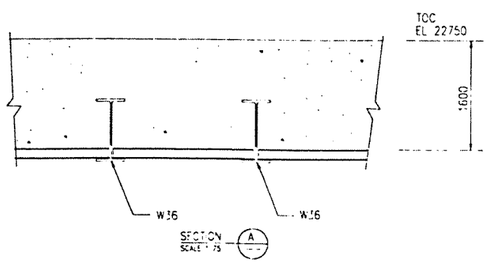
1. FOR GENERAL NOTES, ABBREVIATIONS AND SYMBOLS, SEE FIGURE 3H.2-29.
2. (A) STEEL DECK SUPPORTING 400 CONCRETE SLAB SHALL CONFORM TO "EPIC EP324-16/16" OR APPROVED EQUAL.
   (B) STEEL DECK SUPPORTING 1600 CONCRETE SLAB SHALL CONFORM TO "EPIC EP450-14/16" OR APPROVED EQUAL.
3. 400 CONC SLAB AND SUPPORTING STEEL FRAMING ARE DESIGNED FOR AN OPERATING LIVE LOAD OF 11.96 kPa.
   1600 CONC SLAB IS DESIGNED FOR AN ACCIDENT PRESSURE LOAD OF 150 kPa AND THERMAL LOAD.
   STEEL FRAMING SUPPORTING 1600 CONC SLAB IS DESIGNED FOR A CONSTRUCTION LIVE LOAD OF 4.79 kPa.
   STEEL DECK IS DESIGNED FOR A CONSTRUCTION LIVE LOAD OF 2.39 kPa.
4. FOR TYPICAL STEEL FRAMING TO CONCRETE CONNECTIONS, SEE DETAIL 1, FIGURE 3H.2-30.

Figure 3H.2-26 CONTROL BUILDING-FRAMING PLAN AT ELEVATION TMSL 17150 AND 18250 mm



FRAMING PLAN AT EL 22200 AND 22750 TMSL

SCALE 1:300 TOS EL AS SHOWN



NOTES:

1. FOR GENERAL NOTES, ABBREVIATIONS AND SYMBOLS, SEE FIGURE 3H.2-29.
2. (A) STEEL DECK SUPPORTING 400 CONCRETE SLAB SHALL CONFORM TO "EPIC EP324-16/16" OR APPROVED EQUAL.

   (B) STEEL DECK SUPPORTING 1600 CONCRETE SLAB SHALL CONFORM TO "EPIC EP450-14/16" OR APPROVED EQUAL.
3. SLAB AND STEEL FRAMING ARE DESIGNED FOR A SNOW LOAD OF 2.39 kPa. STEEL DECK IS DESIGNED FOR A CONSTRUCTION LIVE LOAD OF 2.39 kPa. 1600 CONC SLAB IS ALSO DESIGNED FOR AN ACCIDENT PRESSURE LOAD OF 150 kPa AND THERMAL LOAD.
4. FOR TYPICAL STEEL FRAMING TO CONCRETE CONNECTIONS, SEE DETAIL 1, FIGURE 3H.2-30.

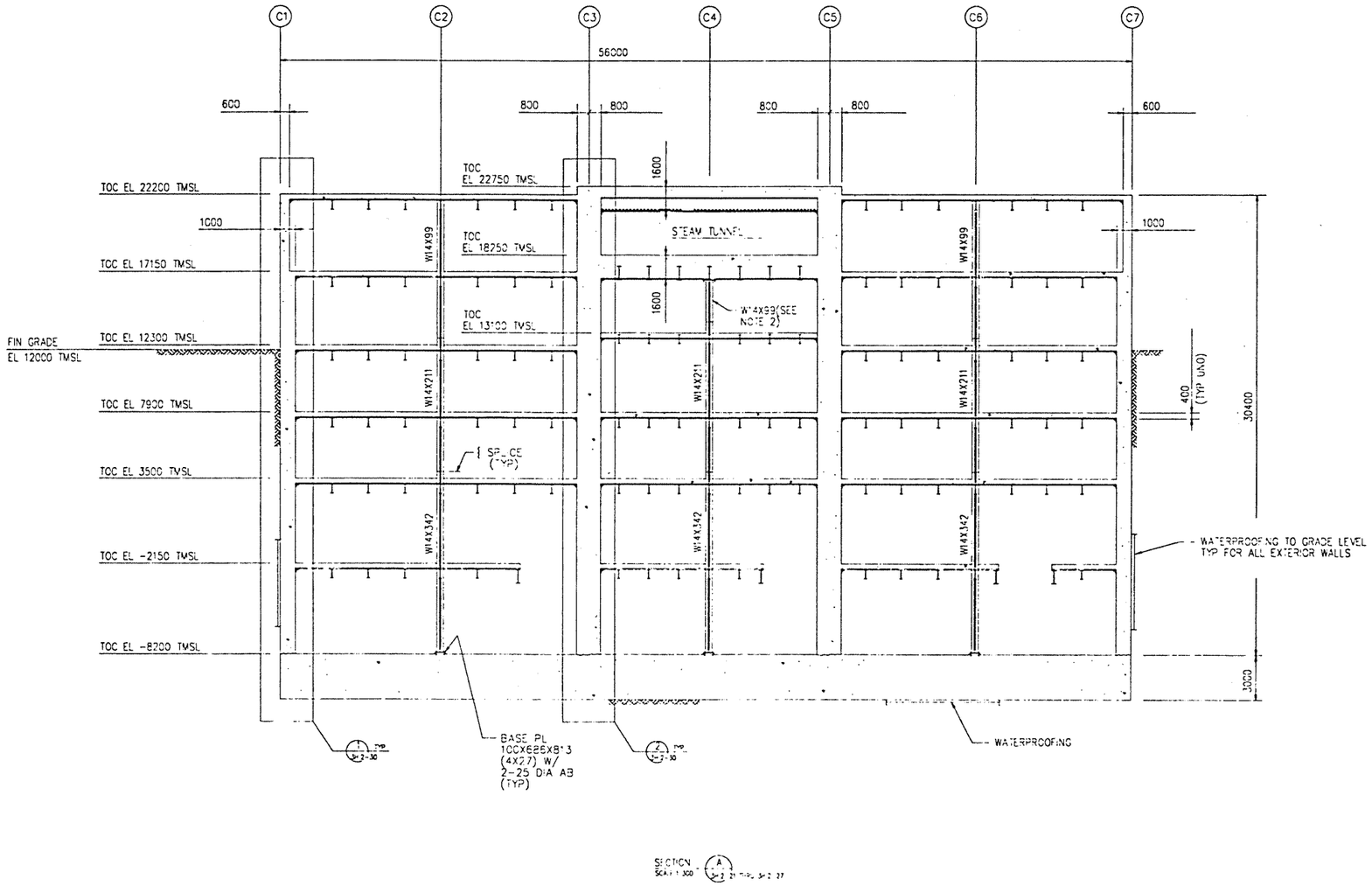
SCALE 1:300

2000 1000 0 2000 4000

SCALE 1:75

1000 500 0 1000 2000

Figure 3H.2-27 CONTROL BUILDING FRAMING PLAN AT ELEVATION TMSL 22200 AND 22750 mm



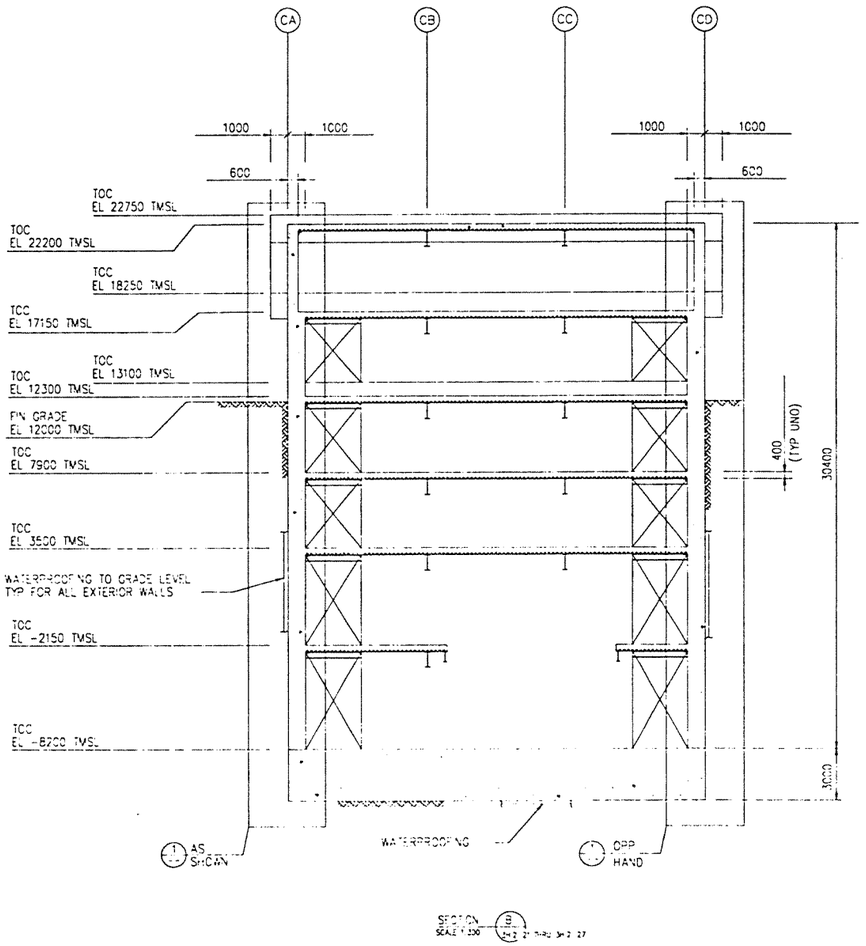
SECTION A
SCALE 1:300

NOTES:

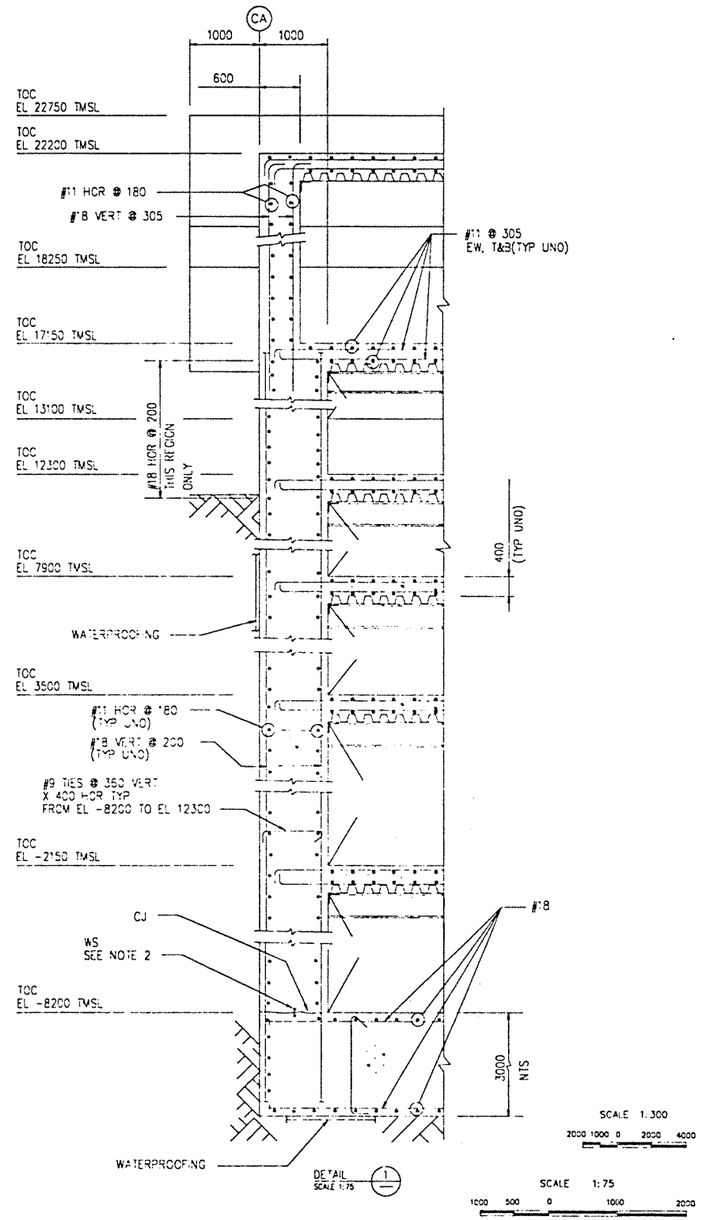
1. FOR GENERAL NOTES, ABBREVIATIONS AND SYMBOLS, SEE FIGURE 3H.2-29.
2. W14X99 SECTION OF COLUMNS B-4 AND C-4 SHALL BE REMOVED AFTER CONCRETE AT EL 18250 mm TMSL ATTAINS ITS DESIGN STRENGTH.

SCALE 1:300
2000 1000 0 2000 4000

Figure 3H.2-28 CONTROL BUILDING-SECTION



SECTION
SCALE 1:300 (1)

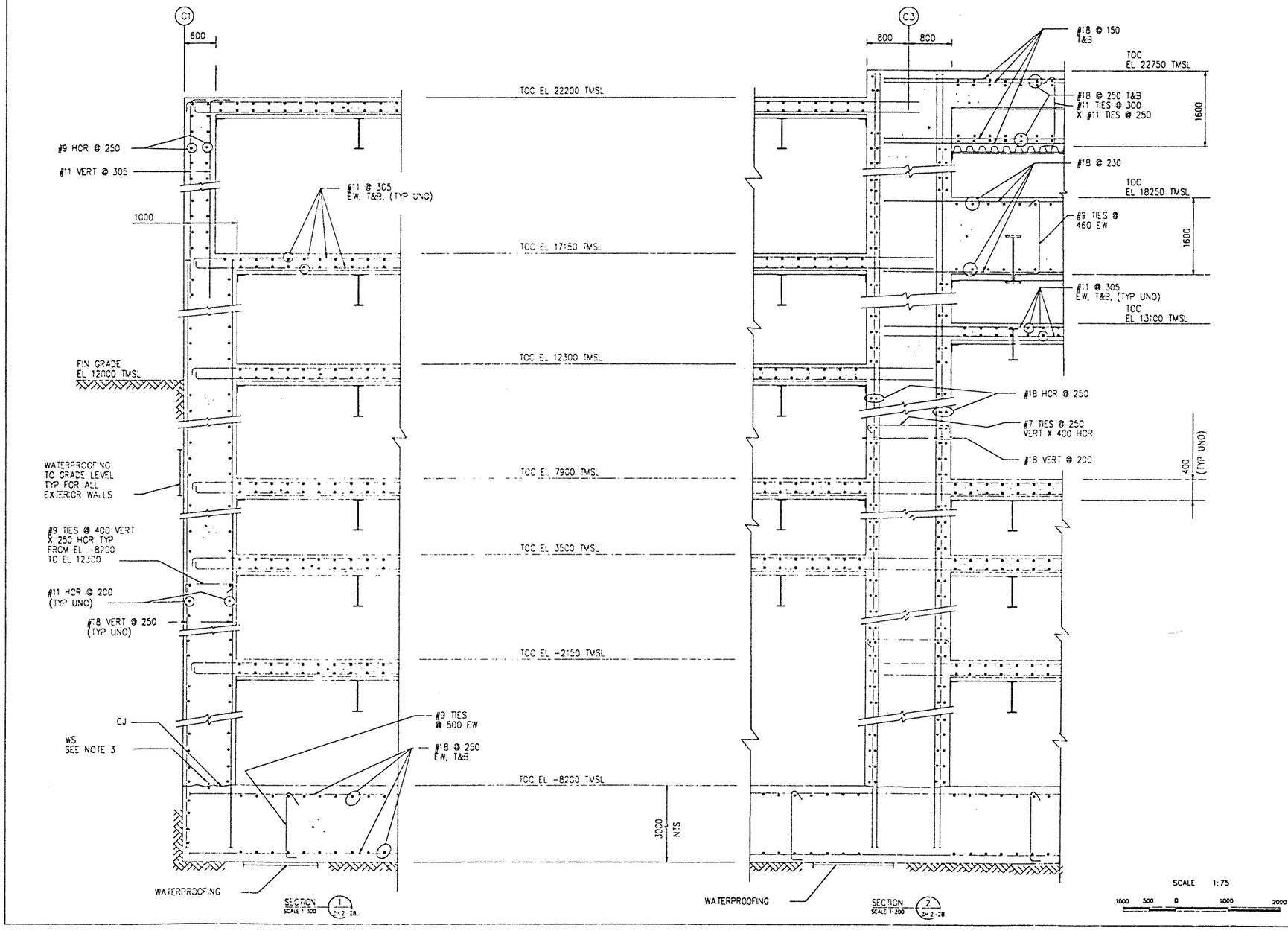


DETAIL
SCALE 1:75 (1)

NOTES:

1. FOR GENERAL NOTES, ABBREVIATIONS AND SYMBOLS, SEE FIGURE 3H.2-29.
2. WATER STOPS SHALL BE PROVIDED AT ALL CONSTRUCTION JOINTS OF EXTERIOR WALLS BELOW GRADE.

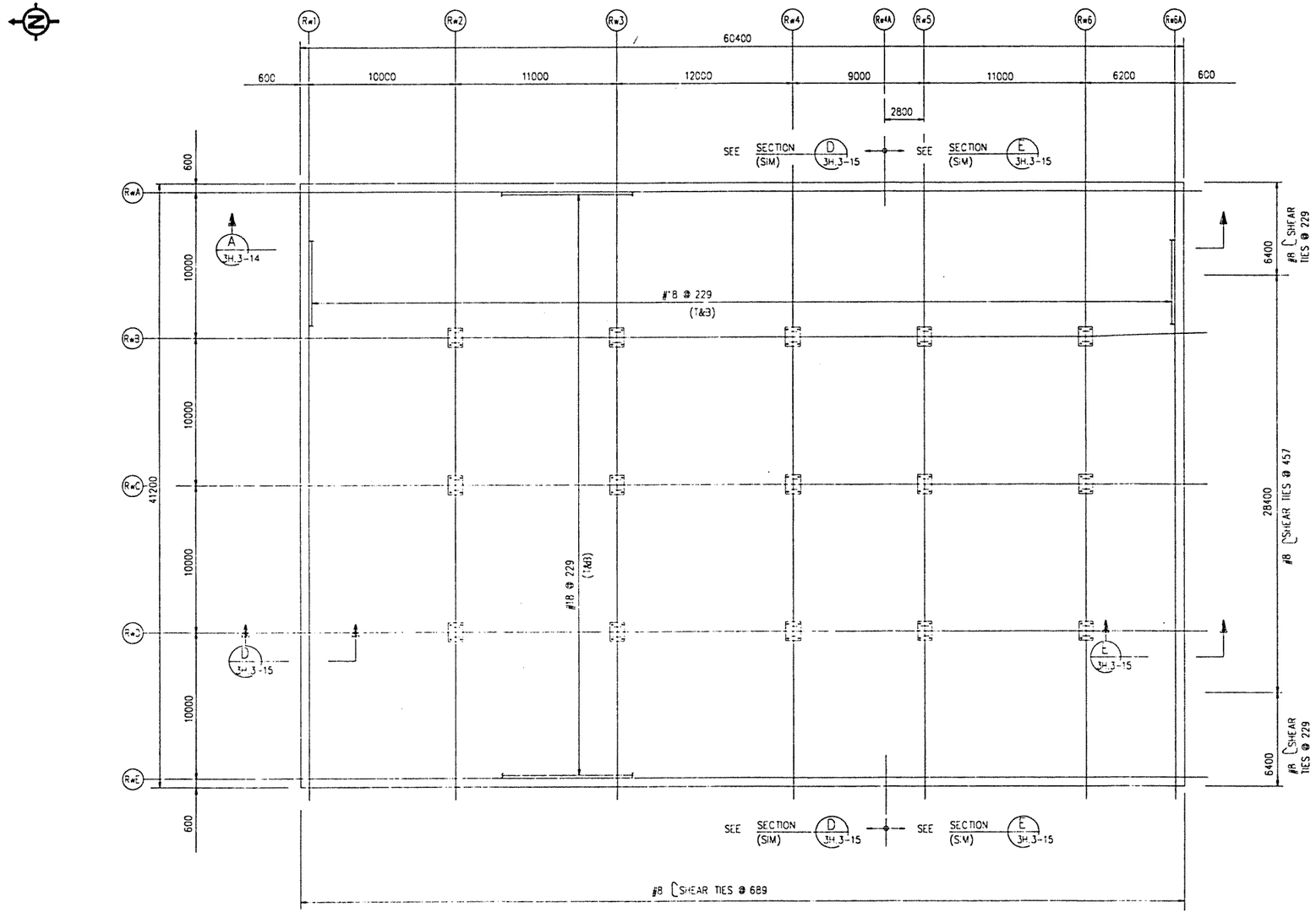
Figure 3H.2-29 CONTROL BUILDING-SECTION AND DETAIL



NOTES:

1. FOR GENERAL NOTES, ABBREVIATIONS AND SYMBOLS, SEE FIGURE 3H.2-29.
2. AT EMBEDDED STRUCTURAL STEEL BEAMS, REINFORCEMENT SHALL BE CONTINUOUS THROUGH THE BEAM WEBS.
3. WATER STOPS SHALL BE PROVIDED AT ALL CONSTRUCTION JOINTS OF EXTERIOR WALLS BELOW GRADE.

Figure 3H.2-30 CONTROL BUILDING-DETAILS



CONCRETE BASEMAT PLAN
TOC EL (-)1500

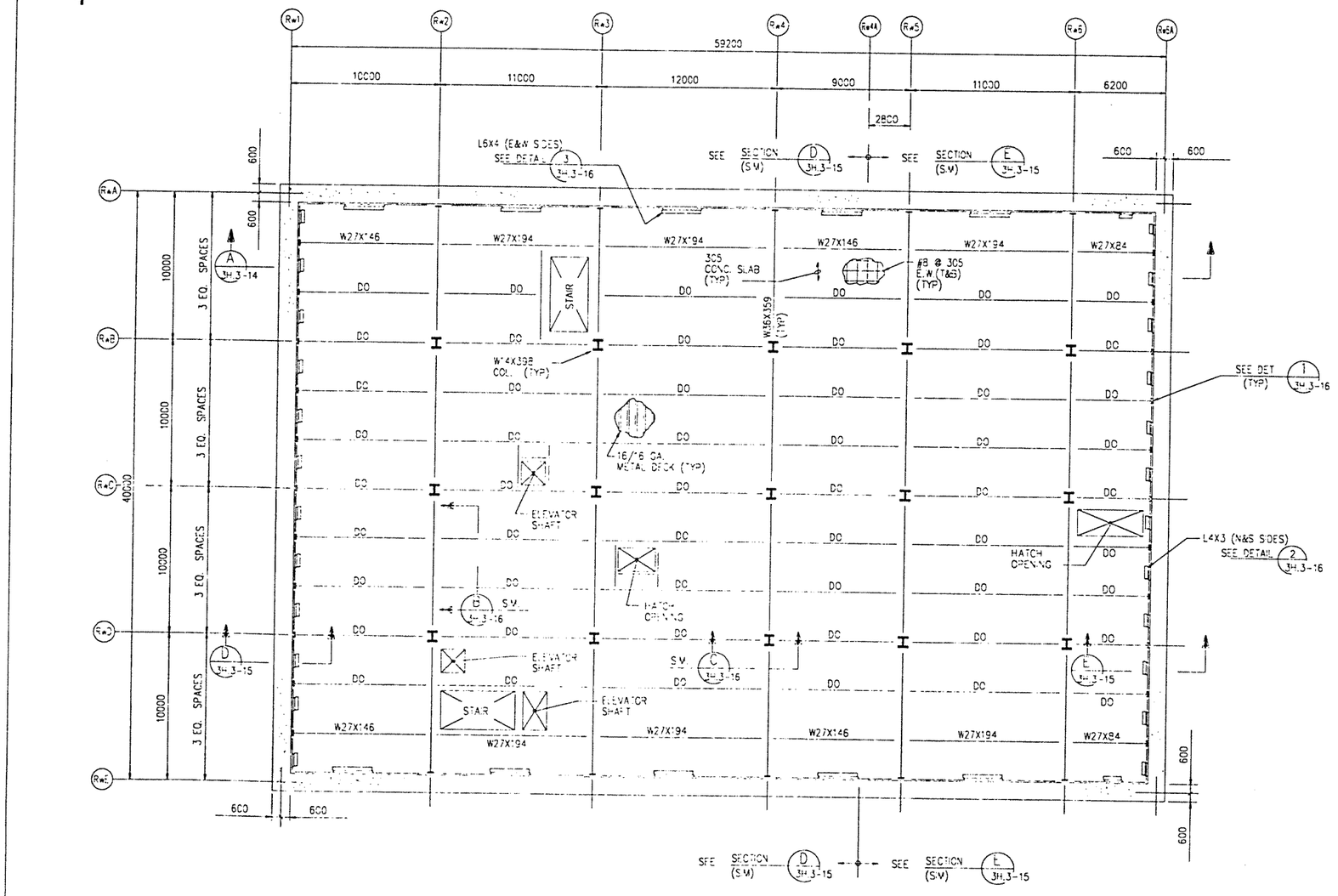
NOTES:
1. ELEVATIONS ARE BASED ON TMSL.
2. ALL WALLS ARE NOT SHOWN FOR CLARITY.

SCALE 1:300
2000 1000 0 2000 4000

NOTES:

1. CONCRETE SHALL HAVE A MINIMUM 90 DAY COMPRESSIVE STRENGTH (Fc') OF 27.6 MPa.
2. REINFORCING STEEL SHALL CONFORM TO ASTM A615, GRADE 60.
3. GROUT SHALL BE NON-SHRINK TYPE WITH A MINIMUM 7 DAY COMPRESSIVE STRENGTH OF 34.5 MPa.
4. ANCHOR BOLTS SHALL CONFORM TO ASTM A307 OR A36 UNO.
5. DEWATERING DURING CONSTRUCTION STAGE SHALL CONTINUE UNTIL ALL STRUCTURES, EQUIPMENTS AND BULK COMMODITIES ARE IN PLACE.
6. FOR ABBREVIATIONS, SYMBOLS AND CALL-OUT INFORMATION, SEE FIGURE 3H.2-21.

Figure 3H.3-11 RADWASTE BUILDING-REINFORCED CONCRETE BASEMAT



STRUCTURAL STEEL FRAMING PLAN

TYPICAL FLOOR: EL. 21000, EL. 17300 & EL. 4800 *
RESPECTIVE TOS: EL. 20600, EL. 11900 & EL. 4400
* AT EL. 4800 NO FLOOR SLAB BETWEEN COL LINES RwA TO RwE AND Rw5 TO Rw6A.

NOTES:

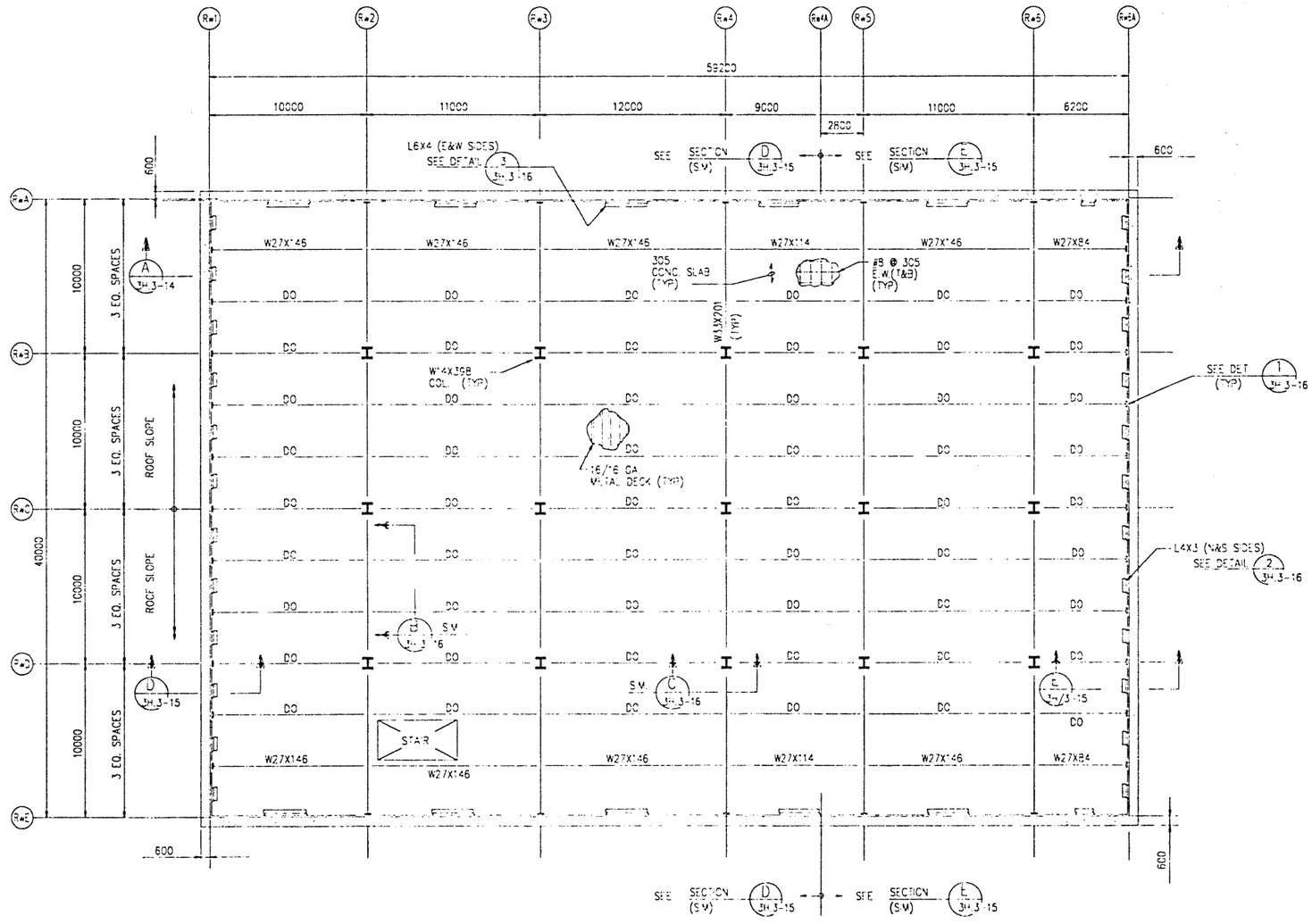
1. ELEVATIONS ARE BASED ON TVSL.
2. INTERIOR PARTITION WALLS ARE NOT SHOWN FOR CLARITY.

SCALE 1:300
2000 1000 0 2000 4000

NOTES:

1. FOR NOTES SEE FIGURE 3H.3-11.
2. SLAB AND STEEL FRAMING ARE DESIGNED FOR AN OPERATING LIVE LOAD OF 1.221 t/m2. STEEL DECK IS DESIGNED FOR A CONSTRUCTION LOAD OF 0.245 t/m2.

Figure 3H.3-12 RADWASTE BUILDING-STRUCTURAL STEEL FRAMING PLAN-TYPICAL FLOOR



STRUCTURAL STEEL FRAMING PLAN AT ROOF EL 28000

TOS EL. 27600

NOTES:

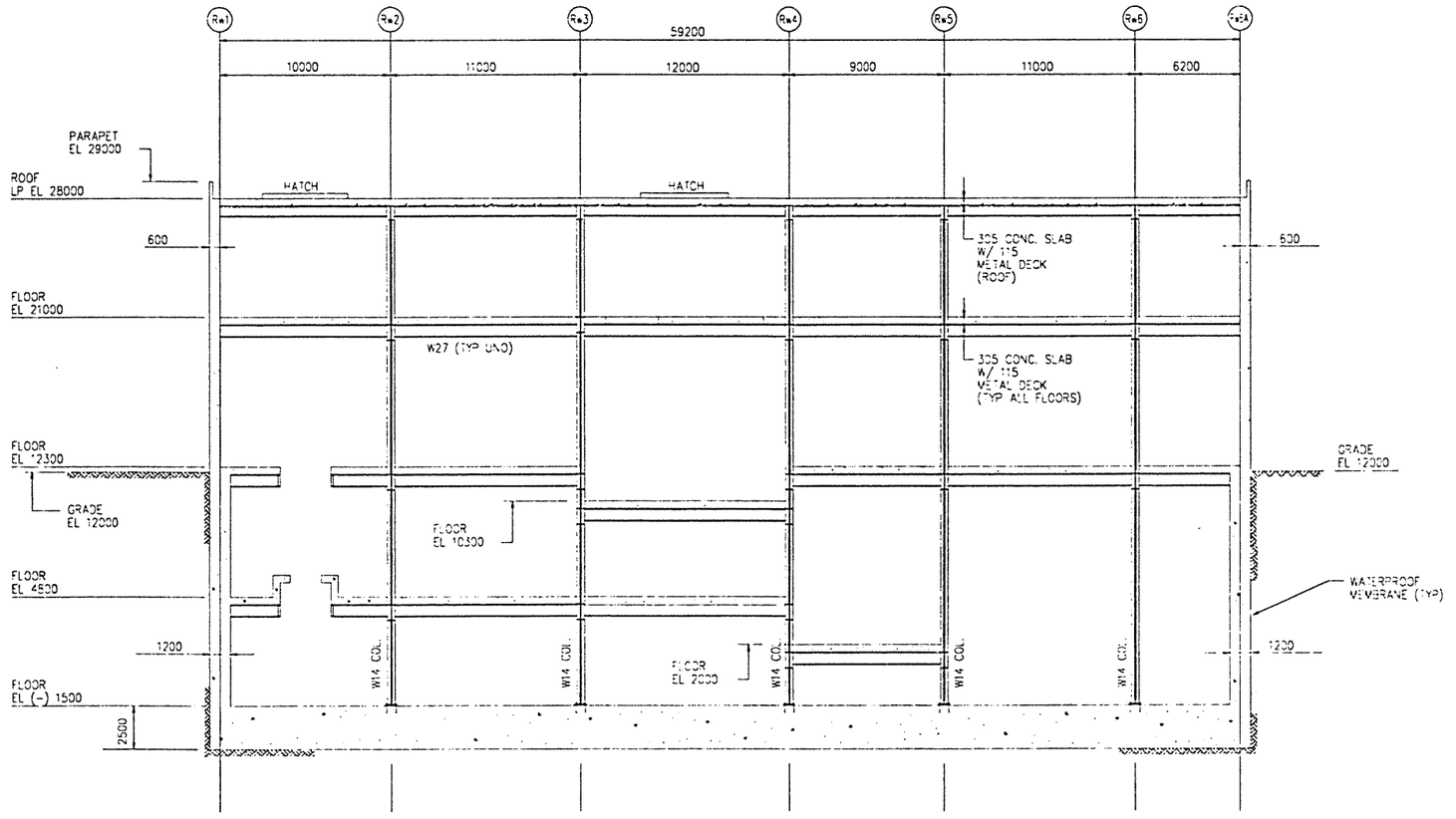
1. ALL STRUCTURAL STEEL SHALL CONFORM TO ASTM A572, GR. 50.
2. ALL CONNECTION BOLTS FOR STRUCTURAL STEEL SHALL BE MIN 2.223cm DIA AND CONFORM TO ASTM A325N WITH THREADS INCLUDED IN SHEAR PLANE, UNO.
3. WELDING SHALL BE PER AWS CODE D1-1 USING E70XXX ELECTRODES.
4. METAL DECK SHALL BE EP450-16/16 FURNISHED BY EPIC METALS CORPORATION OR APPROVED EQUAL.
5. PRE-DRILL HOLES IN METAL DECK TO ALLOW WELDING OF STUDS AT ROOF LEVEL ONLY.

NOTE:
ELEVATIONS ARE BASED ON TMSL.

SCALE 1:300

2000 1000 0 2000 4000

Figure 3H.3-13 RADWASTE BUILDING-STRUCTURAL STEEL FRAMING PLAN-ROOF EL 28000 mm



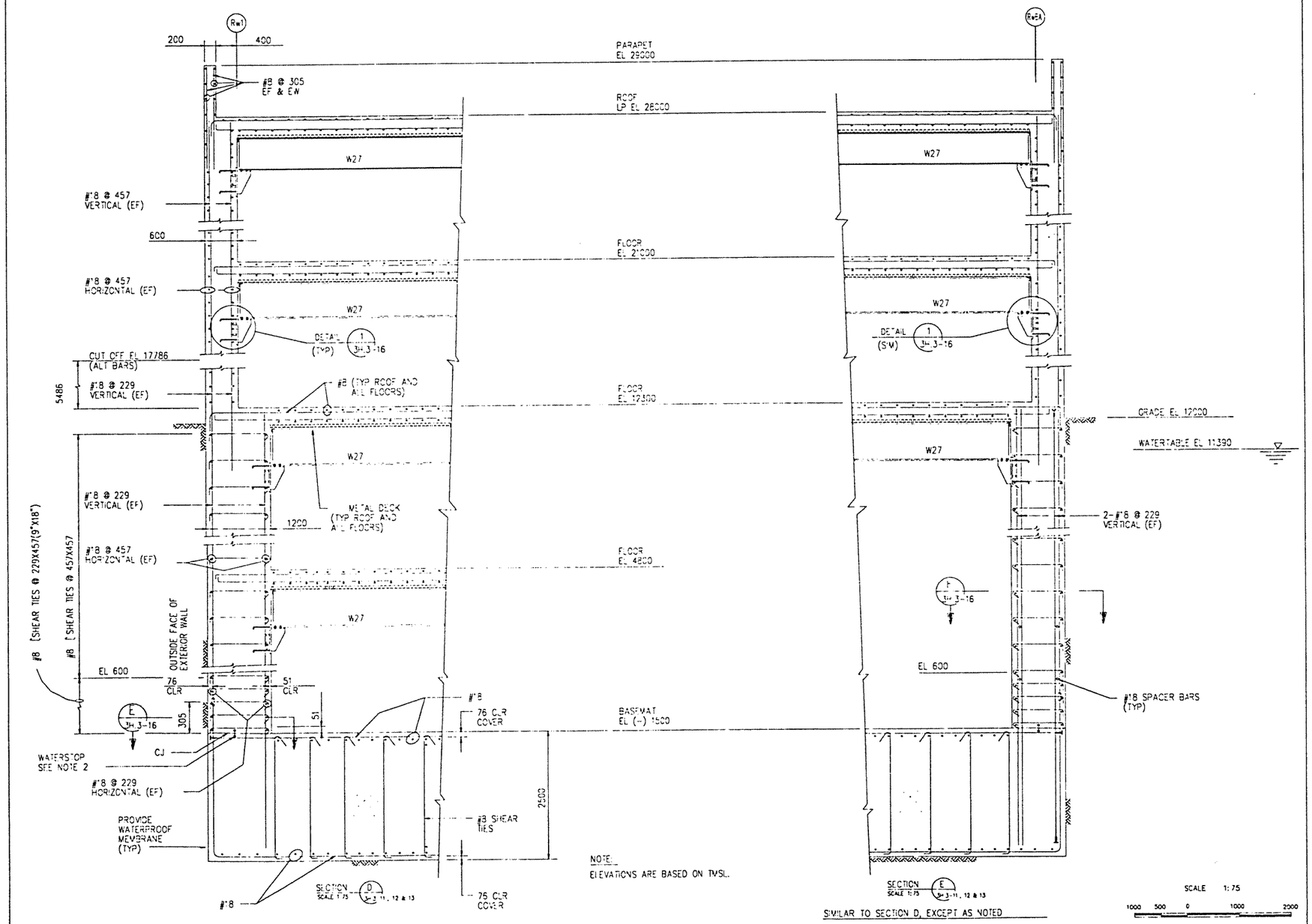
SECTION A
SCALE 1:300

NOTES:
1. ELEVATIONS ARE BASED ON MSL.
2. INTERIOR PARTITION WALLS ARE NOT SHOWN FOR CLARITY.

SCALE 1:300
2000 1000 0 2000 4000

NOTES:
1. FOR NOTES SEE FIGURES 3H.3-11 AND 3H.3-13.

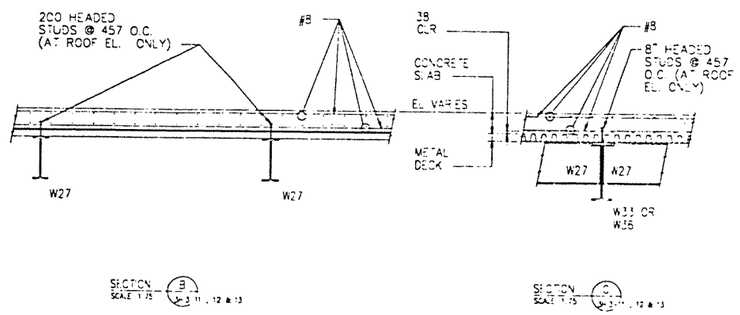
Figure 3H.3-14 RADWASTE BUILDING/CROSS-SECTION A-A



NOTES:

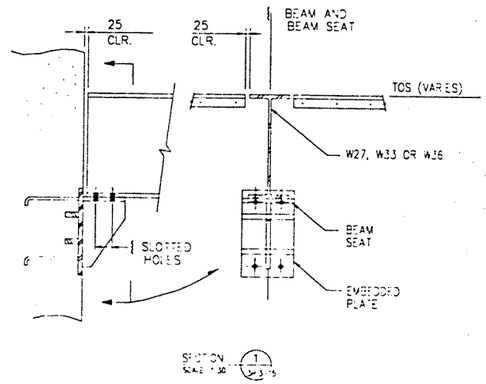
1. FOR NOTES SEE FIGURE 3H.3-11.
2. ALL CONSTRUCTION JOINTS BELOW GRADE EL. SHALL BE PROVIDED WITH WATERSTOP.
3. CONSTRUCTION JOINTS SHOWN ARE TENTATIVE, SUBJECT TO CHANGE BASED UPON CONSTRUCTION SEQUENCE.

Figure 3H.3-15 RADWASTE BUILDING-EXTERIOR WALLS-SECTIONS

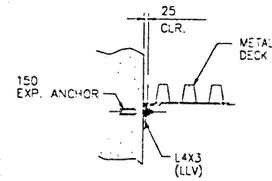


SECTION 3 SCALE 1:75 — 3H.3-11, 12 & 13

SECTION 4 SCALE 1:75 — 3H.3-11, 12 & 13



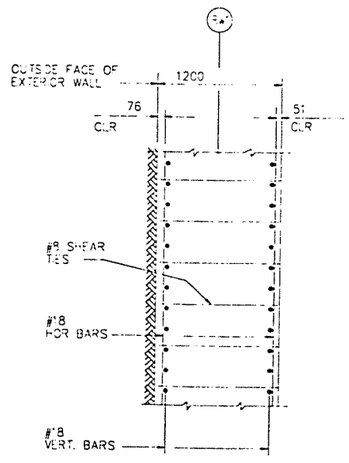
SECTION 1 SCALE 1:30 — 3H.3-15



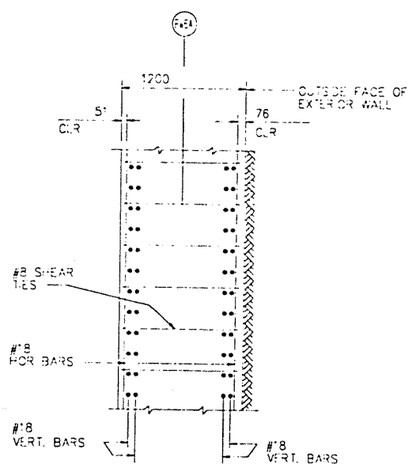
SECTION 2 SCALE 1:30 — 3H.3-11, 12 & 13

NOTES:

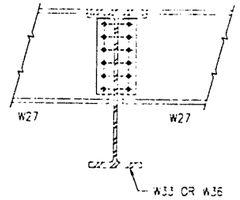
1. FOR NOTES SEE FIGURES 3H.3-11 AND 3H.3-13.
2. HEADED STUDS SHALL BE FURNISHED BY TRW NELSON DIVISION, OR APPROVED EQUAL AND INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS.
3. ALL BEAM TO BEAM AND BEAM TO COLUMN CONNECTIONS SHALL BE BOLTED PER AISC TABLE II.



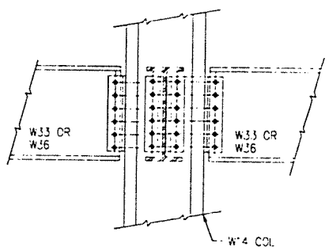
SECTION 5 SCALE 1:30 — 3H.3-15



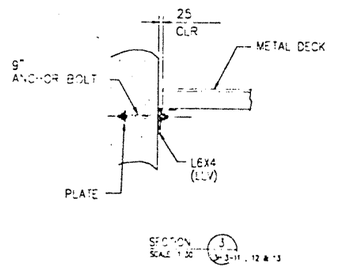
SECTION 6 SCALE 1:30 — 3H.3-15



TYPICAL BEAM TO BEAM CONNECTION
SCALE 1:30



TYPICAL BEAM TO COLUMN CONNECTION
SCALE 1:30



SECTION 7 SCALE 1:30 — 3H.3-11, 12 & 13

SCALE 1:75
1000 500 0 1000 2000

SCALE 1:30
500 250 0 500 1000

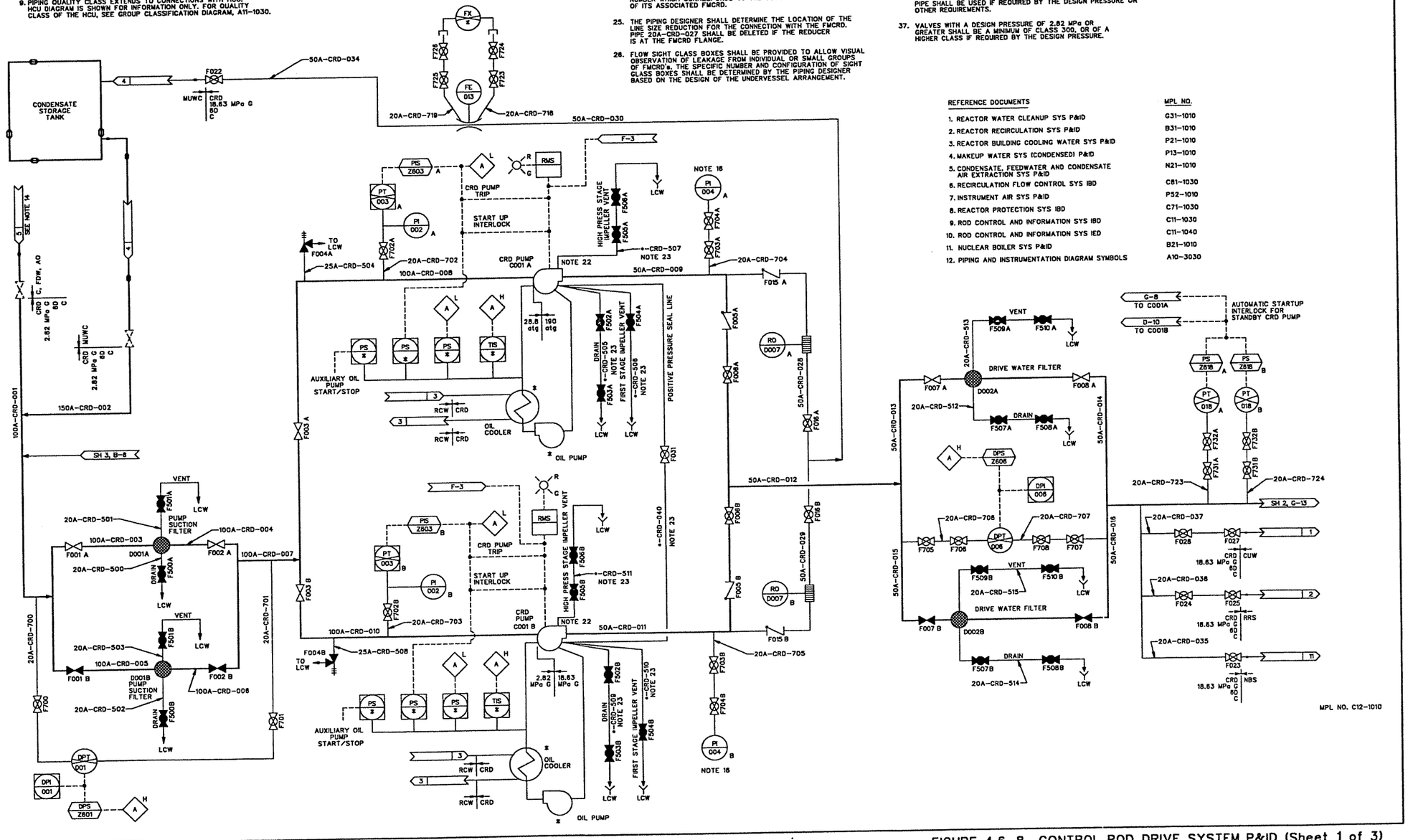
SCALE 1:50
1000 500 0 1000 2000

Figure 3H.3-16 RADWASTE BUILDING-SECTIONS AND DETAILS

NOTES

1. THE PIPING DESIGNER SHALL PROVIDE INSTRUMENT ROOT VALVES AND INSTRUMENT PIPING IN CONFORMANCE WITH THE REQUIREMENTS OF THE PROCESS INSTRUMENT SPECIFICATION A11-3030.
2. THE CRD SYSTEM HCU'S ARE ARRANGED IN FOUR SCRAM GROUPS LOCATED IN TWO MECHANICAL ZONES OF THE REACTOR BUILDING. EACH MECHANICAL ZONE CONTAINS TWO SCRAM GROUPS. EACH HCU SCRAM GROUP SERVES ONE QUADRANT OF THE REACTOR CORE.
3. PROVIDE DRAIN VALVES AT ALL SYSTEM LOW POINTS.
4. PROVIDE VENT VALVES AT ALL SYSTEM HIGH POINTS.
5. EXCEPT AT POINTS OF CONNECTION WITH THE REACTOR VENDOR SUPPLIED EQUIPMENT OR PIPING, THE PIPING DESIGNER SHALL SIZE PIPES IN CONFORMANCE WITH THE SYSTEM DESIGN SPECIFICATION AND PROCESS DIAGRAM.
6. THIS DOCUMENT PROVIDES A FUNCTIONAL DEFINITION OF THE REQUIRED SYSTEM LEVEL PROCESS, MONITORING AND CONTROL INSTRUMENTATION. IT DOES NOT ADDRESS DETAILS OF THE METHODS BY WHICH SIGNALS FROM THESE COMPONENTS WILL BE PROCESSED. THIS PROCESSING MAY INVOLVE THE PLANT MULTIPLEXING SYSTEM (H23) OR MAY UTILIZE DEDICATED HARDWIRING.
7. CRD NITROGEN AND AIR LINES SHALL BE OF A NON-CORRODING MATERIAL.
8. MULTIPLE ORIFICES CONNECTED IN SERIES AS SHOWN IN PURCHASE PART DRAWING OF ORIFICE D006. THE PRESSURE DROP ACROSS EACH ORIFICE IS 1.73 MPa AT PUMP RUN-OUT CONDITION. SEE COMPONENT DEVICE LIST FOR THE QUANTITIES OF ORIFICES.
9. PIPING QUALITY CLASS EXTENDS TO CONNECTIONS WITH HCU. HCU DIAGRAM IS SHOWN FOR INFORMATION ONLY. FOR QUALITY CLASS OF THE HCU, SEE GROUP CLASSIFICATION DIAGRAM, A11-1030.
10. FLUSHING CONNECTIONS SHALL BE PROVIDED IN ACCORDANCE WITH THE SPECIFICATION FOR CLEANING OF PIPE AND EQUIPMENT, A70-4010. TEMPORARY STRAINER SCREENS SHALL BE PROVIDED ON THE SUCTION SIDE OF ALL PUMPS IN ACCORDANCE WITH THE SPECIFICATION FOR FIELD CLEANING AND CLEANLINESS OF NUCLEAR PLANT COMPONENTS, A11-3070.
11. APPROPRIATE ELECTRICAL ISOLATION SHALL BE PROVIDED BETWEEN THE NON-ESSENTIAL ROD WITHDRAW BLOCK SIGNAL (PS-Z811) AND THE ESSENTIAL REACTOR TRIP SIGNAL (PIS-Z811 AND PT-011).
12. PIPE SIZE SHALL BE SPECIFIED BY THE PIPING DESIGNER.
13. A PORTABLE NITROGEN CHARGING SYSTEM SHALL BE PROVIDED TO MEET THE REQUIREMENTS OF THE HCU. IT SHALL BE DESIGNED AND CONSTRUCTED IN ACCORDANCE WITH GOOD INDUSTRY PRACTICE AND SHALL HAVE THE APPROPRIATE SAFETY DEVICES, GAGES AND VALVES. A PRESSURE RELIEF VALVE SHALL BE INSTALLED DOWNSTREAM OF THE CHARGING STATION PRESSURE REGULATOR WHICH SHALL PREVENT PRESSURIZATION ABOVE SYSTEM REQUIREMENTS.
14. SOURCE OF CRD SYSTEM WATER SHALL BE NORMALLY FROM THE CONDENSATE, FEEDWATER AND CONDENSATE AIR EXTRACTION SYSTEM (H21). CONDENSATE STORAGE TANK IS THE ALTERNATE SOURCE IF CONDENSATE TREATMENT SYSTEM IS NOT IN OPERATION. FOR DETAILED DESIGN REQUIREMENT FOR SOURCE AND QUALITY OF WATER SEE CONTROL ROD DRIVE SYSTEM DESIGN SPEC. C12-4010. THE CRD SYSTEM INTERFACE CONFIGURATION WITH THE CONDENSATE,FEEDWATER AND CONDENSATE AIR EXTRACTION SYSTEM (C,FDW,AO) SHALL BE DETERMINED BY THE ACTUAL C,FDW,AO DESIGN.
15. PROVISION FOR CONTAINMENT ISOLATION TO BE IN ACCORDANCE WITH CURRENT LICENSING REQUIREMENTS.
16. PRESSURE INDICATOR SHALL BE LOCATED ON A STRAIGHT PIPE SECTION TEN PIPE DIAMETERS FROM PUMP OUTLET.
17. ALL REFERENCED DESIGNATORS ARE PREFIXED BY C12- UNLESS OTHERWISE INDICATED.
18. FLANGED PUMPS TO BE USED.
19. THESE VALVES MUST BE OPEN FOR RAPID HYDRAULIC ROD INSERTION (SCRAM).
20. FOR SEISMIC CATEGORY OF INDIVIDUAL FMCRD COMPONENTS, SEE REFERENCE 12.
21. SYSTEM DESIGN CONDITIONS:
    A) DESIGN PRESSURE - SEE BOUNDARY SYMBOLS
    B) DESIGN TEMPERATURE = 66 °C
    C) PIPING MATERIAL - SEE TABLE 1
    D) PIPING SCHEDULE NUMBER - SEE TABLE 1
    E) DESIGN/QUALITY CLASS - SEE BOUNDARY SYMBOLS
    F) SEISMIC CATEGORY - SEE BOUNDARY SYMBOLS
    G) FLUID - SEE TABLE 1
22. PIPING INTERFACES WITH THE CRD PUMP, INCLUDING SUCTION, DISCHARGE, VENT, DRAIN AND POSITIVE PRESSURE SEAL LINES SHALL BE SPECIFIED BY THE PUMP SUPPLIER. REDUCERS ON THE SUCTION AND DISCHARGE PIPING SHALL BE PROVIDED AS REQUIRED.
23. PIPE SIZE SHALL BE SPECIFIED BY THE PUMP SUPPLIER.
24. EACH SCRAM INSERT LINE SHALL BE ASSIGNED A SUFFIX NUMBER WHICH CORRESPONDS TO THE CORE LOCATION OF ITS ASSOCIATED FMCRD.
25. THE PIPING DESIGNER SHALL DETERMINE THE LOCATION OF THE LINE SIZE REDUCTION FOR THE CONNECTION WITH THE FMCRD. PIPE 20A-CRD-027 SHALL BE DELETED IF THE REDUCER IS AT THE FMCRD FLANGE.
26. FLOW SIGHT GLASS BOXES SHALL BE PROVIDED TO ALLOW VISUAL OBSERVATION OF LEAKAGE FROM INDIVIDUAL OR SMALL GROUPS OF FMCRD's. THE SPECIFIC NUMBER AND CONFIGURATION OF SIGHT GLASS BOXES SHALL BE DETERMINED BY THE PIPING DESIGNER BASED ON THE DESIGN OF THE UNDERVESSEL ARRANGEMENT.
27. THE FMCRD LEAK DETECTION INSTRUMENTATION AS SHOWN PROVIDES A FUNCTIONAL DEFINITION OF THE MINIMUM LEAK DETECTION MONITORING REQUIREMENTS. THE ACTUAL INSTRUMENTATION CONFIGURATION SHALL BE SPECIFIED BY THE DESIGNER BASED ON THE DETAILED FMCRD LEAK DETECTION SYSTEM ARRANGEMENT.
28. THE PIPING DESIGNER SHALL DETERMINE THE SPECIFIC CONFIGURATION OF DRAIN PIPING TO DELIVER FMCRD LEAKAGE FLOW TO LCW.
29. HCU ROOM CRD FRICTION TEST CONNECTIONS ARE USED IN CONJUNCTION WITH A PORTABLE TEST CART TO PROVIDE TEMPORARY HYDRAULIC CONNECTION TO THE HCU FOR CRD FRICTION TESTING.
30. THE ACTUAL HCU HEADER CONFIGURATION SHALL BE DETERMINED BY THE HCU ROOM PIPING LAYOUT DESIGN.
31. THE PIPING DESIGNER SHALL SPECIFY THE LOCATION OF MAINTENANCE VALVES, IF REQUIRED, FOR ARI VALVE AND AIR HEADER DUMP VALVE MAINTENANCE.
32. THE PIPING DESIGNER SHALL DETERMINE THE NEED FOR LINE SIZE REDUCTIONS FOR THE AIR HEADER DUMP VALVES AND ARI VALVES. THE REDUCERS MAY BE DELETED IF NOT REQUIRED.
33. THE VALVE POSITION INDICATING LIGHT SHALL BE LOCATED EITHER IN A LOCAL PANEL OR ON THE HCU.
34. THE PENETRATION NUMBERS FOR THE SCRAM LINES X-810 (AT 0°) AND X-70 (AT 180°)
35. THE INSTRUMENT AIR SUPPLY SHALL BE DESIGNED TO ASSURE CONTINUED AIR SUPPLY TO THE SCRAM AIR HEADER AND FLOW CONTROL VALVES (F010) WITH ANY SINGLE PRESSURE CONTROL VALVE OUT OF SERVICE.
36. PIPE WITH A DESIGN PRESSURE OF 2.82 MPa OR GREATER SHALL HAVE ITS MINIMUM WALL THICKNESS NO LESS THAN THAT OF A STANDARD WEIGHT PIPE. THICKER THAN STANDARD WEIGHT PIPE SHALL BE USED IF REQUIRED BY THE DESIGN PRESSURE OR OTHER REQUIREMENTS.
37. VALVES WITH A DESIGN PRESSURE OF 2.82 MPa OR GREATER SHALL BE A MINIMUM OF CLASS 300, OR OF A HIGHER CLASS IF REQUIRED BY THE DESIGN PRESSURE.

REFERENCE DOCUMENTS	MPL NO.
1. REACTOR WATER CLEANUP SYS P&ID	G31-1010
2. REACTOR RECIRCULATION SYS P&ID	B31-1010
3. REACTOR BUILDING COOLING WATER SYS P&ID	P21-1010
4. MAKEUP WATER SYS (CONDENSED) P&ID	P13-1010
5. CONDENSATE, FEEDWATER AND CONDENSATE AIR EXTRACTION SYS P&ID	N21-1010
6. RECIRCULATION FLOW CONTROL SYS IBD	C81-1030
7. INSTRUMENT AIR SYS P&ID	P52-1010
8. REACTOR PROTECTION SYS IBD	C71-1030
9. ROD CONTROL AND INFORMATION SYS IBD	C11-1030
10. ROD CONTROL AND INFORMATION SYS IED	C11-1040
11. NUCLEAR BOILER SYS P&ID	B21-1010
12. PIPING AND INSTRUMENTATION DIAGRAM SYMBOLS	A10-3030



MPL NO. C12-1010

FIGURE 4.6-8 CONTROL ROD DRIVE SYSTEM P&ID (Sheet 1 of 3)

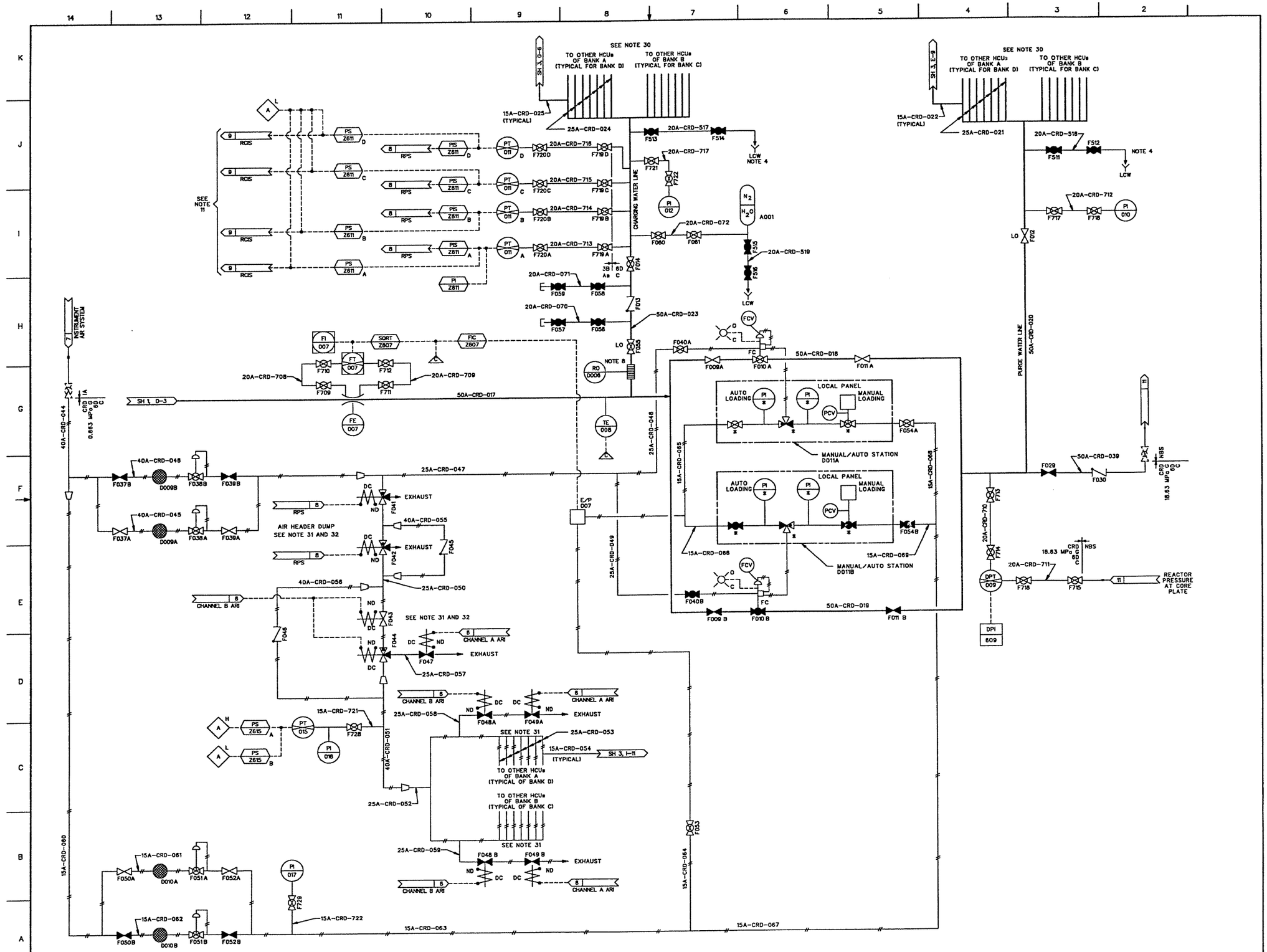


FIGURE 4.6-8 CONTROL ROD DRIVE SYSTEM P&ID (Sheet 2 of 3)

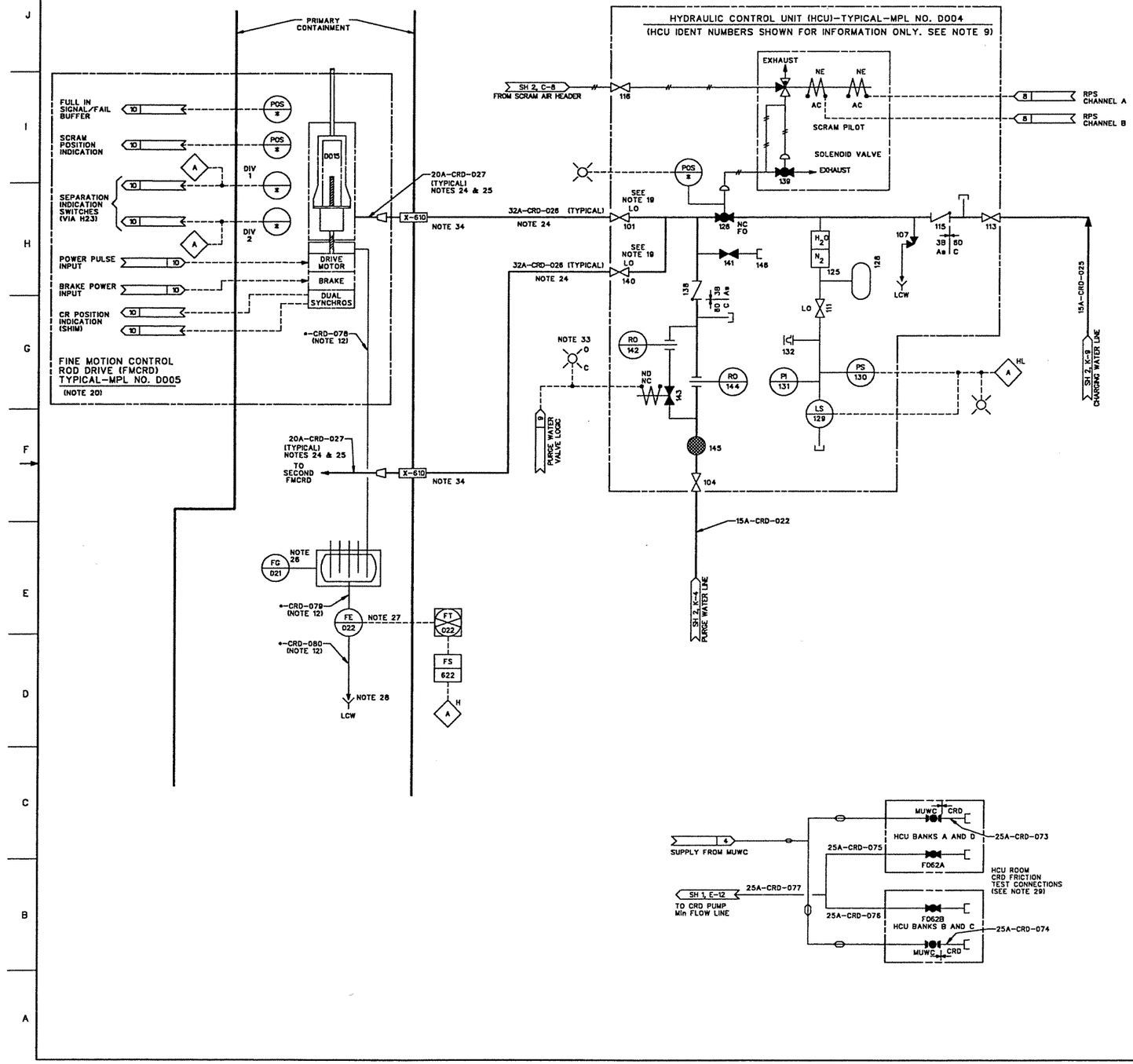


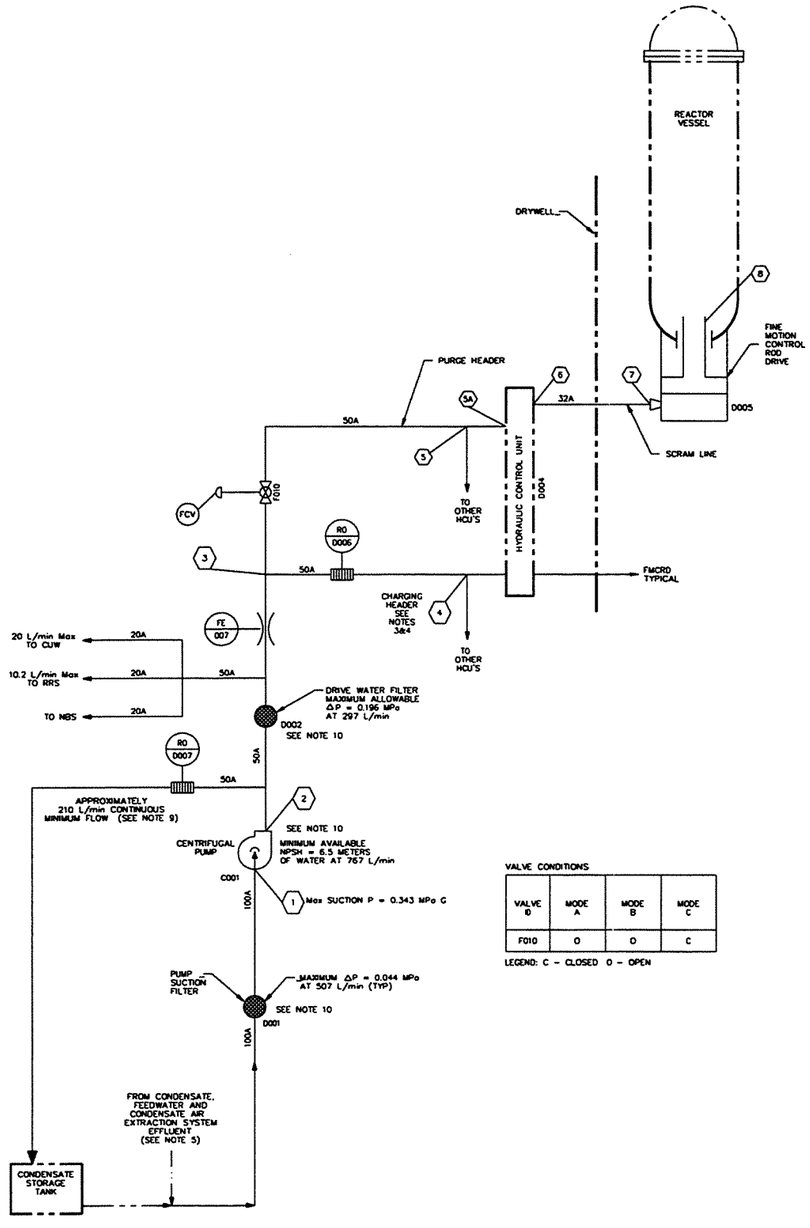
TABLE 1: PIPING SPECIFICATIONS

PIPE NO.	SCHEDULE	MATERIAL	FLUID
001	40S	SS	W
002	40S	SS	W
003	40S	SS	W
004	40S	SS	W
005	40S	SS	W
006	40S	SS	W
007	40S	SS	W
008	40S	SS	W
009	80S	SS	W
010	40S	SS	W
011	80S	SS	W
012	80S	SS	W
013	80S	SS	W
014	80S	SS	W
015	80S	SS	W
016	80S	SS	W
017	80S	SS	W
018	80S	SS	W
019	80S	SS	W
020	80S	SS	W
021	80S	SS	W
022	80S	SS	W
023	80S	SS	W
024	80S	SS	W
025	80S	SS	W
026	80S	SS	W
027	80S	SS	W
028	80S	SS	W
029	80S	SS	W
030	80S	SS	W
034	80S	SS	W
035	80S	SS	W
036	80S	SS	W
037	80S	SS	W
039	80S	SS	W
040	40S	SS	W
044	40S	SS	A
045	40S	SS	A
046	40S	SS	A
047	40S	SS	A
048	40S	SS	A
049	40S	SS	A
050	40S	SS	A
051	40S	SS	A
052	40S	SS	A
053	40S	SS	A
054	40S	SS	A
055	40S	SS	A
056	40S	SS	A
057	40S	SS	A
058	40S	SS	A
059	40S	SS	A
060	40S	SS	A
061	40S	SS	A
062	40S	SS	A
063	40S	SS	A
064	40S	SS	A
065	40S	SS	A
066	40S	SS	A
067	40S	SS	A
068	40S	SS	A
069	40S	SS	A

TABLE 1: PIPING SPECIFICATIONS (CONT'D)

PIPE NO.	SCHEDULE	MATERIAL	FLUID
070	80S	SS	W
071	80S	SS	W
072	80S	SS	W
073	80S	SS	W
074	80S	SS	W
075	40S	SS	W
076	40S	SS	W
077	40S	SS	W
078	40S	SS	W
079	40S	SS	W
080	40S	SS	W
500	40S	SS	W
501	40S	SS	W
502	40S	SS	W
503	40S	SS	W
504	40S	SS	W
505	40S	SS	W
506	40S	SS	W
507	80S	SS	W
508	40S	SS	W
509	40S	SS	W
510	40S	SS	W
511	80S	SS	W
512	80S	SS	W
513	80S	SS	W
514	80S	SS	W
515	80S	SS	W
516	80S	SS	W
517	80S	SS	W
519	80S	SS	W
700	40S	SS	W
701	40S	SS	W
702	40S	SS	W
703	40S	SS	W
704	80S	SS	W
705	80S	SS	W
706	80S	SS	W
707	80S	SS	W
708	80S	SS	W
709	80S	SS	W
710	80S	SS	W
711	80S	SS	W
712	80S	SS	W
713	80S	SS	W
714	80S	SS	W
715	80S	SS	W
716	80S	SS	W
717	80S	SS	W
718	80S	SS	W
719	80S	SS	W
721	40S	SS	A
722	40S	SS	A
723	80S	SS	W
724	80S	SS	W

FIGURE 4.6–8 CONTROL ROD DRIVE SYSTEM P&ID (Sheet 3 of 3)



MODE A NORMAL OPERATION – SIZES PURGE WATER HEADERS (SEE NOTES 6 AND 7)

NODE ⬡	1	2	3	4	5	5A	6	7	8
FLOW, L/min	507	507	267	0	267	2.6	1.3 Max	1.3 Max	1.3 Max
PRESSURE, MPa G	0.343 (Max)	TDH = 15.30 (Min)			PR+0.245 (Min)	PR+0.245 (Min)	PR+0.196	PR+0.196	PR
CONDITIONS :		Max LINE LOSS 0.490				SEE NOTE 6 AND 7			

1. NORMAL DRIVE OPERATION
2. Min/Max PURGE FLOW TO DRIVES.
3. PRESSURE OF REACTOR AT 7.48 MPa G MEASURED AT VESSEL BOTTOM

MODE B SCRAM – SIZES SCRAM LINE

NODE ⬡	1	2	3	4	5	6	7	8
FLOW, L/min	240	240				473	473	473
PRESSURE, MPa G						0.716 Min 1.16 Max LINE LOSSES (SEE NOTE 8)		PR

CONDITIONS :
1. DRIVES SCRAMMING
2. FLOWS BASED ON ROD VELOCITY OF 344 cm/Sec
3. PRESSURE OF REACTOR AT 7.48 MPa G MEASURED AT VESSEL BOTTOM

MODE C SCRAM COMPLETED – SIZES THE PUMP SUCTION LINE

NODE ⬡	1	2	3	4	5	6	7	8
FLOW, L/min	767 Max	767 Max	527	527 Max	0	SEE NOTES 3&4		
PRESSURE, MPa G	TDH=11.77 Min					SEE NOTES 3&4		PR

CONDITIONS :
1. SCRAMMING OF DRIVES COMPLETED
2. MAXIMUM CRD SUPPLY PUMP FLOW
3. PRESSURE OF REACTOR (PR) AT 0 MPa G

TABLE 1: DESIGN PRESSURE/TEMPERATURE

NODE ⬡	1	2	3	4	5	6	7	8
PRESSURE, MPa G	2.82	18.63	18.63	18.63	18.63	23.5	23.5	8.62
TEMP \C	66	66	66	66	66	66	66	332

VALVE CONDITIONS

VALVE ID	MODE A	MODE B	MODE C
F010	O	O	C

LEGEND: C – CLOSED O – OPEN

NOTES :

1. DESIGN PRESSURE, TEMPERATURE AND LINE SIZE WILL BE FINALIZED AT THE DETAILED DESIGN PHASE. ACTUAL LINE SIZES DETERMINED BY PIPING DESIGNER SHALL MEET THE PROCESS DATA HYDRAULIC REQUIREMENTS.
2. THE TERM PR IS DEFINED AS THE REACTOR PRESSURE IMMEDIATELY ABOVE THE CORE PLATE.
3. PUMP RUNOUT CAPACITY OF 767 L/min SHALL NOT BE EXCEEDED. ORIFICE REDUCES THE PRESSURE AT THE INSERT LINE SO THAT NO GREATER THAN A TOTAL OF 527 L/min WILL LEAK THROUGH ALL THE DRIVES WHEN PR = 0 MPa G. LEAKAGE FLOW AT NODES (7) AND (8) IS EQUAL TO 527 DIVIDED BY NUMBER OF DRIVES.
4. RESTRICTING ORIFICE D006 IS COMPOSED OF MULTIPLE ORIFICES CONNECTED IN SERIES. SEE MPL FOR THE QUANTITIES OF ORIFICES. THE PRESSURE DROP EACH ORIFICE IS 1.73 MPa AT 767 L/min .
5. LINE FROM THE CONDENSATE, FEEDWATER AND CONDENSATE AIR EXTRACTION SYSTEM (N21) SHALL BE SIZED TO MAINTAIN A FLOW RATE APPROXIMATELY TWICE NORMAL (MODE A) CRD SYSTEM FLOW RATE. SURPLUS FLOW WILL BE DIVERTED TO CONDENSATE STORAGE TANK (CST). CST WILL PROVIDE AN ALTERNATE SOURCE OF WATER FOR THE CRD SYSTEM IF SYSTEM N21 IS NOT AVAILABLE.
6. IN MODE A, THE DRIVE PURGE FLOW RATE AT LOCATIONS 6 & 7 SHALL NOT BE LESS THAN 0.7 L/min TO ANY DRIVE WHILE ALL DRIVES ARE STATIONARY. THE PURGE FLOW RATE TO THE STATIONARY DRIVES IN MODE A MAY BE LESS THAN THIS LIMIT FOR BRIEF PERIODS OF TIME DURING GANG ROD MOVEMENTS AS DESCRIBED IN NOTE 7.
7. DURING NORMAL MOTOR-DRIVEN ROD INSERTIONS IN MODE A (EITHER SINGLE ROD OR GANGED ROD MOVEMENTS UP TO 26 RODS), THE PURGE WATER FLOW AT LOCATION 5A IS INCREASED TO A MINIMUM OF 8.2 L/min TO EACH HCU ASSOCIATED WITH A MOVING DRIVE. THIS IS ACCOMPLISHED BY AUTOMATIC OPENING OF THE PURGE WATER MAKE-UP VALVE IN THE HCU. THE FLOW FROM EACH HCU DIVIDES EVENLY BETWEEN THE TWO DRIVES SUCH THAT THE FLOW AT LOCATIONS 6 AND 7 IS 4.1 L/min. THE PURGE WATER FLOW TO THE STATIONARY DRIVES DECREASES SINCE THE TOTAL PURGE WATER HEADER FLOW RATE AT THE LOCATION 5 REMAINS CONSTANT.
8. LINE LOSSES ARE FOR THE SCRAM LINES ONLY. TOTAL COMBINED LOSSES FOR THE HCU AND SCRAM LINES ARE 1.67 MPa MINIMUM AND 2.11 MPa MAXIMUM.
9. ACTUAL FLOW WILL BE DETERMINED DURING THE DETAILED DESIGN PHASE.
10. TYPICAL OF BOTH LOOPS. ONLY ONE LOOP SHOWN.

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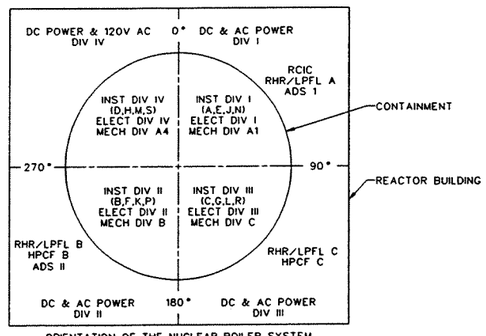
FIGURE 4.6–9 CONTROL ROD DRIVE SYSTEM PFD (Sheet 1 of 1)



ORIENTATION OF THE NUCLEAR BOILER SYSTEM INSTRUMENTS TO MEET SEPARATION REQUIREMENTS (INCLUDES ASSOCIATED INSTRUMENT SUFFIX AND ECCS LOCATION)

NOTES

1. ENCLOSED EQUIPMENT AND COMPONENTS ARE TYPICAL FOR THE OTHER STEAMLINES AND HAVE THE SAME PART NUMBERS UNLESS OTHERWISE NOTED.
   EXAMPLE: XXXB IS ON LINE "B"
   EXAMPLE: XXXC IS ON LINE "C"

2. SEE REFERENCE DOCUMENT 40 FOR THE SIZE OF THE INLET FLANGE FOR THE SAFETY RELIEF VALVES (SRVS).

3. PIPE SIZES SHOWN ON THIS DRAWING ARE APPROXIMATE EXCEPT AT POINTS OF CONNECTION WITH THE SUPPLIED EQUIPMENT OR PIPING. THE PIPING DESIGNER SHALL CHECK AND ADJUST PIPING SIZE IN ACCORDANCE WITH HIS PIPING LAYOUT FOR CONFORMANCE WITH THE NUCLEAR BOILER SYSTEM DESIGN SPECIFICATION (B21-4010) AND PROCESS DIAGRAM (B21-1020).

4. THE GLOBE VALVE F707 MAY NOT BE PROVIDED IF A SHUTOFF VALVE IS SUPPLIED WITH THE LEVEL TRANSMITTER LT004. IF THE SECOND SHUT-OFF VALVE IS PART OF LT004, THE DESIGN PRESSURE FOR THIS INSTRUMENT LINE IS 8.62 MPa G ALL THE WAY TO LT004.

5. (PX) TO BE CONNECTED IN TO THE STRAIGHT RUN OF PIPE DOWNSTREAM OF F009 WITH UPSTREAM AND DOWNSTREAM STRAIGHT LENGTH FROM THE TAP TO GIVE AS ACCURATE A PRESSURE MEASUREMENT AS FEASIBLE. TAPS TO MEET ASME PTC 6 1964 "STEAM TURBINE" PARAGRAPH 4.74.

6. AN EXPANSION LEG SHALL BE PROVIDED IN THE INSTRUMENT LINE BETWEEN THE CONDENSING POT D011 AND THE WATER TIGHT PENETRATION IN THE REFUELING BELLOWS. THE EXPANSION LEG AND PIPING INSTALLATION SHALL BE DESIGNED TO ALLOW FOR THE MAXIMUM CHANGE OF VESSEL LENGTH WITH TEMPERATURE TO AVOID OVERSTRESSING THE PIPING OR THE SEAL OR DAMAGE TO THE INSULATION AROUND THE VESSEL. ELEVATION "A" SHALL BE AT OR ABOVE THE CENTERLINE OF THE RPV HEAD VENT LINE. THE INSTRUMENT LINE FROM ELEVATION "A" TO ELEVATION "B" SHALL BE SLOPED CONTINUOUSLY UPWARD ≥ 1/24 AND BE KEPT AS SHORT AS PRACTICAL. THE INSTRUMENT LINE SHALL BE KEPT INSULATED FROM THE CONNECTION WITH THE RPV HEAD VENT LINE TO THE CONDENSING POT. THE INSULATION SHALL HAVE A MAXIMUM CONDUCTANCE OF 4.103E-01 J/h.cm².°C.

7. PROVISIONS FOR INSTRUMENT LINE ISOLATION SHALL BE IN ACCORDANCE WITH SUPPORTING DOCUMENTS 3 & 4. ONE ORIFICE SHALL BE INSTALLED IN EACH INSTRUMENT LINE CONNECTED TO THE REACTOR COOLANT PRESSURE BOUNDARY (RCPB). ORIFICE SIZE IS 6.4mm AND MAXIMUM NUMBER OF ORIFICES PER LINE IS ONE.

8. VALVE MOTOR OPERATORS AND PILOT SOLENOIDS ARE AC OPERATED UNLESS OTHERWISE SPECIFIED.

9. THE CONDENSING CHAMBER SHALL BE CLOSE COUPLED TO THE 50A RPV INSTRUMENT LINE NOZZLE BY A 50A PIPE. THE 50A PIPE FROM THE REACTOR VESSEL INSTRUMENT LINE NOZZLE SHALL BE LEVEL IN THE HORIZONTAL PLANE FOR ALL CONDITIONS WITHIN 3 mm.
   THE INSTRUMENT LINE CONNECTED TO THE BOTTOM OF THE CONDENSING CHAMBER SHALL HAVE A DOWNWARD SLOPE ≥ 1/25. INSIDE THE PRIMARY CONTAINMENT. THE TOTAL VERTICAL DROP FROM THE CONDENSING CHAMBER TO THE CONTAINMENT WALL, SHALL NOT EXCEED 0.9 METERS. AT THE BOTTOM CONNECTION TO THE CONDENSING CHAMBER, THE INSTRUMENT LINE SHALL BE 25A PIPE, BUT PRIOR TO PENETRATING THE PRIMARY CONTAINMENT, SHALL BE REDUCED TO 20A PIPE.
   IN ADDITION, THE CONDENSING CHAMBER HAS A 25A DRAIN LINE WHICH DRAINS THE EXCESS CONDENSATE OR WATER TO THE VARIABLE LEG INSTRUMENT LINES FOR THE RPV WIDE RANGE WATER LEVEL INSTRUMENTATION. FLEXIBILITY SHALL BE PROVIDED IN THE INSTRUMENT LINE AND CONDENSING CHAMBER DRAIN LINE SUCH THAT THE CONDENSING CHAMBER IS FREE TO MOVE WITH THE REACTOR VESSEL AS IT THERMALLY EXPANDS AND CONTRACTS. THERMAL EXPANSION SHALL NOT CHANGE THE ELEVATION OF THE CONDENSING CHAMBER WITH RESPECT TO THE RPV INSTRUMENT LINE NOZZLE BY MORE THAN 3 mm.
   INSULATE THE 50A PIPE WHICH ATTACHES THE RPV INSTRUMENT LINE NOZZLE TO THE CONDENSING CHAMBER WITH INSULATION WHICH HAS A MAXIMUM CONDUCTANCE OF 4.103E-01 J/h.cm².°C. THE INSULATION SHALL EXTEND FROM THE RPV INSTRUMENT LINE NOZZLE TO THE CONDENSING CHAMBER. THE CONDENSING CHAMBER AND THE INSTRUMENT LINE FROM THE CONDENSING CHAMBER TO THE CONTAINMENT PENETRATION SHALL NOT BE INSULATED. THE 25A DRAIN LINE SHALL BE INSULATED.

10. LOCATE THE TEE AS CLOSE AS POSSIBLE TO REACTOR VESSEL.

11. THE MAXIMUM OPERATING PRESSURE OF AT LEAST 2.82 MPa G, AND TEMPERATURE FOR THE PORTION OF THE MAIN STEAM LINE DRAIN LINE HEADER DOWNSTREAM OF THE MOTOR OPERATED VALVES (MOVS) F014 AND F016 AND THE RESTRICTING ORIFICE D005 AND D007 TO BE DETERMINED BY THE DESIGNERS OF THE MAIN CONDENSER SYSTEM.

12. LOCATE THE DRAIN LINE 20A-NB-542 AND ASSOCIATED EQUIPMENT FOR DETECTING THE LEAKAGE AS CLOSE AS PRACTICAL TO THE RPV.

13. FOR DETAILS, SEE B11-D021 & D025.

14. THERMAL SLEEVE IS SHOWN AS ONE POSSIBLE METHOD OF ACCOMODATING ΔT BETWEEN RCIC/RHR/CUW AND FEEDWATER STREAMS. OTHER METHODS WHICH MEET APPLICABLE CODE REQUIREMENTS MAY BE USED.

15. SPRING CLOSING CHECK VALVE, SPRING ACTUATOR HELD IN OPEN POSITION BY AIR PRESSURE DURING NORMAL OPERATION. IF NO OTHER CHECK VALVE BETWEEN THE REACTOR AND THE FEEDWATER PUMPS IS DESIGNED TO CLOSE PRIOR TO APPRECIABLE FLOW REVERSAL, F003 SHOULD BE INTERLOCKED TO DUMP AIR PRESSURE AUTOMATICALLY IN THE EVENT ALL FEEDWATER PUMPS TRIP.

16. TRANSITION FROM 250A TO 300A PIPING TO BE DETERMINED BY THE PLANT ARRANGEMENT OF THE SRV DISCHARGE LINES.

17. SRV DISCHARGE LINE PIPING TO THE QUENCHER SHALL BE QUALITY GROUP C. IN ADDITION ALL WELDS IN THE SRV DISCHARGE LINE PIPING IN THE WETWELL ABOVE THE SURFACE OF THE SUPPRESSION POOL SHALL BE NON-DESTRUCTIVELY EXAMINED TO THE REQUIREMENTS OF ASME BOILER AND PRESSURE VESSEL CODE, SECTION III, CLASS 2.

18. NOT USED

19. WHEN ALL FEEDWATER FLOW IS THROUGH A LOW FLOW FEEDWATER CONTROL VALVE, ONE FEEDWATER LINE TO THE REACTOR VESSEL IS TO BE SHUT-OFF TO MINIMIZE THERMAL CYCLING OF THE FEEDWATER NOZZLES ON THE RPV. WITH BOTH FEEDWATER LINES OPEN, FLOW MAY OSCILLATE BETWEEN THE TWO LINES DUE TO THE PARTIALLY OPEN CHECK VALVE.

20. ROUTE THE PIPE THROUGH THE MANHOLE IN BETWEEN THE DRYWELL AND THE RPV FLANGE.

21. WATER LEVEL INSTRUMENTS FOR VARIOUS RANGES ARE CALIBRATED AS STATED BELOW. ALL WATER LEVEL SWITCH SETPOINTS ARE NOMINAL. I.E., THE ANALYSES ARE PERFORMED WITH THE SWITCH TRIP UNCERTAINTY INCLUDED. THE CONTAINMENT BUILDING TEMPERATURE ASSUMED TO BE 26.7°C.
   A. FUEL ZONE: THE INSTRUMENTS ARE CALIBRATED FOR SATURATED WATER AND STEAM CONDITIONS AT 0 kPa G IN THE VESSEL AND DRYWELL WITH NO PUMP FLOW.
   B. WIDE RANGE: THE INSTRUMENTS ARE CALIBRATED FOR 7.07 MPa G IN THE VESSEL, 57.2°C IN THE DRYWELL AND 46.47 kJ/kg SUB-COOLING BELOW THE MIDDLE WATER LEVEL NOZZLE.
   C. NARROW RANGE: (SAFEGUARDS AND FEEDWATER) THE INSTRUMENTS ARE CALIBRATED FOR SATURATED WATER AND STEAM CONDITIONS AT 7.07 MPa G IN THE VESSEL AND 57.2°C IN THE DRYWELL.
   D. SHUTDOWN: THE INSTRUMENT IS CALIBRATED FOR 48.9°C WATER AT 0 MPa IN THE VESSEL AND 26.7°C IN THE DRYWELL.

22. THE TEMPERATURE ELEMENT MPL B21-TE032 MAY BE LOCATED ON THE RPV HEAD VENT LINE BETWEEN THE MOTOR-OPERATED VALVES MPL B21-F019 AND B21-F020 PROVIDING THE FOLLOWING CONDITION IS SATISFIED. THE TEMPERATURE ELEMENT MPL B21-TE032 SHALL NOT BE INFLUENCED BY THE POTENTIALLY HIGH TEMPERATURES UPSTREAM OF THE MOTOR-OPERATED VALVE MPL B21-F019 WHEN THERE IS ZERO LEAKAGE THROUGH THE MOTOR-OPERATED VALVES B21-F019 & B21-F020.

23. UNLESS OTHERWISE INDICATED, ALL REFERENCED MPL ARE PREFIXED BY B21-

24. SEE MAIN STEAM PIPING DESIGN SPECIFICATION (B21-G001) FOR THE SPECIAL DESIGN REQUIREMENTS WHICH ARE APPLICABLE TO THE PIPING BETWEEN THE STEAM LINE INBOARD AND OUTBOARD CONTAINMENT ISOLATION VALVES.

25. SEE FEEDWATER PIPING DESIGN SPECIFICATION (B21-G010) FOR THE SPECIAL DESIGN REQUIREMENTS WHICH ARE APPLICABLE TO THE PIPING BETWEEN THE FEEDWATER LINE INBOARD AND OUTBOARD CONTAINMENT ISOLATION VALVES.

26. OPERATION OF 2 OF 2 MANUAL SWITCHES IS REQUIRED FOR GANGED OPERATION OF THE 8 SRV'S USED FOR THE ADS.

27. SEE SUPPORTING DOCUMENT 1 FOR SYSTEM IDENTIFICATION AT INTERCONNECTIONS.

28. PNEUMATIC SUPPLY FROM REFERENCE DOCUMENT 33.

29. THE CONDENSING CHAMBER SHALL CONSIST OF A 25A x 25A PIPE ELBOW WHICH IS CLOSE-COUPLED TO THE MAIN STEAM LINE FLOW RESTRICTOR INSTRUMENT LINE TAPS. THE RUN OF 25A INSTRUMENT LINE FROM THE TAP ON THE MAIN STEAM LINE FLOW RESTRICTOR TO THE ELBOW SHALL BE LEVEL IN THE HORIZONTAL PLANE WITHIN 0.50 CM FOR ALL CONDITIONS. THE 25A INSTRUMENT LINE CONNECTION TO THE ELBOW SHALL BE LOCATED VERTICALLY AND EXTEND DOWNWARD. THE 25A PIPE SHALL HAVE A DOWNWARD SLOPE ≥ 1/24 PRIOR TO PENETRATING THE CONTAINMENT WALL. THE 25A PIPE SHALL BE REDUCED TO 20A. FLEXIBILITY SHALL BE PROVIDED IN THE 25A AND 20A PIPE SUCH THAT THE CONDENSING CHAMBER MOVES WITH THE RPV AS IT THERMALLY EXPANDS AND CONTRACTS.

30. INSULATE WITH INSULATION THAT HAS A MAXIMUM CONDUCTANCE OF 4.103E-01 J/h.cm².°C. THE INSULATION SHALL EXTEND FROM THE INSTRUMENT LINE TAP TO WITHIN 5.1 CM OF THE DOWNWARD EXTENDING INSTRUMENT LINE. THE HORIZONTAL INSTRUMENT LINE TAP TO THE JUNCTION WITH THE DOWNWARD EXTENDING INSTRUMENT LINE SHOULD BE LESS THAN ONE (1) METER.

31. THE MOTOR-OPERATED VALVES (MOVS) MPL B21-F007A&B IN THE CLEAN-UP WATER (CUW) SYSTEM INJECTION LINES TO THE FEEDWATER LINES MAY BE DELETED IF THE RPV FEEDWATER NOZZLE FATIGUE USAGE IS ≤1.0 WITHOUT THE CUW SYS FEEDWATER LINE SELECTION FEATURE.

32. THE THERMAL SLEEVE SHOWN MAY BE DELETED IF THE STRESS ANALYSIS SHOWS THAT IT IS NOT REQUIRED.

33. SEE REFERENCE DOCUMENT 3 FOR THE INSTRUMENT SETPOINT REQUIREMENTS.

34. FOR INTERFACE CONNECTIONS, SEE THE MSIV EQUIPMENT REQUIREMENTS, SPECIFICATION SUPPORT DRAWING MPL F008 AND F009.

35. FOR VENT AND DRAIN LINES OPEN TO THE ATMOSPHERE, DOWNSTREAM OF THE OUTBOARD SHUT-OFF VALVE, THE FOLLOWING BOUNDARY CONDITIONS APPLY:
   MAXIMUM OPERATING PRESSURE = 0 MPa G
   MAXIMUM OPERATING TEMPERATURE = 66°C
   DESIGN CLASS AND QA CLASS = 7G
   SEISMIC CLASS = C

36. PIPING DESIGN SPECIFICATION AS FOLLOWS:
   A. MAXIMUM OPERATING PRESSURE = SEE SPECIFIC BOUNDARIES ON DRAWING
   B. MAXIMUM OPERATING TEMPERATURE = SEE SPECIFIC BOUNDARIES ON DRAWING
   C. MATERIAL = SEE TABLE 5
   D. PIPING THICKNESS = SEE TABLE 5
   E. ASME CLASS = SEE SPECIFIC BOUNDARIES ON DRAWING
   F. QUALITY CLASS = SEE SPECIFIC BOUNDARIES ON DRAWING
   G. SEISMIC CLASS = SEE SPECIFIC BOUNDARIES ON DRAWING
   H. FLUID = SEE TABLE 5

37. THE RELIEF VALVE F708 IS NOT REQUIRED IF INTERNAL PROTECTION IS PROVIDED WITHIN LT004 TO LIMIT THE DIFFERENTIAL PRESSURE ACROSS THE SENSING ELEMENT.

38. THE INSTRUMENT LINES SHALL BE SEISMIC CLASS As FROM THE LAST ANCHOR POINT TO THE PRESSURE TRANSMITTERS PT028 AND PT301.

39. PROVIDES INTERFACE BETWEEN SEISMIC CATEGORY I AND NON-SEISMIC CATEGORY PIPING.

40. THE MAXIMUM OPERATING TEMPERATURE OF THE FEEDWATER LINE FROM THE SEISMIC INTERFACE TO THE UPSTREAM SIDE OF THE MOTOR OPERATED VALVE MPL B21-F001 SHALL BE DETERMINED BY THE DESIGNER OF THE FEEDWATER SYSTEM.

41. PIPE WITH A DESIGN PRESSURE OF 2.82 MPa G OR GREATER SHALL HAVE ITS MINIMUM WALL THICKNESS NO LESS THAN THAT OF A STANDARD WEIGHT PIPE, THICKER THAN STANDARD WEIGHT PIPE SHALL BE USED IF REQUIRED BY THE DESIGN PRESSURE OR OTHER REQUIREMENTS.

42. VALVES WITH A DESIGN PRESSURE OF 2.82 MPa G OR GREATER SHALL BE A MINIMUM OF CLASS 300, OR OF A HIGHER CLASS IF REQUIRED BY THE DESIGN PRESSURE.

43. THE FLOW CONTROL STATION CONTAINS THE EQUIPMENT NECESSARY FOR LOCAL FLOW INDICATION AND LOCAL FLOW CONTROL.

REFERENCE DOCUMENT UNDER THE FOLLOWING IDENTITIES ARE TO BE USED IN CONJUNCTION WITH THIS DRAWING.

		MPL NO.
1.	WATER QUALITY REQUIREMENTS	A11-3040
2.	REACTOR PRESSURE VESSEL SYSTEM, ICD	B11-2020
3.	NUCLEAR BOILER SYS, P&ID DATA	B21-1010
4.	NUCLEAR BOILER SYSTEM, PFD	B21-1020
5.	NUCLEAR BOILER SYSTEM, IBD	B21-1030
6.	NOT USED	------
7.	NOT USED	------
8.	NOT USED	------
9.	CONTROL ROD DRIVE SYSTEM, P&ID	C12-1010
10.	REACTOR RECIRCULATION SYSTEM, P&ID	B31-1010
11.	FEEDWATER CONTROL SYSTEM IBD	C31-1030
12.	FEEDWATER CONTROL SYSTEM, IED	C31-1040
13.	REMOTE SHUTDOWN SYSTEM, IED	C61-1040
14.	REACTOR PROTECTION SYSTEM, IED	C71-1040
15.	RECIRCULATION FLOW CONTROL SYS, IBD	C81-1030
16.	RECIRCULATION FLOW CONTROL SYS, IED	C81-1040
17.	RESIDUAL HEAT REMOVAL SYSTEM, P&ID	E11-1010
18.	RESIDUAL HEAT REMOVAL SYSTEM, IBD	E11-1030
19.	HIGH PRESSURE CORE FLOODER SYSTEM, IBD	E22-1030
20.	LEAK DETECTION AND ISOLATION SYSTEM, IBD	E31-1030
21.	LEAK DETECTION AND ISOLATION SYSTEM, IED	E31-1040
22.	REACTOR CORE ISOLATION COOLING SYSTEM, P&ID	E51-1010
23.	REACTOR CORE ISOLATION COOLING SYSTEM, IBD	E51-1030
24.	REACTOR WATER CLEANUP SYS, P&ID	G31-1010
25.	LIQUID WASTE, RADWASTE SYSTEM, P&ID	K17-1010
26.	LOW CONDUCTIVITY WASTE, RADWASTE SYSTEM, P&ID	K17-1010
27.	TURBINE MAIN STEAM SYSTEM, P&ID	N11-1010
28.	CONDENSATE AND FEEDWATER SYSTEM, P&ID	N21-1010
29.	TURBINE CONTROL SYSTEM, IBD	N32-1030
30.	TURBINE CONTROL SYSTEM, IED	N32-1040
31.	STEAM BYPASS & PRESSURE CONTROL SYS, IED	C85-1040
32.	MAIN CONDENSER	N61-1010
33.	INSTRUMENT AIR SYSTEM, P&ID	P52-1010
34.	HIGH PRESS NITROGEN GAS SUPPLY SYS, P&ID	P54-1010
35.	VALVE GLAND LEAKAGE TREATMENT, RADWASTE SYS, P&ID	K17-1010
36.	SAMPLING SYSTEM, P&ID	P91-1010
37.	NOT USED	------
38.	NOT USED	------
39.	ATMOSPHERIC CONTROL SYSTEM P&ID	T31-1010
40.	MAIN STEAM PIPING EQUIPMENT REQUIREMENTS SPECIFICATION SUPPORT DRAWING	B21-G001

* DENOTES THAT THIS COMPONENT IS PART OF AN ASSEMBLY WHERE THE ENTIRE ASSEMBLY HAS ONE MPL NUMBER.

** REFERENCE INFORMATION TO BE PROVIDED AS: INTERFACE. DOES NOT AFFECT THE DESIGN INFORMATION SHOWN ON THIS DRAWING OR ITS VERIFICATION.

SUPPORTING DOCUMENTS

		MPL NO.
1.	NUCLEAR PLANT SYSTEM STRUCTURE	A10-3010
2.	PIPING AND INSTRUMENT SYMBOLS	A10-3030
3.	GROUP CLASSIFICATION AND CONTAINMENT ISOLATION DIAGRAM	A11-1030
4.	PROCESS INSTRUMENTATION REQUIREMENT SPEC	A11-3030

MPL NO. B21-1010

FIGURE 5.1-3 NUCLEAR BOILER SYSTEM P&ID (Sheet 1 of 11)

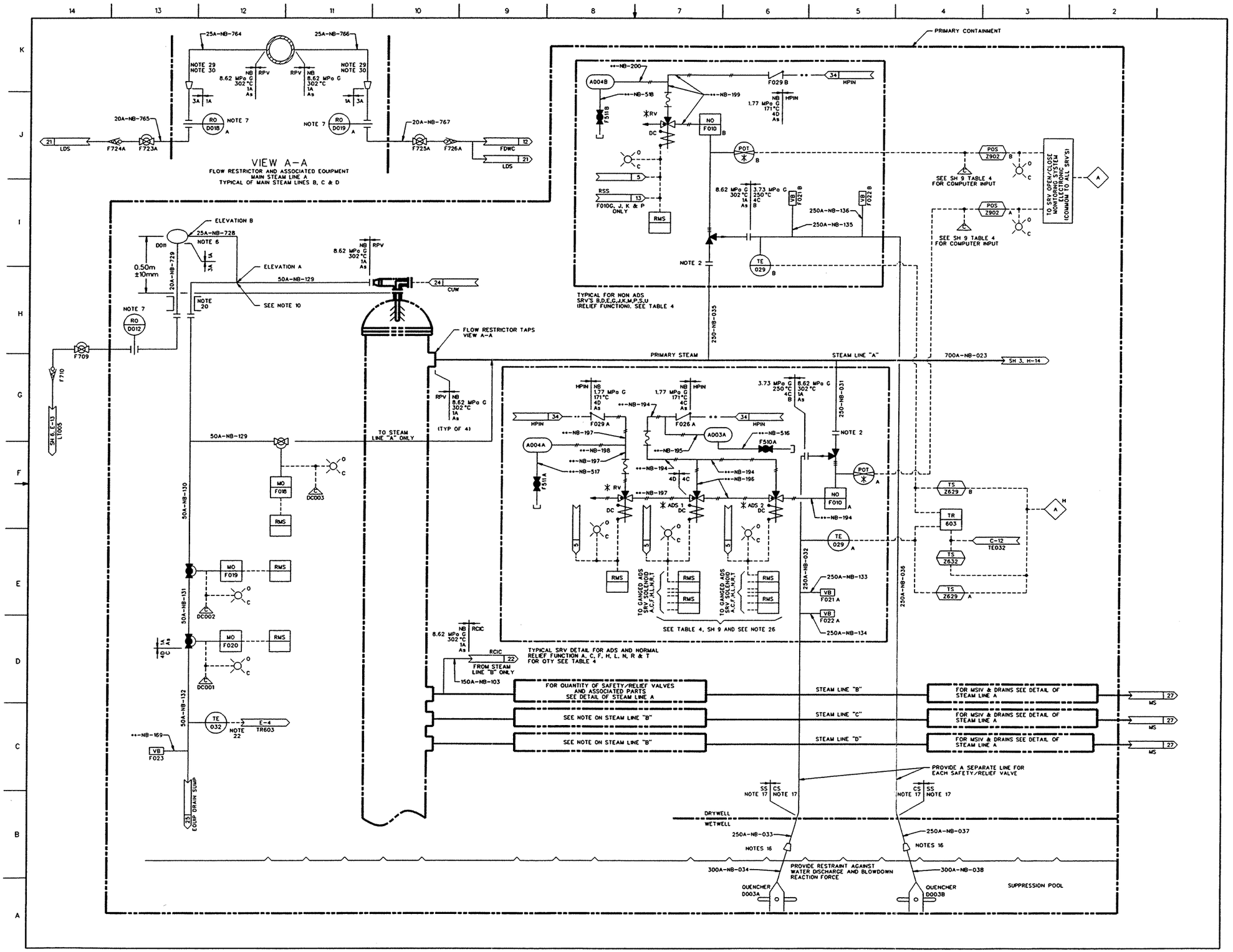


FIGURE 5.1-3 NUCLEAR BOILER SYSTEM P&ID (Sheet 2 of 11)

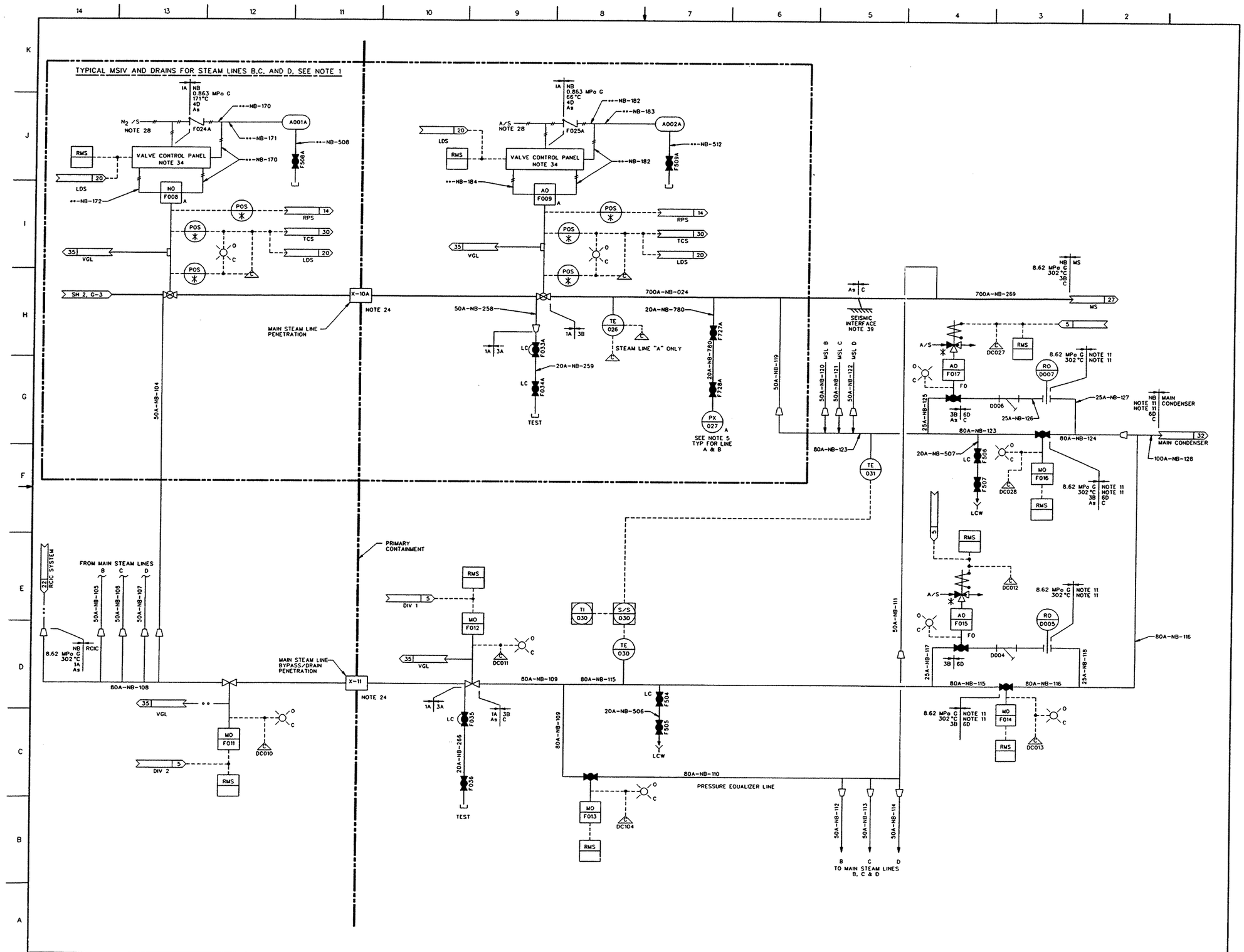


FIGURE 5.1-3 NUCLEAR BOILER SYSTEM P&ID (Sheet 3 of 11)

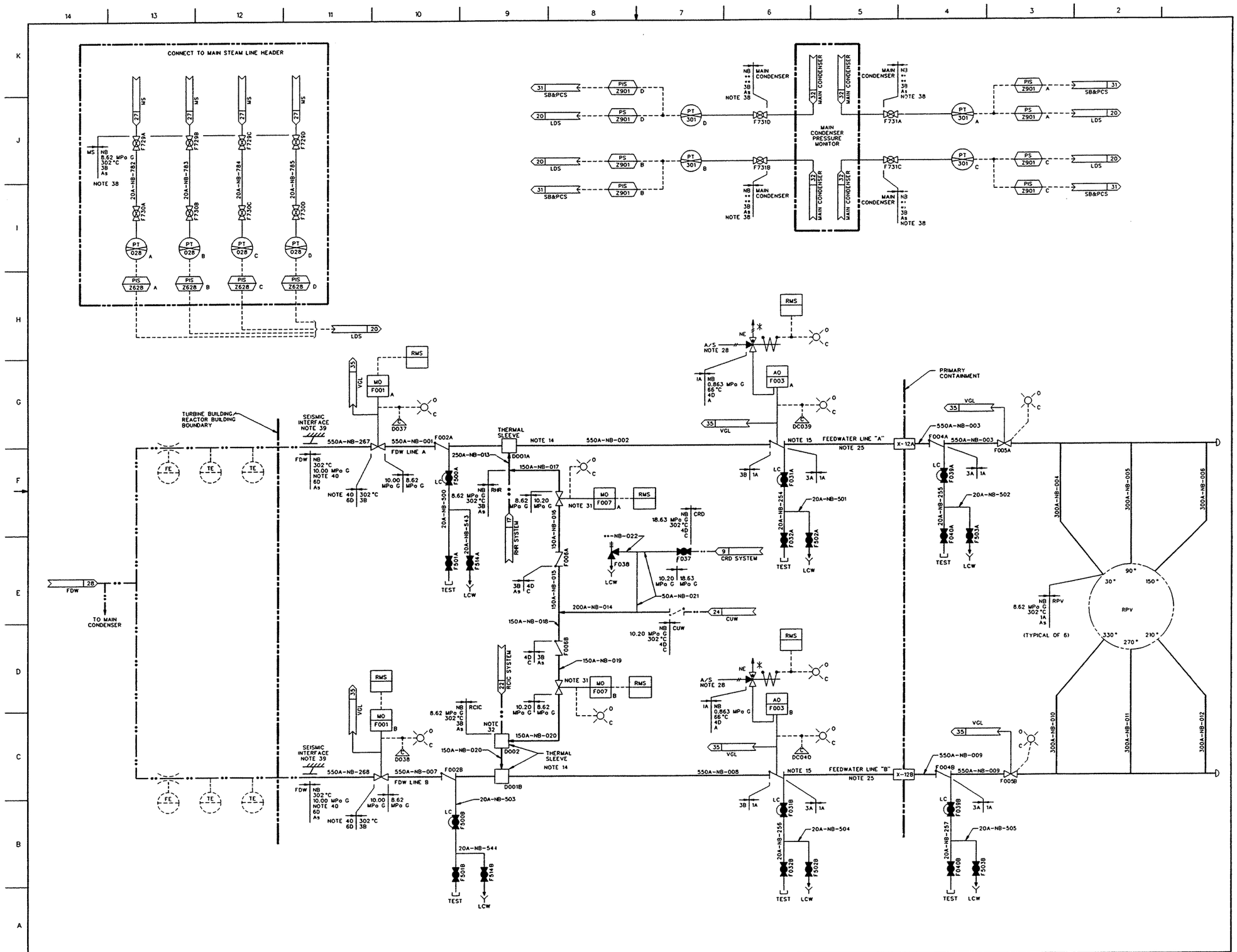


FIGURE 5.1-3 NUCLEAR BOILER SYSTEM P&ID (Sheet 4 of 11)

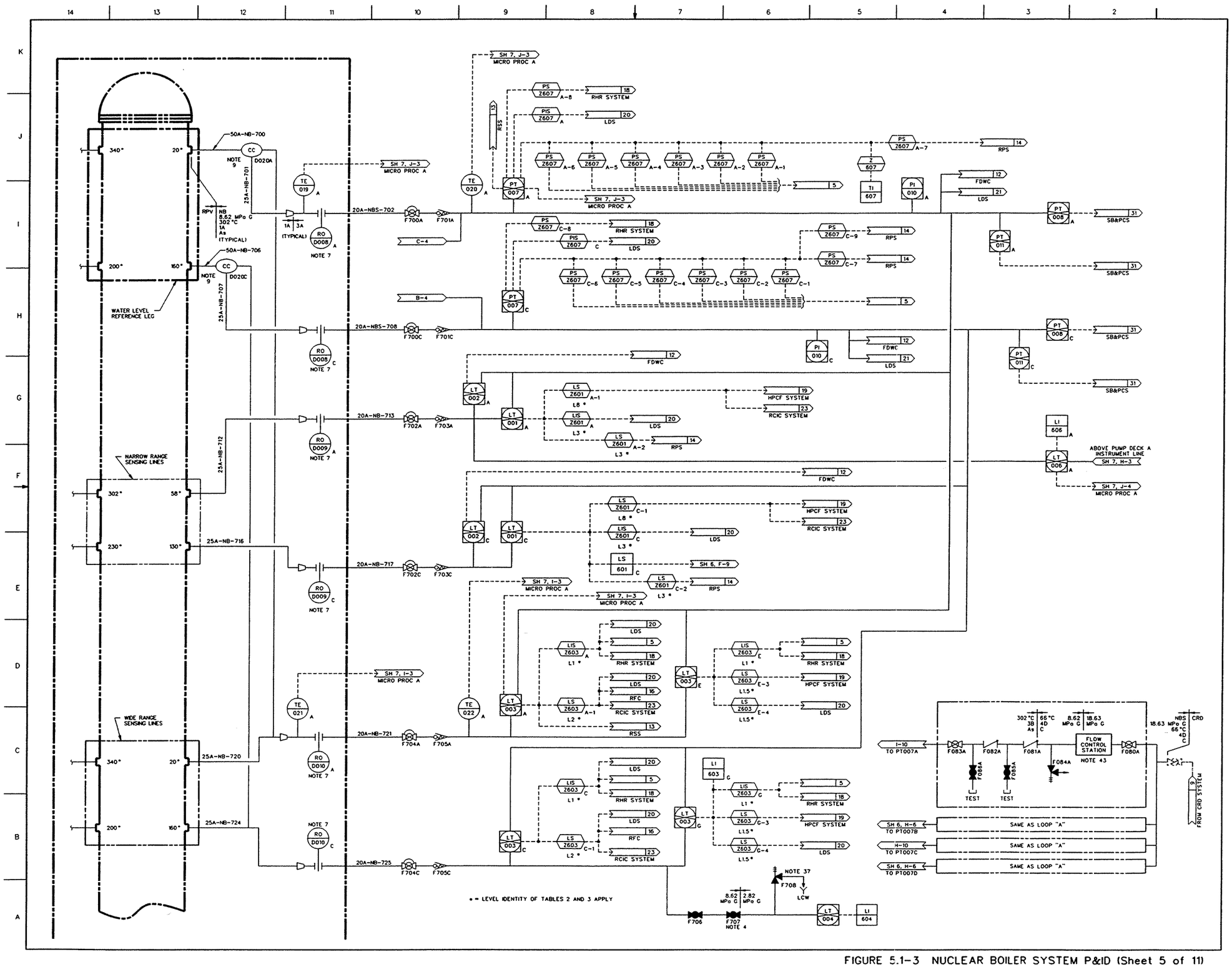


FIGURE 5.1-3 NUCLEAR BOILER SYSTEM P&ID (Sheet 5 of 11)

FIGURE 5.1-3 NUCLEAR BOILER SYSTEM P&ID (Sheet 6 of 11)

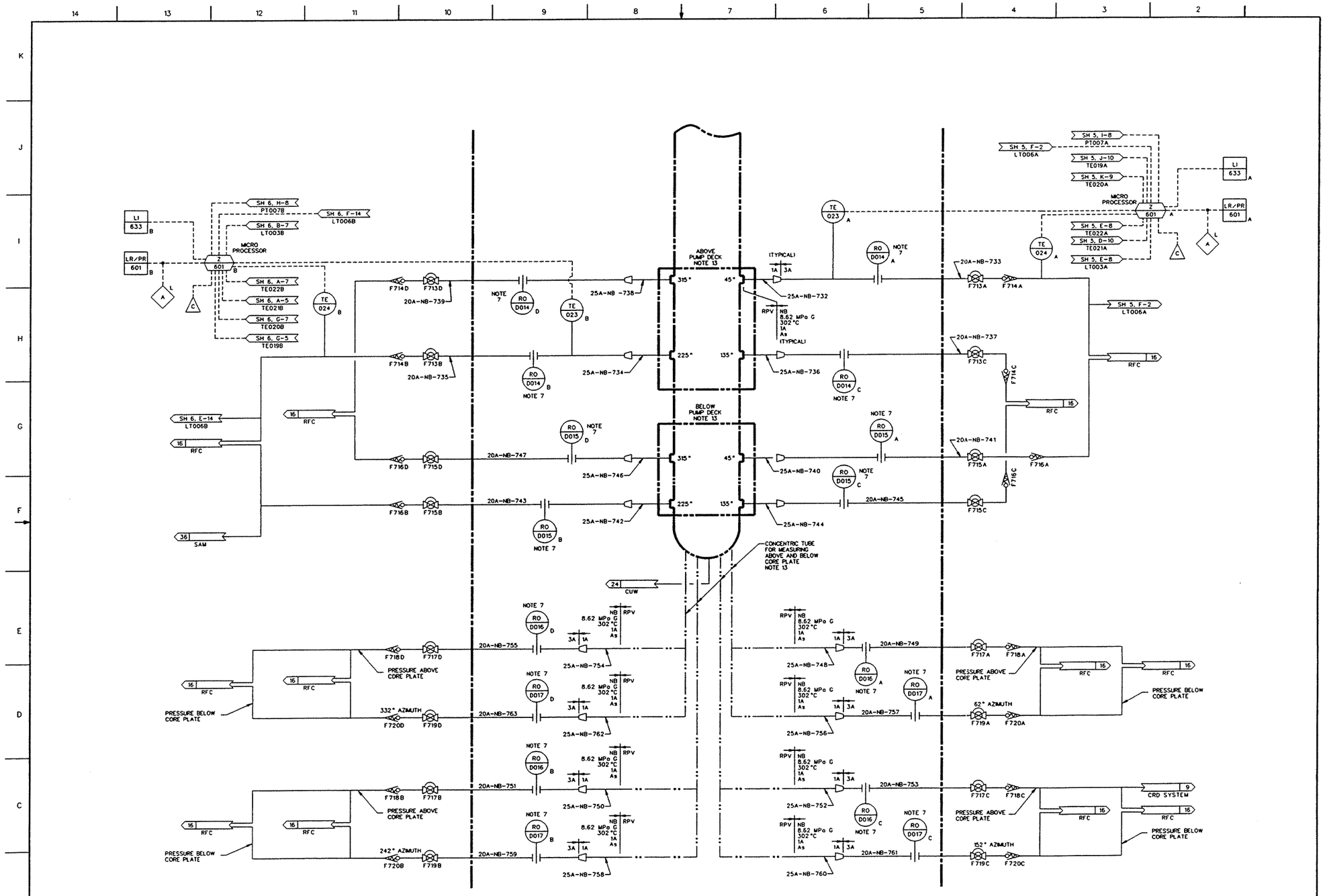


FIGURE 5.1-3 NUCLEAR BOILER SYSTEM P&ID (Sheet 7 of 11)

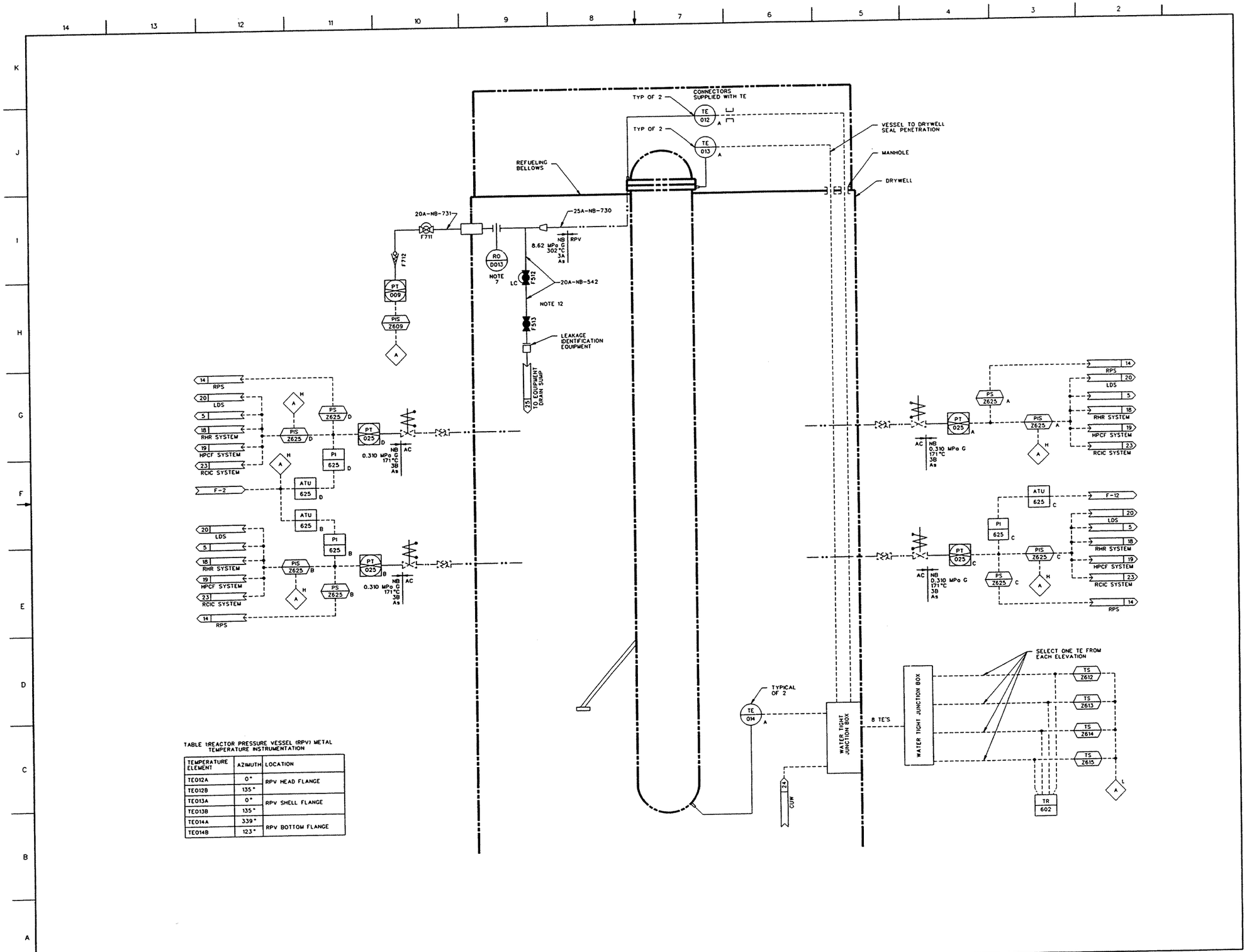


TABLE 1REACTOR PRESSURE VESSEL (RPV) METAL TEMPERATURE INSTRUMENTATION

TEMPERATURE ELEMENT	AZIMUTH	LOCATION
TE012A	0°	RPV HEAD FLANGE
TE012B	135°	
TE013A	0°	RPV SHELL FLANGE
TE013B	135°	
TE014A	339°	RPV BOTTOM FLANGE
TE014B	123°	

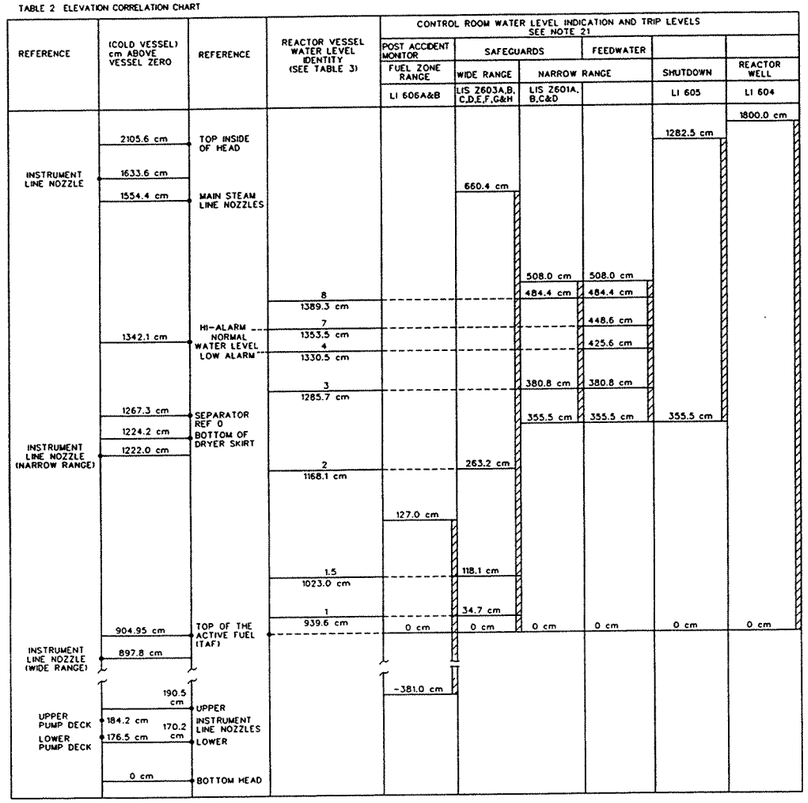
FIGURE 5.1-3 NUCLEAR BOILER SYSTEM P&ID (Sheet 8 of 11)

TABLE 4: SUFFIX LETTER ASSIGNMENTS FOR SAFETY/RELIEF VALVES AND ASSOCIATED EQUIPMENT

SAFETY/RELIEF VALVE F010		P	J	M	G	S	B	K	E	U	D	N	H	T	C	L	F	R	A
TEMPERATURE ELEMENT TE029		P	J	M	G	S	B	K	E	U	D	N	H	T	C	L	F	R	A
SOLENOID VALVE	ADS 1											N	H	T	C	L	F	R	A
	ADS 2											N	H	T	C	L	F	R	A
	RV	P	J	M	G	S	B	K	E	U	D	N	H	T	C	L	F	R	A
ACCUMULATOR	A003											N	H	T	C	L	F	R	A
	A004	P	J	M	G	S	B	K	E	U	D	N	H	T	C	L	F	R	A
CHECK VALVE	F026											N	H	T	C	L	F	R	A
	F029	P	J	M	G	S	B	K	E	U	D	N	H	T	C	L	F	R	A
SRV OPEN CLOSE MONITORING SYSTEM		P	J	M	G	S	B	K	E	U	D	N	H	T	C	L	F	R	A
	COMPUTER INPUT C	NC041	NC042	NC043	NC044	NC045	NC046	NC047	NC048	NC049	NC050	NC051	NC052	NC053	NC054	NC055	NC056	NC057	NC058
* COMPUTER INPUT C		B21 NC023	B21 NC024	B21 NC025	B21 NC026	B21 NC027	B21 NC028	B21 NC029	B21 NC030	B21 NC031	B21 NC032	B21 NC033	B21 NC034	B21 NC035	B21 NC036	B21 NC037	B21 NC038	B21 NC039	B21 NC040
SPRING SET PRESSURE (MPa G)		7.92	7.92	7.99	7.99	7.99	7.99	8.06	8.06	8.06	8.06	8.13	8.13	8.13	8.13	8.20	8.20	8.20	8.20
SPRING RESEAT PRESSURE (MPa G)		7.37	7.37	7.44	7.44	7.44	7.44	7.50	7.50	7.50	7.50	7.56	7.56	7.56	7.56	7.63	7.63	7.63	7.63
RELIEF SET PRESSURE (MPa G)		7.51	7.58	7.65	7.65	7.65	7.65	7.72	7.72	7.72	7.72	7.79	7.79	7.79	7.79	7.86	7.86	7.86	7.86
RELIEF RESEAT PRESSURE (MPa G)		7.00	7.07	7.14	7.14	7.14	7.14	7.21	7.21	7.21	7.21	7.28	7.28	7.28	7.28	7.35	7.35	7.35	7.35
	PT007A THRU D/ PS-Z607A-6 THRU D-6	≥2 OF A,B,C,D																	
	PT007A THRU D/ PS-Z607A-5 THRU D-5		≥2 OF A,B,C,D																
	PT007A THRU D/ PS-Z607A-4 THRU D-4			≥2 OF A,B,C,D															
	PT007A THRU D/ PS-Z607A-3 THRU D-3							≥2 OF A,B,C,D											
	PT007A THRU D/ PS-Z607A-2 THRU D-2											≥2 OF A,B,C,D							
	PT007A THRU D/ PS-Z607A-1 THRU D-1															≥2 OF A,B,C,D			

* COMPUTER INPUTS FOR SRV POSITION SEE PERFORMANCE MONITORING AND CONTROL SYSTEM C91-4010

TABLE 2 ELEVATION CORRELATION CHART



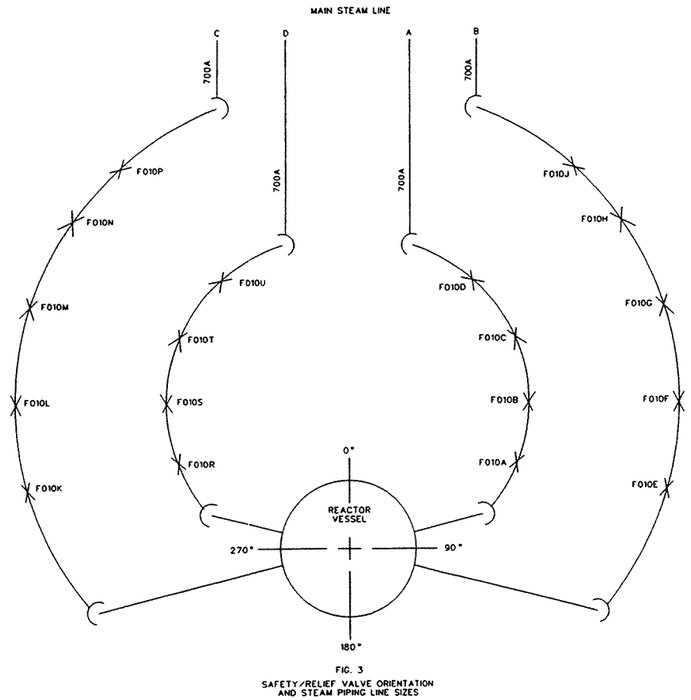


FIG. 3
SAFETY/RELIEF VALVE ORIENTATION AND STEAM PIPING LINE SIZES

TABLE 3 WATER LEVEL TRIP FUNCTION

REACTOR VESSEL WATER LEVEL	DESCRIPTION OF TRIPS	INSTRUMENT PROVIDING TRIP SIGNAL	NOTES
8	TRIPS RCIC TURBINE	LS-Z601A-1 THRU D-1	NARROW RANGE
	TRIP HPCF INJECTION VALVES	LS-Z601A-1 THRU D-1	NARROW RANGE
	CLOSE MAIN TURBINE STOP VALVES TRIPS FEEDWATER PUMPS	SEE REFERENCE DOCUMENT 12	NARROW RANGE
7	HIGH LEVEL ALARM	SEE REFERENCE DOCUMENT 12	NARROW RANGE
4	LOW LEVEL ALARM (RRS FLOW RUN BACK ON TRIP OF FEED PUMP)		NARROW RANGE
3	SCRAMS REACTOR	LIS-Z601A THRU D	NARROW RANGE
	CLOSE RHR SHUTDOWN COOLING ISOLATION VALVES	LIS-Z601A THRU D	NARROW RANGE
	CLOSE CONTAINMENT ISOL VALVES LDS EXCEPT DW COOLING AND CUW ISOL VALVES AND MSIV'S	LIS-Z601A THRU D	NARROW RANGE
	TRIP 4 OF RRS PUMPS	SEE REFERENCE DOCUMENT 12	NARROW RANGE
2	INITIATES RCIC	LS-Z603A-1 THRU D-1	WIDE RANGE
	TRIP REMAINING 6 RRS PUMPS	LS-Z603A-1 THRU D-1	WIDE RANGE
	CLOSE CUW ISOL VALVES	LS-Z603A-2 THRU D-2	WIDE RANGE
1.5	INITIATES HPCF B & C	LS-Z603E-3 THRU H-3	WIDE RANGE
	CLOSE MSIV'S & DW COOLING SYSTEM ISOL VALVES	LS-Z603E-4 THRU H-4	WIDE RANGE
1	INITIATES ADS	LIS-Z603A THRU H	WIDE RANGE
	INITIATES RHR/LPFL MODE	LIS-Z603A THRU H	WIDE RANGE

FIGURE 5.1-3 NUCLEAR BOILER SYSTEM P&ID (Sheet 9 of 11)

TABLE 5: PIPING SPECIFICATIONS

PIPE NO.	SCHEDULE	MATERIAL	FLUID
001	**	CS	W
002	**	CS	W
003	100	CS	W
004	100	CS	W
005	100	CS	W
006	100	CS	W
007	**	CS	W
008	**	CS	W
009	100	CS	W
010	100	CS	W
011	100	CS	W
012	100	CS	W
013	**	CS	W
014	**	CS	W
015	**	CS	W
016	**	CS	W
017	**	CS	W
018	**	CS	W
019	**	CS	W
020	**	CS	W
021	**	CS	W
022	**	CS	W
023	80	CS	S
024	**	CS	S
025	80	CS	S
026	**	CS	S
027	80	CS	S
028	**	CS	S
029	80	CS	S
030	**	CS	S
031	N/A	CS	S
032	80	CS	S
033	60	SS	S
034	60	SS	S
035	N/A	CS	S
036	80	CS	S
037	60	SS	S
038	60	SS	S
039	N/A	CS	S
040	80	CS	S
041	60	SS	S
042	60	SS	S
043	N/A	CS	S
044	80	CS	S
045	60	SS	S
046	60	SS	S
047	N/A	CS	S
048	80	CS	S
049	60	SS	S
050	60	SS	S
051	N/A	CS	S
052	80	CS	S
053	60	SS	S
054	60	SS	S
055	N/A	CS	S
056	80	CS	S
057	60	SS	S
058	60	SS	S
059	N/A	CS	S
060	80	CS	S
061	60	SS	S
062	60	SS	S
063	N/A	CS	S
064	80	CS	S
065	60	SS	S
066	60	SS	S
067	N/A	CS	S
068	80	CS	S
069	60	SS	S
070	60	SS	S
071	N/A	CS	S
072	80	CS	S
073	60	SS	S
074	60	SS	S
075	N/A	CS	S
076	80	CS	S
077	60	SS	S
078	60	SS	S
079	N/A	CS	S
080	80	CS	S

TABLE 5: PIPING SPECIFICATIONS (CONT'D)

PIPE NO.	SCHEDULE	MATERIAL	FLUID
081	60	SS	S
082	60	SS	S
083	N/A	CS	S
084	80	CS	S
085	60	SS	S
086	60	SS	S
087	N/A	CS	S
088	80	CS	S
089	60	SS	S
090	60	SS	S
091	N/A	CS	S
092	80	CS	S
093	60	SS	S
094	60	SS	S
095	N/A	CS	S
096	80	CS	S
097	60	SS	S
098	60	SS	S
099	N/A	CS	S
100	80	CS	S
101	60	SS	S
102	60	SS	S
103	120	CS	S
104	160	CS	S
105	160	CS	S
106	160	CS	S
107	160	CS	S
108	160	CS	S
109	**	CS	S
110	**	CS	S
111	**	CS	S
112	**	CS	S
113	**	CS	S
114	**	CS	S
115	**	CS	S
116	**	CS	S
117	**	CS	S
118	**	CS	S
119	**	CS	S
120	**	CS	S
121	**	CS	S
122	**	CS	S
123	**	CS	S
124	**	CS	S
125	**	CS	S
126	**	CS	S
127	**	CS	S
128	**	CS	S
129	80	CS	S
130	80	CS	S
131	80	CS	S
132	**	CS	S
133	80	CS	S
134	80	CS	S
135	80	CS	S
136	80	CS	S
137	80	CS	S
138	80	CS	S
139	80	CS	S
140	80	CS	S
141	80	CS	S
142	80	CS	S
143	80	CS	S
144	80	CS	S
145	80	CS	S
146	80	CS	S
147	80	CS	S
148	80	CS	S
149	80	CS	S
150	80	CS	S
151	80	CS	S
152	80	CS	S
153	80	CS	S
154	80	CS	S
155	80	CS	S
156	80	CS	S
157	80	CS	S
158	80	CS	S
159	80	CS	S
160	80	CS	S

TABLE 5: PIPING SPECIFICATIONS (CONT'D)

PIPE NO.	SCHEDULE	MATERIAL	FLUID
161	80	CS	S
162	80	CS	S
163	80	CS	S
164	80	CS	S
165	80	CS	S
166	80	CS	S
167	80	CS	S
168	80	CS	S
169	**	CS	S
170	**	SS	N
171	**	SS	N
172	**	SS	N
173	**	SS	N
174	**	SS	N
175	**	SS	N
176	**	SS	N
177	**	SS	N
178	**	SS	N
179	**	SS	N
180	**	SS	N
181	**	SS	N
182	**	SS	A
183	**	SS	A
184	**	SS	A
185	**	SS	A
186	**	SS	A
187	**	SS	A
188	**	SS	A
189	**	SS	A
190	**	SS	A
191	**	SS	A
192	**	SS	A
193	**	SS	A
194	**	SS	N
195	**	SS	N
196	**	SS	N
197	**	SS	N
198	**	SS	N
199	**	SS	N
200	**	SS	N
201	**	SS	N
202	**	SS	N
203	**	SS	N
204	**	SS	N
205	**	SS	N
206	**	SS	N
207	**	SS	N
208	**	SS	N
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222	**	SS	N
223	**	SS	N
224	**	SS	N
225	**	SS	N
226	**	SS	N
227	**	SS	N
228	**	SS	N
229	**	SS	N
230	**	SS	N
231	**	SS	N
232	**	SS	N
233	**	SS	N
234	**	SS	N
235	**	SS	N
236	**	SS	N
237	**	SS	N
238	**	SS	N
239	**	SS	N
240	**	SS	N

TABLE 5: PIPING SPECIFICATIONS (CONT'D)

PIPE NO.	SCHEDULE	MATERIAL	FLUID
241	**	SS	N
242	**	SS	N
243	**	SS	N
244	**	SS	N
245	**	SS	N
246	**	SS	N
247	**	SS	N
248	**	SS	N
249	**	SS	N
250	**	SS	N
251	**	SS	N
252	**	SS	N
253	**	SS	N
254	160	CS	W
255	160	CS	W
256	160	CS	W
257	160	CS	W
258	160	CS	S
259	160	CS	S
260	160	CS	S
261	160	CS	S
262	160	CS	S
263	160	CS	S
264	160	CS	S
265	160	CS	S
266	**	CS	S
267	**	CS	W
268	**	CS	W
269	**	CS	S
270	**	CS	S
271	**	CS	S
272	**	CS	S
500	**	CS	W
501	160	CS	W
502	160	CS	W
503	**	CS	W
504	160	CS	W
505	160	CS	W
506	**	CS	S
507	**	CS	S
508	**	SS	N
509	**	SS	A
510	**	SS	N
511	**	SS	A
512	**	SS	N
513	**	SS	A
514	**	SS	N
515	**	SS	A
516	**	SS	N
517	**	SS	N
518	**	SS	N
519	**	SS	N
520	**	SS	N
521	**	SS	N
522	**	SS	N
523	**	SS	N
524	**	SS	N
525	**	SS	N
526	**	SS	N
527	**	SS	N
528	**	SS	N
529	**	SS	N
530	**	SS	N
531	**	SS	N
532	**	SS	N
533	**	SS	N
534	**	SS	N
535	**	SS	N
536	**	SS	N
537	**	SS	N
538	**	SS	N
539	**	SS	N
540	**	SS	N
541	**	SS	N
542	**	CS	S
543	160	CS	W
544	160	CS	W

TABLE 5: PIPING SPECIFICATIONS (CONT'D)

PIPE NO.	SCHEDULE	MATERIAL	FLUID
700	80	SS	S
701	**	SS	W
702	**	SS	W
703	80	SS	S
704	**	SS	W
705	**	SS	W
706	80	SS	S
707	**	SS	W
708	**	SS	W
709	80	SS	S
710	**	SS	W
711	**	SS	W
712	80	SS	W
713	**	SS	W
714	80	SS	W
715	**	SS	W
716	80	SS	W
717	**	SS	W
718	80	SS	W
719	**	SS	W
720	80	SS	W
721	**	SS	W
722	80	SS	W
723	**	SS	W
724	80	SS	W
725	**	SS	W
726	80	SS	W
727	**	SS	W
728	**	CS	S
729	**	SS	W
730	**	SS	S
731	**	SS	S
732	80	SS	W
733	**	SS	W
734	80	SS	W
735	**	SS	W
736	80	SS	W
737	**	SS	W
738	80	SS	W
739	**	SS	W
740	80	SS	W
741	**	SS	W
742	80	SS	W
743	**	SS	W
744	80	SS	W
745	**	SS	W
746	80	SS	W
747	**	SS	W
748	80	SS	W
749	**	SS	W
750	80	SS	W
751	**	SS	W
752	80	SS	W
753	**	SS	W
754	80	SS	W
755	**	SS	W
756	80	SS	W
757	**	SS	W
758	80	SS	W
759	**	SS	W
760	80	SS	W
761	**	SS	W
762	80	SS	W
763	**	SS	W
764	**	SS	S
765	**	SS	W
766	**	SS	S
767	**	SS	W
768	**	SS	S
769	**	SS	W
770	**	SS	S
771	**	SS	W
772	**	SS	S
773	**	SS	W
774	**	SS	S
775	**	SS	W
776	**	SS	S
777	**	SS	W
778	**	SS	S
779	**	SS	W

TABLE 5: PIPING SPECIFICATIONS (CONT'D)

PIPE NO.	SCHEDULE	MATERIAL	FLUID
780	**	CS	S
781	**	CS	S
782	**	SS	S
783	**	SS	S
784	**	SS	S
785	**	SS	S

FIGURE 5.1-3 NUCLEAR BOILER SYSTEM P&ID (Sheet 10 of 11)

TABLE 6 : PIPE NUMBERS FOR THE MAIN STEAM LINES

MAIN STEAM LINE	RPV TO THE OUTBOARD MSIV	OUTBOARD MSIV TO SEISMIC INTERFACE	SEISMIC INTERFACE TO MAIN STEAM SYSTEM	OUTBOARD MSIV TEST LINE	
				OUTBOARD MSIV TO REDUCER	DOWNSTREAM OF REDUCER
A	700A-NB-023	700A-NB-024	700A-NB-269	50A-NB-258	20A-NB-259
B	700A-NB-025	700A-NB-026	700A-NB-270	50A-NB-260	20A-NB-261
C	700A-NB-027	700A-NB-028	700A-NB-271	50A-NB-262	20A-NB-263
D	700A-NB-029	700A-NB-030	700A-NB-272	50A-NB-264	20A-NB-265

TABLE 7 : PIPE NUMBERS FOR THE SAFETY/RELIEF VALVE (SRV) DISCHARGE LINES

SRV	SRV DISCHARGE LINE				VACUUM BREAKER LINES	
	MSL TO SRV NOTE 2	SRV TO DIAPHRAGM FLOOR	DIAPHRAGM FLOOR TO REDUCER	REDUCER TO QUENCHER	UPSTREAM	DOWNSTREAM
F010A	250A-NB-031	250A-NB-032	250A-NB-033	300A-NB-034	250A-NB-133	250A-NB-134
F010B	250A-NB-035	250A-NB-036	250A-NB-037	300A-NB-038	250A-NB-135	250A-NB-136
F010C	250A-NB-039	250A-NB-040	250A-NB-041	300A-NB-042	250A-NB-137	250A-NB-138
F010D	250A-NB-043	250A-NB-044	250A-NB-045	300A-NB-046	250A-NB-139	250A-NB-140
F010E	250A-NB-047	250A-NB-048	250A-NB-049	300A-NB-050	250A-NB-141	250A-NB-142
F010F	250A-NB-051	250A-NB-052	250A-NB-053	300A-NB-054	250A-NB-143	250A-NB-144
F010G	250A-NB-055	250A-NB-056	250A-NB-057	300A-NB-058	250A-NB-145	250A-NB-146
F010H	250A-NB-059	250A-NB-060	250A-NB-061	300A-NB-062	250A-NB-147	250A-NB-148
F010J	250A-NB-063	250A-NB-064	250A-NB-065	300A-NB-066	250A-NB-149	250A-NB-150
F010K	250A-NB-067	250A-NB-068	250A-NB-069	300A-NB-070	250A-NB-151	250A-NB-152
F010L	250A-NB-071	250A-NB-072	250A-NB-073	300A-NB-074	250A-NB-153	250A-NB-154
F010M	250A-NB-075	250A-NB-076	250A-NB-077	300A-NB-078	250A-NB-155	250A-NB-156
F010N	250A-NB-079	250A-NB-080	250A-NB-081	300A-NB-082	250A-NB-157	250A-NB-158
F010P	250A-NB-083	250A-NB-084	250A-NB-085	300A-NB-086	250A-NB-159	250A-NB-160
F010R	250A-NB-087	250A-NB-088	250A-NB-089	300A-NB-090	250A-NB-161	250A-NB-162
F010S	250A-NB-091	250A-NB-092	250A-NB-093	300A-NB-094	250A-NB-163	250A-NB-164
F010T	250A-NB-095	250A-NB-096	250A-NB-097	300A-NB-098	250A-NB-165	250A-NB-166
F010U	250A-NB-099	250A-NB-100	250A-NB-101	300A-NB-102	250A-NB-167	250A-NB-168

TABLE 8 : PIPE NUMBERS FOR THE MAIN STEAM ISOLATION VALVE (MSIV) PNEUMATIC LINES

MSIV	OPENING-CHECK VALVE TO MSIV	OPENING-FROM ACCUMULATOR	CLOSING-VALVE CONTROL PANEL TO MSIV	DRAIN LINE
F008A	**-NB-170	**-NB-171	**-NB-172	**-NB-508
F008B	**-NB-173	**-NB-174	**-NB-175	**-NB-509
F008C	**-NB-176	**-NB-177	**-NB-178	**-NB-510
F008D	**-NB-179	**-NB-180	**-NB-181	**-NB-511
F009A	**-NB-182	**-NB-183	**-NB-184	**-NB-512
F009B	**-NB-185	**-NB-186	**-NB-187	**-NB-513
F009C	**-NB-188	**-NB-189	**-NB-190	**-NB-514
F009D	**-NB-191	**-NB-192	**-NB-193	**-NB-515

TABLE 9 : PIPE NUMBERS FOR THE SAFETY/RELIEF VALVE (SRV) PNEUMATIC LINES

SRV	ADS PNEUMATIC LINES				PNEUMATIC LINES FOR POWER-ACTUATED RELIEF		
	CHECK VALVE TO SOV "ADS 2" TO SRV	BRANCH LINE FROM ACCUMULATOR	BRANCH LINE THRU SOV "ADS 1" TO SOV "ADS 2"	ACCUMULATOR DRAIN LINE	CHECK VALVE TO SOV "ADS 1" (ADS SRV) OR SRV (NON-ADS SRV)	BRANCH LINE FROM ACCUMULATOR	ACCUMULATOR DRAIN LINE
F010A	**-NB-194	**-NB-195	**-NB-196	**-NB-516	**-NB-197	**-NB-198	**-NB-517
F010B					**-NB-199	**-NB-200	**-NB-518
F010C	**-NB-201	**-NB-202	**-NB-203	**-NB-519	**-NB-204	**-NB-205	**-NB-520
F010D					**-NB-206	**-NB-207	**-NB-521
F010E					**-NB-208	**-NB-209	**-NB-522
F010F	**-NB-210	**-NB-211	**-NB-212	**-NB-523	**-NB-213	**-NB-214	**-NB-524
F010G					**-NB-215	**-NB-216	**-NB-525
F010H	**-NB-217	**-NB-218	**-NB-219	**-NB-526	**-NB-220	**-NB-221	**-NB-527
F010J					**-NB-222	**-NB-223	**-NB-528
F010K					**-NB-224	**-NB-225	**-NB-529
F010L	**-NB-226	**-NB-227	**-NB-228	**-NB-530	**-NB-229	**-NB-230	**-NB-531
F010M					**-NB-231	**-NB-232	**-NB-532
F010N	**-NB-233	**-NB-234	**-NB-235	**-NB-533	**-NB-236	**-NB-237	**-NB-534
F010P					**-NB-238	**-NB-239	**-NB-535
F010R	**-NB-240	**-NB-241	**-NB-242	**-NB-536	**-NB-243	**-NB-244	**-NB-537
F010S					**-NB-245	**-NB-246	**-NB-538
F010T	**-NB-247	**-NB-248	**-NB-249	**-NB-539	**-NB-250	**-NB-251	**-NB-540
F010U					**-NB-252	**-NB-253	**-NB-541

TABLE 10 : PIPE NUMBERS FOR THE MAIN STEAM LINE (MSL) INSTRUMENT LINES

MAIN STEAM LINE	MSL FLOW RESTRICTOR INSTRUMENT LINES				MSL PRESSURE TEST POINT
	INSTRUMENT LINE TO LDS		INSTRUMENT LINE TO LDS & FDWC		
	MSL TO REDUCER	REDUCER TO EXCESS FLOW CHECK VALVE	MSL TO REDUCER	REDUCER TO EXCESS FLOW CHECK VALVE	
A	25A-NB-764	20A-NB-765	25A-NB-766	20A-NB-767	20A-NB-780
B	25A-NB-768	20A-NB-769	25A-NB-770	20A-NB-771	20A-NB-781
C	25A-NB-772	20A-NB-773	25A-NB-774	20A-NB-775	-
D	25A-NB-776	20A-NB-777	25A-NB-778	20A-NB-779	-

FIGURE 5.1-3 NUCLEAR BOILER SYSTEM P&ID (Sheet 11 of 11)

NOTES:

1. ALL SIGNALS ARE TRANSMITTED AS SERIAL DATA TO EACH TLU OR SLU THROUGH EACH SERIAL OUTPUT.

2. FOUR TEMPERATURE ELEMENTS SHALL BE LOCATED AT APPROXIMATELY EQUAL INTERVALS IN THE VERTICAL DIRECTION SO AS TO MONITOR AMBIENT TEMPERATURES OVER THE FULL HEIGHT OF THE DRYWELL.

3. TEMPERATURE DETECTORS SHALL BE LOCATED OR SHIELDED SO THAT THE DETECTOR IS SENSITIVE TO THE AIR TEMPERATURE AND NOT THE RADIATED HEAT FROM HOT EQUIPMENT.

4. ALL INSTRUMENT LINES THAT CONNECT TO THE REACTOR COOLANT PRESSURE BOUNDARY AND PENETRATE THE CONTAINMENT WALL SHALL HAVE 6.35 MM RESTRICTING ORIFICES INSIDE THE CONTAINMENT. SEE SUPPORTING DOCUMENTS 2&3 FOR ADDITIONAL REQUIREMENTS.

5. EACH INSTRUMENT LINE THROUGH THE CONTAINMENT WALL SHALL HAVE TWO ISOLATION VALVES OUTSIDE THE CONTAINMENT LOCATED AS CLOSE TO THE CONTAINMENT AS PRACTICAL.

6. SOLENOID OPERATED GLOBE VALVES MAY BE ADOPTED FOR THE AIR OPERATED VALVES.

7. THIS DOCUMENT PROVIDES A FUNCTIONAL DEFINITION OF THE REQUIRED SYSTEM LEVEL PROCESS MONITORING AND CONTROL INSTRUMENTATION. IT DOES NOT ADDRESS DETAILS OF THE METHODS BY WHICH SIGNALS FROM THESE COMPONENTS WILL BE PROCESSED. THIS PROCESSING MAY INVOLVE THE PLANT MULTIPLEXING SYSTEM (H23) OR MAY UTILIZE HARDWIRING. SPECIFIC ELECTRICAL ISOLATION REQUIREMENTS SHOWN ON THIS DRAWING MAY BE UNNECESSARY IF MULTIPLEXED SIGNAL TRANSMISSION PROVIDES INHERENT ISOLATION.

8. ALL ALARMS SHALL BE LOCATED IN THE MAIN CONTROL ROOM.

9. ALL INPUTS TO C91/PMCS SHALL BE CONTINUOUSLY RECORDED.

10. THE LDS SHALL BE DESIGNED IN ACCORDANCE WITH THE SYSTEM DESIGN SPECIFICATION (E31-4010). OTHER PRIMARY CONTAINMENT ISOLATION (PCV) VALVES, WHICH ARE PART OF OTHER SYSTEMS, ARE NOT SHOWN IN THIS IED. THOSE VALVES ARE SHOWN ON THE LDS/IBD - INTERLOCK BLOCK DIAGRAM (E31-1030).

11. FOR REACTOR WATER LEVELS MONITORING, SEE B21-1010.

12. FOR DRYWELL PRESSURE MONITORING, SEE B21-1010.

13. FOR DETECTION OF RADIATION LEAKAGE INTO COOLING WATER SUPPLYING RECIRC PUMP, RHR, AND CUW HEAT EXCHANGERS, SEE D11-1040.

14. LETTER DESIGNATIONS FOR FOUR DIVISIONS ARE AS FOLLOWS:

    A, E, J, N - DIVISION 1
    B, F, K, P - DIVISION 2
    C, G, L, R - DIVISION 3
    D, H, M, S - DIVISION 4

15. IF HEAT TRACING OF SAMPLE LINE IS NECESSARY TO PREVENT CONDENSATION, THE MAXIMUM ALLOWABLE SAMPLE TEMPERATURE IS LIMITED BY THE PHOTO MULTIPLIER TUBES IN THE MONITORING CHANNELS.

16. BALL VALVE MAY BE ADOPTED FOR THIS GATE VALVE.

17. DTM, TLU, SLU, OLU ARE PART OF SAFETY SYSTEM LOGIC AND CONTROL, (SEE REFERENCE DOCUMENT 121).

    A. DTMs SHOWN ON SHEETS 3 & 4 PROCESS SENSOR INPUTS FOR MSIV ISOLATION TRIP LOGIC.

    B. DTMs SHOWN ON SHEETS 5 & 6 PROCESS SENSOR INPUTS FOR ECCS ISOLATION TRIP LOGIC.

    C. DTMs SHOWN ON SHEETS 7 & 10 PROCESS SENSOR INPUTS FOR AUXILIARY ESF ISOLATION TRIP LOGIC.

    D. TLUs AND OLUs SHOWN ON SHEET 3 AND SHEET 4 PROCESS 2-OUT-OF-4 COINCIDENCE LOGIC FOR MSIV CLOSURE TRIP.

    E. SLUs SHOWN ON SHEETS 5 & 6 PROCESS 2-OUT-OF-4 COINCIDENCE LOGIC FOR ECCS ISOLATION.

    F. SLUs SHOWN ON SHEETS 7 & 10 PROCESS 2-OUT-OF 4 COINCIDENCE LOGIC FOR AUXILIARY ESF ISOLATION.

18. RMUs, MUX, EMS AND NEMS ARE PART OF THE MULTIPLEXING SYSTEM (H23).

19. ALL INSTRUMENT LINES ARE 20A-SS (STAINLESS STEEL) SCHEDULE 40, SAMPLING LINES ARE 32A-SS SCHEDULE 40.

REFERENCES

		MPL NO.
1.	REACTOR CORE ISOLATION COOLING SYSTEM P&ID	E51-1010
2.	NUCLEAR BOILER SYSTEM P&ID	B21-1010
3.	REACTOR WATER CLEANUP SYSTEM P&ID	G31-1010
4.	SAMPLING SYSTEM P&ID	P91-1010
5.	PROCESS RADIATION MONITORING SYSTEM IED	D11-1040
6.	RADWASTE SYSTEM P&ID	K17-1010
7.	INSTRUMENT AIR SYSTEM P&ID	P52-1010
8.	ESSENTIAL MULTIPLEXING SYSTEM IBD	H23-1030
9.	LEAK DETECTION & ISOLATION SYSTEM IBD	E31-1030
10.	REACTOR PROTECTION SYSTEM IED	C71-1040
11.	STANDBY LIQUID CONTROL SYSTEM IBD	C41-1030
12.	SAFETY SYSTEM & LOGIC CONTROL DS	A32-5280
13.	PERFORMANCE MONITORING & CONTROL SYSTEM IED	C91-1010
14.	NEUTRON MONITORING SYSTEM IED	C51-1010
15.	SUPPRESSION POOL CLEAN-UP SYSTEM P&ID	G51-1010
16.	REACTOR BUILDING WATER CLEAN-UP SYSTEM P&ID	P21-1010
17.	HVAC NORMAL COOLING WATER SYSTEM P&ID	P24-1010
18.	STANDBY GAS TREATMENT SYSTEM P&ID	T22-1010
19.	ATMOSPHERIC CONTROL SYSTEM P&ID	T31-1010
20.	FLAMMABILITY CONTROL SYSTEM P&ID	T49-1010
21.	HEATING, VENTILATING & AIR CONDITIONING P&ID	U41-1010

SUPPORTING DOCUMENTS

		MPL NO.
1.	PIPING AND INSTRUMENT DIAGRAM SYMBOLS	A10-3030
2.	PROCESS INSTRUMENTATION	A11-3030
3.	GROUP CLASSIFICATION & CONTAINMENT ISOLATION DIAG	A11-1030

LEGEND

SERIAL MULTIPLEXED DATA

MULTIPLE INSTRUMENT ELECTRICAL WIRING

SERIAL DATA

ABBREVIATIONS:

OLU - OUTPUT LOGIC UNIT
TLU - TRIP LOGIC UNIT
DTM - DIGITAL TRIP MODULE
RMU - REMOTE MULTIPLEXING UNIT
SLU - SAFETY SYSTEM LOGIC UNIT
EMS - ESSENTIAL MULTIPLEXING SYSTEM
NEMS - NON-ESSENTIAL MULTIPLEXING SYSTEM

MPL NO. E31-1040

Figure 5.2-8 LEAK DETECTION AND ISOLATION SYSTEM IED (Sheet 1 of 10)

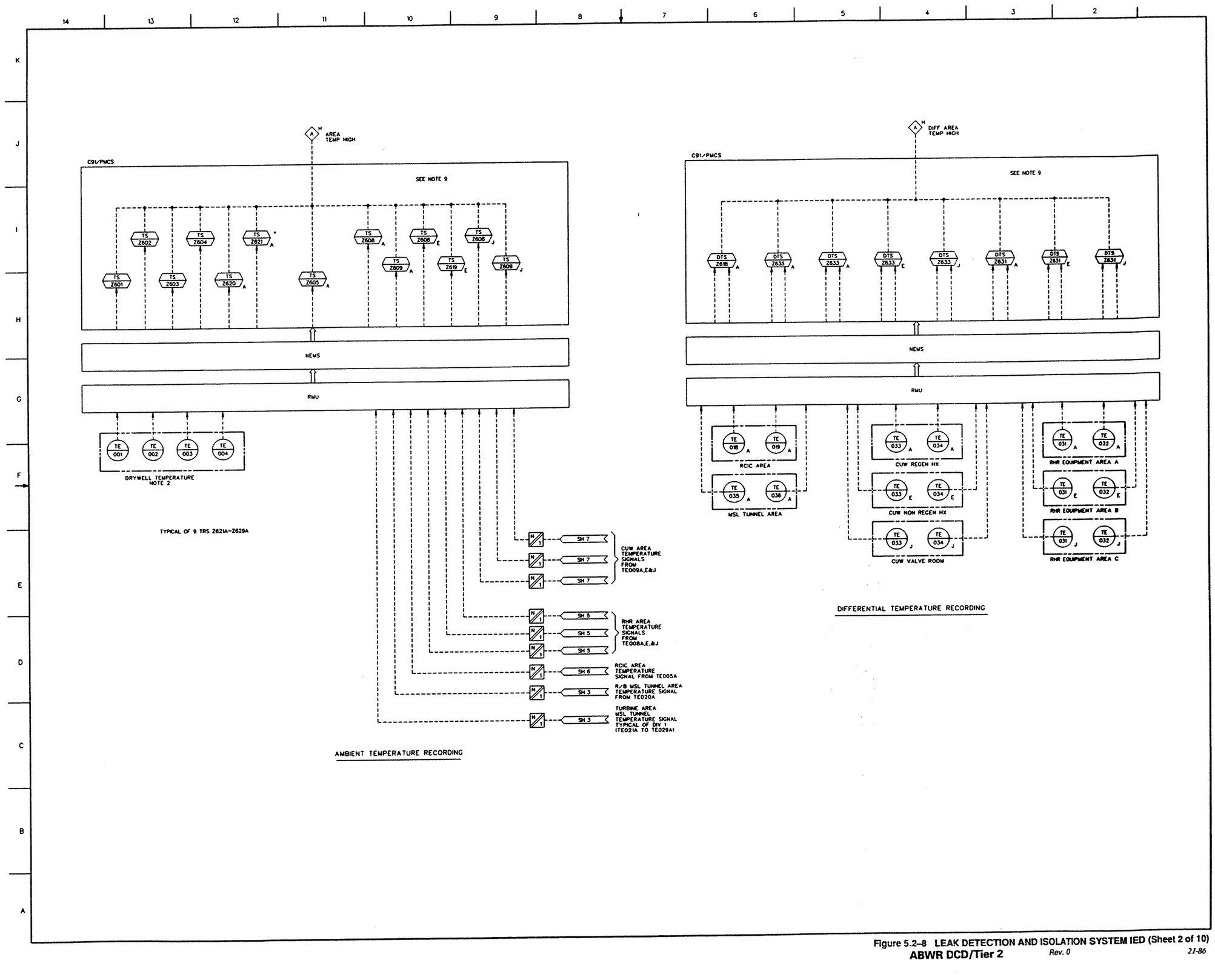
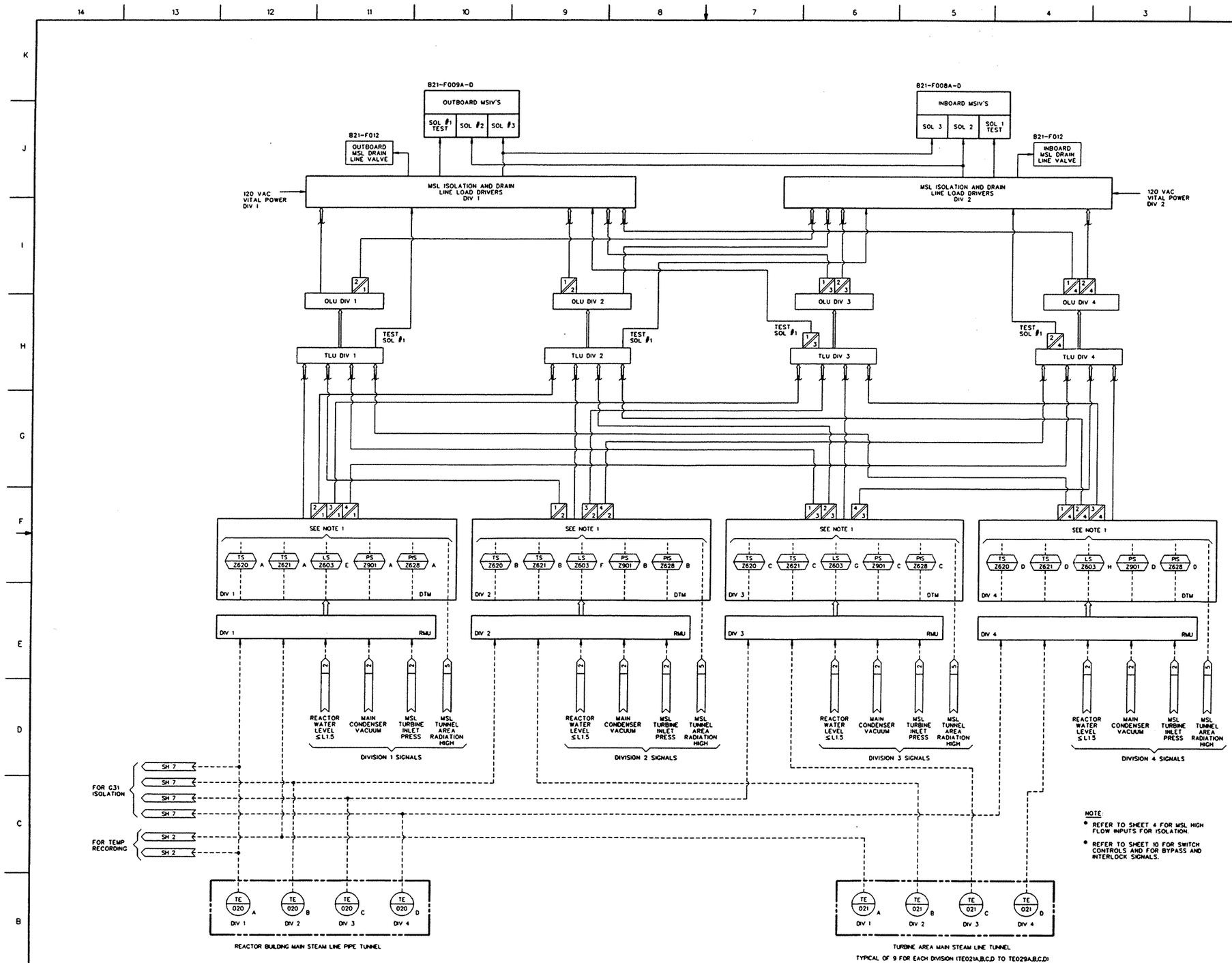


Figure 5.2–8 LEAK DETECTION AND ISOLATION SYSTEM IED (Sheet 2 of 10)



LEAK DETECTION AND ISOLATION FOR MAIN STEAM LINE ISOLATION AND DRAIN LINE VALVES
SEE NOTES 3 & 9

Figure 5.2–8 LEAK DETECTION AND ISOLATION SYSTEM IED (Sheet 3 of 10)

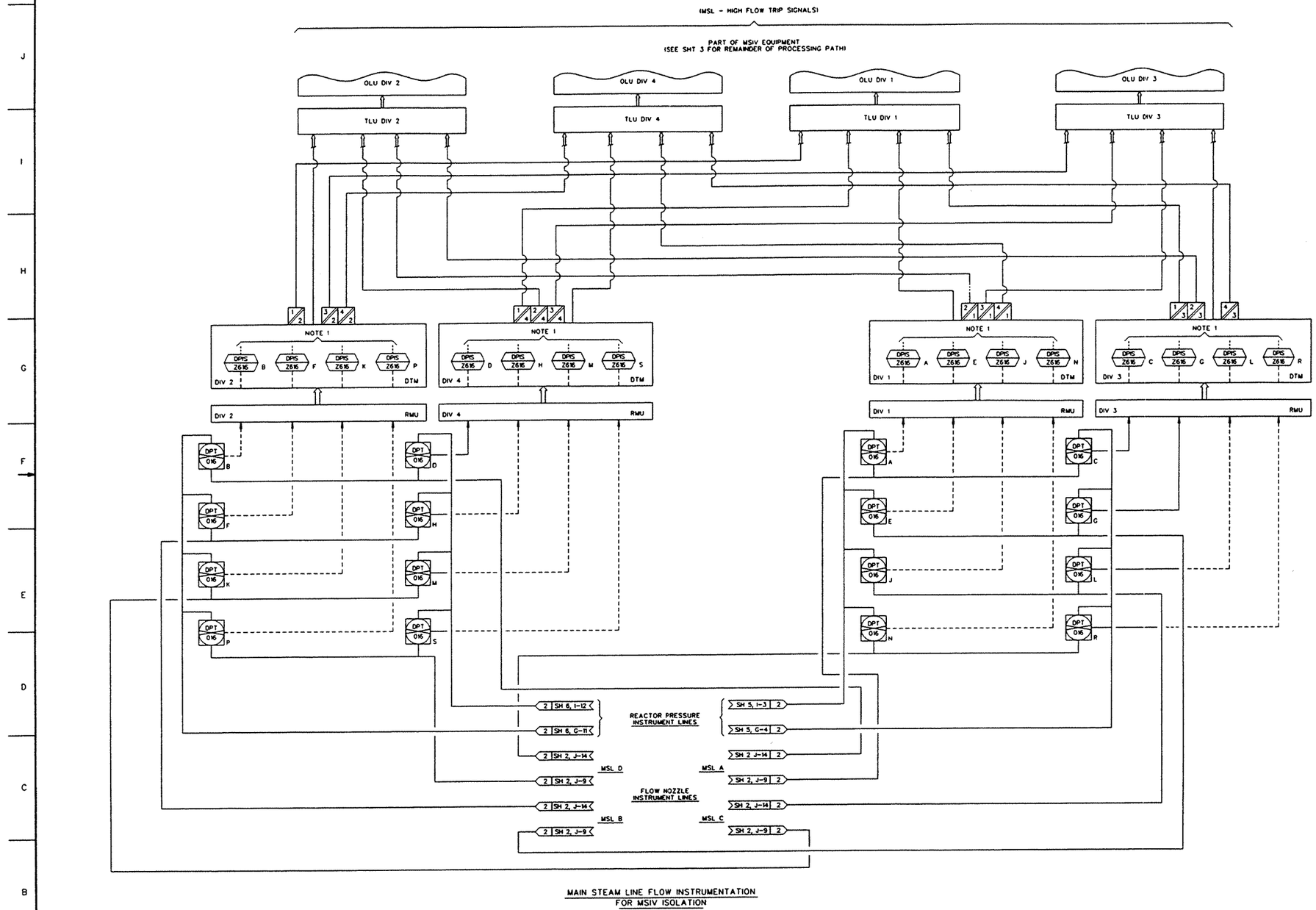
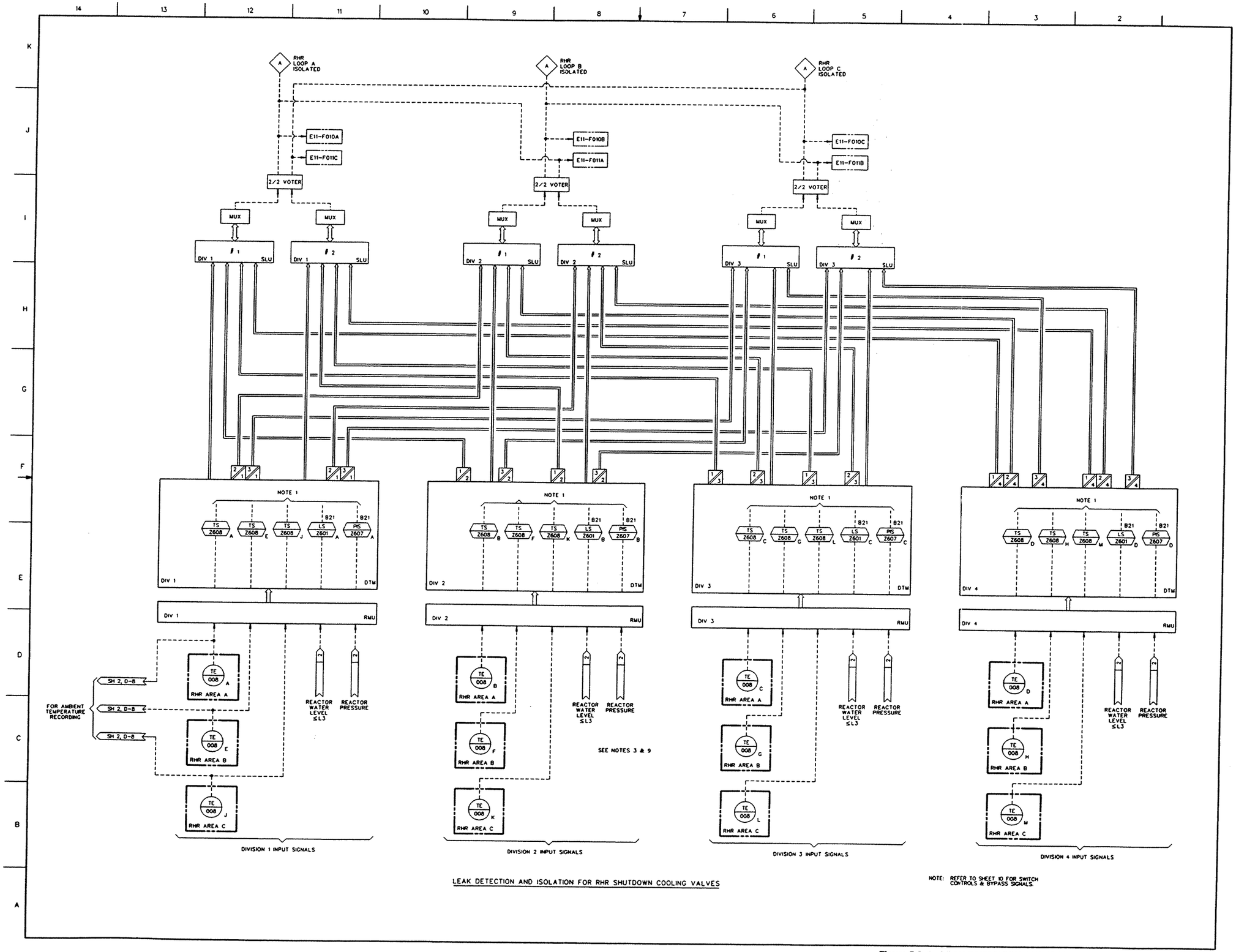


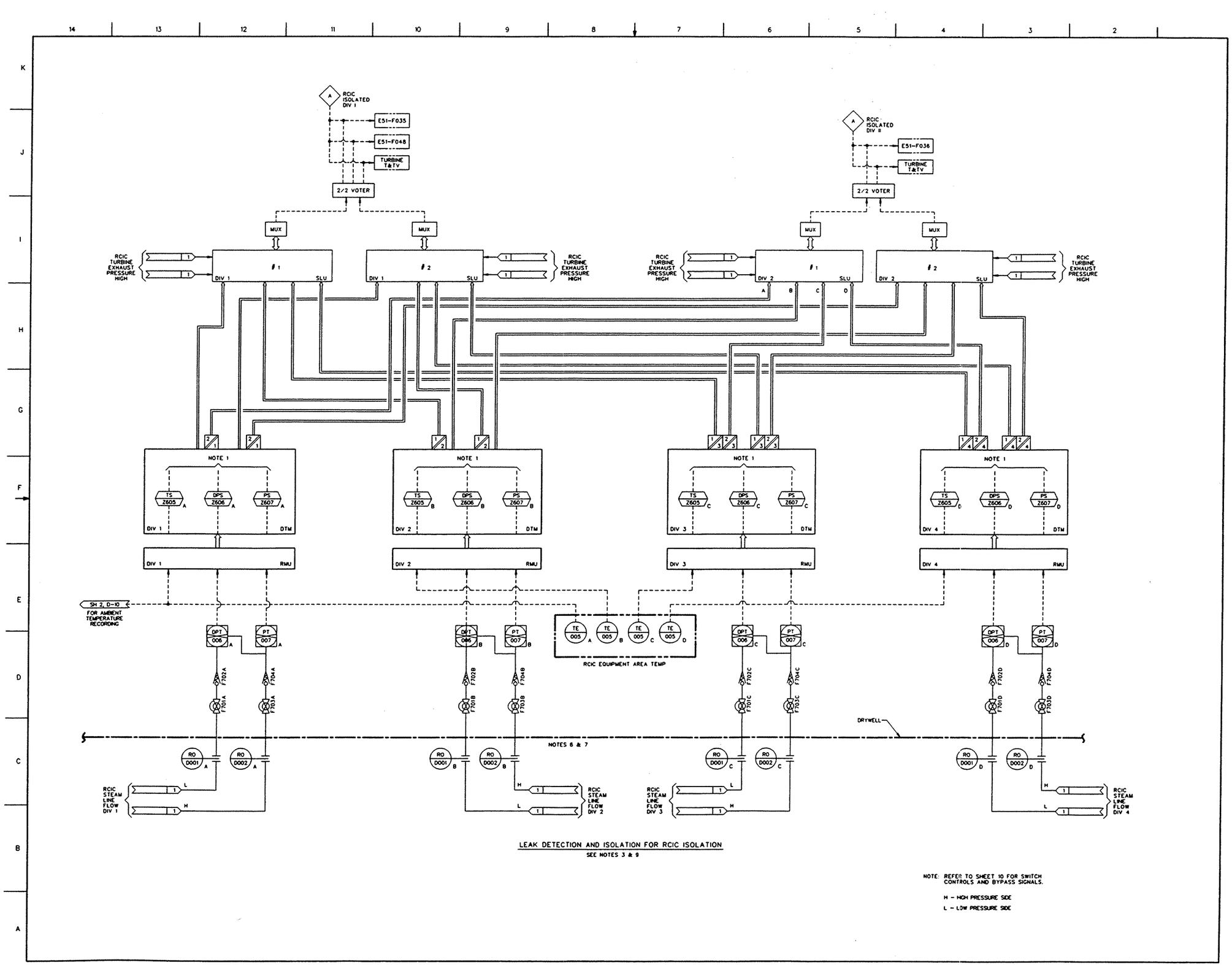
Figure 5.2–8 LEAD DETECTION AND ISOLATION SYSTEM IED (Sheet 4 of 10)



LEAK DETECTION AND ISOLATION FOR RHR SHUTDOWN COOLING VALVES

NOTE: REFER TO SHEET 10 FOR SWITCH CONTROLS & BYPASS SIGNALS.

Figure 5.2–8 LEAK DETECTION AND ISOLATION SYSTEM IED (Sheet 5 of 10)



LEAK DETECTION AND ISOLATION FOR RCIC ISOLATION
SEE NOTES 3 & 9

NOTE: REFER TO SHEET 10 FOR SWITCH CONTROLS AND BYPASS SIGNALS.

H – HIGH PRESSURE SIDE

L – LOW PRESSURE SIDE

Figure 5.2–8 LEAK DETECTION AND ISOLATION SYSTEM IED (Sheet 6 of 10)

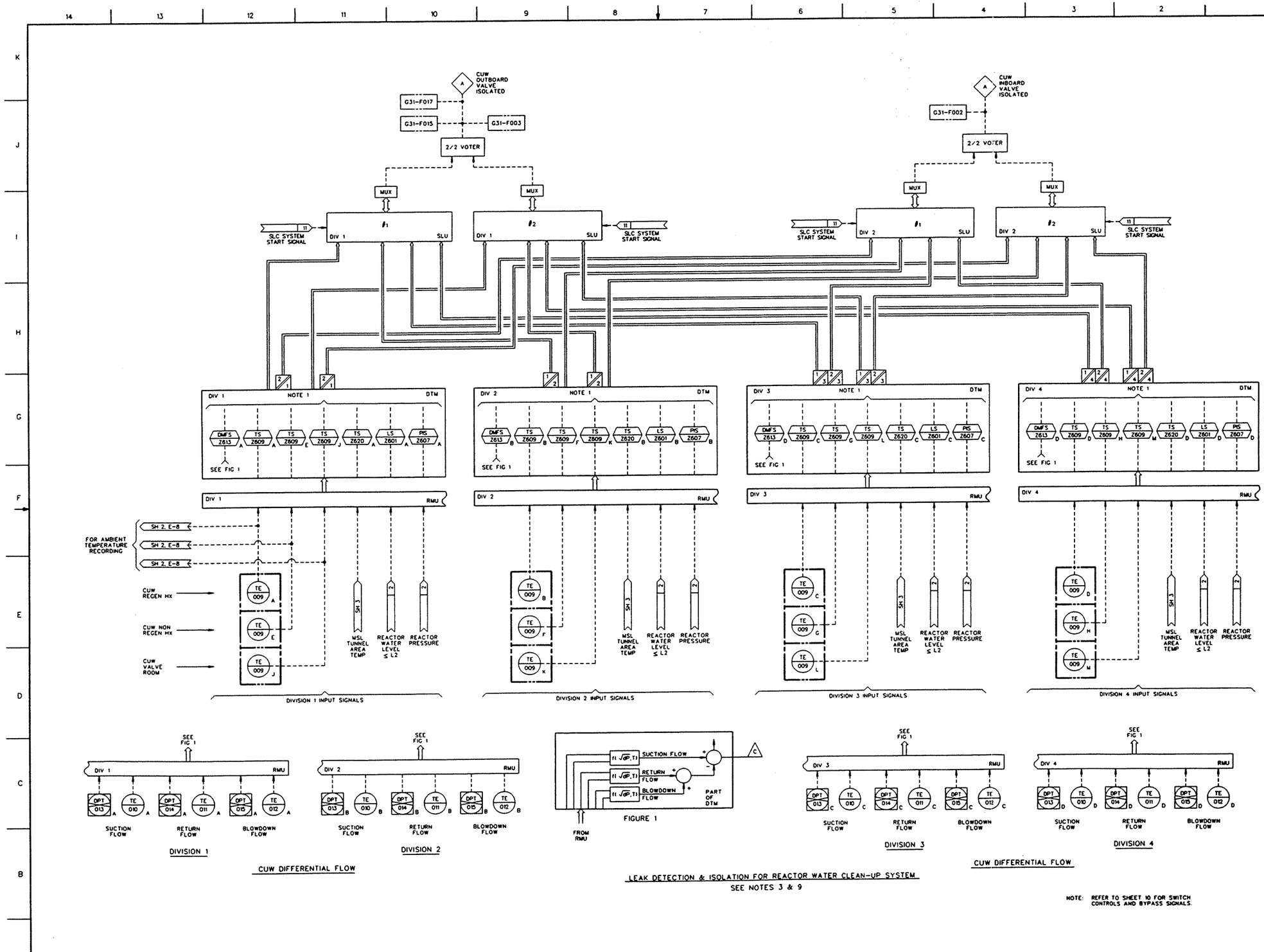


Figure 5.2-8 LEAK DETECTION AND ISOLATION SYSTEM IED (Sheet 7 of 10)

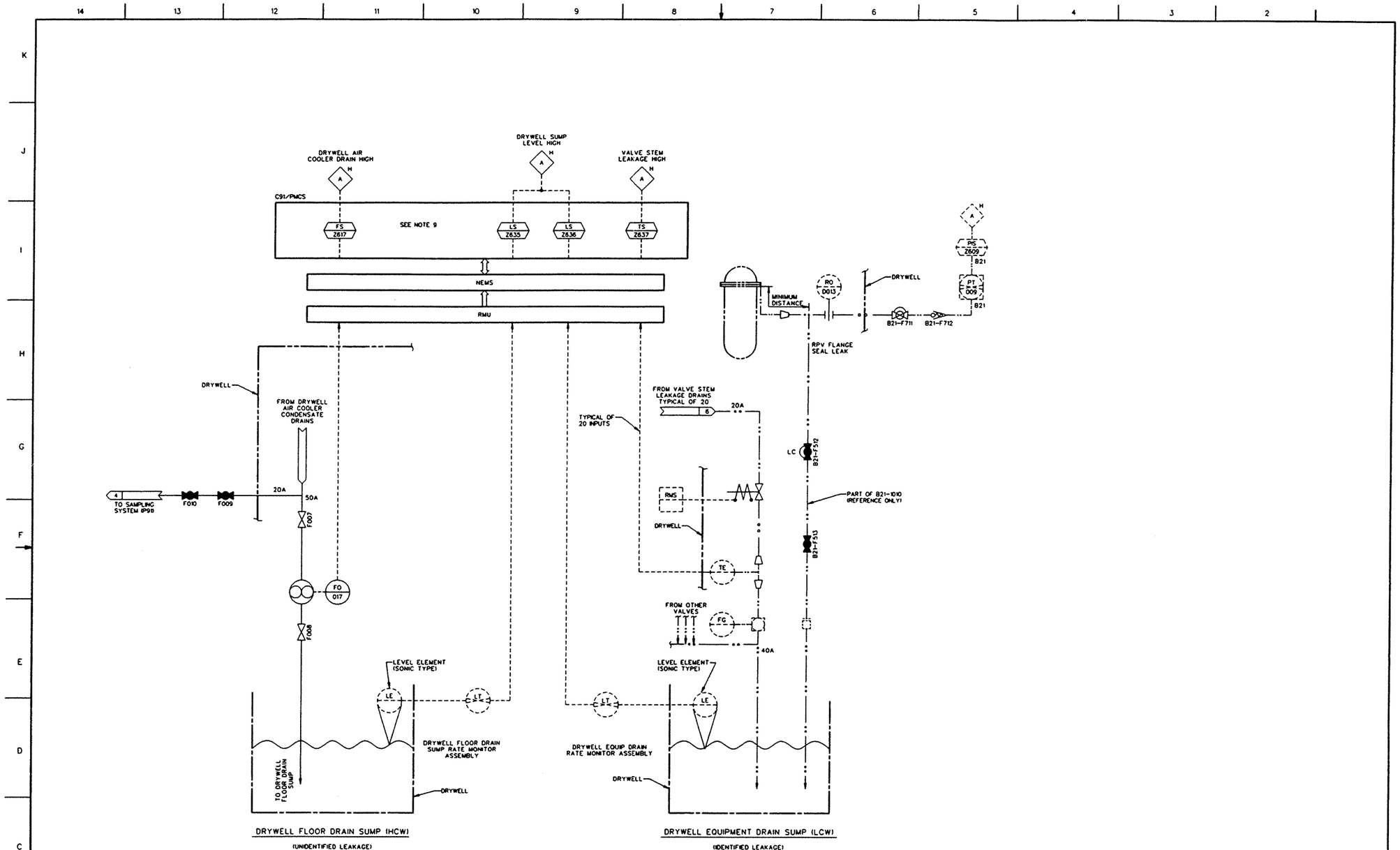


Figure 5.2–8 LEAK DETECTION AND ISOLATION SYSTEM IED (Sheet 8 of 10)

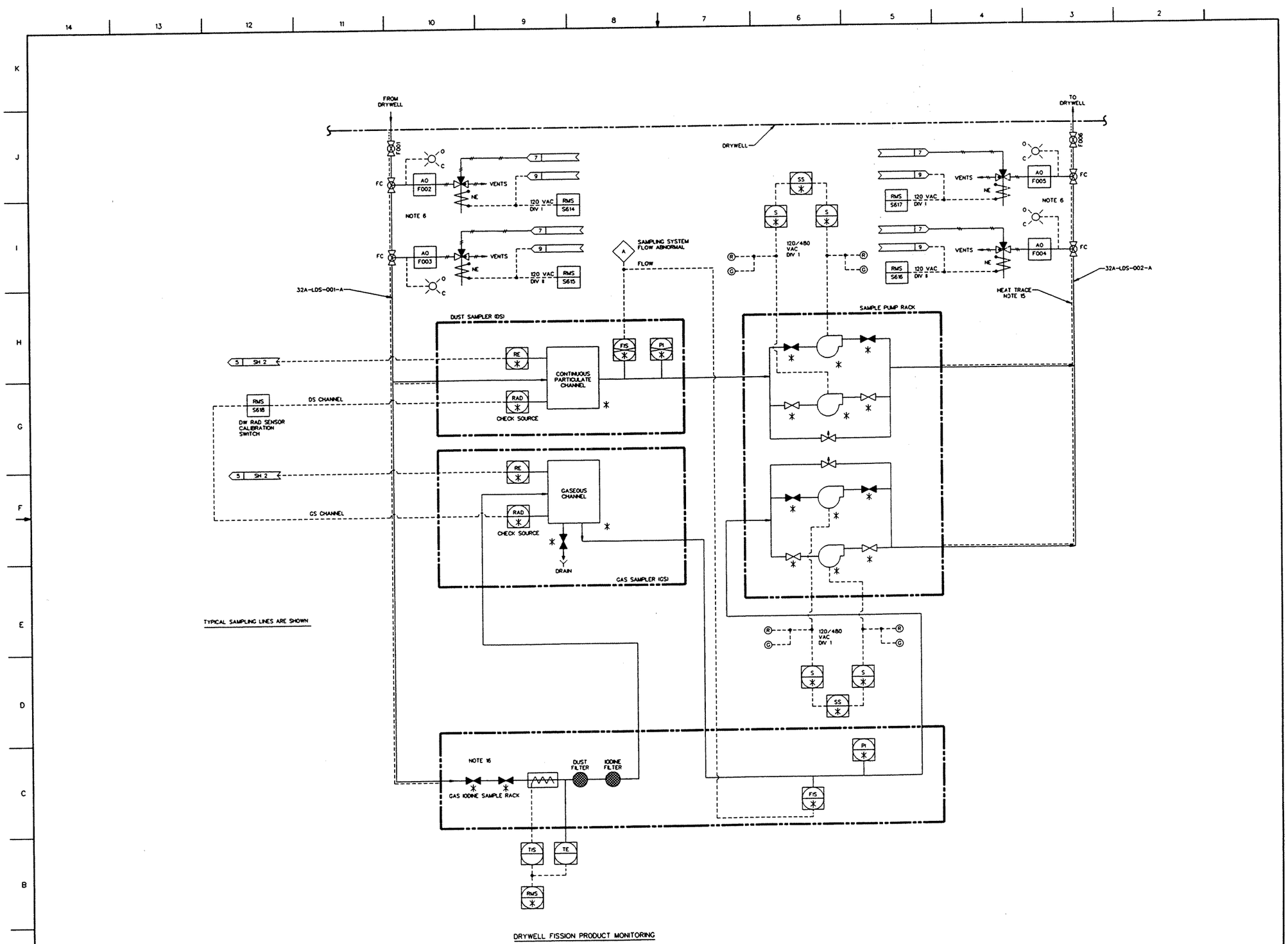
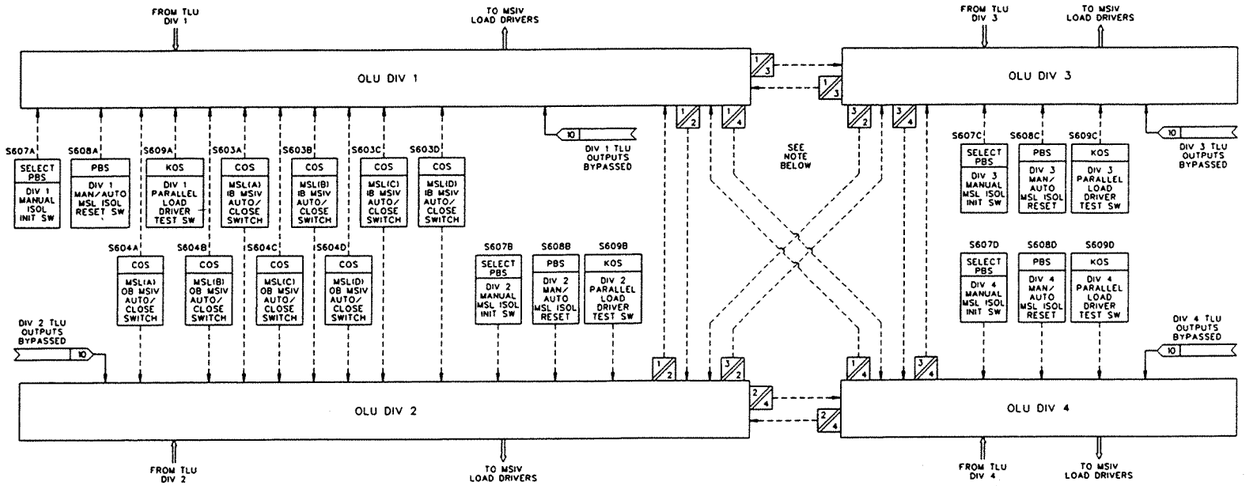
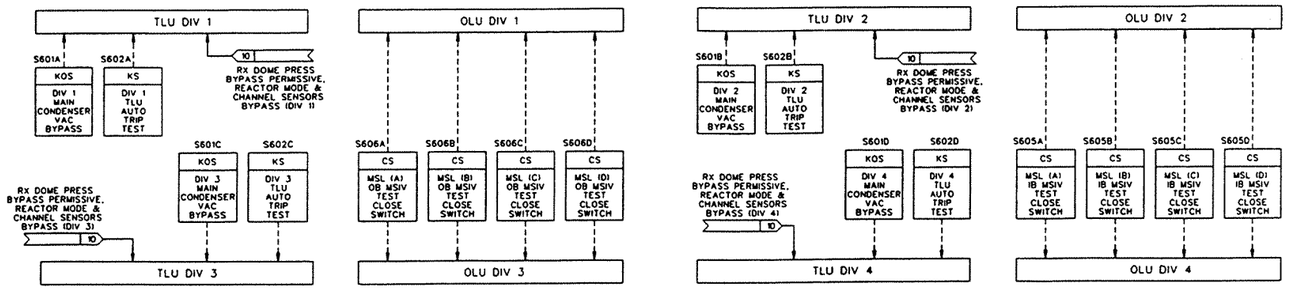
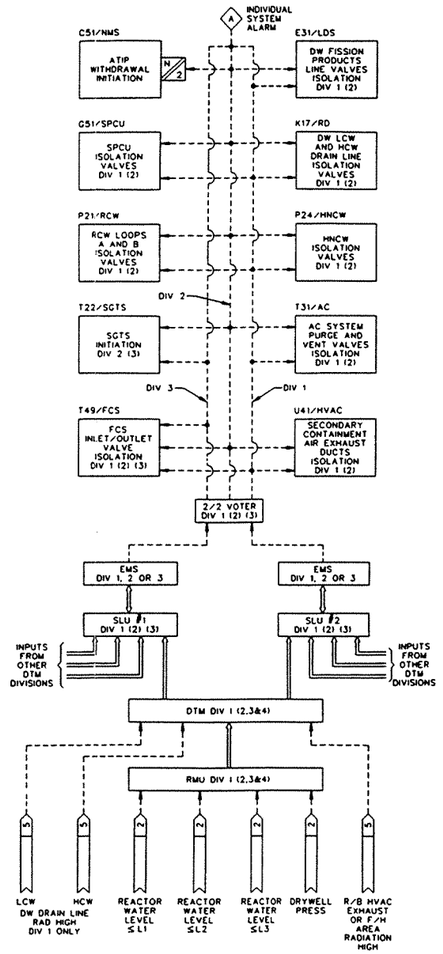


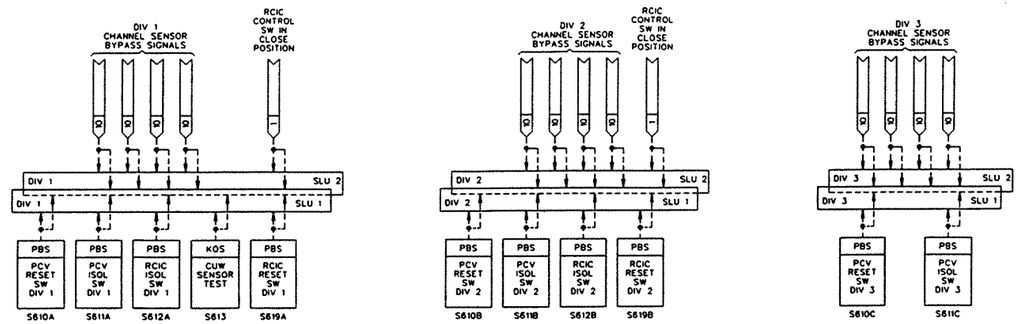
Figure 5.2–8 LEAK DETECTION AND ISOLATION SYSTEM IED (Sheet 9 of 10)







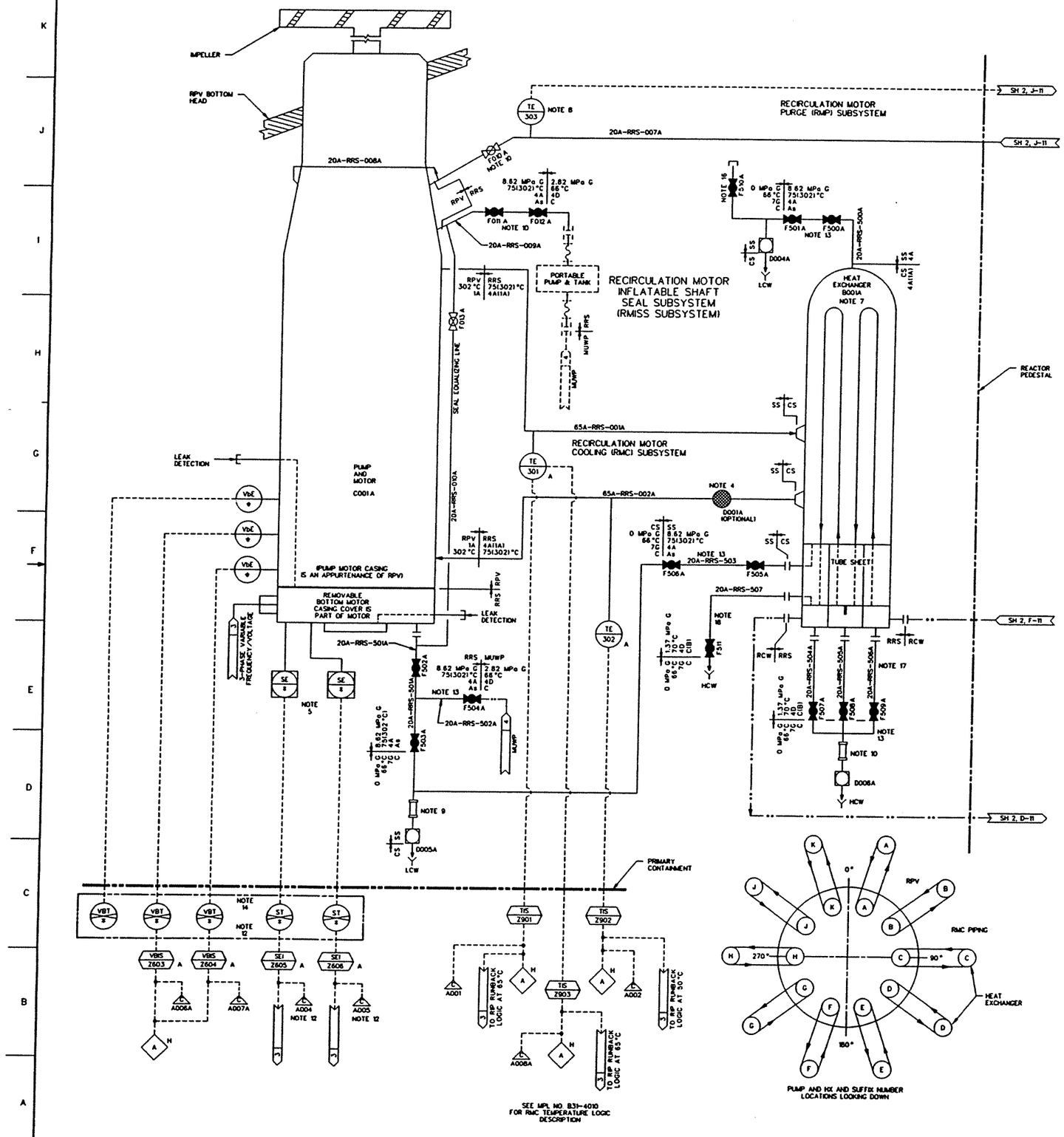
INPUT SIGNALS TO ESF AND OTHER SYSTEMS
TYPICAL OF FOUR DIVISIONS



LEAK DETECTION SYSTEM SWITCHES AND OTHER INTERFACING SIGNALS

NOTE: THE INTERCONNECTING SIGNAL LINES BETWEEN OLU'S REPRESENT MSIV RESET DELAY INTERLOCKS TO PERMIT THE MSIV'S TO FULLY CLOSE BEFORE THEY CAN BE OPENED BY THE OPERATOR.

Figure 5.2-8 LEAK DETECTION AND ISOLATION SYSTEM IED (Sheet 10 of 10)



NOTES:

1. HIGH POINT VENT SHOULD BE PROVIDED FOR PURGE SUBSYSTEM, IF INTERMEDIATE HIGH POINTS EXIST.
2. CONTAINMENT ISOLATION VALVES SHALL BE LOCATED AS CLOSE AS POSSIBLE TO THE DRYWELL PENETRATION AND IN A HORIZONTAL POSITION.
3. ALL EQUIPMENT AND INSTRUMENTS SHALL BE PREFIXED BY B31 UNLESS OTHERWISE SPECIFIED.
4. FILTER D001 IS OPTIONAL IF REACTOR PRE CRITICAL FLUSHING IS ACCORDING TO A11-3070 (CE 1.A.13C). IF FILTER IS USED, SEPARATOR OR FILTER INTERNALS FOR INITIAL SYSTEM FLUSHING TO BE INSTALLED TEMPORARILY WHEN NEEDED. HOUSING IS WELDED PERMANENTLY IN LINE.
5. SPEED ELEMENTS ACCURACY SHALL CONFORM TO REFERENCE DOCUMENT 5 REQUIREMENTS.
6. D003 MAY BE EXCLUDED IF THE D002 FLOW REGULATOR IS CAPABLE OF THE COMPLETE DIFFERENTIAL PRESSURE RANGE.
7. RECIRCULATION MOTOR HEAT EXCHANGER B001 SUPPLIED WITH EACH C001 PUMP. INTERNAL TUBING CONFIGURATION OPTIONAL.
8. TE 303 LOCATED AS CLOSE AS POSSIBLE TO MOTOR CASING. TE 303 INSTALLED ONLY IN SHORTEST AND LONGEST PURGE LINES ONLY (TWO TOTAL).
9. OPTIONAL REMOVABLE SPOOL PIECE FOR DRAIN WATER SAMPLING.
10. LOCATE VALVES AS CLOSE TO MOTOR CASING AS POSSIBLE BUT BELOW RPV BOTTOM HEAD INSULATION.
11. RCW SYSTEM SHOWN IN PHANTOM, BUT THIS RCW PIPE CONFIGURATION AND COMPONENTS ARE REQUIRED BY RRS (B31) SYSTEM.
12. THE RIP SPEED AND VIBRATION ANALOG SIGNALS SHALL BE INPUT TO THE PLANT PROCESS COMPUTER AND PERMANENT CONNECTIONS FOR TEMPORARY SPECIAL RIP MOTOR ANALYTICAL AND RECORDING EQUIPMENT.
13. VENT AND DRAIN VALVES SHOULD BE CENTRALLY LOCATED FOR EACH PUMP AND HX.
14. LOCAL PANEL CONTAINING 3Ø VIBRATION AND 2Ø SPEED TRANSMITTERS, ALL SUPPLIED BY PUMP SUPPLIER.
15. ALL RRS PIPING IS SEISMIC CLASS As EXCEPT RIP HX TUBE SIDE DRAIN PIPES.
16. F510 VENT VALVE OPTIONAL FOR FASTER HX DRAINING/VENTING. IF F510 IS USED, VENT PIPE SHOULD BE ROUTED UPWARDS TO PREVENT WATER DRAINING ONTO FLOOR.
17. HX DRAIN LINES MUST BE DIFFERENT CONFIGURATION THAN SHOWN PROVIDING HX BOTTOM COVER CAN BE COMPLETELY DRAINED PRIOR TO DISASSEMBLY.
18. OPTIONAL RCW VENT.
19. PIPE WITH A DESIGN PRESSURE OF 2.82 MPa OR GREATER SHALL HAVE ITS MINIMUM WALL THICKNESS NO LESS THAN THAT OF A STANDARD WEIGHT PIPE, THICKER THAN STANDARD WEIGHT PIPE SHALL BE USED IF REQUIRED BY THE DESIGN PRESSURE OR OTHER REQUIREMENTS.
20. VALVES WITH A DESIGN PRESSURE OF 2.82 MPa OR GREATER SHALL BE A MINIMUM OF CLASS 300, OR OF A HIGHER CLASS IF REQUIRED BY THE DESIGN PRESSURE.

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

		MFL NO.
1.	CONTROL ROD DRIVE SYS P&ID	C12-1010
2.	REACTOR BUILDING COOLING WATER SYS P&ID	P21-1010
3.	RECIRC FLOW CONTROL SYS IED	C81-1040
4.	MAKE-UP WATER (PURIFIED) SYS P&ID	P11-1010
5.	PIPING AND INSTRUMENT SYMBOLS DIAGRAM	A10-3030

MFL NO. B31-1010

FIGURE 5.4-4 REACTOR RECIRCULATION SYSTEM P&ID (Sheet 1 of 2)

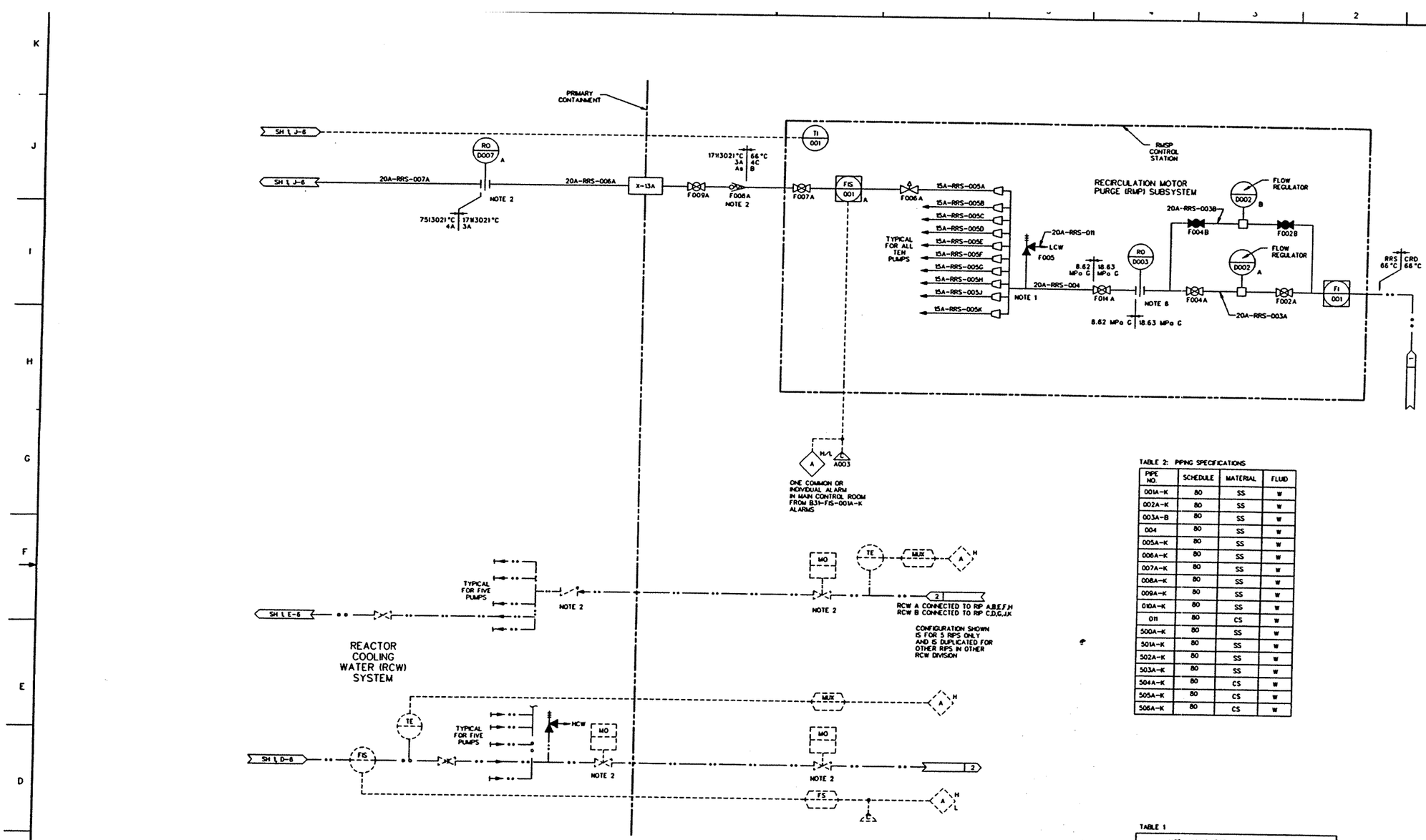


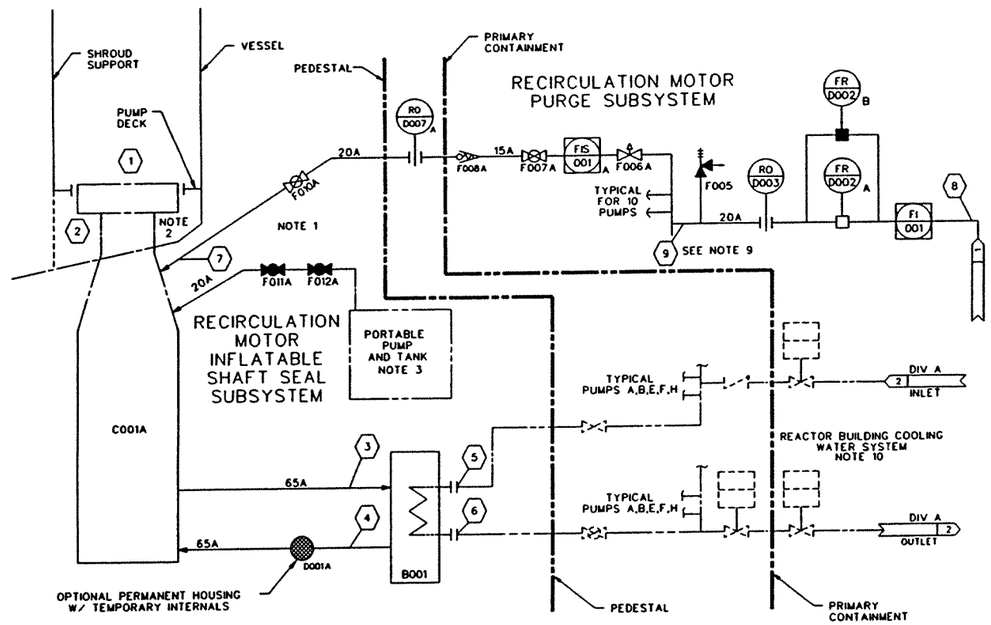
TABLE 2: PIPING SPECIFICATIONS

PIPE NO.	SCHEDULE	MATERIAL	FLUID
001A-K	80	SS	W
002A-K	80	SS	W
003A-B	80	SS	W
004	80	SS	W
005A-K	80	SS	W
006A-K	80	SS	W
007A-K	80	SS	W
008A-K	80	SS	W
009A-K	80	SS	W
010A-K	80	SS	W
011	80	CS	W
500A-K	80	SS	W
501A-K	80	SS	W
502A-K	80	SS	W
503A-K	80	SS	W
504A-K	80	CS	W
505A-K	80	CS	W
506A-K	80	CS	W

TABLE 1

MCR ANNUNCIATOR - ALARMS		
FUNCTION	PRIMARY SENSOR	SET POINT
RHRX PRIMARY SIDE INLET WATER TEMP HIGH	TE301	60 °C
RHRX PRIMARY SIDE OUTLET WATER TEMP HIGH	TE302	45 °C
RP VIBRATION HIGH	VBE	7 mm/s
RP VIBRATION HIGH	VBE	7 mm/s
RP SEAL PURGE FLOW/ PRESSURE HIGH/LOW	FIS001	0.78-1.02 LITERS/min
RHRX SEC COOL WATER OUTLET FLOW HIGH/LOW	SEE P21	SEE P21
RHRX SEC COOL WATER INLET/OUTLET HIGH TEMP	SEE P21	SEE P21

FIGURE 5.4-4 REACTOR RECIRCULATION SYSTEM P&ID (Sheet 2 of 2)



RECIRCULATION MOTOR COOLING SUBSYSTEM
REPEATED FOR PUMPS C,D,G,J,K

MODE "A1" REACTOR NORMAL OPERATION (10 PUMPS OPERATING)
ALL PUMPS ARE AT SAME SPEED
CORE FLOW = 111% -- RATED DESIGN
PUMP SPEED ≤ 100% OF RATED (NOTE 6) SEE NOTE 5

POSITION ○	1	2	3	4	5	6	7	8
FLOW m^3/h	7700	7700	8	8	30 Max	30 Max	0.78/1.02 NOTES 4&11	7.8/10.2 NOTES 4&11
TEMP (°C)	279	279	55	39	35		30/70	40/60
PRESS MPa A	7.25 TDH=40.0 m	7.54	7.65	7.63	Δ P = 0.098 Max			15.30
AVAILABLE NPSH (m)	121							

MODE "A2" REACTOR NORMAL OPERATION (10 PUMPS OPERATING)
ALL PUMPS ARE AT SAME SPEED
CORE FLOW = 100% -- RATED DESIGN
PUMP SPEED ≤ 90% OF RATED (NOTE 6) SEE NOTE 5

POSITION ○	1	2	3	4	5	6	7	8
FLOW m^3/h	6912	6912	7	7	30 Max	30 Max	0.78/1.02 NOTES 4&11	7.8/10.2 NOTES 4&11
TEMP (°C)	278	278	49	38	35		30/70	40/60
PRESS MPa A	7.25 TDH=32.6 m	7.49	7.59	7.57	Δ P = 0.098 Max			15.30
AVAILABLE NPSH (m)	134							

MODE "B1" REACTOR NORMAL OPERATION (9 PUMPS OPERATING)
ONE PUMP OUT OF SERVICE
CORE FLOW = 100% (RUNNING PUMP DATA)
PUMP SPEED ≤ 100% OF RATED (NOTE 6) SEE NOTE 5

POSITION ○	1	2	3	4	5	6	7	8
FLOW m^3/h	8291	8291	8	8	30 Max	30 Max	0.78/1.02 NOTES 4&11	7.8/10.2 NOTES 4&11
TEMP (°C)	278	278	55	39	35		30/70	40/60
PRESS MPa A	7.25 TDH=35.8 m	7.51	7.59	7.57	Δ P = 0.098 Max			15.30
AVAILABLE NPSH (m)	134							

MODE "B2" REACTOR NORMAL OPERATION -- (9 PUMPS OPERATING)
DATA SHOWN FOR THE PUMP OUT OF SERVICE
CORE FLOW = 100%
PUMP SPEED = 0.0% OF RATED SEE NOTE 5

POSITION ○	1	2	3	4	5	6	7	8
FLOW m^3/h	-5370 NOTE 7	-5370 NOTE 7	NAT. CIRC.		30 Max	30 Max	0.78/1.02 NOTES 4&11	7.8/10.2 NOTES 4&11
TEMP (°C)	278	278			35		30/70	40/60
PRESS MPa A	7.25	7.51	7.59	7.57	Δ P = 0.098 Max			15.30
AVAILABLE NPSH (m)	134							

MODE "C" REACTOR HOT STANDBY -- (10 PUMPS OPERATING)
ALL PUMPS ARE AT SAME SPEED
CORE FLOW = 32.2%
PUMP SPEED = 47.12 rad/s SEE NOTE 5

POSITION ○	1	2	3	4	5	6	7	8
FLOW m^3/h	2295	2295	2	2	30 Max	30 Max	0.78/1.02 NOTES 4&11	7.8/10.2 NOTES 4&11
TEMP (°C)	282	282	36	35	35		30/70	40/60
PRESS MPa A	6.70 TDH= ≥ 3.6m	6.73	6.89	6.86	Δ P = 0.098 Max			15.30
AVAILABLE NPSH (m)	16							

MODE "D" REACTOR COLD STARTUP -- (10 PUMPS OPERATING)
ALL PUMPS ARE AT SAME SPEED
CORE FLOW = 32.2%
PUMP SPEED = 47.12 rad/s SEE NOTE 5

POSITION ○	1	2	3	4	5	6	7	8
FLOW m^3/h	2250	2250	2	2	30 Max	30 Max	0.78/1.02 NOTES 4&11	7.8/10.2 NOTES 4&11
TEMP (°C)	<100	<100	36	35	35		10/70	40/60
PRESS MPa A	0.18 TDH= ≥ 3.8m	0.22	0.18	0.22	Δ P = 0.098 Max			15.30
AVAILABLE NPSH (m)	20							

NOTES:

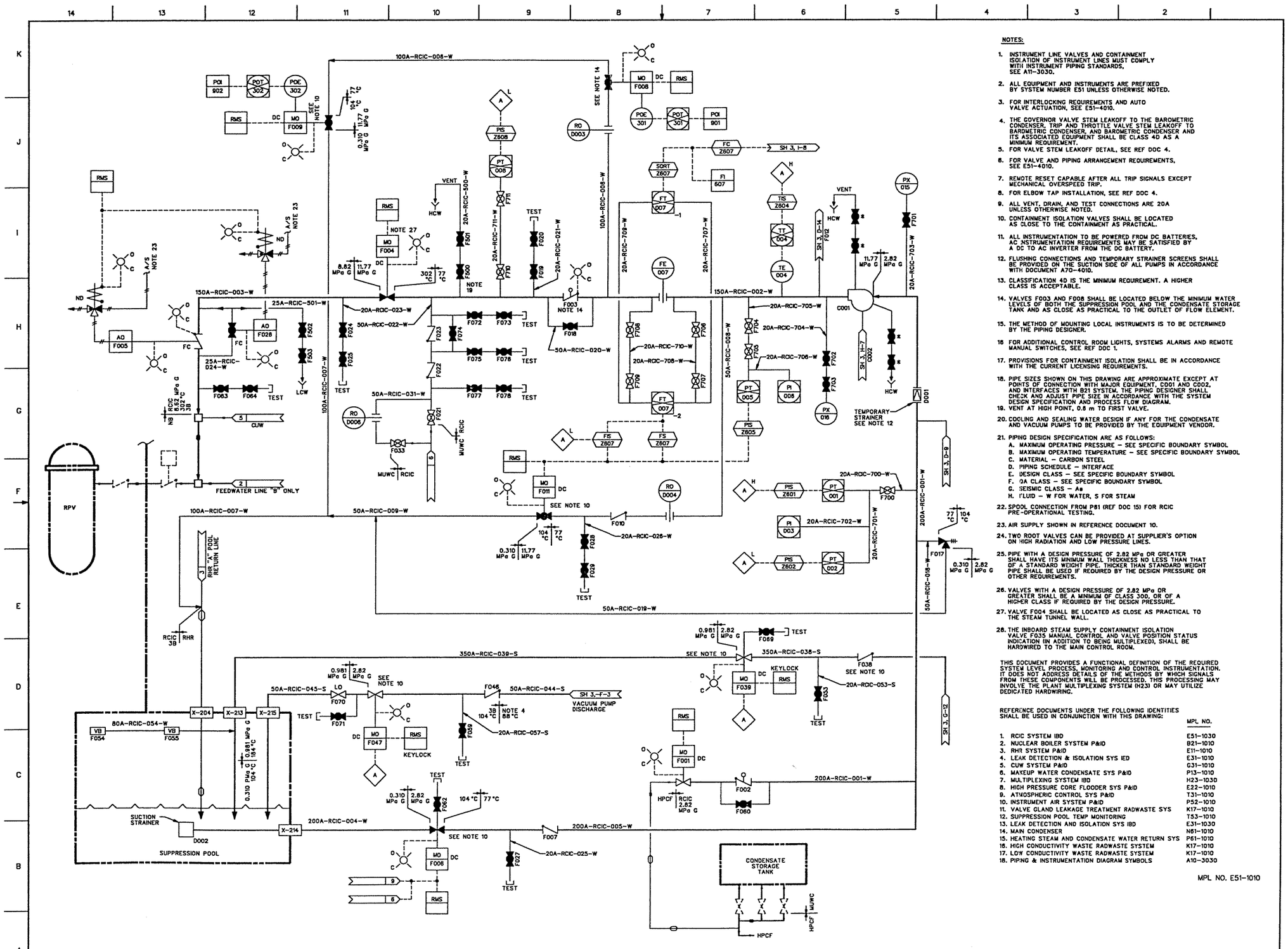
1. ALL VALVES SHOWN IN THIER NORMAL PLANT OPERATING POSITION AND ARE IN THE SAME POSITION FOR ALL OPERATING MODES
2. THE PURGE FLOW (RMP) 7 FLOWS IN TO THE REACTOR AT 2.
3. THE RECIRCULATION MOTOR INFLATABLE SHAFT SEAL SUBSYSTEM IS USED ONLY DURING SHUTDOWN.
4. XX/YY MEANS MIN/MAX CONDITIONS.
5. VALUES GIVEN FOR POSITION 1-7 ARE FOR EACH ONE OF THE PUMPS OPERATING IN THE DEFINED MODE CONDITION (9 OR 10 PUMPS OPERATING).
6. PUMP RATED SPEED ASSUMED AT 157.08 rad/s.
7. THIS VALUE IS MAXIMUM REVERSE FLOW.
8. TDH VALUES INCLUDE 5 PERCENT MARGIN.
9. POSITION "9" CREATED EXCLUSIVELY FOR DEFINING DESIGN PRESSURE/TEMPERATURE CONDITIONS (NOT PROCESS CONDITIONS).
10. RCW (P21) FOR RIP'S C,D,G,J,K, IS SIMILAR TO RIP'S A,B,E,F,H.
11. POSITIONS 7 & 8 FLOW IS Liter/min FOR ALL MODES.

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

	MPL NO.
1. CONTROL ROD DRIVE SYS, PFD	C12-1020
2. REAC BUILDING COOLING WATER SYSTEM, PFD	P21-1020
3. REAC RECIRC SYS P&ID	B31-1010
4. PIPING AND INSTRUMENT SYMBOLS DIAGRAM	A10-3030

MPL NO. B31-1020

FIGURE 5.4-5 REACTOR RECIRCULATION SYSTEM PFD



NOTES:

1. INSTRUMENT LINE VALVES AND CONTAINMENT ISOLATION OF INSTRUMENT LINES MUST COMPLY WITH INSTRUMENT PIPING STANDARDS, SEE A11-3030.
2. ALL EQUIPMENT AND INSTRUMENTS ARE PREFIXED BY SYSTEM NUMBER E51 UNLESS OTHERWISE NOTED.
3. FOR INTERLOCKING REQUIREMENTS AND AUTO VALVE ACTUATION, SEE E51-4010.
4. THE GOVERNOR VALVE STEM LEAKOFF TO THE BAROMETRIC CONDENSER, TRIP AND THROTTLE VALVE STEM LEAKOFF TO BAROMETRIC CONDENSER, AND BAROMETRIC CONDENSER AND ITS ASSOCIATED EQUIPMENT SHALL BE CLASS 4D AS A MINIMUM REQUIREMENT.
5. FOR VALVE STEM LEAKOFF DETAIL, SEE REF DOC 4.
6. FOR VALVE AND PIPING ARRANGEMENT REQUIREMENTS, SEE E51-4010.
7. REMOTE RESET CAPABLE AFTER ALL TRIP SIGNALS EXCEPT MECHANICAL OVERSPEED TRIP.
8. FOR ELBOW TAP INSTALLATION, SEE REF DOC 4.
9. ALL VENT, DRAIN, AND TEST CONNECTIONS ARE 20A UNLESS OTHERWISE NOTED.
10. CONTAINMENT ISOLATION VALVES SHALL BE LOCATED AS CLOSE TO THE CONTAINMENT AS PRACTICAL.
11. ALL INSTRUMENTATION TO BE POWERED FROM DC BATTERIES, AC INSTRUMENTATION REQUIREMENTS MAY BE SATISFIED BY A DC TO AC INVERTER FROM THE DC BATTERY.
12. FLUSHING CONNECTIONS AND TEMPORARY STRAINER SCREENS SHALL BE PROVIDED ON THE SUCTION SIDE OF ALL PUMPS IN ACCORDANCE WITH DOCUMENT A70-4010.
13. CLASSIFICATION 4D IS THE MINIMUM REQUIREMENT. A HIGHER CLASS IS ACCEPTABLE.
14. VALVES F003 AND F008 SHALL BE LOCATED BELOW THE MINIMUM WATER LEVELS OF BOTH THE SUPPRESSION POOL AND THE CONDENSATE STORAGE TANK AND AS CLOSE AS PRACTICAL TO THE OUTLET OF FLOW ELEMENT.
15. THE METHOD OF MOUNTING LOCAL INSTRUMENTS IS TO BE DETERMINED BY THE PIPING DESIGNER.
16. FOR ADDITIONAL CONTROL ROOM LIGHTS, SYSTEMS ALARMS AND REMOTE MANUAL SWITCHES, SEE REF DOC 1.
17. PROVISIONS FOR CONTAINMENT ISOLATION SHALL BE IN ACCORDANCE WITH THE CURRENT LICENSING REQUIREMENTS.
18. PIPE SIZES SHOWN ON THIS DRAWING ARE APPROXIMATE EXCEPT AT POINTS OF CONNECTION WITH MAJOR EQUIPMENT, C001 AND C002, AND INTERFACES WITH B21 SYSTEM. THE PIPING DESIGNER SHALL CHECK AND ADJUST PIPE SIZE IN ACCORDANCE WITH THE SYSTEM DESIGN SPECIFICATION AND PROCESS FLOW DIAGRAM.
19. VENT AT HIGH POINT, 0.8 m TO FIRST VALVE.
20. COOLING AND SEALING WATER DESIGN IF ANY FOR THE CONDENSATE AND VACUUM PUMPS TO BE PROVIDED BY THE EQUIPMENT VENDOR.
21. PIPING DESIGN SPECIFICATION ARE AS FOLLOWS:
    - A. MAXIMUM OPERATING PRESSURE – SEE SPECIFIC BOUNDARY SYMBOL
    - B. MAXIMUM OPERATING TEMPERATURE – SEE SPECIFIC BOUNDARY SYMBOL
    - C. MATERIAL – CARBON STEEL
    - D. PIPING SCHEDULE – INTERFACE
    - E. DESIGN CLASS – SEE SPECIFIC BOUNDARY SYMBOL
    - F. QA CLASS – SEE SPECIFIC BOUNDARY SYMBOL
    - G. SEISMIC CLASS – As
    - H. FLUID – W FOR WATER, S FOR STEAM
22. SPOOL CONNECTION FROM P81 (REF DOC 15) FOR RCIC PRE-OPERATIONAL TESTING.
23. AIR SUPPLY SHOWN IN REFERENCE DOCUMENT 10.
24. TWO ROOT VALVES CAN BE PROVIDED AT SUPPLIER'S OPTION ON HIGH RADIATION AND LOW PRESSURE LINES.
25. PIPE WITH A DESIGN PRESSURE OF 2.82 MPa OR GREATER SHALL HAVE ITS MINIMUM WALL THICKNESS NO LESS THAN THAT OF A STANDARD WEIGHT PIPE. THICKER THAN STANDARD WEIGHT PIPE SHALL BE USED IF REQUIRED BY THE DESIGN PRESSURE OR OTHER REQUIREMENTS.
26. VALVES WITH A DESIGN PRESSURE OF 2.82 MPa OR GREATER SHALL BE A MINIMUM OF CLASS 300, OR OF A HIGHER CLASS IF REQUIRED BY THE DESIGN PRESSURE.
27. VALVE F004 SHALL BE LOCATED AS CLOSE AS PRACTICAL TO THE STEAM TUNNEL WALL.
28. THE INBOARD STEAM SUPPLY CONTAINMENT ISOLATION VALVE F035 MANUAL CONTROL AND VALVE POSITION STATUS INDICATION IN ADDITION TO BEING MULTIPLEXED, SHALL BE HARDWIRED TO THE MAIN CONTROL ROOM.

THIS DOCUMENT PROVIDES A FUNCTIONAL DEFINITION OF THE REQUIRED SYSTEM LEVEL PROCESS, MONITORING AND CONTROL INSTRUMENTATION. IT DOES NOT ADDRESS DETAILS OF THE METHODS BY WHICH SIGNALS FROM THESE COMPONENTS WILL BE PROCESSED. THIS PROCESSING MAY INVOLVE THE PLANT MULTIPLEXING SYSTEM (N23) OR MAY UTILIZE DEDICATED HARDWIRING.

REFERENCE DOCUMENTS UNDER THE FOLLOWING IDENTITIES SHALL BE USED IN CONJUNCTION WITH THIS DRAWING:

	MPL NO.
1. RCIC SYSTEM IBD	E51-1030
2. NUCLEAR BOILER SYSTEM P&ID	B21-1010
3. RHR SYSTEM P&ID	E11-1010
4. LEAK DETECTION & ISOLATION SYS IED	E31-1010
5. CUW SYSTEM P&ID	G31-1010
6. MAKEUP WATER CONDENSATE SYS P&ID	P13-1010
7. MULTIPLEXING SYSTEM IBD	N23-1030
8. HIGH PRESSURE CORE FLOODER SYS P&ID	E22-1010
9. ATMOSPHERIC CONTROL SYS P&ID	T31-1010
10. INSTRUMENT AIR SYSTEM P&ID	P52-1010
11. VALVE GLAND LEAKAGE TREATMENT RADWASTE SYS	K17-1010
12. SUPPRESSION POOL TEMP MONITORING	T53-1010
13. LEAK DETECTION AND ISOLATION SYS IBD	E31-1030
14. MAIN CONDENSER	N61-1010
15. HEATING STEAM AND CONDENSATE WATER RETURN SYS	P61-1010
16. HIGH CONDUCTIVITY WASTE RADWASTE SYSTEM	K17-1010
17. LOW CONDUCTIVITY WASTE RADWASTE SYSTEM	K17-1010
18. PIPING & INSTRUMENTATION DIAGRAM SYMBOLS	A10-3030

MPL NO. E51-1010

FIGURE 5.4-8 REACTOR CORE ISOLATION COOLING SYSTEM P&ID (Sheet 1 of 3)

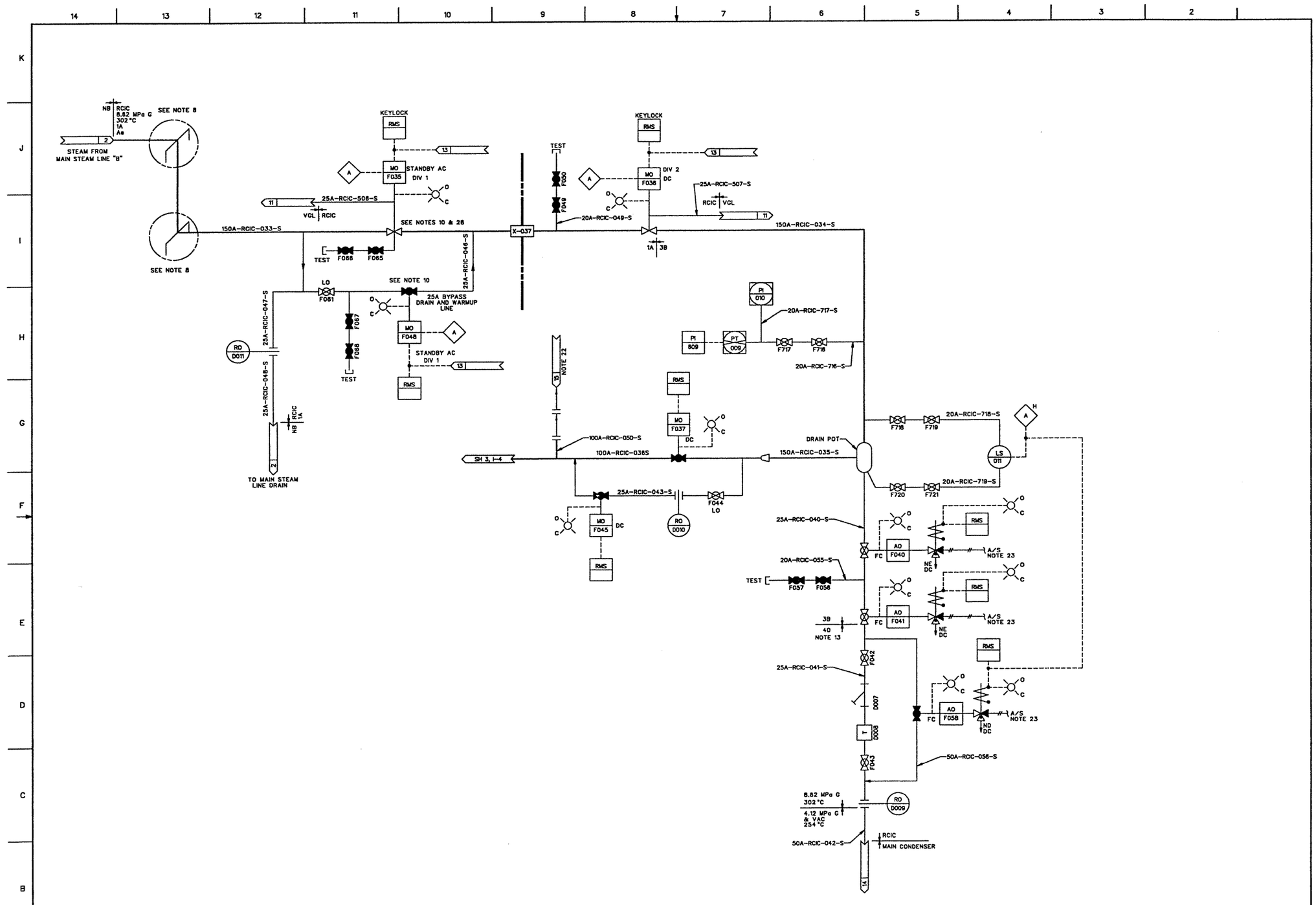


FIGURE 5.4-8 REACTOR CORE ISOLATION COOLING SYSTEM P&ID (Sheet 2 of 3)

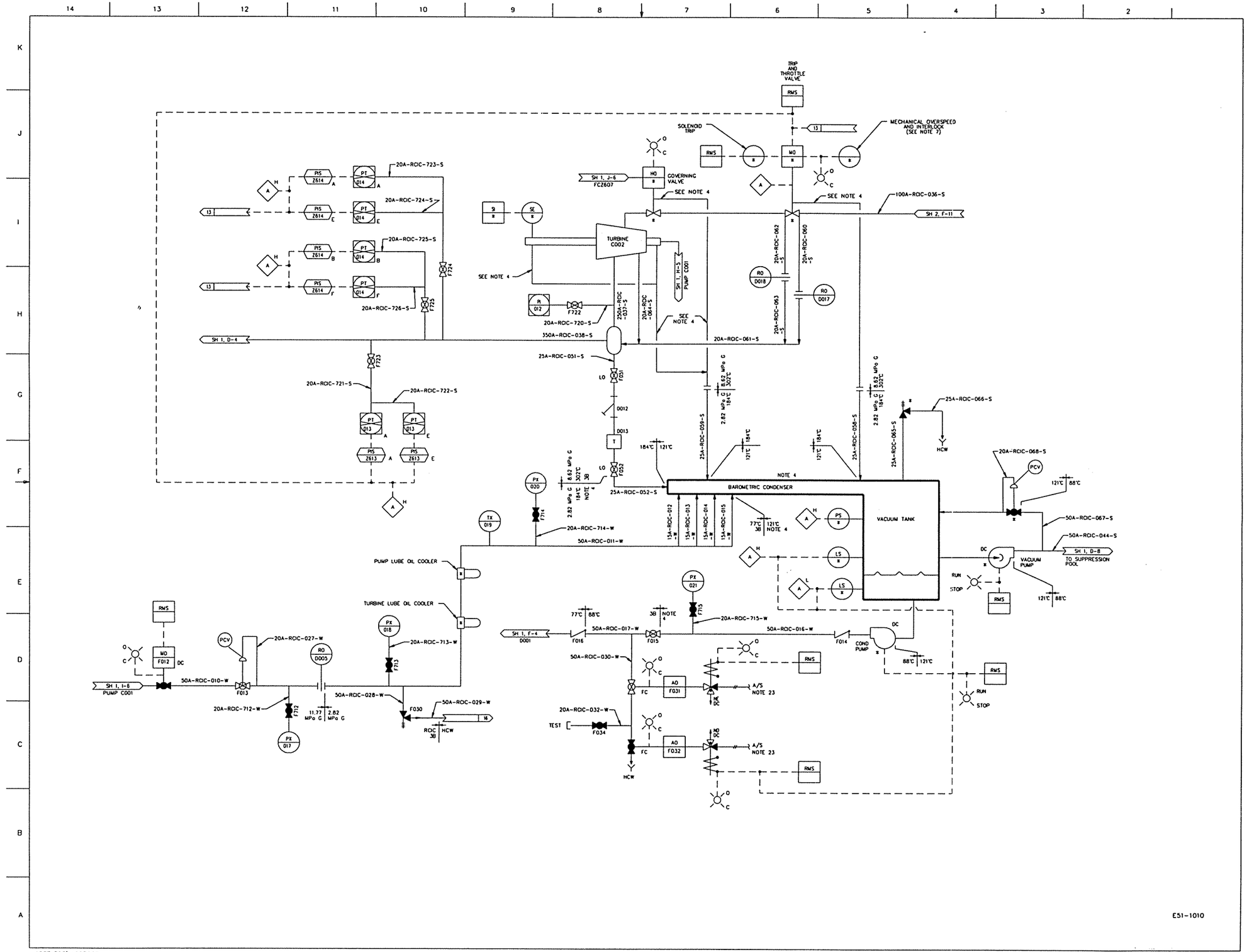


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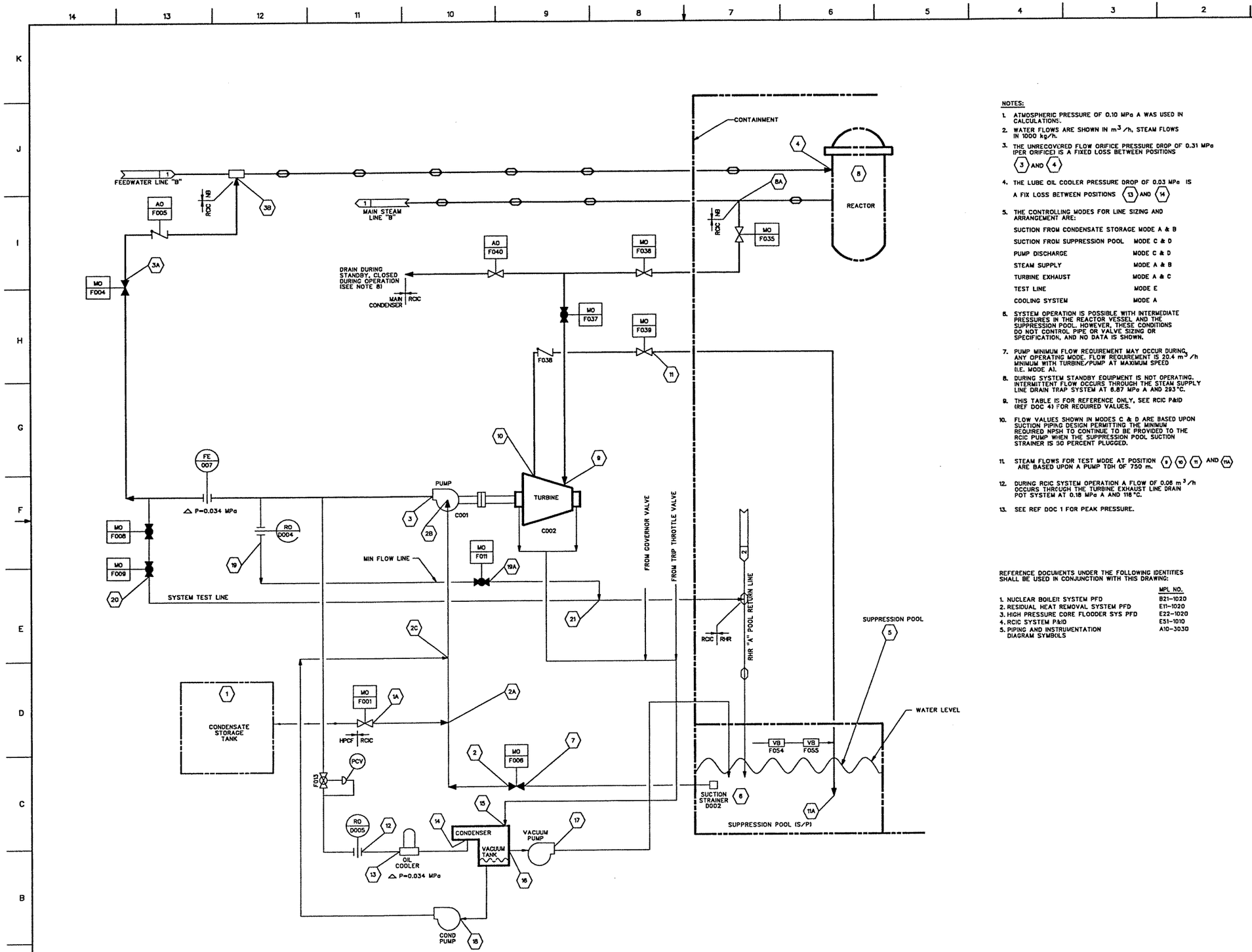
FIGURE 5.4-8 REACTOR CORE ISOLATION COOLING SYSTEM P&ID (Sheet 3 of 3)



NOTES:

1. ATMOSPHERIC PRESSURE OF 0.10 MPa A WAS USED IN CALCULATIONS.
2. WATER FLOWS ARE SHOWN IN m^3/h, STEAM FLOWS IN 1000 kg/h.
3. THE UNRECOVERED FLOW ORIFICE PRESSURE DROP OF 0.31 MPa (PER ORIFICE) IS A FIXED LOSS BETWEEN POSITIONS (3) AND (4)
4. THE LUBE OIL COOLER PRESSURE DROP OF 0.03 MPa IS A FIX LOSS BETWEEN POSITIONS (13) AND (14)
5. THE CONTROLLING MODES FOR LINE SIZING AND ARRANGEMENT ARE:

SUCTION FROM CONDENSATE STORAGE	MODE A & B
SUCTION FROM SUPPRESSION POOL	MODE C & D
PUMP DISCHARGE	MODE C & D
STEAM SUPPLY	MODE A & B
TURBINE EXHAUST	MODE A & C
TEST LINE	MODE E
COOLING SYSTEM	MODE A

6. SYSTEM OPERATION IS POSSIBLE WITH INTERMEDIATE PRESSURES IN THE REACTOR VESSEL AND THE SUPPRESSION POOL. HOWEVER, THESE CONDITIONS DO NOT CONTROL PIPE OR VALVE SIZING OR SPECIFICATION, AND NO DATA IS SHOWN.
7. PUMP MINIMUM FLOW REQUIREMENT MAY OCCUR DURING ANY OPERATING MODE. FLOW REQUIREMENT IS 20.4 m^3/h MINIMUM WITH TURBINE/PUMP AT MAXIMUM SPEED (I.E. MODE A1.
8. DURING SYSTEM STANDBY EQUIPMENT IS NOT OPERATING. INTERMITTENT FLOW OCCURS THROUGH THE STEAM SUPPLY LINE DRAIN TRAP SYSTEM AT 8.87 MPa A AND 293 °C.
9. THIS TABLE IS FOR REFERENCE ONLY, SEE RCIC P&ID (REF DOC 4) FOR REQUIRED VALUES.
10. FLOW VALUES SHOWN IN MODES C & D ARE BASED UPON SUCTION PIPING DESIGN PERMITTING THE MINIMUM REQUIRED NPSH TO CONTINUE TO BE PROVIDED TO THE RCIC PUMP WHEN THE SUPPRESSION POOL SUCTION STRAINER IS 30 PERCENT PLUGGED.
11. STEAM FLOWS FOR TEST MODE AT POSITION (9) (10) (11) AND (11A) ARE BASED UPON A PUMP TDH OF 750 m.
12. DURING RCIC SYSTEM OPERATION A FLOW OF 0.08 m^3/h OCCURS THROUGH THE TURBINE EXHAUST LINE DRAIN POT SYSTEM AT 0.18 MPa A AND 116 °C.
13. SEE REF DOC 1 FOR PEAK PRESSURE.

REFERENCE DOCUMENTS UNDER THE FOLLOWING IDENTITIES SHALL BE USED IN CONJUNCTION WITH THIS DRAWING:

	MPL NO.
1. NUCLEAR BOILER SYSTEM PFD	B21-1020
2. RESIDUAL HEAT REMOVAL SYSTEM PFD	E11-1020
3. HIGH PRESSURE CORE FLOODER SYS PFD	E22-1020
4. RCIC SYSTEM P&ID	E51-1010
5. PIPING AND INSTRUMENTATION DIAGRAM SYMBOLS	A10-3030

FIGURE 5.4-9 REACTOR CORE ISOLATION COOLING SYSTEM PFD (Sheet 1 of 2)

MODE A SUCTION FROM CONDENSATE STORAGE, REACTOR AT HIGH PRESSURE, SUPPRESSION POOL AT ELEVATED PRESSURE

POSITION ⬡	1	2A	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
FLOW	–	182	188	182	–	–	0	–	16.4	16.4	16.4	6	6	6	0.03	–	0.005	6	–	0	0
PRESS MPa A	0.10	*	*	8.24	0.13	–	–	8.24	*	*	0.14	0.52	*	0.31	*	0.07	*	*	*	–	–
TEMP °C	40	40	40	40	60	–	–	296	SAT	SAT	109	40	40	40	110	49	49	49	40	–	–
Max/Min TEMP °C	40/10	40/10	40/10	40/10	77/10	–	–	296/16	296/16	121/16	121/10	40/10	40/10	40/10	121/16	65/16	65/16	65/16	40/10	–	–

MODE B SUCTION FROM CONDENSATE STORAGE, REACTOR AT LOW PRESSURE, SUPPRESSION POOL AT ELEVATED PRESSURE

POSITION ⬡	1	2A	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
FLOW	–	182	188	182	–	–	0	–	5.4	5.3	5.3	6	6	6	.03	–	0.005	6	–	0	0
PRESS MPa A	0.10	*	*	1.18	0.13	–	–	1.18	*	*	0.14	0.52	*	0.31	*	0.07	*	*	*	–	–
TEMP °C	40	40	40	40	60	–	–	185	SAT	SAT	109	40	40	40	110	49	49	49	40	–	–
Max/Min TEMP °C	40/10	40/10	40/10	40/10	77/10	–	–	186/16	186/16	121/16	121/16	40/10	40/10	40/10	121/16	65/16	65/16	65/16	40/10	–	–

MODE C SUCTION FROM SUPPRESSION POOL, REACTOR AT HIGH PRESSURE, SUPPRESSION POOL AT LOW PRESSURE

POSITION ⬡	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
FLOW SEE NOTE 2	–	182	188	182	–	–	182	–	16.4	16.4	16.4	6	6	6	0.03	–	0.005	6	–	0	0
PRESS MPa A	–	*	*	8.24	0.10	0.14	0.14	8.24	*	*	0.12	0.52	*	0.31	*	0.07	*	*	*	–	–
TEMP °C	–	60	60	60	60	60	60	296	SAT	SAT	103	60	60	60	110	71	71	71	60	–	–
Max/Min TEMP °C	–	77/10	77/10	77/10	77/10	77/10	77/10	296/16	296/16	121/16	121/10	77/10	77/10	77/10	121/16	77/16	77/16	77/16	77/10	–	–

MODE D SUCTION FROM SUPPRESSION POOL, REACTOR AT LOW PRESSURE, SUPPRESSION POOL AT LOW PRESSURE

POSITION ⬡	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
FLOW SEE NOTE 2	–	182	188	182	–	–	182	–	5.4	5.3	5.3	6	6	6	0.03	–	0.005	6	–	0	0
PRESS MPa A	–	*	*	1.18	0.10	0.14	0.13	1.18	*	*	0.12	0.52	*	0.31	*	0.07	*	*	*	–	–
TEMP °C	–	60	60	60	60	60	60	185	SAT	SAT	103	60	60	60	110	71	71	71	60	–	–
Max/Min TEMP °C	–	77/10	77/10	77/10	77/10	77/10	77/10	186/16	186/16	121/16	121/16	77/10	77/10	77/10	121/16	77/16	77/16	77/16	77/10	–	–

MODE E TEST MODE: SUCTION FROM SUPPRESSION POOL, REACTOR AT HIGH PRESSURE, SUPPRESSION POOL AT LOW PRESSURE

POSITION ⬡	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
FLOW SEE NOTE 2	–	182	188	–	–	–	182	–	14.15	14.1	14.1	6	6	6	0.03	–	0.005	6	–	182	182
PRESS MPa A	–	*	*	–	0.10	0.14	0.14	7.17	*	*	0.12	0.52	*	0.31	*	0.07	*	*	*	*	*
TEMP °C	–	35	35	–	35	35	35	285	SAT	SAT	103	35	35	35	110	49	49	49	35	35	35
Max/Min TEMP °C	–	77/10	77/10	–	77/10	77/10	77/10	285/16	285/16	121/16	121/16	77/10	77/10	77/10	121/16	77/16	77/16	77/16	77/10	77/10	77/10

(SEE NOTE 9)

POSITION ⬡	1A–2A	2–2B	3–3A	3A–3B	6–7	8A–9	10–11	11–11A	3–12	12–13	13–14	15	17	18–2C	3–19	19–19A	19A–21	3–20	20–21
PEAK PRESS MPa G	N/A	N/A	12.65	NOTE 13	N/A	10.35	N/A	N/A	12.65	N/A	N/A	N/A	N/A	N/A	12.65	12.65	N/A	12.65	N/A
DESIGN MPa G	2.82	2.82	11.77	8.62	0.31	8.62	8.62	0.98	11.77	2.82	2.82	0.76	0.31	1.37	11.77	11.77	0.31	11.77	0.31
DESIGN TEMP °C	77	77	77	302	77	302	302	104	77	77	77	121	88	88	77	77	104	77	104
ESTIMATED LINE SIZE mmA	200	200	150	150	200	200	350	350	50	50	50	25	40	50	50	50	50	100	100

PEAK PRESSURE– IS THE MAXIMUM PRESSURE ANTICIPATED DURING A TRANSIENT PERIOD WITH ALL OF THE CONTRIBUTING ELEMENTS AT A MAXIMUM. IT WOULD BE EXPECTED TO OCCUR LESS THAN 1% OF SYSTEM OPERATING TIME.

* THE PRESSURE AT THIS POSITION DEPENDS ON PIPING ARRANGEMENT AND MAY BE VARIED WITHIN THE FOLLOWING LIMITS.

POSITION

⬡1A INLET TO PUMP FROM CONDENSATE STORAGE TANK

⬡2 MINIMUM NPSH = 7.3 m (1 METER ABOVE PUMP FLOOR)

⬡3 MAXIMUM PUMP TOTAL DYNAMIC HEAD 900 m FOR MODES A & C 186 m FOR MODES B & D

⬡9 MAXIMUM PRESSURE DROP BETWEEN POSITION ⬡8 AND ⬡9 = 0.11 MPa (SEE NOTE 5)

⬡10 MAXIMUM PRESSURE ALLOWED FOR RATED SYSTEM PERFORMANCE = 0.18 MPa A

⬡12 ⬡13 MAXIMUM PRESSURE ALLOWED = 0.86 MPa A @1%

⬡14 PRESSURE IS 0.034 MPa LESS THAN POSITION ⬡13

⬡15 SUFFICIENT VACUUM TO PREVENT TURBINE SHAFT-OUT-LEAKAGE. TO BE SPECIFIED ON TURBINE VENDOR DRAWINGS.

⬡17 MAXIMUM PRESSURE AVAILABLE = 0.21 MPa A

⬡18 MAXIMUM PRESSURE AVAILABLE = 0.45 MPa A

⬡19 SUFFICIENT PRESSURE TO RETURN TO SUPPRESSION POOL

⬡20 ⬡21 SUFFICIENT PRESSURE TO RETURN TO SUPPRESSION POOL

TABLE 1 VALVE POSITION CHART

VALVE	F004	F006	F001	F035	F036	F037	F039	F011	F009	F008
MODE A	O	C	O	O	O	O	O	C	C	C
MODE B	O	C	O	O	O	O	O	C	C	C
MODE C	O	O	C	O	O	O	O	C	C	C
MODE D	O	O	C	O	O	O	O	C	C	C
MODE E	C	O	C	O	O	O	O	C	T	T

O = OPEN C = CLOSE T = THROTTLE

E51-1020

103E1796\A853602

FIGURE 5.4-9 REACTOR CORE ISOLATION COOLING SYSTEM PFD (Sheet 2 of 2)

NOTES:

1. PIPING HIGH POINT VENTS AND LOW POINT DRAINS ARE TO BE ADDED AS NECESSARY.
2. INSTRUMENT LINE DESIGN AND VALVING SHALL BE IN ACCORDANCE WITH INSTRUMENT PIPING SPECIFICATION. A11-3030
3. VALVE F028 IS REQUIRED IF THERE IS POTENTIAL FOR OVERPRESSURE.
4. FOR ADDITIONAL CONTROL ROOM LIGHTS, SYSTEM ALARMS AND REMOTE MANUAL SWITCHES, SEE THE RHR IBD E11-1030.
5. PROVISIONS FOR CONTAINMENT ISOLATION SHALL BE IN ACCORDANCE WITH CURRENT LICENSING REQUIREMENTS.
6. VALVE F002 SHALL BE LOCATED AT AN ELEVATION LOWER THAN THE SUPPRESSION POOL MINIMUM WATER LEVEL.
7. PUMP C001 COOLING WATER, IF REQUIRED, IS SPECIFIED IN P21-1010.
8. ALL PRIMARY CONTAINMENT ISOLATION VALVES SHALL BE LOCATED AS CLOSE AS POSSIBLE TO THE CONTAINMENT PENETRATION.
9. ALL MOTOR OPERATED VALVES ARE AC OPERATED UNLESS OTHERWISE NOTED.
10. EQUIPMENT IN SUBSYSTEMS A, B AND C SHALL HAVE THE SUFFIX LETTER A, B AND C RESPECTIVELY AFTER THE EQUIPMENT NUMBER.
11. FLUSHING CONNECTIONS AND TEMPORARY STRAINER SCREENS ON THE SUCTION SIDE OF ALL PUMPS SHALL BE PROVIDED.
12. DRYWELL PIPING RUNS SHALL BE HORIZONTAL OR VERTICAL UPWARDS FROM THE DRYWELL WALL TO THE POINT OF ATTACHMENT WITH THE REACTOR VESSEL.
13. THIS HIGH POINT VENT SHALL BE LOCATED AT THE HIGHEST POINT IN THE PIPING OUTSIDE THE DRYWELL BETWEEN VALVES F017 AND F018.
14. SUBSYSTEM "A" RETURNS TO RPV THROUGH FEEDWATER LINE "A".
15. DISCHARGE LINES FOR COOLING WATER TO BE ROUTED UPSTREAM OF SERVICE WATER RADIATION MONITORS.
16. VALVE F014 SHALL BE AS CLOSE AS POSSIBLE TO THE CONNECTIONS TO THE MAIN LINE.
17. DESIGN LINE SIZE WILL BE FINALIZED AT THE DETAILED DESIGN PHASE. ACTUAL LINE SIZES DETERMINED BY THE PIPING DESIGNER SHALL MEET THE PROCESS DATA HYDRAULIC REQUIREMENTS.
18. CHECK VALVE F006B(C) SHALL BE LOCATED AS CLOSE AS PRACTICAL TO THE REACTOR VESSEL NOZZLE.
19. VALVES F011A, F011B AND F011C ARE IN ELECTRICAL DIVISIONS 2, 3 AND 1 RESPECTIVELY. THE MANUAL CONTROL SWITCHES FOR VALVES F011A, F011B AND F011C ARE IN ELECTRICAL DIVISIONS 1, 2 AND 3 RESPECTIVELY.
20. PIPING DESIGN SPECIFICATIONS ARE AS FOLLOWS:
    A. MAXIMUM OPERATING PRESSURE – SEE SPECIFIC BOUNDARY SYMBOL
    B. MAXIMUM OPERATING TEMPERATURE – SEE SPECIFIC BOUNDARY SYMBOL
    C. MATERIAL – CARBON STEEL
    D. PIPING SCHEDULE – INTERFACE
    E. DESIGN CLASS – SEE SPECIFIC BOUNDARY SYMBOL
    F. QC CLASS – SEE SPECIFIC BOUNDARY SYMBOL
    G. SEISMIC CLASS – RHR – As
    H. FLUID – WATER
21. AIR SUPPLY IS FROM INSTRUMENT AIR SYSTEM, SUPPL DOC 15. NITROGEN SUPPLY IS FROM HIGH PRESSURE NITROGEN GAS SUPPLY SYSTEM, SUPPL DOC 4.
22. STRAINER TYPE AS SUPPLIED WITH PUMP C002.
23. FLANGE CONNECTION USED FOR OCCASSIONAL SUPPRESSION POOL DRAINING.
24. DRAIN AND VENT PIPING DESIGN CONDITIONS ARE:
    MAXIMUM OPERATING PRESSURE – SAME AS MAIN LINE UPSTREAM OF VALVE (ATMOSPHERIC PRESSURE FROM LAST VALVE TO FUNNEL).
    MAXIMUM OPERATING TEMPERATURE – SAME AS MAIN LINE UPSTREAM OF VALVE (66 °C FROM LAST VALVE TO FUNNEL)
25. UNIQUE PIPE NUMBERS ARE ASSIGNED SEQUENTIALLY FOR EACH RHR LOOP. RANGES OF NUMBERS ARE ALLOCATED FOR EACH LOOP AND TYPE OF PIPE AS FOLLOWS:

	LOOP A	LOOP B	LOOP C
PROCESS PIPING	001-100	101-200	201-300
DRAIN AND VENT PIPING	500-529	530-559	560-589
INSTRUMENT PIPING	700-729	730-759	760-789

26. THE VALVE TYPE FOR F043 AND F044 WILL BE DECIDED IN THE FINAL DESIGN.
27. THE RECORDING FUNCTION IS ACCOMPLISHED THROUGH MICROPROCESSOR CHANNEL OUTPUT TO PRINTER.
28. TWO ROOT VALVES CAN BE PROVIDED AT THE SUPPLIERS OPTION ON HIGH RADIATION/LOW PRESSURE DRAIN AND VENT LINES.
29. BYPASS VALVES F036A,B,C SHALL BE UTILIZED FOR WARMING UP THE RHR PIPING SYSTEM. THE FLOW WILL BE FROM THE REACTOR SIDE. THESE VALVES ARE ALSO USED DURING OPERABILITY TESTING OF TESTABLE CHECK VALVE F006.
30. PIPE WITH A DESIGN PRESSURE OF 2.82 MPa OR GREATER SHALL HAVE ITS MINIMUM WALL THICKNESS NO LESS THAN THAT OF A STANDARD WEIGHT PIPE. THICKER THAN STANDARD WEIGHT PIPE SHALL BE USED IF REQUIRED BY THE DESIGN PRESSURE OR OTHER REQUIREMENTS.
31. VALVES WITH A DESIGN PRESSURE OF 2.82 MPa OR GREATER SHALL BE A MINIMUM OF CLASS 300, OR OF A HIGHER CLASS IF REQUIRED BY THE DESIGN PRESSURE.
32. *(LOCATE THE GATE VALVE OF THIS SPRING SECTION AT A DISTANCE GREATER THAN OR EQUAL TO 75 PIPE DIAMETERS FROM THE RPV NOZZLE. OTHERWISE PERFORM STRESS ANALYSIS TO SHOW THAT STRESSES AND FATIGUE ARE ACCEPTABLE PER THE ASME CODE FROM THE CONCERN OF NRC BULLETIN 88-08, SUPPLEMENT 2 (APRIL 13, 1988) ON POTENTIAL THERMAL STRATIFICATION AND STRIPING DUE TO PERIODIC EXTERNAL LEAKAGE OF THE GATE VALVE.)*
33. THE THREE RETURN LINES BRINGING FLOW INTO THE SUPPRESSION POOL (S/P) SHALL HAVE AN EXIT DESIGN THAT PROMOTES S/P CIRCULATION AND MIXING FOR EFFECIENT COOLING. CONSIDERATIONS SHALL INCLUDE: (1) DIRECTING THE FLOW HORIZONTALLY WITH THE THREE LINES WORKING TOGETHER TO ACHIEVE CIRCULATION AROUND THE S/P'S ANNULAR SHAPE, (2) DIRECTING THE RETURN FLOW TO AVOID DIRECTLY ENTERING A SUCTION INLET, AND (3) SEPARATE THE RETURN LINES FROM THE SUCTION STRAINERS IN THE ELEVATION PLANE TO THE GREATEST EXTENT PRACTICAL, WITH THE RETURN LINES LOCATED NEAR THE S/P TOP AND THE SUCTION STRAINERS NEAR THE S/P BOTTOM.
34. VALVE TO HAVE MANUAL HAND WHEEL OPERABLE AT LOW DELTA PRESSURE FOR POTENTIAL NEED DURING FIRE WATER ADDITION MODE. (NOTE VALVES F005C, F017C, AND F018C).
35. VALVE F005A SHALL BE LOCATED AS CLOSE AS PRACTICAL TO THE STEAM TUNNEL WALL.

* SEE SUBSECTION 3.9.1.7

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

	MPL NO.
1. RESIDUAL HEAT REMOVAL SYSTEM PFD	E11-1020
2. RESIDUAL HEAT REMOVAL SYSTEM IBD	E11-1030
3. SAMPLING SYSTEM P&ID	P91-1010
4. HIGH PRESSURE NITROGEN GAS SUPPLY SYSTEM P&ID	P54-1010
5. REACTOR WATER CLEANUP SYSTEM P&ID	G31-1010
6. FUEL POOL COOLING AND CLEANUP SYSTEM P&ID	G41-1010
7. VALVE GLAND LEAKAGE TREATMENT, RADWASTE SYSTEM P&ID	K17-1010
8. MAKE-UP WATER SYSTEM (CONDENSATE) P&ID	P13-1010
9. REMOTE SHUTDOWN SYSTEM IED	C61-1040
10. HIGH PRESSURE CORE FLOODER P&ID	E22-1010
11. REACTOR CORE ISOLATION COOLING SYSTEM P&ID	E51-1010
12. NUCLEAR BOILER SYSTEM P&ID	B21-1010
13. HIGH CONDUCTIVITY WASTE, RADWASTE SYSTEM P&ID	K17-1010
14. REACTOR BUILDING COOLING WATER SYSTEM P&ID	P21-1010
15. INSTRUMENT AIR SYSTEM P&ID	P52-1010
16. FLAMMABILITY CONTROL SYSTEM P&ID	T49-1010
17. NUCLEAR BOILER SYSTEM IBD	B21-1030
18. SAMPLING SYSTEM P&ID (INCLUDES PASS)	P91-1010
19. FIRE PROTECTION SYSTEM P&ID	U43-1010
20. LOW CONDUCTIVITY WASTE, RADWASTE SYSTEM P&ID	K17-1010
21. REACTOR ICD	B11-2020

SUPPORTING DOCUMENTS

1. PIPING AND INSTRUMENT SYMBOLS	A10-3030

LEGEND:

LEAK TESTABLE DOUBLE DISC GATE VALVE

MPL NO. E11-1010

FIGURE 5.4-10 RESIDUAL HEAT REMOVAL SYSTEM P&ID (Sheet 1 of 7)

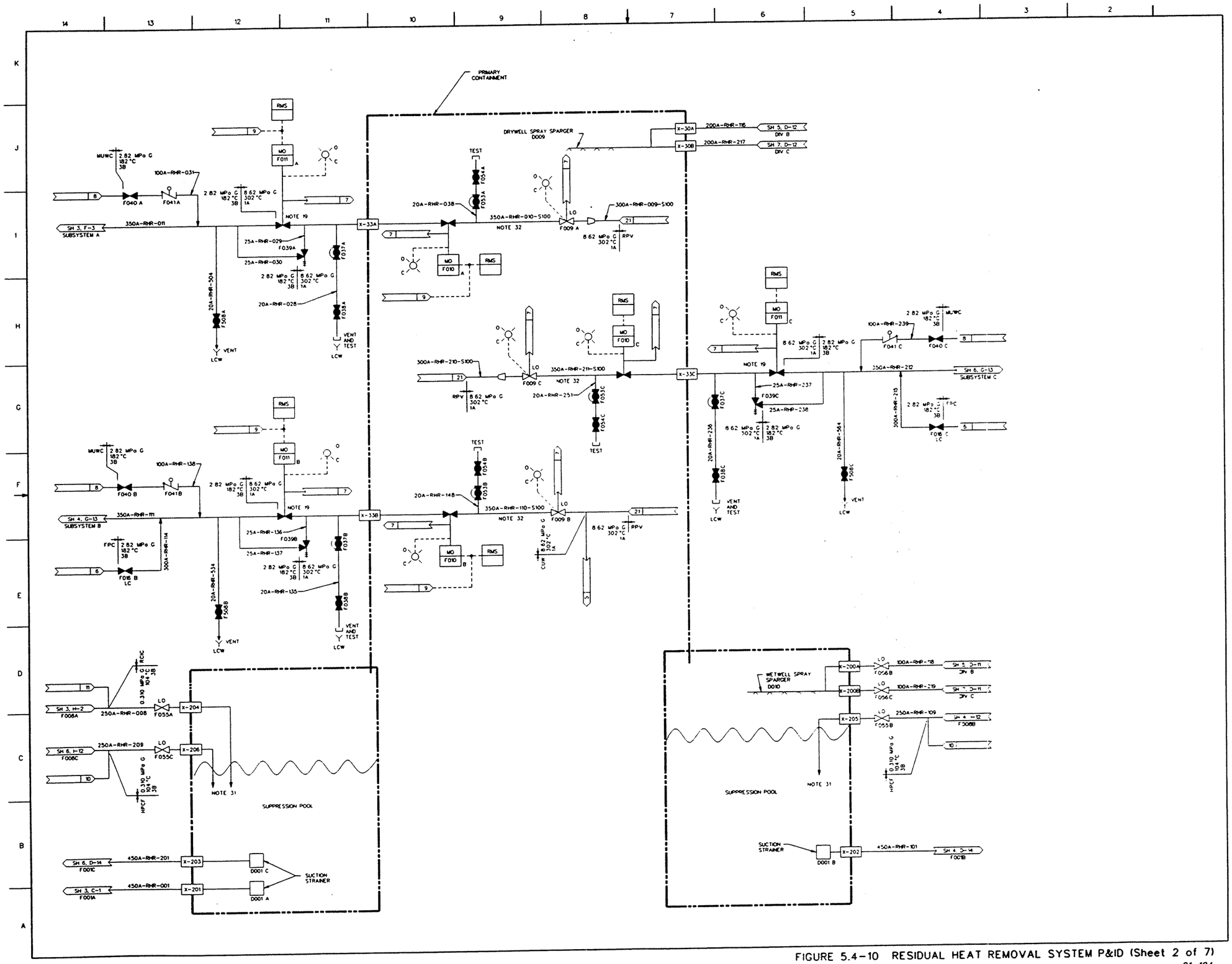


FIGURE 5.4-10 RESIDUAL HEAT REMOVAL SYSTEM P&ID (Sheet 2 of 7)

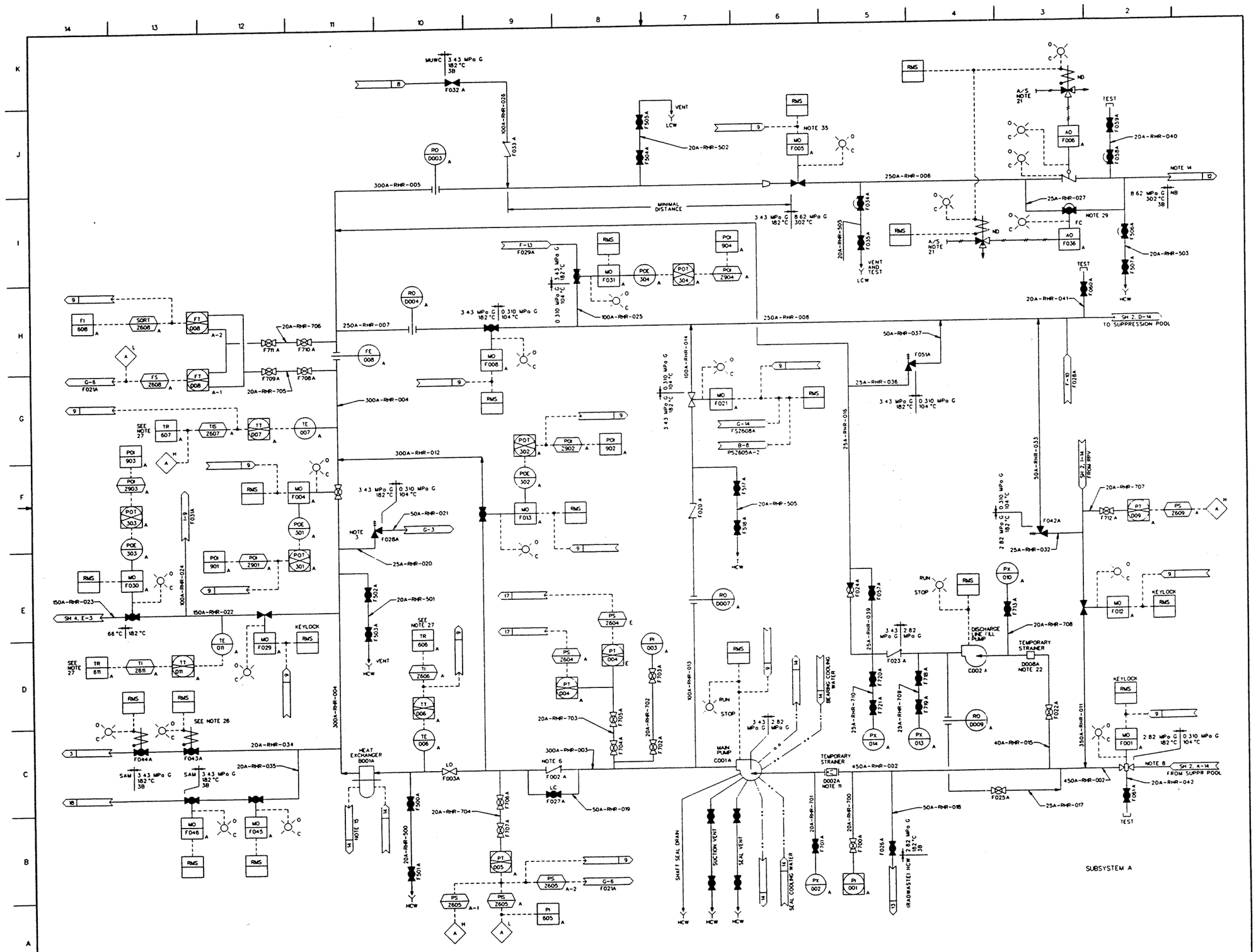


FIGURE 5.4–10 RESIDUAL HEAT REMOVAL SYSTEM P&ID (Sheet 3 of 7)

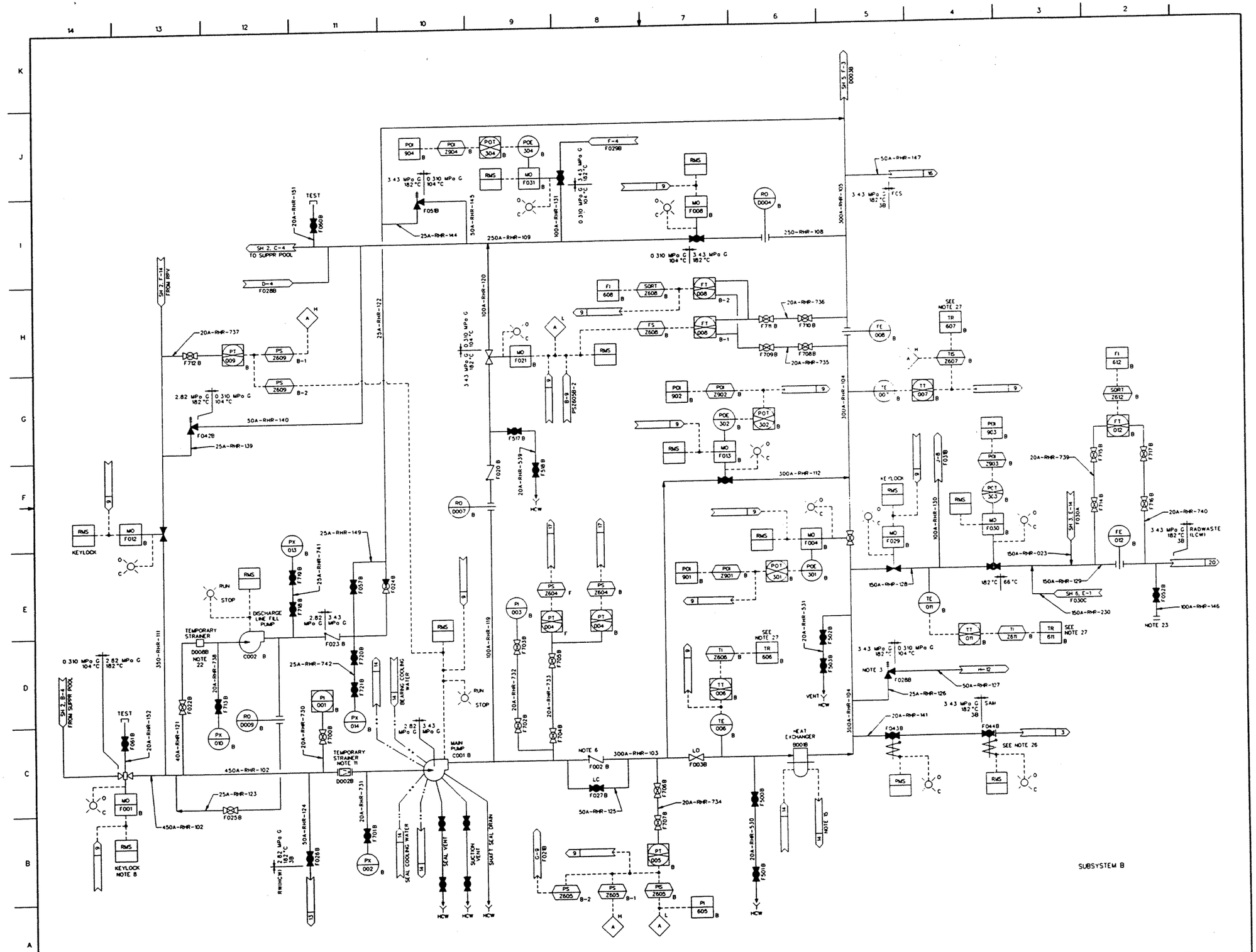


FIGURE 5.4-10 RESIDUAL HEAT REMOVAL SYSTEM P&ID (Sheet 4 of 7)

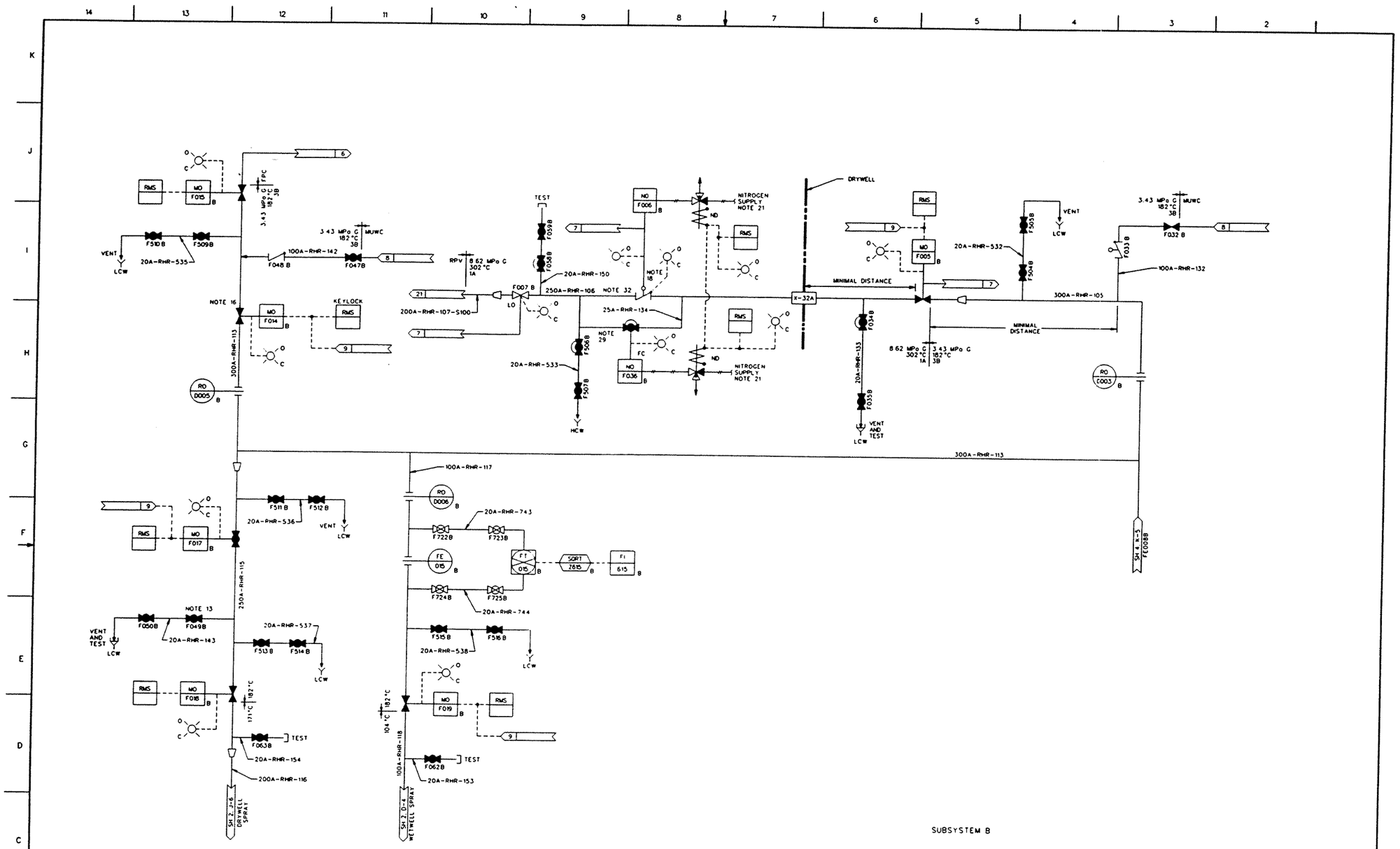


FIGURE 5.4-10 RESIDUAL HEAT REMOVAL SYSTEM P&ID (Sheet 5 of 7)

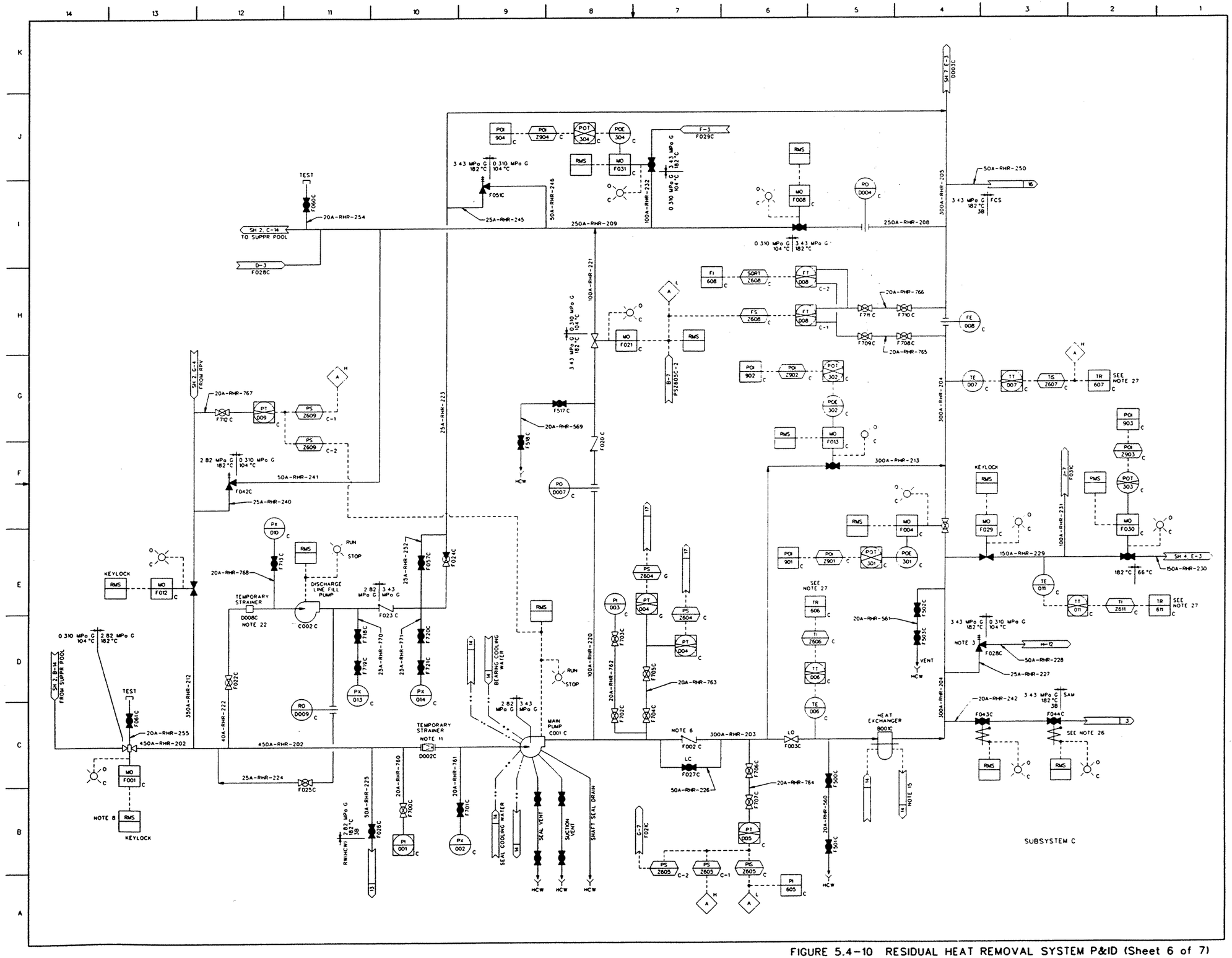
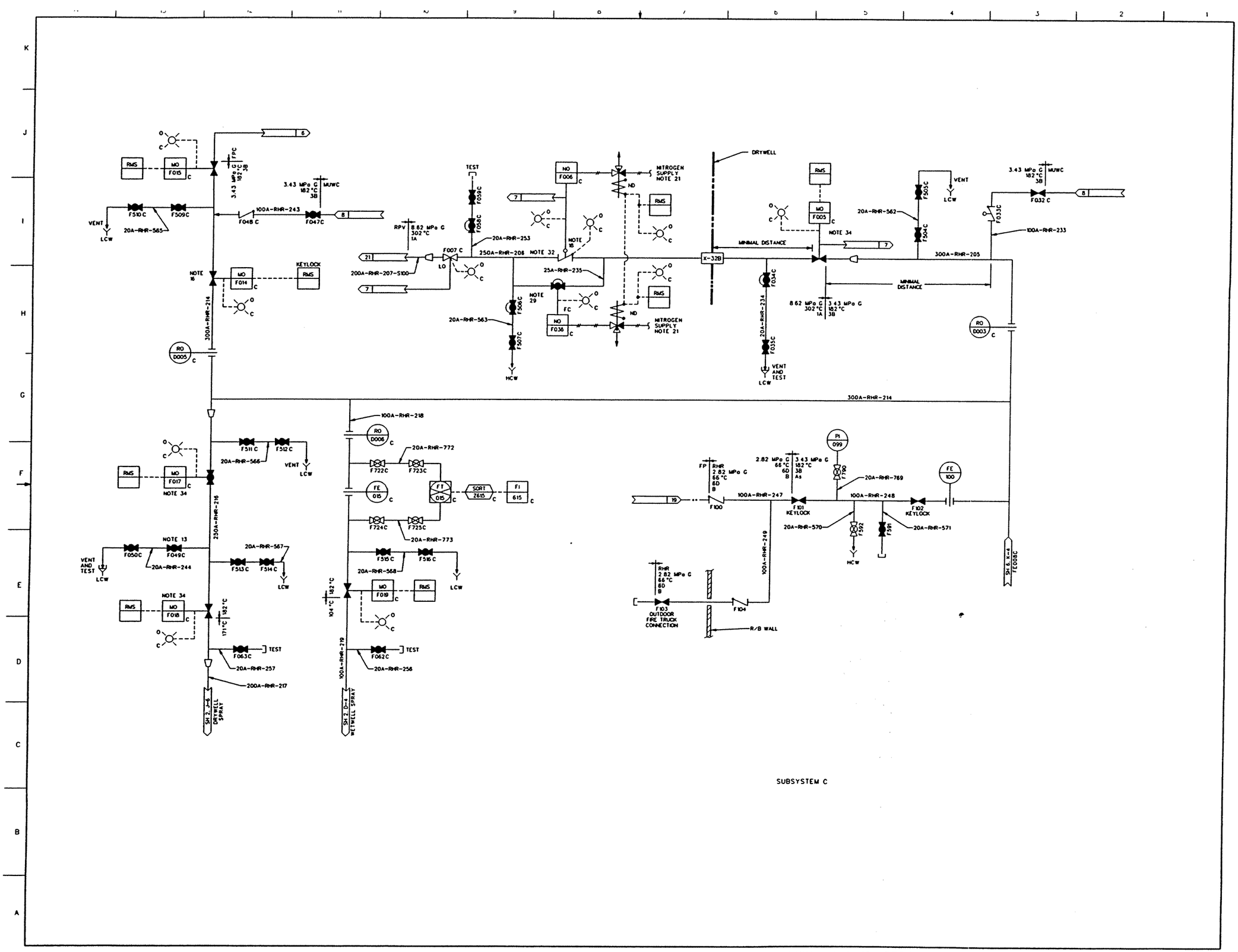
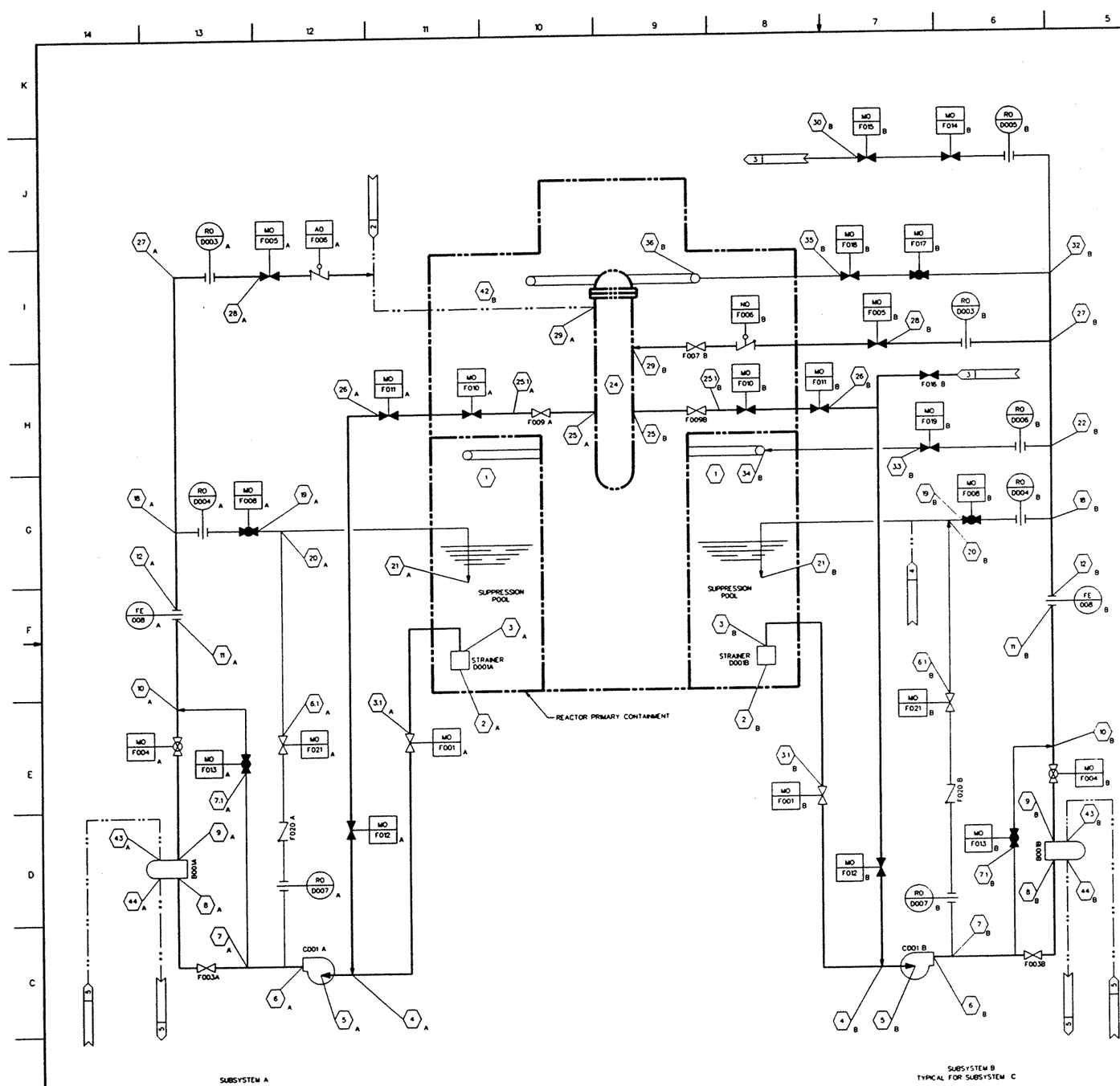


FIGURE 5.4-10 RESIDUAL HEAT REMOVAL SYSTEM P&ID (Sheet 6 of 7)



SUBSYSTEM C

FIGURE 5.4-10 RESIDUAL HEAT REMOVAL SYSTEM P&ID (Sheet 7 of 7)



NOTES

1. SHOWN AS TYPICAL FOR ONE SUBSYSTEM. IF SUBSYSTEMS ARE NOT SYMETRICALLY ARRANGED, VALUES FOR EACH SUBSYSTEM SHALL BE SUBMITTED.
2. PIPING BETWEEN POINTS WITH EMPTY DATA BLANKS SHALL BE SIZED BY OTHERS BASED ON SPECIFIED OPERATING CONDITIONS. EMPTY DATA BLANKS CAN BE FILLED IN BASED ON ACTUAL ARRANGEMENT OR EQUIVALENT HYDRAULIC DATA.

   [⊠] ---- INDICATES THE DATA IS NOT SIGNIFICANT
3. MODE B1 IS THE LIMITING MODE FOR HEAT LOAD. HEAT CAPACITY BASED ON K = 370.54 kJ/°C.s.
4. [X / Y] ---- INDICATES MAXIMUM (X) AND MINIMUM (Y) VALUES FOR THE MODE SPECIFIED.
5. DASHED LINES INDICATE FLOW DOES NOT PASS THROUGH THESE POINTS
6. TYPICAL VALUES FOR MAXIMUM SUPPRESSION POOL TEMPERATURE SHOWN. FINAL TEMPERATURE DEPENDS ON INITIAL POOL WATER TEMPERATURE AND POOL WATER VOLUME.
7. THE NPSH AVAILABLE IN MODES A AND C-1, AT A REFERENCE LOCATION 1 METER ABOVE THE PUMP MOUNTING FLOOR MUST EQUAL OR EXCEED 2.4 METERS ASSUMING SATURATION TEMPERATURES OF 100°C AND 182°C RESPECTIVELY. THE NPSH AVAILABLE AT THE PUMP SUCTION NOZZLE MUST EQUAL OR EXCEED THIS VALUE PLUS THE DIFFERENCE IN ELEVATION BETWEEN THE REFERENCE LOCATION AND THE CENTERLINE OF THE PUMP SUCTION NOZZLE
8. TABLE 1 INDICATES VALVE POSITIONS DURING VARIOUS MODES OF OPERATION
9. THIS TABLE IS FOR REFERENCE ONLY; SEE P&ID, FOR REQUIRED VALUES
10. THE WEIGHT OF WATER IN THE SHUTDOWN COOLING SUBSYSTEM PIPING, INCLUDING THE HEAT EXCHANGERS AND PUMPS SHALL NOT EXCEED THE VALUE SPECIFIED C41-A010 IN ORDER TO PREVENT DILUTION OF STANDBY LIQUID CONTROL NEUTRON ABSORBER BELOW MINIMUM REQUIREMENTS
11. HEAT EXCHANGER HEAT REMOVAL AND SPRAY BASED UPON 954 m^3/h TUBE SIDE FLOW
12. SOM = 195 METERS REQUIRED MINIMUM AND 220 METERS MAXIMUM
13. MAXIMUM TUBE SIDE FLOW RATE IS 1130 m^3/h WHICH IS MAXIMUM PUMP RUNOUT FLOW
14. HEAT EXCHANGER HEAT REMOVAL SHOWN FOR FULL FLOW AND MAXIMUM TEMPERATURE DIFFERENCE
15. ONLY TWO SUBSYSTEMS ARE REQUIRED AT THIS STAGE OF SHUTDOWN
16. LOCATIONS 19,20,21 AND 22,33,34 SHOW THE FLOW SPLIT ON LOOPS B AND C WHEN THE WETWELL SPRAY FUNCTION IS MANUALLY INITIATED.
17. ONLY ONE SUBSYSTEM IS REQUIRED FOR THIS MODE OF OPERATION, EITHER SUBSYSTEM B OR SUBSYSTEM C
18. THESE TEMPERATURE VALUES HAVE BEEN CALCULATED UNDER NOMINAL CONDITIONS, I.E., WITH AN ULTIMATE HEAT SINK TEMPERATURE OF 30°C.

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

	MPL NO
1. RESIDUAL HEAT REMOVAL SYSTEM P&ID	E11-1010
2. NUCLEAR BOILER SYSTEM PFD	B21-1020
3. FUEL POOL COOLING & CLEANUP SYS PFD	G41-1020
4. HIGH PRESSURE CORE FLOODER SYS PFD	E22-1020
5. REACTOR BUILDING COOLING WATER SYSTEM PFD	P21-1020

SUPPORTING DOCUMENTS

	MPL NO
1. PIPING AND INSTRUMENT DIAGRAM SYMBOLS	A10-3030

MPL NO E11-1020

FIGURE 5.4-11 RESIDUAL HEAT REMOVAL SYSTEM PFD (Sheet 1 of 2)

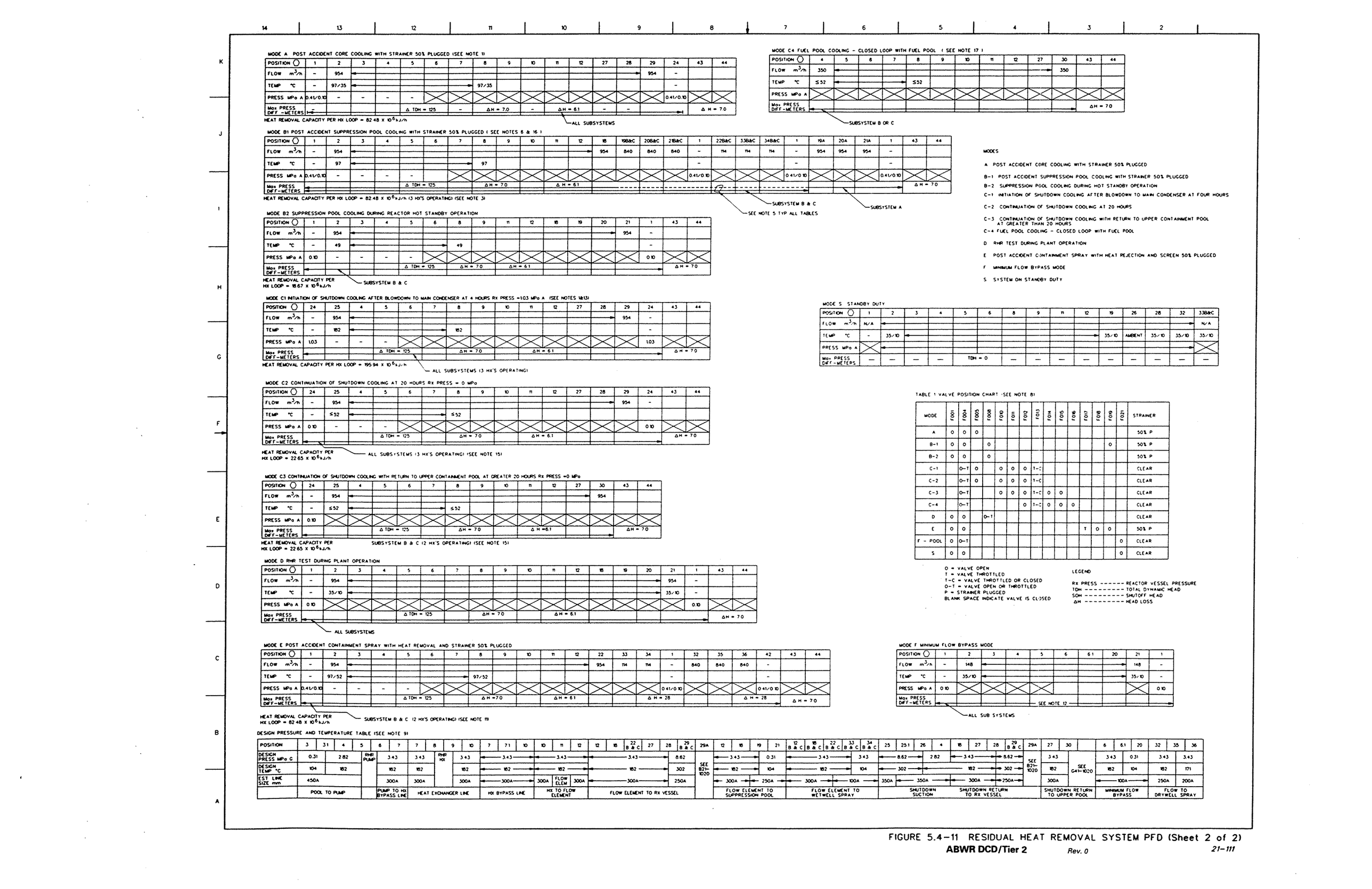
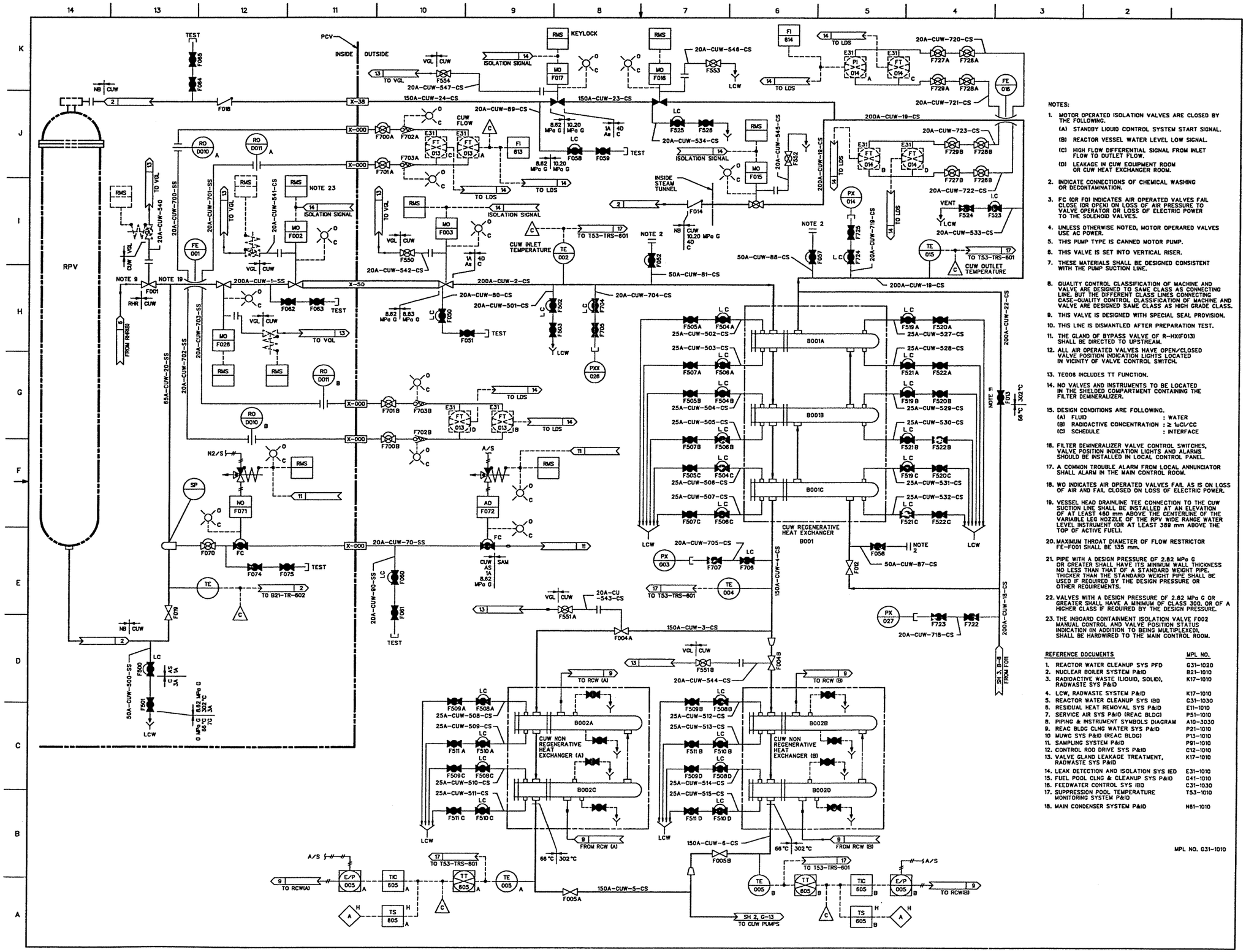


FIGURE 5.4-11 RESIDUAL HEAT REMOVAL SYSTEM PFD (Sheet 2 of 2)



NOTES:

1. MOTOR OPERATED ISOLATION VALVES ARE CLOSED BY THE FOLLOWING.
   (A) STANDBY LIQUID CONTROL SYSTEM START SIGNAL.
   (B) REACTOR VESSEL WATER LEVEL LOW SIGNAL.
   (C) HIGH FLOW DIFFERENTIAL SIGNAL FROM INLET FLOW TO OUTLET FLOW.
   (D) LEAKAGE IN CUW EQUIPMENT ROOM OR CUW HEAT EXCHANGER ROOM.
2. INDICATE CONNECTIONS OF CHEMICAL WASHING OR DECONTAMINATION.
3. FC (OR FO) INDICATES AIR OPERATED VALVES FAIL CLOSE (OR OPEN) ON LOSS OF AIR PRESSURE TO VALVE OPERATOR OR LOSS OF ELECTRIC POWER TO THE SOLENOID VALVES.
4. UNLESS OTHERWISE NOTED, MOTOR OPERARED VALVES USE AC POWER.
5. THIS PUMP TYPE IS CANNED MOTOR PUMP.
6. THIS VALVE IS SET INTO VERTICAL RISER.
7. THESE MATERIALS SHALL BE DESIGNED CONSISTENT WITH THE PUMP SUCTION LINE.
8. QUALITY CONTROL CLASSIFICATION OF MACHINE AND VALVE ARE DESIGNED TO SAME CLASS AS CONNECTING LINE. BUT THE DIFFERENT CLASS LINES CONNECTING CASE-QUALITY CONTROL CLASSIFICATION OF MACHINE AND VALVE ARE DESIGNED SAME CLASS AS HIGH GRADE CLASS.
9. THIS VALVE IS DESIGNED WITH SPECIAL SEAL PROVISION.
10. THIS LINE IS DISMANTLED AFTER PREPARATION TEST.
11. THE GLAND OF BYPASS VALVE OF R-HX(F013) SHALL BE DIRECTED TO UPSTREAM.
12. ALL AIR OPERATED VALVES HAVE OPEN/CLOSED VALVE POSITION INDICATION LIGHTS LOCATED IN VICINITY OF VALVE CONTROL SWITCH.
13. TE006 INCLUDES TT FUNCTION.
14. NO VALVES AND INSTRUMENTS TO BE LOCATED IN THE SHIELDED COMPARTMENT CONTAINING THE FILTER DEMINERALIZER.
15. DESIGN CONDITIONS ARE FOLLOWING.
    (A) FLUID : WATER
    (B) RADIOACTIVE CONCENTRATION : ≥ 1uCi/CC
    (C) SCHEDULE : INTERFACE
16. FILTER DEMINERALIZER VALVE CONTROL SWITCHES, VALVE POSITION INDICATION LIGHTS AND ALARMS SHOULD BE INSTALLED IN LOCAL CONTROL PANEL.
17. A COMMON TROUBLE ALARM FROM LOCAL ANNUNCIATOR SHALL ALARM IN THE MAIN CONTROL ROOM.
18. WO INDICATES AIR OPERATED VALVES FAIL AS IS ON LOSS OF AIR AND FAIL CLOSED ON LOSS OF ELECTRIC POWER.
19. VESSEL HEAD DRAINLINE TEE CONNECTION TO THE CUW SUCTION LINE SHALL BE INSTALLED AT AN ELEVATION OF AT LEAST 460 mm ABOVE THE CENTERLINE OF THE VARIABLE LEG NOZZLE OF THE RPV WIDE RANGE WATER LEVEL INSTRUMENT (OR AT LEAST 389 mm ABOVE THE TOP OF ACTIVE FUEL).
20. MAXIMUM THROAT DIAMETER OF FLOW RESTRICTOR FE-F001 SHALL BE 135 mm.
21. PIPE WITH A DESIGN PRESSURE OF 2.82 MPa G OR GREATER SHALL HAVE ITS MINIMUM WALL THICKNESS NO LESS THAN THAT OF A STANDARD WEIGHT PIPE. THICKER THAN THE STANDARD WEIGHT PIPE SHALL BE USED IF REQUIRED BY THE DESIGN PRESSURE OR OTHER REQUIREMENTS.
22. VALVES WITH A DESIGN PRESSURE OF 2.82 MPa G OR GREATER SHALL HAVE A MINIMUM OF CLASS 300, OR OF A HIGHER CLASS IF REQUIRED BY THE DESIGN PRESSURE.
23. THE INBOARD CONTAINMENT ISOLATION VALVE F002 MANUAL CONTROL AND VALVE POSITION STATUS INDICATION (IN ADDITION TO BEING MULTIPLEXED), SHALL BE HARDWIRED TO THE MAIN CONTROL ROOM.

REFERENCE DOCUMENTS	MPL NO.
1. REACTOR WATER CLEANUP SYS PFD	G31-1020
2. NUCLEAR BOILER SYSTEM P&ID	B21-1010
3. RADIOACTIVE WASTE (LIQUID, SOLID), RADWASTE SYS P&ID	K17-1010
4. LCW, RADWASTE SYSTEM P&ID	K17-1010
5. REACTOR WATER CLEANUP SYS IBD	G31-1030
6. RESIDUAL HEAT REMOVAL SYS P&ID	E11-1010
7. SERVICE AIR SYS P&ID (REAC BLDG)	P51-1010
8. PIPING & INSTRUMENT SYMBOLS DIAGRAM	A10-3030
9. REAC BLDG CLNG WATER SYS P&ID	P21-1010
10 MUWC SYS P&ID (REAC BLDG)	P13-1010
11. SAMPLING SYSTEM P&ID	P81-1010
12. CONTROL ROD DRIVE SYS P&ID	C12-1010
13. VALVE GLAND LEAKAGE TREATMENT, RADWASTE SYS P&ID	K17-1010
14. LEAK DETECTION AND ISOLATION SYS IED	E31-1010
15. FUEL POOL CLNG & CLEANUP SYS P&ID	G41-1010
16. FEEDWATER CONTROL SYS IBD	C31-1030
17. SUPPRESSION POOL TEMPERATURE MONITORING SYSTEM P&ID	T53-1010
18. MAIN CONDENSER SYSTEM P&ID	N61-1010

MPL NO. G31-1010

FIGURE 5.4-12 REACTOR WATER CLEANUP SYSTEM P&ID (Sheet 1 of 4)

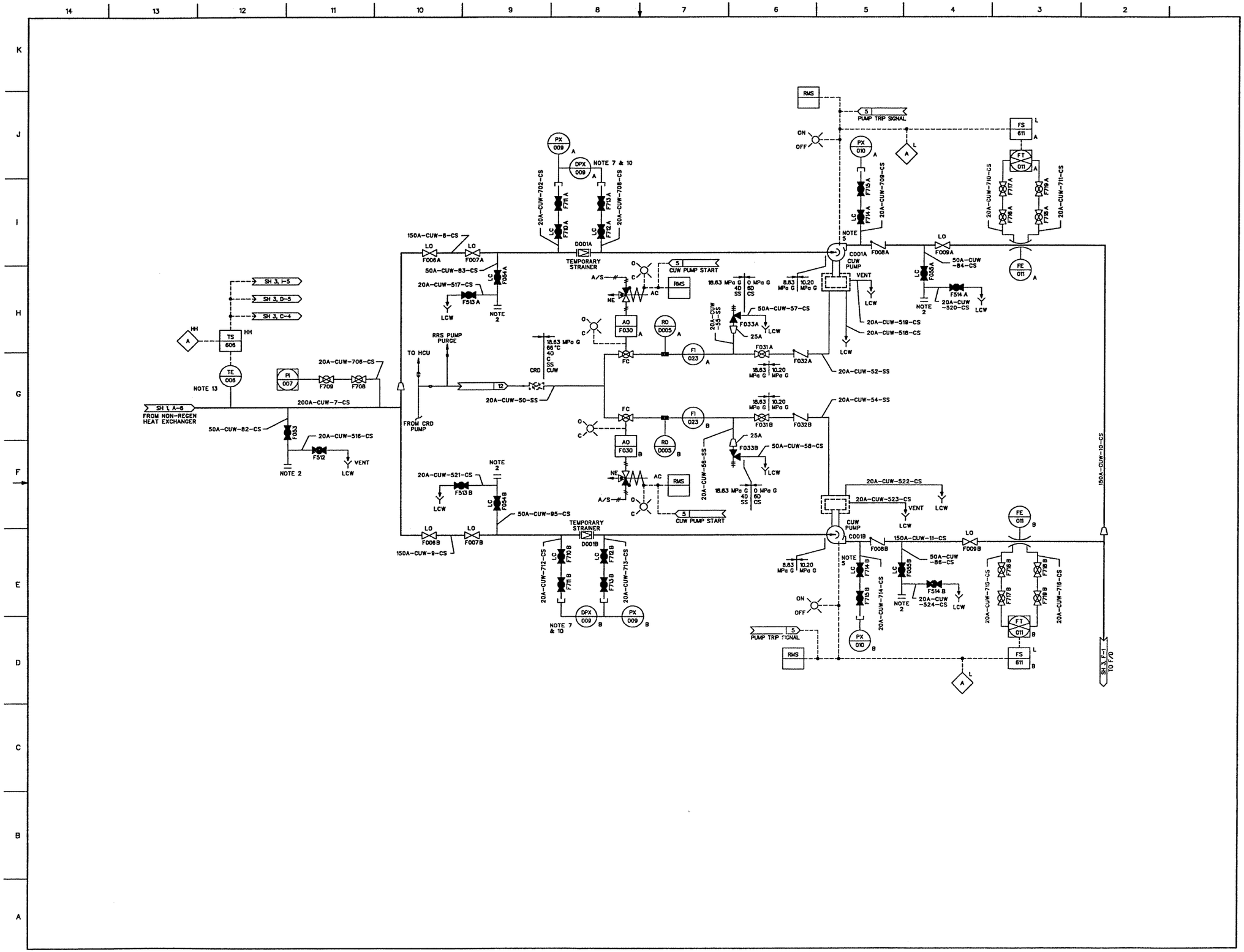


FIGURE 5.4–12 REACTOR WATER CLEANUP SYSTEM P&ID (Sheet 2 of 4)

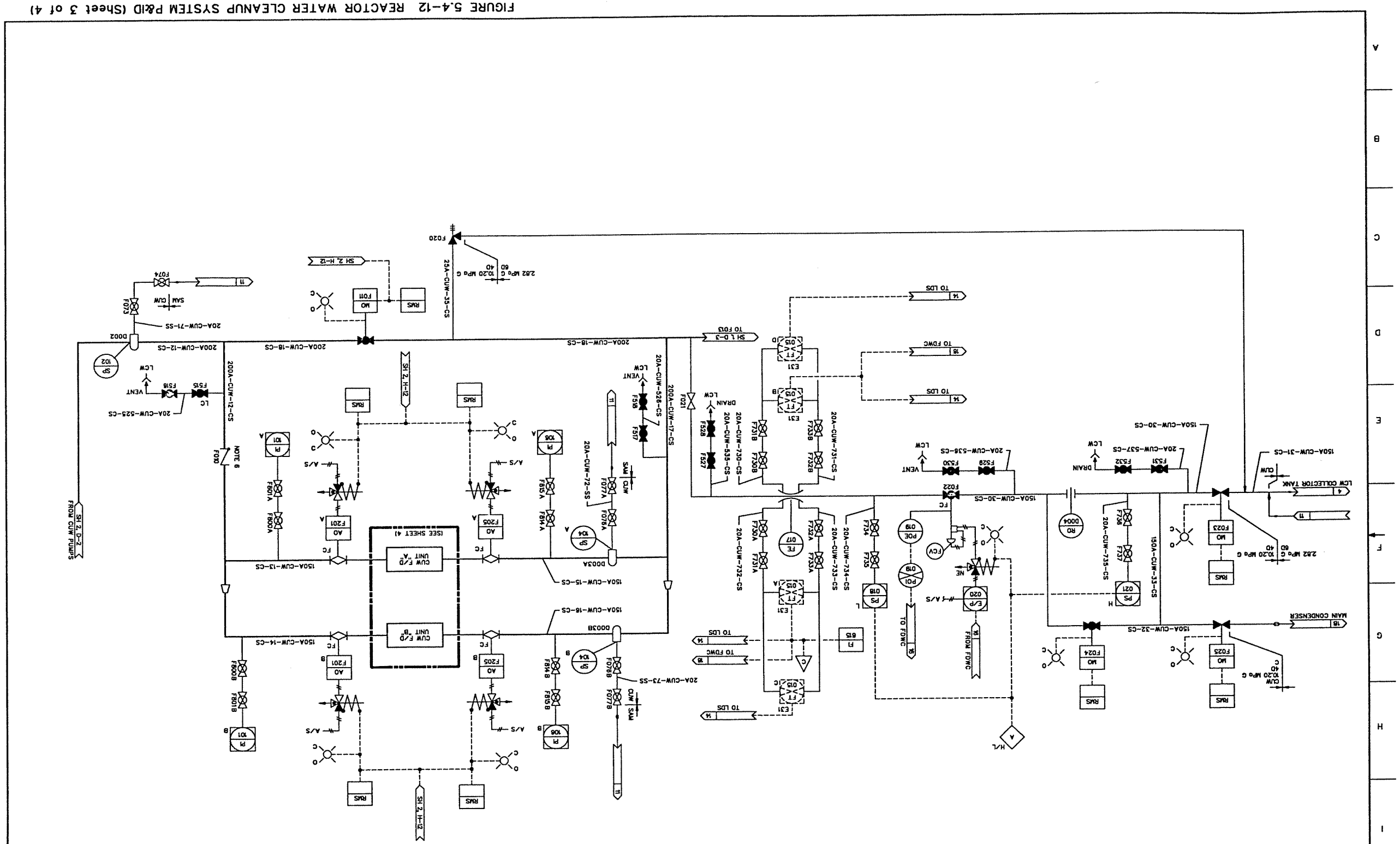


FIGURE 5.4-12 REACTOR WATER CLEANUP SYSTEM P&ID (Sheet 3 of 4)

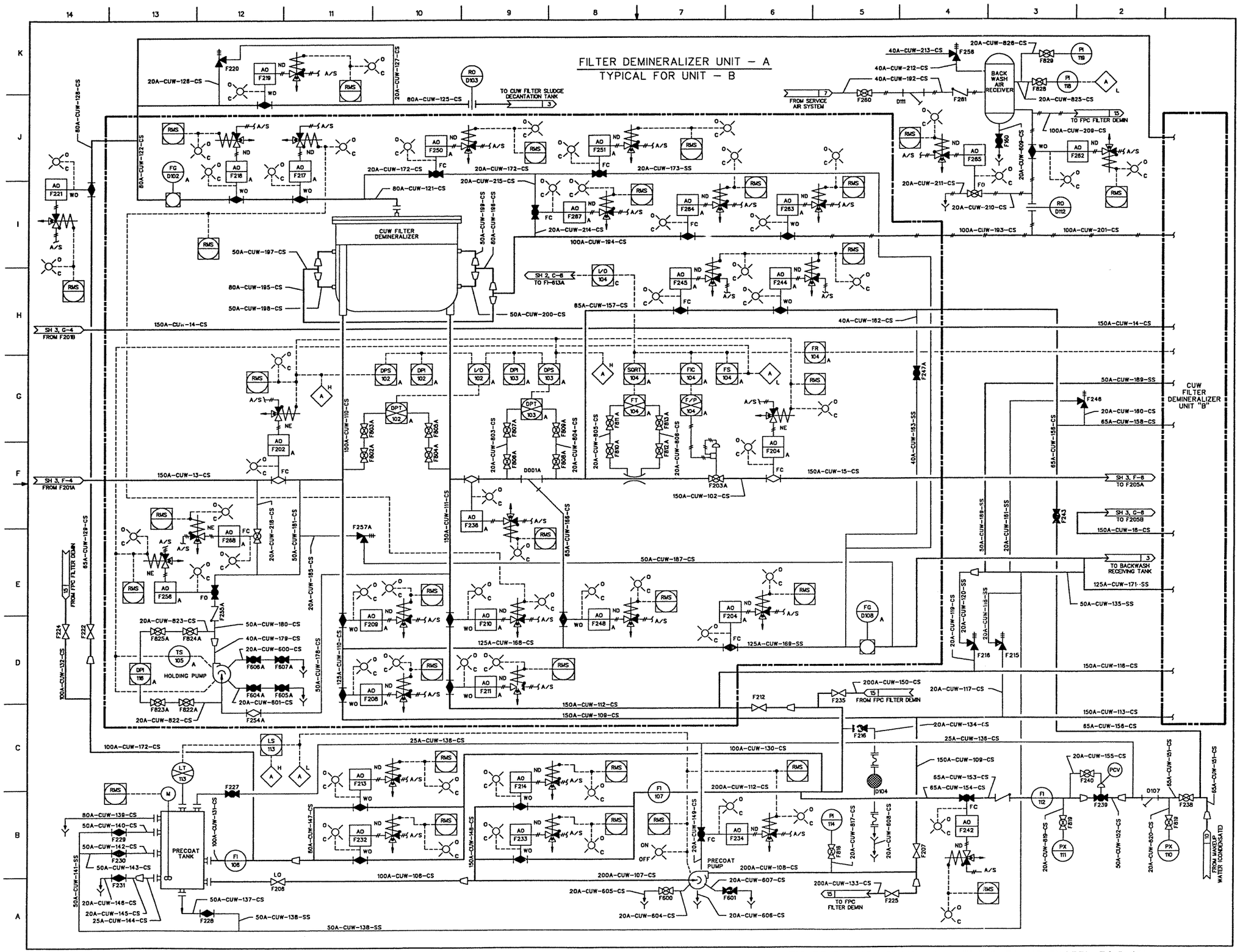


FIGURE 5.4–12 REACTOR WATER CLEANUP SYSTEM P&ID (Sheet 4 of 4)

MODE A: NORMAL OPERATION (REACTOR PRESS 7.17 MPa A)

	1	2	3	4	5	6	7	8 A/B	9 A/B	10	11 A/B	12 A/B	13	14 A/B	15 A/B	16	17	18	19	20	21	22	23	24	25	26	27	28	29 A/B	30 A/B	31
FLOW (m^3 h)	30	172	202	←	→	202	160	80	77	154	77	77	154	77	77	-	154	183	←	→	183	-	-	-	-	-	-	-	140	140	-
PRESS (MPa A)	7.50	X	X	X	X	7.28	7.21	7.28	7.21	X	7.18	8.36	X	8.35	7.93	-	7.98	7.91	X	X	X	-	-	-	-	-	-	-	X	X	-
TEMP (°C)	278	←	→	→	→	278	112	112	49	X	49	49.5	←	→	49.5	-	49	225	←	→	225	-	-	-	-	-	-	-	Max 35	X	-
Max ALLOWABLE PRESS LOSS (m)			ΔP=3	→	→	NOTE 6	→	→	→	→	TDH=120	→	→	Δ P=36	→	→	NOTE 6	→	Δ P=3	→	→								Δ P=10	→	

MODE B: START-UP OPERATION (REACTOR PRESS 1.08 MPa A) NOTE 5

	1	2	3	4	5	6	7	8 A/B	9 A/B	10	11 A/B	12 A/B	13	14 A/B	15 A/B	16	17	18	19	20	21	22	23	24	25	26	27	28	29 A/B	30 A/B	31
FLOW (m^3 h)	NOTE 8	→	172	→	→	172	155	155	77	154	77	77	154	77	77	-	116	-	←	→	127	41	←	→	→	→	→	41	-	140	140	-
PRESS (MPa A)	1.10	1.01	X	X	X	X	X	X	X	X	X	X	-	X	X	-	X	X	X	X	X	X	X	X	X	X	X	X	X	X	-
TEMP (°C)	179	←	→	→	→	179	102	102	Max 54	←	→	→	→	Max 54	→	→	Max 54	156	156	156	156	Max 54	←	→	→	→	→	Max 54	-	Max 35	X	-
Max ALLOWABLE PRESS LOSS (m)			ΔP=3	→	→	NOTE 6	→	→	→	→	TDH=120	→	→	Δ P=36	→	→	NOTE 6	→	Δ P=3	→	→											

MODE C: HOT STANDBY OPERATION (MAIN CONDENSER AVAILABLE) (REACTOR PRESS 7.17 MPa A)

	1	2	3	4	5	6	7	8 A/B	9 A/B	10	11 A/B	12 A/B	13	14 A/B	15 A/B	16	17	18	19	20	21	22	23	24	25	26	27	28	29 A/B	30 A/B	31
FLOW (m^3 h)	NOTE 8	→	207	→	→	207	161	81	77	154	77	77	-	-	-	154	154	186	←	→	186	-	-	-	-	-	-	-	140	140	-
PRESS (MPa A)	7.31	X	X	X	X	7.27	7.20	7.28	7.21	X	7.18	8.36	-	-	-	8.35	7.98	7.91	X	X	X	-	-	-	-	-	-	-	X	X	-
TEMP (°C)	278	←	→	→	→	278	118	118	Max 54	←	→	Max 54	-	-	-	Max 54	Max 54	236	←	→	236	-	-	-	-	-	-	-	Max 35	X	-
Max ALLOWABLE PRESS LOSS (m)			ΔP=3	→	→	NOTE 6	→	→	→	→	TDH=120	→	→	→	→	Δ P= 36	NOTE 6	→	Δ P=3	→	→											

MODE D: HOT STANDBY OPERATION (MAIN CONDENSER ISOLATION) (REACTOR PRESS 7.61 MPa A)

	1	2	3	4	5	6	7	8 A/B	9 A/B	10	11 A/B	12 A/B	13	14 A/B	15 A/B	16	17	18	19	20	21	22	23	24	25	26	27	28	29 A/B	30 A/B	31
FLOW (m^3 h)	NOTE 8	→	209	→	→	209	162	81	77	154	77	77	-	-	-	154	154	187	←	→	187	-	-	-	-	-	-	-	140	140	-
PRESS (MPa A)	7.72	X	X	X	X	X	X	X	X	X	X	X	-	-	-	X	X	X	X	X	X	-	-	-	-	-	-	-	-	-	-
TEMP (°C)	292	←	→	→	→	292	119	119	Max 54	←	→	Max 54	-	-	-	Max 54	Max 54	240	←	→	240	-	-	-	-	-	-	-	Max 35	X	-
Max ALLOWABLE PRESS LOSS (m)			ΔP=3	→	→	NOTE 6	→	→	→	→	TDH=120	→	→	→	→	Δ P= 36	NOTE 6	→	Δ P=3	→	→											

MODE E: REFUELING (RECIRCULATING) (REACTOR PRESS. ATMOSPHERIC PRESS)

	1	2	3	4	5	6	7	8 A/B	9 A/B	10	11 A/B	12 A/B	13	14 A/B	15 A/B	16	17	18	19	20	21	22	23	24	25	26	27	28	29 A/B	30 A/B	31
FLOW (m^3 h)	NOTE 8	→	154	←	→	154	77	77	154	77	77	154	77	77	-	154	←	→	→	154	-	-	-	-	-	-	-	140	140	-	
PRESS (MPa A)	STP	←	→	→	→	→	→	→	→	STP	X	X	X	X	-	X	X	X	X	X	-	-	-	-	-	-	-	X	X	-	
TEMP (°C)	Max 52	←	→	→	→	→	Max 52	Max 49	←	Max 49	Max 49.5	→	→	Max 49.5	-	Max 49.5	Max 52	←	→	Max 52	-	-	-	-	-	-	-	Max 35	X	-	
Max ALLOWABLE PRESS LOSS (m)			ΔP=3	→	→	NOTE 6	→	→	→	→	TDH=120	→	→	Δ P=36	→	→	NOTE 6	→	Δ P=3	→	→											

MODE F: AFTER REFUELING (REACTOR PRESS; ATMOSPHERIC PRESS) NOTE 5

	1	2	3	4	5	6	7	8 A/B	9 A/B	10	11 A/B	12 A/B	13	14 A/B	15 A/B	16	17	18	19	20	21	22	23	24	25	26	27	28	29 A/B	30 A/B	31
FLOW (m^3 h)	NOTE 8	→	154	←	→	154	77	77	154	77	77	154	77	77	-	-	-	-	-	-	154	←	→	→	→	→	→	154	140	140	-
PRESS (MPa A)	STP	←	→	→	→	→	→	→	→	STP	X	X	X	X	-	-	-	-	-	-	X	X	X	X	X	X	X	X	X	X	-
TEMP (°C)	Max 52	←	→	→	→	→	→	→	→	→	→	→	→	Max 52	-	-	-	-	-	-	Max 52	←	→	→	→	→	→	Max 52	Max 35	-	-
Max ALLOWABLE PRESS LOSS (m)			ΔP=3	→	→	NOTE 6	→	→	→	→	TDH=120	→	→	Δ P=36	→	→																

MODE G: RPV SPRAY (REACTOR PRESS 1.03 MPa A) NOTE 7

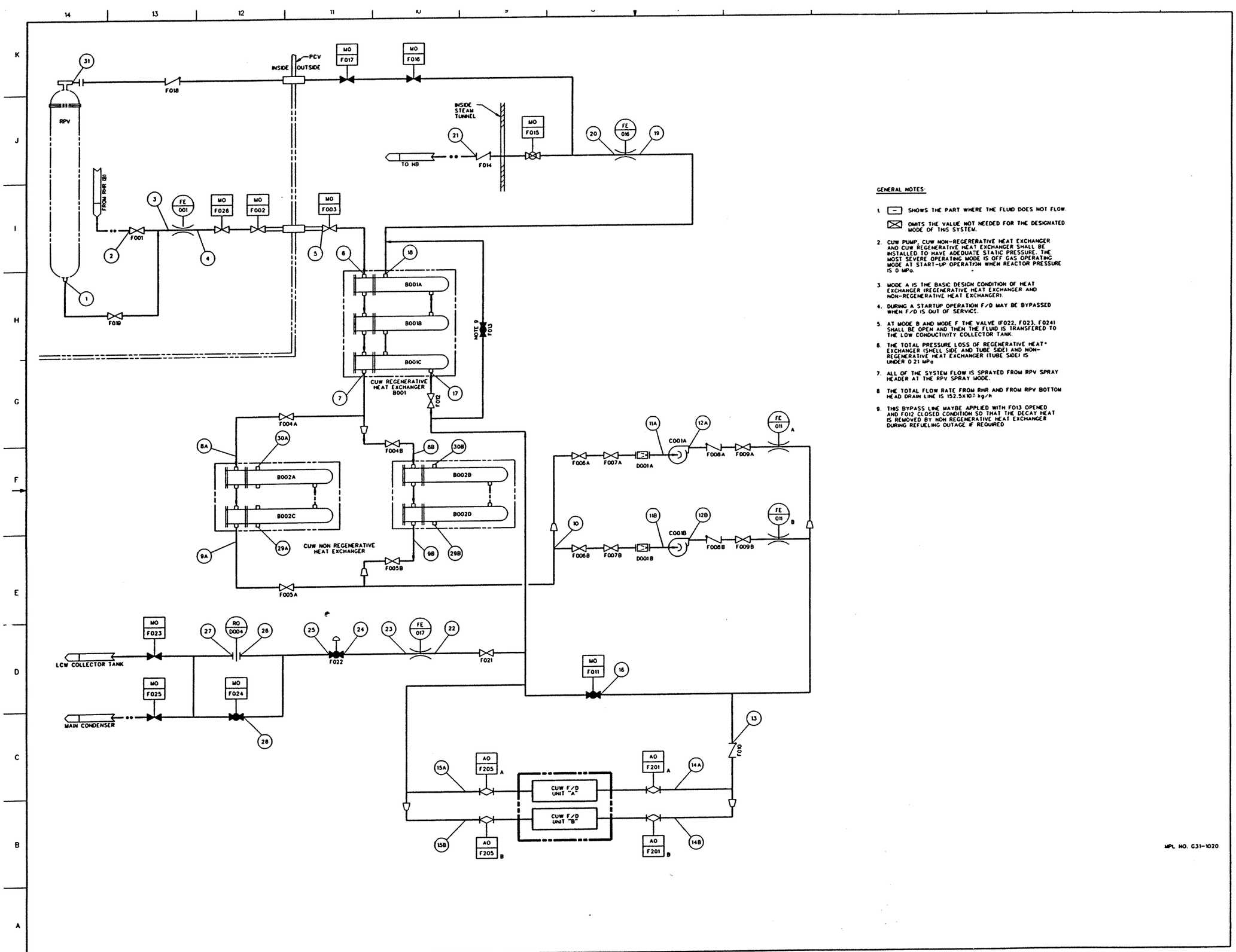
	1	2	3	4	5	6	7	8 A/B	9 A/B	10	11 A/B	12 A/B	13	14 A/B	15 A/B	16	17	18	19	20	21	22	23	24	25	26	27	28	29 A/B	30 A/B	31
FLOW (m^3 h)	NOTE 8	→	172	→	→	172	Max 172	Max 172	76	152	76	76	152	76	76	-	152	Max 172	→	Max 172	-	-	-	-	-	-	-	-	140	140	Max 172
PRESS (MPa A)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	-	X	X	X	X	-	-	-	-	-	-	-	-	X	X	1.03
TEMP (°C)	183	←	→	→	→	183	X	X	Max 49	←	Max 49	Max 49.5	←	→	Max 49.5	-	Max 49.5	148	X	148	-	-	-	-	-	-	-	-	Max 35	X	X
Max ALLOWABLE PRESS LOSS (m)			ΔP=3	→	→	NOTE 6	→	→	→	→	TDH=120	→	→	Δ P=36	→	→	NOTE 6	→	Δ P=3	→	→											

TABLE 1 VALVE OPENING/CLOSING CONDITION

MODE \ VALVE NO	F002	F003	F011	F015	F016	F022	F023	F024	F201	F205
A	O	O	C	O	C	C	C	C	O	O
B	O	O	C	O	C	T	O	C	O	O
C	O	O	O	O	C	C	C	C	C	C
D	O	O	O	O	C	C	C	C	C	C
E	O	O	C	O	C	C	C	C	O	O
F	O	O	C	C	C	O	O	O	O	O
G	O	O	C	C	O	C	C	C	O	O

O OPENING C CLOSING T THROTTLED

FIGURE 5.4-13 REACTOR WATER CLEANUP SYSTEM PFD (Sheet 2 of 2)



GENERAL NOTES:

1. ▭ SHOWS THE PART WHERE THE FLUID DOES NOT FLOW.
   ⊠ OMITS THE VALVE NOT NEEDED FOR THE DESIGNATED MODE OF THIS SYSTEM.
2. CUW PUMP, CUW NON-REGERERATIVE HEAT EXCHANGER AND CUW REGENERATIVE HEAT EXCHANGER SHALL BE INSTALLED TO HAVE ADEQUATE STATIC PRESSURE. THE MOST SEVERE OPERATING MODE IS OFF GAS OPERATING MODE AT START-UP OPERATION WHEN REACTOR PRESSURE IS 0 MPa.
3. MODE A IS THE BASIC DESIGN CONDITION OF HEAT EXCHANGER (REGENERATIVE HEAT EXCHANGER AND NON-REGENERATIVE HEAT EXCHANGER).
4. DURING A STARTUP OPERATION F/D MAY BE BYPASSED WHEN F/D IS OUT OF SERVICE.
5. AT MODE B AND MODE F THE VALVE (F022, F023, F024) SHALL BE OPEN AND THEN THE FLUID IS TRANSFERED TO THE LOW CONDUCTIVITY COLLECTOR TANK.
6. THE TOTAL PRESSURE LOSS OF REGENERATIVE HEAT EXCHANGER (SHELL SIDE AND TUBE SIDE) AND NON-REGENERATIVE HEAT EXCHANGER (TUBE SIDE) IS UNDER 0.21 MPa
7. ALL OF THE SYSTEM FLOW IS SPRAYED FROM RPV SPRAY HEADER AT THE RPV SPRAY MODE.
8. THE TOTAL FLOW RATE FROM RHR AND FROM RPV BOTTOM HEAD DRAIN LINE IS 152.5×10^3 kg/h
9. THIS BYPASS LINE MAYBE APPLIED WITH F013 OPENED AND F012 CLOSED CONDITION SO THAT THE DECAY HEAT IS REMOVED BY NON REGENERATIVE HEAT EXCHANGER DURING REFUELING OUTAGE IF REQUIRED

MPL NO. G31-1020

FIGURE 5.4-13 REACTOR WATER CLEANUP SYSTEM PFD (Sheet 1 of 2)

NOTES:

1. ALL EQUIPMENT IS PREFIXED BY SYSTEM MPL NO. G31 UNLESS OTHERWISE NOTED.
2. ALL EQUIPMENT IS NON IE EXCEPT PRIMARY CONTAINMENT ISOLATION VALVES AND CUW INJECTION VALVE.
3. CUW CONTAINMENT ISOLATION VALVE F002 MANUAL CONTROL AND STATUS LIGHTS (IN ADDITION TO BEING MULTIPLEXED) SHALL BE HARDWIRED TO THE MAIN CONTROL ROOM.

SUPPLEMENTAL DOCUMENT UNDER THE FOLLOWING IDENTITIES SHALL BE USED IN CONJUNCTION WITH THIS DRAWING:

	REFERENCE DESIGNATOR
1. CUW SYSTEM P&ID	G31–1010
2. CUW SYSTEM PFD	G31–1020
3. LEAK DETECTION AND ISOLATION SYSTEM IBD	E31–1030
4. FEEDWATER CONTROL SYSTEM IBD	C31–1030

SUPPORTING DOCUMENTS:

1. 23A5791 – INTERLOCK BLOCK DIAGRAM (IBD) STANDARDS

TABLE OF CONTENTS

MPL NO. G31–1030

TITLE, NOTES AND REFERENCE DOCUMENTS

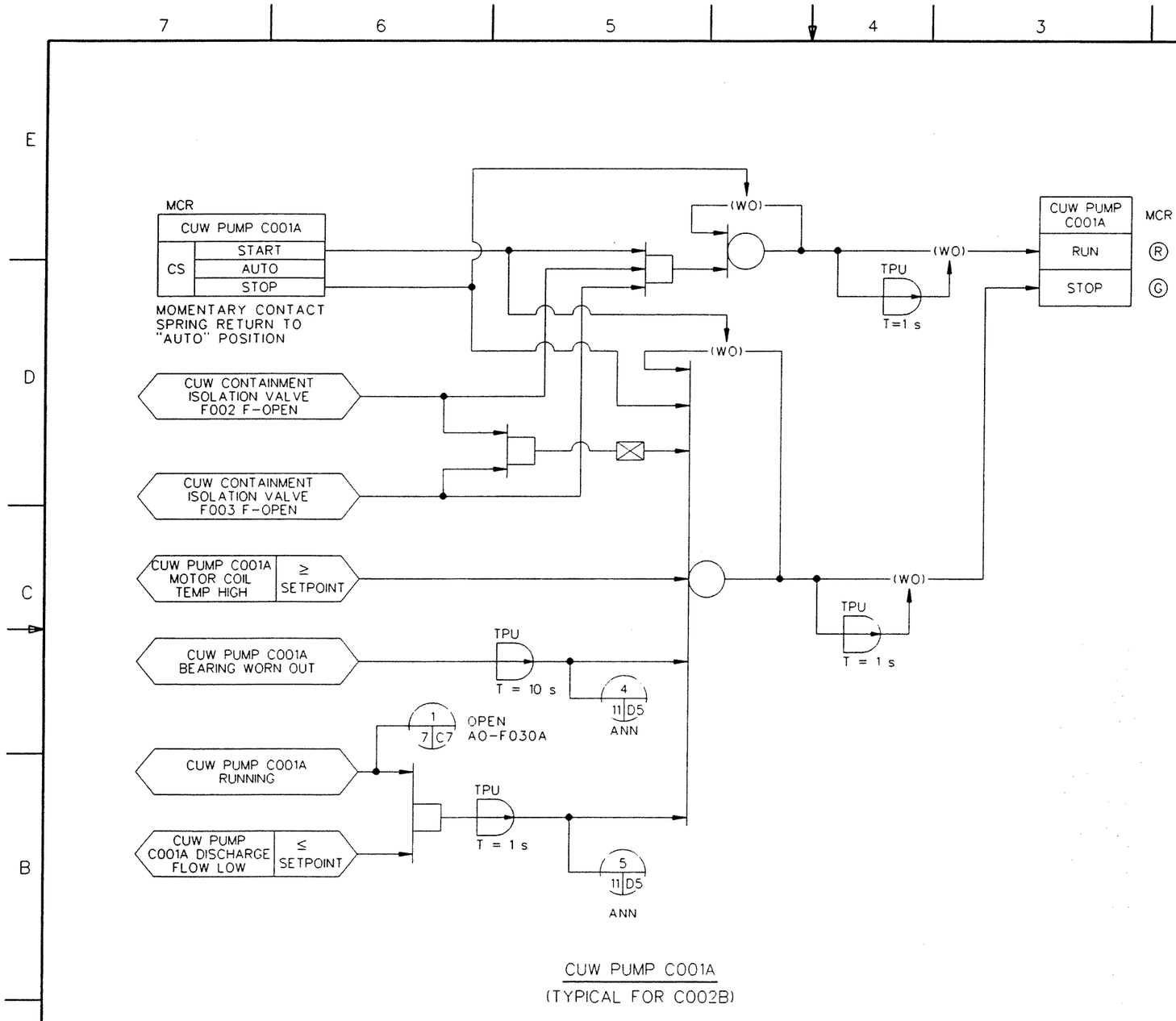
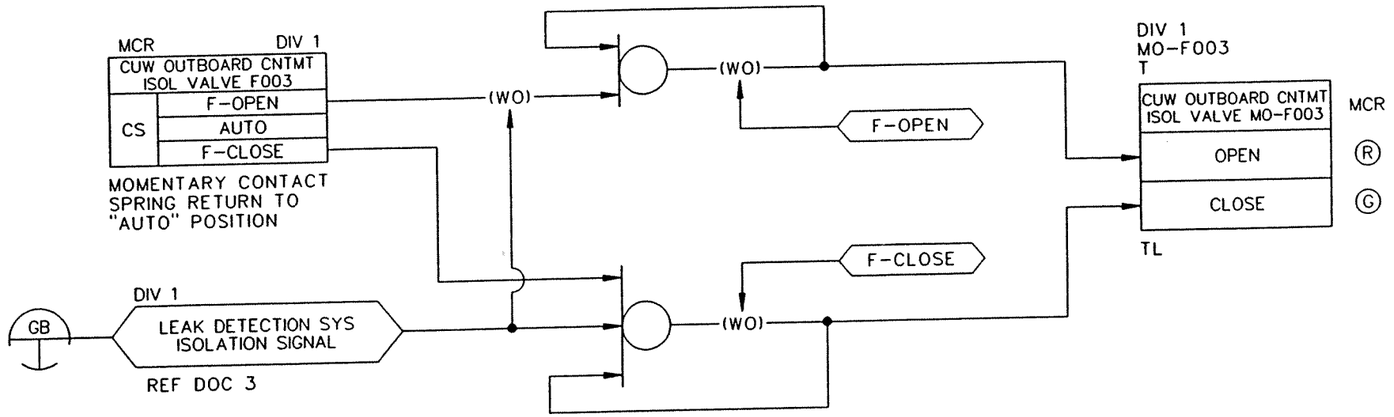
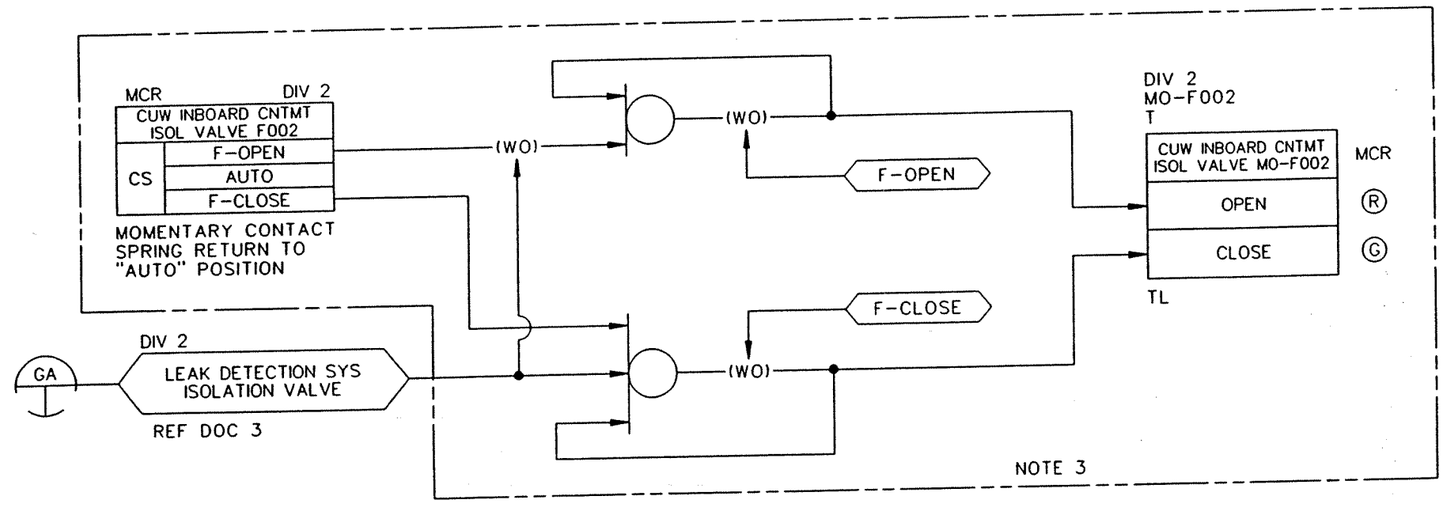


FIGURE 5.4-14 REACTOR WATER CLEANUP SYSTEM IBD (Sheet 2 of 11)



CUW OUTBOARD CONTAINMENT ISOLATION VALVE MO-F003



CUW INBOARD CONTAINMENT ISOLATION VALVE MO-F002

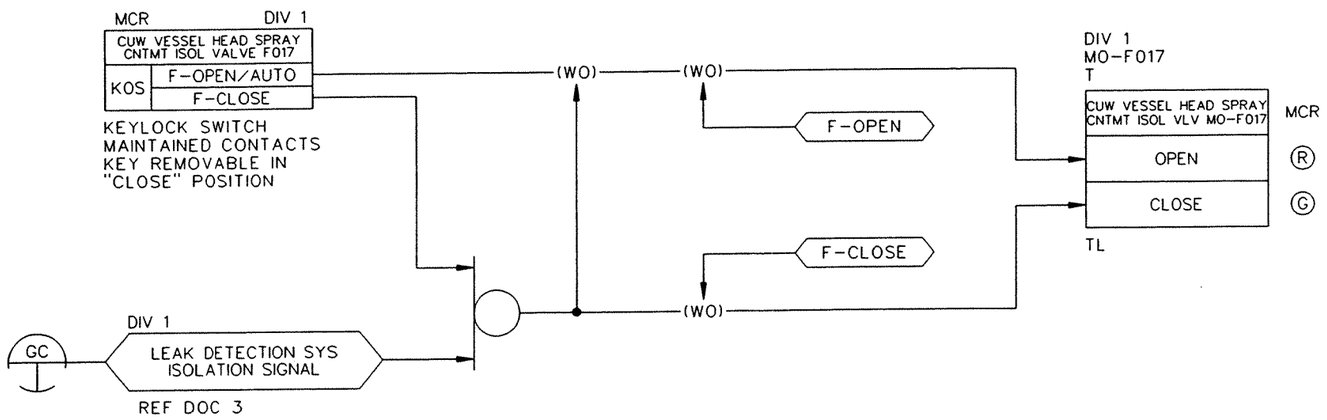
CONTROL SWITCH

OBSERVATIONAL MEASURES		
USE	SPECIFICATION	LOCATION

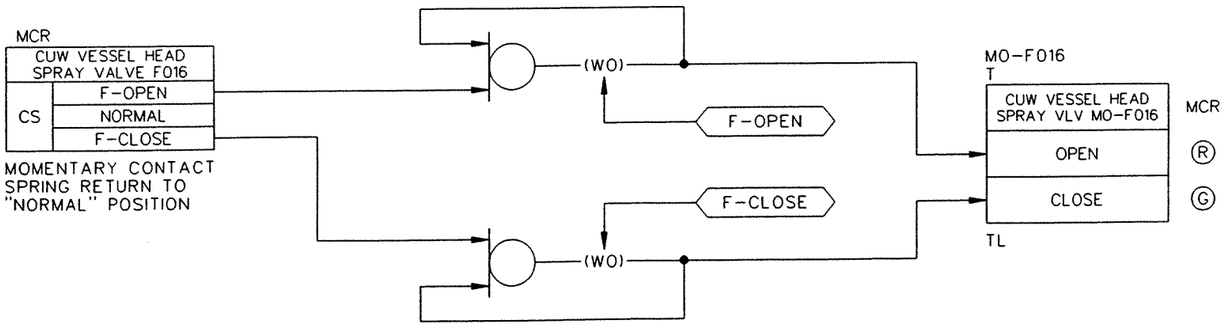
ANNUNCIATOR		
NO.	INDICATOR	LOCATION

OTHERS

FIGURE 5.4-14 REACTOR WATER CLEANUP SYSTEM IBD (Sheet 3 of 11)



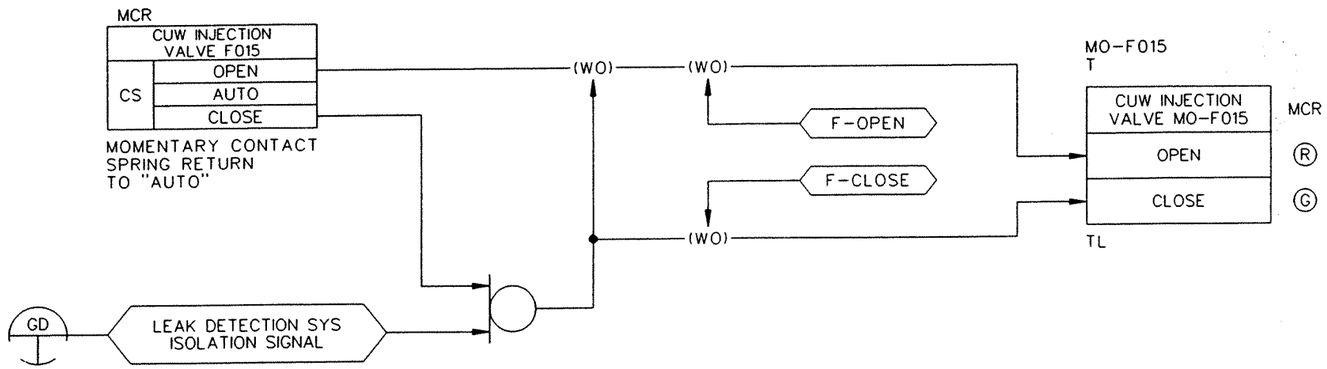
CUW VESSEL HEAD SPRAY CONTAINMENT ISOLATION VALVE MO-F017



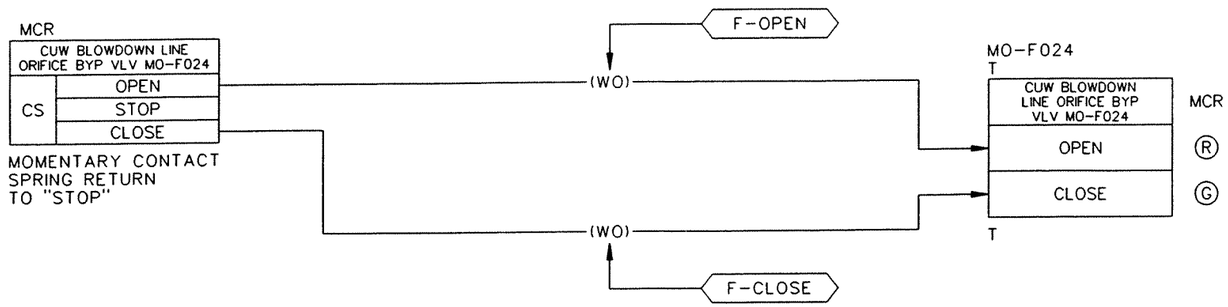
CUW VESSEL HEAD SPRAY VALVE MO-F016

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

FIGURE 5.4-14 REACTOR WATER CLEANUP SYSTEM P&D (Sheet 4 of 11)



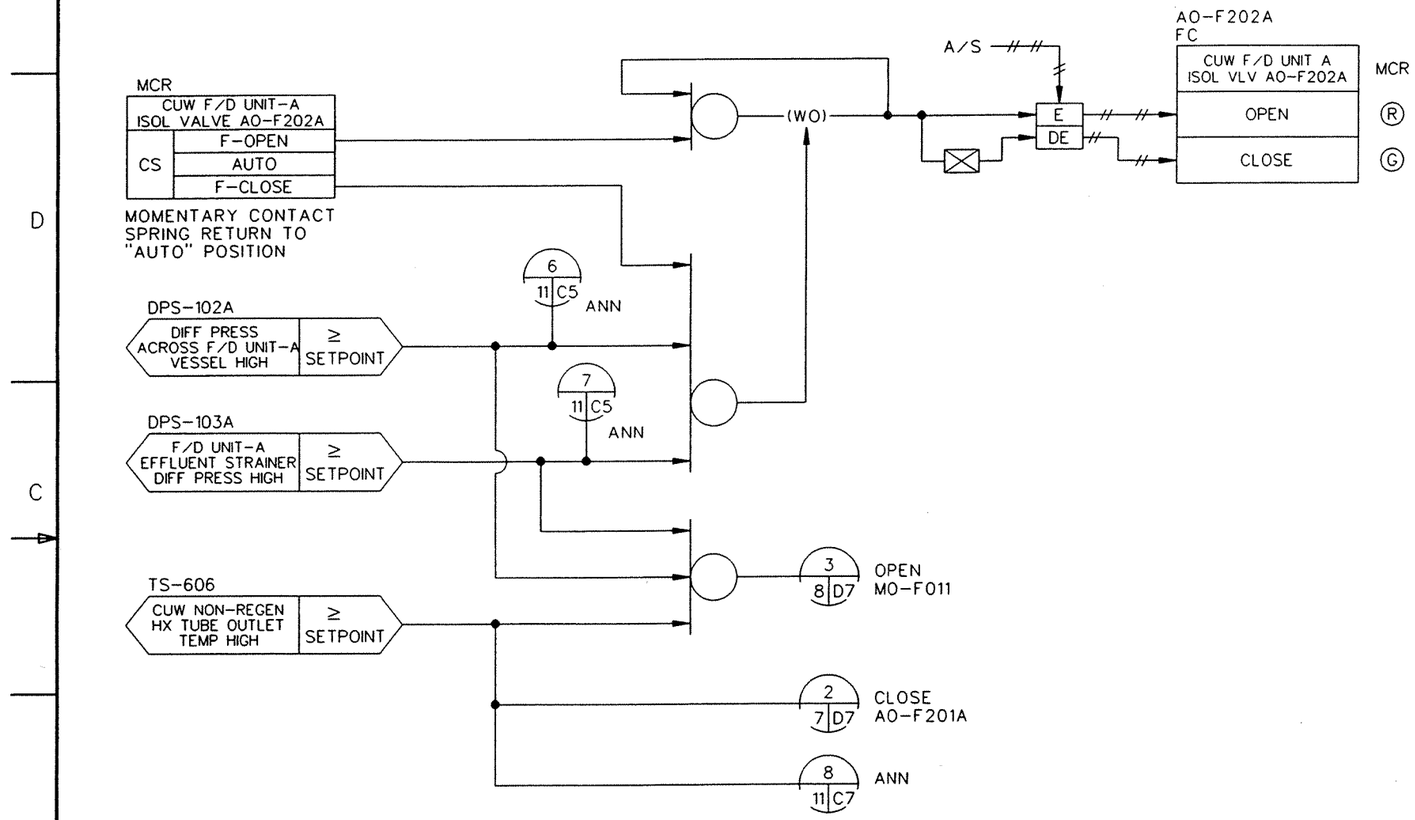
CUW INJECTION VALVE MO-F015



CUW BLOWDOWN LINE ORIFICE BYPASS VALVE MO-F024

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

FIGURE 5.4-14 REACTOR WATER CLEANUP SYSTEM 1BD (Sheet 5 of 11)

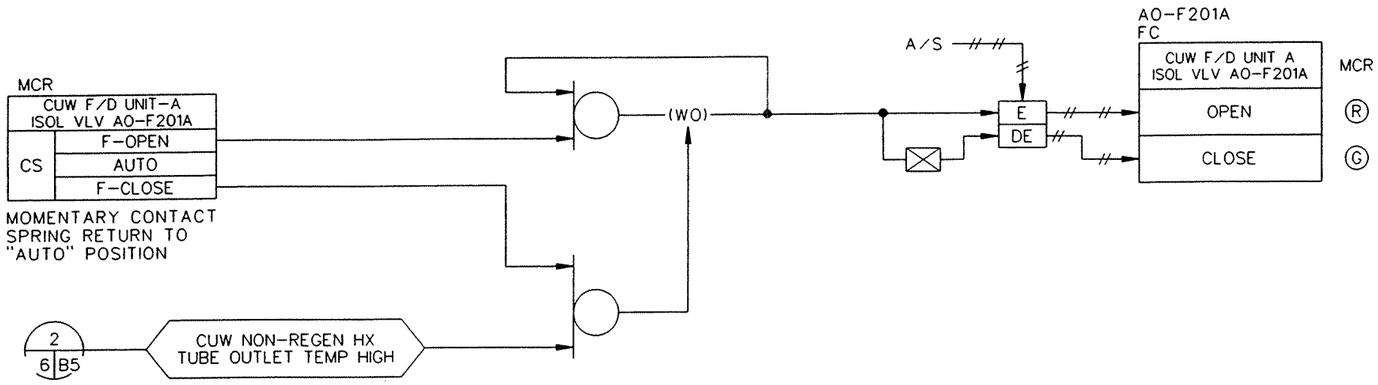


CUW F/D UNIT-A ISOLATION VALVE AO-F202A

(TYPICAL FOR F/D UNIT-A ISOLATION VALVE AO-F204A AND F/D UNIT-B ISOLATION VALVES AO-F202B, AO-F204B)

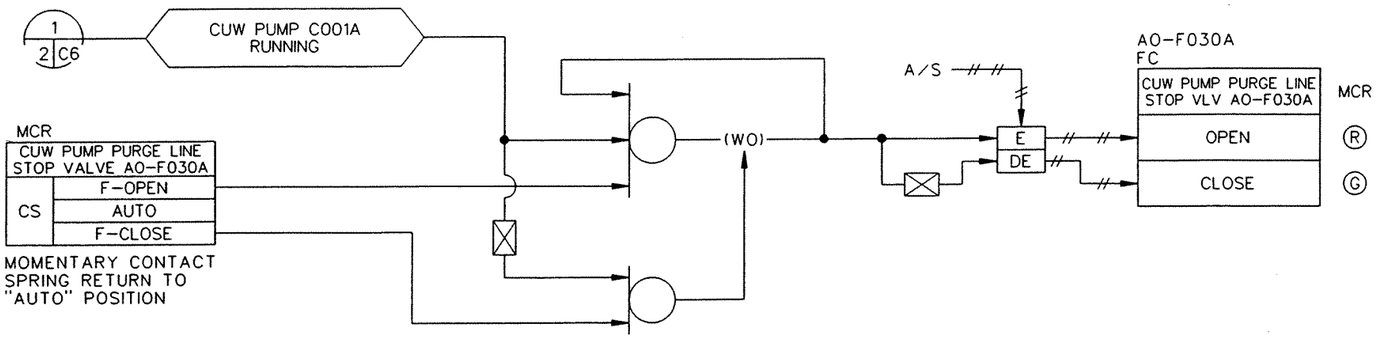
CONTROL SWITCH		
OBSERVATIONAL MEASURES		
USE	SPECIFICATION	LOCATION
ANNUNCIATOR		
NO.	INDICATOR	LOCATION
OTHERS		

FIGURE 5.4-14 REACTOR WATER CLEANUP SYSTEM IBD (Sheet 6 of 11)



CUW F/D UNIT-A ISOLATION VALVE AO-F201A

(TYPICAL FOR F/D UNIT-A ISOLATION VALVE AO-F205A AND F/D UNIT-B ISOLATION VALVES AO-F201B, AO-F205B)

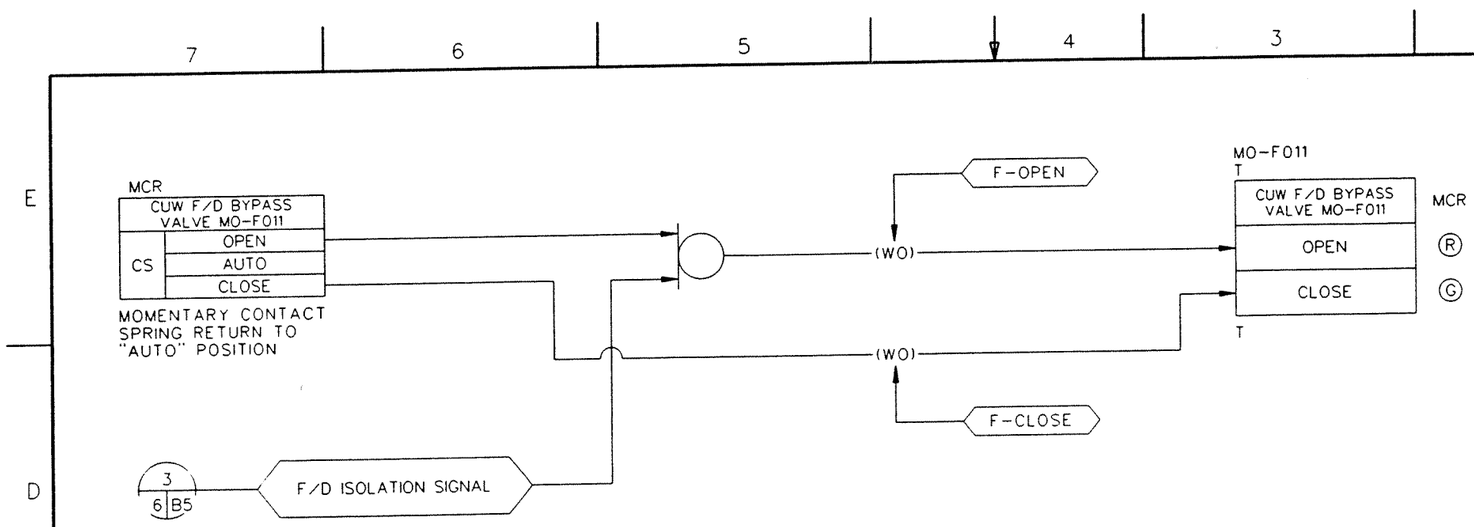


CUW PUMP PURGE LINE STOP VALVE AO-F030A

(TYPICAL FOR AO-F030B)

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

FIGURE 5.4-14 REACTOR WATER CLEANUP SYSTEM IBD (Sheet 7 of 11)



CUW FILTER DEMIN BYPASS VALVE MO-F011

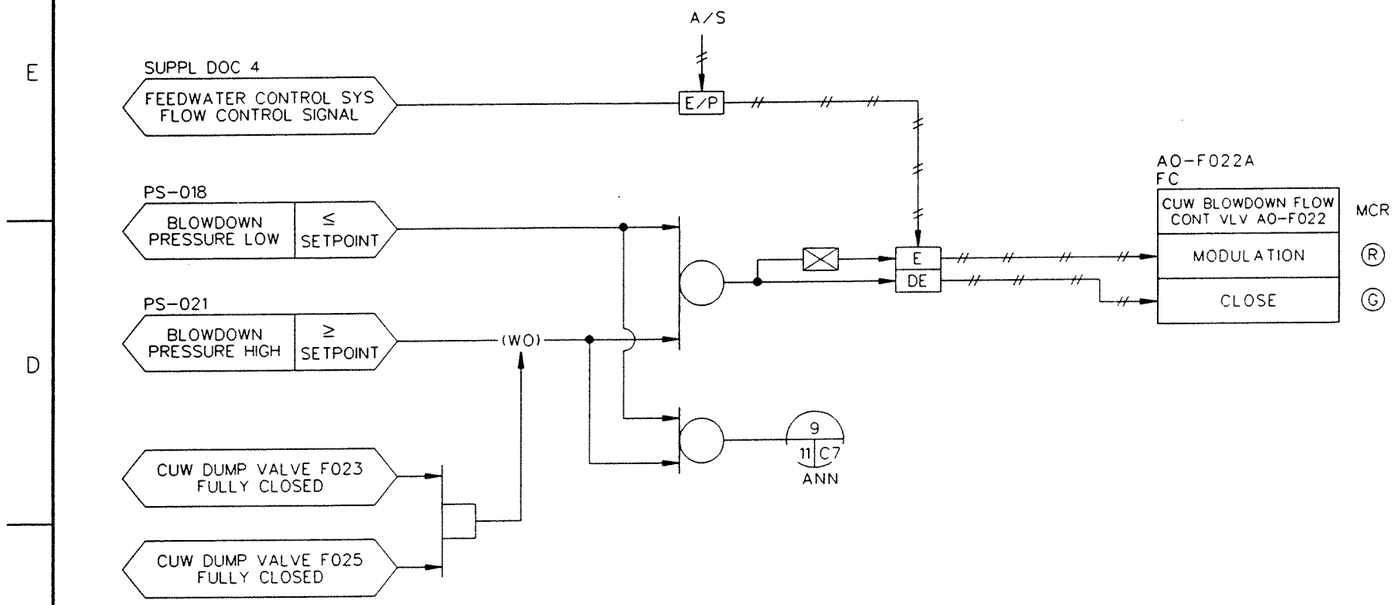
CONTROL SWITCH		

OBSERVATIONAL MEASURES		
USE	SPECIFICATION	LOCATION

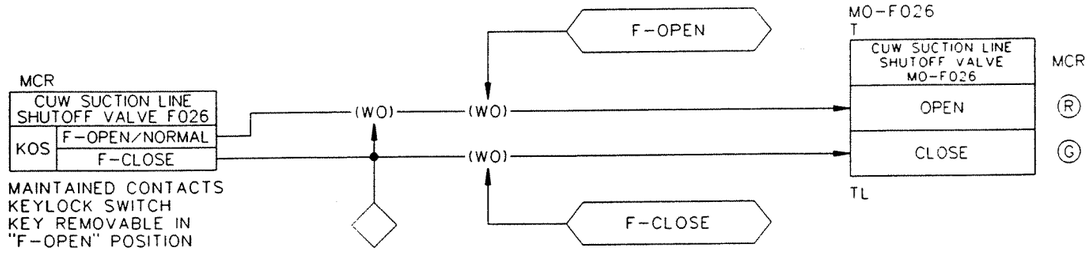
ANNUNCIATOR		
NO.	INDICATOR	LOCATION

OTHERS

FIGURE 5.4-14 REACTOR WATER CLEANUP SYSTEM IBD (Sheet 8 of 11)



CUW BLOWDOWN FLOW CONTROL VALVE AO-F022



CUW SUCTION LINE SHUTOFF VALVE MO-F026

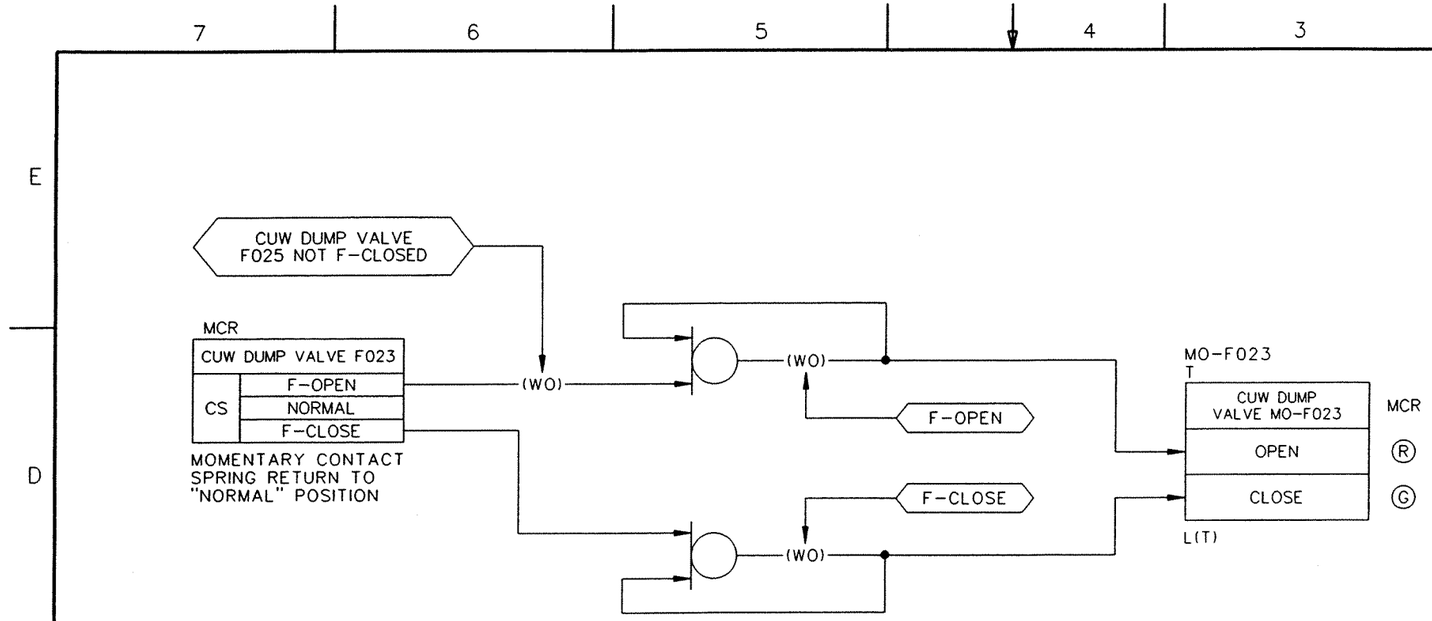
CONTROL SWITCH		

OBSERVATIONAL MEASURES		
USE	SPECIFICATION	LOCATION

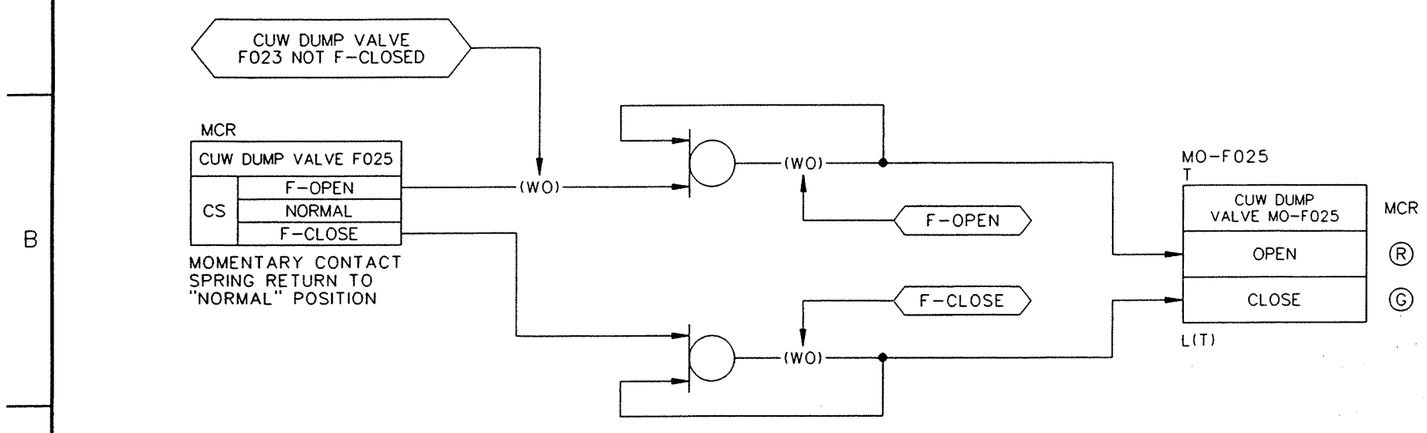
ANNUNCIATOR		
NO.	INDICATOR	LOCATION

OTHERS

FIGURE 5.4-14 REACTOR WATER CLEANUP SYSTEM IBD (Sheet 9 of 11)



CUW DUMP VALVE MO-F023



CUW DUMP VALVE MO-F025

CONTROL SWITCH

OBSERVATIONAL MEASURES		
USE	SPECIFICATION	LOCATION

ANNUNCIATOR		
NO.	INDICATOR	LOCATION

OTHERS

FIGURE 5.4-14 REACTOR WATER CLEANUP SYSTEM IBD (Sheet 10 of 11)

TS-605A
CUW NON-REGEN HX-A TUBE OUTLET TEMP HIGH ≥ SETPOINT

TS-605B
CUW NON-REGEN HX-B TUBE OUTLET TEMP HIGH ≥ SETPOINT

→ A H MCR

CUW F/D UNIT-A TROUBLE → A H MCR
(TYPICAL FOR F/D UNIT-B)

CUW PUMP C001A OVERLOAD TRIP → A H MCR
(TYPICAL FOR PUMP C001B)

8 / 6 B5 — CUW NON-REGEN HX TUBE OUTLET TEMP HIGH → A HH MCR

9 / 9 D5 — CUW BLOWDOWN PRESSURE HIGH/LOW → A H/L MCR

CUW PUMP C001A MOTOR COIL TEMP HIGH ≥ SETPOINT → A H MCR
(TYPICAL FOR PUMP C001B)

CUW PUMP C001A VIBRATION HIGH ≥ SETPOINT → A H MCR
(TYPICAL FOR PUMP C001B)

5 / 2 B5 — CUW PUMP C001A DISCHARGE FLOW LOW → A L MCR
(TYPICAL FOR PUMP C001B)

4 / 2 C5 — CUW PUMP C001A BEARING WORN OUT → A MCR
(TYPICAL FOR PUMP C001B)

6 / 6 D6 — DIFF PRESSURE ACROSS F/D UNIT-A VESSEL HIGH → A H MCR
(TYPICAL FOR F/D UNIT-B)

7 / 6 C6 — F/D UNIT-A EFFLUENT STRAINER DIFF PRESS HIGH → A H MCR
(TYPICAL FOR F/D UNIT-B)

SP-104A
F/D UNIT-A EFFLUENT CONDUCTIVITY HIGH → A H MCR
(TYPICAL FOR F/D UNIT-B)

SP-102
F/D EFFLUENT CONDUCTIVITY HIGH → A H MCR

MISCELLANEOUS ALARMS

CONTROL SWITCH

OBSERVATIONAL MEASURES		
USE	SPECIFICATION	LOCATION

ANNUNCIATOR		
NO.	INDICATOR	LOCATION

OTHERS

FIGURE 5.4-14 REACTOR WATER CLEANUP SYSTEM IBD (Sheet 11 of 11)

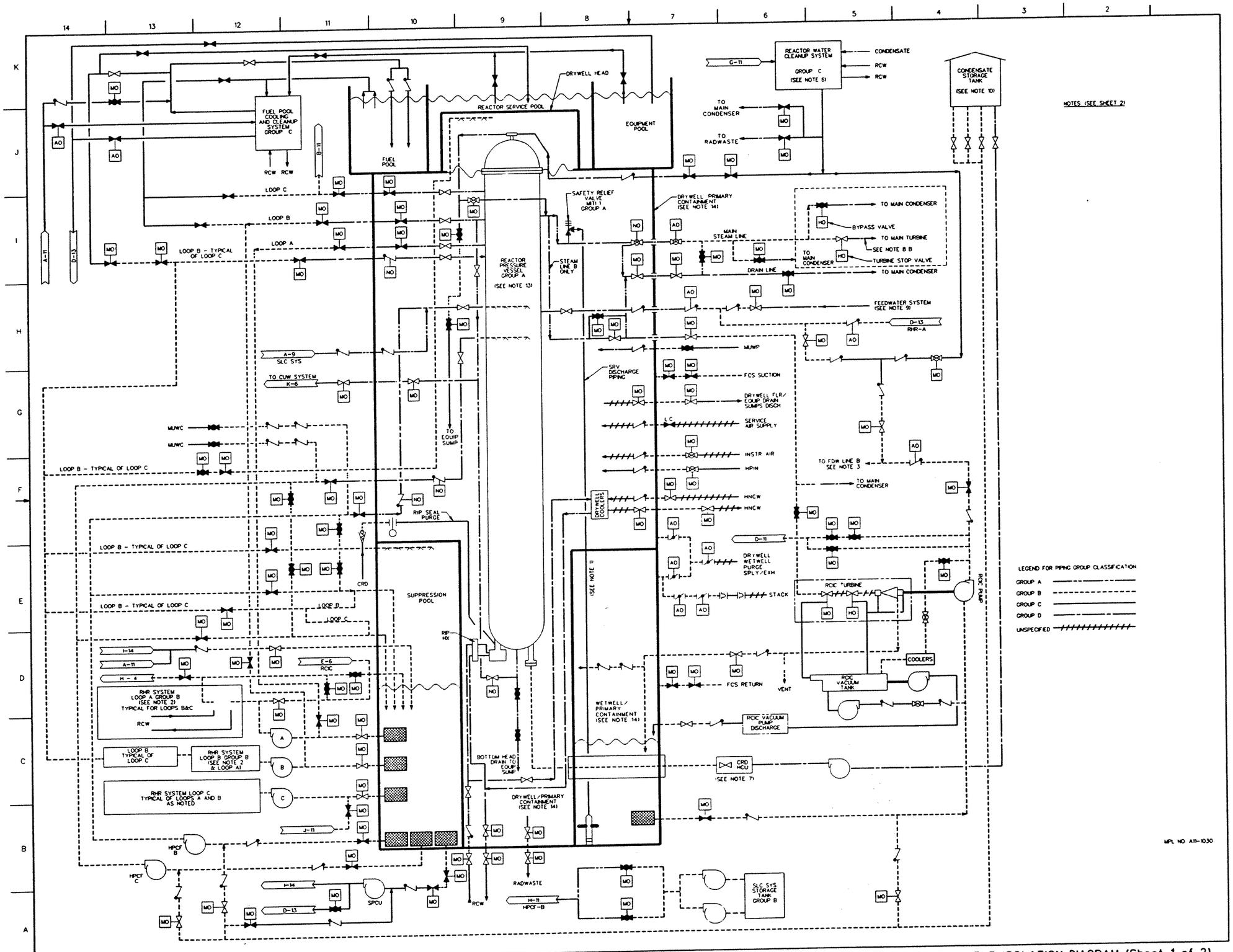


FIGURE 6.2-38 GROUP CLASSIFICATION AND CONTAINMENT ISOLATION DIAGRAM (Sheet 1 of 2)

NOTES:

1. A SEPARATE LINE IS TO BE PROVIDED FOR EACH SAFETY/RELIEF VALVE.

2. RESIDUAL HEAT REMOVAL SYSTEM LOOPS (SUBSYSTEMS) A AND B ONLY ARE REPRESENTED AS TYPICAL LOOPS. LOOP C IS SIMILAR TO LOOP B.

3. RCIC INJECTION VIA FEEDWATER SYSTEM B.

4. TABLE 3.2-1 OF 23A6100 IS CONTROLLING FOR GROUP CLASSIFICATION AND CONTAINMENT ISOLATION REQUIREMENTS. THE PRESSURE INTEGRITY OF NUCLEAR COMPONENTS SPECIFICATION (MPL No. A11-3010) DESCRIBES REQUIREMENTS FOR EACH GROUP CLASSIFICATION. INDIVIDUAL SYSTEMS P&IDS SPECIFY SYSTEM AND COMPONENTS REQUIREMENTS.

5. GROUP CLASSIFICATION CHANGES AT VALVE UNLESS OTHERWISE STATED. VALVES SHALL COMPLY TO HIGHEST CLASSIFICATION. INLINE PUMPS SHALL HAVE LINE GROUP CLASSIFICATION.

6. REACTOR WATER CLEANUP SYSTEM

   THE FILTER-DEMINERALIZER PRECOAT/BACKWASH PORTION OF THE CUW DOWNSTREAM THE HIGH PRESSURE BLOCK VALVES SHALL BE GROUP D.

7. CONTROL ROD DRIVE-HYDRAULIC CONTROL UNIT

   THE PORTION OF THE CRD SYSTEM WHICH IS RELATED TO THE SCRAM FUNCTION IS GROUP B. THE PORTION OF THE CRD SYSTEM WHICH IS NOT RELATED TO THE SCRAM FUNCTION IS GROUP D.

8. MAIN STEAM LINE/TURBINE BYPASS LINE/BRANCH LINES

   A. THE MAIN STEAM LINE INSPECTION RECORDS PERTAINING TO THE LINES BETWEEN THE SHUT-OFF VALVE AND TURBINE STOP VALVE SHALL BE MAINTAINED FOR THE LIFE OF THE PLANT. THESE RECORDS SHALL INCLUDE DATA PERTAINING TO QUALIFICATION OF INSPECTION PERSONNEL, EXAMINATION PROCEEDURES, AND EXAMINATION RESULTS.

   B. THE MAIN STEAM LINES AND INLINE COMPONENTS UP TO THE TURBINE STOP VALVES SHALL BE GROUP B, BEYOND IS GROUP D.

   C. BRANCH LINES OF MSL BETWEEN THE EXTERNAL ISOLATION VALVE AND THE TURBINE STOP VALVE SHALL BE GROUP B OUT TO AND INCLUDING THE FIRST VALVE CAPABLE OF TIMELY ACTUATION.

   D. BRANCH LINES OF THE TURBINE BYPASS LINE UP TO THE BYPASS VALVE SHALL BE GROUP B OUT TO AND INCLUDING THE FIRST VALVE CAPABLE OF TIMELY ACTUATION.

9. FEEDWATER

   BRANCH LINES OF THE FW LINE BETWEEN THE SECOND AND THIRD VALVE OUT TO AND INCLUDING THE FIRST REMOTE ACTUATED VALVE TO BE GROUP B.

10. CONDENSATE STORAGE TANK

    THE CONDENSATE STORAGE TANK WILL BE DESIGNED, FABRICATED, AND TESTED TO MEET THE INTENT OF API STANDARD API 650. IN ADDITION, THE SPECIFICATIONS FROM THIS TANK WILL REQUIRE (1) 100 PERCENT SURFACE EXAMINATION OF THE SIDE WALL TO BOTTOM JOINT AND (2) 100 PERCENT VOLUMETRIC EXAMINATION OF THE SIDE WALL WELD JOINTS, GROUP D CLASSIFICATION.

11. PNEUMATIC PIPING, VESSELS & FITTINGS. (FIG III)

    PNEUMATIC SYSTEMS ASSOCIATED WITH ACTUATION OF SAFETY RELATED VALVES TO ACCOMPLISH SAFETY FUNCTIONS (E.G. MAIN STEAM SAFETY/RELIEF VALVES) ARE CLASSIFIED GROUP C. THIS CLASSIFICATION IS INTENDED TO APPLY TO COMPONENTS SUCH AS THE AIR PIPING, FITTINGS, AND ACCUMULATOR TANKS. THIS CLASSIFICATION DOES NOT APPLY TO COMPONENTS OF THE SYSTEM SUCH AS AIR CONTROL VALVES, AIR CHECK VALVES, AND CYLINDER (OR DIAPHRAM) AIR ACTUATORS. THESE COMPONENTS ARE CONSIDERED AS "SPECIAL EQUIPMENT" AND ARE SELECTED BASED ON ENGINEERING REVIEWS, OPERATING EXPERIENCE, AND TESTING AS BEING THE MOST SUITABLE FOR THE APPLICATION. SUCH EQUIPMENT IS REQUIRED TO BE QUALIFIED TO DEMONSTRATE OPERABILITY DURING NORMAL AND EMERGENCY AMBIENT CONDITIONS. COMPONENTS NORMALLY FURNISHED WITH THE PROCESS VALVE (E.G. AIR CONTROL VALVES, AIR ACTUATORS) ARE PERFORMANCE TESTED WITH THE VALVE AS PART OF ITS ACCEPTANCE TEST PROCEDURE.

12. INSTRUMENT, SAMPLE & OTHER SMALL LINES (FIG II)

    A. VALVE, ORFICE DATA

    I VALVES: AUTOMATIC, REMOTE OPERABLE, OR EXCESS FLOW CHECK* AUTOMATIC OR MANUAL RESETTING, REMOTE POSITION INDICATION MINIMUM PRACTICAL SPACING FROM CONTAINMENT.

    II ORFICE/PIPE* SIZED TO LIMIT FLOW PER NRC REGULATORY GUIDE 1.11.

    III VALVE: LOCKED CLOSED, AUTOMATIC, OR II ABOVE.

    IV VALVE: SAME AS I IF III IS II ; OR LOCKED CLOSED AUTOMATIC (NON-CHECK)

    V VALVE-PROCESS SHUTOFF.

    VI 6.4mm ORIFICE* LOCATED AS CLOSE AS PRACTICAL TO THE PROCESS TO PERMIT OPTIMUM VENTING OF NON-CONDENSIBLES.

    * VALVES AND ORIFICES IN THE LINES SHOULD NOT BE SO RESTRICTIVE AS TO DIMINISH THE SAFETY FUNCTION OF THE LINE.

    B. GROUP CLASSIFICATION OF SMALL DIAMETER LINES.

PROCESS SYSTEM TO WHICH ALL LINES ARE CONNECTED-GROUP CLASSIFICATION	GROUP CLASSIFICATION OF LINES UP TO AND THRU ROOT OR ISOLATION VALVES		CLASSIFICATION OF LINES BEYOND ROOT OR ISOLATION VALVES	
	LINES OVER 25A: WATER 50A: STEAM	LINES 25A: WATER 50A: STEAM AND SMALLER	SAFETY RELATED SYSTEMS (2)	NON-SAFETY RELATED SYSTEMS
A	A	B (1)	B	D
B	B	B	B	D
C	C (2)	C (2)	C	D
D	D (2)	D (2)	N/A	D

(1) GROUP CLASSIFICATION AND CODE REQUIREMENTS ARE BASED ON CURRENT NRC GUIDELINES; HOWEVER, EACH PROJECT SHALL VERIFY WITH STATE JURISDICTIONAL AUTHORITIES TO AVOID MISUNDERSTANDINGS AND POSSIBLE RETROFITS.

(2) SAFETY RELATED SYSTEMS ARE THOSE SYSTEMS WHOSE ACTIONS ARE ESSENTIAL TO BOTH OF THE FOLLOWING:

A. AVOIDING THE UNACCEPTABLE RESULTS FOR ABNORMAL OPERATIONAL TRANSIENTS, ACCIDENTS, AND SPECIAL EVENTS BY CONTRIBUTING TO THE ACCOMPLISHMENT OF ESSENTIAL SAFETY ACTIONS.

B. SATISFYING THE SINGLE FAILURE CRITERION (WHERE APPLICABLE).

13. THE REACTOR COOLANT PRESSURE BOUNDARY INCLUDES THE REACTOR VESSEL AND CONNECTING PIPING, PUMPS AND VALVES, AND EXTENDS TO AND INCLUDES THE OUTERMOST PRIMARY CONTAINMENT ISOLATION VALVE(S) OF THE SYSTEM OR COMPONENT INDICATED.

14. THE CONTAINMENT IS DESIGNED AND CONSTRUCTED TO THE REQUIREMENTS OF THE ASME CODE FOR REINFORCED CONCRETE CONTAINMENT. COMPONENTS WHICH FORM AN EXTENSION OF CONTAINMENT ARE DEFINED AS PRESSURE-RETAINING COMPONENTS, PARTS, MATERIALS OR APPURTENANCES IN THE PORTION OF THE SYSTEM WHICH EXTENDS FROM THE CONTAINMENT TO AND INCLUDING THE OUTERMOST ISOLATION VALVE LOCATED OUTSIDE OF THE CONTAINMENT WHICH IS CAPABLE OF AUTOMATIC ACTUATION GROUP B.

FIG II

INSTRUMENTATION SAMPLE, & OTHER SMALL LINES (SEE NOTE 12) TYPICAL

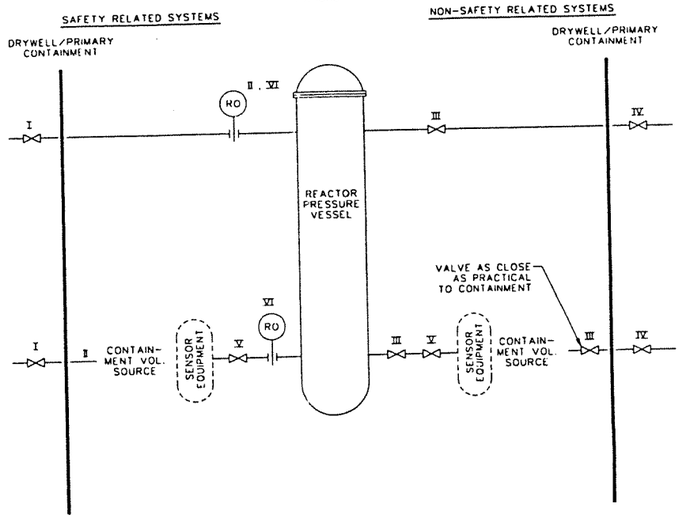


FIG III

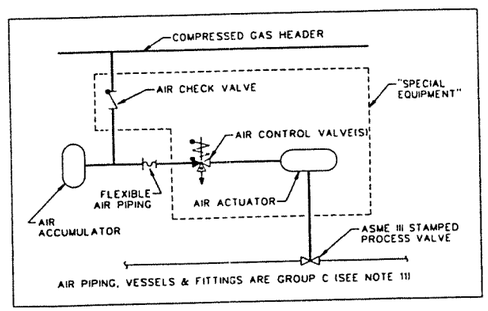
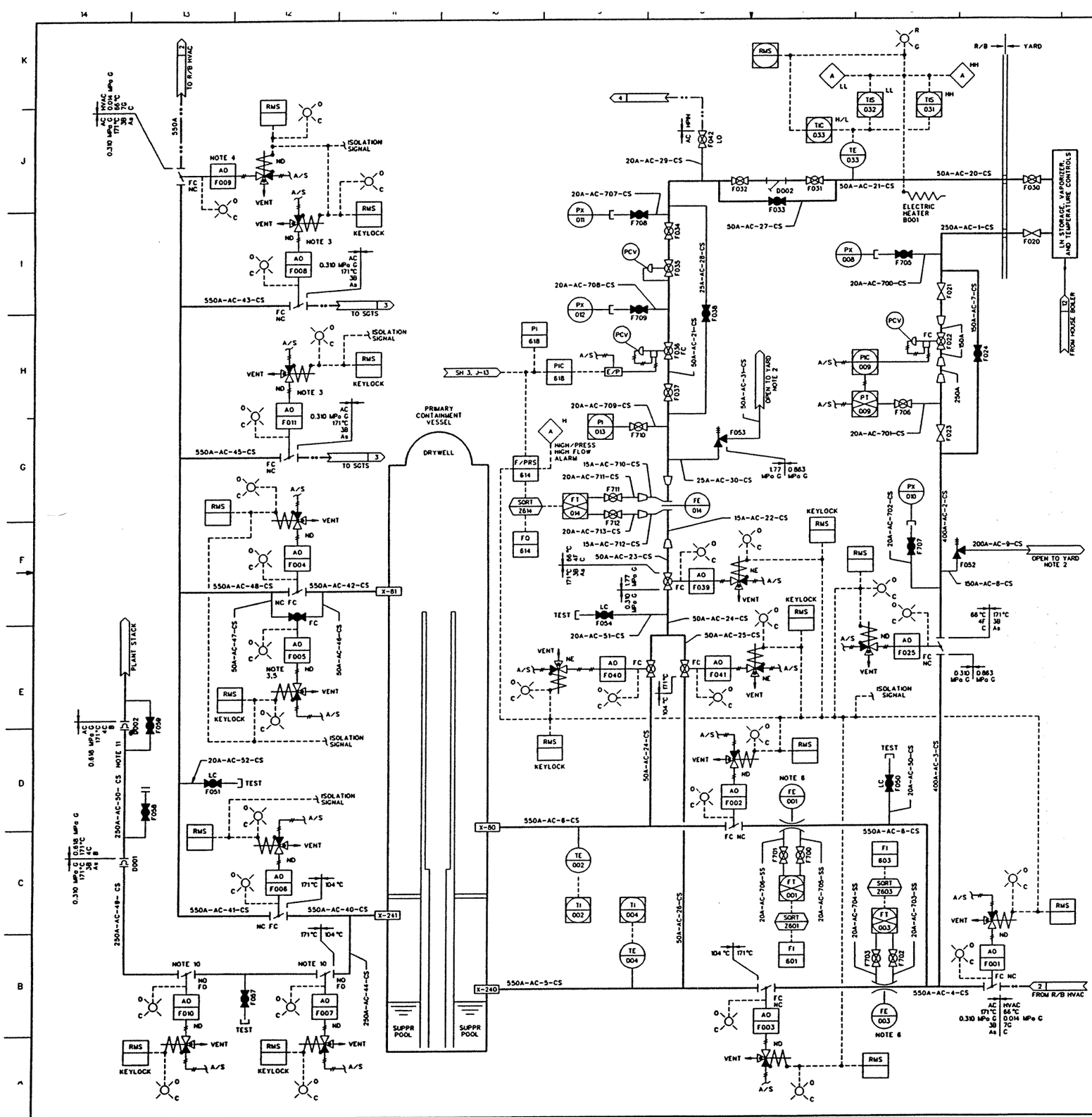


FIGURE 6.2-38 GROUP CLASSIFICATION AND CONTAINMENT ISOLATION DIAGRAM (Sheet 2 of 2)



NOTES:

1. QUALITY CONTROL GROUP AND QUALITY GROUP CLASSIFICATION ARE PROVIDED IN FOLLOWING TABLE.

ITEM		QUALITY CLASSIFICATION	DESIGN CLASSIFICATION
AC SYS EXCEPT FOR FOLLOWING ITEMS		F	4
PCV BOUNDARY		B	3
HVAC SYS		G	7
TEST TAP	UPSTREAM OF VALVE	SAME AS PROCESS LINE	
	DOWNSTREAM OF VALVE	G	7
DRAIN	UPSTREAM OF VALVE	SAME AS PROCESS LINE	
	DOWNSTREAM OF VALVE	G	7
INSTRUMENT PIPING		SAME AS PROCESS LINE	
TEST TAP (FROM VALVE TO CAP)		G	7

2. THE EXHAUST TO THE YARD SHALL BE LOCATED AWAY FROM NORMALLY OCCUPIED AREAS. THE EXHAUST SHALL HAVE A STRUCTURE THAT PREVENTS ENTRY OF RAIN.
3. THESE VALVES SHALL BE ABLE TO BE OPENED MANUALLY BY SWITCHES THAT OVERRIDE THE PCV ISOLATION SIGNAL.
4. THIS VALVE IS MANUALLY OPENED AFTER EACH PCV LEAK TEST BY THE HAND WHEEL.
5. THIS VALVE SHALL BE USED FOR LIMITING FLOW RATE DURING DEPRESSURIZATION FOLLOWING PCV INTEGRATED LEAK RATE TEST.
6. THIS FLOW ELEMENT SHALL BE ANNULAR-TYPE.
7. DESIGN CONDITIONS OF PIPING ARE AS FOLLOWS UNLESS OTHERWISE SPECIFIED.
   - A. MATERIAL ---------- CARBON STEEL
   - B. SCHEDULE ---------- 75A AND OVER – SCH 40
     50A AND LESS – SCH 80
   - C. RADIOACTIVE CONCENTRATION ------- PCV BOUNDARY AND EXHAUST LINE: $\geq 3.7 \times 10^{-6}$ μBq/cc : B.G.
   - D. SEISMIC CLASS ------ PCV BOUNDARY : As, COPS : B
     OTHER AREAS : C
   - E. FLUID ---------- N2 OR AIR
8. DESIGN CONDITIONS OF TEST, DRAIN AND INSTRUMENT PIPING ARE AS FOLLOWS:

ITEM		MAX OPERATING PRESSURE	MAX OPERATING TEMPERATURE	MATERIAL
TEST TAP	UPSTREAM OF VALVE	SAME AS PROCESS LINE		
	DOWNSTREAM OF VALVE	SAME AS PROCESS LINE	66 °C	CS
DRAIN	UPSTREAM OF VALVE	SAME AS PROCESS LINE		
	DOWNSTREAM OF VALVE	ATMOSPHERIC PRESSURE	66 °C	CS
INSTRUMENT PIPING		SAME AS PROCESS LINE		
INSTRUMENT PIPING CONNECTED TO DRYWELL		0.310 MPa G	171 °C	SS
INSTRUMENT PIPING CONNECTED TO SUPPRESSION POOL		0.310 MPa G	104 °C	SS
TEST TAP	UPSTREAM OF VALVE	0.310 MPa G	171 °C	CS
	DOWNSTREAM OF VALVE	0.310 MPa G	66 °C	CS

9. SUPPRESSION POOL WATER TEMPERATURE MONITORING IS PROVIDED BY SPTM SYSTEM, REF 6.
10. THESE VALVES ARE NOT PROVIDED WITH AN ISOLATION SIGNAL. CONTROL SWITCHES SHOULD BE LOCKED OPEN.
11. MEANS SHALL BE PROVIDED FOR MAINTAINING INERT CONTAINMENT OVERPRESSURE PROTECTION SYSTEM (COPS) PIPING VOLUME BETWEEN THE RUPTURE DISKS. D001 IS LOCATED AS CLOSE AS PRACTICAL TO THE CONTAINMENT AND D002 TO THE STACK

REFERENCE DOCUMENTS:

	MPL NO.
1. PIPING AND INSTRUMENT SYMBOLS DIAGRAM	A10-3030
2. HVAC SYSTEM P&ID	U41-1010
3. STANDBY GAS TREATMENT SYSTEM P&ID	T22-1010
4. HIGH PRESS. NITROGEN GAS SUPPLY SYS P&ID	P54-1010
5. NUCLEAR BOILER SYSTEM P&ID	B21-1010
6. SUPPR POOL WATER TEMP MONITORING SYS IED	T53-1010
7. DRYWELL COOLING SYSTEM	T41-1010
8. REMOTE SHUTDOWN SYSTEM IED	C81-1010
9. HIGH PRESSURE CORE FLOODER SYS P&ID	E22-1010
10. REACTOR CORE ISOLATION COOLING SYS P&ID	E51-1010
11. SUPPRESSION POOL CLEANUP SYSTEM P&ID	G51-1010
12. HOUSE BOILER SYS P&ID	P62-1010

MPL NO. T31-1010

FIGURE 6.2-39 ATMOSPHERIC CONTROL SYSTEM P&ID (Sheet 1 of 3)

TABLE 1 LOCATION AND USE OF TEMPERATURE ELEMENTS INSIDE PCV

TAG NUMBER		LOCATION	USE
TE-050	A,B	LOWER DRYWELL (AROUND CRD HOUSING)	INDICATION & ALARM
	C	LOWER DRYWELL (AROUND CRD HOUSING)	RESERVE
TE-051	A,B,C	AROUND RPV HEAD FLANGE	INDICATION
	D,E,F,G,H	AROUND SRV	INDICATION
	J	SUPPLY DUCT TO DRYWELL TOP HEAD	INDICATION
	K	RETURN DUCT FROM DRYWELL TOP HEAD	INDICATION
	L,M,N	SUPPLY DUCT TO ANNULUS AREA BETWEEN RPV AND GAMMA SHIELD	INDICATION
	P,R,S	RETURN DUCT FROM ANNULUS AREA BETWEEN RPV AND GAMMA SHIELD	INDICATION
TE-052	A,B,C	SUCTION AT EACH DRYWELL COOLER	RECORD & ALARM
	D,E,F	DISCHARGE AT EACH DRYWELL COOLER	RECORD & ALARM
	G,H	SUPPLY DUCT TO UPPER DRYWELL	RECORD & ALARM
	J,K,L,M,N	AROUND RPV FLANGE	RECORD & ALARM
	P,R,S,T	SUPPRESSION CHAMBER FREE VOLUME	RECORD & ALARM
TE-053	A,B	LOWER DRYWELL (CRD PIPE TUNNEL)	INDICATION
	C,D	LOWER DRYWELL (CRD PIPE TUNNEL)	INDICATION
	E,F,G,H	LOWER DRYWELL (AROUND CRD PIPE HOUSING)	INDICATION
	J,K,L,M	LOWER DRWELL (AROUND CRD PIPE NEAR AREA TO INTERNAL PUMP)	INDICATION

FIGURE 6.2-39 ATMOSPHERIC CONTROL SYSTEM P&ID (Sheet 2 of 3)

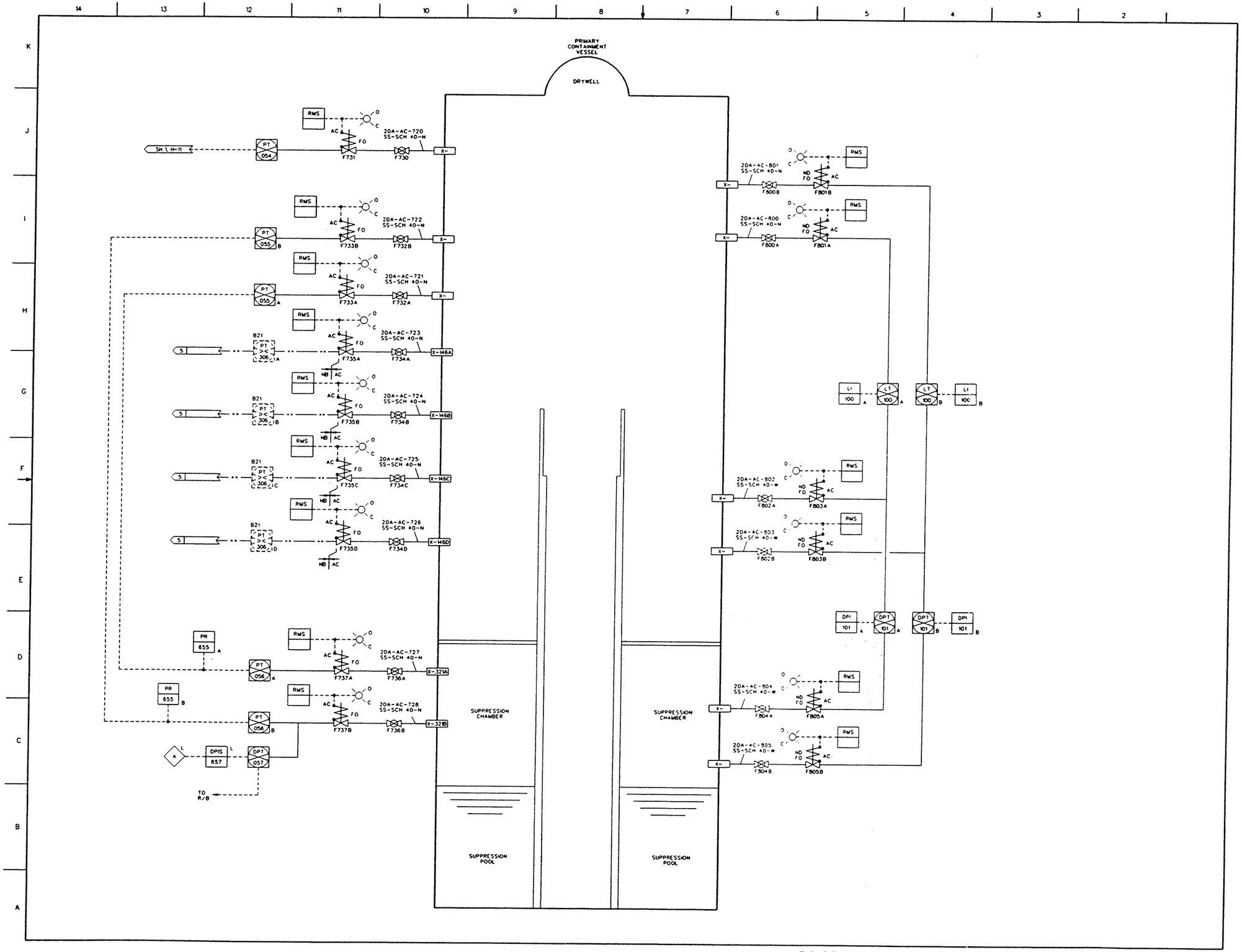
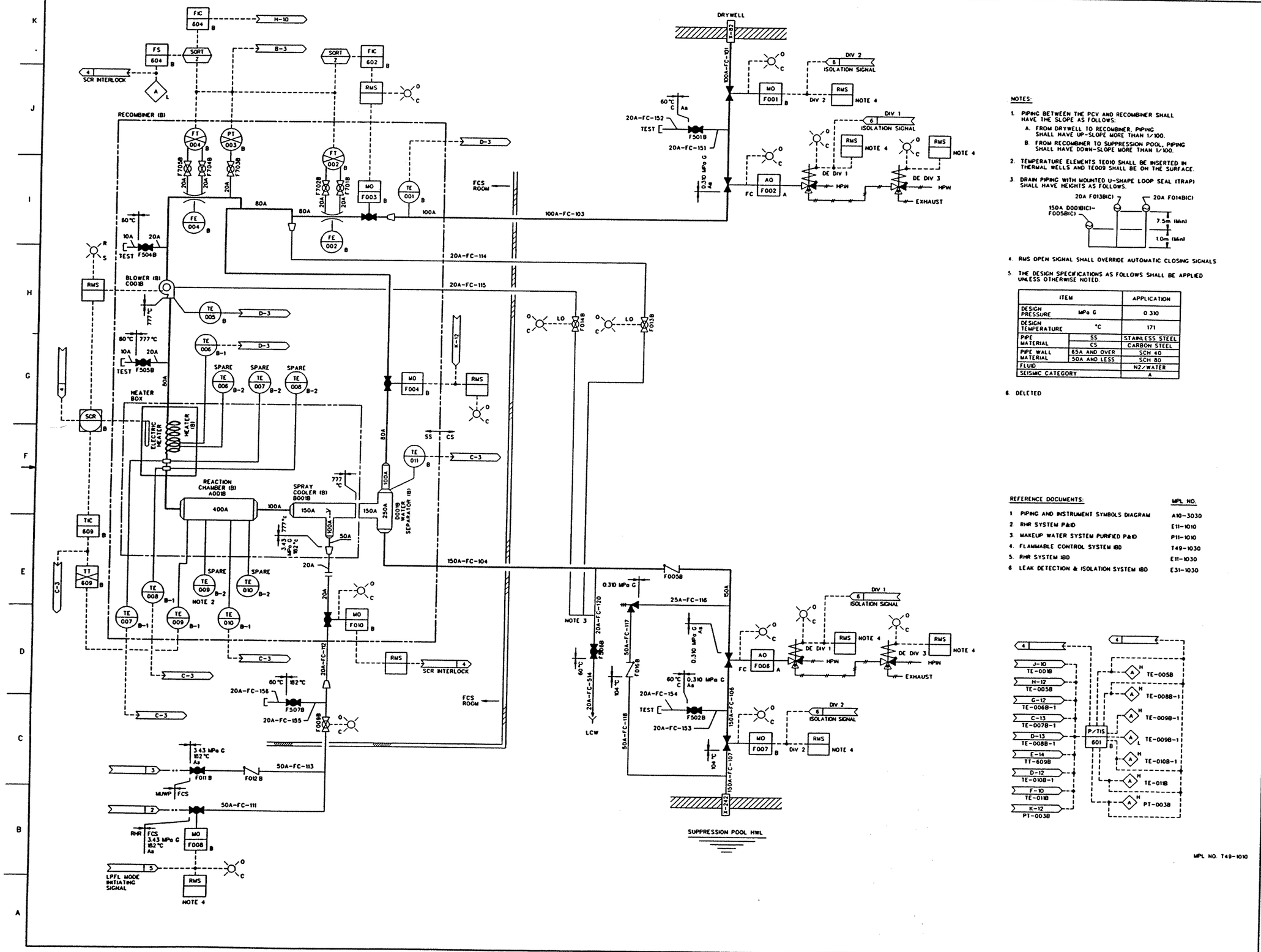


FIGURE 6.2-39 ATMOSPHERIC CONTROL SYSTEM P&ID (Sheet 3 of 3)



NOTES:

1. PIPING BETWEEN THE PCV AND RECOMBINER SHALL HAVE THE SLOPE AS FOLLOWS:
   A. FROM DRYWELL TO RECOMBINER, PIPING SHALL HAVE UP-SLOPE MORE THAN 1/100.
   B. FROM RECOMBINER TO SUPPRESSION POOL, PIPING SHALL HAVE DOWN-SLOPE MORE THAN 1/100.
2. TEMPERATURE ELEMENTS TE010 SHALL BE INSERTED IN THERMAL WELLS AND TE009 SHALL BE ON THE SURFACE.
3. DRAIN PIPING WITH MOUNTED U-SHAPE LOOP SEAL (TRAP) SHALL HAVE HEIGHTS AS FOLLOWS.

4. RMS OPEN SIGNAL SHALL OVERRIDE AUTOMATIC CLOSING SIGNALS
5. THE DESIGN SPECIFICATIONS AS FOLLOWS SHALL BE APPLIED UNLESS OTHERWISE NOTED.

ITEM		APPLICATION
DESIGN PRESSURE	MPa G	0.310
DESIGN TEMPERATURE	°C	171
PIPE MATERIAL	SS	STAINLESS STEEL
	CS	CARBON STEEL
PIPE WALL MATERIAL	65A AND OVER	SCH 40
	50A AND LESS	SCH 80
FLUID		N2/WATER
SEISMIC CATEGORY		A

6. DELETED

REFERENCE DOCUMENTS:

	MPL NO.
1. PIPING AND INSTRUMENT SYMBOLS DIAGRAM	A10-3030
2. RHR SYSTEM P&ID	E11-1010
3. MAKEUP WATER SYSTEM PURIFIED P&ID	P11-1010
4. FLAMMABLE CONTROL SYSTEM IBD	T49-1030
5. RHR SYSTEM IBD	E11-1030
6. LEAK DETECTION & ISOLATION SYSTEM IBD	E31-1030

MPL NO. T49-1010

FIGURE 6.2-40 FLAMMABILITY CONTROL SYSTEM P&ID (Sheet 1 of 2)

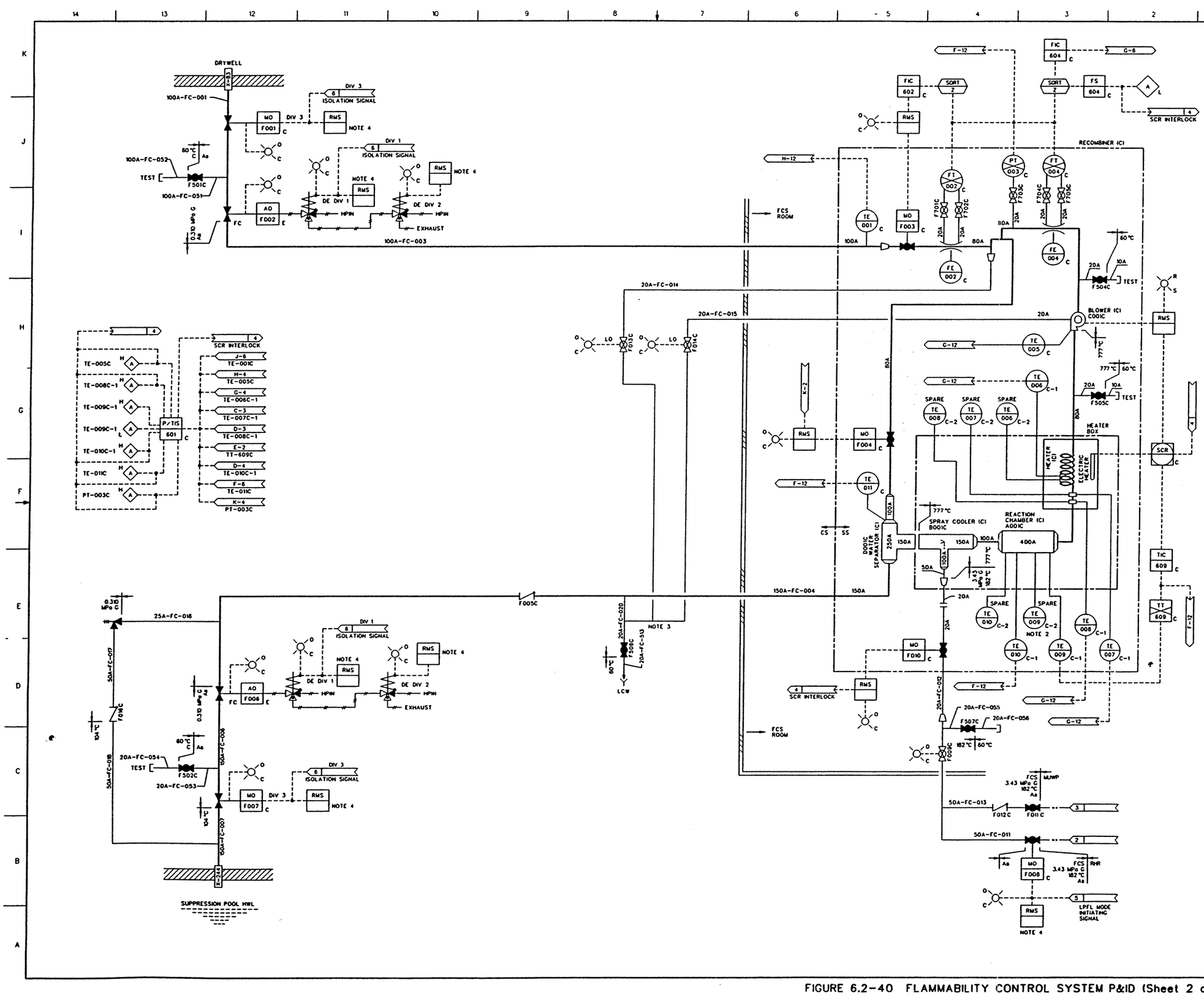
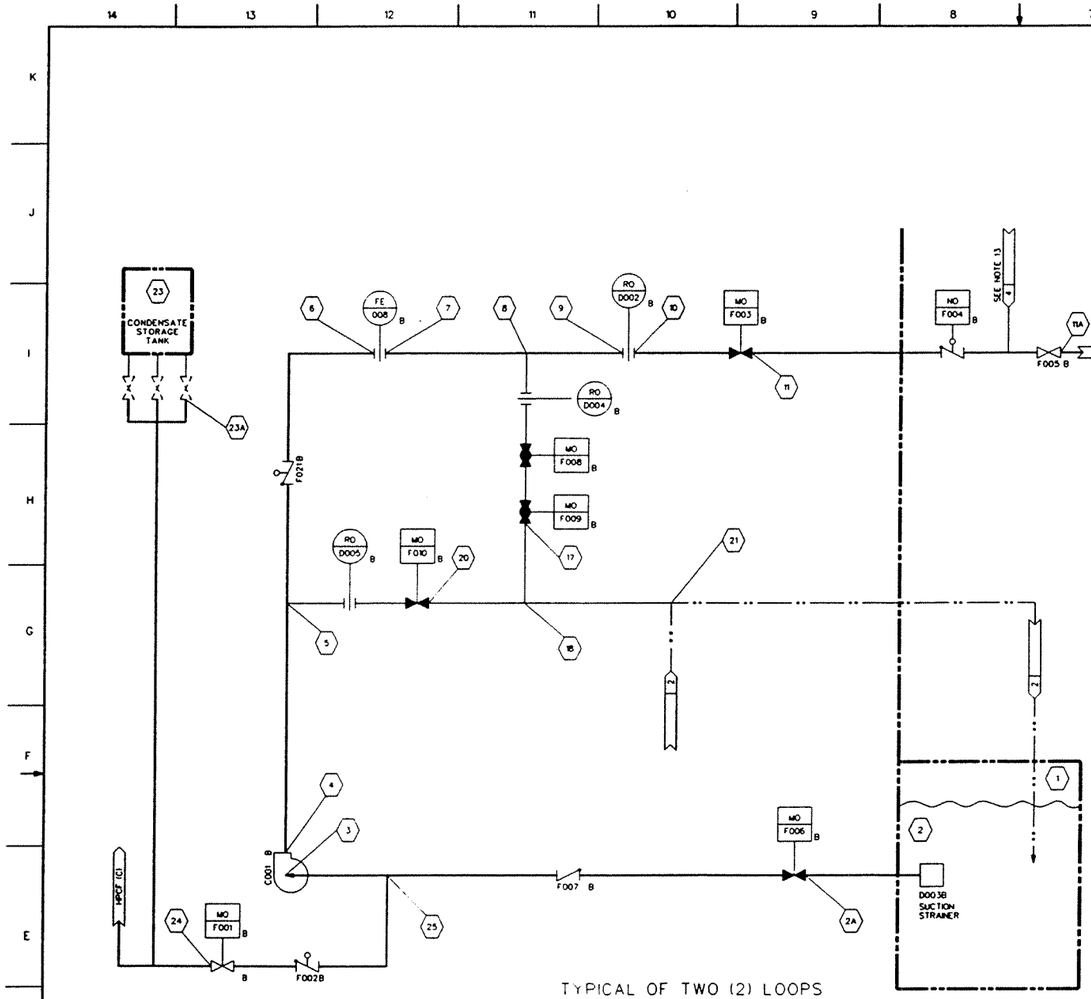


FIGURE 6.2-40 FLAMMABILITY CONTROL SYSTEM P&ID (Sheet 2 of 2)



NOTES

1. STANDBY LIQUID CONTROL (C41) DISCHARGES INTO CORE FLOODER LOOP B, BUT DOES NOT AFFECT SYSTEM PIPING DESIGN FOR THAT LOOP.
2. EMPTY DATA BLANKS ARE TO BE PROVIDED BY THE PIPING DESIGNER. ☒ INDICATES MAXIMUM AND MINIMUM VALUES OF THAT PARAMETER.
3. MAXIMUM ELEVATION DIFFERENCE BETWEEN THE MINIMUM SUPPRESSION POOL LEVEL AND THE CORE COOLING LOOP VESSEL NOZZLES, ≤ 20.1 METERS.
4. IN MODE "C" THE NPSH AVAILABLE AT 1 METER ABOVE THE PUMP FLOOR, SHALL MEET OR EXCEED 2.2 METERS WITH SUCTION STRAINERS 50% PLUGGED
5. THE PRESSURE DIFFERENCE BETWEEN POINTS 9 AND 10 SHALL BE ADJUSTED DURING PREOPERATIONAL TESTING, SO THAT:
   (A) THE FLOW SPECIFIED FOR MODE "B" IS EQUALED OR EXCEEDED AT THE REACTOR PRESSURE SPECIFIED.
   (B) THE NPSH AVAILABLE TO THE HPCF PUMPS IN MODE "C" IS NOT LESS THAN SPECIFIED IN NOTE 4.
   C) THE PUMP VENDOR-ALLOWABLE RUNOUT FLOW IS NOT EXCEEDED
   (D) THE RUNOUT FLOW DOES NOT EXCEED VENDOR TESTED FLOW
6. BYPASS FLOW SPECIFIED IN MODE "E" IS APPROXIMATE IF THE PUMP VENDOR REQUIRES MINIMUM FLOW GREATER THAN THAT SHOWN, THE PUMP REQUIREMENTS FOR MODE "A" MUST BE RE-EXAMINED.
7. THIS TABLE IS FOR REFERENCE ONLY; SEE REFERENCE DOC 1 FOR REQUIRED VALUES.
8. TABLE 1 INDICATES VALVE POSITION DURING VARIOUS OPERATING MODES
9. FOR MODE B, POINTS 1-12, 77.10°C OCCURS FOR A SHORT DURATION TIME AFTER LOCA
10. MODE D REFLECTS SYSTEM TEST CONDITIONS FOR THE RATED CONDITION AND HIGH PRESSURE/LOW FLOW CONDITION. THE RUNOUT FLOW CONDITION SHOULD BE USED FOR DESIGN OF THE FLOW TEST LOOP
11. VALVE E22-F003B & C AUTOMATICALLY OPENS ON REACTOR WATER LOW LEVEL AND CLOSES ON HIGH LEVEL.
12. INTERCONNECTIONS BETWEEN THE HIGH PRESSURE CORE FLOODER SYSTEM AND THE RHR SYSTEM ARE FROM HPCF LOOP "B" TO PMP "B", ETC
13. THIS CONNECTION IS ON LOOP "B" ONLY
14. NPSH AVAILABLE FROM THE CONDENSATE TANK SOURCE MUST EQUAL OR EXCEED NPSH REQUIRED IN NOTE 4
15. POSITIONS 23, 24, AND 25 APPLY WHEN SUCTION IS TAKEN FROM CST.
16. PREFERRED INITIAL SUCTION SOURCE IS CONDENSATE STORAGE TANK.
17. 1.25 METERS SUCTION LINE LOSS FROM SUPPRESSION POOL TO PUMP SUCTION
18. REQUIRED TOTAL DYNAMIC HEAD

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

	MPL NO.
1. HIGH PRESSURE CORE FLOODER SYS P&ID	E22-1010
2. RESIDUAL HEAT REMOVAL SYS PFD	E11-1020
3. REACTOR PRESSURE VESSEL SYSTEM	B11-4011
4. STANDBY LIQUID CONTROL SYS PFD	C41-1020

SUPPORTING DOCUMENTS:

	MPL NO.
1. PIPING & INSTRUMENT DIAGRAM SYMBOLS	A10-3030

MPL NO. E22-1020

FIGURE 6.3-1 HIGH PRESSURE CORE FLOODER SYSTEM PFD (Sheet 1 of 2)

MODE "A" ACCIDENT, REACTOR AT HIGH PRESSURE (LOOP B OR C) SEE NOTE 15

POSITION ◯	1	2	3	4	5	6	7	8	12	13	23	24	25
FLOW m^3/h	N/A	182	←					→	182	N/A	182	182	182
TEMP °C	49/10	←						→	49/10		40/10	40/10	40/10
PRESS MPa A	0.10									8.22	0.10		
Max PRESS DIFF-METERS			890 NOTE 18										

MODE "B" ACCIDENT, INJECTION AT RATED FLOW RATE (LOOP B OR C) SEE NOTE 15 AND 9

POSITION ◯	1	2	3	4	5	6	7	8	12	13	23	24	25
FLOW m^3/h	N/A	727	←					→	727	N/A	727	727	727
TEMP °C	100/10	←						→	100/10		40/10	40/10	40/10
PRESS MPa A	0.10									0.79	0.10		
Max PRESS DIFF-METERS			190 NOTE 18			6.1			50				

MODE "C" ACCIDENT, PUMP OPERATING AT RUNOUT (LOOP B OR C) SEE NOTE 15

POSITION ◯	1	2	3	4	5	6	7	8	12	13	23	24	25
FLOW m^3/h	N/A	890	←					→	890	N/A	890	890	890
TEMP °C	100/10	←						→	100/10		40/10	40/10	40/10
PRESS MPa A	0.10									0.10	0.10		
Max PRESS DIFF-METERS	NOTE 17		~150 NOTE 18										

MODE "D" SYSTEM TEST TO SUPPRESSION POOL (LOOP B OR C) SEE NOTE 15 AND 10

POSITION ◯	1	2	3	4	5	6	7	8	18	21	23	24	25
FLOW m^3/h	N/A	727/182	←					→	727/182	727/182	727/182	727/182	727/182
TEMP °C	35/10	←						→	35/10	35/10	40/10	40/10	40/10
PRESS MPa A	0.10										0.10		
Max PRESS DIFF-METERS			~190/890 NOTE 18										

MODE "F" SYSTEM TEST TO REACTOR VESSEL (LOOP B OR C) SEE NOTE 15

POSITION ◯	1	2	3	4	5	6	7	8	12	13	23	24	25
FLOW m^3/h	N/A	890	←					→	890	N/A	890	890	890
TEMP °C	35/10	←						→	35/10		40/10	40/10	40/10
PRESS MPa A	0.10									0.10	0.10		
Max PRESS DIFF-METERS			~150 NOTE 18										

MODE "E" PUMP OPERATING ON BYPASS SEE NOTE 15 AND 6

POSITION ◯	1	2	3	4	5	20	18	1	23	24	25
FLOW m^3/h	N/A	73	←			→	73	N/A	73	73	73
TEMP °C	100/10	←					→	100/10	40/10	40/10	40/10
PRESS MPa A									0.10		
Max PRESS DIFF-METERS			950 NOTE 18								

MODE "S" - STANDBY

POSITION ◯	23	24	25	3	4	6	8	11	13
FLOW m^3/h	0	←					→	0	N/A
TEMP °C	40/10	←					→	40/10	285
PRESS MPa A	0.10	0.10	1.47	←			→	1.47	~7.17

MISCELLANEOUS INFORMATION (SEE NOTE 7)

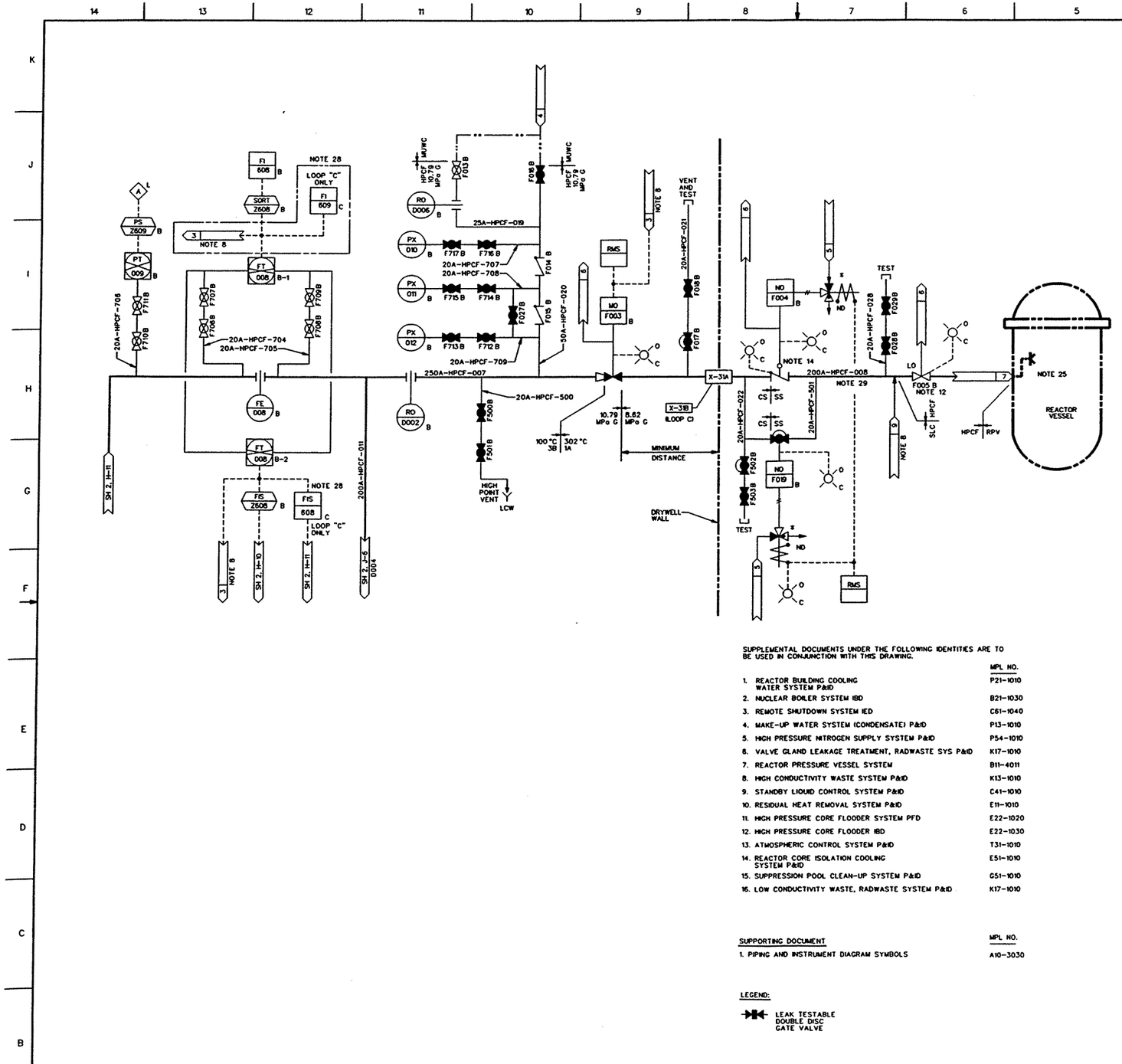
	2	2A	3	4	6	11	11A	12	5	20	18	8	17	18	21	23A	24	25
DESIGN TEMP °C	104	100	100	100	100	302	302			100	104		100	104	104	66	66	100
DESIGN PRESS MPa A	0.31	2.82	10.79	10.79	10.79	8.62	8.62			10.79	0.31		10.79	0.31	0.31	1.37	2.82	2.82
EST LINE SIZE	400A	400A	250A	250A	250A	200A				80A	80A		200A	200A	200A		400A	400A
LINE	SUCTION		DISCHARGE			DRYWELL				Min FLOW	Min FLOW		TEST	TEST	TEST		SUCTION	

TABLE 1 VALVE POSITION TABLE

VALVE	F008B,C	F010B,C	F009B,C	F008B,C	F003B,C	F005B,C	F001B,C	COMMENT
MODE "A"	C/O	C	C	C	O	O	O/C	NOTE 11
MODE "B"	C/O	C	C	C	O	O	O/C	NOTE 11
MODE "C"	C/O	C	C	C	O	O	O/C	NOTE 11
MODE "D"	C/O	C	T	T	C	O	O/C	NOTE 15
MODE "E"	C/O	O	C	C	C	O	O/C	NOTE 6
MODE "F"	C/O	C	C	C	O	O	O/C	NOTE 16
MODE "S"	C	C	C	C	C	O	O	

O - OPEN; C - CLOSED; T - THROTTLED

FIGURE 6.3-1 HIGH PRESSURE CORE FLOODER SYSTEM PFD (Sheet 2 of 2)



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

	MPL NO.
1. REACTOR BUILDING COOLING WATER SYSTEM P&ID	P21-1010
2. NUCLEAR BOILER SYSTEM IBD	B21-1030
3. REMOTE SHUTDOWN SYSTEM IED	C61-1040
4. MAKE-UP WATER SYSTEM (CONDENSATE) P&ID	P13-1010
5. HIGH PRESSURE NITROGEN SUPPLY SYSTEM P&ID	P54-1010
6. VALVE GLAND LEAKAGE TREATMENT, RADWASTE SYS P&ID	K17-1010
7. REACTOR PRESSURE VESSEL SYSTEM	B11-4011
8. HIGH CONDUCTIVITY WASTE SYSTEM P&ID	K13-1010
9. STANDBY LIQUID CONTROL SYSTEM P&ID	C41-1010
10. RESIDUAL HEAT REMOVAL SYSTEM P&ID	E11-1010
11. HIGH PRESSURE CORE FLOODER SYSTEM PFD	E22-1020
12. HIGH PRESSURE CORE FLOODER IBD	E22-1030
13. ATMOSPHERIC CONTROL SYSTEM P&ID	T31-1010
14. REACTOR CORE ISOLATION COOLING SYSTEM P&ID	E51-1010
15. SUPPRESSION POOL CLEAN-UP SYSTEM P&ID	G51-1010
16. LOW CONDUCTIVITY WASTE, RADWASTE SYSTEM P&ID	K17-1010

SUPPORTING DOCUMENT	MPL NO.
1. PIPING AND INSTRUMENT DIAGRAM SYMBOLS	A10-3030

LEGEND:

LEAK TESTABLE DOUBLE DISC GATE VALVE

NOTES:

1. PIPING HIGH POINT VENTS AND LOW POINT DRAINS ARE TO BE ADDED AS NECESSARY.
2. INSTRUMENT LINE DESIGN AND VALVING SHALL BE IN ACCORDANCE WITH INSTRUMENT PIPING SPECIFICATION A11-3030.
3. THE METHOD OF MOUNTING LOCAL INSTRUMENTS IS TO BE DETERMINED BY PIPING DESIGNER.
4. VENT DRAIN AND RELIEF VALVE DISCHARGE SYSTEM TO LCW AND HCW OR SUPPRESSION POOL ARE BY PIPING DESIGNER.
5. FOR ADDITIONAL CONTROL ROOM INDICATOR LIGHTS, SYSTEMS ALARMS AND REMOTE MANUAL SWITCHES, SEE THE HPCF LOGIC DIAGRAM.
6. PROVISIONS FOR CONTAINMENT ISOLATION SHALL BE IN ACCORDANCE WITH THE CURRENT LICENSING REQUIREMENTS.
7. EQUIPMENT AND INSTRUMENTS ARE PREFIXED BY SYSTEM NUMBER (E22) UNLESS OTHERWISE NOTED.
8. THIS EQUIPMENT IS CONTROLLABLE FROM THE REMOTE SHUTDOWN SYSTEM FOR LOOP B ONLY.
9. DRYWELL PIPING RUNS SHALL BE HORIZONTAL OR VERTICAL UPWARDS FROM THE DRYWELL WALL TO THE POINT OF ATTACHMENT WITH THE REACTOR VESSEL.
10. INTERFACES WITH RHR SYSTEM ARE BETWEEN CORRESPONDING LOOPS IN THAT SYSTEM, EXAMPLE, B TO B AND C TO C.
11. DESIGN LINE SIZE WILL BE FINALIZED AT THE DETAILED DESIGN PHASE. ACTUAL LINE SIZES DETERMINED BY THE PIPING DESIGNER SHALL MEET THE PROCESS DATA HYDRAULIC REQUIREMENTS.
12. VALVES F005B&C ARE RECOMMENDED FOR MAINTENANCE AND/OR LEAK RATE TESTING.
13. PUMP C001B&C COOLING WATER, IF REQUIRED, IS FROM SYSTEM P21.
14. CHECK VALVES F004B&C SHALL BE LOCATED AS CLOSE AS PRACTICAL TO THE REACTOR VESSEL NOZZLE.
15. VALVES F009B&C AND F010B&C SHALL BE LOCATED AS CLOSE AS PRACTICAL TO THE CONTAINMENT PENETRATION OF THE RETURN LINE TO THE SUPPRESSION POOL.
16. ALL MOTOR OPERATED VALVES ARE AC OPERATED UNLESS OTHERWISE NOTED.
17. COMMON LINE FOR HPCF-B, HPCF-C, RCIC, AND SPCU.
18. FLUSHING CONNECTIONS AND TEMPORARY STRAINER SCREENS SHALL BE PROVIDED ON THE SUCTION SIDE OF ALL PUMPS C001B & C.
19. FOR LOOP C, REPLACE SUFFIX F WITH G. SUFFIXES D AND E ARE OMITTED.
20. PIPING DESIGN SPECIFICATION ARE AS FOLLOWS:
    - A. MAXIMUM OPERATING PRESSURE – SEE SPECIFIC BOUNDARY SYMBOL
    - B. MAXIMUM OPERATING TEMPERATURE – SEE SPECIFIC BOUNDARY SYMBOL
    - C. MATERIAL – CARBON STEEL EXCEPT AS SPECIFIED
    - D. PIPING THICKNESS SHALL BE PER A62-4030, PRESSURE INTEGRITY OF NUCLEAR COMPONENTS.
    - E. DESIGN CLASS – SEE SPECIFIC BOUNDARY SYMBOL
    - F. QA CLASS – SEE SPECIFIC BOUNDARY SYMBOL
    - G. SEISMIC CLASS – As
    - H. FLUID – WATER
21. VALVE F012 MUST BE AT LOWEST POINT IN THE SYSTEM TO ALLOW FOR DRAINAGE.
22. DRAIN AND VENT PIPING DESIGN CONDITIONS ARE:
    - MAXIMUM OPERATING PRESSURE– SAME AS MAIN LINE UPSTREAM OF VALVE (ATMOSPHERIC PRESSURE FROM LAST VALVE TO FUNNEL).
    - MAX OPERATING TEMPERATURE– SAME AS MAIN LINE UPSTREAM OF VALVE (66°C FROM LAST VALVE TO FUNNEL).
23. PIPE NUMBERS FOR LOOP C SHALL BE THE SAME AS FOR LOOP B PLUS 100 STARTING AT 005 (EXAMPLE: LOOP B – 005 = LOOP C – 105; LOOP B – 701 = LOOP C – 801).
24. VALVES F021B & C SHALL BE LOCATED BELOW THE SUPPRESSION POOL MINIMUM WATER LEVEL.
25. HPCF SPARGER WITHIN THE RPV IS INCLUDED IN HPCF BOUNDARY.
26. PIPE WITH A DESIGN PRESSURE OF 2.82 MPa G OR GREATER SHALL HAVE ITS MINIMUM WALL THICKNESS NO LESS THAN THAT OF A STANDARD WEIGHT PIPE, THICKER THAN STANDARD WEIGHT PIPE SHALL BE USED IF REQUIRED BY THE DESIGN PRESSURE OR OTHER REQUIREMENTS.
27. VALVES WITH A DESIGN PRESSURE OF 2.82 MPa G OR GREATER SHALL BE A MINIMUM OF CLASS 300, OR OF A HIGHER CLASS IF REQUIRED BY THE DESIGN PRESSURE.
28. SIGNAL PROVIDED BY HARDWIRE (NOT MULTIPLEX).
29. *(LOCATE THE GATE VALVE OF THIS PIPING SECTION AT A DISTANCE GREATER THAN OR EQUAL TO 25 PIPE DIAMETERS FROM THE RPV NOZZLE, OTHERWISE, PERFORM STRESS ANALYSIS TO SHOW THAT STRESSES AND FATIGUE ARE ACCEPTABLE PER THE ASME CODE FROM THE CONCERN OF NRC BULLETIN 88-08, SUPPLEMENT 3 (APRIL 11, 1989) ON POTENTIAL THERMAL STRATIFICATION AND STRIPING DUE PERIODIC LEAKAGE OF THE GATE VALVE.)**

* SEE SUBSECTION 3.9.1.7

MPL NO. E22-1010

FIGURE 6.3-7 HIGH PRESSURE CORE FLOODER SYSTEM P&ID (Sheet 1 of 2)

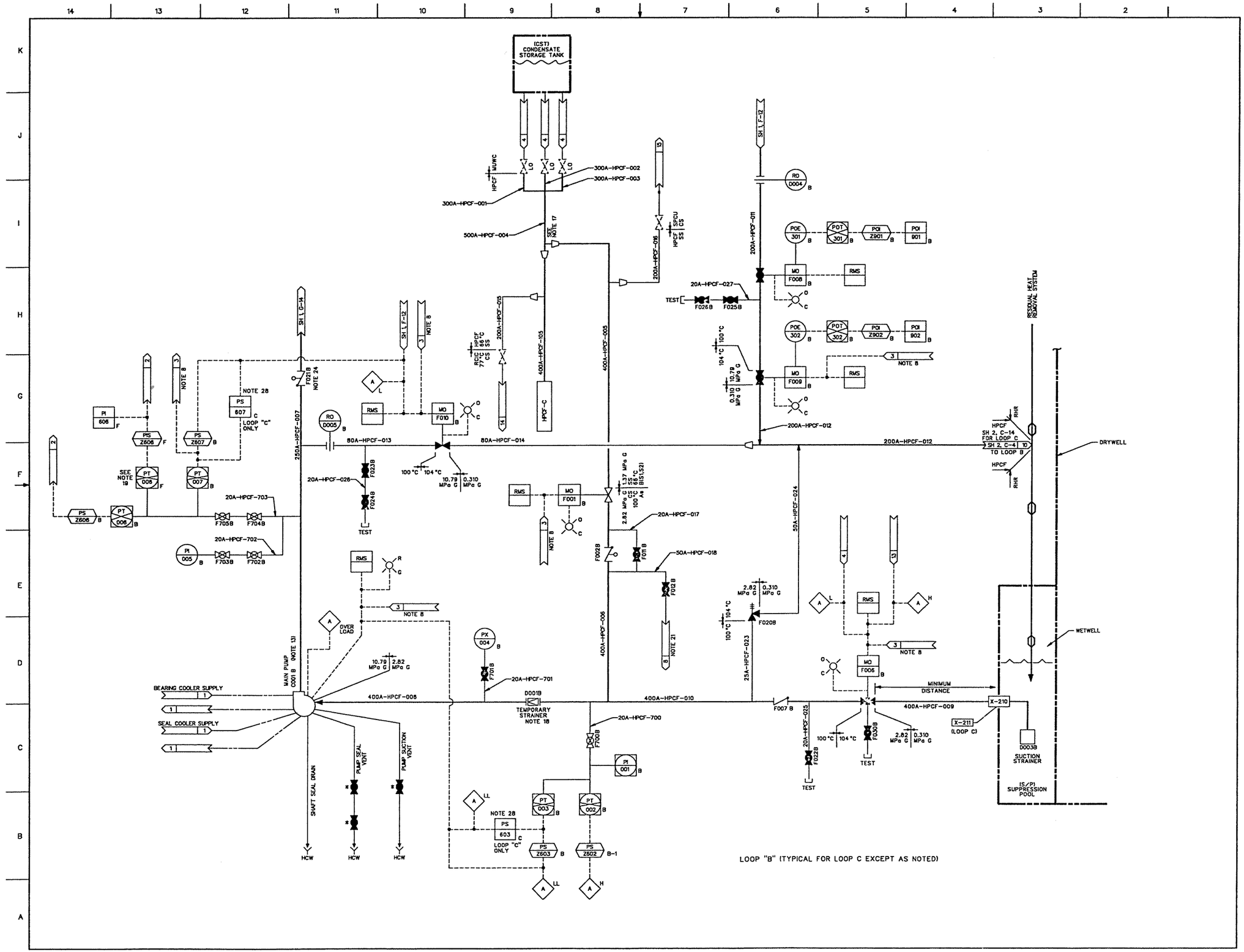
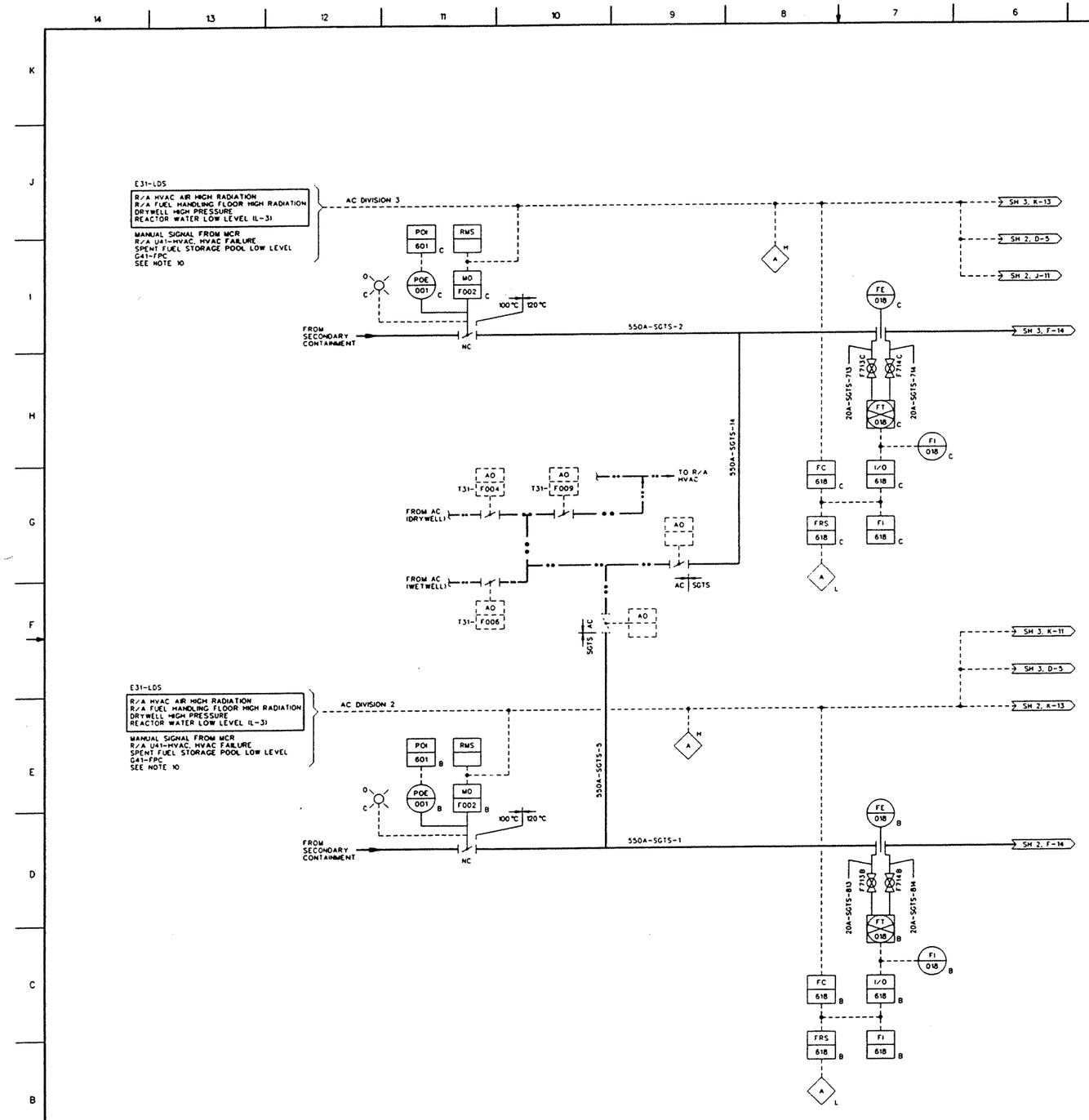


FIGURE 6.3-7 HIGH PRESSURE CORE FLOODER SYSTEM P&ID (Sheet 2 of 2)



NOTES:

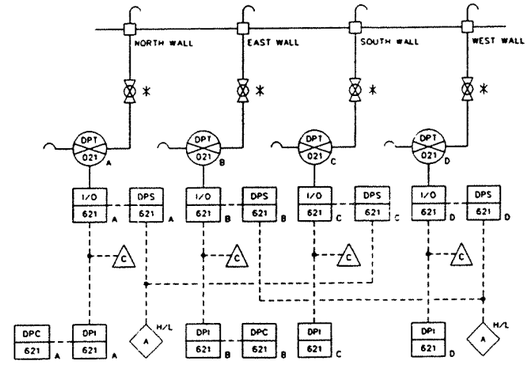
1. QUALITY CLASS, DESIGN CLASS AND SEISMIC CLASS AS FOLLOWS.

	QUALITY CLASS	DESIGN CLASS	SEISMIC CLASS
SGTS EXCEPT FOR FOLLOWING	C	4	B
DRAIN LINE FROM DRAIN VALVE	C	7	B

2. PIPING DESIGN SPECIFICATION SHALL BE AS FOLLOWS EXCEPT AS NOTED.
   MATERIAL GALVANIZED STEEL
   SCHEDULE 50A AND LESS - SCH 10
   GREATER THAN 50A - SCH 20
   FLUID AIR ±0.014 MPa G, 120 °C
3. FREON (R11) INJECTION POINT IS LOCATED UPSTREAM OF CHARCOAL ADSORBER.
4. SAMPLE CANISTERS ARE PROVIDED FOR MONITORING CHARCOAL ADSORBER CONDITION.
5. CHARCOAL ADSORBER TEMPERATURE SHOULD BE MONITORED CONTINUOUSLY.
6. SPACE HEATERS ARE OPERATED DURING SGTS STANDBY MODE TO PREVENT CHARCOAL ADSORBER REACHING THE DEW POINT
7. FILTER IS HEXAMESH) IS PROVIDED TO REMOVE FOREIGN OBJECTS.
8. FLOW ELEMENT IS ANNUBAR-TYPE.
9. STOP VALVES SHALL NOT BE FLANGE TYPE
10. MANUAL INITIATION OF SGTS AND ISOLATION OF HVAC OCCURS WHEN SPENT FUEL STORAGE POOL LOW LEVEL ALARMS
11. COOLING FANS AND SPACE HEATERS OF THE FILTER TRAIN D002C SHOULD BE CONNECTED TO THE DIVISION POWER OF THE FILTER TRAIN D001B AND VICE VERSA.
12. FIRE HOSE CONNECTION

REFERENCE DOCUMENTS

		MPL NO.
1.	ATMOSPHERIC CONTROL SYS P&ID	T31-1010
2.	MAKEUP WATER SYSTEM (PURIFIED) P&ID	P11-1010
3.	PROCESS RAD MONITOR SYS FBD	D11-1030
4.	PIPING AND INSTRUMENT SYMBOLS DIAGRAM	A10-3030
5.	FUEL POOL COOLING & CLEANUP SYS P&ID	G41-1010
6.	LEAK DETECTION & ISOLATION SYS FD	E31-1040
7.	HEATING, VENTILATING AND AIR CONDITIONING SYS P&ID	U41-1010



R/B NEGATIVE PRESSURE INDICATION

MPL NO. T22-1010

FIGURE 6.5-1 STANDBY GAS TREATMENT SYSTEM P&ID (Sheet 1 of 3)

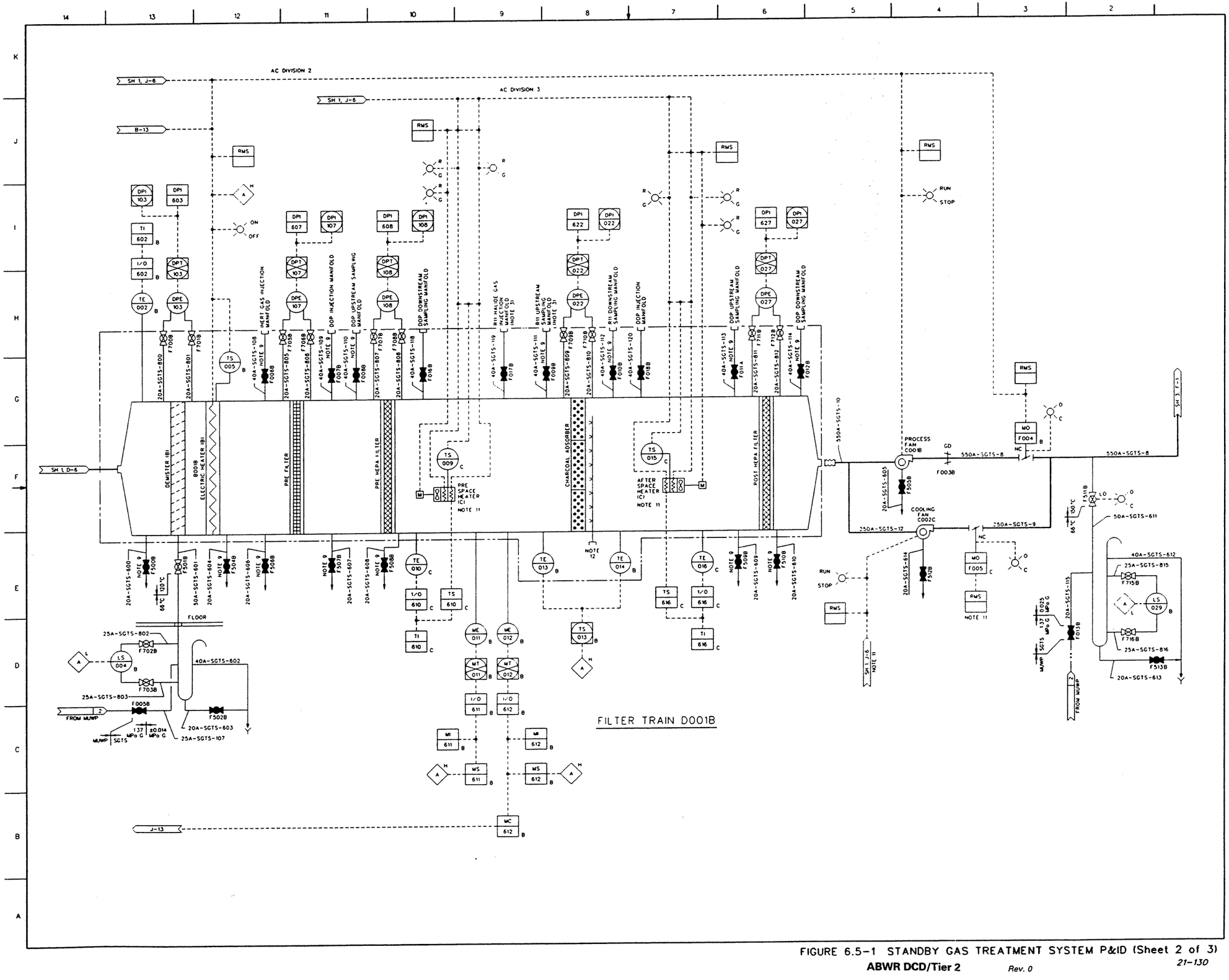


FIGURE 6.5-1 STANDBY GAS TREATMENT SYSTEM P&ID (Sheet 2 of 3)

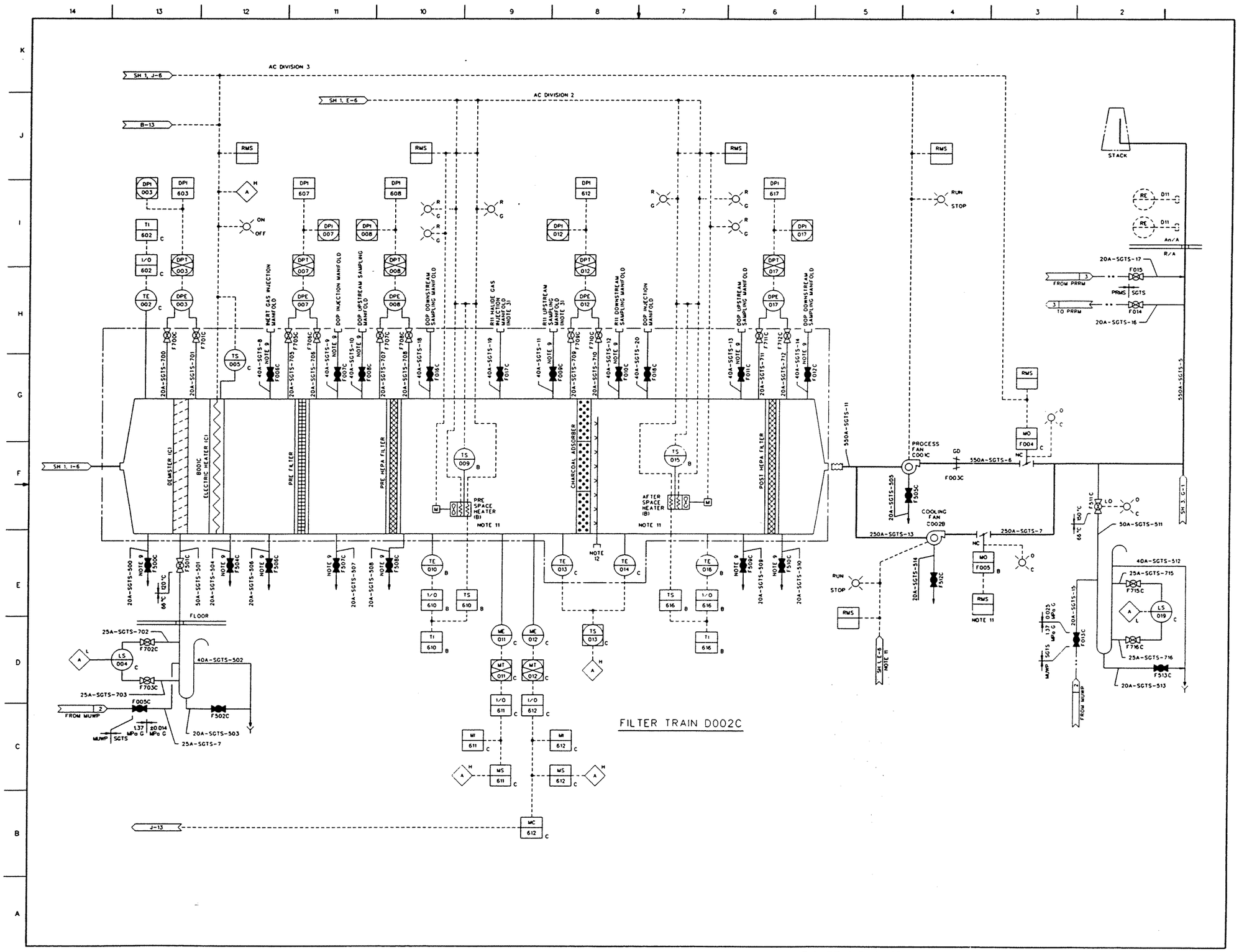
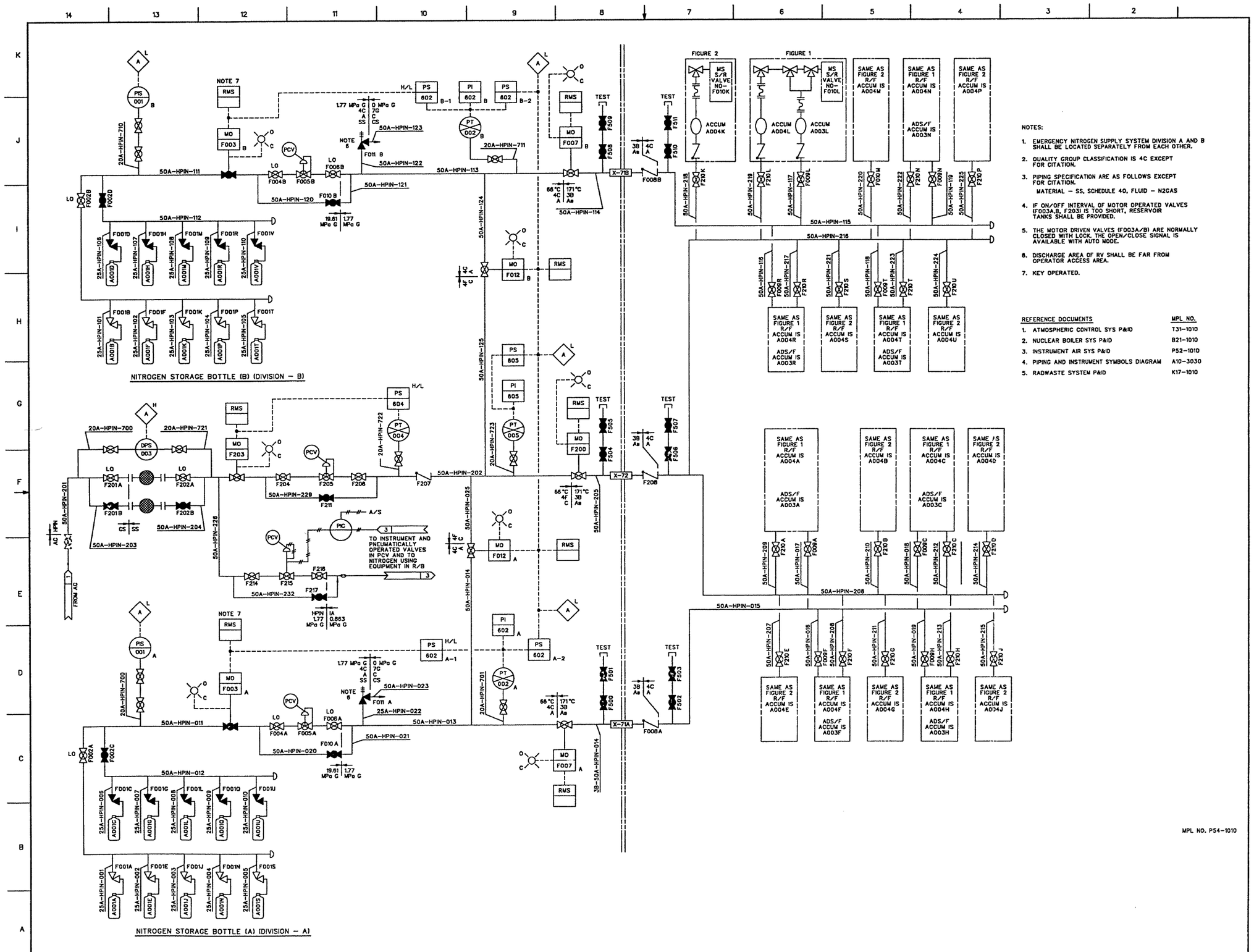


FIGURE 6.5-1 STANDBY GAS TREATMENT SYSTEM P&ID (Sheet 3 of 3)



NOTES:

1. EMERGENCY NITROGEN SUPPLY SYSTEM DIVISION A AND B SHALL BE LOCATED SEPARATELY FROM EACH OTHER.
2. QUALITY GROUP CLASSIFICATION IS 4C EXCEPT FOR CITATION.
3. PIPING SPECIFICATION ARE AS FOLLOWS EXCEPT FOR CITATION.
   MATERIAL – SS, SCHEDULE 40, FLUID – N2GAS
4. IF ON/OFF INTERVAL OF MOTOR OPERATED VALVES (F003A,B, F203) IS TOO SHORT, RESERVOIR TANKS SHALL BE PROVIDED.
5. THE MOTOR DRIVEN VALVES (F003A/B) ARE NORMALLY CLOSED WITH LOCK. THE OPEN/CLOSE SIGNAL IS AVAILABLE WITH AUTO MODE.
6. DISCHARGE AREA OF RV SHALL BE FAR FROM OPERATOR ACCESS AREA.
7. KEY OPERATED.

REFERENCE DOCUMENTS	MPL NO.
1. ATMOSPHERIC CONTROL SYS P&ID	T31–1010
2. NUCLEAR BOILER SYS P&ID	B21–1010
3. INSTRUMENT AIR SYS P&ID	P52–1010
4. PIPING AND INSTRUMENT SYMBOLS DIAGRAM	A10–3030
5. RADWASTE SYSTEM P&ID	K17–1010

FIGURE 6.7–1 HIGH PRESSURE NITROGEN GAS SUPPLY SYSTEM P&ID (Sheet 1 of 1)

NOTES:

1. ALL REFERENCE DESIGNATIONS ARE PREFIXED WITH C71 UNLESS OTHERWISE SPECIFIED.

2. THE POSITION SWITCHES FOR MAIN STEAM LINE ISOLATION VALVE POSITION ARE A PART OF THE MSIV'S. POSITION SWITCH CONTACTS SHALL OPEN BEFORE THE CLOSING VALVE REACHES THE 82% OPEN POSITION AND REMAIN OPEN WHEN THE VALVE IS FULLY CLOSED. THE SWITCH CONTACTS SHALL CLOSE BEFORE THE OPENING VALVE REACHES FULLY OPEN AND REMAIN CLOSED WHEN THE VALVE IS FULLY OPEN.

3. INTERNAL LOGIC AND EQUIPMENT FUNCTIONS ARE SHOWN ON THE REACTOR PROTECTION SYSTEM IBD, C71-1030.

4. THE APRM TRIP SIGNALS PROVIDED BY THE NEUTRON MONITORING SYSTEM (NMS) REPRESENT EITHER HIGH NEUTRON FLUX TRIP, HIGH SIMULATED THERMAL POWER TRIP, CORE FLOW RAPID COASTDOWN TRIP OR APRM INOPERATIVE AS DETERMINED BY THE NMS. THE SRNM TRIP SIGNALS PROVIDED BY THE NMS REPRESENT EITHER SRNM UPSCALE TRIP, SHORT PERIOD TRIP OR INOPERATIVE TRIP AS DETERMINED BY THE NMS.

5. LETTER DESIGNATIONS FOR EQUIPMENT IN THE FOUR RPS DIVISIONS ARE AS FOLLOWS:

   A - DIVISION I
   B - DIVISION II
   C - DIVISION III
   D - DIVISION IV

   THESE DESIGNATIONS DO NOT NECESSARILY APPLY TO MATCH CIRCLE LETTERS.

6. REDUNDANT LOGIC POWER SUPPLIES ARE TO BE PROVIDED WITHIN EACH INDIVIDUAL SSLC PANEL AND/OR WITHIN EACH MAJOR SSLC MODULE OR UNIT.

7. THE MAIN STEAM LINE HIGH RADIATION TRIP SIGNALS REPRESENT EITHER MSL HIGH HIGH RADIATION OR INOPERATIVE RADIATION MONITOR (PRRM) CHANNEL AS DETERMINED BY THE PROCESS RADIATION MONITORING SYSTEM.

8. REACTOR PROTECTION SYSTEM LOGIC AND MAIN STEAM ISOLATION VALVE LOGIC (PART OF LEAK DETECTION AND ISOLATION SYSTEM) SHARE THE SAME DIGITAL TRIP MODULE AND TRIP LOGIC UNIT. SOFTWARE FUNCTIONS WRITTEN FOR EACH SYSTEM WILL SEPARATELY PROCESS SENSOR INPUT SIGNALS, TRIP DECISION LOGIC, AND INTERLOCK LOGIC RELATED TO A PARTICULAR SYSTEM. HOWEVER, FINAL DIVISION OUTPUT TRIP SIGNALS FOR THE TWO SYSTEMS SHALL BE DEVELOPED IN SEPARATE OUTPUT LOGIC UNITS IN EACH SSLC DIVISION LOGIC PANEL. SEE REF DOC 6.

9. TRIP INPUTS FOR THE TURBINE CONTROL VALVE FAST CLOSURE (TCVFC) TRIP SHALL BE DERIVED FROM ALL THOSE EVENTS CAUSING FAST CLOSURE OF THE TURBINE CONTROL VALVE. PROVISIONS SHALL BE MADE FOR THE PRESSURE SWITCHES TO DIRECTLY MEASURE INDIVIDUAL CONTROL VALVE "DISK DUMP" HYDRAULIC TRIP SYSTEM OIL PRESSURE AND FOR THE PRESSURE SWITCHES TO BE MOUNTED DIRECTLY ON THE TURBINE CONTROL VALVES.

10. ONE POSITION SWITCH EACH WITH TWO CONTACTS SHALL BE MOUNTED ON EACH TURBINE MAIN STOP VALVE (TSV). CONTACT NUMBER 1 OF EACH POSITION SWITCH SHALL PROVIDE TSV CLOSURE TRIP SIGNALS TO THE REACTOR PROTECTION SYSTEM. THESE CONTACTS SHALL BE CLOSED AND REMAIN CLOSED WHEN THE STOP VALVE IS FULLY OPEN, SHALL OPEN BEFORE THE CLOSING VALVE REACHES 80% OPEN, SHALL REMAIN OPEN WHILE THE VALVE IS FULLY CLOSED AND SHALL RECLOSE BEFORE THE OPENING VALVE IS FULLY OPEN. CONTACT NUMBER 2 OF EACH POSITION SWITCH SHALL PROVIDE MAIN CONDENSER VACUUM LOW TRIP BYPASS SIGNALS TO THE LEAK DETECTION SYSTEM. IN GENERAL, THE OPERATION OF THE NUMBER 2 SWITCH CONTACTS IS OPPOSITE TO THE OPERATION OF THE NUMBER 1 CONTACTS. SPECIFIC DETAILS OF THE OPERATION OF THE NUMBER 2 CONTACTS IS DESCRIBED IN THE LEAK DETECTION AND ISOLATION SYSTEM IED, REFERENCE DOCUMENT 8.

11. EACH OF THE FOUR TURBINE FIRST STAGE PRESSURE TRANSMITTERS SHALL BE CONNECTED TO A SEPARATE SENSING LINE AND SHALL BE SEPARATED FROM EACH OTHER BY SUITABLE DISTANCE OR BY BARRIERS TO MINIMIZE THE POTENTIAL FOR COMMON CAUSE FAILURE.

12. LOGIC POWER SOURCES FOR THE SCRAM FOLLOW SIGNALS AND SCRAM TEST SWITCH STATUS SIGNALS SHALL BE PROVIDED BY APPROPRIATE UNITS OF THE ROD CONTROL AND INFORMATION SYSTEM (C11).

13. THE REACTOR MODE SWITCH SHALL BE A SINGLE, FOUR POSITIONS, FOUR BANK, KEYLOCKED SWITCH. EACH OF THE FOUR BANKS SHALL BE ELECTRICALLY ISOLATED FROM ALL OTHER BANKS AND PROVIDE A REACTOR MODE SIGNAL TO ONE OF THE FOUR RPS DIVISIONS. WHEN THE SWITCH IS IN ONE POSITION, THE CONTACTS ASSOCIATED WITH THAT POSITION SHALL BE CLOSED AND THE CONTACTS FOR ALL OTHER POSITIONS SHALL BE OPEN. CONTACT ACTION UPON SWITCHING SHALL BE MAKE BEFORE BREAK. THE DIVISION II AND DIVISION III BANKS SHALL EACH HAVE AN ADDITIONAL CONTACT ASSOCIATED WITH THE "SHUTDOWN" POSITION. THESE CONTACTS SHALL BE OPEN WHEN THE MODE SWITCH IS IN THE "SHUTDOWN" POSITION AND SHALL BE CLOSED IN ALL OTHER POSITIONS.

14. THE MANUAL SCRAM RESET SWITCH SHALL BE A SINGLE, THREE POSITION, TWO BANK, SPRING RETURN TO NEUTRAL SWITCH. THE TWO BANKS SHALL BE ISOLATED FROM EACH OTHER. WHEN THE SWITCH IS IN ONE OF THE TWO NON-NEUTRAL POSITIONS, THE ASSOCIATED CONTACTS SHALL BE CLOSED. WHEN THE SWITCH IS IN THE NEUTRAL POSITION, ALL CONTACTS SHALL BE OPEN.

15. GROUPS 1A, 1B, 2A, 2B, 3A, 3B, 4A AND 4B SOLENOID POWER WIRING SHALL ALL BE RUN IN SEPARATE CONDUIT. INTERCONNECTIONS BETWEEN PDLU, DLU AND SCC ARE SHOWN IN LOGIC DIAGRAM REPRESENTATION IN SUPPORTING DOC 5.

16. RPS ALARMS AND STATUS SIGNALS ARE DESCRIBED IN SUPPORTING DOCUMENTS 1, 5 AND 6.

17. THE NEUTRAL WIRING OF ALL FOUR SCRAM GROUPS SHALL BE CONNECTED TO THE SAME COMMON POINT GROUND.

18. WITHIN THE SCRAM SOLENOID FUSE PANELS, CURRENT SURGE SUPPRESSION DEVICES (E.G. VARISTORS OR EQUIVALENT) SHALL BE CONNECTED ACROSS THE COIL LEADS OF EACH HCU SCRAM PILOT VALVE SOLENOID.

REFERENCES	MPL ITEM NO.
1. NUCLEAR BOILER SYSTEM (NBS) P&ID	B21-1010
2. ROD CONTROL AND INFORMATION SYSTEM (RCIS) IED	C11-1040
3. CONTROL ROD DRIVE SYSTEM (CRD) P&ID	C12-1010
4. NEUTRON MONITORING SYSTEM (NMS) IED	C51-1040
5. PROCESS RADIATION MONITORING SYSTEM (PRRM) IED	D11-1040
6. LEAK DETECTION AND ISOLATION SYSTEM (LDS) IED	E31-1040
7. D.C. POWER ONE LINE DIAGRAM	R42-1010
8. VITAL AC POWER ONE LINE DIAGRAM	R48-1010
9. RECIRCULATION FLOW CONTROL SYSTEM (RFCS) IED	C81-1040
10. SUPPRESSION POOL TEMPERATURE MONITORING (SPTM) SYSTEM IED	T53-1010

SUPPORTING DOCUMENT	MPL ITEM NO.
1. REACTOR PROTECTION SYSTEM DESIGN SPEC	C71-4010
2. DESIGN DOCUMENTS STANDARDS	A10-3020
3. PIPING & INSTRUMENT DIAGRAM SYMBOLS	A10-3020
4. IBD STANDARDS	A10-3070
5. REACTOR PROTECTION SYSTEM IBD	C71-1030
6. REACTOR PROTECTION SYSTEM MMIR	C71-5030

19. FIBER OPTIC CABLES PROVIDING ELECTRICAL SEPARATION BETWEEN EQUIPMENT OF REDUNDANT DIVISIONS SHALL BE RUN IN EITHER THE SENDING OR IN THE RECEIVING DIVISION CABLE TRAYS.

20. THE WIRING CIRCUITS ASSOCIATED WITH THE DIV II AND THE DIV III MODE SWITCH IN "SHUTDOWN" SCRAM SIGNALS SHALL BE RUN SEPARATELY AND BE KEPT SEPARATE BY DISTANCE OR BARRIERS FROM THE WIRING CIRCUITS ASSOCIATED WITH THE DIVISION II MANUAL SCRAM AND THE DIVISION III MANUAL SCRAM SIGNALS SUCH AS TO PREVENT A SINGLE FAULT FROM CAUSING THE LOSS OF BOTH MANUAL SCRAM FUNCTIONS.

21. PLACING ANY ONE OF THE HCU (PAIR-ROD) TEST SWITCHES INTO THE "TEST" POSITION SHALL RESULT IN ISOLATED SIGNALS BEING SENT TO THE RCIS (REFERNCE DOCUMENT 2) SUCH AS TO PROVIDE TIMING SIGNALS INDICATING THE START OF A ROD SCRAM TEST.

22. METAL ENCLOSED JUNCTION BOXES AND CONDUIT SHALL BE UTILIZED WITHIN THE SCRAM TEST PANEL TO MAINTAIN SEPARATION OF ALL FOUR SCRAM GROUPS AND PROTECTION FROM HOT SHORTS.

23. THE SUPPRESSION POOL TEMPERATURE MONITORING (SPTM) TRIP SIGNALS REPRESENT EITHER SUPPRESSION POOL HIGH BULK TEMPERATURE OR SPTM INOPERATIVE AS DETERMINED BY THE SUPPRESSION POOL TEMPERATURE MONITORING SYSTEM.

LEGENDS:

- SINGLE SIGNAL OR POWER CONNECTION
- MULTIPLE (PARALLEL) SIGNAL OR POWER CONNECTION
- SERIAL MULTIPLEXED SIGNAL CONNECTION
- LINE CONNECTION
- SOLENOID POWER WIRING WITHIN GROUNDED STEEL CONDUIT

ABREVIATIONS

APRM - AVERAGE POWER RANGE MONITOR
BPU - BYPASS UNITS
CRD - CONTROL ROD DRIVE
DIV 1 - ELECTRICAL DIVISION I
DIV 2 - ELECTRICAL DIVISION II
DIV 3 - ELECTRICAL DIVISION III
DIV 4 - ELECTRICAL DIVISION IV
DTM - DIGITAL TRIP MODULE
EMS - ESSENTIAL MULTIPLEXING SYSTEM
FO - FIBER OPTIC
HCU - HYDRAULIC CONTROL UNIT
L - LINE
MSIV - MAIN STEAM LINE ISOLATION VALVE
N - NEUTRAL
MSL - MAIN STEAM LINE
OLU - OUTPUT LOGIC UNIT
PDLU - POWER DISTRIBUTION LOGIC UNIT
RMU - REMOTE MULTIPLEXING UNIT
SCC - SOLENOID CONTROL CENTER
SLU - SAFETY SYSTEM LOGIC UNIT
SRNM - SOURCE RANGE NEUTRON MONITOR
SSFP - SCRAM SOLENOID FUSE PANEL
SSLC - SAFETY SYSTEM LOGIC & CONTROL
TLU - TRIP LOGIC UNIT
KOS - KEYLOCK OPERATION SWITCH

MPL NO. C71-1040

Figure 7.2-9 REACTOR PROTECTION SYSTEM IED (SHEET 1 OF 11)

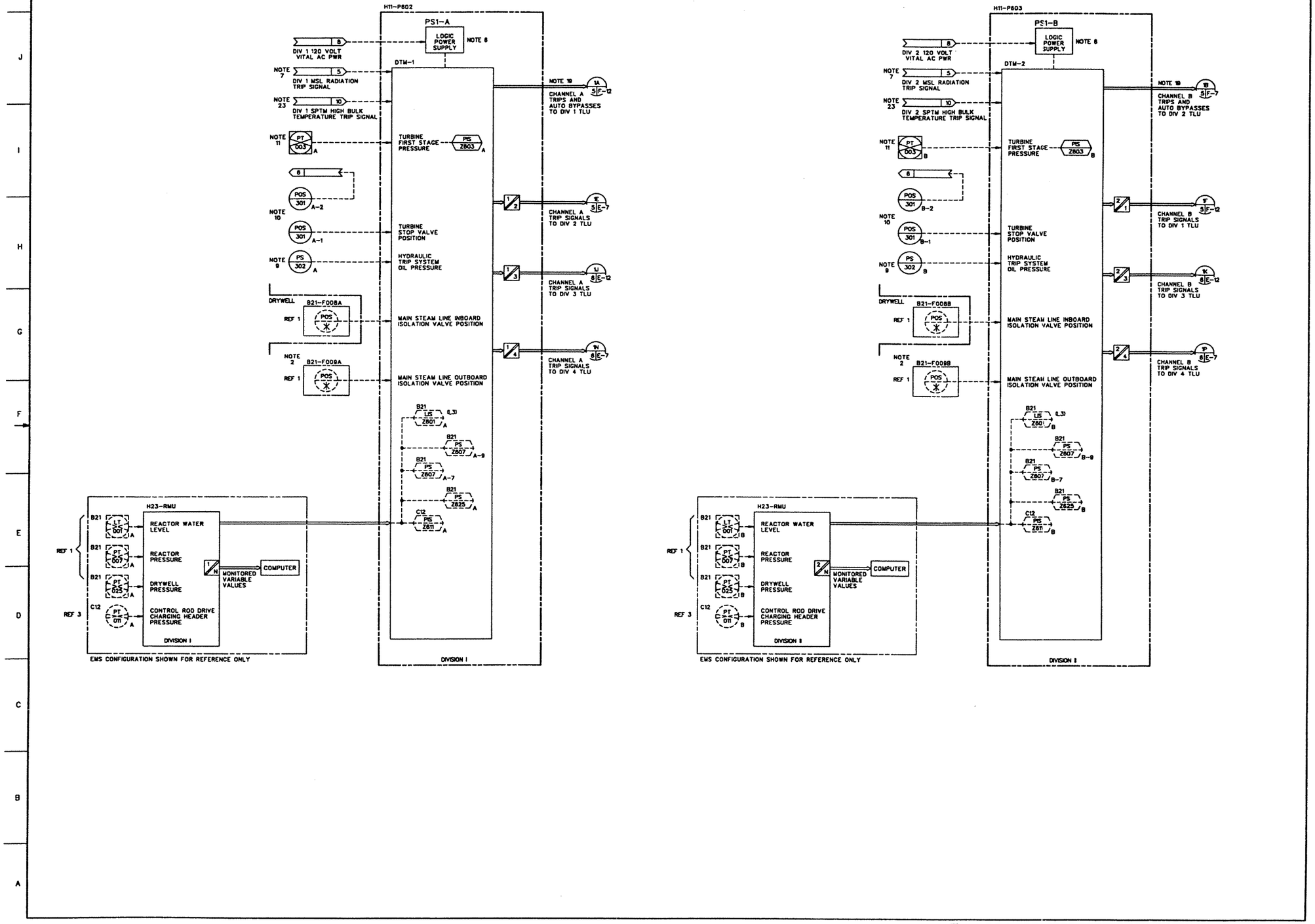


Figure 7.2-9 REACTOR PROTECTION SYSTEM IED (SHEET 2 OF 11)

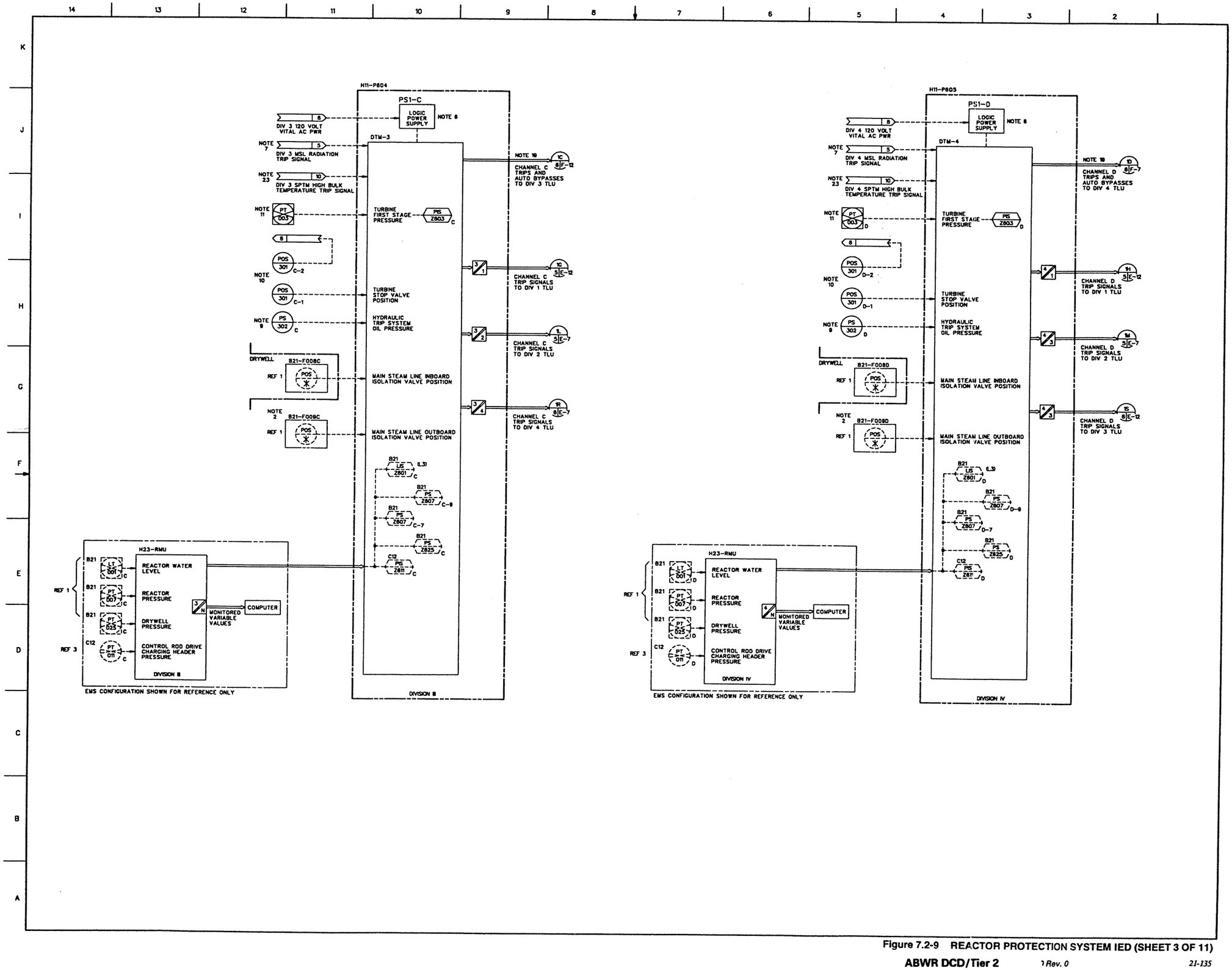


Figure 7.2-9 REACTOR PROTECTION SYSTEM IED (SHEET 3 OF 11)

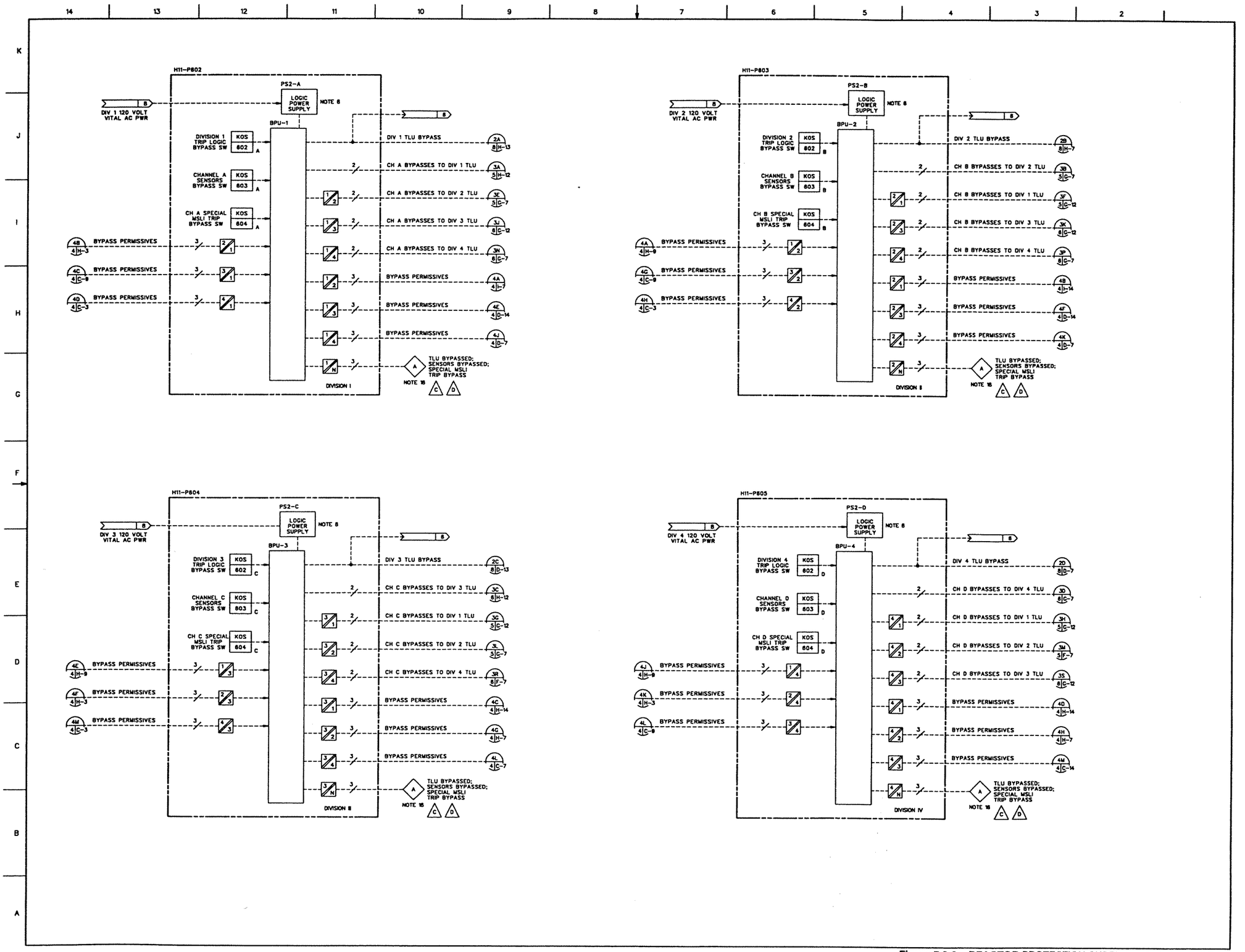


Figure 7.2-9 REACTOR PROTECTION SYSTEM IED (SHEET 4 OF 11)

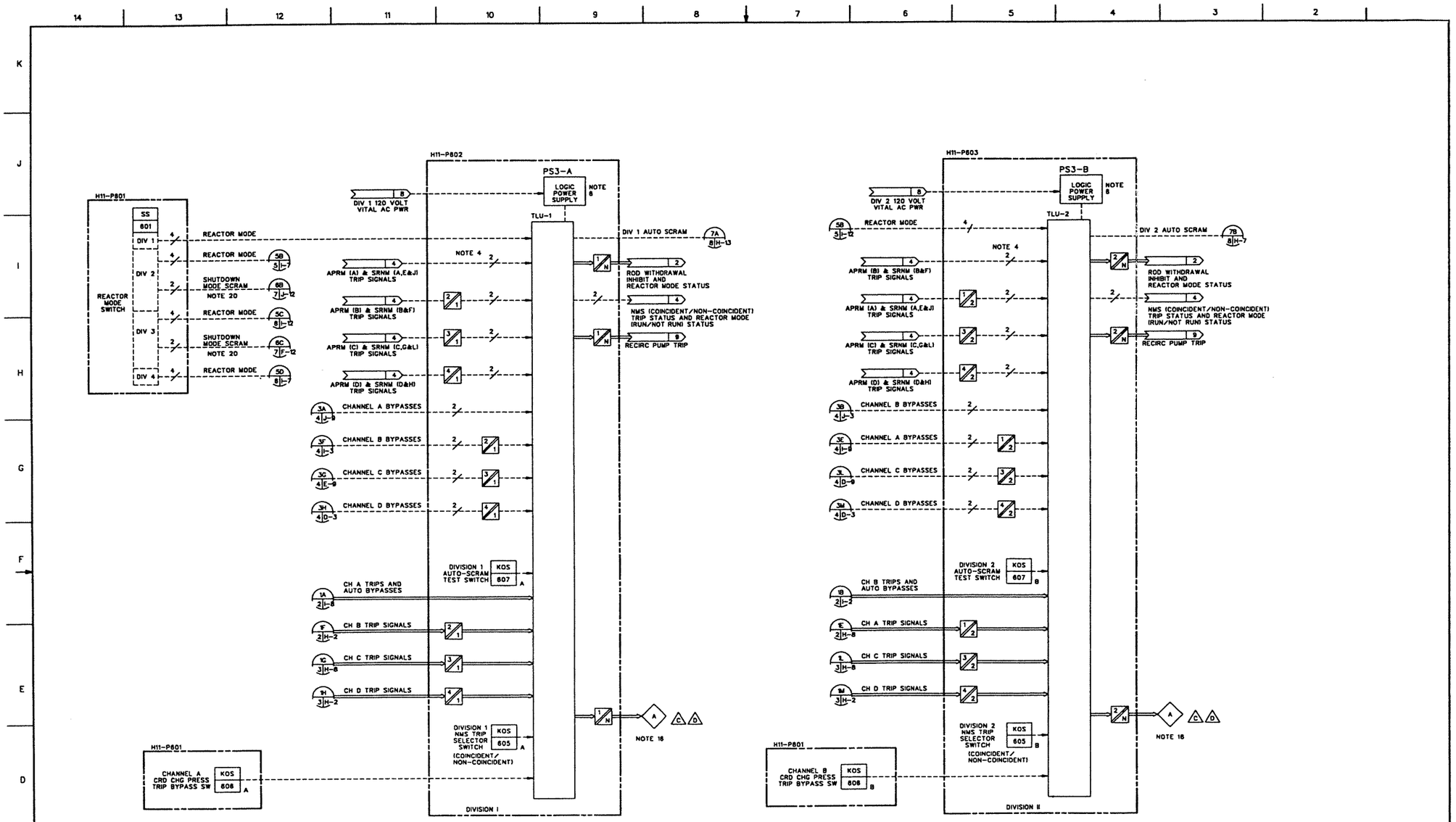


Figure 7.2-9 REACTOR PROTECTION SYSTEM IED (SHEET 5 OF 11)

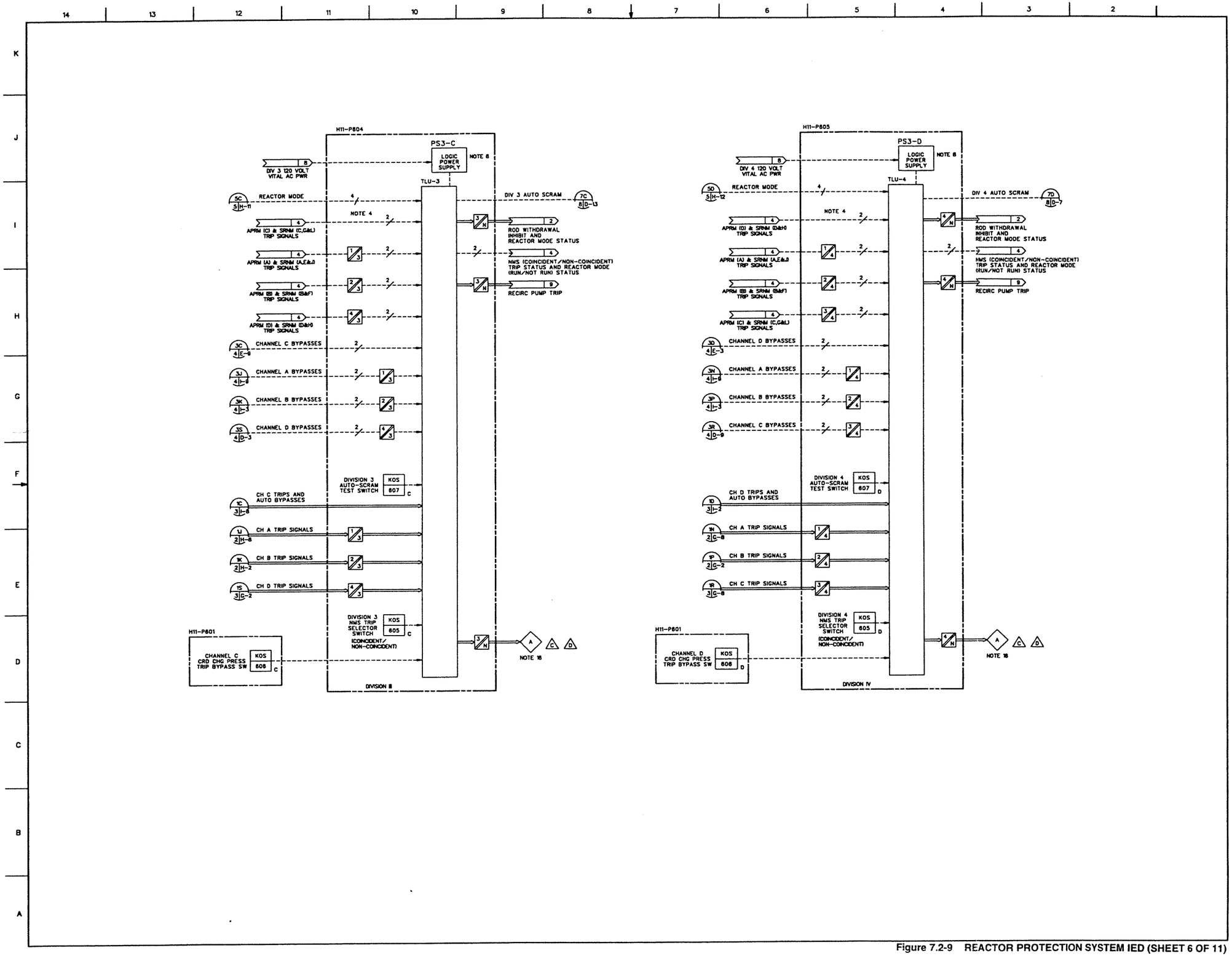


Figure 7.2-9 REACTOR PROTECTION SYSTEM IED (SHEET 6 OF 11)

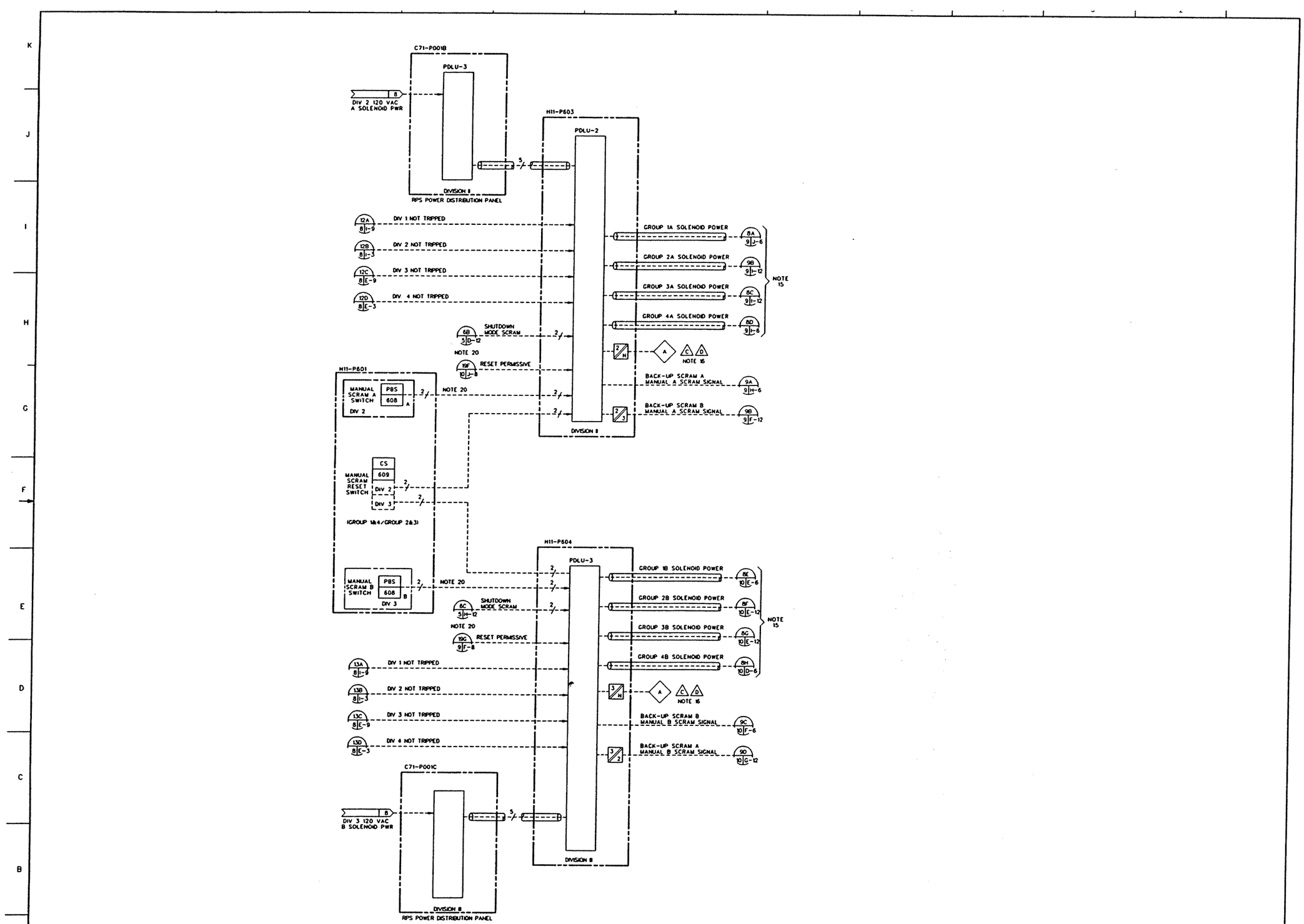
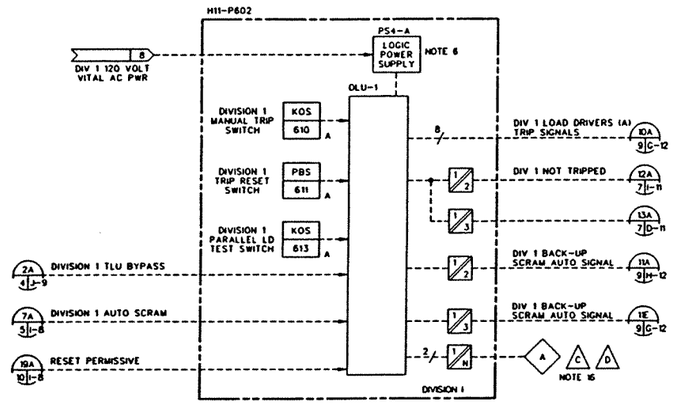
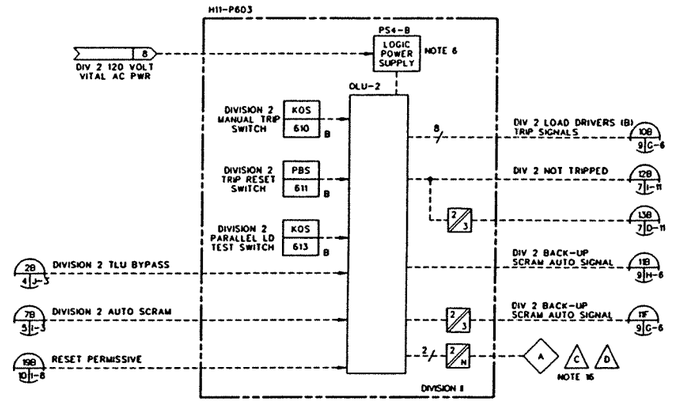
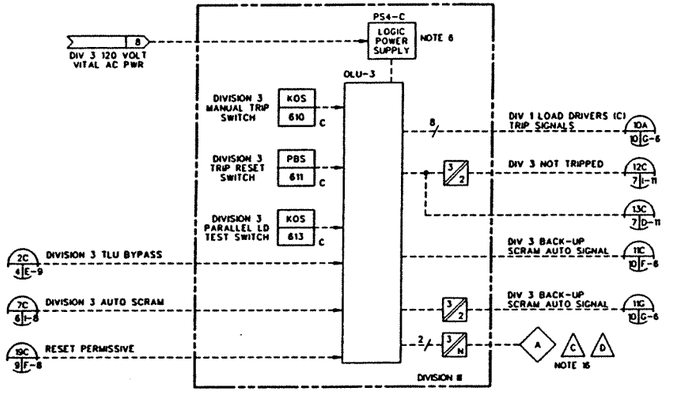


FIGURE 7.2-9 REACTOR PROTECTION SYSTEM IED (Sheet 7 of 11)







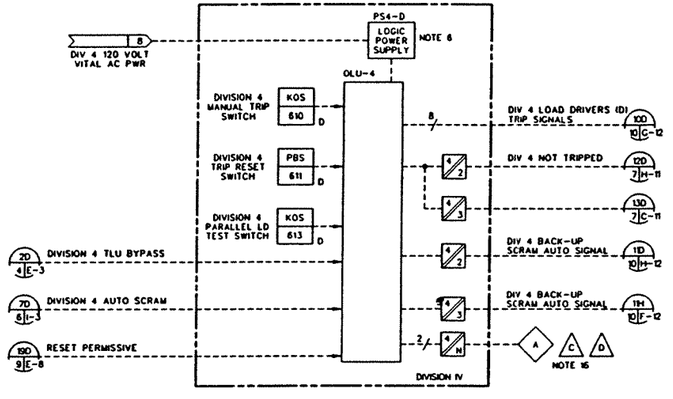


FIGURE 7.2-9 REACTOR PROTECTION SYSTEM IED (Sheet 8 of 11)

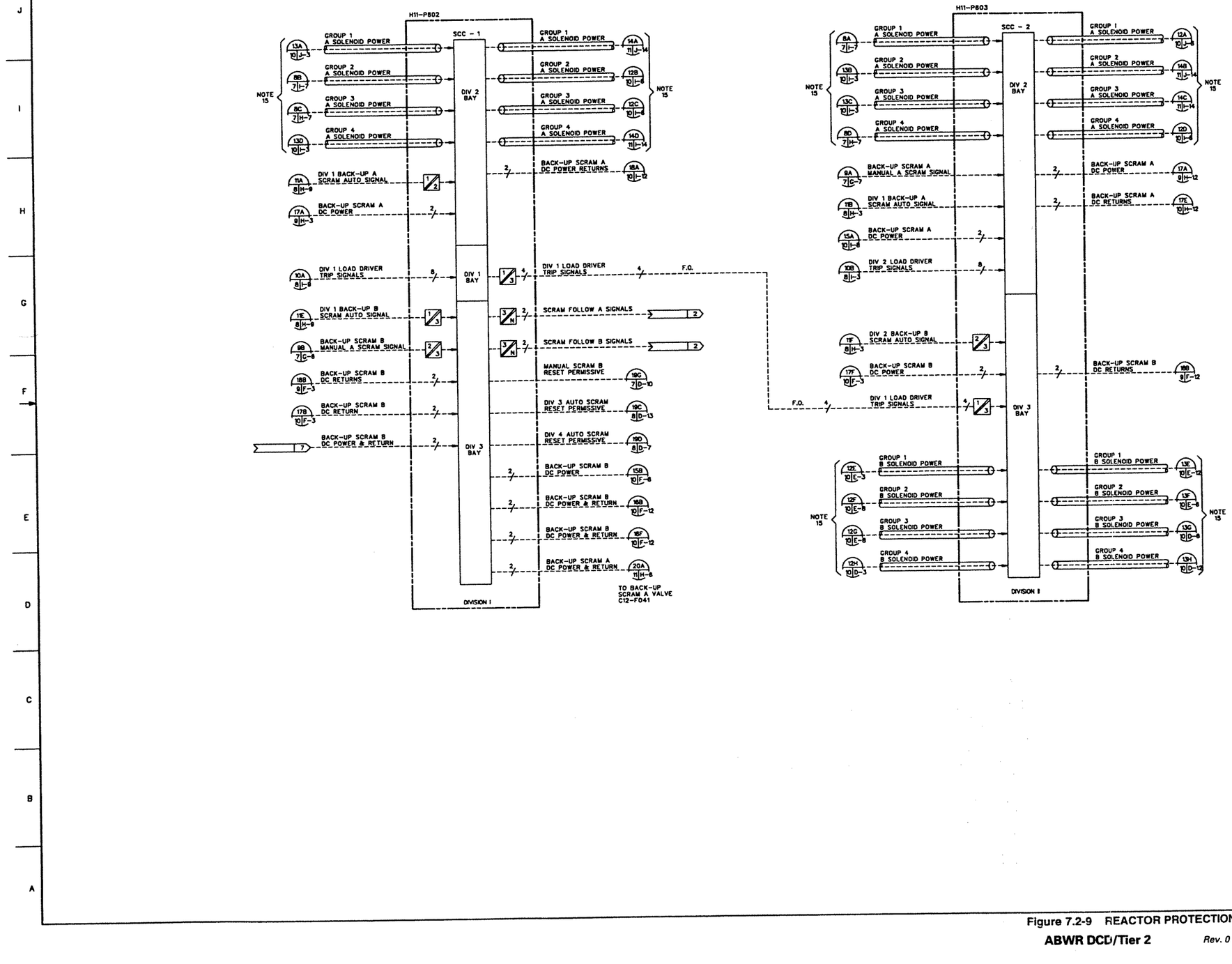


Figure 7.2-9 REACTOR PROTECTION SYSTEM IED (SHEET 9 OF 11)

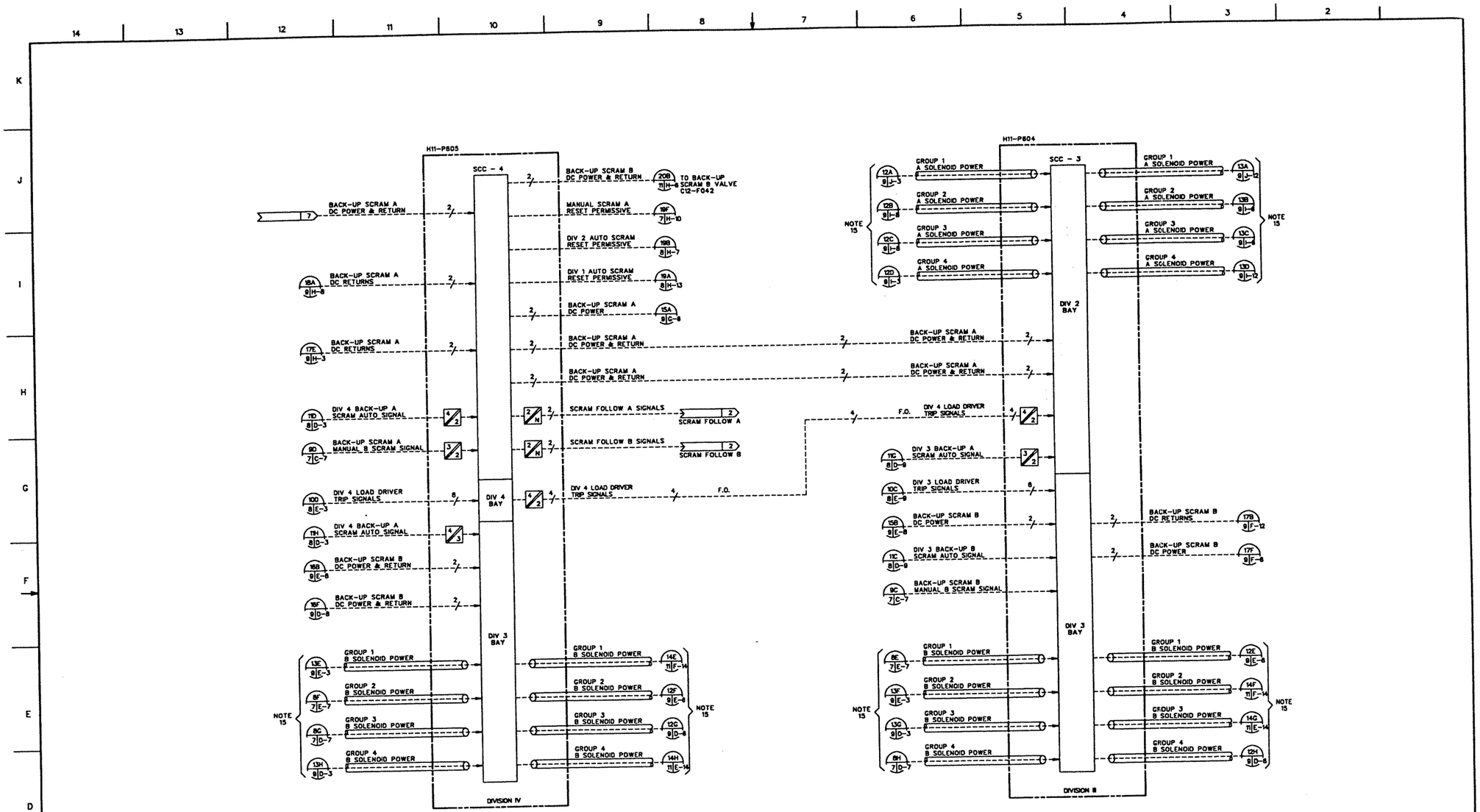
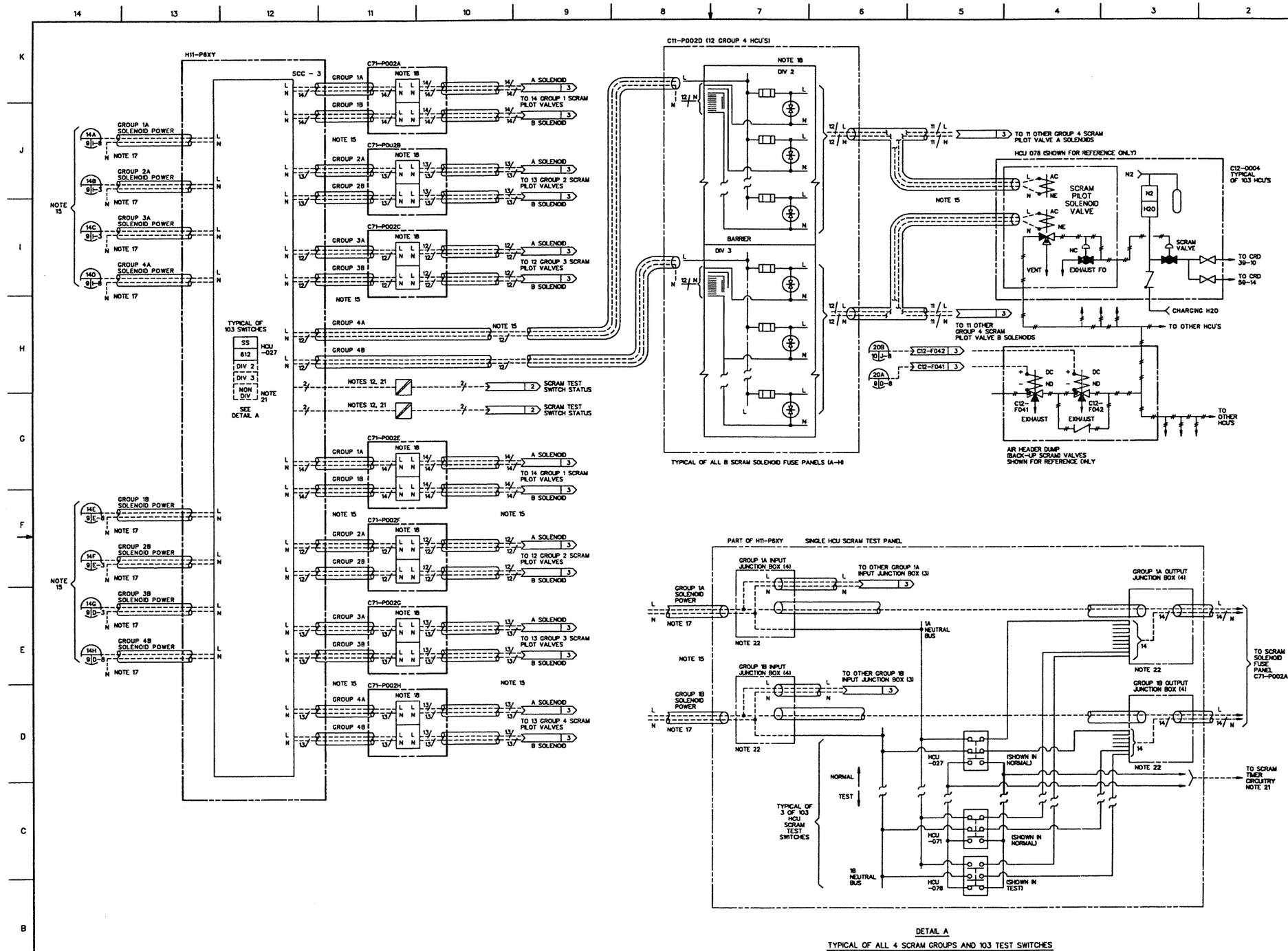


Figure 7.2-9 REACTOR PROTECTION SYSTEM IED (SHEET 10 OF 11)



DETAIL A

TYPICAL OF ALL 4 SCRAM GROUPS AND 103 TEST SWITCHES

Figure 7.2-9 REACTOR PROTECTION SYSTEM IED (SHEET 11 OF 11)

7 6 5 4 3 2

E

D

C

B

A

NOTES:

1. LOGIC GATES ARE USED IN THIS DRAWING TO SHOW REACTOR PROTECTION SYSTEM FUNCTIONAL LOGIC AND NOT ACTUAL HARDWARE.

2. LOGIC REPRESENTED IN THIS DOCUMENT FOR PDLU CAN BE IMPLEMENTED BY RELAY LOGIC.

3. ALL SIGNAL DESCRIPTIONS REFLECT THE CONDITION THAT RESULTS IN A LOGIC "1" ON THE SIGNAL LINE. DTM ANALOG INPUT DESCRIPTIONS REFLECT CONDITIONS THAT WILL CAUSE AN INSTRUMENT TRIP.

4. ALL TRIP SIGNALS INTERNAL TO RPS AT THE CHANNEL AND DIVISION LEVEL ARE ASSERTED LOW.

5. ALL BYPASS SIGNALS AND BYPASS PERMISSIVE SIGNALS ARE ASSERTED HIGH.

6. FOR DRAWING CLARITY, ISOLATED SIGNALS ARE SHOWN WITH AN ISOLATOR AT BOTH TRANSMIT AND RECEIVE END. THIS DOES NOT MEAN TO IMPLY THAT TWO SEPARATE ISOLATORS ARE REQUIRED FOR EACH SIGNAL.

7. 2 OUT OF 4 OUTPUT ARRANGEMENT FOR SCC IS REPRESENTED IN THIS DOCUMMENT.

8. LOGIC AND DEVICE SYMBOLS USED IN THIS DRAWING ARE DEFINED IN THE IBD STANDARDS, SUPPORTING DOCUMENT 4.

9. EACH APRM TRIP SIGNAL REPRESENTS EITHER A HIGH NEUTRON FLUX TRIP, A HIGH SIMULATED THERMAL POWER TRIP, AN APRM INOPERATIVE TRIP, AND/OR A CORE FLOW RAPID COASTDOWN TRIP AS DETERMINED BY AN APRM OF THE NMS.

10. EACH SRNM TRIP SIGNAL REPRESENTS EITHER A SRNM UPSCALE (OR HIGH COUNT RATE) TRIP, A SHORT PERIOD TRIP, AND/OR A SRNM INOPERATIVE TRIP AS DETERMINED BY EITHER TWO OR THREE OF THE SRNM'S OF THE NMS.

11. SCRAM SOLENOID POWER WIRING SHALL BE PROTECTED FROM HOT SHORT CONDITIONS BY RUNNING ALL OF THE GROUP 1A, 1B, 2A, 2B, 3A, 3B, 4A AND 4B SOLENOID POWER WIRING WITHIN SEPARATE METAL ENCLOSED RACEWAYS OR WITHIN SEPARATE METAL CONDUIT FROM THE PDLU'S THROUGH TO THE INDIVIDUAL HCU SCRAM PILOT VALVE SOLENOID.

12. PLACING ANY ONE OF THE HCU (PAIR ROD) TEST SWITCHES IN THE "TEST" POSITION SHALL RESULT IN AN ISOLATED SIGNAL BEING SENT TO THE ROD CONTROL AND INFORMATION SYSTEM INDICATING THE START OF A CONTROL ROD SCRAM TEST.

13. LOGIC REPRESENTED IN THE SCC'S SHOWN ON SHEETS 65 AND 66 OF THIS DOCUMENT CAN BE IMPLEMENTED BY RELAY LOGIC.

MPL NO. C71-1030

FIGURE 7.2-10 REACTOR PROTECTION SYSTEM IBD (Sheet 1 of 72)

SH NO.	TITLE
1	NOTES
2	TABLE OF CONTENTS, REF DOCUMENTS, SUPPORTING DOCUMENTS, ABREVIATIONS
3	DIV 1 TLU; RX MODE AND RELATED BYPASSES
4	DIV 2 TLU; RX MODE AND RELATED BYPASSES
5	DIV 3 TLU; RX MODE AND RELATED BYPASSES
6	DIV 4 TLU; RX MODE AND RELATED BYPASSES
7	DIV 1 BPU; BYPASS LOGIC–TLU BYPASS, CHANNEL SENSOR BYPASS, SPECIAL MSLI TRIP BYPASS
8	DIV 2 BPU; BYPASS LOGIC–TLU BYPASS, CHANNEL SENSOR BYPASS, SPECIAL MSLI TRIP BYPASS
9	DIV 3 BPU; BYPASS LOGIC–TLU BYPASS, CHANNEL SENSOR BYPASS, SPECIAL MSLI TRIP BYPASS
10	DIV 4 BPU; BYPASS LOGIC–TLU BYPASS, CHANNEL SENSOR BYPASS, SPECIAL MSLI TRIP BYPASS
11	DIV 1 DTM; CHANNEL A SENSOR TRIP LOGIC
12	DIV 2 DTM; CHANNEL B SENSOR TRIP LOGIC
13	DIV 3 DTM; CHANNEL C SENSOR TRIP LOGIC
14	DIV 4 DTM; CHANNEL D SENSOR TRIP LOGIC
15	DIV 1 DTM; CHANNEL A SENSOR TRIP LOGIC
16	DIV 2 DTM; CHANNEL B SENSOR TRIP LOGIC
17	DIV 3 DTM; CHANNEL C SENSOR TRIP LOGIC
18	DIV 4 DTM; CHANNEL D SENSOR TRIP LOGIC
19	DIV 1 TLU; NMS DIV 1 TRIP LOGIC
20	DIV 2 TLU; NMS DIV 2 TRIP LOGIC
21	DIV 3 TLU; NMS DIV 3 TRIP LOGIC
22	DIV 4 TLU; NMS DIV 4 TRIP LOGIC
23	DIV 1 TLU; RX PRESS DIV 1 TRIP, SUPPRESSION POOL TEMP, TSV CLOSURE DIV 1 TRIP LOGIC
24	DIV 2 TLU; RX PRESS DIV 2 TRIP, SUPPRESSION POOL TEMP, TSV CLOSURE DIV 2 TRIP LOGIC
25	DIV 3 TLU; RX PRESS DIV 3 TRIP, SUPPRESSION POOL TEMP, TSV CLOSURE DIV 3 TRIP LOGIC
26	DIV 4 TLU; RX PRESS DIV 4 TRIP, SUPPRESSION POOL TEMP, TSV CLOSURE DIV 4 TRIP LOGIC
27	DIV 1 TLU; TSV, TCV CLOSURE DIV 1 TRIP LOGIC
28	DIV 2 TLU; TSV, TCV CLOSURE DIV 2 TRIP LOGIC
29	DIV 3 TLU; TSV, TCV CLOSURE DIV 3 TRIP LOGIC
30	DIV 4 TLU; TSV, TCV CLOSURE DIV 4 TRIP LOGIC
31	DIV 1 TLU; MSLI DIV 1 TRIP LOGIC
32	DIV 2 TLU; MSLI DIV 2 TRIP LOGIC
33	DIV 3 TLU; MSLI DIV 3 TRIP LOGIC
34	DIV 4 TLU; MSLI DIV 4 TRIP LOGIC
35	BLANK
36	BLANK

SH NO.	TITLE
37	BLANK
38	BLANK
39	DIV 1 TLU; MSL RAD DIV 1 , DW PRESS DIV 1 TRIP LOGIC
40	DIV 2 TLU; MSL RAD DIV 2 , DW PRESS DIV 2 TRIP LOGIC
41	DIV 3 TLU; MSL RAD DIV 3 , DW PRESS DIV 3 TRIP LOGIC
42	DIV 4 TLU; MSL RAD DIV 4 , DW PRESS DIV 4 TRIP LOGIC
43	DIV 1 TLU; RX WTR LVL DIV 1, CRD PRESS DIV 1 TRIP LOGIC
44	DIV 2 TLU; RX WTR LVL DIV 2, CRD PRESS DIV 2 TRIP LOGIC
45	DIV 3 TLU; RX WTR LVL DIV 3, CRD PRESS DIV 3 TRIP LOGIC
46	DIV 4 TLU; RX WTR LVL DIV 4, CRD PRESS DIV 4 TRIP LOGIC
47	DIV 1 TLU; DIV 1 AUTO–SCRAM LOGIC
48	DIV 2 TLU; DIV 2 AUTO–SCRAM LOGIC
49	DIV 3 TLU; DIV 3 AUTO–SCRAM LOGIC
50	DIV 4 TLU; DIV 4 AUTO–SCRAM LOGIC
51	DIV 1 TLU; TRIP IN CH A BYPASSED SENSOR
52	DIV 2 TLU; TRIP IN CH B BYPASSED SENSOR
53	DIV 3 TLU; TRIP IN CH C BYPASSED SENSOR
54	DIV 4 TLU; TRIP IN CH D BYPASSED SENSOR
55	DIV 2 PDLU; MANUAL SCRAM, SEAL–IN AND MANUAL SCRAM RESET LOGIC
56	DIV 3 PDLU; MANUAL SCRAM, SEAL–IN AND MANUAL SCRAM RESET LOGIC
57	DIV 1 OLU; DIV 1 AUTO SCRAM, SEAL–IN, RESET, MANUAL TRIP AND LD TEST LOGIC
58	DIV 2 OLU; DIV 2 AUTO SCRAM, SEAL–IN, RESET, MANUAL TRIP AND LD TEST LOGIC
59	DIV 3 OLU; DIV 3 AUTO SCRAM, SEAL–IN, RESET, MANUAL TRIP AND LD TEST LOGIC
60	DIV 4 OLU; DIV 4 AUTO SCRAM, SEAL–IN, RESET, MANUAL TRIP AND LD TEST LOGIC
61	GROUP 1 LD ARRANGEMENT AND HCU'S
62	GROUP 2 LD ARRANGEMENT AND HCU'S
63	GROUP 3 LD ARRANGEMENT AND HCU'S
64	GROUP 4 LD ARRANGEMENT AND HCU'S
65	BACKUP SCRAM RELAY ARRANGEMENT AND RESET PERMISSIVE LOGIC
66	BACKUP SCRAM RELAY ARRANGEMENT AND RESET PERMISSIVE LOGIC
67	RPS ALARMS
68	RPS ALARMS
69	RPS ALARMS
70	RPS ALARMS
71	RPS ALARMS
72	RPS ALARMS

SUPPORTING DOCUMENTS:

	MPL NO.
1. REACTOR PROTECTION SYS DESIGN SPEC	C71–4010
2. REACTOR PROTECTION SYS IED	C71–1040
3. NEUTRON MONITORING SYS IED	C51–1040
4. IBD STANDARDS DESIGN STANDARDS	A10–3070

REFERENCES:

	MPL NO.
1. NEUTRON MONITORING SYS IBD	C51–1030
2. LEAK DETECTION SYSTEM IBD	E31–1030
3. ROD CONTROL & INFO SYSTEM IBD	C11–1030
4. CONTROL ROD DRIVE SYSTEM P&ID	C12–1010
5. PROCESS RAD MONITORING SYS IED	D11–1040
6. NUCLEAR BOILER SYS P&ID	B21–1010
7. RECIRC FLOW CONTROL SYS IBD	C81–1030
8. SUPPRESSION POOL TEMPERATURE MONITORING SYSTEM IED	T53–1010

ABREVIATIONS

BPU – BYPASS UNITS
DTM – DIGITAL TRIP MODULE
RMU – REMOTE MULTIPLEXING UNIT
TLU – TRIP LOGIC UNIT
SLU – SAFETY SYSTEM LOGIC UNIT
OLU – OUTPUT LOGIC UNIT
PDLU – POWER DISTRIBUTION LOGIC UNIT
SCC – SOLENOID CONTROL CENTER
SSFP – SCRAM SOLENOID FUSE PANEL
SSLC – SAFETY SYSTEM LOGIC & CONTROL
APRM – AVERAGE POWER RANGE MONITOR
CRD – CONTROL ROD DRIVE
HCU – HYDRAULIC CONTROL UNIT
MSIV – MAIN STEAM LINE ISOLATION VALVE
MSL – MAIN STEAM LINE
SRNM – STARTUP RANGE NEUTRON MONITOR
mP – MICROPROCESSOR
LD – LOAD DRIVER
KOS – KEY OPERATED SWITCH
HTS – HYDRAULIC TRIP SYSTEM

TABLE OF CONTENTS, REFERENCE DOCUMENTS, SUPPORTING DOCUMENTS, ABREVIATIONS

FIGURE 7.2–10 REACTOR PROTECTION SYSTEM IBD (Sheet 2 of 72)

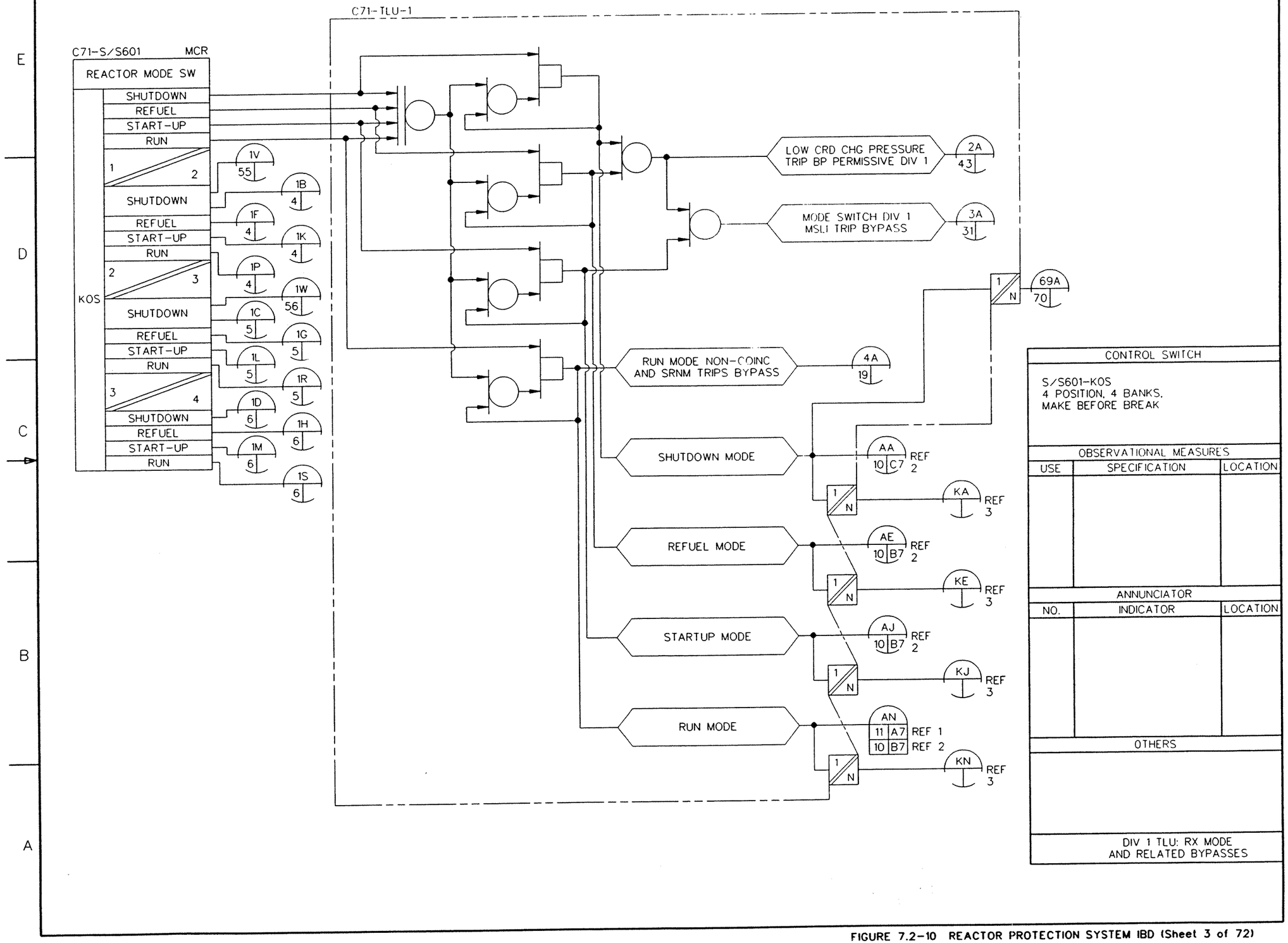


FIGURE 7.2-10 REACTOR PROTECTION SYSTEM IBD (Sheet 3 of 72)

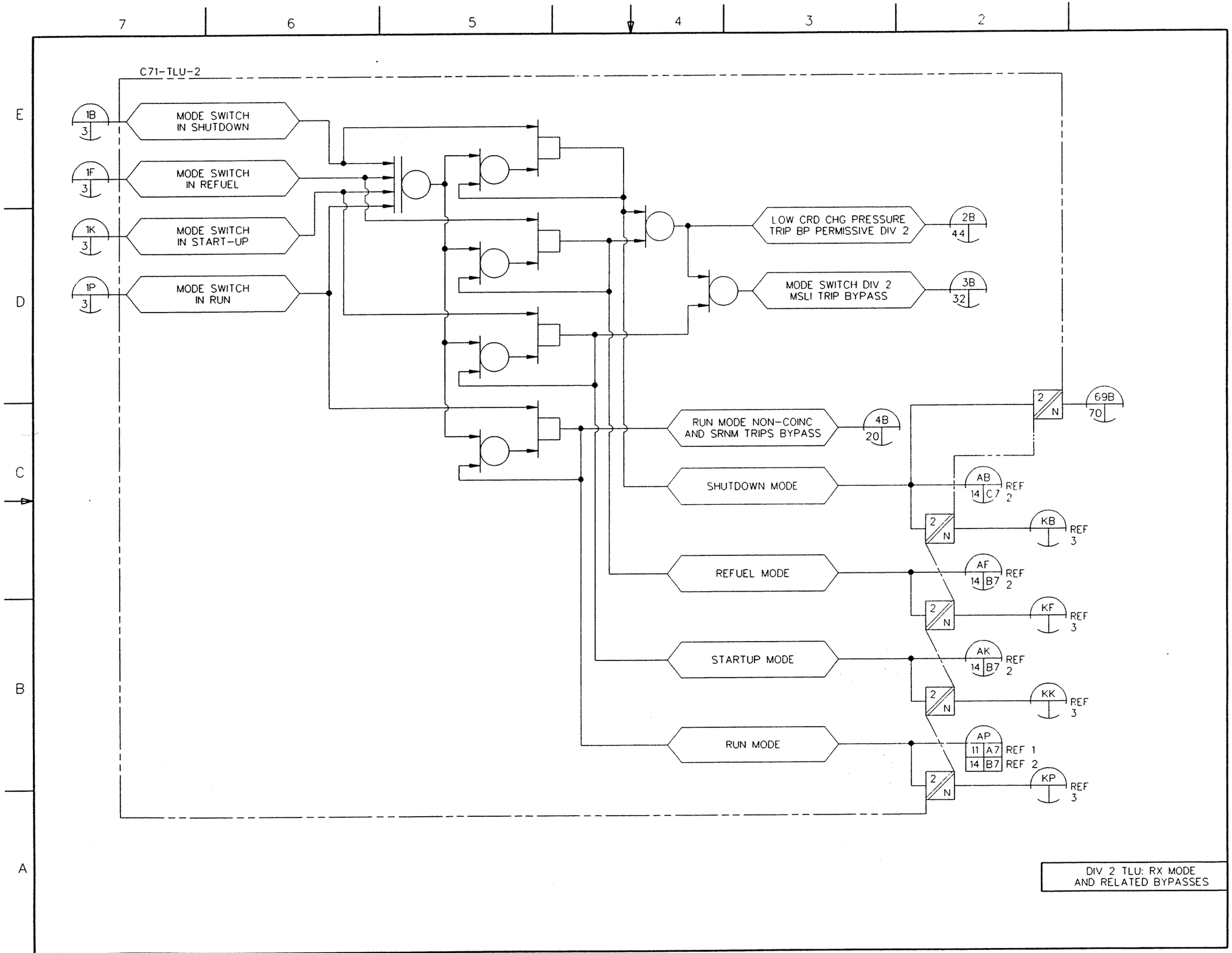


FIGURE 7.2-10 REACTOR PROTECTION SYSTEM IBD (Sheet 4 of 72)

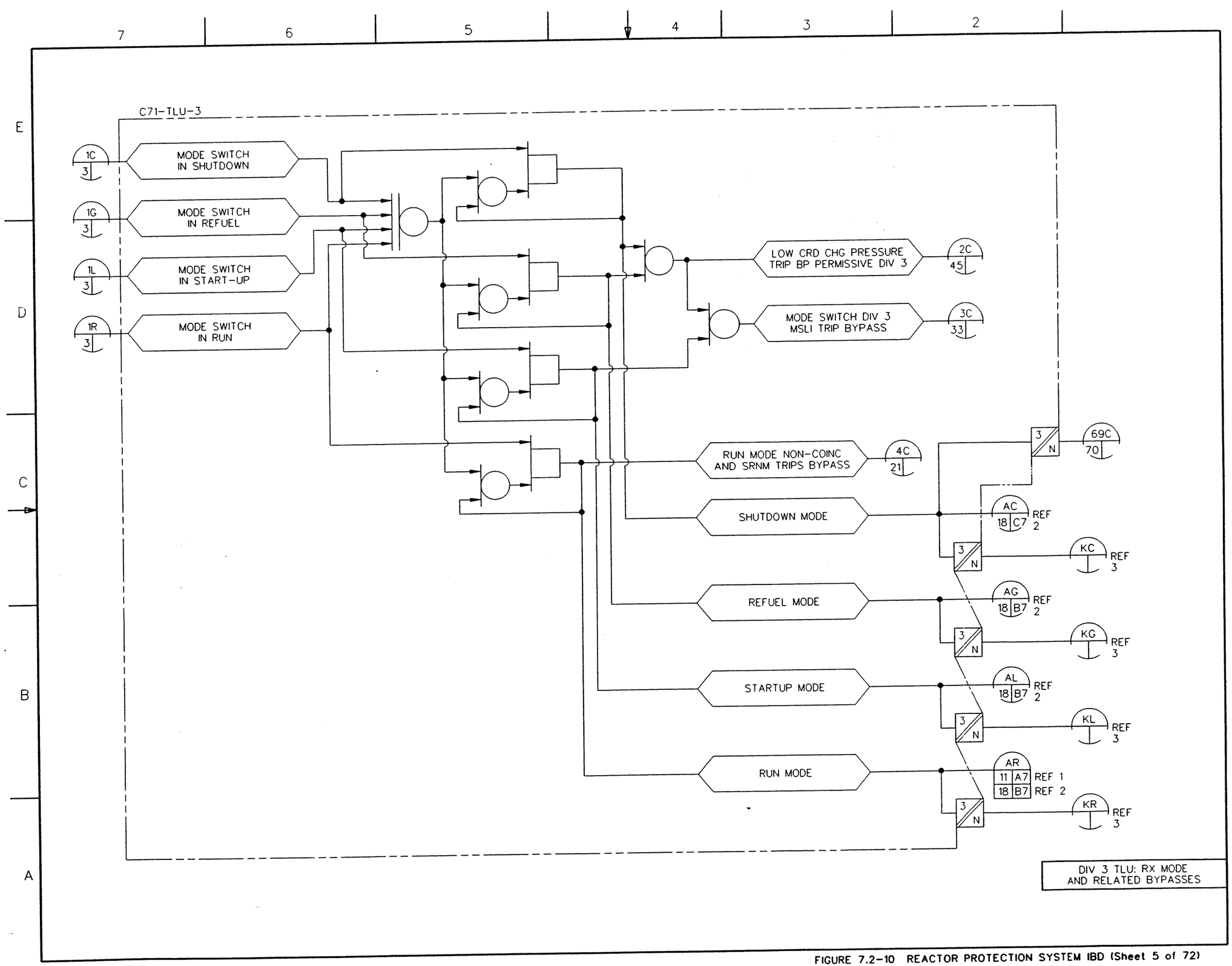


FIGURE 7.2-10 REACTOR PROTECTION SYSTEM IBD (Sheet 5 of 72)

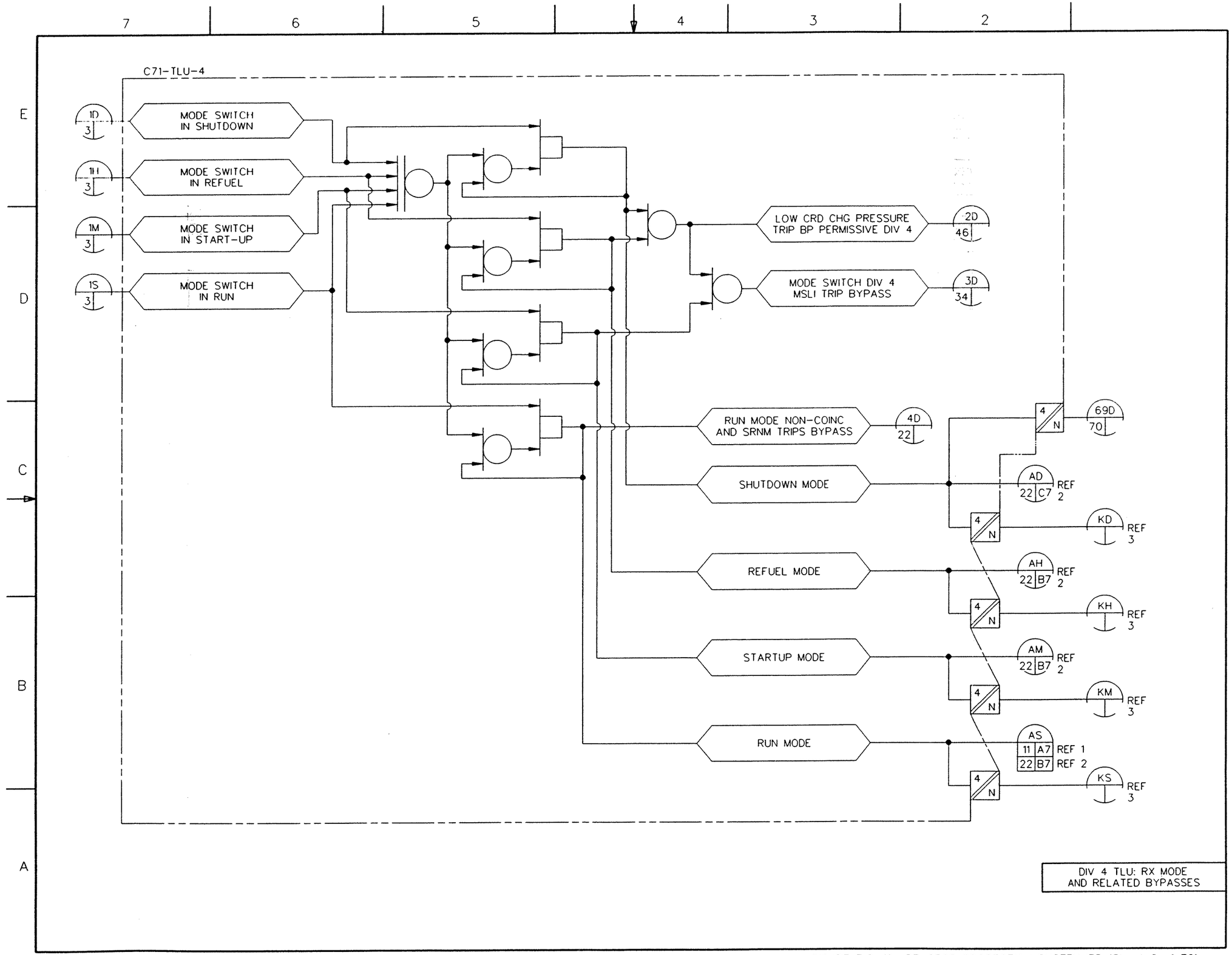


FIGURE 7.2-10 REACTOR PROTECTION SYSTEM IBD (Sheet 6 of 72)

C71-S602A MCR
DIVISION 1 TRIP LOGIC UNIT BYPASS
KOS: NORMAL / BYPASS

C71-S603A MCR
CHANNEL A SENSORS BYPASS
KOS: NORMAL / BYPASS

C71-S604A MCR
CHANNEL A SPECIAL MSLI TRIP BYPASS
KOS: NORMAL / BYPASS

C71-BPU-1

8B 8 — 2/1 — DIVISION 1 TLU BYPASS PERMISSIVE
8C 9 — 3/1 — DIVISION 1 TLU BYPASS PERMISSIVE
8D 10 — 4/1 — DIVISION 1 TLU BYPASS PERMISSIVE

9B 8 — 2/1 — CH A SENSORS BYPASS PERMISSIVE
9C 9 — 3/1 — CH A SENSORS BYPASS PERMISSIVE
9D 10 — 4/1 — CH A SENSORS BYPASS PERMISSIVE

10B 8 — 2/1 — CH A SPECIAL MSLI TRIP BYPASS PERMISSIVE
10C 9 — 3/1 — CH A SPECIAL MSLI TRIP BYPASS PERMISSIVE
10D 10 — 4/1 — CH A SPECIAL MSLI TRIP BYPASS PERMISSIVE

DIV 1 TLU BYPASSED ANNUNCIATE — 1/N — A 1
DIVISION 1 TRIP LOGIC UNIT BYPASS — 5A 57 / BA REF 2
DIVISION 2 TLU BYPASS PERMISSIVE — 1/2 — 8A 8
DIVISION 3 TLU BYPASS PERMISSIVE — 1/3 — 8E 9
DIVISION 4 TLU BYPASS PERMISSIVE — 1/4 — 8J 10
CH B SENSORS BYPASS PERMISSIVE — 1/2 — 9A 8
CH C SENSORS BYPASS PERMISSIVE — 1/3 — 9E 9
CH D SENSORS BYPASS PERMISSIVE — 1/4 — 9J 10
CH A SENSORS BYPASSED ANNUNCIATE — 1/N — A 2
CH A SENSORS BYPASSED — 6A 23
CH B SENSORS BYPASSED — 6E 23
CH C SENSORS BYPASSED — 6J 23
CH D SENSORS BYPASSED — 6N 23
CH B SPECIAL MSLI TRIP BYPASS PERMISSIVE — 1/2 — 10A 8
CH C SPECIAL MSLI TRIP BYPASS PERMISSIVE — 1/3 — 10E 9
CH D SPECIAL MSLI TRIP BYPASS PERMISSIVE — 1/4 — 10J 10
CH A SPECIAL MSLI TRIP BYPASS — 7A 31
CH A SPECIAL MSLI TRIP BYPASSED ANNUNCIATE — 1/N — A 3
CH B SPECIAL MSLI TRIP BYPASSED — 7E 31
CH C SPECIAL MSLI TRIP BYPASSED — 7J 31
CH D SPECIAL MSLI TRIP BYPASSED — 7N 31

CONTROL SWITCH
S602A – KOS
S603A – KOS
S604A – KOS

OBSERVATIONAL MEASURES		
USE	SPECIFICATION	LOCATION

ANNUNCIATOR		
NO.	INDICATOR	LOCATION
1	ALARM	MCR
2	ALARM	MCR
3	ALARM	MCR

OTHERS
DIV 1 BPU; BYPASS LOGIC–TLU BYPASS, CHANNEL SENSOR BYPASS, SPECIAL MSLI TRIP BYPASS

FIGURE 7.2–10 REACTOR PROTECTION SYSTEM IBD (Sheet 7 of 72)

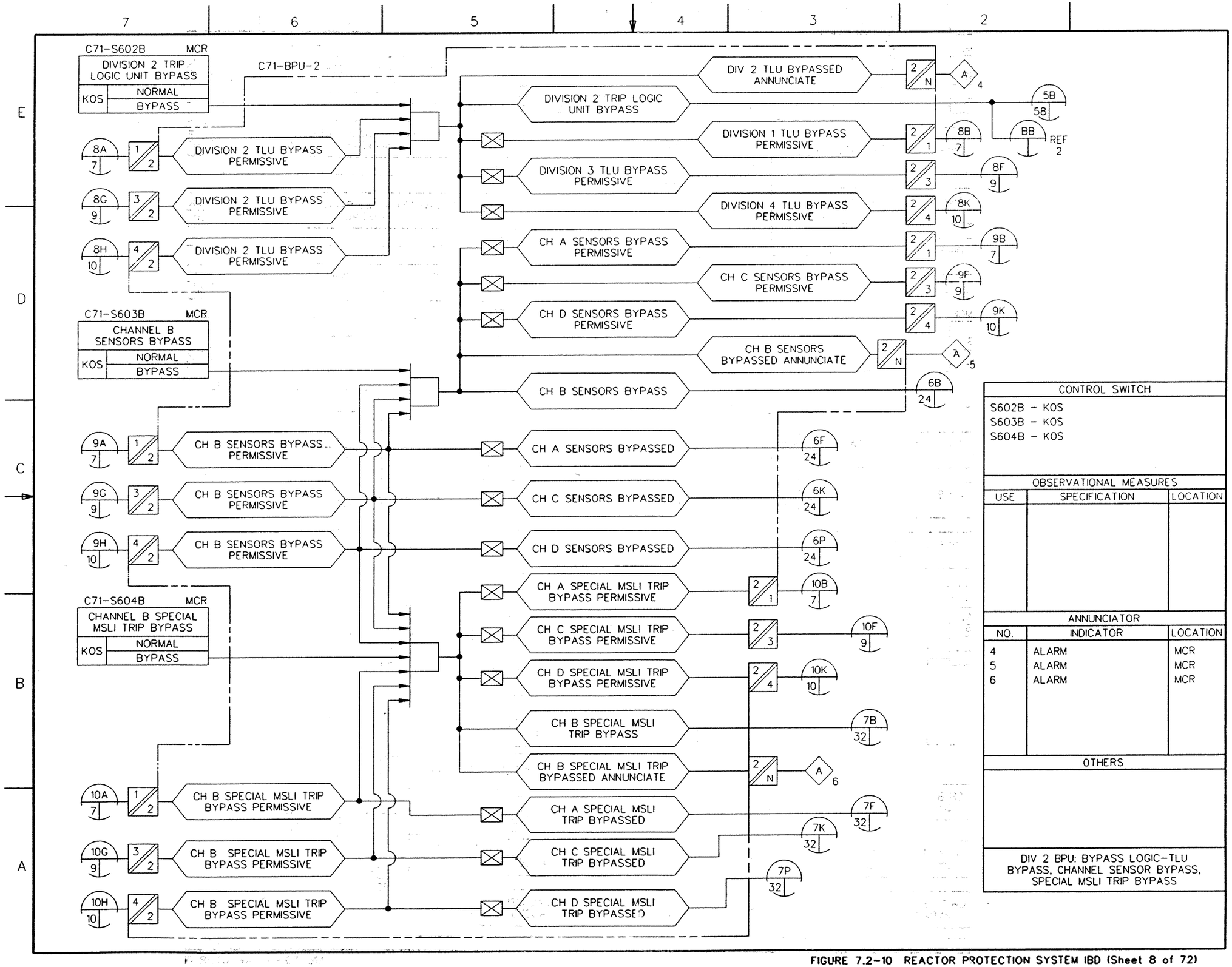


FIGURE 7.2-10 REACTOR PROTECTION SYSTEM IBD (Sheet 8 of 72)

C71-S602C MCR
DIVISION 3 TRIP LOGIC UNIT BYPASS
KOS: NORMAL / BYPASS

C71-S603C MCR
CHANNEL C SENSORS BYPASS
KOS: NORMAL / BYPASS

C71-S604C MCR
CHANNEL C SPECIAL MSLI TRIP BYPASS
KOS: NORMAL / BYPASS

C71-BPU-3

8E 7 — 1/3 — DIVISION 3 TLU BYPASS PERMISSIVE
8F 8 — 2/3 — DIVISION 3 TLU BYPASS PERMISSIVE
8M 10 — 4/3 — DIVISION 3 TLU BYPASS PERMISSIVE

9E 7 — 1/3 — CH C SENSORS BYPASS PERMISSIVE
9F 8 — 2/3 — CH C SENSORS BYPASS PERMISSIVE
9M 10 — 4/3 — CH C SENSORS BYPASS PERMISSIVE

10E 7 — 1/3 — CH C SPECIAL MSLI TRIP BYPASS PERMISSIVE
10F 8 — 2/3 — CH C SPECIAL MSLI TRIP BYPASS PERMISSIVE
10M 10 — 4/3 — CH C SPECIAL MSLI TRIP BYPASS PERMISSIVE

DIVISION 3 TRIP LOGIC UNIT BYPASS
DIVISION 1 TLU BYPASS PERMISSIVE
DIVISION 2 TLU BYPASS PERMISSIVE
DIVISION 4 TLU BYPASS PERMISSIVE
CH A SENSORS BYPASS PERMISSIVE
CH B SENSORS BYPASS PERMISSIVE
CH D SENSORS BYPASS PERMISSIVE
CH C SENSORS BYPASS

CH A SENSORS BYPASSED
CH B SENSORS BYPASSED
CH D SENSORS BYPASSED
CH A SPECIAL MSLI TRIP BYPASS PERMISSIVE
CH B SPECIAL MSLI TRIP BYPASS PERMISSIVE
CH D SPECIAL MSLI TRIP BYPASS PERMISSIVE
CH C SPECIAL MSLI TRIP BYPASS
CH C SPECIAL MSLI TRIP BYPASSED ANNUNCIATE
CH A SPECIAL MSLI TRIP BYPASSED
CH B SPECIAL MSLI TRIP BYPASSED
CH D SPECIAL MSLI TRIP BYPASSED

DIV 3 TLU BYPASSED ANNUNCIATE — 3/N — A 7
CH C SENSORS BYPASSED ANNUNCIATE — 3/N — A 8
CH C SPECIAL MSLI TRIP BYPASSED ANNUNCIATE — 3/N — A 9

3/1 — 8C 7
3/2 — 8G 8
3/4 — 8L 10
3/1 — 9C 7
3/2 — 9G 8
3/4 — 9L 10
6C 25
5C 59
BC REF 2
6G 25
6L 25
6R 25
3/1 — 10C 7
3/2 — 10G 8
3/4 — 10L 10
7C 33
7G 33
7L 33
7R 33

CONTROL SWITCH
S602C – KOS
S603C – KOS
S604C – KOS

OBSERVATIONAL MEASURES		
USE	SPECIFICATION	LOCATION

ANNUNCIATOR		
NO.	INDICATOR	LOCATION
7	ALARM	MCR
8	ALARM	MCR
9	ALARM	MCR

OTHERS

DIV 3 BPU: BYPASS LOGIC–TLU BYPASS, CHANNEL SENSOR BYPASS, SPECIAL MSLI TRIP BYPASS

FIGURE 7.2-10 REACTOR PROTECTION SYSTEM IBD (Sheet 9 of 72)

GE Nuclear Energy

Rev. 4
March 1997

ABWR Design Control Document

Design Control Document Table Of Contents

C71-S602D MCR
DIVISION 4 TRIP LOGIC UNIT BYPASS
KOS | NORMAL / BYPASS

C71-BPU-4

8J 7 — 1/4 — DIVISION 4 TLU BYPASS PERMISSIVE
8K 8 — 2/4 — DIVISION 4 TLU BYPASS PERMISSIVE
8L 9 — 3/4 — DIVISION 4 TLU BYPASS PERMISSIVE

C71-S603D MCR
CHANNEL D SENSORS BYPASS
KOS | NORMAL / BYPASS

9J 7 — 1/4 — CH D SENSORS BYPASS PERMISSIVE
9K 8 — 2/4 — CH D SENSORS BYPASS PERMISSIVE
9L 9 — 3/4 — CH D SENSORS BYPASS PERMISSIVE

C71-S604D MCR
CHANNEL D SPECIAL MSLI TRIP BYPASS
KOS | NORMAL / BYPASS

10J 7 — 1/4 — CH D SPECIAL MSLI TRIP BYPASS PERMISSIVE
10K 8 — 2/4 — CH D SPECIAL MSLI TRIP BYPASS PERMISSIVE
10L 9 — 3/4 — CH D SPECIAL MSLI TRIP BYPASS PERMISSIVE

DIV 4 TLU BYPASSED ANNUNCIATE — 4/N — A 10
DIVISION 4 TRIP LOGIC UNIT BYPASS
DIVISION 1 TLU BYPASS PERMISSIVE — 4/1 — 8D 7
DIVISION 2 TLU BYPASS PERMISSIVE — 4/2 — 8H 8
DIVISION 3 TLU BYPASS PERMISSIVE — 4/3 — 8M 9
CH A SENSORS BYPASS PERMISSIVE — 4/1 — 9D 7
CH B SENSORS BYPASS PERMISSIVE — 4/2 — 9H 8
CH C SENSORS BYPASS PERMISSIVE — 4/3 — 9M 9
CH D SENSORS BYPASSED ANNUNCIATE — 4/N — A 11
CH D SENSORS BYPASS — 6D 26

5D 60 — BD REF 2

CH A SENSORS BYPASSED — 6H 26
CH B SENSORS BYPASSED — 6M 26
CH C SENSORS BYPASSED — 6S 26
CH A SPECIAL MSLI TRIP BYPASS PERMISSIVE — 4/1 — 10D 7
CH B SPECIAL MSLI TRIP BYPASS PERMISSIVE — 4/2 — 10H 8
CH C SPECIAL MSLI TRIP BYPASS PERMISSIVE — 4/3 — 10M 9
CH D SPECIAL MSLI TRIP BYPASS — 7D 34
CH D SPECIAL MSLI TRIP BYPASSED ANNUNCIATE — 4/N — A 12
CH A SPECIAL MSLI TRIP BYPASSED — 7H 34
CH B SPECIAL MSLI TRIP BYPASSED — 7M 34
CH C SPECIAL MSLI TRIP BYPASSED — 7S 34

CONTROL SWITCH
S602D – KOS S603D – KOS S604D – KOS

OBSERVATIONAL MEASURES		
USE	SPECIFICATION	LOCATION

ANNUNCIATOR		
NO.	INDICATOR	LOCATION
10	ALARM	MCR
11	ALARM	MCR
12	ALARM	MCR

OTHERS

DIV 4 BPU: BYPASS LOGIC–TLU BYPASS, CHANNEL SENSOR BYPASS, SPECIAL MSLI TRIP BYPASS

FIGURE 7.2–10 REACTOR PROTECTION SYSTEM IBD (Sheet 10 of 72)

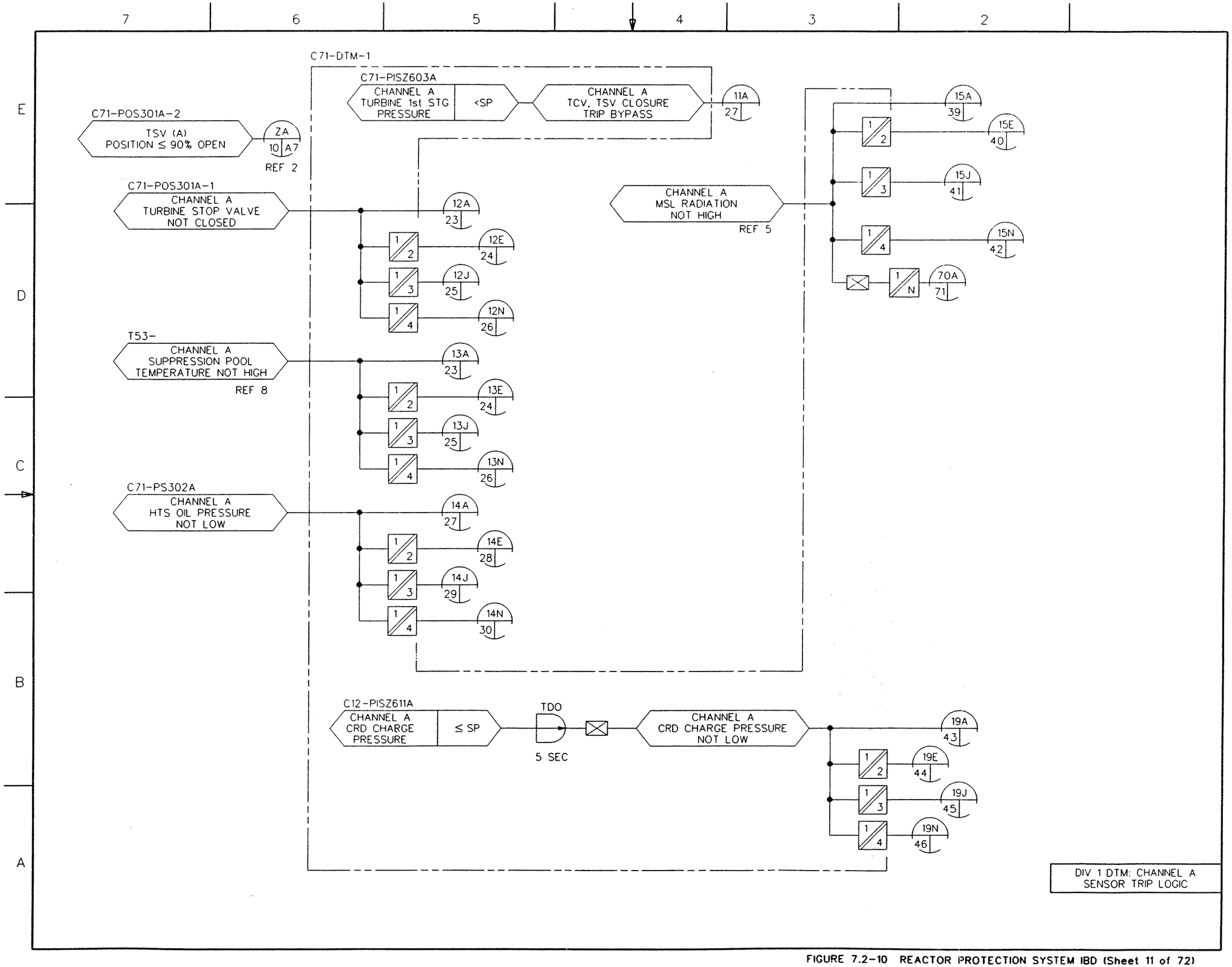


FIGURE 7.2-10 REACTOR PROTECTION SYSTEM IBD (Sheet 11 of 72)

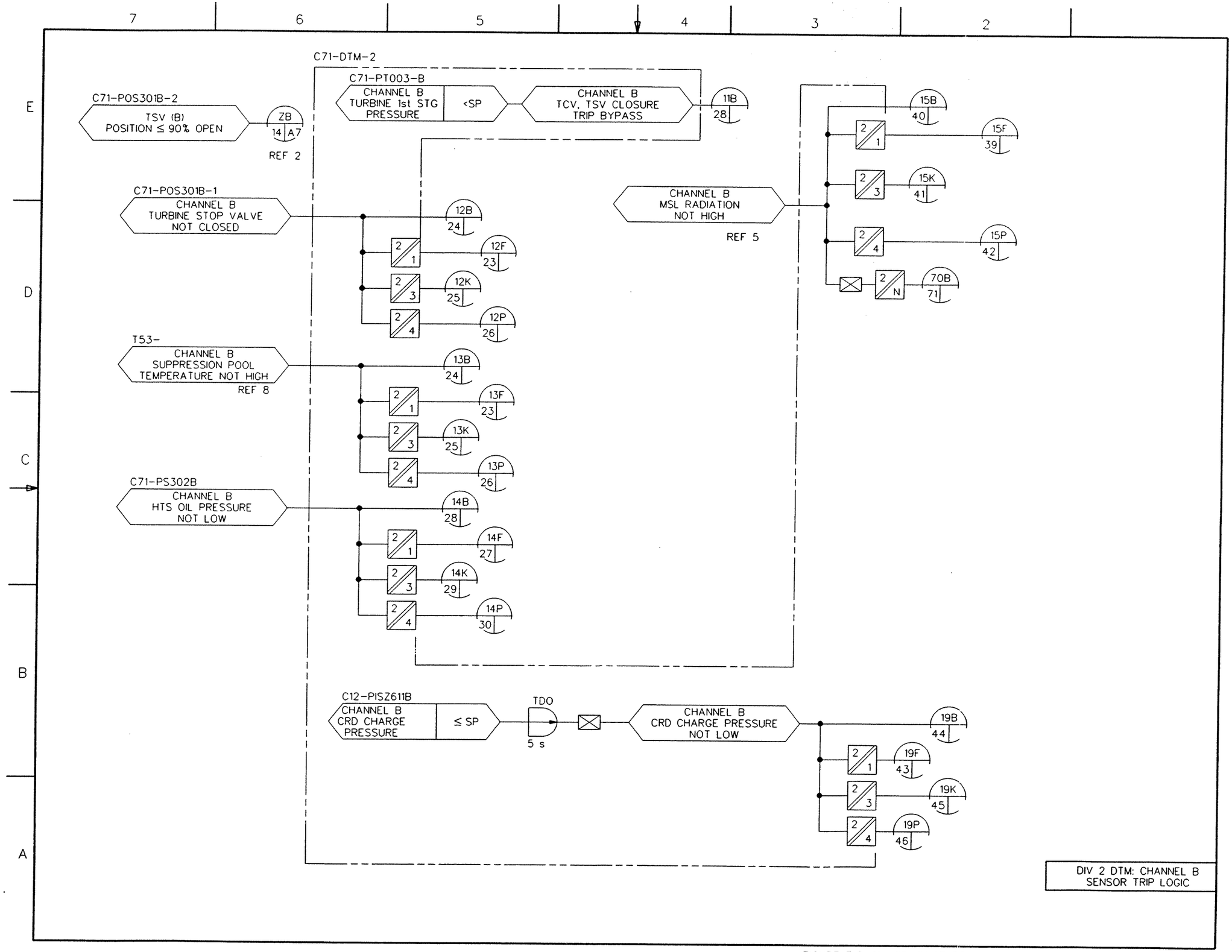


FIGURE 7.2-10 REACTOR PROTECTION SYSTEM IBD (Sheet 12 of 72)

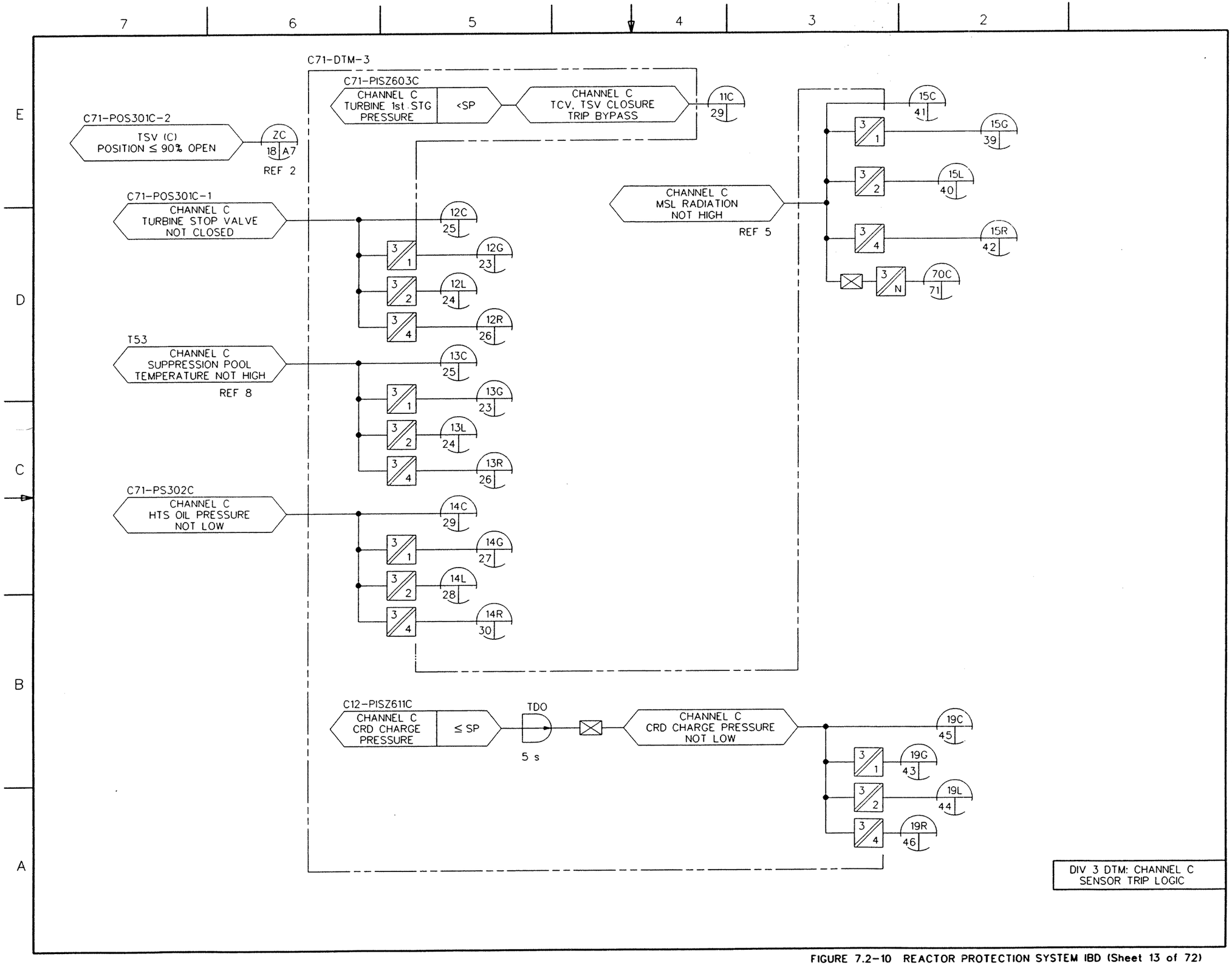


FIGURE 7.2-10 REACTOR PROTECTION SYSTEM IBD (Sheet 13 of 72)

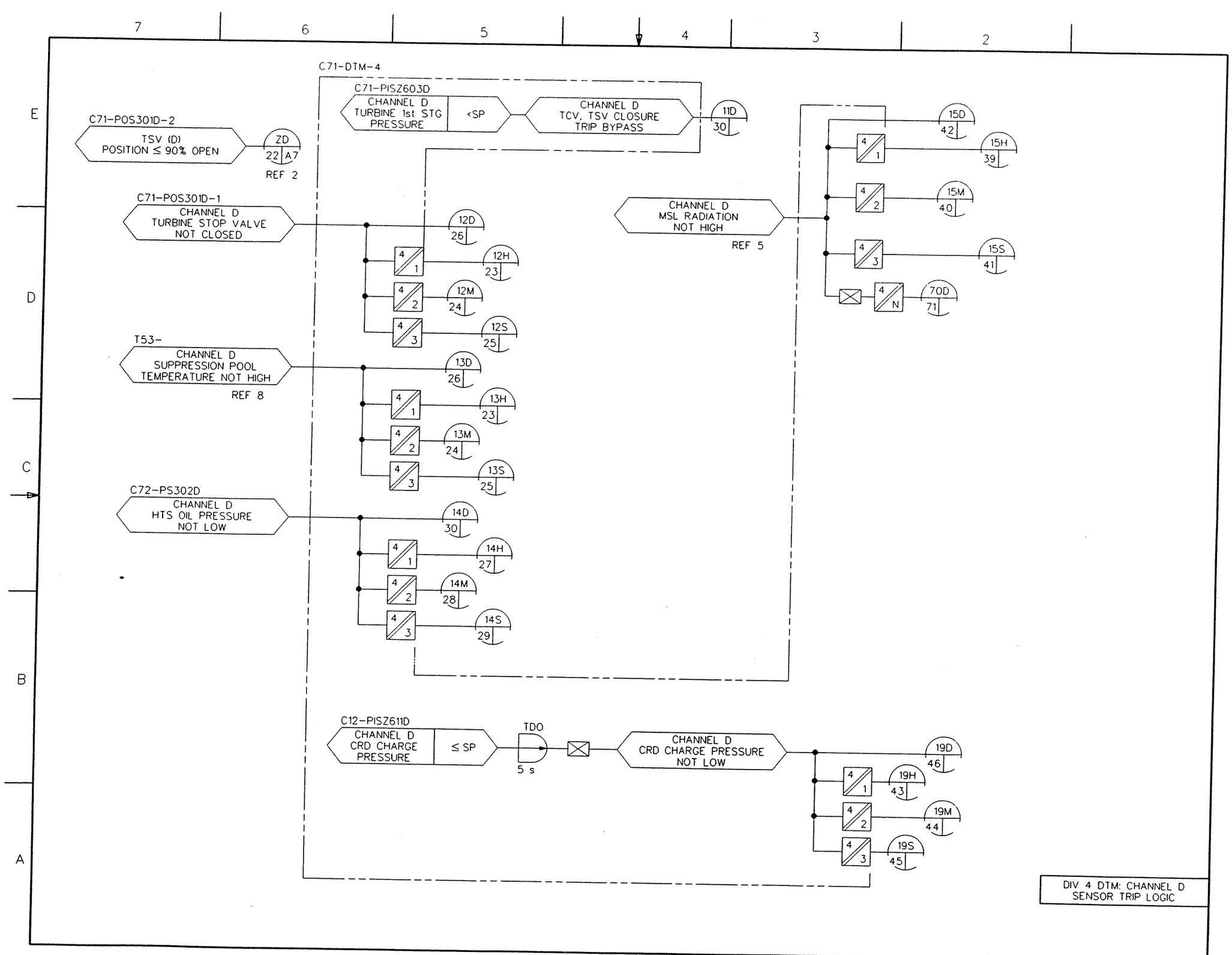


FIGURE 7.2-10 REACTOR PROTECTION SYSTEM IBD (Sheet 14 of 72)

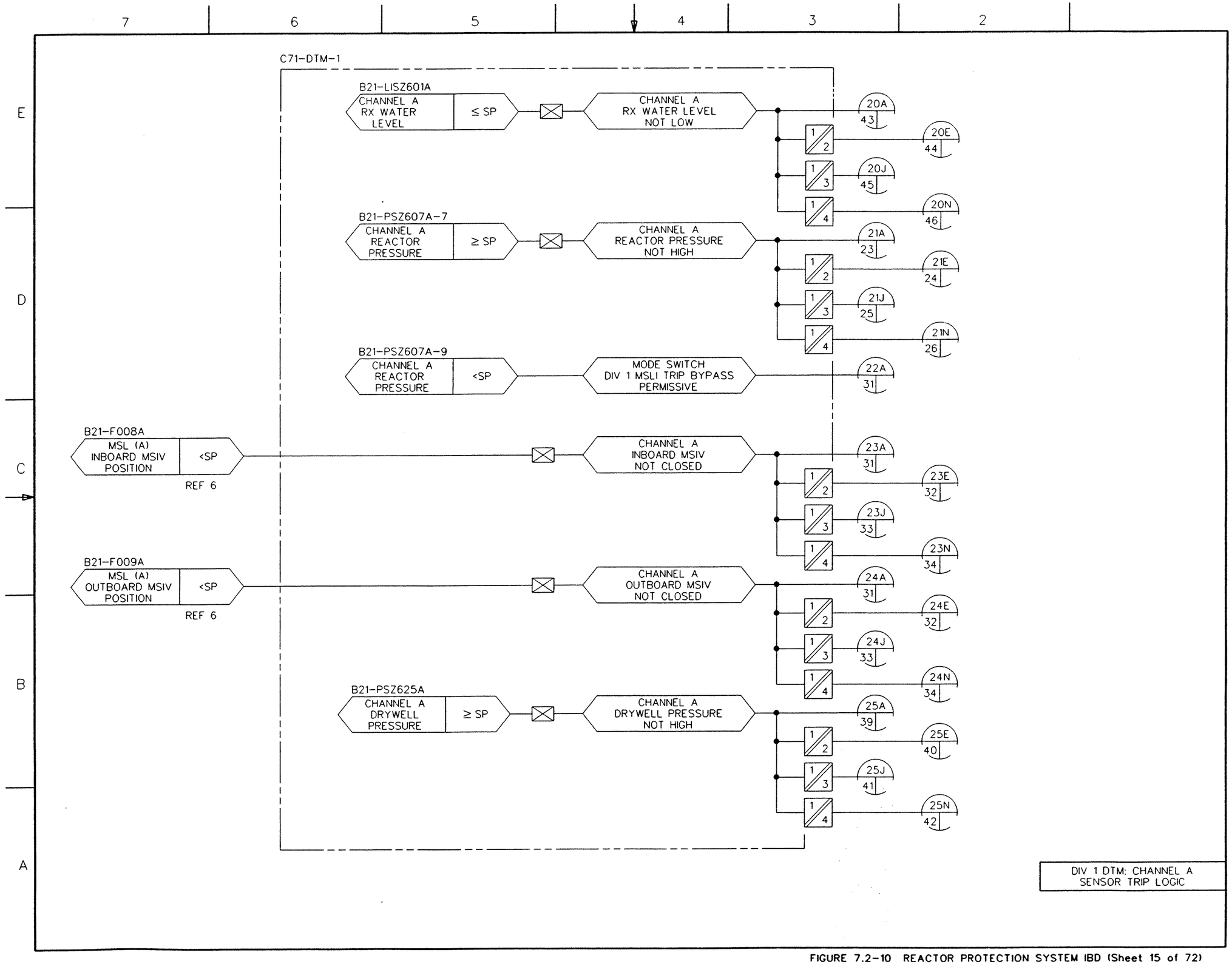


FIGURE 7.2-10 REACTOR PROTECTION SYSTEM IBD (Sheet 15 of 72)

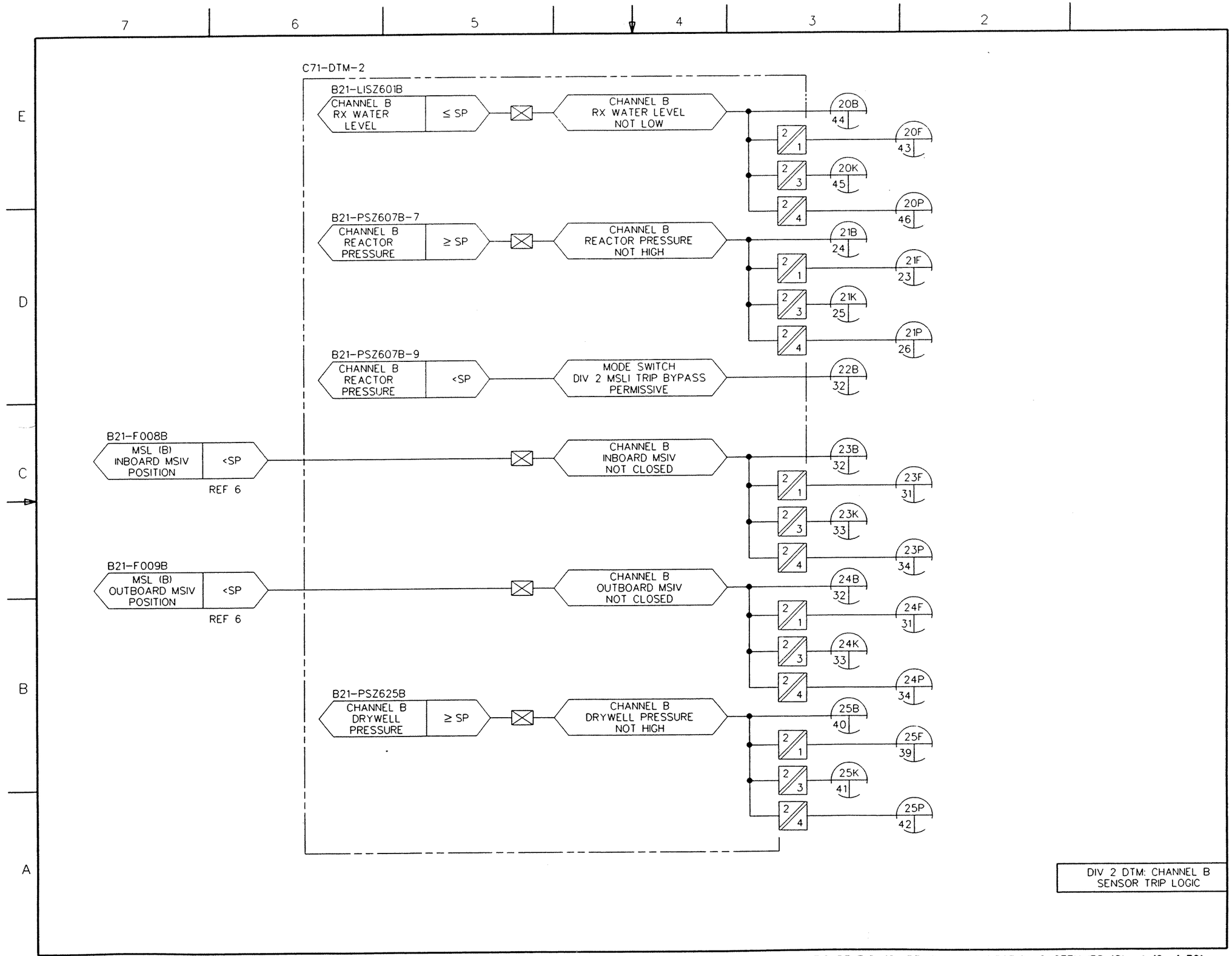


FIGURE 7.2-10 REACTOR PROTECTION SYSTEM IBD (Sheet 16 of 72)

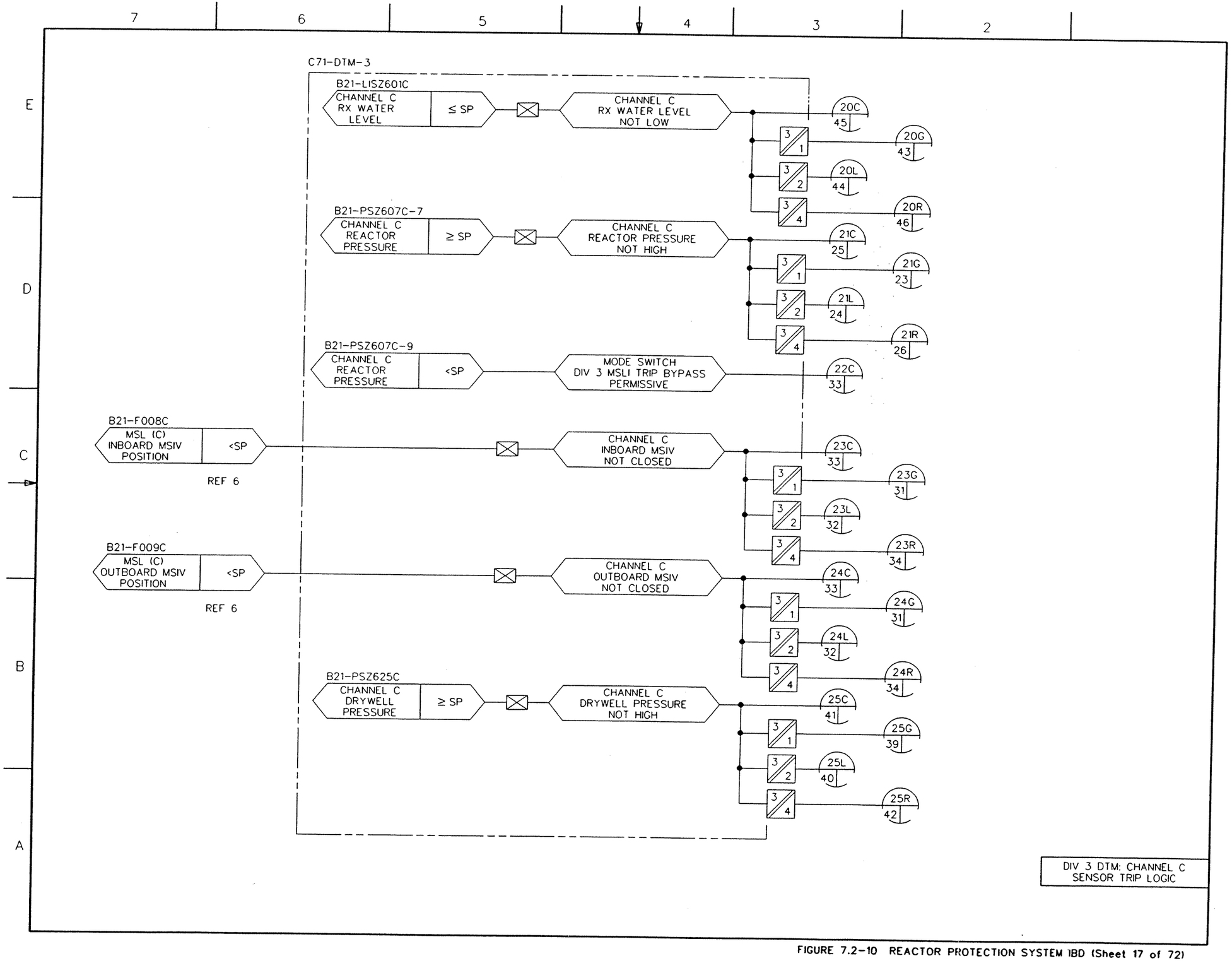


FIGURE 7.2-10 REACTOR PROTECTION SYSTEM IBD (Sheet 17 of 72)

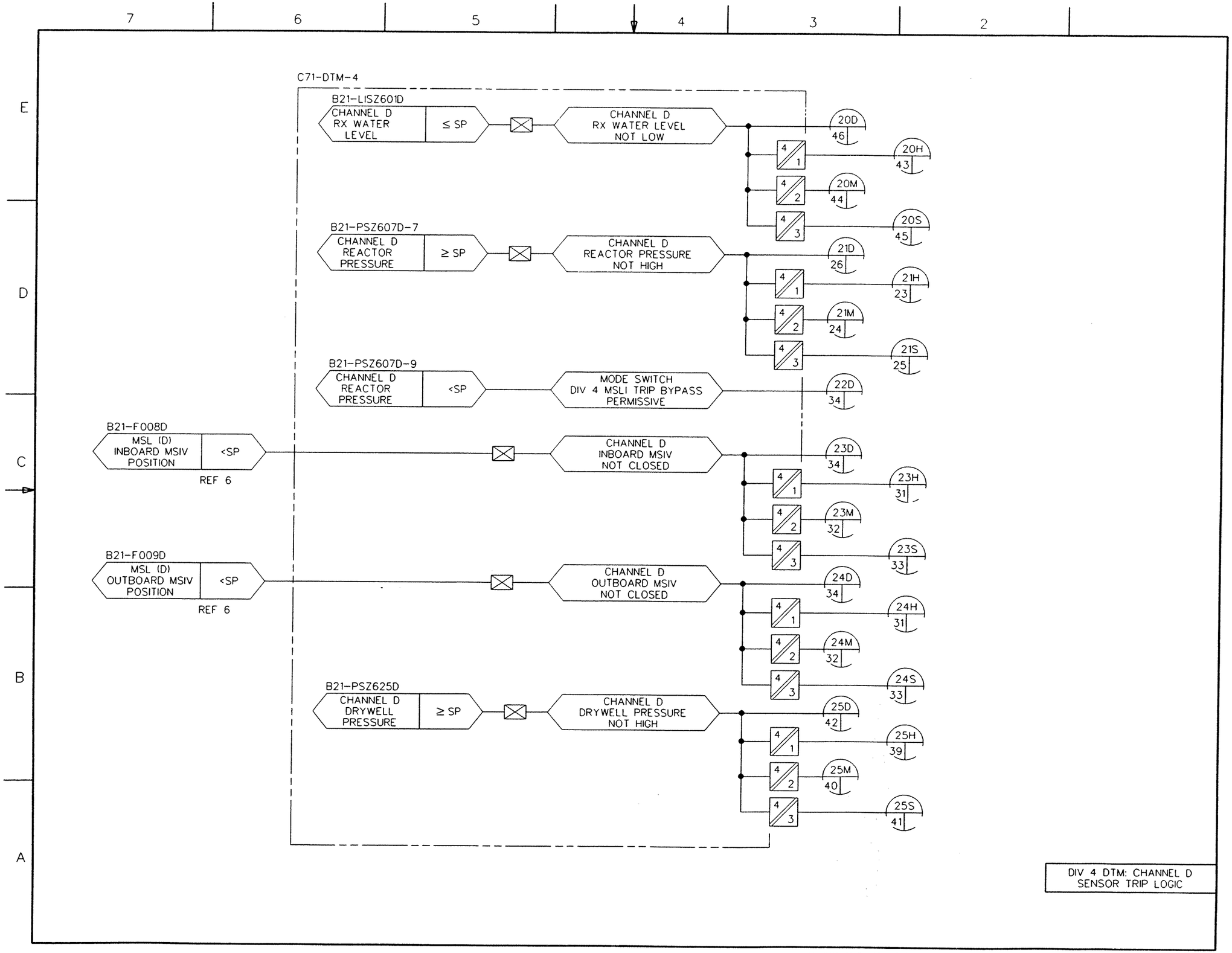


FIGURE 7.2-10 REACTOR PROTECTION SYSTEM IBD (Sheet 18 of 72)

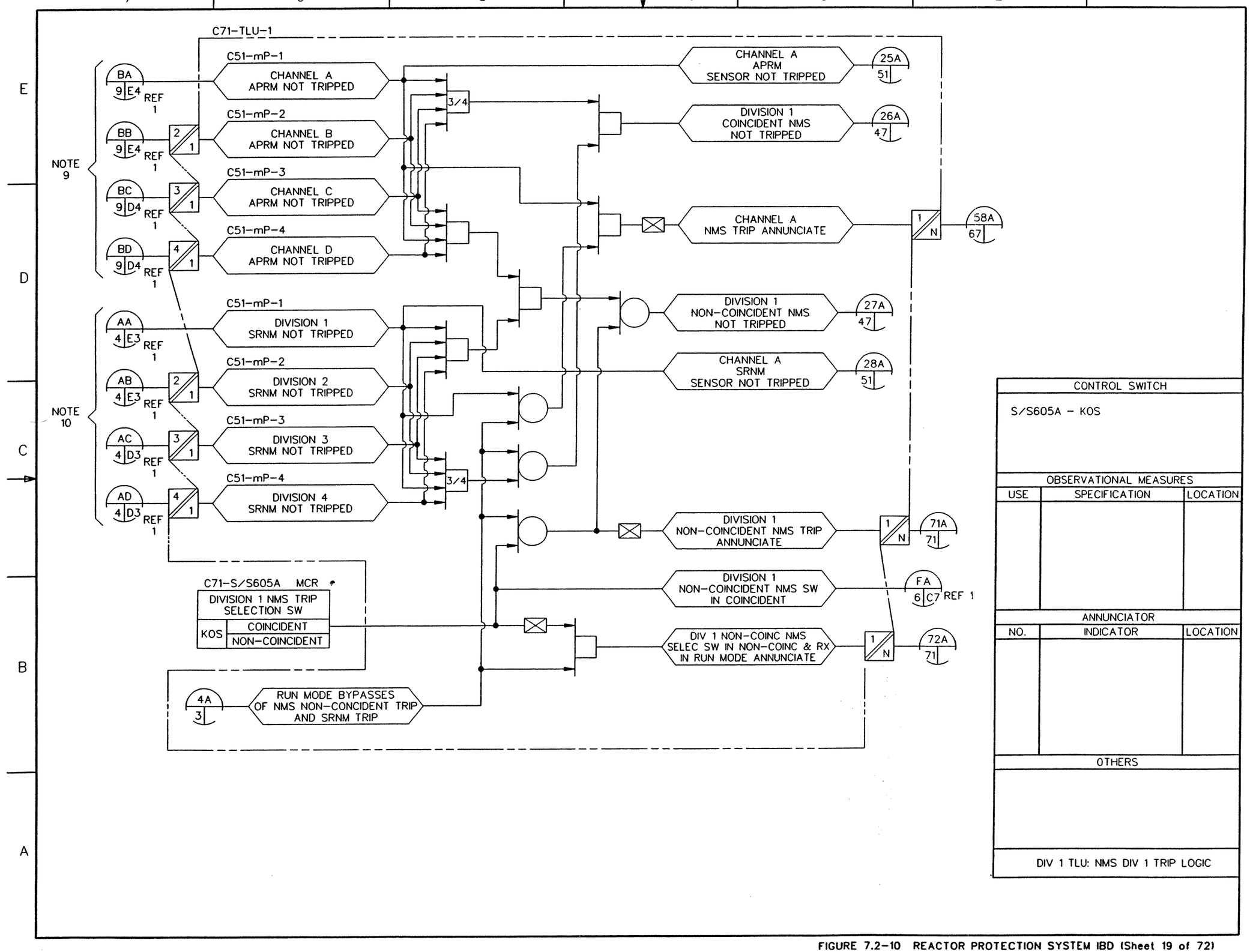


FIGURE 7.2–10 REACTOR PROTECTION SYSTEM IBD (Sheet 19 of 72)

C71-TLU-2

NOTE 9

BF 9 D4 REF 1
BE 9 D4 REF 1
BG 9 D4 REF 1
BH 9 C4 REF 1

C51-mP-2 CHANNEL B APRM NOT TRIPPED
C51-mP-1 CHANNEL A APRM NOT TRIPPED
C51-mP-3 CHANNEL C APRM NOT TRIPPED
C51-mP-4 CHANNEL D APRM NOT TRIPPED

1/2 2/2 3/2 4/2

3/4

CHANNEL B APRM SENSOR NOT TRIPPED → 25B 52
DIVISION 2 COINCIDENT NMS NOT TRIPPED → 26B 48
CHANNEL B NMS TRIP ANNUNCIATE → 2/N → 58B 67
DIVISION 2 NON-COINCIDENT NMS NOT TRIPPED → 27B 48
CHANNEL B SRNM SENSOR NOT TRIPPED → 28B 52

NOTE 10

AF 4 D3 REF 1
AE 4 D3 REF 1
AG 4 D3 REF 1
AH 4 C3 REF 1

C51-mP-2 DIVISION 2 SRNM NOT TRIPPED
C51-mP-1 DIVISION 1 SRNM NOT TRIPPED
C51-mP-3 DIVISION 3 SRNM NOT TRIPPED
C51-mP-4 DIVISION 4 SRNM NOT TRIPPED

1/2 2/2 3/2 4/2

3/4

DIVISION 2 NON-COINCIDENT NMS TRIP ANNUNCIATE → 2/N → 71B 71
DIVISION 2 NON-COINCIDENT NMS SW IN COINCIDENT → FB 6 C7 REF 1
DIV 2 NON-COINC NMS SELEC SW IN NON-COINC & RX IN RUN MODE ANNUNCIATE → 2/N → 72B 71

C71-S/S605B MCR
DIVISION 2 NMS TRIP SELECTION SW
KOS: COINCIDENT / NON-COINCIDENT

4B 4 RUN MODE BYPASSES OF NMS NON-CONCIDENT TRIP AND SRNM TRIP

CONTROL SWITCH
S/S605B – KOS

OBSERVATIONAL MEASURES		
USE	SPECIFICATION	LOCATION

ANNUNCIATOR		
NO.	INDICATOR	LOCATION

OTHERS

DIV 2 TLU: NMS DIV 2 TRIP LOGIC

FIGURE 7.2-10 REACTOR PROTECTION SYSTEM IBD (Sheet 20 of 72)

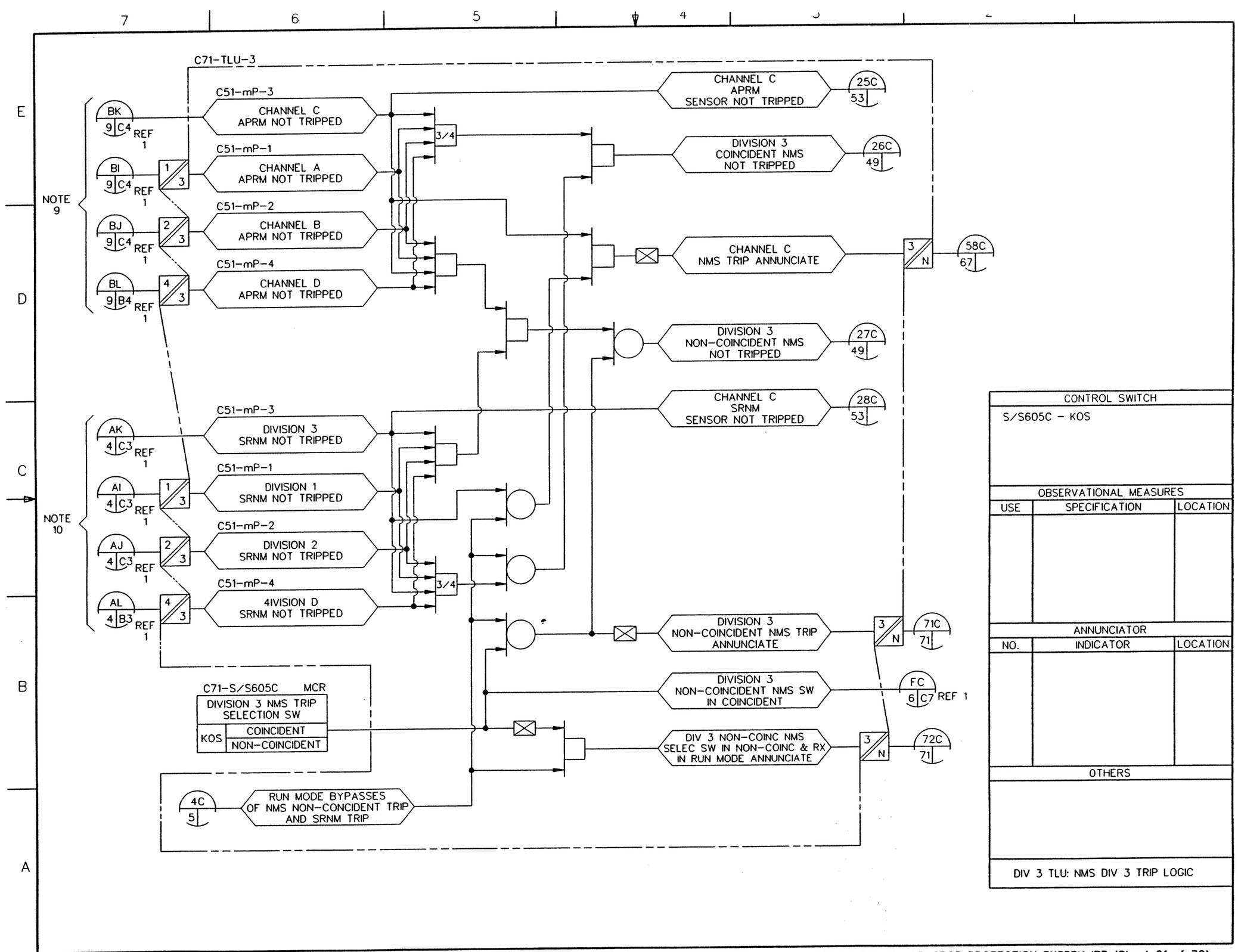


FIGURE 7.2-10 REACTOR PROTECTION SYSTEM IBD (Sheet 21 of 72)

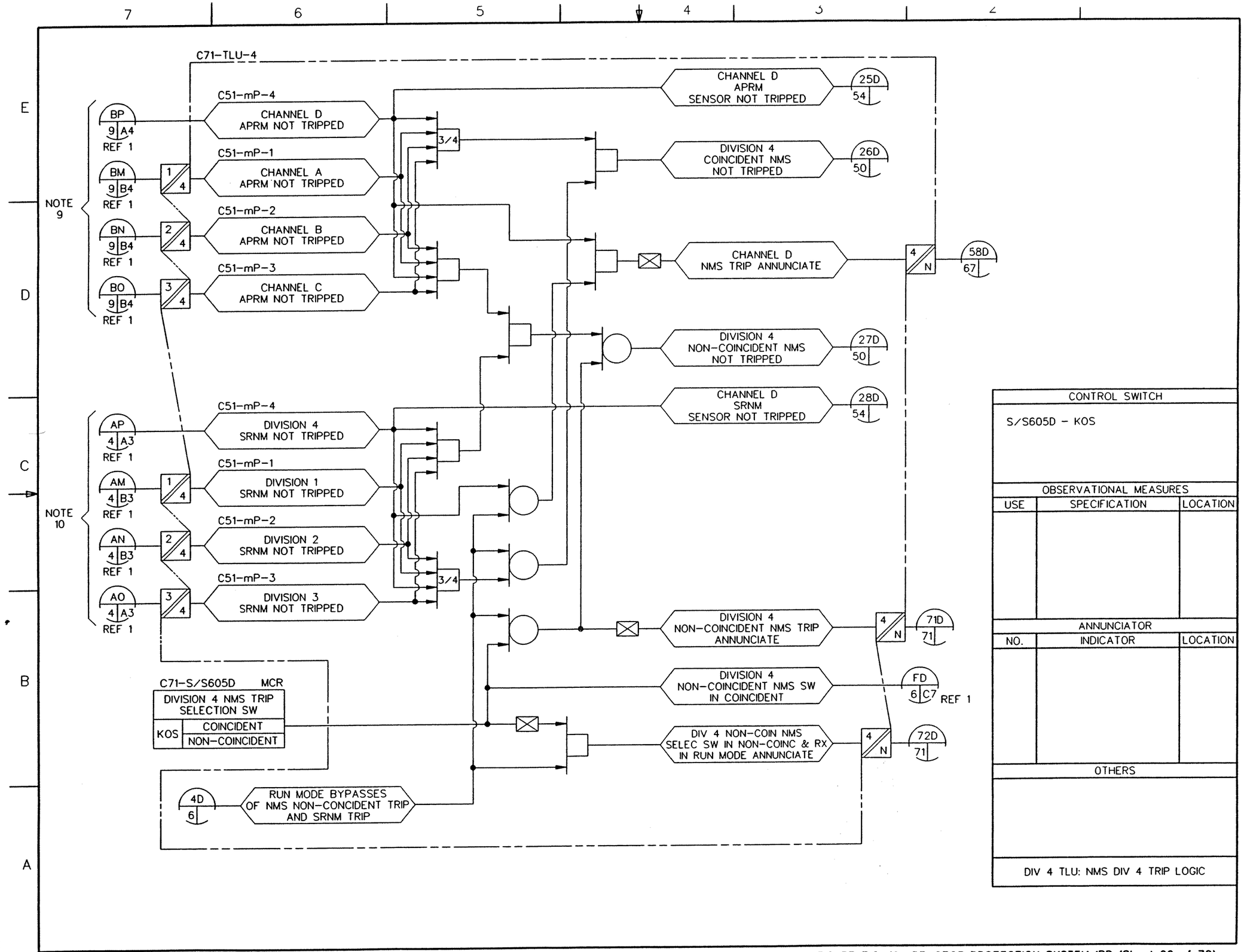


FIGURE 7.2-10 REACTOR PROTECTION SYSTEM IBD (Sheet 22 of 72)

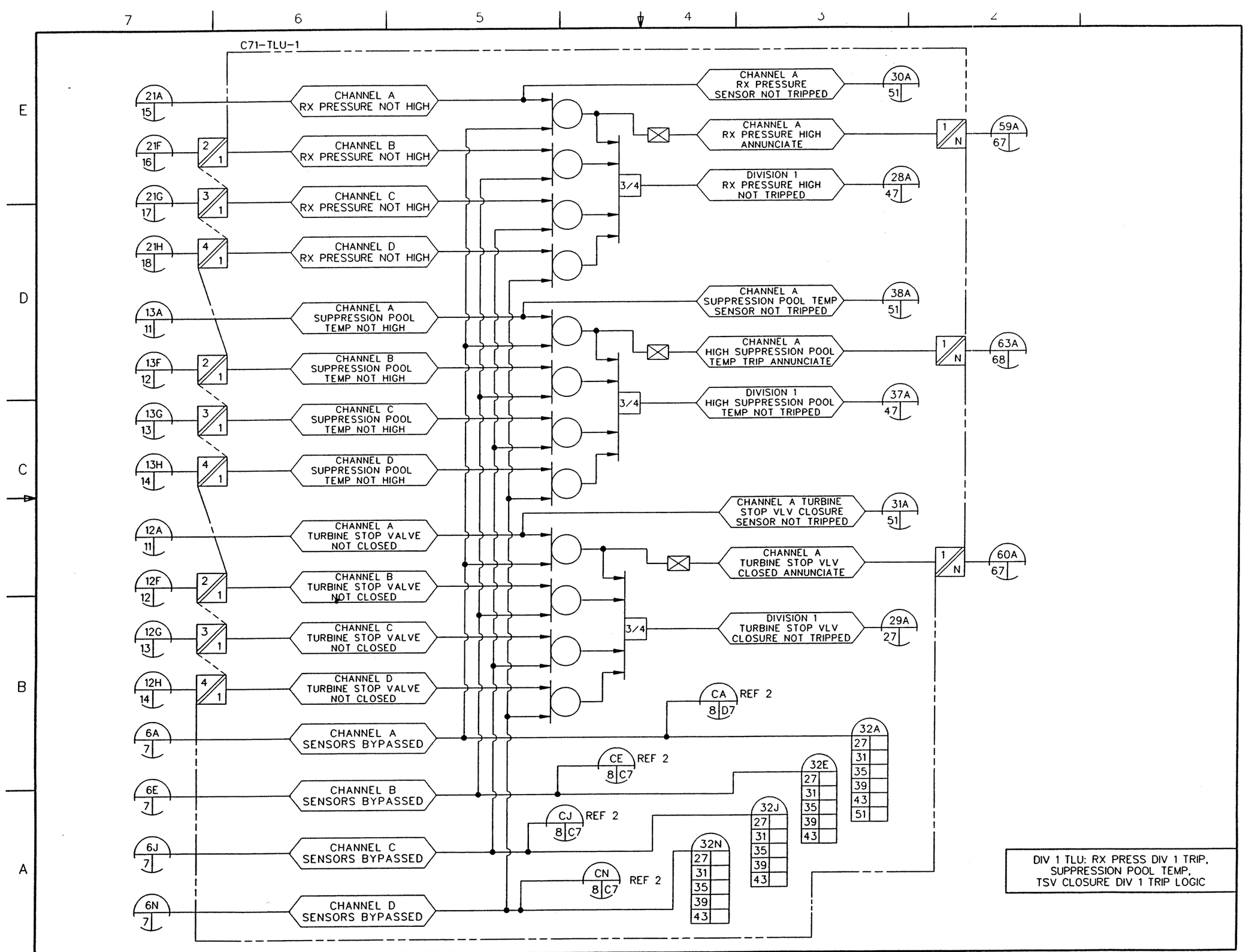


FIGURE 7.2-10 REACTOR PROTECTION SYSTEM IBD (Sheet 23 of 72)

C71-TLU-2

21B 16 — CHANNEL B RX PRESSURE NOT HIGH
21E 15 — 1/2 — CHANNEL A RX PRESSURE NOT HIGH
21L 17 — 3/2 — CHANNEL C RX PRESSURE NOT HIGH
21M 18 — 4/2 — CHANNEL D RX PRESSURE NOT HIGH

13B 11 — CHANNEL B SUPPRESSION POOL TEMP NOT HIGH
13E 12 — 1/2 — CHANNEL A SUPPRESSION POOL TEMP NOT HIGH
13L 13 — 3/2 — CHANNEL C SUPPRESSION POOL TEMP NOT HIGH
13M 14 — 4/2 — CHANNEL D SUPPRESSION POOL TEMP NOT HIGH

12B 12 — CHANNEL B TURBINE STOP VALVE NOT CLOSED
12E 11 — 1/2 — CHANNEL A TURBINE STOP VALVE NOT CLOSED
12L 13 — 3/2 — CHANNEL C TURBINE STOP VALVE NOT CLOSED
12M 14 — 4/2 — CHANNEL D TURBINE STOP VALVE NOT CLOSED

6B 8 — CHANNEL B SENSORS BYPASSED
6F 8 — CHANNEL A SENSORS BYPASSED
6K 8 — CHANNEL C SENSORS BYPASSED
6P 8 — CHANNEL D SENSORS BYPASSED

3/4 — CHANNEL B RX PRESSURE SENSOR NOT TRIPPED — 30B 52
CHANNEL B RX PRESSURE HIGH ANNUNCIATE — 2/N — 59B 67
3/4 — DIVISION 2 RX PRESSURE HIGH NOT TRIPPED — 28B 48

3/4 — CHANNEL B SUPPRESSION POOL TEMP SENSOR NOT TRIPPED — 38B 52
CHANNEL B HIGH SUPPRESSION POOL TEMP TRIP ANNUNCIATE — 2/N — 63B 68
3/4 — DIVISION 2 HIGH SUPPRESSION POOL TEMP NOT TRIPPED — 37B 48

CHANNEL B TURBINE STOP VLV CLOSURE SENSOR NOT TRIPPED — 31B 52
CHANNEL B TURBINE STOP VLV CLOSED ANNUNCIATE — 2/N — 60B 67
3/4 — DIVISION 2 TURBINE STOP VLV CLOSURE NOT TRIPPED — 29B 28

CB 12 D7 REF 2
CF 12 C7 REF 2
CK 12 C7 REF 2
CP 12 C7 REF 2

32B: 28 32 36 40 44 52
32F: 28 32 36 40 44
32K: 28 32 36 40 44
32P: 28 32 36 40 44

DIV 2 TLU: RX PRESS DIV 2 TRIP, SUPPRESSION POOL TEMP, TSV CLOSURE DIV 2 TRIP LOGIC

FIGURE 7.2-10 REACTOR PROTECTION SYSTEM IBD (Sheet 24 of 72)

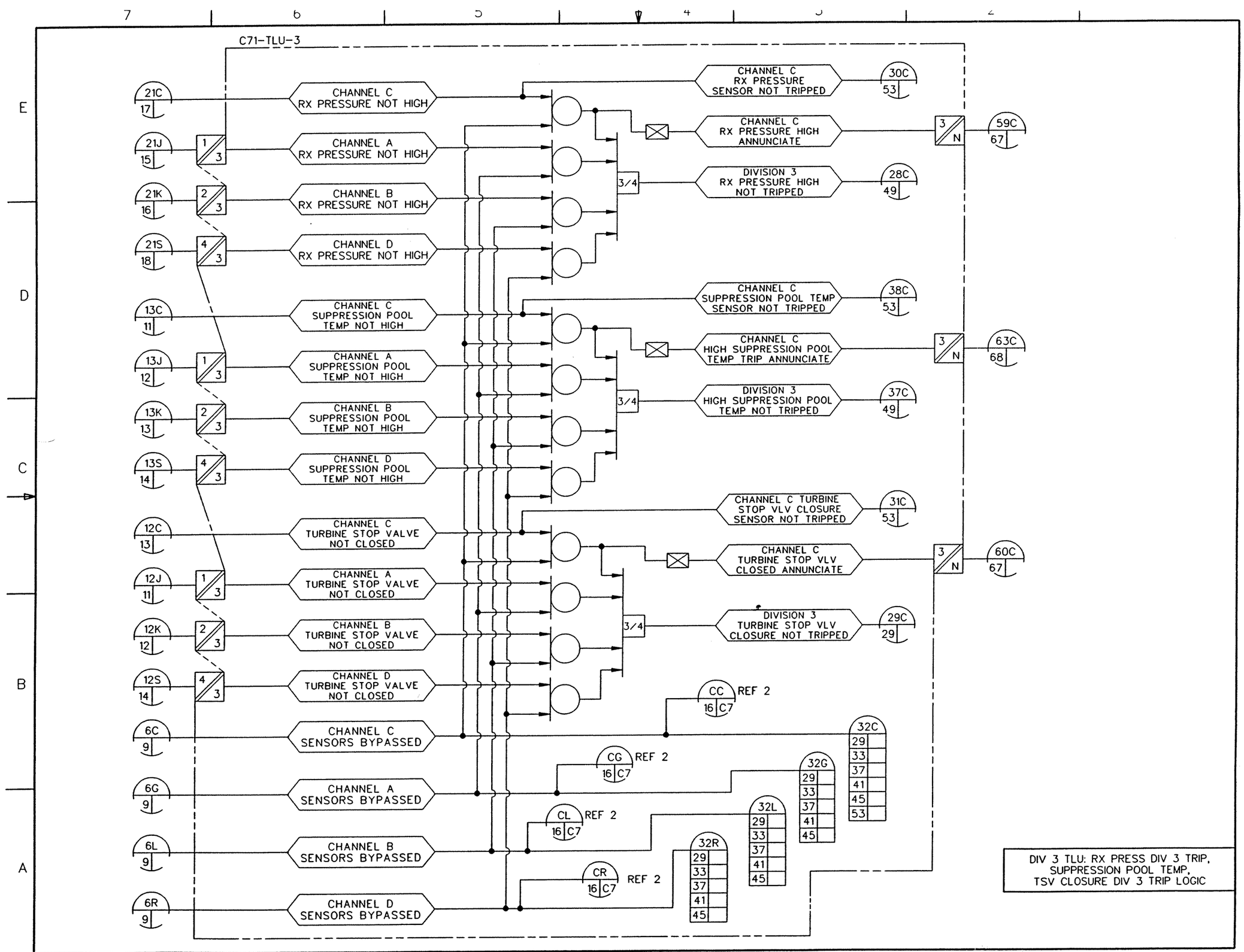


FIGURE 7.2-10 REACTOR PROTECTION SYSTEM IBD (Sheet 25 of 72)

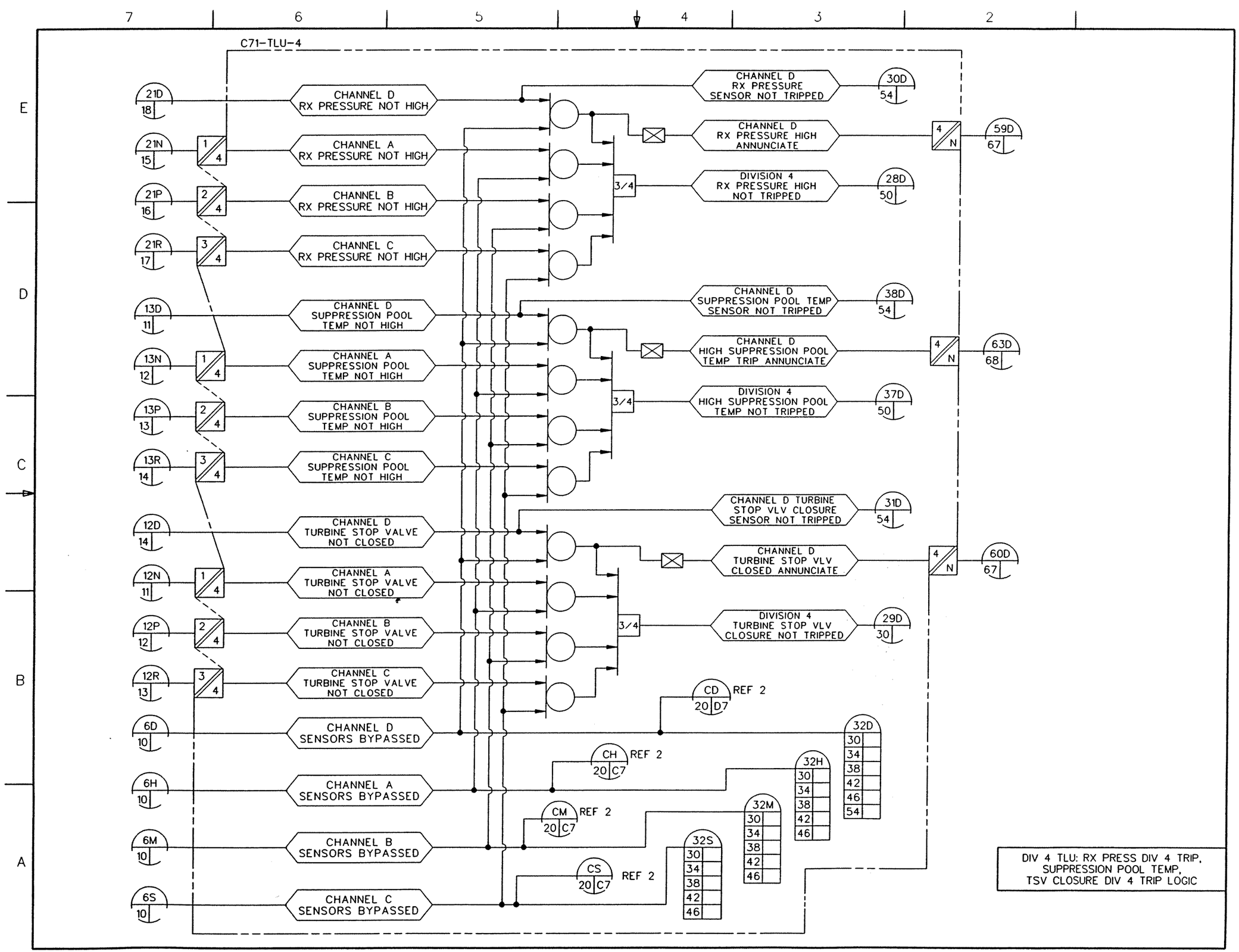


FIGURE 7.2-10 REACTOR PROTECTION SYSTEM IBD (Sheet 26 of 72)

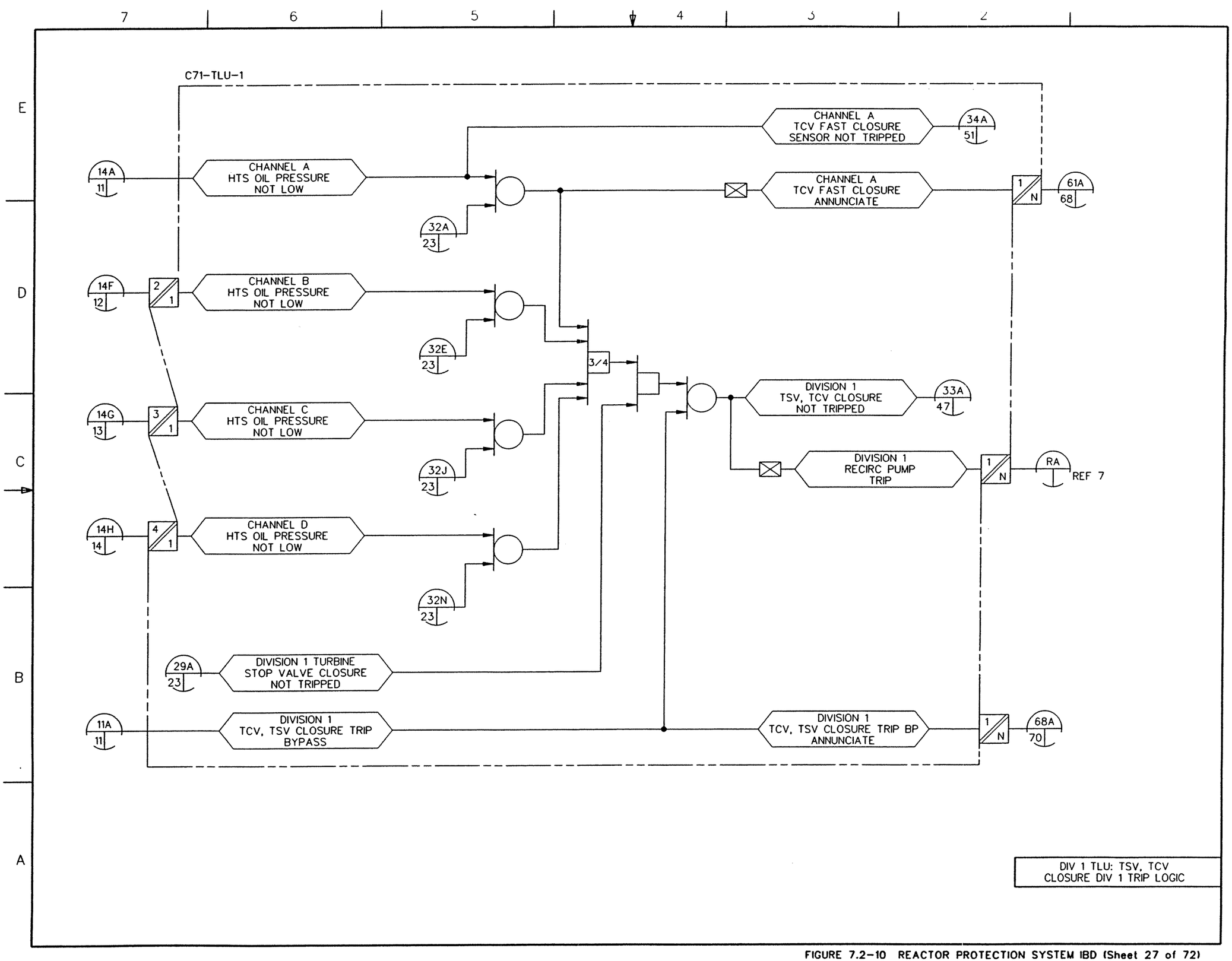


FIGURE 7.2-10 REACTOR PROTECTION SYSTEM IBD (Sheet 27 of 72)

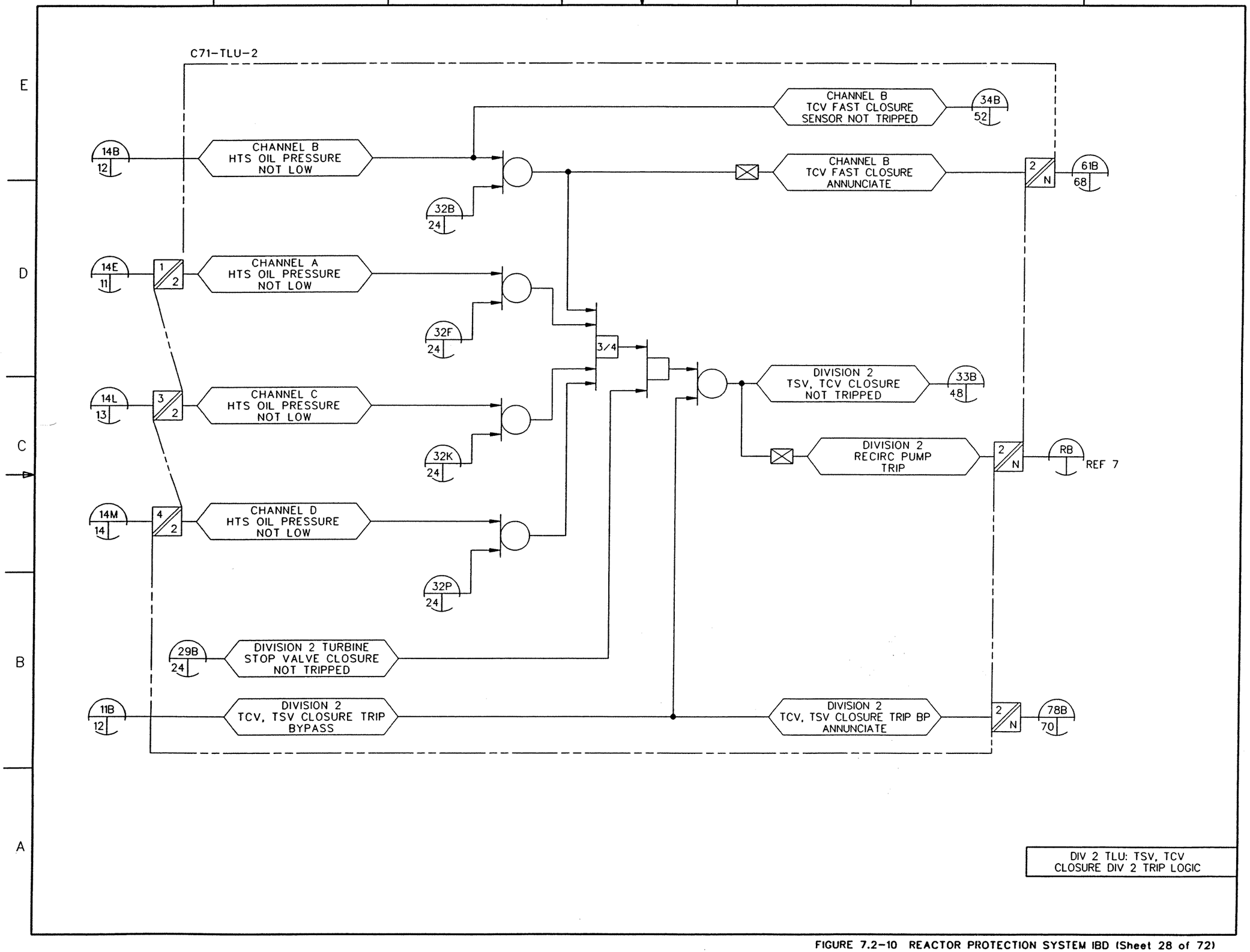


FIGURE 7.2-10 REACTOR PROTECTION SYSTEM IBD (Sheet 28 of 72)

C71-TLU-3

CHANNEL C HTS OIL PRESSURE NOT LOW

14C 13

CHANNEL A HTS OIL PRESSURE NOT LOW

14J 11

1/3

CHANNEL B HTS OIL PRESSURE NOT LOW

14K 12

2/3

CHANNEL D HTS OIL PRESSURE NOT LOW

14S 14

4/3

32C 25

32G 25

32L 25

32R 25

CHANNEL C TCV FAST CLOSURE SERSOR NOT TRIPPED

34C 53

CHANNEL C TCV FAST CLOSURE ANNUNCIATE

3/N

61C 68

3/4

DIVISION 3 TSV, TCV CLOSURE NOT TRIPPED

33C 49

DIVISION 3 RECIRC PUMP TRIP

3/N

RC

REF 7

29C 25

DIVISION 3 TURBINE STOP VALVE CLOSURE NOT TRIPPED

11C 13

DIVISION 3 TCV, TSV CLOSURE TRIP BYPASS

DIVISION 3 TCV, TSV CLOSURE TRIP BP ANNUNCIATE

3/N

68C 70

DIV 3 TLU: TSV, TCV CLOSURE DIV 3 TRIP LOGIC

FIGURE 7.2-10 REACTOR PROTECTION SYSTEM IBD (Sheet 29 of 72)

C71-TLU-4

CHANNEL D TURB CONTROL VLV NOT FAST CLOSED

CHANNEL D TCV FAST CLOSURE SENSOR NOT TRIPPED

34D 54

14D 14

CHANNEL D HTS OIL PRESSURE NOT LOW

32D 26

CHANNEL D TCV FAST CLOSURE ANNUNCIATE

4/N

61D 68

14N 11

1/4

CHANNEL A HTS OIL PRESSURE NOT LOW

32H 26

3/4

14P 12

2/4

CHANNEL B HTS OIL PRESSURE NOT LOW

32M 26

DIVISION 4 TSV, TCV CLOSURE NOT TRIPPED

33D 50

DIVISION 4 RECIRC PUMP TRIP

4/N

RD

REF 7

14R 13

3/4

CHANNEL C HTS OIL PRESSURE NOT LOW

32S 26

29D 26

DIVISION 4 TURBINE STOP VALVE CLOSURE NOT TRIPPED

11D 14

DIVISION 4 TCV, TSV CLOSURE TRIP BYPASS

DIVISION 4 TCV, TSV CLOSURE TRIP BP ANNUNCIATE

4/N

68D 70

DIV 4 TLU: TSV, TCV CLOSURE DIV 4 TRIP LOGIC

FIGURE 7.2-10 REACTOR PROTECTION SYSTEM IBD (Sheet 30 of 72)

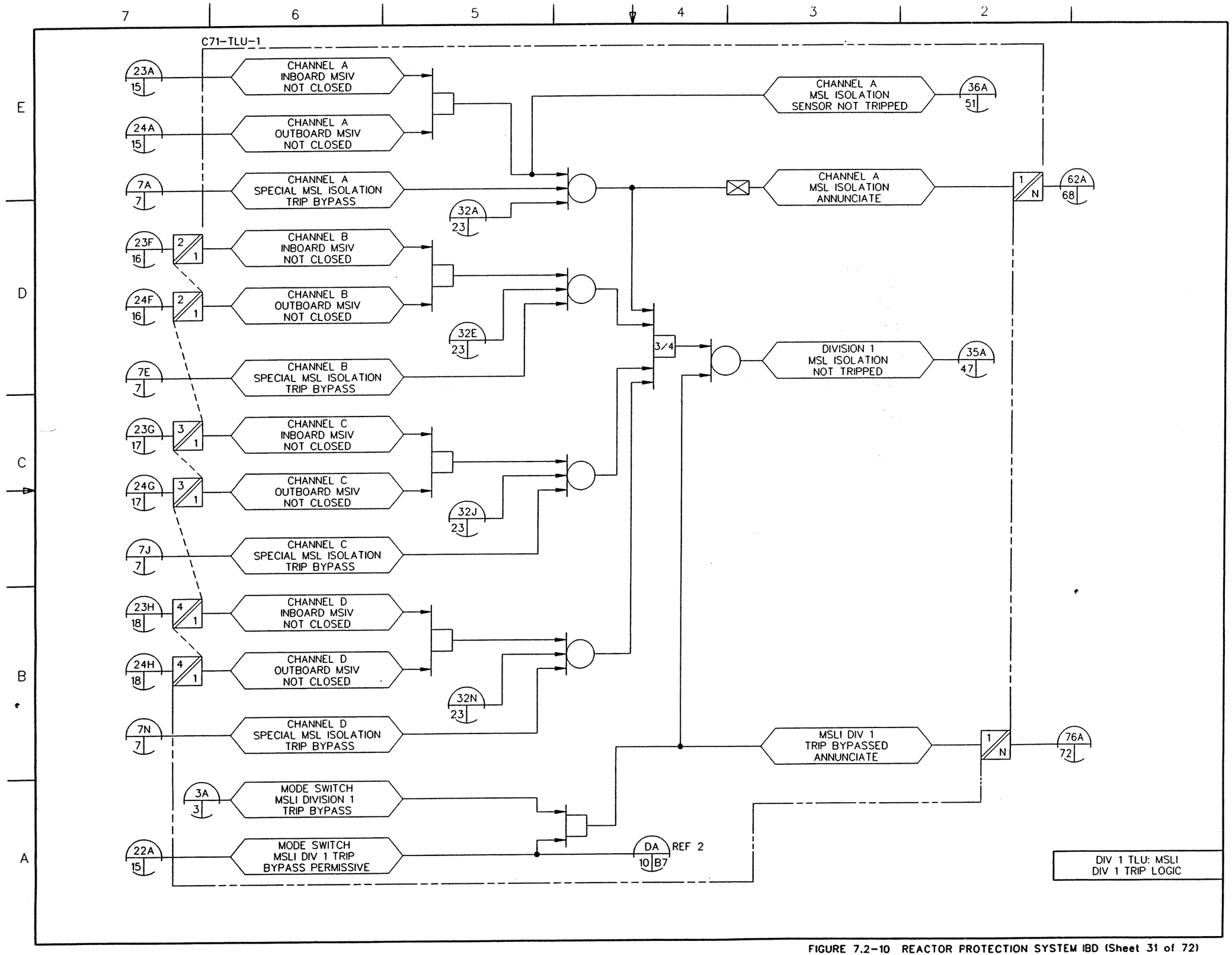


FIGURE 7.2-10 REACTOR PROTECTION SYSTEM IBD (Sheet 31 of 72)

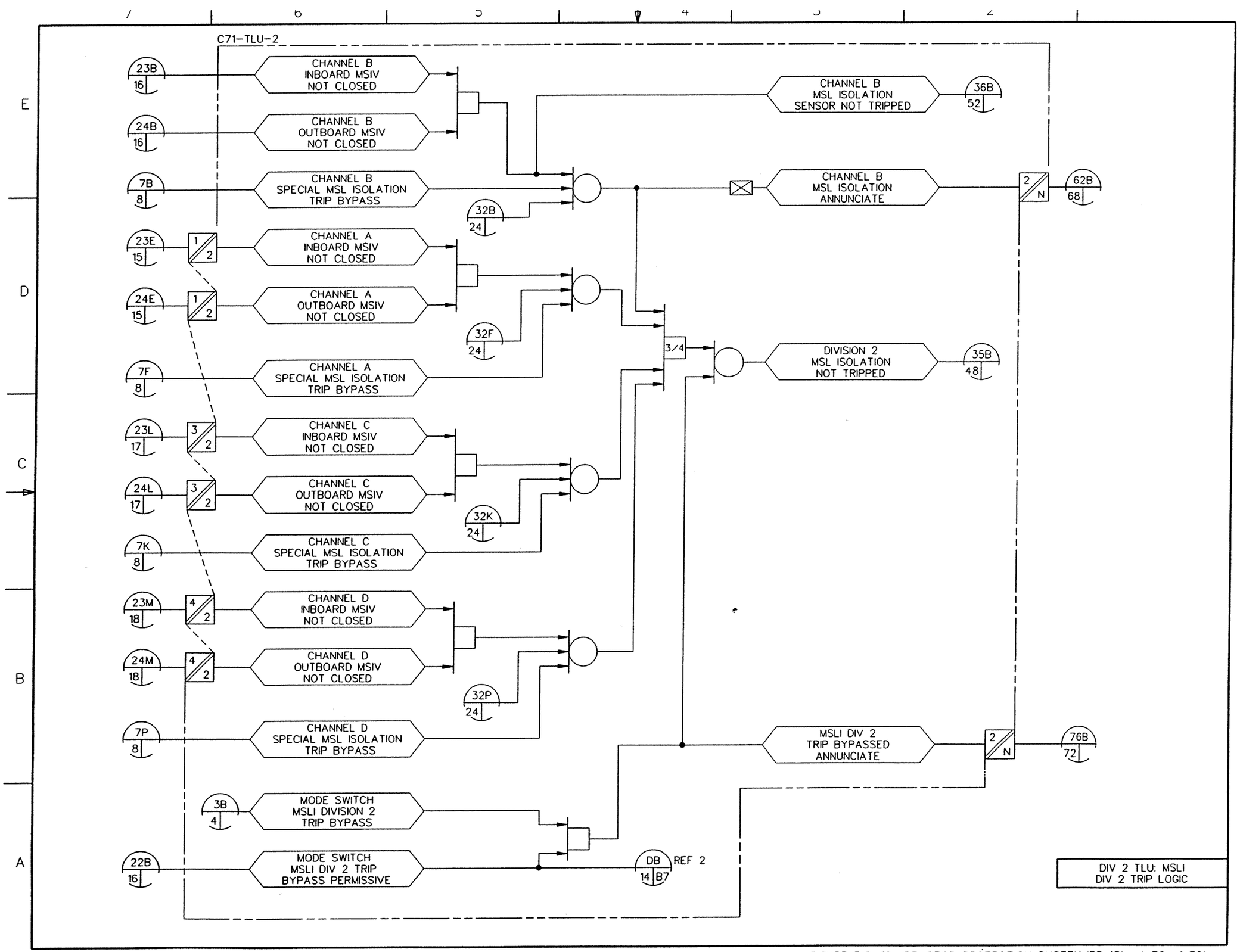


FIGURE 7.2-10 REACTOR PROTECTION SYSTEM IBD (Sheet 32 of 72)

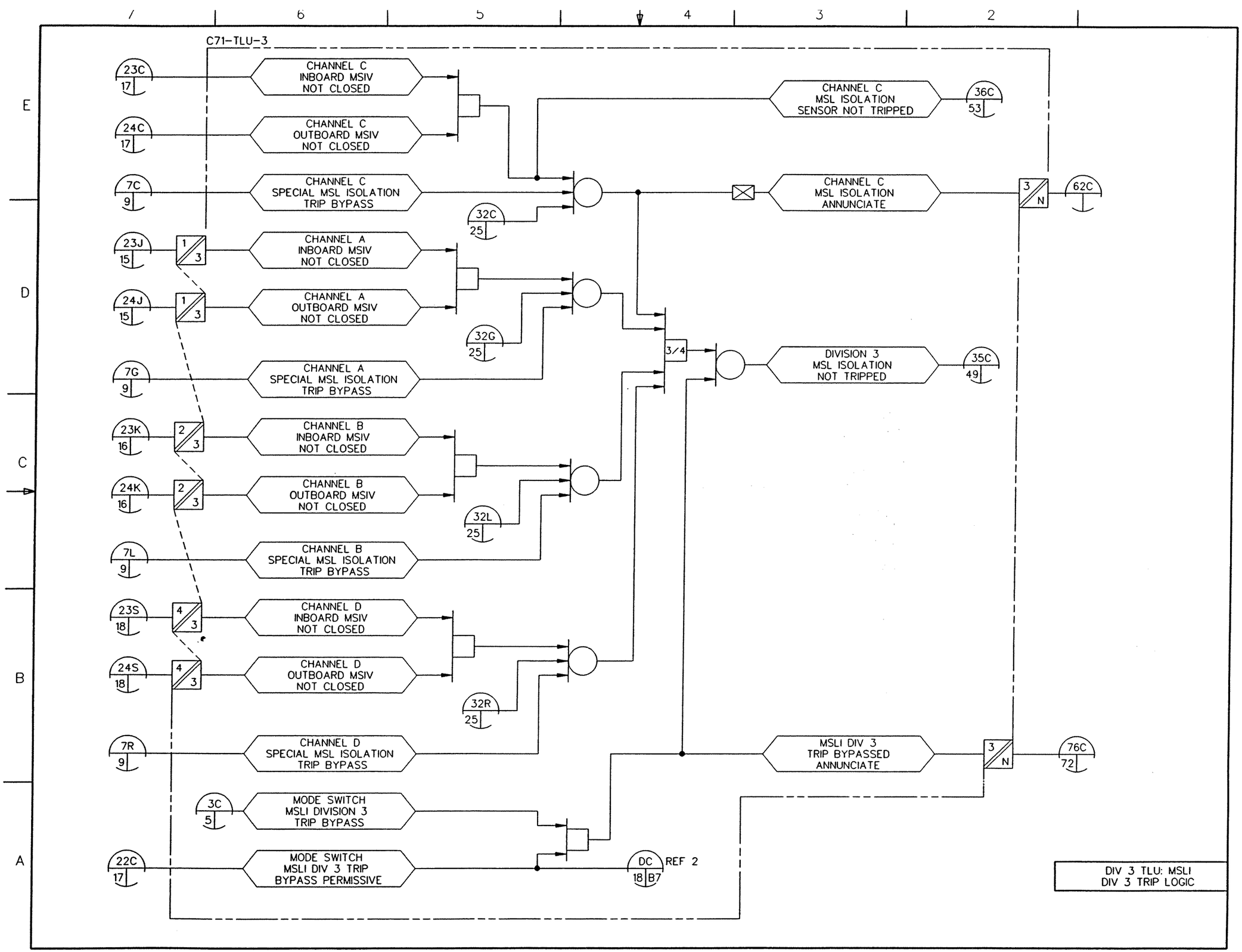


FIGURE 7.2-10 REACTOR PROTECTION SYSTEM IBD (Sheet 33 of 72)

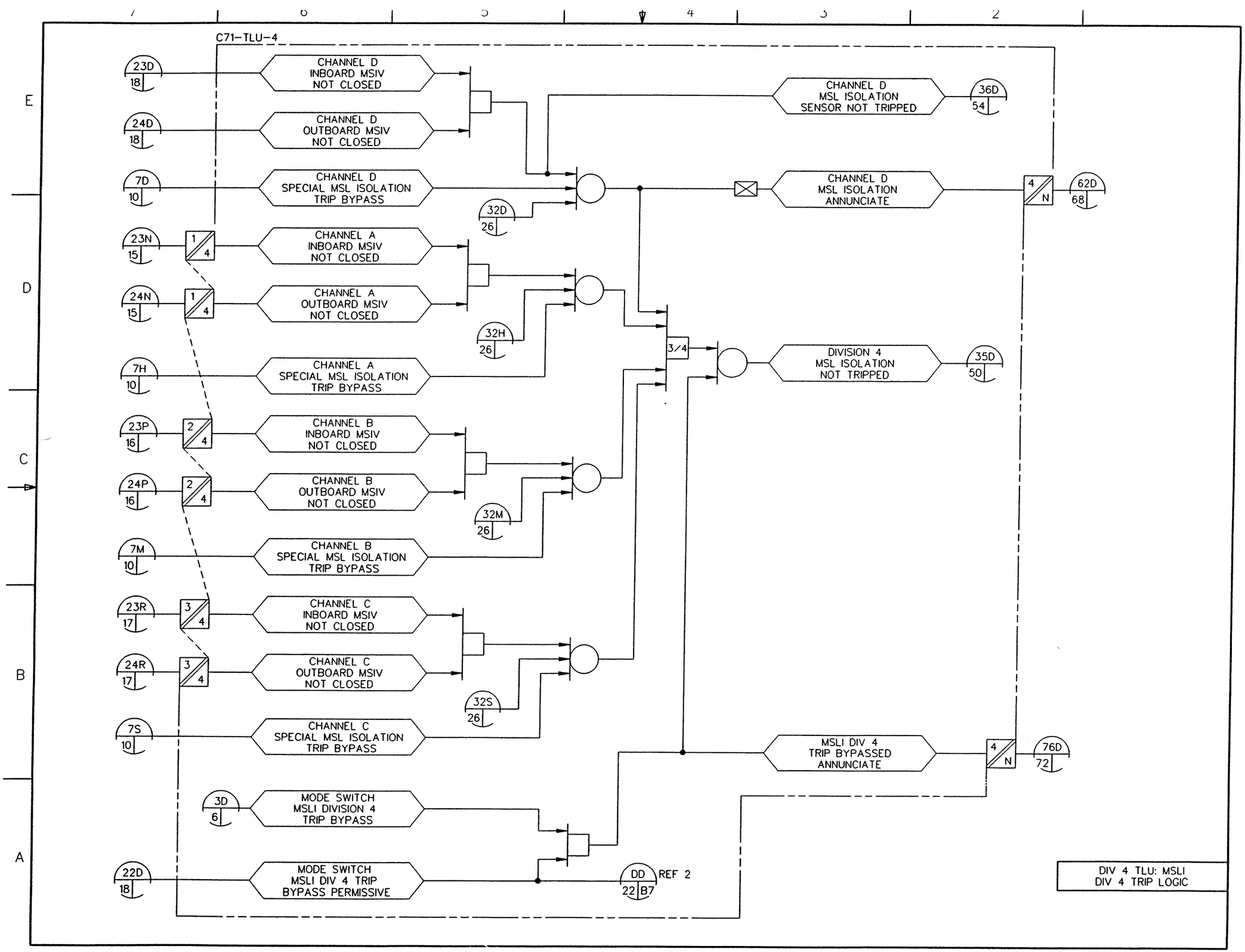


FIGURE 7.2-10 REACTOR PROTECTION SYSTEM IBD (Sheet 34 of 72)

7 6 5 4 3 2

E D C B A

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FIGURE 7.2-10 REACTOR PROTECTION SYSTEM IBD (Sheet 35 of 72)

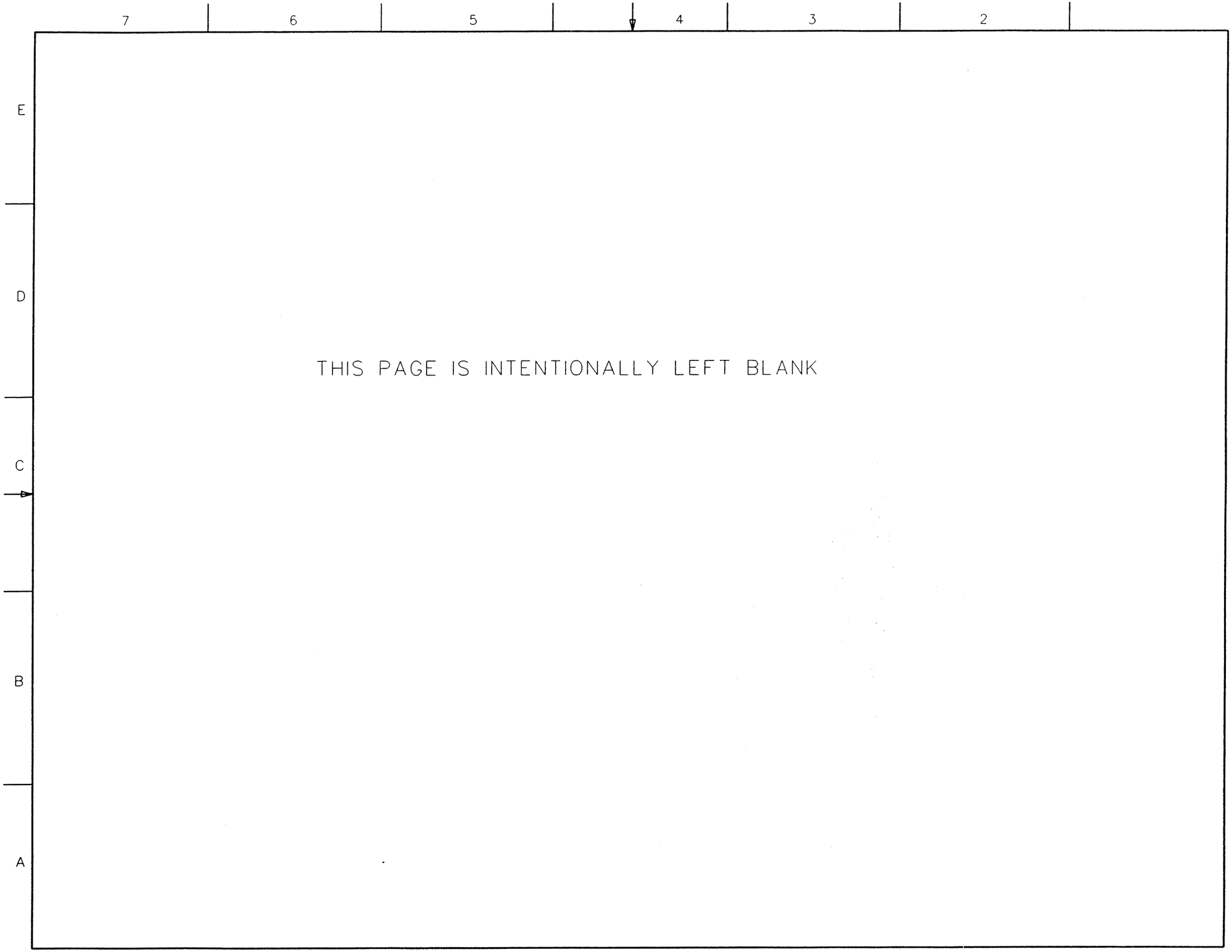

FIGURE 7.2-10 REACTOR PROTECTION SYSTEM IBD (Sheet 36 of 72)

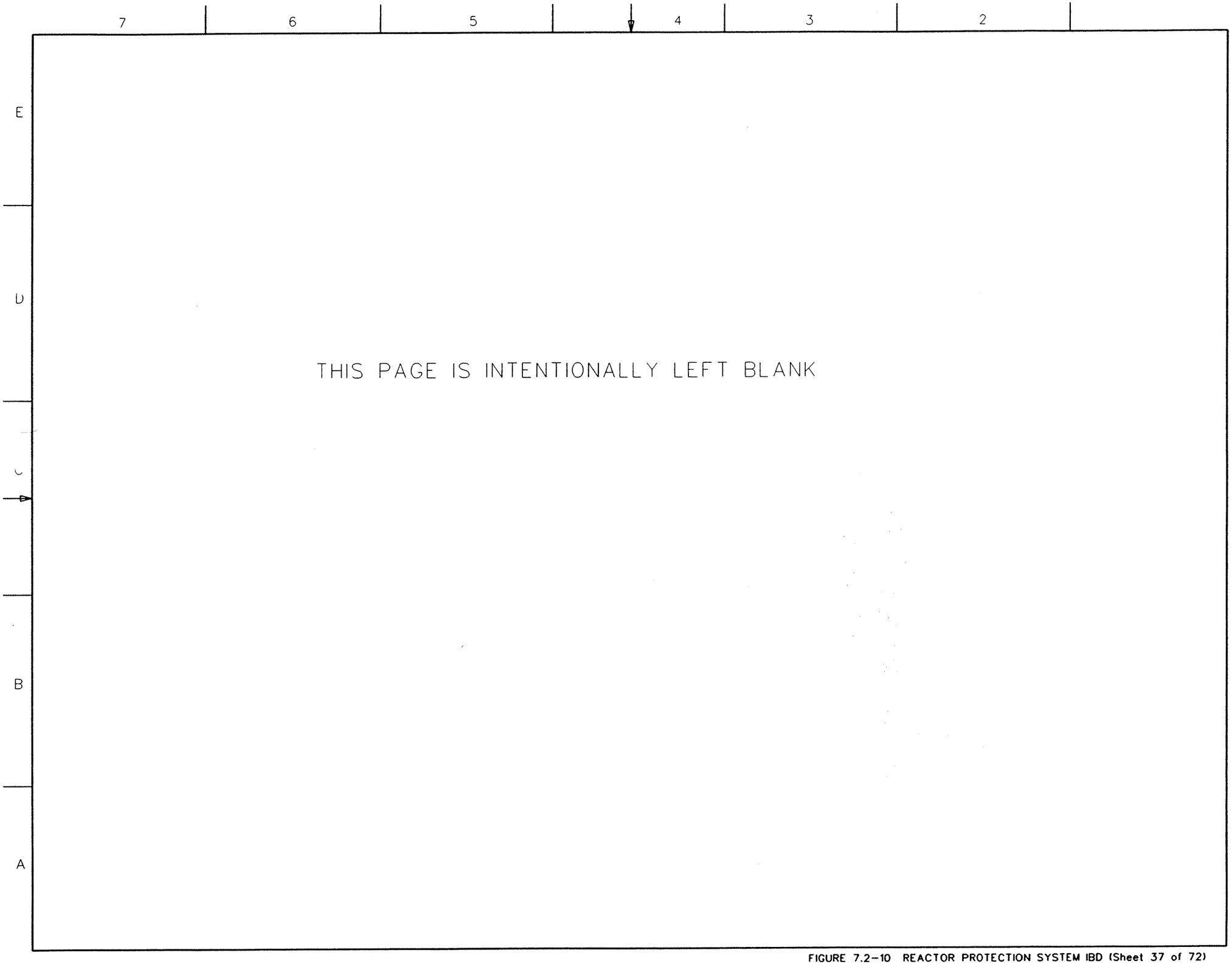

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FIGURE 7.2-10 REACTOR PROTECTION SYSTEM IBD (Sheet 37 of 72)

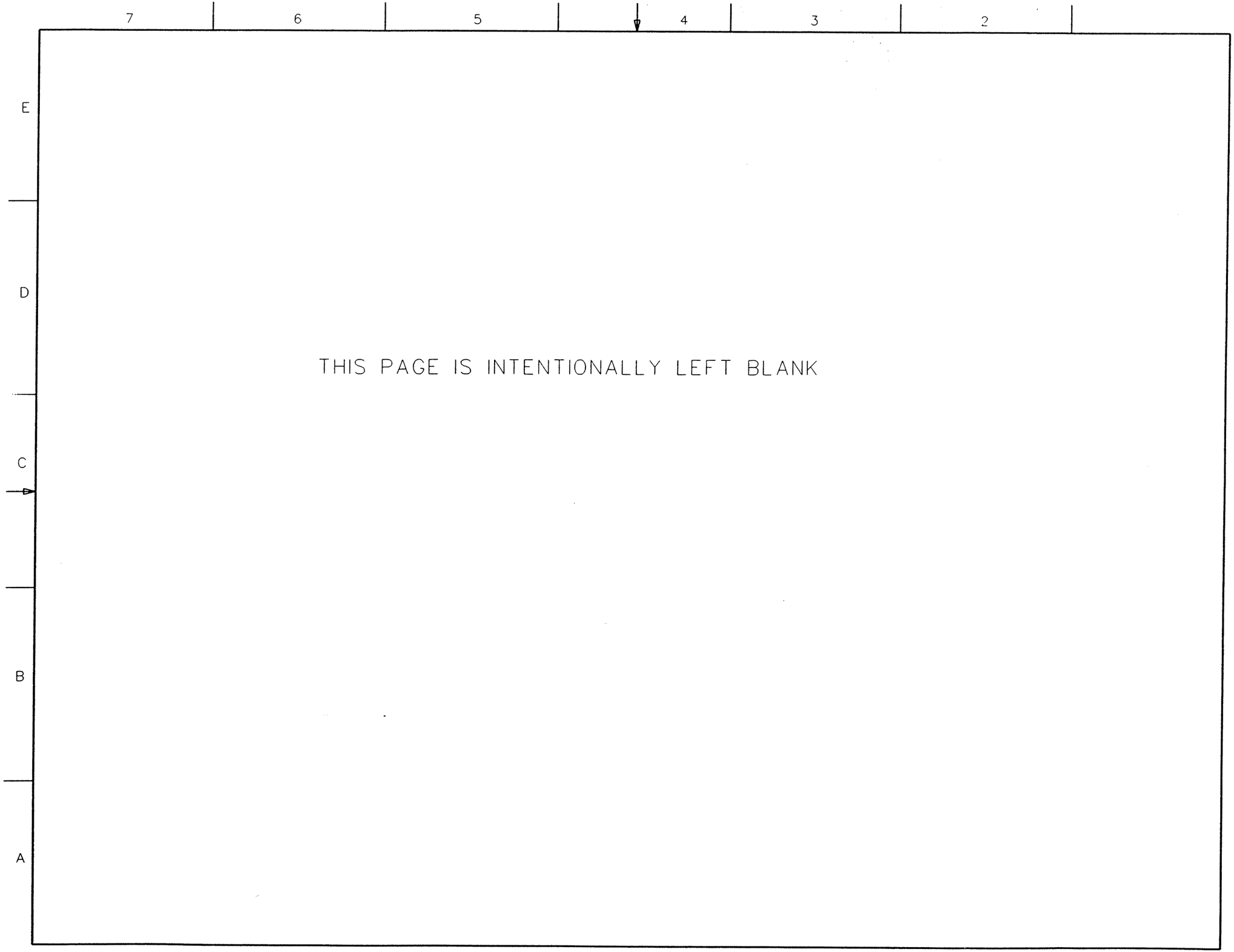


FIGURE 7.2-10 REACTOR PROTECTION SYSTEM IBD (Sheet 38 of 72)

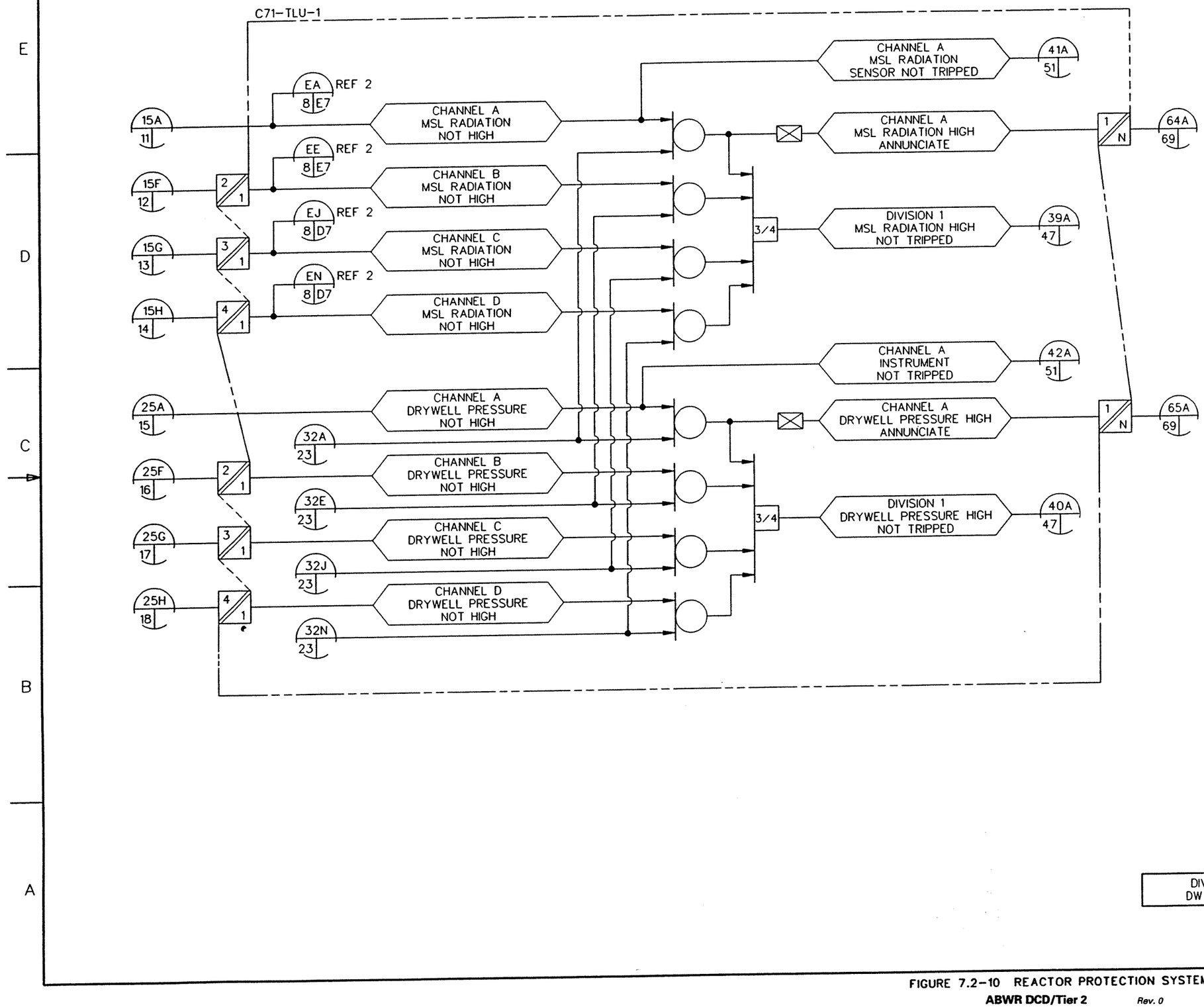


FIGURE 7.2-10 REACTOR PROTECTION SYSTEM IBD (Sheet 39 of 72)

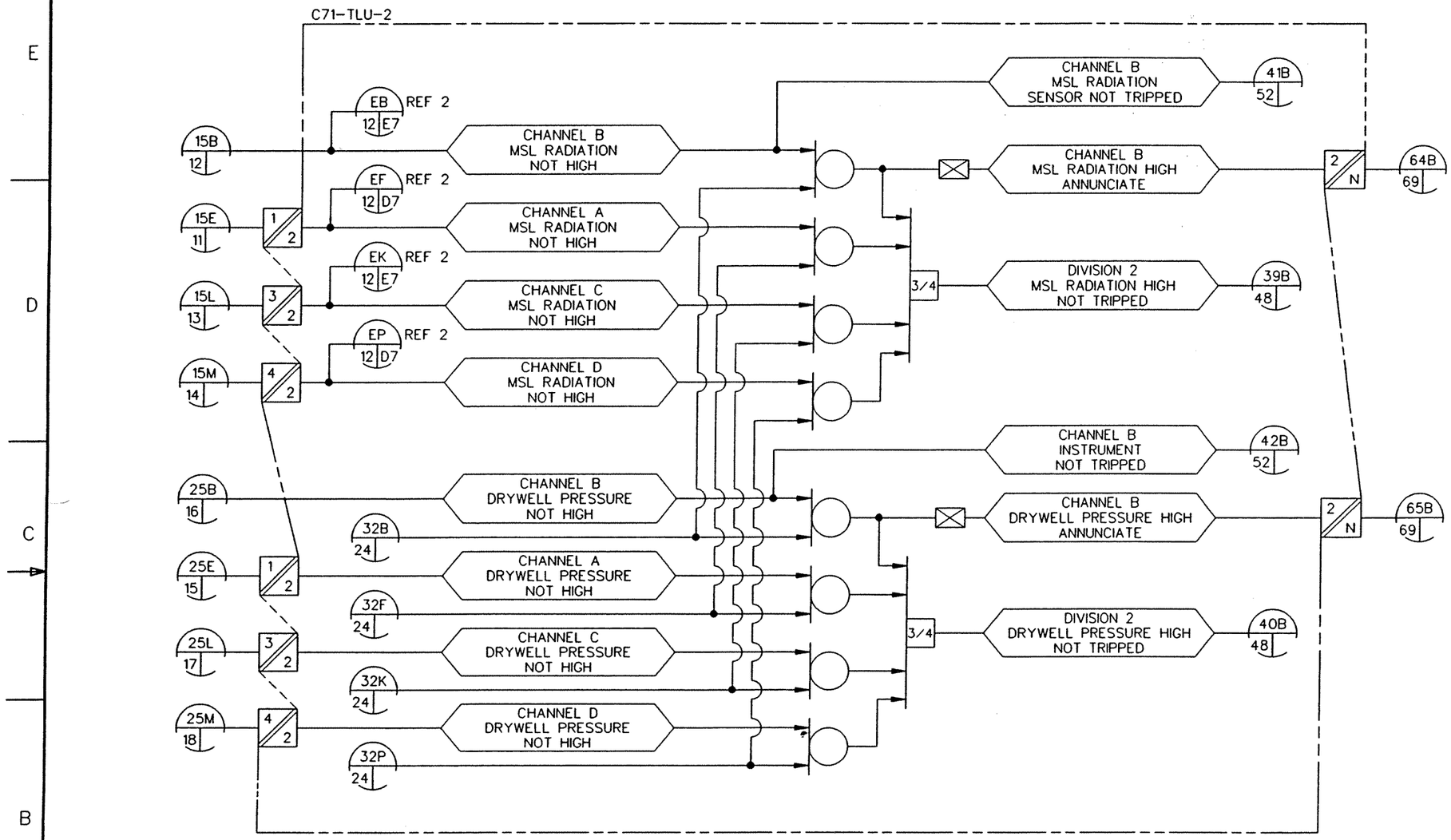


FIGURE 7.2-10 REACTOR PROTECTION SYSTEM IBD (Sheet 40 of 72)

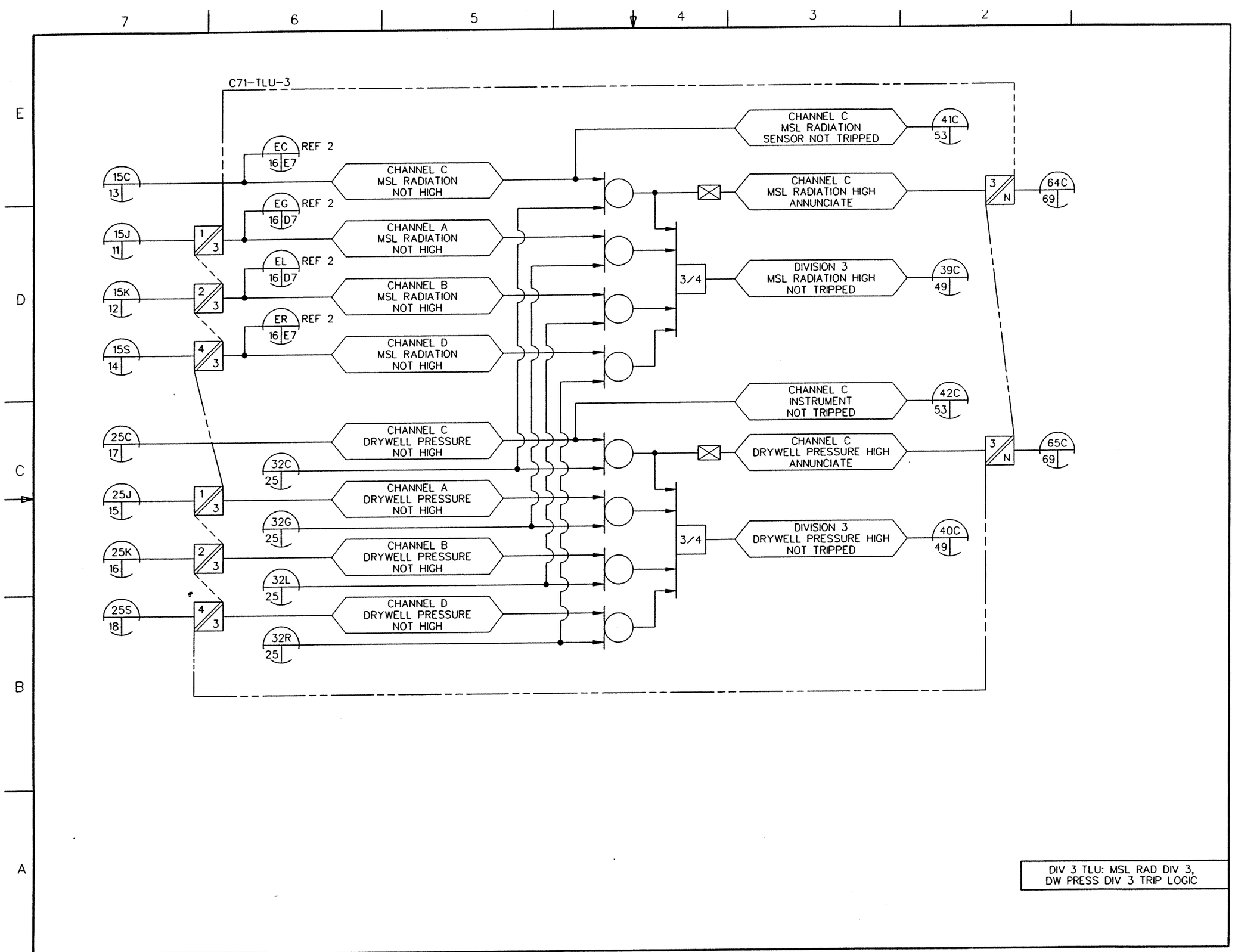


FIGURE 7.2-10 REACTOR PROTECTION SYSTEM IBD (Sheet 41 of 72)

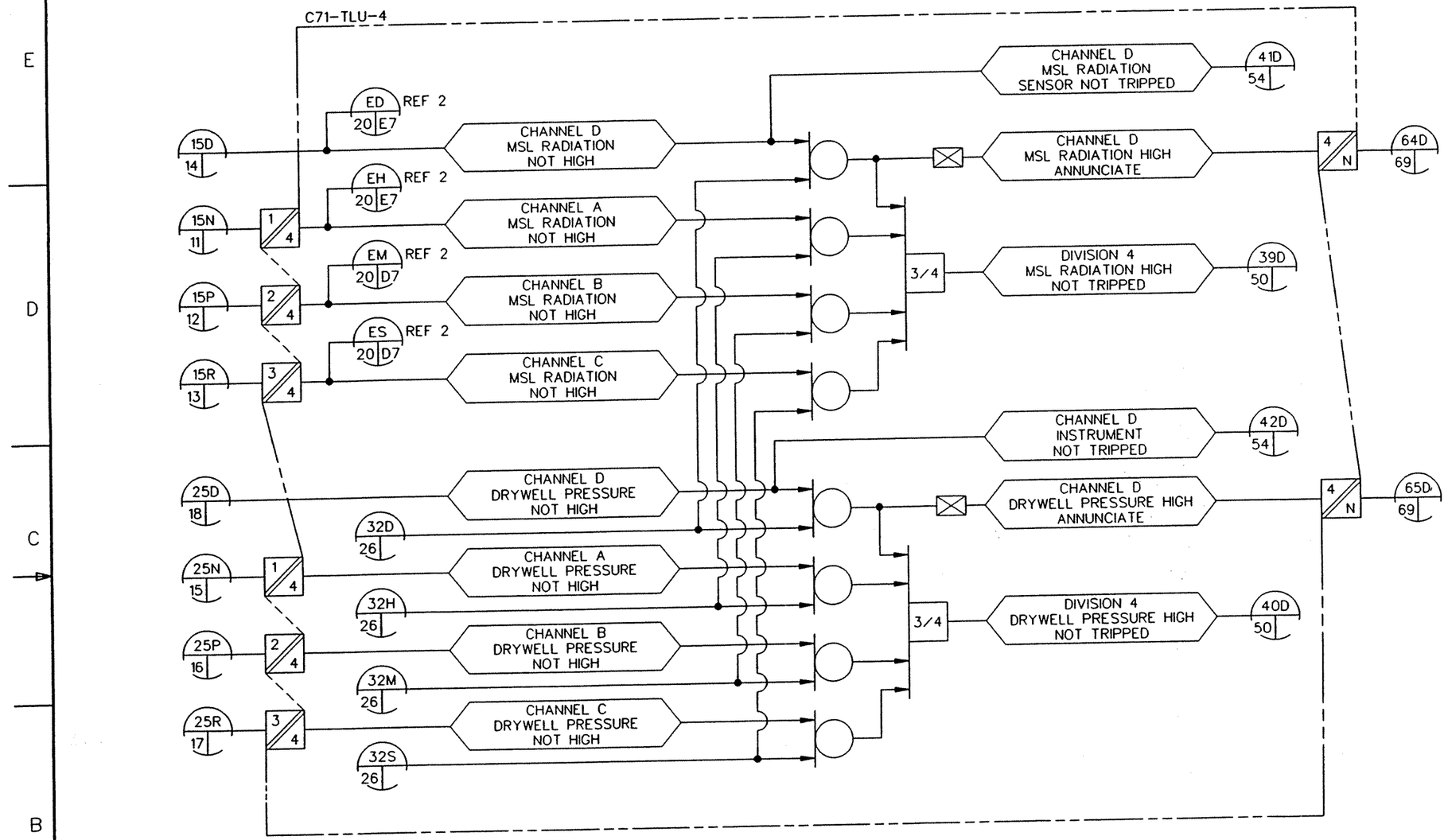


FIGURE 7.2-10 REACTOR PROTECTION SYSTEM IBD (Sheet 42 of 72)

C71-TLU-1

20A 15 — CHANNEL A RX WATER LEVEL NOT LOW
20F 16 — CHANNEL B RX WATER LEVEL NOT LOW
20G 17 — CHANNEL C RX WATER LEVEL NOT LOW
20H 18 — CHANNEL D RX WATER LEVEL NOT LOW
2/1 · 3/1 · 4/1 · 3/4

19A 11 — CHANNEL A CRD CHARGE PRESSURE NOT LOW
32A 23 — CHANNEL B CRD CHARGE PRESSURE NOT LOW
19F 12 · 2/1
32E 23 — CHANNEL C CRD CHARGE PRESSURE NOT LOW
19G 13 · 3/1
32J 23 — CHANNEL D CRD CHARGE PRESSURE NOT LOW
19H 14 · 4/1
32N 23
3/4

CHANNEL A RX WATER LVL SENSOR NOT TRIPPED — 45A 51
CHANNEL A RX WATER LVL LOW ANNUNCIATE — 1/N — 66A 69
DIVISION 1 RX WATER LVL LOW NOT TRIPPED — 43A 47

CHANNEL A CRD CHG PRESSURE SENSOR NOT TRIPPED — 46A 51
CHANNEL A CRD CHG PRESSURE LOW ANNUNCIATE — 1/N — 67A 70
DIVISION 1 CRD CHG PRESSURE LOW NOT TRIPPED — 44A 47

DIVISION 1 CHG PRESS TRIP BYPASS ANNUNCIATE — 1/N — A 13

2A 3 — DIVISION 1 LOW CRD CHG PRESSURE BYPASS PERMISSIVE
CH A CRD CHG PRESS BYP SW IN BYP & RX IN RUN OR SU MODE ANNUNCIATE — 1/N — 74A 72
DIVISION 1 ROD WITHDRAWAL NO INHIBIT — 1/N — LA REF 3

C71-S606A MCR
CHANNEL A CRD CHG PRESS TRIP BYPASS
KOS: NORMAL / BYPASS

CONTROL SWITCH
S606A – KOS

OBSERVATIONAL MEASURES

USE	SPECIFICATION	LOCATION

ANNUNCIATOR

NO.	INDICATOR	LOCATION
13	ALARM	MCR

OTHERS

DIV 1 TLU: RX WTR LVL DIV 1, CRD PRESS DIV 1 TRIP LOGIC

FIGURE 7.2-10 REACTOR PROTECTION SYSTEM IBD (Sheet 43 of 72)

C71-TLU-2

20B 16 — CHANNEL B RX WATER LEVEL NOT LOW

20E 15 — 1/2 — CHANNEL A RX WATER LEVEL NOT LOW

20L 17 — 3/2 — CHANNEL C RX WATER LEVEL NOT LOW

20M 18 — 4/2 — CHANNEL D RX WATER LEVEL NOT LOW

19B 12 — CHANNEL B CRD CHARGE PRESSURE NOT LOW

32B 24 — CHANNEL A CRD CHARGE PRESSURE NOT LOW

19E 11 — 1/2

32F 24 — CHANNEL C CRD CHARGE PRESSURE NOT LOW

19L 13 — 3/2

32K 24 — CHANNEL D CRD CHARGE PRESSURE NOT LOW

19M 14 — 4/2

32P 24

CHANNEL B RX WATER LVL SENSOR NOT TRIPPED — 45B 52

CHANNEL B RX WATER LVL LOW ANNUNCIATE — 2/N — 66B 69

3/4 — DIVISION 2 RX WATER LVL LOW NOT TRIPPED — 43B 48

CHANNEL B CRD CHG PRESSURE SENSOR NOT TRIPPED — 46B 52

CHANNEL B CRD CHG PRESSURE LOW ANNUNCIATE — 2/N — 67B 70

3/4 — DIVISION 2 CRD CHG PRESSURE LOW NOT TRIPPED — 44B 48

DIVISION 2 CHG PRESS TRIP BYPASS ANNUNCIATE — 2/N — A 14

2B 4 — DIVISION 2 LOW CRD CHG PRESSURE BYPASS PERMISSIVE

CH B CRD CHG PRESS BYP SW IN BYP & RX IN RUN OR SU MODE ANNUNCIATE — 2/N — 74B 72

DIVISION 2 ROD WITHDRAWAL NO INHIBIT — 2/N — LB REF 3

C71-S606B MCR

CHANNEL B CRD CHG PRESS TRIP BYPASS	
KOS	NORMAL
	BYPASS

CONTROL SWITCH
S606B – KOS

OBSERVATIONAL MEASURES

USE	SPECIFICATION	LOCATION

ANNUNCIATOR

NO.	INDICATOR	LOCATION
14	ALARM	MCR

OTHERS

DIV2 TLU: RX WTR LVL DIV 2, CRD PRESS DIV 2 TRIP LOGIC

FIGURE 7.2-10 REACTOR PROTECTION SYSTEM IBD (Sheet 44 of 72)

C71-TLU-3

20C 17 — CHANNEL C RX WATER LEVEL NOT LOW
20J 15 — 1/3 — CHANNEL A RX WATER LEVEL NOT LOW
20K 16 — 2/3 — CHANNEL B RX WATER LEVEL NOT LOW
20S 18 — 4/3 — CHANNEL D RX WATER LEVEL NOT LOW

19C 13 — CHANNEL C CRD CHARGE PRESSURE NOT LOW
32C 25
19J 11 — 1/3 — CHANNEL A CRD CHARGE PRESSURE NOT LOW
32G 25
19K 12 — 2/3 — CHANNEL B CRD CHARGE PRESSURE NOT LOW
32L 25
19S 14 — 4/3 — CHANNEL D CRD CHARGE PRESSURE NOT LOW
32R 25

3/4 — CHANNEL C RX WATER LVL SENSOR NOT TRIPPED — 45C 53
CHANNEL C RX WATER LVL LOW ANNUNCIATE — 3/N — 66C 69
3/4 — DIVISION 3 RX WATER LVL LOW NOT TRIPPED — 43C 49

CHANNEL C CRD CHG PRESSURE SENSOR NOT TRIPPED — 46C 53
CHANNEL C CRD CHG PRESSURE LOW ANNUNCIATE — 3/N — 67C 70
3/4 — DIVISION 3 CRD CHG PRESSURE LOW NOT TRIPPED — 44C 49

DIVISION 3 CHG PRESS TRIP BYPASS ANNUNCIATE — 3/N — A — 15
2C 5 — DIVISION 3 LOW CRD CHG PRESSURE BYPASS PERMISSIVE
CH C CRD CHG PRESS BYP SW IN BYP & RX IN RUN OR SU MODE ANNUNCIATE — 3/N — 74C 72
DIVISION 3 ROD WITHDRAWAL NO INHIBIT — 3/N — LC — REF 3

C71-S606C MCR

CHANNEL C CRD CHG PRESS TRIP BYPASS	
KOS	NORMAL
	BYPASS

CONTROL SWITCH
S606C – KOS

OBSERVATIONAL MEASURES		
USE	SPECIFICATION	LOCATION

ANNUNCIATOR		
NO.	INDICATOR	LOCATION
15	ALARM	MCR

OTHERS

DIV 3 TLU: RX WTR LVL DIV 3, CRD PRESS DIV 3 TRIP LOGIC

FIGURE 7.2-10 REACTOR PROTECTION SYSTEM IBD (Sheet 45 of 72)

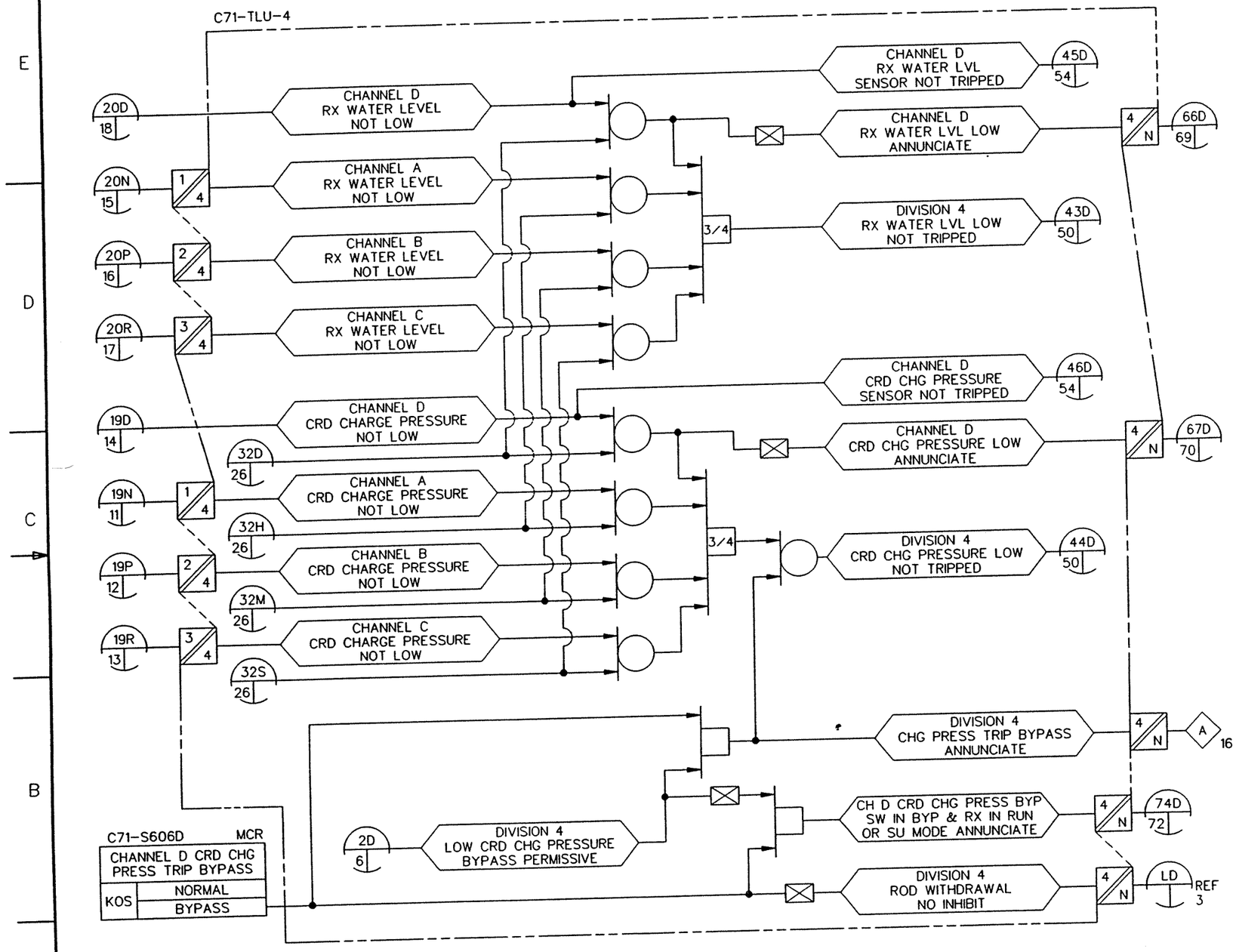


FIGURE 7.2–10 REACTOR PROTECTION SYSTEM IBD (Sheet 46 of 72)

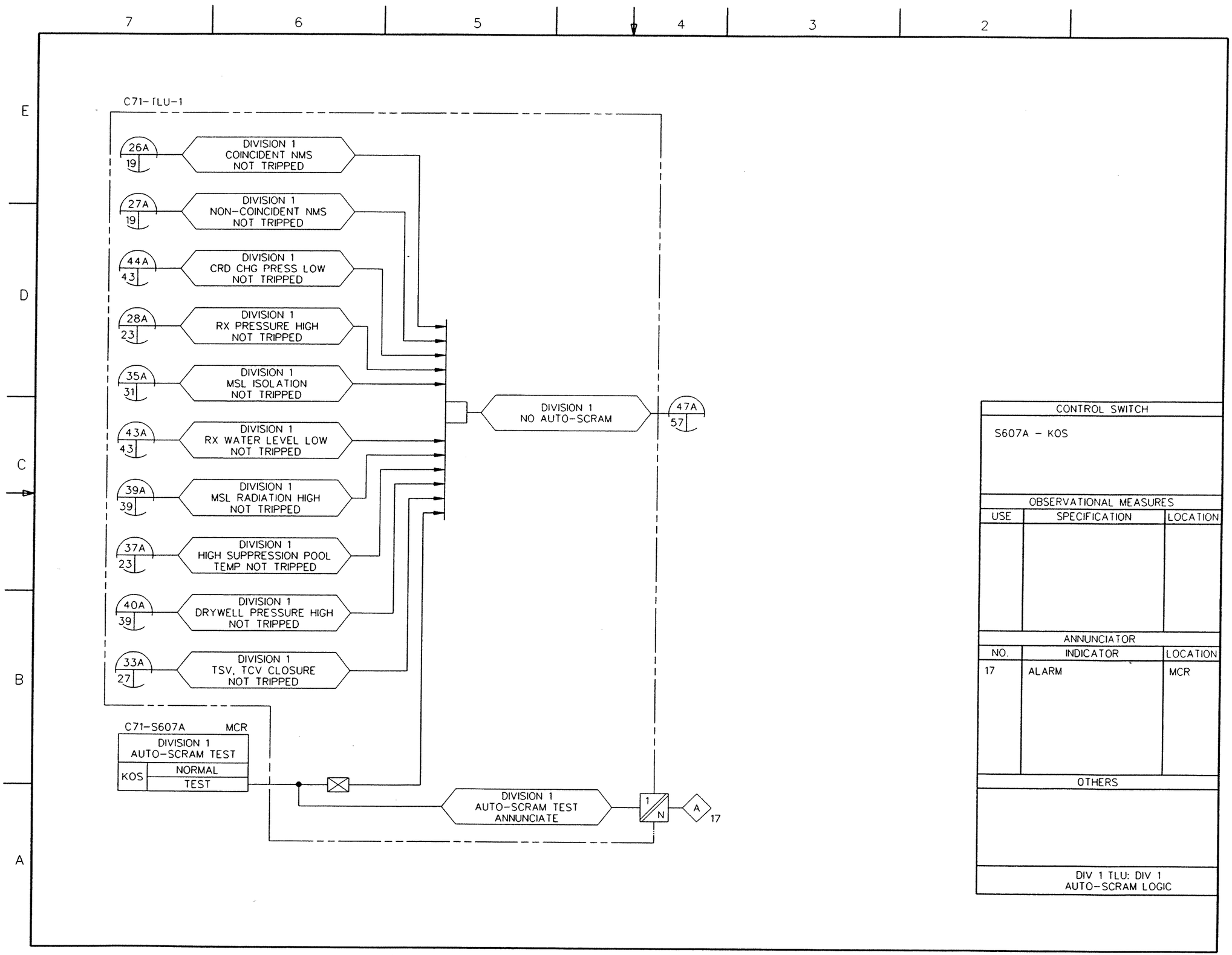


FIGURE 7.2-10 REACTOR PROTECTION SYSTEM IBD (Sheet 47 of 72)

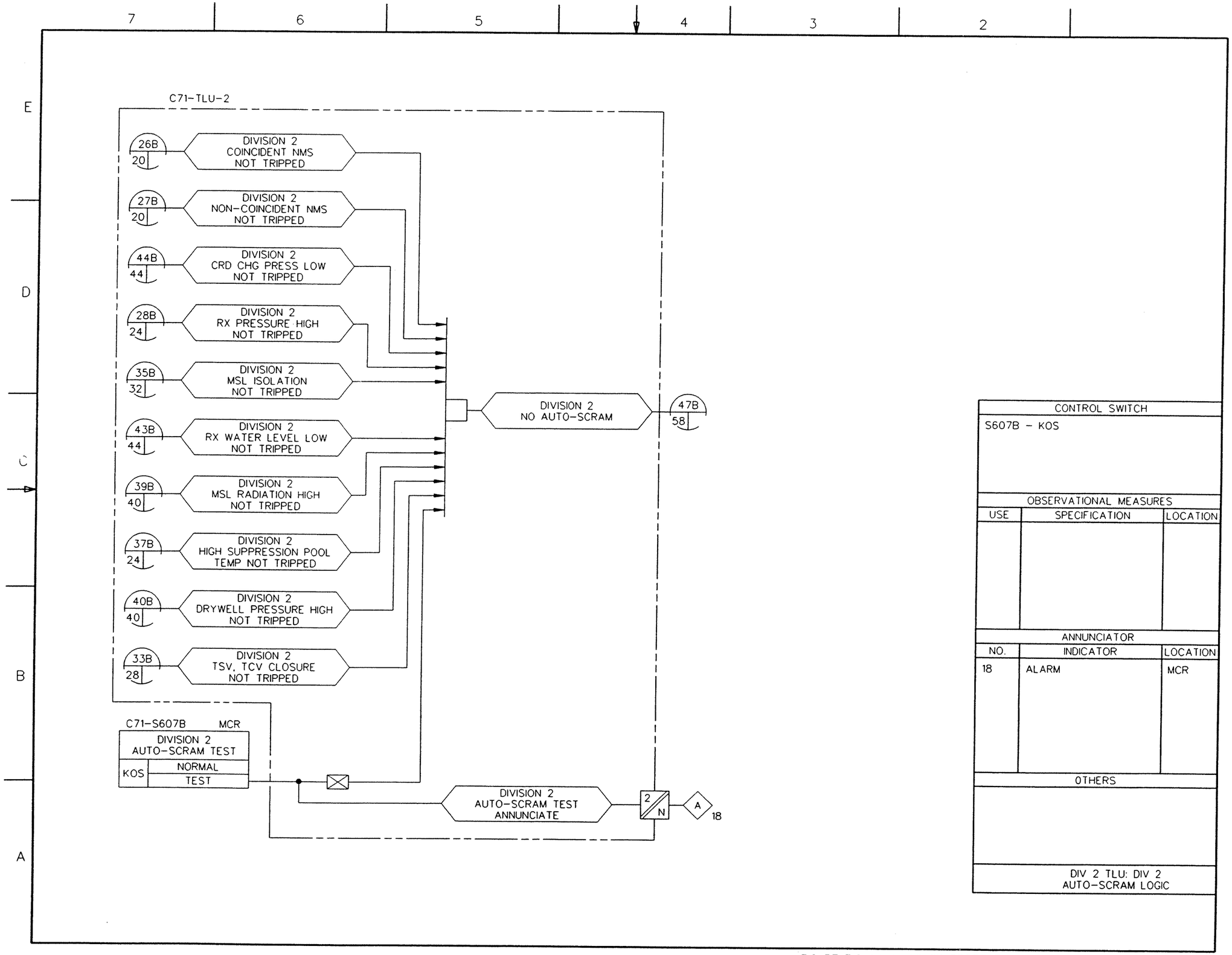


FIGURE 7.2-10 REACTOR PROTECTION SYSTEM IBD (Sheet 48 of 72)

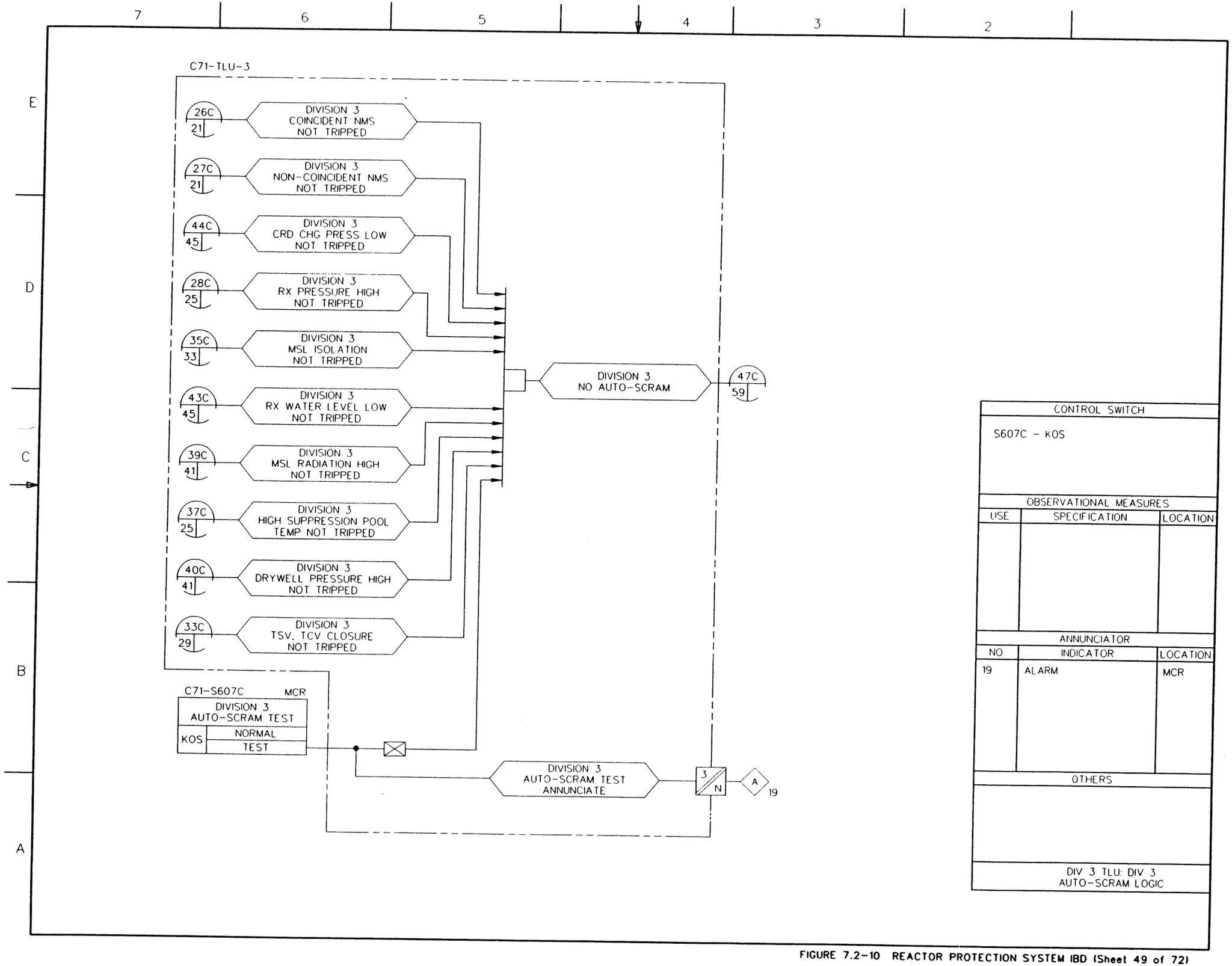


FIGURE 7.2-10 REACTOR PROTECTION SYSTEM IBD (Sheet 49 of 72)

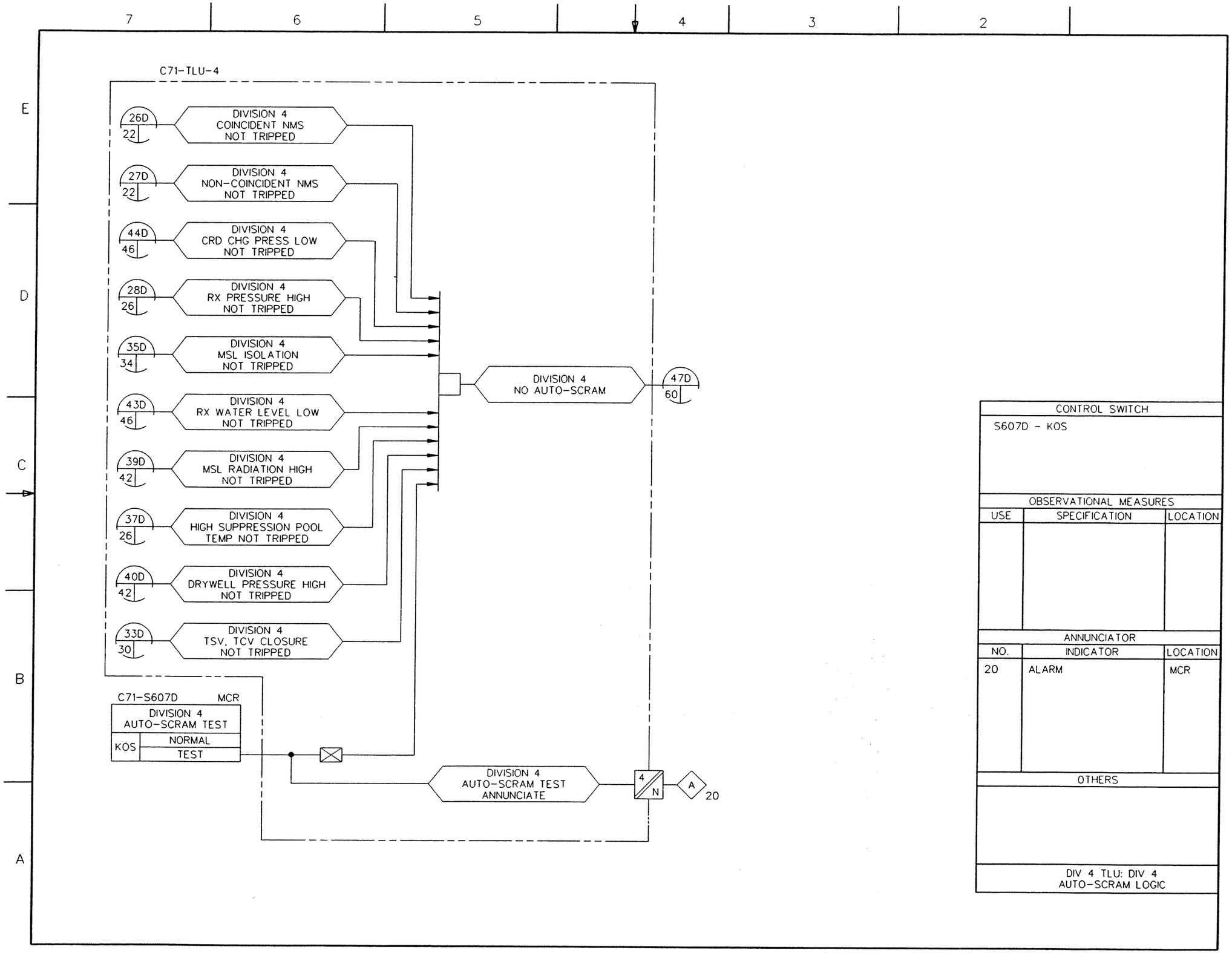


FIGURE 7.2-10 REACTOR PROTECTION SYSTEM IBD (Sheet 50 of 72)

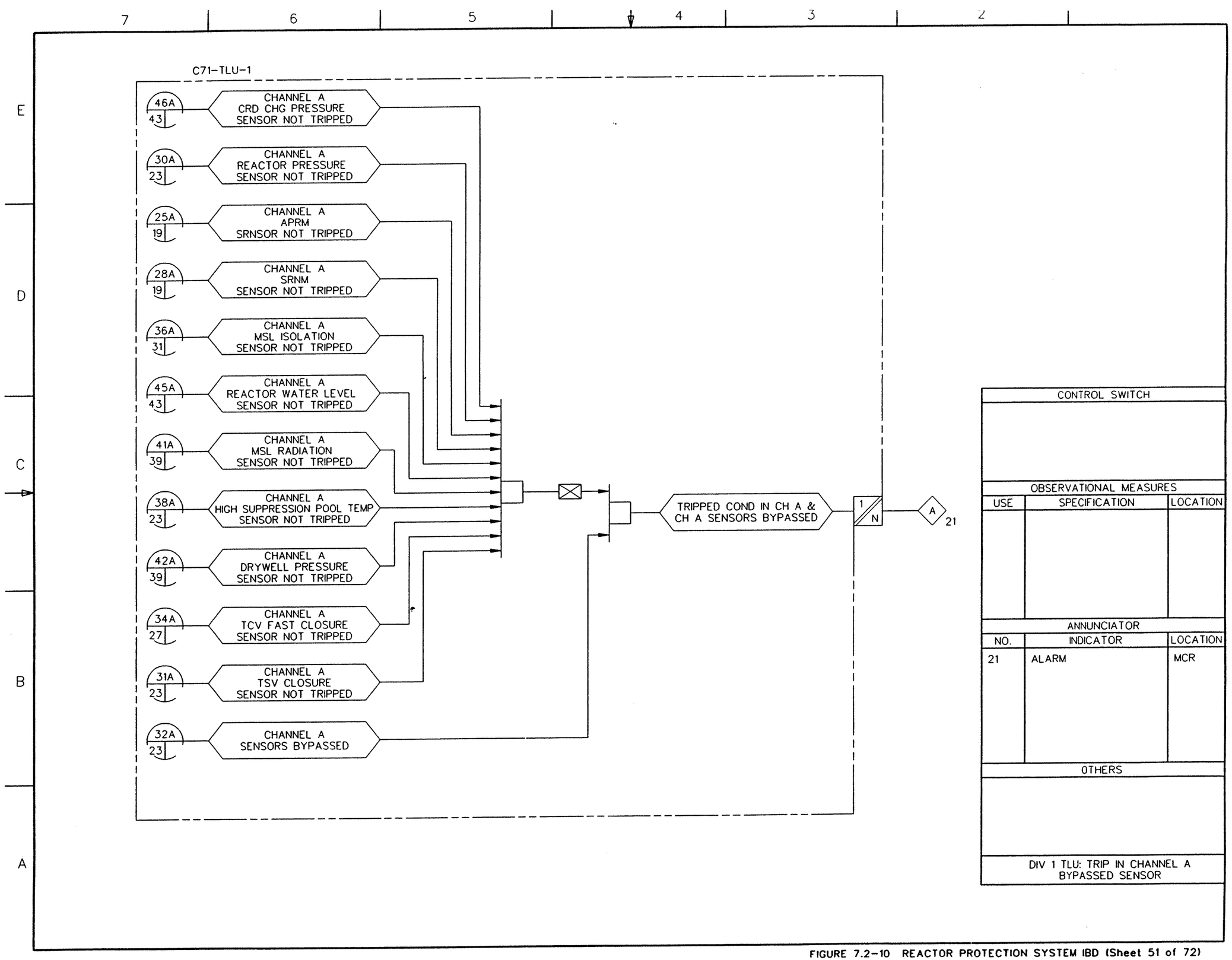


FIGURE 7.2-10 REACTOR PROTECTION SYSTEM IBD (Sheet 51 of 72)

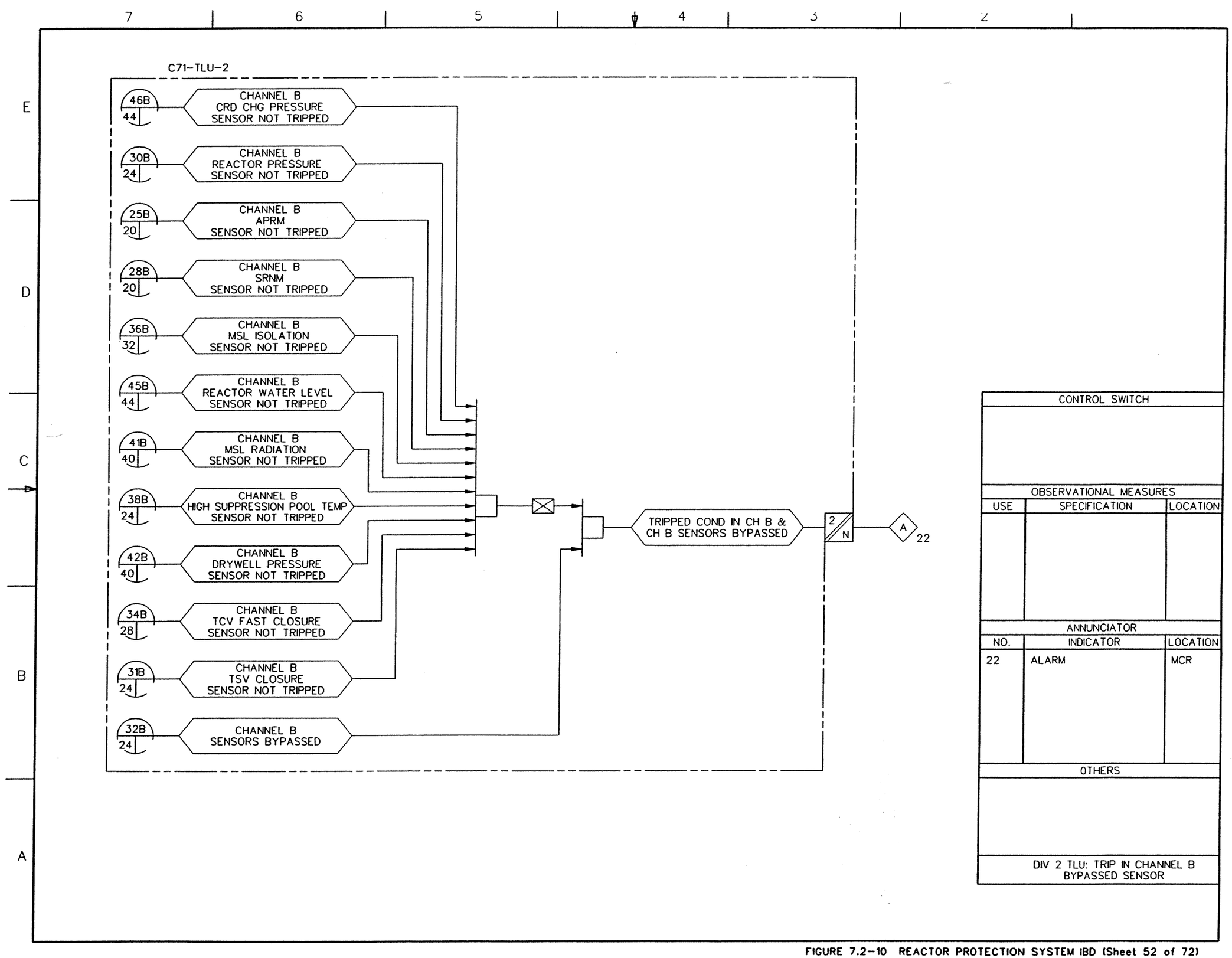


FIGURE 7.2-10 REACTOR PROTECTION SYSTEM IBD (Sheet 52 of 72)

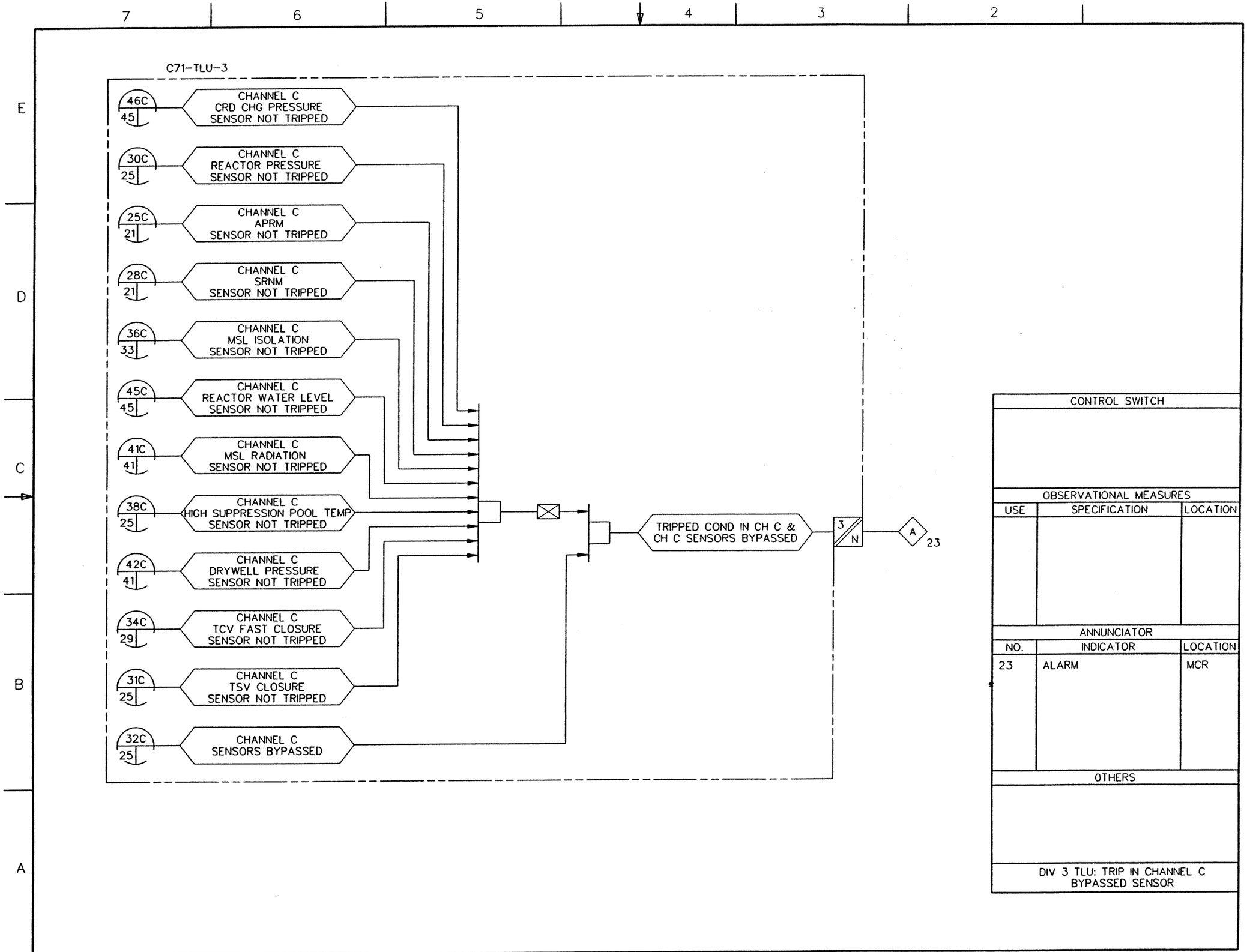


FIGURE 7.2-10 REACTOR PROTECTION SYSTEM IBD (Sheet 53 of 72)

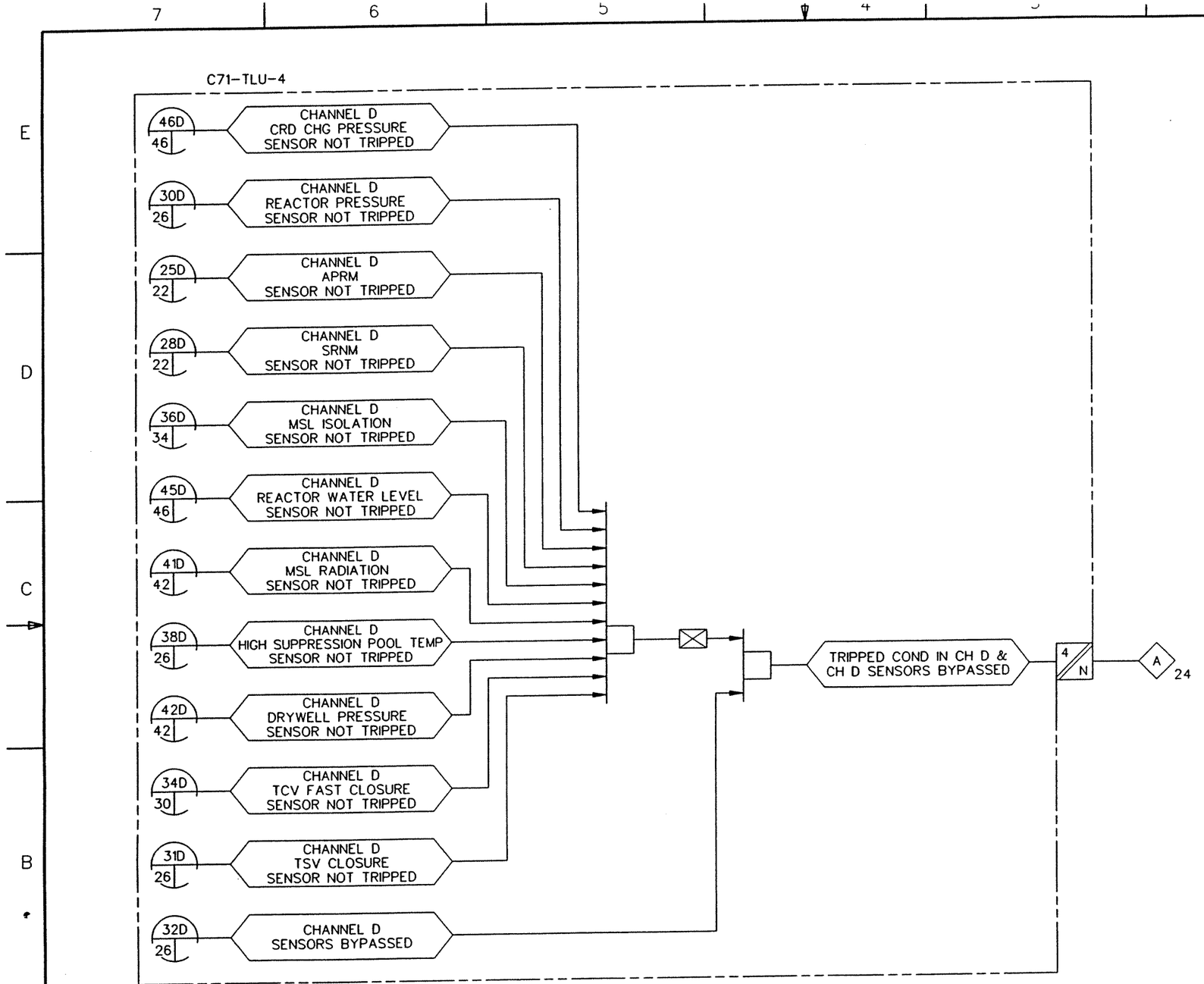


FIGURE 7.2-10 REACTOR PROTECTION SYSTEM IBD (Sheet 54 of 72)

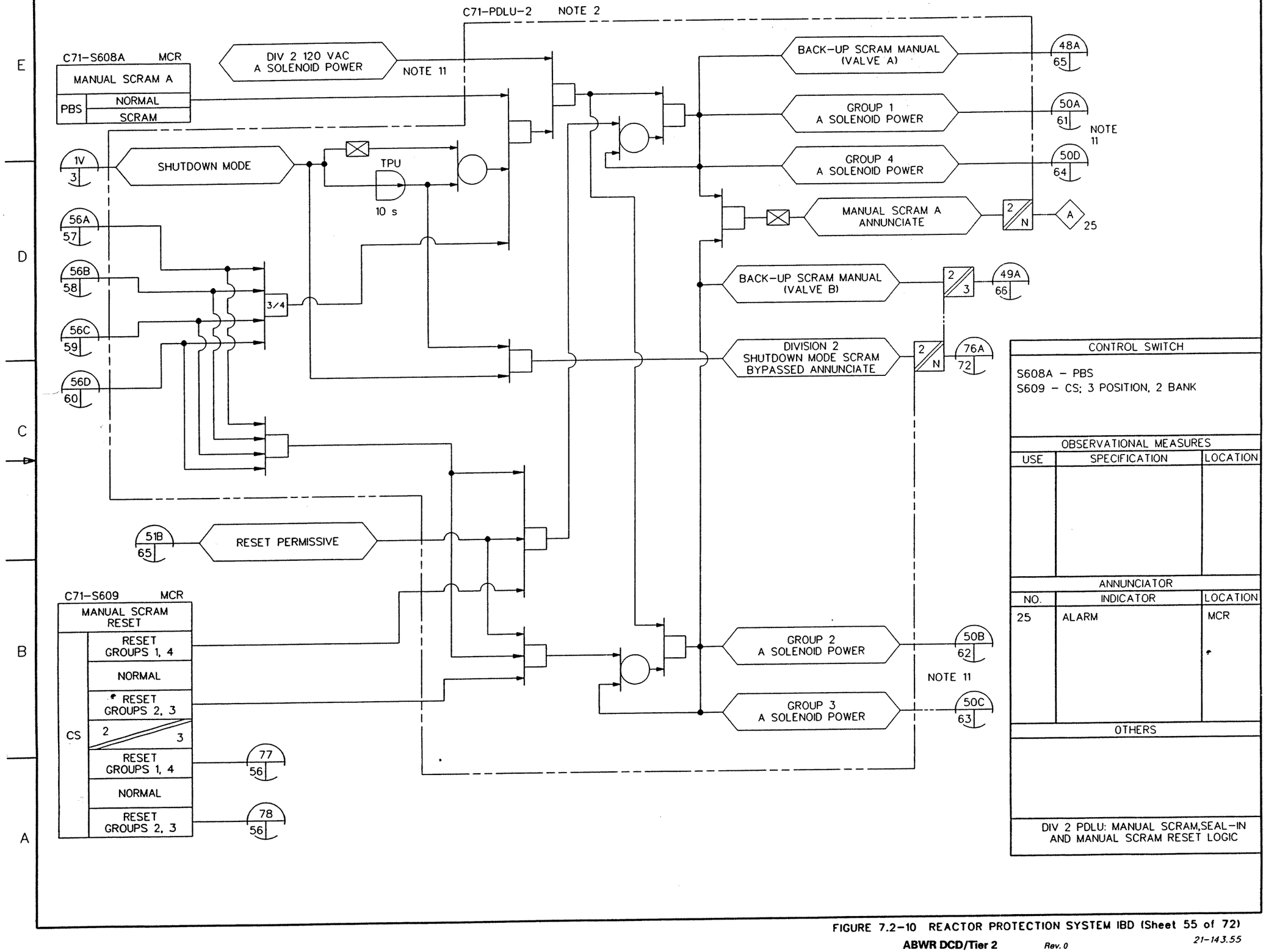


FIGURE 7.2-10 REACTOR PROTECTION SYSTEM IBD (Sheet 55 of 72)

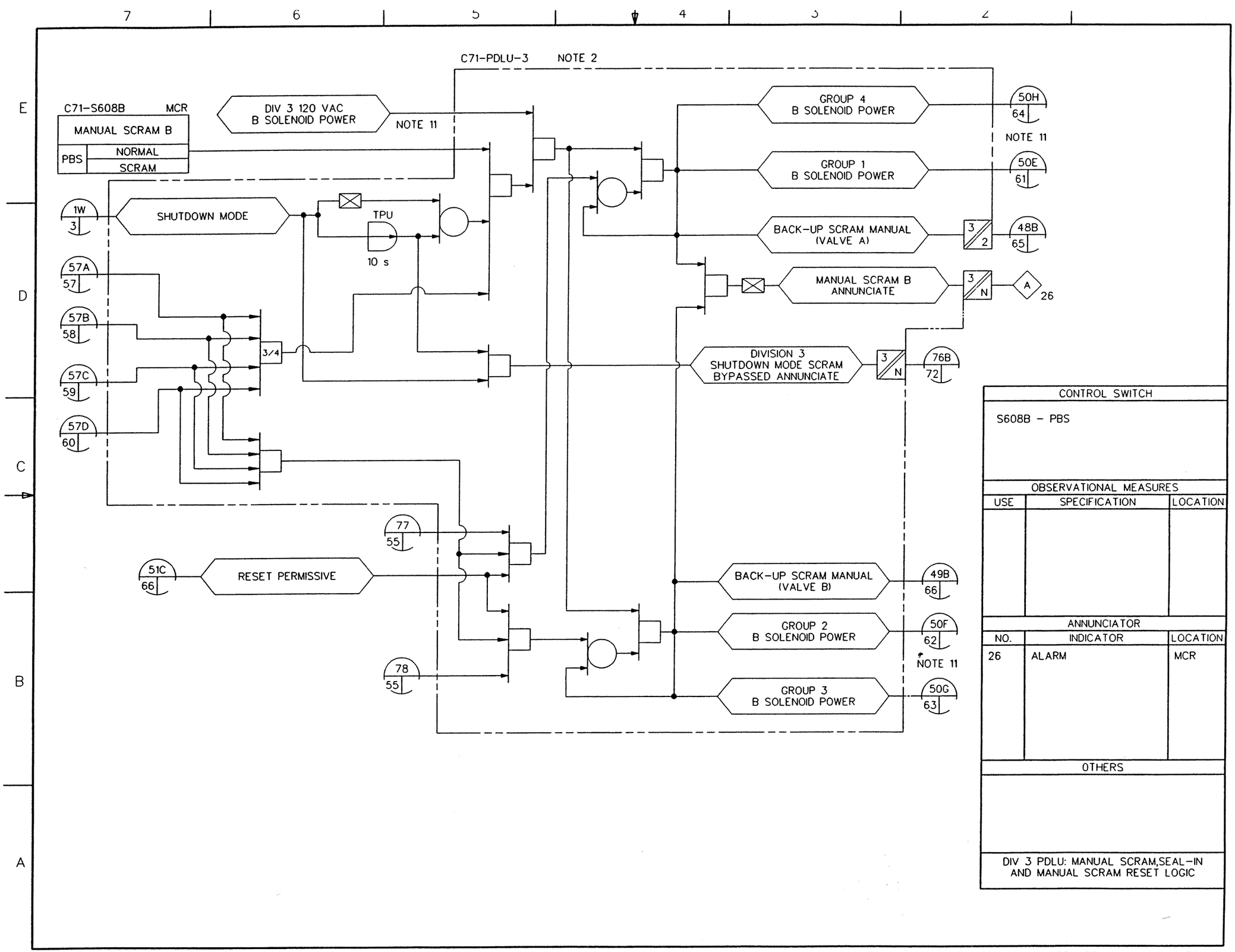


FIGURE 7.2-10 REACTOR PROTECTION SYSTEM IBD (Sheet 56 of 72)

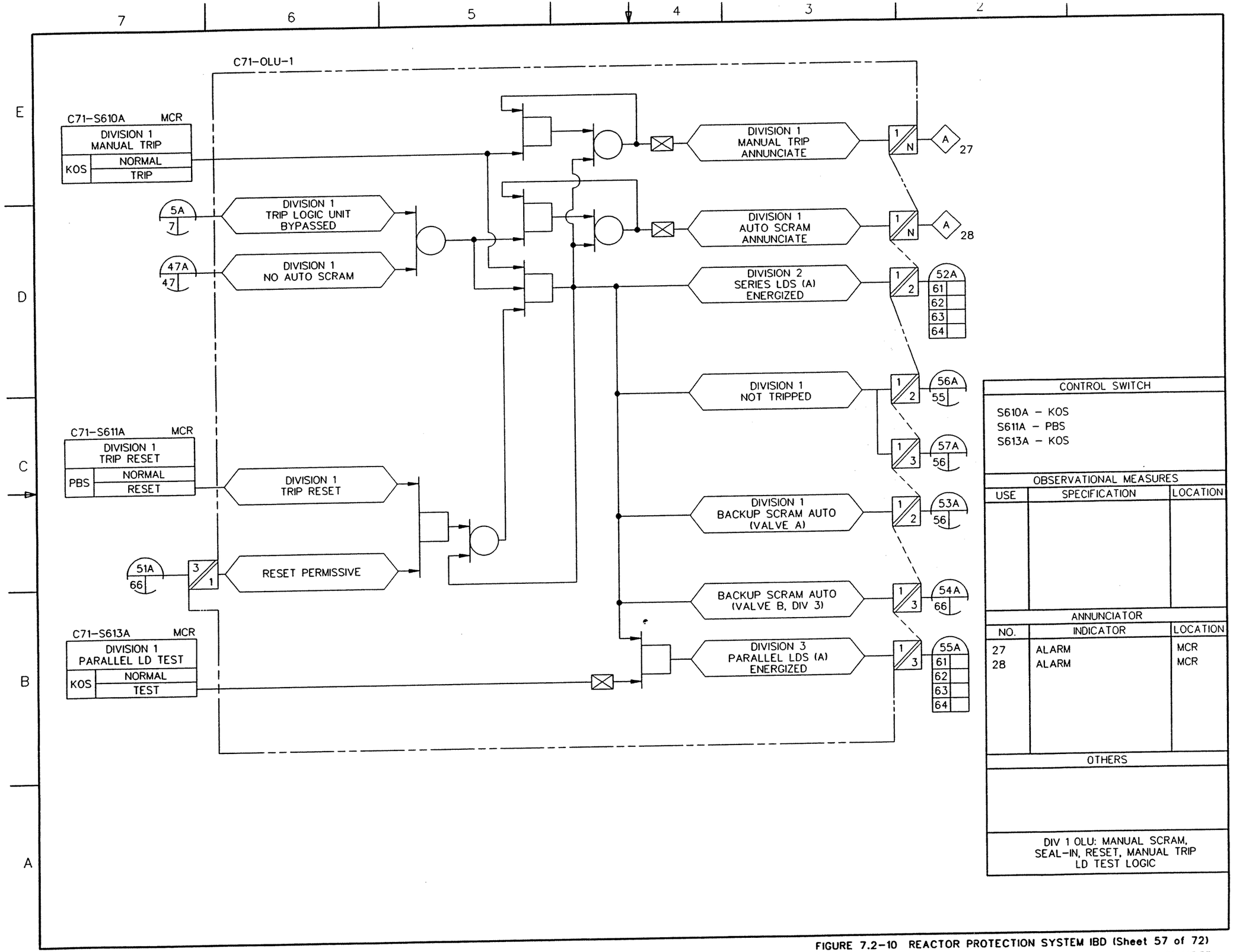


FIGURE 7.2-10 REACTOR PROTECTION SYSTEM IBD (Sheet 57 of 72)

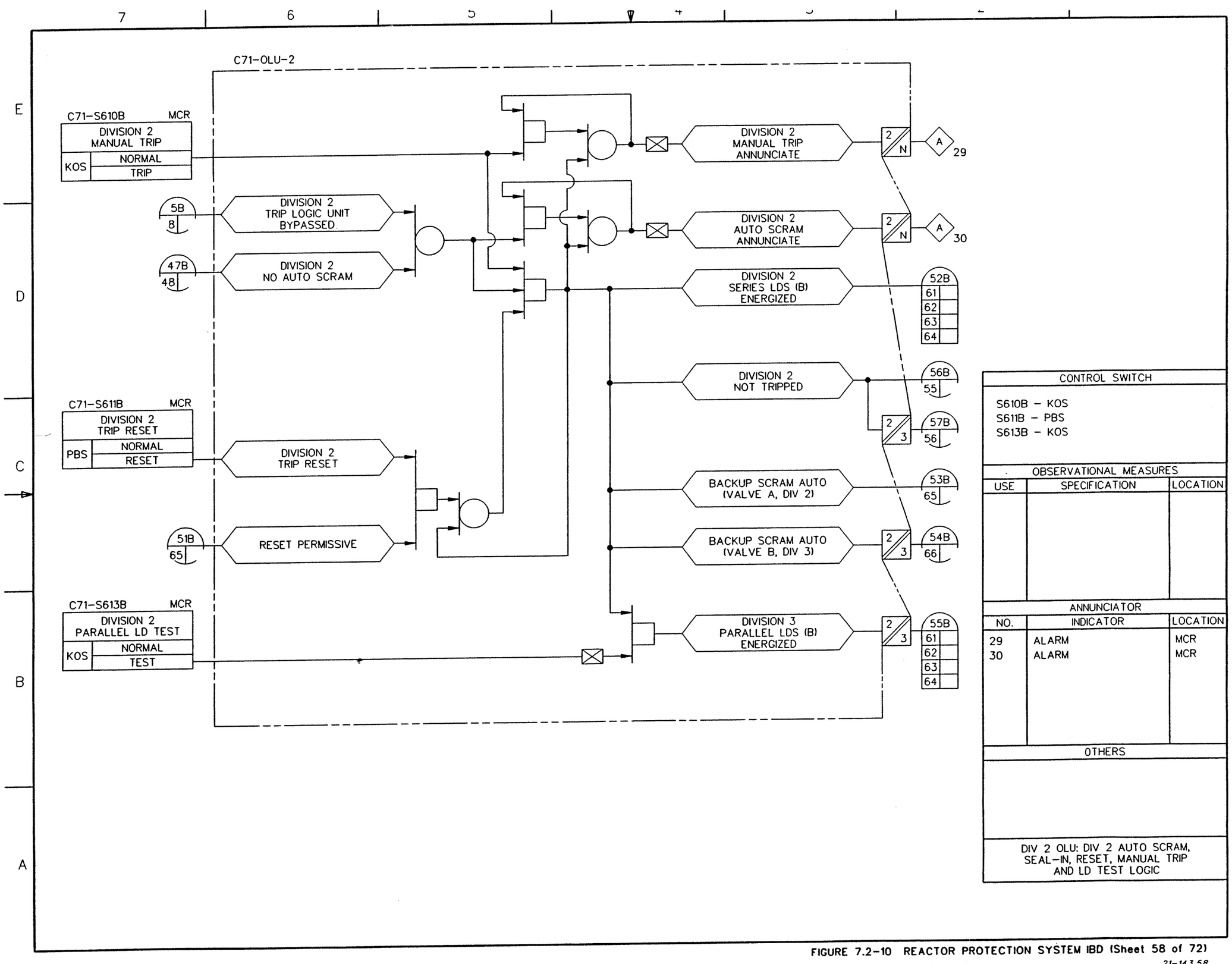


FIGURE 7.2-10 REACTOR PROTECTION SYSTEM IBD (Sheet 58 of 72)

C71-OLU-3

C71-S610C MCR
DIVISION 3 MANUAL TRIP
KOS: NORMAL / TRIP

C71-S611C MCR
DIVISION 3 TRIP RESET
PBS: NORMAL / RESET

C71-S613C MCR
DIVISION 3 PARALLEL LD TEST
KOS: NORMAL / TEST

5C 9 — DIVISION 3 TRIP LOGIC UNIT BYPASSED

47C 49 — DIVISION 3 NO AUTO SCRAM

51C 66 — RESET PERMISSIVE

DIVISION 3 MANUAL TRIP ANNUNCIATE — 3/N — A — 31

DIVISION 3 AUTO SCRAM ANNUNCIATE — 3/N — A — 32

DIVISION 3 SERIES LDS (C) ENERGIZED — 3/2 — 52C (61, 62, 63, 64)

DIVISION 3 NOT TRIPPED — 3/2 — 56C 55 / 57C 56

BACKUP SCRAM AUTO (VALVE A, DIV 2) — 3/2 — 53C 65

BACKUP SCRAM AUTO (VALVE B, DIV 3) — 54C 66

DIVISION 2 PARALLEL LDS (C) ENERGIZED — 3/2 — 55C (61, 62, 63, 64)

CONTROL SWITCH

S610C – KOS
S611C – PBS
S613C – KOS

OBSERVATIONAL MEASURES

USE	SPECIFICATION	LOCATION

ANNUNCIATOR

NO.	INDICATOR	LOCATION
31	ALARM	MCR
32	ALARM	MCR

OTHERS

DIV 3 OLU: DIV 3 AUTO SCRAM, SEAL-IN, RESET, MANUAL TRIP AND LD TEST LOGIC

FIGURE 7.2-10 REACTOR PROTECTION SYSTEM IBD (Sheet 59 of 72)

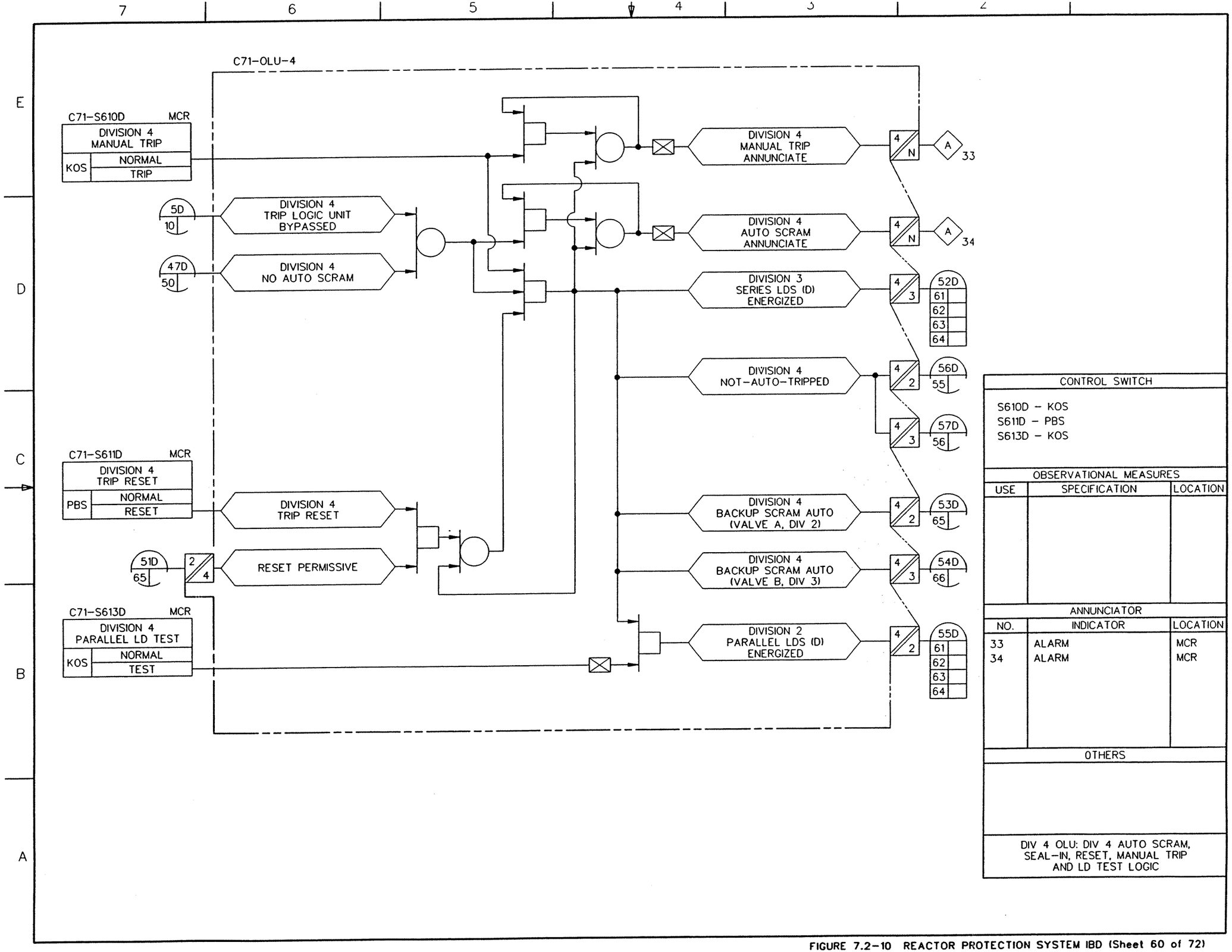


FIGURE 7.2-10 REACTOR PROTECTION SYSTEM IBD (Sheet 60 of 72)

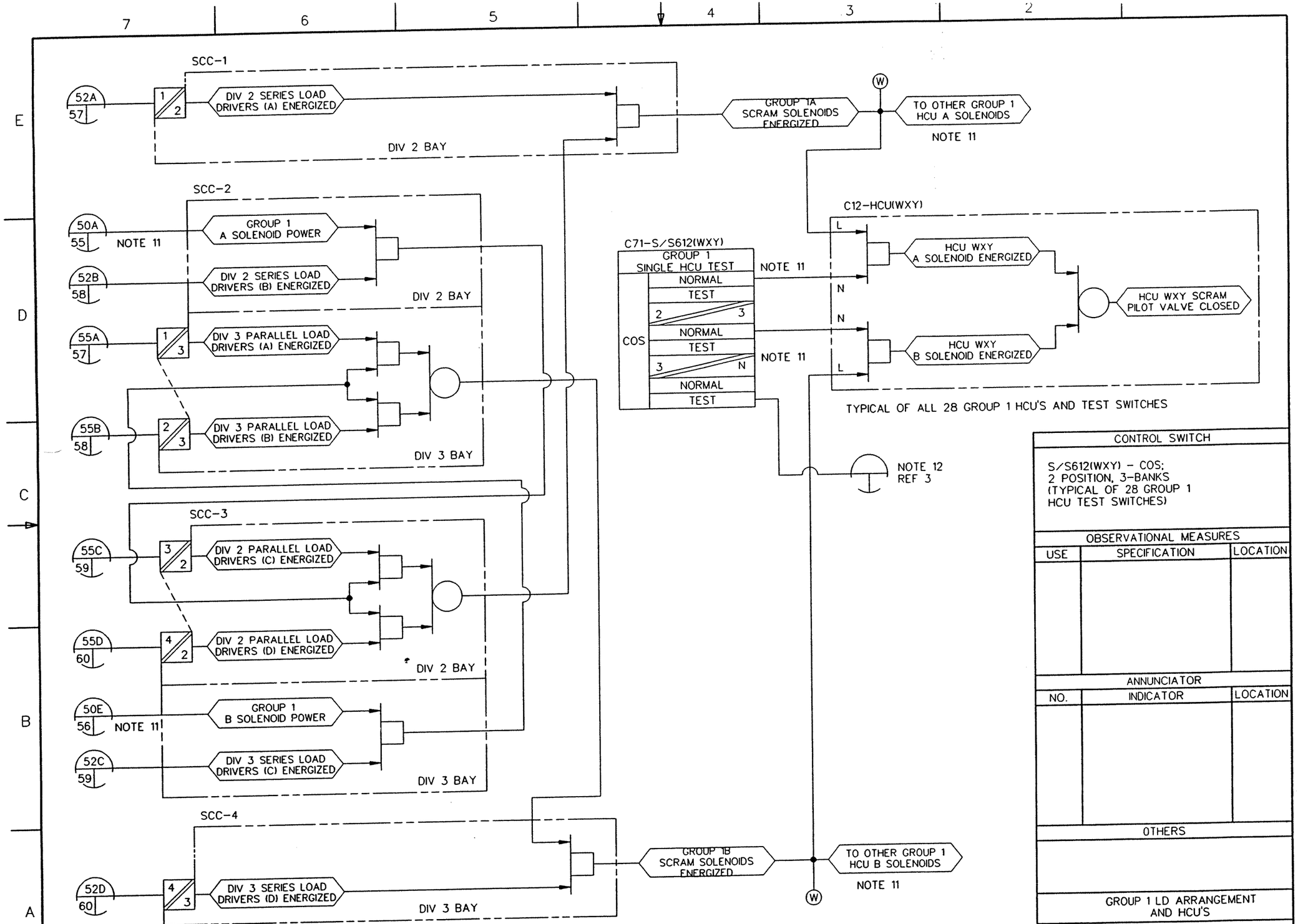


FIGURE 7.2-10 REACTOR PROTECTION SYSTEM IBD (Sheet 61 of 72)

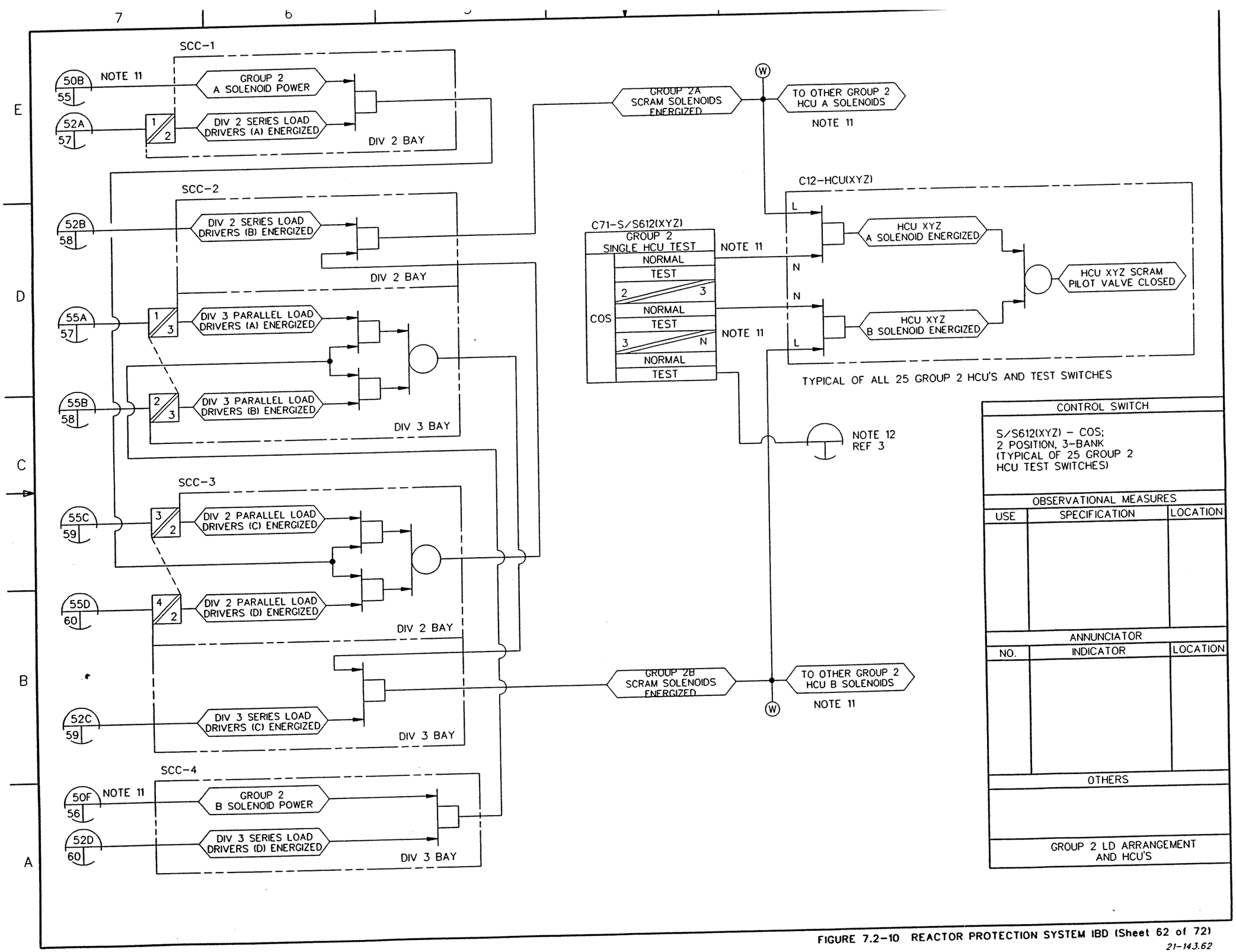


FIGURE 7.2-10 REACTOR PROTECTION SYSTEM IBD (Sheet 62 of 72)

21-143.62

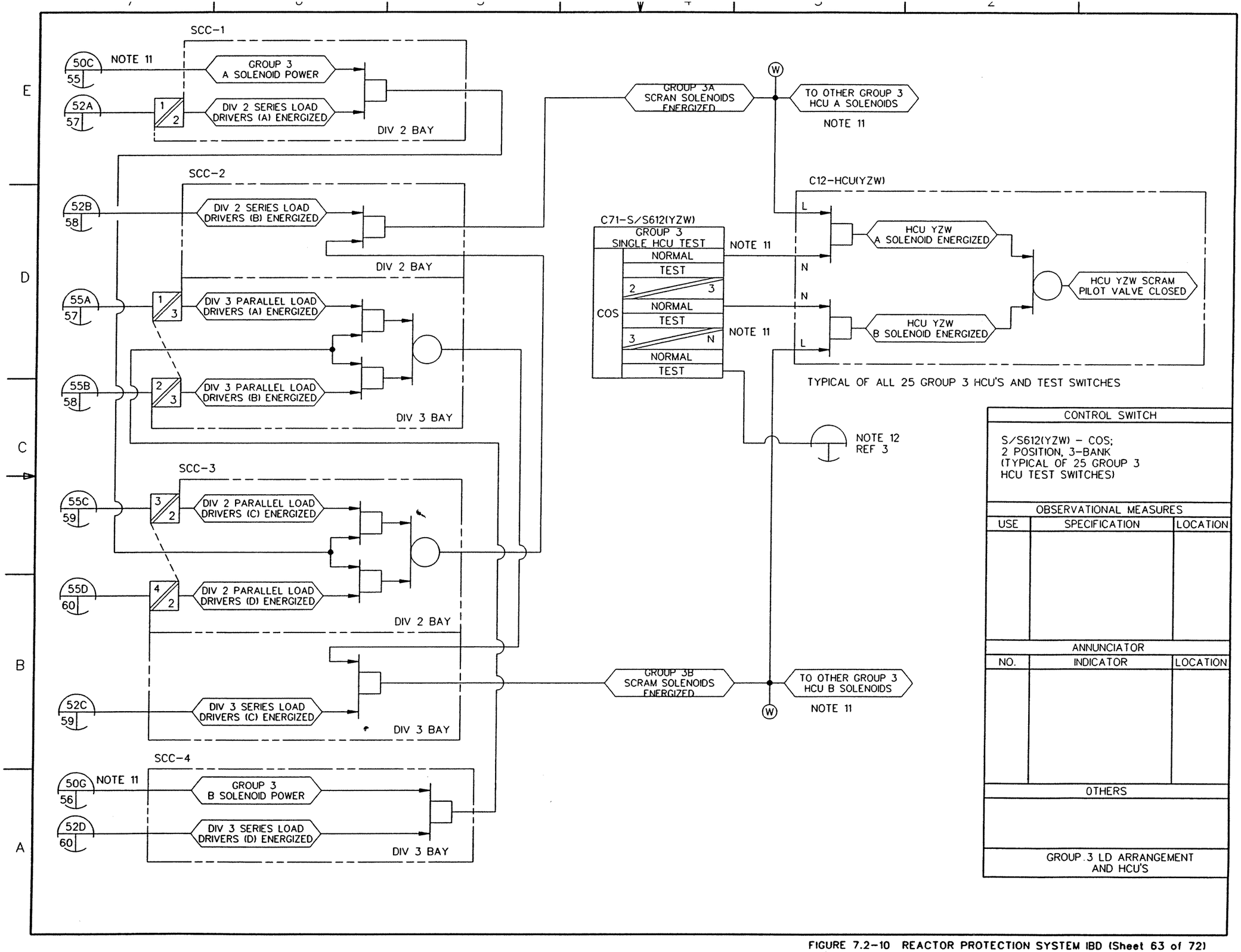


FIGURE 7.2-10 REACTOR PROTECTION SYSTEM IBD (Sheet 63 of 72)

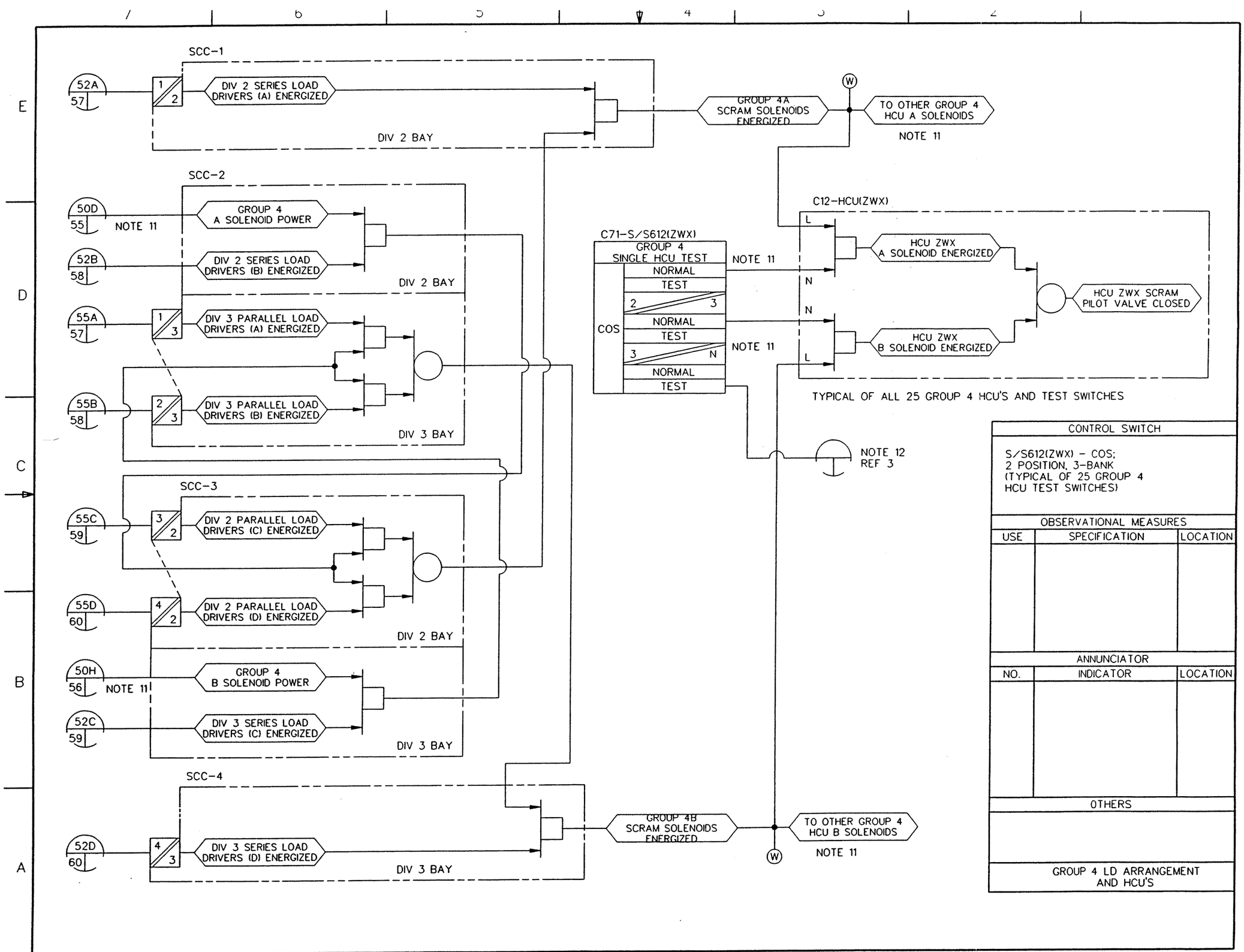


FIGURE 7.2-10 REACTOR PROTECTION SYSTEM IBD (Sheet 64 of 72)

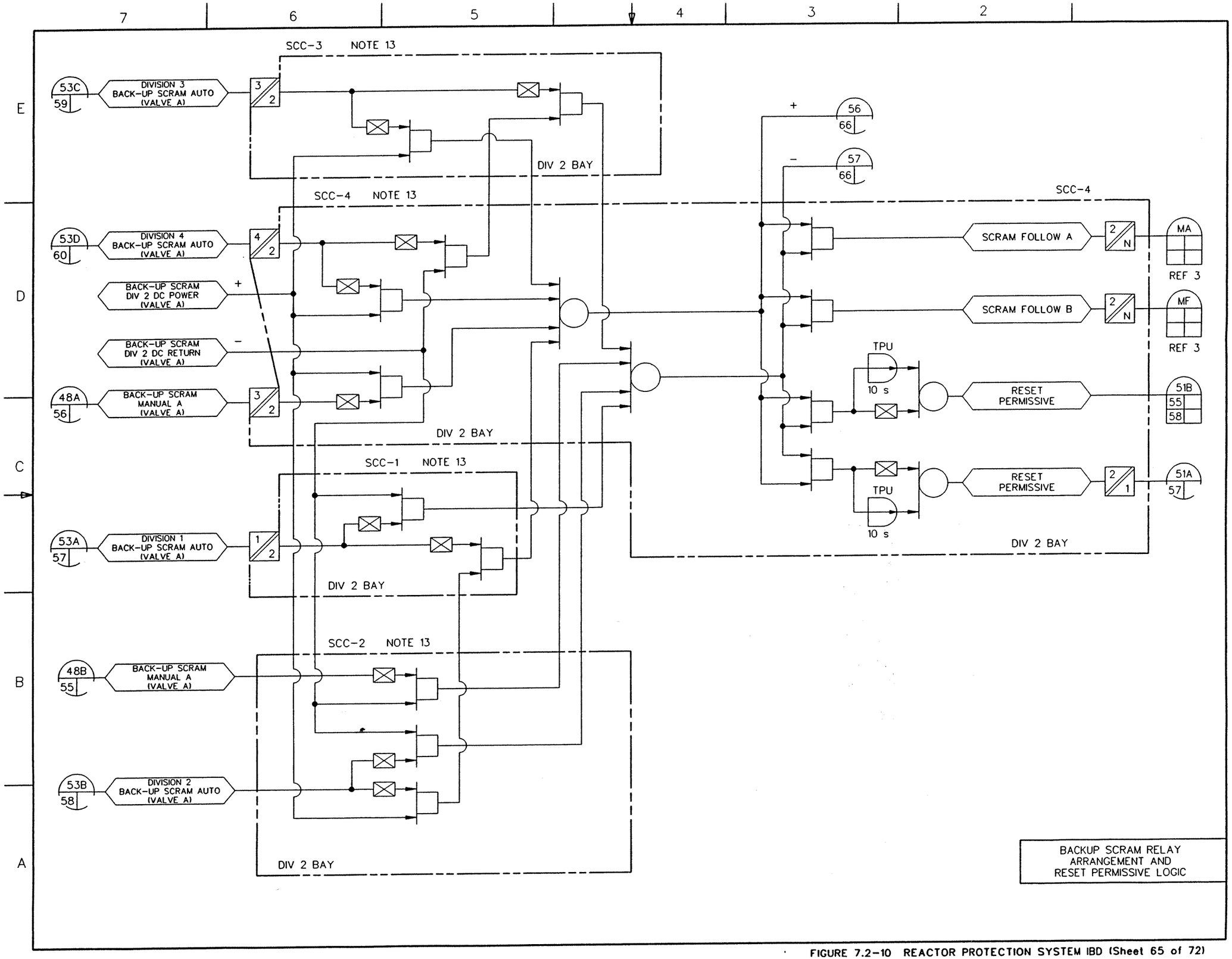


FIGURE 7.2-10 REACTOR PROTECTION SYSTEM IBD (Sheet 65 of 72)

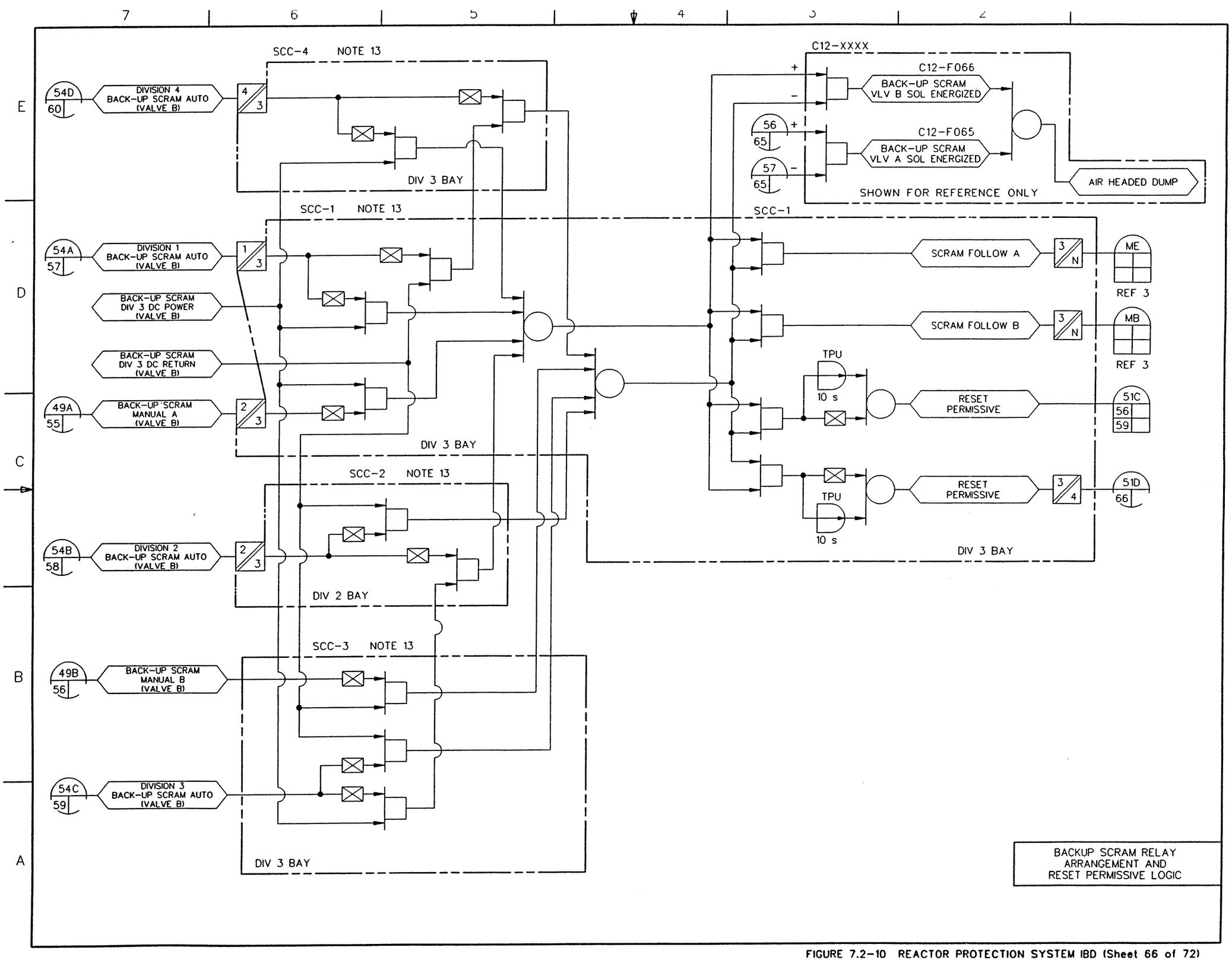
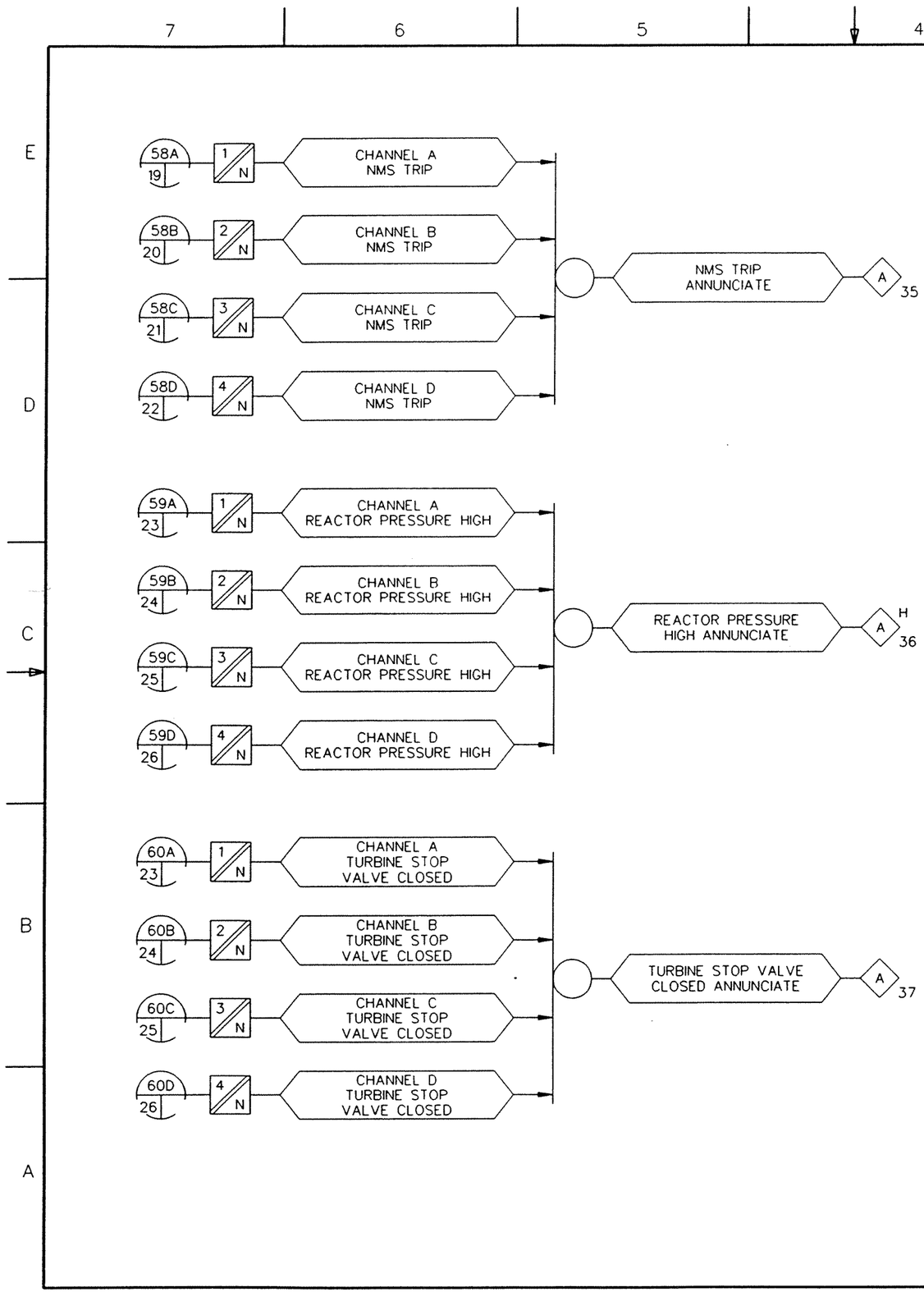
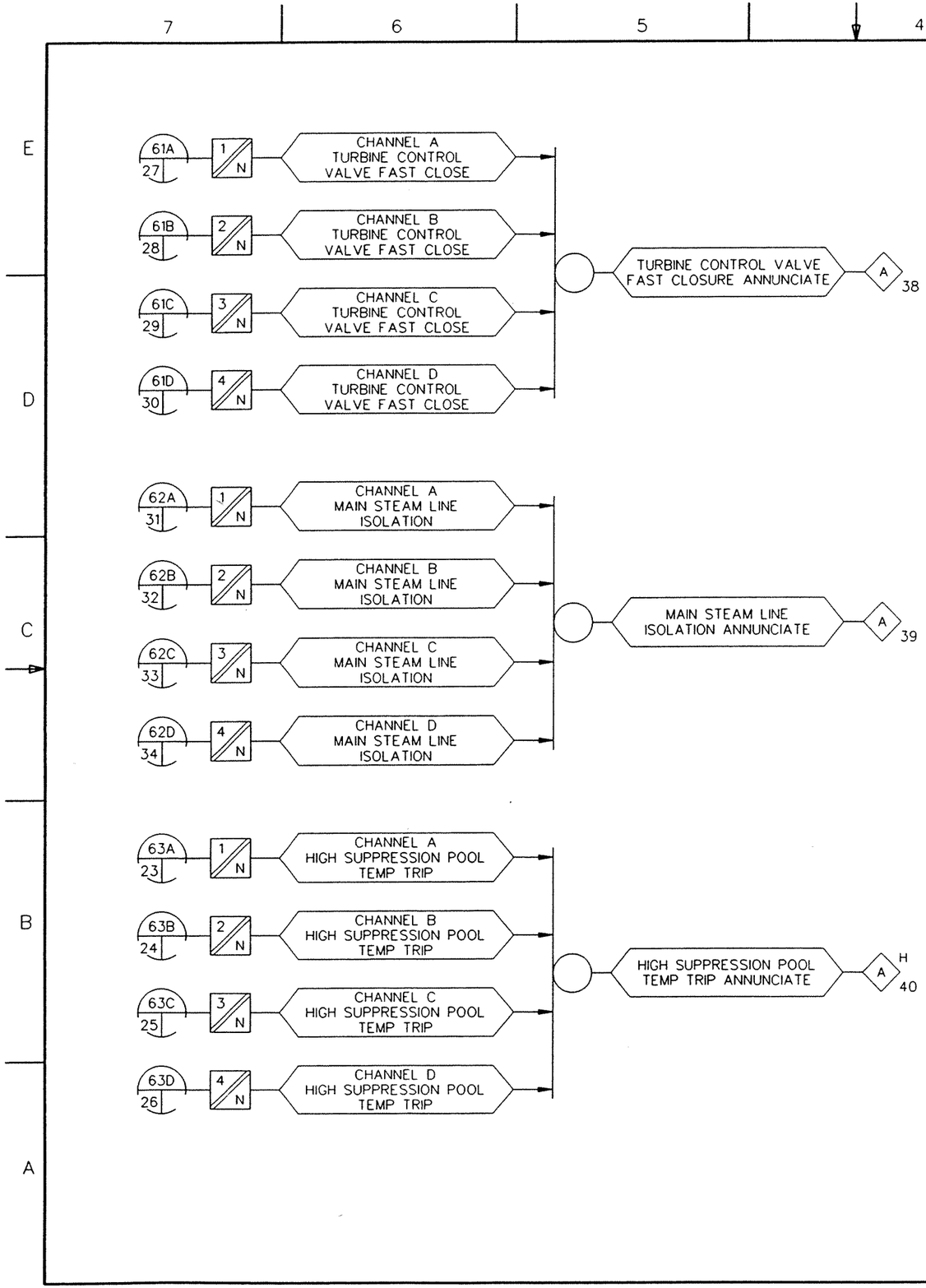


FIGURE 7.2-10 REACTOR PROTECTION SYSTEM IBD (Sheet 66 of 72)



CONTROL SWITCH		
OBSERVATIONAL MEASURES		
USE	SPECIFICATION	LOCATION
ANNUNCIATOR		
NO.	INDICATOR	LOCATION
35	ALARM	MCR
36	ALARM	MCR
37	ALARM	MCR
OTHERS		
RPS ALARMS		

FIGURE 7.2-10 REACTOR PROTECTION SYSTEM IBD (Sheet 67 of 72)



CONTROL SWITCH		
OBSERVATIONAL MEASURES		
USE	SPECIFICATION	LOCATION

ANNUNCIATOR		
NO.	INDICATOR	LOCATION
38	ALARM	MCR
39	ALARM	MCR
40	ALARM	MCR

OTHERS
RPS ALARMS

FIGURE 7.2-10 REACTOR PROTECTION SYSTEM IBD (Sheet 68 of 72)

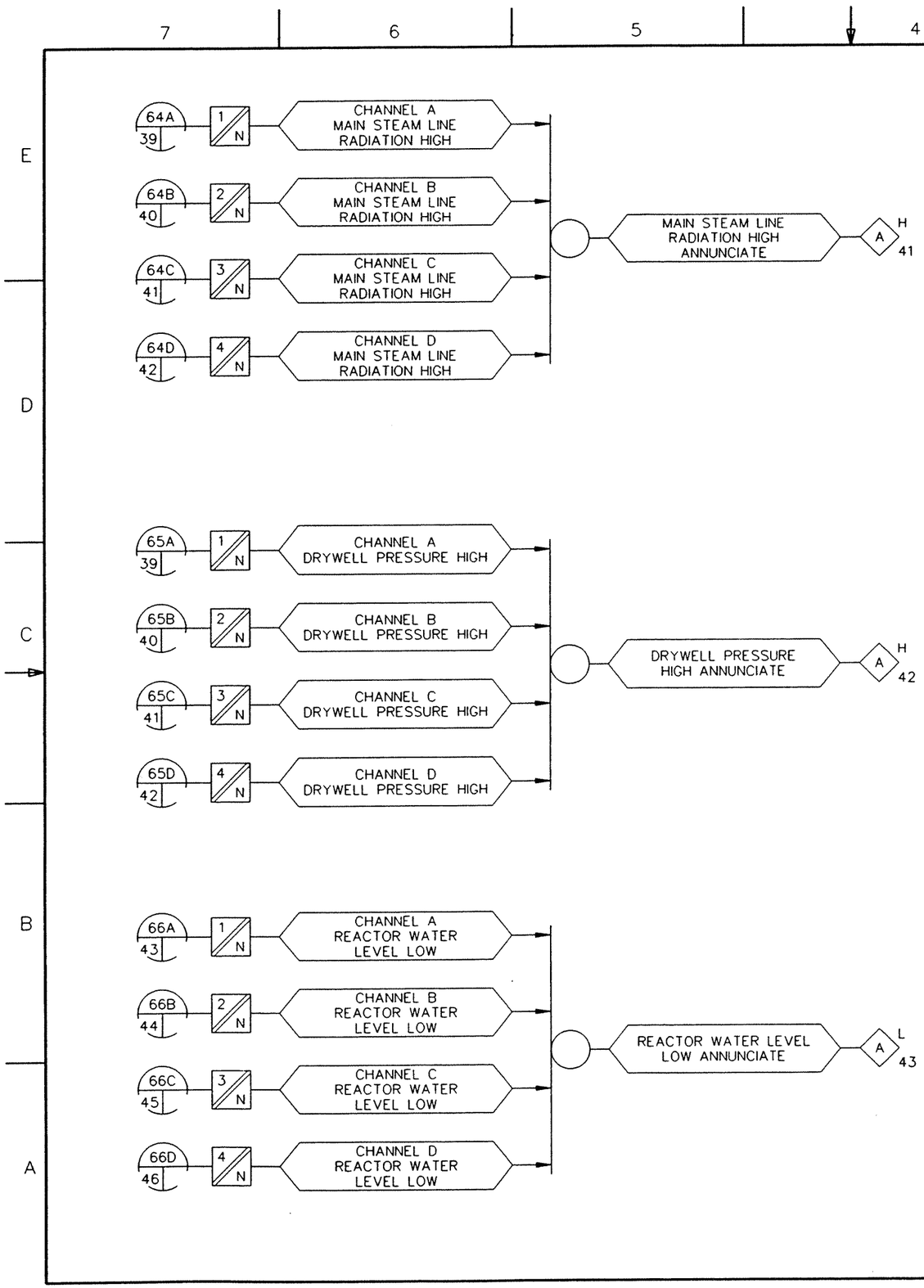
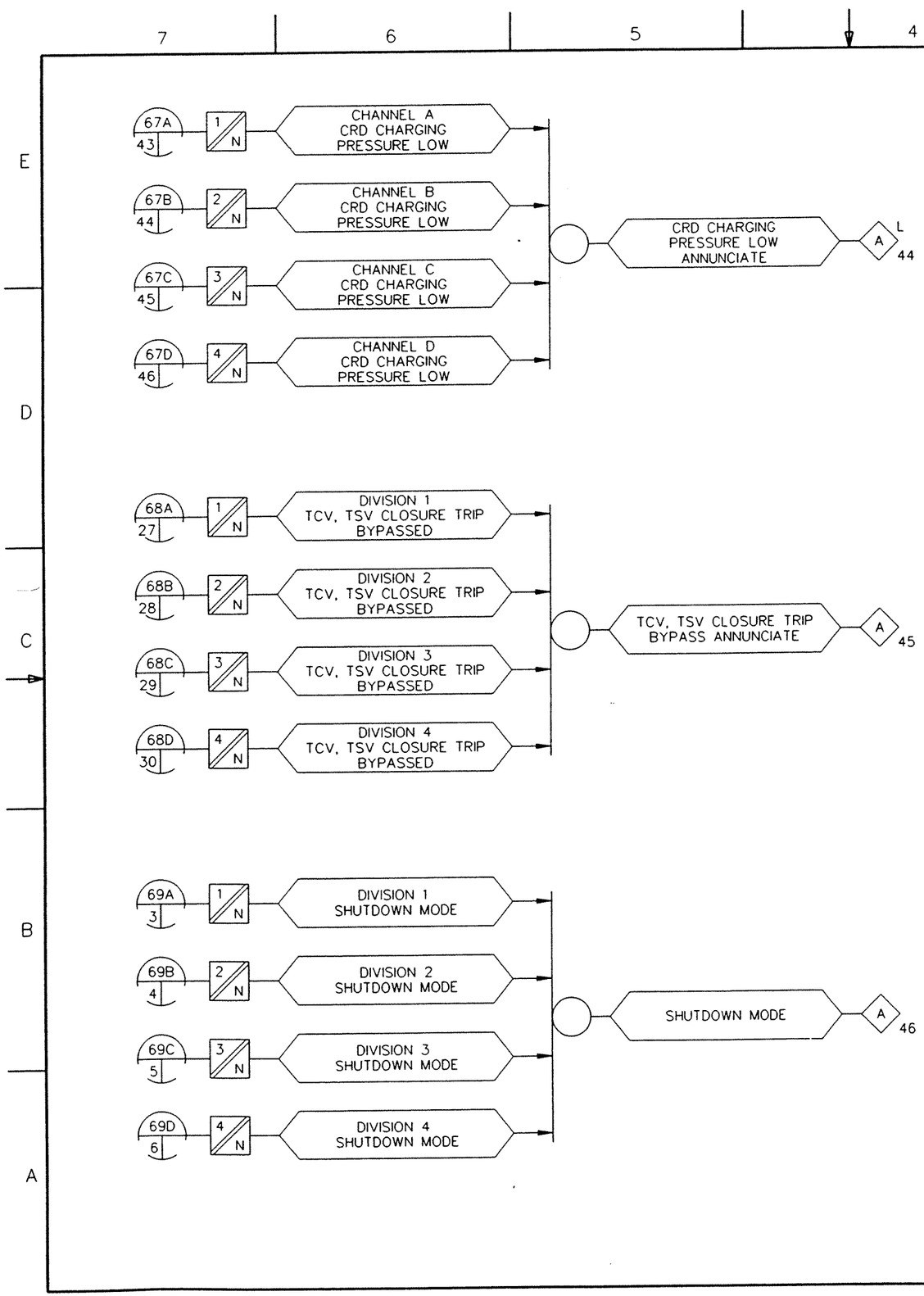


FIGURE 7.2–10 REACTOR PROTECTION SYSTEM IBD (Sheet 69 of 72)



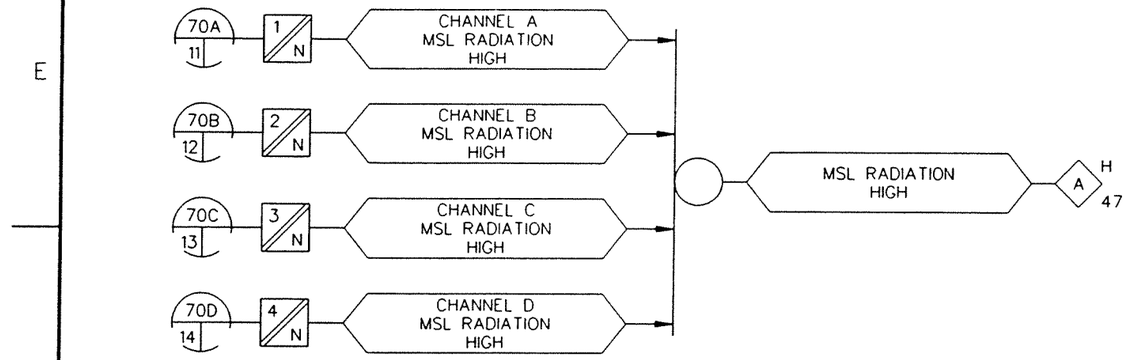
CONTROL SWITCH		
OBSERVATIONAL MEASURES		
USE	SPECIFICATION	LOCATION

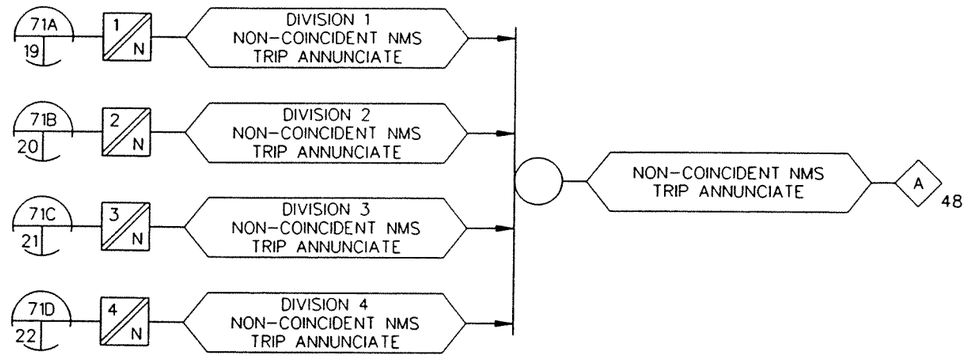
ANNUNCIATOR		
NO.	INDICATOR	LOCATION
44	ALARM	MCR
45	ALARM	MCR
46	ALARM	MCR

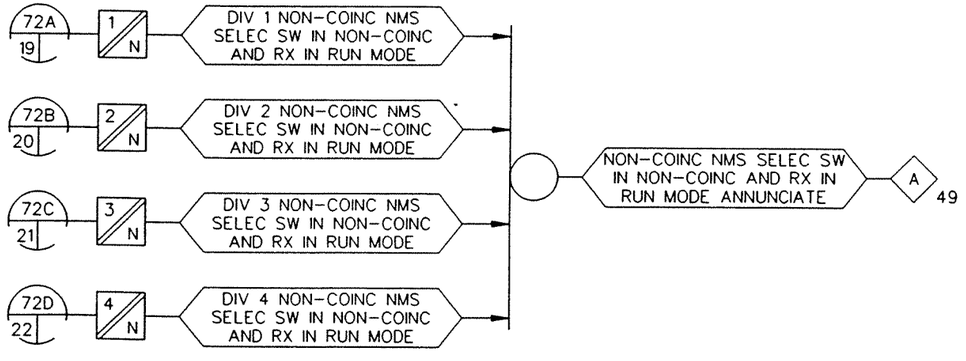
OTHERS

RPS ALARMS

FIGURE 7.2-10 REACTOR PROTECTION SYSTEM IBD (Sheet 70 of 72)







CONTROL SWITCH		
OBSERVATIONAL MEASURES		
USE	SPECIFICATION	LOCATION
ANNUNCIATOR		
NO.	INDICATOR	LOCATION
47	ALARM	MCR
48	ALARM	MCR
49	ALARM	MCR
OTHERS		
RPS ALARMS		

FIGURE 7.2-10 REACTOR PROTECTION SYSTEM IBD (Sheet 71 of 72)

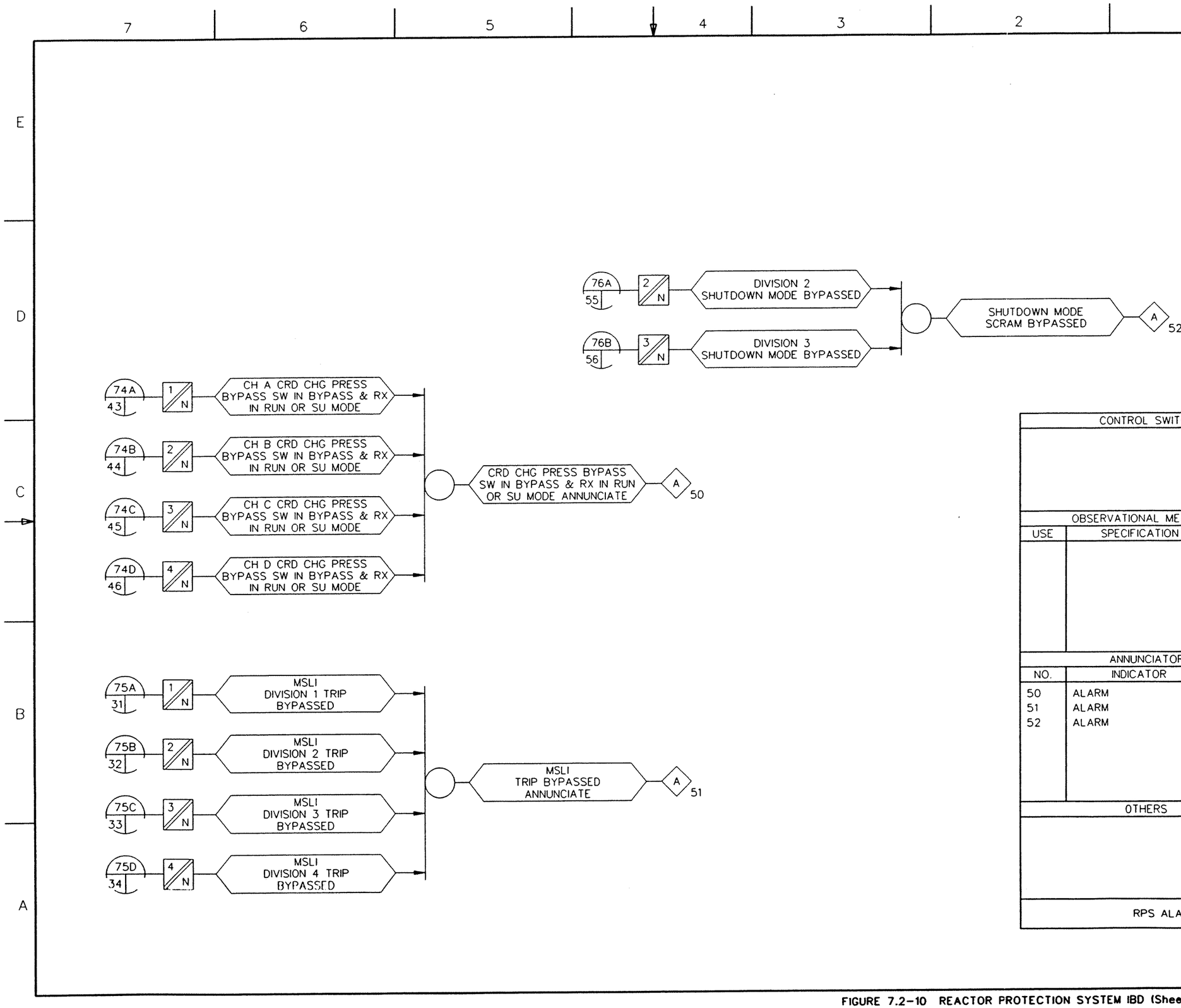


FIGURE 7.2-10 REACTOR PROTECTION SYSTEM IBD (Sheet 72 of 72)

NOTES:

1. ALL EQUIPMENT AND INSTRUMENTS FOR THIS SYSTEM ARE PREFIXED BY SYSTEM MPL NO. E22 UNLESS OTHERWISE NOTED.
2. DIVISIONAL SIGNALS SHALL BE ISOLATED FROM THE NON-IE ALARM.
3. SYSTEM R10, ELECTRICAL POWER DISTRIBUTION SYSTEM, SHALL PERMIT MOTOR TO START ONLY FOR PUMP VOLTAGE >70% NOMINAL.
4. THE LOGIC DESIGN SHALL INCORPORATE PROVISIONS TO REVERT 2/4 LOGIC TO 2/3 LOGIC DURING BYPASS OF A SINGLE DIVISION OF SENSORS. ALSO, THE LOGIC DESIGN SHALL NOT PERMIT THE BYPASS OF MORE THAN ONE DIVISION OF SENSORS AT A TIME.
5. SETPOINT VALUES ARE PRELIMINARY AND WILL BE FINALIZED IN DETAILED DESIGN.
6. THIS EQUIPMENT IS ALSO CONTROLLED BY THE REMOTE SHUTDOWN SYSTEM FOR HPCF LOOP "B" ONLY. SEE REF DOC-2 FOR DETAILED HPCF "B" AND RSS INTERFACES.
7. THE ELECTRICAL POWER DISTRIBUTION SYSTEM (REF DOC 6) SHALL PROVIDE PUMP STOP SIGNALS DUE TO BUS UNDERVOLTAGE (≤ 30% VOLTAGE) AND ANY OF THE FOLLOWING MOTOR PROTECTIVE RELAY TRIP SIGNALS:
   A. MOTOR UNDERCURRENT
   B. BUS DIFFERENTIAL CURRENT
   C. GROUND OVERCURRENT
8. UNLESS OTHERWISE SPECIFIED, POWER AND CONTROL CIRCUITS ARE DIVISIONS 2 AND 3 FOR LOOP B AND C RESPECTIVETLY.

TABLE OF CONTENTS

REFERENCE DOCUMENTS

	MPL NO.
1. NUCLEAR BOILER SYSTEM P&ID	B21-1010
2. REMOTE SHUTDOWN SYSTEM IBD	C61-1030
3. HPCF SYSTEM P&ID	E22-1010
4. NUCLEAR BOILER SYSTEM IBD	B21-1030
5. REMOTE SHUTDOWN SYSTEM IBD	C61-1030
6. ELECTRICAL POWER DISTRIBUTION SYSTEM	R10-1030
7. INTERLOCK BLOCK DIAGRAM (IBD) STANDARDS	A10-3070

FIGURE 7.3-1 HIGH PRESSURE CORE FLOODER SYSTEM IBD (Sheet 1 of 17)

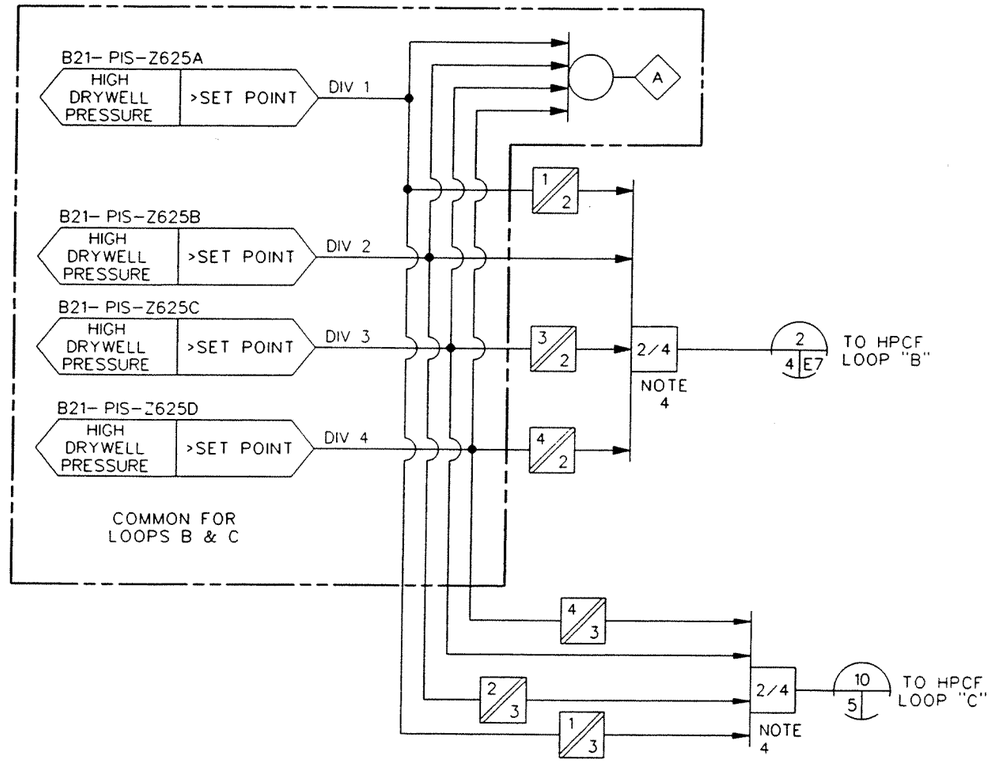
TABLE 1: ANNUNCIATORS/ALARM LIGHTS

INDICATION	FUNCTION	SOURCE OF SIGNAL
ALARM	LOW REACTOR WATER LEVEL 1.5	LOGIC OUTPUT
ALARM	HIGH DRYWELL PRESSURE	LOGIC OUTPUT
ALARM	HPCF PUMP MOTOR OVERLOAD LOOP B	M/C HPCF PUMP B POWER FAILURE
ALARM	HPCF PUMP MOTOR OVERLOAD LOOP C	M/C HPCF PUMP C POWER FAILURE
ALARM	OVERLOAD ANY HPCF VLV MOTOR LOOP B	MOTOR CONTROL CENTER
ALARM	OVERLOAD ANY HPCF VLV MOTOR LOOP C	MOTOR CONTROL CENTER
ALARM	HPCF LOOP B MANUAL INITIATION ARMED	PBS
ALARM	HPCF LOOP C MANUAL INITIATION ARMED	PBS
ALARM	HIGH REACTOR WATER LEVEL 8	LOGIC OUTPUT
ALARM	HPCF LOOP B INITIATED	LOGIC OUTPUT
ALARM	HPCF LOOP C AUTO INITIATION	LOGIC OUTPUT
ALARM	HPCF LOOP B OUT OF SERVICE	LOGIC OUTPUT, COS
ALARM	HPCF LOOP C OUT OF SERVICE	LOGIC OUTPUT, COS
ALARM	HPCF PUMP B LOW-LOW SUCTION PRESSURE	PSZ603B
ALARM	HPCF PUMP C LOW-LOW SUCTION PRESSURE	PSZ603C (MULTIPLEX)
ALARM	HPCF PUMP B DISCHARGE LINE NOT FILLED	PSZ602B-2
ALARM	HPCF PUMP B HIGH SUCTION PRESSURE	PSZ602B-1
ALARM	HPCF PUMP C DISCHARGE LINE NOT FILLED	PSZ602C-2
ALARM	HPCF PUMP C HIGH SUCTION PRESSURE	PSZ602C-1
WHITE LIGHT	HPCF PUMP B MANUAL OVERRIDE	LOGIC OUTPUT, CS
WHTE LIGHT	HPCF PUMP C MANUAL OVERRIDE OF AUTO INITIATION	LOGIC OUTPUT, CS
WHITE LIGHT	HPCF INJECTION VALVE F003B MANUAL OVERRIDE	LOGIC OUTPUT, CS
WHITE LIGHT	HPCF INJECTION VALVE F003C MANUAL OVERRIDE OF AUTO INITIATION	LOGIC OUTPUT, CS
WHITE LIGHT	HPCF LOOP B INITIATION SEALED-IN	LOGIC OUTPUT
WHITE LIGHT	HPCF LOOP C AUTO INITIATION SEALED-IN	LOGIC OUTPUT
ALARM	HPCF C MANUAL INITIATION	PBS
ALARM	HPCF C PUMP C LOW-LOW SUCTION PRESSURE	PS603C (HARDWIRED)
WHITE LIGHT	HPCF C MANUAL INITIATION SEALED-IN	LOGIC OUTPUT
WHITE LIGHT	HPCF C INJECTION VALVE F003C MANUAL OVERRIDE OF MANUAL INITIATION	LOGIC OUTPUT, CS

TABLE 1: ANNUNCIATORS/ALARM LIGHTS (CONT'D)

INDICATION	FUNCTION	SOURCE OF SIGNAL
ALARM	HPCF LOOP B LOW CST WATER LEVEL	LOGIC OUTPUT
ALARM	HPCF LOOP B HIGH SUPPR POOL WATER LEVEL	LOGIC OUTPUT
ALARM	HPCF LOOP C LOW CST WATER LEVEL	LOGIC OUTPUT
ALARM	HPCF LOOP C HIGH SUPPR POOL WATER LEVEL	LOGIC OUTPUT
WHITE LIGHT	HPCF LOOP B HIGH REACTOR WATER LEVEL 8 SEALED-IN	LOGIC OUTPUT
WHITE LIGHT	HPCF LOOP C HIGH REACTOR WATER LEVEL 8 SEALED-IN	LOGIC OUTPUT
ALARM	HPCF LOOP B PUMP CONTROL SW IN PULL LOCK	PULL LOCK
ALARM	HPCF LOOP C PUMP CONTROL SW IN PULL LOCK	PULL LOCK
ALARM	HPCF LOOP B LOSS OF LOGIC POWER SOURCE	LOGIC OUTPUT
ALARM	HPCF LOOP C LOSS OF LOGIC POWER SOURCE	LOGIC OUTPUT
ALARM	HPCF LOOP B TESTING	CS
ALARM	HPCF LOOP C TESTING	CS
ALARM	HPCF PUMP B TRIP	LOGIC OUTPUT
ALARM	HPCF PUMP C TRIP	LOGIC OUTPUT
ALARM	EMERGENCY CONTAINMENT FLOODING -CST/SP SUCTION TRANSFER OVERRIDE LOOP B	KOS
ALARM	EMERGENCY CONTAINMENT FLOODING-CST/SP SUCTION TRANSFER OVERRIDE LOOP C	KOS
ALARM	MCC EQUIPMENT IN TEST MODE (THERMAL RELAY NOT BYPASSED) FOR LOOP B	KOS
ALARM	MCC EQUIPMENT IN TEST MODE (THERMAL RELAY NOT BYPASSED) FOR LOOP C	KOS
ALARM	HPCF LOOP B FLOW LOW	FIS-Z608B, PS-Z607B
ALARM	HPCF LOOP C FLOW LOW	FIS-Z608C, PS-Z607C

FIGURE 7.3-1 HIGH PRESSURE CORE FLOODER SYSTEM IBD (Sheet 2 of 17)



HPCF – LOOP B INITIATION LOGIC (CONT'D ON SH 4)

TYPICAL FOR LOOP C EXCEPT AS NOTED

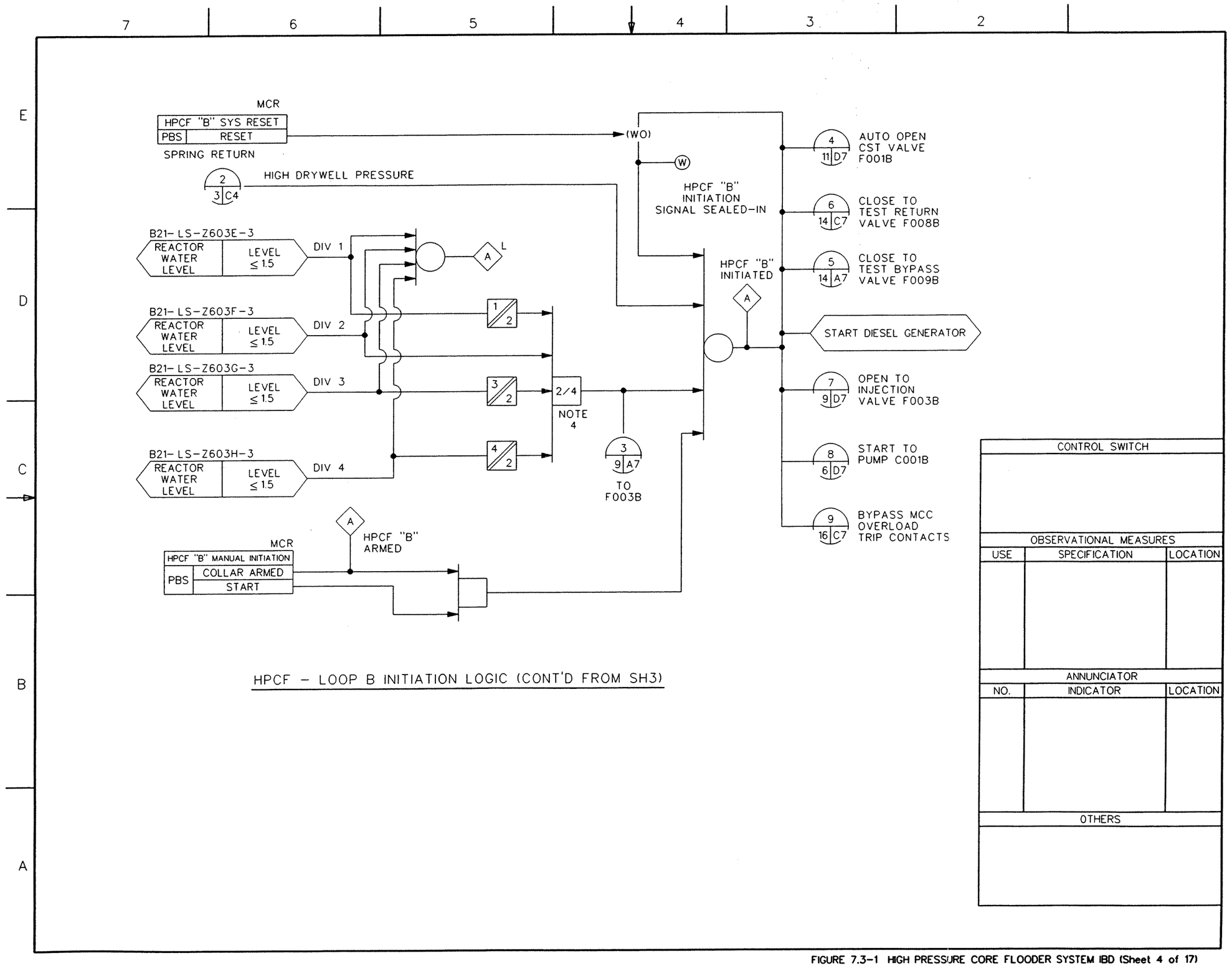
CONTROL SWITCH

OBSERVATIONAL MEASURES		
USE	SPECIFICATION	LOCATION

ANNUNCIATOR		
NO.	INDICATOR	LOCATION

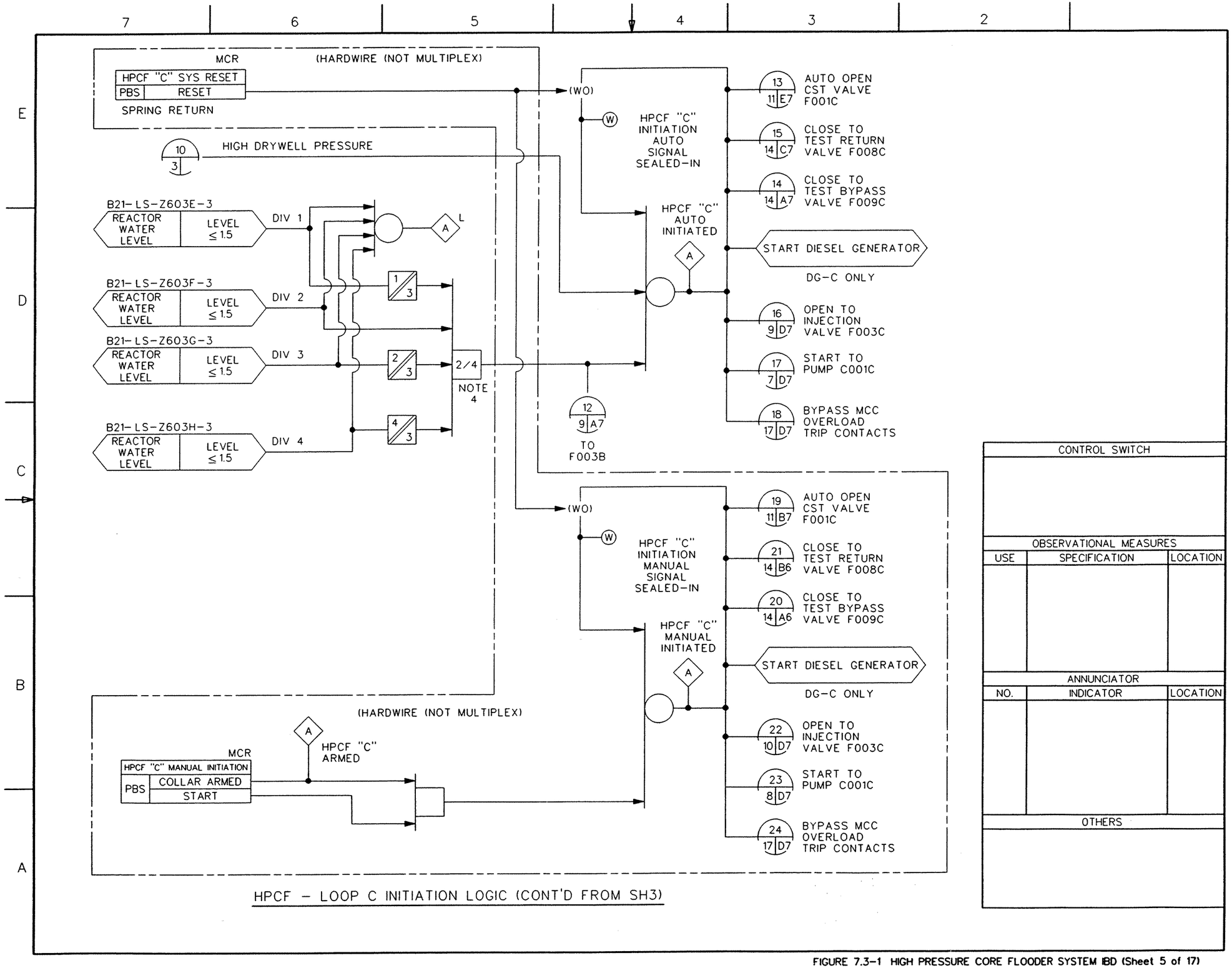
OTHERS

FIGURE 7.3–1 HIGH PRESSURE CORE FLOODER SYSTEM I&D (Sheet 3 of 17)



HPCF – LOOP B INITIATION LOGIC (CONT'D FROM SH3)

FIGURE 7.3-1 HIGH PRESSURE CORE FLOODER SYSTEM IBD (Sheet 4 of 17)



HPCF – LOOP C INITIATION LOGIC (CONT'D FROM SH3)

FIGURE 7.3-1 HIGH PRESSURE CORE FLOODER SYSTEM IBD (Sheet 5 of 17)

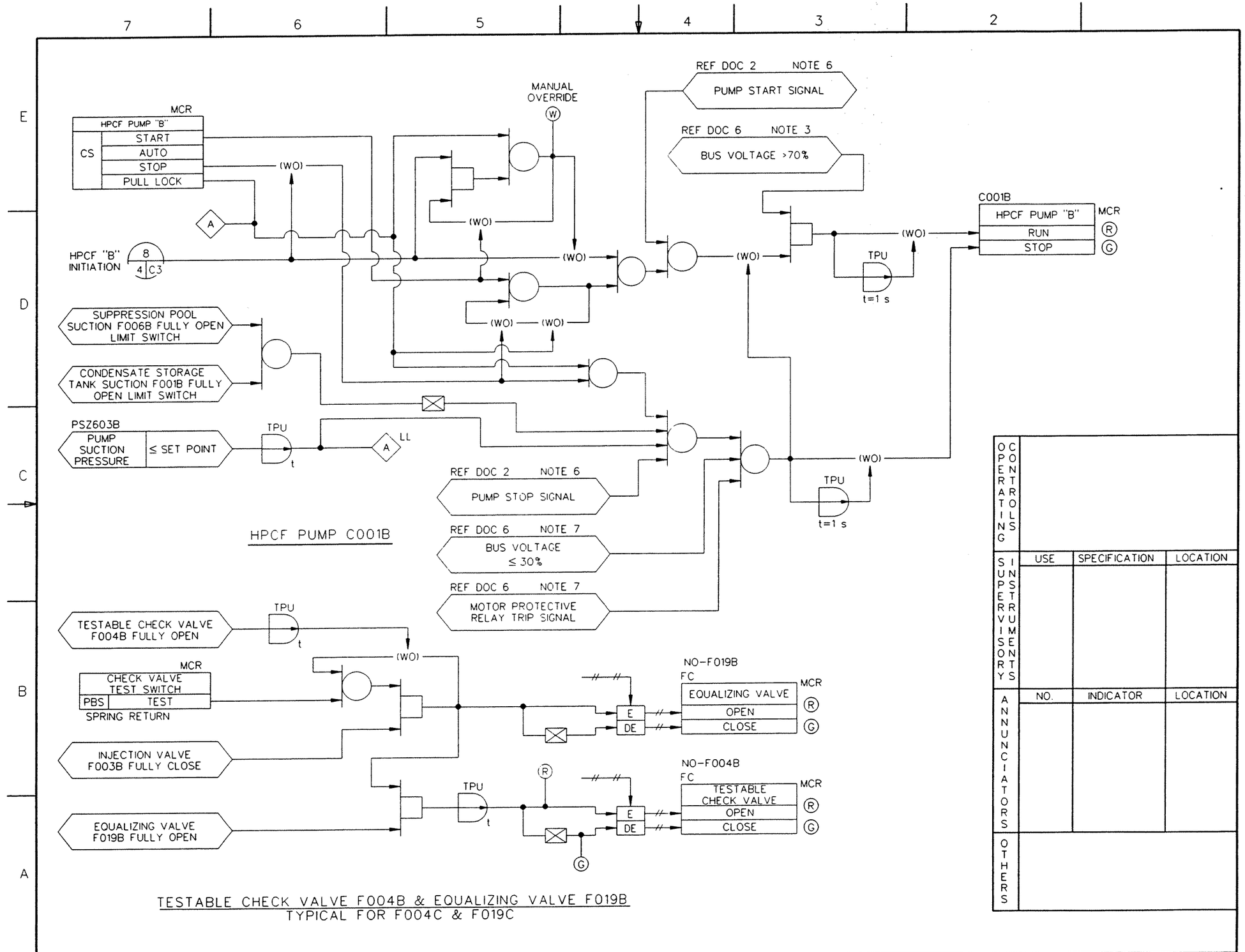


FIGURE 7.3-1 HIGH PRESSURE CORE FLOODER SYSTEM IBD (Sheet 6 of 17)

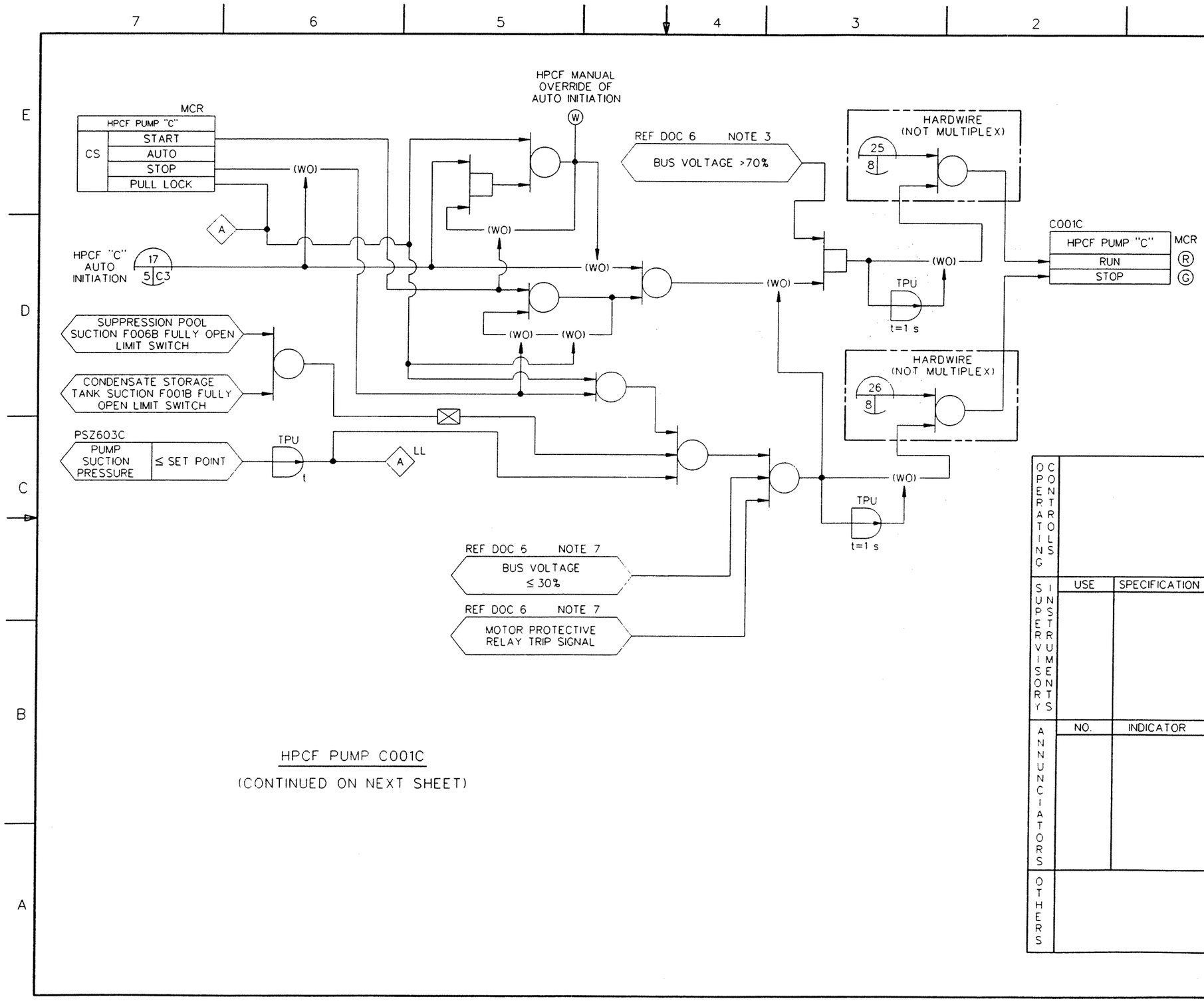


FIGURE 7.3-1 HIGH PRESSURE CORE FLOODER SYSTEM IBD (Sheet 7 of 17)

HARDWIRE (NOT MULTIPLEX)

MCR
HPCF PUMP "C"
CS: START / AUTO / STOP

(WO)

HPCF "C" MANUAL INITIATION — 23 / 5 | A3

SUPPRESSION POOL SUCTION F006B FULLY OPEN LIMIT SWITCH

CONDENSATE STORAGE TANK SUCTION F001B FULLY OPEN LIMIT SWITCH

PS603C
PUMP SUCTION PRESSURE ≤ SET POINT

TPU t

LL A

REF DOC 6 NOTE 3
BUS VOLTAGE >70%

(WO)

TPU t=1 SEC

(WO) 25 / 7

(WO) 26 / 7

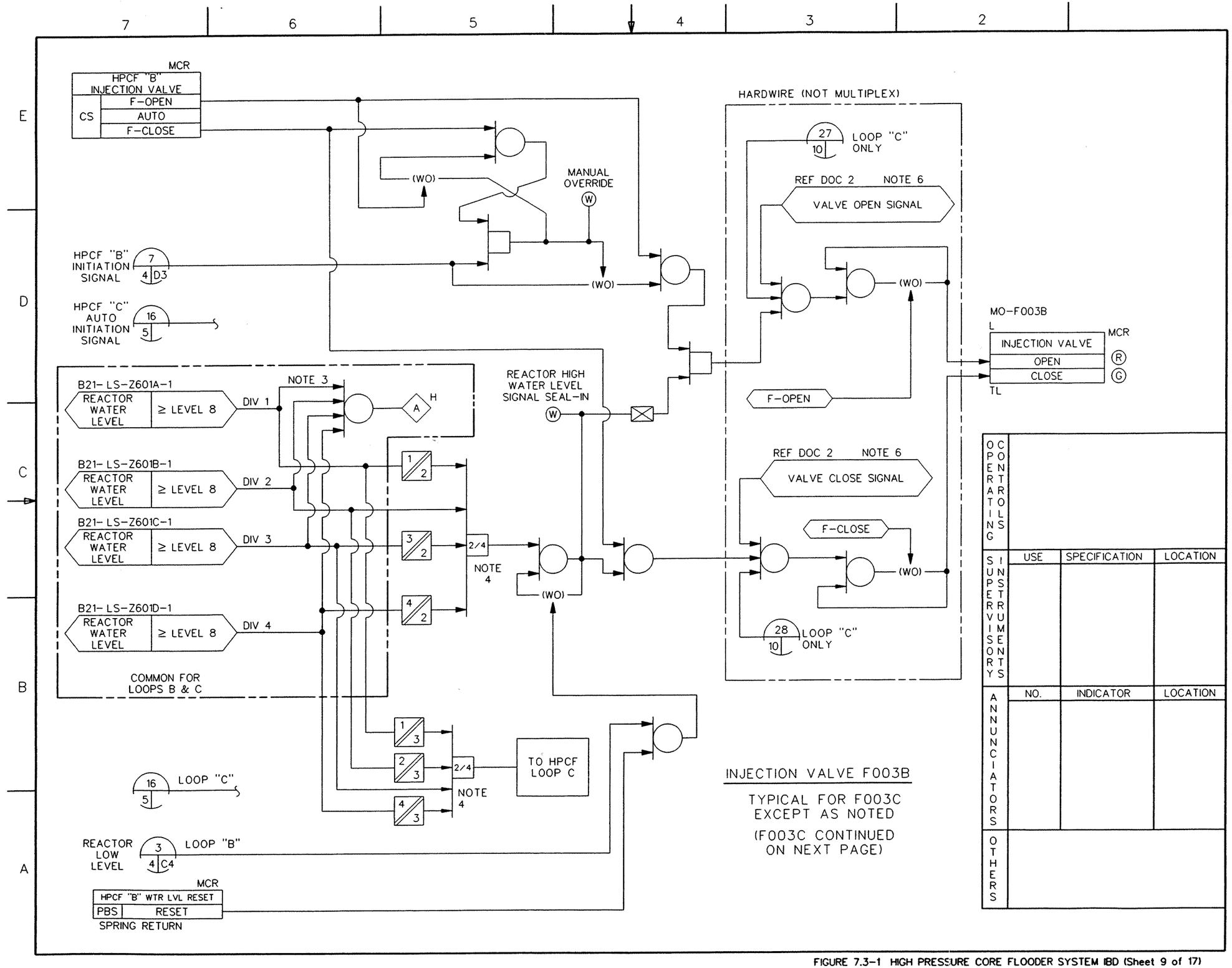
REF DOC 6 NOTE 7
BUS VOLTAGE ≤ 30%

REF DOC 6 NOTE 7
MOTOR PROTECTIVE RELAY TRIP SIGNAL

HPCF PUMP C001C

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

FIGURE 7.3-1 HIGH PRESSURE CORE FLOODER SYSTEM IBD (Sheet 8 of 17)

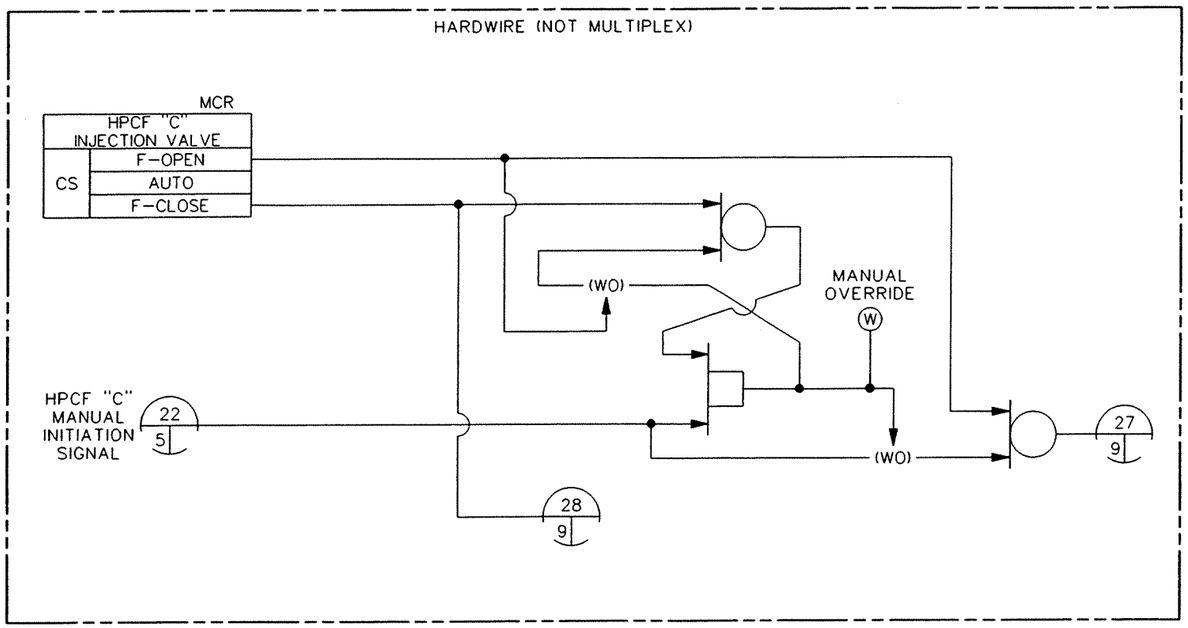


INJECTION VALVE F003B

TYPICAL FOR F003C EXCEPT AS NOTED

(F003C CONTINUED ON NEXT PAGE)

FIGURE 7.3-1 HIGH PRESSURE CORE FLOODER SYSTEM IBD (Sheet 9 of 17)



INJECTION VALVE F003C

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

FIGURE 7.3-1 HIGH PRESSURE CORE FLOODER SYSTEM IBD (Sheet 10 of 17)

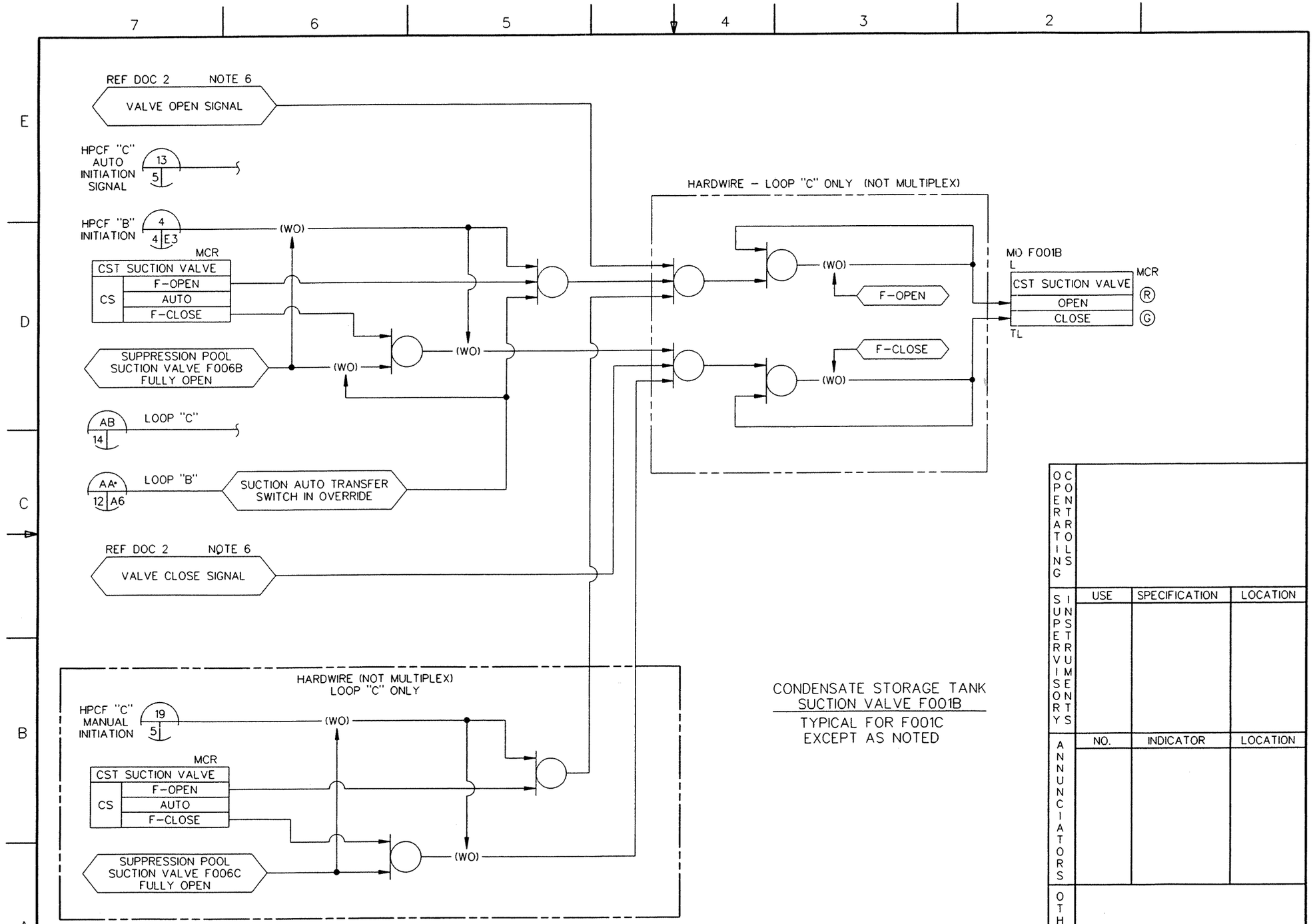


FIGURE 7.3-1 HIGH PRESSURE CORE FLOODER SYSTEM IBD (Sheet 11 of 17)

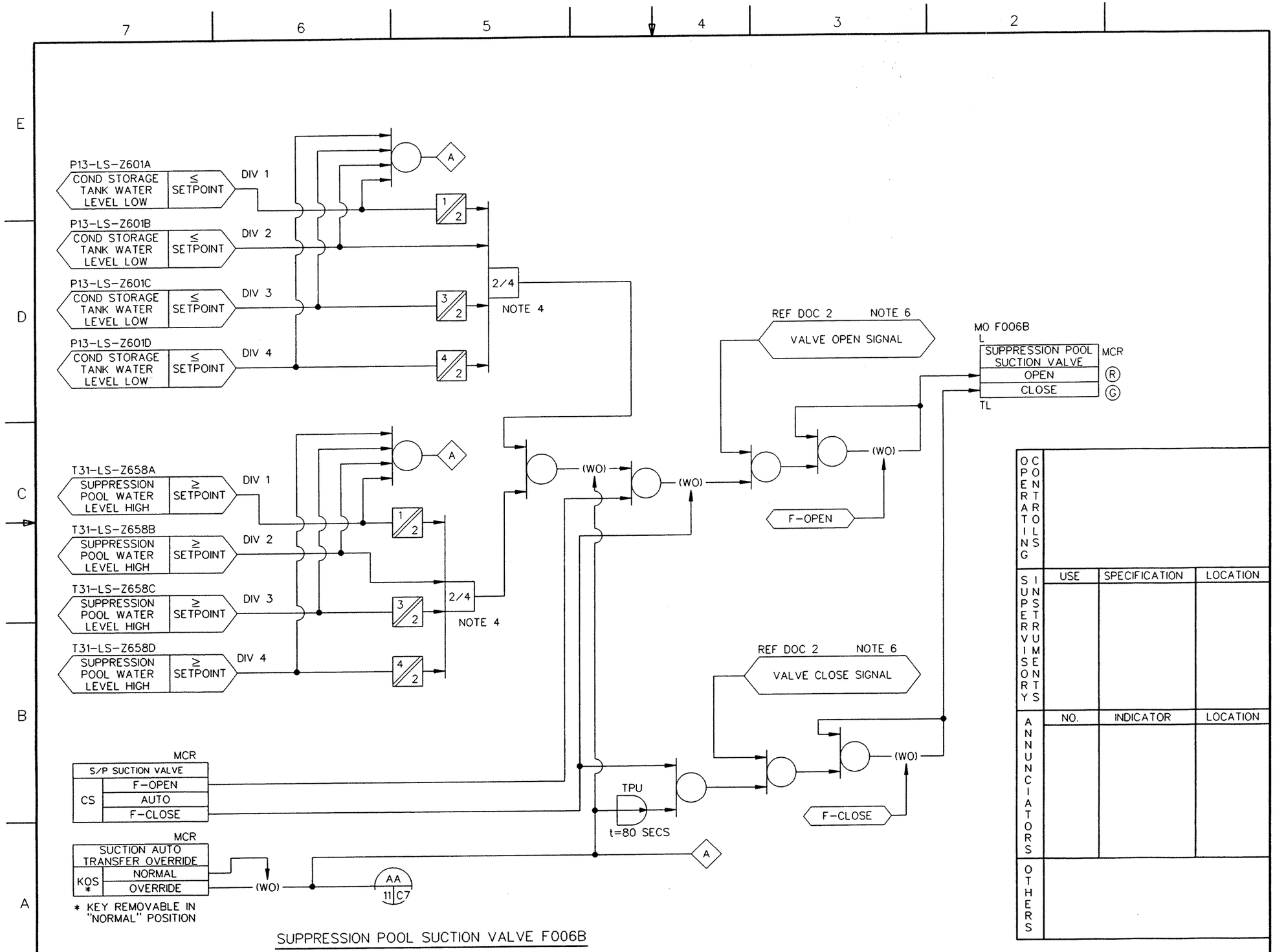


FIGURE 7.3-1 HIGH PRESSURE CORE FLOODER SYSTEM IBD (Sheet 12 of 17)

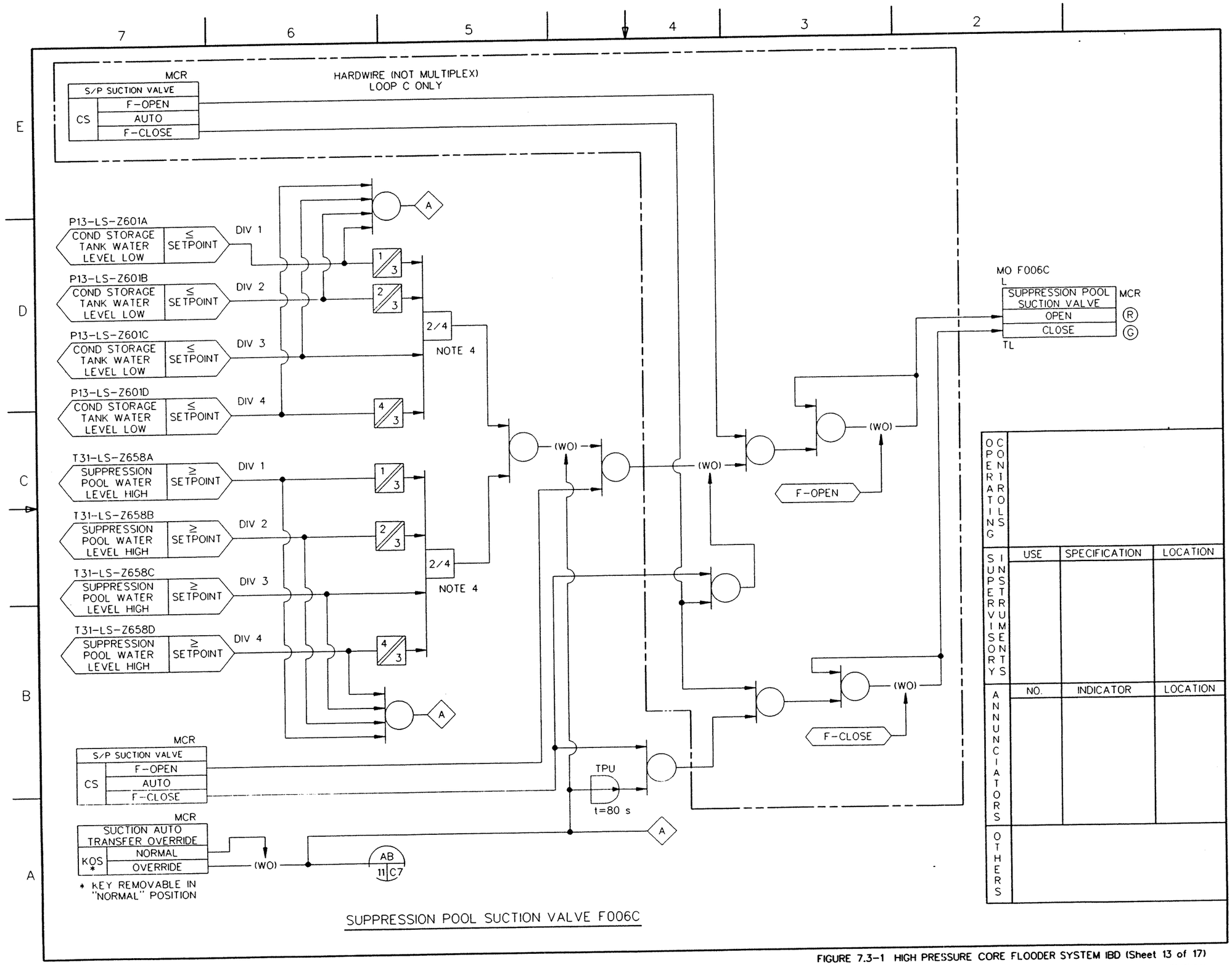


FIGURE 7.3-1 HIGH PRESSURE CORE FLOODER SYSTEM IBD (Sheet 13 of 17)

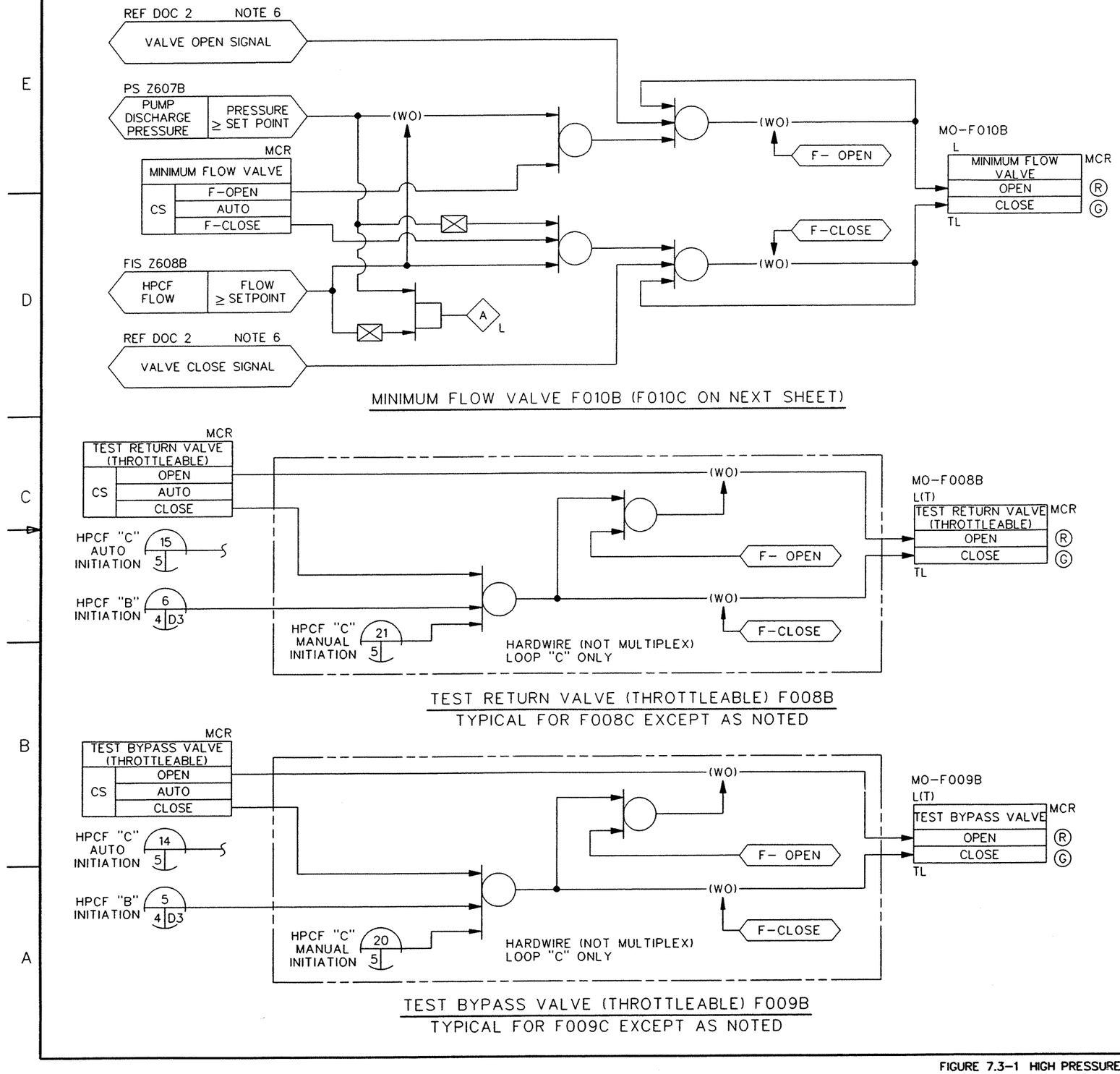
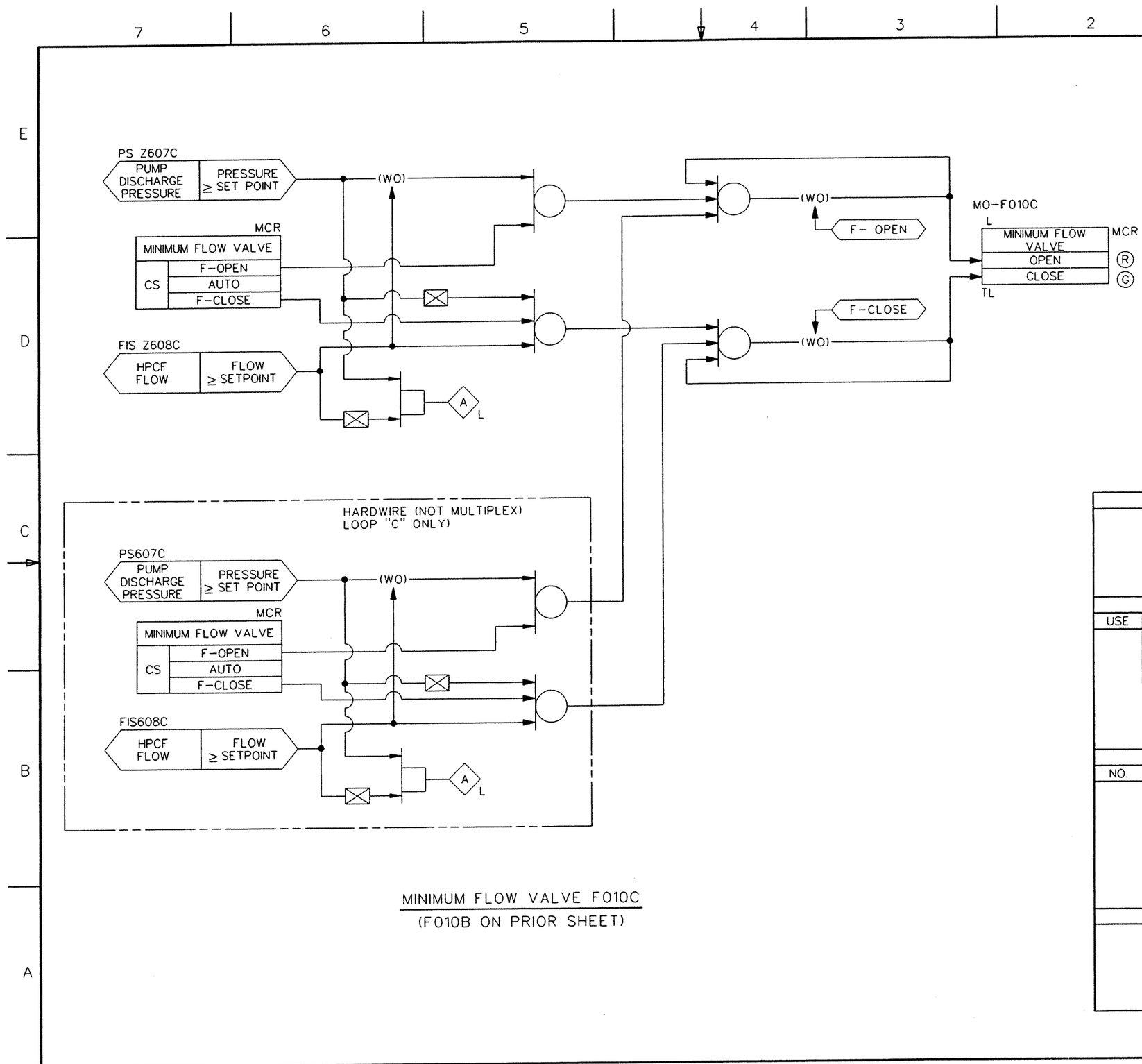


FIGURE 7.3-1 HIGH PRESSURE CORE FLOODER SYSTEM IBD (Sheet 14 of 17)



MINIMUM FLOW VALVE F010C
(F010B ON PRIOR SHEET)

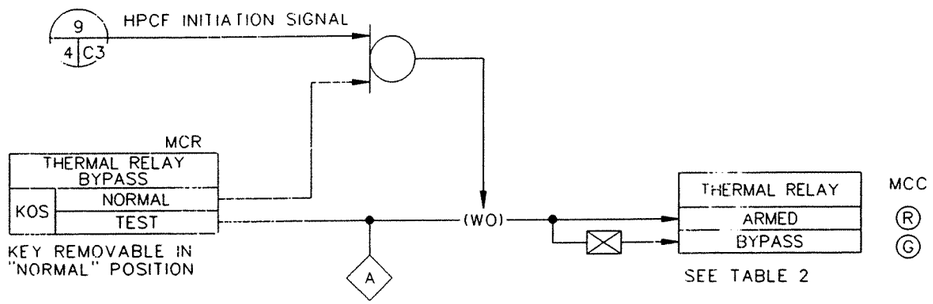
FIGURE 7.3-1 HIGH PRESSURE CORE FLOODER SYSTEM IBD (Sheet 15 of 17)

TABLE 2: THERMAL RELAY BYPASS MCC EQUIPMENT LIST
FOR HPCF LOOP B (TYPICAL FOR HPCF LOOP C)

SYSTEM	EQUIPMENT ID	DESCRIPTION
HPCF LOOP B	E22-MO-F001B	HPCF CST SUCTION VALVE
	E22-MO-F003B	HPCF INJECTION VALVE
	E22-MO-F006B	HPCF S/P SUCTION VALVE
	E22-MO-F008B	HPCF TEST RETURN VALVE (THROTTLEABLE)
	E22-MO-F009B	HPCF TEST BYPASS VALVE
	E22-MO-F010B	HPCF MINIMUM FLOW VALVE

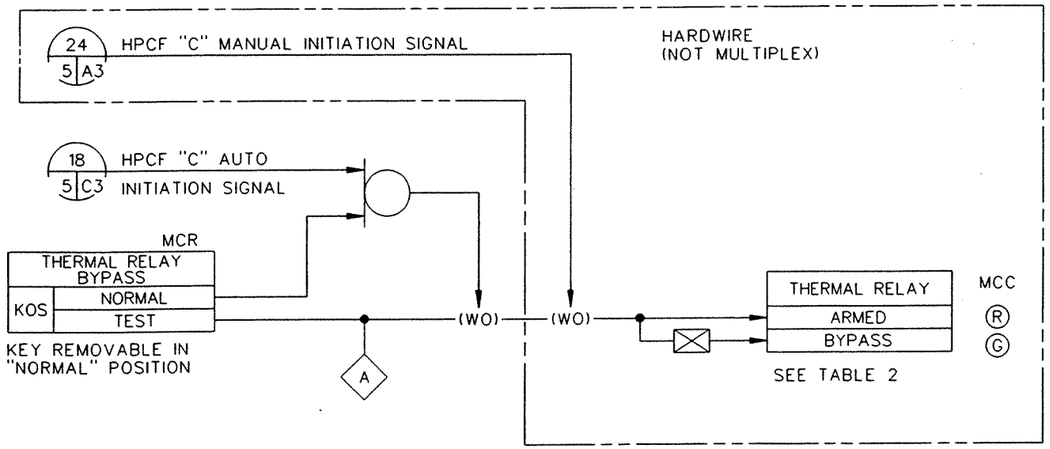
HPCF LOOP B - THERMAL RELAY BYPASS LOGIC

(LOOP "C" ON NEXT SHEET)



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

FIGURE 7.3-1 HIGH PRESSURE CORE FLOODER SYSTEM IBD (Sheet 16 of 17)



HPCF LOOP "C" – THERMAL RELAY BYPASS LOGIC

(LOOP "B" ON PRIOR SHEET)

CONTROL SWITCH

OBSERVATIONAL MEASURES		
USE	SPECIFICATION	LOCATION

ANNUNCIATOR		
NO.	INDICATOR	LOCATION

OTHERS

FIGURE 7.3-1 HIGH PRESSURE CORE FLOODER SYSTEM IBD (Sheet 17 of 17)

SH. NO.	TITLES
1	CONTENTS
2	NOTES AND REFERENCES
3	SRV LOGIC AND CONTROL DIVISION 1 FOR SRV F010P
4	SRV LOGIC AND CONTROL DIVISION 2 FOR SRV F010J
5	SRV LOGIC AND CONTROL DIVISIONS 3(2,3) FOR SRV'S F010M(F010S, F010B)
6	SRV LOGIC AND CONTROL DIVISION 1 FOR SRV F010G
7	SRV LOGIC AND CONTROL DIVISION 1 FOR SRV F010K
8	SRV LOGIC AND CONTROL DIVISIONS 2(3,1) FOR SRV'S F010E(F010U, F010D)
9	SRV LOGIC AND CONTROL DIVISIONS 2(3,1,2) FOR SRV'S F010N(F010H, F010T, F010C)
10	SRV LOGIC AND CONTROL DIVISIONS 3(1,2,3) FOR SRV'S F010L(F010F, F010R, F010A)
11	ADS LOGIC AND CONTROL
12	ADS LOGIC AND CONTROL (CONTINUED)
13	ADS LOGIC AND CONTROL (CONTINUED)
14	ADS LOGIC AND CONTROL (CONTINUED)
15	ADS LOGIC AND CONTROL (CONTINUED)
16	ADS LOGIC AND CONTROL (CONTINUED)
17	ADS LOGIC AND CONTROL (CONTINUED)
18	ADS LOGIC AND CONTROL (CONTINUED)
19	FEEDWATER VALVES F001A(F001B)
20	FEEDWATER CHECK VALVES F003A(F003B)
21	FEEDWATER GATE VALVES F005A(F005B)
22	CUW RETURN FW LOOP SELECTOR VALVES F007A(F007B)
23	MAIN STEAM BYPASS/DRAIN ISOLATION VALVE F011(F012)
24	STEAM LINE DRAIN VALVES F013(F014, F016)
25	MAIN STEAM DRAIN LINE AOV'S F015(F017)
26	RPV HEAD VENT VALVES F018(F019, F020)
27	RPV WATER LEVEL ALARMS AND INDICATORS
28	LOW RPV METAL & BOTTOM DRAIN TEMPERATURE ALARM & RECORDER
29	HIGH DRYWELL PRESSURE ALARMS AND INDICATORS
30	SRV VALVE STEM POSITION ALARM
31	SRV DISCHARGE LINE AND RPV VENT DISCHARGE LINE HIGH TEMP ALARM
32	MSIV VALVE STEM POSITION SWITCHES
33	RPV HEAD SEAL LEAKOFF HIGH PRESSURE ALARM
34	ANNUNCIATOR LIST
35	ANNUNCIATOR LIST (CONTINUED)
36	SSLC (LDS/ECCS) BLOCK DIAGRAM DIV 1 (TYPICAL FOR DIV 2 & DIV 3)
37	SSLC (LDS/ECCS) BLOCK DIAGRAM (CONTINUED)

MPL NO. B21-1030

CONTENTS

FIGURE 7.3-2 NUCLEAR BOILER SYSTEM IBD (Sheet 1 of 37)

NOTES:

1. PRESSURES SHALL BE IN MPa g.
2. THE ADS LOAD DRIVERS SHALL BE CONNECTED SO THAT IT IS NECESSARY TO ENERGIZE BOTH ADS CHANNELS TO ACTUATE THE ADS VALVES.
3. PARTS OF THE LOGIC AND CONTROL SYSTEM FOR THE OPERATION OF THE SRV'S IN THE RELIEF MODE ARE CLASSIFIED AS NON-SAFETY RELATED BUT THE TOTAL SYSTEM IS DESIGNED AS A SAFETY RELATED SYSTEM.
4. DIVISION 2 IS THE SAME AS DIVISION 1 EXCEPT THAT DIVISION 2 SUFFIX LETTERS ARE THOSE IDENTIFIED IN PARENTHESIS.
5. NUMBERS OR LETTERS IN PARENTHESIS DESIGNATE THOSE APPLICABLE TO THE SRV'S WHICH FOLLOW IN SEQUENCE AFTER THE FIRST IN THE GROUP OF 3 OR 4 SRV'S.
6. THE LOGIC SHALL INCORPORATE PROVISIONS TO REVERT 2/4 LOGIC TO 2/3 LOGIC DURING BYPASS OF A SINGLE DIVISION OF SENSORS. ALSO, THE LOGIC DIAGRAM SHALL NOT PERMIT THE BYPASS OF MORE THAN ONE DIVISION OF SENSORS AT A TIME. THE PROVISIONS ARE ILLUSTRATED IN THE SSLC BLOCK DIAGRAM, SH 36, ZONES B4 & C4.
7. ISOLATORS ARE NOT REQUIRED WHERE THE SAME DIVISIONAL LOGIC IS USED FOR BOTH INPUT SIGNALS AND LOGIC.
8. (A) FO IS "FAIL OPEN", FOR EXAMPLE, VALVE OPENS ON LOSS OF POWER AND/OR LOSS OF PNEUMATIC OR HYDRAULIC PRESSURE.

   (B) FC IS "FAIL CLOSED"; FOR EXAMPLE, VALVE CLOSES ON LOSS OF POWER AND/OR LOSS OF PNEUMATIC OR HYDRAULIC PRESSURE.
9. SEE TABLE 1 FOR ANNUNCIATOR/ALARM LIGHT INFORMATION, SH 34 & 35.
10. ALL ANNUNCIATORS ARE LOCATED IN THE MAIN CONTROL ROOM UNLESS OTHERWISE NOTED.
11. THE SRV OUTPUT LOGIC SHALL INCLUDE PROVISIONS TO BYPASS ONE OF TWO CHANNEL OUTPUTS AND TO REVERT 2/2 LOGIC TO 1/1 LOGIC WHEN BYPASSED. THE PROVISIONS ARE ILLUSTRATED IN THE SSLC BLOCK DIAGRAM, SH 36 & 37. ALSO SEE NOTE 3 ON SH 37. POWER SOURCE CONNECTIONS FOR SRV'S ARE 125V DC AND 125V DC RETURN AS SHOWN.
12. ADS OUTPUT LOGIC SHALL NOT INCLUDE PROVISIONS TO BYPASS THE DUAL OUTPUTS. SINGLE CHANNEL FAILURE IN ONE ADS DIVISION SHALL CAUSE LOSS OF OUTPUT FUNCTION IN THAT ADS DIVISION ONLY AS SHOWN ON SH 37.
13. MONITOR THE CONTINUITY OF THE SRV ADS SOLENOIDS BY APPLICATION OF A NON-ENERGIZING CURRENT TO EACH SOLENOID.
14. INTERMEDIATE PROCESSOR WHICH PREVENTS THE FAILURE OF THE NON-SAFETY RELATED DATA FROM AFFECTING THE SAFETY RELATED LOGIC.
15. THIS SIGNAL LINE SHALL BE HARDWIRED. INDICATORS REQUIRED TO BE HARDWIRED ARE SHOWN ON THIS DRAWING.
16. SIGNALS TO ANNUNCIATORS AND NON-SAFETY INDICATORS SHALL BE OPTICALLY ISOLATED FROM THE SAFETY RELATED INPUT SIGNAL.

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

		MPL NO.
1.	NUCLEAR BOILER SYSTEM, P&ID	B21-1010
2.	REMOTE SHUTDOWN SYS, IBD	C61-1030
3.	RESIDUAL HEAT REMOVAL SYSTEM, P&ID	E11-1010
4.	HIGH PRESSURE CORE FLOODER, P&ID	E22-1010
5.	LEAK DETECTION SYSTEM, IBD	E31-1030
6.	REACTOR PROTECTION SYSTEM, IED	C71-1040
7.	TURBINE CONTROL SYSTEM, IBD	N32-1030

SUPPORTING DOCUMENTS	MPL NO.
1. INTERLOCK BLOCK DIAGRAM (IBD) STANDARD	A10-3070

NOTES AND REFERENCES

FIGURE 7.3-2 NUCLEAR BOILER SYSTEM IBD (Sheet 2 of 37)

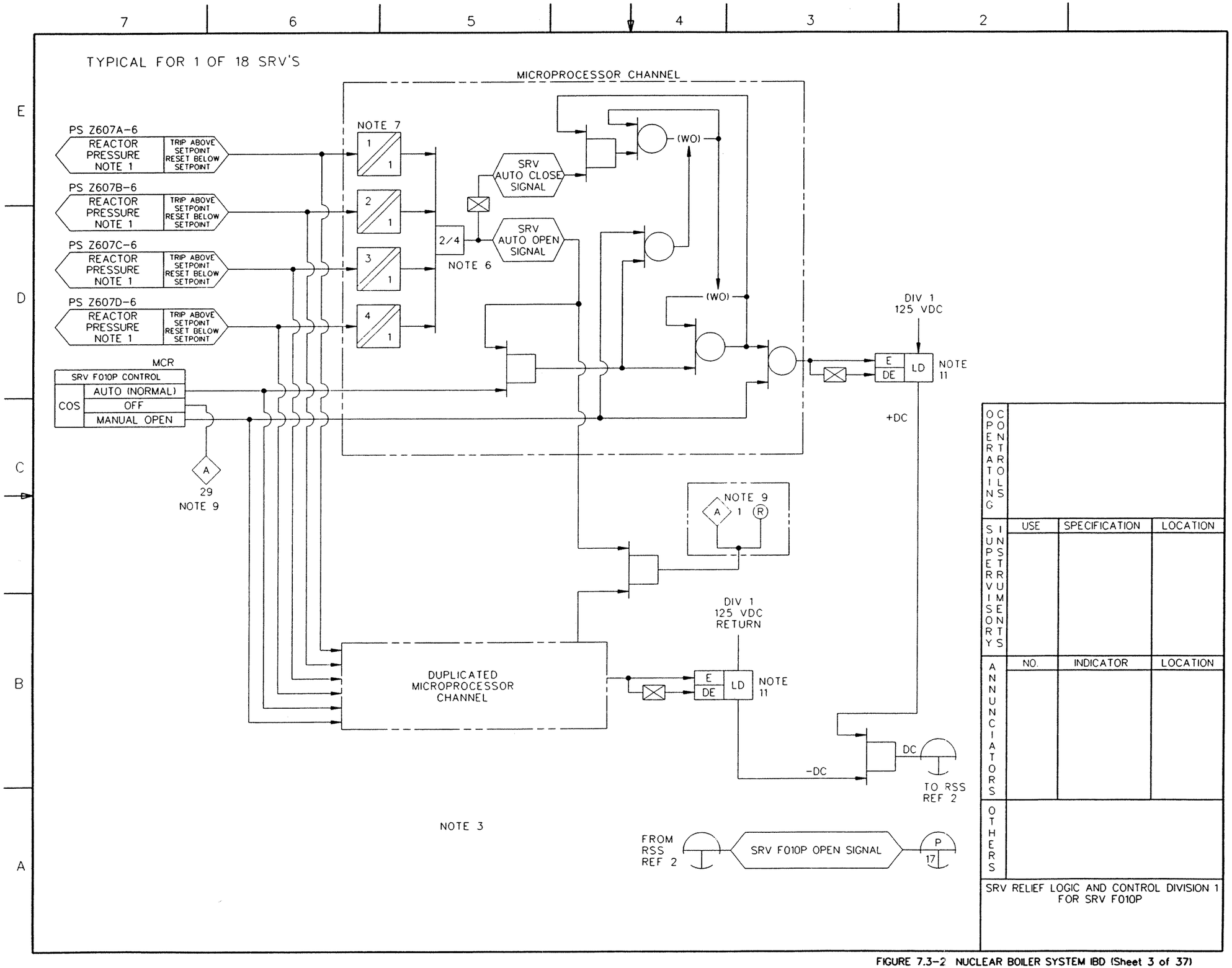


FIGURE 7.3-2 NUCLEAR BOILER SYSTEM IBD (Sheet 3 of 37)

TYPICAL FOR 1 OF 18 SRV'S

MICROPROCESSOR CHANNEL

PS Z607A-5
REACTOR PRESSURE NOTE 1 — TRIP ABOVE SETPOINT, RESET BELOW SETPOINT

PS Z607B-5
REACTOR PRESSURE NOTE 1 — TRIP ABOVE SETPOINT, RESET BELOW SETPOINT

PS Z607C-5
REACTOR PRESSURE NOTE 1 — TRIP ABOVE SETPOINT, RESET BELOW SETPOINT

PS Z607D-5
REACTOR PRESSURE NOTE 1 — TRIP ABOVE SETPOINT, RESET BELOW SETPOINT

NOTE 7
1/2, 2/2, 3/2, 4/2

2/4
NOTE 6

SRV AUTO CLOSE SIGNAL

SRV AUTO OPEN SIGNAL

(WO)

(WO)

MCR
SRV F010J CONTROL
COS: AUTO (NORMAL), OFF, MANUAL OPEN

A
30
NOTE 9

DIV 2
125 VDC

E / DE / LD
NOTE 11

+DC

NOTE 9
A 2 R

DIV 2
125 VDC
RETURN

DUPLICATED MICROPROCESSOR CHANNEL

E / DE / LD
NOTE 11

-DC

DC

TO RSS
REF 2

NOTE 3

FROM RSS REF 2

SRV F010J OPEN SIGNAL

J
17

OPERATING CONTROLS

SUPERVISORY INSTRUMENTS

USE	SPECIFICATION	LOCATION

ANNUNCIATORS

NO.	INDICATOR	LOCATION

OTHERS

SRV RELIEF LOGIC & CONTROL DIVISION 2
FOR SRV F010J

FIGURE 7.3–2 NUCLEAR BOILER SYSTEM IBD (Sheet 4 of 37)

TYPICAL FOR 3 OF 18 SRV'S – NOTE 5

MICROPROCESSOR CHANNEL

PS Z607A-4
REACTOR PRESSURE NOTE 1
TRIP ABOVE SETPOINT
RESET BELOW SETPOINT

PS Z607B-4
REACTOR PRESSURE NOTE 1
TRIP ABOVE SETPOINT
RESET BELOW SETPOINT

PS Z607C-4
REACTOR PRESSURE NOTE 1
TRIP ABOVE SETPOINT
RESET BELOW SETPOINT

PS Z607D-4
REACTOR PRESSURE NOTE 1
TRIP ABOVE SETPOINT
RESET BELOW SETPOINT

NOTE 7
1/3 (2,3)
2/3 (2,3)
3/3 (2,3)
4/3 (2,3)

2/4
NOTE 6

SRV AUTO CLOSE SIGNAL
SRV AUTO OPEN SIGNAL

(WO)
(WO)

DIV 3(2,3)
125 VDC

E
DE
LD
NOTE 11

+DC

MCR
SRV F010M(S,B) CONTROL
COS
AUTO (NORMAL)
OFF
MANUAL OPEN

A
31(32,34)
NOTE 9

DIV 3(2,3)
125 VDC
RETURN

DUPLICATED MICROPROCESSOR CHANNEL

E
DE
LD
NOTE 11

DC
M
17
(S,B)

-DC

NOTE 3

OPERATING CONTROLS

SUPERVISORY INSTRUMENTS

USE	SPECIFICATION	LOCATION

ANNUNCIATORS

NO.	INDICATOR	LOCATION

OTHERS

SRV RELIEF LOGIC & CONTROL DIV'S 3(2,3)
FOR SRV'S F010M(F010S,F010B)

FIGURE 7.3-2 NUCLEAR BOILER SYSTEM IBD (Sheet 5 of 37)

TYPICAL FOR 1 OF 18 SRV'S

MICROPROCESSOR CHANNEL

PS Z607A-4
REACTOR PRESSURE NOTE 1 — TRIP ABOVE SETPOINT / RESET BELOW SETPOINT

PS Z607B-4
REACTOR PRESSURE NOTE 1 — TRIP ABOVE SETPOINT / RESET BELOW SETPOINT

PS Z607C-4
REACTOR PRESSURE NOTE 1 — TRIP ABOVE SETPOINT / RESET BELOW SETPOINT

PS Z607D-4
REACTOR PRESSURE NOTE 1 — TRIP ABOVE SETPOINT / RESET BELOW SETPOINT

NOTE 7
1/1
2/1
3/1
4/1

2/4
NOTE 6

SRV AUTO CLOSE SIGNAL
SRV AUTO OPEN SIGNAL

(WO)
(WO)

DIV 1
125 VDC

E
DE
LD
NOTE 11

+DC

MCR
SRV F010G CONTROL
COS
AUTO (NORMAL)
OFF
MANUAL OPEN

A
33
NOTE 9

DIV 1
125 VDC
RETURN

DUPLICATED MICROPROCESSOR CHANNEL

E
DE
LD
NOTE 11

DC
-DC

TO RSS
REF 2

NOTE 3

FROM RSS REF 2
SRV F010G OPEN SIGNAL
G
17

OPERATING CONTROLS

SUPERVISORY INSTRUMENTS

USE	SPECIFICATION	LOCATION

ANNUNCIATORS

NO.	INDICATOR	LOCATION

OTHERS

SRV RELIEF LOGIC AND CONTROL DIVISION 1
FOR SRV F010G

FIGURE 7.3-2 NUCLEAR BOILER SYSTEM IBD (Sheet 6 of 37)

TYPICAL FOR 1 OF 18 SRV'S

MICROPROCESSOR CHANNEL

PS Z607A-3
REACTOR PRESSURE NOTE 1 — TRIP ABOVE SETPOINT, RESET BELOW SETPOINT

PS Z607B-3
REACTOR PRESSURE NOTE 1 — TRIP ABOVE SETPOINT, RESET BELOW SETPOINT

PS Z607C-3
REACTOR PRESSURE NOTE 1 — TRIP ABOVE SETPOINT, RESET BELOW SETPOINT

PS Z607D-3
REACTOR PRESSURE NOTE 1 — TRIP ABOVE SETPOINT, RESET BELOW SETPOINT

NOTE 7
1/1
2/1
3/1
4/1
2/4
NOTE 6

SRV AUTO CLOSE SIGNAL
SRV AUTO OPEN SIGNAL
(WO)
(WO)

DIV 1
125 VDC
E
DE
LD
NOTE 11
+DC

MCR
SRV F010K CONTROL
COS
AUTO (NORMAL)
OFF
MANUAL OPEN

A
35
NOTE 9

DIV 1
125 VDC
RETURN

DUPLICATED MICROPROCESSOR CHANNEL

E
DE
LD
NOTE 11

DC
-DC
TO RSS REF 2

NOTE 3

FROM RSS REF 2
SRV F010K OPEN SIGNAL
K
17

OPERATING CONTROLS

SUPERVISORY INSTRUMENTS

USE	SPECIFICATION	LOCATION

ANNUNCIATORS

NO.	INDICATOR	LOCATION

OTHERS

SRV RELIEF LOGIC AND CONTROL DIVISION 1
FOR SRV F010K

FIGURE 7.3-2 NUCLEAR BOILER SYSTEM IBD (Sheet 7 of 37)

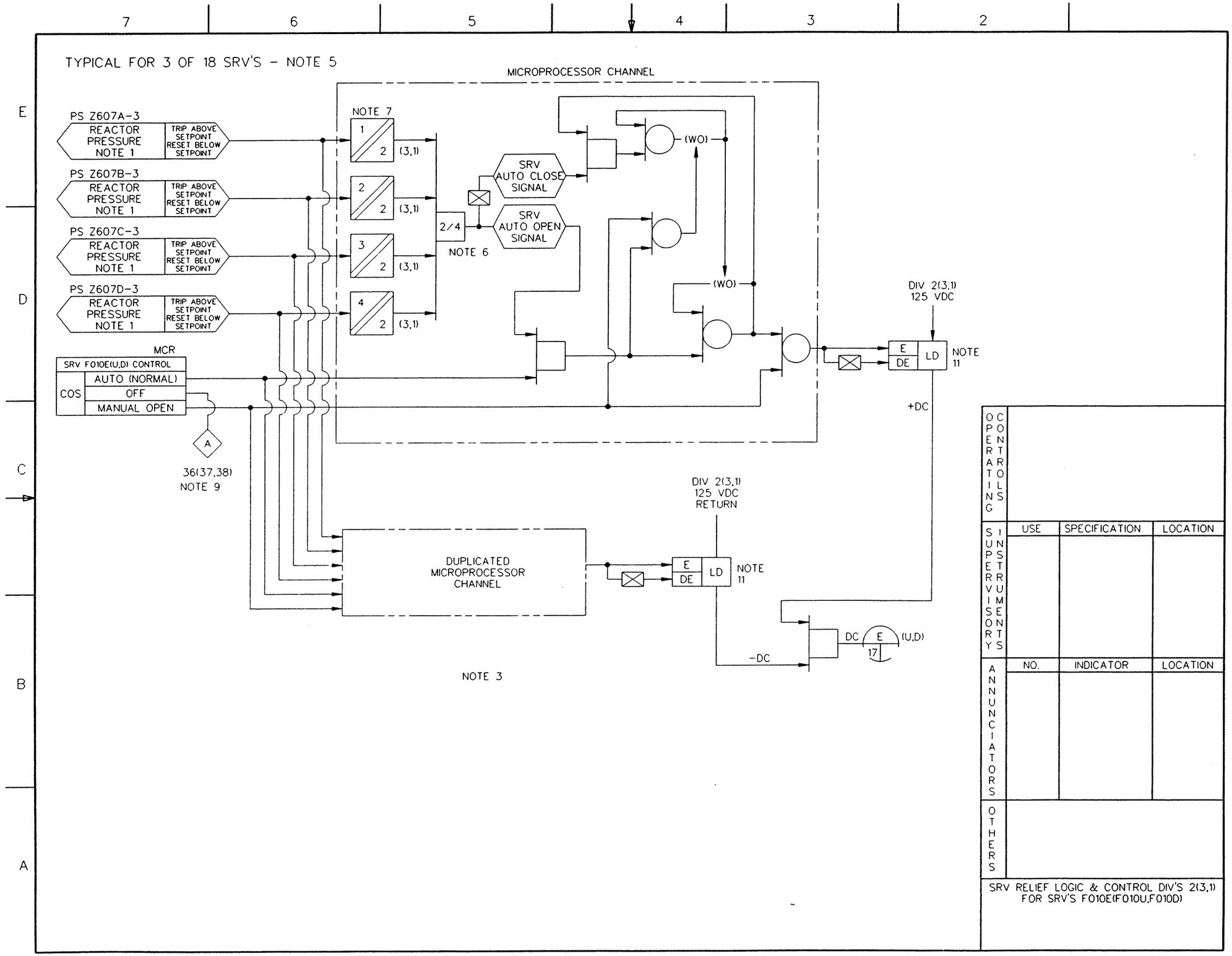


FIGURE 7.3-2 NUCLEAR BOILER SYSTEM IBD (Sheet 8 of 37)

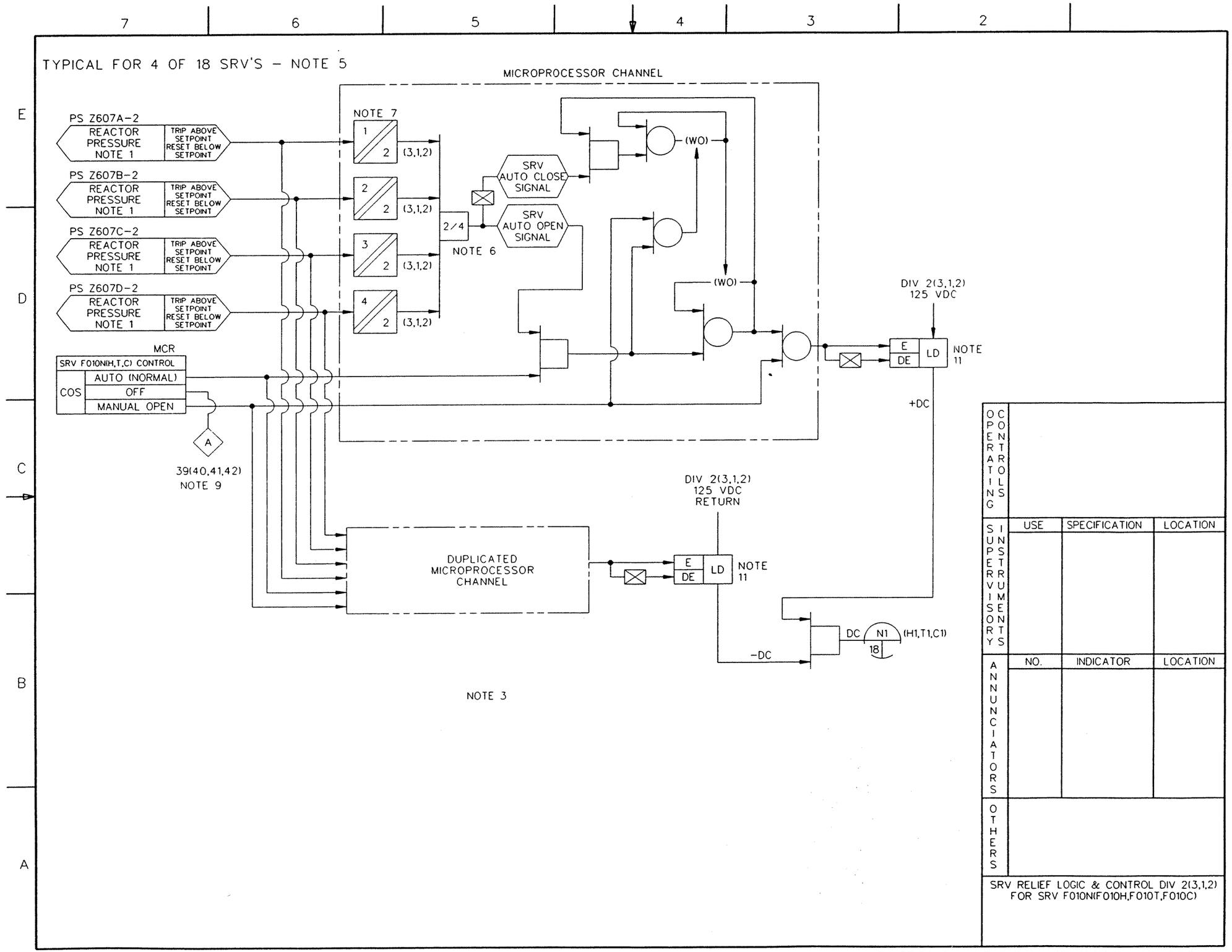
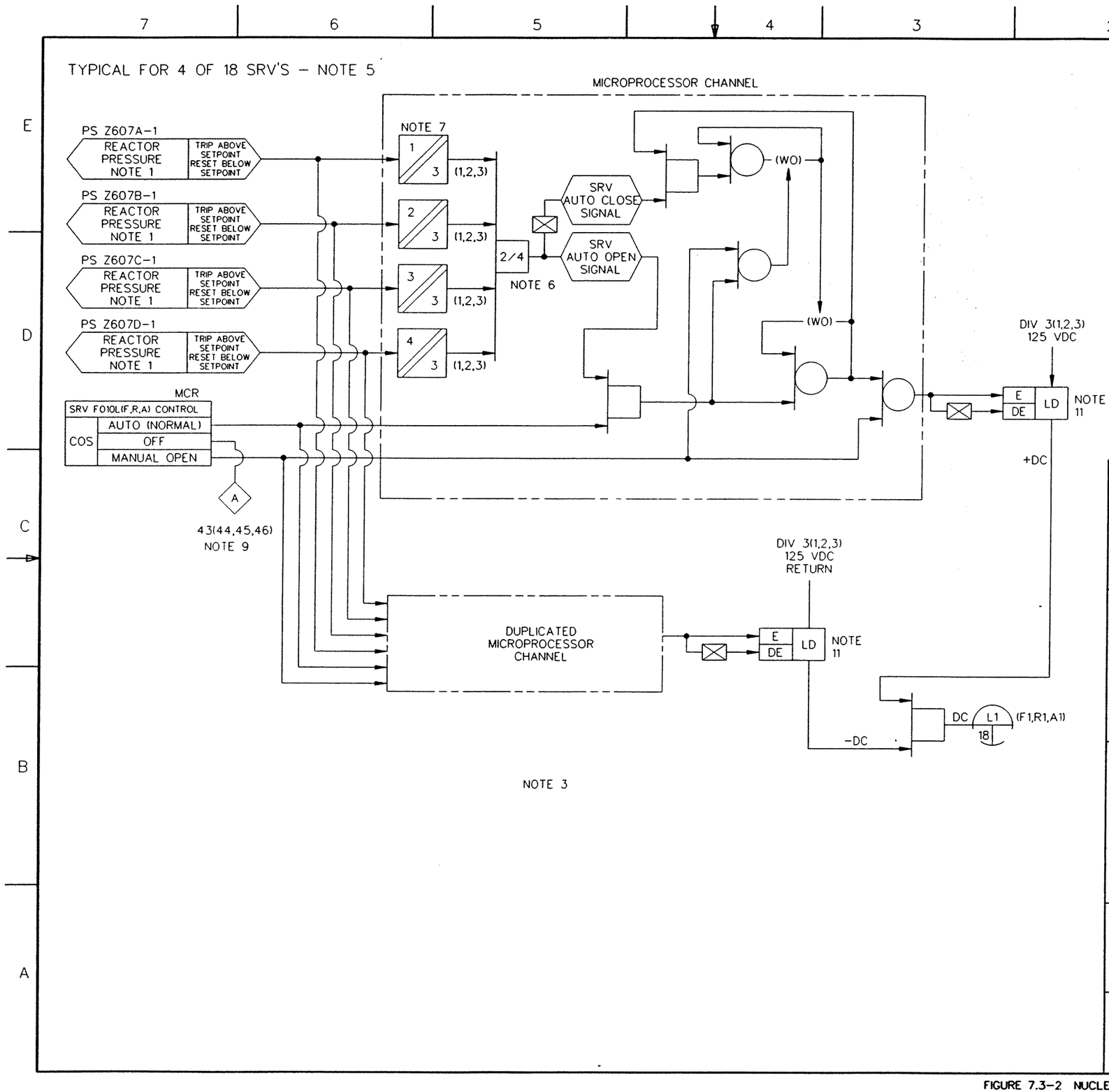


FIGURE 7.3-2 NUCLEAR BOILER SYSTEM (BD (Sheet 9 of 37)



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

SRV RELIEF LOGIC & CONTROL DIV 3(1,2,3)
FOR SRV F010L(F010F,F010R,F010A)

FIGURE 7.3-2 NUCLEAR BOILER SYSTEM ISD (Sheet 10 of 37)

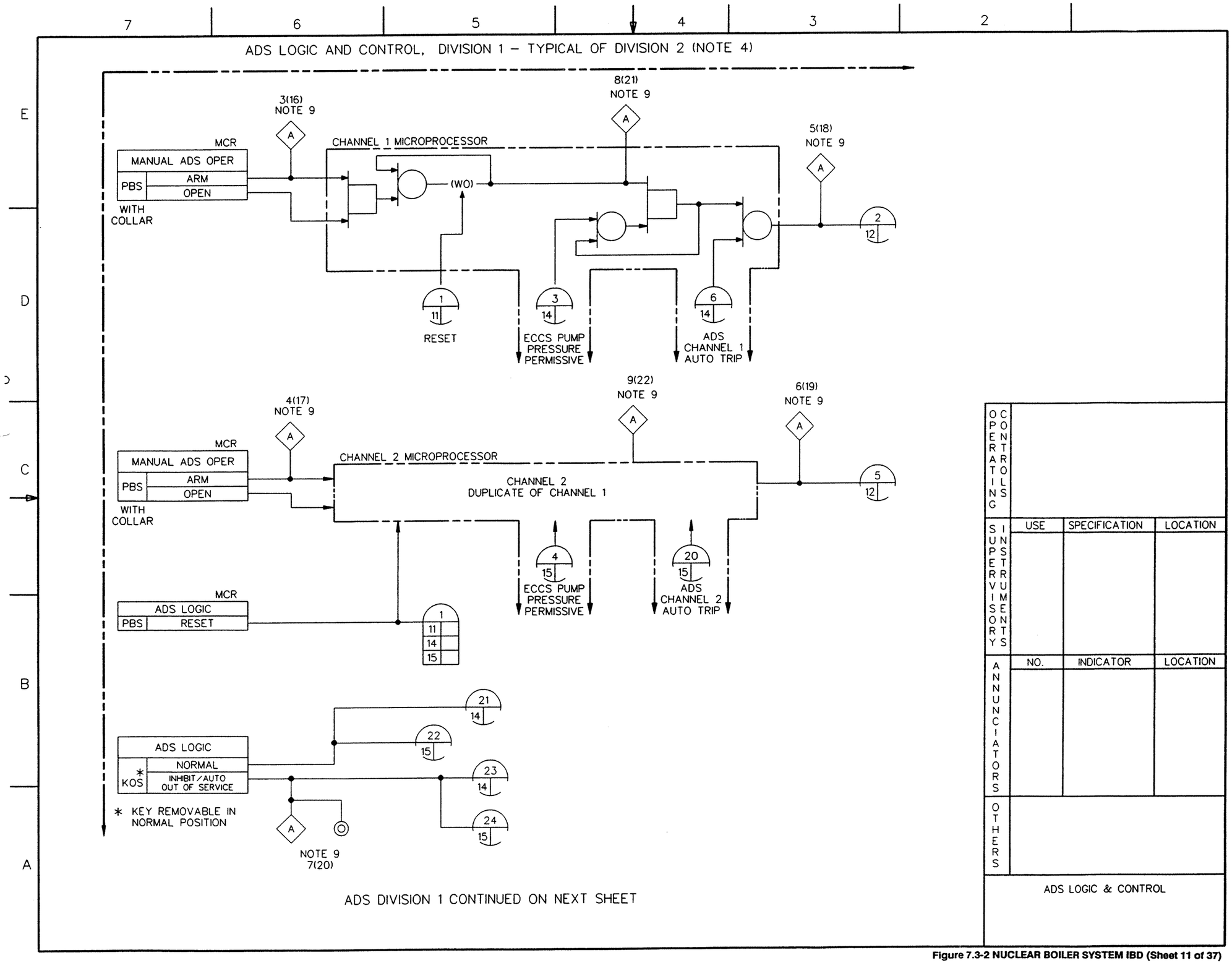
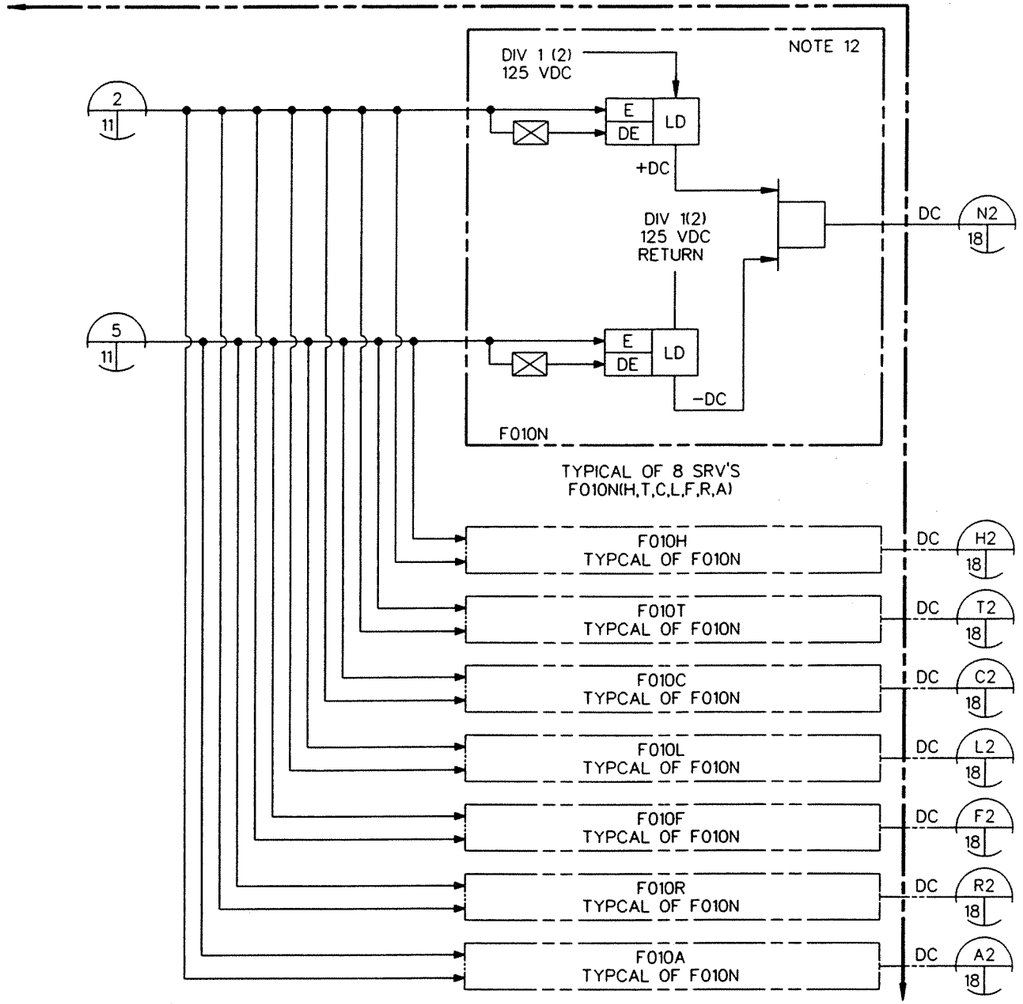


Figure 7.3-2 NUCLEAR BOILER SYSTEM IBD (Sheet 11 of 37)

ADS LOGIC AND CONTROL, DIVISION 1 – TYPICAL OF DIVISION 2 (NOTE 4)



ADS DIVISION 1 CONTINUED ON NEXT SHEET

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

ADS LOGIC & CONTROL (CONT'D)

Figure 7.3-2 NUCLEAR BOILER SYSTEM IBD (Sheet 12 of 37)

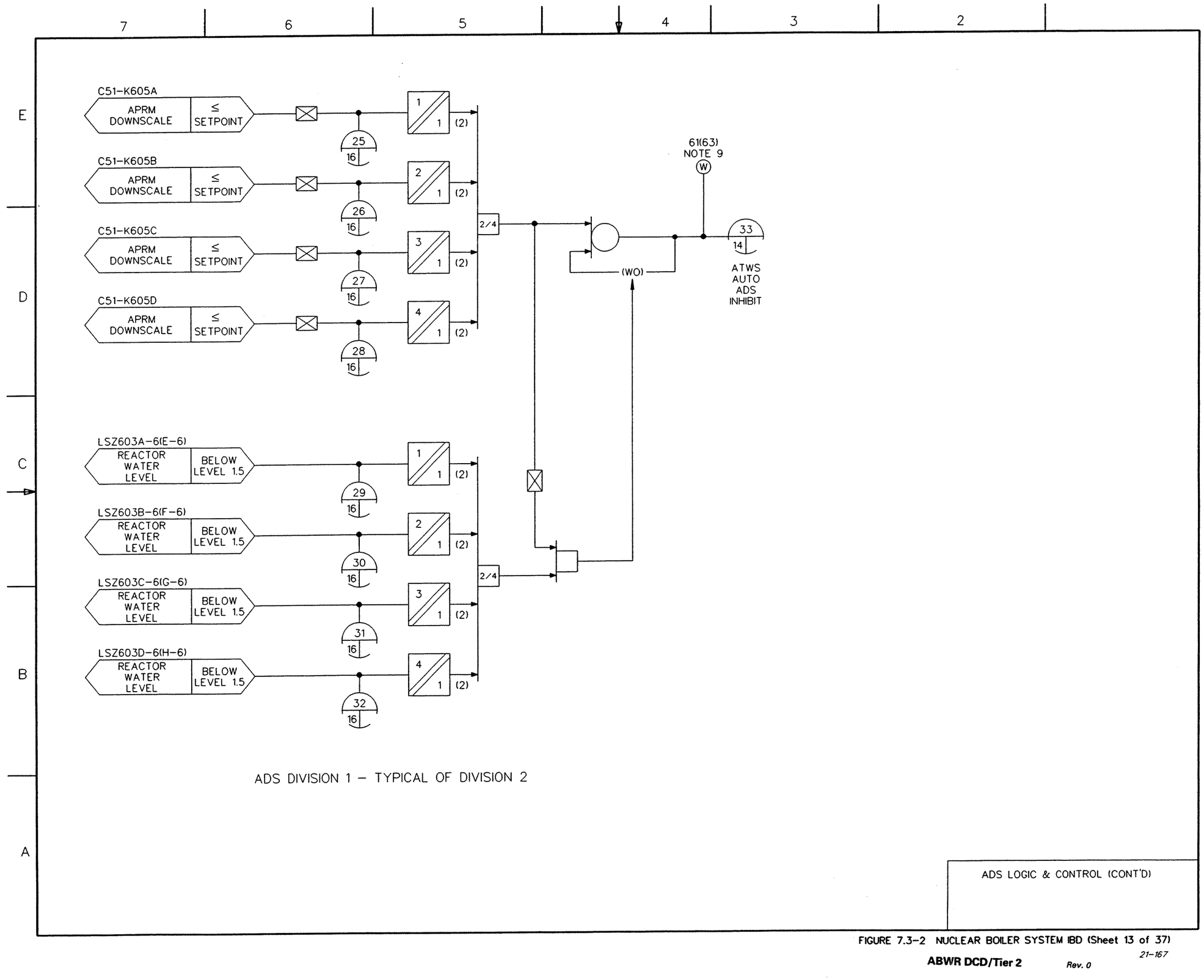


FIGURE 7.3-2 NUCLEAR BOILER SYSTEM IBD (Sheet 13 of 37)

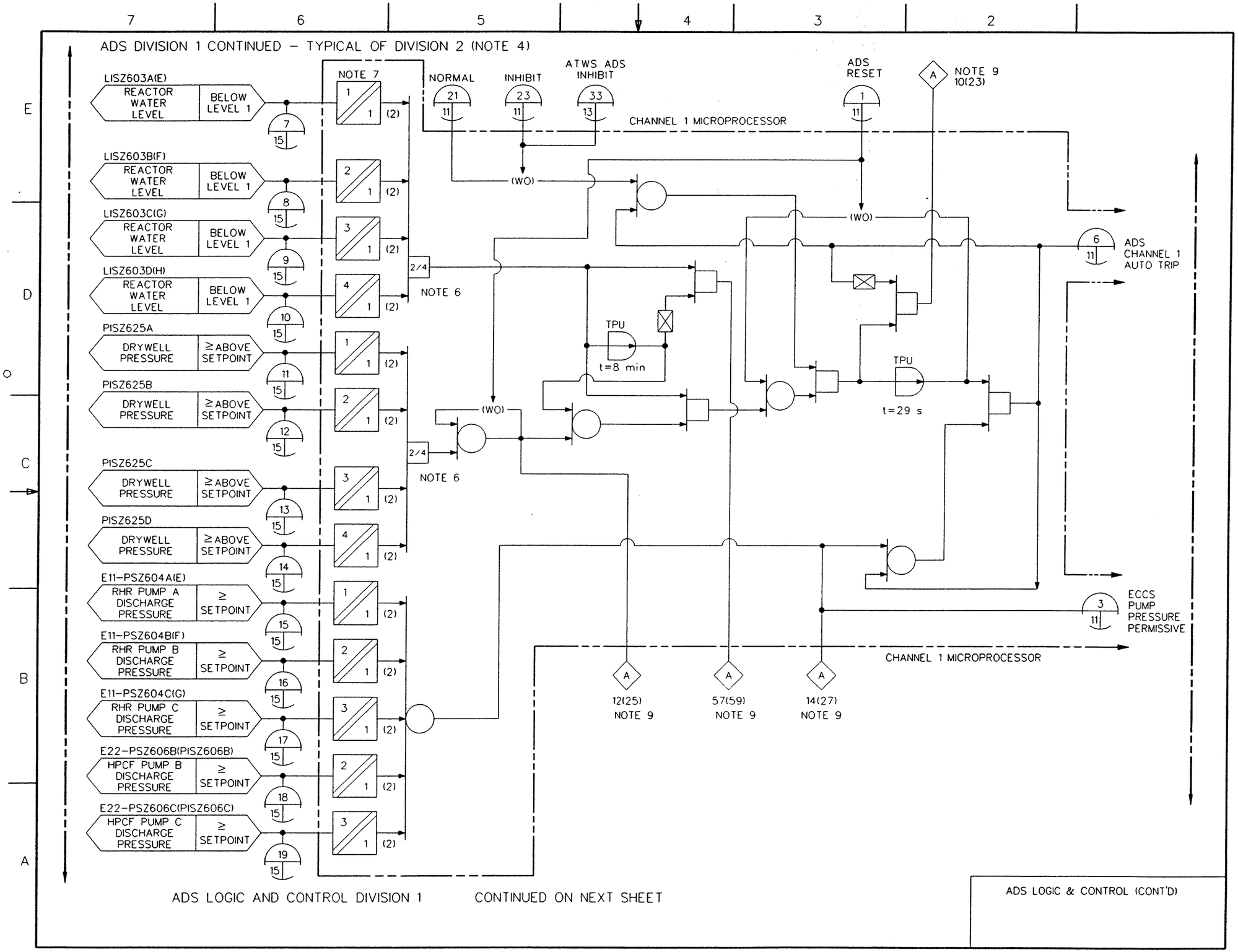


FIGURE 7.3–2 NUCLEAR BOILER SYSTEM IBD (Sheet 14 of 37)

ADS DIVISION 1 CONTINUED – TYPICAL OF DIVISION 2 (NOTE 4)

NORMAL 22 11

INHIBIT 24 11

ATWS ADS INHIBIT 34 16

ADS RESET 1 11

NOTE 9 11(24) A

7 14
8 14
9 14
10 14
11 14
12 14
13 14
14 14
15 14
16 14
17 14
18 14
19 14

CHANNEL 2
DUPLICATE OF CHANNEL 1
MICROPROCESSOR

20 11 ADS CHANNEL 2 AUTO TRIP

4 11 ECCS PUMP PRESSURE PERMISSIVE

ADS LOGIC AND CONTROL DIVISION 1

A NOTE 9 13(26)

A NOTE 9 58(60)

A NOTE 9 15(28)

N3 18
H3 18
T3 18
C3 18
L3 18
F3 18
R3 18
A3 18

ADS LOGIC AND CONTROL DIVISION 2
TYPICAL OF DIVISION 1 (NOTE 4)

ADS LOGIC AND CONTROL
(CONTROLS 8 SRV'S F010A,C,F,H,L,N,R,T)

OPERATING CONTROLS

SUPERVISORY INSTRUMENTS

USE	SPECIFICATION	LOCATION

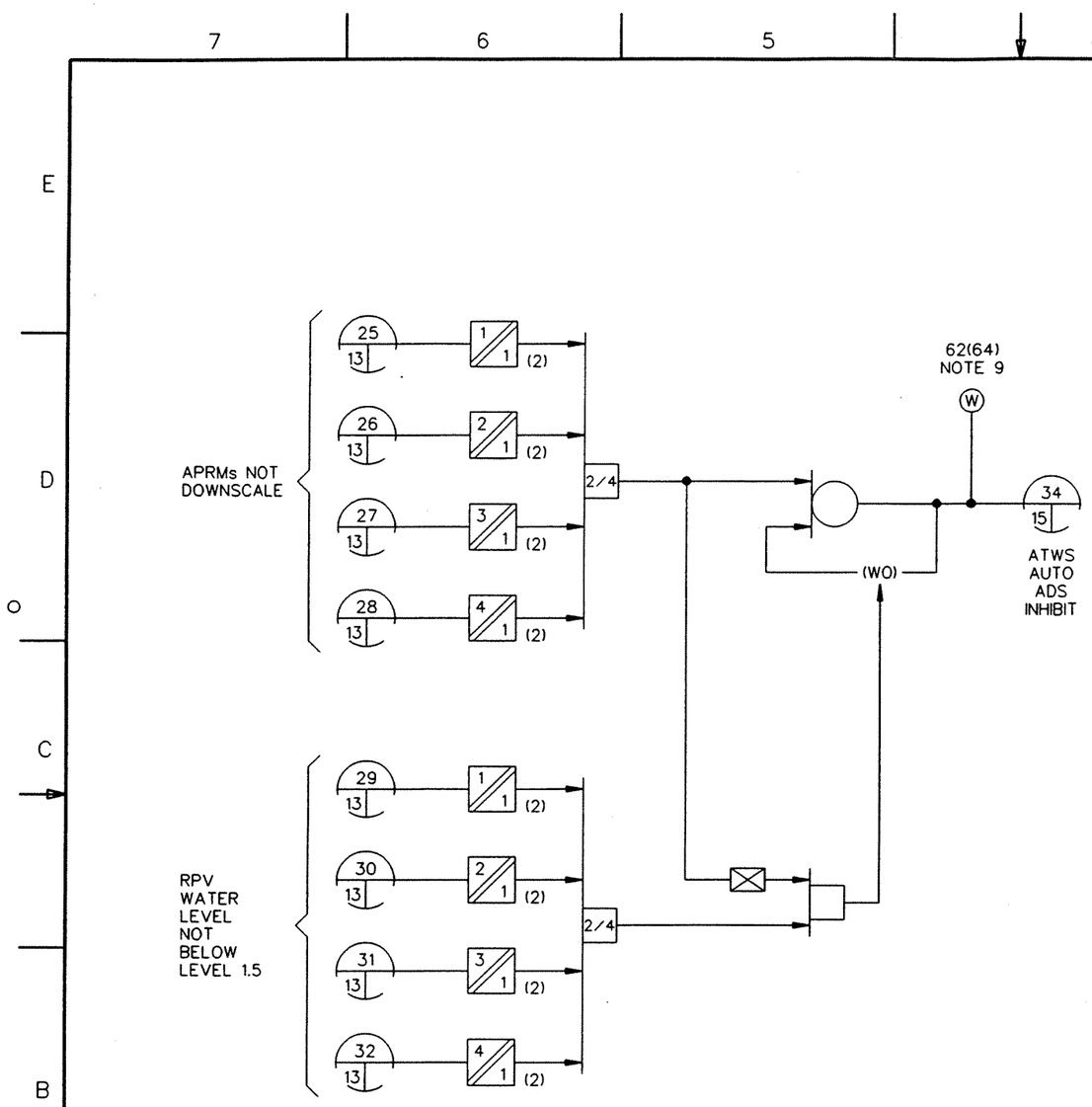
ANNUNCIATORS

NO.	INDICATOR	LOCATION

OTHERS

ADS LOGIC & CONTROL (CONT'D)

Figure 7.3-2 NUCLEAR BOILER SYSTEM IBD (Sheet 15 of 37)

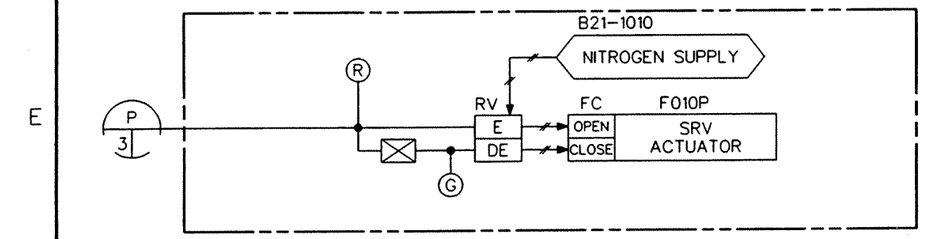


ADS DIVISION 1 – TYPICAL OF DIVISION 2

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

ADS LOGIC & CONTROL (CONT'D)

Figure 7.3-2 NUCLEAR BOILER SYSTEM IBD (Sheet 16 of 37)



TYPICAL FOR 10 SRV'S F010P(J,M,G,S,B,K,E,U,D)

J 4 — F010J TYPICAL OF F010P

M 5 — F010M TYPICAL OF F010P

G 6 — F010G TYPICAL OF F010P

S 5 — F010S TYPICAL OF F010M

B 5 — F010B TYPICAL OF F010M

K 7 — F010K TYPICAL OF F010M

E 8 — F010E TYPICAL OF F010M

U 8 — F010U TYPICAL OF F010M

D 8 — F010D TYPICAL OF F010M

OPERATING CONTROLS

SUPERVISORY INSTRUMENTS

USE	SPECIFICATION	LOCATION

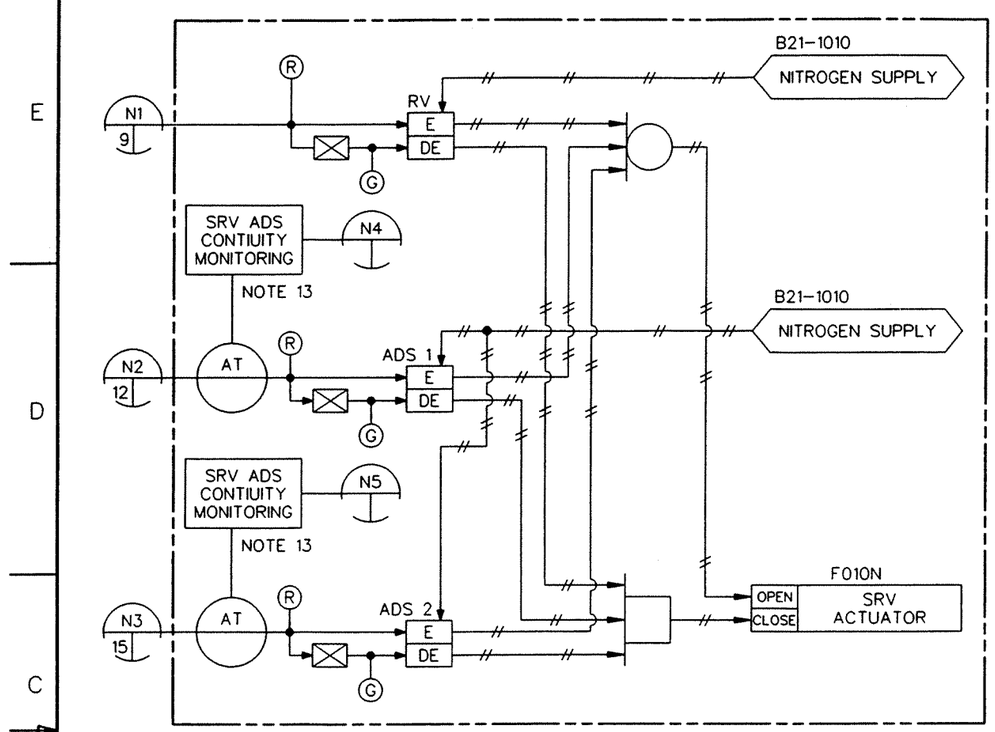
ANNUNCIATORS

NO.	INDICATOR	LOCATION

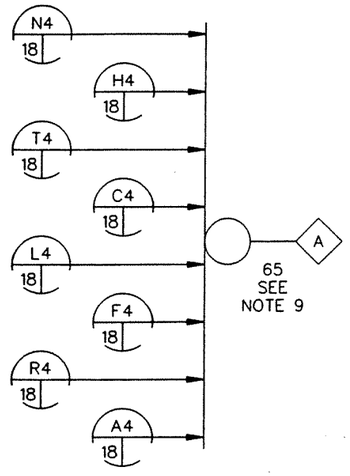
OTHERS

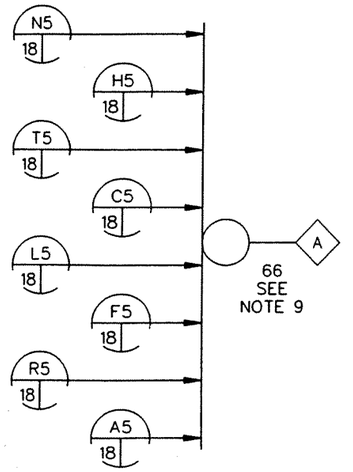
SRV & ADS LOGIC AND CONTROL (CONT'D)

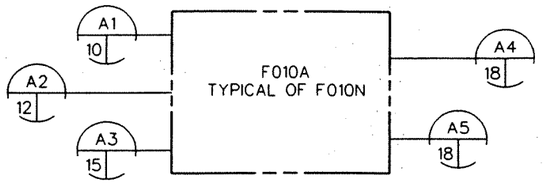
Figure 7.3-2 NUCLEAR BOILER SYSTEM IBD (Sheet 17 of 37)

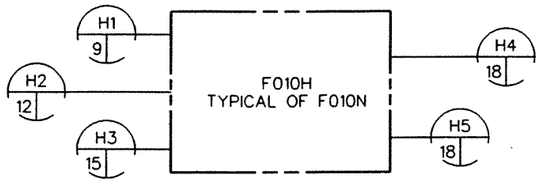


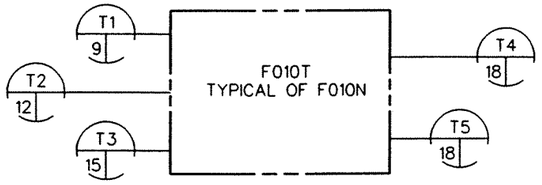
TYPICAL FOR 8 SRV'S F010N(H,T,C,L,F,R,A)

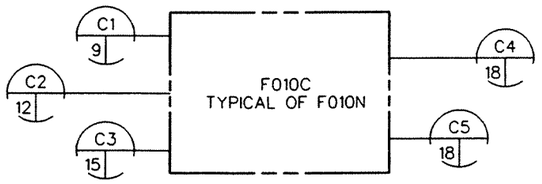


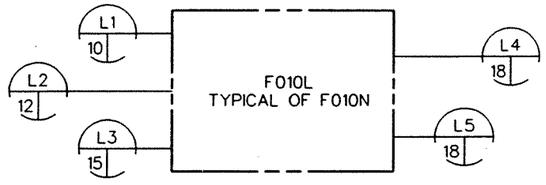


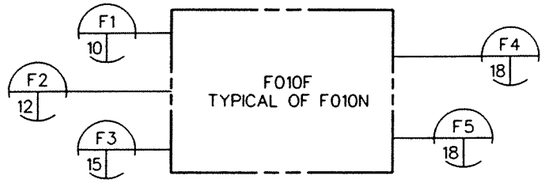


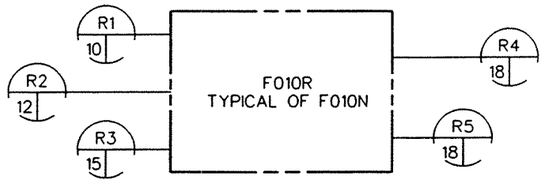








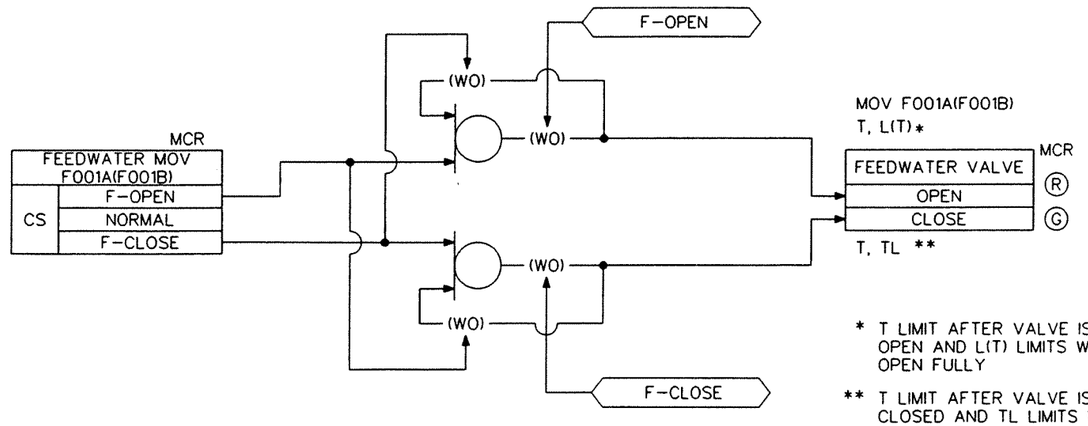




OPERATING CONTROLS			
SUPERVISORY INSTRUMENTS	USE	SPECIFICATION	LOCATION
ANNUNCIATORS	NO.	INDICATOR	LOCATION
OTHERS			

SRV & ADS LOGIC AND CONTROL (CONT'D)

Figure 7.3-2 NUCLEAR BOILER SYSTEM IBD (Sheet 18 of 37)



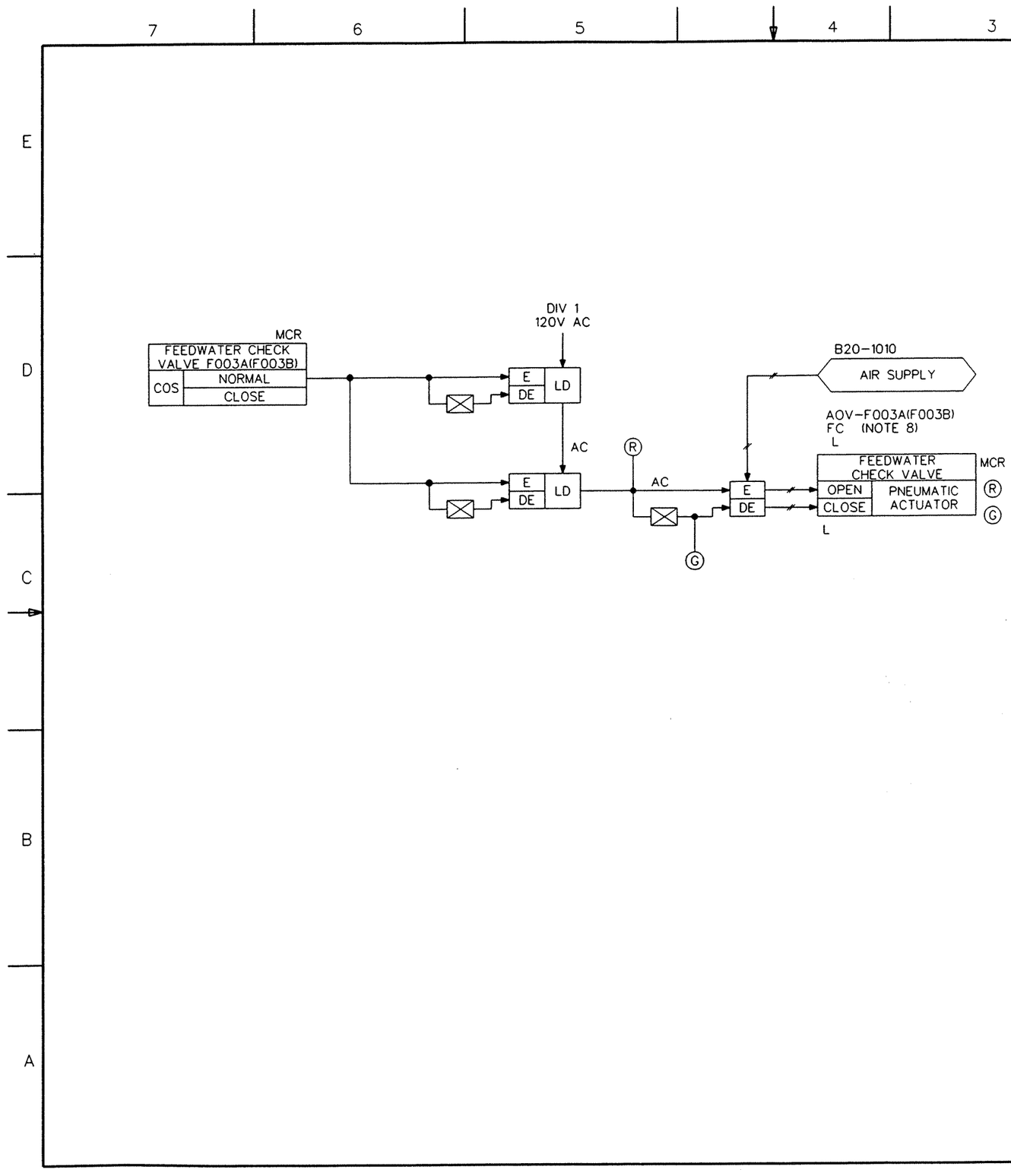
* T LIMIT AFTER VALVE IS PARTLY OPEN AND L(T) LIMITS WHEN VALVE OPEN FULLY

** T LIMIT AFTER VALVE IS PARTLY CLOSED AND TL LIMITS WHEN VALVE CLOSES FULLY

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

FEEDWATER VALVES F001A(F001B)

Figure 7.3-2 NUCLEAR BOILER SYSTEM IBD (Sheet 19 of 37)



OPERATING CONTROLS

SUPERVISORY INSTRUMENTS

USE	SPECIFICATION	LOCATION

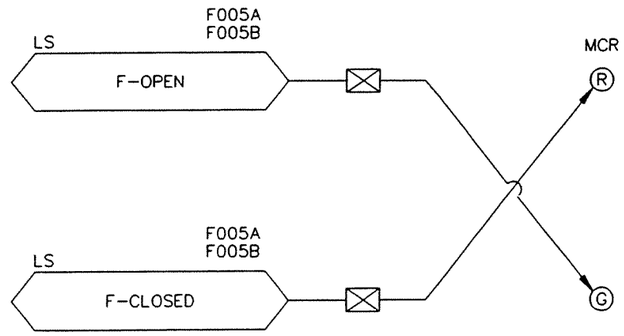
ANNUNCIATORS

NO.	INDICATOR	LOCATION

OTHERS

FEEDWATER CHECK VALVES
F003A(F003B)

Figure 7.3-2 NUCLEAR BOILER SYSTEM IBD (Sheet 20 of 37)



OPERATING CONTROLS

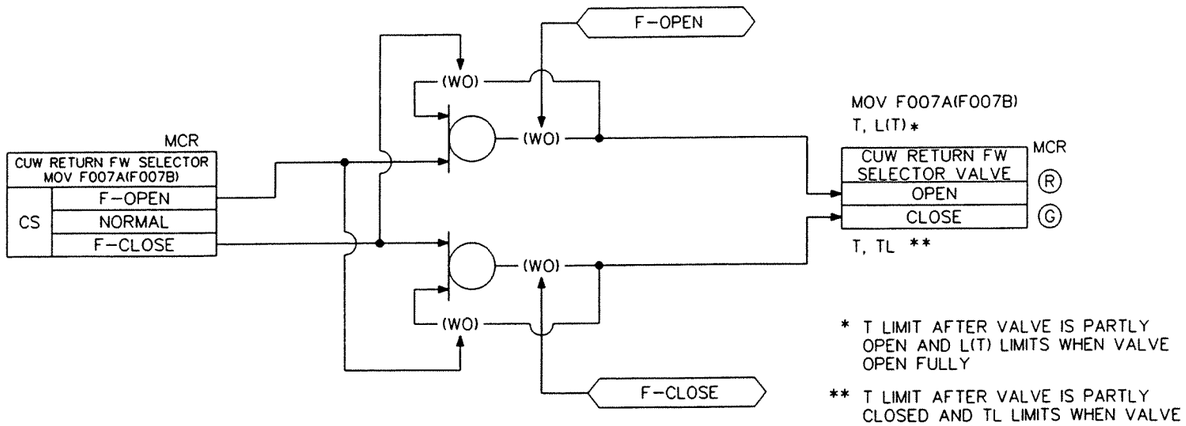
SUPERVISORY INSTRUMENTS	USE	SPECIFICATION	LOCATION

ANNUNCIATORS	NO.	INDICATOR	LOCATION

OTHERS	

FEEDWATER GATE VALVES
F005A(F005B)

Figure 7.3-2 NUCLEAR BOILER SYSTEM IBD (Sheet 21 of 37)



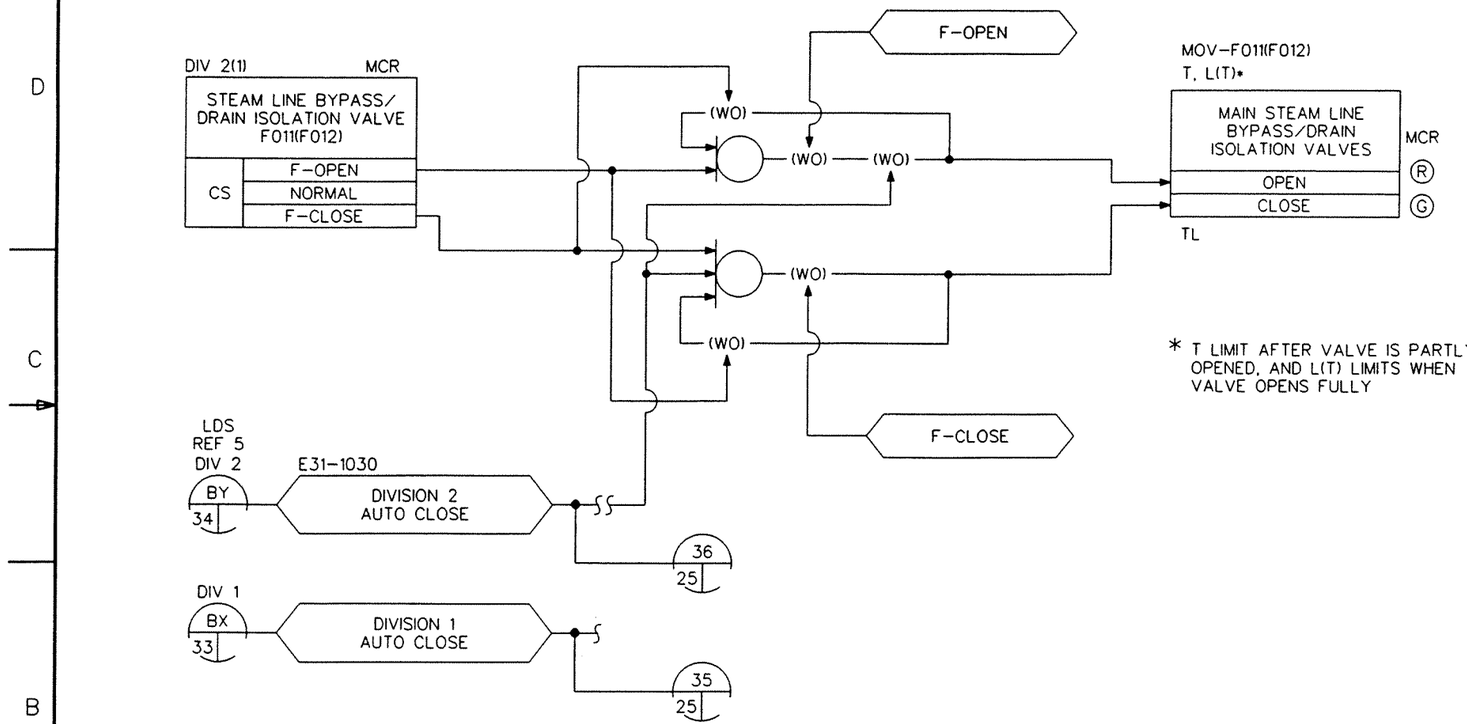
* T LIMIT AFTER VALVE IS PARTLY OPEN AND L(T) LIMITS WHEN VALVE OPEN FULLY

** T LIMIT AFTER VALVE IS PARTLY CLOSED AND TL LIMITS WHEN VALVE CLOSES FULLY

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

CUW RETURN FEEDWATER LOOP SELECTOR VALVES F007A(F007B)

Figure 7.3-2 NUCLEAR BOILER SYSTEM IBD (Sheet 22 of 37)



* T LIMIT AFTER VALVE IS PARTLY OPENED, AND L(T) LIMITS WHEN VALVE OPENS FULLY

OPERATING CONTROLS

SUPERVISORY INSTRUMENTS

USE	SPECIFICATION	LOCATION

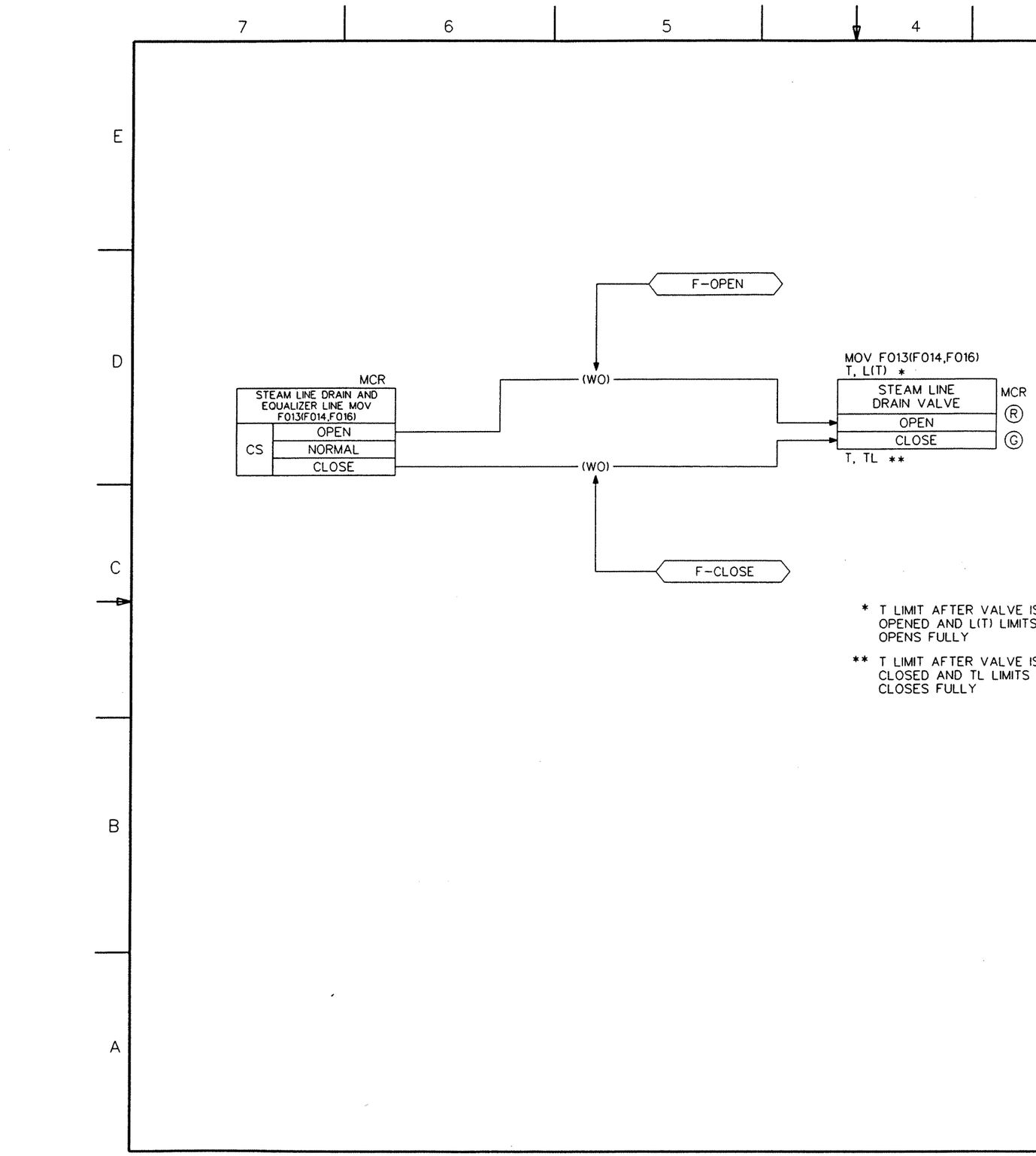
ANNUNCIATORS

NO.	INDICATOR	LOCATION

OTHERS

MAIN STEAM LINE BYPASS/DRAIN ISOLATION VALVES F011(F012)

Figure 7.3-2 NUCLEAR BOILER SYSTEM IBD (Sheet 23 of 37)



* T LIMIT AFTER VALVE IS PARTLY OPENED AND L(T) LIMITS WHEN VALVE OPENS FULLY

** T LIMIT AFTER VALVE IS PARTLY CLOSED AND TL LIMITS WHEN VALVE CLOSES FULLY

OPERATING CONTROLS

SUPERVISORY INSTRUMENTS

USE	SPECIFICATION	LOCATION

ANNUNCIATORS

NO.	INDICATOR	LOCATION

OTHERS

STEAM LINE DRAIN VALVES
F013(F014, F016)

Figure 7.3-2 NUCLEAR BOILER SYSTEM IBD (Sheet 24 of 37)

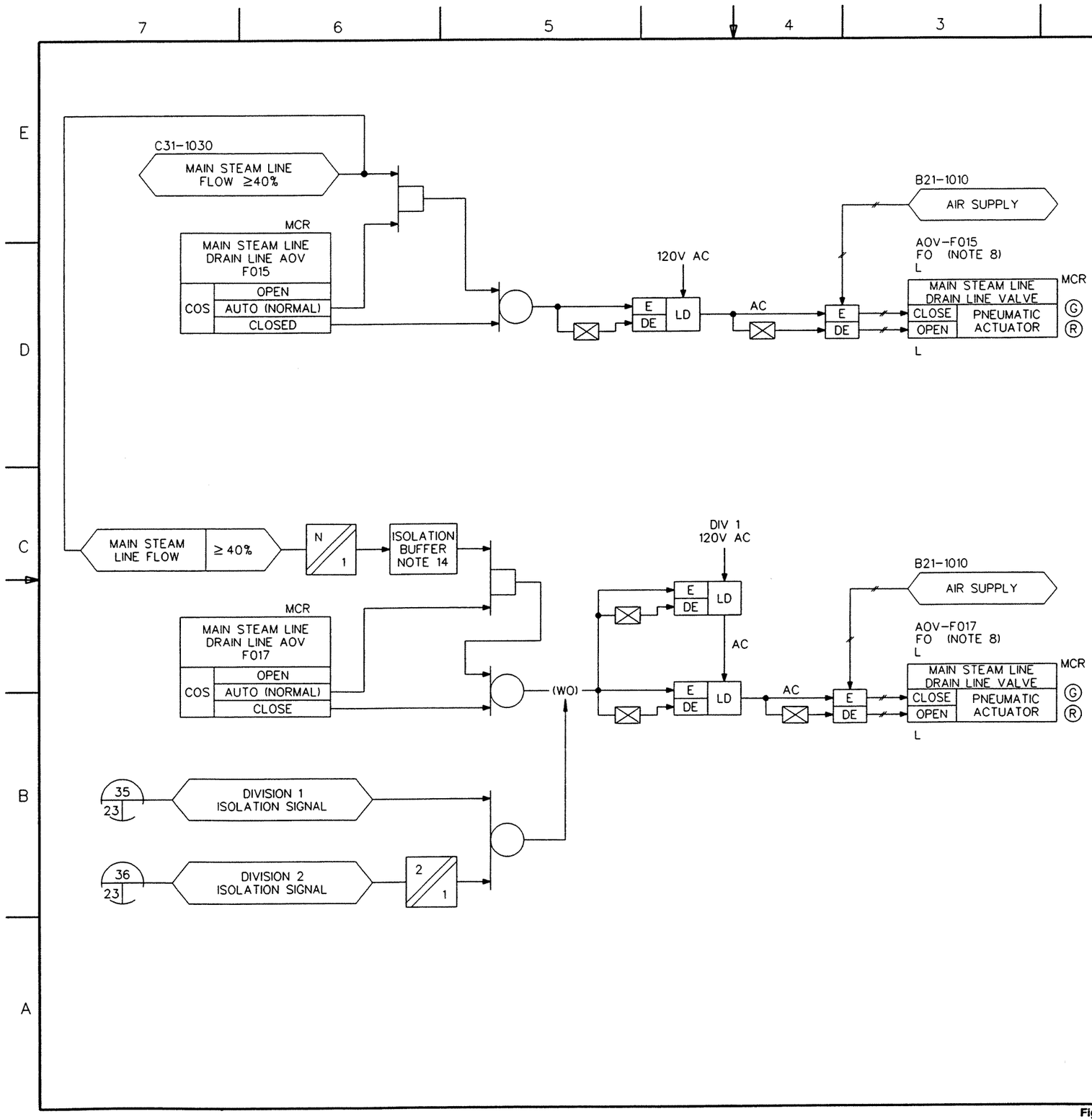


Figure 7.3-2 NUCLEAR BOILER SYSTEM IBD (Sheet 25 of 37)

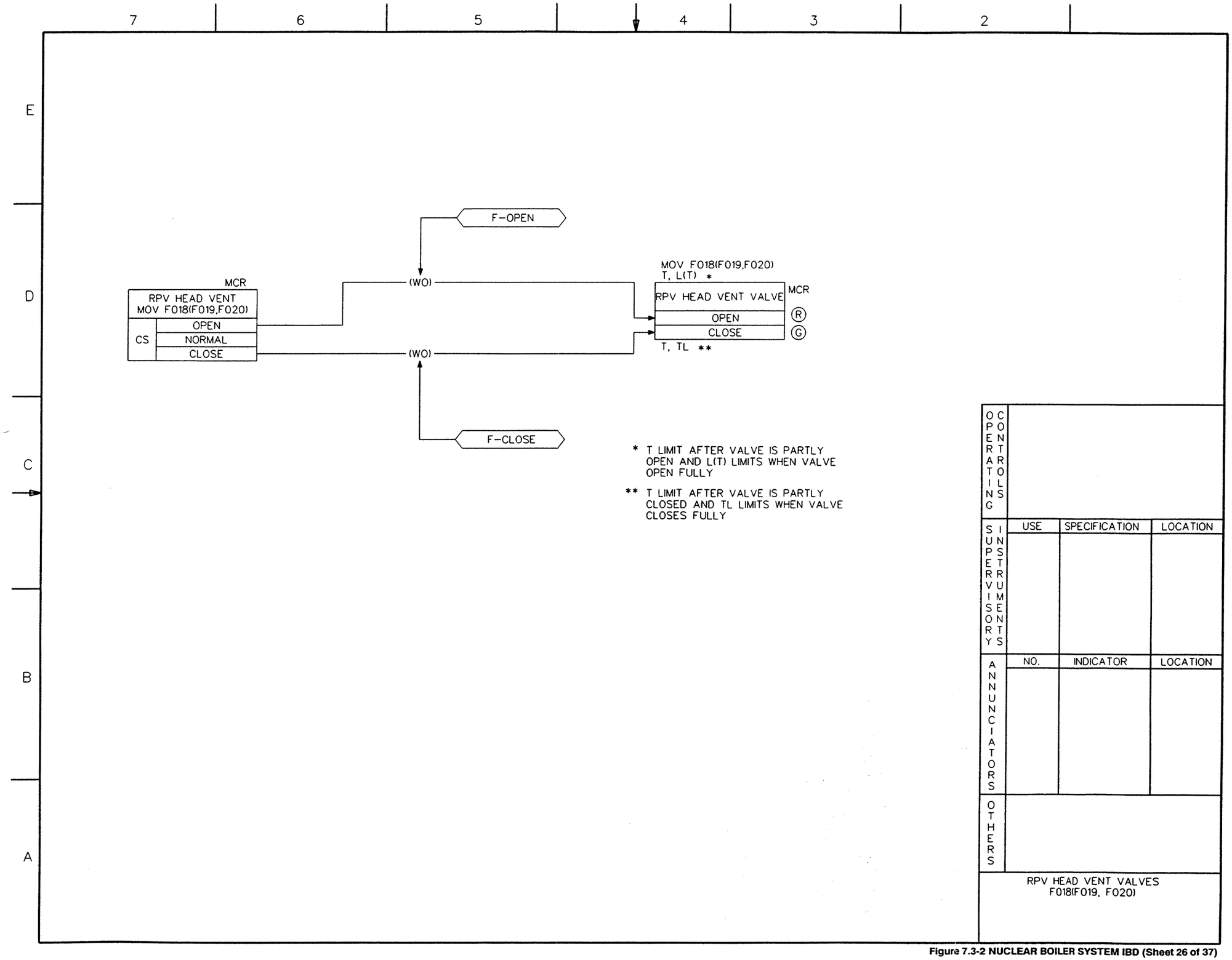


Figure 7.3-2 NUCLEAR BOILER SYSTEM IBD (Sheet 26 of 37)

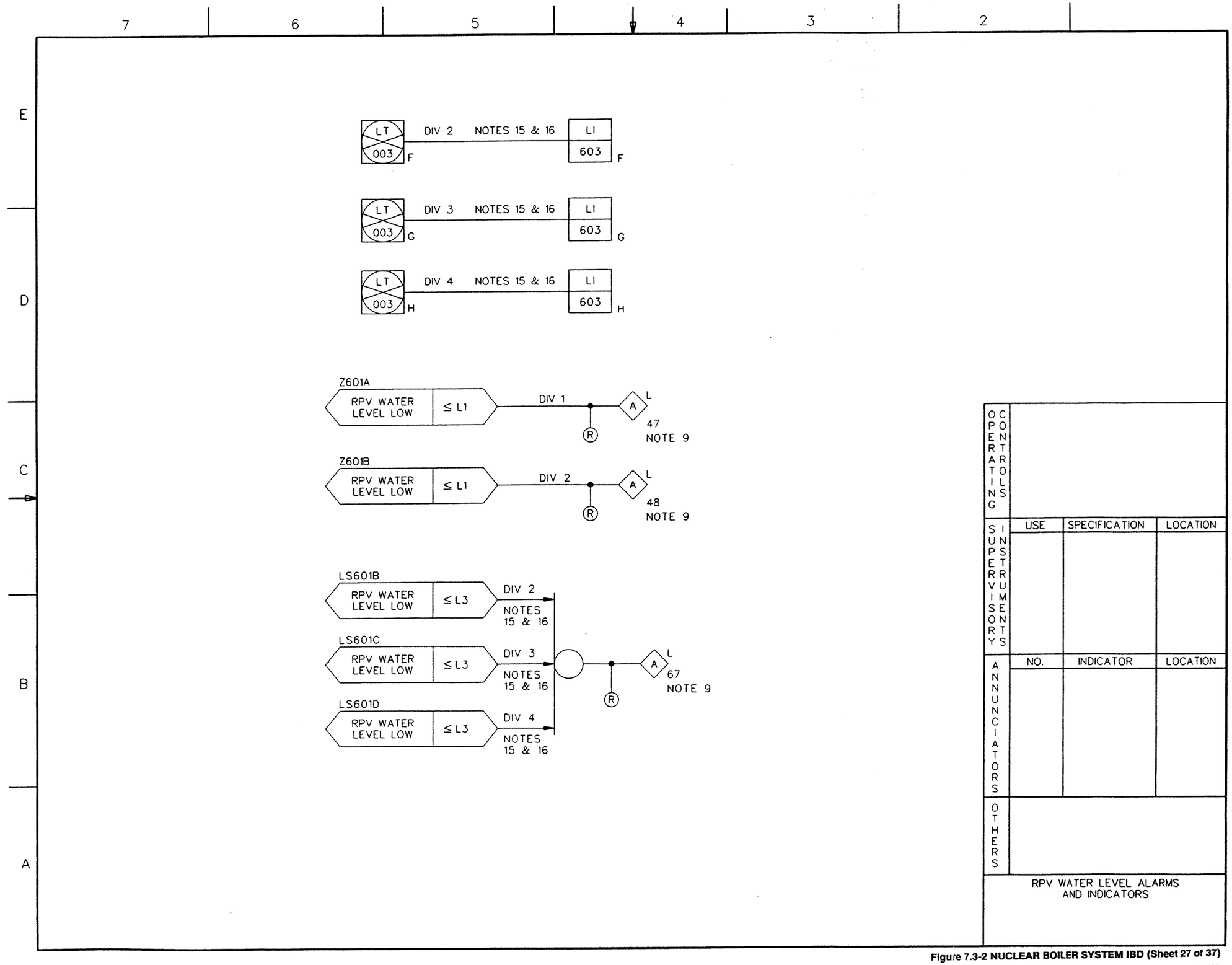
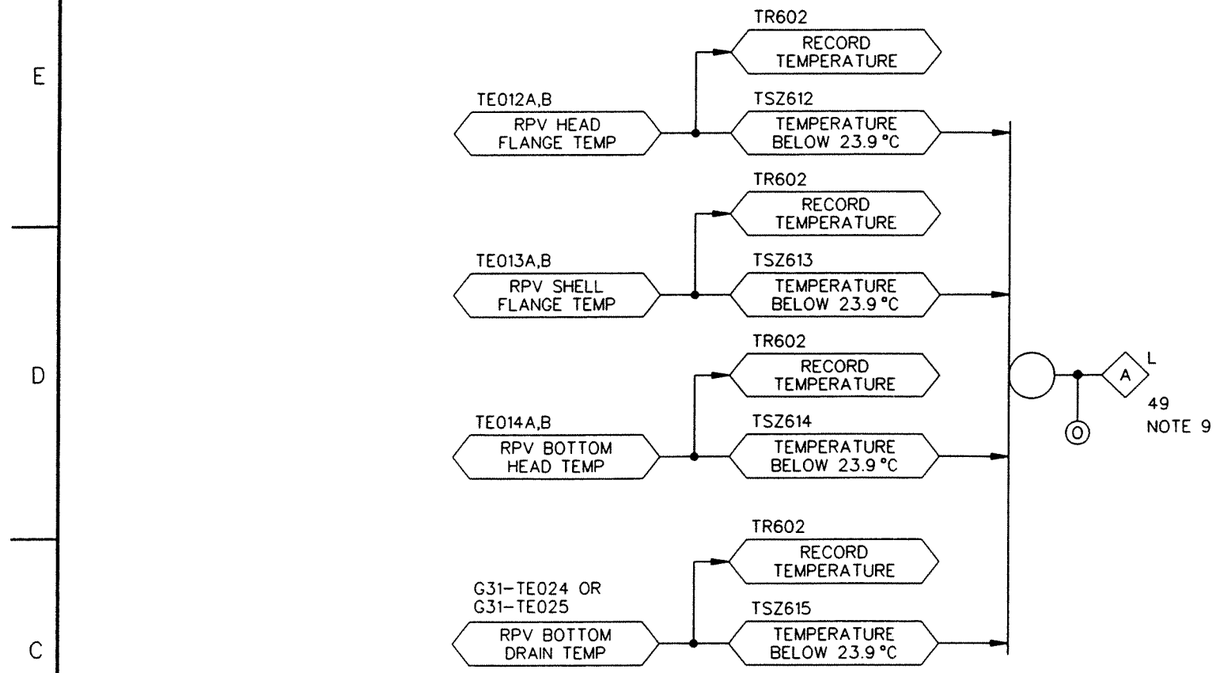


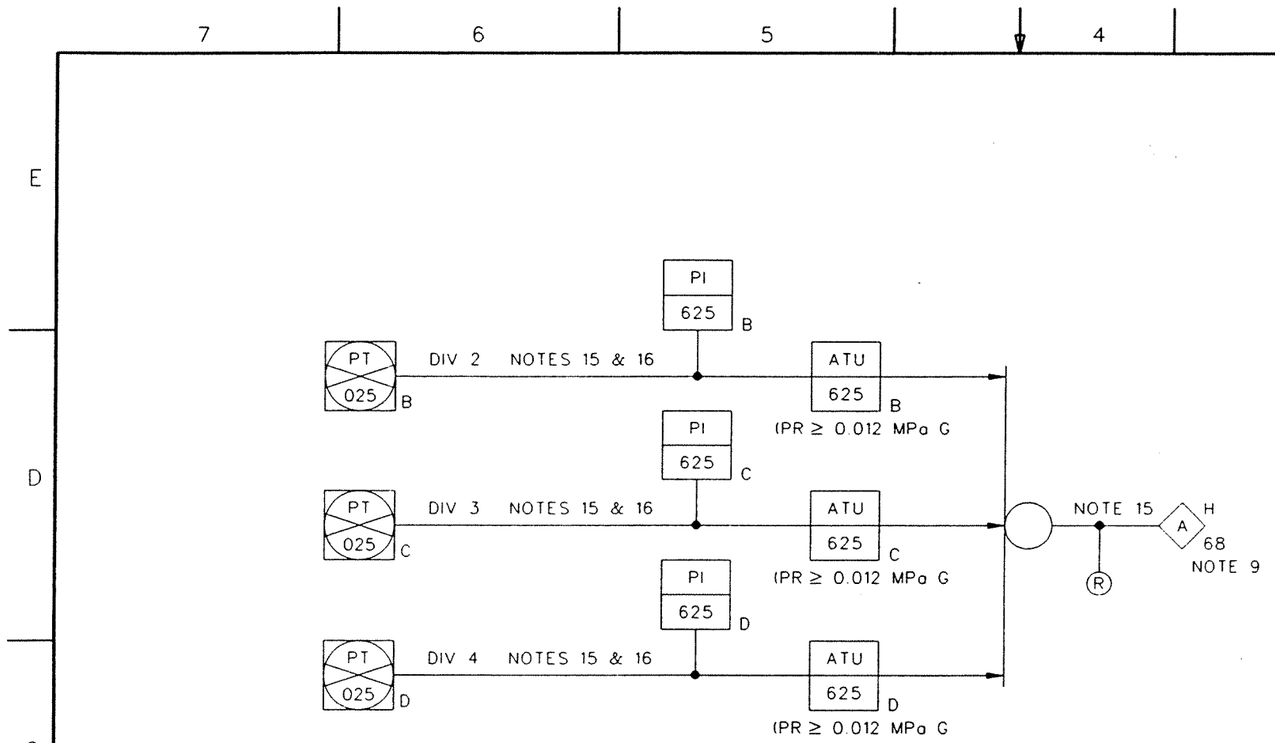
Figure 7.3-2 NUCLEAR BOILER SYSTEM IBD (Sheet 27 of 37)



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

LOW RPV METAL AND BOTTOM DRAIN TEMPERATURE ALARM AND RECORDER

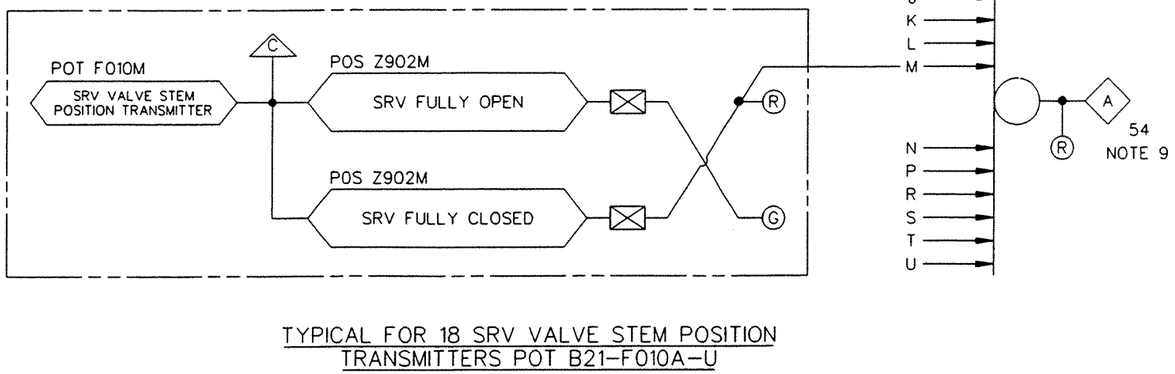
Figure 7.3-2 NUCLEAR BOILER SYSTEM IBD (Sheet 28 of 37)



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

HIGH DRYWELL PRESS ALARMS AND INDICATORS

FIGURE 7.3-2 NUCLEAR BOILER SYSTEM IBD (Sheet 29 of 37)

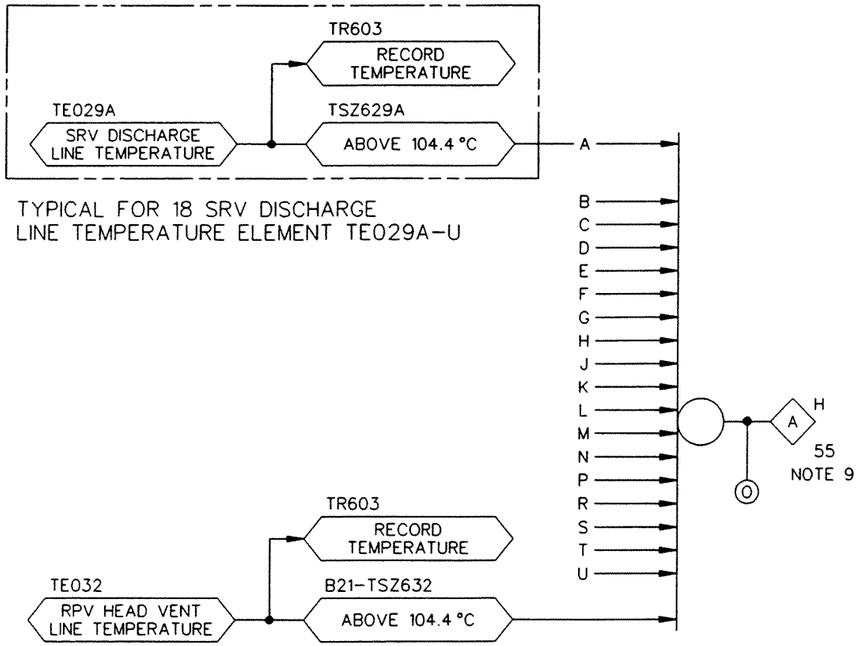


TYPICAL FOR 18 SRV VALVE STEM POSITION TRANSMITTERS POT B21-F010A-U

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

SRV VALVE STEM POSITION ALARM

Figure 7.3-2 NUCLEAR BOILER SYSTEM IBD (Sheet 30 of 37)

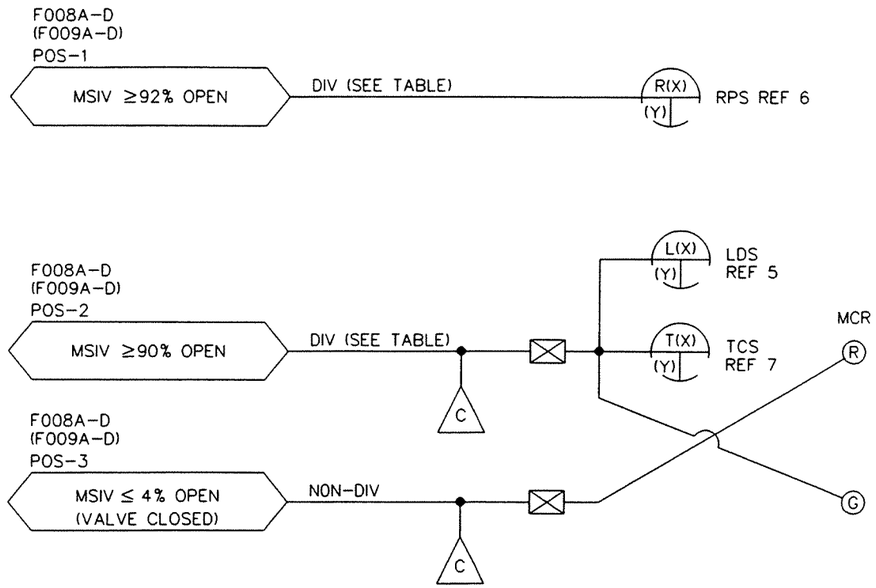


TYPICAL FOR 18 SRV DISCHARGE LINE TEMPERATURE ELEMENT TE029A-U

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

SRV DISCHARGE LINE AND RPV HEAD VENT LINE HIGH TEMPERATURE ALARM

Figure 7.3-2 NUCLEAR BOILER SYSTEM IBD (Sheet 31 of 37)



TABLE

VALVE NO.	POS–1	POS–2	REF (X)	REF SH NO. (Y)		
				RPS	LDS	TCS
F008A	DIV 1	DIV 1	A	16	24	
F008B	DIV 2	DIV 2	B	17	24	
F008C	DIV 3	DIV 3	C	18	24	
F008D	DIV 4	DIV 4	D	19	24	
F009A	DIV 1	DIV 1	E	16	24	
F009B	DIV 2	DIV 2	F	17	24	
F009C	DIV 3	DIV 3	G	18	24	
F009D	DIV 4	DIV 4	H	19	24	

OPERATING CONTROLS

SUPERVISORY INSTRUMENTS

USE	SPECIFICATION	LOCATION

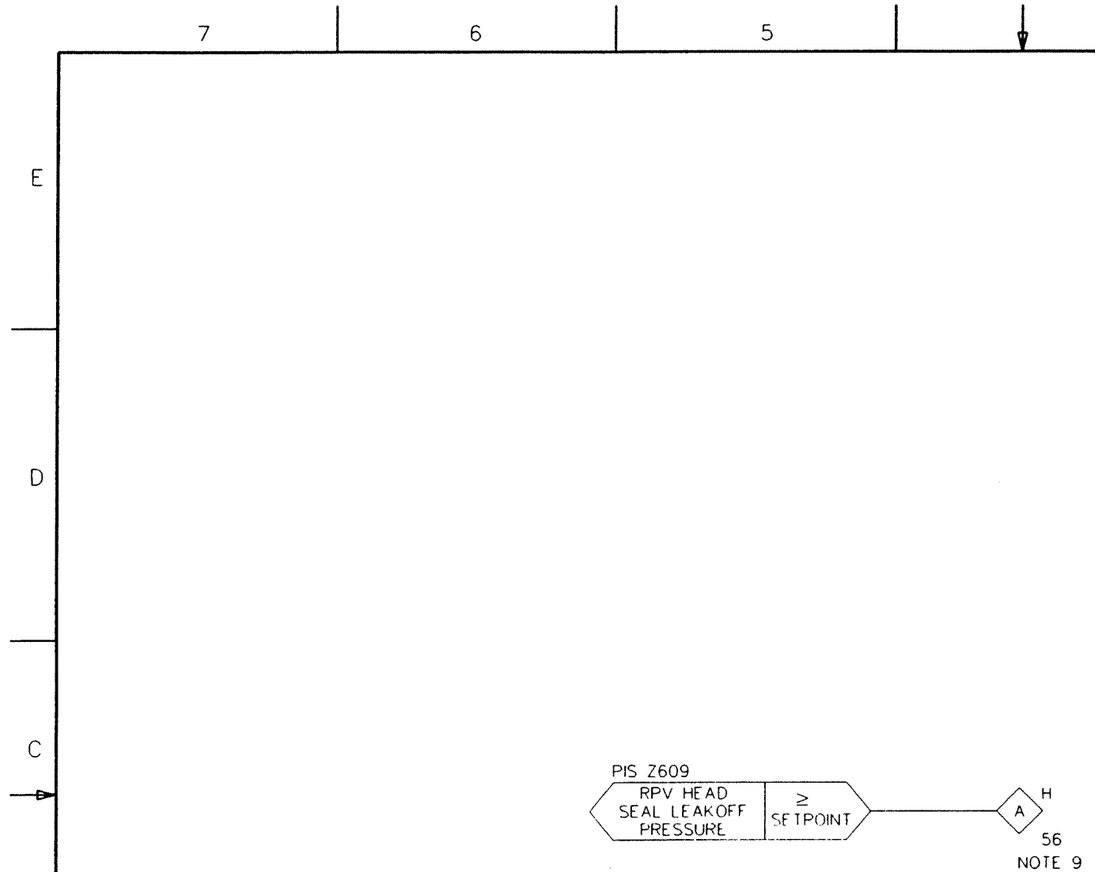
ANNUNCIATORS

NO.	INDICATOR	LOCATION

OTHERS

MSIV VALVE STEM POSITION SWITCHES

Figure 7.3-2 NUCLEAR BOILER SYSTEM IBD (Sheet 32 of 37)



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

RPV HEAD SEAL LEAKOFF HIGH PRESSURE ALARM

FIGURE 7.3-2 NUCLEAR BOILER SYSTEM IBD (Sheet 33 of 37)

TABLE 1: ANNUNCIATOR/ALARM LIGHTS – NOTE 10

ALARM NO.	INDICATION	FUNCTION	SOURCE OF SIGNAL
1	ALARM/RED LIGHT	HIGH REACTOR PRESSURE DIVISION 1	LOGIC OUTPUT FOR SRV B21-F010P SHEET 3
2	ALARM/RED LIGHT	HIGH REACTOR PRESSURE DIVISION 2	LOGIC OUTPUT FOR SRV B21-F010J SHEET 4
3	ALARM	ADS CHANNEL 1 ARMED DIVISION 1	LOGIC OUTPUT SHEET 11
4	ALARM	ADS CHANNEL 2 ARMED DIVISION 1	LOGIC OUTPUT SHEET 11
5	ALARM	ADS CHANNEL 1 TRIP DIVISION 1	LOGIC OUTPUT SHEET 11
6	ALARM	ADS CHANNEL 2 TRIP DIVISION 1	LOGIC OUTPUT SHEET 11
7	ALARM/ORANGE LIGHT	ADS INHIBIT SWITCH IN INHIBIT POSITION DIVISION 1	LOGIC OUTPUT SHEET 11
8	ALARM	ADS CHANNEL 1 MANUAL PERMISSIVE DIVISION 1	LOGIC OUTPUT SHEET 11
9	ALARM	ADS CHANNEL 2 MANUAL PERMISSIVE DIVISION 1	LOGIC OUTPUT SHEET 11
10	ALARM	ADS 29 SECOND TIMER RUNNING CHANNEL 1 DIVISION 1	LOGIC OUTPUT SHEET 14
11	ALARM	ADS 29 SECOND TIMER RUNNING CHANNEL 2 DIVISION 1	LOGIC OUTPUT SHEET 15
12	ALARM	ADS HIGH DRYWELL PRESSURE PERMISSIVE CHANNEL 1 DIV 1	LOGIC OUTPUT SHEET 14
13	ALARM	ADS HIGH DRYWELL PRESSURE PERMISSIVE CHANNEL 2 DIV 1	LOGIC OUTPUT SHEET 15
14	ALARM	ADS ECCS PUMP DISC PRESS PERMISSIVE CHANNEL 1 DIV 1	LOGIC OUTPUT SHEET 14
15	ALARM	ADS ECCS PUMP DISC PRESS PERMISSIVE CHANNEL 2 DIV 1	LOGIC OUTPUT SHEET 15
16	ALARM	ADS CHANNEL 1 ARMED DIVISION 2	LOGIC OUTPUT SHEET 11
17	ALARM	ADS CHANNEL 2 ARMED DIVISION 2	LOGIC OUTPUT SHEET 11
18	ALARM	ADS CHANNEL 1 TRIP DIVISION 2	LOGIC OUTPUT SHEET 11
19	ALARM	ADS CHANNEL 2 TRIP DIVISION 2	LOGIC OUTPUT SHEET 11
20	ALARM/ORANGE LIGHT	ADS INHIBIT SWITCH IN INHIBIT POSITION DIVISION 2	LOGIC OUTPUT SHEET 11
21	ALARM	ADS CHANNEL 1 MANUAL PERMISSIVE DIVISION 2	LOGIC OUTPUT SHEET 11
22	ALARM	ADS CHANNEL 2 MANUAL PERMISSIVE DIVISION 2	LOGIC OUTPUT SHEET 11
23	ALARM	ADS 29 SECOND TIMER RUNNING CHANNEL 1 DIVISION 2	LOGIC OUTPUT SHEET 14
24	ALARM	ADS 29 SECOND TIMER RUNNING CHANNEL 2 DIV 2	LOGIC OUTPUT SHEET 15
25	ALARM	ADS HIGH DRYWELL PRESS PERMISSIVE CHANNEL 1 DIV 2	LOGIC OUTPUT SHEET 14
26	ALARM	ADS HIGH DRYWELL PRESS PERMISSIVE CHANNEL 2 DIV 2	LOGIC OUTPUT SHEET 15
27	ALARM	ADS ECCS PUMP DISCH PRESS PERMISSIVE CHANNEL 1 DIV 2	LOGIC OUTPUT SHEET 14
28	ALARM	ADS ECCS PUMP DISCH PRESS PERMISSIVE CHANNEL 2 DIV 2	LOGIC OUTPUT SHEET 15
29	ALARM	SRV RELIEF "P" SWITCHED OFF	SWITCH OUTPUT SHEET 3

TABLE 1 (CONT)

ALARM NO.	INDICATION	FUNCTION	SOURCE OF SIGNAL
30	ALARM	SRV RELIEF "J" SWITCHED OFF	SWITCH OUTPUT SHEET 4
31	ALARM	SRV RELIEF "M" SWITCHED OFF	SWITCH OUTPUT SHEET 5
32	ALARM	SRV RELIEF "S" SWITCHED OFF	SWITCH OUTPUT SHEET 5
33	ALARM	SRV RELIEF "G" SWITCHED OFF	SWITCH OUTPUT SHEET 6
34	ALARM	SRV RELIEF "B" SWITCHED OFF	SWITCH OUTPUT SHEET 5
35	ALARM	SRV RELIEF "K" SWITCHED OFF	SWITCH OUTPUT SHEET 7
36	ALARM	SRV RELIEF "E" SWITCHED OFF	SWITCH OUTPUT SHEET 8
37	ALARM	SRV RELIEF "U" SWITCHED OFF	SWITCH OUTPUT SHEET 8
38	ALARM	SRV RELIEF "D" SWITCHED OFF	SWITCH OUTPUT SHEET 8
39	ALARM	SRV RELIEF "N" SWITCHED OFF	SWITCH OUTPUT SHEET 9
40	ALARM	SRV RELIEF "H" SIWTCHED OFF	SWITCH OUTPUT SHEET 9
41	ALARM	SRV RELIEF "T" SWITCHED OFF	SWITCH OUTPUT SHEET 9
42	ALARM	SRV RELIEF "C" SWITCHED OFF	SWITCH OUTPUT SHEET 9
43	ALARM	SRV RELIEF "L" SWITCHED OFF	SWITCH OUTPUT SHEET 10
44	ALARM	SRV RELIEF "F" SWITCHED OFF	SWITCH OUTPUT SHEET 10
45	ALARM	SRV RELIEF "R" SWITCHED OFF	SWITCH OUTPUT SHEET 10
46	ALARM	SRV RELIEF "A" SWITCHED OFF	SWITCH OUTPUT SHEET 10
47	ALARM/RED LIGHT	ENHANCED RPV WATER LEVEL LOW DIV 1	LOGIC OUTPUT SHEET 27
48	ALARM/RED LIGHT	ENHANCED RPV WATER LEVEL LOW DIV 2	LOGIC OUTPUT SHEET 27
49	ALARM/ORANGE LIGHT	LOW RPV METAL OR BOTTOM DRAIN TEMP	LOGIC OUTPUT SHEET 28
50	ALARM/RED LIGHT	HIGH DRYWELL PRESSURE DIVISION 1	LOGIC OUTPUT SHEET 29

ANNUNCIATOR LIST

Figure 7.3-2 NUCLEAR BOILER SYSTEM IBD (Sheet 34 of 37)

TABLE 1 (CONT)

ALARM NO.	INDICATION	FUNCTION	SOURCE OF SIGNAL
51	ALARM/RED LIGHT	HIGH DRYWELL PRESSURE DIVISION 2	LOGIC OUTPUT SHEET 29
52	ALARM/RED LIGHT	HIGH DRYWELL PRESSURE DIVISION 3	LOGIC OUTPUT SHEET 29
53	ALARM/RED LIGHT	HIGH DRYWELL PRESSURE DIVISION 4	LOGIC OUTPUT SHEET 29
54	ALARM/RED LIGHT	SRV VALVE(S) OPEN	LOGIC OUTPUT SHEET 30
55	ALARM/ORANGE LIGHT	SRV DISCHARGE LINE(S) OR RPV HEAD VENT HIGH TEMP	LOGIC OUTPUT SHEET 31
56	ALARM	RPV HEAD SEAL LEAKOFF HIGH PRESSURE	LOGIC OUTPUT SHEET 33
57	ALARM	ADS 8 MINUTE TIMER RUNNING, CHANNEL 1, DIVISION 1	LOGIC OUTPUT SHEET 14
58	ALARM	ADS 8 MINUTE TIMER RUNNING, CHANNEL 2, DIVISION 1	LOGIC OUTPUT SHEET 15
59	ALARM	ADS 8 MINUTE TIMER RUNNING, CHANNEL 1, DIVISION 2	LOGIC OUTPUT SHEET 14
60	ALARM	ADS 8 MINUTE TIMER RUNNING, CHANNEL 2, DIVISION 2	LOGIC OUTPUT SHEET 15
61	WHITE LIGHT	ATWS AUTOMATIC INHIBIT OF ADS INITIATION, CHANNEL 1, DIVISION 1	LOGIC OUTPUT SHEET 13
62	WHITE LIGHT	ATWS AUTOMATIC INHIBIT OF ADS INITIATION, CHANNEL 2, DIVISION 1	LOGIC OUTPUT SHEET 16
63	WHITE LIGHT	ATWS AUTOMATIC INHIBIT OF ADS INITIATION, CHANNEL 1, DIVISION 2	LOGIC OUTPUT SHEET 13
64	WHITE LIGHT	ATWS AUTOMATIC INHIBIT OF ADS INITIATION, CHANNEL 2, DIVISION 2	LOGIC OUTPUT SHEET 16
65	ALARM	ADS SRV SOLENOID(S) LOSS OF CONTINUITY DIVISION 1	LOGIC OUTPUT SHEET 18
66	ALARM	ADS SRV SOLENOID(S) LOSS OF CONTINUITY DIVISION 2	LOGIC OUTPUT SHEET 18
67	ALARM	RPV LOW WATER LEVEL 3 HARDWIRED	LOGIC OUTPUT SHEET 27
68	ALARM	HIGH DRYWELL PRESSURE HARDWIRED	LOGIC OUTPUT SHEET 29

ANNUNCIATOR LIST

FIGURE 7.3-2 NUCLEAR BOILER SYSTEM IBD (Sheet 35 of 37)

DIV 1 BYPASS UNIT

BYPASS STATUS AND INTERLOCKS TO AND FROM BYPASS UNITS IN OTHER DIVISIONS

SENSORS BYPASS

KOS	NORMAL
*	BYPASS

* SWITCH FUNCTION TO BE PERFORMED SIMULTANEOUSLY WITH SENSORS BYPASS OF RPS/MSIV (SEE RPS IED REF NO. 6, SH 2)

DIV 1 IN BYPASS
DIV 2 IN BYPASS
DIV 3 IN BYPASS
DIV 4 IN BYPASS
HIGH=BYPASSED

ECCS LOOP 1 LOGIC BYPASS

KOS	RESET
	NORMAL
	BYPASS

ECCS LOOP 2 LOGIC BYPASS

KOS	RESET
	NORMAL
	BYPASS

(WO)

FAILURE DETECTION LOGIC FOR AUTO-BYPASS

LOOP 1
LOOP 2

TO NEXT SHEET

MAIN CONTROL ROOM OPERATOR CONSOLE

DTM FAIL | SLU 1 FAIL | SLU 2 FAIL | MUX 2 FAIL | MUX 1 FAIL | ECCS LOOP 1 OUT-OF-SERVICE | ECCS LOOP 2 OUT-OF-SERVICE

A

TO NEXT SHEET

SENSOR TRIPS TO DIV 2, 3, SLU'S

SENSOR DATA FROM ESSENTIAL MULTIPLEXING SYSTEM

SENSOR TRIPS FROM DTMS IN OTHER DIVISIONS

FROM DIV 2
FROM DIV 3
FROM DIV 4

SOFTWARE SETPOINT COMPARISON FOR TRIP DECISION

LOGIC DIAGNOSTICS

DTM

SOFTWARE IBD LOGIC

SLU 1

LOGIC DIAGNOSTICS

2/4

CONTROL AND INTERLOCK LOGIC

SIGNAL INTERFACE FOR NON-COINCIDENT SENSORS

SOFTWARE IBD LOGIC

SLU 2

LOGIC DIAGNOSTICS

2/4

CONTROL AND INTERLOCK LOGIC

SIGNAL INTERFACE FOR NON-COINCIDENT SENSORS

CMU A

LOGIC DIAGNOSTICS

TO NEXT SHEET (RMU A)

CMU B

LOGIC DIAGNOSTICS

TO NEXT SHEET (RMU B)

MANUAL CONTROLS

MAIN CONTROL ROOM

SSLC PANEL – DIV 1

SSLC (LDS/ECCS) BLOCK DIAGRAM
DIV 1 (TYPICAL FOR DIV 2 & DIV 3)

FIGURE 7.3-2 NUCLEAR BOILER SYSTEM IBD (Sheet 36 of 37)

NOTES:

1. ALL EQUIPMENT AND INSTRUMENT PREFIXED BY SYSTEM NO. E51- UNLESS OTHERWISE NOTED.
2. DIVISIONAL SIGNALS TO ANNUNCIATORS SHALL BE ISOLATED FROM NON-IE ALARM.
3. THE POWER TO CONTROL LOGIC AND TO THE MOTOR OPERATED F036 VALVE SHALL BE SUPPLIED FROM DIVISION 2 POWER.
4. THE LOGIC DESIGN SHALL INCORPORATE PROVISIONS TO REVERT 2/4 LOGIC TO 2/3 LOGIC DURING BYPASS OF A SINGLE DIVISION OF SENSORS. ALSO, THE LOGIC DESIGN SHALL NOT PERMIT THE BYPASS OF MORE THAN ONE DIVISION OF SENSORS AT A TIME.
5. SETPOINT VALUE IS NOT SUBJECT TO THE APPROVAL OF THIS DOCUMENT.
6. POWER SUPPLY SHALL BE DIVISION 1 UNLESS OTHERWISE SPECIFIED.
7. THE INBOARD CONTAINMENT ISOLATION VALVE F035 MANUAL CONTROL AND VALVE POSITION STATUS INDICATION (IN addition TO BEING MULTIPLEXED) SHALL BE HARDWIRED TO THE MAIN CONTROL ROOM.

REFERENCE DOCUMENTS UNDER THE FOLLOWING IDENTITIES SHALL BE USED IN CONJUNCTION WITH THIS DRAWING.

		MPL NO.
1.	MAKEUP WATER CONDENSATE SYSTEM IBD	P13-1030
2.	RCIC SYSTEM P&ID	E51-1010
3.	NUCLEAR BOILER SYSTEM P&ID	B21-1010
4.	LEAK DETECTION & ISOLATION SYSTEM IBD	E31-1030
5.	ATMOSPHERIC CONTROL SYSTEM IBD	T31-1030

MPL NO. E51-1030

FIGURE 7.3-3 REACTOR CORE ISOLATION COOLING SYSTEM IBD (Sheet 1 of 17)

TABLE 1: ANNUNCIATOR/ALARM LIST

INDICATOR	FUNCTION	INITIATING DEVICE
ALARMS	RCIC TURBINE GOVERNOR END BEARING OIL TEMP HIGH	TEMP SWITCH
	RCIC TURB COUP END BEARING OIL TEMP HIGH	TEMP SWITCH
	BAROMETRIC CONDENSER VACUUM TANK LOW LEVEL	LEVEL SWITCH
	BAROMETRIC CONDENSER VACUUM TANK HIGH LEVEL	LEVEL SWITCH
	RCIC TURBINE EXHAUST DIAPHRAGM PRESSURE HIGH	PIS-Z614A,E,B,F
	RCIC TURBINE EXHAUST LINE DISCHARGE PRESSURE HIGH	PIS-Z613A,E
	RCIC PUMP SUCTION PRESSURE HIGH	PIS-Z601
	RCIC PUMP SUCTION PRESSURE LOW	PIS-Z602
	RCIC AREA TEMP HIGH	E31-PS Z605A,B,C,D
	RCIC STEAM LINE FLOW HIGH	E31-FS Z606A,B,C,D
	RCIC STEAMLINE PRESSURE LOW	E31-PS Z607A,B,C,D
	RCIC ISOLATED	E31 LOGIC OUTPUT
	STEAM SUPPLY WARM-UP VALVE F048 NOT FULLY CLOSED	LIMIT SWITCH
	STEAM SUPPLY OUTBOARD ISOLATION VALVE F036 NOT FULLY OPENED	LIMIT SWITCH
	STEAM SUPPLY INBOARD ISOLATION VALVE F035 NOT FULLY OPENED	LIMIT SWITCH
	RCIC TURBINE EXHAUST VALVE F039 NOT FULLY OPENED	LIMIT SWITCH
	RCIC TURBINE INLET STEAM LINE WATER DRAIN POT LEVEL HIGH	LS011
	RCIC DISCHARGE LINE NOT FILLED	PIS-Z608
	CONDENSATE STORAGE TANK TO SUPPRESSION POOL SUCTION AUTO TRANSFER OVERRIDE	KOS
	ANY PUMP MOTOR OVERLOAD OR POWER LOSS	MCC
	SUPPRESSION POOL WATER TEMPERATURE HIGH	TIS-Z604

TABLE 1 (CONT'D) ANNUNCIATOR/ALARM LIST

INDICATOR	FUNCTION	INITIATING DEVICE
ALARMS	OIL FILTER DIFFERENTIAL PRESSURE HIGH	DP SWITCH
	RCIC MANUAL INITIATION SWITCH IN ARMED POSITION	PBS
	RCIC OUT OF SERVICE	COS LOGIC OUTPUT
	RCIC TURBINE BEARING OIL PRESSURE LOW	PRESSURE SWITCH
	VACUUM TANK PRESSURE HIGH	PRESSURE SWITCH
	RCIC LOW FLOW	FIS-Z607
	RCIC LUBE OIL AFTER COOLER TEMP HIGH	TEMP SWITCH
	VACUUM PUMP DISCHARGE ISOLATION VALVE F047 NOT FULLY OPENED	LIMIT SWITCH
	RCIC TURBINE TRIP AND THROTTLE VALVE NOT FULLY OPENED	LIMIT SWITCH
	SUPPRESSION POOL WATER LEVEL HIGH	LOGIC OUTPUT
	CONDENSATE STORAGE TANK WATER LEVEL LOW	LOGIC OUTPUT
	RCIC TEST	COS
	RPV WATER LEVEL LOW (L2)	LOGIC OUTPUT
	DRYWELL PRESSURE HIGH	LOGIC OUTPUT
	RCIC INITIATION SIGNAL	LOGIC OUTPUT
	RPV WATER LEVEL HIGH (L8)	LOGIC OUTPUT
	ANY RCIC VALVE OVERLOAD OR POWER LOSS	MCC
	RCIC LOGIC POWER FAILURE	LOGIC OUTPUT
	STEAM SUPPLY TO TURBINE VALVE F037 CLOSED ON HIGH WATER LEVEL (L8)	LIMIT SWITCH, LOGIC OUTPUT
	THERMAL OVERLOAD RELAY BYPASS CONTROL SWITCH IN "TEST"	KOS

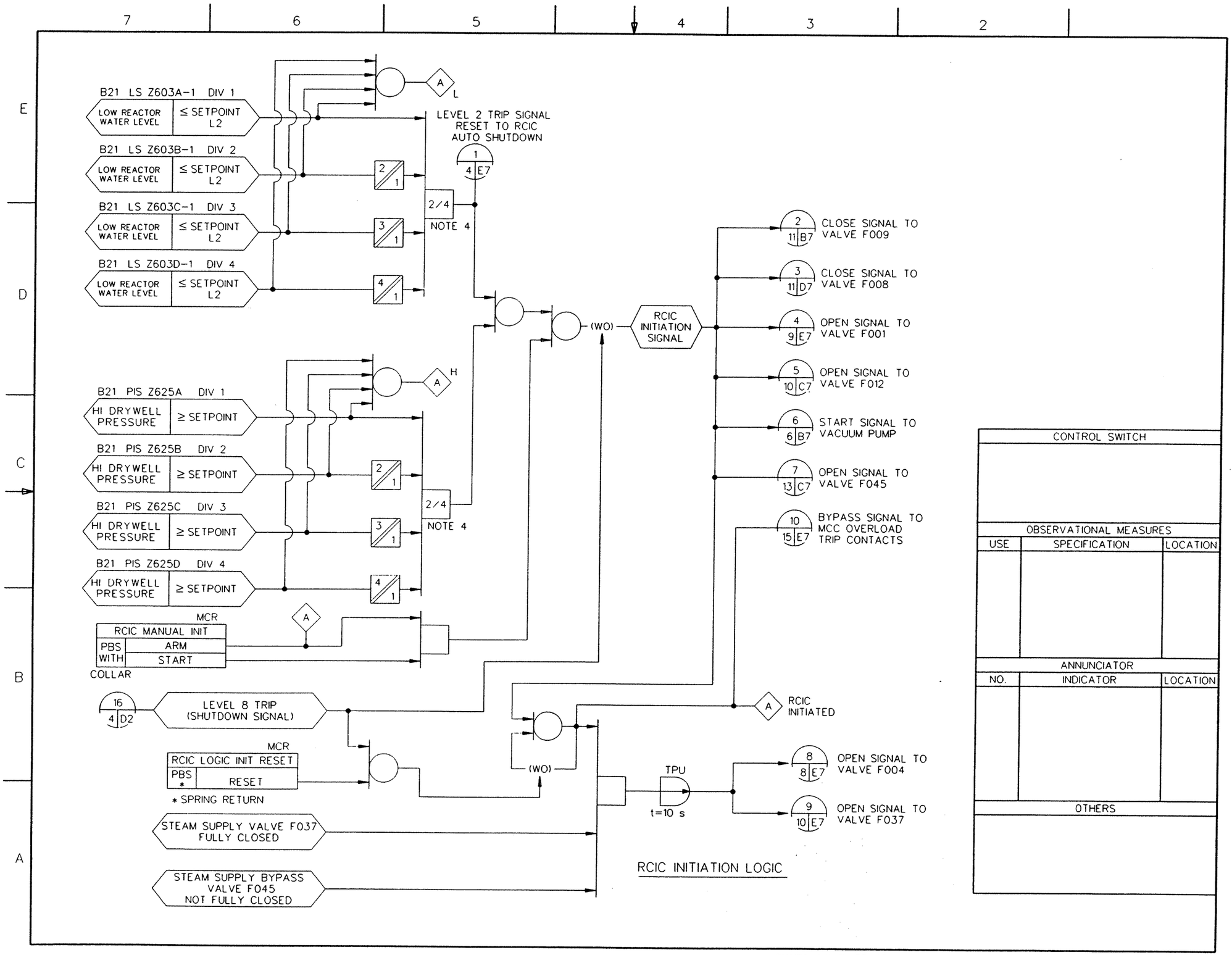


FIGURE 7.3-3 REACTOR CORE ISOLATION COOLING SYSTEM IBD (Sheet 3 of 17)

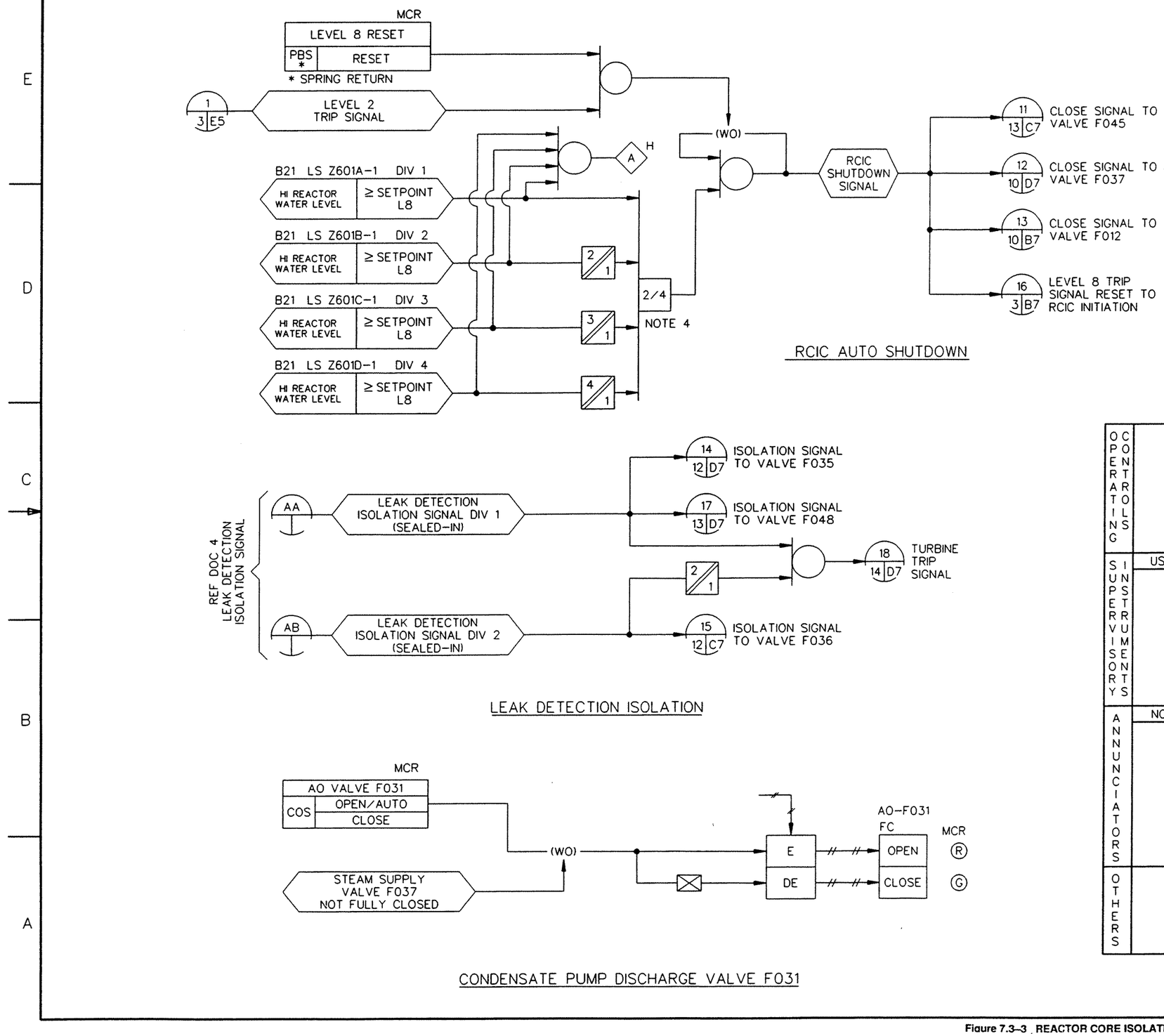
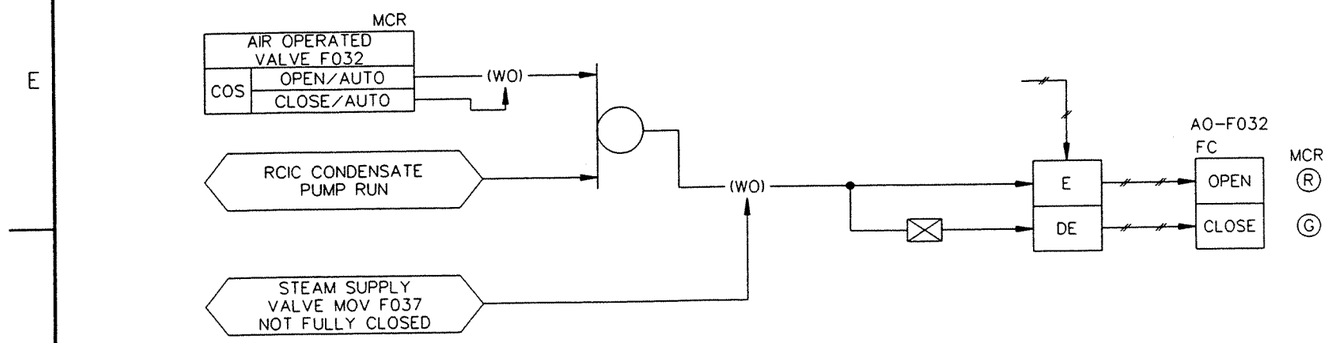
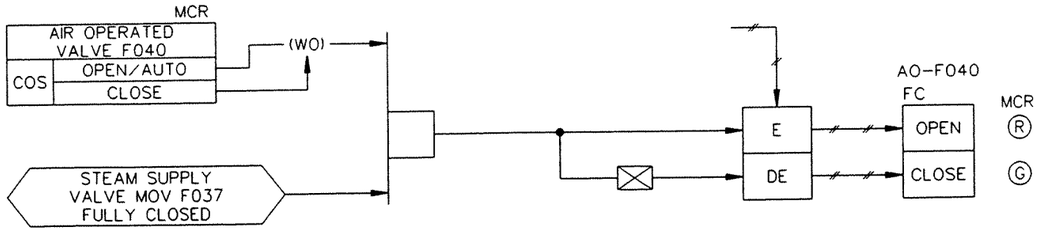


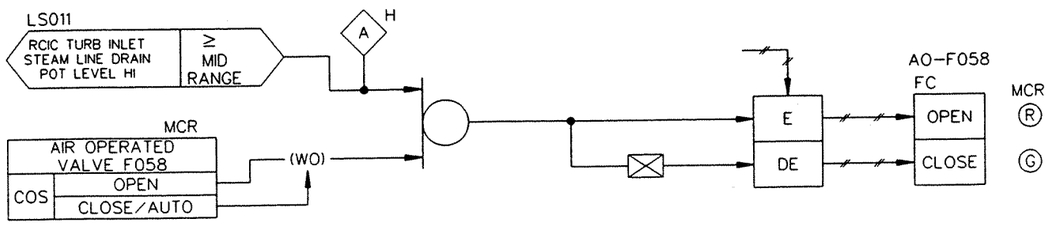
Figure 7.3-3 REACTOR CORE ISOLATION COOLING SYSTEM IBD (Sheet 4 of 17)



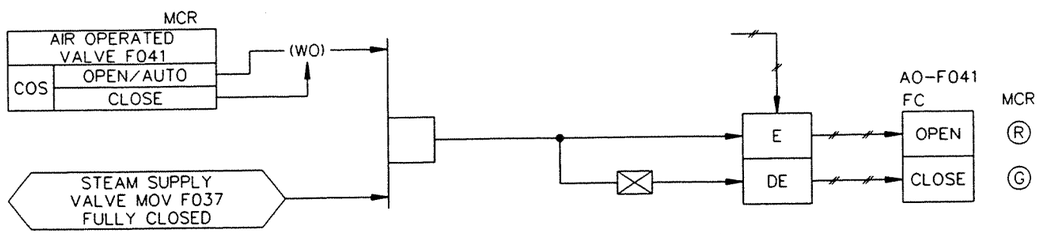
CONDENSATE PUMP DISCHARGE VALVE F032



DRAIN POT SYSTEM ISOLATION VALVE F040



STEAM INLET TRAP BYPASS VALVE F058



DRAIN POT SYSTEM ISOLATION VALVE F041

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

Figure 7.3–3 REACTOR CORE ISOLATION COOLING SYSTEM IBD (Sheet 5 of 17)

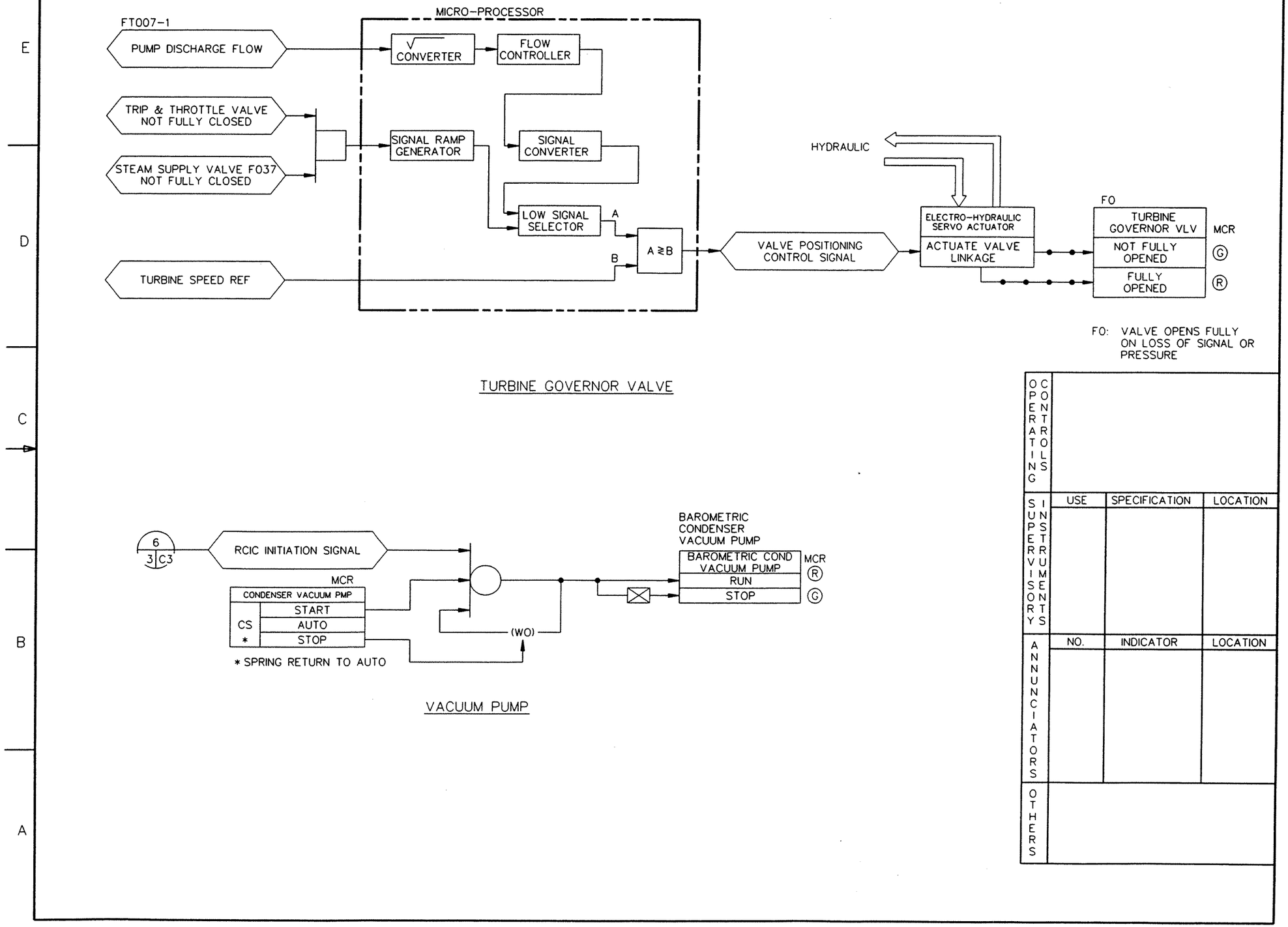
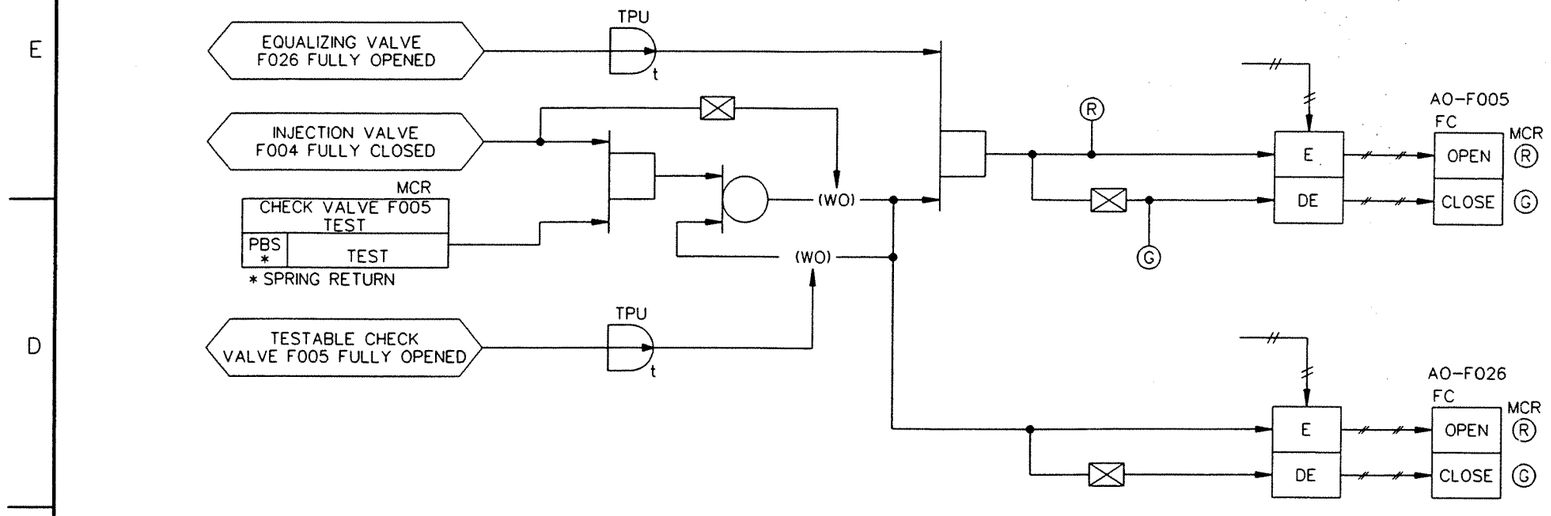
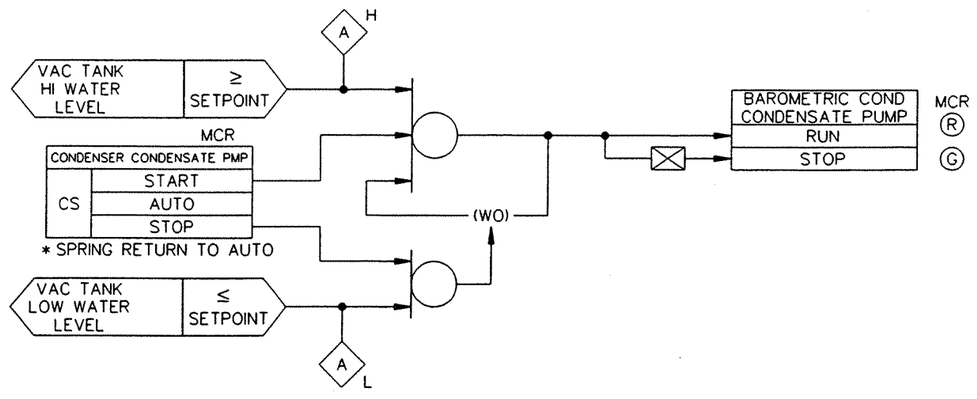


Figure 7.3–3 REACTOR CORE ISOLATION COOLING SYSTEM IBD (Sheet 6 of 17)



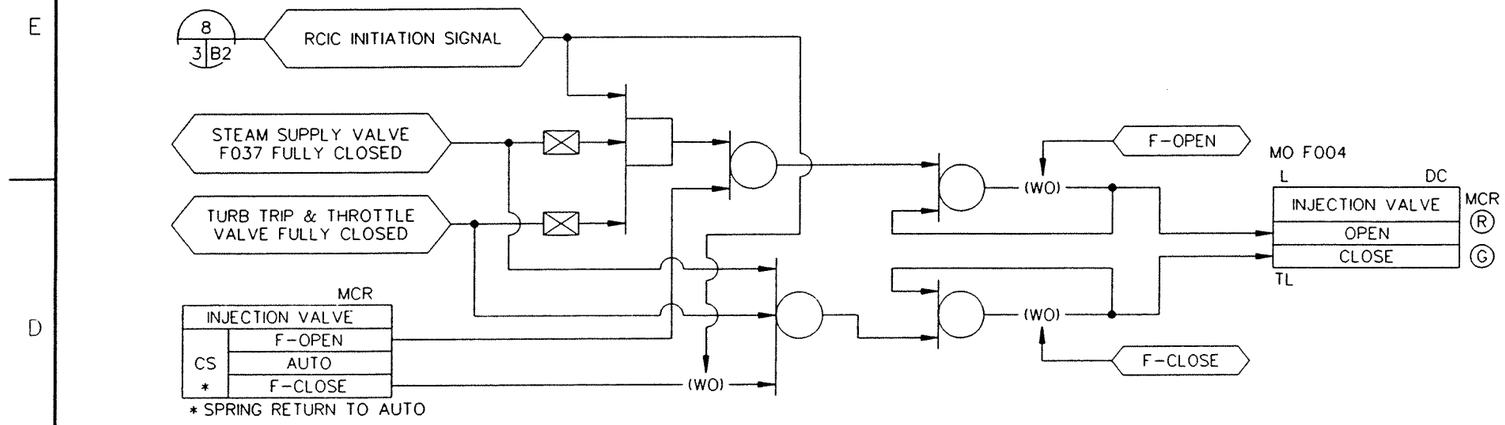
TESTABLE CHECK VALVE F005 & EQUALIZING VALVE F026



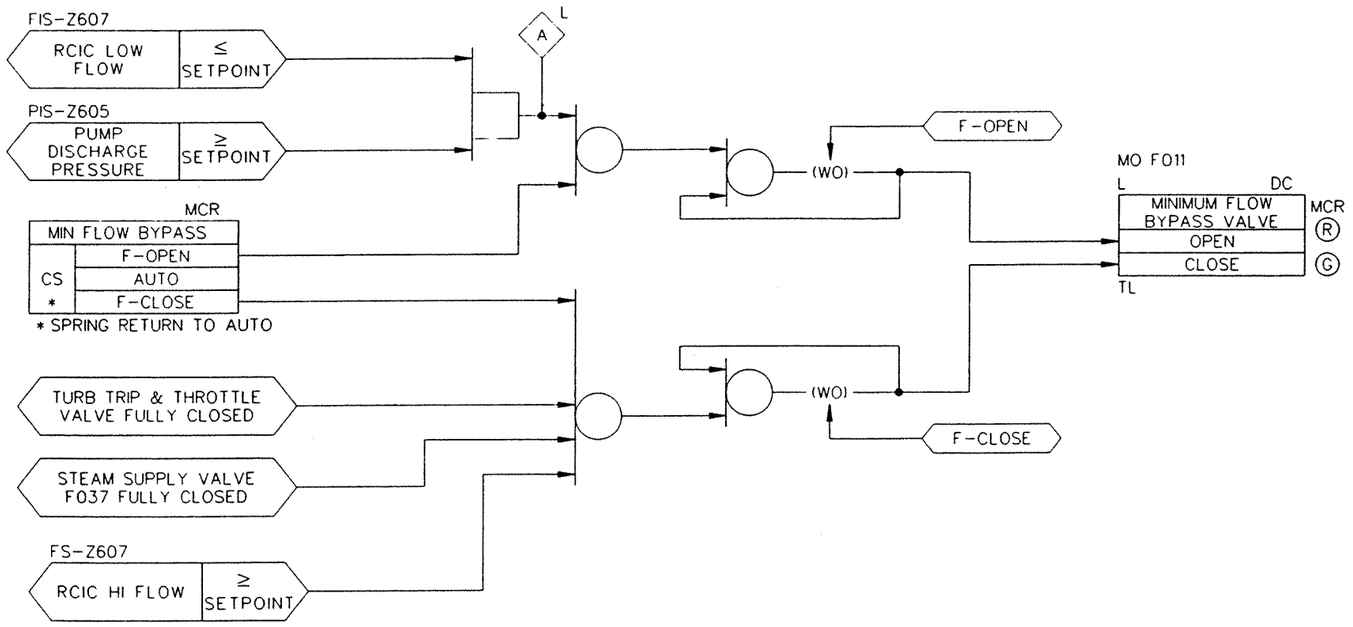
CONDENSATE PUMP

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

Figure 7.3–3 REACTOR CORE ISOLATION COOLING SYSTEM IBD (Sheet 7 of 17)



INJECTION VALVE MO F004



MINIMUM FLOW BYPASS TO SUPPRESSION POOL VALVE MO F011

CONTROL SWITCH

OBSERVATIONAL MEASURES		
USE	SPECIFICATION	LOCATION

ANNUNCIATOR		
NO.	INDICATOR	LOCATION

OTHERS

FIGURE 7.3-3 REACTOR CORE ISOLATION COOLING SYSTEM IBD (Sheet 8 of 17)

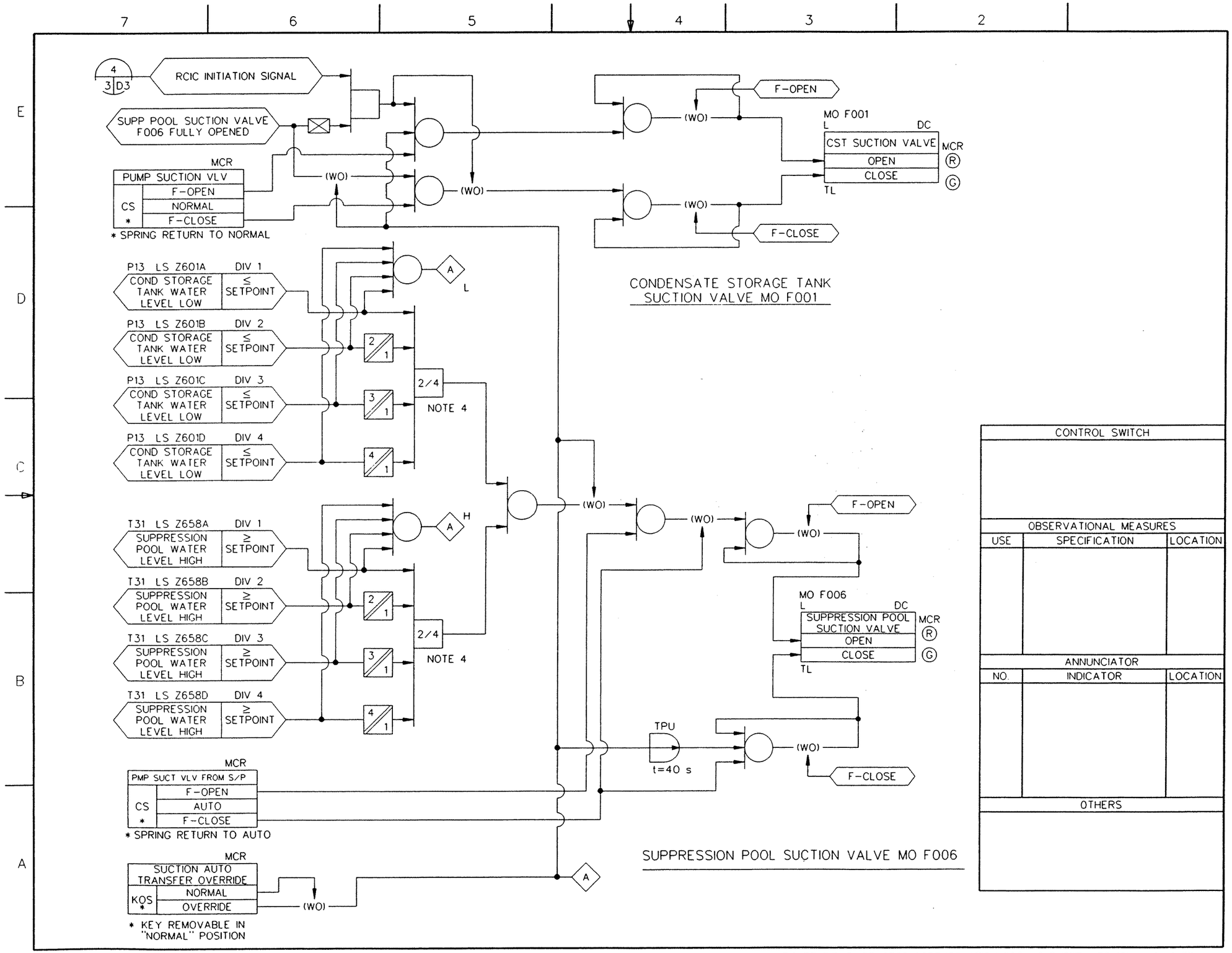
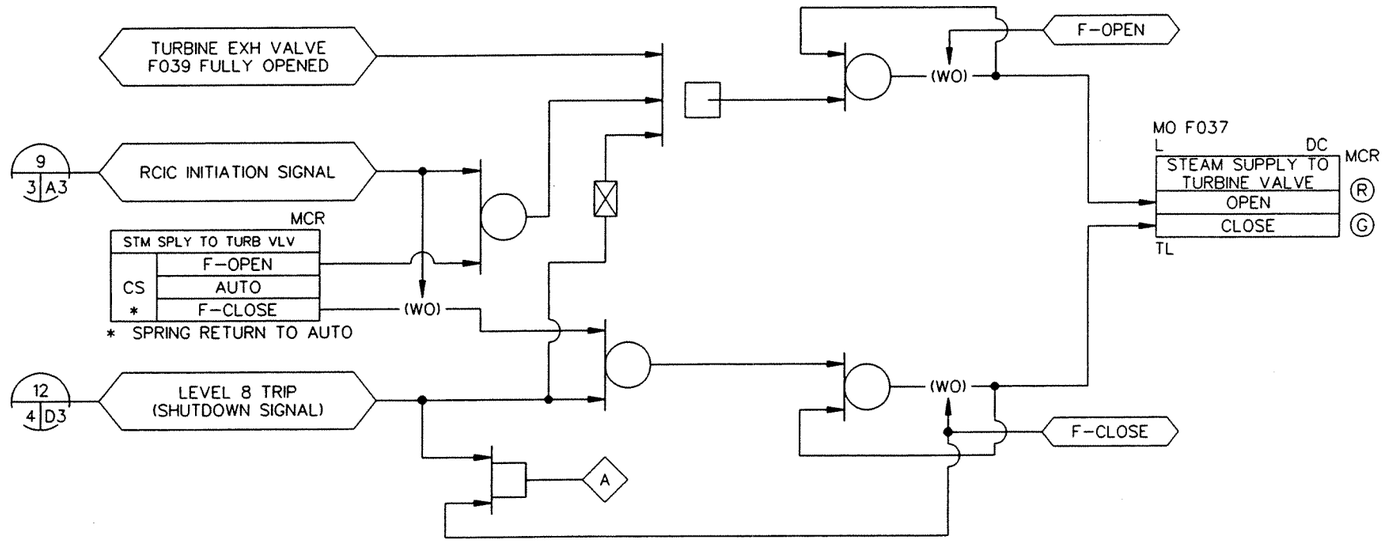
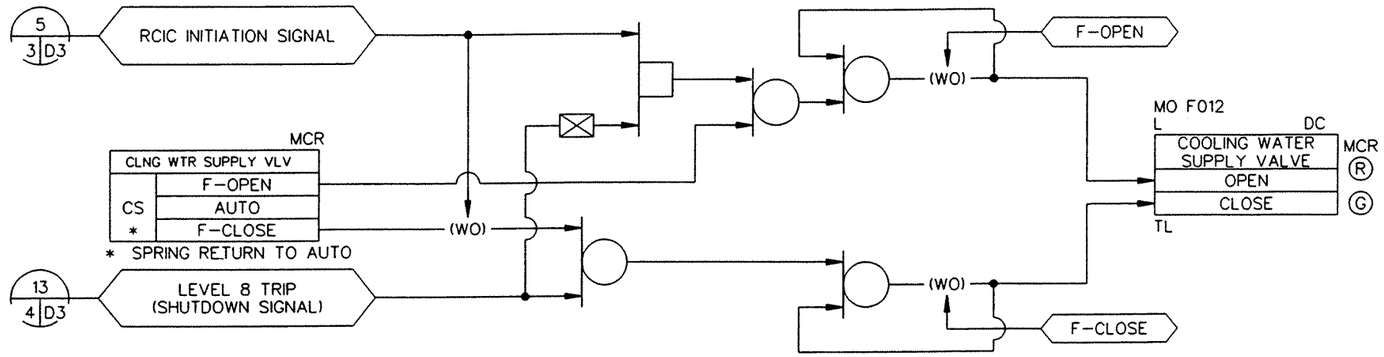


FIGURE 7.3-3 REACTOR CORE ISOLATION COOLING SYSTEM IBD (Sheet 9 of 17)



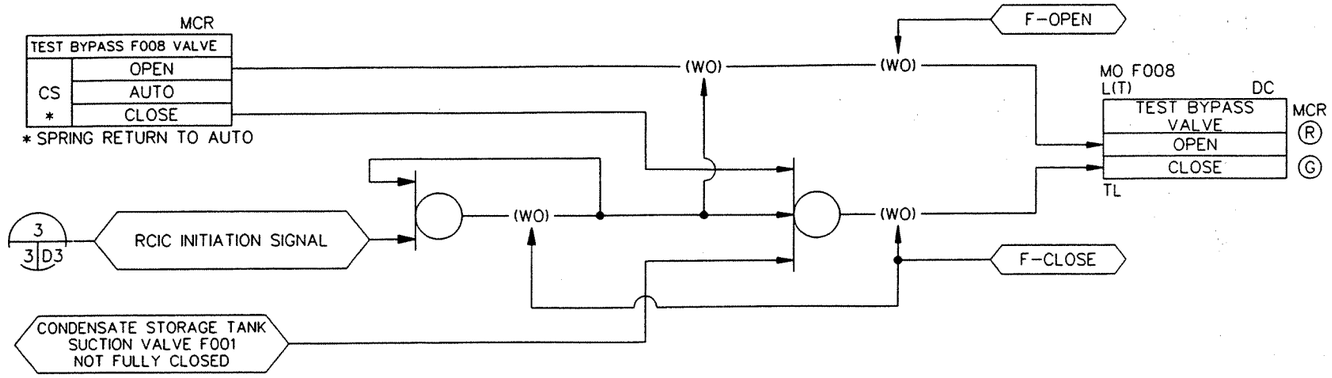
STEAM SUPPLY TO TURBINE VALVE MO F037



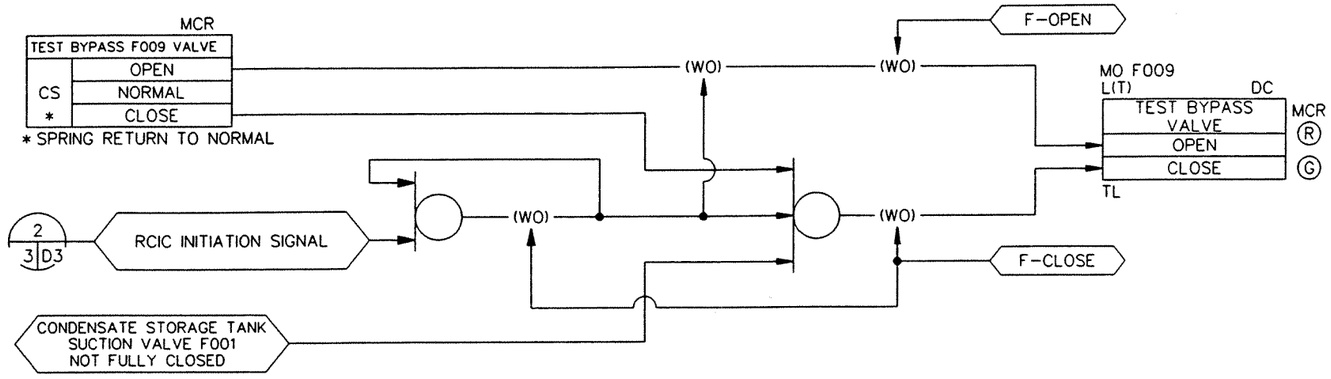
COOLING WATER SUPPLY VALVE MO F012

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

Figure 7.3-3 REACTOR CORE ISOLATION COOLING SYSTEM IBD (Sheet 10 of 17)



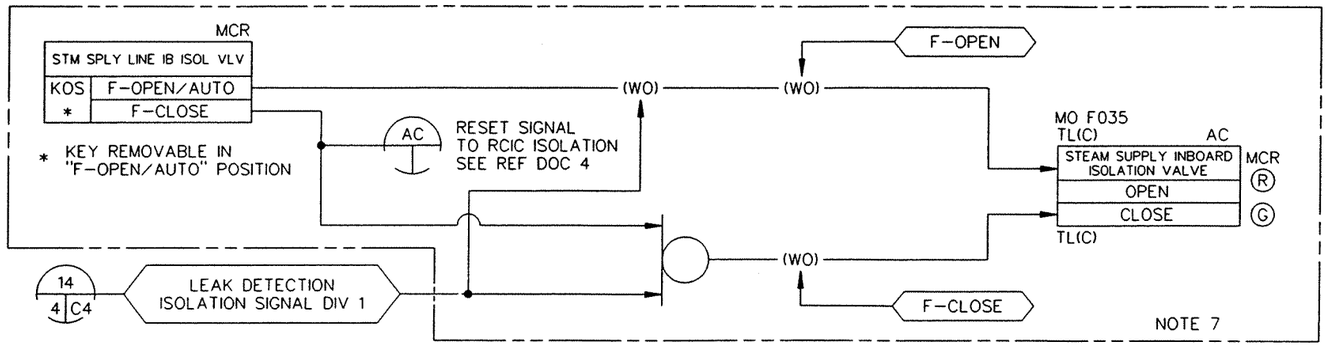
TEST BYPASS TO SUPPRESSION POOL VALVE MO F008



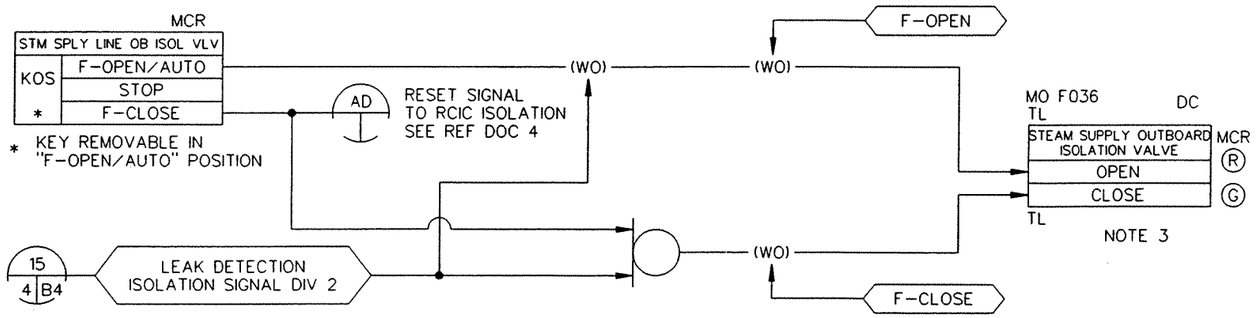
TEST BYPASS TO SUPPRESSION POOL VALVE MO F009

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

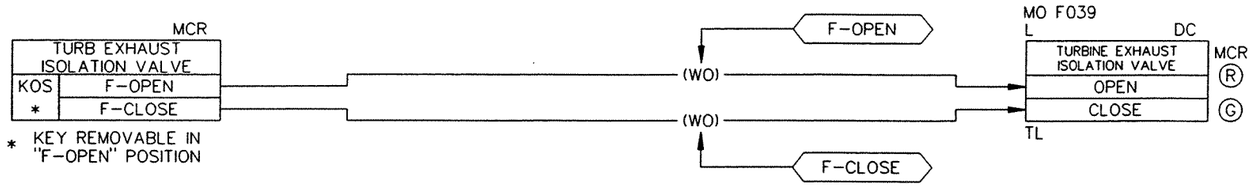
Figure 7.3-3 REACTOR CORE ISOLATION COOLING SYSTEM IBD (Sheet 11 of 17)



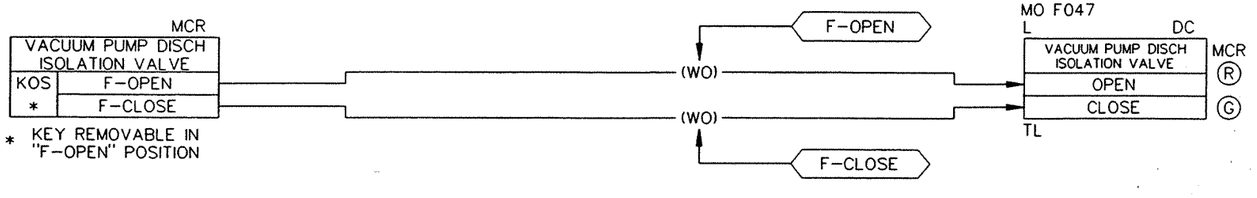
STEAM SUPPLY LINE INBOARD ISOLATION VALVE MO F035



STEAM SUPPLY LINE OUTBOARD ISOLATION VALVE MO F036



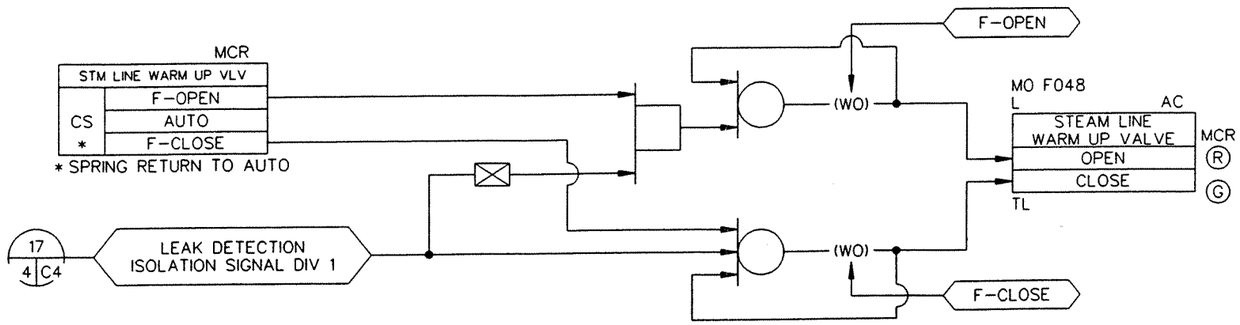
TURBINE EXHAUST TO SUPPRESSION POOL VALVE MO F039



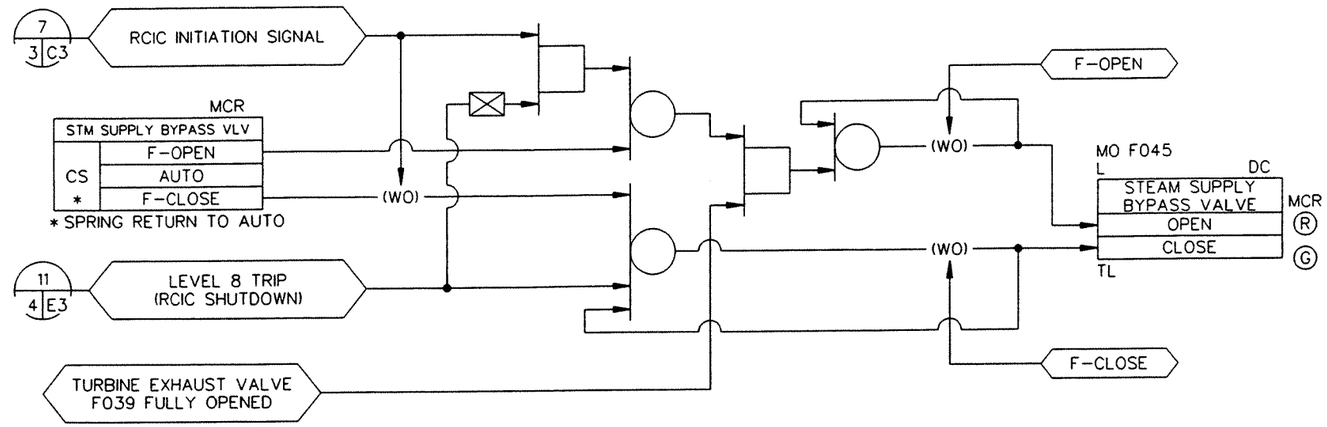
VACUUM PUMP DISCHARGE ISOLATION VALVE MO F047

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

FIGURE 7.3-3 REACTOR CORE ISOLATION COOLING SYSTEM IBD (Sheet 12 of 17)



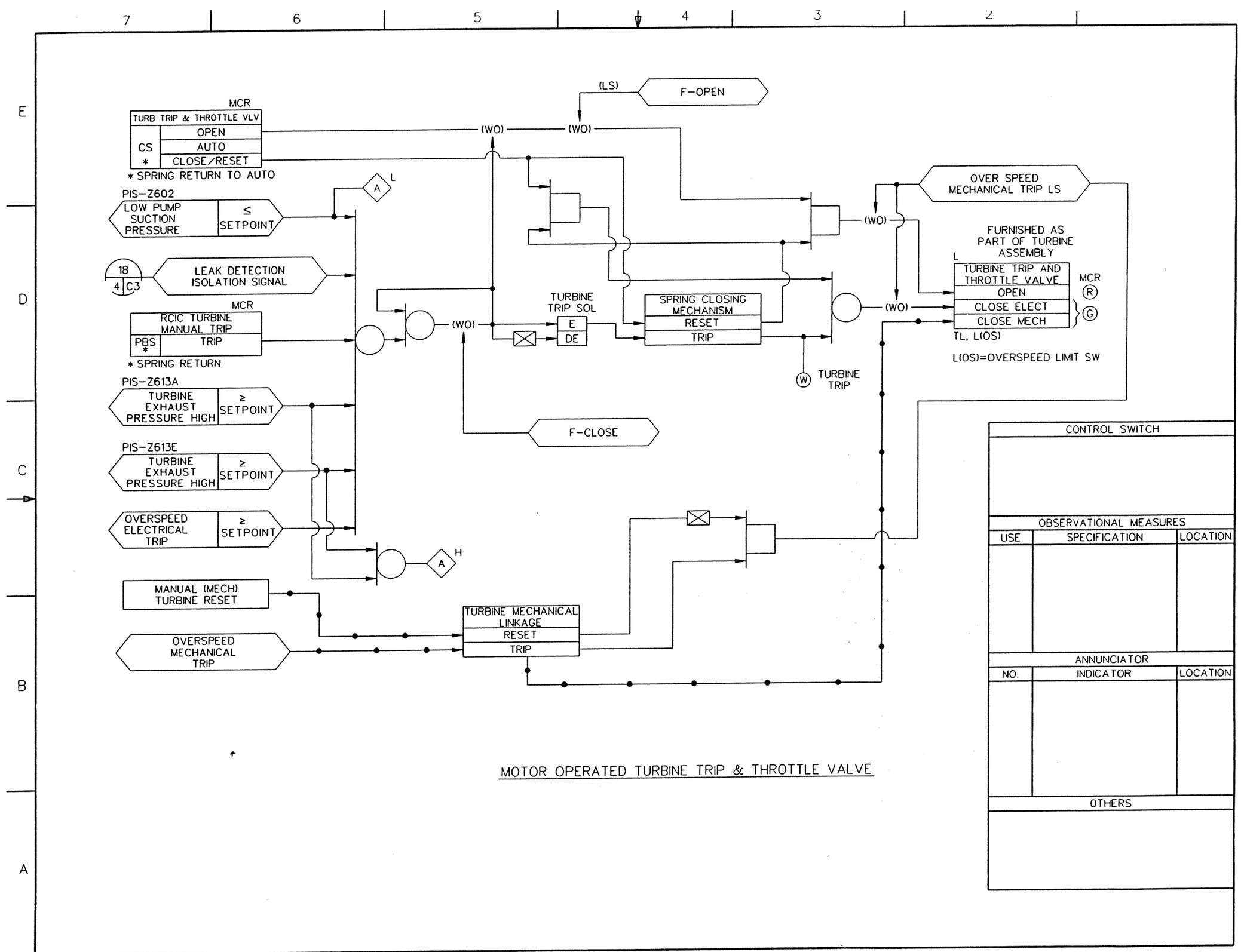
STEAM LINE WARM UP VALVE MO F048



STEAM SUPPLY BYPASS VALVE MO F045

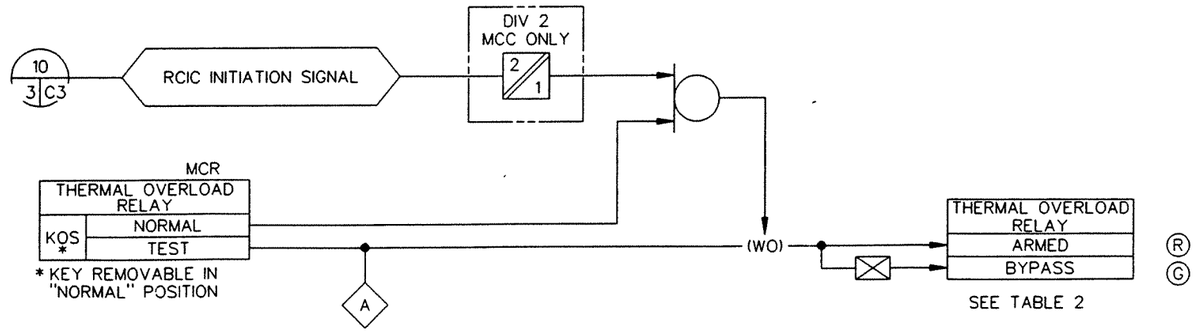
OPERATING CONTROLS			
SUPERVISORY INSTRUMENTS	USE	SPECIFICATION	LOCATION
ANNUNCIATORS	NO.	INDICATOR	LOCATION
OTHERS			

Figure 7.3–3 REACTOR CORE ISOLATION COOLING SYSTEM IBD (Sheet 13 of 17)



MOTOR OPERATED TURBINE TRIP & THROTTLE VALVE

FIGURE 7.3-3 REACTOR CORE ISOLATION COOLING SYSTEM IBD (Sheet 14 of 17)



MOTOR CONTROL CENTER THERMAL OVERLOAD RELAY BYPASS
(TYPICAL FOR DIV 2 MCC EXCEPT AS NOTED)

TABLE 2: LIST OF EQUIPMENT WITH THERMAL OVERLOAD RELAY BYPASS

SYSTEM	VALVE NO.	NAME	POWER SUPPLY
RCIC	E51–F001	CST SUCTION VALVE	DIV 1 DC
RCIC	E51–F004	INJECTION VALVE	DIV 1 DC
RCIC	E51–F006	S/P SUCTION VALVE	DIV 1 DC
RCIC	E51–F008	TEST RETURN VALVE	DIV 1 DC
RCIC	E51–F009	TEST RETURN VALVE	DIV 1 DC
RCIC	E51–F011	MINIMUM FLOW VALVE	DIV 1 DC
RCIC	E51–F012	COOLING WATER SUPPLY VALVE	DIV 1 DC
RCIC	E51–F035	STEAM SUPPLY INBOARD ISOL VALVE	DIV 1 AC
RCIC	E51–F036	STEAM SUPPLY OUTBOARD ISOL VALVE	DIV 2 DC
RCIC	E51–F037	STEAM SUPPLY VALVE	DIV 1 DC
RCIC	E51–F039	TURBINE EXHAUST VALVE	DIV 1 DC
RCIC	E51–F045	STEAM SUPPLY BYPASS VALVE	DIV 1 DC
RCIC	E51–F047	VACUUM PUMP DISCH ISOL VALVE	DIV 1 DC
RCIC	E51–F048	STEAM LINE WARM–UP VALVE	DIV 1 AC
RCIC	*	TURBINE TRIP AND THROTTLE VALVE	DIV 1 DC
RCIC	*	CONDENSATE PUMP	DIV 1 DC
RCIC	*	VACUUM PUMP	DIV 1 DC

* SUPPLIED WITH RCIC TURBINE, E51–C002

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

Figure 7.3–3 REACTOR CORE ISOLATION COOLING SYSTEM IBD (Sheet 15 of 17)

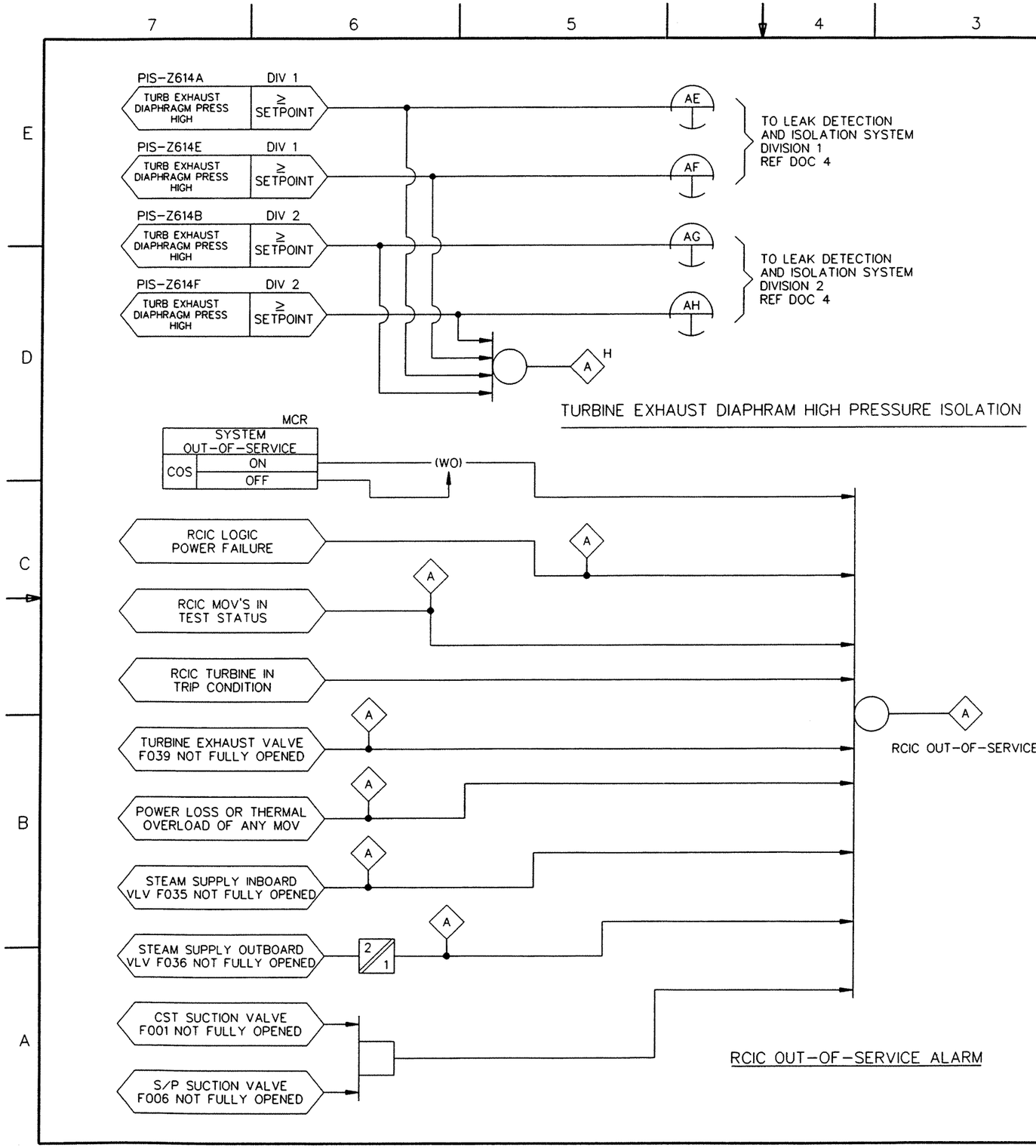


Figure 7.3–3 REACTOR CORE ISOLATION COOLING SYSTEM IBD (Sheet 16 of 17)

TIS Z604

SUPPRESSION POOL WATER TEMPERATURE HIGH — A H

RCIC TURBINE GOVERNOR END BEARING OIL TEMP HIGH — A H

RCIC TURBINE COUPLING END BEARING OIL TEMP HIGH — A H

OIL FILTER DIFFERENTIAL PRESSURE HIGH — A H

RCIC TURBINE BEARING OIL PRESSURE LOW — A L

RCIC LUBE OIL AFTER COOLER TEMP HIGH — A H

VACUUM TANK PRESSURE HIGH — A H

RCIC PUMP SUCTION PRESSURE HIGH — A H

ANY PUMP MOTOR OVERLOAD OR POWER LOSS — A

RCIC DISCHARGE LINE NOT FILLED — A

STEAM SUPPLY WARM-UP VALVE F048 NOT FULLY CLOSED — A

VACUUM PUMP DISCHARGE ISOLATION VALVE F047 NOT FULLY OPENED — A

TURBINE TRIP AND THROTTLE VALVE NOT FULLY OPENED — A

MCR

RCIC TEST

COS: NORMAL / TEST — (WO) — A

MISCELLANEOUS ALARMS

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

Figure 7.3–3 REACTOR CORE ISOLATION COOLING SYSTEM IBD (Sheet 17 of 17)

NOTES:

1. RHR LOOP "A" LOGIC IS SHOWN. RHR LOOP B, & C LOGIC IS IDENTICAL TO "A" EXCEPT AS NOTED.
2. ALL EQUIPMENT AND INSTRUMENTS ARE PREFIXED BY SYSTEM NUMBER E11 UNLESS OTHERWISE NOTED.
3. VALVES F011A, F011B AND F011C ARE IN ELECTRICAL DIVISION 2, 3 AND 1 RESPECTIVELY. THE MANUAL CONTROL SWITCH FOR VALVES F011A, F011B AND F011C ARE IN ELECTRICAL DIVISIONS 1, 2 AND 3 RESPECTIVELY.
4. SYSTEM R10, ELECTRICAL POWER DISTRIBUTION SYSTEM, SHALL PERMIT MOTOR TO START ONLY FOR PUMP VOLTAGE >70 PERCENT OF NOMINAL.
5. DIVISIONAL SIGNALS SHALL BE ISOLATED FROM THE NON-1E ALARM.
6. THE LOGIC DESIGN SHALL INCORPORATE PROVISIONS TO REVERT 2/4 LOGIC TO 2/3 LOGIC DURING BYPASS OF A SINGLE DIVISION OF SENSORS. ALSO, THE LOGIC DESIGN SHALL NOT PERMIT THE BYPASS OF MORE THAN ONE DIVISION OF SENSORS AT A TIME.
7. SETPOINT VALUES ARE PRELIMINARY AND WILL BE FINALIZED IN DETAILED DESIGN.
8. UNLESS OTHERWISE SPECIFIED, POWER AND CONTROL CIRCUITS ARE DIVISION 1, 2 AND 3 FOR LOOPS A, B AND C RESPECTIVELY.
9. THIS EQUIPMENT IS ALSO CONTROLLED BY REMOTE SHUTDOWN SYSTEM (REFERENCE DOCUMENT 11) FOR RHR LOOPS A AND B ONLY.
10. THE ELECTRICAL POWER DISTRIBUTION SYSTEM SHALL PROVIDE PUMP C001A,B,C STOP SIGNALS DUE TO BUS UNDER VOLTAGE (≤ 30% VOLTAGE) AND ANY OF THE FOLLOWING MOTOR PROTECTIVE RELAY TRIP SIGNALS:
    A. MOTOR OVERCURRENT
    B. BUS DIFFERENTIAL CURRENT
    C. GROUND OVERCURRENT

REFERENCE DOCUMENTS

		MPL NO.
1.	NUCLEAR BOILER SYSTEM P&ID	B21-1010
2.	SUPPRESSION POOL TEMPERATURE MONITORING SYSTEM IBD	T53-1030
3.	RHR SYSTEM P&ID	E11-1010
4.	LEAK DETECTION & ISOLATION SYSTEM IBD	E31-1030
5.	DELETED	
6.	FLAMMABILITY CONTROL SYSTEM P&ID	T49-1010
7.	NUCLEAR BOILER SYSTEM IBD	B21-1030
8.	REACTOR WATER CLEAN-UP SYSTEM IBD	G31-1030
9.	FUEL POOL COOLING SYSTEM IBD	G41-1030
10.	REACTOR BLDG COOLING WATER SYSTEM/ REACTOR SERVICE WATER SYSTEM IBD	P21/P41-1030
11.	REMOTE SHUTDOWN SYSTEM IBD	C61-1030
12.	CONTAINMENT ATMOSPHERE MONITORING SYSTEM IBD	D23-1030
13.	INTERLOCK BLOCK DIAGRAM (IBD) STANDARDS	A10-3070
14.	REACTOR BLDG COOLING WATER SYSTEM P&ID	P21-1010

FIGURE 7.3-4 RESIDUAL HEAT REMOVAL SYSTEM IBD (Sheet 1 of 20)

TABLE OF CONTENTS

SH NO.	TITLE
1	COVER, NOTES AND REFERENCE DOCUMENTS
2	TABLE OF CONTENTS
3	RHR INITIATION LOGIC FOR LOOP A,B&C
4	LOCA SIGNAL FOR RHR
5	MISCELLANEOUS ALARMS
6	PUMP C001A,B&C
6	PUMP SUCTION VALVE F001A,B&C
7	SHUTDOWN COOLING SUCTION VALVE F012A,B&C
7	HEAT EXCHANGER TUBE SIDE OUTLET VALVE F004A,B&C
7	HEAT EXCHANGER TUBE SIDE BYPASS VALVE F013A,B&C
8	SHUTDOWN COOLING INBOARD SUCTION ISOLATION VALVE F010A,B&C
8	SHUTDOWN COOLING OUTBOARD SUCTION ISOLATION VALVE F011A
9	SHUTDOWN COOLING OUTBOARD SUCTION ISOLATION VALVE F011B
9	SHUTDOWN COOLING OUTBOARD SUCTION ISOLATION VALVE F011C
10	SUPPRESSION POOL RETURN VALVE F008A,B&C
10	TESTABLE CHECK VALVE F006A,B&C AND WARM-UP VALVE F036A,B&C
11	WETWELL SPRAY VALVE F019B&C
11	RHR DISCHARGE LINE FILL PUMP C002A,B&C
12	MINIMUM FLOW VALVE F021A,B&C
12	FUEL POOL ISOLATION VALVE F014B&C
12	FUEL POOL ISOLATION VALVE F015B&C
13	INJECTION VALVE F005A,B&C
13	REACTOR LOW PRESSURE PERMISSIVE LOGIC
14	DRYWELL SPRAY VALVE F017B&C
14	DRYWELL SPRAY VALVE F018B&C
15	LIQUID WASTE FLUSH VALVE F029A,B&C
15	LIQUID WASTE FLUSH VALVE F030A,B&C
15	WARM-UP VALVE F031A,B&C
16	SAMPLING VALVE F043A,B&C
16	SAMPLING VALVE F044A,B&C
16	SAMPLING VALVE F045A
16	SAMPLING VALVE F046A
17	RHR THERMAL OVERLOAD BYPASS LOGIC AND EQUIPMENT LIST
18	OUT-OF-SERVICE ALARM FOR LOOP A,B&C
19	ANNUNCIATOR/ALARM LIGHTS/STATUS LIGHTS
20	SUPPRESSION POOL COOLING AUTO INITIATION LOGIC

Figure 7.3-4 RESIDUAL HEAT REMOVAL SYSTEM IBD (Sheet 2 of 20)

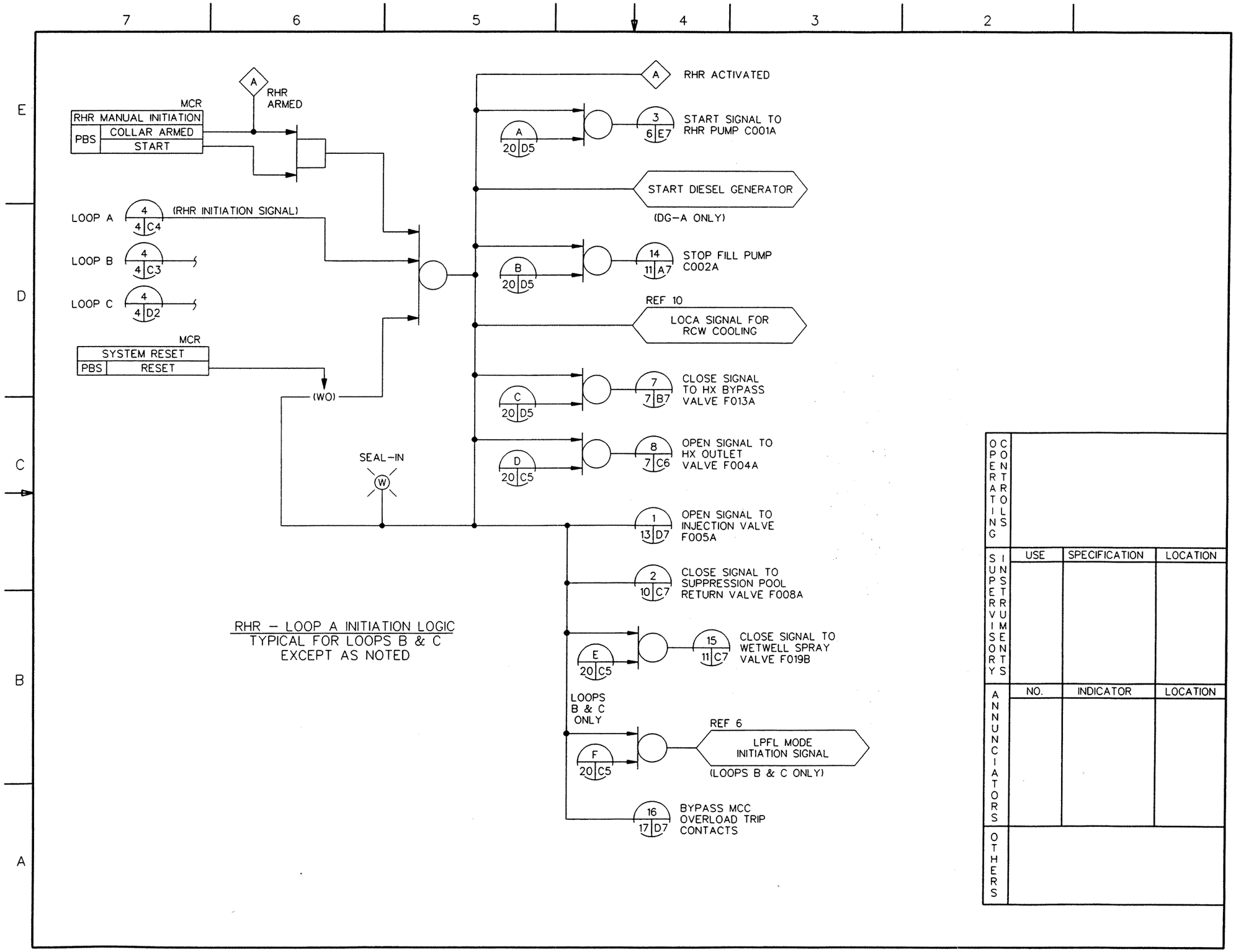


Figure 7.3-4 RESIDUAL HEAT REMOVAL SYSTEM IBD (Sheet 3 of 20)

B21-PIS-Z625A
DRYWELL PRESSURE ≥ SET POINT
B21-PIS-Z625B
DRYWELL PRESSURE ≥ SET POINT
B21-PIS-Z625C
DRYWELL PRESSURE ≥ SET POINT
B21-PIS-Z625D
DRYWELL PRESSURE ≥ SET POINT
DIV 1
DIV 2
DIV 3
DIV 4
H
A
2/4
NOTE 6
1/3
2/3
4/3
1/2
2/4
NOTE 6
3/2
4/2
19
15 D7
15 C7
13
14 E7
14 B7
12
14 E7
14 B7
18
15 D6
15 C6
17
15 D6
15 C6
2/1
3/1
4/1
RHR INITIATION
4
3 D7
LOOP A
LOOP B
LOOP C
AA
3 B6
AB
D23-1030 DIV 1
D23-1030 DIV 2
DIV 1 & 3 INITIATION ALARM
L
B21-LIS-Z603A
REACTOR WATER LEVEL ≤ 1
B21-LIS-Z603B
REACTOR WATER LEVEL ≤ 1
B21-LIS-Z603C
REACTOR WATER LEVEL ≤ 1
B21-LIS-Z603D
REACTOR WATER LEVEL ≤ 1
B21-LIS-Z603E
REACTOR WATER LEVEL ≤ 1
B21-LIS-Z603F
REACTOR WATER LEVEL ≤ 1
B21-LIS-Z603G
REACTOR WATER LEVEL ≤ 1
B21-LIS-Z603H
REACTOR WATER LEVEL ≤ 1
LOCA SIGNAL FOR RHR
DIV 2 INITIATION ALARM

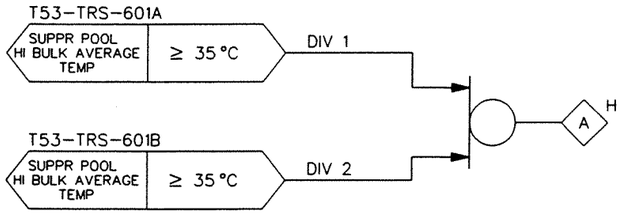
OPERATING CONTROLS

SUPERVISORY INSTRUMENTS	USE	SPECIFICATION	LOCATION

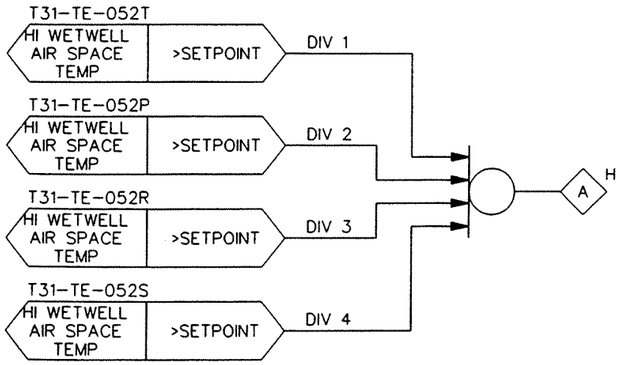
ANNUNCIATORS	NO.	INDICATOR	LOCATION

OTHERS	

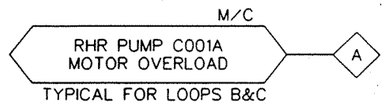
FIGURE 7.3-4 RESIDUAL HEAT REMOVAL SYSTEM IBD (Sheet 4 of 20)

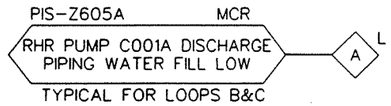


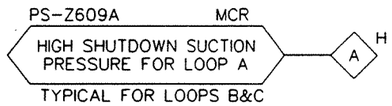
HIGH SUPPRESSION POOL TEMPERATURE ALARM

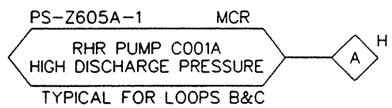


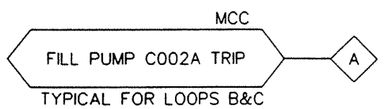
HIGH WETWELL AIR SPACE TEMPERATURE ALARM

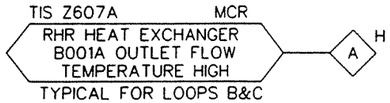


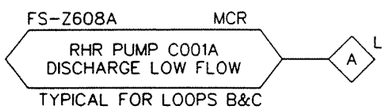












MISCELLANEOUS ALARMS

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

Figure 7.3-4 RESIDUAL HEAT REMOVAL SYSTEM IBD (Sheet 5 of 20)

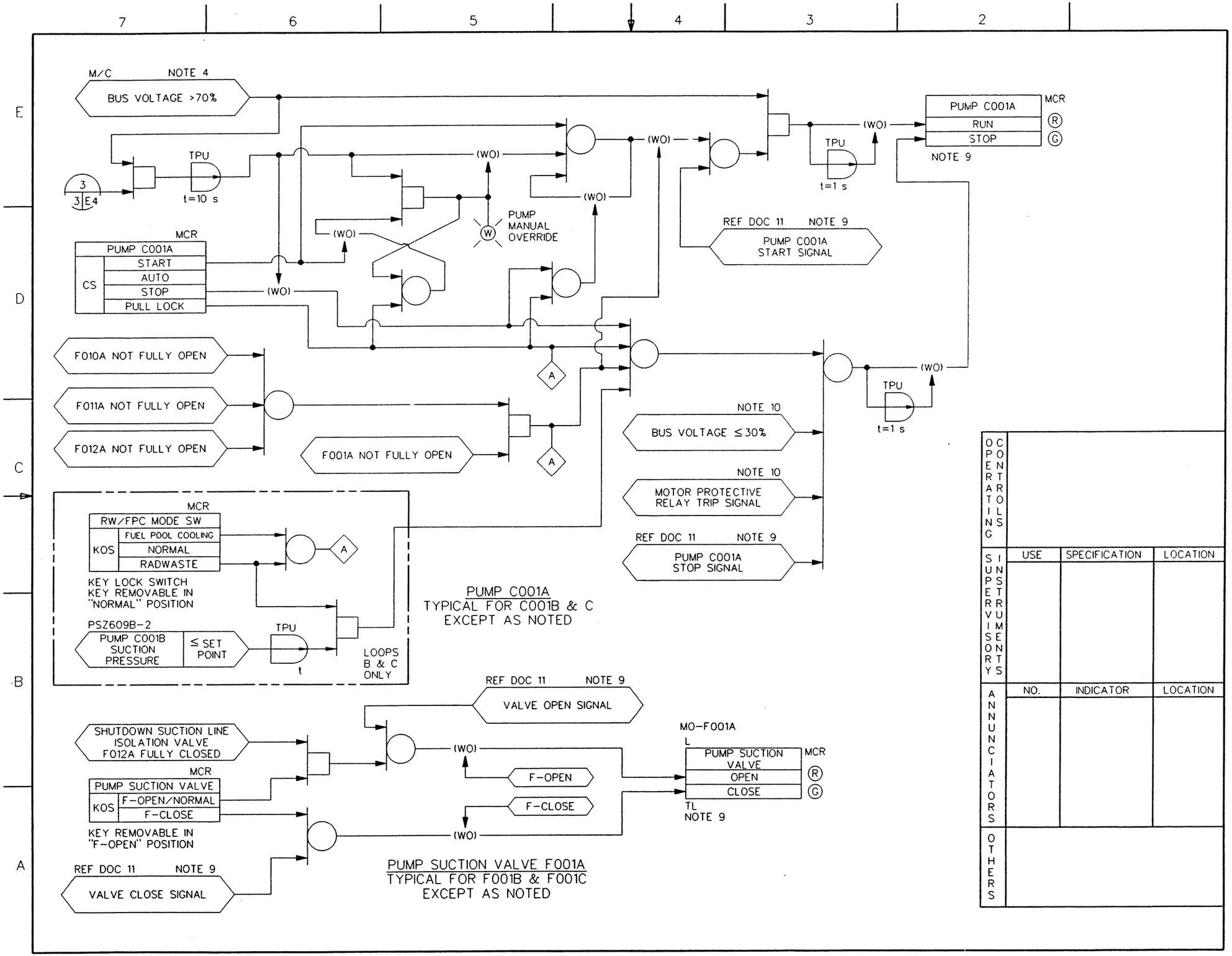


FIGURE 7.3-4 RESIDUAL HEAT REMOVAL SYSTEM IBD (Sheet 6 of 20)

DRYWELL SPRAY VALVE F018B FULLY CLOSED

LOOPS B & C ONLY

SUPPRESSION POOL RETURN VALVE F008A FULLY CLOSED

WETWELL SPRAY VALVE F019B FULLY CLOSED

LOOPS B & C ONLY

PUMP SUCTION F001A FULLY CLOSED

REF DOC 11 NOTE 9

VALVE OPEN SIGNAL

(WO)

F-OPEN

MO-F012A

L

MCR

SHUTDOWN COOLING SUCTION VALVE	
	OPEN (R)
	CLOSE (G)

TL

NOTE 9

F-CLOSE

(WO)

MCR

SHUTDOWN COOLING SUCTION VALVE	
KOS	F-OPEN
	F-CLOSE/NORMAL

KEY REMOVABLE IN "F-CLOSE" POSITION

REF DOC 11 NOTE 9

VALVE CLOSE SIGNAL

SHUTDOWN COOLING SUCTION VALVE F012A
TYPICAL FOR F012B & F012C
EXCEPT AS NOTED

REF DOC 11 NOTE 9

VALVE OPEN SIGNAL

8 3|C4 (RHR INITIATION SIGNAL)

(WO)

F-OPEN

MO-F004A

TL

MCR

HEAT EXCHANGER TUBE SIDE OUTLET VALVE	
	OPEN (R)
	CLOSE (G)

L(T)

NOTE 9

F-CLOSE

(WO)

MCR

HEAT EXCHANGER TUBE SIDE INLET	
CS	OPEN
	AUTO
	CLOSE

(WO)

REF DOC 11 NOTE 9

VALVE CLOSE SIGNAL

HEAT EXCHANGER TUBE SIDE OUTLET VALVE F004A
TYPICAL FOR F004B & F004C
(THROTTLING TYPE)

REF DOC 11 NOTE 9

VALVE OPEN SIGNAL

7 3|D4 (RHR INITIATION SIGNAL)

(WO)

F-OPEN

MO-F013A

L(T)

MCR

HEAT EXCHANGER TUBE SIDE BYPASS VALVE	
	OPEN (R)
	CLOSE (G)

TL

NOTE 9

F-CLOSE

(WO)

MCR

HEAT EXCHANGER TUBE SIDE BYPASS VALVE	
CS	OPEN
	AUTO
	CLOSE

(WO)

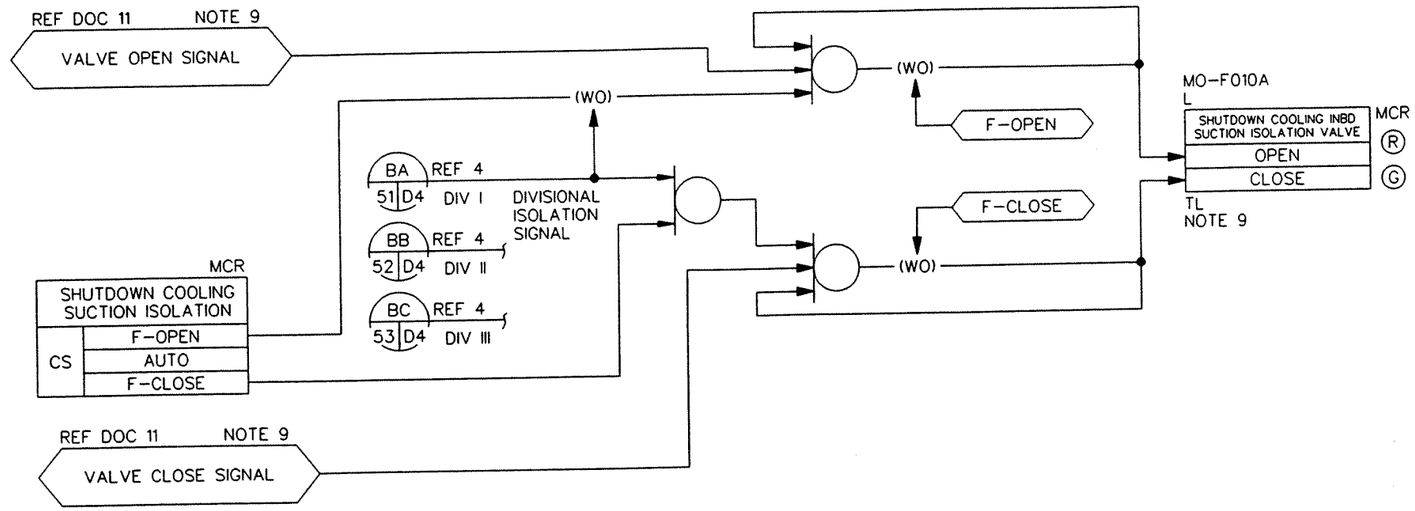
REF DOC 11 NOTE 9

VALVE CLOSE SIGNAL

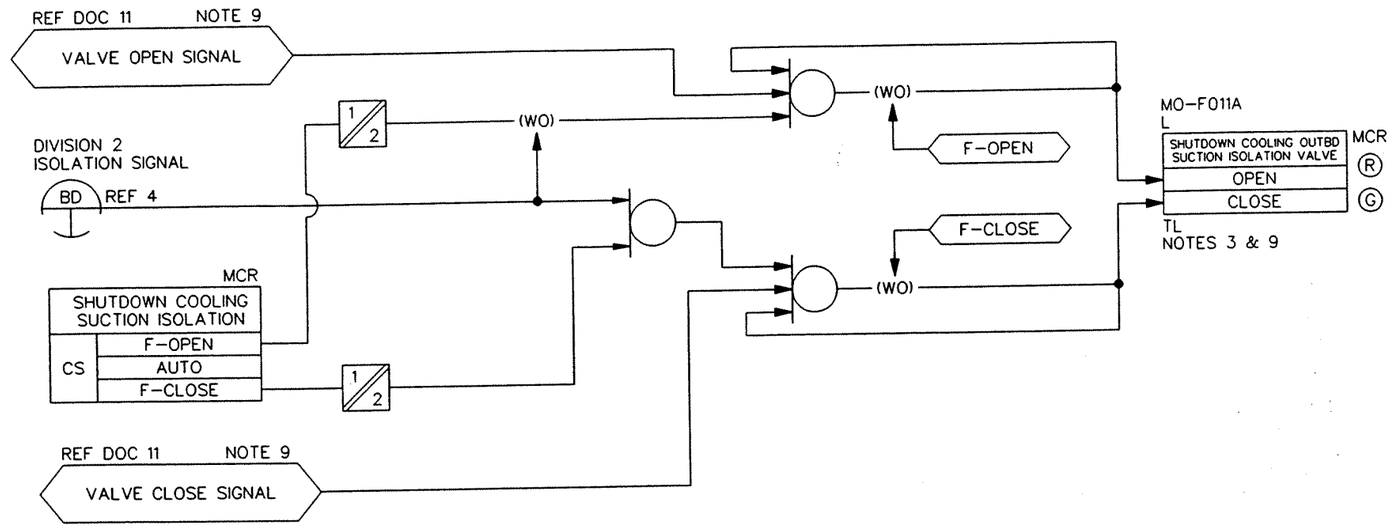
HEAT EXCHANGER TUBE SIDE BYPASS VALVE F013A
TYPICAL FOR F013B & F013C
(THROTTLING TYPE)

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

Figure 7.3-4 RESIDUAL HEAT REMOVAL SYSTEM IBD (Sheet 7 of 20)



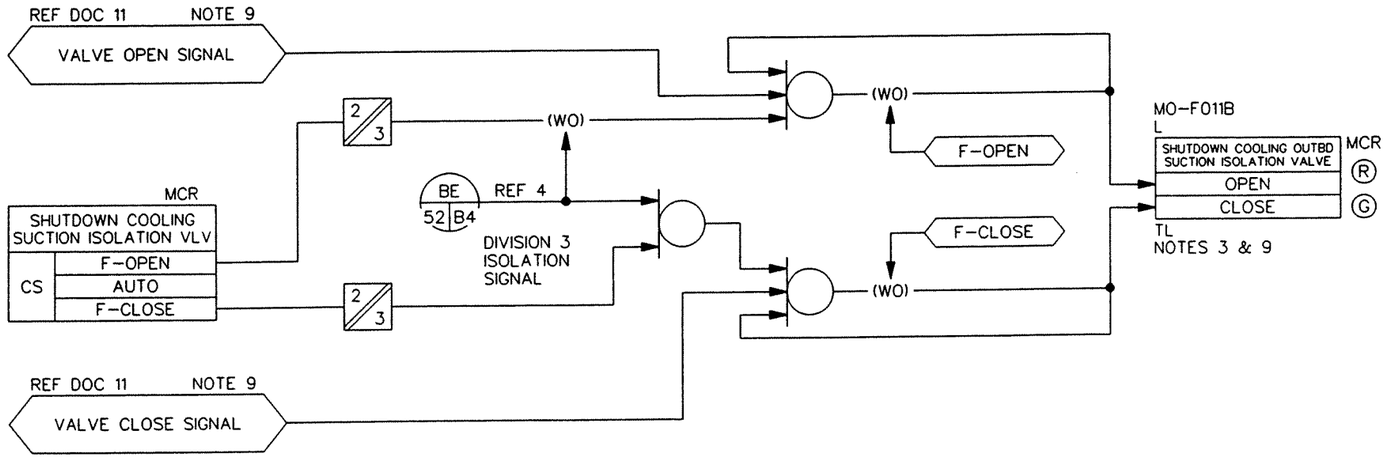
SHUTDOWN COOLING INBOARD SUCTION ISOLATION VALVE F010A
TYPICAL FOR F010B & F010C
EXCEPT AS NOTED



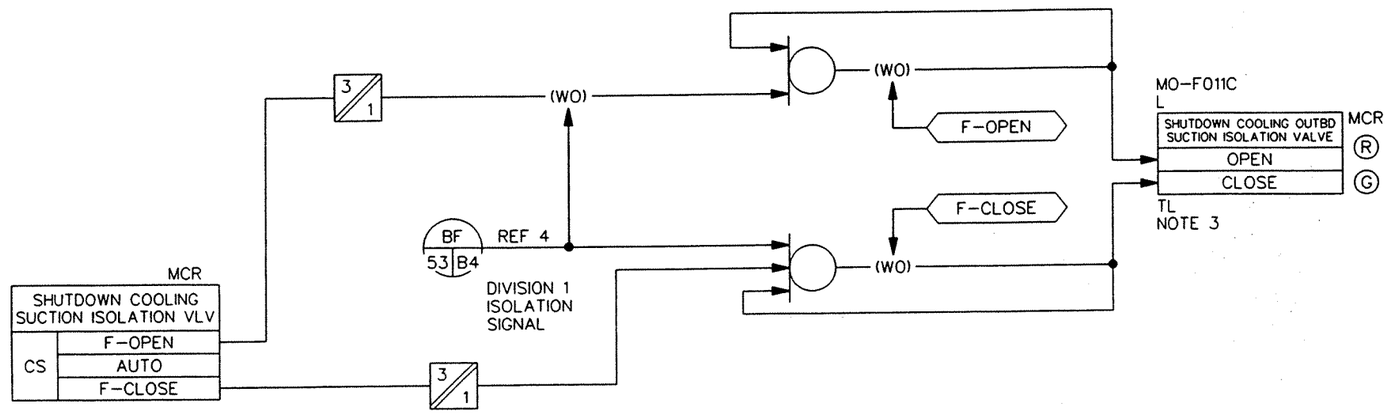
SHUTDOWN COOLING OUTBOARD SUCTION ISOLATION VALVE F011A

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

Figure 7.3-4 RESIDUAL HEAT REMOVAL SYSTEM IBD (Sheet 8 of 20)



SHUTDOWN COOLING OUTBOARD SUCTION ISOLATION VALVE F011B



SHUTDOWN COOLING OUTBOARD SUCTION ISOLATION VALVE F011C

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

Figure 7.3-4 RESIDUAL HEAT REMOVAL SYSTEM IBD (Sheet 9 of 20)

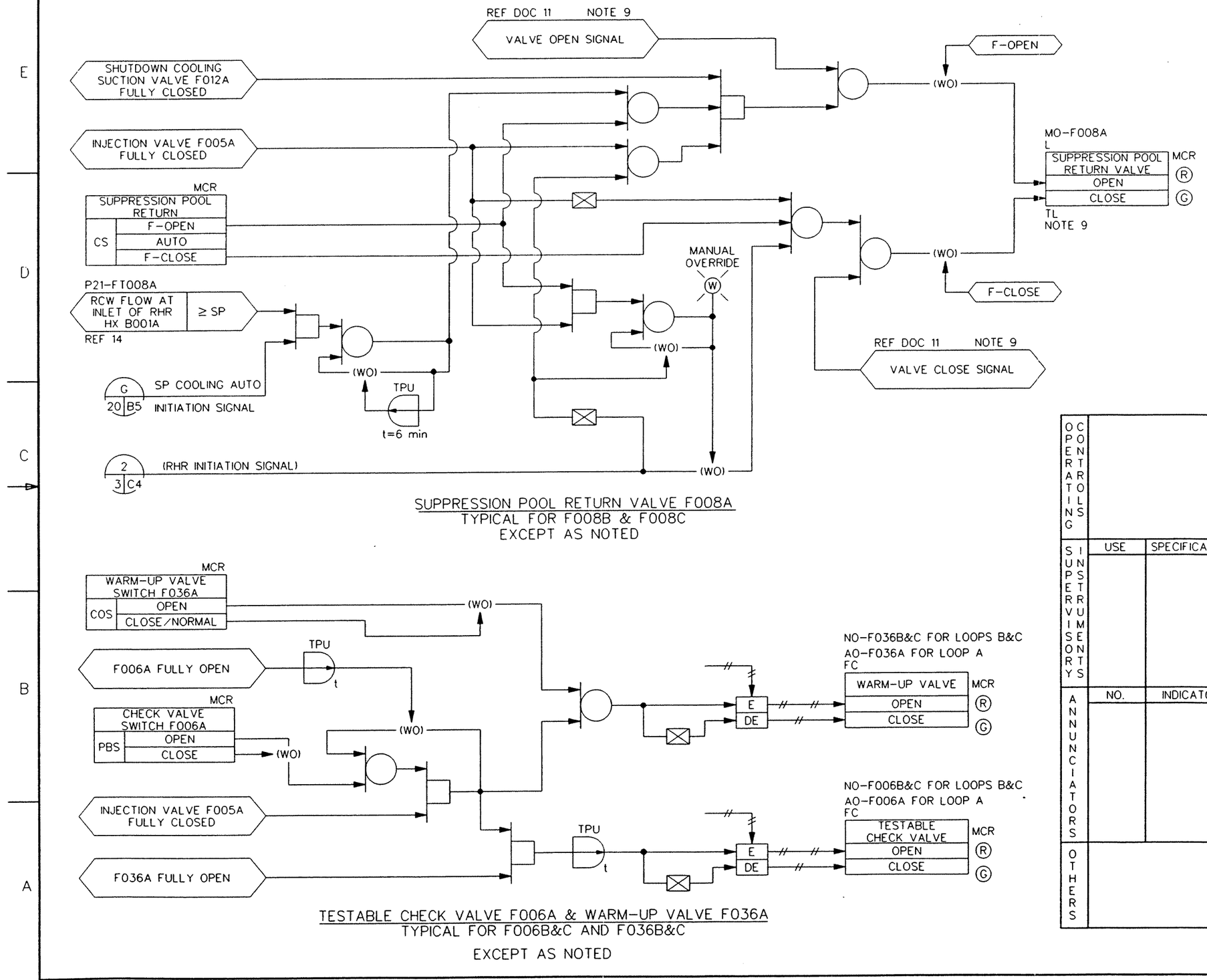
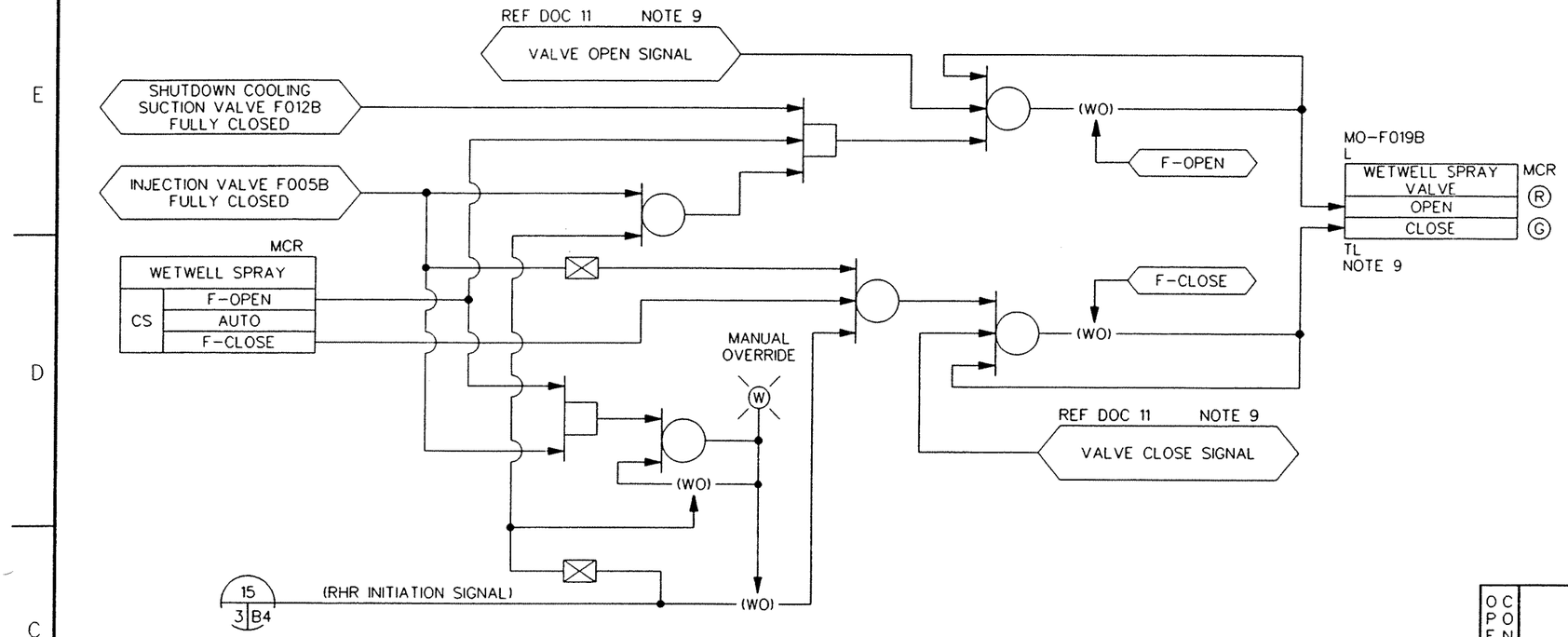
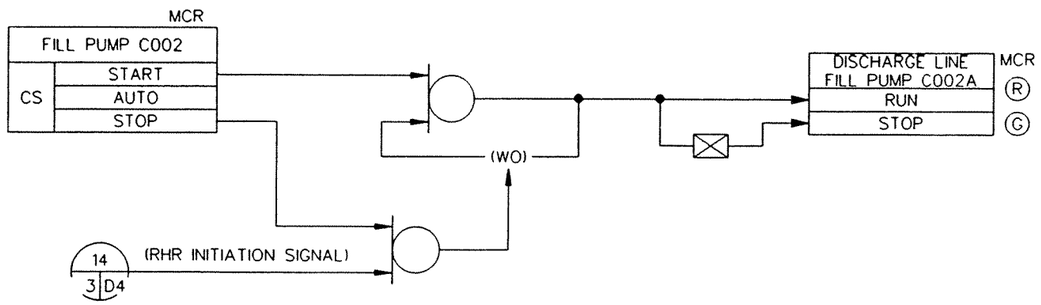


FIGURE 7.3-4 RESIDUAL HEAT REMOVAL SYSTEM IBD (Sheet 10 of 20)



WETWELL SPRAY VALVE F019B
TYPICAL FOR F019C
EXCEPT AS NOTED



RHR DISCHARGE LINE FILL PUMP C002A
TYPICAL FOR C002B & C

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

FIGURE 7.3-4 RESIDUAL HEAT REMOVAL SYSTEM IBD (Sheet 11 of 20)

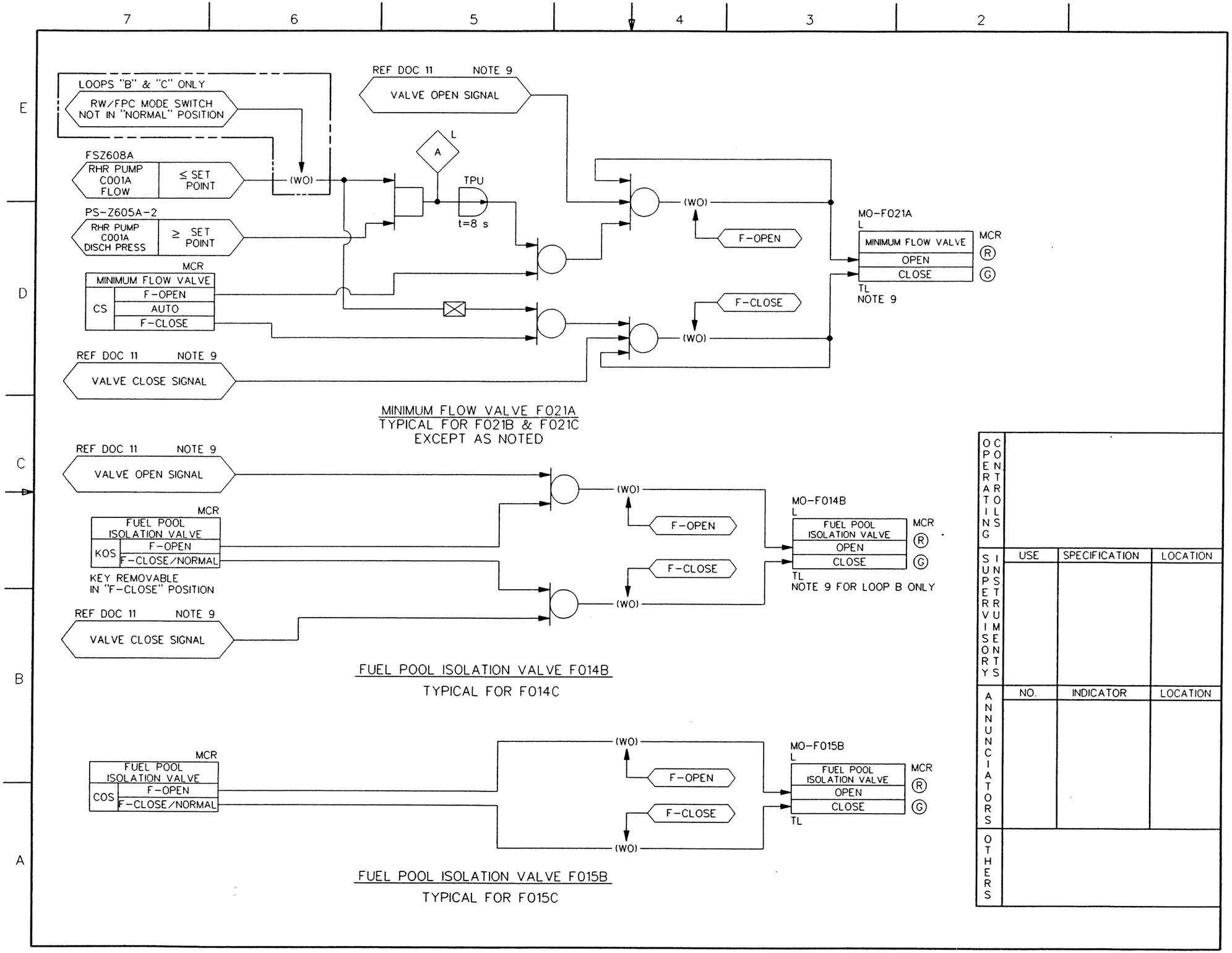


FIGURE 7.3-4 RESIDUAL HEAT REMOVAL SYSTEM IBD (Sheet 12 of 20)

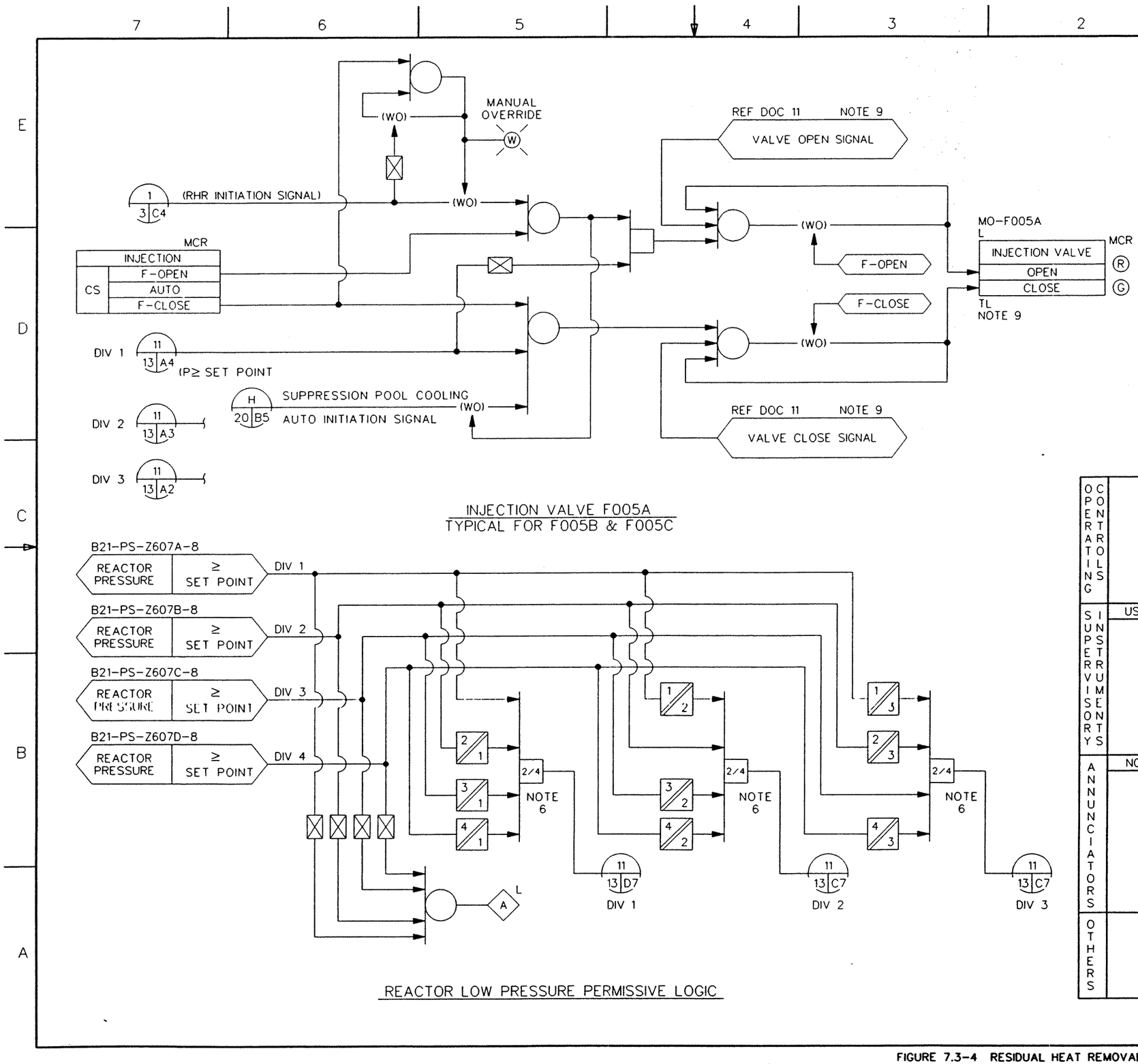


FIGURE 7.3-4 RESIDUAL HEAT REMOVAL SYSTEM IBD (Sheet 13 of 20)

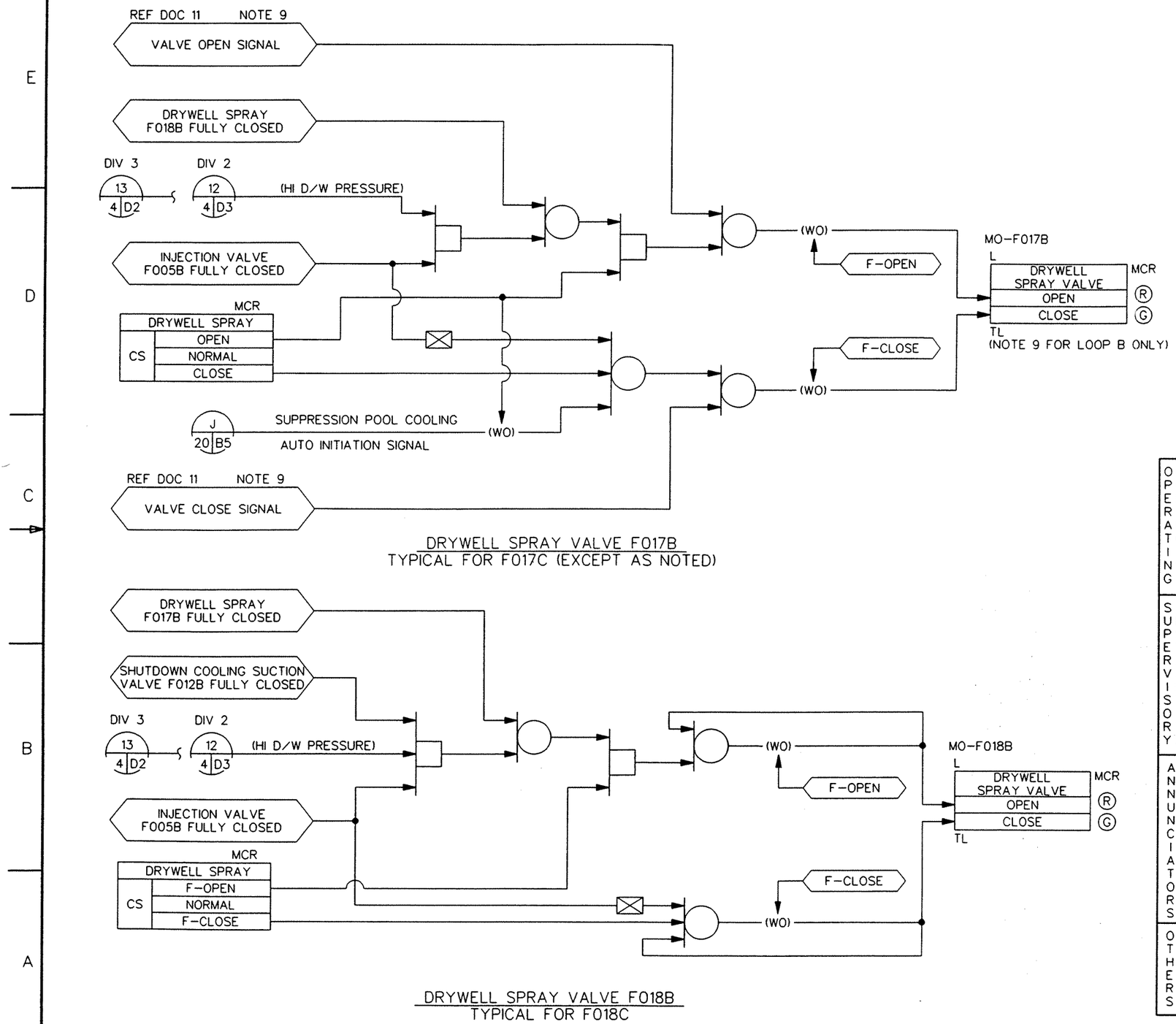


Figure 7.3-4 RESIDUAL HEAT REMOVAL SYSTEM IBD (Sheet 14 of 20)

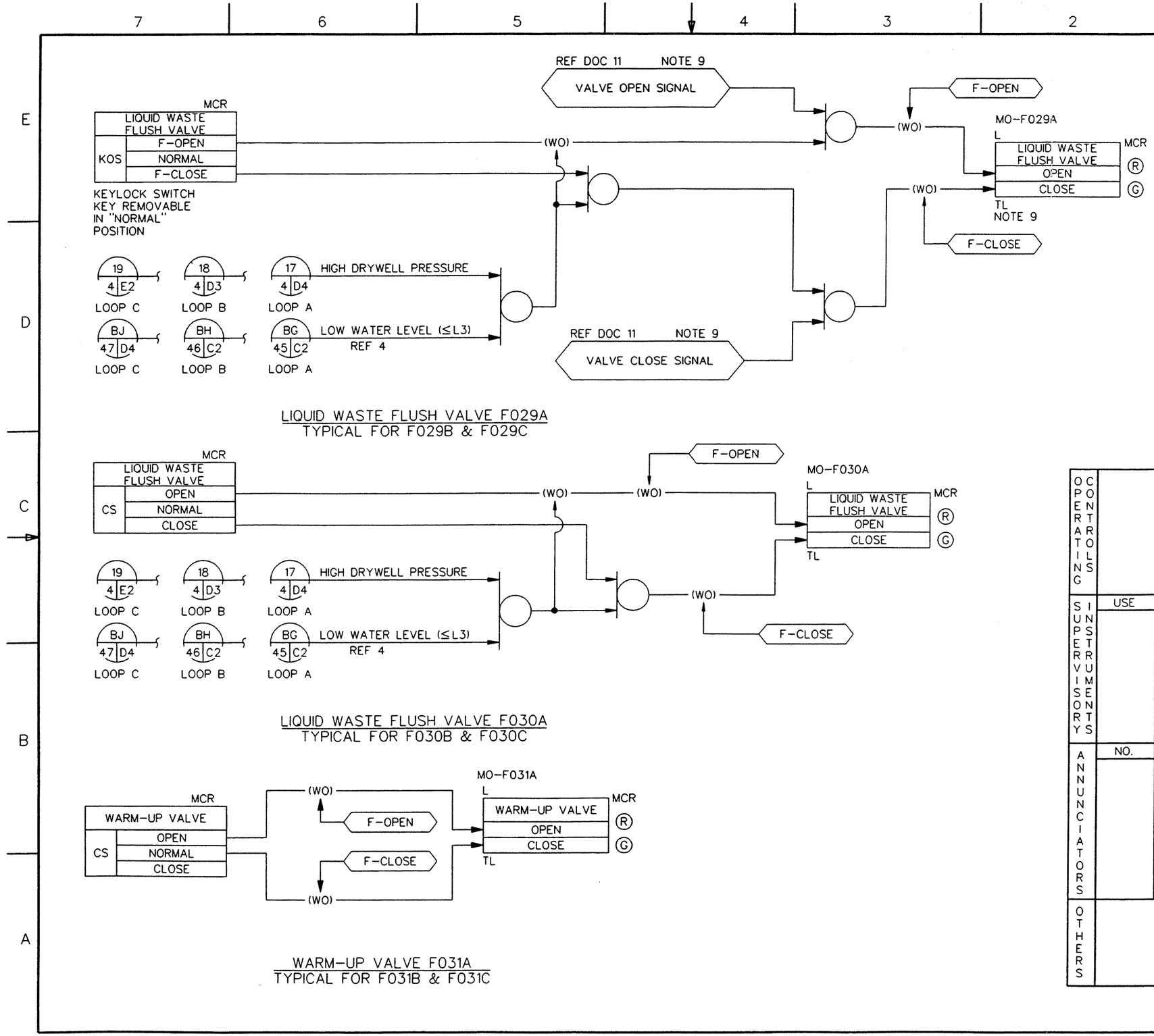
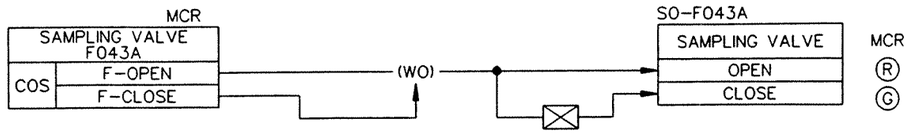
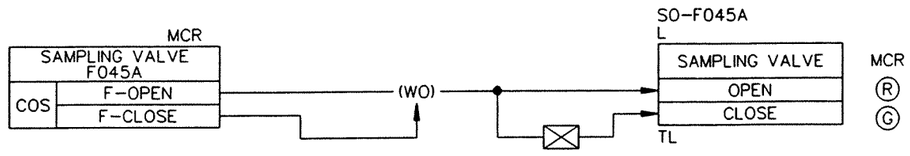


Figure 7.3-4 RESIDUAL HEAT REMOVAL SYSTEM IBD (Sheet 15 of 20)



SAMPLING VALVE F043A

TYPICAL FOR F043B&C
AND F044A,B,C



SAMPLING VALVE F045A

TYPICAL FOR F046A

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

Figure 7.3-4 RESIDUAL HEAT REMOVAL SYSTEM IBD (Sheet 16 of 20)

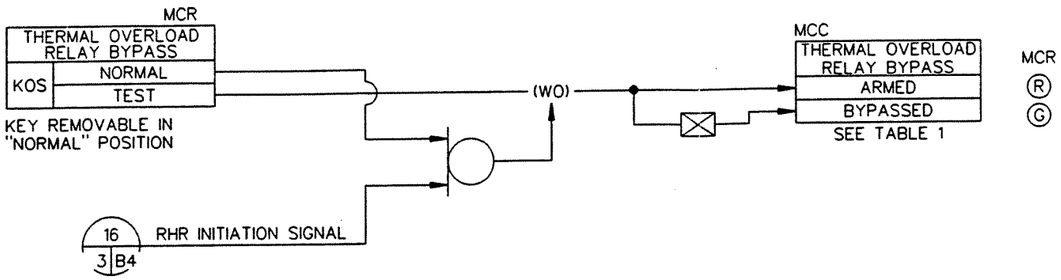
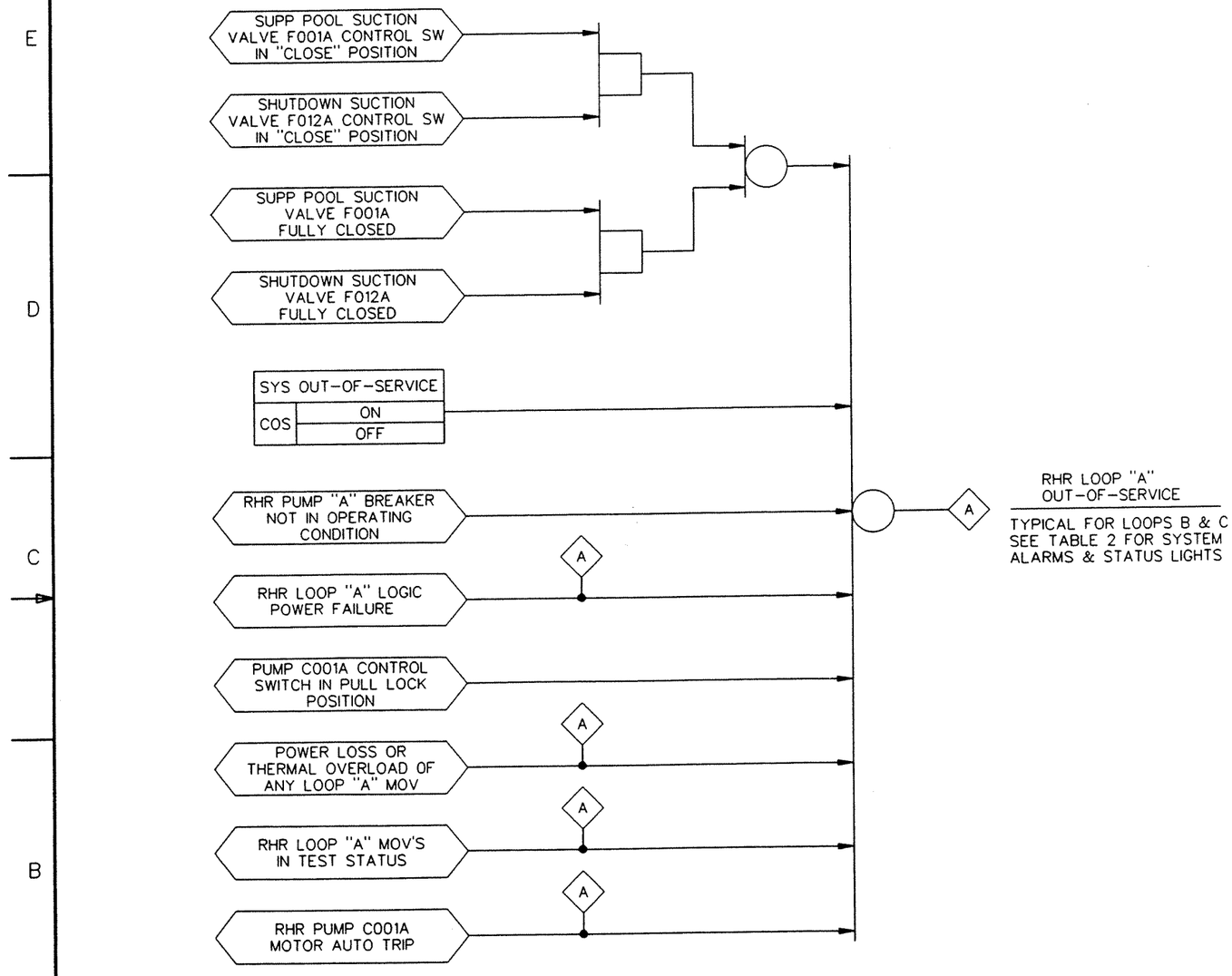


TABLE 1: THERMAL OVERLOAD RELAY BYPASS MCC EQUIPMENT LIST

SYSTEM	EQUIPMENT ID	DESCRIPTION	TYPICAL
RHR LOOP A	E11-MO-F001A	RHR PUMP SUCTION VALVE "A"	FOR LOOPS B&C ALSO
	E11-MO-F004A	RHR HX TUBE SIDE OUTLET VALVE "A"	
	E11-MO-F005A	RHR INJECTION VALVE "A"	
	E11-MO-F008A	RHR SUPPRESSION POOL RETURN VALVE "A"	
	E11-MO-F013A	RHR HX TUBE SIDE BYPASS VALVE "A"	
	E11-MO-F021A	RHR MINIMUM FLOW VALVE "A"	
RHR LOOP B	E11-MO-F017B	RHR DRYWELL SPRAY VALVE "B"	FOR LOOP C ALSO
	E11-MO-F018B	RHR DRYWELL SPRAY VALVE "B"	
	E11-MO-F019B	RHR WETWELL SPRAY VALVE "B"	

RHR LOOP A – THERMAL OVERLOAD RELAY BYPASS LOGIC
TYPICAL FOR LOOPS B&C EXCEPT AS NOTED

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



OUT-OF-SERVICE ALARM FOR LOOP "A"
TYPICAL FOR LOOPS B & C

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

Figure 7.3-4 RESIDUAL HEAT REMOVAL SYSTEM IBD (Sheet 18 of 20)

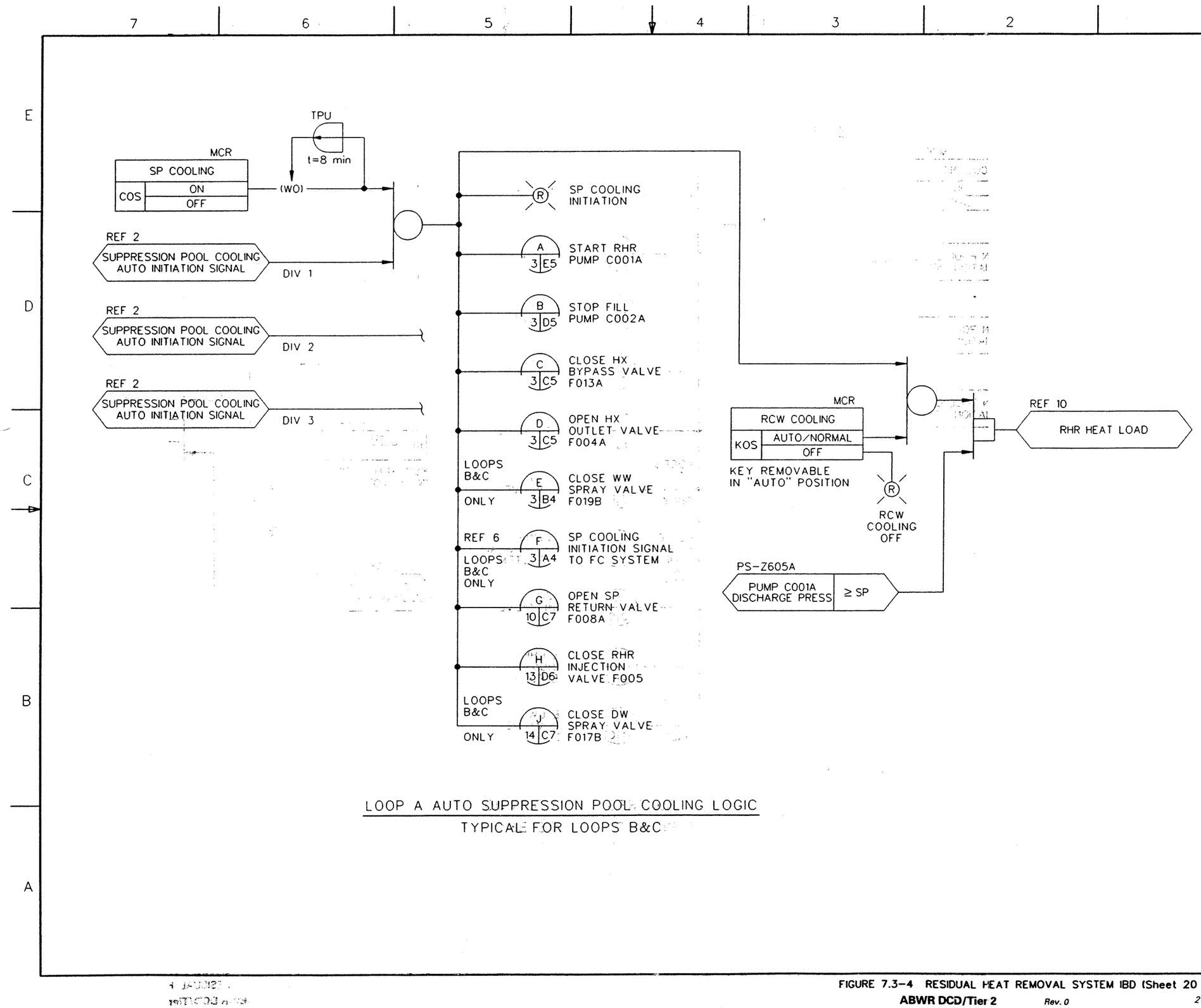
TABLE 2

ANNUNCIATOR / ALARM LIGHTS / STATUS LIGHTS		
INDICATOR	FUNCTION	INITIATING DEVICE
ALARMS	HIGH DRYWELL PRESSURE	LOGIC OUTPUT
	HIGH SUPPRESSION POOL TEMPERATURE	LOGIC OUTPUT
	LOW REACTOR WATER LEVEL 1	LOGIC OUTPUT
	HIGH WETWELL AIR SPACE TEMPERATURE	LOGIC OUTPUT
	RHR PUMP C001A,B,C HIGH DISCHARGE PRESSURE	PSZ605A–1, B–1, C–1
	RHR LOOP A,B,C ACTIVATED	LOGIC OUTPUT
	RHR PUMP C001A,B,C MOTOR OVERLOAD	METAL CLAD SWITCHGEAR
	LOW REACTOR PRESSURE	LOGIC OUTPUT
	RHR LOOP A,B,C MANUAL INITIATION SWITCH IN ARMED POSITION	PBS
	RHR LOOP A,B,C OUT–OF–SERVICE	COS, LOGIC OUTPUT
	HIGH SHUTDOWN SUCTION PRESSURE LOOP A,B,C	PSZ609A–1, B–1, C–1
	RHR PUMP C001A,B,C DISCHARGE PIPING WATER FILL LOW	PSZ604A, B, C
	RHR LOOP A,B,C LOGIC POWER FAILURE	LOGIC OUTPUT
	POWER LOSS OR THERMAL OVERLOAD OF ANY RHR LOOP A,B,C MOV	MCC
	RHR LOOP A,B,C MOV'S IN TEST STATUS	CS
	RHR C001A,B,C PUMP MOTOR AUTO TRIP	LOGIC OUTPUT
	FILL PUMP C002A,B,C TRIP	MCC
	RHR HEAT EXCHANGER B001A,B,C OUTLET FLOW TEMP HIGH	TIS–Z607A,B,C
	RHR PUMP C001A,B,C OPERATION SWITCH IN PULL–LOCK	PULL LOCK
	RHR PUMPS C001A,B,C SUCTION VALVES CLOSED	LOGIC OUTPUT
	MODE SWITCH IN RW/FPC FOR RHR LOOPS B&C	KOS
	MCC EQUIPMENT IN TEST MODE (THERMAL OVERLOAD RELAY NOT BYPASSED)	KOS
	RHR PUMP C001A,B,C FLOW LOW	LOGIC OUTPUT

TABLE 2 (CON'T)

ANNUNCIATOR / ALARM LIGHTS / STATUS LIGHTS		
INDICATOR	FUNCTION	INITIATING DEVICE
WHITE LIGHT	RHR LOOPS A,B,C INITIATION SIGNAL SEALED–IN	LOGIC OUTPUT
WHITE LIGHT	RHR INJECTION VALVE F005A.B.C MANUAL OVERRIDE	CS, LOGIC OUTPUT
WHITE LIGHT	RHR PUMP C001A,B,C MANUAL OVERRIDE	CS, LOGIC OUTPUT
WHITE LIGHT	WETWELL SPRAY VALVE F019B,C MANUAL OVERRIDE	CS, LOGIC OUTPUT
WHITE LIGHT	SUPPPRESSION POOL RETURN VALVE F008A,B,C MANUAL OVERRIDE	CS, LOGIC OUTPUT
RED LIGHT	SUPPRESSION POOL COOLING INITIATION	LOGIC OUTPUT
RED LIGHT	RCW COOLING OFF FOR TEST OR DRAIN	KOS

Figure 7.3-4 RESIDUAL HEAT REMOVAL SYSTEM IBD (Sheet 19 of 20)



LOOP A AUTO SUPPRESSION POOL COOLING LOGIC

TYPICAL FOR LOOPS B&C

GE Nuclear Energy

Rev. 4
March 1997

ABWR Design Control Document

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NOTES:

1. ALL REFERENCE LDS MPL DESIGNATORS ARE PREFIXED BY E31 UNLESS INDICATED OTHERWISE.

2. NEGATIVE TRUE LOGIC IS USED IN THIS IBD TO DEPICT FAIL SAFE CONCEPTS FOR ALL SYSTEM ISOLATION FUNCTIONS. HIGH OR STATE 1 FOR THE UNTRIPPED NORMAL CONDITION AND LOW OR STATE 0 FOR THE TRIPPED CONDITION.

3. ALL 2/4 LOGIC SHALL REVERT TO 2/3 LOGIC DURING BYPASS OF A SINGLE DIVISION OF SENSORS. NOT MORE THAN ONE DIVISION OF SENSOR SHALL BE BYPASSED AT ANY ONE TIME.

4. THE MSIV PILOT SOLENOIDS SHALL BE POWERED FROM SAFETY DIVISIONS 1 AND 2 AS FOLLOWS:

MSIV \ SOLENOID	1*	2	3
B21-F008A-D INBD	DIV II	DIV II	DIV I
B21-F009A-D OUTBD	DIV I	DIV II	DIV I

5. ALL SIGNAL OUTPUTS TO ALARMS AND COMPUTER SHALL BE OPTICALLY ISOLATED FROM ESSENTIAL CIRCUIT.

6. THE LAST TWO SHEETS OF THIS IBD DEPICT THE SSLC HARDWARE CONFIGURATION FOR PROCESSING THE CONTROL AND INTERLOCK LOGIC IN THIS IBD EXCEPT MSIV. THE BLOCK DIAGRAM ILLUSTRATES THE FOLLOWING SPECIAL FEATURES:

   A. BYPASS UNIT FOR DIVISION-OF-SENSORS BYPASS. (ONE UNIT PER DIVISION).

   B. DUAL REDUNDANT SLU MICROPROCESSORS WITH 2/2 OUTPUT VOTER TO PREVENT INADVERTENT INITIATION.

   C. AUTO-BYPASS OF EACH REDUNDANT MICROPROCESSOR CHANNEL ON LOOP FAILURE, WITH MANUAL BACKUP.

REFERENCE DOCUMENTS

	MPL NO.
1. NUCLEAR BOILER SYSTEM, IBD	B21-1030
2. NUCLEAR BOILER SYSTEM, P&ID	B21-1010
3. STANDBY LIQUID CONTROL SYSTEM, IBD	C41-1030
4. NEUTRON MONITORING SYSTEM, IBD	C51-1030
5. REACTOR PROTECTION SYSTEM, IBD	C71-1030
6. PROCESS RADIATION MONITORING SYSTEM, IBD	D11-1030
7. RESIDUAL HEAT REMOVAL SYSTEM, IBD	E11-1030
8. INTERLOCK BLOCK DIAGRAM STANDARD	A10-3070
9. LEAK DETECTION AND ISOLATION SYSTEM, IED	E31-1040
10. REACTOR CORE ISOLATION SYSTEM, IBD	E51-1030
11. REACTOR WATER CLEAN-UP SYSTEM, IBD	G31-1030
12. SUPPRESSION POOL CLEAN-UP SYSTEM, IBD	G51-1030
13. RADIOACTIVE WASTE SYSTEM, P&ID	K17-1010
14. REACTOR BUILDING COOLING WATER SYSTEM, IBD	P21-1030
15. HVAC NORMAL COOLING WATER SYSTEM, IBD	P24-1030
16. STANDBY GAS TREATMENT SYSTEM, IBD	T22-1030
17. ATMOSPHERIC CONTROL SYSTEM, IBD	T31-1030
18. FLAMMABILITY CONTROL SYSTEM, IBD	T49-1030
19. HEATING, VENTILLATING & AIR CONDITIONING SYSTEM, P&ID	U41-1010

MSIV OPERATIONAL MODES

OPERATING MODES \ SOLENOID VALVES	1*	2	3
(1) MSIV AUTO/OPEN (PLANT NORMAL OPER.)	DE DE DE	E DE E	DE E E
(2) MSIV QUICK CLOSED	DE	DE	DE
(3) MSIV TEST CLOSED	E E E	DE E E	E E DE

E = ENERGIZED
DE =DE-ENERGIZED
* = TEST SOLENOID

ABBREVIATIONS:

OLU - OUTPUT LOGIC UNIT
TLU - TRIP LOGIC UNIT
DTM - DIGITAL TRIP MODULE
SLU - SAFETY SYSTEM LOGIC UNIT

MPL NO. E31-1030

NOTES AND REFERENCE DOCUMENTS

FIGURE 7.3-5 LEAK DETECTION AND ISOLATION SYSTEM IBD (Sheet 1 of 77)

7 6 5 4 3 2

E D C B A

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CONTENTS

FIGURE 7.3–5 LEAK DETECTION AND ISOLATION SYSTEM IBD (Sheet 2 of 77)

7 6 5 4 3 2

E D C B A

E31/LDS ANNUNCIATOR LIST

ITM. NO.	ALARM FUNCTION	SH. NO.
1	MSL AUTO TRIP – ONE PER LOGIC DIVISION	33–36
2	MSL MANUAL TRIP – ONE PER LOGIC DIVISION	33–36
3	MSL TUNNEL TEMP HIGH – ONE COMMON TO FOUR DIVISIONS	39
4	MSL TURBINE AREA AMBIENT TEMP HIGH – SAME AS 3 ABOVE	39
5	MSL RADIATION HIGH – SAME AS 3 ABOVE	39
6	REACTOR WATER LEVEL LOW – SAME AS 3 ABOVE	39
7	MSL A STEAM FLOW HIGH – SAME AS 3 ABOVE	39
8	MSL B STEAM FLOW HIGH – SAME AS 3 ABOVE	39
9	MSL C STEAM FLOW HIGH – SAME AS 3 ABOVE	39
10	MSL D STEAM FLOW HIGH – SAME AS 3 ABOVE	39
11	MAIN CONDENSER VACUUM LOW – SAME AS 3 ABOVE	39
12	MSL PRESSURE LOW – SAM AS 3 ABOVE	39
13	TRIPPED MSIV VARIABLE IN BYPASSED CHANNEL A	40
14	TRIPPED MSIV VARIABLE IN BYPASSED CHANNEL B	40
15	TRIPPED MSIV VARIABLE IN BYPASSED CHANNEL C	40
16	TRIPPED MSIV VARIABLE IN BYPASSED CHANNEL D	40
17	RHR EQUIPMENT AREA A TEMP HIGH	48
18	RHR EQUIPMENT AREA B TEMP HIGH	49
19	RHR EQUIPMENT AREA C TEMP HIGH	50
20	RHR ISOLATED – LOOP A	51
21	RHR ISOLATED – LOOP B	52
22	RHR ISOLATED – LOOP C	53
23	RCIC EQUIPMENT AREA TEMP HIGH	54
24	RCIC STEAMLINE PRESSURE LOW	55
25	RCIC STEAMLINE FLOW HIGH	56
26	RCIC ISOLATED	57

ITM. NO.	ALARM FUNCTION	SH. NO.
27	CUW REGEN HX AREA TEMP HIGH	59
28	CUW NON–REGEN HX AREA TEMP HIGH	60
29	CUW VALVE ROOM TEMP HIGH	61
30	CUW INBOARD VALVE ISOLATED	62
31	CUW OUTBOARD VALVE ISOLATED	63
32	CUW INJECTION VALVE ISOLATED	64
33	CUW HEAD SPRAY VALVE ISOLATED	65
34	DW INBOARD PCV VALVES ISOLATED	67
35	DW OUTBOARD PCV VALVES ISOLATED	67
36	DW FISSION PRODUCT SAMPLING SYSTEM ABNORMAL	68
37	SPCU ISOLATED	69
38	DRYWELL LCW DRAIN LINE ISOLATED	70
39	DRYWELL HCW DRAIN LINE ISOLATED	70
40	RCW/HNCW PCV VALVES ISOLATED	71
41	AC SYSTEM/HVAC ISOLATED	72
42	SGTS INITIATED ONE EACH PER TRAINS B & C	73
43	FC SYSTEM ISOLATED ONE EACH PER TRAINS B & C	74
44	MONITORED AREA DIFF TEMP HIGH	75
45	DRYWELL AREA TEMP HIGH – ONE COMMON TO FOUR DIVISIONS	75
46	CUW MASS DIFF FLOW HIGH	75
47	CUW MASS DIFF FLOW HIGH WARNING	75
48	DRYWELL AIR COOLER CONDENSATE FLOW HIGH	75
49	VALVE STEMS LEAKAGE TEMP HIGH	75
50	DRYWELL DRAIN SUMPS WATER LEVEL HIGH	75

FIGURE 7.3–5 LEAK DETECTION AND ISOLATION SYSTEM IBD (Sheet 3 of 77)

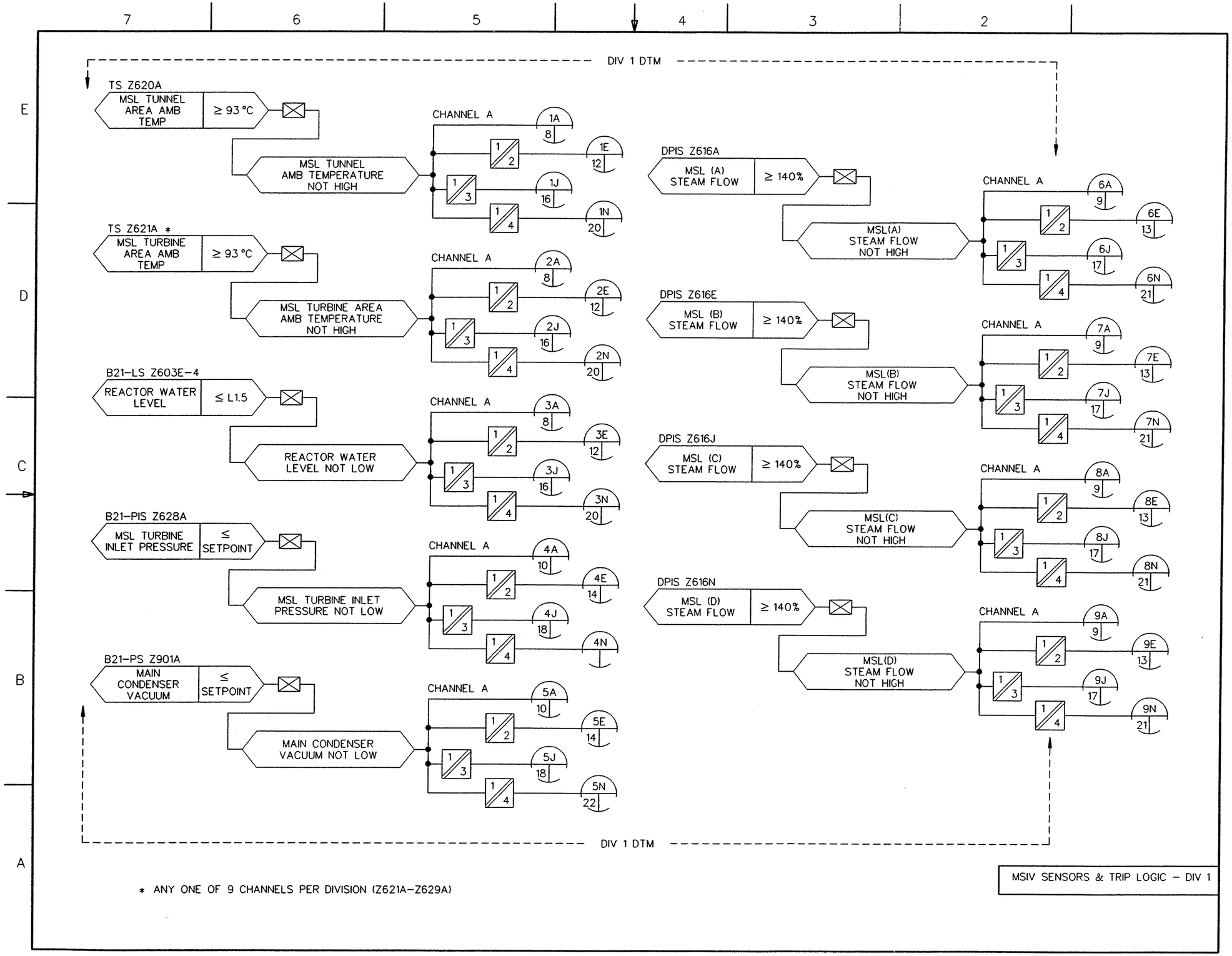


FIGURE 7.3–5 LEAK DETECTION AND ISOLATION SYSTEM IBD (Sheet 4 of 77)

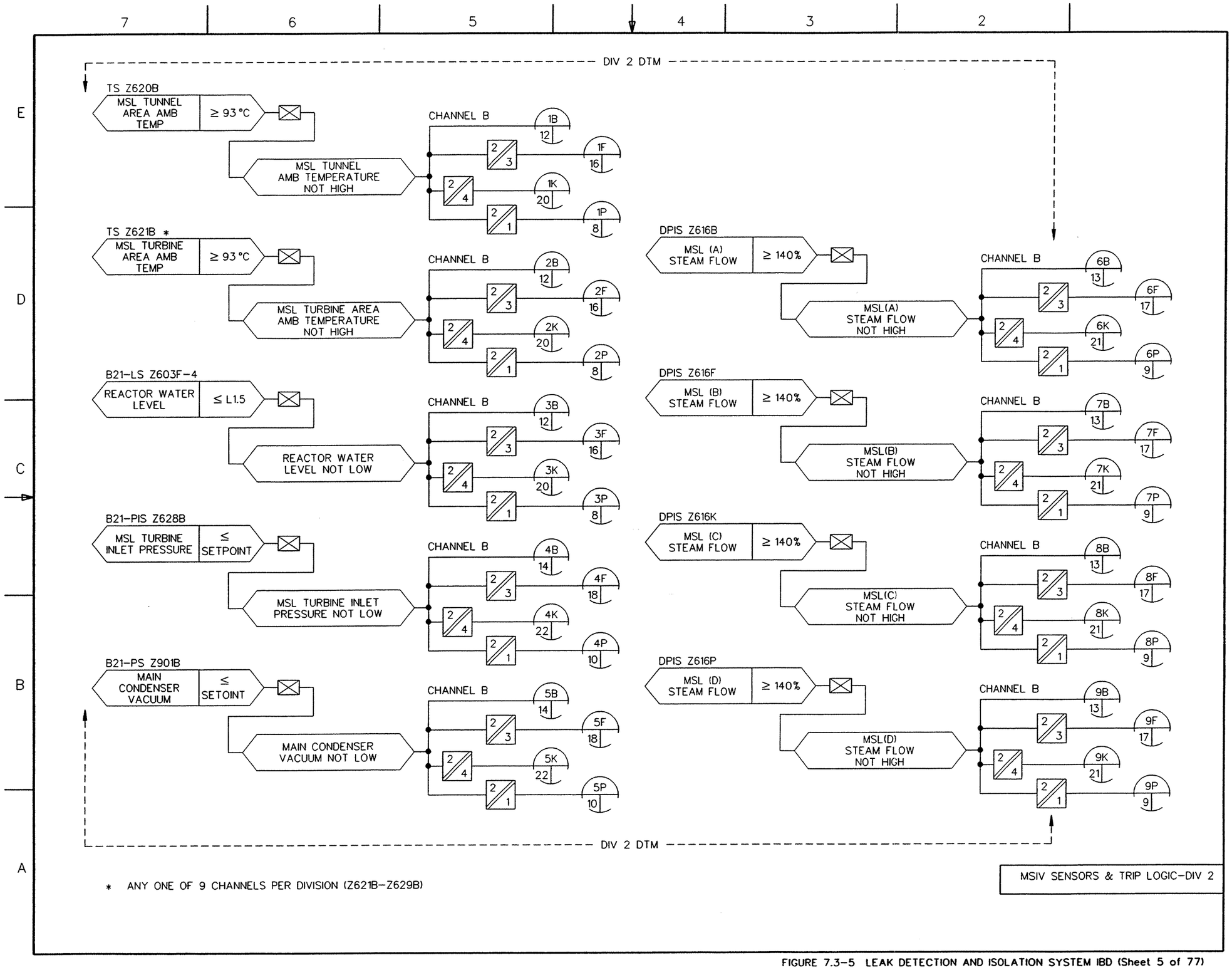


FIGURE 7.3–5 LEAK DETECTION AND ISOLATION SYSTEM IBD (Sheet 5 of 77)

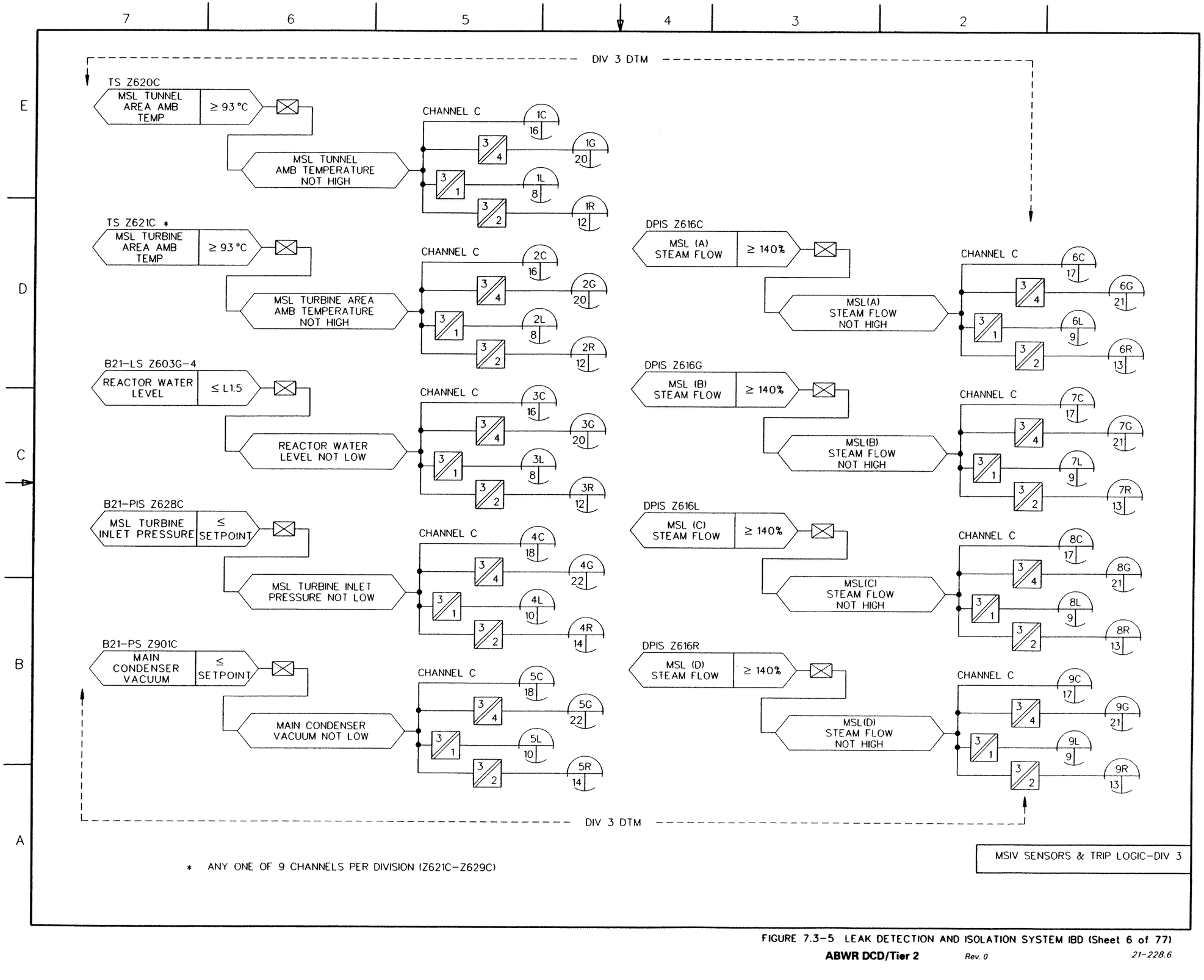


FIGURE 7.3-5 LEAK DETECTION AND ISOLATION SYSTEM IBD (Sheet 6 of 77)

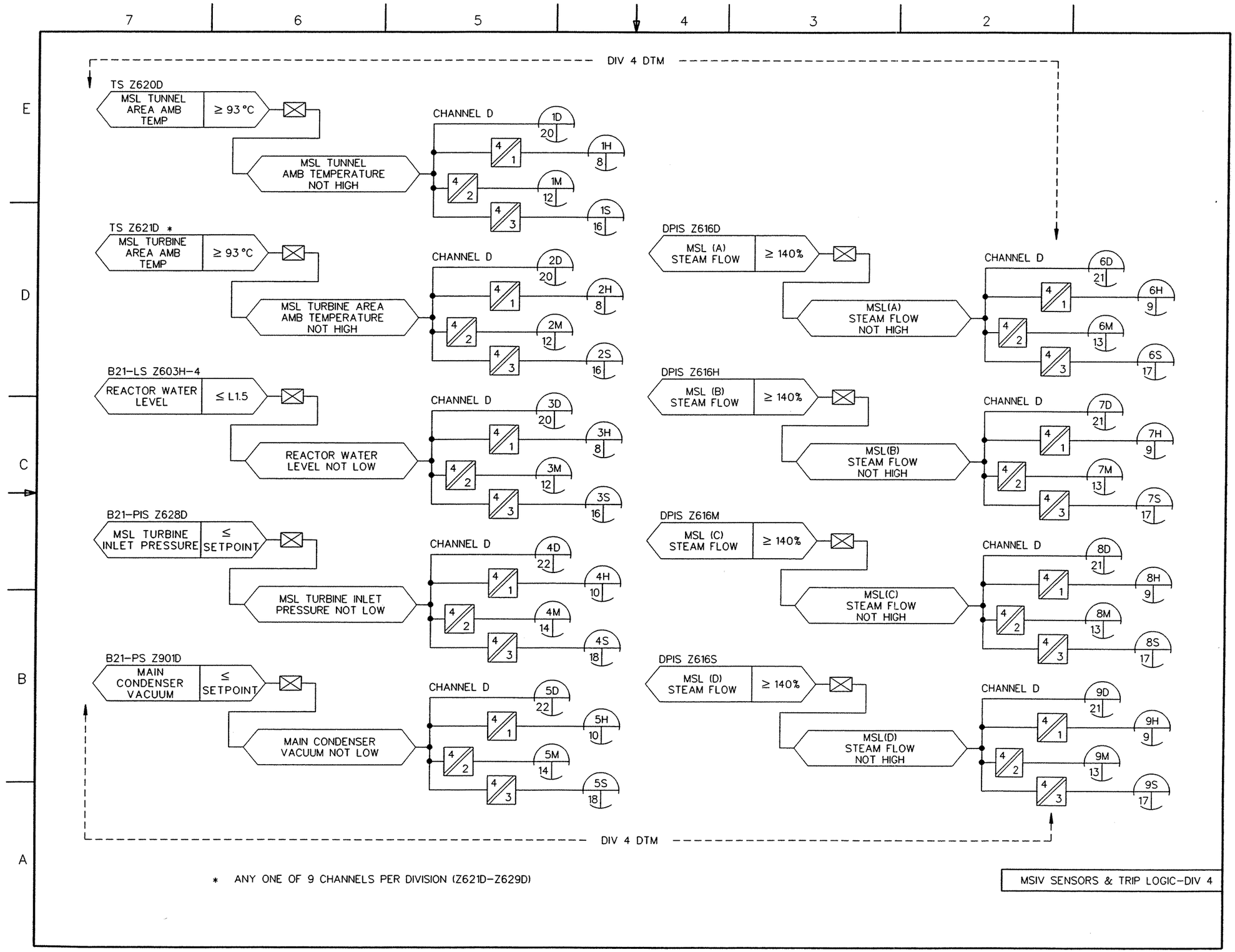


FIGURE 7.3–5 LEAK DETECTION AND ISOLATION SYSTEM IBD (Sheet 7 of 77)

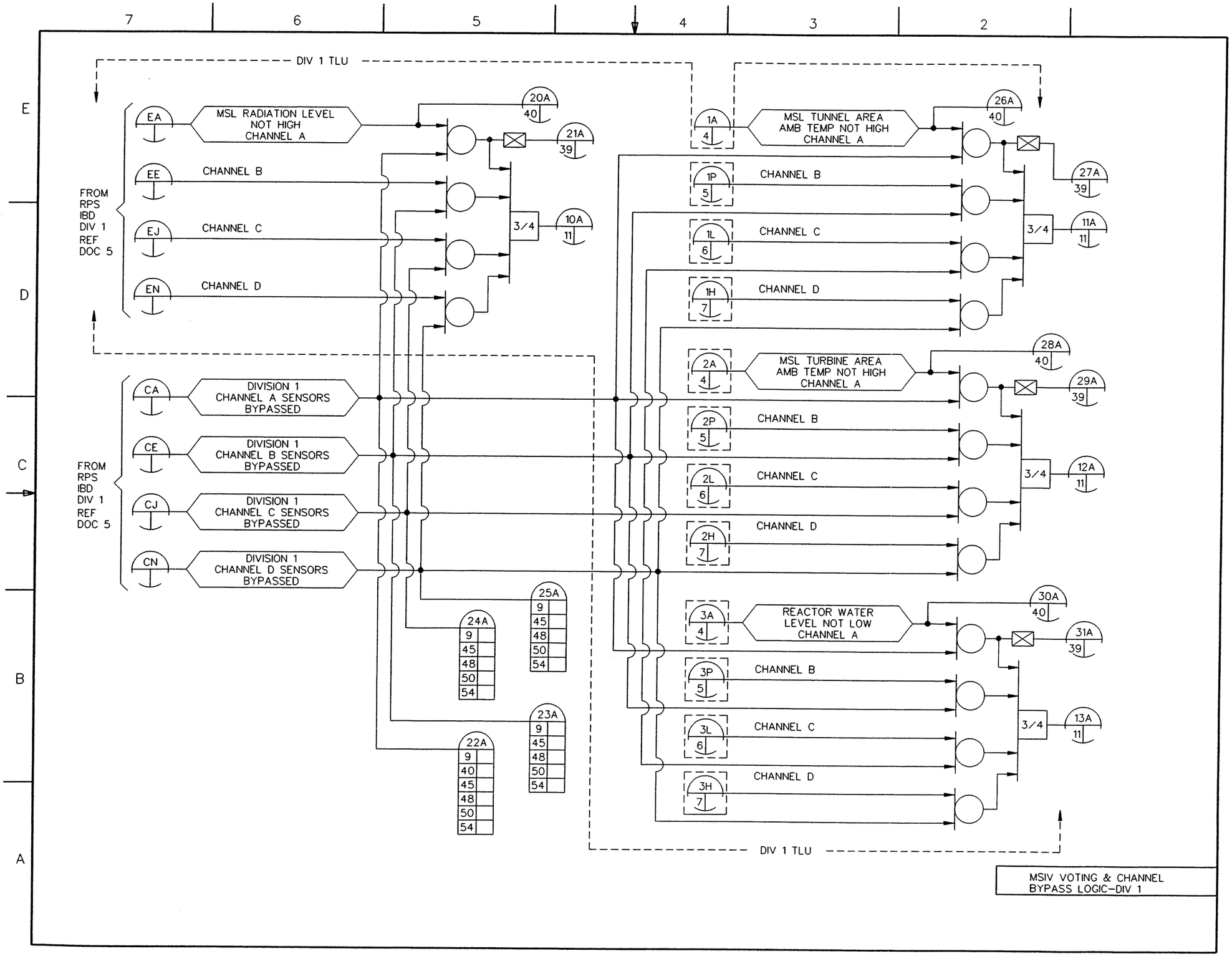


FIGURE 7.3–5 LEAK DETECTION AND ISOLATION SYSTEM IBD (Sheet 8 of 77)

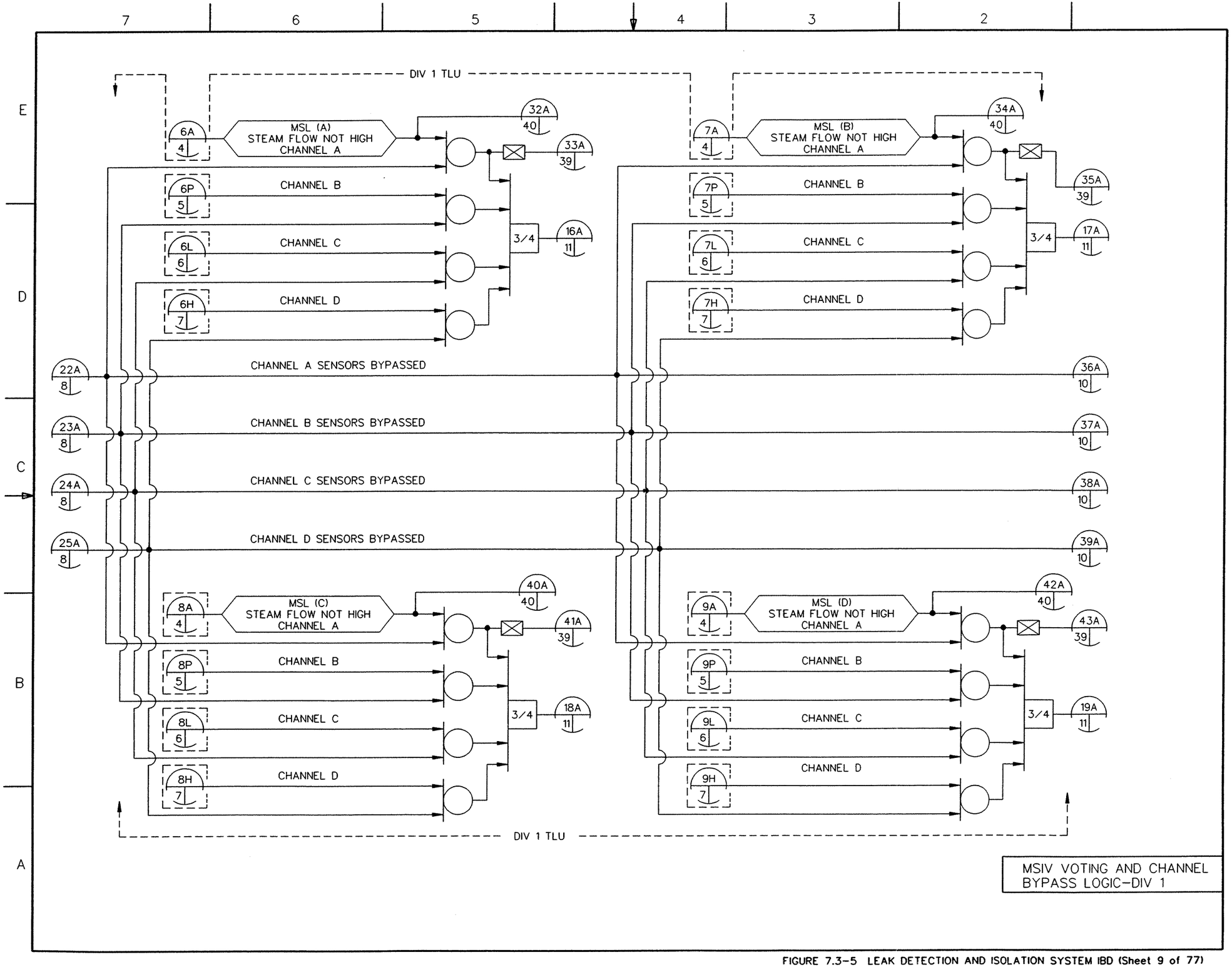


FIGURE 7.3–5 LEAK DETECTION AND ISOLATION SYSTEM IBD (Sheet 9 of 77)

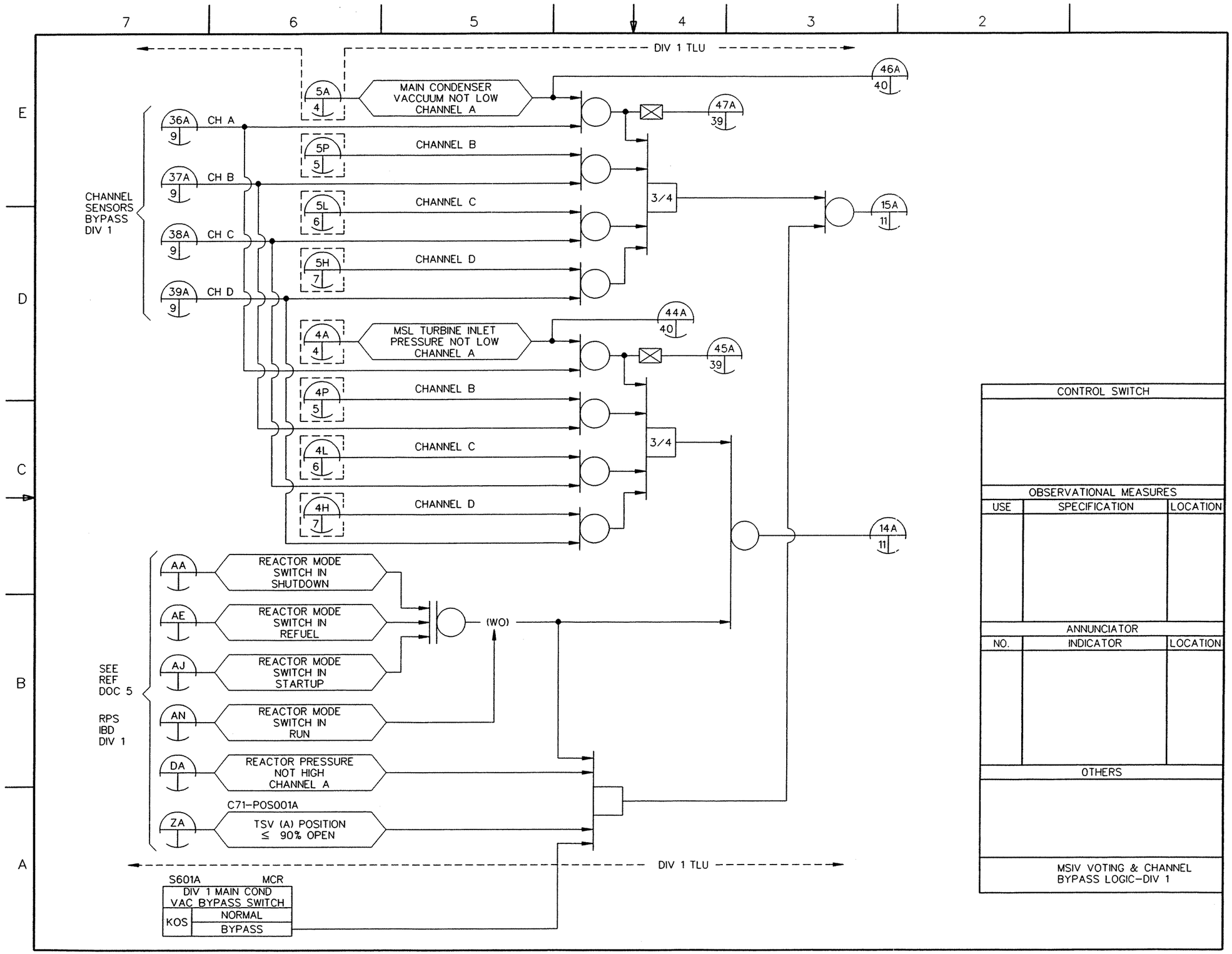


FIGURE 7.3–5 LEAK DETECTION AND ISOLATION SYSTEM IBD (Sheet 10 of 77)

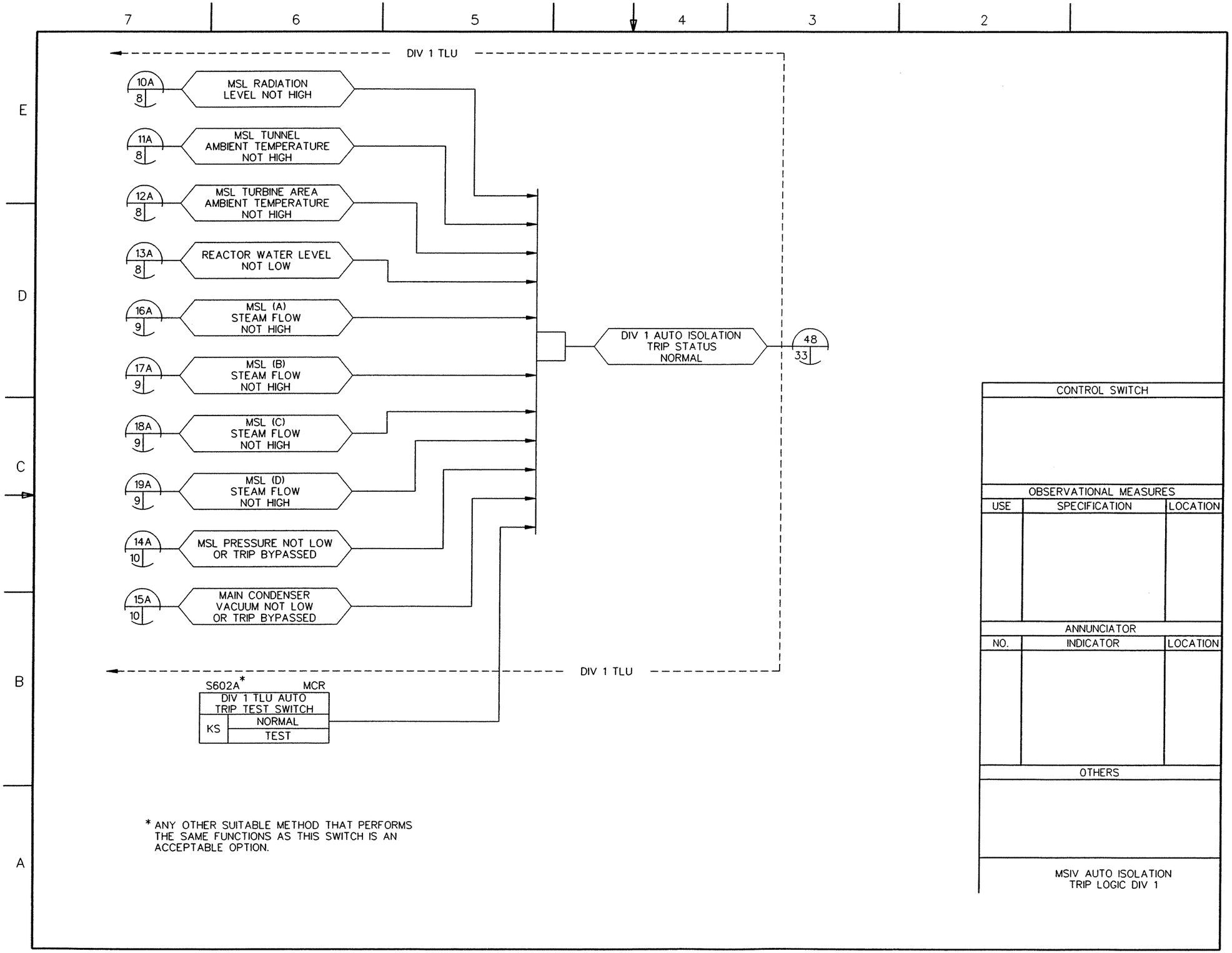


FIGURE 7.3-5 LEAK DETECTION AND ISOLATION SYSTEM IBD (Sheet 11 of 77)

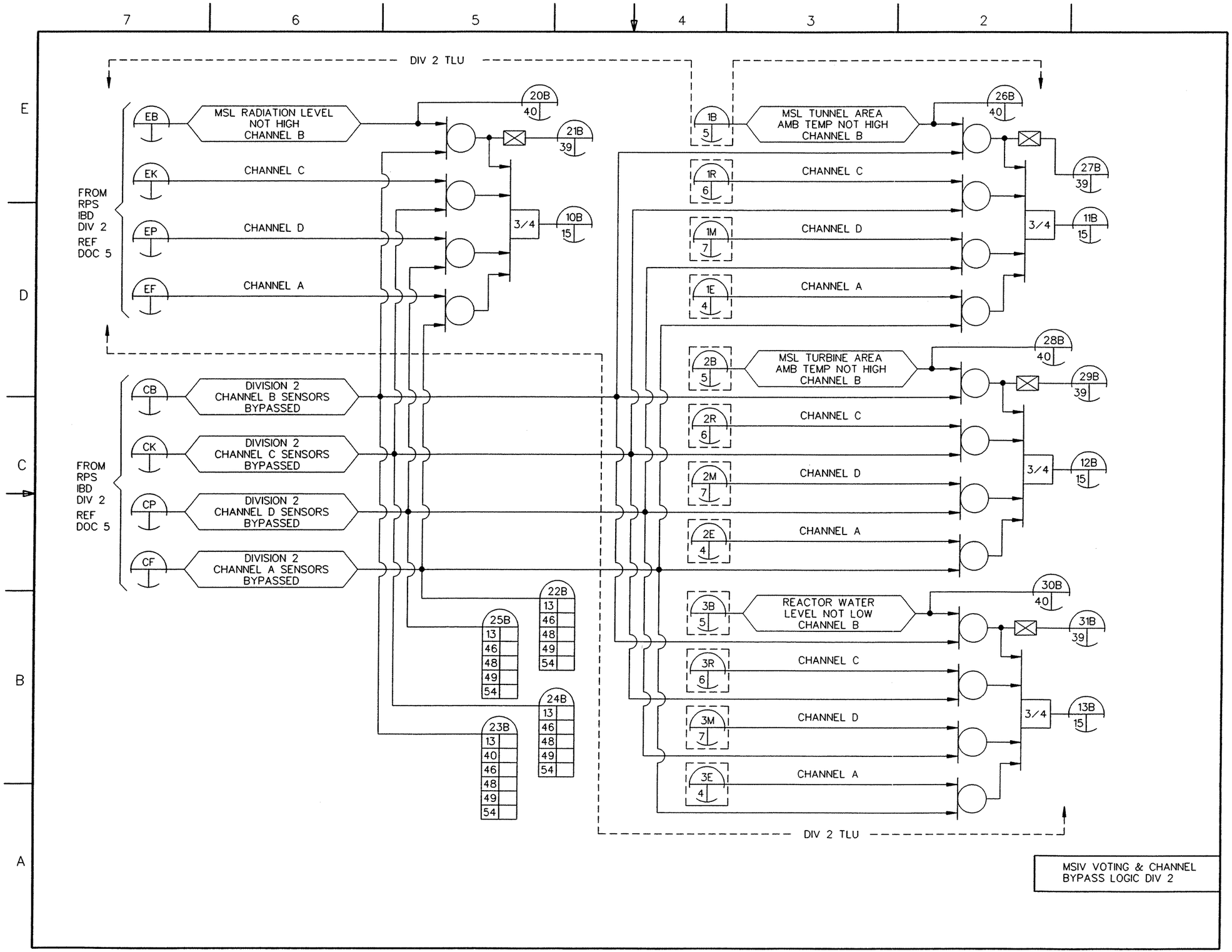


FIGURE 7.3-5 LEAK DETECTION AND ISOLATION SYSTEM IBD (Sheet 12 of 77)

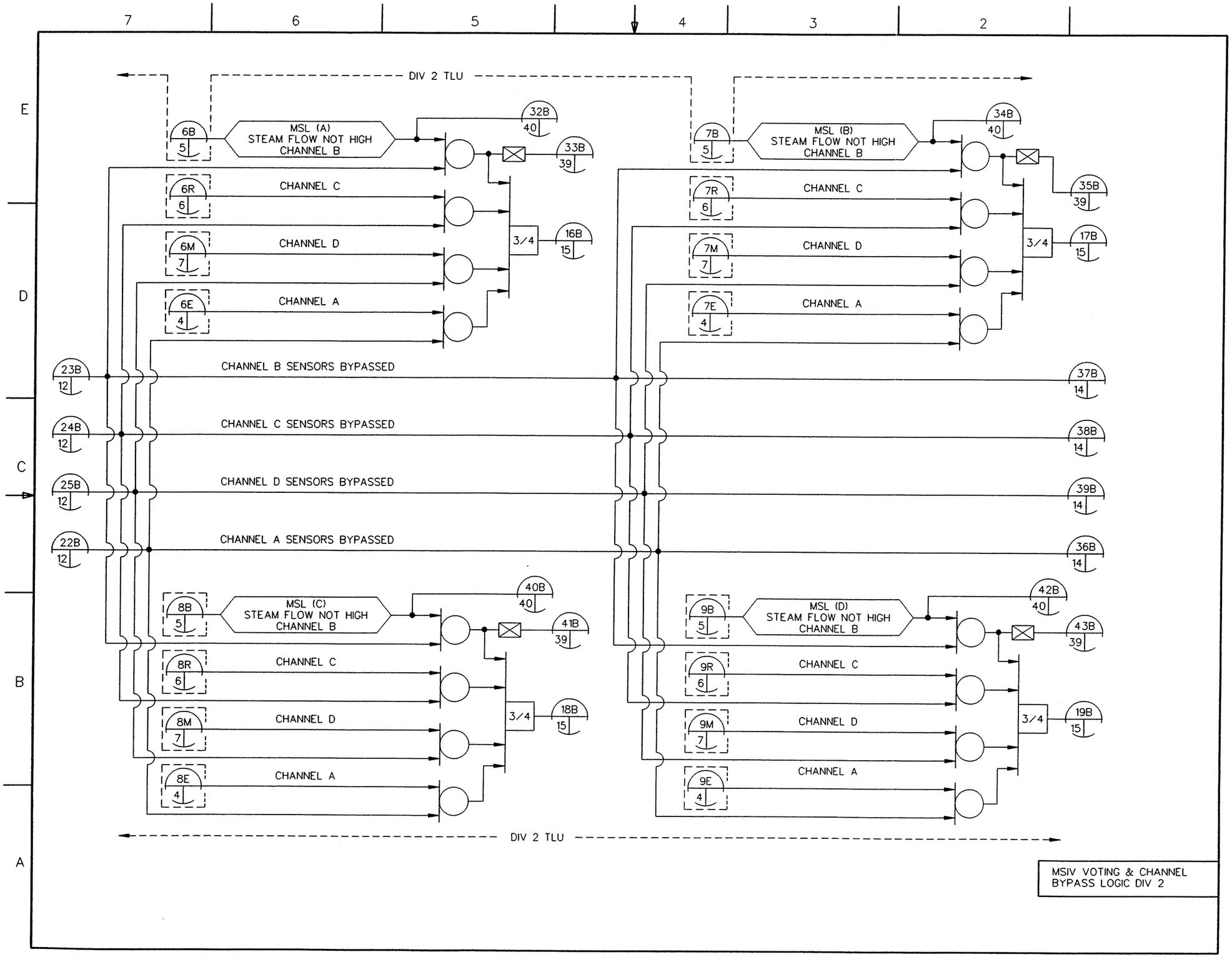


FIGURE 7.3-5 LEAK DETECTION AND ISOLATION SYSTEM IBD (Sheet 13 of 77)

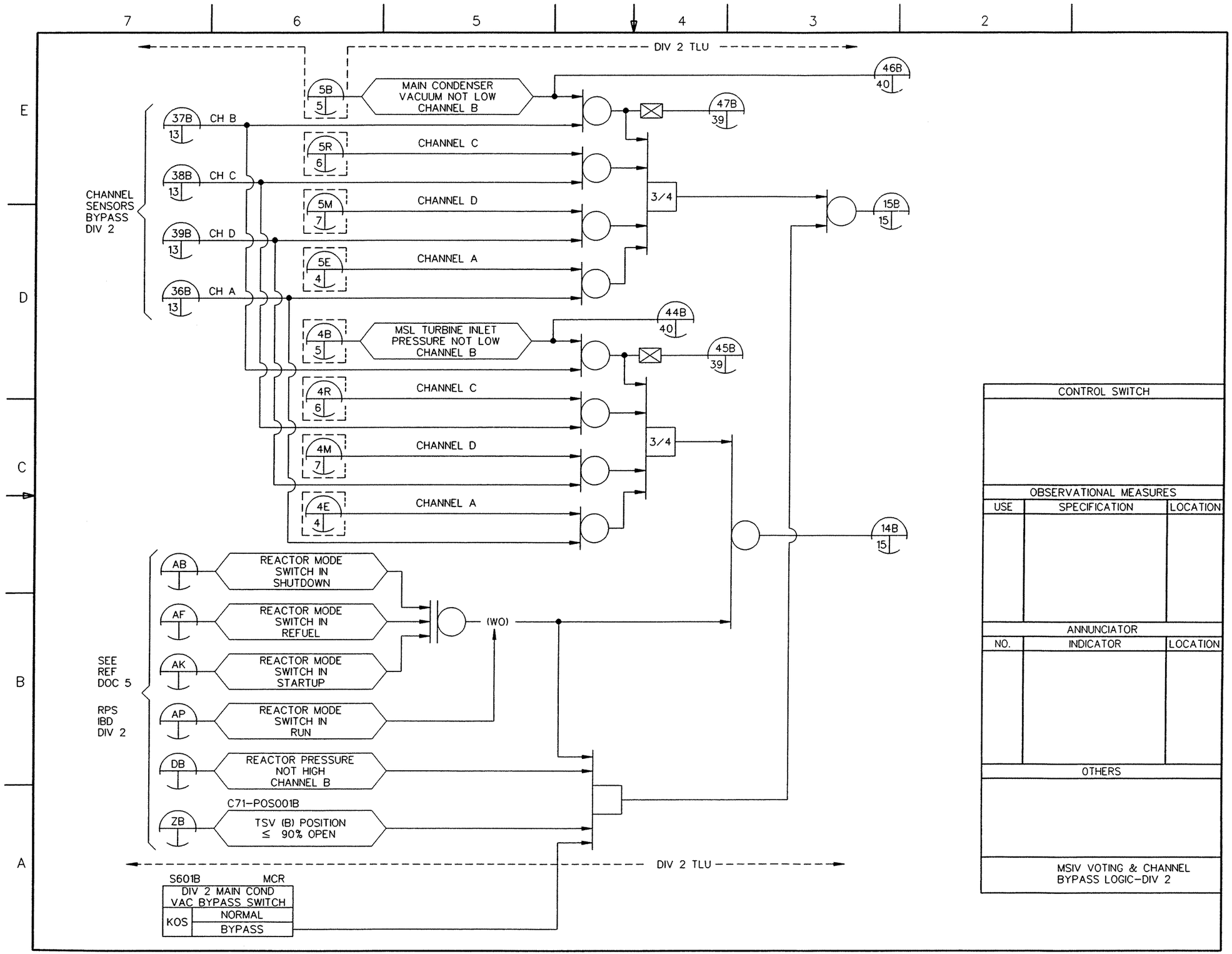
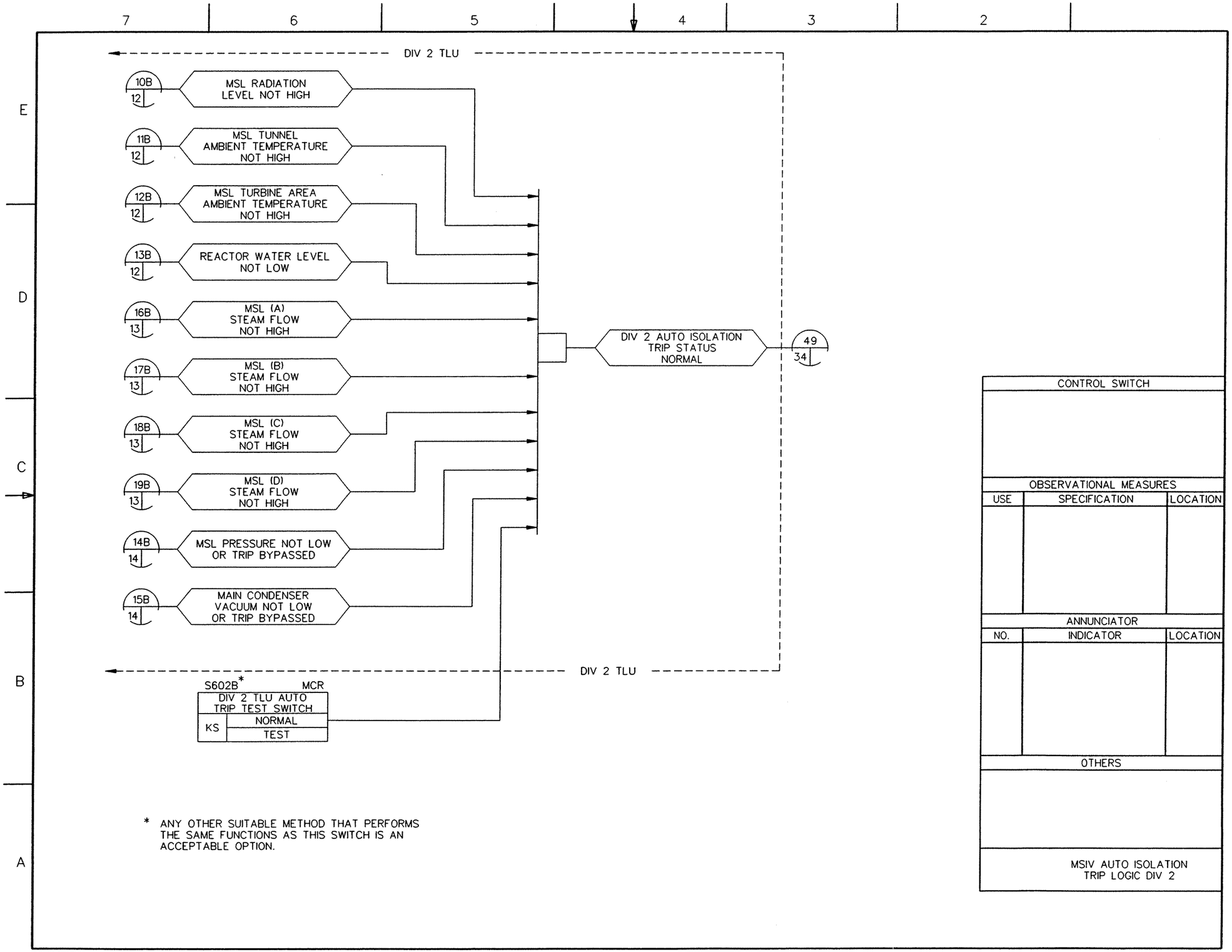


FIGURE 7.3-5 LEAK DETECTION AND ISOLATION SYSTEM IBD (Sheet 14 of 77)



* ANY OTHER SUITABLE METHOD THAT PERFORMS THE SAME FUNCTIONS AS THIS SWITCH IS AN ACCEPTABLE OPTION.

FIGURE 7.3-5 LEAK DETECTION AND ISOLATION SYSTEM IBD (Sheet 15 of 77)

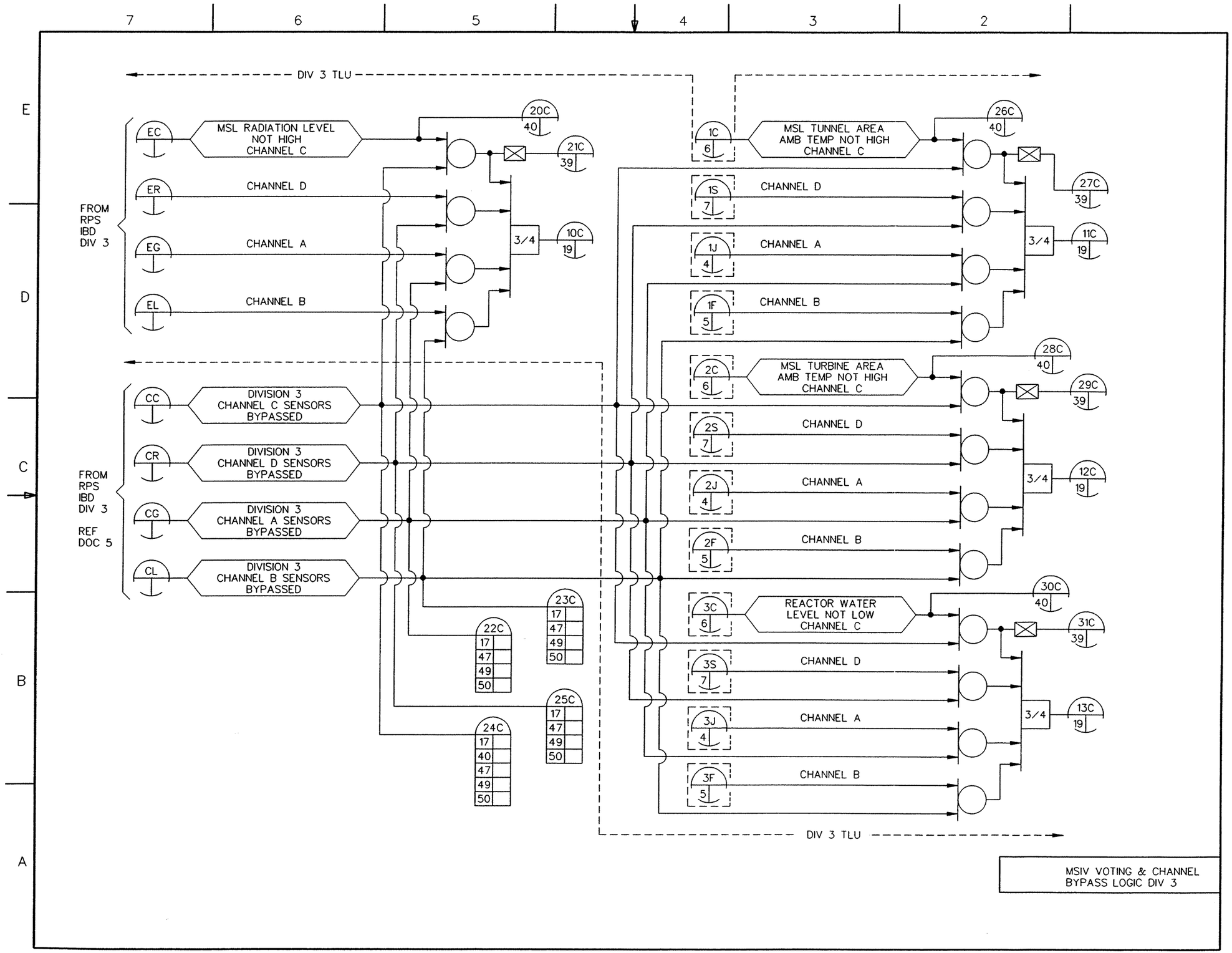


FIGURE 7.3-5 LEAK DETECTION AND ISOLATION SYSTEM IBD (Sheet 16 of 77)

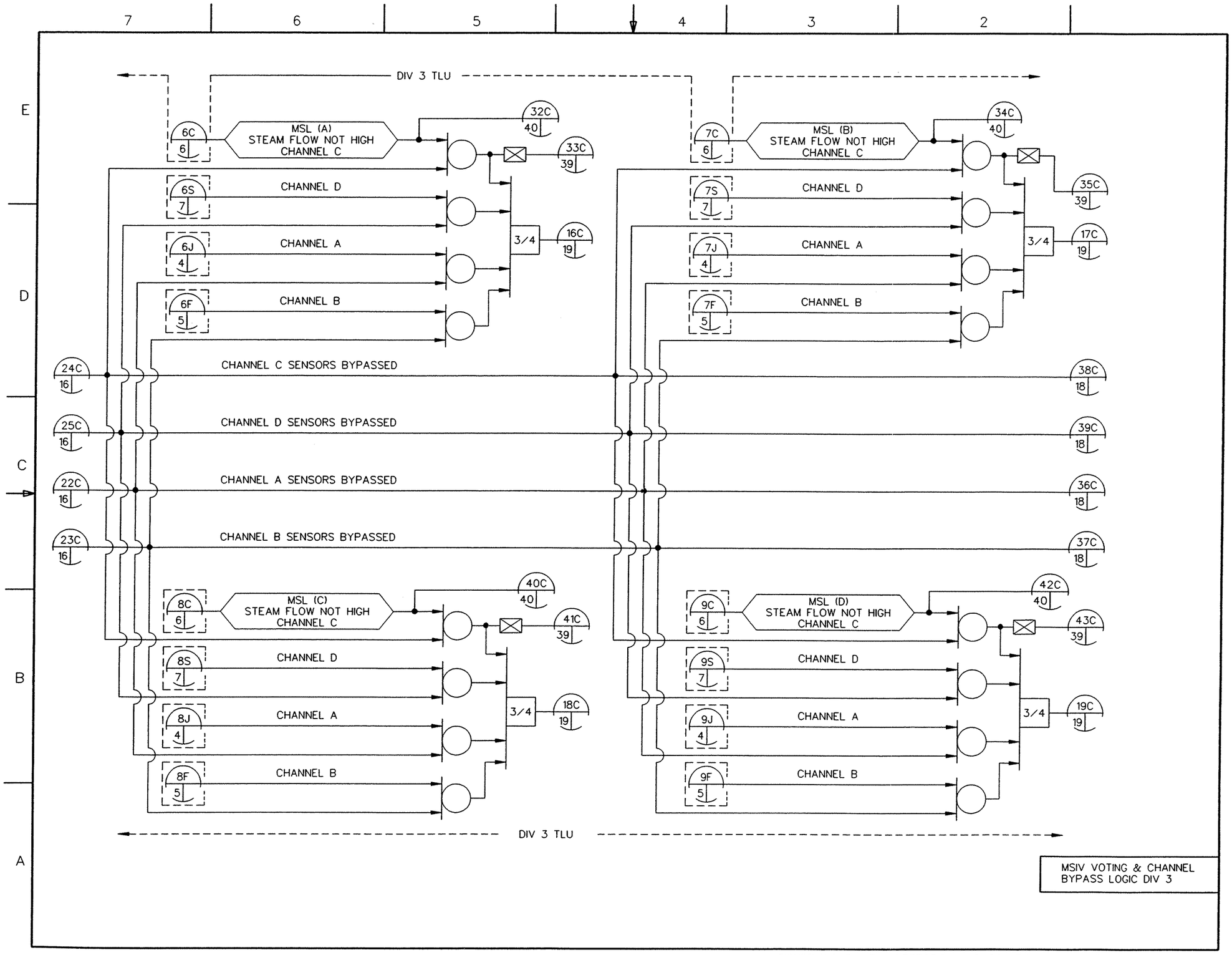


FIGURE 7.3-5 LEAK DETECTION AND ISOLATION SYSTEM IBD (Sheet 17 of 77)

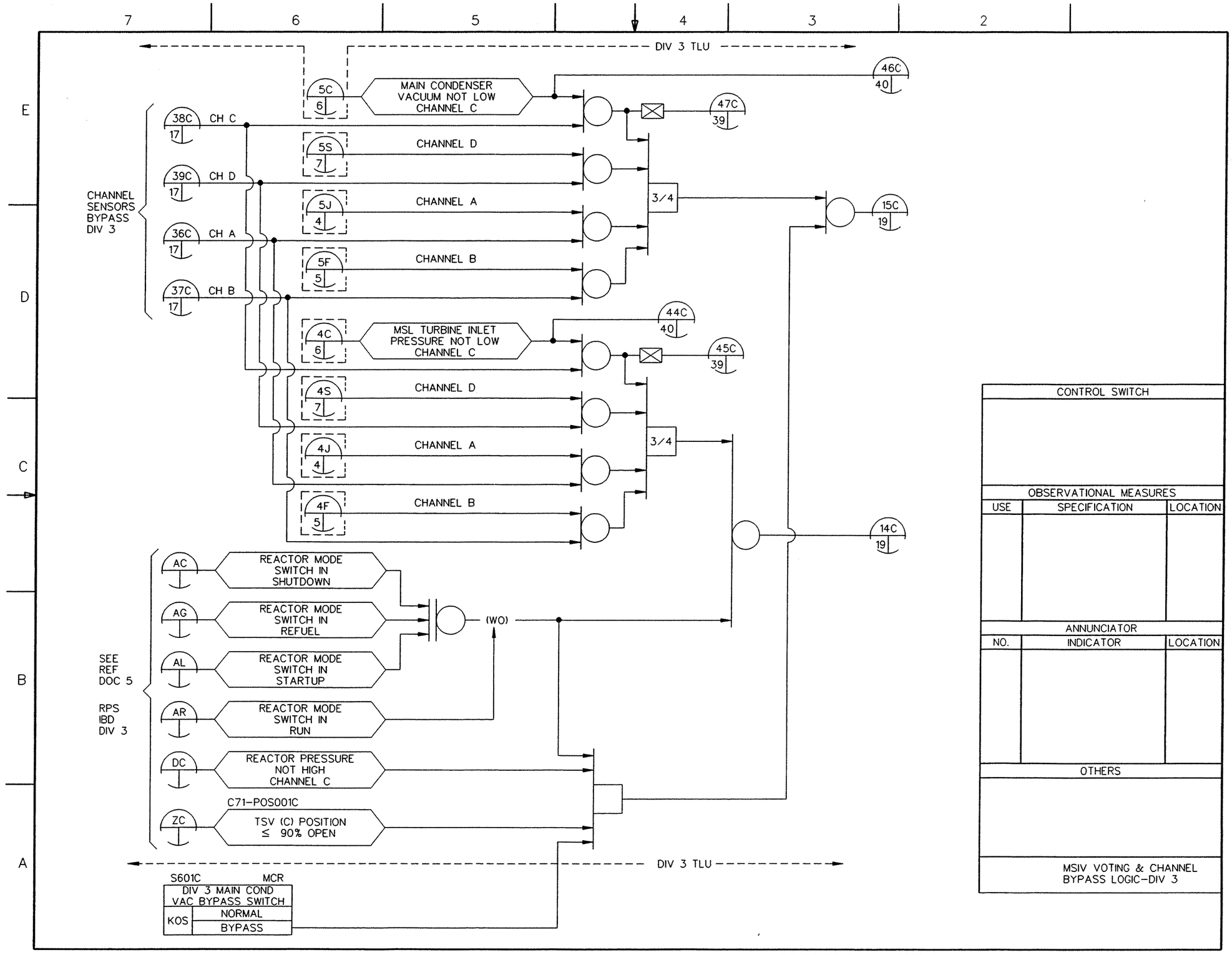
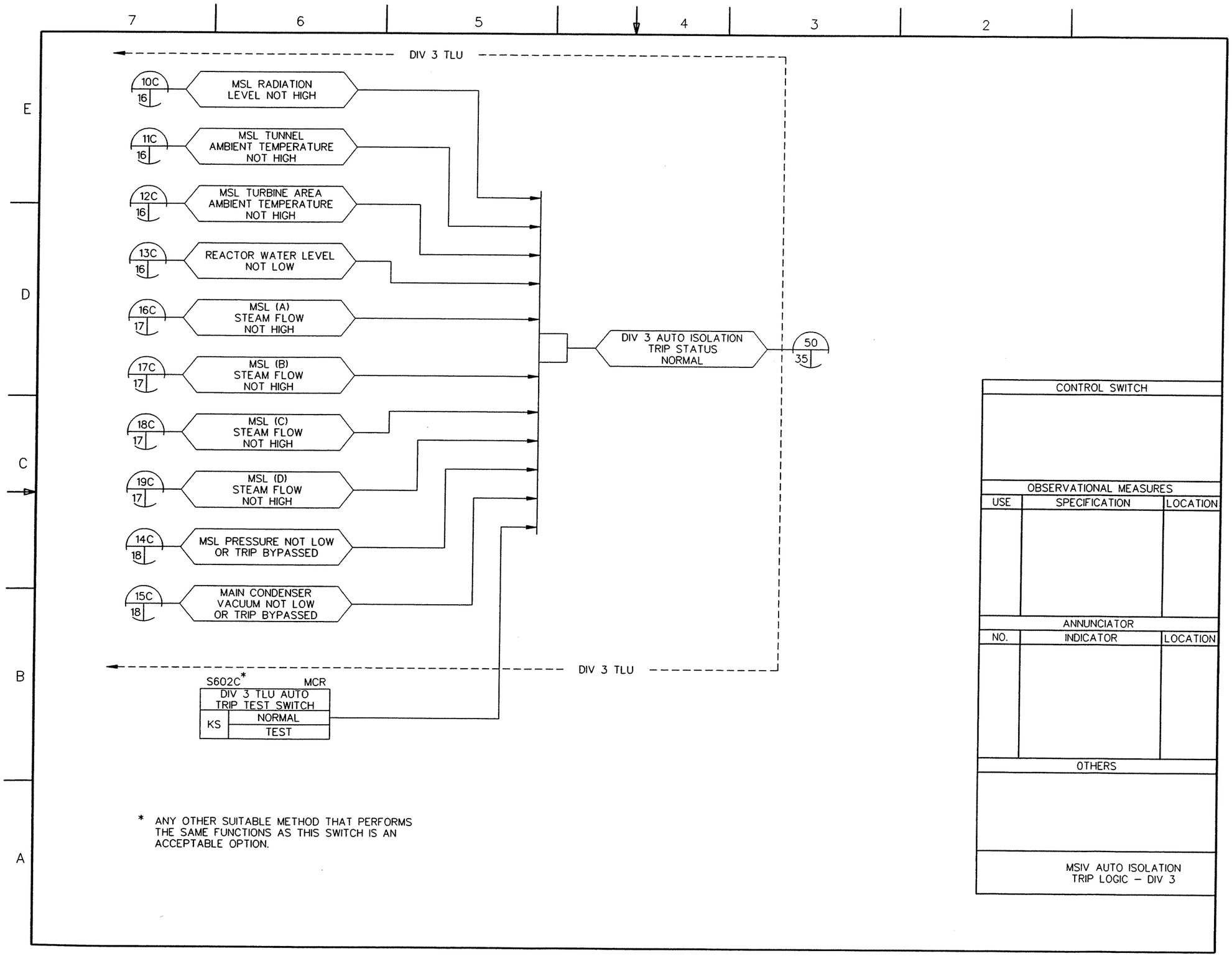


FIGURE 7.3-5 LEAK DETECTION AND ISOLATION SYSTEM IBD (Sheet 18 of 77)



* ANY OTHER SUITABLE METHOD THAT PERFORMS THE SAME FUNCTIONS AS THIS SWITCH IS AN ACCEPTABLE OPTION.

FIGURE 7.3-5 LEAK DETECTION AND ISOLATION SYSTEM IBD (Sheet 19 of 77)

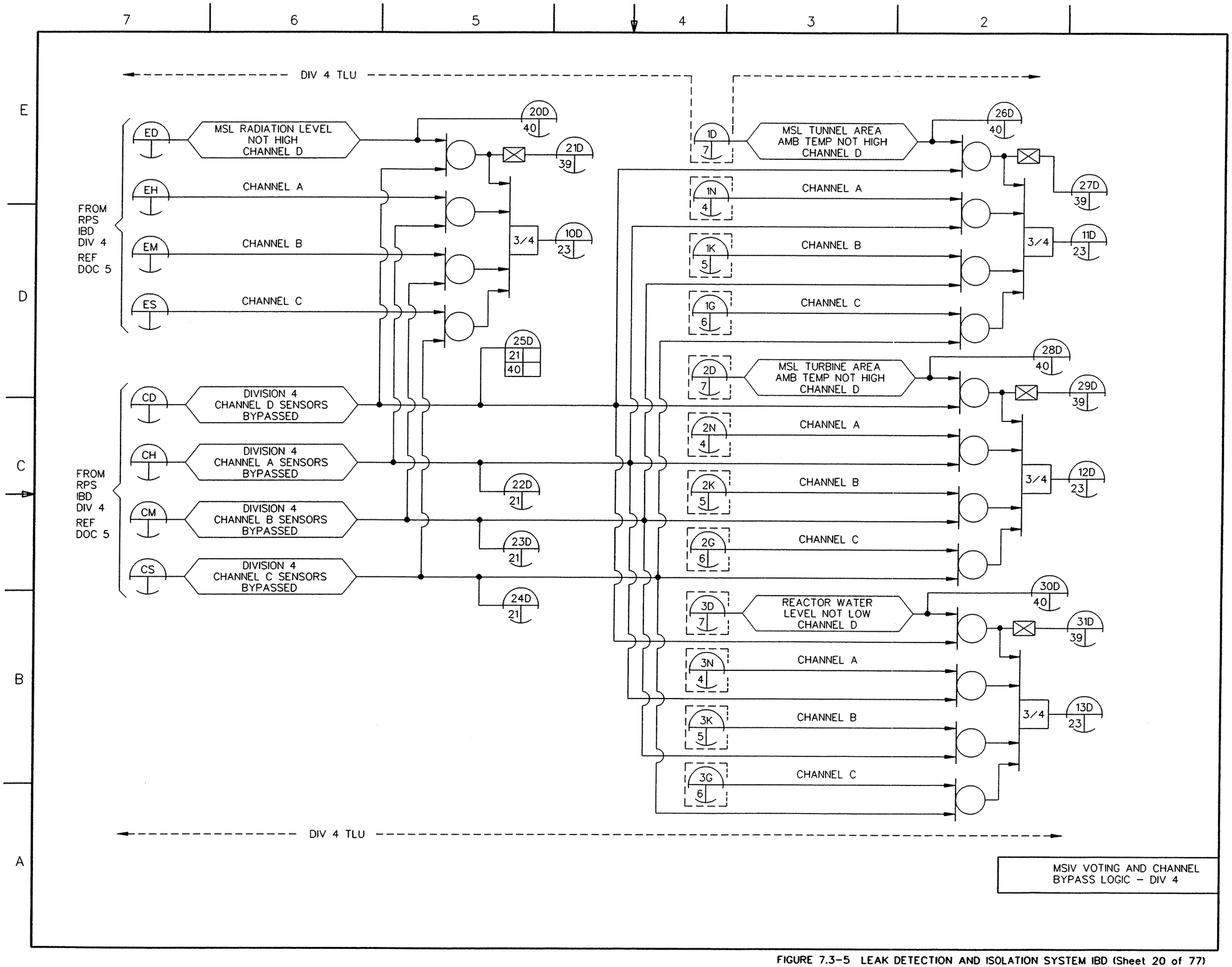


FIGURE 7.3-5 LEAK DETECTION AND ISOLATION SYSTEM IBD (Sheet 20 of 77)

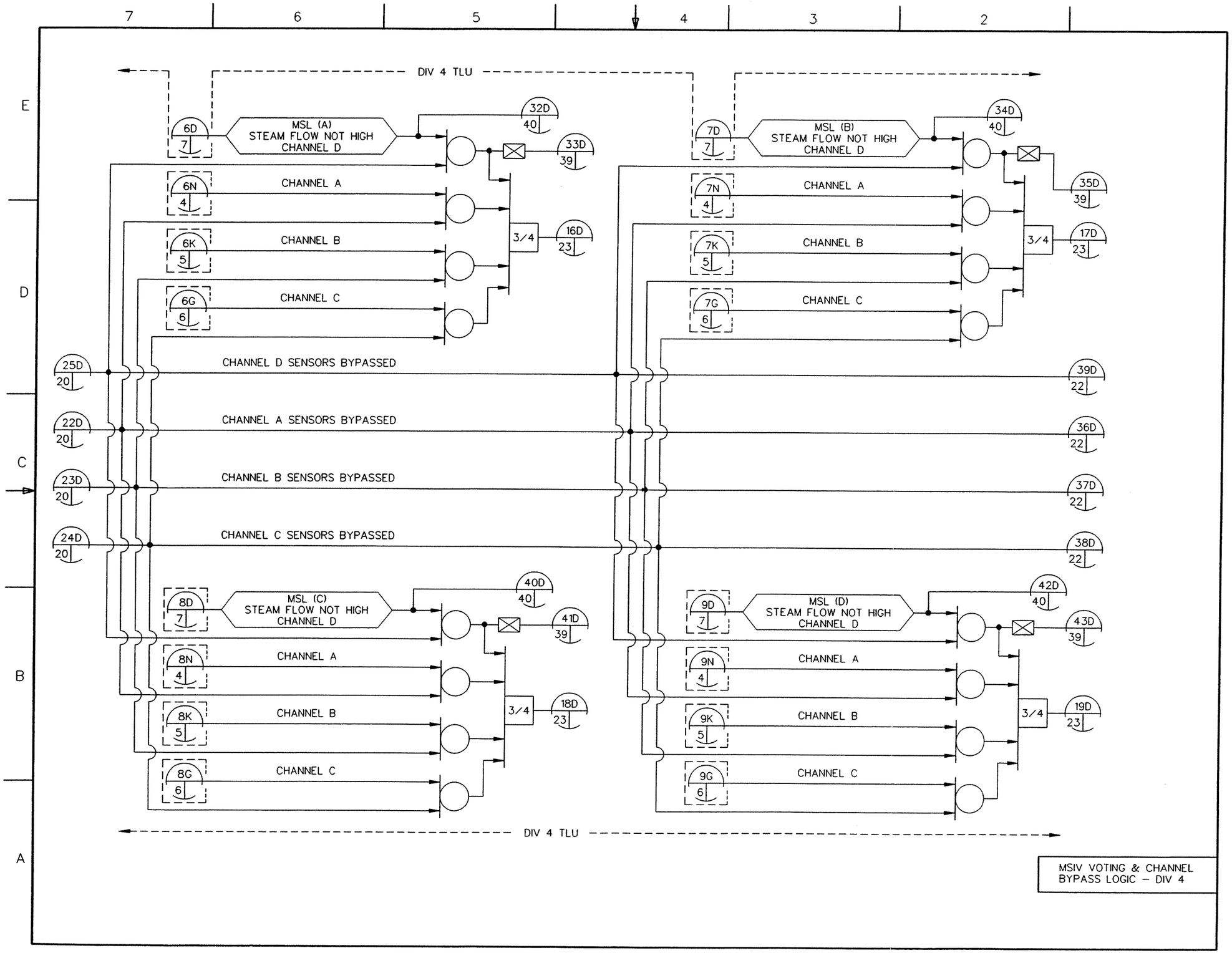


FIGURE 7.3–5 LEAK DETECTION AND ISOLATION SYSTEM IBD (Sheet 21 of 77)

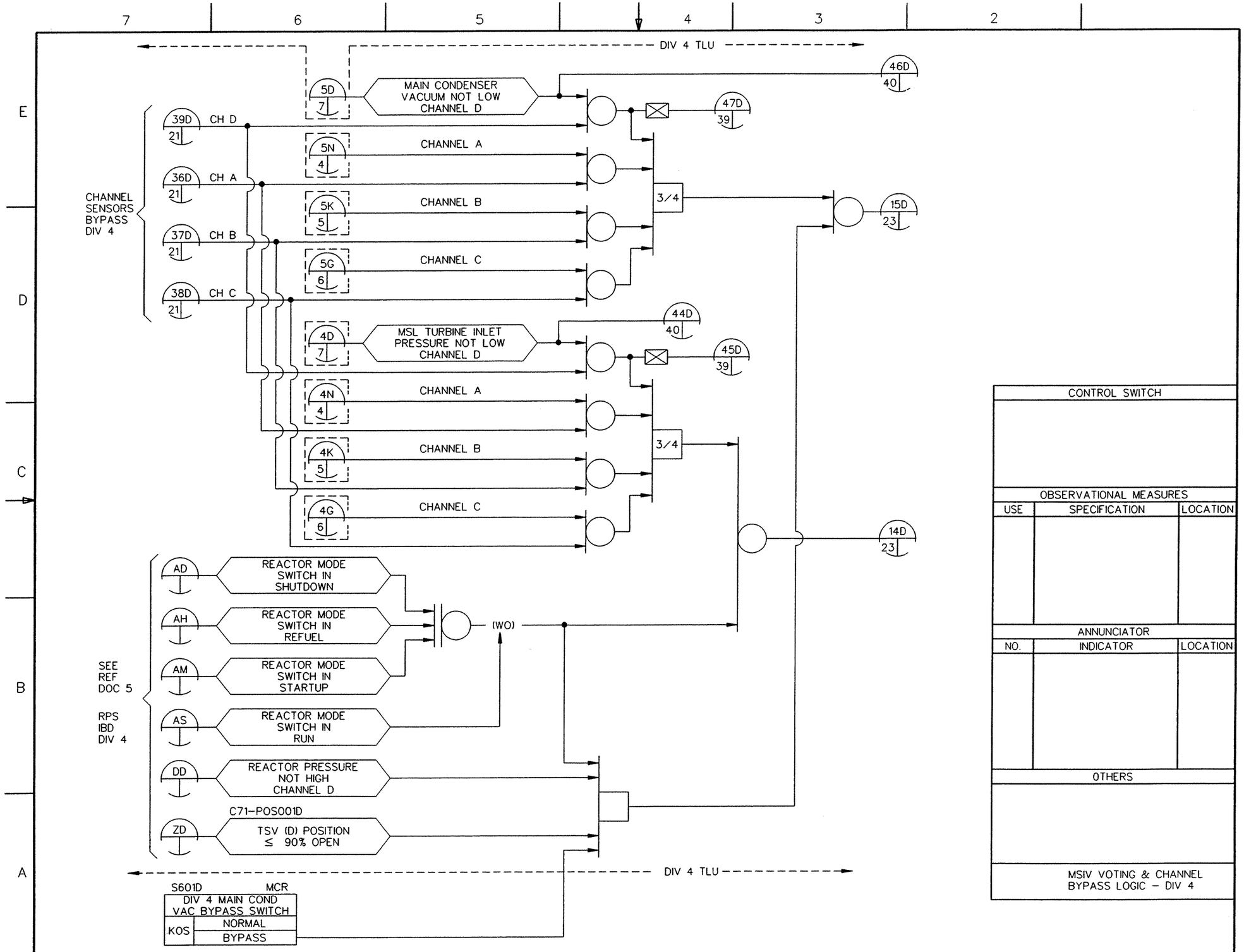


FIGURE 7.3-5 LEAK DETECTION AND ISOLATION SYSTEM IBD (Sheet 22 of 77)

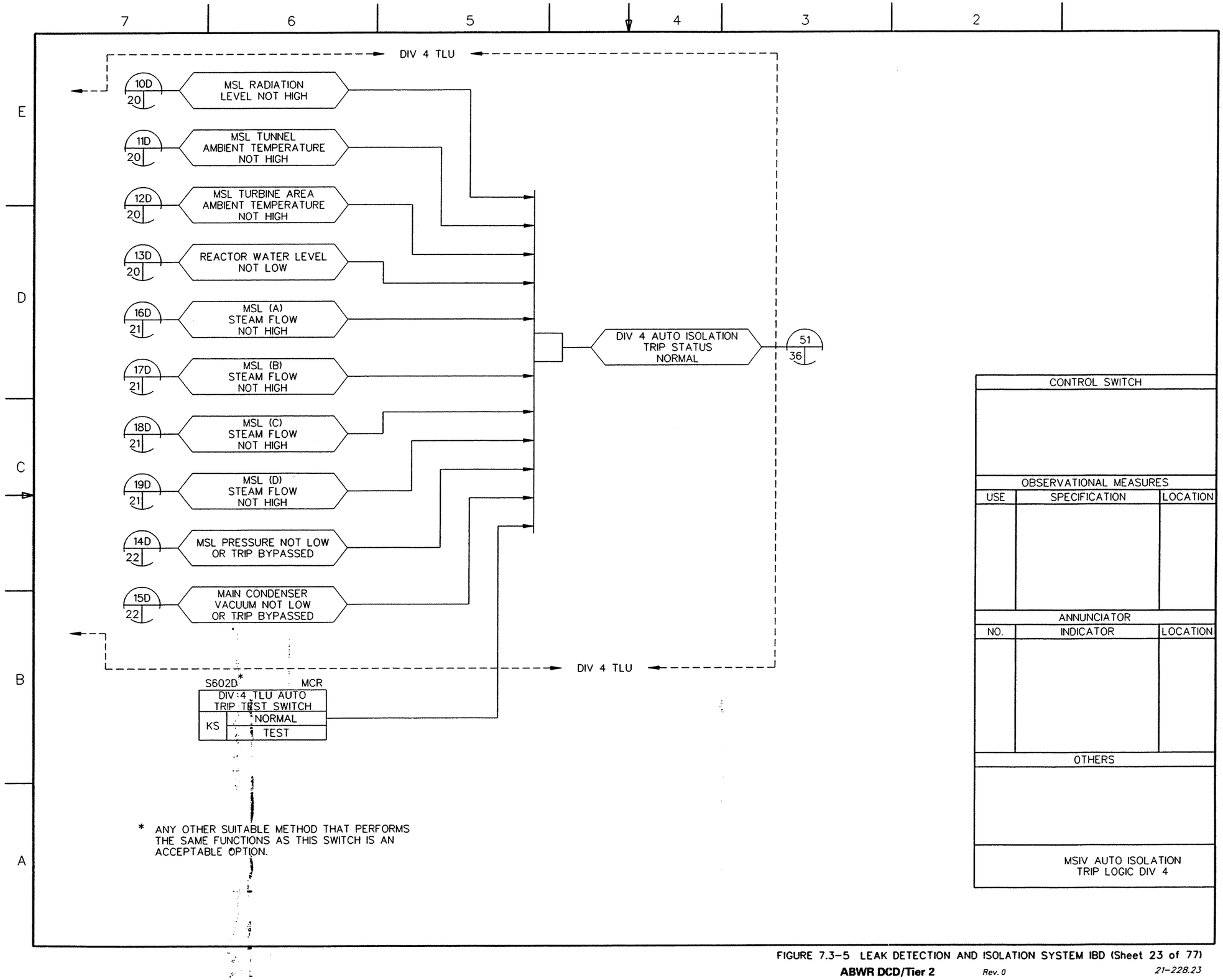


FIGURE 7.3-5 LEAK DETECTION AND ISOLATION SYSTEM IBD (Sheet 23 of 77)

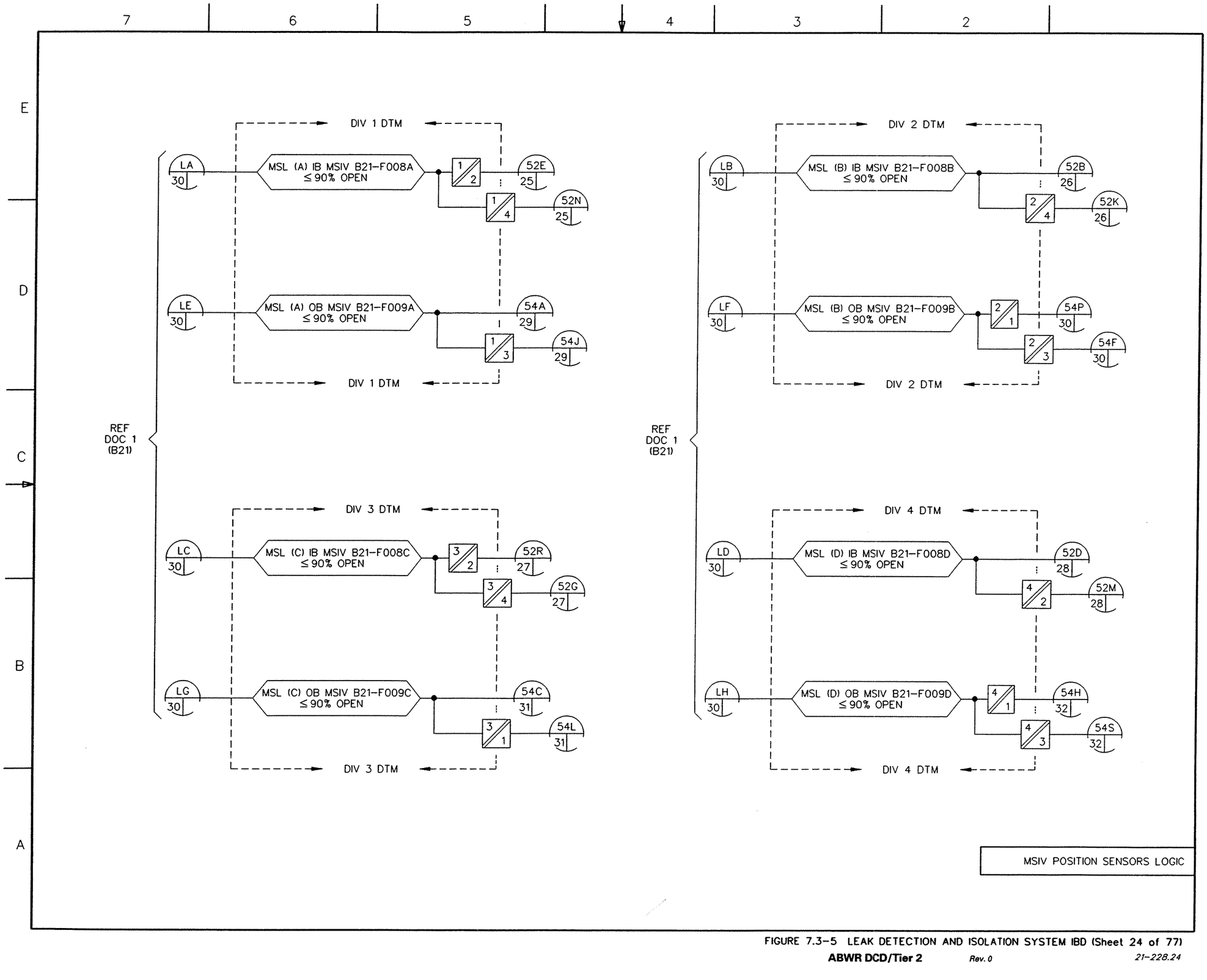


FIGURE 7.3–5 LEAK DETECTION AND ISOLATION SYSTEM IBD (Sheet 24 of 77)

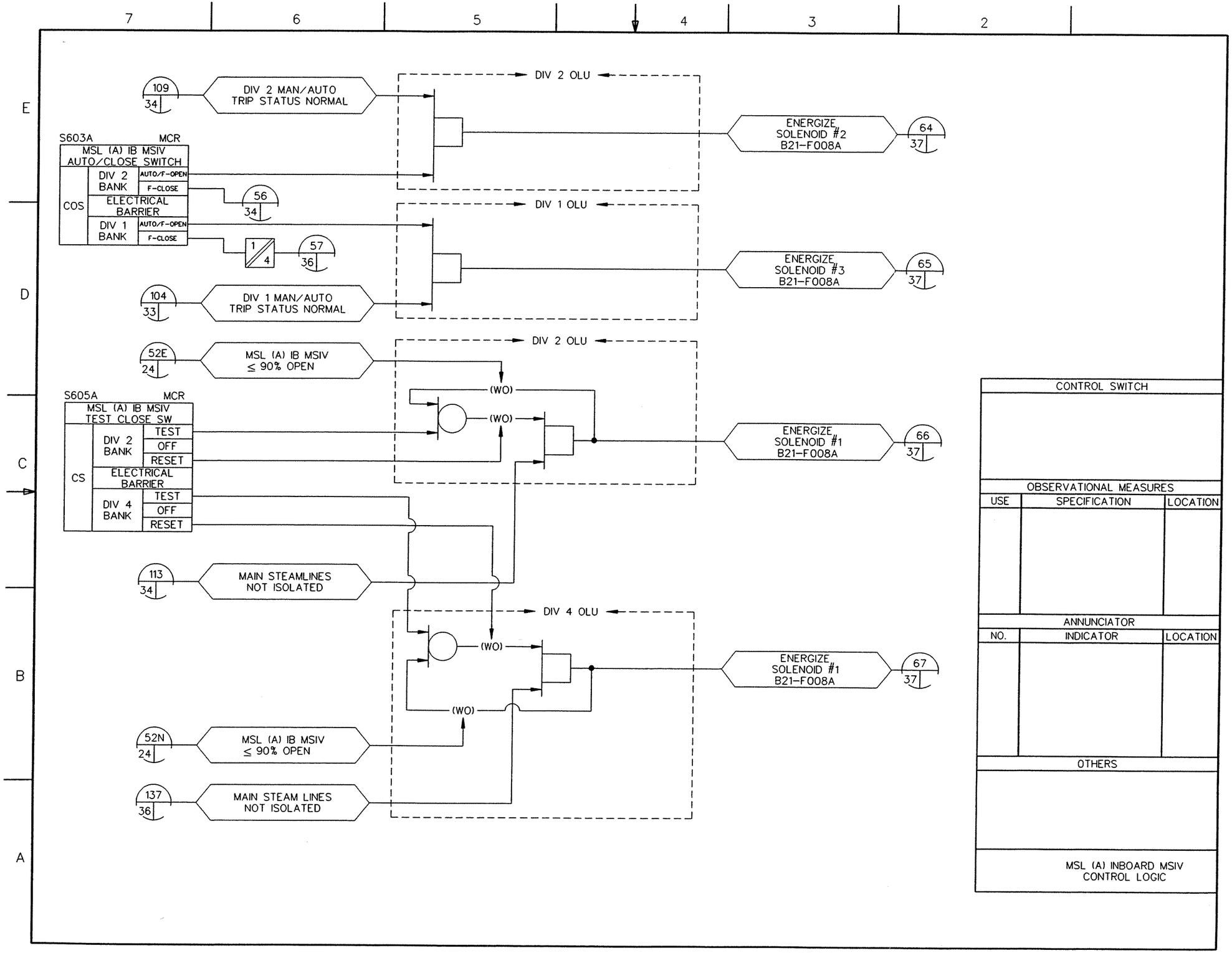


FIGURE 7.3-5 LEAK DETECTION AND ISOLATION SYSTEM IBD (Sheet 25 of 77)

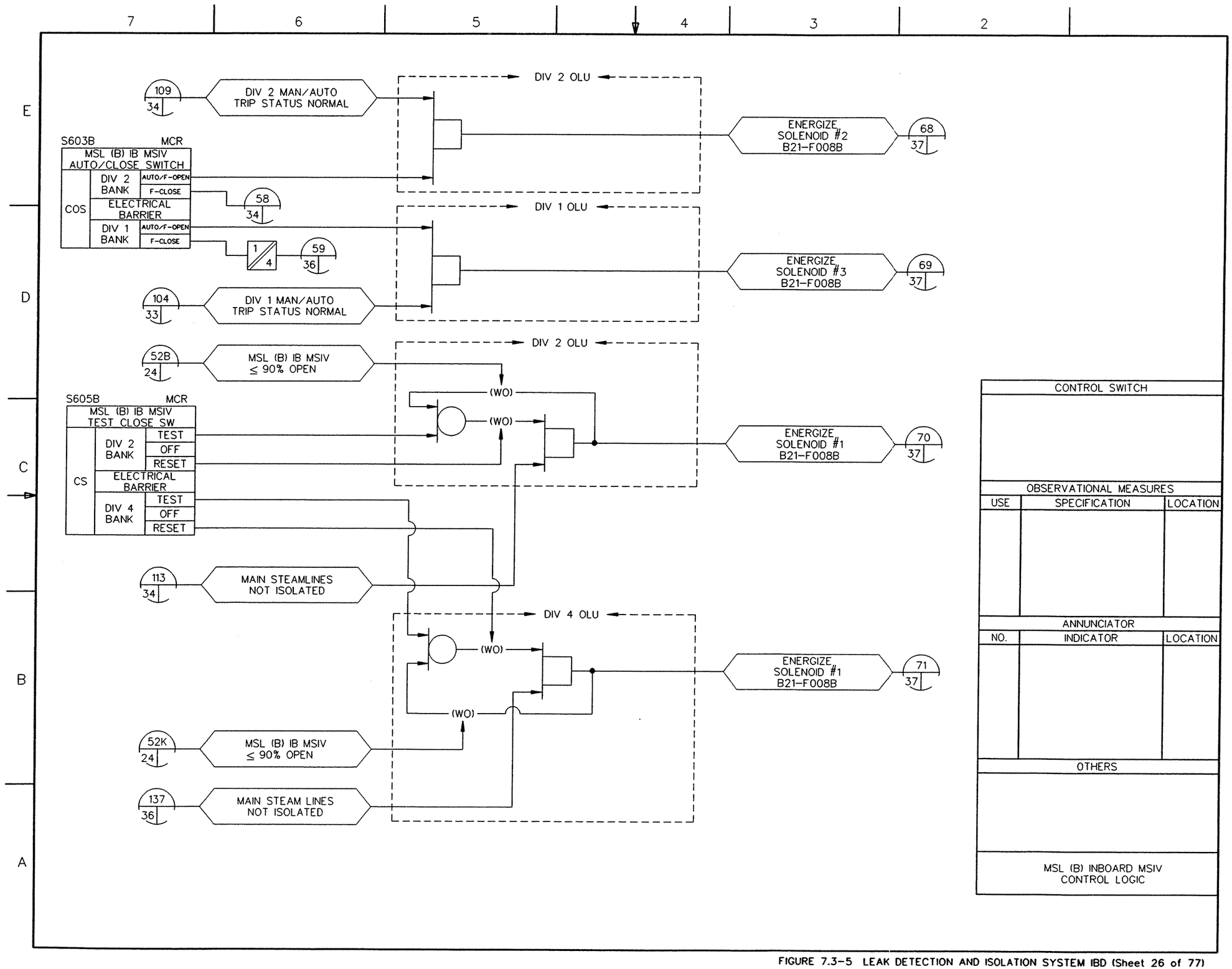


FIGURE 7.3-5 LEAK DETECTION AND ISOLATION SYSTEM IBD (Sheet 26 of 77)

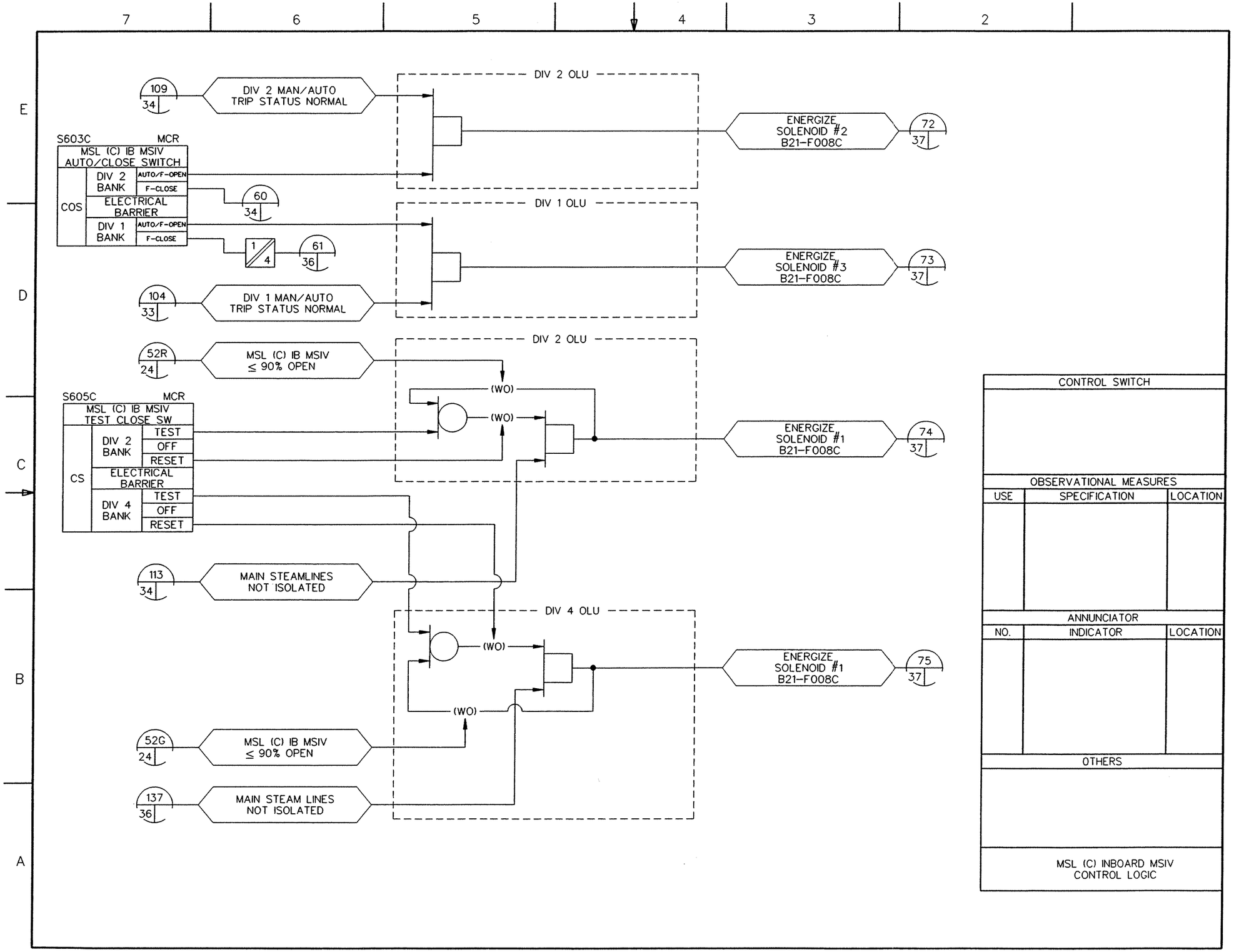


FIGURE 7.3-5 LEAK DETECTION AND ISOLATION SYSTEM IBD (Sheet 27 of 77)

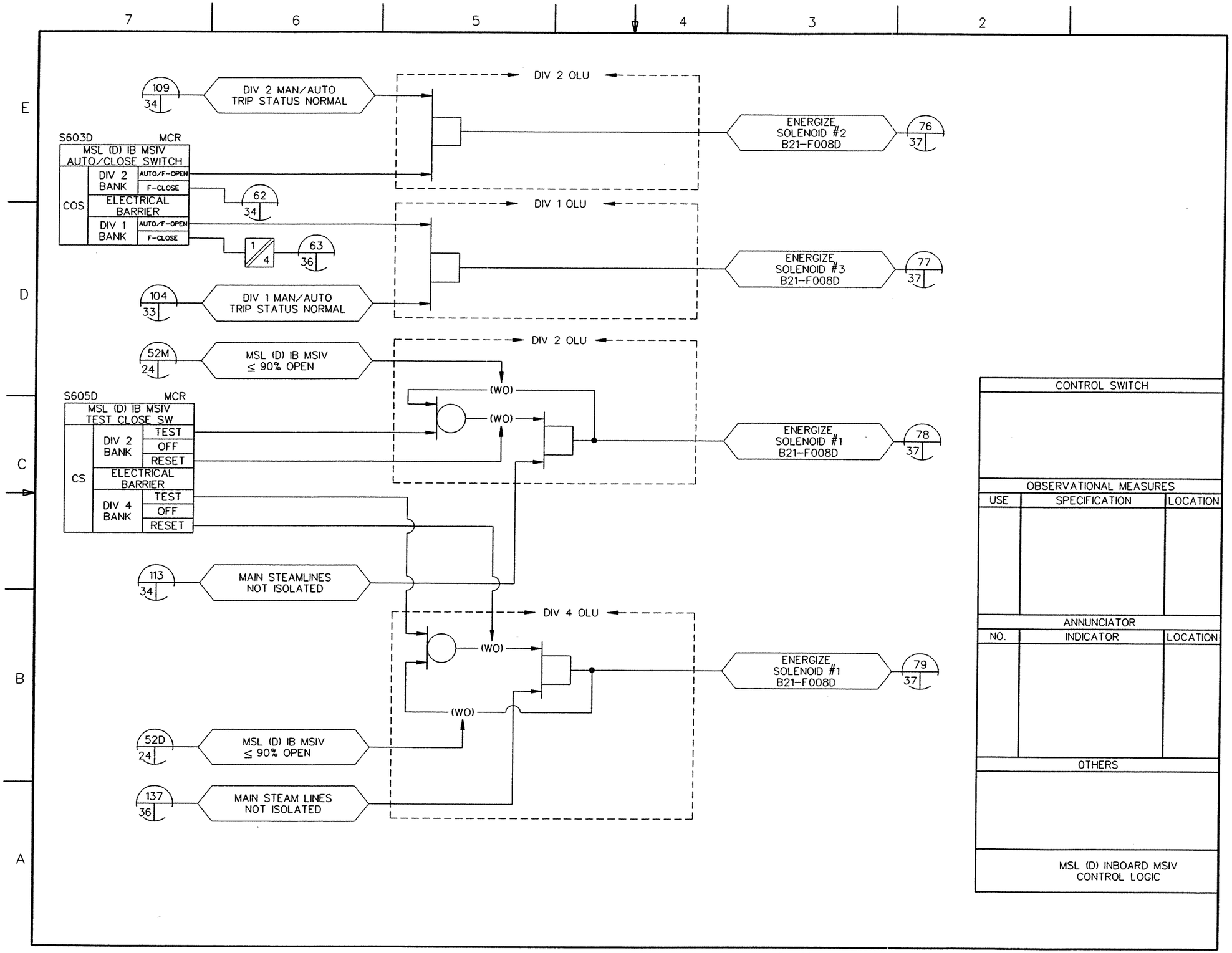


FIGURE 7.3-5 LEAK DETECTION AND ISOLATION SYSTEM IBD (Sheet 28 of 77)

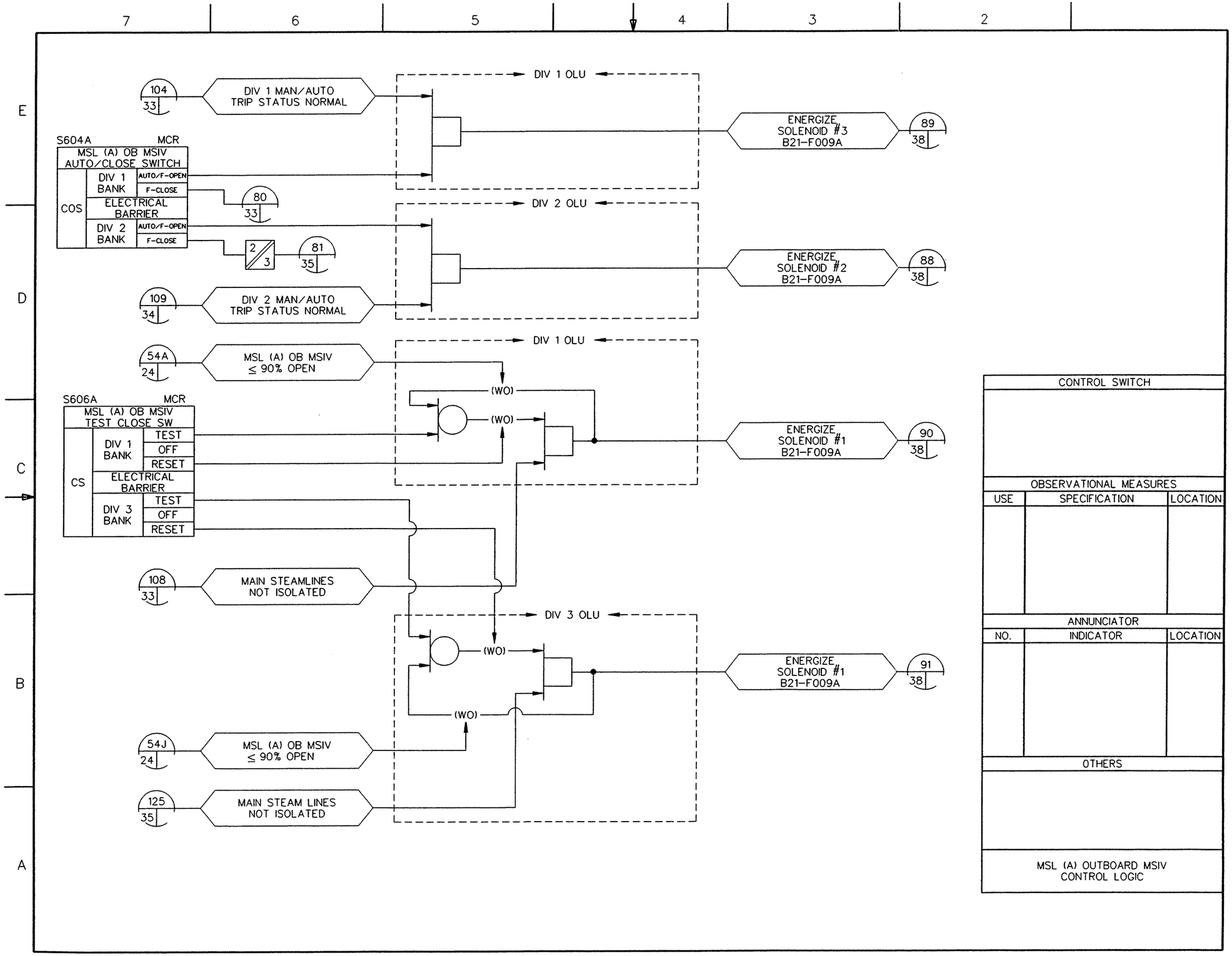


FIGURE 7.3–5 LEAK DETECTION AND ISOLATION SYSTEM IBD (Sheet 29 of 77)

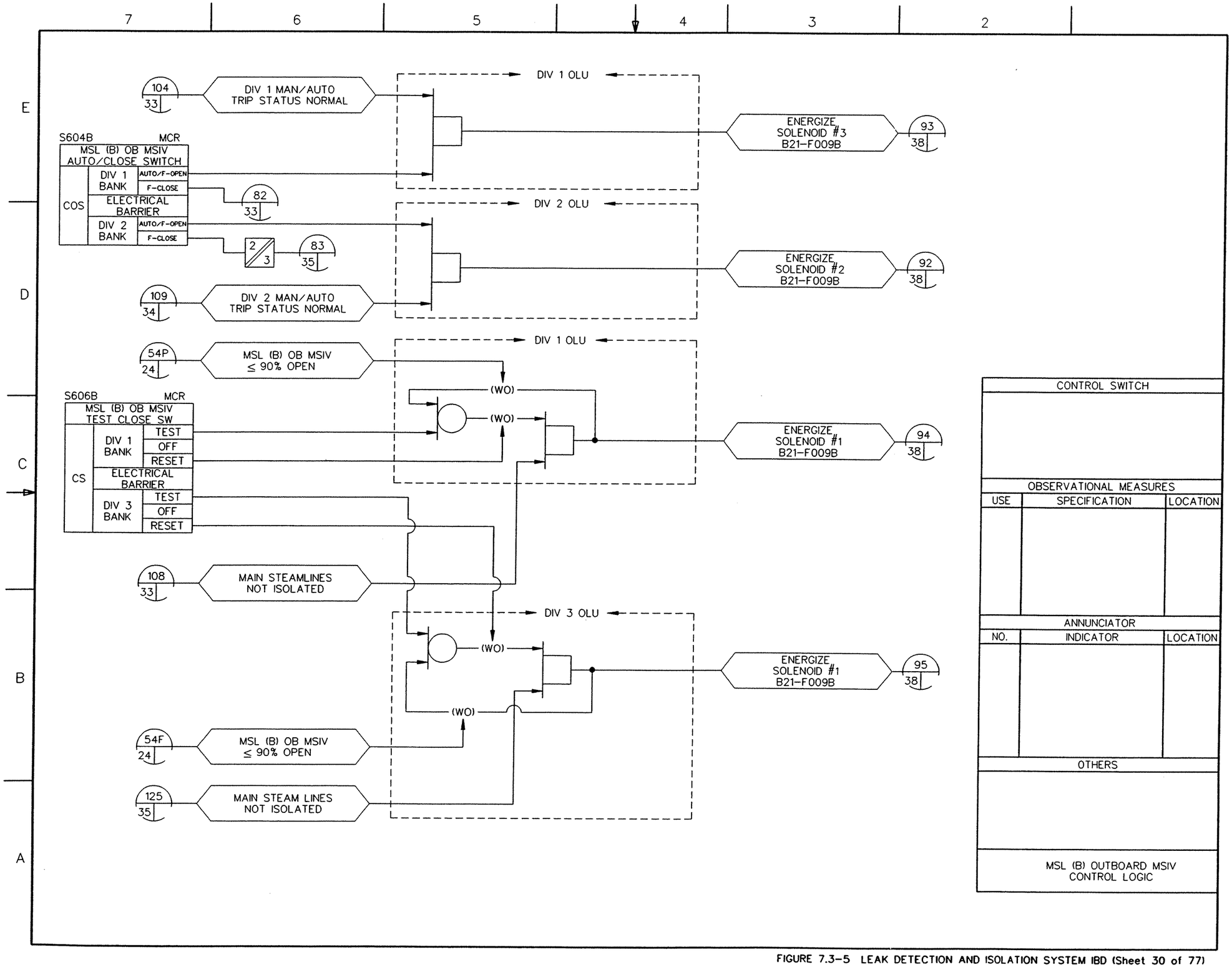


FIGURE 7.3-5 LEAK DETECTION AND ISOLATION SYSTEM IBD (Sheet 30 of 77)

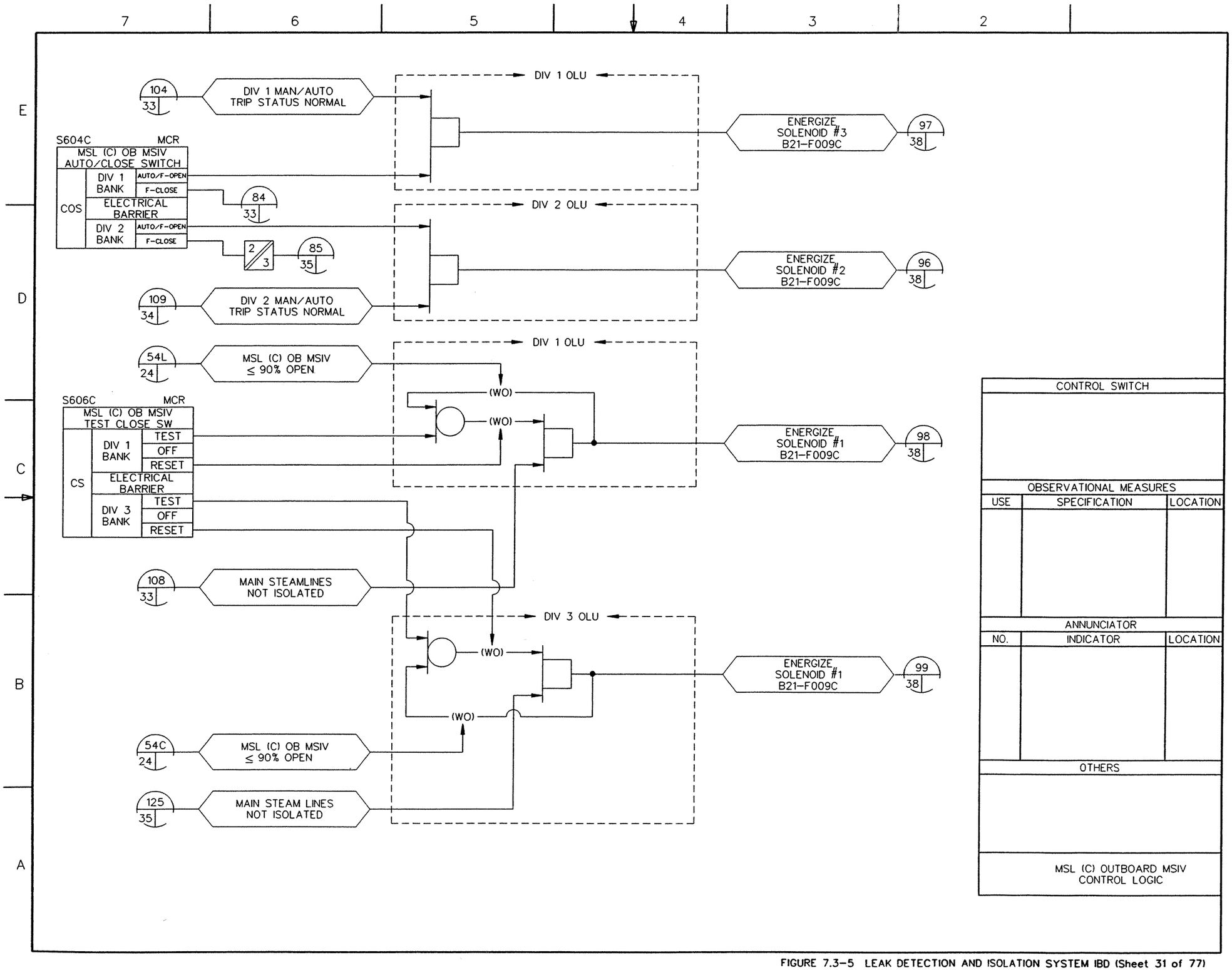


FIGURE 7.3-5 LEAK DETECTION AND ISOLATION SYSTEM IBD (Sheet 31 of 77)

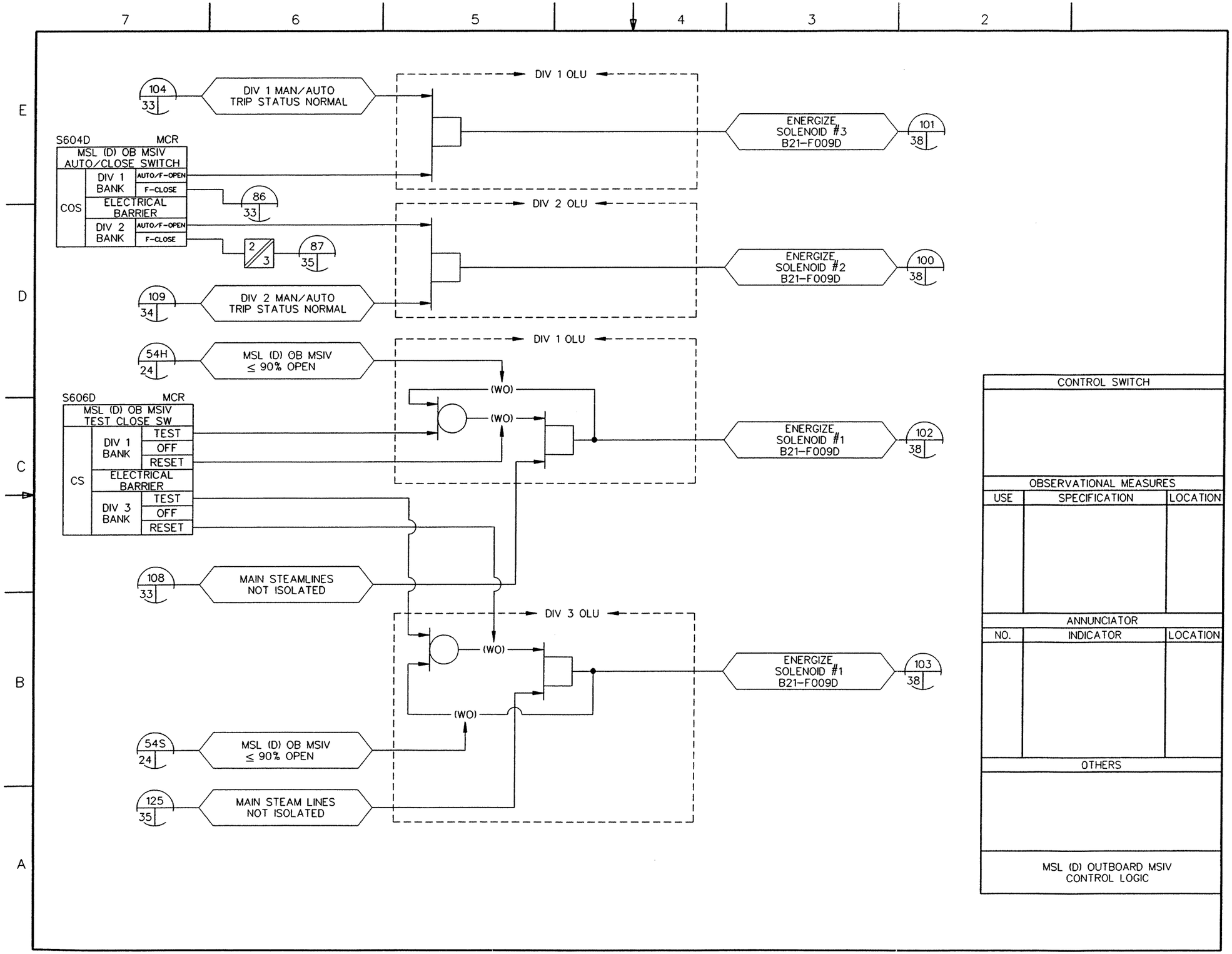


FIGURE 7.3-5 LEAK DETECTION AND ISOLATION SYSTEM IBD (Sheet 32 of 77)

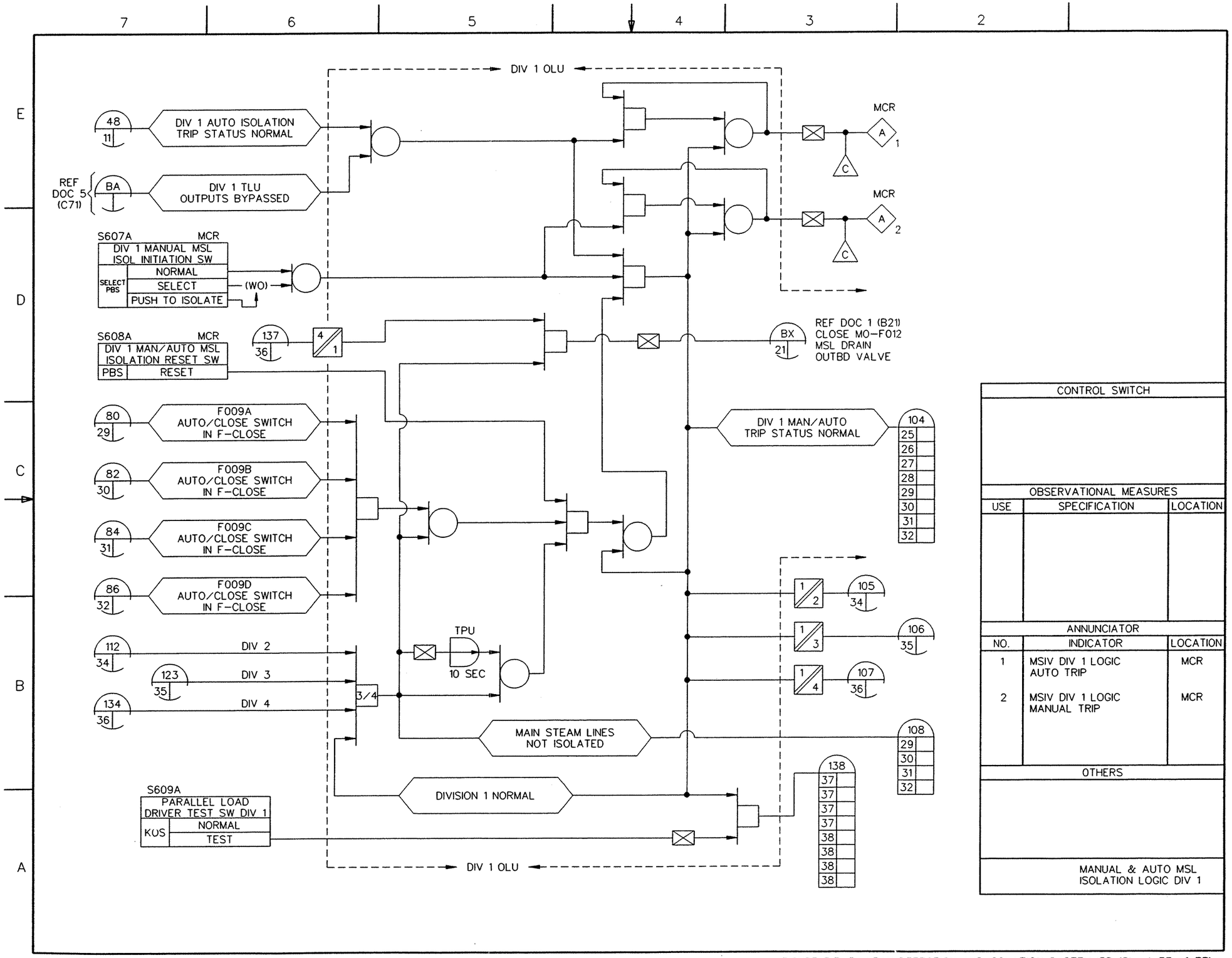


FIGURE 7.3-5 LEAK DETECTION AND ISOLATION SYSTEM IBD (Sheet 33 of 77)

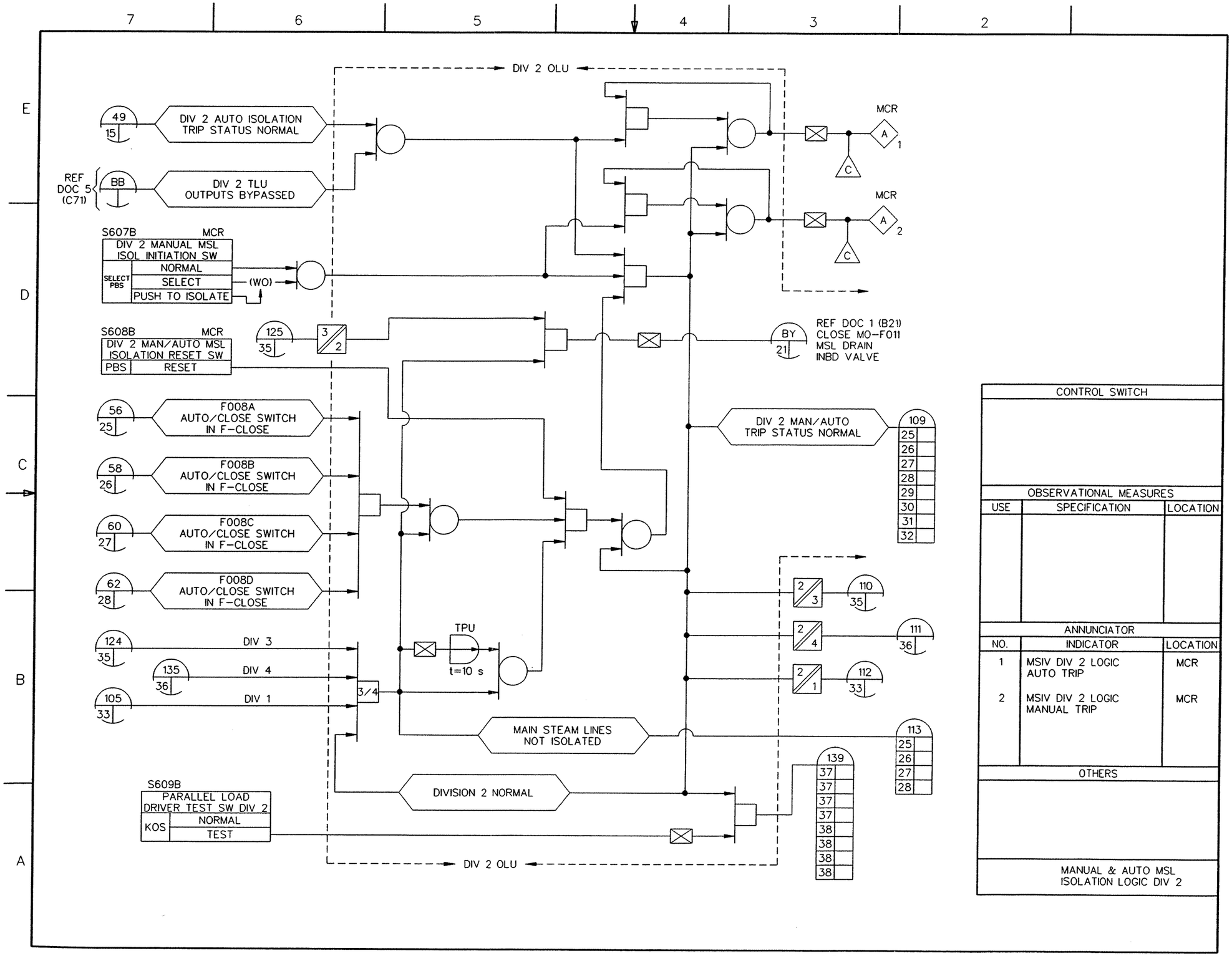


FIGURE 7.3-5 LEAK DETECTION AND ISOLATION SYSTEM IBD (Sheet 34 of 77)

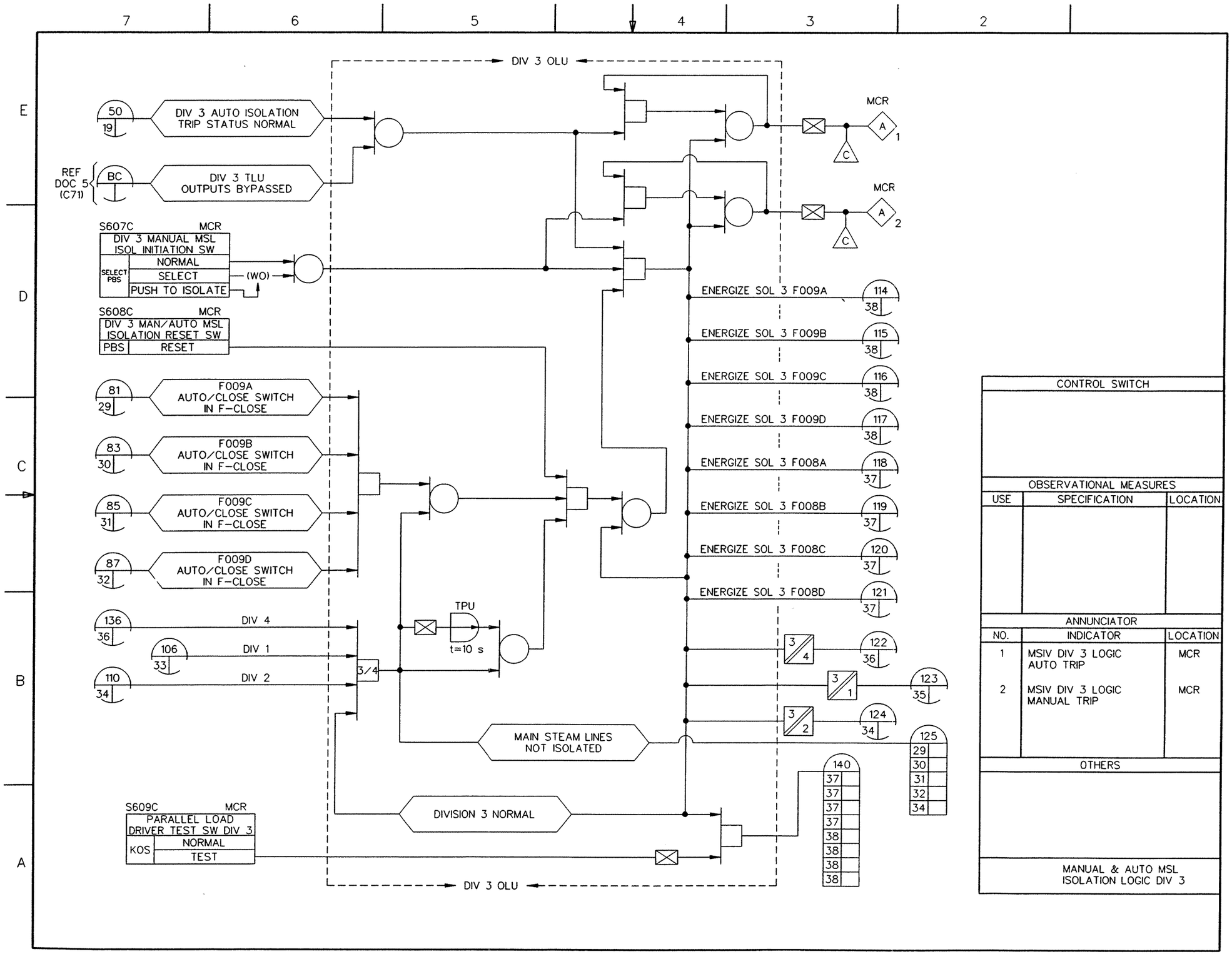


FIGURE 7.3-5 LEAK DETECTION AND ISOLATION SYSTEM IBD (Sheet 35 of 77)

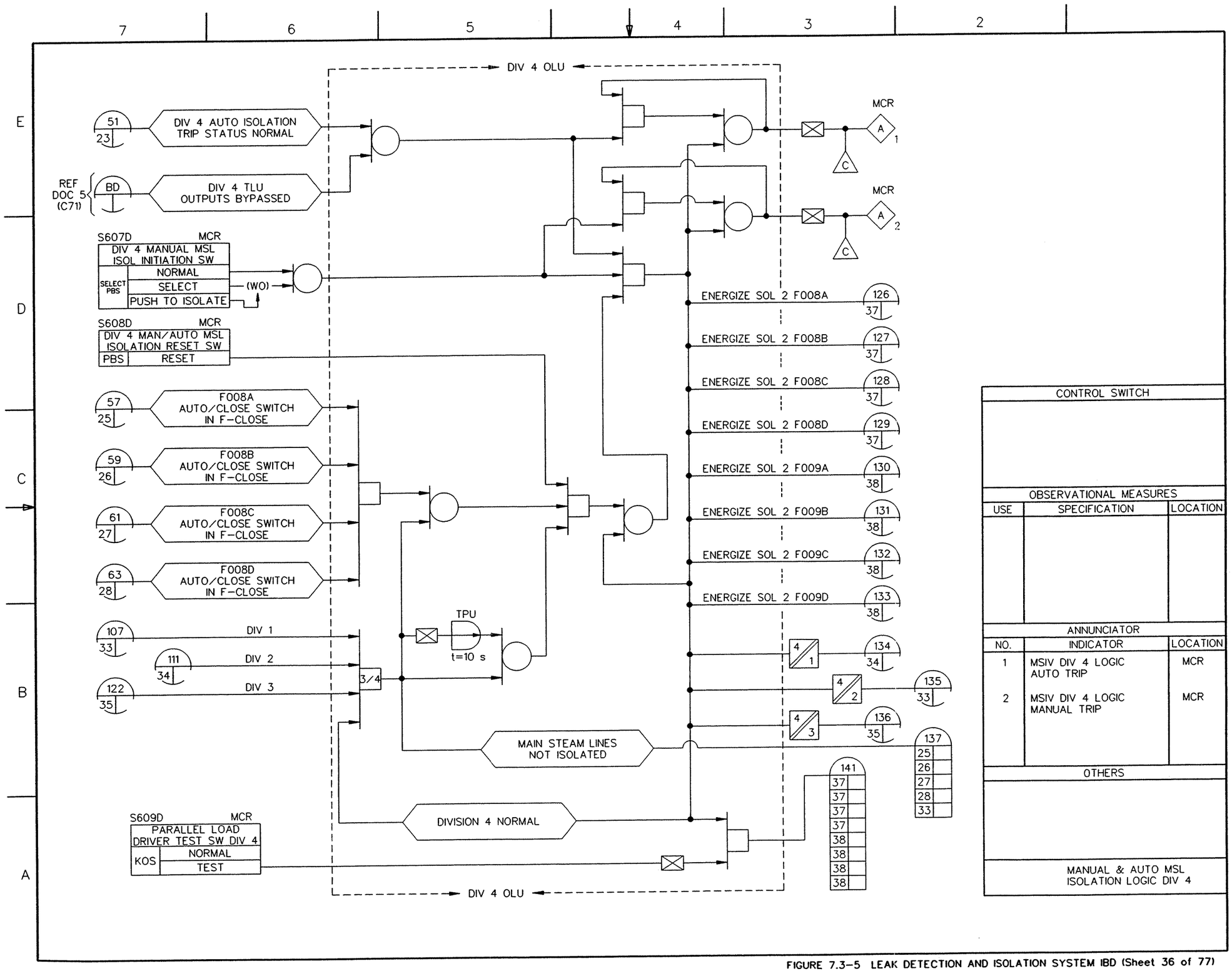


FIGURE 7.3–5 LEAK DETECTION AND ISOLATION SYSTEM IBD (Sheet 36 of 77)

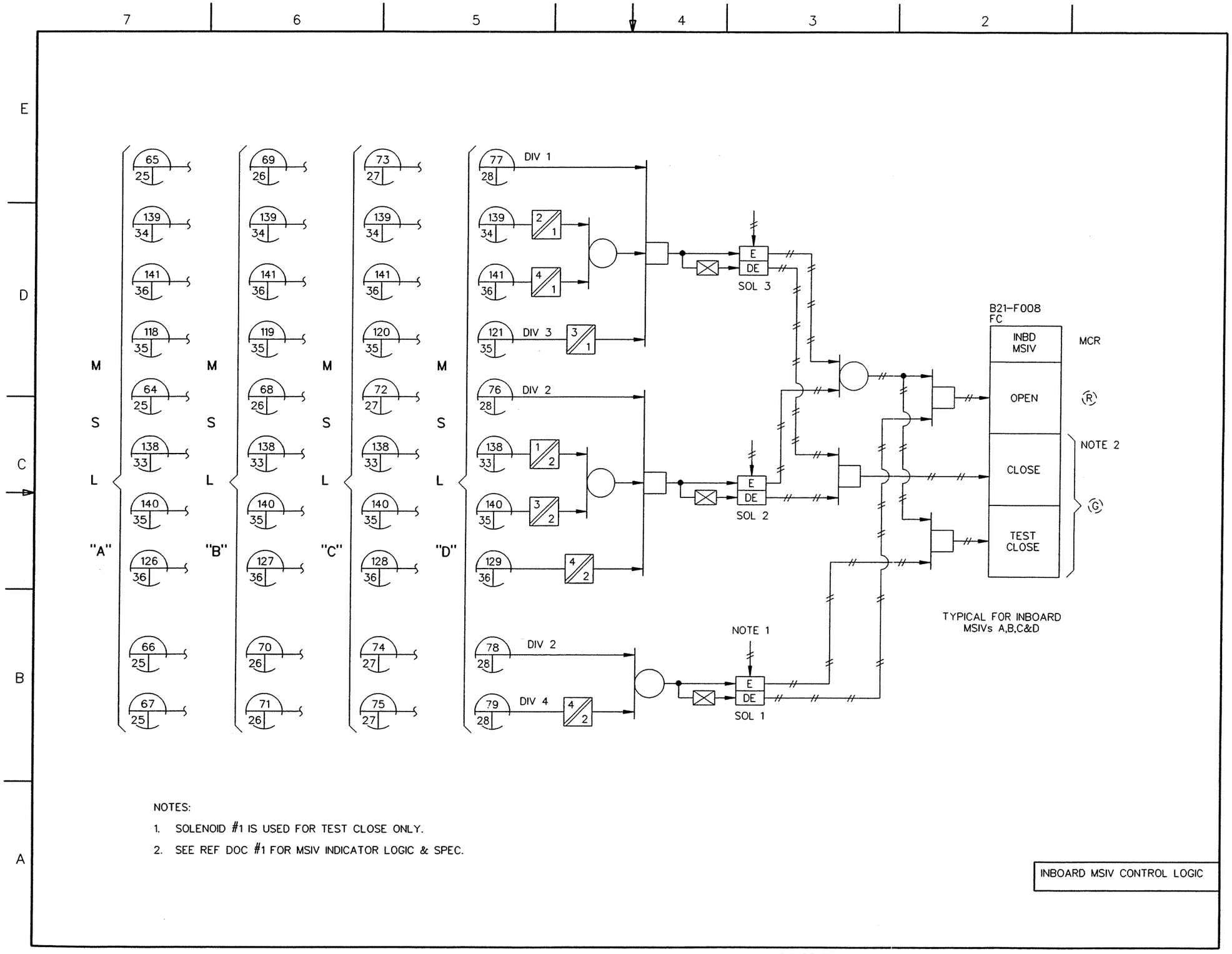


FIGURE 7.3-5 LEAK DETECTION AND ISOLATION SYSTEM IBD (Sheet 37 of 77)

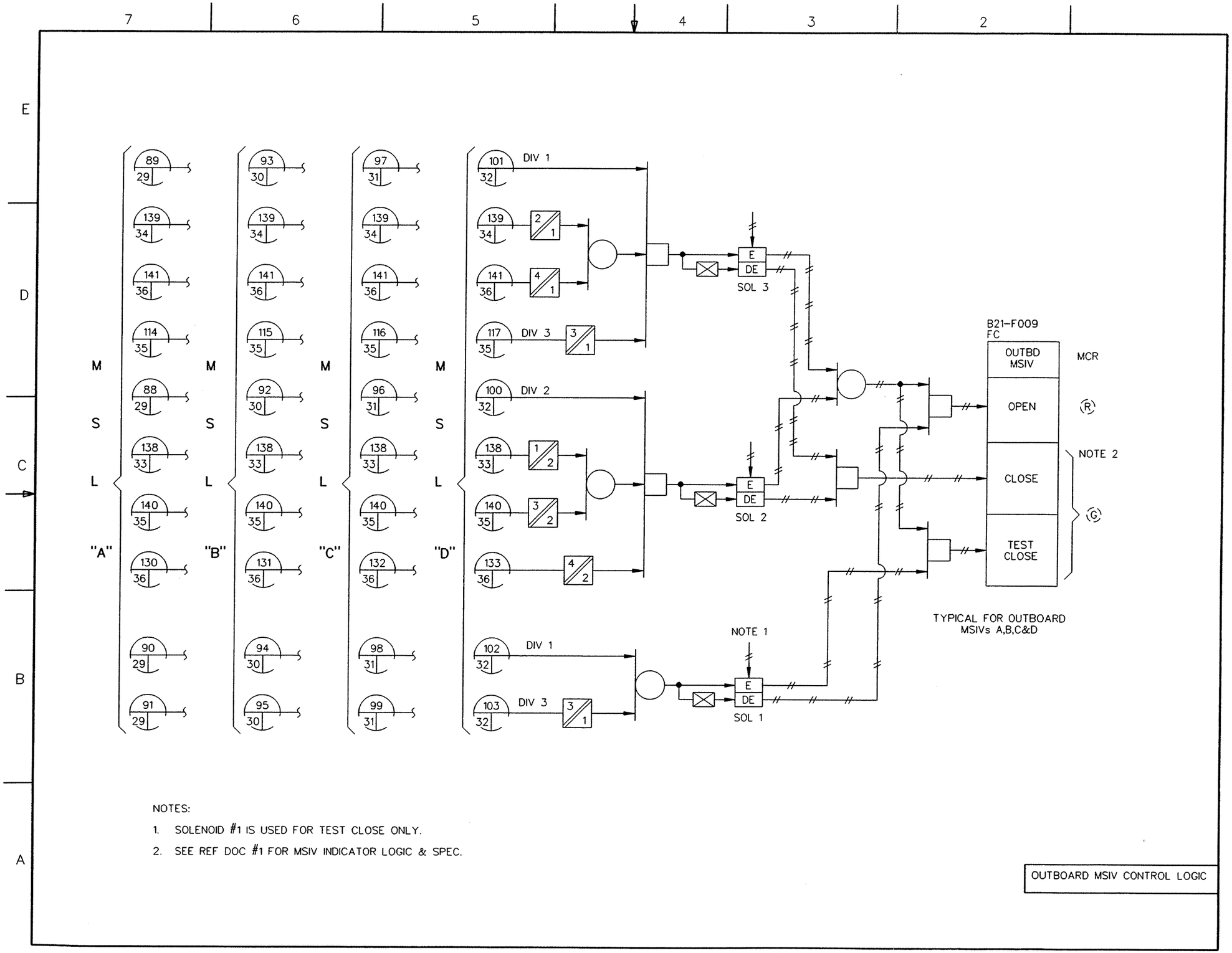
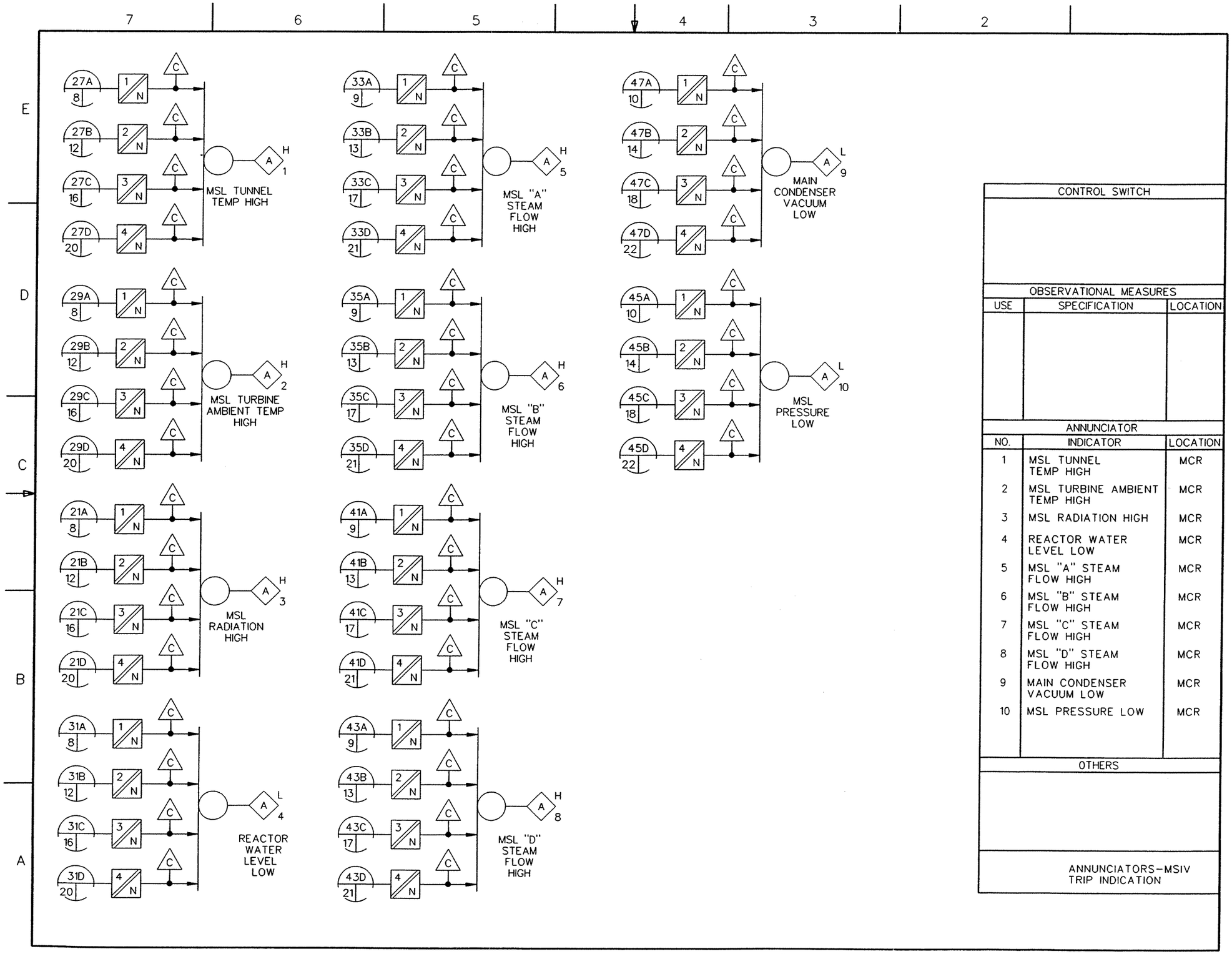


FIGURE 7.3-5 LEAK DETECTION AND ISOLATION SYSTEM IBD (Sheet 38 of 77)



CONTROL SWITCH		

OBSERVATIONAL MEASURES		
USE	SPECIFICATION	LOCATION

ANNUNCIATOR		
NO.	INDICATOR	LOCATION
1	MSL TUNNEL TEMP HIGH	MCR
2	MSL TURBINE AMBIENT TEMP HIGH	MCR
3	MSL RADIATION HIGH	MCR
4	REACTOR WATER LEVEL LOW	MCR
5	MSL "A" STEAM FLOW HIGH	MCR
6	MSL "B" STEAM FLOW HIGH	MCR
7	MSL "C" STEAM FLOW HIGH	MCR
8	MSL "D" STEAM FLOW HIGH	MCR
9	MAIN CONDENSER VACUUM LOW	MCR
10	MSL PRESSURE LOW	MCR

OTHERS

ANNUNCIATORS–MSIV TRIP INDICATION

FIGURE 7.3–5 LEAK DETECTION AND ISOLATION SYSTEM IBD (Sheet 39 of 77)

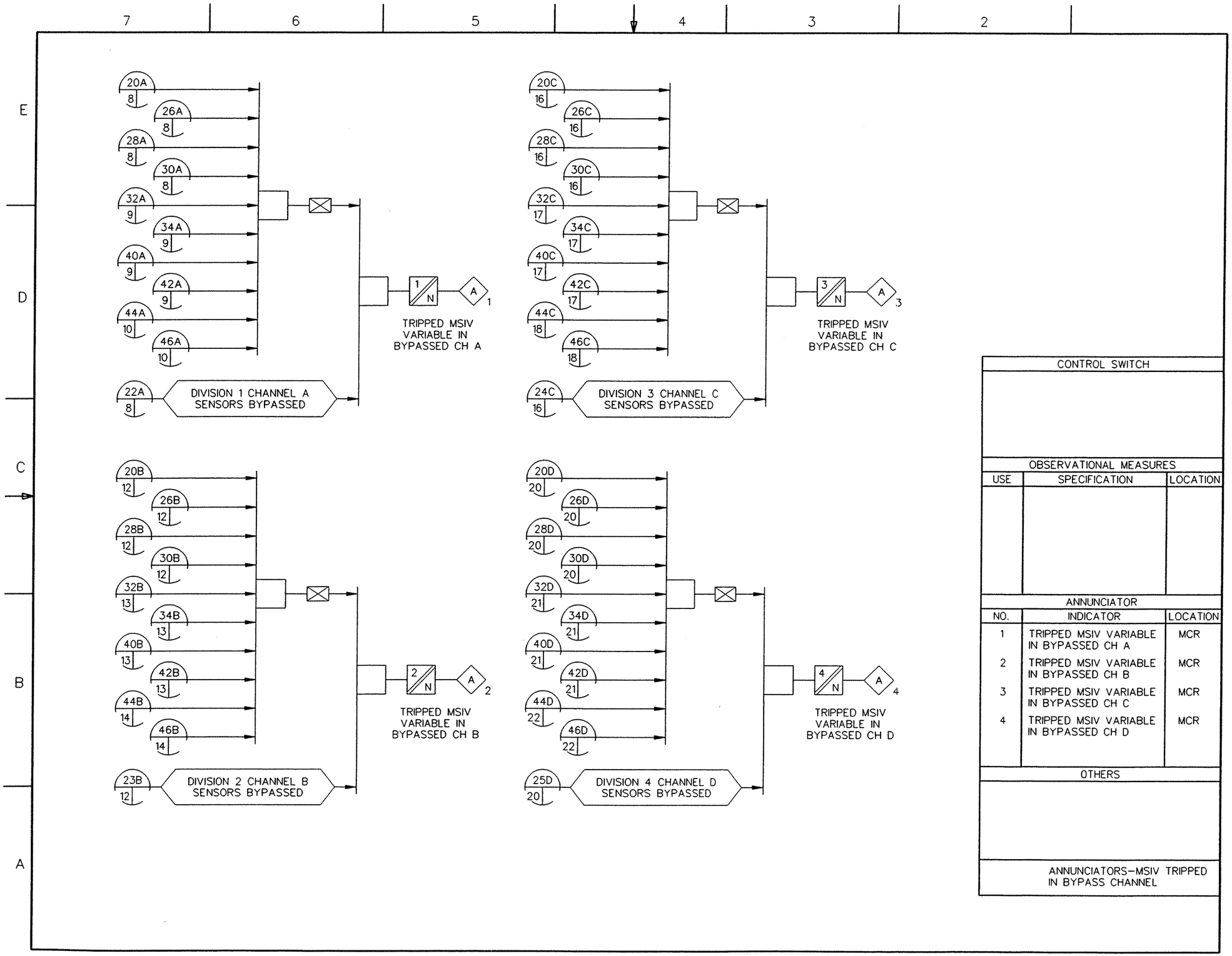


FIGURE 7.3–5 LEAK DETECTION AND ISOLATION SYSTEM IBD (Sheet 40 of 77)

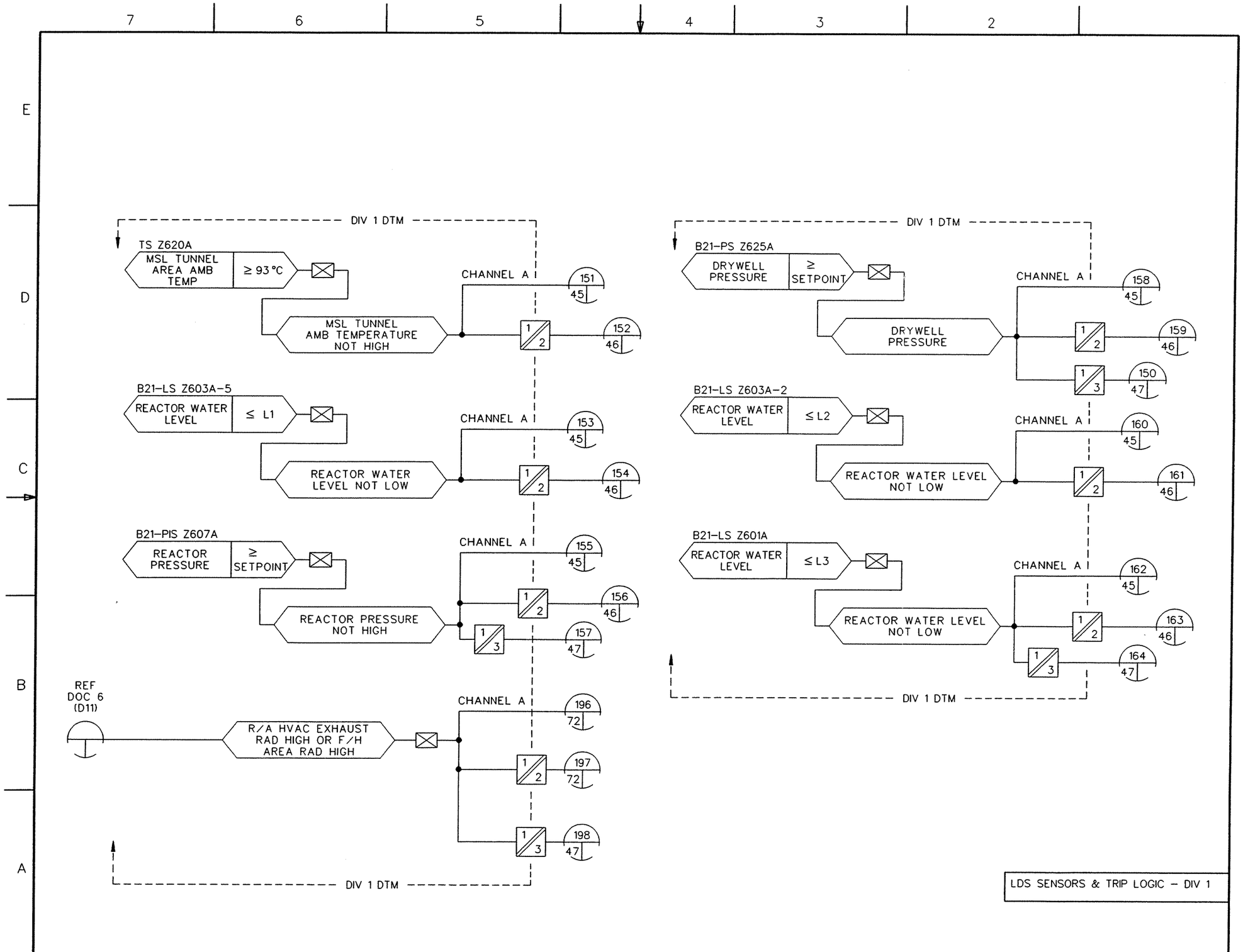


FIGURE 7.3–5 LEAK DETECTION AND ISOLATION SYSTEM IBD (Sheet 41 of 77)

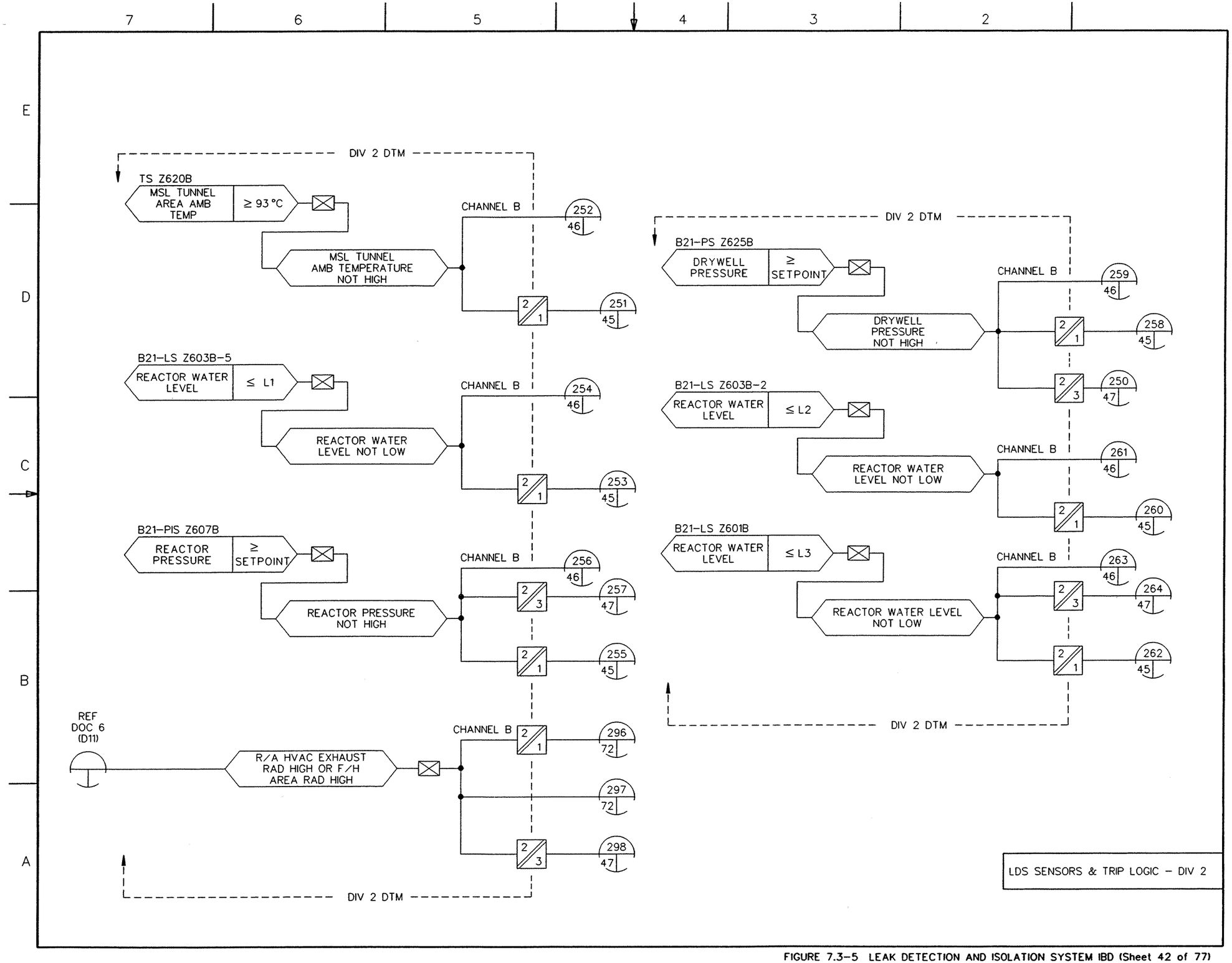


FIGURE 7.3–5 LEAK DETECTION AND ISOLATION SYSTEM IBD (Sheet 42 of 77)

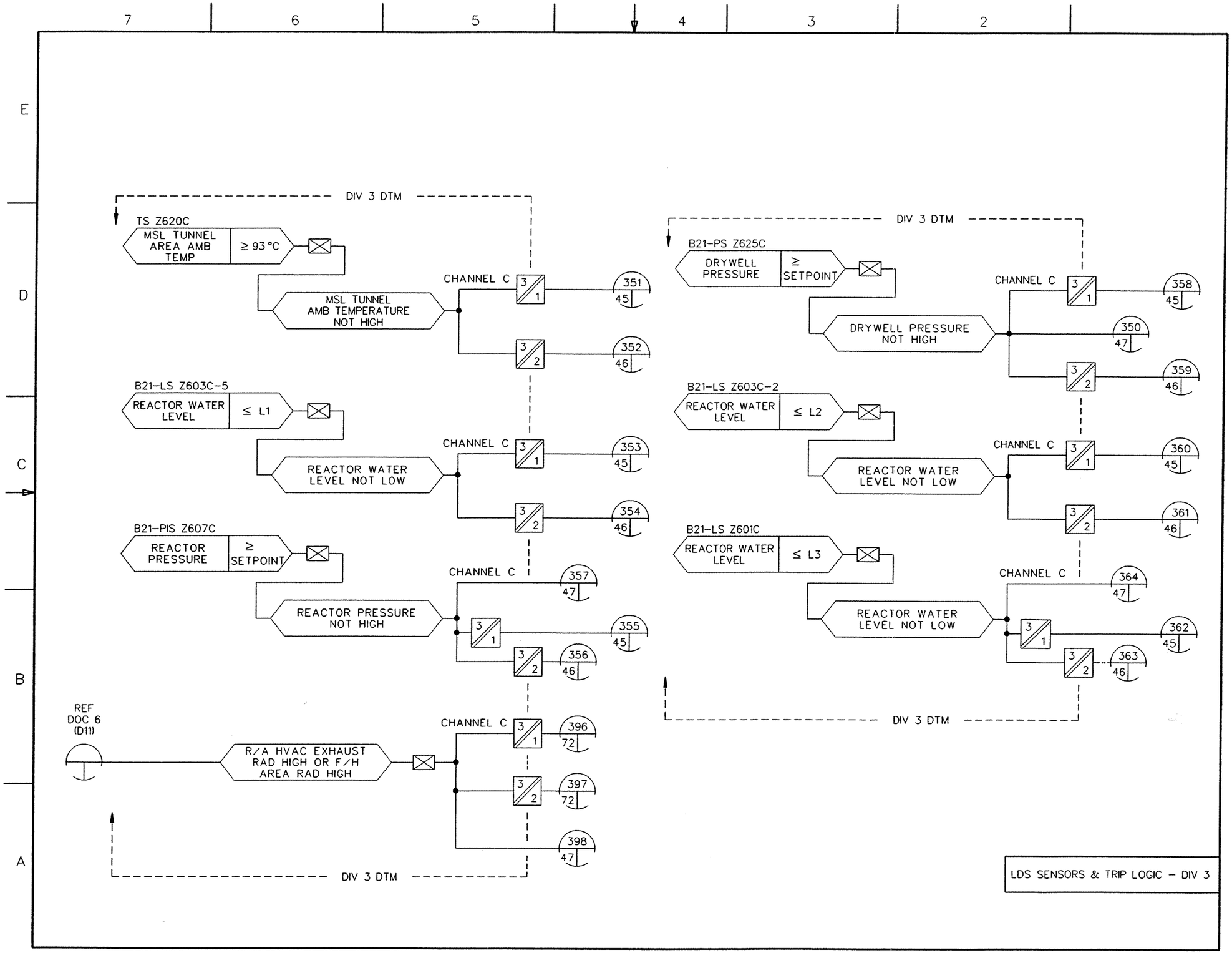


FIGURE 7.3–5 LEAK DETECTION AND ISOLATION SYSTEM IBD (Sheet 43 of 77)

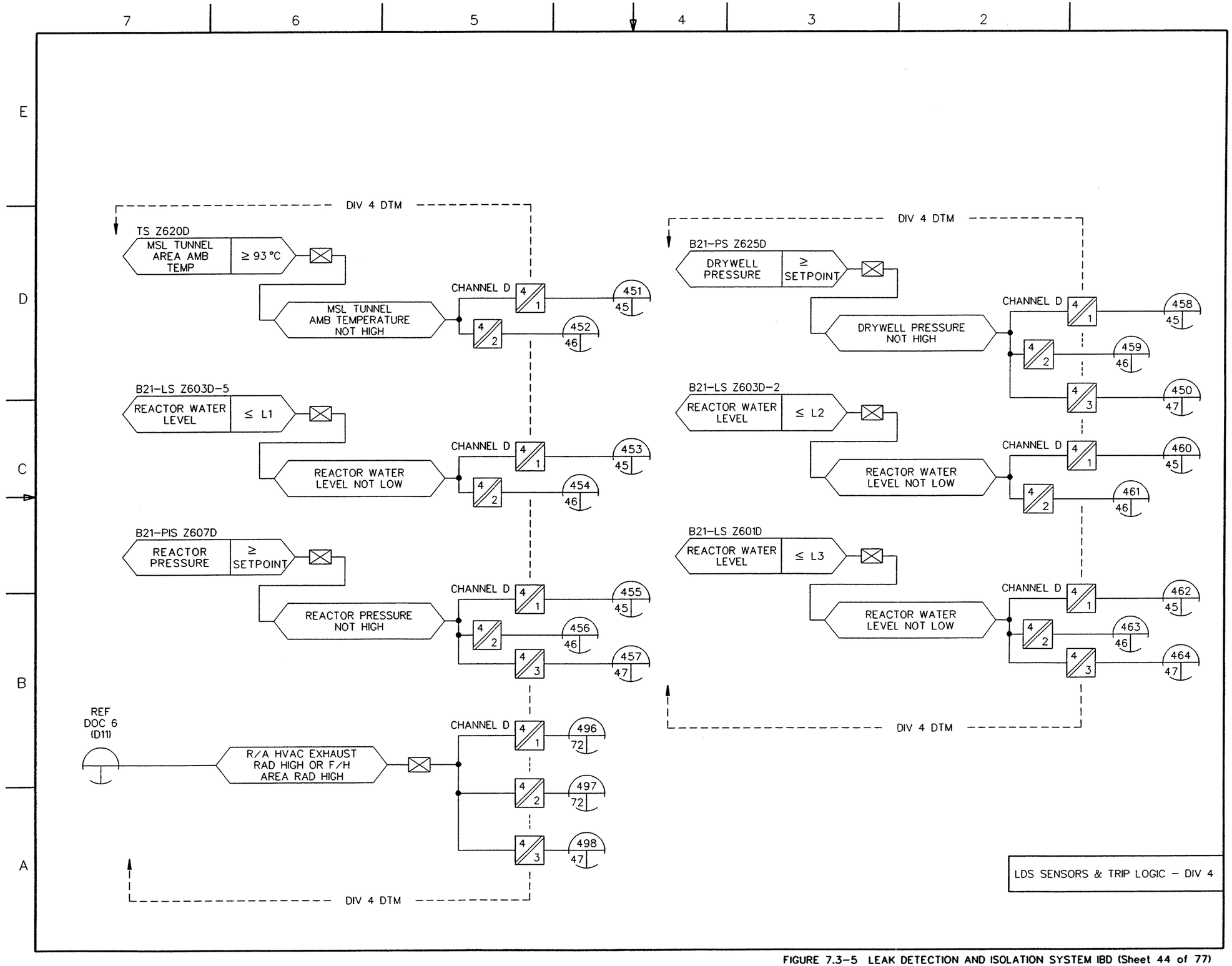


FIGURE 7.3–5 LEAK DETECTION AND ISOLATION SYSTEM IBD (Sheet 44 of 77)

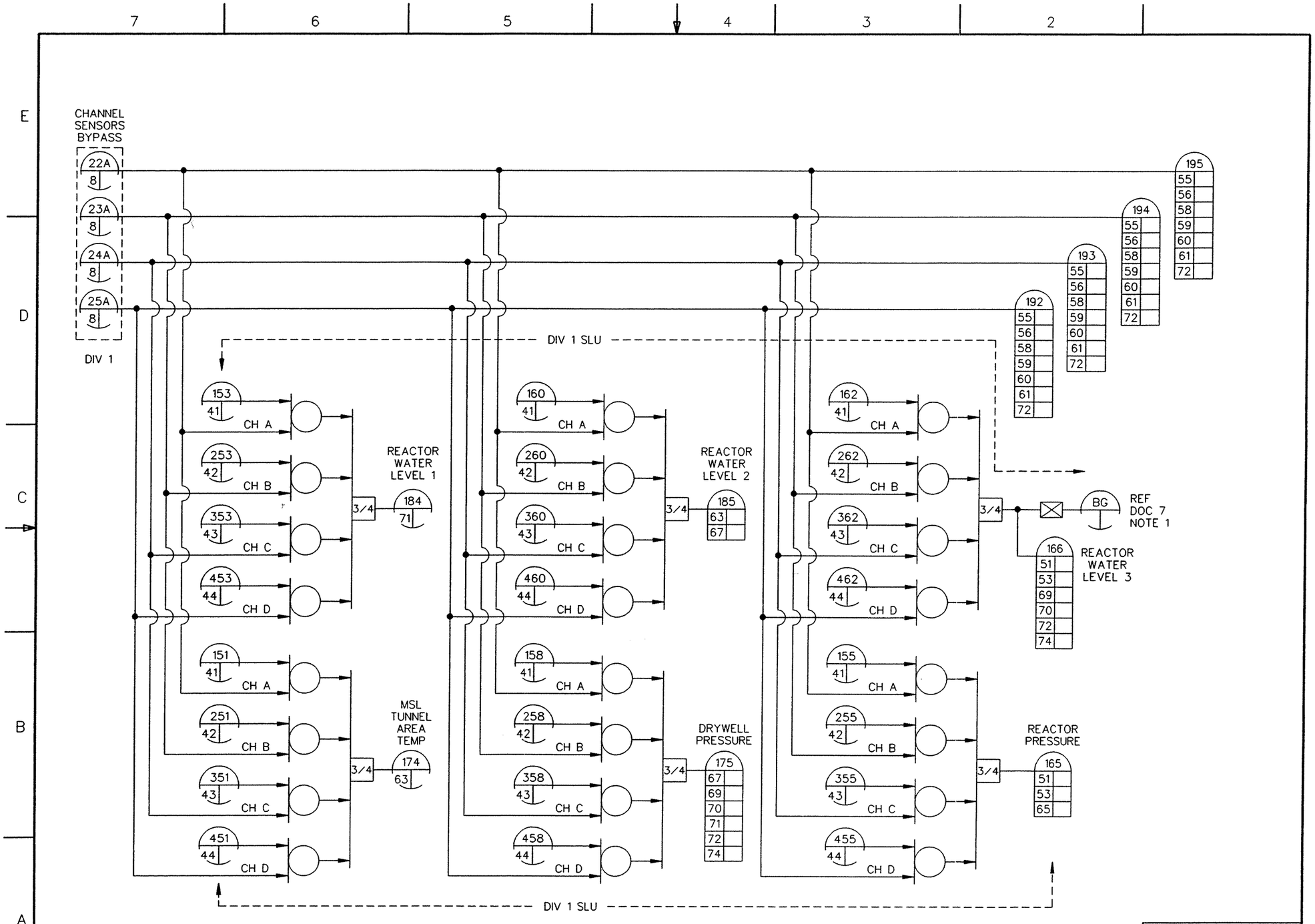


FIGURE 7.3-5 LEAK DETECTION AND ISOLATION SYSTEM IBD (Sheet 45 of 77)

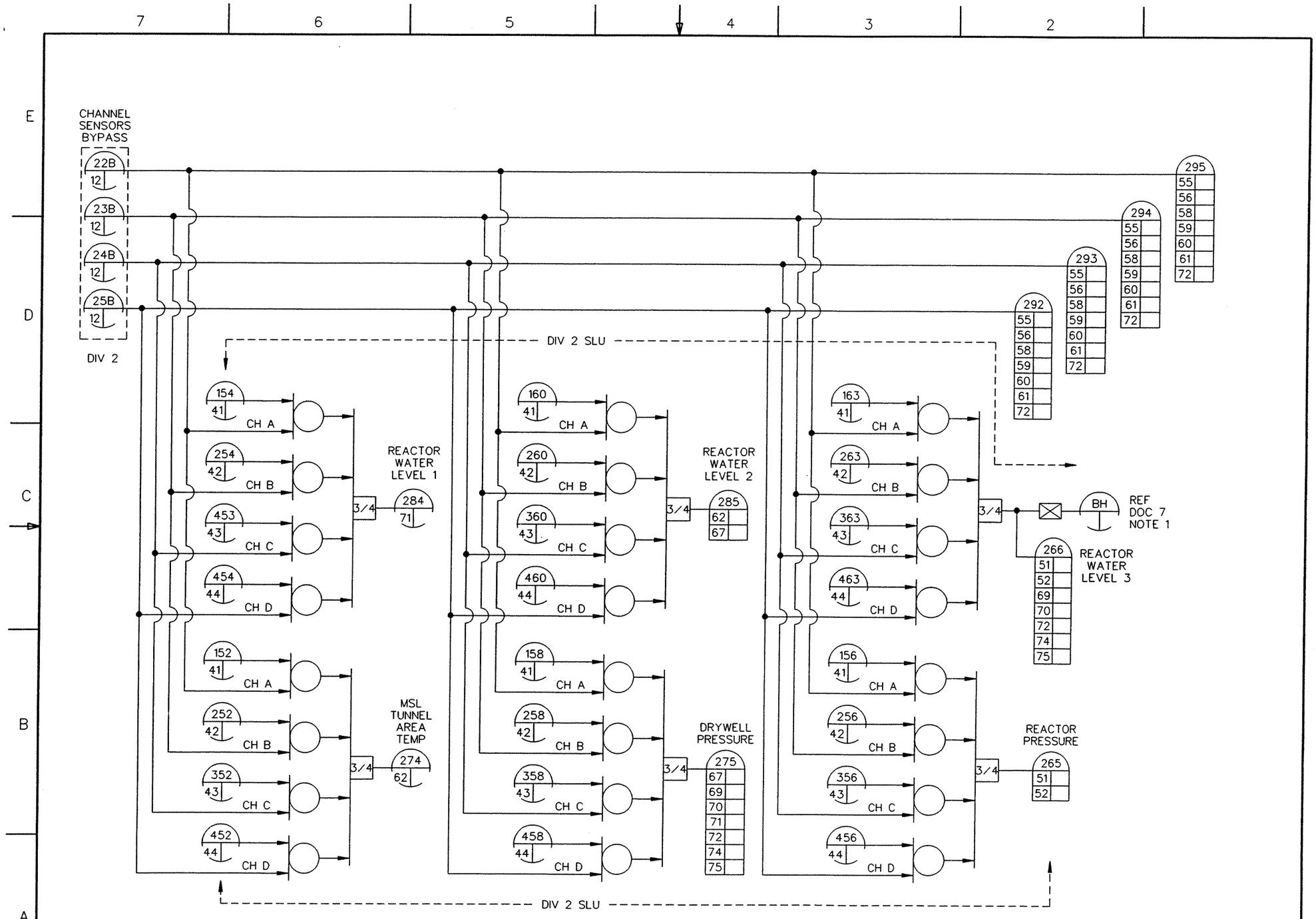


FIGURE 7.3-5 LEAK DETECTION AND ISOLATION SYSTEM IBD (Sheet 46 of 77)

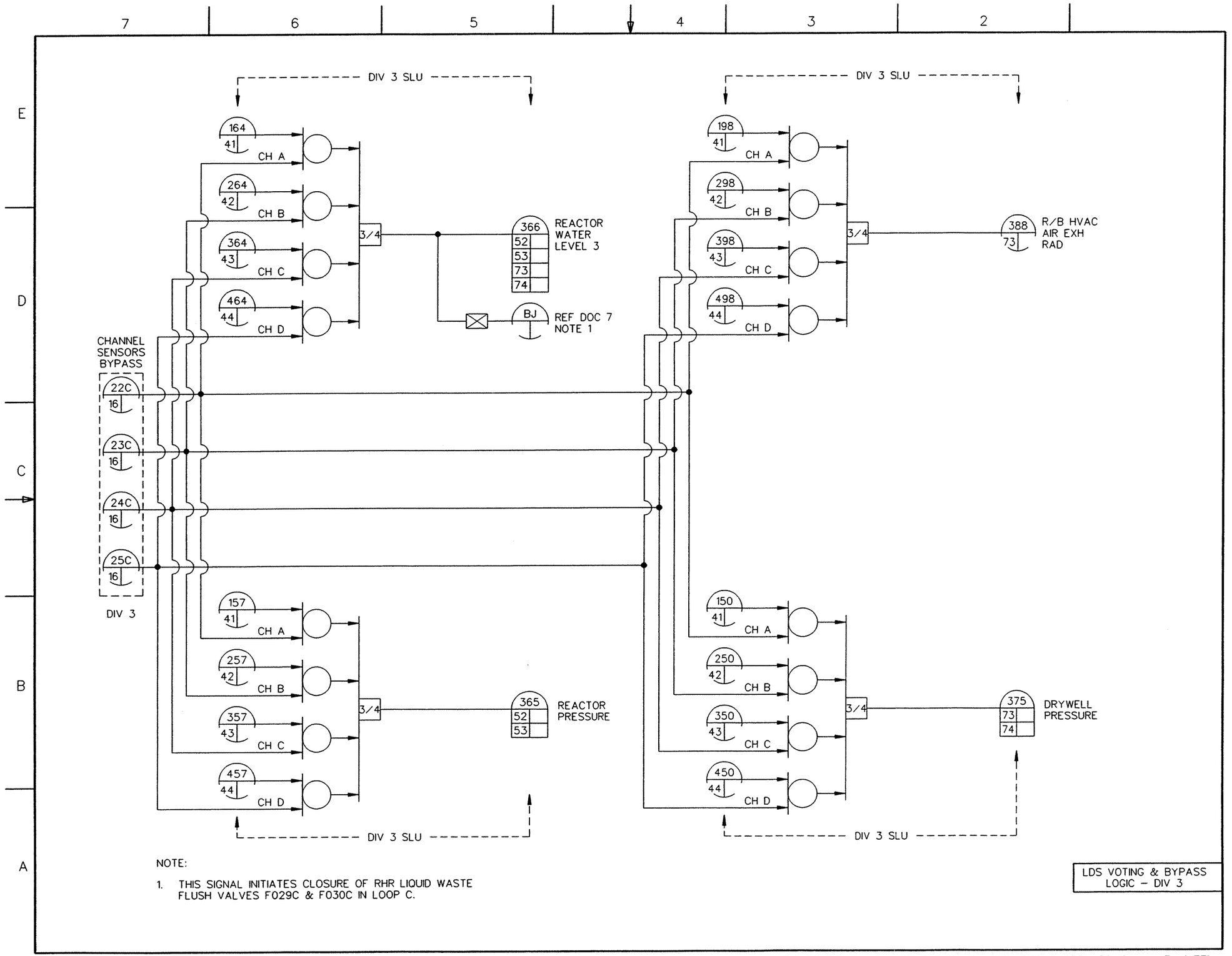


FIGURE 7.3-5 LEAK DETECTION AND ISOLATION SYSTEM IBD (Sheet 47 of 77)

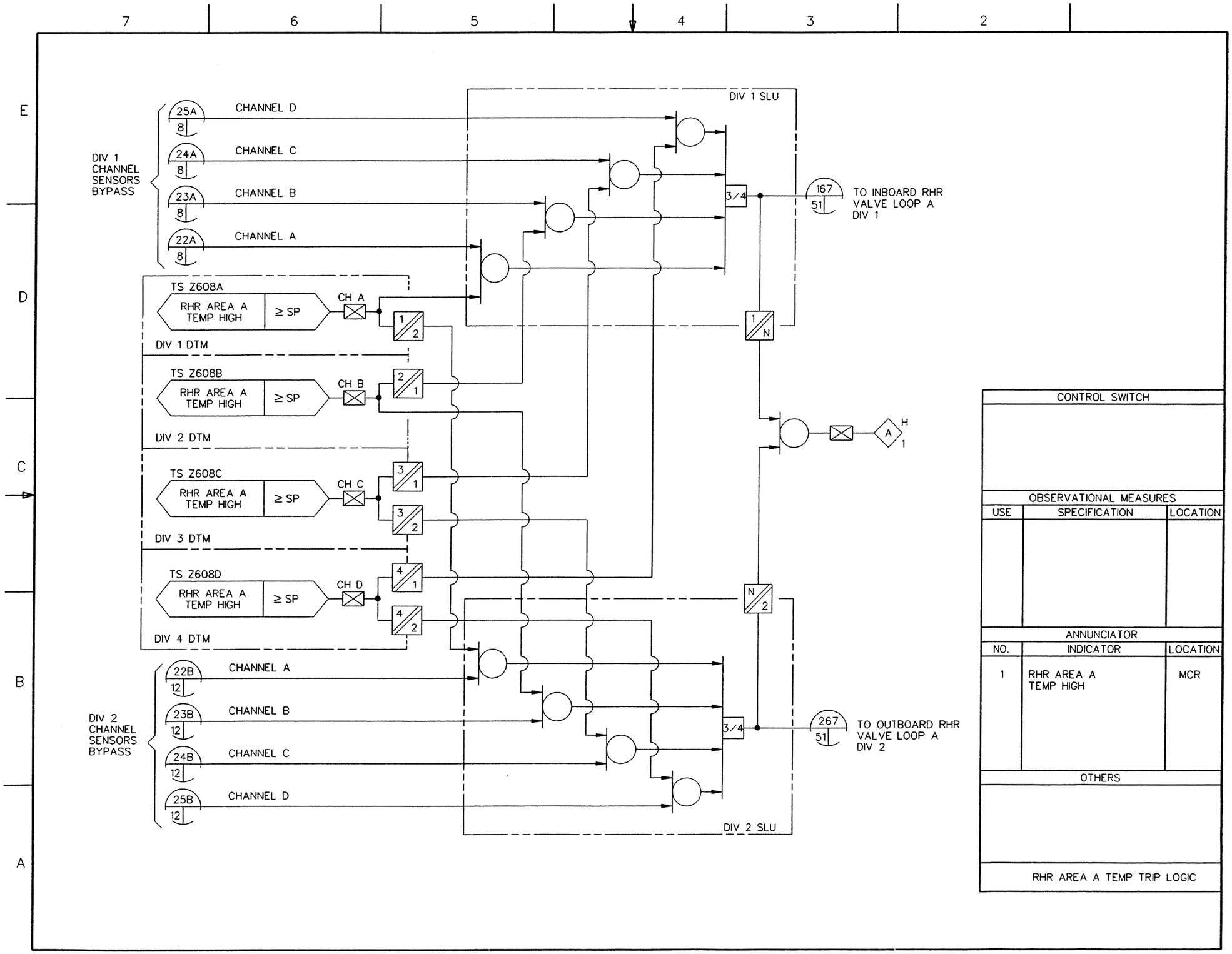


FIGURE 7.3-5 LEAK DETECTION AND ISOLATION SYSTEM IBD (Sheet 48 of 77)

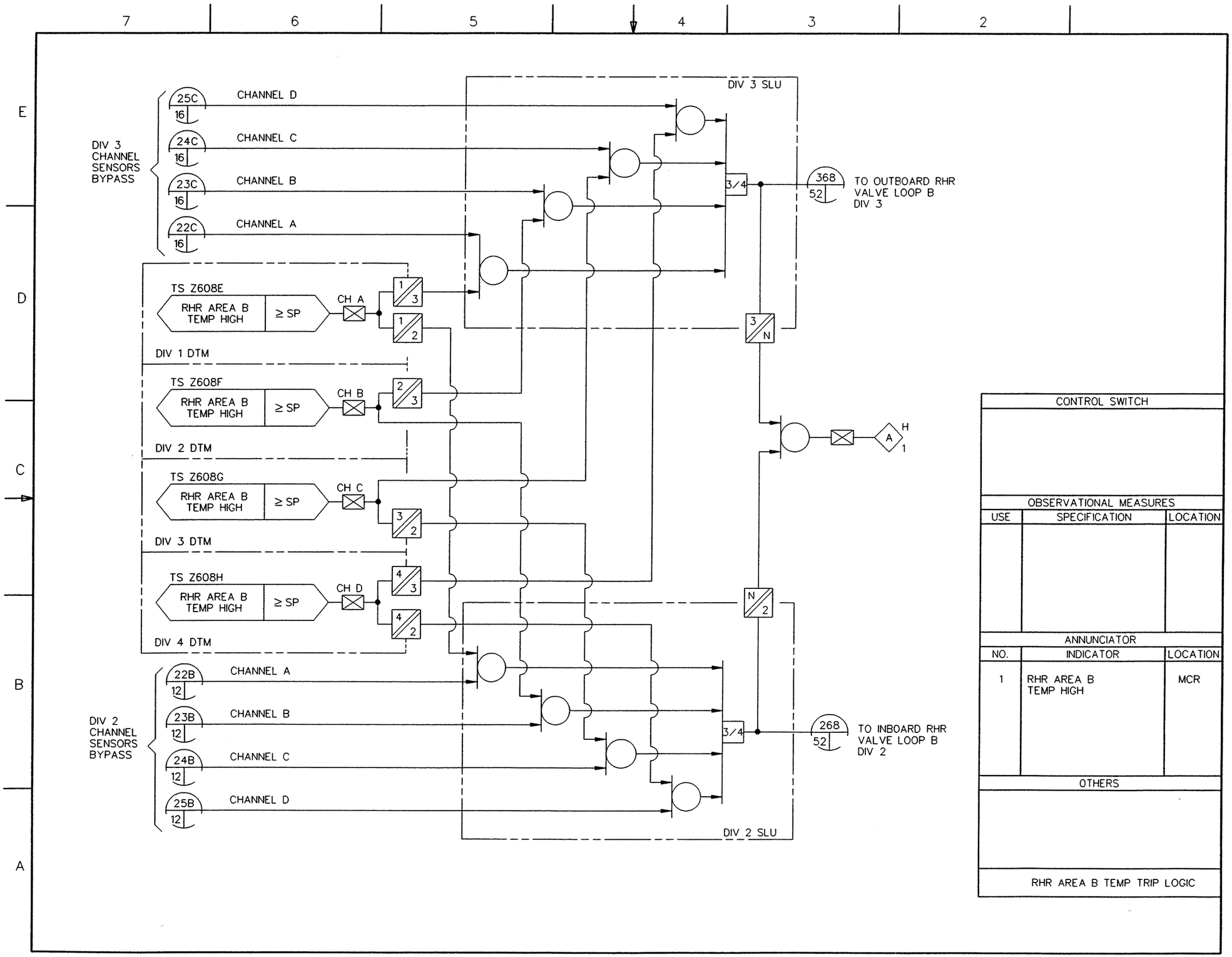


FIGURE 7.3-5 LEAK DETECTION AND ISOLATION SYSTEM IBD (Sheet 49 of 77)

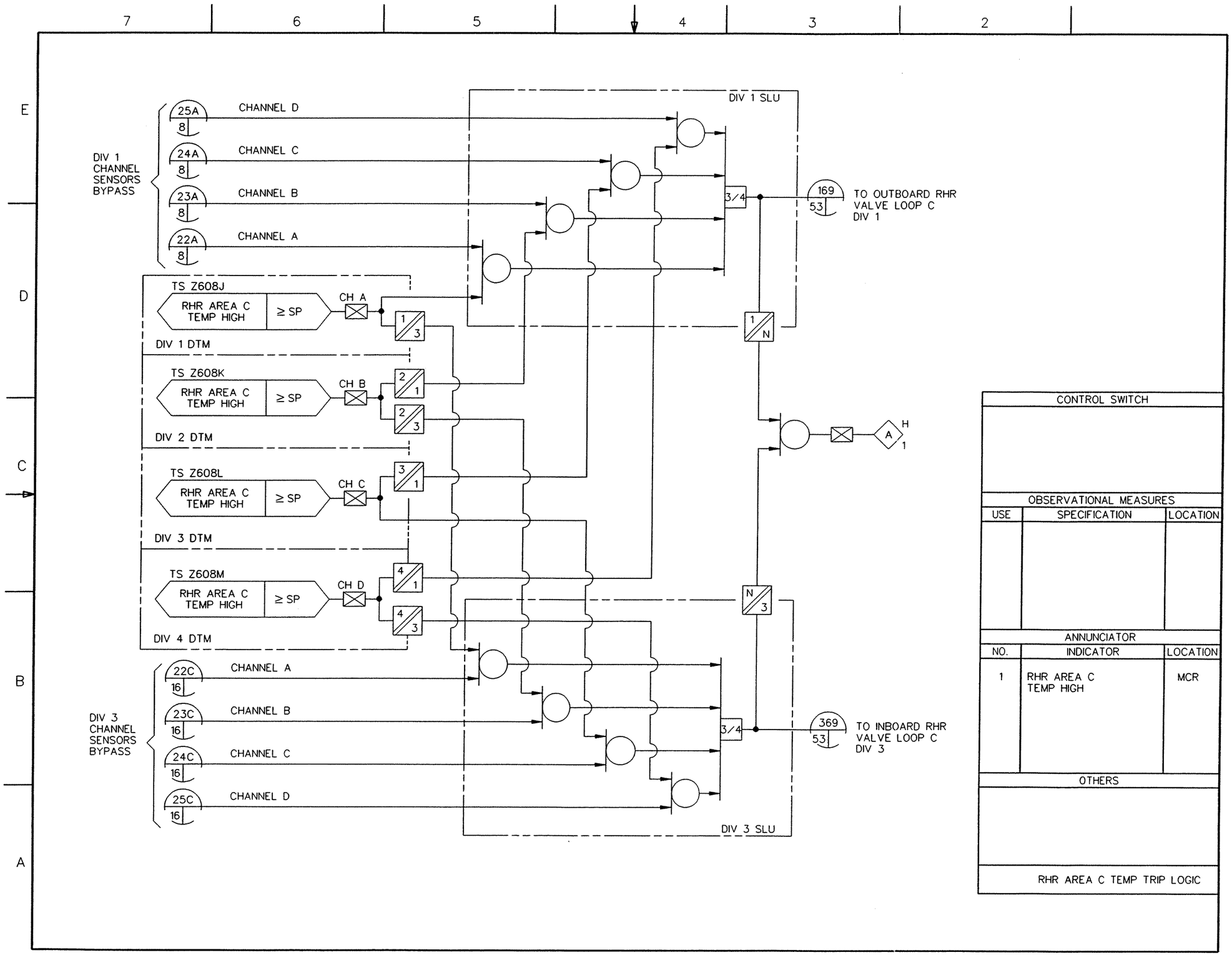


FIGURE 7.3-5 LEAK DETECTION AND ISOLATION SYSTEM IBD (Sheet 50 of 77)

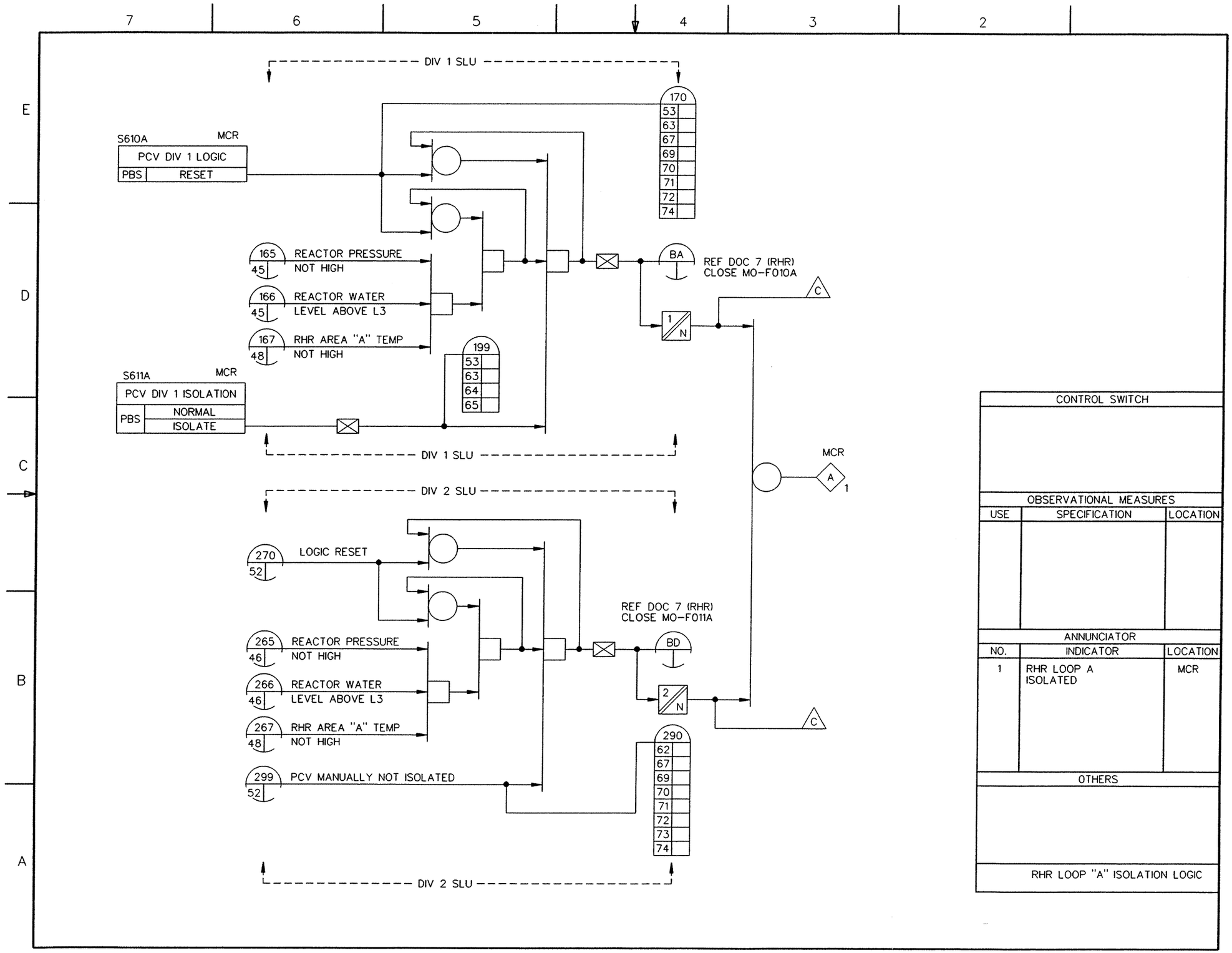
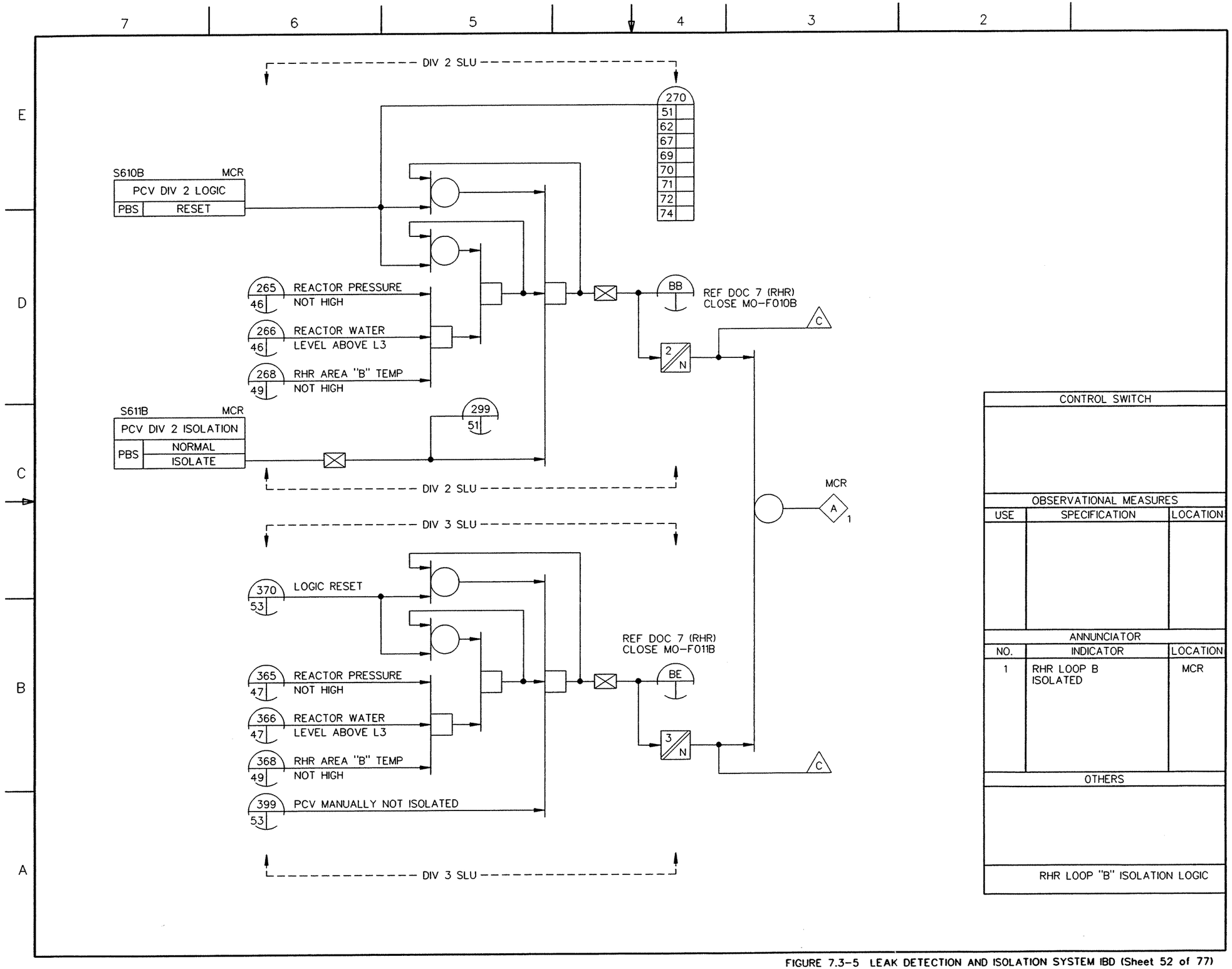


FIGURE 7.3–5 LEAK DETECTION AND ISOLATION SYSTEM IBD (Sheet 51 of 77)



CONTROL SWITCH		
OBSERVATIONAL MEASURES		
USE	SPECIFICATION	LOCATION
ANNUNCIATOR		
NO.	INDICATOR	LOCATION
1	RHR LOOP B ISOLATED	MCR
OTHERS		
RHR LOOP "B" ISOLATION LOGIC		

FIGURE 7.3-5 LEAK DETECTION AND ISOLATION SYSTEM IBD (Sheet 52 of 77)

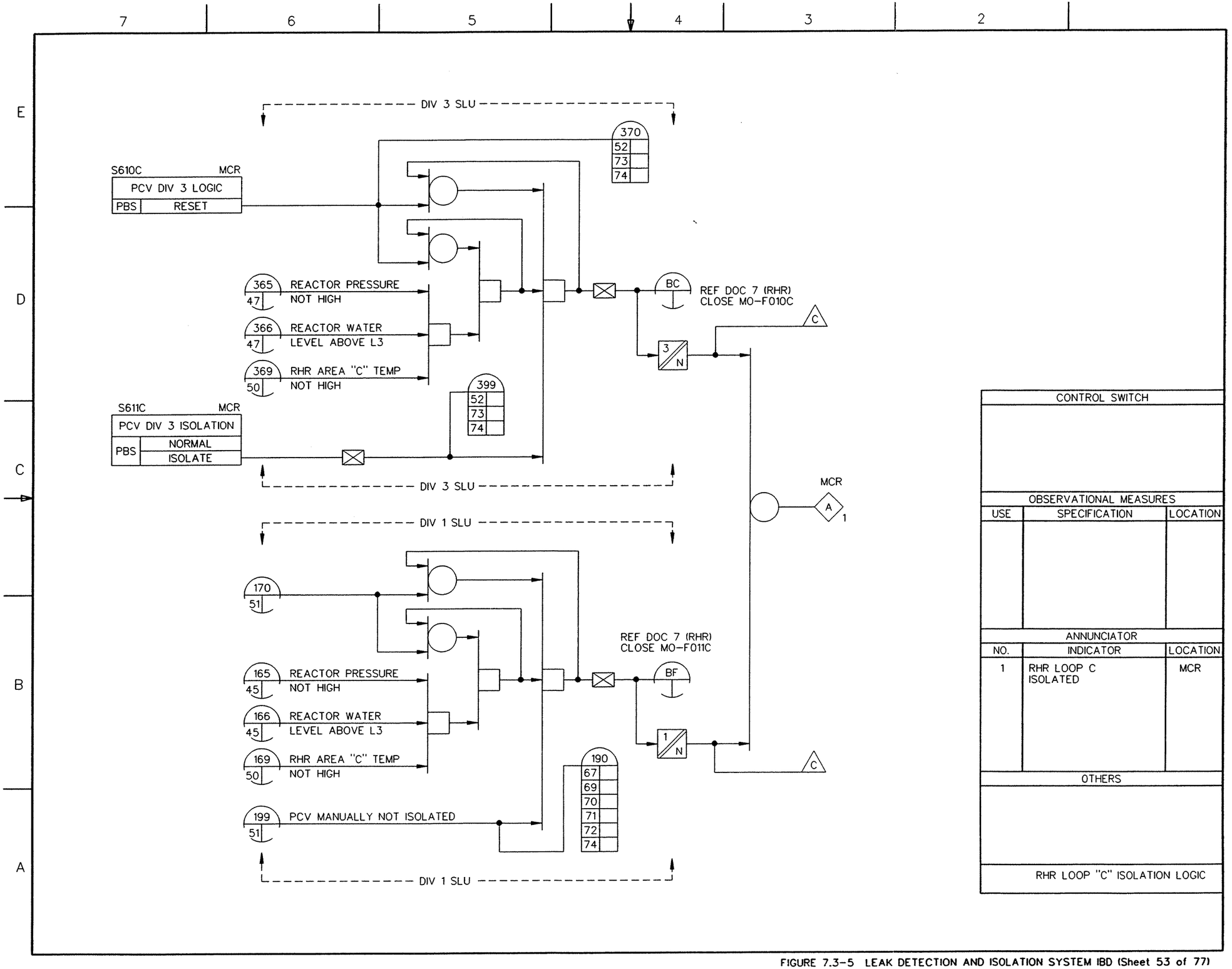


FIGURE 7.3-5 LEAK DETECTION AND ISOLATION SYSTEM IBD (Sheet 53 of 77)

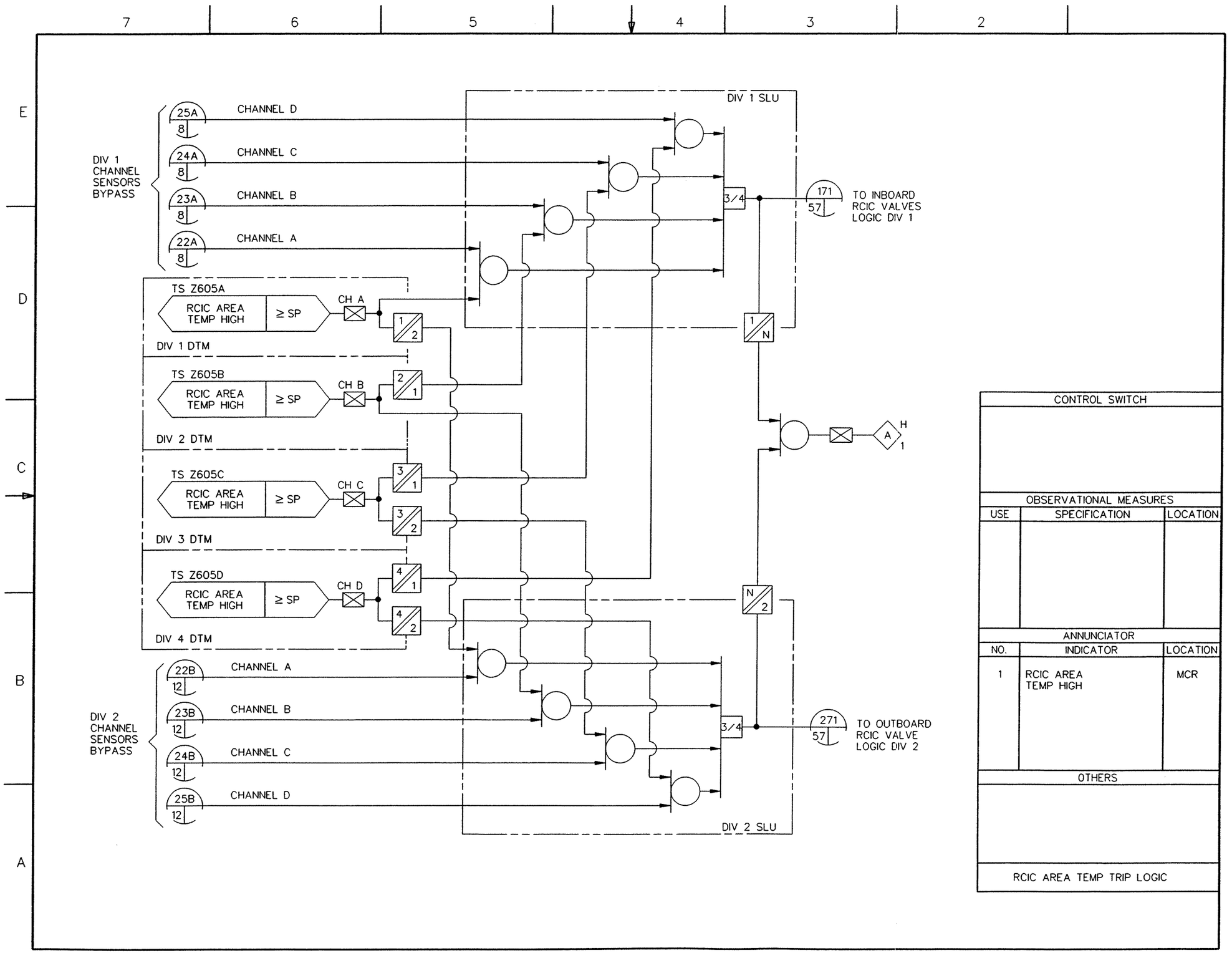


FIGURE 7.3-5 LEAK DETECTION AND ISOLATION SYSTEM IBD (Sheet 54 of 77)

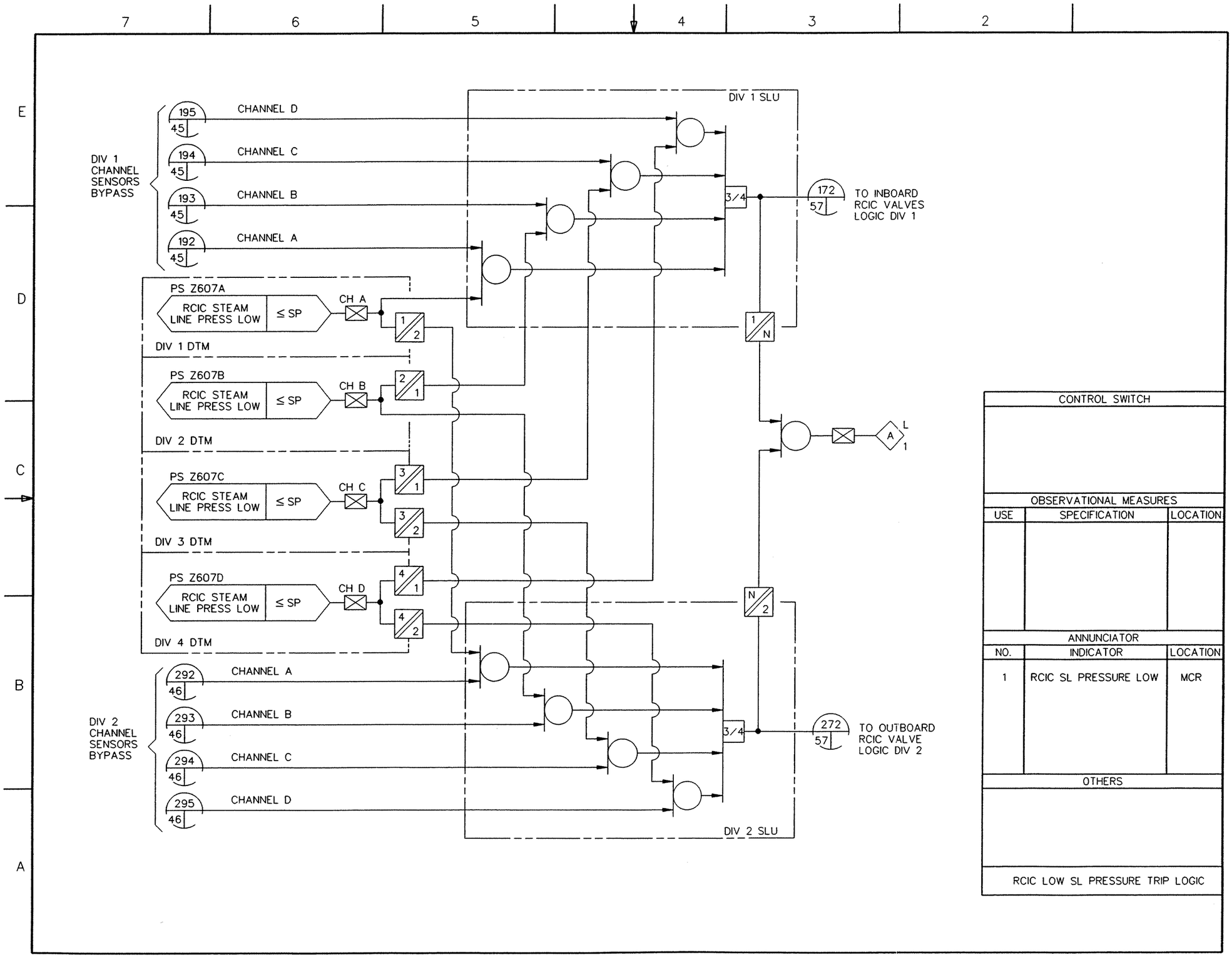


FIGURE 7.3-5 LEAK DETECTION AND ISOLATION SYSTEM IBD (Sheet 55 of 77)

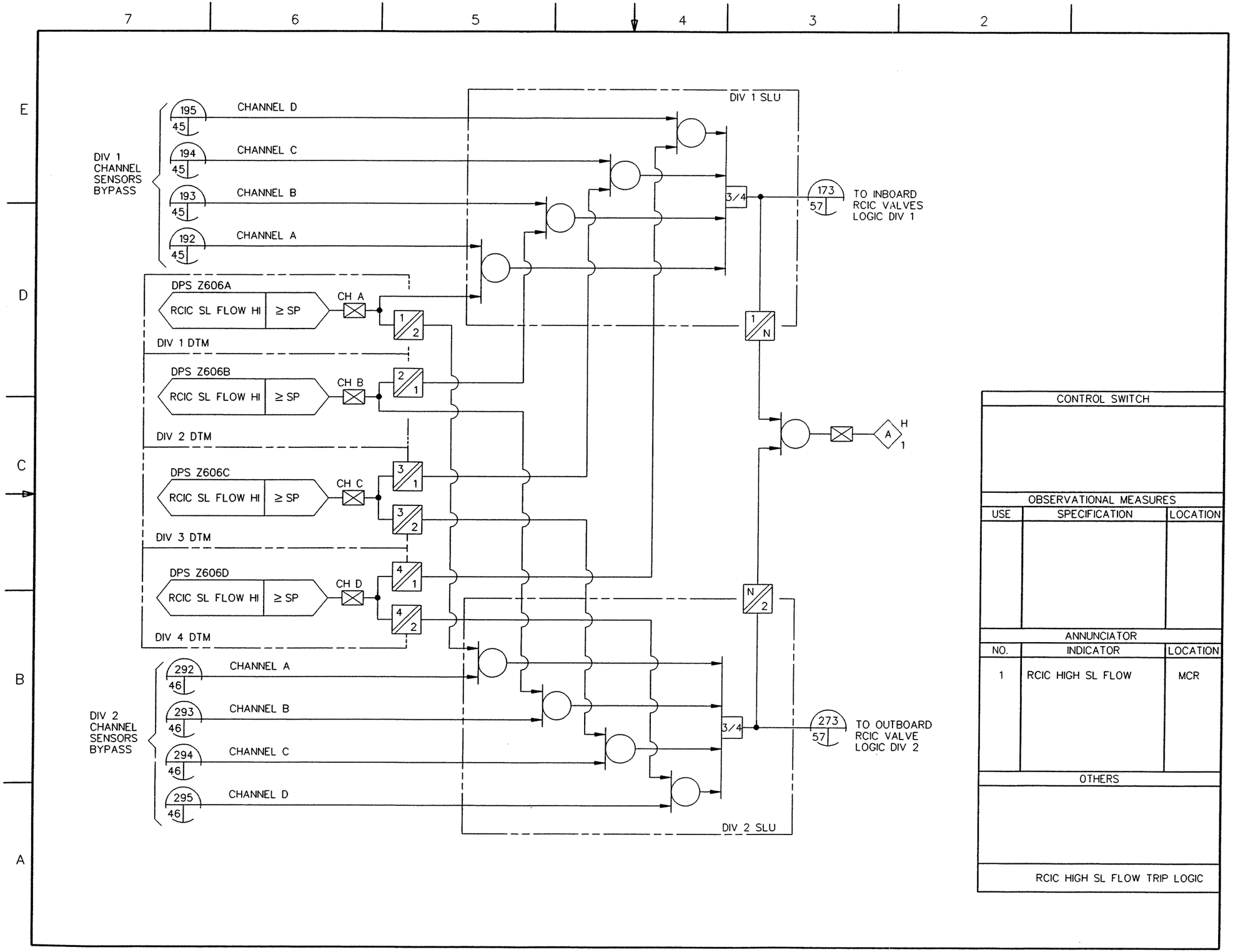


FIGURE 7.3–5 LEAK DETECTION AND ISOLATION SYSTEM IBD (Sheet 56 of 77)

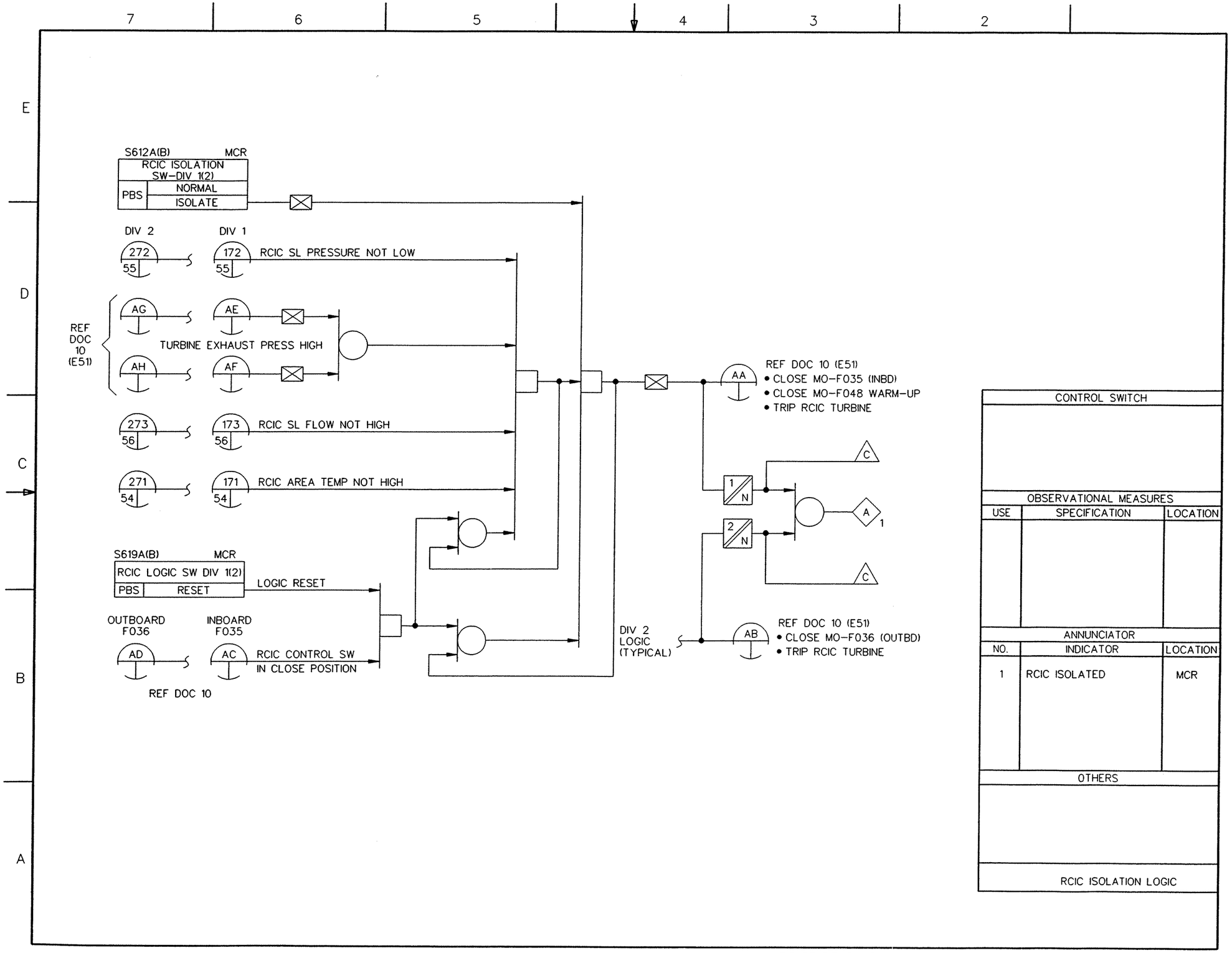


FIGURE 7.3–5 LEAK DETECTION AND ISOLATION SYSTEM IBD (Sheet 57 of 77)

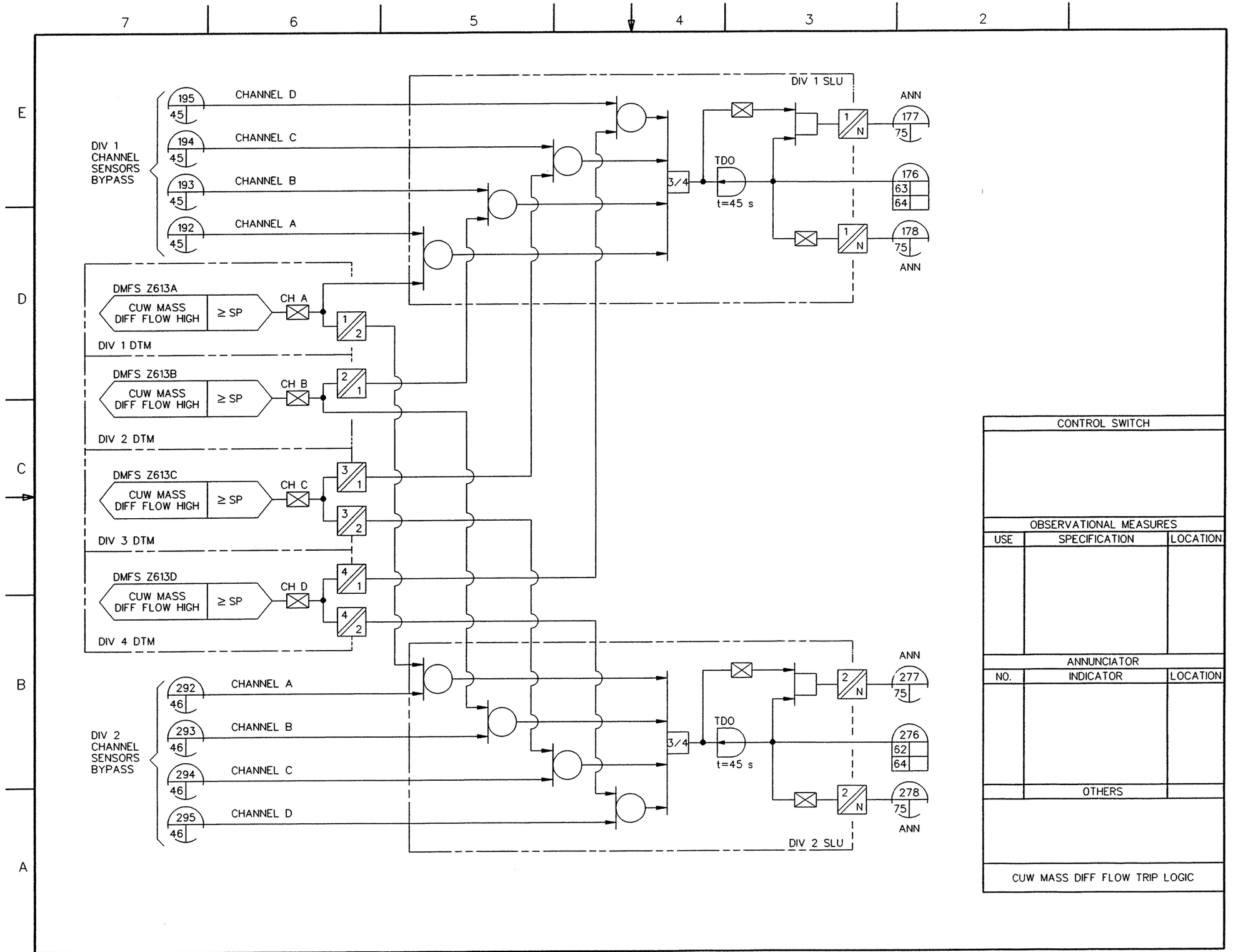


FIGURE 7.3-5 LEAK DETECTION AND ISOLATION SYSTEM IBD (Sheet 58 of 77)

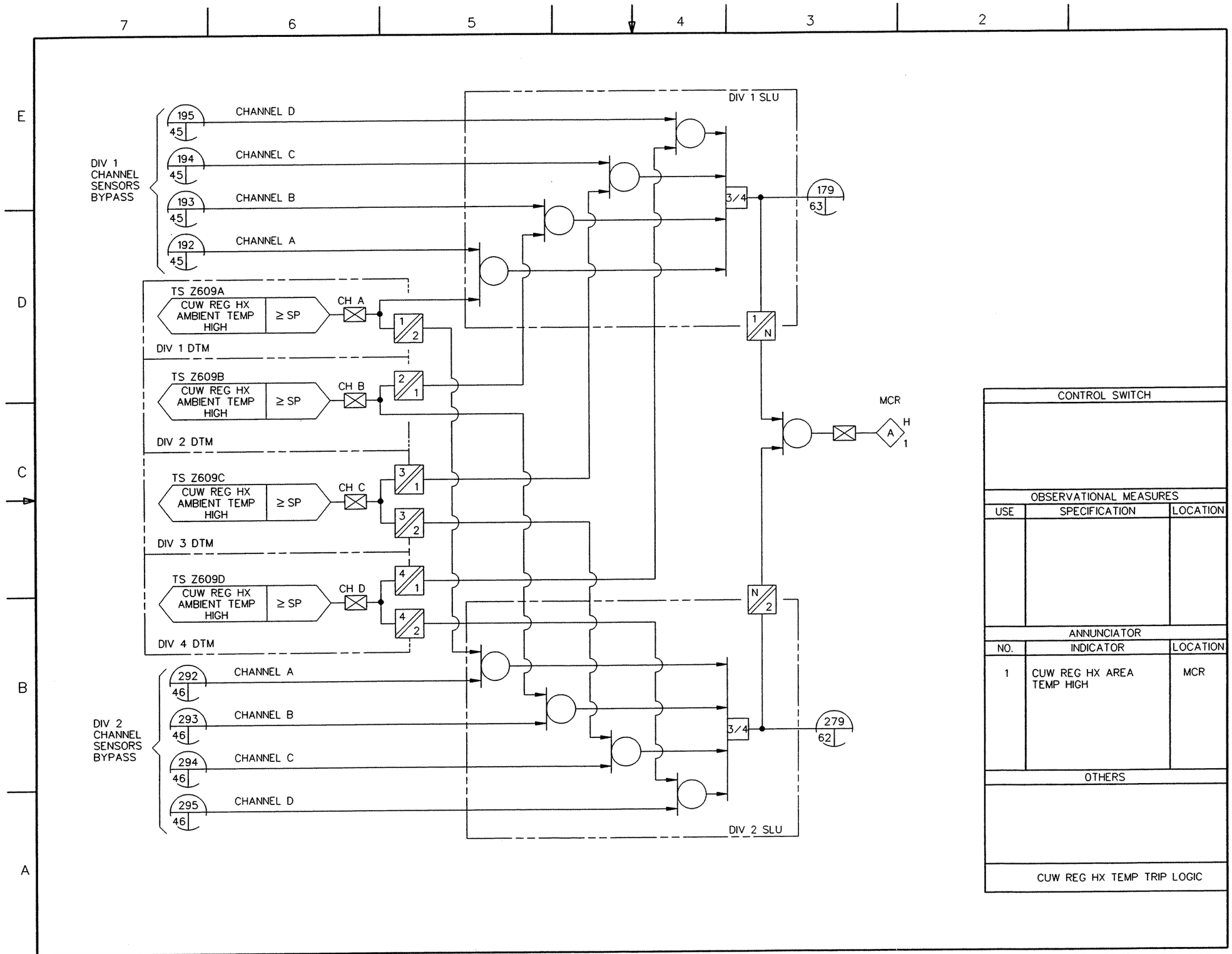


FIGURE 7.3–5 LEAK DETECTION AND ISOLATION SYSTEM IBD (Sheet 59 of 77)

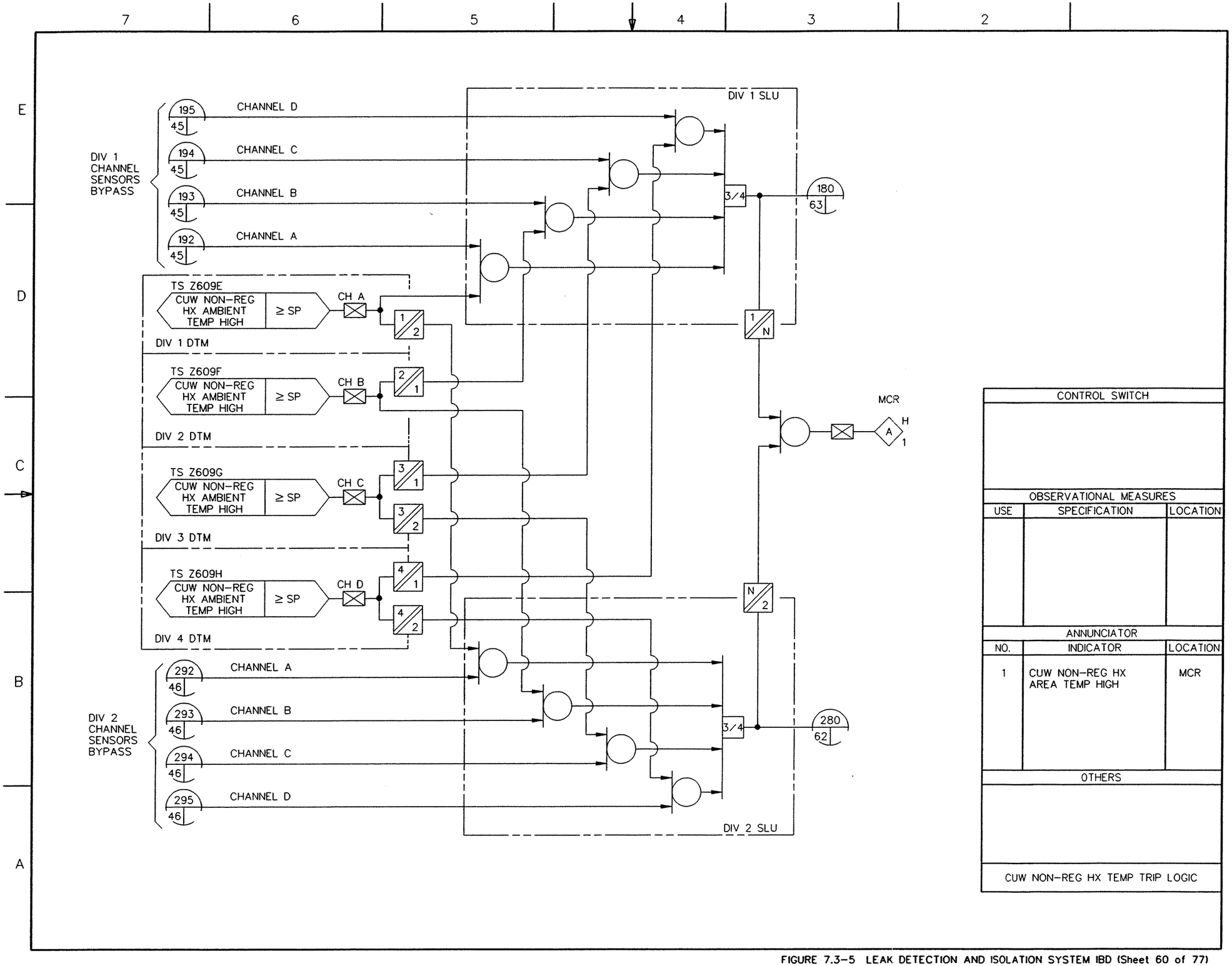


FIGURE 7.3-5 LEAK DETECTION AND ISOLATION SYSTEM IBD (Sheet 60 of 77)

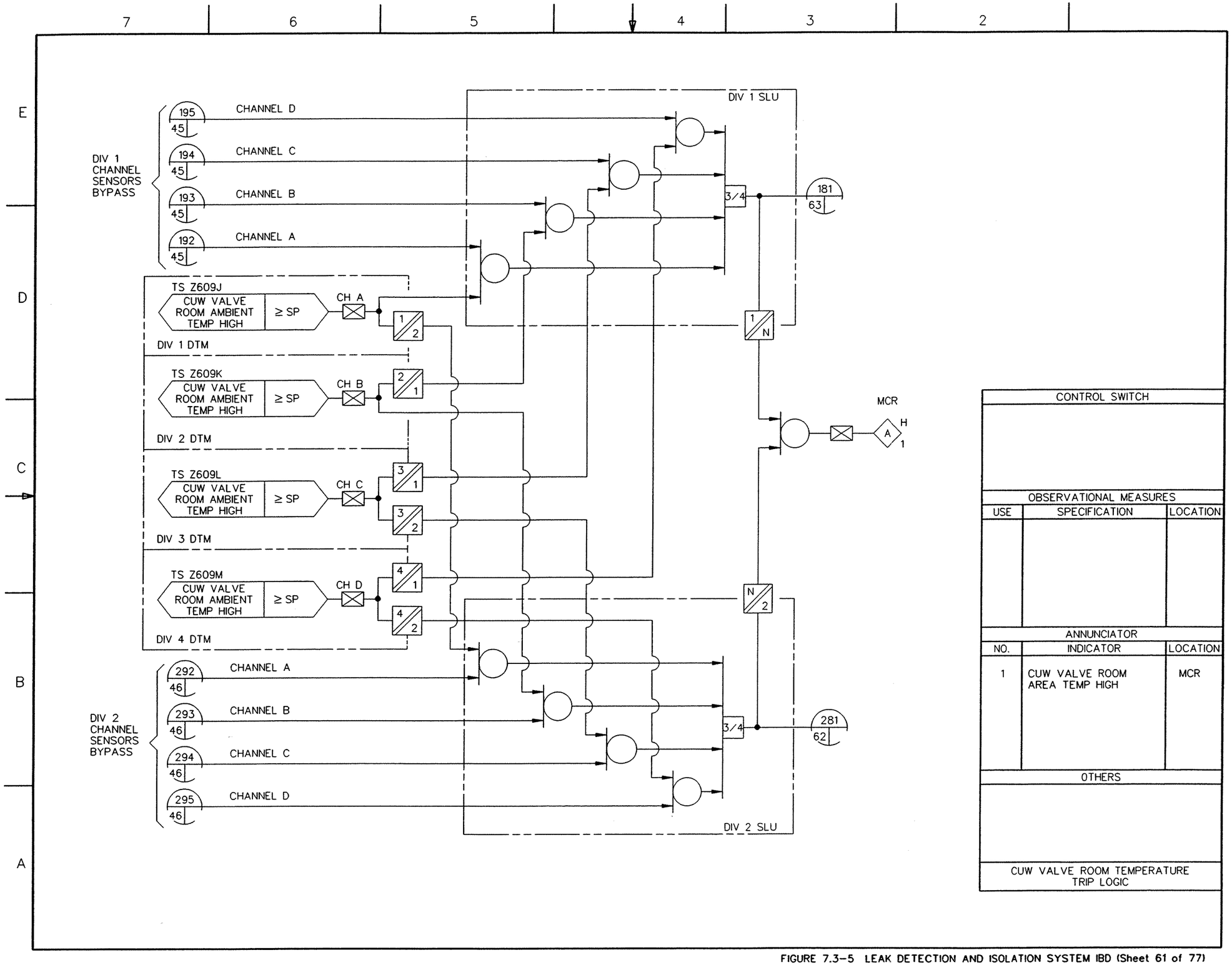


FIGURE 7.3–5 LEAK DETECTION AND ISOLATION SYSTEM IBD (Sheet 61 of 77)

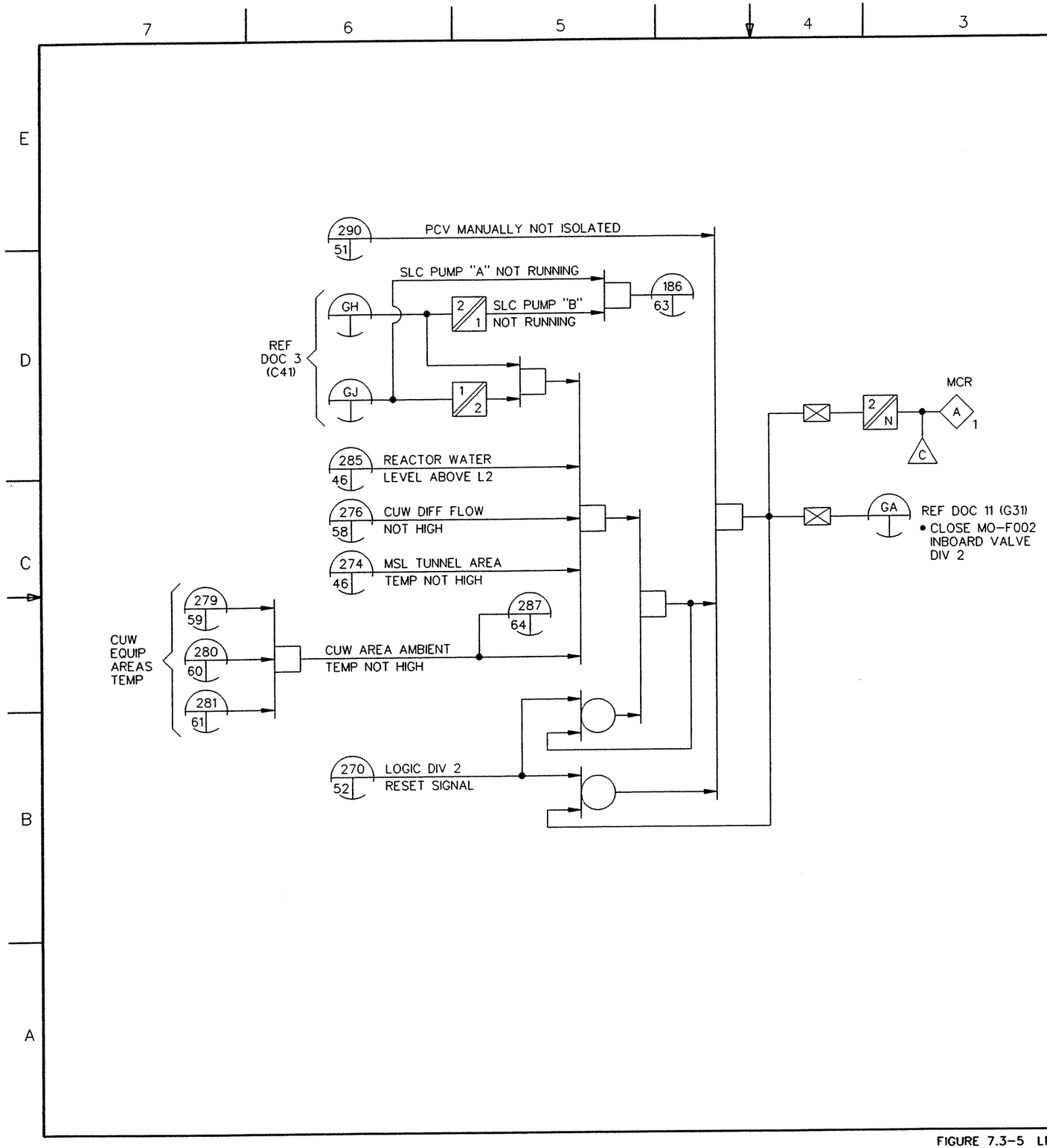


FIGURE 7.3-5 LEAK DETECTION AND ISOLATION SYSTEM IBD (Sheet 62 of 77)

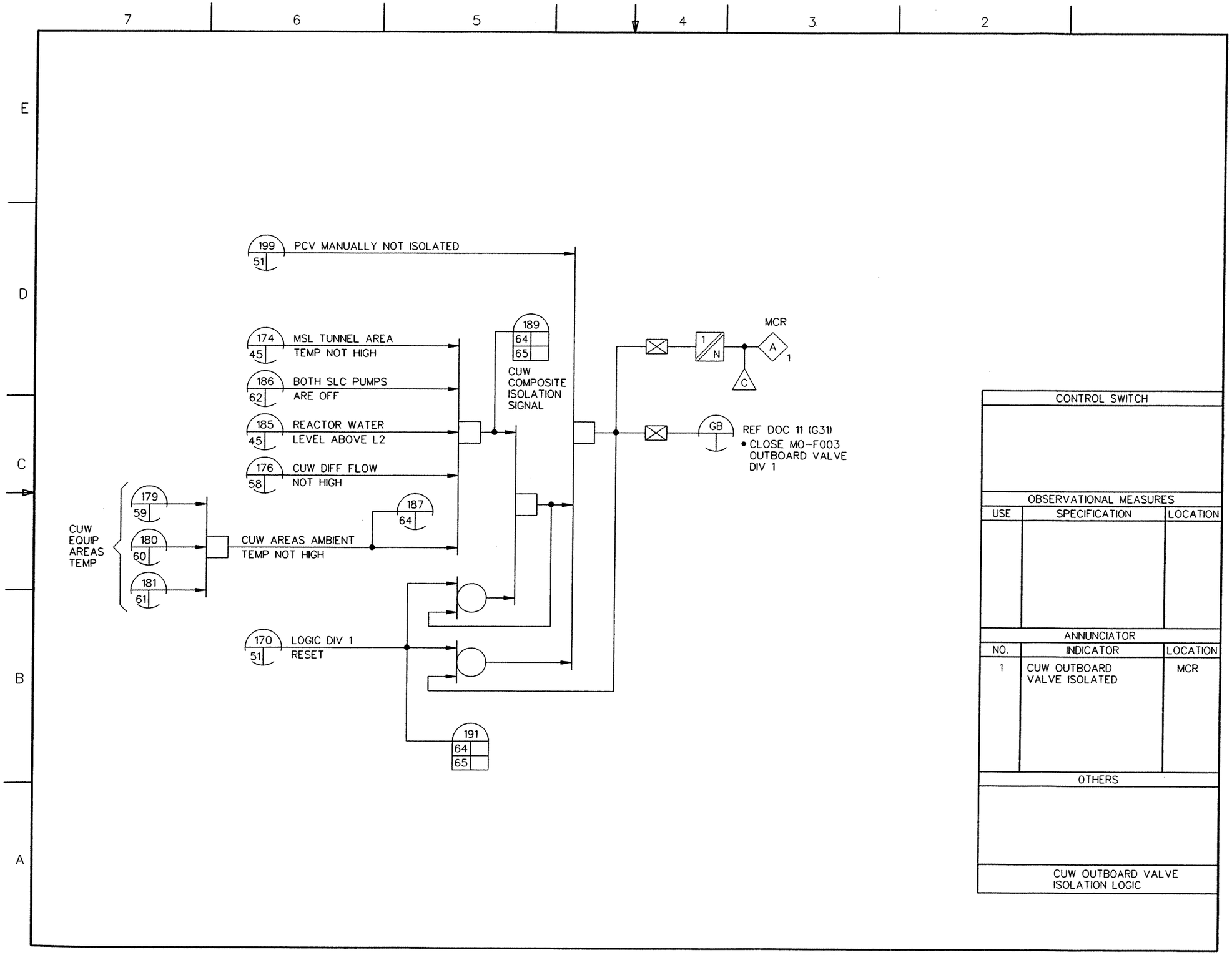
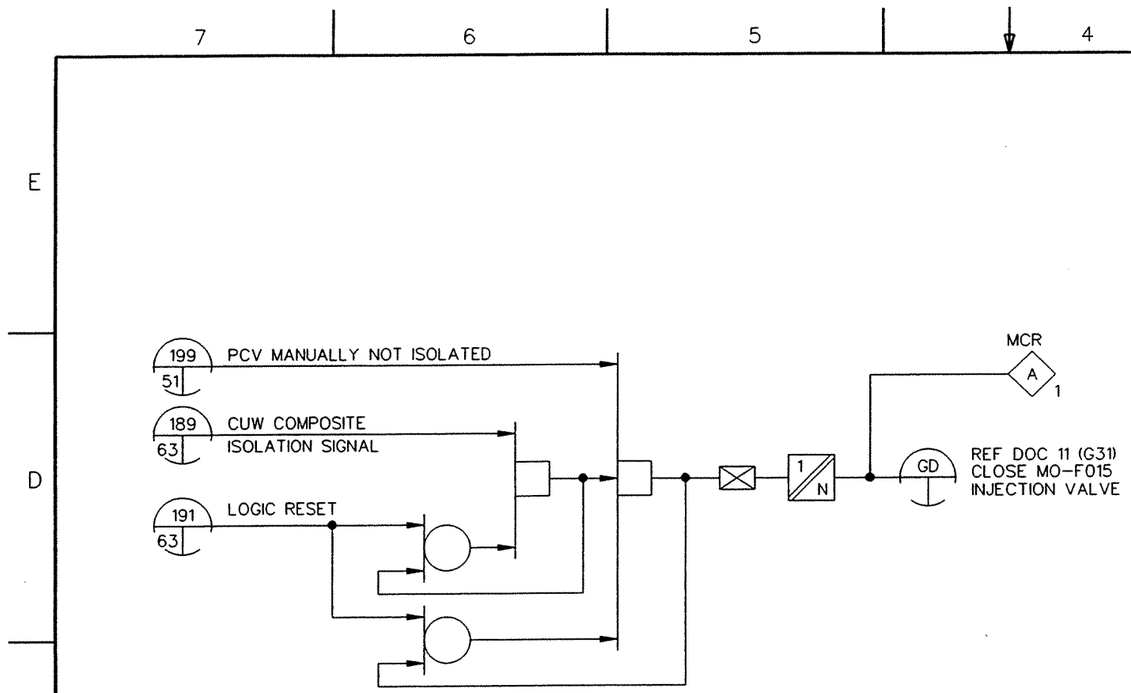


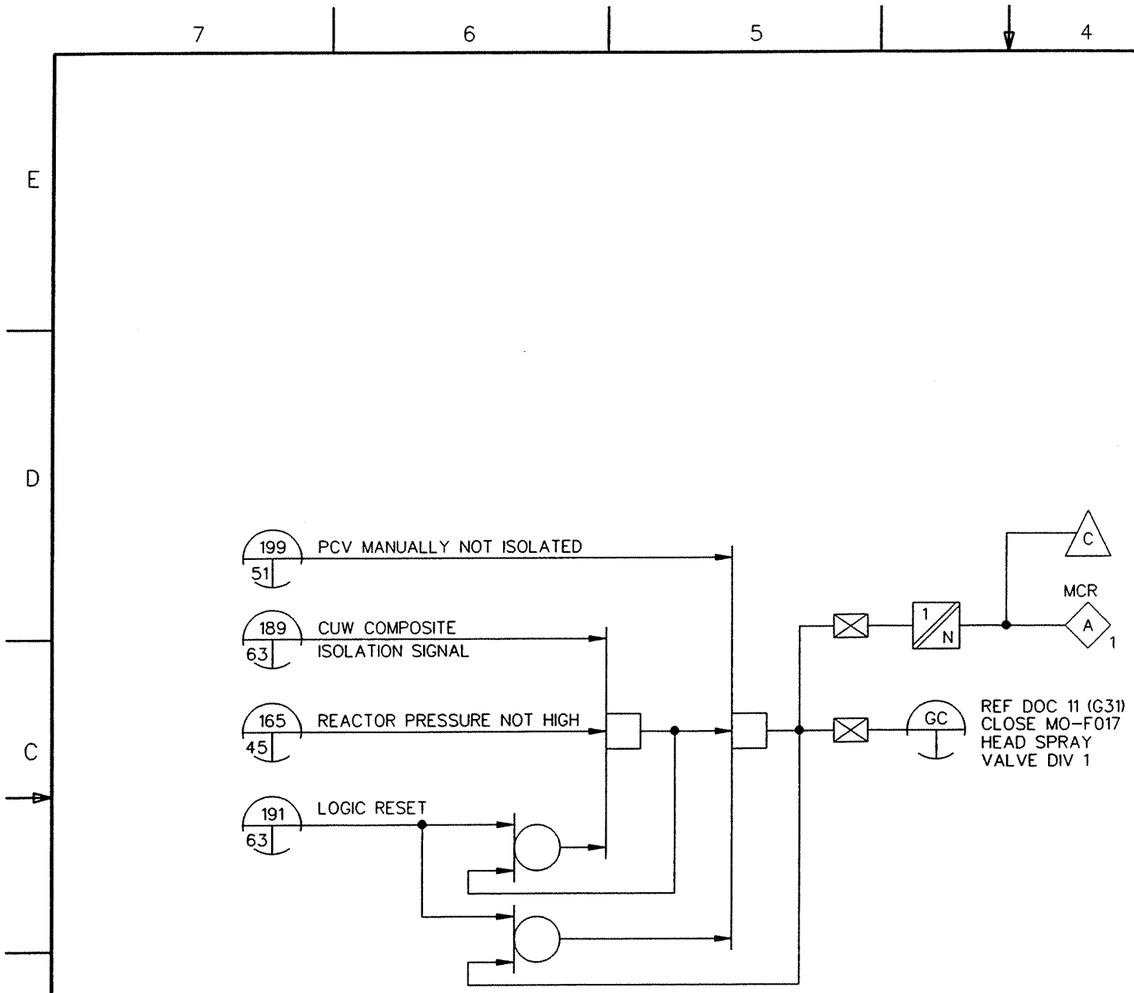
FIGURE 7.3-5 LEAK DETECTION AND ISOLATION SYSTEM IBD (Sheet 63 of 77)



CONTROL SWITCH		
OBSERVATIONAL MEASURES		
USE	SPECIFICATION	LOCATION
ANNUNCIATOR		
NO.	INDICATOR	LOCATION
1	CUW INJECTION VALVE ISOLATED	MCR
OTHERS		

CUW INJECTION & PURGE LINE VALVES ISOLATION LOGIC

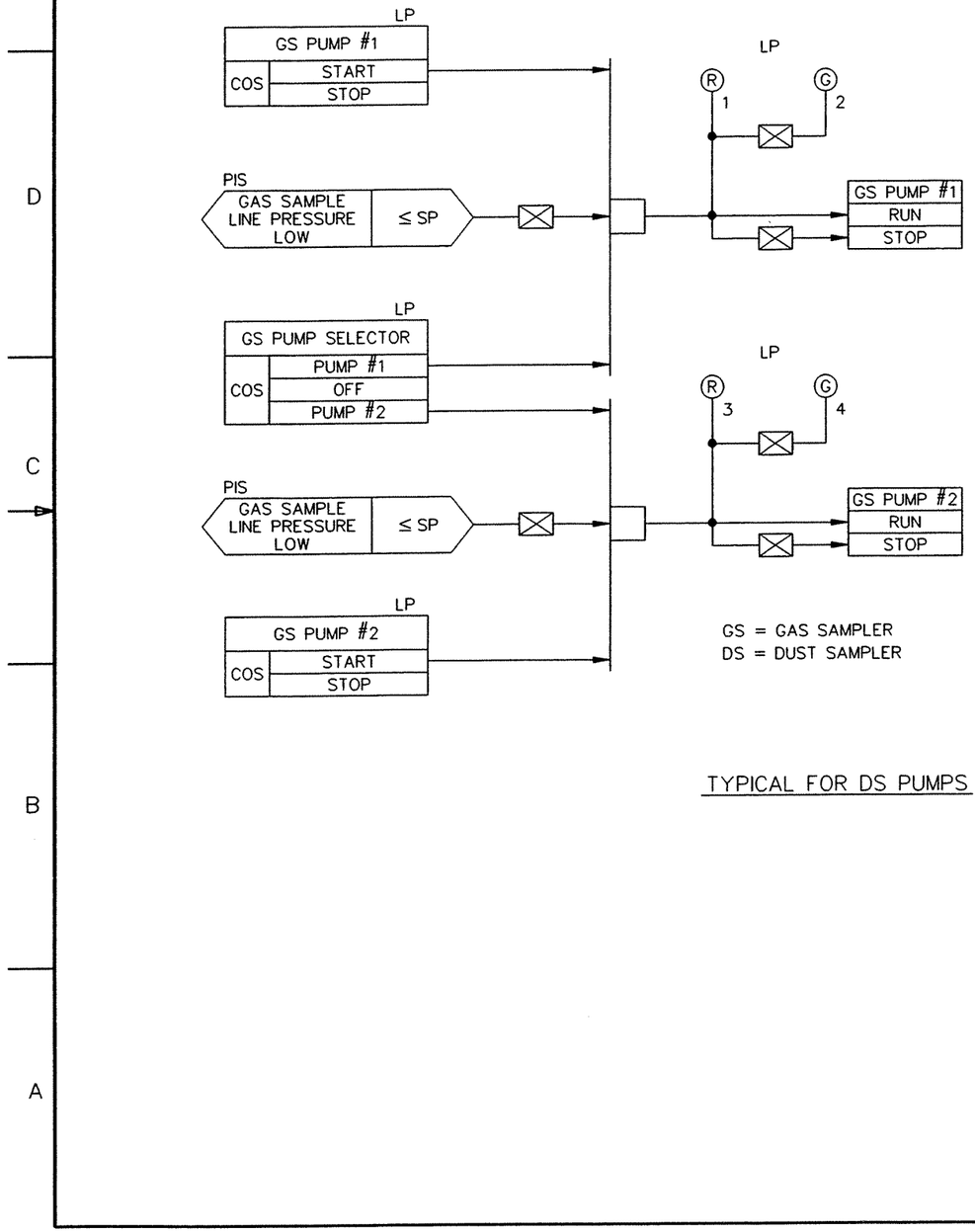
FIGURE 7.3-5 LEAK DETECTION AND ISOLATION SYSTEM IBD (Sheet 64 of 77)



CONTROL SWITCH		
OBSERVATIONAL MEASURES		
USE	SPECIFICATION	LOCATION
STATUS IND	(W)	MCR
ANNUNCIATOR		
NO.	INDICATOR	LOCATION
1	CUW HEAD SPRAY VALVE ISOLATED	MCR
OTHERS		

CUW HEAD SPRAY VALVE ISOLATION LOGIC

FIGURE 7.3-5 LEAK DETECTION AND ISOLATION SYSTEM IBD (Sheet 65 of 77)



TYPICAL FOR DS PUMPS

CONTROL SWITCH		
OBSERVATIONAL MEASURES		
USE	SPECIFICATION	LOCATION
STATUS INDI-CATOR	G 2,4 R 1,3	LP
ANNUNCIATOR		
NO.	INDICATOR	LOCATION
OTHERS		

DRYWELL FISSION PRODUCTS SAMPLING PUMPS

FIGURE 7.3-5 LEAK DETECTION AND ISOLATION SYSTEM IBD (Sheet 66 of 77)

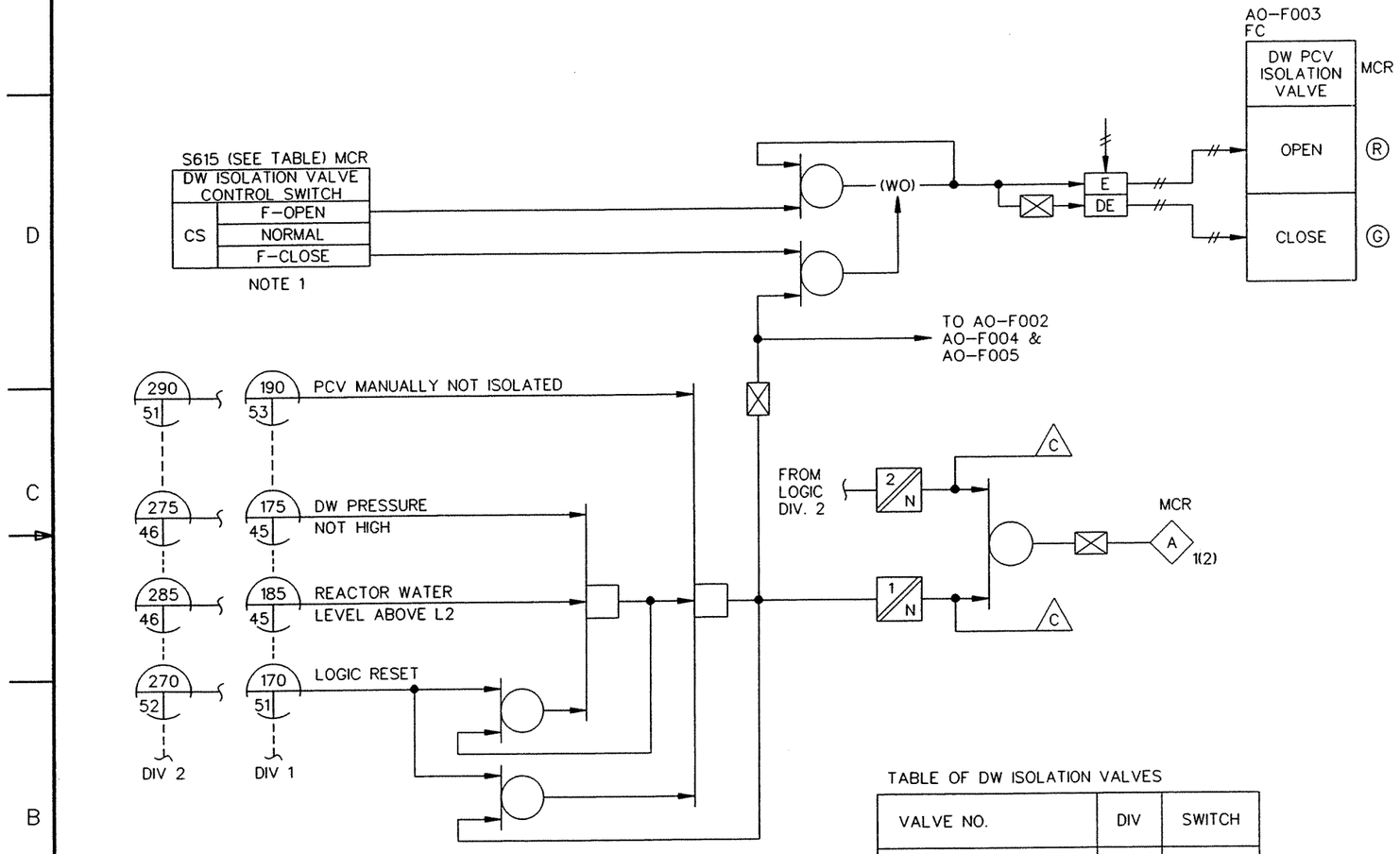


TABLE OF DW ISOLATION VALVES

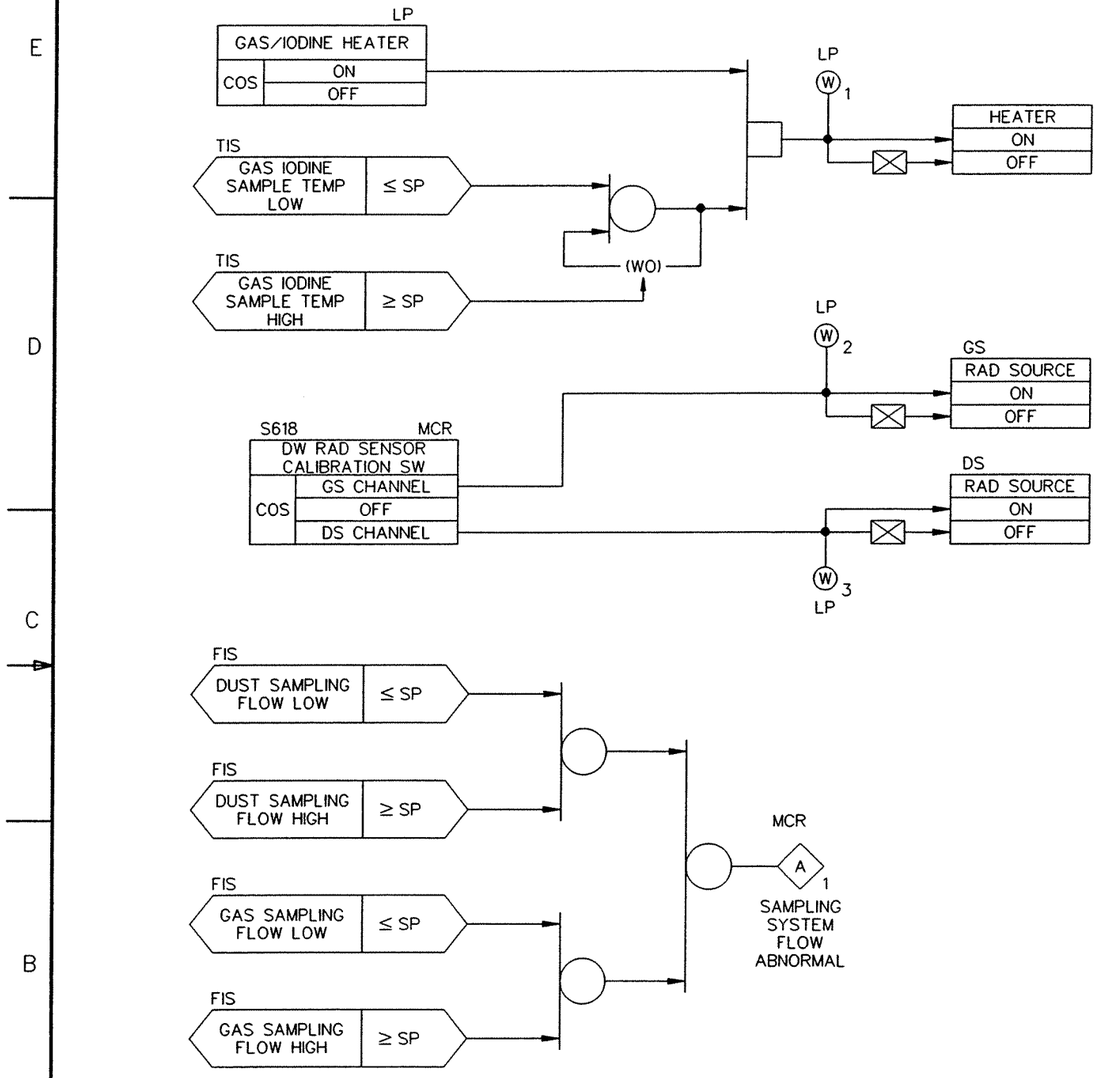
VALVE NO.	DIV	SWITCH
AO–F002 INBOARD	2	S614
AO–F003 OUTBOARD	1	S615
AO–F004 OUTBOARD	1	S616
AO–F005 INBOARD	2	S617

NOTES:

1. A SEPARATE SWITCH IS REQUIRED FOR EACH VALVE.
2. ONE SWITCH IS REQUIRED FOR DIV 1 AND ONE FOR DIV 2.

CONTROL SWITCH		
OBSERVATIONAL MEASURES		
USE	SPECIFICATION	LOCATION
POSI–TION IND	G R	MCR
ANNUNCIATOR		
NO.	INDICATOR	LOCATION
1	DW OUTBD PCV VALVES ISOLATED – DIV 1	MCR
2	DW INBD PCV VALVES ISOLATED – DIV 2	MCR
OTHERS		
DRYWELL FISSION PRODUCTS ISOLATION VALVES		

FIGURE 7.3–5 LEAK DETECTION AND ISOLATION SYSTEM IBD (Sheet 67 of 77)



CONTROL SWITCH

OBSERVATIONAL MEASURES		
USE	SPECIFICATION	LOCATION
STATUS IND	W 1 W 2 W 3	LP

ANNUNCIATOR		
NO.	INDICATOR	LOCATION
1	SAMPLING SYSTEM FLOW ABNORMAL	MCR

OTHERS

DRYWELL FISSION PRODUCTS MISCELLANEOUS CIRCUIT LOGIC

FIGURE 7.3-5 LEAK DETECTION AND ISOLATION SYSTEM IBD (Sheet 68 of 77)

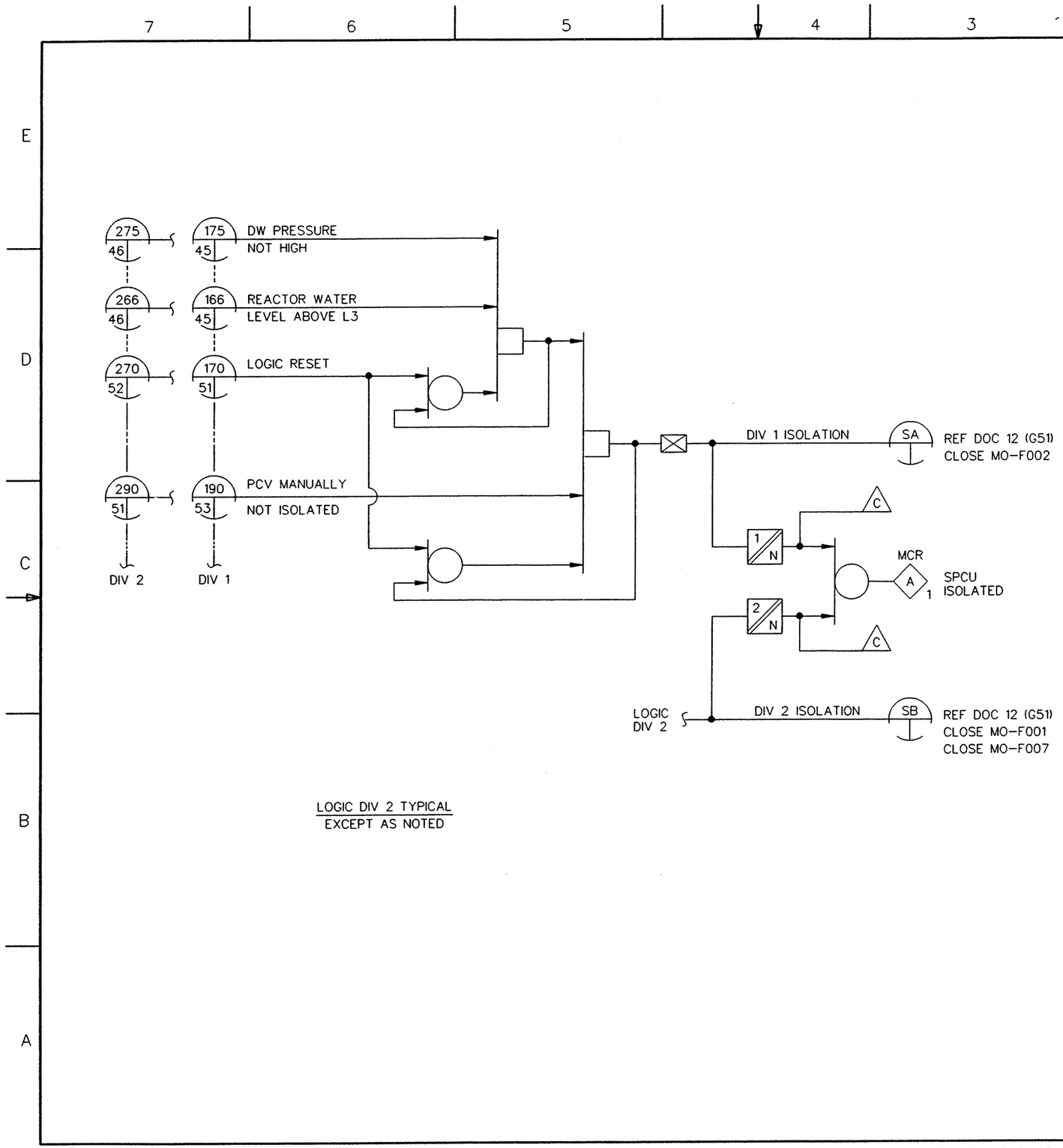


FIGURE 7.3-5 LEAK DETECTION AND ISOLATION SYSTEM IBD (Sheet 69 of 77)

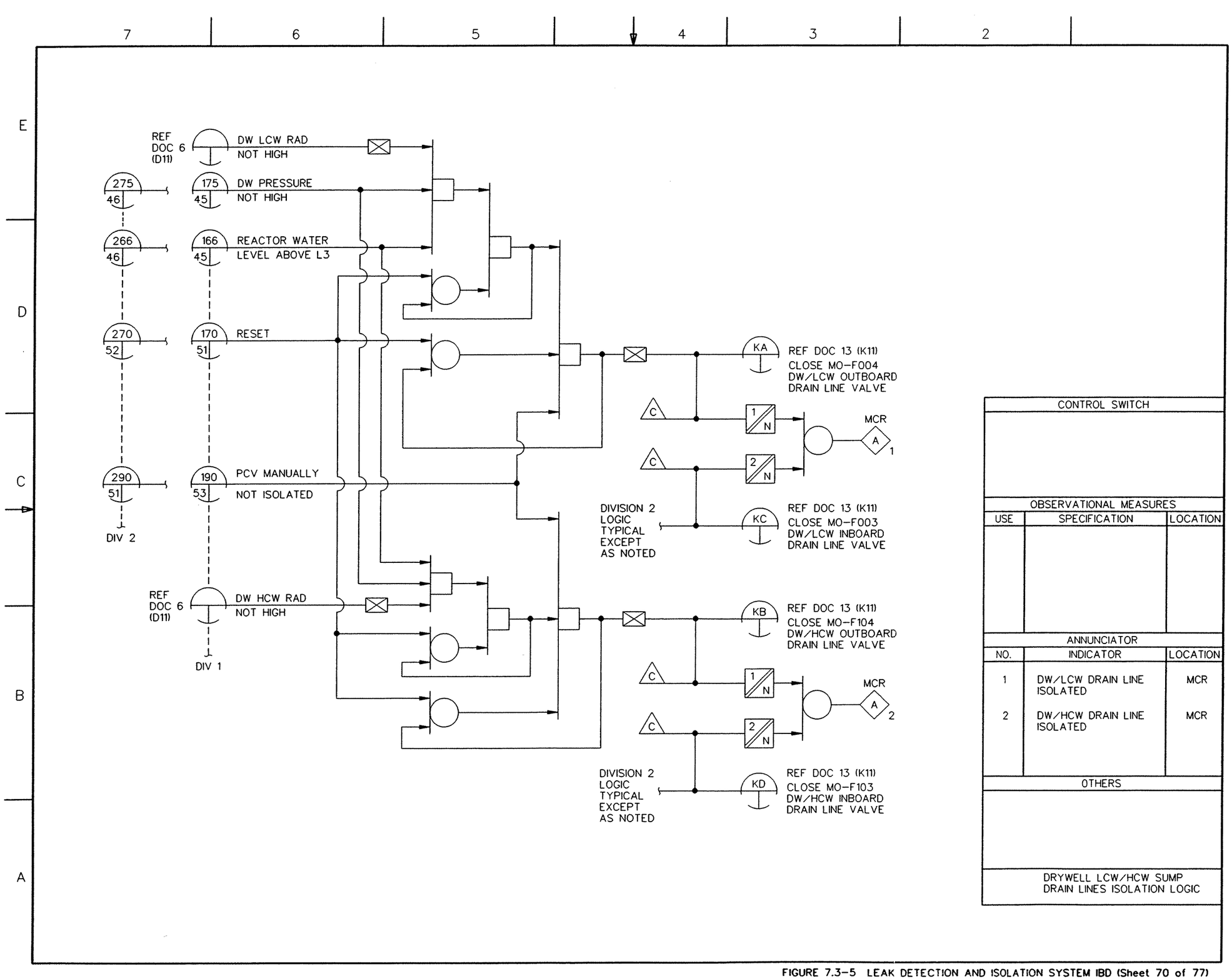
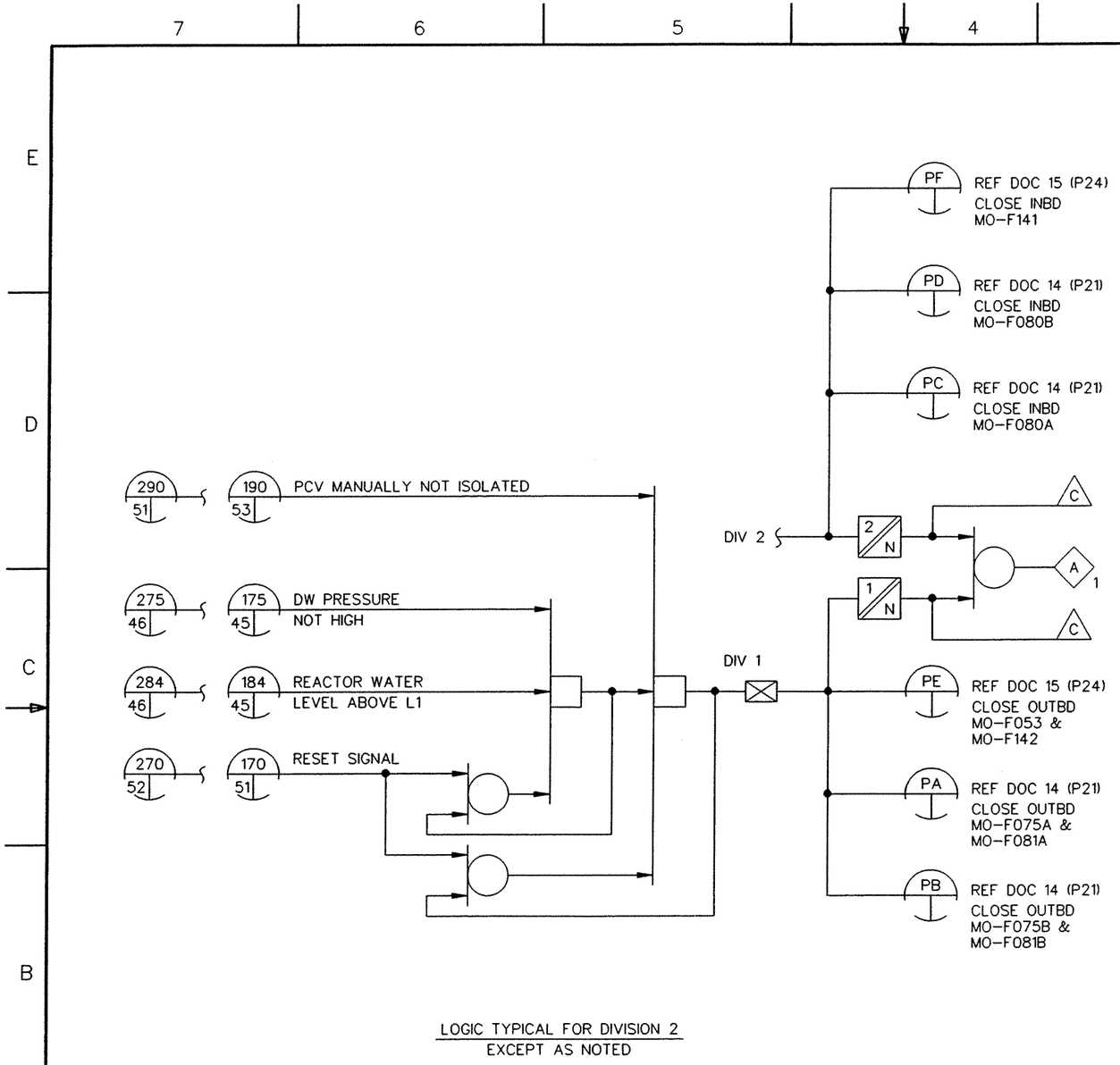


FIGURE 7.3-5 LEAK DETECTION AND ISOLATION SYSTEM IBD (Sheet 70 of 77)



LOGIC TYPICAL FOR DIVISION 2
EXCEPT AS NOTED

CONTROL SWITCH		

OBSERVATIONAL MEASURES		
USE	SPECIFICATION	LOCATION

ANNUNCIATOR		
NO.	INDICATOR	LOCATION
1	RCW/HNCW PCV VALVES ISOLATED	MCR

OTHERS

RCW/HNCW PCV VALVES
ISOLATION LOGIC

FIGURE 7.3-5 LEAK DETECTION AND ISOLATION SYSTEM IBD (Sheet 71 of 77)

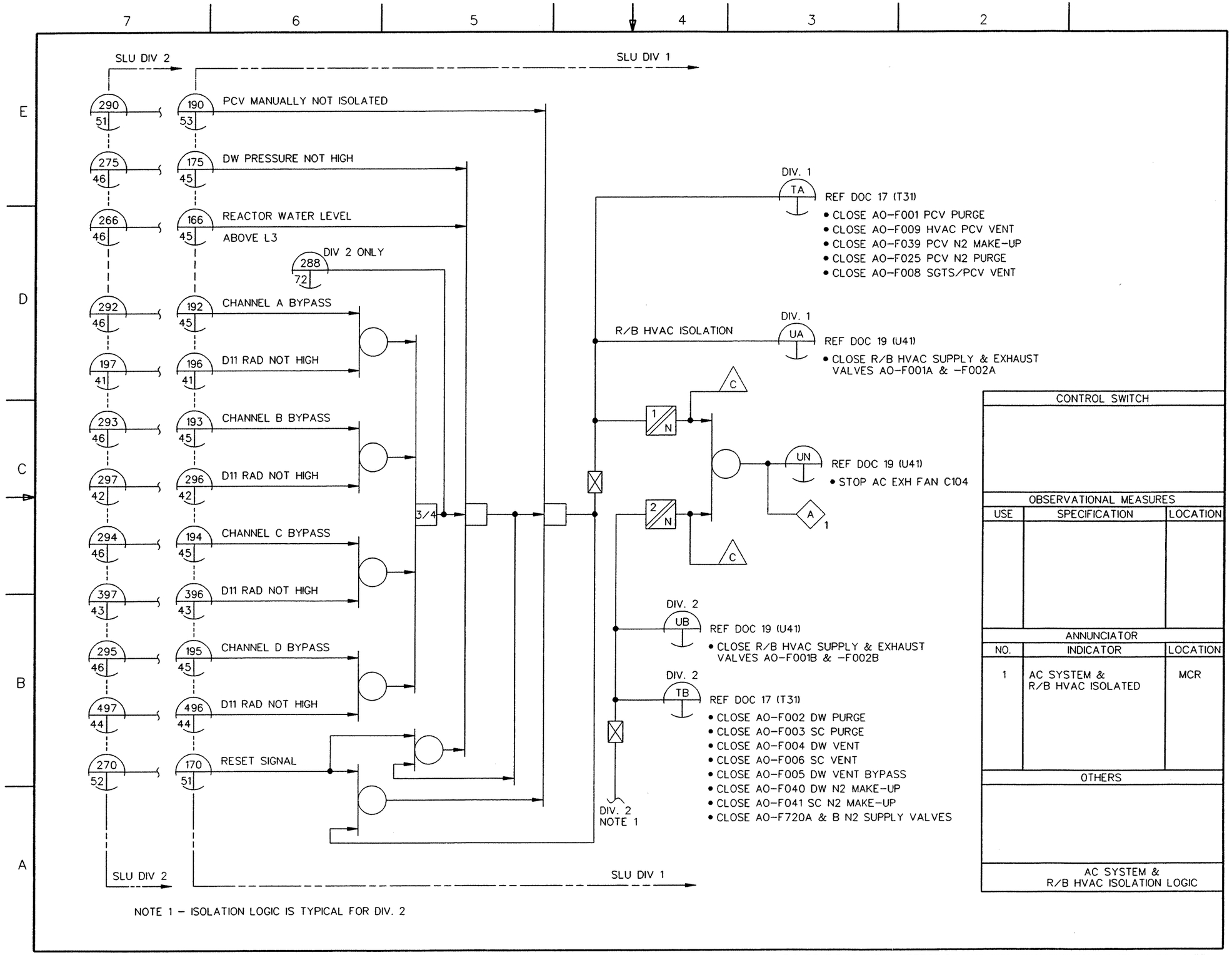
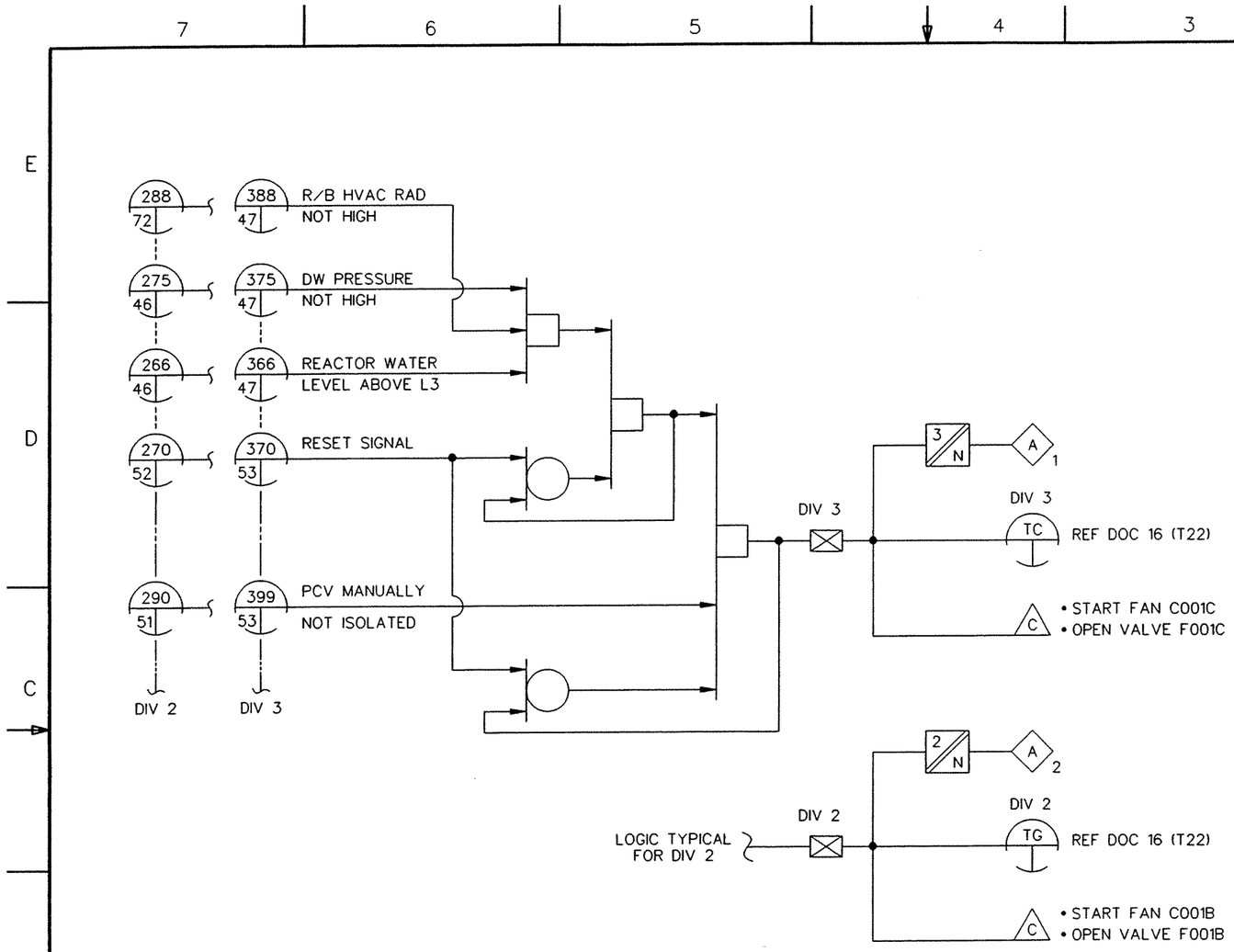


FIGURE 7.3-5 LEAK DETECTION AND ISOLATION SYSTEM IBD (Sheet 72 of 77)



CONTROL SWITCH		
OBSERVATIONAL MEASURES		
USE	SPECIFICATION	LOCATION
ANNUNCIATOR		
NO.	INDICATOR	LOCATION
1	SGTS–C INITIATED	MCR
2	SGTS–B INITIATED	MCR
OTHERS		

SGTS INITIATION LOGIC

FIGURE 7.3–5 LEAK DETECTION AND ISOLATION SYSTEM IBD (Sheet 73 of 77)

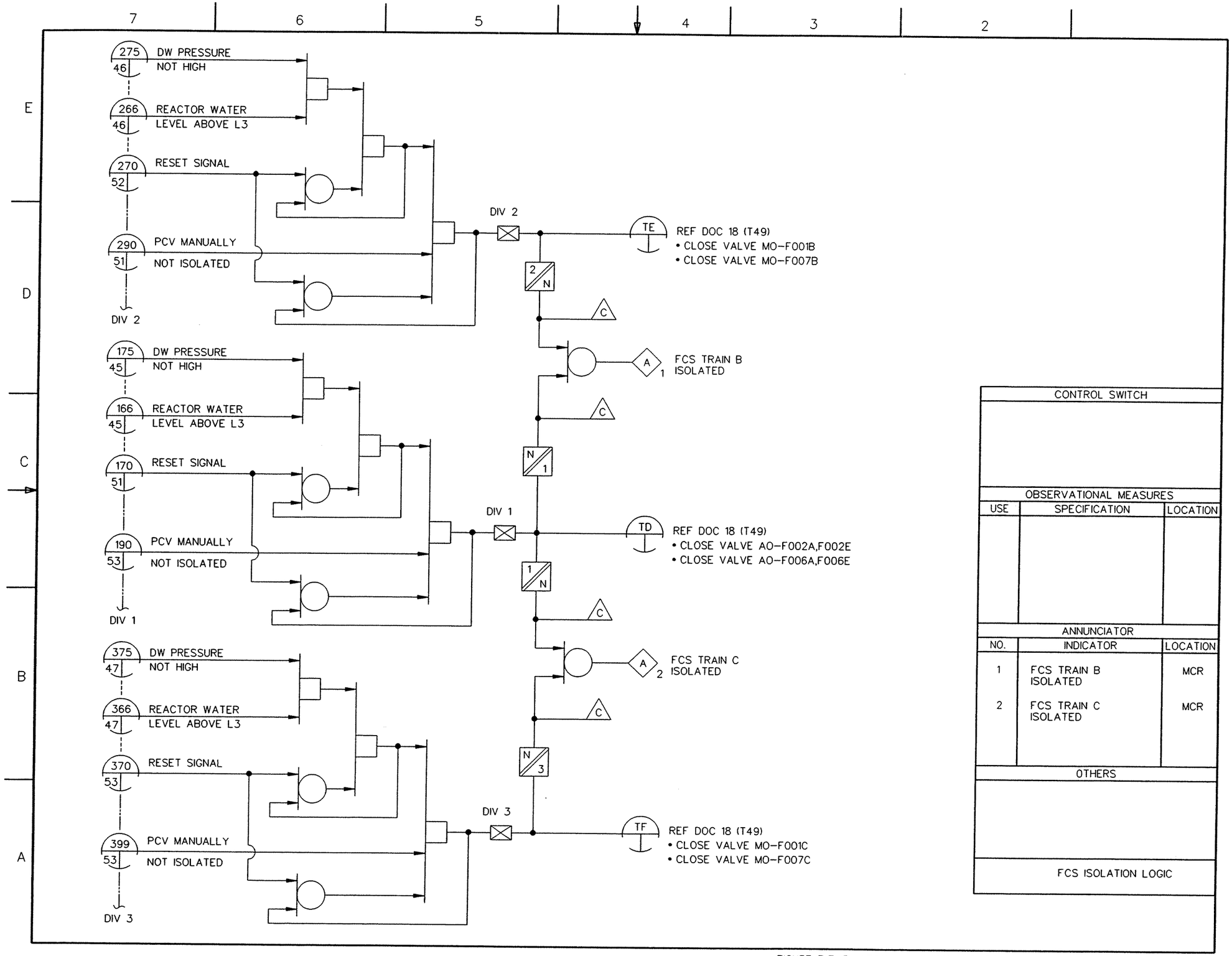


FIGURE 7.3-5 LEAK DETECTION AND ISOLATION SYSTEM IBD (Sheet 74 of 77)

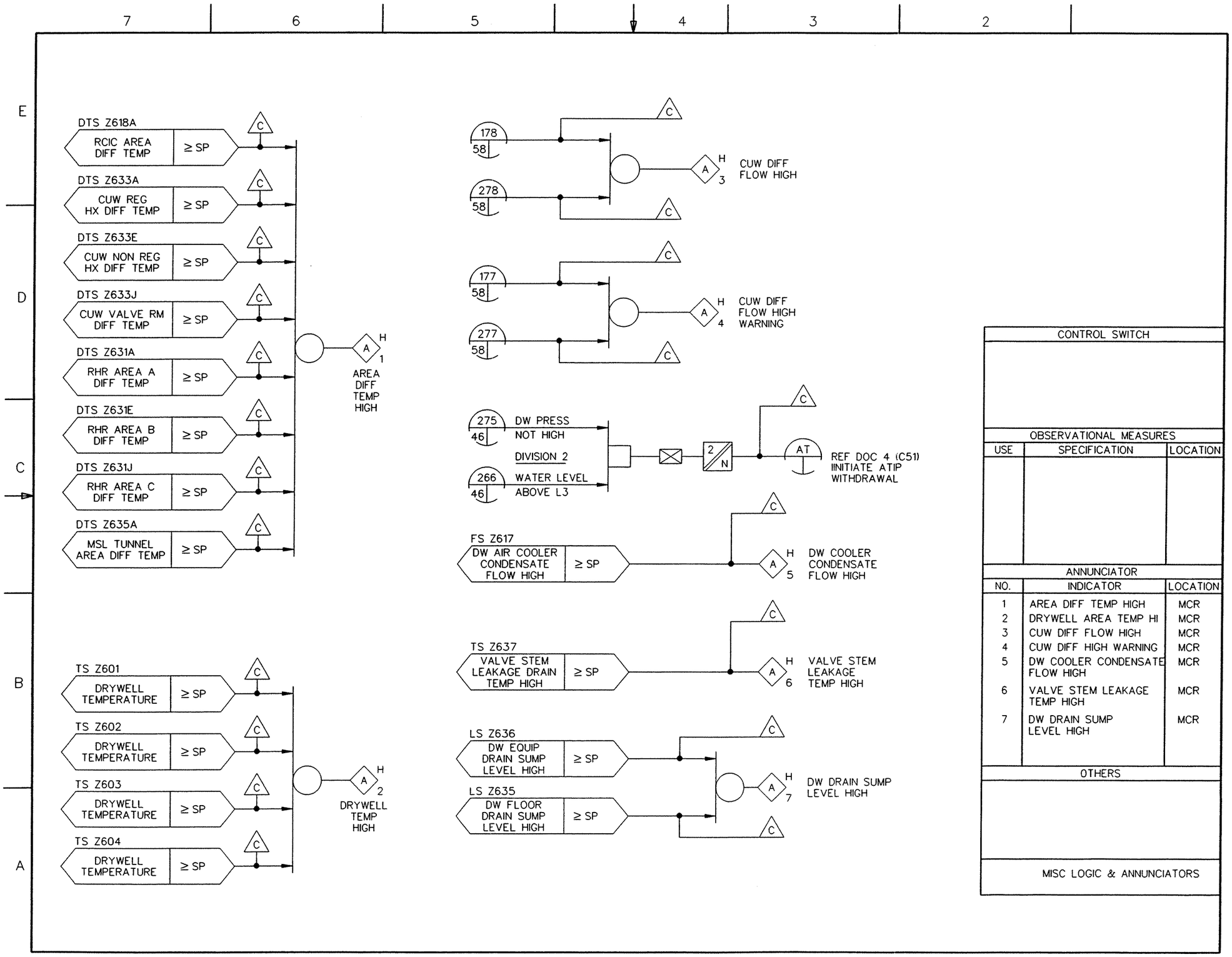


FIGURE 7.3-5 LEAK DETECTION AND ISOLATION SYSTEM IBD (Sheet 75 of 77)

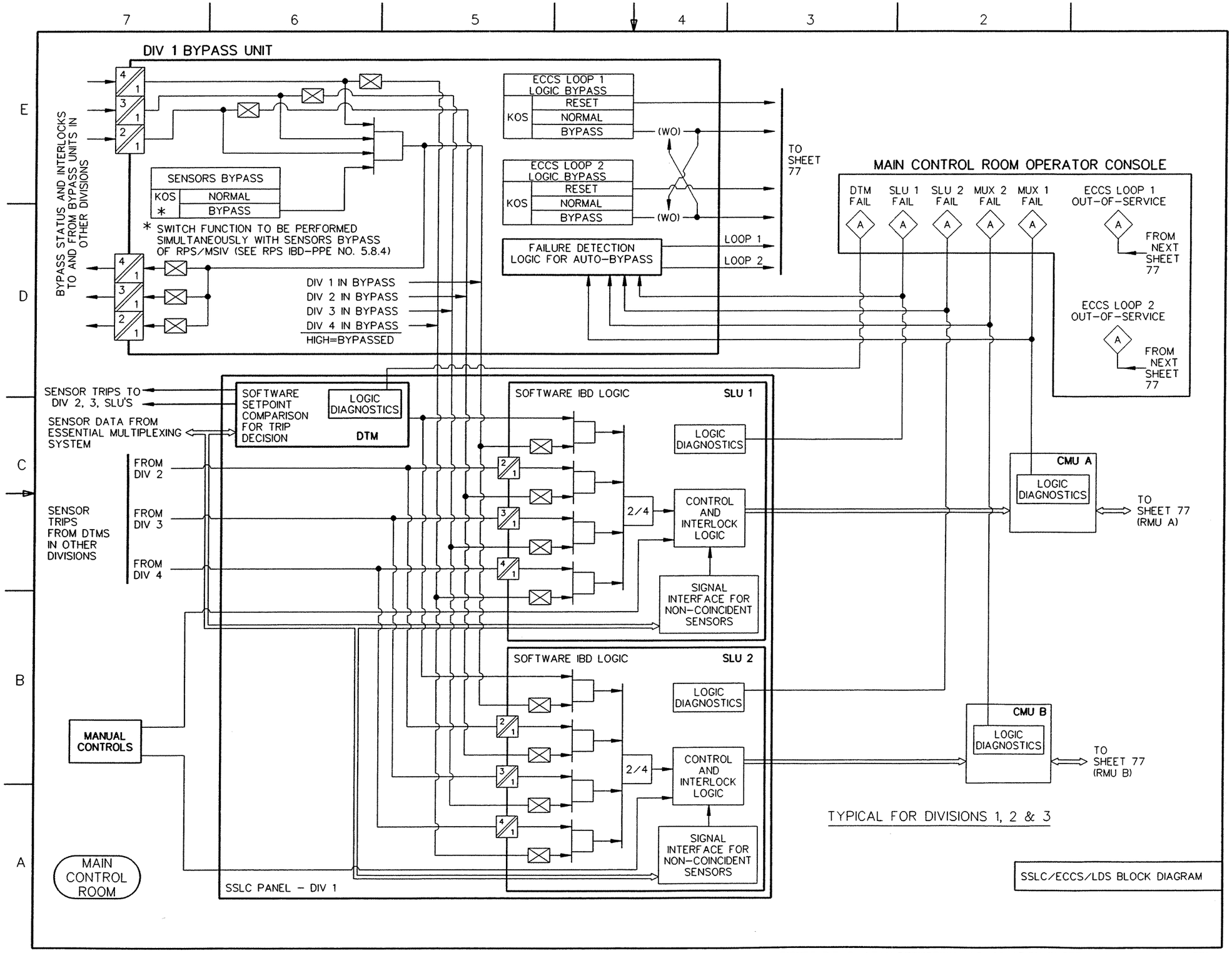


FIGURE 7.3–5 LEAK DETECTION AND ISOLATION SYSTEM IBD (Sheet 76 of 77)

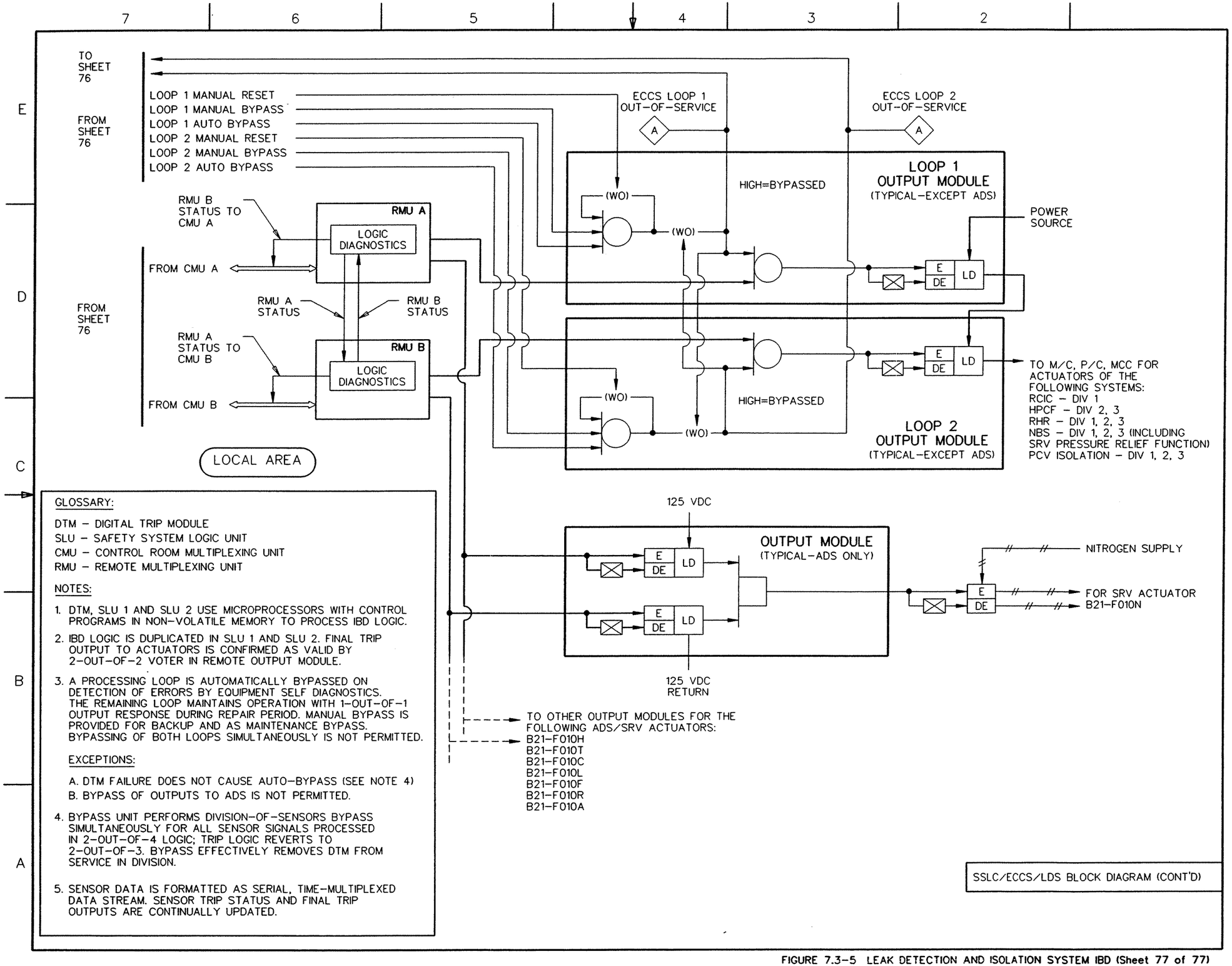


FIGURE 7.3-5 LEAK DETECTION AND ISOLATION SYSTEM IBD (Sheet 77 of 77)

NOTES:

1. AUTOMATIC SGTS B(C) INITIATION FROM LDS (E31–1030) SIGNAL FOR REACTOR WATER LEVEL LOW (L3) OR DRYWELL PRESSURE HIGH OR R/B EXHAUST RADIATION HIGH INCLUDING PURGE EXHAUST, OR FUEL HANDLING AREA RADIATION HIGH AND MANUAL SGTS INITIATION WHEN SPENT FUEL STORAGE POOL LEVEL LOW ALARMS. MANUAL PULL LOCK STOP OF SGTS C(B) AFTER CONFIRMATION OF SGTS B(C) OPERATION.
2. TRIAL RUN POSITION IS USED IN PLANT SCHEDULED INSPECTION.
3. SETPOINT VALUE IS A REFERENCE ITEM IN IBD.
4. SGTS FAN B(C) TIME DELAY FOR STOP SIGNAL TO ALLOW ELECTRIC HEATERS B(C) TO COOL.

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

		REFERENCE DESIGNATOR
1.	STANDBY GAS TREATMENT SYSTEM P&ID	T22–1010
2.	PROCESS RADIATION MONITORING SYSTEM IBD	D11–1030
3.	LEAK DETECTION AND ISOLATION SYSTEM IED	E31–1010
4.	FUEL POOL COOLING & CLEANUP SYSTEM P&ID	G41–1010
5.	HEATING, VENTILATING & AIR CONDITIONING P&ID	U41–1010
6.	ELECTRICAL POWER & DISTRIBUTION SYSTEM	R10–1010

TABLE OF CONTENTS

MPL NO. T22–1030

FIGURE 7.3–6 STANDBY GAS TREATMENT SYSTEM IBD (Sheet 1 of 11)

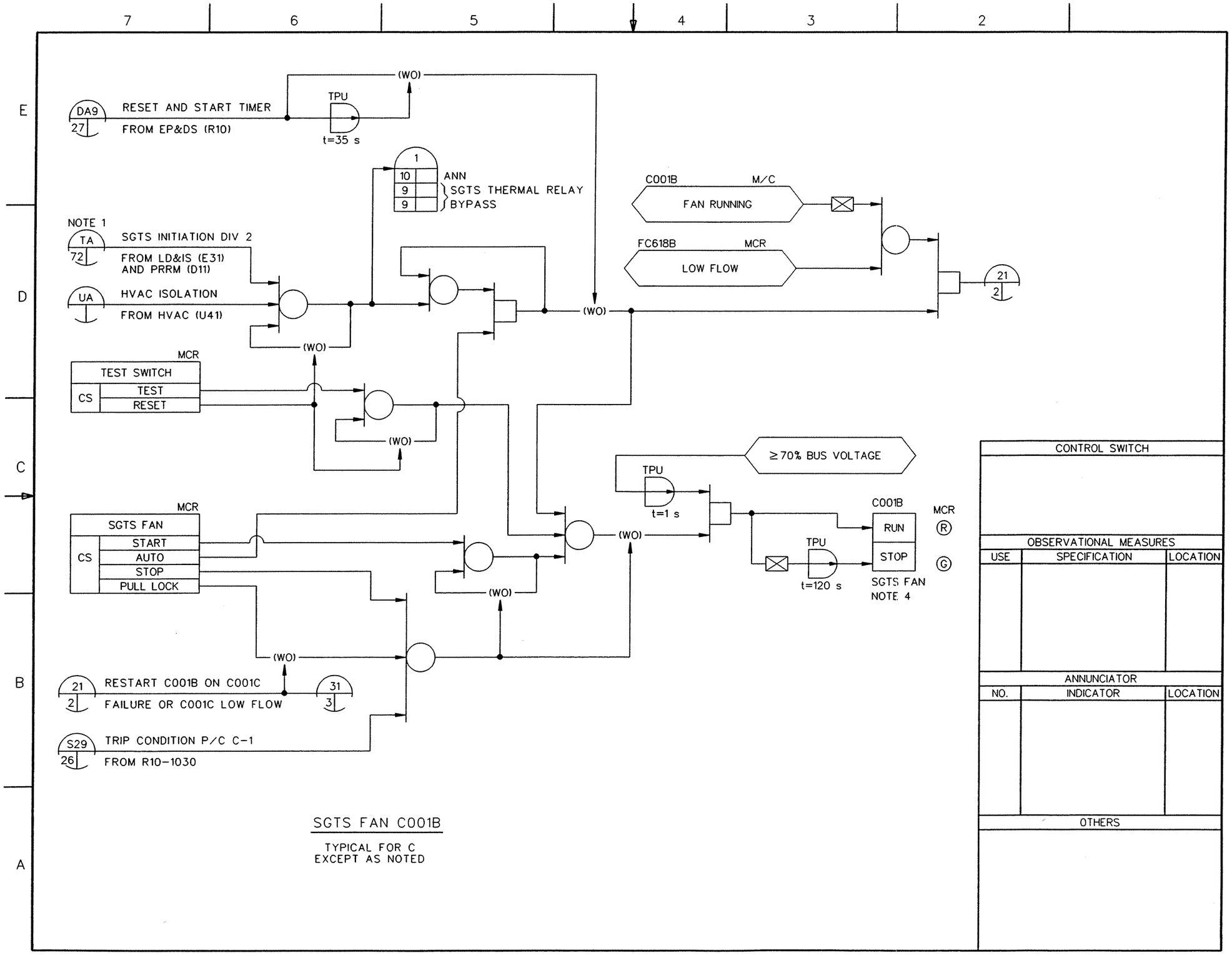
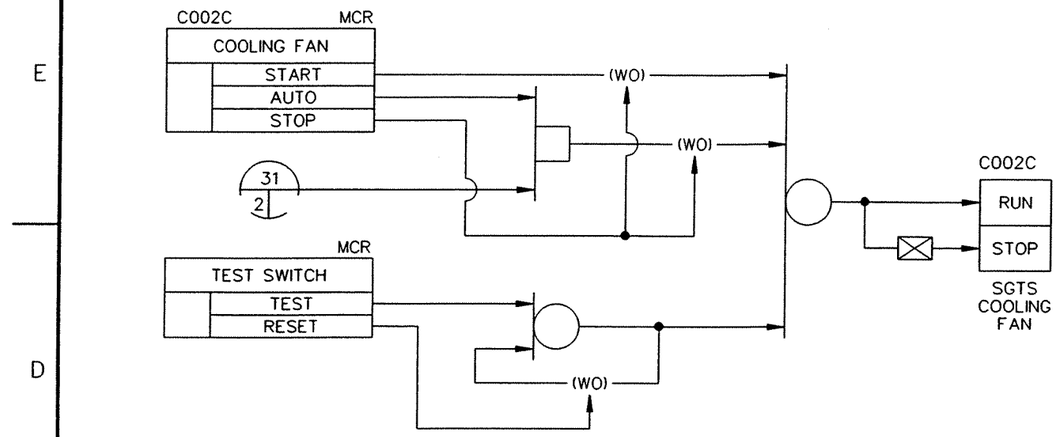
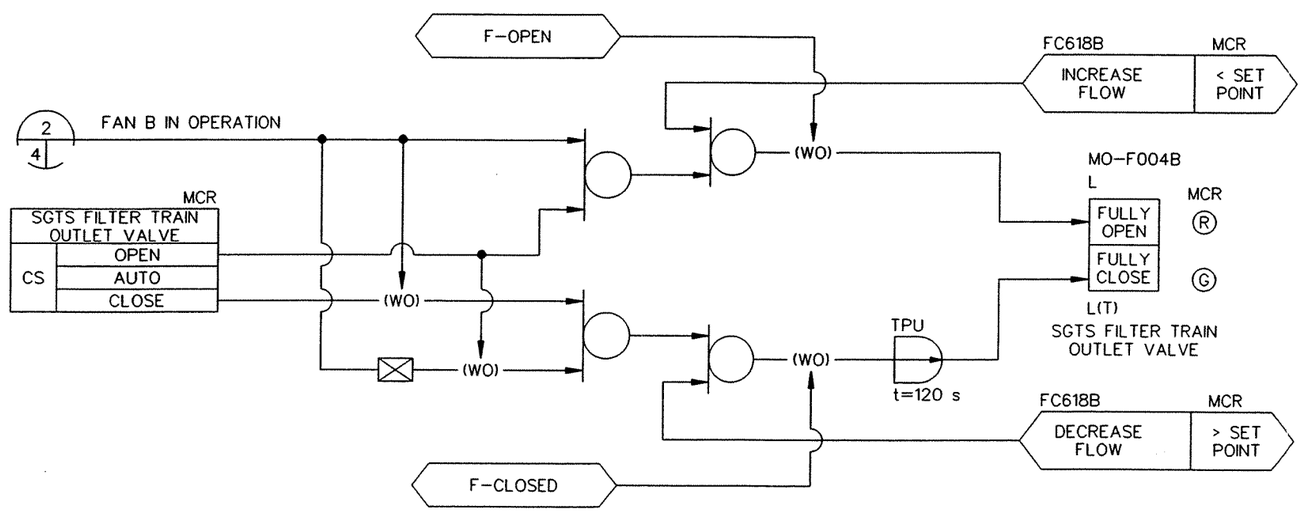


FIGURE 7.3-6 STANDBY GAS TREATMENT SYSTEM IBD (Sheet 2 of 11)



SGTS COOLING FAN C002C(B)



SGTS FILTER TRAIN OUTLET VALVE F004B

TYPICAL FOR C
EXCEPT AS NOTED

CONTROL SWITCH

OBSERVATIONAL MEASURES		
USE	SPECIFICATION	LOCATION

ANNUNCIATOR		
NO.	INDICATOR	LOCATION

OTHERS

FIGURE 7.3-6 STANDBY GAS TREATMENT SYSTEM IBD (Sheet 3 of 11)

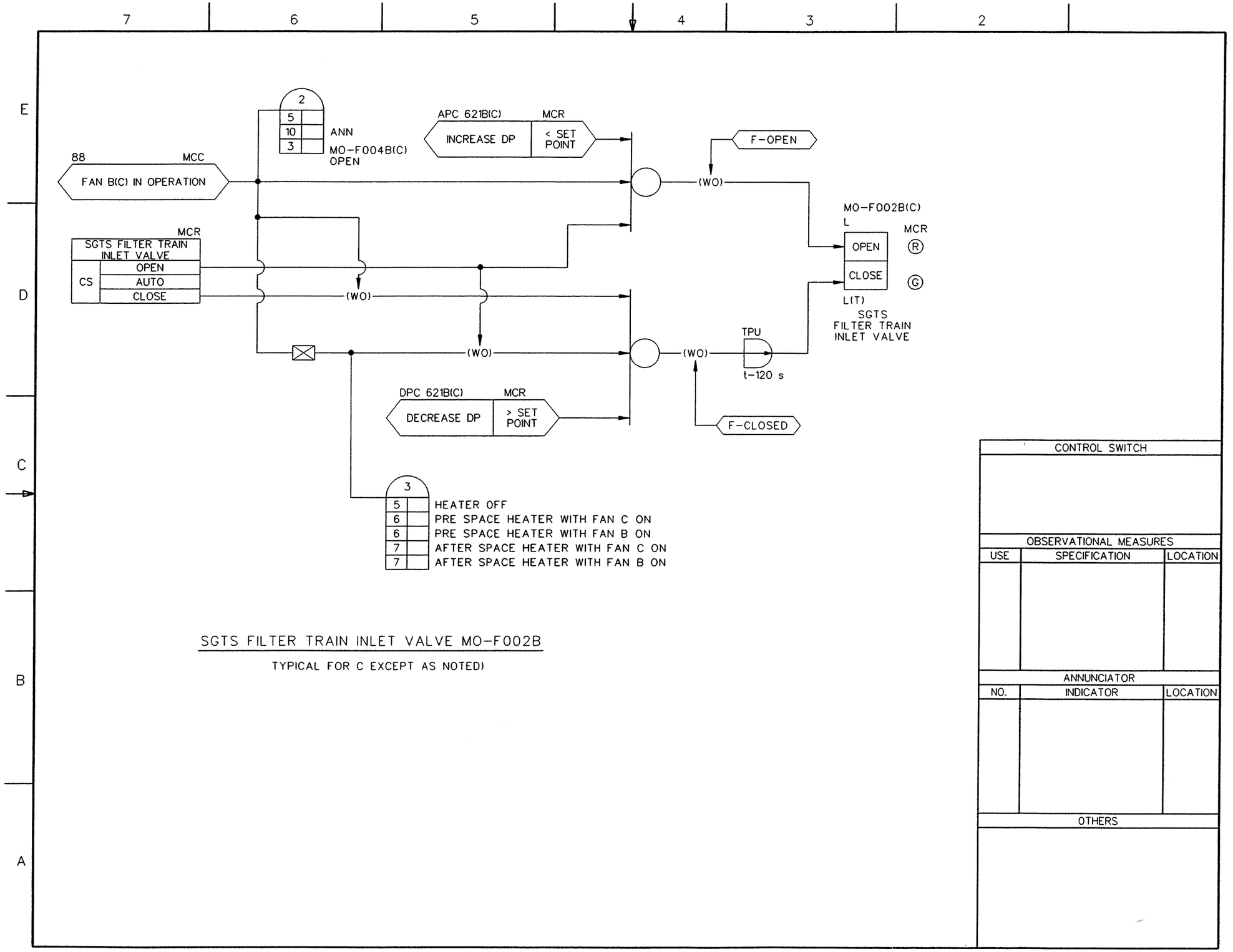
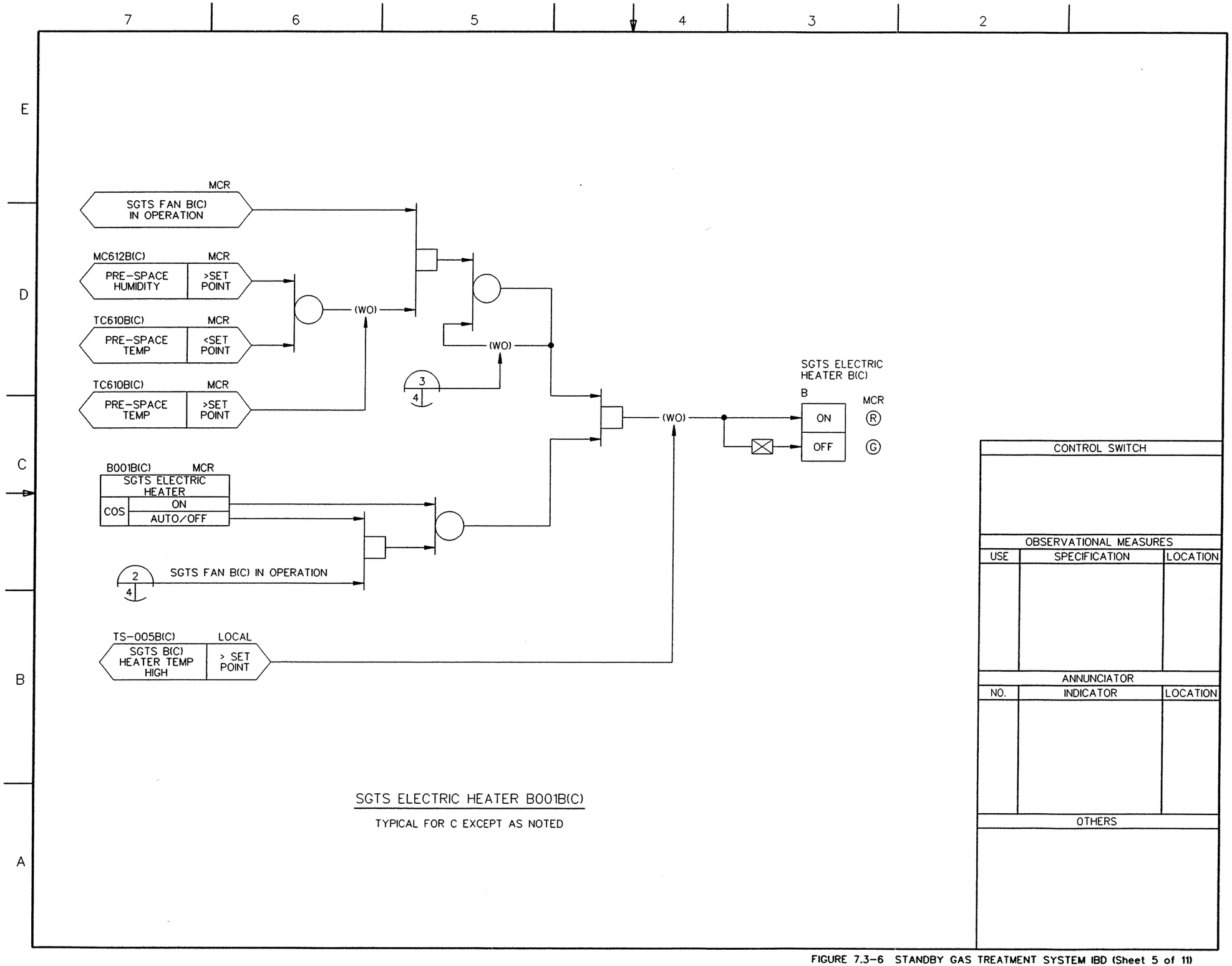


FIGURE 7.3-6 STANDBY GAS TREATMENT SYSTEM IBD (Sheet 4 of 11)



SGTS ELECTRIC HEATER B001B(C)

TYPICAL FOR C EXCEPT AS NOTED

FIGURE 7.3-6 STANDBY GAS TREATMENT SYSTEM IBD (Sheet 5 of 11)

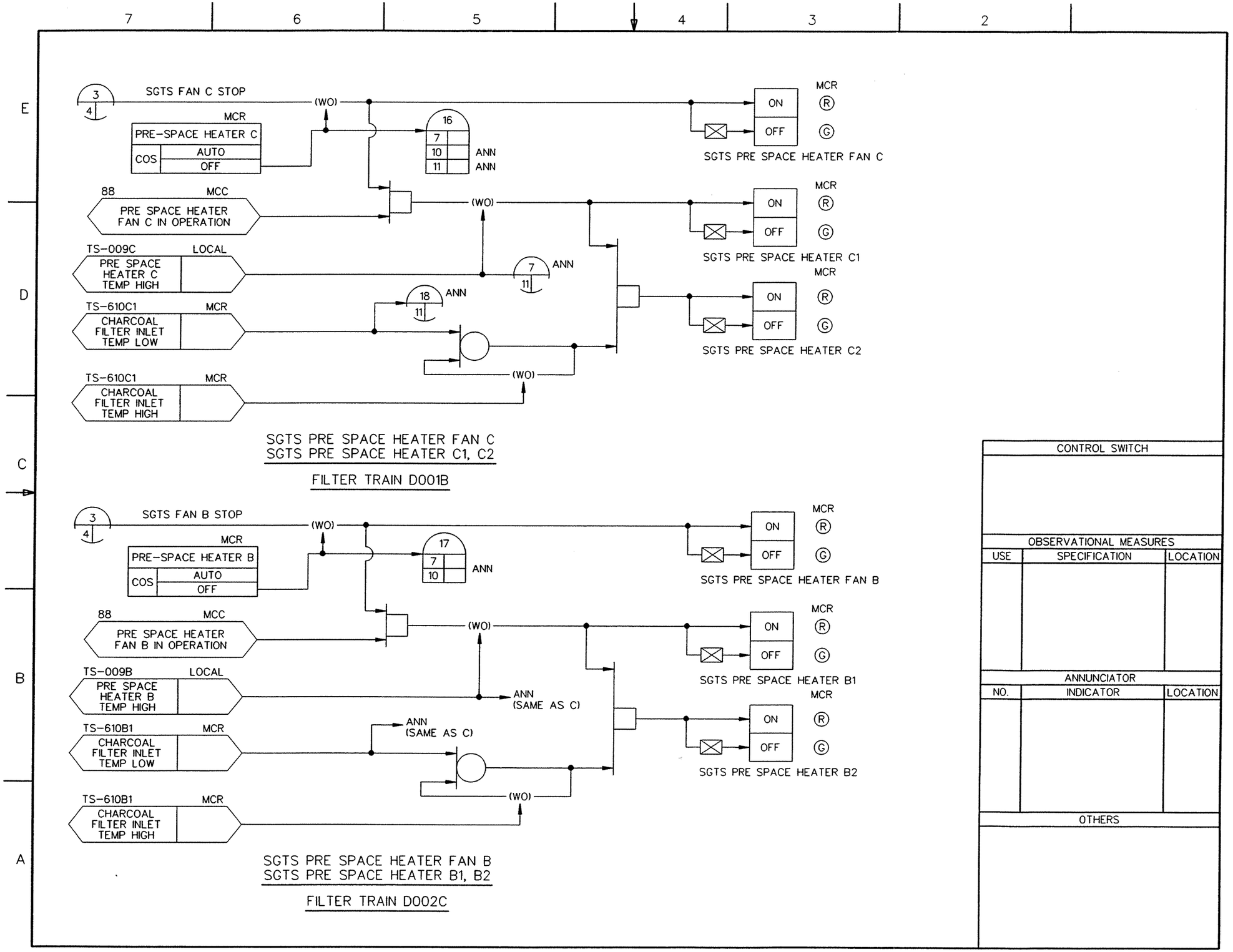


FIGURE 7.3-6 STANDBY GAS TREATMENT SYSTEM IBD (Sheet 6 of 11)

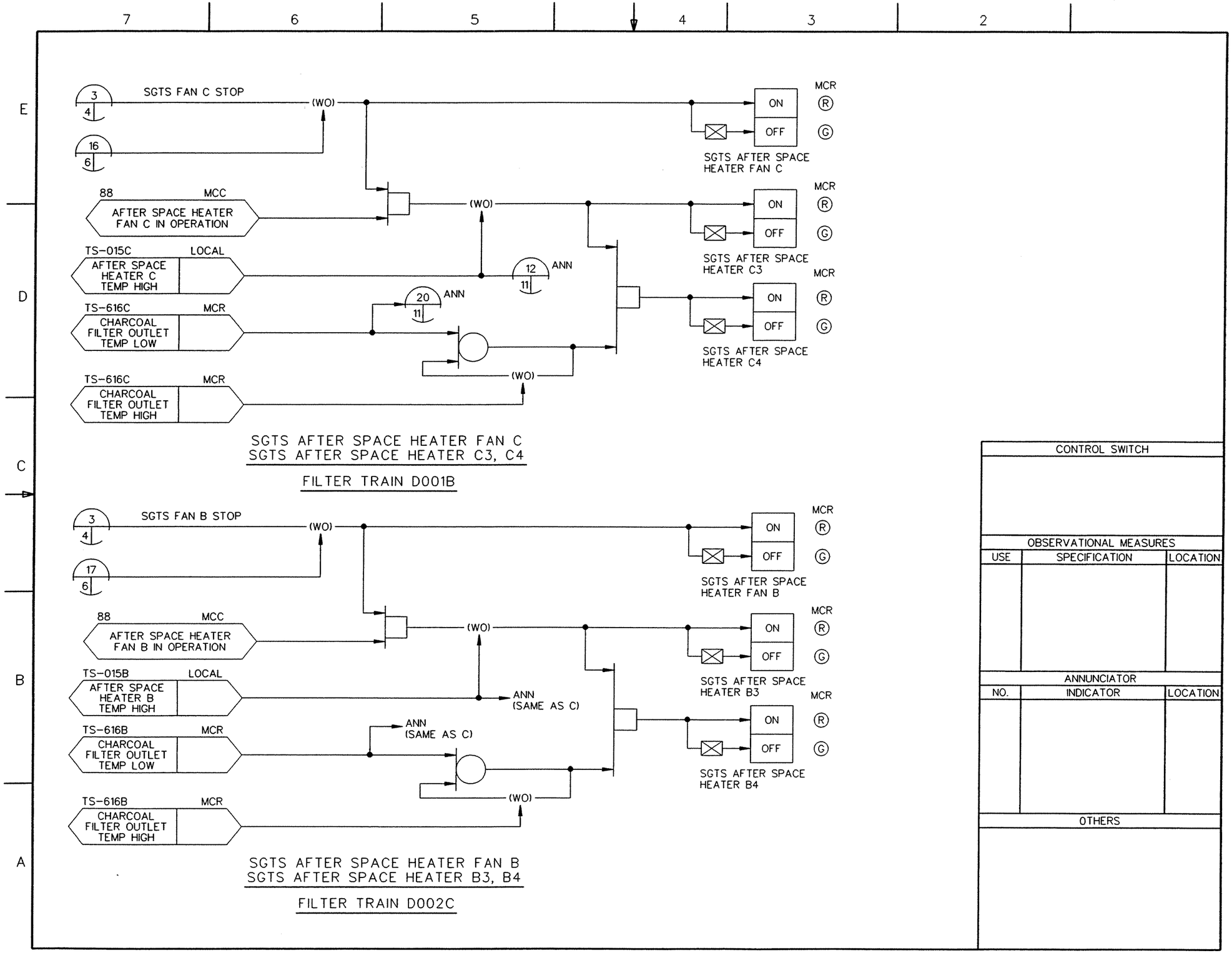
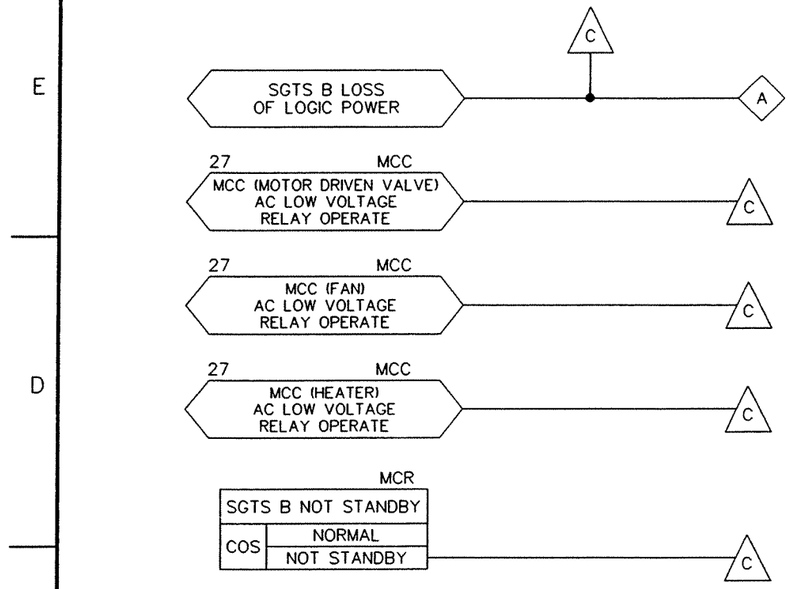
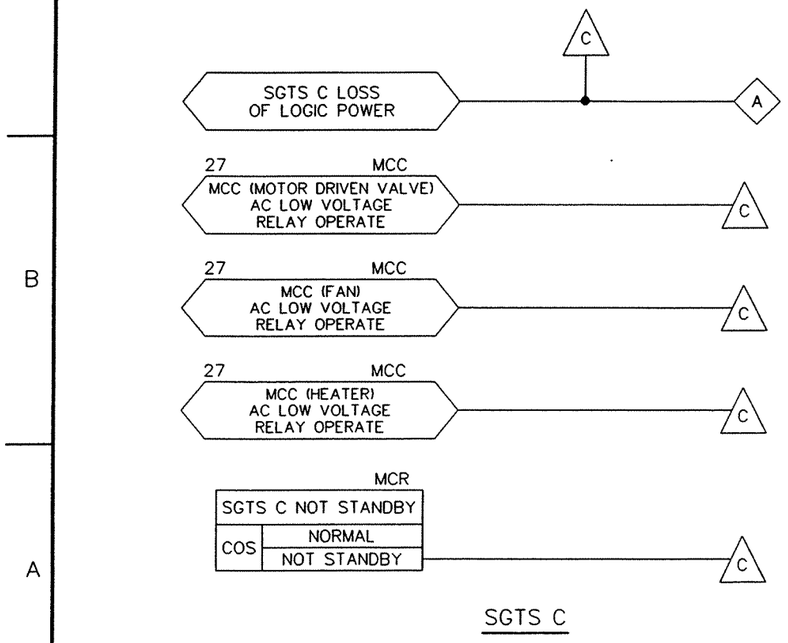


FIGURE 7.3-6 STANDBY GAS TREATMENT SYSTEM IBD (Sheet 7 of 11)



SGTS B



SGTS C

ANNUNCIATORS

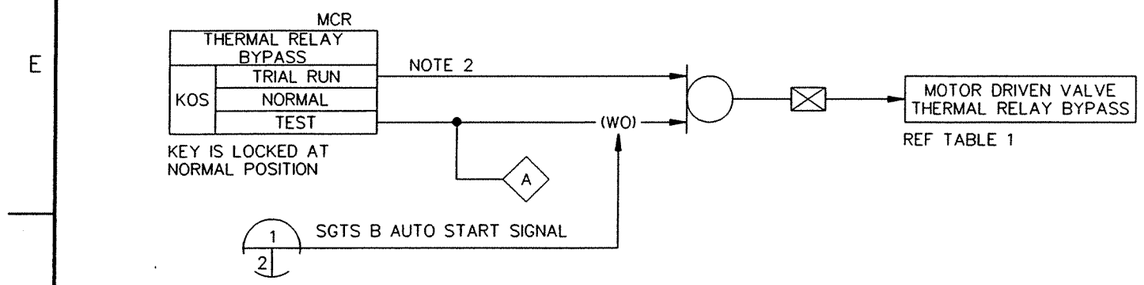
CONTROL SWITCH

OBSERVATIONAL MEASURES		
USE	SPECIFICATION	LOCATION

ANNUNCIATOR		
NO.	INDICATOR	LOCATION

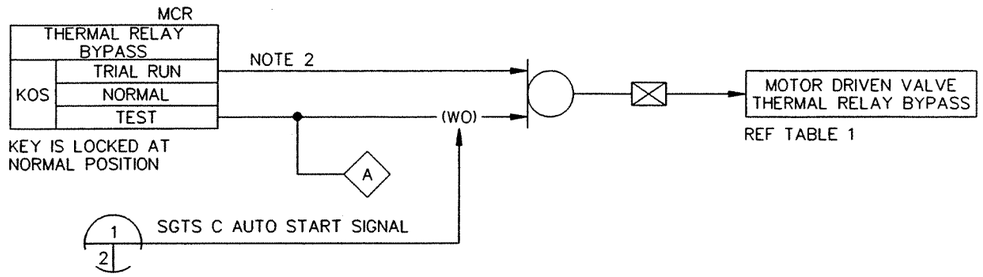
OTHERS

FIGURE 7.3-6 STANDBY GAS TREATMENT SYSTEM IBD (Sheet 8 of 11)



SGTS B

ANNUNCIATOR



SGTS C

TABLE 1: MOTOR DRIVEN VALVE THERMAL TRIP

SYSTEM	VALVE NO.	VALVE	POWER SUPPLY	REMARKS
SGTS B	T22-MO-F002B	SGTS FILTER TRAIN INLET VALVE	B	
	T22-MO-F004B	SGTS FILTER TRAIN OUTLET VALVE	B	
	T22-C001B	SGTS PROCESS FAN	B	
	T22-C002B	COOLING FAN	C	
SGTS C	T22-MO-F002C	SGTS FILTER TRAIN INLET VALVE	C	
	T22-MO-F004C	SGTS FILTER TRAIN OUTLET VALVE	C	
	T22-C001C	SGTS PROCESS FAN	C	
	T22-C002C	COOLING FAN	B	

CONTROL SWITCH

OBSERVATIONAL MEASURES		
USE	SPECIFICATION	LOCATION

ANNUNCIATOR		
NO.	INDICATOR	LOCATION

OTHERS

FIGURE 7.3-6 STANDBY GAS TREATMENT SYSTEM IBD (Sheet 9 of 11)

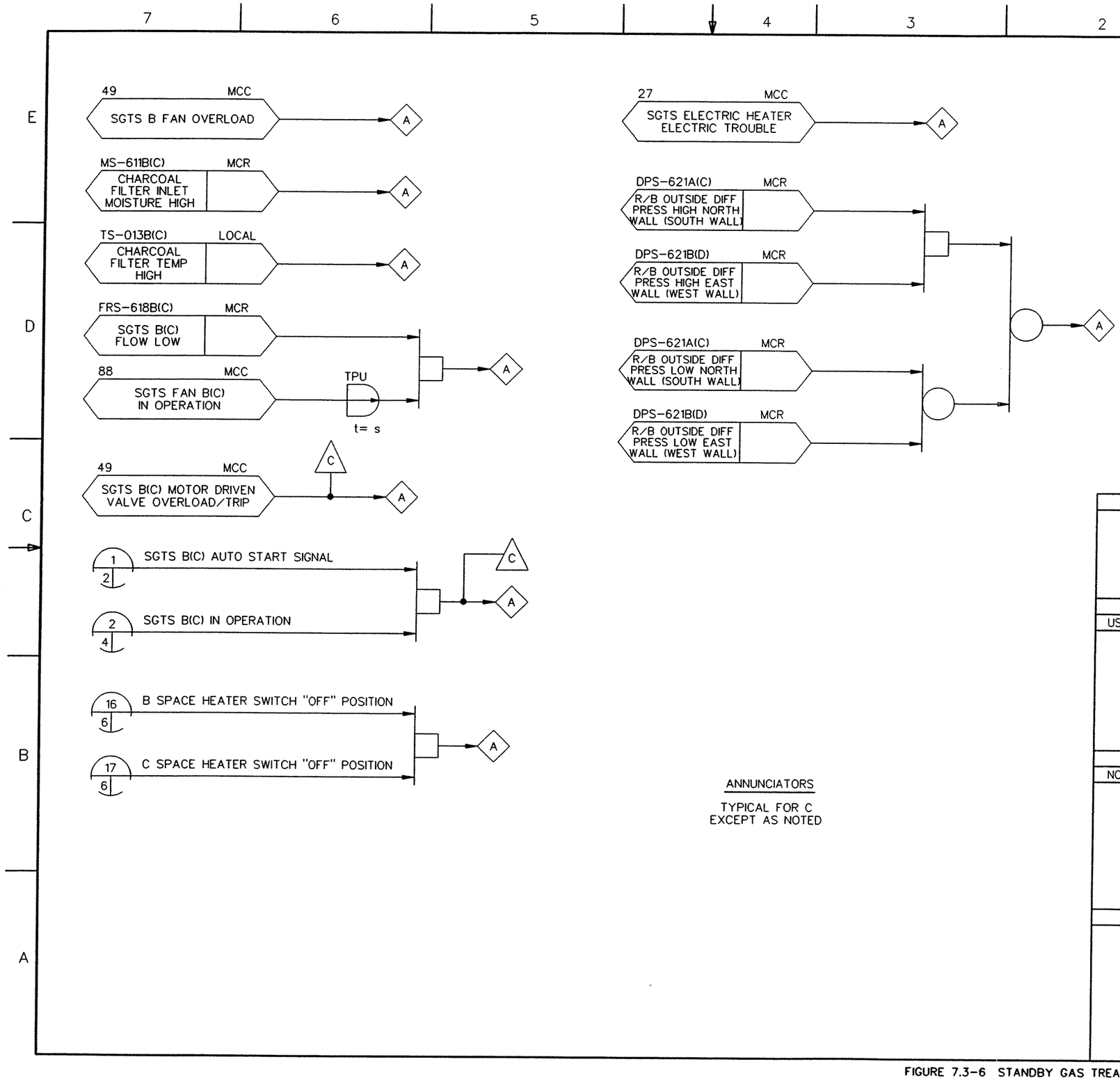


FIGURE 7.3-6 STANDBY GAS TREATMENT SYSTEM IBD (Sheet 10 of 11)

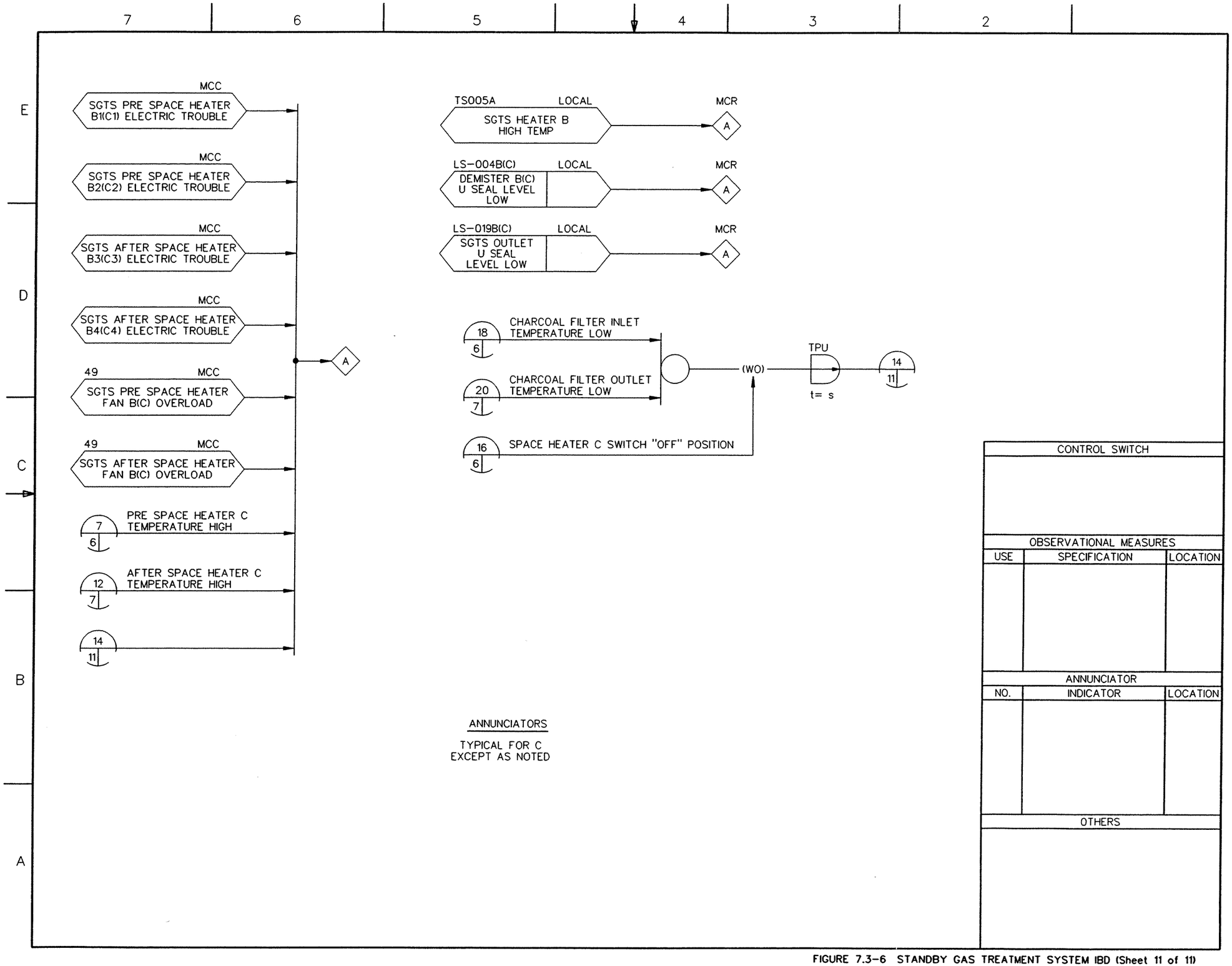


FIGURE 7.3-6 STANDBY GAS TREATMENT SYSTEM IBD (Sheet 11 of 11)

NO.	TITLE
1	NOTES, CONTENTS
2	RCW PUMP
3	RCW MAKE-UP VALVE
4	RHR/HX RCW OUTLET VALVE
5	D/G RCW OUTLET VALVE
6	RCW SEPARATE VALVE
7	RCW SAFETY RELATED/ NON SAFETY-RELATED SEPARATION VALVE
8	RCW COOLING WATER TEMP CONTROL VALVE
9	PCV ISOLATION VALVE
10	RCW NON ESSENTIAL EQUIPMENT COOLING WATER STOP VALVE
11	RSW PUMP
12	RCW HX OUTLET VALVE
13	STRAINER BACKWASH VALVE
14	RCW HX DILUTION VALVE
15	MOTOR VALVE THERMAL BYPASS
16	ANNUNCIATOR (1)
17	ANNUNCIATOR (2)
18	RCW HX/RSW INLET VALVE
19	RSW (A) SUPPLY VALVE

NOTES:

1. UNLESS OTHERWISE NOTED, THE POWER SUPPLY OF ASSISTS IS ESSENTIAL POWER SUPPLY.
2. "#" FIXED NUMBERS IN THIS DIAGRAM INDICATE THE SWGR FUNTIONAL NUMBERS.
3. THIS IBD EXPRESSLY FOR SYSTEM (A), AND TYPICAL FOR SYSTEM (B),(C).
4. INTERFACES FROM THE REMOTE SHUTDOWN SYSTEM ARE PROVIDED IN DIVISIONS A AND B ONLY.

REFERENCE DOCUMENT

	MPL NO.
1. REACTOR BUILDING COOLING WATER SYS P&ID	P21-1010
2. REACTOR SERVICE WATER SYSTEM P&ID	P41-1010
3. REMOTE SHUTDOWN SYSTEM IBD	C61-1030
4. RESIDUAL HEAT REMOVAL SYSTEM IBD	E11-1030
5. RADWASTE SYSTEM P&ID	K17-1010
6. ELECTRICAL POWER DISTRIBUTION SYSTEM	R10-1010
7. SUPPRESSION POOL TEMPERATURE MONITORING SYSTEM IBD	T53-1030
8. REACTOR WATER CLEANUP SYSTEM IBD	G31-1030

MPL NO. P21/P41-1030

FIGURE 7.3-7 REACTOR BUILDING COOLING WATER/REACTOR SERVICE WATER SYSTEM IBD (Sheet 1 of 19)

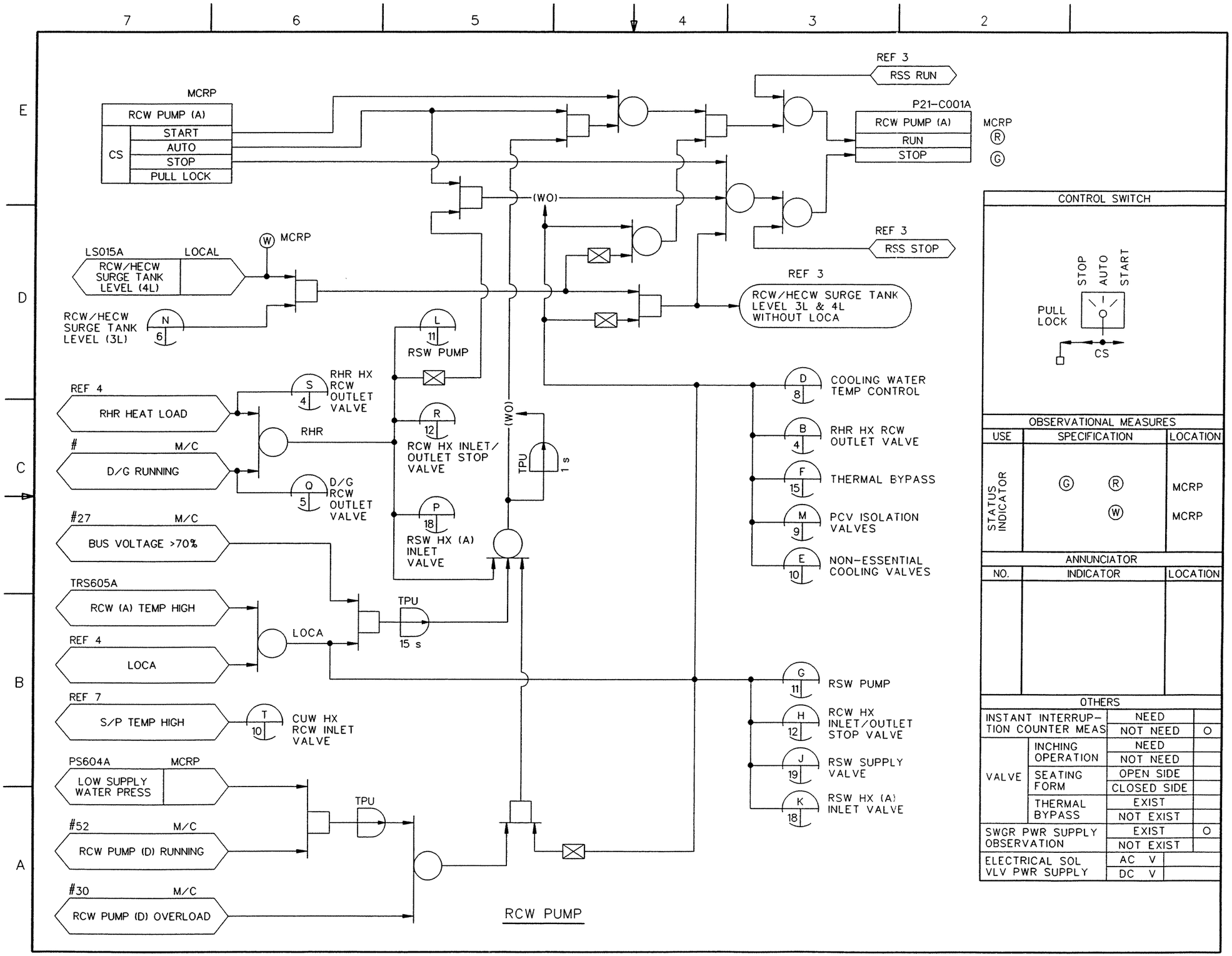
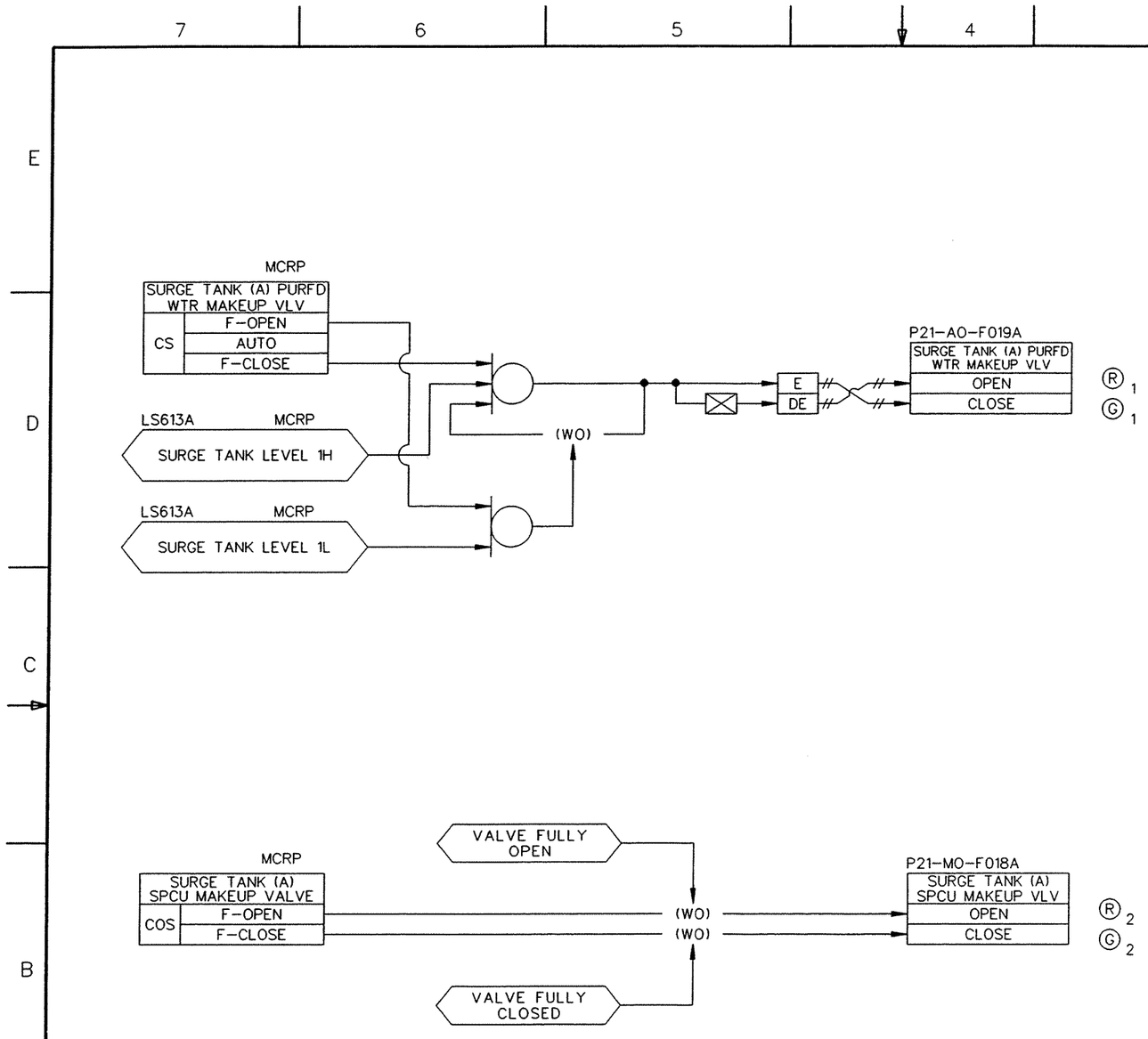
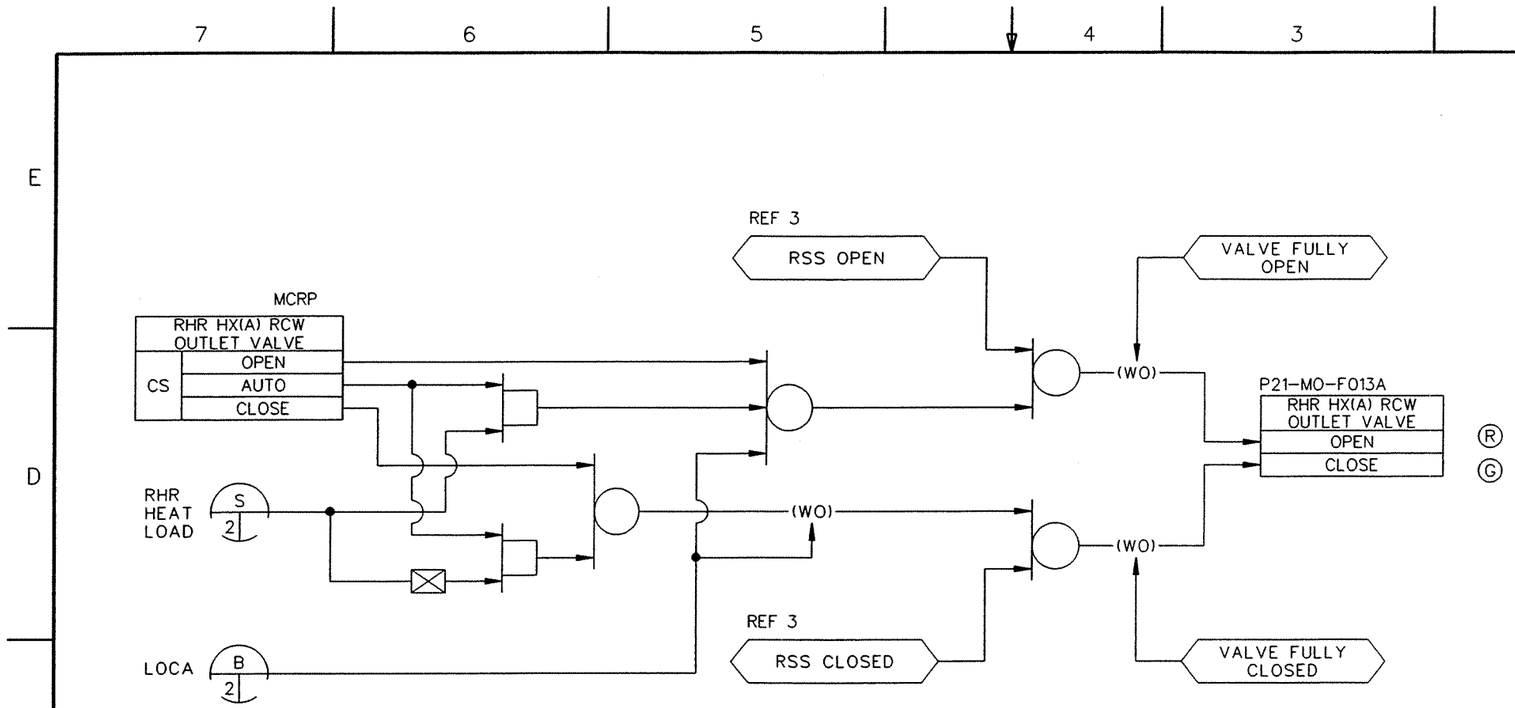


FIGURE 7.3-7 REACTOR BUILDING COOLING WATER/REACTOR SERVICE WATER SYSTEM IBD (Sheet 2 of 19)



CONTROL SWITCH			
F-CLOSE AUTO F-OPEN (CS)		F-CLOSE F-OPEN (COS)	
THE KEY CAN BE PULLED OUT IN (F-CLOSE) POS			
OBSERVATIONAL MEASURES			
USE	SPECIFICATION		LOCATION
STATUS INDICATOR	Ⓖ 1 Ⓡ 1		MCRP
	Ⓖ 2 Ⓡ 2		MCRP
ANNUNCIATOR			
NO.	INDICATOR		LOCATION
OTHERS			
INSTANT INTERRUPTION COUNTER MEAS	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 PWR SUPPLY OBSERVATION	EXIST		O
	NOT EXIST		
ELECTRICAL SOL VLV PWR SUPPLY	AC V		
	DC V		

FIGURE 7.3-7 REACTOR BUILDING COOLING WATER/REACTOR SERVICE WATER SYSTEM IBD (Sheet 3 of 19)



RHR HX/RCW OUTLET VALVE

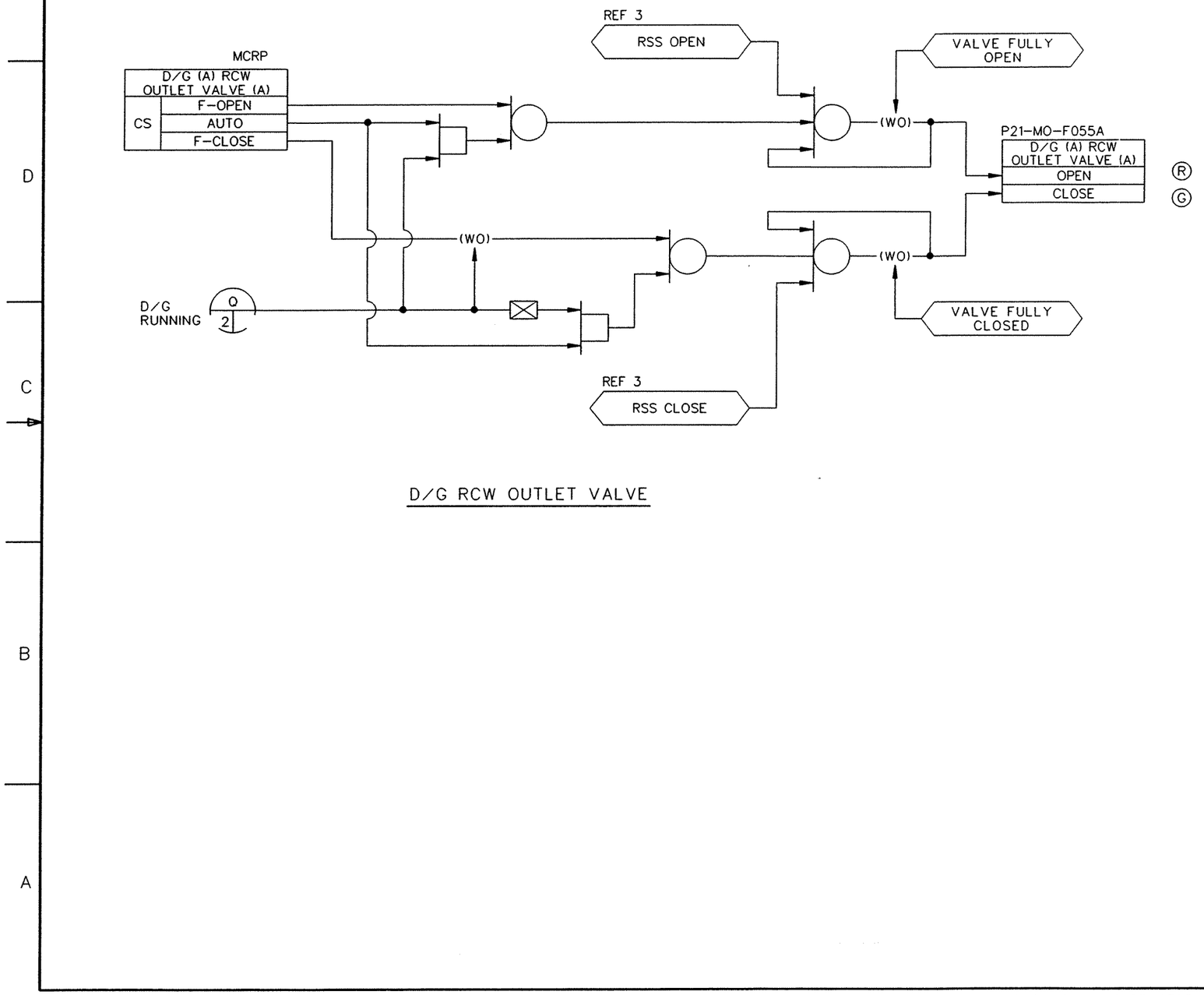
CONTROL SWITCH

OBSERVATIONAL MEASURES		
USE	SPECIFICATION	LOCATION
STATUS INDICATOR	Ⓖ Ⓡ	MCRP

ANNUNCIATOR		
NO.	INDICATOR	LOCATION

OTHERS			
INSTANT INTERRUPTION COUNTER MEAS		NEED	
		NOT NEED	
VALVE	INCHING OPERATION	NEED	
		NOT NEED	
	SEATING FORM	OPEN SIDE	TL
		CLOSED SIDE	T
	THERMAL BYPASS	EXIST	O
		NOT EXIST	
SWGR PWR SUPPLY OBSERVATION		EXIST	O
		NOT EXIST	
ELECTRICAL SOL VLV PWR SUPPLY		AC V	
		DC V	

FIGURE 7.3-7 REACTOR BUILDING COOLING WATER/REACTOR SERVICE WATER SYSTEM IBD (Sheet 4 of 19)



D/G RCW OUTLET VALVE

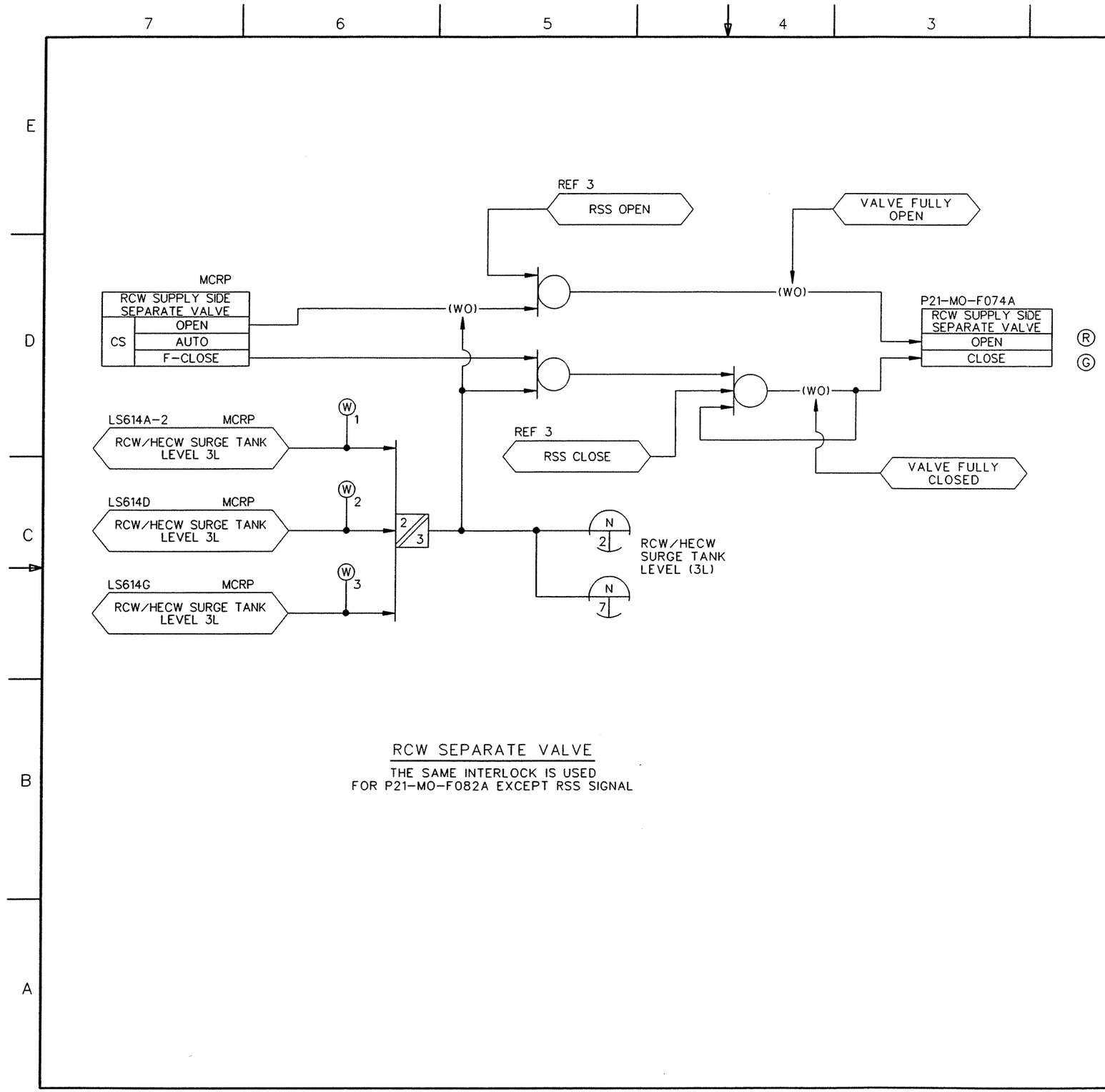
CONTROL SWITCH
F-CLOSE AUTO F-OPEN CS

OBSERVATIONAL MEASURES		
USE	SPECIFICATION	LOCATION
STATUS INDICATOR	Ⓖ Ⓡ	MCRP

ANNUNCIATOR		
NO.	INDICATOR	LOCATION

OTHERS			
INSTANT INTERRUPTION COUNTER MEAS		NEED	
		NOT NEED	
VALVE	INCHING OPERATION	NEED	
		NOT NEED	
	SEATING FORM	OPEN SIDE	TL
		CLOSED SIDE	L(T)
	THERMAL BYPASS	EXIST	O
		NOT EXIST	
SWGR PWR SUPPLY OBSERVATION		EXIST	O
		NOT EXIST	
ELECTRICAL SOL VLV PWR SUPPLY		AC V	
		DC V	

FIGURE 7.3-7 REACTOR BUILDING COOLING WATER/REACTOR SERVICE WATER SYSTEM IBD (Sheet 5 of 19)



RCW SEPARATE VALVE

THE SAME INTERLOCK IS USED FOR P21-MO-F082A EXCEPT RSS SIGNAL

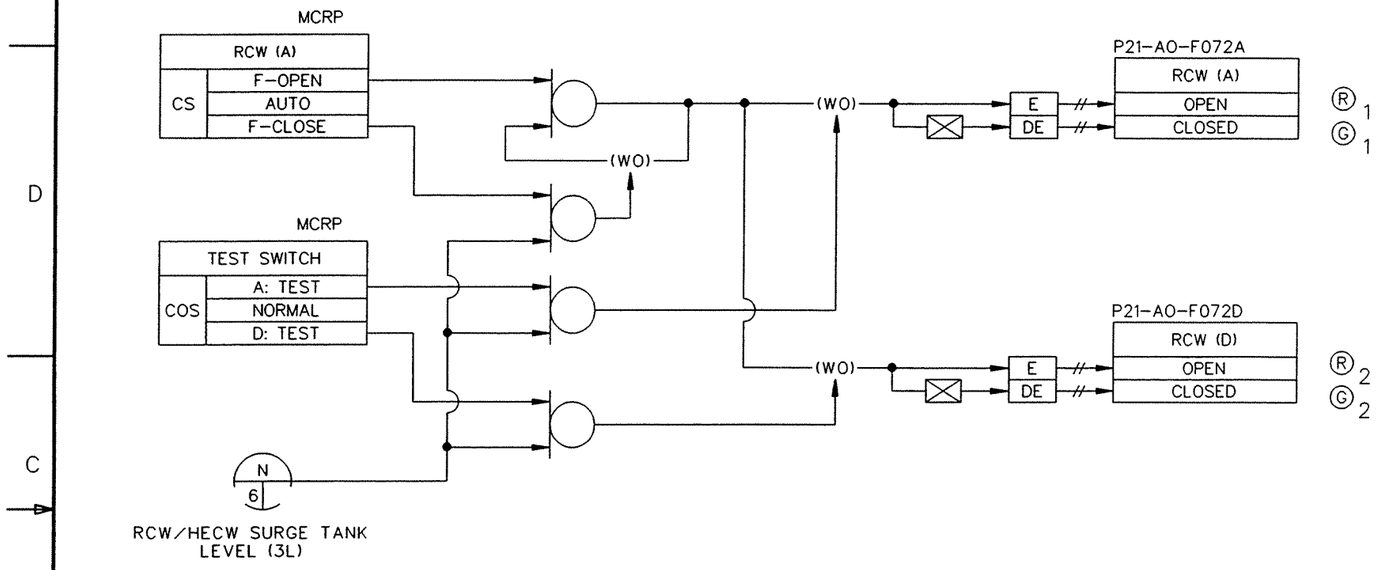
CONTROL SWITCH
F-CLOSE / AUTO / OPEN — CS

OBSERVATIONAL MEASURES		
USE	SPECIFICATION	LOCATION
STATUS INDICATOR	Ⓖ Ⓡ	MCRP
	Ⓦ 1 Ⓦ 2 Ⓦ 3	MCRP

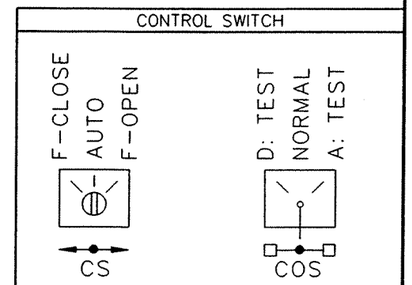
ANNUNCIATOR		
NO.	INDICATOR	LOCATION

OTHERS			
INSTANT INTERRUPTION COUNTER MEAS		NEED	
		NOT NEED	
VALVE	INCHING OPERATION	NEED	
		NOT NEED	
	SEATING FORM	OPEN SIDE	T
		CLOSED SIDE	L(T)
	THERMAL BYPASS	EXIST	O
		NOT EXIST	
SWGR PWR SUPPLY OBSERVATION		EXIST	O
		NOT EXIST	
ELECTRICAL SOL VLV PWR SUPPLY		AC V	
		DC V	

FIGURE 7.3-7 REACTOR BUILDING COOLING WATER/REACTOR SERVICE WATER SYSTEM IBD (Sheet 6 of 19)



RCW SAFETY-RELATED/NON SAFETY-RELATED SEPARATION VALVE

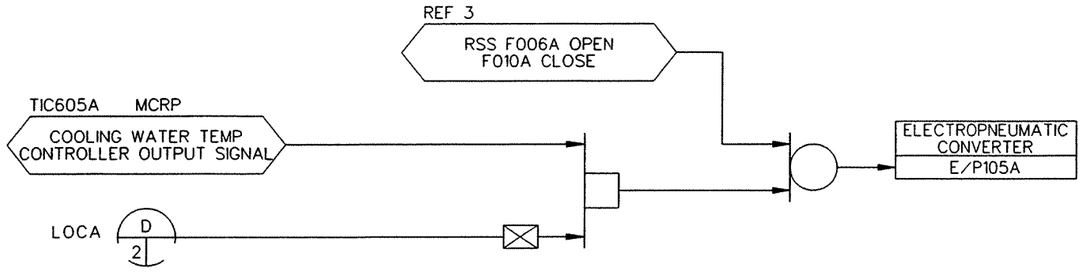


OBSERVATIONAL MEASURES		
USE	SPECIFICATION	LOCATION
STATUS INDICATOR	Ⓖ1 Ⓡ1 Ⓖ2 Ⓡ2	MCRP MCRP

ANNUNCIATOR		
NO.	INDICATOR	LOCATION

OTHERS			
INSTANT INTERRUPTION COUNTER MEAS		NEED	
		NOT NEED	
VALVE	INCHING OPERATION	NEED	
		NOT NEED	
	SEATING FORM	OPEN SIDE	
		CLOSED SIDE	
	THERMAL BYPASS	EXIST	
		NOT EXIST	
SWGR PWR SUPPLY OBSERVATION		EXIST	
		NOT EXIST	
ELECTRICAL SOL VLV PWR SUPPLY		AC V	
		DC 125V	

FIGURE 7.3-7 REACTOR BUILDING COOLING WATER/REACTOR SERVICE WATER SYSTEM IBD (Sheet 7 of 19)



F006A: RCW SUPPLIED COOLING WATER TEMP CONTROL VALVE (HX SIDE) (A)

F010A: RCW SUPPLIED COOLING WATER TEMP CONTROL VALVE (HX BYPASS SIDE) (A)

RCW COOLING WATER TEMP CONTROL VALVE

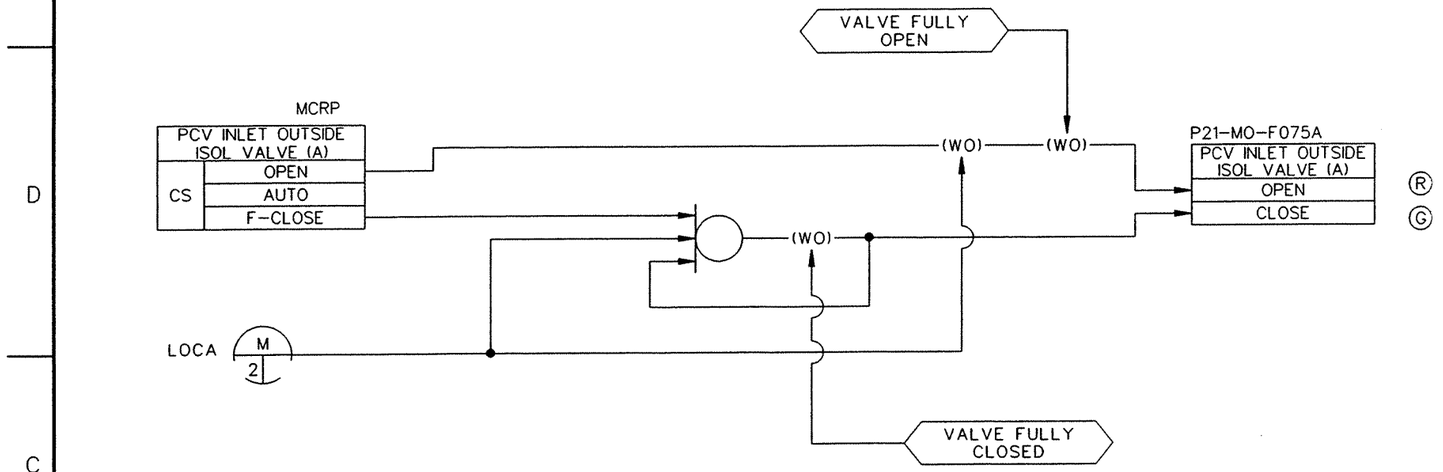
CONTROL SWITCH		

OBSERVATIONAL MEASURES		
USE	SPECIFICATION	LOCATION

ANNUNCIATOR		
NO.	INDICATOR	LOCATION

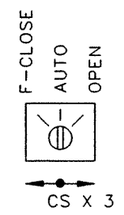
OTHERS			
INSTANT INTERRUPTION COUNTER MEAS		NEED	
		NOT NEED	
VALVE	INCHING OPERATION	NEED	
		NOT NEED	
	SEATING FORM	OPEN SIDE	
		CLOSED SIDE	
	THERMAL BYPASS	EXIST	
		NOT EXIST	
SWGR PWR SUPPLY OBSERVATION		EXIST	
		NOT EXIST	
ELECTRICAL SOL VLV PWR SUPPLY		AC V	
		DC V	

FIGURE 7.3-7 REACTOR BUILDING COOLING WATER/REACTOR SERVICE WATER SYSTEM IBD (Sheet 8 of 19)



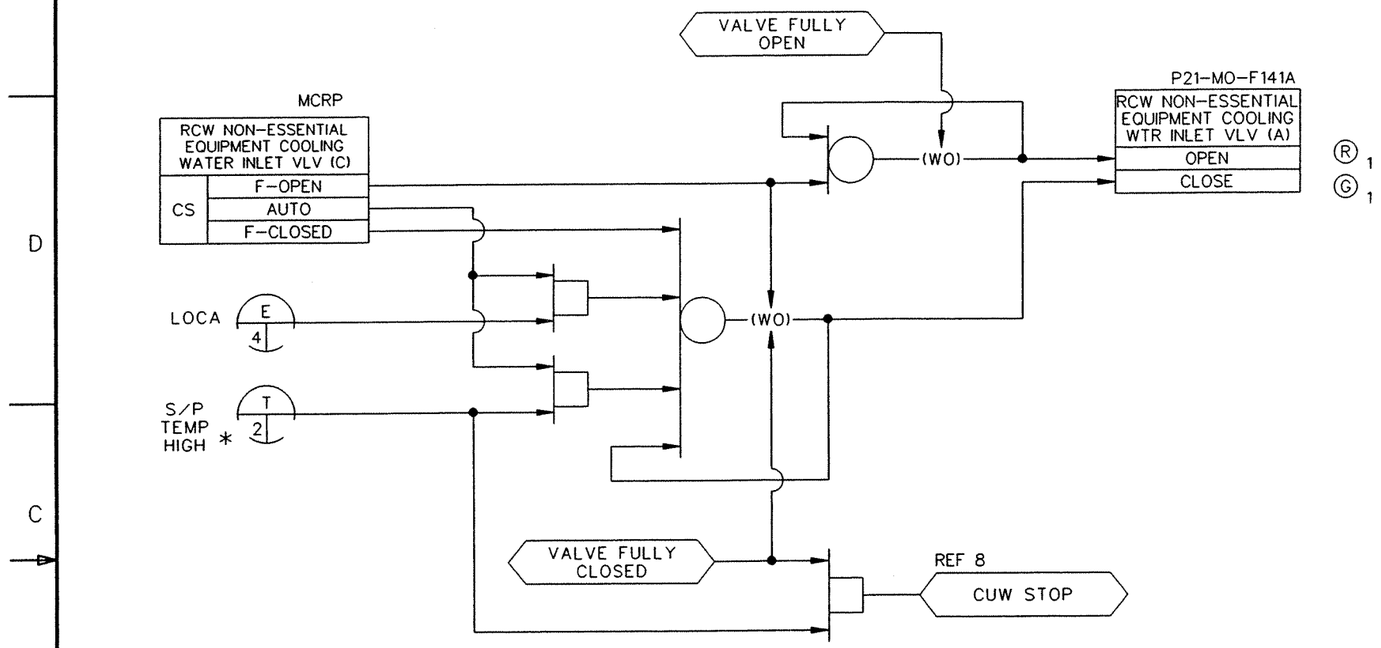
VALVE	VALVE NUMBER	SEATING FORM O-SIDE	SEATING FORM C-SIDE
PCV OUTLET OUTSIDE ISOLATION VALVE (A)	P21-MO-F081A	T	TL
PCV OUTLET INSIDE ISOLATION VALVE (A)	P21-MO-F080A	T	L(T)

PCV ISOLATION VALVE



CONTROL SWITCH			
OBSERVATIONAL MEASURES			
USE	SPECIFICATION		LOCATION
STATUS INDICATOR	G R		MCRP
ANNUNCIATOR			
NO.	INDICATOR		LOCATION
OTHERS			
INSTANT INTERRUPTION COUNTER MEAS		NEED	
		NOT NEED	
VALVE	INCHING OPERATION	NEED	
		NOT NEED	
	SEATING FORM	OPEN SIDE	T
		CLOSED SIDE	TL
	THERMAL BYPASS	EXIST	O
		NOT EXIST	
SWGR PWR SUPPLY OBSERVATION		EXIST	O
		NOT EXIST	
ELECTRICAL SOL VLV PWR SUPPLY		AC V	
		DC V	

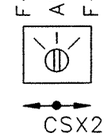
FIGURE 7.3-7 REACTOR BUILDING COOLING WATER/REACTOR SERVICE WATER SYSTEM IBD (Sheet 9 of 19)



RCW NON-ESSENTIAL EQUIPMENT COOLING WATER STOP VALVE P21-MO-F141A

TYPICAL FOR VALVES P21-MO-F101A,B
P21-MO-F175A,B
P21-MO-F176A,B

* FOR VALVES P21-MO-F101A,B ONLY

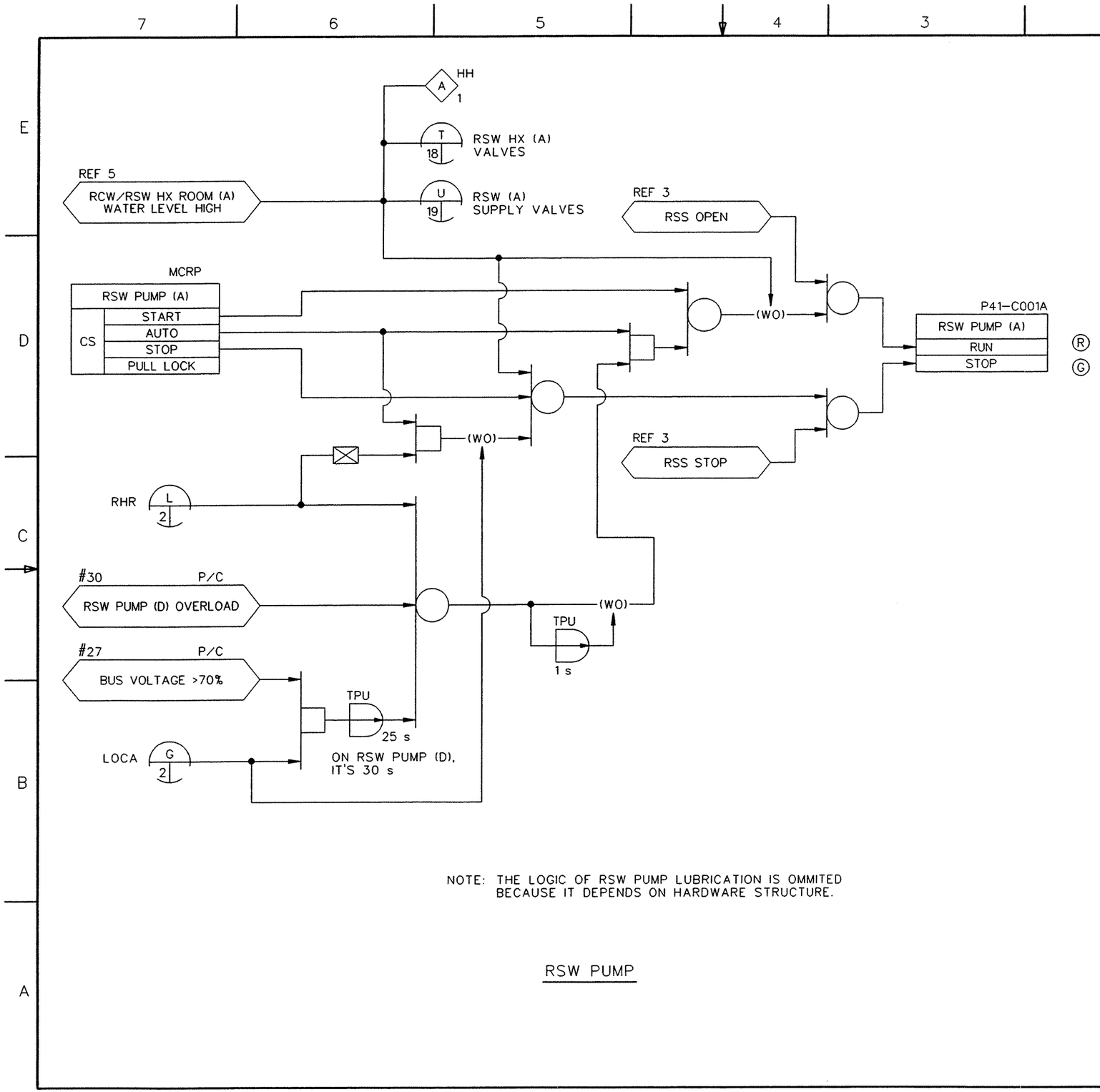
CONTROL SWITCH
F-CLOSE AUTO F-OPEN  CSX2

OBSERVATIONAL MEASURES		
USE	SPECIFICATION	LOCATION
STATUS INDICATOR	G 1 R 1 G 2 R 2	MCRP MCRP

ANNUNCIATOR		
NO.	INDICATOR	LOCATION

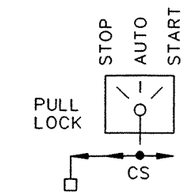
OTHERS			
INSTANT INTERRUPTION COUNTER MEAS		NEED	
		NOT NEED	
VALVE	INCHING OPERATION	NEED	
		NOT NEED	
	SEATING FORM	OPEN SIDE	T
		CLOSED SIDE	TL
	THERMAL BYPASS	EXIST	O
		NOT EXIST	
SWGR PWR SUPPLY OBSERVATION		EXIST	O
		NOT EXIST	
ELECTRICAL SOL VLV PWR SUPPLY		AC V	
		DC V	

FIGURE 7.3-7 REACTOR BUILDING COOLING WATER/REACTOR SERVICE WATER SYSTEM IBD (Sheet 10 of 19)



NOTE: THE LOGIC OF RSW PUMP LUBRICATION IS OMMITED BECAUSE IT DEPENDS ON HARDWARE STRUCTURE.

RSW PUMP



CONTROL SWITCH			
OBSERVATIONAL MEASURES			
USE	SPECIFICATION		LOCATION
STATUS INDICATOR	Ⓖ Ⓡ		MCRP
ANNUNCIATOR			
NO.	INDICATOR		LOCATION
1	RSW HIGH WATER LEVEL DIVISION A TRIP		MCR
OTHERS			
INSTANT INTERRUPTION COUNTER MEAS		NEED	
		NOT NEED	O
VALVE	INCHING OPERATION	NEED	
		NOT NEED	
	SEATING FORM	OPEN SIDE	
		CLOSED SIDE	
	THERMAL BYPASS	EXIST	
		NOT EXIST	
SWGR PWR SUPPLY OBSERVATION		EXIST	O
		NOT EXIST	
ELECTRICAL SOL VLV PWR SUPPLY		AC V	
		DC V	

FIGURE 7.3-7 REACTOR BUILDING COOLING WATER/REACTOR SERVICE WATER SYSTEM IBD (Sheet 11 of 19)

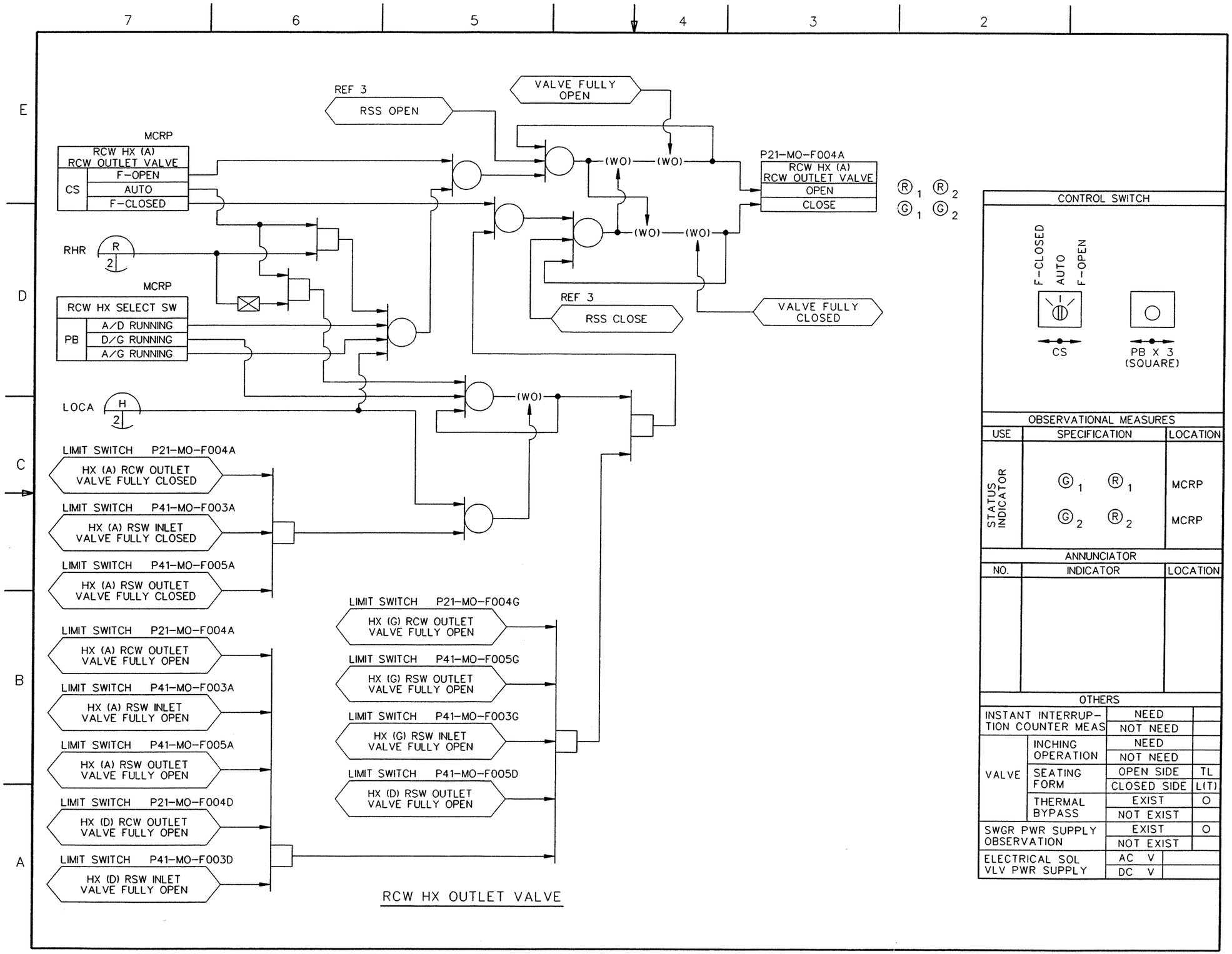
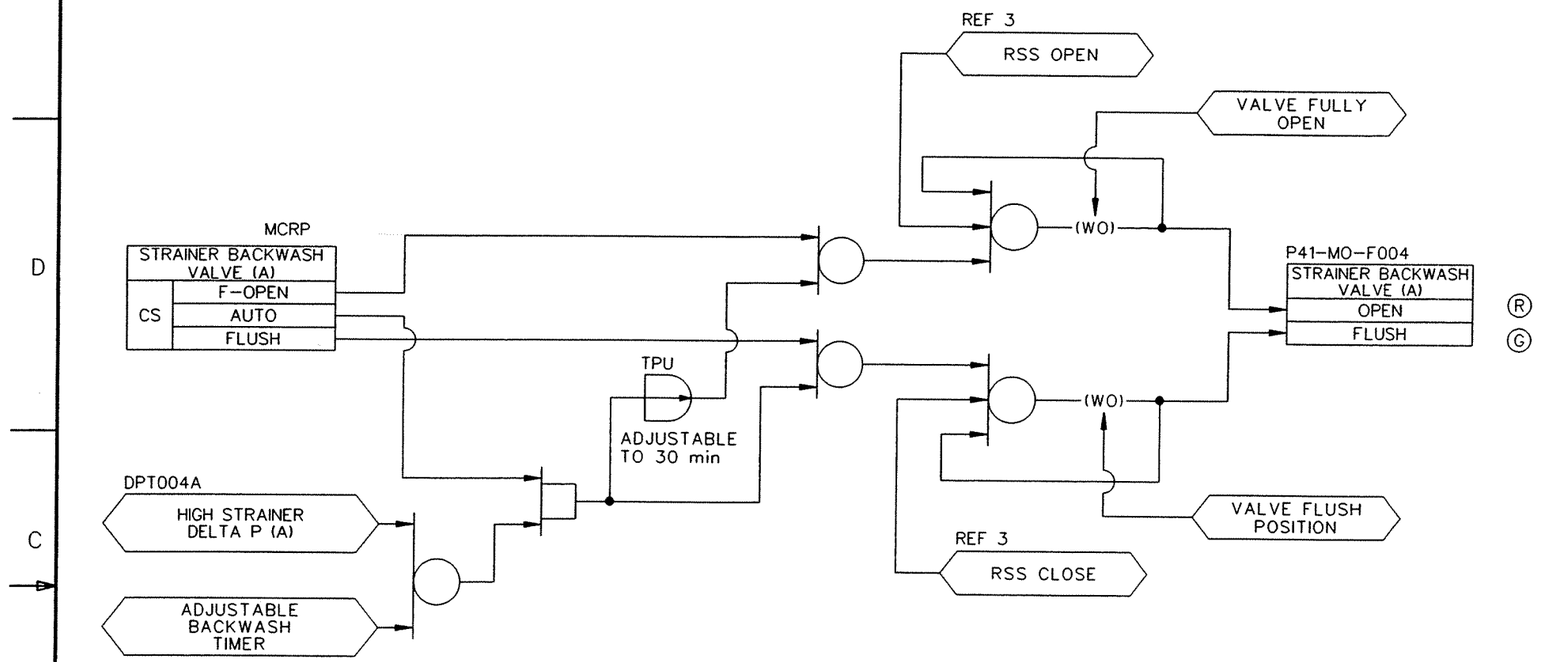


FIGURE 7.3-7 REACTOR BUILDING COOLING WATER/REACTOR SERVICE WATER SYSTEM IBD (Sheet 12 of 19)



STRAINER BACKWASH VALVE (A)

TYPICAL FOR P41-MO-F006(A) WITH FLUSH CHANGED TO F-OPEN AND OPEN CHANGED TO F-CLOSE

CONTROL SWITCH
FLUSH AUTO F-OPEN CS

OBSERVATIONAL MEASURES		
USE	SPECIFICATION	LOCATION
STATUS INDICATOR	Ⓖ Ⓡ	MCRP

ANNUNCIATOR		
NO.	INDICATOR	LOCATION

OTHERS			
INSTANT INTERRUPTION COUNTER MEAS		NEED	
		NOT NEED	
VALVE	INCHING OPERATION	NEED	
		NOT NEED	
	SEATING FORM	OPEN SIDE	TL
		CLOSED SIDE	L(T)
	THERMAL BYPASS	EXIST	O
		NOT EXIST	
SWGR PWR SUPPLY OBSERVATION		EXIST	O
		NOT EXIST	
ELECTRICAL SOL VLV PWR SUPPLY		AC V	
		DC V	

FIGURE 7.3-7 REACTOR BUILDING COOLING WATER/REACTOR SERVICE WATER SYSTEM IBD (Sheet 13 of 19)

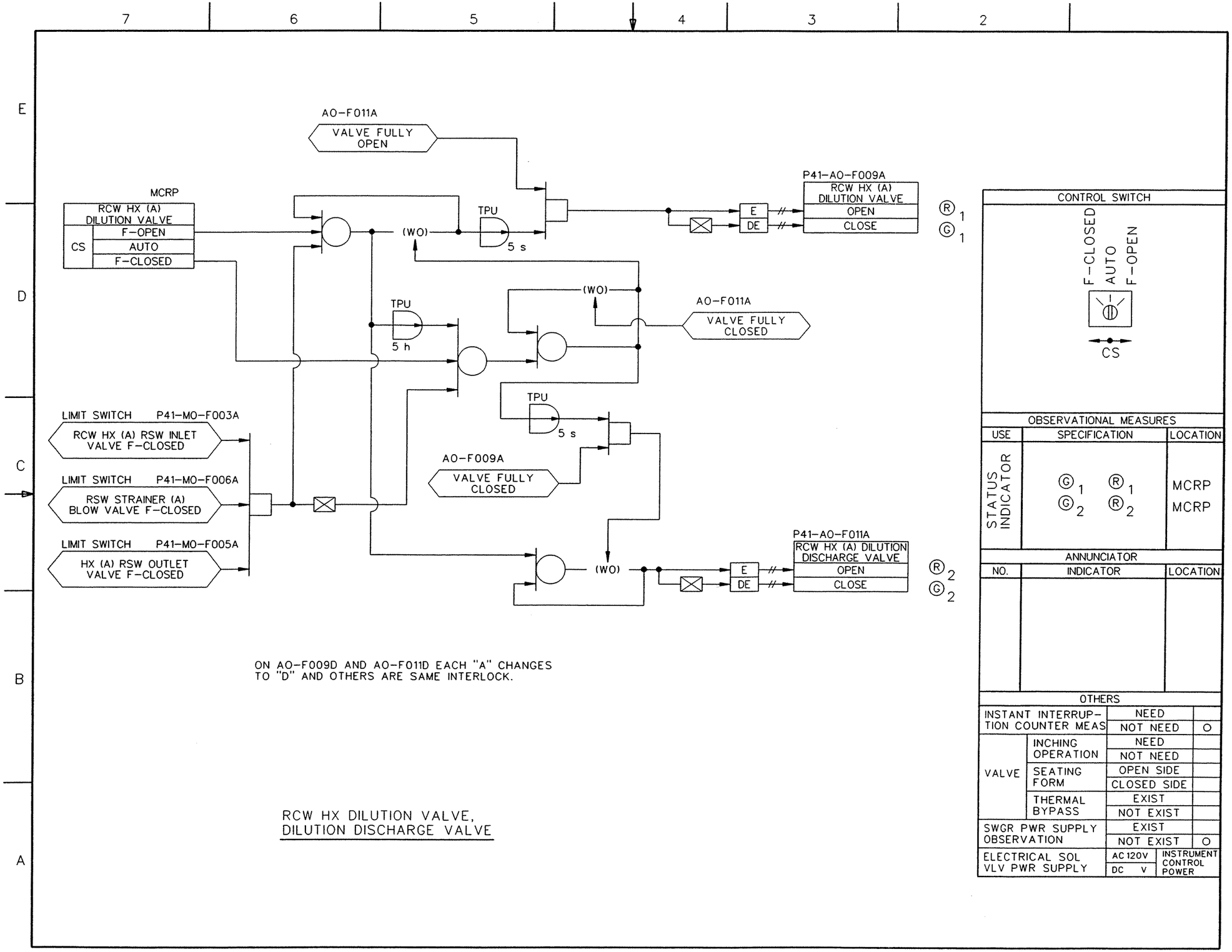
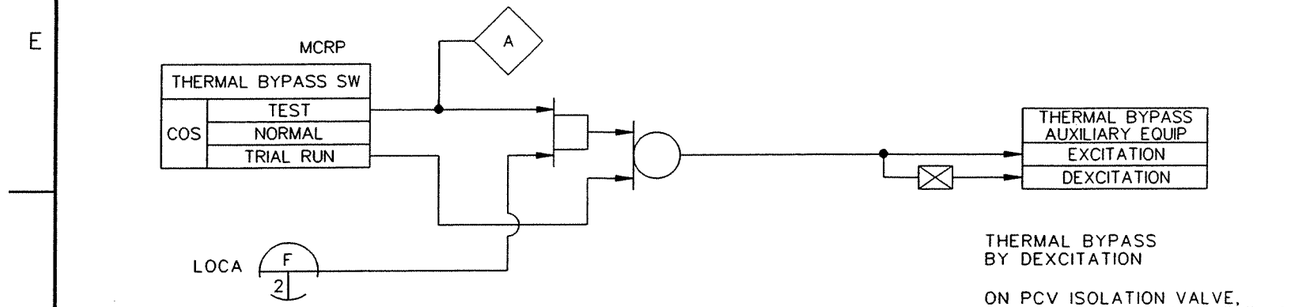
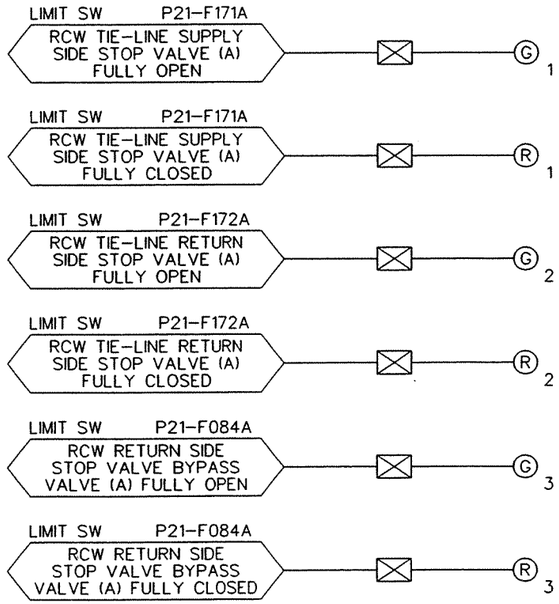


FIGURE 7.3-7 REACTOR BUILDING COOLING WATER/REACTOR SERVICE WATER SYSTEM IBD (Sheet 14 of 19)



THERMAL BYPASS
BY DEXCITATION

ON PCV ISOLATION VALVE,
VALVES OF SUBSYSTEM "A" USE
SUBSYSTEM "A" TEST SWITCH.
VALVES OF SUBSYSTEM "B" USE
SUBSYSTEM "B" TEST SWITCH.



MOTOR VALVE THERMAL BYPASS

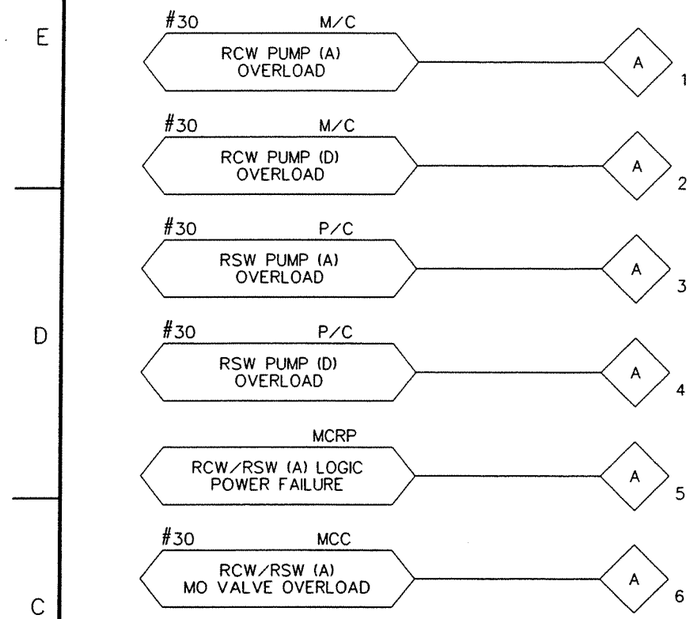
CONTROL SWITCH
TRIAL RUN / NORMAL / TEST CS THE KEY CAN BE PULLED OUT IN "NORMAL" POSITION

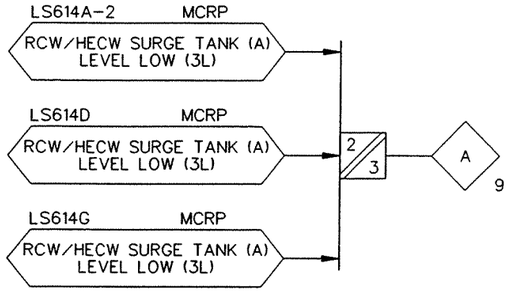
OBSERVATIONAL MEASURES		
USE	SPECIFICATION	LOCATION
STATUS INDICATOR	G 1 R 1	MCRP
	G 2 R 2	MCRP
	G 3 R 3	MCRP

ANNUNCIATOR		
NO.	INDICATOR	LOCATION
1	RCW/RSW (A) IS TESTING	MCRP

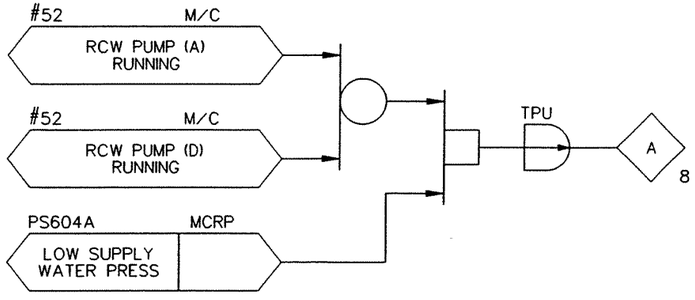
OTHERS			
INSTANT INTERRUPTION COUNTER MEAS		NEED	
		NOT NEED	
VALVE	INCHING OPERATION	NEED	
		NOT NEED	
	SEATING FORM	OPEN SIDE	
		CLOSED SIDE	
	THERMAL BYPASS	EXIST	
		NOT EXIST	
SWGR PWR SUPPLY OBSERVATION		EXIST	
		NOT EXIST	
ELECTRICAL SOL VLV PWR SUPPLY		AC V	
		DC V	

FIGURE 7.3-7 REACTOR BUILDING COOLING WATER/REACTOR SERVICE WATER SYSTEM IBD (Sheet 15 of 19)





NO.	INDICATOR	LOCATION
1	RCW PUMP (A) OVERLOAD/TRIP	MCRP
2	RCW PUMP (D) OVERLOAD/TRIP	MCRP
3	RSW PUMP (A) OVERLOAD/TRIP	MCRP
4	RSW PUMP (D) OVERLOAD/TRIP	MCRP
5	RCW/RSW (A) LOGIC POWER FAILURE	MCRP
6	RCW/RSW (A) MOTOR VALVE OVERLOAD/TRIP	MCRP
7		
8	RCW (A) LOW SUPPLY COOLING WATER PRESSURE	MCRP
9	RCW/HECW SURGE TANK (A) LEVEL LOW (3L)	MCRP

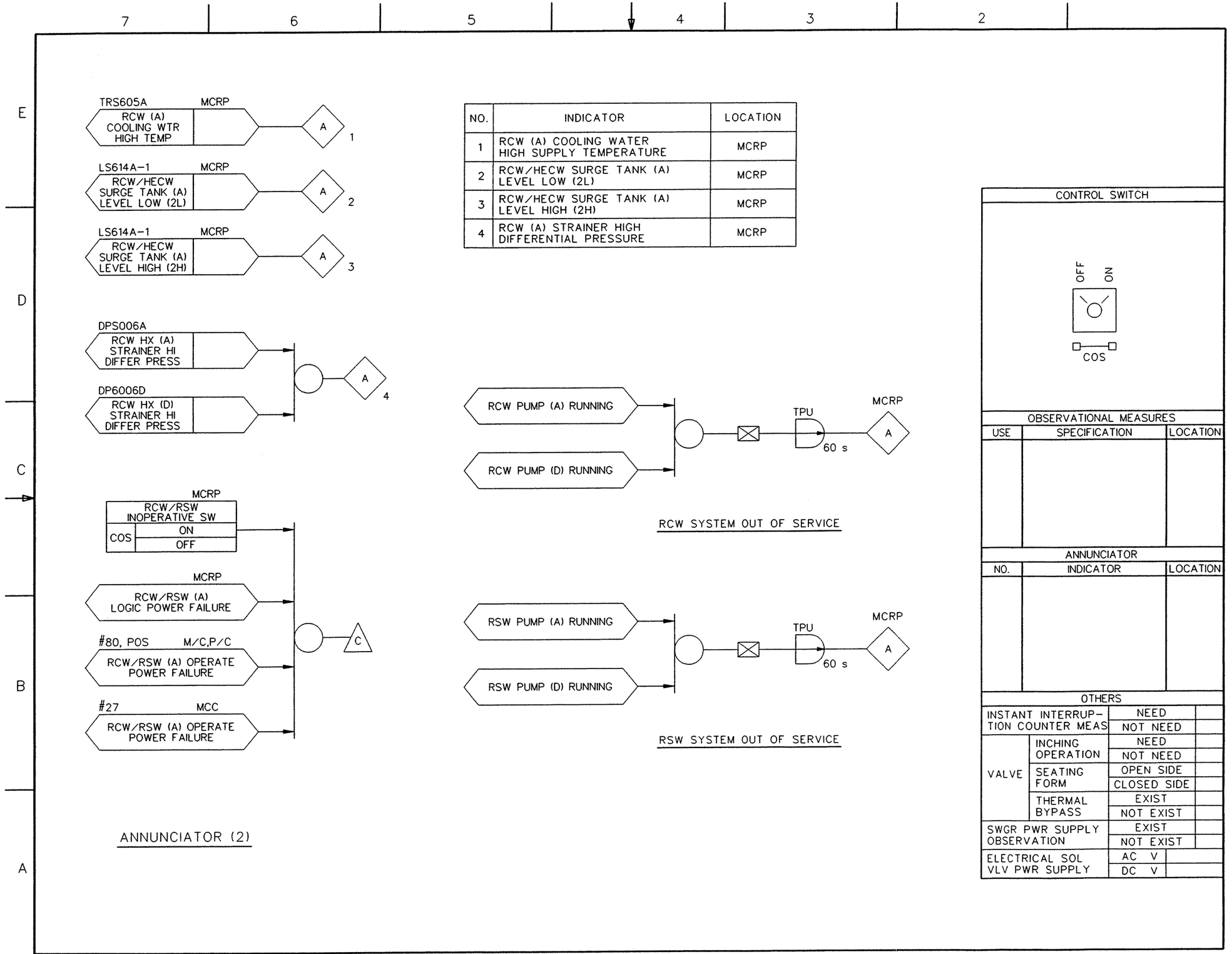


ANNUNCIATOR (1)

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

OTHERS			
INSTANT INTERRUPTION COUNTER MEAS		NEED	
		NOT NEED	
VALVE	INCHING OPERATION	NEED	
		NOT NEED	
	SEATING FORM	OPEN SIDE	
		CLOSED SIDE	
	THERMAL BYPASS	EXIST	
		NOT EXIST	
SWGR PWR SUPPLY OBSERVATION		EXIST	
		NOT EXIST	
ELECTRICAL SOL VLV PWR SUPPLY		AC V	
		DC V	

FIGURE 7.3-7 REACTOR BUILDING COOLING WATER/REACTOR SERVICE WATER SYSTEM IBD (Sheet 16 of 19)



NO.	INDICATOR	LOCATION
1	RCW (A) COOLING WATER HIGH SUPPLY TEMPERATURE	MCRP
2	RCW/HECW SURGE TANK (A) LEVEL LOW (2L)	MCRP
3	RCW/HECW SURGE TANK (A) LEVEL HIGH (2H)	MCRP
4	RCW (A) STRAINER HIGH DIFFERENTIAL PRESSURE	MCRP

OBSERVATIONAL MEASURES

USE	SPECIFICATION	LOCATION

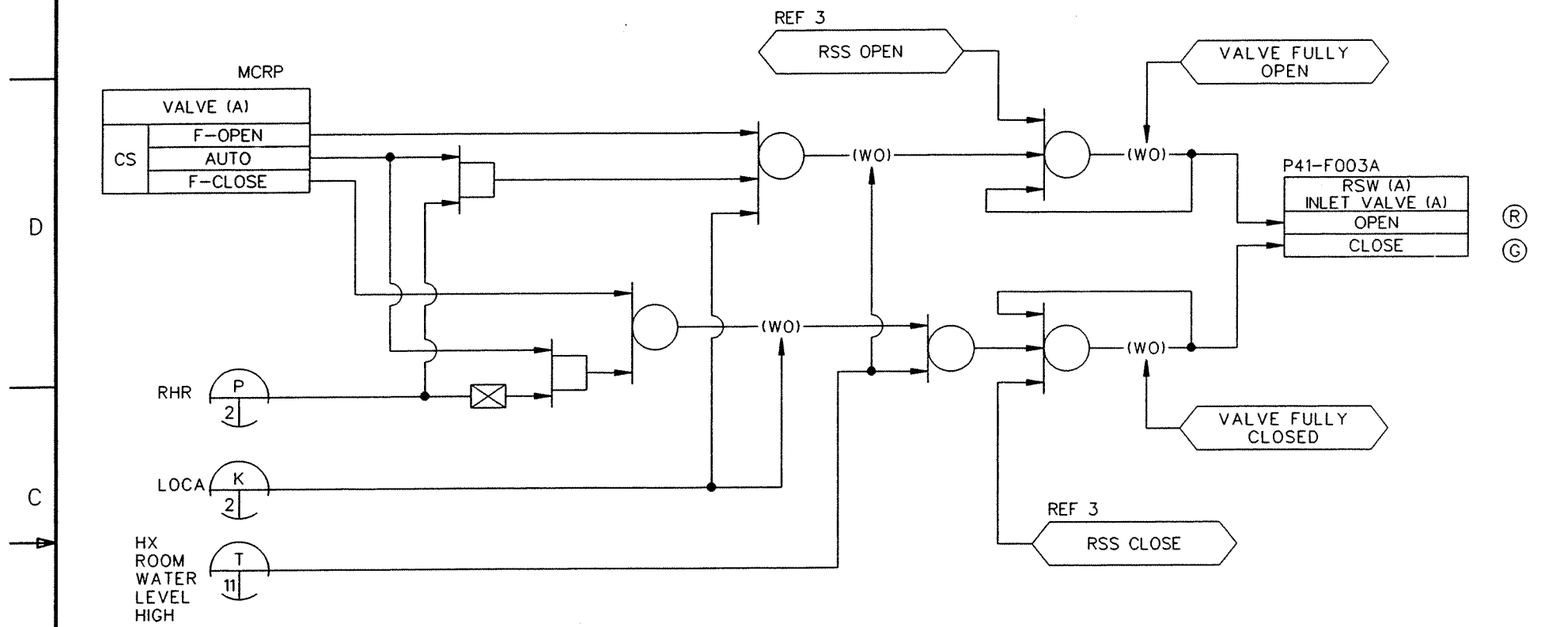
ANNUNCIATOR

NO.	INDICATOR	LOCATION

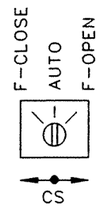
OTHERS

INSTANT INTERRUPTION COUNTER MEAS		NEED	
		NOT NEED	
VALVE	INCHING OPERATION	NEED	
		NOT NEED	
	SEATING FORM	OPEN SIDE	
		CLOSED SIDE	
	THERMAL BYPASS	EXIST	
		NOT EXIST	
SWGR PWR SUPPLY OBSERVATION		EXIST	
		NOT EXIST	
ELECTRICAL SOL VLV PWR SUPPLY		AC V	
		DC V	

FIGURE 7.3-7 REACTOR BUILDING COOLING WATER/REACTOR SERVICE WATER SYSTEM IBD (Sheet 17 of 19)



CONTROL SWITCH



OBSERVATIONAL MEASURES		
USE	SPECIFICATION	LOCATION
STATUS INDICATOR	Ⓖ Ⓡ	MCRP

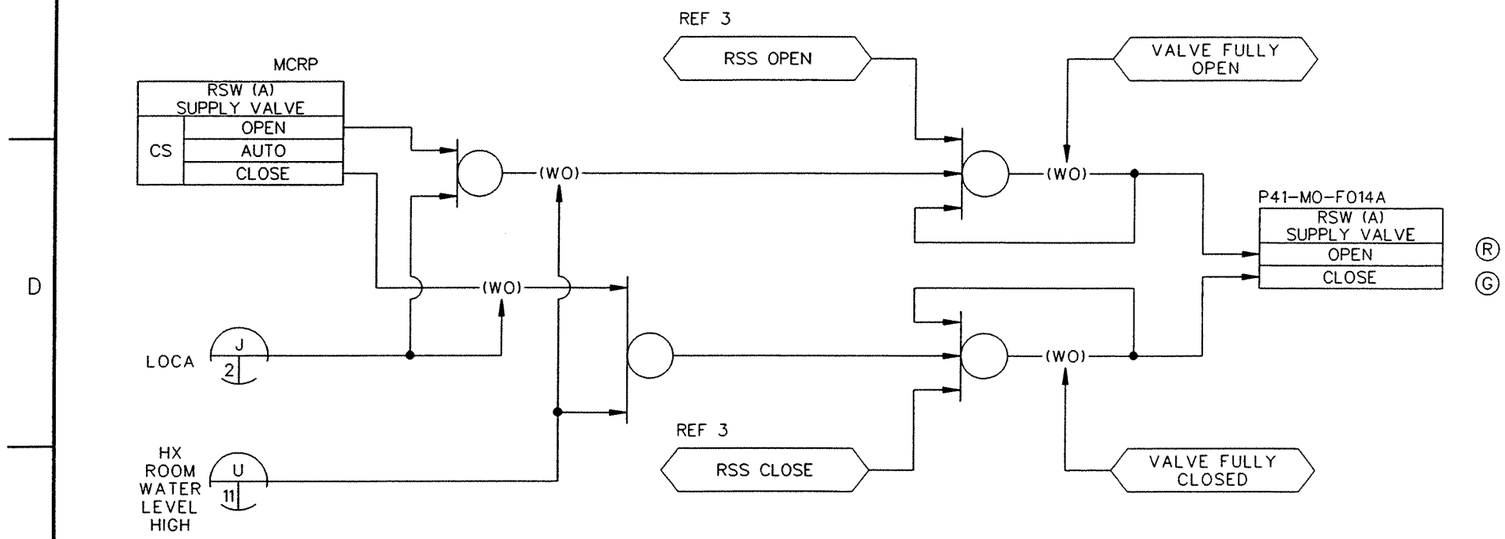
ANNUNCIATOR		
NO.	INDICATOR	LOCATION

OTHERS			
INSTANT INTERRUPTION COUNTER MEAS		NEED	
		NOT NEED	
VALVE	INCHING OPERATION	NEED	
		NOT NEED	
	SEATING FORM	OPEN SIDE	TL
		CLOSED SIDE	L(T)
	THERMAL BYPASS	EXIST	O
		NOT EXIST	
SWGR PWR SUPPLY OBSERVATION		EXIST	O
		NOT EXIST	
ELECTRICAL SOL VLV PWR SUPPLY		AC V	
		DC V	

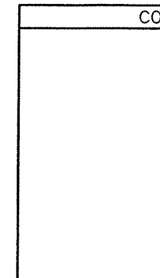
RCW HX/RSW (A) INLET VALVE (P41-F003A)

TYPICAL FOR RSW HX (A) OUTLET VALVE P41-F005A
TYPICAL FOR RSW STRAINER OUTLET VALVE P41-F013A

FIGURE 7.3-7 REACTOR BUILDING COOLING WATER/REACTOR SERVICE WATER SYSTEM IBD (Sheet 18 of 19)



RSW (A) SUPPLY VALVE P41-F014A
(TYPICAL FOR P41-F015A)



OBSERVATIONAL MEASURES		
USE	SPECIFICATION	LOCATION
STATUS INDICATOR	Ⓖ Ⓡ	MCRP

ANNUNCIATOR		
NO.	INDICATOR	LOCATION

OTHERS			
INSTANT INTERRUPTION COUNTER MEAS		NEED	
		NOT NEED	
VALVE	INCHING OPERATION	NEED	
		NOT NEED	
	SEATING FORM	OPEN SIDE	TL
		CLOSED SIDE	T
	THERMAL BYPASS	EXIST	O
		NOT EXIST	
SWGR PWR SUPPLY OBSERVATION		EXIST	O
		NOT EXIST	
ELECTRICAL SOL VLV PWR SUPPLY		AC V	
		DC V	

FIGURE 7.3-7 REACTOR BUILDING COOLING WATER/REACTOR SERVICE WATER SYSTEM IBD (Sheet 19 of 19)

NO.	TITLE
1	NOTES, CONTENTS
2	HECW PUMP (A&D) (1)
3	HECW PUMP (A&D) (2)
4	HECW PUMP (A&D) (3)
5	HECW REFRIGERATOR (A) COMPRESSOR
6	HECW PUMP (B&E) (1)
7	HECW PUMP (B&E) (2)
8	HECW PUMP (B&E) (3)
9	HECW REFRIGERATOR (A) REACTOR BUILDING COOLING WATER INLET VALVE (P21)
10	HECW CHILLED WATER IN-OUT PRESSURE DIFFERENCE CONTROL VALVE
11	ANNUNCIATOR

NOTES:

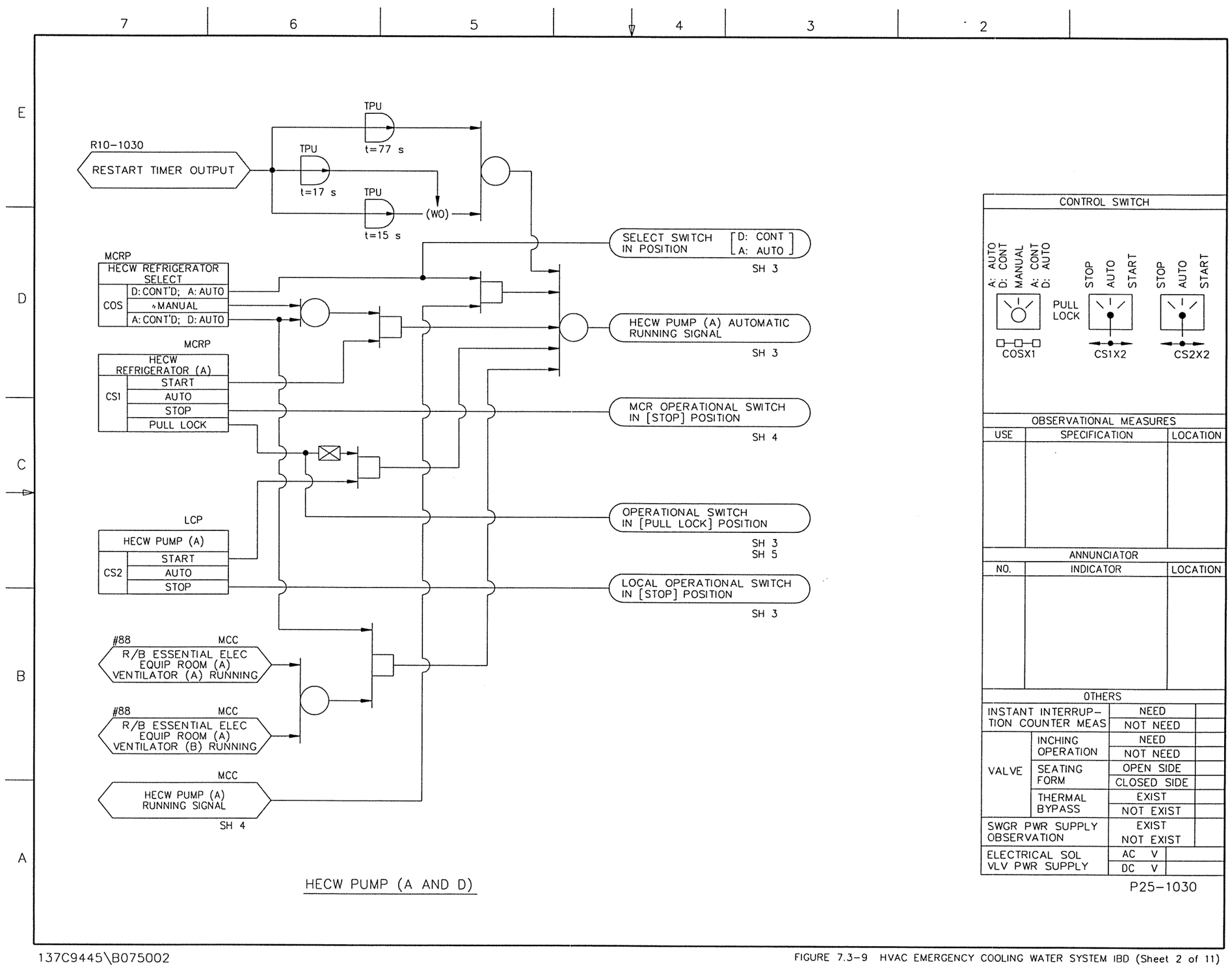
1. UNLESS OTHERWISE NOTED, THE EQUIPMENT NUMBERS SHOWN ON THIS DIAGRAM ARE PREFIXED WITH P25.
2. UNLESS OTHERWISE NOTED, THE POWER SUPPLY FOR SUPPORTING EQUIPMENT IS FROM THE ESSENTIAL POWER.
3. "#" FIXED NUMBERS IN THIS DIAGRAM INDICATE THE SWGR FUNTIONAL NUMBERS.
4. THE LOGIC OF REFRIGERATOR IS OMITTED BECAUSE IT DEPENDS ON HARDWARE STRUCTURE.

REFERENCE DOCUMENT	MPL NO.
1. HVAC EMERGENCY COOLING WATER SYS P&ID	P25-1010
2. REACTOR BUILDING COOLING WATER SYS P&ID	P21-1010
3. REACTOR BUILDING COOLING WATER SYS/ REACTOR SERVICE WATER SYS IBD	P21/P41-1030

P25-1030

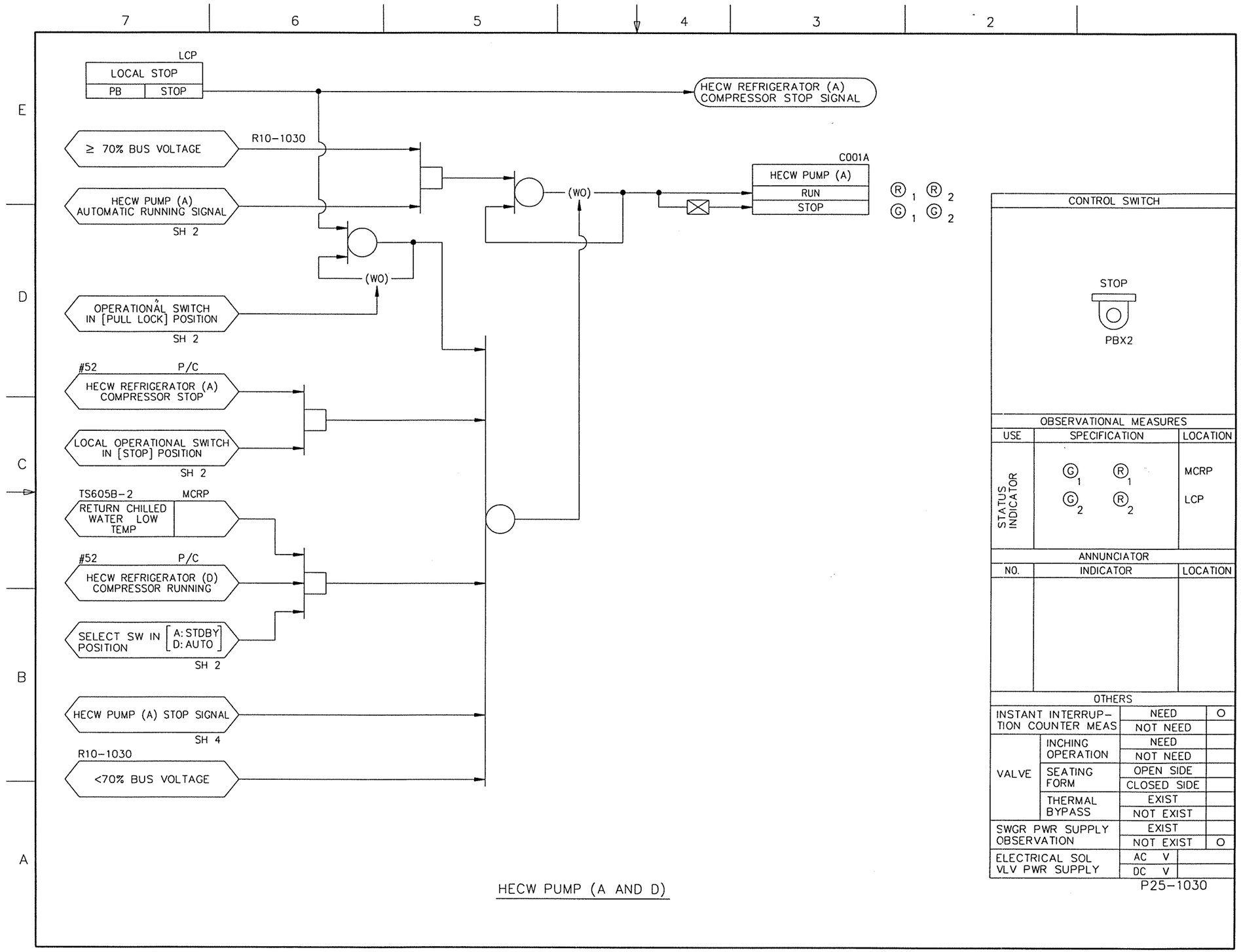
137C9445\B075001

FIGURE 7.3-9 HVAC EMERGENCY COOLING WATER SYSTEM IBD (Sheet 1 of 11)



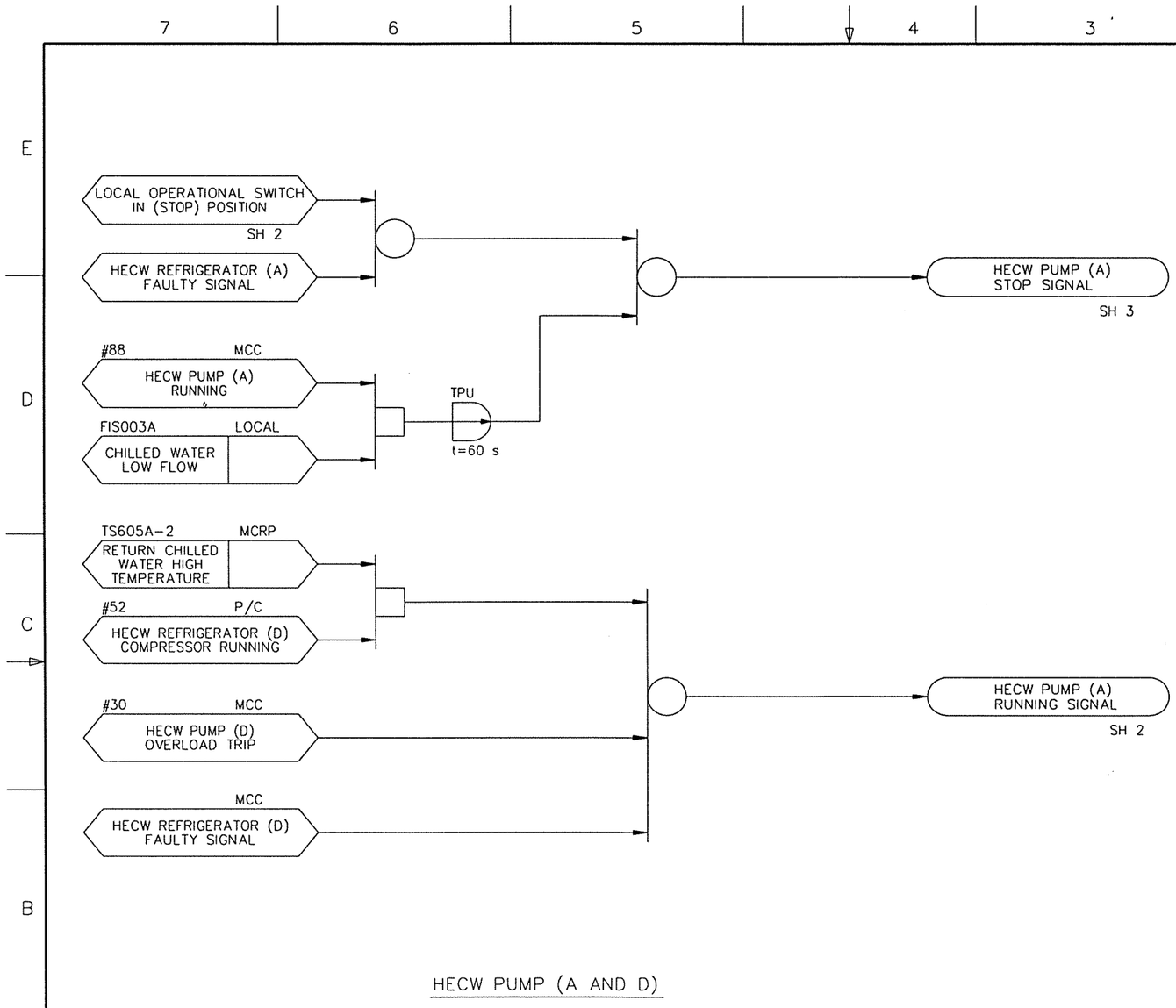
137C9445\B075002

FIGURE 7.3-9 HVAC EMERGENCY COOLING WATER SYSTEM IBD (Sheet 2 of 11)



137C9445\B075003

FIGURE 7.3-9 HVAC EMERGENCY COOLING WATER SYSTEM IBD (Sheet 3 of 11)



HECW PUMP (A AND D)

CONTROL SWITCH			

OBSERVATIONAL MEASURES		
USE	SPECIFICATION	LOCATION

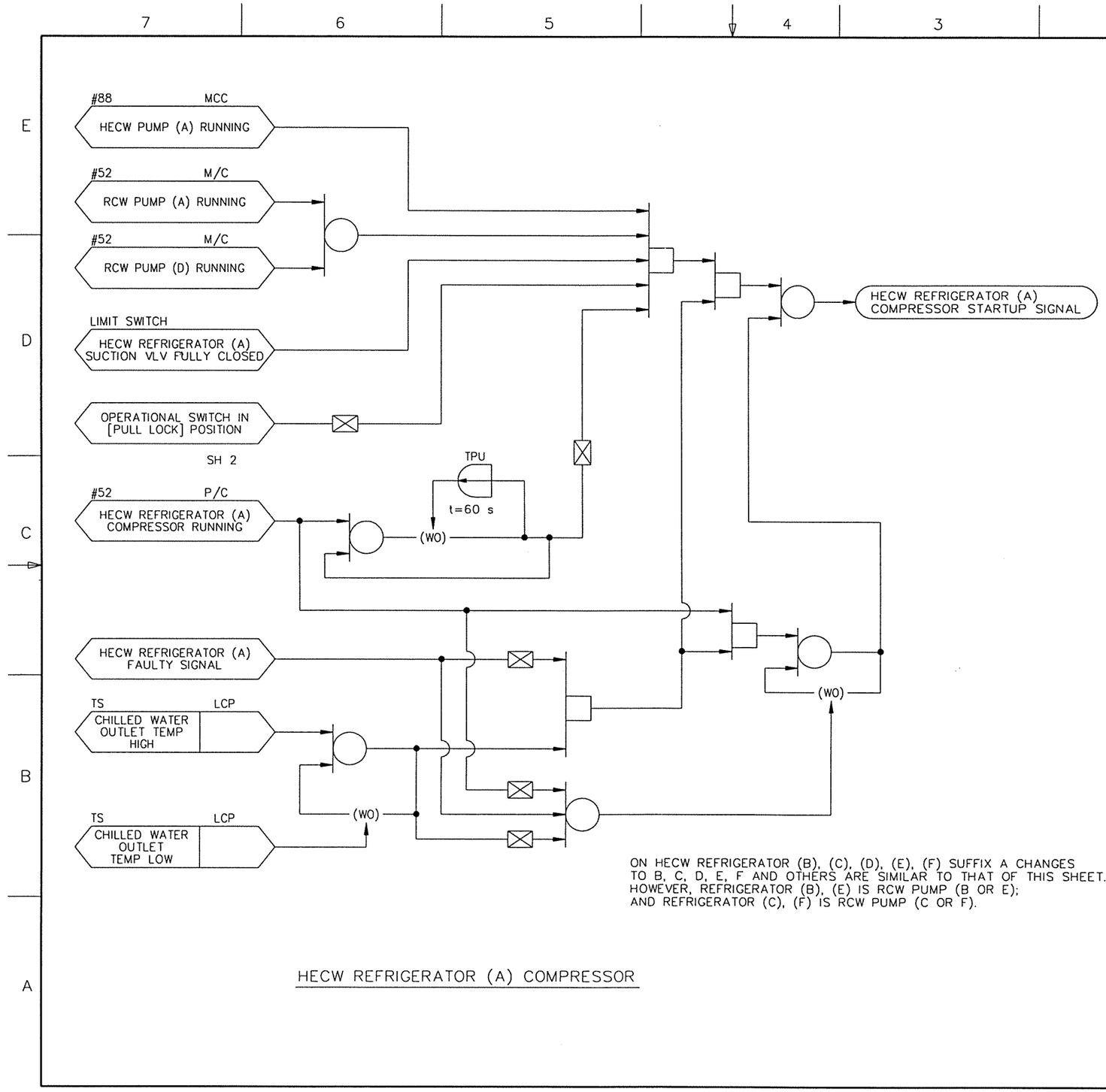
ANNUNCIATOR		
NO.	INDICATOR	LOCATION

OTHERS			
INSTANT INTERRUPTION COUNTER MEAS		NEED	
		NOT NEED	
VALVE	INCHING OPERATION	NEED	
		NOT NEED	
	SEATING FORM	OPEN SIDE	
		CLOSED SIDE	
	THERMAL BYPASS	EXIST	
		NOT EXIST	
SWGR PWR SUPPLY OBSERVATION		EXIST	
		NOT EXIST	
ELECTRICAL SOL VLV PWR SUPPLY		AC V	
		DC V	

P25-1030

137C9445\B075004

FIGURE 7.3-9 HVAC EMERGENCY COOLING WATER SYSTEM IBD (Sheet 4 of 11)



CONTROL SWITCH		

OBSERVATIONAL MEASURES		
USE	SPECIFICATION	LOCATION

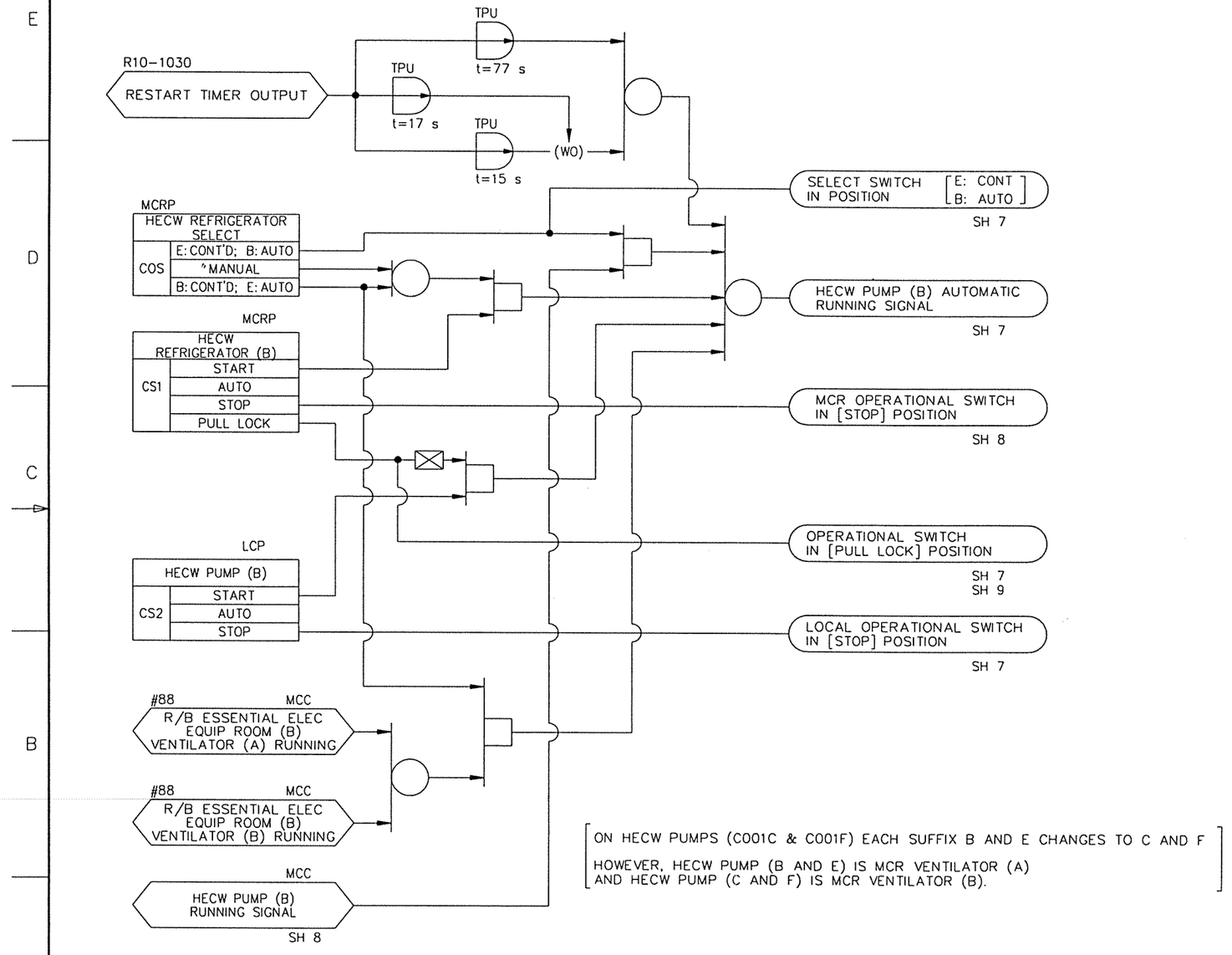
ANNUNCIATOR		
NO.	INDICATOR	LOCATION

OTHERS			
INSTANT INTERRUPTION COUNTER MEAS		NEED	
		NOT NEED	
VALVE	INCHING OPERATION	NEED	
		NOT NEED	
	SEATING FORM	OPEN SIDE	
		CLOSED SIDE	
	THERMAL BYPASS	EXIST	
		NOT EXIST	
SWGR PWR SUPPLY OBSERVATION		EXIST	
		NOT EXIST	
ELECTRICAL SOL VLV PWR SUPPLY		AC V	
		DC V	

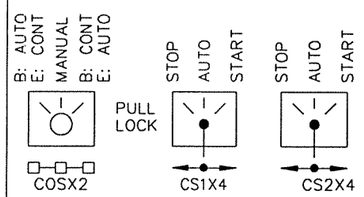
P25-1030

137C9445\B075005

FIGURE 7.3-9 HVAC EMERGENCY COOLING WATER SYSTEM IBD (Sheet 5 of 11)



CONTROL SWITCH



OBSERVATIONAL MEASURES		
USE	SPECIFICATION	LOCATION

ANNUNCIATOR		
NO.	INDICATOR	LOCATION

OTHERS			
INSTANT INTERRUPTION COUNTER MEAS		NEED	
		NOT NEED	
VALVE	INCHING OPERATION	NEED	
		NOT NEED	
	SEATING FORM	OPEN SIDE	
		CLOSED SIDE	
	THERMAL BYPASS	EXIST	
		NOT EXIST	
SWGR PWR SUPPLY OBSERVATION		EXIST	
		NOT EXIST	
ELECTRICAL SOL VLV PWR SUPPLY		AC V	
		DC V	

P25-1030

137C9445\B075006

FIGURE 7.3-9 HVAC EMERGENCY COOLING WATER SYSTEM IBD (Sheet 6 of 11)

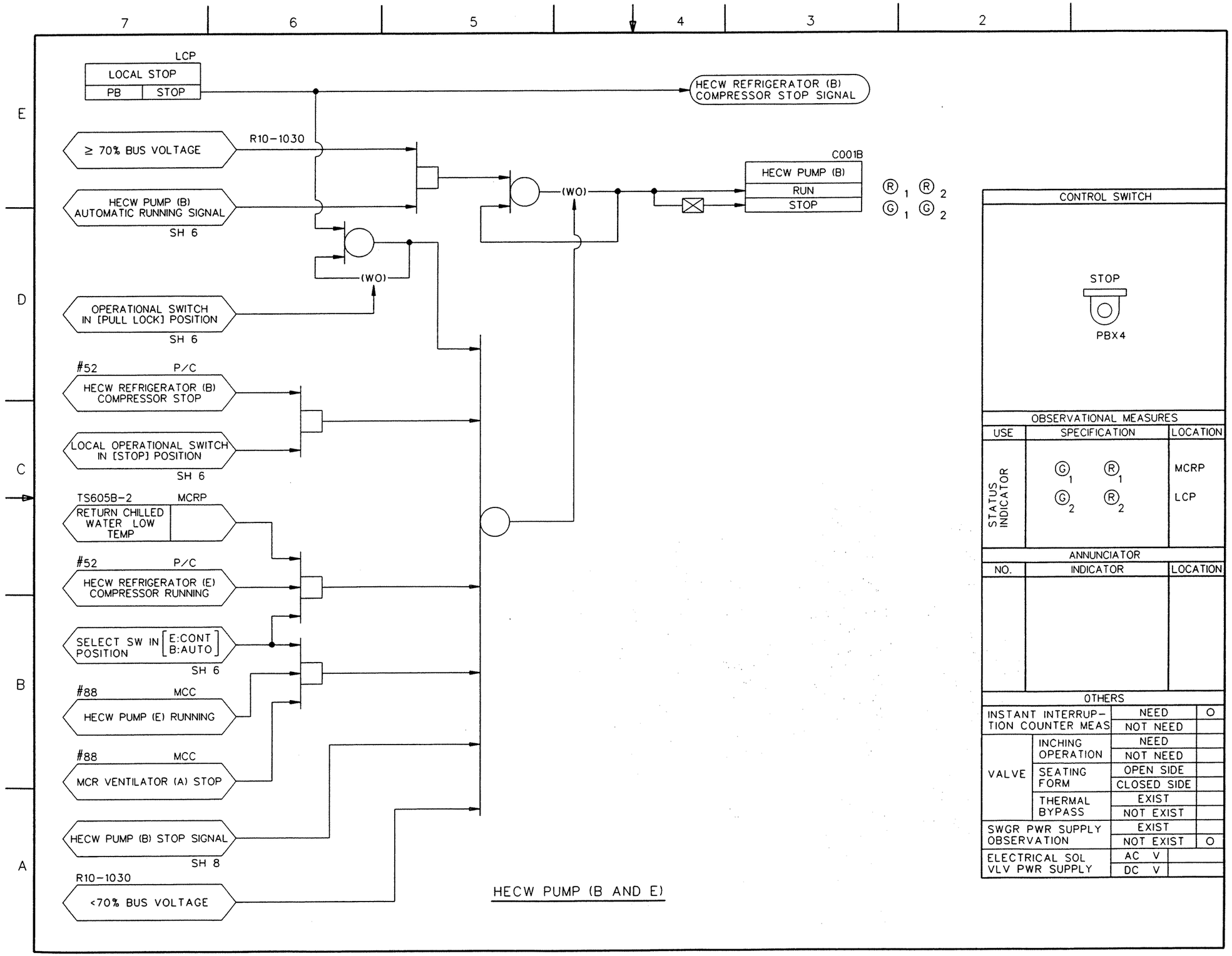
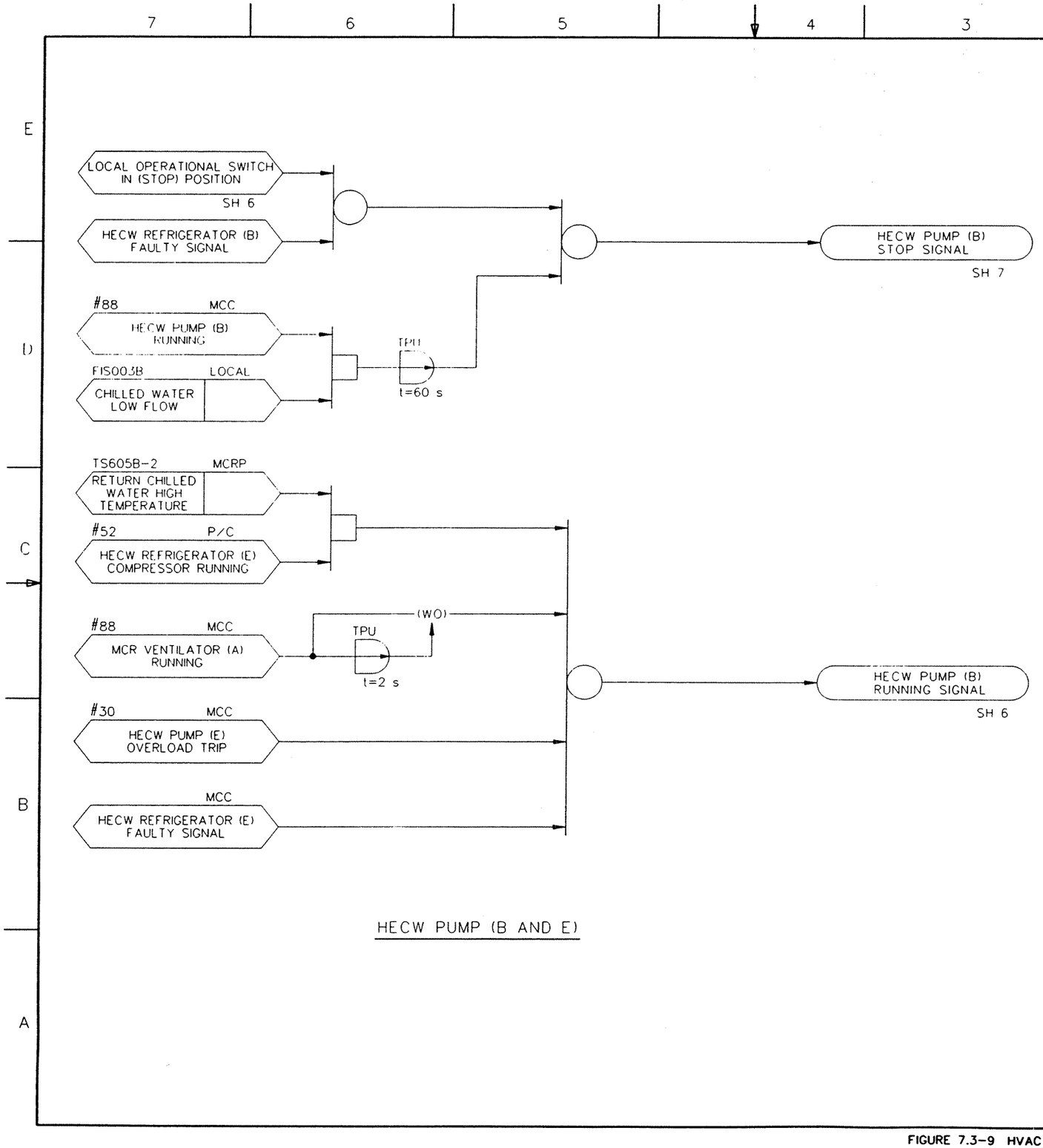


Figure 7.3-9 HVAC EMERGENCY COOLING WATER SYSTEM IBD (Sheet 7 of 11)



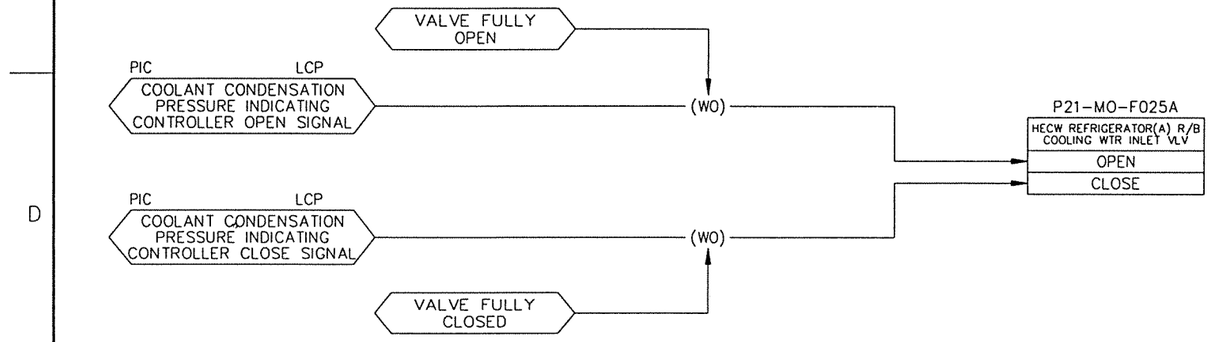
CONTROL SWITCH		

OBSERVATIONAL MEASURES		
USE	SPECIFICATION	LOCATION

ANNUNCIATOR		
NO.	INDICATOR	LOCATION

OTHERS			
INSTANT INTERRUPTION COUNTER MEAS		NEED	
		NOT NEED	
VALVE	INCHING OPERATION	NEED	
		NOT NEED	
	SEATING FORM	OPEN SIDE	
		CLOSED SIDE	
	THERMAL BYPASS	EXIST	
		NOT EXIST	
SWGR PWR SUPPLY OBSERVATION		EXIST	
		NOT EXIST	
ELECTRICAL SOL VLV PWR SUPPLY		AC V	
		DC V	

FIGURE 7.3-9 HVAC EMERGENCY COOLING WATER SYSTEM IBD (Sheet 8 of 11)



ON HECW REFRIGERATOR (B), (C), (D), (E), (F) COOLING WATER INLET VALVE, SUFFIX A CHANGES TO B, C, D, E, F ARE SIMILAR TO THAT OF THIS SHEET.

REFRIGERATOR (A) COOLING WATER INLET VALVE

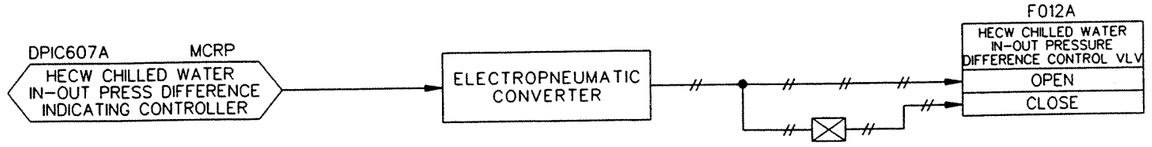
CONTROL SWITCH		

OBSERVATIONAL MEASURES		
USE	SPECIFICATION	LOCATION

ANNUNCIATOR		
NO.	INDICATOR	LOCATION

OTHERS			
INSTANT INTERRUPTION COUNTER MEAS		NEED	O
		NOT NEED	O
VALVE	INCHING OPERATION	NEED	
		NOT NEED	
	SEATING FORM	OPEN SIDE	LT
		CLOSED SIDE	LT
	THERMAL BYPASS	EXIST	
		NOT EXIST	
SWGR PWR SUPPLY OBSERVATION		EXIST	
		NOT EXIST	O
ELECTRICAL SOL VLV PWR SUPPLY		AC V	
		DC V	

P25-1030



ON HECW CHILLED WATER IN-OUT PRESSURE DIFFERENCE CONTROL VALVES (F012B, F012C) AND OTHERS ARE SIMILAR TO THAT OF THIS SHEET.

HECW CHILLED WATER IN-OUT PRESSURE DIFFERENCE CONTROL VALVE

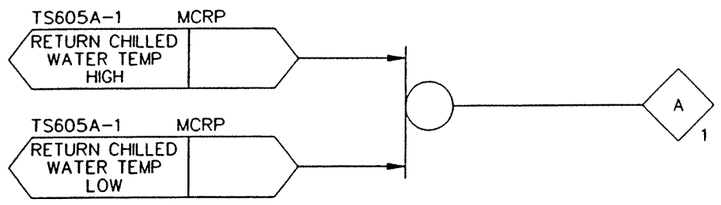
CONTROL SWITCH		

OBSERVATIONAL MEASURES		
USE	SPECIFICATION	LOCATION

ANNUNCIATOR		
NO.	INDICATOR	LOCATION

OTHERS			
INSTANT INTERRUPTION COUNTER MEAS		NEED	
		NOT NEED	
VALVE	INCHING OPERATION	NEED	
		NOT NEED	
	SEATING FORM	OPEN SIDE	
		CLOSED SIDE	
	THERMAL BYPASS	EXIST	
		NOT EXIST	
SWGR PWR SUPPLY OBSERVATION		EXIST	
		NOT EXIST	
ELECTRICAL SOL VLV PWR SUPPLY		AC V	
		DC V	

Figure 7.3-9 HVAC EMERGENCY COOLING WATER SYSTEM IBD (Sheet 10 of 11)



ON HECW PUMP (B AND E), (C AND F) SUFFIX A CHANGES TO B, C, AND ARE SIMILAR TO THAT OF THIS SHEET.

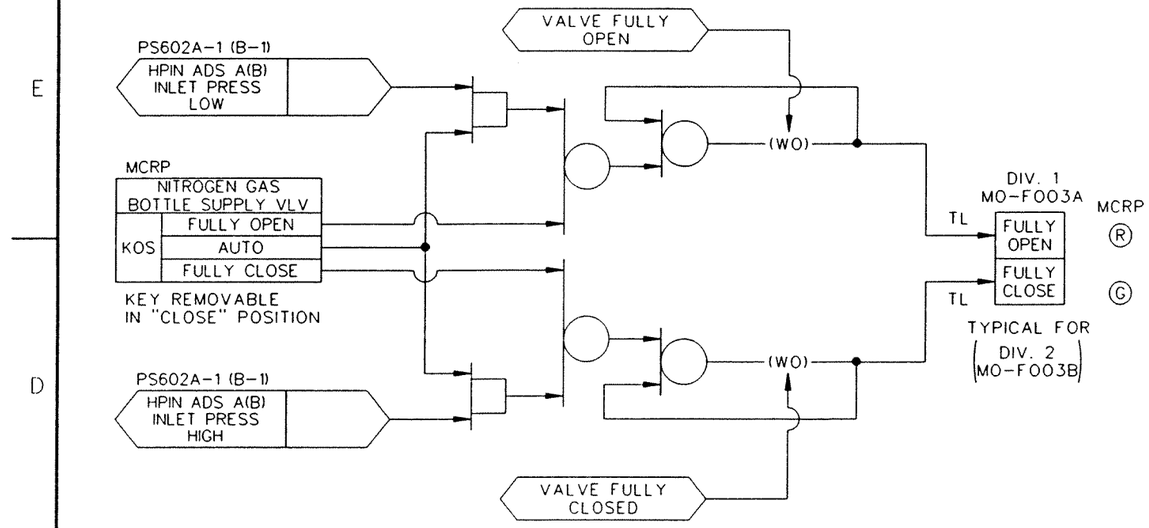
ANNUNCIATOR

CONTROL SWITCH		
OBSERVATIONAL MEASURES		
USE	SPECIFICATION	LOCATION

ANNUNCIATOR		
NO.	INDICATOR	LOCATION
1	HECW PUMP A RETURN CHILLED WATER TEMPERATURE HIGH/LOW	MCRP

OTHERS			
INSTANT INTERRUPTION COUNTER MEAS		NEED	
		NOT NEED	
VALVE	INCHING OPERATION	NEED	
		NOT NEED	
	SEATING FORM	OPEN SIDE	
		CLOSED SIDE	
	THERMAL BYPASS	EXIST	
		NOT EXIST	
SWGR PWR SUPPLY OBSERVATION		EXIST	
		NOT EXIST	
ELECTRICAL SOL VLV PWR SUPPLY		AC V	
		DC V	

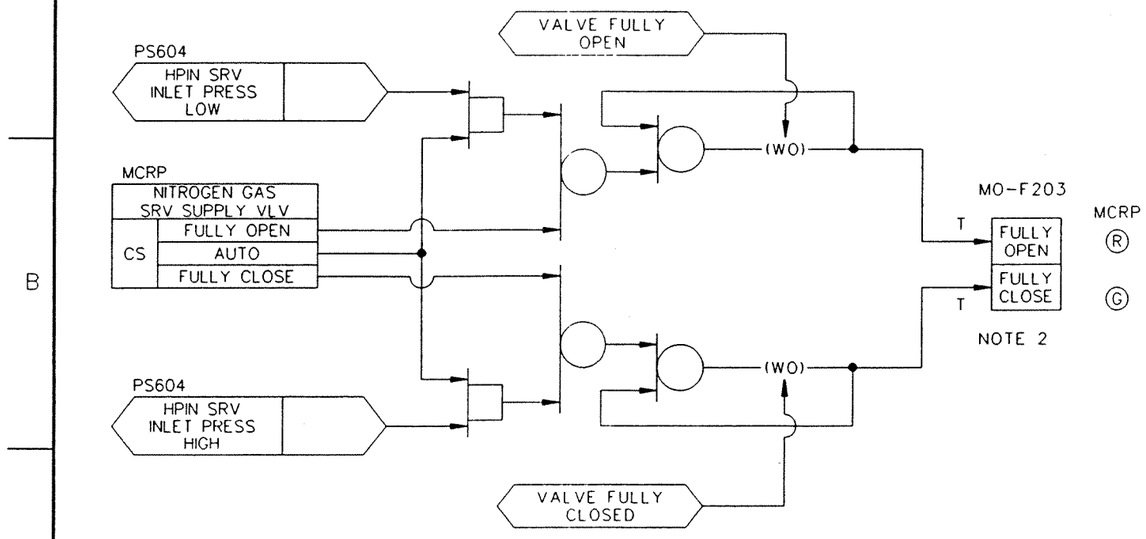
FIGURE 7.3-9 HVAC EMERGENCY COOLING WATER SYSTEM IBD (Sheet 11 of 11)



NITROGEN GAS BOTTLE SUPPLY MO-F003A

NOTES.

1. HPIN SYSTEM DIVISION – A IS POWERED FROM CLASS 1E DIVISION 1 AND HPIN SYSTEM DIVISION – B IS POWERED FROM CLASS 1E DIVISION 2.
2. THE NON-SAFETY RELATED PORTION OF HPIN IS POWERED FROM NON-CLASS 1E SOURCE.



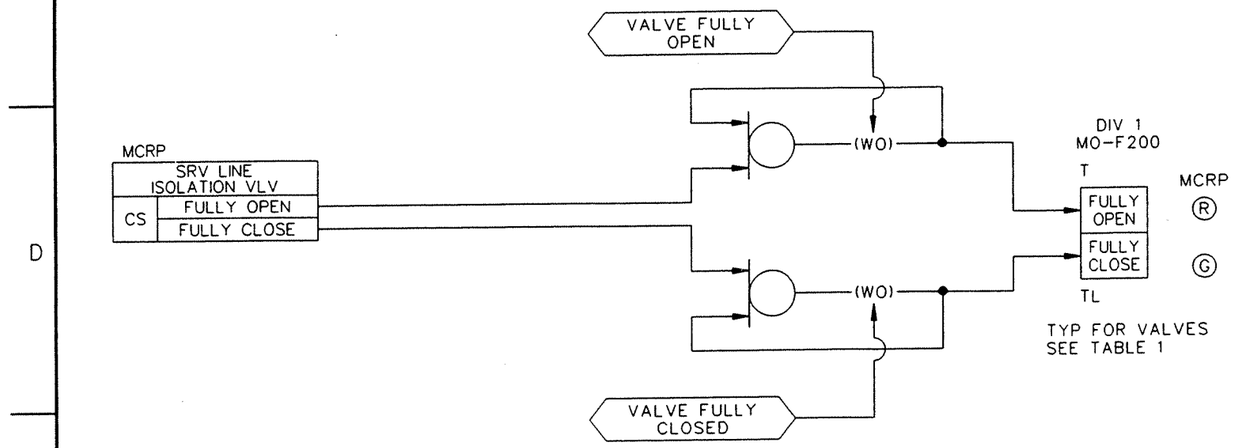
NITROGEN GAS SRV SUPPLY VALVE MO-F203

REFERENCE DOCUMENT:

	MPL NO.
1. HIGH PRESS NITROGEN GAS SUPPLY SYS P&ID	P54-1010

MPL NO. P54-1030

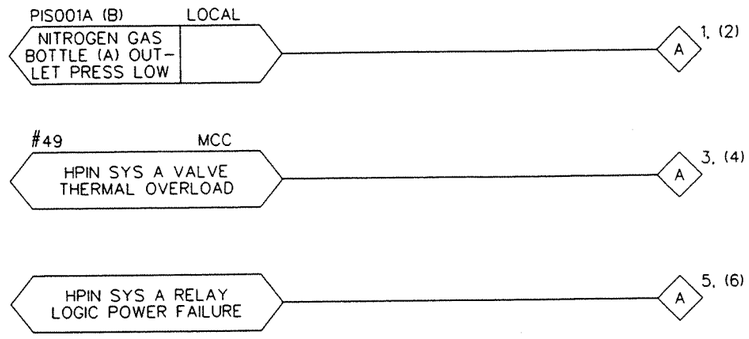
FIGURE 7.3-10 HIGH PRESSURE NITROGEN GAS SUPPLY SYSTEM IBD (Sheet 1 of 3)



SRV LINE ISOLATION VALVE MO-F200

TABLE 1

VALVE DESCRIPTION	VALVE NUMBER	SWITCH LOCATION	SEATING FORM		DIVISION
			OPEN	CLOSE	
ADS LINE – A ISOLATION VALVE	MO-F007A	MCRP	TL	TL	1
ADS LINE – B ISOLATION VALVE	MO-F007B	MCRP	TL	TL	2



MISCELLANEOUS ALARMS

CONTROL SWITCH

OBSERVATIONAL MEASURES		
USE	SPECIFICATION	LOCATION

ANNUNCIATOR			
NO.	GRADE	INDICATOR	LOCATION
1	IV	N2 GAS BOTTLE (A) OUTLET PRESS LOW	MCRP
2	IV	N2 GAS BOTTLE (B) OUTLET PRESS LOW	MCRP
3	IV	HPIN SYS A VALVE THERMAL OVERLOAD	MCRP
4	IV	HPIN SYS B VALVE THERMAL OVERLOAD	MCRP
5	IV	HPIN SYS A RELAY LOGIC POWER FAILURE	MCRP
6	IV	HPIN SYS B RELAY LOGIC POWER FAILURE	MCRP

OTHERS

Figure 7.3-10 HIGH PRESSURE NITROGEN GAS SYSTEM IBD (Sheet 2 of 3)

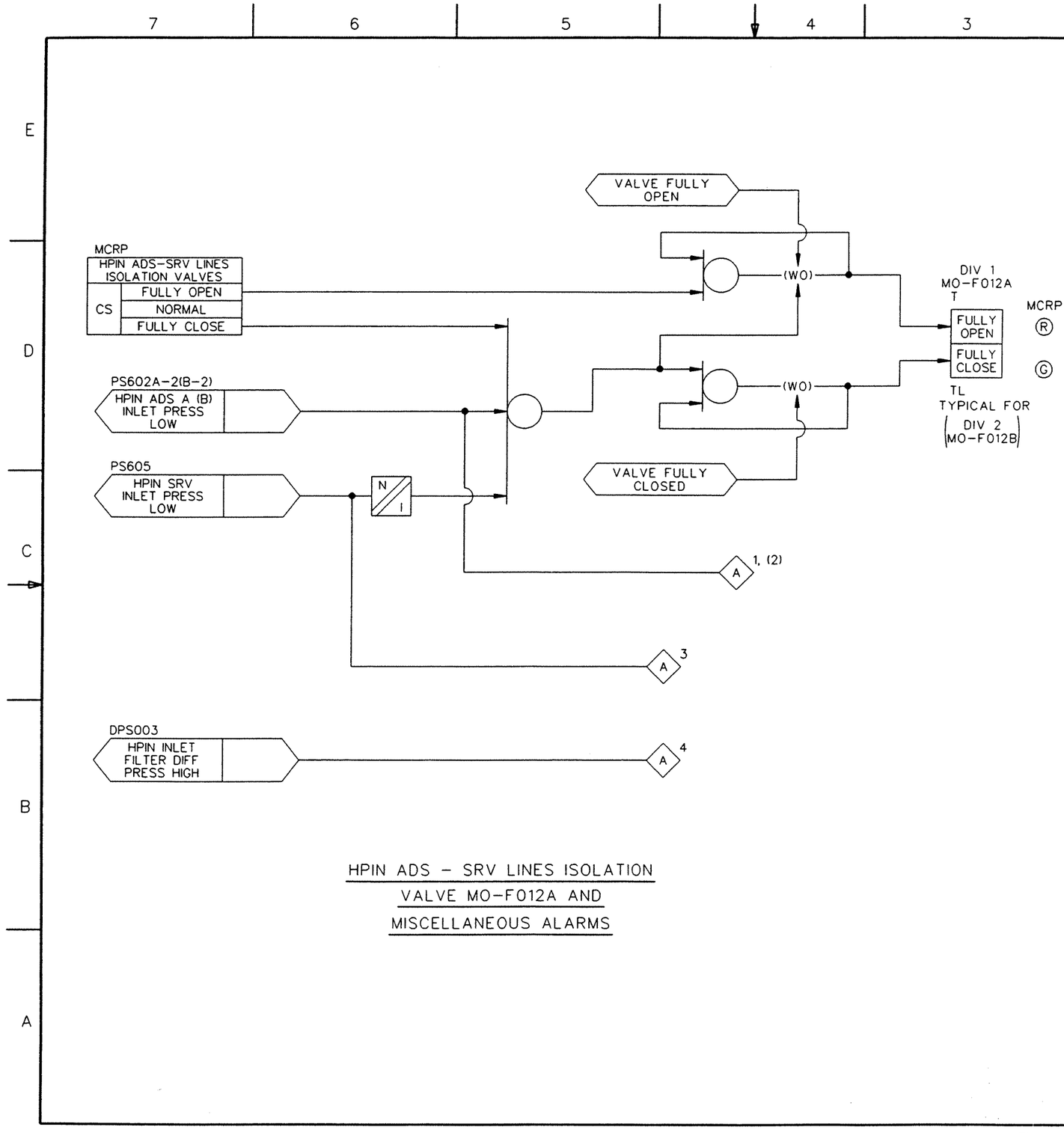


Figure 7.3-10 HIGH PRESSURE NITROGEN GAS SYSTEM IBD (Sheet 3 of 3)

SH NO.	TITLE
1	NOTES, CONTENTS
2	SLC PUMP (A), (B)
3	SLC LUBRICANT PUMP (A), (B)
4	SLC INJECTION VALVE (A), (B)
5	SLC PUMP (A), (B) SUCTION VALVE
6	SLC STORAGE TANK LOW POWER HEATER, HIGH POWER HEATER & SLC MANUAL VALVE

NOTES:

1. UNLESS OTHERWISE NOTED, THE DEVICE NUMBERS SHOWN ON THIS DIAGRAM ARE PREFIXED WITH C41.
2. UNLESS OTHERWISE NOTED, POWER SUPPLY OF THIS SYSTEM IS EMERGENCY ONE.
3. "#" FIXED NUMBERS IN THIS DIAGRAM INDICATE THE SWGR FUNCTION NUMBERS.
4. THIS IBD EXPRESS FOR SYSTEM (A) AND TYPICAL FOR (B).

REFERENCE DOCUMENT	MPL NO.
1. STANDBY LIQUID CONTROL SYS P&ID	C41-1010
2. STANDBY LIQUID CONTROL SYS PFD	C41-1020
3. LEAK DETECTION AND ISOLATION SYS IBD	E31-1030

MPL NO. C41-1030

FIGURE 7.4-1 STANDBY LIQUID CONTROL SYSTEM IBD (Sheet 1 of 6)

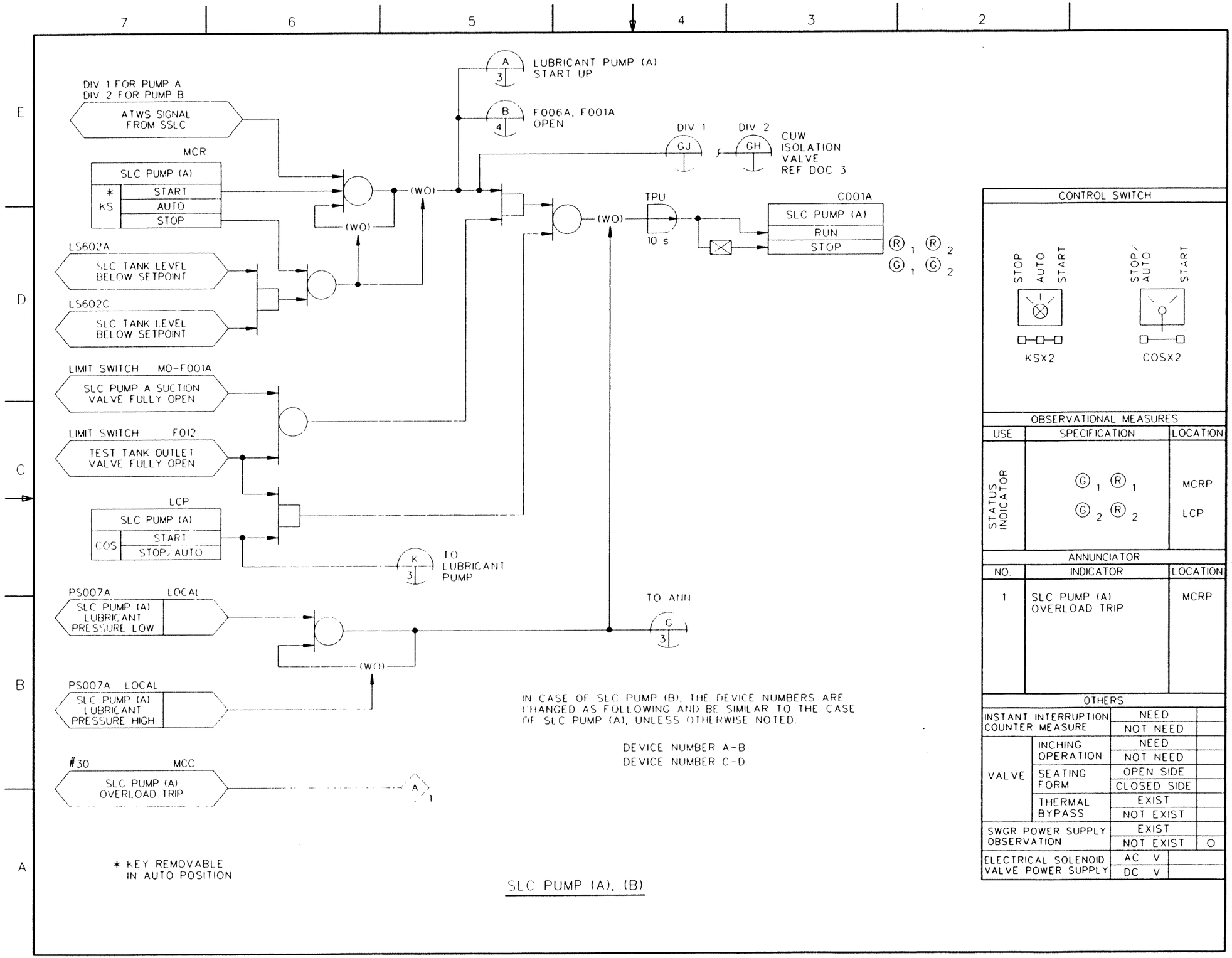
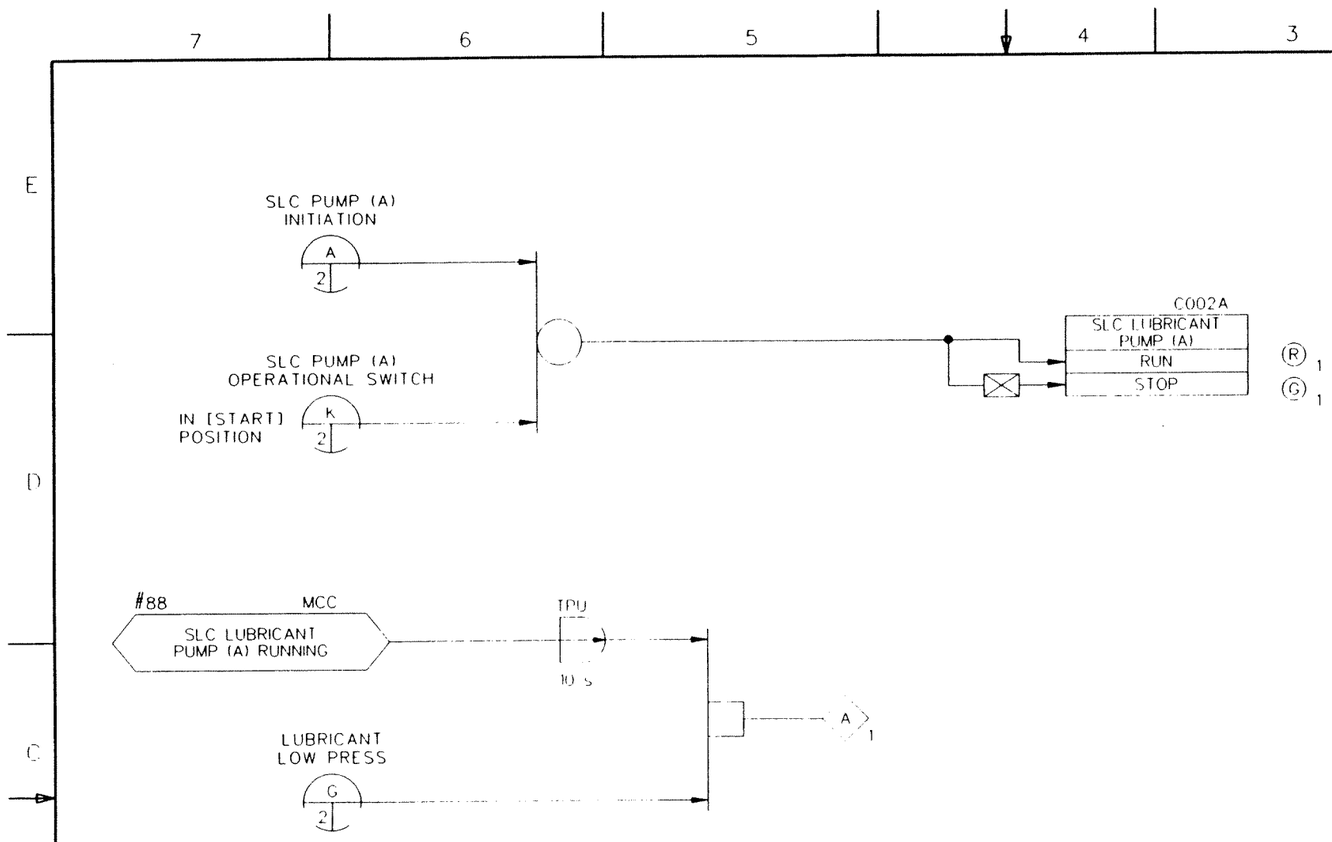


FIGURE 7.4-1 STANDBY LIQUID CONTROL SYSTEM IBD (Sheet 2 of 6)



IN CASE OF LUBRICANT PUMP (B), THE DEVICE NUMBERS ARE CHANGED AS FOLLOWING AND BE SIMILAR TO THE CASE OF LUBRICANT PUMP (A), UNLESS OTHERWISE NOTED.

DEVICE NUMBER A-B

SLC LUBRICANT PUMP (A), (B)

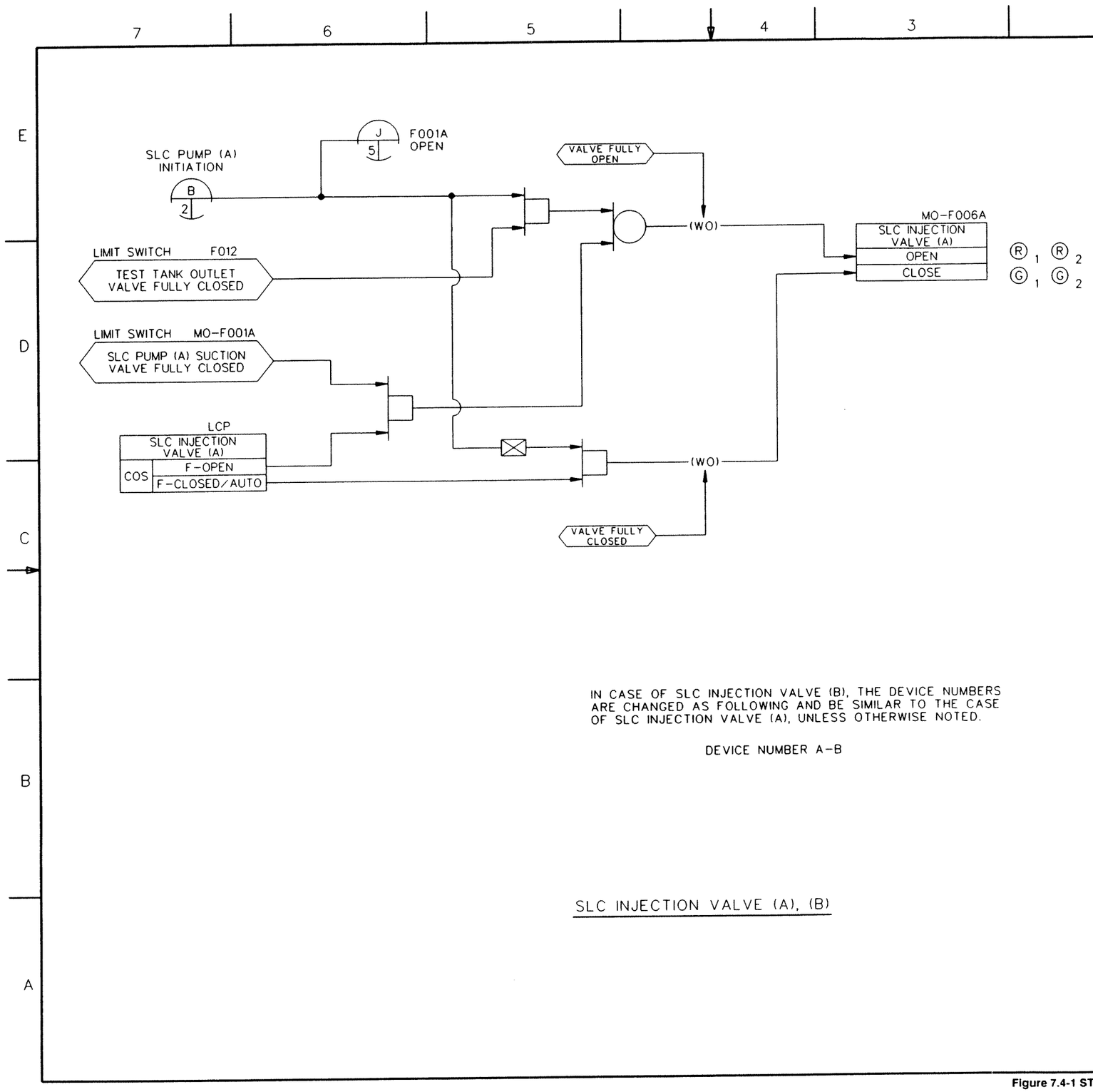
CONTROL SWITCH			

OBSERVATIONAL MEASURES		
USE	SPECIFICATION	LOCATION
STATUS INDICATOR	G 1 R 1	MCRP

ANNUNCIATOR		
NO.	INDICATOR	LOCATION
1	SLC PUMP (A) LUBRICANT PRESS LOW	MCRP

OTHERS			
INSTANT INTERRUPTION COUNTER MEASURE		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	O
ELECTRICAL SOLENOID VALVE POWER SUPPLY		AC V	
		DC V	

FIGURE 7.4-1 STANDBY LIQUID CONTROL SYSTEM IBD (Sheet 3 of 6)



OBSERVATIONAL MEASURES

USE	SPECIFICATION	LOCATION
STATUS INDICATOR	G 1 R 1 G 2 R 2	MCRP LCP

ANNUNCIATOR

NO.	INDICATOR	LOCATION

OTHERS

INSTANT INTERRUPTION COUNTER MEASURE		NEED	
		NOT NEED	
VALVE	INCHING OPERATION	NEED	
		NOT NEED	O
	SEATING FORM	OPEN SIDE	T
		CLOSED SIDE	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 7.4-1 STANDBY LIQUID CONTROL SYSTEM IBD (Sheet 4 of 6)

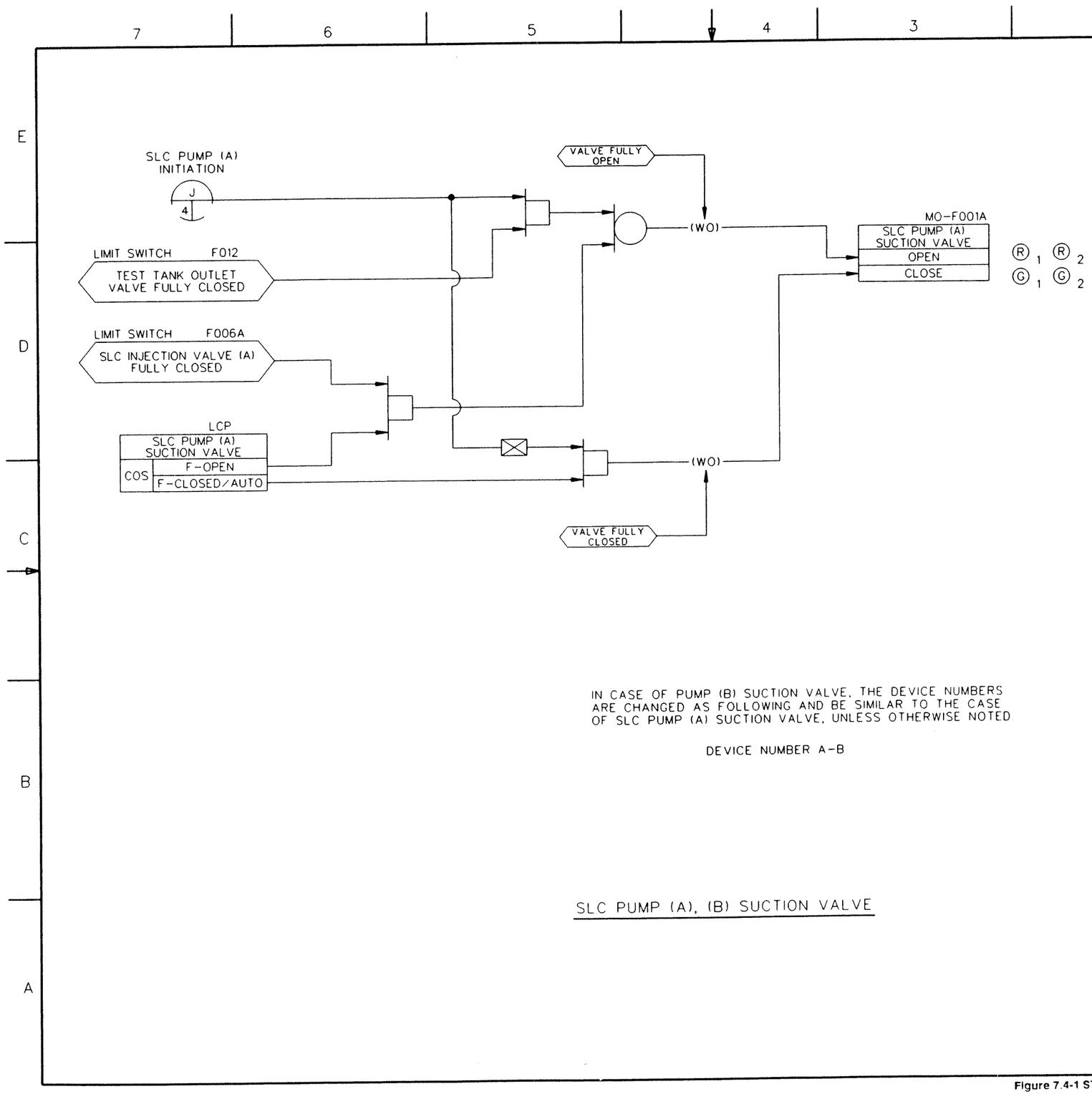
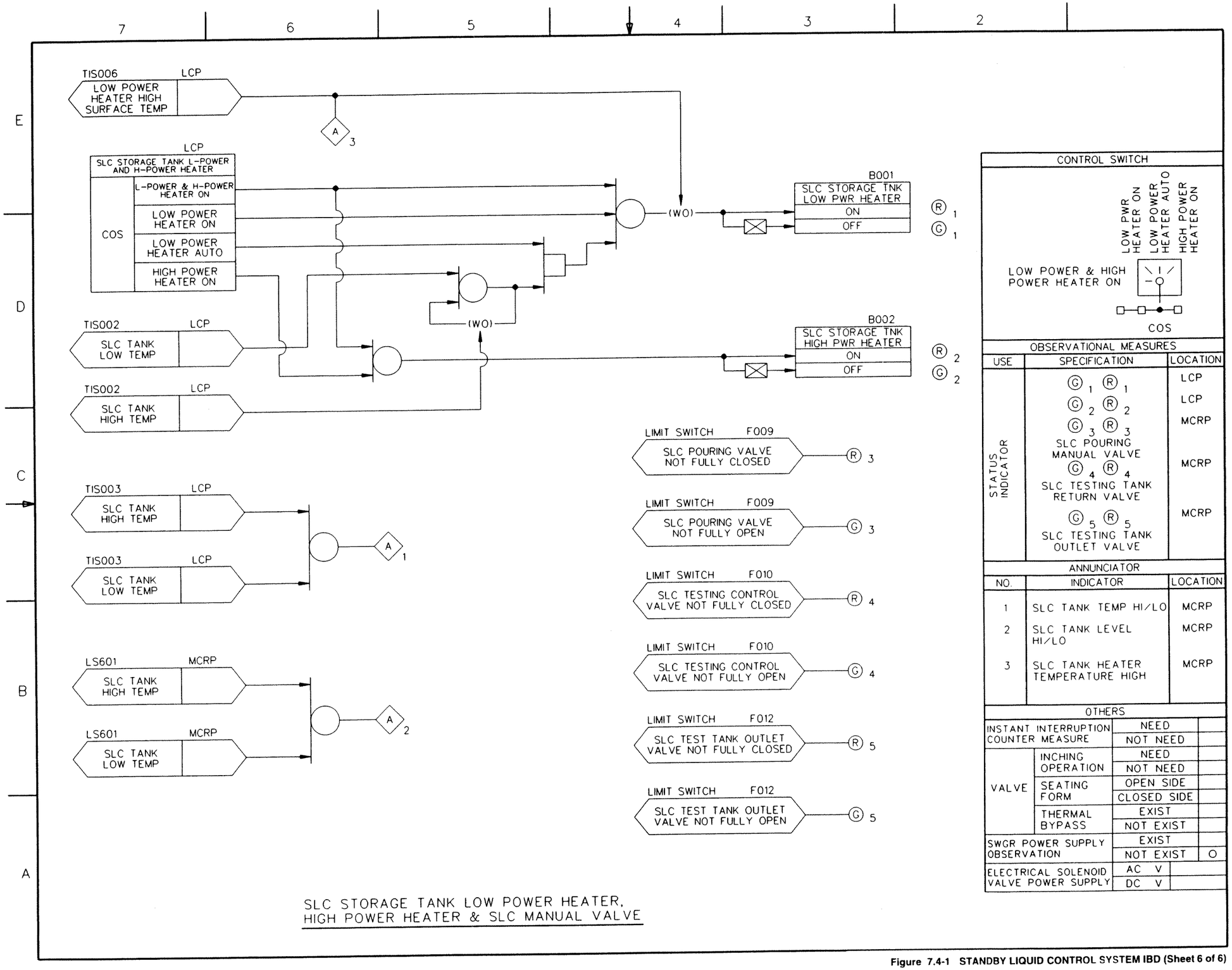


Figure 7.4-1 STANDBY LIQUID CONTROL SYSTEM IBD (Sheet 5 of 6)



CONTROL SWITCH

OBSERVATIONAL MEASURES

USE	SPECIFICATION	LOCATION
STATUS INDICATOR	G 1 R 1	LCP
	G 2 R 2	LCP
	G 3 R 3 SLC POURING MANUAL VALVE	MCRP
	G 4 R 4 SLC TESTING TANK RETURN VALVE	MCRP
	G 5 R 5 SLC TESTING TANK OUTLET VALVE	MCRP

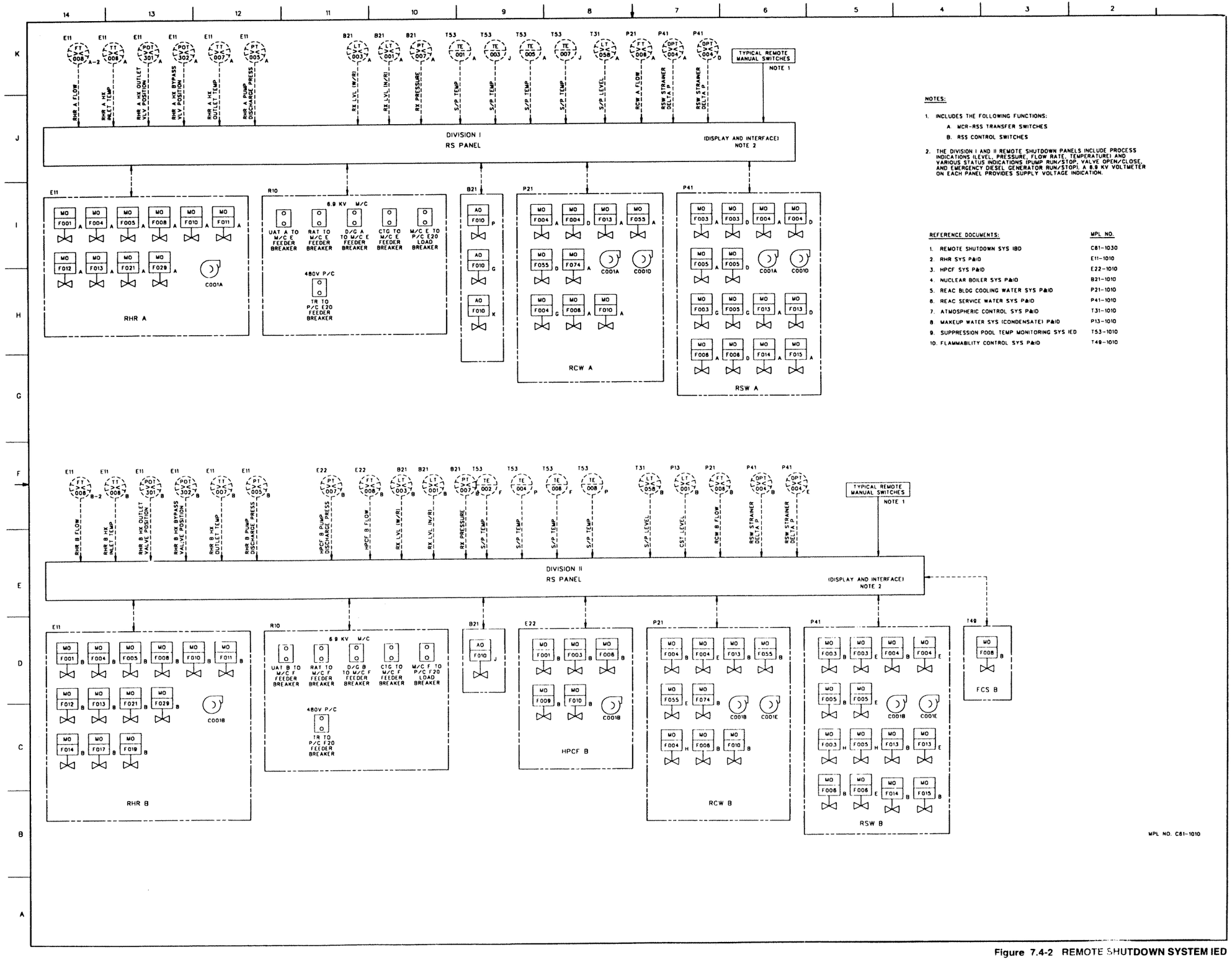
ANNUNCIATOR

NO.	INDICATOR	LOCATION
1	SLC TANK TEMP HI/LO	MCRP
2	SLC TANK LEVEL HI/LO	MCRP
3	SLC TANK HEATER TEMPERATURE HIGH	MCRP

OTHERS

INSTANT INTERRUPTION COUNTER MEASURE		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	O
ELECTRICAL SOLENOID VALVE POWER SUPPLY		AC V	
		DC V	

Figure 7.4-1 STANDBY LIQUID CONTROL SYSTEM IBD (Sheet 6 of 6)



NOTES:

1. INCLUDES THE FOLLOWING FUNCTIONS:
   A. MCR-RSS TRANSFER SWITCHES
   B. RSS CONTROL SWITCHES
2. THE DIVISION I AND II REMOTE SHUTDOWN PANELS INCLUDE PROCESS INDICATIONS (LEVEL, PRESSURE, FLOW RATE, TEMPERATURE) AND VARIOUS STATUS INDICATIONS (PUMP RUN/STOP, VALVE OPEN/CLOSE, AND EMERGENCY DIESEL GENERATOR RUN/STOP). A 8.9 KV VOLTMETER ON EACH PANEL PROVIDES SUPPLY VOLTAGE INDICATION.

REFERENCE DOCUMENTS:	MPL NO.
1. REMOTE SHUTDOWN SYS IBD	C81-1030
2. RHR SYS P&ID	E11-1010
3. HPCF SYS P&ID	E22-1010
4. NUCLEAR BOILER SYS P&ID	B21-1010
5. REAC BLDG COOLING WATER SYS P&ID	P21-1010
6. REAC SERVICE WATER SYS P&ID	P41-1010
7. ATMOSPHERIC CONTROL SYS P&ID	T31-1010
8. MAKEUP WATER SYS (CONDENSATE) P&ID	P13-1010
9. SUPPRESSION POOL TEMP MONITORING SYS IED	T53-1010
10. FLAMMABILITY CONTROL SYS P&ID	T49-1010

MPL NO. C81-1010

Figure 7.4-2 REMOTE SHUTDOWN SYSTEM IED

NOTES:

1. MOTOR OPERATED VALVE CONTROL LOGIC ON SHEETS 6 AND 8 APPLIES TO MANY VALVES AS TABULATED ON SHEETS 2 AND 3. INTERFACE INFORMATION IS AVAILABLE FROM APPLICABLE REFERENCE DOCUMENTS LISTED ON SHEET 1.

REFERENCE DOCUMENT	MPL NO.
1. REMOTE SHUTDOWN SYS IED	C61–1010
2. RESIDUAL HEAT REMOVAL SYS IBD	E11–1030
3. HIGH PRESS CORE FLOODER SYS IBD	E22–1030
4. REAC BLDG COOLING WATER SYS/ REACTOR SERVICE WATER SYS IBD	P21/P41–1030
5. NUCLEAR BOILER SYS IBD	B21–1030
6. FLAMMABILITY CONTROL SYSTEM P&ID	T49–1010
7. ELECTRICAL POWER DISTRIBUTION ONE LINE DIAG	R10–1010
8. MAKEUP WATER SYSTEM (CONDENSATE) P&ID	P13–1010
9. ATMOSPHERIC CONTROL SYSTEM P&ID	T31–1010
10. RESIDUAL HEAT REMOVAL SYSTEM P&ID	E11–1010
11. HIGH PESSURE CORE FLOODER SYSTEM P&ID	E22–1010
12. NUCLEAR BOILER SYSTEM P&ID	B21–1010
13. INTERLOCK BLOCK DIAGRAM (IBD) STANDARDS	A10–3070

LEGEND:

MCR = MAIN CONTROL ROOM

RSP = REMOTE SHUTDOWN CONTROL PANEL

RSTS = REMOTE SHUTDOWN TRANSFER SWITCH

RSCS = REMOTE SHUTDOWN CONTROL SWITCH

MPL NO. C61–1030

FIGURE 7.4–3 REMOTE SHUTDOWN SYSTEM IBD (Sheet 1 of 27)

SYS	NAME	SH NO.	PART NO.
RHR	RHR PUMP (A)	SH 14	E11-C001A
	RHR S/P SUCTION VALVE (A)	SH 7	E11-F001A
	RHR HX BYPASS VALVE (A)	SH 6	E11-F013A
	RHR INJECTION VALVE (A)	SH 15	E11-F005A
	RHR HX OUTLET VALVE (A)	SH 6	E11-F004A
	RHR S/P RETURN VALVE (A)	SH 16	E11-F008A
	RHR SHC (INBOARD) SUCTION ISOL VALVE (A)	SH 21	E11-F010A
	RHR SHC (OUTBOARD) SUCTION ISOL VALVE (A)	SH 22	E11-F011A
	RHR SHC SUCTION VALVE (A)	SH 17	E11-F012A
	RHR MINIMUM FLOW VALVE (A)	SH 12	E11-F021A
	RHR LIQUID WASTE FLUSH ISOLATION VALVE (A)	SH 8	E11-F029A
	RHR PUMP (B)	SH 14	E11-C001B
	RHR S/P SUCTION VALVE (B)	SH 7	E11-F001B
	RHR HX BYPASS VALVE (B)	SH 6	E11-F013B
	RHR INJECTION VALVE (B)	SH 15	E11-F005B
	RHR HX OUTLET VALVE (B)	SH 6	E11-F004B
	RHR D/W SPRAY VALVE (B)	SH 8	E11-F017B
	RHR WW SPRAY VALVE (B)	SH 25	E11-F019B
	RHR S/P RETURN VALVE (B)	SH 16	E11-F008B
	RHR SHC (INBOARD) SUCTION ISOL VALVE (B)	SH 23	E11-F010B
	RHR SHC (OUTBOARD) SUCTION ISOL VALVE (B)	SH 24	E11-F011B
	RHR SHC SUCTION VALVE (B)	SH 18	E11-F012B
	RHR MINIMUM FLOW VALVE (B)	SH 12	E11-F021B
	RHR LIQUID WASTE FLUSH ISOLATION VALVE (B)	SH 8	E11-F029B
	RHR-FPC ISOLATION VALVE (B)	SH 8	E11-F014B

SYS	NAME	SH NO.	PART NO.
HPCF	HPCF PUMP (B)	SH 19	E22-C001B
	HPCF CST SUCTION VALVE (B)	SH 6	E22-F001B
	HPCF INJECTION VALVE (B)	SH 6	E22-F003B
	HPCF S/P SUCTION VALVE (B)	SH 20	E22-F006B
	HPCF TEST LINE BYPASS VALVE (B)	SH 8	E22-F009B
	HPCF MINIMUM FLOW VALVE (B)	SH 13	E22-F010B
NBS	SAFETY RELIEF VALVE (NON ADS)	SH 9	B21-F010P
	SAFETY RELIEF VALVE (NON ADS)	SH 9	B21-F010G
	SAFETY RELIEF VALVE (NON ADS)	SH 9	B21-F010K
	SAFETY RELIEF VALVE (NON ADS)	SH 9	B21-F010J
RCW	RCW PUMP (A)	SH 5	P21-C001A
	RCW PUMP (D)	SH 5	P21-C001D
	RCW HX COOLING WATER OUTLET VALVE (A)	SH 6	P21-F004A
	RCW HX COOLING WATER OUTLET VALVE (D)	SH 6	P21-F004D
	RCW HX COOLING WATER OUTLET VALVE (G)	SH 6	P21-F004G
	RCW RHR HX OUTLET VALVE (A)	SH 6	P21-F013A
	RCW D/G OUTLET VALVE (A)	SH 6	P21-F055A
	RCW D/G OUTLET VALVE (D)	SH 6	P21-F055D
	RCW SEPARATE VALVE (A)	SH 6	P21-F074A
	RCW PUMP (B)	SH 5	P21-C001B
	RCW PUMP (E)	SH 5	P21-C001E
	RCW HX COOLING WATER OUTLET VALVE (B)	SH 6	P21-F004B
	RCW HX COOLING WATER OUTLET VALVE (E)	SH 6	P21-F004E
	RCW HX COOLING WATER OUTLET VALVE (H)	SH 6	P21-F004H
	RCW RHR HX OUTLET VALVE (B)	SH 6	P21-F013B
	RCW D/G OUTLET VALVE (B)	SH 6	P21-F055B
	RCW D/G OUTLET VALVE (E)	SH 6	P21-F055E
	RCW SEPARATE VALVE (B)	SH 6	P21-F074B
	RCW COOLING WATER TEMPERATURE CONTROL VALVES	SH 27	P21-F006A(B) P21-F010A(B)

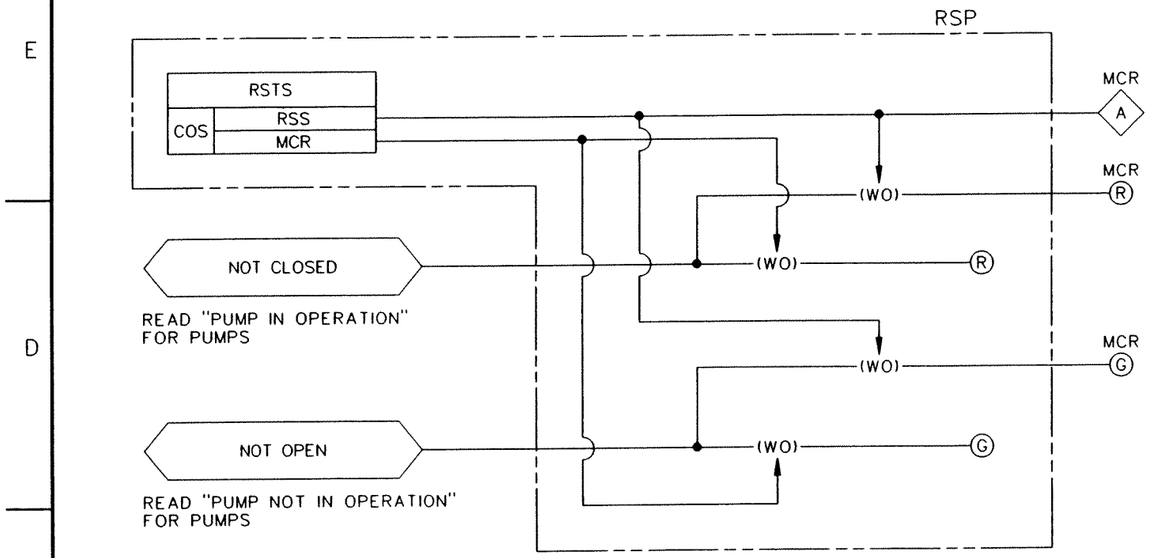
FIGURE 7.4-3 REMOTE SHUTDOWN SYSTEM IBD (Sheet 2 of 27)

SYS	NAME	SH NO.	PART NO.
RSW	RSW PUMP (A)	SH 5	P41-C001A
	RSW PUMP (D)	SH 5	P41-C001D
	RCW HX SERVICE WATER INLET VALVE (A)	SH 6	P41-F003A
	RCW HX SERVICE WATER INLET VALVE (D)	SH 6	P41-F003D
	RSW STRAINER INLET VALVE (A)	SH 26	P41-F004A
	RSW STRAINER INLET VALVE (D)	SH 26	P41-F004D
	RCW HX SERVICE WATER OUTLET VALVE (A)	SH 6	P41-F005A
	RCW HX SERVICE WATER OUTLET VALVE (D)	SH 6	P41-F005D
	RCW HX SERVICE WATER INLET VALVE (G)	SH 6	P41-F003G
	RCW HX SERVICE WATER OUTLET VALVE (G)	SH 6	P41-F005G
	RSW STRAINER OUTLET VALVE (A)	SH 6	P41-F013A
	RSW STRAINER OUTLET VALVE (D)	SH 6	P41-F013D
	RSW STRAINER BACKWASH VALVE (A)	SH 6	P41-F006A
	RSW STRAINER BACKWASH VALVE (D)	SH 6	P41-F006D
	RSW (A) SUPPLY VALVE	SH 6	P41-F014A
	RSW (A) RETURN VALVE	SH 6	P41-F015A
	RSW PUMP (B)	SH 5	P41-C001B
	RSW PUMP (E)	SH 5	P41-C001E
	RCW HX SERVICE WATER INLET VALVE (B)	SH 6	P41-F003B
	RCW HX SERVICE WATER INLET VALVE (E)	SH 6	P41-F003E
	RSW STRAINER INLET VALVE (B)	SH 26	P41-F004B
	RSW STRAINER INLET VALVE (E)	SH 26	P41-F004E
	RCW HX SERVICE WATER OUTLET VALVE (B)	SH 6	P41-F005B
	RCW HX SERVICE WATER OUTLET VALVE (E)	SH 6	P41-F005E
	RCW HX SERVICE WATER INLET VALVE (H)	SH 6	P41-F003H
	RCW HX SERVICE WATER OUTLET VALVE (H)	SH 6	P41-F005H
	RSW STRAINER OUTLET VALVE (B)	SH 6	P41-F013B
	RSW STRAINER OUTLET VALVE (E)	SH 6	P41-F013E
	RSW STRAINER BACKWASH VALVE (B)	SH 6	P41-F006B
	RSW STRAINER BACKWASH VALVE (E)	SH 6	P41-F006E
	RSW (B) SUPPLY VALVE	SH 6	P41-F014B
	RSW (B) RETURN VALVE	SH 6	P41-F015B

SYS	NAME	SH NO.	PART NO.
D/G	DIESEL GENERATOR A START-UP CIRCUIT	SH 11	–
	DIESEL GENERATOR B START-UP CIRCUIT	SH 11	–
FCS	FCS COOLING WATER INLET VALVE B	SH 8	T49-F008B

SYS	NAME	SH NO.	PART NO.
EPDS	6.9KV FEEDER BREAKER – UAT A TO M/C E	SH 10	–
	6.9KV FEEDER BREAKER – RAT TO M/C E	SH 10	–
	6.9KV FEEDER BREAKER – D/G A TO M/C E	SH 10	–
	6.9KV FEEDER BREAKER – CTG TO M/C E	SH 10	–
	6.9KV LOAD BREAKER – M/C E TO PC E20	SH 10	–
	480V FEEDER BREAKER – TR TO P/C E20	SH 10	–
	6.9KV FEEDER BREAKER – UAT B TO M/C F	SH 10	–
	6.9KV FEEDER BREAKER – RAT TO M/C F	SH 10	–
	6.9KV FEEDER BREAKER – D/G B TO M/C F	SH 10	–
	6.9KV FEEDER BREAKER – CTG TO M/C F	SH 10	–
	6.9KV LOAD BREAKER – M/C F TO PC F20	SH 10	–
	480V FEEDER BREAKER – TR TO P/C E 20	SH 10	–

FIGURE 7.4–3 REMOTE SHUTDOWN SYSTEM IBD (Sheet 3 of 27)

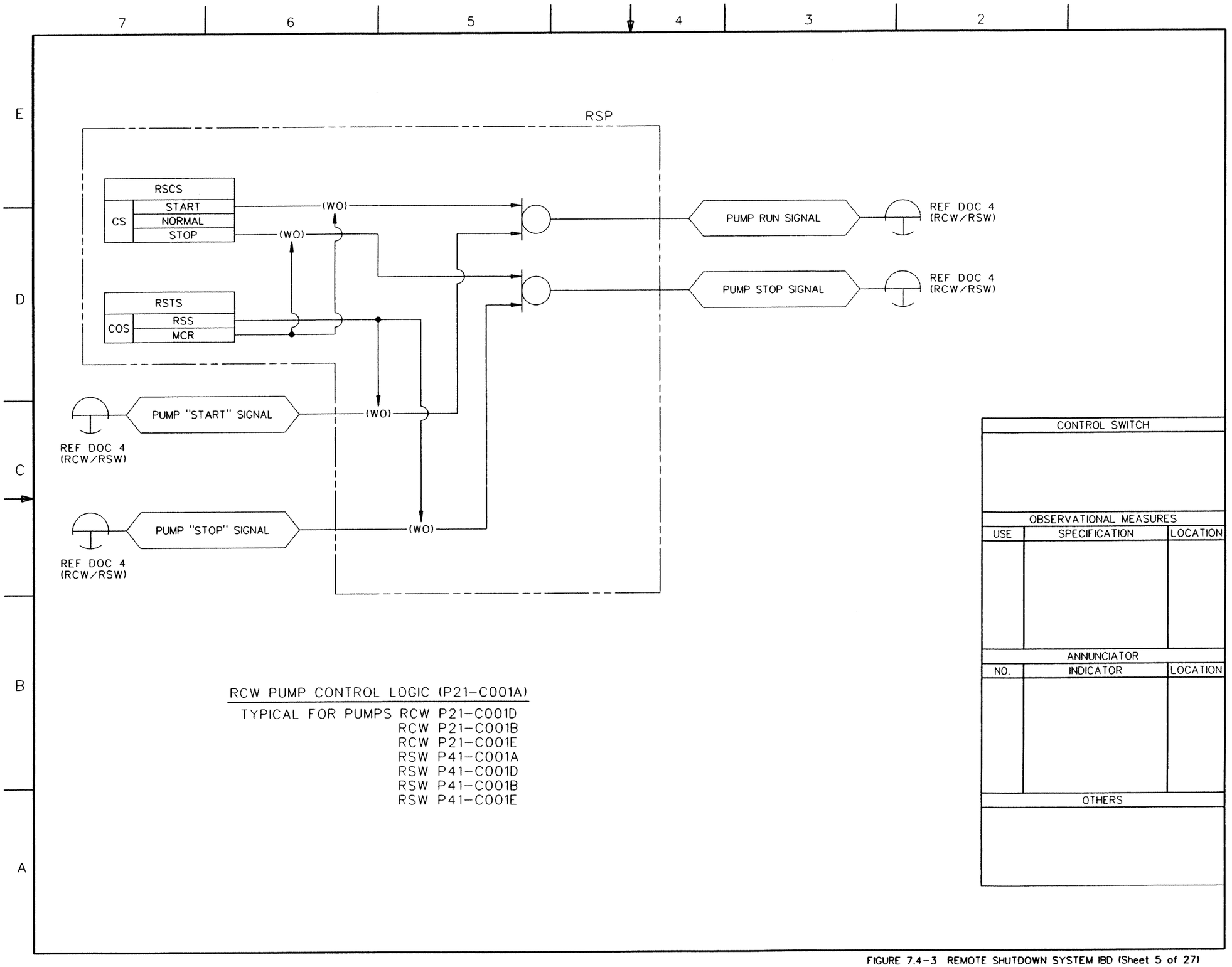


STATUS INDICATION

APPLY TO ALL VALVES AND PUMPS

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

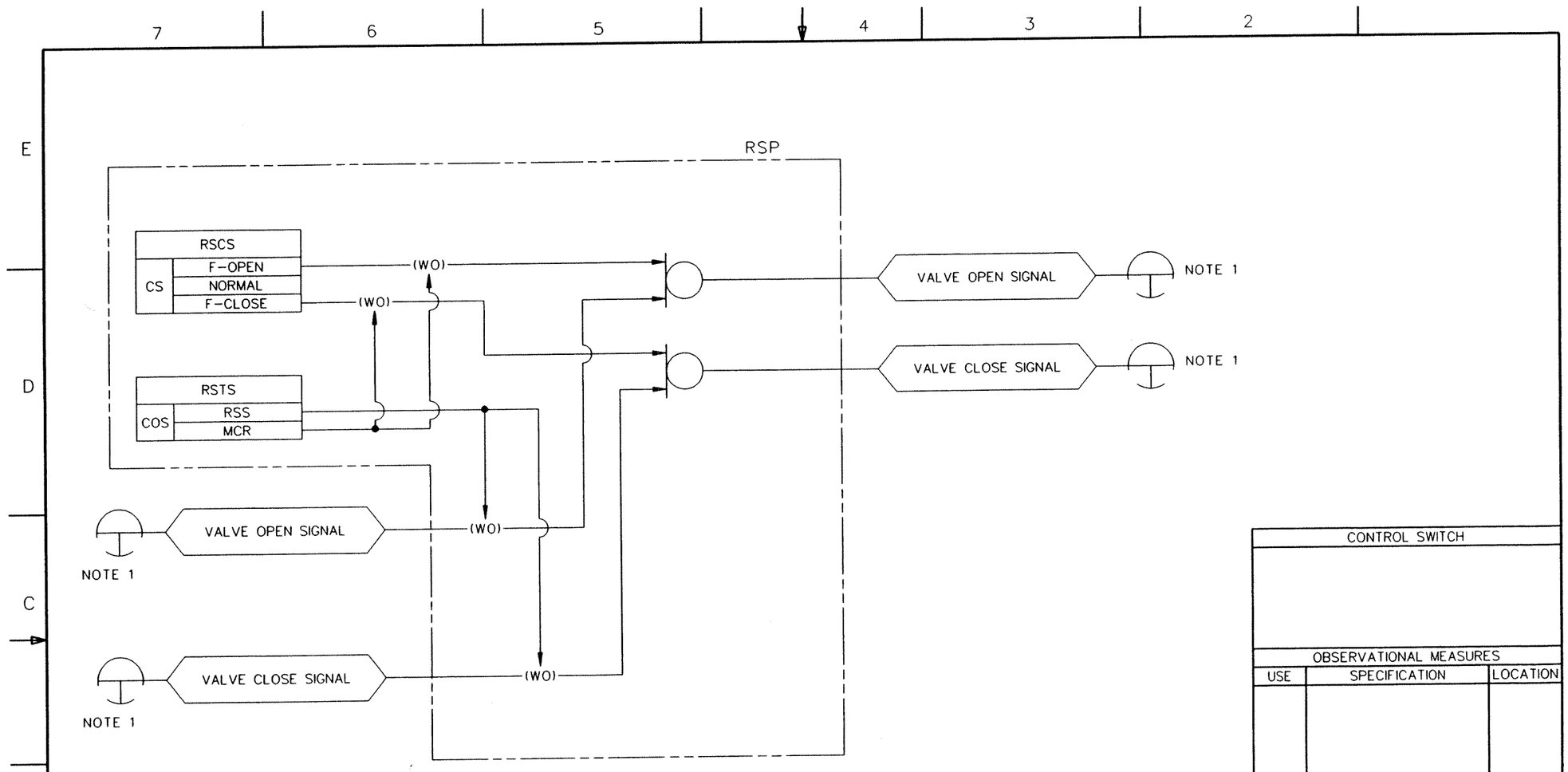
FIGURE 7.4-3 REMOTE SHUTDOWN SYSTEM IBD (Sheet 4 of 27)



RCW PUMP CONTROL LOGIC (P21-C001A)

TYPICAL FOR PUMPS RCW P21-C001D
RCW P21-C001B
RCW P21-C001E
RSW P41-C001A
RSW P41-C001D
RSW P41-C001B
RSW P41-C001E

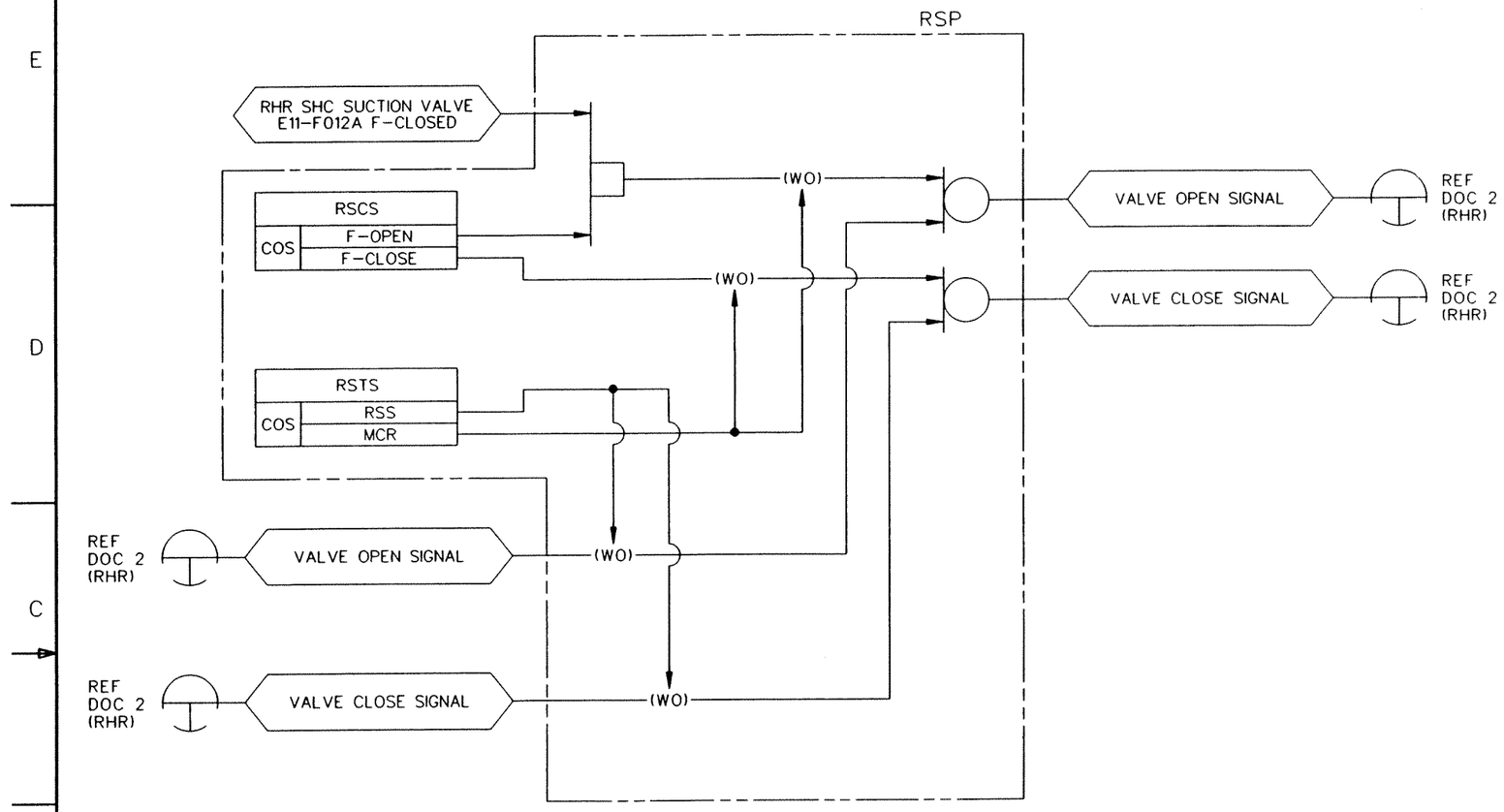
FIGURE 7.4-3 REMOTE SHUTDOWN SYSTEM IBD (Sheet 5 of 27)



MOTOR OPERATED VALVE

(APPLICABLE TO VALVES TABULATED ON SHEETS 2 & 3 THAT REFERENCE THIS SHEET)

FIGURE 7.4-3 REMOTE SHUTDOWN SYSTEM IBD (Sheet 6 of 27)

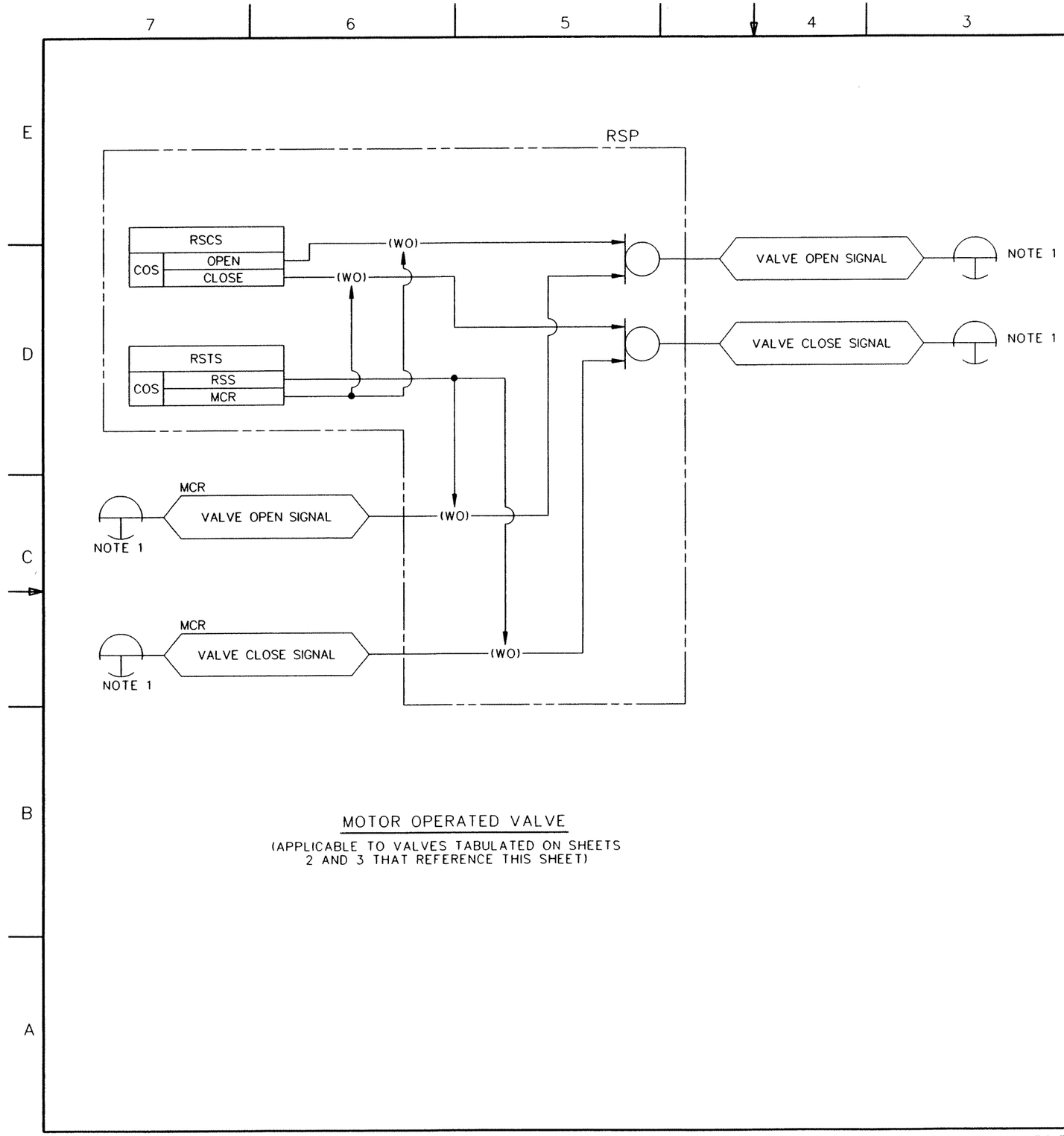


RHR S/P SUCTION VALVE E11-F001A

TYPICAL FOR VALVE E11-F001B

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

FIGURE 7.4-3 REMOTE SHUTDOWN SYSTEM IBD (Sheet 7 of 27)

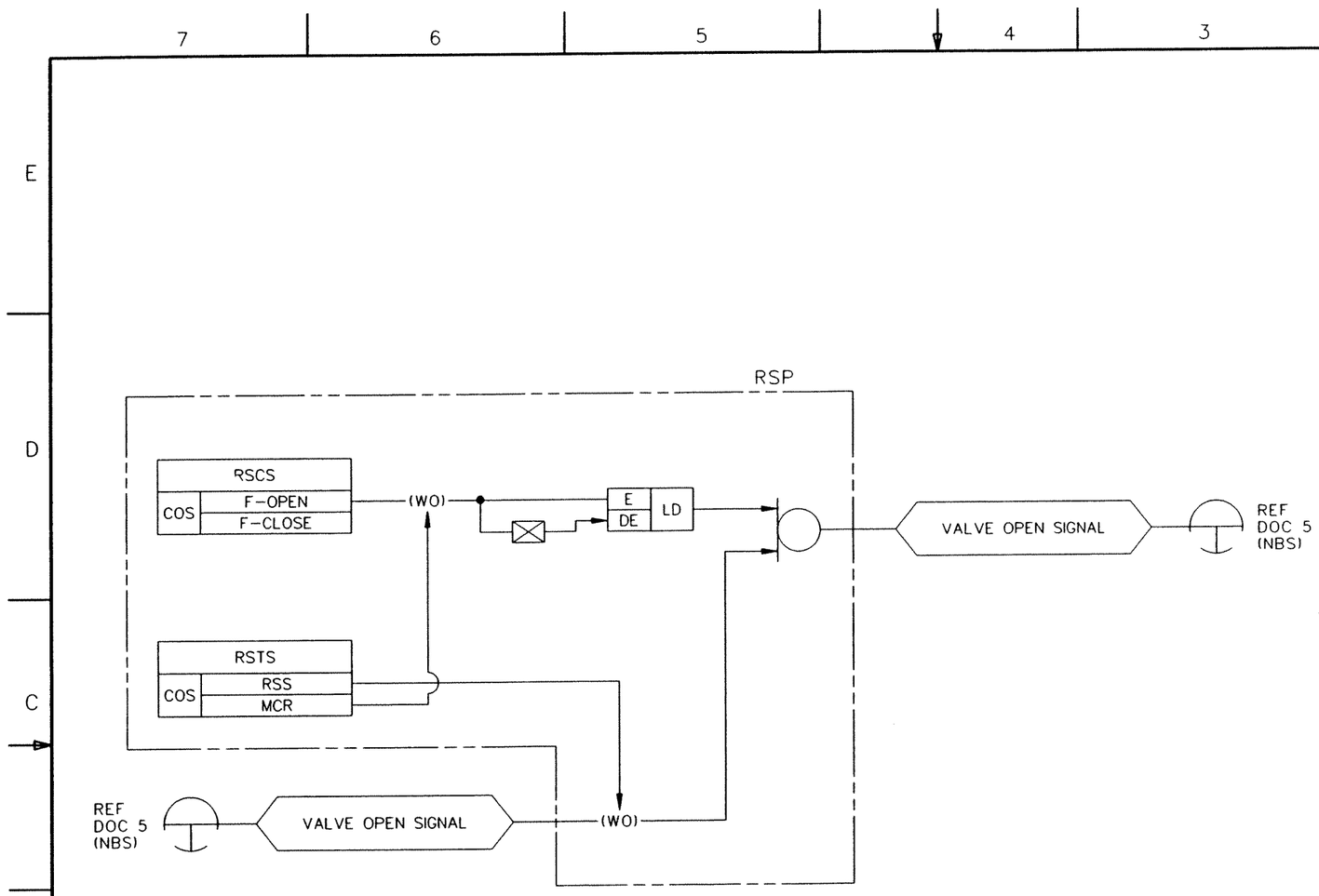


MOTOR OPERATED VALVE

(APPLICABLE TO VALVES TABULATED ON SHEETS 2 AND 3 THAT REFERENCE THIS SHEET)

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

FIGURE 7.4-3 REMOTE SHUTDOWN SYSTEM IBD (Sheet 8 of 27)

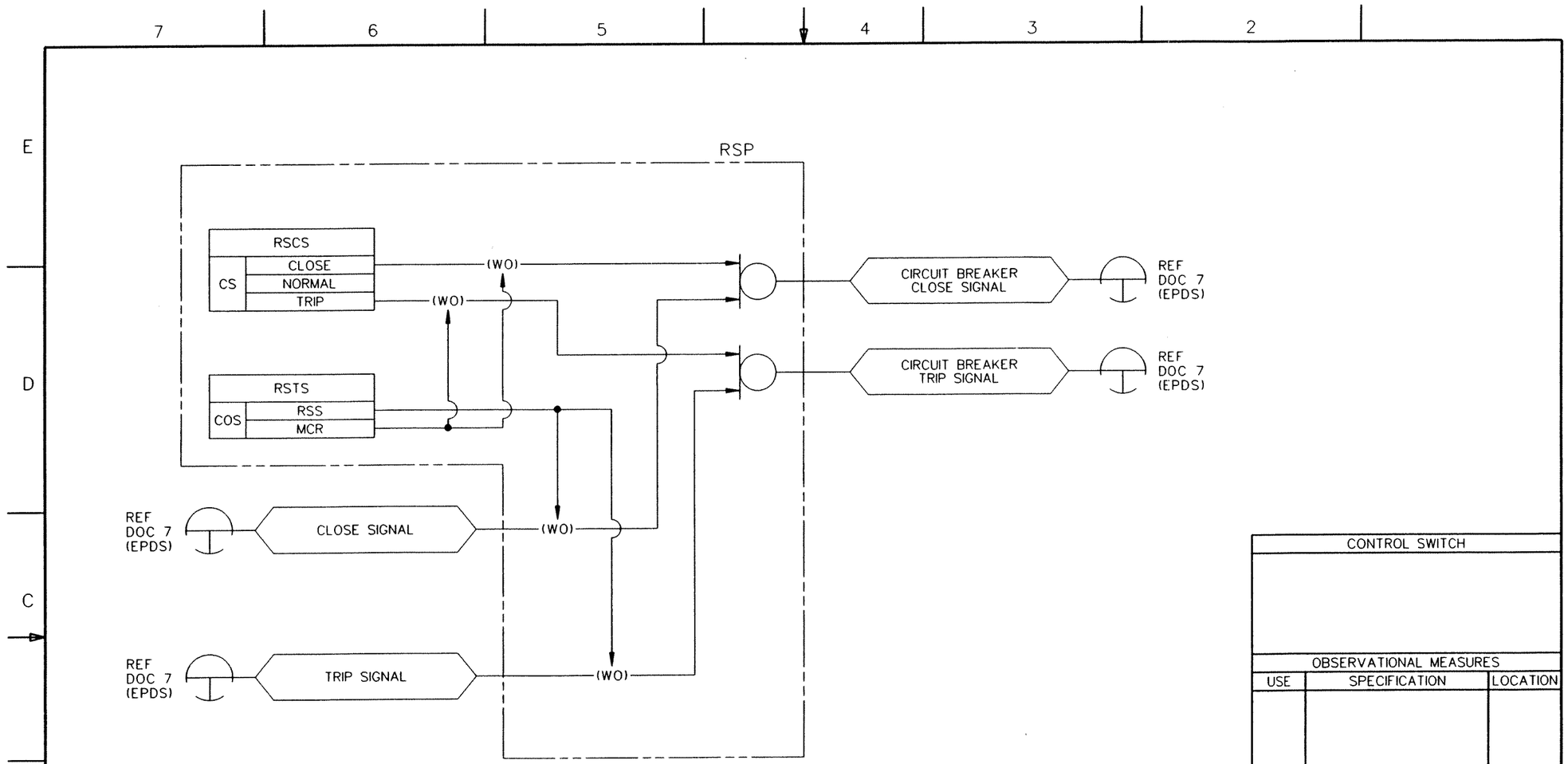


AIR OPERATED SAFETY RELIEF VALVE B21-F010G (DIV I)

TYPICAL FOR VALVES B21-F010K (DIV I)
B21-F010P (DIV I)
B21-F010J (DIV II)

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

FIGURE 7.4-3 REMOTE SHUTDOWN SYSTEM IBD (Sheet 9 of 27)



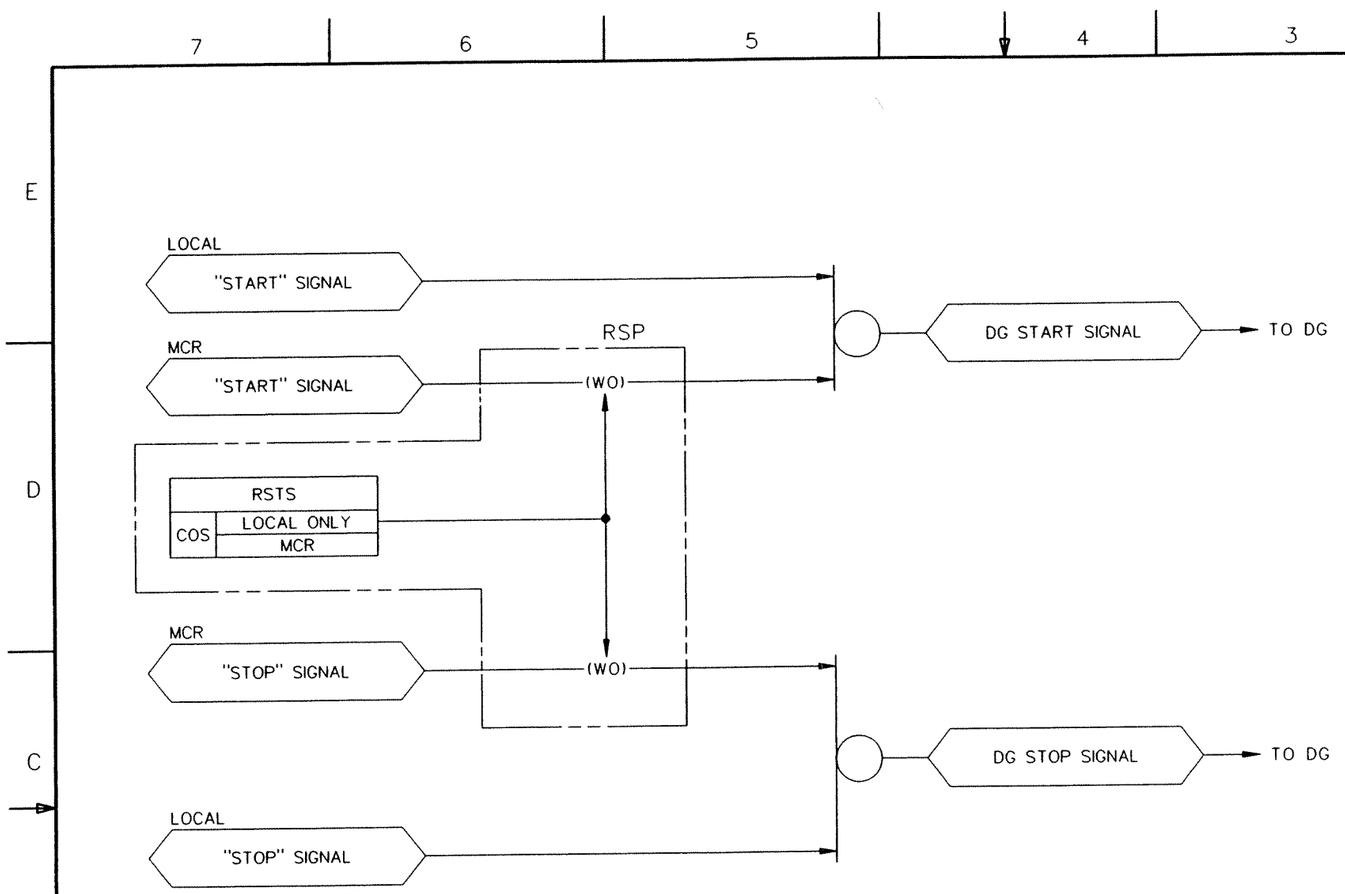
CIRCUIT BREAKER LOGIC

(APPLICABLE TO CIRCUIT BREAKERS TABULATED ON SH 3)

NOTE:

ALL LOGIC WHICH CAN INTERACT WITH THE RSS CIRCUITS MUST BE LOCATED EXTERNAL TO THE MAIN CONTROL ROOM.

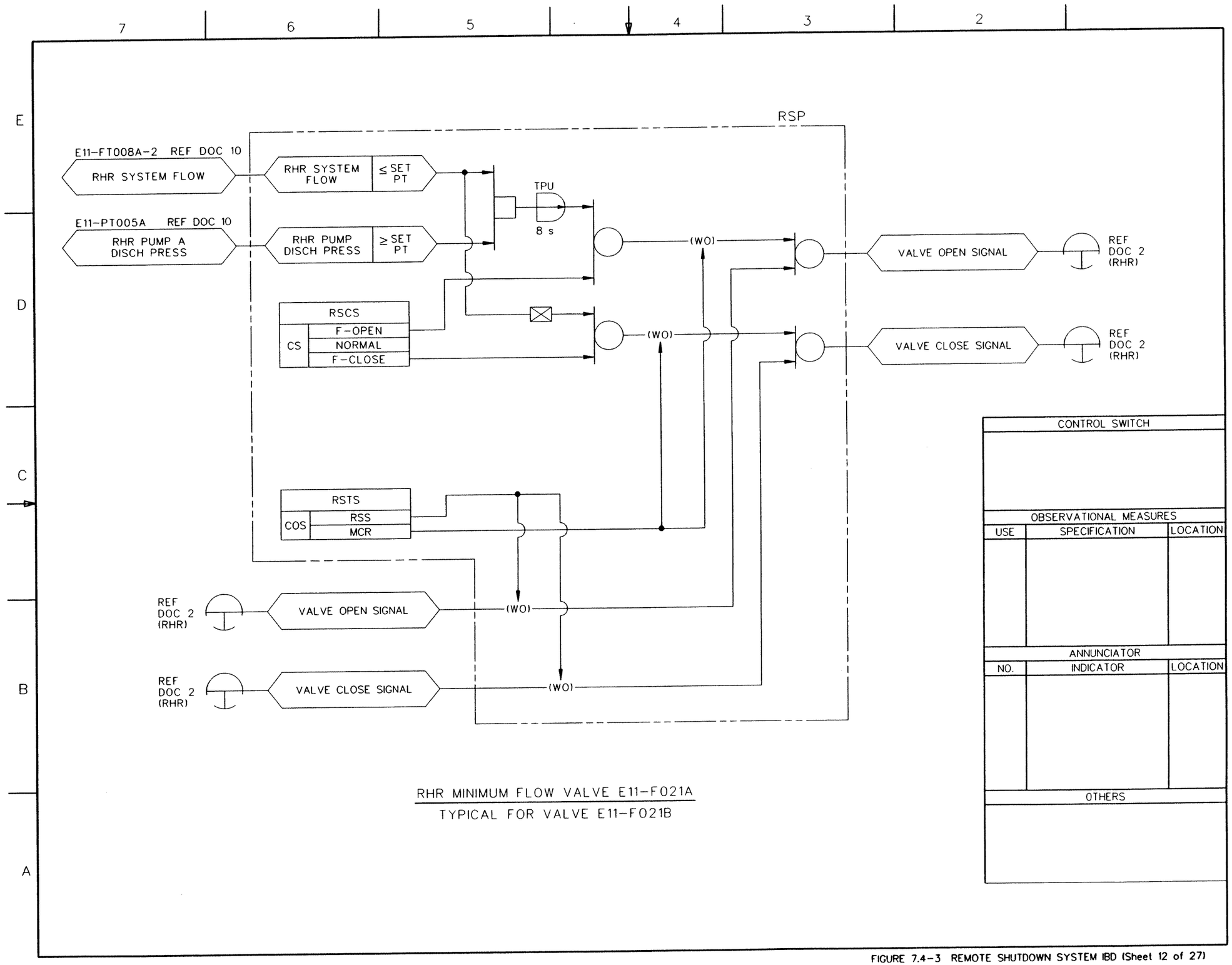
FIGURE 7.4-3 REMOTE SHUTDOWN SYSTEM IBD (Sheet 10 of 27)



DIESEL GENERATOR (D/G) LOGIC
TYPICAL FOR D/G A AND B

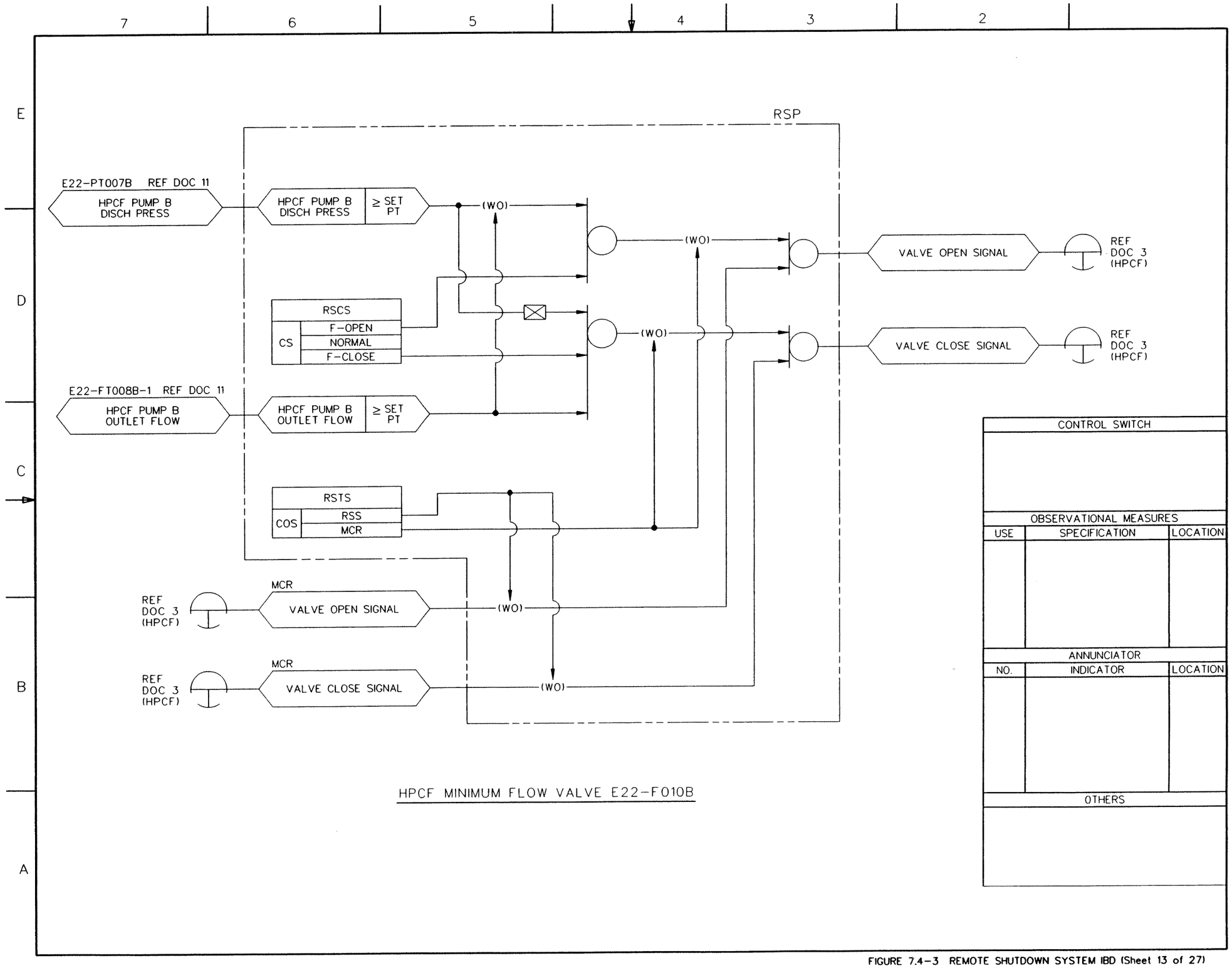
CONTROL SWITCH		
OBSERVATIONAL MEASURES		
USE	SPECIFICATION	LOCATION
ANNUNCIATOR		
NO.	INDICATOR	LOCATION
OTHERS		

FIGURE 7.4-3 REMOTE SHUTDOWN SYSTEM IBD (Sheet 11 of 27)



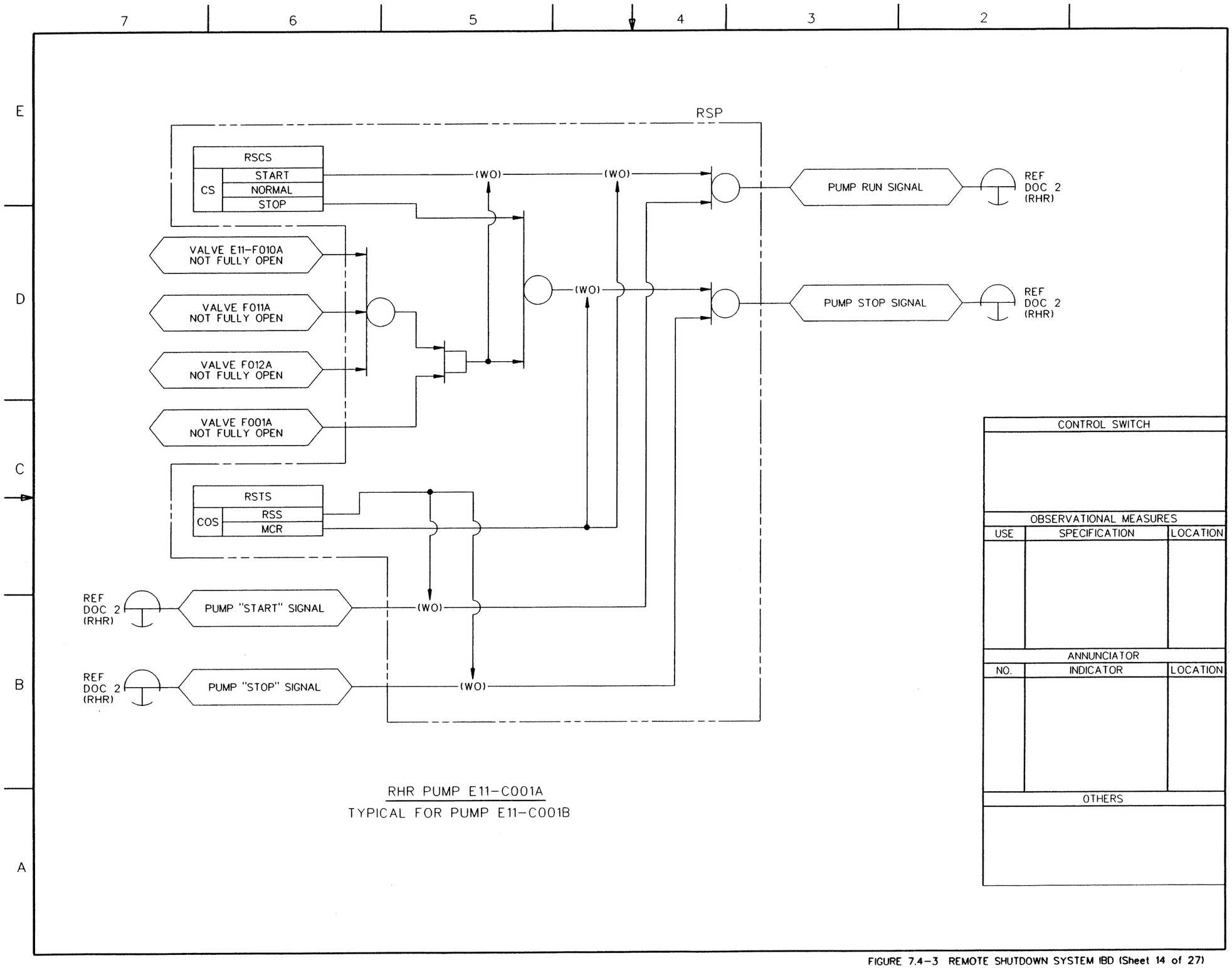
RHR MINIMUM FLOW VALVE E11-F021A
TYPICAL FOR VALVE E11-F021B

FIGURE 7.4-3 REMOTE SHUTDOWN SYSTEM IBD (Sheet 12 of 27)



HPCF MINIMUM FLOW VALVE E22-F010B

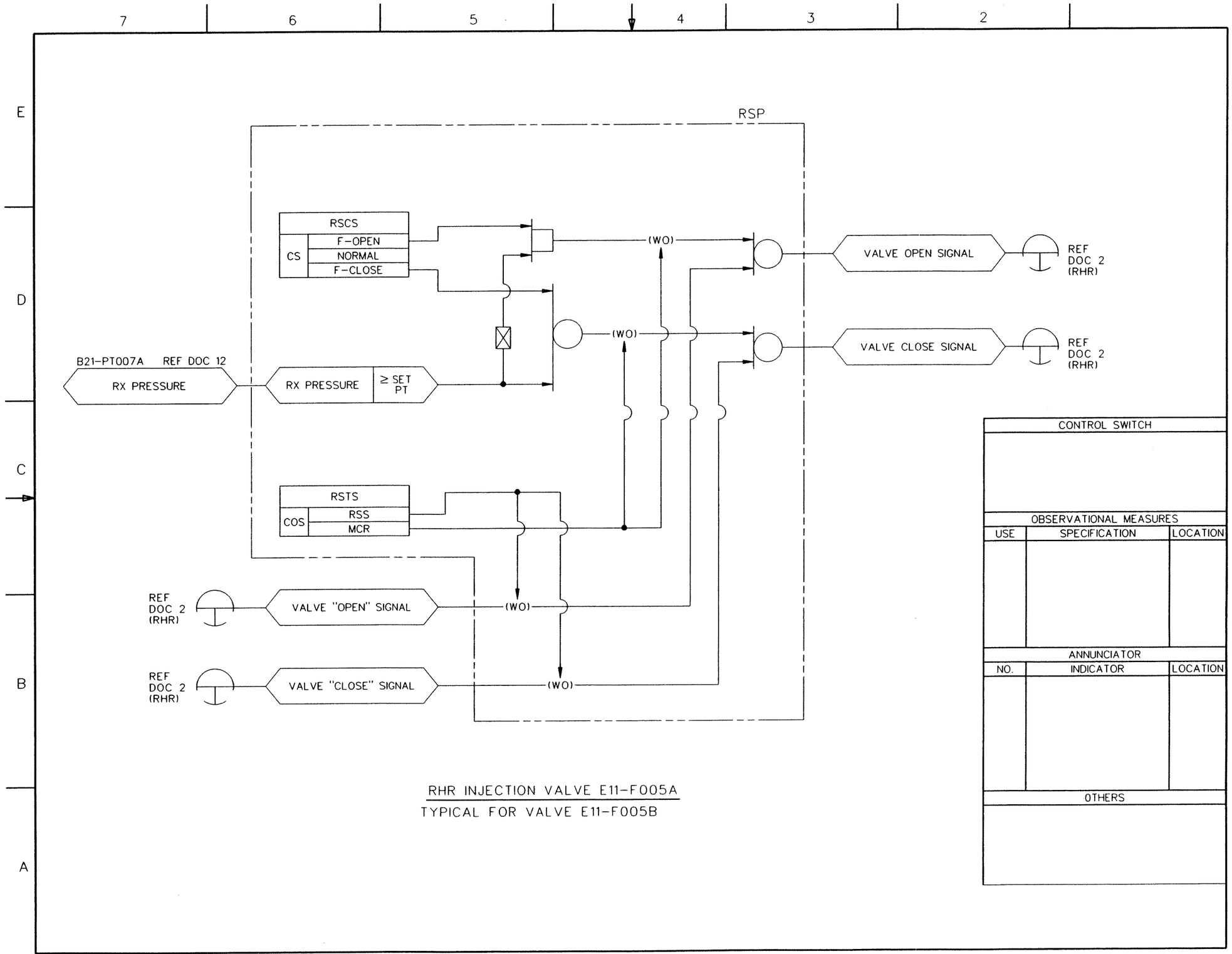
FIGURE 7.4-3 REMOTE SHUTDOWN SYSTEM IBD (Sheet 13 of 27)



RHR PUMP E11-C001A

TYPICAL FOR PUMP E11-C001B

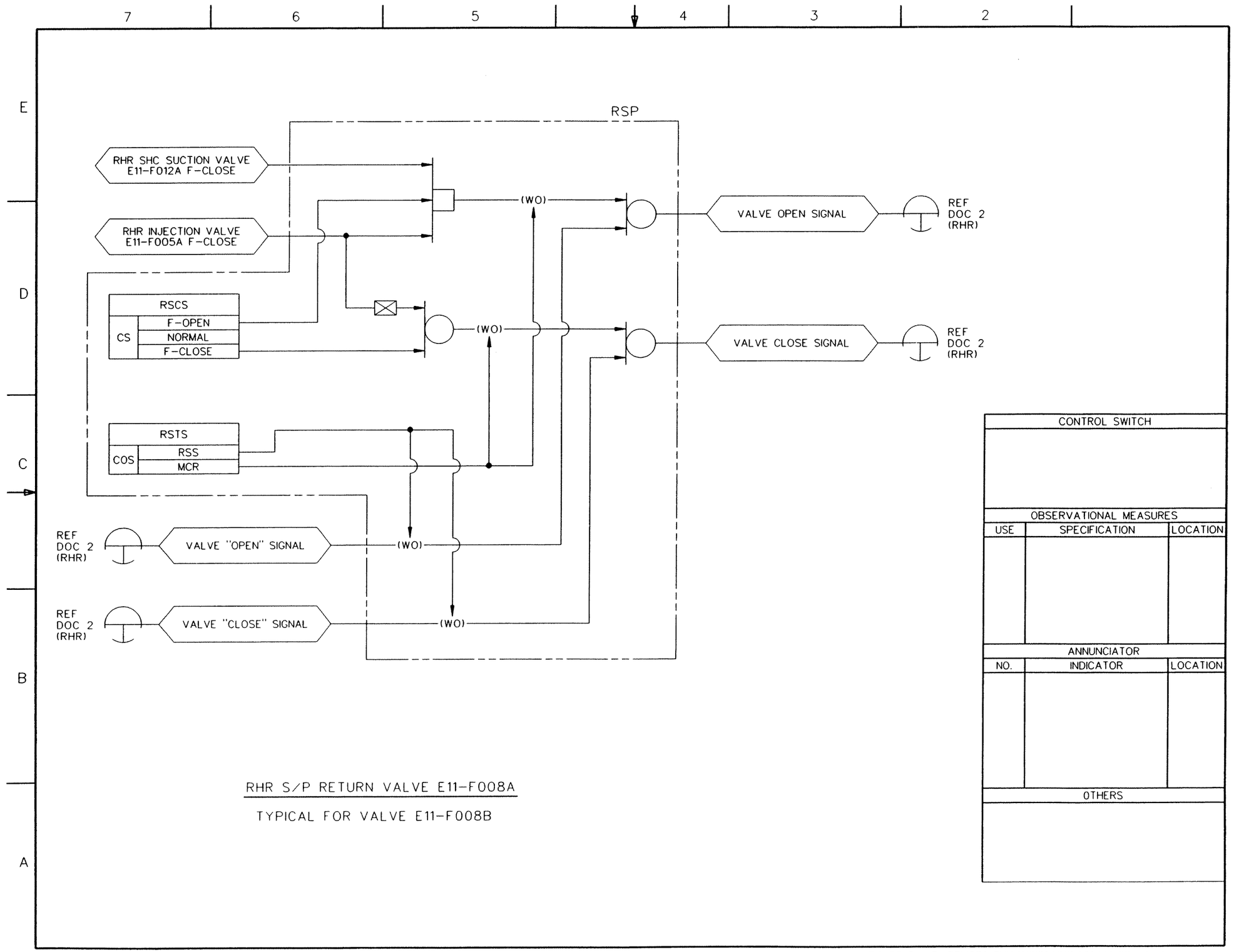
FIGURE 7.4-3 REMOTE SHUTDOWN SYSTEM IBD (Sheet 14 of 27)



RHR INJECTION VALVE E11-F005A

TYPICAL FOR VALVE E11-F005B

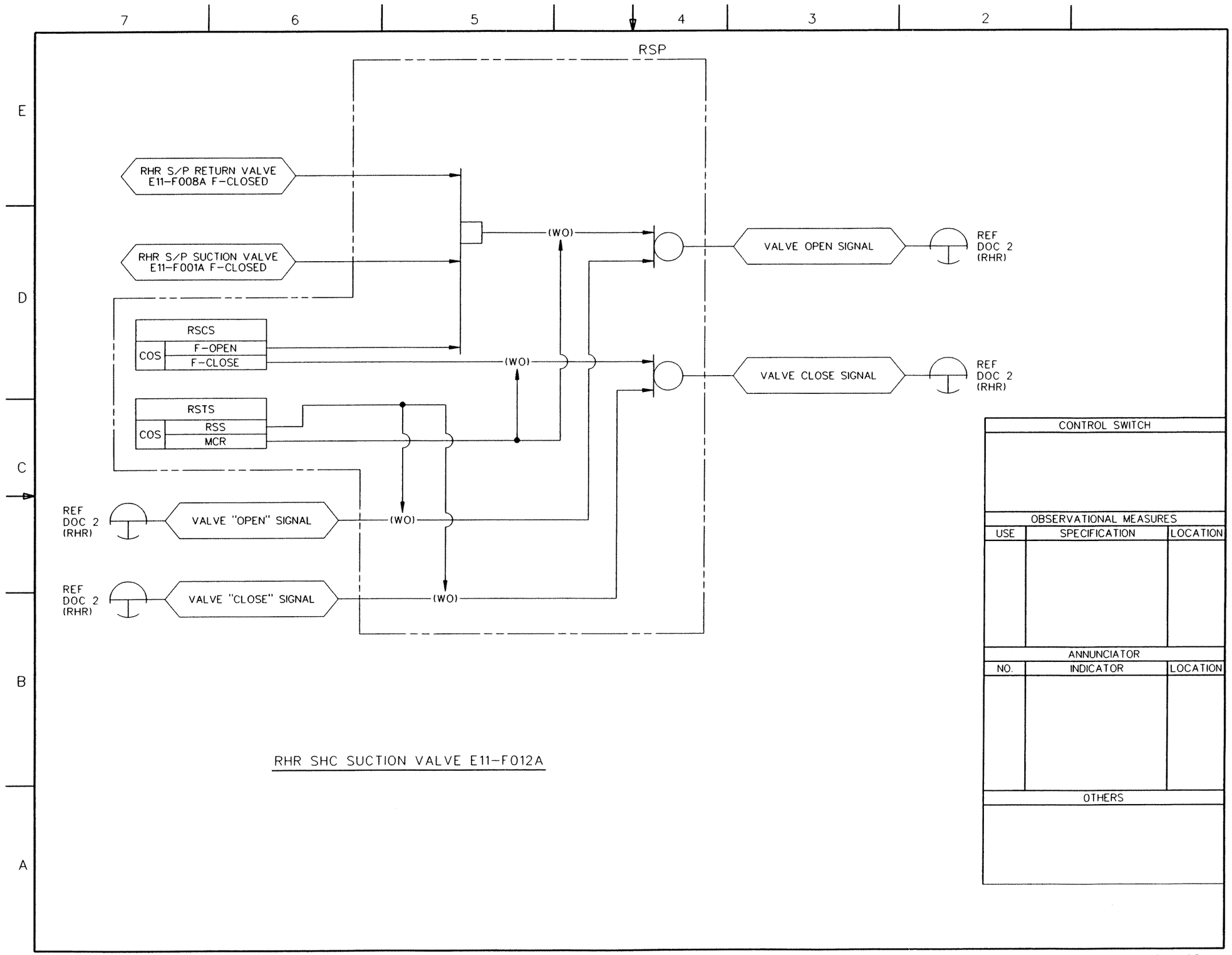
FIGURE 7.4-3 REMOTE SHUTDOWN SYSTEM IBD (Sheet 15 of 27)



RHR S/P RETURN VALVE E11-F008A

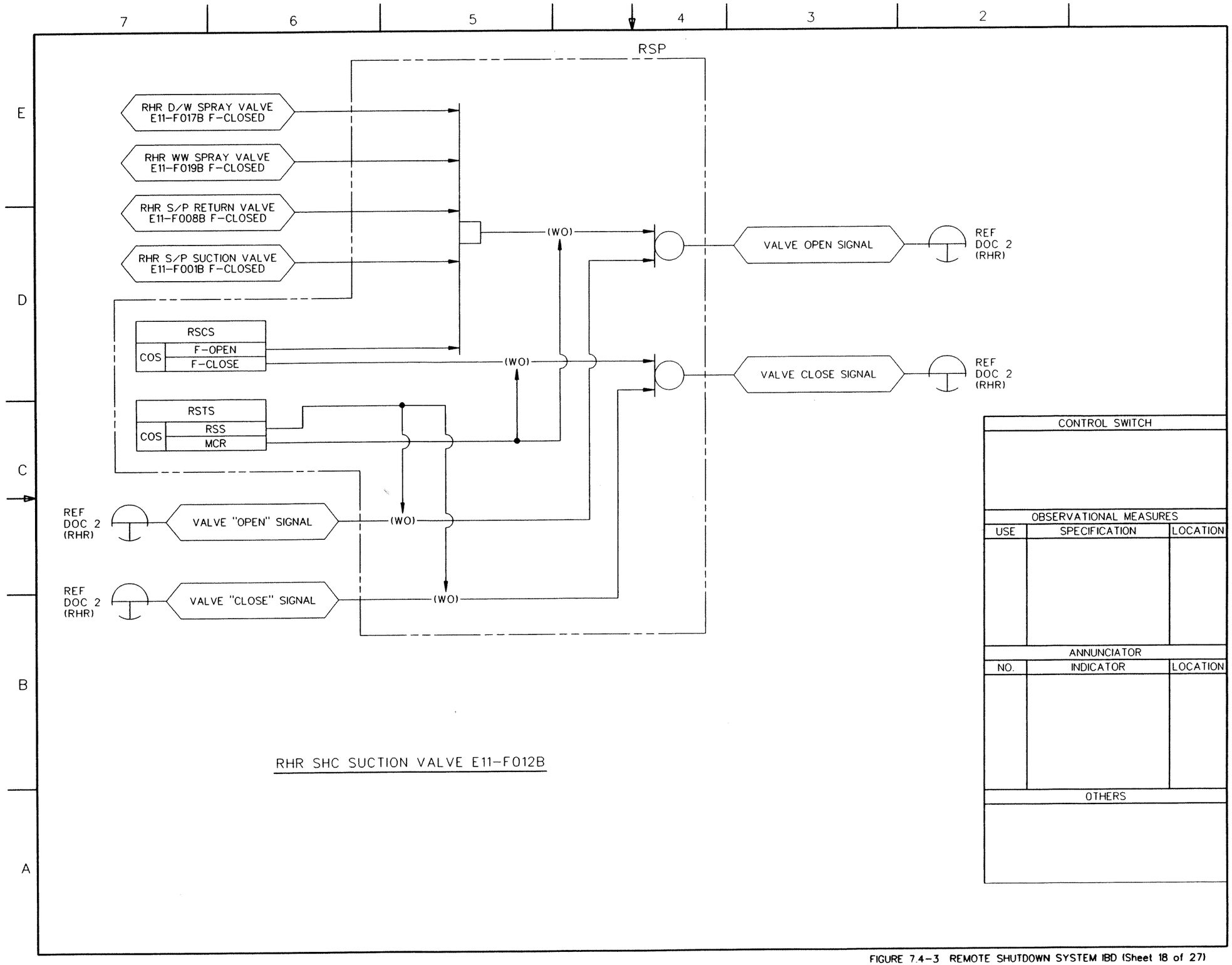
TYPICAL FOR VALVE E11-F008B

FIGURE 7.4-3 REMOTE SHUTDOWN SYSTEM IBD (Sheet 16 of 27)



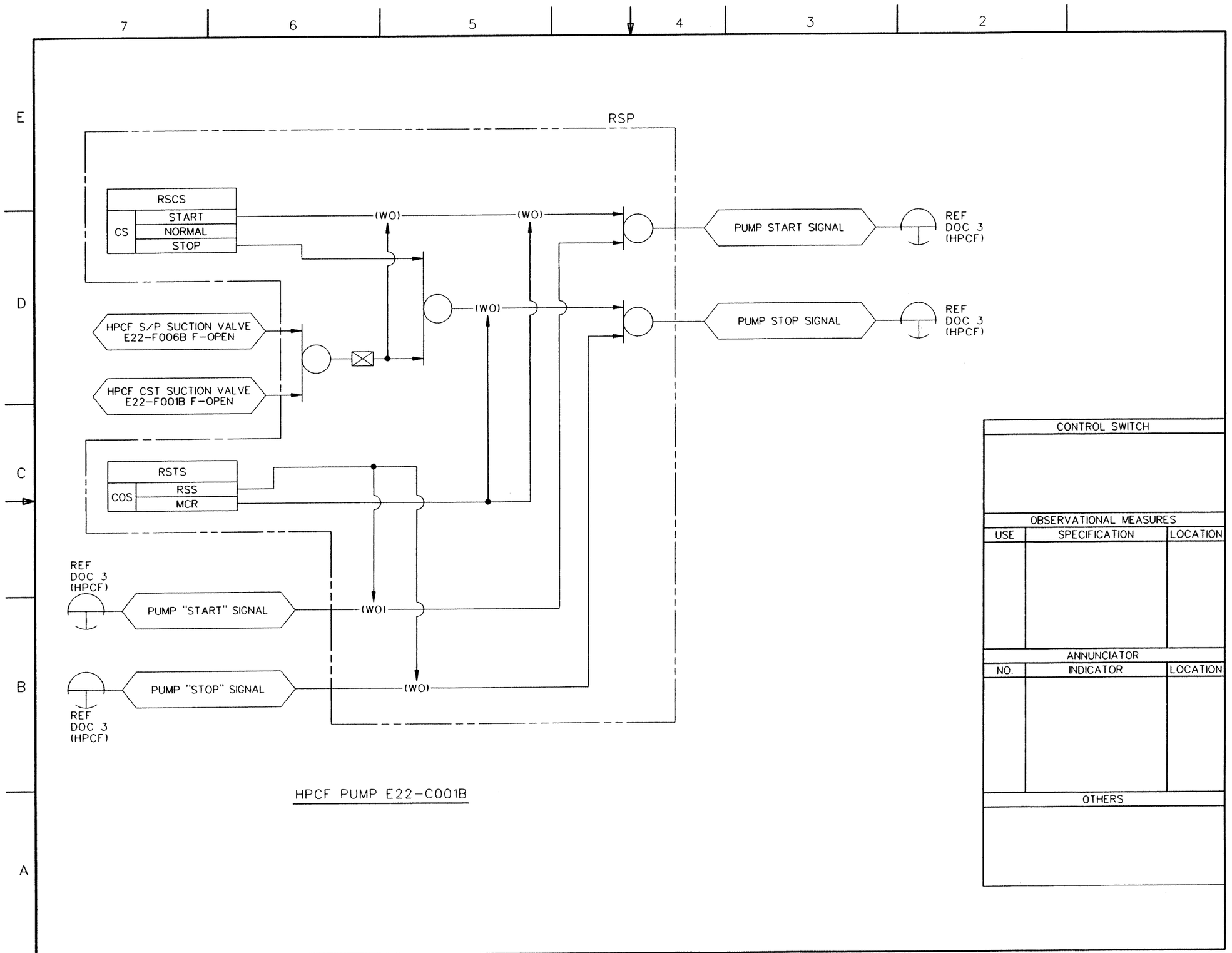
RHR SHC SUCTION VALVE E11-F012A

FIGURE 7.4-3 REMOTE SHUTDOWN SYSTEM IBD (Sheet 17 of 27)



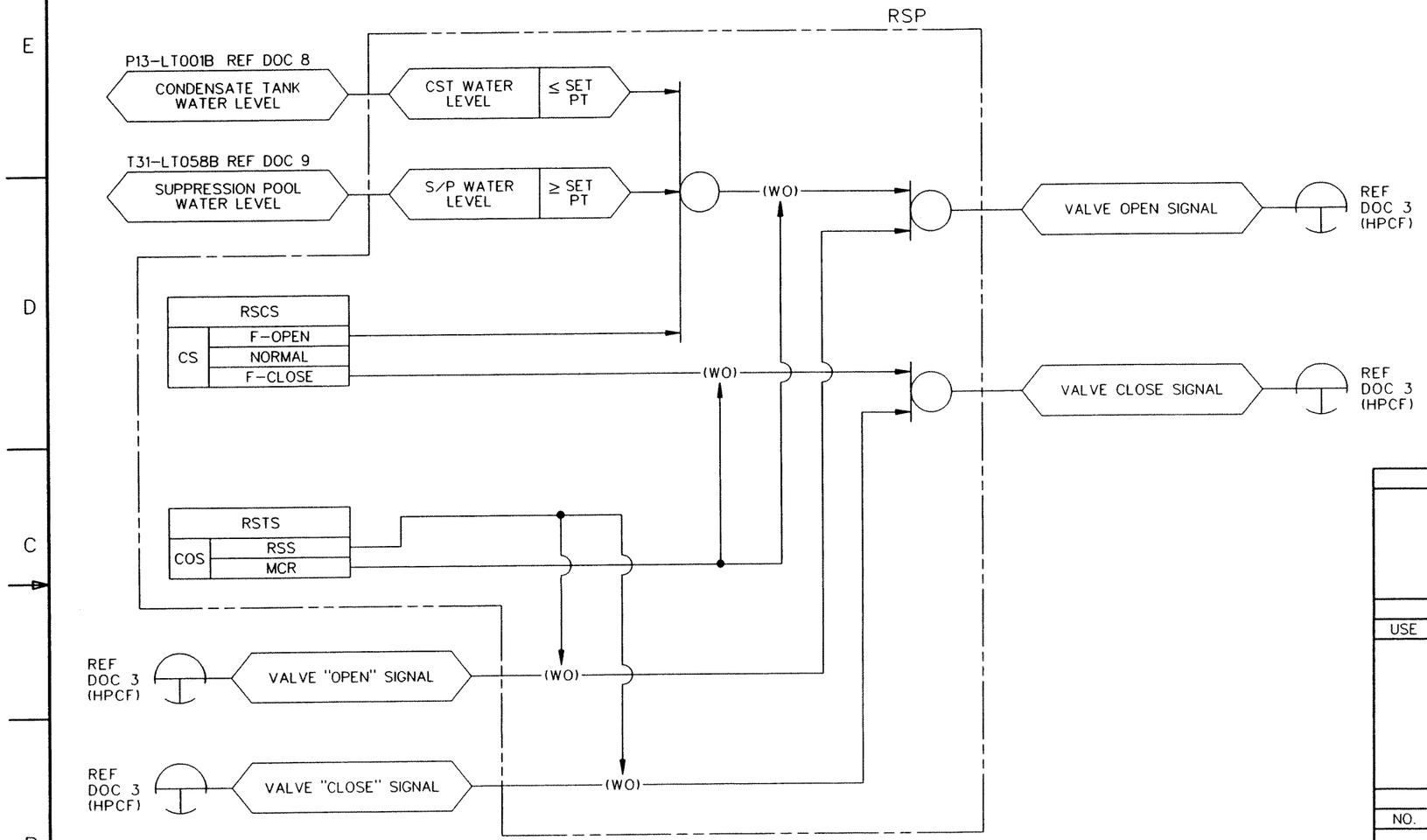
RHR SHC SUCTION VALVE E11-F012B

FIGURE 7.4-3 REMOTE SHUTDOWN SYSTEM IBD (Sheet 18 of 27)



HPCF PUMP E22-C001B

FIGURE 7.4-3 REMOTE SHUTDOWN SYSTEM IBD (Sheet 19 of 27)



HPCF S/P SUCTION VALVE B (E22-F006B)

CONTROL SWITCH

OBSERVATIONAL MEASURES		
USE	SPECIFICATION	LOCATION

ANNUNCIATOR		
NO.	INDICATOR	LOCATION

OTHERS

FIGURE 7.4-3 REMOTE SHUTDOWN SYSTEM IBD (Sheet 20 of 27)

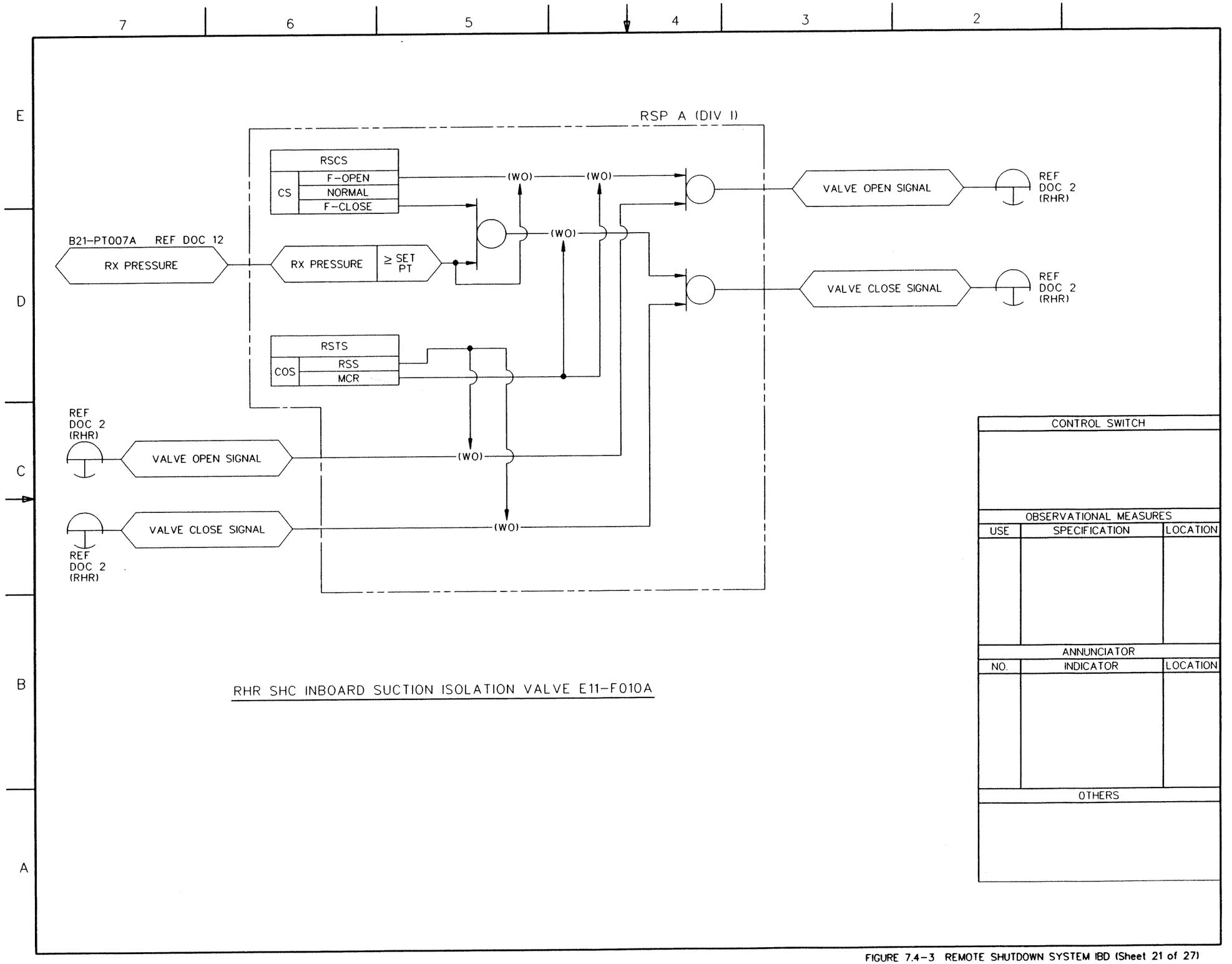


FIGURE 7.4-3 REMOTE SHUTDOWN SYSTEM IBD (Sheet 21 of 27)

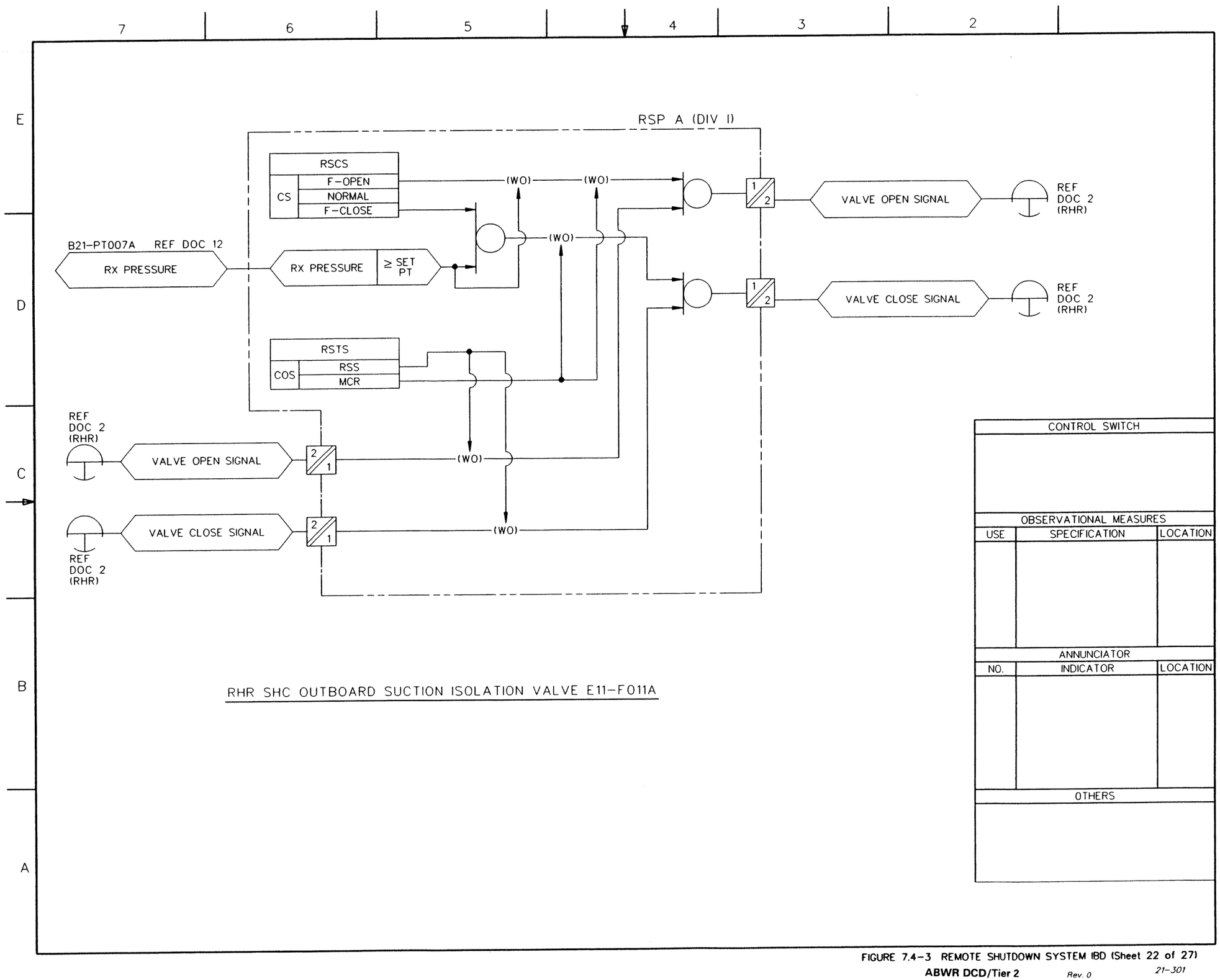


FIGURE 7.4-3 REMOTE SHUTDOWN SYSTEM IBD (Sheet 22 of 27)

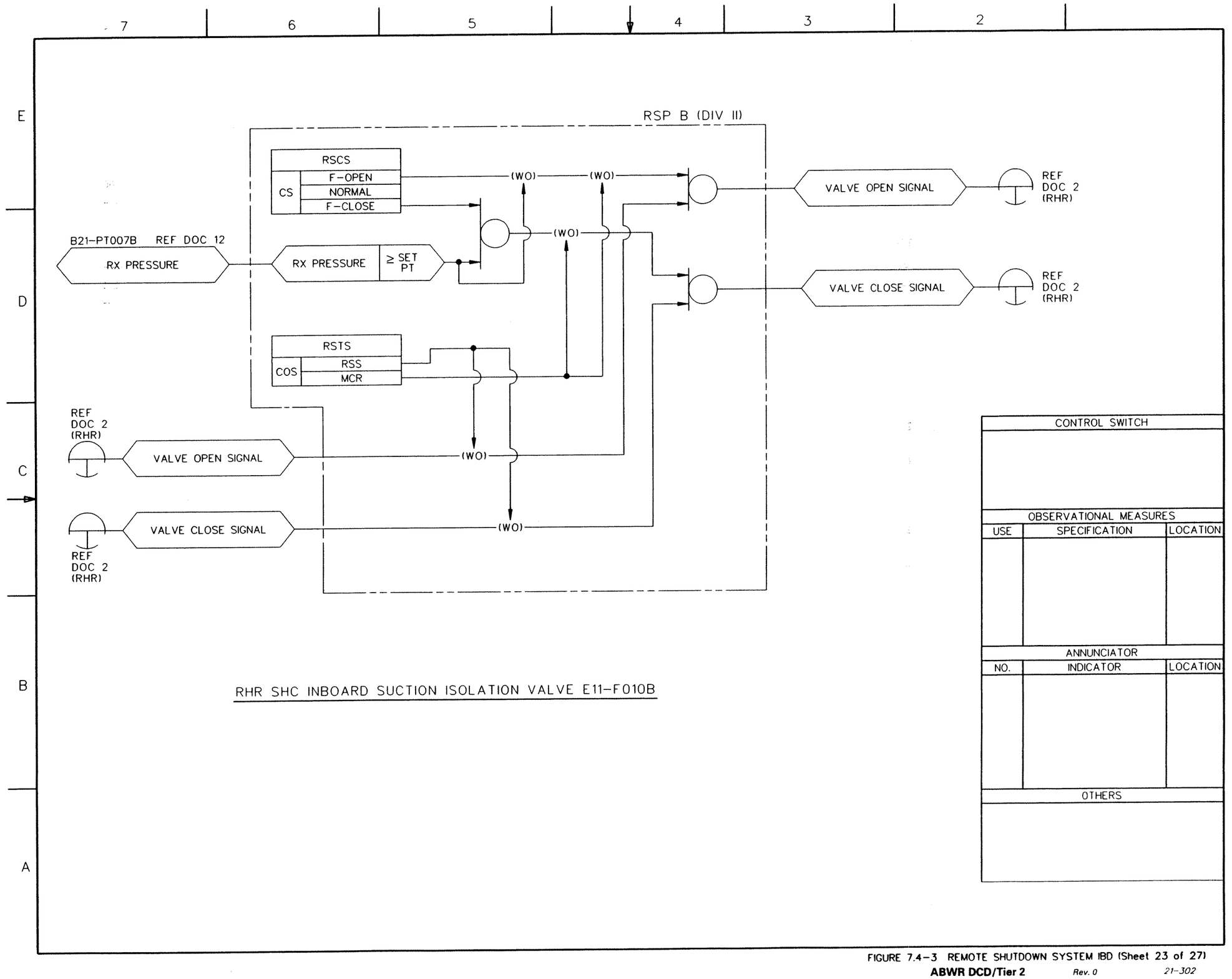
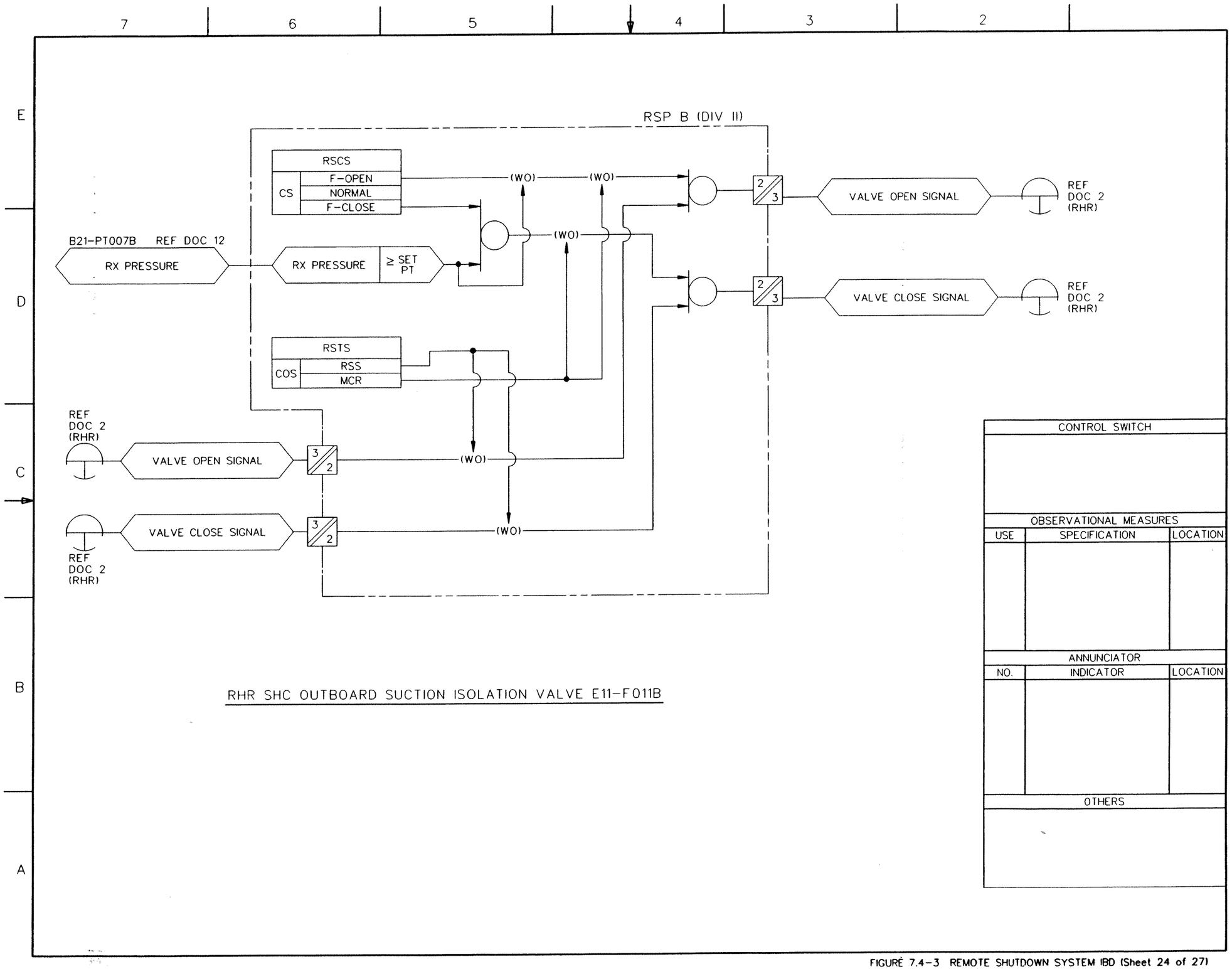


FIGURE 7.4-3 REMOTE SHUTDOWN SYSTEM IBD (Sheet 23 of 27)



RHR SHC OUTBOARD SUCTION ISOLATION VALVE E11-F011B

FIGURE 7.4-3 REMOTE SHUTDOWN SYSTEM IBD (Sheet 24 of 27)

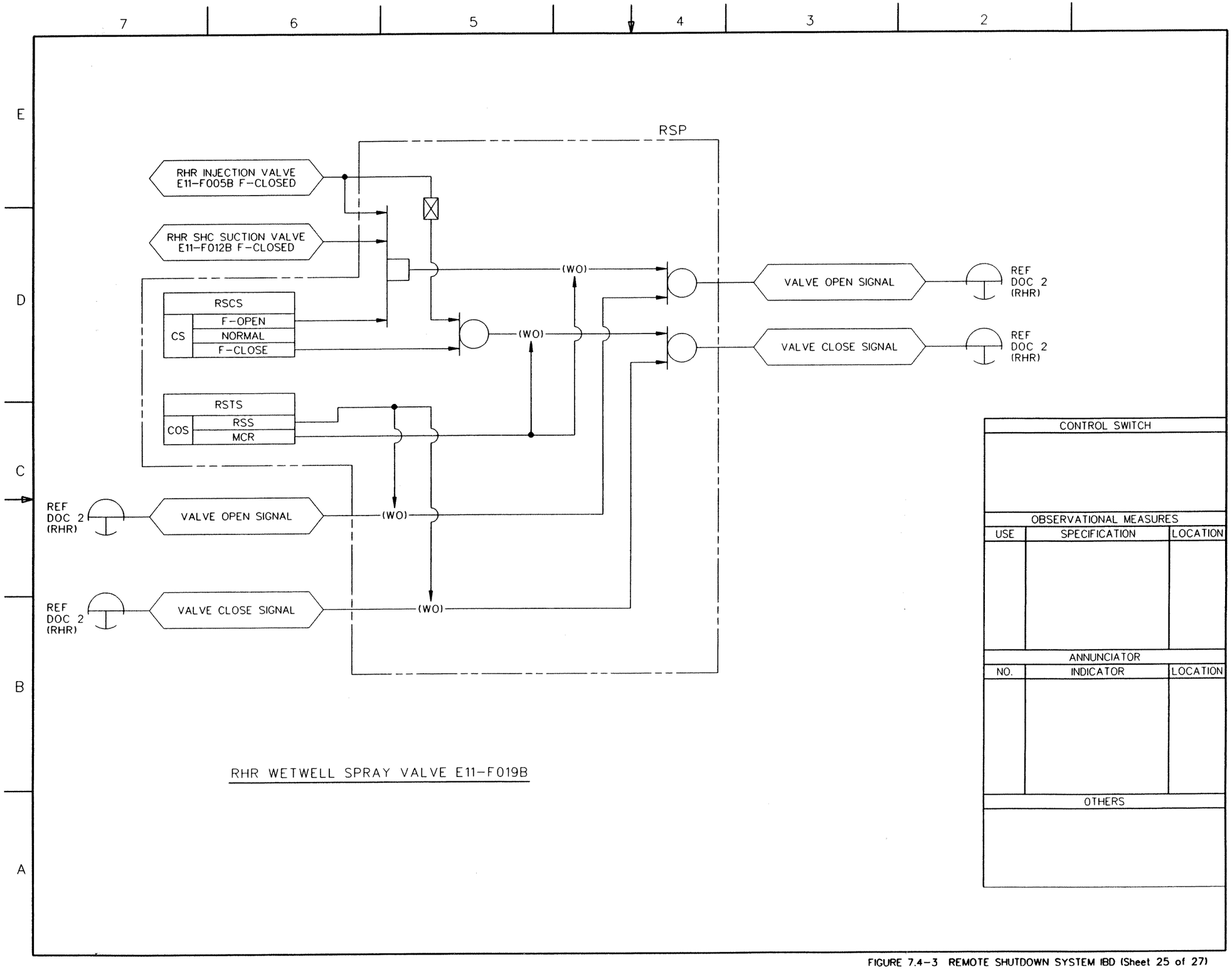
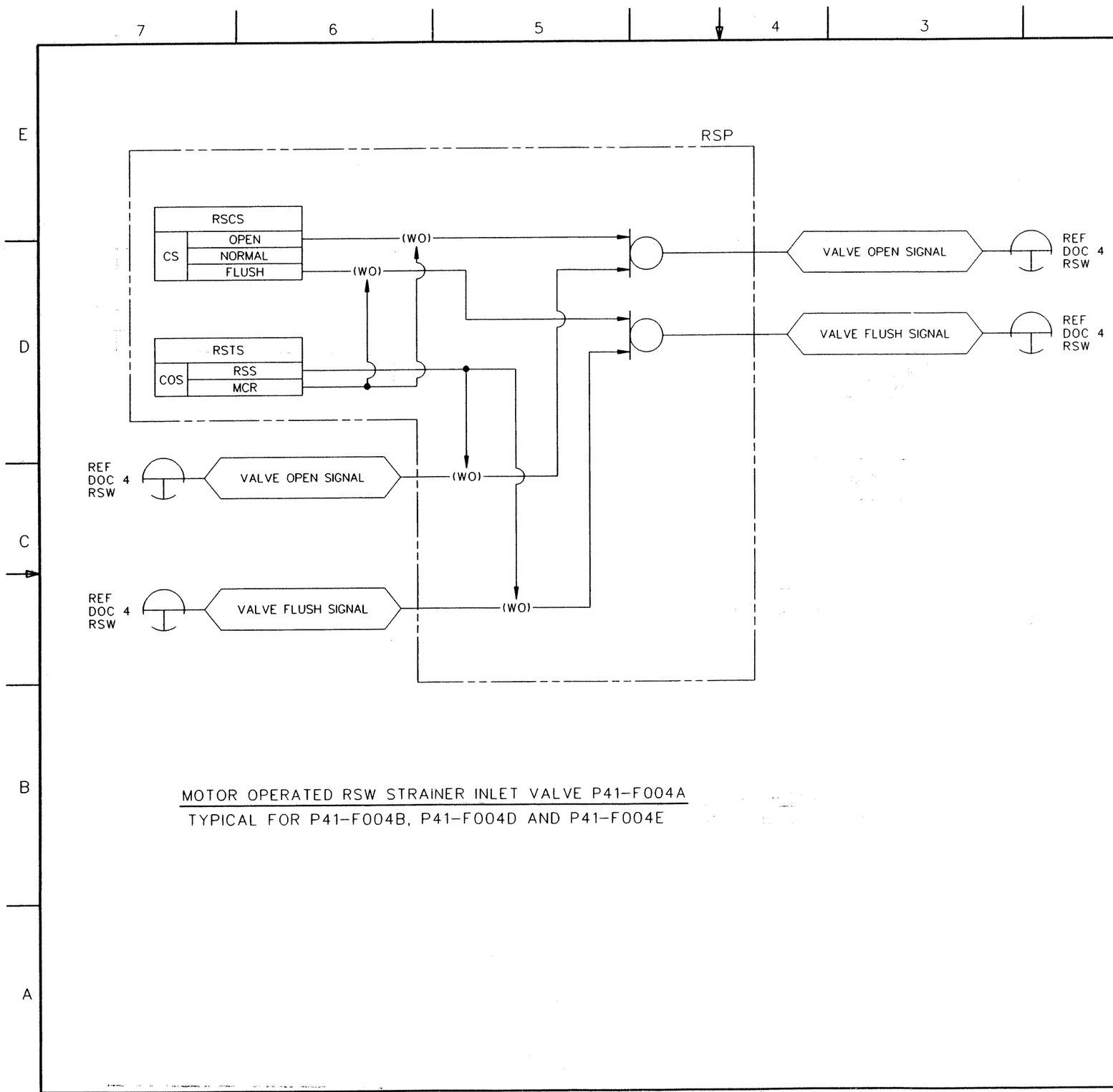


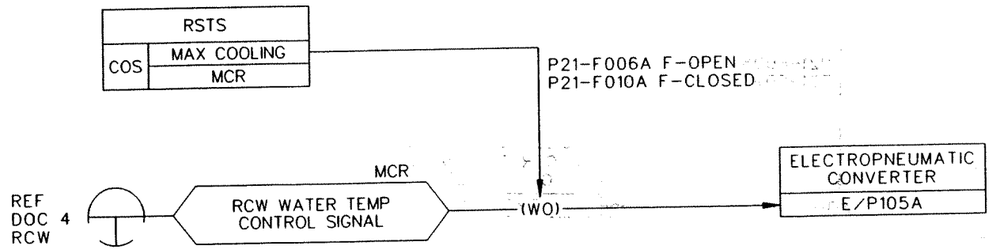
FIGURE 7.4-3 REMOTE SHUTDOWN SYSTEM IBD (Sheet 25 of 27)



MOTOR OPERATED RSW STRAINER INLET VALVE P41-F004A

TYPICAL FOR P41-F004B, P41-F004D AND P41-F004E

FIGURE 7.4-3 REMOTE SHUTDOWN SYSTEM IBD (Sheet 26 of 27)



P21-F006A: RCW COOLING WATER TEMPERATURE CONTROL VALVE (HX SIDE) (A)

P21-F010A: RCW COOLING WATER TEMPERATURE CONTROL VALVE (HX BYPASS SIDE) (A)

RCW COOLING WATER TEMPERATURE CONTROL VALVES

TYPICAL FOR P21-F006B AND P21-F010B

CONTROL SWITCH

OBSERVATIONAL MEASURES		
USE	SPECIFICATION	LOCATION

ANNUNCIATOR		
NO.	INDICATOR	LOCATION

OTHERS

FIGURE 7.4-3 REMOTE SHUTDOWN SYSTEM IBD (Sheet 27 of 27)

GE Nuclear Energy

Rev. 4
March 1997

ABWR Design Control Document

Design Control Document Table Of Contents

TABLE 1 LPRM TO APRM ASSIGNMENTS

DET AND LPRM LOCATION	APRM CHANNEL A	B	C	D	MUX UNIT NO.
20-61	B	C	D	A	1
28-61	C	D	A	B	2
36-61	B	C	D	A	3
44-61	C	D	A	B	4
52-61	B	C	D	A	1
12-53	D	A	B	C	1
20-53	A	B	C	D	4
28-53	D	A	B	C	3
36-53	A	B	C	D	2
44-53	D	A	B	C	1
52-53	A	B	C	D	4
60-53	D	A	B	C	3
04-45	B	C	D	A	4
12-45	C	D	A	B	3
20-45	B	C	D	A	2
28-45	C	D	A	B	1
36-45	B	C	D	A	4
44-45	C	D	A	B	3
52-45	B	C	D	A	2
60-45	C	D	A	B	1
04-37	A	B	C	D	2
12-37	D	A	B	C	2
20-37	A	B	C	D	3
28-37	D	A	B	C	4
36-37	A	B	C	D	1
44-37	D	A	B	C	2
52-37	A	B	C	D	3
60-37	D	A	B	C	4
04-29	B	C	D	A	3
12-29	C	D	A	B	4
20-29	B	C	D	A	1
28-29	C	D	A	B	2
36-29	B	C	D	A	3
44-29	C	D	A	B	4
52-29	B	C	D	A	1
60-29	C	D	A	B	2

TABLE 1 LPRM TO APRM ASSIGNMENTS (CONT'D)

DET AND LPRM LOCATION	APRM CHANNEL A	B	C	D	MUX UNIT NO.
12-21	D	A	B	C	1
20-21	A	B	C	D	4
28-21	D	A	B	C	3
36-21	A	B	C	D	2
44-21	D	A	B	C	1
52-21	A	B	C	D	4
60-21	D	A	B	C	3
12-13	C	D	A	B	3
20-13	B	C	D	A	2
28-13	C	D	A	B	1
36-13	B	C	D	A	4
44-13	C	D	A	B	3
52-13	B	C	D	A	2
28-05	D	A	B	C	4
36-05	A	B	C	D	1
44-05	D	A	B	C	2

(NOTE 9)

TABLE 3 POWER DISTRIBUTION

	120V AC DIVISIONAL UPS BUS A	B	C	D
DIVISION	I	II	III	IV
SRNM CH'S	A,E,J	B,F	C,G,L	D,H
APRM CH'S	A	B	C	D
	120V AC NON-DIVISIONAL UPS A	B	C	D
MRBM CH'S	A	B		
SRNM RECORDERS	A,E,J	B,F	C,G,L	D,H
APRM RECORDERS	A	B	C	D
MRBM RECORDERS	A	B	A	B

460V, 3 Ø 3KVA: ATIP DRIVE MECHANISMS

120V AC: ATIP INSTR. PANEL

TABLE 2 LPRM STRING ASSIGNMENT TO ATIP MACHINES

ATIP A POSITION #	ATIP A LPRM LOC.	ATIP B POSITION #	ATIP B LPRM LOC.	ATIP C POSITION #	ATIP C LPRM LOC.
1	04-29	1	28-05	1	44-13
2	04-37	2	28-13	2	44-21
3	04-45	3	28-21	3	44-29
4	12-13	4	28-29	4	44-37
5	12-21	5	28-37	5	44-45
6	12-29	6	28-45	6	44-53
7	12-37	7	28-53	7	44-61
8	12-45	8	28-61	8	52-13
9	12-53	9	36-05	9	52-21
10	20-13	10	36-13	10	52-29
11	20-21	11	36-21	11	52-37
12	20-29	12	36-29	12	52-45
13	20-37	13	36-45	13	52-53
14	20-45	14	36-53	14	52-61
15	20-53	15	36-61	15	60-21
16	20-61	16	44-05	16	60-29
17	–	17	–	17	60-37
18	–	18	–	18	60-45
19	–	19	–	19	60-53
20	36-37	20	36-37	20	36-37

LEGEND:

- O – LPRM DETECTOR ASM (52)
- + – CONTROL RODS (205)
- □ – SRNM DETECTORS (10)
- △ – NEUTRON SOURCES (5)
- ◫ – SIGNAL ISOLATION
- C – COMPUTER INPUTS
- T – TRANSIENT TEST PANEL INPUTS
- ⇒ – MULTIPLEXING TRANSMISSION (VIA OPTIC FIBER OR METALLIC CONDUCTOR)
- —● – SINGLE TRANSMISSION

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

	MPL NO.
1. RECIRCULATION FLOW CONTROL SYS, IED	C81-1040
2. PMCS INPUT/OUTPUT LIST	C90-1060
3. PIPING AND INSTRUMENT SYMBOLS DIAGRAM	A10-3030
4. REACTOR PROTECTION SYS, IED	C71-1040
5. ROD CONTROL AND INFORMATION SYS, IED	C11-1040
6. PMCS IED	C90-1040
7. MCRP SYSTEM IED	H11-1040
8. AUTOMATIC POWER REGULATOR SYS IED	C82-1040
9. NEUTRON MONITORING SYSTEM, IBD	C51-1030
10. NEUTRON MONITORING SYS ARCMT	C51-1070

ABBREVIATIONS

RPS ——— REACTOR PROTECTION SYSTEM
SRNM ——— STARTUP RANGE NEUTRON MONITOR
LPRM ——— LOCAL POWER RANGE MONITOR
APRM ——— AVERAGE POWER RANGE MONITOR
ATIP ——— AUTOMATED TRAVERSING INCORE PROBE
MRBM ——— MULTI-CHANNEL ROD BLOCK MONITOR
UPS ——— UNINTERRUPTABLE POWER SUPPLY
NMS ——— NEUTRON MONITORING SYSTEM
RC&IS ——— ROD CONTROL AND INFORMATION SYSTEM
MCRP ——— MAIN CONTROL ROOM PANEL
PMCS ——— PERFORMANCE MONITORING CONTROL SYSTEM
APRS ——— AUTOMATIC POWER REGULATOR SYSTEM
MSV ——— MEAN SQUARE VOLTAGE
ATLM ——— AUTOMATED THERMAL LIMIT MONITOR
OPRM ——— OSCILLATION POWER RANGE MONITOR

NOTES:

1. THIS DOCUMENT PRESENTS THE BASIC REQUIREMENTS OF FUNCTIONAL UNITS ALLOCATION OF THE NMS INSTRUMENTS, THEIR BASIC FUNCTIONS, AND THEIR INPUT AND OUTPUT REQUIREMENTS TO OTHER SYSTEMS. IT ALSO INCLUDES REQUIREMENTS OF DETECTOR LOCATION ASSIGNMENTS IN CORE AS WELL AS THEIR ASSIGNMENTS TO DIFFERENT DIVISIONS.
2. ALL EQUIPMENT, INSTRUMENTS AND DISPLAY CONTROL SYSTEM INPUT SIGNALS ARE PREFIXED BY C51– UNLESS OTHERWISE NOTED. THE PART NUMBERS ARE LOCATED ADJACENT TO OR ON THE SIGNAL CONDITIONING EQUIPMENT PERFORMING THE FUNCTION INDICATED.
3. AN AREA RADIATION MONITOR IS RECOMMENDED TO BE INSTALLED IN THE TIP DRIVE MECHANISM ROOM, AND THE OUTSIDE OF THE PERSONNEL HATCH DOOR (TO THE DRYWELL).
4. REMOTE DISPLAY MEANS DISPLAY ON MAIN CONTROL ROOM PANEL. FOR DISPLAY DEVICE TYPE, REFER TO C51-5030.
5. REMOTE RECORDING DEVICE SHALL BE BASED ON THAT SPECIFIED IN H11-4010.
6. SRNM NON-COINCIDENT UPSCALE LEVEL TRIP IS ONLY ACTIVATED BY MANUAL SWITCH IN RPS.
7. THESE ARE SAFETY RELATED CORE PLATE DIFFERENTIAL PRESSURE (C81-DPT301A-D) SIGNALS OF THE RFCS ESSENTIAL CORE PLATE DIFFERENTIAL PRESSURE SIGNALS.
8. COMMAND AND CONTROL SIGNALS BETWEEN THE PROCESS COMPUTER AND THE ATIP OTHER THAN ATIP MEASURED DATA ARE TRANSMITTED THROUGH THIS DATA ENTRY POINT.
9. IN CASE OF USING MULTIPLEXING UNITS OR SUB-APRM UNITS, DETECTORS SIGNALS ARE DISTRIBUTED TO FOUR MULTIPLEXER UNITS, IN EACH DIVISION ACCORDING TO TABLE 1 ARRANGEMENT. THE MULTIPLEXER UNIT ASSIGNMENT ONLY DEPENDS ON LPRM STRING LOCATION AND ARE IDENTICAL FOR ALL FOUR DIVISIONS.
10. THE DATA COMMUNICATION FUNCTION (DCF) REFERS TO THE INPUT/OUTPUT FUNCTION OF THE SRNM AND THE APRM. THIS IED DOES NOT SPECIFY THE ACTUAL HARDWARE IMPLEMENTATION OF THIS DCF.
11. FOR DETAIL TRIP SIGNAL FUNCTIONAL INTERFACES WITH RC&IS & RPS, REFER TO SUPPL DOC 8. THERE SHOULD BE A SEPARATE RC&IS AND RPS TRIP LOGIC FUNCTION INDEPENDENT OF EACH INDIVIDUAL SRNM CHANNEL IN THE DIVISION. THE SSLC INTERLOCK SIGNAL IS THE "ATWS PERMISSIVE" SIGNAL.
12. THIS IED INCLUDES ALL MAIN INPUT/OUTPUT SIGNALS REQUIRED TO BE INCLUDED IN THE INSTRUMENT DESIGN. FOR DETAIL BINARY TRIP SIGNALS, REFER TO NMS IBD, SUPPLEMENTAL DOCUMENT 9.
13. THE SIGNAL TRANSMISSION PATH CAN BE EITHER THROUGH MULTIPLEXING OR THROUGH DEDICATED CONDUCTORS.
14. TRIP SIGNALS FROM THE NMS TO THE PMCS SHALL BE TRANSMITTED VIA DEDICATED CONDUCTORS (E.G. METAL CABLE WITH PROPER ISOLATION) TO AVOID UNNECESSARY TIME DELAY FOR TRIP SEQUENCE RECORDING.
15. THE OPRM IS A FUNCTIONAL SUBSYSTEM OF THE APRM. IT RECEIVES THE SAME LPRM SIGNALS THE APRM OF THE SAME DIVISION RECEIVES AS INPUT, AS SHOWN IN TABLE 1. THE OPRM LOGIC IS DESCRIBED IN SUPPL DOC 9.

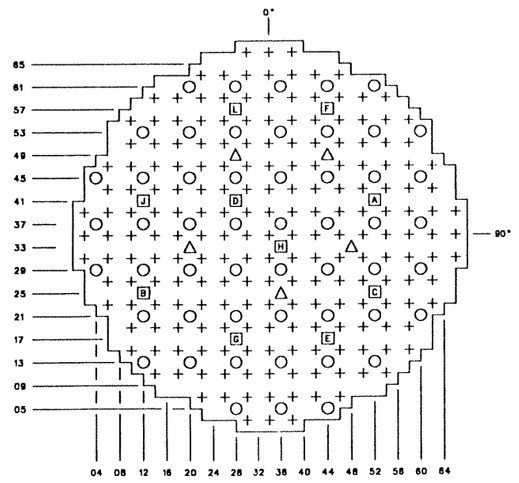


FIGURE 1: DETECTOR AND CONTROL ELEMENT ARRANGEMENT (TOP VIEW OF CORE)

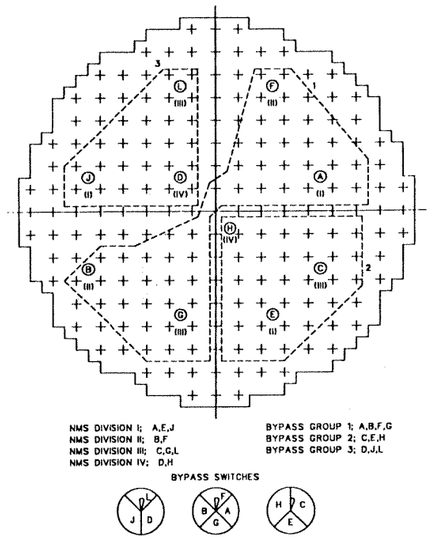
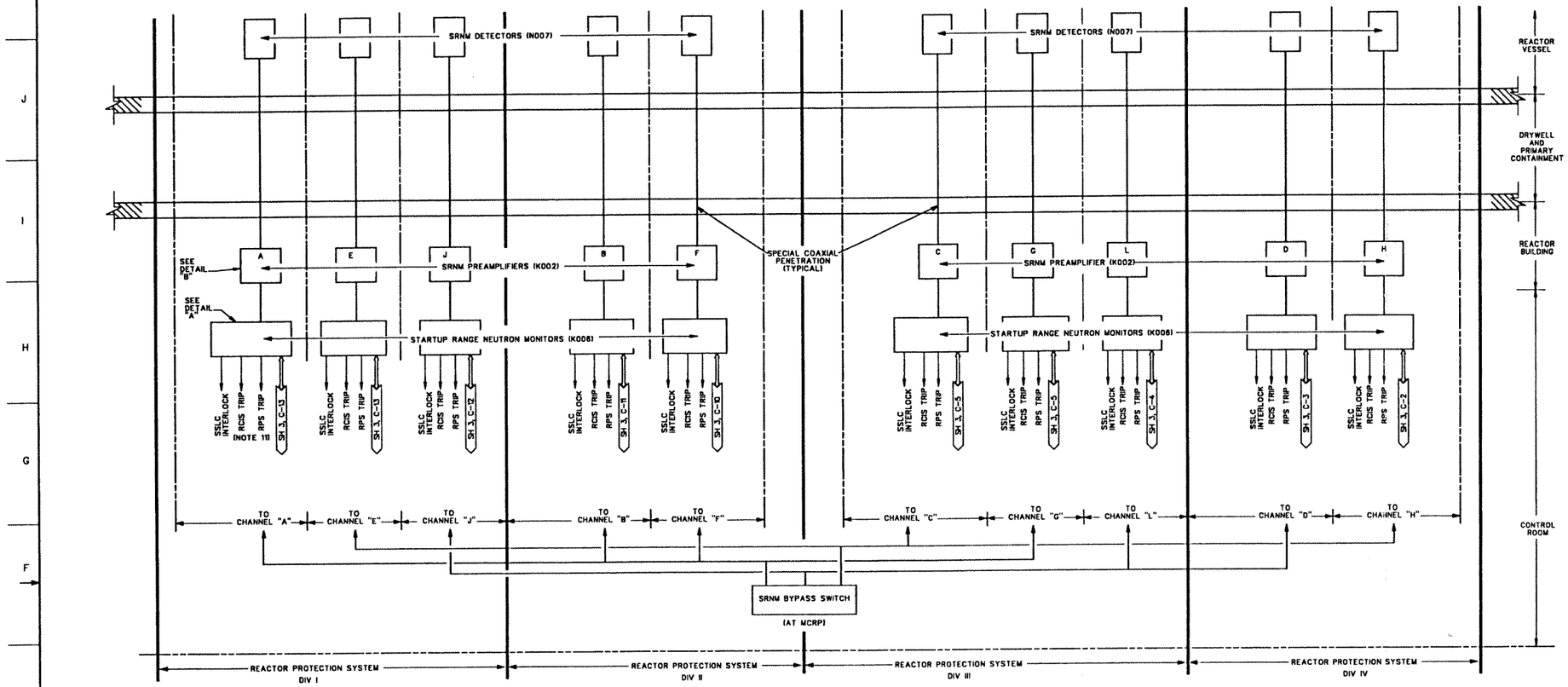


FIGURE 2: SRNM DIVISION & BYPASS GROUP ASSIGNMENTS

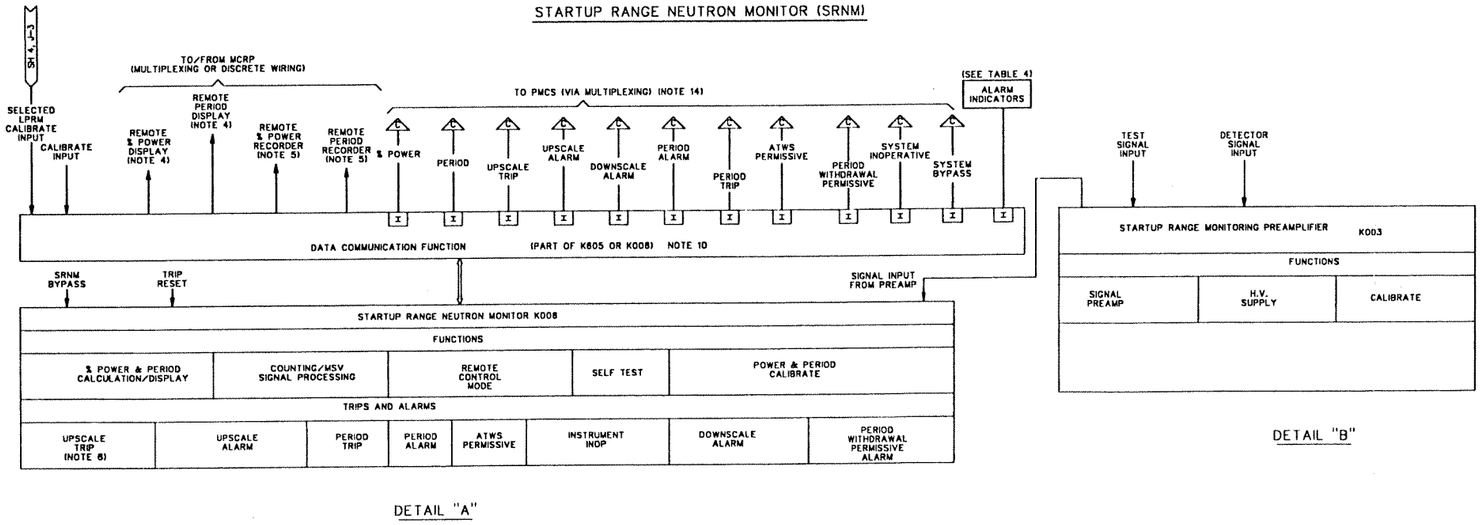
MPL NO. C51-1040

FIGURE 7.6-1 NEUTRON MONITORING SYSTEM IED SH 1 OF 4

STARTUP RANGE NEUTRON MONITOR (SRNM)



STARTUP RANGE NEUTRON MONITOR (SRNM)



DETAIL "A"

DETAIL "B"

FIGURE 7.6-1 NEUTRON MONITORING SYSTEM (SH 2 OF 4

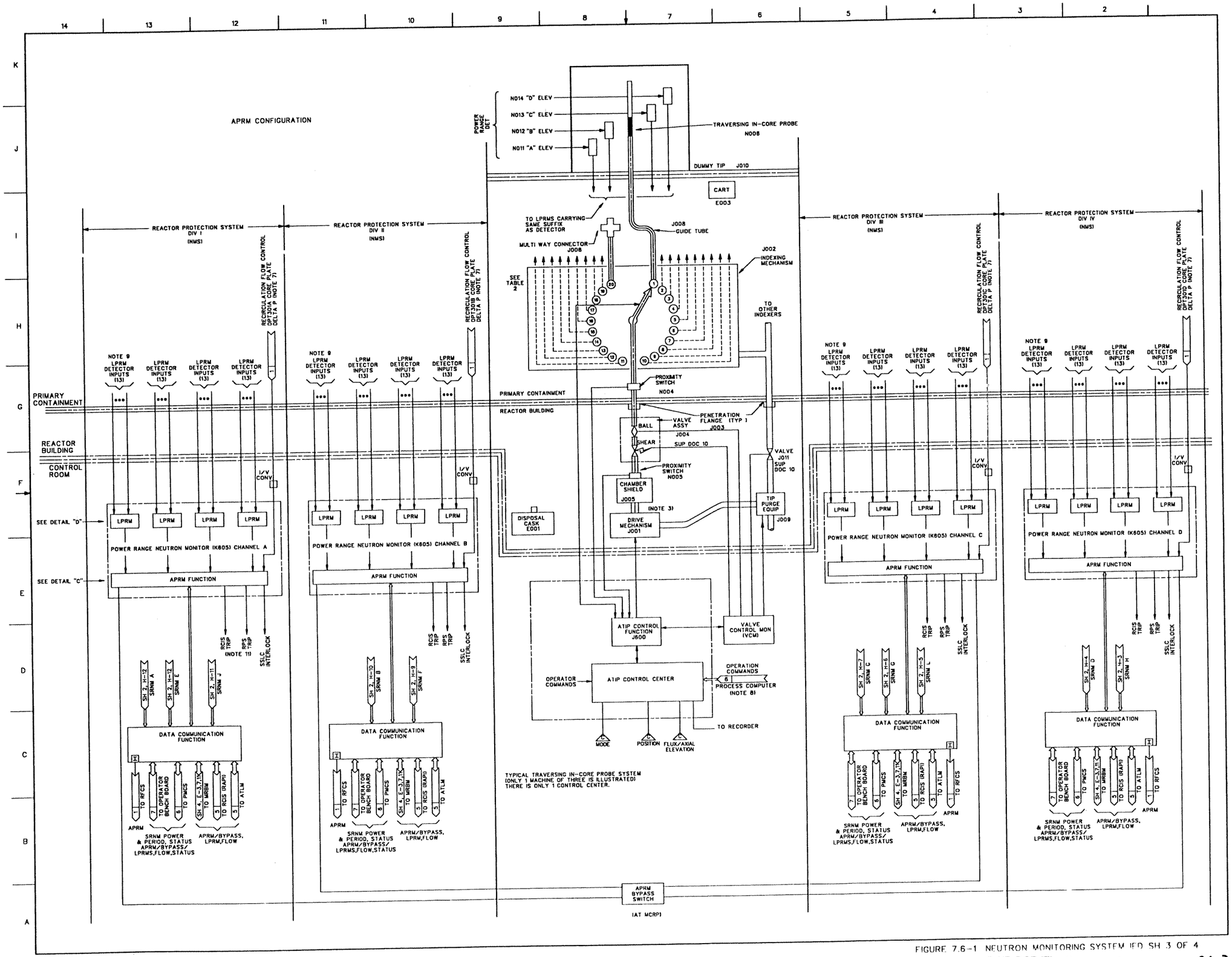
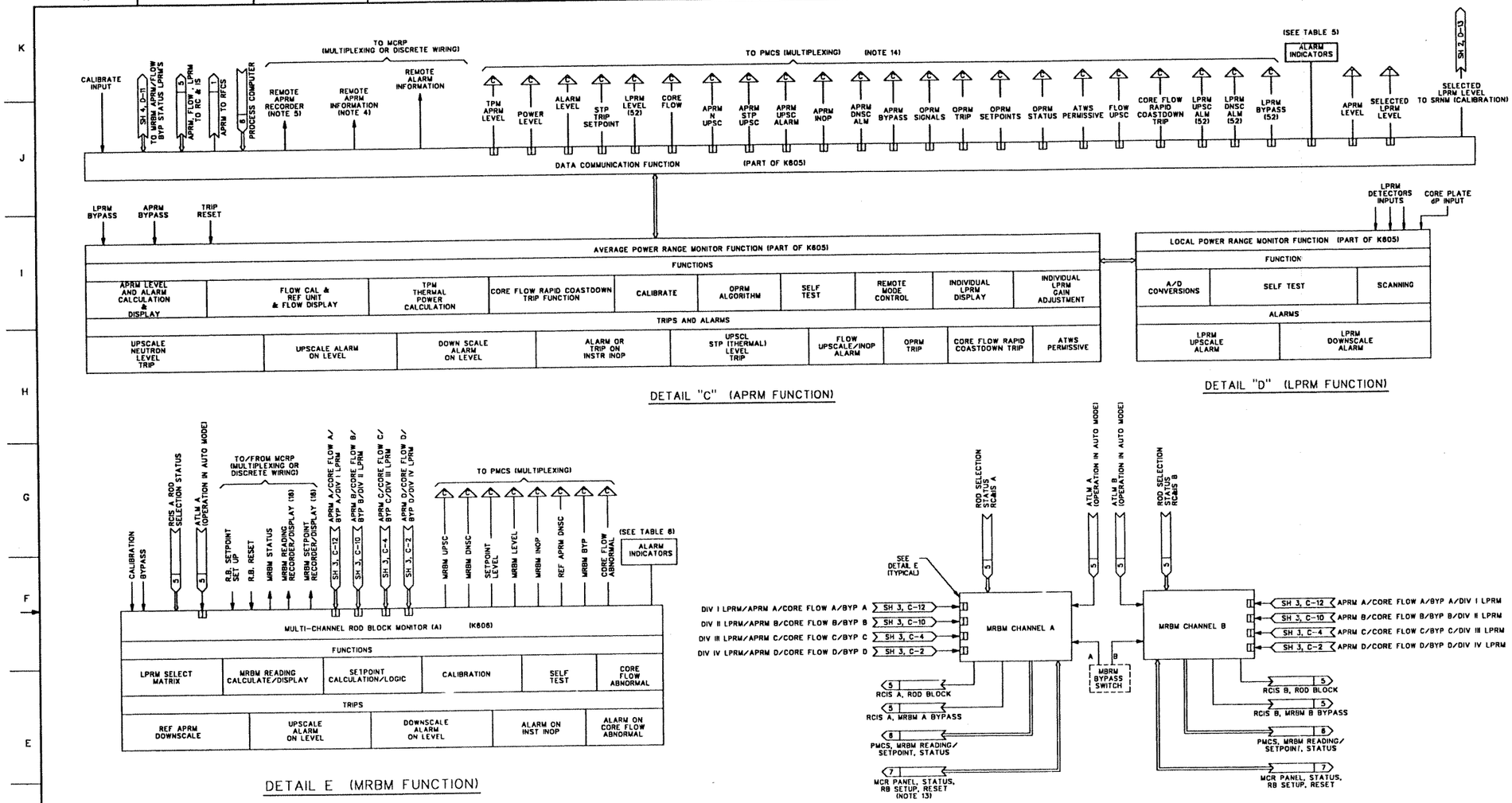


FIGURE 7.6-1 NEUTRON MONITORING SYSTEM (FD SH 3 OF 4



DETAIL "C" (APRM FUNCTION)

DETAIL "D" (LPRM FUNCTION)

DETAIL E (MRBM FUNCTION)

TABLE 4
SRNM TRIP & ALARM INDICATIONS

TRIP/ALARM FUNCTION	OUTPUT TO:	MCRP INDICATION	MCRP ANNUNCIATION	COMPUTER INPUT
UPSCALE TRIP	RPS	EACH CHANNEL	EACH DIV	EACH CHANNEL
UPSCALE ALARM	RCIS	EACH CHANNEL	NON-DIV	EACH CHANNEL
INOP	RPS/RCIS	EACH CHANNEL	EACH DIV	EACH CHANNEL
DOWNSCALE ALARM	RCIS	EACH CHANNEL	NON-DIV	EACH CHANNEL
PERIOD TRIP	RPS	EACH CHANNEL	EACH DIV	EACH CHANNEL
PERIOD ALARM	RCIS	EACH CHANNEL	NON-DIV	EACH CHANNEL
BYPASS	-----	EACH CHANNEL	NO	EACH CHANNEL
PERIOD WITHDRAWAL PERMISSIVE	RCIS	EACH CHANNEL	NON-DIV	EACH CHANNEL
ATWS PERMISSIVE	SSLC	EACH DIVISION	---	EACH DIVISION

TABLE 5
APRM/LPRM TRIP & ALARM INDICATIONS

TRIP/ALARM FUNCTION	OUTPUT TO:	MCRP INDICATION	MCRP ANNUNCIATION	COMPUTER INPUT
APRM NEUTRON UPSC TRIP	RPS	EACH DIV •	EACH DIV •	EACH DIV
APRM THERMAL UPSC TRIP	RPS	EACH DIV •	EACH DIV •	EACH DIV
APRM UPSC ALARM	RCIS	EACH DIV	NON-DIV	EACH DIV
APRM INOP	RPS/RCIS	EACH DIV •	EACH DIV •	EACH DIV
APRM DOWNSC ALARM	RCIS	EACH DIV	NON DIV	EACH DIV
APRM BYPASS	---	EACH DIV	NO	EACH DIV
FLOW UPSC ALARM	RCIS	EACH DIV	NON-DIV	EACH DIV
FLOW INOP	RCIS	EACH DIV	NON-DIV	EACH DIV
CORE FLOW RAPID COASTDOWN	RPS	EACH DIV	EACH DIV	EACH DIV
LPRM UPSC ALARM	RCIS	EACH CHANNEL	NON-DIV	EACH CHANNEL
LPRM DOWNSC ALARM	RCIS	EACH CHANNEL	NON-DIV	EACH CHANNEL
LPRM BYPASS	---	EACH CHANNEL	NO	EACH CHANNEL
ATWS PERMISSIVE	SSLC	EACH DIV	---	EACH DIV
OPRM TRIP	RPS	EACH DIV	EACH DIV	EACH DIV

• – SHARED AMONG APRM NEUTRON UPSC TRIP, THERMAL UPSC TRIP & INOP.

TABLE 6
MRBM ALARM INDICATIONS

ALARM FUNCTION	OUTPUT TO:	MCRP INDICATION	MCRP ANNUNCIATION	COMPUTER INPUT
REF APRM DOWNSCALE	RCIS	EACH CHANNEL	NON-DIV	EACH CHANNEL
UPSCALE ALARM	RCIS	EACH CHANNEL	NON-DIV	EACH CHANNEL
DOWNSCALE ALARM	RCIS	EACH CHANNEL	NON-DIV	EACH CHANNEL
ALARM INST INOP	RCIS	EACH CHANNEL	NON-DIV	EACH CHANNEL
MRBM BYPASS	RCIS	EACH CHANNEL	NO	EACH CHANNEL
CORE FLOW ABNORMAL ALARM	RCIS	EACH CHANNEL	NON-DIV	EACH CHANNEL

FIGURE 7.6-1 NEUTRON MONITORING SYSTEM IFD SH 4 OF 4

NOTES:

1. THIS IBD PRESENTS THE BASIC FUNCTIONAL REQUIREMENTS OF THE NEUTRON MONITORING SYSTEM (NMS) OF THE APPLIED PROJECT. IT CONTAINS THE SUBSYSTEMS OF SRNM, APRM & LPRM, ATIP AND MRBM. IT DOES NOT NECESSARILY REFLECT THE ACTUAL PHYSICAL LOCATIONS OF LOGICS TO BE IMPLEMENTED TO THE HARDWARE OR SOFTWARE LEVEL. (FOR INSTANCE, THE LOCATION OF THE SRNM OR APRM CHANNEL BYPASS FUNCTION MAY BE AT DIFFERENT LOCATION OR MORE THAN ONE LOCATION AS SHOWN IN THIS IBD).

2. FAIL SAFE LOGIC: ALL OUTPUT CONNECTIONS FROM LOGIC UNITS EXCEPT ATIP AND MRBM IBD ARE DEFINED AS LOGIC "1" DURING NORMAL REACTOR OPERATION. THEY CHANGE TO LOGIC "0" UPON A TRIP CONDITION. ANY "LOSS OF SIGNAL" CONDITION WILL ALSO CAUSE THE STATE TO BE CHANGED TO "0".

3. ONE RESET SWITCH SHALL BE USED FOR EACH CHANNEL ON THE MCR BACK PANEL.

4. THE PRESENCE OF AN OPERATOR INPUT, SUCH AS RESET, BYPASS, AUTO CALIBRATION, ETC., IMPLIES LOGIC "1".

5. TIME CONSTANT REFERS TO THE FILTER TIME CONSTANT WHERE THE FILTERED SIGNAL IS LAGGED BEHIND THE ORIGINAL SIGNAL BY THIS TIME CONSTANT AFTER SIGNIFICANT TIME ELAPSE. THIS IS SHOWN IN THE LEGEND SECTION.

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

TRUTH TABLE

R	S	OUTPUT
0	0	PREVIOUS STATE
0	1	1
1	0	0
1	1	0

7. FAIL SAFE LOGIC: EXCEPT ATIP AND MRBM IBD, THE OUTPUT OF THE COMPARATOR IS DEFINED AS ZERO WHEN A TRIP OCCURS (FAIL SAFE LOGIC), I.E., WHEN THE COMPARISON EQUATION IS TRUE. OTHERWISE IT IS "1" DURING NORMAL CONDITION. HOWEVER, ALARMS, ANNUNCIATORS ARE ACTIVATED WITH LOGIC "1".

8. THE FAULT CONDITION RESULTED FROM A CHANNEL SELF-TEST IS LOGIC "0", SO IS THE CONDITION OF AN INSTRUMENT INOPERATIVE TRIP. THE SCOPE OF "CRITICAL SELF TEST" ITEMS IS TO BE REFERENCED IN NMS HARDWARE & SOFTWARE SYSTEM SPEC, C51-4010.

9. SETPOINTS FOR NMS LOGICS (NOMINAL) (I.E., SP 1 TO SP 22, MRBM AND SRNM PERIOD TRIP SETPOINTS) ARE INCLUDED IN AND SHALL BE GOVERNED BY THE NMS SYSTEM DESIGN SPEC, C51-4010.

10. CORE FLOW CONVERSION, FLOW REFERENCE LOGIC AND CORE FLOW RAPID COASTDOWN TRIP ALGORITHMS, MRBM CORE FLOW COMPARISON ALGORITHM AND OPRM TRIP ALGORITHM ARE DEFINED IN THE NMS HARDWARE AND SOFTWARE SYSTEM SPEC, C51-4010. ALSO THE TIME DELAY IN ATIP AUTO PARK LOGIC IS REFERENCED IN THIS DOCUMENT.

11. FOR ATIP IBD, IN DRIVE MECHANISM LOGIC,
X = 1 INDICATES "MOVE", X = 0 INDICATES "STOP",
Y = 1 INDICATES "FORWARD", Y = 0 INDICATES "REVERSE"
Z = 1 INDICATES "FAST", Z = 0 INDICATES "SLOW"

12. FOR ATIP IBD, THE DESCRIPTION OF AUTO MECHANISM IS PROVIDED.

13. STATUS INDICATORS CAN BE APPLIED BY ELECTRO LUMINESCENT TYPE OR CATHODE RAY TUBE DISPLAY, ETC., WHICH ARE INSTALLED ON THE UNITS. THE NOTE "LOCAL" REFERS TO CONTROL ROOM BACK BACK; THE NOTE "MCRP" REFERS TO MAIN CONTROL ROOM OPERATOR MAIN PANELS.

14. INDICATIONS IN MAIN CONTROL ROOM PANEL (MCRP) CAN BE PROVIDED USING THE NMS SIGNALS VIA THE PERFORMANCE MONITORING AND CONTROL SYSTEM (PMCS) OF THE PROCESS COMPUTER, OR DIRECTLY FROM THE NMS.

15. SRNM PERIOD WITHDRAWAL PERMISSIVE SIGNALS TO APRS ARE FOR INTERRUPT OF AUTOMATED CONTROL ROD WITHDRAWAL DURING AUTOMATED OPERATION.

16. THE OR GATE IS LOCATED IN THE MCRP SYSTEM.

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

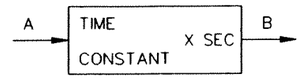
		MPL NO.
1.	AUTOMATIC POWER REGULATOR SYS, IBD	C82-1030
2.	ROD CONTROL & INFORMATION SYS, IBD	C11-1030
3.	REACTOR PROTECTION SYSTEM, IBD	C71-1030
4.	RECIRCULATION FLOW CONTROL SYS, IED	C81-1040
5.	ROD CONTROL & INFORMATION SYS, IED	C11-1040
6.	NEUTRON MONITORING SYSTEM, IED	C51-1040
7.	LEAK DETECTION AND ISOLATION SYS, IBD	E31-1030
8.	SAFETY SYSTEM LOGIC & CONTROL SYSTEM IBD	C74-1030

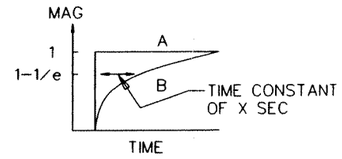
SUPPORTING DOCUMENTS

		MPL NO.
1.	INTERLOCK BLOCK DIAGRAM (IBD) STANDARDS	A10-1030

LEGEND:

1. FILTERED TIME CONSTANT





ABBREVIATIONS

NMS-NEUTRON MONITORING SYSTEM
RPS- REACTOR PROTECTION SYSTEM
SRNM-STARTUP RANGE NEUTRON MONITOR
LPRM-LOCAL POWER RANGE MONITOR
APRM-AVERAGE POWER RANGE MONITOR
ATIP-AUTOMATED TRAVERSING IN-CORE PROBE
MRBM-MULTI CHANNEL ROD BLOCK MONITOR
RC&IS-ROD CONTROL & INFORMATION SYSTEM
MCRP-MAIN CONTROL ROOM PANEL
PMCS-PERFORMANCE MONITORING CONTROL SYSTEM
ATCF-AUTOMATED TIP CONTROL FUNCTION
OPRM – OSCILLATION POWER RANGE MONITOR
ATWS – ANTICIPATED TRANSIENT WITHOUT SCRAM
UPSC-UPSCALE
INOP-INOPERABLE
DNSC-DOWNSCALE

MPL NO. C51-1030

FIGURE 7.6-2 NEUTRON MONITORING SYSTEM IBD (Sheet 1 of 28)

7 6 5 4 3 2

E D C B A

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TABLE OF CONTENT

FIGURE 7.6-2 NEUTRON MONITORING SYSTEM IBD (Sheet 2 of 28)

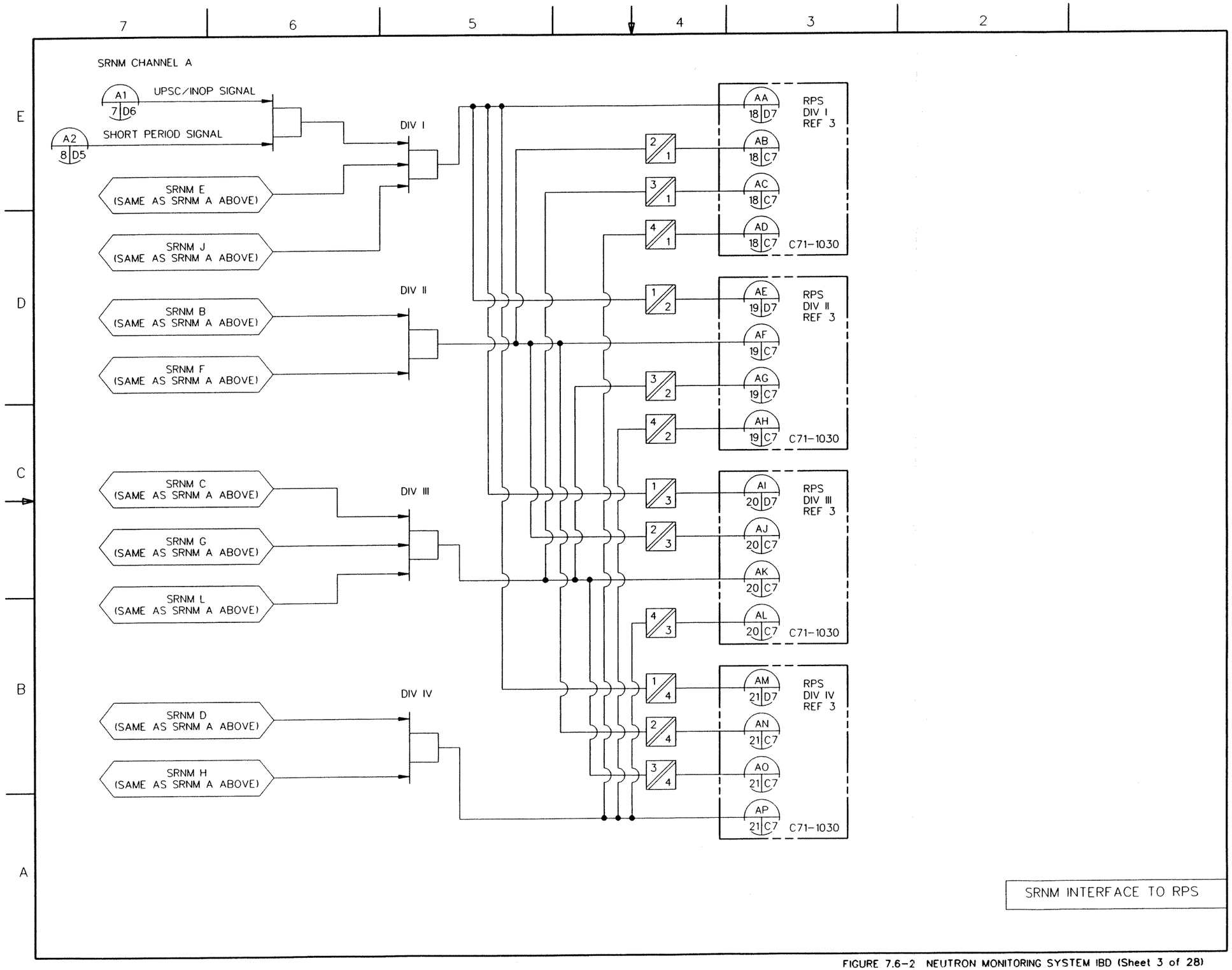


FIGURE 7.6-2 NEUTRON MONITORING SYSTEM IBD (Sheet 3 of 28)

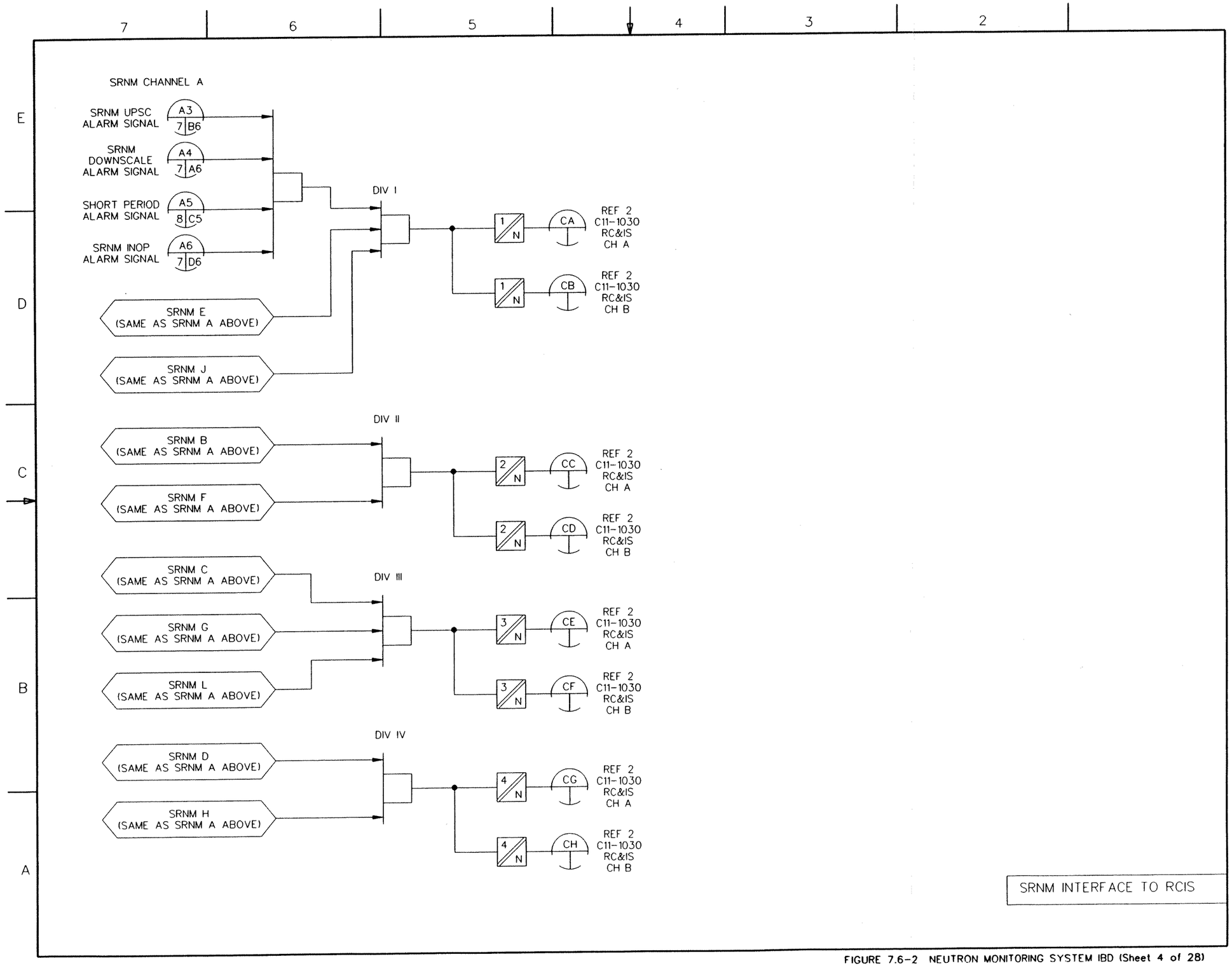


FIGURE 7.6-2 NEUTRON MONITORING SYSTEM IBD (Sheet 4 of 28)

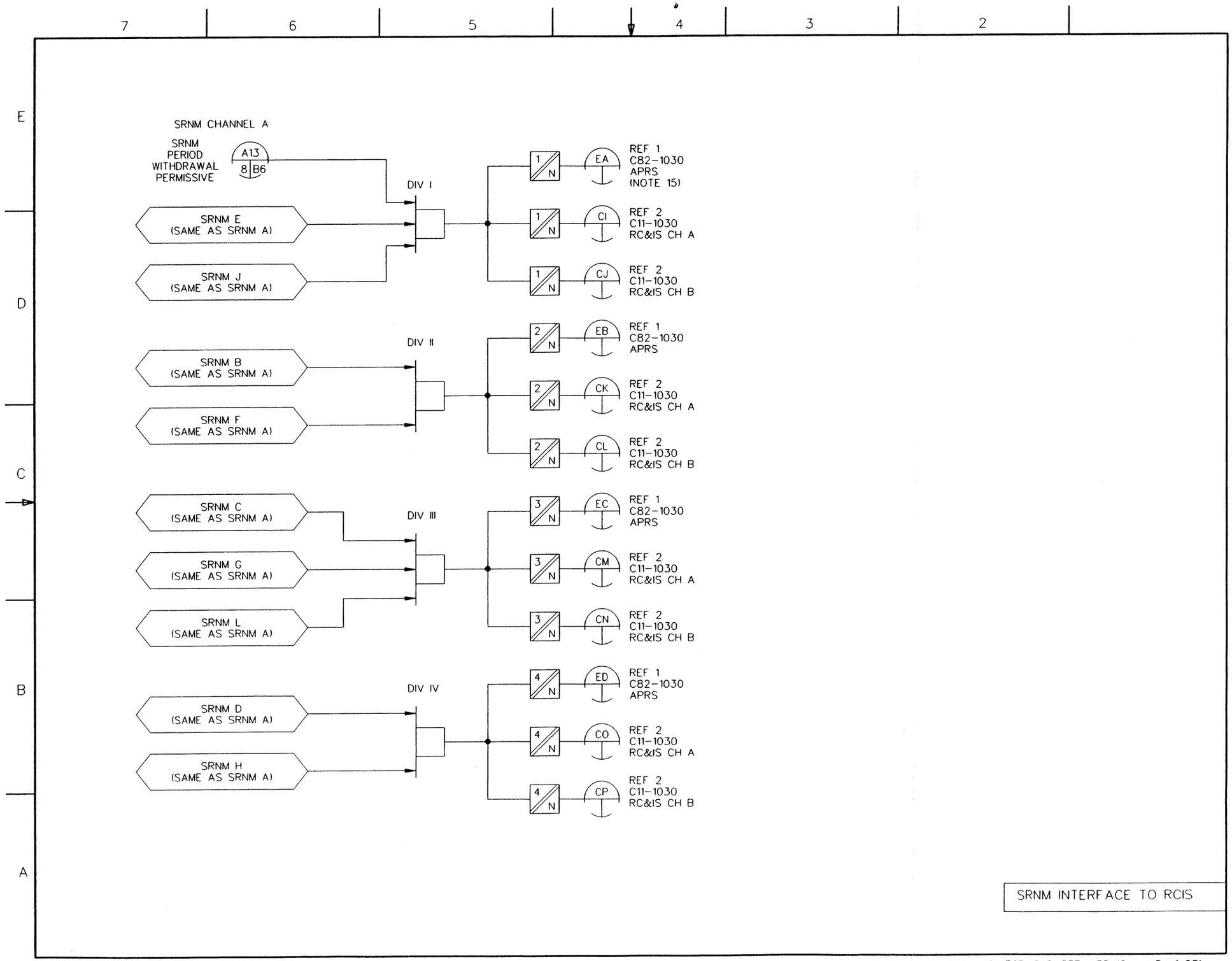


FIGURE 7.6-2 NEUTRON MONITORING SYSTEM IBD (Sheet 5 of 28)

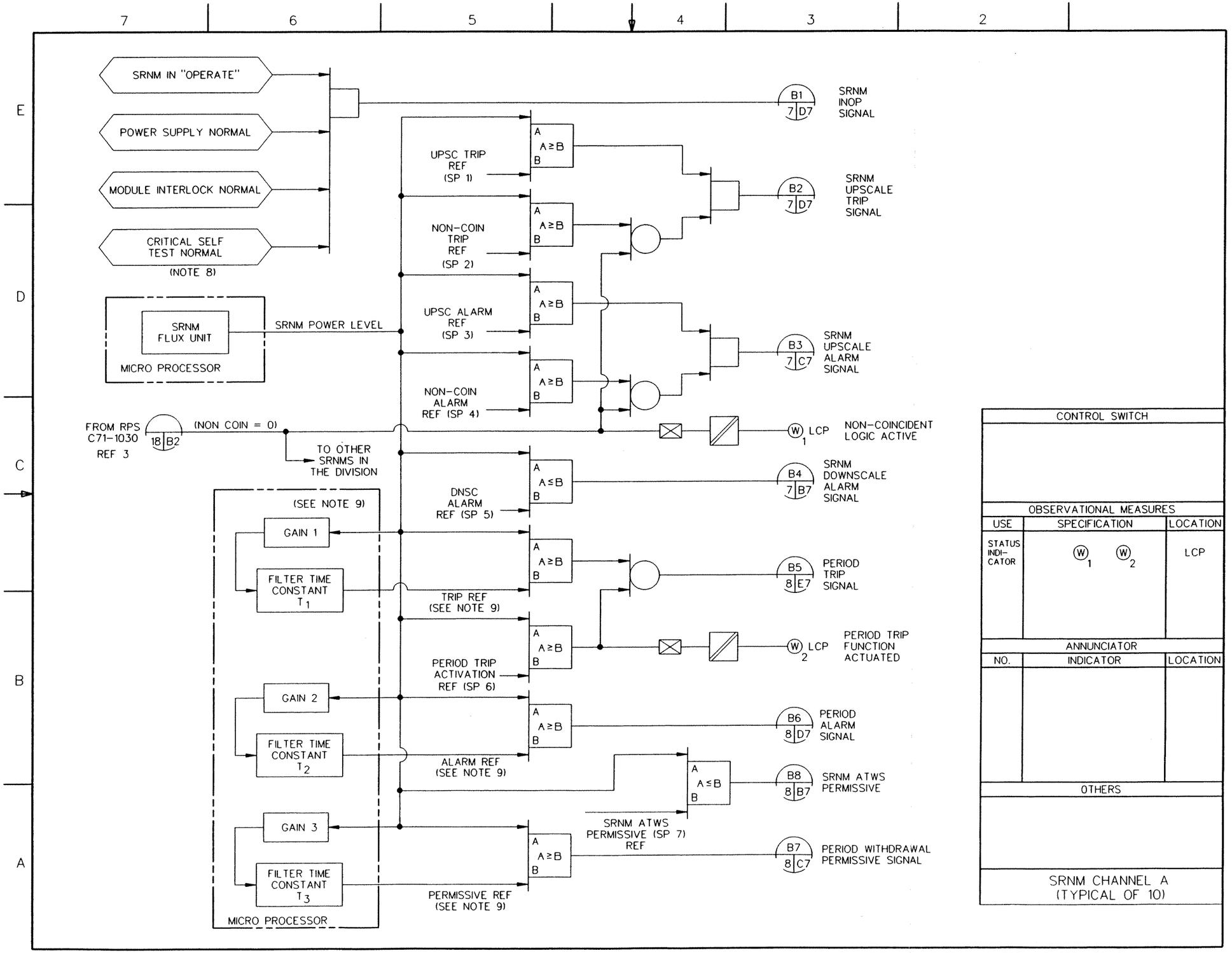


FIGURE 7.6-2 NEUTRON MONITORING SYSTEM IBD (Sheet 6 of 28)

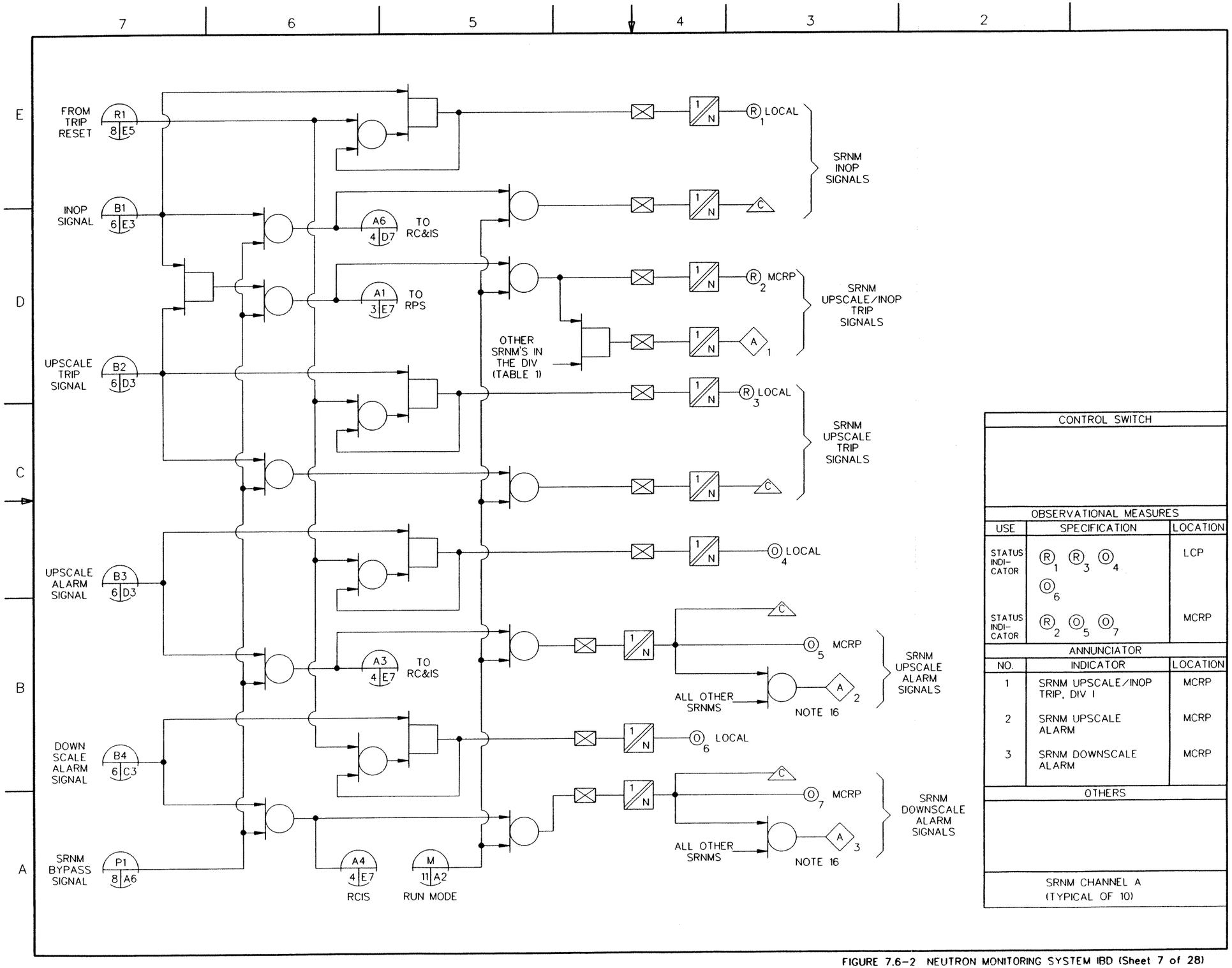


FIGURE 7.6-2 NEUTRON MONITORING SYSTEM IBD (Sheet 7 of 28)

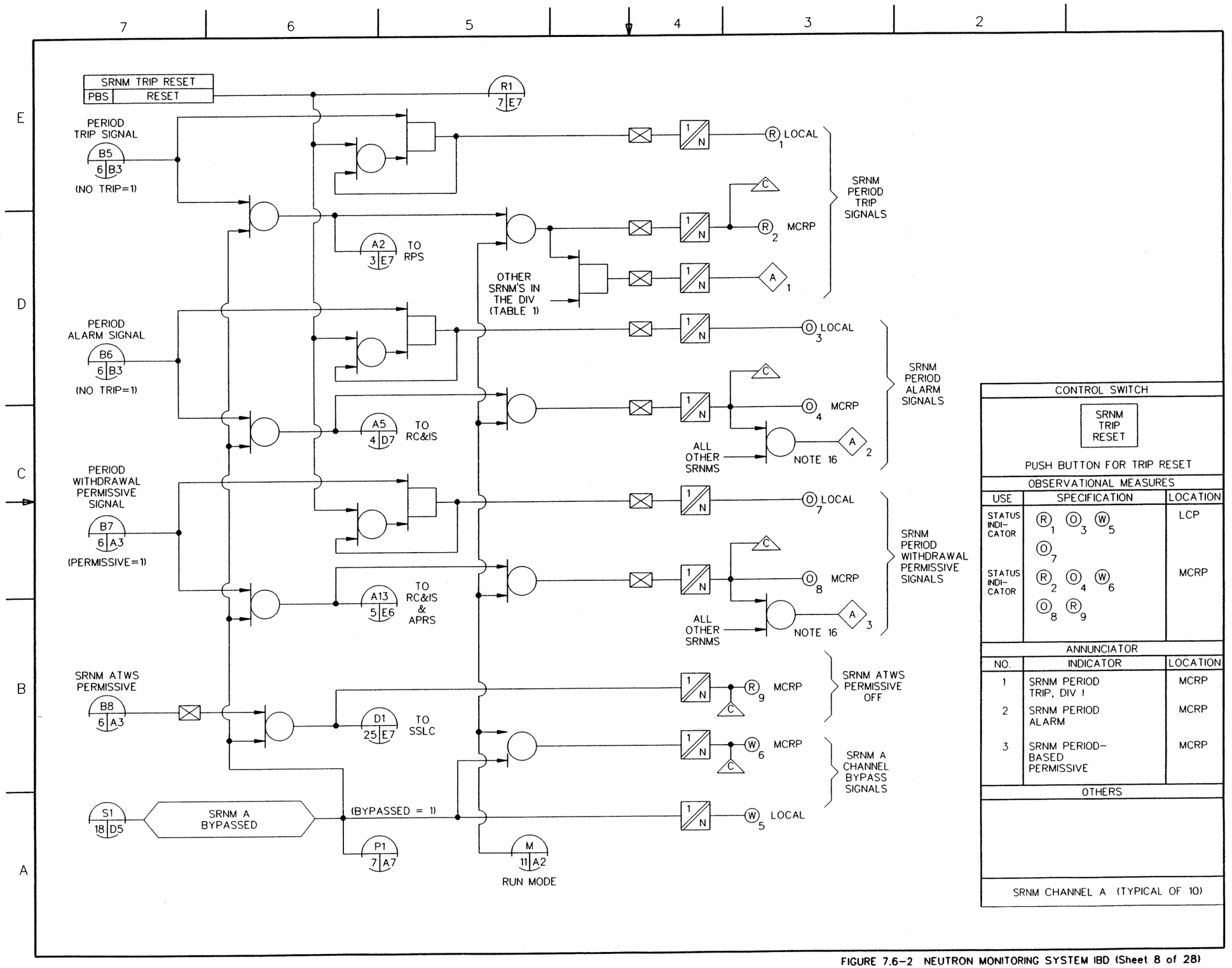


FIGURE 7.6-2 NEUTRON MONITORING SYSTEM IBD (Sheet 8 of 28)

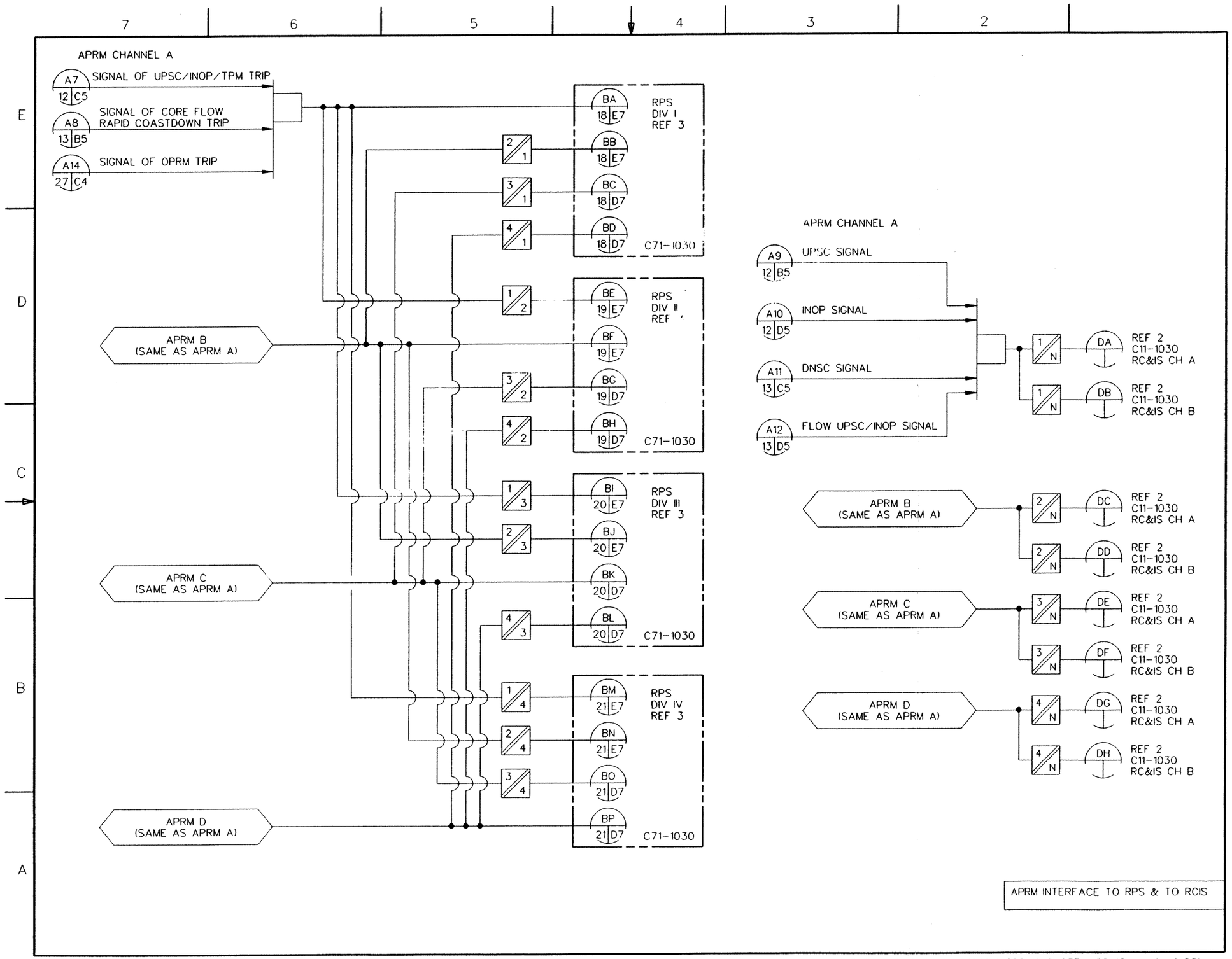
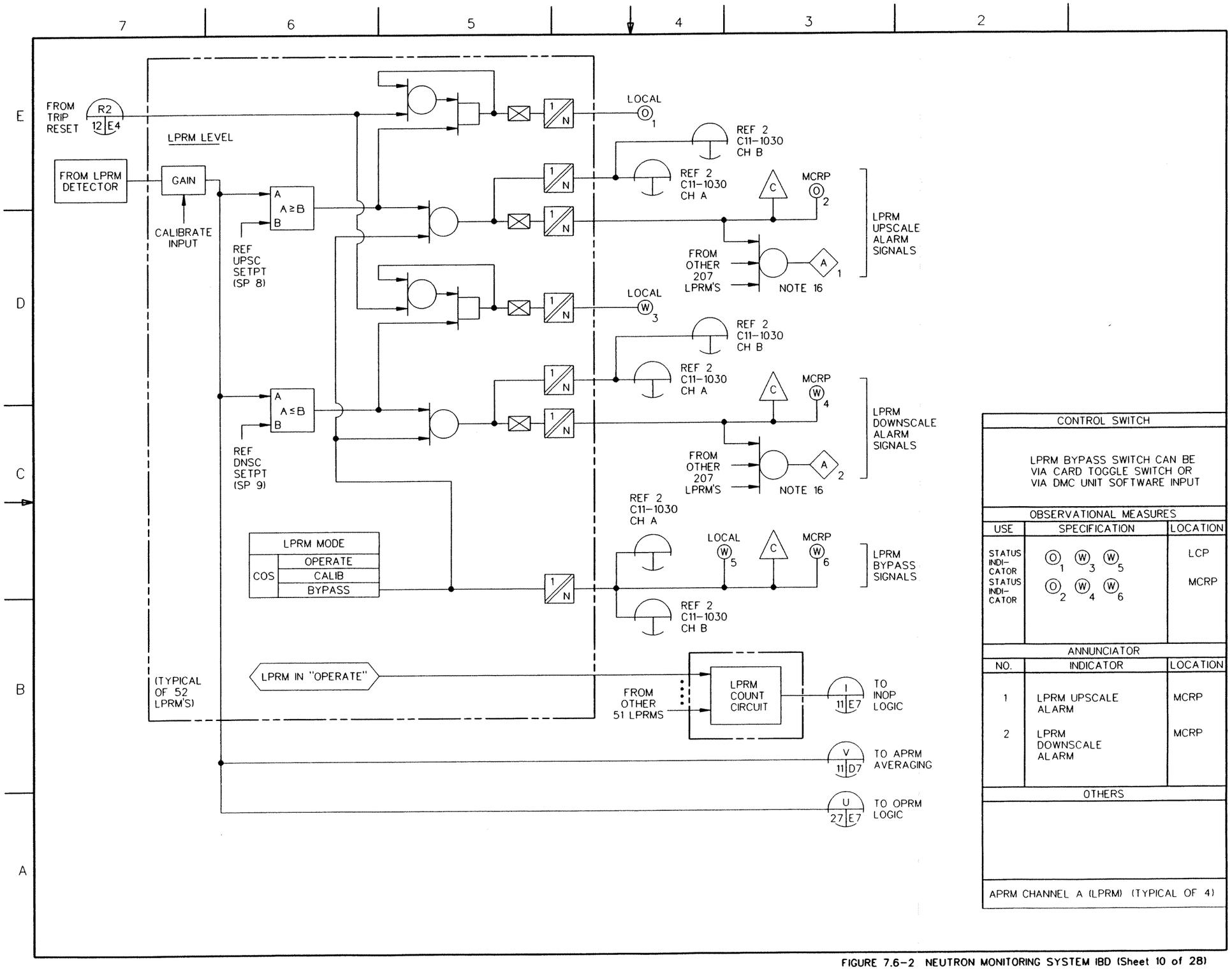


FIGURE 7.6-2 NEUTRON MONITORING SYSTEM IBD (Sheet 9 of 28)



CONTROL SWITCH
LPRM BYPASS SWITCH CAN BE VIA CARD TOGGLE SWITCH OR VIA DMC UNIT SOFTWARE INPUT

OBSERVATIONAL MEASURES		
USE	SPECIFICATION	LOCATION
STATUS INDICATOR STATUS INDICATOR	O 1, W 3, W 5 O 2, W 4, W 6	LCP MCRP

ANNUNCIATOR		
NO.	INDICATOR	LOCATION
1	LPRM UPSCALE ALARM	MCRP
2	LPRM DOWNSCALE ALARM	MCRP

OTHERS

APRM CHANNEL A (LPRM) (TYPICAL OF 4)

FIGURE 7.6-2 NEUTRON MONITORING SYSTEM IBD (Sheet 10 of 28)

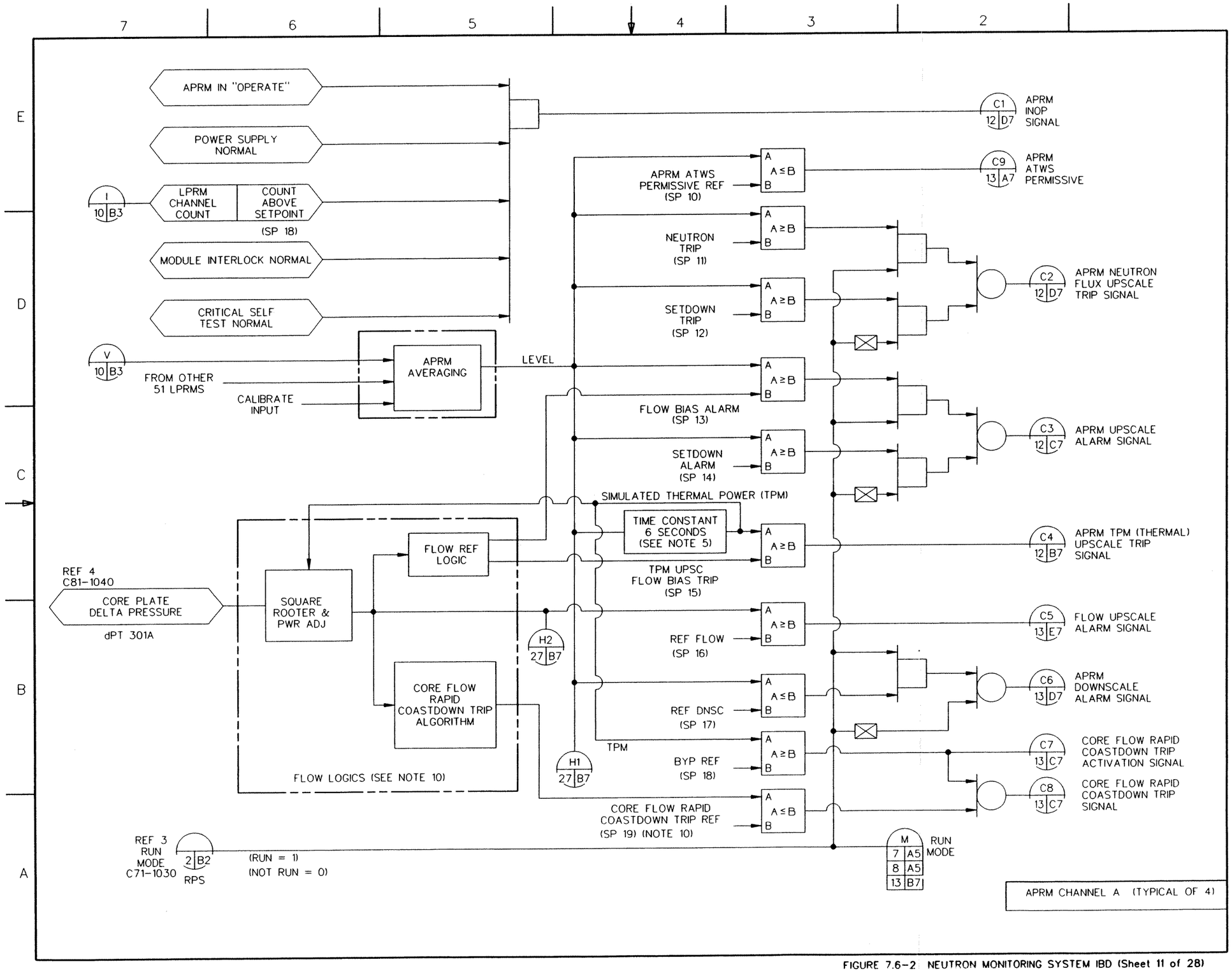


FIGURE 7.6-2 NEUTRON MONITORING SYSTEM IBD (Sheet 11 of 28)

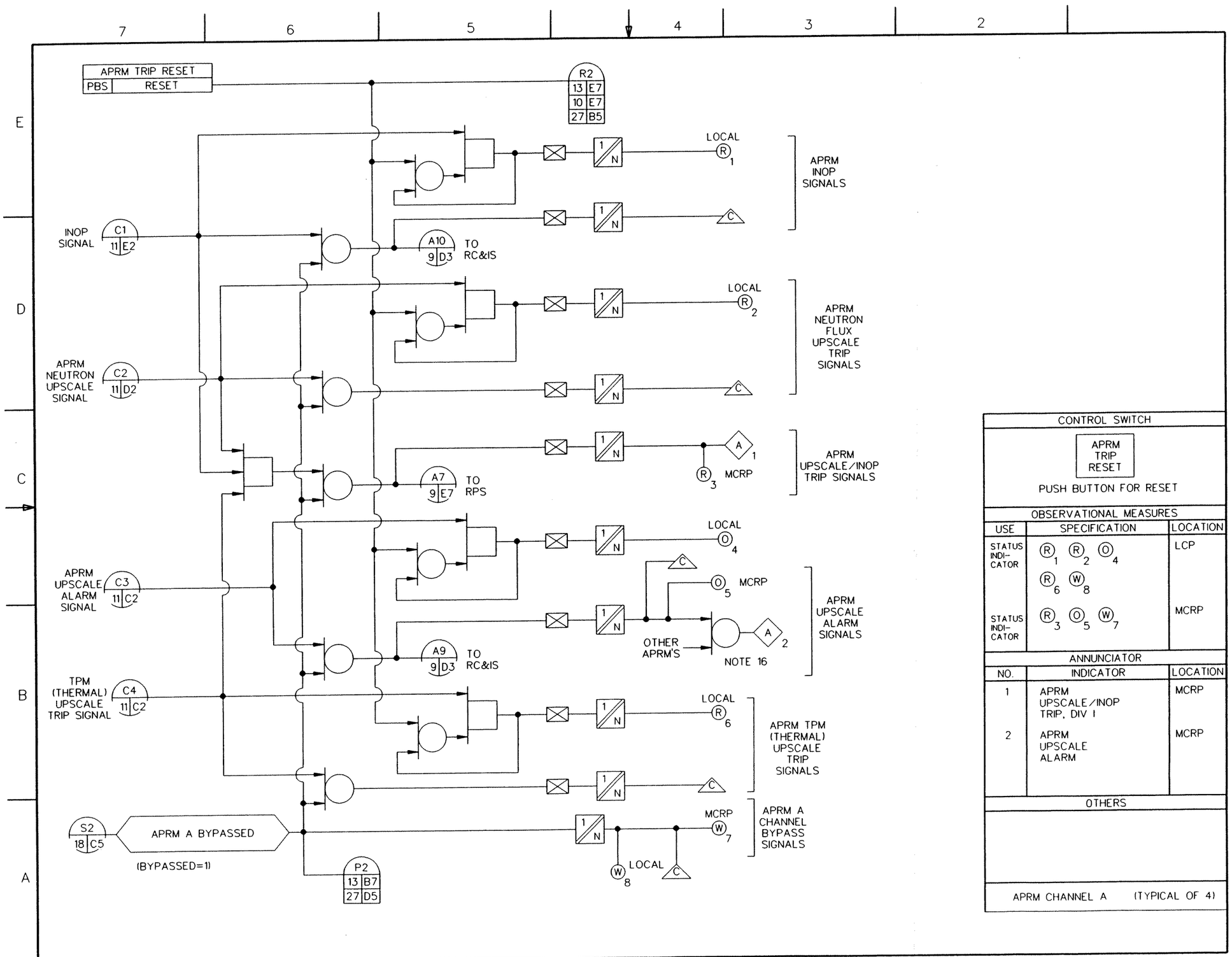


FIGURE 7.6-2 NEUTRON MONITORING SYSTEM IBD (Sheet 12 of 28)

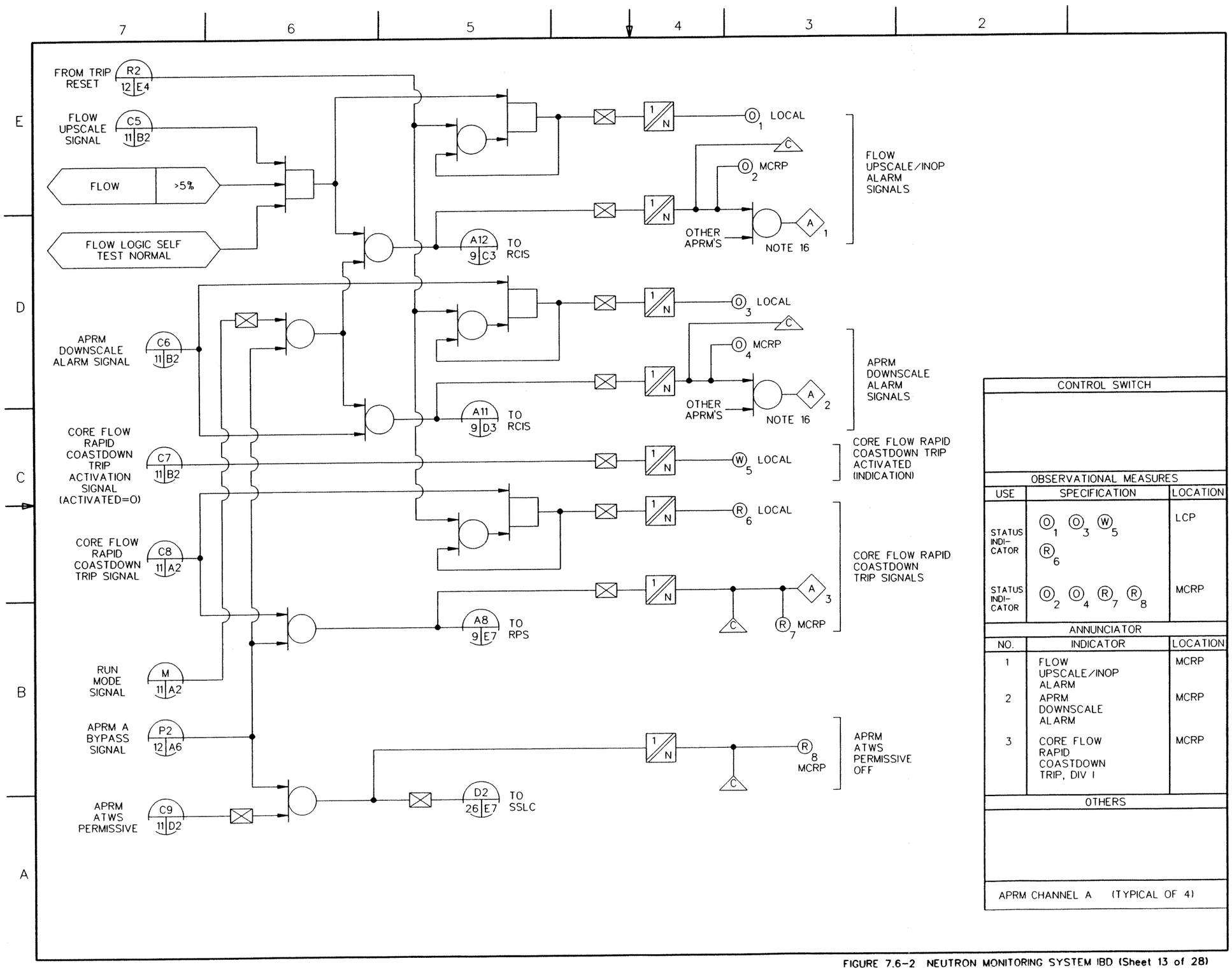
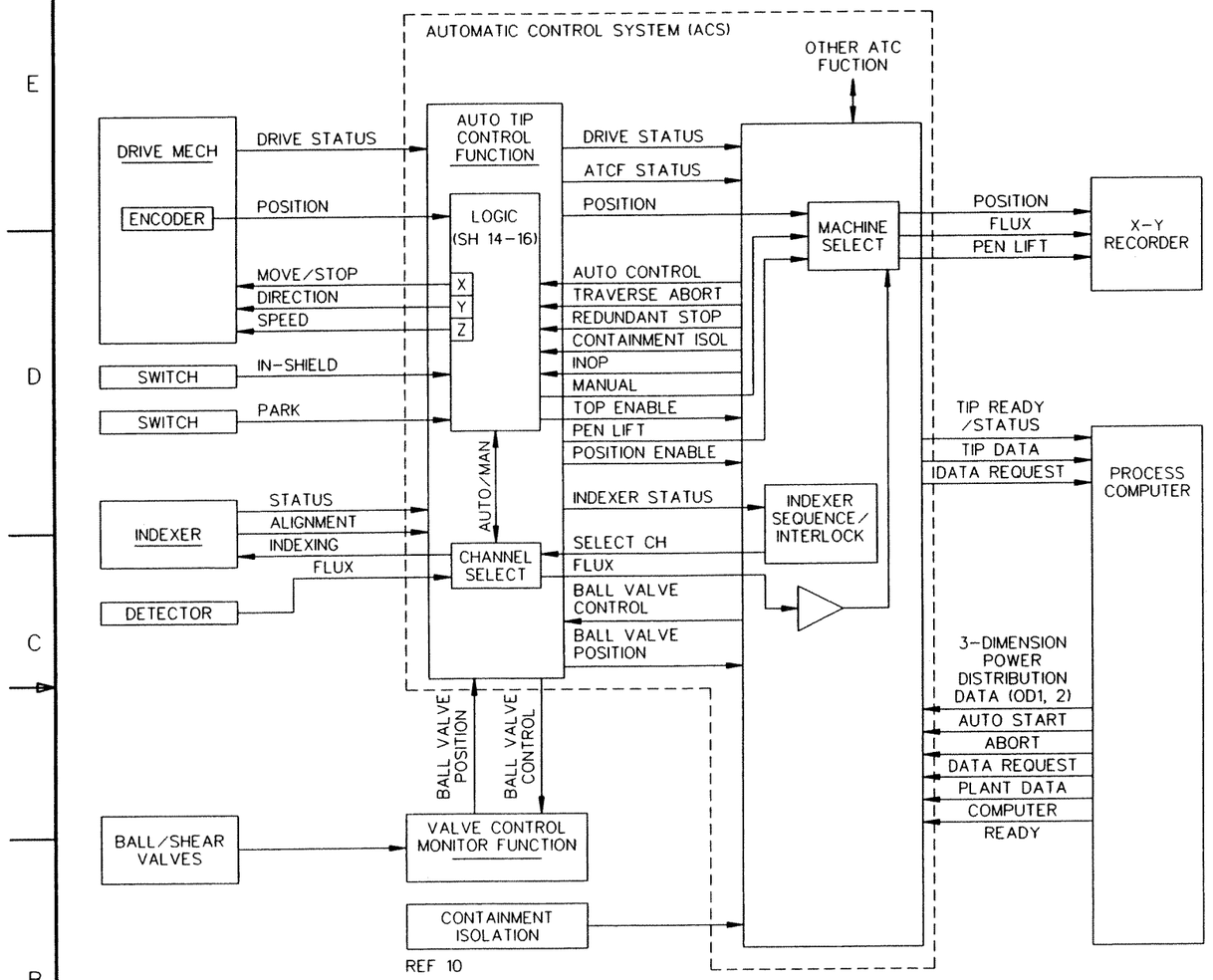


FIGURE 7.6-2 NEUTRON MONITORING SYSTEM IBD (Sheet 13 of 28)



SUPPLEMENT TO ATIP IBD

AUTO TIP MECHANISM DESCRIPTION

1. COMMAND FOR AUTO TIP FROM PROCESS COMPUTER IS TRANSFERRED TO THE ATCF'S THROUGH THE ACS. THIS INITIATES AUTO-TIP COMMAND SEQUENCE.
2. EACH ATCF BEGINS SCANS FOR ALL OF ITS GUIDE TUBES. TIP DATA ARE RETAINED IN MEMORY UNIT FOR LATER ACCESS. INDEXING AND TRAVERSING IS AUTOMATICALLY SEQUENCED. THE INDEXING SEQUENCE/INTERLOCK IS CONTROLLED BY THE ACS. THE TRAVERSING LOGIC FOR EACH SCAN IS FROM THE ATCF LOGIC.
3. ACS CONTROLS THE USE OF THE COMMON (REFERENCE) TUBE TO PROTECT AGAINST MULTIPLE ENTRY AND TO COORDINATE THE REFERENCE TUBE CROSS CALIBRATION.
4. WHEN ALL ATCFS HAVE COMPLETED THEIR SCANS, A SIGNAL IS RETURNED TO THE PROCESS COMPUTER NOTIFYING IT THAT THE NEW TIP DATA IS AVAILABLE.
5. PROCESS COMPUTER CAN THEN REQUEST FOR THE TIP DATA TO BE TRANSFERED.
6. AN AUTO TIP WILL BE ABORTED FOR ANY OF THE FOLLOWING REASONS:
   A. IMPROPER INDEXER OPERATION
   B. CONTAINMENT ISOLATION
   C. EXCESSIVE WAITING FOR COMMON CHANNEL
   D. MANUAL ABORT

ATIP FUNCTIONAL CONFIGURATION

FIGURE 7.6-2 NEUTRON MONITORING SYSTEM IBD (Sheet 14 of 28)

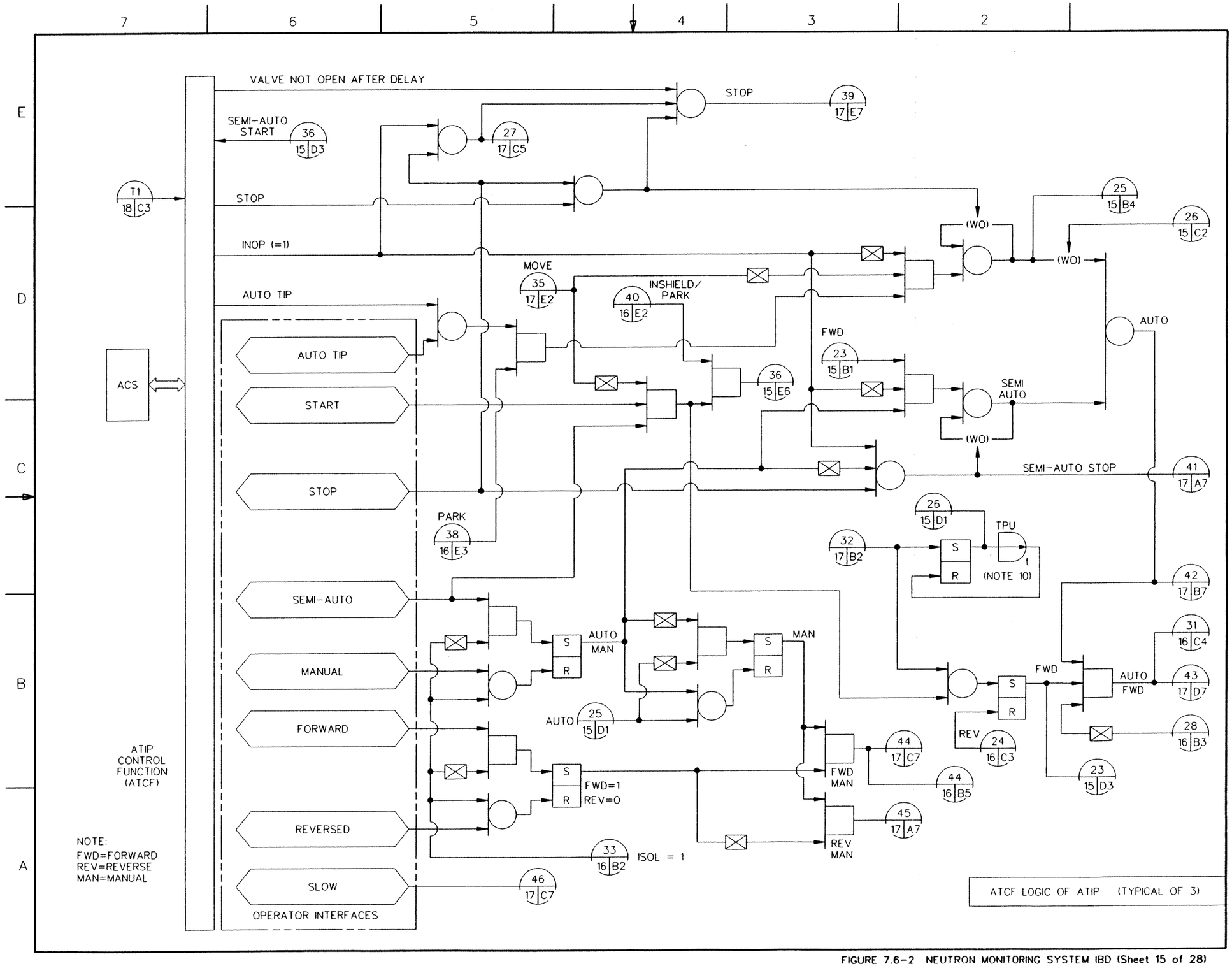


FIGURE 7.6-2 NEUTRON MONITORING SYSTEM IBD (Sheet 15 of 28)

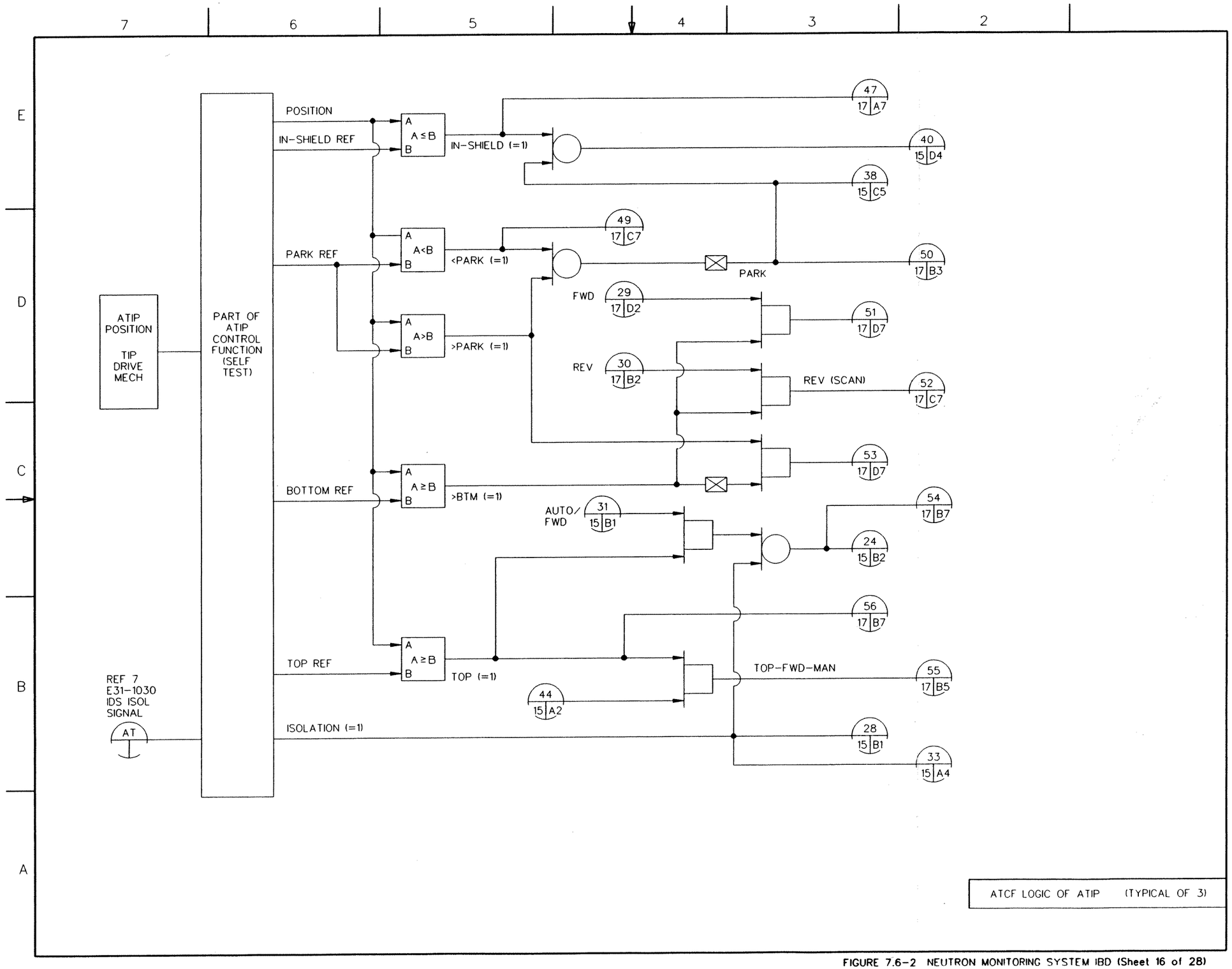


FIGURE 7.6-2 NEUTRON MONITORING SYSTEM IBD (Sheet 16 of 28)

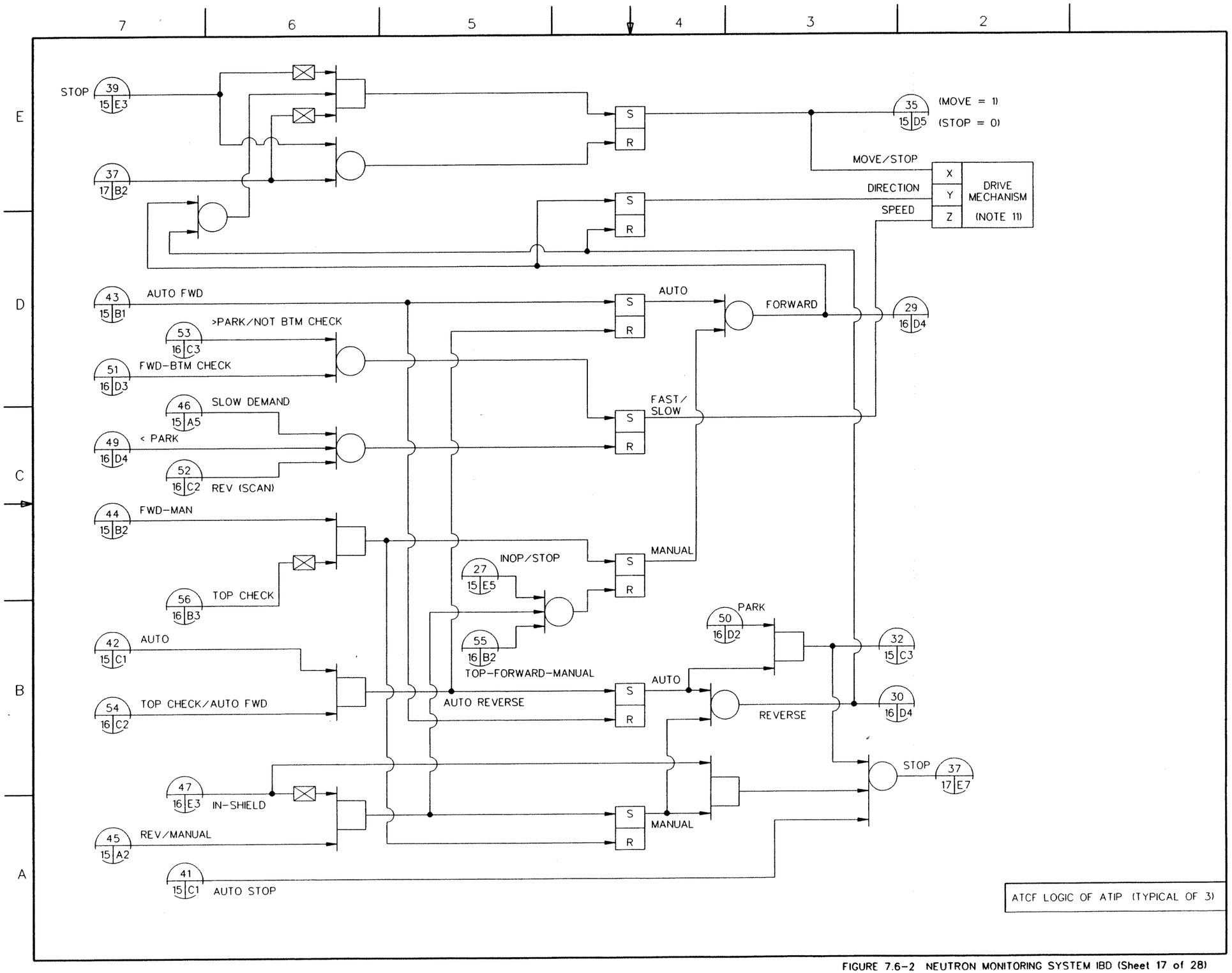
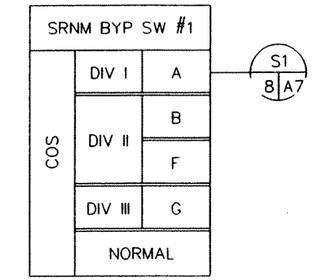


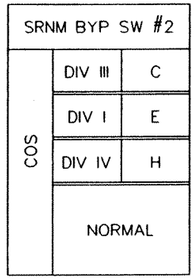
FIGURE 7.6-2 NEUTRON MONITORING SYSTEM IBD (Sheet 17 of 28)

TABLE 1

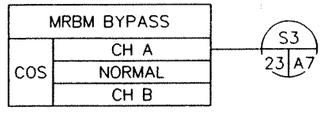
SRNM CH #	DIV	BYP GP
A	I	1
B	II	1
C	III	2
D	IV	3
E	I	2
F	II	1
G	III	1
H	IV	2
J	I	3
L	III	3



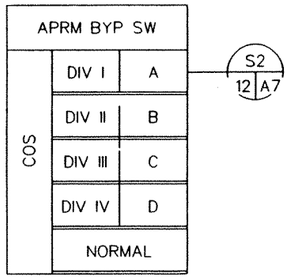
5–POSITION JOYSTICK SW
(WITH SEPARATION BARRIER
BETWEEN DIFFERENT DIVISION)



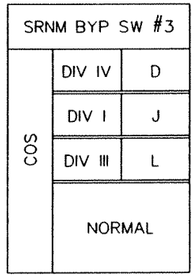
4–POSITION JOYSTICK SW
(WITH SEPARATION BARRIER
BETWEEN DIFFERENT DIVISION)



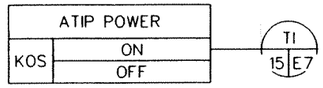
3–POSITION
CONTROL SWITCH



5–POSITION JOYSTICK SW
(WITH SEPARATION BARRIER
BETWEEN DIFFERENT DIVISION)



4–POSITION JOYSTICK SW
(WITH SEPARATION BARRIER
BETWEEN DIFFERENT DIVISION)



SRNM AND APRM BYPASS
SWITCH ASSIGNMENT

FIGURE 7.6–2 NEUTRON MONITORING SYSTEM IBD (Sheet 18 of 28)

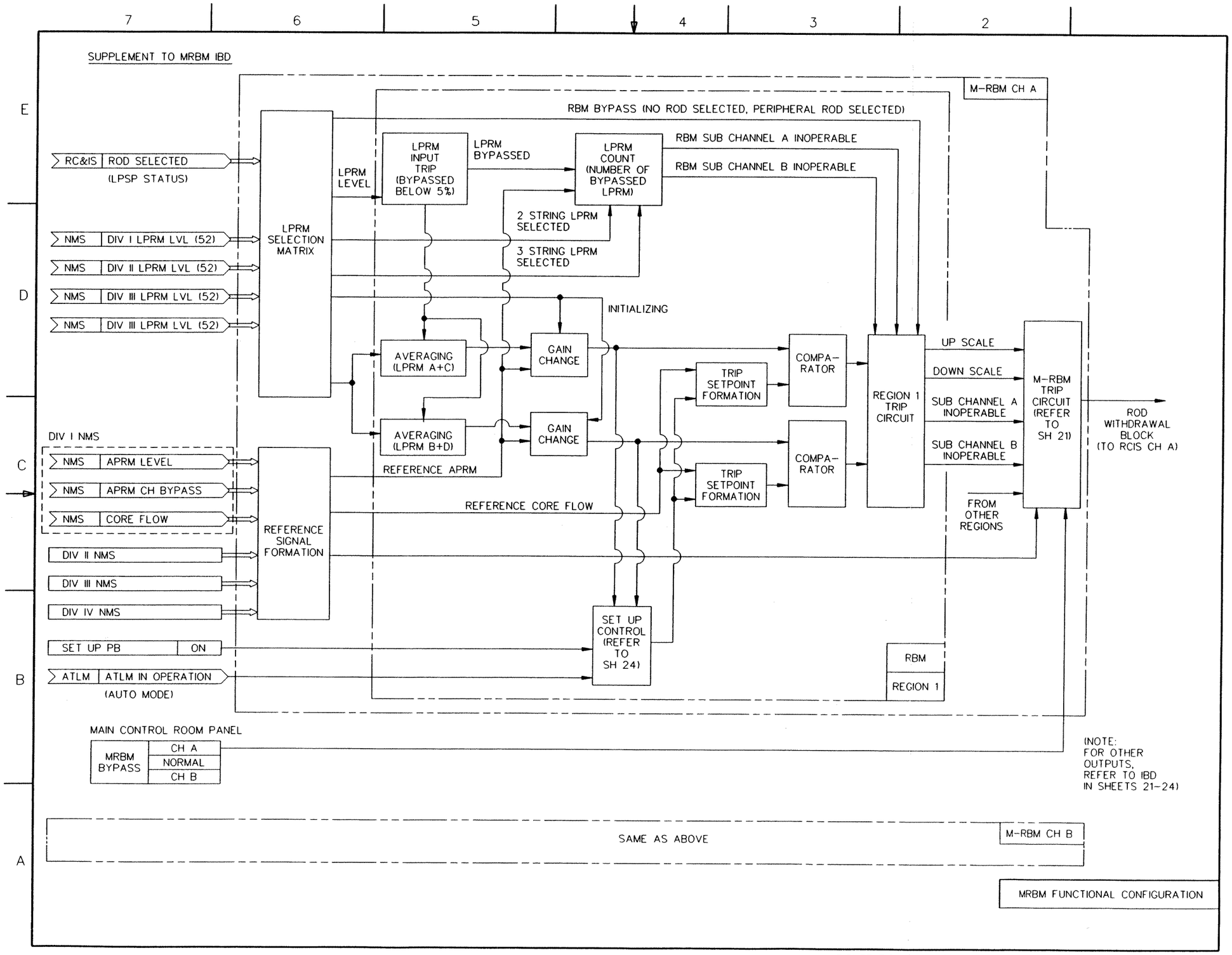


FIGURE 7.6-2 NEUTRON MONITORING SYSTEM IBD (Sheet 19 of 28)

SUPPLEMENT TO MRBM IBD

MRBM BASIC CONFIGURATION:

EACH MRBM CHANNEL HAS EIGHT RBM'S THAT COVER EIGHT CORE REGIONS, CORRESPONDING TO THE EIGHT CONTROL RODS BEING WITHDRAWN. MRBM GENERATES ROD BLOCK TRIP ACCORDING TO EACH RBM TRIP CONDITIONS. CONTROL ROD REGION ASSIGNMENT IS SHOWN IN THE FIGURE ON THIS SHEET. FOR DETAIL DESCRIPTION OF MRBM FUNCTION, REFER TO NMS HARDWARE AND SOFTWARE SYSTEM SPEC, C51-4010.

SUBSYSTEMS OF THE MRBM:

LPRM SELECTION MATRIX

WHEN ROD(S) ARE SELECTED, A MAXIMUM OF 16 LPRMS OF EACH REGION IS SELECTED WITH THE LPRM READINGS TRANSFERRED TO THE AVERAGING UNIT.

LPRM AVERAGING FUNCTION

ACTIVE LPRM SIGNALS OF EACH REGION ARE DIVIDED INTO TWO SUBCHANNELS "A & C" LEVELS AND "B & D" LEVELS. THE SIGNALS ARE SUMMED AND AVERAGE, RESPECTIVELY.

LPRM INPUT TRIP FUNCTION

EACH LPRM SIGNAL MUST BE GREATER THAN THE PRESET VALUE (5%) TO AVOID INPUT TRIP.

LPRM COUNT FUNCTION

IF THE NUMBER OF TRIPPED LPRMS EXCEEDS THE SETPOINT (SHEET 21) THIS SUBCHANNEL BECOMES INOPERABLE.
CONDITIONS FOR MRBM CHANNEL
INOPERABLE: 1) BOTH SUBCHANNEL A AND B IN ONE REGION ARE INOPERABLE; 2) ALL SUBCHANNEL A'S (OR B) IN ALL REGIONS ARE INOPERABLE; 3) SINGLE ROD CASE FOLLOWS CONDITION 1 ABOVE.

REFERENCE SIGNAL FORMATION FUNCTION

IT FORMS THE REFERENCE APRM SIGNAL AND THE CORE FLOW SIGNAL BY TAKING THE AVERAGE OF THE FOUR DIVISIONAL INPUTS.

GAIN CHANGE FUNCTION

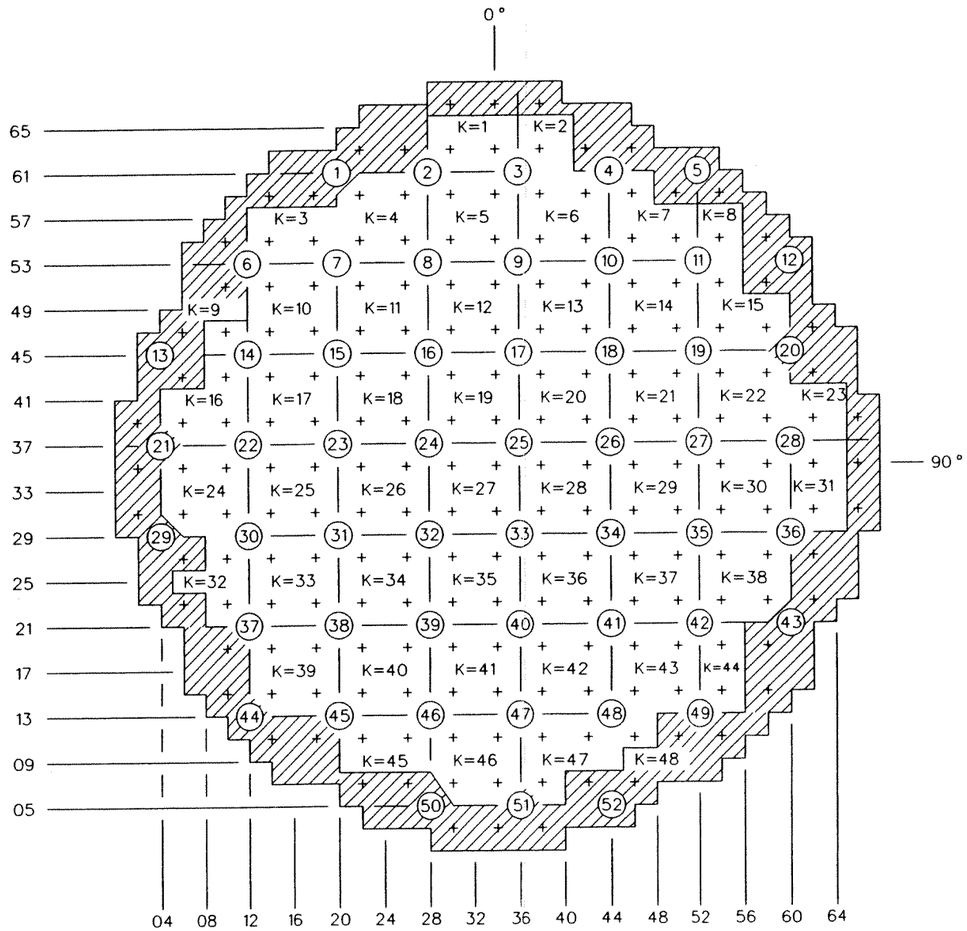
THE AVERAGED RBM SUBCHANNEL SIGNAL IS ADJUSTED TO BE EQUAL TO OR GREATER THAN THE REFERENCE APRM.
SEE NMS HARDWARE AND SOFTWARE SYSTEM SPEC, C51-4010.

TRIP SETPOINT FORMATION AND TRIP FUNCTION

RBM TRIP SETPOINTS ARE CORE FLOW BIASED AND HAVE MULTIPLE ROD BLOCK LINES.

CORE FLOW COMPARISON FUNCTION

IT PERFORMS CORE FLOW COMPARISON FUNCTION BETWEEN EACH INDIVIDUAL PAIR OF CORE FLOW VALUES. IT ISSUES ROD BLOCK SIGNAL IF ABNORMAL CORE FLOW CONDITION EXISTS.



LEGEND:

+ : CONTROL ROD
O : LPRM
K = 1-48: SUFFIX STANDS FOR 16-BUNDLES
SHADOWED AREA : PERIPHERAL CONTROL ROD

MRBM CONFIGURATION DESCRIPTION

FIGURE 7.6-2 NEUTRON MONITORING SYSTEM IBD (Sheet 20 of 28)

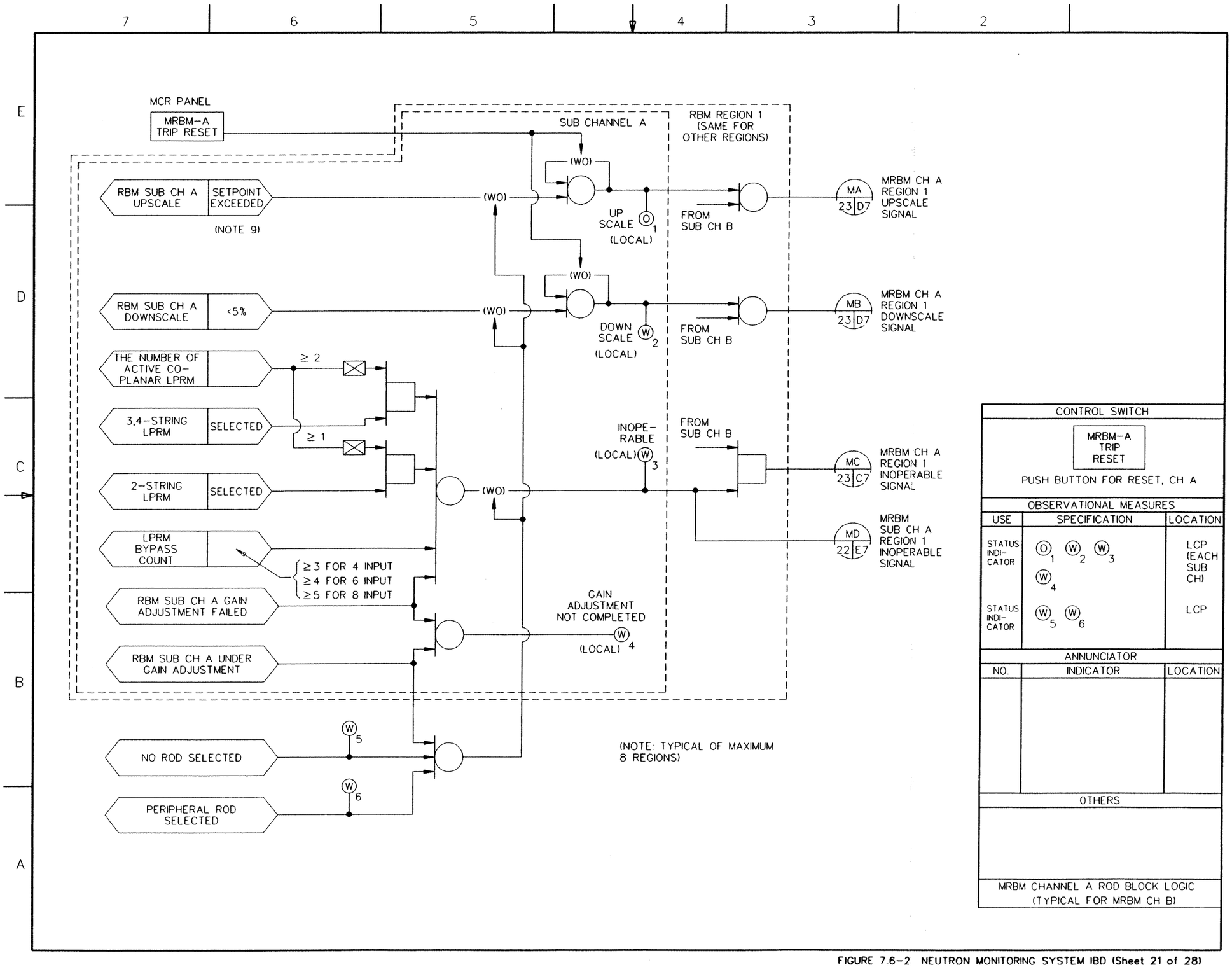


FIGURE 7.6-2 NEUTRON MONITORING SYSTEM IBD (Sheet 21 of 28)

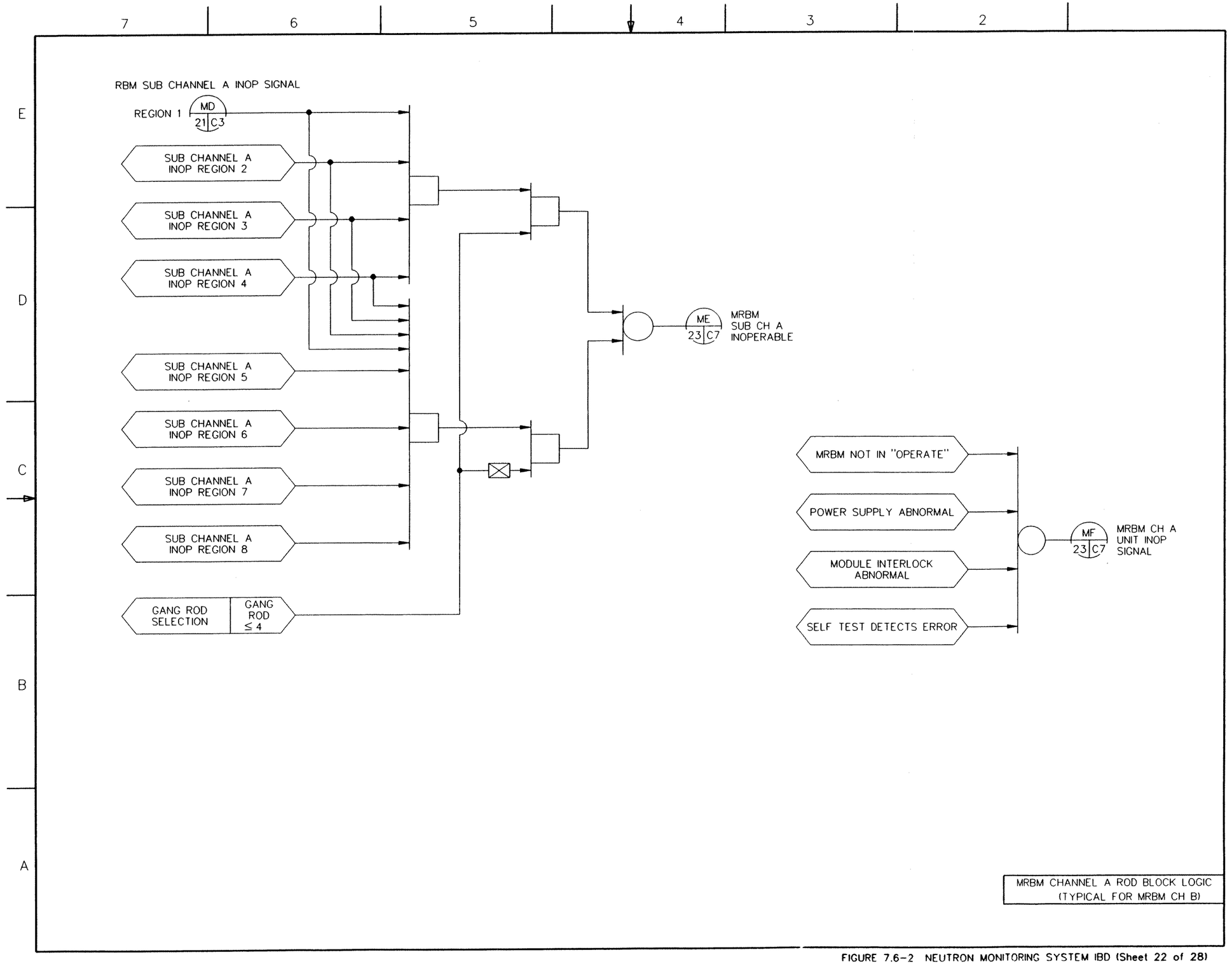
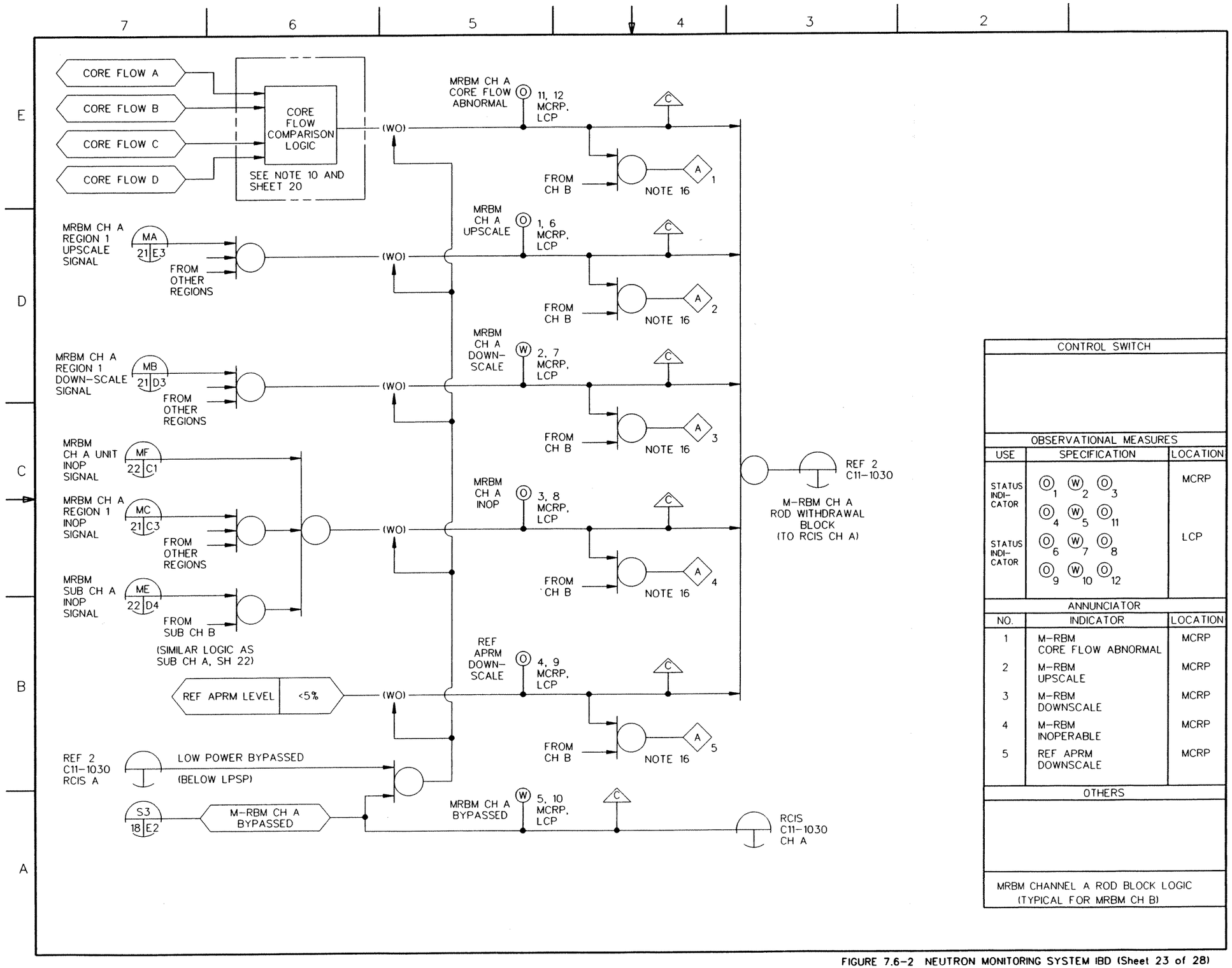


FIGURE 7.6-2 NEUTRON MONITORING SYSTEM IBD (Sheet 22 of 28)



CONTROL SWITCH		
OBSERVATIONAL MEASURES		
USE	SPECIFICATION	LOCATION
STATUS INDICATOR	O 1, W 2, O 3 O 4, W 5, O 11	MCRP
STATUS INDICATOR	O 6, W 7, O 8 O 9, W 10, O 12	LCP

ANNUNCIATOR		
NO.	INDICATOR	LOCATION
1	M-RBM CORE FLOW ABNORMAL	MCRP
2	M-RBM UPSCALE	MCRP
3	M-RBM DOWNSCALE	MCRP
4	M-RBM INOPERABLE	MCRP
5	REF APRM DOWNSCALE	MCRP

OTHERS

MRBM CHANNEL A ROD BLOCK LOGIC
(TYPICAL FOR MRBM CH B)

FIGURE 7.6-2 NEUTRON MONITORING SYSTEM IBD (Sheet 23 of 28)

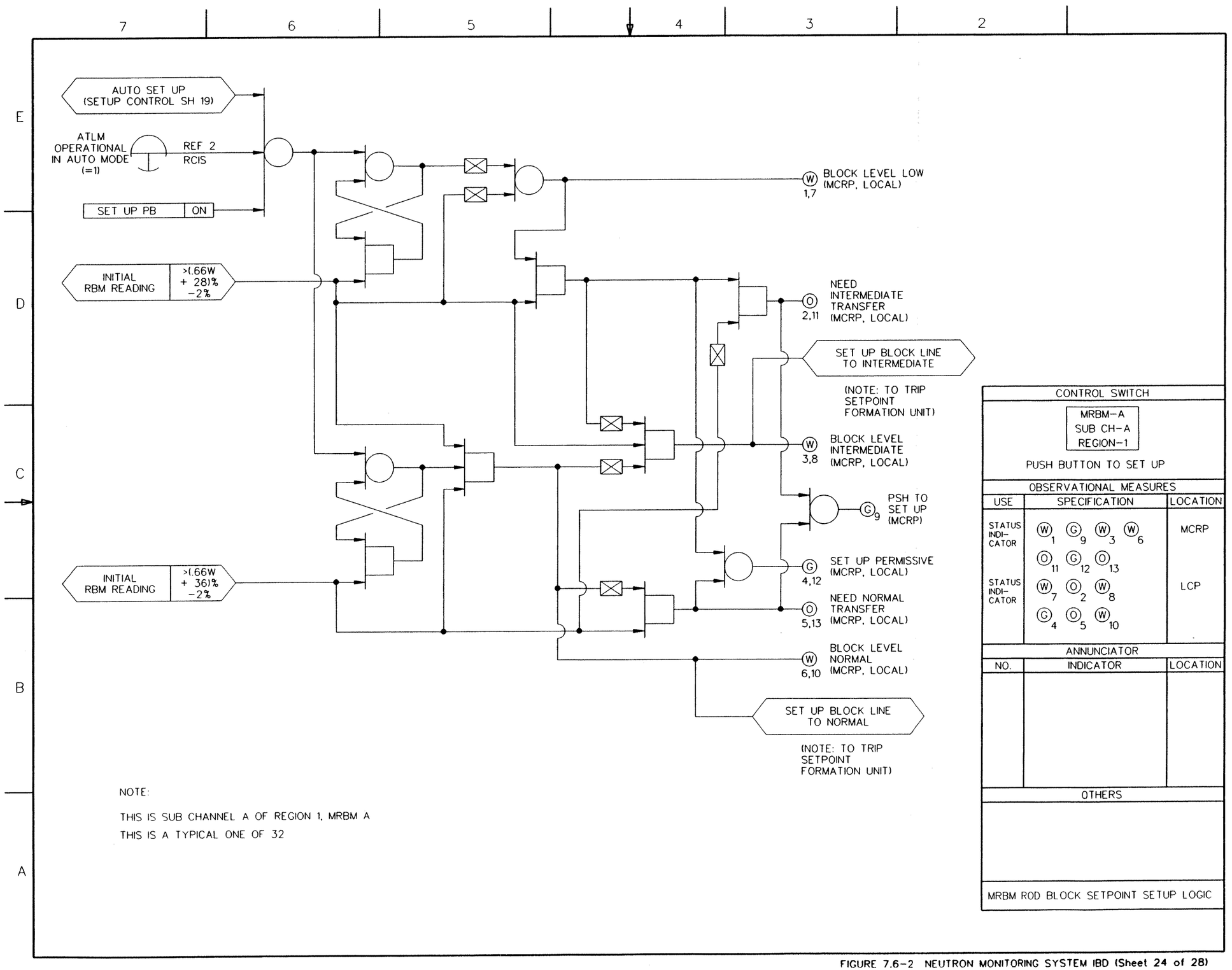


FIGURE 7.6–2 NEUTRON MONITORING SYSTEM IBD (Sheet 24 of 28)

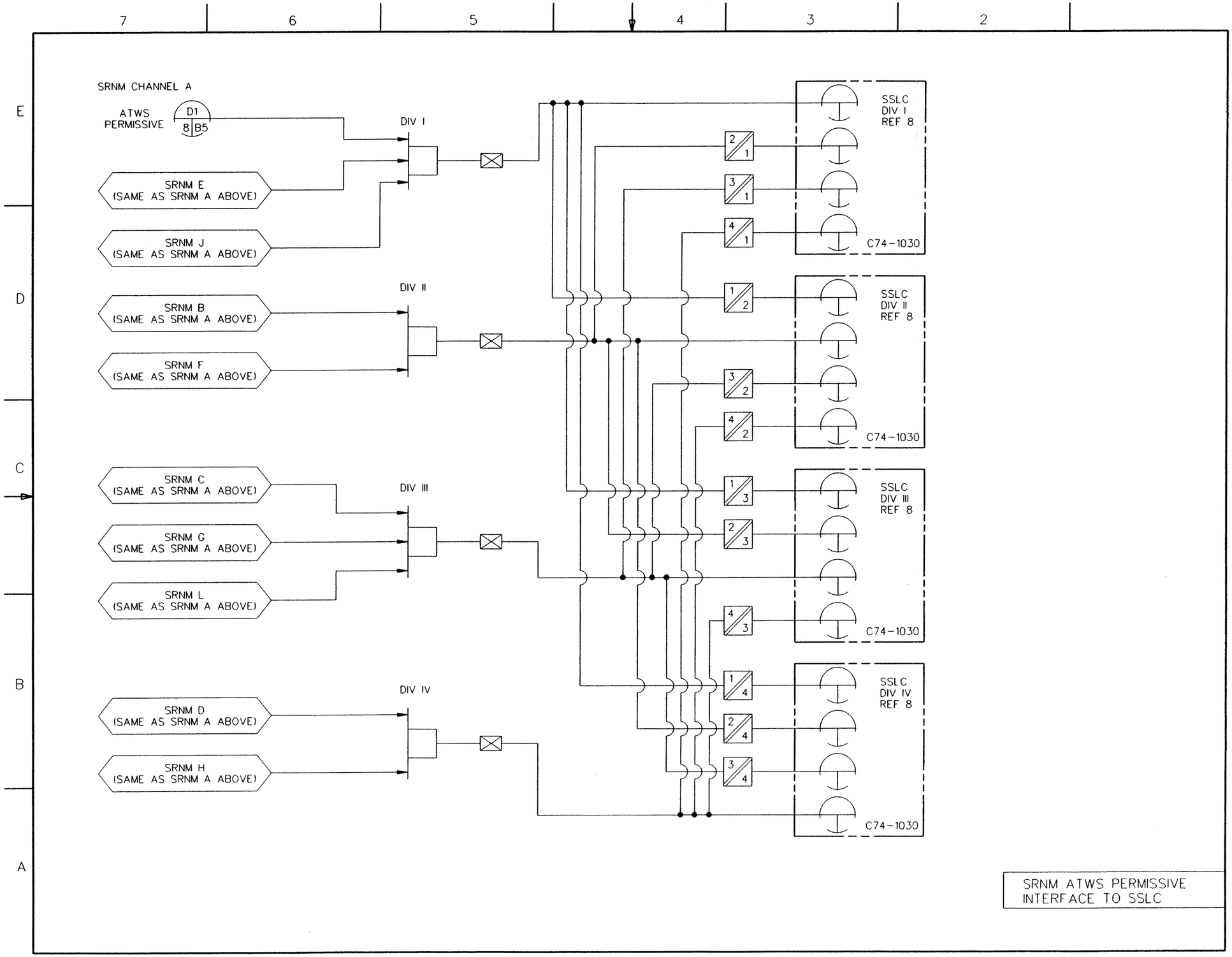


FIGURE 7.6-2 NEUTRON MONITORING SYSTEM IBD (Sheet 25 of 28)

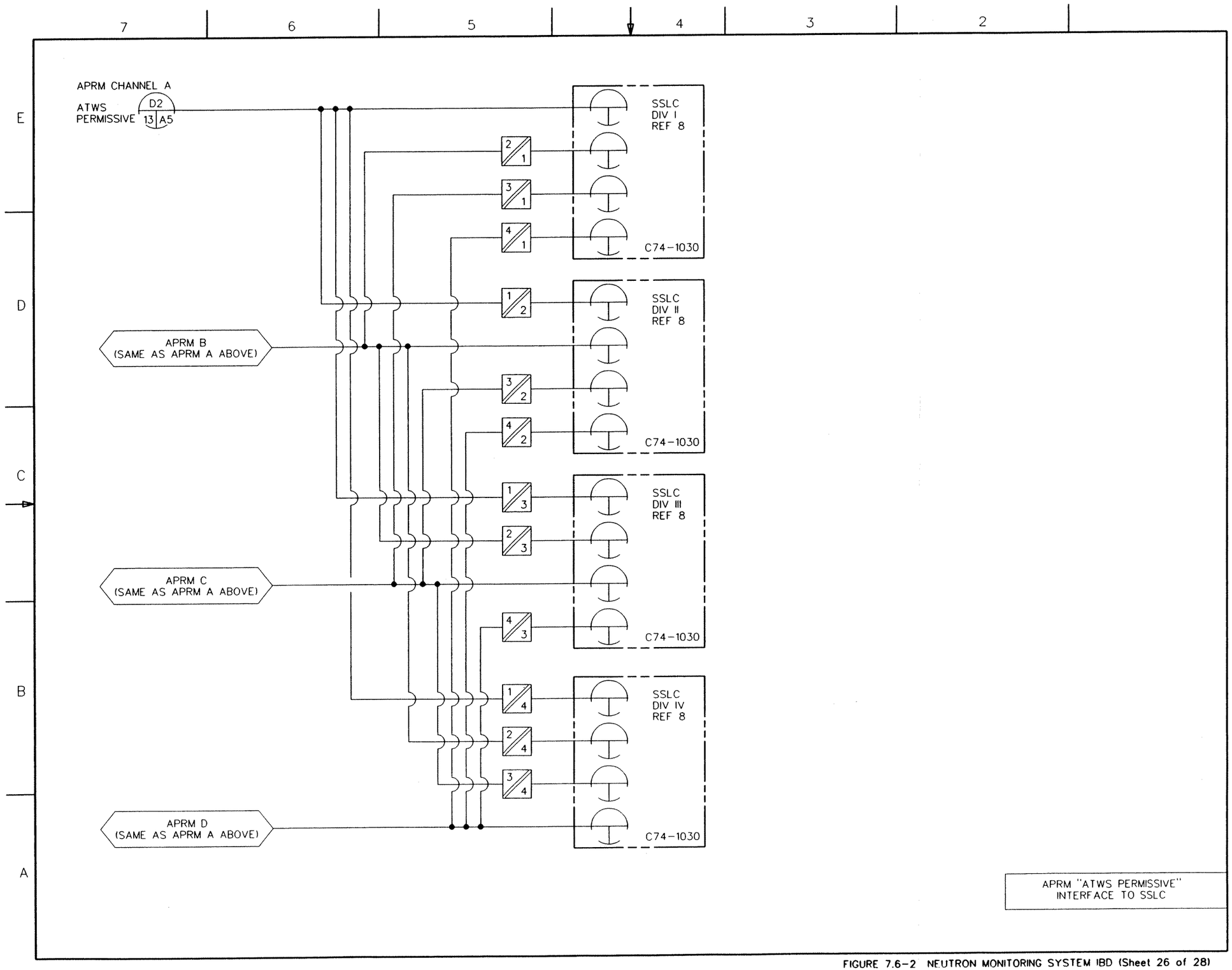
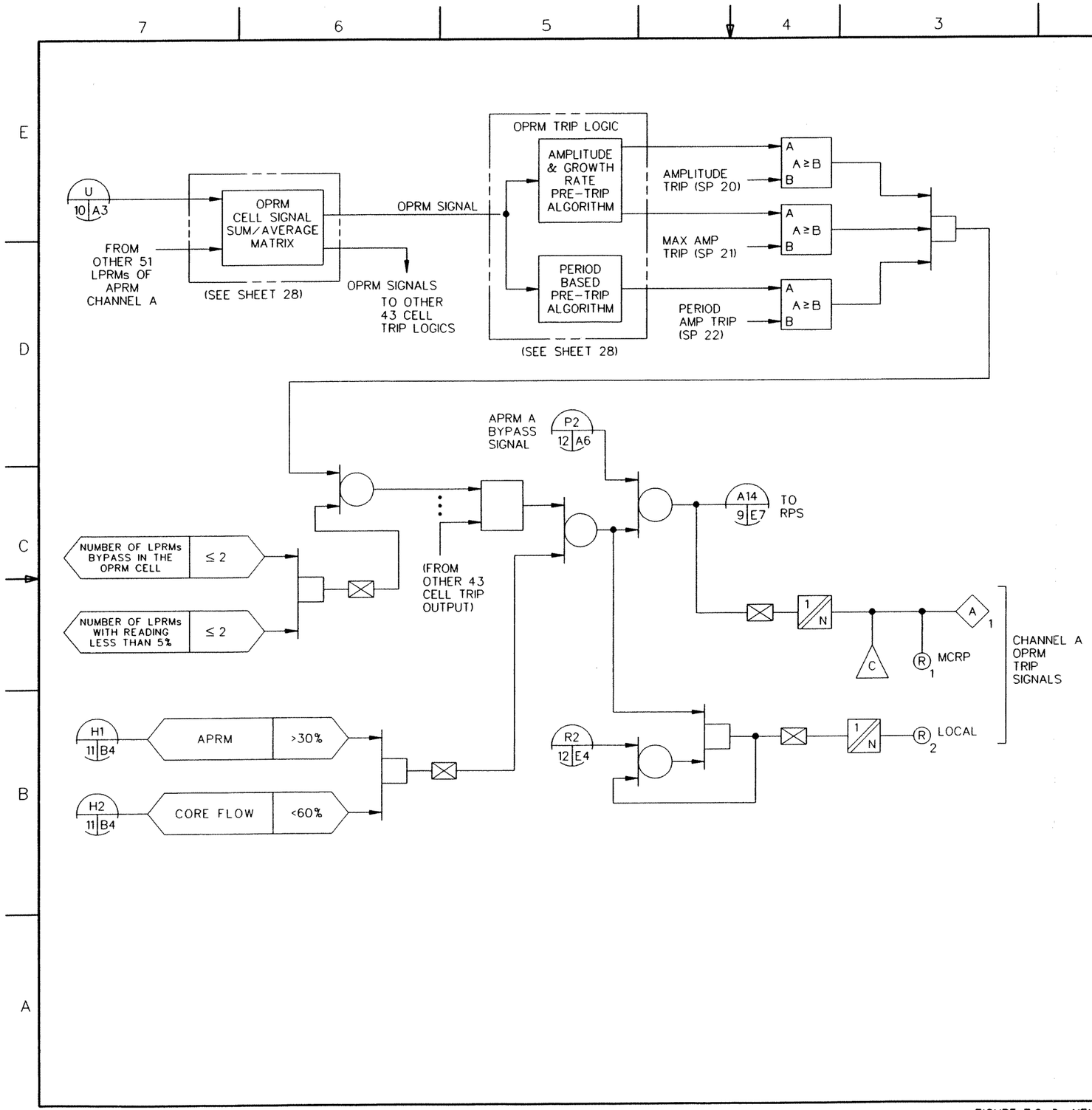


FIGURE 7.6-2 NEUTRON MONITORING SYSTEM IBD (Sheet 26 of 28)



CONTROL SWITCH

OBSERVATIONAL MEASURES		
USE	SPECIFICATION	LOCATION
STATUS INDI-CATOR	R 1	MCRP
STATUS INDI-CATOR	R 2	LCP

ANNUNCIATOR		
NO.	INDICATOR	LOCATION
1	OPRM TRIP	MCRP

OTHERS

OPRM CHANNEL A
(TYPICAL OF 4)

FIGURE 7.6-2 NEUTRON MONITORING SYSTEM IBD (Sheet 27 of 28)

SUPPLEMENT TO OPRM IBD

A. OPRM BASIC CONFIGURATION:

THE ASSIGNMENT OF LPRM SIGNALS TO DIFFERENT OPRM CHANNELS IS SHOWN IN THE RIGHT FIGURE. THE OPRM CHANNEL A RECEIVES THE SAME 52 LPRM SIGNALS AS FROM THE SAME APRM CHANNEL A. THERE ARE 44 OPRM CELLS. EACH CELL TAKES FOUR LPRM SIGNALS AS INPUT, EXCEPT NEAR THE PERIPHERY WHERE THREE LPRMS ARE USED. THE FOUR LPRMs ARE FROM THE LPRM STRINGS AT THE FOUR CORNERS OF A 4X4 FUEL BUNDLE SQUARE REGION. EACH OPRM CELL MONITORS THE NEUTRON FLUX IN THE ASSIGNED CORE REGION AND ISSUES TRIP SIGNAL AS AN OPRM TRIP IF THE TRIP SETPOINT IS EXCEEDED.

B. OPRM DESIGN LOGICS & ALGORITHM

OPRM CELL SIGNAL CALCULATION

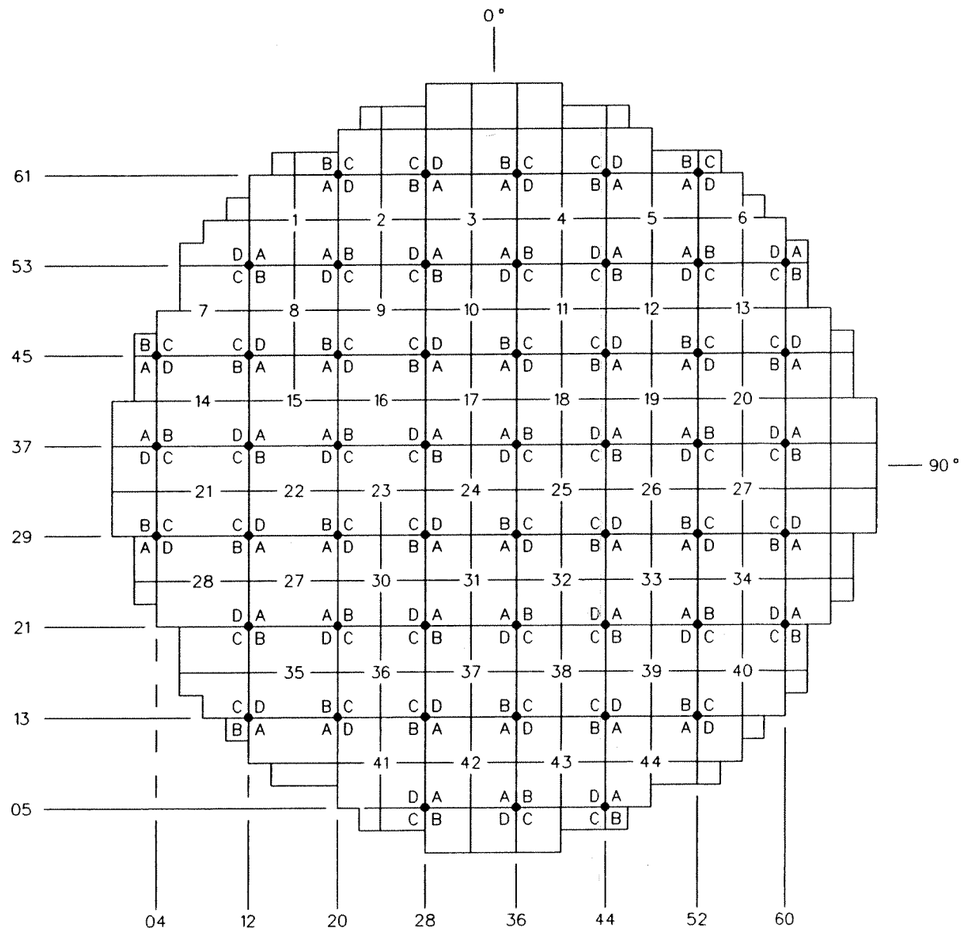
FOR EACH CELL, THE LPRM SIGNALS ARE FIRST FILTERED TO ELIMINATE HIGH FREQUENCY NOISES AND THEN NORMALIZED WITH RESPECT TO A TIME-AVERAGED SIGNAL OF THIS LPRM. THE FOUR (OR THREE) PROCESSED LPRM SIGNALS ARE THEN SUMMED AND AVERAGE TO PROVIDE A RELATIVE OPRM SIGNAL FOR THIS CELL.

OPRM CELL TRIP ALGORITHM

THERE ARE TWO INDEPENDENT OPRM TRIP ALGORITHMS. ONE IS THE AMPLITUDE AND GROWTH RATE BASED ALGORITHM, WHERE THE ALGORITHM IS TO FIRST DETECT A FLUX OSCILLATION WITHIN A DEFINED PERIOD RANGE FOR ONE CYCLE AND THEN DETECT THE OSCILLATING FLUX MAGNITUDE FOR TRIP. THE SECOND ONE IS THE PERIOD BASED ALGORITHM WHERE IT MUST DETECT A DEFINED NUMBER OF OSCILLATIONS BEFORE IT WILL ISSUE TRIP BASED ON A DEFINED OSCILLATING MAGNITUDE. FOR DETAILED DESCRIPTION OF THE ALGORITHM, REFER TO NMS HARDWARE AND SOFTWARE SYSTEM SPEC, C51-4010.

OPRM TRIP BYPASS FUNCTION

FOR EACH CELL, IF THE NUMBER OF BYPASS LPRMs IS GREATER THAN TWO OR IF THE NUMBER OF LPRMs WITH A READING OF 5% OR LESS IS GREATER THAN TWO THEN THIS OPRM CELL IS AUTOMATICALLY BYPASSED FOR TRIP OUTPUT. THE OPRM CHANNEL TRIP IS BYPASSED IF THE APRM IS LESS THAN 30% OR IF THE CORE FLOW IS GREATER THAN 60%. ALSO, THE APRM CHANNEL BYPASS WILL AUTOMATICALLY BYPASS THE TRIP OUTPUT OF THE OPRM OF THIS APRM CHANNEL.



A|B / D|C LPRMs PROVIDING INPUT TO OPRM CHANNELS A,B,C,D

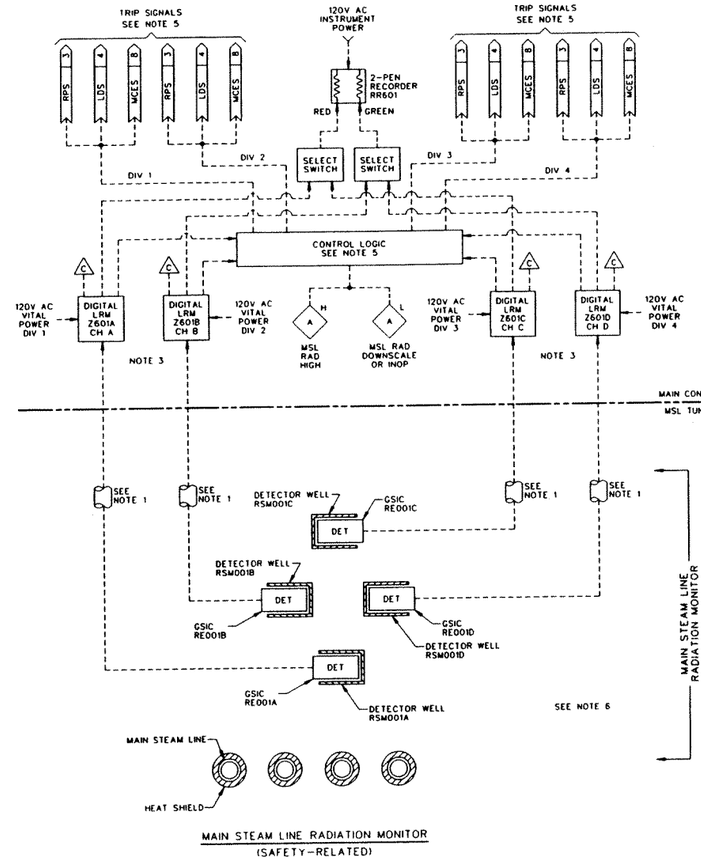
UPPER LEFT LETTER = INPUT FOR OPRM CHANNEL A
UPPER RIGHT LETTER = INPUT FOR OPRM CHANNEL B
LOWER RIGHT LETTER = INPUT FOR OPRM CHANNEL C
LOWER LEFT LETTER = INPUT FOR OPRM CHANNEL D
(LETTERS IN THE MAP REFER TO LPRM DETECTORS A,B,C,D PER ASSEMBLY)

n OPRM CELL

n = CELL NUMBER

OPRM CONFIGURATION DESCRIPTION

FIGURE 7.6-2 NEUTRON MONITORING SYSTEM IBD (Sheet 28 of 28)



MAIN STEAM LINE RADIATION MONITOR
(SAFETY-RELATED)

REFERENCE DOCUMENTS

		REFERENCE DESIGNATOR
1	SPECIAL WIRE & CABLE REQUIREMENTS SPEC	A11-3080
2	ELECTRICAL EQUIPMENT SEPARATION SPEC	A11-3120
3	REACTOR PROTECTION SYSTEM IED	C71-1040
4	LEAK DETECTION AND ISOLATION SYSTEM IED	E31-1040
5	RADWASTE SYSTEM P&ID	K17-1010
6	MAKEUP WATER SYSTEM (PURIFIED) P&ID	P11-1010
7	REACTOR BUILDING COOLING WATER SYSTEM P&ID	P21-1010
8	MAIN CONDENSER EVACUATION SYSTEM P&ID	N61-1010
9	OFFGAS SYSTEM P&ID	N62-1010
10	INSTRUMENT AIR SYSTEM P&ID	P52-1010
11	STANDBY GAS TREATMENT SYSTEM P&ID	T22-1010
12	HEATING, VENTILATING & AIR CONDITIONING SYSTEM P&ID	U41-1010

LEGEND:

- ARM - AREA RADIATION MONITOR
- LCRM - DIGITAL LOG COUNT RATE METER
- GM-B - BETA SENSITIVE GM DETECTOR
- GSIC - GAMMA SENSITIVE ION CHAMBER
- S/C - DIGITAL GAMMA SENSITIVE GM DETECTOR
- LRM - LOG RADIATION MONITOR
- USC - ULTRASONIC CLEANING
- ⇉ - SERIAL MULTIPLEXED SIGNALS

NOTES

1. ALL CABLES AND WIRING SHALL CONFORM TO THE SPECIAL WIRE AND CABLE REQUIREMENTS AS SPECIFIED IN REF DOC 1
2. THE SAFETY RELATED SUBSYSTEMS OF THE PROCESS RADIATION MONITORING SYSTEM SHALL CONFORM TO THE CRITERIA AND REQUIREMENTS FOR ELECTRICAL SEPARATION AS DEFINED IN REF DOC 2.
3. FIBER OPTIC CABLES MAY BE USED IN THE DESIGN OF THIS SYSTEM PROVIDED THESE CABLES CONFORM TO THE REQUIREMENTS STIPULATED IN REF DOC(S) 1&2.
4. EACH DIGITAL ARM (Z602A,B,C,D & Z603) AND LCRM (Z701 TO Z704) CAN ACCOMODATE MULTIPLE CHANNELS. THESE MONITORS ARE SHARED WITH THE OTHER SUBSYSTEMS AS INDICATED IN THIS DRAWING.
5. EACH MSL RADIATION MONITOR SHALL PROVIDE A DIVISIONAL TRIP SIGNAL ON EITHER RADIATION HIGH-HIGH OR ON DOWNSCALE INOPERATIVE (INOP) TO INITIATE THE FOLLOWING FUNCTIONS ON A COINCIDENCE VOTE OF ANY TWO OUT OF FOUR CHANNEL TRIPS:
   A. REACTOR SCRAM
   B. CLOSURE OF THE MSIVs AND MS DRAIN LINE VALVES
   C. SHUTDOWN OF THE MAIN CONDENSER MECHANICAL VACUUM PUMP AND CLOSURE OF THE EXIT LINE ISOLATION VALVE
6. THE MSL ION CHAMBERS SHALL BE SENSITIVE TO GAMMA RAYS (GSIC) AND SHALL BE ARRANGED INSIDE THE MSL TUNNEL IN A MANNER SO EACH CAN PROVIDE APPROXIMATELY THE SAME RESPONSE FROM ALL THE STEAM LINES. EACH DETECTOR ASSEMBLY SHALL BE INSERTED INTO A SEALED PIPE WELL TO BE RETRIEVABLE FROM OUTSIDE THE TUNNEL.
7. THESE DETECTORS ARE PROVIDED TO MONITOR RADIATION THAT MAY RESULT FROM A FUEL HANDLING ACCIDENT IN THE FUEL POOL OR THE REACTOR WELL.
8. EACH HVAC AIR EXHAUST RADIATION MONITOR IN THE REACTOR BUILDING AND IN THE FUEL HANDLING AREA PROVIDES A CHANNEL TRIP SIGNAL TO INITIATE THE FOLLOWING FUNCTIONS ON A COINCIDENCE VOTE OF ANY TWO OUT OF FOUR CHANNEL TRIPS:
   A. INITIATE OPERATION OF THE STANDBY GAS TREATMENT SYSTEM (SGTS)
   B. ISOLATE THE AIR INTAKE AND EXHAUST DUCTS OF THE HVAC SYSTEM
   C. ISOLATE THE PURGE AND VENT VALVES OF SECONDARY CONTAINMENT

   THE CHANNEL TRIP SIGNAL FROM EACH MONITOR SHALL CONSIST OF EITHER RADIATION HIGH-HIGH TRIP OR RADIATION DOWNSCALE/INOPERATIVE (INOP) TRIP.
9. THE OFF-GAS SAMPLE CHAMBER SHALL BE MOUNTED VERTICALLY WITH ITS PIPING SLOPED AWAY FROM THE CHAMBER TO PERMIT THE CONDENSATE TO DRAIN TO THE PROCESS LINE. A DRAIN SHALL BE PROVIDED AT THE BOTTOM OF THE SAMPLE CHAMBER
10. EACH RADIATION MONITOR SHALL PROVIDE TRIP SIGNALS TO THE OFF-GAS SYSTEM TO PERFORM THE FOLLOWING FUNCTIONS:
    A. BASED ON ONE-OUT-TWO LOGIC SIGNAL, THE RADIATION HIGH-HIGH TRIP SIGNAL FROM EITHER MONITOR SHALL INITIATE VALVE ALIGNMENT OF THE OFF-GAS SYSTEM TO FORCE THE GASEOUS EFFLUENTS THROUGH THE CHARCOAL VAULT FOR TREATMENT PRIOR TO RELEASE TO THE STACK.
    B. BASED ON TWO-OUT-OF TWO LOGIC SIGNALS, THE RADIATION MONITOR CHANNEL TRIP SIGNALS SHALL INITIATE CLOSURE OF THE OFF-GAS SYSTEM VENT RELEASE VALVE ON RADIATION HIGH-HIGH-HIGH (HHH) CHANNEL TRIP FROM BOTH MONITORS, OR ON DOWNSCALE/INOPERATIVE CHANNEL TRIP FROM BOTH MONITORS, OR ON ONE HHH CHANNEL TRIP FROM ONE MONITOR AND ONE DOWNSCALE/INOPERATIVE CHANNEL TRIP FROM THE SECOND MONITOR.
11. HEATING OF THESE LINES MAY BE REQUIRED TO PREVENT CONDENSATION. HEATERS SHALL BE SIZED SO THE TEMPERATURE IS KEPT ABOVE THE DEW POINT.
12. THE RADIATION HIGH-HIGH TRIP SIGNAL FROM EACH MONITOR SHALL INITIATE CLOSURE OF ITS RESPECTIVE LCW AND HCW OUTBOARD DRAIN LINE ISOLATION VALVE.
13. THE RADIATION HIGH-HIGH TRIP, THE DOWNSCALE/INOPERATIVE, OR A NOT SAMPLING CONDITION SHALL CAUSE SHUTDOWN OF THE RADWASTE SYSTEM LIQUID EFFLUENT DISCHARGE PUMPS AND CLOSURE OF THE OULET VALVE IN THE DISCHARGE LINE
14. THE RADIATION MONITORS OF EACH SUBSYSTEM SHALL ISOLATE ITS RESPECTIVE AIR INTAKE DUCTS TO THE CONTROL BUILDING AND START THE EMERGENCY AIR CIRCULATING FAN ON A COINCIDENCE VOTE OF ANY TWO OUT OF FOUR CHANNEL TRIPS ON EITHER RADIATION HIGH-HIGH OR ON DOWNSCALE/INOPERATIVE INDICATION
15. TEE SHALL BE UNION TEE SWAGELOCK TYPE SS-1610-3.
16. THE SAMPLE LINE SHALL BE 25.4mm X 1.47mm WALL THICKNESS SEAMLESS STAINLESS STEEL TUBING. THE TUBING MINIMUM BEND RADIUS SHALL BE 508mm. THE TUBING LENGTH SHALL BE JOINED WITH SWAGELOCK TYPE SS-1610-6 UNIONS. THE TUBING SHALL SLOPE SO THAT THE CONDENSATE WILL RUN TO DRAIN TEE.
17. REMOVABLE SECTION SHALL BE PROVIDED NEAR THE ISOKINETIC PROBE FOR THE INSERTION OF A CHARCOAL FILTER HOLDER IF SIGNIFICANT DEPOSITION IS SUSPECTED. THE FITTINGS ETC. SHALL PROVIDE SMOOTH TRANSITIONS WITHOUT EITHER INTRODUCING DISCONTINUITIES OR REDUCING THE CROSS SECTIONAL AREA OF THE FLOW STREAM.
18. HEATER AND CONDENSATE DRAIN WITH TRAP TO BE SIZED SO THAT TEMPERATURE OF SAMPLE STREAM IS KEPT ABOVE DEW POINT.
19. CONTROL OF THE CHECK SOURCE CAN BE INTEGRATED INTO THE DIGITAL LCRM AS PART OF THE MONITOR
20. THE RADIATION HIGH-HIGH TRIP OR THE DOWNSCALE/INOPERATIVE TRIP SHALL TERMINATE OPERATION OF THE INCINERATOR FANS.

MPL NO. D11-1010

FIGURE 7.6-5 PROCESS RADIATION MONITORING SYSTEM IED (Sheet 1 of 11)

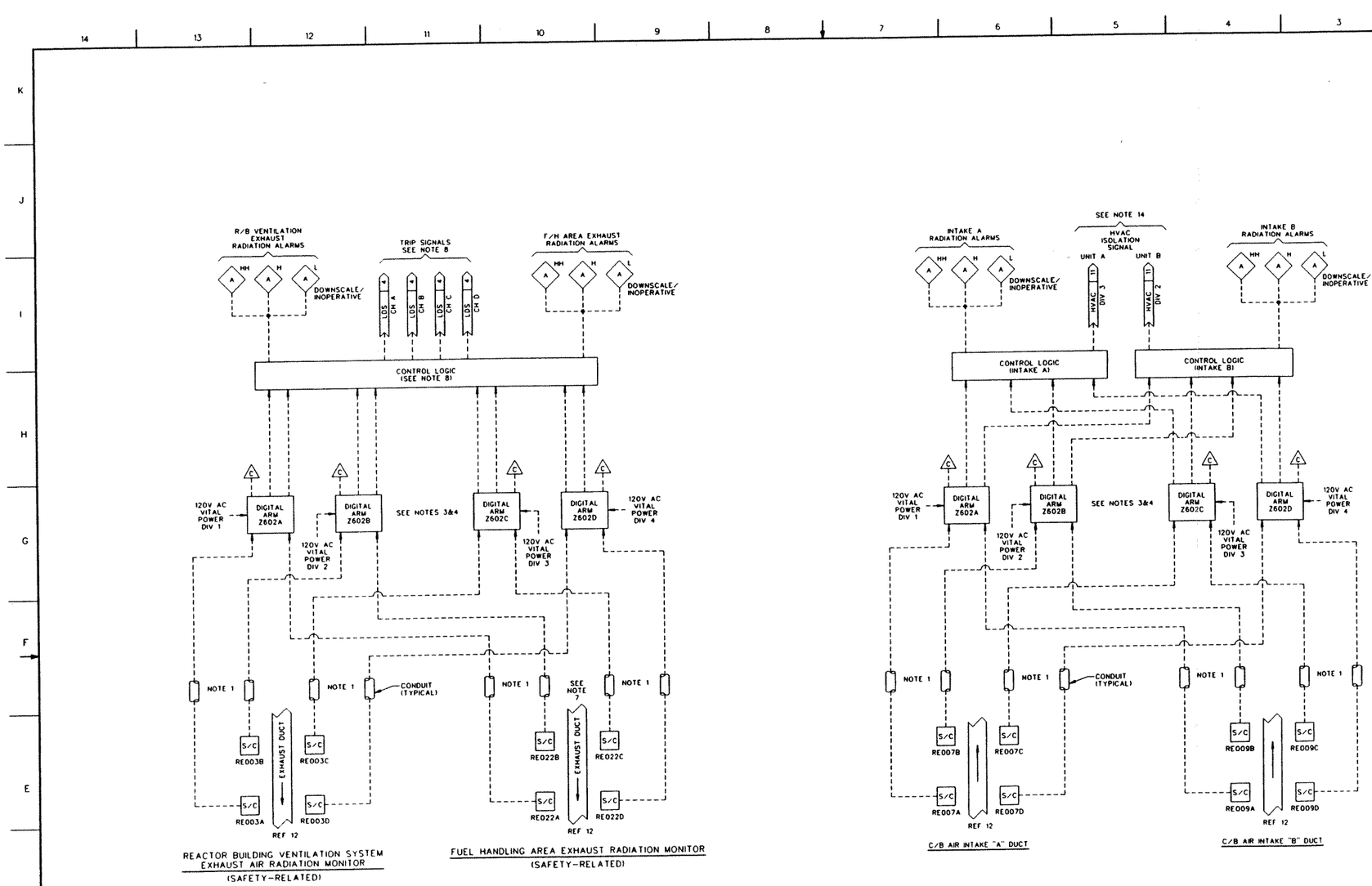
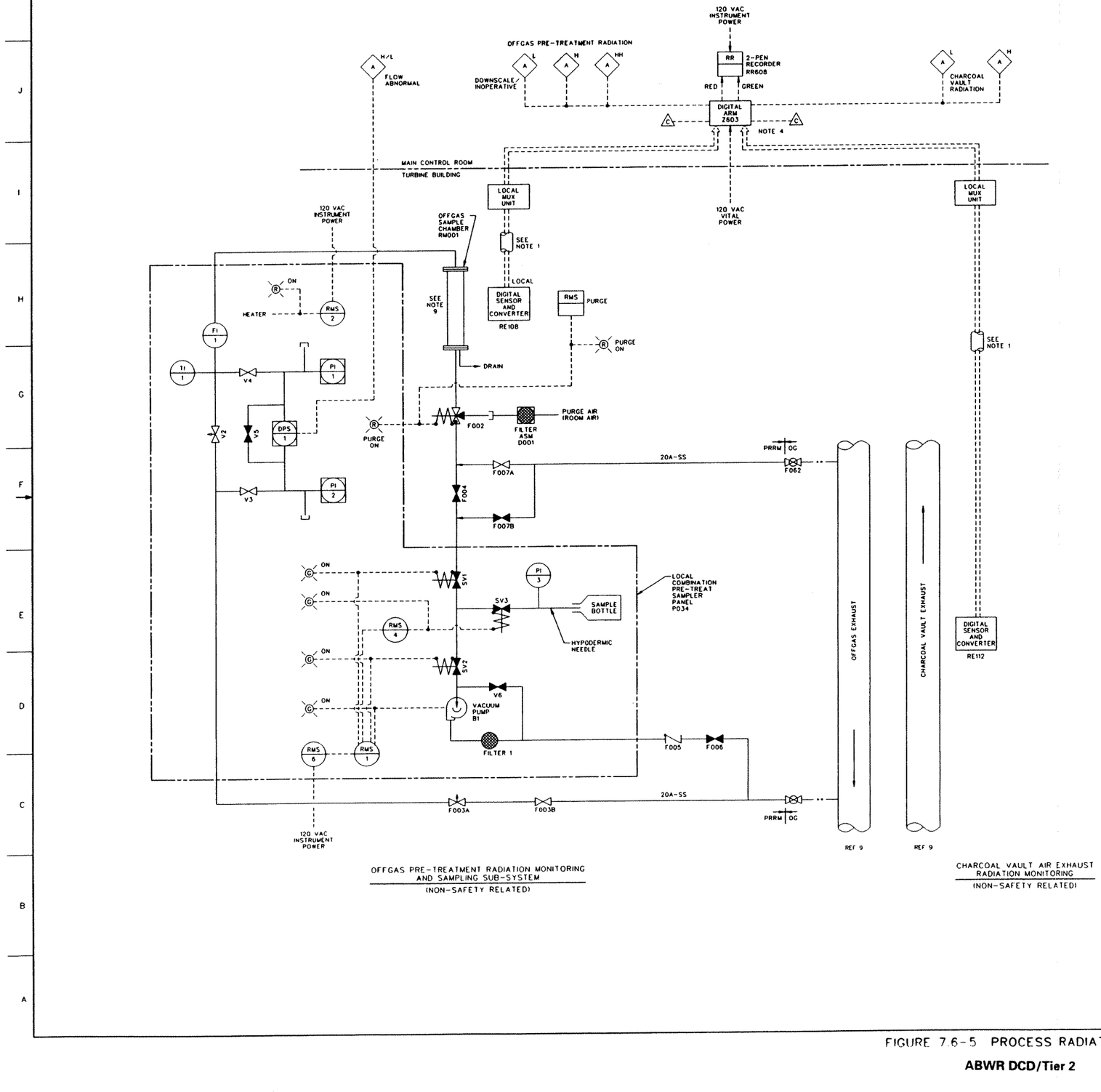


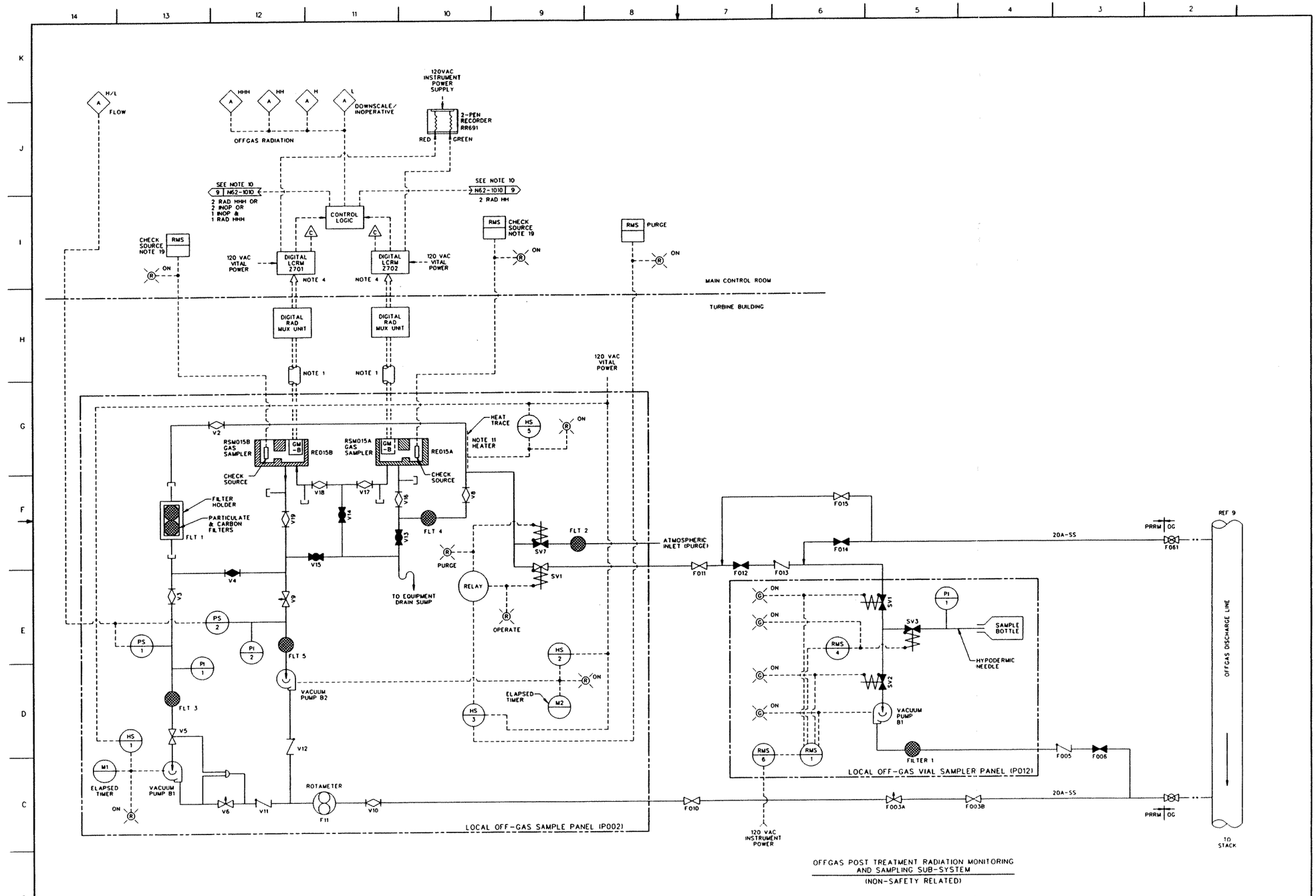
FIGURE 7.6-5 PROCESS RADIATION MONITORING SYSTEM IED (Sheet 2 of 11)



OFFGAS PRE-TREATMENT RADIATION MONITORING AND SAMPLING SUB-SYSTEM
(NON-SAFETY RELATED)

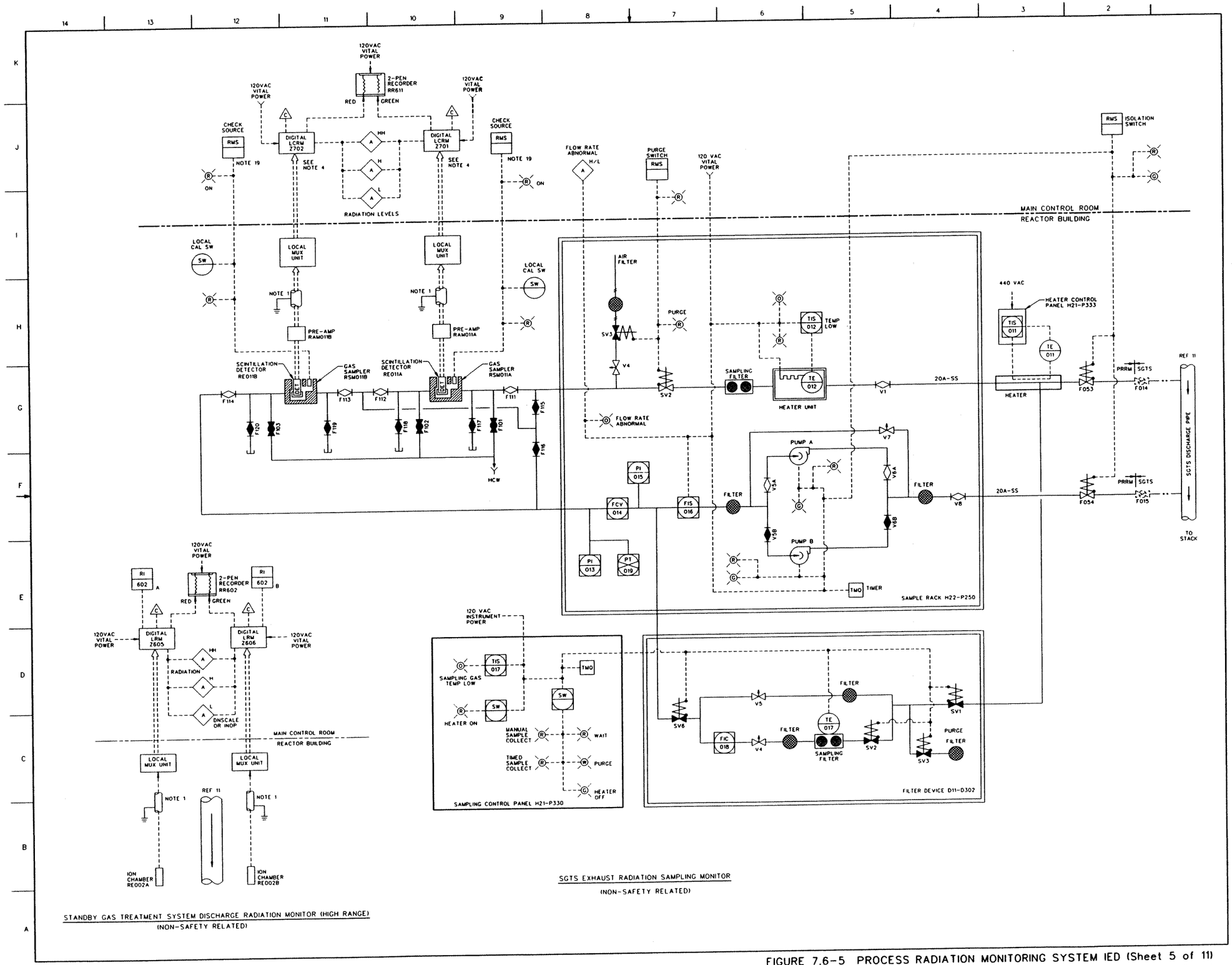
CHARCOAL VAULT AIR EXHAUST RADIATION MONITORING
(NON-SAFETY RELATED)

FIGURE 7.6-5 PROCESS RADIATION MONITORING SYSTEM IED (Sheet 3 of 11)



OFFGAS POST TREATMENT RADIATION MONITORING AND SAMPLING SUB-SYSTEM
(NON-SAFETY RELATED)

FIGURE 7.6-5 PROCESS RADIATION MONITORING SYSTEM IED (Sheet 4 of 11)



STANDBY GAS TREATMENT SYSTEM DISCHARGE RADIATION MONITOR (HIGH RANGE)
(NON-SAFETY RELATED)

SGTS EXHAUST RADIATION SAMPLING MONITOR
(NON-SAFETY RELATED)

FIGURE 7.6-5 PROCESS RADIATION MONITORING SYSTEM IED (Sheet 5 of 11)

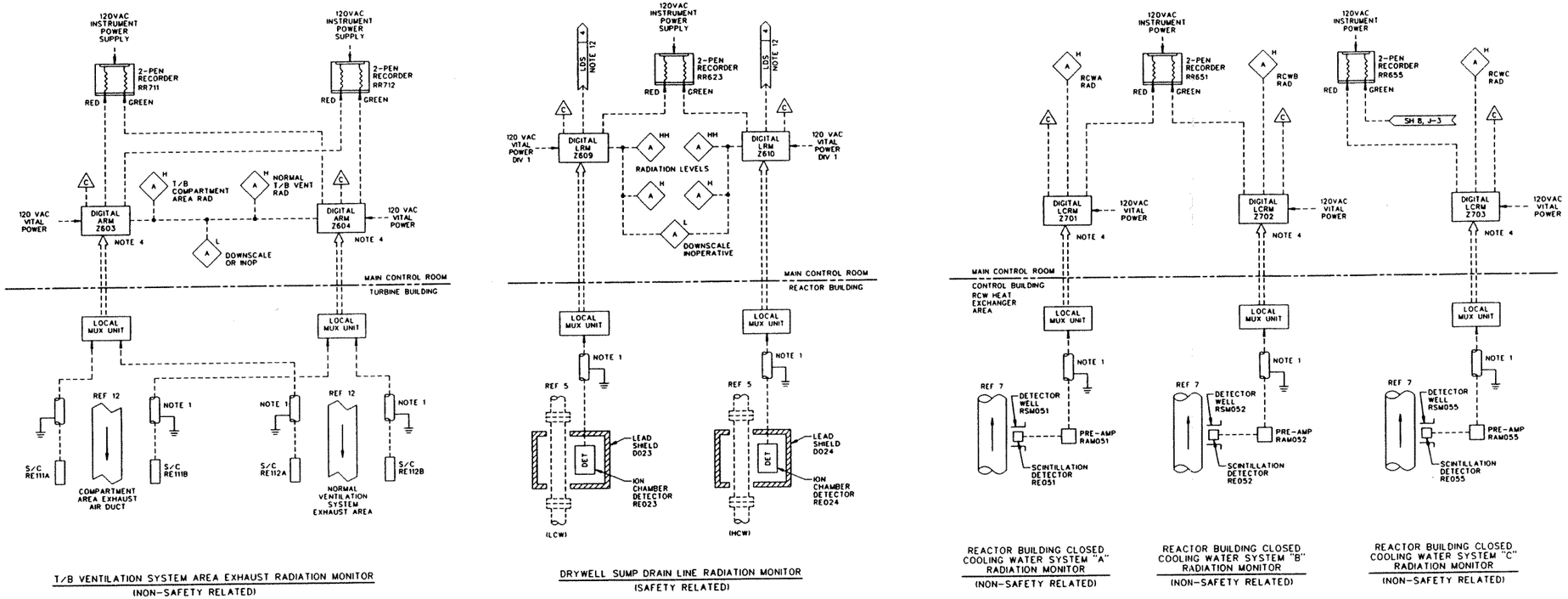


FIGURE 7.6-5 PROCESS RADIATION MONITORING SYSTEM IED (Sheet 6 of 11)

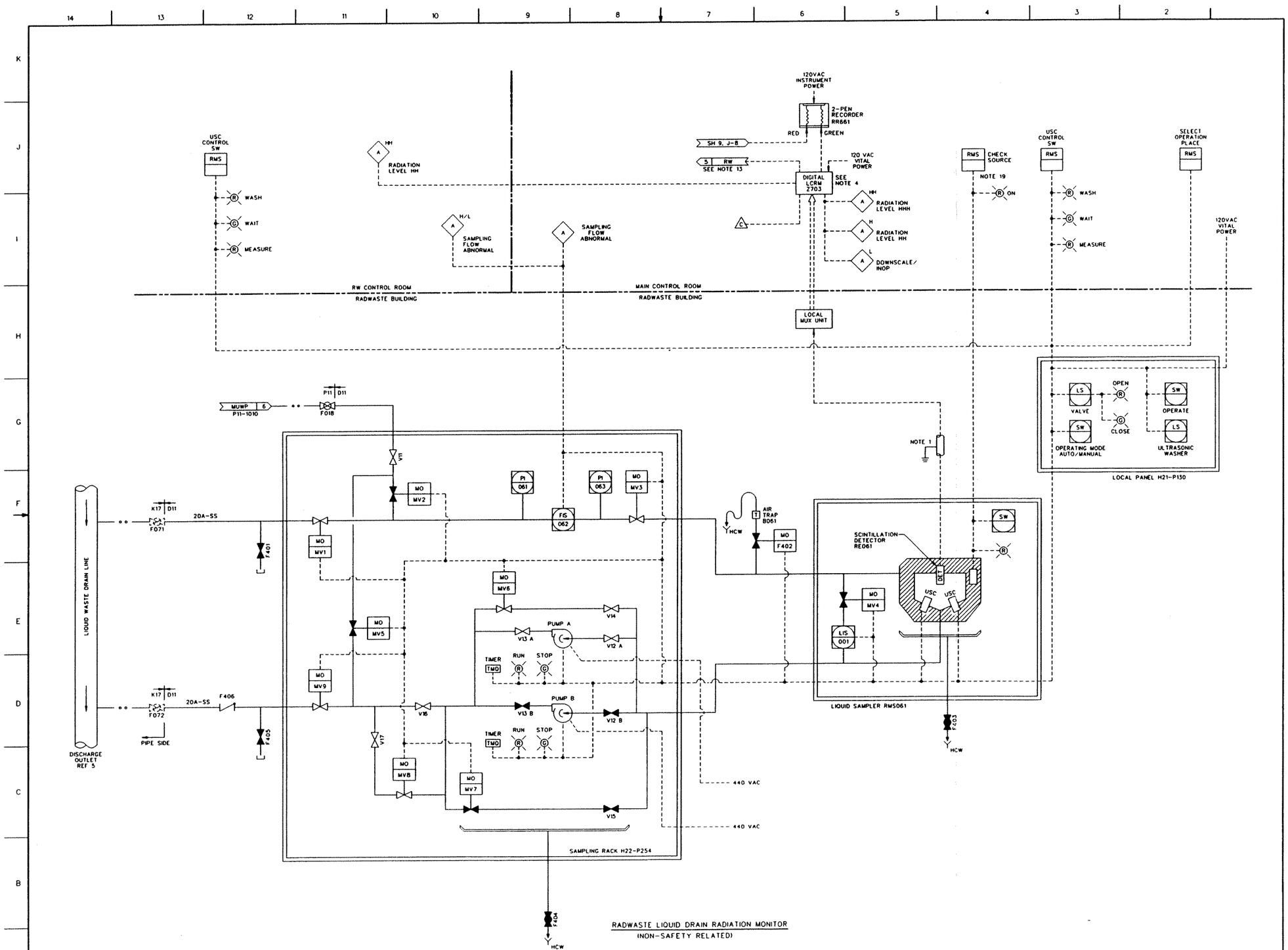
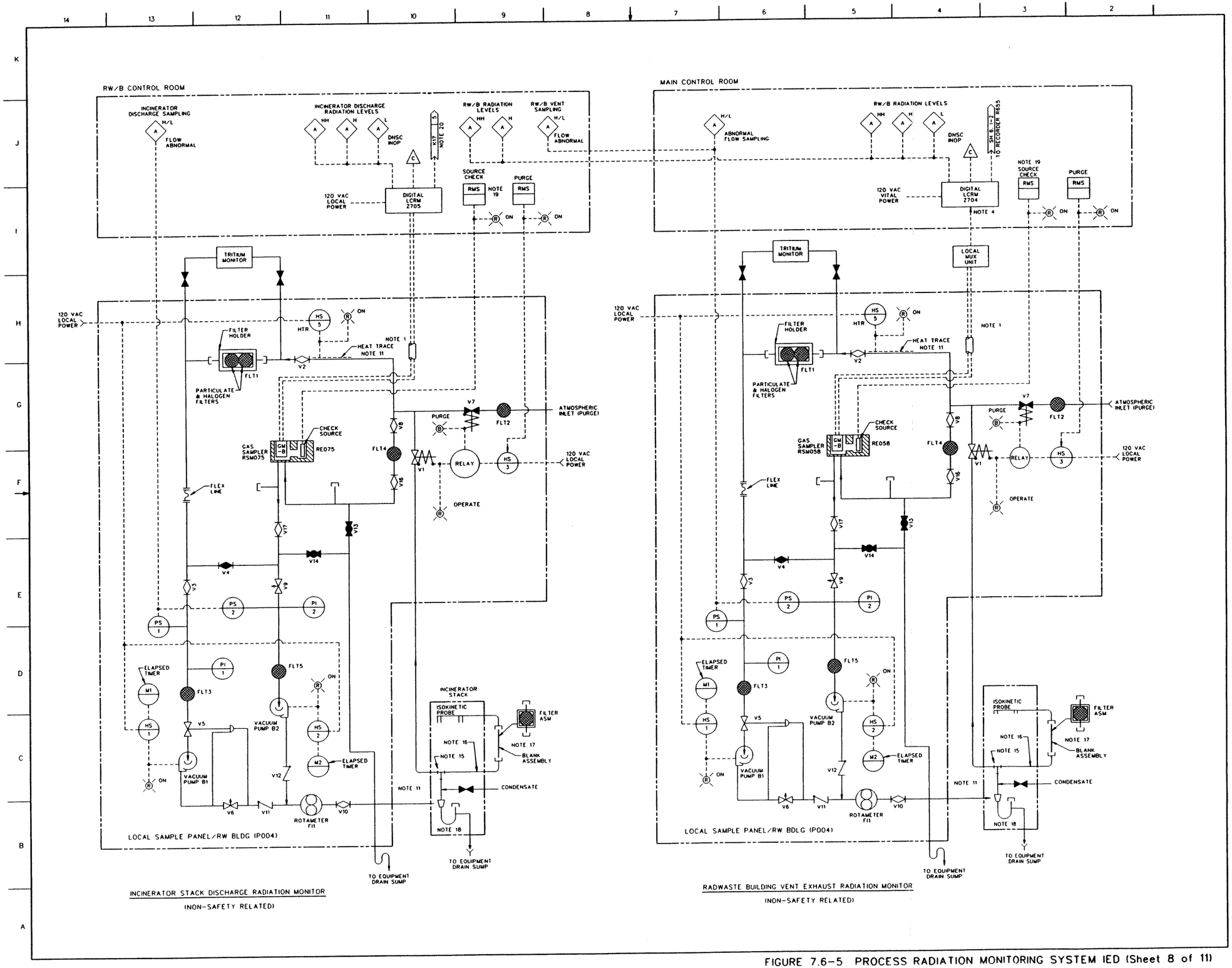


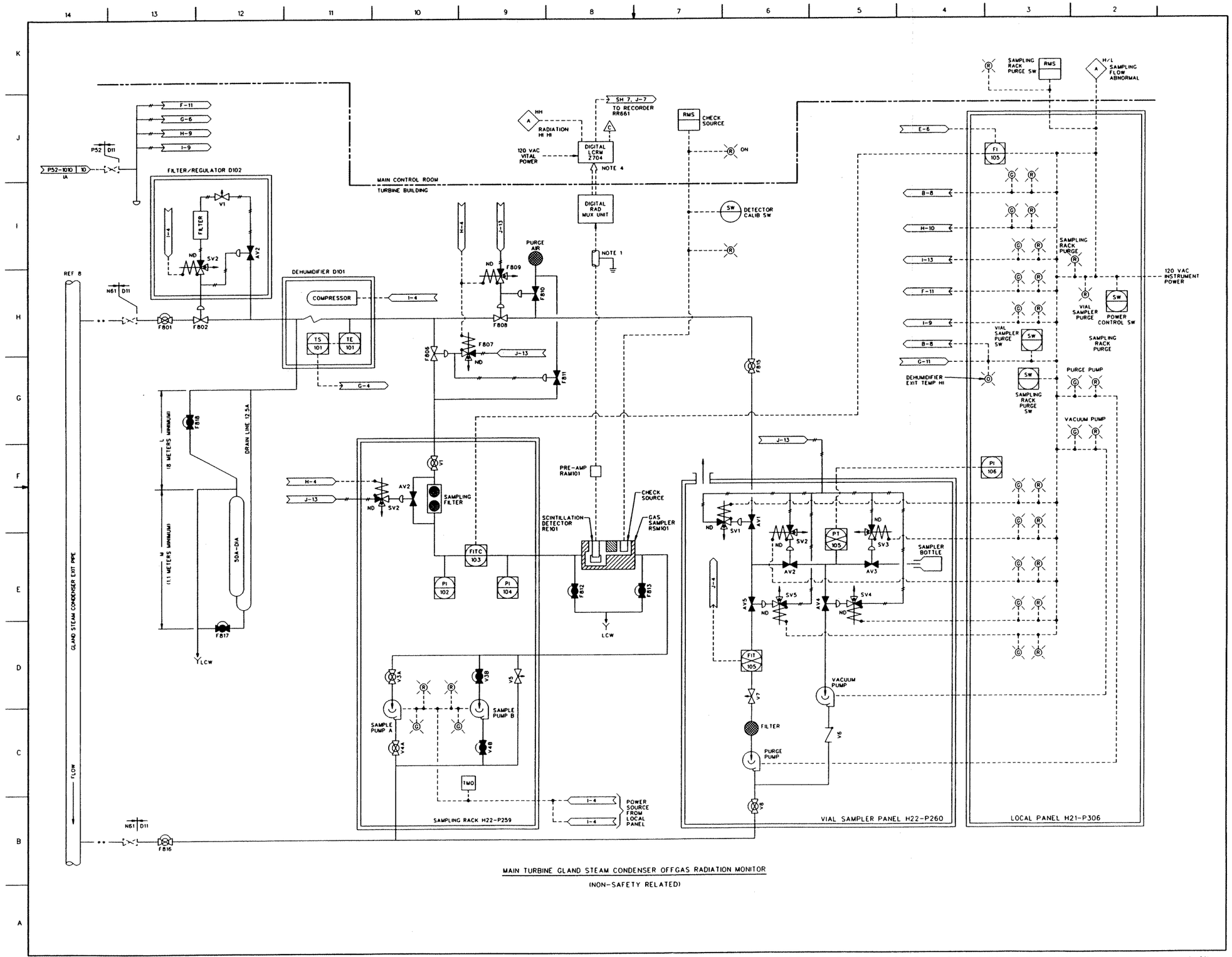
FIGURE 7.6-5 PROCESS RADIATION MONITORING SYSTEM IED (Sheet 7 of 11)



INCINERATOR STACK DISCHARGE RADIATION MONITOR
(NON-SAFETY RELATED)

RADWASTE BUILDING VENT EXHAUST RADIATION MONITOR
(NON-SAFETY RELATED)

FIGURE 7.6-5 PROCESS RADIATION MONITORING SYSTEM IED (Sheet 8 of 11)



MAIN TURBINE GLAND STEAM CONDENSER OFFGAS RADIATION MONITOR

(NON-SAFETY RELATED)

FIGURE 7.6-5 PROCESS RADIATION MONITORING SYSTEM IED (Sheet 9 of 11)

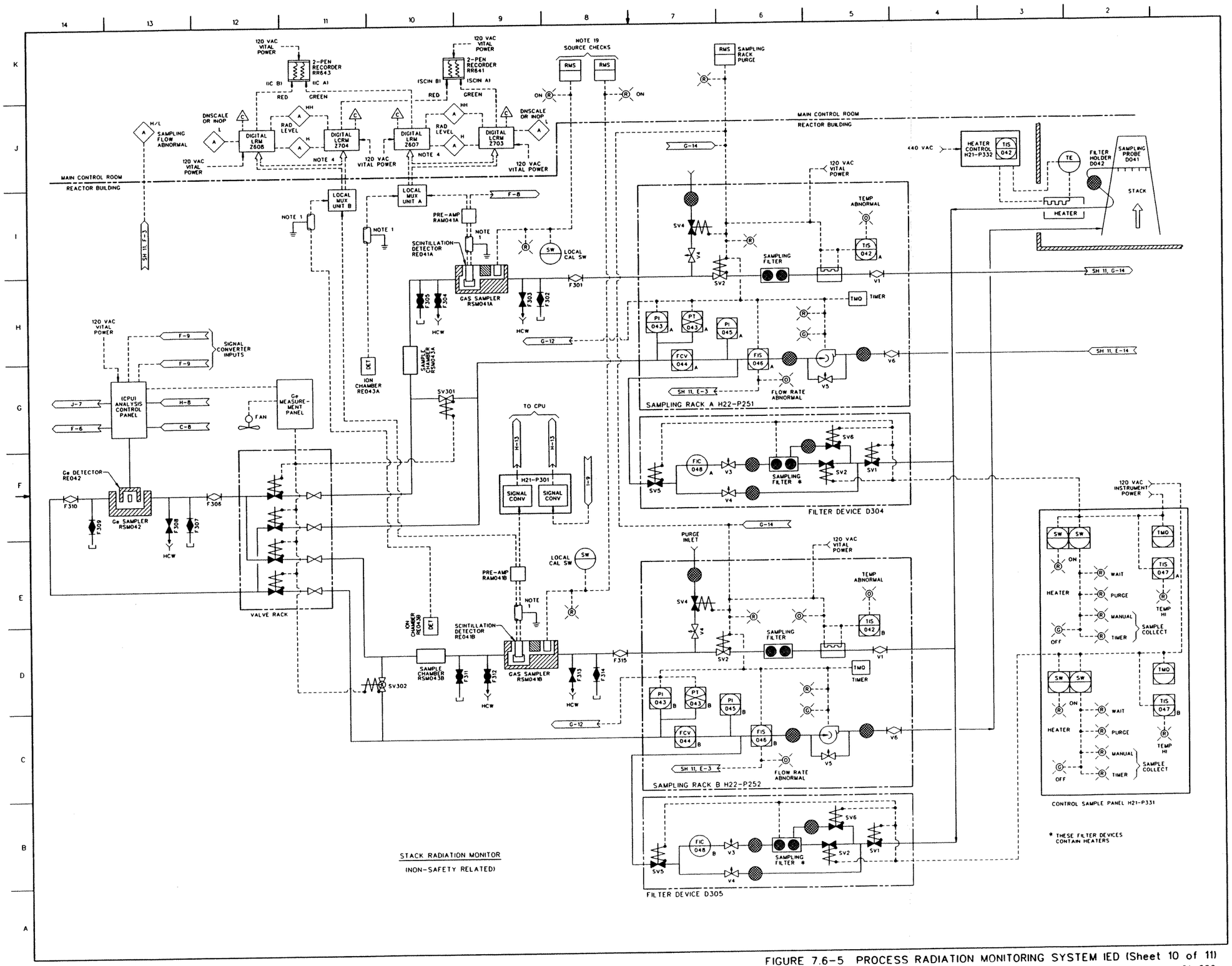


FIGURE 7.6-5 PROCESS RADIATION MONITORING SYSTEM IED (Sheet 10 of 11)

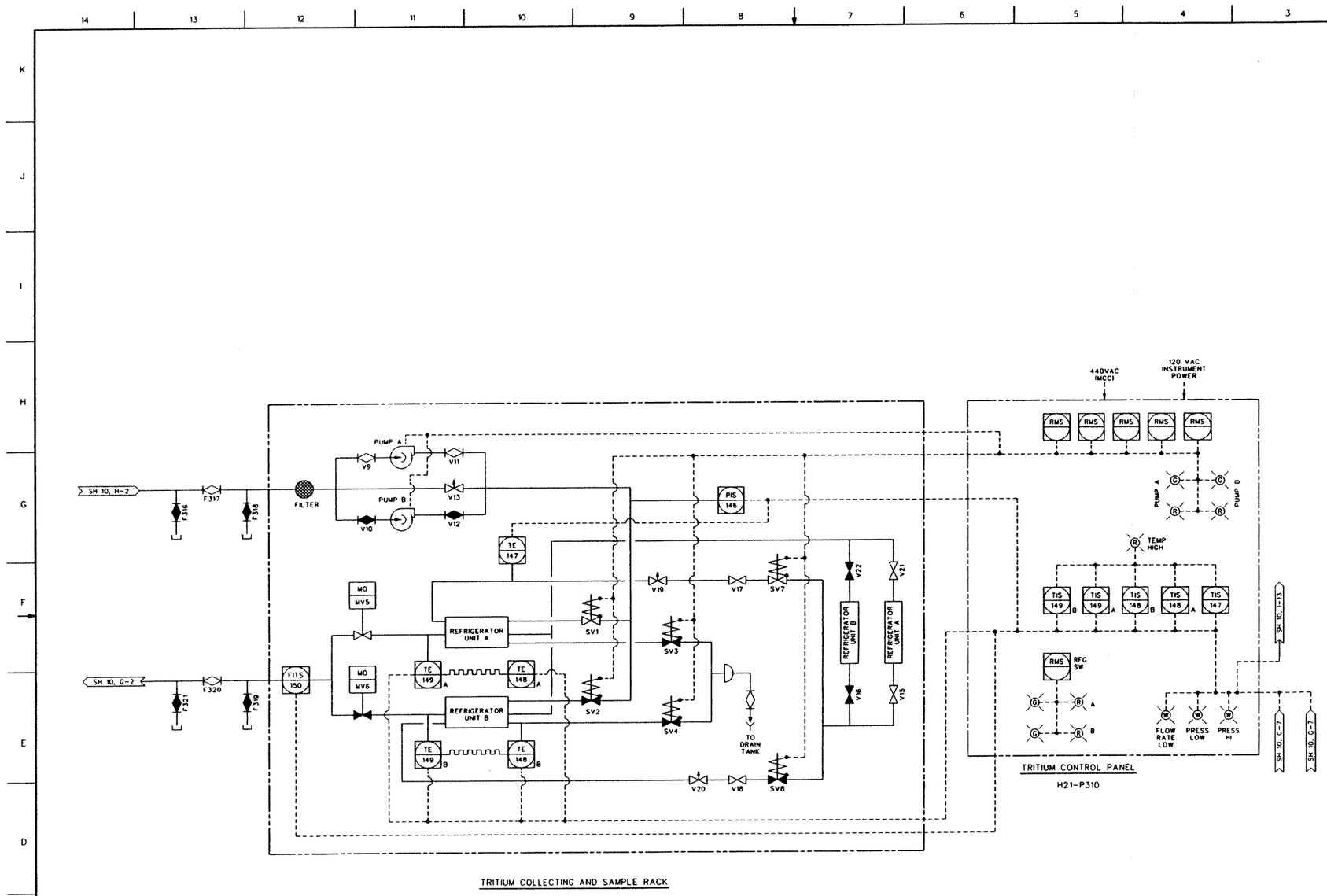
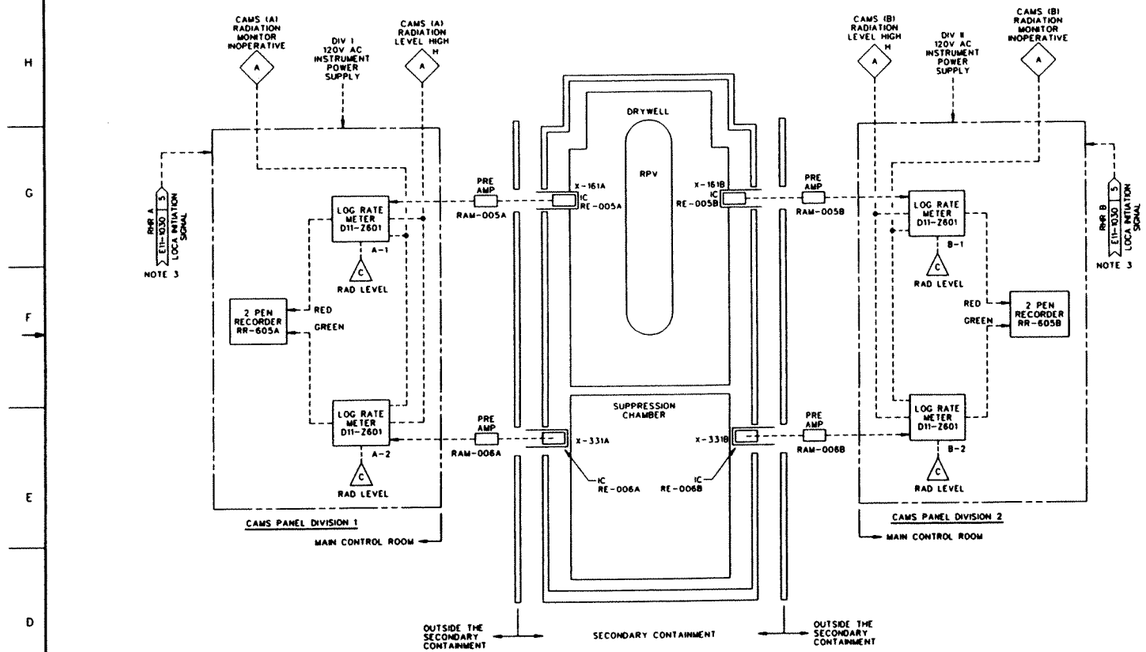


FIGURE 7.6-5 PROCESS RADIATION MONITORING SYSTEM IED (Sheet 11 of 11)



NOTES

1. ALL CONNECTING PIPING TO THE RACKS ARE SCHEDULE 40 SS.
2. THE SAMPLING PUMPS ARE IDENTICAL AND CAN BE USED DURING NORMAL OR ACCIDENT OPERATION
3. THE LOCA SIGNAL SHALL AUTOMATICALLY TURN ON THE OPERATION OF THE RADIATION MONITOR, THE ACCIDENT SAMPLING PUMPS, AND LINE UP THE ASSOCIATED SYSTEM VALVES

REFERENCE DOCCUMENT UNDER THE FOLLOWING IDENTITIES ARE TO BE USED IN CONJUNCTION WITH THIS DRAWING.

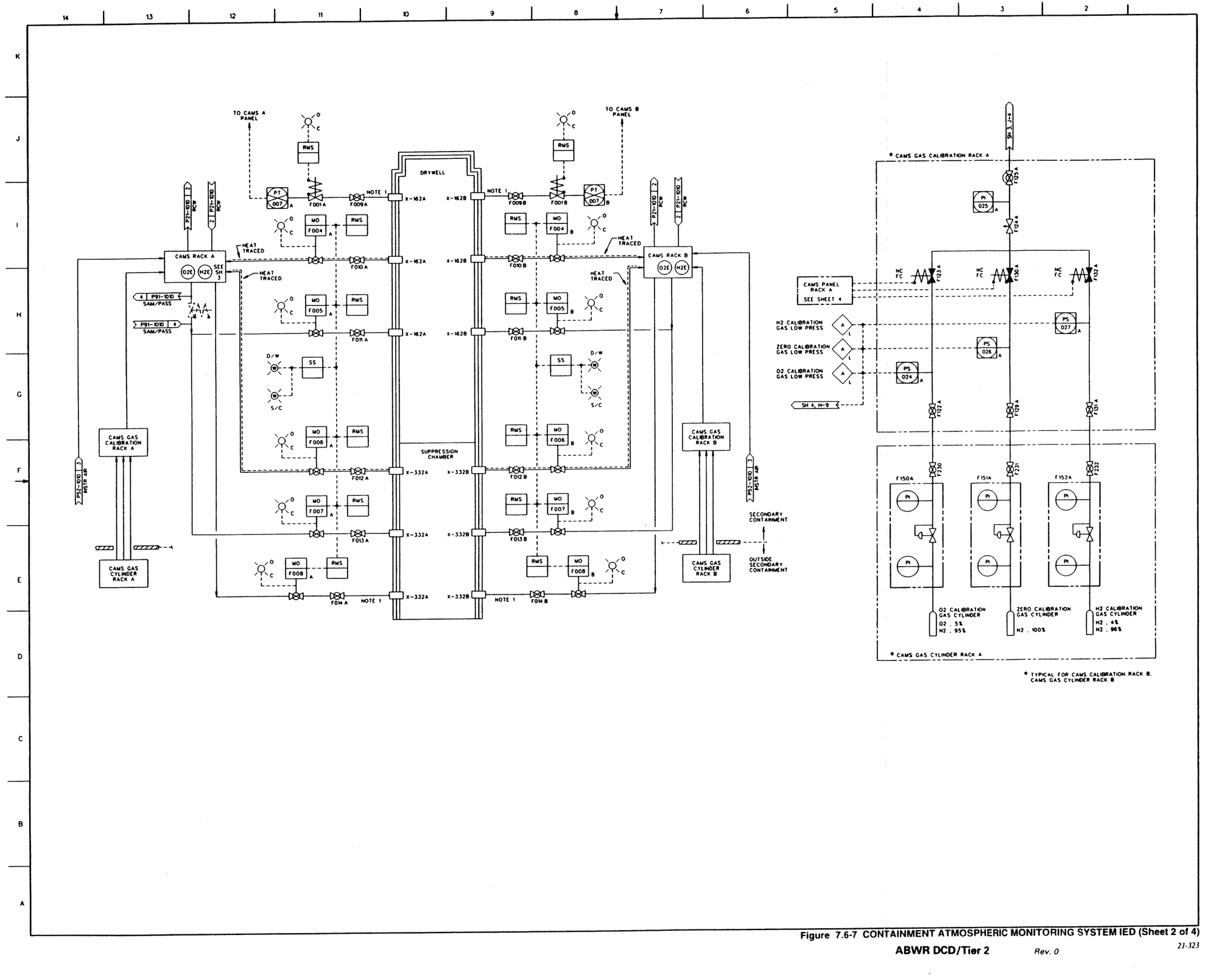
	MPL NO
1 PIPING AND INSTRUMENT DIAGRAM SYMBOLS	A10-3030
2 REACTOR BLDG COOLING WATER SYS P&ID	P21-1010
3 INSTRUMENT AIR SYS P&ID	P52-1010
4 POST ACCIDENT, SAMPLING SYS P&ID	P91-1010 (PART OF SAM)
5 RHR SYS IBD	E11-1030

LEGEND:

x PENETRATION NUMBER

MPL NO D23-1010

Figure 7.6-7 CONTAINMENT ATMOSPHERIC MONITORING SYSTEM IED (Sheet 1 of 4)



* TYPICAL FOR CAMS CALIBRATION RACK B, CAMS GAS CYLINDER RACK B

Figure 7.6-7 CONTAINMENT ATMOSPHERIC MONITORING SYSTEM IED (Sheet 2 of 4)

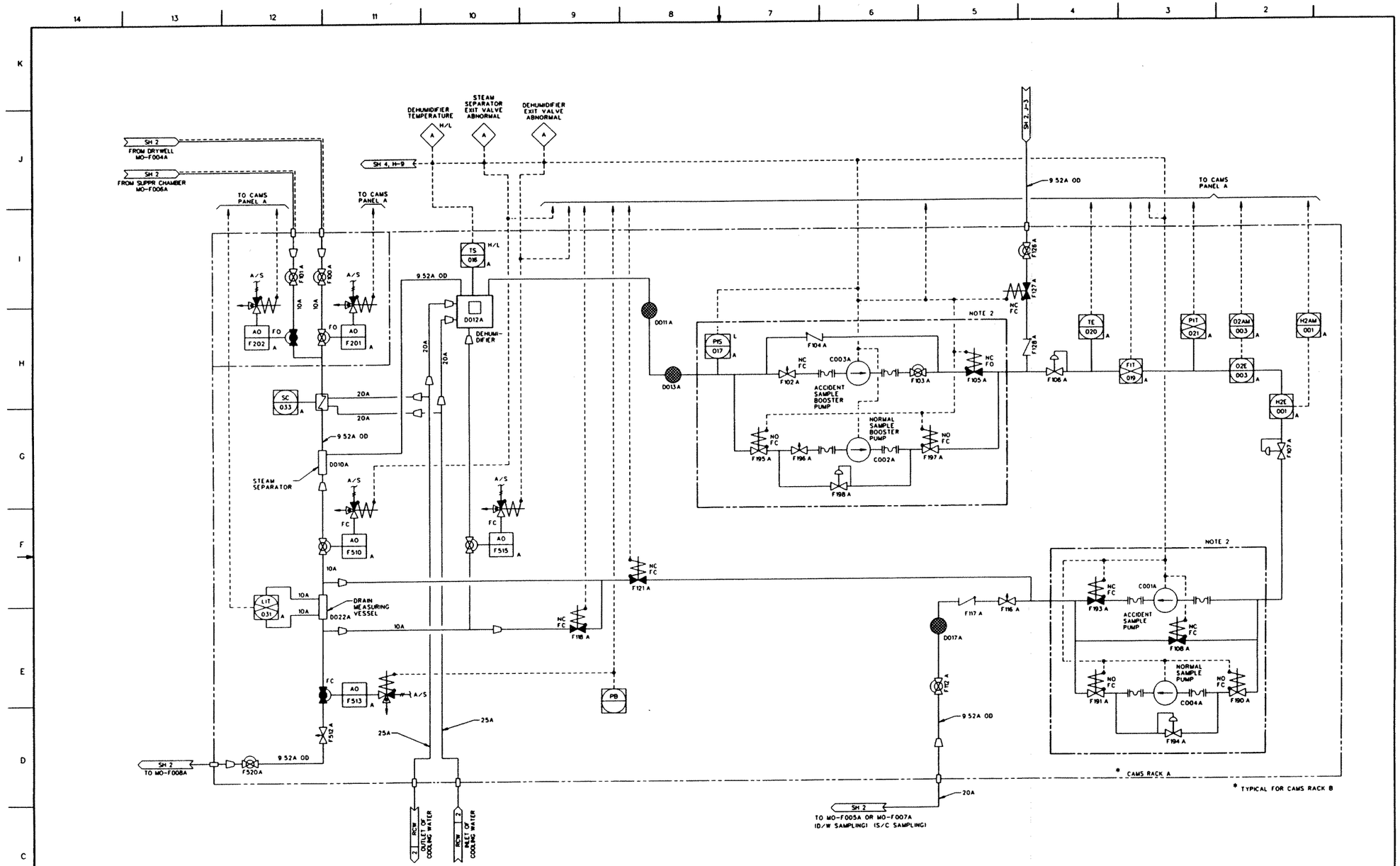


Figure 7.6-7 CONTAINMENT ATMOSPHERIC MONITORING SYSTEM IED (Sheet 3 of 4)

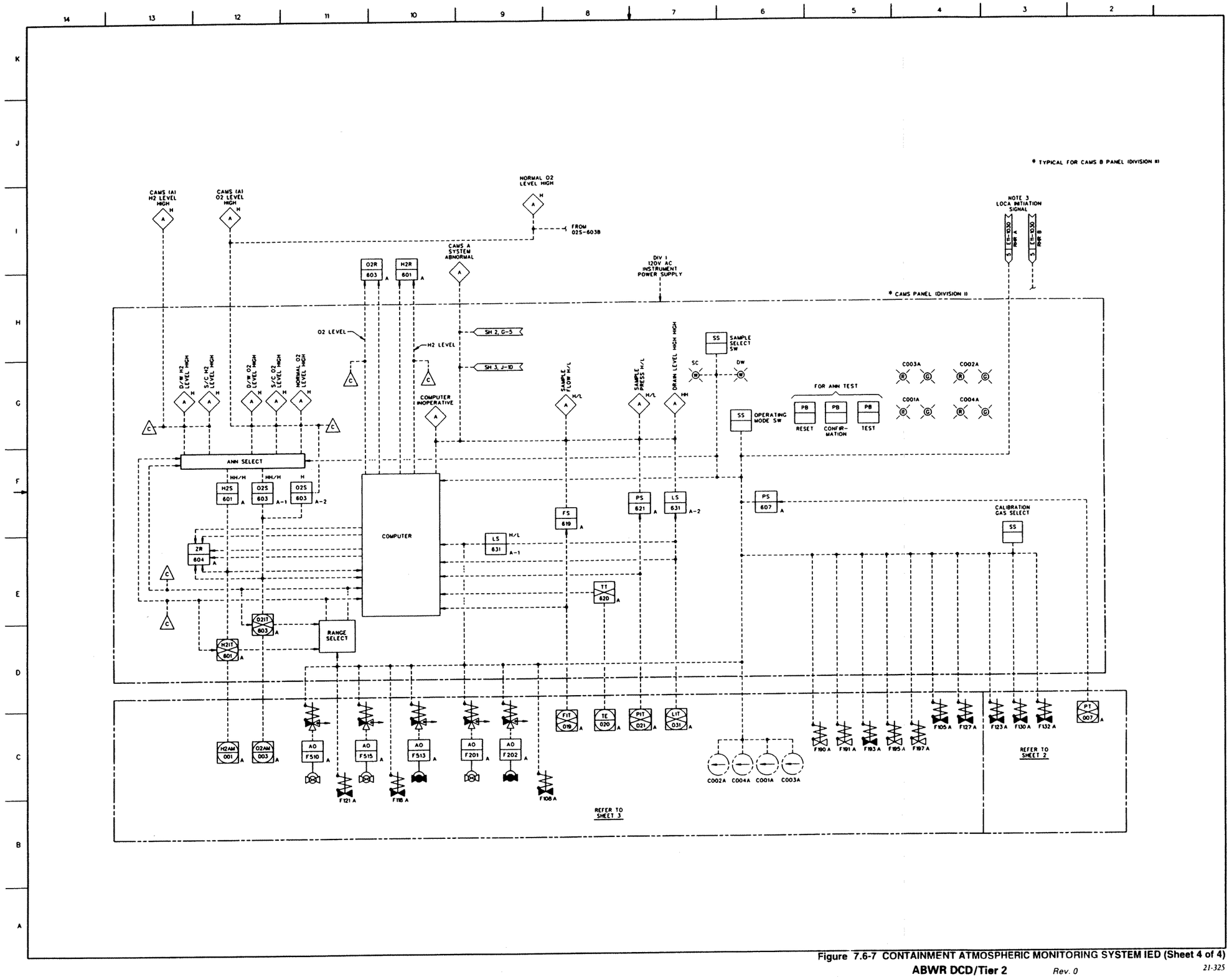


Figure 7.6-7 CONTAINMENT ATMOSPHERIC MONITORING SYSTEM IED (Sheet 4 of 4)

TABLE OF CONTENTS

NOTES:

1. THE SAMPLING PUMPS ARE IDENTICAL AND CAN BE USED DURING NORMAL OR ACCIDENT OPERATION.

REFERENCE DOCUMENTS

	MPL NO
1. CONTAINMENT ATMOSPHERIC MONITORING SYS IED	D23-1010
2. RESIDUAL HEAT REMOVAL SYS IBD	E11-1030

MPL NO. D23-1030

FIGURE 7.6-8 CONTAINMENT ATMOSPHERIC MONITORING SYSTEM IBD (Sheet 1 of 10)

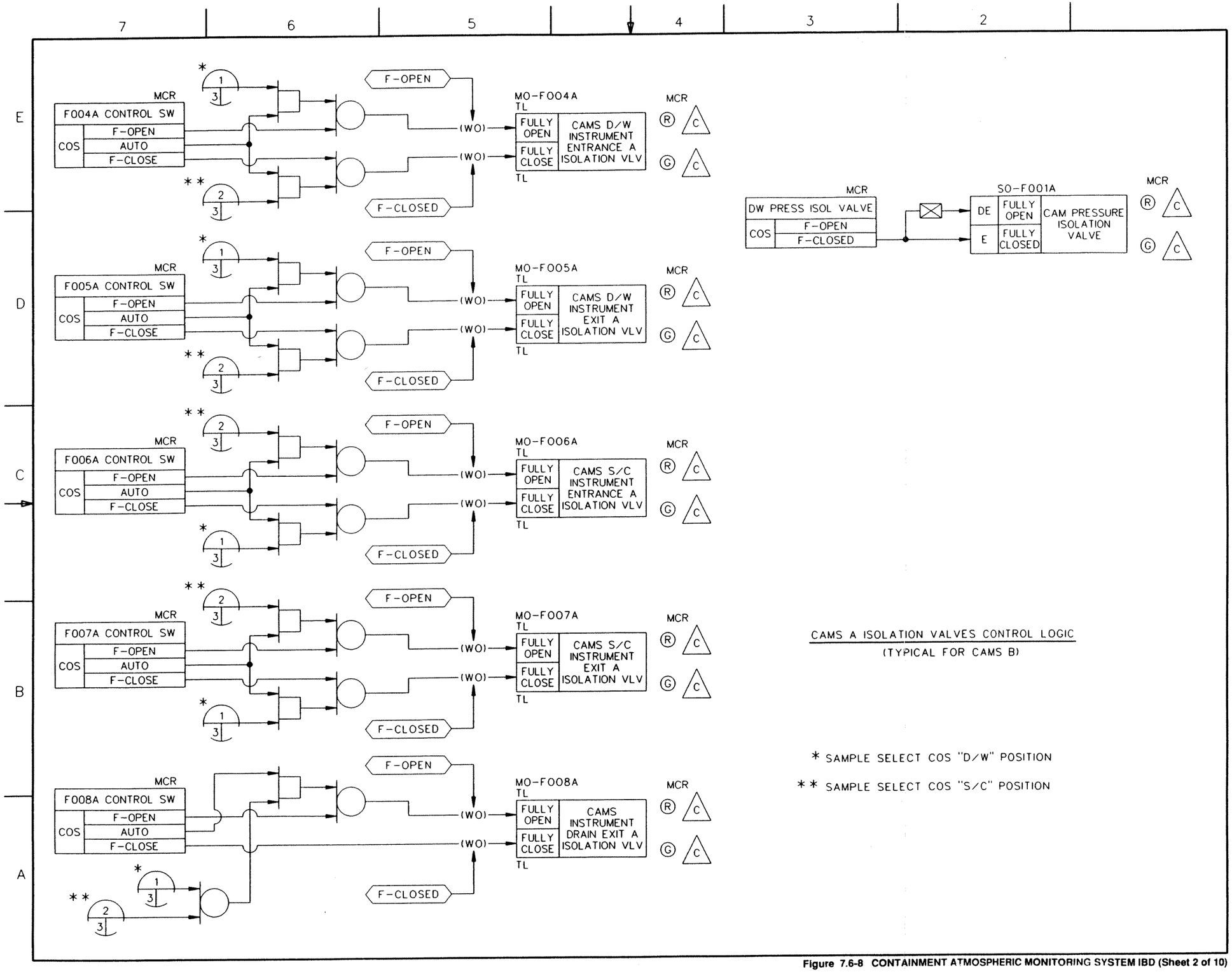


Figure 7.6-8 CONTAINMENT ATMOSPHERIC MONITORING SYSTEM IBD (Sheet 2 of 10)

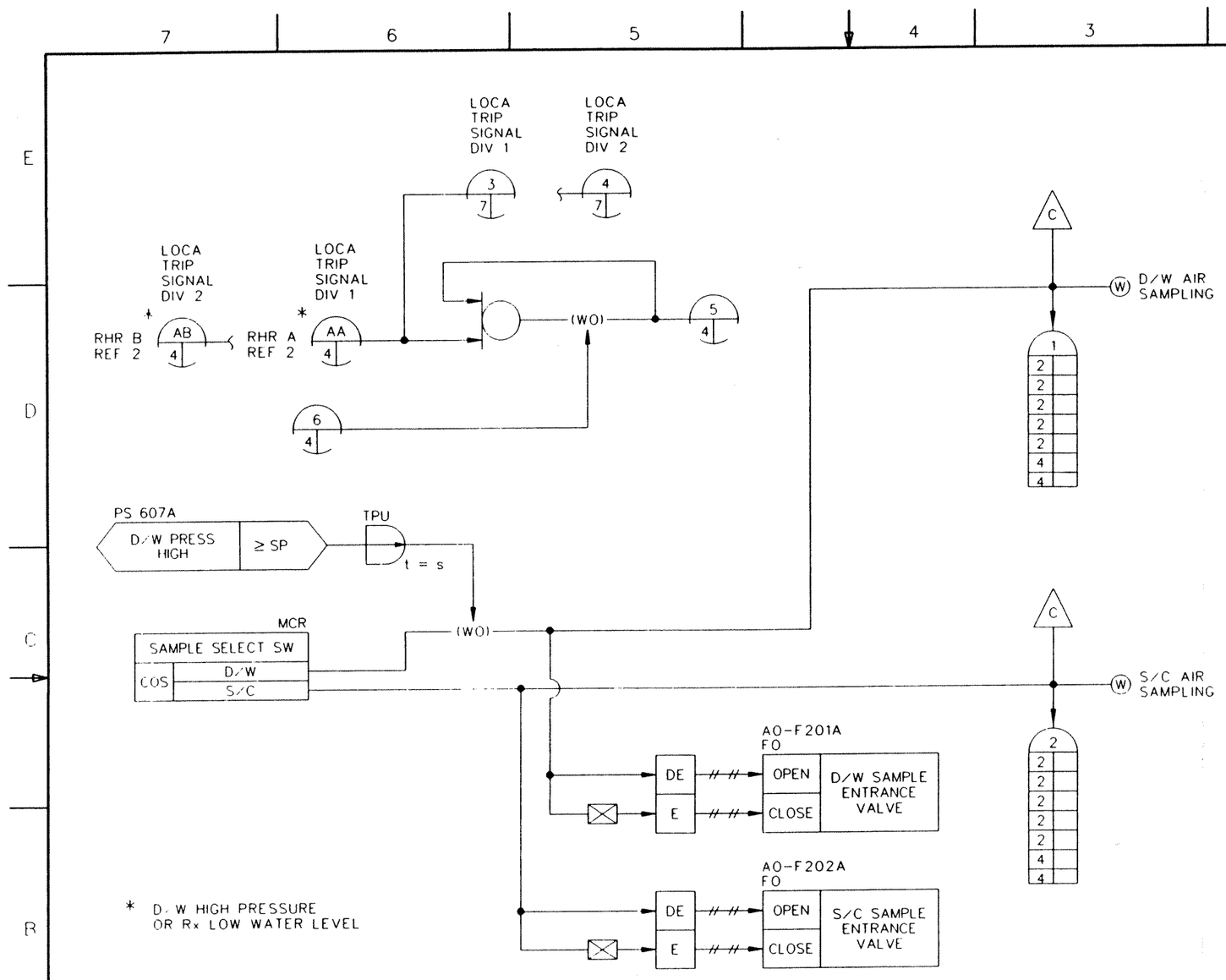


FIGURE 7.6-8 CONTAINMENT ATMOSPHERIC MONITORING SYSTEM IBD (Sheet 3 of 10)

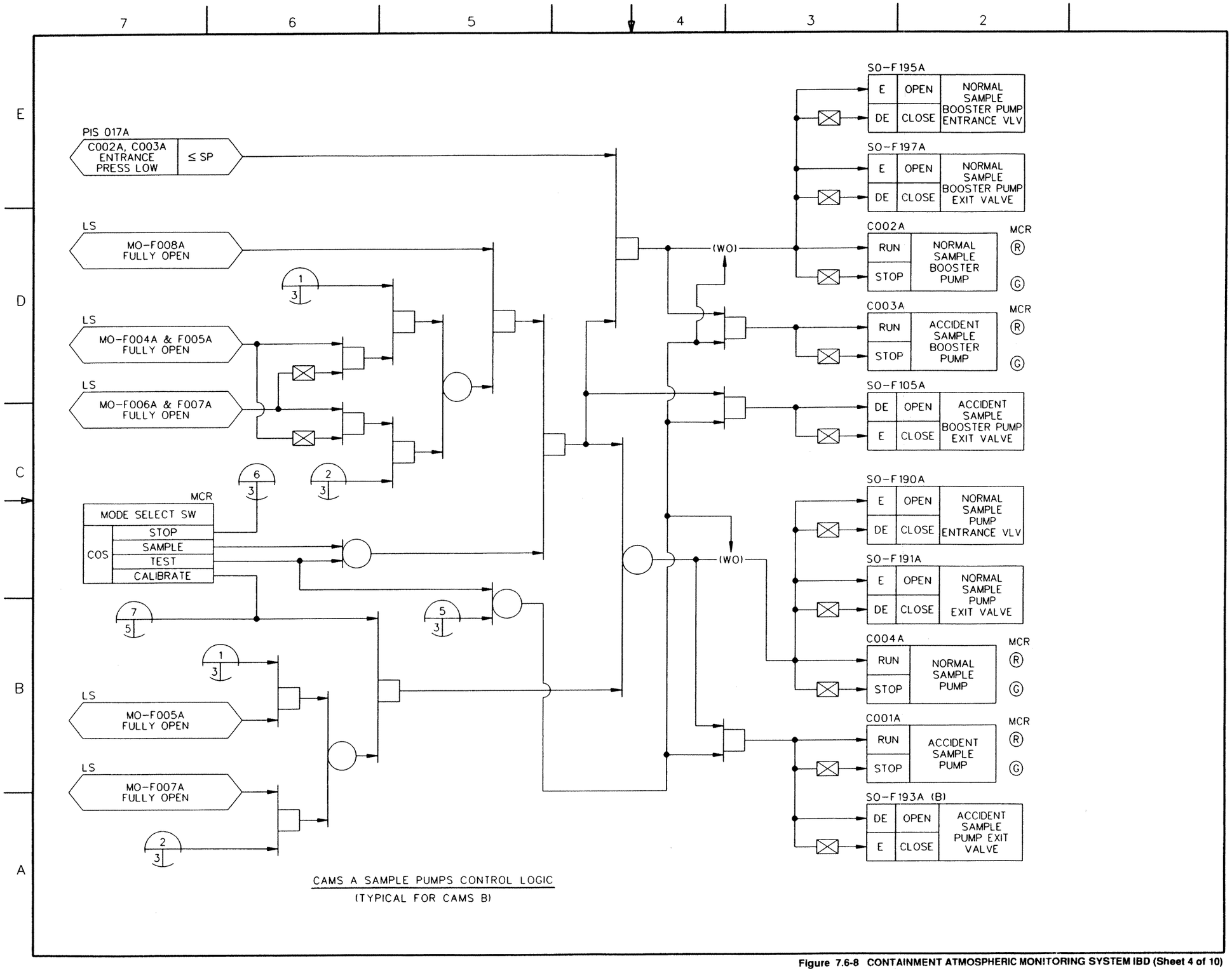


Figure 7.6-8 CONTAINMENT ATMOSPHERIC MONITORING SYSTEM IBD (Sheet 4 of 10)

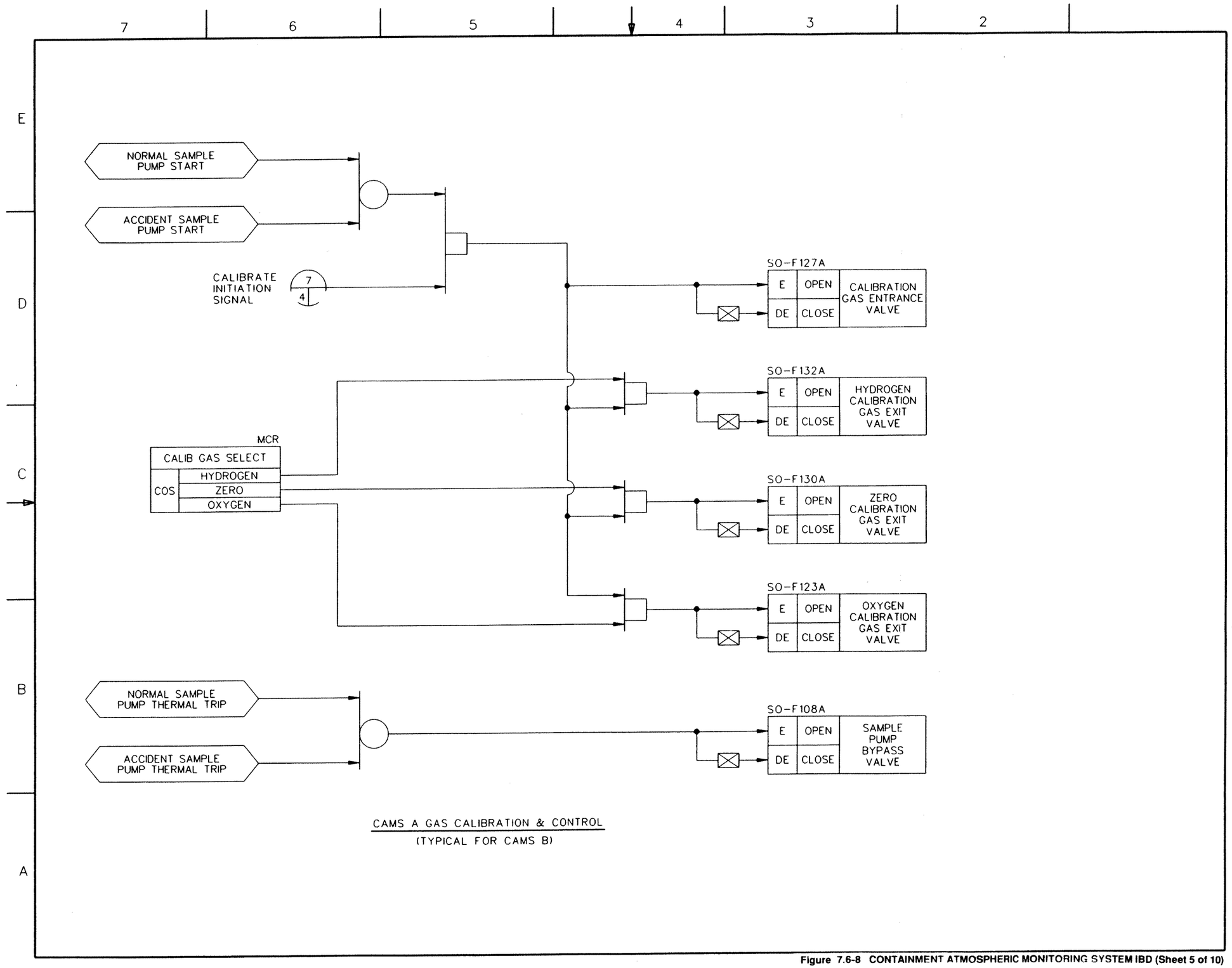


Figure 7.6-8 CONTAINMENT ATMOSPHERIC MONITORING SYSTEM IBD (Sheet 5 of 10)

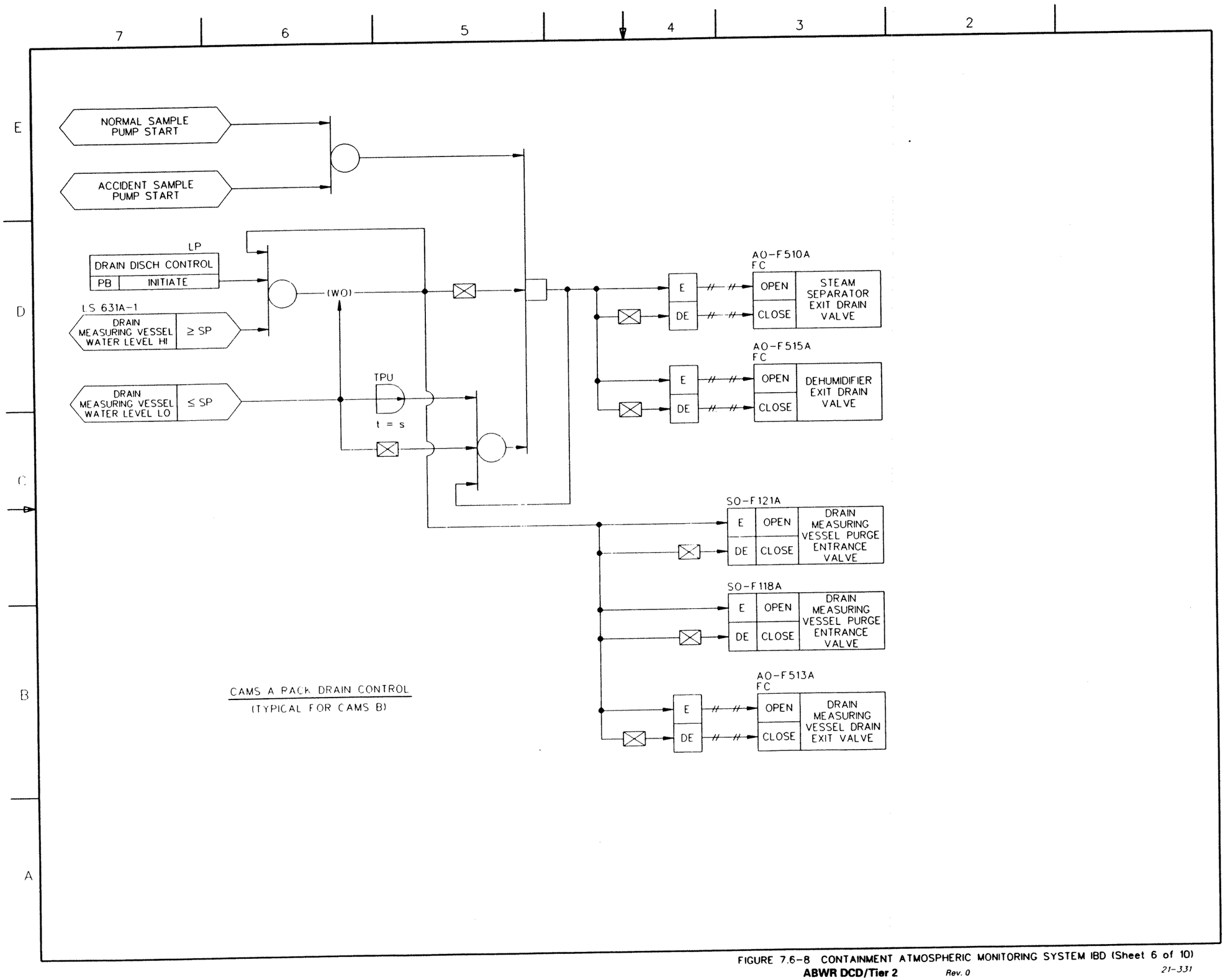


FIGURE 7.6-8 CONTAINMENT ATMOSPHERIC MONITORING SYSTEM IBD (Sheet 6 of 10)

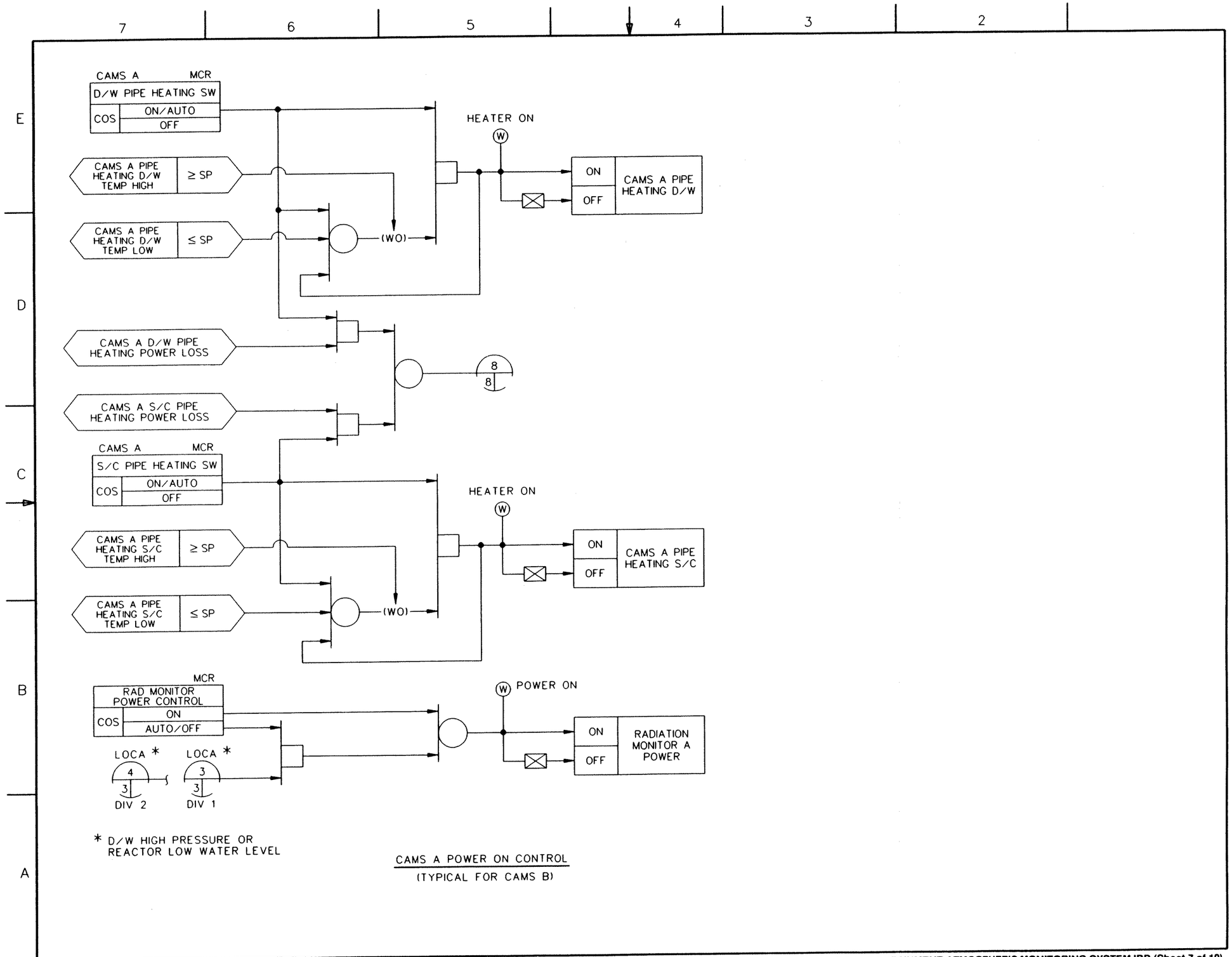
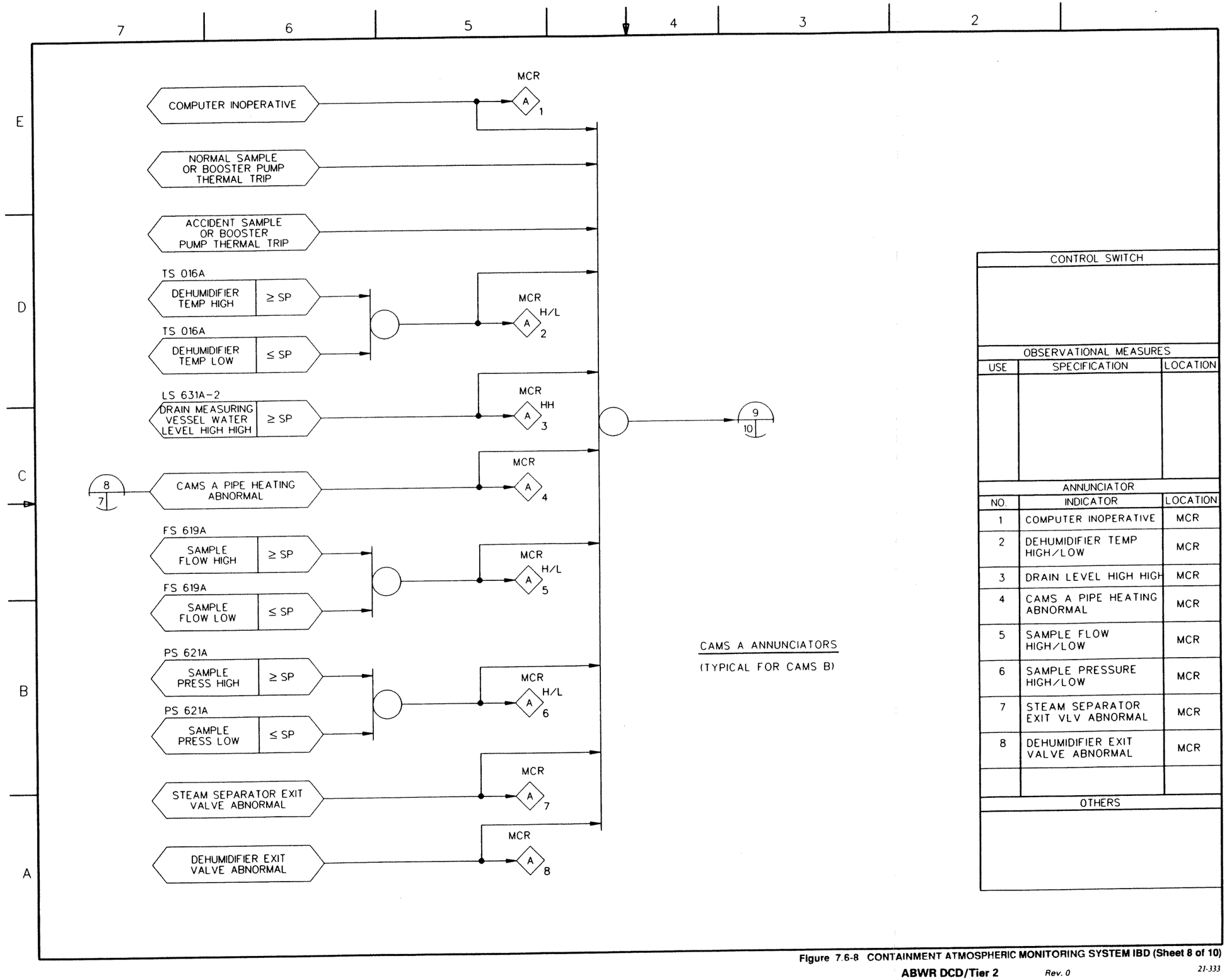


Figure 7.6-8 CONTAINMENT ATMOSPHERIC MONITORING SYSTEM IBD (Sheet 7 of 10)

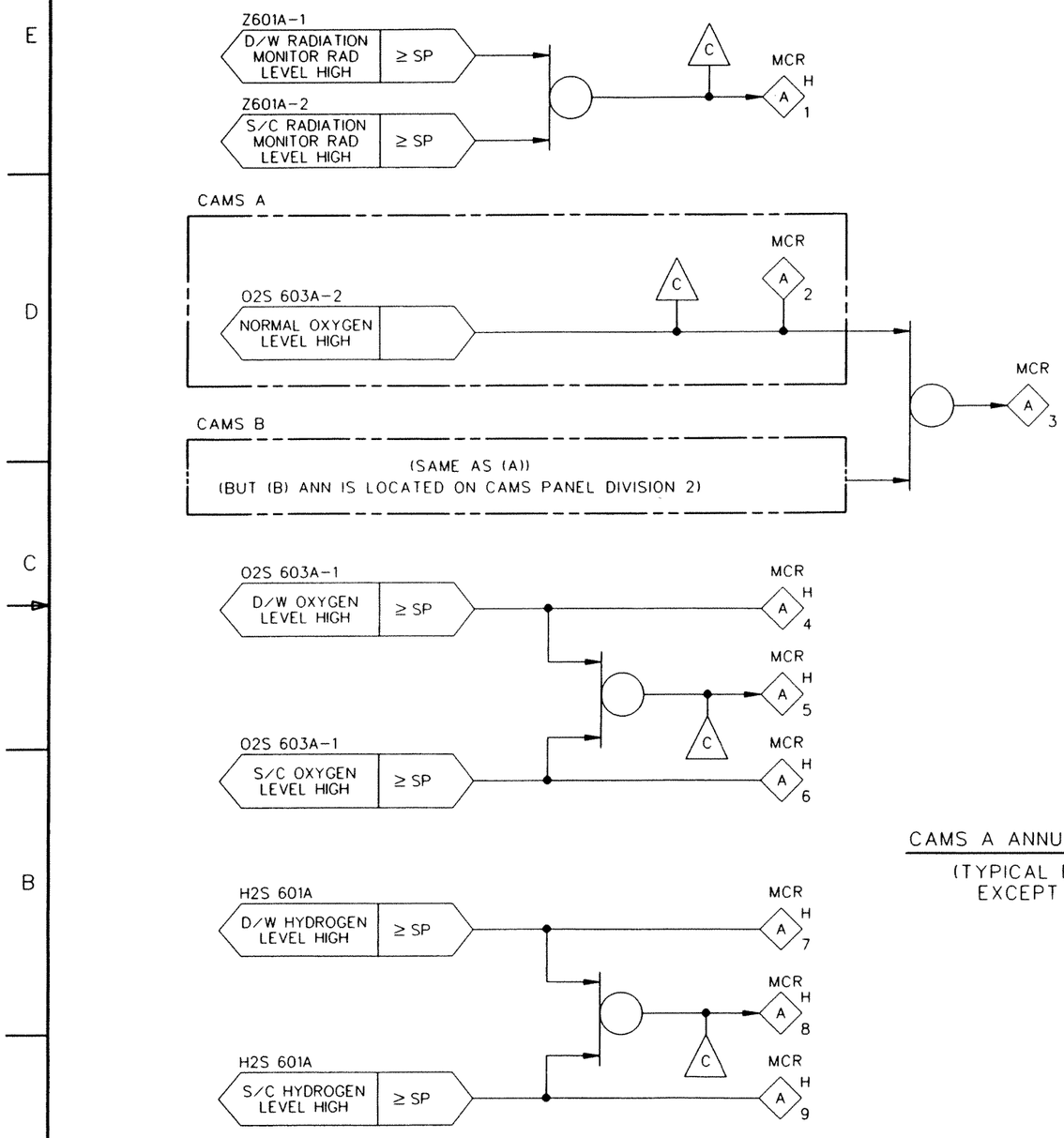


CAMS A ANNUNCIATORS

(TYPICAL FOR CAMS B)

CONTROL SWITCH		
OBSERVATIONAL MEASURES		
USE	SPECIFICATION	LOCATION
ANNUNCIATOR		
NO.	INDICATOR	LOCATION
1	COMPUTER INOPERATIVE	MCR
2	DEHUMIDIFIER TEMP HIGH/LOW	MCR
3	DRAIN LEVEL HIGH HIGH	MCR
4	CAMS A PIPE HEATING ABNORMAL	MCR
5	SAMPLE FLOW HIGH/LOW	MCR
6	SAMPLE PRESSURE HIGH/LOW	MCR
7	STEAM SEPARATOR EXIT VLV ABNORMAL	MCR
8	DEHUMIDIFIER EXIT VALVE ABNORMAL	MCR
OTHERS		

Figure 7.6-8 CONTAINMENT ATMOSPHERIC MONITORING SYSTEM IBD (Sheet 8 of 10)



CAMS A ANNUNCIATORS (CONT'D)

(TYPICAL FOR CAMS B)
EXCEPT AS NOTED

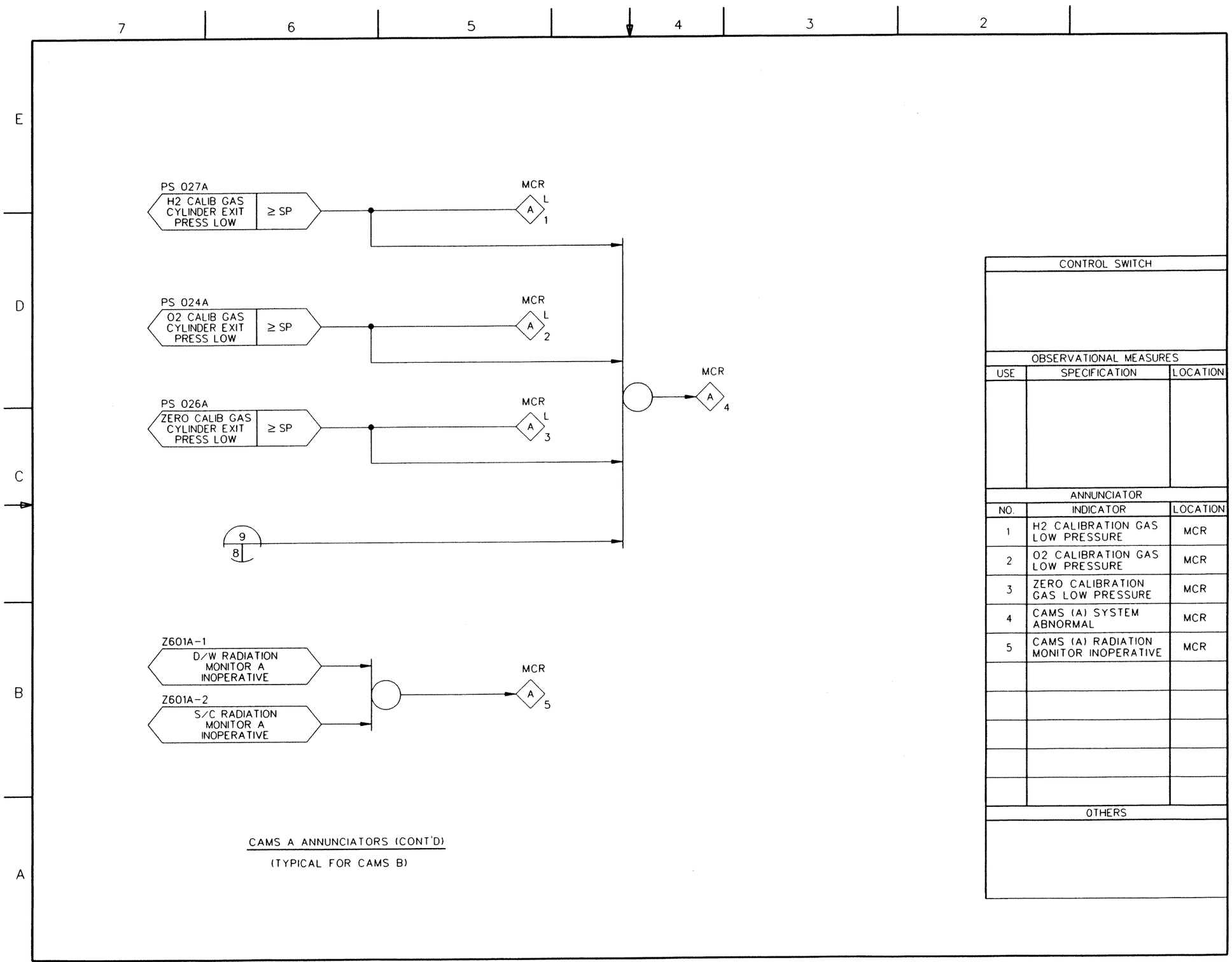
CONTROL SWITCH		

OBSERVATIONAL MEASURES		
USE	SPECIFICATION	LOCATION

ANNUNCIATOR		
NO.	INDICATOR	LOCATION
1	CAMS (A) RADIATION LEVEL HIGH	MCR
2	NORMAL O2 LEVEL HIGH – CAMS A	MCR
3	NORMAL O2 LEVEL HIGH	MCR
4	D/W O2 LEVEL HIGH – CAMS A	MCR
5	CAMS (A) O2 LEVEL HIGH	MCR
6	S/C O2 LEVEL HIGH – CAMS A	MCR
7	D/W H2 LEVEL HIGH – CAMS A	MCR
8	CAMS (A) H2 LEVEL HIGH	MCR
9	S/C H2 LEVEL HIGH – CAMS A	MCR

OTHERS

Figure 7.6-8 CONTAINMENT ATMOSPHERIC MONITORING SYSTEM IBD (Sheet 9 of 10)



CAMS A ANNUNCIATORS (CONT'D)

(TYPICAL FOR CAMS B)

Figure 7.6-8 CONTAINMENT ATMOSPHERIC MONITORING SYSTEM IBD (Sheet 10 of 10)

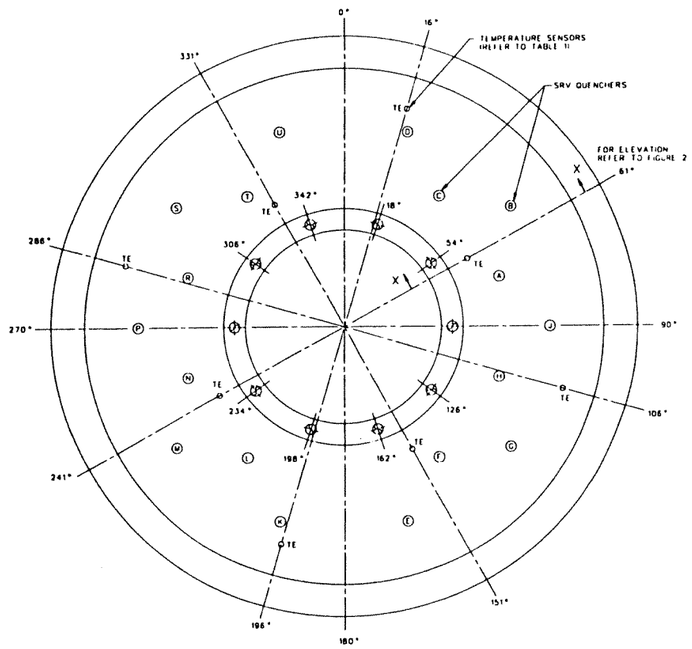
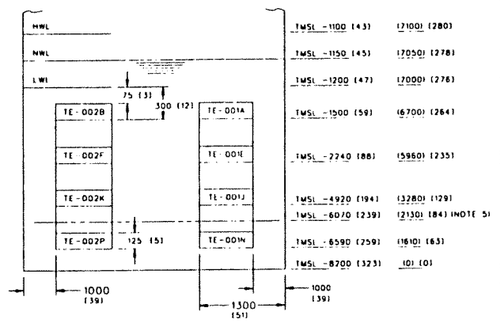


FIGURE 1 INSTRUMENTATION LOCATION DEFINITION



VIEW X-X FROM FIGURE 1
NOTES 2,6,7

FIGURE 2 SENSOR AND ENVELOPE DEFINITION

TABLE 1 SENSOR DIVISION ASSIGNMENT

	DIVISION I	DIVISION II	DIVISION III	DIVISION IV
16°	TE-001A,E,J,N		TE-001C,G,L,R	
61°		TE-002B,F,K,P		TE-002D,H,M,S
106°		TE-003B,F,K,P		TE-003D,H,M,S
151°	TE-004A,E,J,N		TE-004C,G,L,R	
196°	TE-005A,E,J,N		TE-005C,G,L,R	
241°		TE-006B,F,K,P		TE-006D,H,M,S
286°		TE-007B,F,K,P		TE-007D,H,M,S
331°	TE-008A,E,J,N		TE-008C,G,L,R	

NOTES

1 DIVISION I AND DIVISION III AND DIVISION II AND DIVISION IV TEMPERATURE SENSORS AT EACH LOCATION SHALL BE SEPARATED BY 150 100 MM (6-12 INCHES)

2 TYPICAL OF DIVISION I AND DIVISION II SENSORS AT AZIMUTHAL LOCATIONS 16° AND 61°. DIVISION III AND DIVISION IV SENSORS ARE NOT SHOWN

3 BULK AVERAGE TEMPERATURE ALARM

4 SIGNALS FROM TE WHICH ARE LOCATED AT THE SAME LEVEL SHALL BE OMITTED FROM AVERAGE TEMPERATURE CALCULATION, WHEN S/P WATER LEVEL DECREASE BELOW SENSOR LEVEL

5 MIDDLE QUENCHER LEVEL

6 TMSL = TYPICAL MEAN SEA LEVEL

7 NUMBER ARE IN MILIMETER EXCEPT () WHICH ARE IN INCHES

SUPPLEMENTAL DOCUMENTS UNDER THE FOLLOWING IDENTITIES SHALL BE USED IN CONJUNCTION WITH THIS DRAWING

		REFERENCE DESIGNATOR
1	ATMOSPHERIC CONTROL SYSTEM P&ID	T31-1010
2	REMOTE SHUTDOWN SYSTEM IED	C61-1010
3	RESIDUAL HEAT REMOVAL SYS P&ID	E11-1010
4	PIPING AND INSTRUMENT SYMBOLS DIAGRAM	A10-3030
5	REACTOR PROTECTION SYSTEM IED	C71-1010
6	REACTOR BUILDING COOLING WATER SYS P&ID	P21-1010

MPL NO 153 1010

FIGURE 7.6-11 SUPPRESSION POOL TEMPERATURE MONITORING SYSTEM SHEET 1 OF 5

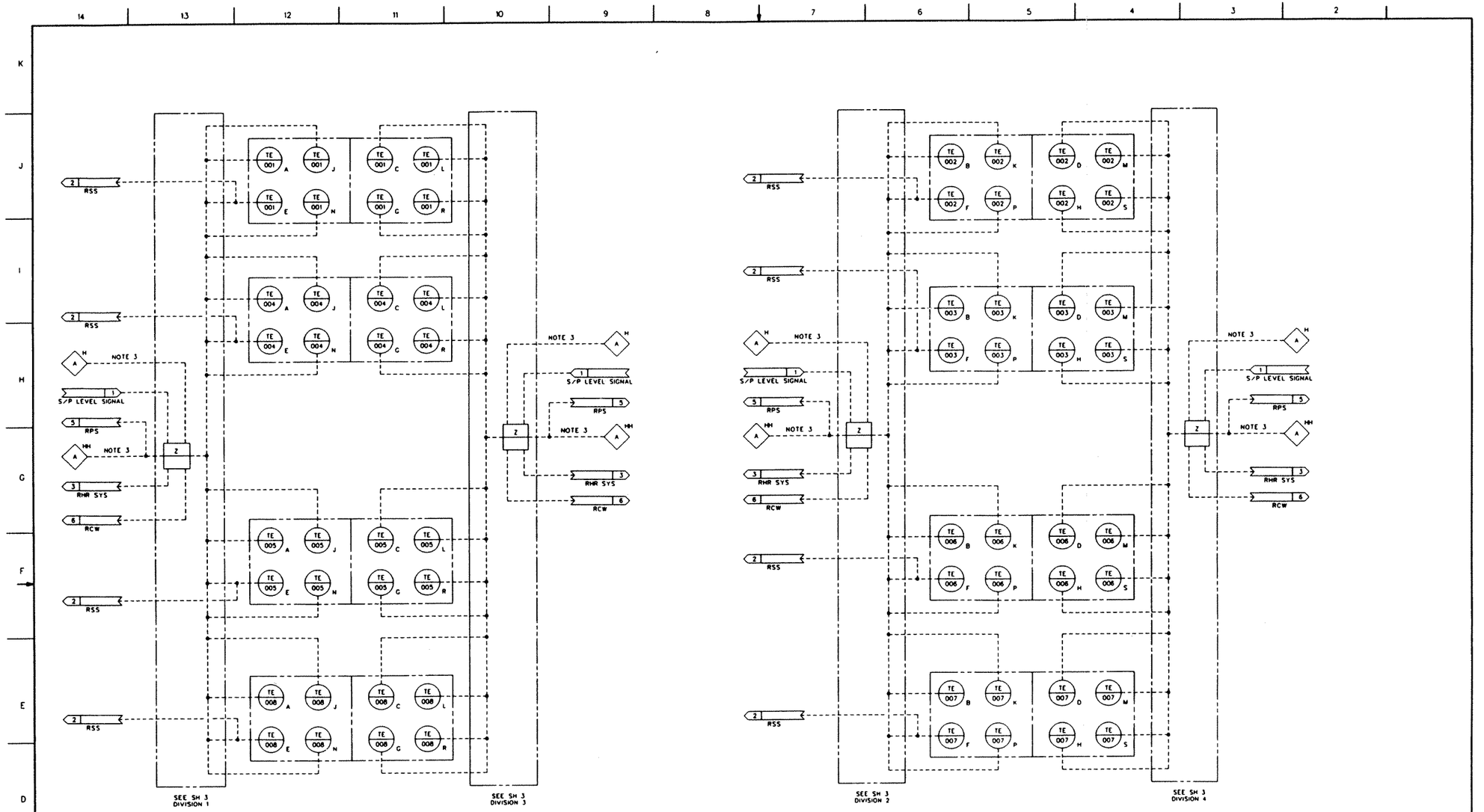
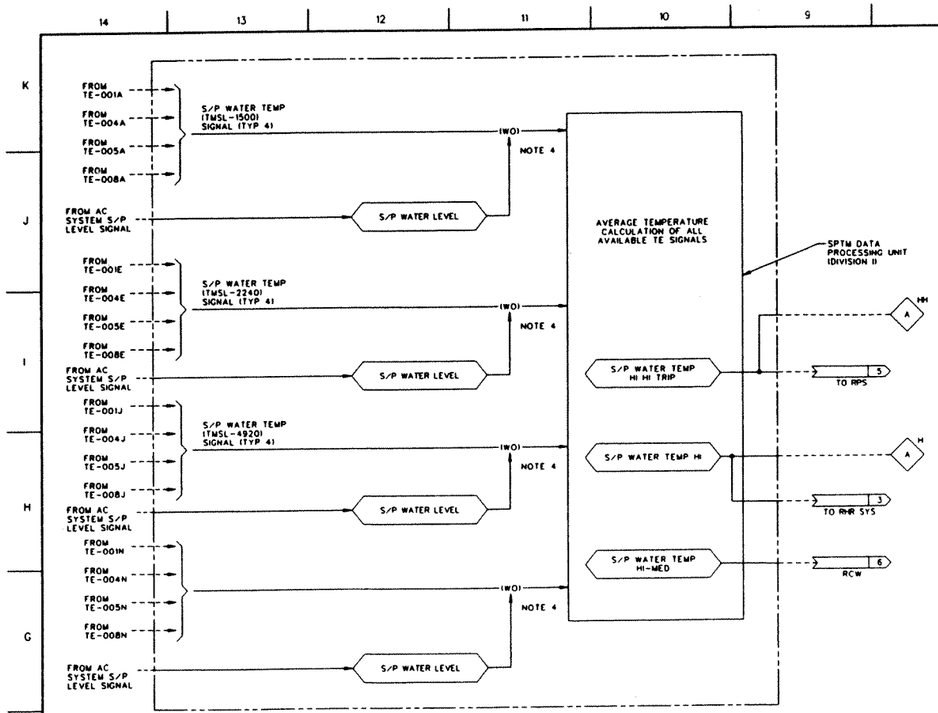
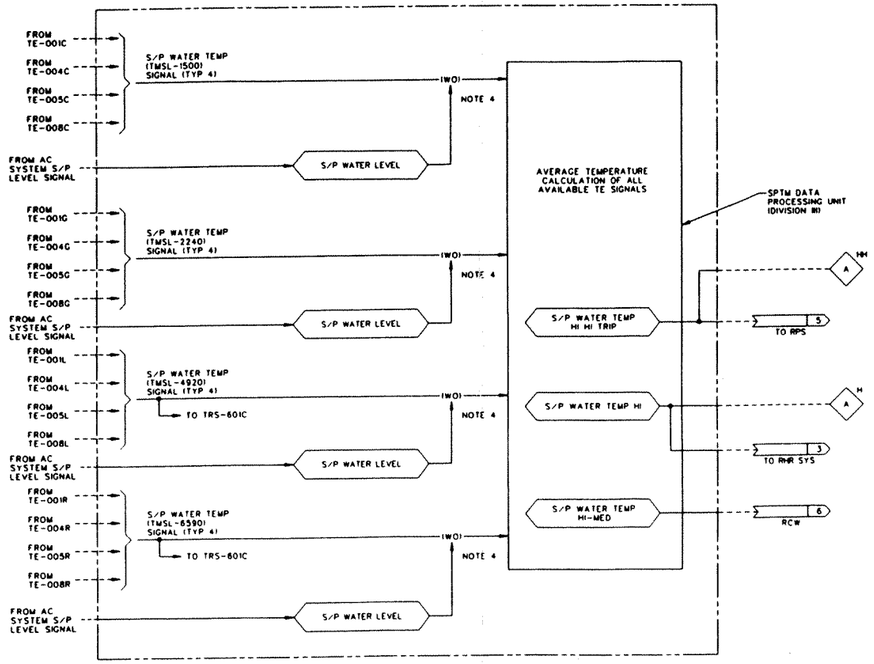


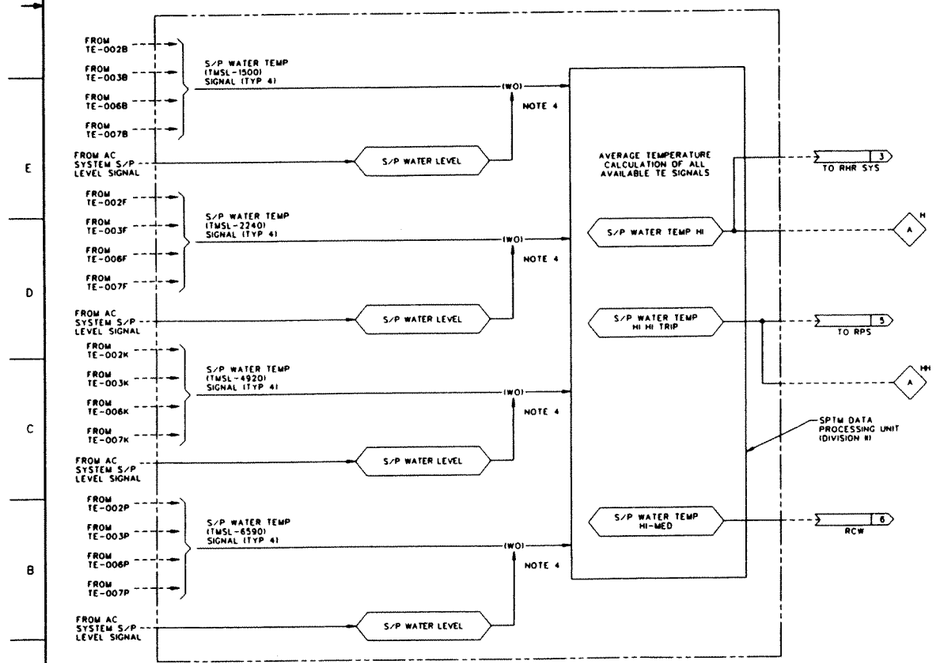
Figure 7.6-11 SUPPRESSION POOL TEMPERATURE MONITORING SYSTEM IED (Sheet 2 of 3)



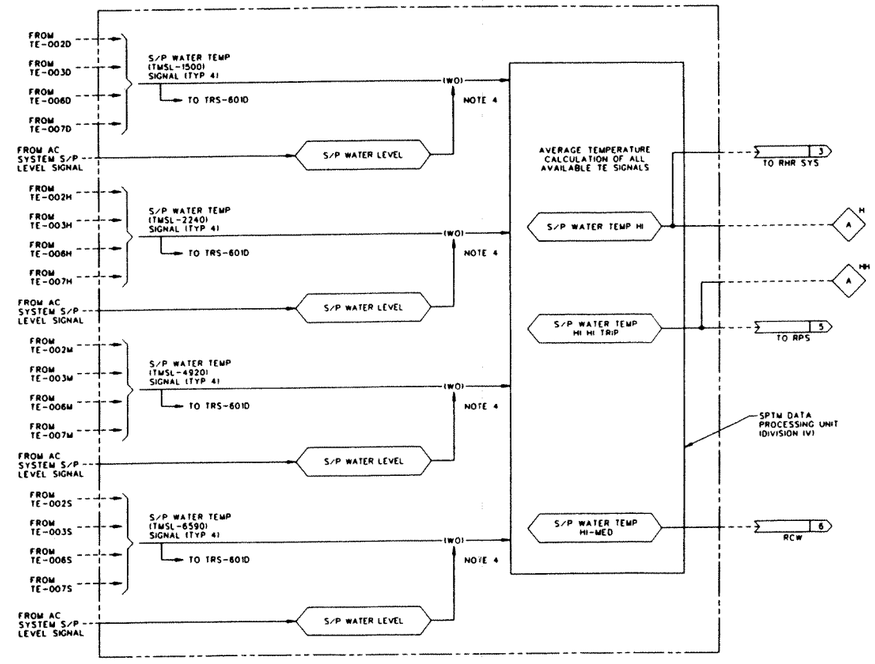
TE SIGNAL PROCESSING IN SPTM (DIVISION II)



TE SIGNAL PROCESSING IN SPTM (DIVISION III)



TE SIGNAL PROCESSING IN SPTM (DIVISION III)



TE SIGNAL PROCESSING IN SPTM (DIVISION IV)

Figure 7.6-11 SUPPRESSION POOL TEMPERATURE MONITORING SYSTEM IED (Sheet 3 of 3)

TABLE 1: ANNUNCIATORS

NUMBER	INDICATION	FUNCTION	SOURCE OF THE SIGNAL	LOCATION
1	ALARM	SUPPRESSION POOL WATER (A) TEMP HIGH	LOGIC OUTPUT	
2	ALARM	SUPPRESSION POOL WATER (B) TEMP HIGH	LOGIC OUTPUT	
3	ALARM	SUPPRESSION POOL WATER (C) TEMP HIGH	LOGIC OUTPUT	
4	ALARM	SUPPRESSION POOL WATER (D) TEMP HIGH	LOGIC OUTPUT	
5	ALARM	SUPPRESSION POOL WATER (A) TEMP HI-HI	LOGIC OUTPUT	
6	ALARM	SUPPRESSION POOL WATER (B) TEMP HI-HI	LOGIC OUTPUT	
7	ALARM	SUPPRESSION POOL WATER (C) TEMP HI-HI	LOGIC OUTPUT	
8	ALARM	SUPPRESSION POOL WATER (D) TEMP HI-HI	LOGIC OUTPUT	

NOTES:

1. SUPPRESSION POOL TEMPERATURE SIGNALS ARE PROCESSED BY POOL WATER LEVEL SIGNALS. SEE REFERENCE DOC 1.
2. SETPOINTS ARE REFERENCE VALUES.
3. SUM TO DETERMINE NUMBER OF INPUTS (1-4).
4. SUM OF UP TO 4 TEMPERATURES.
5. AVERAGE OF 12 TO 16 TEMPERATURE INPUTS.

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

	REFERENCE DESIGNATOR
1. SUPPRESSION POOL TEMP MONITORING SYS IED	T53-1010
2. INTERLOCK BLOCK DIAGRAM STANDARD	A10-3070
3. RESIDUAL HEAT REMOVAL SYSTEM IBD	E11-1030
4. REACTOR COOLING WATER/ REACTOR SERVICE WATER SYSTEM IBD	P21/P41-1030
5. REACTOR PROTECTION SYSTEM IBD	C71-1030

ABREVIATIONS

STPT = SETPOINT
NR = NARROW RANGE
WR = WIDE RANGE

MPL NO. T53-1030

Figure 7.6-12 SUPPRESSION POOL TEMPERATURE MONITORING SYSTEM IBD (Sheet 1 of 6)

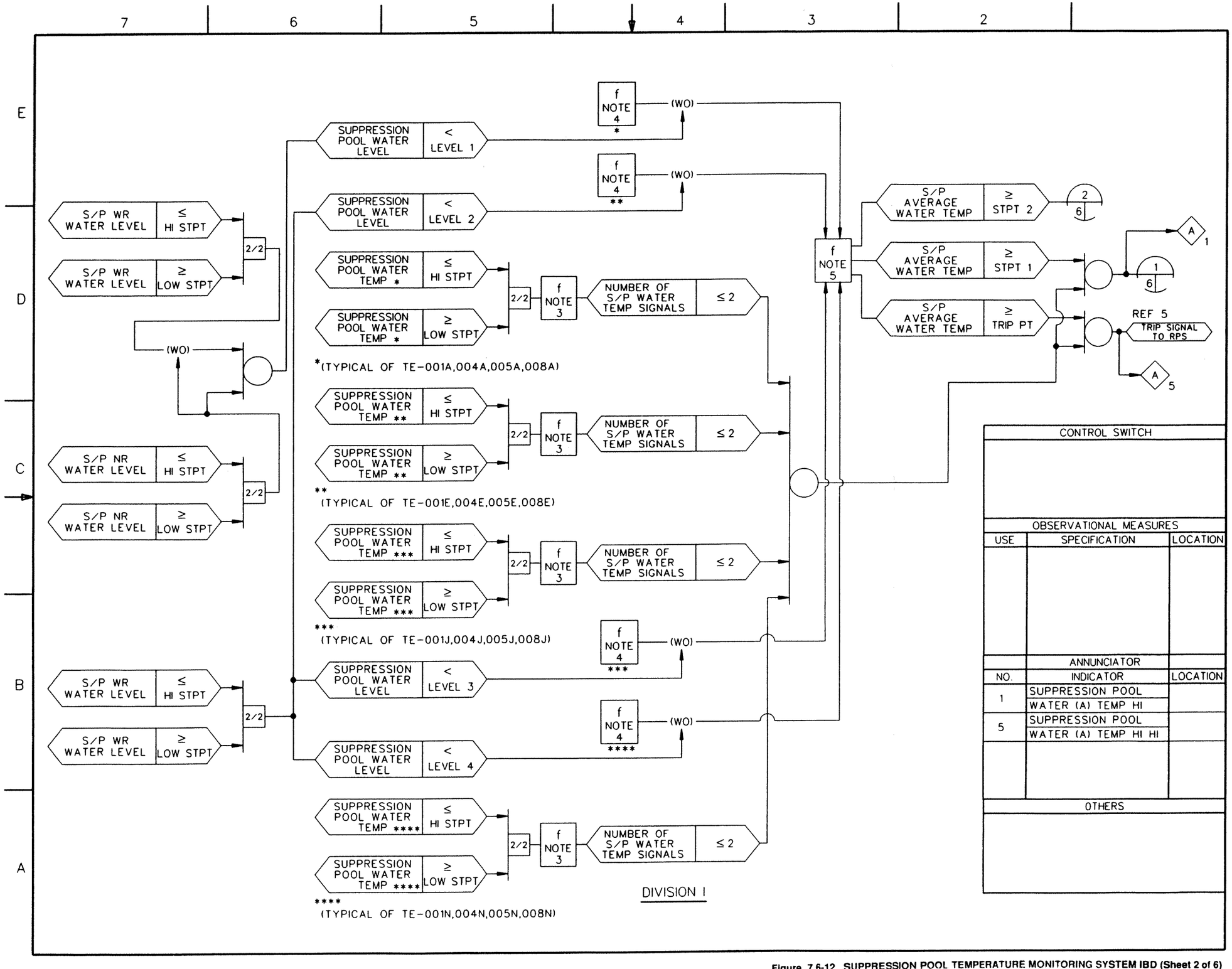


Figure 7.6-12 SUPPRESSION POOL TEMPERATURE MONITORING SYSTEM IBD (Sheet 2 of 6)

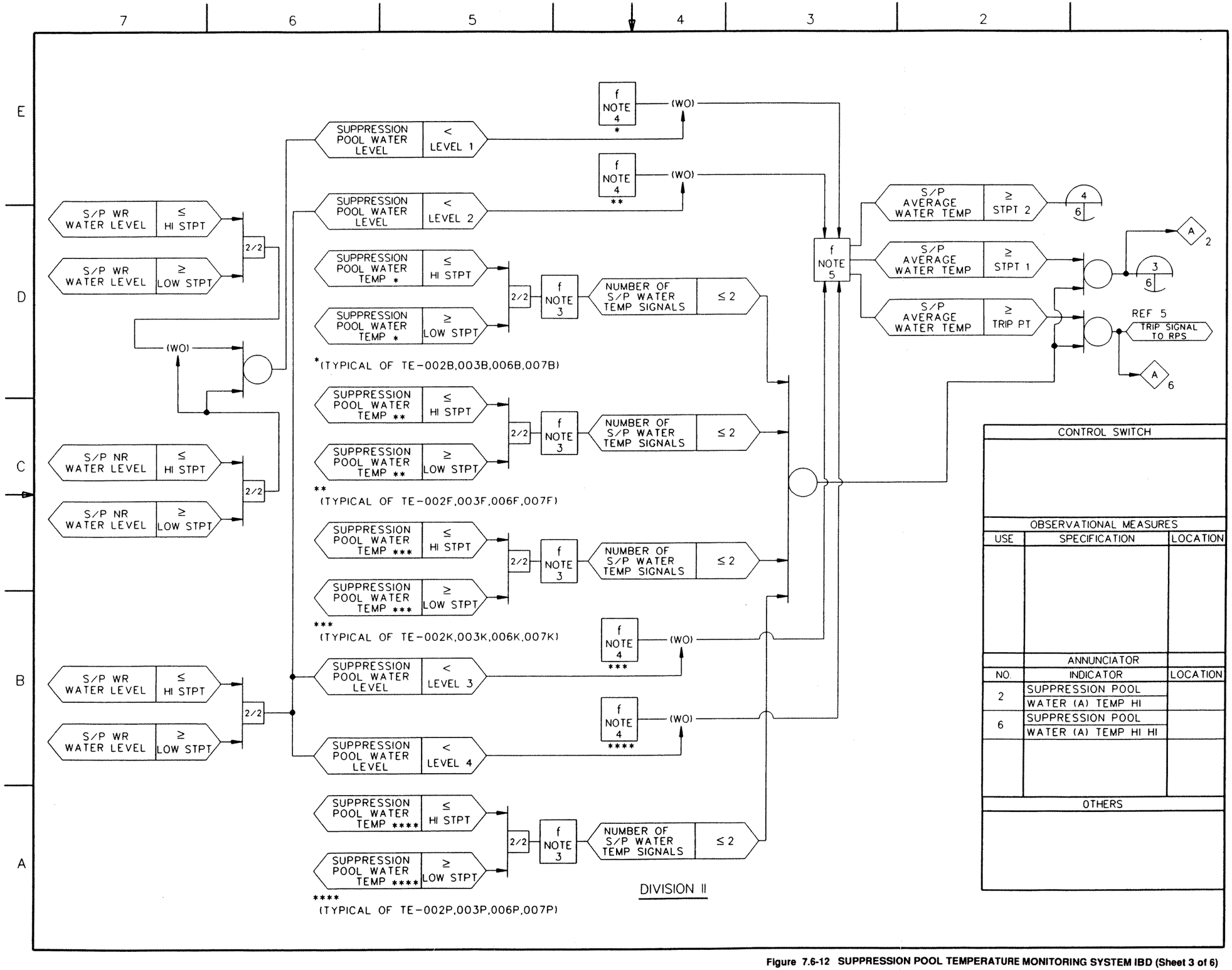


Figure 7.6-12 SUPPRESSION POOL TEMPERATURE MONITORING SYSTEM IBD (Sheet 3 of 6)

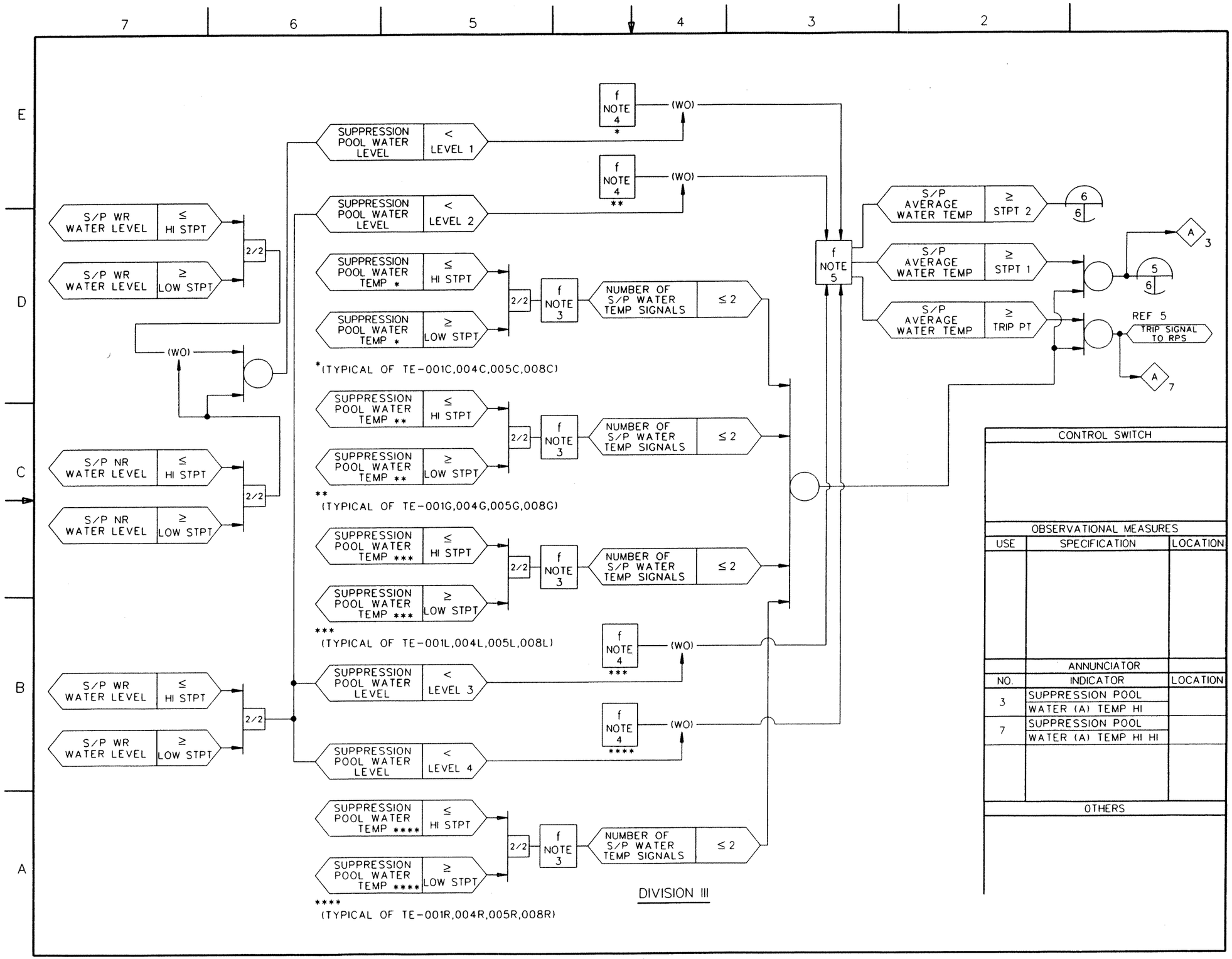


Figure 7.6-12 SUPPRESSION POOL TEMPERATURE MONITORING SYSTEM IBD (Sheet 4 of 6)

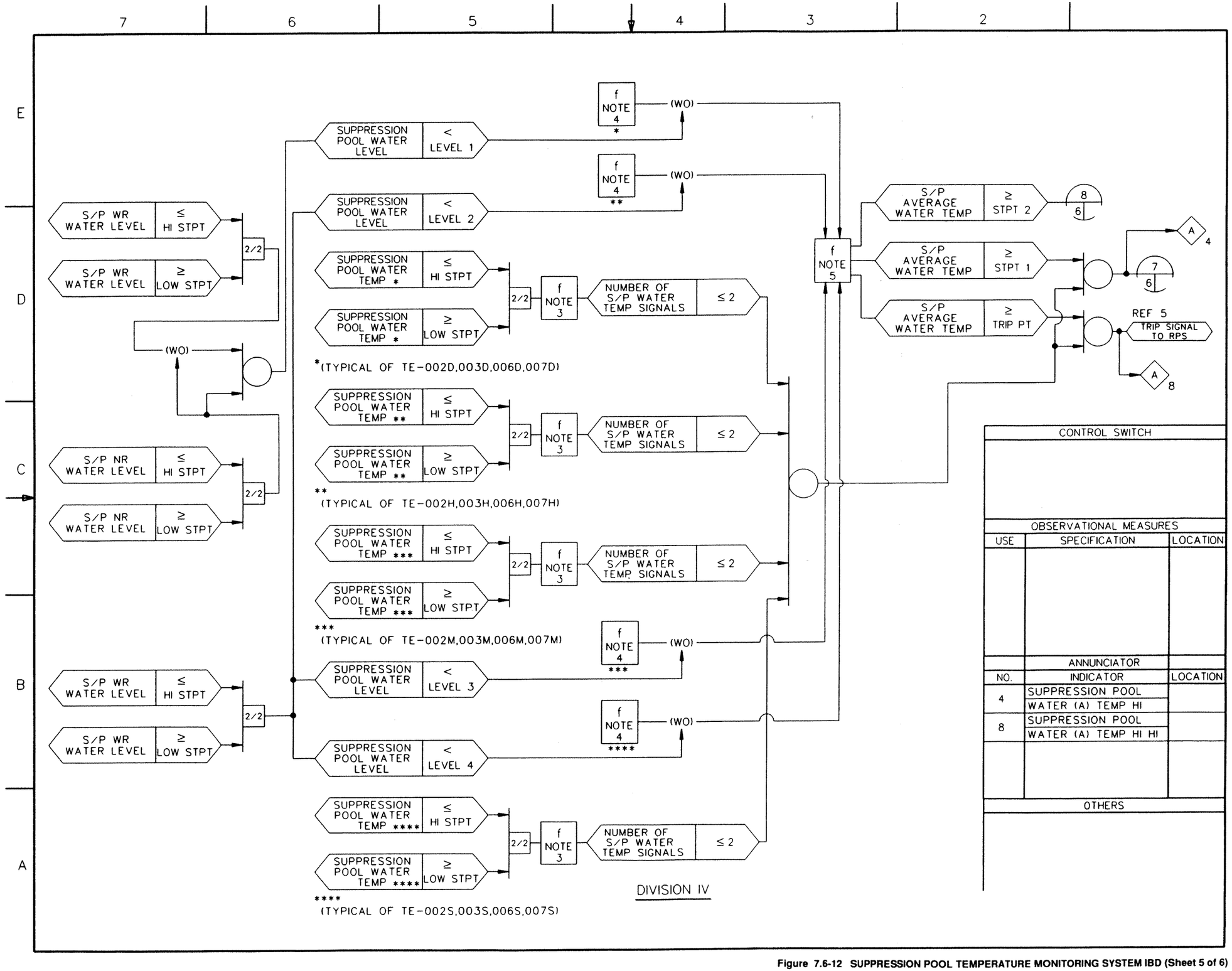


Figure 7.6-12 SUPPRESSION POOL TEMPERATURE MONITORING SYSTEM IBD (Sheet 5 of 6)

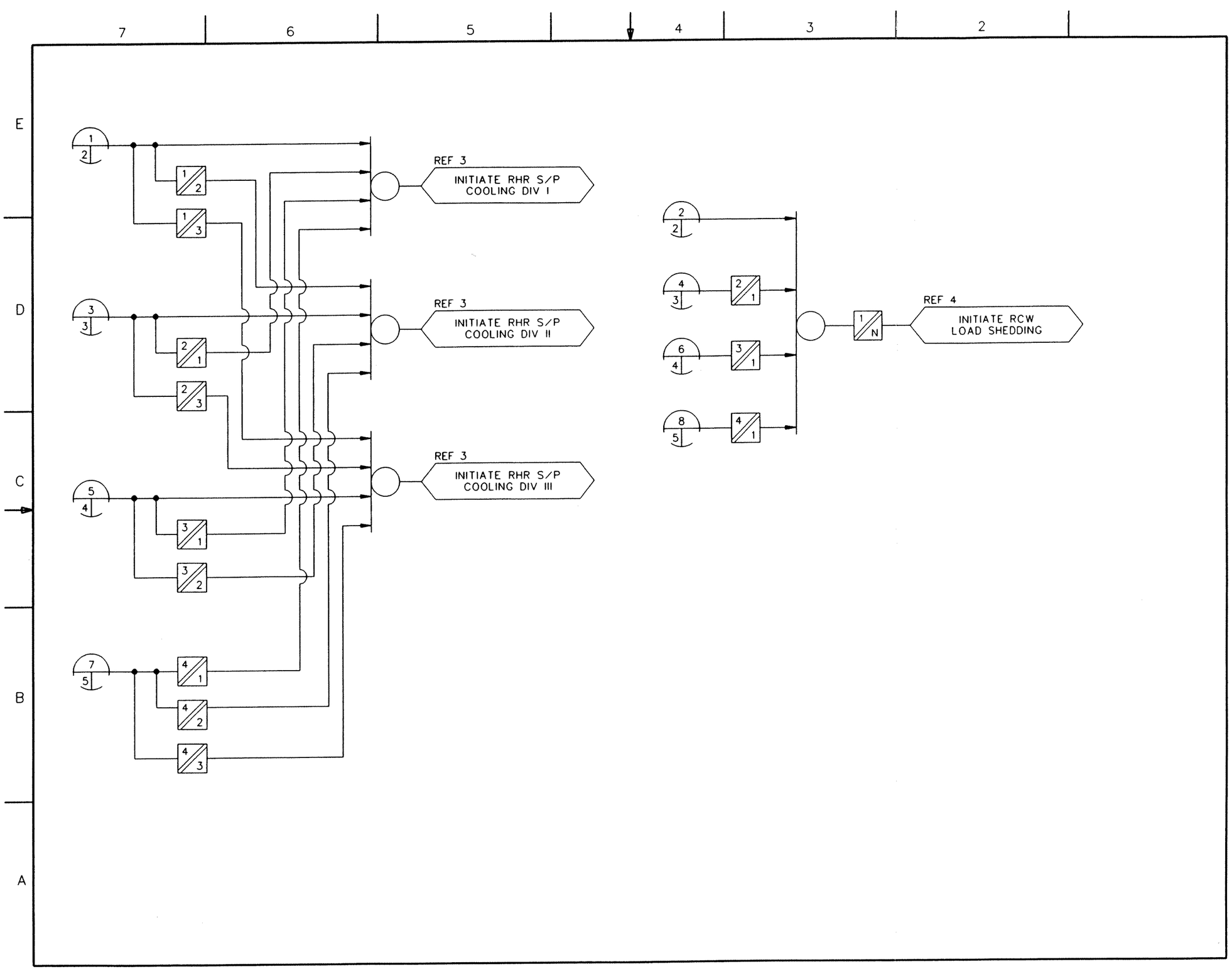
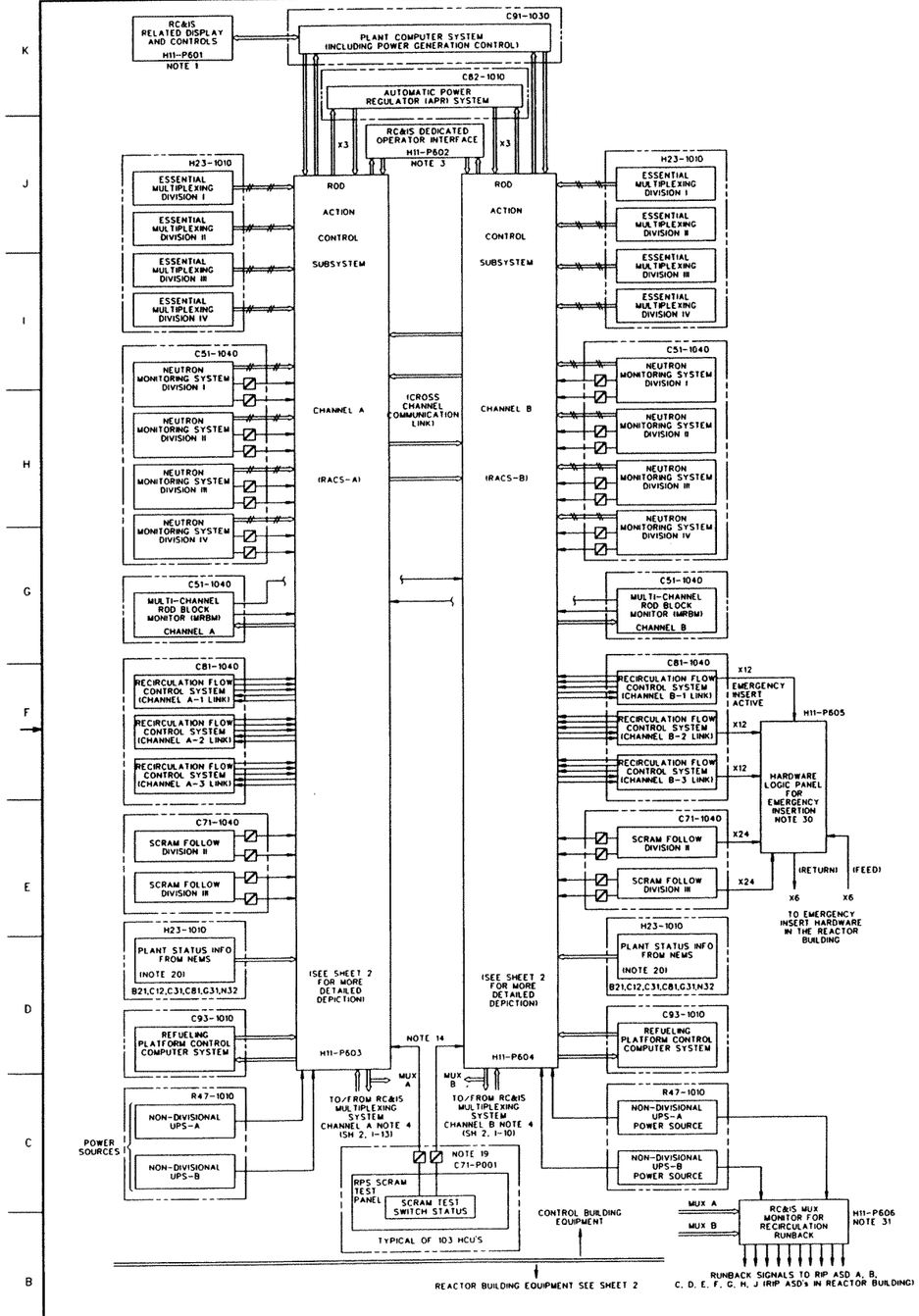


Figure 7.6-12 SUPPRESSION POOL TEMPERATURE MONITORING SYSTEM IBD (Sheet 6 of 6)



NOTES

1. THESE RC&IS RELATED DISPLAYS AND CONTROLS INTERFACE DIRECTLY WITH THE PROCESS COMPUTER SYSTEM. THESE DISPLAYS AND CONTROLS ARE MOSTLY CRT OR KEYBOARD BASED AND ARE LOCATED AT THE MAIN OPERATOR INTERFACE CONTROL PANEL. NORMAL MANUAL ROD MOVEMENT CONTROLS AND DISPLAYS ARE INCLUDED IN THESE CONTROLS AND DISPLAYS.

2. SIGNAL TO RFCS PROVIDE FLOW BLOCK AND RACS /ATLM BYPASS STATUS. RFCS SIGNALS TO RC&IS CONSIST OF ROD BLOCK, ARI AND SCRRI SIGNALS.

3. THE RC&IS DEDICATED OPERATOR INTERFACE PROVIDES RC&IS STATUS SUMMARY INFORMATION AND INCLUDES CONTROLS FOR ACTIVATING SPECIAL RC&IS INSERTION FEATURES AND KEY BYPASS CONDITIONS, AND FOR INITIATING OTHER SPECIAL RC&IS FEATURES (E.G. REQUESTING ATLM SETPOINT UPDATE)

4. THE RC&IS MULTIPLEXING NETWORK INCLUDES SUITABLE CONFIGURATION OF ALL THE FIBER OPTIC COMMUNICATION LINKS SUCH THAT REQUIRED COMMUNICATION TO ACHIEVE THE RC&IS FUNCTIONS AND OPERATION IS ESTABLISHED. THE EXACT CONFIGURATION USED (EXAMPLE STAR, RING, ETC.) FOR THIS NETWORK IS NOT SPECIFIED OR DEPICTED BY THIS IED (THIS IS A DETAILED DESIGN DECISION). THERE SHALL BE TWO INDEPENDENT CHANNELS OF THIS MULTIPLEXING NETWORK.

5. POWER SUPPLIES C11-K001A/B PROVIDE APPROPRIATE DC POWER FOR THE REED SWITCH SENSOR MODULE, SYNCHRO CONVERTER, FILE CONTROL MODULE AND ROD SERVER MODULE LOGIC, WITHIN A GIVEN REMOTE COMMUNICATION CABINET.

6. THERE IS ONE FILE CONTROL MODULE CONSISTING OF CHANNEL A&B IN EACH REMOTE COMMUNICATION CABINET INTERFACING WITH ALL THE ROD SERVER MODULES (CHANNEL A&B RESPECTIVELY) HOUSED IN THAT REMOTE COMMUNICATION CABINET.

7. THE 3-PHASE AC POWER SOURCE FOR THE STEPPING MOTOR DRIVER MODULES, THE INVERTER CONTROLLER POWER SUPPLIES, AND THE ROD BRAKE CONTROLLER POWER SUPPLIES IS NORMALLY DERIVED FROM THE DIVISION I, CLASS 1E, POWER BUS. THE COMBUSTION TURBINE POWER BUS SERVES AS THE BACKUP AC POWER SOURCE FOR THIS EQUIPMENT.

8. MULTIPLE STEPPING MOTOR DRIVER MODULES ARE HOUSED IN FINE MOTION DRIVER CABINETS. THERE ARE 205 STEPPING MOTOR DRIVER MODULES AND ASSOCIATED WITH EACH ONE IS A CORRESPONDING INVERTER CONTROLLER HOUSED IN THE SAME CABINET.

9. APPROPRIATE EXCITATION POWER SHALL BE PROVIDED FOR THE FMCRD INSTRUMENTATION. THIS DETAIL IS NOT DEPICTED ON THIS IED.

10. THE SEPARATION SWITCHES (A/B) OF THE FMCRD DO NOT DIRECTLY INTERFACE WITH THE RC&IS. THESE SWITCHES DIRECTLY INTERFACE WITH THE ESSENTIAL MULTIPLEXING SYSTEM. THE ESSENTIAL MULTIPLEXING SYSTEM PROVIDES APPROPRIATE STATUS SIGNALS TO THE RACS SO THAT ROD BLOCK OCCURS WHEN SEPARATION IS DETECTED.

11. AN APPROPRIATE REFERENCE ROD PULL SEQUENCE IS TO BE ESTABLISHED PRIOR TO COMMENCING PLANT STARTUP.

12. TIME OUT CONDITION IS USED TO DETECT LOSS OF COMMUNICATION FROM A ROD SERVER MODULE CHANNEL (EXAMPLE DUE TO CPU FAILURE) TO THE ASSOCIATED INVERTER CONTROLLER.

13. THE ISOLATED CURRENT SENSE SIGNALS ARE ANALOG INPUT SIGNALS TO THE ROD SERVER MODULE CHANNELS. ALL OTHER INVERTER CONTROLLER INPUTS TO THE ROD SERVER MODULE CHANNELS ARE DISCRETE SIGNALS.

14. THIS IED IS BASED UPON ONE REFERENCE RC&IS DESIGN CONFIGURATION IN WHICH THE SCRAM TIME RECORDING FUNCTION IS PERFORMED BY THE ROD SERVER PROCESSING CHANNELS AND THE RAPIDS CHANNELS. AN ACCEPTABLE ALTERNATIVE DESIGN CONFIGURATION USES SEPARATE RC&IS SCRAM TIME RECORDING CABINETS IN THE REACTOR BUILDING FOR THIS FUNCTION. FOR THIS ALTERNATIVE DESIGN REED SWITCH CABLING DOES NOT GO TO THE ROD SERVER PROCESSING CHANNELS (VIA REED SWITCH SENSOR MODULES). THIS CABLING GOES DIRECTLY TO THE SEPARATE RC&IS SCRAM TIME RECORDING CABINETS. SUMMARY REED SWITCH STATUS INFORMATION (NOT TIME TAGGED) IS PROVIDED TO EACH RAPI CHANNEL FROM THESE SCRAM TIME RECORDING PANELS VIA MULTIPLEXING LINKS. THE FINAL CHOICE ON WHICH ALTERNATIVE IS TO BE USED WILL BE MADE DURING THE DETAILED DESIGN PHASE AND THIS IED WILL BE MODIFIED ACCORDINGLY.

15. PART OF FMCRD POWER AND INSTRUMENTATION CABLES (C11-T001). USE OF EITHER PARALLEL OR SERIAL LINKS TO/FROM THE ROD SERVER MODULE TO THE INVERTER CONTROLLER IS PERMITTED.

16. MULTI-CHANNEL ROD BLOCK MONITOR IS PART OF NMS. IT IS A DUAL CHANNEL AND INTERFACES WITH RAPI A/B RESPECTIVELY.

17. ADDITIONAL INVERTER CONTROL SIGNALS ARE THOSE ADDITIONAL SIGNALS REQUIRED TO ASSURE PROPER MOTOR CONTROL AND DEPEND ON THE DETAILED INVERTER DESIGN.

18. THE ADDITIONAL INVERTER CONTROL SIGNALS ARE NOT SHOWN. DETAIL CONFIGURATION DEPENDS ON THE DETAIL INVERTER DESIGN ALSO PROTECTION DESIGN MAY DIFFER BASED ON DETAILED INVERTER DESIGN.

19. AN ISOLATED HARDWIRED OUTPUT SHALL BE PROVIDED TO RACS-A AND RACS-B FOR SCRAM TEST TIME TAGGING FUNCTION OF THE RC&IS. THE STATUS OF THESE SIGNALS SHALL CHANGE TO ACTIVE ONLY WHEN A SINGLE HCU SCRAM TEST HAS BEEN ACTIVATED (I.E., WHENEVER THE POSITION OF ANY SCRAM TEST SWITCH FOR A SINGLE HCU HAS BEEN CHANGED FROM THE "NORMAL" TO THE "TEST" POSITION).

20. THE NON-ESSENTIAL MULTIPLEXING SYSTEM (H23) PROVIDES THE PLANT STATUS INFORMATION OF THE FOLLOWING SYSTEMS TO RACS-A AND RACS-B: CONTROL ROD DRIVE SYSTEM (C12); FEEDWATER CONTROL SYSTEM (C31); RECIRCULATION FLOW CONTROL SYSTEM (C81); STEAM BYPASS AND PRESSURE CONTROL SYSTEM (N32); REACTOR WATER CLEANUP SYSTEM (G31); NUCLEAR BOILER SYSTEM (B21).

21. SYNCHRO A POSITION BUFFER CONTAINS SAME DIGITAL REPRESENTATION OF THE SYNCHRO A POSITION AS USED IN ROD SERVER PROCESSING CHANNEL A. ROD SERVER PROCESSING CHANNEL B CAN READ SYNCHRO A POSITION DATA VIA THIS BUFFER INTERFACE. SIMILAR CAPABILITY EXISTS FOR ROD SERVER PROCESSING CHANNEL A TO READ SYNCHRO B POSITION DATA.

22. FOR ARI, SCRAM FOLLOWING AND SCRRI FUNCTIONS, AUTOMATIC RESTART CAPABILITY SHALL BE INCLUDED.

23. EXACT SPEED PATTERNS TO ACHEIVE ROD MOVEMENT ARE TO BE DETERMINED IN DETAILED DESIGN.

24. FUSES (OR SIMILAR DEVICES) SHALL BE PROVIDED FOR THE INVERTER POWER OUTPUT PROTECTION.

25. FUSES AND/OR CIRCUIT BREAKERS (OR SIMILAR PROTECTION DEVICES) SHALL BE INCLUDED FOR THE DC POWER SUPPLY FOR PROTECTION OF THE INCOMING POWER BUS.

26. FUSES AND/OR CIRCUIT BREAKERS SHALL BE PROVIDED FOR EACH SMDM POWER INPUT FOR PROTECTION OF THE INCOMING POWER BUS, AND FOR PERFORMING INDIVIDUAL SMDM MAINTENANCE.

27. THE SYNCHRO A RECEIVES ITS EXCITATION POWER FROM THE UPS-A VIA ITS ASSOCIATED SYNCHRO CONVERTER.

28. THE SYNCHRO B RECEIVES ITS EXCITATION POWER FROM THE UPS-B VIA ITS ASSOCIATED SYNCHRO CONVERTER.

29. THE ROD BRAKE CONTROLLER'S POWER SUPPLIES (C11-K003A/B), SHALL PROVIDE CONTINUOUS STATUS FEEDBACK SIGNALS TO FILE CONTROL MODULE.

30. HARDWARE LOGIC IS USED IN ADDITION TO THE RAPI CHANNEL A AND RAPI CHANNEL B LOGIC FOR ACTIVATING EMERGENCY INSERTION. THE HARDWARE LOGIC IS BASED ON TWO-OUT-OF-FOUR LOGIC FOR THE RPS SCRAM FOLLOWING SIGNALS AND TWO-OUT-OF-THREE LOGIC FOR THE RFCS EMERGENCY INSERTION SIGNALS. IN ADDITION, THERE ARE 6 SETS OF POWER FEED/RETURNS) FOR THIS HARDWARE LOGIC. THIS IS WHY 12 SEPARATE SIGNALS ARE NEEDED FROM EACH RFCS CHANNEL AND 24 SIGNALS FROM EACH OF RPS DIVISION II AND DIVISION III.

31. THE RC&IS MUX MONITOR FOR RECIRCULATION RUNBACK PROVIDES FOR AUTOMATIC RECIRCULATION FLOW RUNBACK AFTER DETECTION OF AN ALL FMCRD RUN-IN CONDITION BEING ACTIVATED. THE COMMAND SIGNALS FROM RAPI CHANNEL A AND RAPI CHANNEL B ARE MONITORED FOR DETECTING THIS CONDITION.

32. HCU VALVE 143 IS TO BE OPENED UPON INSERTION OF THE FMCRD BY THE MOTOR. THIS DEPICTION SHOWS ONE METHOD FOR THIS LOGIC. IT IS PERMITTED TO INCLUDE THIS LOGIC IN ANOTHER PART OF THE RC&IS.

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

		MPL NO.
1	PROCESS COMPUTER SYSTEM	C91-1030
2	ESSENTIAL MULTIPLEXING INST DATA FLOW, MULTIPLEXING SYSTEM	H23-1010
3	NEUTRON MONITORING SYSTEM IED	C51-1040
4	RECIRCULATION FLOW CONTROL SYSTEM IED	C81-1040
5	REACTOR PROTECTION SYSTEM IED	C71-1040
6	REFUELING PLATFORM CONTROL COMPUTER SYSTEM	C93-1010
7	INSTRUMENT AND CONTROL POWER SUPPLY ONE LINE DIAGRAM	R47-1010
8	ELECTRICAL POWER DISTRIBUTION SYSTEM ONE LINE DIAGRAM	R10-1010
9	CONTROL ROD DRIVE SYSTEM P&ID	C12-1010
10	AUTOMATIC POWER REGULATOR SYSTEM	C82-1010

SUPPORTING DOCUMENTS:

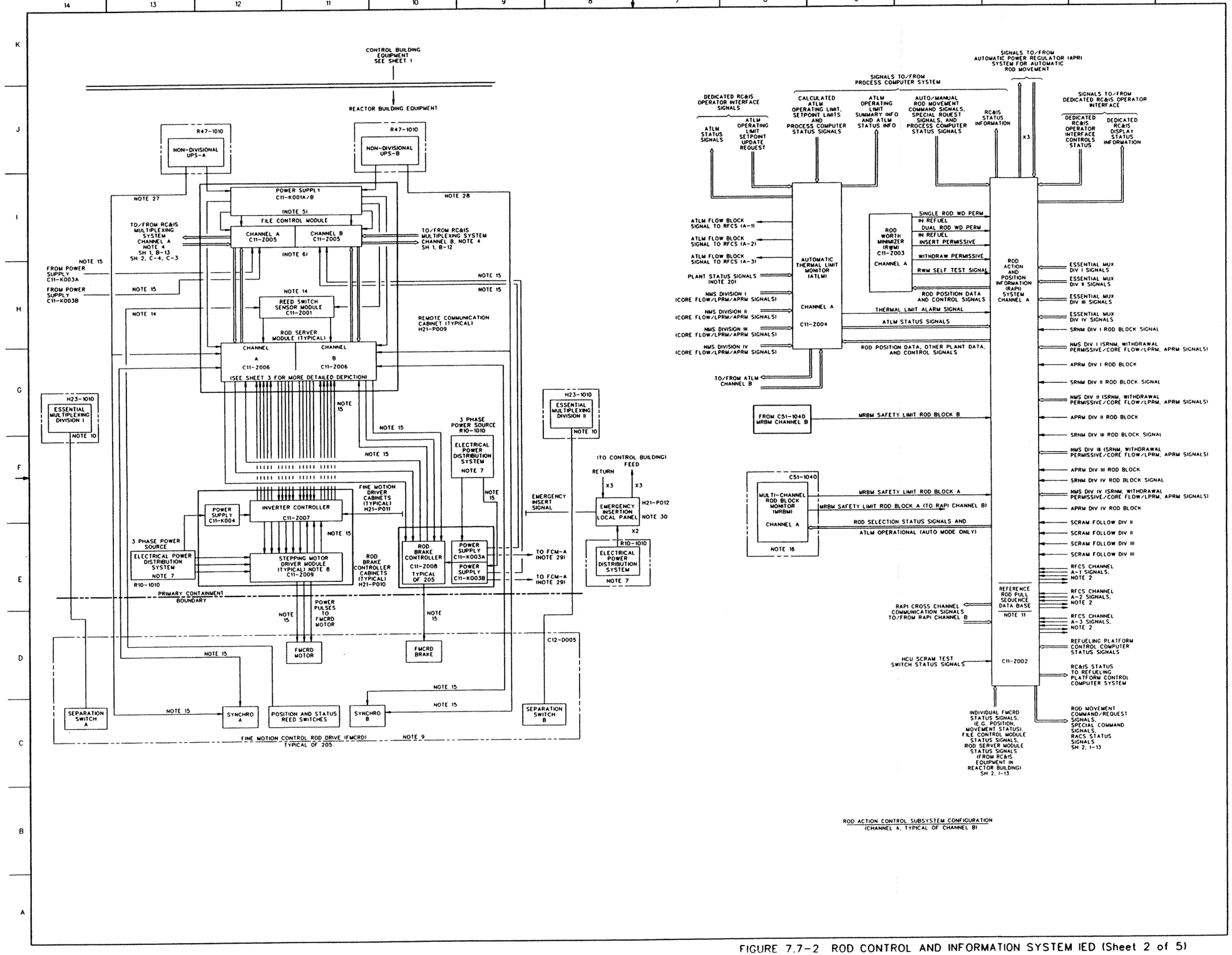
		MPL NO.
1	PIPING AND INSTRUMENT SYMBOLS DIAGRAM	A10-3030

LEGEND:

- ☐ - ISOLATOR
- ⟹ - FIBER OPTIC IS USED TO PROVIDE THE COMMUNICATION LINKS VIA NON-ESSENTIAL MULTIPLEXING
- ⟹ (with #) - FIBER OPTIC WITH SUITABLE ISOLATION IS USED TO PROVIDE THE COMMUNICATION LINKS BETWEEN THE CLASS 1E SAFETY SYSTEMS AND THE NON-SAFETY RCIS
- ⟶ - HARDWIRE INTERFACE CONNECTION

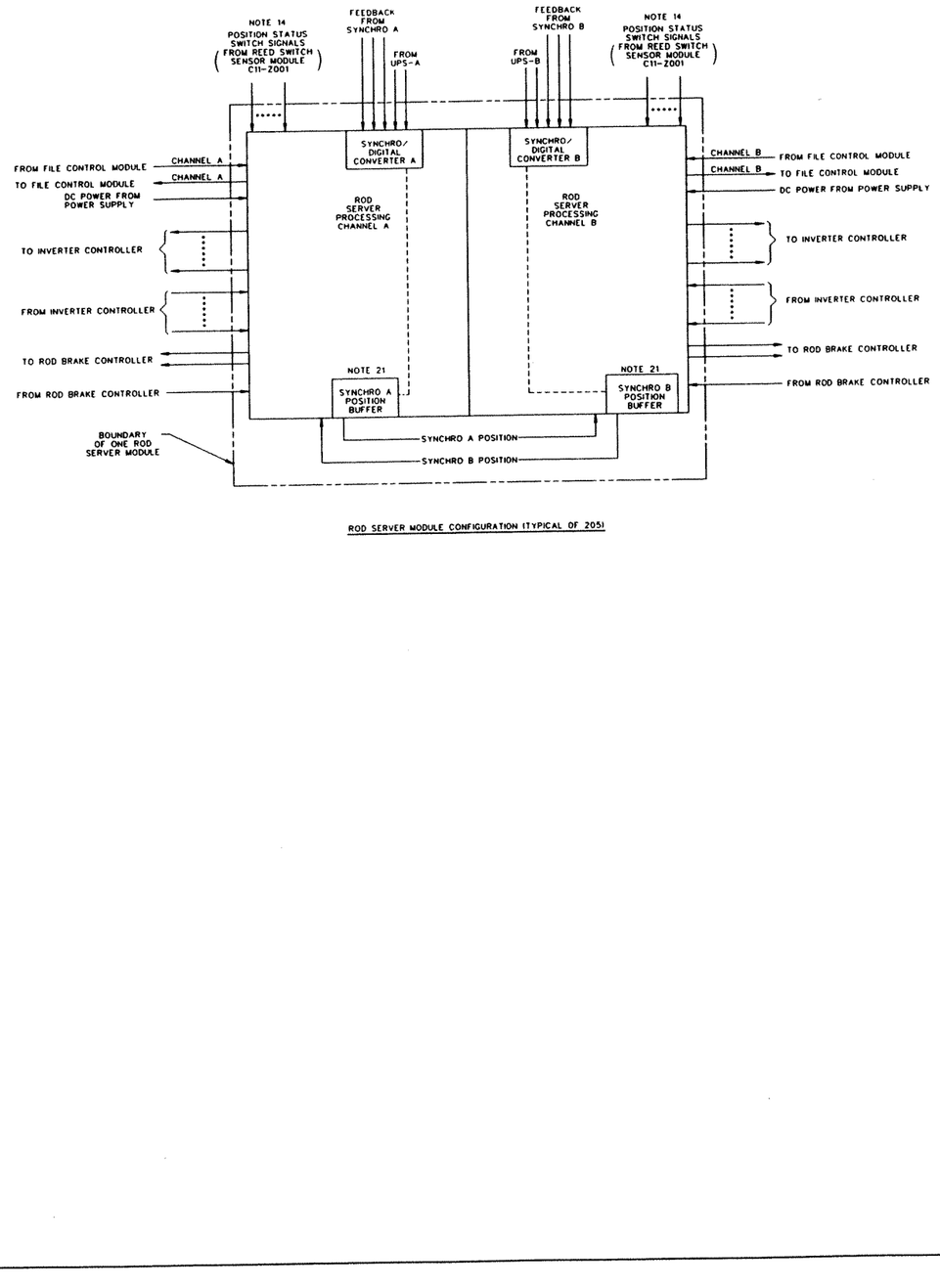
MPL NO C11-1010

FIGURE 7.7-2 ROD CONTROL AND INFORMATION SYSTEM IED (Sheet 1 of 5)

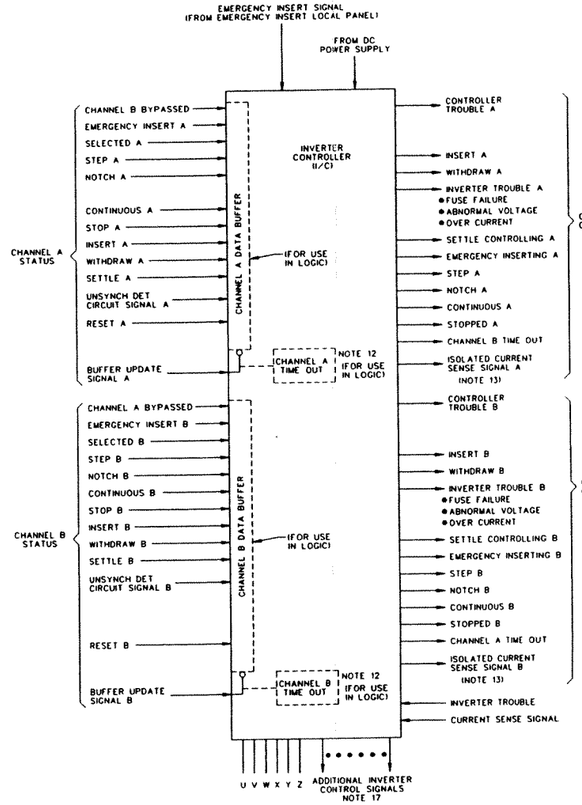


ROD ACTION CONTROL SUBSYSTEM CONFIGURATION
(CHANNEL A, TYPICAL OF CHANNEL B)

FIGURE 7.7-2 ROD CONTROL AND INFORMATION SYSTEM IED (Sheet 2 of 5)



ROD SERVER MODULE CONFIGURATION (TYPICAL OF 205)



INVERTER CONTROLLER CONFIGURATION (TYPICAL OF 205)

FIGURE 7.7-2 ROD CONTROL AND INFORMATION SYSTEM IED (Sheet 3 of 5)

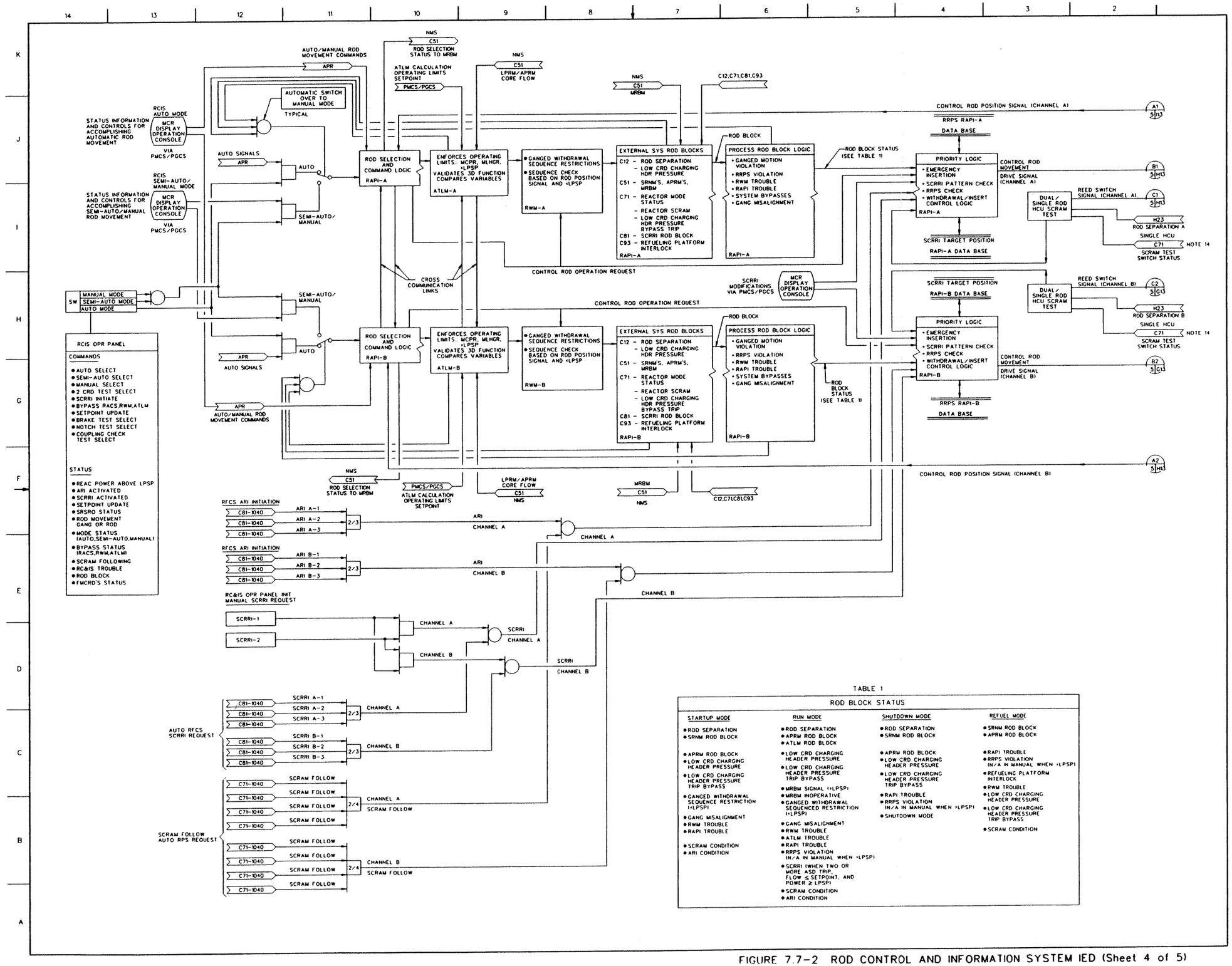


TABLE 1

ROD BLOCK STATUS

STARTUP MODE	RUN MODE	SHUTDOWN MODE	REFUEL MODE
• ROD SEPARATION • SRNM ROD BLOCK • APRM ROD BLOCK • LOW CRD CHARGING HEADER PRESSURE • LOW CRD CHARGING HEADER PRESSURE TRIP BYPASS • GANGED WITHDRAWAL SEQUENCE RESTRICTION (<LPSP) • GANG MISALIGNMENT • RWM TROUBLE • RAPI TROUBLE • SCRAM CONDITION • ARI CONDITION	• ROD SEPARATION • APRM ROD BLOCK • ATLM ROD BLOCK • LOW CRD CHARGING HEADER PRESSURE • LOW CRD CHARGING HEADER PRESSURE TRIP BYPASS • MRBM SIGNAL (>LPSP) • MRBM INOPERATIVE • GANGED WITHDRAWAL SEQUENCED RESTRICTION (<LPSP) • GANG MISALIGNMENT • RWM TROUBLE • ATLM TROUBLE • RAPI TROUBLE • RRPS VIOLATION (N/A IN MANUAL WHEN >LPSP) • SCRRI (WHEN TWO OR MORE ASD TRIP, FLOW ≤ SETPOINT, AND POWER ≥ LPSP) • SCRAM CONDITION • ARI CONDITION	• ROD SEPARATION • SRNM ROD BLOCK • APRM ROD BLOCK • LOW CRD CHARGING HEADER PRESSURE • LOW CRD CHARGING HEADER PRESSURE TRIP BYPASS • RAPI TROUBLE • RRPS VIOLATION (N/A IN MANUAL WHEN >LPSP) • SHUTDOWN MODE	• SRNM ROD BLOCK • APRM ROD BLOCK • RAPI TROUBLE • RRPS VIOLATION (N/A IN MANUAL WHEN >LPSP) • REFUELING PLATFORM INTERLOCK • RWM TROUBLE • LOW CRD CHARGING HEADER PRESSURE • LOW CRD CHARGING HEADER PRESSURE TRIP BYPASS • SCRAM CONDITION

FIGURE 7.7-2 ROD CONTROL AND INFORMATION SYSTEM IED (Sheet 4 of 5)

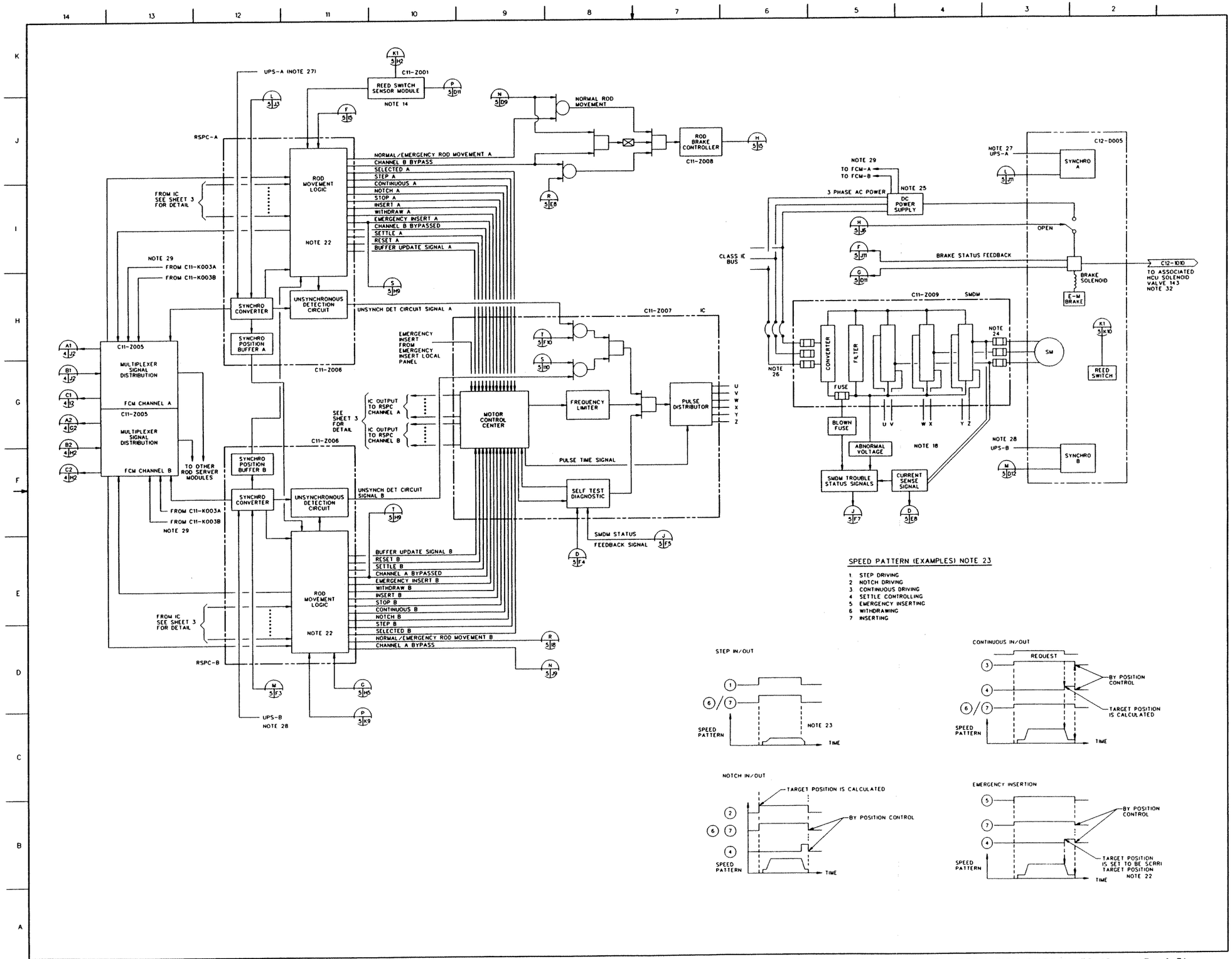


FIGURE 7.7-2 ROD CONTROL AND INFORMATION SYSTEM IED (Sheet 5 of 5)

ABWR CERTIFICATION PROGRAM

TABLE OF CONTENTS

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	C91–1030
2.	CONTROL ROD DRIVE SYSTEM IBD	C12–1030
3.	AUTOMATIC POWER REGULATOR SYSTEM IBD	C82–1030
4.	REACTOR PROTECTION SYSTEM IBD	C71–1030
5.	FEEDWATER CONTROL SYSTEM IBD	C31–1030
6.	RECIRCULATION FLOW CONTROL SYSTEM IBD	C81–1030
7.	NEUTRON MONITORING SYSTEM IBD	C51–1030
8.	REFUELING PLATFORM CONTROL COMPUTER SYSTEM IBD	C93–1030
9.	ESSENTIAL/NON–ESSENTIAL MULTIPLEXING SYSTEM IBD	H23–1030
10.	ROD CONTROL & INFORMATION SYSTEM IED	C11–1040

LEGENDS:

⟹ – STREAM OF BINARY BITS

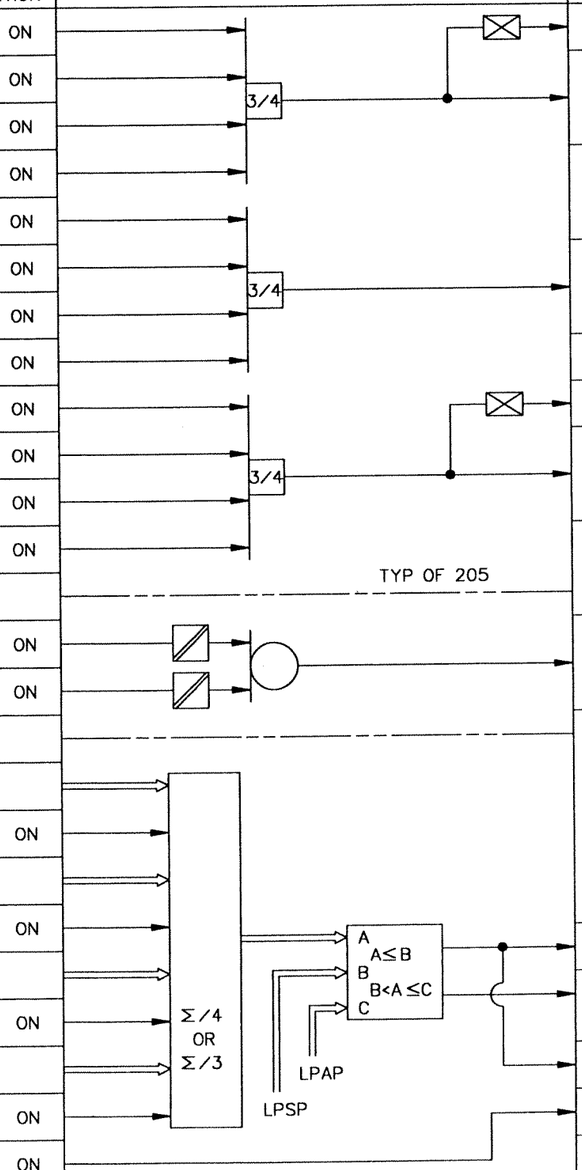
⟶ – ANALOG SIGNALS AND DISCRETE SIGNALS
IN CASE OF AN ANALOG SIGNAL, "A" IS PLACED IN THE "CLASS" COLUMN.

NOMENCLATURE/REFERENCES

FIGURE 7.7–3 ROD CONTROL AND INFORMATION SYSTEM IBD (Sheet 2 of 87)

INPUT				
REF SH	CLASS	SIGNAL ID	DESCRIPTION	COND-ITION
C71	D		LOW CRD HDR PRESS TRIP NOT BYPASSED DIV I	ON
	D		LOW CRD HDR PRESS TRIP NOT BYPASSED DIV II	ON
	D		LOW CRD HDR PRESS TRIP NOT BYPASSED DIV III	ON
	D		LOW CRD HDR PRESS TRIP NOT BYPASSED DIV IV	ON
C51	D		NO SRNM ROD BLOCK DIV I	ON
	D		NO SRNM ROD BLOCK DIV II	ON
	D		NO SRNM ROD BLOCK DIV III	ON
	D		NO SRNM ROD BLOCK DIV IV	ON
C51	D		NO APRM ROD BLOCK DIV I	ON
	D		NO APRM ROD BLOCK DIV II	ON
	D		NO APRM ROD BLOCK DIV III	ON
	D		NO APRM ROD BLOCK DIV IV	ON
C12	D		N-TH ROD SEPARATION A SWITCH ACTIVATED	ON
	D		N-TH ROD SEPARATION B SWITCH ACTIVATED	ON
C51	D		APRM LEVEL DIV I	
C51	D		APRM DIV I BYPASSED	ON
	D		APRM LEVEL DIV II	
	D		APRM DIV II BYPASSED	ON
	D		APRM LEVEL DIV III	
	D		APRM DIV III BYPASSED	ON
	D		APRM LEVEL DIV IV	
	D		APRM DIV IV BYPASSED	ON
C71	D		A SCRAM TEST SWITCH IS ACTIVATED DIV II	ON

LOGIC



OUTPUT			
CLASS	DESCRIPTION	SIGNAL ID	REF SH
D	LOW CRD HDR PRESS TRIP BYPASSED ROD BLOCK IDENTIFICATION	0310	PMCS CRT/C91
B	LOW CRD HDR PRESS TRIP NOT BYPASSED	0301	18
B	NO SRNM ROD BLOCK	0302	18
D	APRM ROD W/D BLOCK IDENTIFICATION	0309	PMCS CRT/C91
B	NO APRM ROD BLOCK	0303	18
B	N-TH ROD IS SEPARATED	0304	15,18
B	REACTOR POWER IS BELOW LPSP	0305	10,17 18,69
ANN	REACTOR POWER IS BELOW LPAP	0307	
B		0308	DOI * 33
B	A SCRAM TEST SWITCH IS ACTIVATED	0306	15

* DEDICATED OPERATOR INTERFACE

INPUT SIGNAL LOGIC

FIGURE 7.7-3 ROD CONTROL AND INFORMATION SYSTEM IBD (Sheet 3 of 87)

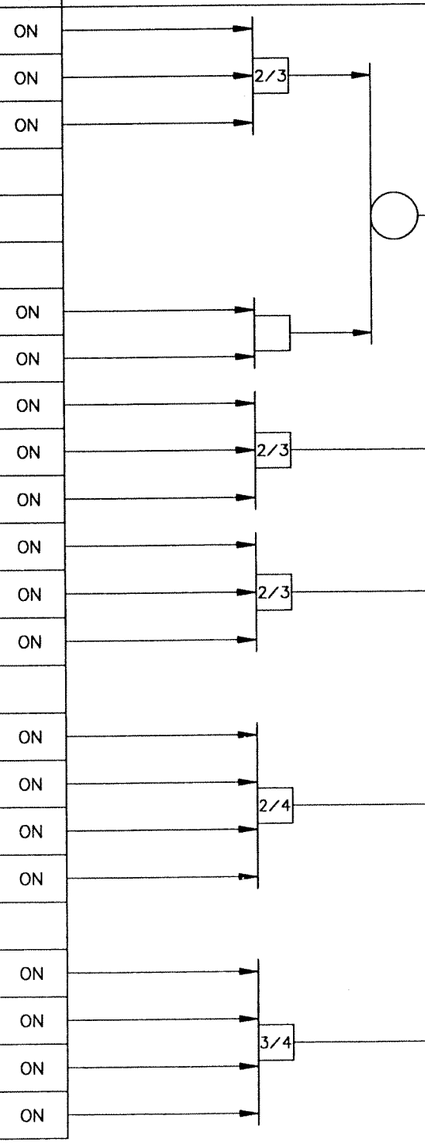
INPUT					LOGIC	OUTPUT			
REF SH	CLASS	SIGNAL ID	DESCRIPTION	COND-ITION		CLASS	DESCRIPTION	SIGNAL ID	REF SH
C71	D		SCRAM FOLLOW FROM RPS DIV II	ON		B		0408	DOI 33
	D		SCRAM FOLLOW FROM RPS DIV II	ON	2/4	B	SCRAM FOLLOW CONDITION EXIST	0401	10,18
	D		SCRAM FOLLOW FROM RPS DIV III	ON		D	SCRAM FOLLO CONDITION ROD WD BLOCK IDENTIFICATION	0409	PMCS CRT/C91
	D		SCRAM FOLLOW FROM RPS DIV III	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)

INPUT				
REF SH	CLASS	SIGNAL ID	DESCRIPTION	COND-ITION
C81	D		SCRRI REQUEST FROM RFCS CH-A1	ON
	D		SCRRI REQUEST FROM RFCS CH-A2	ON
	D		SCRRI REQUEST FROM RFCS CH-A3	ON
D01	B		SCRRI MANUAL SWITCH ACTIVATED-1	ON
D01	B		SCRRI MANUAL SWITCH ACTIVATED-2	ON
C81	D		ROD WITHDRAWAL BLOCK REQ FROM RFCS-A1	ON
	D		ROD WITHDRAWAL BLOCK REQ FROM RFCS-A2	ON
	D		ROD WITHDRAWAL BLOCK REQ FROM RFCS-A3	ON
C81	D		ARI REQUEST FROM RFCS CH 1	ON
	D		ARI REQUEST FROM RFCS CH 2	ON
	D		ARI REQUEST FROM RFCS CH 3	ON
C12	D		LOW CRD CHARGING HDR PRESS DIV I	ON
	D		LOW CRD CHARGING HDR PRESS DIV II	ON
	D		LOW CRD CHARGING HDR PRESS DIV III	ON
	D		LOW CRD CHARGING HDR PRESS DIV IV	ON
C51	D		PERIOD BASED ROD WD PERMISSIVE DIV I	ON
	D		PERIOD BASED ROD WD PERMISSIVE DIV II	ON
	D		PERIOD BASED ROD WD PERMISSIVE DIV III	ON
	D		PERIOD BASED ROD WD PERMISSIVE DIV IV	ON

LOGIC



OUTPUT			
CLASS	DESCRIPTION	SIGNAL ID	REF SH
B		0507	DOI 33
B	SCRRI CONDITION EXISTS	0501	10,18
D	SCRRI CONDITION ROD WD BLOCK IDENTIFICATION	0508	PMCS CRT/C91
D	RFCS ROD WD BLOCK CONDITION IDENTIFICATION	0509	PMCS CRT/C91
B	RFCS ROD WITHDRAW BLOCK REQUEST	0502	18
B		0506	DOI 33
B	ARI CONDITION EXISTS	0503	10,18
D	ARI ROD WD BLOCK CONDITION IDENTIFICATION	0510	PMCS CRT/C91
D	LOW CRD CHARGING HDR PRESSURE ROD WD BLOCK IDENTIFICATION	0511	PMCS CRT/C91
B	CRD CHARGING HDR PRESS IS LOW	0504	18
B	PERIOD BASED ROD WD PERMISSIVE	0505	18

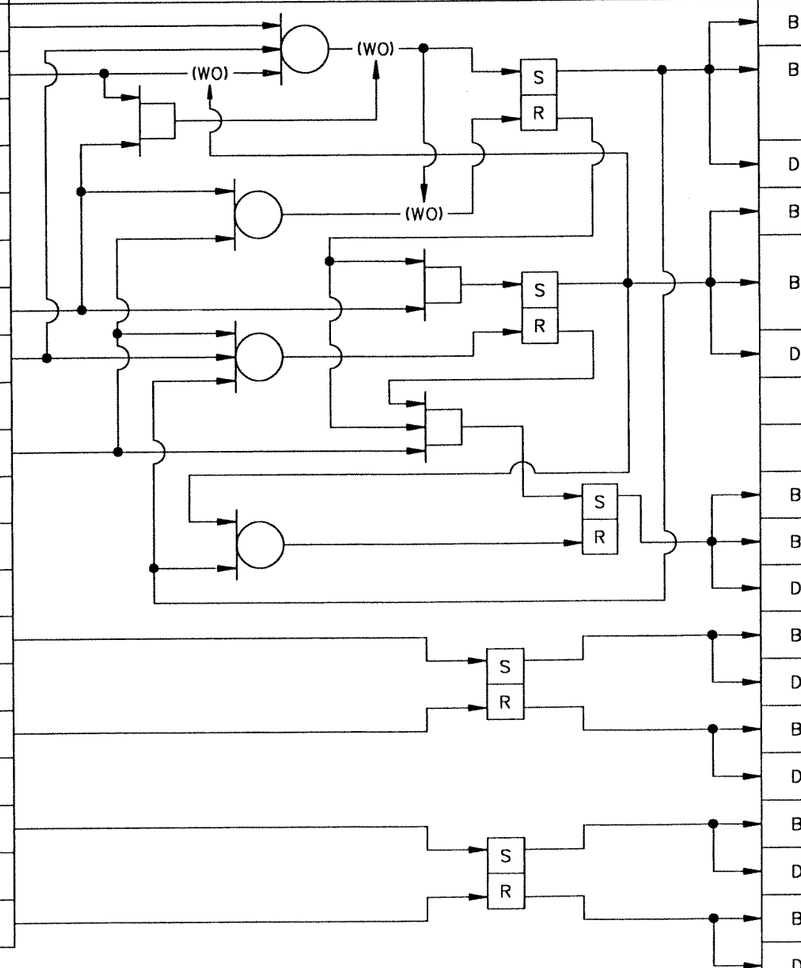
INPUT SIGNALS LOGIC

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

LOGIC



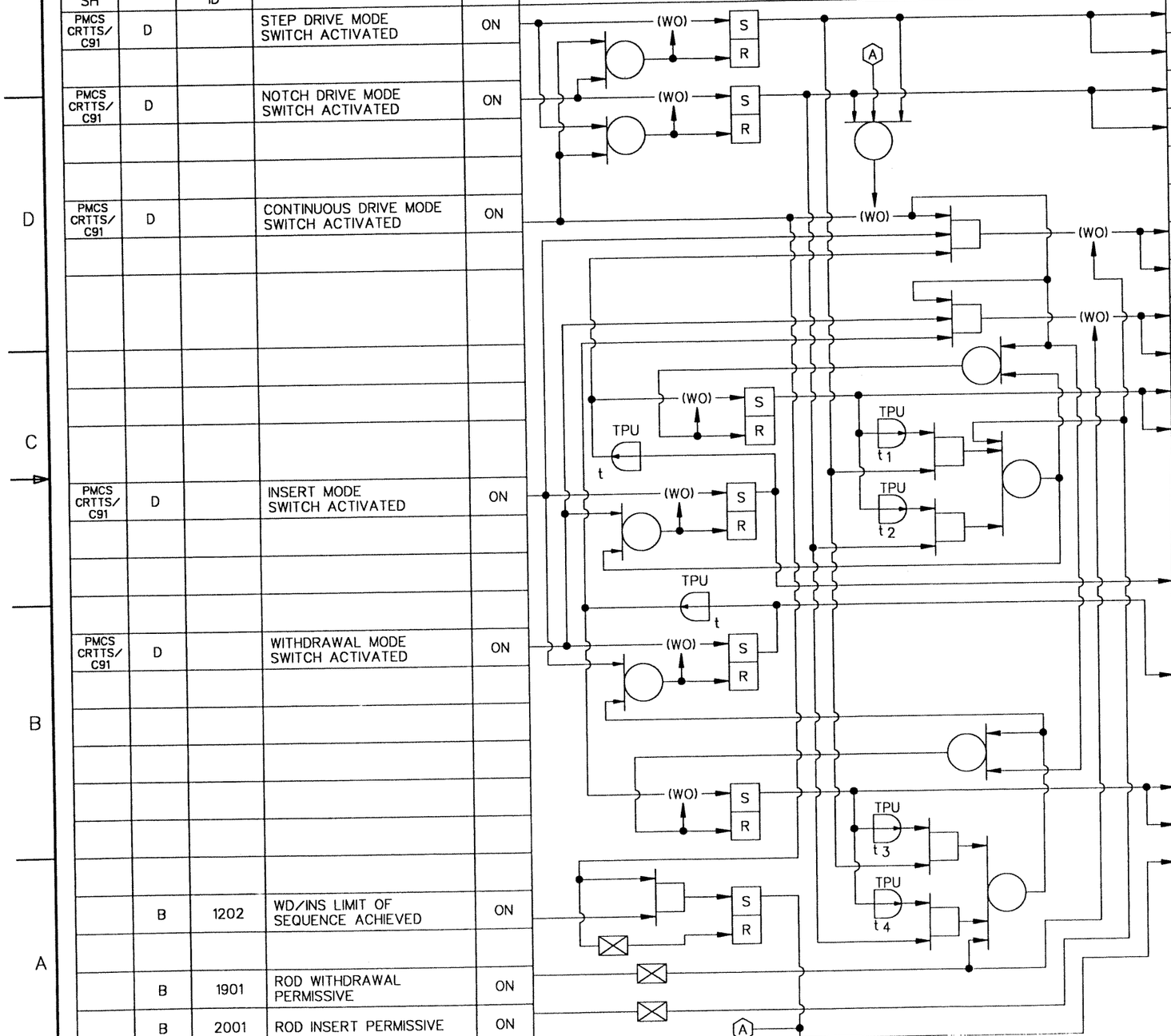
OUTPUT			
CLASS	DESCRIPTION	SIGNAL ID	REF SH
B		0615	DOI 33
B	RCIS IN MANUAL MODE	0601	4,10,11 14,17 22,23
D		0608	PMCS CRT/C91
B		0616	DOI 33
B	RCIS IN SEMI-AUTO MODE	0602	10,12
D		0609	PMCS CRT/C91
B		0617	DOI 33
B	RCIS IN AUTO MODE	0603	10,13 26,27,28 29,30
D		0610	PMCS CRT/C91
B	RCIS IN SINGLE ROD 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)

INPUT				
REF SH	CLASS	SIGNAL ID	DESCRIPTION	CONDITION
PMCS CRTTS/ C91	D		STEP DRIVE MODE SWITCH ACTIVATED	ON
PMCS CRTTS/ C91	D		NOTCH DRIVE MODE SWITCH ACTIVATED	ON
PMCS CRTTS/ C91	D		CONTINUOUS DRIVE MODE SWITCH ACTIVATED	ON
PMCS CRTTS/ C91	D		INSERT MODE SWITCH ACTIVATED	ON
PMCS CRTTS/ C91	D		WITHDRAWAL MODE SWITCH ACTIVATED	ON
	B	1202	WD/INS LIMIT OF SEQUENCE ACHIEVED	ON
	B	1901	ROD WITHDRAWAL PERMISSIVE	ON
	B	2001	ROD INSERT PERMISSIVE	ON

LOGIC

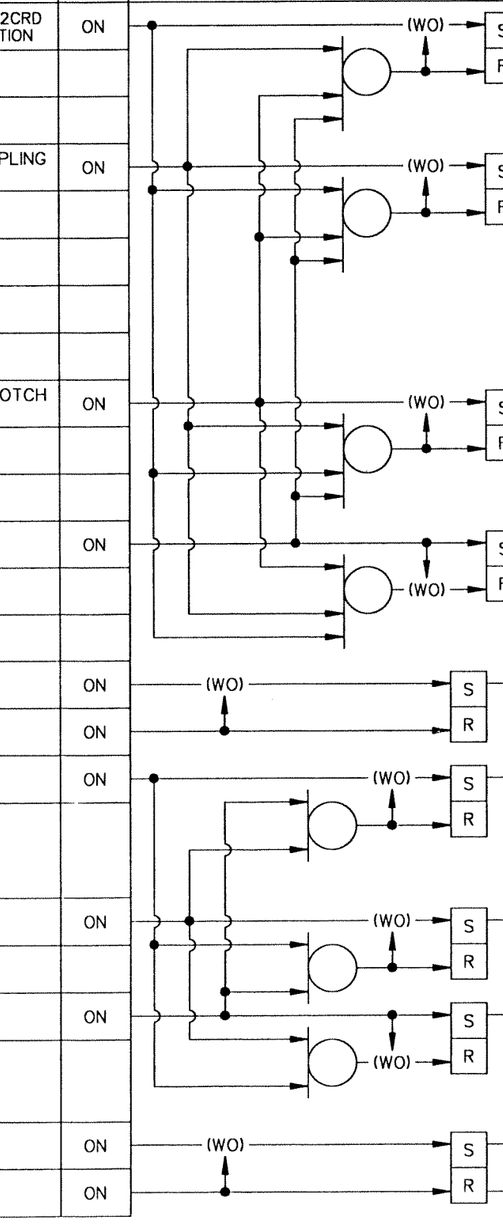


OUTPUT			
CLASS	DESCRIPTION	SIGNAL ID	REF SH
B	RCIS IN STEP DRIVE MODE	0701	11,12 39,40
D		0710	PMCS CRT/C91
B	RCIS IN NOTCH DRIVE MODE	0702	11,12, 41,42
D		0711	PMCS CRT/C91
B	RCIS IN CONTINUOUS INSERT DRIVE MODE	0703	11,12,44
D		0712	PMCS CRT/C91
B	RCIS IN CONTINUOUS WITHDRAWAL DRIVE MODE	0704	11,12
D		0713	PMCS CRT/C91
B	RCIS IN STEP/NOTCH INSERT DRIVE MODE	0706	12,40 42
D		0714	PMCS CRT/C91
B	RCIS IN ROD INSERT MODE	0707	11,12 69,71
B	RCIS IN ROD WITHDRAWAL MODE	0708	11,12 69,71
B	RCIS IN STEP/NOTCH WITHDRAWAL DRIVE MODE	0709	12,39 41
D		0714	PMCS CRT/C91
D	WD/INS LIMIT OF RRPS ACHIEVED	0717	PMCS CRT/C91

DRIVE MODE ACTIVATION LOGIC

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
						B		0826	DOI,34
DOI	B		CRDSTMS PUT IN MANUAL MODE	ON		B	CRDSTMS IN IDLE	0811	PMCS CRT/C91
						B		0827	DOI,35
DOI	B		CRDSTMS PUT IN IDLE MODE	ON		B	CRDSTSMS IN MANUAL	0808	14
						D		0828	PMCS CRT/C91
						B		0829	DOI,35
DOI	B		START CRD SURVEILLANCE TEST	ON		B	CRD SURVEILLANCE TEST STARTED	0809	14,17
DOI	B		STOP CRD SURVEILLANCE TEST	ON		D		0830	PMCS CRT/C91
						B		0831	DOI,35
						B	CRD SURVEILLANCE TEST STOPPED	0810	10,14 17
						D		0832	PMCS CRT/C91



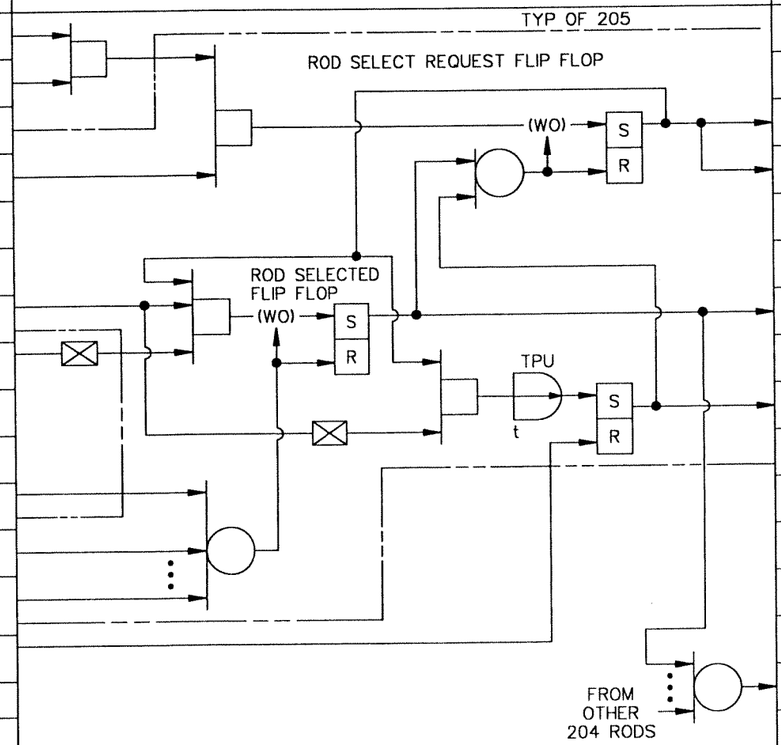
CRD SURVEILLANCE TEST SELECTION LOGIC

* 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

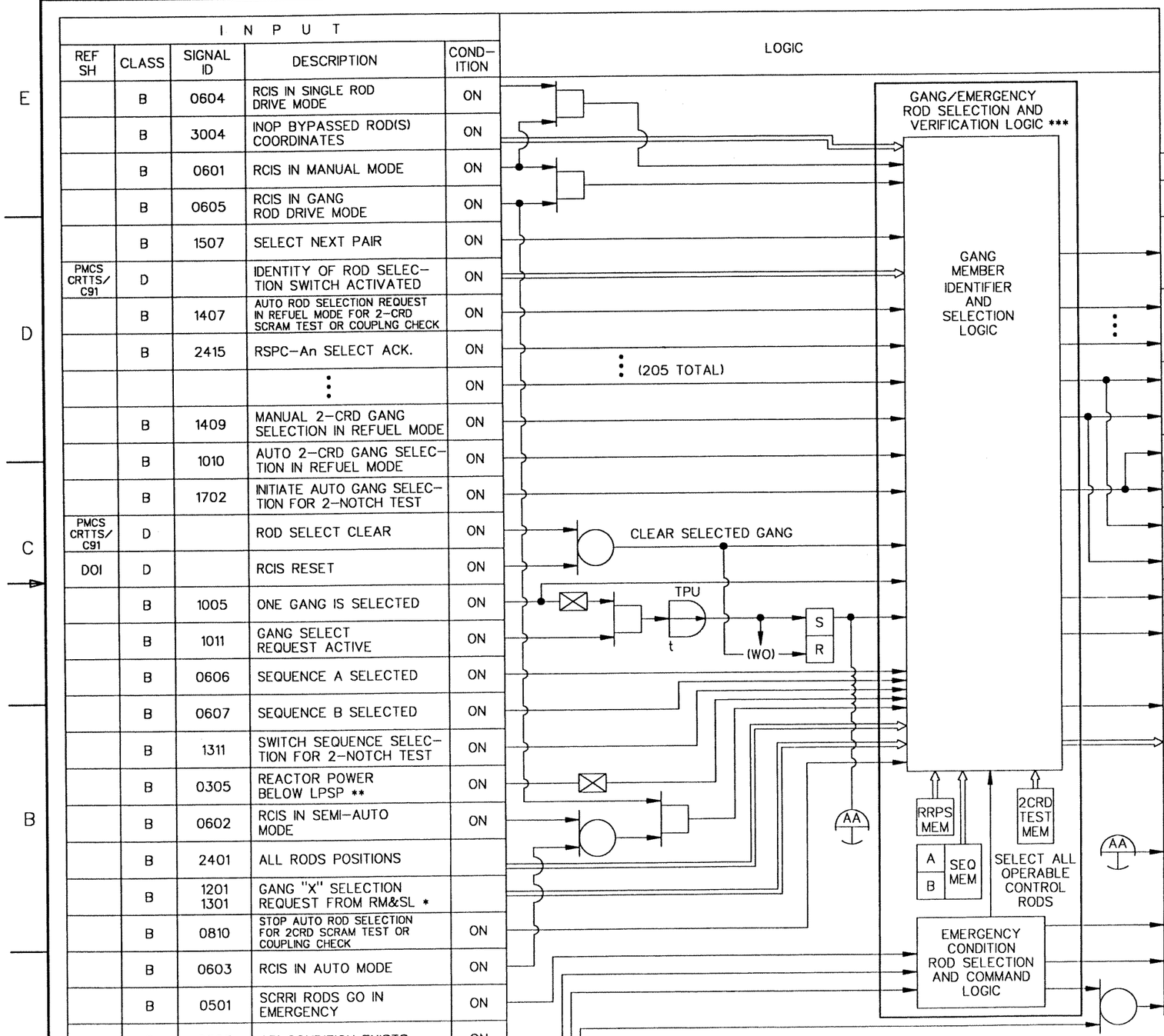


O U T P U T			
CLASS	DESCRIPTION	SIGNAL ID	REF SH
B	SELECT REQUEST FOR RSPC-An	0901	38
B	OTHER RODS SELECT CLEAR	0905	9
B	THE N-TH ROD IS SELECTED	0902	38
ANN	ROD SELECT TROUBLE	0903	
B	A ROD IS SELECTED	0904	9,11 14

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	COND-ITION
	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 SELEC-TION SWITCH ACTIVATED	ON
	B	1407	AUTO ROD SELECTION REQUEST IN REFUEL MODE FOR 2-CRD SCRAM TEST OR COUPLNG 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 SELEC-TION IN REFUEL MODE	ON
	B	1702	INITIATE AUTO GANG SELEC-TION 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 SELEC-TION 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 SELEC-TION 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

* ROD MOVEMENT AND SEQUENCING LOGIC

** THIS SIGNAL PREVENTS INADVERTENT SELECTION OF GROUPS 1,2,3,4 GANGED RODS ABOVE LPSP

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

GANG, EMERGENCY AND AUTO 2-CRD TEST ROD SELECTION LOGIC AND EMERGENCY INSERTION LOGIC

FIGURE 7.7-3 ROD CONTROL AND INFORMATION SYSTEM IBD (Sheet 10 of 87)

I N P U T				
REF SH	CLASS	SIGNAL ID	DESCRIPTION	COND-ITION
	B	0701	RC & IS IN STEP DRIVE MODE	ON
	B	0904	A ROD IS SELECTED	ON
	B	0601	RCIS IN MANUAL MODE	ON
	B	0604	RCIS IN SINGLE ROD DRIVE MODE	ON
	B	0702	RCIS IN NOTCH DRIVE MODE	ON
	B	0707	RCIS IN INSERT DRIVE MODE	ON
	B	0708	RCIS IN WITHDRAWAL DRIVE MODE	ON
	B	2403	SELECTED ROD POSITION	ON
	B	2409	SELECTED ROD SETTLING	ON
	B	0703	RCIS IN CONTINUOUS INSERT DRIVE MODE	ON
	B	0704	RCIS IN CONTINUOUS WITHDRAWAL DRIVE MODE	ON
	B	0806	OVERTRAVEL PERMIT	ON
	B	0605	RCIS IN GANG ROD DRIVE MODE	ON
	B	1005	ONE GANG IS SELECTED	ON
	B	2410	SELECTED GANG SETTLING	ON
	B	2404	SELECTED GANG ROD POSITIONS	

LOGIC

ROD MOVEMENT & SEQUENCING LOGIC *

(–) REFERENCE POSITION GENERATOR
(+) FOR SINGLE ROD STEP, NOTCH, AND CONTINUOUS MOVEMENT

(–)
(+) REFERENCE POSITION GENERATOR AND GANG SYNCH LOGIC FOR GANG STEP, NOTCH, AND CONTINUOUS ROD MOVEMENT

GANG MISALIGNMENT ROD BLOCK LOGIC

O U T P U T			
CLASS	DESCRIPTION	SIGNAL ID	REF SH
B	REFERENCE POSITION TO SELECTED RSPC–A	1101	39,40 41,42 43,44
B	REFERENCE POSITION TO THE RSPC'S OF SELECTED GANG	1102	39,40 41,42 43,44
B	GANG MISALIGNMENT ROD BLOCK	1103	18

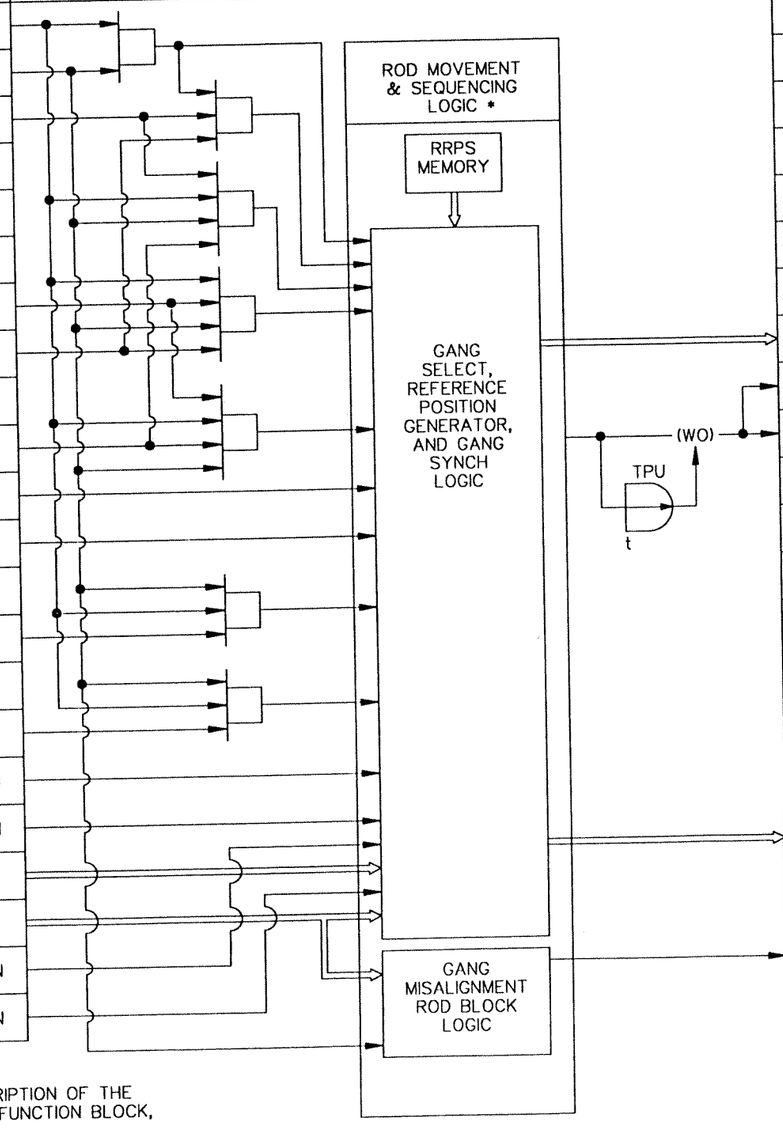
* FOR DETAILED DESCRIPTION OF THE ALGORITHM OF THIS FUNCTION BLOCK, REFER TO NOTE 5.

ROD MOVEMENT AND SEQUENCING LOGIC FOR RCIS MANUAL MODE OF OPERATION

FIGURE 7.7–3 ROD CONTROL AND INFORMATION SYSTEM IBD (Sheet 11 of 87)

INPUT				
REF SH	CLASS	SIGNAL ID	DESCRIPTION	CONDITION
	B	0602	RCIS IN SEMI-AUTO MODE	ON
	B	0605	RCIS IN GANG MODE	ON
	B	0701	RCIS IN STEP DRIVE MODE	ON
	B	0702	RCIS IN NOTCH DRIVE MODE	ON
	B	0709	RCIS IN STEP/NOTCH WITHDRAWAL MODE	ON
	B	0706	RCIS IN STEP/NOTCH INSERT MODE	ON
	B	1005	ONE GANG IS SELECTED	ON
	B	2410	SELECTED GANG SETTLING	ON
	B	0703	RCIS IN CONTINUOUS INSERT DRIVE MODE	ON
	B	0704	RCIS IN CONTINUOUS WITHDRAWAL DRIVE MODE	ON
	B	0707	RCIS IN INSERT DRIVE MODE	ON
	B	0708	RCIS IN WITHRAWAL DRIVE MODE	ON
	B	1012	CURRENT RRPS STEP NUMBER	
	B	2404	SELECTED GANG RODS POSITIONS	
	B	0606	SEQUENCE A SELECTED	ON
	B	0607	SEQUENCE B SELECTED	ON

LOGIC



OUTPUT			
CLASS	DESCRIPTION	SIGNAL ID	REF SH
B	GANG "X" SELECTION REQUEST	1201	10
B		1202	7
D	WD/INSERT LIMIT OF SEQUENCE ACHIEVED	1203	PMCS CRT/C91
B	REFERENCE POSITION TO THE RSPC'S OF SELECTED GANG	1204	39,40 41,42 43,44
B	GANG MISALIGNMENT ROD BLOCK	1205	18

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

ROD MOVEMENT AND SEQUENCING LOGIC FOR RCIS SEMIAUTOMATIC MODE OF OPERATION

FIGURE 7.7-3 ROD CONTROL AND INFORMATION SYSTEM IBD (Sheet 12 of 87)

INPUT				
REF SH	CLASS	SIGNAL ID	DESCRIPTION	COND-ITION
	B	1702	INITIATE AUTO GANG SELEC-TION FOR 2-NOTCH TEST	ON
	B	0603	RCIS IN AUTOMATIC ROD MOVEMENT MODE	ON
	B	0605	RCIS IN GANG ROD DRIVE MODE	ON
C82	D		APR IN AUTO	ON
C82	D		APR IN ROD WITHDRAWAL MODE	ON
C82	D		APR IN ROD INSERT MODE	ON
C82	D		NORMAL SEQUENCE STROKE WD/INSERT REQUEST FROM APR	ON
C82	D		SEQUENCE SUBSTROKE WD/ INSERT REQUEST FROM APR	ON
C82	D		SEQUENCE STEP WD/INSERT REQUEST FROM APR	ON
	B	1005	ONE GANG IS SELECTED	ON
	B	2410	SELECTED GANG SETTLING	ON
	B	0606	SEQUENCE A SELECTED	ON
	B	0607	SEQUENCE B SELECTED	ON
	B	1012	CURRENT RRPS STEP NUMBER	
	B	2404	SELECTED GANG RODS POSITIONS	
	B	1901	ROD WITHDRAWAL PERMISSIVE	ON
	B	2001	ROD INSERT PERMISSIVE	ON

LOGIC

ROD MOVEMENT & SEQUENCING LOGIC *

RRPS MEM

GANG SELECT LOGIC, REFERENCE POSITION GENERATOR, GANG SYNCH LOGIC, AUTO ROD MOVEMENT COMMAND LOGIC AND AUTO STEP TEST COMMAND LOGIC

GANG MISALIGNMENT ROD BLOCK LOGIC

(WO)

(WO)

OUTPUT			
CLASS	DESCRIPTION	SIGNAL ID	REF SH
B	GANG "X" SELECTION REQUEST	1301	10
D		1312	PMCS CRT/ C91
B	2-NOTCH TEST COMPLETE	1302	17
B	SWITCH SEQUENCE SELEC-TION FOR 2-NOTCH TEST	1311	10
B	REFERENCE POSITION TO THE RSPC'S OF SELECTED GANG	1303	39,40 41,42 43,44
B	INSERT	1304	40,44
B	WITHDRAW	1305	39,43
B	CONTINUOUS	1306	43,44
B	STEP	1307	39,40
B	SELECTED GANG 2-NOTCH TEST UNSUCCESSFUL	1308	17
B	GANG MISALIGNMENT ROD BLOCK	1309	18
B	SWITCH TO MANUAL	1310	31

ROD MOVEMENT AND SEQUENCING LOGIC FOR RCIS AUTOMATIC MODE OF OPERATION AND LOGIC FOR AUTOMATIC 2-NOTCH TEST

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

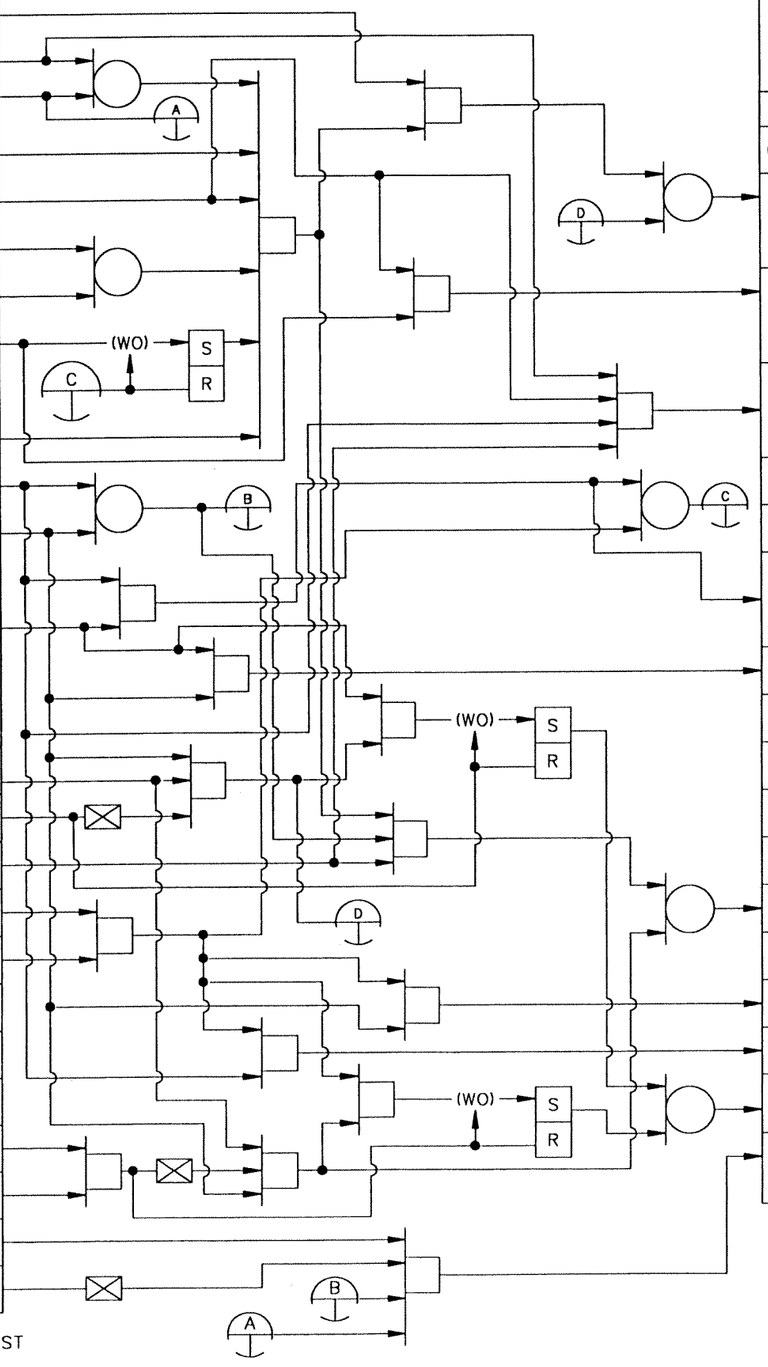
FIGURE 7.7-3 ROD CONTROL AND INFORMATION SYSTEM IBD (Sheet 13 of 87)

INPUT				
REF SH	CLASS	SIGNAL ID	DESCRIPTION	COND-ITION
	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

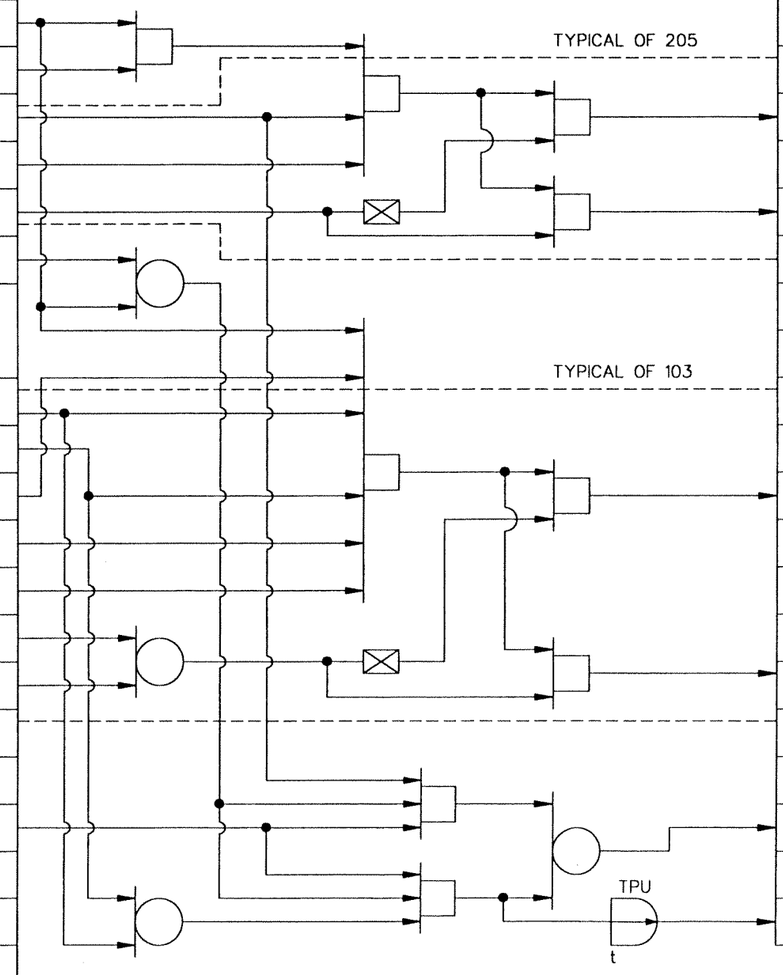


OUTPUT			
CLASS	DESCRIPTION	SIGNAL ID	REF SH
B	SINGLE ROD WITHDRAWAL PERMISSIVE IN REFUEL MODE	1401	19
B	RCIS PERMISSIVE SIGNAL FOR REFUEL PLATFORM MOVEMENT IN REFUEL	1402	C93
B	MANUAL 2-CRD GANG SELECTION IN REFUEL MODE	1409	10
D	READY FOR SINGLE ROD SCRAM TIME TEST	1403	PMCS CRT/ C91
D	READY FOR SINGLE 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					
	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					
	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		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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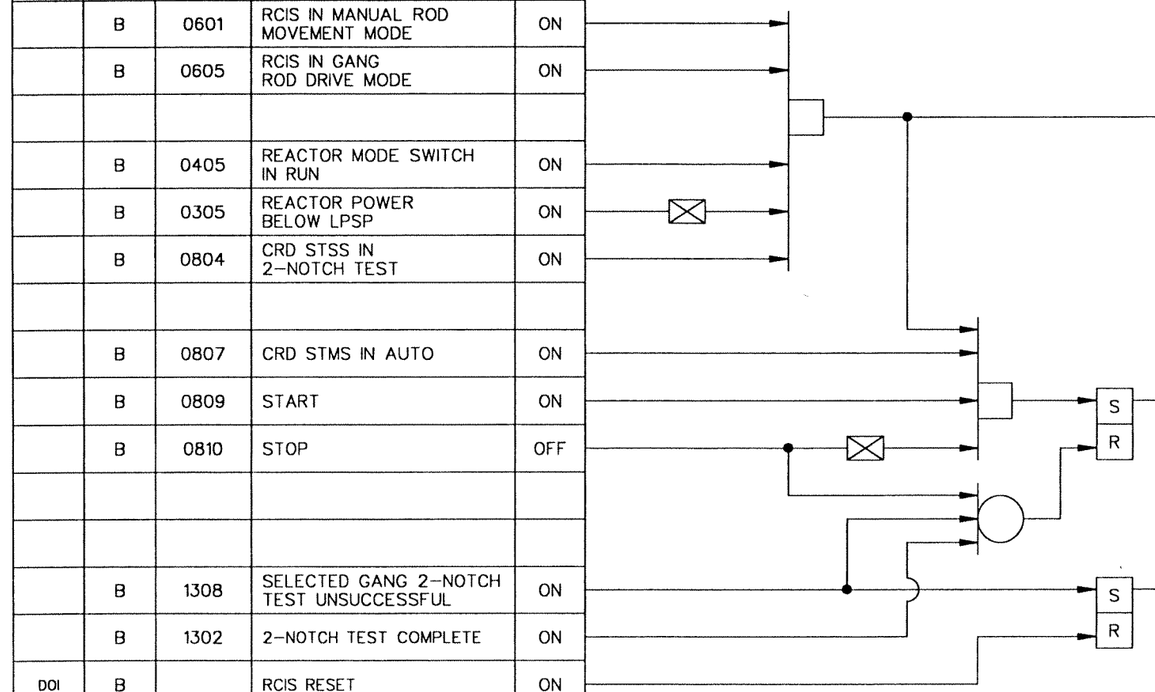
FIGURE 7.7-3 ROD CONTROL AND INFORMATION SYSTEM IBD (Sheet 16 of 87)

I N P U T				
REF SH	CLASS	SIGNAL ID	DESCRIPTION	COND-ITION
	B	0601	RCIS IN MANUAL ROD MOVEMENT MODE	ON
	B	0605	RCIS IN GANG ROD DRIVE MODE	ON
	B	0405	REACTOR MODE SWITCH IN RUN	ON
	B	0305	REACTOR POWER BELOW LPSP	ON
	B	0804	CRD STSS IN 2-NOTCH TEST	ON
	B	0807	CRD STMS IN AUTO	ON
	B	0809	START	ON
	B	0810	STOP	OFF
	B	1308	SELECTED GANG 2-NOTCH TEST UNSUCCESSFUL	ON
	B	1302	2-NOTCH TEST COMPLETE	ON
DOI	B		RCIS RESET	ON

LOGIC



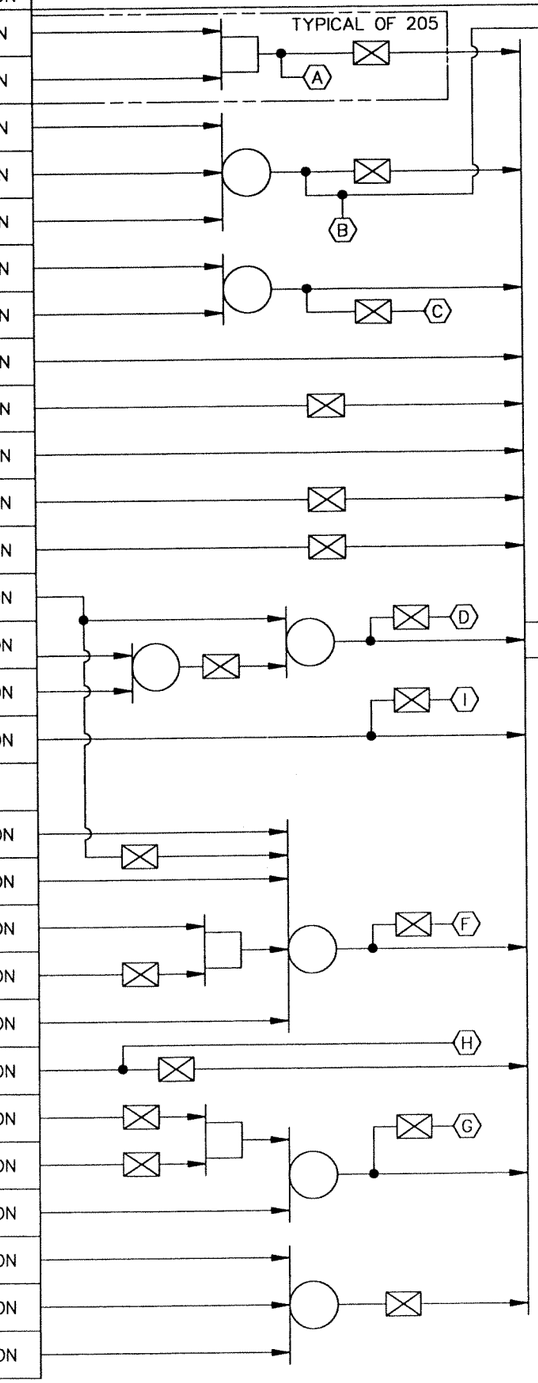
O U T P U T			
CLASS	DESCRIPTION	SIGNAL ID	REF SH
B	ROD WITHDRAWAL PERMISSIVE FOR 2-NOTCH TEST	1701	19
B	INITIATE AUTO GANG SELEC-TION FOR 2-NOTCH TEST	1702	10 13,26
ANN		1703	

AUTOMATIC 2-NOTCH TEST LOGIC

FIGURE 7.7-3 ROD CONTROL AND INFORMATION SYSTEM IBD (Sheet 17 of 87)

INPUT				
REF SH	CLASS	SIGNAL ID	DESCRIPTION	COND-ITION
	B	2416	THE N-TH ROD IS SELECTED	ON
	B	0304	THE N-TH ROD IS SEPARATED	ON
	B	1103	GANG MISALIGNMENT ROD BLOCK	ON
	B	1205	GANG MISALIGNMENT ROD BLOCK	ON
	B	1309	GANG MISALIGNMENT ROD BLOCK	ON
	B	0302	NO SRNM ROD BLOCK	ON
	B	0405	REACTOR MODE SWITCH IN RUN	ON
	B	0303	NO APRM ROD BLOCK	ON
	B	0402	REACTOR MODE SWITCH IN SHUT DOWN	ON
	B	0301	LOW CRD CHARGING HDR PRESS TRIP NOT BYPASSED	ON
	B	0504	CRD CHARGING HDR PRESS IS LOW	ON
	B	0502	RFCS WITHDRAWAL BLOCK REQUEST	ON
	B	0305	REACTOR POWER BELOW LPSP	ON
	B	0406	MRBM-A ROD BLOCK	ON
	B	0407	MRBM-B ROD BLOCK	ON
	B	0505	PERIOD BASED ROD WD PERMISSIVE	ON
	B	1410	COUPLING CHECK ROD WITHDRAWAL PERMISSIVE	ON
	B	0403	REACTOR MODE SWITCH IN REFUEL	ON
	B	8301	RWM ROD WITHDRAWAL PERMISSIVE	ON
	B	8503	RWM-A TROUBLE	ON
	B	2105	RWM-A BYPASSED	ON
	B	3201	RAPI-A TROUBLE	ON
	B	6709	ATLM-A TROUBLE	ON
	B	3105	ATLM-A ROD WD BLOCK SIGNAL TO RAPI-A	ON
	B	2103	ATLM-A BYPASSED	ON
	B	0501	SCRRI CONDITION EXISTS	ON
	B	0503	ARI CONDITION EXISTS	ON
	B	0401	SCRAM FOLLOW CONDITION EXISTS	ON

LOGIC



OUTPUT			
CLASS	DESCRIPTION	SIGNAL ID	REF SH
ANN	GANG MISALIGNMENT ROD WD BLOCK	1802	
D	ROD SEPARATION ROD WD BLOCK CONDITION IDENT	1803	PMCS CRT/C91
D	GANG MISALIGNMENT ROD WD BLOCK CONDITION IDENT	1804	PMCS CRT/C91
D	SRNM ROD WD BLOCK CONDITION IDENT	1805	PMCS CRT/C91
D	MRBM ROD WD BLOCK CONDITION IDENT	1806	PMCS CRT/C91
D	RWM ROD WD BLOCK CONDITION IDENT	1808	PMCS CRT/C91
B	ROD WITHDRAWAL PERMISSIVE NO. 1	1801	19
D	ATLM-A TROUBLE/ROD WD BLOCK CONDITION IDENT	1809	PMCS CRT/C91
D	RAPI-A TROUBLE ROD WD BLOCK CONDITION IDENT	1810	PMCS CRT/C91
D	PERIOD BASED ROD WD BLOCK CONDITION IDENT	1811	PMCS CRT/C91

ROD WITHDRAWAL PERMISSIVE LOGIC 1/2

FIGURE 7.7-3 ROD CONTROL AND INFORMATION SYSTEM IBD (Sheet 18 of 87)

I N P U T				
REF SH	CLASS	SIGNAL ID	DESCRIPTION	COND–ITION
	B	8503	RWM–A TROUBLE	ON
	B	1401	SINGLE ROD WITHDRAWAL PERMISSIVE IN REFUEL MODE	ON
	B	8501	RWM SINGLE ROD WD PERMISSIVE IN REFUEL MODE	ON
	B	1404	DUAL ROD WITHDRAWAL PERMISSIVE IN REFUEL MODE	ON
	B	8502	RWM DUAL ROD WD PERMISSIVE IN REFUEL MODE FOR DUAL CRD SCRAM TIME TEST	ON
	B	1410	COUPLING CHECK ROD WITHDRAWAL PERMISSIVE	ON
	B	1701	ROD WITHDRAWAL PER–MISSIVE FOR 2–NOTCH TEST	ON
	B	0805	CRD SURVEILLANCE TEST SELECTION SWITCH IN IDLE	ON
	B	1801	ROD WITHDRAWAL PERMISSIVE NO. 1	ON
	B	3701	2–CHANNEL DISAGREEMENT	ON

LOGIC

O U T P U T			
CLASS	DESCRIPTION	SIGNAL ID	REF SH
D	CRD SURVEILLANCE TEST RELATED ROD WD BLOCK CONDITION IDENTIFICATION	1903	PMCS CRT/ C91
B	ROD WITHDRAWAL PERMISSIVE	1901	7,13 39,41 43,50
L		1906	DOI
ANN		1902	

ROD WITHDRAWAL PERMISSIVE LOGIC 2/2

FIGURE 7.7–3 ROD CONTROL AND INFORMATION SYSTEM IBD (Sheet 19 of 87)

INPUT					LOGIC	OUTPUT			
REF SH	CLASS	SIGNAL ID	DESCRIPTION	COND-ITION		CLASS	DESCRIPTION	SIGNAL ID	REF SH
	B	3201	RAPI-A TROUBLE	ON		L		2007	DOI
						ANN		2008	
	B	0305	REACTOR POWER IS BELOW LPSP	ON		B	ROD INSERT PERMISSIVE	2001	7
	B	8401	RWM ROD INSERT PERMISSIVE	ON					
	B	2105	RWM-A BYPASSED	ON		D	RAPI-A TROUBLE INSERT BLOCK CONDITION IDENTIFICATION	2003	PMCS CRT/ C91
	B	8503	RWM-A TROUBLE	ON		D	RWM-A TROUBLE INSERT BLOCK CONDITION IDENTIFICATION	2004	PMCS CRT/ C91
	B	2103	ATLM-A BYPASSED	ON		D	ATLM-A TROUBLE INSERT BLOCK CONDITION IDENTIFICATION	2005	PMCS CRT/ C91
	B	6709	ATLM-A TROUBLE	ON					
	B	6703	ATLM-A ROD BLOCK SIGNAL TO RAPI-A	ON					
	B	3701	2-CHANNEL DISAGREEMENT	ON					

ROD INSERT PERMISSIVE LOGIC

FIGURE 7.7-3 ROD CONTROL AND INFORMATION SYSTEM IBD (Sheet 20 of 87)

INPUT				
REF SH	CLASS	SIGNAL ID	DESCRIPTION	COND-ITION
	B	3101	RACS-A PARTIAL BYPASS PERMISSIVE	ON
DOI	B		RACS BYPASS SWITCH PLACED IN "NONE"	
DOI	B		RACS-A BYPASS SWITCH ACTIVITED	ON
		2102	RACS-B BYPASSED	ON
		2101	RACS-A BYPASSED	ON
DOI	B		RACS-B BYPASS SWITCH ACTIVITED	ON
	B	3101(B)	RACS-B PARTIAL BYPASS PERMISSIVE	ON
		2103	ATLM-A BYPASSED	ON
DOI	B		ATLM-A BYPASS SWITCH ACTIVITED	ON
		2104	ATLM-B BYPASSED	ON
DOI	B		ATLM BYPASS SWITCH PLACED IN "NONE"	ON
DOI	B		ATLM-B BYPASS SWITCH ACTIVITED	ON
		2105	RWM-A BYPASSED	ON
DOI	B		RWM-A BYPASS SWITCH ACTIVITED	ON
		2106	RWM-B BYPASSED	ON
DOI	B		RWM-B BYPASS SWITCH ACTIVITED	ON
DOI	B		RWM BYPASS SWITCH PLACED IN "NONE"	ON

LOGIC

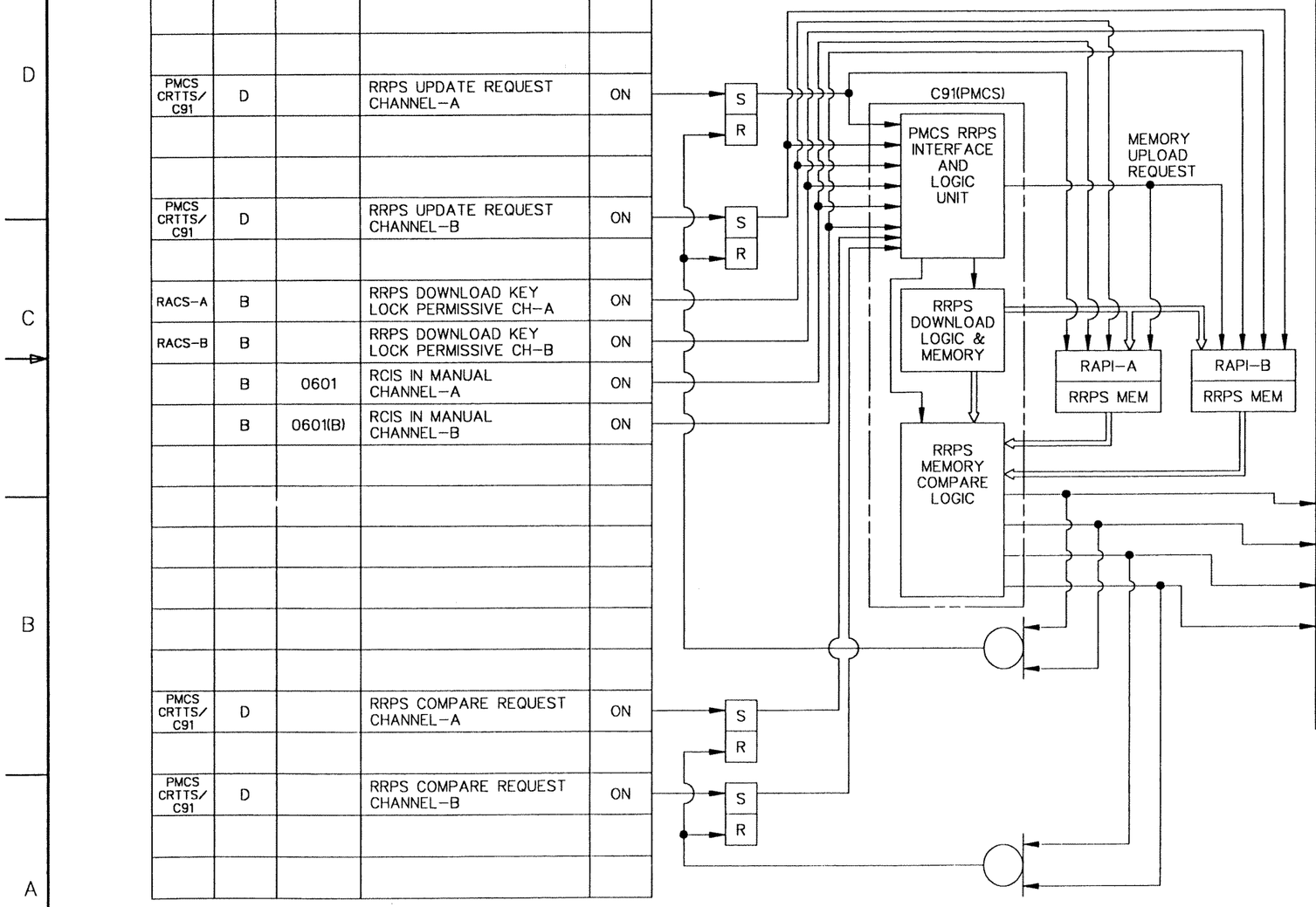
OUTPUT			
CLASS	DESCRIPTION	SIGNAL ID	REF SH
B		2113	DOI
D		2114	PMCS CRT/C91
B	SWITCH TO MANUAL	2107	31
B	RACS-A BYPASSED	2101	21
B		2115	DOI
D		2116	PMCS CRT/C91
B	SWITCH TO MANUAL *	2108	
B	RACS-B BYPASSED	2102	28 29(B)
B		2117	DOI
D		2118	PMCS CRT/C91
B	SWITCH TO MANUAL	2109	31
B	ATLM-A BYPASSED	2103	18,20 66(B)
B		2119	DOI
D		2120	PMCS CRT/C91
B	SWITCH TO MANUAL *	2110	
B	ATLM-B BYPASSED	2104	21,66
B		2121	DOI
D		2122	PMCS CRT/C91
B	SWITCH TO MANUAL	2111	31
B	RWM-A BYPASSED	2105	18,20
B		2123	DOI
D		2124	PMCS CRT/C91
B	SWITCH TO MANUAL *	2112	
B	RWM-B BYPASSED	2106	21

* THESE SIGNALS GENERATE CHANNEL-B SWITCH TO MANUAL CONDITION IN CHANNEL-B. THE INPUT SIGNALS AND RELATED LOGIC THAT GENERATE THESE SIGNALS ARE PART OF CHANNEL B.

RACS, ATLM & RWM SINGLE CHANNEL BYPASS LOGIC FOR A & B CHANNELS

FIGURE 7.7-3 ROD CONTROL AND INFORMATION SYSTEM IBD (Sheet 21 of 87)

I N P U T					LOGIC	O U T P U T			
REF SH	CLASS	SIGNAL ID	DESCRIPTION	COND-ITION		CLASS	DESCRIPTION	SIGNAL ID	REF SH
PMCS CRTTS/ C91	D		RRPS UPDATE REQUEST CHANNEL-A	ON					
PMCS CRTTS/ C91	D		RRPS UPDATE REQUEST CHANNEL-B	ON					
RACS-A	B		RRPS DOWNLOAD KEY LOCK PERMISSIVE CH-A	ON					
RACS-B	B		RRPS DOWNLOAD KEY LOCK PERMISSIVE CH-B	ON					
	B	0601	RCIS IN MANUAL CHANNEL-A	ON					
	B	0601(B)	RCIS IN MANUAL CHANNEL-B	ON					
PMCS CRTTS/ C91	D		RRPS COMPARE REQUEST CHANNEL-A	ON					
PMCS CRTTS/ C91	D		RRPS COMPARE REQUEST CHANNEL-B	ON					
						L	RRPS DOWNLOAD SUCCESSFUL	2201	PMCS CRT/C91
						L	RRPS DOWNLOAD UNSUCCESSFUL	2202	PMCS CRT/C91
						L	RRPS COMPARE SUCCESSFUL	2203	PMCS CRT/C91
						L	RRPS COMPARE UNSUCCESSFUL	2204	PMCS CRT/C91

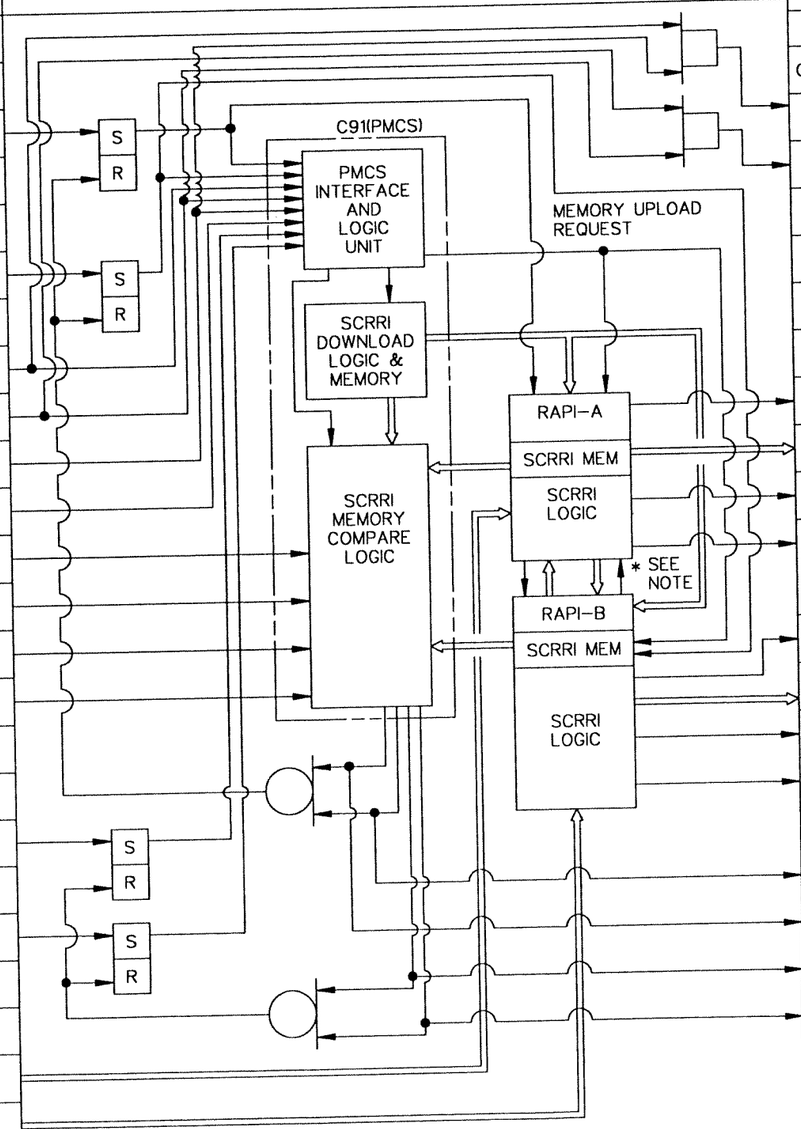


RRPS DOWNLOAD AND COMPARE LOGIC

FIGURE 7.7-3 ROD CONTROL AND INFORMATION SYSTEM IBD (Sheet 22 of 87)

INPUT				
REF SH	CLASS	SIGNAL ID	DESCRIPTION	COND-ITION
PMCS CRTTS/ C91	D		SCRRI UPDATE REQUEST CHANNEL-A	ON
PMCS CRTTS/ C91	D		SCRRI UPDATE REQUEST CHANNEL-B	ON
RACS-A	B		SCRRI DOWNLOAD KEY LOCK PERMISSIVE CH-A	ON
RACS-B	B		SCRRI DOWNLOAD KEY LOCK PERMISSIVE CH-B	ON
	B	0601	RCIS IN MANUAL CHANNEL-A	ON
	B	0601(B)	RCIS IN MANUAL CHANNEL-B	ON
RAPI-A TO PMCS	D	2305	CROSS CHANNEL CHECK OK	ON
RAPI-A TO PMCS			SCRRI TARGET POSITION DOWNLOAD TO RSPCS-A COMPLETE	ON
RAPI-B TO PMCS			CROSS CHANNEL CHECK OK	ON
RAPI-B TO PMCS			SCRRI TARGET POSITION DOWNLOAD TO RSPCS-B COMPLETE	ON
PMCS CRTTS/ C91	D		SCRRI COMPARE REQUEST CHANNEL-A	ON
PMCS CRTTS/ C91	D		SCRRI COMPARE REQUEST CHANNEL-B	ON
	B	2561	SCRRI TARGET POSITION ANSWER BACK	ON
	B	2561(B)	SCRRI TARGET POSITION ANSWER BACK	ON

LOGIC



OUTPUT			
CLASS	DESCRIPTION	SIGNAL ID	REF SH
B	SCRRI UPDATE PERMITTED	2301	45
B	SCRRI UPDATE PERMITTED	2302	45
B	SCRRI TARGET POSITION UPDATE REQUEST	2303	45
B	SCRRI TARGET POSITION	2304	45
D	CROSS CHANNEL CHECK OK	2305	PMCS
D	SCRRI TARGET POSITION DOWNLOAD TO RSPC-A COMPLETE	2306	PMCS
B	SCRRI TARGET POSITION UPDATE REQUEST	2303(B)	45(B)
B	SCRRI TARGET POSITION	2304(B)	45(B)
D	CROSS CHANNEL CHECK OK	2309	PMCS
D	SCRRI TARGET POSITION DOWNLOAD TO RSPC-B COMPLETE	2310	PMCS
L	SCRRI DOWNLOAD SUCCESSFUL	2311	PMCS CRT/C91
L	SCRRI DOWNLOAD UNSUCCESSFUL	2312	PMCS CRT/C91
L	SCRRI COMPARE SUCCESSFUL	2313	PMCS CRT/C91
L	SCRRI COMPARE UNSUCCESSFUL	2314	PMCS CRT/C91

THIS LOGIC REPRESENTS THE INTERCONNECTIONS BETWEEN RAPI-A, RAPI-B AND THE PMCS FOR THE ACCOMPLISHMENT OF SCRRI TARGET POSITIONS DOWNLOAD TO RSPCS AND THE RELATED VERIFICATIONS.

* THESE SIGNALS REPRESENT REQUEST FOR MEMORY DOWNLOAD AND ACTUAL MEMORY DOWNLOAD FROM RAPI-A TO RAPI-B AND VISE VERSA.

SCRRI/PMCS DOWNLOAD AND COMPARE LOGIC

FIGURE 7.7-3 ROD CONTROL AND INFORMATION SYSTEM IBD (Sheet 23 of 87)

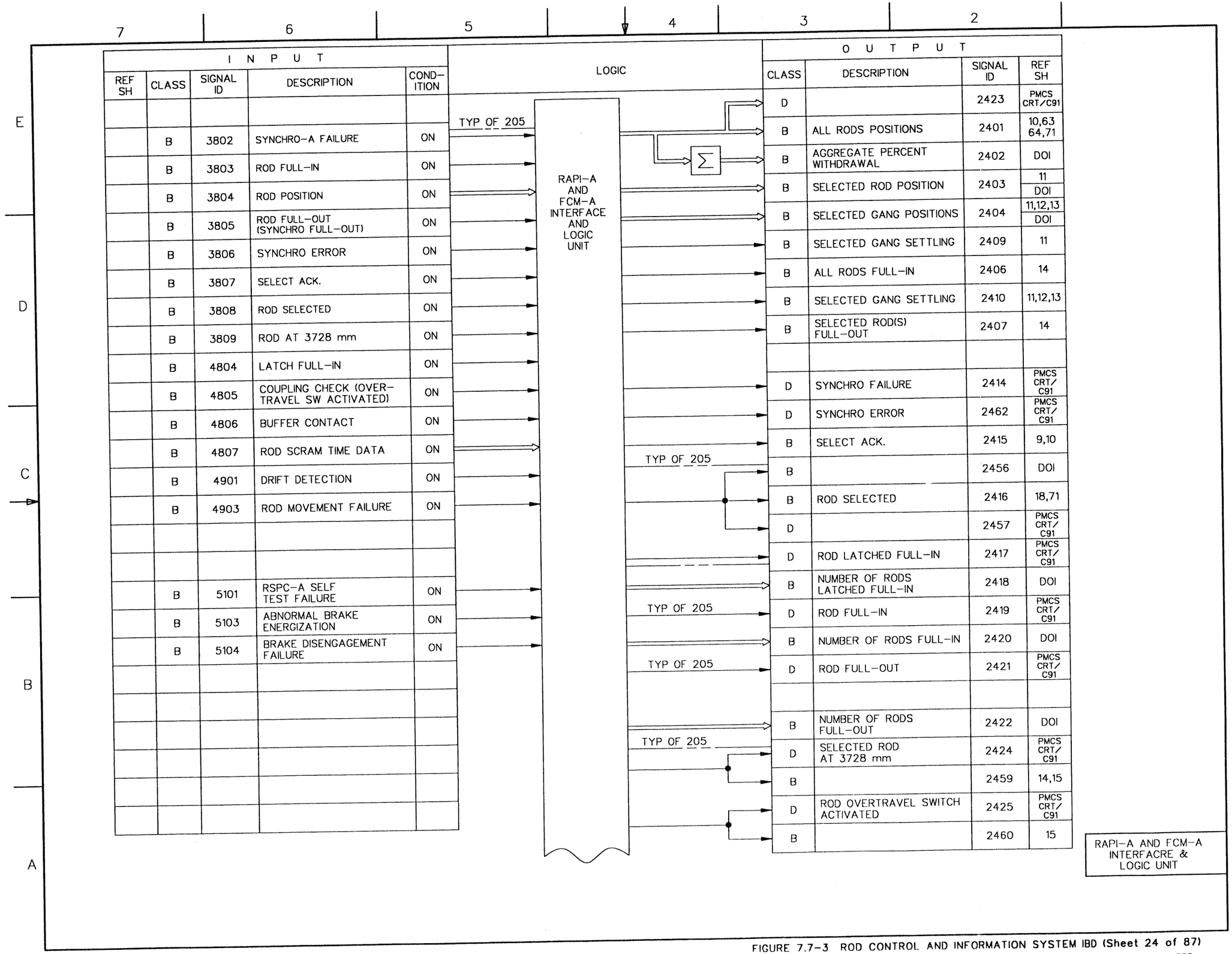


FIGURE 7.7-3 ROD CONTROL AND INFORMATION SYSTEM IBD (Sheet 24 of 87)

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		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

RAPI-A AND FCM-A INTERFACE & LOGIC UNIT

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
	B	5211	A POWER SUPPLY IN FCM-Aj HAS FAILED	ON	TYP OF *	D	INVERTER TROUBLE	2644	PMCS CRT/C91
	B	5212	FCM-Aj IS OK	ON		B		2645	32
						D	INVERTER CONTROLLER TROUBLE	2646	PMCS CRT/C91
	B	0604	RCIS IN SINGLE ROD DRIVE MODE	ON		B		2647	32
	B	0605	RCIS IN GANG ROD DRIVE MODE	ON					
	B	3004	INOP BYPASSED ROD(S) COORDINATES	ON					
					TYP OF *	D	A POWER SUPPLY IN FCM-Aj HAS FAILED	2648	PMCS CRT/ C91
	B	1003	COORDINATES OF SELECTED GANG	ON		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

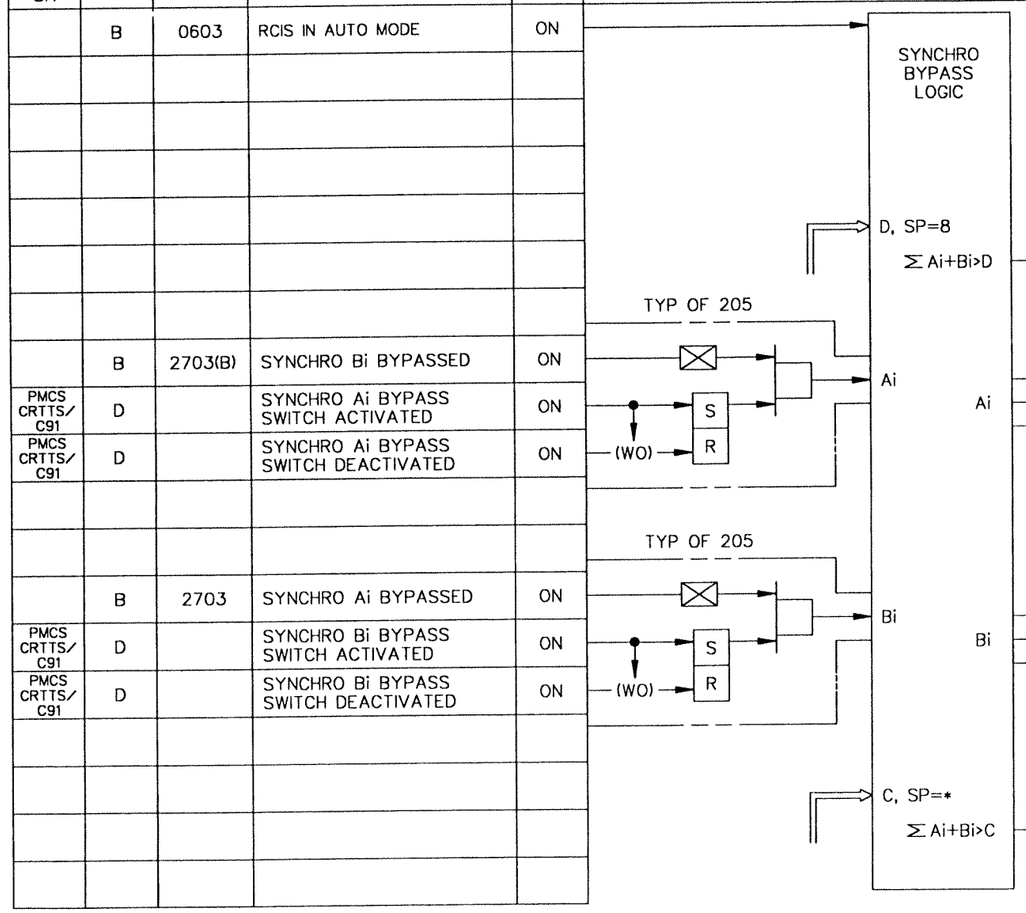
* TYPICAL OF 205/# OF RSPCs PER FCM

ROD POSITION INTERFACE LOGIC

FIGURE 7.7-3 ROD CONTROL AND INFORMATION SYSTEM IBD (Sheet 26 of 87)

I N P U T				
REF SH	CLASS	SIGNAL ID	DESCRIPTION	COND-ITION
	B	0603	RCIS IN AUTO MODE	ON
	B	2703(B)	SYNCHRO Bi BYPASSED	ON
PMCS CRTTS/ C91	D		SYNCHRO Ai BYPASS SWITCH ACTIVATED	ON
PMCS CRTTS/ C91	D		SYNCHRO Ai BYPASS SWITCH DEACTIVATED	ON
	B	2703	SYNCHRO Ai BYPASSED	ON
PMCS CRTTS/ C91	D		SYNCHRO Bi BYPASS SWITCH ACTIVATED	ON
PMCS CRTTS/ C91	D		SYNCHRO Bi BYPASS SWITCH DEACTIVATED	ON

LOGIC



O U T P U T			
CLASS	DESCRIPTION	SIGNAL ID	REF SH
D		2701	PMCS CRT/C91
B	SWITCH TO MANUAL	2702	31
D		2705	PMCS CRT/C91
B	SYNCHRO Ai BYPASSED	2703	27
D		2706	PMCS CRT/C91
B	SYNCHRO Bi BYPASSED	2703(B)	27
ANN	BYPASSED SYNCHROS MORE THAN ALLOWED	2704	

* SP TO BE DETERMINED BY PLANT TECHNICAL SPECIFICATION

SYNCHRO BYPASS LOGIC

FIGURE 7.7-3 ROD CONTROL AND INFORMATION SYSTEM IBD (Sheet 27 of 87)

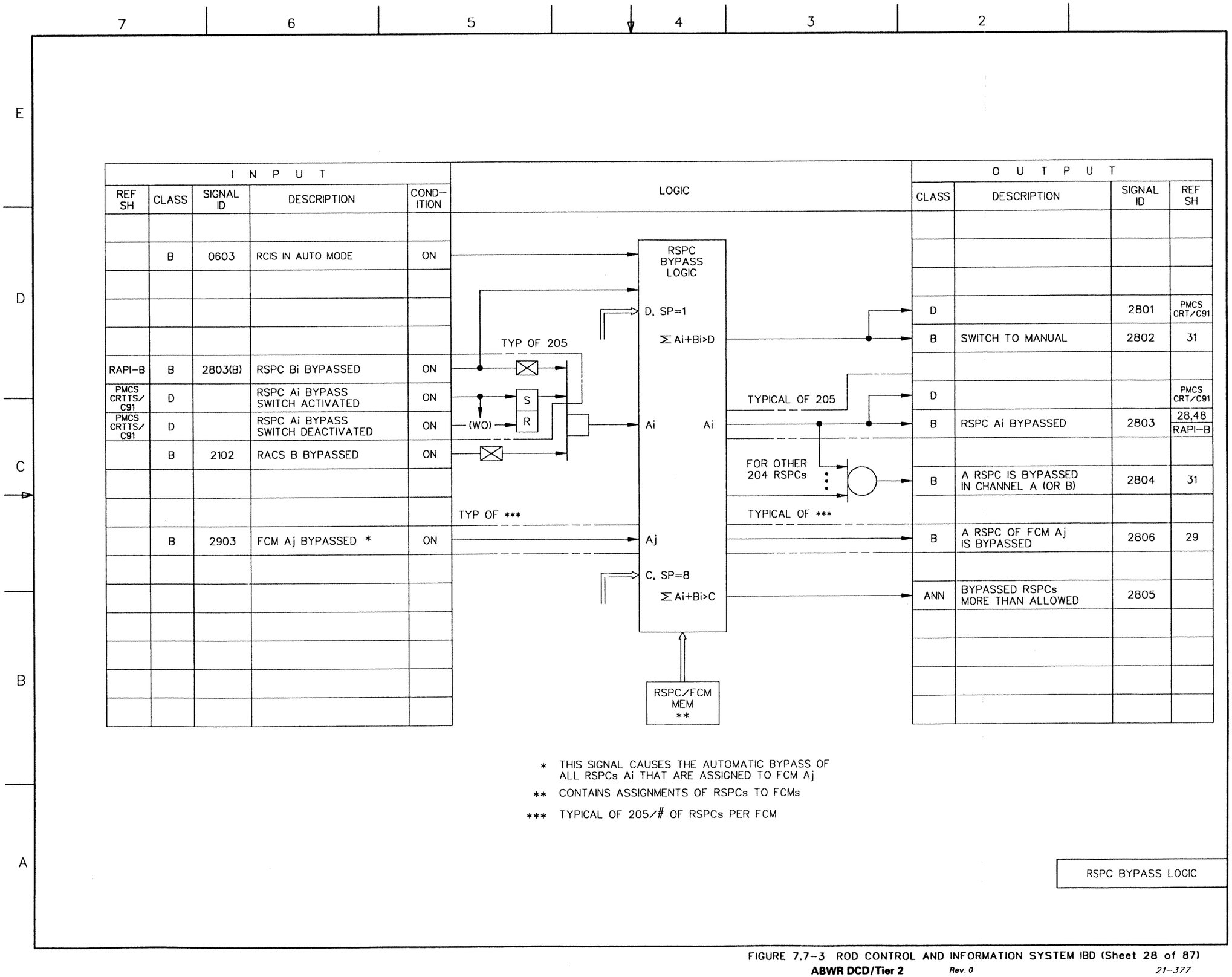
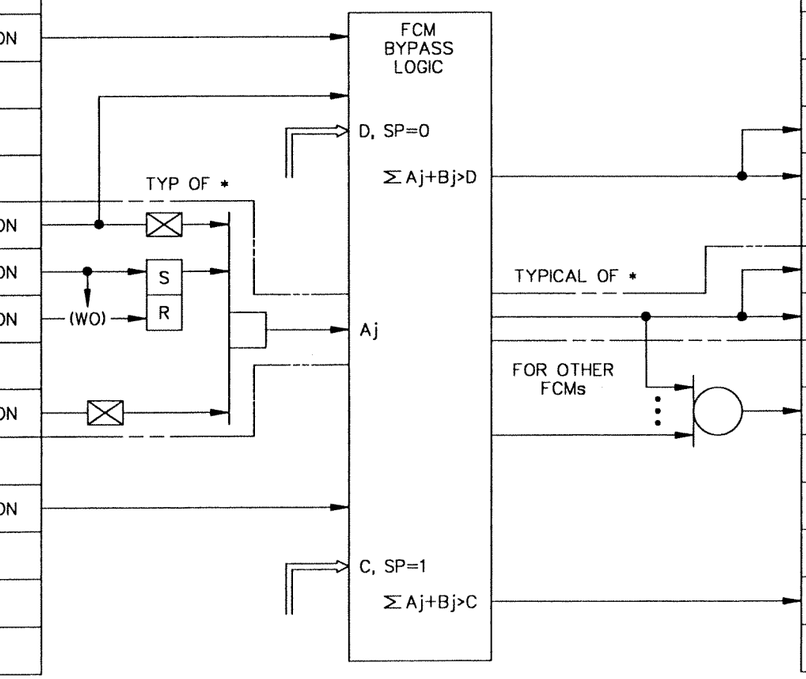


FIGURE 7.7–3 ROD CONTROL AND INFORMATION SYSTEM IBD (Sheet 28 of 87)

I N P U T				
REF SH	CLASS	SIGNAL ID	DESCRIPTION	COND-ITION
	B	0603	RCIS IN AUTO MODE	ON
RAPI-B		2903(B)	FCM Bj BYPASSED	ON
PMCS CRTTS/ C91	D		FCM Aj BYPASS SWITCH ACTIVATED	ON
PMCS CRTTS/ C91	D		FCM Aj BYPASS SWITCH DEACTIVATED	ON
		2806(B)	A RSPC OF FCM Bj IS BYPASSED	ON
	B	2101	RACS A BYPASSED **	ON

LOGIC



O U T P U T			
CLASS	DESCRIPTION	SIGNAL ID	REF SH
D		2901	PMCS CRT/C91
B	SWITCH TO MANUAL	2902	31
D			PMCS CRT/C91
B	FCM Aj BYPASSED	2903	28,29
B	A FCM IS BYPASSED IN CHANNEL A (OR B)	2904	31
ANN	BYPASSED FCMs MORE THAN ALLOWED	2905	

* TYPICAL OF 205/# OF RSPCs PER FCM

** THIS SIGNAL CAUSES THE AUTOMATIC BYPASS OF ALL FCMs Aj

FCM BYPASS LOGIC

FIGURE 7.7-3 ROD CONTROL AND INFORMATION SYSTEM IBD (Sheet 29 of 87)

INPUT					LOGIC	OUTPUT			
REF SH	CLASS	SIGNAL ID	DESCRIPTION	COND-ITION		CLASS	DESCRIPTION	SIGNAL ID	REF SH
	B	0603	RCIS IN AUTO MODE	ON	CONTROL ROD INOP BYPASS LOGIC				
					D, SP=8	D		3001	PMCS CRT/C91
					ΣAi>D	B	SWITCH TO MANUAL	3002	31
	B	0403	REACTOR MODE SWITCH IN REFUEL	ON		B	NUMBER OF INOP BYPASS RODS	3007	DOI
					TYPICAL OF 205	D		3006	PMCS CRT/C91
PMCS CRTTS/ C91			INOP BYPASS SWITCH OF ROD Ai ACTIVATED	ON	S	Ai	B	ROD Ai INOP BYPASSED	3003	50
PMCS CRTTS/ C91			INOP BYPASS SWITCH OF ROD Ai DEACTIVATED	ON	(WO) R				
						B	INOP BYPASSED ROD(S) COORDINATES	3004	9,10 26,71
					E, SP=21				
						ANN	INOP BYPASSED RODS MORE THAN ALLOWED IN REFUELING MODE	3008	
					C, SP=8 ΣAi>C				
						ANN	INOP BYPASSED RODS MORE THAN ALLOWED	3005	

TYPICAL OF 205

INOP BYPASS LOGIC

FIGURE 7.7-3 ROD CONTROL AND INFORMATION SYSTEM IBD (Sheet 30 of 87)

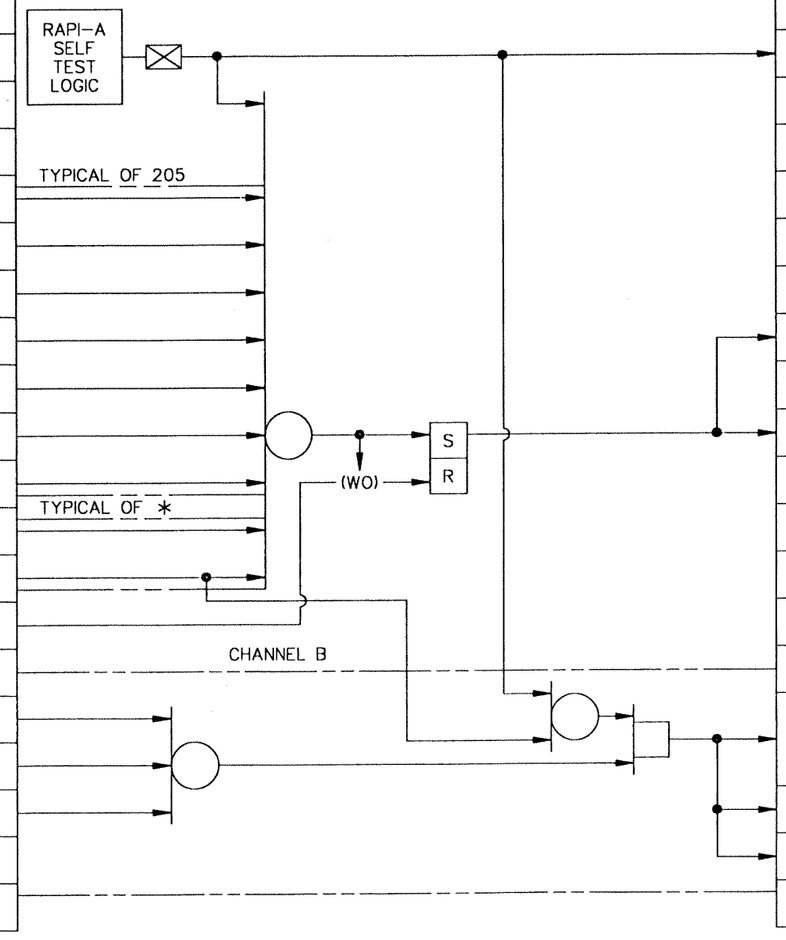
I N P U T					LOGIC	O U T P U T			
REF SH	CLASS	SIGNAL ID	DESCRIPTION	COND-ITION		CLASS	DESCRIPTION	SIGNAL ID	REF SH
	B	2904(B)	A FCM Bi IS BYPASSED	ON					
	B	2804(B)	A RSPC Bi IS BYPASSED	ON		B	RACS–A PARTIAL BYPASS PERMISSIVE	3101	21
	B	2702	SWITCH TO MANUAL	ON					
	B	2802	SWITCH TO MANUAL	ON					
	B	2902	SWITCH TO MANUAL	ON		D			PMCS CRT/C91
	B	3002	SWITCH TO MANUAL	ON					
	B	2107	SWITCH TO MANUAL	ON		B	SWITCH TO MANUAL	3102	6
	B	2109	SWITCH TO MANUAL	ON					
	B	2111	SWITCH TO MANUAL	ON					
	B	1310	SWITCH TO MANUAL	ON					
	B	2103	ATLM–A BYPASSED	ON					
	B	6703	ATLM–A ROD WITHDRAWAL BLOCK SIGNAL TO RAPI–A	ON		ANN		3103	
	B	0305	REACTOR POWER BELOW LPSP	ON		B	ATLM–A ROD WITHDRAWAL BLOCK	3105	18
	B	2105	RWM–A BYPASSED	ON		ANN	RWM–A WD/INS BLOCK	3104	
	B	8401	RWM–A ROD INSERT PERMISSIVE	ON					
			RWM–A SINGLE ROD WD PERMISSIVE	ON					
			RWM–A DUAL ROD WD PERMISSIVE	ON					
			RWM–A ROD WD PERMISSIVE	ON					

RWM, ATLM, AND RACS BYPASS LOGIC

FIGURE 7.7–3 ROD CONTROL AND INFORMATION SYSTEM IBD (Sheet 31 of 87)

I N P U T				
REF SH	CLASS	SIGNAL ID	DESCRIPTION	COND–ITION
	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	2555	BRAKE DISENGAGEMENT FAILURE	ON
	B	2645	INVERTER TROUBLE	ON
	B	2647	INVERTER CONTROLLER TROUBLE	ON
	B	2649	A POWER SUPPLY IN FCM–Aj HAS FAILED	ON
	B	2651	FCM–Aj HAS FAILED	ON
DOI	B		RCIS RESET	ON
RAPI–B	B	0501(B)	SCRRI RODS GO IN EMERGENCY	ON
RAPI–B	B	0503(B)	ARI CONDITION EXIST	ON
RAPI–B	B	0401(B)	SCRAM FOLLOW CONDITION EXISTS	ON

LOGIC



O U T P U T			
CLASS	DESCRIPTION	SIGNAL ID	REF SH
B	RAPI–A TROUBLE	3201	18,20
B		3202	DOI
ANN	RCIS TROUBLE	3203	
B	RACS–A AUTO BYPASSED WITHIN CHANNEL B	3206(B)	48
D		3205	PMCS CRT/C91
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)

INPUT					LOGIC	OUTPUT			
REF SH	CLASS	SIGNAL ID	DESCRIPTION	CONDITION		CLASS	DESCRIPTION	SIGNAL ID	REF SH
	B	0308(A)	REACTOR POWER IS BELOW LPSP	ON	SELECTION LOGIC DETAIL A*	L	REACTOR POWER IS ABOVE LPSP	3301	
	B	0308(B)		ON		B	VALIDATION ERROR	3302	37
	B	0408(A)	SCRAM FOLLOW CONDITION EXISTS	ON	SELECTION LOGIC DETAIL A*	L	SCRAM FOLLOW CONDITION EXISTS	3303	
	B	0408(B)		ON		B	VALIDATION ERROR	3304	37
	B	0507(A)	SCRRI CONDITION EXISTS	ON	SELECTION LOGIC DETAIL A*	L	SCRRI CONDITION EXISTS	3305	
	B	0507(B)		ON		B	VALIDATION ERROR	3306	37
	B	0506(A)	ARI CONDITION EXISTS	ON	SELECTION LOGIC DETAIL A*	L	ARI CONDITION EXISTS	3307	
	B	0506(B)		ON		B	VALIDATION ERROR	3308	37
	B	0615(A)	RCIS IN MANUAL	ON	SELECTION LOGIC DETAIL A*	L	RCIS IN MANUAL	3309	
	B	0615(B)		ON		B	VALIDATION ERROR	3310	37
	B	0616(A)	RCIS IN SEMI-AUTO	ON	SELECTION LOGIC DETAIL A*	L	RCIS IN SEMI AUTO	3311	
	B	0616(B)		ON		B	VALIDATION ERROR	3312	37
	B	0617(A)	RCIS IN AUTO	ON	SELECTION LOGIC DETAIL A*	L	RCIS IN AUTO	3313	
	B	0617(B)		ON		B	VALIDATION ERROR	3314	37
	B	3204(A)	RACS-A AUTO BYPASSED	ON		B	RACS-A BYPASS IN EFFECT	3315	
	B	2101	RACS-A BYPASSED	ON		B	RACS-B BYPASS IN EFFECT	3316	
	B	2102	RACS-B BYPASSED	ON					
	B	3204(B)	RACS-B AUTO BYPASSED	ON					

* SEE DETAIL A ON SHEET 59

DOI LOGIC

FIGURE 7.7-3 ROD CONTROL AND INFORMATION SYSTEM IBD (Sheet 33 of 87)

INPUT					LOGIC	OUTPUT			
REF SH	CLASS	SIGNAL ID	DESCRIPTION	COND-ITION		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)

INPUT					LOGIC	OUTPUT			
REF SH	CLASS	SIGNAL ID	DESCRIPTION	COND-ITION		CLASS	DESCRIPTION	SIGNAL ID	REF SH
	B	0827(A)	CRDSTMS IN MANUAL	ON	SELECTION LOGIC DETAIL A*	L	CRDSTMS IN MANUAL	3501	
	B	0827(B)		ON		B	VALIDATION ERROR	3502	37
	B	0829(A)	CRD SURVEILLANCE TEST STARTED	ON	SELECTION LOGIC DETAIL A*	L	CRD SURVEILLANCE TEST STARTED	3503	
	B	0829(B)		ON		B	VALIDATION ERROR	3504	37
	B	0831(A)	CRD SURVEILLANCE TEST STOPPED	ON	SELECTION LOGIC DETAIL A*	L	CRD SURVEILLANCE TEST STOPPED	3505	
	B	0831(B)		ON		B	VALIDATION ERROR	3506	37
	B	1906(A)	ROD WITHDRAWAL BLOCK	ON	SELECTION LOGIC DETAIL A*	L	ROD WITHDRAWAL BLOCK	3507	
	B	1906(B)		ON		B	VALIDATION ERROR	3508	37
	B	2007(A)	ROD INSERT BLOCK	ON	SELECTION LOGIC DETAIL A*	L	ROD INSERT BLOCK	3509	
	B	2007(B)		ON		B	VALIDATION ERROR	3510	37
	B	2402(A)	AGGREGATE PERCENT WITHDRAWAL		SP → A C B COMPARATOR LOGIC |A-B|>C	L	AGGREGATE PERCENT WITHDRAWAL	3511	
	B	2402(B)				B	VALIDATION ERROR	3512	37
	B	2403(A)	SELECTED ROD POSITION		SP → A C B COMPARATOR LOGIC |A-B|>C	L	SELECTED ROD POSITION	3513	
	B	2403(B)				B	VALIDATION ERROR	3514	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 35 of 87)

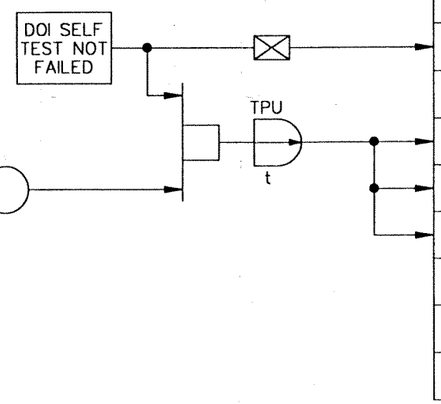
INPUT					LOGIC	OUTPUT			
REF SH	CLASS	SIGNAL ID	DESCRIPTION	COND-ITION		CLASS	DESCRIPTION	SIGNAL ID	REF SH
	B	2404(A)	SELECTED GANG POSITION		SP → A COMPARATOR LOGIC C B |A−B|>C	L	SELECTED GANG POSITION	3601	
	B	2404(B)				B	VALIDATION ERROR	3602	37
	B	2456(A)	ROD SELECTED	ON	A COMPARATOR LOGIC B |A−B|>0	L	SELECTED ROD	3603	
	B	2456(B)		ON		B	VALIDATION ERROR	3604	37
	B	2418(A)	NUMBER OF RODS LATCHED FULL-IN	ON	A COMPARATOR LOGIC B |A−B|>0	L	NUMBER OF RODS LATCHED FULL-IN	3605	
	B	2418(B)		ON		B	VALIDATION ERROR	3606	37
	B	2420(A)	NUMBER OF RODS FULL-IN	ON	A COMPARATOR LOGIC B |A−B|>0	L	NUMBER OF RODS FULL-IN	3607	
	B	2420(B)		ON		B	VALIDATION ERROR	3608	37
	B	2422(A)	NUMBER OF RODS FULL-OUT	ON	A COMPARATOR LOGIC B |A−B|>0	L	NUMBER OF RODS FULL-OUT	3609	
	B	2422(B)		ON		B	VALIDATION ERROR	3610	37
	B	3007(A)	NUMBER OF INOP BYPASSED RODS	ON	A COMPARATOR LOGIC B |A−B|>0	L	NUMBER OF INOP BYPASSED RODS	3611	
	B	3007(B)		ON		B	VALIDATION ERROR	3612	37
	B	3202(A)	RCIS TROUBLE	ON	SELECTION LOGIC DETAIL A*	L	RCIS TROUBLE	3613	
	B	3202(B)		ON		B	VALIDATION ERROR	3614	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 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					
	B	3412	VALIDATION ERROR	ON					
	B	3414	VALIDATION ERROR	ON					
	B	3502	VALIDATION ERROR	ON					
	B	3504	VALIDATION ERROR	ON					
	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					



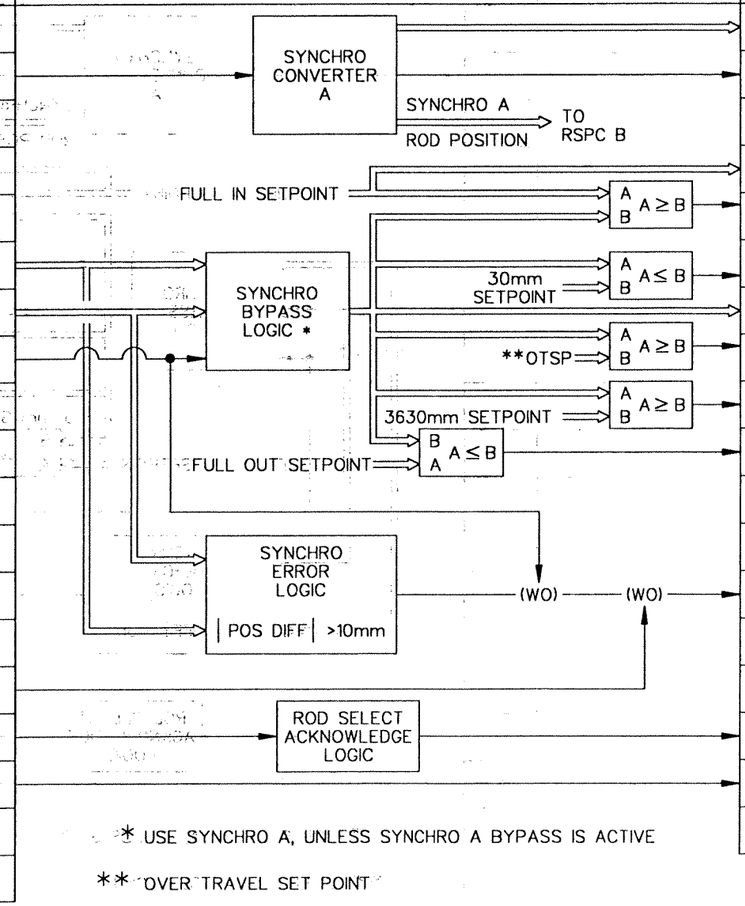
ANN	DOI SELF TEST FAILURE	3702	
B	2–CHANNEL DISAGREEMENT	3701	19,20
B		3703	PMCS CRT/C91
ANN		3704	

2–CHANNEL DISAGREEMENT LOGIC (PART OF DOI)

FIGURE 7.7–3 ROD CONTROL AND INFORMATION SYSTEM IBD (Sheet 37 of 87)

INPUT				
REF SH	CLASS	SIGNAL ID	DESCRIPTION	CONDITION
C12	A		SYNCHRO A ROD POSITION	
	B	3801	SYNCHRO A ROD POSITION	
	B	3801(B)	SYNCHRO B ROD POSITION	
	B	2703	SYNCHRO Ai BYPASSED	ON
	B	2703(B)	SYNCHRO Bi BYPASSED	ON
	B	0901 1002	SELECT REQUEST	ON
	B	0902 1003	ROD SELECTED	ON

LOGIC



OUTPUT			
CLASS	DESCRIPTION	SIGNAL ID	REF SH
B	SYNCHRO A ROD POSITION	3801	38
B	SYNCHRO A FAILURE	3802	24
B	FULL IN SETPOINT	3814	46
B	ROD FULL IN	3803	24
B	SETTLE	3810	47
B	ROD POSITION	3804	24 39 THRU 46,49
B	ROD AT 3728 mm	3809	24
B	SETTLE	3811	47
B	ROD FULL OUT	3805	39
B	SYNCHRO ERROR	3806	24
B	SELECT ACK.	3807	24
B	ROD SELECTED	3808	24,39 46

* USE SYNCHRO A, UNLESS SYNCHRO A BYPASS IS ACTIVE

** OVER TRAVEL SET POINT

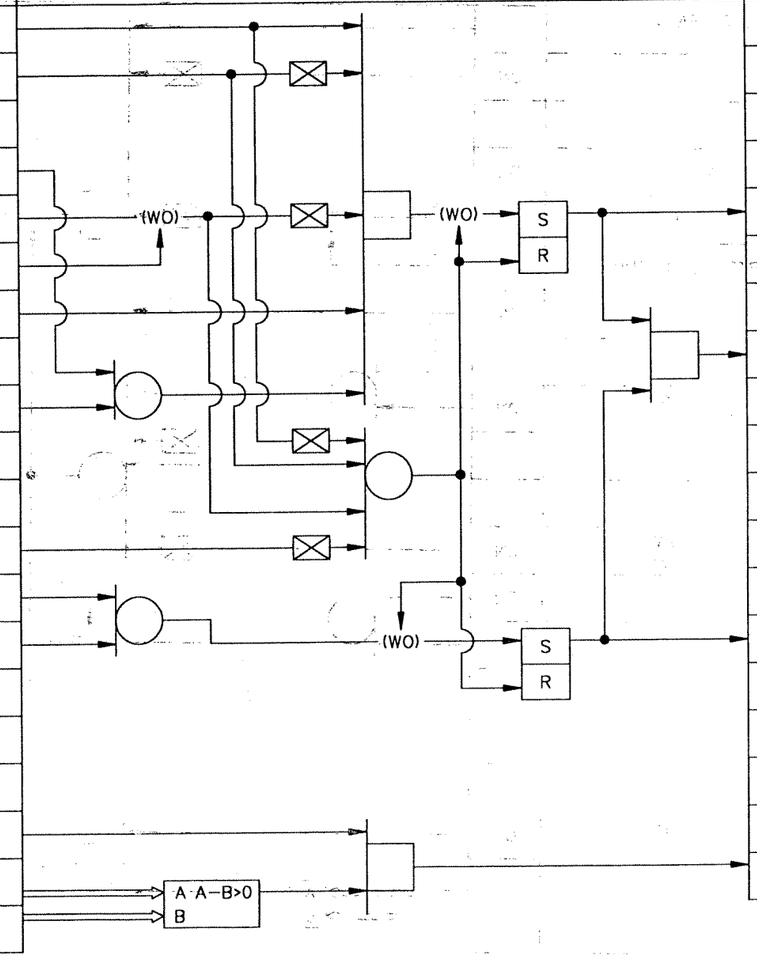
CHANNEL A
TYPICAL OF CHANNEL B

SYNCHRO SELECTION, ECHO, AND ROD POSITION LOGIC

FIGURE 7.7-3 ROD CONTROL AND INFORMATION SYSTEM IBD (Sheet 38 of 87)

INPUT					OUTPUT			
REF SH	CLASS	SIGNAL ID	DESCRIPTION	CONDITION	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					

LOGIC



CHANNEL A
TYPICAL OF CHANNEL B

STEP WITHDRAWAL LOGIC

FIGURE 7.7–3 ROD CONTROL AND INFORMATION SYSTEM IBD (Sheet 39 of 87)

GE Nuclear Energy

Rev. 4
March 1997

ABWR Design Control Document

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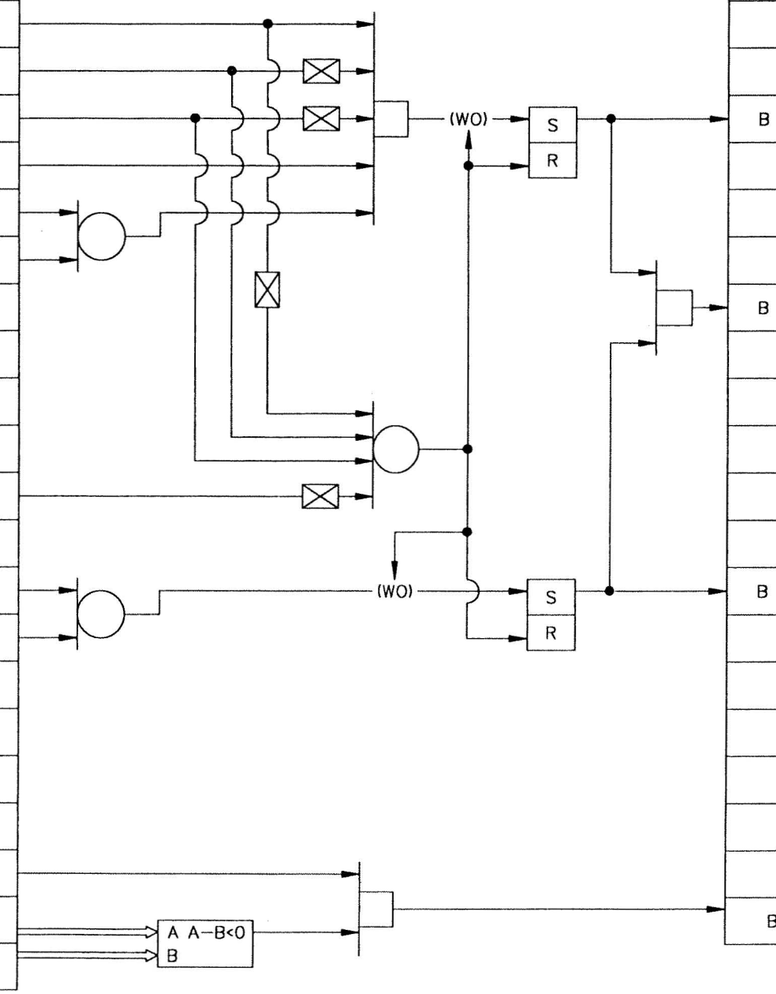
INPUT					LOGIC	OUTPUT			
REF SH	CLASS	SIGNAL ID	DESCRIPTION	COND–ITION		CLASS	DESCRIPTION	SIGNAL ID	REF SH
	B	2001	ROD INSERT PERMISSIVE	ON					
	B	1009	EMERGENCY INSERT	ON					
	B	3803	ROD FULL IN	ON		B	INSERT	4001	48,50
	B	3808	ROD SELECTED	ON					
	B	0706	RCIS IN STEP/NOTCH INSERT MODE	ON					
	B	1304	INSERT	ON					
						B	ROD SELECTED STEP INSERT	4002	40
	B	4004	STEP INSERT NOT COMPLETED	ON					
	B	0701	RCIS IN STEP DRIVE MODE	ON		B	STEP	4003	47
	B	1307	STEP	ON					
	B	4002	ROD SELECTED STEP INSERT	ON					
	B	1101,1102 1204,1303	REFERENCE ROD POSITION			B	STEP INSERT NOT COMPLETED	4004	40
	B	3804	ROD POSITION						



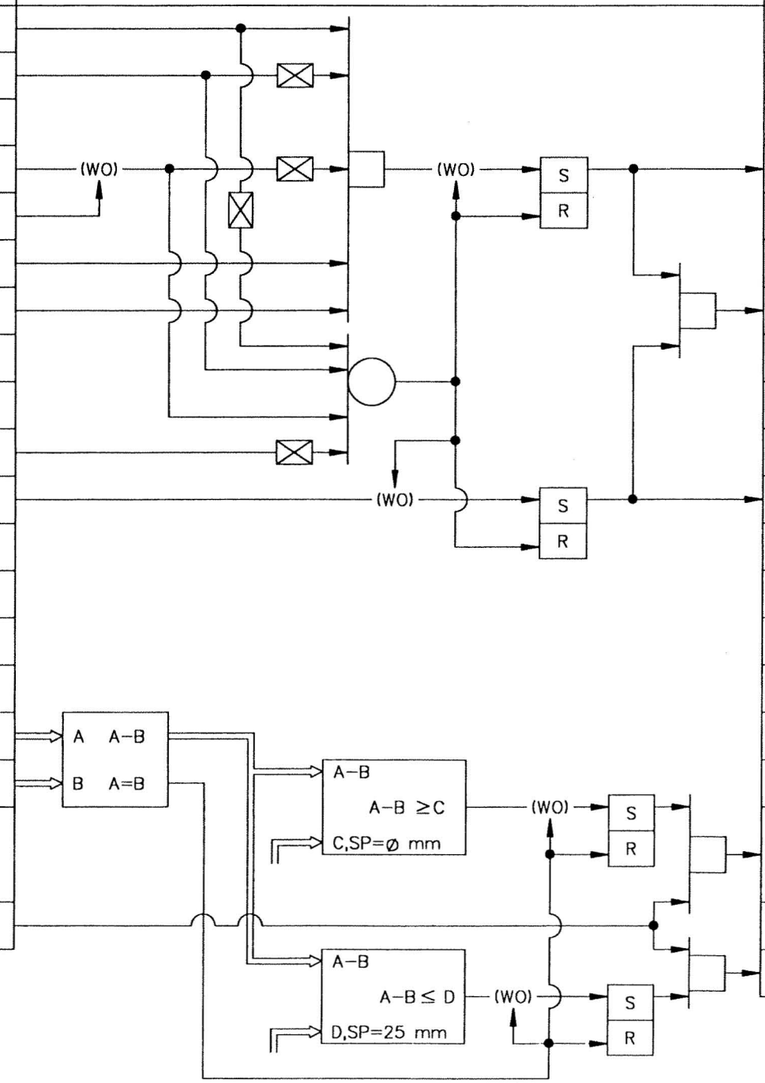
CHANNEL A
TYPICAL OF CHANNEL B

STEP INSERT LOGIC

FIGURE 7.7–3 ROD CONTROL AND INFORMATION SYSTEM IBD (Sheet 40 of 87)

I N P U T				
REF SH	CLASS	SIGNAL ID	DESCRIPTION	CONDITION
	B	1901	ROD WITHDRAWAL PERMISSIVE	ON
	B	1009	EMERGENCY INSERT	ON
	B	3805	ROD FULL OUT	ON
	B	0806	OVERTRAVEL PERMIT	ON
	B	3808	ROD SELECTED	ON
	B	0709	RCIS IN STEP/NOTCH WITHDRAWAL MODE	ON
	B	4106	NOTCH WITHDRAWAL NOT COMPLETED	ON
	B	0702	RCIS IN NOTCH DRIVE MODE	ON
	B	1101,1102, 1204,1303	REFERENCE ROD POSITION	
	B	3804	ROD POSITION	
	B	4102	ROD SELECTED NOTCH WITHDRAW	ON

LOGIC



O U T P U T			
CLASS	DESCRIPTION	SIGNAL ID	REF SH
B	WITHDRAW	4101	48
B	ROD SELECTED NOTCH WITHDRAW	4102	41
B	NOTCH	4103	47
B	NOTCH WITHDRAWAL NOT COMPLETED	4106	41
B	SETTLE	4107	47

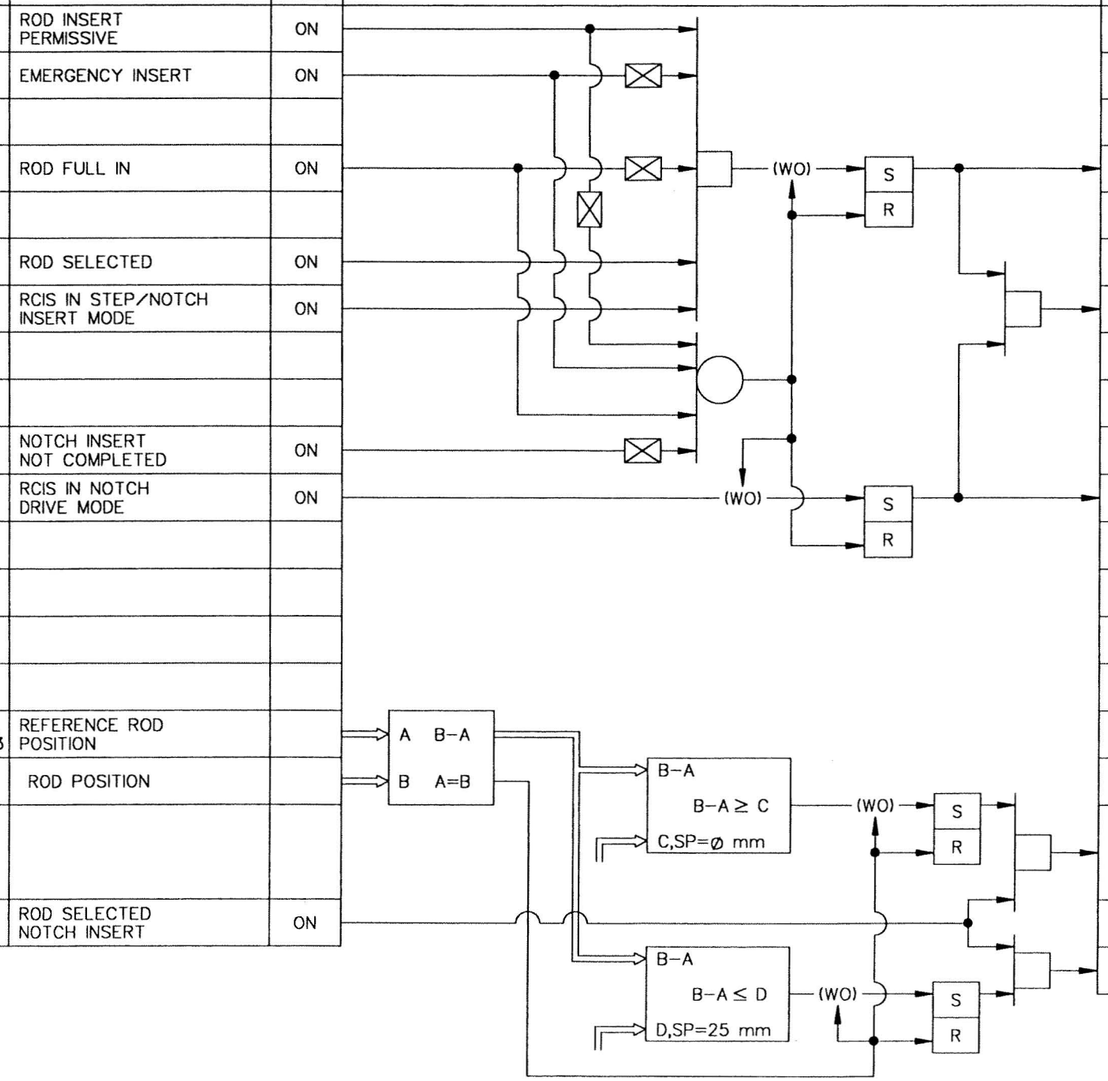
CHANNEL A
TYPICAL OF CHANNEL B

NOTCH WITHDRAWAL LOGIC

FIGURE 7.7-3 ROD CONTROL AND INFORMATION SYSTEM IBD (Sheet 41 of 87)

I N P U T				
REF SH	CLASS	SIGNAL ID	DESCRIPTION	COND-ITION
	B	2001	ROD INSERT PERMISSIVE	ON
	B	1009	EMERGENCY INSERT	ON
	B	3803	ROD FULL IN	ON
	B	3808	ROD SELECTED	ON
RAPI	B	0706	RCIS IN STEP/NOTCH INSERT MODE	ON
	B	4206	NOTCH INSERT NOT COMPLETED	ON
	B	0702	RCIS IN NOTCH DRIVE MODE	ON
	B	1101,1102, 1204,1303	REFERENCE ROD POSITION	
	B	3804	ROD POSITION	
	B	4202	ROD SELECTED NOTCH INSERT	ON

LOGIC



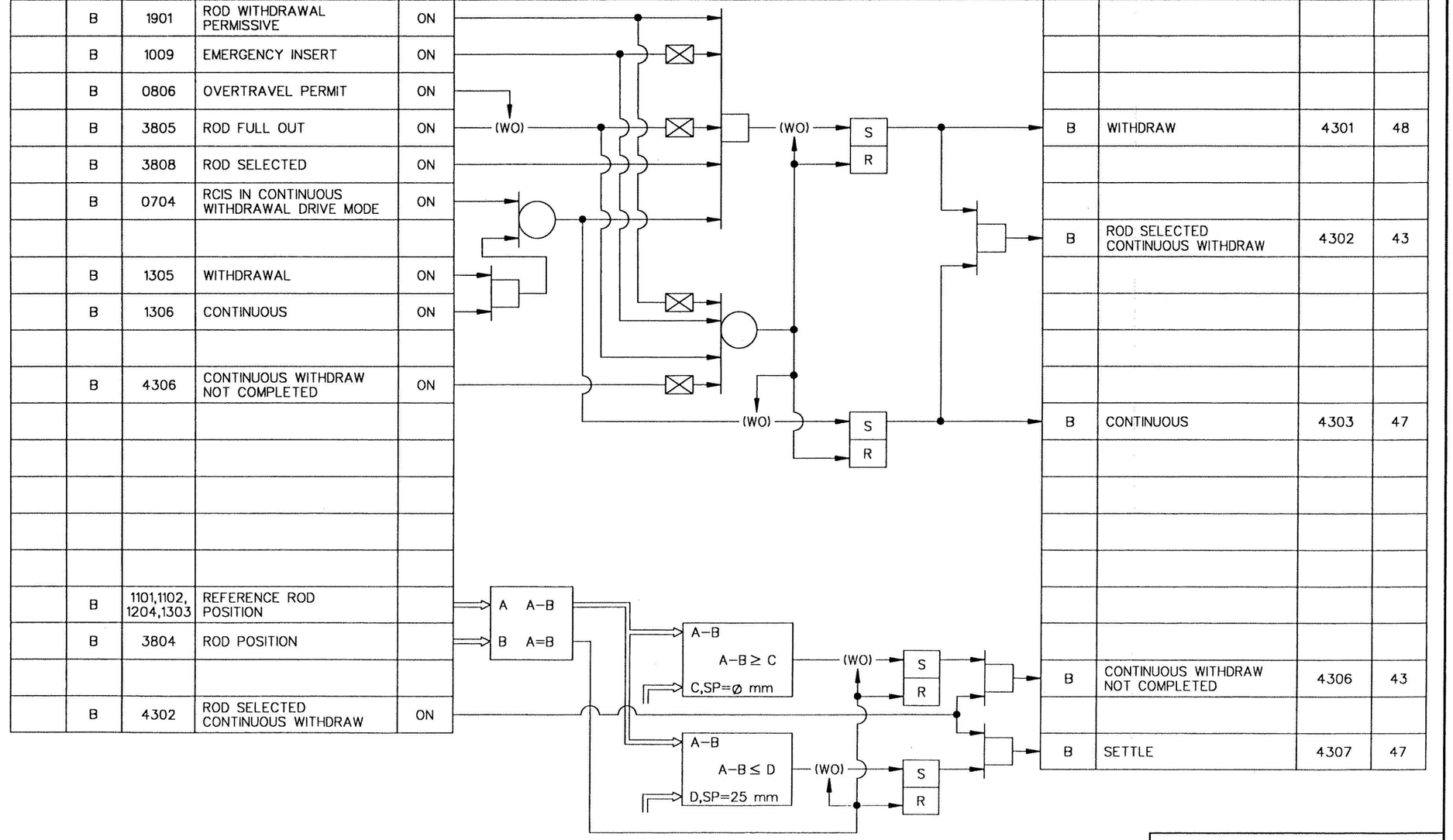
O U T P U T			
CLASS	DESCRIPTION	SIGNAL ID	REF SH
B	INSERT	4201	48
B	ROD SELECTED NOTCH INSERT	4202	42
B	NOTCH	4203	47
B	NOTCH INSERT NOT COMPLETED	4206	42
B	SETTLE	4207	47

CHANNEL A
TYPICAL OF CHANNEL B

NOTCH INSERT LOGIC

FIGURE 7.7-3 ROD CONTROL AND INFORMATION SYSTEM IBD (Sheet 42 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	0806	OVERTRAVEL PERMIT	ON					
	B	3805	ROD FULL OUT	ON		B	WITHDRAW	4301	48
	B	3808	ROD SELECTED	ON					
	B	0704	RCIS IN CONTINUOUS WITHDRAWAL DRIVE MODE	ON					
						B	ROD SELECTED CONTINUOUS WITHDRAW	4302	43
	B	1305	WITHDRAWAL	ON					
	B	1306	CONTINUOUS	ON					
	B	4306	CONTINUOUS WITHDRAW NOT COMPLETED	ON					
						B	CONTINUOUS	4303	47
	B	1101,1102, 1204,1303	REFERENCE ROD POSITION						
	B	3804	ROD POSITION						
						B	CONTINUOUS WITHDRAW NOT COMPLETED	4306	43
	B	4302	ROD SELECTED CONTINUOUS WITHDRAW	ON		B	SETTLE	4307	47



CHANNEL A
TYPICAL OF CHANNEL B

CONTINUOUS WITHDRAWAL LOGIC

FIGURE 7.7-3 ROD CONTROL AND INFORMATION SYSTEM IBD (Sheet 43 of 87)

INPUT					LOGIC	OUTPUT			
REF SH	CLASS	SIGNAL ID	DESCRIPTION	COND-ITION		CLASS	DESCRIPTION	SIGNAL ID	REF SH
	B	2001	ROD INSERT PERMISSIVE	ON					
	B	1009	EMERGENCY INSERT	ON					
	B	3803	ROD FULL IN	ON					
	B	3808	ROD SELECTED	ON					
	B	0703	RCIS IN CONTINUOUS INSERT DRIVE MODE	ON					
						B	ROD SELECTED CONTINUOUS INSERT	4402	44
	B	1304	INSERT	ON					
	B	1306	CONTINUOUS	ON					
	B	4406	CONTINUOUS INSERT NOT COMPLETED	ON					
						B	CONTINUOUS	4403	47
RAPI	B	1101,1102, 1204,1303	REFERENCE ROD POSITION		A B−A B A=B				
	B	3804	ROD POSITION						
						B	CONTINUOUS INSERT NOT COMPLETED	4406	44
	B	4402	ROD SELECTED CONTINUOUS INSERT	ON					
						B	SETTLE	4407	47

(WO) S R

B−A
B−A ≥ C
C,SP=Ø mm

B−A
B−A ≤ D
D,SP=25 mm

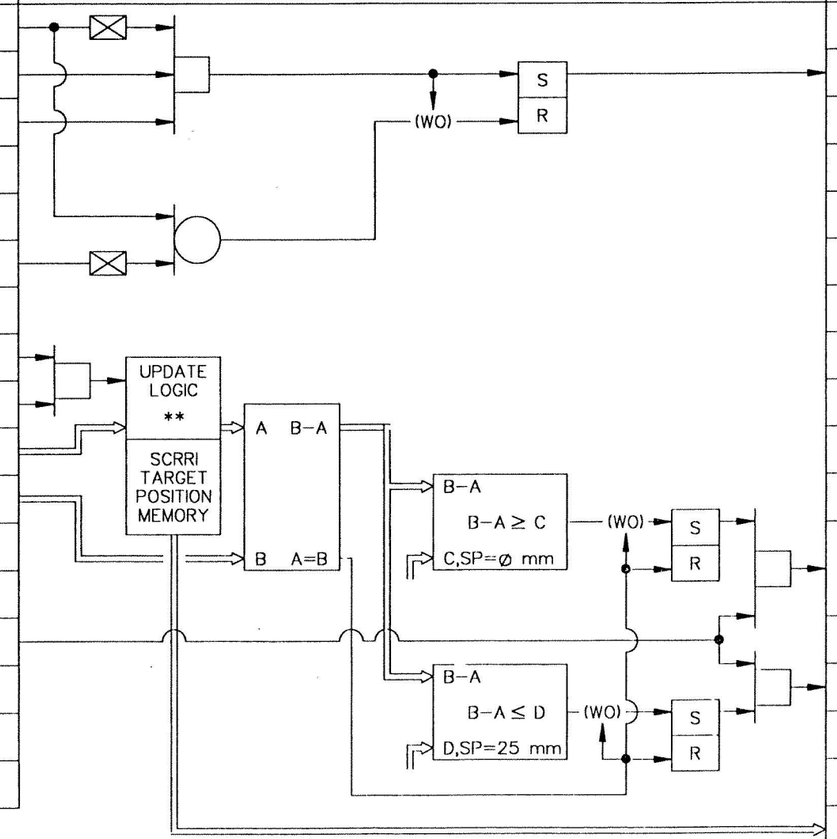
CHANNEL A
TYPICAL OF CHANNEL B

CONTINUOUS INSERT LOGIC

FIGURE 7.7−3 ROD CONTROL AND INFORMATION SYSTEM IBD (Sheet 44 of 87)

I N P U T				
REF SH	CLASS	SIGNAL ID	DESCRIPTION	COND-ITION
	B	3803	ROD FULL IN	ON
	B	1008	ROD SELECTED	ON
	B	1007	SCRRI CONDITION EXISTS	ON
	B	4507	SCRRI INSERT NOT COMPLETED	ON
	B	2301	SCRRI UPDATE PERMITTED	ON
	B	2303	SCRRI TARGET POSITION UPDATE REQUEST	ON
	B	2304	NEW SCRRI TARGET POSITION	
	B	3804	ROD POSITION	ON
	B	4501	SCRRI INSERT	ON

LOGIC



O U T P U T			
CLASS	DESCRIPTION	SIGNAL ID	REF SH
B	SCRRI INSERT	4501	45,47
B	SCRRI INSERT NOT COMPLETED	4507	
B	SETTLE	4508	
B	SCRRI TARGET POSITION ANSWER BACK	4509	25

** SCRRI TARGET POSITION MAY BE UPDATED ONLY WHEN UPDATE SCRRI TARGET REQUEST IS ACTIVE WITH THE SCRRI UPDATE PERMIT STATUS ACTIVE, OTHERWISE LAST VALUE IS MAINTAINED IN RSPC BUFFER.

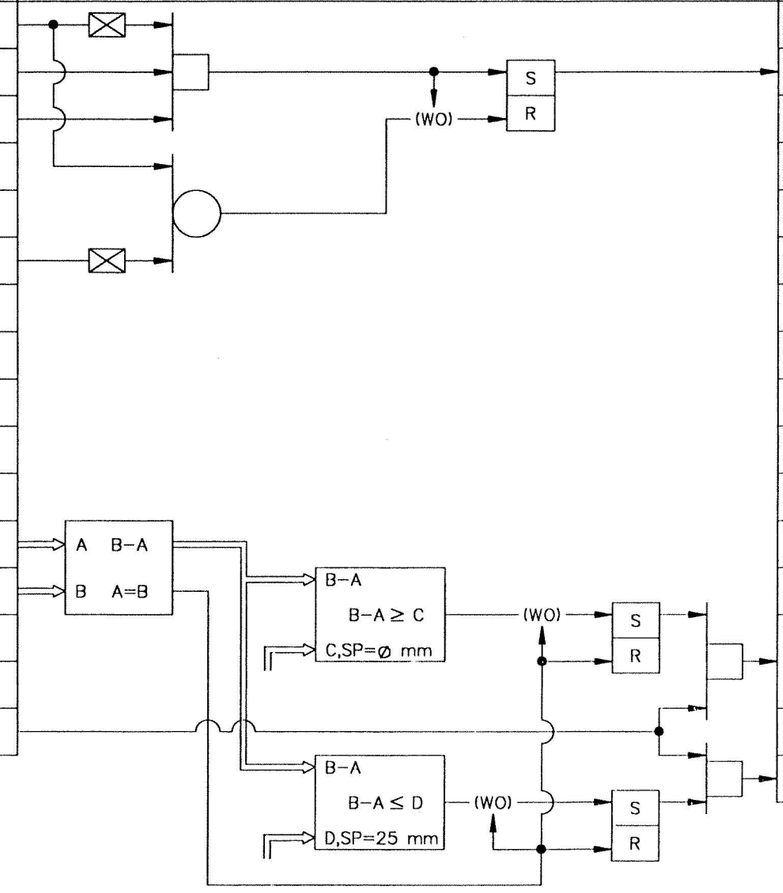
CHANNEL A
TYPICAL OF CHANNEL B

SCRRI EMERGENCY INSERTION & SCRRI TARGET POSITION UPDATE LOGIC

FIGURE 7.7-3 ROD CONTROL AND INFORMATION SYSTEM IBD (Sheet 45 of 87)

I N P U T				
REF SH	CLASS	SIGNAL ID	DESCRIPTION	COND-ITION
	B	3803	ROD FULL IN	ON
	B	3808	ROD SELECTED	ON
	B	1009	EMERGENCY INSERT	ON
	B	4604	CONTINUOUS ARI/SCRAM FOLLOW NOT COMPLETED	ON
	B	3814	FULL-IN SET POINT	ON
	B	3804	ROD POSITION	ON
	B	4601	EMERGENCY INSERT	ON

LOGIC



O U T P U T			
CLASS	DESCRIPTION	SIGNAL ID	REF SH
B	EMERGENCY INSERT	4601	46,47
B	CONTINUOUS ARI/SCRAM FOLLOW NOT COMPLETED	4604	46
B	SETTLE	4605	47

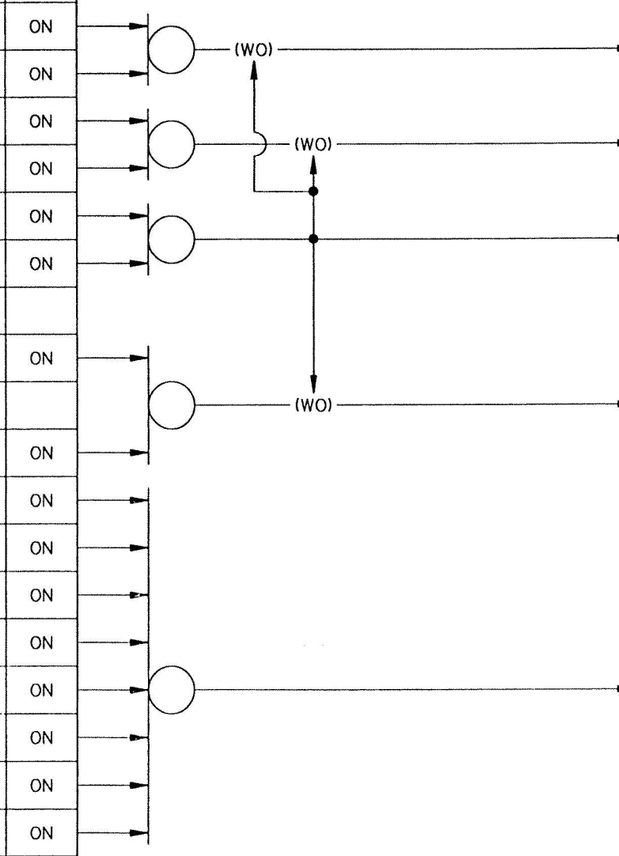
CHANNEL A
TYPICAL OF CHANNEL B

EMERGENCY INSERTION LOGIC

FIGURE 7.7-3 ROD CONTROL AND INFORMATION SYSTEM IBD (Sheet 46 of 87)

I N P U T				
REF SH	CLASS	SIGNAL ID	DESCRIPTION	COND–ITION
	B	3903	STEP	ON
	B	4003	STEP	ON
	B	4103	NOTCH	ON
	B	4203	NOTCH	ON
	B	4501	SCRRI INSERT	ON
	B	4601	EMERGENCY INSERT	ON
	B	4303	CONTINUOUS	ON
	B	4403	CONTINUOUS	ON
	B	3810	SETTLE	ON
	B	3811	SETTLE	ON
	B	4107	SETTLE	ON
	B	4207	SETTLE	ON
	B	4307	SETTLE	ON
	B	4407	SETTLE	ON
	B	4508	SETTLE	ON
	B	4605	SETTLE	ON

LOGIC



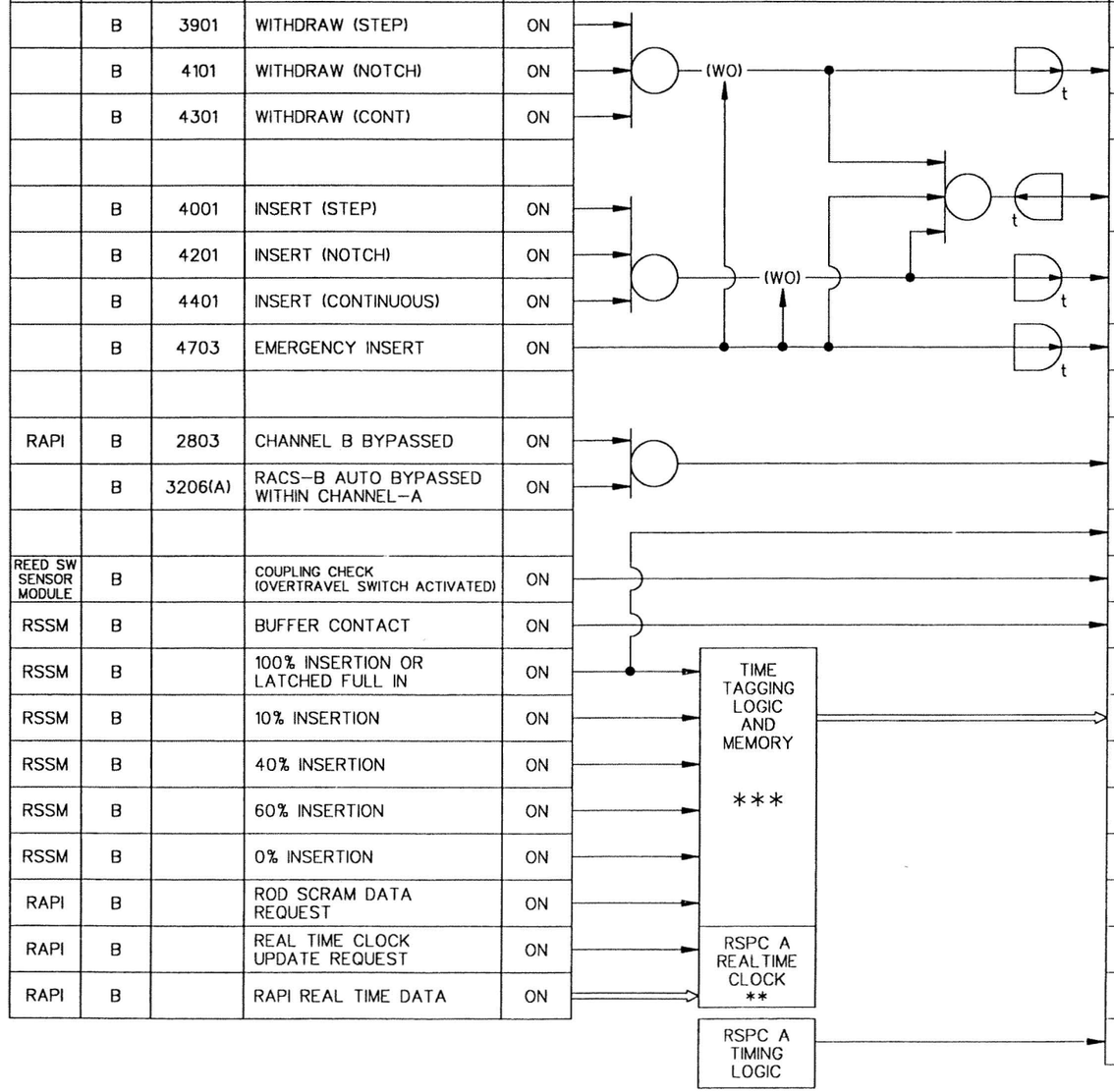
O U T P U T			
CLASS	DESCRIPTION	SIGNAL ID	REF SH
B	STEP A	4701	54
B	NOTCH A	4702	54
B	EMERGENCY INSERT	4703	48,49 50,51
B	CONTINUOUS A	4704	54
B	SETTLE	4706	55

CHANNEL A
TYPICAL OF CHANNEL B

INVERTER CONTROLLER INTERFACE LOGIC

FIGURE 7.7–3 ROD CONTROL AND INFORMATION SYSTEM IBD (Sheet 47 of 87)

INPUT					LOGIC	OUTPUT			
REF SH	CLASS	SIGNAL ID	DESCRIPTION	COND-ITION		CLASS	DESCRIPTION	SIGNAL ID	REF SH
	B	3901	WITHDRAW (STEP)	ON					
	B	4101	WITHDRAW (NOTCH)	ON		B	WITHDRAW A	4801	49,55
	B	4301	WITHDRAW (CONT)	ON					
						B	NORMAL/EMERGENCY ROD MOVEMENT A	4809	51,53
	B	4001	INSERT (STEP)	ON					
	B	4201	INSERT (NOTCH)	ON		B	INSERT A	4802	49,54
	B	4401	INSERT (CONTINUOUS)	ON					
	B	4703	EMERGENCY INSERT	ON		B	EMERGENCY INSERT	4810	54
RAPI	B	2803	CHANNEL B BYPASSED	ON		B	CHANNEL B BYPASSED	4803	53,54
	B	3206(A)	RACS-B AUTO BYPASSED WITHIN CHANNEL-A	ON					
						B	100% INSERTION OR LATCHED FULL IN	4804	24
REED SW SENSOR MODULE	B		COUPLING CHECK (OVERTRAVEL SWITCH ACTIVATED)	ON		B	COUPLING CHECK (OVER-TRAVEL SW ACTIVATED)	4805	24
RSSM	B		BUFFER CONTACT	ON		B	BUFFER CONTACT	4806	24
RSSM	B		100% INSERTION OR LATCHED FULL IN	ON					
RSSM	B		10% INSERTION	ON		B	ROD SCRAM TIME DATA *	4807	24
RSSM	B		40% INSERTION	ON					
RSSM	B		60% INSERTION	ON					
RSSM	B		0% INSERTION	ON					
RAPI	B		ROD SCRAM DATA REQUEST	ON					
RAPI	B		REAL TIME CLOCK UPDATE REQUEST	ON					
RAPI	B		RAPI REAL TIME DATA	ON					
						D	BUFFER UPDATE	4808	55



* TIME TAGGED DATA BASED ON RSPC REAL TIME CLOCK

** RSPC REAL TIME CLOCK, SLAVE TO MASTER CLOCK OF RAPI SYNCHRONIZED TO RAPI CLOCK PERIODICALLY TO ASSUME SMALL TIME SKEW BETWEEN UPDATES

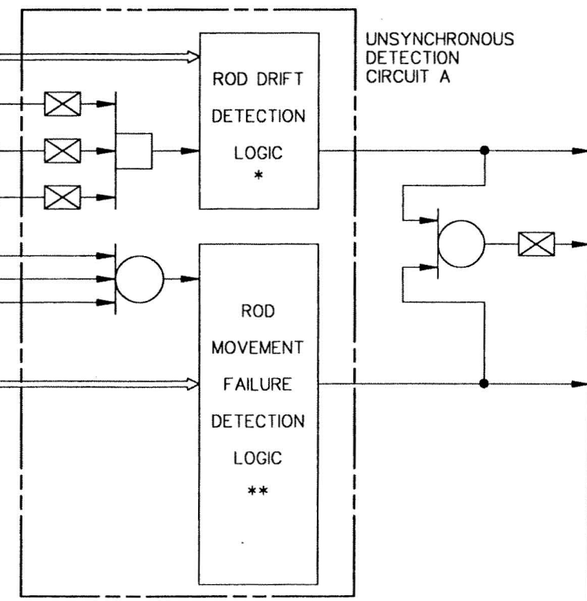
*** SCRAM TIME DATA MAY ALSO BE OBTAINED VIA THE ALTERNATE DESIGN OF USING SCRAM TIME TEST PANELS, SEE NOTE 5.

CHANNEL A
TYPICAL OF CHANNEL B

INVERTER CONTROLLER/RBC INTERFACE LOGIC AND REED SWITCH DATA COLLECTION AND TRANSFER LOGIC

FIGURE 7.7-3 ROD CONTROL AND INFORMATION SYSTEM IBD (Sheet 48 of 87)

INPUT					LOGIC	OUTPUT			
REF SH	CLASS	SIGNAL ID	DESCRIPTION	CONDITION		CLASS	DESCRIPTION	SIGNAL ID	REF SH
	B	3804	ROD POSITION						
	B	4703	EMERGENCY INSERT	ON					
	B	4801	WITHDRAW	ON		B	DRIFT DETECTION	4901	24
	B	4802	INSERT	ON					
						B	NO UNSYNCHRONOUS DETECTION	4902	54
						B	ROD MOVEMENT FAILURE	4903	24



CHANNEL A
TYPICAL OF CHANNEL B

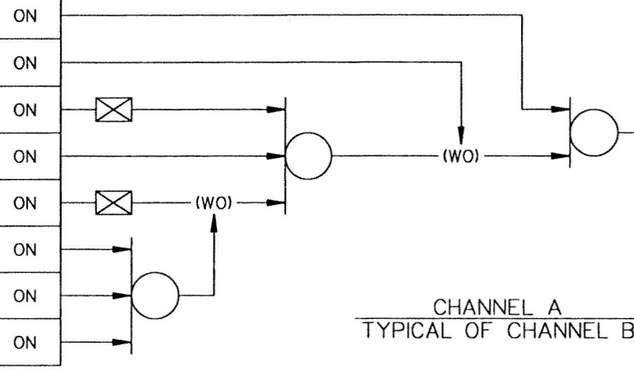
* DRIFT DETECTION OUTPUT BECOMES HIGH WHEN ROD POSITION CHANGES IN THE ABSENCE OF WITHDRAW/INSERT/EMERGENCY INSERT SIGNALS.

** ROD MOVEMENT FAILURE OUTPUT BECOMES HIGH WHEN ROD POSITION DOES NOT CHANGE WHILE ROD MOVEMENT COMMANDS ARE PRESENT.

UNSYNCHRONOUS DETECTION LOGIC

FIGURE 7.7-3 ROD CONTROL AND INFORMATION SYSTEM IBD (Sheet 49 of 87)

I N P U T					LOGIC	O U T P U T			
REF SH	CLASS	SIGNAL ID	DESCRIPTION	COND-ITION		CLASS	DESCRIPTION	SIGNAL ID	REF SH
	B	3003	ROD Ai PLACED IN INOP BYPASS	ON					
	B	4703	EMERGENCY INSERT	ON					
	B	2001	ROD INSERT PERMISSIVE	ON					
	B	5101	RSPC SELF TEST FAILURE	ON		B	STOP	5004	54
	B	1901	ROD WITHDRAWAL PERMISSIVE	ON					
	B	4001	INSERT (STEP)	ON					
	B	4201	INSERT (NOTCH)	ON					
	B	4401	INSERT (CONTINOUS)	ON					

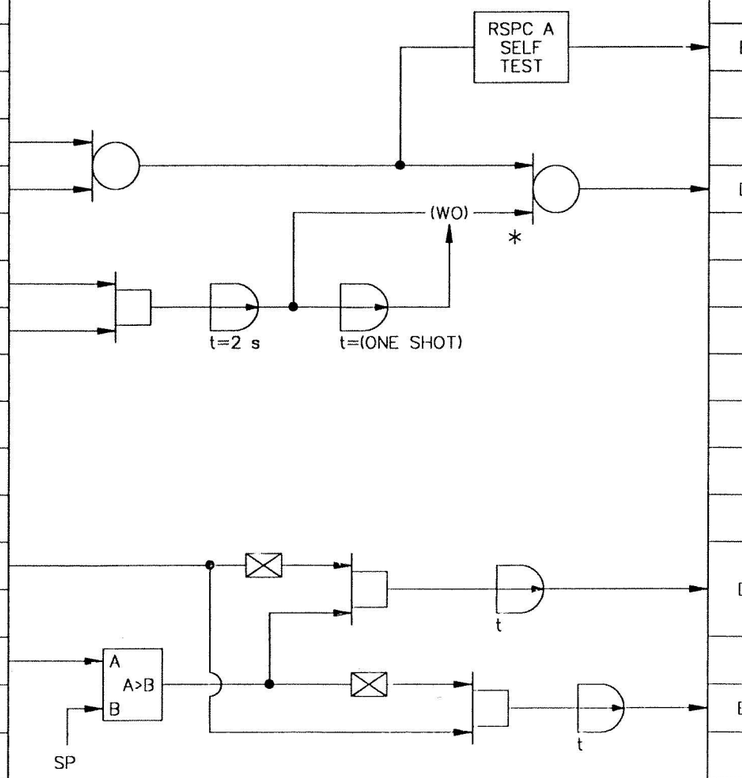


CHANNEL A
TYPICAL OF CHANNEL B

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

INPUT					LOGIC	OUTPUT			
REF SH	CLASS	SIGNAL ID	DESCRIPTION	COND-ITION		CLASS	DESCRIPTION	SIGNAL ID	REF SH
						B	RSPC SELF TEST FAILURE	5101	24,50
RAPI	B		RESET A	ON					
RSPC A	B		LOCAL RESET	ON		D	RESET	5102	55
	B	5505	IC TROUBLE	ON					
	B	4703	EMERGENCY INSERT	ON					
	B	4809	NORMAL/EMERGENCY ROD MOVEMENT A	ON		D	ABNORMAL BRAKE SOLENOID ENERGIZATION	5103	24
	A	5302	BRAKE CURRENT SENSE SIGNAL			B	BRAKE DISENGAGEMENT FAILURE	5104	24



* THIS PROVIDES AUTOMATIC RESTART CAPABILITY IF EITHER ARI CONDITION/SCRAM FOLLOW CONDITION OR SCRRI EXIST.

CHANNEL A
TYPICAL OF CHANNEL B

DIAGNOSTICS AND RESTART LOGIC

I N P U T					LOGIC	O U T P U T			
REF SH	CLASS	SIGNAL ID	DESCRIPTION	COND-ITION		CLASS	DESCRIPTION	SIGNAL ID	REF SH
	B	5403	STEP	ON	→	B	STEP	5201	25
	B	5404	NOTCH	ON	→	B	NOTCH	5202	25
	B	5402	CONTINUOUS	ON	→	B	CONTINUOUS	5203	25
	B	5503	SETTLE	ON	→	B	SETTLE	5204	25
	B	5401	EMERGENCY INSERT	ON	→	B	EMERGENCY INSERT	5205	25
	B	5406	INSERT	ON	→	B	INSERT	5206	25
	B	5502	WITHDRAW	ON	→	B	WITHDRAW	5207	25
	B	5405	STOP	ON	→	B	STOP	5208	25
	B	5802	INVERTER TROUBLE	ON	→	B	INVERTER TROUBLE	5209	25
	B	5505	INVERTER CONTROLLER TROUBLE	ON	→	B	INVERTER CONTROLLER TROUBLE	5210	25
					TYPICAL OF *				
					FCM–Aj SELF TEST LOGIC →	B	A POWER SUPPLY IN FCM–Aj HAS FAILED	5211	26
					→	B	FCM–Aj IS OK	5212	26

* TYPICAL OF 205/NUMBER OF RSPCs PER FCM

CHANNEL A
TYPICAL OF CHANNEL B

IC AND FCM SIGNAL TRANSFER TO RAPI

FIGURE 7.7–3 ROD CONTROL AND INFORMATION SYSTEM IBD (Sheet 52 of 87)

INPUT					LOGIC	OUTPUT			
REF SH	CLASS	SIGNAL ID	DESCRIPTION	COND-ITION		CLASS	DESCRIPTION	SIGNAL ID	REF SH
	B	4809	NORMAL/EMERGENCY ROD MOVEMENT CHANNEL A	ON					
						D	BRAKE SOLENOID ENERGIZATION SIGNAL	5301	BRAKE POWER SUPPLY
		4809(B)	NORMAL/EMRGENCY ROD MOVEMENT CHANNEL B	ON					
	B	4803(B)	CHANNEL A BYPASSED	ON					
	B	4803	CHANNEL B BYPASSED	ON					
					BRAKE CURRENT SENSE SIGNAL CHANNEL A	A	BRAKE CURRENT SENSE SIGNAL	5302	51
					BRAKE CURRENT SENSE SIGNAL CHANNEL B	A	BRAKE CURRENT SENSE SIGNAL	5303	51(B)

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

ROD BRAKE CONTROLLER LOGIC

FIGURE 7.7-3 ROD CONTROL AND INFORMATION SYSTEM IBD (Sheet 53 of 87)

INPUT					LOGIC	OUTPUT			
REF SH	CLASS	SIGNAL ID	DESCRIPTION	CONDITION		CLASS	DESCRIPTION	SIGNAL ID	REF SH
	B	4810	EMERGENCY INSERT A	ON	SELECTION LOGIC DETAIL A *				
	B	4810(B)	EMERGENCY INSERT B	ON		B	EMERGENCY INSERT	5401	52,57
	B	4704	CONTINUOUS A	ON	SELECTION LOGIC DETAIL A *				
	B	4704(B)	CONTINUOUS B	ON		B	CONTINUOUS	5402	52,56
	B	4701	STEP A	ON	SELECTION LOGIC DETAIL A *				
	B	4701(B)	STEP B	ON		B	STEP	5403	52,56
	B	4702	NOTCH A	ON	SELECTION LOGIC DETAIL A *				
	B	4702(B)	NOTCH B	ON		B	NOTCH	5404	52,56
	B	5004	STOP A	ON	SELECTION LOGIC DETAIL A *				
	B	5004(B)	STOP B	ON		B	STOP	5405	52,57
	B	4802	INSERT A	ON	SELECTION LOGIC DETAIL A *				
	B	4802(B)	INSERT B	ON		B	INSERT	5406	52,56
	B	4902	NO UNSYNCHRONOUS DETECTION A	ON	SELECTION LOGIC DETAIL A *				
	B	4902(B)	NO UNSYNCHRONOUS DETECTION B	ON					
	B	4803	RSPC-B BYPASSED	ON					
	B	4803(B)	RSPC-A BYPASSED	ON		B	NO UNSYNCHRONOUS DETECTION	5407	57
	B	3808	ROD SELECTED A	ON	SELECTION LOGIC DETAIL A *				
	B	3808(B)	ROD SELECTED B	ON		B	ROD SELECTED	5408	57

* SEE DETAIL A ON SHEET 66

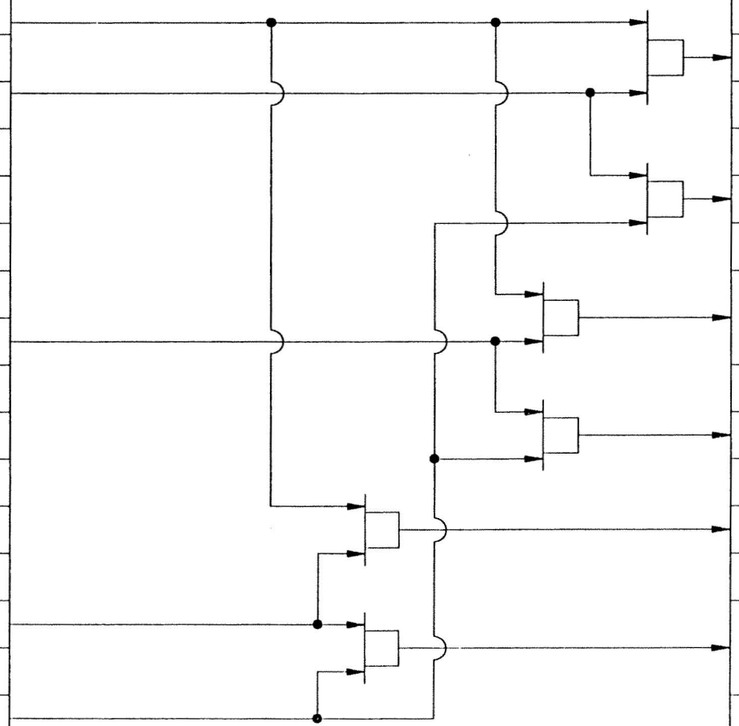
FIGURE 7.7-3 ROD CONTROL AND INFORMATION SYSTEM IBD (Sheet 54 of 87)

I N P U T					LOGIC	O U T P U T			
REF SH	CLASS	SIGNAL ID	DESCRIPTION	COND-ITION		CLASS	DESCRIPTION	SIGNAL ID	REF SH
	B	4803(B)	RSPC-A BYPASSED	ON					
	B	4803	RSPC-B BYPASSED	ON					
	B	4801	WITHDRAW A	ON	SELECTION LOGIC DETAIL A	B	WITHDRAW	5502	52,56
	B	4801(B)	WITHDRAW B	ON					
	B	4706	SETTLE A	ON	SELECTION LOGIC DETAIL A	B	SETTLE	5503	52,57
	B	4706(B)	SETTLE B	ON					
	B	5102	RESET A	ON	SELECTION LOGIC DETAIL A	L	RESET FAILURE DISPLAY	5504	LOCAL
	B	5102(B)	RESET B	ON	RESET ROUTINE NOTE 1				
	B		LOCAL RESET	ON					
	B		VALIDATION ERROR (NOTE 7)	ON	DETAIL A	B	IC TROUBLE	5505	51,52 57
	B	5508	CHANNEL A TIME OUT (NOTE 2)	ON					
	B	5509	CHANNEL B TIME OUT (NOTE 2)	ON					
	B		POWER ON (NOTE 3)	ON	NOTE 3 SELF TEST ROUTINE	L	SELF TEST FAILURE DISPLAY (NOTE 3)	5506	LOCAL
	B	4808	BUFFER UPDATE, CH A	ON	COUNT DOWN TIMER (WO) SP	B	CHANNEL A TIME OUT	5508	55
	B	4808(B)	BUFFER UPDATE, CH B	ON	(WO)	B	CHANNEL B TIME OUT	5509	55

FIGURE 7.7-3 ROD CONTROL AND INFORMATION SYSTEM IBD (Sheet 55 of 87)

I N P U T				
REF SH	CLASS	SIGNAL ID	DESCRIPTION	COND-ITION
	B	5502	WITHDRAW	ON
	B	5402	CONTINUOUS	ON
	B	5403	STEP	ON
	B	5404	NOTCH	ON
	B	5406	INSERT	ON

LOGIC

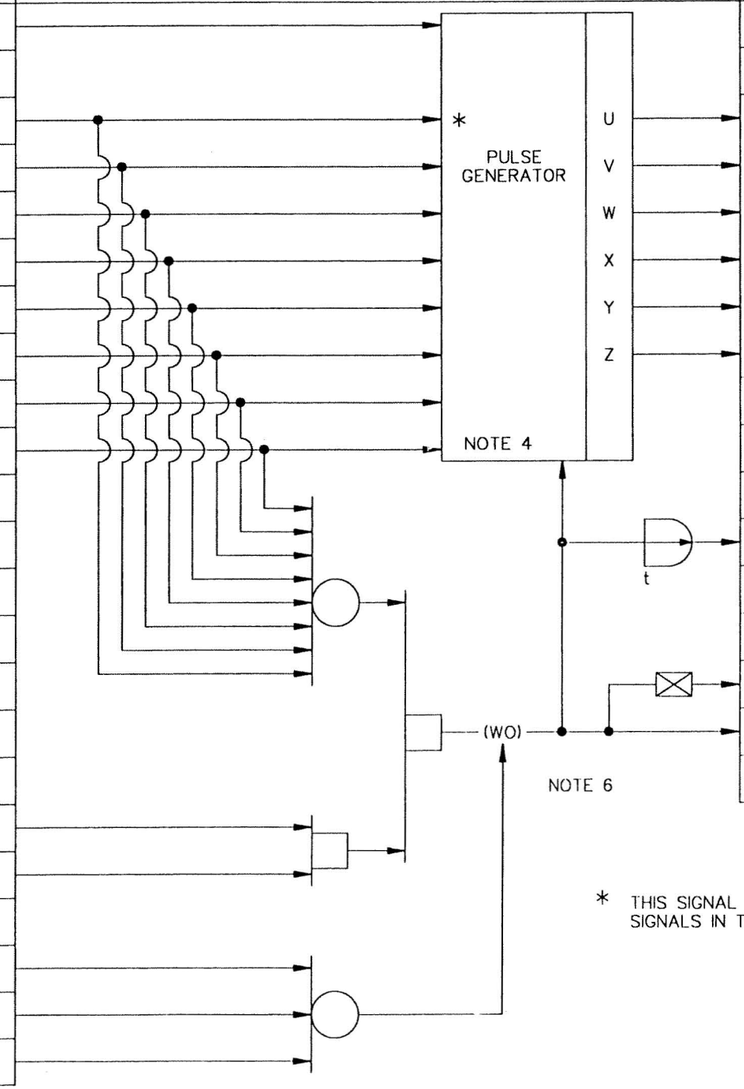


O U T P U T			
CLASS	DESCRIPTION	SIGNAL ID	REF SH
B	CONTINUOUS WITHDRAW	5601	57
B	CONTINUOUS INSERT	5602	57
B	STEP WITHDRAW	5603	57
B	STEP INSERT	5604	57
B	NOTCH WITHDRAW	5605	57
B	NOTCH INSERT	5606	57

FIGURE 7.7-3 ROD CONTROL AND INFORMATION SYSTEM IBD (Sheet 56 of 87)

I N P U T				
REF SH	CLASS	SIGNAL ID	DESCRIPTION	COND-ITION
	B	5408	ROD SELECTED	ON
	B	5401	EMERGENCY INSERT	ON
	B	5503	SETTLE	ON
	B	5601	CONTINUOUS WITHDRAW	ON
	B	5602	CONTINUOUS INSERT	ON
	B	5603	STEP WITHDRAW	ON
	B	5604	STEP INSERT	ON
	B	5605	NOTCH WITHDRAW	ON
	B	5606	NOTCH INSERT	ON
	B	5407	NO UNSYNCHRONOUS DETECTION	ON
	B	LOCAL	NO OVER FREQ DETECTION (NOTE 4)	ON
	B	5505	IC TROUBLE	ON
	B	5802	INVERTER TROUBLE	ON
	B	5405	STOP	ON

LOGIC



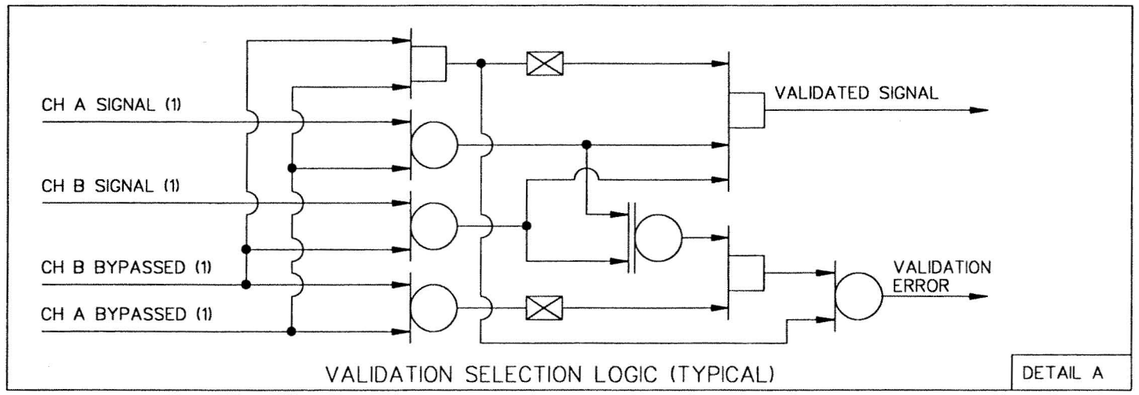
O U T P U T			
CLASS	DESCRIPTION	SIGNAL ID	REF SH
P	STEPPER MOTOR CONTROLLING PULSES NOTE 8	5701	SMDM
P			
P			
P			
P			
P			
D	BASE CUTOFF	5702	SMDM
L	STOPPED (LOCAL DISPLAY)	5703	IC
L	RUN (LOCAL DISPLAY)	5704	IC

* THIS SIGNAL TAKES PRECEDENCE OVER OTHER SIGNALS IN THE PULSE GENERATOR LOGIC.

FIGURE 7.7-3 ROD CONTROL AND INFORMATION SYSTEM IBD (Sheet 57 of 87)

I N P U T					LOGIC	O U T P U T			
REF SH	CLASS	SIGNAL ID	DESCRIPTION	COND-ITION		CLASS	DESCRIPTION	SIGNAL ID	REF SH
						L	INVERTER TROUBLE DISPLAY	5801	IC
SMDM	B		FUSE FAILURE	ON					
SMDM	B		ABNORMAL VOLTAGE	ON		B	INVERTER TROUBLE	5802	52,57
SMDM	B		OVER CURRENT	ON					
						L	FUSE FAILURE DISPLAY		IC
						L	ABNORMAL VOLTAGE DISPLAY		IC
						L	OVERCURRENT DISPLAY		IC

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)

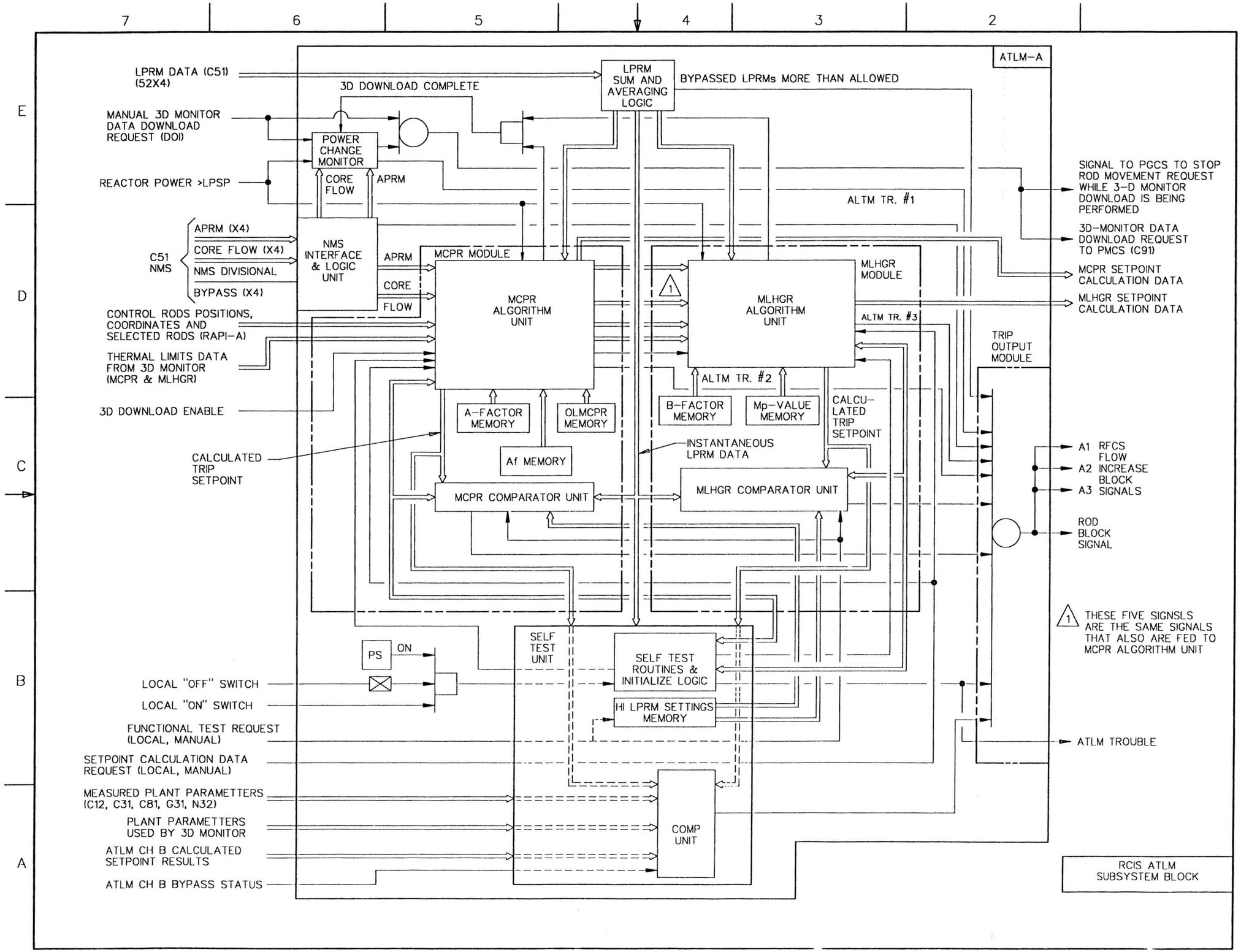


FIGURE 7.7-3 ROD CONTROL AND INFORMATION SYSTEM IBD (Sheet 60 of 87)

INPUT					OUTPUT			
REF SH	CLASS	SIGNAL ID	DESCRIPTION	CONDITION	CLASS	DESCRIPTION	SIGNAL ID	REF SH
					B	BYPASSED LPRMs MORE THAN ALLOWED	6101	67
C51			LPRM DATA (52X4, INCLUDES BYPASS INFO)		B	PROCESSED LPRM DATA FOR MCPR CALCULATIONS	6102	63
					B	PROCESSED LPRM DATA FOR MLHGR CALCULATIONS	6108	64
					B	INSTANTANEOUS LPRM DATA	6103	63,64
C51			APRM DIV I					
C51			APRM DIV II					
C51			APRM DIV III		B	APRM	6104	62,63 64
C51			APRM DIV IV		B	REACTOR POWER IS ABOVE LPSP	6107	62,63 64
C51			CORE FLOW DIV I					
C51			CORE FLOW DIV II					
C51			CORE FLOW DIV III					
C51			CORE FLOW DIV IV		B	CORE FLOW	6105	62,63 64
C51			NMS DIVISIONAL BYPASS DIV I	ON				
C51			NMS DIVISIONAL BYPASS DIV II	ON				
C51			NMS DIVISIONAL BYPASS DIV III	ON				
C51			NMS DIVISIONAL BYPASS DIV IV	ON	B	TROUBLE AT LEAST 2 NMS DIVISIONS ARE BYPASSED	6106	67

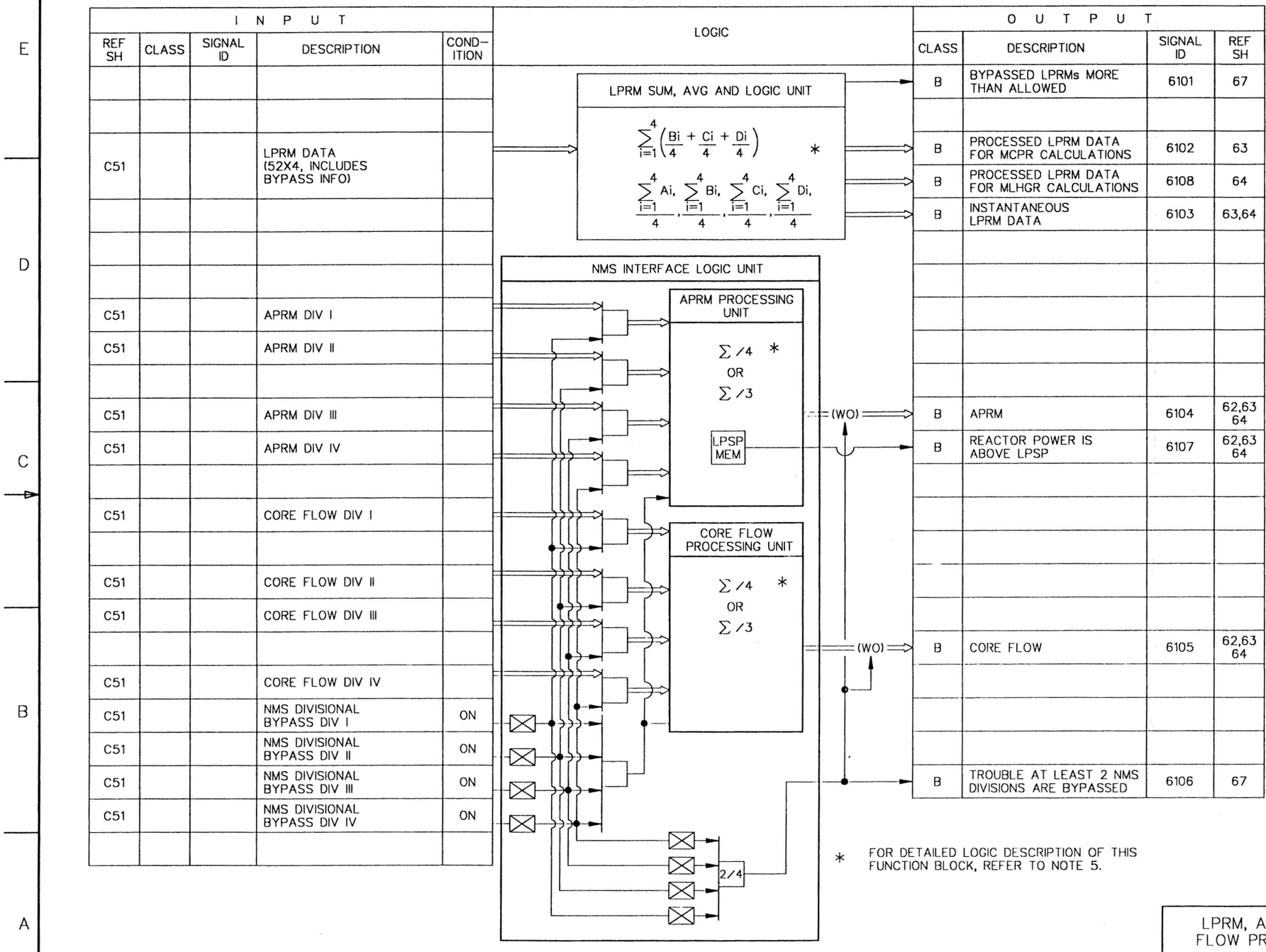
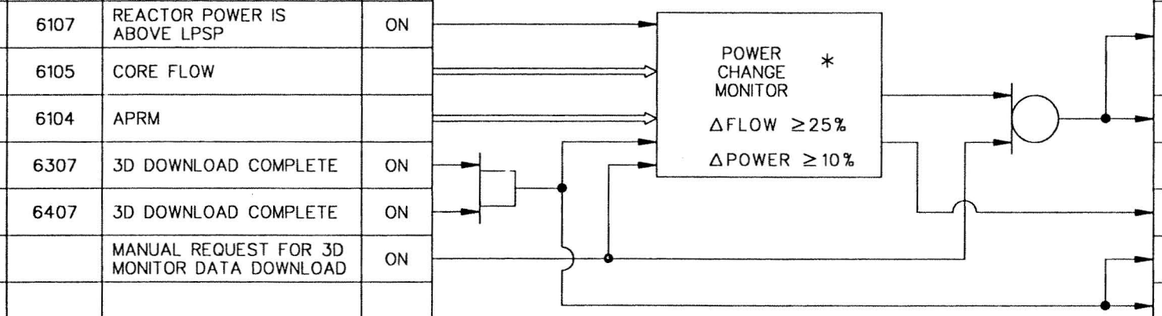


FIGURE 7.7-3 ROD CONTROL AND INFORMATION SYSTEM IBD (Sheet 61 of 87)

I N P U T				
REF SH	CLASS	SIGNAL ID	DESCRIPTION	COND-ITION
	B	6107	REACTOR POWER IS ABOVE LPSP	ON
	B	6105	CORE FLOW	
	B	6104	APRM	
	B	6307	3D DOWNLOAD COMPLETE	ON
	B	6407	3D DOWNLOAD COMPLETE	ON
DOI	B		MANUAL REQUEST FOR 3D MONITOR DATA DOWNLOAD	ON

LOGIC



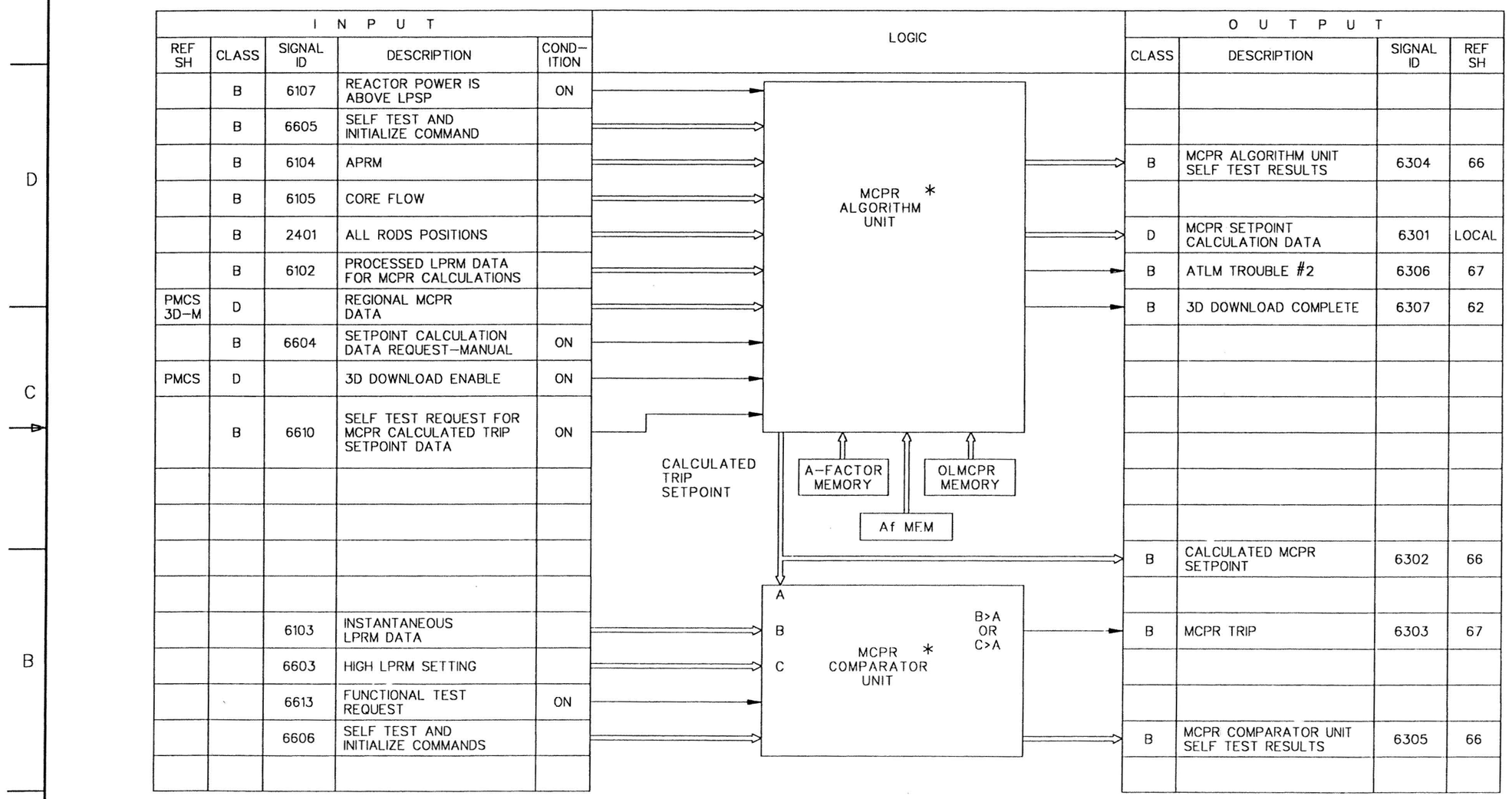
O U T P U T			
CLASS	DESCRIPTION	SIGNAL ID	REF SH
D	SIGNAL TO PGCS/APR TO STOP AUTOMATIC POWER CHANGE WHILE 3D MONITOR DATA DOWNLOAD IS IN PROGRESS	6201	PGCS/ APR
D	3D MONITOR DATA DOWNLOAD REQUEST	6202	PMCS C91
B	ATLM TROUBLE #1	6205	67
D		6203	PMCS CRT/C91
L	3D DOWNLOAD COMPLETE	6204	DOI

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

3D-MONITOR DATA DOWNLOAD REQUEST LOGIC

FIGURE 7.7-3 ROD CONTROL AND INFORMATION SYSTEM IBD (Sheet 62 of 87)

I N P U T					LOGIC	O U T P U T			
REF SH	CLASS	SIGNAL ID	DESCRIPTION	COND–ITION		CLASS	DESCRIPTION	SIGNAL ID	REF SH
	B	6107	REACTOR POWER IS ABOVE LPSP	ON					
	B	6605	SELF TEST AND INITIALIZE COMMAND						
	B	6104	APRM			B	MCPR ALGORITHM UNIT SELF TEST RESULTS	6304	66
	B	6105	CORE FLOW						
	B	2401	ALL RODS POSITIONS			D	MCPR SETPOINT CALCULATION DATA	6301	LOCAL
	B	6102	PROCESSED LPRM DATA FOR MCPR CALCULATIONS			B	ATLM TROUBLE #2	6306	67
PMCS 3D–M	D		REGIONAL MCPR DATA			B	3D DOWNLOAD COMPLETE	6307	62
	B	6604	SETPOINT CALCULATION DATA REQUEST–MANUAL	ON					
PMCS	D		3D DOWNLOAD ENABLE	ON					
	B	6610	SELF TEST REQUEST FOR MCPR CALCULATED TRIP SETPOINT DATA	ON					
		6103	INSTANTANEOUS LPRM DATA			B	CALCULATED MCPR SETPOINT	6302	66
		6603	HIGH LPRM SETTING						
		6613	FUNCTIONAL TEST REQUEST	ON		B	MCPR TRIP	6303	67
		6606	SELF TEST AND INITIALIZE COMMANDS						
						B	MCPR COMPARATOR UNIT SELF TEST RESULTS	6305	66



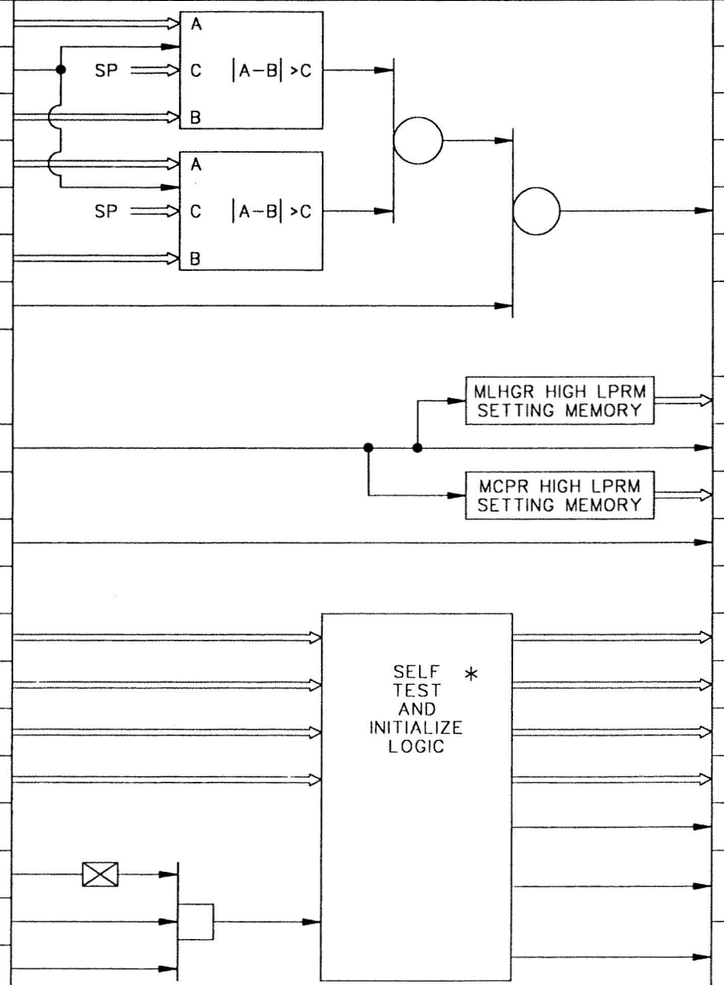
* FOR DETAILED LOGIC DESCRIPTION OF THIS FUNCTION BLOCK, REFER TO NOTE 5.

MCPR LOGIC

FIGURE 7.7–3 ROD CONTROL AND INFORMATION SYSTEM IBD (Sheet 63 of 87)

I N P U T				
REF SH	CLASS	SIGNAL ID	DESCRIPTION	COND-ITION
		6302(B)	ATLM CH B MCPR CALCULATED SETPOINT	
		2204	ATLM CHANNEL B BYPASSED	ON
		6302	ATLM CH A MCPR CALCULATED SETPOINT	
		6402(B)	ATLM CH B MLHGR CALCULATED SETPOINT	
		6402	ATLM CH A MLHGR CALCULATED SETPOINT	
		6501	SELF TEST COMPARATOR TRIP 1	ON
LOCAL PBS			FUNCTIONAL TEST REQUEST	ON
LOCAL PBS	B		SETPOINT CALCULATION DATA REQUEST	ON
		6304	MCPR ALGORITHM UNIT SELF TEST RESULTS	
		6305	MCPR COMPARATOR UNIT SELLF TEST RESULTS	
		6404	MLHGR ALGORITHM UNIT SELF TEST RESULTS	
		6405	MLHGR ALGORITHM UNIT SELF TEST RESULTS	
LOCAL	B		LOCAL "OFF" SWITCH	ON
LOCAL	B		LOCAL "ON" SWITCH	ON
LOCAL	B		POWER SUPPLY	ON

LOGIC



O U T P U T			
CLASS	DESCRIPTION	SIGNAL ID	REF SH
B	SELF TEST COMPARATOR TRIP	6601	67
B	MLHGR HIGH LPRM SETTING DATA	6612	64
B	FUNCTIONAL TEST REQUEST−MANUAL	6613	63,64
B	MCPR HIGH LPRM SETTING DATA	6603	63
B	SETPOINT CALCULATION DATA REQUEST−MANUAL	6604	63
B	MCPR ALGORITHM UNIT SELF TEST & INITIALIZE COMMANDS	6605	63
B	MCPR COMPARATOR UNIT SELF TEST & INITIALIZE COMMANDS	6606	63
B	MLHGR ALGORITHM UNIT SELF TEST & INITIALIZE COMMANDS	6607	64
B	MLHGR COMPARATOR UNIT SELF TEST & INITIALIZE COMMANDS	6608	64
B	SELF TEST & INITIALIZE LOGIC TRIP	6609	67
B	SELF TEST REQUEST FOR MCPR CALCULATED TRIP SETPOINT DATA	6610	63
B	SELF TEST REQUEST FOR MLHGR CALCULATED TRIP SETPOINT DATA	6611	64

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

SELF TEST COMPARATOR, HI LPRM AND SELF TEST & INITIALIZE LOGIC

FIGURE 7.7−3 ROD CONTROL AND INFORMATION SYSTEM IBD (Sheet 66 of 87)

I N P U T					LOGIC	O U T P U T			
REF SH	CLASS	SIGNAL ID	DESCRIPTION	COND-ITION		CLASS	DESCRIPTION	SIGNAL ID	REF SH
						L	LOCAL INDICATOR	6701	
	B	6101	BYPASSED LPRMs MORE THAN ALLOWED	ON					
	B	6106	TROUBLE AT LEAST 2 NMS DIVISIONS ARE BYPASSED	ON		D	ATLM FLOW BLOCK SIGNAL TO 3 CHANNELS OF RFCS	6702	RFCS C81
	B	6303	MCPR TRIP	ON		B	ATLM-A ROD WD BLOCK SIGNAL TO RAPI-A	6703	31
	B	6403	MLHGR TRIP	ON					
	B	6601	SELF TEST COMPARATOR TRIP	ON					
	B	6609	SELF TEST & INITIALIZE LOGIC TRIP	ON					
						L	LOCAL INDICATOR	6704	
	B	6205	ATLM TROUBLE #1	ON		L	LOCAL INDICATOR	6705	
	B	6306	ATLM TROUBLE #2	ON		L	LOCAL INDICATOR	6706	
	B	6406	ATLM TROUBLE #3	ON		L	LOCAL INDICATOR	6707	
						L	LOCAL INDICATOR	6708	
						B	ATLM TROUBLE	6709	
						ANN		6710	
						L	LOCAL INDICATOR	6711	
						L	LOCAL INDICATOR	6712	
						L	LOCAL INDICATOR	6713	

TRIP OUTPUT MODULE LOGIC

FIGURE 7.7-3 ROD CONTROL AND INFORMATION SYSTEM IBD (Sheet 67 of 87)

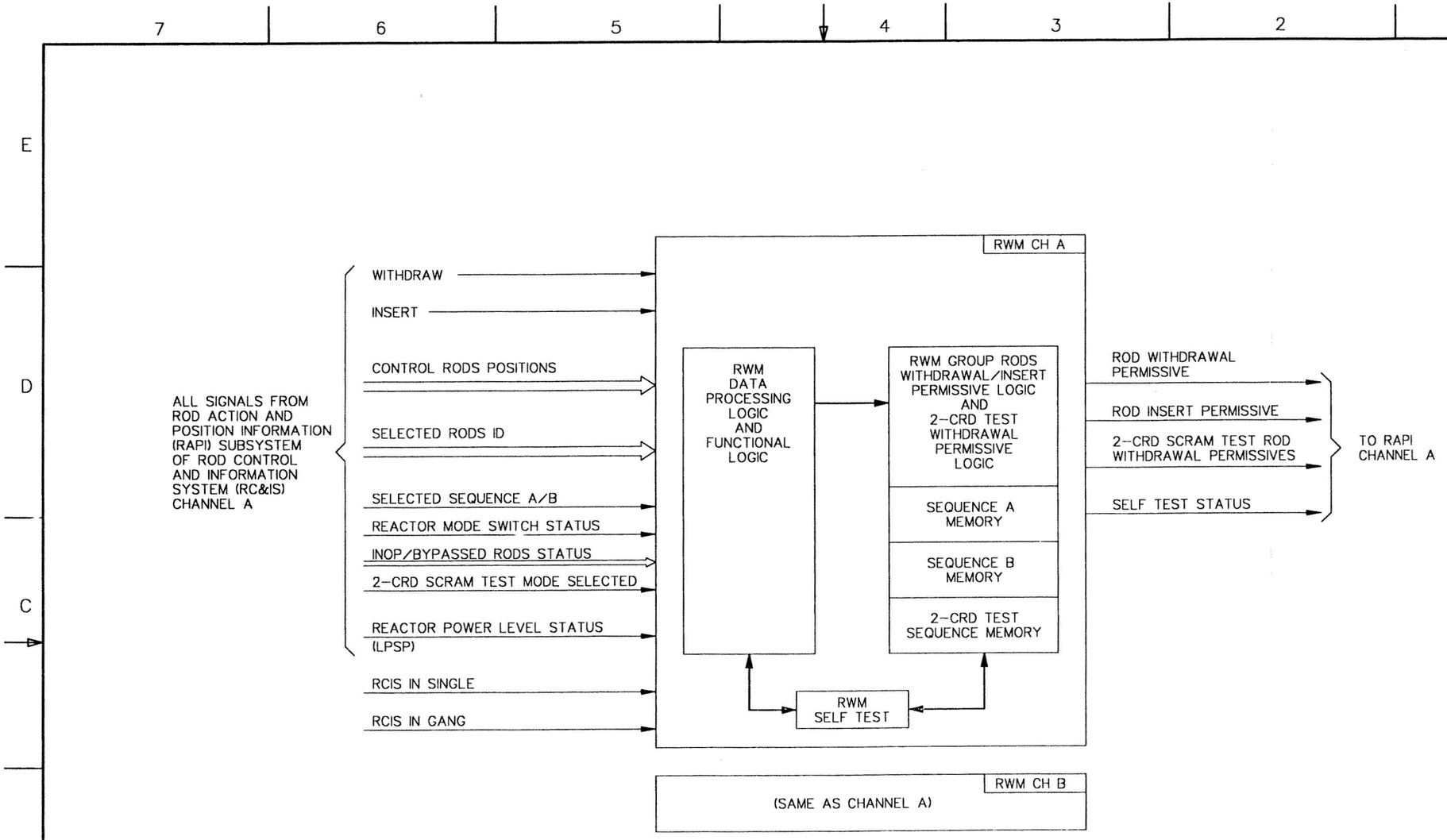


FIGURE 7.7-3 ROD CONTROL AND INFORMATION SYSTEM IBD (Sheet 68 of 87)

I N P U T					LOGIC	O U T P U T			
REF SH	CLASS	SIGNAL ID	DESCRIPTION	COND–ITION		CLASS	DESCRIPTION	SIGNAL ID	REF SH
	B	0404	REACTOR MODE SWITCH IN START–UP	ON		B	G1–G4 GANG ROD WITHDRAWAL INITIAL CONDITIONS OK	6901	73,74 75,76
	B	0305	REACTOR POWER IS BELOW LPSP	ON					
						B	G1–G4 GANG ROD INSERT INITIAL CONDITIONS OK	6902	73,74 75,76
	B	0405	REACTOR MODE SWITCH IS IN RUN	ON		B	G1–G4 SINGLE ROD INSERT INITIAL CONDITIONS OK	6903	73,74 75,76
	B	0605	RCIS IN GANG ROD DRIVE MODE	ON					
	B	0604	RCIS IN SINGLE ROD DRIVE MODE	ON		B	G1–G4 SINGLE ROD WITHDRAWAL INITIAL CONDITIONS OK	6904	73,74 75,76
	B	0707	RCIS IN ROD INSERT MODE	ON		B	G5–G10 GANG ROD INSERT INITIAL CONDITIONS OK	6905	77,78 79,80 81,82
	B	0708	RCIS IN ROD WITHDRAWAL MODE	ON					
						B	G5–G10 GANG ROD WITHDRAWAL INITIAL CONDITIONS OK	6906	77,78 79,80 81,82
						B	G5–G10 SINGLE ROD WITHDRAWAL INITIAL CONDITIONS OK	6907	77,78 79,80 81,82
						B	G5–G10 SINGLE ROD INSERT INITIAL CONDITIONS OK	6908	77,78 79,80 81,82

RWM INITIAL CONDITIONS GENERATION LOGIC

FIGURE 7.7–3 ROD CONTROL AND INFORMATION SYSTEM IBD (Sheet 69 of 87)

I N P U T				
REF SH	CLASS	SIGNAL ID	DESCRIPTION	COND–ITION
	B	0606	SEQUENCE A SELECTED	ON
	B	0607	SEQUENCE B SELECTED	ON

LOGIC

RWM ROD POSITION DATA PROCESSING AND LOGIC UNIT

SEQ A * MEM

SEQ B * MEM

ROD POSITION PROCESSING

2CRD TEST MEM

O U T P U T			
CLASS	DESCRIPTION	SIGNAL ID	REF SH
B	ALL G1 RODS FULL–IN	7001	72,74 75,76
B	ALL G1 RODS FULL–OUT	7002	72,74 75,76
B	ALL G2 RODS FULL–IN	7003	72,73 75,76
B	ALL G2 RODS FULL–OUT	7004	72,73 75,76
B	ALL G3 RODS FULL–IN	7005	72,73 74,76
B	ALL G3 RODS FULL–OUT	7006	72,73 74,76
B	ALL G4 RODS FULL–IN	7007	72,73 74,75
B	ALL G4 RODS FULL–OUT	7008	72,73 74,75
B	ALL G5 RODS FULL–IN	7009	72
B	ALL G6 RODS FULL–IN	7011	72
B	ALL G7 RODS FULL–IN	7013	72
B	ALL G8 RODS FULL–IN	7015	72
B	ALL G9 RODS FULL–IN	7017	72
B	ALL G10 RODS FULL–IN	7019	72
B	ALL G5 RODS >957 mm	7021	72
B	ALL G6 RODS >957 mm	7022	72
B	ALL G5 RODS ≥914±10 mm	7025	72
B	ALL G6 RODS ≥914±10 mm	7026	72
B	ALL G7 RODS ≥914±10 mm	7031	72
B	ALL G8 RODS ≥914±10 mm	7032	72
B	ALL G9 RODS ≥914±10 mm	7033	72
B	ALL G10 RODS ≥914±10 mm	7034	72

CONTINUED ON SHEET 71

* THE CONTENTS OF THESE TWO SEQUENCE MEMORIES ARE THE SAME AS THOSE ON SHEET 10.

RWM ROD POSITION PROCESSING LOGIC

FIGURE 7.7–3 ROD CONTROL AND INFORMATION SYSTEM IBD (Sheet 70 of 87)

INPUT					LOGIC	OUTPUT			
REF SH	CLASS	SIGNAL ID	DESCRIPTION	CONDITION		CLASS	DESCRIPTION	SIGNAL ID	REF SH
	B	2401	ALL RODS POSITIONS		RWM ROD POSITION DATA PROCESSING AND LOGIC UNIT	B	NO ROD IS SELECTED	7158	83,84
						B	G1 RODS ARE SELECTED	7135	73
						B	A ROD IN G1 IS SELECTED	7136	73
	B	3004	BYPASSED RODS STATUS			B	G2 RODS ARE SELECTED	7137	74
	B	0604	RCIS IN SINGLE ROD DRIVE MODE	ON		B	A ROD IN G2 IS SELECTED	7138	74
	B	0605	RCIS IN GANG ROD DRIVE MODE	ON		B	G3 RODS ARE SELECTED	7139	75
						B	A ROD IN G3 IS SELECTED	7140	75
	B	1003	SELECTED GANG			B	G4 RODS ARE SELECTED	7141	76
						B	A ROD IN G4 IS SELECTED	7142	76
	B	2416	SELECTED ROD			B	G5 RODS ARE SELECTED	7143	77
						B	A ROD IN G5 IS SELECTED	7144	77
	B	0707	RCIS IN ROD INSERT MODE	ON		B	G6 RODS ARE SELECTED	7145	78
						B	A ROD IN G6 IS SELECTED	7146	78
	B	0708	RCIS IN ROD WITHDRAWAL MODE	ON		B	A GANG IN G7 IS SELECTED	7147	79
						B	A ROD IN G7 IS SELECTED	7148	79
						B	A GANG IN G8 IS SELECTED	7149	80
						B	A ROD IN G8 IS SELECTED	7150	80
						B	A GANG IN G9 IS SELECTED	7151	81
						B	A ROD IN G9 IS SELECTED	7152	81
						B	A GANG IN G10 IS SELECTED	7153	82
						B	A ROD IN G10 IS SELECTED	7154	82
						B	SELECTED RODS COORDINATES	7155	85
						B	SELECTED ROD FULL-OUT	7156	85
						B	SELECTED DUAL RODS ARE FULL-OUT	7157	85
						B	LEADING/TRAILING RODS POSITION DIFFERENCE VIOLATION	7127	73,74 75,76 79,80 81,82
						B	G1-G4 SEQUENCE WD/INS OK	7128	73,74 75,76
						B	SELECTED ROD WD/INS SEQ OK	7129	

ROD POSITION PROCESSING

LEADING/TRAILING RODS POSITION DIFFERENCE DETECTION LOGIC

G1-G10 WD/INS STATUS

ROD GROUP SEQUENCE CONTROL

CONTINUED FROM SHEET 70

RWM ROD POSITION PROCESSING LOGIC

FIGURE 7.7-3 ROD CONTROL AND INFORMATION SYSTEM IBD SH 71 OF 87

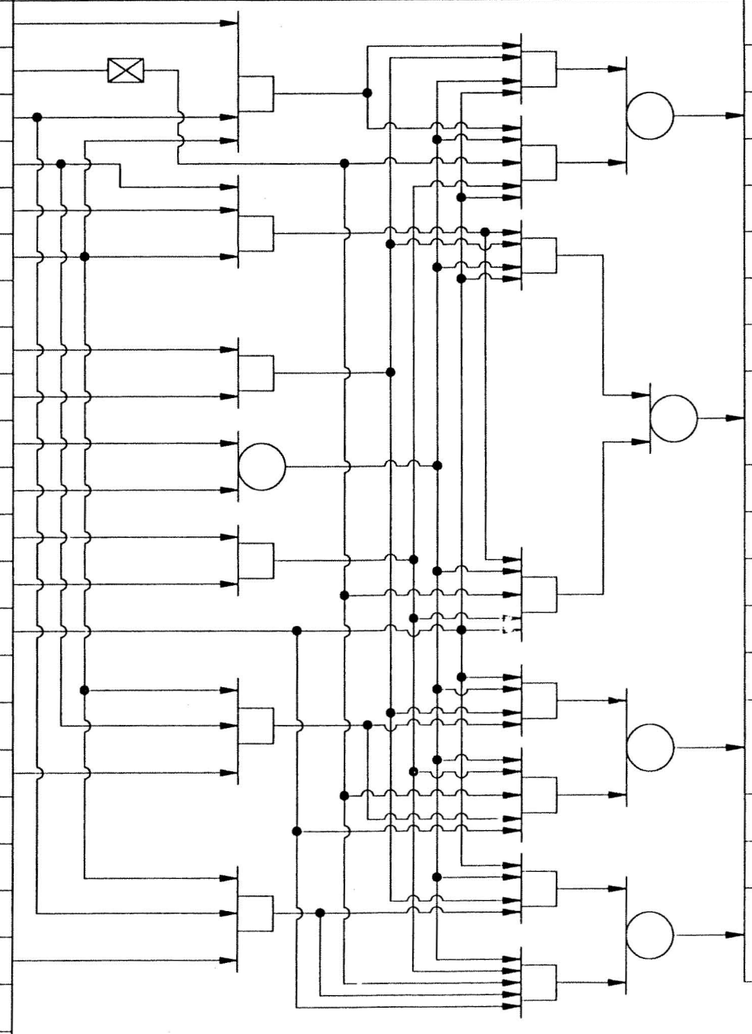
INPUT					LOGIC	OUTPUT			
REF SH	CLASS	SIGNAL ID	DESCRIPTION	COND-ITION		CLASS	DESCRIPTION	SIGNAL ID	REF SH
	B	7009	G5 RODS FULL-IN	OFF					
	B	7011	G6 RODS FULL-IN	ON					
	B	7013	G7 RODS FULL-IN	ON		B	G5-G10 RODS FULL-IN	7201	73,74 75,76
	B	7015	G8 RODS FULL-IN	ON					
	B	7017	G9 RODS FULL-IN	ON					
	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	G1-G4 RODS FULL-OUT	7203	77,78 79,80 81,82
	B	7006	G3 RODS FULL-OUT	ON					
	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)

I N P U T				
REF SH	CLASS	SIGNAL ID	DESCRIPTION	COND-ITION
	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



O U T P U T			
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)

I N P U T				
REF SH	CLASS	SIGNAL ID	DESCRIPTION	COND-ITION
	B	6904	G1–G4 SINGLE ROD WD INITIAL CONDITIONS OK	ON
	B	7127	LEADING/TRAILING ROD POS DIFF VIOLATION	ON
	B	7138	A ROD IN G2 IS SELECTED	ON
	B	7137	G2 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	7001	ALL G1 RODS FULL–IN	ON
	B	7002	ALL G1 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

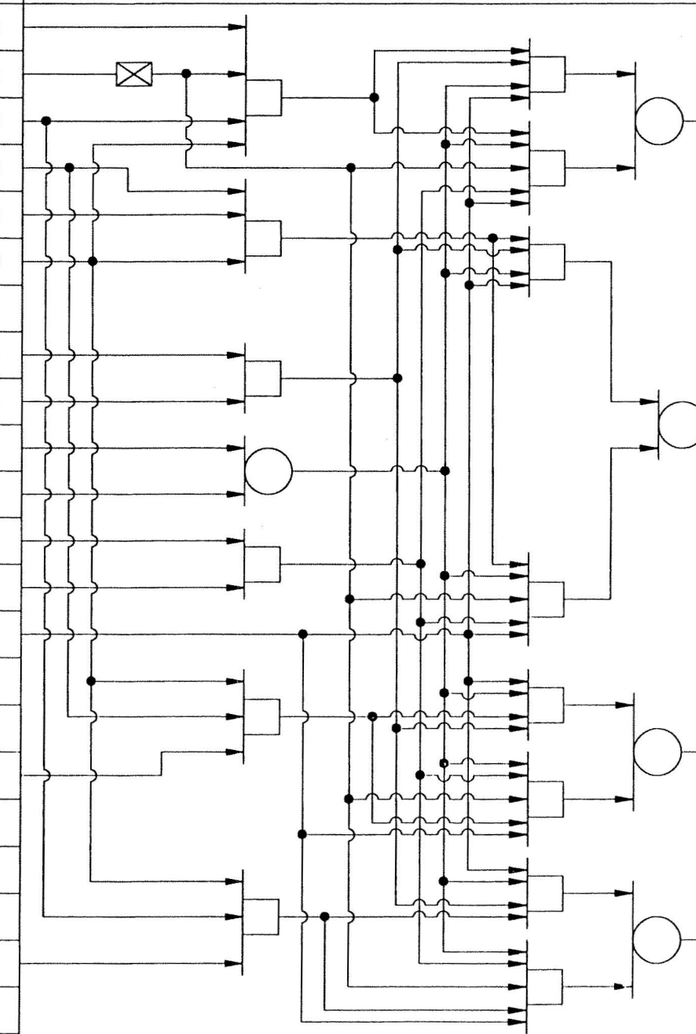
O U T P U T			
CLASS	DESCRIPTION	SIGNAL ID	REF SH
B	G2 SINGLE ROD WD PERMISSIVE	7401	83
B	G2 RODS GANG WD PERMISSIVE	7402	83
B	G2 RODS GANG INSERT PERMISSIVE	7403	84
B	G2 SINGLE ROD INSERT PERMISSIVE	7404	84

G2 ROD(S) WD/INS PERMISSIVE LOGIC

FIGURE 7.7–3 ROD CONTROL AND INFORMATION SYSTEM IBD (Sheet 74 of 87)

I N P U T				
REF SH	CLASS	SIGNAL ID	DESCRIPTION	COND–ITION
	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	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	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	6903	G1–G4 SINGLE ROD INS INITIAL CONDITIONS OK	ON

LOGIC



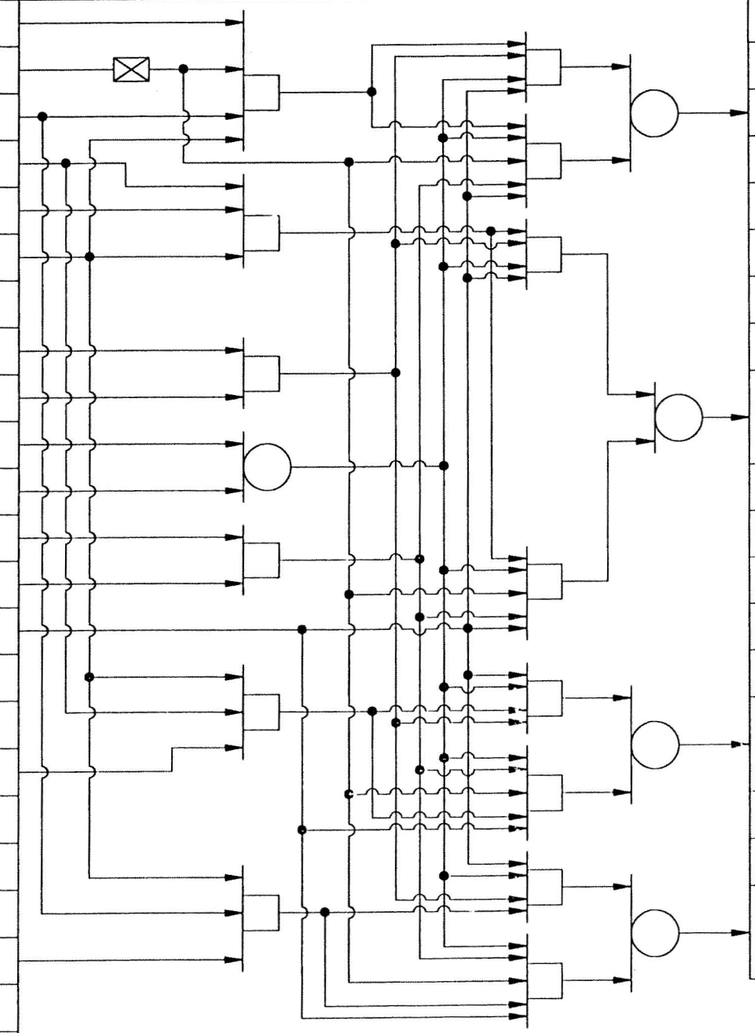
O U T P U T			
CLASS	DESCRIPTION	SIGNAL ID	REF SH
B	G3 SINGLE ROD WD PERMISSIVE	7501	83
B	G3 RODS GANG WD PERMISSIVE	7502	83
B	G3 RODS GANG INSERT PERMISSIVE	7503	84
B	G3 SINGLE ROD INSERT PERMISSIVE	7504	84

G3 ROD(S) WD/INS PERMISSIVE LOGIC

FIGURE 7.7–3 ROD CONTROL AND INFORMATION SYSTEM IBD (Sheet 75 of 87)

I N P U T				
REF SH	CLASS	SIGNAL ID	DESCRIPTION	COND-ITION
	B	6904	G1–G4 SINGLE ROD WD INITIAL CONDITIONS OK	ON
	B	7127	LEADING/TRAILING ROD POS DIFF VIOLATION	ON
	B	7142	A ROD IN G4 IS SELECTED	ON
	B	7141	G4 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	7005	ALL G3 RODS FULL–IN	ON
	B	7006	ALL G3 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	6903	G1–G4 SINGLE ROD INS INITIAL CONDITIONS OK	ON

LOGIC



O U T P U T			
CLASS	DESCRIPTION	SIGNAL ID	REF SH
B	G4 SINGLE ROD WD PERMISSIVE	7601	83
B	G4 RODS GANG WD PERMISSIVE	7602	83
B	G4 RODS GANG INSERT PERMISSIVE	7603	84
B	G4 SINGLE ROD INSERT PERMISSIVE	7604	84

G4 ROD(S) WD/INS PERMISSIVE LOGIC

FIGURE 7.7-3 ROD CONTROL AND INFORMATION SYSTEM IBD (Sheet 76 of 87)

I N P U T					LOGIC	O U T P U T			
REF SH	CLASS	SIGNAL ID	DESCRIPTION	COND–ITION		CLASS	DESCRIPTION	SIGNAL ID	REF SH
	B	6906	G5–G10 GANG ROD WD INITIAL COND OK	ON					
	B	7203	G1–G4 RODS FULL–OUT	ON		B	G5 RODS GANG WD PERMISSIVE	7701	83
	B	6907	G5–G10 SINGLE ROD WD INITIAL COND OK	ON		B	G5 SINGLE ROD WD PERMISSIVE	7702	83
	B	7143	G5 RODS ARE SELECTED	ON					
	B	7144	A ROD IN G5 IS SELECTED	ON					
	B	6905	G5–G10 GANG ROD INS INITIAL COND OK	ON		B	G5 RODS GANG INSERT PERMISSIVE	7703	84
	B	7205	G5 RODS PARTIAL INSERT PERMISSIVE	ON					
	B	6908	G5–G10 SINGLE ROD INS INITIAL COND OK	ON		B	G5 SINGLE ROD INSERT PERMISSIVE	7704	84

G5 RODS WD/INS PERMISSIVE LOGIC

FIGURE 7.7–3 ROD CONTROL AND INFORMATION SYSTEM IBD (Sheet 77 of 87)

I N P U T					LOGIC	O U T P U T			
REF SH	CLASS	SIGNAL ID	DESCRIPTION	COND-ITION		CLASS	DESCRIPTION	SIGNAL ID	REF SH
	B	6906	G5–G10 GANG ROD WD INITIAL COND OK	ON					
	B	7203	G1–G4 RODS FULL–OUT	ON		B	G6 RODS GANG WD PERMISSIVE	7801	83
	B	6907	G5–G10 SINGLE ROD WD INITIAL COND OK	ON		B	G6 SINGLE ROD WD PERMISSIVE	7802	83
	B	7145	G5 RODS ARE SELECTED	ON					
	B	7146	A ROD IN G6 IS SELECTED	ON					
	B	6905	G5–G10 GANG ROD INS INITIAL COND OK	ON		B	G6 RODS GANG INSERT PERMISSIVE	7803	84
	B	7206	G6 RODS PARTIAL INSERT PERMISSIVE	ON					
						B	G6 SINGLE ROD INSERT PERMISSIVE	7804	84
	B	6908	G5–G10 SINGLE ROD INS INITIAL COND OK	ON					

G6 RODS WD/INS PERMISSIVE LOGIC

FIGURE 7.7–3 ROD CONTROL AND INFORMATION SYSTEM IBD (Sheet 78 of 87)

I N P U T					LOGIC	O U T P U T			
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	G7 RODS GANG WD PERMISSIVE	7901	83
	B	7204	G7 & G8 ROD(S) WD/INS PERMISSIVE ENABLE	ON					
	B	7147	A GANG IN G7 IS SELECTED	ON					
	B	7148	A ROD IN G7 IS SELECTED	ON		B	G7 SINGLE ROD WD PERMISSIVE	7902	83
	B	6907	G5–G10 SINGLE ROD WD INITIAL CONDITIONS OK	ON					
						B	G7 RODS GANG INSERT PERMISSIVE	7903	84
	B	6905	G5–G10 GANG ROD INS INITIAL CONDITIONS OK	ON					
						B	G7 SINGLE ROD INSERT PERMISSIVE	7904	84
	B	6908	G5–G10 SINGLE ROD INS INITIAL CONDITIONS OK	ON					

G7 RODS WD/INS PERMISSIVE LOGIC

FIGURE 7.7–3 ROD CONTROL AND INFORMATION SYSTEM IBD (Sheet 79 of 87)

I N P U T				
REF SH	CLASS	SIGNAL ID	DESCRIPTION	COND-ITION
	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	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	6907	G5–G10 SINGLE ROD WD INITIAL CONDITIONS OK	ON
	B	6905	G5–G10 GANG ROD INS INITIAL CONDITIONS OK	ON
	B	6908	G5–G10 SINGLE ROD INS INITIAL CONDITIONS OK	ON

LOGIC

O U T P U T			
CLASS	DESCRIPTION	SIGNAL ID	REF SH
B	G8 RODS GANG WD PERMISSIVE	8001	83
B	G8 SINGLE ROD WD PERMISSIVE	8002	83
B	G8 RODS GANG INSERT PERMISSIVE	8003	84
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)

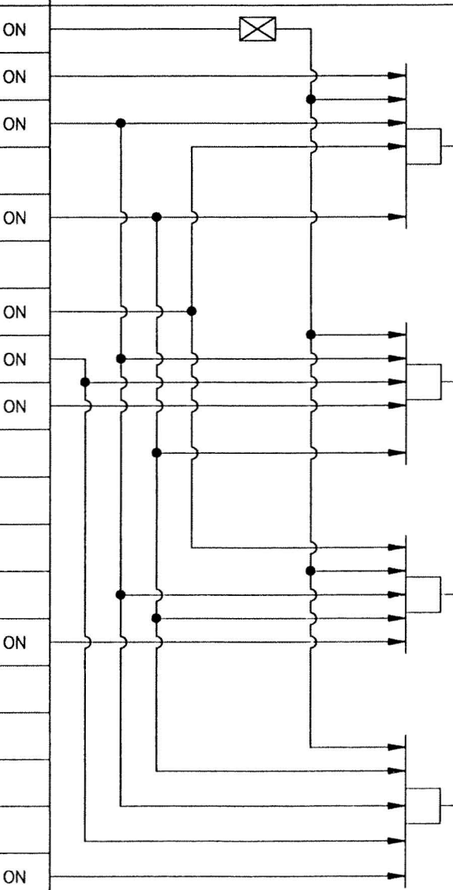
I N P U T					LOGIC	O U T P U T			
REF SH	CLASS	SIGNAL ID	DESCRIPTION	COND-ITION		CLASS	DESCRIPTION	SIGNAL ID	REF SH
	B	7127	LEADING/TRAILING ROD POS DIFF VIOLATION	ON					
	B	6906	G5–G10 GANG ROD WD INITIAL CONDITIONS OK	ON					
	B	7203	G1–G4 RODS FULL–OUT	ON		B	G9 RODS GANG WD PERMISSIVE	8101	83
	B	7202	G9 & G10 ROD(S) WD/INS PERMISSIVE ENABLE	ON					
	B	7150	A GANG IN G9 IS SELECTED	ON					
	B	7151	A ROD IN G9 IS SELECTED	ON		B	G9 SINGLE ROD WD PERMISSIVE	8102	83
	B	6907	G5–G10 SINGLE ROD WD INITIAL CONDITIONS OK	ON					
	B	6905	G5–G10 GANG ROD INS INITIAL CONDITIONS OK	ON		B	G9 RODS GANG INSERT PERMISSIVE	8103	84
	B	6908	G5–G10 SINGLE ROD INS INITIAL CONDITIONS OK	ON		B	G9 SINGLE ROD INSERT PERMISSIVE	8104	84

G9 RODS WD/INS PERMISSIVE LOGIC

FIGURE 7.7–3 ROD CONTROL AND INFORMATION SYSTEM IBD (Sheet 81 of 87)

I N P U T				
REF SH	CLASS	SIGNAL ID	DESCRIPTION	COND–ITION
	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	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	6907	G5–G10 SINGLE ROD WD INITIAL CONDITIONS OK	ON
	B	6905	G5–G10 GANG ROD INS INITIAL CONDITIONS OK	ON
	B	6908	G5–G10 SINGLE ROD INS INITIAL CONDITIONS OK	ON

LOGIC



O U T P U T			
CLASS	DESCRIPTION	SIGNAL ID	REF SH
B	G10 RODS GANG WD PERMISSIVE	8201	83
B	G10 SINGLE ROD WD PERMISSIVE	8202	83
B	G10 RODS GANG INSERT PERMISSIVE	8203	84
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	RWM ROD WD PERMISSIVE	8301	18
	B	7801	G6 RODS GANG WD PERMISSIVE	ON					
	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)

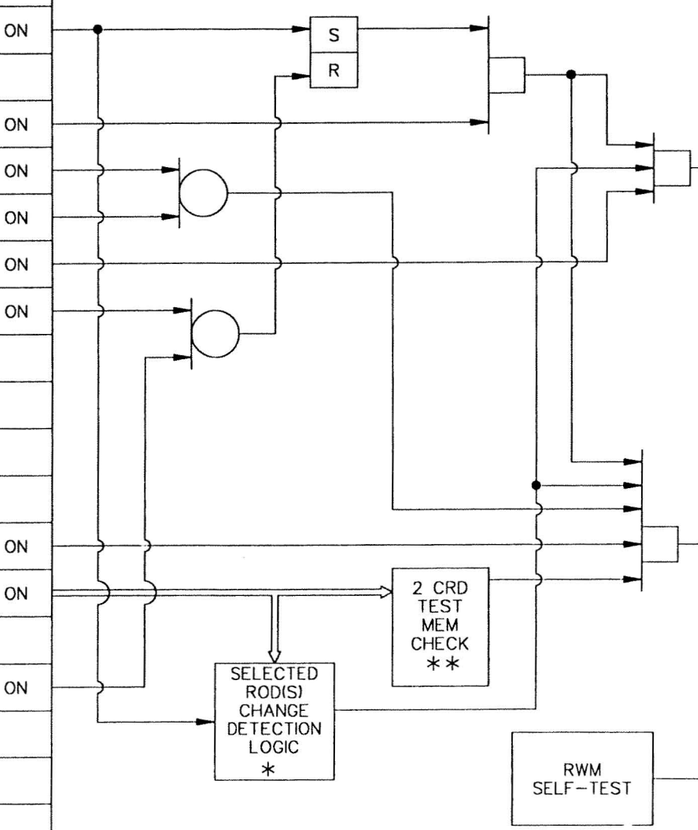
INPUT					LOGIC	OUTPUT			
REF SH	CLASS	SIGNAL ID	DESCRIPTION	COND-ITION		CLASS	DESCRIPTION	SIGNAL ID	REF SH
	B	7303	G1 RODS GANG INS PERMISSIVE	ON					
	B	7304	G1 SINGLE ROD INS PERMISSIVE	ON					
	B	7403	G2 RODS GANG INS PERMISSIVE	ON					
	B	7404	G2 SINGLE ROD INS PERMISSIVE	ON					
	B	7503	G3 RODS 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	RWM ROD INS PERMISSIVE	8401	20
	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					

RWM ROD INS PERMISSIVE LOGIC

FIGURE 7.7-3 ROD CONTROL AND INFORMATION SYSTEM IBD (Sheet 84 of 87)

I N P U T				
REF SH	CLASS	SIGNAL ID	DESCRIPTION	COND–ITION
	B	7207	ALL RODS FULL–IN	ON
	B	0403	REACTOR MODE SWITCH IN REFUEL	ON
	B	0801	CRD STSS IN 2CRD/1CRD SCRAM TIME TEST MODE	ON
	B	0802	CRD STSS IN COUPLING CHECK MODE	ON
	B	0604	RCIS IN SINGLE ROD DRIVE MODE	ON
	B	7156	SELECTED ROD IS FULL–OUT	ON
	B	0605	RCIS IN GANG ROD DRIVE MODE	ON
	B	7155	SELECTED RODS COORDINATES	ON
	B	7157	SELECTED DUAL RODS ARE FULL–OUT	ON

LOGIC



O U T P U T			
CLASS	DESCRIPTION	SIGNAL ID	REF SH
B	RWM SINGLE ROD WD PERMISSIVE IN REFUEL MODE FOR SINGLE CRD SCRAM TIME TEST	8501	19
B	RWM DUAL ROD WD PERMISSIVE IN REFUEL MODE FOR DUAL CRD SCRAM TIME TEST	8502	19
B	RWM SELF–TEST FAULT/TROUBLE	8503	18,19 20

* THIS LOGIC GENERATES A HIGH OUTPUT AS LONG AS THERE IS NO CHANGE IN THE COORDINATES OF SELECTED ROD(S), AFTER "ALL RODS FULL–IN" SIGNAL BECOMES LOW.

** THIS LOGIC GENERATES A HIGH OUTPUT WHENEVER THE "SELECTED RODS COORDINATES" INPUT IS CONSISTENT WITH THE MEMORY CONTENT AS DEPICTED ON SH 87.

RWM ROD WD PERMISSIVE LOGIC FOR 1CRD/2CRD TEST & SELF–TEST LOGIC

FIGURE 7.7–3 ROD CONTROL AND INFORMATION SYSTEM IBD (Sheet 85 of 87)

7 6 5 4 3 2

E

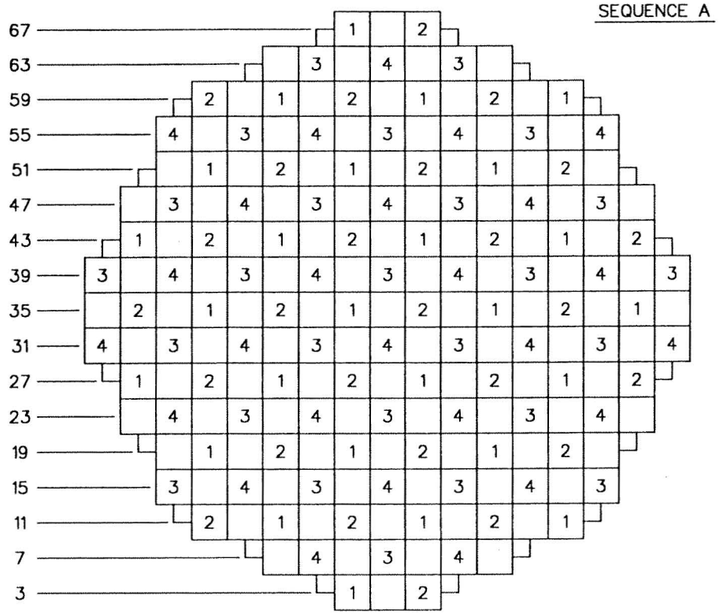
D

C

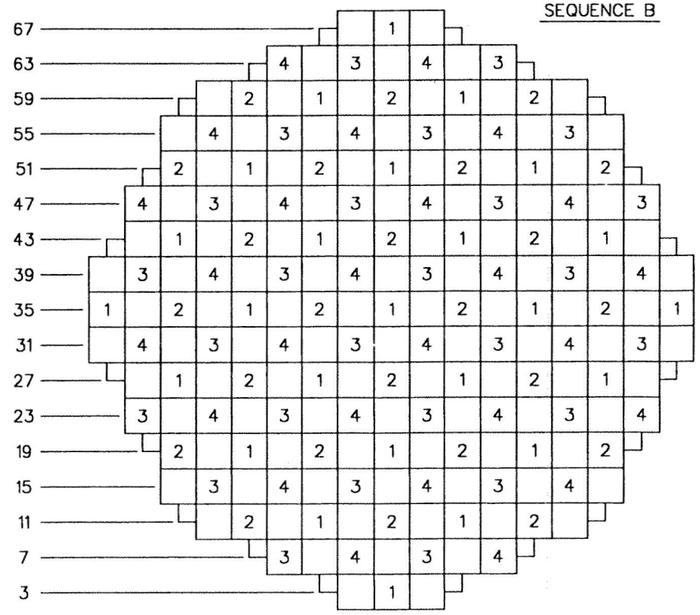
B

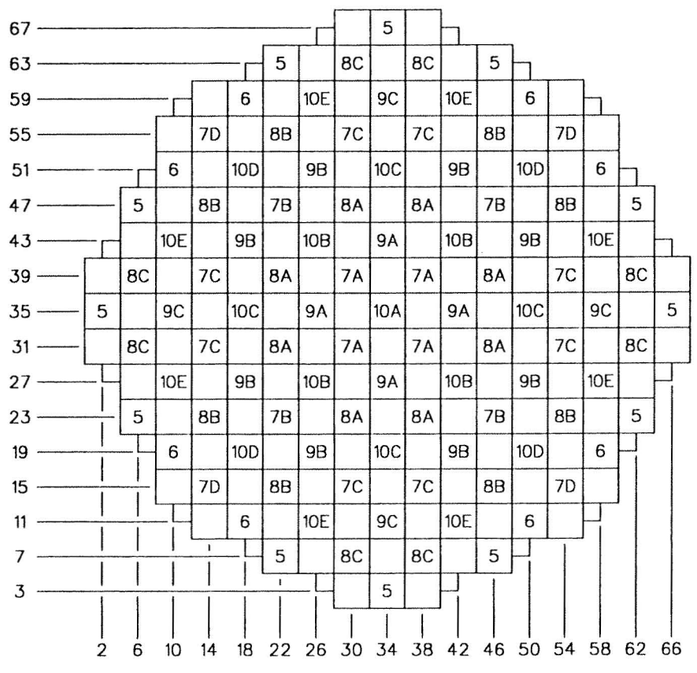
A

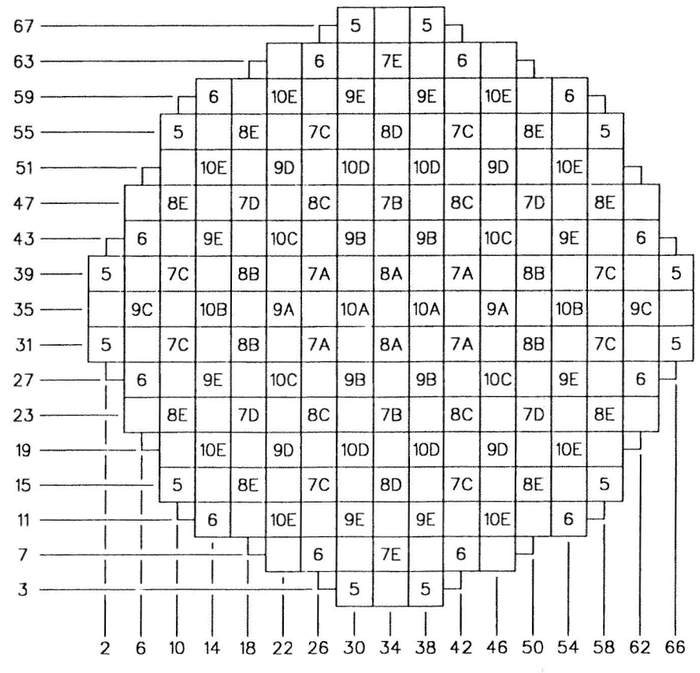
SEQUENCE A



SEQUENCE B



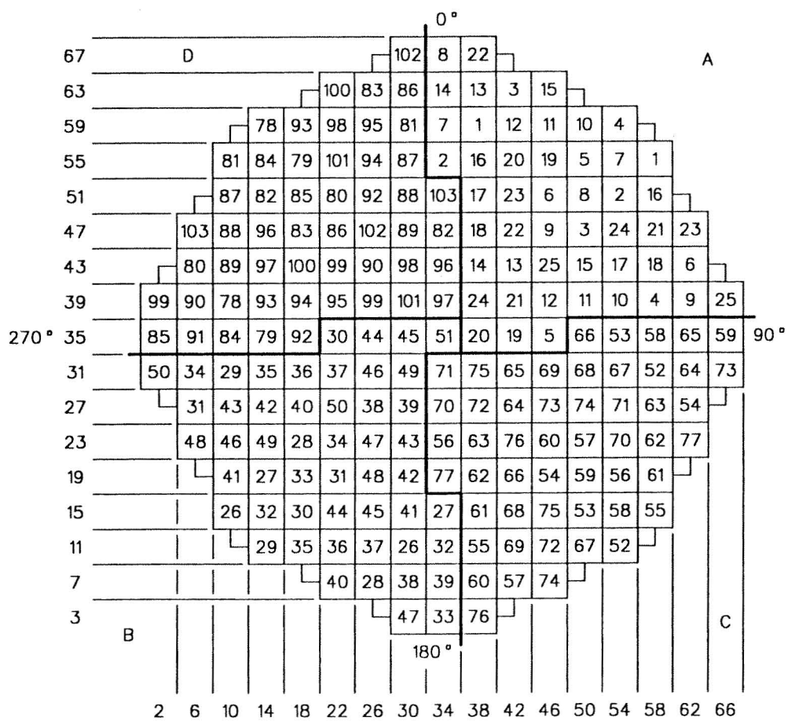




RWM SEQUENCE DATA – ROD GROUP

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

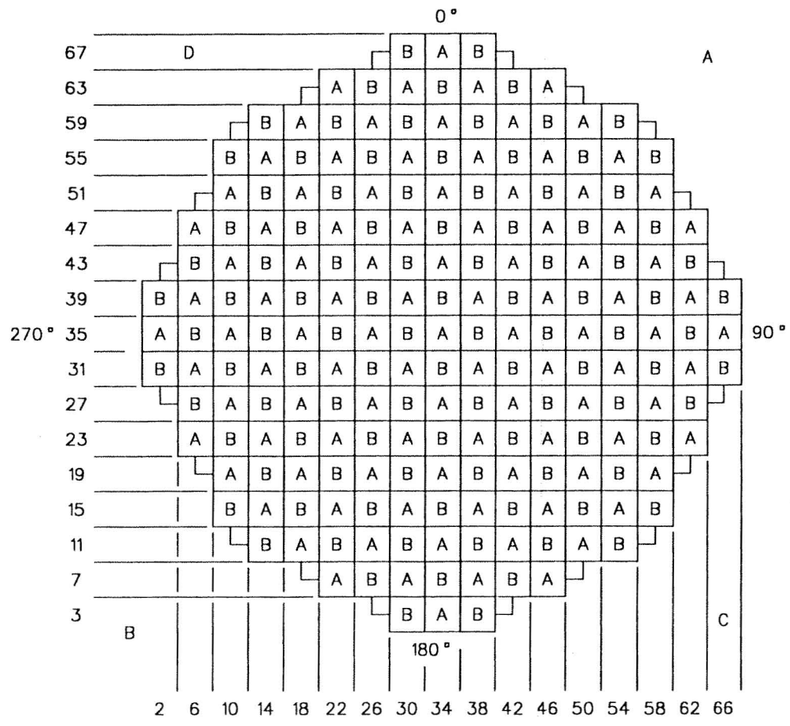


TOP VIEW

CONTROL ROD ASSIGNMENT TO HYDRAULIC CONTROL UNITS

A – A–SEQUENCE ROD (101 CONTROL RODS)

B – B–SEQUENCE ROD (104 CONTROL RODS)



TOP VIEW

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:

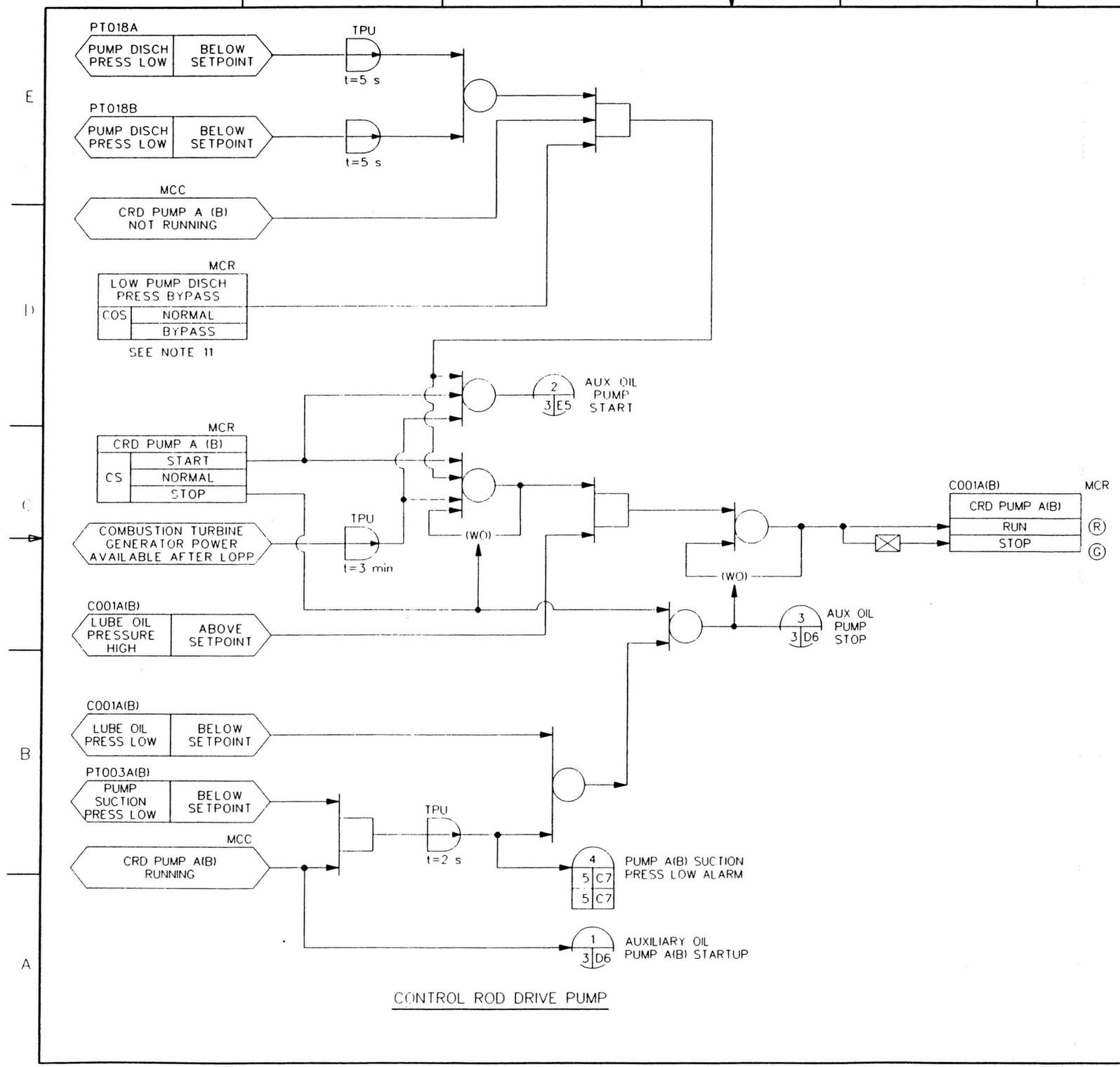
(BL) - BLUE LIGHT

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)

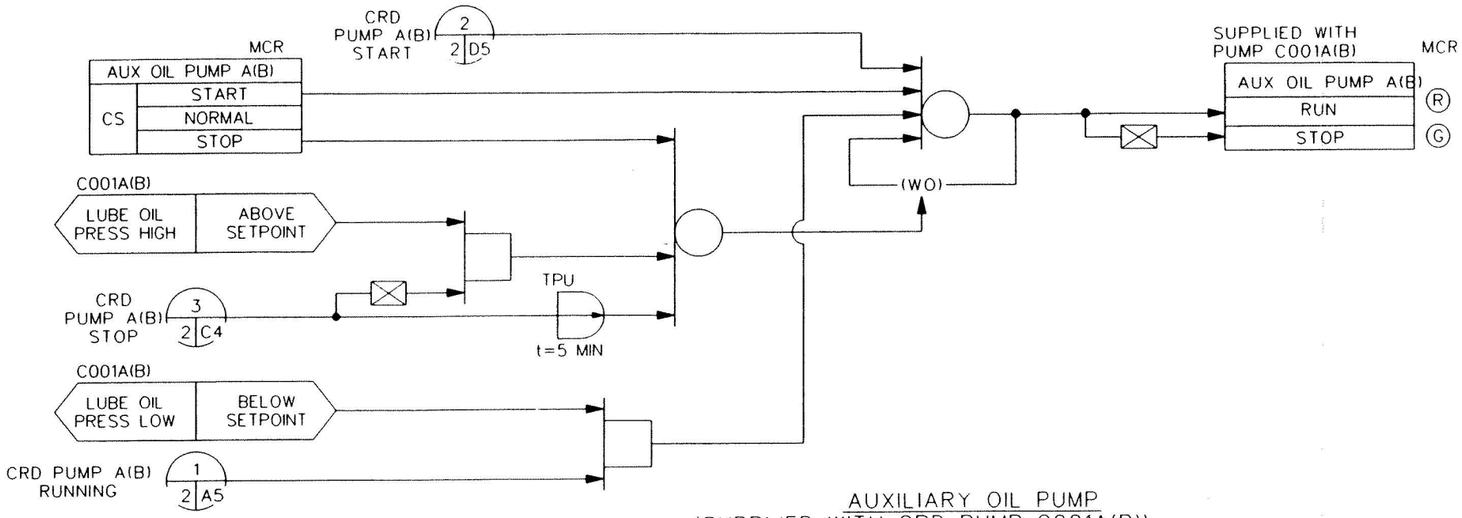
MPL NO C12-1030

FIGURE 7.7-4 CONTROL ROD DRIVE SYSTEM IBD (Sheet 1 of 8)

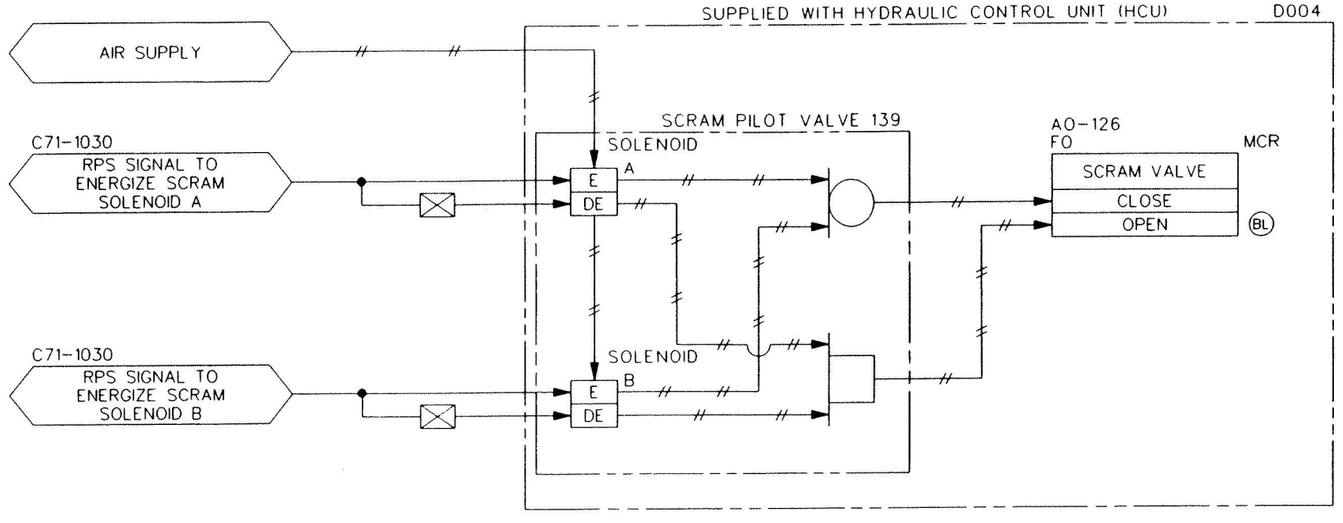


OPERATING CONTROLS			
SUPERVISORY INSTRUMENTS	USE	SPECIFICATION	LOCATION
ANNUNCIATORS	NO.	INDICATOR	LOCATION
OTHERS			

FIGURE 7.7-4 CONTROL ROD DRIVE SYSTEM IBD (Sheet 2 of 8)



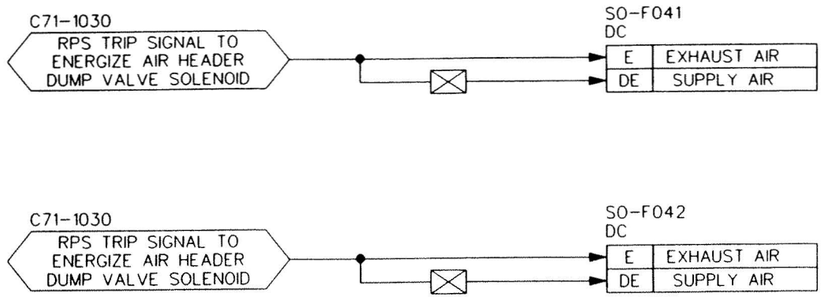
AUXILIARY OIL PUMP
(SUPPLIED WITH CRD PUMP C001A(B))



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			

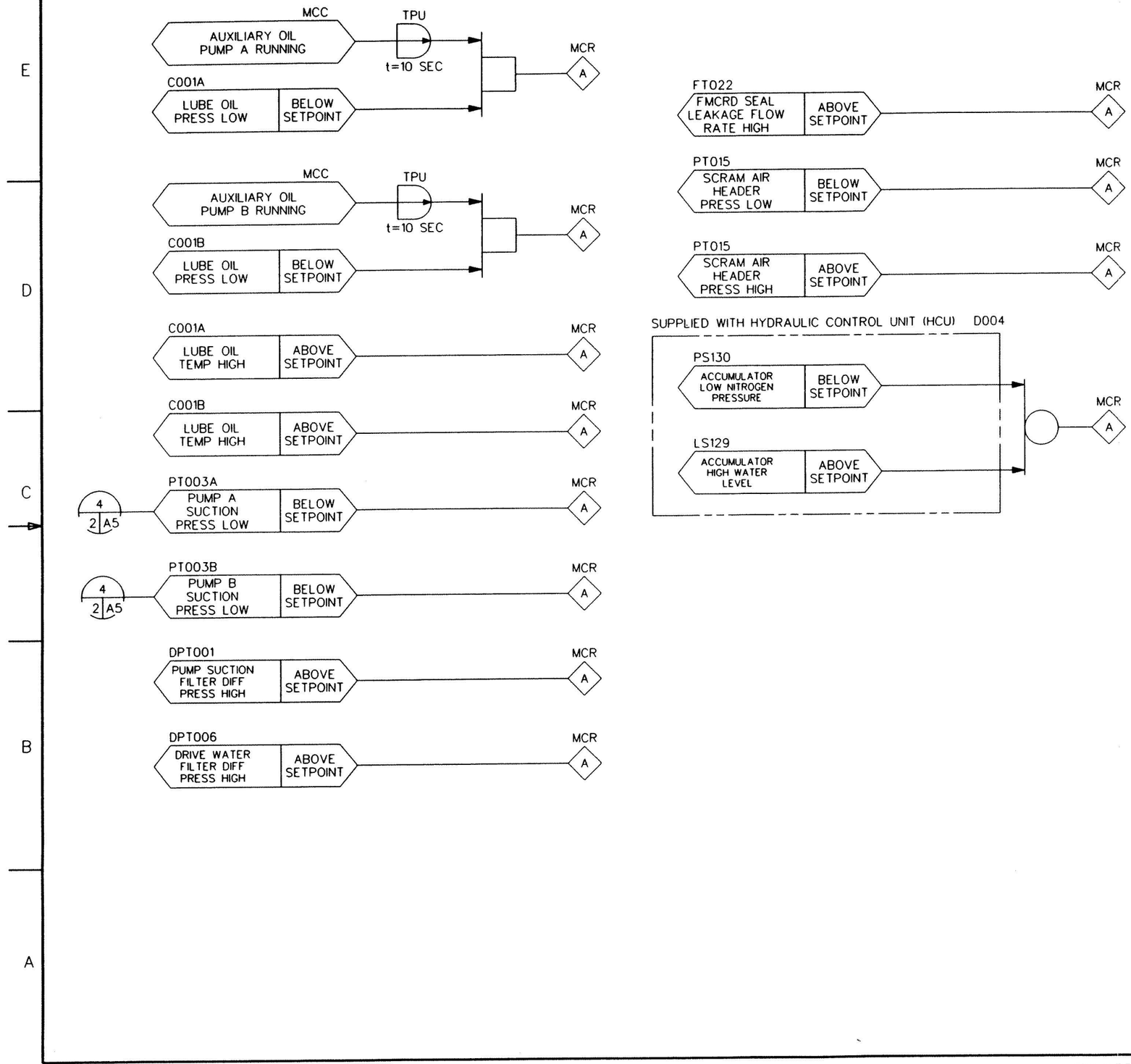
Figure 7.7-4 CONTROL ROD DRIVE SYSTEM IBD (SHEET 3 0F 8)



AIR HEADER DUMP VALVES

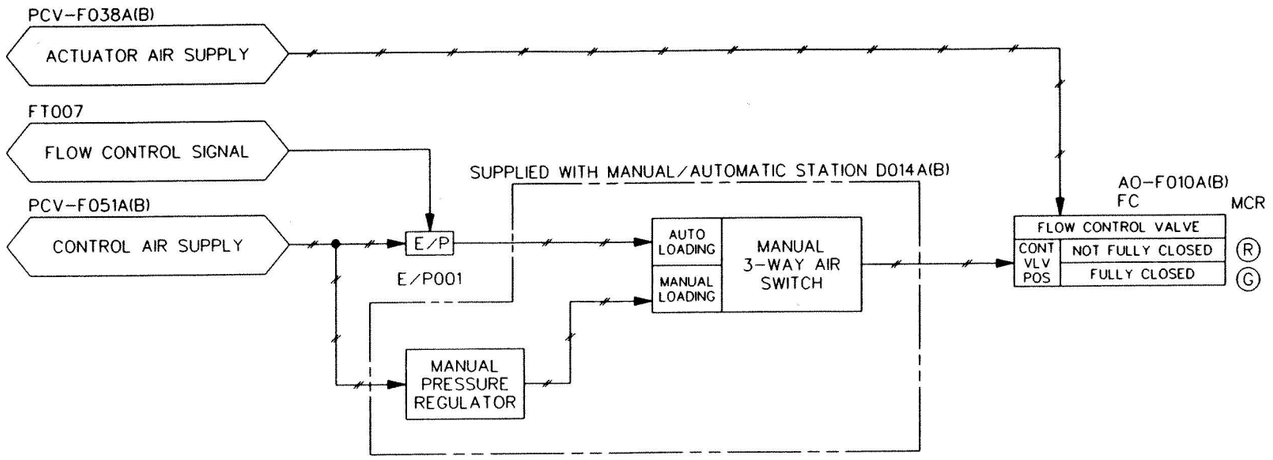
OPERATING CONTROLS			
SUPERVISORY INSTRUMENTS	USE	SPECIFICATION	LOCATION
ANNUNCIATORS	NO.	INDICATOR	LOCATION
OTHERS			

Figure 7.7-4 CONTROL ROD DRIVE SYSTEM IBD (SHEET 4 0F 8)



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

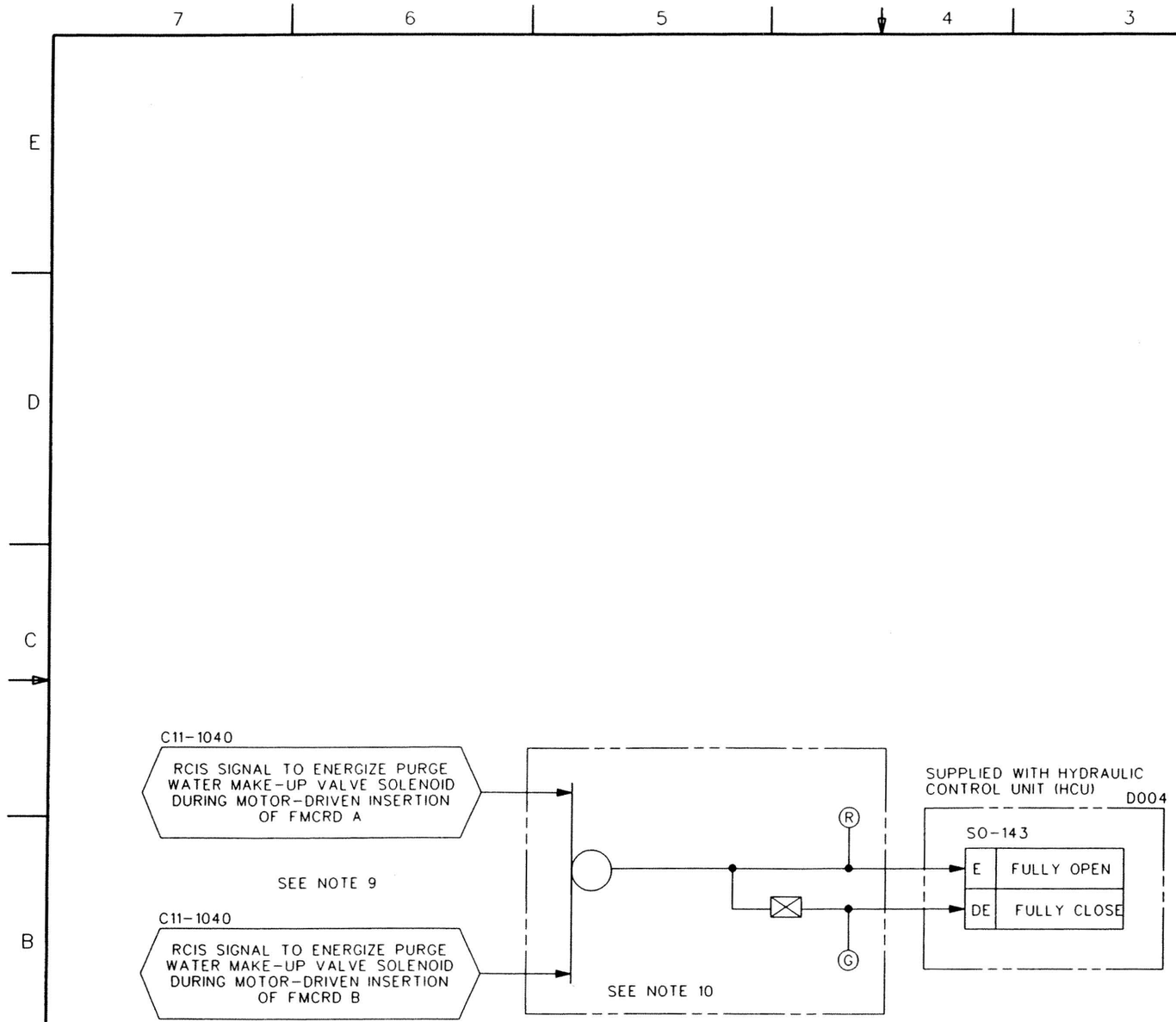
Figure 7.7-4 CONTROL ROD DRIVE SYSTEM IBD (SHEET 5 0F 8)



FLOW CONTROL VALVE

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

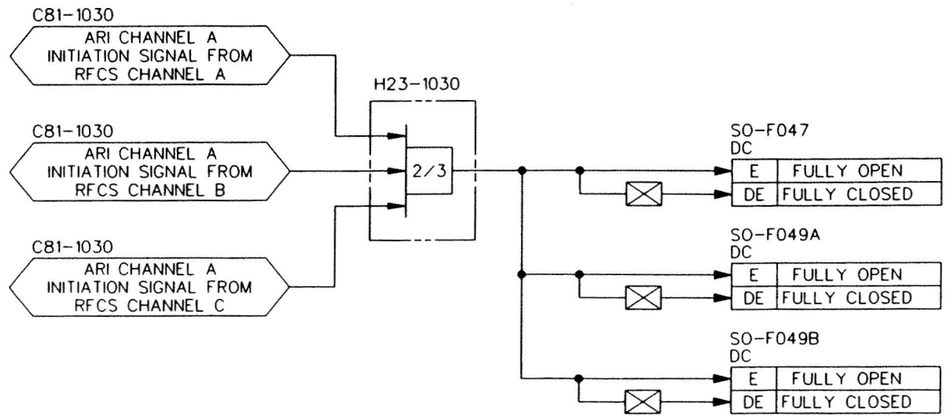
Figure 7.7-4 CONTROL ROD DRIVE SYSTEM IBD (SHEET 6 0F 8)



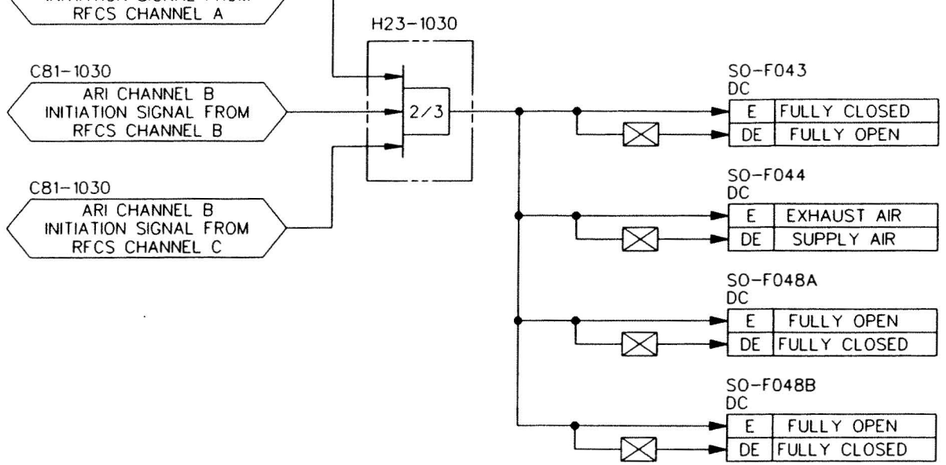
CRD PURGE WATER MAKE-UP VALVE

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

Figure 7.7-4 CONTROL ROD DRIVE SYSTEM IBD (SHEET 7 0F 8)



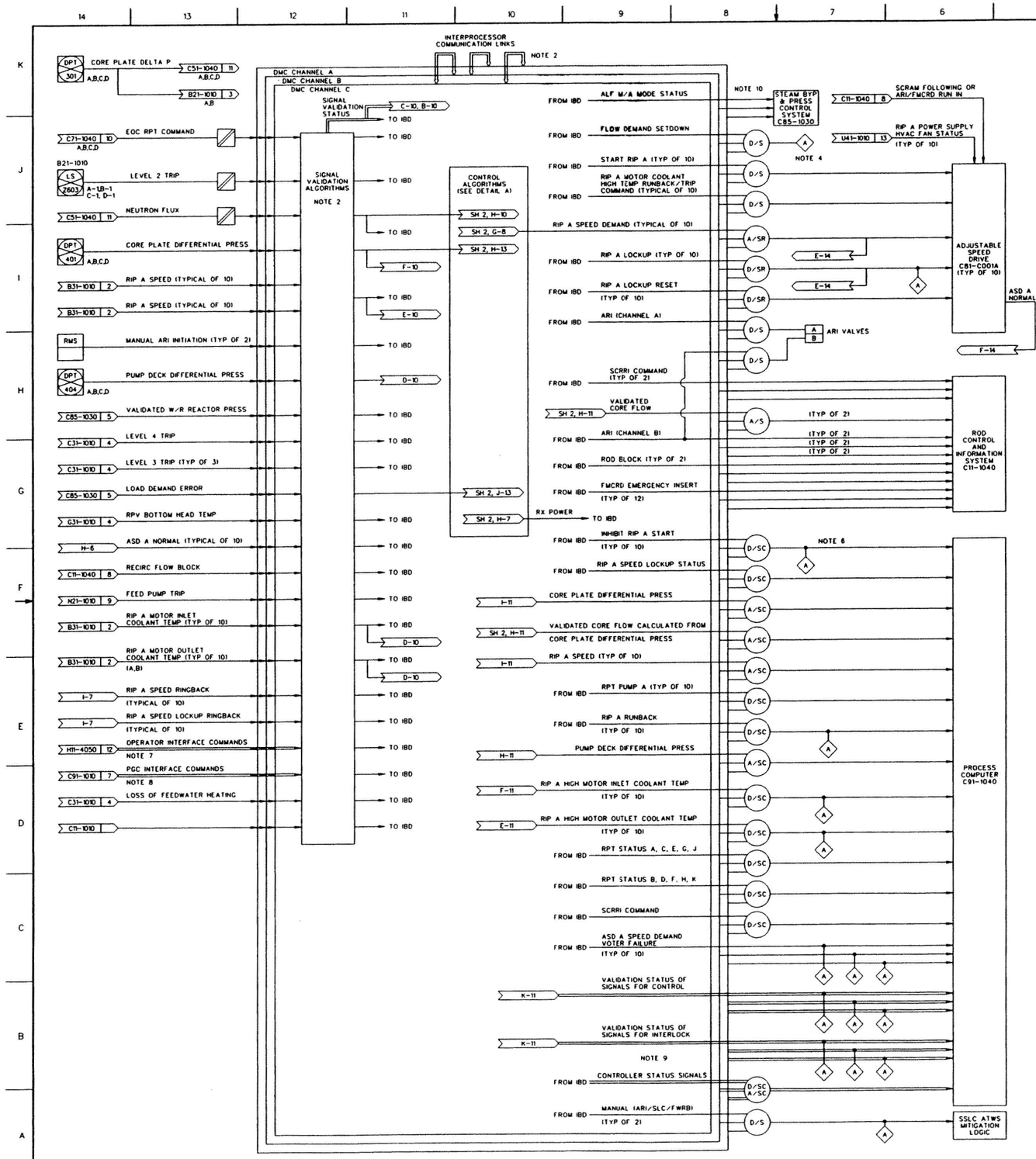
ALTERNATE ROD INSERTION (ARI) VALVES – CHANNEL A



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 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. 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 ADJUSTMENT.
   A. RFC LOCAL/RGC 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

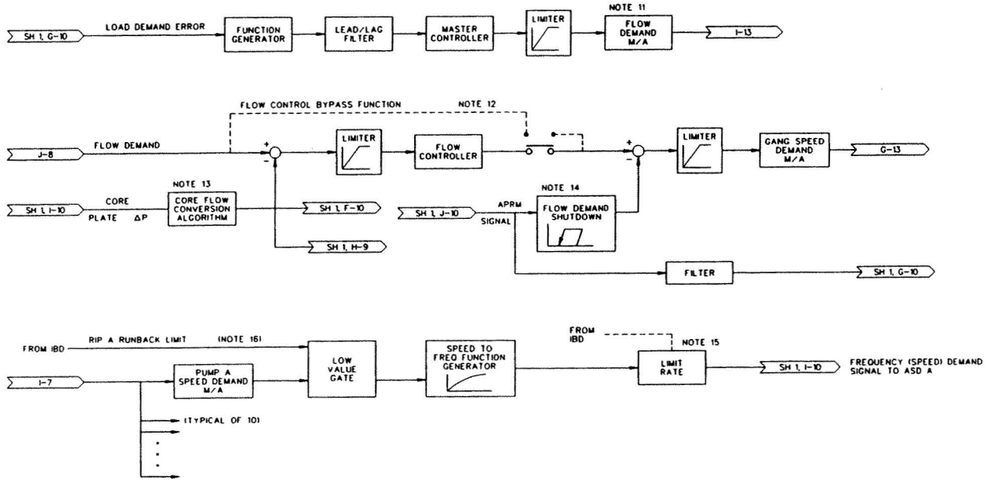
NOTES CONTINUED ON SHEET 2

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

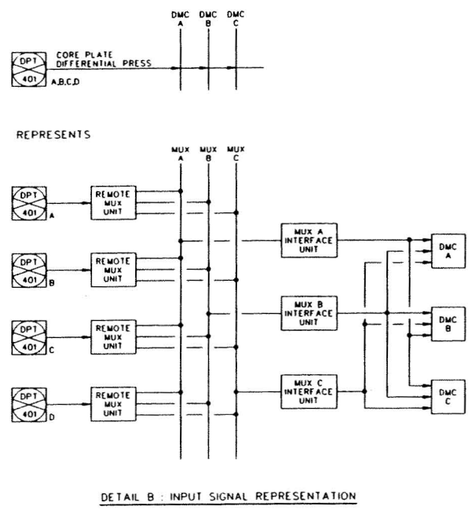
		MPL NO.
1.	RECIRC FLOW CONTROL SYSTEM IBD	C81-1030
2.	REACTOR RECIRC SYSTEM P&ID	B31-1010
3.	NUCLEAR BOILER SYSTEM P&ID	B21-1010
4.	FEEDWATER CONTROL SYSTEM IED	C31-1010
5.	STEAM BYPASS & PRESSURE CONTROL SYSTEM IED	C85-1010
6.	REACTOR WATER CLEANUP SYSTEM P&ID	G31-1010
7.	PROCESS COMPUTER SYSTEM IED	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 ARCMT	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 IBD, C81-1030
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 IBD, C81-1030. 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 IBD (WHEN RIP RUNBACK IS ENABLED) OR THE 100 PERCENT SPEED DEMAND (WHEN 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.

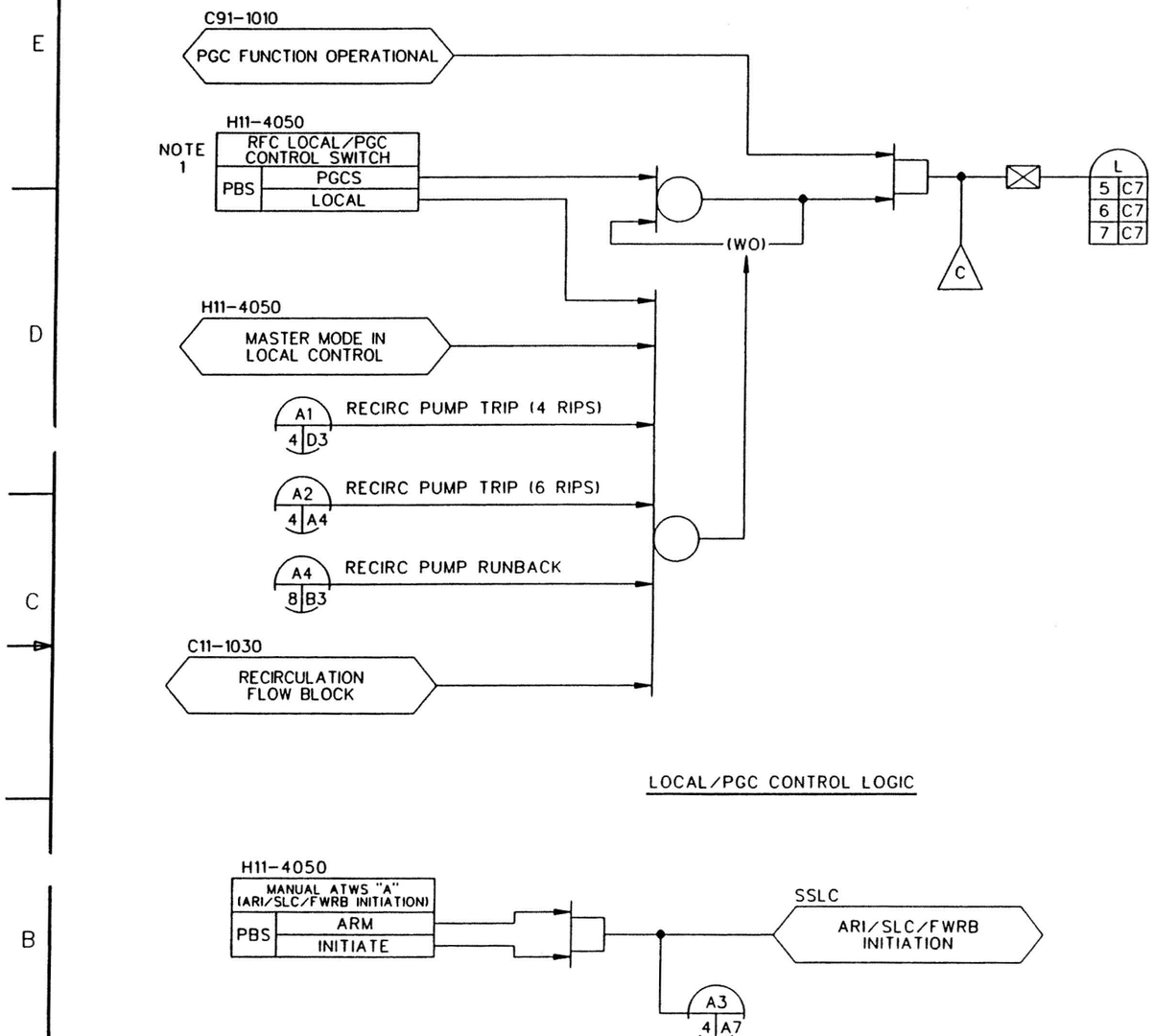
5. THE REMAINING FOUR OR SIX RIPS WILL BE RUNBACK TO MINIMUM SPEED AFTER A TRIP OF THE OTHER SIX OR FOUR. THIS WILL ENHANCE GANG RIP RESTART CAPABILITIES.

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.

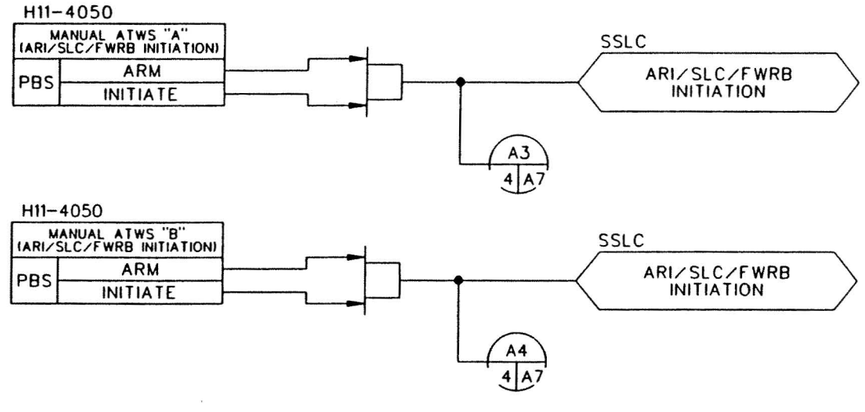
7. THIS BLOCK SYMBOL REPRESENTS THE MULTIPLICATION OF INPUT SIGNALS. IN THIS APPLICATION, THE ANALOG SPEED SIGNALS ARE MULTIPLIED BY THE DISCRETE SIGNALS. IF THE DISCRETE SIGNAL IS A LOGICAL "1", THE SPEED SIGNAL IS PASSED ON THE AVERAGING FUNCTION. IF THE DISCRETE SIGNAL IS LOW "0", THE SPEED SIGNAL 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)

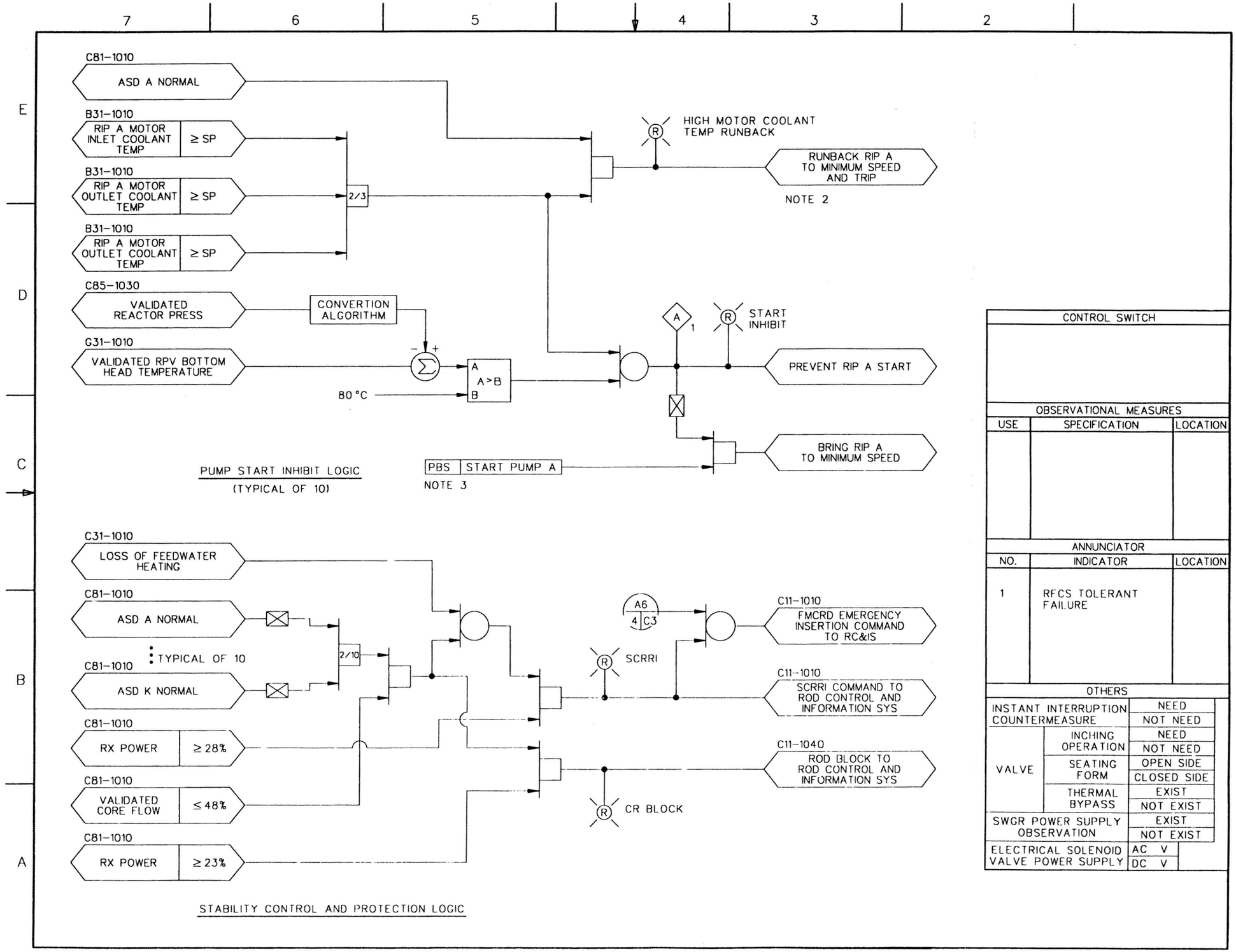
CONTROL SWITCH		
RFC LOCAL/PGC CONTROL SWITCH		
PBS	PGCS	LOCAL

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)

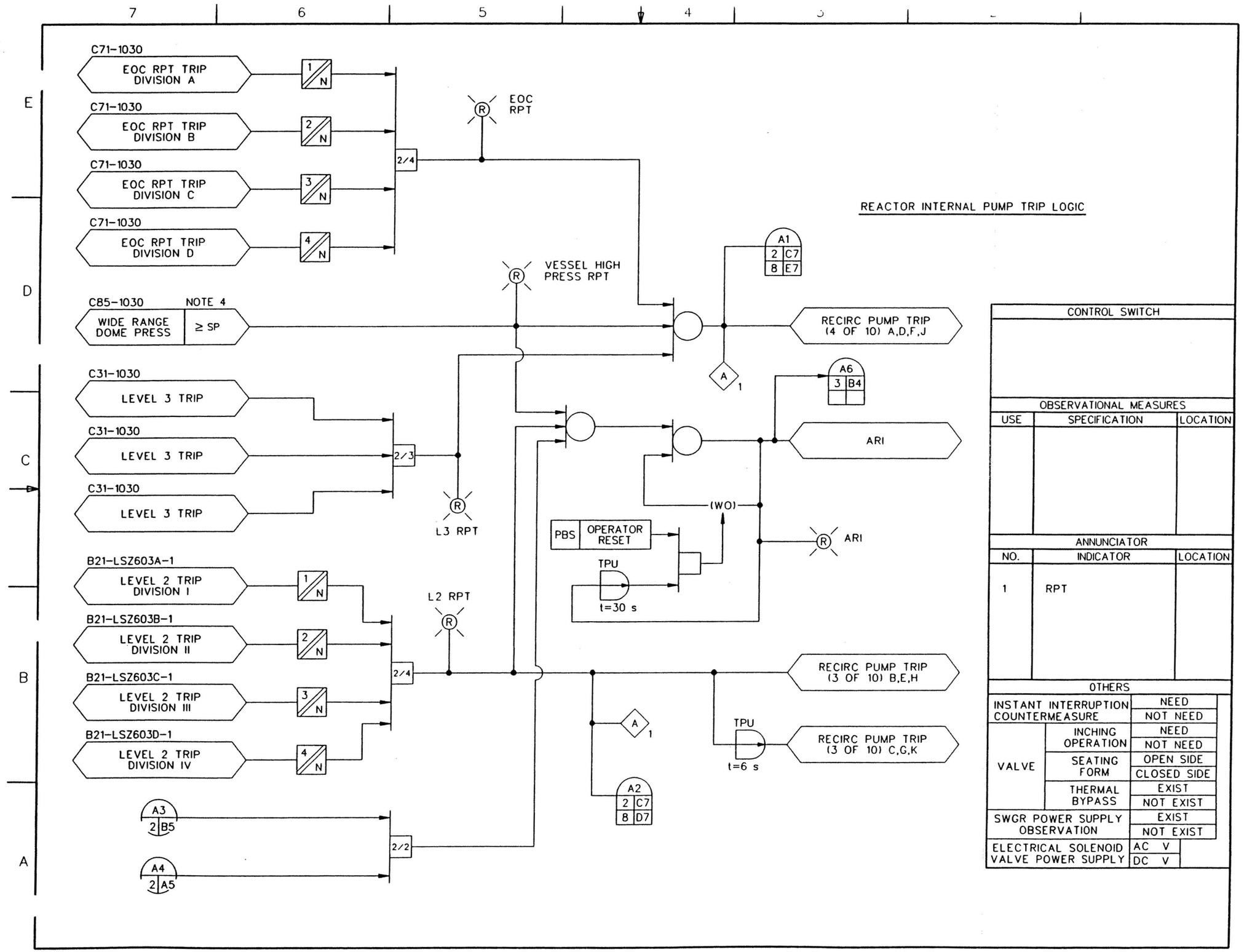
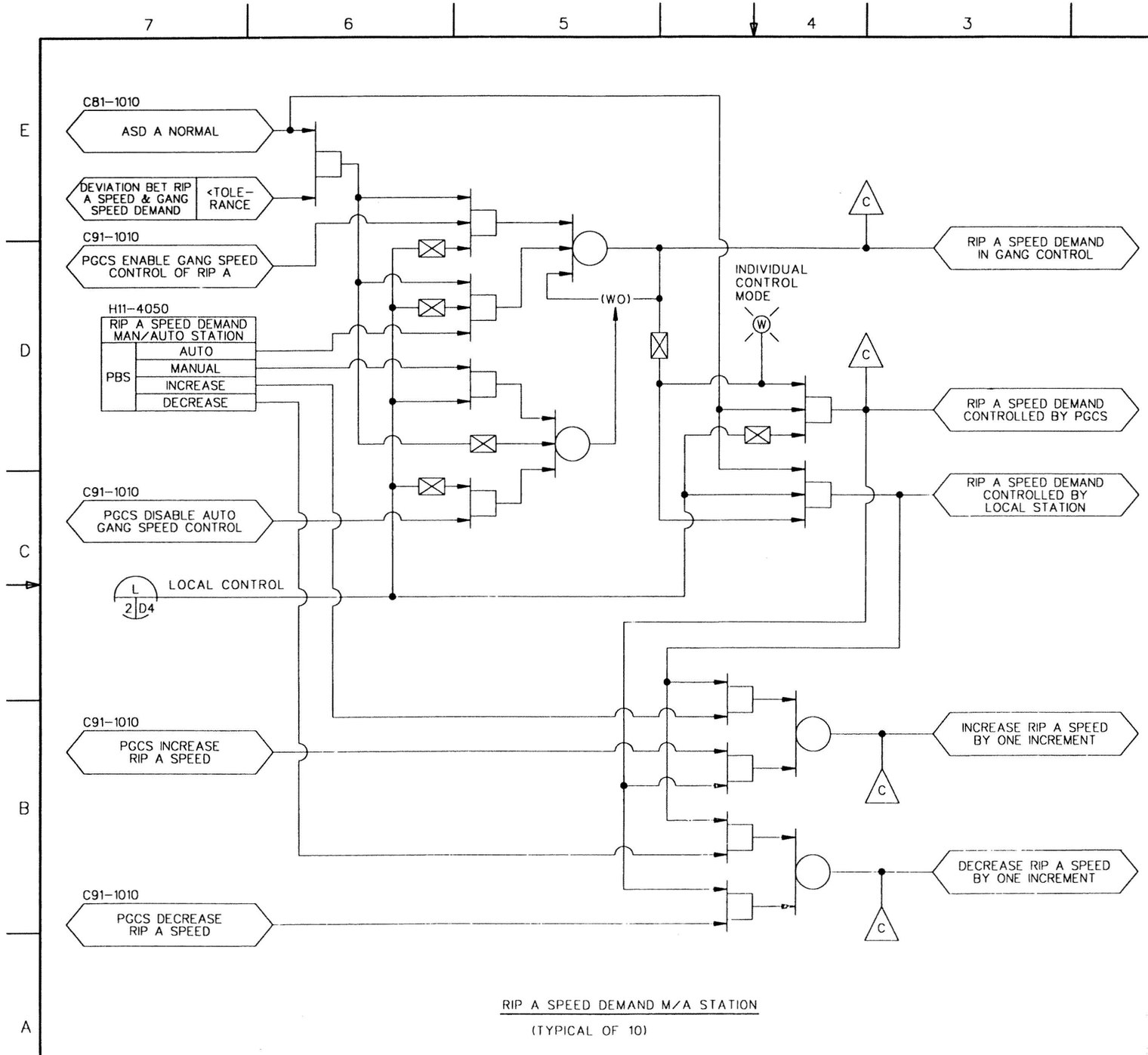


FIGURE 7.7-7 RECIRCULATION FLOW CONTROL SYSTEM IBD (Sheet 4 of 9)



RIP A SPEED DEMAND M/A STATION

(TYPICAL OF 10)

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)

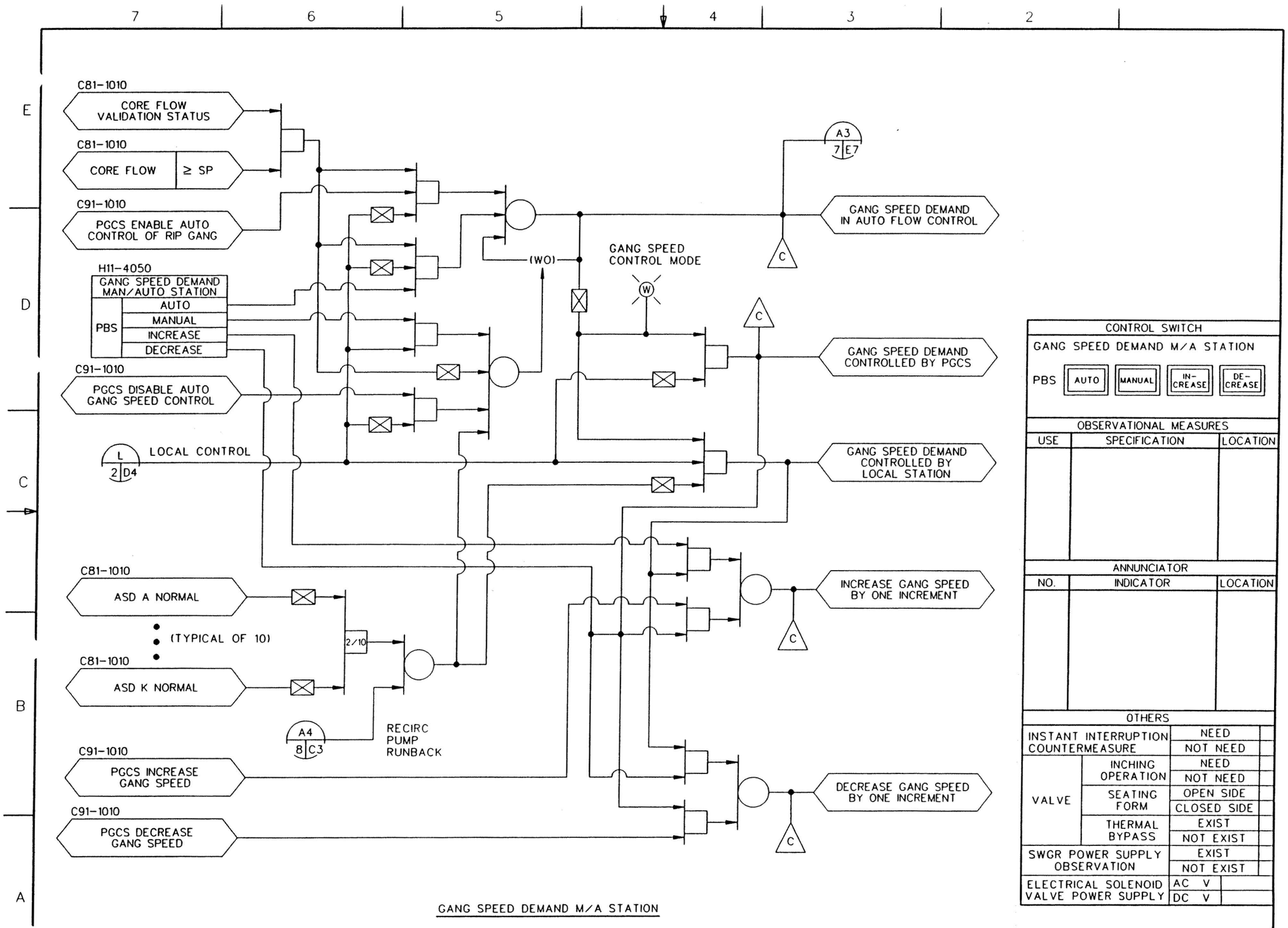


FIGURE 7.7-7 RECIRCULATION FLOW CONTROL SYSTEM IBD (Sheet 6 of 9)

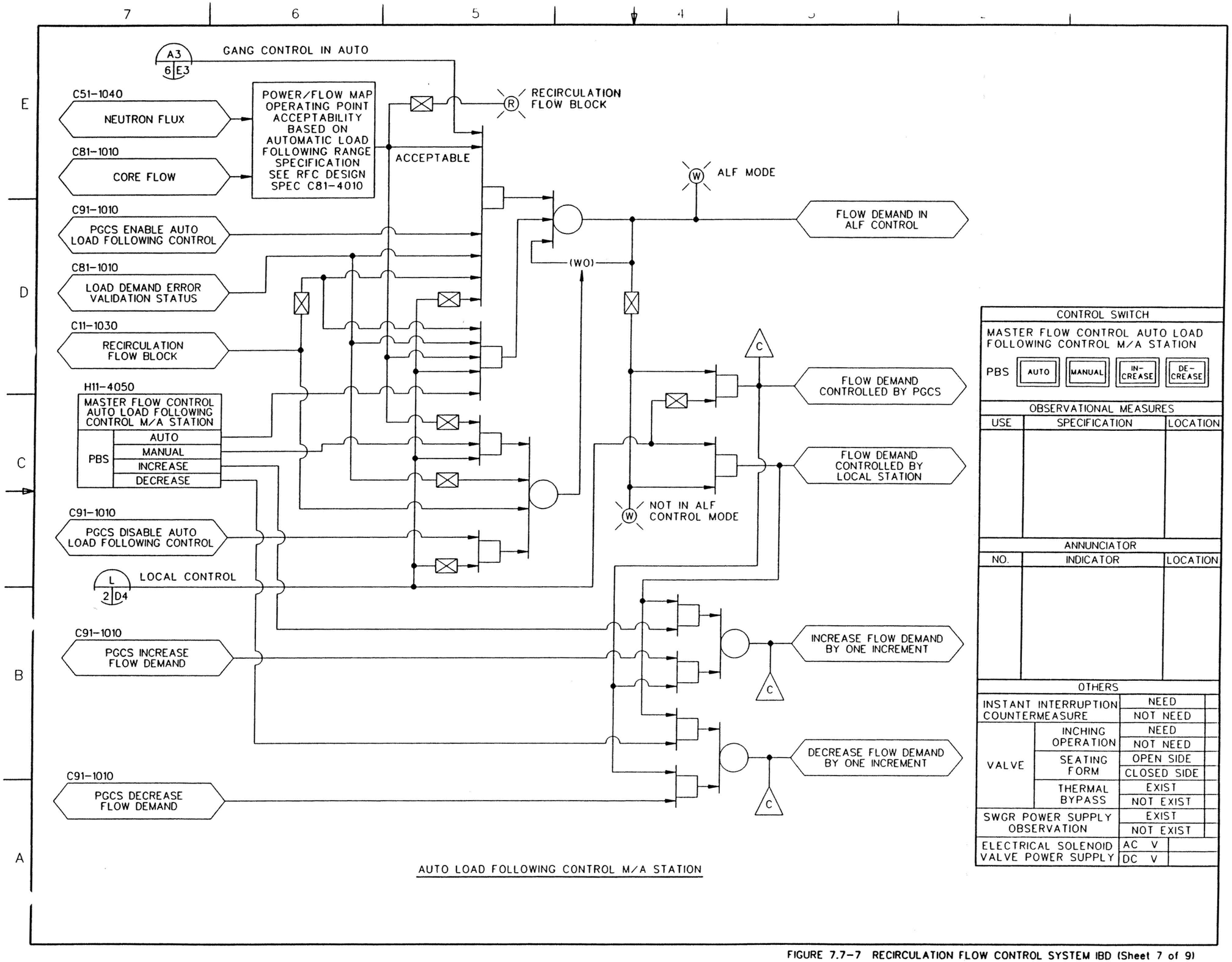
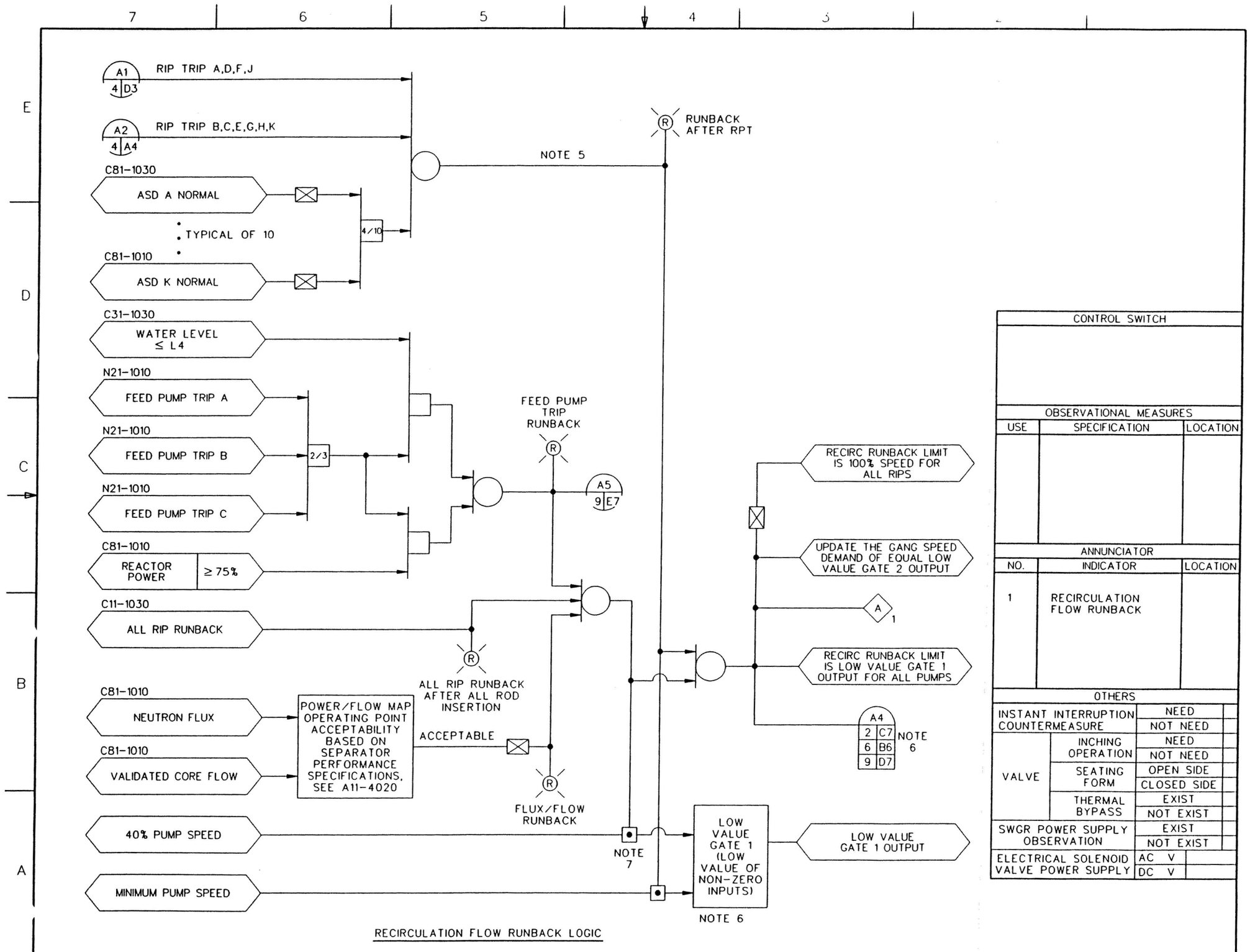


FIGURE 7.7-7 RECIRCULATION FLOW CONTROL SYSTEM IBD (Sheet 7 of 9)



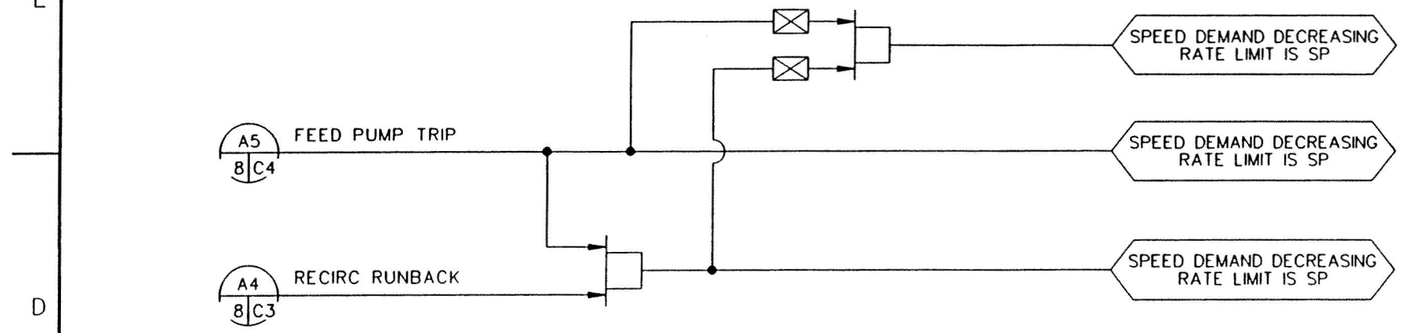
CONTROL SWITCH		

OBSERVATIONAL MEASURES		
USE	SPECIFICATION	LOCATION

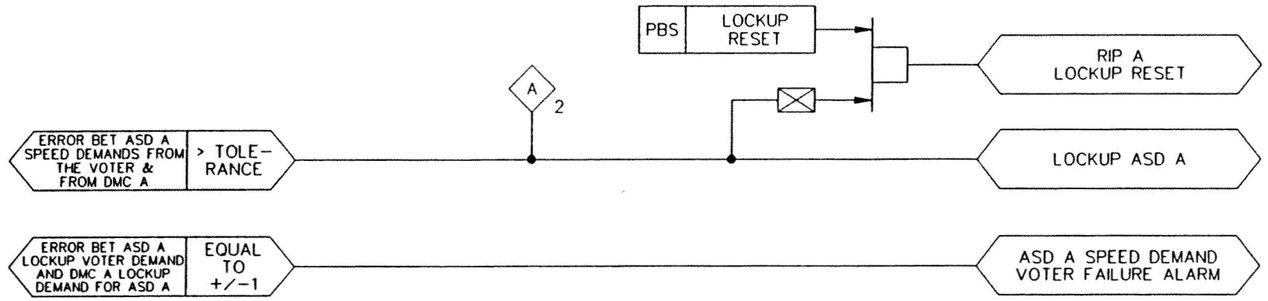
ANNUNCIATOR		
NO.	INDICATOR	LOCATION
1	RECIRCULATION FLOW RUNBACK	

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 8 of 9)

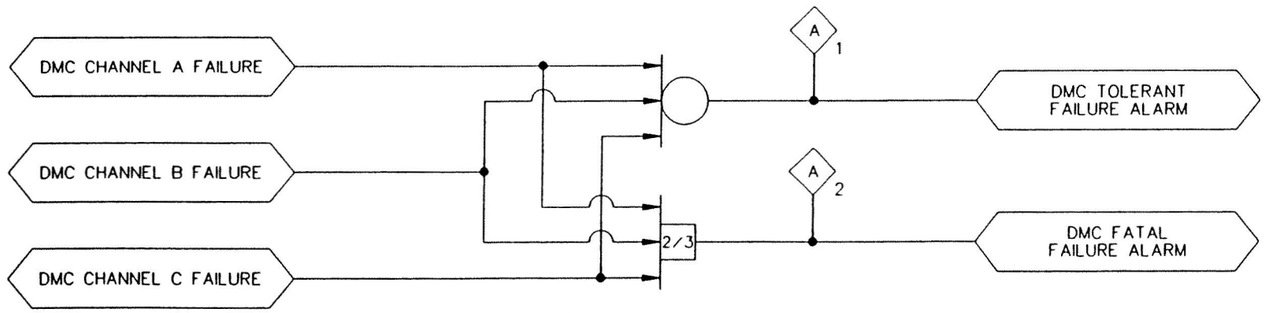


RATE DECREASE LIMIT LOGIC



LOCKUP RUNBACK LOGIC

(TYPICAL OF 10)



DMC CONTROLLER FAILURE

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 ARCHT	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)

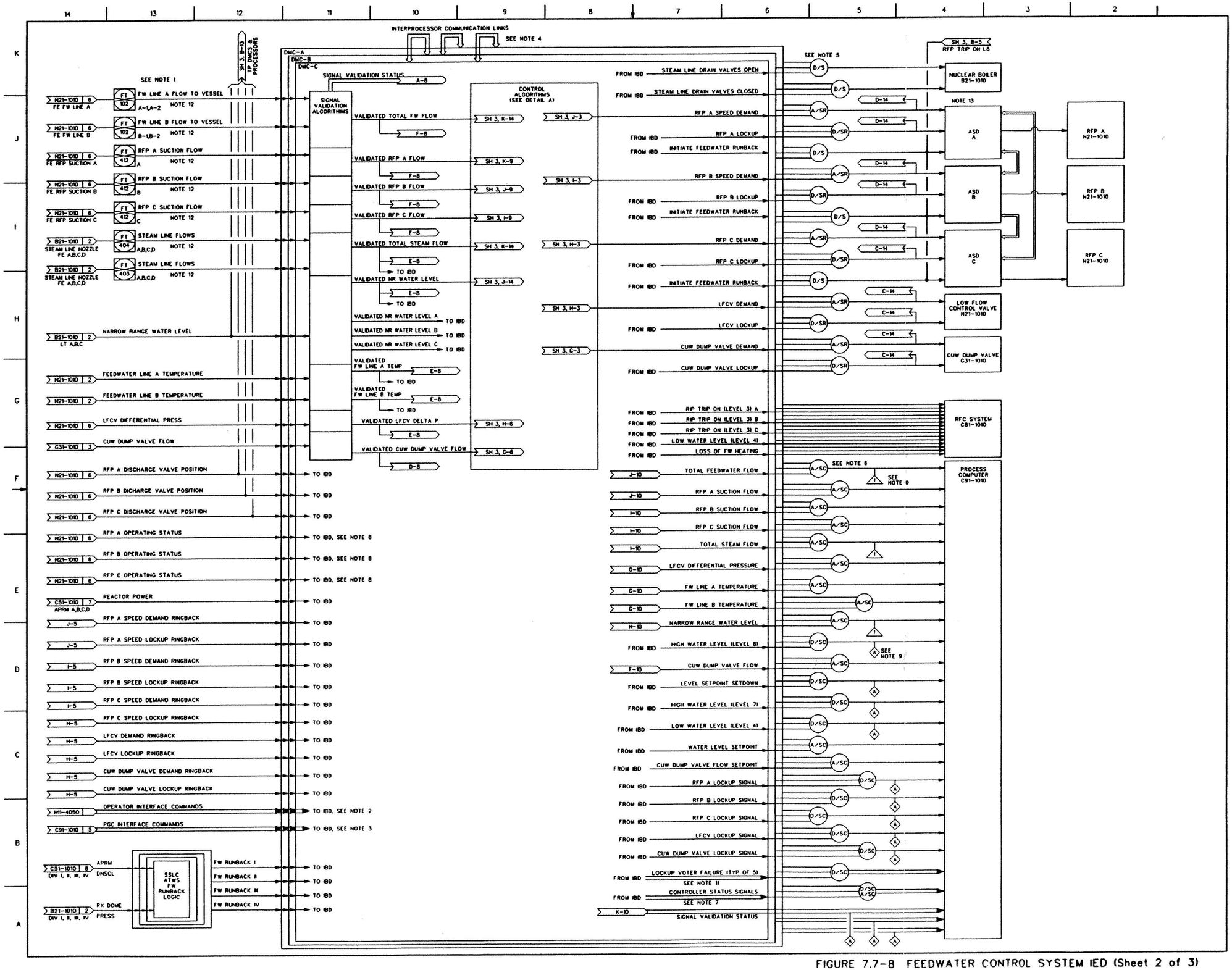


FIGURE 7.7-8 FEEDWATER CONTROL SYSTEM IED (Sheet 2 of 3)

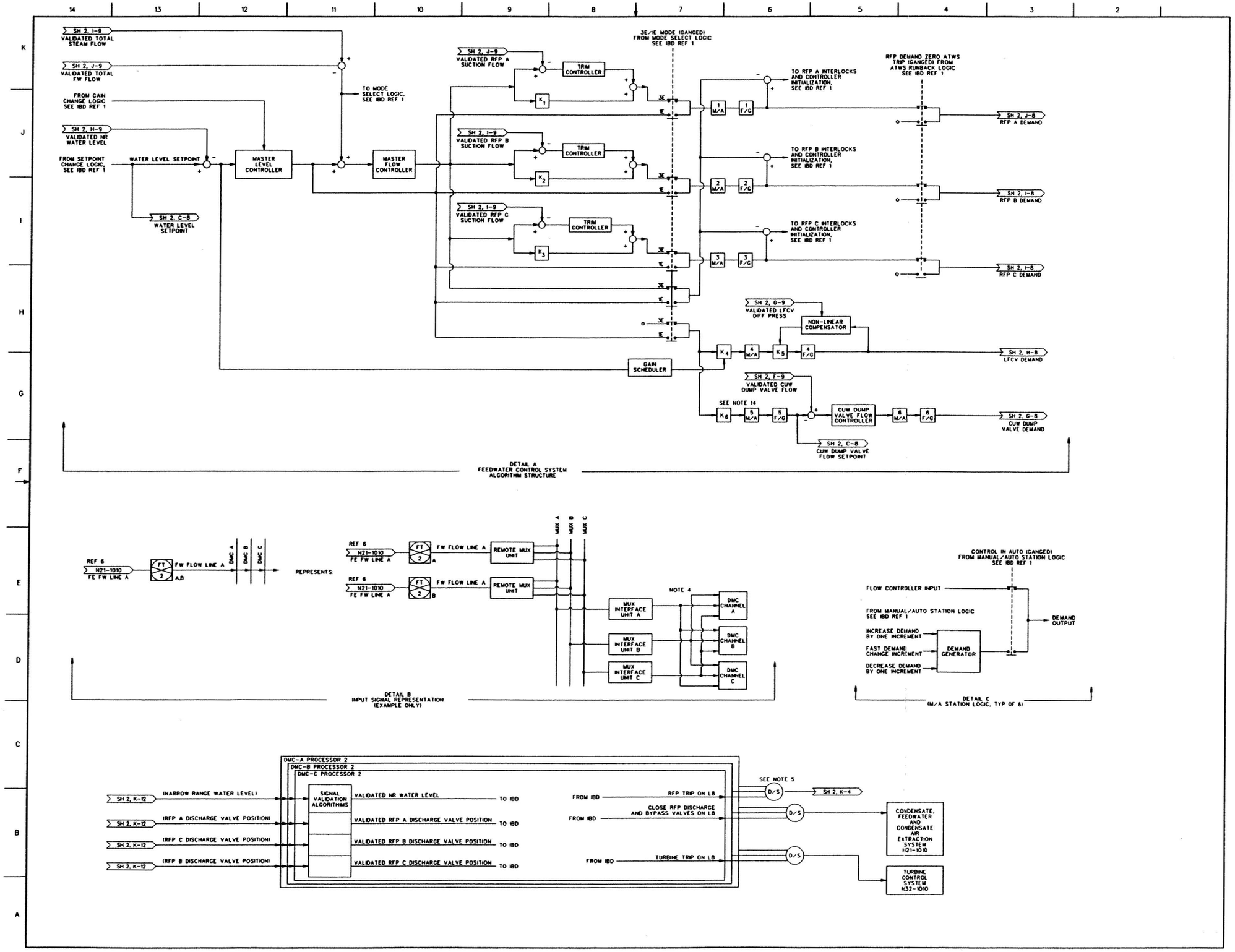


FIGURE 7.7-8 FEEDWATER CONTROL SYSTEM IED (Sheet 3 of 3)

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.

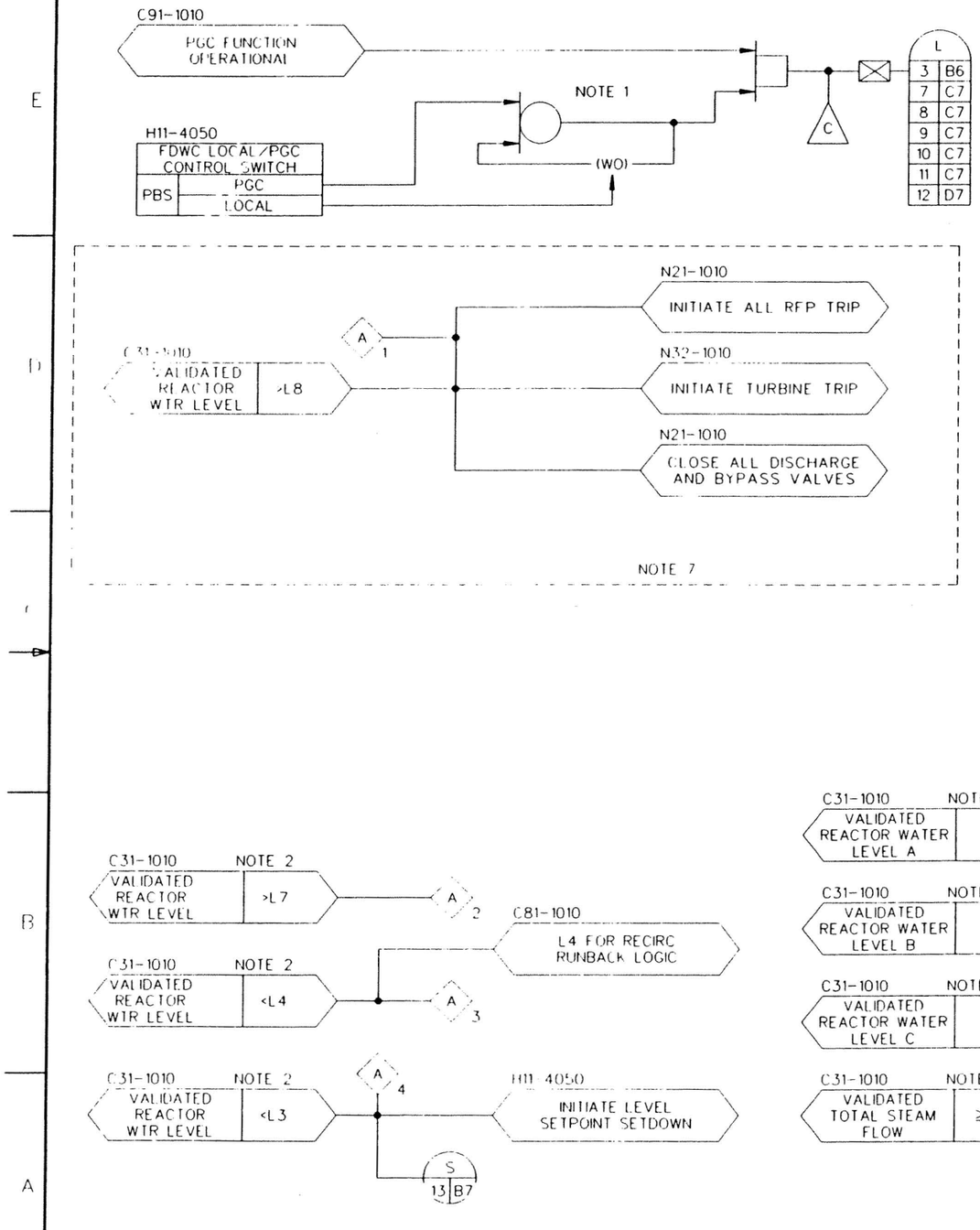
TABLE OF CONTENTS

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)

7 6 5 4 3 2

E

D

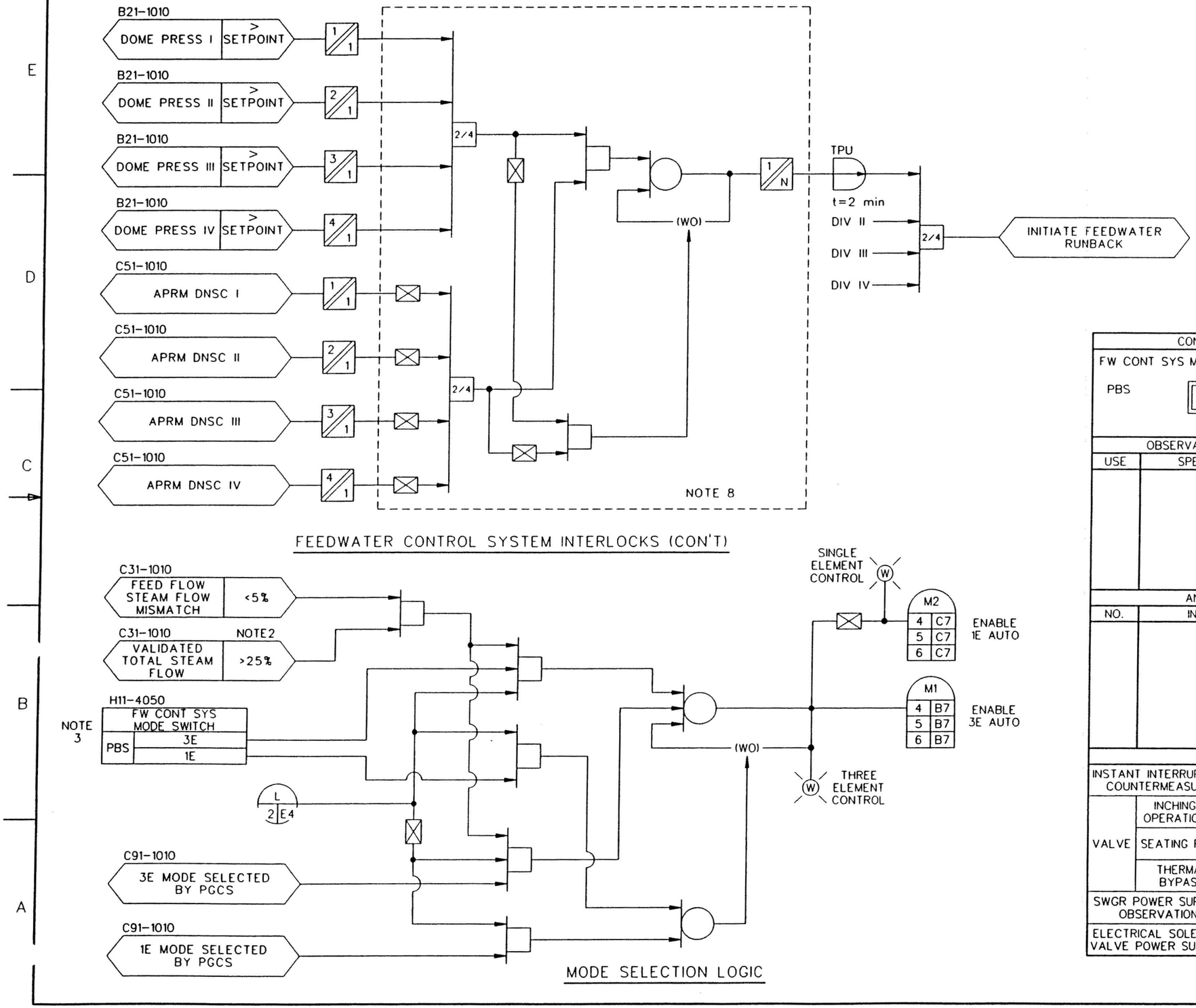
DELETED

C

B

A

FIGURE 7.7-9 FEEDWATER CONTROL SYSTEM IBD (Sheet 2a of 14)



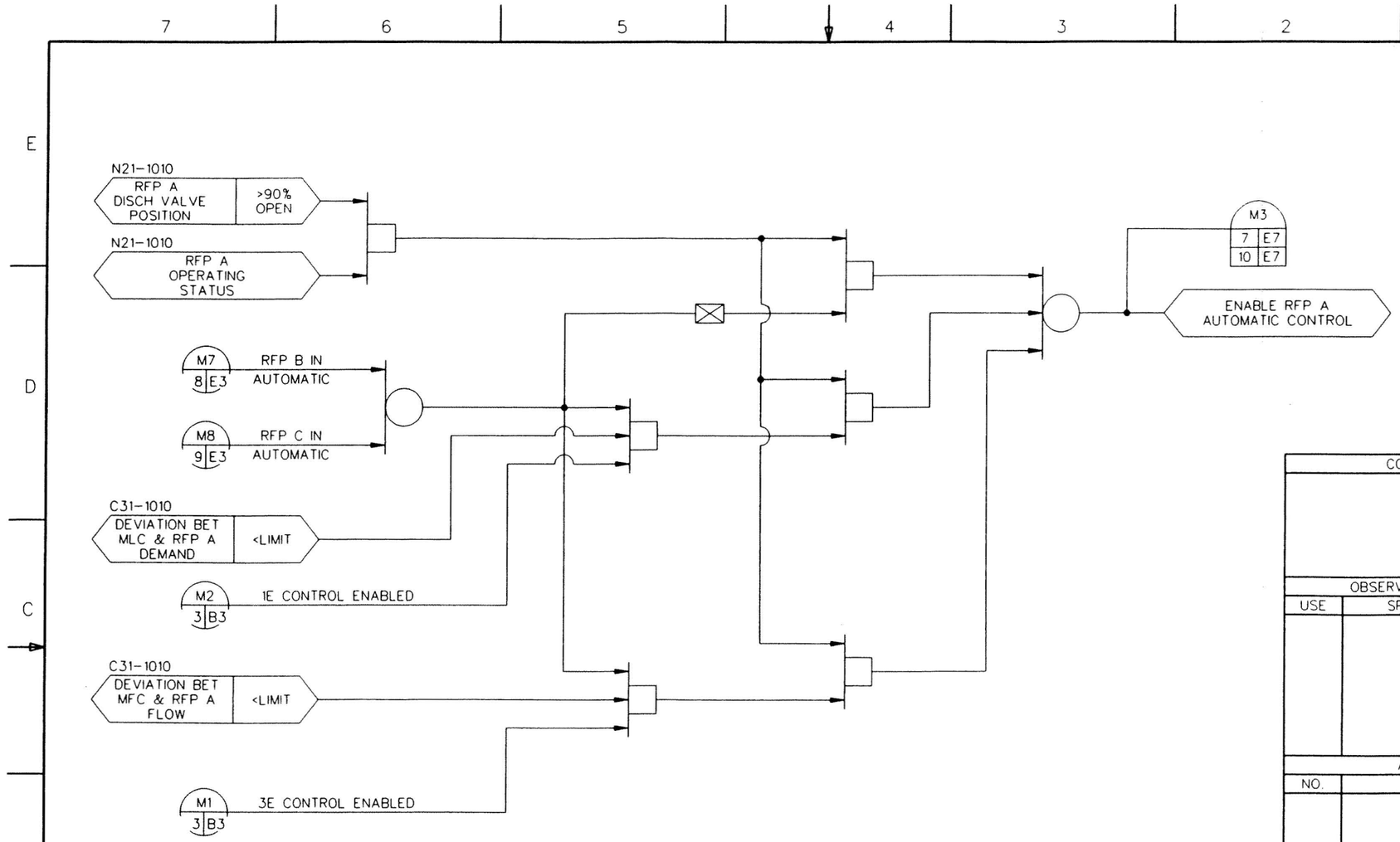
CONTROL SWITCH		
FW CONT SYS MODE SWITCH		
PBS	1E	3E

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

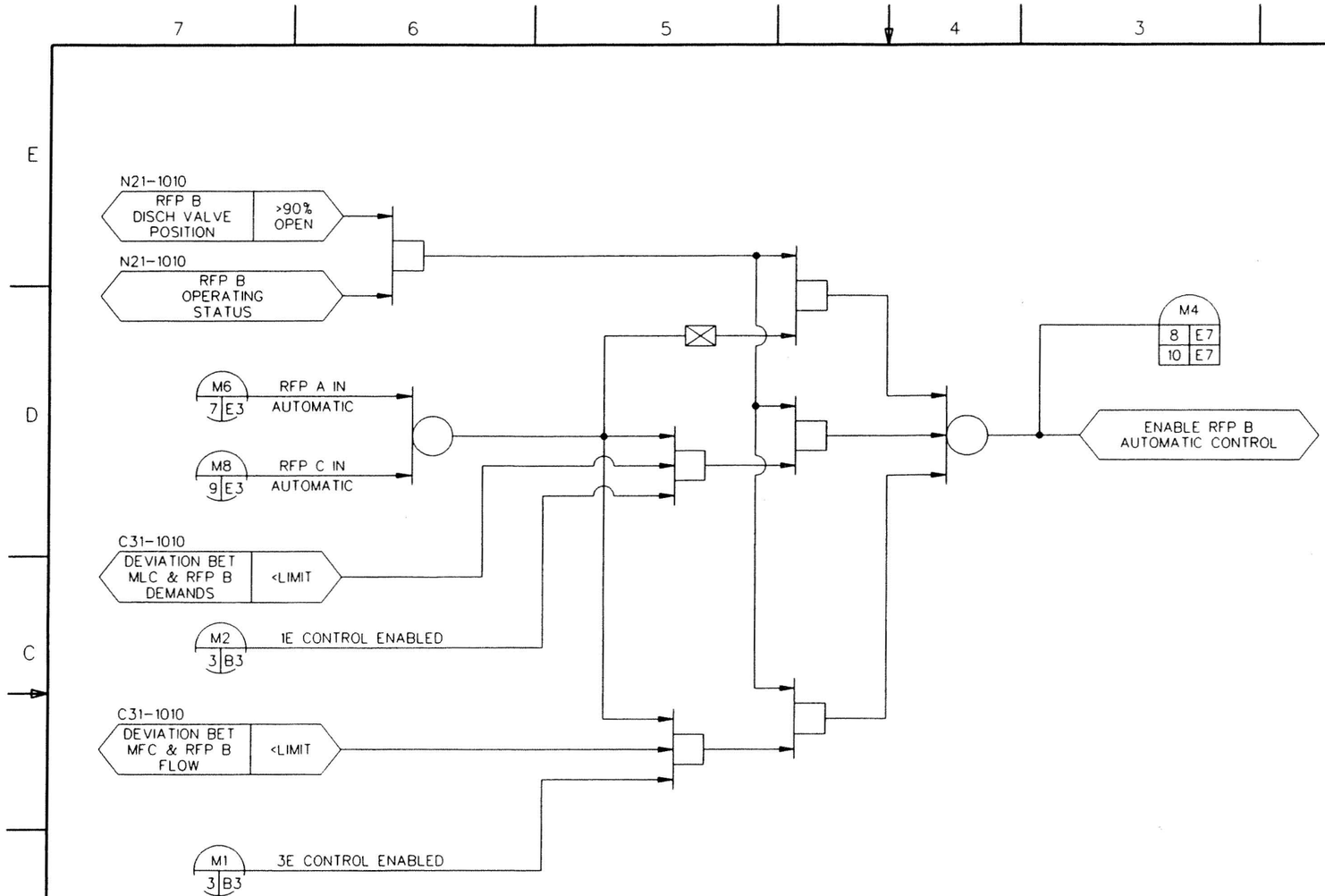
CONTROL SWITCH		

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)

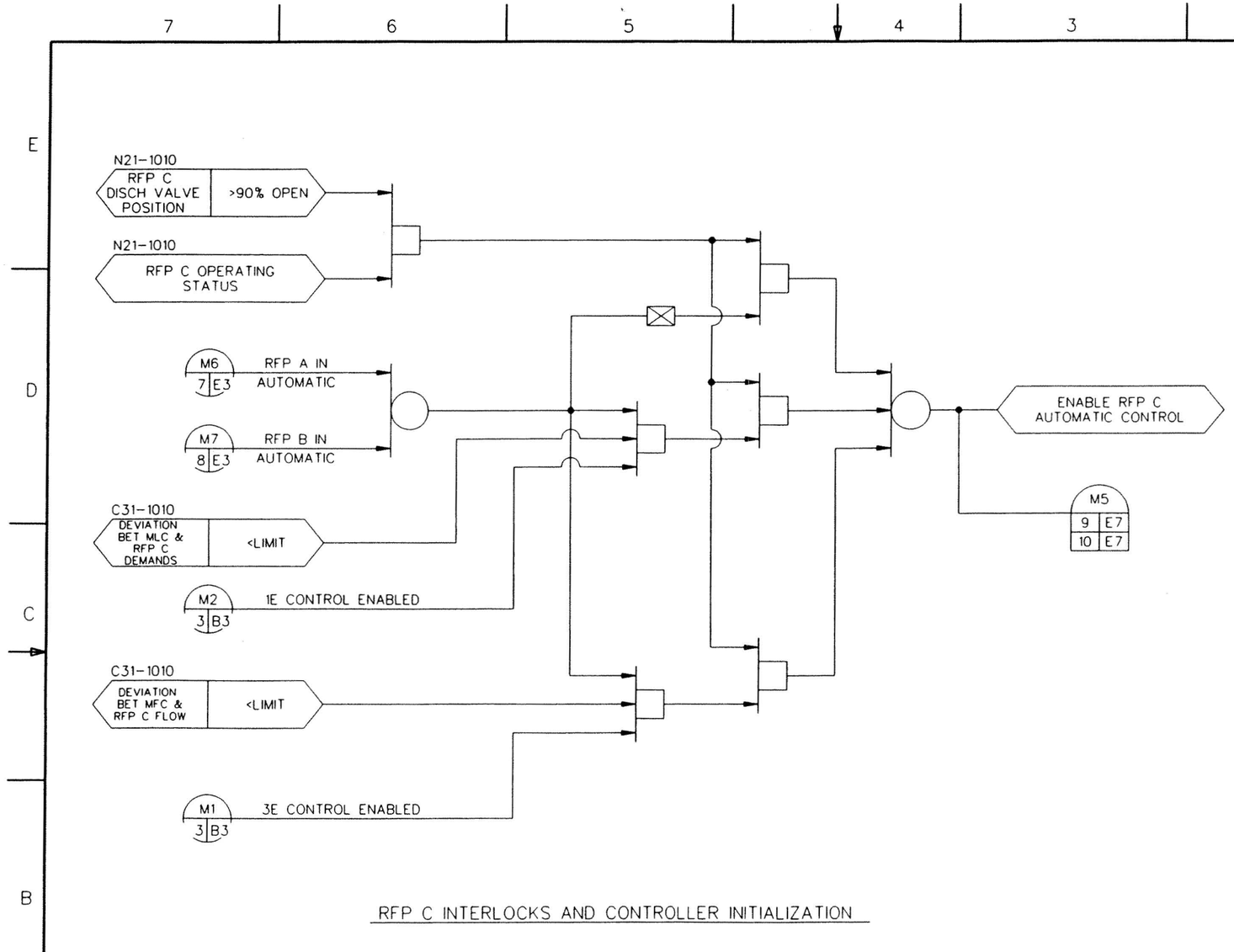


RFP B INTERLOCKS AND CONTROLLER INITIALIZATION

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

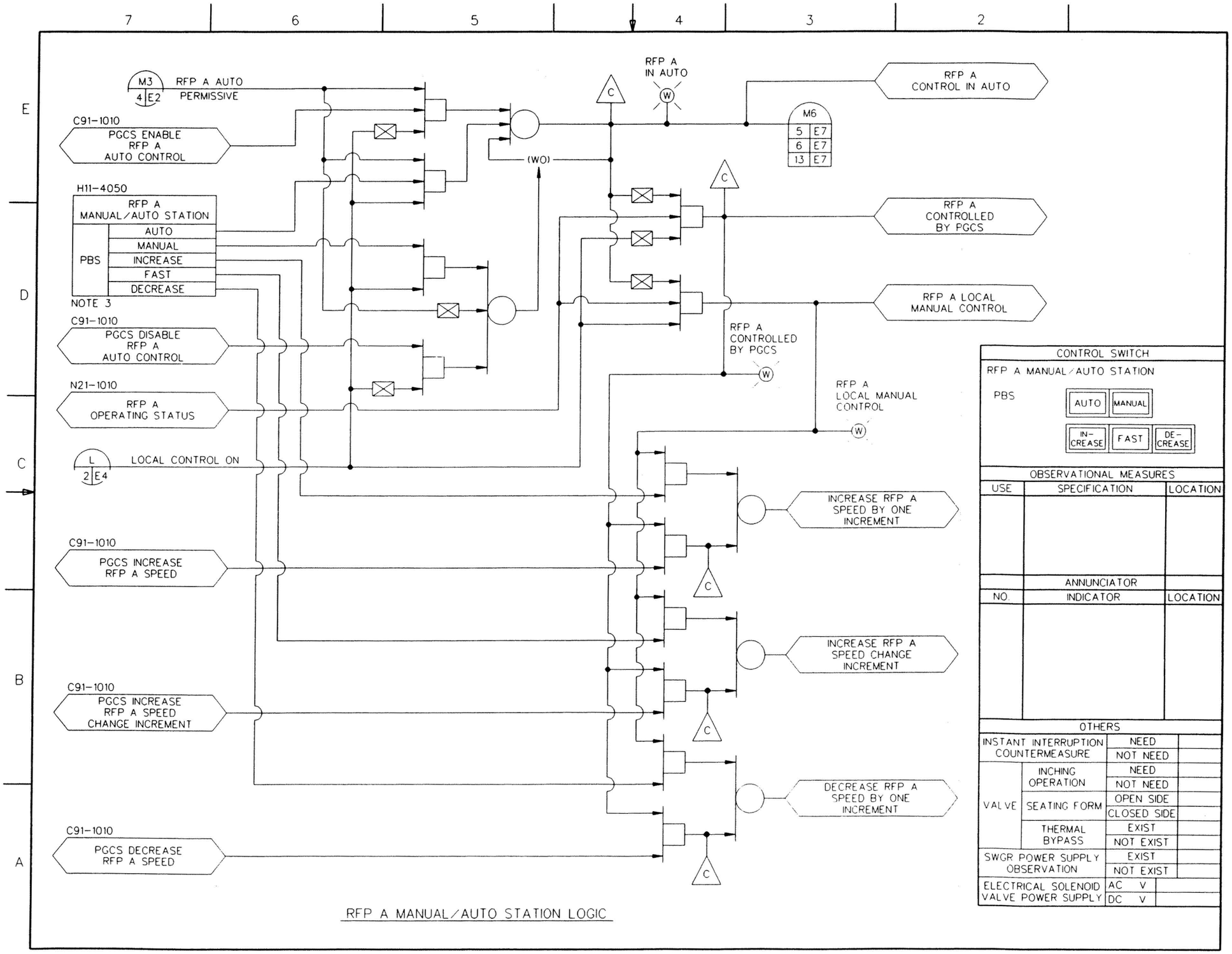
CONTROL SWITCH			

OBSERVATIONAL MEASURES		
USE	SPECIFICATION	LOCATION

ANNUNCIATOR		
NO.	INDICATOR	LOCATION

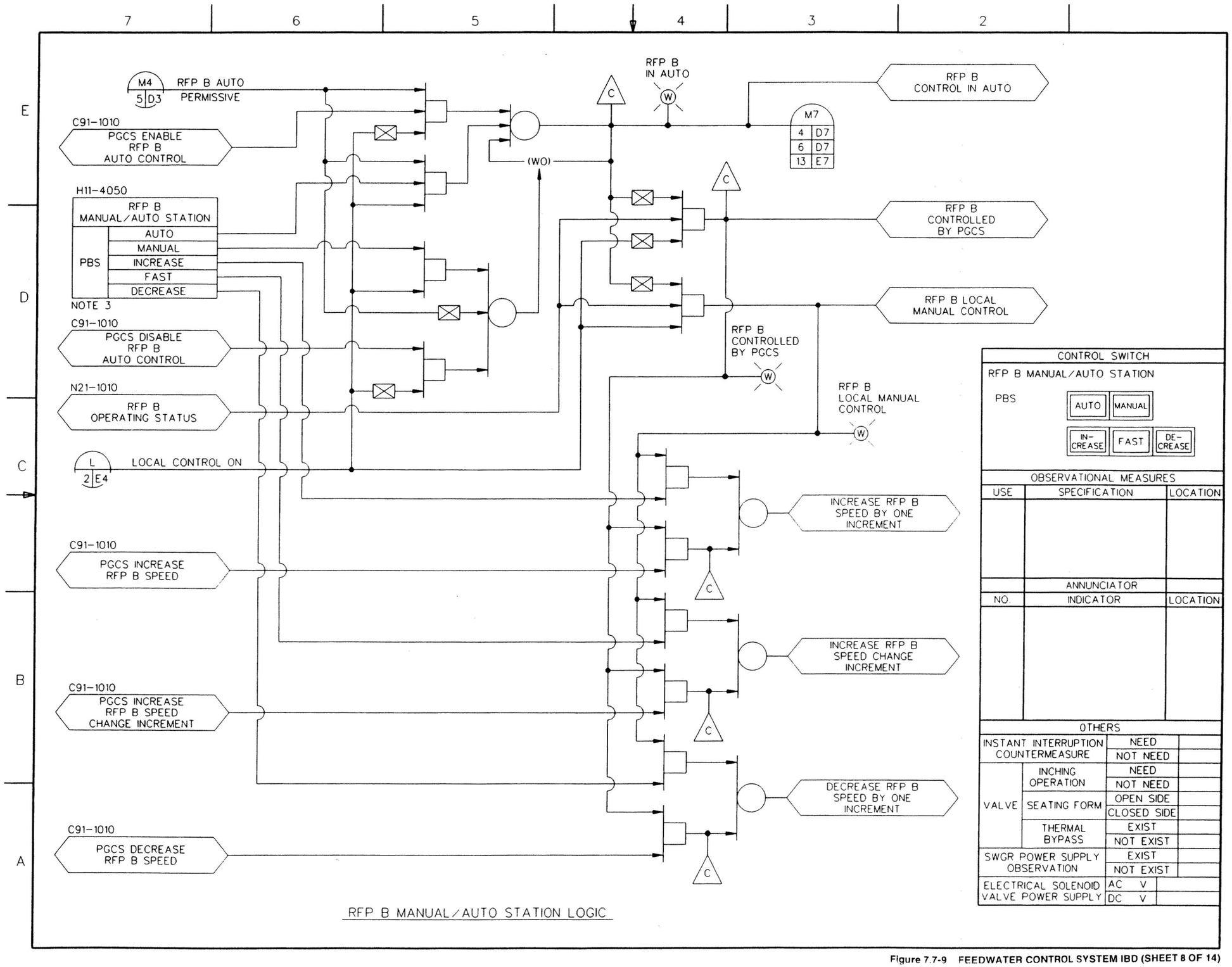
OTHERS			
INSTANT INTERRUPTION COUNTERMEASURE		NEED	
		NOT NEED	
VALVE	INCHING OPERATION	NEED	
		NOT NEED	
	SEATING FORM	OPEN SIDE	
		CLOSED SIDE	
	THERMAL BYPASS	EXIST	
		NOT EXIST	
SWGR POWER SUPPLY OBSERVATION		EXIST	
		NOT EXIST	
ELECTRICAL SOLENOID VALVE POWER SUPPLY		AC V	
		DC V	

Figure 7.7-9 FEEDWATER CONTROL SYSTEM IBD (SHEET 6 OF 14)



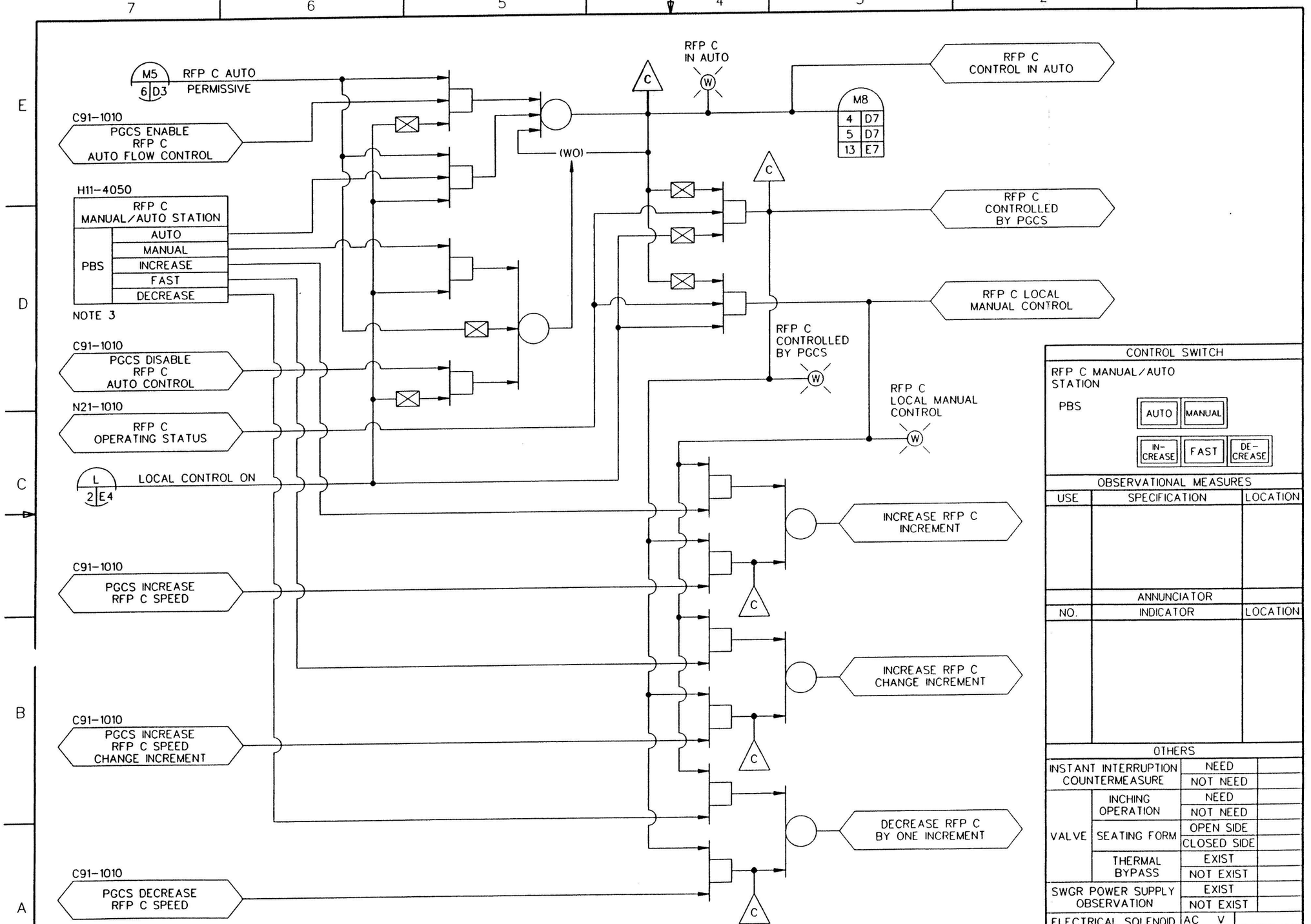
RFP A MANUAL/AUTO STATION LOGIC

Figure 7.7-9 FEEDWATER CONTROL SYSTEM IBD (SHEET 7 OF 14)



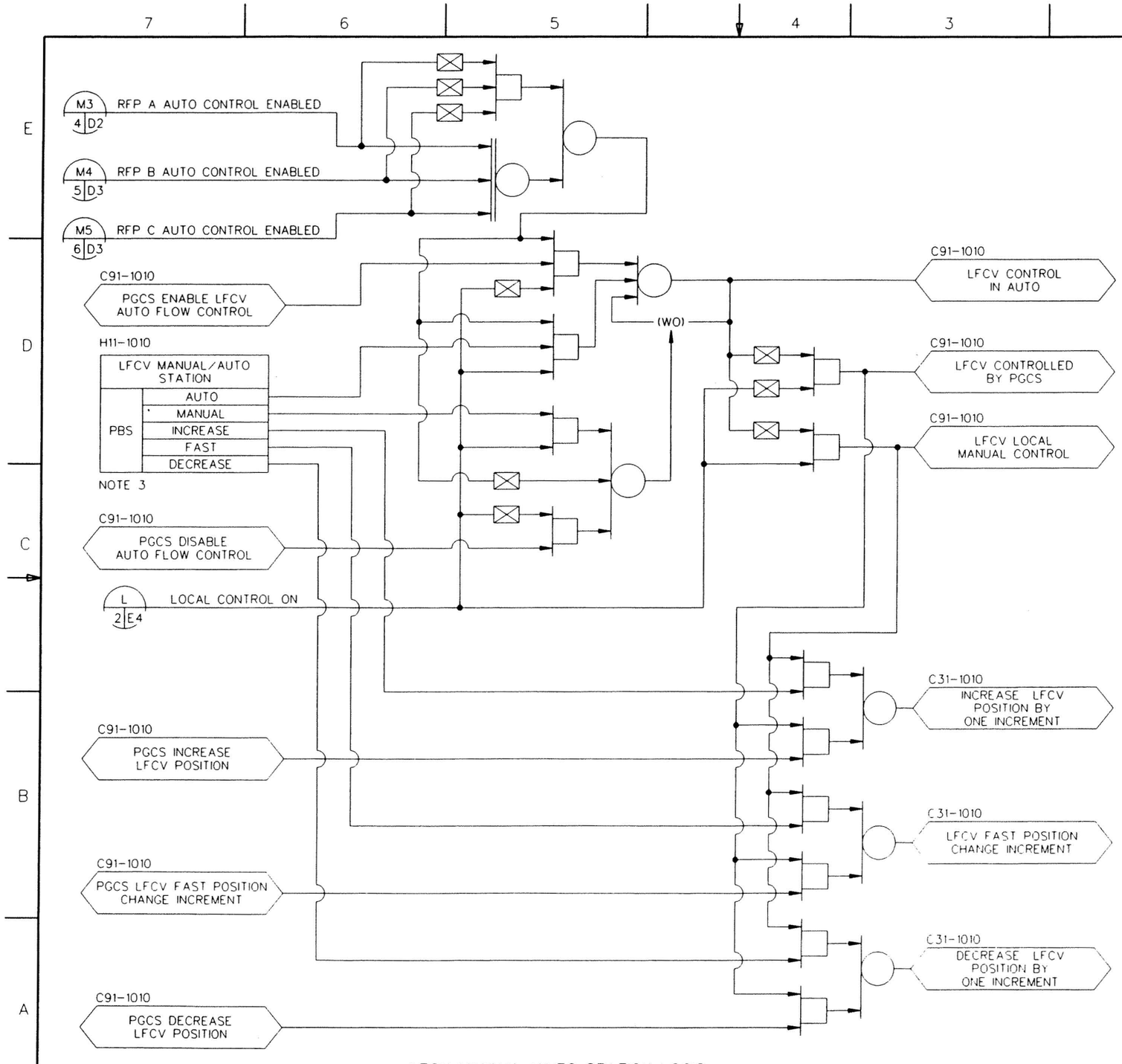
CONTROL SWITCH			
RFP B MANUAL/AUTO STATION			
PBS	AUTO / MANUAL / IN-CREASE / FAST / DE-CREASE		
OBSERVATIONAL MEASURES			
USE	SPECIFICATION		LOCATION
	ANNUNCIATOR		
NO.	INDICATOR		LOCATION
OTHERS			
INSTANT INTERRUPTION COUNTERMEASURE		NEED	
		NOT NEED	
VALVE	INCHING OPERATION	NEED	
		NOT NEED	
	SEATING 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 7.7-9 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	
	IN-CREASE / FAST / 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 7.7-9 FEEDWATER CONTROL SYSTEM IBD (SHEET 10 OF 14)

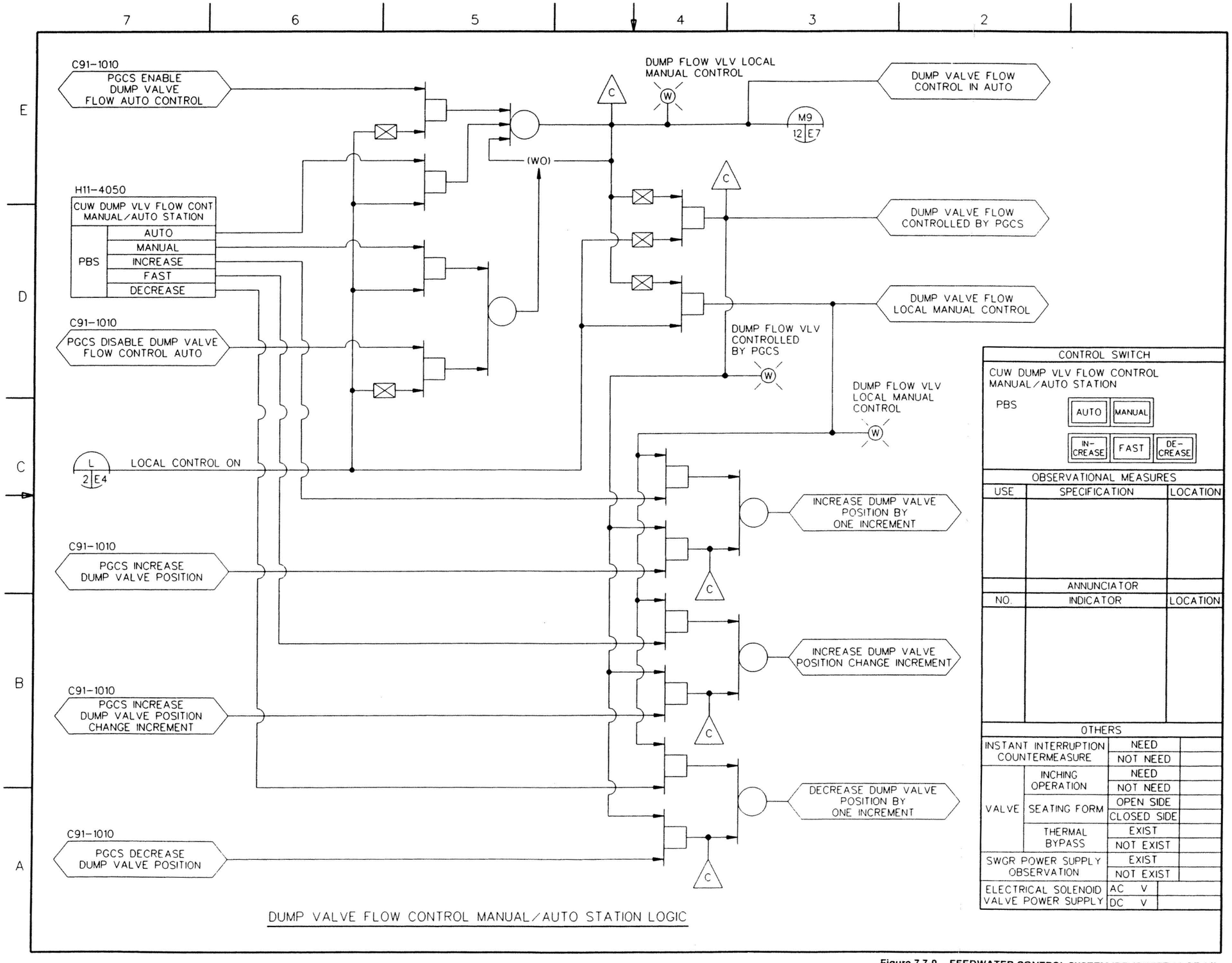


Figure 7.7-9 FEEDWATER CONTROL SYSTEM IBD (SHEET 11 OF 14)

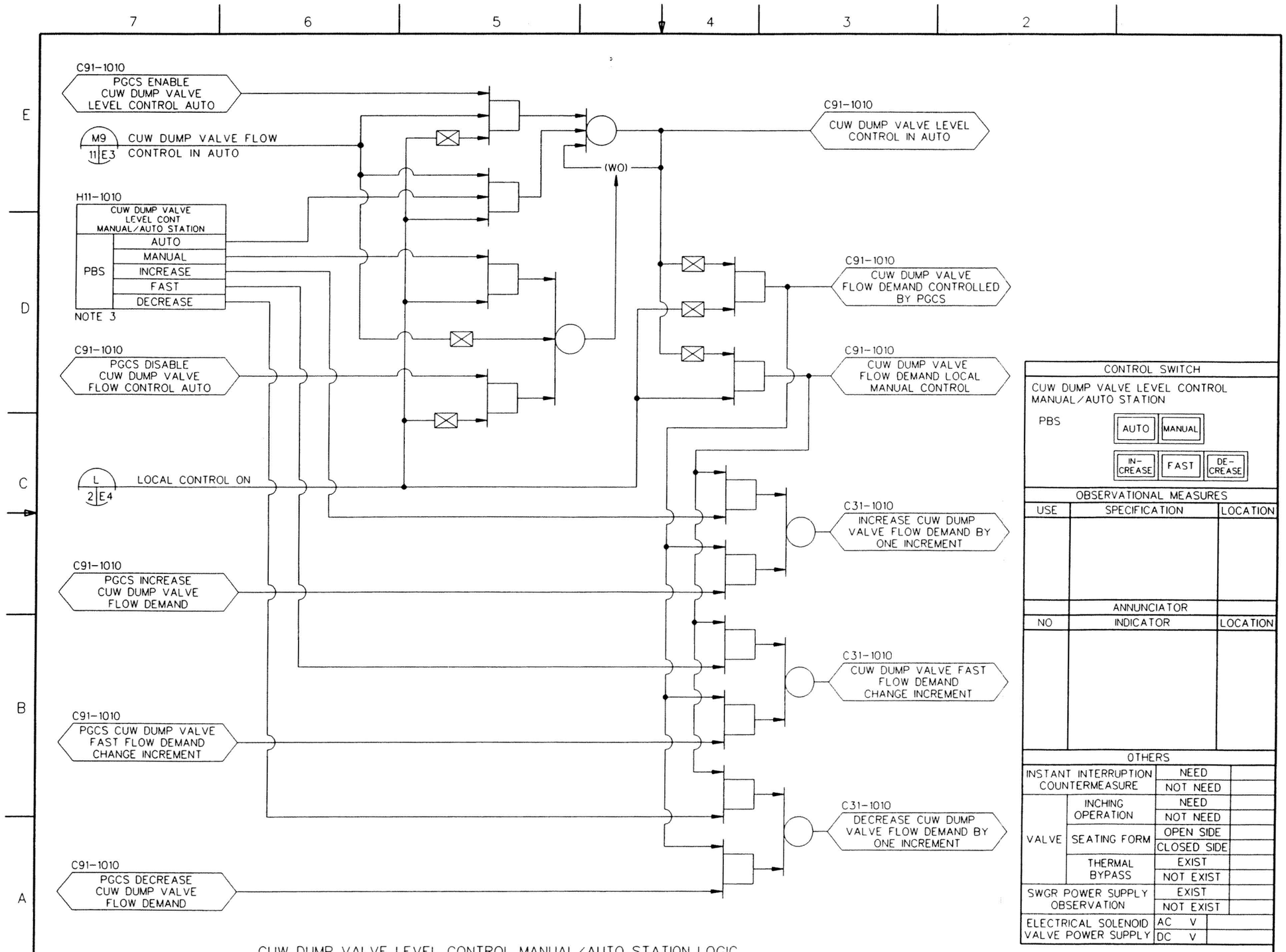
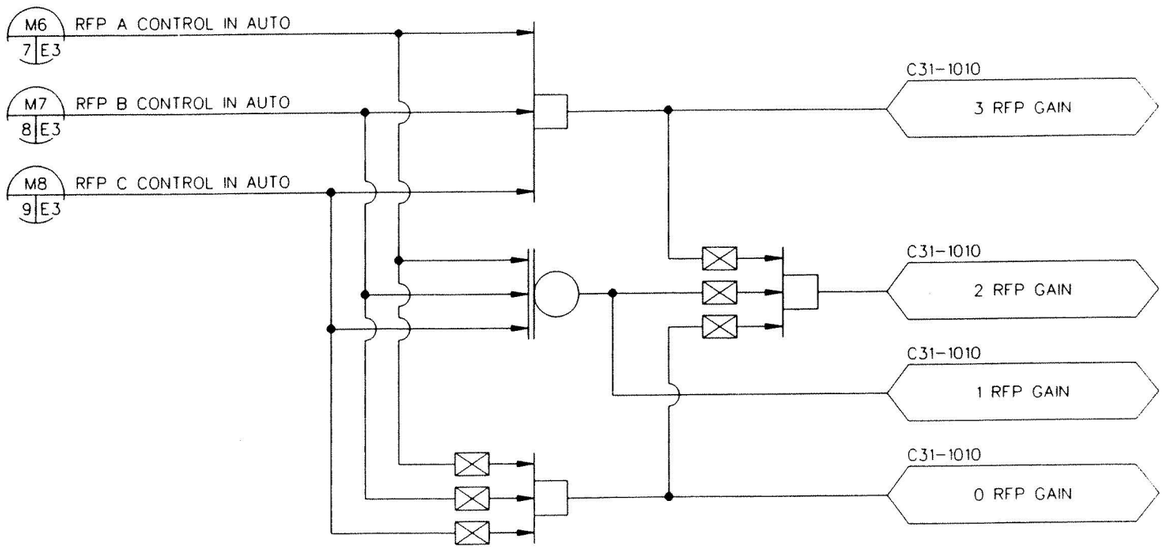
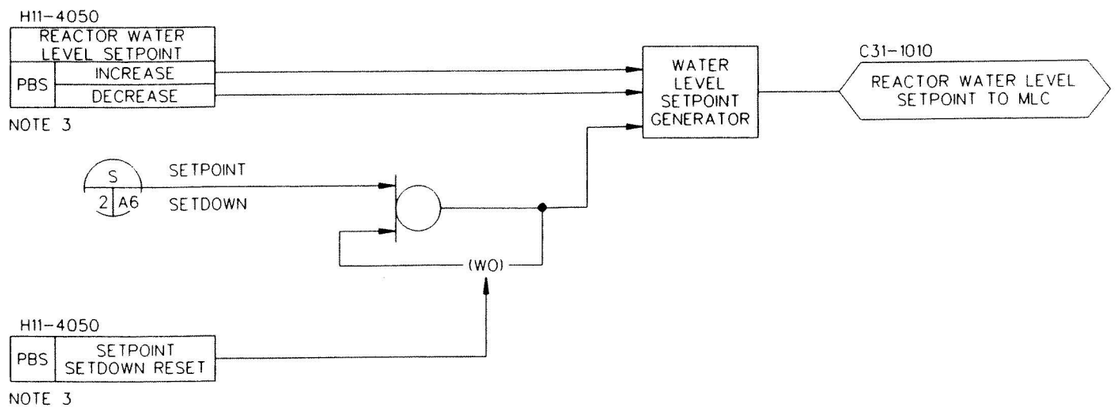


Figure 7.7-9 FEEDWATER CONTROL SYSTEM IBD (SHEET 12 OF 14)



GAIN CHANGE LOGIC



SETPOINT CHANGE LOGIC

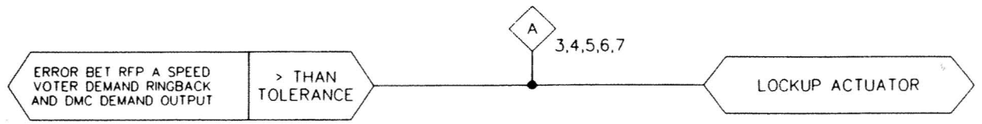
CONTROL SWITCH			
REACTOR WATER LEVEL SETPOINT			
PBS	IN-CREASE	DE-CREASE	
SETPOINT SETDOWN RESET			
PBS	RESET		

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)

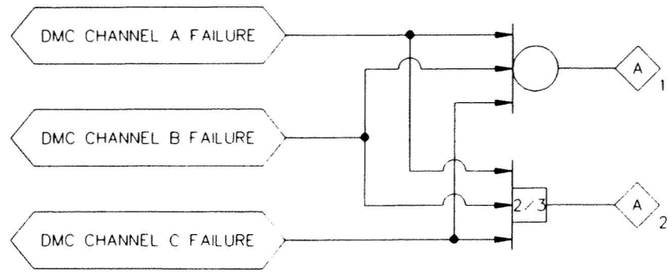


ACTUATOR LOCKUP LOGIC

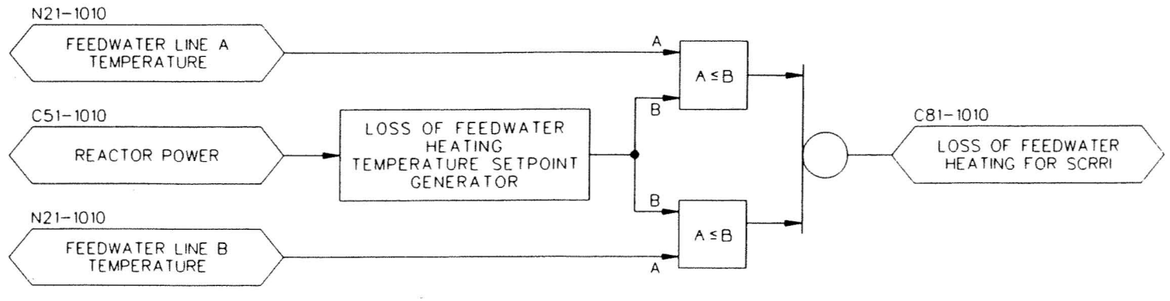
(TYPICAL OF RFP A, B, C, LFCV, AND CUW DUMP VALVE LOCKUP SIGNALS)

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

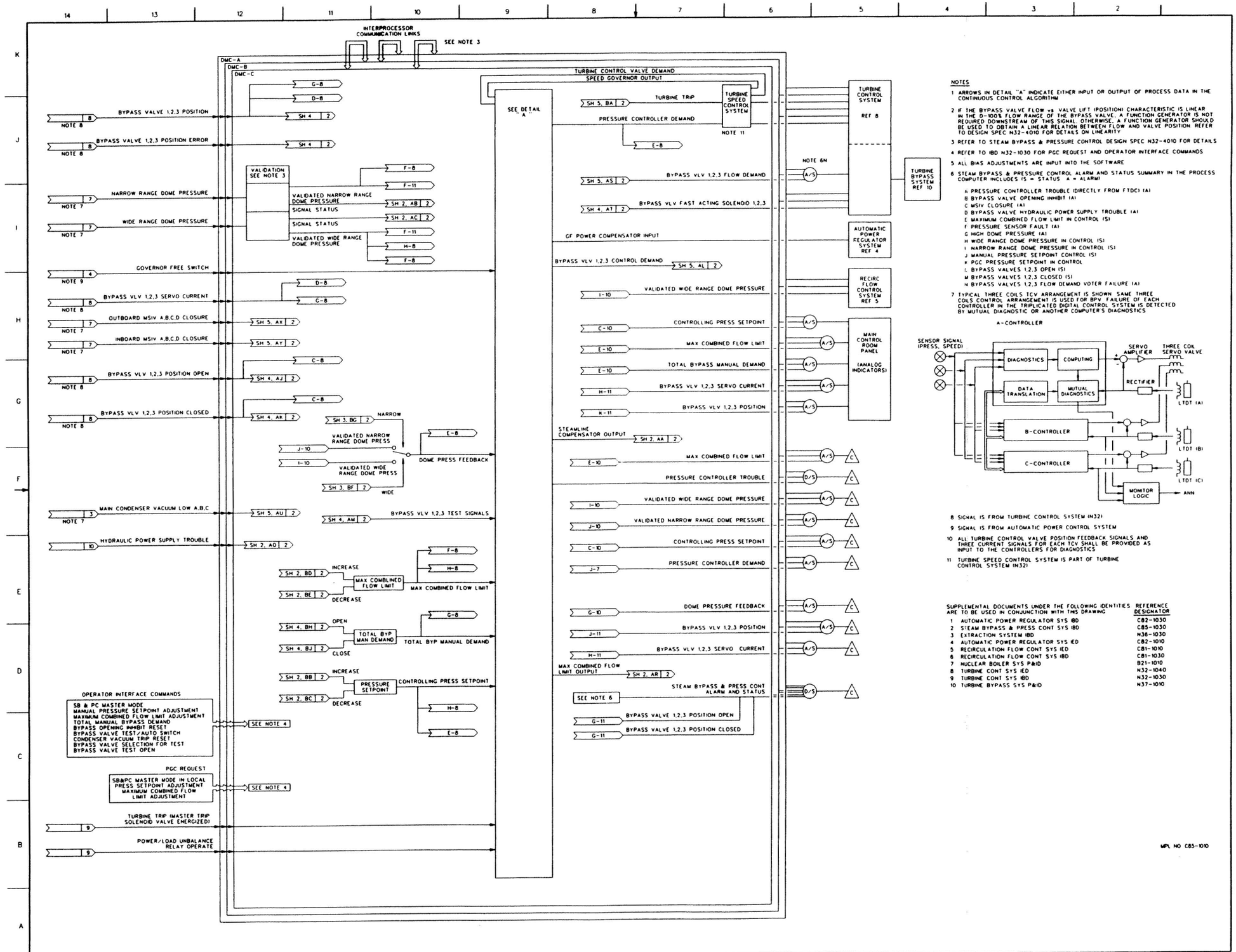
CONTROL SWITCH		

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)



NOTES

1 ARROWS IN DETAIL "A" INDICATE EITHER INPUT OR OUTPUT OF PROCESS DATA IN THE CONTINUOUS CONTROL ALGORITHM

2 IF THE BYPASS VALVE FLOW vs VALVE LIFT (POSITION) CHARACTERISTIC IS LINEAR IN THE 0-100% FLOW RANGE OF THE BYPASS VALVE, A FUNCTION GENERATOR IS NOT REQUIRED DOWNSTREAM OF THIS SIGNAL. OTHERWISE, A FUNCTION GENERATOR SHOULD BE USED TO OBTAIN A LINEAR RELATION BETWEEN FLOW AND VALVE POSITION. REFER TO DESIGN SPEC N32-4010 FOR DETAILS ON LINEARITY

3 REFER TO STEAM BYPASS & PRESSURE CONTROL DESIGN SPEC N32-4010 FOR DETAILS

4 REFER TO IBD N32-1030 FOR PGC REQUEST AND OPERATOR INTERFACE COMMANDS

5 ALL BIAS ADJUSTMENTS ARE INPUT INTO THE SOFTWARE

6 STEAM BYPASS & PRESSURE CONTROL ALARM AND STATUS SUMMARY IN THE PROCESS COMPUTER INCLUDES (S = STATUS A = ALARM)

- A PRESSURE CONTROLLER TROUBLE (DIRECTLY FROM FTDC) (A)
- B BYPASS VALVE OPENING INHIBIT (A)
- C MSIV CLOSURE (A)
- D BYPASS VALVE HYDRAULIC POWER SUPPLY TROUBLE (A)
- E MAXIMUM COMBINED FLOW LIMIT IN CONTROL (S)
- F PRESSURE SENSOR FAULT (A)
- G HIGH DOME PRESSURE (A)
- H WIDE RANGE DOME PRESSURE IN CONTROL (S)
- I NARROW RANGE DOME PRESSURE IN CONTROL (S)
- J MANUAL PRESSURE SETPOINT CONTROL (S)
- K PGC PRESSURE SETPOINT IN CONTROL
- L BYPASS VALVES 1,2,3 OPEN (S)
- M BYPASS VALVES 1,2,3 CLOSED (S)
- N BYPASS VALVES 1,2,3 FLOW DEMAND VOTER FAILURE (A)

7 TYPICAL THREE COILS TCV ARRANGEMENT IS SHOWN. SAME THREE COILS CONTROL ARRANGEMENT IS USED FOR BPV. FAILURE OF EACH CONTROLLER IN THE TRIPLICATED DIGITAL CONTROL SYSTEM IS DETECTED BY MUTUAL DIAGNOSTIC OR ANOTHER COMPUTER'S DIAGNOSTICS

8 SIGNAL IS FROM TURBINE CONTROL SYSTEM (N32)

9 SIGNAL IS FROM AUTOMATIC POWER CONTROL SYSTEM

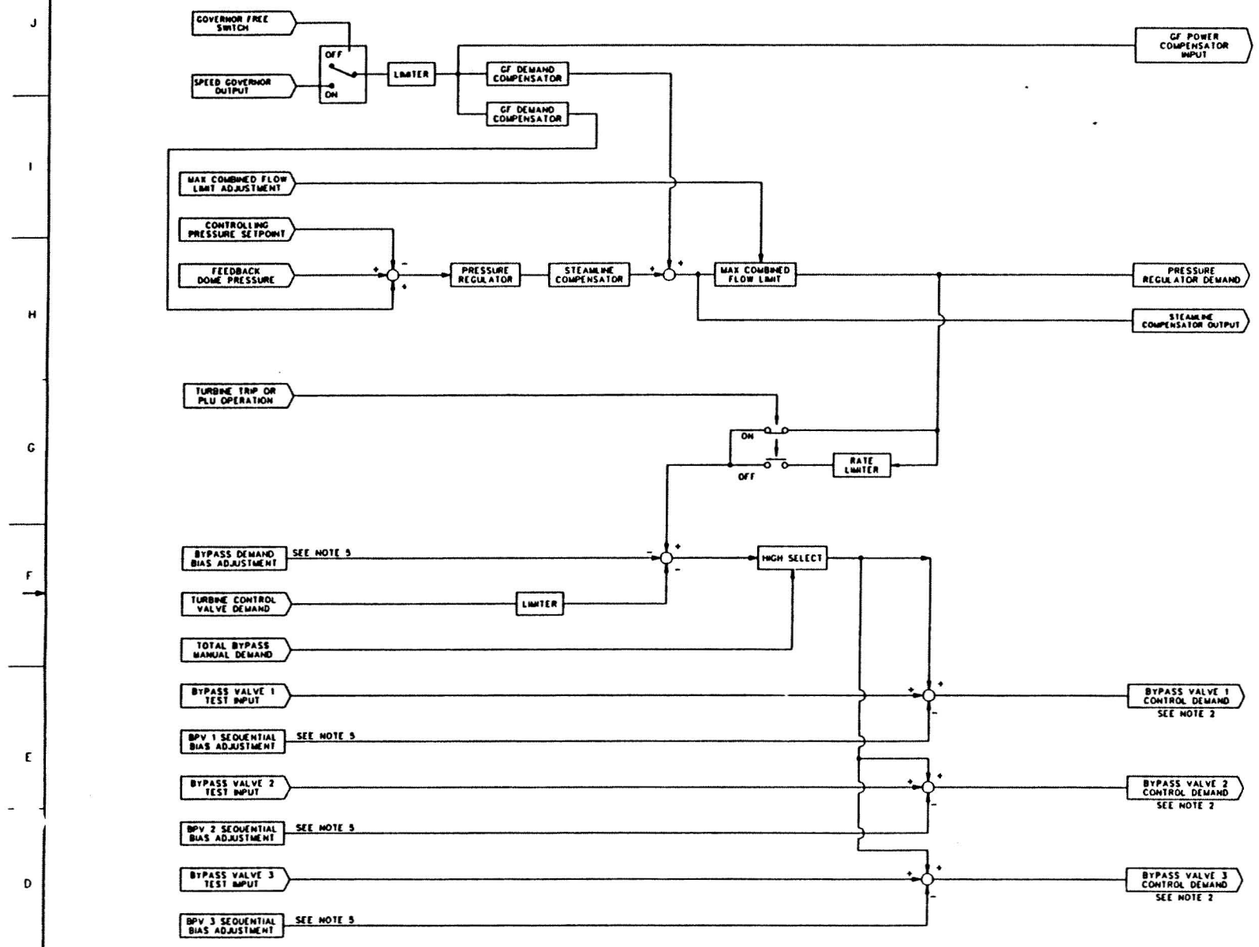
10 ALL TURBINE CONTROL VALVE POSITION FEEDBACK SIGNALS AND THREE CURRENT SIGNALS FOR EACH TCV SHALL BE PROVIDED AS INPUT TO THE CONTROLLERS FOR DIAGNOSTICS

11 TURBINE SPEED CONTROL SYSTEM IS PART OF TURBINE CONTROL SYSTEM (N32)

SUPPLEMENTAL DOCUMENTS UNDER THE FOLLOWING IDENTITIES ARE TO BE USED IN CONJUNCTION WITH THIS DRAWING	REFERENCE DESIGNATOR
1 AUTOMATIC POWER REGULATOR SYS IBD	C82-1030
2 STEAM BYPASS & PRESS CONT SYS IBD	C85-1030
3 EXTRACTION SYSTEM IBD	N36-1030
4 AUTOMATIC POWER REGULATOR SYS IED	C82-1010
5 RECIRCULATION FLOW CONT SYS IED	C81-1010
6 RECIRCULATION FLOW CONT SYS IBD	C81-1030
7 NUCLEAR BOILER SYS P&ID	B21-1010
8 TURBINE CONT SYS IED	N32-1040
9 TURBINE CONT SYS IBD	N32-1030
10 TURBINE BYPASS SYS P&ID	N37-1010

MPL NO C85-1010

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

TABLE OF CONTENTS

MPL NO C85-1030

FIGURE 7.7-13 STEAM BYPASS AND PRESSURE CONTROL SYSTEM IBD (Sheet 1 of 5)

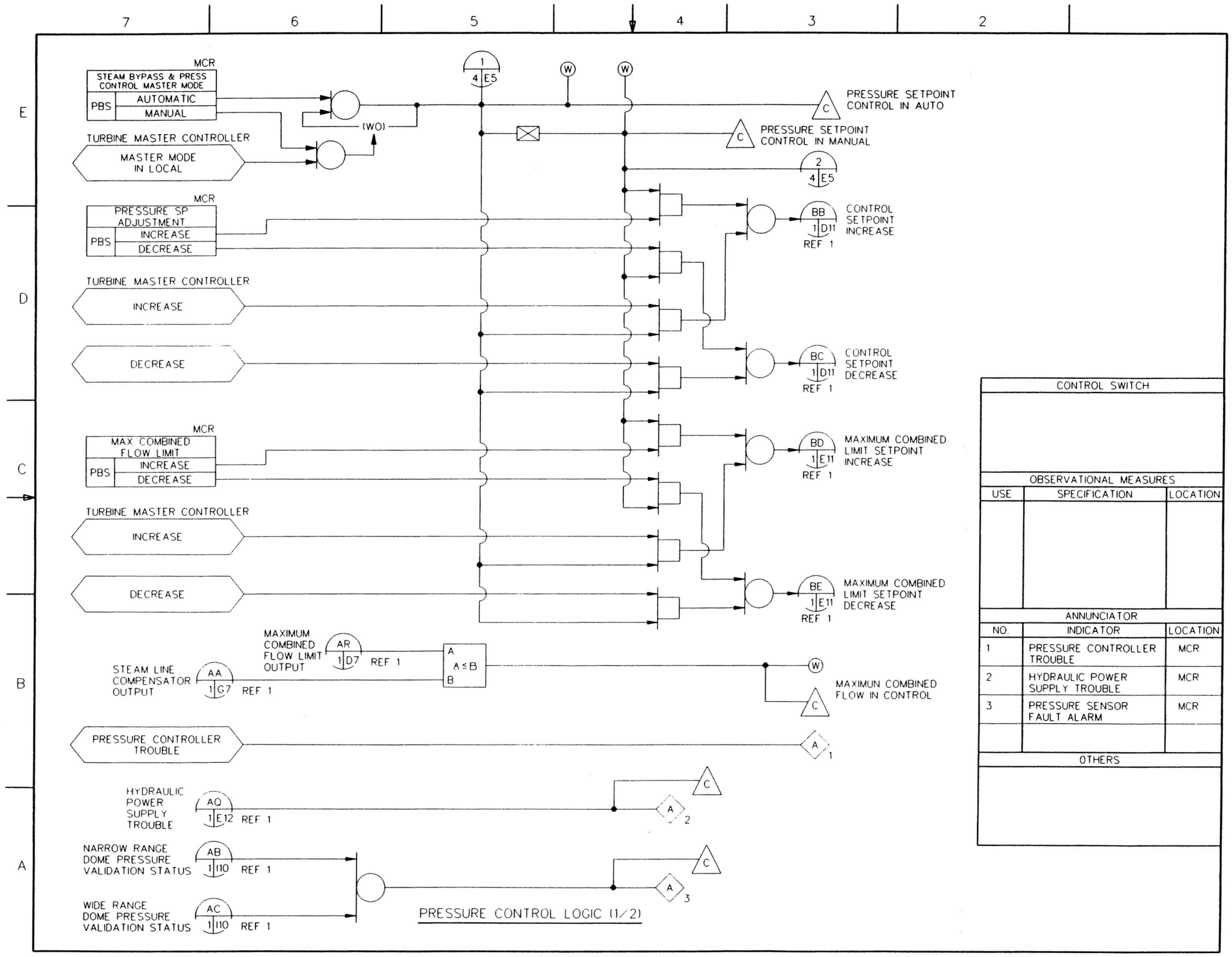
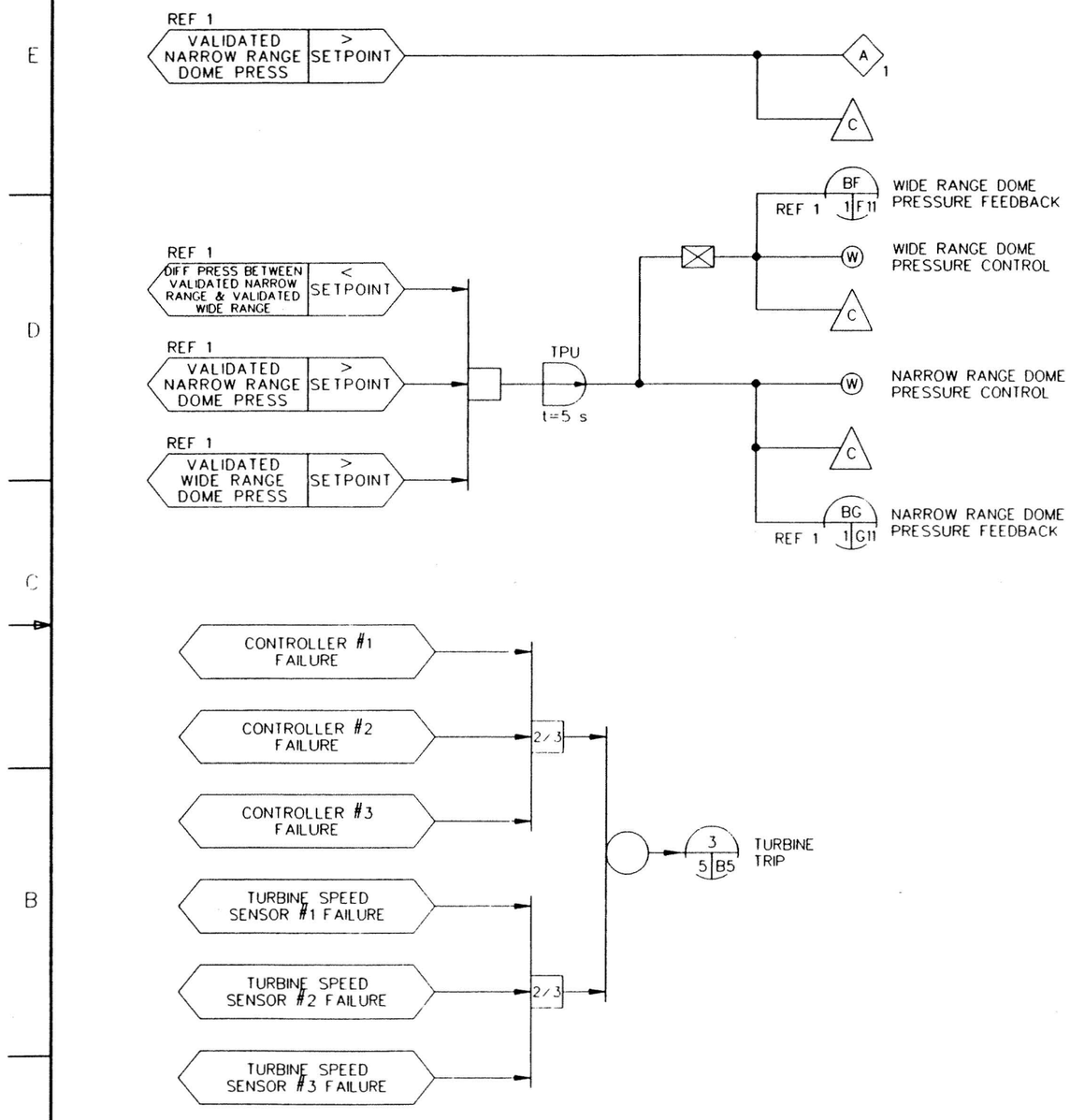


Figure 7.7-13 STEAM BYPASS AND PRESSURE CONTROL SYSTEM IBD (SHEET 2 OF 5)



PRESSURE CONTROL LOGIC (2/2)

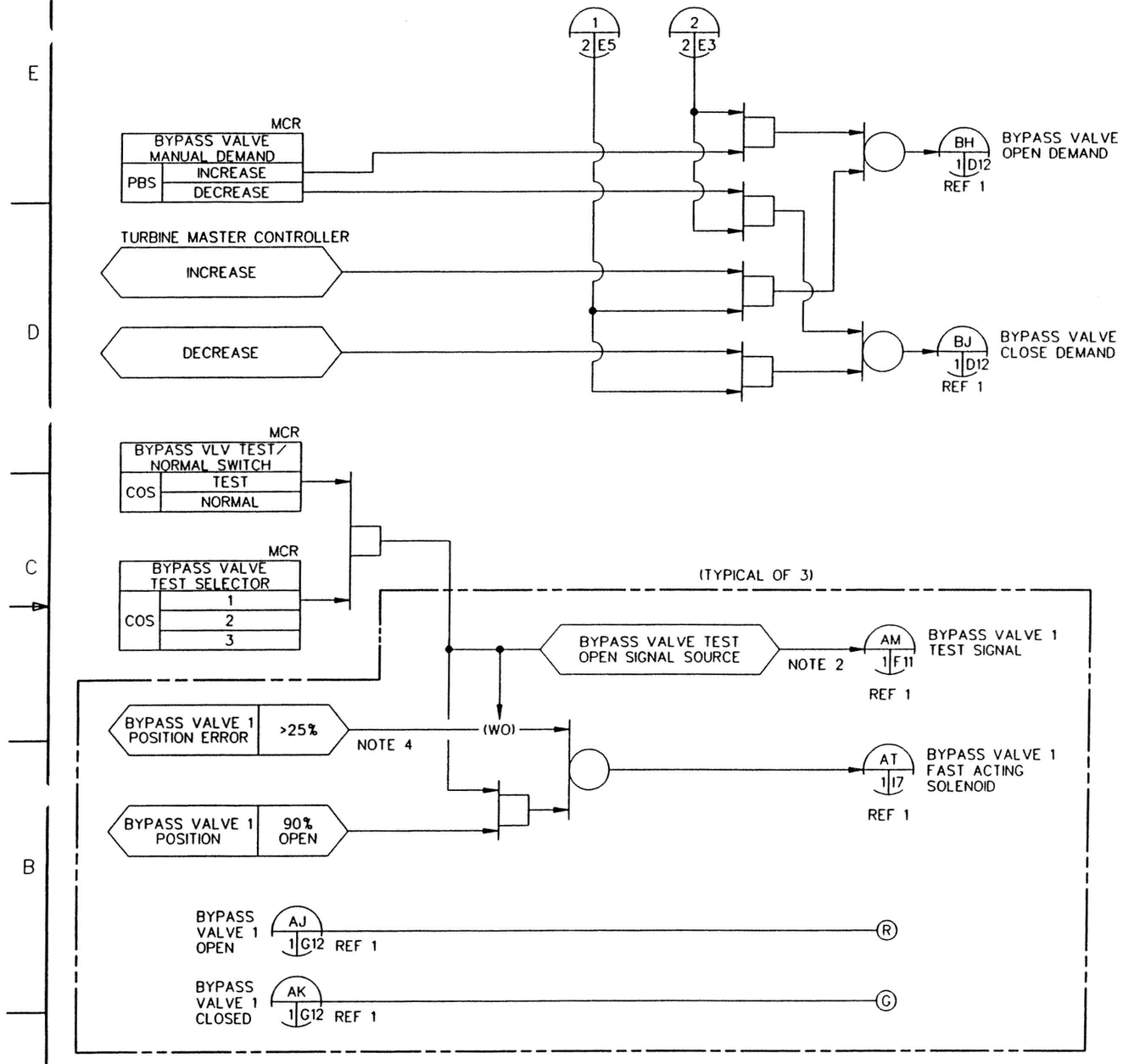
CONTROL SWITCH

OBSERVATIONAL MEASURES		
USE	SPECIFICATION	LOCATION

ANNUNCIATOR		
NO.	INDICATOR	LOCATION
1	HIGH DOME PRESSURE	MCR

OTHERS

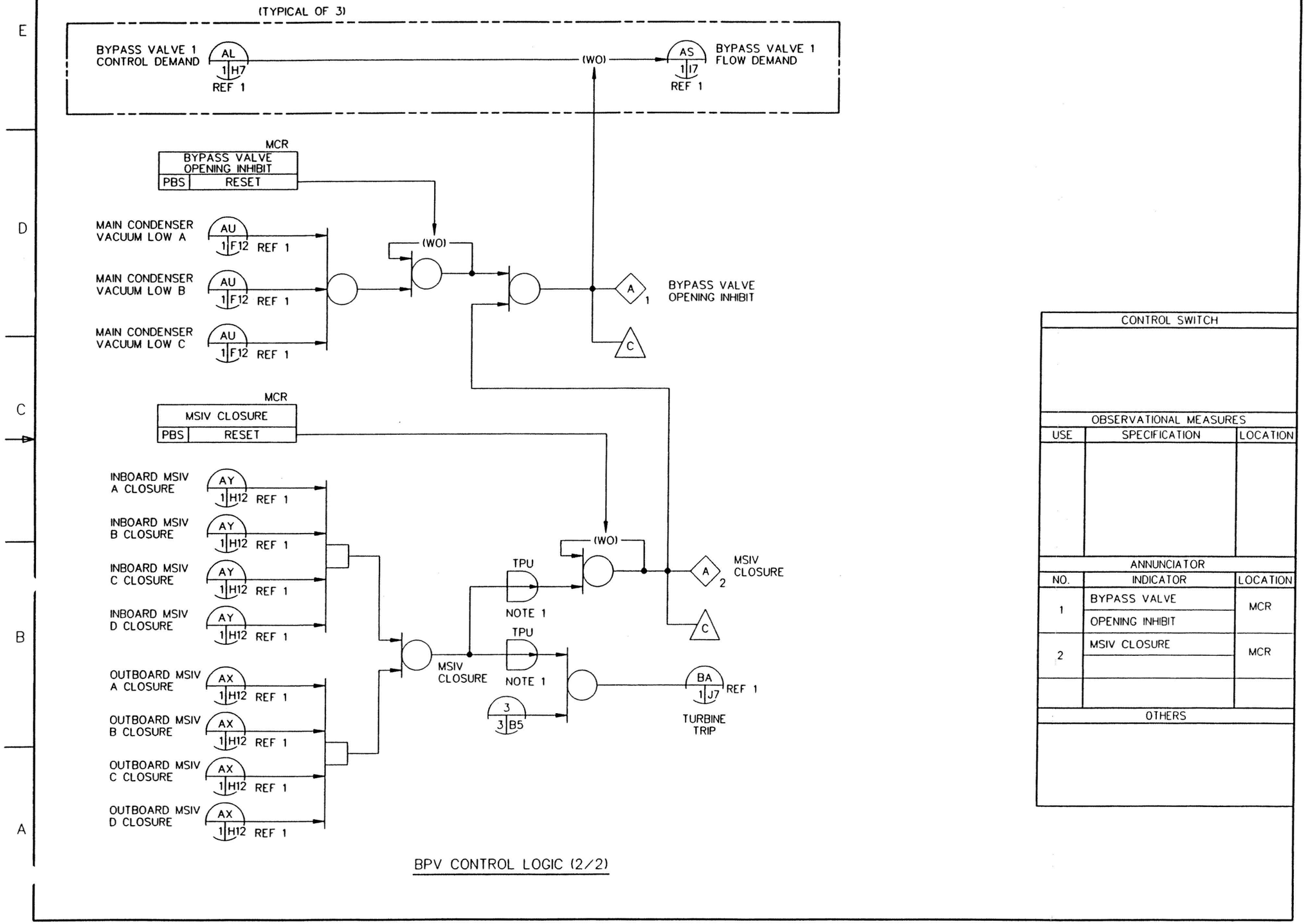
FIGURE 7.7-13 STEAM BYPASS AND PRESSURE CONTROL SYSTEM IBD (Sheet 3 of 5)



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)

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.

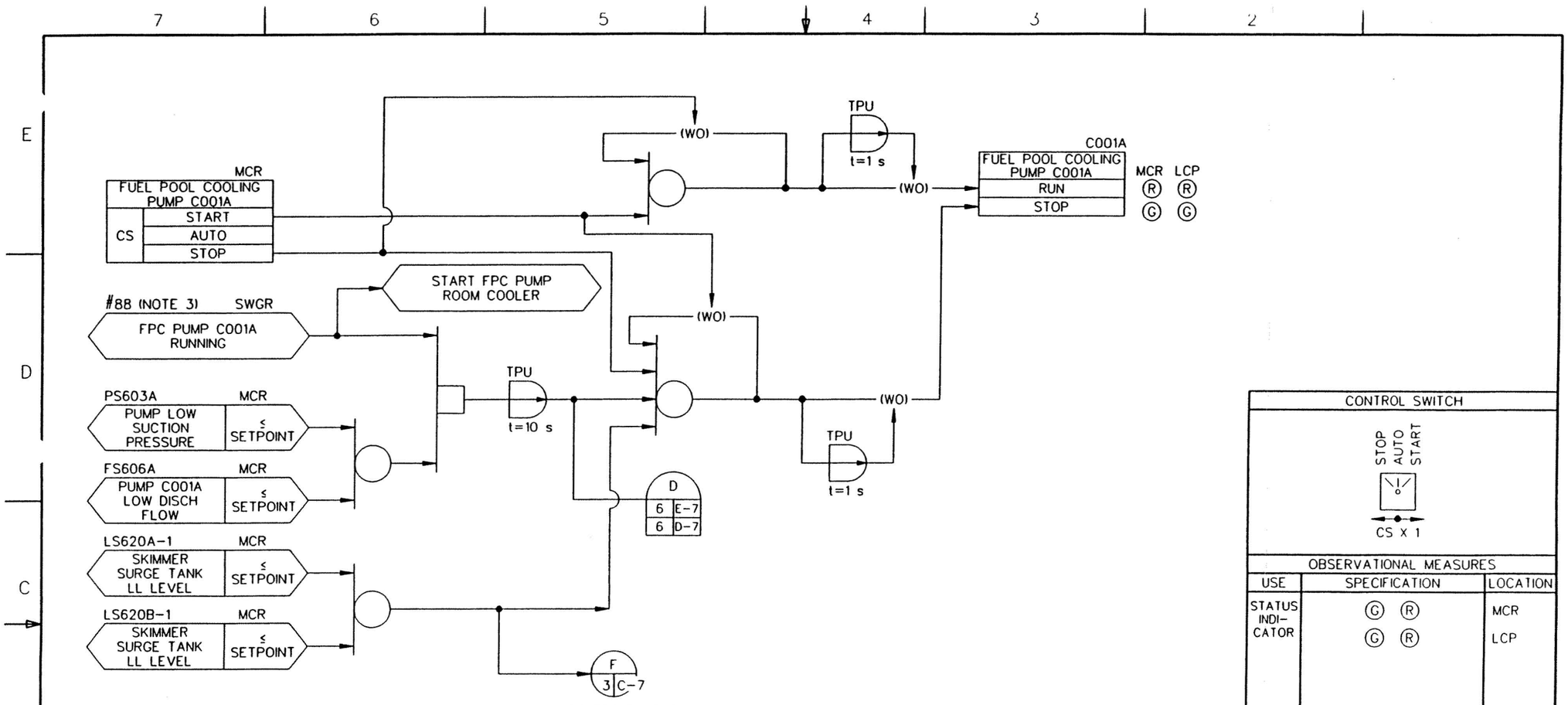
SUPPLEMENTAL DOCUMENTS UNDER THE FOLLOWING IDENTITIES ARE TO BE USED IN CONJUNCTION WITH THIS DRAWING.

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

TABLE OF CONTENTS

MPL NO. G41-1030

FIGURE 7.7-14 FUEL POOL COOLING & CLEANUP SYSTEM IBD (Sheet 1 of 8)



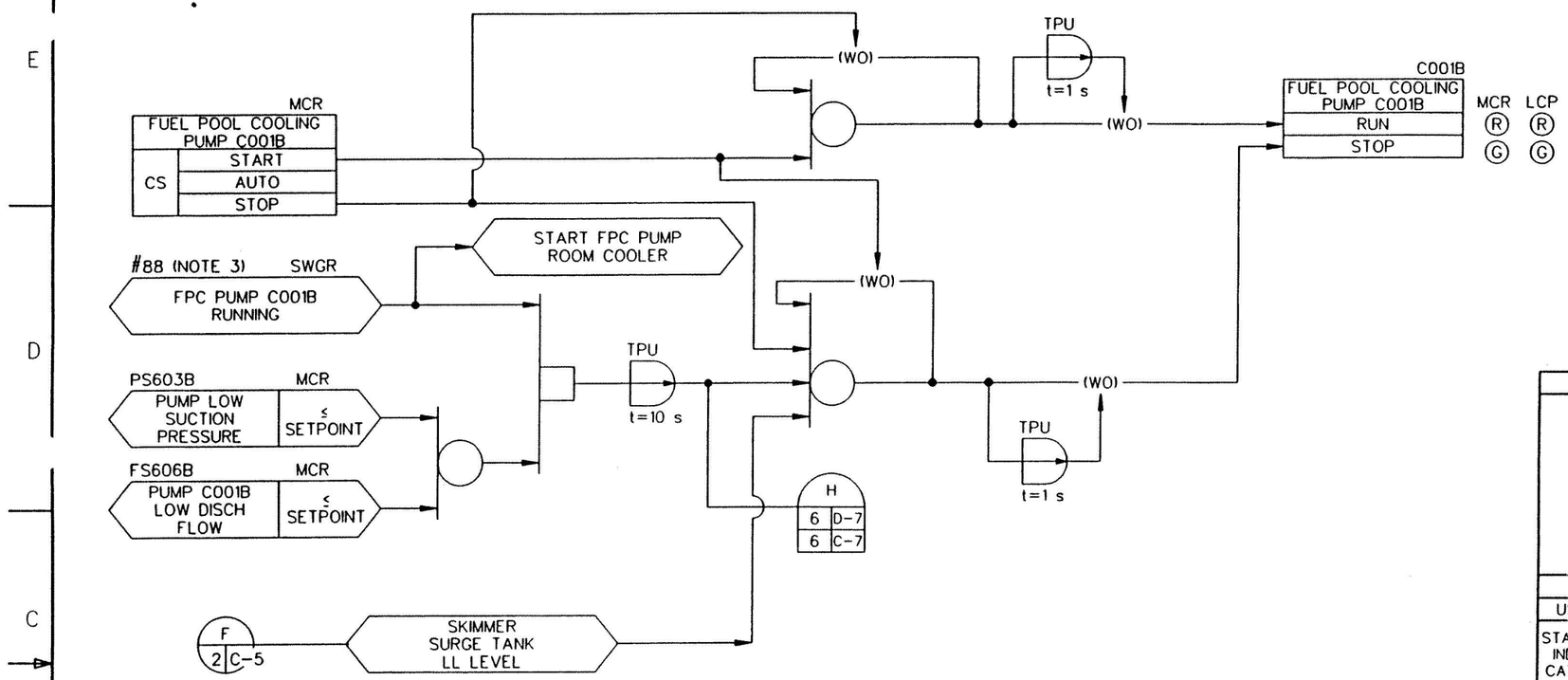
CONTROL SWITCH
STOP AUTO START CS x 1

OBSERVATIONAL MEASURES		
USE	SPECIFICATION	LOCATION
STATUS INDI-CATOR	G R G R	MCR LCP

ANNUNCIATOR		
NO.	INDICATOR	LOCATION

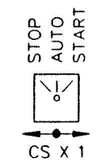
OTHERS			
INSTANT INTERRUPTION COUNTERMEASURE		NEED	
		NOT NEED	0
VALVE	INCHING OPERATION	NEED	
		NOT NEED	
	SEATING FORM	OPEN SIDE	
		CLOSED SIDE	
	THERMAL BYPASS	EXIST	
		NOT EXIST	0
SWGR POWER SUPPLY OBSERVATION		EXIST	
		NOT EXIST	0
ELECTRICAL SOLENOID VALVE POWER SUPPLY		AC V	
		DC V	

FIGURE 7.7-14 FUEL POOL COOLING & CLEANUP SYSTEM IBD (Sheet 2 of 8)



FPC PUMP C001B

CONTROL SWITCH



OBSERVATIONAL MEASURES

USE	SPECIFICATION	LOCATION
STATUS INDICATOR	G R G R	MCR LCP

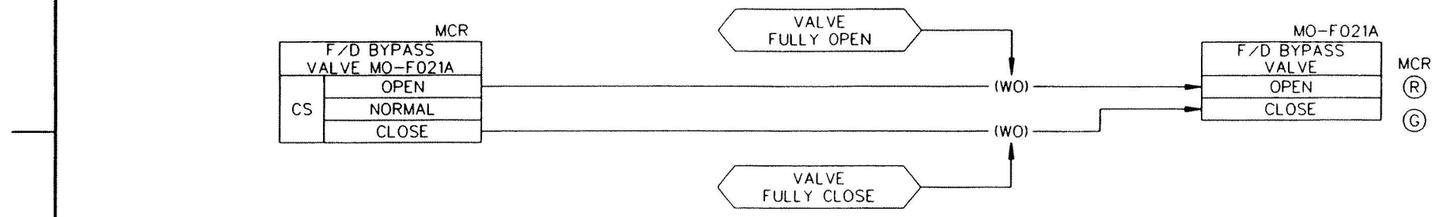
ANNUNCIATOR

NO.	INDICATOR	LOCATION

OTHERS

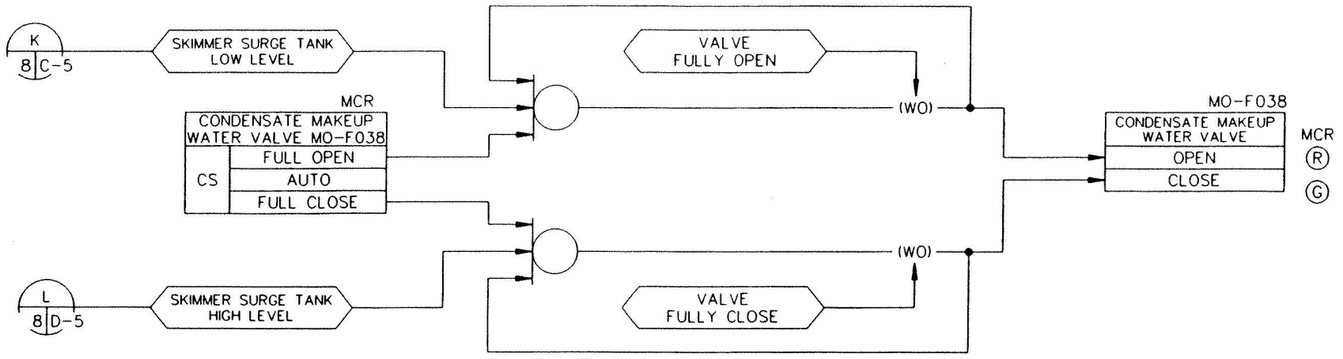
INSTANT INTERRUPTION COUNTERMEASURE		NEED	
		NOT NEED	0
VALVE	INCHING OPERATION	NEED	
		NOT NEED	
	SEATING FORM	OPEN SIDE	
		CLOSED SIDE	
	THERMAL BYPASS	EXIST	
		NOT EXIST	0
SWGR POWER SUPPLY OBSERVATION		EXIST	
		NOT EXIST	0
ELECTRICAL SOLENOID VALVE POWER SUPPLY		AC V	
		DC V	

FIGURE 7.7-14 FUEL POOL COOLING & CLEANUP SYSTEM IBD (Sheet 3 of 8)



F/D BYPASS VALVE MO-F021A

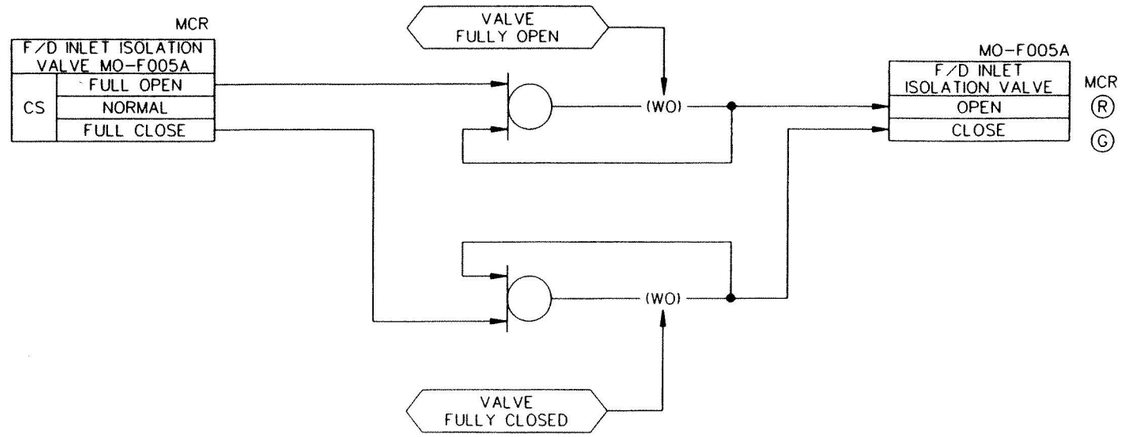
(TYPICAL FOR F/D BYPASS VALVE MO-F021B)



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 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	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 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

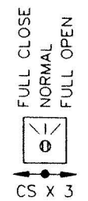
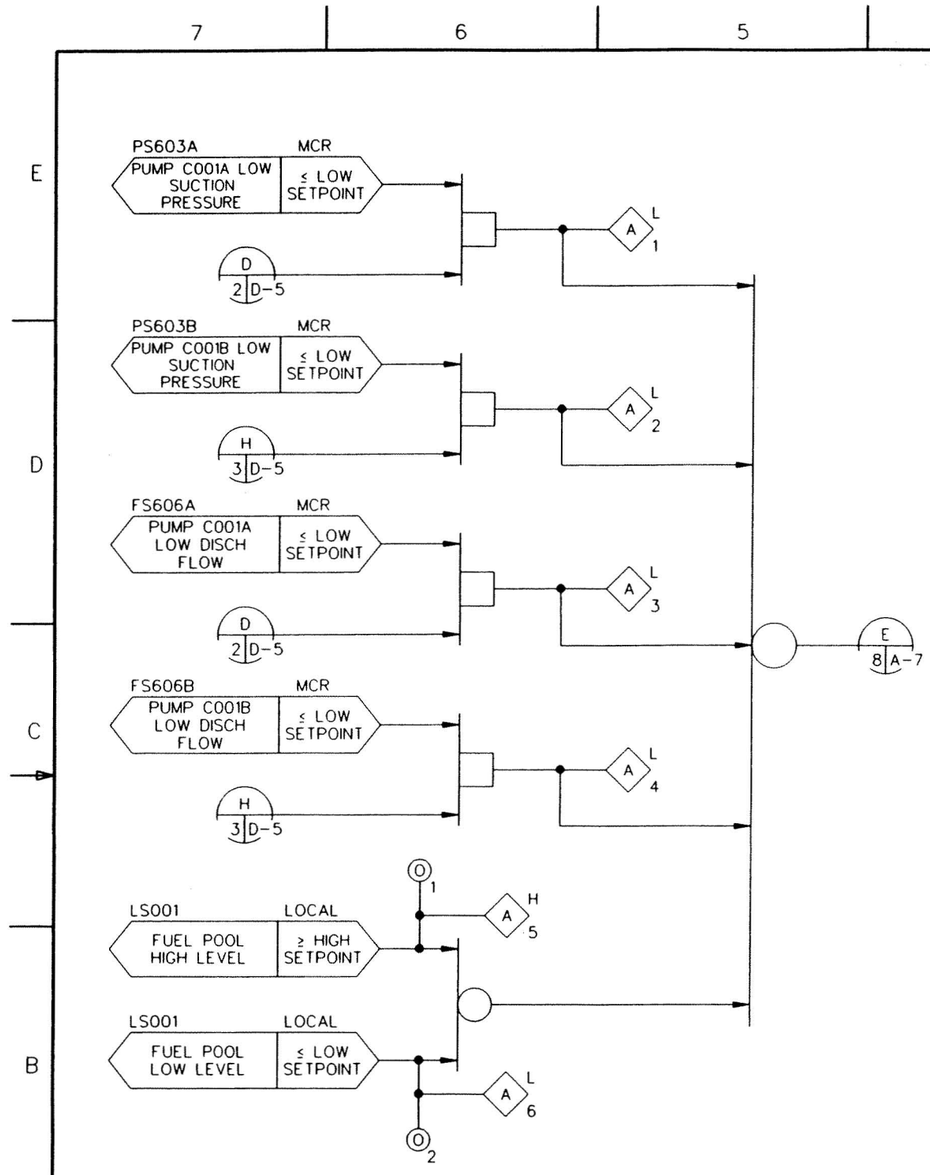
CONTROL SWITCH			
 CS X 3			
OBSERVATIONAL MEASURES			
USE	SPECIFICATION		LOCATION
STATUS INDI-CATOR	G R		MCR
ANNUNCIATOR			
NO.	INDICATOR		LOCATION
OTHERS			
INSTANT INTERRUPTION COUNTERMEASURE		NEED	
		NOT NEED	
VALVE	INCHING OPERATION	NEED	
		NOT NEED	
	SEATING FORM	OPEN SIDE	T
		CLOSED SIDE	L(T)
	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)



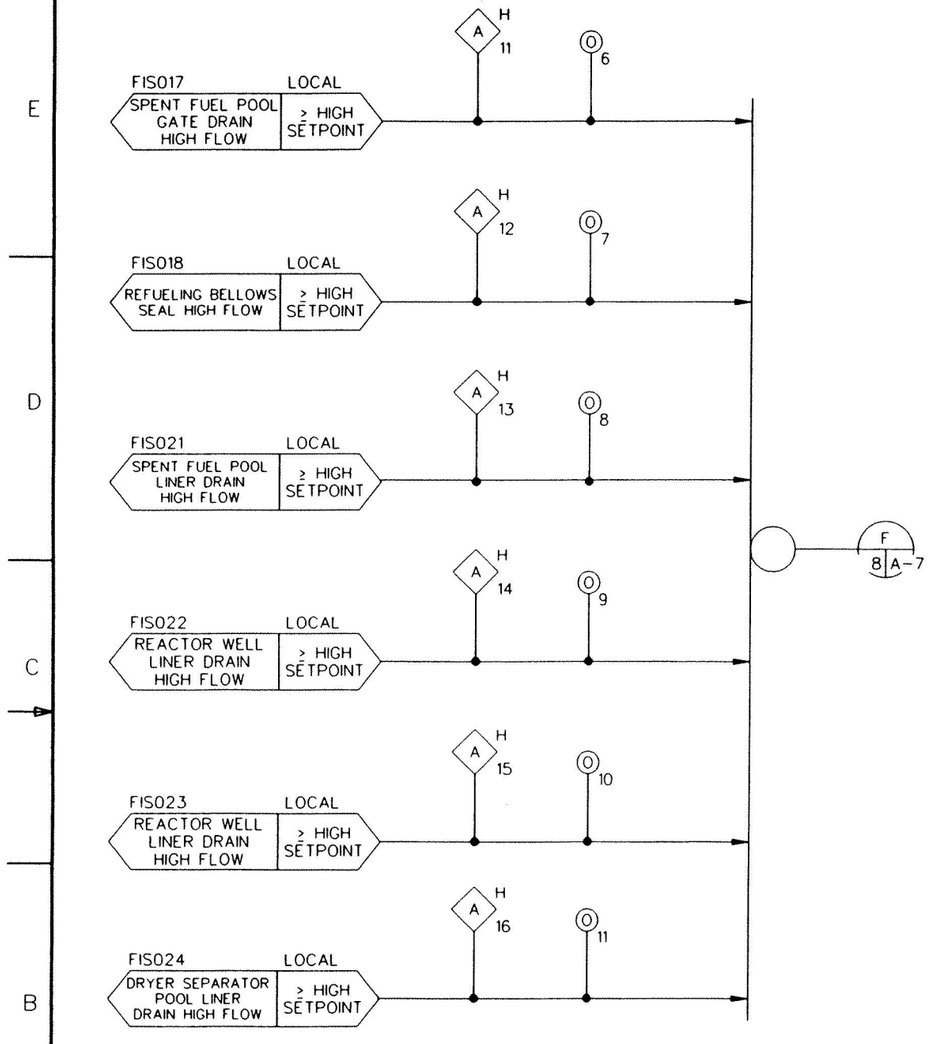
CONTROL SWITCH		

OBSERVATIONAL MEASURES		
USE	SPECIFICATION	LOCATION
STATUS INDI-CATOR	⓪ 1	LCP
	⓪ 2	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)



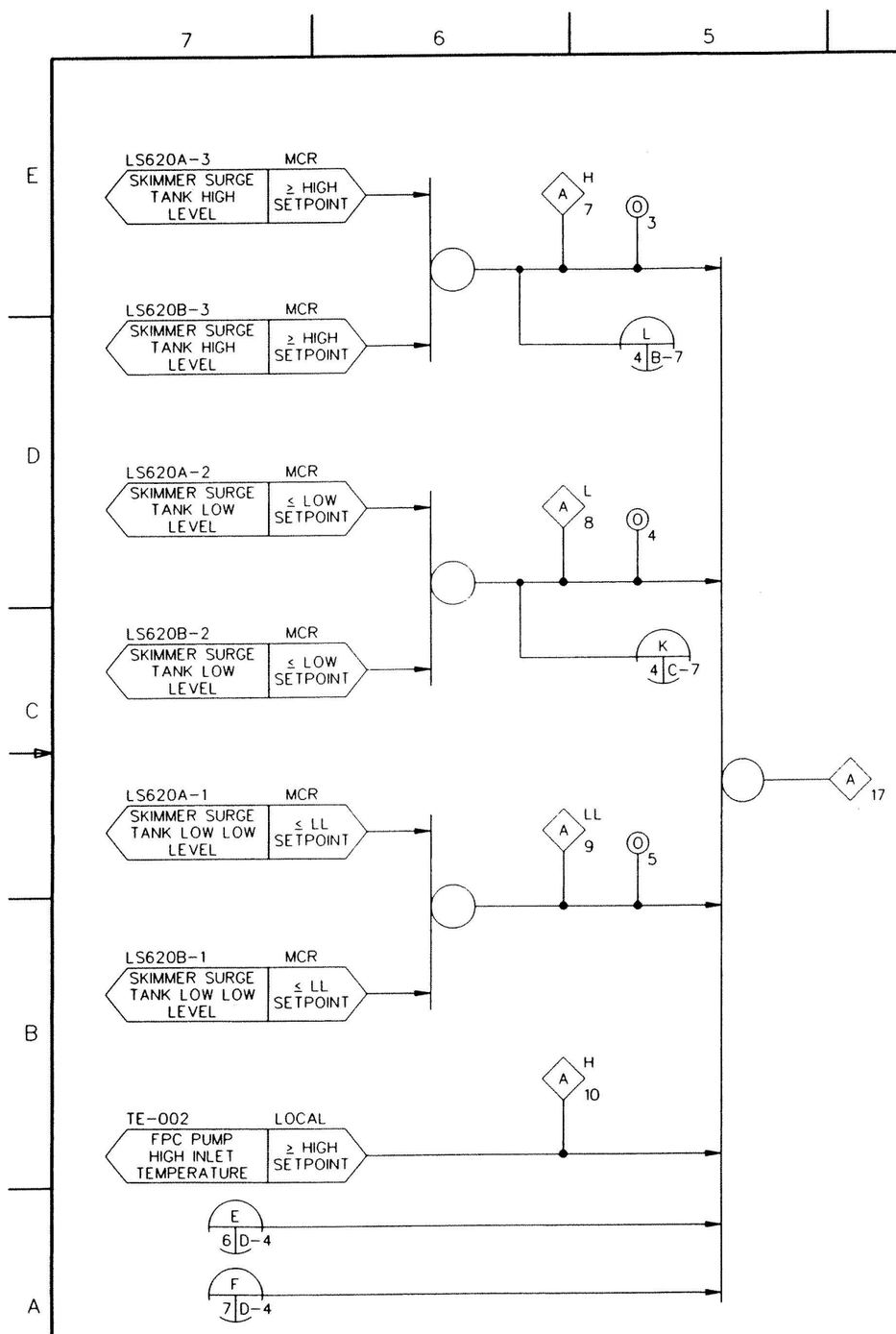
CONTROL SWITCH		

OBSERVATIONAL MEASURES		
USE	SPECIFICATION	LOCATION
STATUS INDICATOR	0 6	LCP
	0 7	LCP
	0 8	LCP
	0 9	LCP
	0 10	LCP
	0 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)



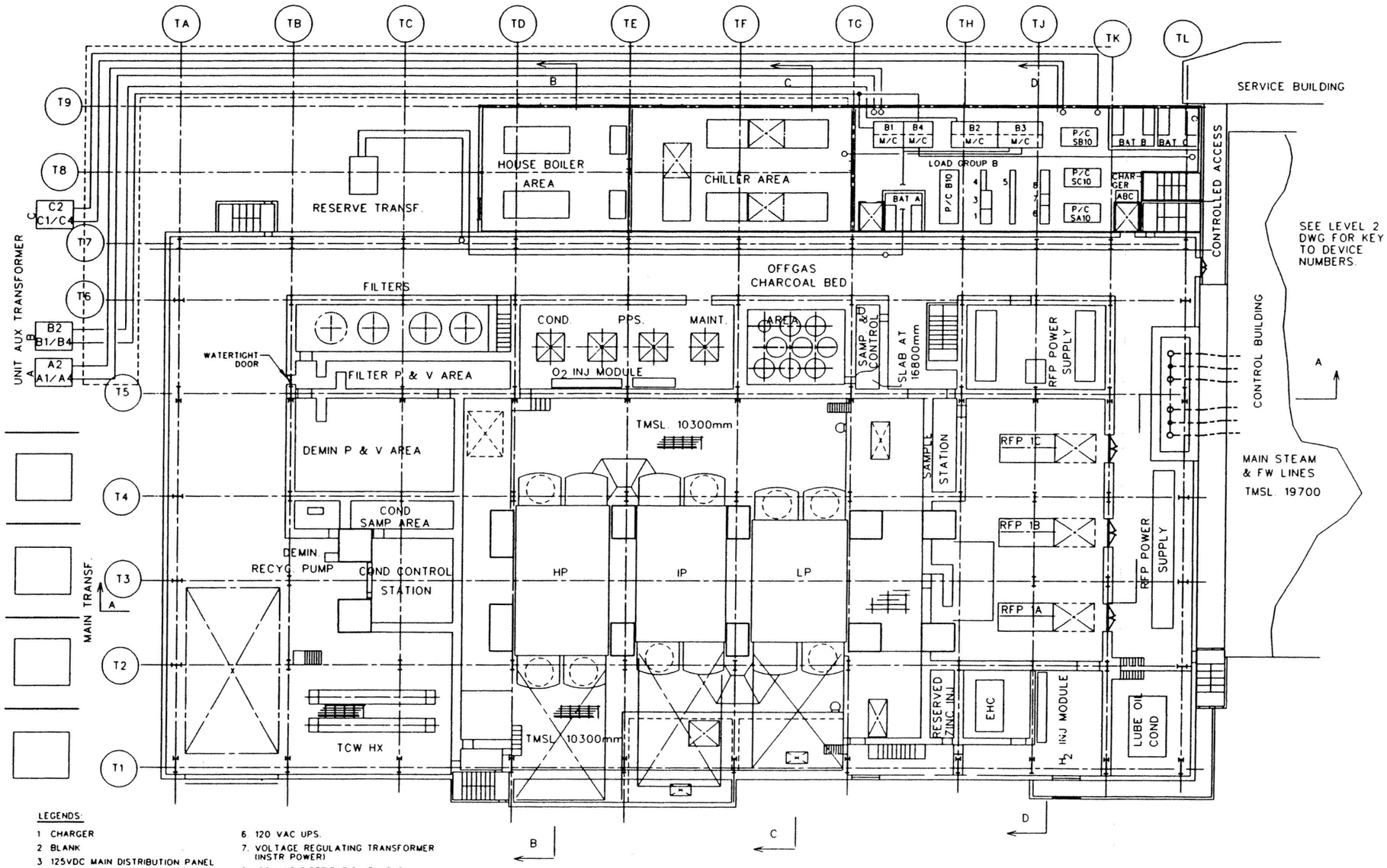
CONTROL SWITCH

OBSERVATIONAL MEASURES		
USE	SPECIFICATION	LOCATION
STATUS INDICATOR	0 3	LCP
	0 4	LCP
	0 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)



LEGENDS:

1. CHARGER
2. BLANK
3. 125VDC MAIN DISTRIBUTION PANEL
4. 125VDC MCC
5. MCC A330 (B330, C330) 11 BACK TO BACK DOUBLE STACKS, 66 CUBICLES AT AVERAGE OF 3 CUBICLES PER STACK
6. 120 VAC UPS.
7. VOLTAGE REGULATING TRANSFORMER (INSTR POWER)
8. 120 VAC DISTRIBUTION PANELS

—— - SPLICE CONNECTION GOING DOWN

TURB. BUILDING
EL 12300mm

FIGURE 8.2-1 POWER DISTRIBUTION SYSTEM ROUTING DIAGRAM (Sheet 1 of 7)

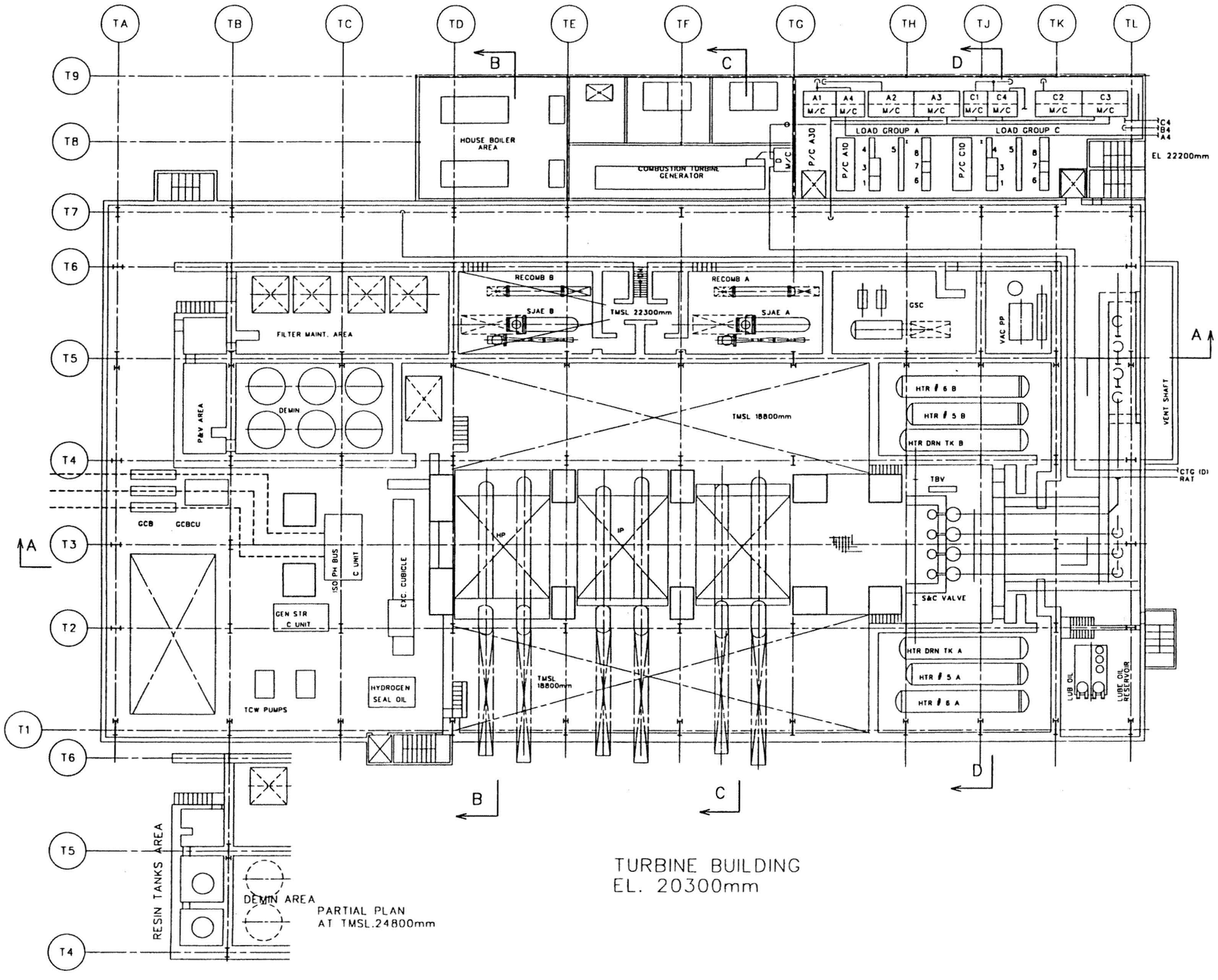
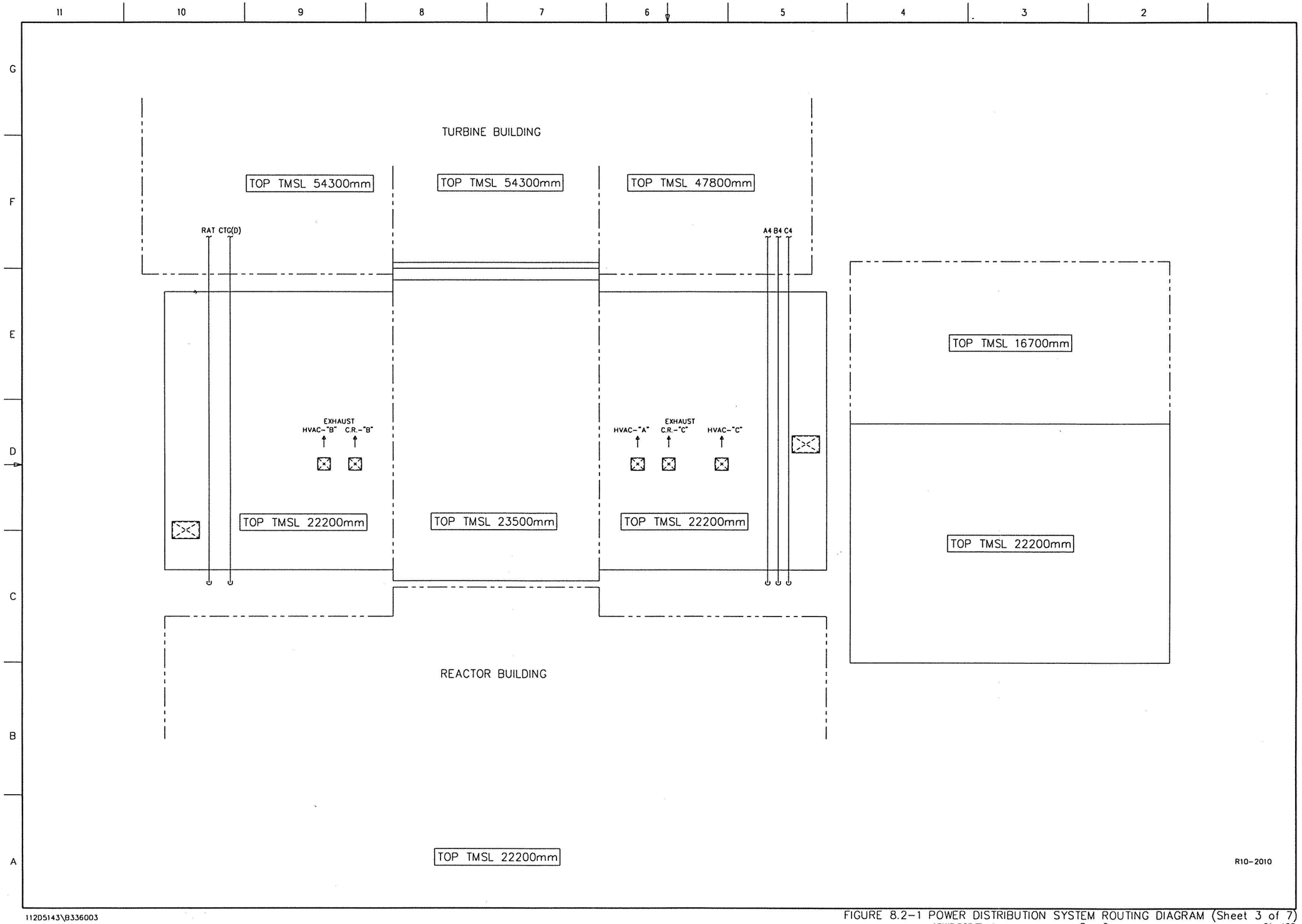


FIGURE 8.2-1 POWER DISTRIBUTION SYSTEM ROUTING DIAGRAM (Sheet 2 of 7)



112D5143\B336003

FIGURE 8.2–1 POWER DISTRIBUTION SYSTEM ROUTING DIAGRAM (Sheet 3 of 7)

11 10 9 8 7 6 5 4 3 2

G F E D C B A

TURBINE BUILDING

SUPPLY C.R.-"B"

SUPPLY C.R.-"C"

C.R.-HVAC SUPPLY "B"

CHILLER UNIT "B"

HVAC "B" EXHAUST

CR-HVAC "B" EXHAUST

C.R.-HVAC SUPPLY "C"

CHILLER UNIT "A"

HVAC "A" EXHAUST

CR-HVAC"C" EXHAUST

HVAC "C" EXHAUST

HVAC "A" SUPPLY

HVAC "C" SUPPLY

SUPPLY

HVAC-"A"

HVAC-"C"

RAT CTG(D)

A4 B4 C4

REACTOR BUILDING

CHILLER UNIT

T.S.C. HVAC

S/B HVAC

T.S.C. HVAC

S/B HVAC

S/B HVAC

S/B HVAC

S/B HVAC

TMSL 17150mm

R10-2010

112D5143\B336004

FIGURE 8.2-1 POWER DISTRIBUTION SYSTEM ROUTING DIAGRAM (Sheet 4 of 7)

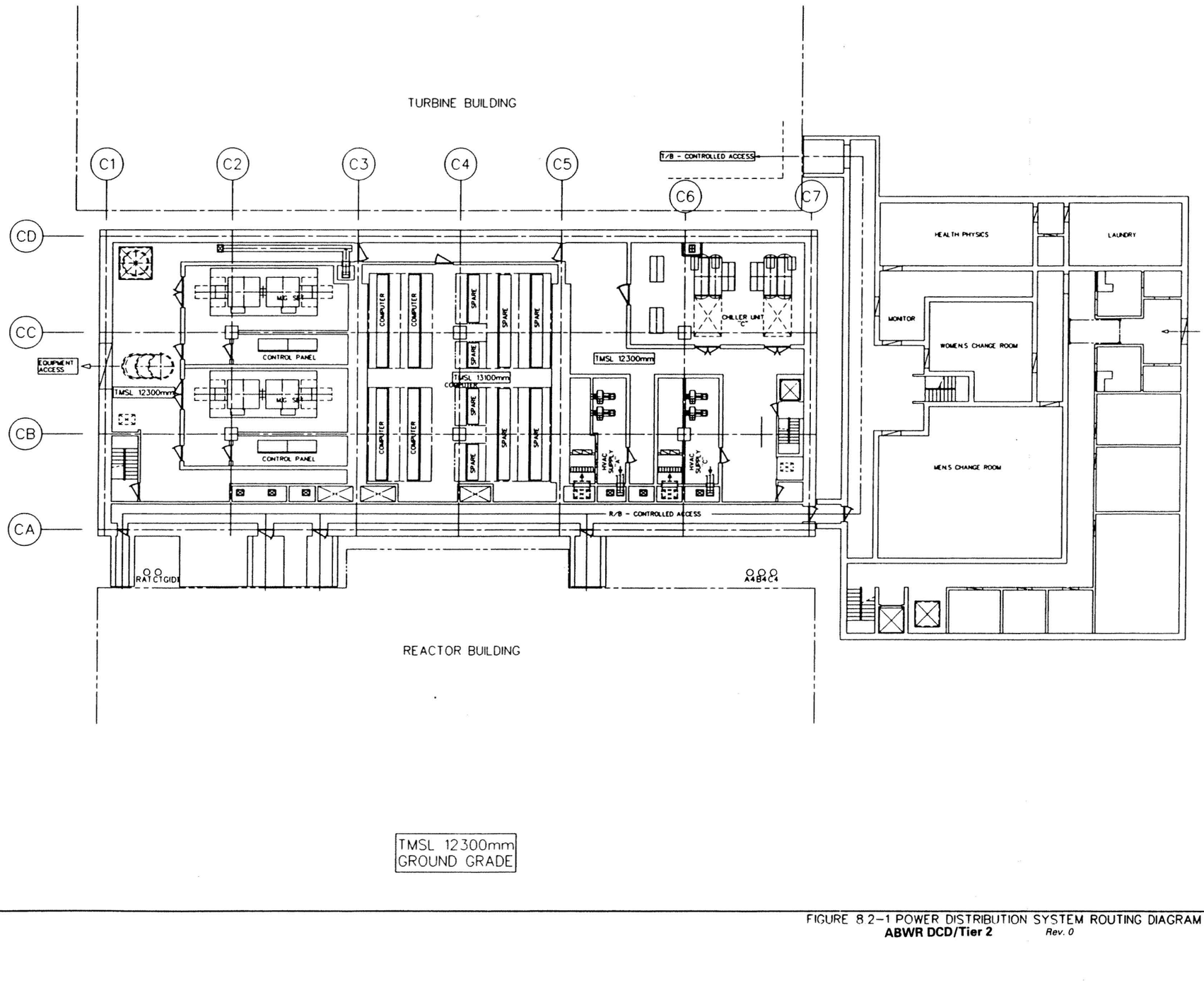
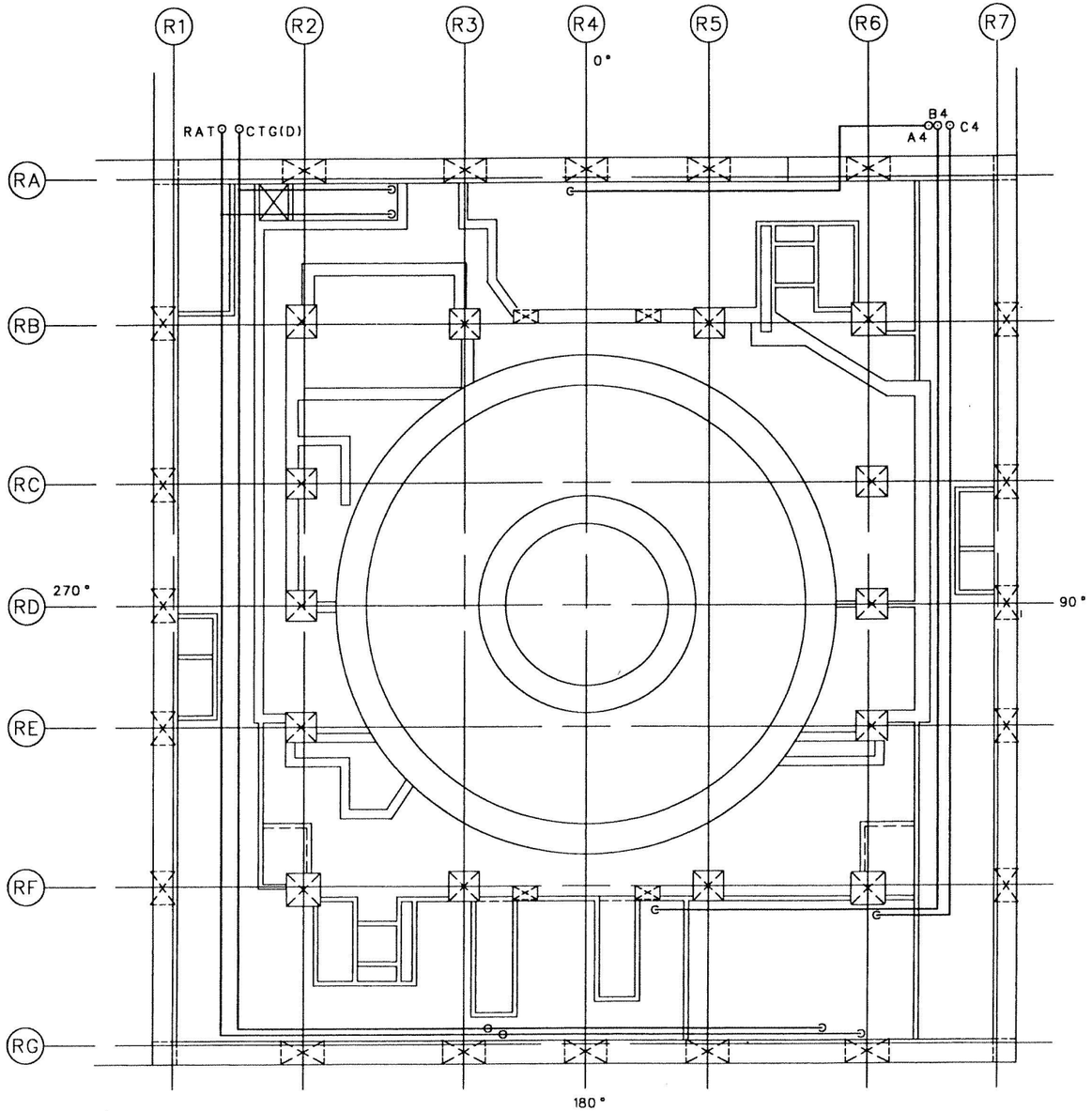
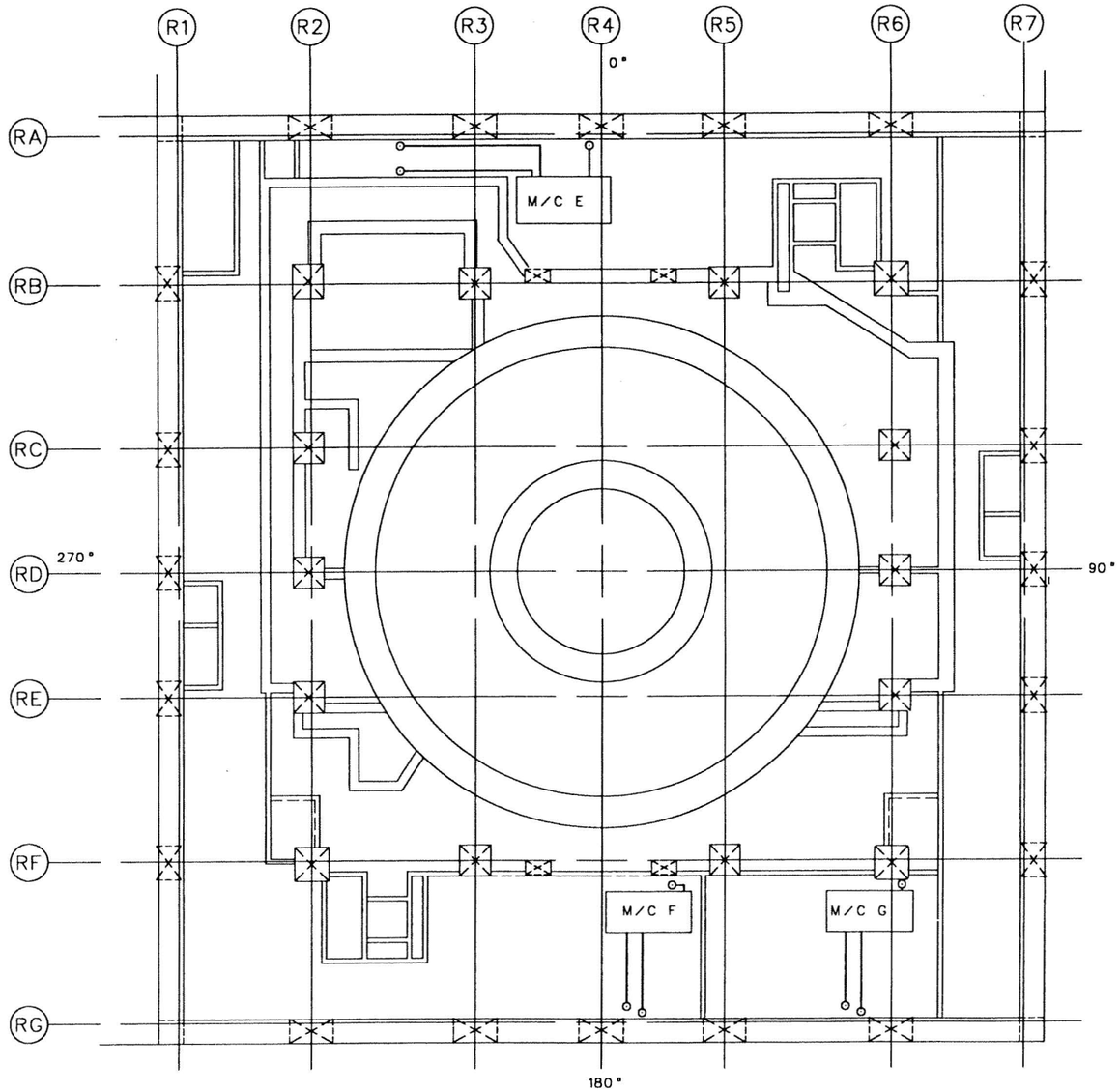


FIGURE 8.2-1 POWER DISTRIBUTION SYSTEM ROUTING DIAGRAM (Sheet 5 of 7)



REACTOR BUILDING
T.M.S.L. 8500mm

FIGURE 8.2-1 POWER DISTRIBUTION SYSTEM ROUTING DIAGRAM (Sheet 6 of 7)



REACTOR BUILDING
T.M.S.L.4800mm

FIGURE 8.2-1 POWER DISTRIBUTION SYSTEM ROUTING DIAGRAM (Sheet 7 of 7)

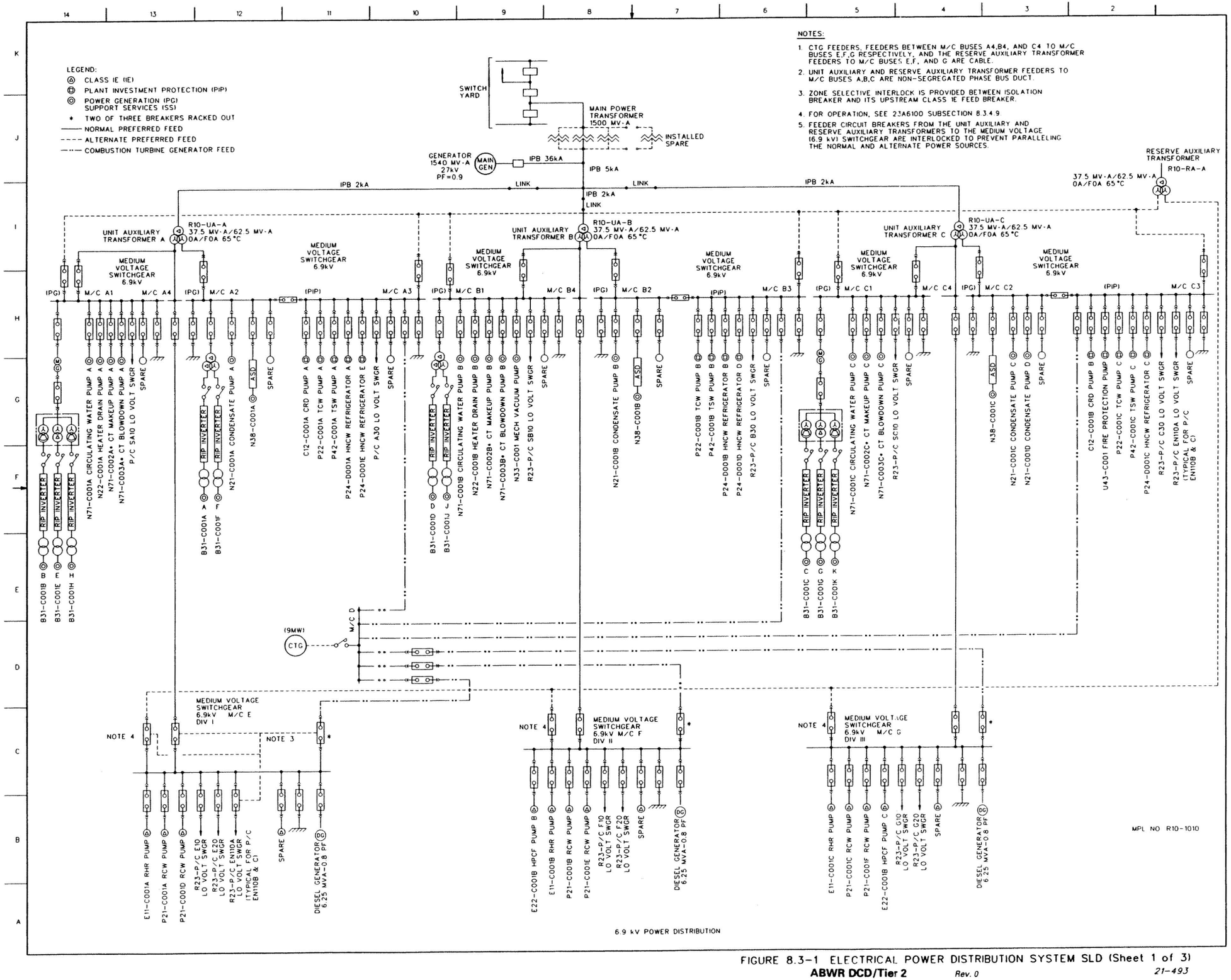
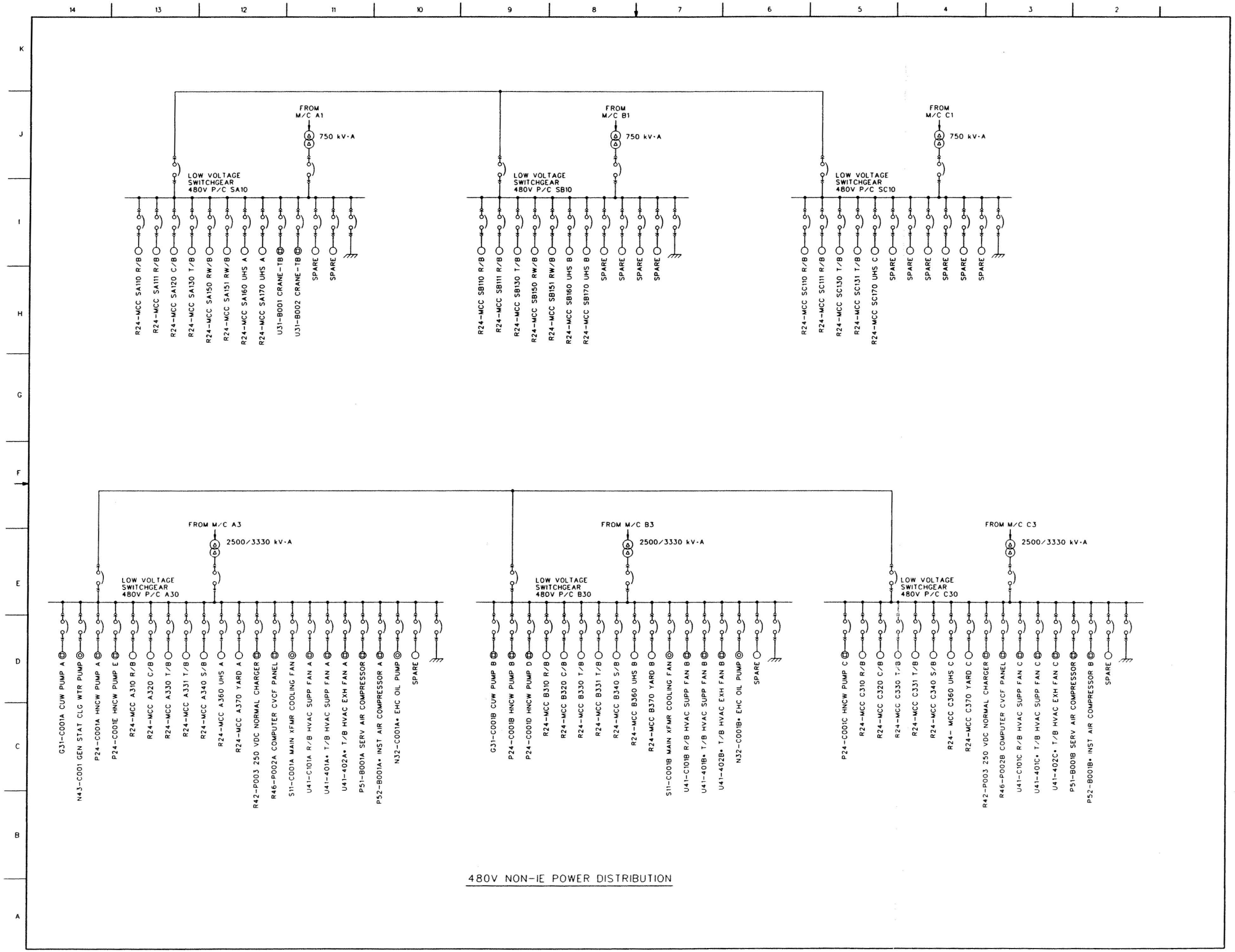
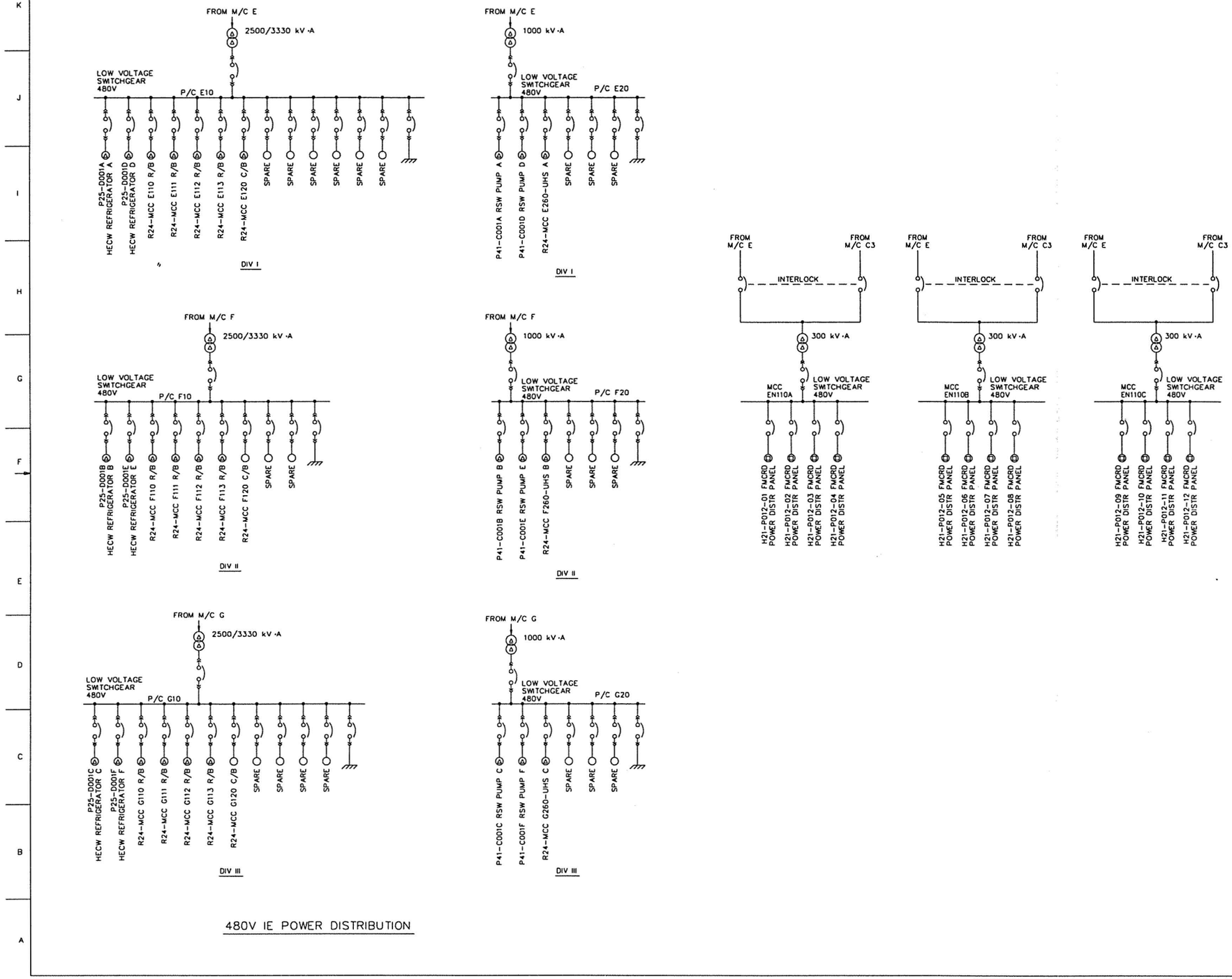


FIGURE 8.3-1 ELECTRICAL POWER DISTRIBUTION SYSTEM SLD (Sheet 1 of 3)



480V NON-IE POWER DISTRIBUTION

FIGURE 8.3-1 ELECTRICAL POWER DISTRIBUTION SYSTEM SLD (Sheet 2 of 3)



107E5072\A807403

FIGURE 8.3-1 ELECTRICAL POWER DISTRIBUTION SYSTEM SLD (Sheet 3 of 3)

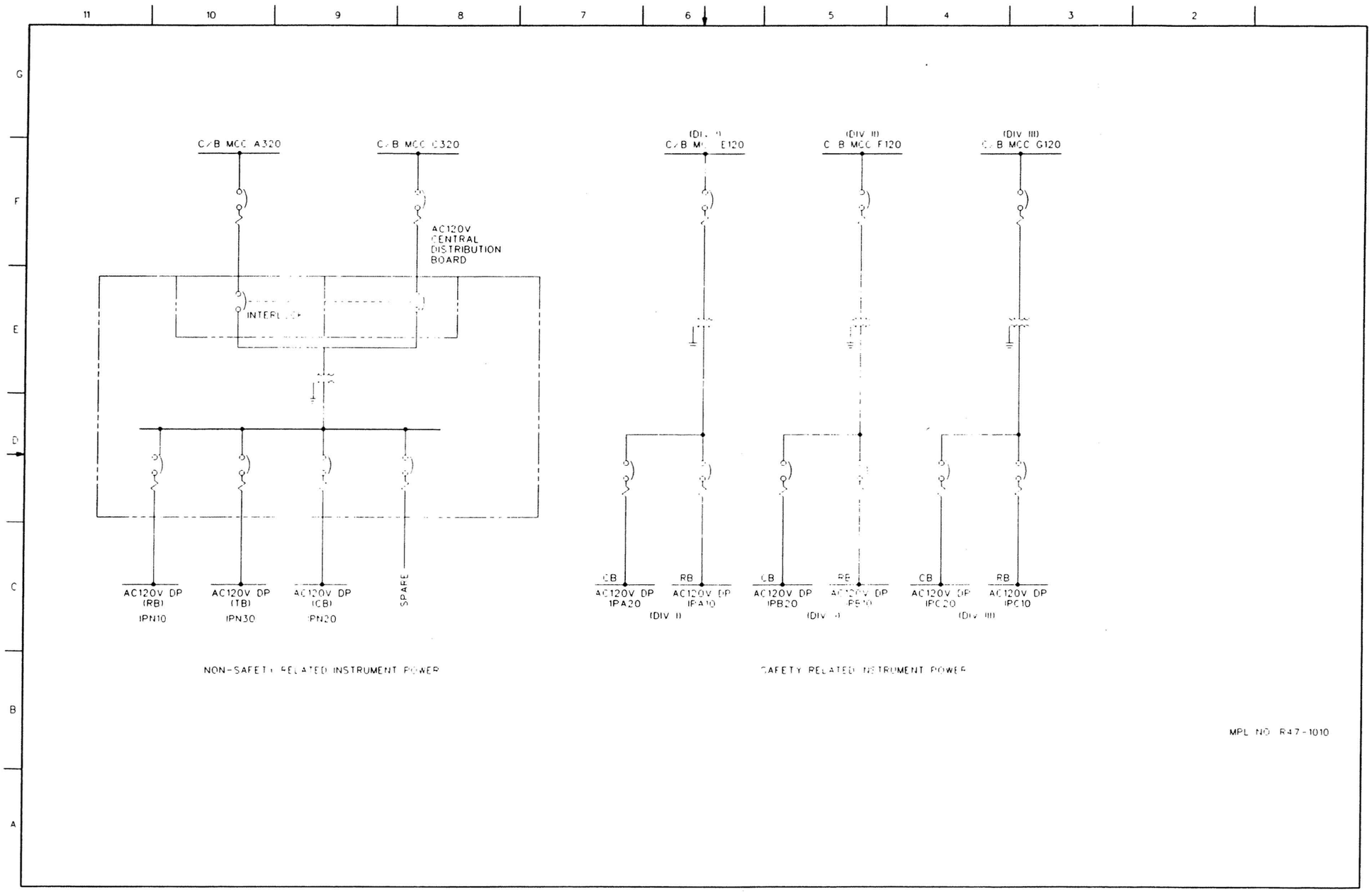


FIGURE 8.3-2 INSTRUMENT AND CONTROL POWER SUPPLY SYSTEM SLD

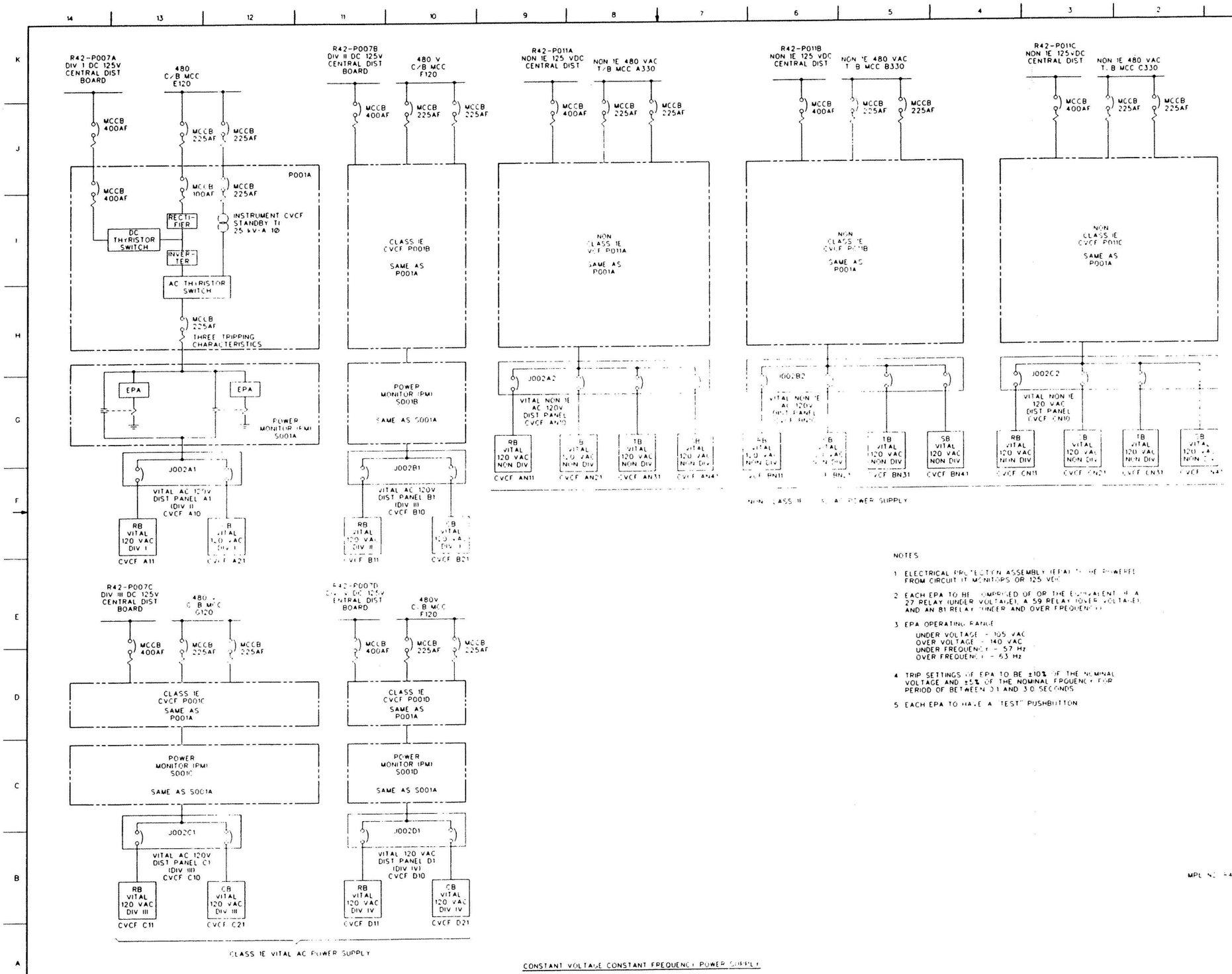
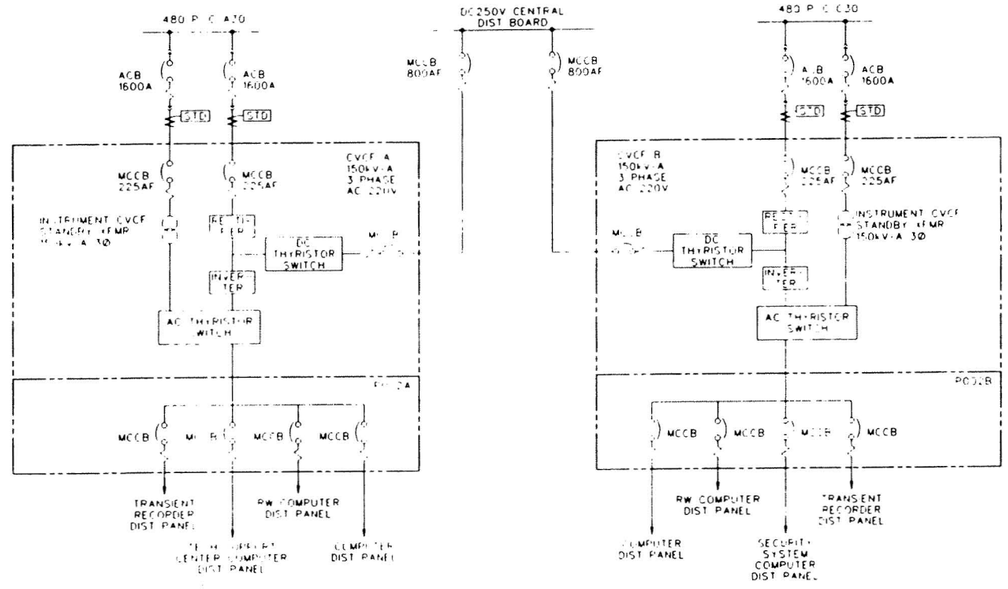
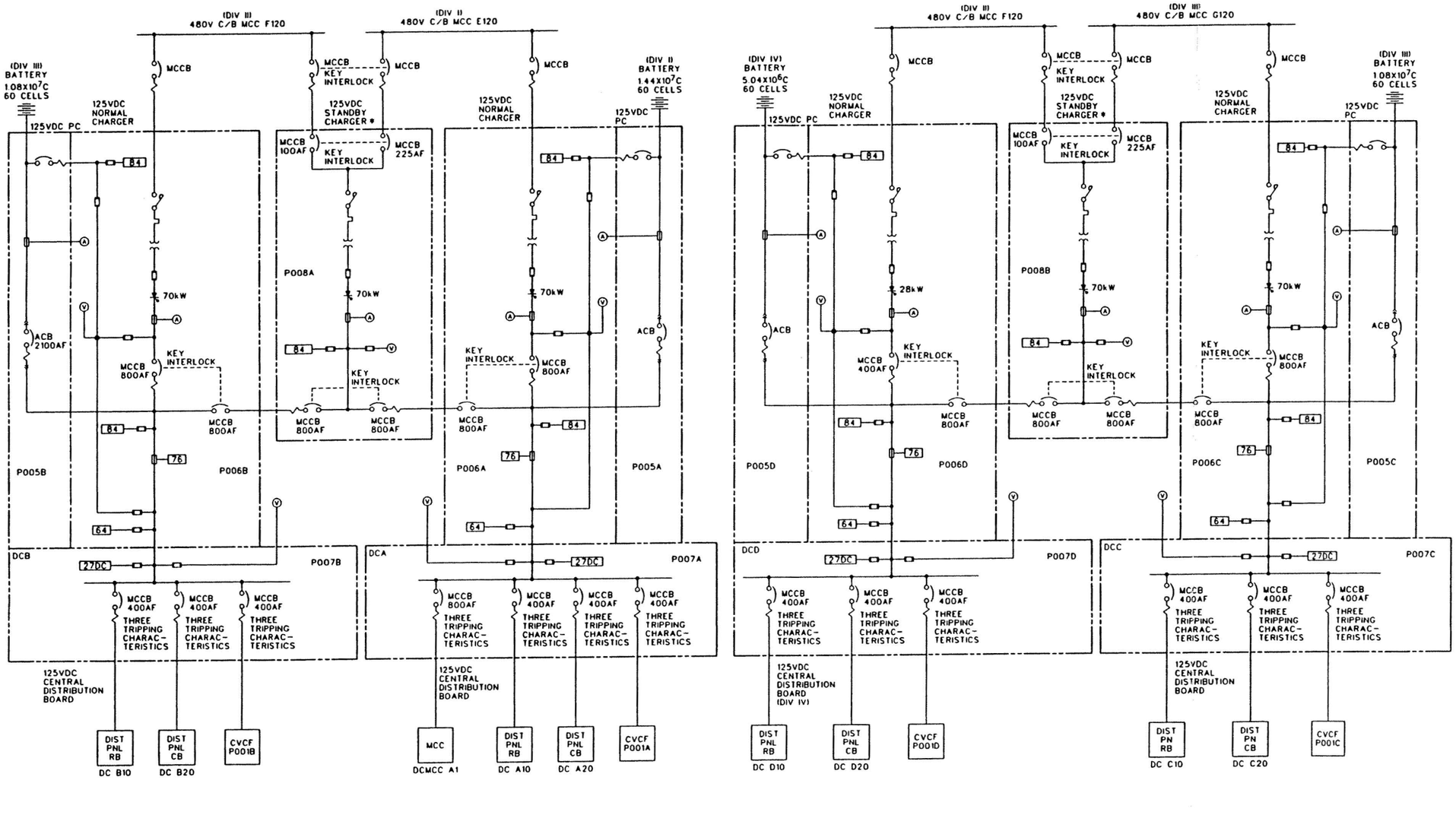


FIGURE 8.3-3 PLANT VITAL AC POWER SUPPLY SYSTEM SLD (Sheet 1 of 2)



COMPUTER 1EAL A POWER SUPPLY

FIGURE 8.3-3 PLANT VITAL AC POWER SUPPLY SYSTEM SLD (Sheet 2 of 2)



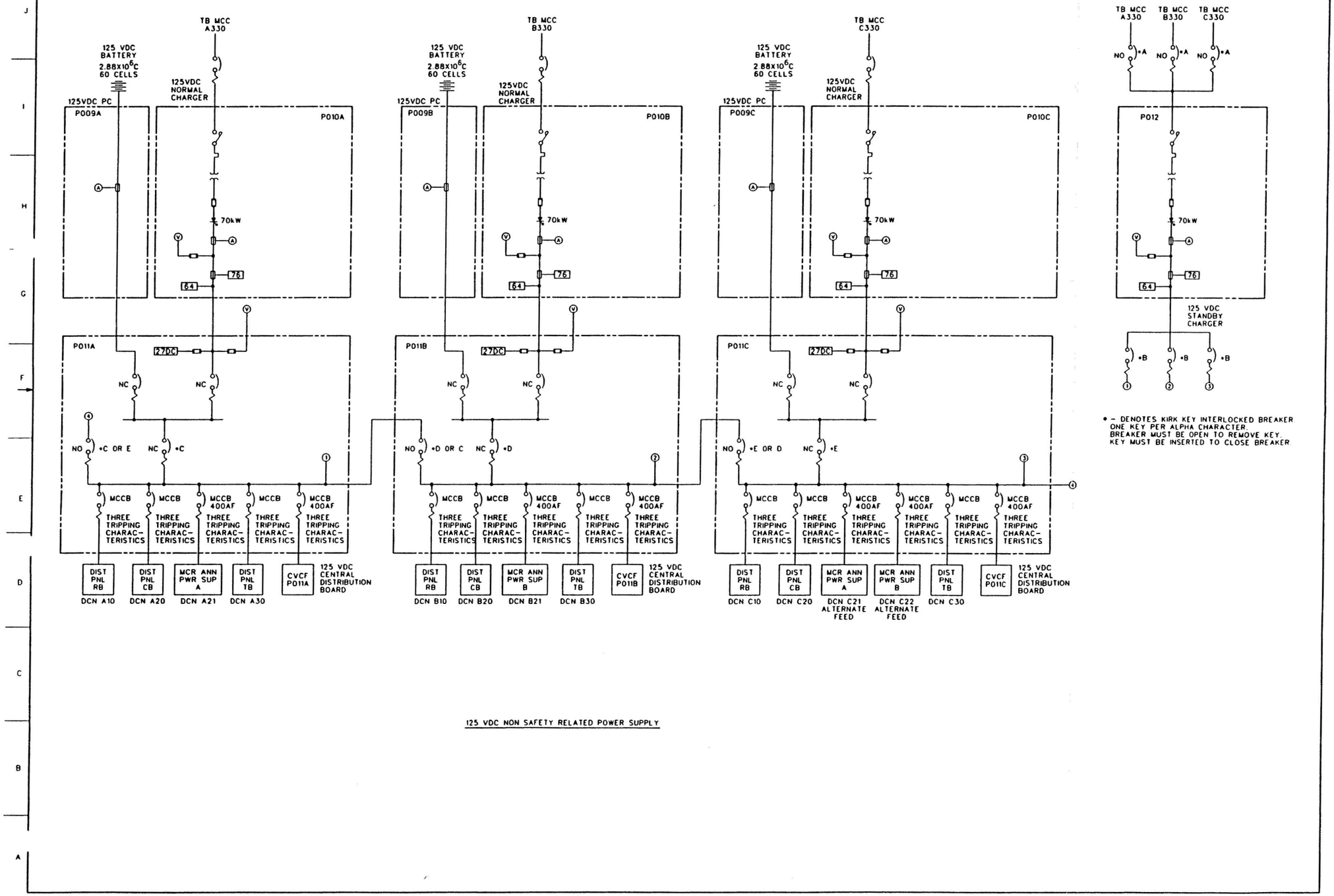
* NOTES:

1. SUPPLY INPUT AND OUTPUT BREAKERS SHALL BE NORMALLY OPEN.
2. INTERLOCKS SHALL BE PROVIDED SUCH THAT SIMULTANEOUS CLOSURE OF BOTH SUPPLY INPUT OR OUTPUT BREAKERS IS NOT POSSIBLE.
3. SEE 23A6100 SUBSECTION 8.3.4.18 FOR ADMINISTRATIVE CONTROLS OF SWITCHING 125 VDC STANDBY CHARGER.

125 VDC SAFETY RELATED POWER SUPPLY

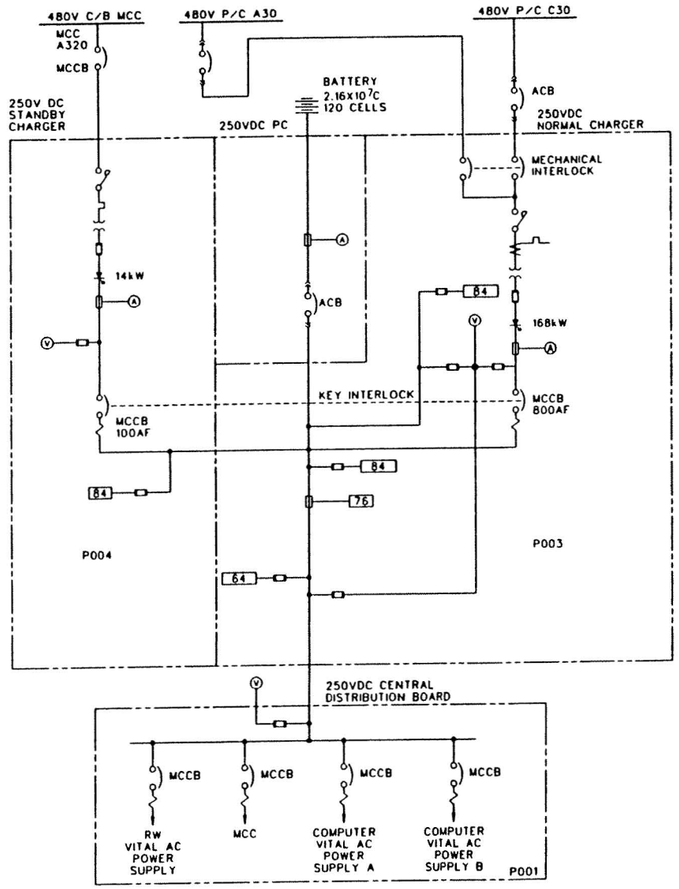
MPL NO R42-1010

FIGURE 8.3-4 DC POWER SUPPLY SYSTEM SLD (Sheet 1 of 3)



125 VDC NON SAFETY RELATED POWER SUPPLY

FIGURE 8.3-4 DC POWER SUPPLY SYSTEM SLD (Sheet 2 Of 3)



250 VDC POWER SUPPLY

FIGURE 8.3-4 DC POWER SUPPLY SYSTEM SLD (Sheet 3 of 3)

NOTES

1. ALL EQUIPMENT AND INSTRUMENTS ARE PREFIXED BY G41 UNLESS OTHERWISE NOTED.
2. VENT AND DRAIN VALVES ARE REQUIRED AT ALL HIGH OR LOW POINTS IN PIPING NOT SERVED BY EQUIPMENT HAVING VENTS AND DRAINS
3. SYSTEM DESIGN SPECIFICATION

(A) UNLESS OTHERWISE NOTED

ITEM		APPLICATION
MAXIMUM OPERATING PRESS MPa G		1.57
MAXIMUM OPERATING TEMP °C		66
NORMAL OPERATING TEMP °C		52
SEISMIC CATEGORY		BIS1,S2)
PROCESS FLUID		W
PIPING MATERIAL		CSISSI
PIPING THICKNESS	50A AND SMALLER	SCH 80
	80A AND LARGER	SCH 40
DESIGN CLASS	QUALITY CLASS	4D

(B) APPLY STANDARD PIPING DIAGRAMS SHOWN IN STANDARD DESIGN SPECIFICATION FOR SMALL PIPING AND INSTRUMENTATION FOR VENTS, DRAINS AND INSTRUMENTS. ALSO, APPLY PIPE SCHEDULES AND INSULATION THICKNESS SPECIFIED

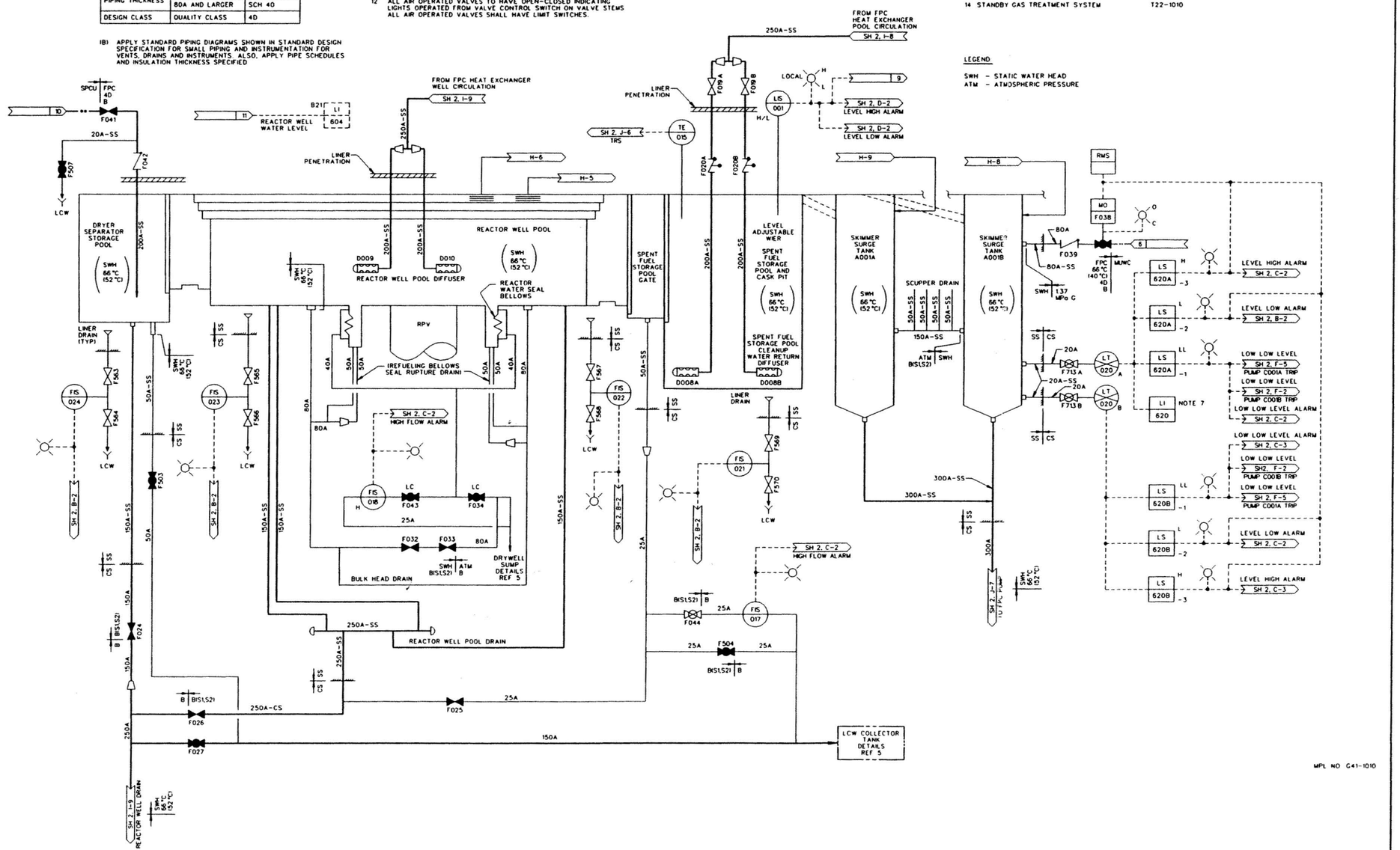
4. VALVE POSITION INDICATING LIGHTS AND ALARMS SHALL BE INSTALLED IN THE MAIN CONTROL ROOM UNLESS OTHERWISE NOTED.
5. TWO SETS OF VALVES MARKED ** AND *** ARE SHOWN. EACH VALVE SHOULD BE LOCATED CLOSE TO OTHER VALVES IN ITS SET TO MORE EASILY PROVIDE COORDINATED MANUAL OPERATION.
6. PIPING MATERIAL, UNLESS OTHERWISE NOTED SHOULD BE CS BUT PIPING BURRIED IN CONCRETE SHOULD BE SS
7. WATER LEVEL INDICATOR LI620 SHOULD BE INSTALLED NEAR THE OPERATING SWITCH OF VALVE F038.
8. TEMPERATURE ELEMENT TE002 INPUT TO RECORDER TRS605 IS THE ONLY ONE ALARMED
9. AFTER SYSTEM TEST, PX005A AND B SHOULD BE REMOVED
10. PIPING BURIED IN CONCRETE IS SHOWN BY ..... SYMBOL
11. FC (OR FO) INDICATES FALVES ARE FAIL CLOSED OR FAIL OPEN ON LOSS OF AIR PRESSURE TO VALVE OPERATOR OR LOSS OF ELECTIRC POWER TO AIR CONTROLLING SOLENOID VALVES
12. ALL AIR OPERATED VALVES TO HAVE OPEN-CLOSED INDICATING LIGHTS OPERATED FROM VALVE CONTROL SWITCH ON VALVE STEMS ALL AIR OPERATED VALVES SHALL HAVE LIMIT SWITCHES.
13. NO VALVES OR INSTRUMENTS ARE TO BE LOCATED IN THE SHIELDED COMPARTMENT CONTAINING THE FILTER/DEMINERALIZER.
14. A COMMOM TROUBLE ALARM FROM LOCAL ANNUNCIATORS SHALL ALARM IN THE MAIN CONTROL ROOM.
15. VALVE F028 IS LOCK CLOSED AND IS NOT OPENED UNLESS SPENT FUEL STORAGE POOL GATE IS IN CLOSED POSITION
16. PIPE WITH A DESIGN PRESSURE OF 2.82 MPa G OR GREATER SHALL HAVE ITS MINIMUM WALL THICKNESS NO LESS THAN THAT OF A STANDARD WEIGHT PIPE. THICKER THAN STANDARD WEIGHT PIPE SHALL BE USED IF REQUIRED BY THE DESIGN PRESSURE OR OTHER REQUIREMENTS.
17. VALVES WITH A DESIGN PRESSURE OF 2.82 MPa G OR GREATER SHALL BE A MINIMUM OF CLASS 300, OR OF A HIGHER CLASS IF REQUIRED BY THE DESIGN PRESSURE.

REFERENCE DOCUMENTS

		MPL NO.
1.	PIPING AND INSTRUMENT SYMBOLS DIAGRAM	A10-3030
2	FUEL POOL COOLING & CLEANUP SYS PFD	G41-1020
3	FUEL POOL COOLING & CLEANUP SYSTEM P&ID	G41-1030
4	RHR SYSTEM P&ID	E11-1010
5	RADWASTE SYSTEM P&ID	K17-1010
6	MAKEUP WATER SYSTEM (CONDENSATE)	P13-1010
7	REAC BLDG COOLING WATER SYS P&ID	P21-1010
8	SAMPLING SYSTEM P&ID	P91-1010
9	HVAC SYSTEM P&ID	U41-1010
10.	SUPPRESSION POOL CLEANUP SYS P&ID	G51-1010
11	NUCLEAR BOILER SYSTEM P&ID	B21-1010
12.	INSTRUMENT AIR SYSTEM P&ID	P52-1010
13.	REACTOR WATER CLEANUP SYS P&ID	G31-1010
14	STANDBY GAS TREATMENT SYSTEM	T22-1010

LEGEND

SWH - STATIC WATER HEAD
ATM - ATMOSPHERIC PRESSURE



MPL NO G41-1010

FIGURE 9.1-1 FUEL POOL COOLING AND CLEANUP SYSTEM P&ID (Sheet 1 of 3)

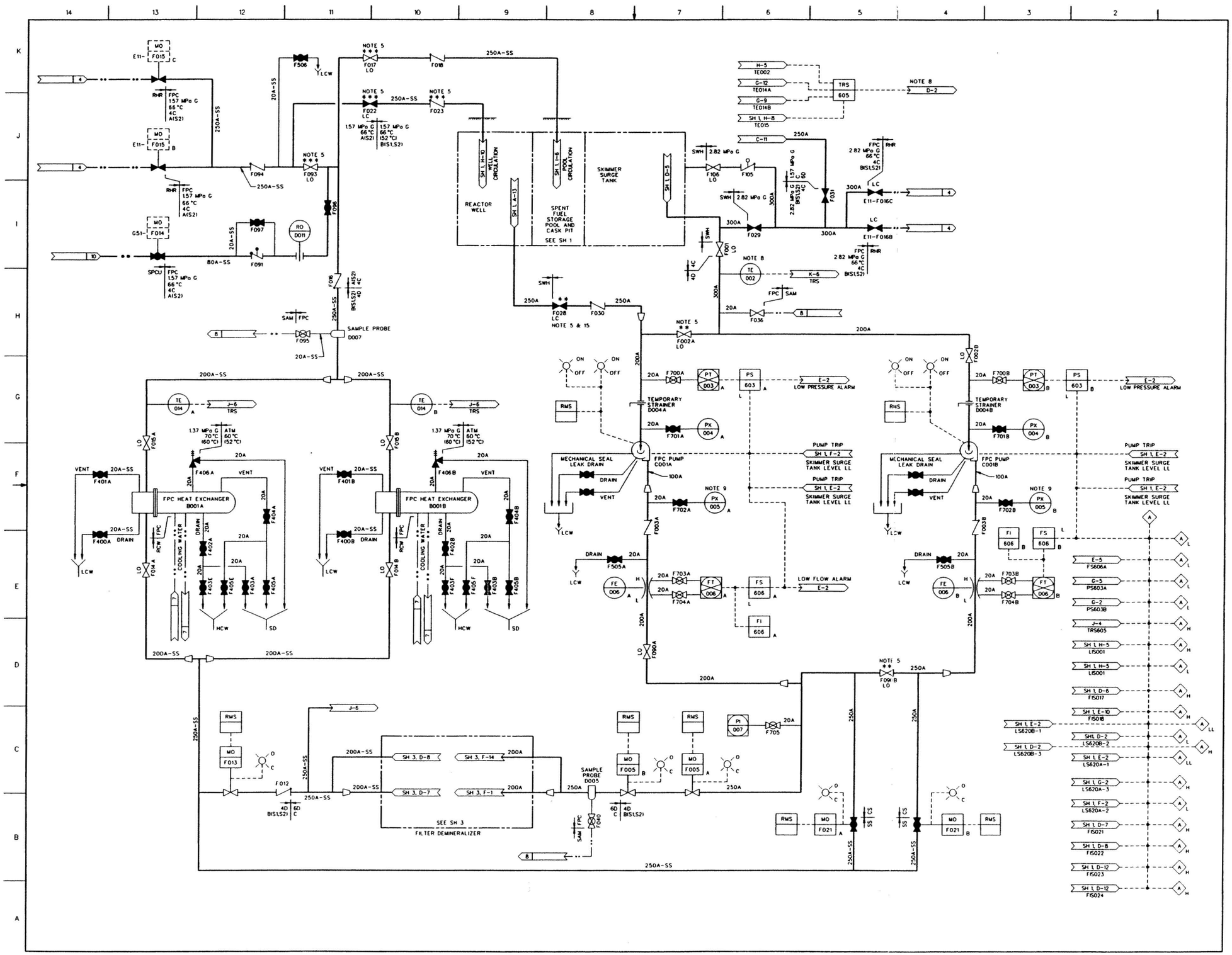


FIGURE 9.1-1 FUEL POOL COOLING AND CLEANUP SYSTEM P&ID (Sheet 2 of 3)

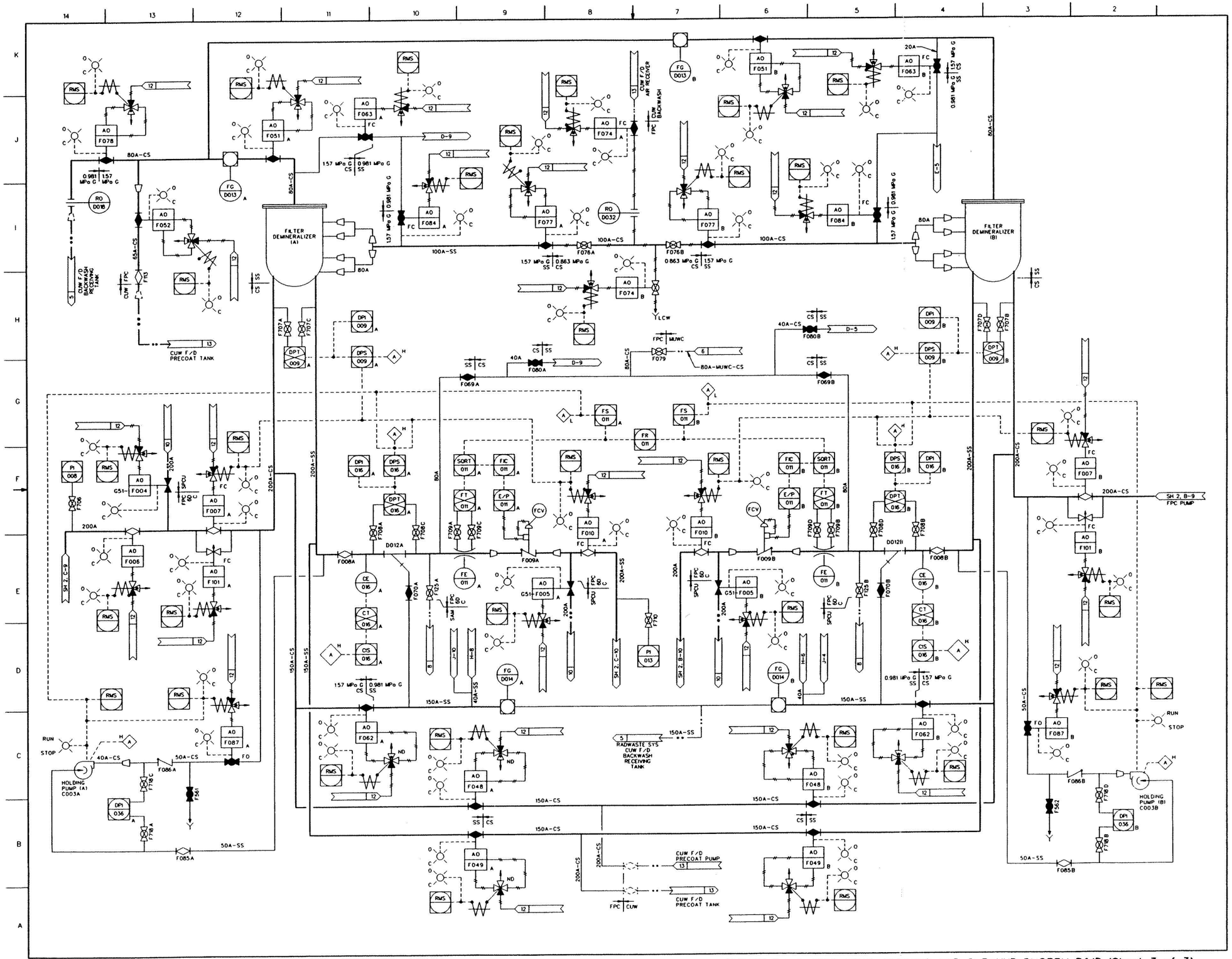
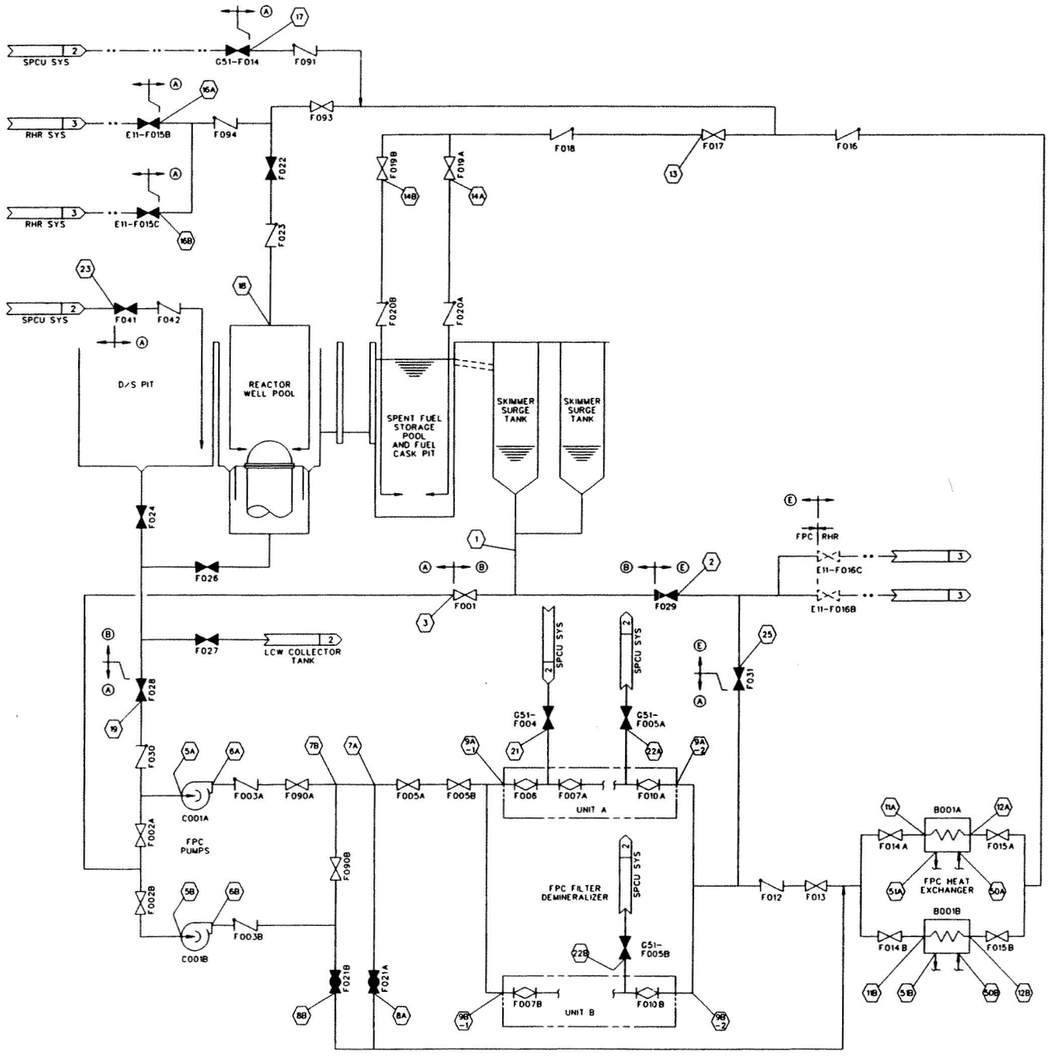


FIGURE 9.1-1 FUEL POOL COOLING AND CLEANUP SYSTEM P&ID (Sheet 3 of 3)



MODE A FPC SYSTEM FLOW DIAGRAM

BOUNDARY CONDITION	Ⓐ	Ⓑ	Ⓒ	Ⓓ	Ⓔ
DESIGN PRESSURE (MPa G)	1.57	STATIC WATER HEAD	3.43	2.82	2.82
DESIGN TEMPERATURE (°C)	66	66	66	66	66

NOTES

1. ⊡ TABLE VALUES NOT AVAILABLE UNTIL DETAILED DESIGN IS COMPLETE.
2. EXCHANGED HEAT LOADS FOR MODES A AND B APPLY TO SYSTEM HEAT EXCHANGERS AFTER REACTOR WELL/FUEL STORAGE POOL GATE IS IN CLOSED POSITION.
3. IN MODE B, RHR OPERATES IN PARALLEL WITH FPC SYSTEM.
4. MODE D, REFUELING OPERATION WATER TO FILL REACTOR WELL DISCHARGES THROUGH DIFFUSERS AND WALL SPARGER OR EXPOSED WALL WETTING METHOD.
5. DURING MODES E-1, E-2, E-3 AND G, SPENT FUEL STORAGE POOL TEMPERATURE MAY EXCEED 52°C FOR SHORT PERIOD.
6. 5 $\frac{A}{B}$ MEANS 5A AND 5B, EACH AT VALUE SHOWN
   5A(B) MEANS 5A OR 5B AT VALUE SHOWN BUT NOT CONCURRENTLY.
7. MODE C, FAILURE OF A OR B TRAIN IS POSTULATED.
8. DRAIN OPERATING MODES
   MODE E-1, TWO FPC PUMPS ARE OPERATING TO DRAIN D/S PIT AND REACTOR WELL, DISCHARGING THE WATER FOR TREATMENT BY F/D A AND F/D B BEFORE RELEASE INTO THE SUPPRESSION POOL THROUGH THE SPCU SYSTEM PIPING.
   MODE E-2, ONE FPC PUMP IS OPERATING TO DRAIN REACTOR WELL AND DISCHARGE THE WATER FOR TREATMENT IN ONE F/D BEFORE RELEASE INTO THE SUPPRESSION POOL THROUGH THE SPCU SYSTEM PIPING. THE SECOND FPC PUMP IS OPERATING TO REMOVE WATER FROM THE SPENT FUEL STORAGE POOL SKIMMER TANKS AND DISCHARGING THE WATER THROUGH THE F/D BYPASS PIPE INTO THE FPC HEAT EXCHANGERS TO COOL IT BEFORE RETURN TO THE SPENT FUEL STORAGE POOL DIFFUSERS.
   MODE E-3, TWO FPC PUMPS ARE OPERATING TO DRAIN THE D/S PIT AND REACTOR WELL AND DISCHARGE THE WATER FOR TREATMENT IN TWO F/D'S BEFORE RELEASE TO THE LCW COLLECTOR TANK OF RADWASTE SYSTEM THROUGH THE RHR SYSTEM.
9. IN MODE B, ONE RHR PUMP AND HEAT EXCHANGER IS OPERATED FOR BACKUP COOLING BECAUSE FPC SYSTEM ALONE CAN NOT COOL POOL SUFFICIENTLY.
10. IN MODE D, RHR SHUTDOWN COOLING RETURN WATER IS INJECTED THROUGH REACTOR WELL DIFFUSERS.
11. IN MODE F, 1 FPC PUMP (A) OR (B) IS OPERATED FOR FUEL POOL COOLING AND SPCU IS OPERATED FOR S/P CLEANUP THROUGH F/D (A).
12. IN MODE G, 1 FPC PUMP (A) OR (B) IS OPERATED FOR FUEL POOL COOLING AND S/P WATER IS SUPPLIED TO D/S PIT THROUGH F/D BY SPCU PUMP OPERATION.
13. VALVES F014A, F014B, F027 AND G41-F014 ARE NOT SHOWN IN THE MODE TABLES BECAUSE THEY DO NOT OPEN/CLOSE FOR ANY OPERATING MODE.
14. FLOWS SHOWN FOR MODE E-3 ARE TO BE FINALIZED AFTER DETAIL DESIGN IS COMPLETE.

REFERENCE DOCUMENTS	MPL NO.
1. FUEL POOL COOLING CLEANUP SYS P&ID	G41-1010
2. SUPRESSION POOL CLEANUP SYSTEM P&ID	G51-1010
3. RESIDUAL HEAT REMOVAL SYSTEM P&ID	E11-1010
2. RADWASTE SYSTEM P&ID	K17-1010

MPL NO. G41-1020

FIGURE 9.1-2 FUEL POOL COOLING AND CLEANUP SYSTEM PFD (Sheet 1 of 2)

MODE A: NORMAL HEAT LOAD OPERATING MODE

POSITION ⬡	1	3	5A/B	6A/B	7A	7B	9A-1/B-1	9A-2/B-2	11A/B	12A/B	13	14A/B	50A/B	51A/B
FLOW (m³/h)	500	500	250	250	500	500	250	250	250	250	500	250		
PRESS (MPa G)	*	*	*	*	*	*	*	*	*	*	*	*		
TEMP (°C)	52	←						→	52	45.4	45.4	45.4		
Max ALLOWABLE PRESS LOSS (m)			TDH = 80				ΔP = 41		ΔP = 7					

EXCHANGED HEAT/UNIT 6.9 x 10^6 kJ/h (21 DAYS AFTER SHUTDOWN) NOTE 2

MODE B: MAXIMUM HEAT LOAD OPERATING MODE NOTE 9

POSITION ⬡	1	2	3	5A/B	6A/B	7A	7B	9A-1/B-1	9A-2/B-2	11A/B	12A/B	13	16	14A/B	50A/B	51A/B
FLOW (m³/h)	850	350	500	250	250	500	500	250	250	250	250	850	350	425		
PRESS (MPa G)	*	*	*	*	*	*	*	*	*	*	*	*	*	*		
TEMP (°C)	60	←							→	60	53.4	51.5	48.9	51.5		

EXCHANGED HEAT/UNIT 30.14 x 10^6 kJ/h (21 DAYS AFTER SHUTDOWN) NOTE 2
FPC Hx/UNIT 6.9 x 10^6 kJ/h AND RHR Hx 16.32 x 10^6 kJ/h

MODE C: COOLING MODE AFTER EARTHQUAKE (POSTULATED SINGLE FAILURE) NOTE 7

POSITION ⬡	1	3	5A	6A	7A	8A	11A	12A	13	14A/B	50A	51A
FLOW (m³/h)	250	250	250	250	250	250	250	250	250	125		
PRESS (MPa G)	*	*	*	*	*	*	*	*	*	*		
TEMP (°C)	62.7	←				→	62.7	51.9	51.9	51.9		

EXCHANGED HEAT 11.22 x 10^6 kJ/h (45 DAYS AFTER SHUTDOWN)

MODE D: REFUELING OPERATING MODE NOTE 10

POSITION ⬡	1	3	5A/B	6A/B	7A	7B	9A-1/B-1	9A-2/B-2	11A/B	12A/B	13	50A/B	51A/B	16A(B)	18
FLOW (m³/h)	500	500	250	250	500	500	250	250	250	250	500			954	954
PRESS (MPa G)	*	*	*	*	*	*	*	*	*	*	*			*	*
TEMP (°C)	Max 52	←						→	Max 52	Max 45.4	Max 45.4			Max 52	Max 52

MODE E1: DRAIN OPERATING MODE NOTES 5 & 8

POSITION ⬡	19	5A/B	6A/B	7A	7B	9A-1/B-1	22A/B
FLOW (m³/h)	500	250	250	500	500	250	250
PRESS (MPa G)	*	*	*	*	*	*	*
TEMP (°C)	Max 52	←				→	Max 52

MODE E3: DRAIN OPERATING MODE NOTES 5, 8 & 14

POSITION ⬡	19	5A/B	6A/B	7A	7B	9A-1/B-1	9A-2/B-2	25
FLOW (m³/h)	500	250	250	500	500	250	250	500
PRESS (MPa G)	*	*	*	*	*	*	*	*
TEMP (°C)	Max 52	←					→	Max 52

MODE E2: DRAIN OPERATING MODE NOTES 5 & 8

POSITION ⬡	19	5A	6A	7A	7B	9A-1 (B-1)	22A(B)	1	3	4	5B	6B	8A	11A/B	12A/B	13	14A/B	50A/B	51A/B
FLOW (m³/h)	250	250	250	250	250	250	250	250	250	250	250	250	250	125	125	250	125		
PRESS (MPa G)	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*		
TEMP (°C)	Max 52	←											→	Max 52	Max 42.2	Max 42.2	Max 42.2		

MODE F: SUPPRESSION POOL CLEANUP OPERATING MODE NOTE 11

POSITION ⬡	1	3	5A(B)	6A(B)	7A	7B	9B-1	9B-2	11A/B	12A/B	13	14A/B	50A/B	51A/B	21	22A
FLOW (m³/h)	250	250	250	250	250	250	250	250	125	125	250	125			250	250
PRESS (MPa G)	*	*	*	*	*	*	*	*	*	*	*	*			*	*
TEMP (°C)	53.7	←						→	53.7	42.9	42.9	42.9			Max 35	Max 35

EXCHANGED HEAT 11.22 x 10^6 kJ/h (45 DAYS AFTER SHUTDOWN)

MODE G: D/S PIT AND REACTOR WELL FILL OPERATING MODE NOTES 5 & 12

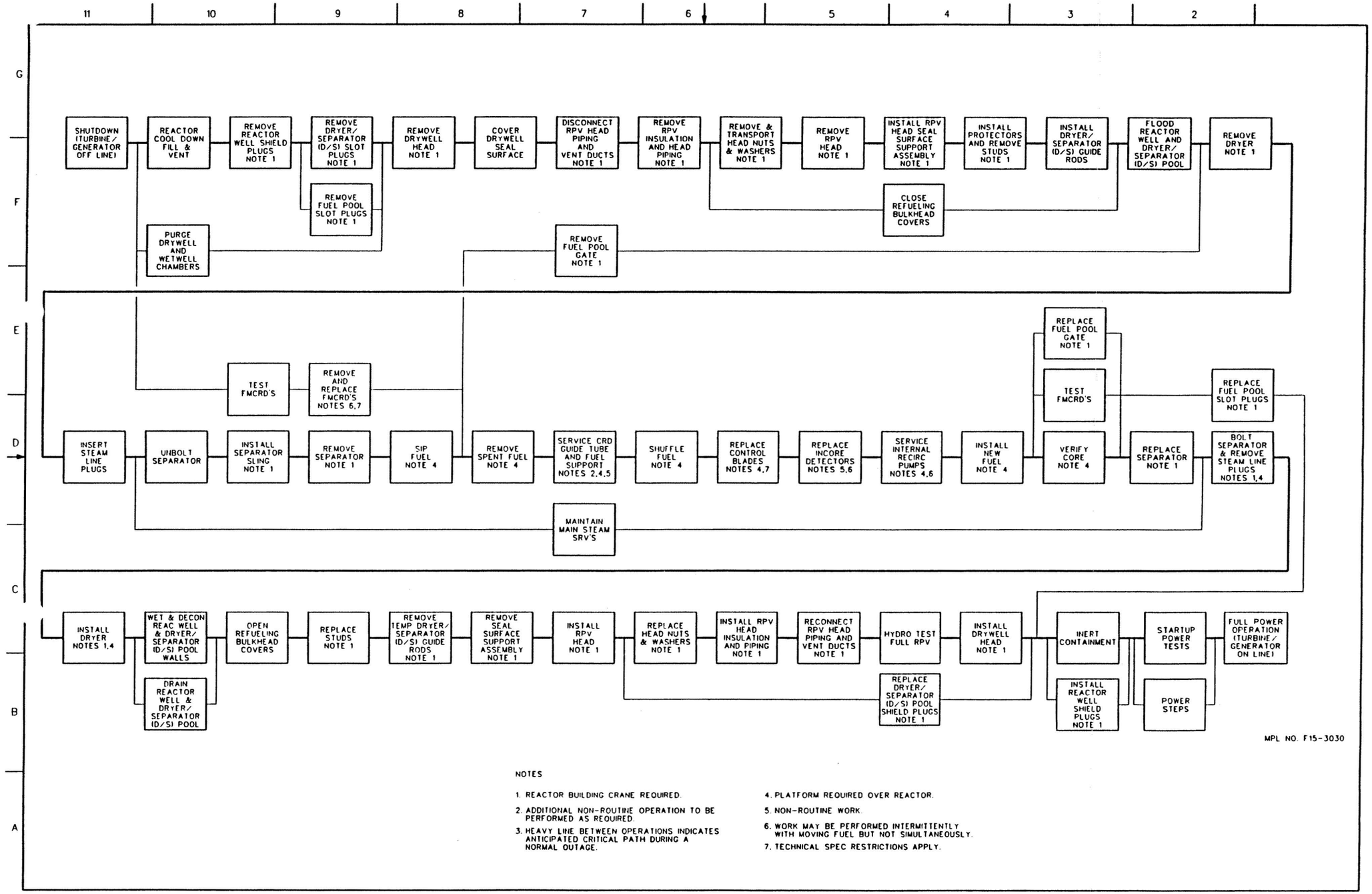
POSITION ⬡	1	3	5A(B)	6A(B)	7A	7B	9B-1	9B-2	11A/B	12A/B	13	14A/B	50A/B	51A/B	21	22A	23
FLOW (m³/h)	250	250	250	250	250	250	250	250	125	125	250	125			250	250	250
PRESS (MPa G)	*	*	*	*	*	*	*	*	*	*	*	*			*	*	*
TEMP (°C)	Max 52	←										→			Max 35	Max 35	Max 35

VALVE OPENING/CLOSING CONDITION NOTE 13

	F001	F002A	F002B	F090A	F090B	F021A	F021B	F005 A,B	F013	F014A	F014B	F015A	F015B	F017	F022	F024	F026	F028	F029	F041	F093	F006	F010A	G51-F004	G51-F005A	F007B	F010B	G51-F005B	E11-F015B	E11-F015C	E11-F016B	E11-F016C	F031
MODE A	O	O	O	O	O	x	x	O	O	O	O	O	O	O	x	x	x	x	x	x	O	O	O	x	x	O	O	x	x	x	x	x	x
MODE B	O	O	O	O	O	x	x	O	O	O	O	O	O	O	x	x	x	x	x	x	O	O	O	x	x	O	O	x	O/x	x/O	O/x	x/O	x
MODE C	O	O/x	x/O	O	O	P/x	x/P	x	x	O/x	x/O	O/x	x/O	O	x	x	x	x	x	x	O	O	O	x	x	O	O	x	x	x	x	x	x
MODE D	O	O	O	O	O	x	x	O	O	O	O	O	O	O	O	x	x	x	x	x	O	O	O	x	x	O	O	x	O/x	x/O	x	x	x
MODE E1	x	O	O	O	O	x	x	O	O	O	O	O	O	O	x	O	O	O	x	x	O	O	x	x	O	O	x	O	x	x	x	x	x
MODE E2	O	x	O	O	x	x	P	O	O	O	O	O	O	O	x	x	O	O	x	x	O	O/x	x	x	O/x	x/O	x	x/O	x	x	x	x	x
MODE E3	x	O	O	O	O	x	x	O	x	O	O	O	O	O	x	O	O	O	x	x	O	O	O	x	x	O	O	x	x	x	O/x	x/O	O
MODE F	O	O/x	x/O	O	O	x	x	O	O	O	O	O	O	O	x	x	x	x	x	x	O	x	x	O	O	O	O	x	x	x	x	x	x
MODE G	O	O/x	x/O	O	O	x	x	O	O	O	O	O	O	O	x	x	x	x	x	O	O	x	x	O	O	O	O	x	x	x	x	x	x

O : OPEN P : PARTIALLY OPEN x : CLOSE

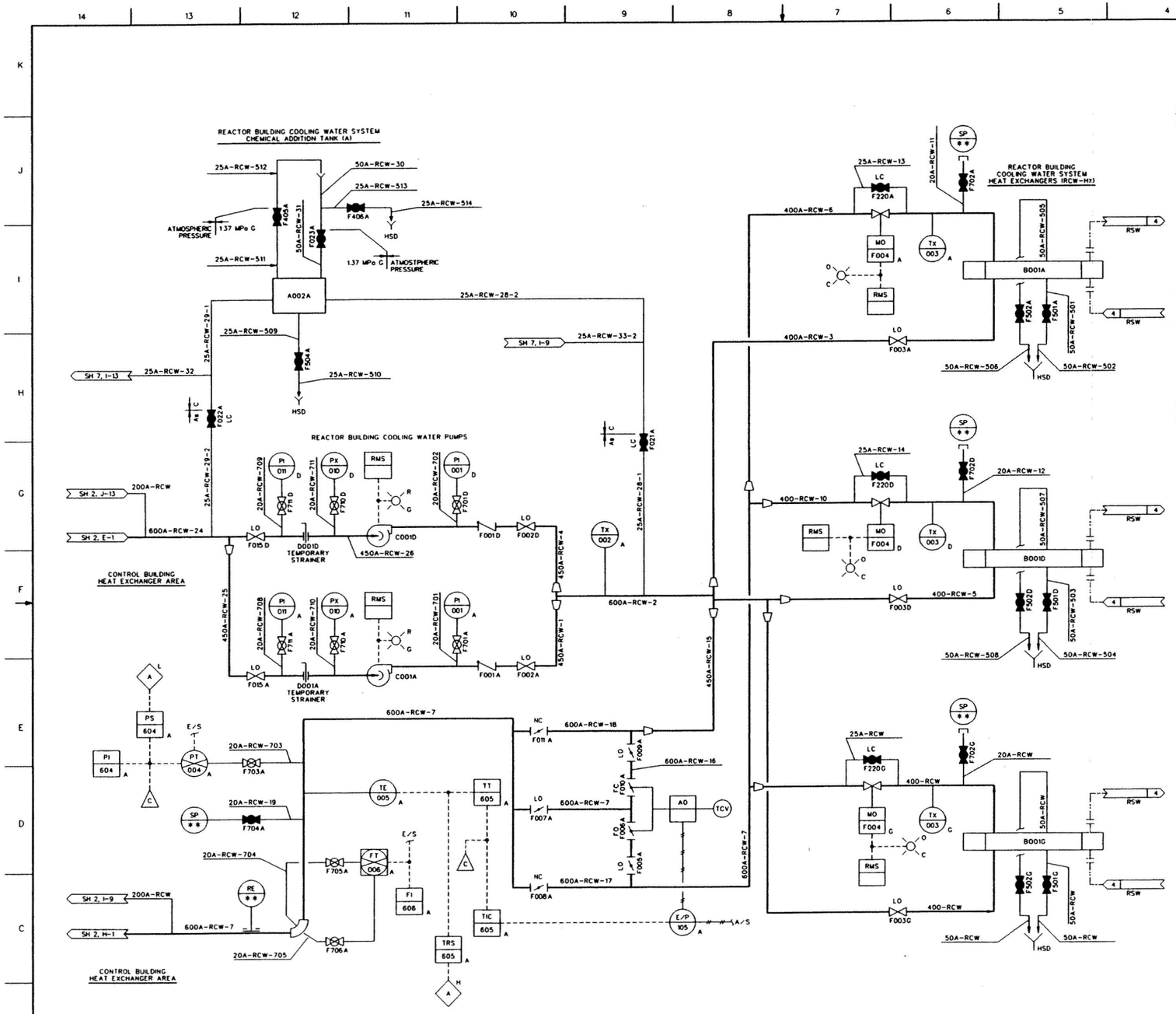
FIGURE 9.1-2 FUEL POOL COOLING AND CLEANUP SYSTEM PFD (Sheet 2 of 2)



NOTES

1. REACTOR BUILDING CRANE REQUIRED.
2. ADDITIONAL NON-ROUTINE OPERATION TO BE PERFORMED AS REQUIRED.
3. HEAVY LINE BETWEEN OPERATIONS INDICATES ANTICIPATED CRITICAL PATH DURING A NORMAL OUTAGE.
4. PLATFORM REQUIRED OVER REACTOR.
5. NON-ROUTINE WORK.
6. WORK MAY BE PERFORMED INTERMITTENTLY WITH MOVING FUEL BUT NOT SIMULTANEOUSLY.
7. TECHNICAL SPEC RESTRICTIONS APPLY.

FIGURE 9.1-12 PLANT REFUELING AND SERVICING SEQUENCE



NOTES:

1. THE FOLLOWING DESIGN SPECIFICATIONS ARE APPLIED UNLESS OTHERWISE NOTED

ITEM		APPLICATION	
DESIGN PRESSURE (MPa G)		1.37	
DESIGN TEMPERATURE (C°)		70(85)	
MAX. OPERATING TEMP. (C°)			
PIPE MATERIAL		CARBON STEEL	
PIPE WALL THICKNESS	50A AND LESS	SCH 80	
	65A TO 350A	SCH 40	
	400A AND OVER	STD	
FLUID		DEMINERALIZED WATER	
SEISMIC CLASS		As CLASS	C CLASS

2. THE HEATING ISOLATION OF LOADS INLET OR OUTLET LINES AND INTERCONNECTION SUPPLY AND RETURN LINES THAT ACQUIRE THE ULTRASONIC FLOW METER WILL CONSIDER TO TAKE DOWN.
3. THE FOLLOWING VALVES SHOULD BE LOCATED AT THE CLEAN AREA
   (A) SURGE TANK DISCHARGE LINE STOP VALVE
   (B) INTERCONNECTION LINE CHANGE VALVE
   (C) R/B SAMPLING ETC PRIMARY VALVE
4. THE TEMPERATURE PRIMARY ELEMENTS SHOULD BE LOCATED AT THE POINT THAT THE COOLING WATER WILL BE SUFFICIENTLY MIXED.
5. TYPE OF THE STRAINER (D001) CAN BE CHANGED
6. COOLING LOAD HEAT EXCHANGERS ARE PART OF THE NOTED SYSTEM.

REFERENCE DOCUMENTS

		MPL NO.
1	PIPING AND INSTRUMENT SYMBOLS DIAGRAM	A10-3030
2	MAKEUP WATER SYSTEM (PURIFIED)	P11-1010
3	CONTAINMENT ATMOSPHERIC MONITORING SYS IED	D23-1010
4	REACTOR SERVICE WATER SYS P&ID	P41-1010
5	EMERGENCY DIESEL GENERATOR COOLING WATER SYS P&ID	R43-1010
6	SAMPLING SYS P&ID	P91-1010
7	HVAC EMERGENCY COOLING WATER SYS P&ID	P25-1010
8	REACTOR WATER CLEANUP SYS P&ID	G31-1010
9	HOT WATER HEATING SYS P&ID	P63-1010
10	OFFGAS SYS P&ID	N62-1010
11	RESIDUAL HEAT REMOVAL SYS P&ID	E11-1010
12	INSTRUMENT AIR SYS P&ID	P52-1010
13	REACTOR RECIRC SYS P&ID	B31-1010
14	LEAK DETECTION & ISOLATION SYS IED	E31-1010
15	REAC BLDG COOLING WATER PUMP P&ID	P21-1010
16	TURBINE BLDG COOLING WATER SYS P&ID	P22-1010
17	SUPPRESSION POOL CLEANUP SYS P&ID	G51-1010
18	HIGH PRESSURE CORE FLOODER SYS P&ID	E22-1010
19	REACTOR CORE ISOLATION COOLING SYS P&ID	E51-1010
20	FUEL POOL COOLING CLEANUP SYS P&ID	G41-1010
21	RADWASTE SYSTEM P&ID	K17-1010
22	TURBINE MAIN STEAM SYS P&ID	N11-1010
23	CONDENSATE, FEEDWATER AND CONDENSATE AIR EXTRACTION SYS P&ID	N21-1010
24	TURBINE GLAND STEAM SYS P&ID	N33-1010
25	STATION SERVICE AIR SYS P&ID	P51-1010
26	HEATING STEAM & CONDENSATE WATER RETURN SYS P&ID	P61-1010
27	STANDBY GAS TREATMENT SYS P&ID	T22-1010
28	DRYWELL COOLING SYS P&ID	T41-1010
29	FLAMMABILITY CONTROL SYS P&ID	T49-1010

LEGEND

** - REGISTRATION BY THE OTHER SYS

FS - FT - FLOAT TYPE FLOW SWITCH

MPL NO P21-1010

FIGURE 9.2-1 REACTOR BUILDING COOLING WATER SYSTEM P&ID (Sheet 1 of 9)

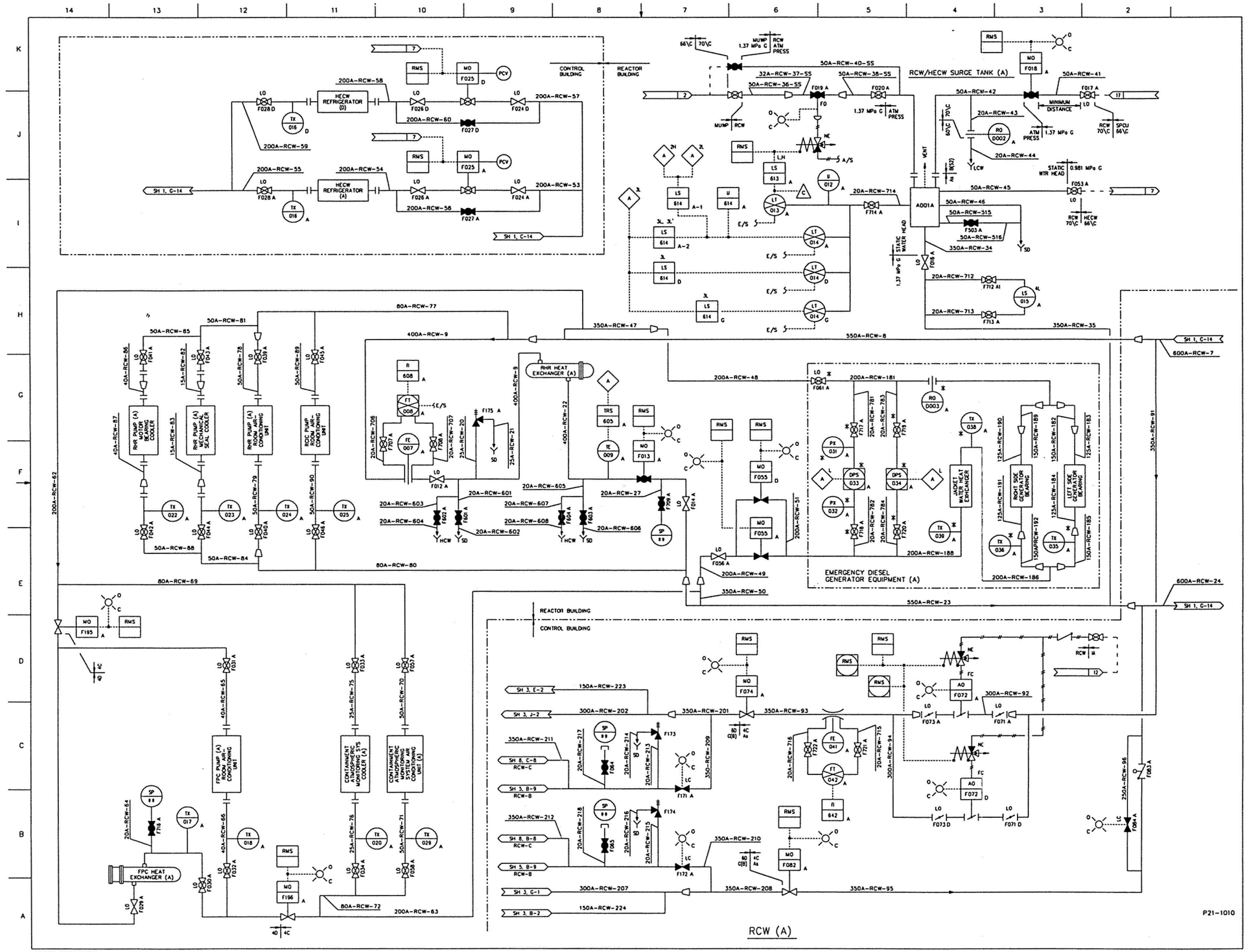


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FIGURE 9.2-1 REACTOR BUILDING COOLING WATER SYSTEM P&ID (Sheet 2 of 9)

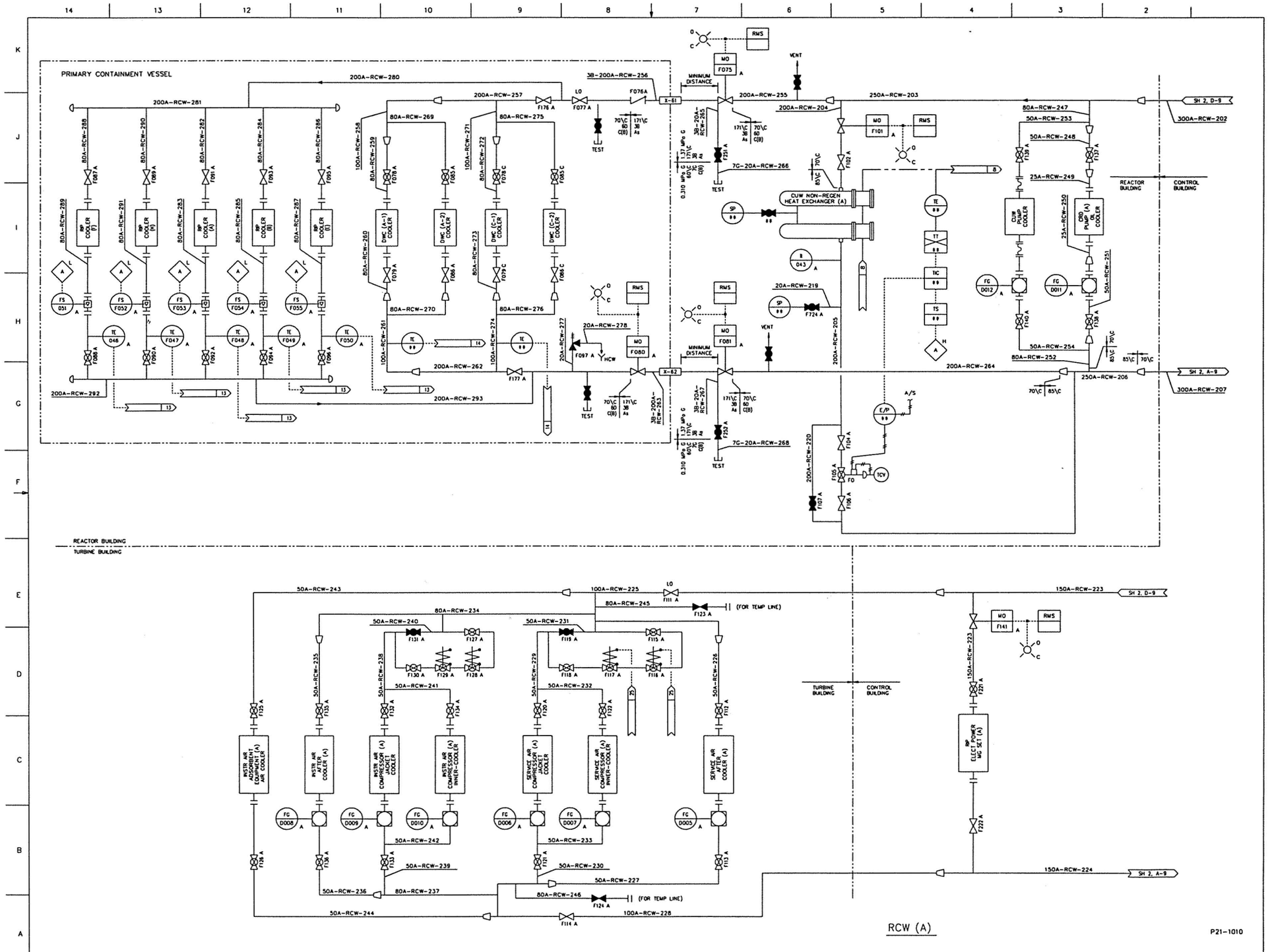

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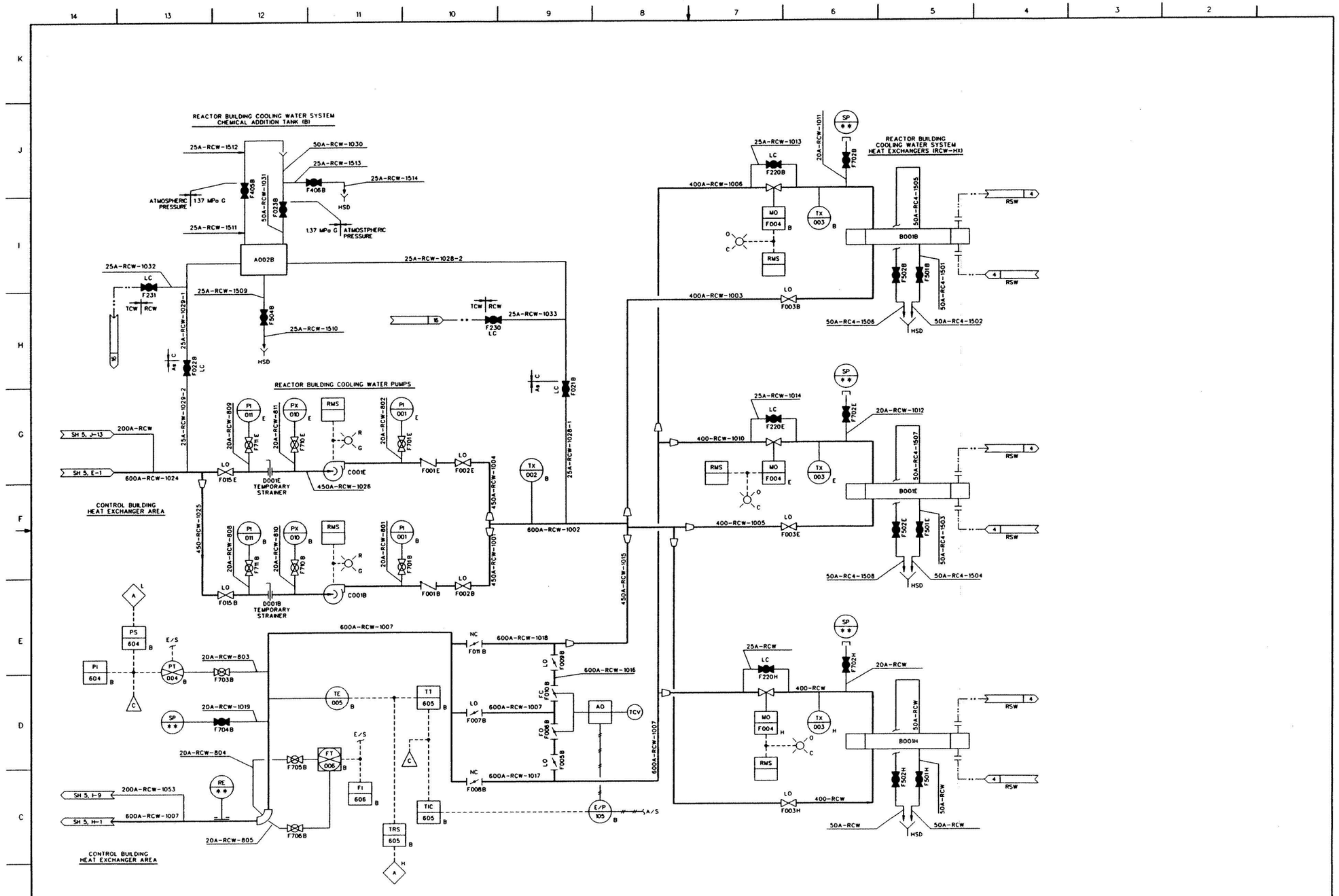
FIGURE 9.2-1 REACTOR BUILDING COOLING WATER SYSTEM P&ID (Sheet 3 of 9)



REACTOR BLDG COOLING WATER – B

FIGURE 9.2-1 REACTOR BUILDING COOLING WATER SYSTEM P&ID (Sheet 4 of 9)

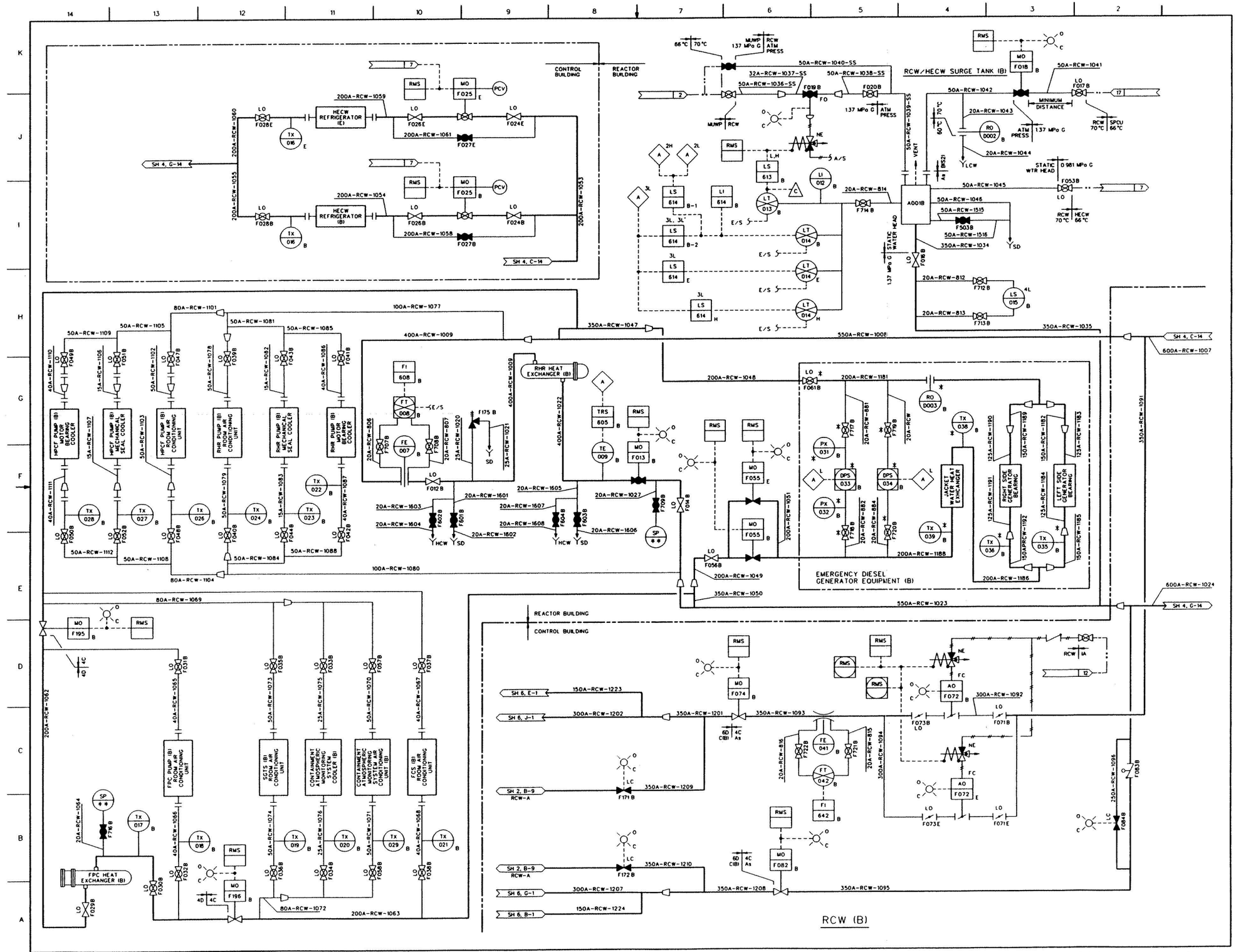


FIGURE 9.2-1 REACTOR BUILDING COOLING WATER SYSTEM P&ID (Sheet 5 of 9)

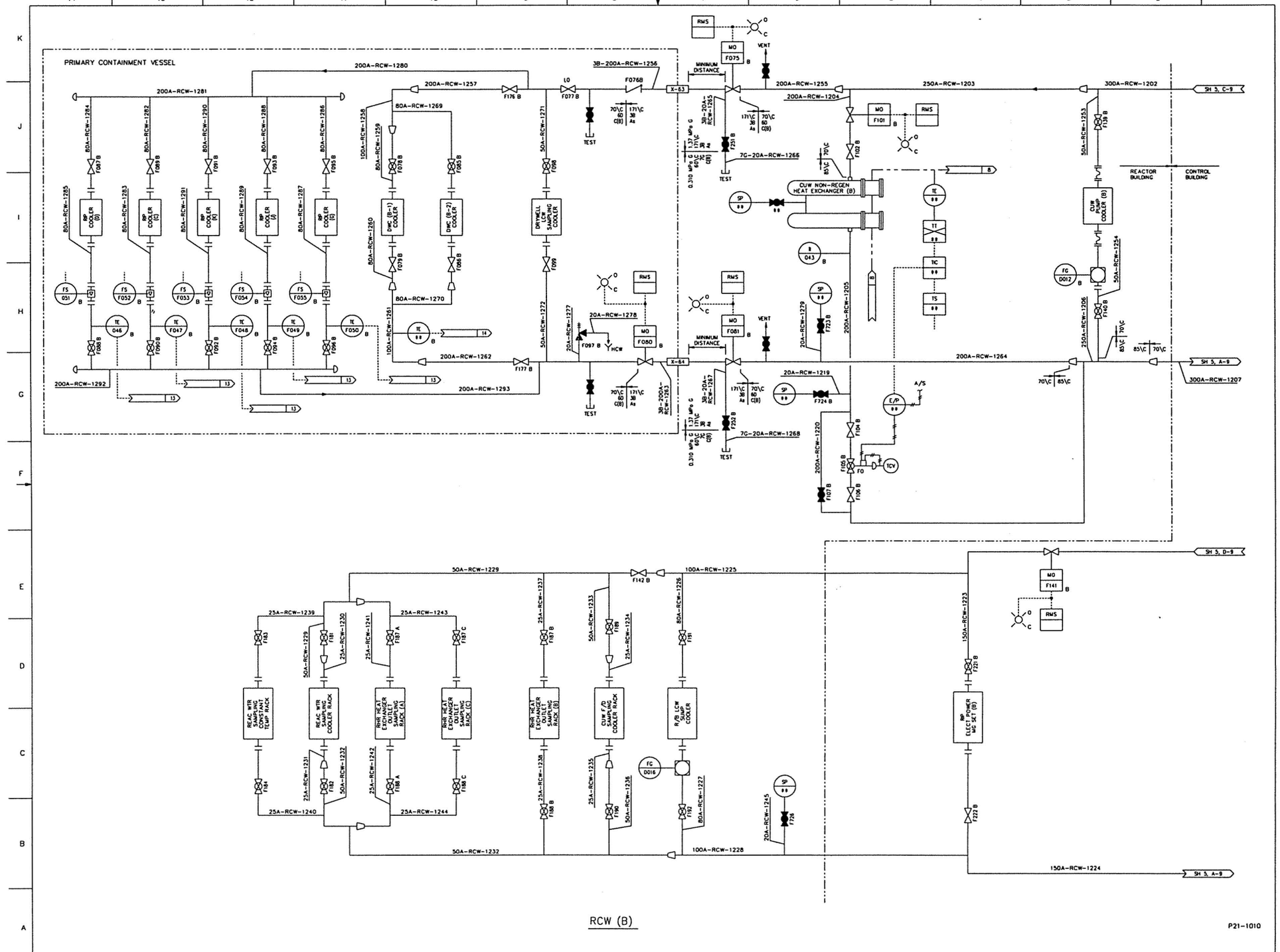


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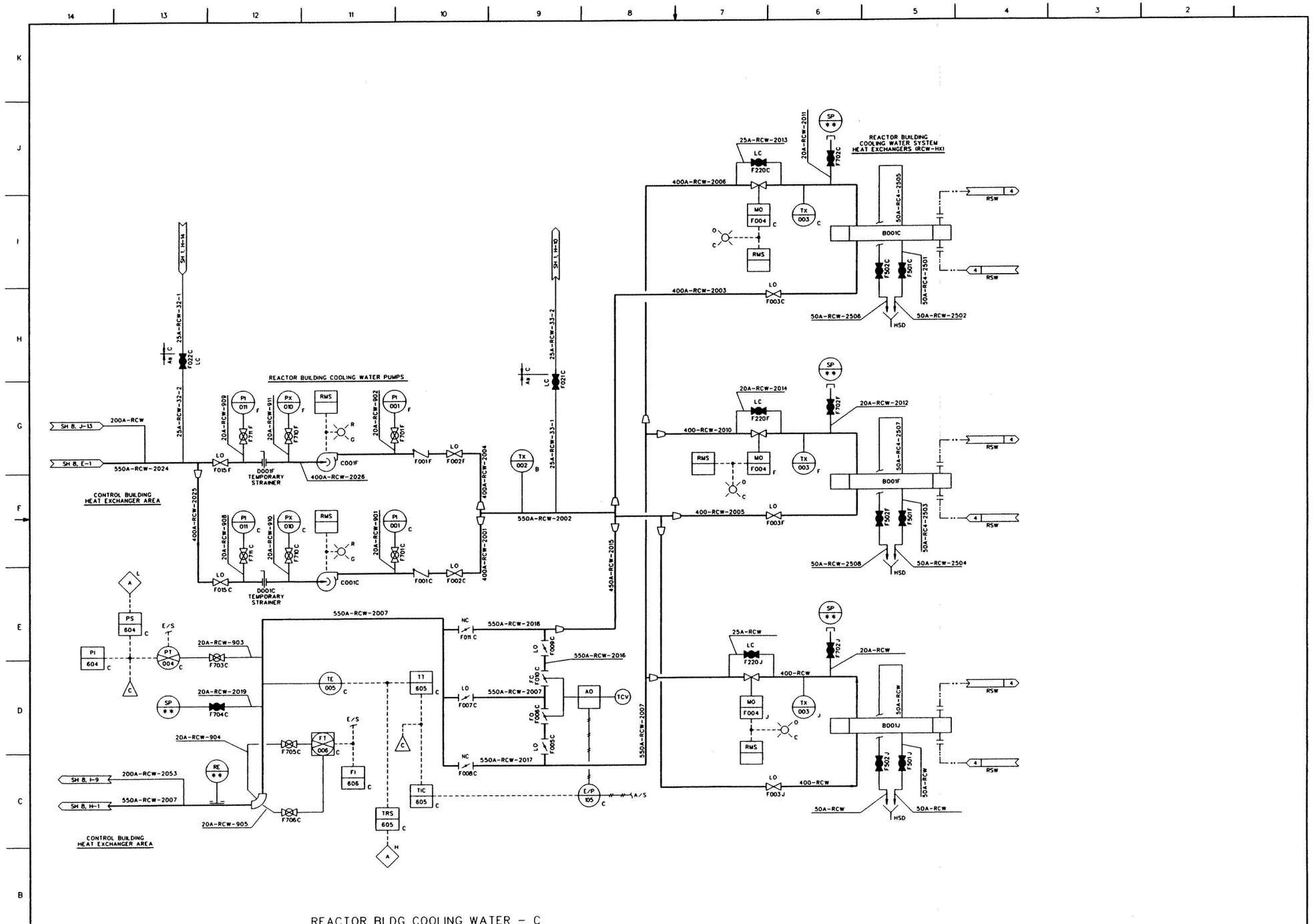
FIGURE 9.2-1 REACTOR BUILDING COOLING WATER SYSTEM P&ID (Sheet 6 of 9)



REACTOR BLDG COOLING WATER – C

FIGURE 9.2-1 REACTOR BUILDING COOLING WATER SYSTEM P&ID (Sheet 7 of 9)

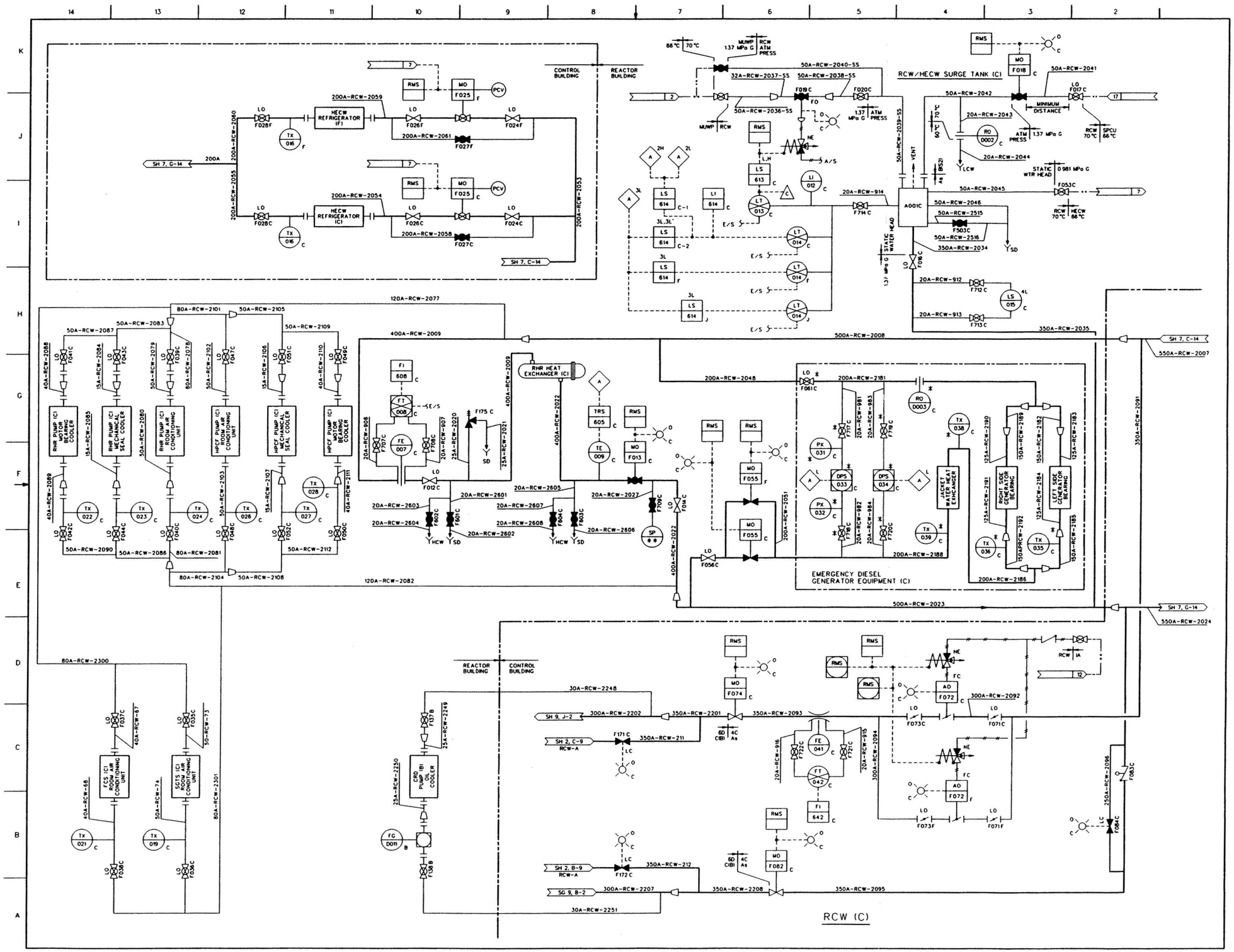


FIGURE 9.2-1 REACTOR BUILDING COOLING WATER SYSTEM P&ID (Sheet 8 of 9)

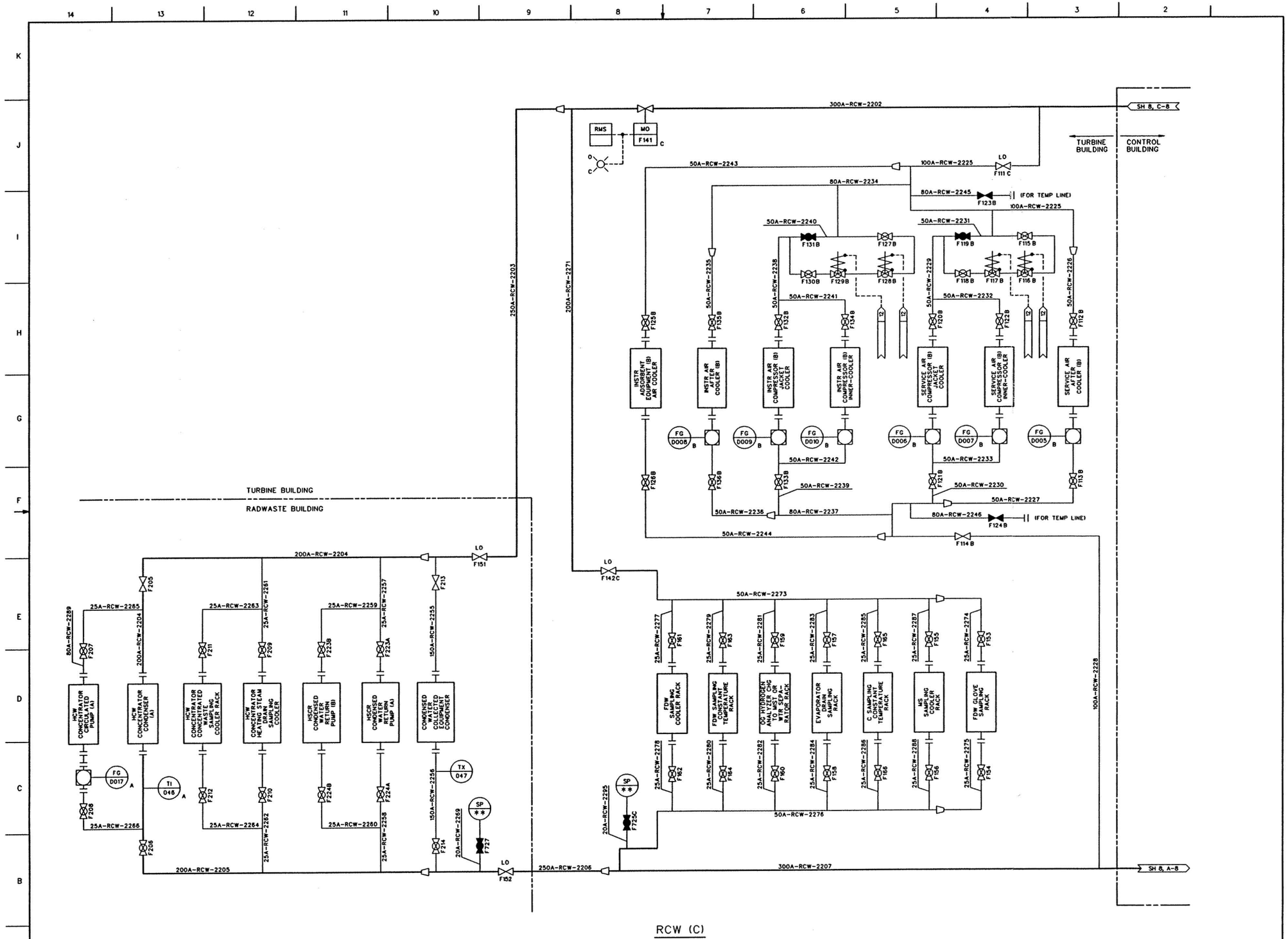


FIGURE 9.2-1 REACTOR BUILDING COOLING WATER SYSTEM P&ID (Sheet 9 of 9)

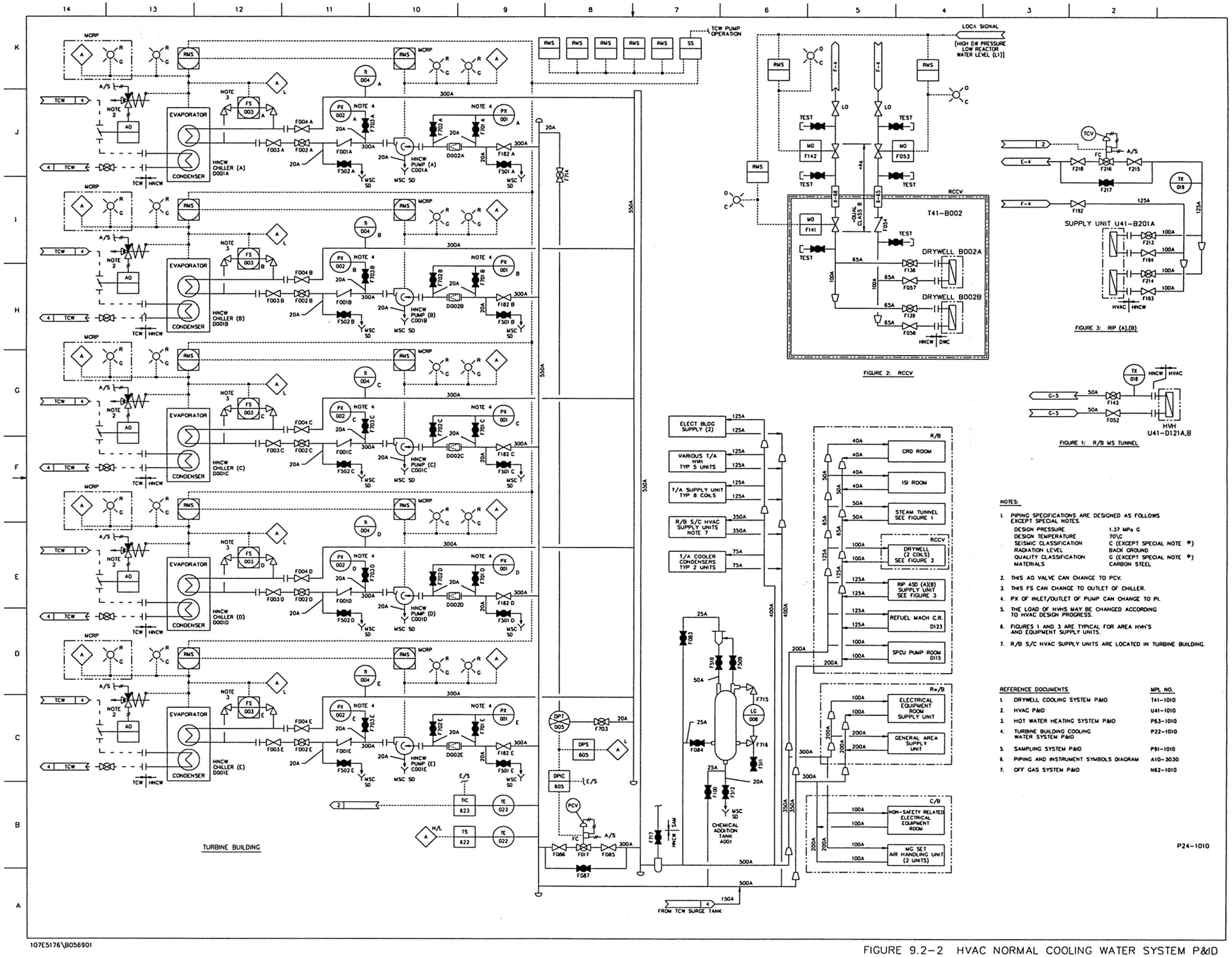


FIGURE 2: RCCV

FIGURE 3: RIP (A),(B)

FIGURE 1: R/B M5 TUNNEL

NOTES:

1. PIPING SPECIFICATIONS ARE DESIGNED AS FOLLOWS EXCEPT SPECIAL NOTES.

DESIGN PRESSURE	1.37 MPa G
DESIGN TEMPERATURE	70\C
SEISMIC CLASSIFICATION	C (EXCEPT SPECIAL NOTE *)
RADIATION LEVEL	BACK GROUND
QUALITY CLASSIFICATION	G (EXCEPT SPECIAL NOTE *)
MATERIALS	CARBON STEEL

2. THIS AO VALVE CAN CHANGE TO PCV.
3. THIS FS CAN CHANGE TO OUTLET OF CHILLER.
4. PX OF INLET/OUTLET OF PUMP CAN CHANGE TO PI.
5. THE LOAD OF HVHS MAY BE CHANGED ACCORDING TO HVAC DESIGN PROGRESS.
6. FIGURES 1 AND 3 ARE TYPICAL FOR AREA HVH'S AND EQUIPMENT SUPPLY UNITS.
7. R/B S/C HVAC SUPPLY UNITS ARE LOCATED IN TURBINE BUILDING.

REFERENCE DOCUMENTS

		MPL NO.
1.	DRYWELL COOLING SYSTEM P&ID	T41-1010
2.	HVAC P&ID	U41-1010
3.	HOT WATER HEATING SYSTEM P&ID	P63-1010
4.	TURBINE BUILDING COOLING WATER SYSTEM P&ID	P22-1010
5.	SAMPLING SYSTEM P&ID	P91-1010
6.	PIPING AND INSTRUMENT SYMBOLS DIAGRAM	A10-3030
7.	OFF GAS SYSTEM P&ID	N62-1010

P24-1010

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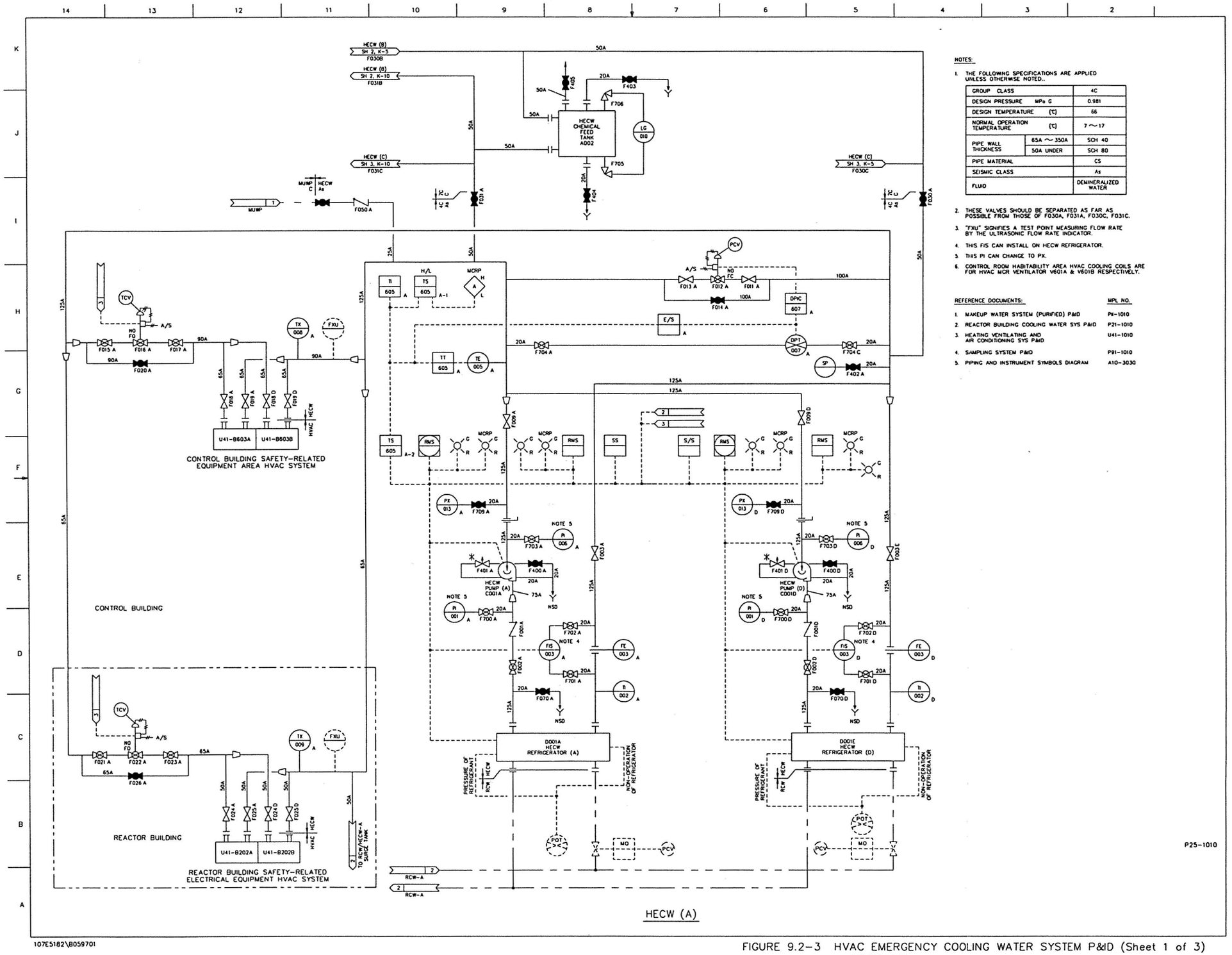
FIGURE 9.2-2 HVAC NORMAL COOLING WATER SYSTEM P&ID



NOTES:

1. THE FOLLOWING SPECIFICATIONS ARE APPLIED UNLESS OTHERWISE NOTED..

GROUP CLASS		4C
DESIGN PRESSURE MPa G		0.981
DESIGN TEMPERATURE (℃)		66
NORMAL OPERATION TEMPERATURE (℃)		7～17
PIPE WALL THICKNESS	65A～350A	SCH 40
	50A UNDER	SCH 80
PIPE MATERIAL		CS
SEISMIC CLASS		As
FLUID		DEMINERALIZED WATER

2. THESE VALVES SHOULD BE SEPARATED AS FAR AS POSSIBLE FROM THOSE OF F030A, F031A, F030C, F031C.
3. "FXU" SIGNIFIES A TEST POINT MEASURING FLOW RATE BY THE ULTRASONIC FLOW RATE INDICATOR.
4. THIS F/S CAN INSTALL ON HECW REFRIGERATOR.
5. THIS PI CAN CHANGE TO PX.
6. CONTROL ROOM HABITABILITY AREA HVAC COOLING COILS ARE FOR HVAC MCR VENTILATOR V601A & V601B RESPECTIVELY.

REFERENCE DOCUMENTS:

	MPL NO.
1. MAKEUP WATER SYSTEM (PURIFIED) P&ID	P1-1010
2. REACTOR BUILDING COOLING WATER SYS P&ID	P21-1010
3. HEATING VENTILATING AND AIR CONDITIONING SYS P&ID	U41-1010
4. SAMPLING SYSTEM P&ID	P81-1010
5. PIPING AND INSTRUMENT SYMBOLS DIAGRAM	A10-3030

P25-1010

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FIGURE 9.2-3 HVAC EMERGENCY COOLING WATER SYSTEM P&ID (Sheet 1 of 3)

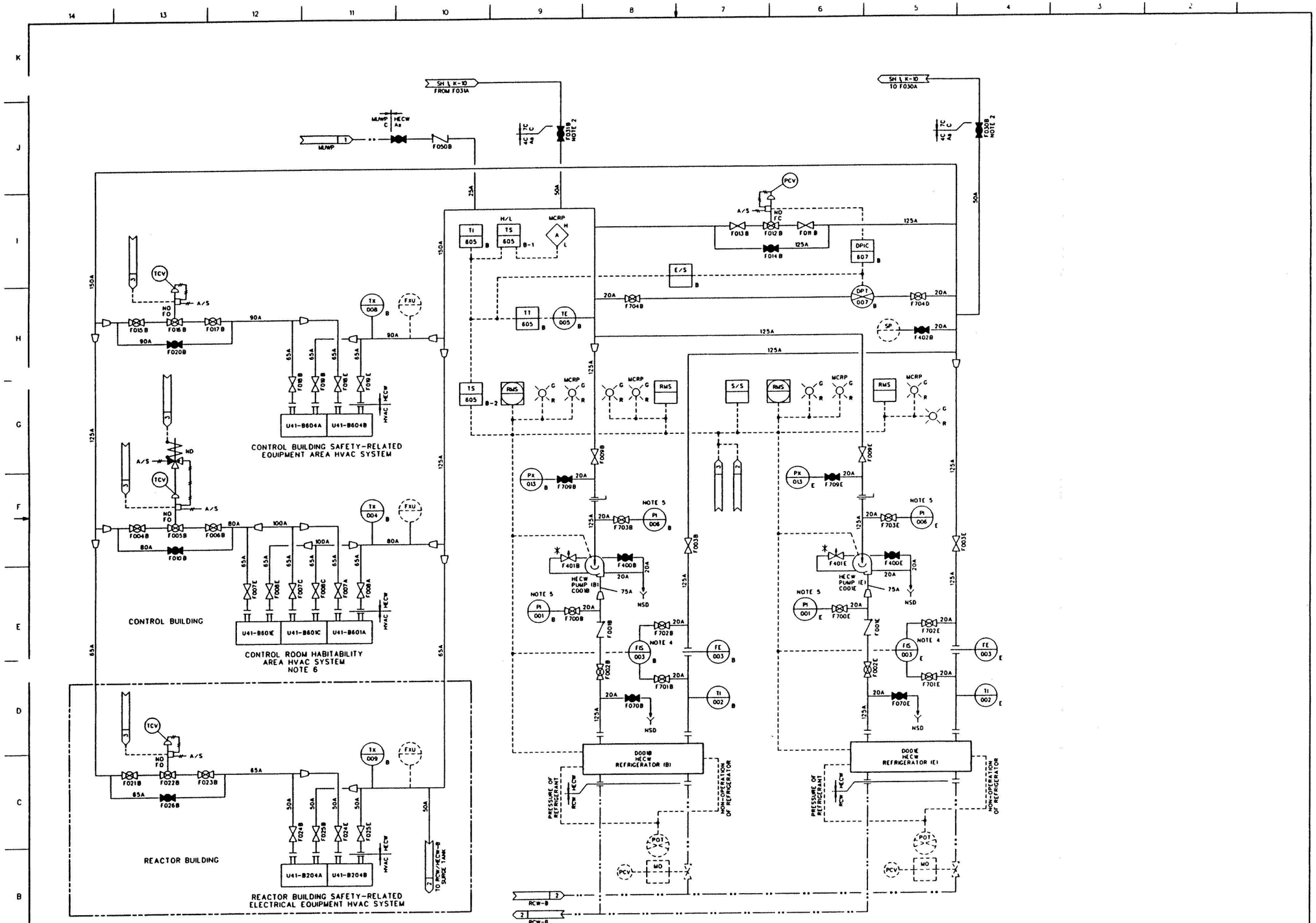


FIGURE 9.2-3 HVAC EMERGENCY COOLING WATER SYSTEM P&ID (Sheet 2 of 3)

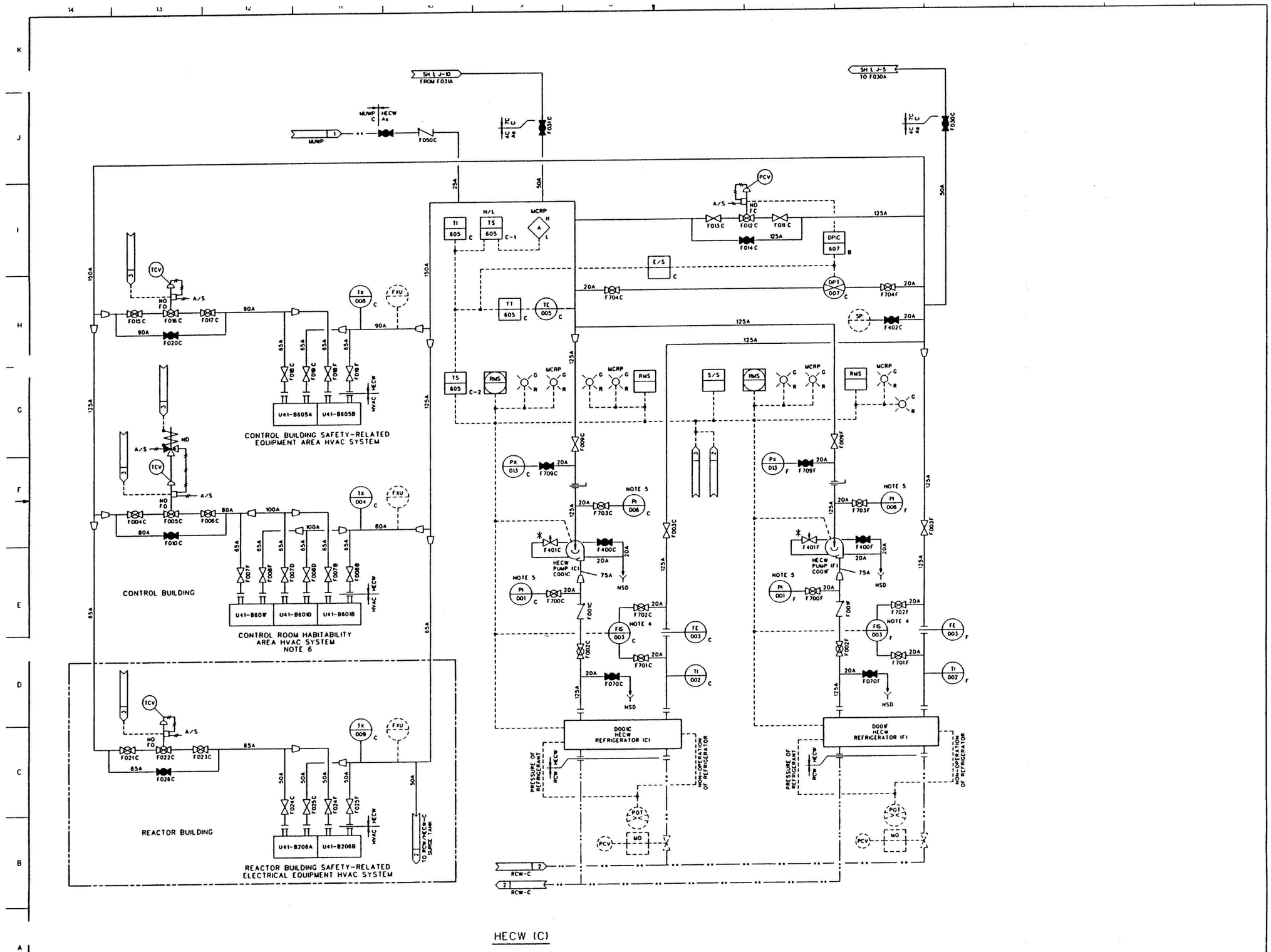


FIGURE 9.2-3 HVAC EMERGENCY COOLING WATER SYSTEM P&ID (Sheet 3 of 3)

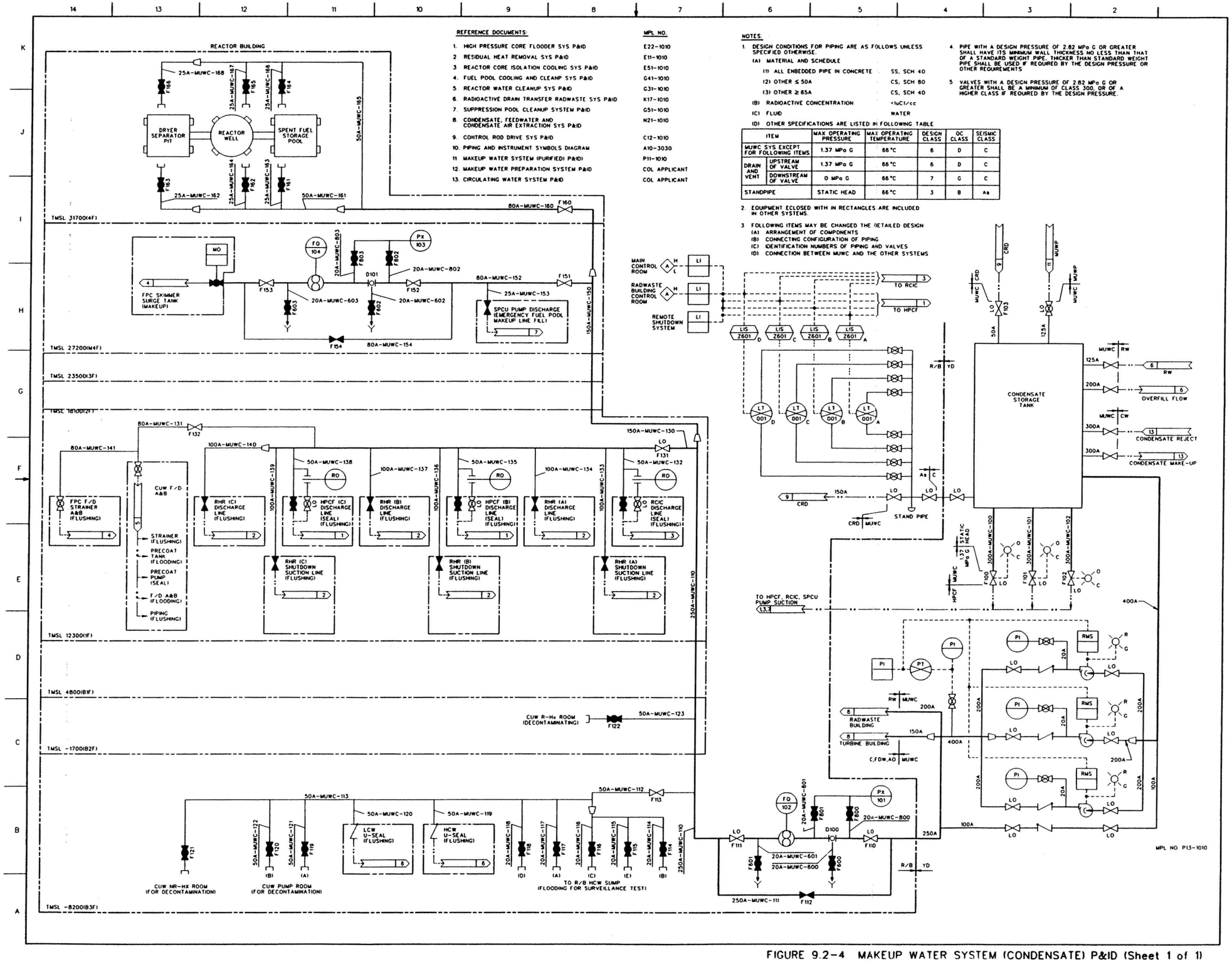
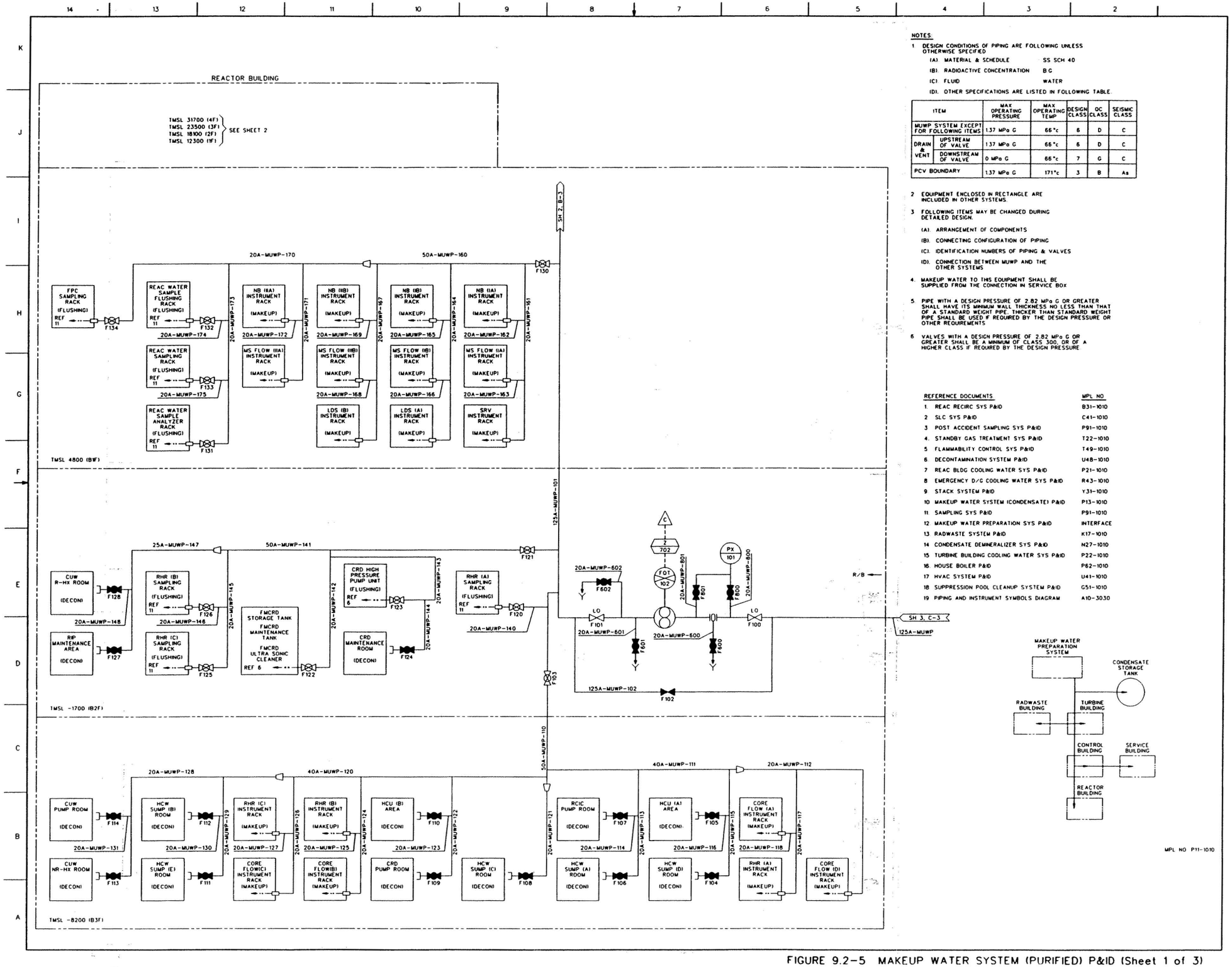


FIGURE 9.2-4 MAKEUP WATER SYSTEM (CONDENSATE) P&ID (Sheet 1 of 1)



NOTES:

1. DESIGN CONDITIONS OF PIPING ARE FOLLOWING UNLESS OTHERWISE SPECIFIED
   - (A). MATERIAL & SCHEDULE : SS SCH 40
   - (B). RADIOACTIVE CONCENTRATION : B.G
   - (C). FLUID : WATER
   - (D). OTHER SPECIFICATIONS ARE LISTED IN FOLLOWING TABLE.

ITEM		MAX OPERATING PRESSURE	MAX OPERATING TEMP	DESIGN CLASS	QC CLASS	SEISMIC CLASS
MUWP SYSTEM EXCEPT FOR FOLLOWING ITEMS		1.37 MPa G	66°c	6	D	C
DRAIN & VENT	UPSTREAM OF VALVE	1.37 MPa G	66°c	6	D	C
	DOWNSTREAM OF VALVE	0 MPa G	66°c	7	G	C
PCV BOUNDARY		1.37 MPa G	171°c	3	B	As

2. EQUIPMENT ENCLOSED IN RECTANGLE ARE INCLUDED IN OTHER SYSTEMS.
3. FOLLOWING ITEMS MAY BE CHANGED DURING DETAILED DESIGN.
   - (A). ARRANGEMENT OF COMPONENTS
   - (B). CONNECTING CONFIGURATION OF PIPING
   - (C). IDENTIFICATION NUMBERS OF PIPING & VALVES
   - (D). CONNECTION BETWEEN MUWP AND THE OTHER SYSTEMS
4. MAKEUP WATER TO THIS EQUIPMENT SHALL BE SUPPLIED FROM THE CONNECTION IN SERVICE BOX
5. PIPE WITH A DESIGN PRESSURE OF 2.82 MPa G OR GREATER SHALL HAVE ITS MINIMUM WALL THICKNESS NO LESS THAN THAT OF A STANDARD WEIGHT PIPE. THICKER THAN STANDARD WEIGHT PIPE SHALL BE USED IF REQUIRED BY THE DESIGN PRESSURE OR OTHER REQUIREMENTS.
6. VALVES WITH A DESIGN PRESSURE OF 2.82 MPa G OR GREATER SHALL BE A MINIMUM OF CLASS 300, OR OF A HIGHER CLASS IF REQUIRED BY THE DESIGN PRESSURE

REFERENCE DOCUMENTS	MPL NO.
1. REAC RECIRC SYS P&ID	B31-1010
2. SLC SYS P&ID	C41-1010
3. POST ACCIDENT SAMPLING SYS P&ID	P91-1010
4. STANDBY GAS TREATMENT SYS P&ID	T22-1010
5. FLAMMABILITY CONTROL SYS P&ID	T49-1010
6. DECONTAMINATION SYSTEM P&ID	U48-1010
7. REAC BLDG COOLING WATER SYS P&ID	P21-1010
8. EMERGENCY D/G COOLING WATER SYS P&ID	R43-1010
9. STACK SYSTEM P&ID	Y31-1010
10. MAKEUP WATER SYSTEM (CONDENSATE) P&ID	P13-1010
11. SAMPLING SYS P&ID	P91-1010
12. MAKEUP WATER PREPARATION SYS P&ID	INTERFACE
13. RADWASTE SYSTEM P&ID	K17-1010
14. CONDENSATE DEMINERALIZER SYS P&ID	N27-1010
15. TURBINE BUILDING COOLING WATER SYS P&ID	P22-1010
16. HOUSE BOILER P&ID	P62-1010
17. HVAC SYSTEM P&ID	U41-1010
18. SUPPRESSION POOL CLEANUP SYSTEM P&ID	G51-1010
19. PIPING AND INSTRUMENT SYMBOLS DIAGRAM	A10-3030

FIGURE 9.2-5 MAKEUP WATER SYSTEM (PURIFIED) P&ID (Sheet 1 of 3)

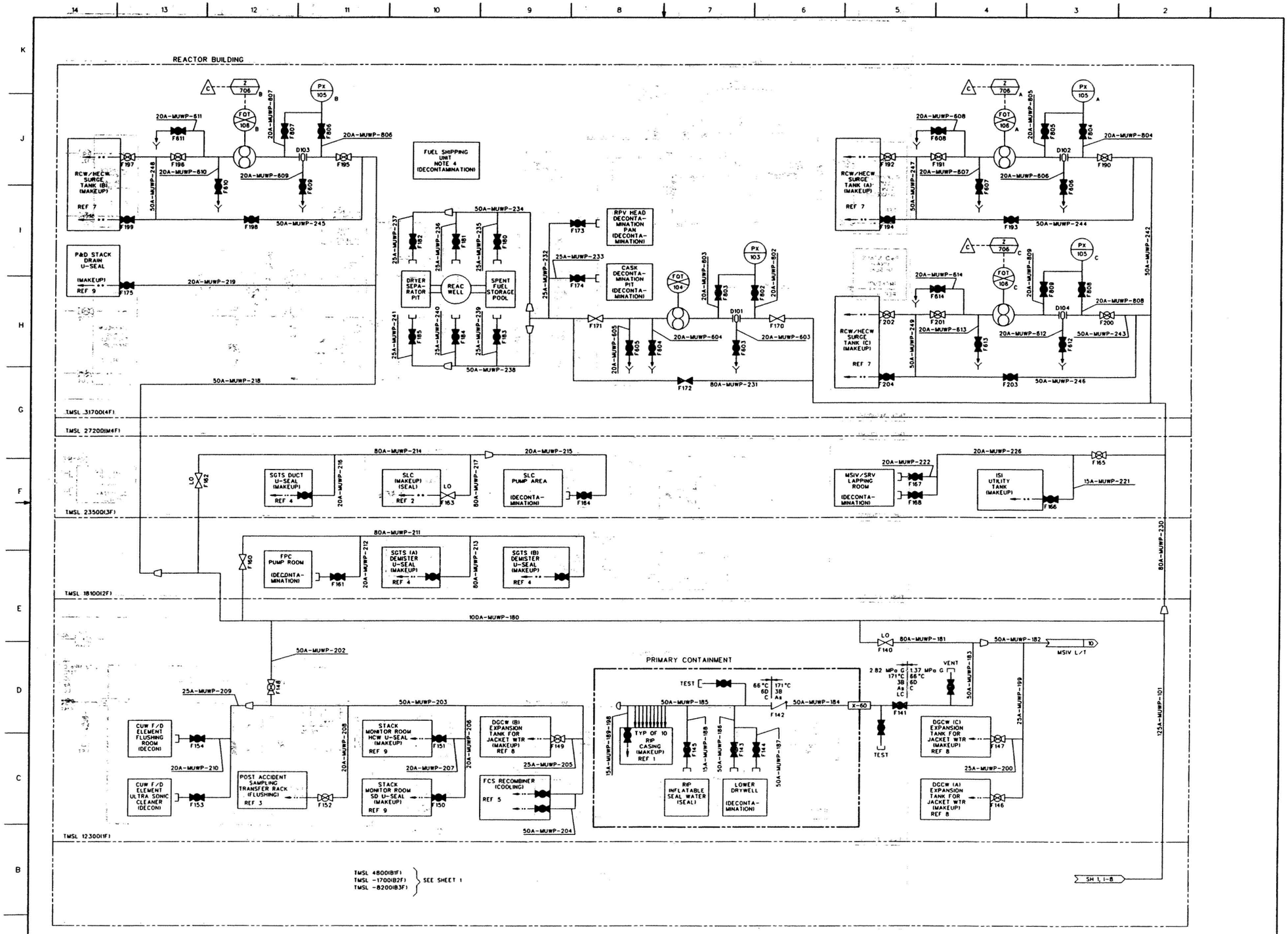


FIGURE 9.2-5 MAKEUP WATER SYSTEM (PURIFIED) P&ID (Sheet 2 of 3)

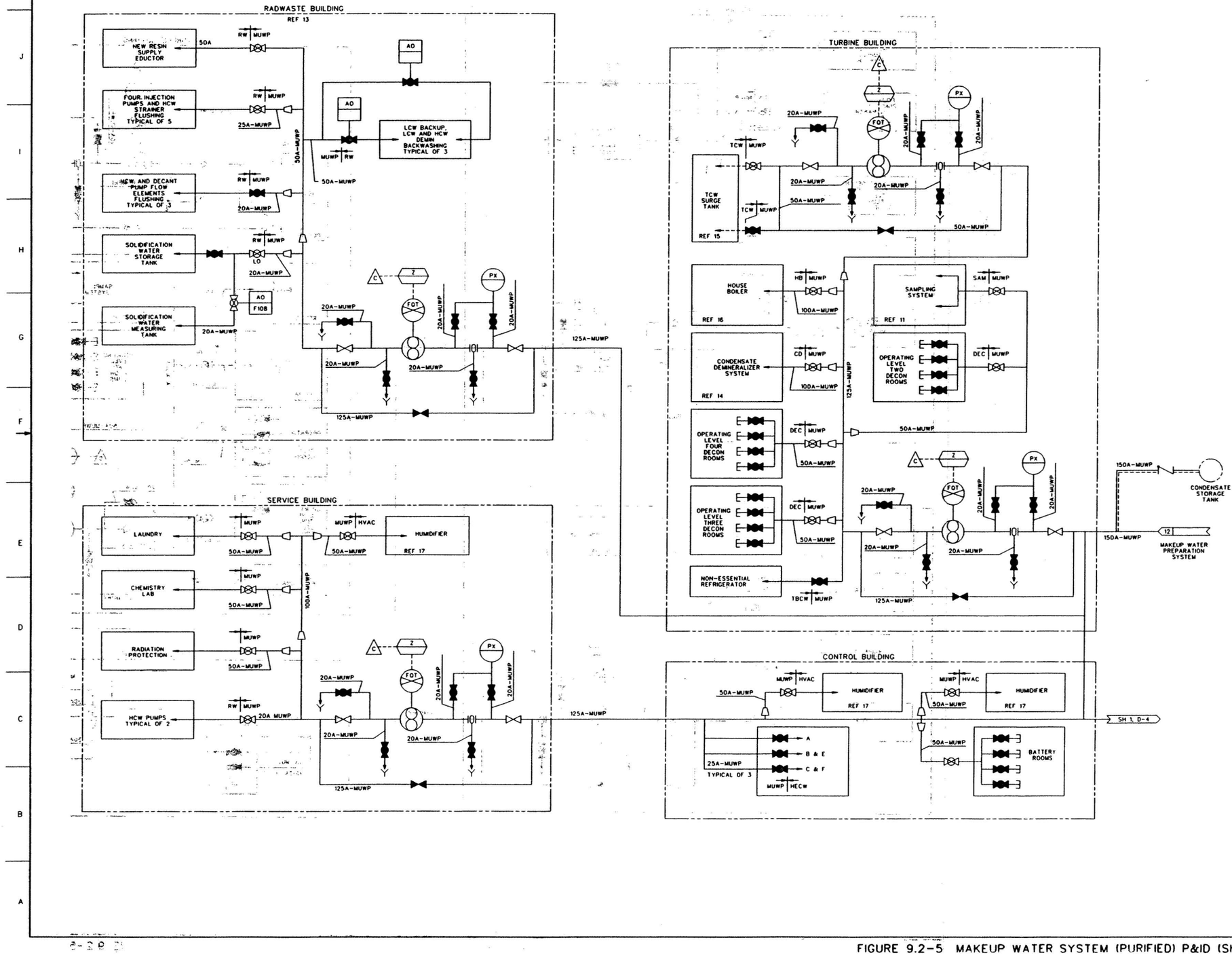


FIGURE 9.2-5 MAKEUP WATER SYSTEM (PURIFIED) P&ID (Sheet 3 of 3)

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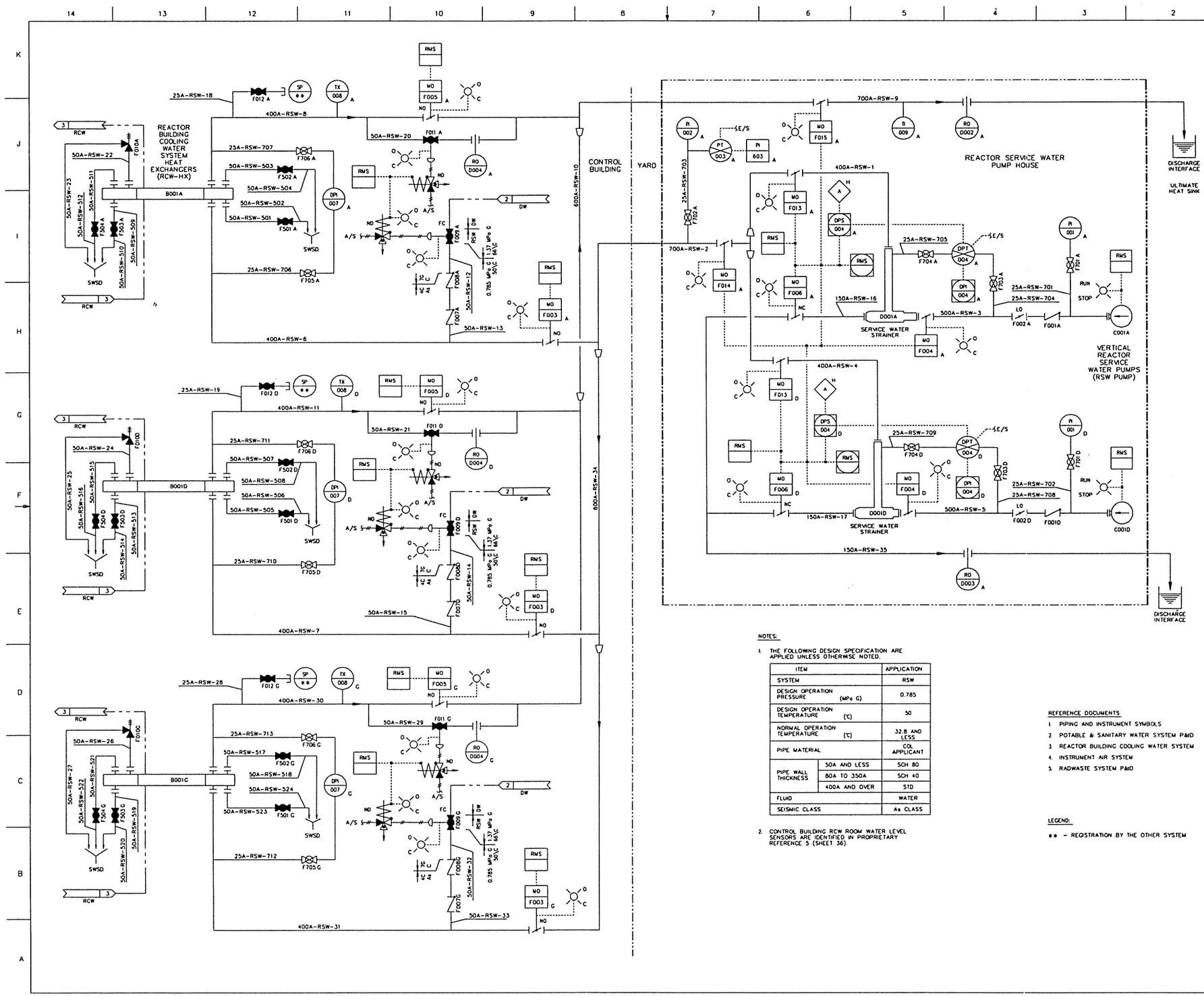

NOTES:

1. THE FOLLOWING DESIGN SPECIFICATION ARE APPLIED UNLESS OTHERWISE NOTED.

ITEM		APPLICATION
SYSTEM		RSW
DESIGN OPERATION PRESSURE (MPa G)		0.785
DESIGN OPERATION TEMPERATURE (℃)		50
NORMAL OPERATION TEMPERATURE (℃)		32.8 AND LESS
PIPE MATERIAL		COL APPLICANT
PIPE WALL THICKNESS	50A AND LESS	SCH 80
	80A TO 350A	SCH 40
	400A AND OVER	STD
FLUID		WATER
SEISMIC CLASS		As CLASS

2. CONTROL BUILDING RCW ROOM WATER LEVEL SENSORS ARE IDENTIFIED IN PROPRIETARY REFERENCE 5 (SHEET 36).

REFERENCE DOCUMENTS	MPL NO.
1. PIPING AND INSTRUMENT SYMBOLS	A10-3030
2. POTABLE & SANITARY WATER SYSTEM P&ID	U42-1010
3. REACTOR BUILDING COOLING WATER SYSTEM	P21-1010
4. INSTRUMENT AIR SYSTEM	P52-1010
5. RADWASTE SYSTEM P&ID	K17-1010

LEGEND:

** - REGISTRATION BY THE OTHER SYSTEM

P41-1010

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FIGURE 9.2-7 REACTOR SERVICE WATER SYSTEM P&ID (Sheet 1 of 3)

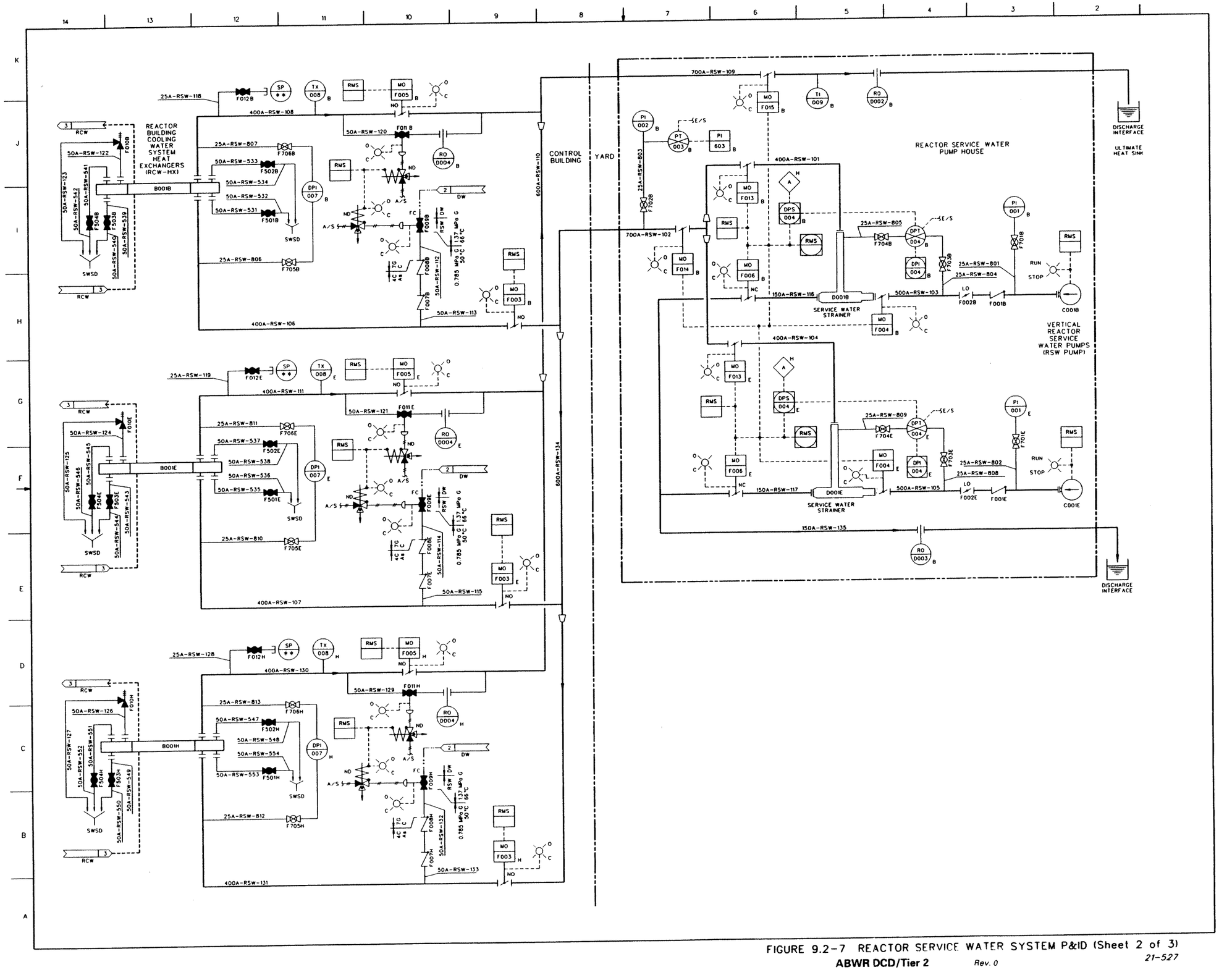


FIGURE 9.2-7 REACTOR SERVICE WATER SYSTEM P&ID (Sheet 2 of 3)

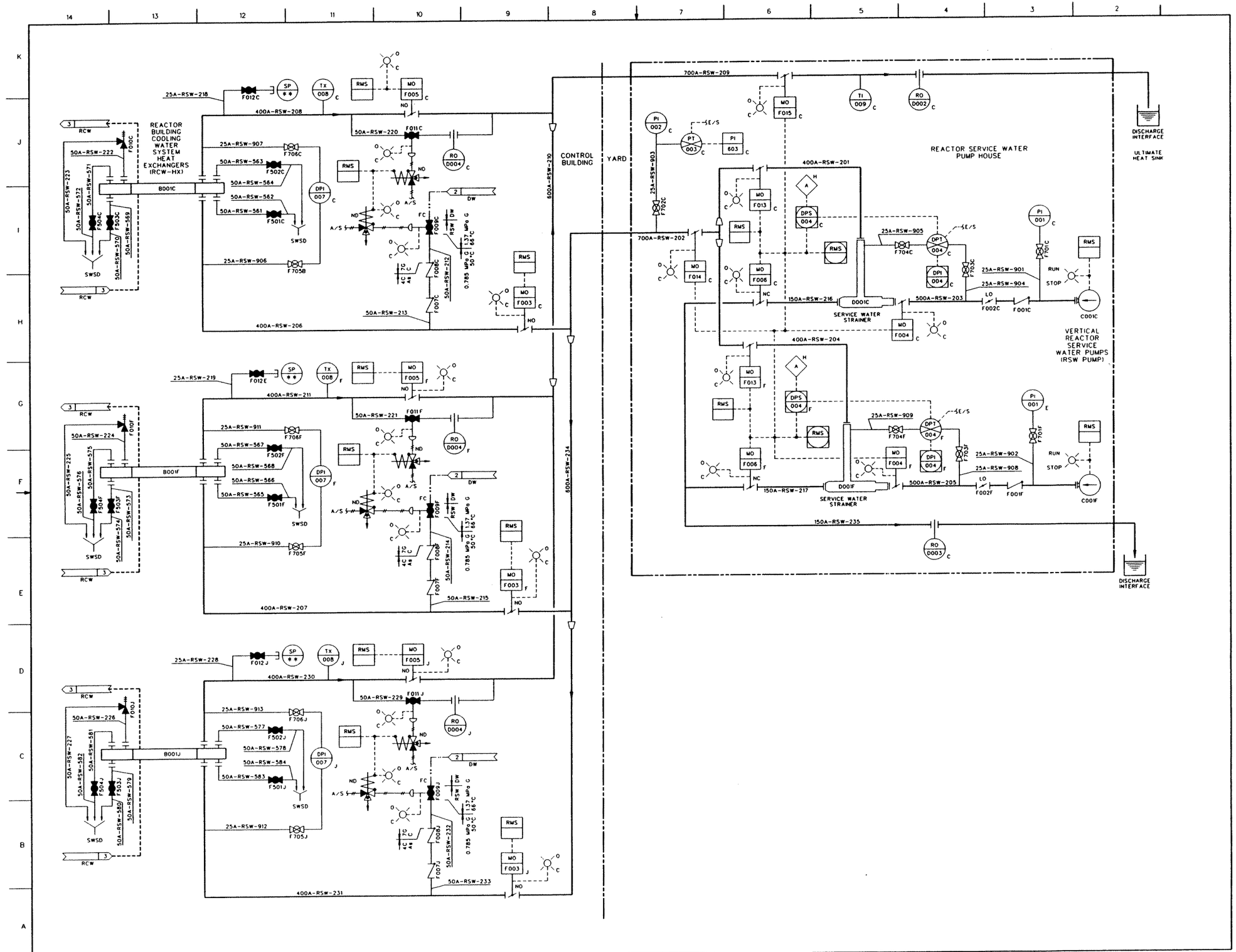
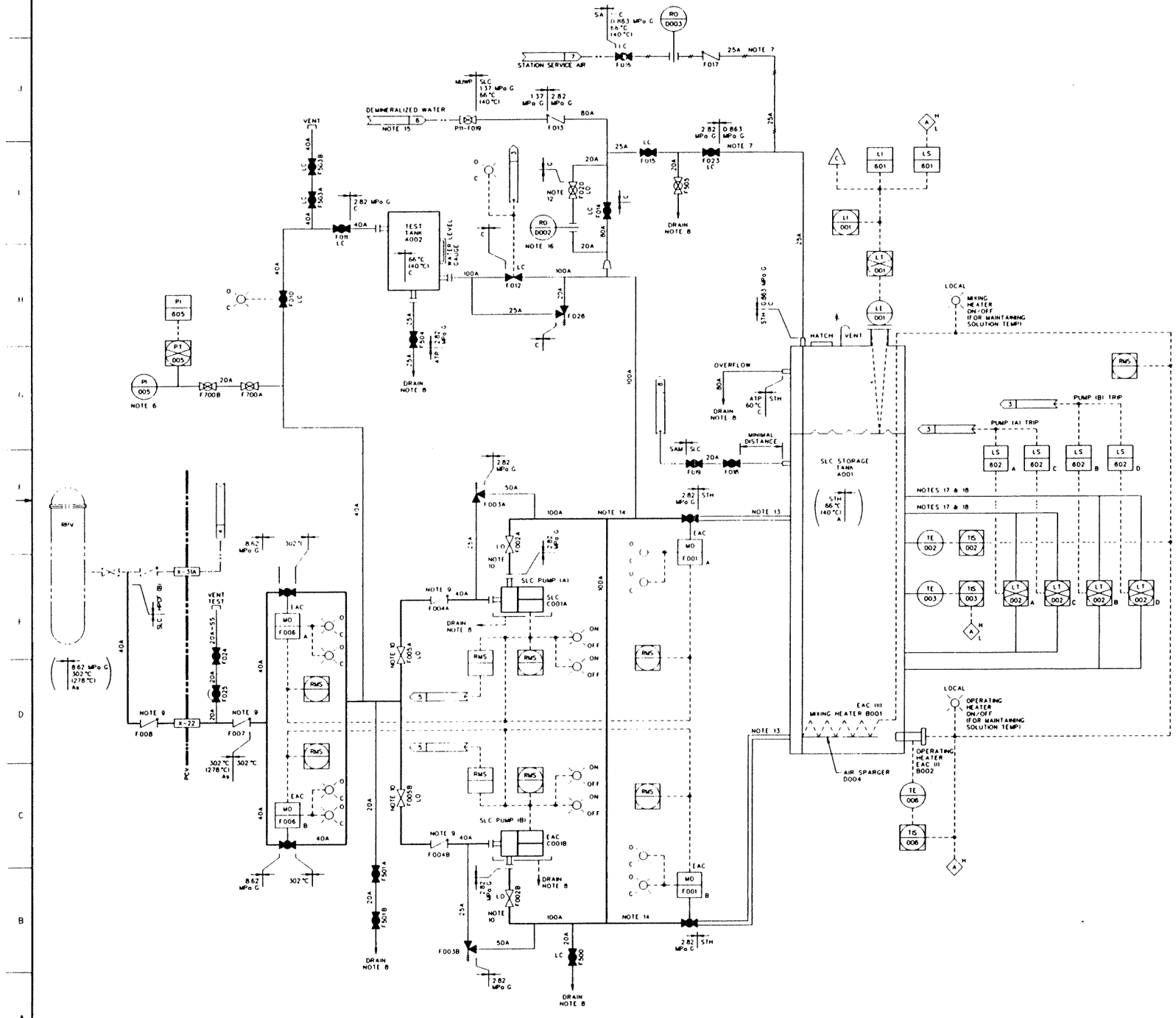


FIGURE 9.2-7 REACTOR SERVICE WATER SYSTEM P&ID (Sheet 3 of 3)



NOTES

1 ALL EQUIPMENT AND INSTRUMENTS ARE PREFIXED BY C41 UNLESS OTHERWISE NOTED

2 PIPING HIGH POINT VENTS AND LOW POINT DRAINS ARE TO BE ADDED AT ALL SUCH HIGH OR LOW POINTS NOT SERVED BY EQUIPMENT VENTS AND DRAINS

3 UNLESS OTHERWISE NOTED, VALVE POSITION LAMP AND ALARM SHOULD BE INSTALLED IN MAIN CONTROL ROOM

4 SYSTEM DESIGN SPECIFICATION

(A) UNLESS OTHERWISE NOTED, AS FOLLOWS

ITEM	APPLICATION
MAXIMUM OPERATING PRESS MPa G	10.79
MAXIMUM OPERATING TEMP °C	66
NORMAL OPERATING TEMP °C	40
SEISMIC CATEGORY	A
PROCESS FLUID	B/W
PIPING MATERIAL	SS

(B) UNLESS OTHERWISE NOTED, "EXPLANATION DIAGRAM OF STANDARD DESIGN SPECIFICATION FOR SMALL PIPING, VALVES AND INSULATION" SHOULD BE ADOPTED FOR DRAINS, VENTS, SMALL PIPING FOR INSTRUMENTATION, DESIGN SPEC OF VALVE AND INSULATION THICKNESS FOR PIPING AND COMPONENT

5 PIPING DRAINS, VENTS AND TEST TAP SHOULD BE INDICATED

6 PRESSURE INDICATOR PI 005 SHOULD BE LOCATED SO THAT IT CAN BE READ FROM VALVE F010 LOCATION

7 THE CONNECTION OF DEMINERALIZED AND STATION SERVICE AIR LINES SHOULD BE ABOVE THE TOP OF THE STORAGE TANK TO AVOID SIPHON OF TANK SOLUTION

8 DRAINS SHOULD BE COLLECTED IN A REMOVABLE CONTAINER AT FIRST

9 F004A, B, F007 AND F008 SHOULD BE SWING-CHECK VALVES

10 F002A, B AND F005A, B SHOULD BE GATE VALVES

11 THE DISTANCE FROM SLC STORAGE TANK AND TEST TANK TO PUMP SUCTION SHOULD BE LESS THAN SIX METERS

12 VALVE F020 SHOULD BE LOCATED ABOVE THE WATER LEVEL OF SLC STORAGE TANK

13 VALVE F001A, B SHOULD BE CONNECTED DIRECTLY TO SLC STORAGE TANK

14 INSULATION MATERIAL SHOULD BE PROVIDED TO VALVE F001A, B AND SLC PUMP SUCTION PIPING

15 THE DEMINERALIZED WATER SUPPLY SHALL HAVE PRESSURE HIGHER THAN THE STATIC PRESSURE OF THE STORAGE TANK SOLUTION BUT LOW ENOUGH TO PREVENT LEAKAGE OR BACK-FLOW THROUGH VALVE F001 INTO THE STORAGE TANK WHILE THIS VALVE IS NORMALLY CLOSED

16 THE RESTRICTING ORIFICE D002 SHALL ALLOW THE SUCTION PIPING TO REMAIN FULL OF WATER. THE ORIFICE SHALL BE SIZED (DURING PREOPERATIONAL TEST) LARGE ENOUGH TO PASS SUFFICIENT FLOW TO MAKE UP ALL LEAKAGE OF EQUIPMENT, BUT SMALL ENOUGH TO PREVENT A VARIATION IN THE BORON INJECTION RATE AS LOW AS PRACTICABLE

17 THE VERTICAL DISTANCE BETWEEN THE VARIABLE AND REFERENCE PIPING LEG NOZZELS SHALL BE ONE METER (NOMINAL)

18 INSTRUMENT LINES SHALL BE HEAT TRACED

19 PIPE WITH A DESIGN PRESSURE OF 2.82 MPa OR GREATER SHALL HAVE ITS MINIMUM WALL THICKNESS NO LESS THAN THAT OF A STANDARD WEIGHT PIPE. THICKER THAN STANDARD WEIGHT PIPE SHALL BE USED IF REQUIRED BY THE DESIGN PRESSURE OR OTHER REQUIREMENTS

20 VALVES WITH A DESIGN PRESSURE OF 2.82 MPa OR GREATER SHALL BE A MINIMUM OF CLASS 300, OR OF A HIGHER CLASS IF REQUIRED BY THE DESIGN PRESSURE

REFERENCE DOCUMENTS

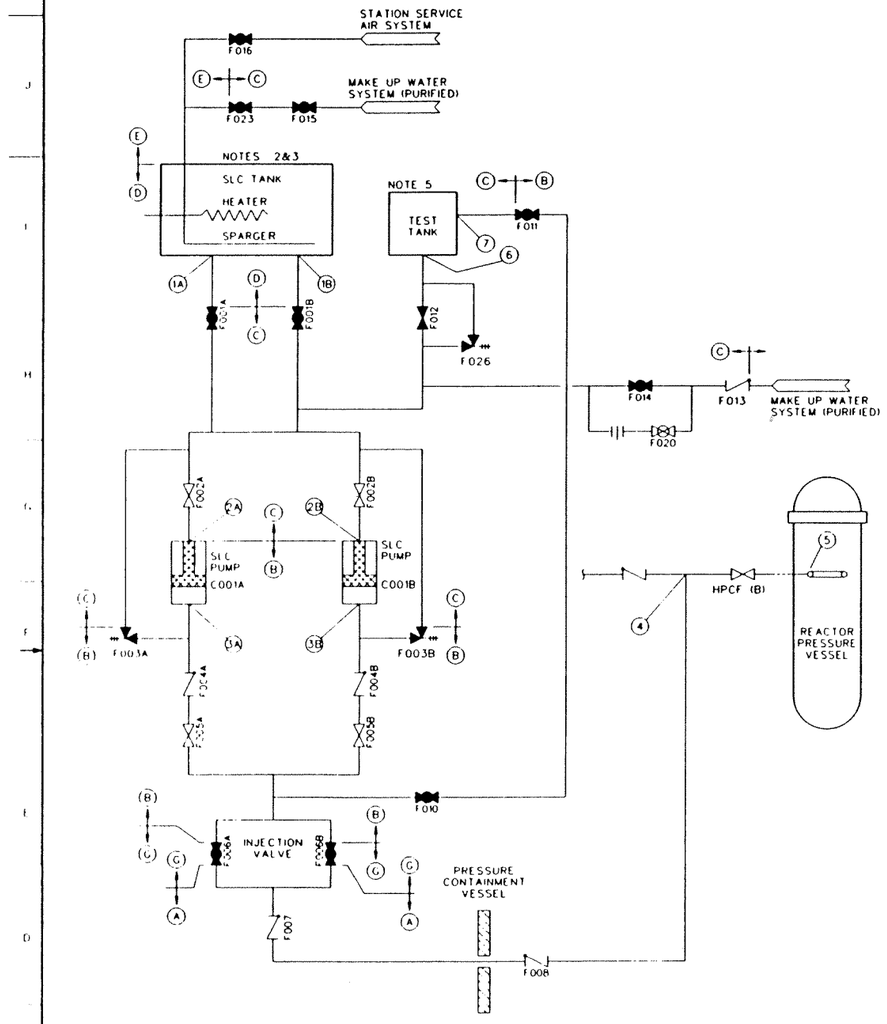
		MPL NO.
1	PIPING AND INSTRUMENT SYMBOLS DIAGRAM	A10-3030
2	STANDBY LIQUID CONTROL SYS PFD	C41-1020
3	STANDBY LIQUID CONTROL SYS IBD	C41-1030
4	HIGH PRESSURE CORE FLOODER SYS P&ID	E22-1010
5	REAC WATER CLEANUP SYS IBD	G31-1030
6	MAKEUP WATER SYS P&ID	P11-1010
7	STATION SERVICE AIR SYS P&ID	P51-1010
8	SAMPLING SYS P&ID	P91-1010

LEGEND

STH - STATIC WATER HEAD
ATP - ATMOSPHERIC PRESSURE

MPL NO. C41-1010

FIGURE 9.3-1 STANDBY LIQUID CONTROL SYSTEM P&ID (Sheet 1 of 1)



MODE A	REACTOR INJECTION MODE					NOTE 6	
LOCATION	1	2	3	4	5	6	7
FLOW (L/min)	189	189	189	189	189	0	0
PRESS (MPa G)	STH	-0.001	Max 8.43*	7.97	7.92	STH	ATP
TEMP (°C)	30	30	30	30	30	AMT	AMT
MAX ALLOWABLE PRESS LOSS (m)	← 0.12		* PEAK PRESS 9.81 MPa G				

MODE B	NON-INJECTION TEST MODE					NOTE 6	
LOCATION	6	2	3	7	1	4	5
FLOW (L/min)	189	189	189	189	0	0	0
PRESS (MPa G)	STH	-0.001	Max 8.43*	ATP	STH	R×P	R×P
TEMP (°C)	DWT	DWT	DWT	DWT	30	R×T	R×T
MAX ALLOWABLE PRESS LOSS (m)	← 0.12		* PEAK PRESS 9.81 MPa G				

MODE C	INJECTION TEST MODE					NOTE 6	
LOCATION	6	2	3	4	5	1	7
FLOW (L/min)	189	189	189	189	189	0	0
PRESS (MPa G)	STH	-0.001	*	*	R×P	STH	ATP
TEMP (°C)	DWT	DWT	DWT	DWT	DWT	30	AMT
MAX ALLOWABLE PRESS LOSS (m)	← 0.12						

MODE D	STANDBY MODE						
LOCATION	1	2	3	4	5	6	7
FLOW (L/min)	0	0	0	0	0	0	0
PRESS (MPa G)	STH	DWP	DWP	R×P	R×P	ATP	ATP
TEMP (°C)	30	AMT	AMT	R×T	R×T	AMT	AMT
MAX ALLOWABLE PRESS LOSS (m)							

		A	B	C	D	E	F	G
DESIGN PRESSURE	MPa G	8.62	10.79	2.82	STH	0.863	2.82	10.79
DESIGN TEMPERATURE	(°C)	302	66	66	66	66	66	302

VALVE OPENING/CLOSING CONDITION — NOTE 6

	F 001 A&B	F 002 A&B	F 004 A&B	F 005 A&B	F 006 A&B	F 007	F 008	F 010	F 011	F 012	F 014
MODE A	O	O	O	O	O	O	O	x	x	x	x
MODE B	x	O	O	O	x	x	x	P	O	O	x
MODE C	x	O	O	O	O (1st)	O	O	x	x	O	x
MODE D	x	O	x	O	x	x	x	x	x	x	x

O FULL OPEN P PARTIALLY OPEN x CLOSE

NOTES:

1. [*] SHOWS THE VALUE WHICH IS NOT NEEDED IN A BASIC PLANNING OF THIS SYSTEM.
2. SOLUTION TEMP IN SLC TANK SHALL BE MAINTAINED AT 30±3°C DURING NORMAL PLANT OPERATION.
3. SLC TANK SHALL BE LOCATED SUCH THAT PUMP SUCTION PIPING IS ALWAYS FILLED WITH THE SOLUTION.
4. SLC PUMP SHALL BE ABLE TO INJECT BORON SOLUTION AT REACTOR PRESSURE OF 10.79 MPa G.
5. TEST TANK SHALL BE LOCATED SUCH THAT PUMP SUCTION PIPING IS ALWAYS FILLED WITH WATER.
6. DURING OPERATING MODE A,B OR C, ONLY ONE PUMP IS RUN.

REFERENCE DOCUMENTS

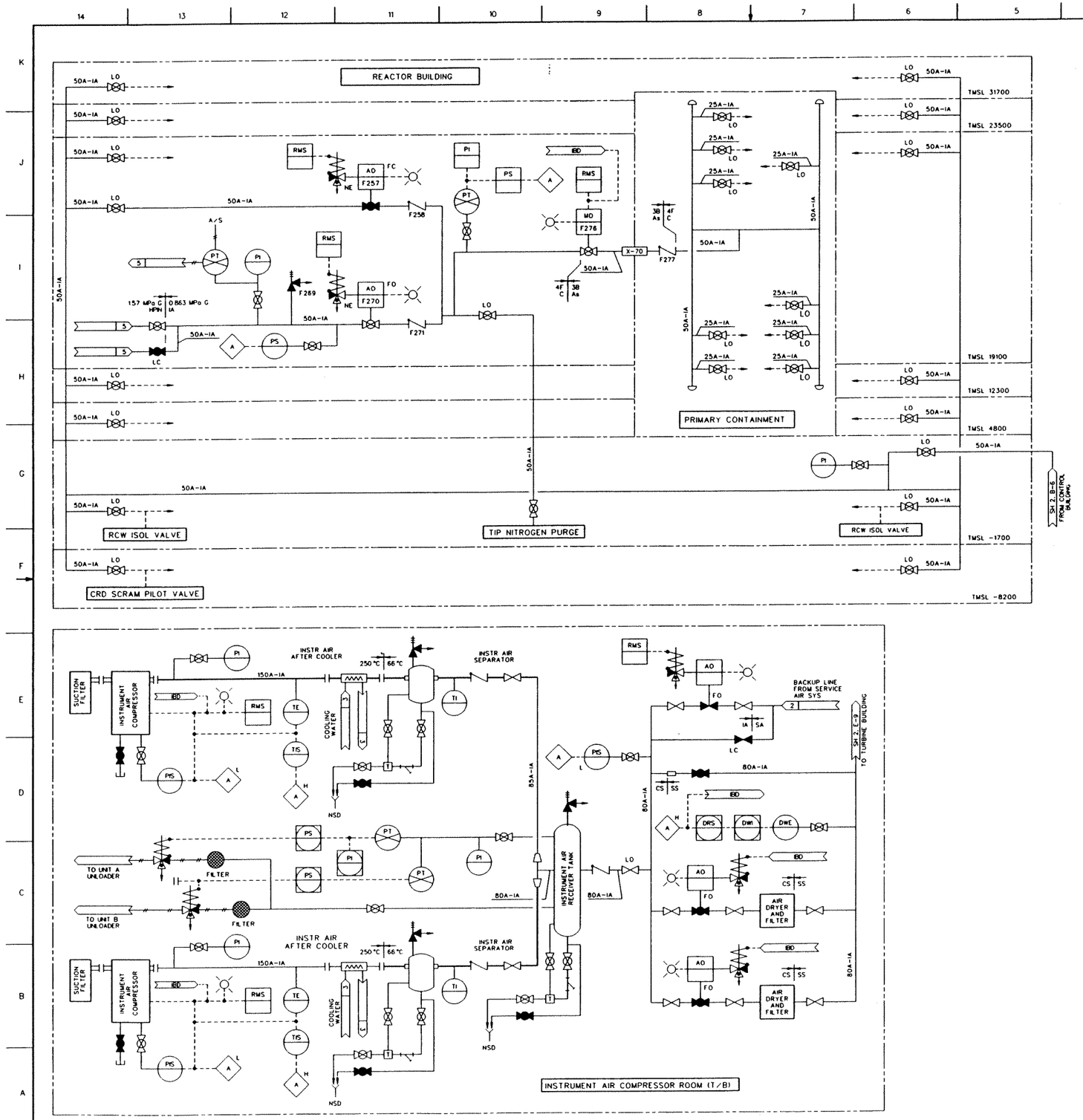
	MPL ITEM NO
1. STANDBY LIQUID CONTROL SYS IBD	C41-1030
2. STANDBY LIQUID CONTROL SYS P&ID	C41-1010

ABREVIATION

STH : STATIC WATER HEAD
ATP : ATMOSPHERIC PRESSURE
AMT : AMBIENT TEMPERATURE
DWT : SUPPLIED DEMIN WATER TEMPERATURE
DWP : SUPPLIED DEMIN WATER PRESSURE
R×P : REACTOR PRESSURE
R×T : REACTOR TEMPERATURE

MPL NO C41-1020

FIGURE 9.3-1a STANDBY LIQUID CONTROL SYSTEM PFD (Sheet 1 OF 1)



NOTES

1 THE FOLLOWING DESIGN SPECIFICATIONS ARE APPLIED UNLESS OTHERWISE NOTED.

ITEM	APPLICATION		
SYSTEM	1A		
GROUP CLASSIFICATION	4D		
MAXIMUM OPERATING PRESSURE (MPa G)	0.863		
MAXIMUM OPERATING TEMPERATURE (°C)	COMPRESSOR TO AFTER COOLER		250
	OTHER		56
OPERATING TEMP (°C)	60 (MAX)		
PIPE MATERIAL	CS		
	SS		
PIPE WALL THICKNESS	CS	65A AND MORE SCH 40	
		50A AND LESS SCH 80	
	SS	SCH 40	
SEISMIC CATEGORY	PCV BOUNDARY		As
	OTHER		C
FLUID	AIR/NITROGEN		

2 FOLLOWING ITEMS MAY BE CHANGED AT THE DETAIL DESIGN STAGE

A ARRANGEMENT OF COMPONENTS

B CONFIGURATION OF PIPING

C IDENTIFICATION OF VALVES

REFERENCE DOCUMENTS

		MPL NO.
1	PIPING AND INSTRUMENT SYMBOLS	A10-3030
2	SERVICE AIR SYSTEM	P51-1010
3	REACTOR BUILDING COOLING WATER SYSTEM	P21-1010
4	ATMOSPHERIC CONTROL SYSTEM	T31-1010
5	HIGH PRESSURE NITROGEN GAS SUPPLY SYSTEM	P54-1010
6	INSTRUMENT AIR SYSTEM IBD	P52-1030
7	RADWASTE SYSTEM	K17-1010

MPL NO P52-1010

FIGURE 9.3-6 INSTRUMENT AIR SYSTEM P&ID (Sheet 1 of 2)

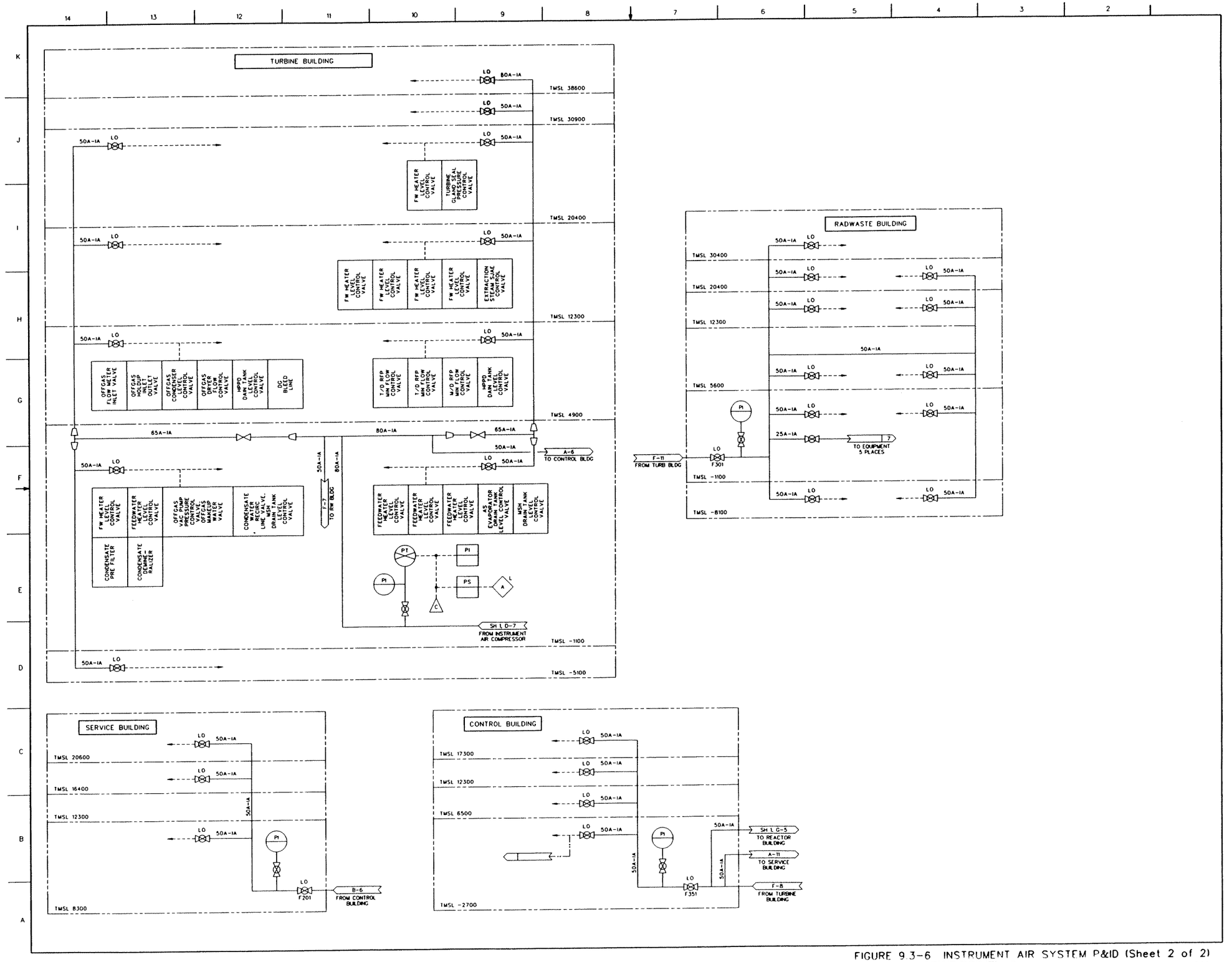
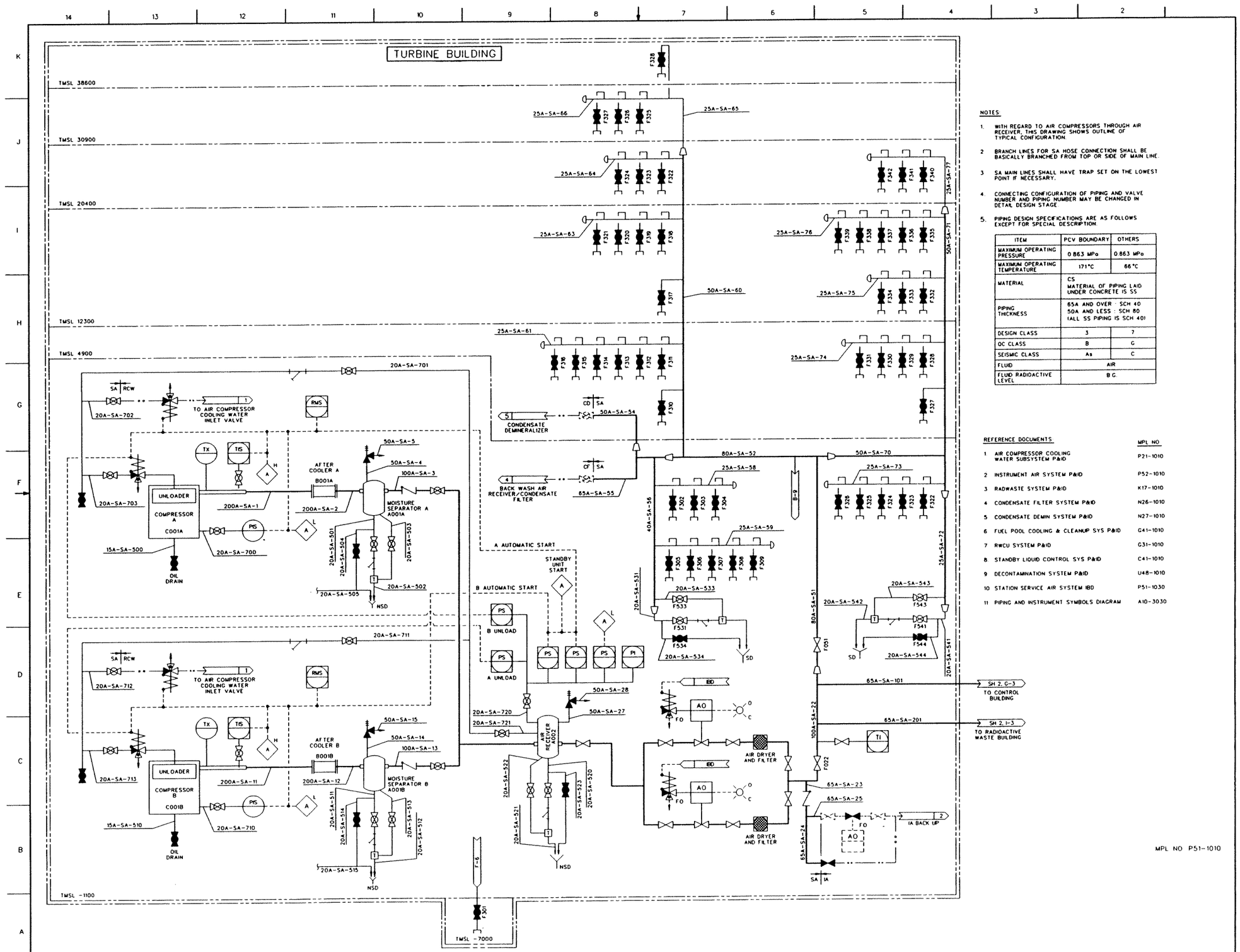


FIGURE 9.3-6 INSTRUMENT AIR SYSTEM P&ID (Sheet 2 of 2)



NOTES:

1. WITH REGARD TO AIR COMPRESSORS THROUGH AIR RECEIVER, THIS DRAWING SHOWS OUTLINE OF TYPICAL CONFIGURATION.
2. BRANCH LINES FOR SA HOSE CONNECTION SHALL BE BASICALLY BRANCHED FROM TOP OR SIDE OF MAIN LINE.
3. SA MAIN LINES SHALL HAVE TRAP SET ON THE LOWEST POINT IF NECESSARY.
4. CONNECTING CONFIGURATION OF PIPING AND VALVE NUMBER AND PIPING NUMBER MAY BE CHANGED IN DETAIL DESIGN STAGE.
5. PIPING DESIGN SPECIFICATIONS ARE AS FOLLOWS EXCEPT FOR SPECIAL DESCRIPTION.

ITEM	PCV BOUNDARY	OTHERS
MAXIMUM OPERATING PRESSURE	0.863 MPa	0.863 MPa
MAXIMUM OPERATING TEMPERATURE	171°C	66°C
MATERIAL	CS MATERIAL OF PIPING LAID UNDER CONCRETE IS SS	
PIPING THICKNESS	65A AND OVER : SCH 40 50A AND LESS : SCH 80 (ALL SS PIPING IS SCH 40)	
DESIGN CLASS	3	7
QC CLASS	B	G
SEISMIC CLASS	As	C
FLUID	AIR	
FLUID RADIOACTIVE LEVEL	B.G.	

REFERENCE DOCUMENTS

		MPL NO
1	AIR COMPRESSOR COOLING WATER SUBSYSTEM P&ID	P21-1010
2	INSTRUMENT AIR SYSTEM P&ID	P52-1010
3	RADWASTE SYSTEM P&ID	K17-1010
4	CONDENSATE FILTER SYSTEM P&ID	N26-1010
5	CONDENSATE DEMIN SYSTEM P&ID	N27-1010
6	FUEL POOL COOLING & CLEANUP SYS P&ID	G41-1010
7	RWCU SYSTEM P&ID	G31-1010
8	STANDBY LIQUID CONTROL SYS P&ID	C41-1010
9	DECONTAMINATION SYSTEM P&ID	U48-1010
10	STATION SERVICE AIR SYSTEM IBD	P51-1030
11	PIPING AND INSTRUMENT SYMBOLS DIAGRAM	A10-3030

MPL NO P51-1010

FIGURE 9.3-7 STATION SERVICE AIR SYSTEM P&ID (Sheet 1 of 2)

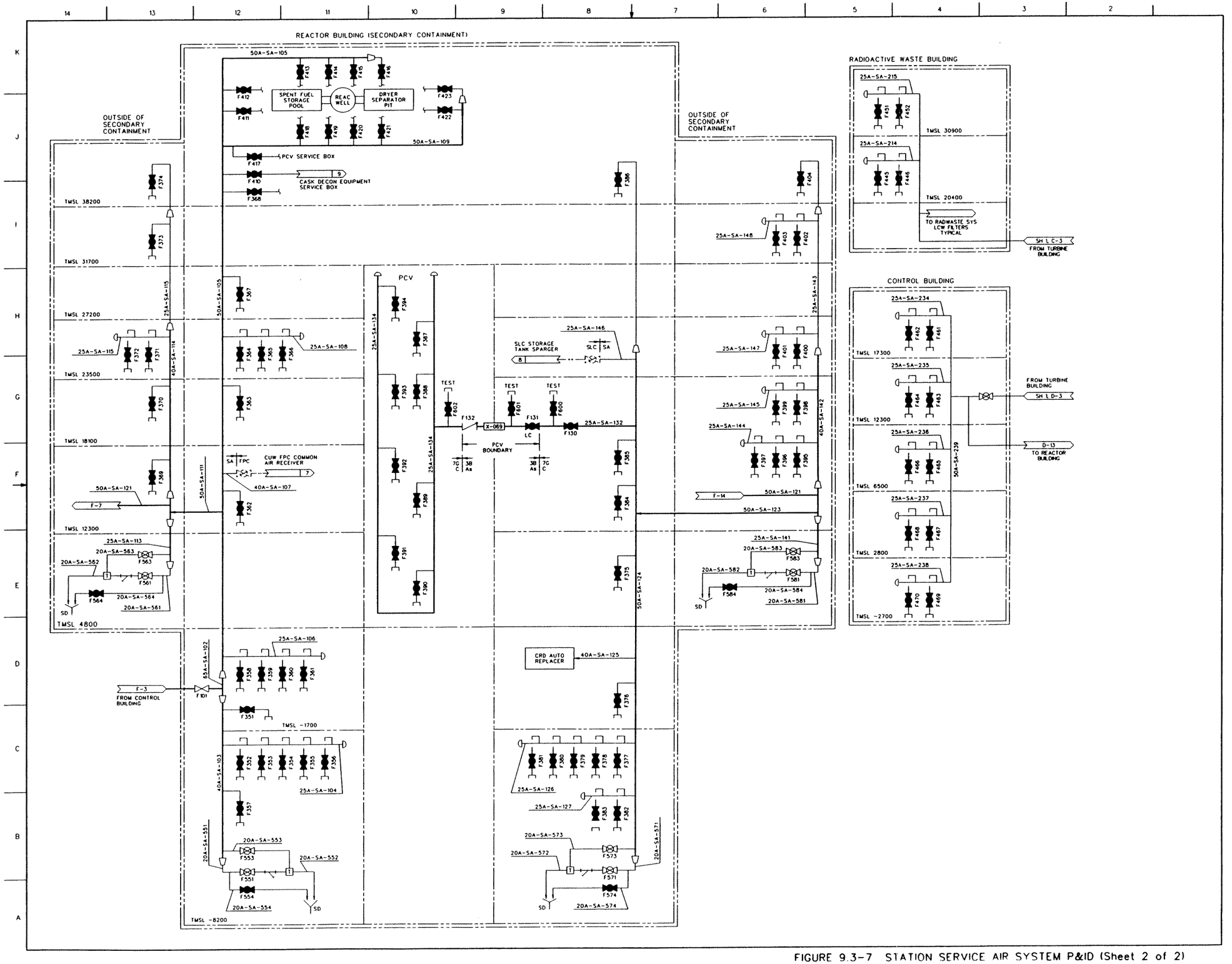
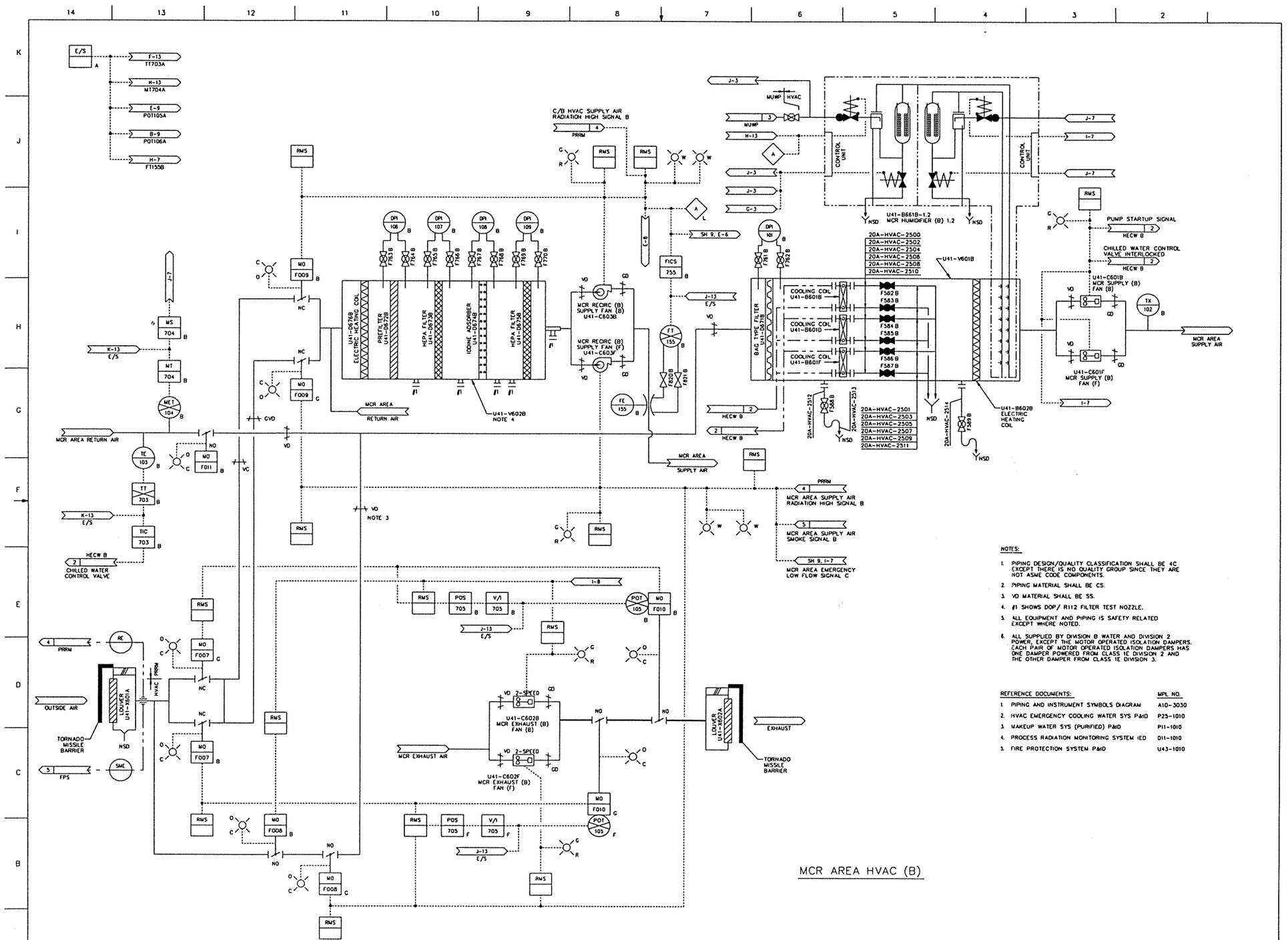


FIGURE 9.3-7 STATION SERVICE AIR SYSTEM P&ID (Sheet 2 of 2)



NOTES:

1. PIPING DESIGN/QUALITY CLASSIFICATION SHALL BE 4C EXCEPT THERE IS NO QUALITY GROUP SINCE THEY ARE NOT ASME CODE COMPONENTS.
2. PIPING MATERIAL SHALL BE CS.
3. VO MATERIAL SHALL BE SS.
4. #1 SHOWS DOP/ R112 FILTER TEST NOZZLE.
5. ALL EQUIPMENT AND PIPING IS SAFETY RELATED EXCEPT WHERE NOTED.
6. ALL SUPPLIED BY DIVISION B WATER AND DIVISION 2 POWER, EXCEPT THE MOTOR OPERATED ISOLATION DAMPERS. EACH PAIR OF MOTOR OPERATED ISOLATION DAMPERS HAS ONE DAMPER POWERED FROM CLASS 1E DIVISION 2 AND THE OTHER DAMPER FROM CLASS 1E DIVISION 3.

REFERENCE DOCUMENTS:

	MPL NO.
1. PIPING AND INSTRUMENT SYMBOLS DIAGRAM	A10-3030
2. HVAC EMERGENCY COOLING WATER SYS P&ID	P25-1010
3. MAKEUP WATER SYS (PURIFIED) P&ID	P11-1010
4. PROCESS RADIATION MONITORING SYSTEM IED	D11-1010
5. FIRE PROTECTION SYSTEM P&ID	U43-1010

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FIGURE 9.4-1 CONTROL BUILDING HVAC FLOW DIAGRAM (Sheet 1 of 5)

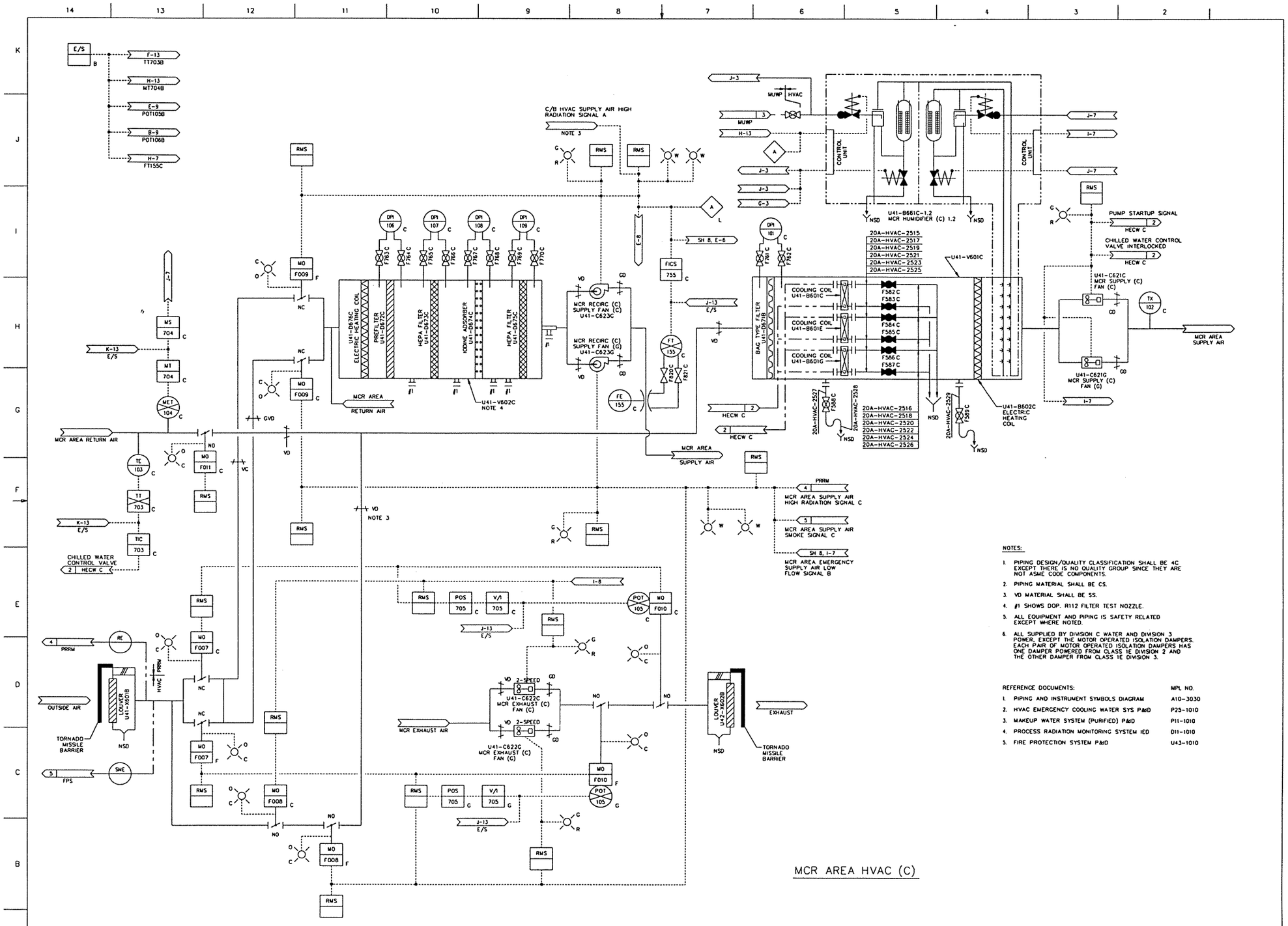

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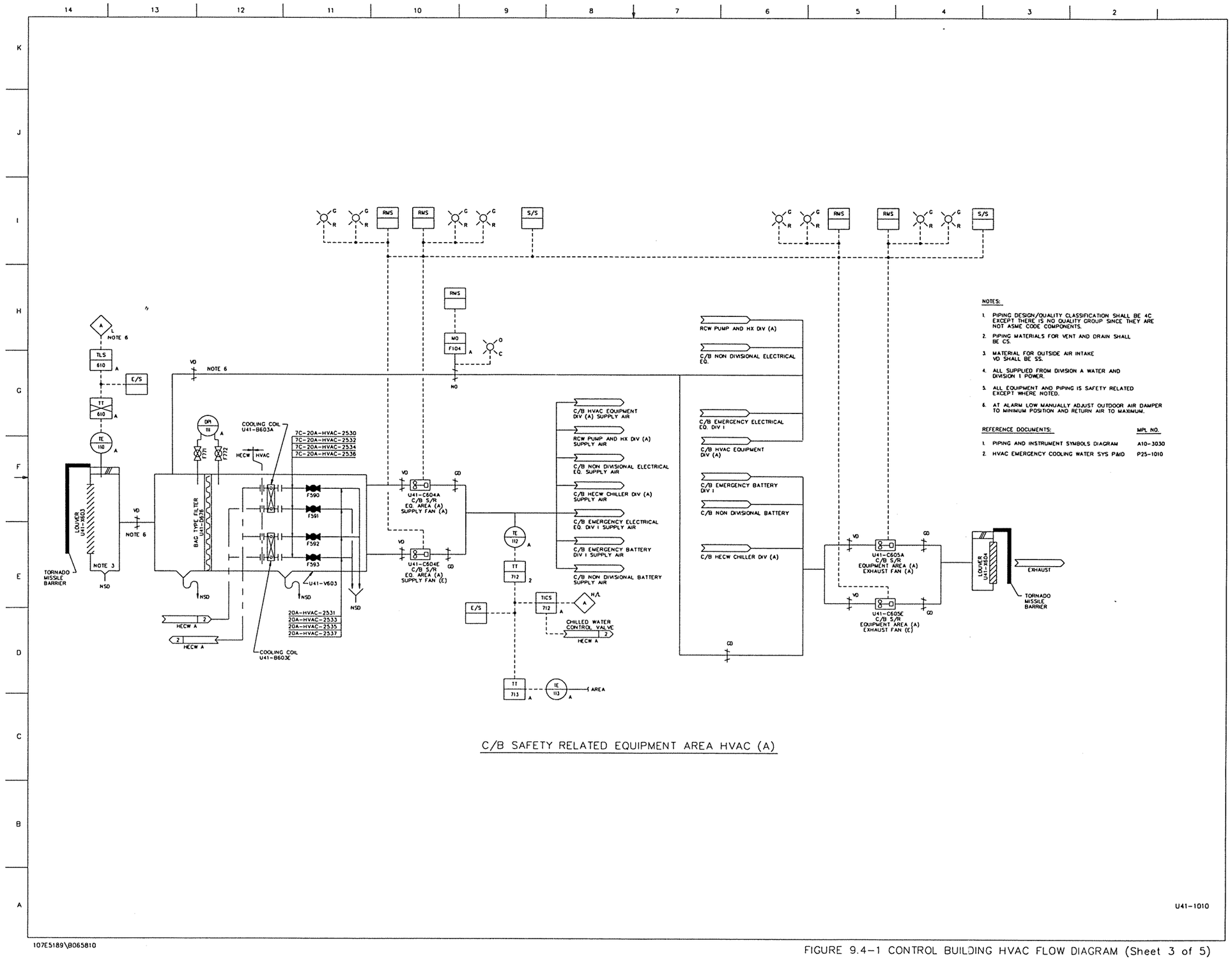
FIGURE 9.4-1 CONTROL BUILDING HVAC FLOW DIAGRAM (Sheet 2 of 5)



NOTES:

1. PIPING DESIGN/QUALITY CLASSIFICATION SHALL BE 4C EXCEPT THERE IS NO QUALITY GROUP SINCE THEY ARE NOT ASME CODE COMPONENTS.
2. PIPING MATERIALS FOR VENT AND DRAIN SHALL BE CS.
3. MATERIAL FOR OUTSIDE AIR INTAKE VD SHALL BE SS.
4. ALL SUPPLIED FROM DIVISION A WATER AND DIVISION 1 POWER.
5. ALL EQUIPMENT AND PIPING IS SAFETY RELATED EXCEPT WHERE NOTED.
6. AT ALARM LOW MANUALLY ADJUST OUTDOOR AIR DAMPER TO MINIMUM POSITION AND RETURN AIR TO MAXIMUM.

REFERENCE DOCUMENTS:

	MPL NO.
1. PIPING AND INSTRUMENT SYMBOLS DIAGRAM	A10-3030
2. HVAC EMERGENCY COOLING WATER SYS P&ID	P25-1010

C/B SAFETY RELATED EQUIPMENT AREA HVAC (A)

U41-1010

107E5189\B065810

FIGURE 9.4-1 CONTROL BUILDING HVAC FLOW DIAGRAM (Sheet 3 of 5)

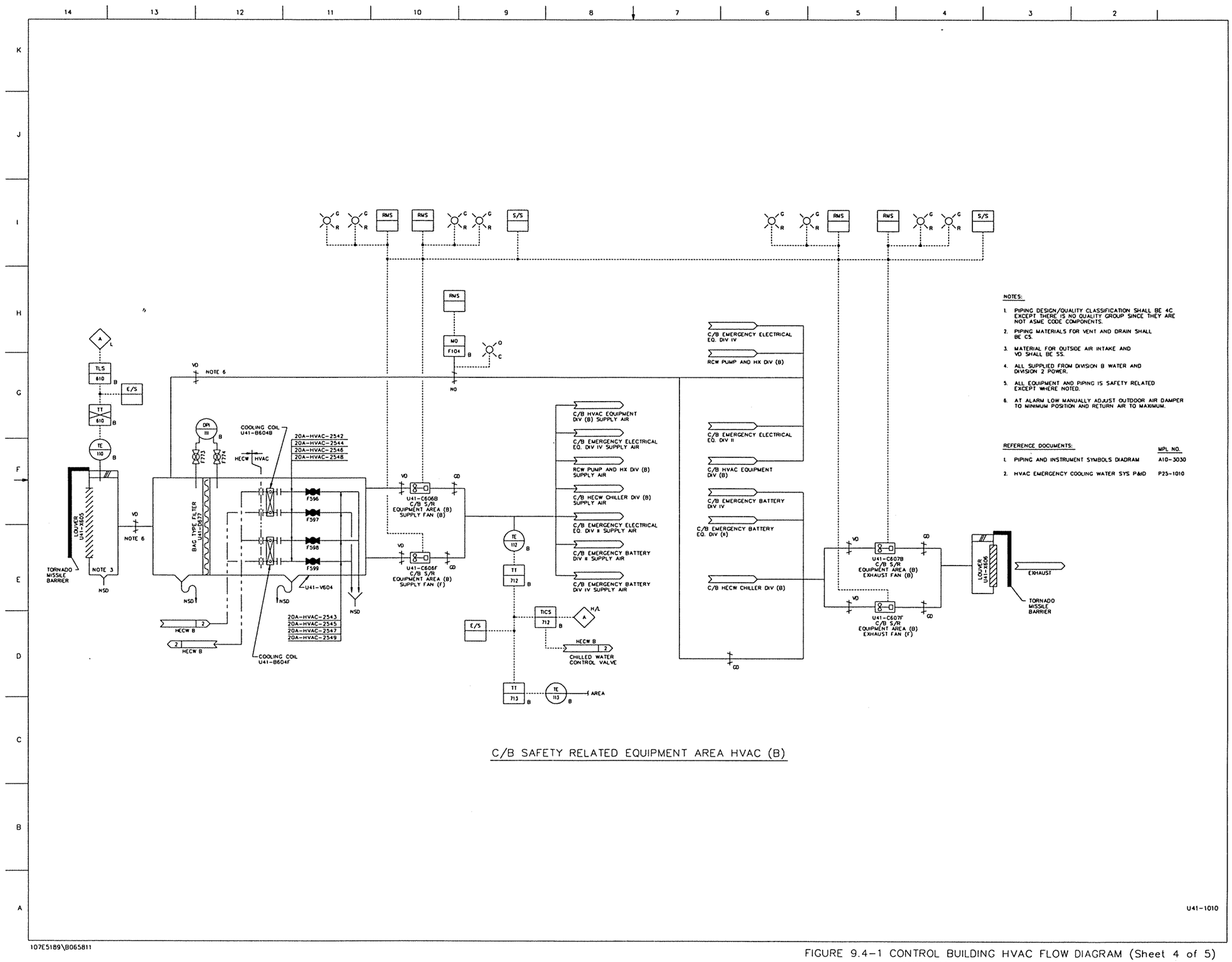
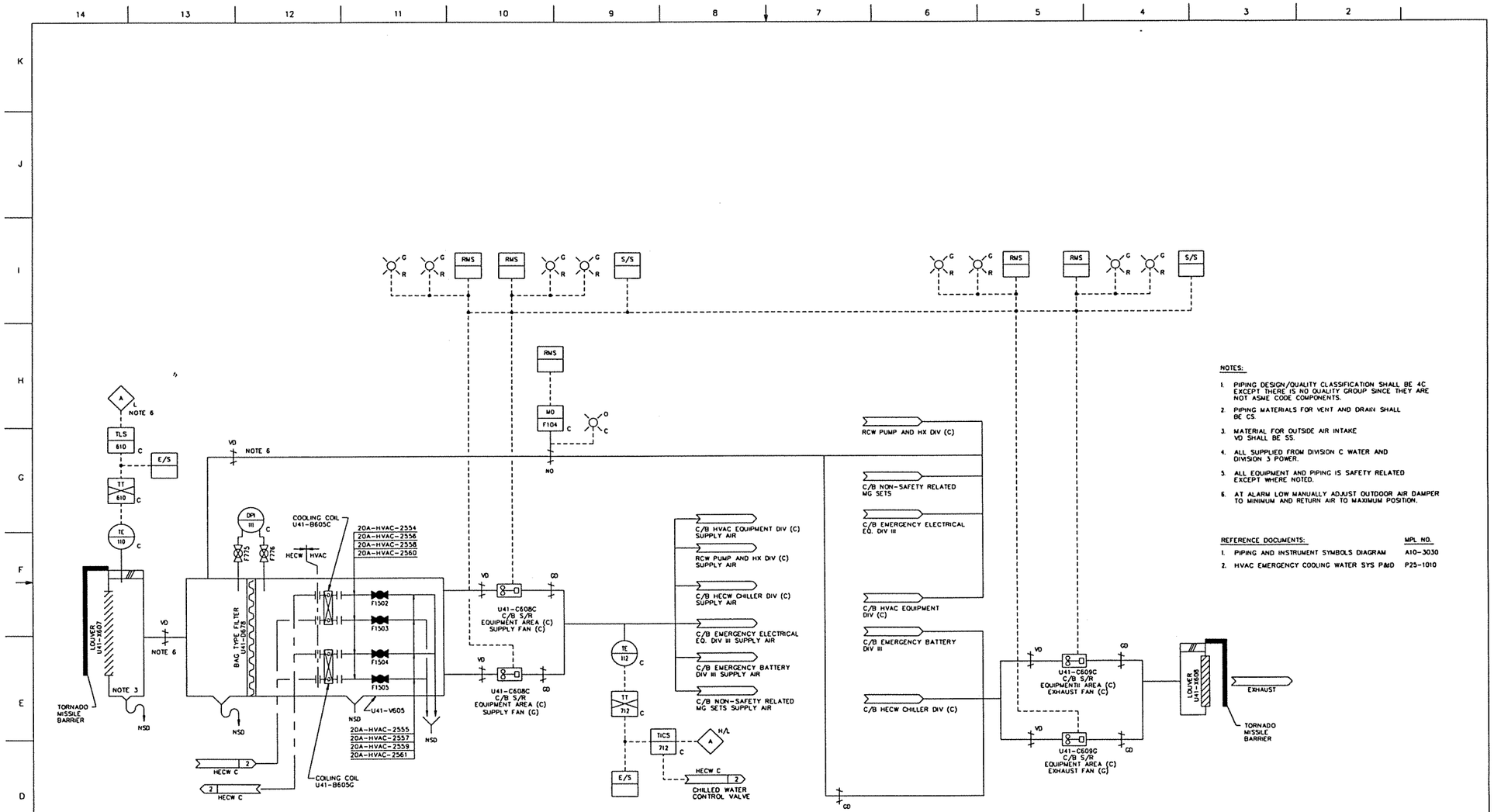


FIGURE 9.4-1 CONTROL BUILDING HVAC FLOW DIAGRAM (Sheet 4 of 5)



C/B SAFETY RELATED EQUIPMENT AREA HVAC (C)

107E5189\B065812

FIGURE 9.4-1 CONTROL BUILDING HVAC FLOW DIAGRAM (Sheet 5 of 5)

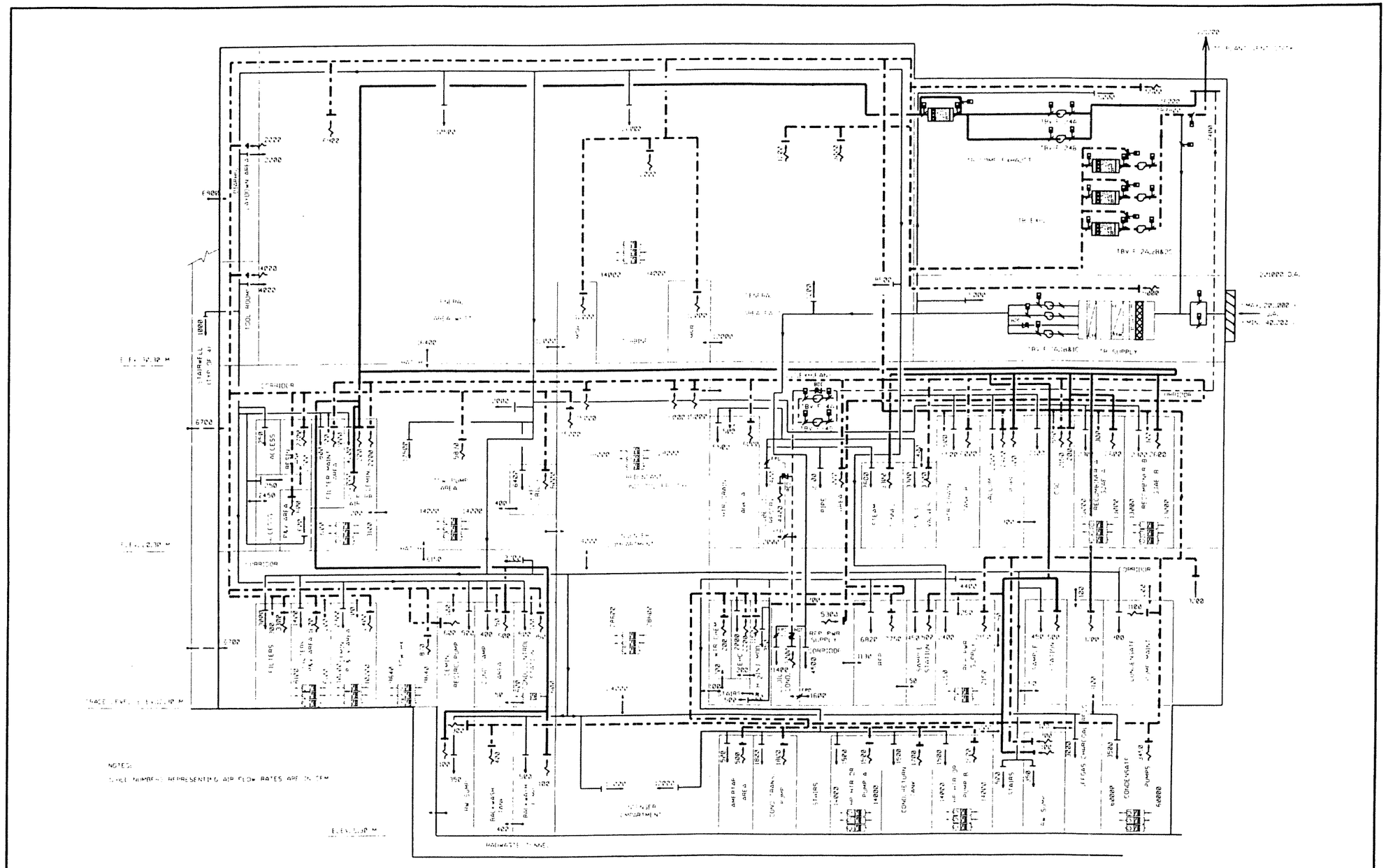


Figure 9.4-2a TURBINE BUILDING VENTILATION SYSTEM AIR FLOW DIAGRAM

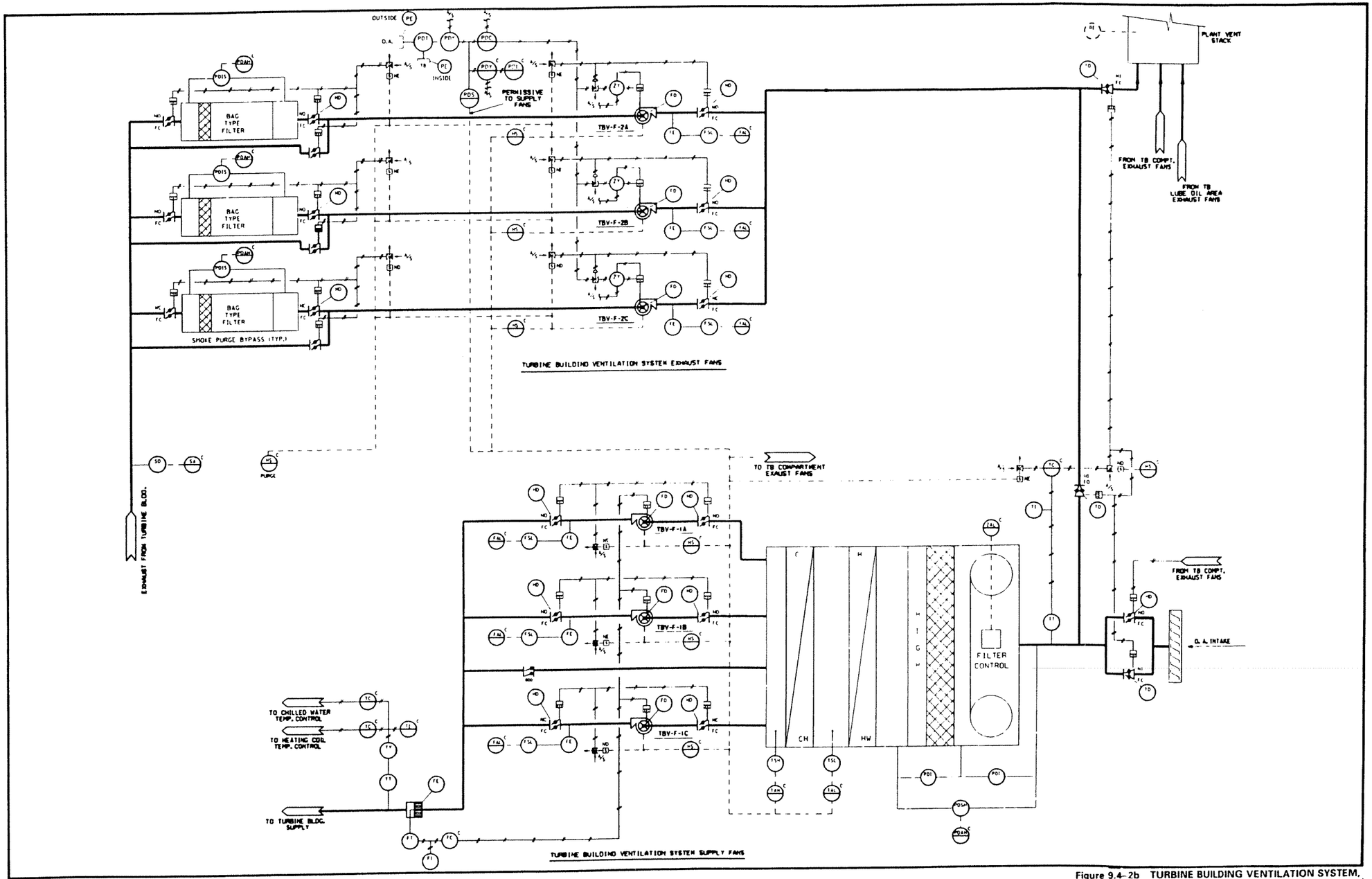


Figure 9.4-2b TURBINE BUILDING VENTILATION SYSTEM, CONTROL DIAGRAM, Sheet 1

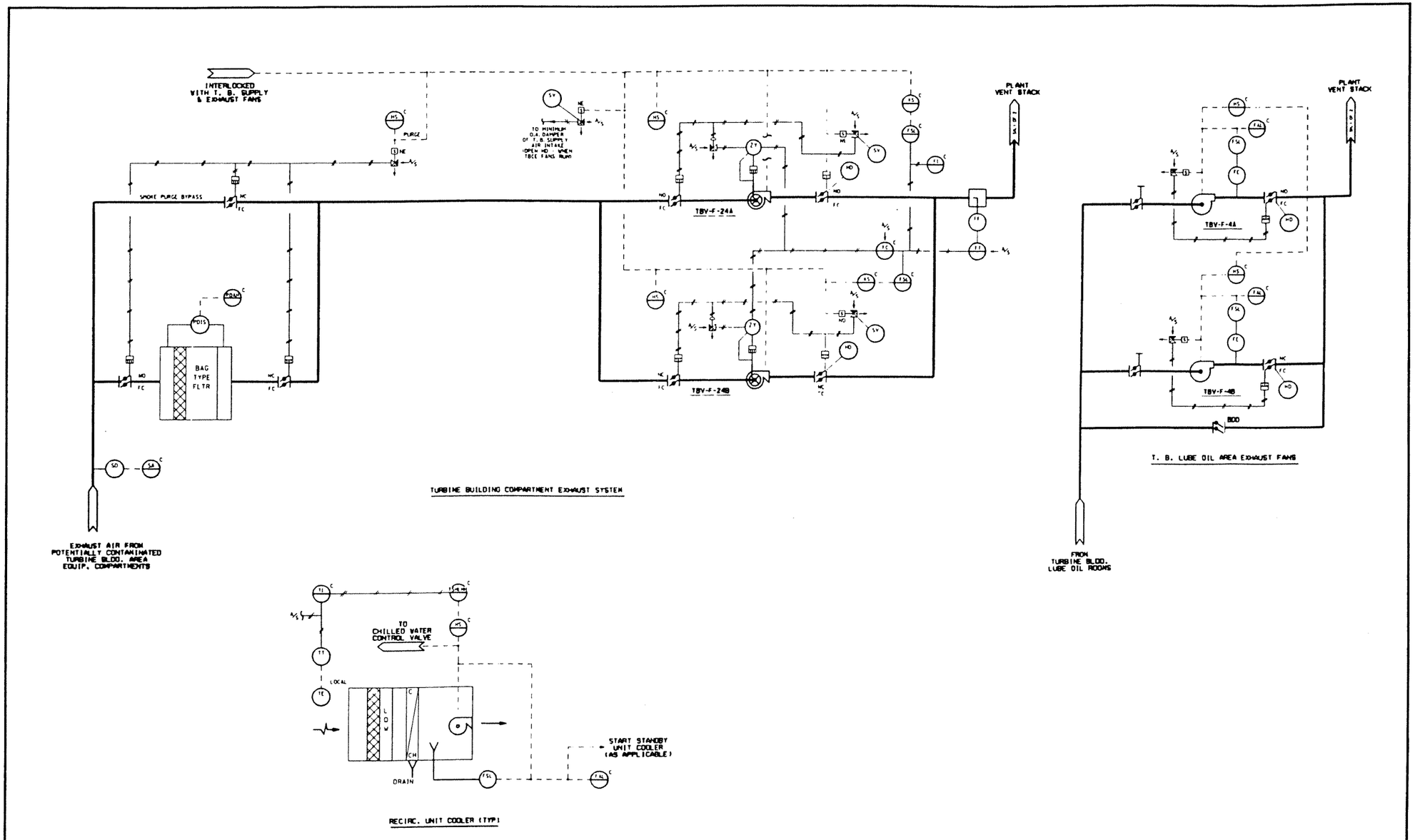
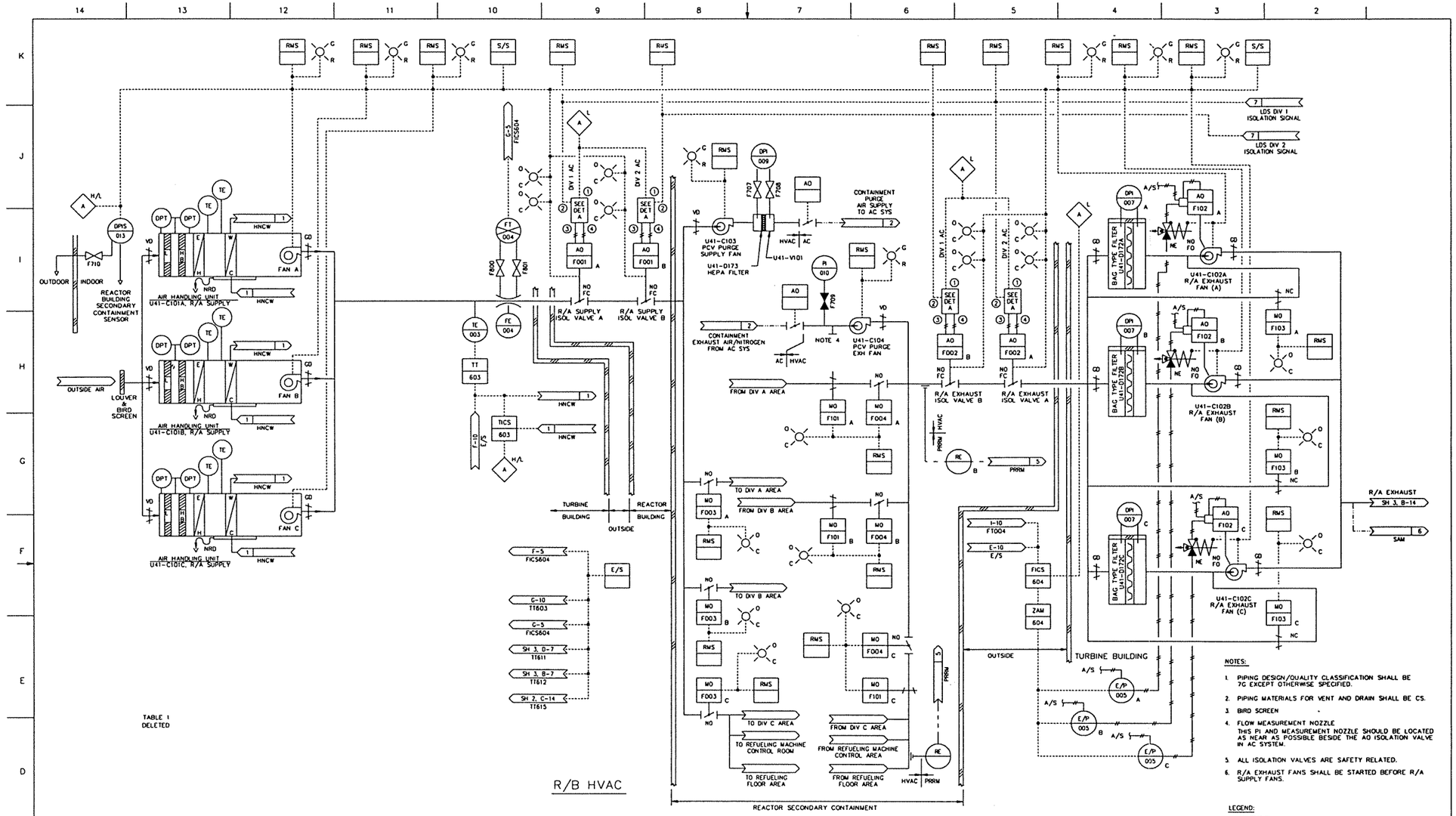


Figure 9.4–2b TURBINE BUILDING VENTILATION SYSTEM, CONTROL DIAGRAM, Sheet 2



NOTES:

1. PIPING DESIGN/QUALITY CLASSIFICATION SHALL BE 7G EXCEPT OTHERWISE SPECIFIED.
2. PIPING MATERIALS FOR VENT AND DRAIN SHALL BE CS.
3. BIRD SCREEN
4. FLOW MEASUREMENT NOZZLE
   THIS PI AND MEASUREMENT NOZZLE SHOULD BE LOCATED AS NEAR AS POSSIBLE BESIDE THE AO ISOLATION VALVE IN AC SYSTEM.
5. ALL ISOLATION VALVES ARE SAFETY RELATED.
6. R/A EXHAUST FANS SHALL BE STARTED BEFORE R/A SUPPLY FANS.

LEGEND:

L = LOW EFFICIENCY
HE = HIGH EFFICIENCY

REFERENCE DOCUMENTS:

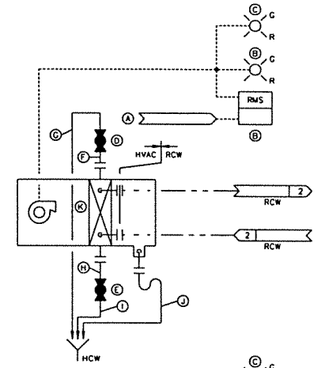
	MPL NO.
1. HVAC NORMAL COOLING WATER SYSTEM P&ID	P24-1010
2. ATMOSPHERIC CONTROL SYSTEM P&ID	T31-1010
3. PIPING AND INSTRUMENT SYMBOLS DIAGRAM	A10-3030
4. DELETED	
5. PROCESS RADIATION MONITORING SYSTEM IED	D11-1010
6. SAMPLING SYSTEM P&ID	P91-1010
7. LEAK DETECTION & ISOLATION SYSTEM IED	E31-1010

TABLE 2

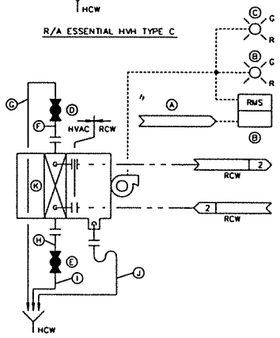
VALVE NO.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	Ⓔ	Ⓕ	Ⓖ	Ⓗ	Ⓙ	Ⓚ	Ⓛ
U41-F001A	F011A	F012A	F013A	F014A	F015A	F016A	F017A	F018A	F019A	F703A	005A
U41-F001B	F011B	F012B	F013B	F014B	F015B	F016B	F017B	F018B	F019B	F703B	005B
U41-F002A	F021A	F022A	F023A	F024A	F025A	F026A	F027A	F028A	F029A	F704A	006A
U41-F002B	F021B	F022B	F023B	F024B	F025B	F026B	F027B	F028B	F029B	F704B	006B

U41-1010

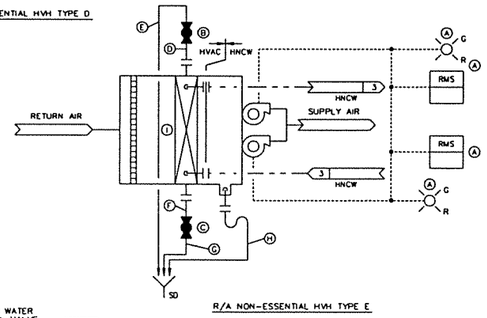
107E5189\B065801



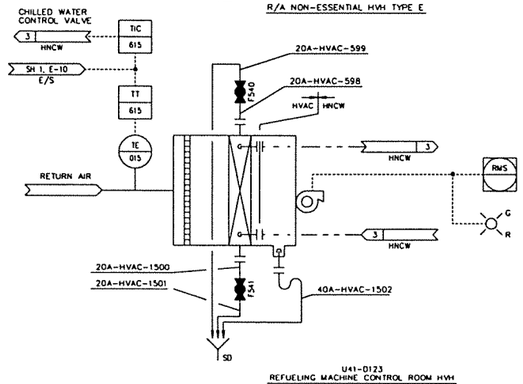
R/A ESSENTIAL HVH TYPE C



R/A ESSENTIAL HVH TYPE D



R/A NON-ESSENTIAL HVH TYPE E



U41-D123
REFUELING MACHINE CONTROL ROOM HVH

TABLE 3: ESSENTIAL HVH

TYPE	EQ. NO.	HVH NAME	HVH INITIATION SIGNAL (A)	PANEL NO. (B)	PANEL NO. (C)	VALVE NO. (D)	VALVE NO. (E)	PIPING SIZE & NO. (F)	PIPING SIZE & NO. (G)	PIPING SIZE & NO. (H)	PIPING SIZE & NO. (I)	PIPING SIZE & NO. (J)	COOLING COIL (K)
D	U41-D101	RCIC PUMP ROOM HVH	RCIC PUMP START SIGNAL			F504	F505	20A-HVAC -508	20-HVAC -509	20-HVAC -510	20-HVAC -511	40-HVAC -512	B101
D	U41-D102	HPCF PUMP (C) ROOM HVH	HPCF PUMP (C) START SIGNAL			F506	F507	-513	-514	-515	-516	-517	B102
D	U41-D103	RHR PUMP (A) ROOM HVH	RHR PUMP (A) START SIGNAL			F508	F509	-518	-519	-520	-521	-522	B103
D	U41-D104	RHR PUMP (C) ROOM HVH	RHR PUMP (C) START SIGNAL			F510	F511	-523	-524	-525	-526	-527	B104
D	U41-D105	RHR PUMP (B) ROOM HVH	RHR PUMP (B) START SIGNAL			F512	F513	-528	-529	-530	-531	-532	B105
D	U41-D106	HPCF PUMP (B) ROOM HVH	HPCF PUMP (B) START SIGNAL			F514	F515	-533	-534	-535	-536	-537	B106
D	U41-D107	FCS ROOM HVH (C)	SECONDARY CONTAINMENT ISOLATION SIGNAL			F516	F517	-538	-539	-540	-541	-542	B107
D	U41-D108	FCS ROOM HVH (B)	SECONDARY CONTAINMENT ISOLATION SIGNAL			F518	F519	-543	-544	-545	-546	-547	B108
D	U41-D111	SGTS ROOM HVH (C)	SECONDARY CONTAINMENT ISOLATION SIGNAL			F524	F525	-558	-559	-560	-561	-562	B111
D	U41-D112	SGTS ROOM HVH (B)	SECONDARY CONTAINMENT ISOLATION SIGNAL			F526	F527	-563	-564	-565	-566	-567	B112
C	U41-D113	CAMS (A) ROOM HVH	SECONDARY CONTAINMENT ISOLATION SIGNAL			F528	F529	-568	-569	-570	-571	-572	B113
C	U41-D114	CAMS (B) ROOM HVH	SECONDARY CONTAINMENT ISOLATION SIGNAL			F530	F531	-573	-574	-575	-576	-577	B114

TABLE 4 : NON-ESSENTIAL AIR HANDLING UNIT (NON-SAFETY RELATED)

TYPE	EQ. NO.	HVH NAME	PANEL NO. (A)	VALVE NO. (B)	VALVE NO. (C)	PIPING SIZE & NO. (D)	PIPING SIZE & NO. (E)	PIPING SIZE & NO. (F)	PIPING SIZE & NO. (G)	PIPING SIZE & NO. (H)	COOLING COIL (I)
E	U41-D121A	R/A MS TUNNEL HVH (A) NOTE 3		F536	F537	20A-HVAC -588	20A-HVAC -589	20A-HVAC -590	20A-HVAC -591	40A-HVAC -592	B121A
E	U41-D121B	R/A MS TUNNEL HVH (B) NOTE 3		F538	F539	20A-HVAC -593	20A-HVAC -594	20A-HVAC -595	20A-HVAC -596	40A-HVAC -597	B121B
E	U41-D115	R/A SPCU PUMP ROOM		F	F	20A-HVAC -1503	20A-HVAC -1504	20A-HVAC -1505	20A-HVAC -1506	40A-HVAC -1507	B115
-	U41-D123	R/A REFUELING MACHINE CONTROL ROOM HVH		F	F	20A-HVAC -598	20A-HVAC -599	20A-HVAC -1500	20A-HVAC -1501	40A-HVAC -1502	B123
D	U41-D109	FPC PUMP (A) ROOM HVH		F520	F521	-548	-549	-550	-551	-552	B109
D	U41-D110	FPC PUMP (B) ROOM HVH		F522	F523	-553	-554	-555	-556	-557	B110

TABLE 5 : NON-ESSENTIAL AIR HANDLING UNIT (NON-SAFETY RELATED)

TYPE	EQ. NO.	HVH NAME	PIPE SIZE & NO. (B)	COOLING COIL (C)
MV504	U41-D131A	CRD CONTROL ROOM	20A-HVAC -1514	B131A
MV504	U41-D132A	MG SET ROOM (A) NOTE 4	20A-HVAC -1517	B132A
MV504	U41-D132B	MG SET ROOM (C) NOTE 4	20A-HVAC -1518	B132B
MV504	U41-D133A	NON-DIVISIONAL ELECTRICAL EQUIPMENT ZONE NOTE 4	20A-HVAC -1519	B133
MV504	U41-D134A	ISI ROOM	20A-HVAC -1512	B134A

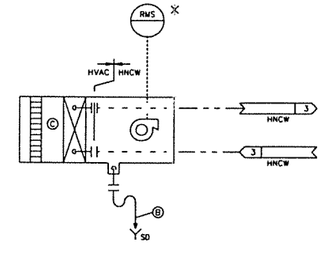
R/B AND C/B HVAC

NOTES:

1. PIPING MATERIALS FOR VENT AND DRAIN SHALL BE CS.
2. PIPING DESIGN/QUALITY CLASSIFICATION SHALL BE 7G EXCEPT OTHERWISE SPECIFIED.
3. THESE HVH'S CAN BE COMBINED INTO A COMMON COIL.
4. THESE UNITS ARE IN CONTROL BUILDING.

REFERENCE DOCUMENTS:

	MPL NO.
1. PIPING AND INSTRUMENT SYMBOLS DIAGRAM	A10-3030
2. REACTOR BLDG COOLING WATER SYS P&ID	P21-1010
3. HVAC NORMAL COOLING WATER SYS P&ID	P24-1010



R/A NON-ESSENTIAL UNIT TYPE MV504

U41-1010

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FIGURE 9.4-3 SECONDARY CONTAINMENT HVAC SYSTEM (Sheet 2 of 3)

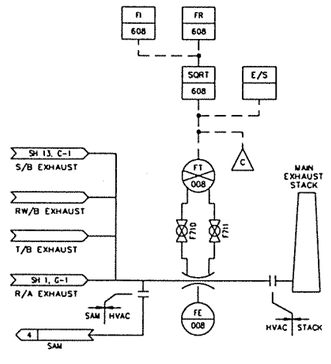
TABLE 6 : EMERGENCY ISOLATION DAMPER (SAFETY-RELATED)

DAMPER NAME	DAMPER NO.
SECONDARY CONTAINMENT SUPPLY DAMPER	F001A
SECONDARY CONTAINMENT SUPPLY DAMPER	F001B
SECONDARY CONTAINMENT EXHAUST DAMPER	F002A
SECONDARY CONTAINMENT EXHAUST DAMPER	F002B

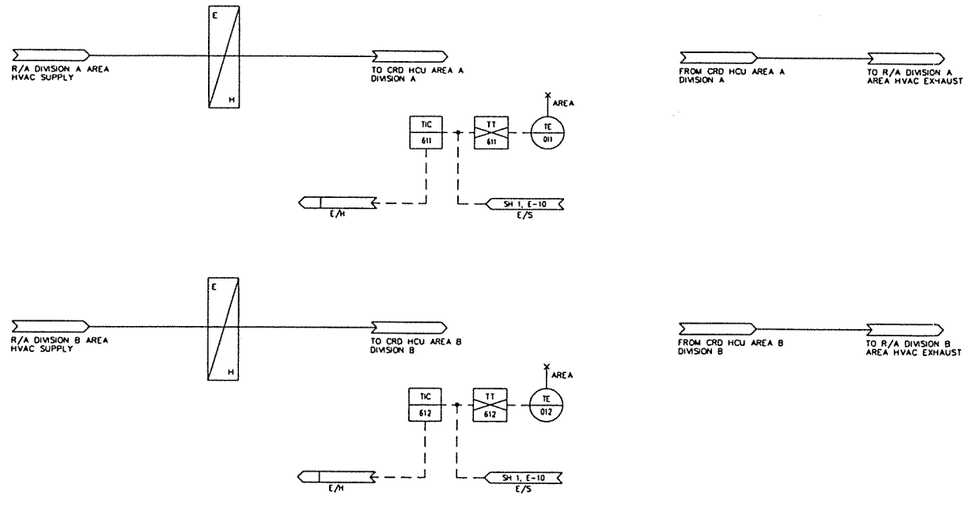
NOTES:

1. PIPING DESIGN/QUALITY CLASSIFICATION SHALL BE 7G EXCEPT OTHERWISE SPECIFIED.
2. PIPING MATERIALS FOR VENT AND DRAIN SHALL BE CS.

REFERENCE DOCUMENTS:	MPL NO.
1. PIPING AND INSTRUMENT SYMBOLS DIAGRAM	A10-3030
2. DELETED	
3. PROCESS RADIATION MONITORING SYS P&ID	D11-1010
4. SAMPLING SYSTEM P&ID	P91-1010



EXHAUST AIR MEASUREMENT

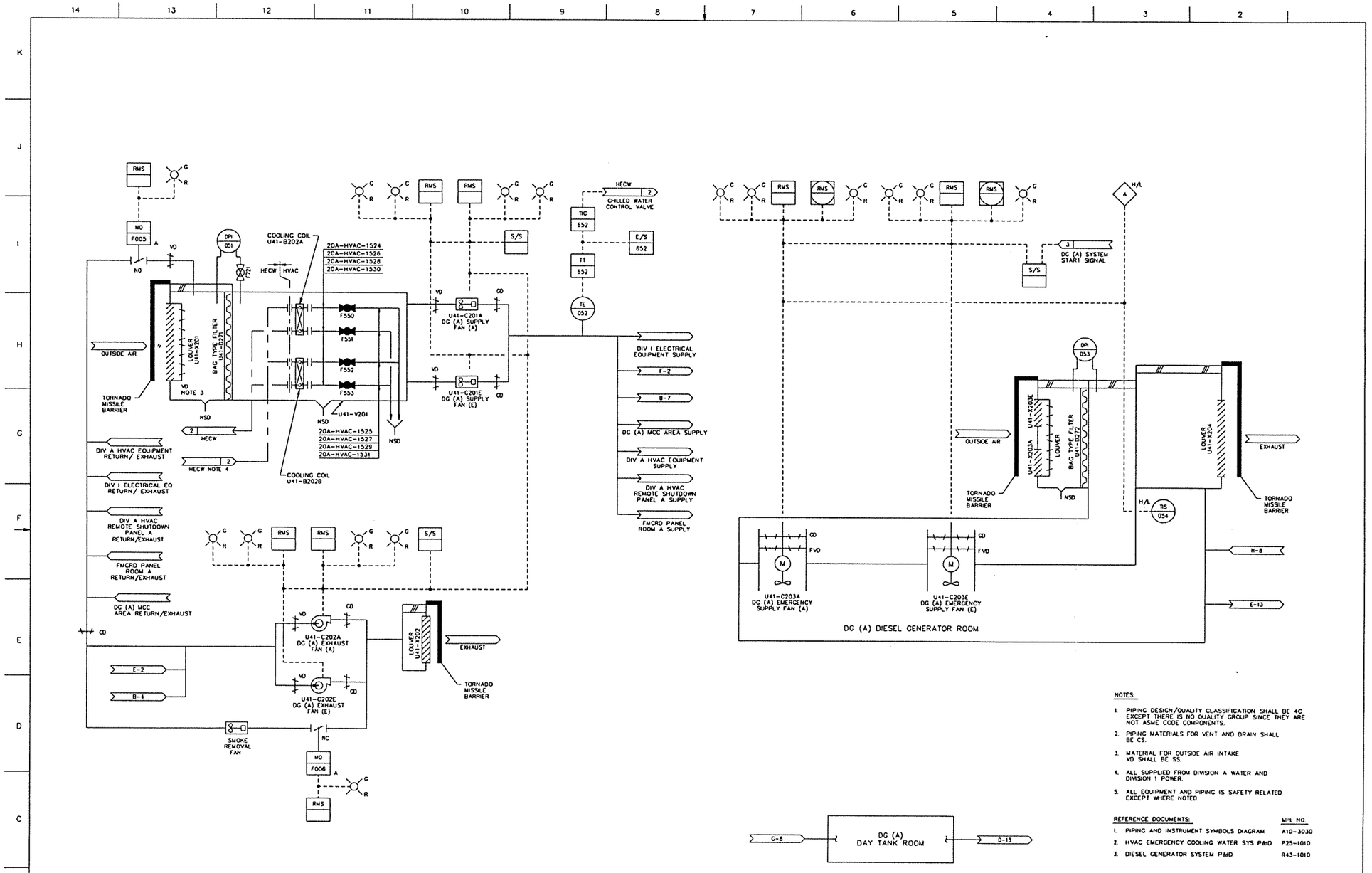


R/B HVAC

U41-1010

107E5189\B065803

FIGURE 9.4-3 SECONDARY CONTAINMENT HVAC SYSTEM (Sheet 3 of 3)



NOTES:

1. PIPING DESIGN/QUALITY CLASSIFICATION SHALL BE 4C EXCEPT THERE IS NO QUALITY GROUP SINCE THEY ARE NOT ASME CODE COMPONENTS.
2. PIPING MATERIALS FOR VENT AND DRAIN SHALL BE CS.
3. MATERIAL FOR OUTSIDE AIR INTAKE VD SHALL BE SS.
4. ALL SUPPLIED FROM DIVISION A WATER AND DIVISION 1 POWER.
5. ALL EQUIPMENT AND PIPING IS SAFETY RELATED EXCEPT WHERE NOTED.

REFERENCE DOCUMENTS:

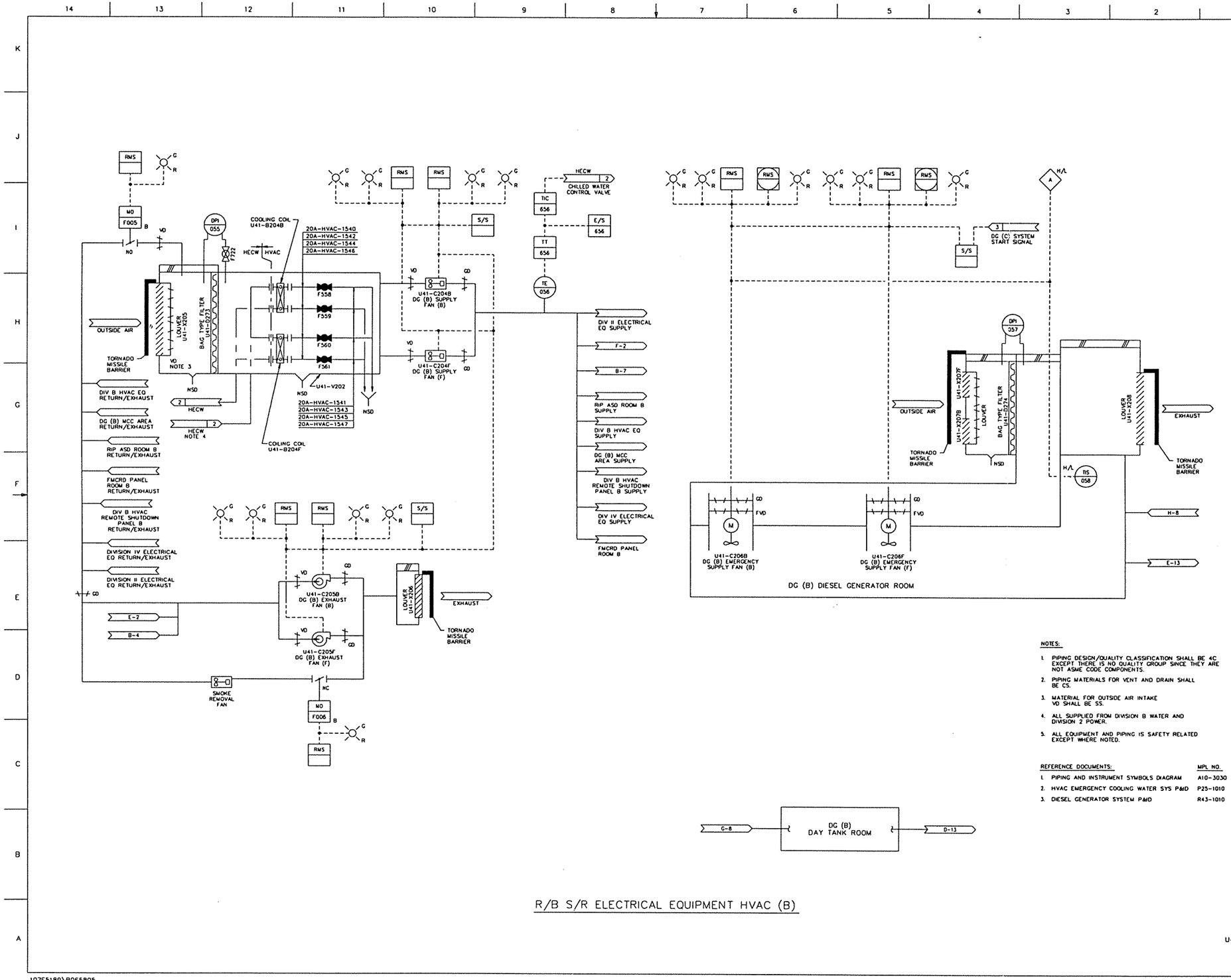
		MPL NO.
1.	PIPING AND INSTRUMENT SYMBOLS DIAGRAM	A10-3030
2.	HVAC EMERGENCY COOLING WATER SYS P&ID	P25-1010
3.	DIESEL GENERATOR SYSTEM P&ID	R43-1010

R/B S/R ELECTRICAL EQUIPMENT HVAC (A)

U41-1010

107E5189\B065804

FIGURE 9.4-4 R/B SAFETY-RELATED ELECTRICAL EQUIPMENT HVAC SYSTEM (Sheet 1 of 3)



NOTES:

1. PIPING DESIGN/QUALITY CLASSIFICATION SHALL BE 4C EXCEPT THERE IS NO QUALITY GROUP SINCE THEY ARE NOT ASME CODE COMPONENTS.
2. PIPING MATERIALS FOR VENT AND DRAIN SHALL BE CS.
3. MATERIAL FOR OUTSIDE AIR INTAKE VD SHALL BE SS.
4. ALL SUPPLIED FROM DIVISION B WATER AND DIVISION 2 POWER.
5. ALL EQUIPMENT AND PIPING IS SAFETY RELATED EXCEPT WHERE NOTED.

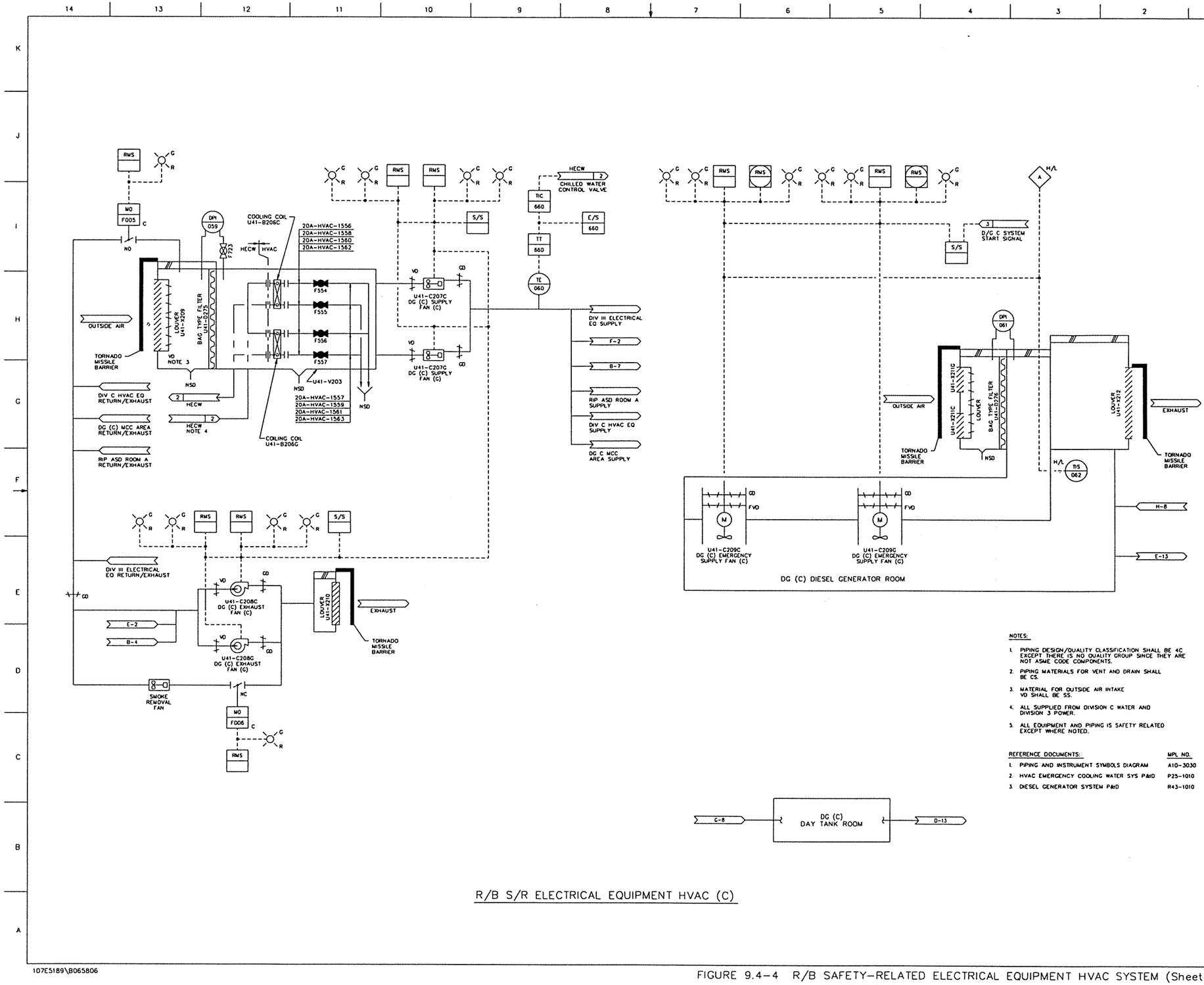
REFERENCE DOCUMENTS:		MPL NO.
1.	PIPING AND INSTRUMENT SYMBOLS DIAGRAM	A10-3030
2.	HVAC EMERGENCY COOLING WATER SYS P&ID	P25-1010
3.	DIESEL GENERATOR SYSTEM P&ID	R43-1010

R/B S/R ELECTRICAL EQUIPMENT HVAC (B)

U41-1010

107E5189\B065805

FIGURE 9.4-4 R/B SAFETY-RELATED ELECTRICAL EQUIPMENT HVAC SYSTEM (Sheet 2 of 3)



NOTES:

1. PIPING DESIGN/QUALITY CLASSIFICATION SHALL BE 4C EXCEPT THERE IS NO QUALITY GROUP SINCE THEY ARE NOT ASME CODE COMPONENTS.
2. PIPING MATERIALS FOR VENT AND DRAIN SHALL BE CS.
3. MATERIAL FOR OUTSIDE AIR INTAKE VD SHALL BE SS.
4. ALL SUPPLIED FROM DIVISION C WATER AND DIVISION 3 POWER.
5. ALL EQUIPMENT AND PIPING IS SAFETY RELATED EXCEPT WHERE NOTED.

REFERENCE DOCUMENTS:

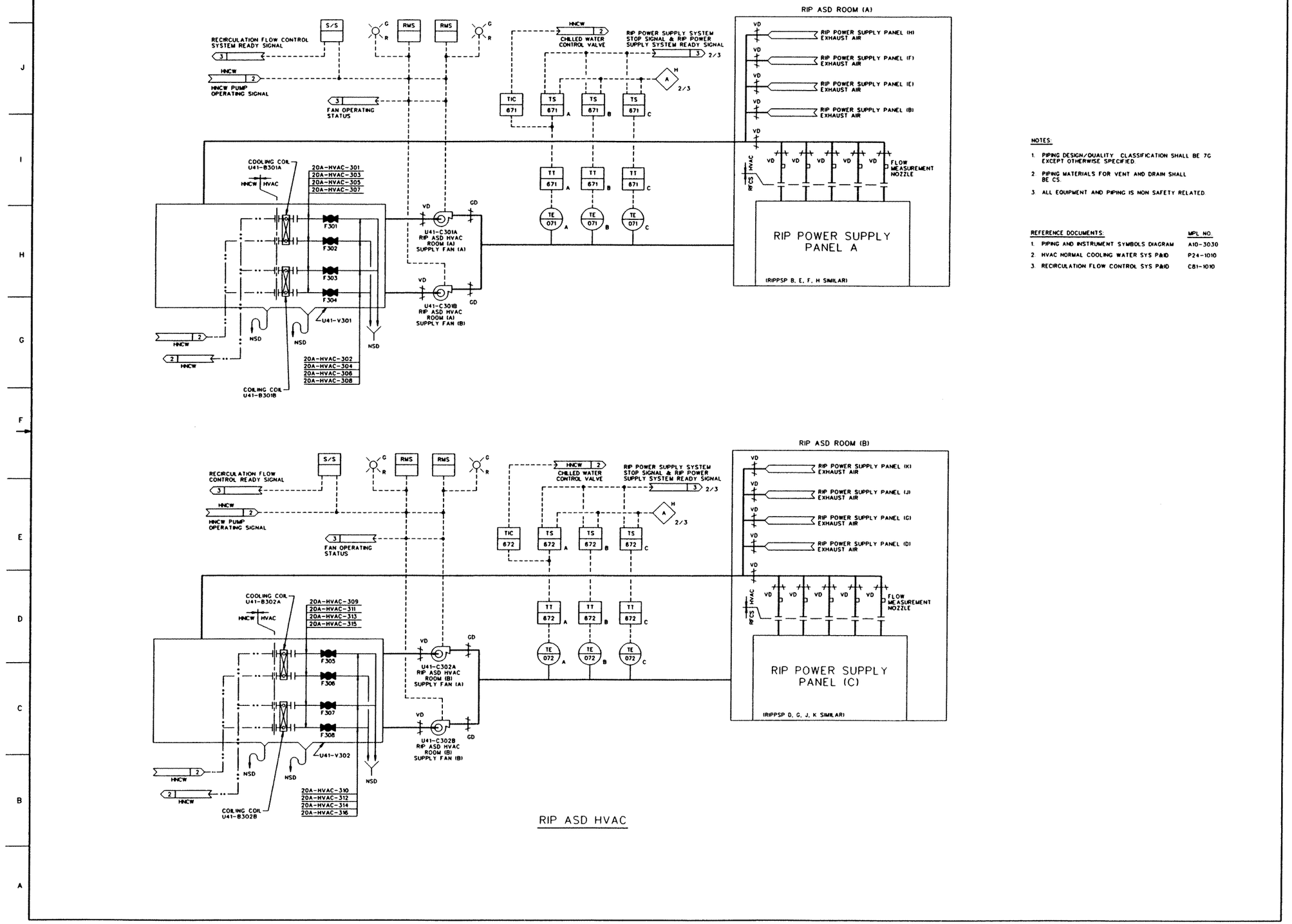
		MPL NO.
1.	PIPING AND INSTRUMENT SYMBOLS DIAGRAM	A10-3030
2.	HVAC EMERGENCY COOLING WATER SYS P&ID	P25-1010
3.	DIESEL GENERATOR SYSTEM P&ID	R43-1010

R/B S/R ELECTRICAL EQUIPMENT HVAC (C)

U41-1010

107E5189\B065806

FIGURE 9.4-4 R/B SAFETY-RELATED ELECTRICAL EQUIPMENT HVAC SYSTEM (Sheet 3 of 3)

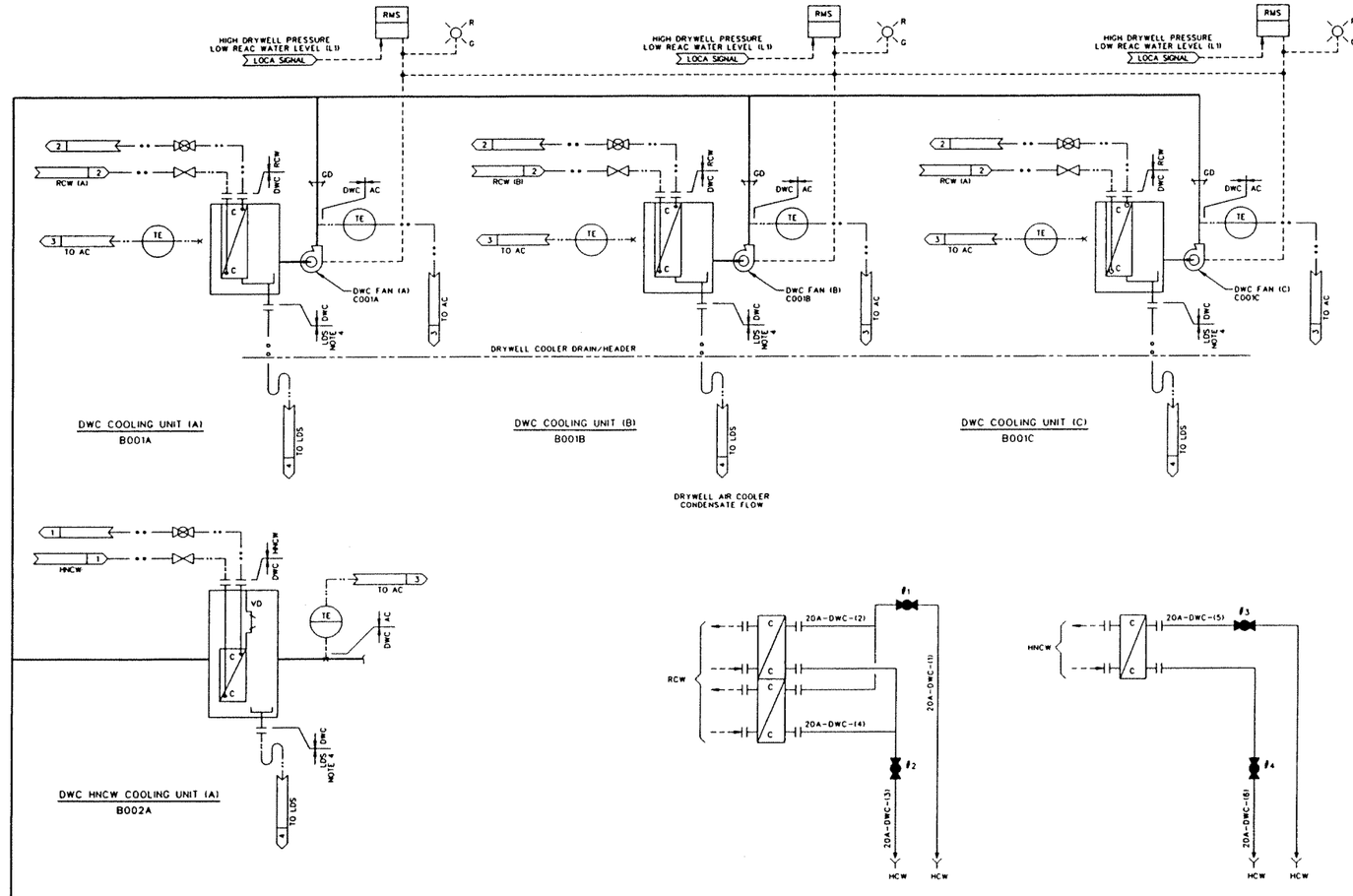


NOTES:

1. PIPING DESIGN/QUALITY CLASSIFICATION SHALL BE 7G EXCEPT OTHERWISE SPECIFIED.
2. PIPING MATERIALS FOR VENT AND DRAIN SHALL BE CS.
3. ALL EQUIPMENT AND PIPING IS NON SAFETY RELATED.

REFERENCE DOCUMENTS:	MPL NO.
1. PIPING AND INSTRUMENT SYMBOLS DIAGRAM	A10-3030
2. HVAC NORMAL COOLING WATER SYS P&ID	P24-1010
3. RECIRCULATION FLOW CONTROL SYS P&ID	C81-1010

FIGURE 9.4-5 REACTOR INTERNAL PUMP ASD HVAC SYSTEM



DETAILED DRAWING OF COOLING COIL'S DRAIN AND VENT LINE
SEE TABLE 1

TABLE 1

EQUIPMENT NO.	PIPING NO						VALVE NO.			
	(1)	(2)	(3)	(4)	(5)	(6)	#1	#2	#3	#4
T41-B001A	501	502	503	504			F501A	F502A		
T41-B001B	505	506	507	508			F501B	F502B		
T41-B001C	509	510	511	512			F501C	F502C		
T41-B002A					513	514			F503A	F504A
T41-B002B					515	516			F503B	F504B

NOTES

1. TWO OF DWC FANS ARE OPERATED UNDER NORMAL CONDITIONS
2. ALL FANS ARE STOPPED WITH LOCA SIGNAL
3. DESIGN CONDITION OF THIS SYSTEM IS AS FOLLOWS

SEISMIC CLASS		C
DESIGN/QUALITY CLASS		7G
MATERIALS	(PIPING)	CARBON STEEL
	(DUCT)	GALVANIZED SHEET
	(COOLING COIL)	COOPER TUBE & ALUMINUM FIN

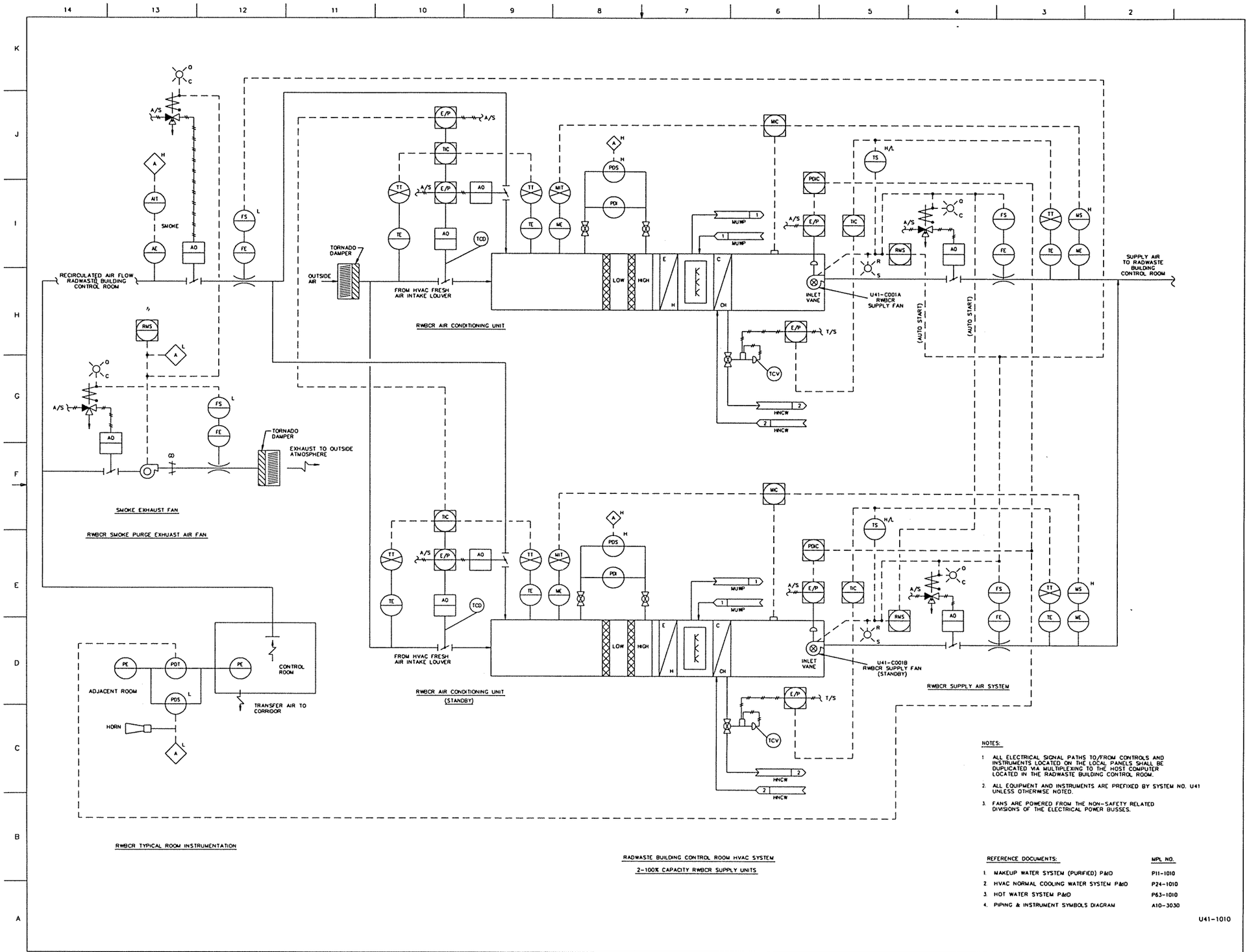
4. THIS CONDENSATE LINE USES STAINLESS STEEL UNTIL LDS INSTRUMENT AND THIS LINE CAN CHANGE DWC SYS.

REFERENCE DOCUMENTS

		MPL NO.
1	HVAC NORMAL COOLING WATER SYSTEM P&ID	P24-1010
2	REAC BLDG COOLING WATER SYS P&ID	P21-1010
3	ATMOSPHERIC CONTROL SYSTEM P&ID	D23-1010
4	LEAK DETECTION & ISOLATION SYS ICD	E31-1040
5	PIPING AND INSTRUMENT SYMBOLS DIAGRAM	A10-3030

MPL NO T41-1010

FIGURE 9.4-8 DRYWELL COOLING SYSTEM P&ID (Sheet 1 of 1)



NOTES:

1. ALL ELECTRICAL SIGNAL PATHS TO/FROM CONTROLS AND INSTRUMENTS LOCATED ON THE LOCAL PANELS SHALL BE DUPLICATED VIA MULTIPLEXING TO THE HOST COMPUTER LOCATED IN THE RADWASTE BUILDING CONTROL ROOM.
2. ALL EQUIPMENT AND INSTRUMENTS ARE PREFIXED BY SYSTEM NO. U41 UNLESS OTHERWISE NOTED.
3. FANS ARE POWERED FROM THE NON-SAFETY RELATED DIVISIONS OF THE ELECTRICAL POWER BUSSES.

REFERENCE DOCUMENTS:

		MPL NO.
1.	MAKEUP WATER SYSTEM (PURIFIED) P&ID	P11-1010
2.	HVAC NORMAL COOLING WATER SYSTEM P&ID	P24-1010
3.	HOT WATER SYSTEM P&ID	P63-1010
4.	PIPING & INSTRUMENT SYMBOLS DIAGRAM	A10-3030

U41-1010

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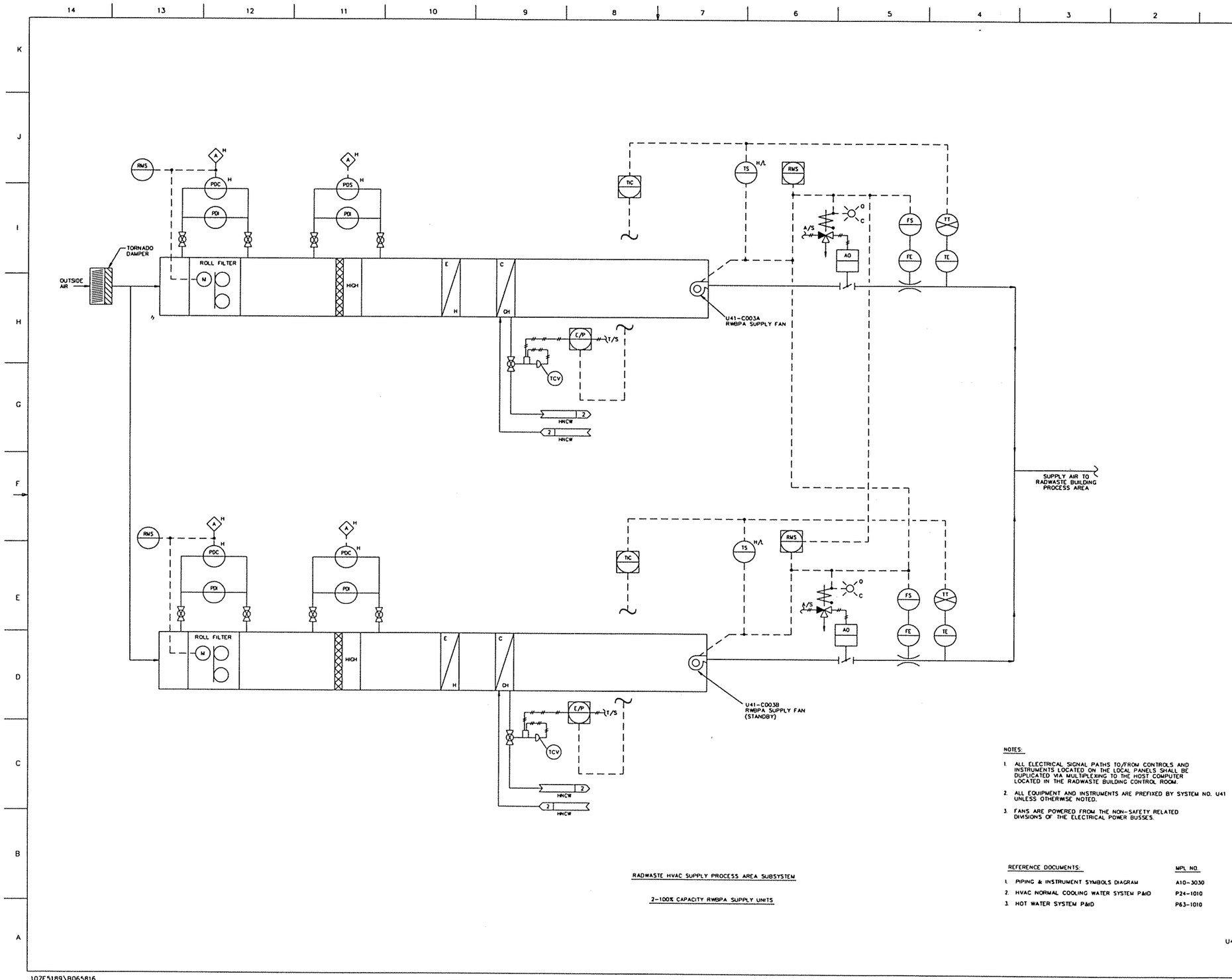
FIGURE 9.4-10 RADWASTE BUILDING HVAC P&ID (Sheet 1 of 3)



NOTES:

1. ALL ELECTRICAL SIGNAL PATHS TO/FROM CONTROLS AND INSTRUMENTS LOCATED ON THE LOCAL PANELS SHALL BE DUPLICATED VIA MULTIPLEXING TO THE HOST COMPUTER LOCATED IN THE RADWASTE BUILDING CONTROL ROOM.
2. ALL EQUIPMENT AND INSTRUMENTS ARE PREFIXED BY SYSTEM NO. U41 UNLESS OTHERWISE NOTED.
3. FANS ARE POWERED FROM THE NON-SAFETY RELATED DIVISIONS OF THE ELECTRICAL POWER BUSSES.

RADWASTE HVAC SUPPLY PROCESS AREA SUBSYSTEM

2-100% CAPACITY RWBPA SUPPLY UNITS

REFERENCE DOCUMENTS:

	MPL NO.
1. PIPING & INSTRUMENT SYMBOLS DIAGRAM	A10-3030
2. HVAC NORMAL COOLING WATER SYSTEM P&ID	P24-1010
3. HOT WATER SYSTEM P&ID	P63-1010

U41-1010

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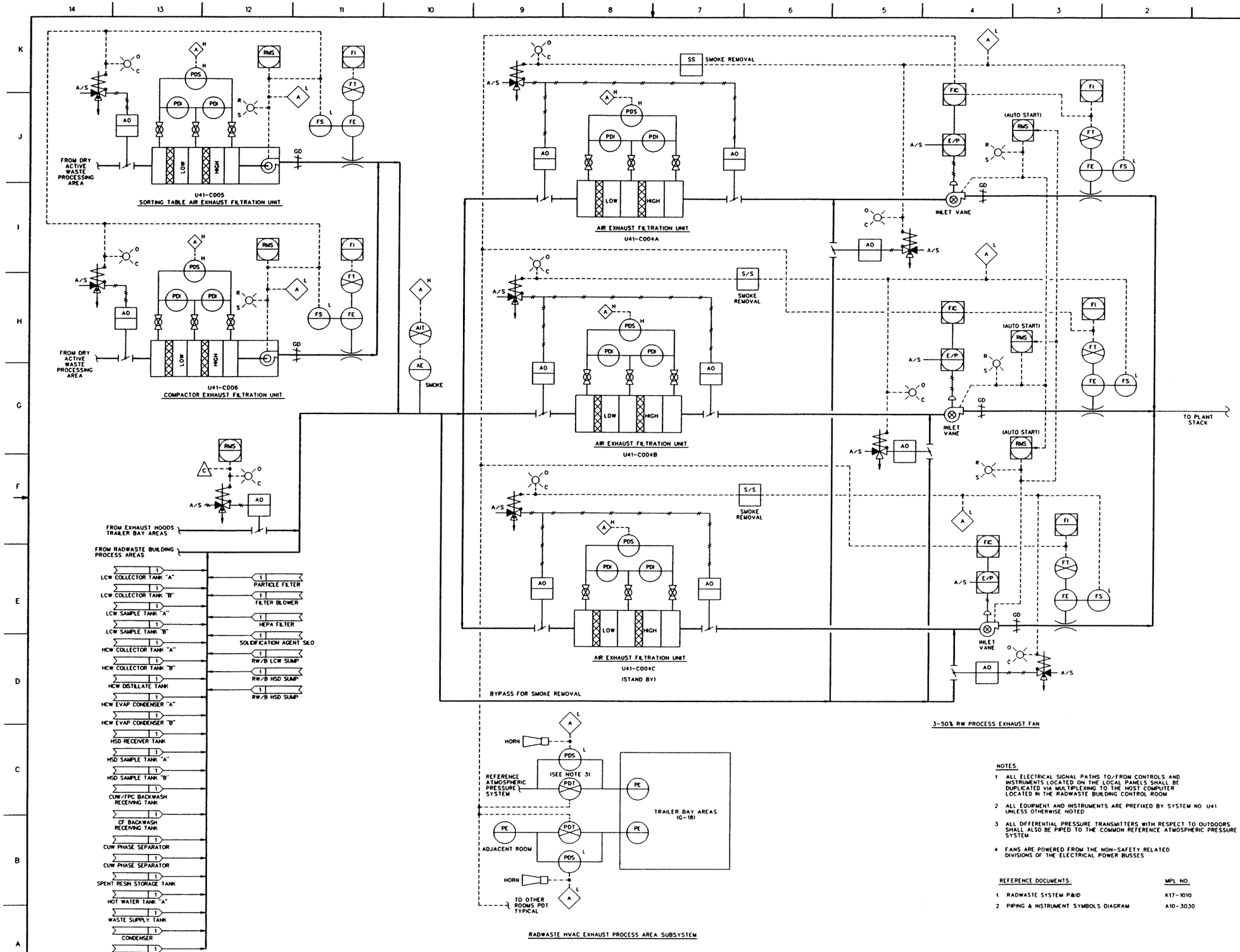
FIGURE 9.4-10 RADWASTE BUILDING HVAC P&ID (Sheet 2 of 3)



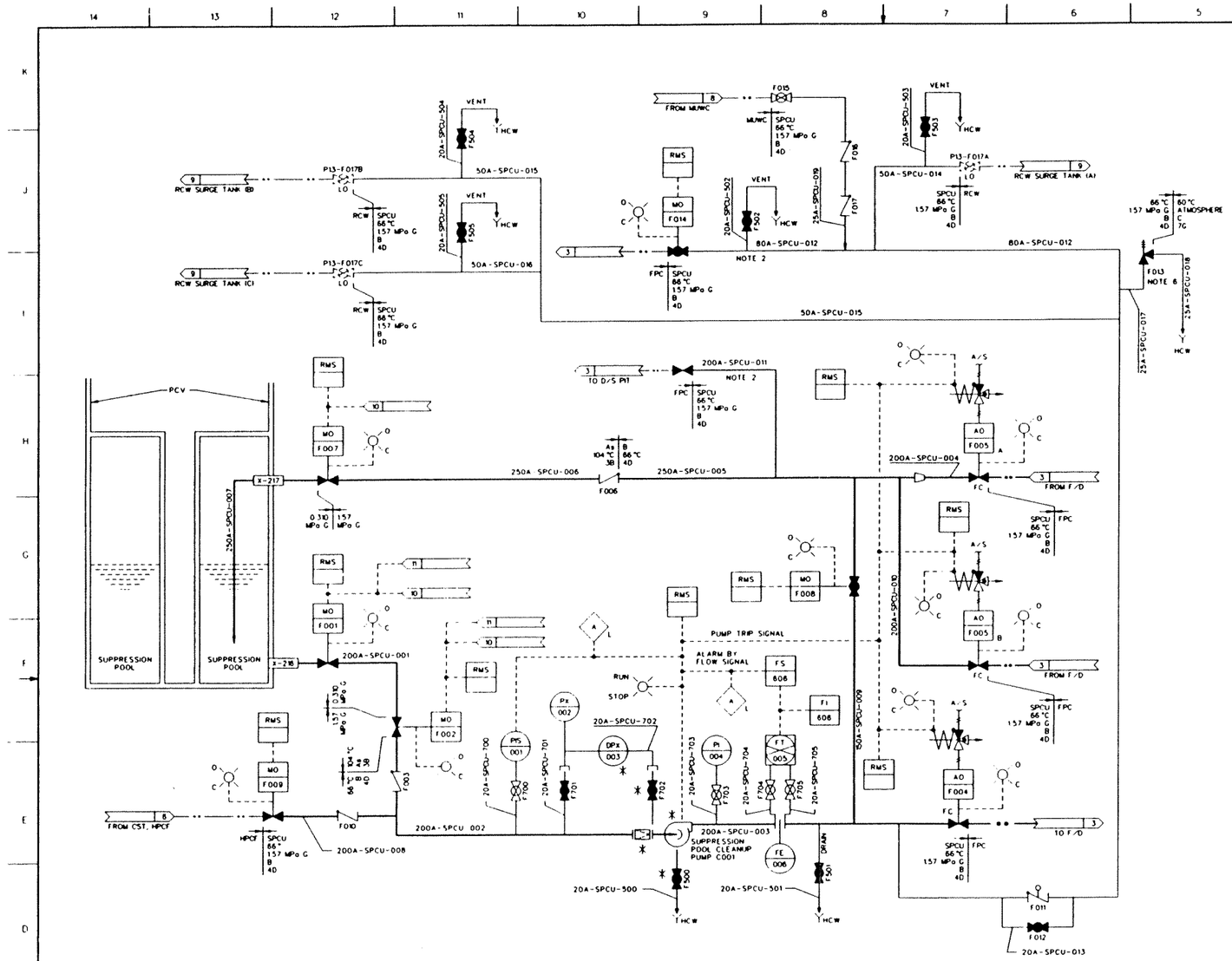
NOTES:

1. ALL ELECTRICAL SIGNAL PATHS TO/FROM CONTROLS AND INSTRUMENTS LOCATED ON THE LOCAL PANELS SHALL BE DUPLICATED VIA MULTIPLEXING TO THE HOST COMPUTER LOCATED IN THE RADWASTE BUILDING CONTROL ROOM
2. ALL EQUIPMENT AND INSTRUMENTS ARE PREFIXED BY SYSTEM NO U41 UNLESS OTHERWISE NOTED
3. ALL DIFFERENTIAL PRESSURE TRANSMITTERS WITH RESPECT TO OUTDOORS SHALL ALSO BE PIPED TO THE COMMON REFERENCE ATMOSPHERIC PRESSURE SYSTEM
4. FANS ARE POWERED FROM THE NON-SAFETY RELATED DIVISIONS OF THE ELECTRICAL POWER BUSSES

REFERENCE DOCUMENTS:

		MPL NO.
1.	RADWASTE SYSTEM P&ID	K17-1010
2.	PIPING & INSTRUMENT SYMBOLS DIAGRAM	A10-3030

FIGURE 9.4-10 RADWASTE BUILDING HVAC P&ID (Sheet 3 of 3)



NOTES

1 DESIGN CONDITION OF THIS SYSTEM IS AS FOLLOWS EXCEPT FOR SPECIAL NOTES

DESIGN PRESSURE	157 MPa G
DESIGN TEMPERATURE	88 °C
DESIGN CLASS	4
SEISMIC CLASS	SEISMIC CLASS As OR SEISMIC CLASS B
QUALITY CONTROL CLASS	D
MATERIALS	CS

LINE AND VALVE DESIGN CONDITION FOR DRAIN, VENT AND INSTRUMENT ADJUST MAIN LINE DESIGN CONDITION

2 THIS PIPE MAY BE USED FOR FUEL POOL MAKEUP AT LOSS OF THE NORMAL MAKEUP FUNCTION

3 ALARMS GENERATED BY THIS SYSTEM ARE INDICATED ON THE FPC PANEL IN THE MAIN CONTROL ROOM.

4 VALVE DESIGN CONDITION IS DEFINED BY THE MORE SEVERE CONDITION AT VALVE INLET OR OUTLET

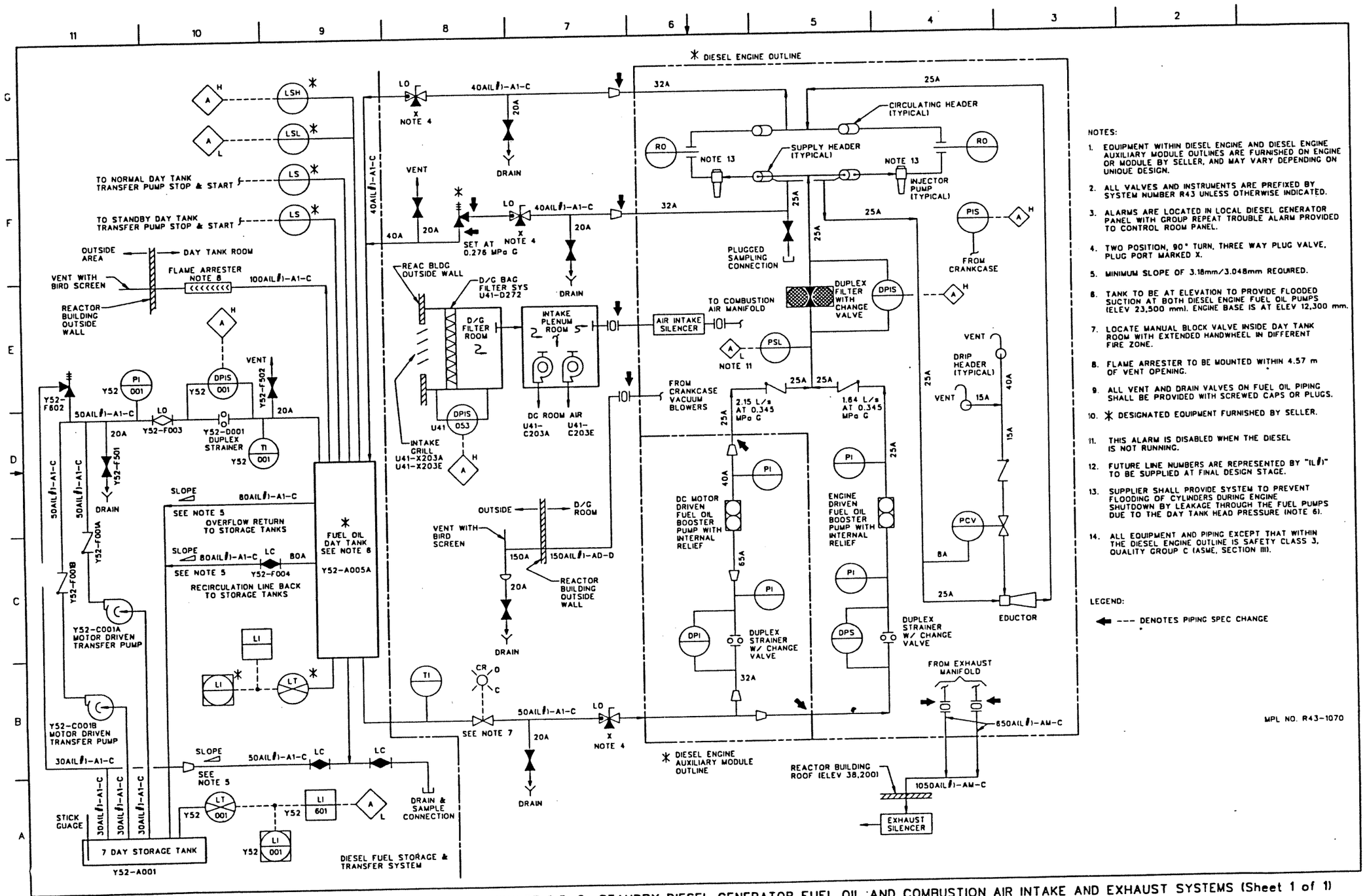
5 ELECTRIC POWER TO THE SYSTEM EXCEPT CONTAINMENT ISOLATION VALVES IS SUPPLIED FROM NON 1E PIP BUSES BACKED BY THE COMBUSTION TURBINE GENERATOR

6 RELIEF VALVE SHALL BE INSTALLED DUE TO HEAT INPUT TO THIS CLOSED PIPING SECTION

REFERENCE DOCUMENTS	MPL NO.
1 PIPING AND INSTRUMENT SYMBOLS DIAGRAM	A10-3030
2 PROCESS SAMPLING SYSTEM P&ID	P91-1010
3 FUEL POOL COOLING AND CLEANUP SYSTEM P&ID	G41-1010
4 HIGH CONDUCTIVITY WASTE, RADWASTE SYSTEM P&ID	K17-1010
5 SUPPRESSION POOL CLEANUP SYSTEM #BD	G51-1030
6 HIGH PRESSURE CORE FLOODER SYSTEM P&ID	E22-1010
7 MAKEUP WATER SYSTEM (PURIFIED) P&ID	P11-1010
8 MAKEUP WATER SYSTEM (CONDENSATE) P&ID	P13-1010
9 REACTOR BUILDING COOLING WATER SYS P&ID	P21-1010
10 LEAK DETECTION AND ISOLATION SYSTEM #ED	E31-1010
11 ATMOSPHERIC CONTROL SYSTEM P&ID	T31-1010

MPL NO. G51-1010

FIGURE 9.5-1 SUPPRESSION POOL CLEANUP SYSTEM P&ID (Sheet 1 of 1)


* DIESEL ENGINE OUTLINE
TO NORMAL DAY TANK TRANSFER PUMP STOP & START
TO STANDBY DAY TANK TRANSFER PUMP STOP & START
OUTSIDE AREA
DAY TANK ROOM
VENT WITH BIRD SCREEN
FLAME ARRESTER NOTE 8
REACTOR BUILDING OUTSIDE WALL
Y52-C001A MOTOR DRIVEN TRANSFER PUMP
Y52-C001B MOTOR DRIVEN TRANSFER PUMP
7 DAY STORAGE TANK Y52-A001
STICK GUAGE
SLOPE
SEE NOTE 5
OVERFLOW RETURN TO STORAGE TANKS
RECIRCULATION LINE BACK TO STORAGE TANKS
FUEL OIL DAY TANK SEE NOTE 8 Y52-A005A
DRAIN & SAMPLE CONNECTION
DIESEL FUEL STORAGE & TRANSFER SYSTEM
SET AT 0.276 MPa G
NOTE 4
REAC BLDG OUTSIDE WALL
D/G BAG FILTER SYS U41-D272
D/G FILTER ROOM 2
INTAKE PLENUM ROOM 5 7
DG ROOM AIR U41-C203A U41-C203E
INTAKE GRILL U41-X203A U41-X203E
OUTSIDE
D/G ROOM
VENT WITH BIRD SCREEN
REACTOR BUILDING OUTSIDE WALL
SEE NOTE 7
DIESEL ENGINE AUXILIARY MODULE OUTLINE
CIRCULATING HEADER (TYPICAL)
SUPPLY HEADER (TYPICAL)
INJECTOR PUMP (TYPICAL)
PLUGGED SAMPLING CONNECTION
TO COMBUSTION AIR MANIFOLD
AIR INTAKE SILENCER
DUPLEX FILTER WITH CHANGE VALVE
FROM CRANKCASE
FROM CRANKCASE VACUUM BLOWERS
2.15 L/s AT 0.345 MPa G
1.84 L/s AT 0.345 MPa G
DRIP HEADER (TYPICAL)
DC MOTOR DRIVEN FUEL OIL BOOSTER PUMP WITH INTERNAL RELIEF
ENGINE DRIVEN FUEL OIL BOOSTER PUMP WITH INTERNAL RELIEF
DUPLEX STRAINER W/ CHANGE VALVE
DUPLEX STRAINER W/ CHANGE VALVE
EDUCTOR
FROM EXHAUST MANIFOLD
REACTOR BUILDING ROOF (ELEV 38.200)
EXHAUST SILENCER
Y52-F602
Y52-F003
Y52-D001 DUPLEX STRAINER
Y52-F502
Y52-F501
Y52-F008A
Y52-F008B
Y52-F004
Y52-F005
Y52-F006
Y52-F007
Y52-F009
Y52-F010
Y52-F011
Y52-F012
Y52-F013
Y52-F014
Y52-F015
Y52-F016
Y52-F017
Y52-F018
Y52-F019
Y52-F020
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Y52-F032
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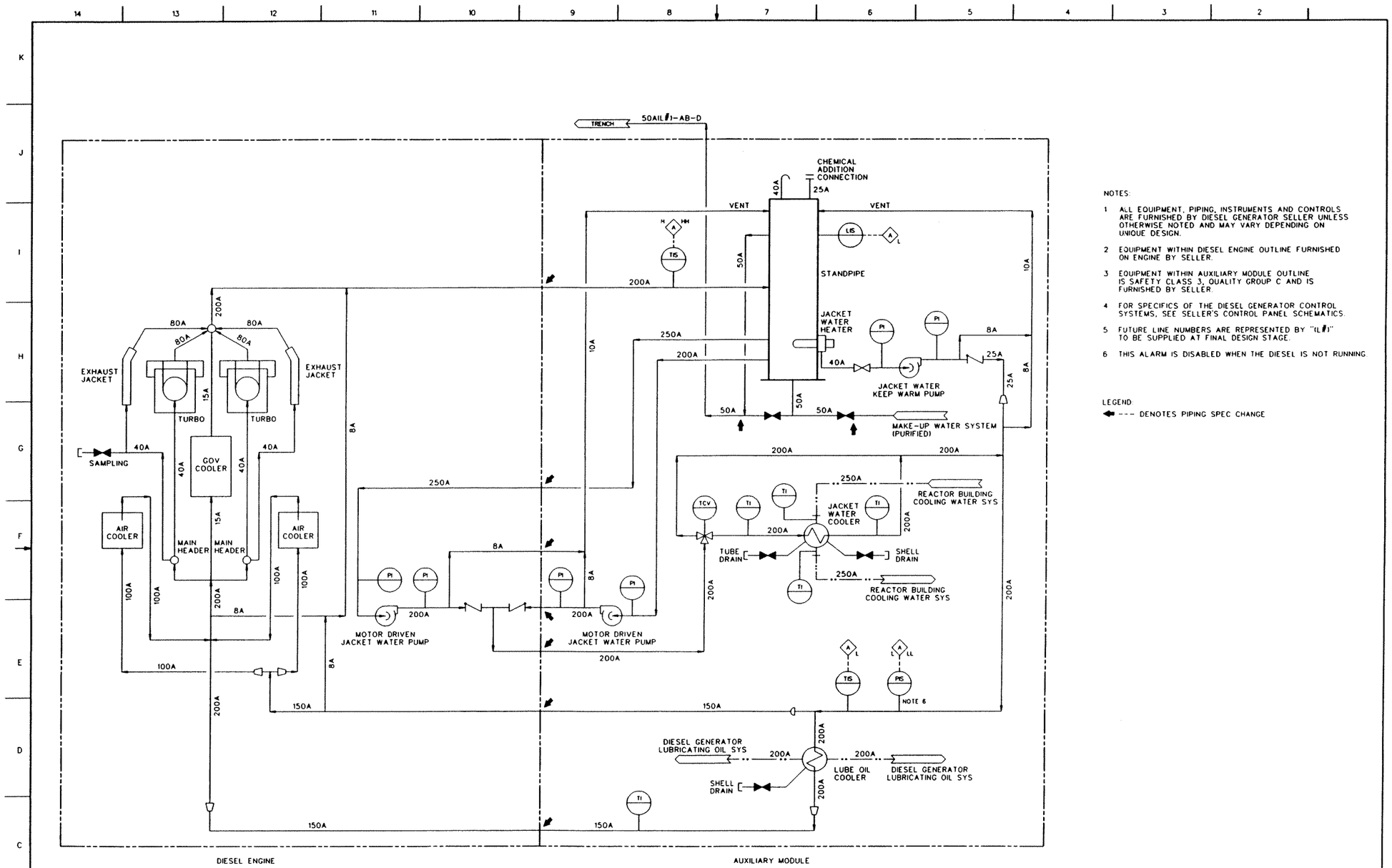
Y52-F037
Y52-F038
Y52-F039
Y52-F040
Y52-F041
Y52-F042
Y52-F043
Y52-F044
Y52-F045
Y52-F046
Y52-F047
Y52-F048



NOTES:

1. ALL EQUIPMENT, PIPING, INSTRUMENTS AND CONTROLS ARE FURNISHED BY DIESEL GENERATOR SELLER UNLESS OTHERWISE NOTED AND MAY VARY DEPENDING ON UNIQUE DESIGN.
2. EQUIPMENT WITHIN DIESEL ENGINE OUTLINE FURNISHED ON ENGINE BY SELLER.
3. EQUIPMENT WITHIN AUXILIARY MODULE OUTLINE IS SAFETY CLASS 3, QUALITY GROUP C AND IS FURNISHED BY SELLER.
4. FOR SPECIFICS OF THE DIESEL GENERATOR CONTROL SYSTEMS, SEE SELLER'S CONTROL PANEL SCHEMATICS.
5. FUTURE LINE NUMBERS ARE REPRESENTED BY "tL(#)" TO BE SUPPLIED AT FINAL DESIGN STAGE.
6. THIS ALARM IS DISABLED WHEN THE DIESEL IS NOT RUNNING.

LEGEND:

◄ --- DENOTES PIPING SPEC CHANGE

MPL NO. R43-1040

FIGURE 9.5-7 STANDBY DIESEL GENERATOR JACKET COOLING WATER SYSTEM

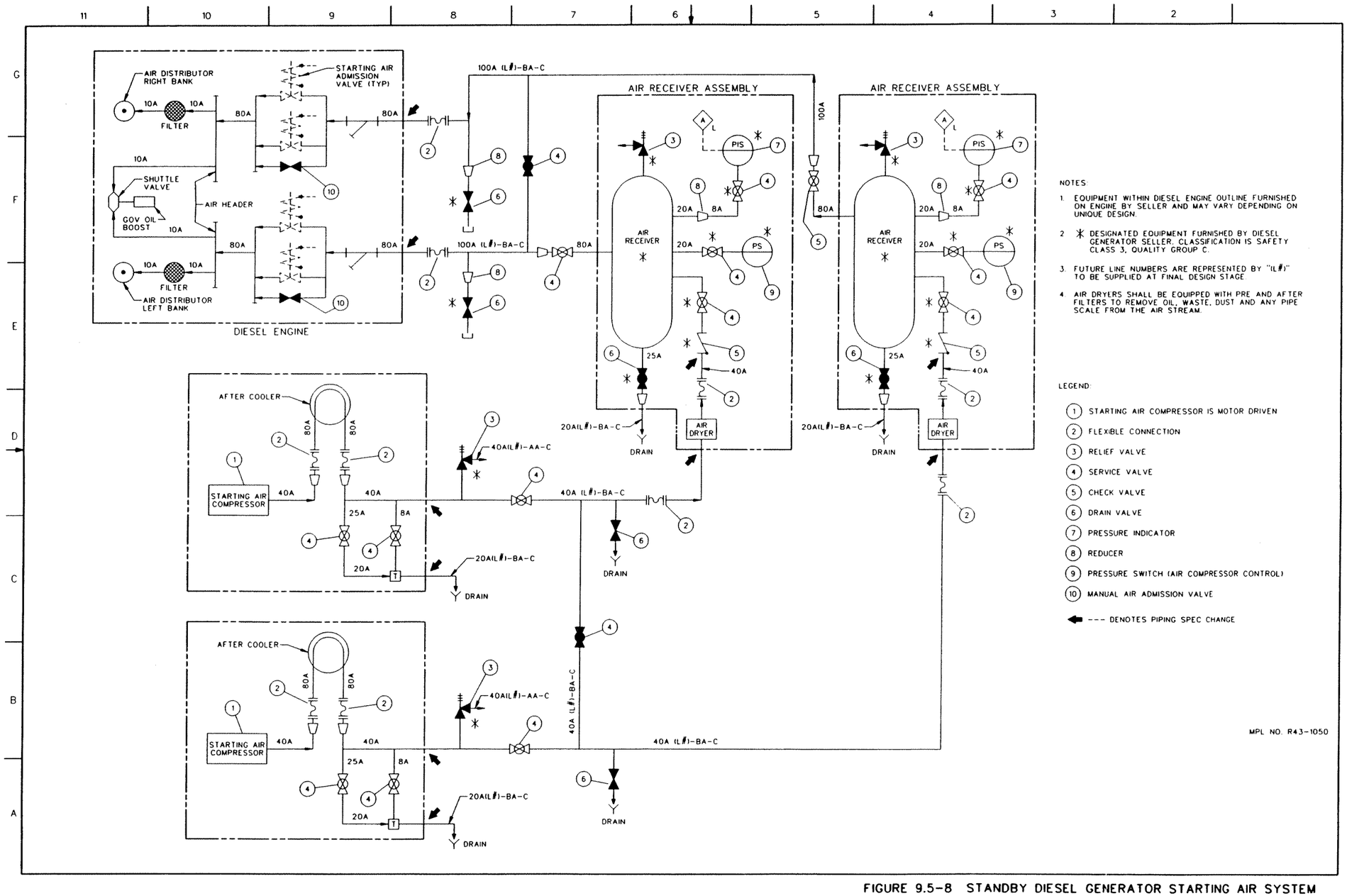
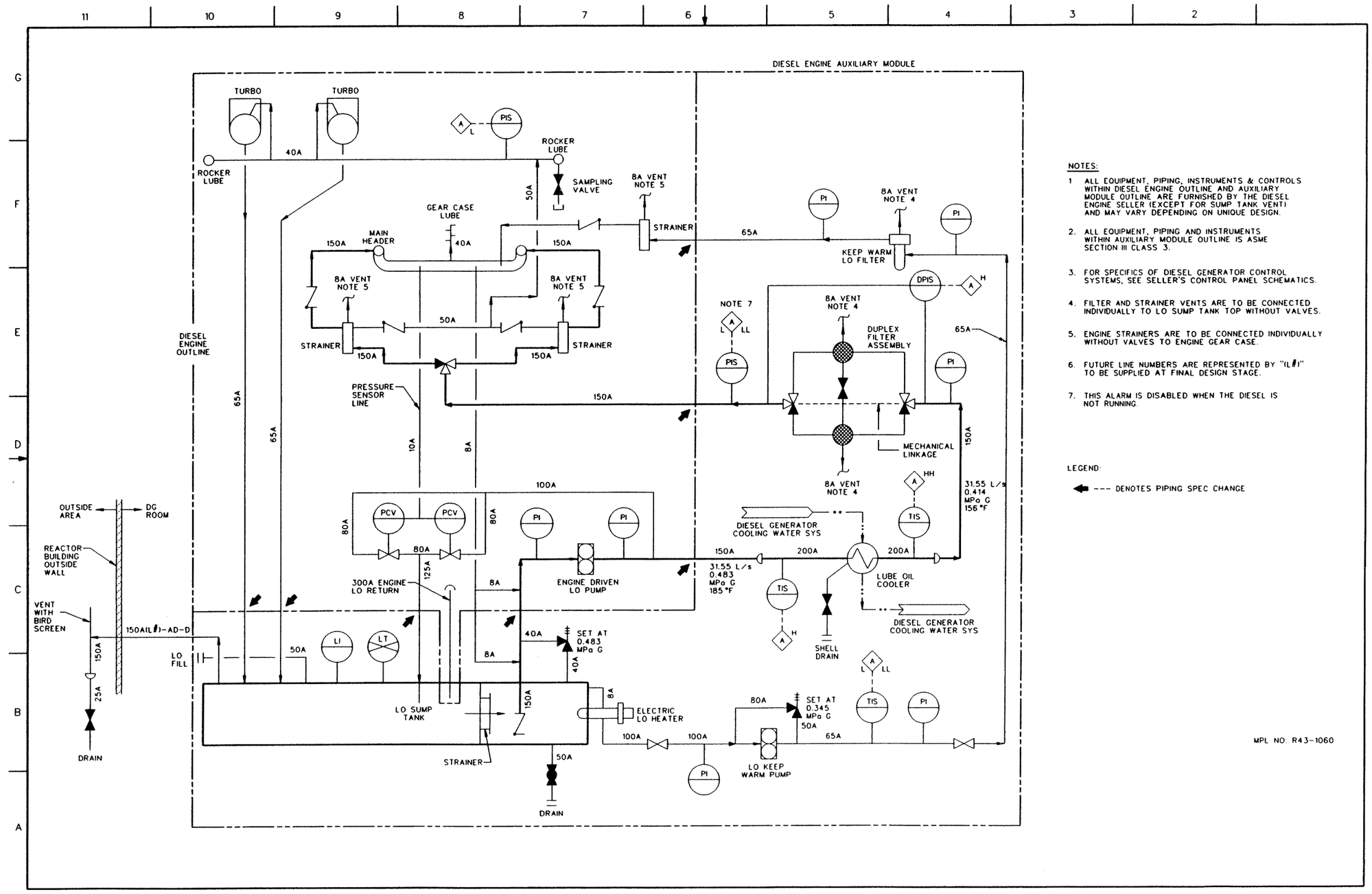


FIGURE 9.5-8 STANDBY DIESEL GENERATOR STARTING AIR SYSTEM



NOTES:

1. ALL EQUIPMENT, PIPING, INSTRUMENTS & CONTROLS WITHIN DIESEL ENGINE OUTLINE AND AUXILIARY MODULE OUTLINE ARE FURNISHED BY THE DIESEL ENGINE SELLER (EXCEPT FOR SUMP TANK VENT) AND MAY VARY DEPENDING ON UNIQUE DESIGN.
2. ALL EQUIPMENT, PIPING AND INSTRUMENTS WITHIN AUXILIARY MODULE OUTLINE IS ASME SECTION III CLASS 3.
3. FOR SPECIFICS OF DIESEL GENERATOR CONTROL SYSTEMS, SEE SELLER'S CONTROL PANEL SCHEMATICS.
4. FILTER AND STRAINER VENTS ARE TO BE CONNECTED INDIVIDUALLY TO LO SUMP TANK TOP WITHOUT VALVES.
5. ENGINE STRAINERS ARE TO BE CONNECTED INDIVIDUALLY WITHOUT VALVES TO ENGINE GEAR CASE.
6. FUTURE LINE NUMBERS ARE REPRESENTED BY "(L#)" TO BE SUPPLIED AT FINAL DESIGN STAGE.
7. THIS ALARM IS DISABLED WHEN THE DIESEL IS NOT RUNNING.

LEGEND:

--- DENOTES PIPING SPEC CHANGE

MPL NO. R43-1060

FIGURE 9.5-9 STANDBY DIESEL GENERATOR LUBRICATING OIL SYSTEM

Figure Redacted by NRC Staff
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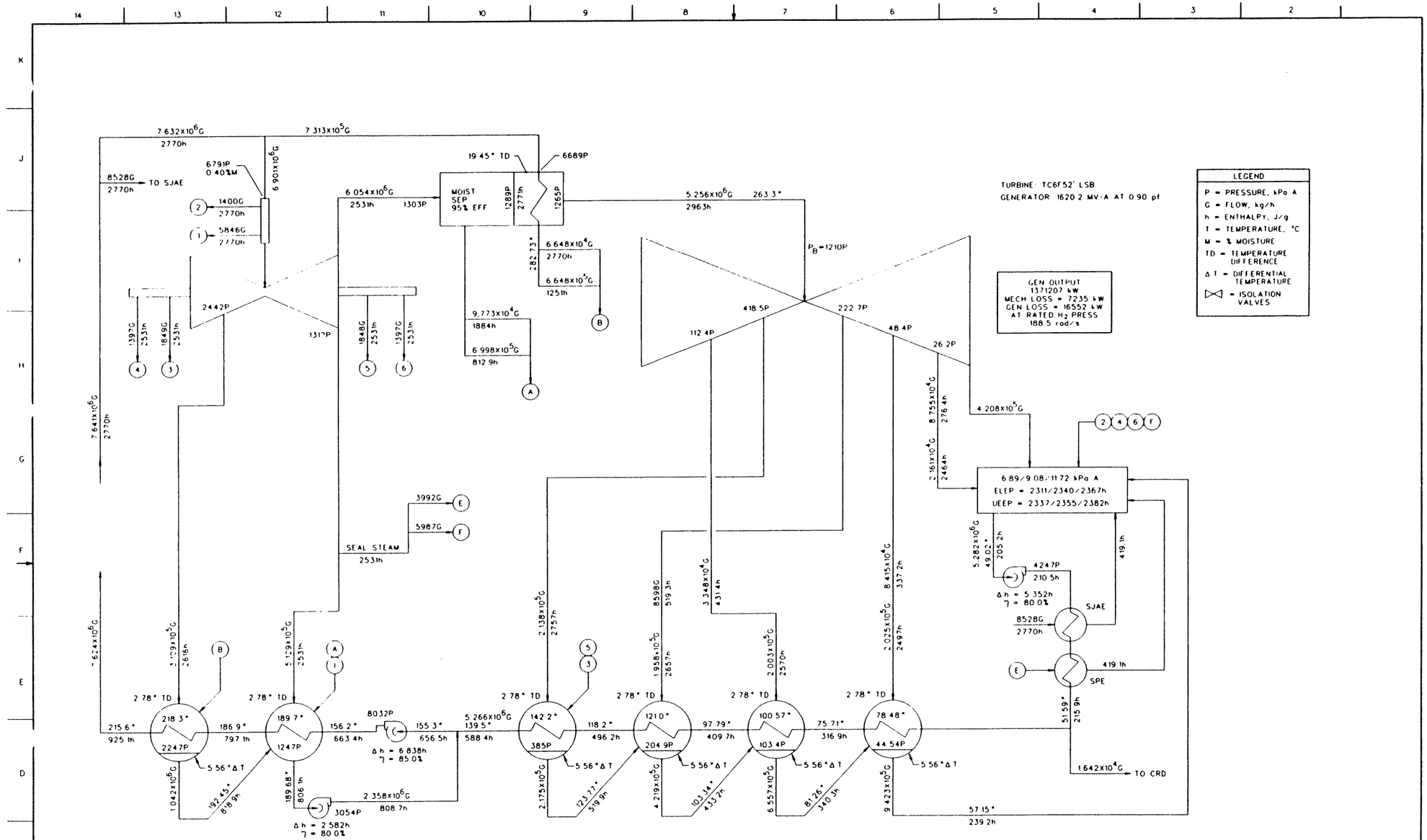
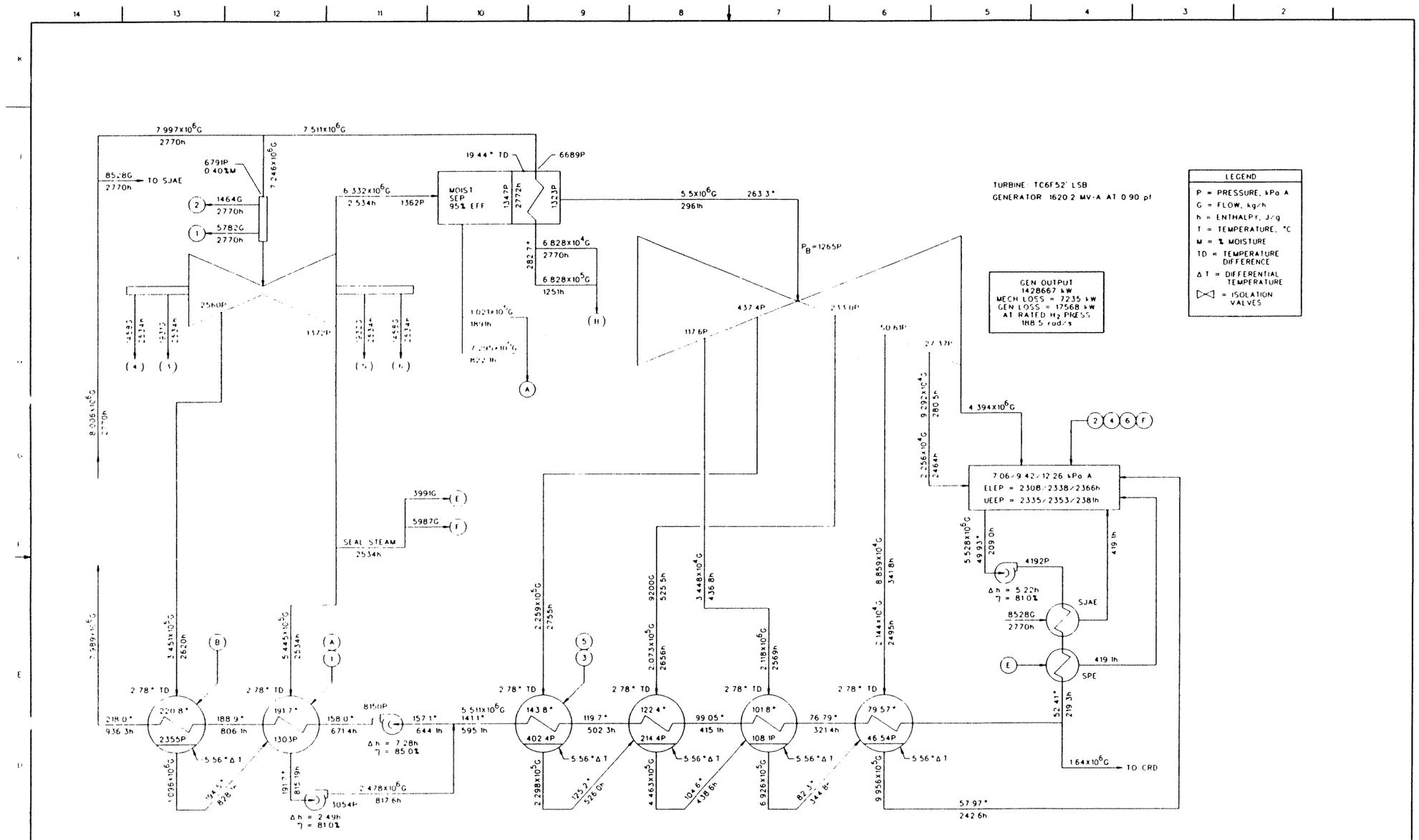


REFERENCE HEAT BALANCE FOR GUARANTEED REACTOR RATING

MPL NO N31-3030

FIGURE 10.1-2 REFERENCE HEAT BALANCE FOR GUARANTEED REACTOR RATING



$$THR = \frac{7.989\times10^{6}(2770-936.3)+1.64\times10^{4}(2770-219.3)}{1428667} = 10283\ J/W\text{-}h$$

VWO HEAT BALANCE (4081.1 MWt)
NET OUTPUT = 1400873

REFERENCE HEAT BALANCE FOR VALVES-WIDE-OPEN (VWO)

FIGURE 10.1-3 REFERENCE HEAT BALANCE FOR VALVES-WIDE-OPEN (VWO)

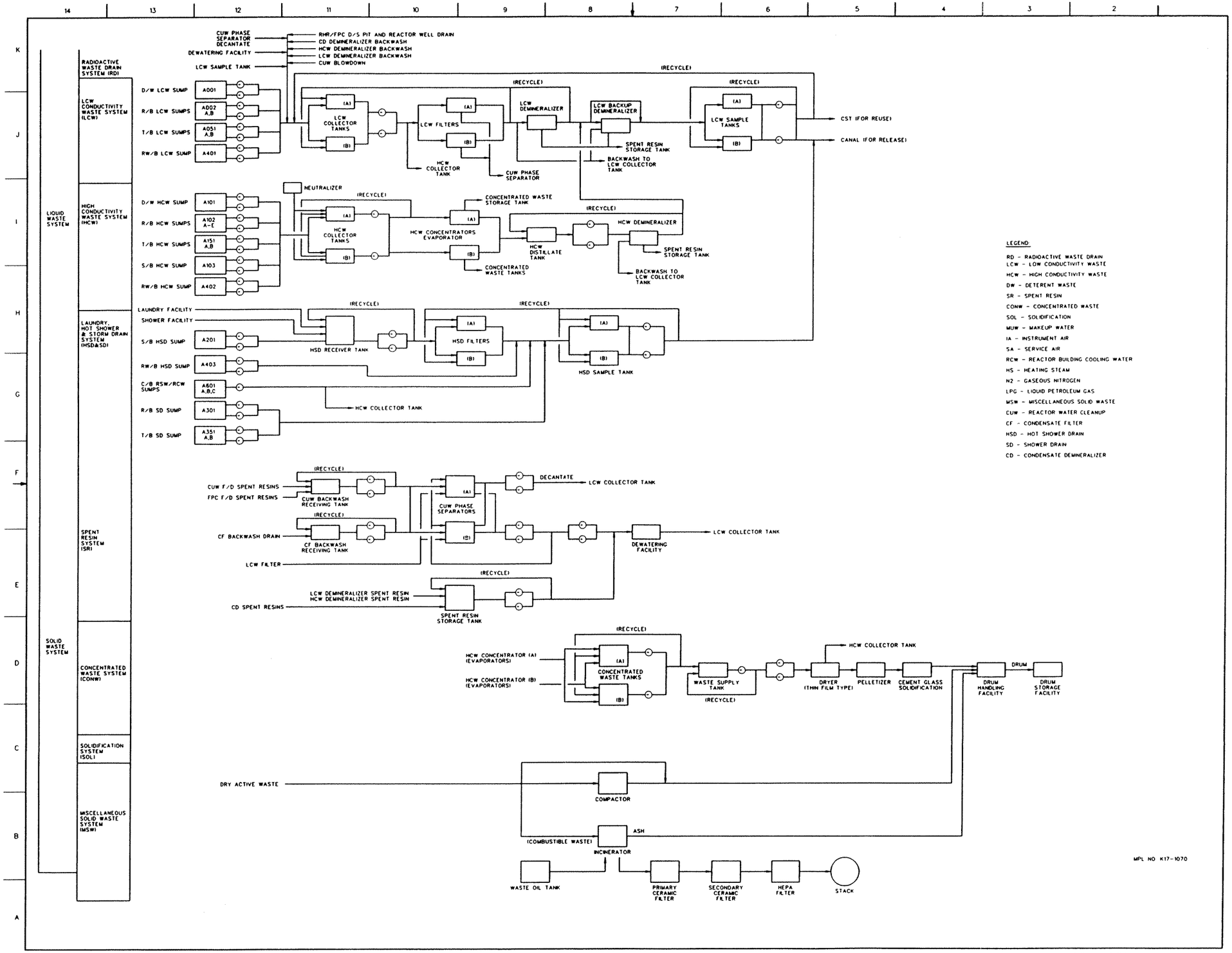
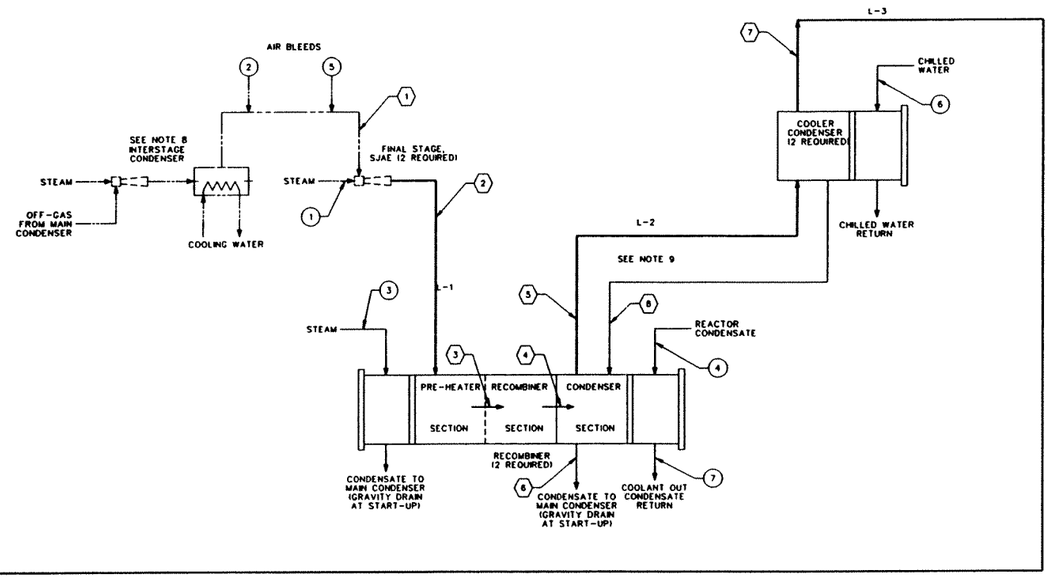
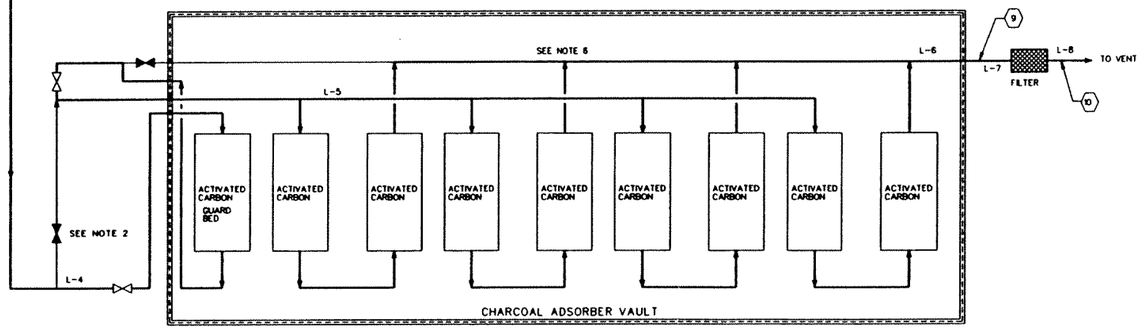


FIGURE 11.2-1 RADWASTE SYSTEM





NOTES:

1. USE COMPRESSED AIR FOR PRE-STARTUP, SYSTEM PURGING, AND MINIMUM AIR MAKEUP. SUPPLY AIR TO BE OIL FREE , DERIVED FROM A NON-OIL LUBRICATED COMPRESSCR.
2. GUARD BED BYPASSED ONLY IF IT GETS WET OR CATCHES FIRE.
3. FOR M-CYCLE FORWARD PUMPED PLANT, CONDENSATE SHUTOFF PRESSURE: 1.22 MPa, DESIGN PRESSURE: 2.41 MPa. CONDENSATE FLOW RATE TO OFFGAS CONDENSERS SHALL BE ADEQUATE TO ALLOW BOTH RECOMBINER TRAINS TO OPERATE AT THE SAME TIME.
4. USE NUCLEAR STEAM FOR NORMAL OPERATION AND STARTUP. SIZE PREHEATER AND OFFGAS CONDENSER SECTIONS OF RECOMBINER FOR 115% OF STEAM FLOW.
5. REFER TO MPL #A62-4100 FOR N-16 AND O-19 ACTIVITY AT THE REACTOR NOZZLE.
6. CHARCOAL ADSORBER BED SYSTEM DIFFERENTIAL PRESSURE AT NORMAL AND STARTUP BASED ON A GUARD BED ADSORBER VESSEL FOLLOWED BY 4 PARALLEL TRAINS OF TWO ADSORBER VESSELS IN SERIES. EACH ADSORBER IN 2.13 m IN DIAMETER PACKED WITH 8-16 MESH CHARCOAL EVENLY DISTRIBUTED WITHIN THE NINE VESSESL TO PROVIDE A TOTAL EFFECTIVE, (LOCATED BETWEEN THE TOP AND BOTTOM DISCHARGE DEVICES), CHARGE OF 102.1 MT.
7. EJECTOR TO BE PROVIDED TO PERFORM AGAINST 0.046 MPa BACK PRESSURE AT CITED STARTUP AIR RATE TO ASSURE PROCESS FLEXIBILITY. SUB-SYSTEM DIFFERENTIAL PRESSURE TO BE MAINTAINED AS SHOWN IN TABLES. LINE SIZES ARE PRELIMINARY AND MAY NEED TO BE ADJUSTED.
8. STEAM JET AIR EJECTOR (EQUIPMENT TO THE EXIT OF THE FINAL STAGE), TO BE FURNISHED BY OTHERS.
9. PROCESS STREAMS (5) AND (8) ARE PHYSICALLY LOCATED IN THE SAME PROCESS PIPE.

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

	REFERENCE DESIGNATOR
1. OFF GAS SYSTEM P&ID	N62-1010
2. RADIOLYTIC GAS GENERATION	A62-4450
3. RADIATION SOURCES	A62-4100

DESIGN BASIS:

37 GBq/s GE 1971 SOURCE TERM DOC GAS MIXTURE AFTER 30 MINUTES DECAY.
37 7°C CHARCOAL TEMPERATURE.
50.1 m^3/h AT STANDARD ATMOSPHERE AIR FLOW AT NORMAL OPERATION.
424.8 m^3/h AT STANDARD ATMOSPHERE AIR FLOW DURING START-UP OPERATION.
(STANDARD CUBIC METER AT 15.6°C AND 0.101 MPa A)

	STREAM NUMBER		(1)	(2)	(3)	(4)	(5)	(6)	(7)
	STREAM DESCRIPTION		DISCH. FROM INTERMEDIATE STAGE OF SJAE	STEAM DILUTED OFFGAS	PREHEATER DISCHARGE	RECOMBINER DISCHARGE	CONDENSER DISCHARGE	CONDENSER CONDENSATE	CHARCOAL BED FEED
NORMAL OPERATION 100% POWER	FLOW RATAE, POUNDS PER HOUR kg/h	AIR	62.47	62.47	62.47	62.47	62.47	0.	62.47
		HYDROGEN (RADIOLYTIC ONLY)	16.42	16.42	16.42	0.005	0.005	0.	0.005
		OXYGEN (RADIOLYTIC ONLY)	131.36	131.36	131.36	0.04	0.04	0.	0.04
		WATER	323.6	3711.21	3711.21	3859.0	14.77	3958.1	0.02
		TOTAL -	533.85	3921.46	3921.46	3921.46	77.28	3958.1	62.53
	RADIOACTIVITY, MBq/s	RARE GASES, KRYPTON & XENON	4.44E+04	4.44E+04	4.44E+04	4.07E+04	2.78E+04	x.	2.55E+04
		NITROGEN-13 (NOTE 5)	107.08	107.08	107.04	106.93	103.85	x.	102.87
	TEMPERATURE, DEGREES C.		54.4	132.2	176.7	443.5	67.8 (Max)	42.2 (Max)	18.3
	PRESSURE, (NOTE 7) MPa A		0.027	0.113	0.112	0.110	0.104	0.104	0.104
STARTUP OPERATION 5% POWER	FLOW RATE, kg/h	AIR	520.57	520.57	520.57	520.57	520.57	0.	520.57
		HYDROGEN (RADIOLYTIC ONLY)	0.82	0.82	0.82	0.04	0.04	0.	0.04
		OXYGEN (RADIOLYTIC ONLY)	6.57	6.57	6.57	0.29	0.29	0.	0.29
		WATER	414.2	3801.84	3801.84	3808.90	49.32	3802.5	6.35
		TOTAL -	942.16	4329.8	4329.8	4329.8	570.22	3802.5	527.25
	TEMPERATURE, DEGREES C.		54.4	132.2	176.7	189.2	57.2 (Max)	57.2 (Max)	21.1
	PRESSURE (NOTE 7) MPa A		0.027	0.146	0.142	0.140	0.134	0.134	0.133

X. = NO CALCULATIONS PERFORMED

MPL NO: N62-1020

FIGURE 11.3-1 OFFGAS SYSTEM PFD (Sheet 1 of 2)

	STREAM NUMBER		(8)	(9)	(10)
	STREAM DESCRIPTION		COOLER CONDENSER CONDENSATE	CHARCOAL BED DISCHARGE	FILTER DISCHARGE
NORMAL OPERATION	FLOW RATE kg/h	AIR	0.	62.48	62.48
		HYDROGEN (RADIOLYTIC ONLY)	0.	0.005	0.005
		OXYGEN (RADIOLYTIC ONLY)	0.	0.04	0.04
		WATER	13.98	0.80	0.80
		TOTAL -	13.98	63.3	63.3
	RADIOACTIVITY, MBq/s	RARE GASES, KRYPTON & XENON	X.	3.52	3.52
		NITROGEN-13 (NOTE 5)	X.	0.00	0.00
	TEMPERATURE, DEGREES C.		18.3	37.8	37.8
	PRESSURE, (NOTE 7) MPa A		0.104	0.102	0.102
STARTUP OPERATION	FLOW RATE, kg/h	AIR	0.	519.89	519.89
		HYDROGEN (RADIOLYTIC ONLY)	0.	0.036	0.036
		OXYGEN (RADIOLYTIC ONLY)	0.	0.290	0.290
		WATER	42.62	6.34	6.34
		TOTAL -	42.62	526.56	526.56
	TEMPERATURE, DEGREES C.		31.7	45.3	45.3
	PRESSURE, (NOTE 7) MPa A		0.134	0.106	0.103

X. = NO CALCULATIONS PERFORMED

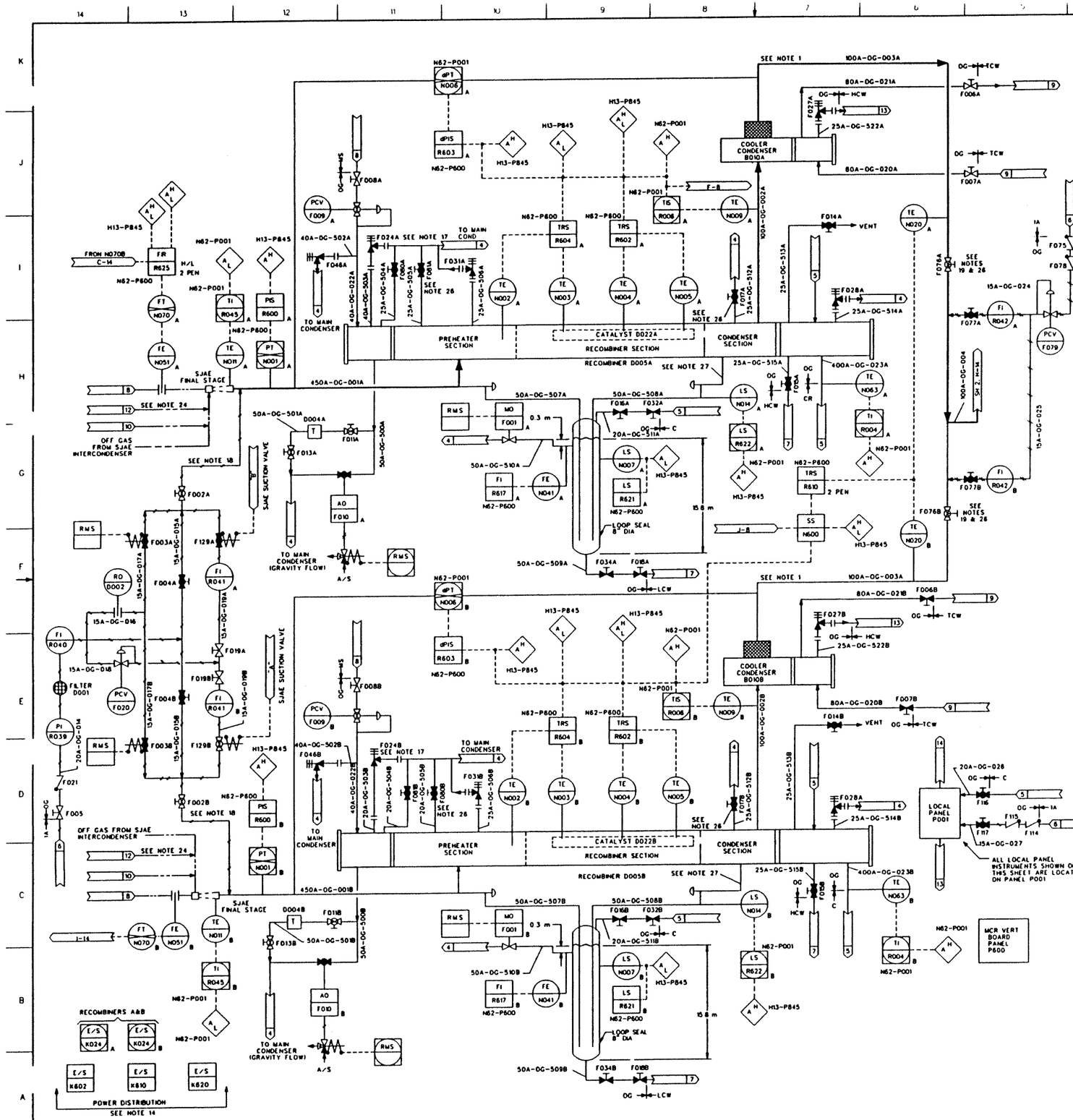
EQUIPMENT SUMMARY - PROCESS STREAM PRESSURE DROP				
PART NO	EQUIPMENT PIECE	DESIGN CONDITIONS		START-UP
		PRESS MPa	TEMP °C	MPa D
D005	MULTIPURPOSE VESSEL	2.41	232.2	0.009
B010	COOLER-CONDENSER	2.41	121.1	0.0008
D012	CHARCOAL ADSORBER	2.41	4.4/121.1	0.014
D016	FILTER	2.41	10.0/121.1	0.003

PIPE LENGTH SUMMARY (1)		
LINE No.	BETWEEN	EQUIVALENT PIPE LENGHT m
L-1	EXIT OF SJAE AND ENTRANCE TO PRE-HEATER SECTION	71
L-2	EXIT OF CONDENSER AND ENTRANCE TO COOLER CONDENSER	1.5
L-3	EXIT OF COOLER CONDENSER AND LINE TO CHARCOAL VAULT	71
L-4	COMMON LINE TEE AND ENTRANCE TO CHARCOAL VAULT	7.1
L-5	ENTRANCE TO CHARCOAL VAULT AND ENTRANCE TO CHARCOAL VESSELS	15
L-6	EXIT OF CHARCOAL VESSELS AND EXIT FROM CHARCOAL VAULT	15
L-7	EXIT OF CHARCOAL VAULT AND ENTRANCE TO FILTER	71
L-8	EXIT OF FILTER TO VENT	91

(1) - EQUIVALENT LENGTHS ARE FOR PIPE, FITTINGS, AND VALVES, BETWEEN POINTS NOTED.

	STREAM NUMBER		(1)	(2)	(3)	(4)	(5)	(6)
	STREAM DESCRIPTION		DILUTION STEAM (NOTE 4,7)	AIR BLEED (NOTE 1)	PREHEATER STEAM (NOTE 4)	REACTOR CONDENSATE (NOTE 3)	AIR PURGE (NOTE 1)	CHILLED WATER
NORMAL OPERATION	FLOW RATE, kg/h	AIR	0.	12.7	0.	0.	2.04	0.
		HYDROGEN (RADIOLYTIC ONLY)	0.	0.	0.	0.	0.	0.
		OXYGEN (RADIOLYTIC ONLY)	0.	0.	0.	0.	0.	0.
		WATER	3383.2	0.	376.5	0.104E+7	0.	33,883.9
		TOTAL -	3383.2	12.7	376.5	0.104E+7	2.04	33,883.9
	TEMPERATURE, DEGREES C.		170.0	21.1	207.8	56.7 (MAX)	21.1	15.6
	PRESSURE, (NOTE 7) MPa A		0.790	0.173	1.83	0.965	0.173	0.414
STARTUP OPERATION	FLOW RATE, kg/h	AIR	0.	125.2	0.	0.	2.04	0.
		HYDROGEN (RADIOLYTIC ONLY)	0.	0.	0.	0.	0.	0.
		OXYGEN (RADIOLYTIC ONLY)	0.	0.	0.	0.	0.	0.
		WATER	3382.2	0.	376.5	0.34E+06	0.	33,883.9
		TOTAL -	3382.2	125.2	376.5	0.34E+06	2.04	33,883.9
	TEMPERATURE, DEGREES C.		170.0	21.1	207.8	43.3 (MAX)	21.1	15.6
	PRESSURE, (NOTE 7) MPa A		0.790	0.173	1.83	0.965	0.173	0.414

FIGURE 11.3-1 OFFGAS SYSTEM PFD (Sheet 2 of 2)



NOTES:

1. INSULATE PIPING FROM STEAM JET AIR EJECTORS UP TO AND INCLUDING THE RECOMBINERS
2. LINES SHALL HAVE HIGH POINT VENTS AND SHALL BE FULLY DRAINABLE
3. INSULATE PIPING FROM COOLER CONDENSOR TO CHARCOAL VAULT.
4. INSULATE ALL CHILLED WATER LINES.
5. PIPE FROM AIR EJECTORS TO BE SLOPED SO CONDENSATE DRAINS TOWARD DRAIN LINE.
6. AFTER ANY VALVE CLOSES DUE TO HIGH RADIATION SIGNAL, IT SHALL REMAIN CLOSED UNTIL RESET BY MANUAL SWITCH.
7. SMOKE INJECTION EQUIPMENT OF STANDBY GAS TREATMENT SYSTEM TO BE USED FOR FILTER TESTING (USE HANSEN COUPLINGS).
8. THOSE LINES WITH TWO PRESSURE-TEMPERATURE INTEGRITY CLASSIFICATIONS SHALL CONFORM TO THE LOWER CLASSIFICATION IN STRAIGHT PIPE RUNS AND SHALL CONFORM TO THE HIGH CLASSIFICATION AT ALL STRAIGHT RUN ENDS. A STRAIGHT RUN END INCLUDES BENDS, VALVES AND ANY DISCONTINUITY REDUCING THE DIAMETER 5 PERCENT OR MORE. THE END SHALL INCLUDE THE LAST 3 m OF LINE TO SUCH END OR DISCONTINUITY. IF L/D RATIO OF A PIPE RUN BETWEEN DISCONTINUITIES (EG. VESSELS, SJAE) IS ≤7.0, DECREASED DESIGN PRESSURE PERMITS USE OF SCHEDULE 40 PIPING AND 600 POUNDS ANSI RATED FLANGES. THIS RELIEF IS ALSO APPLICABLE TO SHORT PIPE RUNS BETWEEN TWO VESSELS L/D ≤7.0.
9. UNLESS OTHERWISE SPECIFIED, LINE SIZING SHALL BE AS FOLLOWS: (A) INSTRUMENT SENSOR LINES; 18 mm MINIMUM (B) NORMALLY FLOWING PROCESS DRAINS; 60 mm MINIMUM (C) VENTS & MAINTENANCE DRAINS; 36 mm MINIMUM. PRE-TREATMENT PROCESS RADIATION MONITORING SAMPLE LINES SHOULD PROVIDE A TWO MINUTE DELAY. POST TREATMENT PROCESS RADIATION MONITORING SAMPLE LINES BE 18 mm MINIMUM AND OF MINIMUM LENGTH.
10. OPERATED VALVES ARE SHOWN IN THEIR POSITION FOR NORMAL OPERATION, AS OPPOSED TO "SHELF" OR "FAILED" POSITION. VALVES SHALL FAIL "AS IS" UNLESS OTHERWISE NOTED
11. PUMPS SHALL HAVE RUNNING LIGHTS AND OPERATING VALVES SHALL HAVE POSITION INDICATING LIGHTS LOCATED WITH THE RWS
12. DELETED
13. LINE SIZES REPRESENT A TRIAL PRESSURE DROP. LINES SHALL BE SIZED TO CONFORM TO PROCESS DATA REQUIREMENTS OF OFF GAS SYSTEM PROCESS DIAGRAM AND DATA SHEET
14. EACH TRAIN SHALL HAVE AN INDEPENDENT POWER SUPPLY
15. ALL MPL ITEM NO'S ARE PREFIXED BY SYSTEM MPL NO #N62 UNLESS OTHERWISE NOTED
16. ALL PROCESS INSTRUMENT SHALL BE PROVIDED WITH ISOLATION VALVES AS REQUIRED BY REFERENCE SUPPLEMENTAL DOCUMENT 3
17. RECOMBINER VESSEL RELIEF VALVES ARE SIZED TO RELIEVE ONLY THE THERMAL EXPANSION OF LIQUID WATER IF VESSEL IS FLOODED.
18. THE 51, 102 & 17 m^3/h AT STANDARD ATMOSPHERE AIR BLEED LINES SHALL BE CONNECTED TO THE PROCESS IMMEDIATELY DOWNSTREAM OF EACH STEAM DILUTION SJAE
19. MAINTENANCE ISOLATION VALVES AND AIR BLEEDS SHALL BE LOCATED AT LEAST 5 DIAMETERS FROM THE PROCESS TEE
20. RECOMBINER TRAIN "B" IS SHOWN IN STANDBY MODE WITH 17 m^3/h AT STANDARD ATMOSPHERE CONTINUAL AIR BLEED ENTERING THE PROCESS LINE USPREAM OF THE RECOMBINER VESSEL.
21. HYDROGEN ANALYZER LINES SHALL BE HEAT-TRACED TO PREVENT CONDENSATION
22. DELETED
23. A COMMON MOISTURE DROP-OUT CHAMBER, EMPLOYING AVAILABLE COOLING EQUIPMENT OR SOURCE, SHALL BE PROVIDED HERE TO PRE-TREAT THE GAS SAMPLED BY THE HYDROGEN ANALYZERS AND THE PROCESS RADIATION MONITORING SYSTEM
24. OXYGEN INJECTION CONNECTION FOR HYDROGEN WATER CHEMISTRY SYSTEM
25. LINES TO OXYGEN ANALYZERS PROVIDED FOR HYDROGEN WATER CHEMISTRY SYSTEM.
26. VALVE TO BE EITHER DOUBLE STEM SEAL WITH AIR BLOCK OR BELLOWS SEAL
27. LINE TO DRAIN BY GRAVITY FROM RECOMBINER TO MAIN CONDENSER

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

		REFERENCE DESIGNATOR
1	PRESSURE INTEGRITY OF NUCLEAR COMPONENTS	A11-3010
2	PIPING & INSRUMENT SYMBOLS	A10-3030
3	PROCESS INSTRUMENTATION DESIGN SPECIFICATION	A11-3024
4	MAIN CONDENSER SYS P&ID	N61-1010
5	CONDENSATE SYS P&ID	N21-1010
6	INSTRUMENT AIR SYS P&ID	P52-1010
7	LOW CONDUCTIVITY WASTE SYS P&ID	K12-1010
8	TURBINE MAIN STEAM SYS P&ID	N11-1010
9	TURB BLDG CHILLED WATER SYS P&ID	P22-1010
10	PROCESS RAD MONITORING SYS P&ID	D11-1010
11	HIGH PRESSURE NITROGEN GAS SUPPLY SYS P&ID	P54-1010
12	OXYGEN INJECTION SYS P&ID	P32-1010
13	HIGH CONDUCTIVITY WASTE SYS P&ID	K13-1010
14	HEATING,VENTILATING & AIR CONDITIONING SYS P&ID	U41-1010

MPL NO N62-1010

FIGURE 11.3-2 OFFGAS SYSTEM P&ID (Sheet 1 of 3)

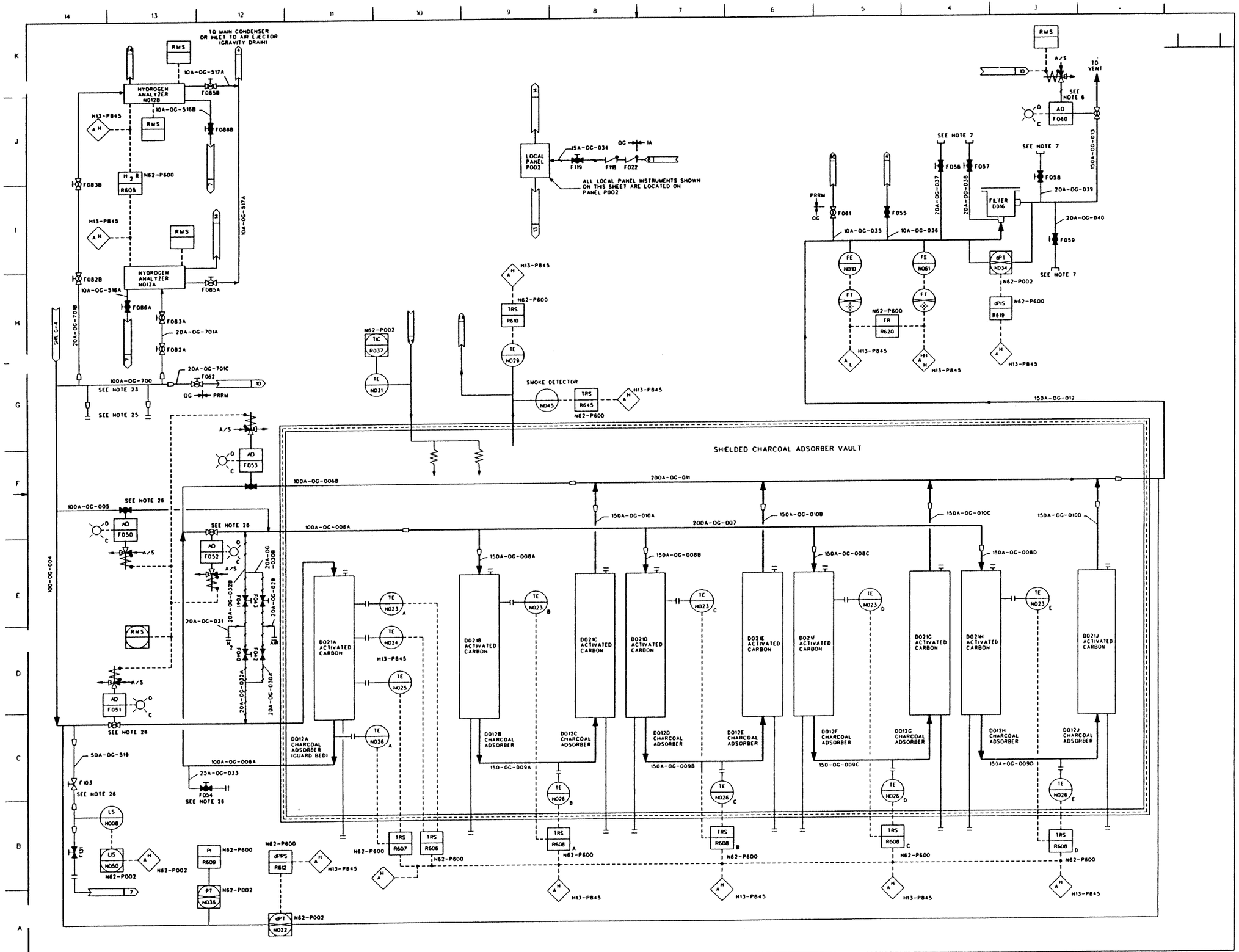


FIGURE 11.3-2 OFFGAS SYSTEM P&ID (Sheet 2 of 3)

TABLE I: MAIN CONTROL ROOM ANNUNCIATOR ALARMS

FUNCTION	PRIMARY SENSOR	SET POINT
DILUTION STEAM FLOW	FE-N051	AH 110 % AL 95 %
PREHEATER INLET PRESSURE	PT-N001	AH 0.046 MPa
RECOMBINER INLET TEMPERATURE	TE-N002,N003	AL 149 °C
RECOMBINER TEMPERATURE PROFILE	TE-N004,N005	AH 443 °C AL 149 °C
CONDENSER LOOP SEAL WATER LEVEL	LS-N007	AL -0.3 m
CONDENSER DRAIN LINE WATER LEVEL	LS-N014	AH 0.5 m
HYDROGEN ANALYZER	HZE-N012	AH 2%
COOLER CONDENSER EXIT TEMPERATURE	TE-N020	AH 21.7 °C
PREHEATER TO COOLER CONDENSER EXIT PRESSURE DROP	dPT-N006	AH 0.011 MPa
CHARCOAL ADSORBER PRESSURE DROP	dPT-N022	AH 0.015 MPa
CHARCOAL VESSEL TEMPERATURE	TE-N023,N026	AH 34.4 °C
CHARCOAL VAULT AIR TEMPERATURE	TE-N029	AL 26.7 °C AH 43.3 °C
CHARCOAL VAULT SMOKE LEVEL	N045	----
AFTER FILTER PRESSURE DROP	dPT-N034	AH 12cm w.g.
PROCESS FLOW (AT STANDARD ATMOSPHERE)	FE-N010,N061	AL 10.2 m^3/h AH 68 m^3/h AHH 425 m^3/h

TABLE II. PIPING SPECIFICATIONS

PIPE No.	SCHEDUAL	MATERIAL	FLUID
001A-B	160	CS	S
002A-B	160	CS	A,W
003A-B	80	CS	A
004	80	CS	A
005A	80	CS	A
006A-B	80	CS	A
007	80	CS	A
008A-D	80	CS	A
009A-D	80	CS	A
010A-D	80	CS	A
011	80	CS	A
012	80	CS	A
013	80	CS	A
014	40	CS	A
015A-B	40	CS	A
016	40	CS	A
017A-B	40	CS	A
018	40	CS	A
019A-B	40	CS	A
020A-B	40	CS	W
021A-B	40	CS	W
022A-B	160	CS	S
023A-B	100	CS	W
024	40	CS	A
025	40	CS	A
026	40	CS	W
027	40	CS	A
028	80	CS	A
029	40	CS	A
030A-B	160	CS	A
031	40	CS	N
032A-B	160	CS	N
033	160	CS	A
034	160	CS	A
035	80	CS	A
036	80	CS	A
037	80	CS	A
038	80	CS	A
039	80	CS	A
040	80	CS	A
500A-B	160	CS	W
501A-B	160	CS	W
502A-B	160	CS	S
503A-B	160	CS	S,A
504A-B	160	CS	A
505A-B	160	CS	A
506A-B	160	CS	A
507A-B	160	CS	W
508A-B	160	CS	W
509A-B	80	CS	W
510A-B	160	CS	W
511A-B	160	CS	W
512A-B	160	CS	A
513A-B	160	CS	A
514A-B	80	CS	A,W
515A-B	40	CS	W
516A-B	40	SS	W
517A-B	40	SS	A
518	160	CS	W
519	160	CS	W
700	40	SS	A
701A-B	40	SS	A

FIGURE 11.3-2 OFFGAS SYSTEM P&ID (Sheet 3 of 3)

Figure Redacted by NRC Staff
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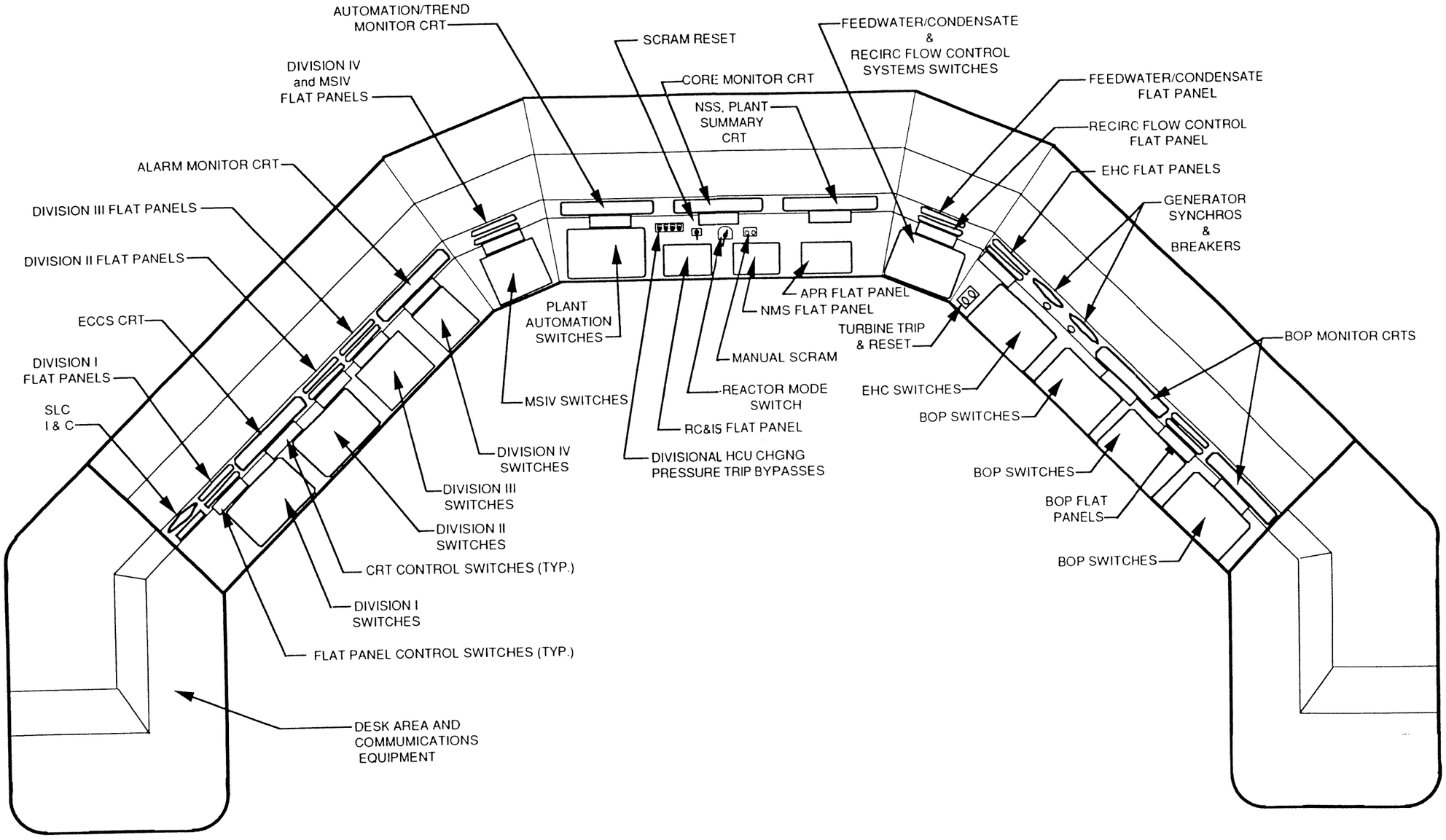


Figure 18C-5 ARRANGMENT OF EQUIPMENT ON MAIN CONTROL CONSOLE

FIXED-POSITION DISPLAY

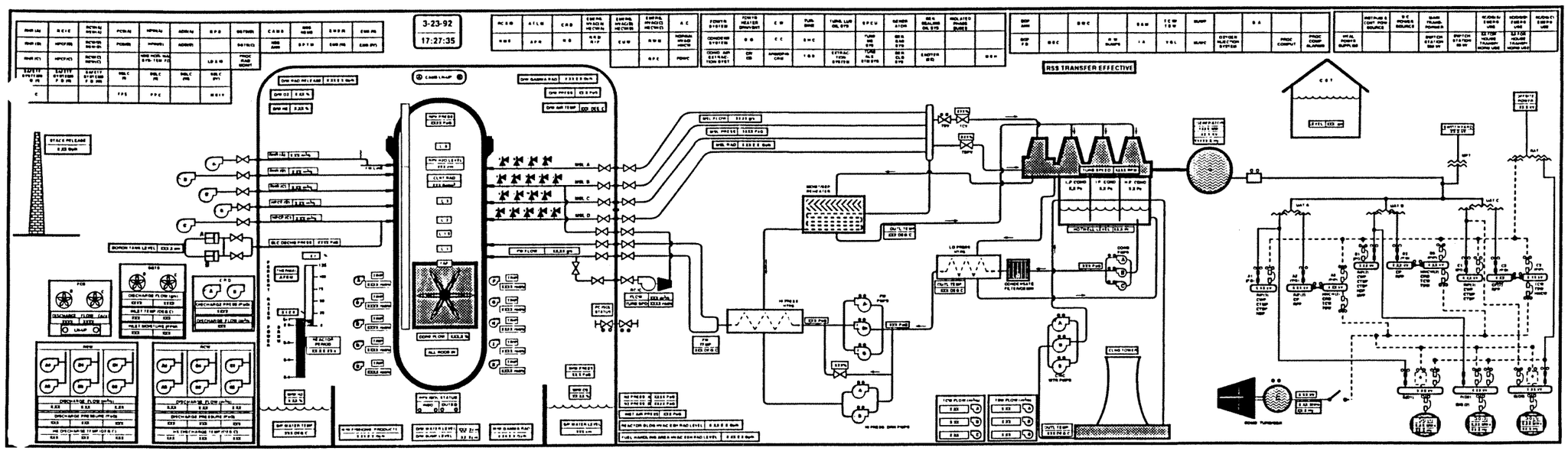
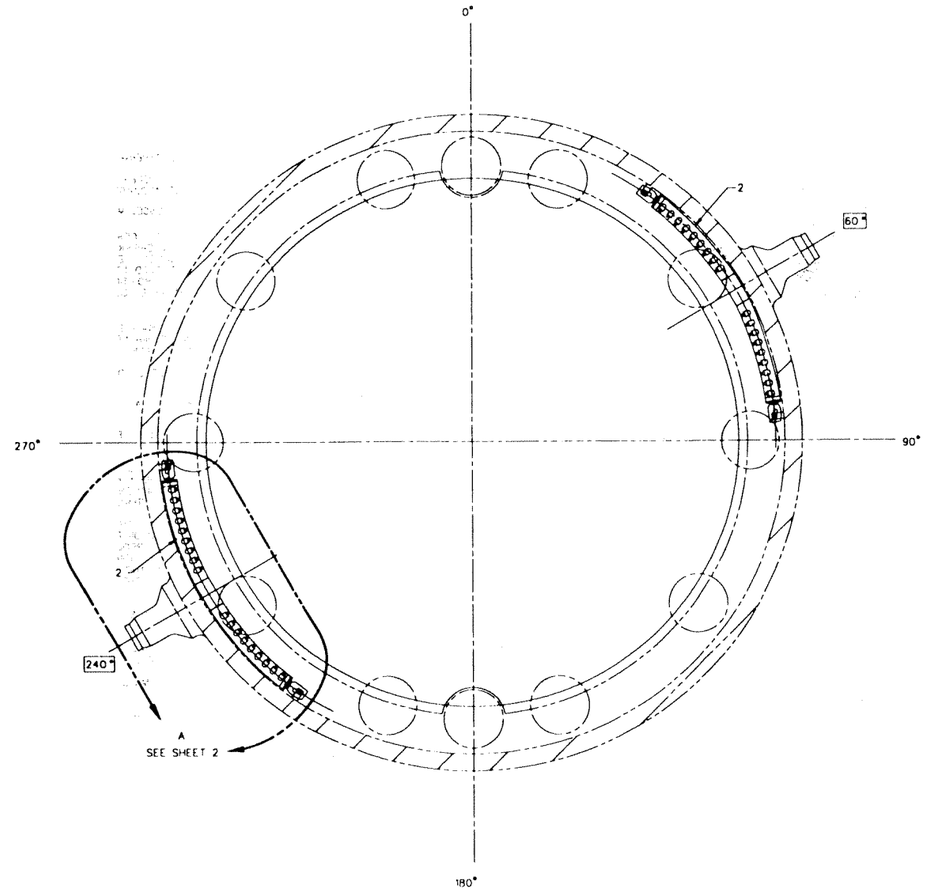


Figure 18C-7 FIXED-POSITION DISPLAY



RPV SECTION AT ELEVATION 1092100

(1)

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED.
2. FOR ADDITIONAL INSTALLATION REQUIREMENTS REFER TO VESSEL AND COMPONENTS INSTALLATION SPECIFICATION 23A6152.
3. THE THERMAL SLEEVE IS SUPPLIED BY THE VESSEL MANUFACTURER.
4. THE THERMAL SLEEVE MUST BE TRIMMED TO THE CORRECT LENGTH WITH ADJUSTMENT TO WELD SHRINKAGE (TWO WELD SHRINKAGE FOR THE THERMAL SLEEVE). TO DETERMINE THE CORRECT THERMAL SLEEVE LENGTH, THE END BRACKETS SHALL BE ATTACHED TO THE SPARGER BUT NOT WELDED TO IT, AND THE SPARGER IS POSITIONED SO THAT THE SPARGER ARMS ARE AS CLOSE AS POSSIBLE TO THE MIDPOINT OF THE ENVELOPE RANGE.
5. THE THERMAL SLEEVE WHEN WELDED TO THE SAFE END SHALL HAVE EQUAL GAP TO THE NOZZLE BORE WITHIN 3.2 mm AT 4 EQUALLY SPACED LOCATIONS JUST INSIDE THE NOZZLE BLEND RADIUS.
6. THE THERMAL SLEEVE MAY HAVE TO BE MITERED TO SATISFY THE ENVELOPE REQUIREMENT.
7. MISMATCH OF CENTER LINES OF WELD PREPS SHALL BE LESS THAN 0.8 DIAMETER BEFORE WELDING.
8. DO NOT SLING BY NOZZLE ELBOWS OR CONTACT ELBOWS WHEN LIFTING AND HANDLING.
9. GRINDING OF THE HEADER END PLATE IS PERMITTED IF REQUIRED TO MEET THIS REQUIREMENT (EXCEPT NOT WITHIN 6 mm OF THE BRACKET WELD OR OF THE HEADER TO SPARGER END PLATE). GRINDING OF THE SPARGER TO MEET THIS REQUIREMENT IS PROHIBITED.
10. CONTACT OF THE TOP OF THE END BRACKET TO THE WASHER AND CONTACT OF THE PIN TO BACK (TOWARD REACTOR PRESSURE VESSEL WALL) OF THE SLOT IN THE END BRACKET ARE REQUIRED AFTER THE SPARGER TO SAFE END WELDING. MAXIMUM HORIZONTAL COLD SPRING MEASURED AT THE END PIN AFTER WELDING TO BE 3.2 mm. MAXIMUM VERTICAL COLD SPRING MEASURED AT THE WASHER AFTER WELDING TO BE ALSO 3.2 mm.
11. ALL WELDS ARE AUSTENITIC SST TO AUSTENITIC SST UNLESS OTHERWISE SPECIFIED.
12. TIGHTEN NUT, ITEM 4, UNTIL IT HAS BOTTOMED AGAINST SHOULDER OF PIN, ITEM 3, BEFORE PLACING WELD ON END OF THREAD.
13. THIS WELD HAS TO BE COMPATIBLE WITH THE MATERIAL OF THE WELD PREP OR WELD BUTTER.
14. THE CONFIGURATION OF THE THERMAL SLEEVE WELD PREP MUST MATCH THAT OF THE SAFE END.

Figure 20.3.4-5a LOW PRESSURE CORE FLOODER SPARGER, SHEET 1

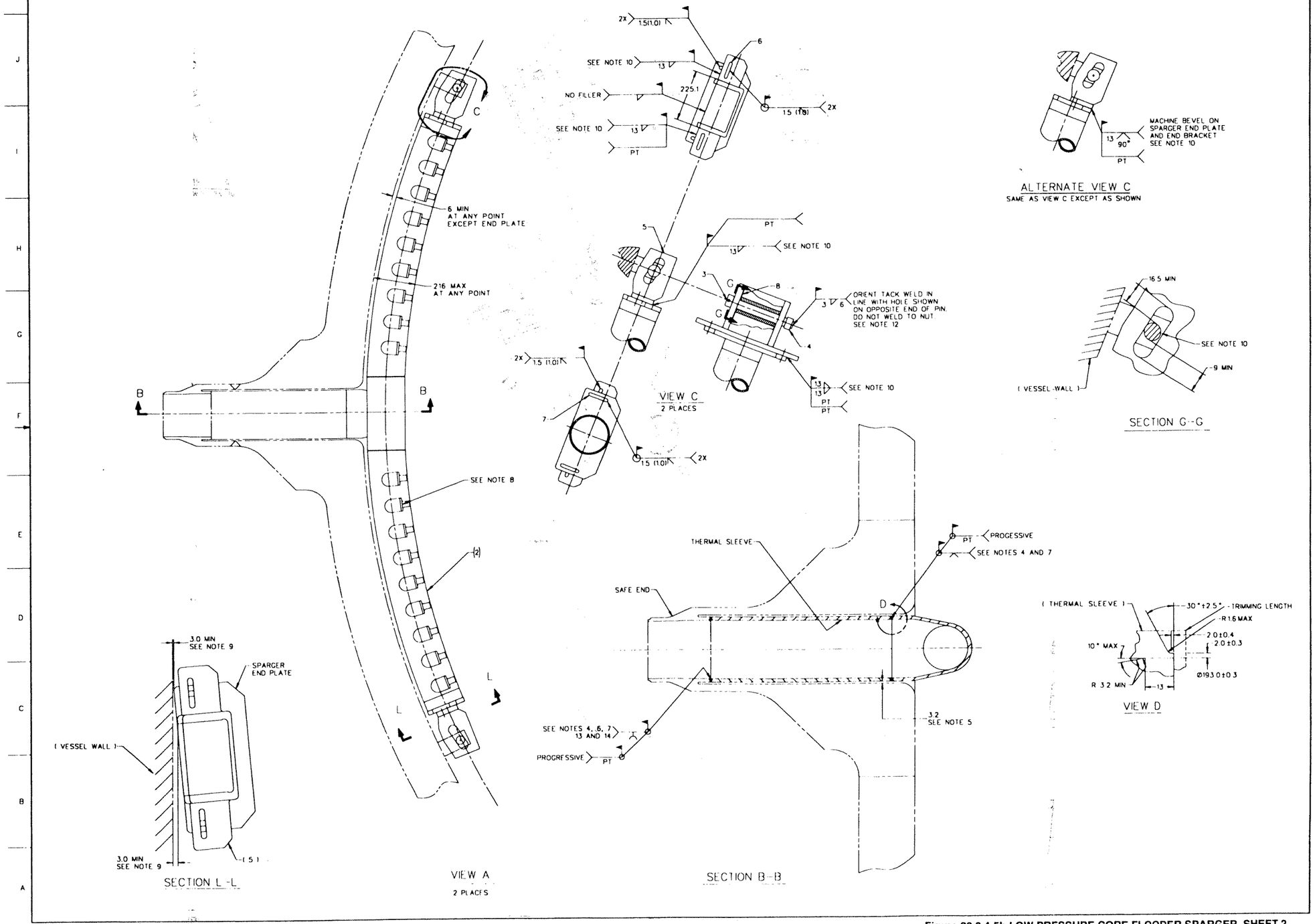
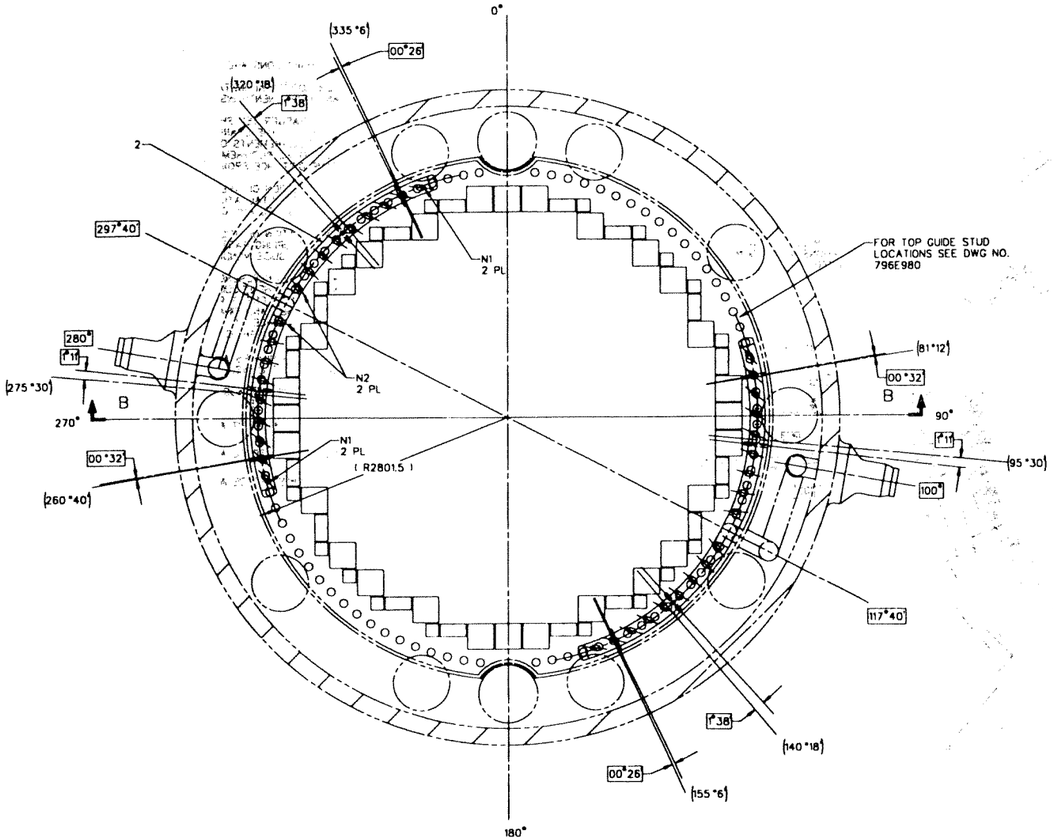


Figure 20.3.4-5b LOW PRESSURE CORE FLOODER SPARGER, SHEET 2



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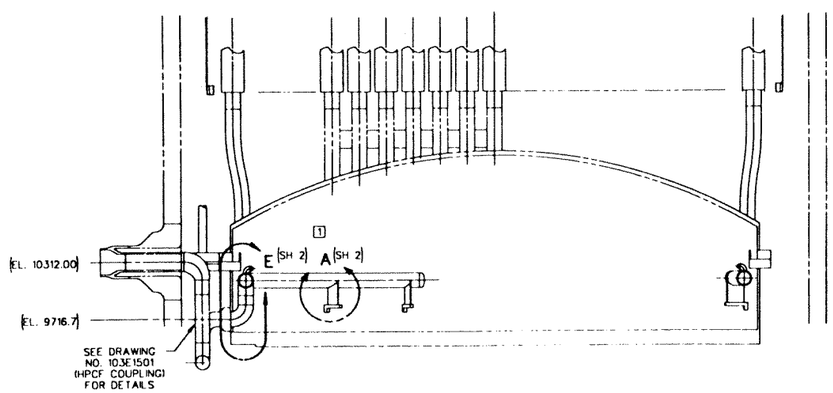
RPV SECTION AT 10312.00



SECTION B B

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED.
2. FOR ADDITIONAL INSTALLATION REQUIREMENTS REFER TO VESSEL AND COMPONENTS INSTALLATION SPECIFICATION 23A6162.
3. THE SPARGER TEE SHALL BE POSITIONED IN ACCORDANCE WITH DETAIL E. THE SPARGER SHALL BE POSITIONED TO MEET THE REQUIREMENTS OF DETAIL A AT ANY POINT WITH THE ADDITIONAL REQUIREMENT THAT THE SPARGER ENDS BE THE SAME DISTANCE FROM THE TOP GUIDE WALL WITHIN 12 mm.
4. INSTALLATION OF THE HPCF COUPLING SHALL BE PERFORMED AFTER SPARGER INSTALLATION TO ENSURE THAT THE SPARGER TEE AND COUPLING PIPE ARE CONCENTRIC (SEE 10XE1501).
5. INSTALLATION OF THE HPCF SPARGERS, THEIR SUPPORTS AND HPCF COUPLING PARTS SHALL BE PERFORMED IN THE SHOP BY THE TOP GUIDE VENDOR.
6. ALL WELDS REFERENCED TO THIS NOTE SHALL BE AS FOLLOWS AND MEET THE REQUIREMENTS OF GE SPEC. 23A6096.
   a. PROGRESSIVE PT
   b. ROOT, AND FINAL PT
   c. SURFACE PT.
   d. RADIOGRAPHIC
7. APPLIES 4 PLACES AT THE OUTERMOST (N1) AND INNERMOST (N2) SPARGER ELBOWS.
8. ALL WELDS ARE AUSTINITIC STAINLESS STEEL TO AUSTENITIC STAINLESS STEEL.
9. TRIM ITEM 4 TO FIT AS SHOWN.
10. WELD FINISH TO BE AS SHOWN IN VIEW C (SH 2).
11. WELD FINISH TO BE AS SHOWN IN SECTION D-D (SH 2).