
	UPDATED FSAR INSTRUMENTATION AND CONTROLS CHAPTER 7 FIGURES	Revision: 25 Chapter: 7 Page: 1 of 2
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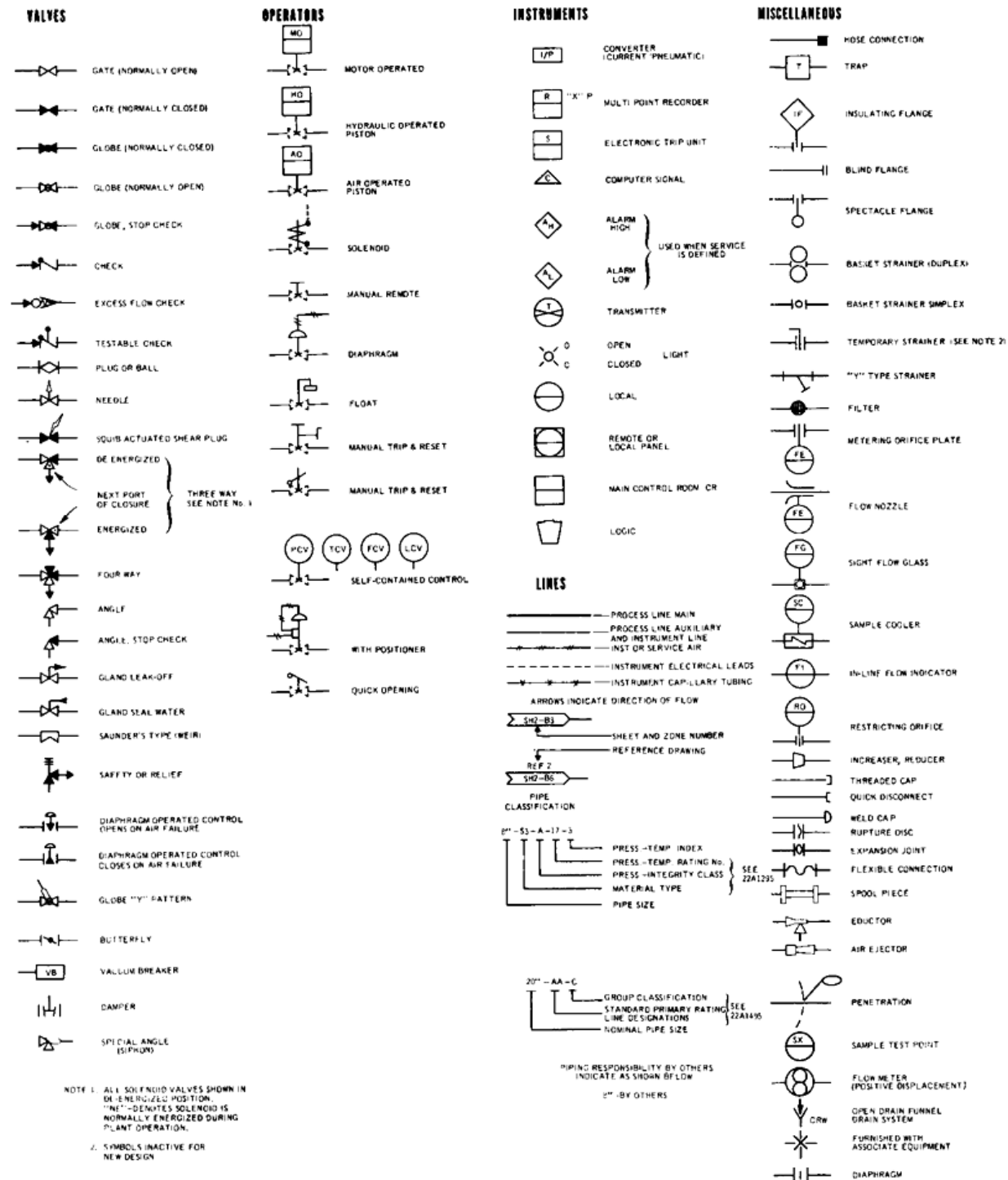
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PIPING, INSTRUMENTATION AND CONTROL SYMBOLS

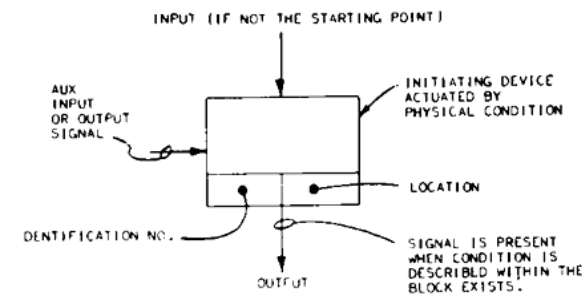
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MISCELLANEOUS ABBREVIATIONS:

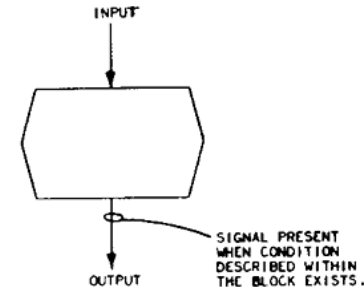
PIPING SPEC CHANGE
(NOT TO BE USED
ON EQUIPMENT)

AW	AIR SUPPLY	RBCON	REACTOR BUILDING COOLING SYSTEM START
AX	ACID WASTE - CORROSIVE, CAUSTIC	RBEOT	REACTOR BUILDING EQUIPMENT DRAIN TANK
CAT	CONDUCTIVITY INDICATOR TRANSMITTER	RM	REMOTE MANUAL
CRD	CONTROL ROD DRIVE	RMC	REMOTE MANUAL CONTROL
CRDHS	CONTROL ROD DRIVE HYDRAULIC SYSTEM	RMS	REMOTE MANUAL SWITCH
CRS	CONDUCTIVITY RECORDING SWITCH	RPS	REACTOR PROTECTION SYSTEM
CRW	CLEAN RADWASTE	RPV	REACTOR PRESSURE VESSEL
CRW	DILUTE RADWASTE	SS	SELECTOR SWITCH
CTS	DIFFERENTIAL TEMPERATURE SWITCH	SSA	SELECTIVE SWITCH AUTOMATIC
ELP	ELECTRIC VOLTAGE PNEUMATIC	SSC	SQUARE ROOT CONVERTER
EFS	SPECIAL ELECTRIC POWER SUPPLY REQUIRED	TBCON	TURBINE BUILDING COOLING CIRCULATING WATER CHARGE TIME
FA	FAIL AS - SEE NOTE 1	TC	CYCLE TIME
FC	INDICATES CLOSURE ON AIR OR ELECTRICAL FAILURE	TR	TRIP
FI	FLOW INDICATOR TRANSMITTER	TQMS	TORQUE OVERLOAD SWITCH
FO	INDICATES OPEN ON AIR OR ELECTRICAL FAILURE	TQMS	TORQUE MECHANISM TRANSDUCER
FPCS	FLOW RECORDING CONTROLLER - SWITCH	TQI	TORQUE TRANSDUCER
HCU	HYDRAULIC CONTROL UNIT	TPS	TEMPERATURE INTERLOCK SWITCH
HS	HAND SWITCH - SEE NOTE 2		
IP	CURRENT - CURRENT PNEUMATIC		
LC	LOCK CLOSED		
L/DMS	LEVEL & DENSITY RECORDING SWITCH		
LIM SW	LIMIT SWITCH		
LIRS	LEVEL INDICATOR RECORDING SWITCH		
LO	LOCK OPEN		
LMS	LEVEL RECORDING SWITCH		
MOV	MILLIVOLT TO CURRENT CONVERTER		
NC	NORMAL - CLOSED		
ND	NORMAL - DE ENERGIZED		
NE	NORMAL - ENERGIZED		
NO	NORMAL - OPEN		
NW	NORMAL WASTE - CONVENTIONAL		

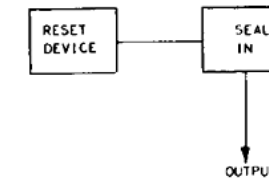
LOGIC SYMBOLS USED ON FUNCTIONAL CONTROL DIAGRAMS



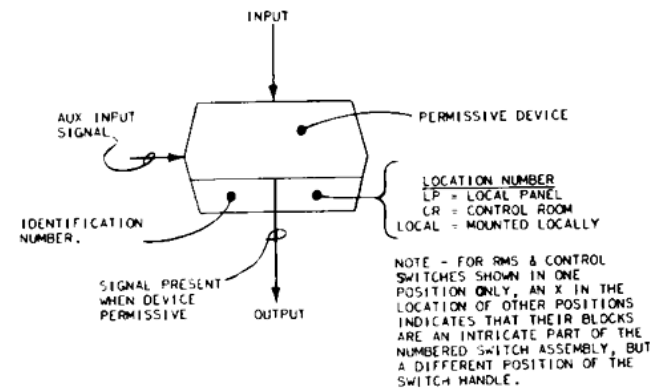
COMMAND BLOCK
THIS BLOCK CAN REPRESENT A SWITCH, VALVE, PROBE, TIMER, OR TRIP CIRCUIT. IT IS NORMALLY THE STARTING POINT OF A FUNCTIONAL SEQUENCE WITH AN OUTPUT ONLY, BUT CAN HAVE INPUT AND AUX. INPUT DEPENDING ON THE TYPE OF DEVICE. THE SAME DEVICE MAY HAVE A NUMBER OF OUTPUTS, BUT EACH FUNCTIONAL SEQUENCE INITIATED SHALL BE SHOWN BY AN INDIVIDUAL BLOCK SHOWING THE SAME IDENTIFICATION NUMBER.



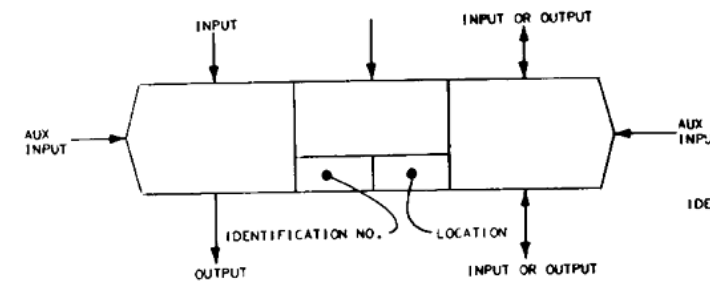
PERMISSIVE CONDITION BLOCK
WHERE THE PERMISSIVE IS A GENERAL CONDITION AND NOT IDENTIFIED WITH A SINGLE DEVICE THE OUTPUTS ENCLOSURE ONLY IS SHOWN



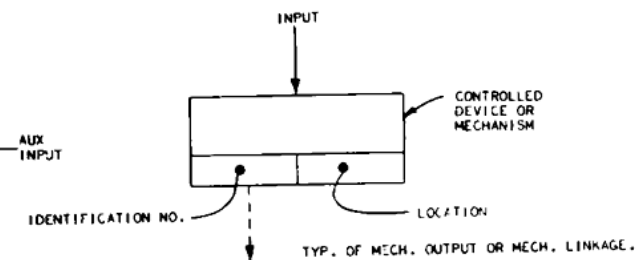
SEAL-IN BLOCK
A SEAL-IN OR LATCHING BLOCK'S FUNCTION IS TO MAINTAIN AN INPUT SIGNAL TO A DEVICE ONCE THE DEVICE HAS BEEN ACTUATED. RESETTING OR INHIBITING A SEAL-IN MAY BE EITHER EXPRESSED OR IMPLIED. IF IMPLIED, THE SEAL-IN WILL BE RESET OR INHIBITED BY INTERRUPTING THE SIGNAL TO THE DEVICE DOWNSTREAM FROM THE POINT WHERE SEAL-IN IS INDICATED. A SEAL-IN SHOWN WITHOUT A RESET DEVICE IMPLIES THAT THE RESET DEVICE IS PART OF, AND LOCATED ON THE NEAREST VALVE OR CONTACTOR. IN ALL OTHER CASES THE RESET DEVICE SHALL BE SHOWN IN CONJUNCTION WITH THE SEAL-IN.



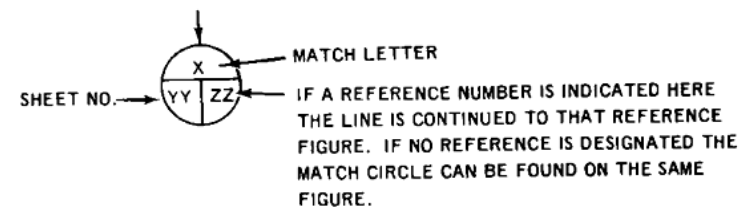
PERMISSIVE DEVICE BLOCK
THIS BLOCK DEFINES A PERMISSIVE FUNCTION WHICH MUST BE SATISFIED TO PERMIT THE SIGNAL FLOW TO PASS TO THE NEXT BLOCK. THIS BLOCK HAS INCOMING, OUTGOING AND MAY HAVE AUXILIARY SIGNALS. THE OUTPUT FROM THIS PERMISSIVE MAY BE SEALED IN.



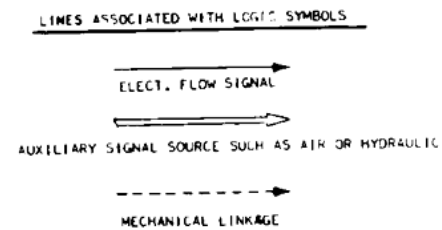
PERMISSIVE OPERATED BY OTHER DEVICES BLOCK
THIS BLOCK IS A PERMISSIVE OPERATED BY DEVICES SUCH AS VALVE OR PUMP SWITCHGEAR DESIGNATED IN THE INNER BLOCK. THIS COND. OR DEVICE EFFECTS THE OPERATION OF THE FINAL DEVICE. IT HAS ELECT. INPUTS, MECH INPUTS, AUX INPUTS (MECH OR ELEC) AND MECH OR ELEC OUTPUTS. THIS DEVICE IS NORMALLY A VALVE. THIS IS ALSO USED FOR OTHER INPUT/OUTPUT POWER SOURCES SUCH AS AIR OR HYDRAULIC. A SOLENOID PILOT VALVE FOR AN AIR OPERATED VALVE IS AN EXAMPLE OF THIS TYPE DEVICE.



FINAL DEVICE BLOCK
THIS BLOCK CAN BE A RELAY, VALVE, ELECTRO-MECH SW. ETC. NORMALLY IT HAS ONLY INPUTS, BUT CAN HAVE MECH OUTPUTS OR POSITION SWITCH OUTPUTS.

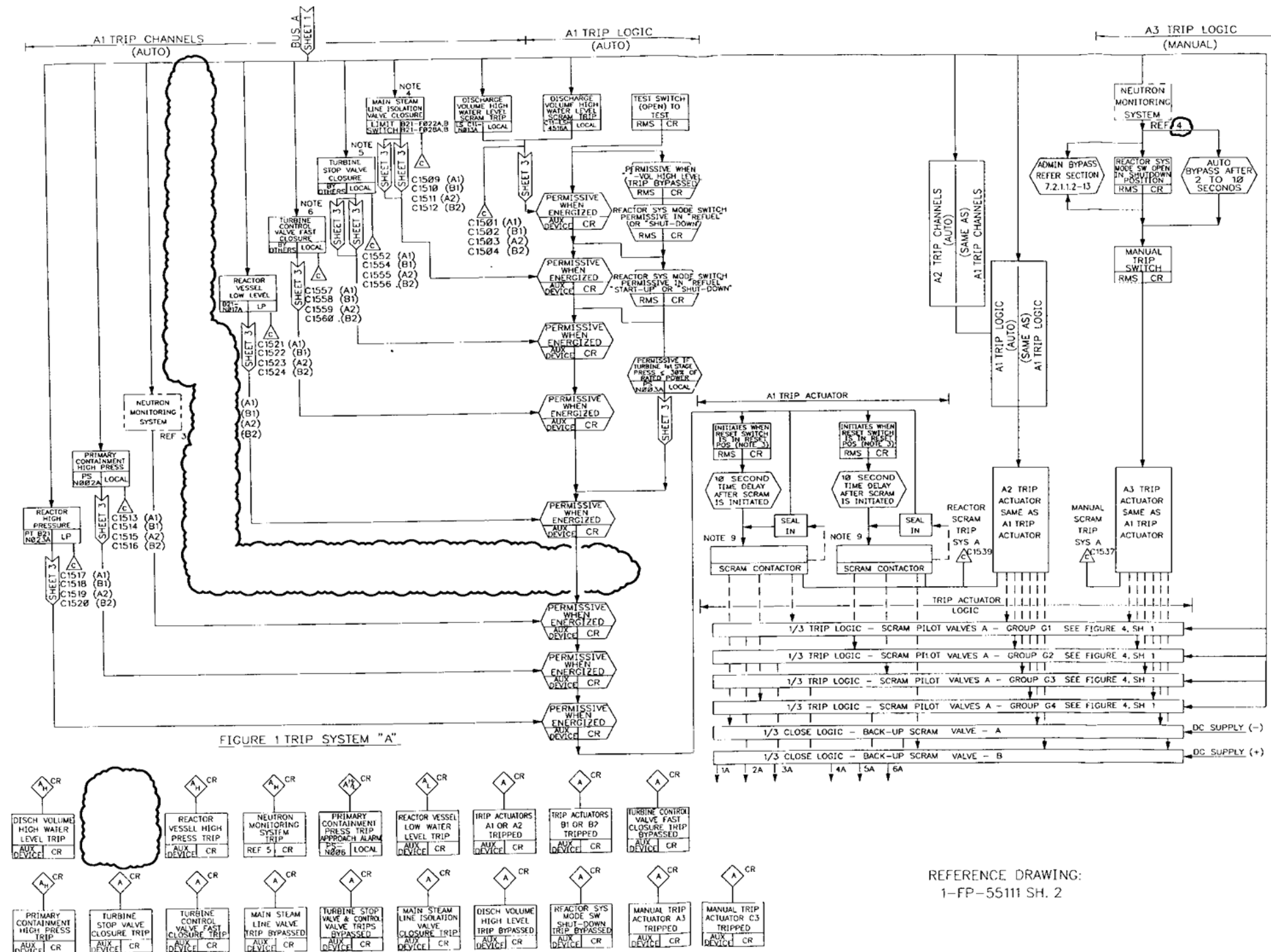


MATCH CIRCLE
THIS CIRCLE DESIGNATES THAT THE LINE CONNECTED TO IT IS CONTINUED TO ANOTHER LOCATION OF THE SAME FIGURE. THE LINE CAN BE FOLLOWED FROM A CIRCLE WITH THE CORRESPONDING MATCH LETTER ON THE DESIGNATED FIGURE SHEET.



REFERENCE DRAWING:
1-FP-55111 SH. 1

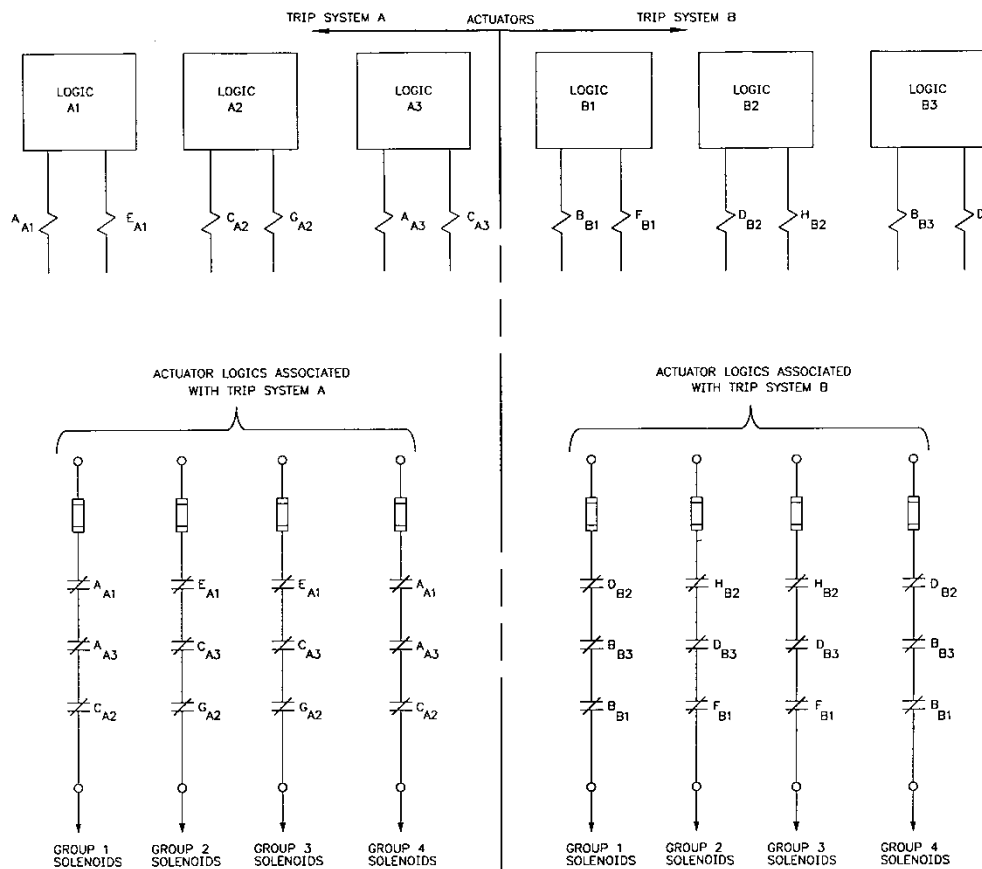
REACTOR PROTECTION SYSTEM (IED) SHEET 2



The image displays three schematic diagrams of reactor protection systems, labeled A1, A2, and A3. Each diagram shows a vertical sequence of safety interlocks (normally closed contacts) leading to a reactor protection logic unit (A1, A2, or A3). The logic units then trigger a reset mechanism (normally open contact) to a common reset line.

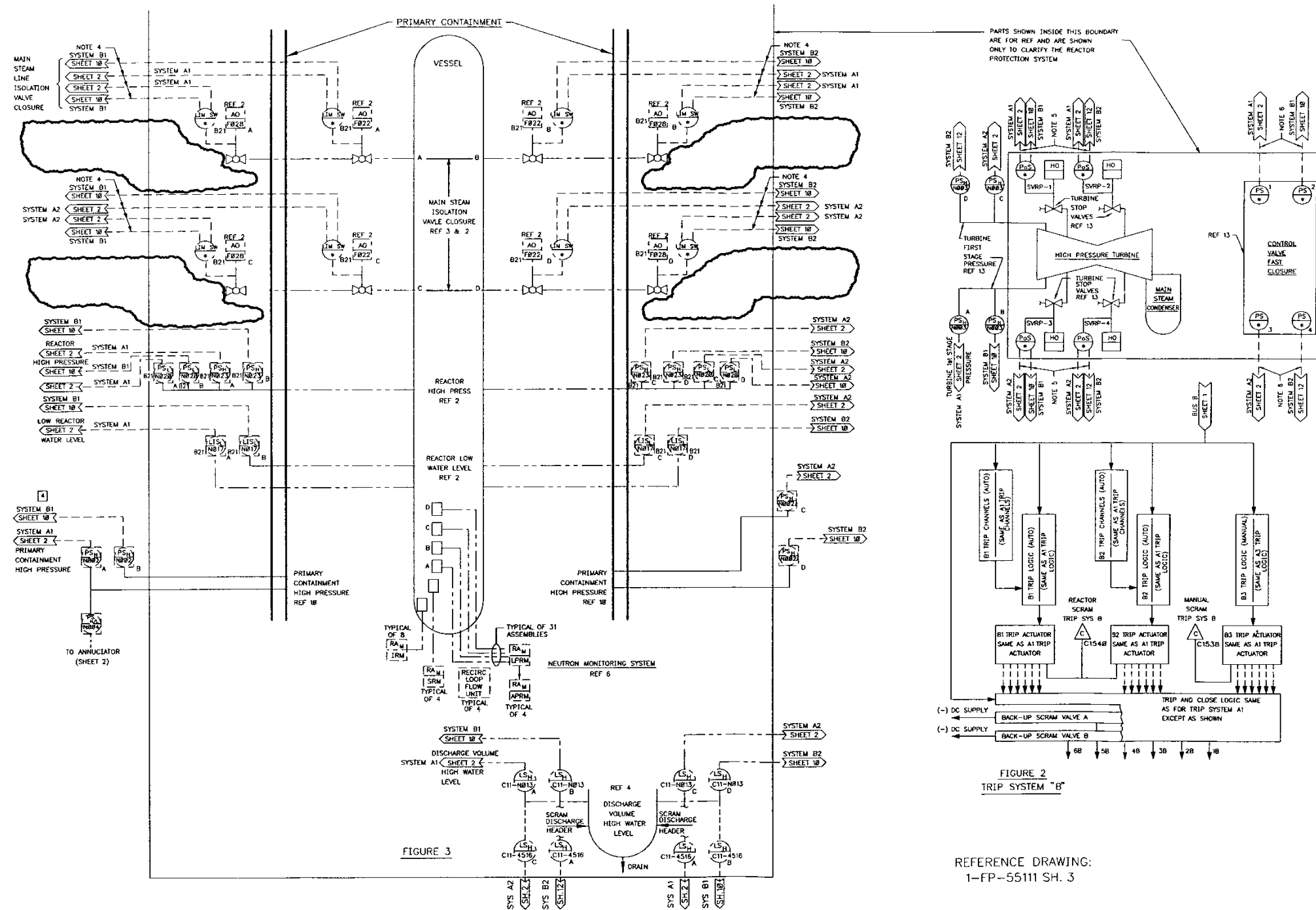
- Diagram A1 (Left):** Features a test switch, bypass, turbine control valve fast closure, discharge volume high water level, main steam line isolation valve, primary containment high pressure, nuclear system high pressure, reactor low water level, and a neutron monitoring system. The logic unit is labeled "REACTOR PROTECTION SYSTEM LOGIC A1".
- Diagram A2 (Middle):** Features a test switch, bypass, turbine control valve fast closure, discharge volume high water level, main steam line isolation valve, primary containment high pressure, nuclear system high pressure, reactor low water level, and a neutron monitoring system. The logic unit is labeled "REACTOR PROTECTION SYSTEM LOGIC A2".
- Diagram A3 (Right):** Features a test switch, bypass, turbine control valve fast closure, discharge volume high water level, main steam line isolation valve, primary containment high pressure, nuclear system high pressure, reactor low water level, and a neutron monitoring system. The logic unit is labeled "REACTOR PROTECTION SYSTEM LOGIC A3".

SCHEMATIC DIAGRAM OF ACTUATORS AND ACTUATOR LOGIC



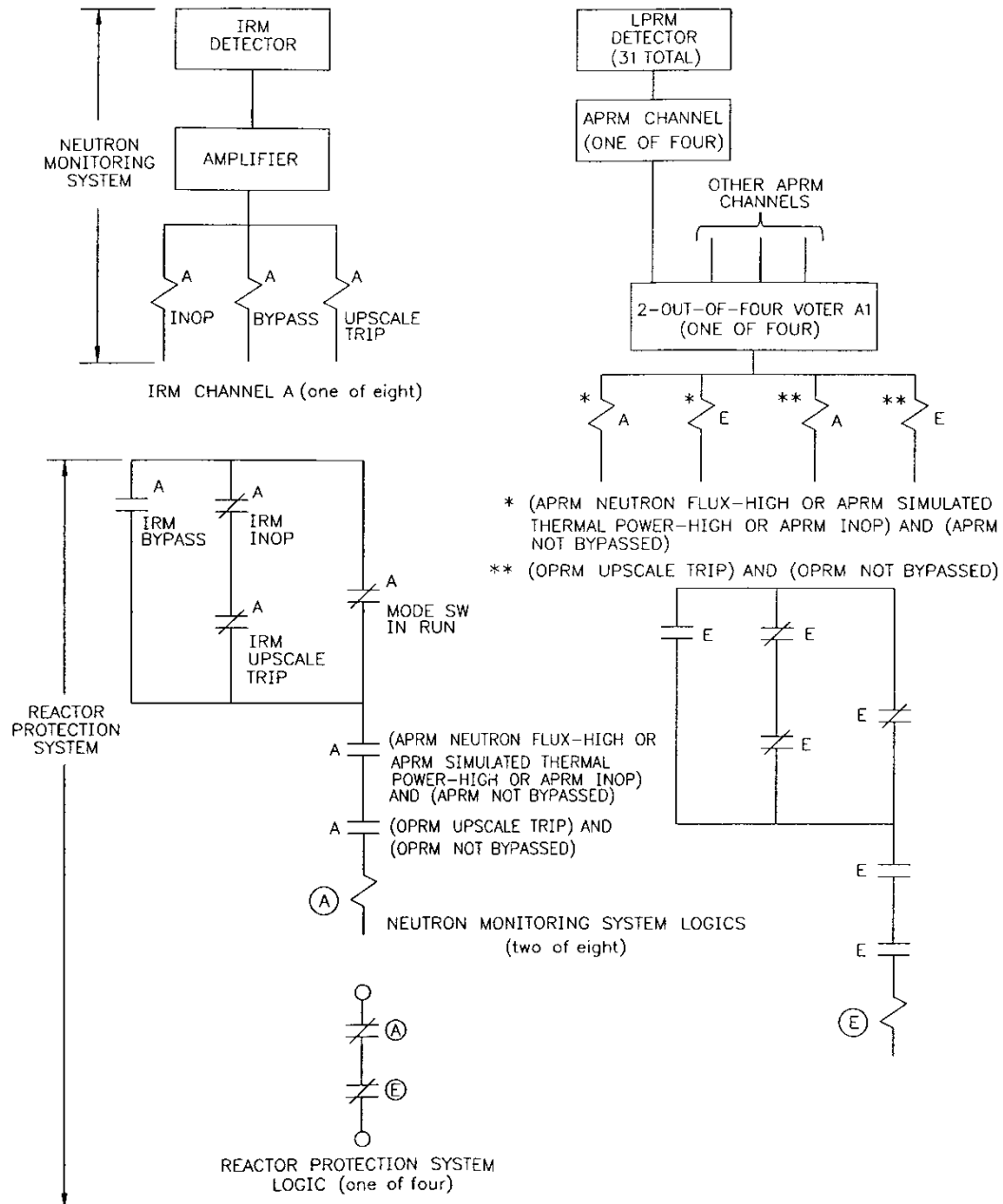
NOTE:
 CONTACTS SHOWN IN NORMAL CONDITION

REACTOR PROTECTION SYSTEM (IED) SHEET 3



RELATIONSHIP BETWEEN NEUTRON MONITORING SYSTEM AND REACTOR PROTECTION SYSTEM

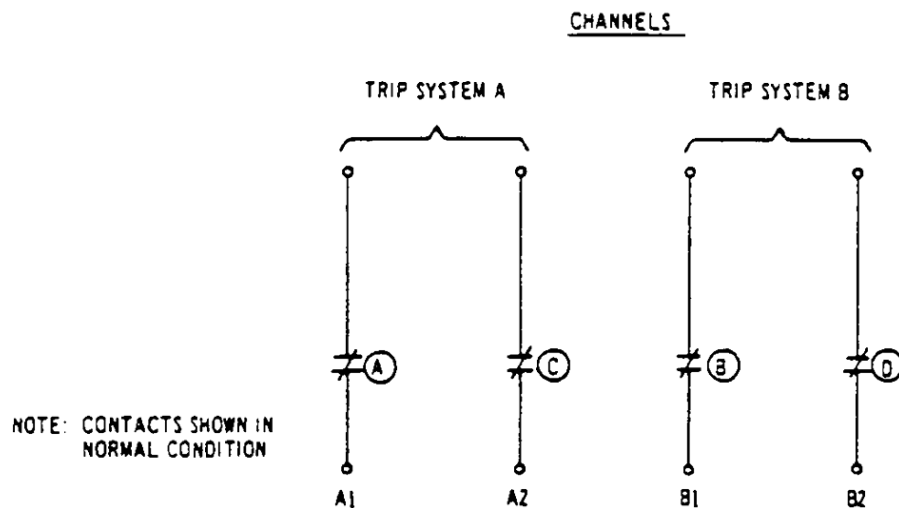
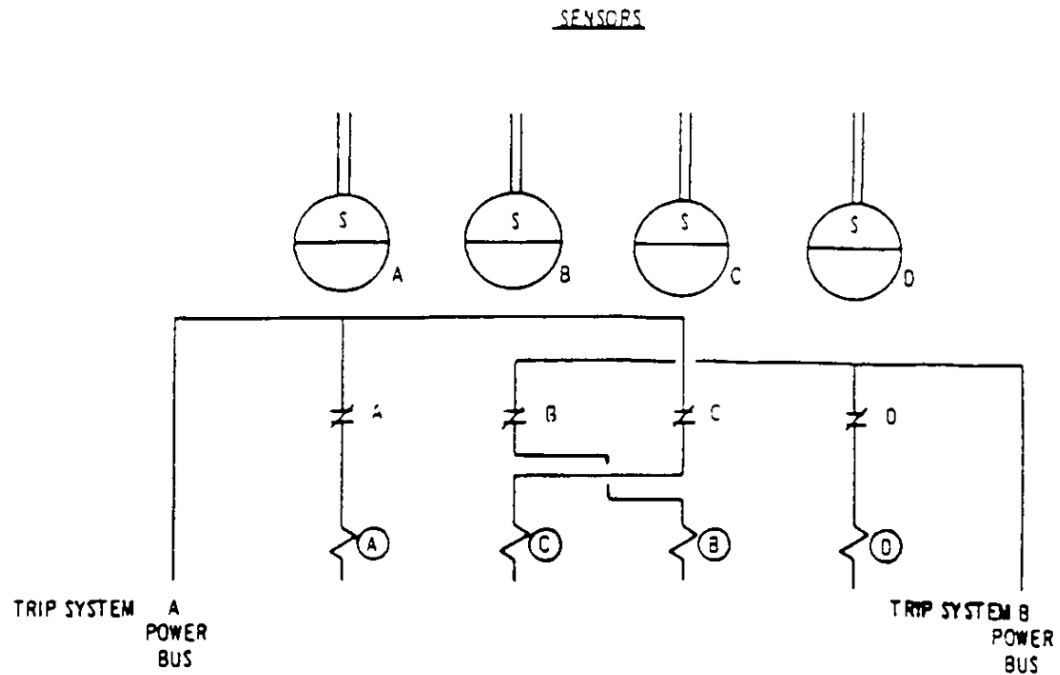
NEUTRON MONITORING SYSTEM TRIP CHANNELS



NOTES:

1. CONTACTS SHOWN IN NORMAL CONDITION.
2. RELAY NUMBERING FOR REFERENCE ONLY.

TYPICAL ARRANGEMENT OF CHANNELS AND LOGICS

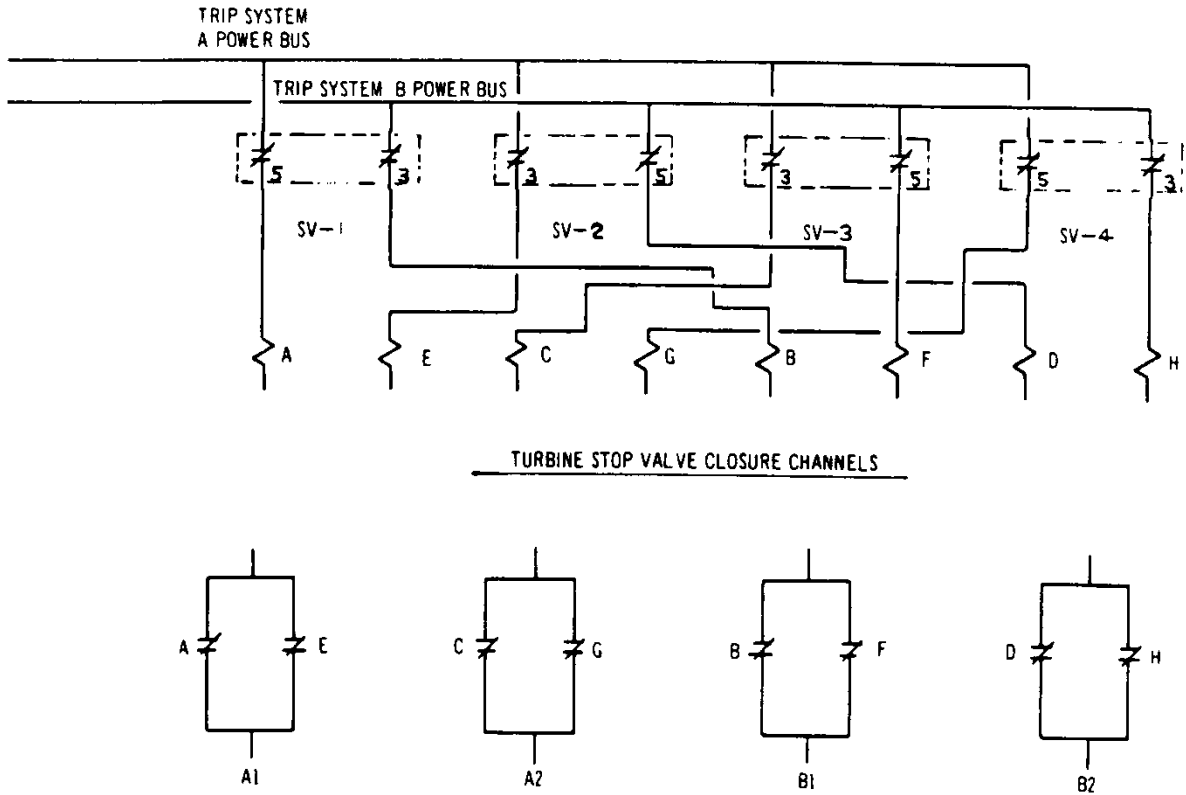


REACTOR PROTECTION SYSTEM LOGICS

TYPICAL CONFIGURATION FOR:
SCRAM DISCHARGE VOLUME HIGH WATER LEVEL
TURBINE CONTROL VALVE FAST CLOSURE
REACTOR VESSEL LOW WATER LEVEL

PRIMARY CONTAINMENT HIGH PRESSURE
NUCLEAR SYSTEM HIGH PRESSURE

TYPICAL CONFIGURATION FOR TURBINE STOP VALVE CLOSURE SCRAM

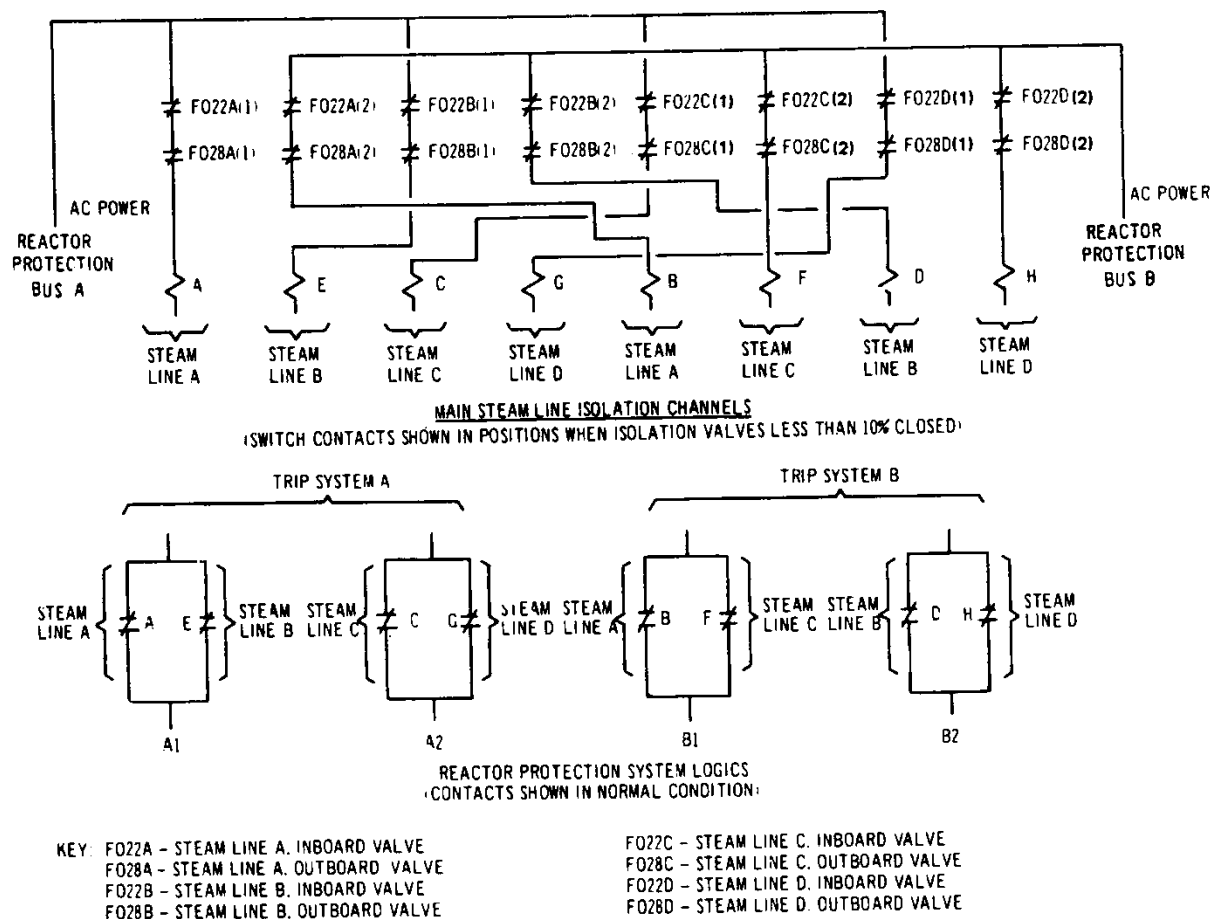


REACTOR PROTECTION SYSTEM LOGICS

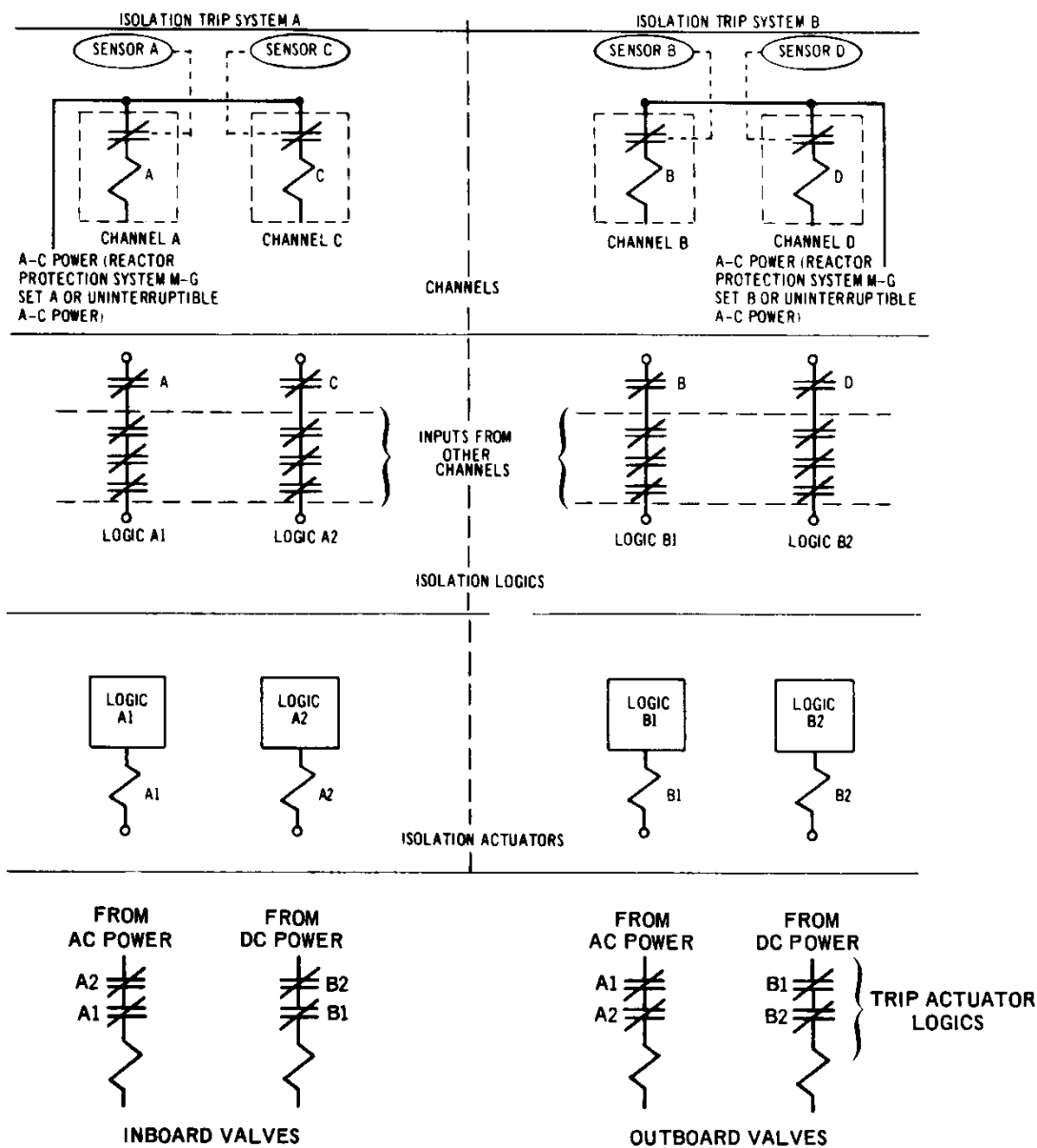
NOTE: CONTACTS SHOWN IN NORMAL CONDITION

SV = STOP VALVE

TYPICAL CONFIGURATION FOR MAIN STEAM LINE ISOLATION SCRAM

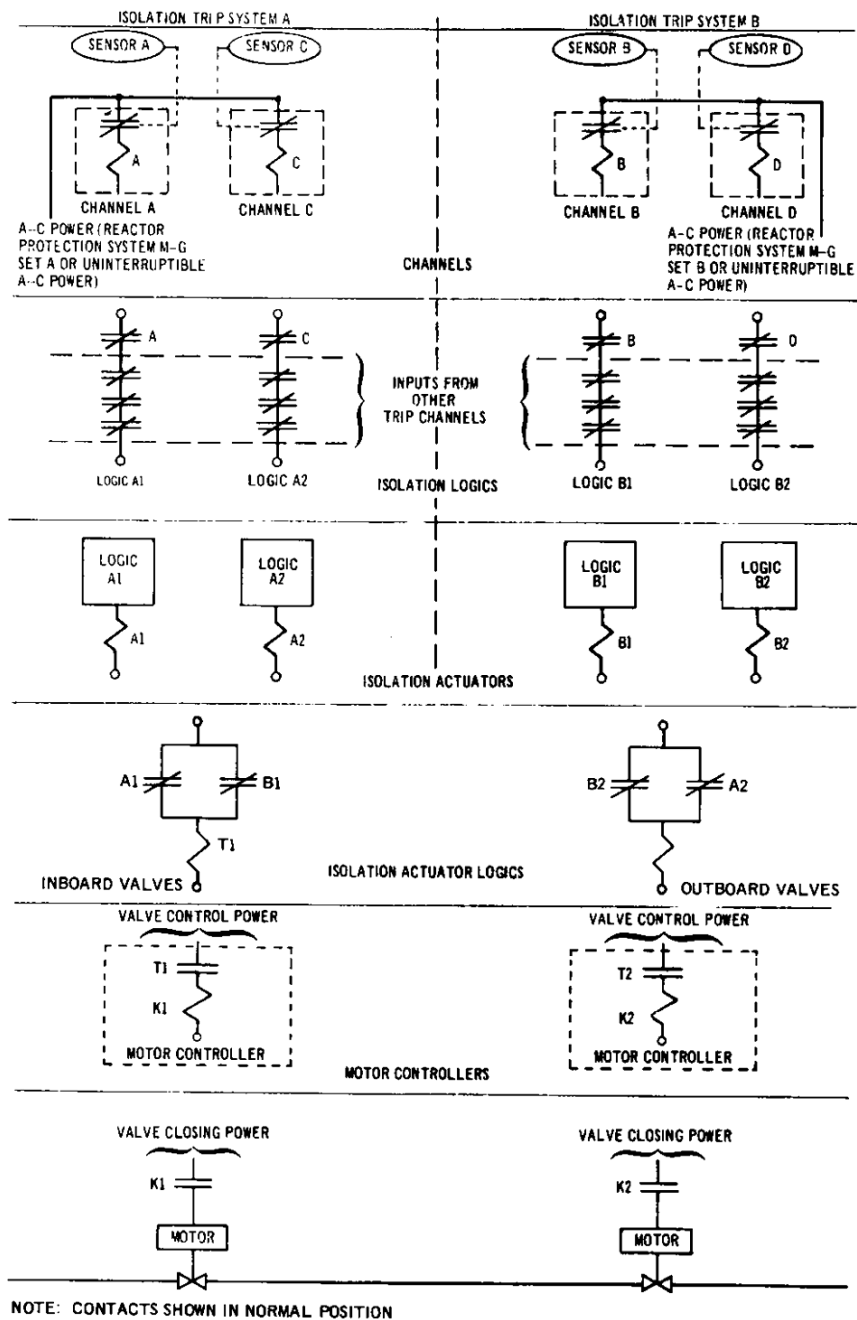


TYPICAL ISOLATION CONTROL SYSTEM FOR MAIN STEAM LINE ISOLATION VALVES



NOTE: CONTACTS SHOWN IN NORMAL POSITION

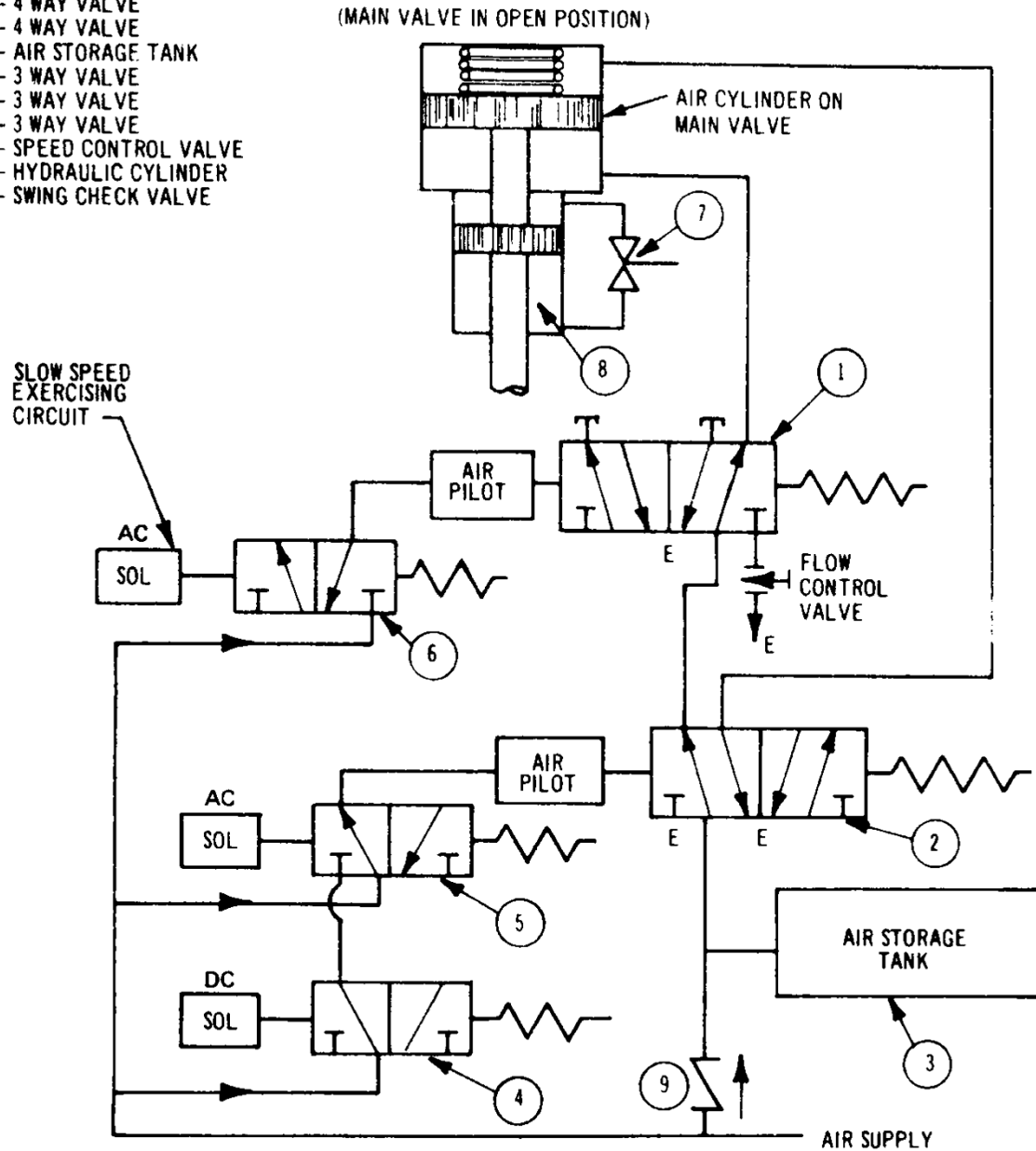
TYPICAL ISOLATION CONTROL SYSTEM USING MOTOR OPERATED VALVES



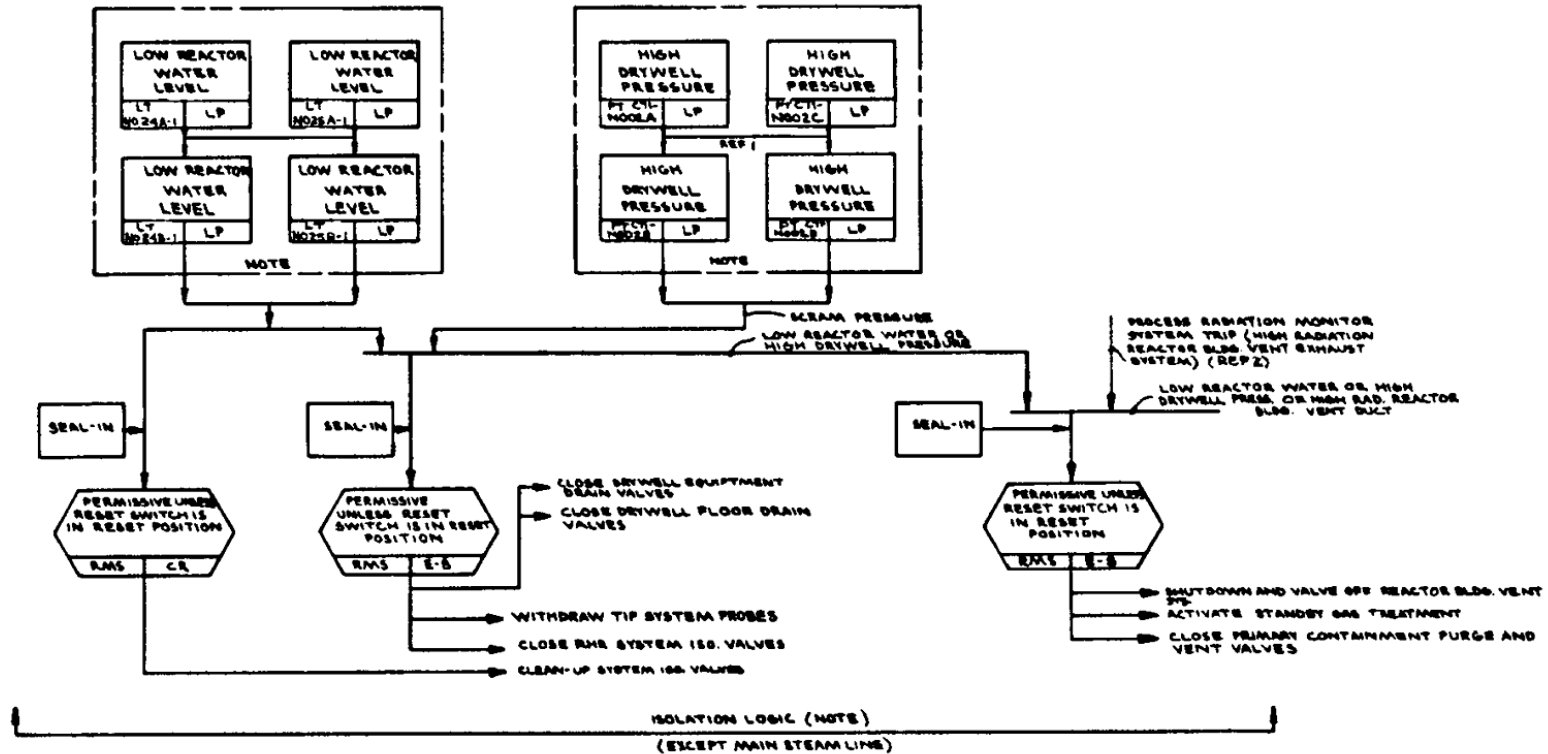
MAIN STEAM LINE ISOLATION VALVE, SCHEMATIC CONTROL DIAGRAM

LEGEND

- 1 - 4 WAY VALVE
- 2 - 4 WAY VALVE
- 3 - AIR STORAGE TANK
- 4 - 3 WAY VALVE
- 5 - 3 WAY VALVE
- 6 - 3 WAY VALVE
- 7 - SPEED CONTROL VALVE
- 8 - HYDRAULIC CYLINDER
- 9 - SWING CHECK VALVE



TYPICAL ISOLATION LOGIC



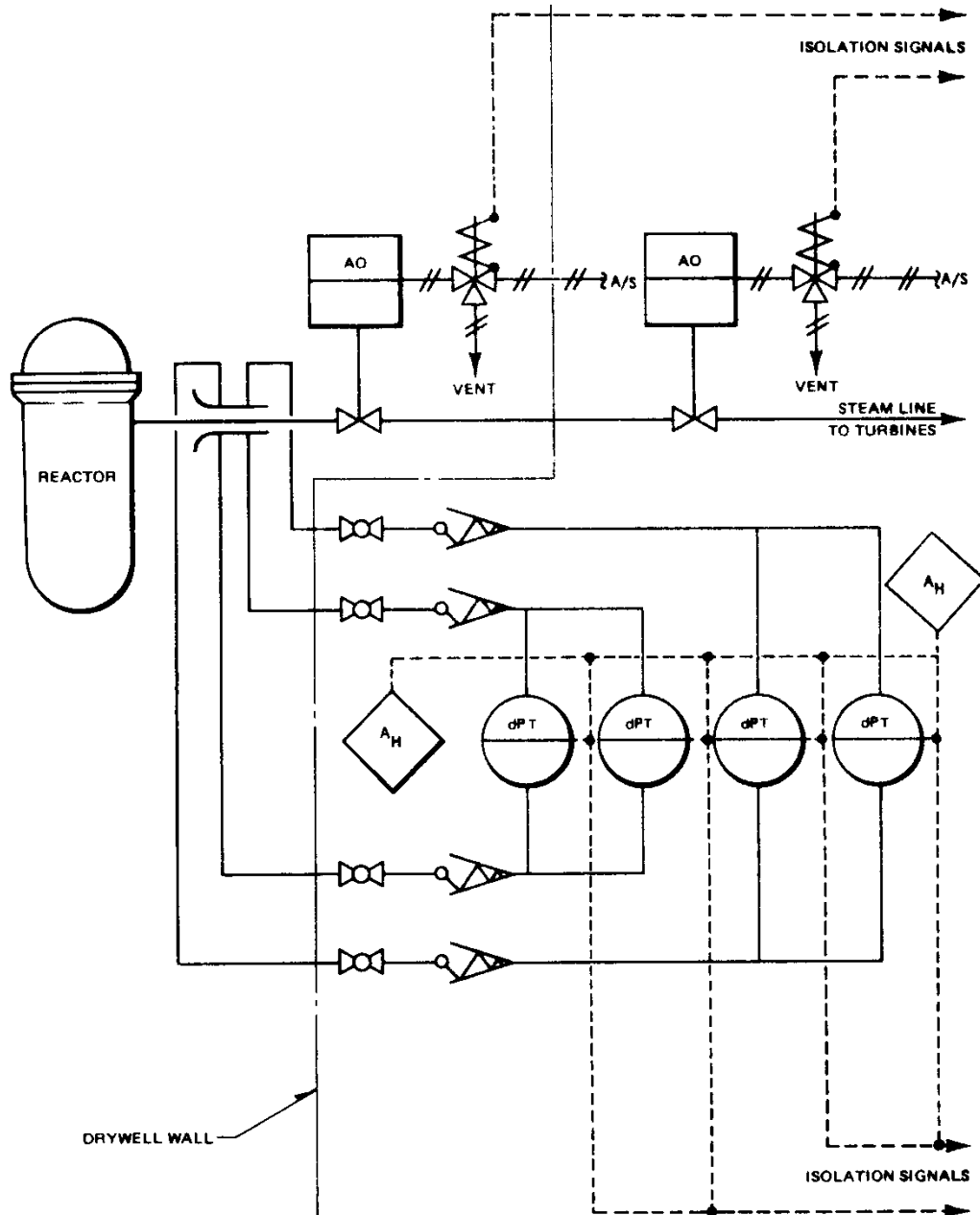
REFERENCE DOCUMENTS

1. REACTOR PROTECTION SYS. IBD.
2. PROCESS RADIATION SYS. IBD.

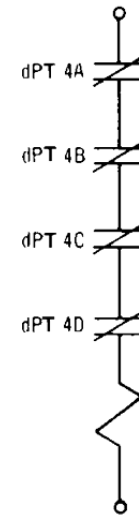
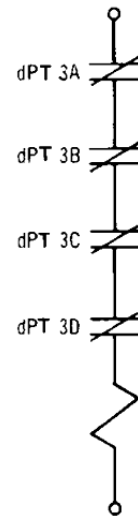
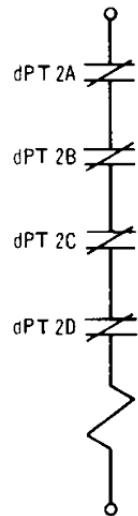
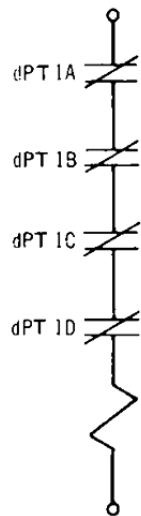
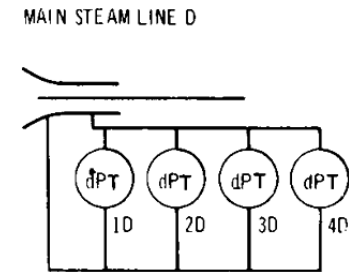
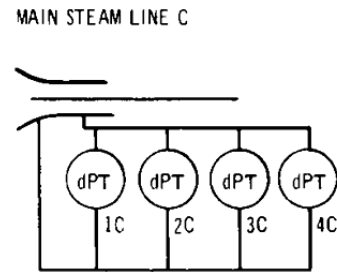
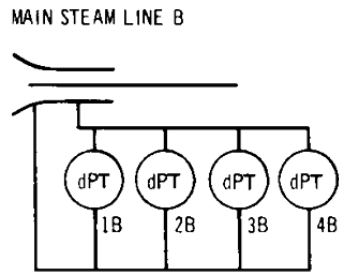
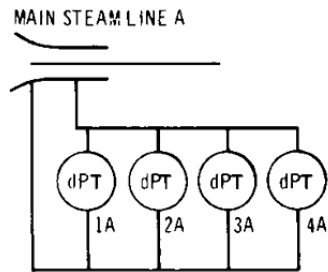
NOTE

Isolation logic shall be "fail-safe", i.e., logic shall be decided to initiate isolation functions when de-energized.

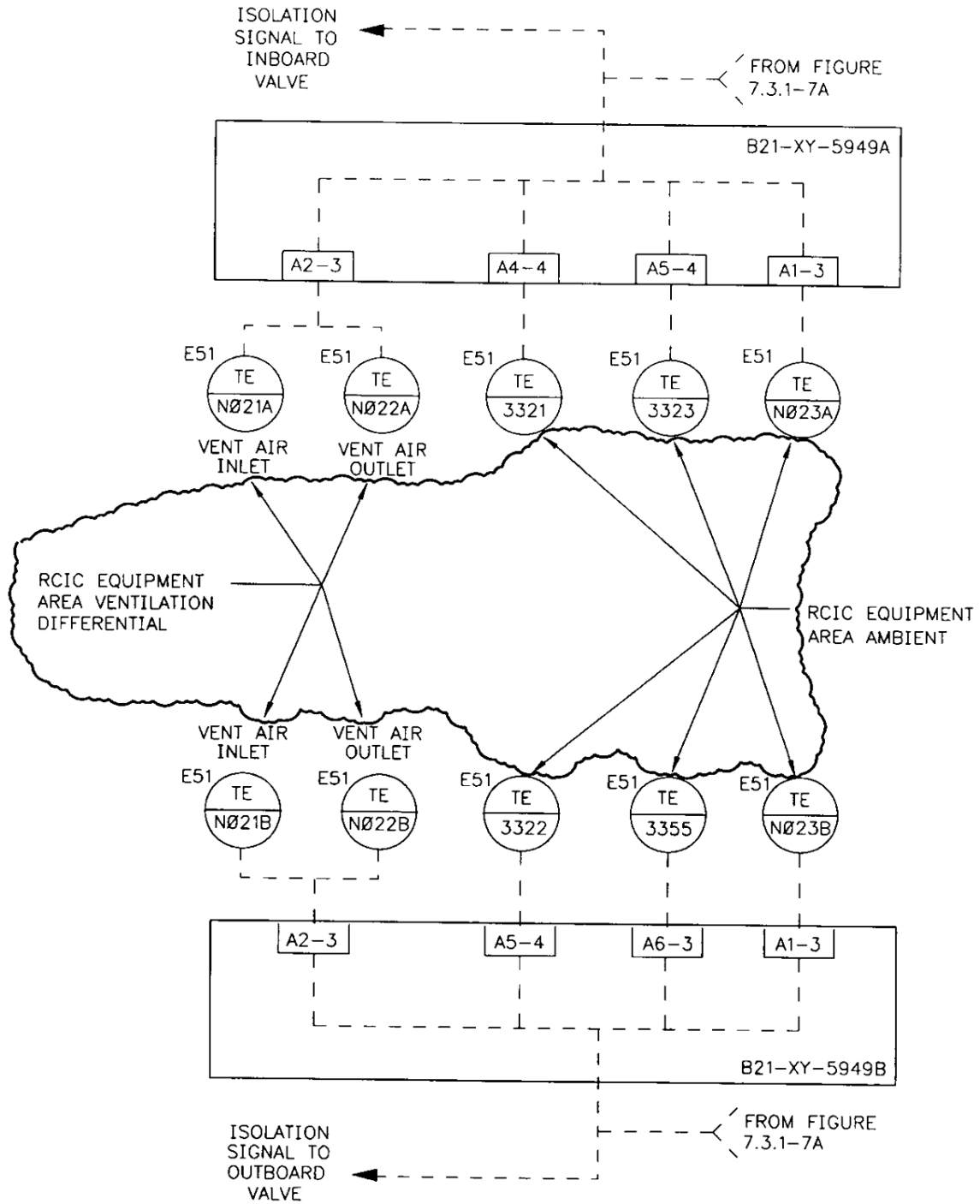
TYPICAL ARRANGEMENT FOR MAIN STEAM LINE BREAK DETECTION BY FLOW MEASUREMENT



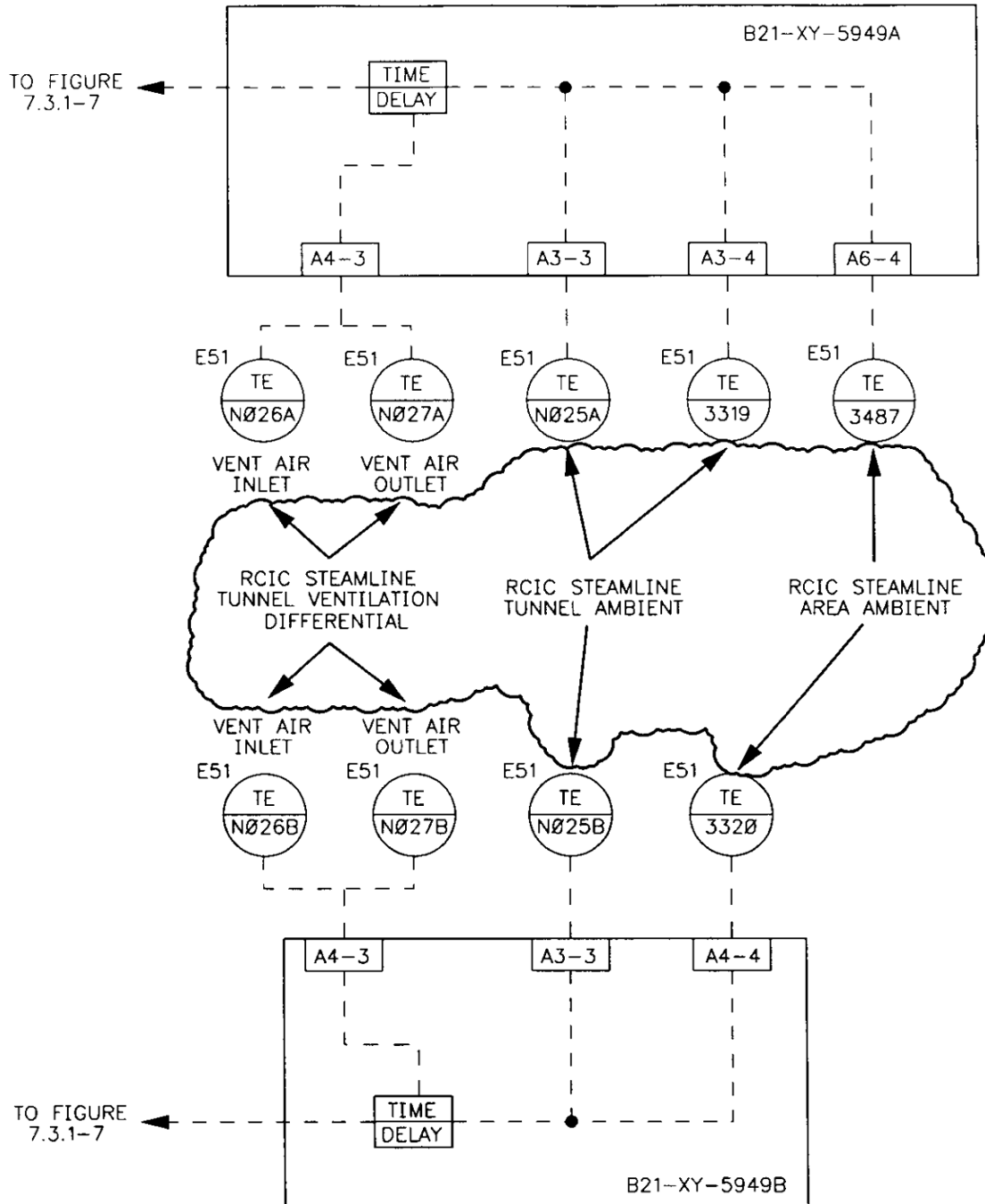
MAIN STEAM LINE HIGH FLOW CHANNELS



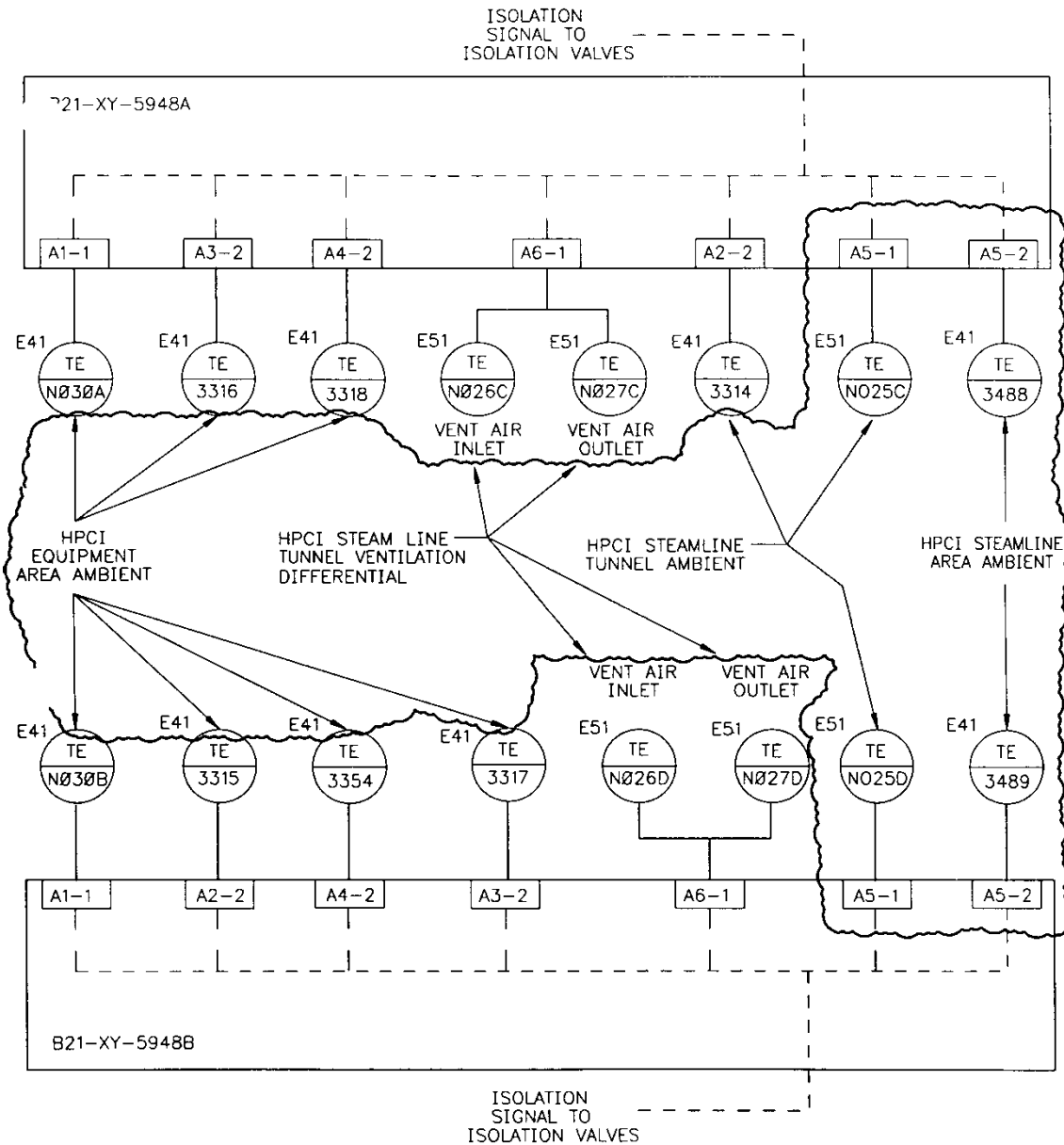
RCIC EQUIPMENT AREA LEAK DETECTION ARRANGEMENT



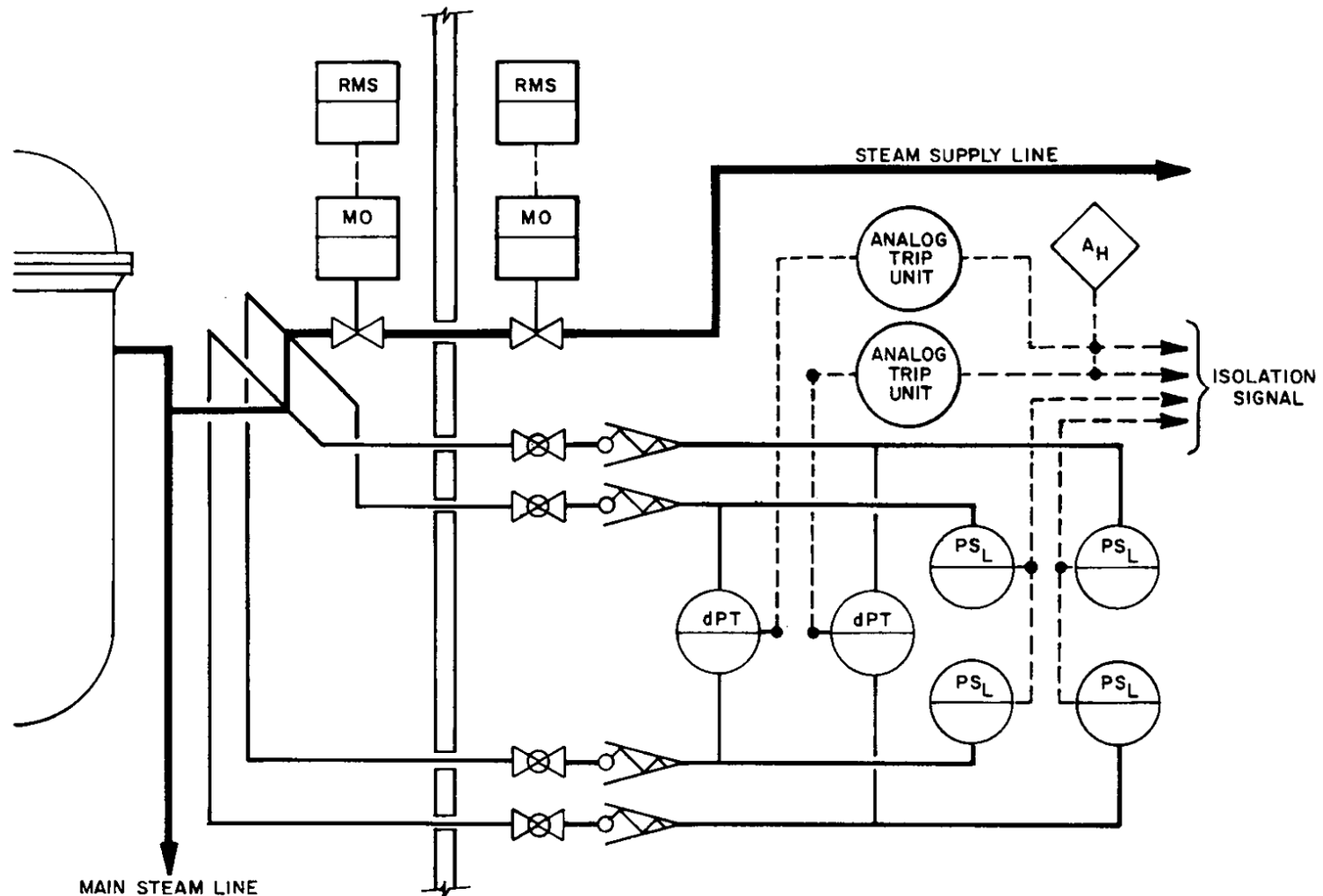
RCIC STEAM LINE TUNNEL AND STEAM LINE AREA LEAK DETECTION ARRANGEMENT



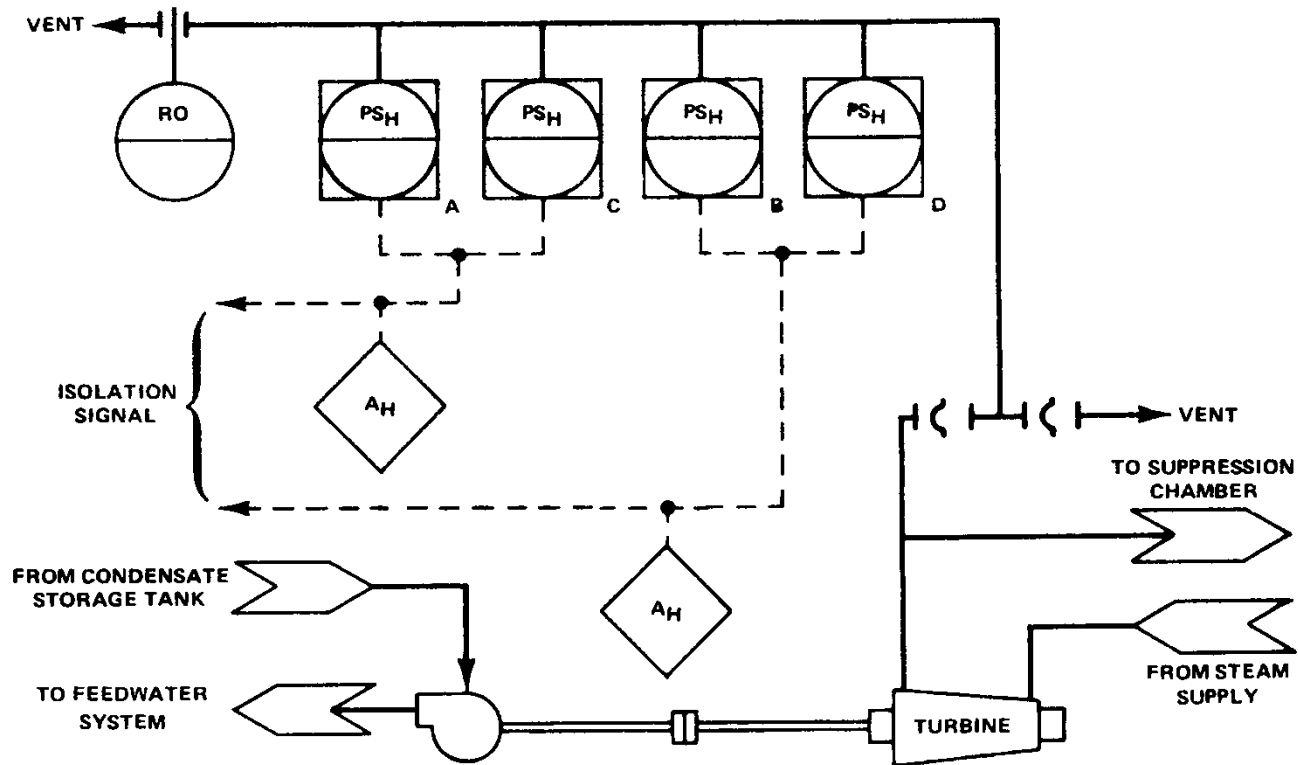
HPCI LEAK DETECTION ARRANGEMENT



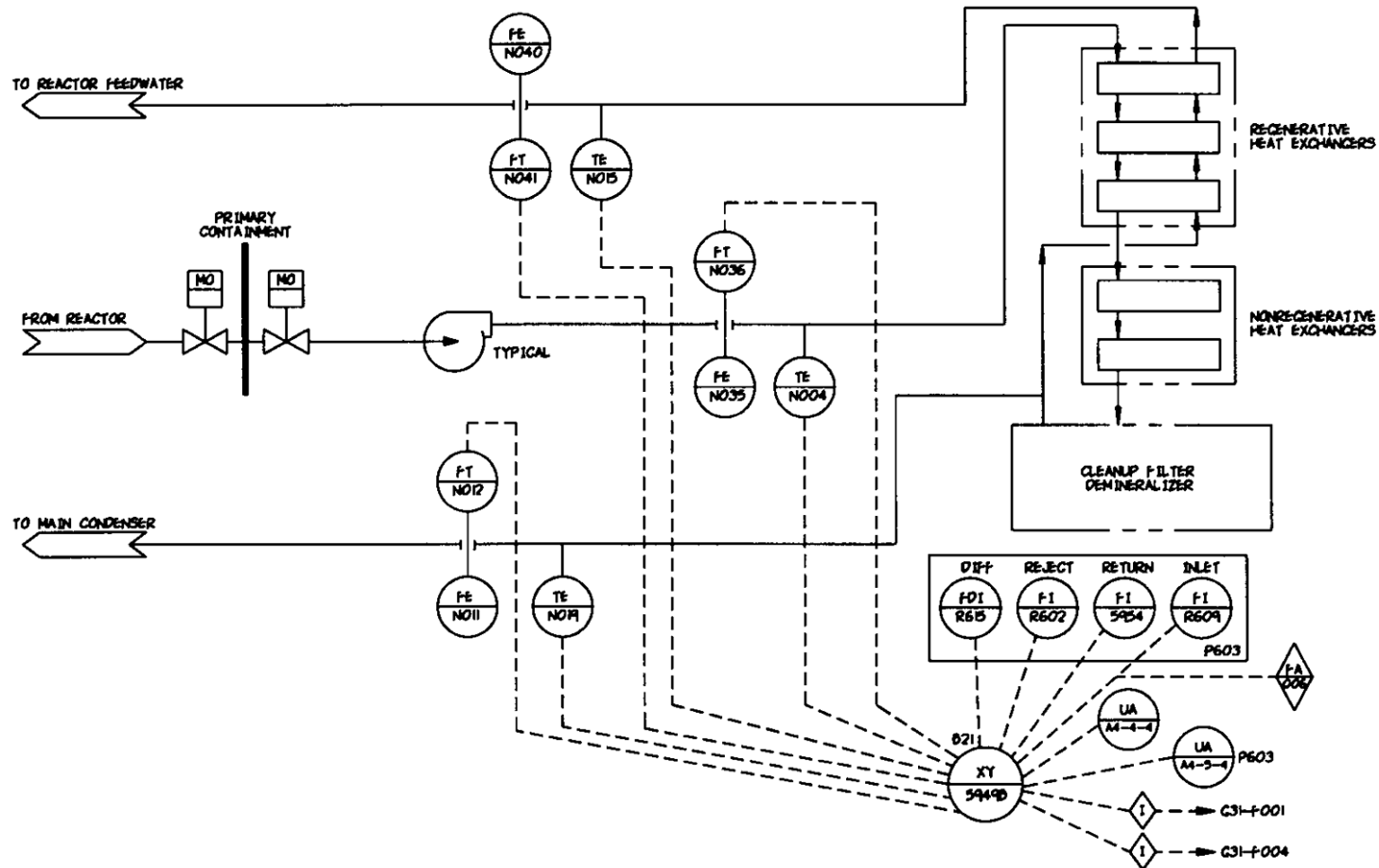
TYPICAL HPCI OR RCIC ELBOW FLOW SENSING ARRANGEMENT



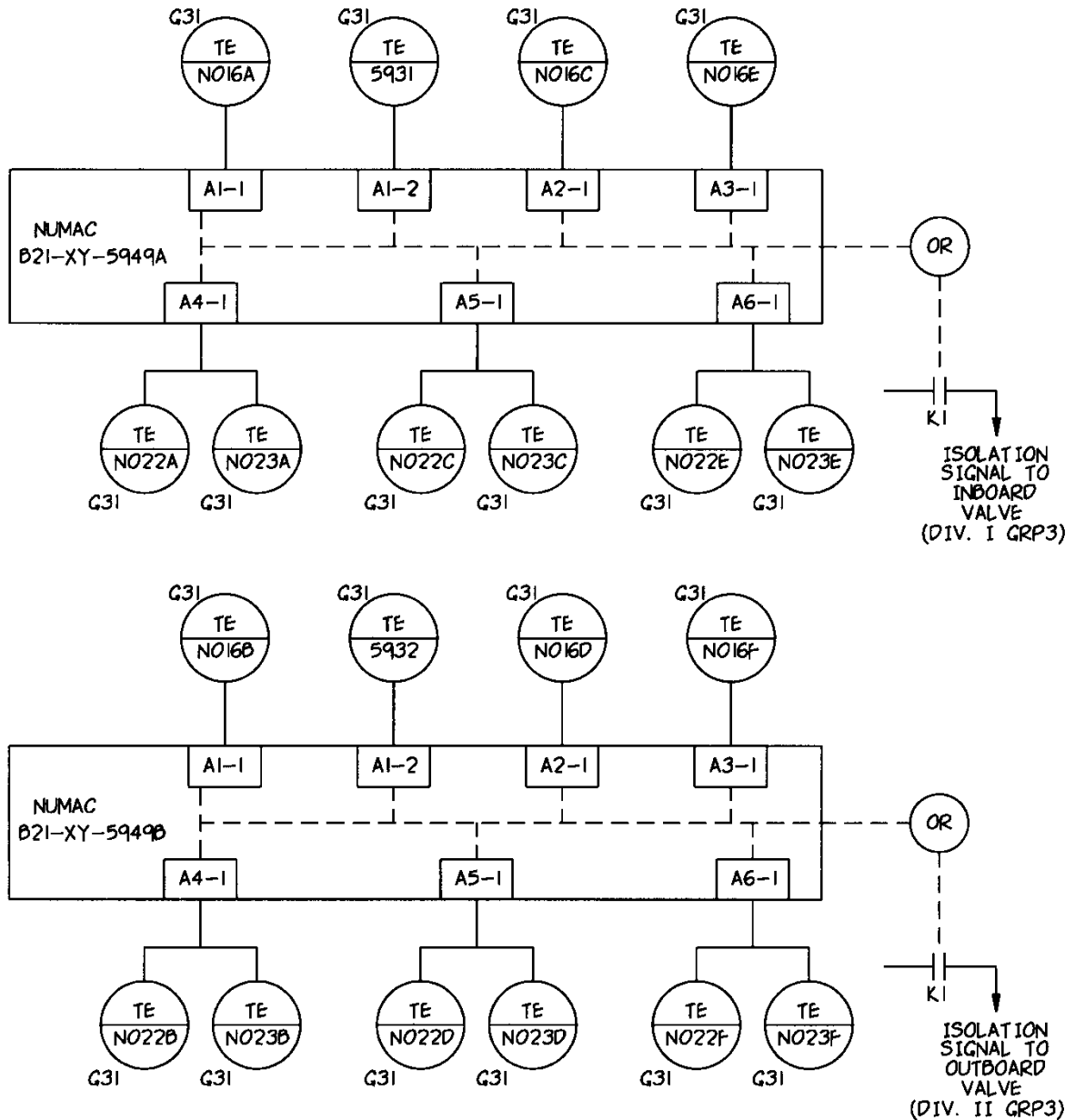
TYPICAL HPCI OR RCIC HIGH EXHAUST PRESSURE DETECTION ARRANGEMENT



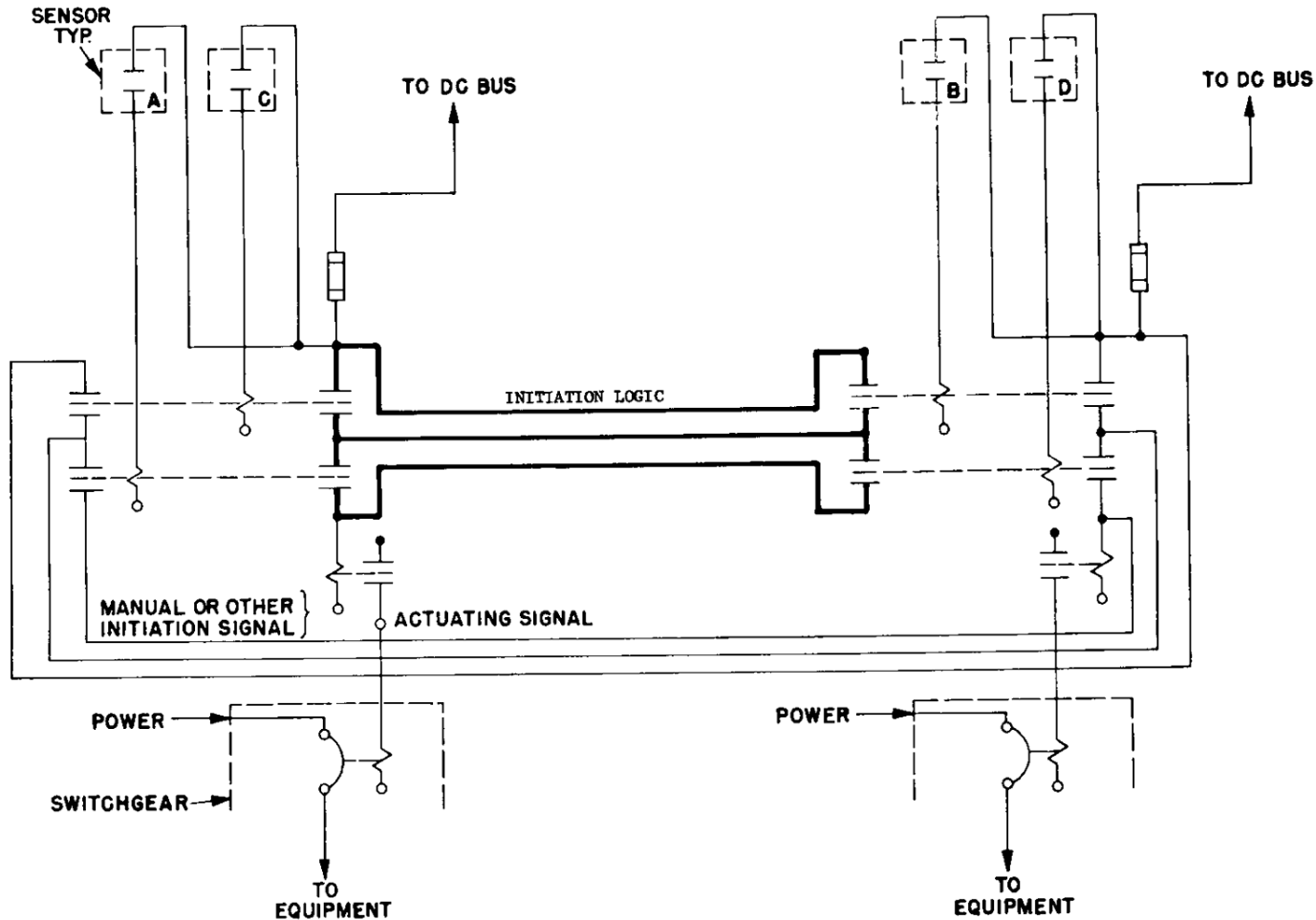
REACTOR WATER CLEANUP BREAK DETECTION BY DIFFERENTIAL FLOW MEASUREMENT



REACTOR WATER CLEANUP BREAK DETECTION BY HIGH AMBIENT AND HIGH DIFFERENTIAL TEMPERATURE MEASUREMENT

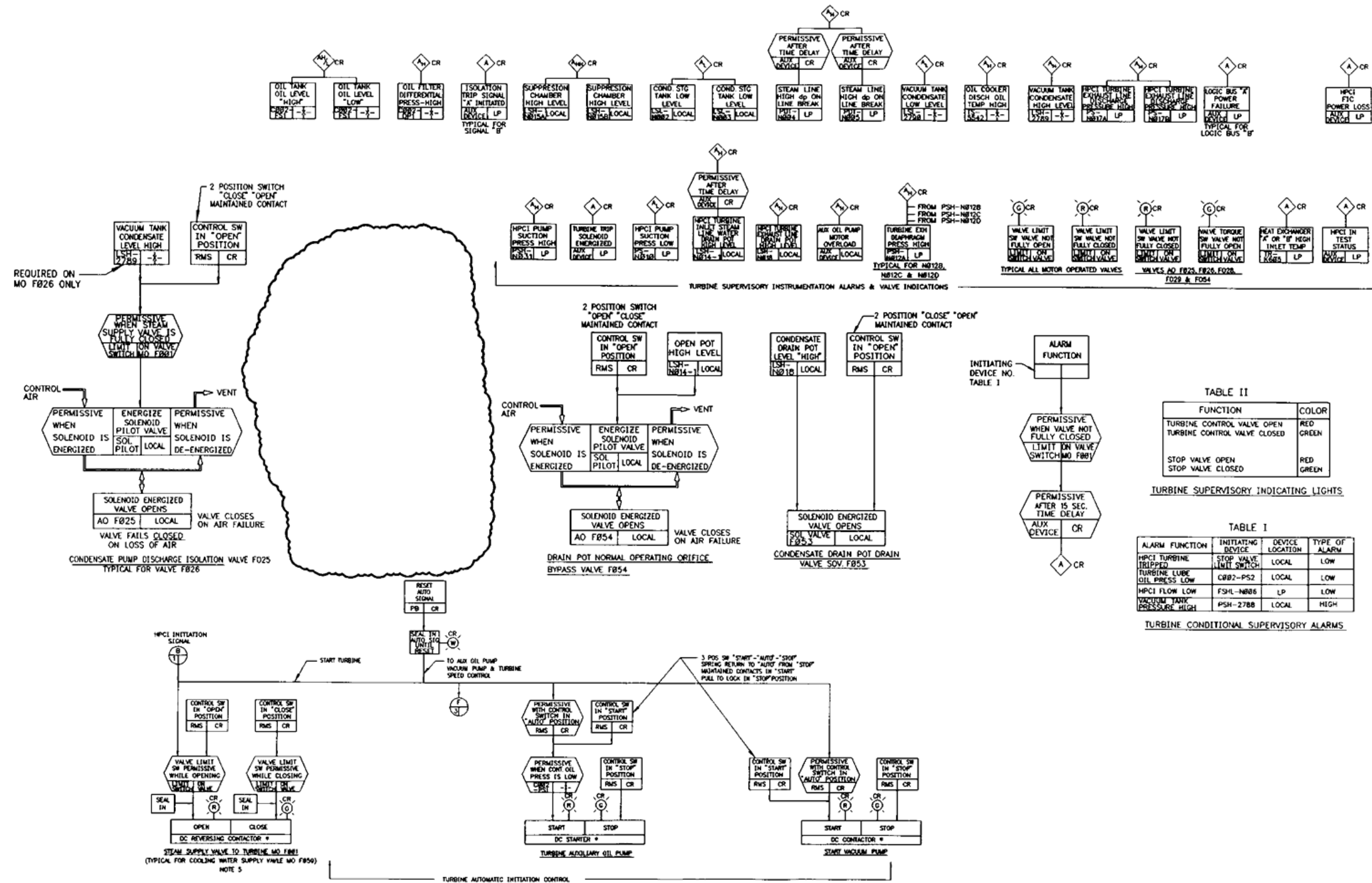


TYPICAL CSCS ACTUATION AND INITIATION LOGIC

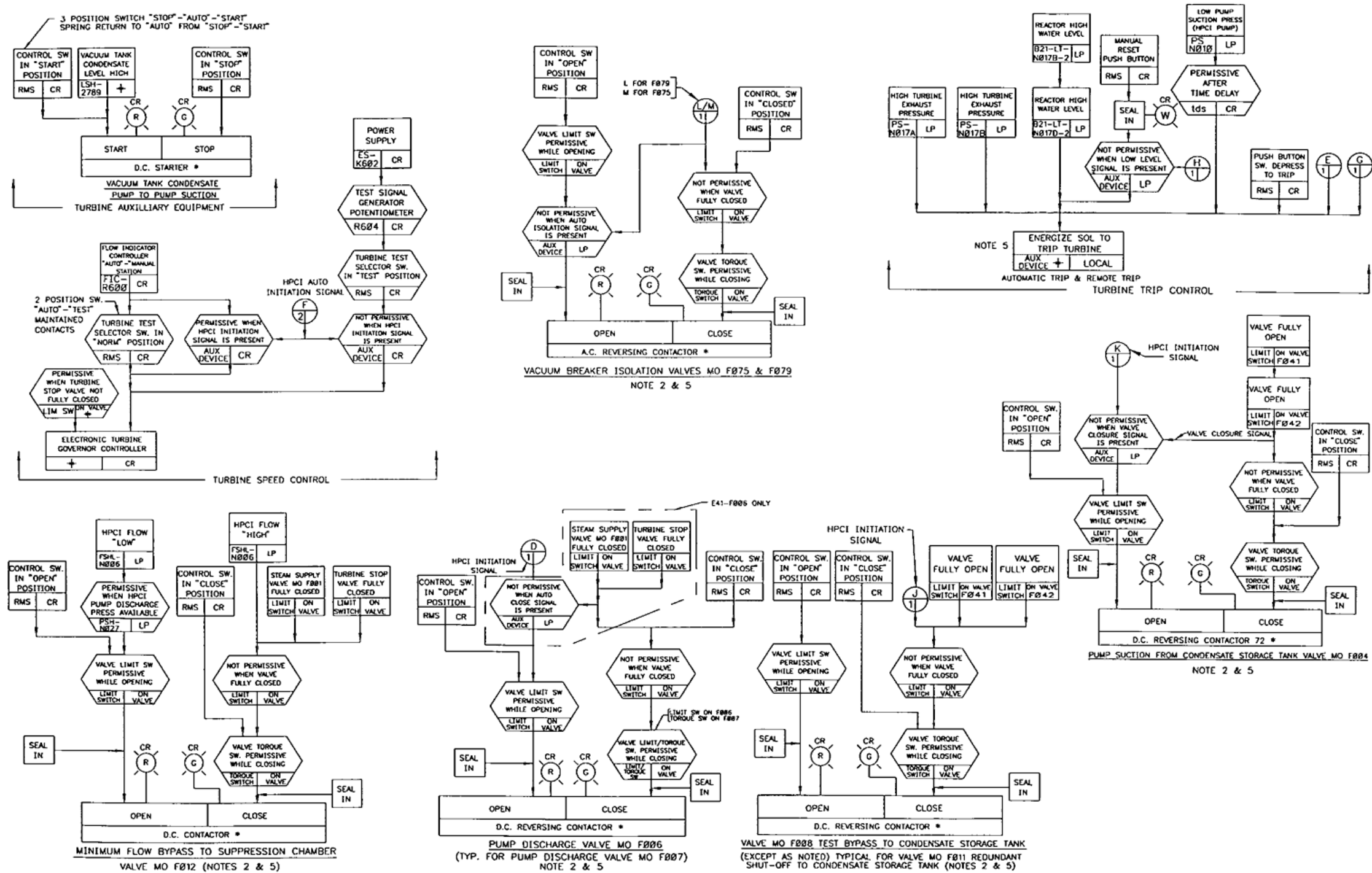


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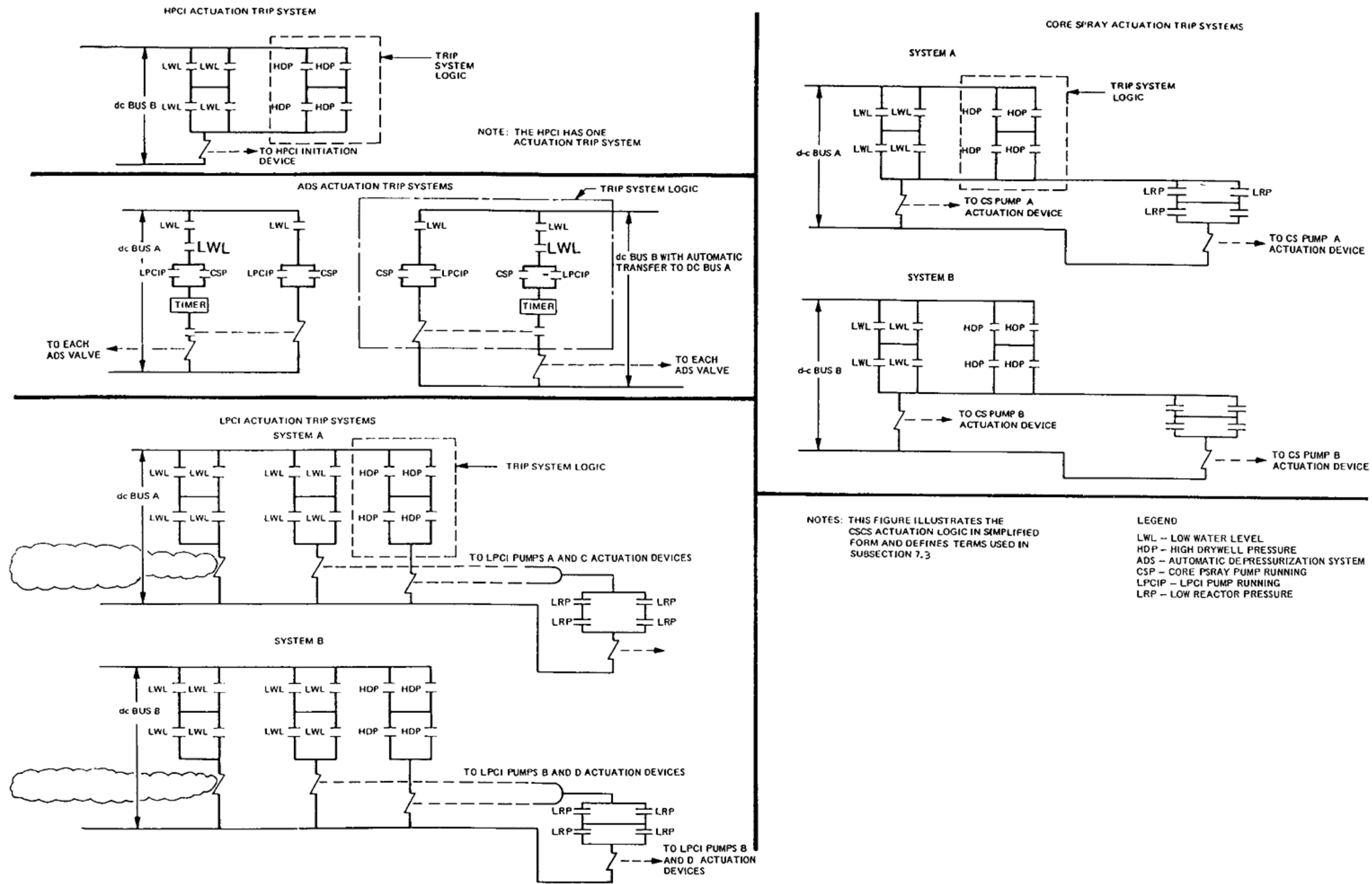
HIGH PRESSURE COOLANT INJECTION SYSTEM (FCD) SHEET 2



HIGH PRESSURE COOLANT INJECTION SYSTEM (FCD) SHEET 3



TYPICAL CSCS TRIP SYSTEM ACTUATION LOGIC



AUTOMATED DEPRESSURIZATION SYSTEM (FCD)

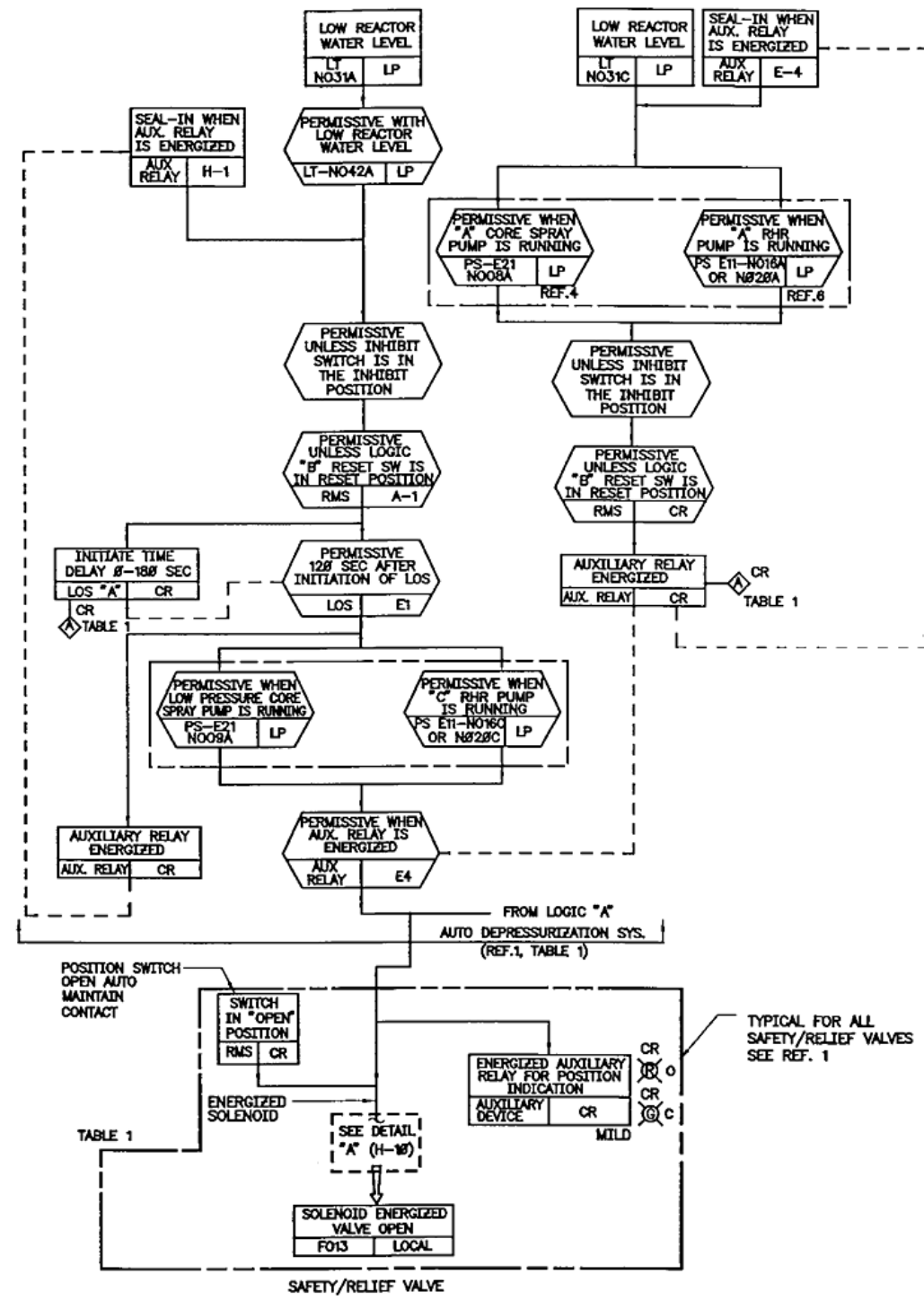
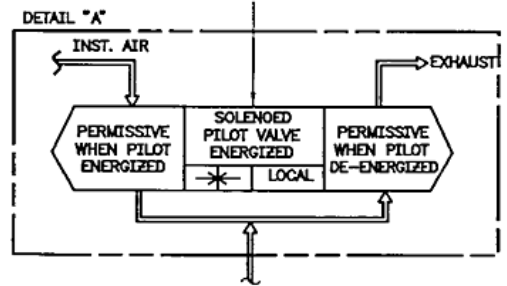
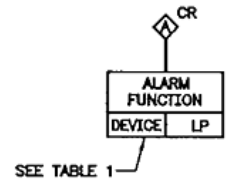


TABLE 1

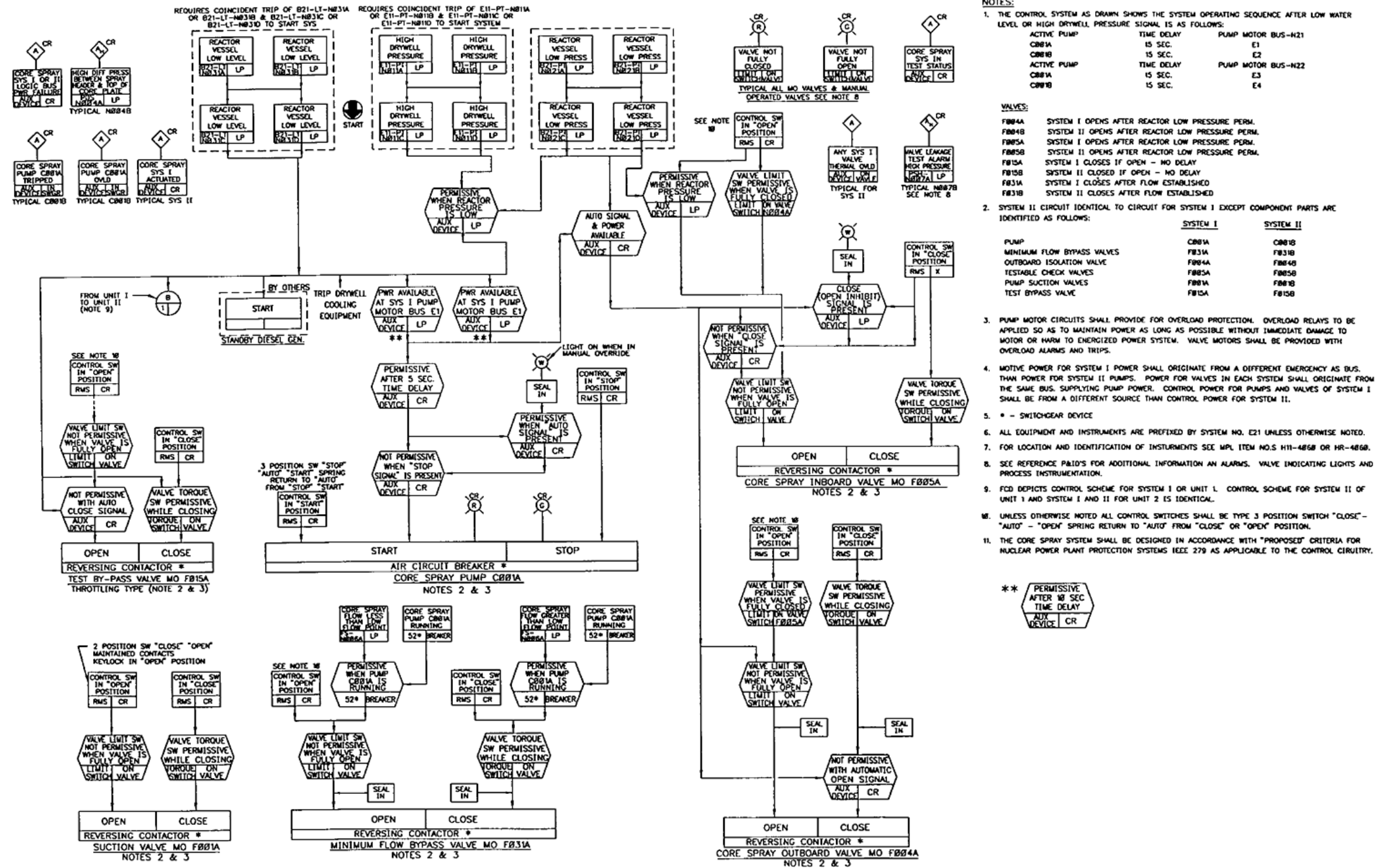
ALARM FUNCTION	INITIATING DEVICE
AUTO. DEPRESSURIZATION TIME TIMER INITIATED	TIMING DEVICE
AUTO. DEPRESSURIZATION POWER FAILURE	AUX. POWER FAILURE RELAY FOR EACH LOGIC CHANNEL
DEPRESSURIZATION SYS. AUX. AUX. RELAY ENERGIZED	AUXILIARY RELAY CAND D



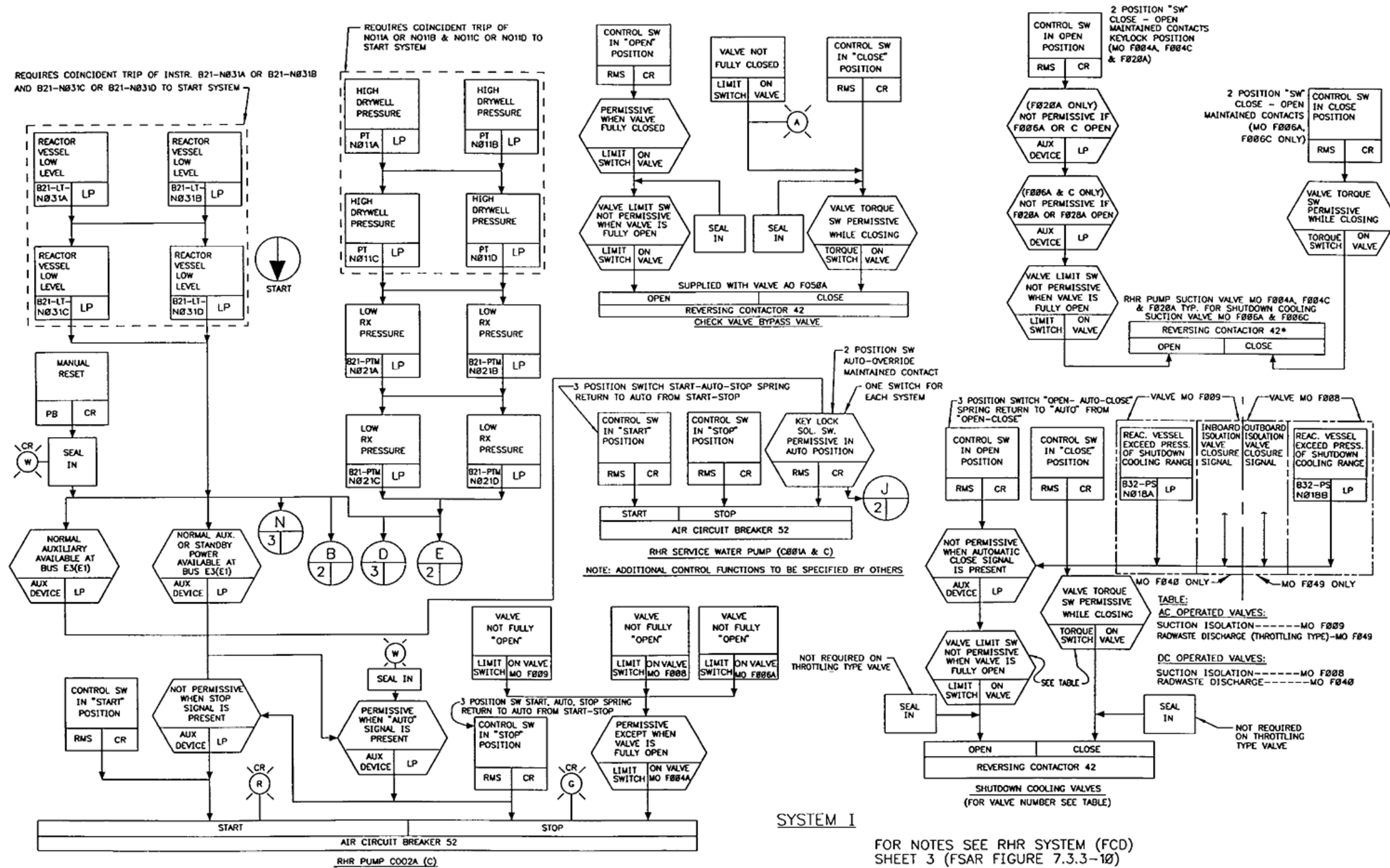
REFERENCE DOCUMENTS:

1. NUCLEAR BOILER SYSTEM P&ID
2. REACTOR RECIRCULATION SYS. FCD.
3. NEURON MONITORING SYS. FCD.
4. REACTOR PROTECTION SYS. IKD.
5. PROCESS RADIATION SYS. IKD.
6. RHR SYS. P&ID

CORE SPRAY SYSTEM (FCD)

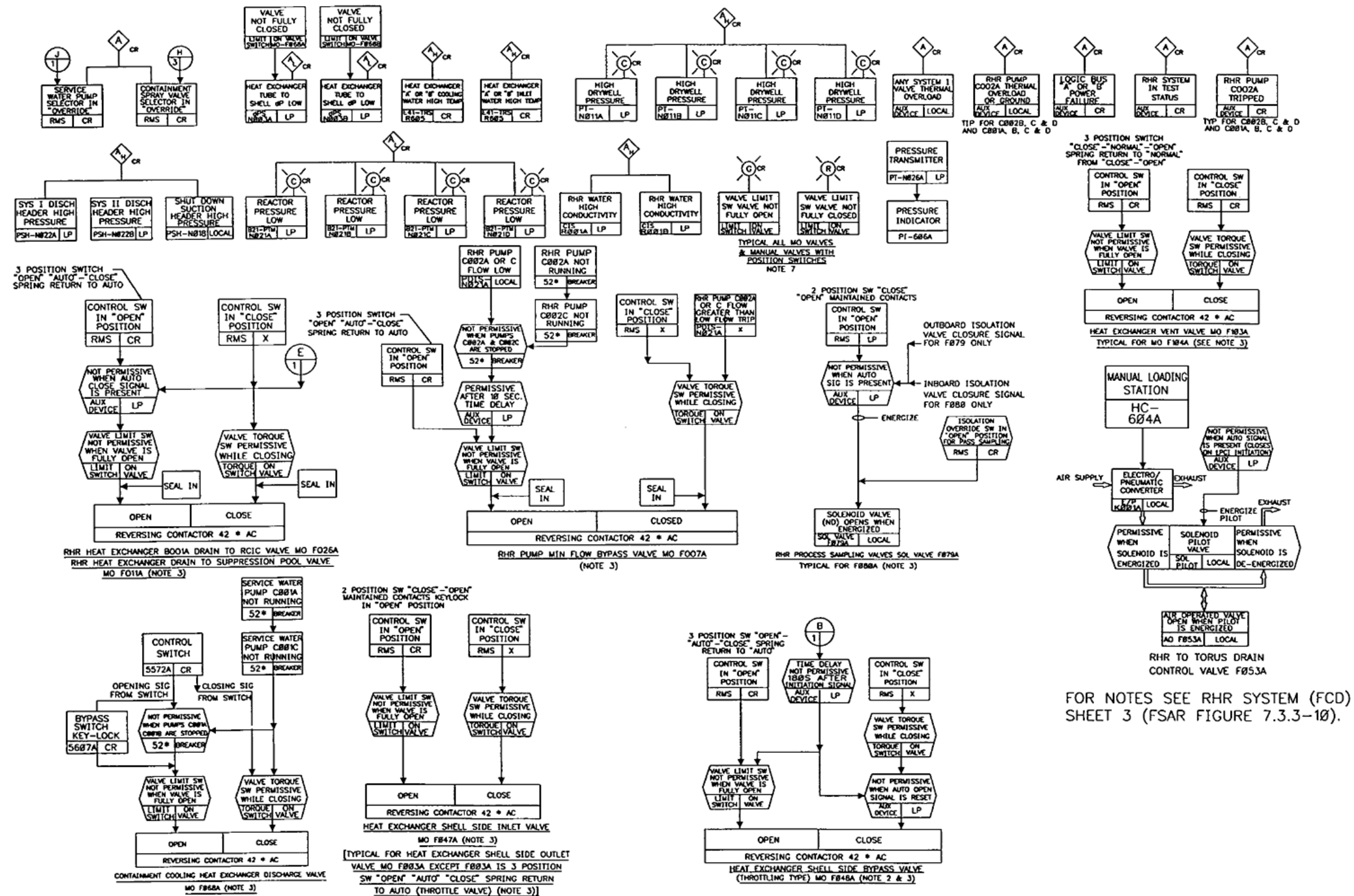


RESIDUAL HEAT REMOVAL SYSTEM (FCD) SHEET 1

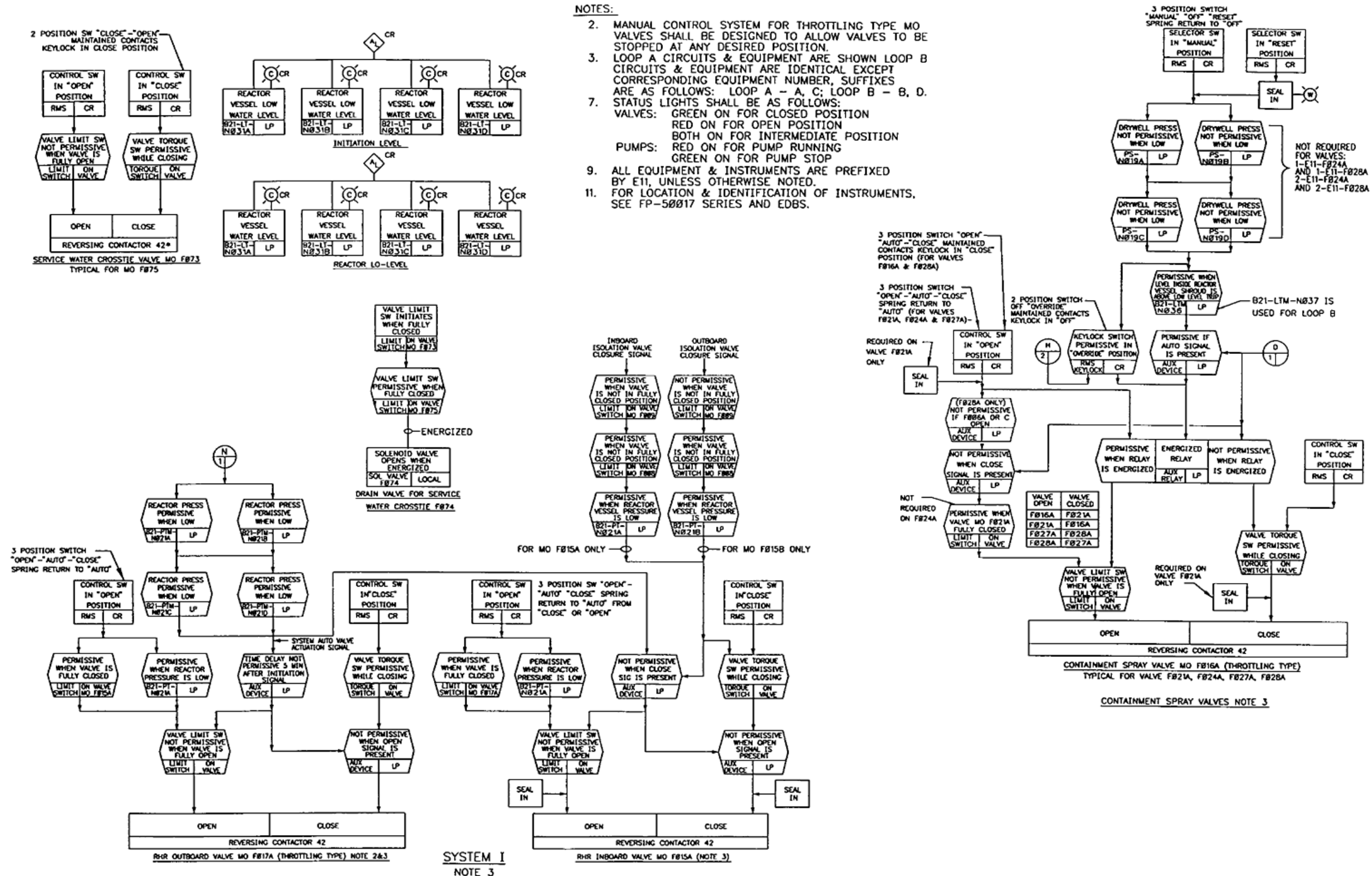


SYSTEM I

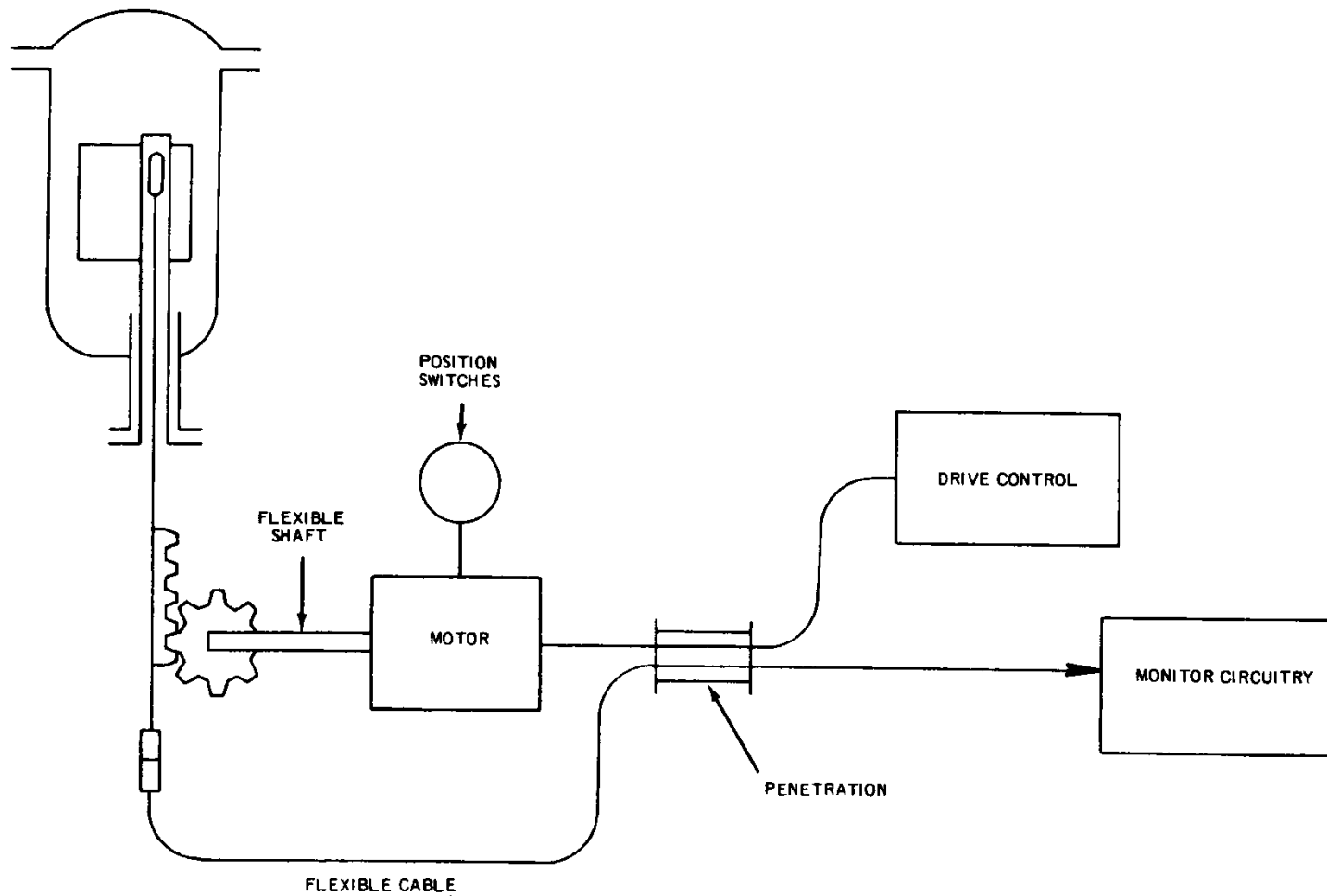
RESIDUAL HEAT REMOVAL SYSTEM (FCD) SHEET 2



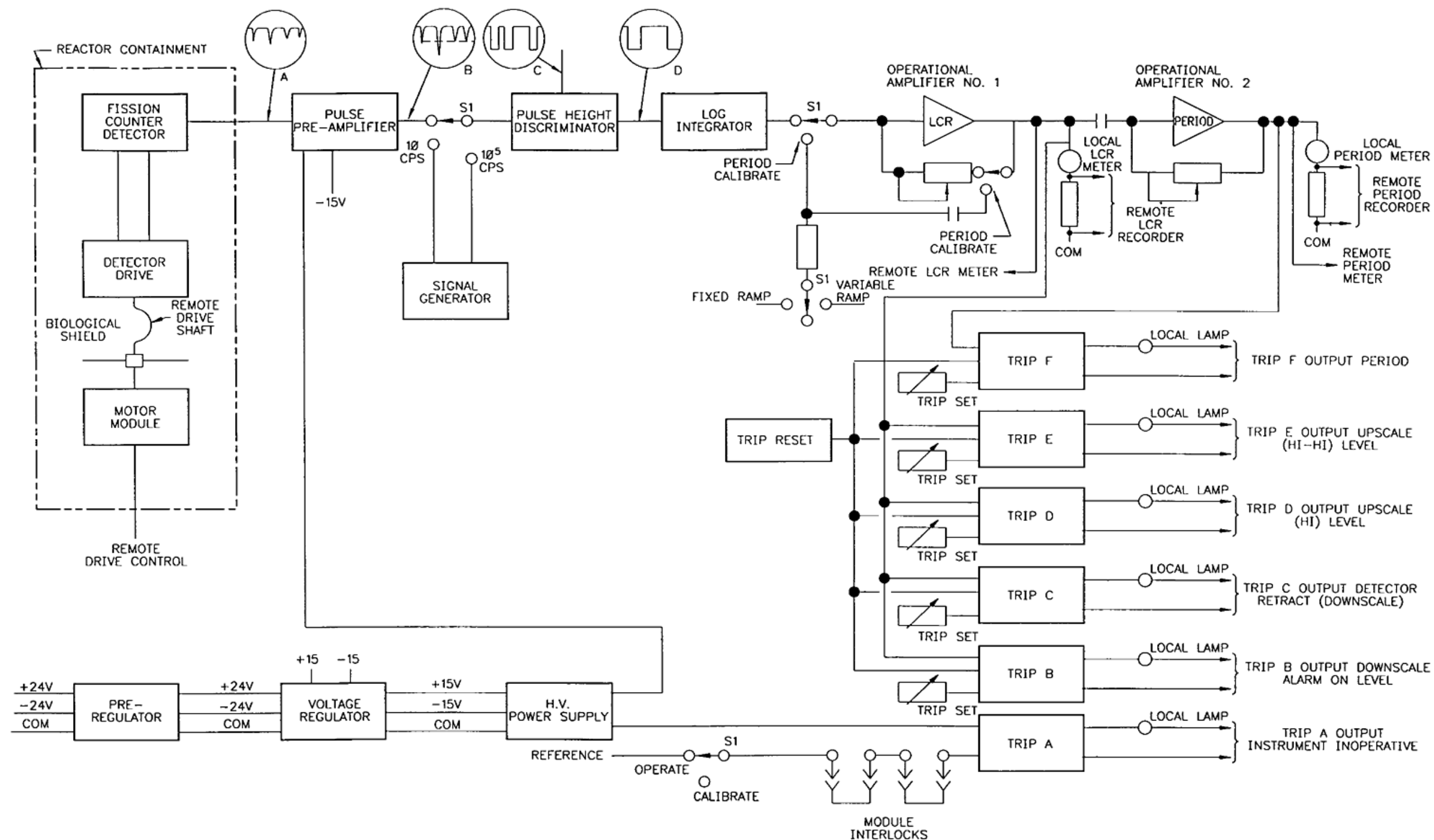
RESIDUAL HEAT REMOVAL SYSTEM (FCD) SHEET 3



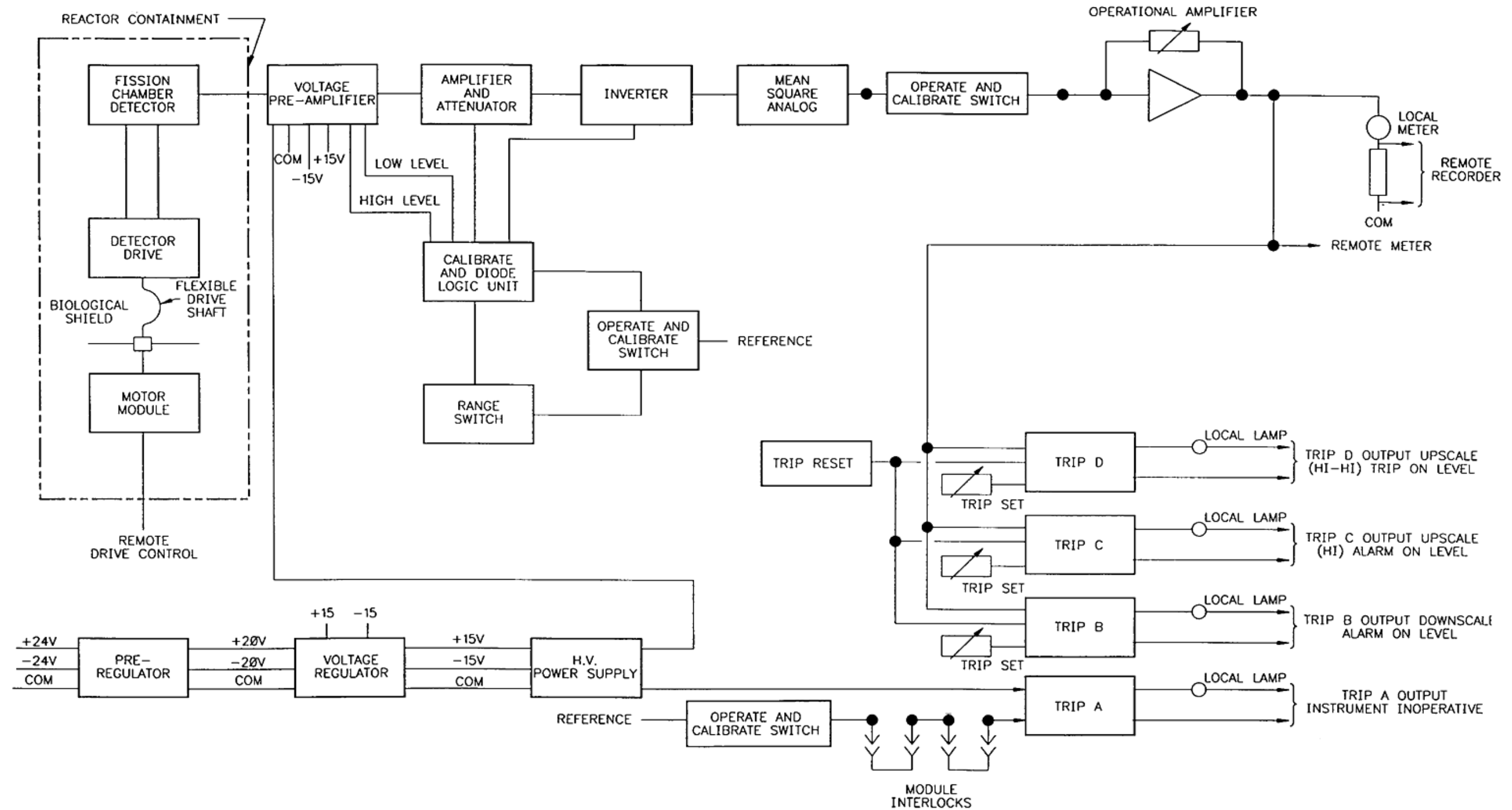
DETECTOR DRIVE SYSTEM, SCHEMATIC



FUNCTIONAL BLOCK DIAGRAM OF SRM CHANNEL



FUNCTIONAL BLOCK DIAGRAM OF IRM CHANNEL



REACTOR VESSEL

CORE SUPPORT

IN CORE GUIDE TUBE

IN CORE HOUSING

PEDESTAL

2, 3, 4, 5, 6, 8

POWER RANGE DETECTOR

IN CORE HOUSING AND GUIDE TUBE

FLANGE (SEE NOTE 12)

WASHER

NUT

DRIP SHIRT

SEAL

SLEEVE

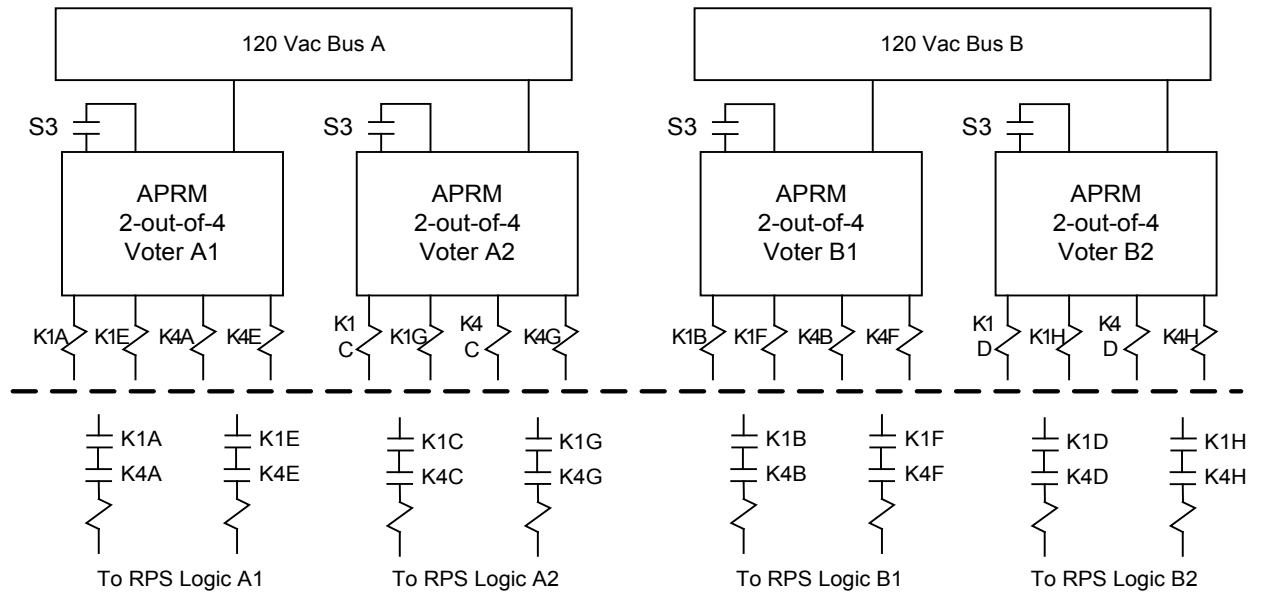
CONNECTION FOR POWER RANGE DET LEADS

CONNECTION FOR T/P TUBE

3/4" DIA. 1/2" DIA. 1/4" DIA. 1/8" DIA. 1/16" DIA. 1/32" DIA. 1/64" DIA. 1/128" DIA. 1/256" DIA. 1/512" DIA. 1/1024" DIA. 1/2048" DIA. 1/4096" DIA. 1/8192" DIA. 1/16384" DIA. 1/32768" DIA. 1/65536" DIA. 1/131072" DIA. 1/262144" DIA. 1/524288" DIA. 1/1048576" DIA. 1/2097152" DIA. 1/4194304" DIA. 1/8388608" DIA. 1/16777216" DIA. 1/33554432" DIA. 1/67108864" DIA. 1/134217728" DIA. 1/268435456" DIA. 1/536870912" DIA. 1/1073741824" DIA. 1/2147483648" DIA. 1/4294967296" DIA. 1/8589934592" DIA. 1/17179869184" DIA. 1/34359738368" DIA. 1/68719476736" DIA. 1/137438953472" DIA. 1/274877906944" DIA. 1/549755813888" DIA. 1/1099511627776" DIA. 1/2199023255552" DIA. 1/4398046511104" DIA. 1/8796093022208" DIA. 1/17592186044416" DIA. 1/35184372088832" DIA. 1/70368744177664" DIA. 1/140737488355328" DIA. 1/281474976710656" DIA. 1/562949953421312" DIA. 1/1125899906842624" DIA. 1/2251799813685248" DIA. 1/4503599627370496" DIA. 1/9007199254740992" DIA. 1/18014398509481984" DIA. 1/36028797018963968" DIA. 1/72057594037927936" DIA. 1/144115188075855872" DIA. 1/288230376151711744" DIA. 1/576460752303423488" DIA. 1/1152921504606846976" DIA. 1/2305843009213693952" DIA. 1/4611686018427387904" DIA. 1/9223372036854775808" DIA. 1/18446744073709551616" DIA. 1/36893488147419103232" DIA. 1/73786976294838206464" DIA. 1/147573952589676412928" DIA. 1/295147905179352825856" DIA. 1/590295810358705651712" DIA. 1/1180591620717411303424" DIA. 1/2361183241434822606848" DIA. 1/4722366482869645213696" DIA. 1/9444732965739290427392" DIA. 1/18889465931478580854784" DIA. 1/37778931862957161709568" DIA. 1/75557863725914323419136" DIA. 1/151115727451828646838272" DIA. 1/302231454903657293676544" DIA. 1/604462909807314587353088" DIA. 1/1208925819614629174706176" DIA. 1/2417851639229258349412352" DIA. 1/4835703278458516698824704" DIA. 1/9671406556917033397649408" DIA. 1/19342813113834066795298816" DIA. 1/38685626227668133590597632" DIA. 1/77371252455336267181195264" DIA. 1/154742504910672534362390528" DIA. 1/309485009821345068724781056" DIA. 1/618970019642690137449562112" DIA. 1/1237940039285380274899124224" DIA. 1/2475880078570760549798248448" DIA. 1/4951760157141521099596496896" DIA. 1/9903520314283042199192993792" DIA. 1/19807040628566084398385987584" DIA. 1/39614081257132168796771975168" DIA. 1/79228162514264337593543950336" DIA. 1/158456325028528675187087900672" DIA. 1/316912650057057350374175801344" DIA. 1/633825300114114700748351602688" DIA. 1/1267650600228229401496703205376" DIA. 1/2535301200456458802993406410752" DIA. 1/5070602400912917605986812821504" DIA. 1/10141204801825835211973625643008" DIA. 1/20282409603651670423947251286016" DIA. 1/40564819207303340847894502572032" DIA. 1/81129638414606681695789005144064" DIA. 1/162259276829213363391578010288128" DIA. 1/324518553658426726783156020576256" DIA. 1/649037107316853453566312041152512" DIA. 1/1298074214633706907132624082305024" DIA. 1/2596148429267413814265248164610048" DIA. 1/5192296858534827628530496329220096" DIA. 1/10384593717069655257060992658440192" DIA. 1/20769187434139310514121985316880384" DIA. 1/41538374868278621028243970633760768" DIA. 1/83076749736557242056487941267521536" DIA. 1/166153499473114484112975882535043072" DIA. 1/332306998946228968225951765070086144" DIA. 1/664613997892457936451903530140172288" DIA. 1/1329227995784915872903807060280344576" DIA. 1/2658455991569831745807614120560689152" DIA. 1/5316911983139663491615228241121378304" DIA. 1/10633823966279326983230456482242756608" DIA. 1/21267647932558653966460912964485513216" DIA. 1/42535295865117307932921825928971026432" DIA. 1/85070591730234615865843651857942052864" DIA. 1/170141183460469231731687303715884105728" DIA. 1/340282366920938463463374607431768211456" DIA. 1/680564733841876926926749214863536422912" DIA. 1/1361129467683753853853498429727072845824" DIA. 1/2722258935367507707706996859454145691648" DIA. 1/5444517870735015415413993718908291383296" DIA. 1/10889035741470030830827987437816582766592" DIA. 1/21778071482940061661655974875633165533184" DIA. 1/43556142965880123323311949751266331066368" DIA. 1/87112285931760246646623899502532662132736" DIA. 1/174224571863520493293247799005065324265472" DIA. 1/3484491437270409865864955980101306485309

PT. NO.	^{238}Pu	^{239}Pu	^{241}Pu
2	509-13/16	488-11/16	480-15/16
3	513-13/16	492-11/16	484-15/16
4	512-13/16	491-13/16	483-15/16
5	518-9/16	497-7/16	489-11/16
6	517-9/16	496-7/16	488-11/16
7			
8	514-9/16	493-7/16	485-11/16

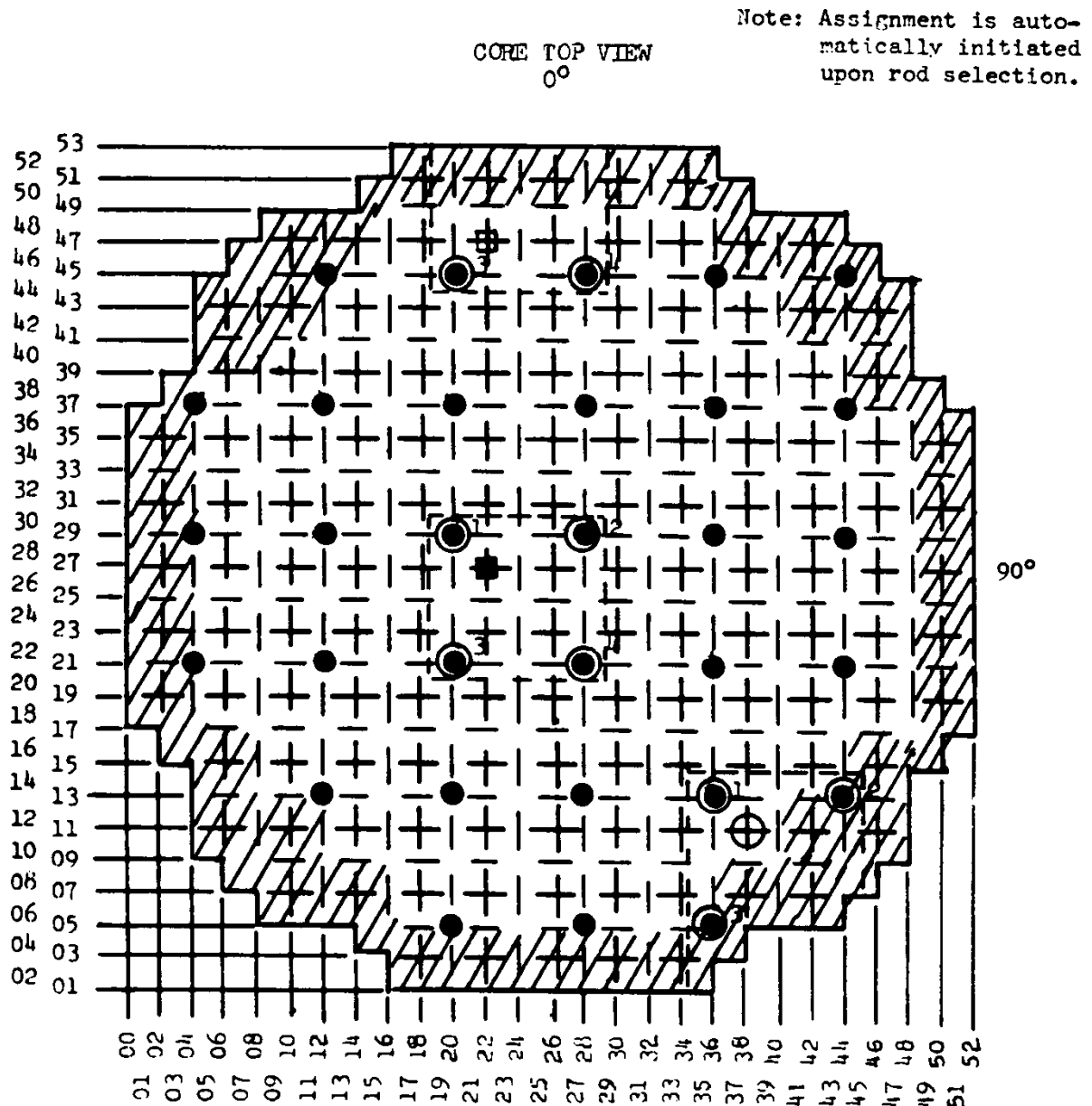
TYPICAL APRM CIRCUIT ARRANGEMENT FOR REACTOR PROTECTION SYSTEM INPUT



NOTE: Relay numbering for reference only. Contacts are shown in normal operation position.
LEGEND: K1A, K1B, K1C, K1D, K1H - (APRM Neutron Flux High or APRM Simulated thermal Power High or APRM Inop) and (APRM Bypassed)
 K4A, K4B, K4C, K4D, K4E, K4F, K4G, K4H - (OPRM Upscale Trip) and (OPRM Not Bypassed)
 S3 - APRM Bypass Switch

[WRM1]

ASSIGNMENT OF POWER RANGE DETECTOR ASSEMBLIES TO RBM

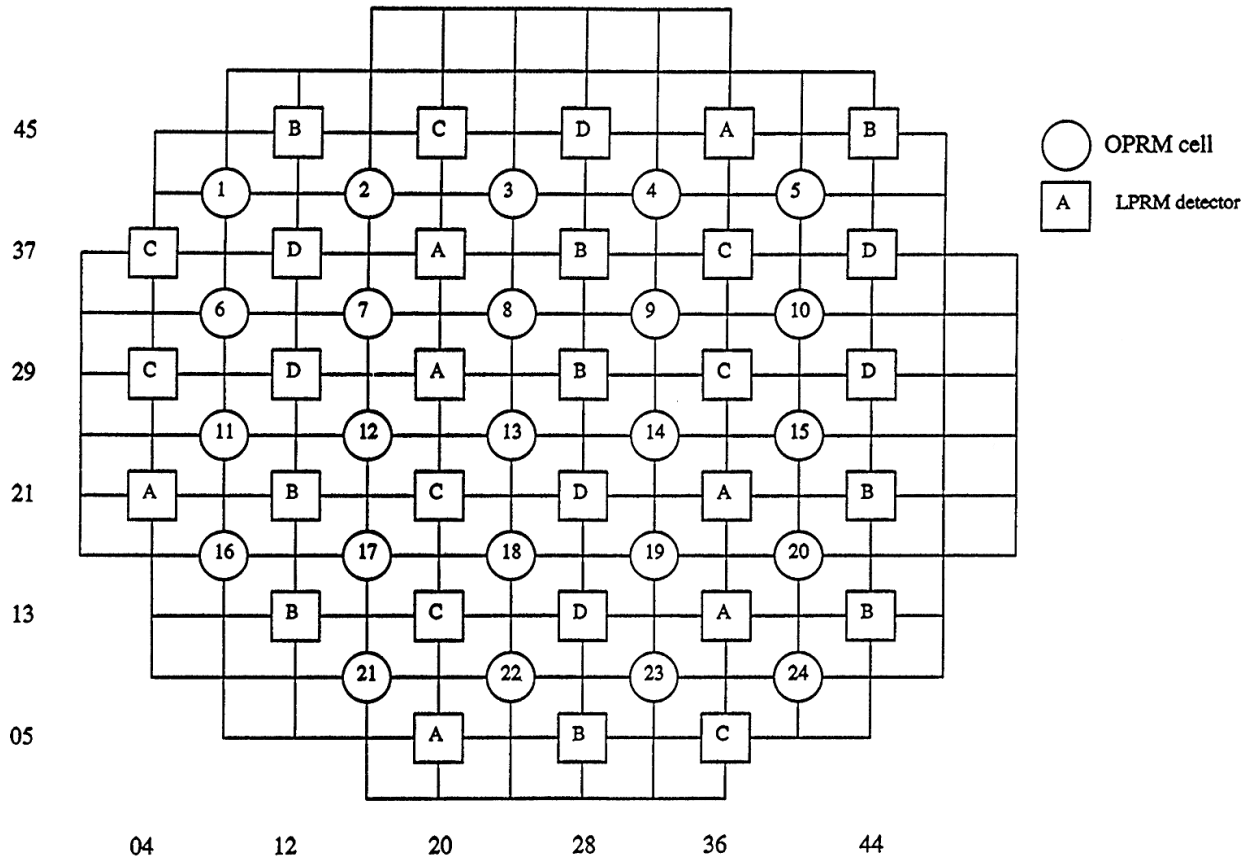


///RBM Automatically bypassed (Reading Zeroed)

- Typical Rod Yielding Two Power Range Detector Assemblies
- Typical Rod Yielding Three Power Range Detector Assemblies
- Typical Rod Yielding Four Power Range Detector Assemblies

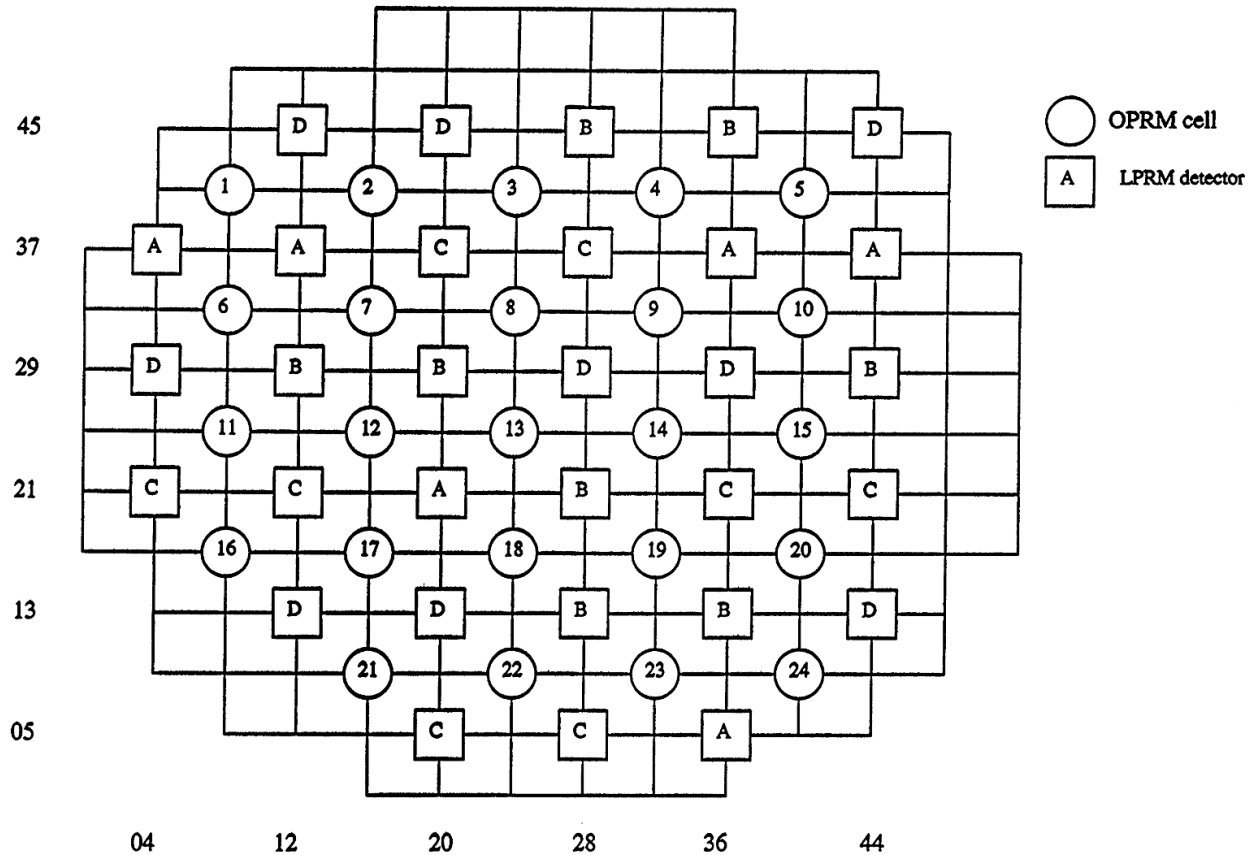
OPRM CELL ASSIGNMENTS

APRM CHANNEL 1 AND OPRM CHANNEL 1[WRM1]



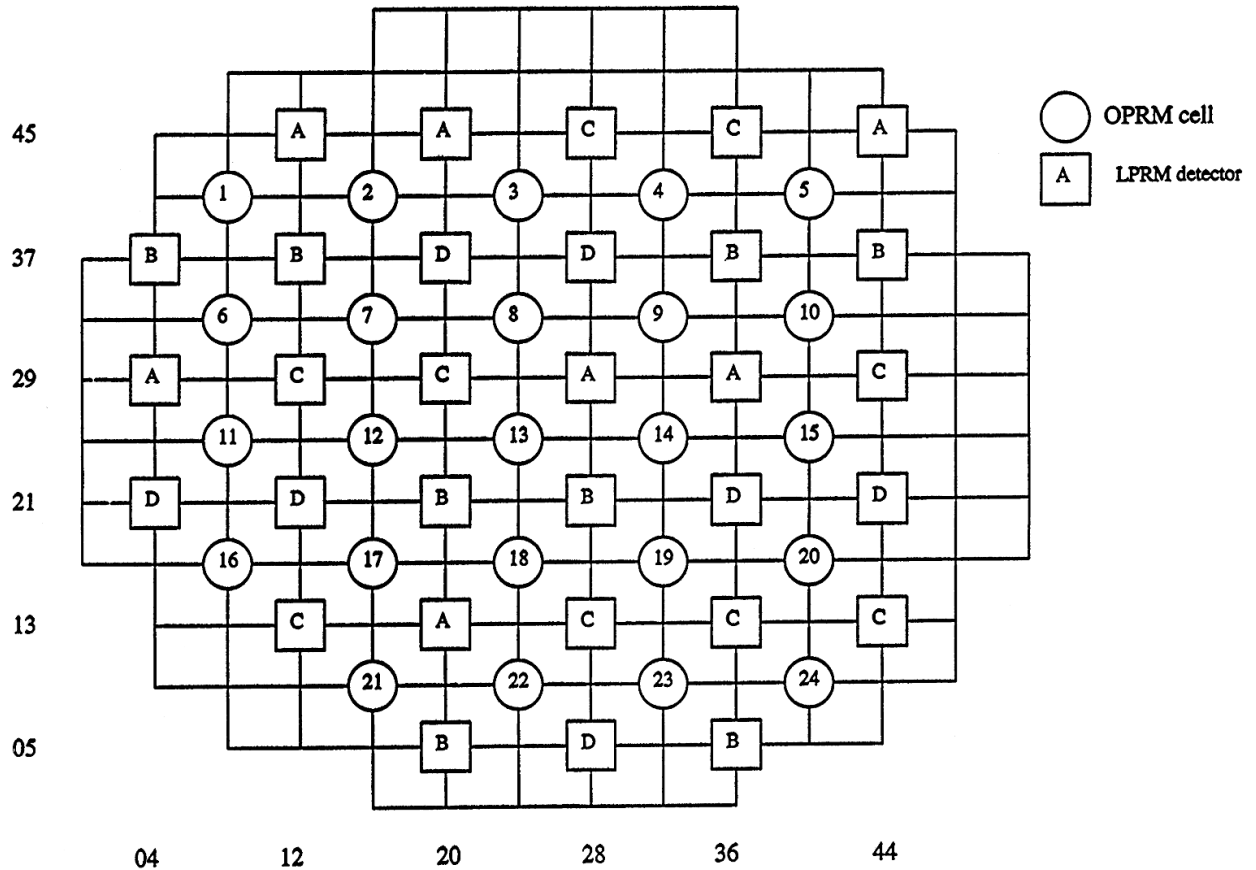
OPRM CELL ASSIGNMENTS

APRM CHANNEL 2 AND OPRM CHANNEL 2[WRM2]



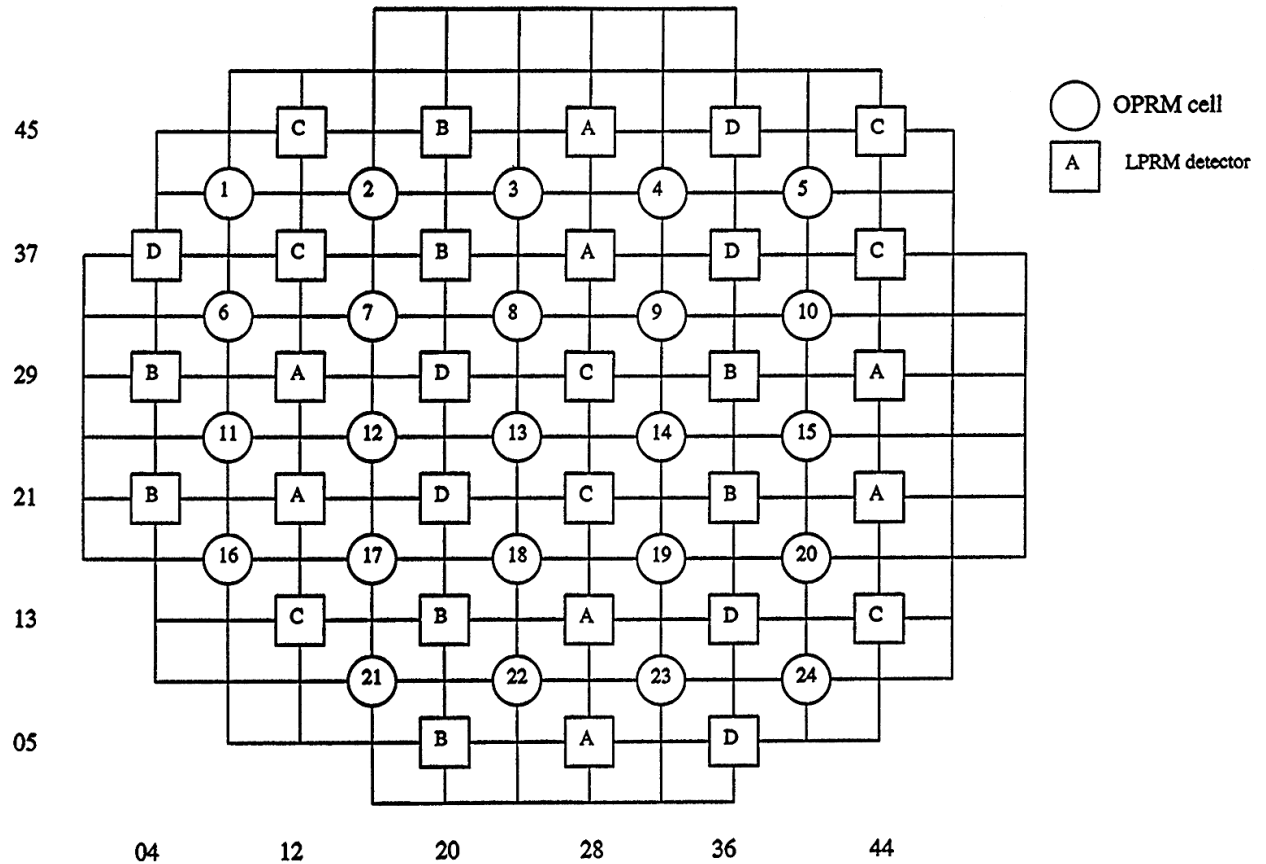
OPRM CELL ASSIGNMENTS

APRM CHANNEL 3 AND OPRM CHANNEL 3[WRM3]

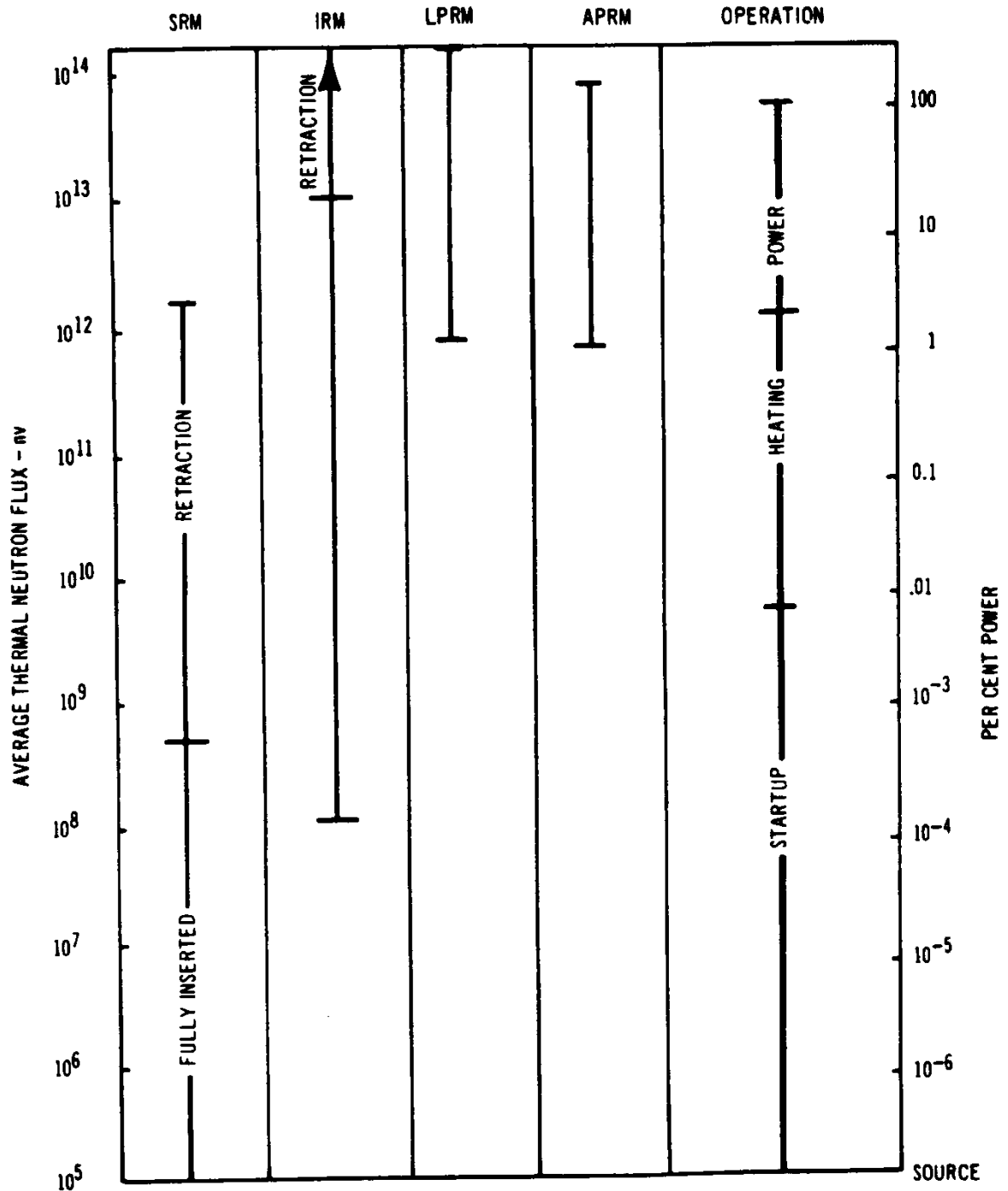


OPRM CELL ASSIGNMENTS

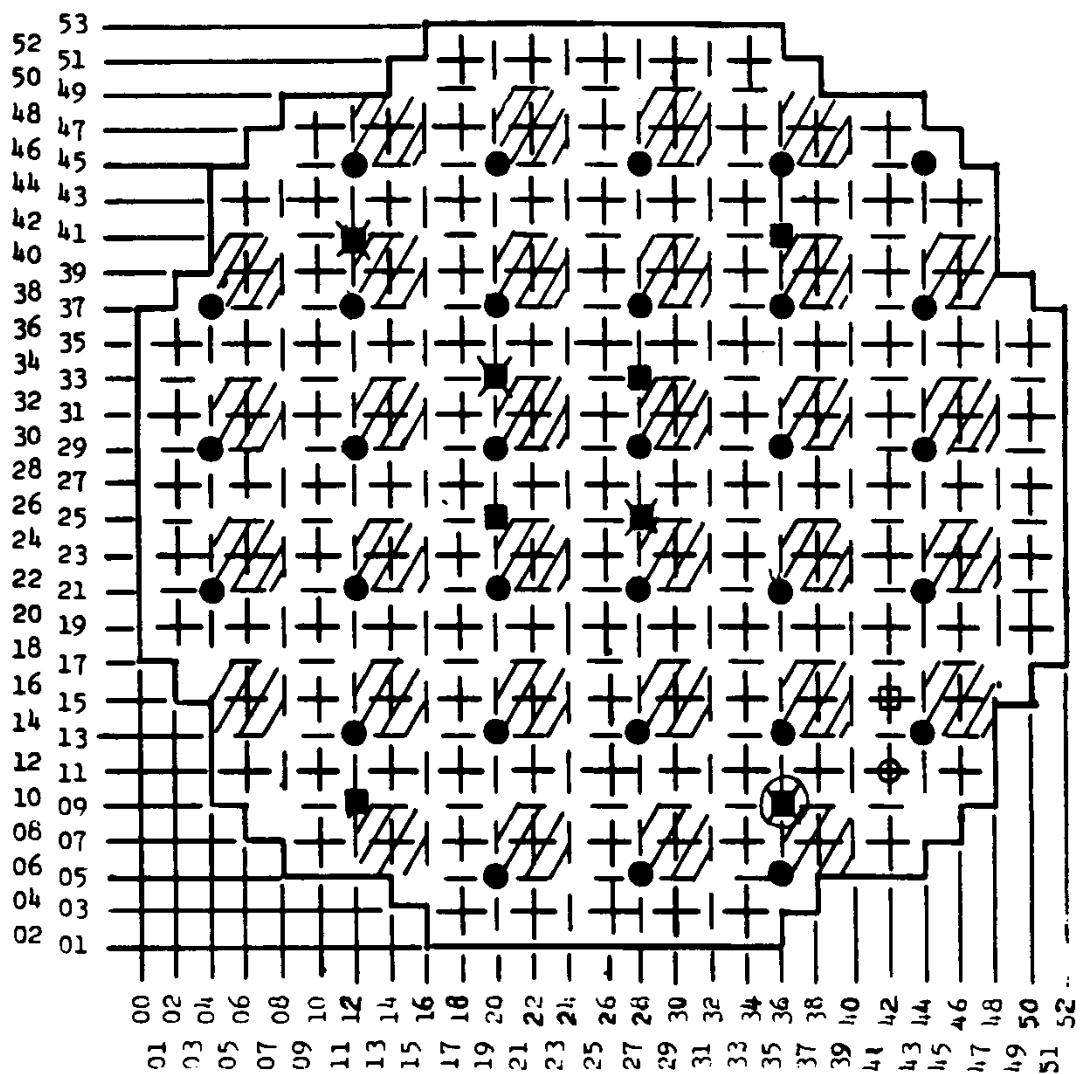
APRM CHANNEL 4 AND OPRM CHANNEL 4[WRM4]



RANGES OF NEUTRON MONITORING SYSTEM



CONTROL ROD WITHDRAWAL ERROR



IRM DETECTOR, TRIP SYSTEM A



NEXT CONTROL ROD WITHDRAWN IN SEQUENCE



IRM DETECTOR, TRIP SYSTEM B



CONTROL ROD WITHDRAWN OUT OF SEQUENCE

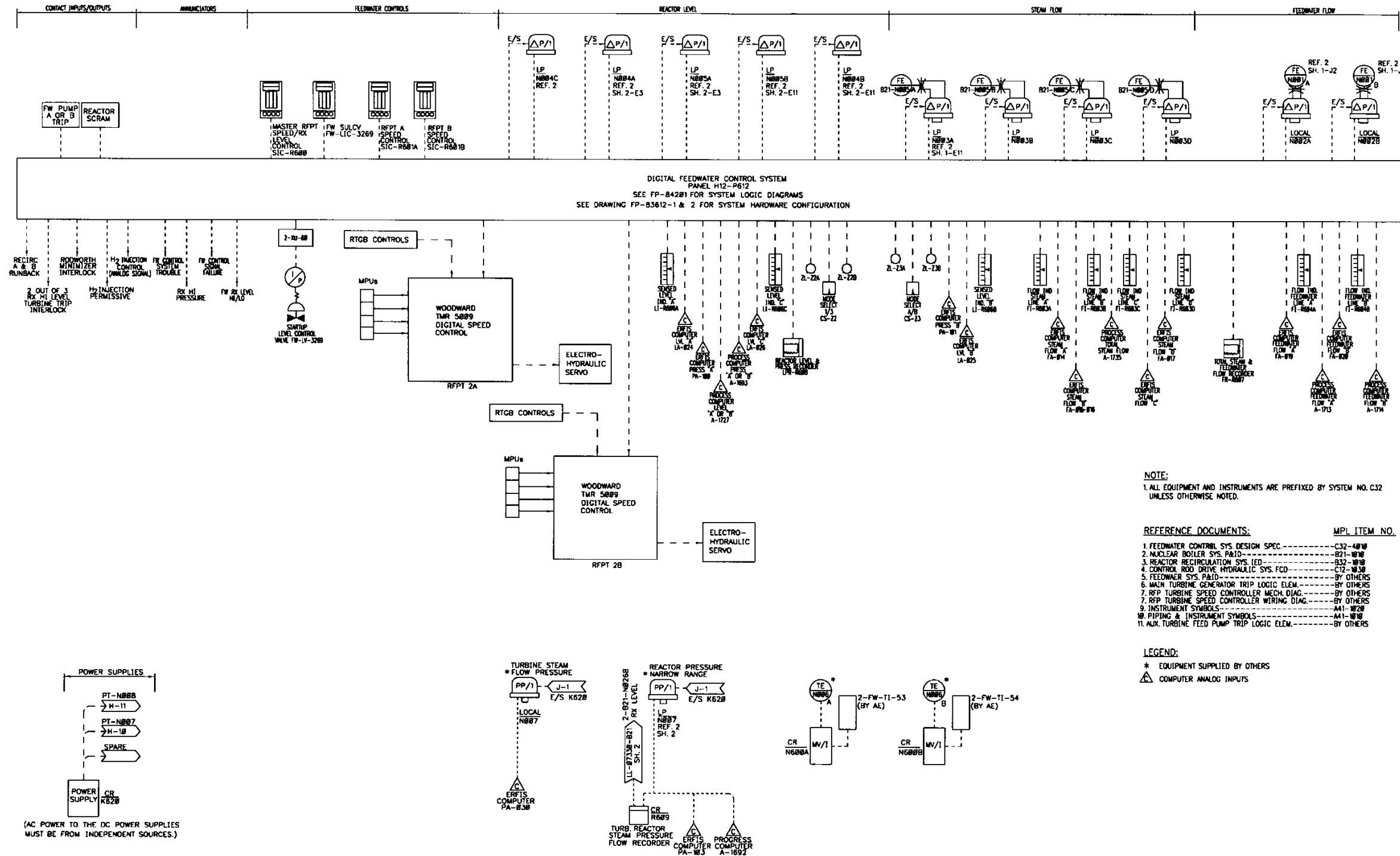


CONTROL ROD WITHDRAWN



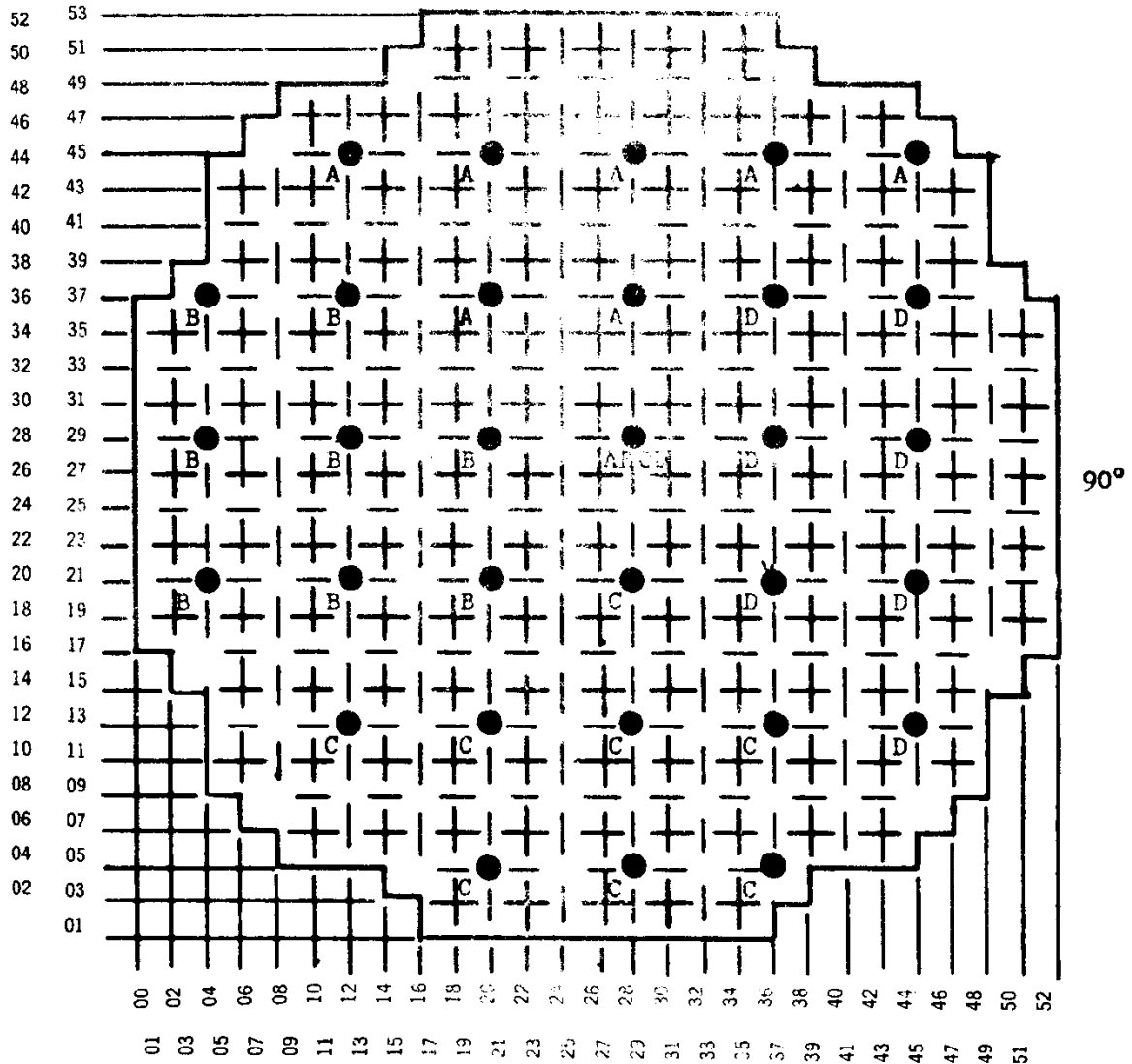
IRM DETECTOR BYPASSED

FEEDWATER CONTROL SYSTEM (IED)



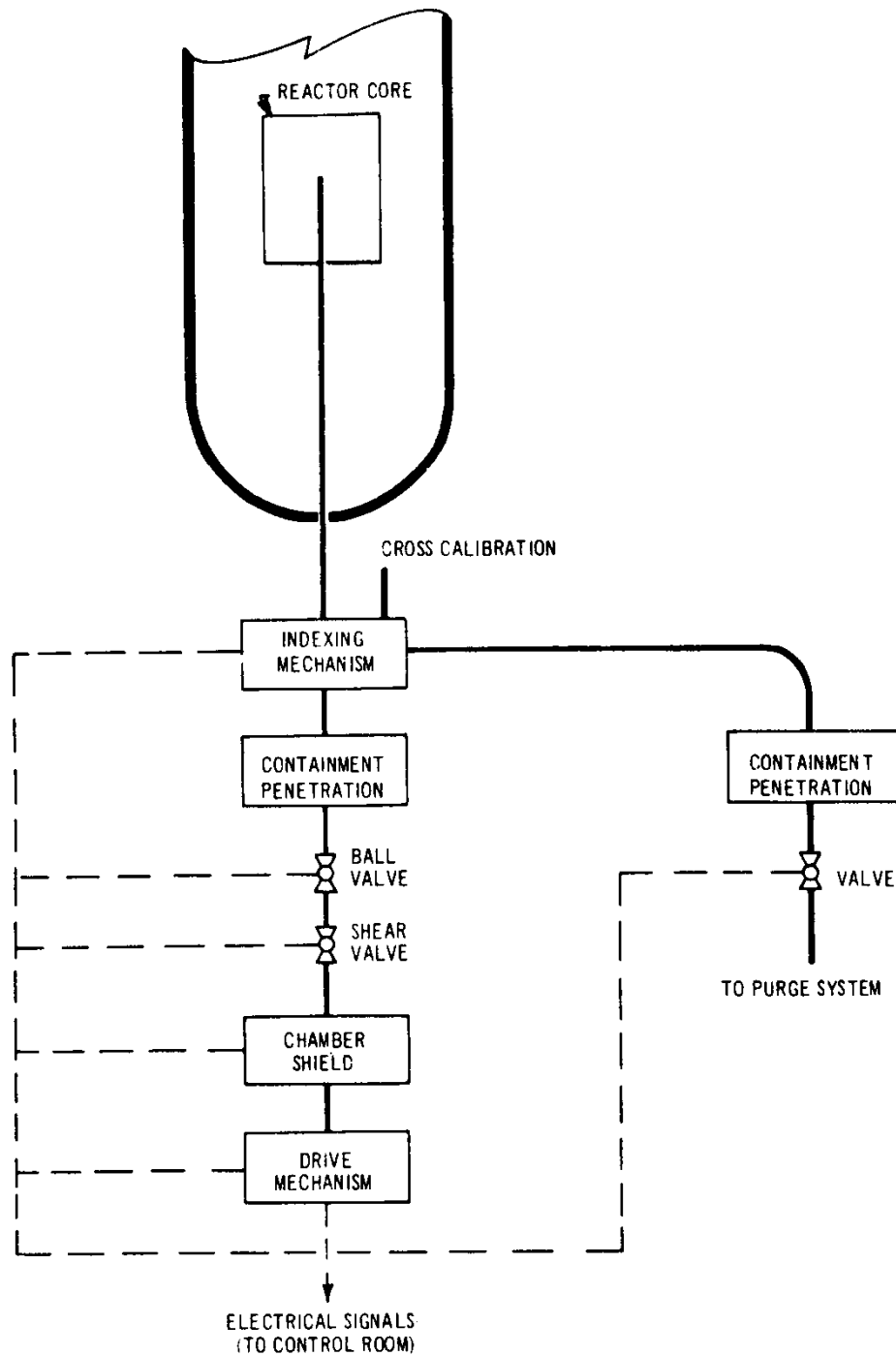
ASSIGNMENT OF LPRM STRINGS TO TIP MACHINE

CORE TOP VIEW
0°

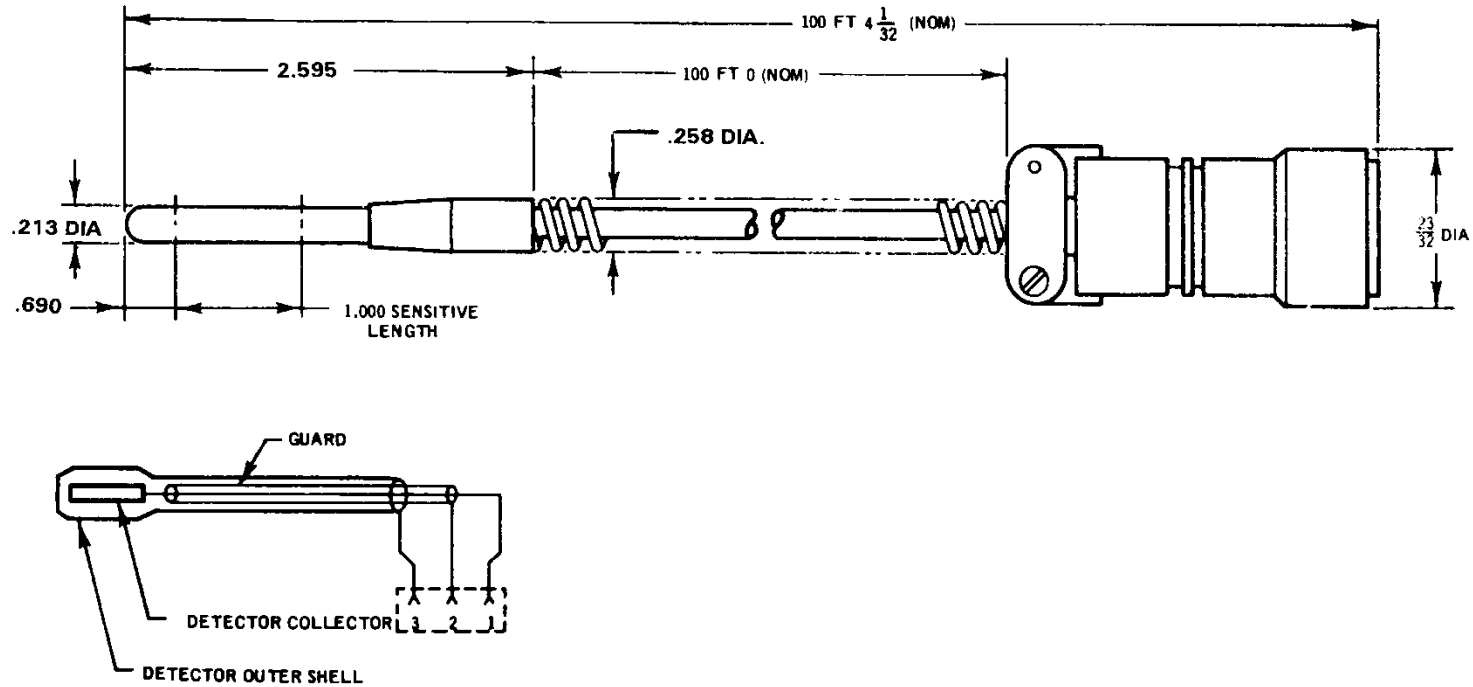


LETTER= TIP MACHINE ASSIGNED TO POWER RANGE DETECTOR ASSEMBLY

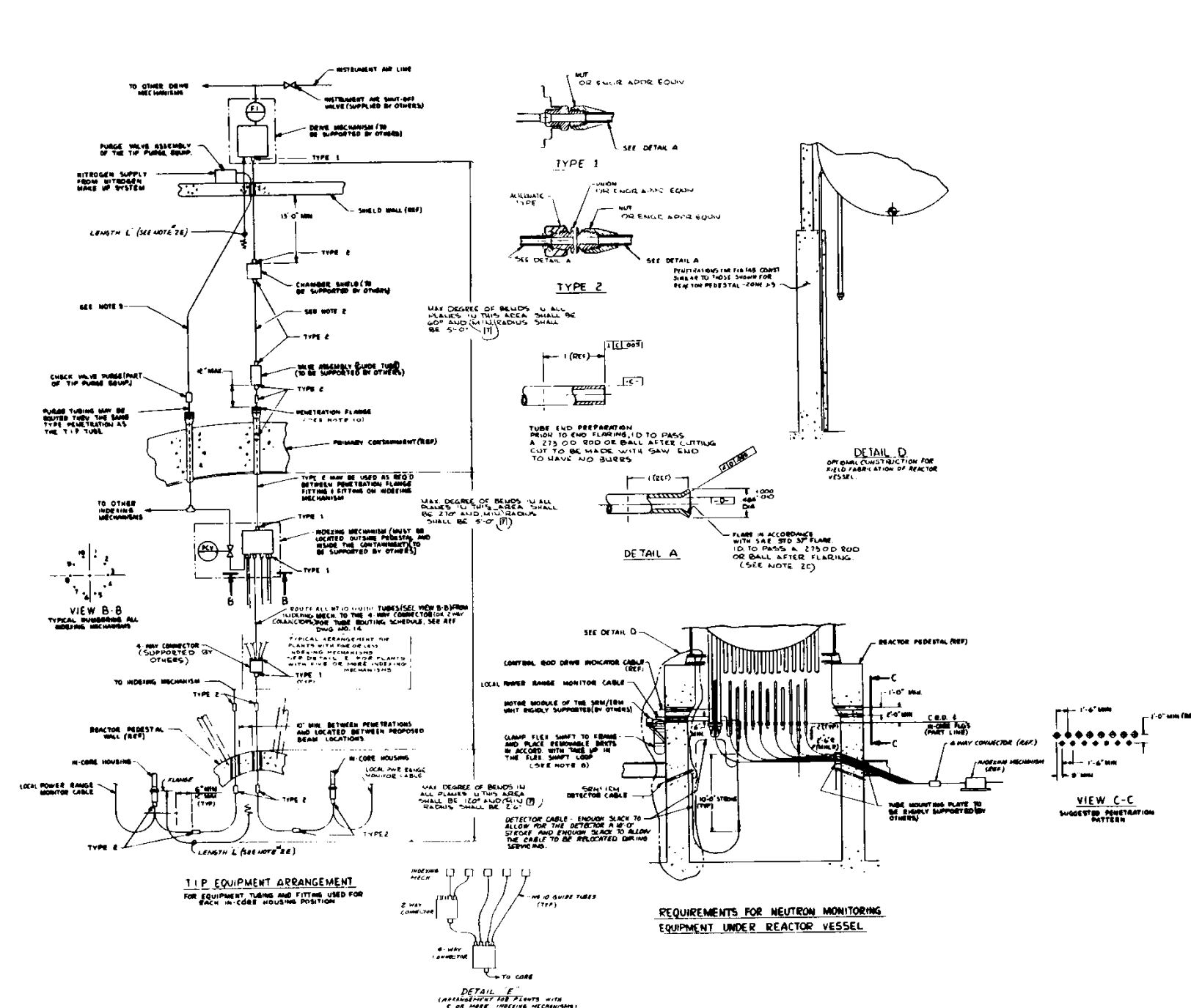
TRAVERSING IN-CORE PROBE SUBSYSTEM BLOCK DIAGRAM



TRAVERSING IN-CORE PROBE ASSEMBLY



TIP EQUIPMENT AND NEUTRON MONITORING SYSTEM ARRANGEMENT



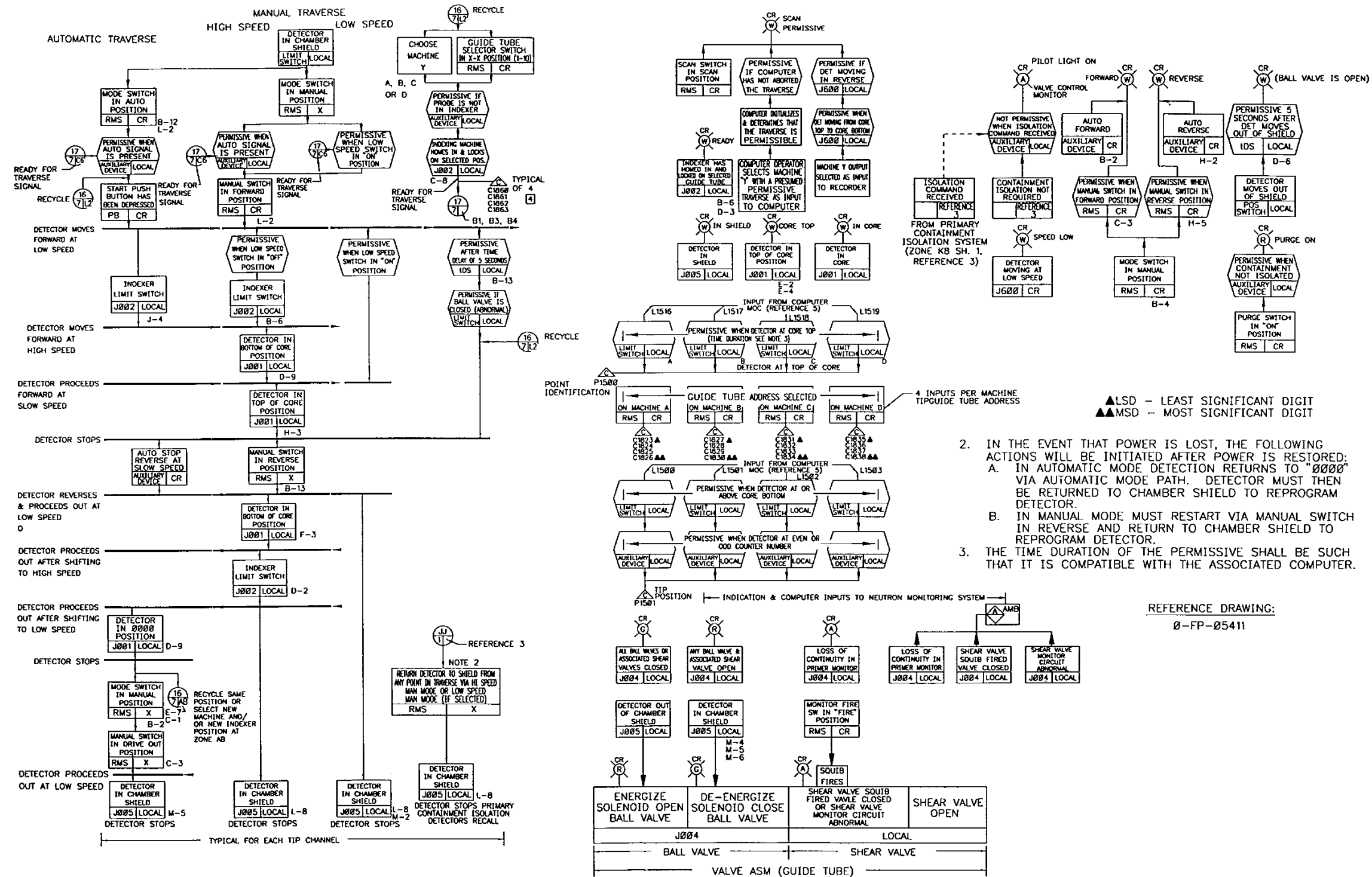
NOTES:

1. TUBE JOINT MAY BE LOCATED AS REQUIRED BETWEEN REACTOR VESSEL WALL AND DRIVE WALL PENETRATION.
2. THE NUMBER OF T.I.P. GUIDE TUBE BENDS SHALL BE HELD TO A MINIMUM.
 - A. THE TOTAL DEGREES OF BENDS SHALL NOT EXCEED 450°. FOR INTERVALL DEGREE REQUIREMENTS SEE ZONE DS, HS & KS.
 - B. BENDS MUST BE SMOOTH AND MADE WITH A FUTURE BEND MUST BE UNIFORM NOT A SERIES OF SMALLER BENDS, AND FREE OF INTERNAL DEFORMATION.
 - C. TUBE FLARE TO BE FORMED WITH PROPER FLARING TOOLS AND CAREFULLY ASSEMBLED INTO FITTING FOR GOOD ALIGNMENT (SEE DETAIL A). TEST ALL JOINTS WITH UNION ATTACHED WITH 275 ± 5% DIA ROD 3" LG. FOR PROPER CLEARANCE AND ALIGNMENT.
 - D. CORRECT FIT OF ALL ATTACHMENTS SHALL BE CHECKED BY INSERTING 1/4" PLUG TIP (SERVICING TOOLS) AND ASSURING SMOOTH MOVEMENT.
 - E. MAXIMUM 12" LENGTH OF T.I.P. RUN FROM IN-CORE HOUSING FLANGE TO DRIVE MECHANISM TO BE 140-160". ACTUAL LENGTH TO BE SPECIFIED BY A.I.
 - F. THE T.I.P. GUIDE TUBES SHALL BE SUPPORTED AT 5'-0" MAXIMUM INTERVALS.
3. CHAMBER SHIELDS TO BE FILLED WITH 1/2" MAXIMUM DIAMETER FREE FLOWING CORRODING LEAD SHOT.
4. SIGNAL CABLE CONDUIT AND POWER CABLE CONDUIT SHALL BE SEPARATED BY A MIN OF 12".
5. THE FOLLOWING EQUIPMENT WILL BE SUPPLIED AS PART OF THE NEUTRON MONITORING EQUIP: T.I.P. (TRAVELING DET.), DUMMY T.I.P. (TRAVELING DET.), DRIVE MECHANISM, INDEXING MECHANISM, PENETRATION FLANGE, 4-WAY CONNECTION, CHAMBER SHIELD, VALVE ASM. (GUIDE TUBE), SRM RM DRIVE UNIT, POWER RANGE NEUTRON MONITOR INST., DISPOSAL CASK, GUIDE TUBES (T.I.P.), ALL TUBE FITTING CONNECTIONS AS SHOWN AND T.I.P. PURGE EQUIP.
6. ALL TUBING AND FITTINGS ARE TO BE SHIPPED TO FIELD FOR MODIFICATION AND INSTALLATION.
7. ALL TUBE RINS, FROM PENETRATION FLANGE TO VALVE ASSEMBLY, TO BE TESTED AND BE BUREAU TIGHT AT 80 PSIG INTERNAL AIR PRESSURE.
8. SUPPORT FLARE SHAFT AT 4'-0" MAX. INTERVALS TO PREVENT CASING ROTATION. CARE MUST BE TAKEN TO PREVENT LAMING THE INNER SHAFT. THE MIN. BEND RADIUS SHALL BE 9".
9. ALL GAS AND AIR LINES SUPPLIED BY OTHERS FOR 100 PSI SERVICE.
10. PENETRATION SHALL BE LOCATED SO THAT THEY WILL NOT INTERFERE WITH THE CDR REMOVAL AND EQUIPMENT PLACEMENT.
11. THE PREFERRED METHOD OF ROUTING AND CROUTING THE POWER RANGE MONITOR CABLES WOULD BE TO ROUTE THEM IN THE SAME MANNER AS THEY ARE ASSIGNED TO AVERAGE POWER RANGE MONITOR CABLE CHANNELS AS INDICATED IN TABLE 1A AND LABEL 12 OF THE REFERENCE 1A DRAWING. CABLE BUNDLES WOULD THEN BE ROUTED SEPARATELY IN CONDUIT TO THE APPROPRIATE PRIMARY CONTAINMENT PENETRATION.
12. PENETRATION THROUGH PRIMARY CONTAINMENT AND PEDESTAL SHOULD BE ALIGNED TO PROVIDE THE STRAIGHTEST POSSIBLE ROUTING FOR THE T.I.P. GUIDE TUBES.
13. T.I.P. EQUIPMENT SHOULD BE ARRANGED TO MINIMIZE BENDS AND OBTAIN THE BEST FUNCTIONAL LAYOUT.
14. MECHANICAL PROTECTION FOR T.I.P. GUIDE TUBING SHALL BE PROVIDED BY OTHERS TO PREVENT DAMAGE DURING MAINTENANCE AND OPERATION.

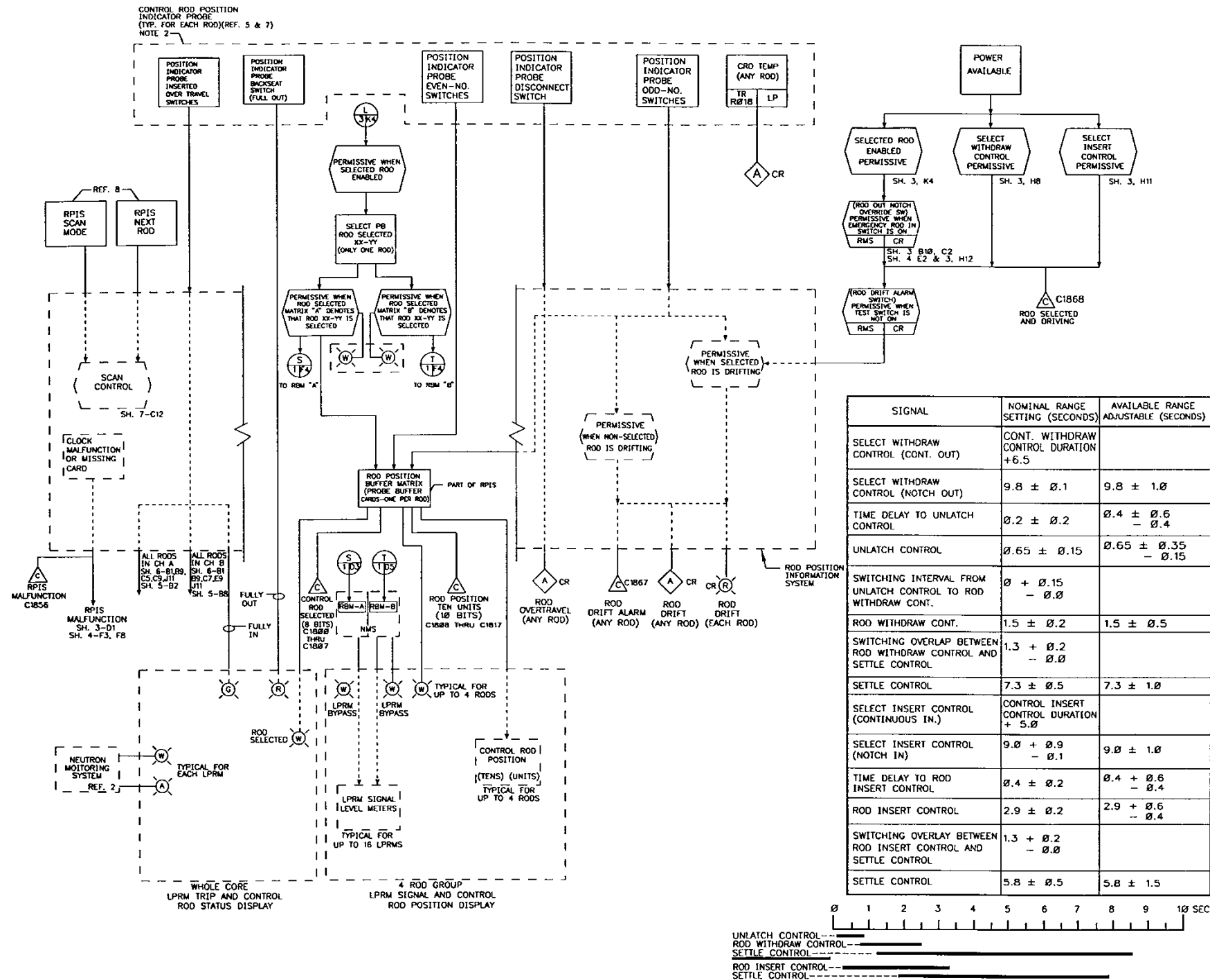
REFERENCE DRAWINGS:

REF. DRAWING	NO. ITEMS
1. DRIVE MECHANISM	CS1 J001
2. CHAMBER SHIELD	CS1 J003
3. T.I.P. PURGE EQUIP	CS1 J009
4. PENETRATION FLANGE	CS1 J003
5. INDEXING MECHANISM	CS1 J002
6. 4-WAY CONNECTION	CS1 J006
7. VALVE ASM (GUIDE TUBE)	CS1 J004
8. SRM RM DRIVE UNIT	B11/513 D192
9. T.I.P. (TRAVELING DETECTOR)	CS1 N003
10. DUMMY T.I.P. (TRAVELING DETECTOR)	CS1 J010
11. GUIDE TUBES	CS1 J008
12. POWER RANGE NEUTRON MONITOR INST.	CS1 K603
13. DISPOSAL CASK	CS1 E001
14. I.E.D. NEUTRON MONITORING SYSTEM	CS1 J010
15. 2-WAY CONNECTION	CS1 J007
16. POWER RANGE DETECTOR	B11/513 D193
17. P.R.M. INSTALL. HARDWARE	B11/513 D19-

TRAVERSING IN-CORE PROBE (FCD)



CONTROL ROD DRIVE HYDRAULIC SYSTEM (FCD) - SHEET 1



NOTES:

- THE ROD CIRCUIT SHALL BE DESIGNED TO INSURE THAT:
 - ONLY ONE ROD MAY BE SELECTED AT A TIME.
 - WHEN MOVEMENT IS INITIATED, THE SELECTED ROD SHALL BE SEALED IN TO INHIBIT SELECTION OF ANOTHER ROD DURING THE MOVEMENT CYCLE (EXCEPT FOR LOSS OF CONTROL CIRCUIT POWER).
- EACH CONTROL ROD, AS IT TRAVELS UP (INSERTED) OR DOWN (WITHDRAWN) PASSES A NUMBER OF SWITCHES. THE TOP TWO POSITION SWITCHES ARE CALLED "OVER TRAVEL" AND THE BOTTOM TWO POSITIONS ARE CALLED "WITHDRAWN" (BACKSEAT AND DISCONNECT). SWITCHES IN BETWEEN ARE DIVIDED INTO ODD (DRIFT) AND EVEN (LATCH) POSITIONS. AS THE ROD TRAVELS OVER ANY SWITCH AN INDICATING SIGNAL IS ACTUATED.
- FOR LOCATION AND IDENTIFICATION OF INSTRUMENTS SEE INSTRUMENT DATA SHEET LISTED IN MPL FOR EACH INSTRUMENT.

NOTES:

SYSTEM SELECTION OPTIONS ARE INDICATED BY MULTIPLE MPL ITEM NUMBERS

REFERENCE DOCUMENTS

MPL ITEM NO.

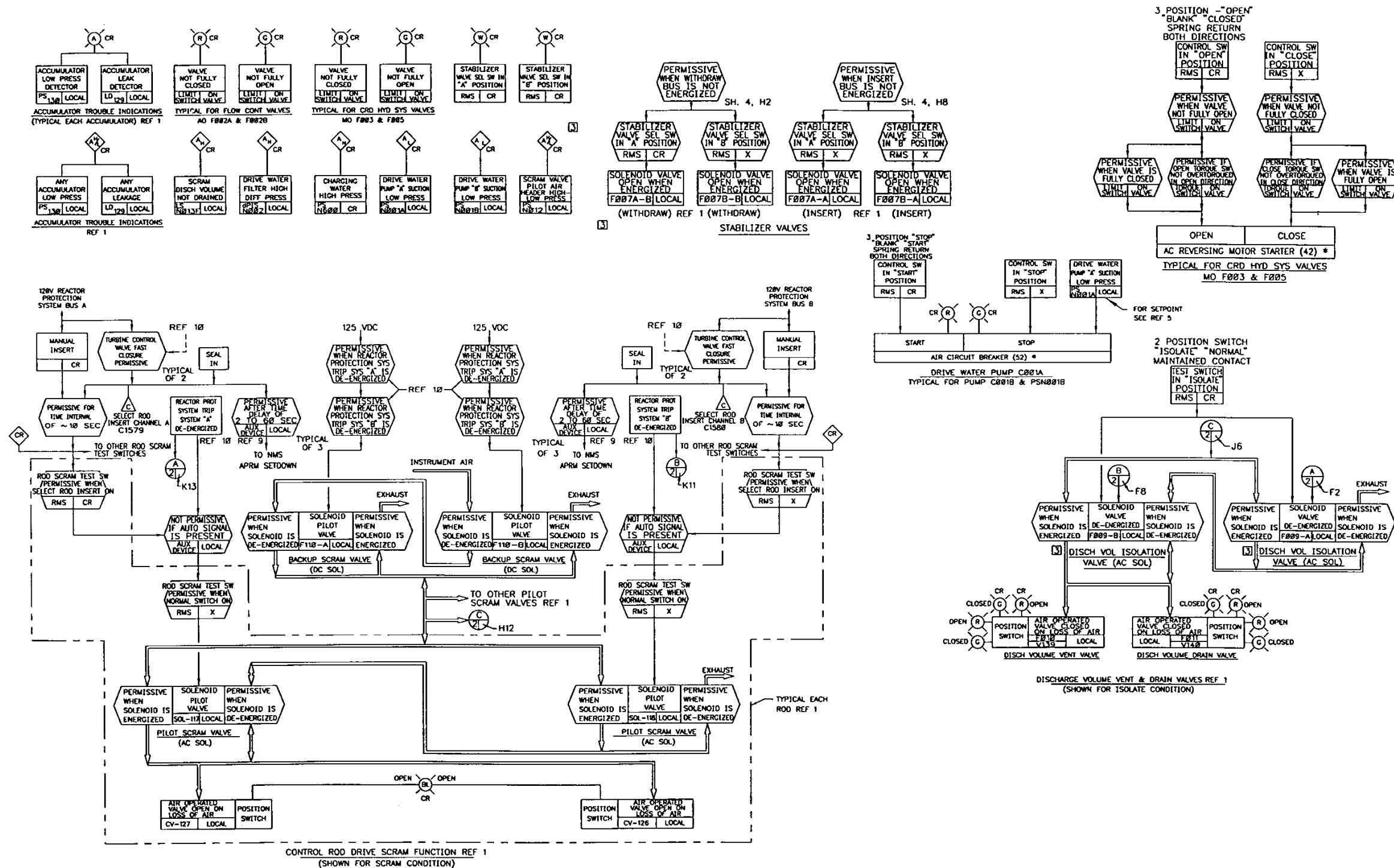
- CONTROL ROD DRIVE HYD. SYS. P&ID----- C12-1010
- NEUTRON MONITORING SYS. IED----- C51-1010
- FDWTR CONTROL SYS. IED----- C32-1010
- FDWTR CONTROL SYS. DESIGN SPEC.----- C32-4010
- CONTROL ROD DRIVE HYD. SYS. DESIGN SPEC.----- C12-4010
- PROCESS COMPUTER SYS. INPUT/OUTPUT REQUIREMENTS----- C91-4010
- POSITION INDICATOR PROBE CONNECTION DIAGRAM----- 10482506
- LOGIC SYMBOLS----- 209A4756
- NEUTRON MONITORING SYS. FCD----- C51-1020
- REACTOR PROTECTION SYSTEM IED----- C72-1010
- PIPING & INSTRUMENT SYMBOLS----- 197R567

LEGEND:

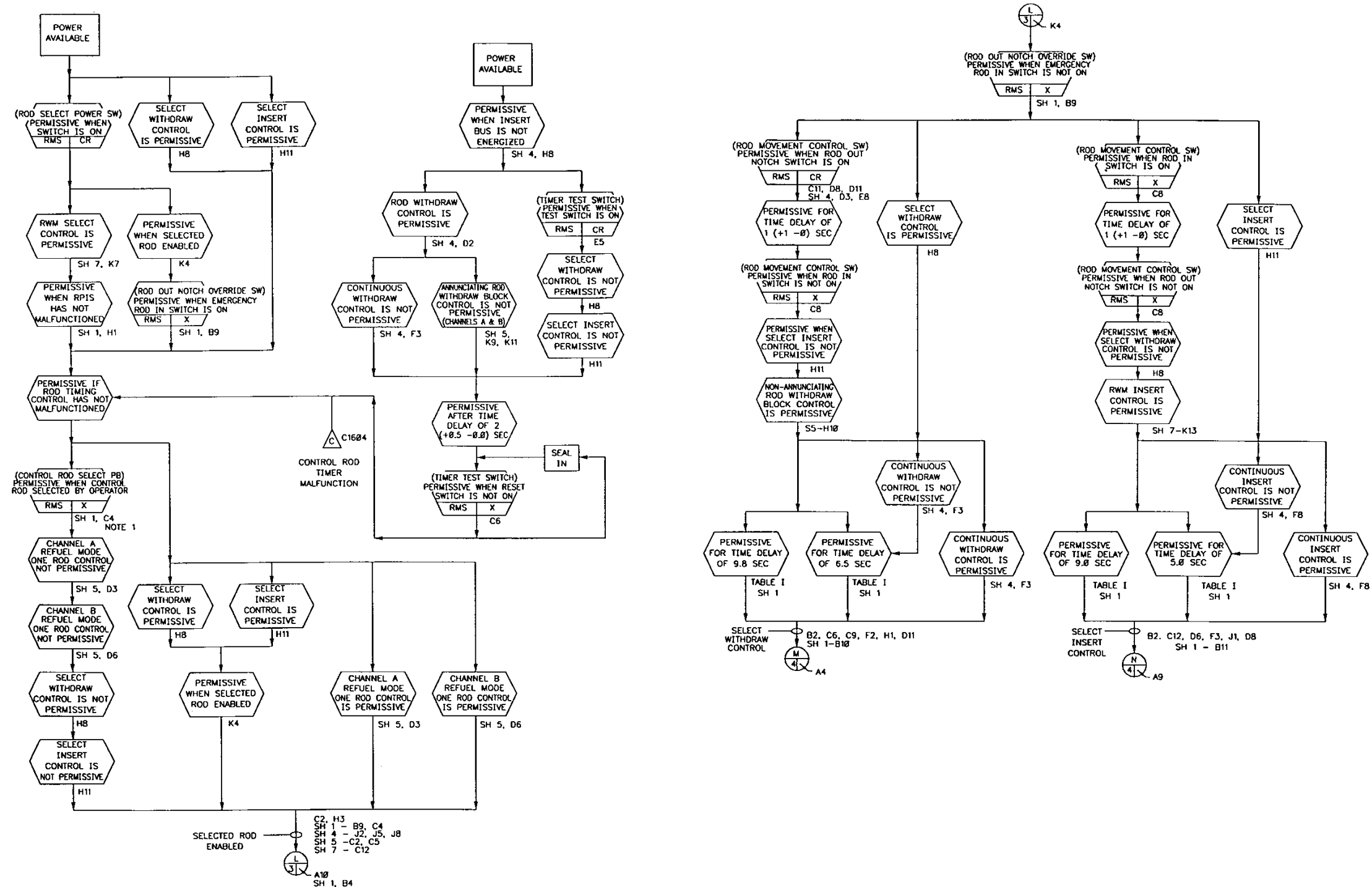
- * = SWITCHGEAR DEVICE FUNCTION NO. USAS SPEC. 037.2
- RWM = ROD WORTH MINIMIZER
- LPRM = LOCAL POWER RANGE MONITOR
- RPIS = ROD POSITION INFORMATION SYSTEM
- △ = INPUT TO COMPUTER
- NMS = NEUTRON MONITORING SYSTEM
- APRM = AVERAGE POWER RANGE MONITOR
- RBM = ROD BLOCK MONITOR
- IRM = INTERMEDIATE RANGE MONITOR

TABLE I FUNCTIONS OF CONTROL ROD TIMING

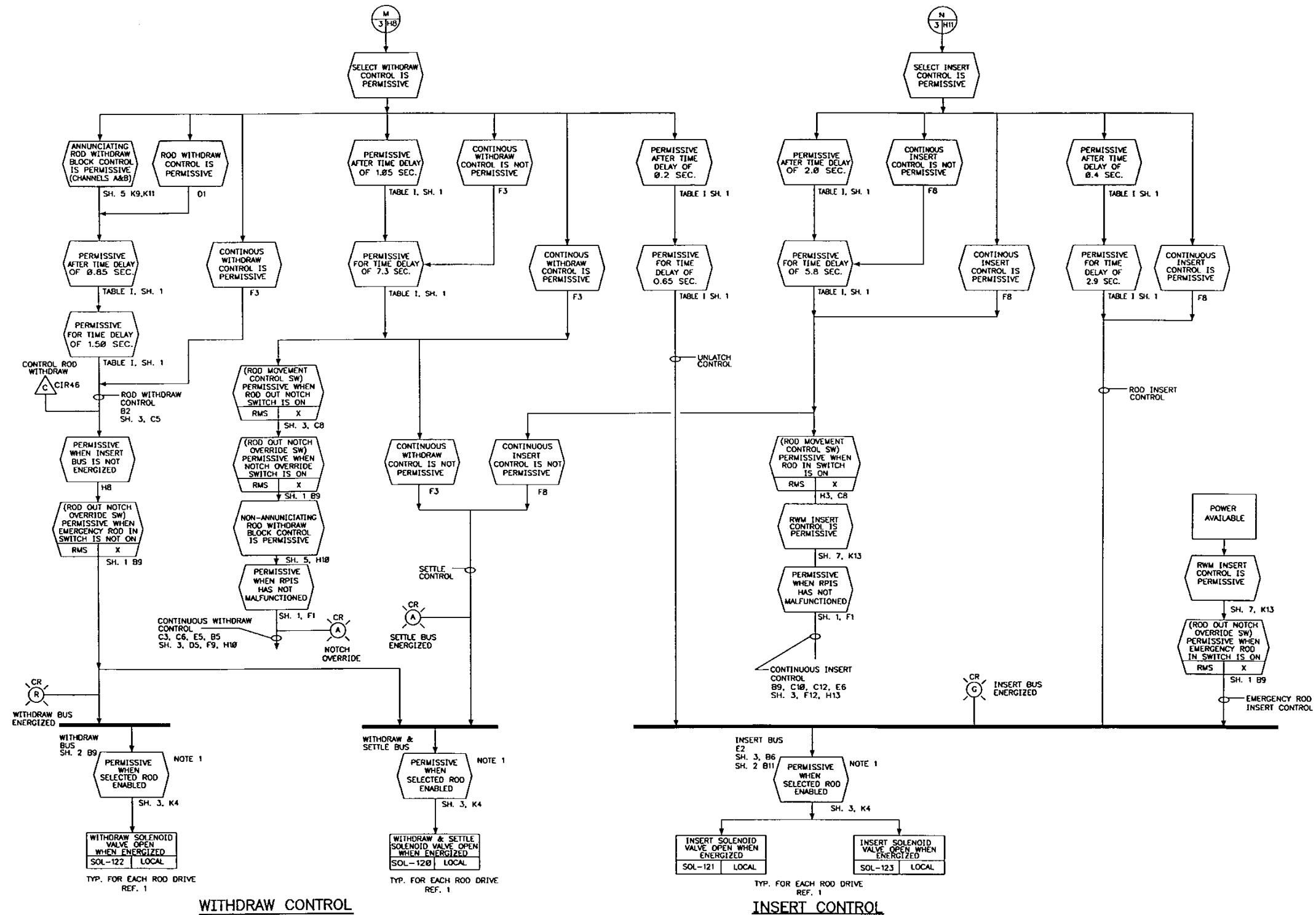
CONTROL ROD DRIVE HYDRAULIC SYSTEM (FCD) - SHEET 2



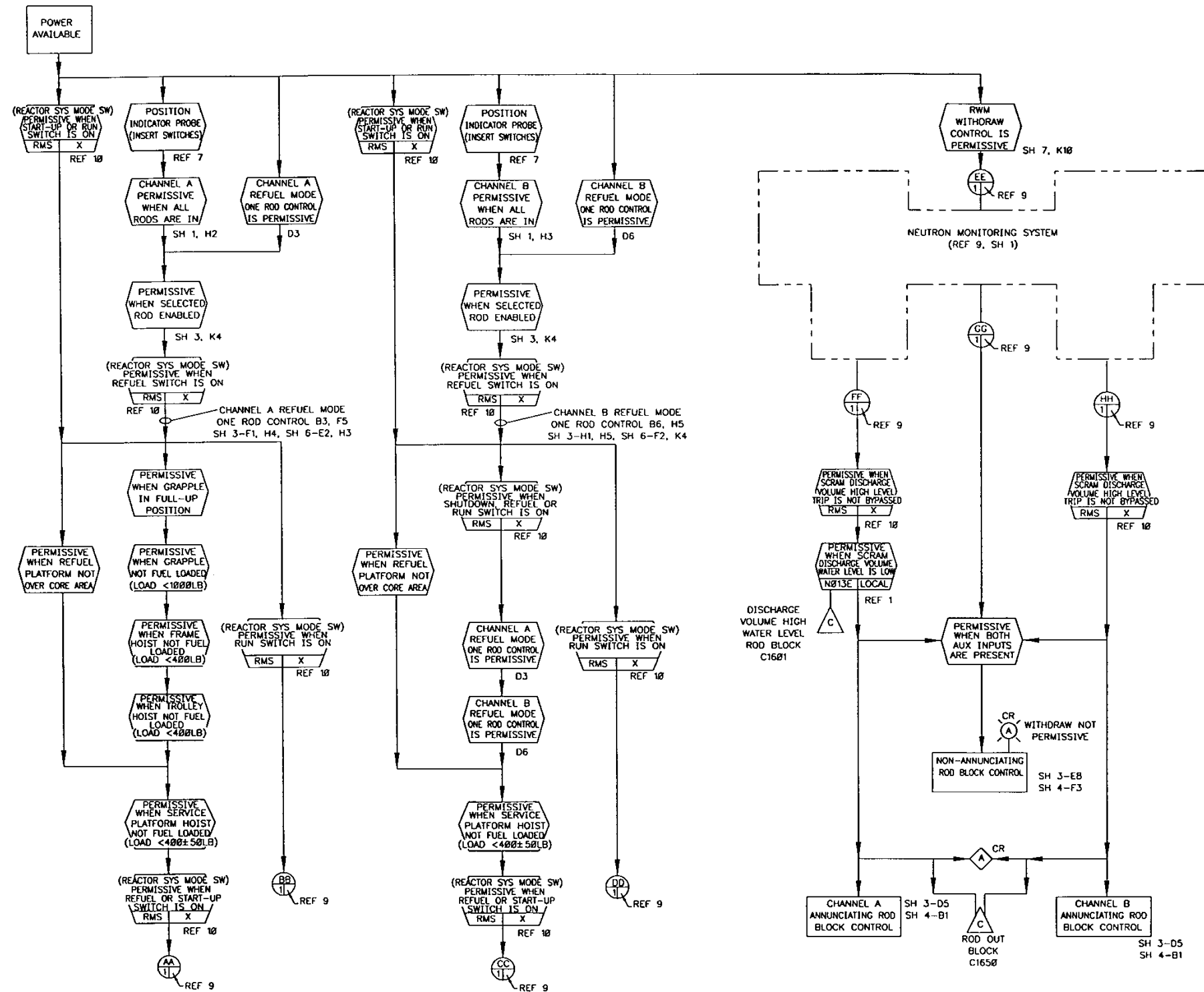
CONTROL ROD DRIVE HYDRAULIC SYSTEM (FCD) - SHEET 3



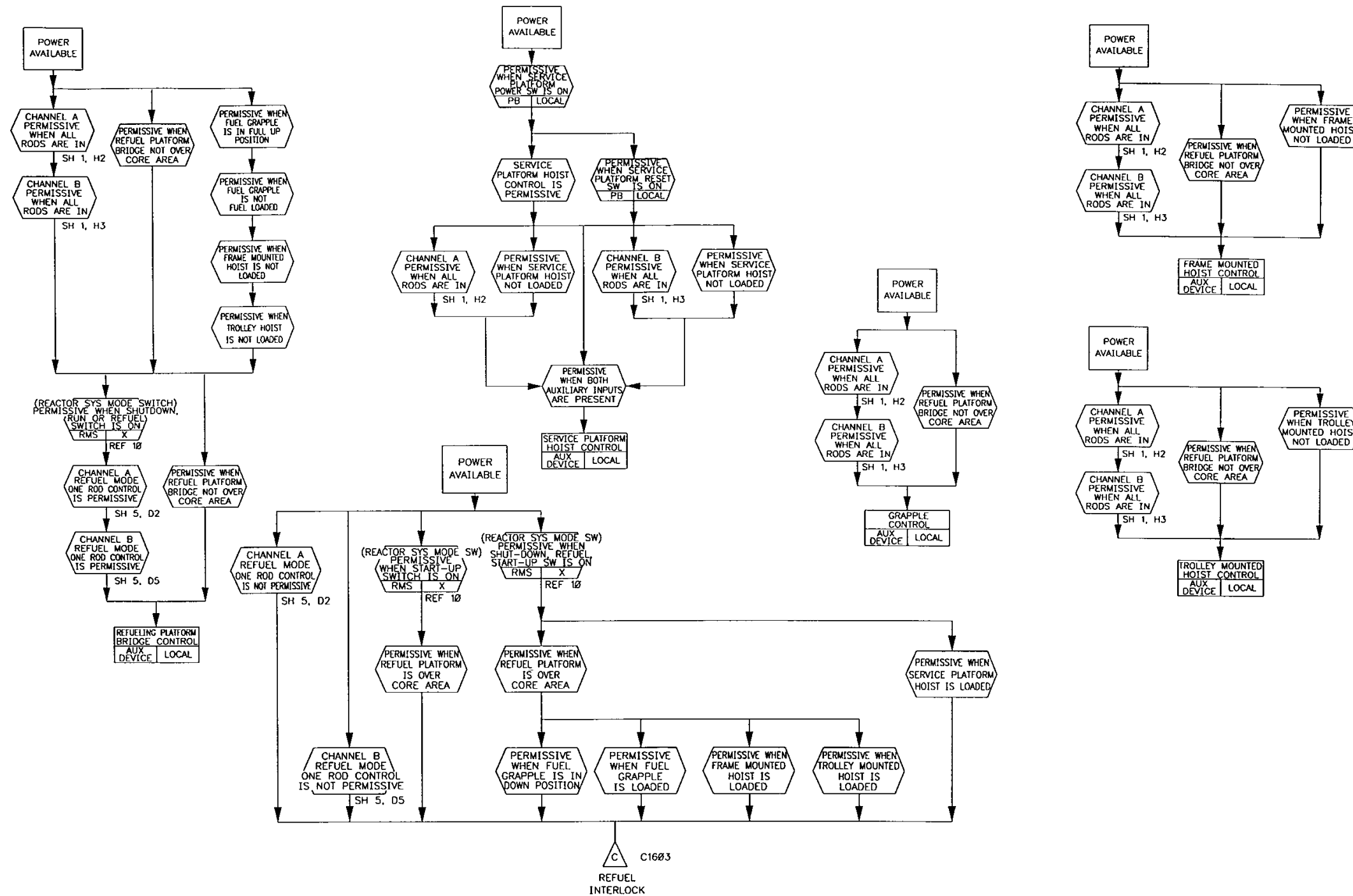
CONTROL ROD DRIVE HYDRAULIC SYSTEM (FCD) - SHEET 4



CONTROL ROD DRIVE HYDRAULIC SYSTEM (FCD) - SHEET 5



CONTROL ROD DRIVE HYDRAULIC SYSTEM (FCD) - SHEET 6



[illegible]

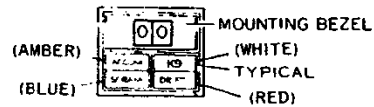
CONTROL ROD SELECTION AND DISPLAY TYPICAL ARRANGEMENT

(WHITE) (AMBER)



DETAIL "A"

The background of the indicated digit is red for full-out ("48") and green for full-in ("00").

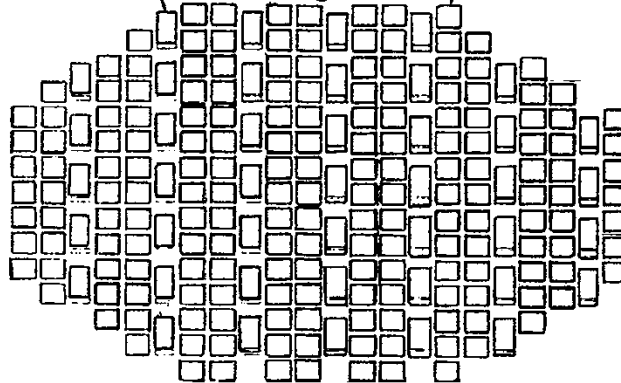


DETAIL "B"

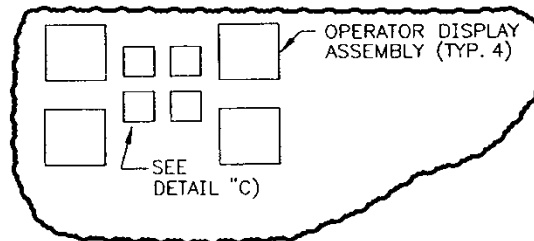
SEE DETAIL "A"

SELECT RODS

SEE DETAIL "B"

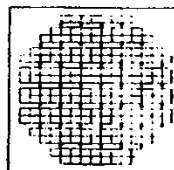


VERTICAL SECTION



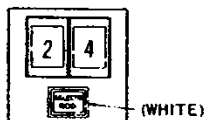
OPERATOR DISPLAY ASSEMBLY (TYP. 4)

SEE DETAIL "C"



DESK SECTION

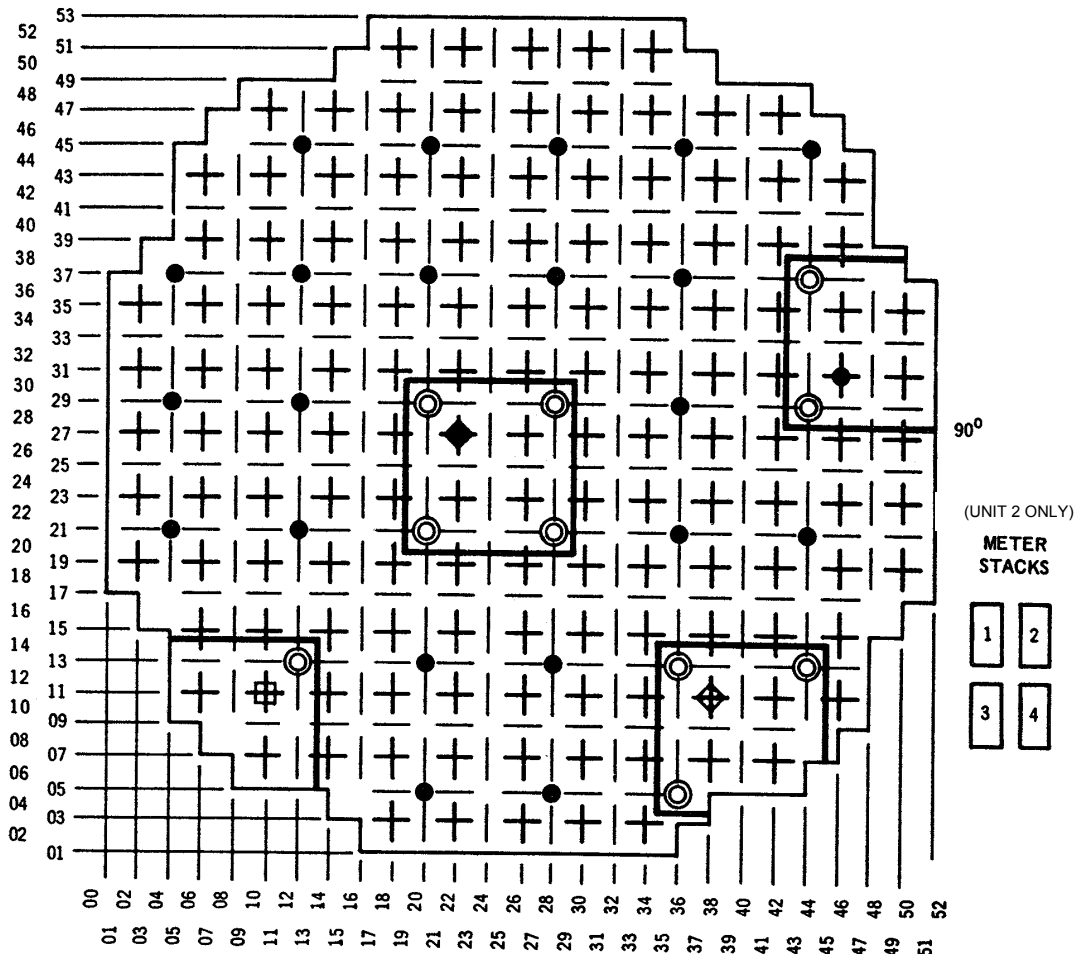
SELECT PUSHBUTTON MODULE



DETAIL "C"

INPUT SIGNALS TO RBM ODAS

Core Top View
 0°



LPRM input upon rod selection,
 Typical rod yielding four string input.
 Typical rod yielding three string input.
 Typical rod yielding two string input.
 Typical rod yielding one string input.

The LPRMs and rods within the heavily marked lines around the selected rods are those presented on the RBM ODAs.



UPDATED FSAR
INSTRUMENTATION AND CONTROLS
CHAPTER 7 FIGURES

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TYPICAL PROCESS COMPUTER PRINTOUT

51					XX	XX	XX	XX	XX				
47			XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	
43		XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX
39		XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX
35	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX
31	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX
27	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX
23	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX
19	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX
15		XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	
11		XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	
07			XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	
03					XX	XX	XX	XX	XX				
	02	06	10	14	18	22	26	30	34	38	42	46	50