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SCHWENCER,A. Licensing Branch 2

SUBJECT: Forwards addl info re SER outstanding Issue 10, standby svc water instrumentation & control design, in response to NRC 820601 ltr. Issue 10 considered closed.

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	NRR/DSI/ICSB	16	1	1	NRR/DSI/PSB	19	1	1
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August 2, 1982
G02-82-634
SS-L-02-PLP-82-054

Mr. A. Schwencer, Chief
Licensing Branch No. 2
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Schwencer:

Subject: NUCLEAR PROJECT NO. 2
SAFETY EVALUATION REPORT, NUREG-0892, OUTSTANDING ISSUE (10) STANDBY SERVICE WATER INSTRUMENTATION AND CONTROL DESIGN, CLOSURE OF

Reference: Letter, A. Schwencer (NRC) to R.L. Ferguson, "WNP-2 Request for Additional Information", dated June 1, 1982

The referenced letter forwarded question 031.139 (10 parts) as a result of a meeting between the Supply System and NRC staff. Enclosed are sixty (60) copies of the Supply System response to this question.

With submittal of this information, the Supply System considers Outstanding Issue 10 of the WNP-2 SER, NUREG-0892, to be closed.

Very truly yours,

GD Bouchey

G. D. Bouchey
Deputy Director, Safety and Security

A001

PLP/jca
Enclosures

cc: R Auluck - NRC
WS Chin - BPA
R Feil - NRC Site
JE Rosenthal - NRC

ADDITIONAL INFORMATION ON MULTIPLEXER

Q. 031.139

Please provide the following information regarding the use of multiplexer in the standby service water system.

1. Copies of tables and drawings presented at the meeting:

   - Attachment 1 - Summary of Meeting and Discussion
   - Attachment 2 - Multiplexer Configuration
   - Attachment 3 - Standby Service Water System Major Component Configuration
   - Attachment 4 - Central Control Unit (CCU) Front Panel Alarm Configuration and Description

2. An explicit discussion of how the system conforms to IEEE-279, Paragraph 4.17, "Manual Initiation".

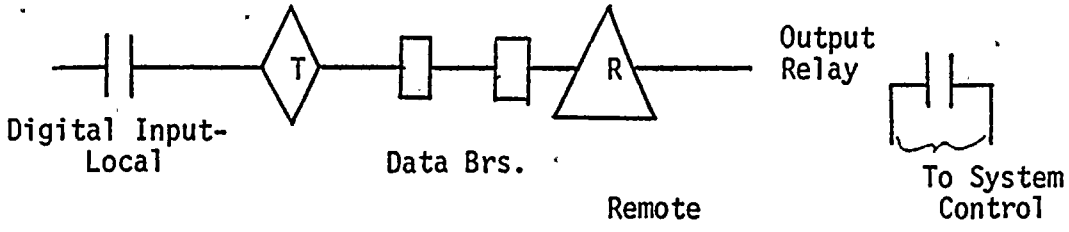
- IEEE-279, Paragraph 4.17, stipulates that "protection system shall include means for manual initiation of each protective action at the system level... Manual initiation should depend upon the operation of a minimum of equipment".

  The standby service water pump control does have a manual initiation at the switchgear which is independent of remote multiplexer operation. The local control does not depend on any permissive except for the stationary cell switch at the breaker. The cell switch closes when the controls are desired at the local location (see E517, Sheet 14, provided during April 19, 1982, meeting).

  The discharge valve controls depend on multiplexer operation for remote operation. The valves can be manually opened or closed at the location using hand wheels. (See Attachment 1, Item 2 for more details)

3. An explicit discussion of how the sytem conforms to IEEE-279, Paragraph 4.7.2 "Isolation Devices", as supplemented by Regulatory Guide 1.75 and IEEE 384.

- There are two distinct channels of operation for the standby service water system. Each channel has Class 1E qualified components. Within the multiplexers, the inputs are optically isolated from the outputs at the transmitter and receiver cards:



The input signals and the output relay contacts are wired to the respective control systems via divisionalized wireways. The above design meets with the design criteria for the isolation devices as stipulated in IEEE 384.

4. Confirmation that system level failures of the multiplexer system, detected by automated diagnostic techniques identified in (1) above, are indicated to the operator consistent with Regulatory Guide 1.47:

- System level failure of the multiplexer system is annunciated in the main control room in accordance with the requirement of Regulatory Guide 1.47. Division I multiplex system failure annunciation at MCR Bd, H13-P840. Division II multiplex system failure annunciation at MCR Bd, H13-P820. The system operability status is annunciated on the respective boards as illustrated in the attached diagrams.

5. Commitment to install remote multiplexer unit point diagnostic hardware, or the rationale, including planned manual testing, for not procuring the above hardware. The rationale, if provided, should be consistent with the guidance of Regulatory Guide 1.47.

- The scheduled maintenance for the multiplexing system (requiring off-line operation) will be performed once per refueling cycle. This off-line test may include the removal and replacement (by procedure) of boards in the control room multiplexer, but will not affect the field multiplexer. The test will demontrate the operability of the on-line diagnostic features of the system.

  The field multiplexer cabinets are kept locked and there is controlled access to the standby service water pumphouses.

  Periodic testing of the standby service water system insures that the unit point hardware is installed and operational.

  Since there is no inoperable condition expected to occur greater than once per year, the unit point diagnostic hardware is not required.

6. Confirmation based on review of equipment elementary electrical diagrams that failures of the multiplexer system will not, itself, cause standby service water (SSW) equipment to change state, while SSW is in the standby mode, such that SSW equipment is damaged.

- Standby service water loop "A" pump and valve control circuits were reviewed in detail. The design of the loop is identical to loop "B" (with the exception that loop "B" has remote shutdown room control transfer capability).

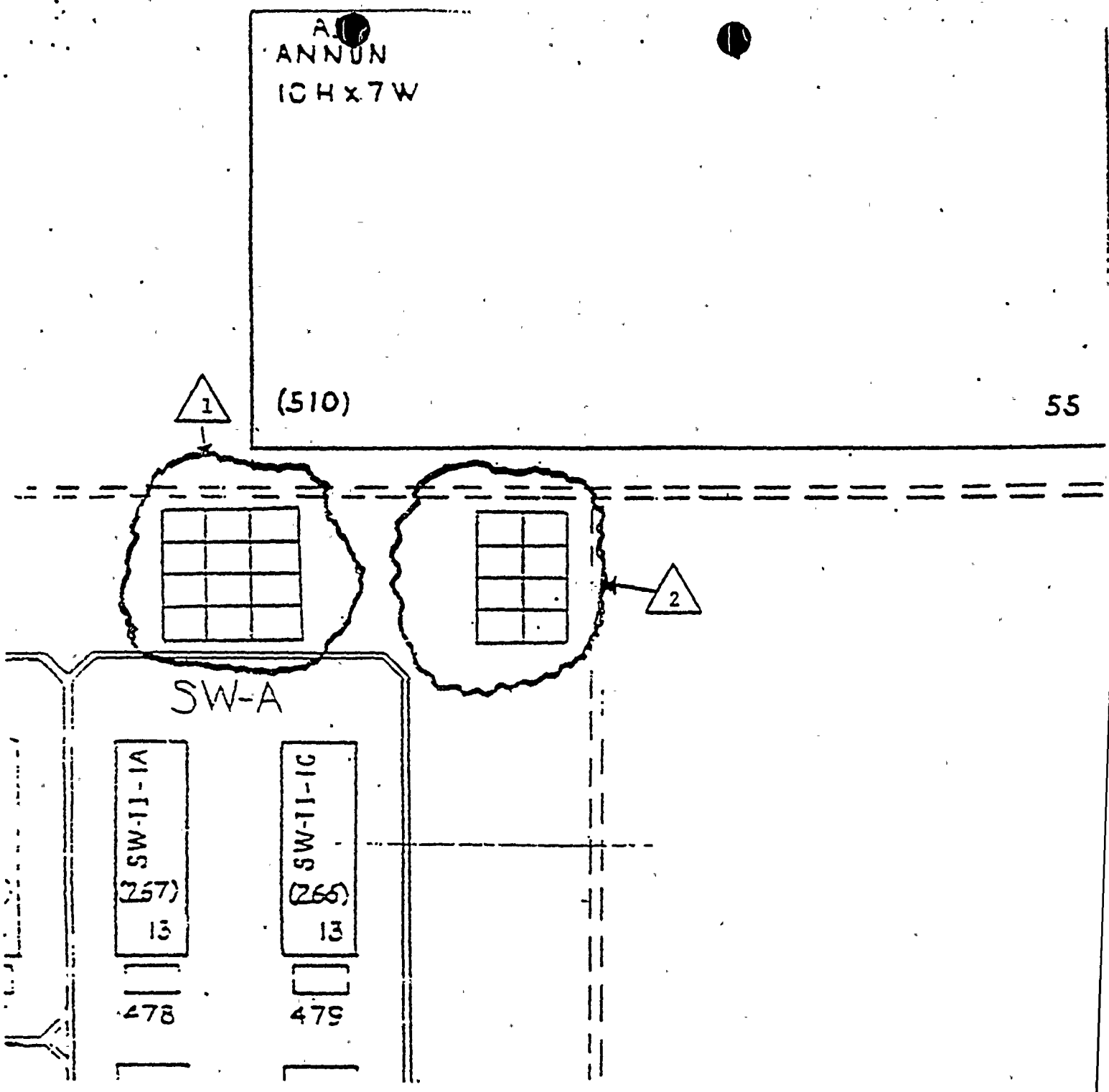
  The only components which change state as a result of multiplexer system failures are:

  a. Pump motor heater.
  b. Loop pressure control valve SW-PCV-38A.

  Change of energized/de-energized state of the pump motor heater is not critical and has no short term consequences for the system.

  Opening of the loop pressure control valve SW-PCV-38A has no effect on the system when the standby service water pump is not operating.

  Table 031.139 presents the unit point functions of various multiplexer channels by component in the Standby Service Water System.



R.G. 1.47 Display Location on H13-P840 (Board "A")

1 = SW-A Bypass and Inoperable Status Indication

2 = C1A Div. I Bypass and Inoperable Status Indication

Reference Drawing - E537-IVF-32 Rev.

RG 1.47

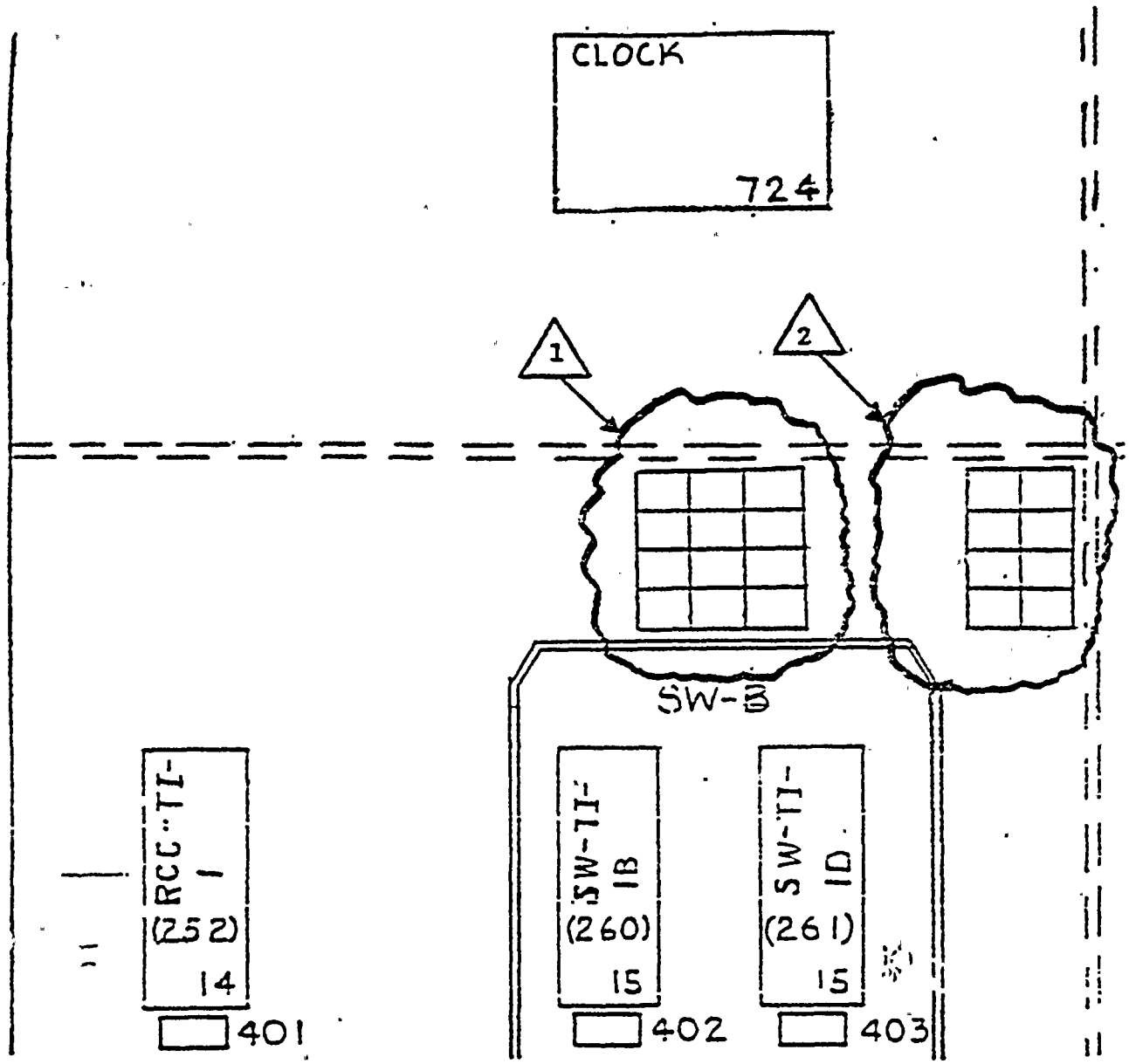
	1	2	3
1	DIV1 SERVICE WTR ~~EQPT~~. MULTIPLEXING SYSTEM. OUT OF SERVICE.	SPARE	SPARE
2	DN1 SWGR RM C208 HVAC OUT OF SERV	125V DC DIV 1 BATT B1-1 OUT OF SERV	DIV 1 SW. LOW HEADER PRESS
3	BKR SW1A NOT IN OPER POS/ CONTR PWR LOSS/OC LD.	DG1 OUT OF SERV	DIV 1 SW PMP HSE HVAC OUT OF SERV
4	LAMP TEST	MAN SWITCH SW DIV 1 OUT OF SERV.	NETWORK MDV PWR LOSS/OL

NOTE: ABBREVIATION 'OPER' (WHICH MEANS OPERATING/OPORATION) IS TO BE APPROVED BY HUMAN ENGINEERING STUDY GROUP.

Q. 031.139 Part 4
Sheet 2 of 4

SW DIV 1 BISI (BYPASS & INOPERABLE STATUS INDICATION)

(WINDOW LOGIENDS)



R.G. 1.47 Display Locations on H13-P820 (Board "B")

1 = SW-B Bypass and Inoperable Status Indication

2 = CIA Div. II Bypass and Inoperable Status Indication

Reference Drawing - E537-IVF-19 Rev. 1

RG 1.47

DIV 2 SERVICE WTR MULTIPLEXING SYSTEM OUT OF SERVICE.	SPARE	SPARE
DIV2 SWGR RM C206 HVAC OUT OF SERV	125V DC DIV1 BATT B1-2 OUT OF SERV	DIV 2 SW LOW HEADER PRESS
BKR SWIB NOT IN OPER. POS/ CONTR PWR LOSS/OL LO	DG2 OUT OF SERV	DIV 2 SW PMP HSE HVAC OUT OF SERV
LAMP TEST	MAN. SWITCH SW DIV 2 OUT OF SERV.	NETWORK MOV PWR LOSS/OL.

Q. 031.139 Part 4
Sheet 4 of 4

SW DIV 2 BISI (BYPASS & INOPERABLE STATUS INDICATION)

(WINDOW LEGENDS)

7. An explicit discussion of electromagnetic interference (EMI) susceptibility and testing. Radiative and conductive EMI testing should be discussed.

- No specific EMI tests have been performed on the multiplexing system. However, based on the design parameters of the multiplexer system, it is expected that EMI resulting in malfunction of the multiplexer system is not credible. The following specific design features support this statement:

  - The multiplexer cabinets are located in the main control room where no high energy circuits are routed.

  - The wiring to and from multiplexer units is routed in exclusive wireways where only low energy/signal circuits are allowed.

  - Multiplexer channels use optical isolaters for channel separation, hence, any malfunction in one of the channels is not transmitted downstream or into other channels. Thus, failure, if any, is restricted to the defective channel.

  - The data bus carries digitalized signals, and hence is less susceptible to EMI.

  - The system, Class 1E qualified, has been designed with two independent systems for Division I and Division II. The control room multiplexer for Division I is located in the main control room and for Division II in the remote shutdown room. The field multiplexers are located in two physically separated pumphouses. It is not feasible to predict that a single EMI event could affect both the Division I and Division II systems simultaneously.

8. A discussion of the feasibility of running the SSW system, or altering its standby state, should the multiplexer be inoperable. The discussion should consider loss of offsite power subsequent to SSW modified alignment, with the multiplexer inoperable.

- Response 031.139(2) addressed the "manual initiation" mode of the Standby Service Water System. The system status could be altered in this manner upon a multiplexer failure to establish flow in the SSW loop. Running of the SSW pumps under this altered standby mode has no adverse impact on the RHR heat exchanger or any other cooling component.

  However, under this altered mode, a subsequent loss of offsite power would cause a SSW pump trip. The discharge valve would not receive a close signal due to the multiplexer inop condition. Twenty seconds after the diesel assumes loading capability, the SSW pump breaker closes. Starting the SSW pump with the discharge valve open would excessively load the pump and probable damage to the pump motor would occur.

  Analysis has shown that a discharge valve position of 25% open would sufficiently protect the SSW pump under the loss of offsite power restart. The altered standby mode could therefore operate safely only if the discharge valve was positioned properly.

  Because of the above discussion, it is not advisable to manually operate the SSW system upon multiplexer failure to consider it operable under technical specifications. At the present time, the Supply System does not intend to operate the SSW system without an operable multiplexer. However, should we elect to align the SSW system in this manner, we would develop appropriate procedures to provide cautionary information for the operator to protect the SSW pumps.

9. Commitment to declare the SSW system division inoperable when the corresponding division multiplexer is inoperable. Commitment to include the above in the plant procedures used to define SSW system operability in accordance with the current plant Technical Specifications.

- The multiplexing system is considered a component within the standby service water system. Operability of the SSW system is demonstrated on a system basis. Any component malfunction which precludes SSW operation will result in a declaration of SSW system inoperability. This direction is currently given in system operating and surveillance procedures. Specific delineation of components failures is not included in other procedures because of the large number of potential failures and the possibility of omitting a component. For this reason it is inappropriate to identify the multiplexer specifically in plant procedures.

10. A discussion of the feasibility and advisability of adding remote multiplexer override capability at the switchgear, such that SSW pumps may be run, and SSW valves aligned, from the switchgear located in the auxiliary building, should the multiplexer fail.

- It is technically possible to hardwire remote multiplexer override capability into the system such that it can be controlled from the switchgear room, or any other location that is chosen.

  The advisability for generic override is questionable. As demonstrated in questions 6 and 8 above, the multiplexer failure does not cause any ill effect in a standby system or an operating system. There are two separate loops designed to cater the need for standby service water in case of accident conditions. These separate loops contain Class 1E qualified components. Failure of any one multiplexer unit in a loop is a credible and acceptable event under single failure criteria. The other loop is available for operation which will automatically come on line should there be a need.

  The complete design meets with separation criteria, and the multiplexers are fed from an uninterruptible power source, hence, degradation of the multiplexer system because of an external source is not credible.

TABLE 3.11.19

SOTBYER	Item	Supervisory Relays[1] Transmitter	Receiver	Supervisory	Function	Location/Type of Supervisory Relay[2,4] Contact in Control Ckt Trip/Open	Close	Common	Possible Supervisory Contact Position w/Multiple[3,8] Failures /Inoperable[4,8] Trip/Open	Close	Common
T C	SW-P-1A	TS1-021	RCS1-021	SCS1-021*	Trip pump on spray pond level low	N.O.(C/O)	N.C.(C/C)	--	(E/E)	(E/E)	--
		TCS1-003	RS1-003	SS1-003	Energize motor heater when pump off	--	--	N.C.(C/O)	--	--	E
		TS1-022	RCS1-022	SCS1-022	Prohibit manual start if SW-V-2A open	--	N.O.(C/O)	--	--	(E/O)	--
C O	SW-V-2A	TS1-001	RCS1-001	SCS1-001	Status display	N/A	N/A	N/A	N/A	N/A	N/A
		TS1-002	RCS1-002	SCS1-002	Status display & SW-PCV-38A ctrl[5]	N/A	N/A	N/A	N/A	N/A	N/A
		TS1-003	RCS1-003	SCS1-003	Valve open ckt. permissive	N.O.(C/O)	--	--	(E/O)	--	--
		TS1-004	RCS1-004	SCS1-004	Valve close ckt permissive	--	N.O.(O.C)	--	--	(O/E)	--
		TS1-022	RCS1-022	SCS1-022	See SW-P-1A (above)	--	--	--	--	--	--
		TS1-031	RCS1-031	SCS1-031	Valve auto open pressure intl'k	N.O.(O.C)	--	--	(O/E)	--	--
C O	SW-V-12A	TS1-013	RCS1-013	SCS1-013	Status display	N/A	N/A	N/A	N/A	N/A	N/A
		TS1-014	RCS1-014	SCS1-014	Status display	N/A	N/A	N/A	N/A	N/A	N/A
		TS1-015	RCS1-015	SCS1-015	Valve open ckt permissive	N.O.(C/O)	--	--	(E/O)	--	--
		TS1-016	RCS1-016	SCS1-016	Vavle close ckt permissive	--	N.O.(O/C)	--	--	(O/E)	--
		TS1-017	RCS1-017	SCS1-017	Annunciation	--	--	--	--	--	--
		TS1-024	RCS1-024	SCS1-024	Valve auto open FA intl'k	N.O.(C/O)	--	--	(E/O)	--	--
		--	--	SCS1-020	Auto close/open intl'k to SW-V-69A	N.O.(O/C)	N.C.(C/O)	--	(O/E)	(C/E)	--
C	SW-PCV-38A	TCS1-037	RS1-037	SS1-037	Status display	N/A	N/A	N/A	N/A	N/A	N/A
		TCS1-038	RS1-038	SS1-038	Status display	N/A	N/A	N/A	N/A	N/A	N/A
		TS1-006	RCS1-006	SCS1-006	C.S. close control	--	--	N.O.(O/O)	--	--	(O/O)
		TS1-007	RCS1-007	SCS1-007	C.S. auto control	--	--	N.O.(C/O)	--	--	(E/O)
		--	--	SCS1-002	Intl'k from SW-V-2A	--	--	N.O.(C/O)	--	--	(E/O)
O C	SW-V-69A	TS1-005	RCS1-005	SCS1-005	Status display	N/A	N/A	N/A	N/A	N/A	N/A
		TS1-006	RCS1-006	SCS1-006	Status display	N/A	N/A	N/A	N/A	N/A	N/A
		TS1-007	RCS1-007	SCS1-007	Valve open ckt permissive	N.O.(O/C)	--	--	(O/E)	--	--
		TS1-008	RCS1-008	SCS1-008	Valve close ckt permissive	--	N.O.(C/O)	--	--	(E/O)	--
		TS1-020	RCS1-020	SCS1-020	Auto ckt level intl'k & SW-V-12A intl'k	N.C.(C.O)	N.O.(O/C)	--	(C/E)	(O/E)	--
		TS1-032	RCS1-032	SCS1-032	Auto close FA ckt	--	N.O.(C/O)	--	--	(E/O)	--

TABLE 3.1.2-2

SOTBYR	Item	Supervisory Relays[1]			Function	Location/Type of Supervisory Relay[2,4] Contact in Control Ckt			Possible Supervisory Contact Position w/Multiple[4,8] Failures /Inoperable		
		Transmitter	Receiver	Supervisory		Trip/Open	Close	Common	Trip/Open	Close	Common
0 C	SW-V-70A	TS2-009	RCS2-009	SCS2-009	Status display	N/A	N/A	N/A	N/A	N/A	N/A
		TS2-010	RCS2-010	SCS2-010	Status display	N/A	N/A	N/A	N/A	N/A	N/A
		TS2-011	RCS2-011	SCS2-011	Valve open ckt permissive	N.O.(O/C)	--	--	(O/E)	--	--
		TS2-012	RCS2-012	SCS2-012	Valve close ckt permissive	--	N.O.(C/O)	--	--	(E/O)	--
		TS2-023	RCS2-023	SCS2-023	Auto ckt level intl'k	N.C.(C/O)	N.O.(O/C)	--	(C/E)	(O/E)	--
		TS2-033	RCS2-033	SCS2-033	Auto close FA intl'k	--	N.O.(C/O)	--	--	(E/O)	--

TABLE 031.139

Notes:

1. Asterik (*) indicates relay coil connected to N.C contacts of output function card rather than to N.O. contacts of output function card.

2. Refers to status with coil de-energized.

3. For failure modes:

   a) Receiver retains last valid signal received if input wires cut or shorted
   b) In event of receiver power failure, output contacts revert to de-energized state

4. Brackets (/) indicate contact position in standby/ operating modes.

5. See SW-PCV-38A for description of interlock contact.

6. Multiplexer failures evaluated:

   a) Loss of transmitter power (receiver de-energizes)
   b) Loss of receiver power (supervisory relay de-energizes)
   c) Short/open of data bus (receiver retains last valid signal)

7. Open only if Diesel Generator operating; otherwise closed.

8. Either position (E).

9. Mutliplexer failures cause loss of ability to change state.

SUMMARY OF WPPSS/NRC-ICSB MEETING
MAY 19, 1982

Attendees:

R.M. Nelson	-	Supply System
G.C. Dockter	-	Supply System
K. Shah	-	Anaconda Advanced Technology
R. Auluda	-	NRC/DL
J.E. Rosenthal	-	NRC/ICSB
G. Günes	-	NRC/ICSB
J. Joyce	-	NRC/ICSB
R. Karsch	-	NRC/ICSB
T. Dunnins	-	NRC/ICSB

The meeting agenda consisted of eleven (11) questions previously forwarded to the Supply System by J.E. Rosenthal (NRC).

Agenda - Remote Multiplexing System Application to WNP-2:

1. Provide a complete list of components (pumps, valves) whose actuation, interlock, or status indication is dependent on the proper operation of each 1-E multiplexer.

2. For the components sited above, describe the means of remote or local control (other than cutting wires or jumpering) which may be employed should the multiplexer fail.

3. Describe the multiplexer pre-operational test program.

4. Describe test and/or hardware features employed to demonstrate fault tolerance to electro-magnetic interference.

5. Describe interconnection, if any, of the 1-E mutliplexer to non-1-E devices such as the plant computer.

6. Describe on-line test and/or diagnostic features which may be employed including operator alarms/indicators and their position.

7. Describe the multiplexer power source(s).

8. Describe the dynamic response to momentary interruption of A/C power.

9. Describe the applicability of the current proposed plant technical specifications to the 1-E multiplexers.

10. Describe hardware architecture of the unit field mutliplexer, central control unit, and control room multiplexer.

11. Describe firmware architecture.

Attachment I

The discussion of each item was as follows:

1. Provide a complete list of components (pumps, valves) whose actuation, interlock, or status indication is dependent on the proper operation of each 1-E multiplexer.

DIV I (SW LOOP A)

DIV.	COMPONENT	ACTUATION	INTERLOCK	STATUS INDICATION
I	SW-P-1A		1. Discharge Valve 2. Spray Pond Level	
	SW-V-2A	1. Torque and Limit Switch Functions 2. Pump Discharge Pressure		Valve Position
	SW-V-38A	SW-V-2A Position		Valve Position
	SW-V-12A SW-V-69A SW-V-70A	1. Torque and Limit Switch Functions 2. Spray Pond Level		Valve Position
II	SW-P-1B		1. Discharge Valve 2. Spray Pond Level	
	SW-V-2B	1. Torque and Limit Switch Functions 2. Pump Discharge Pressure		Valve Position
	SW-V-38B	SW-V-2A Position		Valve Position
	SW-V-12B SW-V-69B SW-V-70B	1. Torque and Limit Switch Functions 2. Spray Pond Level		Valve Position
III	HPCS-P-2		Discharge Valve	
	SW-V-29	1. Torque and Limit Switch Functions 2. Pump Discharge Pressure		Valve Position

2. For the components sited above, describe means of remote or local control (other than cutting wires or jumpering) which may be employed should the multiplexer fail.

SW-P-1A	Pump will auto start.
SW-P-V-2A SW-V-38A	Operator manually opens valves at SWPPHSE (about two minutes each).
SW-V-12A SW-V-69A SW-V-70A	Operator manually opens valves at SWPPHSE (about 20 minutes each).

SW-P-1B	Pump will auto start.
SW-V-2B SW-V-38B	Operator manually opens valves at SWPPHSE (about two minutes each).
SW-V-12B SW-V-69B SW-V-70B	Operator manually opens valves at SWPPHSE (about 20 minutes each).
HPCS-P-2 SW-V-29	Pump will auto start. Operator manually opens valve at SWPPHSE (about two minutes).

3. Describe the multiplexer preoperational test program.

- A Special Lineup Test (SLT-545.0-2) has been performed on the system, This test verified that all input/output channels were functional and checked the following diagnostic/error tests:

  - RF Power Failure Diagnostic and CCU Alarm Test
  - CCU Power Failure and Alarm Test
  - Stuck Bit Diagnostic Test
  - Major Mode Diagnostic Test
  - Interrogate Delay Time Error Diagnostic Test
  - Diagnostic In/Out Test
  - CRM Scan Time Diagnostic Test
  - UFM Alarm Test
  - CRM Alarm Test

  The results of this test will be Test Working Group (TWG) approved as a prerequisite for the Standby Service Water System Preoperational Test.

  The Standby Service Water Preop will demonstrate the proper throughput (I/O) functions of each Class 1E system.

  Loss of Power (LOP) testing will demonstrate the electrical separation of each independent system.

4. Describe test and/or hardware features employed to demonstrate fault tolerance to electro-magnetic interference.

- Each UFM channel is designed to provide 1,500 Volt RMS isolation line to ground and 600 VRMS isolation channel to channel. Each CRM channel provides 600 VRMS protection for both cases.

  Specific EMI testing information was not available at the meeting.

5. Describe interconnection, if any, of the 1-E multiplexer to non-1-E devices such as the plant computer.

- There are no non-1E devices connected to the multiplexing system at the data bus level. Annunciator and computer alarms (see question 6) outputs are provided via interface boards from the Central Control Unit (CCU).

Some non-1E equipment is services by the multiplexer. These are:

- TMU-LCV-2A This is an analog output to an I/P. Controls Circ Water Pit Level.
- TMU-LCV-1A,1B Makeup Water to Spray Ponds A & B. Solenoid valve control.
- TMU-P-1A,1B Interface to the TMU pumps. Auto start on Low Spray Pond Level.

A discussion of the maximum credible fault design resulted from this question. The system will be verified to this design criteria (Response to Q. 031.139 (3)).

6. Describe on-line test and/or diagnostic features which may be employed including operator alarms/indicators and their position.

- Alarm display at the CCU (See Figure 1).

*Annunciators at Board P in Main Control Room:

Drop # P1-6.3 "STDBY SERVICE WTR PPHSE 1A SUPV SYSTEM DIV. I TROUBLE"

Drop # P2-6.2 "STDBY SERVICE WTR PPHSE 1B SUPV SYSTEM DIV. II TROUBLE"

Drop # P1-8.4 "STDBY SERVICE WTR PPHSE 1A SUPV SYSTEM DIV. III TROUBLE"

**Alarms at the Process Computer:

C1227	"SUPV PNL S1 PWR"	NORM	TBLE
C1231	"SUPV PNL S2 PWR"	NORM	TBLE
C1232	"SUPV PNL S3 PWR"	NORM	TBLE

*These alarms annunciate on:

- CRM alarm
- UFM alarm
- CCU alarm
- Loss of 24VAC in CRM or UFM

**These alarms annunciate on a UFM alarm.

A commitment was made by the Supply System to confirm that these alarms are indicated to the operator consistent with Regulatory Guide 1.47 (Q. 031.139 (4)).

7. Describe the multiplexer power source(s).

-

	CRM/CCU	UFM
DIV. I	PP-7A-A Figure 8.3-2	PP-7A-G to MC-7A via PP-7A-B Figure 8.3-1a

	CRM/CCU	UFM
DIV. II	PP-8A-A Figure 8.3-2	PP-8A-G to MC-8A via PP-8A-B Figure 8.3-1a
DIV. III	PP-4A to MC-4A and DG3 Figure 8.3-1d	PP-4A to MC-4A and DG-3 Figure 8.3-1d

8. Describe the dynamic response to momentary interruption of A/C power.

- The power on restart function of the system was discussed. The CCU will reset the required initiation and error flags and begin the normal mode operation. There is no direct bus level monitoring circuits which prevent operation microprocessor operation. There are crowbar circuits to protect the hardware and on-line diagnostics to prevent inadvertent operation of equipment during the power-on restart (POR) cycle.

9. Describe the applicability of the current proposed plant technical specifications to the 1-E multiplexers.

- The current proposed plant technical specifications do not contain a section directly addressing the multiplexing system as a component.

  The system operability checks for the standby service water system include the operability of the multiplexing system as a component of standby service water system. Per technical specifications, this system's operability is demonstrated periodically.

  In addition, on-line diagnostics will alarm malfunctions in the main control room. Annunciator response procedures will direct operations personnel to consider the standby service water technical specifications sections that apply to system operability.

10. Describe hardware architecture of the unit field multiplexer, central control unit, and control room multiplexer.

- UFM-J1 Coupler
  -J2 Coder-Decoder (clock 14.78 mttz)
  -J3 Bus I/F and Diagnostic
  -J4- I/O Boards
  -J20 I/O Boards

  CRM-J1 CCU/CRM Interface
  -J2 CRM Diagnostic
  -J3- I/O Boards
  -J17 I/O Boards

  CCU-J1 Modem
  -J2 Coder/Decoder
  -J3-J5 Controller
  -J6 CRM Interface
  -J7 Sequencer (point table)
  -J8 Alarm Interface Board
  -J16 UFM Diagnostic
  -J17 CCU Diagnostic

11. Describe firmware architecture.

- Mr. Khirti Shah of I/C Engineering described the 6 basic instructions utilized by the micro-processor. References to the central control unit were addressed to provide further information.

The meeting was adjourned at this time to allow time for discussion of items which required clarification of commitments.

ATTACHMENT 2
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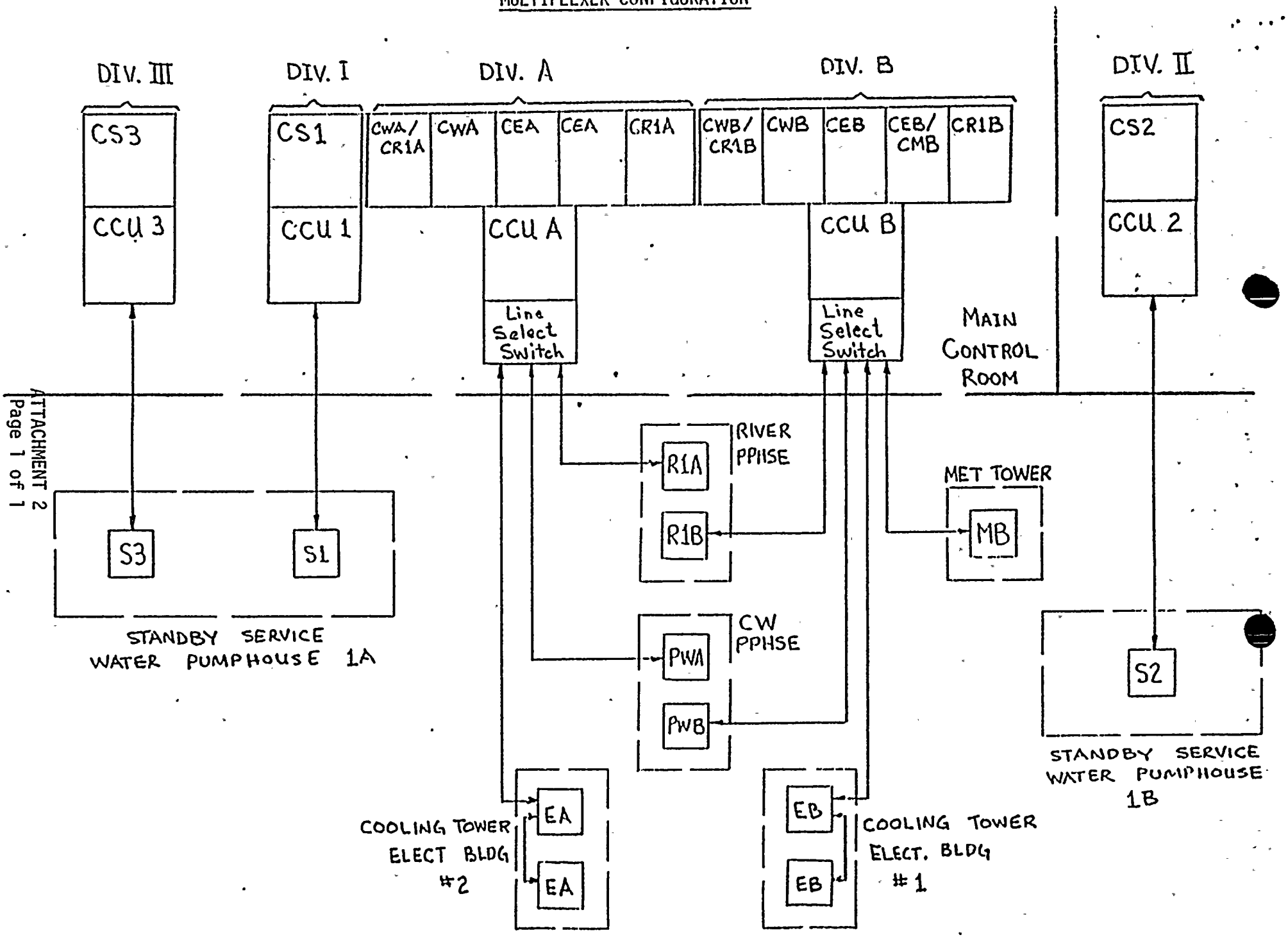
MULTIPLEXER CONFIGURATION



ATTACHMENT 3
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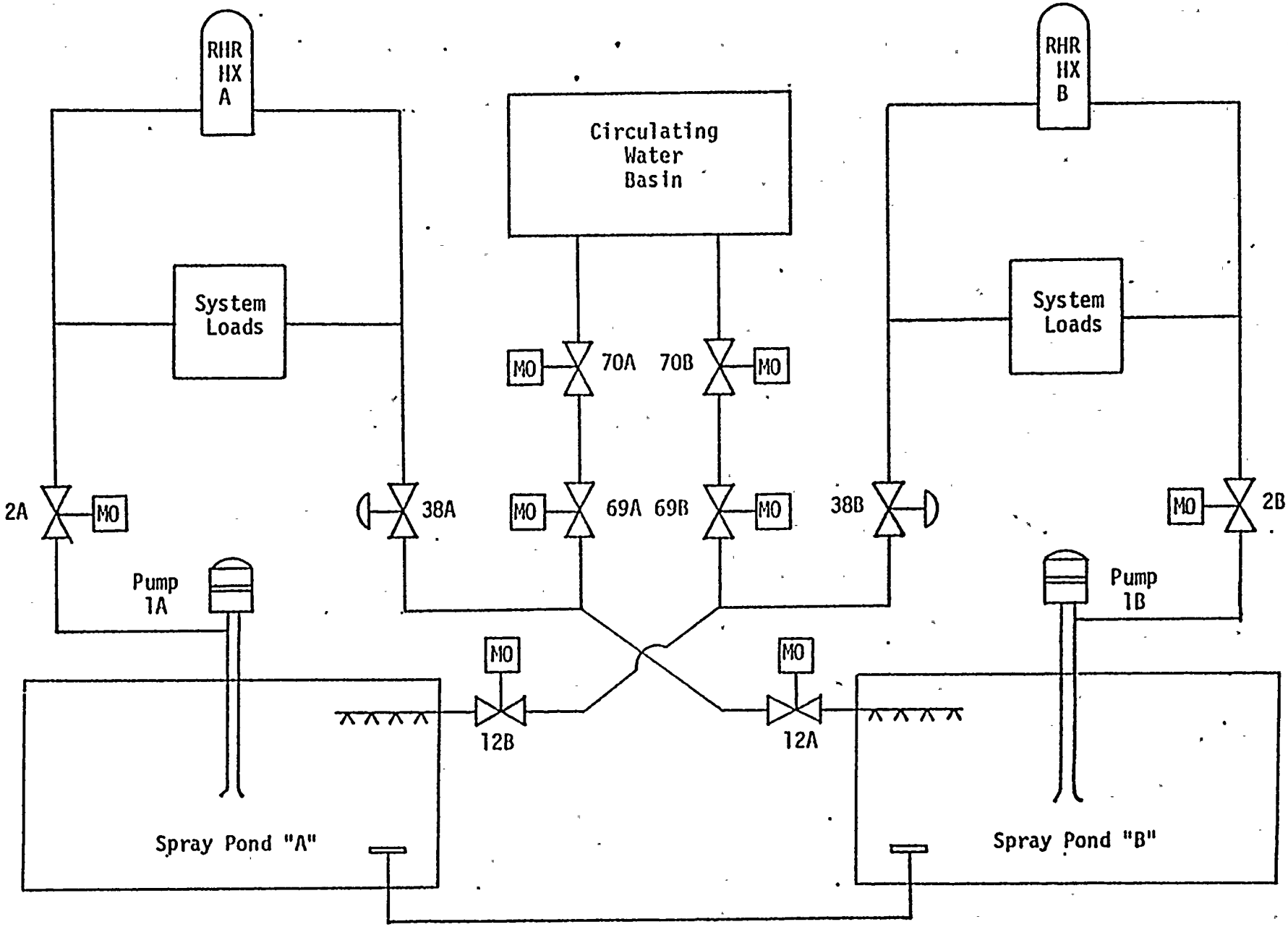
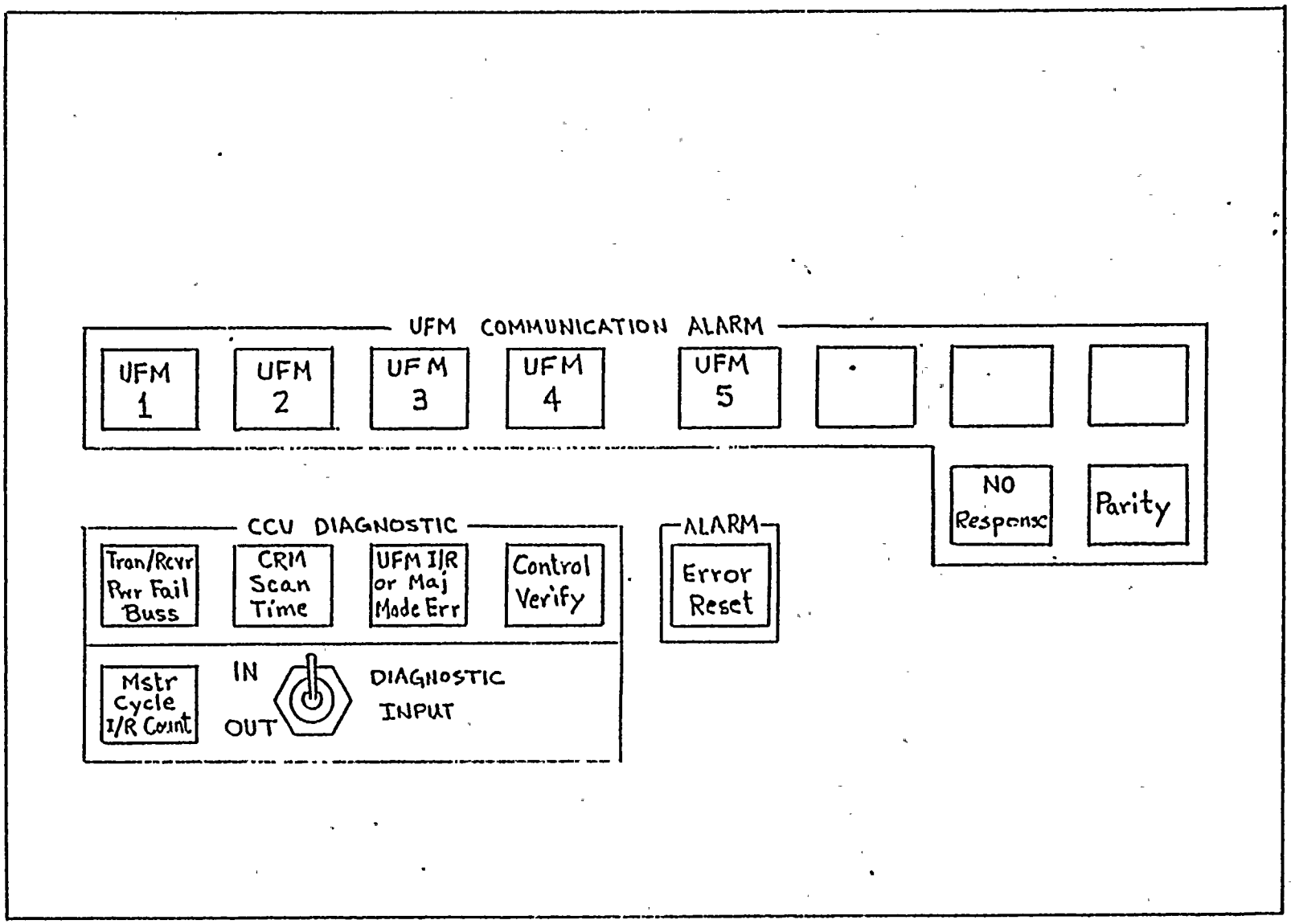
STANDBY SERVICE WATER SYSTEM



CCU FRONT PANEL



CCU FRONT PANEL CONTROLLERS AND INDICATORS

Indicator	Function	Action
UFM COMMUNICATION ALARM		
• UFM 1 - UFM n indicators	Communication-type failure detected by the UFM Diagnostic Card (600-3140) in the CCU. Illuminated LED indicates specific UFM.	Check UFM Power Supply. Check card 1143. Check coder/decoder. Finally, check communication cable.
• NO RESPONSE/PARITY indicator	LED indicates specific type of communication failure as "Parity" or "No Response."	
CCU DIAGNOSTIC		
• T/R PWR FAIL BUS indicator	Transmitter/Receiver failure of CCU Power Failure or stuck bit on CCU Data Bus indicated illuminated LED.	Check CCU power. Check T/R. Lastly, check each card in CCU.
• CRM SCAN TIME indicator	CRM/DMI Scan Time Error - continuous scan for more than 10 msec. - indicated by illuminated LED.	First check for malfunction alarms on CRMs; try to reset card 2105 in J1. Then check cards 3112, 3113, 3119 (in that order). Finally, check the communication cable.
• UFM I/R MAJ MODE ERROR indicator	I/R counter major mode error. LED illuminated when error detected in the I/R count, 3 major modes, or INDT Timer (Interrogate Delay Timer).	First check UFM communications. If ok, check cards 3135, 3115, 3116, 3137 (in that order).
• CONTROL VERIFY indicator	Failure to confirm a CCO message if CCU is programmed to verify and transmit Execute message. (N/A when verify is done by CRM's.)	

CCU FRONT PANEL CONTROLLERS AND INDICATORS (Continued)

Indicator	Function	Action
• MSTR CYCLE I/R CONT indicator	Master Cycle or Interrogate Counter Error. Checks system scan time for all points and counts the number of Interrogate messages.	Check for CRM malufunction alarms. If none, check cards,3112, 3113, 3119.
• DIAGNOSTIC INPUT switch	Arms Master Cycle Alarm Indicator. Toggle switch normally in "out" position during system start up.	
• ERROR RESET button	This pushbutton resets any of the alarms displayed on the panel.	
POWER ON indicator	When illuminated, this LED indicates that power is supplied to the CCU.	