NORTHEAST UTILITIES

THE CONNECTICUT LIGHT AND POWER COMPANY
WESTERN MASSACHUSETTS ELECTRIC COMPANY
HOLYOKE WATER POWER COMPANY
NORTHEAST UTILITIES SERVICE COMPANY
NORTHEAST NUCLEAR ENERGY COMPANY

General Offices • Selden Street, Berlin, Connecticut

P.O. BOX 270
HARTFORD, CONNECTICUT 06141-0270
(203) 665-5000

June 27, 1988

Docket No. 50-336
A07296
Re: 10CFR50.62

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D.C. 20555

Gentlemen:

Millstone Nuclear Power Station, Unit No. 2
ATWS Modifications (TAC #59114)

In a June 8, 1988 letter,(1) the Staff requested that Northeast Nuclear Energy Company (NNECO) provide responses to a number of questions regarding proposed ATWS modifications at Millstone Unit No. 2. These responses were to be submitted to the Staff within 15 days from receipt of the June 8, 1988 letter. However, discussions with the Project Manager for Millstone Unit No. 2, on June 10, 1988, resulted in a mutually agreeable due date of 15 days after the June 10 telephone discussion for approximately one-half of the required responses, with the remainder being due by July 12, 1988. Since the agreed upon due date fell on a week-end, the requested material is being submitted on the first business day following.

Accordingly, enclosed are responses to questions 1.a; 1.b; 1.d; 1.e; 1.f; 2.a; 2.b; 3.a; and 3.b of the Staff request for additional information on ATWS modifications at Millstone Unit No. 2. These responses constitute approximately half of the total amount of information requested by the NRC Staff. NNECO plans to submit the remaining responses by July 12, 1988, and trusts this information will be adequate to support Staff review.

Very truly yours,

NORTHEAST NUCLEAR ENERGY COMPANY

E. J. Mroczka
Senior Vice President

A046

cc: W. T. Russell, Region I Administrator
D. H. Jaffe, NRC Project Manager, Millstone Unit No. 2
W. J. Raymond, Senior Resident Inspector, Millstone Unit Nos. 1, 2 and 3

(1) D. H. Jaffe letter to E. J. Mroczka, "Millstone Nuclear Power Station, Unit No. 2, Request for Additional Information," dated June 8, 1988.

Docket No. 50-336
A07296

Attachment 1

Millstone Nuclear Power Station
Unit No. 2

Responses to Questions on
ATWS Modifications

June 1988

The design scope for mitigating Anticipated Transients Without Scram (ATWS) events consist of a Diverse Scram System (DSS) and an ATWS Mitigating System Actuating Circuitry (AMSAC). The DSS provides a redundant path of reactor and turbine trip by a high pressurizer pressure setpoint. The AMSAC is modified from the existing Auxiliary Feedwater Actuating System (AFAS) to mitigate an ATWS event by redundant auxiliary feedwater initiation from DSS.

It should be noted that the existing turbine trip is actuated by the undervoltage relays on the CEDM power cables from the Motor Generator (MG) output. The DSS relays interrupt the MG output thus providing a diverse turbine trip (DTT). Therefore, NNECO's design in DSS/AMSAC meets the ATWS Rule requirements on DSS, DTT, and diverse auxiliary feedwater system (AFWS). The following paragraphs address the detailed response to the NRC's questions on our design (Docket No. 50-336).

Question 1:

NNECO proposes to install a DSS at Millstone, Unit 2, that receives inputs from the existing reactor protection system (RPS) pressurizer pressure sensors. The pressurizer pressure signals are processed by newly installed instrumentation consisting of bistables and logic circuitry arranged in a two-out-of-four energize-to-actuate logic to trip the RPS Motor Generator (MG) set output contractors upon detection of conditions indicative of an ATWS event. Provisions will be included to allow the bypass of any one sensor input thus converting the logic to two-out-of-three to allow for maintenance of the sensors.

a. It is the staff's understanding that the DSS and DTT will be designed and installed as non-safety-related (non-Class IE equipment). Is this understanding correct? If not, please explain.

b. Please provide electrical schematic/elementary diagrams for the DSS and DTT designs that clearly show all instrument channels (including bistables), logic, actuation circuits, test circuits, interlocks, bypass, alarms and indications. Also, provide electrical one-line diagrams showing the CEDM MG sets, DSS actuated output contactors, and power distribution to the RPS, AFWS, DSS and DTT circuits, including vital buses, inverters, batteries and chargers, etc.

c. For all DSS and DTT instrument channel components (excluding sensors and signal conditioning equipment upstream of the bistables) and logic channel components, and DSS actuation devices, provide information sufficient to demonstrate compliance with the ATWS rule diversity requirements. The information should include a diversity comparison of the DSS and DTT components with the components used in the existing RPS, e.g., manufacturer, model number, design principle (electromechanical, solid state, etc.) mode of operation (energize/deenergize to actuate), power source (AC/DC), etc. The similarities and differences in the physical and operational characteristics of these components must be analyzed to determine the potential for common mode failure (CMF) mechanisms that could disable both the RPS and ATWS prevention/mitigation functions. The evaluation of the adequacy of the diversity provided must be performed at a detailed level to include hardware design considerations and diversity aspects that might not be apparent from a cursory/

audit review. For example, two electromechanical relays from the same manufacturer and having the same voltage/current ratings and energize-to-actuate/deenergize-to-actuate trip status, and therefore, which appear to be unacceptable for satisfying the diversity requirements of the ATWS rule, may actually be acceptable if different materials and different manufacturing processes are used. Conversely, two printed circuit cards from different manufacturers, and therefore, which appear to be acceptable for satisfying diversity requirements of the rule, may not be acceptable if they both use identical components.

d. Please provide information necessary to explain how the DSS and DTT will remain operable to perform their intended functions given a loss of offsite power.

e. Please describe in detail the indications and alarms used to alert the control room operators to DSS and DTT inoperable conditions (e.g., when a channel/system or equipment is placed in a bypass or test status). Include a discussion of all operating and/or maintenance bypasses that will be used in conjunction with the DSS or DTT.

f. Explain the specific operator actions required to manually initiate a DSS and/or DTT protective action. Also, following manual or automatic initiation, is the protective action sealed in at the system level to ensure completion of the ATWS prevention/mitigation function?

Response:

a. Although the ATWS mitigation is not required to be safety-related per 10CFR50.62, the DSS/AMSAC is designed to Category 1E in accordance with the NU Quality Assurance (QA) Program. All basic components for this design were procured to QA requirements for Cat. 1E equipment. The Cat. 1E components include the pressurizer pressure signal processing instruments (Foxboro SPEC 200 bistables and relay cards) and the time delay relays (Amerace Agastat E7012PD) in AMSAC.

b. The following attached figures provide the highlight of system/elementary diagrams, electrical circuitry and schematics for the DSS/AMSAC design.

Figure 1: DSS/AMSAC System Block Diagram
Figure 2: Schematic Diagram for the DSS Trip and Bypass Matrix.
Figure 3: Elementary Connection Diagram of MG Sets With the DSS Trip Connectors.
Figure 4: Diverse AFWS (AMSAC) Modified From the Existing AFWS.
Figure 5: DTT Through the Under-Voltage (UV) Relay.
Figure 6: Power Supply (P.S.) of 125 VDC to DSS/AMSAC.
Figure 7: P.S. of 120 VAC to RPS.
Figure 8: Vital Buses of 120 VAC and 125 VDC.

c. Will be answered with Questions 4 and 6 in the second response.

d. As shows in Figures 2 & 6, the DSS/AMSAC is powered by 125 VDC from redundant vital 120 VAC buses, VA10 and VA20. The vital AC system is an uninterrupted power supply (UPS) from facilities battery through inverters and static switches as shown in Figure 8. Therefore, the DSS/AMSAC will remain fully operable to perform designed functions following loss of offsite power.

e. The DSS trip and bypass matrix in Figure 2 shows that the trip signal channel will be prevented from actuating the DSS relays with the hand switch (HS) contact "open" indicated by the HS position at "bypass" rather than "normal" (Figure 9). The HS mounted on the same enclosure panel (C100) as those for the AFWS bypass switches is locked by a key controlled by administrative procedures. Furthermore, the DSS or AFWS bypass condition will be indicated by the annunciator windows on the main control board.

f. No manual trip action is designed for the DSS actuation because there are four manual trip buttons for the RPS trip. Since the DSS actuation is automatic instantaneous response to input signals, the sealed action is not necessary to ensure completion of mitigation function.

Question 2:

The ATWS rule requires that the equipment/systems installed to prevent and/or mitigate the consequences of ATWS events be electrically independent of the existing RPS to minimize the potential for CMFs that could affect both RPS and ATWS circuits. Electrical independence of the DSS from the existing RPS should be provided from the sensor output up to and including the final actuation device. Electrical independence of the diverse AFWS and DTT system from the existing RPS should be provided from the sensor output up to the final actuation device.

The staff has allowed exceptions to the electrical independence requirements for DSS, diverse AFW actuation and DTT circuits where these circuits are designed, procured, installed and maintained as fully redundant safety related (Class 1E) circuits, and it has been demonstrated that CMF of the shared power sources will not result in loss of both RPS and ATWS prevention/mitigation functions as discussed in item (a) below.

a. Identify all DSS, AFWS and DTT system components that receive power from sources that are also used to provide power to the existing RPS. If RPS power supplies are used, information must be provided to demonstrate that: 1) faults within the DSS or DTT circuits cannot degrade the reliability/integrity of the existing RPS below an acceptable level, and 2) that a common mode failure affecting the RPS power distribution system (including degraded voltage and/or frequency conditions e.g., overvoltage and undervoltage; the effects of degraded voltage/frequency conditions over time must be considered if such conditions can go undetected) cannot compromise both the RPS and ATWS prevention/mitigation functions. If alarms are relied on to provide early detection of degraded voltage/frequency conditions, the information should include the specific alarm(s) and their setpoint value(s), and the limiting voltage/frequency values for which the affected circuits/components have been analyzed/demonstrated to still be capable of performing their intended functions. A discussion of the periodic surveillance/testing performed to verify operability of the alarm circuits should also be provided.

b. Electrical independence of nonsafety-related ATWS circuits from safety related circuits is required in accordance with the guidance provided in IEEE Standard 384, "IEEE Standard Criteria for Independence of Class 1E Equipment and Circuits," as supplemented by Regulatory Guide 1.75, Revision 2, "Physical Independence of Electrical Systems."

Information must be provided to demonstrate the adequacy of all isolation devices used to protect the integrity of safety related circuits form nonsafety-related ATWS DSS and DTT circuits. The required information is identified in Attachment 1. [This attachment refers to Attachment 1 in the NRC Staff's June 8, 1988 letter and is not included in this submittal.] If the isolation devices are identical to isolation devices used in other applications (e.g., to isolate the safety parameter display system from safety related circuits), and the requested information has been previously submitted for staff review, and the isolation devices have approved for their applications, the related correspondence should be referenced, and no additional information need be provided.

Response:

a. The DSS electronics which share the same instrument rack and same power supply as isolation electronics for RPS are qualified to IEEE-323 (1983) and IEEE-344 (1975). They will be classified as Cat 1E devices and subject to installation, surveillance and maintenance controls in accordance with that classification. This portion of the DSS electronics will not degrade the qualification of the existing RPS channel electronics.

   Both RPS and DSS/AMSAC are powered from the same vital AC buses. The common mode failures affecting the power distribution system can not compromise both the RPS and ATWS mitigation functions because the RPS is deenergized to trip while the DSS is energized to trip.

b. The DSS/AMSAC is isolated from the RPS and the nuclear instrumentation (NI) system so that the maximum credible fault voltage and fault current will not unacceptably degrade the operation of the RPS or the AFAS to meet the Millstone Unit No. 2 design basis for isolation and separation of circuits and components (Ref. 1). The design basis criteria are met by the use of Foxboro's SPEC 200 alarm and relay cards.

   In the DSS design, the isolated voltage signal for pressurizer pressure in the SPEC 200 cabinets RC30A, B, C and D is input to an Alarm Card for limit checking. The alarm contact output drives four relays. The relay contacts are routed to a separate panel (C100) and combined with other channel contact wiring to perform as a two-out-of-four voting matrix. If two contacts from two separate channels close, the matrix will supply current to two Diverse Scram (DS) relays which in turn will actuate a reactor/turbine trip and an auxiliary feed initiation.

   Isolation for this system occurs at each channel's relay contact input to the two-out-of-four voting matrix. Each contact output is pre-wired through dedicated conduits to the C100 enclosure; therefore, the maximum credible voltage transient and maximum credible current transient that could occur would be caused by a malfunction in the C100 power supply or associated circuitry. If a short occurs from the negative power feed to a closed contact, the maximum credible current would be .4 amps which is the current limitation on the C100 power supply. The maximum credible voltage of 125 VDC would occur across an open contact with the low side shorted to the negative power feed. Because the SPEC 200 L2C relay card is rated at 125 VDC at .5 amps, with a margin of 230 VAC and 5 amps, the isolation criteria of the maximum credible voltage and maximum credible current are met.

In the AMSAC design, the NI signals are also isolated by use of the SPEC 200 alarm and relay cards between the present output to power range indicators and the added output to AFAS facilities Z1 and Z2. Such isolation will protect the AFAS from the indicators' degradation.

The ATWS input to the annunciator system is a 1E/non 1E interface but is bound by the following discussion:

The preceding paragraphs demonstrate the isolation between the C100 circuits and the safety related circuits (RPS) by use of the SPEC 200 cards. Further protection from field faults is also provided by the DS relays as isolation devices. The DS relay contacts are in series with the control circuit which limits the credible fault current, thus the DS relays prevent damage from credible faults in the power circuitry.

All cabling to and from the final actuation devices are segregated in instrumentation and control cable trays and conduit to meet Millstone Unit No. 2 separation criteria. Cables are procured to the Class 1E requirements of IEEE-383-1974.

Based on the fact that the C100 Cabinet is isolated from the RPS signal processing cabinets by SPEC 200 relay cards to meet the isolation criteria and the fact that the DS relays provide isolation for any field cabling induced faults, the DSS is effectively isolated from the RPS.

Several parts of this question, included in the Staff RAI, do not apply to the design basis for Millstone Unit No. 2 and therefore are not addressed in this response.

Question 3:

The equipment required by 10 CFR 50.62 to reduce the risk associated with an ATWS event must be designed to perform its function in a reliable manner. The DSS and DTT circuits must be designed to allow periodic testing to verify operability while at power. All bypass conditions should be automatically and continuously indicated in the main control room.

a. Describe the scope and intent of the various surveillance tests (e.g., sensor/channel checks, instrument channel functional tests, logic channel and actuation device tests, channel/system calibrations, overall system functional tests, etc.) that NNECO intends to use to periodically verify operability of the DSS and DTT equipment/circuitry installed at Millstone Unit 2. Indicate the frequency for which each surveillance test is conducted. Also, discuss the controls/programs (e.g., technical specifications) to be used to ensure that the equipment/circuitry installed in accordance with the ATWS rule will be properly tested and maintained in an operable condition. The controls/programs should provide positive assurance that the ATWS equipment/circuitry will perform its design functions when required, and therefore, satisfy the reliability requirements of the ATWS rule.

b. Please indicate whether the test procedures involve undesirable practices such as installing jumpers, lifting leads, pulling leads, pulling fuses, tripping breakers, blocking relays, or other circuit alternations.

Response:

a. From Reference 2:

> "Provisions are to be made to permit periodic testing of process equipment, bistable and logic of the DSS when the reactor is operating at power."

The DSS is designed as a four channel system with individual bypass switch for each channel. The bypass switch will permit individual channel testing while the reactor is operating at power.

NNECO intends to perform the fully functional test to verify the DSS/AMSAC operability at each refueling outage. The controls/programs to assure that DSS/AMSAC performs its design function will be detailed by the test procedure.

The above surveillance frequency has been established based on the failure history of the utilized components, system performance of like systems, and balancing the importance of functionality versus the jeopardy of spurious operation.

b. No undesirable practices will be involved in the test procedure. Testability is one of the important inputs to the DSS/AMSAC design basis.

REFERENCES:

1. Final Safety Analysis Report for Millstone Unit No. 2 Section 7 and 14.1.

2. Functional Design Specification for the diverse Scram System for Compliance with the ATWS Rule 10CFR50.62, CEOG Task 494, May 1986, CE-NPSD-354.

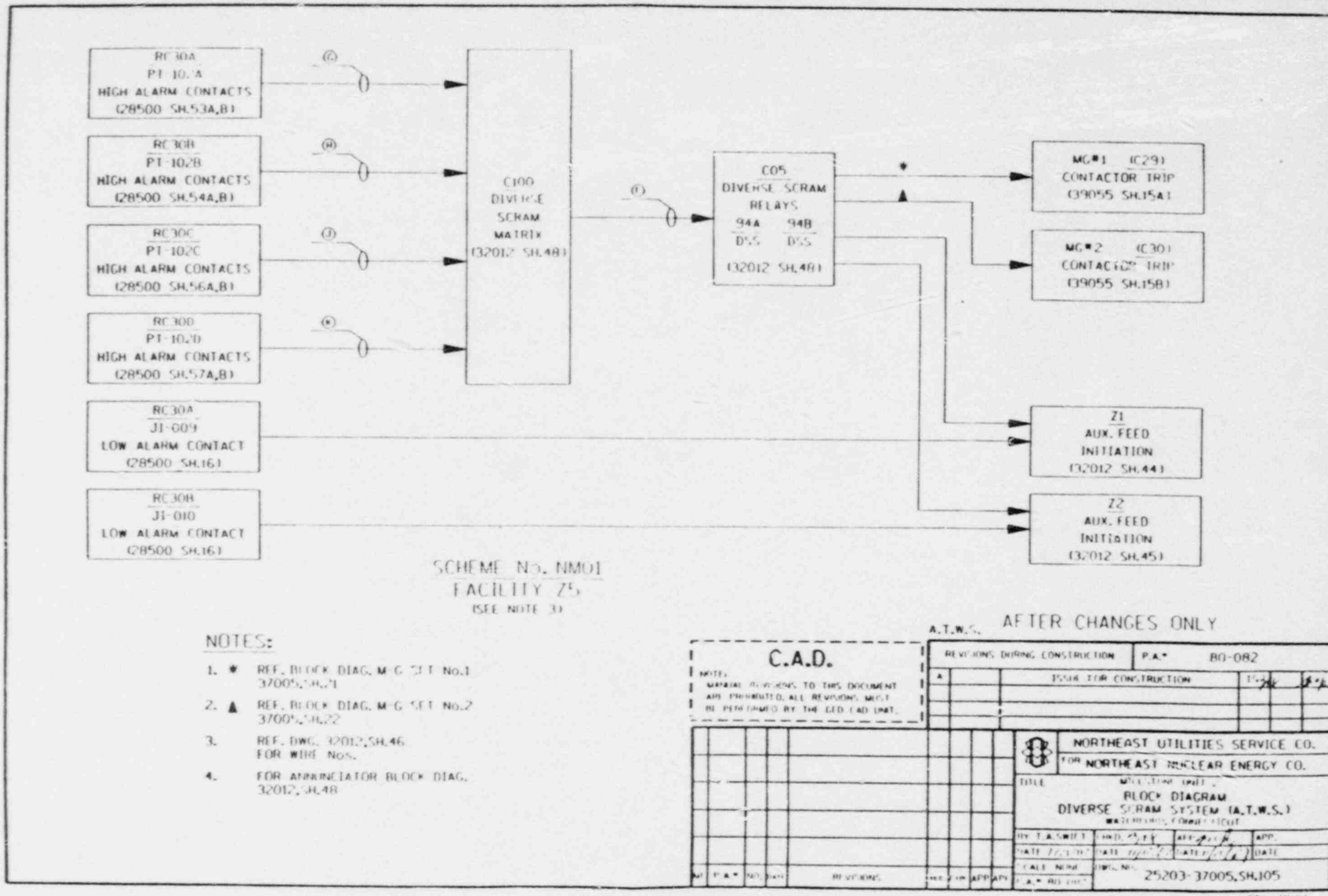
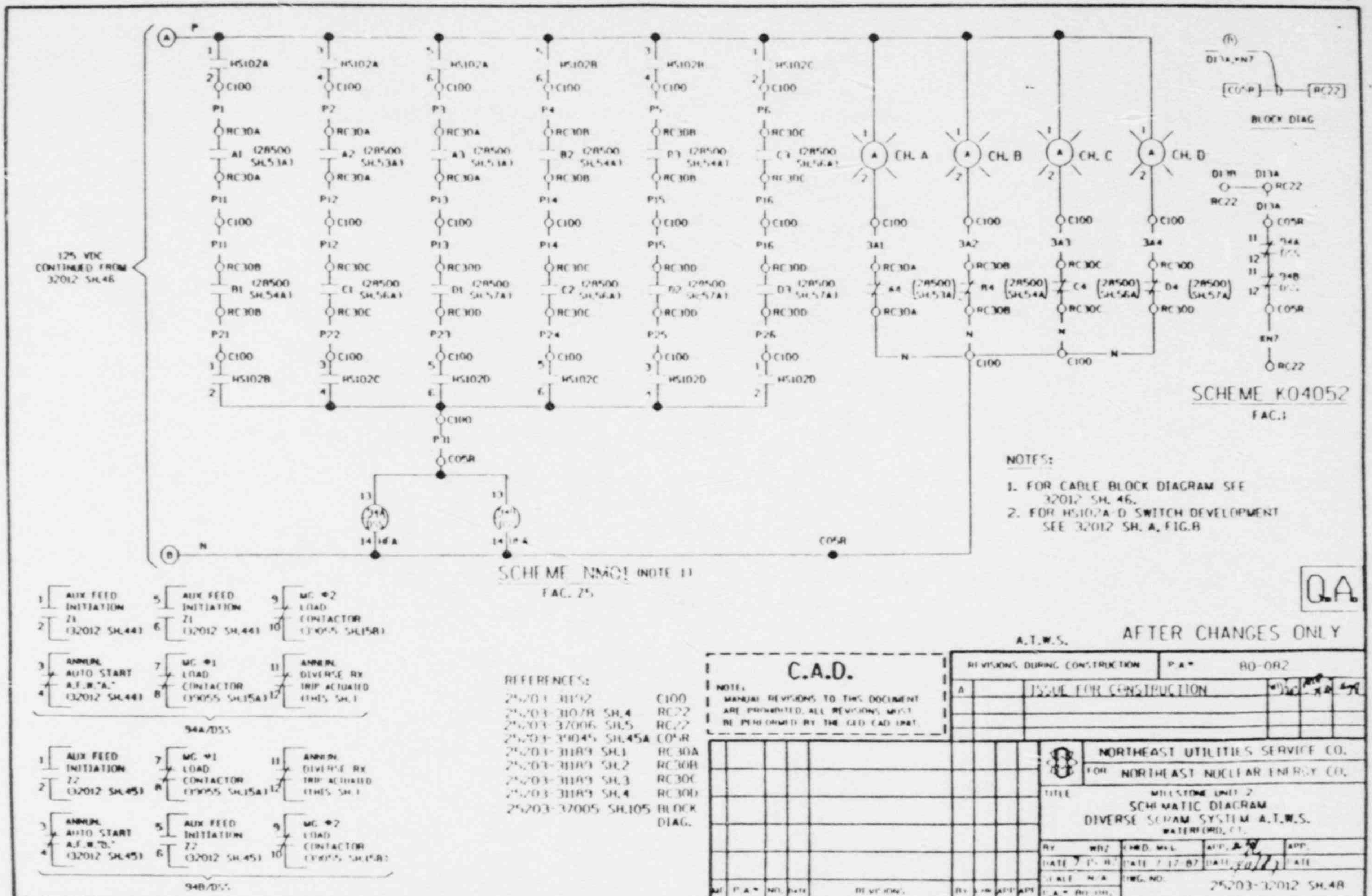

RC30A
PT-102A
HIGH ALARM CONTACTS
(28500 SH.53A,B)
RC30B
PT-102B
HIGH ALARM CONTACTS
(28500 SH.54A,B)
RC30C
PT-102C
HIGH ALARM CONTACTS
(28500 SH.56A,B)
RC30D
PT-102D
HIGH ALARM CONTACTS
(28500 SH.57A,B)
RC30A
JI-009
LOW ALARM CONTACT
(28500 SH.16)
RC30B
JI-010
LOW ALARM CONTACT
(28500 SH.16)
C100
DIVERSE
SCRAM
MATRIX
(32012 SH.48)
C05
DIVERSE SCRAM
RELAYS
94A DSS
94B DSS
(32012 SH.48)
MG#1 (C29)
CONTACTOR TRIP
(39055 SH.15A)
MG#2 (C30)
CONTACTOR TRIP
(39055 SH.15B)
Z1
AUX. FEED
INITIATION
(32012 SH.44)
Z2
AUX. FEED
INITIATION
(32012 SH.45)
SCHEME No. NM01
FACILITY Z5
(SEE NOTE 3)
NOTES:
1. * REF. BLOCK DIAG. M-G SET No.1 37005,SH.21
2. ▲ REF. BLOCK DIAG. M-G SET No.2 37005,SH.22
3. REF. DWG. 32012,SH.46 FOR WIRE Nos.
4. FOR ANNUNCIATOR BLOCK DIAG. 32012,SH.48
A.T.W.S.
AFTER CHANGES ONLY
C.A.D.
REVISIONS DURING CONSTRUCTION
P.A.# 80-082
ISSUE FOR CONSTRUCTION
NORTHEAST UTILITIES SERVICE CO.
FOR NORTHEAST NUCLEAR ENERGY CO.
BLOCK DIAGRAM
DIVERSE SCRAM SYSTEM (A.T.W.S.)
REVISIONS
25203-37005,SH.105

FIGURE 1



125 VDC CONTINUED FROM 32012 SH.46
SCHEME K04052
FAC.1
SCHEME NM01 (NOTE 1)
FAC. 25
BLOCK DIAG
CH. A
CH. B
CH. C
CH. D
NOTES:
1. FOR CABLE BLOCK DIAGRAM SEE 32012 SH. 46.
2. FOR HS102A-D SWITCH DEVELOPMENT SEE 32012 SH. A, FIG.B
AUX FEED INITIATION
ANNUN. AUTO START
MG #1 LOAD CONTACTOR
MG #2 LOAD CONTACTOR
ANNUN. DIVERSE RX TRIP ACTUATED (THIS SH.)
94A/DSS
94B/DSS
REFERENCES:
25203-31192 C100
25203-31078 SH.4 RC22
25203-37006 SH.5 RC22
25203-39045 SH.45A C05R
25203-31189 SH.1 RC30A
25203-31189 SH.2 RC30B
25203-31189 SH.3 RC30C
25203-31189 SH.4 RC30D
25203-37005 SH.105 BLOCK DIAG.
C.A.D.
NOTE: MANUAL REVISIONS TO THIS DOCUMENT ARE PROHIBITED. ALL REVISIONS MUST BE PERFORMED BY THE GED CAD UNIT.
QA
A.T.W.S.
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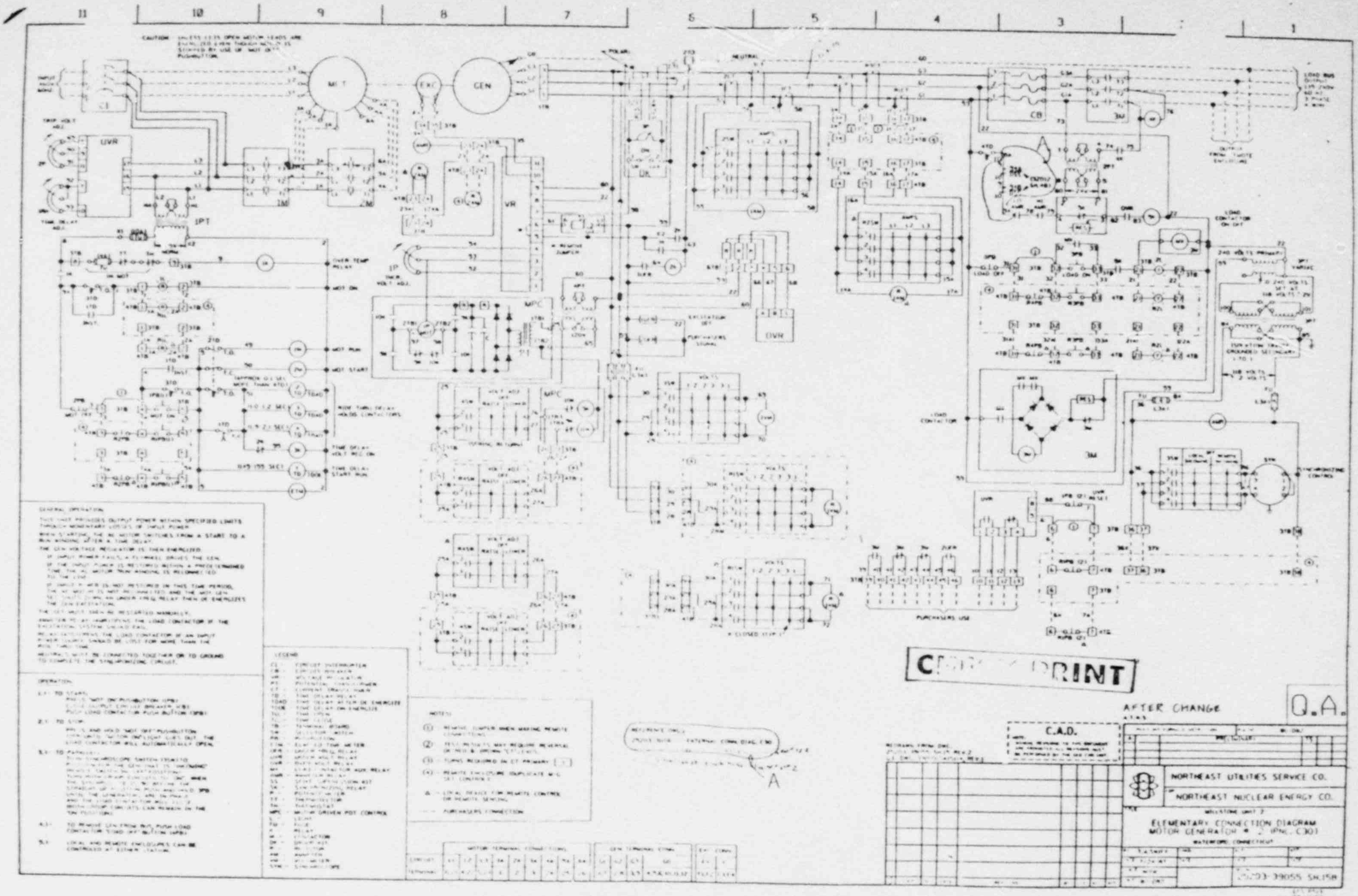
REVISIONS DURING CONSTRUCTION
80-082
ISSUE FOR CONSTRUCTION
NORTHEAST UTILITIES SERVICE CO.
FOR NORTHEAST NUCLEAR ENERGY CO.
MILLSTONE UNIT 2
SCHEMATIC DIAGRAM
DIVERSE SCRAM SYSTEM A.T.W.S.
WATERFORD, CT.
25203-32012 SH.48

FIGURE 2



GEN
UVR
IPT
MPC
VR
CB
OVR
C.A.D.
AFTER CHANGE
Q.A.
NORTHEAST UTILITIES SERVICE CO.
NORTHEAST NUCLEAR ENERGY CO.
ELEMENTARY CONNECTION DIAGRAM
A

FIGURE 3

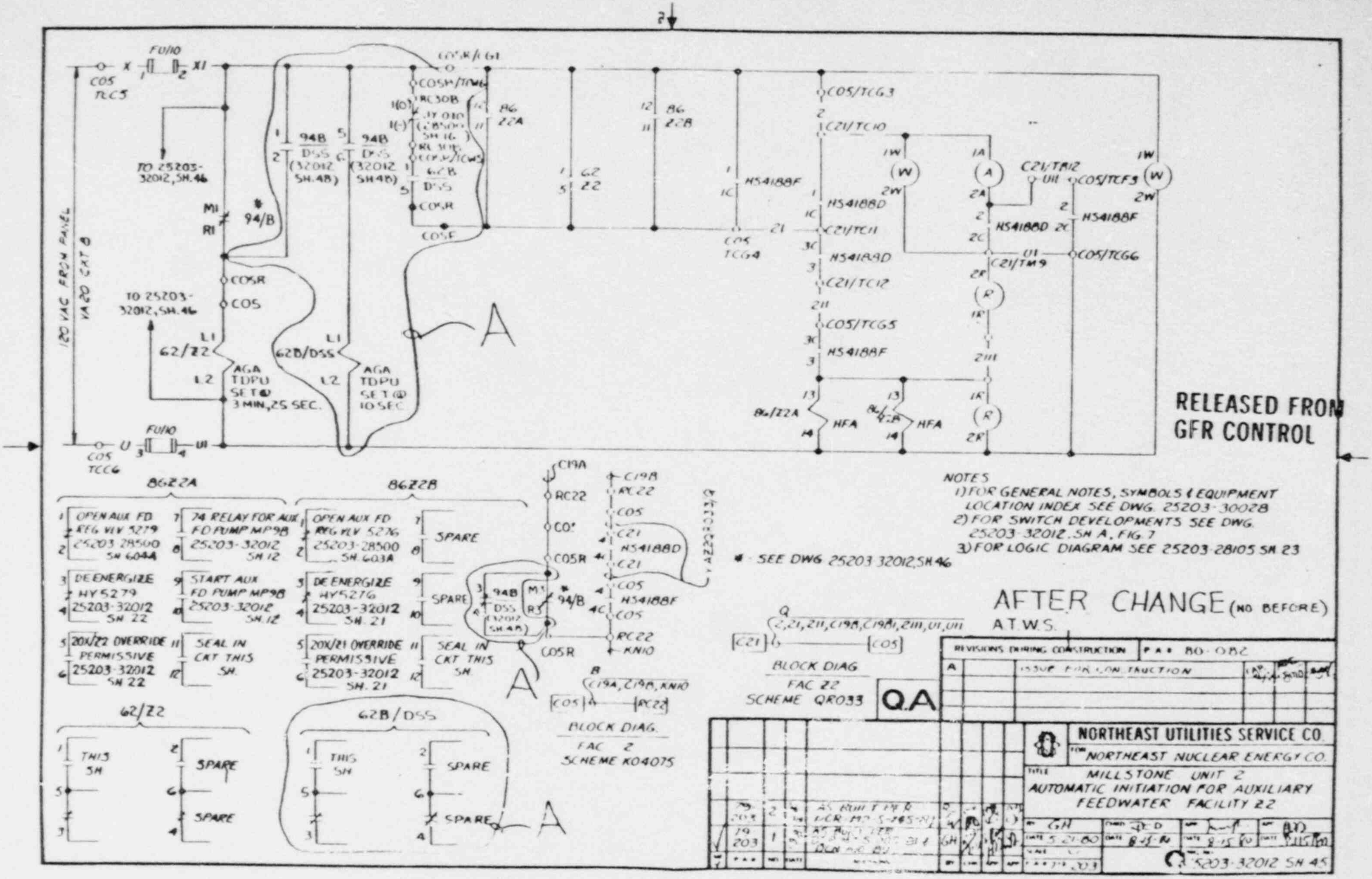

RELEASED FROM GFR CONTROL
120 VAC FROM PANEL VA20 CKT 8
FU110
TO 25203-32012, SH.46
62/Z2
AGA TDPU SET @ 3 MIN, 25 SEC.
62B/DSS
AGA TDPU SET @ 10 SEC.
94B DSS (32012 SH.4B)
86 22A
86 22B
HS4188F
HS4188D
HFA
NOTES
1) FOR GENERAL NOTES, SYMBOLS & EQUIPMENT LOCATION INDEX SEE DWG. 25203-30028
2) FOR SWITCH DEVELOPMENTS SEE DWG. 25203-32012, SH A, FIG. 7
3) FOR LOGIC DIAGRAM SEE 25203-28105 SH 23
* SEE DWG 25203-32012, SH.46
8622A
OPEN AUX FD REG VLV 5279 25203-28500 SH 604A
74 RELAY FOR AUX FD PUMP MP9B 25203-32012 SH 12
DEENERGIZE HY5279 25203-32012 SH. 22
START AUX FD PUMP MP9B 25203-32012 SH. 12
20X/Z2 OVERRIDE PERMISSIVE 25203-32012 SH 22
SEAL IN CKT THIS SH.
8622B
OPEN AUX FD REG VLV 5276 25203-28500 SH. 603A
SPARE
DE ENERGIZE HY5276 25203-32012 SH. 21
20X/21 OVERRIDE PERMISSIVE 25203-32012 SH. 21
SEAL IN CKT THIS SH.
62/Z2
THIS SH
SPARE
62B/DSS
A
AFTER CHANGE (NO BEFORE)
A.T.W.S.
BLOCK DIAG FAC 22 SCHEME QR033
BLOCK DIAG. FAC 2 SCHEME K04075
QA
REVISIONS DURING CONSTRUCTION
P.A.# 80-082
ISSUE FOR CONSTRUCTION
NORTHEAST UTILITIES SERVICE CO.
NORTHEAST NUCLEAR ENERGY CO.
MILLSTONE UNIT 2
AUTOMATIC INITIATION FOR AUXILIARY FEEDWATER FACILITY 22
25203-32012 SH 45

FIGURE 4

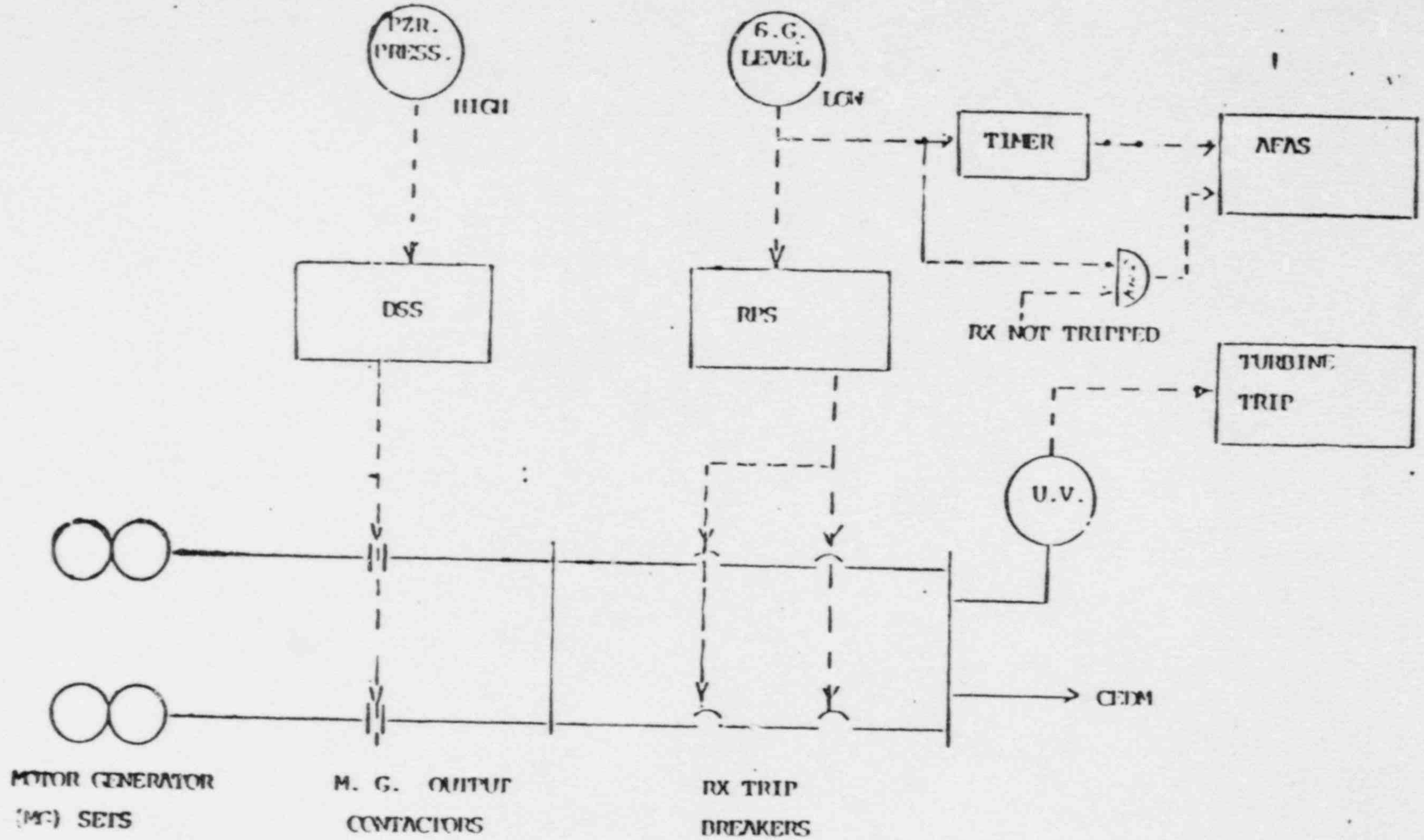


FIGURE 5

Simplified Representation of the Millstone Unit 2 Proposed ATWS System

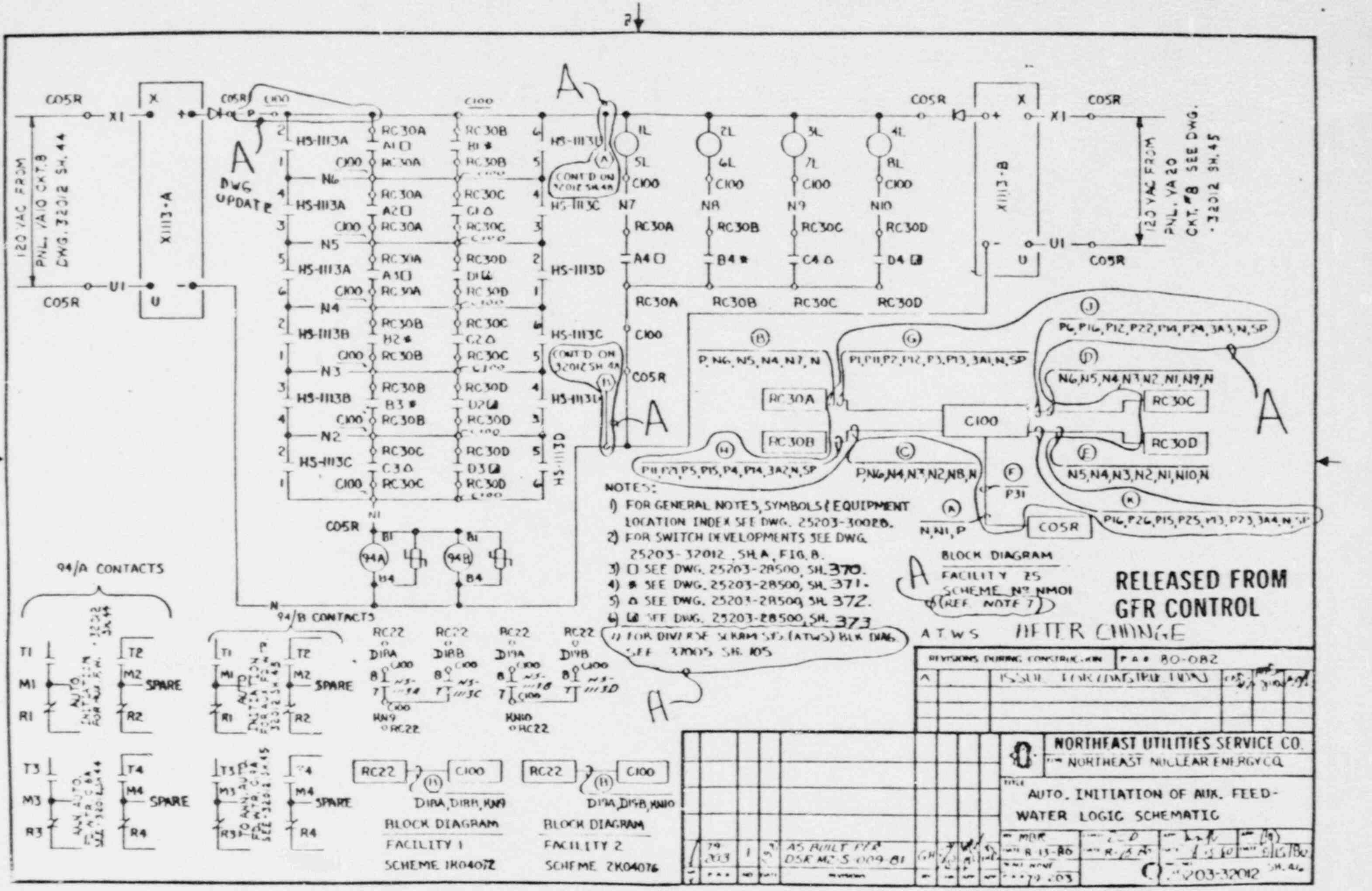

NOTES:
1) FOR GENERAL NOTES, SYMBOLS & EQUIPMENT LOCATION INDEX SEE DWG. 25203-30028.
2) FOR SWITCH DEVELOPMENTS SEE DWG. 25203-32012, SH.A, FIG.B.
3) □ SEE DWG. 25203-28500, SH. 370.
4) * SEE DWG. 25203-28500, SH. 371.
5) Δ SEE DWG. 25203-28500, SH. 372.
6) SEE DWG. 25203-28500, SH. 373
7) FOR DIVERSE SCRAM SYS (ATWS) BLK DIAG. SEE 37005 SH. 105
RELEASED FROM GFR CONTROL
AFTER CHANGE
NORTHEAST UTILITIES SERVICE CO.
NORTHEAST NUCLEAR ENERGY CO.
AUTO. INITIATION OF AUX. FEED-WATER LOGIC SCHEMATIC
BLOCK DIAGRAM
FACILITY 1
SCHEME 1K04072
BLOCK DIAGRAM
FACILITY 2
SCHEME 2K04076
94/A CONTACTS
94/B CONTACTS

FIGURE 6

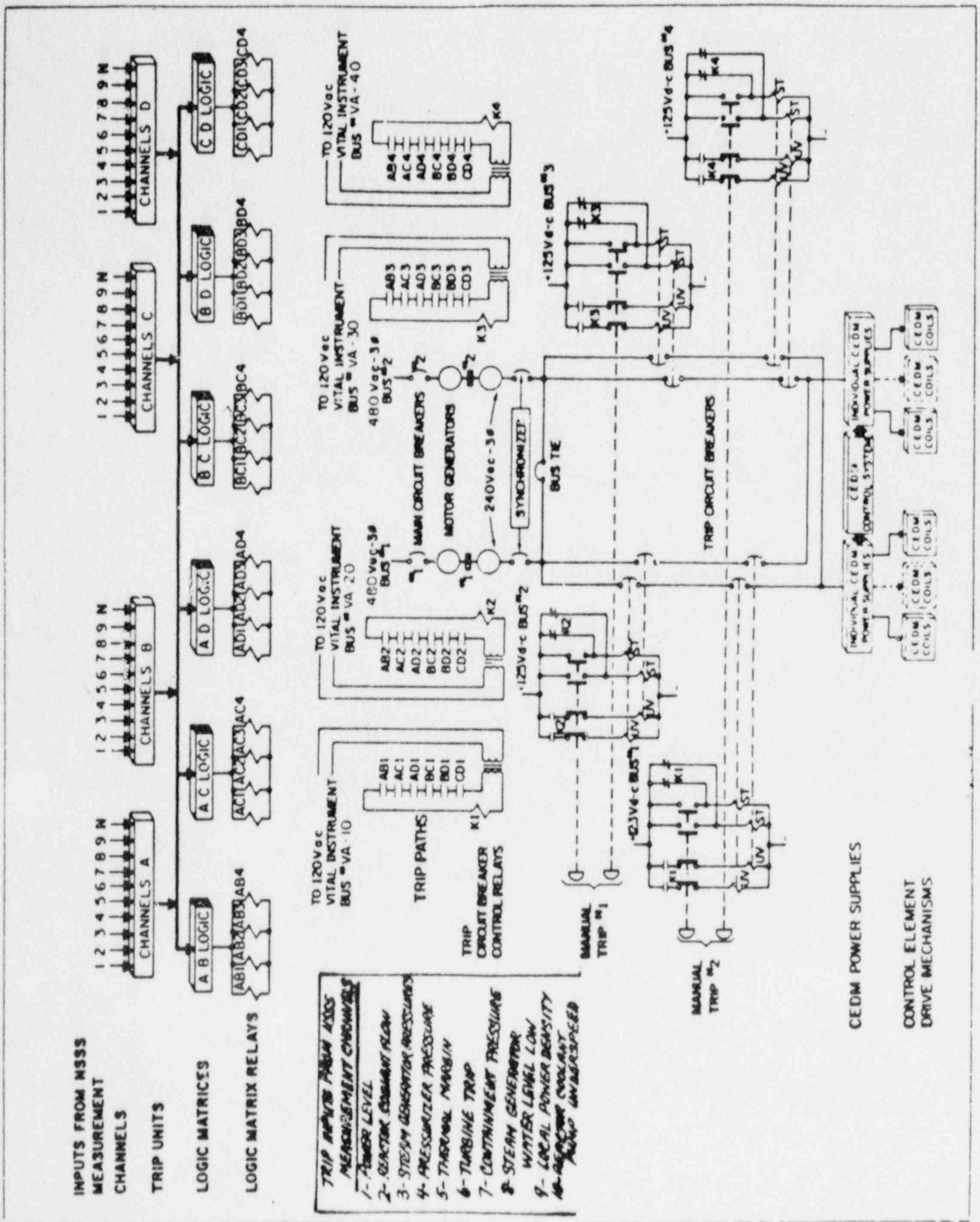


FIGURE 7

Millstone Nuclear Power Station Unit No. 2	Reactor Protective System - Block Diagram	Figure 7.2-1

JUN 1 0 1982

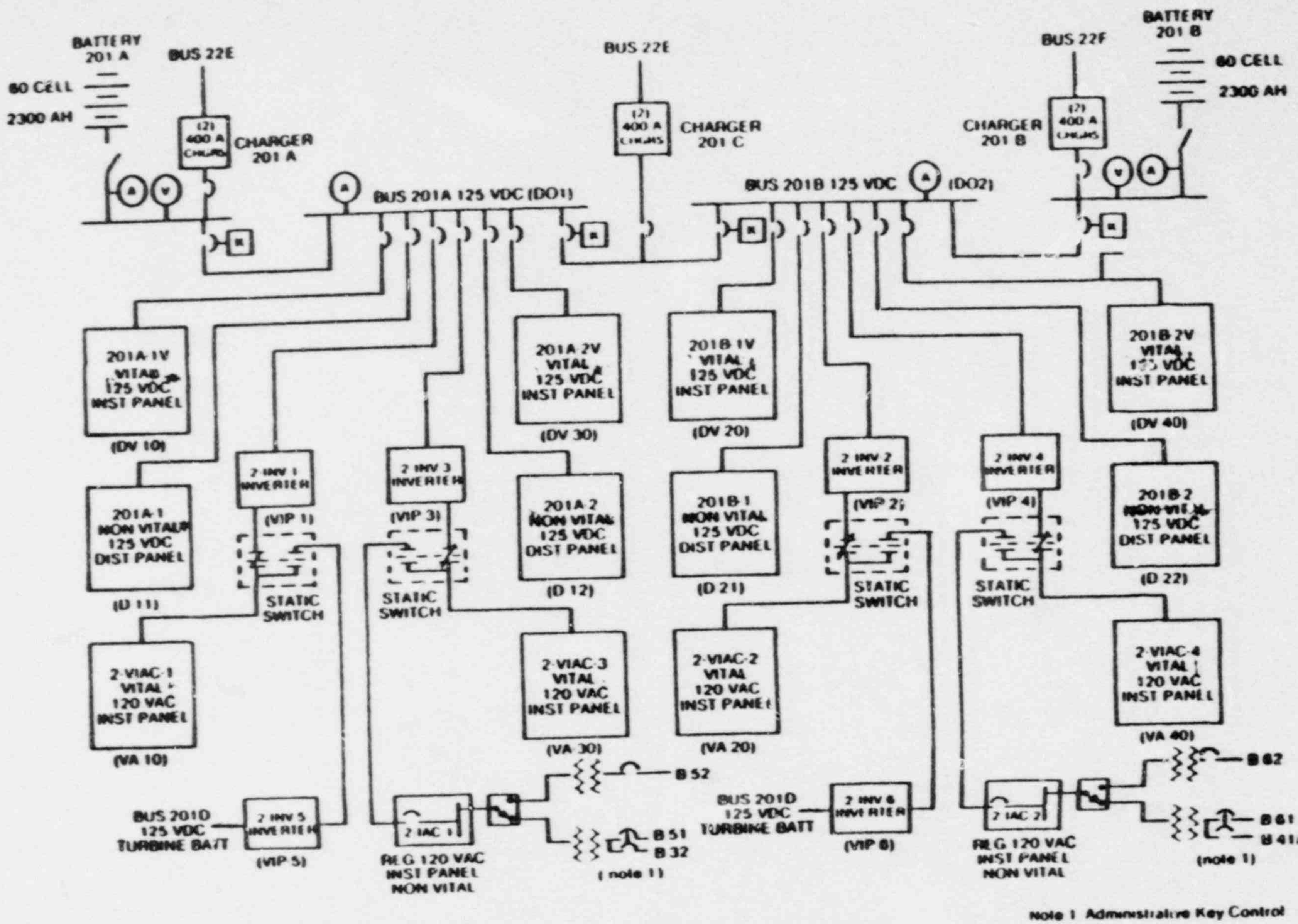
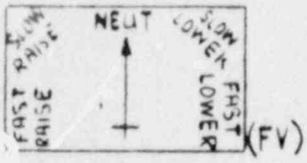


FIGURE 8 120 VAC 125 VDC

STOP

ULL



HANDLE END	CONTACTS	FAST LOWER	SLOW LOWER	NEUTRAL	SLOW RAISE	FAST RAISE
1 —||— 1C 2C —||— 2	1	X	X		X	X
	2	X	X		X	X
3 —||— 3C 4C —||— 4	3				X	X
	4	X	X			
5 —||— 5C 6C —||— 6	5				X	X
	6	X	X			
7 —||— 7C 8C —||— 8	7	X				X
	8	X				X

HS CONTACTS TO BREAK BEFORE MAKE SPRING RETURN TO NEUTRAL
TYPE GE SB-1

FIGURE 3

HANDLE END	CONTACTS	START	NORM AFT START	NORM AFT RESET	RESET	PULL TO LOCK
1 —||— 1C 2C —||— 2	1	X				
	2				X	X
3 —||— 3C 4C —||— 4	3	X	X	X		
	4	X	X	X	X	
5 —||— 5C 6C —||— 6	5	X	X			
	6	X	X			

SPRING RETURN
GE TYPE 16SB1B20

FIGURE 7

ELECTRO S.W.
SERIES 20K
FIG. 8

HANDLE END	NORMAL	BYPASS
1 —||— —||— 2		X
3 —||— —||— 4		X
5 —||— —||— 6		X
7 —||— —||— 8		X

CONTACTS HANDLE END		POSITION STOP	START
[illegible] 1C 2C 2	1		X
	2		X

MAINTAINED CONTACT
GE TYPE 16SB1AB205SVM2P

FIGURE 6

NOTES:

1. - FOR STANDARD NUTRE SYMBOLS AND EQUIP. LOCATION INDEX SEE DWG. 25203-30028
2. - X DENOTES CONTACT CLOSED
3. - SUPPLIED & WIRED BY GE SAME KEY OPERATES PB1, PB2 & PB3
4. - SUPPLIED & WIRED BY GE

FIGURE 9

NORTHEAST UTILITIES SERVICE COMPANY	title: CONTROL SWITCH DEVELOPMENT		
MILLSTONE NUCLEAR POWER STATION UNIT NO. 2	dwg. no. 25203-32012	sh A	rev 1