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
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(203) 665-5000

April 25, 1989

Docket No. 50-245
A07899
Re: 10CFR50.90

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555

Gentlemen:

Millstone Nuclear Power Station, Unit No. 1
Response to Request for Additional Information
Undervoltage and LNP Protection Modification

Pursuant to 10CFR50.90, Northeast Nuclear Energy Company (NNECO) requested an amendment to Millstone Unit No. 1's Operating License, via letter dated December 2, 1988.(1) The proposed changes will reflect the implementation of the modifications related to degraded grid protection for Class 1E power systems at Millstone Unit No. 1, which are scheduled to be completed during the 1989 refueling outage. A summary of the planned modifications was provided to the NRC Staff via letter dated August 15, 1988.(2)

An NRC letter dated March 20, 1989(3) requested additional information concerning the undervoltage detection modifications and related license amendment request. Provided herein are responses to the NRC Staff's requests. In addition to the specific responses, a discussion of the design philosophy is also provided. These responses may be used as a basis for a future meeting to discuss the design change and license amendment request in detail.

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(1) E. J. Mroczka letter to U.S. Nuclear Regulatory Commission, "Undervoltage and LNP Protection Modifications," dated December 2, 1988.

(2) E. J. Mroczka letter to U. S. Nuclear Regulatory Commission, "Degraded Grid Protection for Class 1E Power Systems," dated August 15, 1988.

(3) M. L. Boyle letter to E. J. Mroczka, dated March 20, 1989.

A001
1/1

Design Philosophy

The existing LNP design consists of two identical and redundant sets of relaying that sense an LNP condition and then load shed buses, start the diesel and gas turbine generators, and automatically align the generators to the buses. The circuits are not unique, i.e., the relay logic actuates all the same devices in parallel or series circuits such that a single failure of one circuit is compensated for by its redundant counterpart. The voltage sensing is presently taken on the high side of the RSST, not the 4160 volt buses. Also, an LNP condition is defined as a loss of normal (NSST) or reserve (RSST) offsite power to both trains of emergency equipment; not just one bus or the other.

The design that was proposed prior to May 1987 would have altered the existing design as follows:

- o relocate the undervoltage sensing to the Class 1E 4160 volt buses,

- o provide for the automatic reinstatement of the load shed feature, and

- o split the existing load shed and LNP logic into separate divisions.

However, the splitting of the load shed and LNP logic into separate divisions raised concerns with respect to the plant's response to partial LNPs due to the unit's asymmetrical bus arrangement (Refer to Reference 2 for details).

Subsequently, a new design was to be developed that could safely relocate the undervoltage sensing to the Class 1E 4160 volt buses without requiring the LNP logic to be split. The design transmitted by Reference 2 accomplishes this goal. The requirements used in developing the design are as follows:

- o relocate the sensing to the Class 1E 4160 volt buses,
- o do not split the load shed/LNP logic.
- o meet the single failure criterion,
- o use the existing definition that an LNP condition exists only if both safety buses lose off-site power, and
- o assume conditions that could cause a loss of voltage or degraded voltage on one bus and not the other would be caused by the single failure.

In light of the above, the following responses to the NRC questions are provided.

Request No. 1:

The load shed and LNP logic diagram provided in your August 15, 1988 letter shows multiple points where signals from redundant divisions are brought together into common logic gates. Identify the isolation and separation you have provided between redundant circuits. Provide the actual schematic diagram of the undervoltage detection logic.

Response:

Attachment 1 provides the actual schematic (wiring) drawings for your review. Refer to CWDs 279, 279A, 279B, 282, 282A, and 282B for the redundant undervoltage sensing on Class 1E buses 14E and 14F. The redundant S1 and S2 relays are located in the same enclosures, but are physically separated by a barrier. Electrically the relays are sensing off the same potential transformers but are separated by fuses. The DC power supplies are from separate supplies.

Request No. 2:

The load shed and LNP logic diagram shows multiple points where a single failure of a logic gate can cause load shedding of both redundant divisions and starting and loading of the emergency generators even though off-site power is still available. Please justify.

Response:

The diagram showing the AND and OR logic gates is only a diagram to describe the logic. The actual wiring drawings represent a true indication of separation and redundancy. The design is single failure proof.

Request No. 3:

There is no signal identified in the load shed and LNP logic that separates the onsite buses from the normal station service transformer and the reserve station service transformer (trips NSST and RSST breakers on buses 14A, 14B, 14C, and 14D) on a loss of voltage or degraded voltage signal. Please explain how this is accomplished.

Response:

To allow a fast transfer of the station buses after a generator lockout occurs, a .3 second time delay is used to allow for the momentary condition when both the NSST and RSST breakers are open. The fast transfer occurs within 6 cycles.

Request No. 4:

It appears from the load shed and LNP logic diagram that a loss of power (<70% voltage) can exist on a single division (14E or 14F) with no automatic action taken to correct it other than load shedding of the respective buses and a degraded voltage annunciation. Does the load shedding also start the automatic connection of the emergency power sources to the buses? If not, how does the plant respond to a LOCA with simultaneous loss of off-site power to one division and a single failure of the redundant division?

Request No. 5:

With respect to question 4 above, the same situation applies to a degraded voltage condition (<90% but >70% voltage) except the buses are not load shed. How then does the plant respond to a LOCA with simultaneous degraded voltage on one division and a single failure of the redundant division?

Request No. 6:

From the load shed and LNP logic diagram provided, it appears that a single failure in 14E or 14F switchgear such as a switchgear fire that disables the switchgear undervoltage relays will also disable the undervoltage detection logic for the redundant division. The remaining division will then not be able to respond to a loss of voltage condition. Please justify this violation of the single failure criteria.

Response to Questions 4, 5, & 6:

These three questions pertain to the fact that a loss-of-normal power condition is assumed to exist if less than 70% voltage or less than 90% voltage (with an accident signal generated) is present on both buses 14E and 14F. This is consistent with the existing plant design. The design is such that if one bus has a degraded voltage or loss-of-voltage condition, its cause would have to have been the single failure and thus the other bus would remain with adequate voltage.

Request No. 7:

Identify the source of power to the redundant S1 and S2 logic channels shown in the load shed and LNP logic diagram. If the source of power is from the Class 1E power system, justify the connection of the Class 1E power between redundant divisions. Describe the separation and isolation provided between redundant systems.

Response:

The source of power for the main load shed and LNP circuits (CWDs 288, 288A & 289) are as follow:

S1 Circuit (SH-288) - DC-11A-1
S2 Circuit (SH-289) - DC-11A-2

The circuits identified above are from redundant Class 1E DC sources. The existing method of isolation between trains at Millstone Unit No. 1 is to utilize coil-to-contact as well as contact-to-contact isolation. The new design utilizes the same methodology. Cable separation is accomplished by running S1 and S2 cables in separate trays and conduits.

The new voltage sensing relays and timers which provide sensing for 14E and 14F (CWD's 279A&B, 282A&B) provide a redundant method for sensing loss of voltage to buses 14E and 14F. The new relays and timers are also powered by separate Class 1E DC circuits. Both trains of voltage relays and timers for bus 14E are located within panel 2421B but in separate sections of the panel. Also, both trains of voltage relays and timers for bus 14F are located within panel 2422, where the divisions of equipment are located within separate sections of the panel. The voltage relays for both divisions sense off the same set of PTs.

Request No. 8:

It is not clear from the logic diagrams you provided in your August 15, 1988 letter how the load shedding of the emergency buses will be bypassed during load sequencing and subsequently reinstated following load sequencing. Please provide an explanation of how this is accomplished.

Response:

Once a load shed/LNP signal is received, the NSST and RSST breakers to buses 14C and 14D are tripped open on load shed.

When both NSST and RSST breakers to buses 14C and 14D have opened, a signal sensing breaker position will provide a seal-in for the LNP circuitry such that once on-site power is established on buses 14E and 14F, the LNP initiation signal will not clear thus blocking any further total bus load shed signals.

Reinstatement of the load shed feature following an LNP is accomplished in the new design by treating each bus as an island. If a bus loses power, its voltage sensing relays will sense the condition and initiate a load shed for only that bus. The buses which incorporate this design are as follows:

Bus	Voltage Setpoint	Logic
14A	40%	2 of 2
14B	40%	2 of 2
14C	40%	2 of 2
14D	40%	2 of 2
14E	70%	3 of 3
14F	70%	3 of 3
12C	40%	2 of 2
12D	40%	2 of 2
12E	40%	2 of 2
12F	40%	2 of 2

Request No. 9:

The load shed and LNP logic diagram indicates that a signal with no time delay will be sent to the load shed and LNP actuation circuits whenever the NSST and RSST breakers to buses 14C and 14D are all simultaneously open. One of the actions this accomplishes is blocking of the fast transfer circuits. Will the logic interfere with a legitimate fast transfer when all the breakers to buses 14C and 14D are simultaneously open as part of the fast transfer sequence?

Response:

When both the NSST and RSST breakers to buses 14C and 14D are simultaneously open, a signal will be sent directly to the load shed and LNP actuation circuits. Within the load shed and LNP actuation circuits, a 0.3 second timer delays the initiation of the load shed and LNP actuation.

On a successful fast transfer from the NSST to the RSST, the 0.3 second timer will prevent the load shed and LNP circuits from actuating. The new design is no different from the existing design with respect to this. The existing design looks at the breaker position as well and provides a 0.3 second time delay to allow fast transfer prior to declaring a load shed/LNP condition.

Request No. 10:

The load shed and LNP logic diagram shows 3-out-of-3 logic for the loss of voltage relaying and 2-out-of-3 logic for the degraded voltage relaying. Why isn't 2-out-of-3 logic used for both?

Response:

The loss-of-voltage logic requires a 3-out-of-3 condition so as to preclude a blown PT fuse causing a bus to be load shed inadvertently. Since the 2-out-of-3 degraded voltage logic is interlocked with the accident signal and the same condition on the other bus, a blown PT fuse does not negatively impact the 2-out-of-3 logic.

Request No. 11:

With regard to Table 3.9.1 in the revised Technical Specifications you submitted in your December 2, 1988 letter, the first part of that table identifies power available relaying on the emergency buses. This apparently replaces the power available relaying previously identified in Tables 3.2.2 and 4.2.1, however, the relays identified in Table 3.9.1 do not appear to be the same as those relays identified in Tables 3.2.2 and 4.2.1 since more buses and more relays are involved. No description however is provided for the new configuration. Please clarify whether this is a new configuration and, in either case, describe the actuation logic and function of these relays.

Response:

The power available relays for buses 14E and 14F that were previously specified on Table 3.2.2 are covered by Table 3.9.1. In addition to these relays, power available relays for buses 14G, 14A & 14C are also included since these relays provide permissive for the FWCI start circuits.

Request No. 12:

Identify the function of the Train A and Train B load shed and LNP circuit relays shown at the bottom of page 3/4 9-2a in Table 3.9.1 of the revised Technical Specification. Are these the relays that provide the functional logic shown in the load shed and LNP logic diagram?

Response:

The train A and B relays shown on the bottom of page 3/4 9-2a are the LNP actuation circuits that send signals to load shed the buses, disconnect the off-site supply and start the gas turbine and diesel generators.

Request No. 13:

Regarding the load shedding function identified on the logic diagrams provided in your August 15, 1988 letter, clarify whether the phrase "Load Shed Bus" and "Load Sheds Buses" means separation of the loads from the buses or separation of the buses from their power source. If it means separation of the loads from the buses, then why is load shedding provided for the loads of buses 14B and 14D if these buses are not loaded to the emergency diesel or gas turbine generators, and why aren't the bus 14B load shed relays identified in Technical Specification Table 3.9.1? If it means separation of the loads from the buses from their power sources then how is separation of the loads from the buses accomplished prior to load sequencing?

Response:

The difference between load sheds bus and load sheds buses is simply a load shed bus occurs if only one bus loses voltage. Load sheds buses implies a complete loss-of-voltage to the station and all buses are load shed simultaneously. It also means the off-site supply breakers are tripped. Bus 14B is not included in the technical specifications since it is not a safety bus and is in no way aligned to the gas turbine generator or diesel generator buses.

Request No. 14:

a. No instrument functional test, calibration, or instrument check frequencies are identified for the "Undervoltage/Time Relaying" in Table 3.9.1 of the revised Technical Specifications. The surveillance frequencies for these items should be once per shift, one per month, and once every refueling outage respectively. Please add these surveillance requirements to the revised technical specification.

b. Also, the trip setpoints with minimum and maximum limits for the "Undervoltage/Timer Relaying" are not specified in Table 3.9.1. This information should be provided in the revised Technical Specifications, and the basis for the setpoint values should be provided to us for our review.

c. In addition, there is no operability requirement identified for the "Undervoltage/Timer Relaying" in Table 3.9.1 when in the "Refuel/Shutdown" mode. This relaying should be operable in these modes whenever the safety-related equipment in the division it monitors is required to be operable. Please revise the technical specifications accordingly.

Response:

a. It was intended to functionally test and calibrate the undervoltage/timing relaying once per refueling outage. This is consistent with what is done with the power available relaying. Also, all the relaying is continuously monitored to annunciate any single relay that may fail with the plant on-line.

b. It is not intended to include relay tolerances within the technical specifications. Allowable setpoint ranges are covered by plant setpoint control procedures. The 90% and 70% voltage setpoint values correspond to 4160 volt bus voltages. The 8-second 90% time delay is long enough to allow motor starts but less than the 10 second DG FSAR start time. The 2-second 70% time delay is long enough to allow coordination with main bus overcurrent devices to allow for bus fault design by the individual circuit breaker.

c. With the plant in the Refuel/Shutdown mode, "automatic" emergency AC power is not required since plenty of time is available to align power to the emergency buses through manual actions. The ECCS motor breakers are racked out to prevent inadvertent operation. Also, voltage studies indicate that with the transformers lightly loaded an overvoltage condition is much more likely than an undervoltage condition.

Request No. 15:

The undervoltage relaying that initiates transfer of the safety buses to the gas turbine generator are all connected to bus 14E which is not connected to the same winding of the NSST that feeds bus 14A. How then can you assure that a degraded condition on bus 14A will be detected by the relaying on bus 14E in order to automatically transfer bus 14A to the gas turbine?

<u>Response</u>:

This failure mode has been addressed by the attached GE analysis (Attachment 2).

If you have any questions on the above information, please feel free to contact my staff.

Very truly yours,

NORTHEAST NUCLEAR ENERGY COMPANY

E. J. Mroczka
Senior Vice President

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

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Attachment 1

Millstone Unit No. 1

Undervoltage and LNP Protection Modification

April 1989

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A07899

Attachment 2

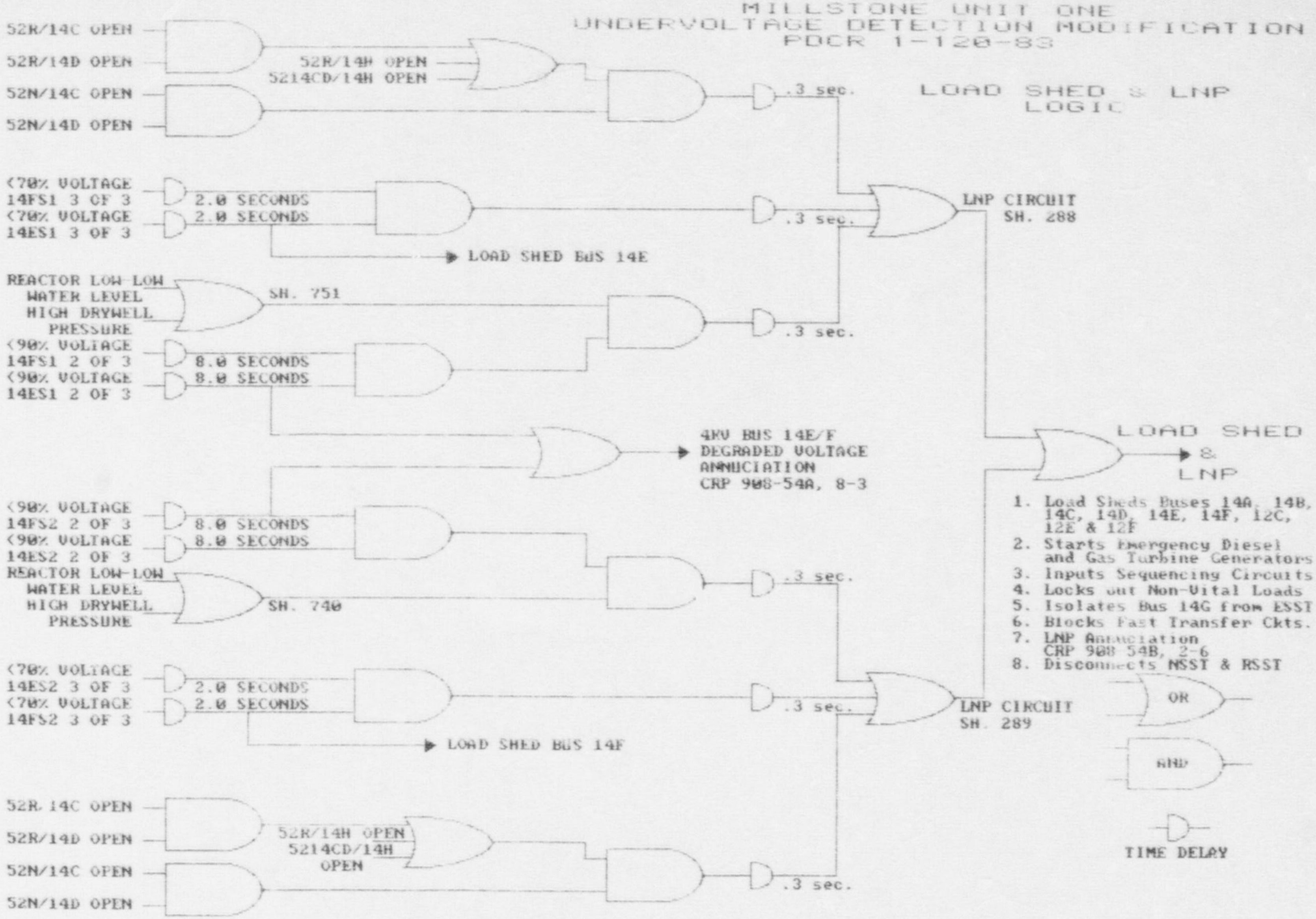
Millstone Unit No. 1

Undervoltage and LNP Protection Modification

April 1989

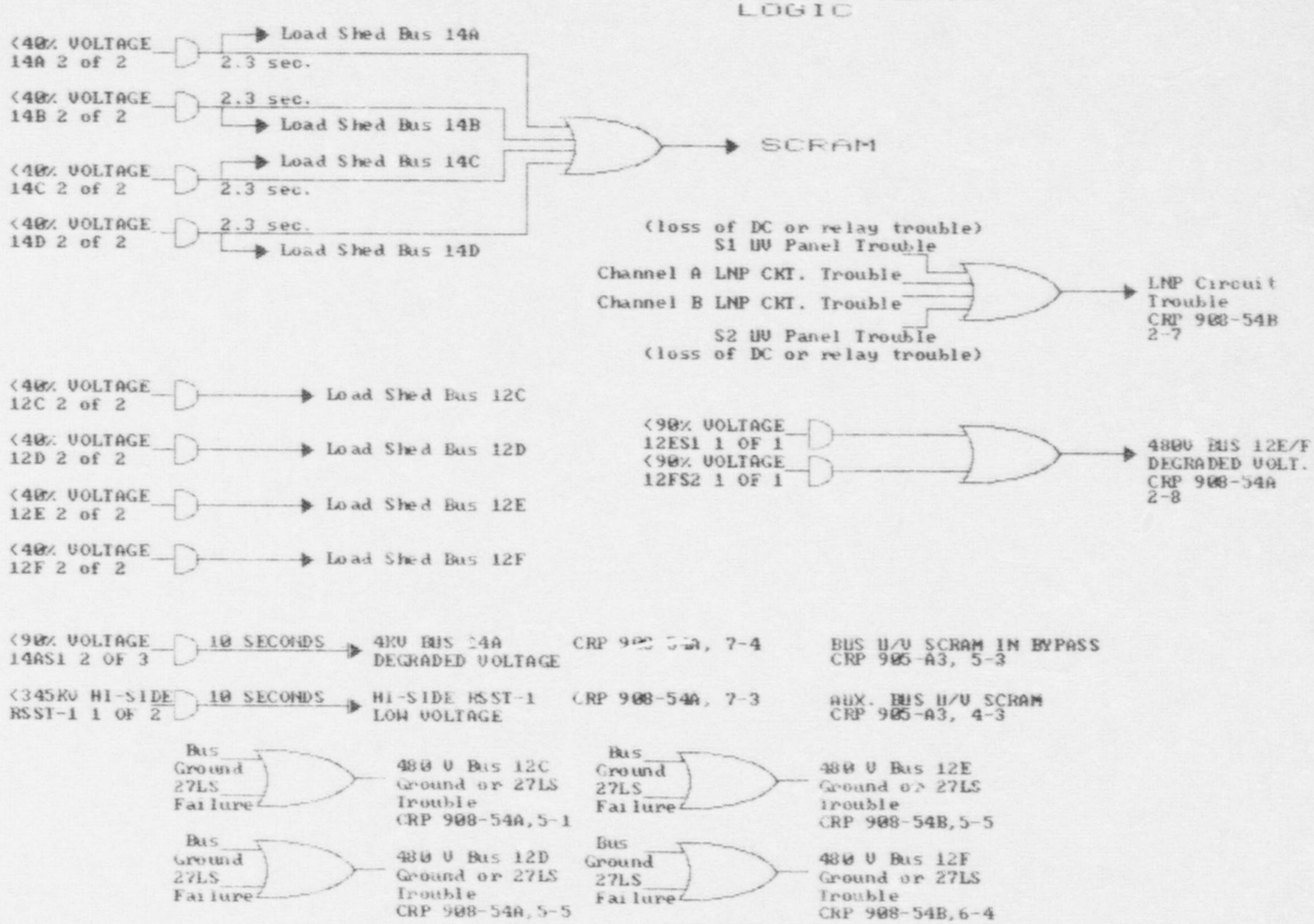
MILLSTONE UNIT ONE
UNDERVOLTAGE DETECTION MODIFICATION
PDCR 1-120-83

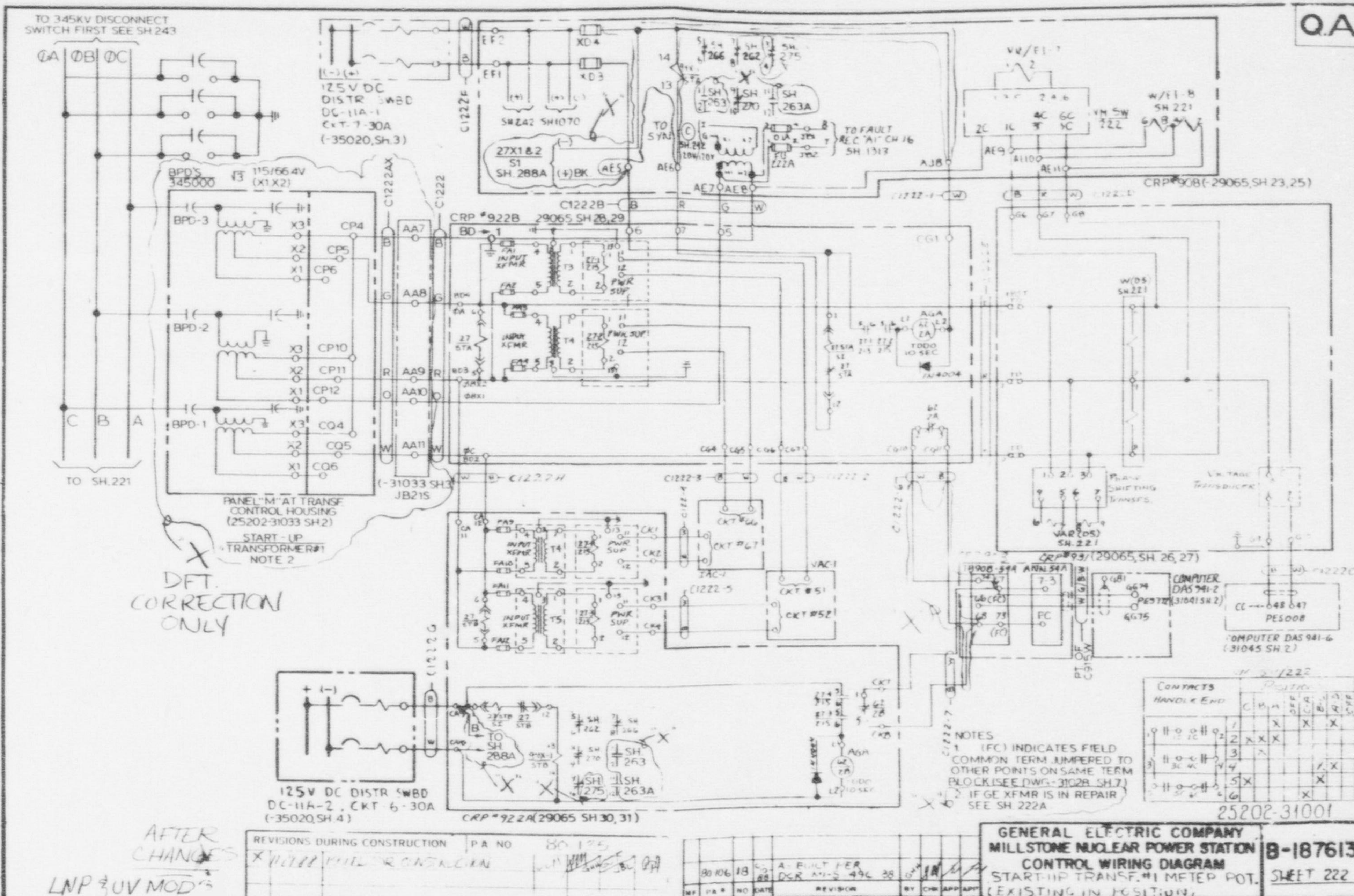
LOAD SHED & LNP LOGIC



MILLSTONE UNIT ONE
UNDERVOLTAGE DETECTION MODIFICATION
PDCR 1-120-83

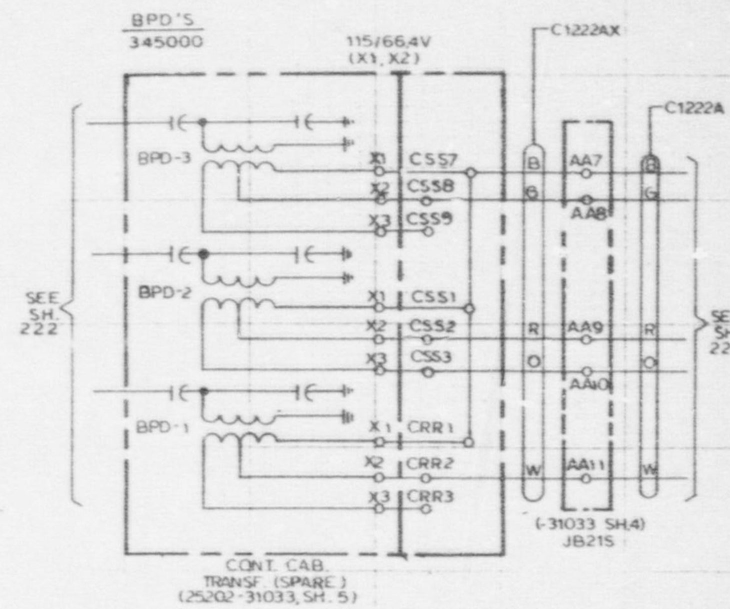
U/V SCRAM & ALARM
LOGIC





QA
TO 345KV DISCONNECT SWITCH FIRST SEE SH.243
ØA ØB ØC
TO SH.221
BPD'S 345000 / √3 115/66.4V (X1,X2)
BPD-3
BPD-2
BPD-1
PANEL "M" AT TRANSF. CONTROL HOUSING (25202-31033 SH.2)
START-UP TRANSFORMER#1 NOTE 2
DFT. CORRECTION ONLY
125V DC DISTR SWBD DC-11A-1 CKT-7-30A (-35020,SH.3)
27X1 & 2 S1 SH.288A
TO SYN
TO FAULT REC "A" CH 16 SH.1313
CRP #922B 29065 SH 28,29
CRP #908 (-29065,SH 23,25)
(-31033 SH3) JB215
INPUT XFMR
PWR SUP
CRP #922A (29065 SH 30,31)
CRP #931 (29065,SH 26,27)
PHASE SHIFTING TRANSFS.
VOLTAGE TRANSDUCER
COMPUTER DAS 941-2 (31041 SH.2)
COMPUTER DAS 941-6 (31045 SH.2)
PES008
125V DC DISTR SWBD DC-11A-2, CKT 6-30A (-35020,SH.4)
NOTES
1. (FC) INDICATES FIELD COMMON TERM JUMPERED TO OTHER POINTS ON SAME TERM BLOCK (SEE DWG-31028 SH.7)
2. IF GE XFMR IS IN REPAIR SEE SH 222A
CONTACTS HANDLE END
25202-31001
GENERAL ELECTRIC COMPANY
MILLSTONE NUCLEAR POWER STATION
CONTROL WIRING DIAGRAM
START-UP TRANSF. #1 METER POT. (EXISTING IN POSITION)
B-187613
SHEET 222
REVISIONS DURING CONSTRUCTION
P.A. NO
80-175
AS BUILT PER DCR M1-S 496 38
AFTER CHANGES
LNP & UV MOD'S

NON Q.A.



DETAIL "C"

AFTER CHANGES
UV & LNP MODS

NOTES:

"X" (1) DETAIL "C" REFLECTS WIRING OF WESTINGHOUSE XFMR ONLY DURING THE REPAIR PERIOD OF THE G.E. RSST XFMR.

REDRAWN FROM (-31001, SH. 222A)
REV. 3

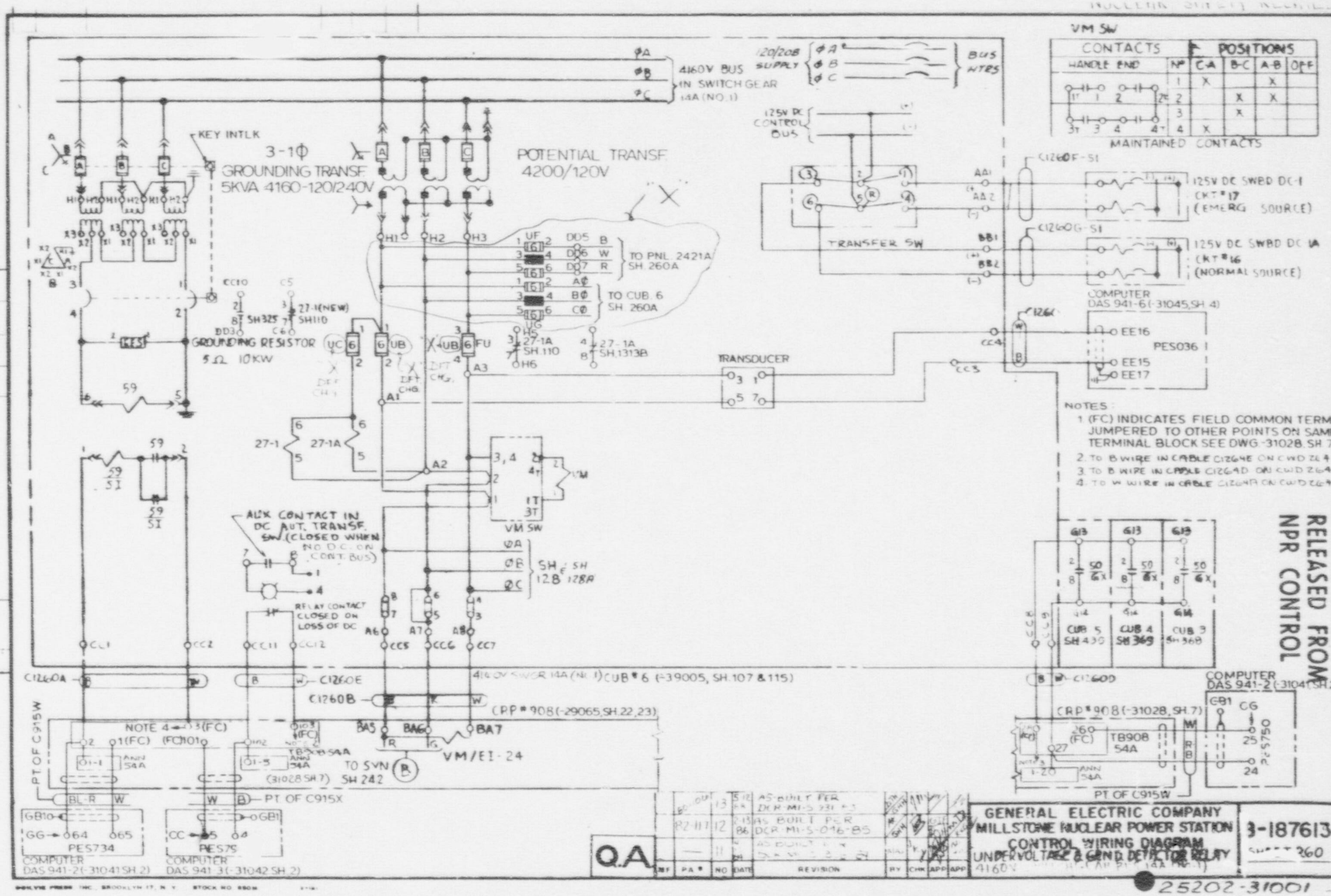
REVISIONS DURING CONSTRUCTION		P.A. # 80-135			
X	11/29/84	ISSUED FOR CONSTRUCTION (REMOVAL ONLY)	DJH		

P.A. #	NO.	DATE	REVISIONS	BY	CHK	APP	APP
79185	5	9/24/87	AS-BUILT PER DCR-MI-S-284-80	DJH			
80-135	4	3/14	REDRAWN FROM DCR-MI-S-1329-83	MAT		D	D

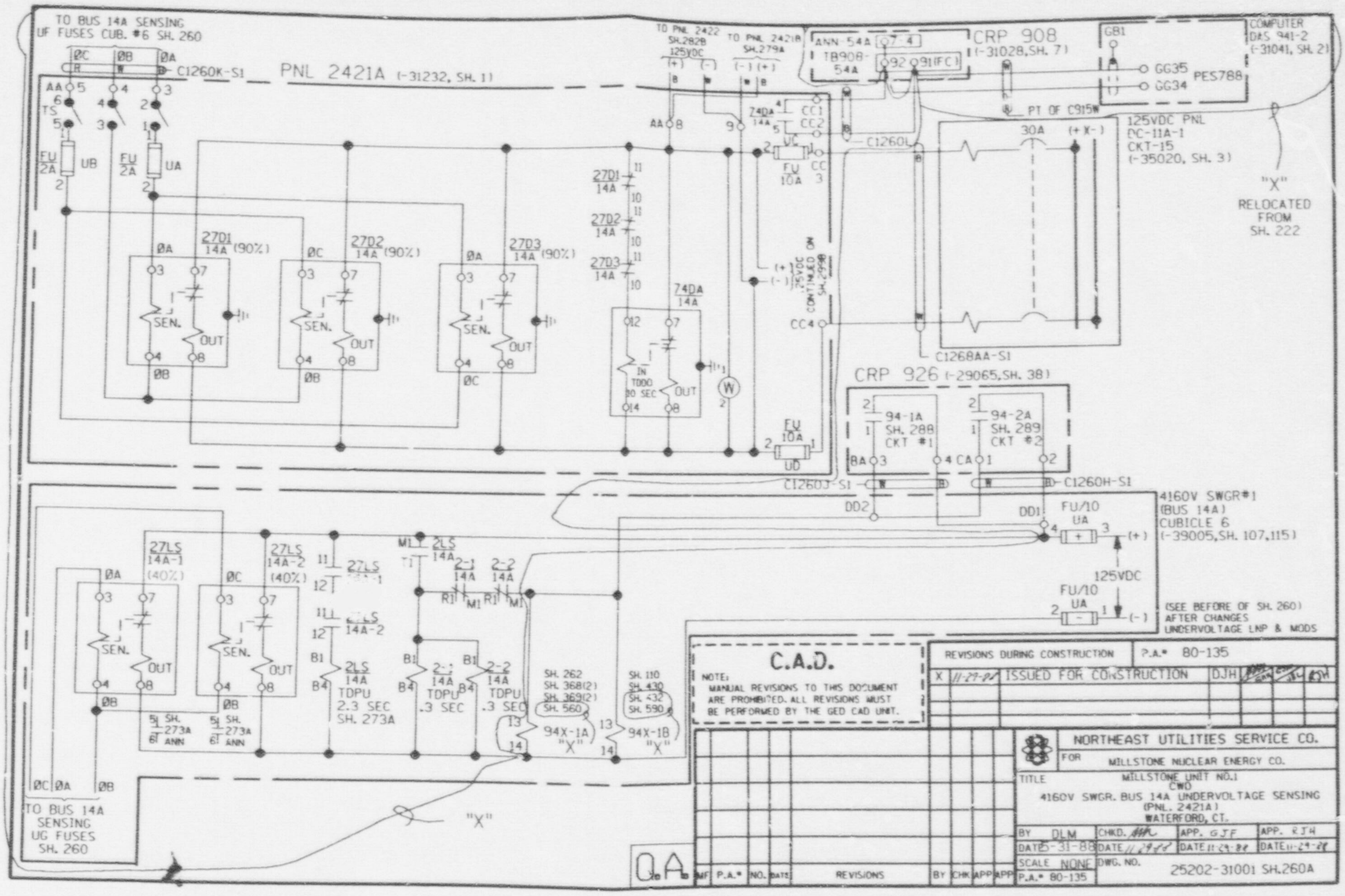
NORTHEAST UTILITIES SERVICE CO.
FOR NORTHEAST NUCLEAR ENERGY CO.

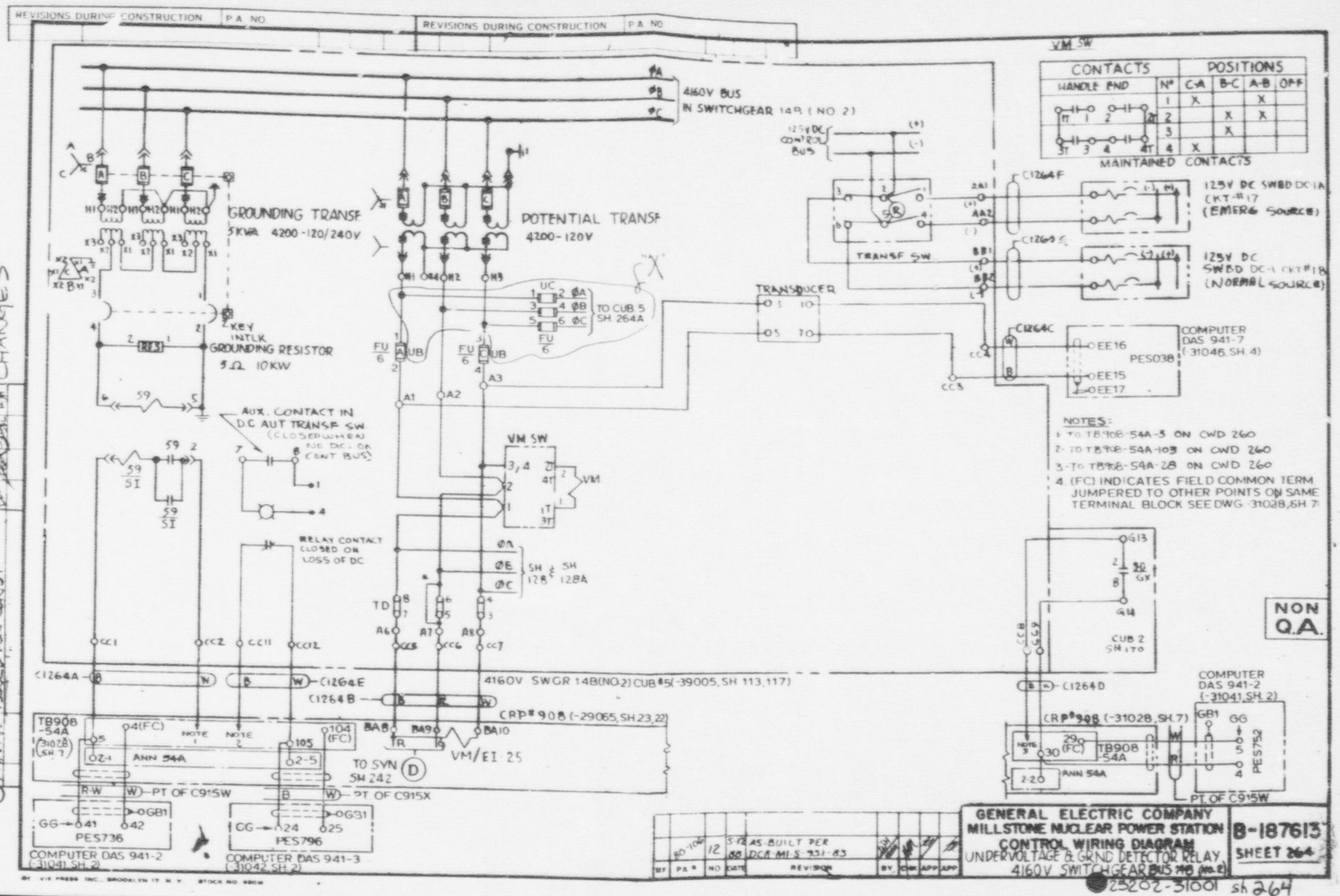
TITLE: MILLSTONE UNIT 1
START-UP TRANSF. #1 METER POT.
WATERFORD, CONN

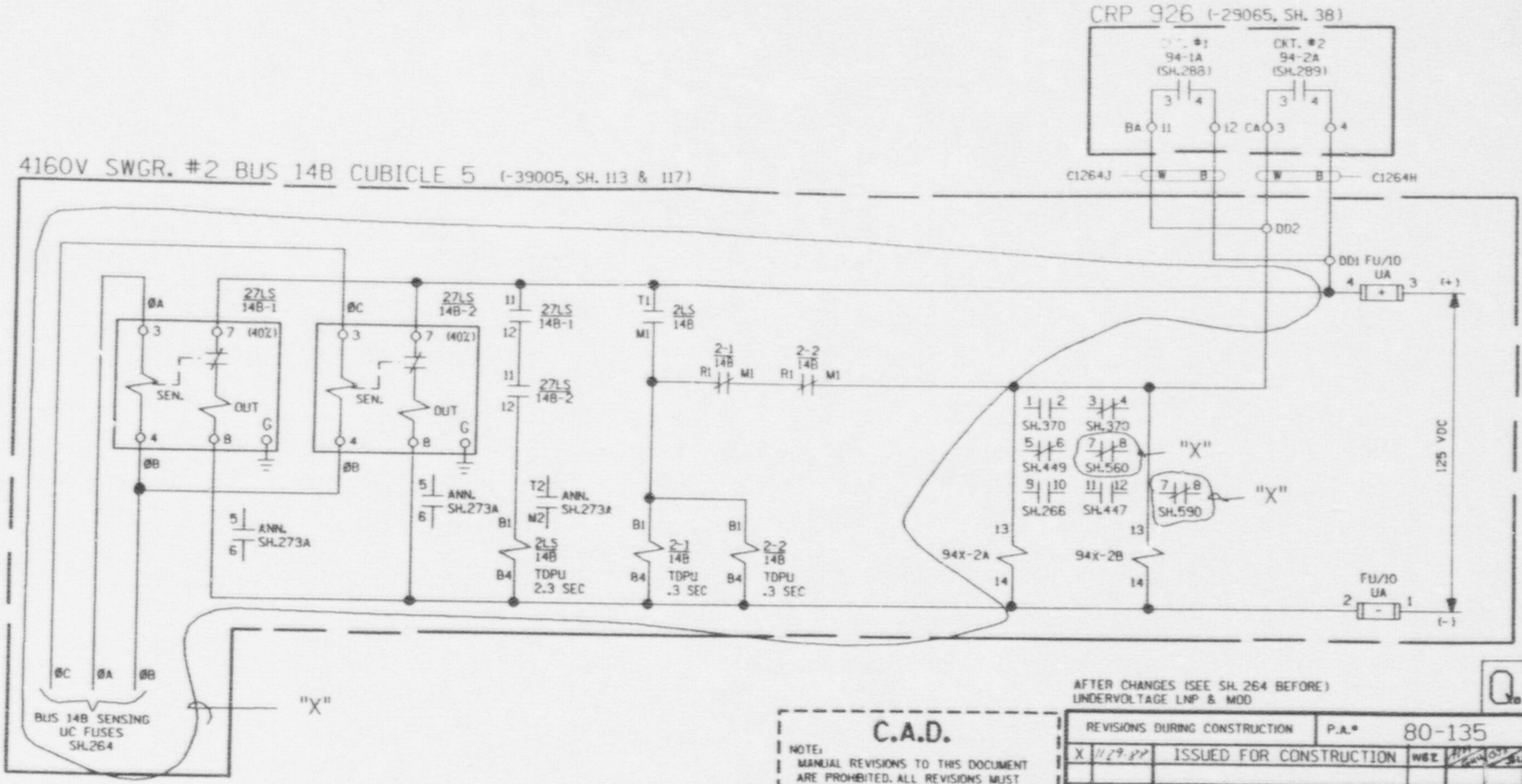
BY MAT	CHKD	APP DED	APP DED
DATE 12-5-83	DATE 4-2-84	DATE 4-2-84	DATE 4-2-84
SCALE			
P.A. # 80-135			NO. 25202-31001, 222A



4160V BUS IN SWITCH GEAR 14A (NO.1)
3-1Φ GROUNDING TRANSF. 5KVA 4160-120/240V
KEY INTLK
POTENTIAL TRANSF. 4200/120V
GROUNDING RESISTOR 5Ω 10KW
TO PNL. 2421A SH. 260A
TO CUB. 6 SH. 260A
TRANSDUCER
TRANSFER SW
125V DC CONTROL BUS
120/208 SUPPLY
BUS HTRS
125V DC SWBD DC-1 CKT #17 (EMERG. SOURCE)
125V DC SWBD DC 1A CKT #16 (NORMAL SOURCE)
COMPUTER DAS 941-6(-31045,SH.4)
PES036
VM SW
CONTACTS
HANDLE END
POSITIONS
MAINTAINED CONTACTS
AUX CONTACT IN DC AUT. TRANSF. SW (CLOSED WHEN NO D.C. ON CONT. BUS)
RELAY CONTACT CLOSED ON LOSS OF DC
TO SYN SH 242
VM/EI-24
CRP #908(-29065,SH.22,23)
CRP #908(-31028,SH.7)
4160V SWGR 14A (NO.1) CUB #6 (-39005, SH.107 & 115)
PT. OF C915W
PT. OF C915X
COMPUTER DAS 941-2(-31041 SH.2)
COMPUTER DAS 941-3(-31042 SH.2)
PES734
PES75
NOTES:
1. (FC) INDICATES FIELD COMMON TERM. JUMPERED TO OTHER POINTS ON SAME TERMINAL BLOCK SEE DWG.-31028, SH. 7
2. TO B WIRE IN CABLE C1264E ON CWD 264
3. TO B WIRE IN CABLE C1264D ON CWD 264
4. TO W WIRE IN CABLE C1264R ON CWD 264
RELEASED FROM NPR CONTROL
GENERAL ELECTRIC COMPANY
MILLSTONE NUCLEAR POWER STATION
CONTROL WIRING DIAGRAM
UNDERVOLTAGE & GRND DETECTOR RELAY
3-187613
SHEET 260
Q.A.
REVISION
REVISIONS DURING CONSTRUCTION
ISSUED FOR CONST.
25202-31001


TO BUS 14A SENSING UF FUSES CUB. #6 SH. 260
PNL 2421A (-31232, SH. 1)
C1260K-S1
CRP 908 (-31028, SH. 7)
ANN-54A
TB908-54A
COMPUTER D&S 941-2 (-31041, SH. 2)
PES788
GG35
GG34
GB1
PT OF C915W
125VDC PNL DC-11A-1 CKT-15 (-35020, SH. 3)
"X" RELOCATED FROM SH. 222
TO PNL 2422 SH.282B 125VDC
TO PNL 2421B SH.279A
27D1 14A (90%)
27D2 14A (90%)
27D3 14A (90%)
74DA 14A
IN TDDO 30 SEC
SEN.
OUT
125VDC CONTINUED ON SH.299B
C1260L
C1268AA-S1
CRP 926 (-29065, SH. 38)
94-1A SH. 288 CKT #1
94-2A SH. 289 CKT #2
C1260J-S1
C1260H-S1
4160V SWGR#1 (BUS 14A) CUBICLE 6 (-39005, SH. 107, 115)
125VDC
(SEE BEFORE OF SH. 260) AFTER CHANGES UNDERVOLTAGE LNP & MODS
27LS 14A-1 (40%)
27LS 14A-2 (40%)
2LS 14A TDPU 2.3 SEC SH. 273A
2-1 14A TDPU .3 SEC
2-2 14A TDPU .3 SEC
SH. 262 SH. 368(2) SH. 369(2) SH. 560
94X-1A "X"
SH. 110 SH. 430 SH. 432 SH. 590
94X-1B "X"
SH. 273A ANN
TO BUS 14A SENSING UG FUSES SH. 260
"X"
C.A.D.
NOTE: MANUAL REVISIONS TO THIS DOCUMENT ARE PROHIBITED. ALL REVISIONS MUST BE PERFORMED BY THE GED CAD UNIT.
REVISIONS DURING CONSTRUCTION
P.A.# 80-135
X 11-29-88 ISSUED FOR CONSTRUCTION DJH
NORTHEAST UTILITIES SERVICE CO.
FOR MILLSTONE NUCLEAR ENERGY CO.
TITLE MILLSTONE UNIT NO.1 CWD 4160V SWGR. BUS 14A UNDERVOLTAGE SENSING (PNL. 2421A) WATERFORD, CT.
BY DLM
DATE 5-31-88
APP. GJF
APP. RJH
SCALE NONE
DWG. NO. 25202-31001 SH.260A
P.A.# 80-135
0A
REVISIONS


REVISIONS DURING CONSTRUCTION P.A. NO
4160V BUS IN SWITCHGEAR 14B (NO 2)
125V DC CONTROL BUS
GROUNDING TRANSF 5KVA 4200-120/240V
POTENTIAL TRANSF 4200-120V
KEY INTLK
GROUNDING RESISTOR 5Ω 10KW
TO CUB 5 SH 264A
TRANSDUCER
TRANSF SW
125V DC SWBD DC-1A CKT #17 (EMERG SOURCE)
125V DC SWBD DC-1 CKT #18 (NORMAL SOURCE)
COMPUTER DAS 941-7 (-31046, SH 4)
PES038
AUX. CONTACT IN DC AUT TRANSF SW (CLOSED WHEN NO DC ON CONT BUS)
RELAY CONTACT CLOSED ON LOSS OF DC
VM SW
SH 128 & SH 128A
NOTES:
1-TO TB908-54A-3 ON CWD 260
2-TO TB908-54A-103 ON CWD 260
3-TO TB908-54A-28 ON CWD 260
4-(FC) INDICATES FIELD COMMON TERM JUMPERED TO OTHER POINTS ON SAME TERMINAL BLOCK SEE DWG -31028, SH 7
CUB 2 SH 170
NON Q.A.
4160V SWGR 14B(NO.2) CUB #5 (-39005, SH 113, 117)
CRP#908 (-29065, SH 23, 22)
CRP#908 (-31028, SH 7)
TB908 -54A (31028) (SH 7)
ANN 54A
TO SYN SH 242
VM/EI-25
PT OF C915W
PT OF C915X
COMPUTER DAS 941-2 (-31041, SH 2)
PES736
COMPUTER DAS 941-3 (-31042, SH 2)
PES796
PES752
CONTACTS | POSITIONS
HANDLE END | Nº | C-A | B-C | A-B | OFF
MAINTAINED CONTACTS
12 | 5-12-80 | AS-BUILT PER DCR-MI-S-331-83
GENERAL ELECTRIC COMPANY
MILLSTONE NUCLEAR POWER STATION
CONTROL WIRING DIAGRAM
UNDERVOLTAGE & GRND DETECTOR RELAY 4160V SWITCHGEAR BUS 14B (NO 2)
B-187613
SHEET 264
25202-31001 sh 264
AFTER CHANGES
ISSUED FOR CONST
UNDERVOLTAGE & ... MODS
30-135



AFTER CHANGES (SEE SH. 264 BEFORE)
UNDERVOLTAGE LNP & MOD

C.A.D.

NOTE:
MANUAL REVISIONS TO THIS DOCUMENT ARE PROHIBITED. ALL REVISIONS MUST BE PERFORMED BY THE GED CAD UNIT.

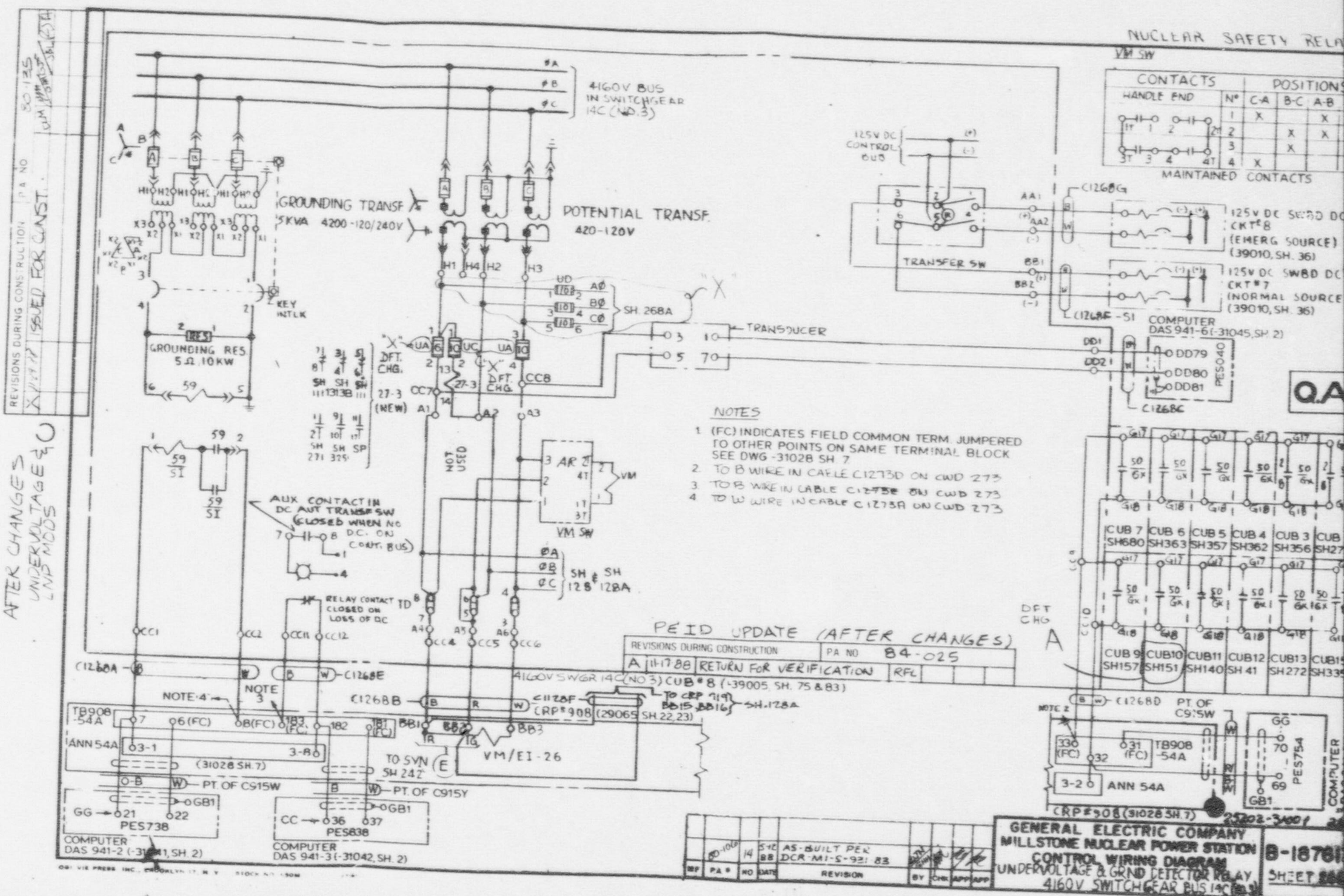
THIS DWG. WAS REDRAWN IN PART FROM NUSCO DWG NO. 25202-31001, SH. 264, REV. 12

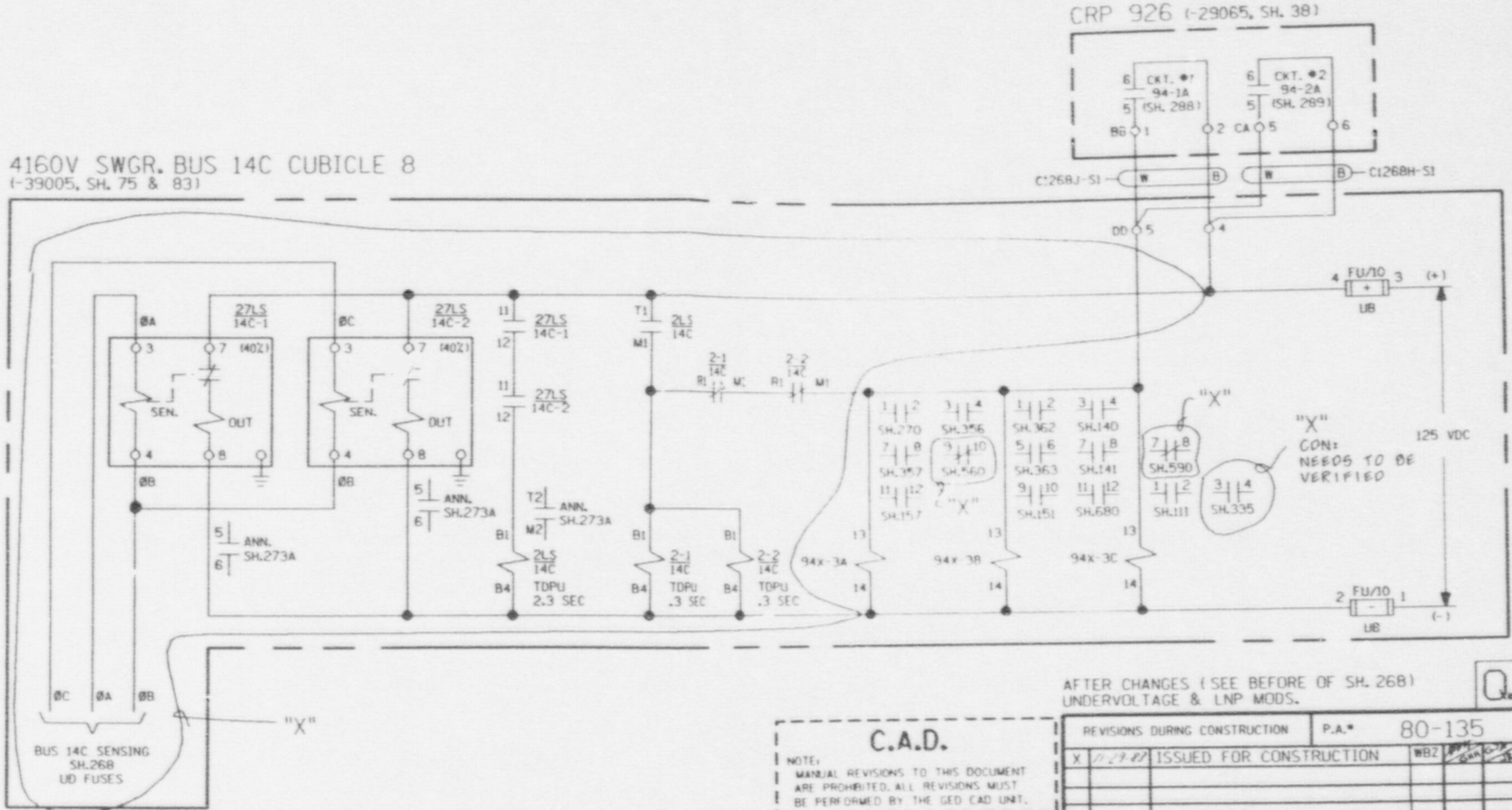
REVISIONS DURING CONSTRUCTION	P.A.# 80-135
X 11-29-88 ISSUED FOR CONSTRUCTION	WBZ

NORTHEAST UTILITIES SERVICE CO.
FOR NORTHEAST NUCLEAR ENERGY CO.
TITLE MILLSTONE UNIT NO. 1
CWD - 4160V SWGR. 14B
UNDERVOLTAGE SENSING
WATERFORD, CT.

BY WBZ	CHKD.	APP. GJF	APP.
DATE 5/23/88	DATE 11-29-88	DATE 11-29-88	DATE 11-29-88
SCALE N/A	DWG. NO. 25202-31001 SH.264A		
P.A.# 80-135			

Q.A.


NUCLEAR SAFETY RELA
4160V BUS IN SWITCHGEAR 14C (NO.3)
GROUNDING TRANSF 5KVA 4200-120/240V
POTENTIAL TRANSF. 420-120V
GROUNDING RES. 5Ω 10KW
KEY INTLK
TRANSDUCER
SH. 268A
DFT. CHG.
27-3 (NEW)
NOT USED
VM SW
AUX CONTACT IN DC AUT TRANSF SW (CLOSED WHEN NO D.C. ON CONT. BUS)
RELAY CONTACT TD CLOSED ON LOSS OF DC
125V DC CONTROL BUS
TRANSFER SW
125V DC SWBD DC CKT#8 (EMERG SOURCE) (39010, SH. 36)
125V DC SWBD DC CKT#7 (NORMAL SOURCE) (39010, SH. 36)
COMPUTER DAS 941-6 (-31045, SH. 2)
CONTACTS
HANDLE END
MAINTAINED CONTACTS
NOTES
1. (FC) INDICATES FIELD COMMON TERM. JUMPERED TO OTHER POINTS ON SAME TERMINAL BLOCK SEE DWG -31028 SH. 7
2. TO B WIRE IN CABLE C1273D ON CWD 273
3. TO B WIRE IN CABLE C1273E ON CWD 273
4. TO W WIRE IN CABLE C1273A ON CWD 273
PEID UPDATE (AFTER CHANGES)
REVISIONS DURING CONSTRUCTION
PA NO 84-025
A 11-17-88 RETURN FOR VERIFICATION RFL
4160V SWGR 14C (NO 3) CUB #8 (-39005, SH. 75 & 83)
CRP#908 (29065 SH. 22, 23)
VM/EI-26
TO SYN SH 242
PT. OF C915W
PT. OF C915Y
COMPUTER DAS 941-2 (-31041, SH. 2)
COMPUTER DAS 941-3 (-31042, SH. 2)
ANN 54A
CRP#908 (31028 SH. 7)
AS-BUILT PER DCR-M1-S-921 83
REVISION
GENERAL ELECTRIC COMPANY
MILLSTONE NUCLEAR POWER STATION
CONTROL WIRING DIAGRAM
UNDERVOLTAGE & GRND DETECTOR RELAY
4160V SWITCHGEAR BUS 14C (NO.3)
B-18761
ISSUED FOR CONST.
AFTER CHANGES
UNDERVOLTAGE & LNP MODS



AFTER CHANGES (SEE BEFORE OF SH. 268)
UNDERVOLTAGE & LNP MODS.

Q.A.

C.A.D.

NOTE: MANUAL REVISIONS TO THIS DOCUMENT ARE PROHIBITED. ALL REVISIONS MUST BE PERFORMED BY THE GED CAD UNIT.

THIS DWG. WAS REDRAWN IN PART FROM NUSCO DWG. NO. 25202-31001, SH. 268, REV. 14

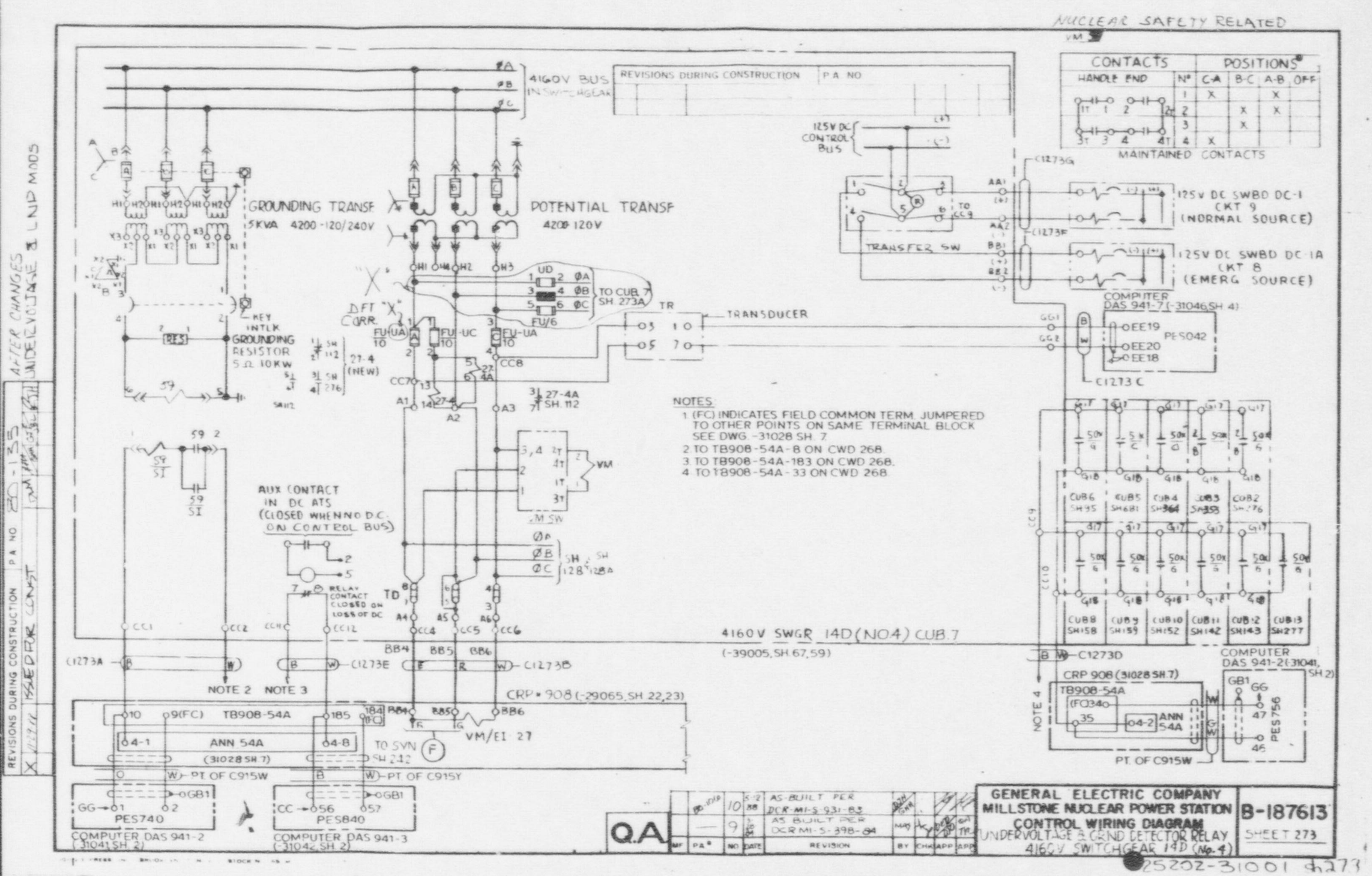
REVISIONS DURING CONSTRUCTION	P.A.# 80-135			
X	11-29-88	ISSUED FOR CONSTRUCTION	WBZ	

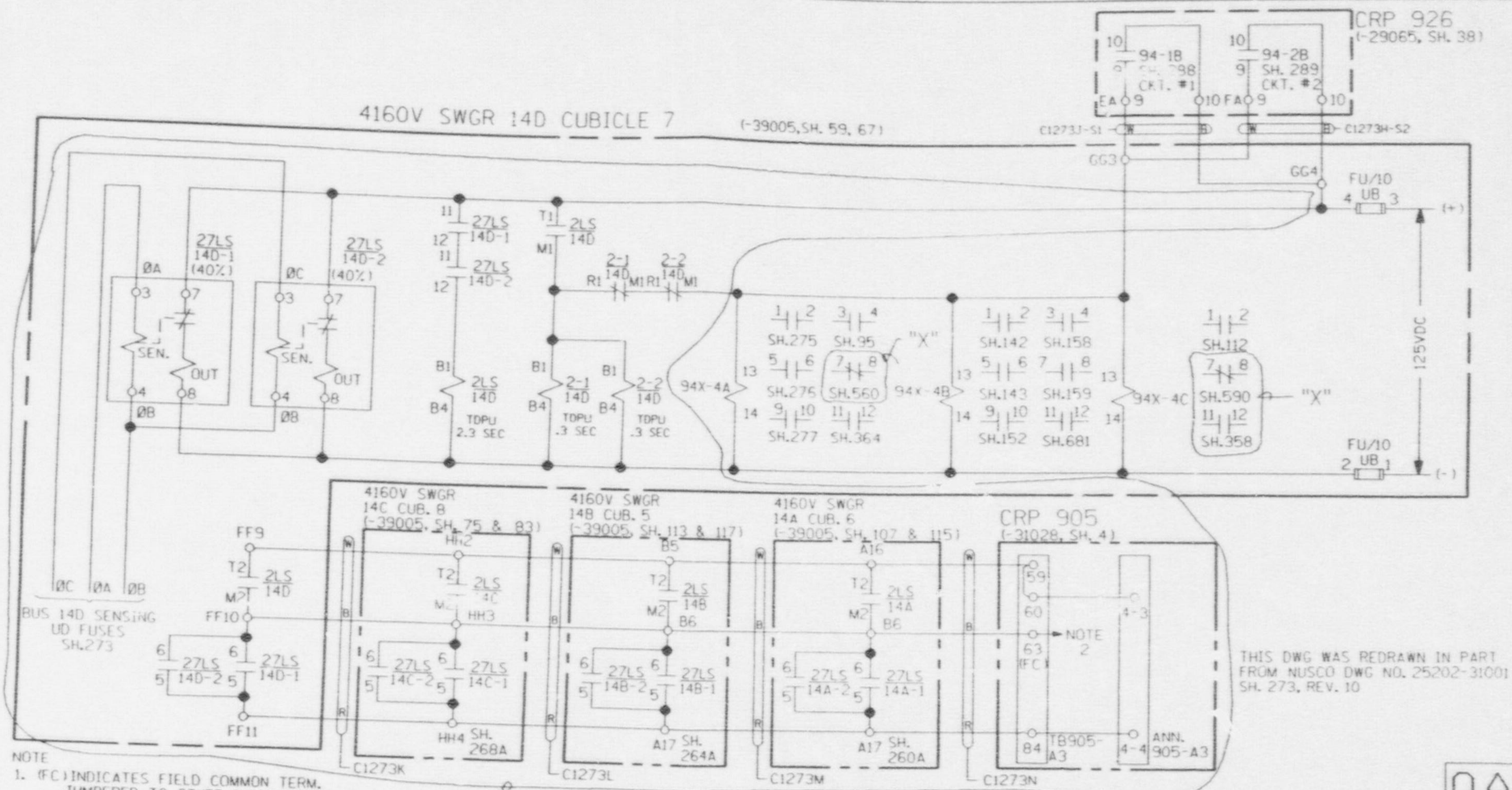
NORTHEAST UTILITIES SERVICE CO.
FOR NORTHEAST NUCLEAR ENERGY CO.

TITLE: MILLSTONE UNIT NO. 1
CWD 4160V SWGR. BUS 14C
UNDERVOLTAGE SENSING
WATERFORD, CT.

BY WBZ	CHKD.	APP.	APP.
DATE 5/23/88	DATE	DATE	DATE
SCALE N/A	DWG. NO.	25202-31001 SH.268A	
P.A.# 80-135			

NF	P.A.#	NO.	DATE	REVISIONS	BY	CHK	APP	APP


NUCLEAR SAFETY RELATED
4160V BUS IN SWITCHGEAR
GROUNDING TRANSF 5KVA 4200-120/240V
POTENTIAL TRANSF 4200-120V
GROUNDING RESISTOR 5Ω 10KW
KEY INTLK
TO CUB 7 SH 273A
TRANSDUCER
125V DC CONTROL BUS
TRANSFER SW
125V DC SWBD DC-1 CKT 9 (NORMAL SOURCE)
125V DC SWBD DC-1A CKT 8 (EMERG SOURCE)
COMPUTER DAS 941-7 (-31046 SH 4)
PES042
AUX CONTACT IN DC ATS (CLOSED WHEN NO D.C. ON CONTROL BUS)
RELAY CONTACT CLOSED ON LOSS OF DC
NOTES:
1. (FC) INDICATES FIELD COMMON TERM. JUMPERED TO OTHER POINTS ON SAME TERMINAL BLOCK SEE DWG. -31028 SH. 7.
2. TO TB908-54A-8 ON CWD 268.
3. TO TB908-54A-183 ON CWD 268.
4. TO TB908-54A-33 ON CWD 268.
4160V SWGR 14D (NO4) CUB 7
(-39005, SH 67,59)
CRP # 908 (-29065, SH 22,23)
TB908-54A
ANN 54A (31028 SH 7)
VM/EI 27
TO SYN SH 242
PT. OF C915W
PT. OF C915Y
COMPUTER DAS 941-2 (-31041 SH 2) PES740
COMPUTER DAS 941-3 (-31042 SH 2) PES840
COMPUTER DAS 941-2 (-31041, SH 2) PES756
CRP 908 (31028 SH 7)
CONTACTS | POSITIONS
HANDLE END | Nº | C-A | B-C | A-B | OFF
MAINTAINED CONTACTS
REVISIONS DURING CONSTRUCTION | P.A. NO
QA
10 | 5-2-88 | AS-BUILT PER DCR-MI-S-931-83
9 | AS BUILT PER DCR MI-S-398-84
GENERAL ELECTRIC COMPANY
MILLSTONE NUCLEAR POWER STATION
CONTROL WIRING DIAGRAM
UNDERVOLTAGE & GRND DETECTOR RELAY 4160V SWITCHGEAR 14D (No. 4)
B-187613
SHEET 273
25202-31001 sh273
AFTER CHANGES UNDERVOLTAGE & LNP MODS
ISSUED FOR CONST



THIS DWG WAS REDRAWN IN PART FROM NUSCO DWG NO. 25202-31001 SH. 273, REV. 10

NOTE
1. (FC) INDICATES FIELD COMMON TERM. JUMPERED TO OTHER POINTS ON SAME TERMINAL BLOCK SEE DWG. -31028, SH. 4
2. TO (W) WIRE IN CABLE C1560E ON CWD 560

AFTER CHANGES (SEE BEFORE OF SH. 273)
UNDERVOLTAGE LNP & MOD

Q.A.

C.A.D.

NOTE: MANUAL REVISIONS TO THIS DOCUMENT ARE PROHIBITED. ALL REVISIONS MUST BE PERFORMED BY THE [illegible] CAD UNIT.

REVISIONS DURING CONSTRUCTION	P.A.*	80-135		
X	ISSUED FOR CONSTRUCTION	DJH	[illegible]	

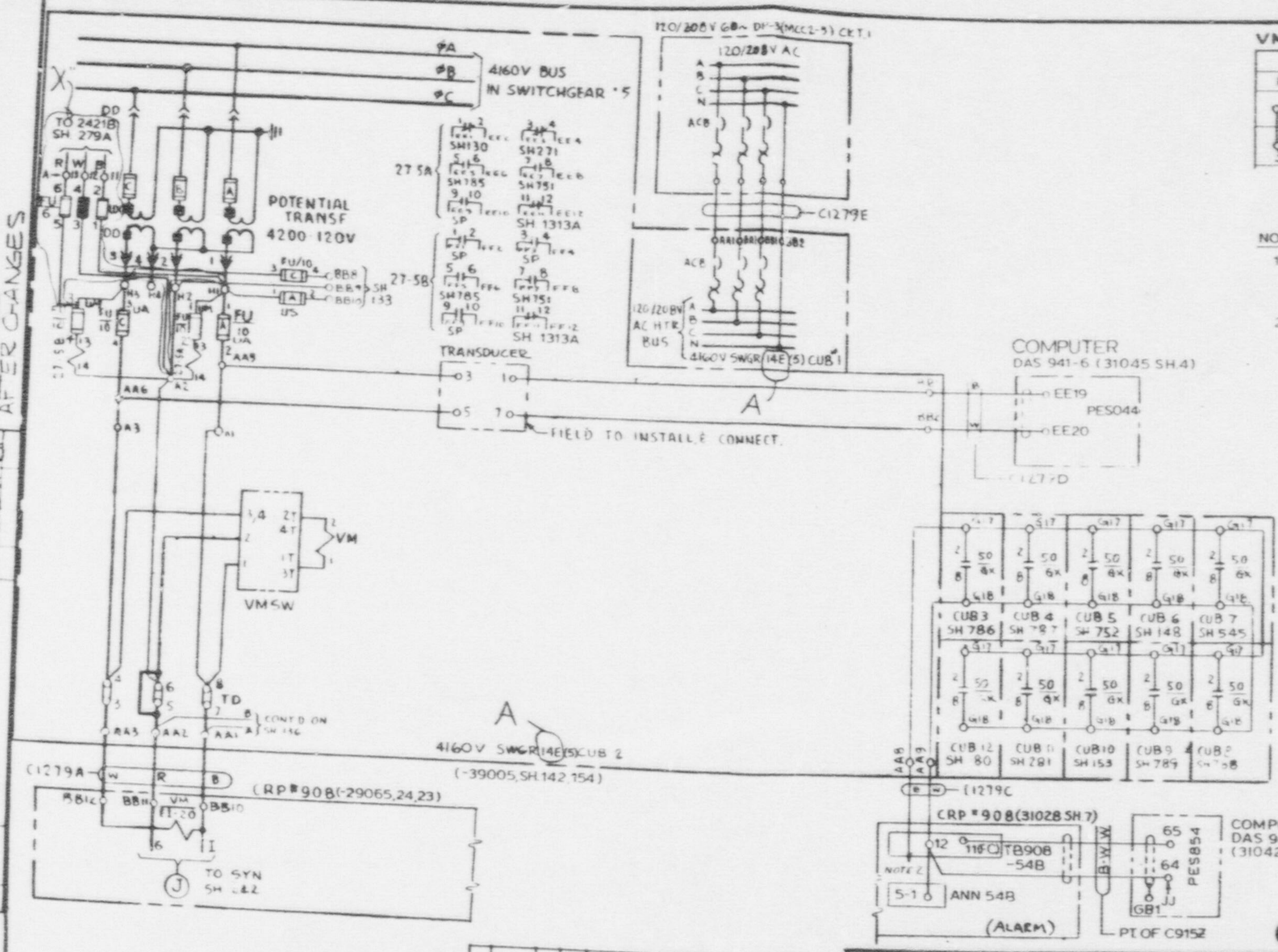
MF	P.A.*	NO.	DATE	REVISIONS	BY	CHK	APP	APP

NORTHEAST UTILITIES SERVICE CO.

FOR MILLSTONE NUCLEAR ENERGY CO.

TITLE MILLSTONE UNIT NO.1
CWD - 4160V SWGR. BUS 14D
UNDERVOLTAGE BUS SENSING
WATERFORD, CT.

BY DLM	CHKD. [illegible]	APP. [illegible]	APP. [illegible]
DATE 6-1-88	DATE [illegible]	DATE [illegible]	DATE [illegible]
SCALE NONE	DWG. NO. 25202-31001 SH.273A		
P.A.* 80-135			



VM SW

CONTACTS		POSITIONS			
HANDLE END	Nº	C-A	B-C	A-B	OFF
1 — 1C 2C — 2	1	X		X	
	2		X	X	
	3		X		
3 — 3C 4C — 4	4	X			

MAINTAINED CONTACTS

NOTES:

1. (FC) INDICATES FIELD COMMON TERM. JUMPERED TO OTHER POINTS ON SAME TERMINAL BLOCK SEE DWG 31028, SH. 7
2. TO TB908-54B-13 ON CWD 282

UNDERVOLTAGE
1 LUP MODS
AFTER CHANGES

REVISIONS DURING CONSTRUCTION	PA NO
X	ISSUED FOR CONST.	80-135

P&ID UPDATE (AFTER CHANGES)

REVISIONS DURING CONSTRUCTION	PA NO
A 11-7-88 RETURN FOR VERIFICATION	84-025 REL

QA

25202-31001 sh 279

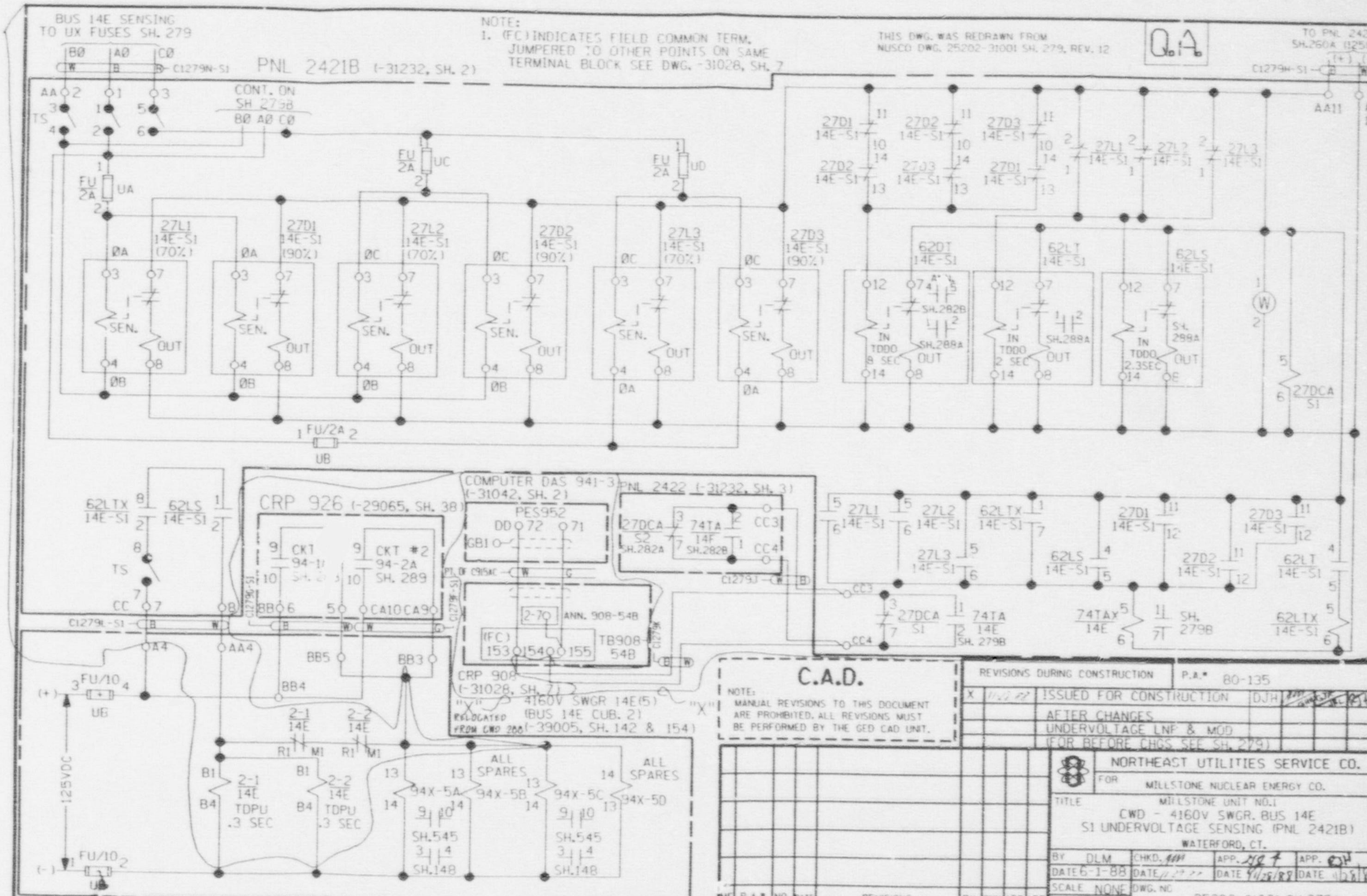
PA#	NO	DATE	REVISION
80-106	12	5-18-88	AS BUILT PER DCR-MI-S-932-83
82-117	11	2-13-86	AS BUILT PER DCR-MI-S-044-85

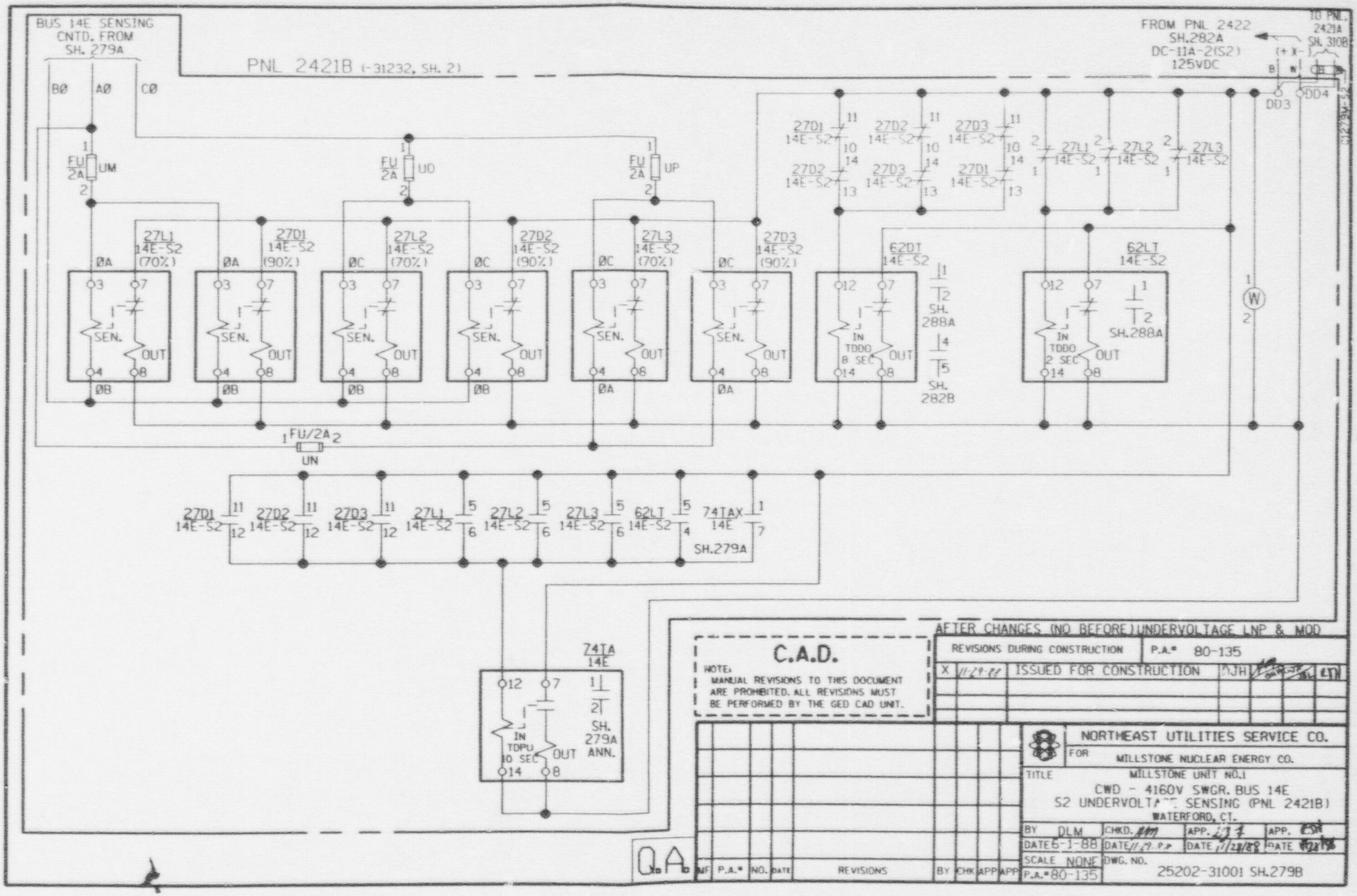
EBASCO SERVICES INCORPORATED
NEW YORK

DIV. ELEC. DATE OCT 16, 1968

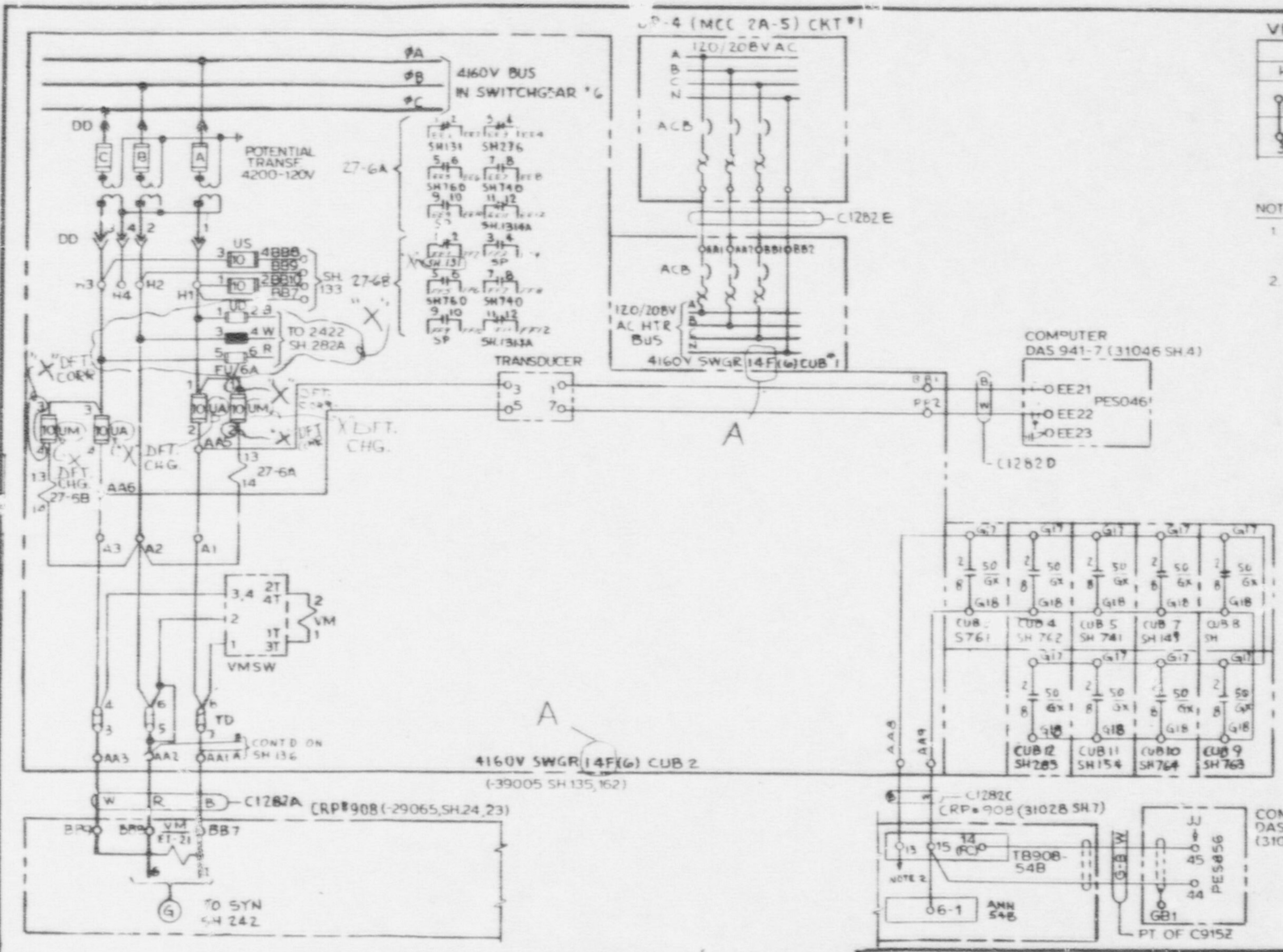
GENERAL ELECTRIC COMPANY
MILLSTONE NUCLEAR POWER STATION
CONTROL WIRING DIAGRAM
4160V SWITCHGEAR BUS 14E (NO.5)
UNDERVOLTAGE RELAY

B-187613
SHEET 279


BUS 14E SENSING
TO UX FUSES SH. 279
PNL 2421B (-31232, SH. 2)
NOTE:
1. (FC) INDICATES FIELD COMMON TERM. JUMPERED TO OTHER POINTS ON SAME TERMINAL BLOCK SEE DWG. -31028, SH. 7
THIS DWG. WAS REDRAWN FROM NUSCO DWG. 25202-31001 SH. 279, REV. 12
Q.A.
CONT. ON SH 279B
COMPUTER DAS 941-3 (-31042, SH. 2)
PNL 2422 (-31232, SH. 3)
CRP 926 (-29065, SH. 38)
CRP 908 (-31028, SH. 7)
4160V SWGR 14E(5) (BUS 14E CUB. 2) (-39005, SH. 142 & 154)
125VDC
C.A.D.
NOTE: MANUAL REVISIONS TO THIS DOCUMENT ARE PROHIBITED. ALL REVISIONS MUST BE PERFORMED BY THE GED CAD UNIT.
REVISIONS DURING CONSTRUCTION
P.A.# 80-135
ISSUED FOR CONSTRUCTION
AFTER CHANGES
UNDERVOLTAGE LNF & MOD
(FOR BEFORE CHGS SEE SH. 279)
NORTHEAST UTILITIES SERVICE CO.
FOR MILLSTONE NUCLEAR ENERGY CO.
TITLE MILLSTONE UNIT NO.1
CWD - 4160V SWGR. BUS 14E
S1 UNDERVOLTAGE SENSING (PNL 2421B)
WATERFORD, CT.
BY DLM
DATE 6-1-88
SCALE NONE
P.A.#80-135
DWG. NO
25202-31001 SH.279A



BUS 14E SENSING CNTD. FROM SH. 279A
PNL 2421B (-31232, SH. 2)
FROM PNL 2422 SH.282A DC-11A-2(S2) 125VDC
TO PNL 2421A SH. 310B
27L1 14E-S2 (70%)
27D1 14E-S2 (90%)
27L2 14E-S2 (70%)
27D2 14E-S2 (90%)
27L3 14E-S2 (70%)
27D3 14E-S2 (90%)
62DT 14E-S2
62LT 14E-S2
SH. 288A
SH. 282B
74TAX 14E SH.279A
74TA 14E
SH. 279A ANN.
AFTER CHANGES (NO BEFORE) UNDERVOLTAGE LNP & MOD
C.A.D.
NOTE: MANUAL REVISIONS TO THIS DOCUMENT ARE PROHIBITED. ALL REVISIONS MUST BE PERFORMED BY THE GED CAD UNIT.
REVISIONS DURING CONSTRUCTION
P.A.# 80-135
X 11-29-88 ISSUED FOR CONSTRUCTION
NORTHEAST UTILITIES SERVICE CO.
FOR MILLSTONE NUCLEAR ENERGY CO.
TITLE MILLSTONE UNIT NO.1
CWD - 4160V SWGR. BUS 14E
S2 UNDERVOLTAGE SENSING (PNL 2421B)
WATERFORD, CT.
BY DLM
DATE 6-1-88
SCALE NONE
P.A.# 80-135
DWG. NO. 25202-31001 SH.279B
QA



VM SW

CONTACTS		POSITIONS			
HANDLE END	Nº	C-A	B-C	A-B	OFF
1 — 1C 2C — 2	1	X		X	
	2		X	X	
3 — 3C 4C — 4	3		X		
	4	X			

MAINTAINED CONTACTS

NOTES

1. (FC) INDICATES FIELD COMMON TERM JUMPERED TO OTHER POINTS ON SAME TERMINAL BLOCK SEE DWG -31028, SH.7
2. TO (B) WIRE IN CABLE C1279C ON CWD 279.

RELEASED FROM NPR CONTROL

REVISIONS DURING CONSTRUCTION P.A. NO 80-12
X 11-29-80 ISSUED FOR CONST.

REVISIONS DURING CONSTRUCTION P.A. NO 84 025
A 11-17-88 RETURN FOR VERIFICATION RL

FEID UPDATE (AFTER CHANGES)

REF	P.A. #	NO	DATE	REVISION	BY	CHK	APP	APP
	80-106	12	3-88	AS BUILT PER UCR-MI-S-932-83				
	82-117	11		AS BUILT PER DCR-MI-S-044-85				

EBASCO SERVICES INCORPORATED NEW YORK
DIV. ELEC. DR. EH
SCALE — CK. JAG
DATE OCT 16 1968

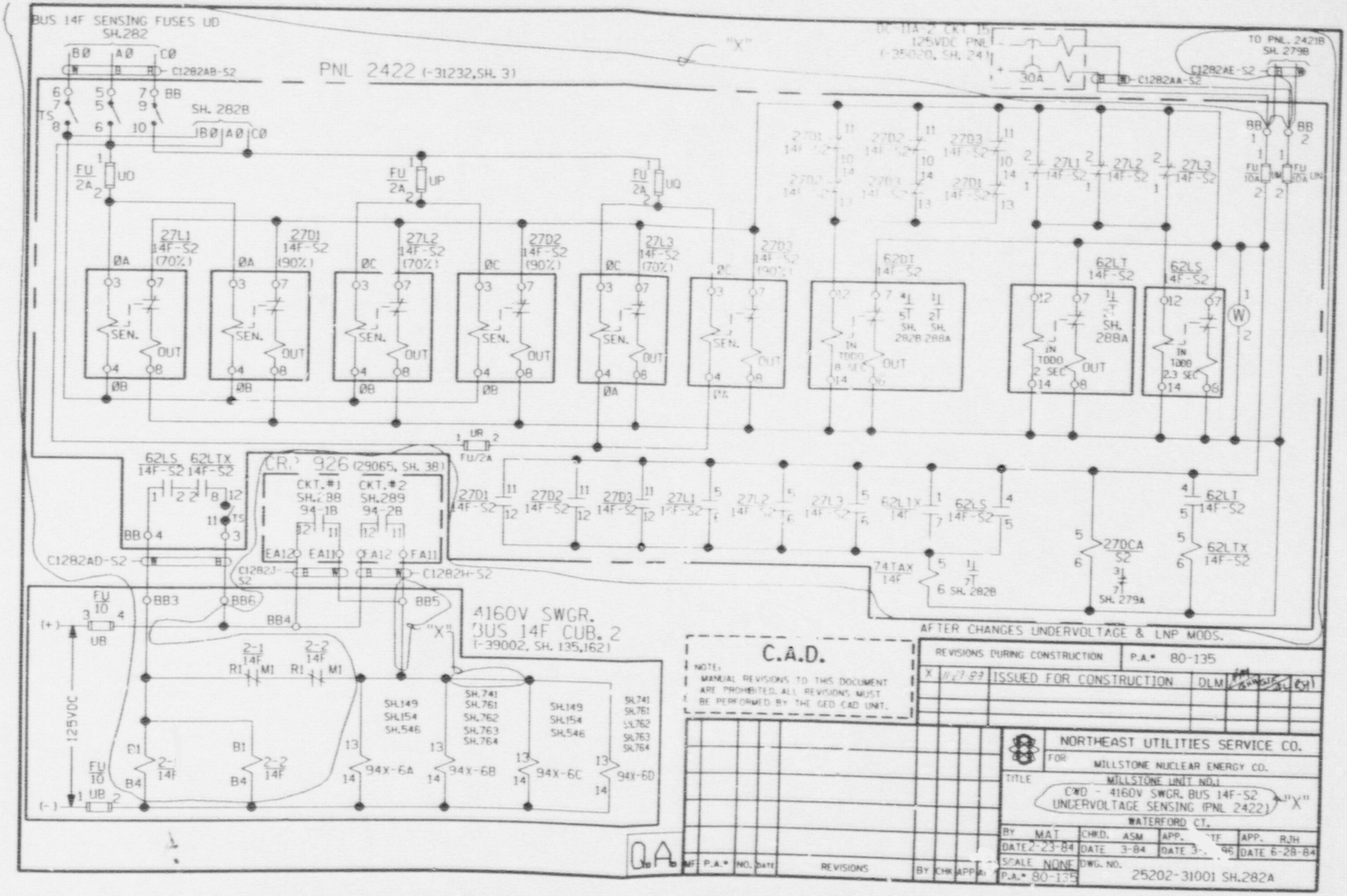
GENERAL ELECTRIC COMPANY
MILLSTONE NUCLEAR POWER STATION
CONTROL WIRING DIAGRAM
4160V SWITCHGEAR BUS 14F(#6)
UNDERVOLTAGE RELAY

B-187613
SHEET 2

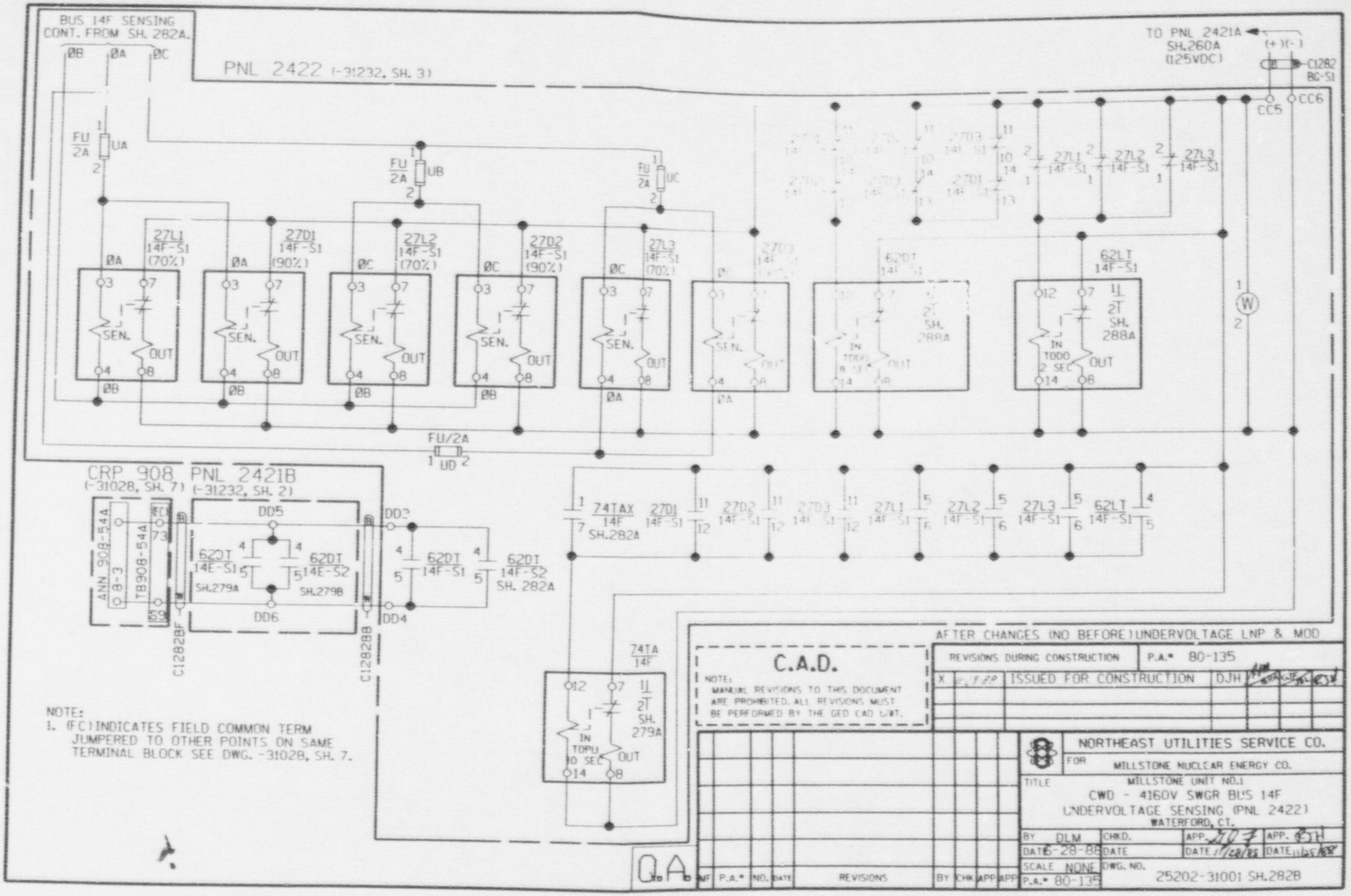
QA

25202-31001

OGILVIE PRESS, INC. BROOKLYN 17, N.Y.



BUS 14F SENSING FUSES UD SH.282
PNL 2422 (-31232,SH. 3)
DC-11A-2 CKT 15 125VDC PNL (-35020, SH. 24)
TO PNL. 2421B SH. 279B
"X"
4160V SWGR. BUS 14F CUB. 2 (-39002, SH. 135,162)
125VDC
AFTER CHANGES UNDERVOLTAGE & LNP MODS.
C.A.D.
NOTE: MANUAL REVISIONS TO THIS DOCUMENT ARE PROHIBITED. ALL REVISIONS MUST BE PERFORMED BY THE GED CAD UNIT.
REVISIONS DURING CONSTRUCTION
P.A.# 80-135
ISSUED FOR CONSTRUCTION
DLM
NORTHEAST UTILITIES SERVICE CO.
FOR MILLSTONE NUCLEAR ENERGY CO.
TITLE MILLSTONE UNIT NO.1
CWD - 4160V SWGR. BUS 14F-S2 UNDERVOLTAGE SENSING (PNL 2422)
WATERFORD CT.
BY MAT
DATE 2-23-84
CHKD. ASM
DATE 3-84
APP. RJH
DATE 6-28-84
SCALE NONE
P.A.# 80-135
DWG. NO. 25202-31001 SH.282A
REVISIONS
QA



NOTE:
1. (FC) INDICATES FIELD COMMON TERM JUMPERED TO OTHER POINTS ON SAME TERMINAL BLOCK SEE DWG. -31028, SH. 7.

AFTER CHANGES (NO BEFORE) UNDERVOLTAGE LNP & MOD

C.A.D.
NOTE: MANUAL REVISIONS TO THIS DOCUMENT ARE PROHIBITED. ALL REVISIONS MUST BE PERFORMED BY THE GED CAD UNIT.

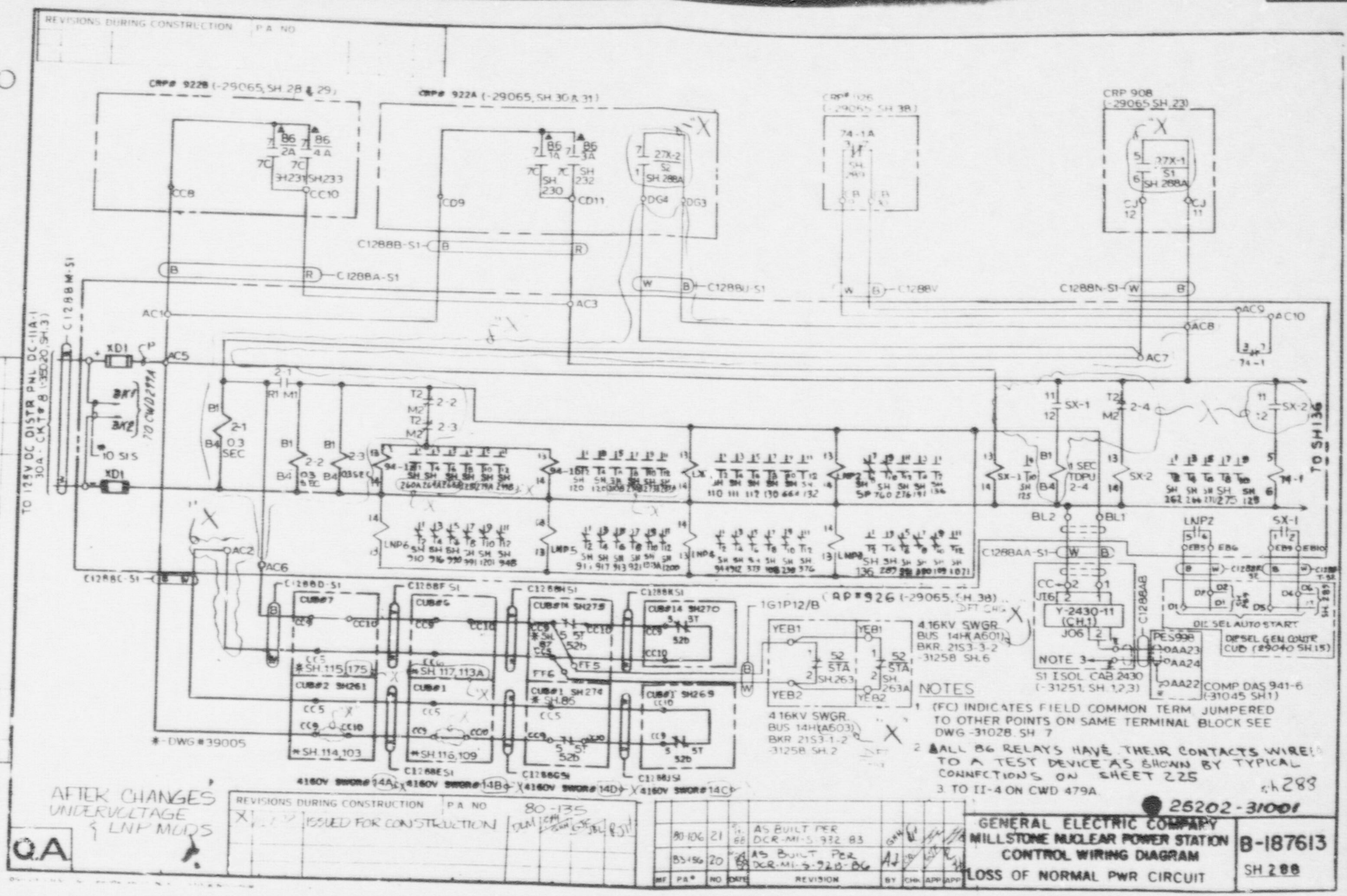
REVISIONS DURING CONSTRUCTION	P.A.# 80-135	
X	ISSUED FOR CONSTRUCTION	DJH

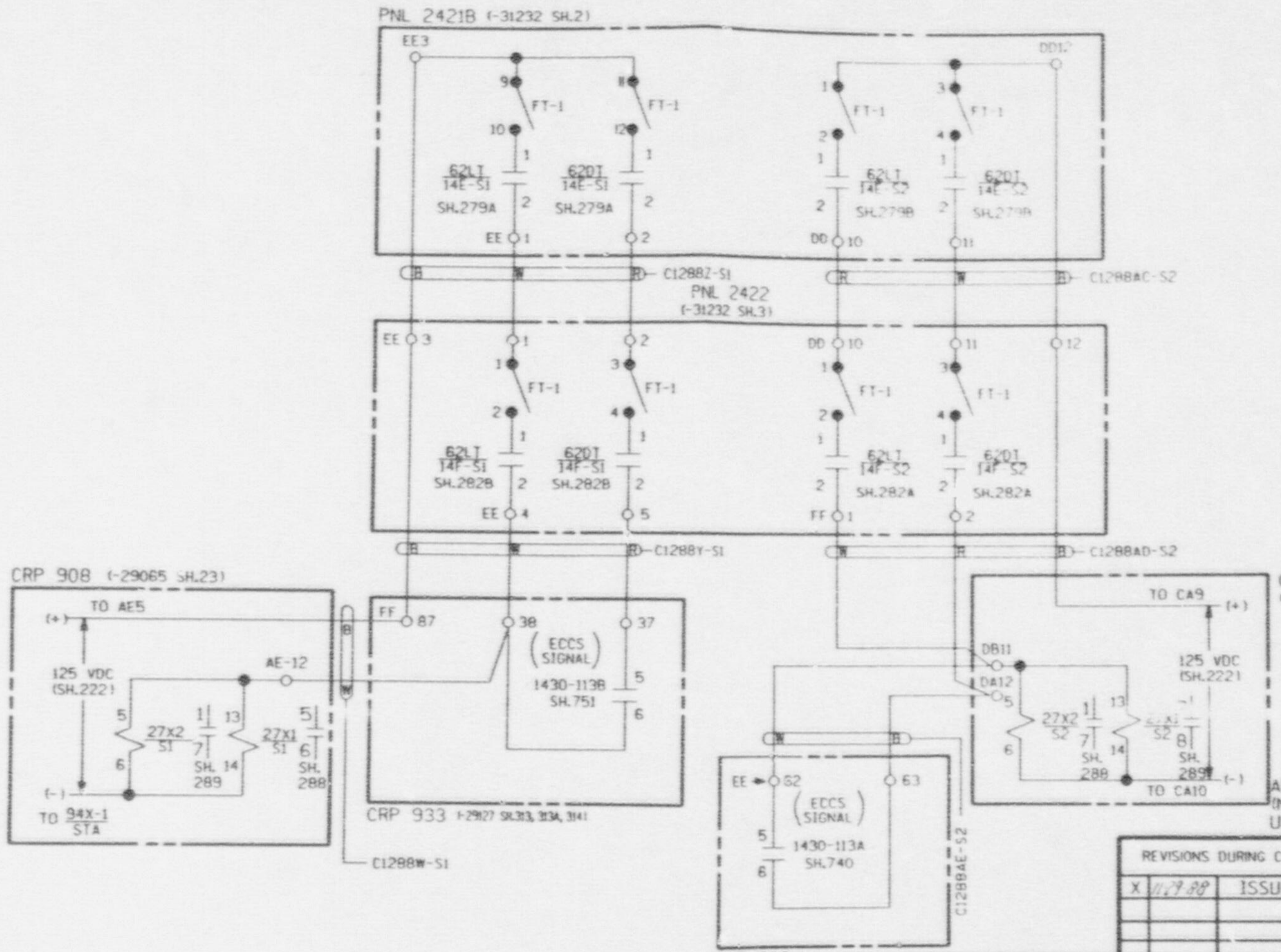
NF	P.A.#	NO.	DATE	REVISIONS	BY	CHK	APP	APP

NORTHEAST UTILITIES SERVICE CO.
FOR MILLSTONE NUCLEAR ENERGY CO.
TITLE MILLSTONE UNIT NO.1
CWD - 4160V SWGR BUS 14F UNDERVOLTAGE SENSING (PNL 2422)
WATERFORD, CT.

BY DLM	CHKD.	APP.	APP.
DATE 6-28-88	DATE	DATE	DATE
SCALE NONE	DWG. NO. 25202-31001 SH.282B		
P.A.# 80-135			

QA


REVISIONS DURING CONSTRUCTION P.A. NO
CRP# 922B (-29065, SH.28 & 29)
CRP# 922A (-29065, SH.30 & 31)
CRP 908 (-29065 SH.23)
TO 125V DC DISTR PNL DC-11A-1 30A - CKT# 8 (-35020, SH.3)
TO CWD277A
TO SH136
CAP#926 (-29065, SH.38)
4.16KV SWGR. BUS 14H (A601) BKR. 21S3-3-2 -31258 SH.6
4.16KV SWGR. BUS 14H (A603) BKR 21S3-1-2 -31258 SH.2
S1 ISOL CAB 2430 (-31251, SH. 1,2,3)
DIESEL AUTO START
DIESEL GEN CONTR CUB (29040 SH.15)
COMP DAS 941-6 (-31045 SH.1)
*-DWG#39005
NOTES
1 (FC) INDICATES FIELD COMMON TERM. JUMPERED TO OTHER POINTS ON SAME TERMINAL BLOCK SEE DWG -31028, SH 7
2 ALL 86 RELAYS HAVE THEIR CONTACTS WIRED TO A TEST DEVICE AS SHOWN BY TYPICAL CONNECTIONS ON SHEET 225
3. TO II-4 ON CWD 479A
sh 288
25202-31001
AFTER CHANGES UNDERVOLTAGE & LNP MODS
QA
ISSUED FOR CONSTRUCTION
80-135
80-106 21 AS BUILT PER DCR-MI-S-932-83
83-156 20 AS BUILT PER DCR-MI-S-928-86
REVISION
GENERAL ELECTRIC COMPANY
MILLSTONE NUCLEAR POWER STATION
CONTROL WIRING DIAGRAM
LOSS OF NORMAL PWR CIRCUIT
B-187613
SH 288



AFTER CHANGES
(NO BEFORE)
UNDERVOLTAGE & LNP MODS.

Q.A.

REVISIONS DURING CONSTRUCTION		P.A.*	80-135
X	11-29-88	ISSUED FOR CONSTRUCTION	GT

C.A.D.

NOTE:
MANUAL REVISIONS TO THIS DOCUMENT ARE PROHIBITED. ALL REVISIONS MUST BE PERFORMED BY THE GED CAD UNIT.

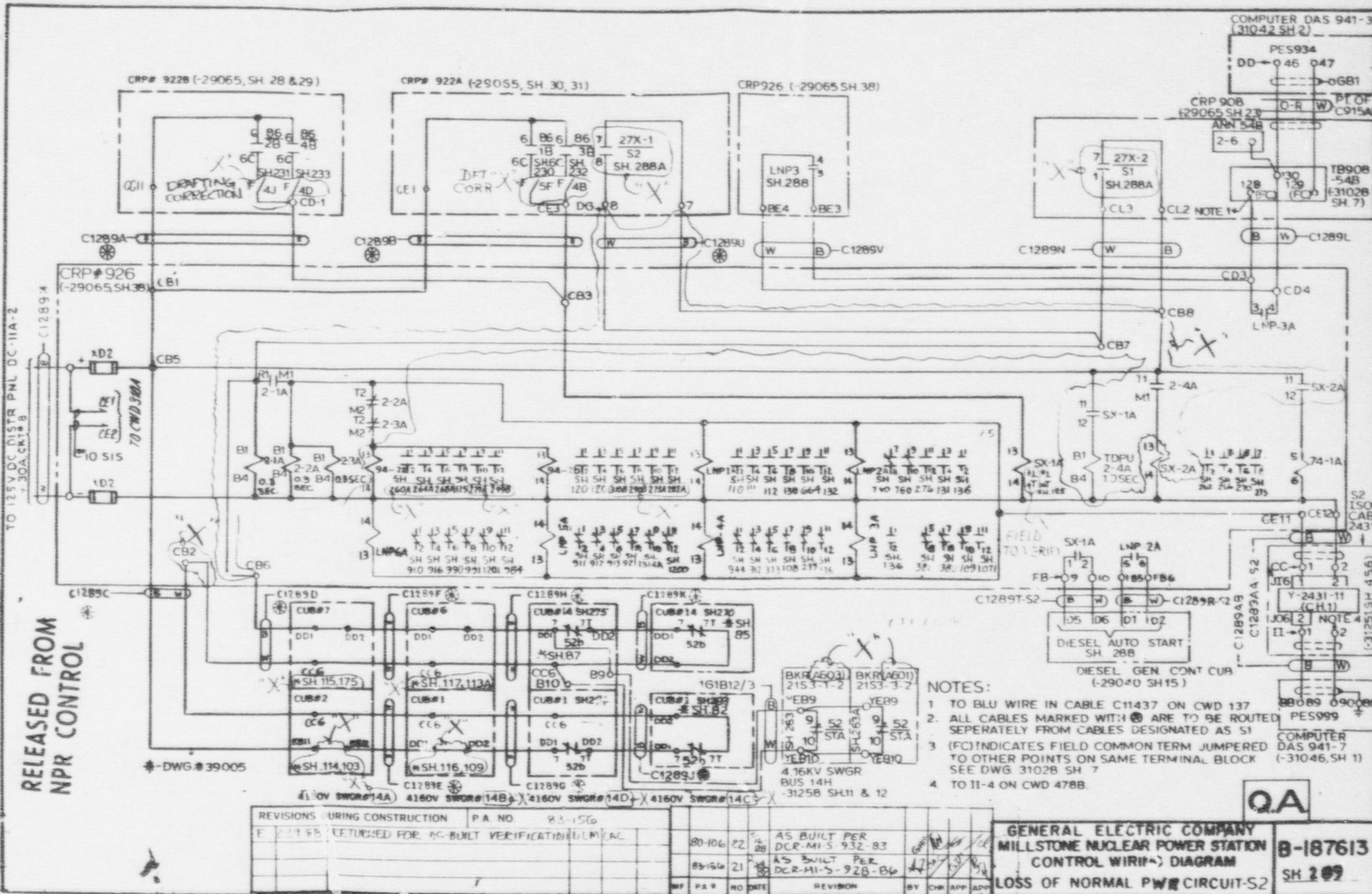
MF	P.A.*	NO.	DATE	REVISIONS	BY	CHK	APP	APP

NORTHEAST UTILITIES SERVICE CO.

FOR NORTHEAST NUCLEAR ENERGY CO.

TITLE MILLSTONE UNIT NO.1
CONTROL WIRING DIAGRAM
LNP INITIATION
WATERFORD, CT.

BY DLU	CHKD.	APP.	APP.
DATE 5-13-88	DATE 11-29-88	DATE	DATE
SCALE NONE	DWG. NO.		
P.A.* 80-135	25202-31001 SH.288A		



NOTES:

1. TO BLU WIRE IN CABLE C11437 ON CWD 137
2. ALL CABLES MARKED WITH ⊛ ARE TO BE ROUTED SEPERATELY FROM CABLES DESIGNATED AS S1
3. (FC) INDICATES FIELD COMMON TERM JUMPERED TO OTHER POINTS ON SAME TERMINAL BLOCK SEE DWG. 31028 SH. 7
4. TO II-4 ON CWD 478B.

REV	P.A. #	NO	DATE	REVISION	BY	CHK	APP	APP
	80-106	22		AS BUILT PER DCR-MI-S-932-83				
	83-156	21		AS BUILT PER DCR-MI-S-928-86				

REVISIONS DURING CONSTRUCTION — P.A. NO. 83-156

E — RETURNED FOR AS-BUILT VERIFICATION

GENERAL ELECTRIC COMPANY
MILLSTONE NUCLEAR POWER STATION
CONTROL WIRING DIAGRAM
LOSS OF NORMAL PWR CIRCUIT-S2

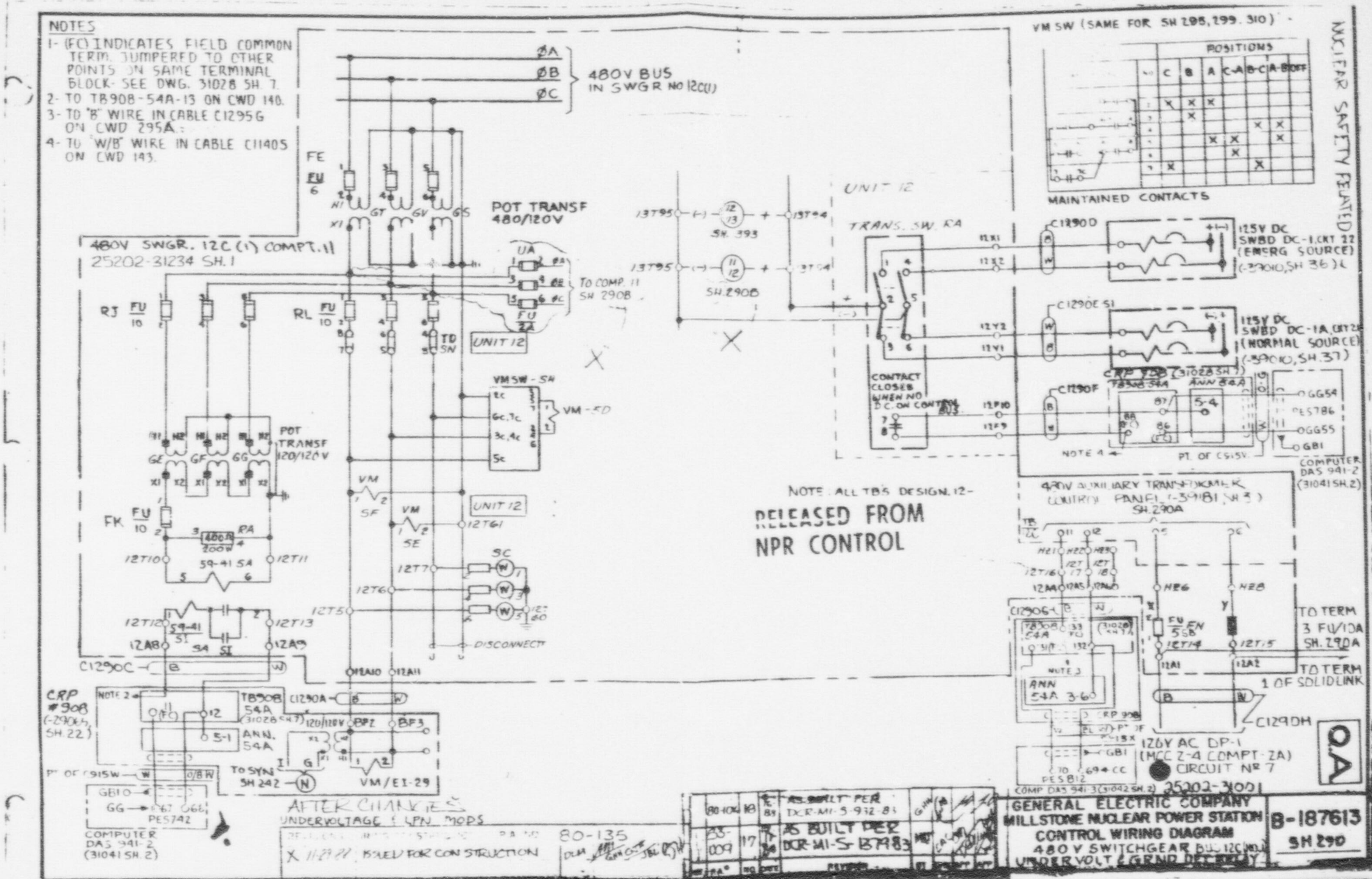
B-187613
SH 209

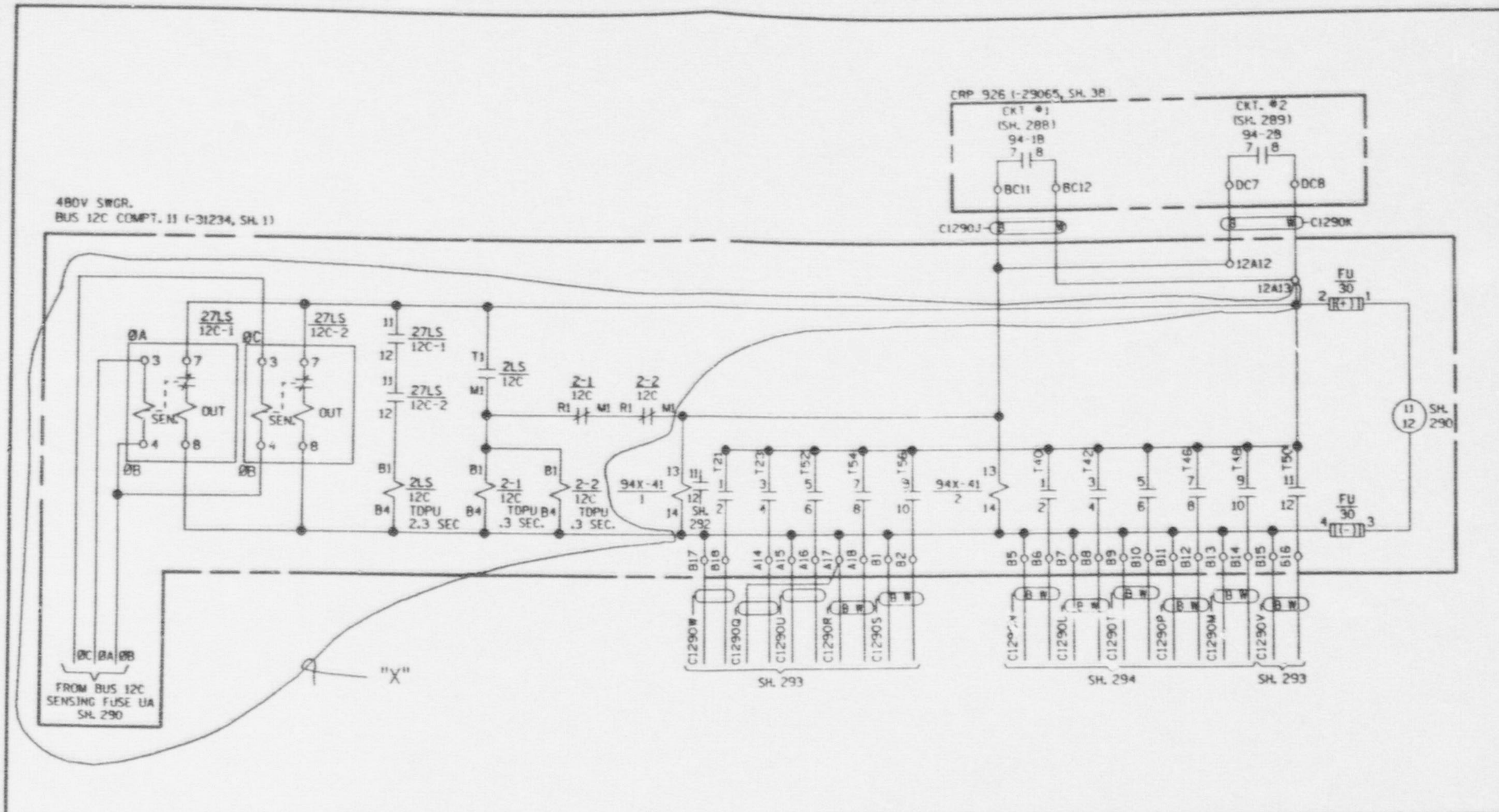
25202-31001

REVISIONS DURING CONSTRUCTION — P.A. NO

X 11-29-77 ISSUED FOR CONST.

AFTER CHANGES UNDER P.A. NO


NOTES
1- (FC) INDICATES FIELD COMMON TERM. JUMPERED TO OTHER POINTS ON SAME TERMINAL BLOCK- SEE DWG. 31028 SH. 7.
2- TO TB908-54A-13 ON CWD 140.
3- TO "B" WIRE IN CABLE C1295G ON CWD 295A.
4- TO "W/B" WIRE IN CABLE C11405 ON CWD 143.
480V BUS IN SWGR NO 12C(1)
480V SWGR. 12C (1) COMPT. 11
25202-31234 SH. 1
POT TRANSF 480/120V
POT TRANSF 120/120V
TO COMP. 11 SH 290B
UNIT 12
DISCONNECT
AFTER CHANGES
UNDERVOLTAGE & LPN MODS
80-135
ISSUED FOR CONSTRUCTION
NOTE: ALL TB'S DESIGN. 12-
RELEASED FROM
NPR CONTROL
TRANS. SW. RA
CONTACT CLOSES WHEN NO D.C. ON CONTROL BUS
VM SW (SAME FOR SH 298, 299, 310)
POSITIONS
MAINTAINED CONTACTS
NUCLEAR SAFETY RELATED
125V DC SWBD DC-1, CKT 22 (EMERG SOURCE) (-39010, SH 36)
125V DC SWBD DC-1A, CKT 22 (NORMAL SOURCE) (-39010, SH. 37)
COMPUTER DAS 941-2 (31041 SH. 2)
480V AUXILIARY TRANSFORMER CONTROL PANEL (-39181, SH 3) SH. 290A
TO TERM 3 FU/10A SH. 290A
TO TERM 1 OF SOLIDLINK
120V AC DP-1 (MCC Z-4 COMPT-ZA) CIRCUIT Nº 7
25202-31001
Q.A
AS BUILT PER DCR-MI-S-932-83
AS BUILT PER DCR-MI-S-137-83
GENERAL ELECTRIC COMPANY
MILLSTONE NUCLEAR POWER STATION
CONTROL WIRING DIAGRAM
480 V SWITCHGEAR BUS 12C (NO.1)
UNDERVOLT & GRND DETECTION
B-187613
SH 290



NON
Q.A.

AFTER CHANGES (SEE BEFORE OF SH. 290)

C.A.D.

NOTE:
MANUAL REVISIONS TO THIS DOCUMENT ARE PROHIBITED. ALL REVISIONS MUST BE PERFORMED BY THE NED CAD UNIT.

REVISIONS DURING CONSTRUCTION		P.A.#	80-135
X	11/29/88 ISSUED FOR CONSTRUCTION	DJH	

MF	P.A.#	NO.	DATE	REVISIONS	BY	CHK	APP	APP

NORTHEAST UTILITIES SERVICE CO.
FOR NORTHEAST NUCLEAR ENERGY CO.

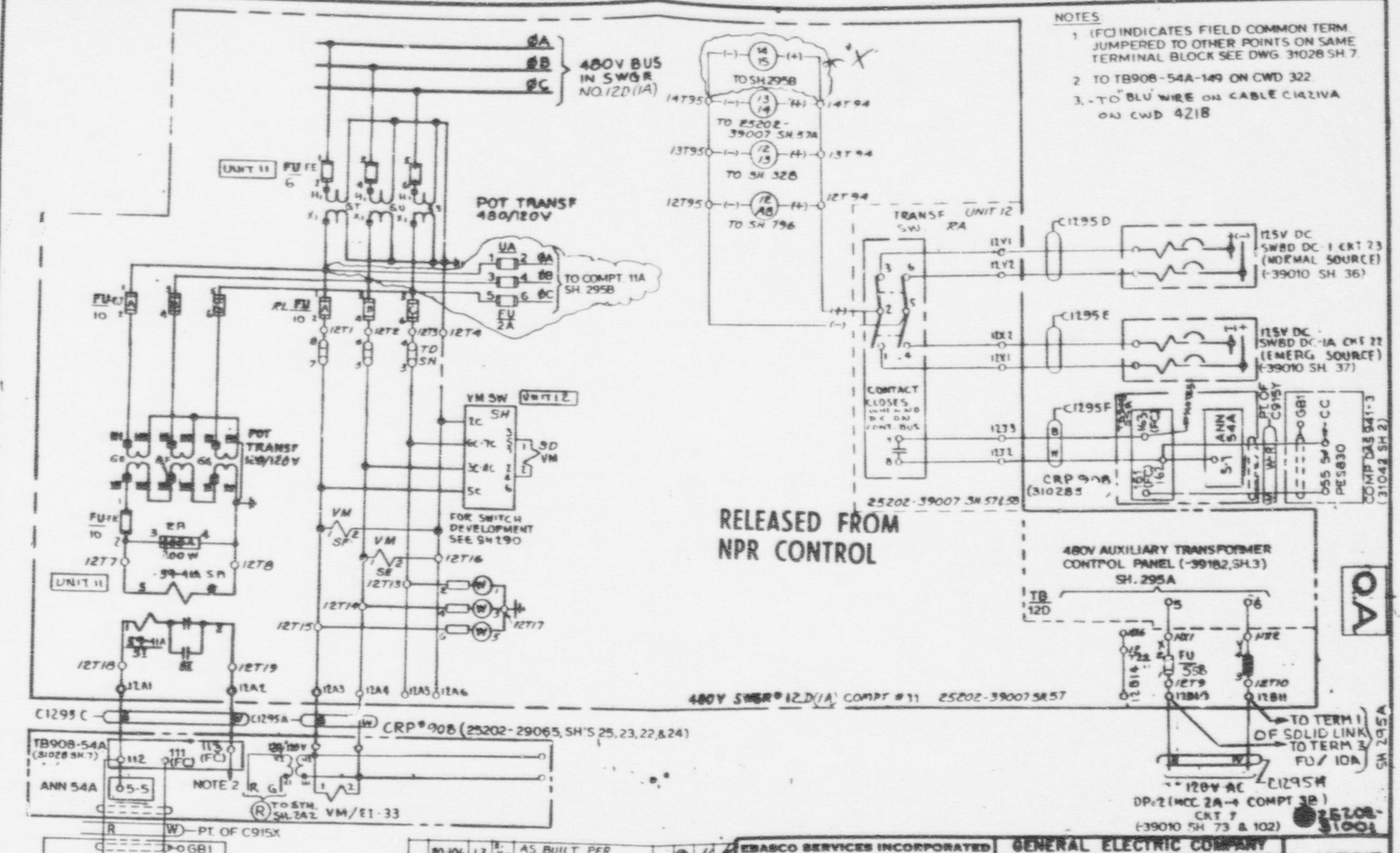
TITLE
MILLSTONE UNIT NO. 1
CWD - 480V BUS 12C UNDERVOLTAGE SENSING
WATERFORD, CT

BY DJH	CHKD.	APP.	APP.
DATE 5-24-88	DATE 11/29/88	DATE	DATE
SCALE N/A	DWG. NO.		
P.A.# 80-135	25202-31001 SH. 290B		

AFTER CHANGES
UNDERVOLTAGE & UVP MODS

80-135

REVISIONS DURING CONSTRUCTION | P.A. NO
X | 11-29-88 ISSUED FOR CONST.

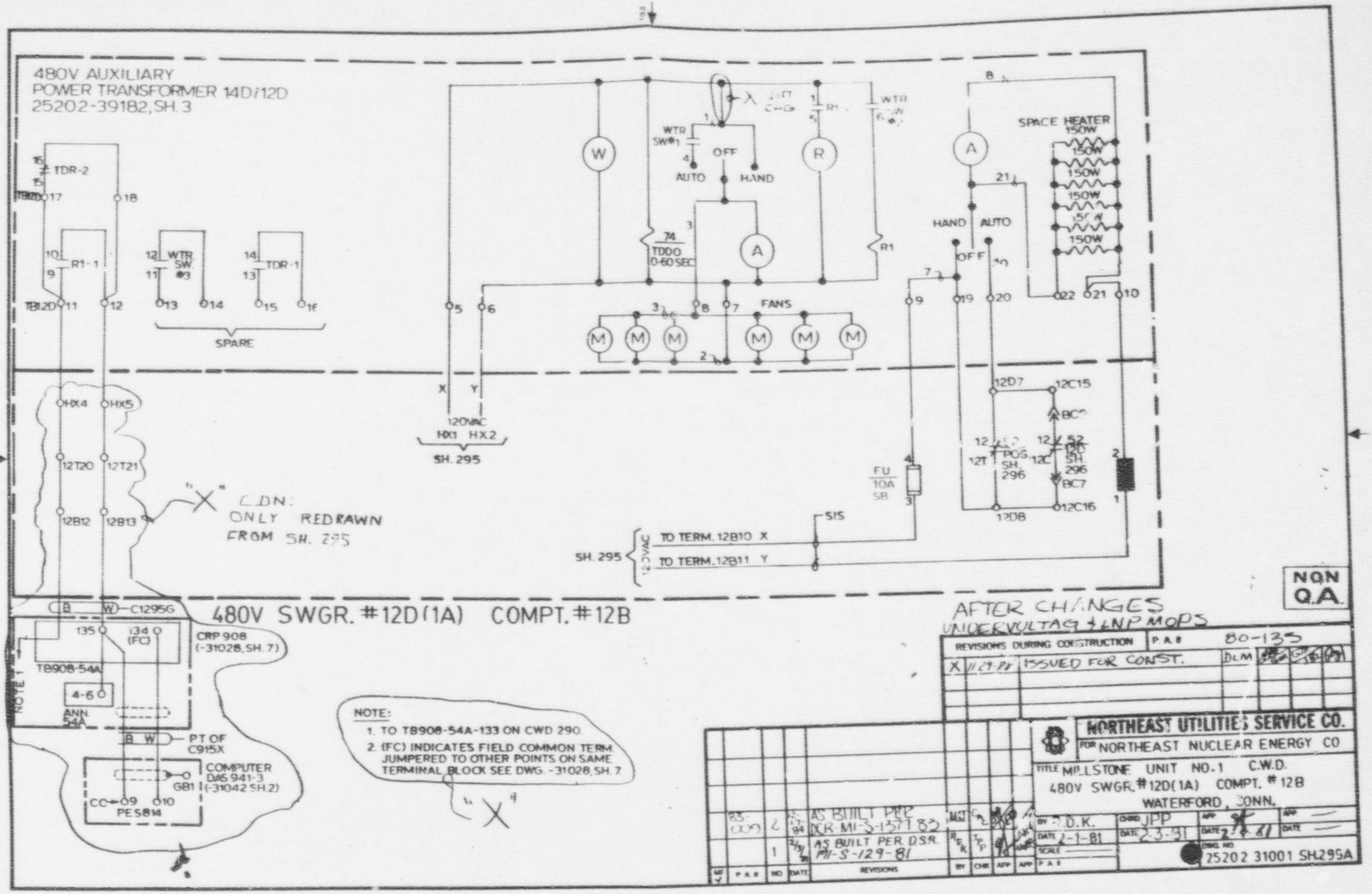


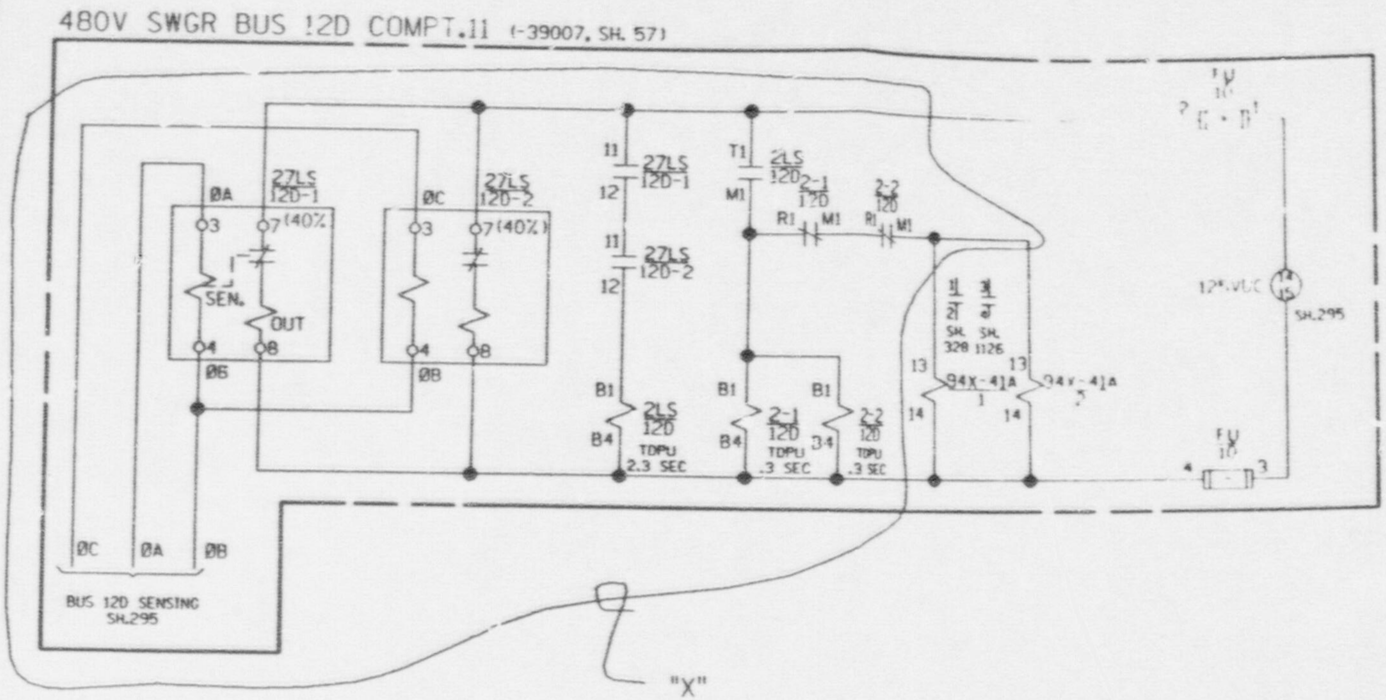
80-106	13		AS BUILT PER DCR-MI-S-932-83	
—	12		AS-BUILT PER DCR-MI-P-003-85	
4-5 009	11		AS BUILT PER DCR-MI-S-1377-83	
INT	PA*	NO	DATE	REVISION	BY	CHK	APP	APP

EBASCO SERVICES INCORPORATED
NEW YORK
DRN ELEC. DR. TR
SCALE — CH. JAG
DATE OCT 4 1968

GENERAL ELECTRIC COMPANY
MILLSTONE NUCLEAR POWER STATION
CONTROL WIRING DIAGRAM
480 V SWITCHGEAR NO 12D(1A)
UNDERVOLT & GRND DET RELAY

B-187613
SH 295


480V AUXILIARY
POWER TRANSFORMER 14D/12D
25202-39182, SH.3
TDR-2
R1-1
WTR SW. #3
TDR-1
SPARE
WTR SW#1
OFF
AUTO
HAND
TDDO 0-60 SEC
FANS
SPACE HEATER
150W
FU 10A SB
120VAC
HX1 HX2
SH. 295
TO TERM. 12B10 X
TO TERM. 12B11 Y
"X" CDN: ONLY REDRAWN FROM SH. 295
480V SWGR. #12D(1A) COMPT. #12B
CRP 908 (-31028, SH.7)
TB908-54A
ANN. 54A
PT OF C915X
COMPUTER DAS 941-3 (-31042 SH.2)
PES814
NOTE 1
NOTE:
1. TO TB908-54A-133 ON CWD 290.
2. (FC) INDICATES FIELD COMMON TERM. JUMPERED TO OTHER POINTS ON SAME TERMINAL BLOCK SEE DWG. -31028, SH. 7.
NON Q.A.
AFTER CHANGES
UNDERVOLTAG & LNP MODS
REVISIONS DURING CONSTRUCTION
80-135
ISSUED FOR CONST.
AS BUILT PER DCR-MI-S-1371-82
AS BUILT PER DSR. MI-S-129-81
REVISIONS
NORTHEAST UTILITIES SERVICE CO.
FOR NORTHEAST NUCLEAR ENERGY CO
TITLE MILLSTONE UNIT NO.1 C.W.D.
480V SWGR. #12D(1A) COMPT. #12B
WATERFORD, CONN.
25202 31001 SH.295A



THIS DWG. WAS REDRAWN IN PART FROM NUSCO DWG. 25202-31001, 2958, REV 13

AFTER CHANGES (SEE BEFORE OF SH. 295) UNDERVOLTAGE & LNP & MODS

NON Q.A.

C.A.D.

NOTE: MANUAL REVISIONS TO THIS DOCUMENT ARE PROHIBITED. ALL REVISIONS MUST BE PERFORMED BY THE GED CAD UNIT.

REVISIONS DURING CONSTRUCTION		P.A.# 80-135		
X		ISSUED FOR CONSTRUCTION	DJH	

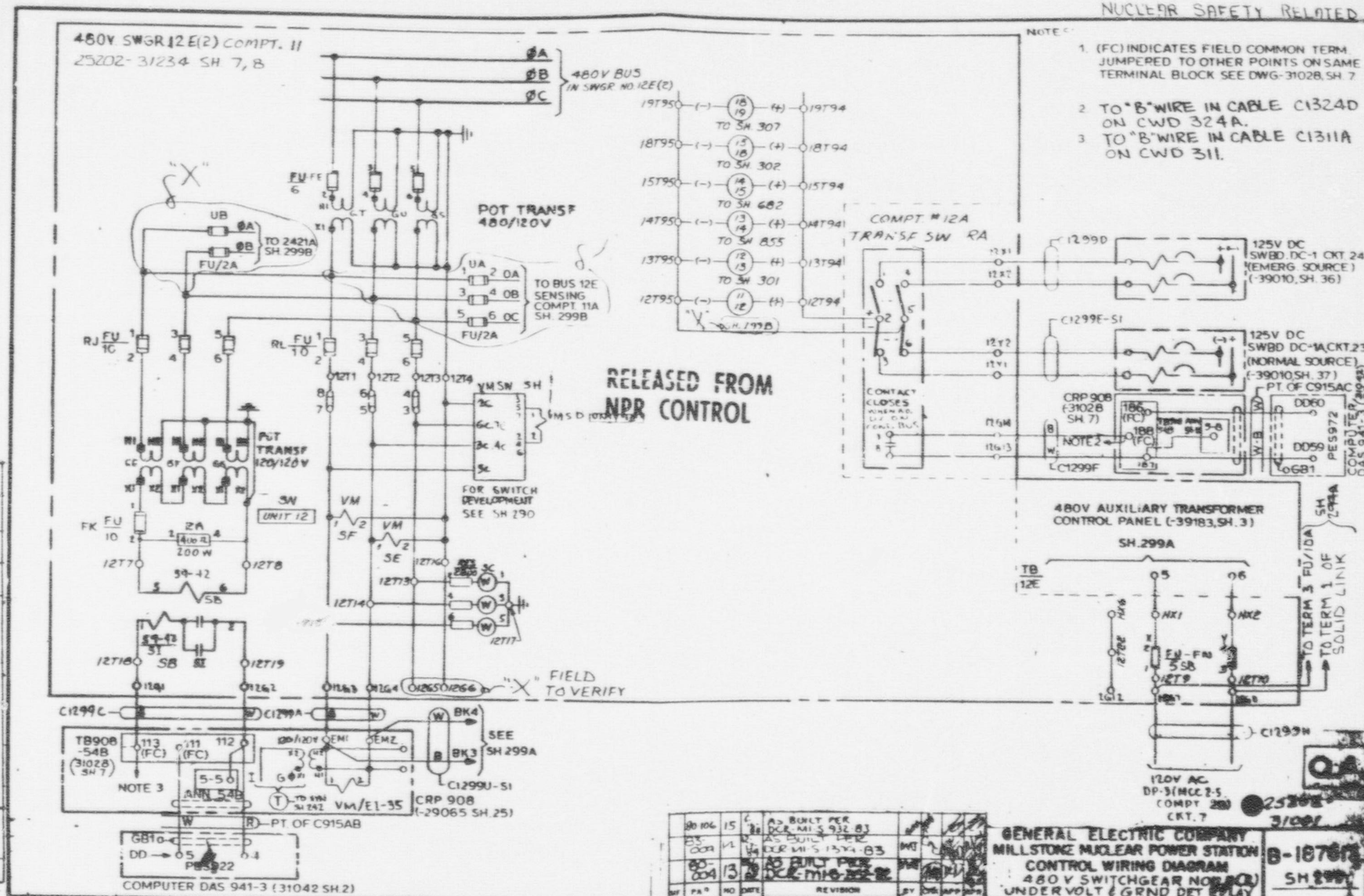
NORTHEAST UTILITIES SERVICE CO.

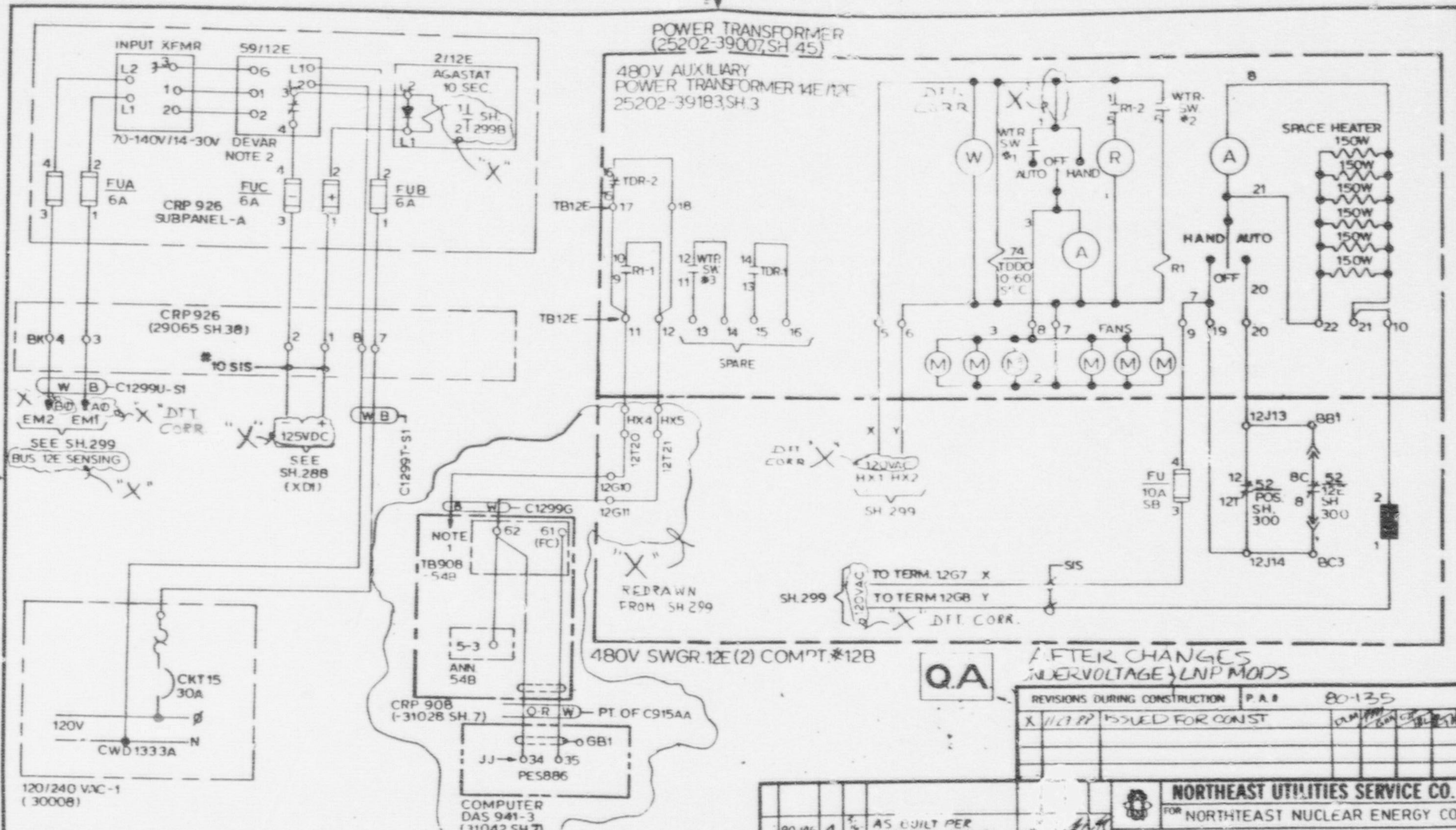
FOR MILLSTONE NUCLEAR ENERGY CO.

TITLE MILLSTONE UNIT NO.1 CWD 480V BUS 12D UNDERVOLTAGE SENSING WATERFORD, CT.

BY DLM	CHKD.	APP.	APP.
DATE 5-31-88	DATE	DATE	DATE
SCALE NONE	DWG. NO.	25202-31001 SH.2958	
P.A.# 80-135			

MF	P.A.#	NO.	DATE	REVISIONS	BY	CHK	APP	APP


NUCLEAR SAFETY RELATED
480V SWGR 12E(2) COMPT. 11
25202-31234 SH 7, 8
480V BUS IN SWGR NO 12E(2)
POT TRANSF 480/120V
TO BUS 12E SENSING COMPT. 11A SH. 299B
TO 2421A SH 299B
POT TRANSF 120/120V
UNIT 12
RELEASED FROM NPR CONTROL
COMPT #12A TRANSF SW RA
FOR SWITCH DEVELOPMENT SEE SH 290
"X" FIELD TO VERIFY
NOTES
1. (FC) INDICATES FIELD COMMON TERM. JUMPERED TO OTHER POINTS ON SAME TERMINAL BLOCK SEE DWG-31028, SH. 7
2. TO "B" WIRE IN CABLE C1324D ON CWD 324A.
3. TO "B" WIRE IN CABLE C1311A ON CWD 311.
125V DC SWBD DC-1 CKT 24 (EMERG. SOURCE) (-39010, SH. 36)
125V DC SWBD DC-1A CKT 23 (NORMAL SOURCE) (-39010, SH. 37)
PT. OF C915AC
CRP 908 (-31028 SH. 7)
COMPUTER DAS 941-3
480V AUXILIARY TRANSFORMER CONTROL PANEL (-39183, SH. 3)
SH. 299A
TO TERM 3 FU/1DA
TO TERM 1 OF SOLID LINK
120V AC. DP-3 (MCC 2-5 COMPT 2B) CKT. 7
TB908 -54B (31028 SH 7)
NOTE 3
SEE SH 299A
CRP 908 (-29065 SH. 25)
PT. OF C915AB
COMPUTER DAS 941-3 (31042 SH. 2)
AFTER CHANGES
UNDERVOLTAGE & LNP MODS
REVISIONS DURING CONSTRUCTION
P A NO. 80-135
ISSUED FOR CONST.
AS BUILT PER DCR-M-S 932-83
AS BUILT PER DCR M-S 1374-83
AS BUILT PER DCR-M16-252-82
REVISION
GENERAL ELECTRIC COMPANY
MILLSTONE NUCLEAR POWER STATION
CONTROL WIRING DIAGRAM
480 V SWITCHGEAR NO 12E(2)
UNDER VOLT & GRND DET RELAY
B-18761
OGILVIE PRESS INC. BROOKLYN 17, N. Y.



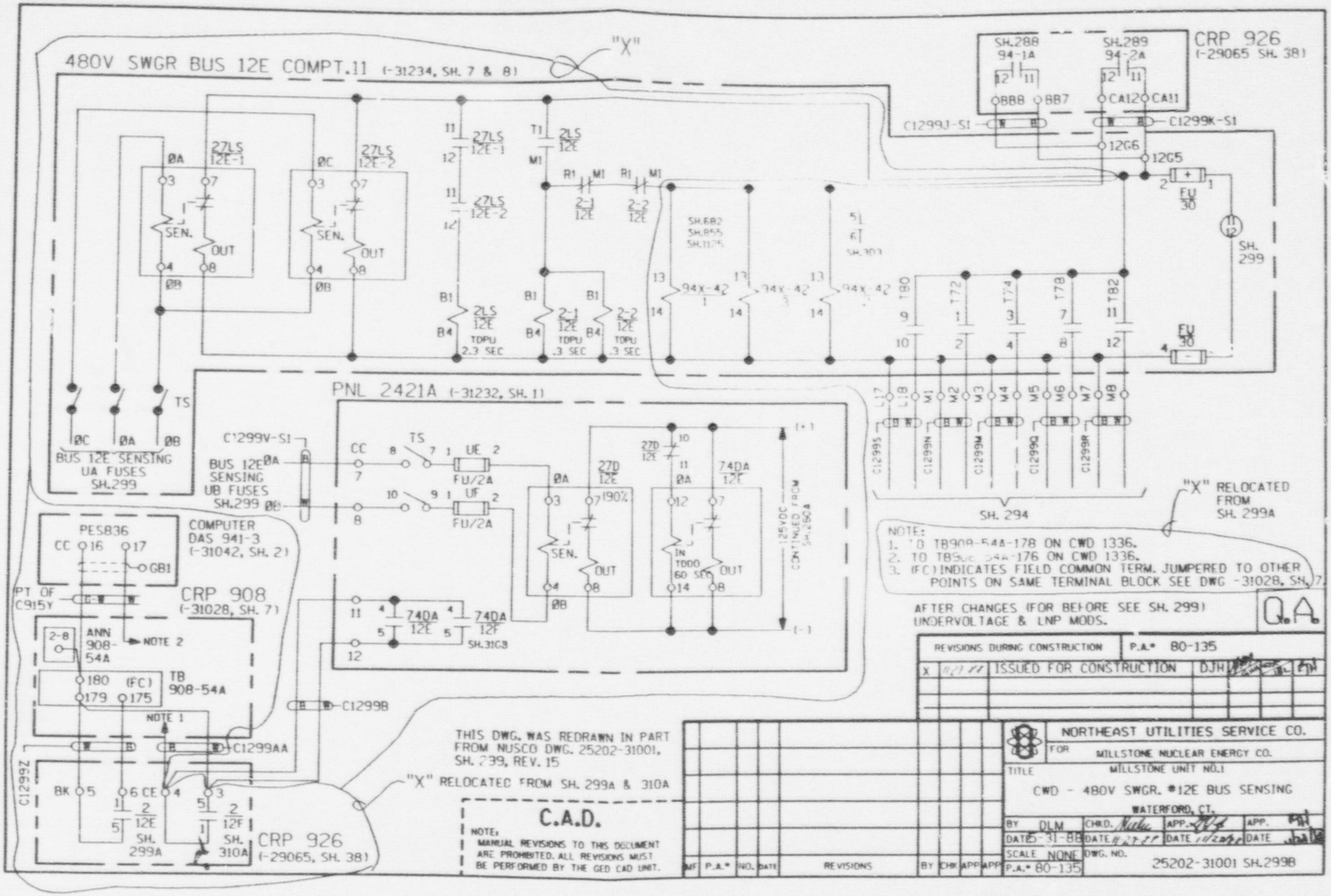
NOTES:
1. TO TB-908-54B-63 ON CWD 310
2. RELAY CLOSES WHEN PWR. SUPPLY TO L1 & L2 IS REMOVED & ALSO AT ALARM SET POINT OF OVERVOLTAGE. RELAY DOES NOT CLOSE WHEN ALARM SIGNAL TO 1&2 IS REMOVED.
3. -IN4004

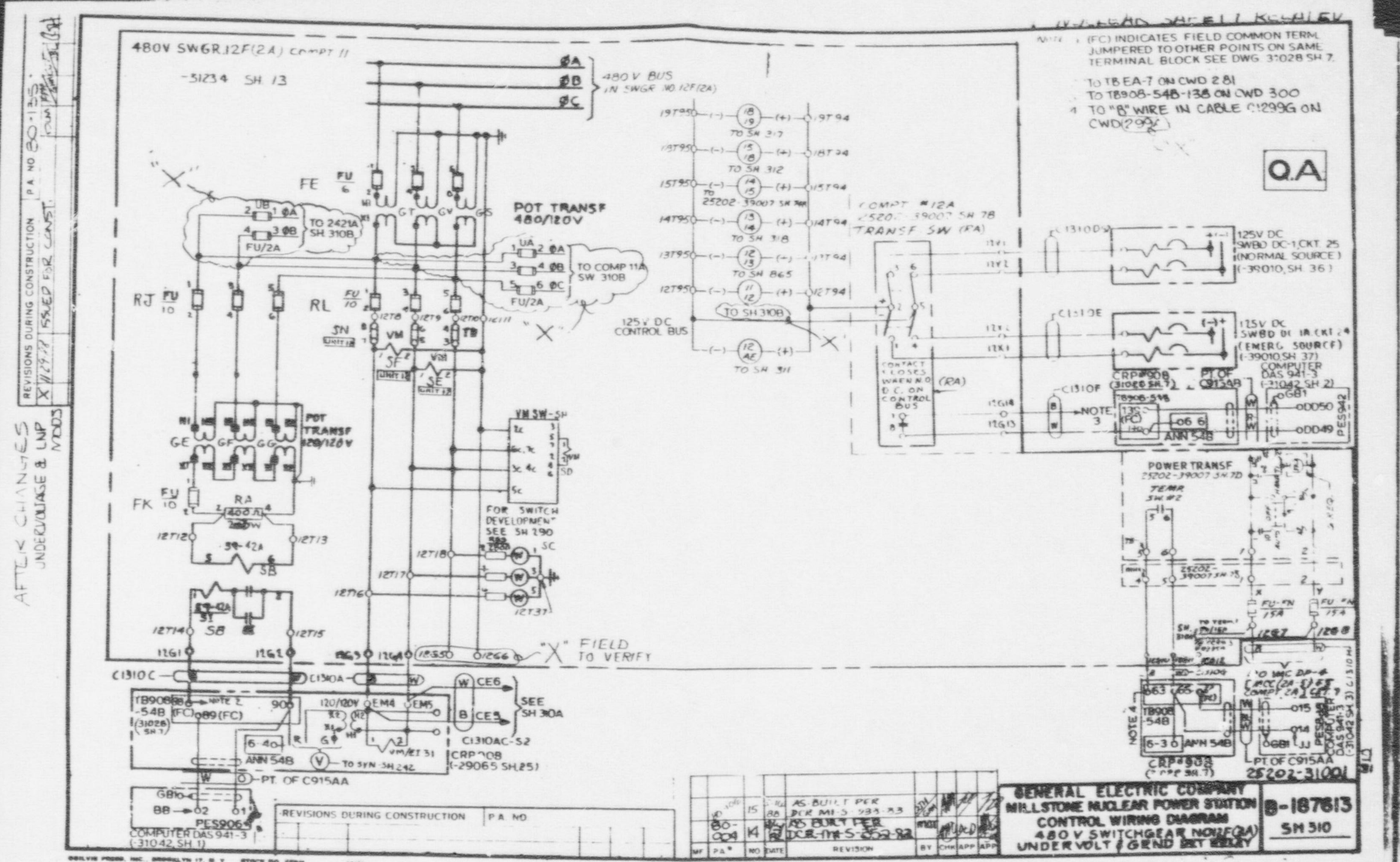
(FC) INDICATES FIELD COMMON TERM. JUMPERED TO OTHER POINTS ON SAME TERMINAL BLOCK SEE DWG. 31028, SH. 7.

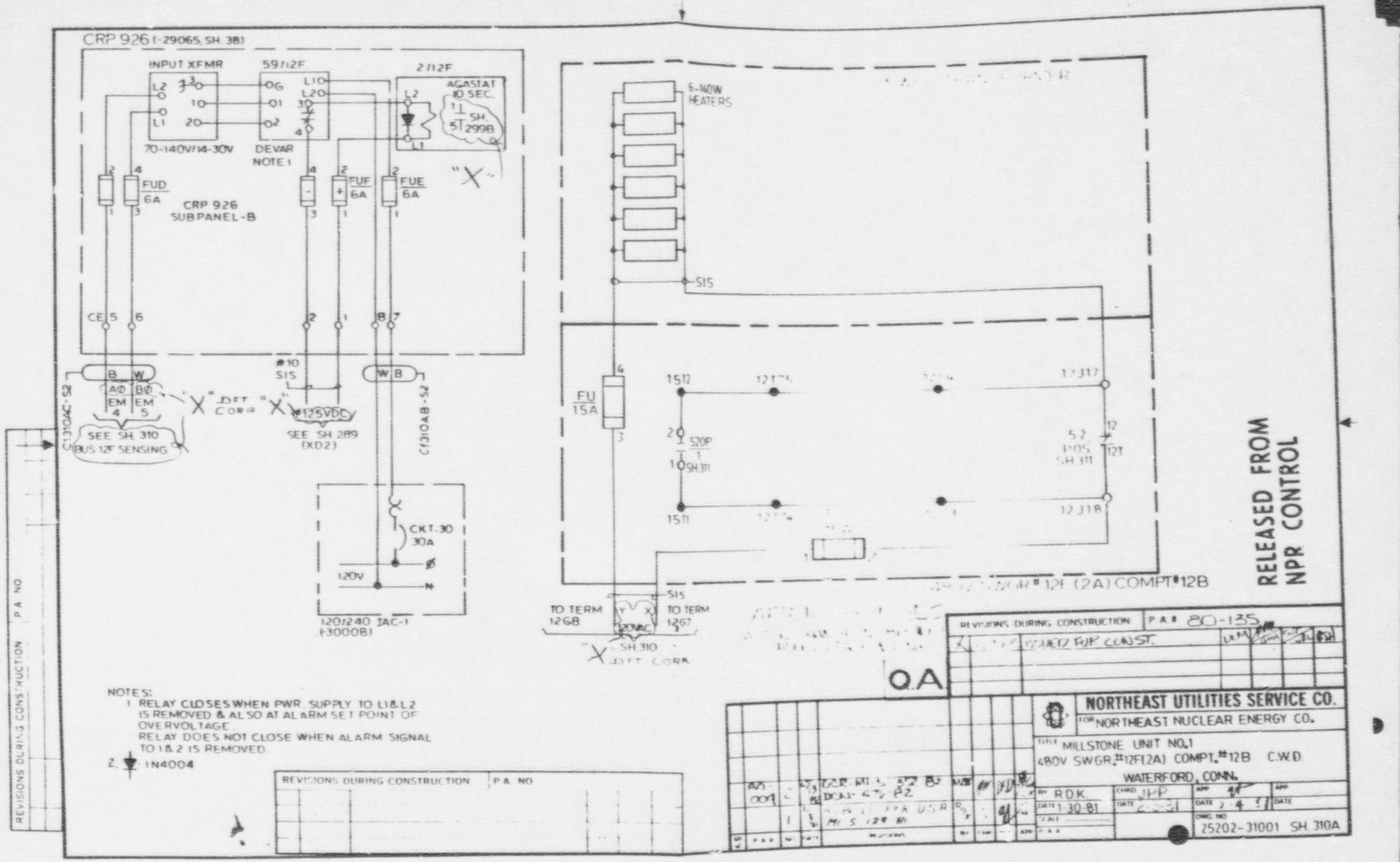
REVISIONS DURING CONSTRUCTION	P.A.#	80-135
X 11/21/77 ISSUED FOR CONST		

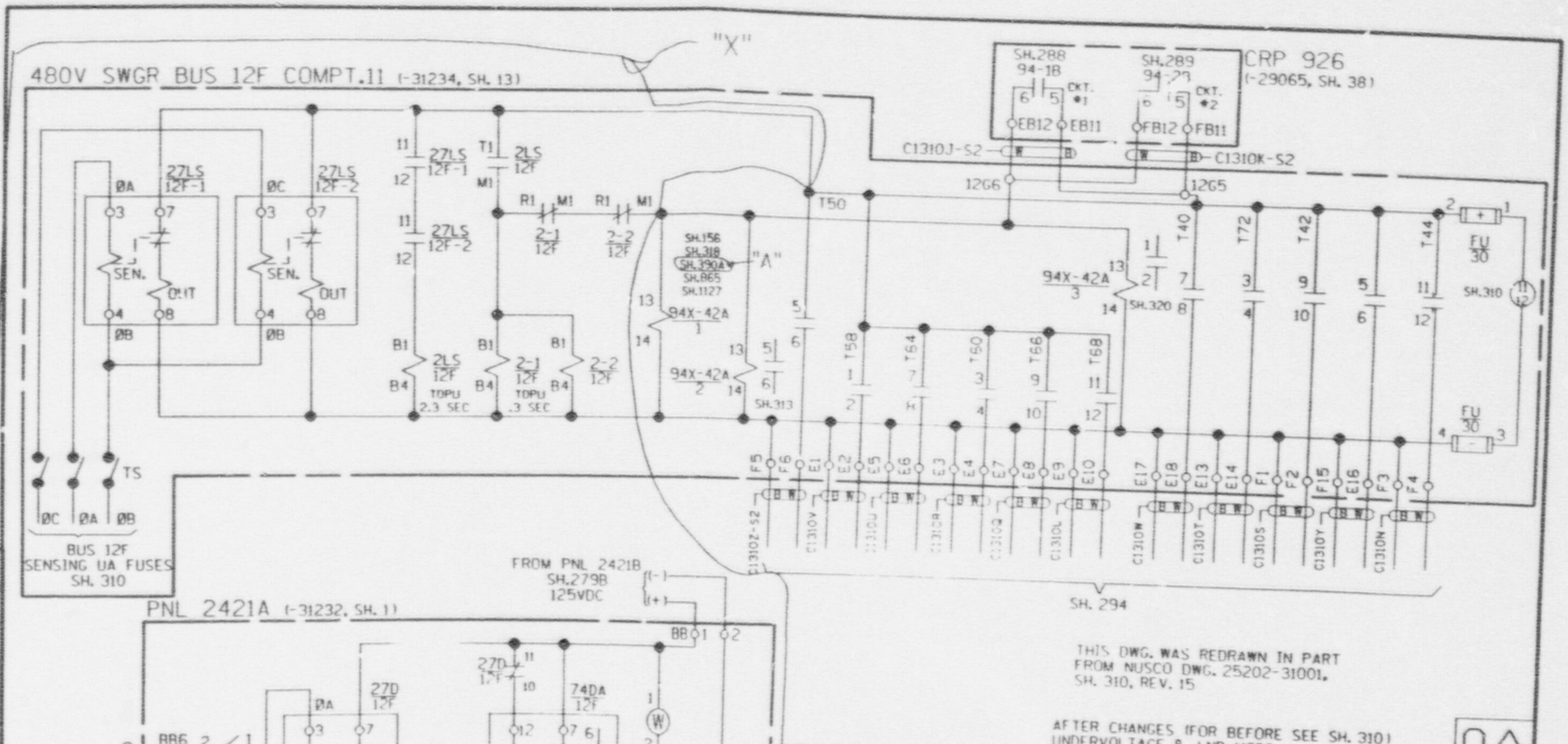
P.A.#	NO	DATE	REVISIONS	BY
80 106	4		AS BUILT PER DCR-MI-S 932-83	
83-009	3	1/89	AS BUILT PER DCR-MI-S-1371-83	
80-004	2	1/82	AS BUILT PER DCR-MI-S-352-82, DCN-0476-82	
	1		AS BUILT PER DSR MI-S-129-81	R.D.K.

NORTHEAST UTILITIES SERVICE CO.
FOR NORTHEAST NUCLEAR ENERGY CO.
TITLE MILLSTONE UNIT NO.1
480V SWGR.#12E(2) COMPT.#12B CWD.
WATERFORD, CONN.
BY R.D.K. CHKD JPP
DATE 2-1-81 DATE 2-3-81
DWG. NO. 25202-31001 SH.299A


480V SWGR BUS 12E COMPT.11 (-31234, SH. 7 & 8)
CRP 926 (-29065 SH. 38)
SH.288 94-1A
SH.289 94-2A
C1299J-S1
C1299K-S1
27LS 12E-1
27LS 12E-2
2LS 12E
TDPU 2.3 SEC
TDPU .3 SEC
SEN.
OUT
94X-42
SH. 299
FU 30
BUS 12E SENSING UA FUSES SH.299
BUS 12E SENSING UB FUSES SH.299
C1299V-S1
PNL 2421A (-31232, SH. 1)
FU/2A
27D 12E
74DA 12E
74DA 12F
125VDC CONTINUED FROM SH.280A
SH. 294
"X" RELOCATED FROM SH. 299A
NOTE:
1. TO TB908-54A-178 ON CWD 1336.
2. TO TB908-54A-176 ON CWD 1336.
3. (FC) INDICATES FIELD COMMON TERM. JUMPERED TO OTHER POINTS ON SAME TERMINAL BLOCK SEE DWG -31028, SH. 7.
AFTER CHANGES (FOR BEFORE SEE SH. 299) UNDERVOLTAGE & LNP MODS.
Q.A.
PES836
COMPUTER DAS 941-3 (-31042, SH. 2)
PT OF C915Y
CRP 908 (-31028, SH. 7)
ANN 908-54A
TB 908-54A
NOTE 1
NOTE 2
C1299AA
C1299B
C1299Z
CRP 926 (-29065, SH. 38)
THIS DWG. WAS REDRAWN IN PART FROM NUSCO DWG. 25202-31001, SH. 299, REV. 15
"X" RELOCATED FROM SH. 299A & 310A
C.A.D.
NOTE: MANUAL REVISIONS TO THIS DOCUMENT ARE PROHIBITED. ALL REVISIONS MUST BE PERFORMED BY THE GED CAD UNIT.
REVISIONS DURING CONSTRUCTION
P.A.# 80-135
ISSUED FOR CONSTRUCTION
DJH
NORTHEAST UTILITIES SERVICE CO.
FOR MILLSTONE NUCLEAR ENERGY CO.
MILLSTONE UNIT NO.1
CWD - 480V SWGR. #12E BUS SENSING
WATERFORD, CT.
BY DLM
DATE 5-31-88
SCALE NONE
P.A.# 80-135
DWG. NO. 25202-31001 SH.299B
REVISIONS


480V SWGR.12F(2A) COMPT 11
-31234 SH 13
480 V BUS IN SWGR NO.12F(2A)
POT TRANSF 480/120V
TO 2421A SH 310B
TO COMP 11A SW 310B
125V DC CONTROL BUS
TO SH 310B
COMPT #12A
TRANSF SW (RA)
125V DC SWBD DC-1,CKT. 25 (NORMAL SOURCE) (-39010,SH. 36)
125V DC (EMERG. SOURCE) (-39010,SH 37)
COMPUTER DAS 941-3 (-31042 SH 2)
POWER TRANSF
FOR SWITCH DEVELOPMENT SEE SH 290
"X" FIELD TO VERIFY
SEE SH 30A
PT. OF C915AA
COMPUTER DAS 941-3 (-31042 SH 1)
REVISIONS DURING CONSTRUCTION
P.A. NO
NOTE: (FC) INDICATES FIELD COMMON TERM. JUMPERED TO OTHER POINTS ON SAME TERMINAL BLOCK SEE DWG 31028 SH 7.
TO TB EA-7 ON CWD 281
TO TB908-54B-138 ON CWD 300
4 TO "B" WIRE IN CABLE C1299G ON CWD(299)
Q.A
AS BUILT PER DCR M1-S-933-83
AS BUILT PER DCR-M1-S-252-82
REVISION
GENERAL ELECTRIC COMPANY
MILLSTONE NUCLEAR POWER STATION
CONTROL WIRING DIAGRAM
480 V SWITCHGEAR NO.12F(2A)
UNDERVOLT & GRND DET RELAY
B-187813
SH 310
25202-31001
AFTER CHANGES
UNDERVOLTAGE & LNP MODS
REVISIONS DURING CONSTRUCTION
ISSUED FOR CONST.
P.A. NO 80-135


CRP 926 (-29065, SH. 38)
INPUT XFMR
59/12F
2/12F
AGASTAT 10 SEC.
70-140V/14-30V
DEVAR NOTE 1
FUD 6A
CRP 926 SUBPANEL-B
FUF 6A
FUE 6A
"X"
6-140W HEATERS
SIS
FU 15A
C1310AC-S2
C1310AB-S2
SEE SH. 310 BUS 12F SENSING
#10 SIS
125VDC
SEE SH 289 (XD2)
CKT. 30 30A
120V
120/240 IAC-1 (30008)
520P 1 SH311
52 POS SH.311
12J17
12J18
TO TERM 1268
TO TERM 1267
120VAC
SH.310
DFT CORR
COMPT.#12B
RELEASED FROM NPR CONTROL
REVISIONS DURING CONSTRUCTION
P.A.# 80-135
ISSUED FOR CONST.
Q.A
NOTES:
1. RELAY CLOSES WHEN PWR. SUPPLY TO L1 & L2 IS REMOVED & ALSO AT ALARM SET POINT OF OVERVOLTAGE. RELAY DOES NOT CLOSE WHEN ALARM SIGNAL TO 1 & 2 IS REMOVED.
2. 1N4004
NORTHEAST UTILITIES SERVICE CO.
FOR NORTHEAST NUCLEAR ENERGY CO.
MILLSTONE UNIT NO.1
480V SWGR.#12F(2A) COMPT.#12B C.W.D.
WATERFORD, CONN.
R.D.K.
1-30-81
JPP
25202-31001 SH. 310A
P.A. NO



THIS DWG. WAS REDRAWN IN PART FROM NUSCO DWG. 25202-31001, SH. 310, REV. 15

AFTER CHANGES (FOR BEFORE SEE SH. 310) UNDERVOLTAGE & LNP MODS.

Q.A.

C.A.D.

NOTE: MANUAL REVISIONS TO THIS DOCUMENT ARE PROHIBITED. ALL REVISIONS MUST BE PERFORMED BY THE GED CAD UNIT.

REVISIONS DURING CONSTRUCTION	P.A.# 80-135
X 11/29/88 ISSUED FOR CONSTRUCTION	DJH

NORTHEAST UTILITIES SERVICE CO.

FOR MILLSTONE NUCLEAR ENERGY CO.

MILLSTONE UNIT NO.1

TITLE CWD - 480V SWGR. #12F BUS SENSING

WATERFORD, CT.

BY DLM; DATE 5-31-88; SCALE NONE; P.A.# 80-135; DWG. NO. 25202-31001 SH.310B

REVISIONS DURING CONSTRUCTION	P.A.#	
4 ISSUE FOR CONSTRUCTION	82-037	DLM

AFTER CHANGES (NO BEFORE) INSTR AIR COMP. REPLACE.

MILLSTONE UNIT 1 RELAY SETTINGS

4.16KV BUS 14A — PT RATIO 4200/120

QTY	DEVICE NO.	TYPE	CAT. NO.	RANGE	FUNCTION	SETTINGS	PRIMARY	NOTES
3	27DA/14A	BBC ITE-27N	211T0175	60-110V	DEGRADED VOLTAGE ALARM	D.O. @ 106.6V P.U. <= 107.3V	3731V	L2421A
1	74DA/14A	BBC ITE-62K	217T3175	0-100SEC	DEG. VOLT. ALM. TIME DELAY	10.0 SEC. TDDO	N/A	L2421A
2	27LS/14A	BBC ITE-27H	211R0275	30-55V	LOSS-OF-VOLTS SCRAM & BUS LS	D.O. @ 45.7V P.U. @ 47.1V	1600V	BUS 14A, CUB. 6
1	2LS/14A	AGASTAT	ETR14D3AN	.15-3SEC	LOSS-OF-VOLTS TD SCRM & BUS LS	2.3 SEC. TDPU	N/A	BUS 14A, CUB. 6
1	2-1/14A	AGASTAT	ETR14D3AN	.15-3SEC	LOSS-OF-VOLTS SCRM & LS PULSE	0.3 SEC. TDPU	N/A	BUS 14A, CUB. 6
1	2-2/14A	AGASTAT	ETR14D3AN	.15-3SEC	LOSS-OF-VOLTS SCRM & LS PULSE	0.3 SEC. TDPU	N/A	BUS 14A, CUB. 6

4.16KV BUS 14B — PT RATIO 4200/120

QTY	DEVICE NO.	TYPE	CAT. NO.	RANGE	FUNCTION	SETTINGS	PRIMARY	NOTES
2	27LS/14B	BBC ITE-27H	211R0275	30-55V	LOSS-OF-VOLTS SCRAM & BUS LS	D.O. @ 45.7V P.U. <= 47.1V	1600V	BUS 14B, CUB. 5
1	2LS/14B	AGASTAT	ETR14D3AN	.15-3SEC	LOSS-OF-VOLTS TD SCRM & BUS LS	2.3 SEC. TDPU	N/A	BUS 14B, CUB. 5
1	2-1/14B	AGASTAT	ETR14D3AN	.15-3SEC	LOSS-OF-VOLTS SCRM & LS PULSE	0.3 SEC. TDPU	N/A	BUS 14B, CUB. 5
1	2-2/14B	AGASTAT	ETR14D3AN	.15-3SEC	LOSS-OF-VOLTS SCRM & LS PULSE	0.3 SEC. TDPU	N/A	BUS 14B, CUB. 5

4.16KV BUS 14C — PT RATIO 4200/120

QTY	DEVICE NO.	TYPE	CAT. NO.	RANGE	FUNCTION	SETTINGS	PRIMARY	NOTES
2	27LS/14C	BBC ITE-27H	211R0275	30-55V	LOSS-OF-VOLTS SCRAM & BUS LS	D.O. @ 45.7V P.U. <= 47.1V	1600V	BUS 14C, CUB. 8
1	2LS/14C	AGASTAT	ETR14D3AN	.15-3SEC	LOSS-OF-VOLTS TD SCRM & BUS LS	2.3 SEC. TDPU	N/A	BUS 14C, CUB. 8
1	2-1/14C	AGASTAT	ETR14D3AN	.15-3SEC	LOSS-OF-VOLTS SCRM & LS PULSE	0.3 SEC. TDPU	N/A	BUS 14C, CUB. 8
1	2-2/14C	AGASTAT	ETR14D3AN	.15-3SEC	LOSS-OF-VOLTS SCRM & LS PULSE	0.3 SEC. TDPU	N/A	BUS 14C, CUB. 8

4.16KV BUS 14D — PT RATIO 4200/120

QTY	DEVICE NO.	TYPE	CAT. NO.	RANGE	FUNCTION	SETTINGS	PRIMARY	NOTES
2	27LS/14D	BBC ITE-27H	211R0275	30-55V	LOSS-OF-VOLTS SCRAM & BUS LS	D.O. @ 45.7V P.U. <= 47.1V	1600V	BUS 14D, CUB. 7
1	2LS/14D	AGASTAT	ETR14D3AN	.15-3SEC	LOSS-OF-VOLTS TD SCRM & BUS LS	2.3 SEC. TDPU	N/A	BUS 14D, CUB. 7
1	2-1/14B	AGASTAT	ETR14D3AN	.15-3SEC	LOSS-OF-VOLTS SCRM & LS PULSE	0.3 SEC. TDPU	N/A	BUS 14D, CUB. 7
1	2-2/14B	AGASTAT	ETR14D3AN	.15-3SEC	LOSS-OF-VOLTS SCRM & LS PULSE	0.3 SEC. TDPU	N/A	BUS 14D, CUB. 7

4.16KV BUS 14E — PT RATIO 4200/120

QTY	DEVICE NO.	TYPE	CAT. NO.	RANGE	FUNCTION	SETTINGS	PRIMARY	NOTES
6	27L/14E	BBC ITE-27H	211R0175	60-110V	LOSS OF VOLTAGE TRIP	D.O. @ 84.2V P.U. <= 86.7V	2947V	Tech Spec L2421B
6	27D/14E	BBC ITE-27N	211T0175	60-110V	DEGRADED VOLTAGE TRIP	D.O. @ 106.6V P.U. <= 107.3V	3731V	Tech Spec L2421B
2	62LT/14E	BBC ITE-62K	217K0275D	.2-4SEC	LOSS OF VOLTAGE TRIP TD	2.0 SEC TDDO	N/A	Tech Spec L2421B
1	62DT/14E	BBC ITE-62K	217T3175	0-100SEC	DEGRADED VOLTAGE TRIP TD	8.0 SEC TDDO	N/A	Tech Spec L2421B
1	62DT/14E	BBC ITE-62K	217K0575D	0-100SEC	DEGRADED VOLTAGE TRIP TD	8.0 SEC TDDO	N/A	Tech Spec L2421B
1	74TA/14E	BBC ITE-62K	217K5075	0-100SEC	TROUBLE ALARM TIME DELAY	10.0 SEC TDPU	N/A	L2421B
[illegible]	62LS/14E	BBC ITE-62K	217T2175	.2-4SEC	LOSS-OF-VOLTS TD BUS LOAD SHED	2.3 SEC. TDDO	N/A	L2421B
1	2-1/14E	AGASTAT	ETR14D3AN	.15-3SEC	LOSS-OF-VOLTS BUS LS PULSE	0.3 SEC. TDPU	N/A	BUS 14E, CUB. 2
1	2-2/14E	AGASTAT	ETR14D3AN	.15-3SEC	LOSS-OF-VOLTS BUS LS PULSE	0.3 SEC. TDPU	N/A	BUS 14E, CUB. 2

4.16KV BUS 14F — PT RATIO 4200/120

QTY	DEVICE NO.	TYPE	CAT. NO.	RANGE	FUNCTION	SETTINGS	PRIMARY	NOTES
6	27L/14F	BBC ITE-27H	211R0175	60-110V	LOSS OF VOLTAGE TRIP	D.O. @ 84.2V P.U. <= 86.7V	2947V	Tech Spec L2422
6	27D/14F	BBC ITE-27N	211T0175	60-110V	DEGRADED VOLTAGE TRIP	D.O. @ 106.6V P.U. <= 107.3V	3731V	Tech Spec L2422
2	62LT/14F	BBC ITE-62K	217K0275D	.2-4SEC	LOSS OF VOLTAGE TRIP TD	2.0 SEC TDDO	N/A	Tech Spec L2422
1	62DT/14F	BBC ITE-62K	217T3175	0-100SEC	DEGRADED VOLTAGE TRIP TD	8.0 SEC TDDO	N/A	Tech Spec L2422
1	62DT/14F	BBC ITE-62K	217K0575D	0-100SEC	DEGRADED VOLTAGE TRIP TD	8.0 SEC TDDO	N/A	Tech Spec L2422
1	74TA/14F	BBC ITE-62K	217K5075	0-100SEC	TROUBLE ALARM TIME DELAY	10.0 SEC TDPU	N/A	L2422
1	62LS/14F	BBC ITE-62K	217T2175	.2-4SEC	LOSS-OF-VOLTS TD BUS LOAD SHED	2.3 SEC. TDDO	N/A	L2422
1	2-1/14F	AGASTAT	ETR14D3AN	.15-3SEC	LOSS-OF-VOLTS BUS LS PULSE	0.3 SEC. TDPU	N/A	BUS 14F, CUB. 2
1	2-2/14F	AGASTAT	ETR14D3AN	.15-3SEC	LOSS-OF-VOLTS BUS LS PULSE	0.3 SEC. TDPU	N/A	BUS 14F, CUB. 2

MILLSTONE UNIT 1 RELAY SETTINGS

480V BUS 12C — PT RATIO 480/120

QTY	DEVICE NO.	TYPE	CAT. NO.	RANGE	FUNCTION	SETTINGS	PRIMARY	NOTES
2	27LS/12C	BBC ITE-27H	211R0275	30-55V	LOSS-OF-VOLTS BUS LOAD SHED	D.O. @ 45.7V P.U. <= 47.1V	183V	AUX. PNL.
1	2LS/12C	AGASTAT	ETR14D3AN	.15-3SEC	LOSS-OF-VOLTS TD BUS LOAD SHED	2.3 SEC. TDPU	N/A	AUX. PNL.
1	2-1/12C	AGASTAT	ETR14D3AN	.15-3SEC	LOSS-OF-VOLTS BUS LS PULSE	0.3 SEC. TDPU	N/A	AUX. PNL.
1	2-2/12C	AGASTAT	ETR14D3AN	.15-3SEC	LOSS-OF-VOLTS BUS LS PULSE	0.3 SEC. TDPU	N/A	AUX. PNL.

480V BUS 12D — PT RATIO 480/120

QTY	DEVICE NO.	TYPE	CAT. NO.	RANGE	FUNCTION	SETTINGS	PRIMARY	NOTES
2	27LS/12D	BBC ITE-27H	211R0275	30-55V	LOSS-OF-VOLTS BUS LOAD SHED	D.O. @ 45.7V P.U. <= 47.1V	183V	AUX. PNL.
1	2LS/12D	AGASTAT	ETR14D3AN	.15-3SEC	LOSS-OF-VOLTS TD BUS LOAD SHED	2.3 SEC. TDPU	N/A	AUX. PNL.
1	2-1/12D	AGASTAT	ETR14D3AN	.15-3SEC	LOSS-OF-VOLTS BUS LS PULSE	0.3 SEC. TDPU	N/A	AUX. PNL.
1	2-2/12D	AGASTAT	ETR14D3AN	.15-3SEC	LOSS-OF-VOLTS BUS LS PULSE	0.3 SEC. TDPU	N/A	AUX. PNL.

4.16KV BUS 12E — PT RATIO 480/120

QTY	DEVICE NO.	TYPE	CAT. NO.	RANGE	FUNCTION	SETTINGS	PRIMARY	NOTES
1	27D/12E	BBC ITE-27N	211T0175	60-110V	DEGRADED VOLTAGE ALARM	D.O. @ 109.3V P.U. <= 110.0V	418V	L2421A
1	74DA/12E	BBC ITE-62K	217K0575D	0-100SEC	DEG. VOLT. ALM. TIME DELAY	60.0 SEC. TDDO	N/A	L2421A
2	27LS/12E	BBC ITE-27H	211R0275	30-55V	LOSS-OF-VOLTS BUS LOAD SHED	D.O. @ 45.7V P.U. <= 47.1V	183V	AUX. PNL.
1	2LS/12E	AGASTAT	ETR14D3AN	.15-3SEC	LOSS-OF-VOLTS TD BUS LOAD SHED	2.3 SEC. TDPU	N/A	AUX. PNL.
1	2-1/12E	AGASTAT	ETR14D3AN	.15-3SEC	LOSS-OF-VOLTS BUS LS PULSE	0.3 SEC. TDPU	N/A	AUX. PNL.
1	2-2/12E	AGASTAT	ETR14D3AN	.15-3SEC	LOSS-OF-VOLTS BUS LS PULSE	0.3 SEC. TDPU	N/A	AUX. PNL.

4.16KV BUS 12F — PT RATIO 480/120

QTY	DEVICE NO.	TYPE	CAT. NO.	RANGE	FUNCTION	SETTINGS	PRIMARY	NOTES
1	27D/12F	BBC ITE-27N	211T0175	60-110V	DEGRADED VOLTAGE ALARM	D.O. @ 109.3V P.U. <= 110.0V	418V	L2422
1	74DA/12F	BBC ITE-62K	217K0575D	0-100SEC	DEG. VOLT. ALM. TIME DELAY	60.0 SEC. TDDO	N/A	L2422
2	27LS/12F	BBC ITE-27H	211R0275	30-55V	LOSS-OF-VOLTS BUS LOAD SHED	D.O. @ 45.7V P.U. <= 47.1V	183V	AUX. PNL.
1	2LS/12F	AGASTAT	ETR14D3AN	.15-3SEC	LOSS-OF-VOLTS TD BUS LOAD SHED	2.3 SEC. TDPU	N/A	AUX. PNL.
1	2-1/12F	AGASTAT	ETR14D3AN	.15-3SEC	LOSS-OF-VOLTS BUS LS PULSE	0.3 SEC. TDPU	N/A	AUX. PNL.
1	2-2/12F	AGASTAT	ETR14D3AN	.15-3SEC	LOSS-OF-VOLTS BUS LS PULSE	0.3 SEC. TDPU	N/A	AUX. PNL.

LNP CIRCUITS 61 & 62

QTY	DEVICE NO.	TYPE	CAT. NO.	RANGE	FUNCTION	SETTINGS	PRIMARY	NOTES
1	2-1	AGASTAT	ETR14D3AN	.15-3SEC	LNP AND BUS LOAD SHED PULSE	0.3 SEC. TDPU	N/A	TechSpec CRP 926
1	2-2	AGASTAT	ETR14D3AN	.15-3SEC	LNP AND BUS LOAD SHED PULSE	0.3 SEC. TDPU	N/A	TechSpec CRP 926
1	2-3	AGASTAT	ETR14D3AN	.15-3SEC	LNP AND BUS LOAD SHED PULSE	0.3 SEC. TDPU	N/A	TechSpec CRP 926
1	2-4	AGASTAT	ETR14D3AN	.15-3SEC	RSST FAST TRANSFER BLOCK	1.0 SEC. TDPU	N/A	CRP 926
1	2-1A	AGASTAT	ETR14D3AN	.15-3SEC	LNP AND BUS LOAD SHED PULSE	0.3 SEC. TDPU	N/A	TechSpec CRP 926
1	2-2A	AGASTAT	ETR14D3AN	.15-3SEC	LNP AND BUS LOAD SHED PULSE	0.3 SEC. TDPU	N/A	TechSpec CRP 926
1	2-3A	AGASTAT	ETR14D3AN	.15-3SEC	LNP AND BUS LOAD SHED PULSE	0.3 SEC. TDPU	N/A	TechSpec CRP 926
1	2-4A	AGASTAT	ETR14D3AN	.15-3SEC	RSST FAST TRANSFER BLOCK	1.0 SEC. TDPU	N/A	CRP 926

Note - 2-1 thru 2-3 and 2-1A thru 2-3A relays are in tech specs; however, settings are not

RELAY TOLERANCES

TYPE	TECH-SPEC*	AS-FOUND	AS-LEFT	PICK-UP OR RESET
BBC ITE-27N	3.0%	2.7%	0.6%	NTX 0.7 V of Drop-Out
BBC ITE-27H	5.0%	3.0%	0.8%	NTX 1.03 times Drop-Out
BBC ITE-62K	10.0%	8.0%	4.0%	Instantaneous
BBC ITE-62T	10.0%	4.0%	2.0%	Instantaneous
AGASTAT ETR	10.0%	5.0%	2.5%	Instantaneous

*If Applicable

Docket No. 50-245
A07899

Attachment 2

Millstone Unit No. 1

Undervoltage and LNP Protection Modification

April 1989