William J. Cahill, Jr.
Vice President

Consolidated Edison Company of New York, Inc.
4 Irving Place, New York, N Y 10003
Telephone (212) 460-3819

December 14, 1979

Re: Indian Point Unit No. 2
Docket No. 50-247

Director of Nuclear Reactor Regulation
Attention: Mr. A. Schwencer, Chief
Operating Reactors Branch No. 1
Division of Operating Reactors
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Schwencer:

Your request for additional detailed information regarding our responses to Lessons Learned Recommendations 2.1.7a and 2.1.7b was received by Con Edison via telecopy on December 10, 1979. As requested, attached is our response to that request.

Should you or your staff have any questions regarding the information provided, please contact us.

Very truly yours,

William J. Cahill, Jr.
Vice President

attach.

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REG FILES
All others RECEIVE
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Response to
"LICENSEE INFORMATION REQUIRED FOR STAFF
EVALUATION OF LICENSEE RESPONSE OF
LESSONS LEARNED RECOMMENDATIONS 2.1.7a and b"
(December 10, 1979)

Consolidated Edison Company of New York, Inc.

Indian Point Unit No. 2

Docket No. 50-247

December, 1979

STAFF REQUEST NO. 1

2.1.7a AFW System Automatic Initiation:

We require that the licensee provide information that describes how the AFW automatic initiation system design meets each of the control grade functional criteria in NUREG 0578 (2.1.7a) and the clarifications to NUREG-0578 in the October 30 1979 NRC (H. Denton) letter to all operating plants. The information should be sufficiently descriptive to permit independent technical review of the information and a conclusion that each of the criteria are met.

To demonstrate conformance with criteria 1, 2, 5 and 7, specific descriptive information (reference to specific FSAR sections is acceptable) supported by electrical drawings, such as schematic or elementary wiring diagrams should be submitted.

For power supply criteria 4 and 6, the licensee should submit a table or a detailed power distribution one-line diagram indicating power supply channels for each component.

To demonstrate testability criterion 3, the licensee should submit a summary description of the functional test procedures along with the existing or proposed test interval - (e.g., Standard Technical Specification surveillance requirements for typical engineered safety feature systems).

GENERAL RESPONSE:

As described in Con Edison's October 17, 1979 and November 20, 1979 submittals, Indian Point Unit No. 2 meets the NRC control grade functional criteria 1 through 7 for Auxiliary Feedwater System (AFWS) automatic initiation. Additional detailed descriptive information is provided for each control grade functional criterion below. In addition, twenty-four (24) electrical and one-line drawings are being provided with this submittal to support the specific descriptive information. Attachment A contains a listing of those drawings being provided.

STAFF CRITERION 1:

The design shall provide for the automatic initiation of the auxiliary feedwater system.

RESPONSE:

The following conditions will automatically start the auxiliary pumps:

A) Motor Driven Pumps (2-400 gpm) -

1. Auto trip of either of 2 main boiler feed pumps (low control oil pressure with main boiler feed pump control switch last operated to "reset" position).
2. 2 out of 3 coincidence of low-low steam generator level in any one of 4 steam generators.
3. Unit trip (1 out of 2 coincidence of main generator primary and backup lockout relays) plus loss of offsite

power (2 out of 3 coincidence of undervoltage relays on both buses 5A & 6A) with no "Safety Injection" signal (2 out of 2 coincidence from both "SI" actuation trains).

4. "Safety Injection" (independent signals from both "SI" trains to each pump in a final 1 out of 2 coincidence).

B) Steam Driven Pump (1-800 gpm) -

1. 2 out of 3 coincidence of low-low steam generator level in any 2 of 4 steam generators.
2. Unit trip (1 out of 2 coincidence of main generator primary and backup lockout relays) plus loss of offsite power (2 out of 3 coincidence of undervoltage relays on both buses 5A & 6A) with no "Safety Injection" signal (2 out of 2 coincidence from both "SI" actuation trains).

STAFF CRITERION 2:

The automatic initiation signals and circuits shall be designed so that a single failure will not result in the loss of auxiliary feedwater system function.

RESPONSE:

The actuation system power supply dependencies as described below do not follow more recently accepted trends toward complete unitization. Indian Point Unit No. 2 does provide considerable flexibility, however, with no loss of function from any of the three (3) auxiliary feedwater pumps for many single failures which can be postulated within the actuation system. This design philosophy also permitted the minimization of physical

crossovers within the cable raceway system, thus reducing the potential for physical hazards to effect more than one functional train. Another important design aspect is the common circuit dependency for the main actuation logic and the "fail safe" Auxiliary Boiler Feed Pump 22 Auto-Start valve. The automatic starting circuitry for all three (3) auxiliary feedwater pumps, excluding the completely independent and redundant "Safety Injection" signal actuation logic, has a common dependency on 125 volt D.C. Distribution Panel No. 22 circuit 18. However, any failure or loss of this circuit or for that matter the Battery No. 22 power train will de-energize the Auto-Start Solenoid and start Auxiliary Boiler Feed Pump No. 22. We believe that this improves the overall operational reliability of the AFW system by making many potential failures in the logic system a mode of auto-start for the steam driven Auxiliary Boiler Feed Pump.

The existing actuation system design is acceptable to meet control grade requirements since:

1) The single failure criteria for "SI" actuation of the motor driven Auxiliary Boiler Feed Pumps is met and any single failures which could be postulated for the "Unit Trip Plus Loss of Offsite" start signal should only defeat one (1) pump train.
2) For any single failures including those which could defeat the "Main Boiler Feed Pump Trip" and "Steam Generator Low-Low Level" auto-start signals to the Auxiliary

Boiler Feed Pumps, manual initiation could not be prevented for more than one of three trains and the operator has approximately 30 minutes to act to initiate AFW manually.

STAFF CRITERION 3:

Testability of the initiating signals and circuits shall be a feature of the design.

RESPONSE:

Testability of the AFWS initiating signals and circuits is a feature of the plant design. The automatic initiation of the two (2) motor driven AFW pumps upon receipt of an engineered safeguards (SI) signal is tested and verified at refueling (i.e., ~eighteen (18) month) intervals.

In addition, as committed to in Con Edison's October 17, 1979 submittal, surveillance test procedures will be developed by January 1, 1980 to implement periodic testing of all automatic AFWS initiation signals. Such surveillance tests will also be performed at refueling intervals.

The actual surveillance testing involves injecting a simulated actuation signal into the initiation circuitry being tested and verifying that all appropriate actions take place including starting of the auxiliary feedwater pump(s).

STAFF CRITERION 4:

The initiating signals and circuits shall be powered from the emergency buses.

RESPONSE:

The power supplies for the various actuation systems for each pump are as follows:

A) Motor Driven Pump No. 21

1) Required for Main Boiler Feed Pump Auto Trip Signal

a) From Main Boiler Feed Pump 21:

125 Volt D.C. Distribution Panel 21 -	Aux. Relay ("63 x 1/BFP1") activated by pressure switch.
125 Volt D.C. Distribution Panel 22 -	Aux. Relay activated by "63 x 1/BFP1" & main boiler feed pump No. 21 Control Switch ("1/BFPT1").
125 Volt D.C. Power Panel 21 or - 22 Via Auto Transfer Switch	Aux. Blr. Fd. Pump No. 21 Control Circuit.

b) From Main Boiler Feed Pump 22:

125 Volt D.C. Distribution Panel 22 -	Aux. Relay ("63 x 1/BFP2") activated by pressure switch.
125 Volt D.C. Distribution Panel 22 -	Aux. Relay activated by "63 x 1/BFP2" & main blr. fd. pump No. 22 Control Switch ("1/BFPT2").
125 Volt D.C. Power Panel 21 or 22 - Via Auto Transfer Switch	Aux. Blr. Fd. Pump No. 21 Control Circuit.

2) <u>Required for Low-Low Steam Generator Level Signals</u>

120 Volt A.C. Instrument Buses 21, 22, 23, & 24 (only 3 out of 4 required and all instruments and logics are "fail safe" on loss of power) -	Individual instrument loops and logic relays. 3 level channels on each steam generator powered from 3 different instrument buses.

125 Volt D.C. Distribution Panel 22	- Coincidence relays "71-1X" thru "71-4X" (2/3 low-low level at each S.G.) and "BFP" (1/4 S.G.'s).
125 Volt D.C. Power Panel 21 or 22 Via Auto Transfer Switch	- Aux. Blr. Fd. Pump 21 Control Circuit

3) <u>Required for Unit Trip Plus Loss of Offsite With No "SI" Signals</u>

a) 125 Volt D.C. Distribution Panel 21 ("86P") or 22 ("86BU")	- Primary & back-up lockout relays in 1/2 coincidence.
b) 125 Volt D.C. Distribution Panel 21	- Undervoltage aux. relays ("27-51/X2" thru "27-53/X2") from 480 volt bus 5A.
c) 125 Volt D.C. Distribution Panel 22	- Undervoltage aux. relays ("27-61/X2" thru "27-63/X2") from 480 volt bus 6A.

d)	125 Volt D.C. Distribution Panel 21 ("SI-13X") or 22 ("SI-23X")	- Train "A" & Train "B" "SI" relays.
e)	125 Volt D.C. Power Panel 21 or 22 - Via Auto Transfer Switch	Aux. Blr. Fd. Pump 21 Control Circuit.

4) <u>Required for "Safety Injection" Signals</u>

120 Volt A.C. Instrument Buses 21, 22, 23 & 24 (only 3 out of 4 required and all instruments and logics are "fail safe" on loss of power.	- Individual instrument loops and logic relays for various "SI" initiation signals powered from different instrument buses.
125 Volt D.C. Distribution Panel 21 ("SI-11X" & "3-5") or 125 Volt D.C. Distribution Panel 22 ("SI-21X" & "3-15").	- "SI" initiation and "safeguards" logic relays respectively from each of two actuation trains.
125 Volt D.C. Power Panel 21 or 22 - Via Auto Transfer Switch	Aux. Blr. Fd. Pump 21 Control Circuit.

B) Turbine Driven Pump No. 22

1) Required for Low-Low Steam Generator Level Signals

120 Volt A.C. Instrument Buses 21, 22, 23 & 24 (only 3 out of 4 required and all instruments and logics "fail safe" on loss of power.	- Individual instrument loops and logic relays. 3 level channels on each steam generator powered from 3 different instrument buses.
125 Volt D.C. Distribution Panel 22 -	Coincidence relays "71-1X" thru "71-4X" (2/3 low-low level at each S.G.).
125 Volt D.C. Distribution Panel 22*	- Aux. Blr. Fd. Pump 22 Auto-Start solenoid valve control circuit.

*Solenoid valve will open starting aux. blr. feed pump 22 on loss of power.

2) Required for Unit Trip Plus Loss of Offsite With No "SI" Signals

Receives signals from both motor driven pump 21 and 23 actuation logics as described in Section A)3) a) thru d) and C)3) a) thru d) via "BFPB" & "BFPB3" aux. relays respectively.

125 Volt D.C. Distribution Panel 22*	-	Aux. Blr. Fd. Pump 22 Auto-Start Solenoid Valve Control Circuit.

*Solenoid valve will open starting aux. blr. feed pump 22 on loss of power.

C) Motor Driven Pump No. 23

1) Required for Main Blr. Fd. Pump Auto Trip Signals

a) From Main Blr. Fd. Pump 21:

125 Volt D.C. Distribution Panel 21	-	Aux. Relay ("63 x 1/BFP1") activated by pressure switch.

b)

125 Volt D.C. Distribution Panel 22	-	Aux. relay activated by "63X1/BFP1" and main blr. fd. pump No. 21 Control Switch ("1/BFPT1").

125 Volt D.C. Power Panel 21 or 22 - Via Auto Transfer Switch	Aux. Blr. Fd. Pump No. 23 Control Circuit.

c) From Main Boiler Feed Pump 22:

125 Volt D.C. Distribution Panel 22 -	Aux. relay ("63X1/BFP2") activated by pressure switch.
125 Volt D.C. Distribution Panel 22 -	Aux. relay activated by "63X1/BFP2" and main blr. fd. pump No. 22 Control Switch ("1/BFPT2")
125 Volt D.C. Power Panel 21 or 22 - Via Auto Transfer Switch	Aux. Blr. Fd. Pump No. 23 Control Circuit.

2) <u>Required for Low-Low Steam Generator Level Signals</u>

120 Volt A.C. Instrument Buses 21, 22, 23 & 24 (only 3 out of 4 required and all instruments and logics "fail safe" on loss of power). -	Individual instrument loops and logic relays. 3 level channels on each steam generator powered from 3 different instrument buses.

125 Volt D.C. Distribution Panel 22 -	Coincidence relays "71-1X" thru "71-4X" (2/3 low-low level at each steam generator) and "BFP" (1/4 S.G.'s).
125 Volt D.C. Power Panels 21 or 22 - Via Auto Transfer Switch	Aux. Blr. Fd. Pump 23 Control Circuit.

3) <u>Required for Unit Trip Plus Loss of Offsite With No "SI" Signals</u>

a) 125 Volt D.C. Distribution Panel 21 ("86P") or 22 (86BU") -	Primary & back-up lockout relay in 1/2 coincidence.
b) 125 Volt D.C. Distribution Panel 21 -	Undervoltage aux. relays ("27-51/X3" thru "27-53/X3") from 480 volt bus 5A.
c) 125 Volt D.C. Distribution Panel 22 -	Undervoltage aux. relays ("27-61/X3" thru "27-63/X3") from 480 volt bus 6A.

d)	125 Volt D.C. Distribution Panel 21 ("SI-13X") or 22 ("SI-23X") -	Train "A" and Train "B" "SI" relays.
e)	125 Volt D.C. Power Panel 21 or 22 Via Auto Transfer Switch -	Aux. Blr. Fd. Pump 23 Control Circuit.

4) <u>Required for "Safety Injection" Signals</u>

120 Volt A.C. Instrument Buses 21, 22, 23 & 24 (only 3 out of 4 required and all instruments and logics "fail safe" on loss of power). -	Individual instrument loops and logic relays for various "SI" initiation signals powered from different instrument buses.
125 Volt D.C. Distribution Panel 21 ("SI-11X" & "3-4") or 125 Volt D.C. Distribution Panel 22 ("SI-21X" and "3-14"). -	"SI" Initiation and "Safeguards" logic relays respectively from each of two actuation trains.
125 Volt D.C. Panel 21 or 22 Via Auto Transfer Switch -	Aux. Blr. Fd. Pump 23 Control Circuit.

STAFF CRITERION 5:

Manual capability to initiate the auxiliary feedwater system from the control room shall be retained and shall be implemented so that a single failure in the manual circuits will not result in the loss of system function.

STAFF CRITERION 7:

The automatic initiating signals and circuits shall be designed so that their failure will not result in the loss of manual capability to initiate the AFWS from the control room.

COMBINED RESPONSE (5 & 7):

Single failures in the manual circuits will not result in the loss of AFW system function. Failure of any of the manual circuitry identified below will only affect one of the three AFW pumps. Furthermore, failure of the automatic initiating signals and circuits will not result in the loss of manual capability to initiate the AFWS from the control room.

In fact, should the automatic actuation system fail, the following manual actuation mechanisms are available to the operator:

(1) Auxiliary boiler feed pump 22 is provided with manual control switches in the Central Control Panel on supervisory panel "SC" ("1-1/ABFP2") and locally at the pump ("1-2/ABFP2"). Either of these control switches can directly de-energize the auto-start solenoid valve (steam supply) to start auxiliary boiler feed pump 22.

In the extremely unlikely event that the "fail safe" designed pneumatic operator does not open the valve, it could be "jacked open" mechanically at the pump room.

(2) Both motor driven auxiliary boiler feed pumps are provided with capability for manual control from two separate locations. Each pump is provided with a control switch in the Central Control Room on supervisory panel "SC". A set of "stop-start" push buttons is provided locally at each pump. A "local/remote" switch which must be operated to arm the local push buttons also disconnects all automatic circuitry from the pump control circuit when it is operated to the "local" position.

STAFF CRITERION 6:

The a-c motor-driven pumps and valves in the auxiliary feedwater system shall be included in the automatic actuation (simultaneous and/or sequential) of the loads onto the emergency buses.

RESPONSE:

The a-c motor-driven pumps are included in the automatic actuation sequence of loads to the emergency buses (as described below). System valves are presently supplied from a single non-safety grade bus. In accordance with the short-term plant specific recommendation contained in NRC's (Mr. A. Schwencer) November 7, 1979 letter to Con Edison (Mr. W. J. Cahill, Jr.), suitable emergency procedures will be established by January 1, 1980 to assure AFWS function should the valves lose electrical power or instrument air. Furthermore, the power supplies for

these valves will be reconnected to separate safety grade buses by January 1, 1981 as required by the long-term plant specific recommendation also contained in the November 7, 1979 letter.

Table 1 provides a tabulated summary of the power supplies and functions of the AFWS pumps and valves.

TABLE 1 (1 of 4)

A. Steam Supply Train

Component	Power Supply	Diesel or Battery Backup	Function
PCV-1139 (20-1/ABFP2)	125 Volt DC Pnl. 22	Battery 22*	Stm. Supply to Aux. Blr. Fd. Pump 22 Turbine.
PCV-1139 (20-2/ABFP2)	125 Volt DC Pnl. 22	Battery 22**	Stm. Supply to Aux. Blr. Fd. Pump 22 Turbine.
PCV-1310A (SOV-1310)	125 Volt DC Pnl. 21	Battery 21***	Stm. Supply Isolation Valve to Aux. BFP 22 Turbine.
PCV-1310B (SOV-1311)	125 Volt DC Pnl. 22	Battery 22***	Stm. Supply Isolation Valve to Aux. BFP 22 Turbine.

B. Turbine Pump 22 Train

Aux. Blr. Fd. Pump 22	Steam Driven	Residual Heat Generated Steam	
CT-30	Hand Operated	----------	Valve on Pump 22 Suction Header from Condensate Storage Tank.

* Valve Fails Open on Loss of Air or Electric Power
**Valve Fails Open on Loss of Air and Can Not Be Closed Without Electric Power
***Valve Fails Closed on Loss of Air or Electric Power

TABLE 1 (2 of 4)

B. Turbine Pump 22 Train (Cont'd)

Component	Power Supply	Diesel or Backup Battery	Function
PCV-1188 (SOV-1288)	120 Volt AC Dist. Panel 21.	None***	Valve on alt. path from City Wtr. Sys. for Aux. Fd Wtr. Pump 22 Suction.
FCV-405A	120 Volt AC Dist. Panel 21.	None*	Aux. Blr. Fd. Pump 22 Discharge to Stm. Gen. 21.
FCV-405B	120 Volt AC Dist. Panel 21.	None*	Aux. Blr. Fd. Pump 22 Discharge to Stm. Gen. 22.
FCV-405C	120 Volt AC Dist. Panel 21.	None*	Aux. Blr. Fd. Pump 22 Discharge to Stm. Gen. 23.
FCV-405D	120 Volt AC Dist. Panel 21.	None*	Aux. Blr. Fd. Pump 22 Discharge to Stm. Gen. 24.

C. Motor Driven Pump 21 Train

Aux. Blr. Fd. Pump 21	480 Volt Bus 3A	Diesel 22	
CT-27	Hand Operated	----------	Valve on Pump 21 Suction Header from Condensate Storage Tank.

* Valve Fails Open on Loss of Air or Electric Power
*** Valve Fails Closed on Loss of Air or Electric Power

TABLE 1 (3 of 4)

C. Motor Driven Pump 21 Train (Cont'd)

Component	Power Supply	Diesel or Battery Backup	Function
PCV-1187 (SOV-1287)	120 Volt AC Dist. Panel 21.	None***	Valve on Alt. Path from City Wtr. Sys. for Aux. Fd. Pump 21 Suction.
FCV-406A	120 Volt AC Dist. Panel 21.	None*	Aux. Blr. Fd. Pump 21 Discharge to Stm. Gen. 21.
FCV-407B	120 Volt AC Dist. Panel 21	None*	Aux. Blr. Fd. Pump 21 Discharge to Stm. Gen. 22.

D. Motor Driven Pump 23 Train

Aux. Blr. Fd. Pump 23	480 Volt Bus 6A	Diesel 23	
CT-33	Hand Operated	----------	Valve on Pump 23 Suction Header from Condensate Storage Tank.
PCV-1189 (SOV-1289)	120 Volt AC Dist. Panel 21.	None***	Valve on Alt. Path from City Water Sys. for Aux. Fd. Pump 23 Suction.
FCV-406C	120 Volt AC Dist. Panel 21.	None*	Aux. Blr. Fd. Pump 23 Discharge to Stm. Gen. 23.

* Valve Fails Open on Loss of Air or Electric Power
***Valve Fails Closed on Loss of Air or Electric Power

TABLE 1 (4 of 4)

D. Motor Driven Pump 23 Train (Cont'd)

Component	Power Supply	Diesel or Battery Backup	Function
FCV-406D	120 Volt AC Dist. Panel 21.	None*	Aux. Blr. Fd. Pump 23 Discharge to Stm. Gen. 23.
E. Miscellaneous			
LCV-1158 (SOV-1258)	125 Volt DC Pnl. 21	Battery 21***	Condensate Storage Tank Low Level Shut-Off Valve
CT-6	Hand Operated	----------	Condensate Storage Tank Discharge Valve.
CT-64	Hand Operated	----------	Condensate Storage Tank Discharge Valve.

* Valve Fails Open on Loss of Air or Electric Power
***Valve Fails Closed on Loss of Air or Electric Power

STAFF REQUEST NO. 2

2.1.7b AFW System Flow Indication to Steam Generators:

We require information of a similar nature to that described in 2.1.7a above to demonstrate conformance with the 2.1.7b criteria and clarifications to NUREG-0578 in the October 30, 1979 NRC (H. Denton) letter to all operating plants; namely, single failure, testability, power supply and indication accuracy.

GENERAL RESPONSE:

As described in Con Edison's December 7, 1979 submittal, the Indian Point Unit No. 2 auxiliary feedwater (AFW) flow indication satisfies the NRC's control grade functional criteria. Each criterion is addressed individually below. The drawings and specifications provided with this submittal (see Attachments B & C) can be referenced to support the descriptive information provided here.

STAFF CRITERION 1:

Auxiliary feedwater flow indication to each steam generator shall satisfy the single failure criterion. The flow indication channels should by themselves satisfy the single failure criterion for each steam generator. As a fall-back position, one auxiliary feed water flow channel may be backed up by a steam generator level channel.

RESPONSE:

Indian Point 2 AFW flow indication currently satisfies the single failure criterion by having individual AFW flow indicators

for each of the four steam generators as well as steam generator level indication.

STAFF CRITERION 2:

Testability of the auxiliary feedwater flow indication channels shall be a feature of the design.

RESPONSE:

Testability of the AFW flow indication channels is a feature of the design. Simulated flow signals can be injected into the flow transmitters and verification of flow indication made at the particular indicator being tested. The steam generator level channels are already "safety grade" and also have the capability for being tested by use of simulated level signals. The AFW flow indication surveillance tests will be performed at refueling intervals.

STAFF CRITERION 3:

Auxiliary feedwater flow instrument channels shall be powered from the vital instrument buses. For those designs where instrument air is needed for operation, the electric power supply requirment should be capable of being manually connected to emergency power sources.

RESPONSE:

Since the AFW flow indication system is pneumatic, this criterion is met in that the electric power supplies for instrument air are capable of being manually connected to emergency power sources.

STAFF CRITERION 4:

Each auxiliary feedwater channel should provide an indication of feed flow with an accuracy on the order of ± 10%.

RESPONSE:

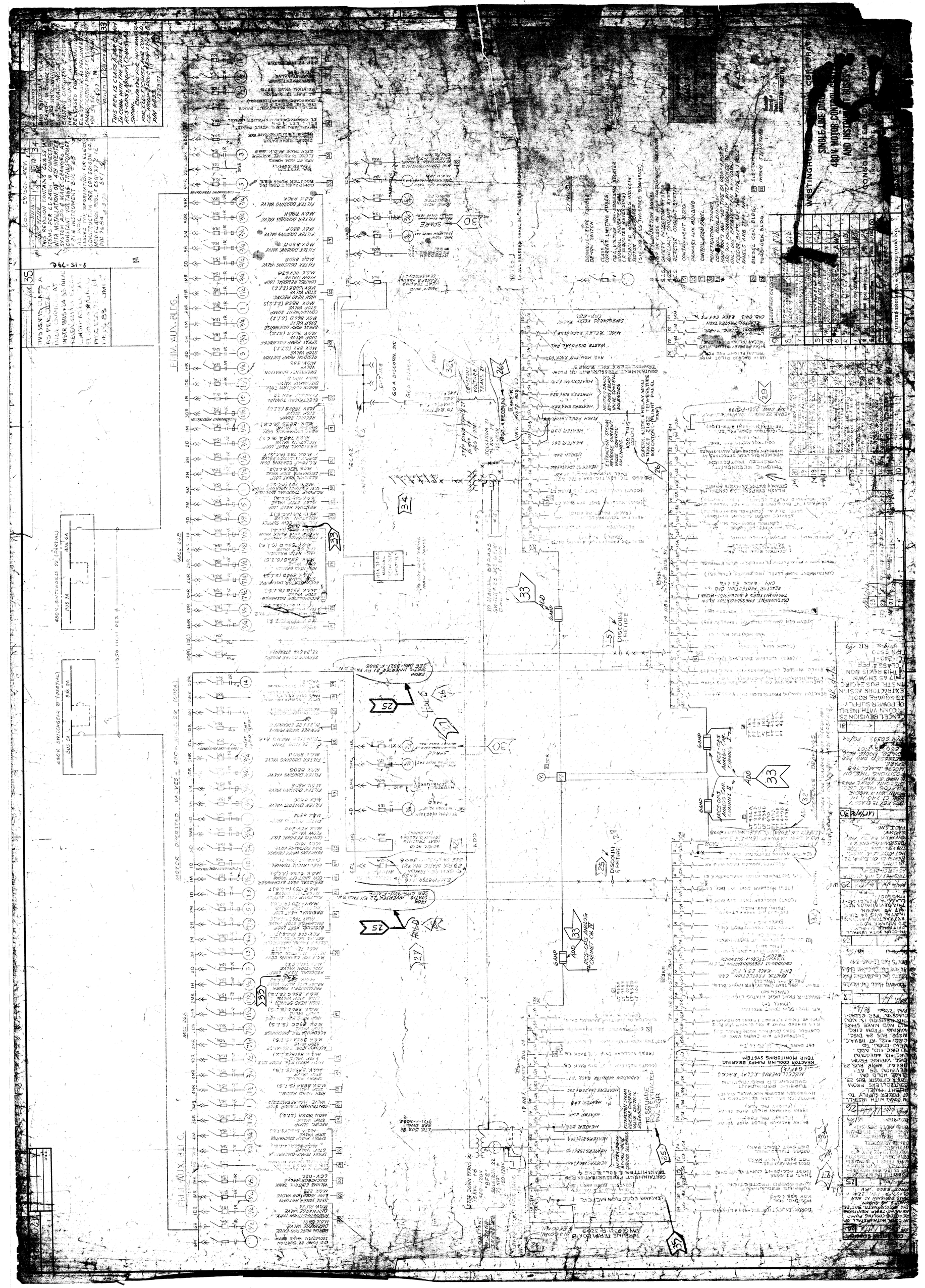
As described in document No. 1 of Attachment C, the existing AFW flow indicators are capable of providing flow indication within the required ± 10% accuracy.

ATTACHMENT A

LIST OF AUXILIARY FEEDWATER SYSTEM AUTOMATIC INITIATION ELECTRICAL DRAWINGS

9321-F-3006 Revision 35	Single Line Diagrams, 480V Motor Control Centers and Instrument Buses.
9321-F-3008 Revision 24	Single Line Diagram, D.C. System.
9321-F-3041 Revision 13	Lighting Panels and Circuit Diagrams (Sheet No. 1).
9321-LL-3117 Revision 13	Schematic Diagram 480V. Switchgear 21 (Sheet No. 2).
9321-LL-3117 Revision 12	Schematic Diagram 480V. Switchgear 21 (Sheet No. 3).
9321-LL-3117 Revision 11	Schematic Diagram 480V. Switchgear 21 (Sheet No. 22).
9321-LL-3118 Revision 12	Schematic Diagram 480V. Switchgear 22 (Sheet No. 2).
9321-LL-3118 Revision 14	Schematic Diagram 480V. Switchgear 22 (Sheet No. 3).
9321-LL-3118 Revision 12	Schematic Diagram 480V. Switchgear 22 (Sheet No. 15).
9321-LL-3118 Revision 11	Schematic Diagram 480V. Switchgear 22 (Sheet No. 16).
9321-LL-3118 Revision 15	Schematic Diagram 480V. Switchgear 22 (Sheet No. 20).
9321-LL-3118 Revision 9	Schematic Diagram 480V. Switchgear 22 (Sheet No. 21).
9321-LL-3130 Revision 12	Schematic Diagram, Turbine Generator (Sheet No. 5).
9321-LL-3130 Revision 17	Schematic Diagram, Turbine Generator (Sheet No. 6).
9321-LL-3131 Revision 4	Schematic Diagram, Misc. Solenoid Valves (Sheet No. 8).
9321-LL-3131 Revision 7	Schematic Diagram, Misc. Solenoid Valves (Sheet No. 9).

9321-LL-3131 Revision 1	Schematic Diagram, Misc. Solenoid Valves (Sheet No. 28).
9321-LL-3140 Revision 15	Schematic Diagram, Miscellaneous D.C. Circuits (Sheet No. 7).
9321-LL-3140 Revision 14	Schematic Diagram, Miscellaneous D.C. Circuits (Sheet No. 12).
9321-F-3227 Revision 19	Wiring Diagram, Supervisory Control Panel SC.
110E073 Revision 10	Reactor Protection System, Schematic (Sheet No. 5).
110E069 Revision 20	Safeguards Actuation Schemes (Sheet No. 4).
540F921 Revision 6A	Main One Line Diagram.
540F923 Revision 9	480V One Line Diagram.


WESTINGHOUSE
SINGLE LINE DIAG
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FIRM AUX. BLDG.
MOTOR OPERATED VALVES
480 V. SWITCHGEAR
TURBINE BUILDING
DIESEL GEN. BLDG.
TURBINE BLDG.
REACTOR COOLING PUMPS BEARING TEMP MONITORING SYSTEM
CONTAINMENT PRESSURIZATION FLOW TRANSMITTERS & SOLENOIDS
REACTOR PROTECTION CAB
CH-2 CAB. E-1 / 2
CONTAINMENT PRESSURIZATION FLOW TRANSMITTERS & SOLENOIDS
REACTOR PROTECTION CAB
CH-1 CAB. E-1 / 2
TURBINE FRAME BOX B DISCONN
TO SQUARE POST ENTRANCE PNL SQR
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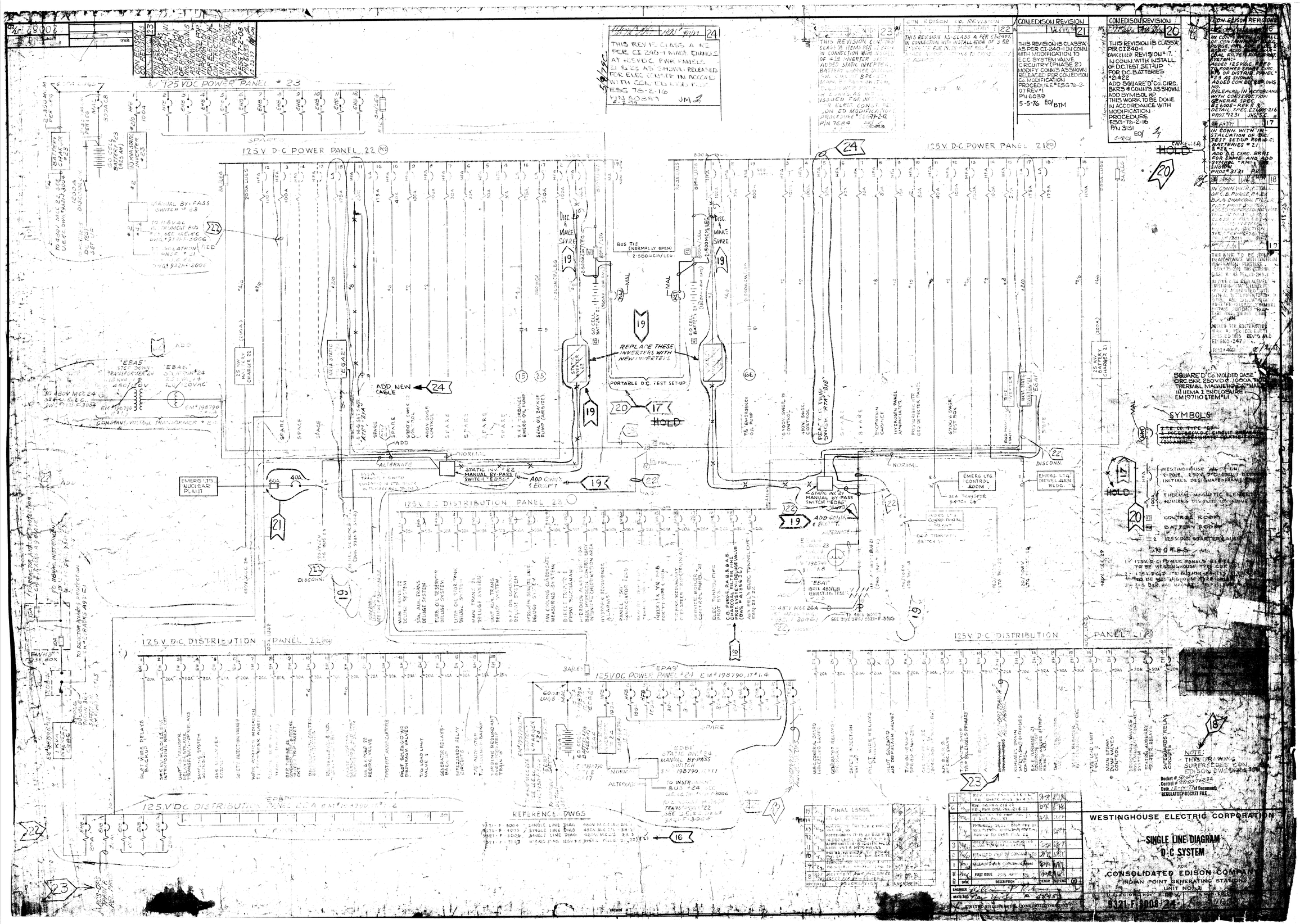
125 VDC POWER PANEL # 23
125 V D-C POWER PANEL 22
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125 V D-C DISTRIBUTION PANEL 22
125 V D-C DISTRIBUTION PANEL 21
125VDC POWER PANEL #21
125VDC DISTRIBUTION
REFERENCE DWGS
SYMBOLS
NOTES
WESTINGHOUSE ELECTRIC CORPORATION
SINGLE LINE DIAGRAM
D-C SYSTEM
CONSOLIDATED EDISON COMPANY
INDIAN POINT GENERATING STATION
UNIT NO. 2
UNITED ENGINEERS & CONSTRUCTORS INC.
5321-F-1000-24

TITLE: LTG. PNLS & CKT. DIAG'S. SH. # 1 — 9321F 3041

LIGHTING PANEL No 27
TURBINE ROOM
EL. 53'-0" COL. A-15

No OUTL.	LOCATION	LOAD	CIR No	CIR No	LOAD	LOCATION	No OUTL.
5	T.R. HI-BAY LTG. ROW #1 - COLS. 11,14,16, 18 & 20	5 KW	1	2	5KW	T.R. HI-BAY LTG. ROW #2 - COLS. 13,15,17, 19 & 21	5
5	#3	5KW	3	4	5KW	#4	5
5	#5	5KW	5	6	5KW	#6	5
5	#7	5KW	7	8		SPARE	
5	HTR. BAY HI BAY LTG. ROW #8 - COLS. 13,15,17 19 & 21	5KW	9	10		SPARE	
5	#9 11,14,16 18 & 20	5KW	11	12		SPARE	

600V-3Ø, 3W, 60~ A.C. LIGHTING PANEL WITH 225 AMP MAIN LUGS ONLY, WITH 11-20 AMP 480V, 2P BRANCH BREAKERS & 1-20 AMP 2P SPACE, WESTINGHOUSE TYPE "NHEB" OR EQUAL. — A B C

AØ = 15KW
BØ = 15KW
CØ = 15KW

LIGHTING PANEL No 28
TURBINE ROOM
EL. 53'-0" COL. A-15

No OUTL.	LOCATION	LOAD	CIR No	CIR No	LOAD	LOCATION	No OUTL.
5	T.R. HI BAY LTG. ROW #1 - COLS. 13,15,17, 19 & 21	4.4 KW	1	2	4.4 KW	T.R. HI-BAY LTG. ROW #2 - COLS. 11,14,16 18 & 20	5
5	#3	4.4 KW	3	4	4.4 KW	#4	5
5	#5	4.4 KW	5	6	4.4 KW	#6	5
5	#7	4.4 KW	7	8		SPARE	
5	HTR. BAY HI BAY LTG. ROW #8 - COLS. 13,15,17, 19 & 21	4.4 KW	9	10		SPARE	
5	#9 11,14,16 18 & 20	4.4 KW	11	12		SPARE	

600V-3Ø, 3W, 60~ A.C. LIGHTING PANEL WITH 225 AMP MAIN LUGS ONLY, WITH 11-20 AMP 480V, 2P BRANCH BREAKERS & 1-20 AMP 2P SPACE, WESTINGHOUSE TYPE "NHEB" OR EQUAL. — A B C

AØ = 13.2 KW
BØ = 13.2 KW
CØ = 13.2 KW

LIGHTING PANEL No 22
TURBINE ROOM
EL. 15'-0" COL. B9-14

No OUTL.	LOCATION	LOAD	CIR No	CIR No	LOAD	LOCATION	No OUTL.
10	LTG.-HEATER BAY-EL.15'0" COLS. 11-12 & A-CC3	960	1	2	1200	LTG.-HEATER BAY-EL. 5'3" COLS. 13-14 & A-CC3	12
10	12-13 & A-CC3	870	3	4	1020	14-15 & A-CC3	11
3	DEICING PIT & OUTSIDE	550	5	6	745	15-16 & A-CC3	8
8	HEATER BAY-EL.15'-0" COLS. 15-17 & A-CC3	785	7	8		SPARE	
8	16-17 & A-CC3	800	9	10	1176	UNIT HTR. No 23 EL. 15'0" COL. CC3-16	1
5	RECEPT.-EL.15'-0" HEATER BAY & DEICING PIT	900	11	12	1176	UNIT HTR. No 21- EL. 15'-0" COL. CC3-13	1
8	LTG.-TURBINE-EL.15'-0" COLS. 13-14 & A-C	845	13	14	1000	LTG.-TURBINE-EL 15'-0" COLS. 14-17 & A-B	8
7	LTG.-TURBINE-EL 15'-0" COLS. 12-13 & A-C & HYD. PNL.	775	15	16	720	RECEPT.-EL 15'-0" COLS. A,F & 11 TEL LTS.	6
8	LTG.-TURBINE-EL. 15'-0" COLS. 11-12 & A-C	1120	17	18	860	LTG.-TURBINE-EL. 15'-0" COLS. 11-14 & C-D	9
8	14-16 & D-F	805	19	20	785	11-15 & D-F	6
6	15-17 & D-F	620	21	22	300	11-14 & E-F	8
1	UNIT HTR. No 22 EL. 15'-0" COL. F-16	1176	23	24	900	LTG.-TRENCH EL. 3'-8" TURBINE & HTR BAY	6
3	RECEPTACLES-EL. 3'-3" TURBINE & HTR. BAY	540	25	26		SPARE	
	SPARE		27	28		SPARE	
	SPARE		29	30		SPARE	

120/208V-3Ø, 4W-S.N., 60~ A.C. LIGHTING PNL. WITH 100 AMP MAIN LUGS ONLY WITH 30-120V, 20 AMP, 1P BRANCH BREAKERS, WESTINGHOUSE TYPE "NEB" OR EQUAL. — A B C, S.N.

AØ = 6,920 WATTS
BØ = 6,781
CØ = 7,427

LIGHTING PANEL No 23
TURBINE ROOM
EL. 15'-0" COL. B4-20

No OUTL.	LOCATION	LOAD	CIR No	CIR No	LOAD	LOCATION	No OUTL.
9	LTG.-HEATER BAY-EL. 15'0" COLS. 17-18 & A-CC3	830	1	2	800	LTG.-HEATER BAY EL. 15'0" COLS. 19-20 & A-CC3	8
9	17-19 & A-CC3	900	3	4	950	HEATER BAY EL 15'0" COLS. 20-21 & A-CC3 & OUTSIDE	5
8	18-20 & A-CC3	800	5	6	965	LTG.-TURBINE-EL 15'0" COLS. 17-19 & A-B	10
9	TURBINE-EL. 15'-0" COLS. 19-20 & A-C2	980	7	8	680	TURBINE-EL. 15'-0" COLS. 19-21 & C2-F & OUTSIDE	8
13	20-21 & A-E1	1020	9	10	700	LTG.-TURBINE-EL. 15'-0" COLS. 18-20 & C2-F	5
11	TURBINE-EL. 15'-0" COLS. 21-22 & A-F & OUTSIDE	780	11	12	900	17-19 & C2-F	8
5	RECEPT. EL. 15'-0" COLS. A & CC3 TEL LT.	720	13	14		SPARE	
1	UNIT HTR. No 25 EL. 15'0" COL. CC3-20	1176	15	16	1176	UNIT HTR. No 27 EL. 15'0" COL. B8-22	1
1	UNIT HTR. No 26 EL. 15'0" COL. [illegible]	1176	17	18	1176	UNIT HTR. No 24 EL. 15'-0" COL. F-20	1
3	RECEPT.-TRENCH-EL. 3'-5" TURBINE	540	19	20	750	LTG.-TRENCH-EL. 3'-8" TURBINE	5
	SPARE		21	22		SPARE	
	SPARE		23	24		SPARE	
	SPARE		25	26		SPARE	

120/208V-3Ø 4W-S.N., 60~ A.C. LIGHTING PNL WITH 100 AMP MAIN LUGS ONLY, WITH 26-120V 20 AMP, 1P BREAKERS, WESTINGHOUSE TYPE "NEB" OR EQUAL. — A B C, S.N.

AØ = 5,300 WATTS
BØ = 5,922
CØ = 5,737

LIGHTING PANEL No 24
TURBINE ROOM
EL. 36'-9" COL. A-14

No OUTL.	LOCATION	LOAD	CIR No	CIR No	LOAD	LOCATION	No OUTL.
10	LTG.-TURBINE-EL. 36'-9" COLS. 15-17 & A-B4	840	1	2	940	LTG. TURBINE-EL. 36'-9" COLS. 11-15 & A-D	11
9	14-16 & A-B4	790	3	4	880	11-13 & D-F	12
11	12-14 & A-B8	1100	5	6	800	13-14 & D-F	8
4	EL. 30'-6" 11-14 & C-D	600	7	8	1080	RECEPT.-TURBINE & HTR. BAY-EL. 36'-9"	6
10	EL. 36'-9" 14-16 & D6-F	840	9	10	720	RECEPT.-TURBINE-EL. 36'-9" & 30'-6" TEL LT.	5
10	15-17 & D6-F	800	11	12	1176	UNIT HTR. No 28 EL. 36'-9" COL. CC3-12	1
	SPARE		13	14	1176	UNIT HTR. No 214 EL. 53'-0" COL. A-11	1
1	UNIT HTR. #29 EL. 36'-9" COL. F-15	1176	15	16	1176	UNIT HTR. No 216 53'-0" COL. A-13	1
1	UNIT HTR. #215 EL. 53'-0" COL. F-13	1176	17	18	1176	UNIT HTR. No 218 EL. 53'-0" COL. A-15	1
1	UNIT HTR. #217 EL. 53'-0" COL. F-15	1176	19	20	1080	RECEPT.-TURBINE-EL 53'-0" & EXC. HOUSING	6
1	UNIT HTR. #210 EL. 36'-9" COL. CC3-16	1176	21	22	180	RECEPT. BATT. RM. #23 EL33'-0" SUPHTR BLDG	1
1	CONT. RM. AIR CONDITIONER UNIT, EL.53'-0" COL F-11.1, F11.4	2800	23	24	300	LTG. BATT. RM. #23 EL33'-0" SUPHTR BLDG	1
				26		EXH. FAN BATT. RM. 23 EL 33'-0" CONTR. BLDG	1

(13) EM/98845 IT. 1.1 — (12) — (13)

120/208V-3Ø, 4W-S.N. 60~ A.C. LIGHTING PNL. WITH 100 AMP MAIN LUGS ONLY WITH 24-120V 20 AMP, 1P & 1-208V, 20AMP, 2P BRANCH BREAKERS WESTINGHOUSE TYPE "NEB" OR EQUAL. — A B C, S.N.

AØ = ~~6,632~~ 8,232 WATTS
BØ = ~~6935~~
CØ = ~~6,988~~ 7,028

LIGHTING PANEL No 25
TURBINE ROOM
EL. 36'-9" COL. B4-20

No OUTL.	LOCATION	LOAD	CIR No	CIR No	LOAD	LOCATION	No OUTL.
14	LTG.-TURBINE EL 36'-9" COLS. 17-20 & A-E4	990	1	2	900	LTG. TURBINE EL 36'-9" COLS. 20-22 & B8-C8	9
13	19-21 & A-E1	1020	3	4	860	20-22 & C8-E1	9
11	20-22 & A-B8	860	5	6	660	20-22 & E-F	7
9	18-20 & C6-F	820	7	8	720	RECEPT.-TURBINE & HTR. BAY EL. 36'-9" & 32'-0" TEL. LT.	5
2	EL. 32'-0" 19-20 & B8-C8	300	9	10	720	RECEPT.-TURBINE EL. 36'-9"	4
9	EL. 36'-9" 17-19 & D6-F	740	11	12	1176	UNIT HTR. No 212 EL. 36'-9" COL. CC3-20	1
	SPARE		13	14	1176	UNIT HTR. No 220 EL 53'-0" COL. A-18	1
1	UNIT HTR. No 211 EL. 36'-9" COL. F-20	1176	15	16	1176	UNIT HTR. 222 EL. 53'-0" COL. A-20	1
1	UNIT HTR. No 223 EL. 53'-0" COL. B9-22	1176	17	18	1176	UNIT HTR. #221 EL. 53'-0" COL. F-20	1
1	UNIT HTR. No 224 EL. 53'-0" COL. D2-22	1176	19	20	1176	UNIT HTR. #219 EL. 53'-0" COL. F-18	1
1	UNIT HTR. No 225 EL. 53'-0" COL. F-22	1176	21	22	960	RECEPT.-TURBINE EL. 36'-0" TEL. LT.	
1	UNIT HTR. No 213 EL. 36' COL. B8-22	[illegible]	23	24	540	RECEPT. EL. 15'-0" COL. F-22	3
	SPARE		25	26		SPARE	
	SPARE		27	28		SPARE	

120/208V-3Ø 4W-S.N., 60~ A.C. LIGHTING PNL. WITH 100AMP MAIN LUGS ONLY, WITH 28 120V 20 AMP 1P BRANCH BREAKERS, WESTINGHOUSE TYPE "NEB" OR EQUAL. — A B C, S.N.

AØ = 6,958 WATTS
BØ = 7,328
CØ = 7,500

* RECPT. BOX "A" & "B" ON MAIN GENERATOR (SEE F.P. 9321-3049 & 9321-3209)

EMERGENCY LIGHTING PANEL No 26
TURBINE ROOM
EL. 36'-9" COL. A-14

No OUTL.	LOCATION	LOAD	CIR No	CIR No	LOAD	LOCATION	No OUTL.
4	A.C.-D.C. EMERG. LTG. EL. 15'0" TURBINE & HTR. BAY	600	1	2	600	A.C.-D.C. EMERG. LTG. EL. 15'-0" TURBINE	4
4	A.C.-D.C. EMERG. LTG. EL. 3'3" & 15'0" TURBINE & HTR BAY	600	3	4	450	A.C.-D.C. EMERG. LTG. EL. 36'-9" & 30'-6" - TURBINE & HTR. BAY	3
3	A.C.-D.C. EMERG. LTG. EL. 36'-9" & 32'-0" TURBINE	450	5	6	450	A.C.-D.C. EMERG. LTG. EL. 53'-0" - TURBINE	3
1	A.C.-D.C. EMERG. LTG. BATTERY RM #23 EL33'-0 SUPHTR BLDG.	300	7	8		SPARE	

(12)

120V-60~ A.C. - 125V D.C. - 1Ø, 2W LIGHTING PANEL WITH 100 AMP MAIN LUGS ONLY, WITH 8-20AMP-2P "EH" FRAME BRANCH BREAKERS WESTINGHOUSE TYPE "NHEB" OR EQUAL. — CØ N (A.C.) (D.C.)

3450 ~~3150~~ WATTS (12)

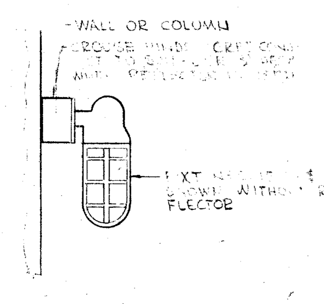
LEGEND

Symbol	Description
	FLUORESCENT LIGHTING FIXTURE
	CEILING MOUNTED INCANDESCENT LIGHTING FIXTURE
	CRANE
	WALL
	GOOSENECK
	HI-BAY TWIN LIGHTING FIXTURE INTEGRAL BALLAST
K1	DUPLEX CONVENIENCE OUTLET-3 WIRE GROUNDING TYPE-120V, 15A HUBBELL CAT# 5262
K2	DUPLEX CONVENIENCE OUTLET 3 WIRE GROUNDING TYPE-120V-15A-WEATHERPROOF-CAT# 5214
S1	TOGGLE SWITCH-20 AMP S.P. HUBBELL CAT # 8941
S2	TOGGLE SWITCH 15 AMP-S.P. HUBBELL CAT# 1161SL WITH #1377 PILOT LIGHT WITH #1242 BULLS EYE JEWEL & #94021 PLATE
	UNIT HEATER WITH THERMOSTAT-BY OTHERS
	ON-OFF MAINTAINED PUSH BUTTON SIMILAR TO WESTINGHOUSE CAT # 1764 817
K3	CONVENIENCE OUTLET-3 WIRE GROUNDING TYPE 120V, 15A HUBBELL CAT # 5261
S3	TOGGLE SWITCH-20 AMP-3 WAY HUBBELL CAT.# 8943
S4	TOGGLE SWITCH-WITH PILOT LIGHT-10 AMP 3 WAY HUBBELL CAT # 7953

LETTERS WITHIN CIRCLE
"AE" A.C.-D.C. EMERG. LTG. FIXT.
"F" - FLOOD LTG. FIXT.
"E" - D.C. EMERG. LTG. FIXT.

GENERAL NOTES

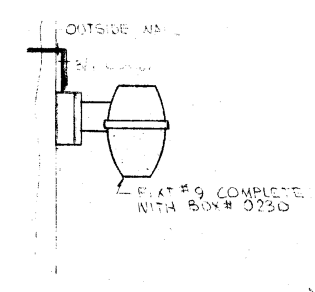
1. ALL BRANCH CKT. WIRING IS TO BE DETERMINED BY THE SUB-CONTRACTOR. SUB-CONTRACTOR IS TO PROVIDE NECESSARY SUPPORTS, FITTINGS & JUNCTION BOXES FOR FIXTURES, PANELS ETC.
2. WHERE FIXTURE LOCATIONS ARE NOT DIMENSIONED, LOCATIONS SHALL BE SCALED FROM DRAWINGS. LOCATIONS OF FIXTURES MAY BE CHANGED BY SUB-CONTRACTOR TO AVOID INTERFERENCE WITH PERMISSION OF ELECTRICAL FIELD SUPERINTENDENT.
3. MOUNTING HEIGHTS OF ALL RECEPTACLES TO BE 4'-0" ABOVE FLOOR OR PLATFORM UNLESS NOTED OTHERWISE.
4. MOUNTING HEIGHT OF ALL SWITCHES TO BE 4'-6" ABOVE FLOOR OR PLATFORM UNLESS NOTED OTHERWISE.
5. ALL MOUNTING HEIGHTS (M.H.) SHOWN ON DWGS. ARE REFERRED TO:
   A. BOTTOM OF LIGHTING FIXTURES
   B. CENTER LINE OF SWITCHES, RECEPT. ETC.
6. NUMBERING SYSTEM IS AS FOLLOWS:
   FIRST NO. = FIXTURE No (SEE FIXT. SCHEDULE DWG. # 9321-LL-3042) — 1-21-5a
   SECOND NO. = PANEL No
   THIRD NO. = CIRCUIT No
   SMALL LETTER = SWITCH CIRCUIT
7. ELECTRICAL CONTRACTOR IS TO CHECK ALL PIPING & CABLE TRAY DWGS. BEFORE INSTALLING LIGHTING FIXTURES.
8. ALL SWITCHES, RECEPTACLES ETC. ARE TO BE MOUNTED IN STANDARD OUTLET BOXES UNLESS NOTED OTHERWISE.
9. FOR THREE LINE DIAGRAM OF NUCLEAR PLANT LIGHTING SYSTEM SEE DWG # 9321-F-3035



DETAIL "G"

DWG. No 9321-F-3022	DWG. No 9321-F-3023
DWG. No 9321-F-3029	DWG. No 9321-F-3030
DWG. No 9321-F-3033	DWG. No 9321-F-3034
DWG. No 9321-F-3035	DWG. No 9321-F-303[illegible]
DWG. No 9321-F-3039	DWG. No 9321-F-3026
DWG. No 9321-F-3028	DWG. No 9321-F-3031

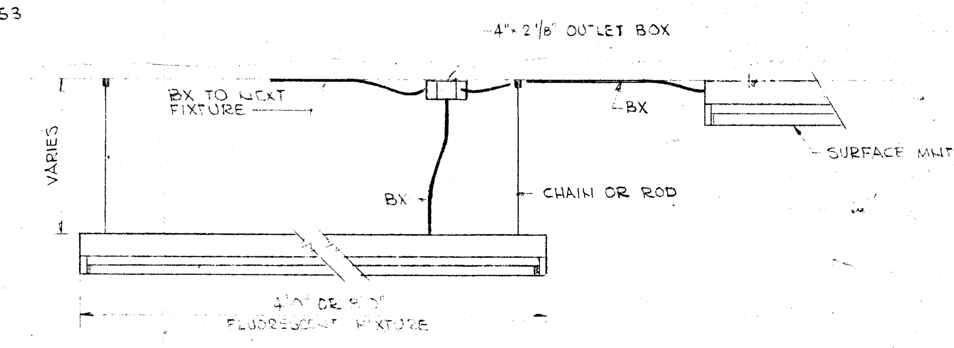
N.T.S.



DETAIL "H"

DWG. No 9321-F-3022	DWG. No 9321-F-3033
DWG. No 9321-F-3035	DWG. No 9321-F-3038
DWG. No 9321-F-3039	DWG. No 9321-F-3030
DWG. No 9321-F-3026	DWG. No 9321-F-3028

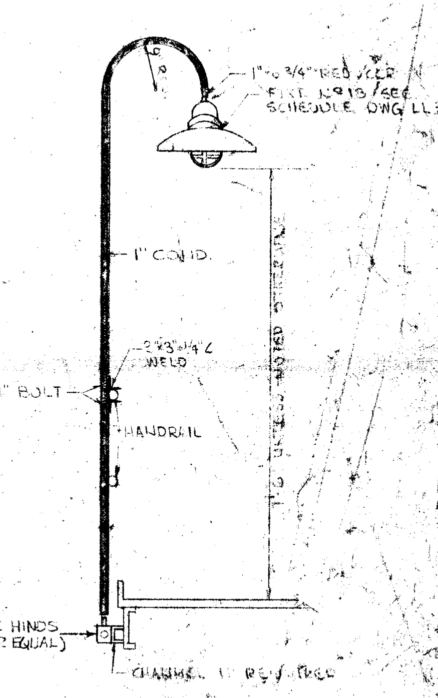
N.T.S.



DETAIL "F"

DWG. No 9321-F-3022	DWG. No 9321-F-3023
DWG. No 9321-F-3033	DWG. No 9321-F-3035
DWG. No 9321-F-3038	DWG. No 9321-F-3039
DWG. No 9321-F-3028	DWG. No 9321-F-3031

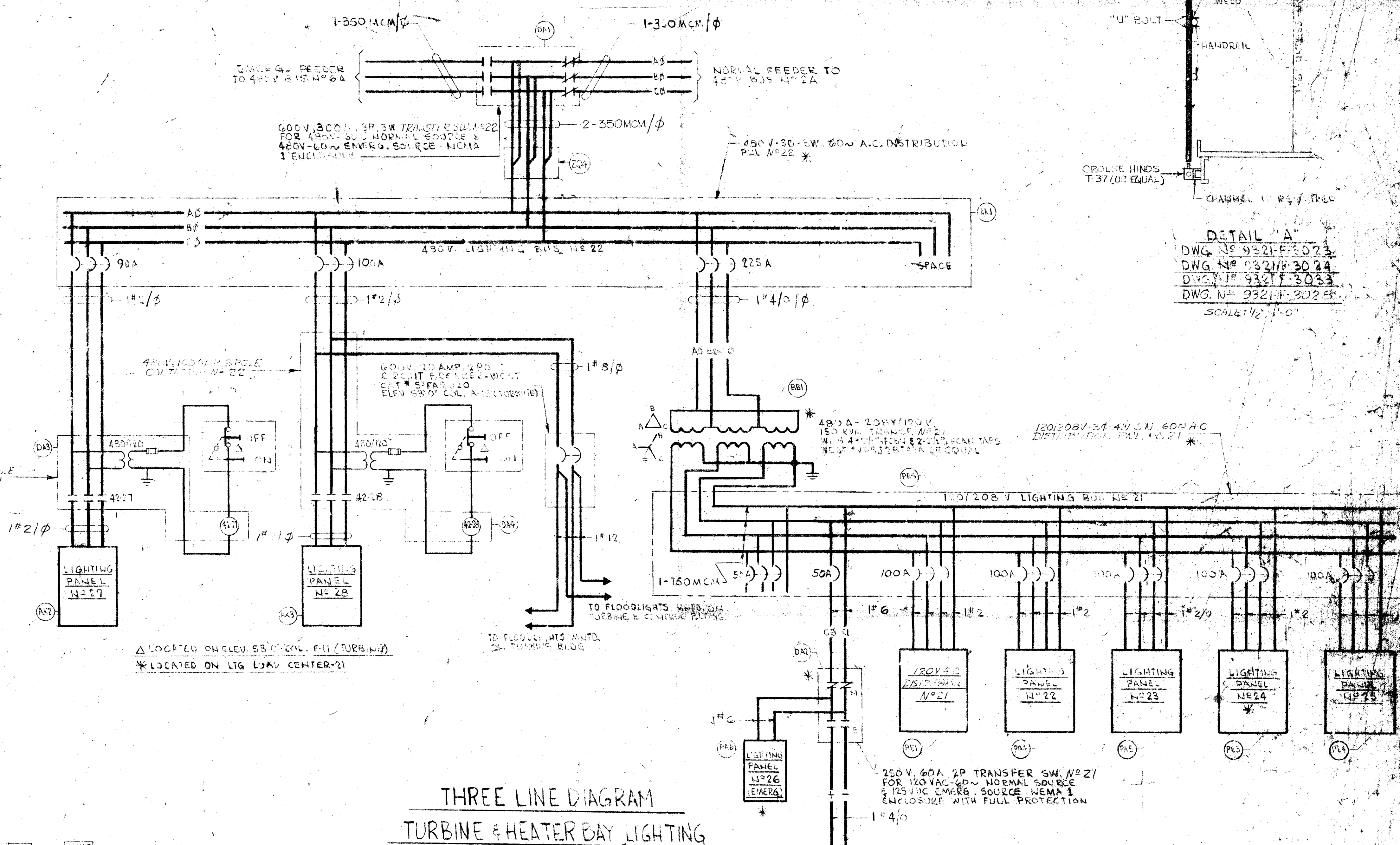
N.T.S.



DETAIL "A"

DWG. No 9321-F-3023
DWG. No 9321-F-3024
DWG. No 9321-F-3033
DWG. No 9321-F-3028

SCALE: 1/2" = 1'-0"

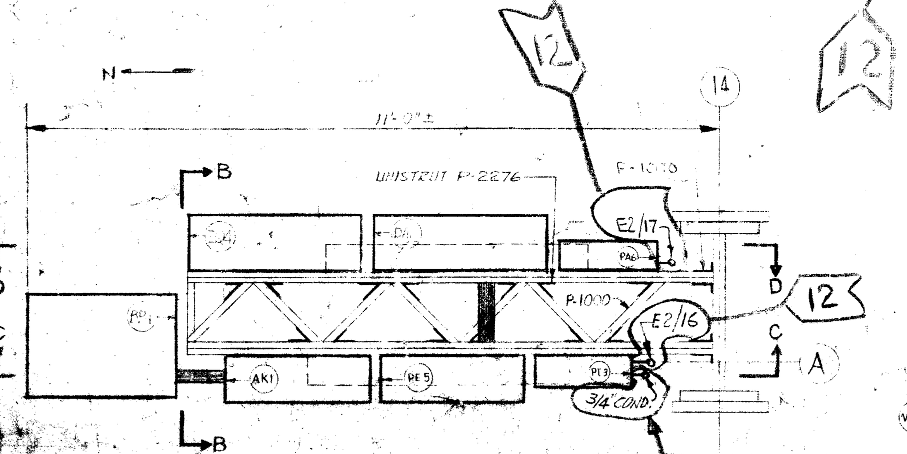


THREE LINE DIAGRAM
TURBINE & HEATER BAY LIGHTING

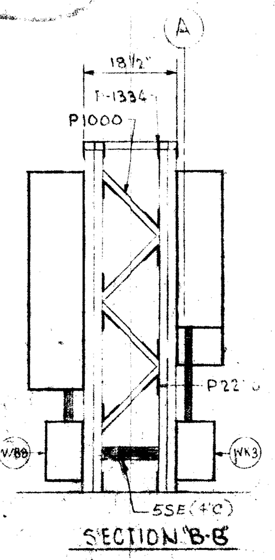
120V. BRANCH CIRCUIT WIRE DETERMINATIONS

WATTAGE LOAD 120V CIRCUITS	AMP LOAD	LENGTH OF RUN IN FEET															
		30	40	50	60	70	80	90	100	120	140	160	180	200	240	280	320
575	5	12	12	12	12	12	12	12	12	12	10	10	10	10	8	8	8
690	6	12	12	12	12	12	12	12	12	10	10	10	8	8	8	8	
805	7	12	12	12	12	12	12	12	10	10	10	8	8	8			
920	8	12	12	12	12	12	12	10	10	10	8	8	8	8			
1,035	9	12	12	12	12	12	10	10	10	8	8	8	8				
1,150	10	12	12	12	12	10	10	10	10	8	8	8					
1,380	12	12	12	12	10	10	10	8	8	8	8						

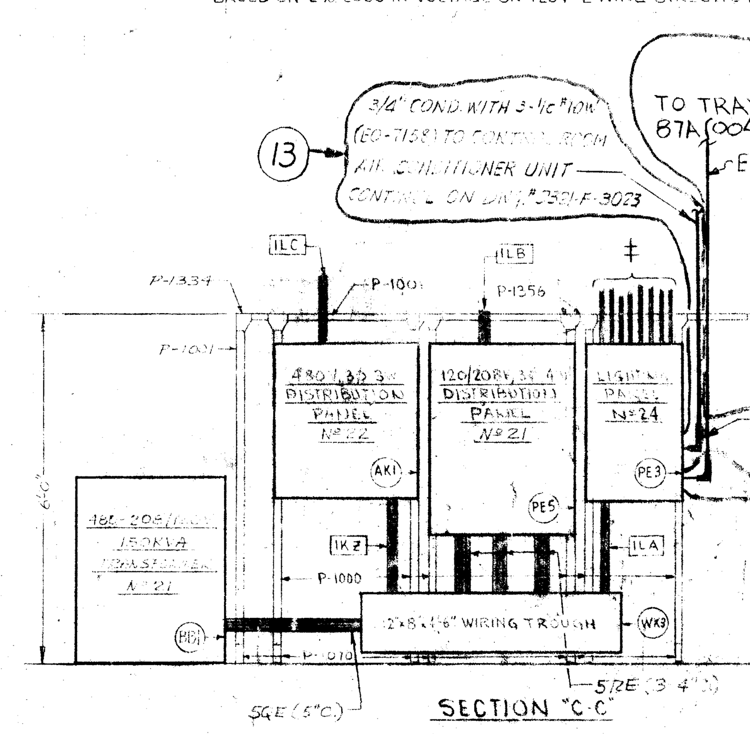
BASED ON 2% LOSS IN VOLTAGE ON 120V 2 WIRE CIRCUITS @ 50°C. MAX.



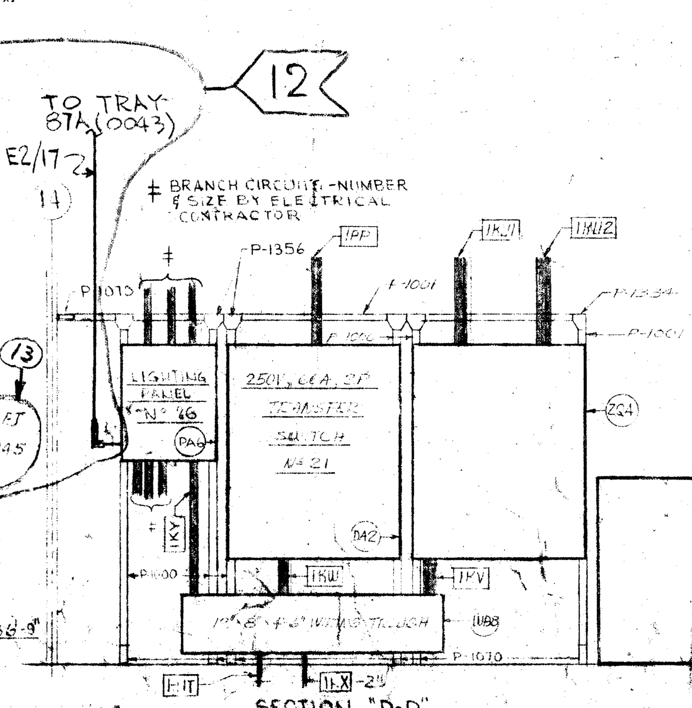
PLAN VIEW
LIGHTING LOAD CENTER-21
DWG. No 9321-F-3023
SCALE: 1/2" = 1'-0"



SECTION "B-B"



SECTION "C-C"



SECTION "D-D"

NOTE:
ALL NUMBERS SHOWN WITH THE PREFIX "P" ARE UNISTRUT CAT. NO. USE SPRING NUTS & SCREWS TO SUIT.

INCHES 0 1 2 3 4 5 6

REV. NO.	DATE	DESCRIPTION	ENGR	SUP ENG	
13	6/7/78	THIS ISSUE IS NON CLASS "A" PER CI-24[illegible] IN CONN. WITH THE INSTALL. OF CONT. RM. AIR COND. UNIT. REVISED LTG. PNL. NO. 24, PLAN VIEW & SECT. "C-C" ISSUED FOR CONSTR. — D. REDDY			
12	1-18-78	THIS ISSUE IS NON CLASS "A" PER CI-240-1. IN CONN. WITH INSTALL. OF 4th INVERTER FOR INSTR. BUS. ADDED NORM. FEED TO BATT. RM #23 FROM LTG. PNL. 24 CKTS 22 & 24 & EMERG. FEED TO BATT. RM. #23 FROM LTG. PNL. 26 CKT. #7. ADDED FEED FOR BATT. RM #23 EXH. FAN TO LTG. PNL. #24, CKT #26 & ADDED CDTS E2/16 & E2/17 TO LTG. LOAD CTR.-21 PLAN & SECTS. C-C & D-D. ISSUED FOR INSTR. PER [illegible] 77-2-12 WORK & EPB. PD 7684			
11	10/73	FINAL ISSUE			
10	10/70	ADDED TEL. BOOTH CIR. TO CIR 16 (PNL 27) CIR 18 (PNL 28) & CIR 13 (PNL 25). RELOCATED RECEPT. CIR. FROM PNL. 23 CIR. 14 TO PNL. 25 CIR. 24 - CIR. BRKR. AT "RESC" [illegible]			
9		ADDED NOTES & GENERAL REV.			
	9/8/66	FIRST ISSUE			

ENGINEER: [illegible]
STATE REG. NEW YORK NO. 042458
UNITED ENGINEERS & CONSTRUCTORS INC.

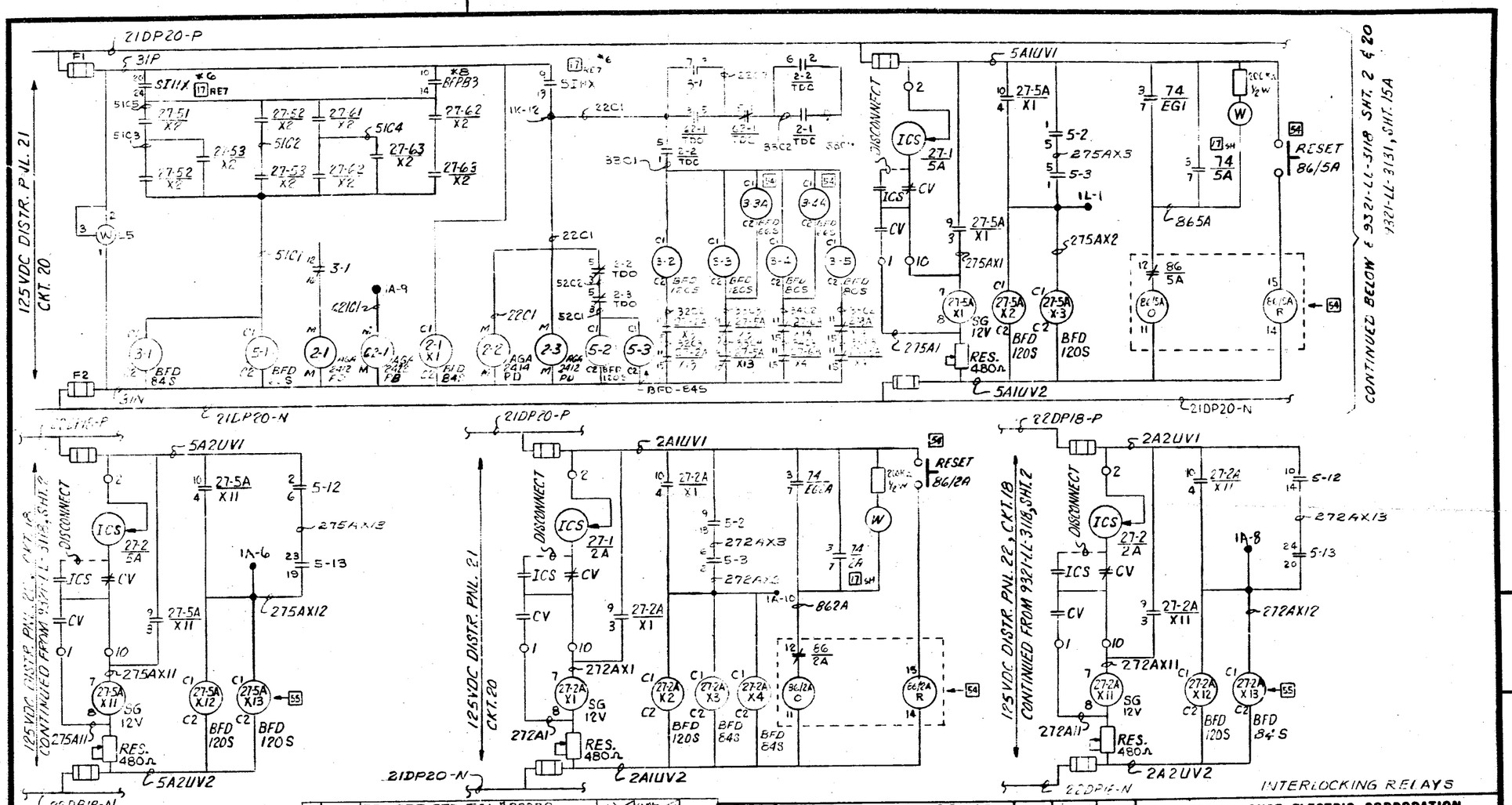
WESTINGHOUSE ELECTRIC CORPORATION

LIGHTING PANELS & CIRCUIT DIAGRAMS - SHEET 1

FOR
CONSOLIDATED EDISON COMPANY
INDIAN POINT GENERATING STATION
UNIT NO. 2

U.E. & C. DWG. NO. 9321-F-3041-13
CON. ED. CO. DWG. NO.

Docket # 50-247
Control # 7912270232
Date 12-14-79 of Document:
REGULATORY DOCKET FILE



FOR NOTES & RELAY CONTACT TABULATION SEE SHTS 3 & 54

REV.	DATE	DESCRIPTION	ENGR	SUP ENG
13	10 1 72	FINAL ISSUE		
12	10 13 70	REVISED PER ECN # 70229		
11	9 14 70	REVISED PER ECN # 70227		
10	8 11 70	REVISED PER E.C.N. 70205		
9	3 70	ADDED DC PWR LAMP & REVISED WIRING PER ECN-70147 & ECN-70155		
8	12 22 69	REV. 624, TDC CONTACT		
7	12 10 69	REVISED PER AS BUILT CHANGES		
6	4 7 69	CHANGED CONTACT LOCATION		
5	10 29 68	REV. CKT. [illegible] ADDED WIRING [illegible]		
4	10 14 68	REVISED CONTACTS ON DEVICE 5-2, 27-2A/X3 & 27-5A/X3		
3	9 9 68	REV. 86/2A & 86/5A RELAYS - REVISE CONTACTS: REV. LOC. SYMBOLS - ADDED [illegible] RES.		
2	4 5 68	ADDED DEVICE 2-1 & 2-2		
1	11 28 67	GENERAL REVISION		
0	7 11 67	FIRST ISSUE FOR APPROVAL		

ENGINEER Kellison R. Kelman

STATE REG. NEW YORK NO. 42453

UNITED ENGINEERS & CONSTRUCTORS INC.

WESTINGHOUSE ELECTRIC CORPORATION
FOR
CONSOLIDATED EDISON COMPANY
INDIAN POINT GENERATING STATION - UNIT NO. 2

SCHEMATIC DIAGRAM
480 V SWITCHGEAR 21

SHEET NO. 2

U.E.&C. DWG. NO. 9321-LL-3117

CON. ED. CO. DWG. NO. D200902

Docket # 50-247
Control # 7912270232
Date 12-14-79 of Documents
REGULATORY DOCKET FILE

CONTACT	27-2A/X2 & /X12 BFD-120S	27-2A/X3 & /X13 BFD-84S	27-5A/X2 & /X12 BFD-120S	27-5A/X3 & /X13 BFD-84S	27-2A/X4 BFD-84S	3-2 BFD-120S	3-3 BFD-120S	3-4 BFD-80S	3-5 BFD-80S	5-1 BFD-66S	5-2 BFD-120S	5-3 BFD-84S	5-3A BFD-66S	2-1/X1 BFD-84S	3-1 BFD-84S	3-4A BFD-66S
	DEVICE NUMBER & TYPE															
1 || 5	52/EG2A SHT. 8	52/MCC1 SHT. 11	52/EG1 SHT. 7	52/CS1 △ 32	DG 21-PRIM. SHT. 22	2/CRF3 △ 47	SPARE	52/SI3 △ 28	2/CC25 △ 32	52/5A SHT. 4	27-5A/X2 SHT. 2	27-5A/X2 SHT. 2	—	TERMS. 1K-7 & 1C	SPARE	—
2 || 6	52/2AT5A SHT. 5	52/MG1 △ 25	52/2AT5A SHT. 5	52/CRF1 △ 37	DG 22 PRIM SHT. 22	SPARE	52/MCC6A SHT. 10	2/AF3 LL-3118, SHT. 16	2/SW2B △ 43	b 2/BFG LL-3118, SHT. 4	TERMS. 1C-2 & 1C-3	27-2A/X2 SHT. 2	b 52/CS1 △ 32	TERMS. 2N-4 & NC	TERMS. 1C-7 & NC	b 52/CS2 △ 40
3 || 7	52/2AT5A SHT. 5	52/SW2A △ 42	52/2AT5A SHT. 5	52/PBU3 △ 39	DG 23 PRIM SHT. 22	SPARE	2/SW1 △ 33	52/MCC6B LL-3118, SH. 9	52/SW5A △ 34	b SPARE	TERMS. 1P-3 & 1P-7	27-3A/X12 LL-3118, SHT. 2	b —	SPARE	SHT. 2 ○	b —
4 || 8	52/2AT3A SHT. 9	52/SI2A △ 29	52/5A SHT. 4	52/MCC8 SHT. 11	SPARE	2/CC3-2 △ 45	2/SW4 △ 33	2/RHR2 △ 31	2/RHR1 △ 3	52/3A LL-3118, SHT. 6	27-6A/X12 LL-3118, SHT. 2	27-6A/X12 LL-3118, SHT. 2	—	SPARE	SPARE	—
9 || 13	52/2AT3A SHT. 9	b 52/CC2 △ 45	SPARE	b 3-3 SHT. 2	b SPARE	2/SW2A △ 42	SPARE	2/CRF5 △ 37	2/CC3-3 △ 46	b SPARE	27-2A/X2 SHT. 2	b SPARE	b —	TERMS. b NC & 1K-11	b SPARE	b —
10 || 14	52/2A SHT. 6	b 52/SW5B+2A △ 35 + △ 42	52/CRF2 △ 37	b 52/CC1 △ 27	b SPARE	SPARE	TERMS 2K-1 & 2K-6	2/SW3 △ 44	SPARE	b 2/CC2-2 △ 27	TERMS. A-11 & 1A-12	b SPARE	b —	b TERMS NC & 1Q-5	b SPARE	b —
11 || 15	52/MCC210 SHT. 11	b 3-2 SHT. 2	52/C1 △ 26	b 52/SW4 & 4 △ 33	b SPARE	SPARE	2/CRF1 △ 37	2/CS2 △ 40	2/CRF4 △ 48	b 2/CC2-2 △ 45	TERMS. 1P-6 & 1P-9	b SPARE	b —	SBIIF-PNL b 499B444 SH. 162	b SPARE	b —
12 || 16	SPARE	b 3-12 LL-3118, SHT. 2	52/SAC SHTS. 19 & 20	b 3-13 LL-3118, SHT. 2	b SPARE	SPARE	2/CRF2 △ 37	2/SW6 △ 44	2/AF1 LL-3118, SH. 15	b 2/CC3-2 △ 46	27-3A/X12 LL-3118, SHT. 2	b SPARE	b —	b SPARE	b SHT. 2 ○	b —
17 || 21	52/PBU12 △ 39	52/SW5B △ 35	52/MCC9 SHT. 11	52/CC1 △ 27	SPARE	2/SI2A △ 29	TERMS. NC & 1G-8	—	—	52/6A LL-3118 SHT. 4	SPARE	SPARE	—	TERMS NC & 1E-8	52/EG2A SHT. 8	—
18 || 22	52/MCC4 SHT. 11	52/MCC3 SHT. 11	52/SW4 △ 33	SPARE	SPARE	SPARE	2/CRF-2 △ 37	—	—	52/2A SHT. 6	SPARE	SPARE	—	TERMS. 1C & 1D-8	52/2G2B LL-3118 SHT. 8	—
19 || 23	52/CC2 △ 45	52/LTIN SHT. 11	52/SW1 △ 33	52/R1 △ 24	SPARE	2/SW5B △ 35	2/CS1 △ 32	—	—	SPARE	SPARE	SPARE	—	SPARE	52/EG3 LL-3118, SHT. 7	—
20 || 24	52/DI1 SHT. 13	52/CRF3 △ 47	52/SI1 △ 28	52/LT3 SHT. 11	SPARE	SPARE	2/SI1 △ 28	—	—	SPARE	SPARE	SPARE	—	SPARE	52/EG1 SHT. 7	—

△ — INDICATES W DWG. 499B444 (U.E.&C.-F.P. 9321-3072) SHEET NO.

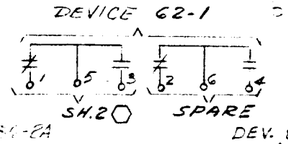
○ — INDICATES CONTACT WIRED OR PARTIALLY WIRED. SEE SCHEMATIC.

DEVICE — NC — INDICATES NOT CONNECTED

b — INDICATES CONTACT NORM. CLOSED

FOR NOTES SEE SHT. 3A

DEVICE 62-1



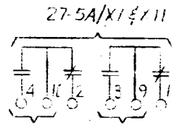
01	02	03	04
09	10	11	12
BF			
13	14	15	16
21	22	23	24
05	06	07	08

OC1

OC2

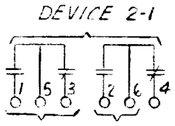
WESTINGHOUSE TYPE BF RELAY - SUPPLIED WITH UNMARKED TERMINALS. NUMBERS ASSIGNED FOR LOCATION PURPOSES ONLY.

DEVICE 27-2A/X1 & X11
27-5A/X1 & /11



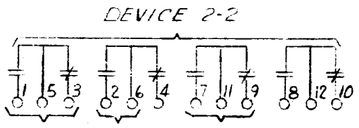
SHT. 2 SHT. 2

DEVICE 2-1



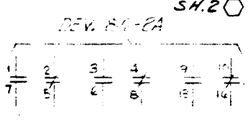
SPARE SHT. 2 ○

DEVICE 2-2



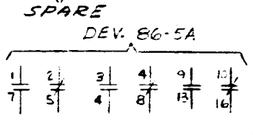
SHT. 2 SHT. 2 ○ SPARE SPARE

DEV. 86-2A



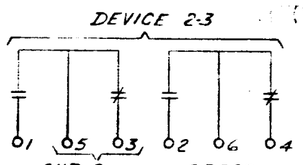
SHT. 8 SHT. 9

DEV. 86-5A



SHT. 5 SHT. 7 SPARE

DEVICE 2-3



SHT. 2 SPARE

INTERLOCKING RELAYS

REV.	DATE	DESCRIPTION	ENGR	SUP ENG
12	10 1 73	FINAL ISSUE		
11	[illegible]	REVISED PER ECN #70225		
10	[illegible]	REVISED PER ECN #70227		
9	8 11 70	REVISED PER ECN-70225		
8	[illegible] 7 70	REV. PER W DWG 499B444 SHEET #47		
7	[illegible]	REV. DEV. 27/X1 CONTACTS PER ECN [illegible]		
[illegible]	12 10 69	REVISED PER AS BUILT CHANGES		
5	4 7 69	REV. DEVICE TYPE		

REV. NO.	DATE	DESCRIPTION	ENGR	SUP ENG	(W)
4	10 14 68	GENERAL REVISION			
3	9 9 68	REV. PER W APD COMMENTS			
2	4 5 68	GENERAL REVISION			
1	11 28 67	GENERAL REVISION			
		FIRST ISSUE FOR APPROVAL			

ENGINEER

STATE REG. NEW YORK NO. 42453

UNITED ENGINEERS & CONSTRUCTORS INC.

WESTINGHOUSE ELECTRIC CORPORATION
FOR
CONSOLIDATED EDISON COMPANY
INDIAN POINT GENERATING STATION - UNIT NO. 2

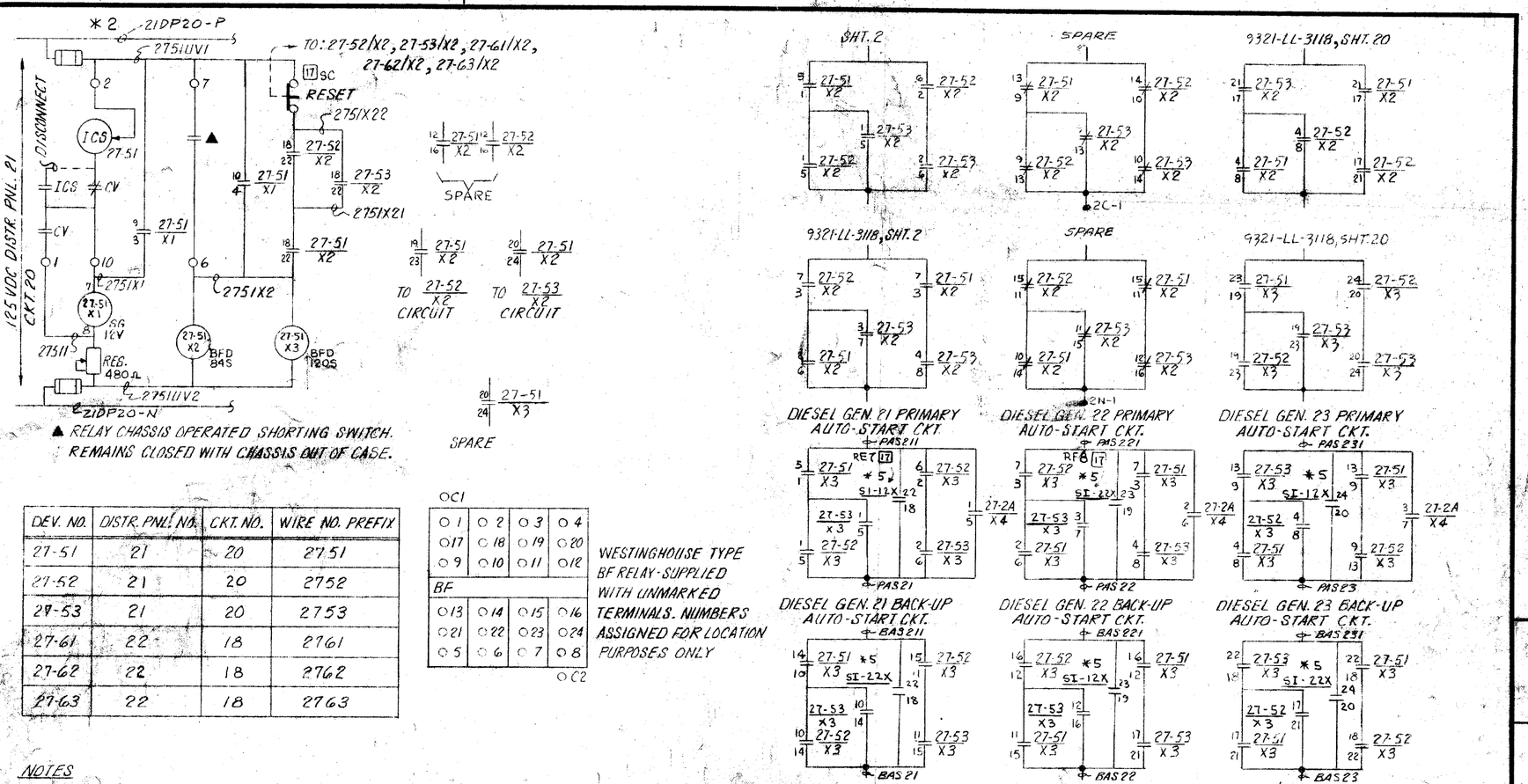
SCHEMATIC DIAGRAM
480 V SWITCHGEAR 21

SHEET NO. 3

U.E.&C. DWG. NO. 9321-LL-3117

CON. ED. CO. DWG. NO. D200902

Docket # 50-247
Control # 7912270232
Date 12-14-79 of Document
REGULATORY DOCKET FILE



DEV. NO.	DISTR. PNL. NO.	CKT. NO.	WIRE NO. PREFIX
27-51	21	20	2751
27-52	21	20	2752
27-53	21	20	2753
27-61	22	18	2761
27-62	22	18	2762
27-63	22	18	2763

WESTINGHOUSE TYPE BF RELAY-SUPPLIED WITH UNMARKED TERMINALS. NUMBERS ASSIGNED FOR LOCATION PURPOSES ONLY

NOTES

*1. NUMBERS IN SQUARES REFER TO EQUIPMENT LOCATION. FOR LEGEND SEE SHT. 1.

*2. CKT. SHOWN IS TYPICAL FOR 27-52, 27-53, 27-61, 27-62 & 27-63.

*3. ALL BUS 5A DEVICE 27 & 27X RELAYS LOCATED IN SAFEGUARDS RELAY CABINET 21, 54
" " 6A " " " " " " " " 22, 55

*4. FOR DEVICE 27-2A/X4, SEE SHT. 2.

*5. FOR SI-12X & SI-22X SEE W DWG. 110E089 SHT. #4 (U.E.&C. F.P. 9321-3648)

REV.	DATE	DESCRIPTION	ENGR	SUP ENG	W
11	10 1 73	FINAL ISSUE			
10	11 13 70	ADDED NOTE 5 & SI-12X, SI-22X CONTACTS			
9	8 11 70	REVISED PER ECN-70205			
8	8 7 70	REV. AS MARKED BY - (W) (AS BUILT)			
7	3 12 70	REVISED - AS BUILT - PER ECN-70147			
6	12 22 69	REV. RELAY CONTACT DESCRIPTION			
5	12 10 68	REVISED PER AS BUILT CHANGES			
4	11 14 68	ADDED WIRE NUMBERS			
3	9 9 68	REVISED FOR 4.50V			
2	5 6 68	FOR CONSTRUCTION			
1	3 26 68	REV. CONTACT NO. & ADDED WIRE NO'S			
0	1 4 67	FIRST ISSUE FOR APPROVAL			

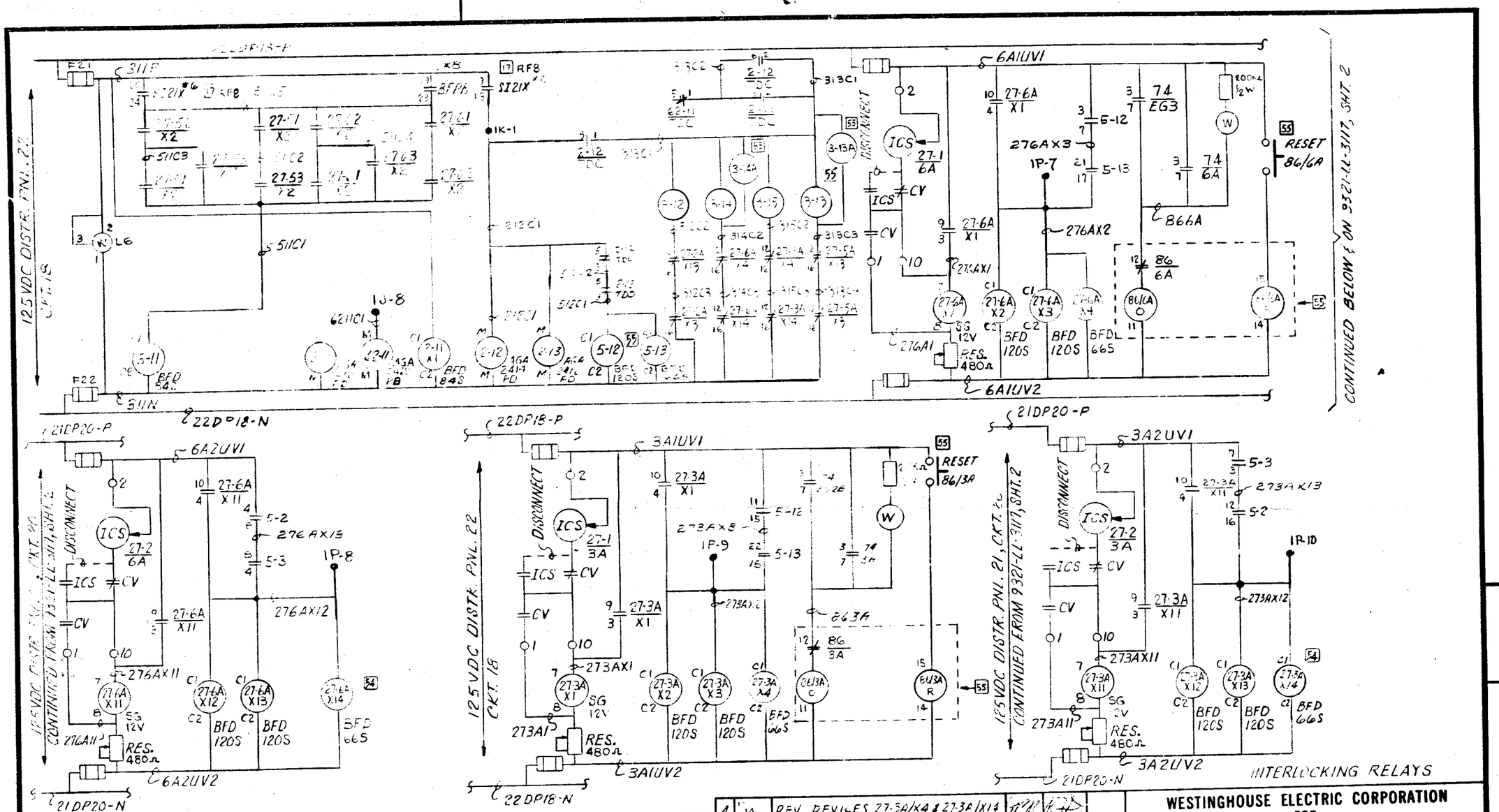
ENGINEER William P. Rickman Jr.
STATE REG. NEW YORK NO. 42453
UNITED ENGINEERS & CONSTRUCTORS INC.

WESTINGHOUSE ELECTRIC CORPORATION
FOR
CONSOLIDATED EDISON COMPANY
INDIAN POINT GENERATING STATION - UNIT NO. 2

SCHEMATIC DIAGRAM
480 V SWITCHGEAR 21
SHEET NO. 22

U.E. & C. DWG. NO. 9321-LL-3117
CON. ED. CO. DWG. NO. D200902

Docket # 50-247
Control # 7912270232
Date 12-14-79 of Document:
REGULATORY DOCKET FILE



FOR NOTES & RELAY CONTACT TABULATION SEE SH'S 3 & 3A

REV. NO	DATE	DESCRIPTION	ENGR	SUP ENG	W
12	10/72	FINAL ISSUE			
11	10/70	REVISED PER ECN# 70229			
10	9/14/70	REV. SHD PER ECN# 70227			
9	3/70	ADDED DC PWR. LAMP & REV. WIRING PER ECN-70147 & ECN-70155			
8	12/22/69	REV. 62-1, TDC CONTACT			
7	12/10/69	REVISED PER AS BUILT CHANGES			
6	4/7/69	CHANGED CONTACT LOCATION			
5	10/8/68	ADDED WIRE NO'S.			
4	10/14/68	REV. DEVICES 27-3A/X4 & 27-3A/X14			
3	9/9/68	REV. 86-3A/3C/3R RELAYS, REV. ST. CONTACTS REV. 86C-3A RELAY, ADDED 20 OHM RES.			
2	4/5/68	ADDED DEVICE 27-3A X4			
1	11/29/67	GENERAL REVISION			
	8/12/67	FIRST ISSUE FOR APPROVAL			

ENGINEER
STATE REG. NEW YORK NO. 42453

UNITED ENGINEERS & CONSTRUCTORS INC.

WESTINGHOUSE ELECTRIC CORPORATION
FOR
CONSOLIDATED EDISON COMPANY
INDIAN POINT GENERATING STATION - UNIT NO. 2

SCHEMATIC DIAGRAM
480 V SWITCHGEAR 22
SHEET NO. 2

U.E. & C. DWG. NO. **9321-LL-3118**

CON. ED. CO. DWG. NO. D200903

Docket # 50-247
Control # 7912270232
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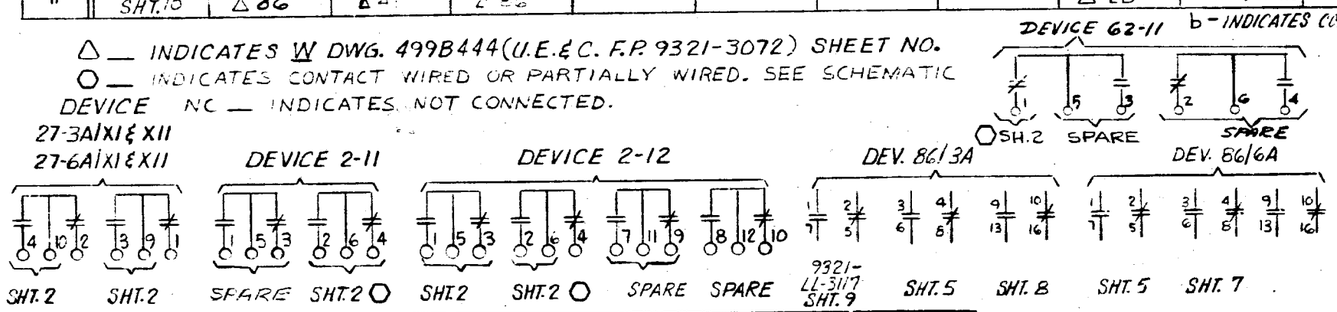
CONTACT	27-3A/X2&X12 BFD-120S	27-3A/X3&X13 BFD-120S	27-6A/X2&X12 BFD-120S	27-6A/X3&X13 BFD-120S	27-3A/X4&X14 BFD-66S	3-14 BFD-80S	3-15 BFD-80S	3-12 BFD-120S	3-13 BFD-120S	5-13 BFD-66S	5-12 BFD-120S	27-6A/X4&X14 BFD-66S	3-13A BFD-66S	2-11/X1 BFD-84S	3-11 BFD-84S	3-14A BFD-66S
	DEVICE NUMBER & TYPE															
1 || 5	52/EG2B SHT. 8	52/CRF4 △ 48	52/EG3 SHT. 7	52/AF3 SHT. 16	SPARE	52/SI3 △ 28	2/SI2B △ 30	2/CRF3 △ 47	SPARE	SPARE	TERMS. 1A-1 & 1A-5	SPARE	—	TERMS. 1K-5 & NC	52/A LL-3117, SHT. 4	—
2 || 6	52/3AT6A SHT. 5	52/MCC2 SHT. 10	52/3AT6A SHT. 5	52/SI3 △ 28	b 52/CC3 △ 46	2/AF3 SHT. 16	2/SW2B △ 43	SPARE	52/MCC6A LL-3117, SH. 10	b SPARE	27-5A/X12 LL-3117, SHT. 2	b 52/SW5 & 6 △ 44	b 52-CS1 △ 32	TERMS. 2N-6 & NC	52/6A SHT. 4	b 52/CS2 △ 40
3 || 7	52/3AT6A SHT. 5	52/SW5A △ 34	52/3AT6A SHT. 5	52/MCC7 SHT. 10	b SPARE	52/MCC6B SHT. 9	52/SW5A △ 34	SPARE	2/SW1 △ 33	b SPARE	27-6A/X2 SHT. 2	b SPARE	—	SPARE	52/2A LL-3117, SHT. 6	—
4 || 8	52/2AT3A LL-3117, SH. 9	52/PBU1 △ 49	52/6A SHT. 4	52/CRF5 △ 37	SPARE	2/RHR2 △ 31	2/RHR1 △ 31	2/CC3-2 △ 45	2/SW4 △ 33	SPARE	TERMS. 1P-4 & 1P-8		b —	SPARE	52/3A SHT. 6	b —
9 || 13	52/2AT3A LL-3117, SHT. 9	52/CT2B △ 30	SPARE	52/RHR2 △ 31	b 52/SW5A+2B △ 34 + △ 43	2/CRF5 △ 37	2/CC3-2 △ 46	2/SW2A △ 42	SPARE	b SPARE	TERMS 1A-3 & 1A-7	b	b —	b TERMS. 1K-9 & 1K-6	b 20/BPG LL-3131, SHT. 4	b —
10 || 14	52/3A SHT. 6	52/SW2B △ 43	52/TAO SHT. 18	SPARE	b SPARE	2/SW3 △ 44	SPARE	SPARE	TERMS 2M-7 & 2M-10	b SPARE	27-2A/X12 LL-3117, SHT. 2	b	b —	b TERMS. 1Q-6 & NC	b 2/CC1-2 △ 27	b —
11 || 15	SPARE	52/C2 △ 26	52/MG2 △ 25	52/C3 △ 26	b 3-5 LL-3117, SH. 2	2/CS2 △ 40	2/CRF4 △ 48	SPARE	2/CRF1 △ 37	b SPARE	27-3A/X2 SHT. 2	b 3-4 LL-3117, SH. 2	b —	SBIF-PNL b 499B44 SH. 162	b 2/CC2-2 △ 45	b —
12 || 16	52/AF1 SHT. 15	SPARE	52/LTIE SHT. 10	52/R2 △ 36	b 3-13 SH. 2	2/SW6 △ 44	2/AF1 SHT. 15	SPARE	2/CRF2 △ 37	b SPARE	TERMS. 1P-5 & 1P-10	b 3-14 SH. 2	—	b SPARE	b 2/CC3-2 △ 46	—
17 || 21	52/CC3 △ 46	52/RHR1 △ 31	52/SW6 △ 44	52/AF3 SHT. 16	DG 21-PRIM. LL-3117-SHT. 22A (X4-ONLY)	—	—	2/SI2A △ 29	TERMS NC & 1H-5	27-6A/X2 SHT. 2	SPARE	SPARE	—	TERMS. NC & NC	52/EG2A LL-3117, SHT. 6	—
18 || 22	52/DI2 SHT. 14	52/AF1 SHT. 15	52/SW3 △ 44	52/CS2 △ 40	DG 22-PRIM LL-3117-SHT. 22A (X4-ONLY)	—	—	SPARE	2/CC1-2 △ 27	27-3A/X2 SHT. 2	SPARE	SPARE	—	TERMS. NC & 1D-6	52/EG2B SHT. 8	—
19 || 23	52/MCC5 SHT. 10	AFPR1 LL-3131, SHT. 10	52/PC △ 38	AFPR3 LL-3131, SHT. 11	DG. 23-PRIM. LL-3117-SHT. 22A (X4-ONLY)	—	—	2/SW5B △ 35	2/CS1 △ 32	27-5A/X12 LL-3117, SHT. 2	SPARE	SPARE	—	SPARE	52/EG3 SHT. 7	—
20 || 24	52/LT2 SHT. 10	UNIT 4B △ 86	UNIT 12C △ 4[illegible]	UNIT 12C △ 86	SPARE	—	—	SPARE	2/SI1 △ 28	27-2A/X12 LL-3117, SHT. 2	SPARE	SPARE	—	SPARE	52/EG1 LL-3117, SHT. 7	—

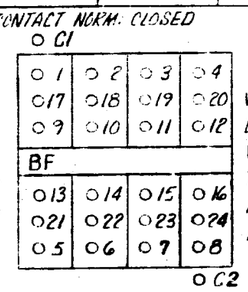
△ — INDICATES W DWG. 499B444 (U.E.&C. F.P. 9321-3072) SHEET NO.

○ — INDICATES CONTACT WIRED OR PARTIALLY WIRED. SEE SCHEMATIC

DEVICE NC — INDICATES NOT CONNECTED.

b - INDICATES CONTACT NORM. CLOSED

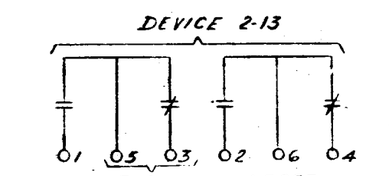




FOR NOTES SEE SHT. 3A

WESTINGHOUSE TYPE BF RELAY - SUPPLIED WITH UNMARKED TERMINALS. NUMBERS ASSIGNED FOR LOCATION PURPOSES ONLY.

INTERLOCKING RELAYS



REV.	DATE	DESCRIPTION	ENGR	SUP ENGR	W
14	10-1-73	FINAL ISSUE			
13	10-15-70	REVISED PER ECN # 70229			
12	9-14-70	REVISED PER ECN # 70227			
11	8-11-70	REV. PER. ECN-70205			
10	8-7-70	REV. PER W DWG 499B444 SHT. 47			
9	3-11-70	REV. DEV. 2-11/X1 CONTACTS PER ECN 70147; REV. BFD-66S PER ECN 70155			
8	12-22-69	REV. SH. CONTACT 17/21			
7	12-10-69	REVISED PER AS BUILT CHANGES			
6	9-7-69	REV. DEVICE NO & TYPE.			
5	12-29-68	REV. COL. 4, CONTACTS 20-24			
4	10-14-68	GENERAL REVISION			
3	9-9-68	REV. PER W APD			
2	4-5-68	GENERAL REVISION			
1	11-28-67	GENERAL REVISION			
		FIRST ISSUE FOR APPROVAL			

ENGINEER Arthur P. Rahmann

STATE REG. NEW YORK NO. 42453

UNITED ENGINEERS & CONSTRUCTORS INC.

WESTINGHOUSE ELECTRIC CORPORATION FOR CONSOLIDATED EDISON COMPANY

INDIAN POINT GENERATING STATION - UNIT NO. 2

SCHEMATIC DIAGRAM

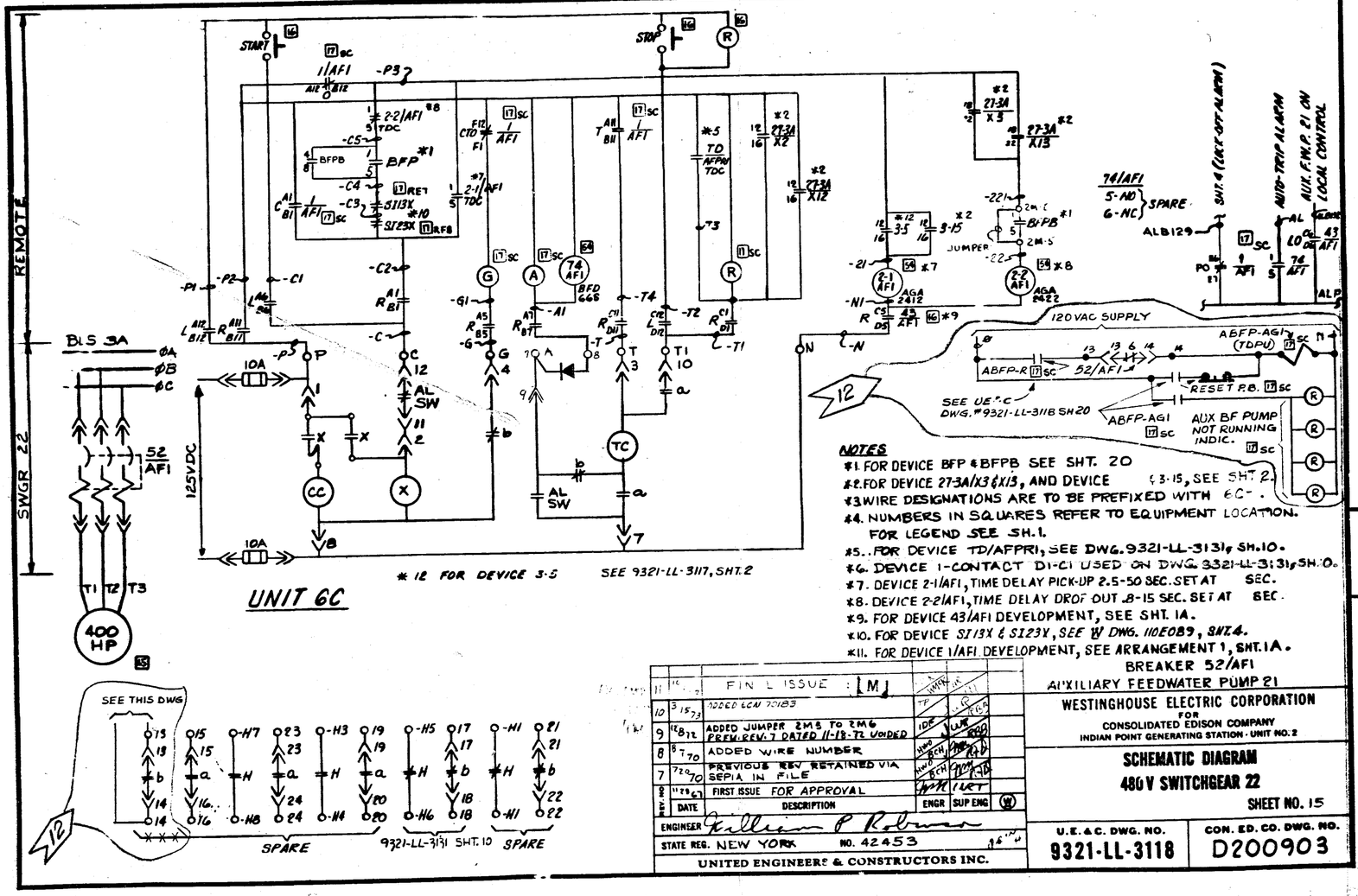
480 V SWITCHGEAR 22

SHEET NO. 3

U.E.&C. DWG. NO. 9321-LL-3118

CON. ED. CO. DWG. NO. D200903

Docket # 50-247
Control # 7912270232
Date 12-14-79 of Document:
REGULATORY DOCKET FILE



NOTES

*1. FOR DEVICE BFP & BFPB SEE SHT. 20
*2. FOR DEVICE 27-3A/X3 & X13, AND DEVICE 3-15, SEE SHT. 2.
*3. WIRE DESIGNATIONS ARE TO BE PREFIXED WITH 6C-.
*4. NUMBERS IN SQUARES REFER TO EQUIPMENT LOCATION. FOR LEGEND SEE SH.1.
*5. FOR DEVICE TD/AFPR1, SEE DWG. 9321-LL-3131, SH.10.
*6. DEVICE 1-CONTACT D1-C1 USED ON DWG. 9321-LL-3131, SH.10.
*7. DEVICE 2-1/AF1, TIME DELAY PICK-UP 2.5-50 SEC. SET AT SEC.
*8. DEVICE 2-2/AF1, TIME DELAY DROP OUT .8-15 SEC. SET AT SEC.
*9. FOR DEVICE 43/AF1 DEVELOPMENT, SEE SHT. 1A.
*10. FOR DEVICE SI13X & SI23X, SEE W DWG. 110E089, SHT.4.
*11. FOR DEVICE 1/AF1 DEVELOPMENT, SEE ARRANGEMENT 1, SHT.1A.

BREAKER 52/AF1
AUXILIARY FEEDWATER PUMP 21

REV NO	DATE	DESCRIPTION	ENGR	SUP ENG
11		FIN L ISSUE : M		
10	3 15 73	ADDED LCN 70183		
9	12 8 72	ADDED JUMPER 2M5 TO 2M6 PREV. REV. 7 DATED 11-18-72 VOIDED		
8	8 7 70	ADDED WIRE NUMBER		
7	7 20 70	PREVIOUS REV RETAINED VIA SEPIA IN FILE		
6	11 20 67	FIRST ISSUE FOR APPROVAL		

ENGINEER William P. Robinson
STATE REG. NEW YORK NO. 42453
UNITED ENGINEERS & CONSTRUCTORS INC.

WESTINGHOUSE ELECTRIC CORPORATION
FOR
CONSOLIDATED EDISON COMPANY
INDIAN POINT GENERATING STATION · UNIT NO. 2

SCHEMATIC DIAGRAM
480 V SWITCHGEAR 22
SHEET NO. 15

U.E.&C. DWG. NO. 9321-LL-3118
CON. ED. CO. DWG. NO. D200903

CON EDISON REVISIONS
12
IN CONN WITH THE INSTALL. OF INDIC. LTS FOR A.B.F. PUMPS #21 & 23 ADD RELS. ABFP-2 & ABFP-AGI. ALSO RESET PUSHBUTTON & BKR 52/AF1 "b" CONTACT. THIS REVISION CONTAINS NON CLASS "A" ITEMS AS DEFINED BY CORPORATE INSTRUCTION CI-240-1
P/N 5500

Docket #50-247
Control #7912270232
Date 12-14-79 of Document:
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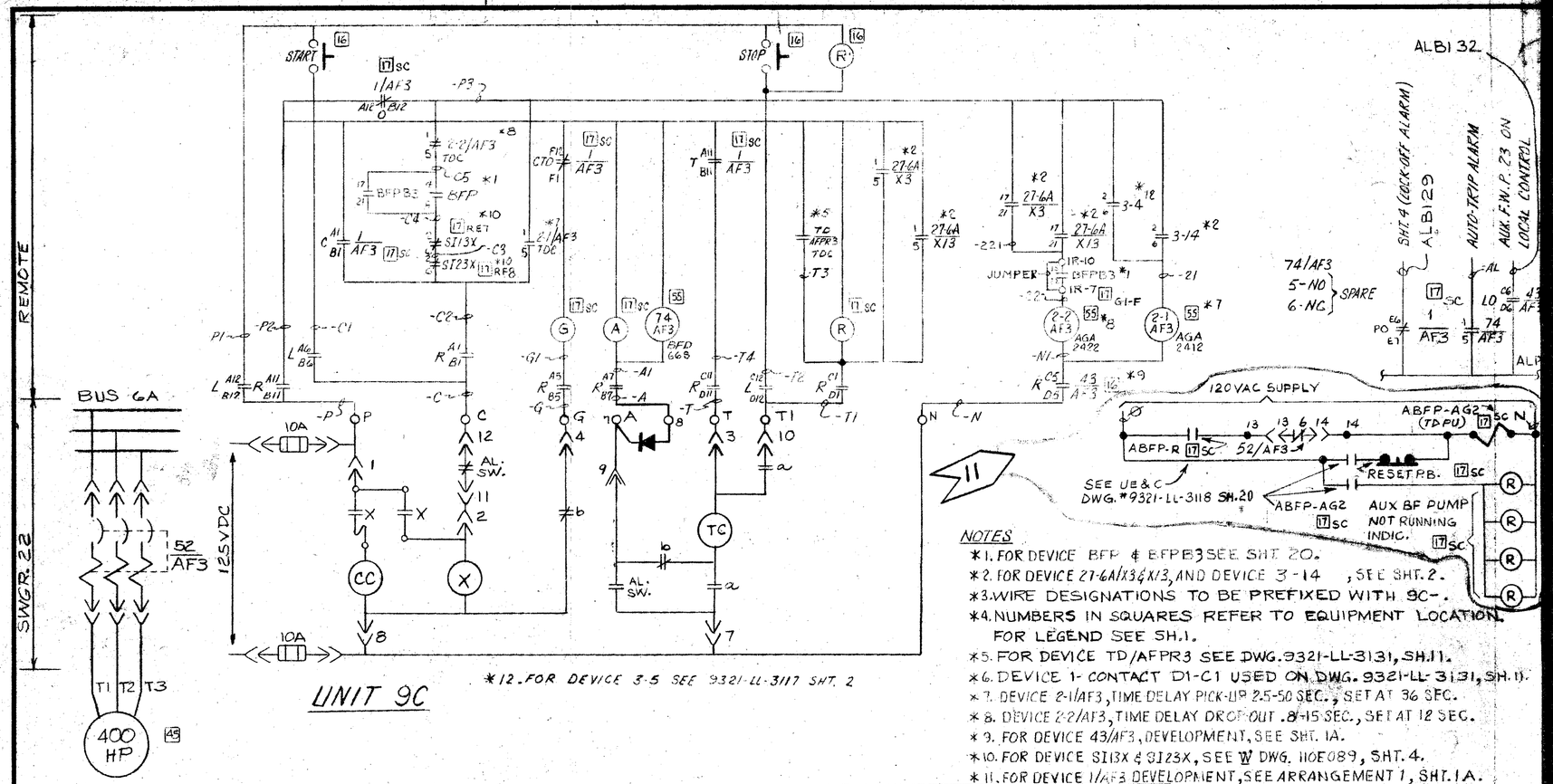
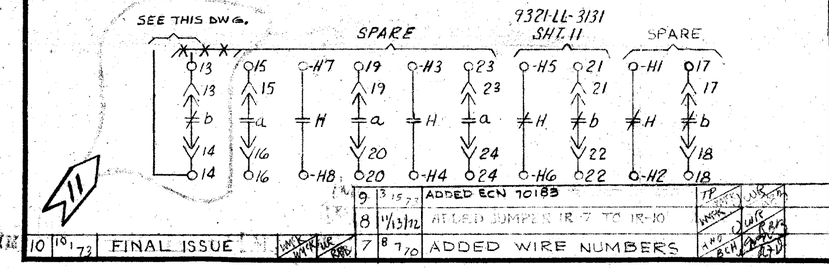
Docket # 79-1270-2
Control # 79-1270-2
Date 12-14-79
REGULATORY DOCKET FILE



NOTES

*1. FOR DEVICE BFP & BFPB3 SEE SHT. 20.
*2. FOR DEVICE 27-6A/X3 & X13, AND DEVICE 3-14, SEE SHT. 2.
*3. WIRE DESIGNATIONS TO BE PREFIXED WITH 9C-.
*4. NUMBERS IN SQUARES REFER TO EQUIPMENT LOCATION. FOR LEGEND SEE SH. 1.
*5. FOR DEVICE TD/AFPR3 SEE DWG. 9321-LL-3131, SH. 11.
*6. DEVICE 1-CONTACT D1-C1 USED ON DWG. 9321-LL-3131, SH. 11.
*7. DEVICE 2-1/AF3, TIME DELAY PICK-UP 2.5-50 SEC., SET AT 36 SEC.
*8. DEVICE 2-2/AF3, TIME DELAY DROP-OUT .8-15 SEC., SET AT 12 SEC.
*9. FOR DEVICE 43/AF3, DEVELOPMENT, SEE SHT. 1A.
*10. FOR DEVICE SI13X & SI23X, SEE W DWG. 110E089, SHT. 4.
*11. FOR DEVICE 1/AF3 DEVELOPMENT, SEE ARRANGEMENT 1, SHT. 1A.



REV. NO	DATE	DESCRIPTION	ENGR	SUP ENG
10	10/1/73	FINAL ISSUE		
9	3/15/72	ADDED ECN 70183		
8	11/13/72	ADDED JUMPER IR-7 TO IR-10		
7	8/7/70	ADDED WIRE NUMBERS		
6	12/10/69	REVISED PER AS BUILT CHANGES		
5	4/7/69	CHANGED CONTACT LOCATION		
4	2/14/69	REVISED CONTROL CIRCUIT		
3	7/9/68	REV. NOTES, LOC. SYMBS, WIRE NOS.		
2	5/6/68	ADDED SPARE CONTACT REV. ALARM & 22-AF3		
1	4/5/68	REV. UNDERVOLTAGE TRIP CKT.		
	11/29/67	FIRST ISSUE FOR APPROVAL		

ENGINEER William P. Robinson
STATE REG. NEW YORK NO. 42453
UNITED ENGINEERS & CONSTRUCTORS INC.

BREAKER 52/AF3
AUXILIARY FEEDWATER PUMP 23

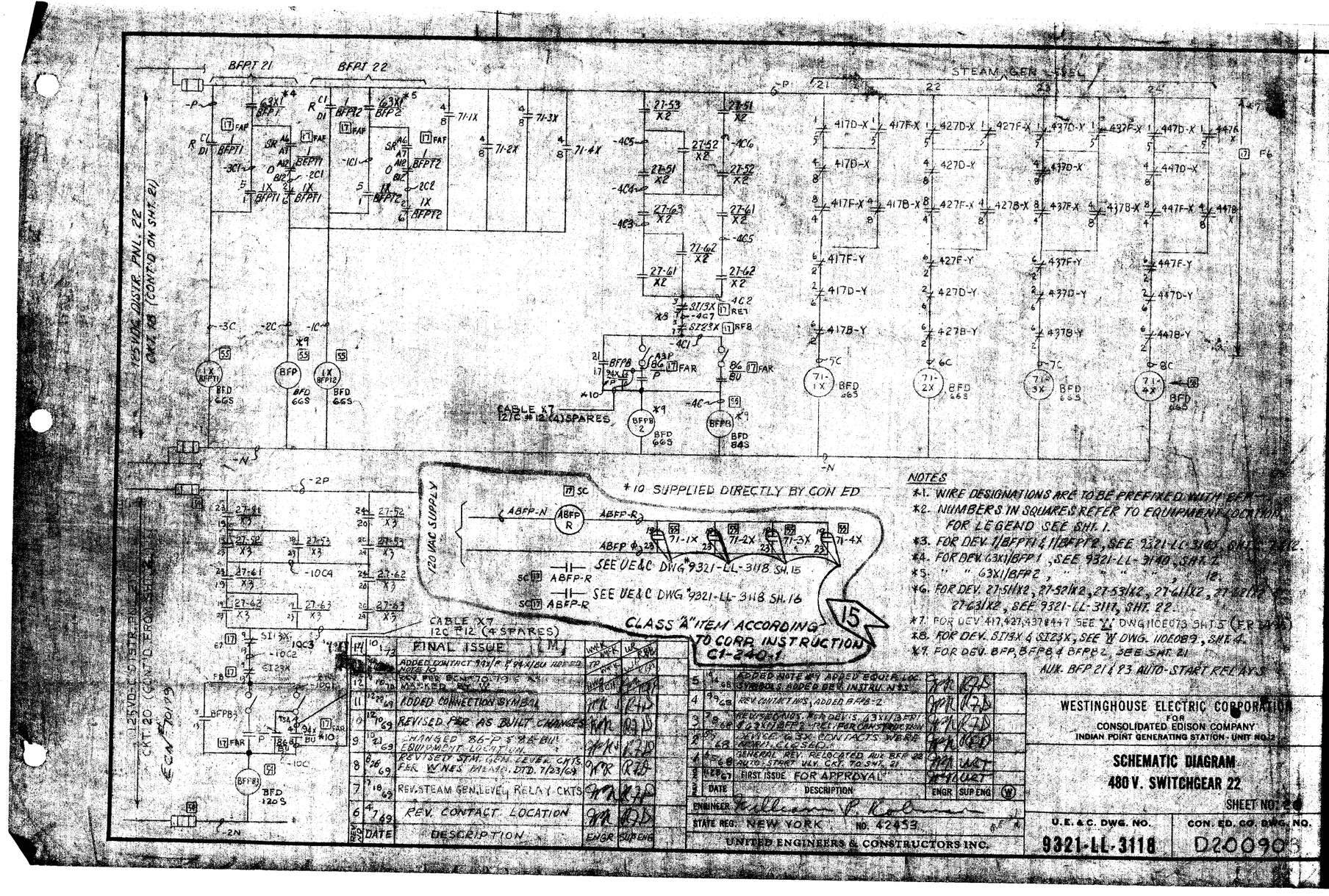
WESTINGHOUSE ELECTRIC CORPORATION
FOR
CONSOLIDATED EDISON COMPANY
INDIAN POINT GENERATING STATION - UNIT NO. 2

SCHEMATIC DIAGRAM
480 V SWITCHGEAR 22
SHEET NO. 16

U.E.&C. DWG. NO. 9321-LL-3118
CON. ED. CO. DWG. NO. D200903

CON EDISON REVISIONS
11
IN CONN WITH THE INSTALL. OF INDIC. LIGHTS FOR AUX. B.F. PUMPS #21 & 23 ADD RELS. ABFP-R & ABFP-AG2. ALSO RESET PUSHBUTTON & BKR 52/AF3 "B" CONTACT. THIS REV. CONTAINS NON CLASS "A" ITEMS AS DEFINED BY CORPORATE INSTRUCTION CI-240-1
P/N 5500 FH

91-81



CON EDISON
REVISIONS

15

IN CONN WITH THE INSTALL. OF INDICATOR LTS FOR AUX. B.F PUMPS #21 & 23 ADD REL. ABFP-R. ALSO ADD CONTACTS 71-1X, 71-2X, 71-3X & 71-4X. THIS REVISION CONTAINS CLASS "A" ITEM AS DEFINED BY CORPORATE INSTRUCTION C1-240-1
RELEASED FOR CONSTRUCTION PER MODIFICATION PROCEDURE ESG #75-2-08
P/N 5500 FG/

7/10/75

3118-20

REGULATORY DOCKET FILE
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Control # 7912270252
Date 12-17-79
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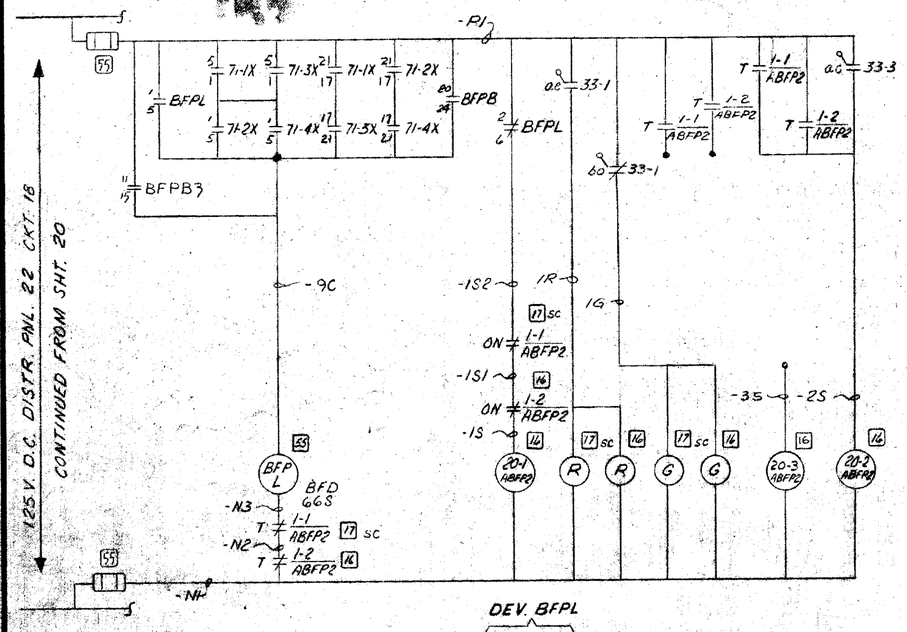

DEVICE	MFR'S ITEM NO.	FUNCTION
20-1	4	DE-EN TO OPEN P.C.V. & START AUX. B.F.P. 22
20-2	6	EN TO CLOSE P.C.V. (OVERRIDES 20-1 BY SHUTING OFF POSITIONER OUTPUT.)
20-3	17	EN TO CLOSE TRIP VLV.
33-1	21 & 22	P.C.V. LIMIT SWITCH
33-3	18	TRIP VLV. LIMIT SW. (ALSO OPERATES ON OVERSPEED TRIP)

REF. F.P. 9321-3913 & -20273

CONTACT	DEVICE NUMBER & TYPE						
	BFP B3 BFD-1205	TYP. 71-1X TO 71-4X BFD-66S	BFPB BFD-84S	BFPB 2 BFD-66S	1X/BFPT1 1X/BFPT2 BFD-66S	BFP BFD-66S	BFPL BFD-66S
1/5	2/CC1-2 Δ27	THIS DWG.	52/AF1 SHT.15	SPARE	SHT. 20	52/AF1 SHT. 15	THIS DWG.
2/6	52/SW3 Δ44	b SPARE	2/CC2-2 Δ45	b SPARE	b SHT. 20	b CKT. 1 LL-3131, SHT.17	THIS DWG.
3/7	52/SW6 Δ44	b SPARE	2/CC3-2 Δ46	b SPARE	b SPARE	b CKT.2 LL-3131, SHT.17	b SPARE
4/8	2/CC2-2 Δ45	SHT. 20	52/AF1 SHT.15	SPARE	SPARE	52/AF3 SHT.16	SPARE
9/13	SHT. 20	b SPARE	b CKT.1 LL-3131, SHT.17	b SPARE	b SPARE	b SPARE	b SPARE
10/14	LL-3117 SHT. 2	b SPARE	b CKT.2 LL-3131, SHT.17	b SPARE	b SPARE	b SPARE	b SPARE
11/15	THIS DWG.	b SPARE	b SPARE	b TERMINALS 2A-4 2A-5	b SPARE	b SPARE	b SPARE
12/16	SPARE	b SPARE	b SPARE	b TERMINALS 2A-10 2A-11	b SPARE	b SPARE	b SPARE
17/21	52/AF3 SHT. 16	THIS DWG	SHT. 20	52/SW5B Δ35	SPARE	SPARE	SPARE
18/22	52/AF3 SHT. 16	SPARE	SPARE	52/SW1 Δ33	SPARE	SPARE	SPARE
19/23	52/SW5A Δ34	SPARE	SHT. 2	52/SW4 Δ33	SPARE	SPARE	SPARE
20/24	52/SW2B Δ43	SPARE	THIS DWG.	52/SW2A Δ42	SPARE	SPARE	SPARE

Δ — INDICATES W DWG. 499B444 (U.E.&C.-F.P.-9321-3072) SHEET NO.
b — INDICATES NORM. CLOSED CONTACT.

PER EC-666-734

NOTES

*1. WIRE DESIGNATIONS ARE TO BE PREFIXED WITH BFP—.
*2. NUMBERS IN SQUARES REFER TO EQUIPMENT LOCATION, FOR LEGEND SEE SHT.1.
*3. FOR DEVICE BFPB, SEE SHT. 20.
*4. FOR DEVICE 1-1 & 1-2/ABFP2 DEVELOPMENT, SEE SHT. 1A, ARRG'T. 3.

REV. NO.	DATE	DESCRIPTION	ENGR	SUP ENG	W
6	12/10/69	REVISED PER AS BUILT CHANGES			
5	10/21/69	ADDED ITEM NO'S & F.P. NO'S.			
4	10/29/68	WIRE NO. 9C WAS 5C REV. BFPB2 CONTACTS 12-16 & 17-21			
3	10/16/68	REV. CONTACTS, REVISED CONTACT TABLE			
2	9/9/68	ADDED CONTACT TABLE			
1	5/6/68	FOR CONSTRUCTION			
	4/5/68	FIRST ISSUE - FOR APPROVAL			

REV.	DATE	DESCRIPTION			W
9	10/1/73	FINAL ISSUE [M]			
8	8/7/70	REV. PER EC-666-734 & AS MARKED BY W			
7	1/30/70	REVISED CIRCUIT: DEV. 20-3 ABFP2			

ENGINEER William R. Robinson
STATE REG. New York NO. 42453
UNITED ENGINEERS & CONSTRUCTORS INC.

AUX. BFP 22 AUTO-START VALVE

WESTINGHOUSE ELECTRIC CORPORATION
FOR
CONSOLIDATED EDISON COMPANY
INDIAN POINT GENERATING STATION - UNIT NO. 2

SCHEMATIC DIAGRAM
480 V. SWITCHGEAR 22
SHEET NO. 21

U.E.&C. DWG. NO. 9321-LL-3118
CON. ED. CO. DWG. NO. D200903

Docket # 50-247
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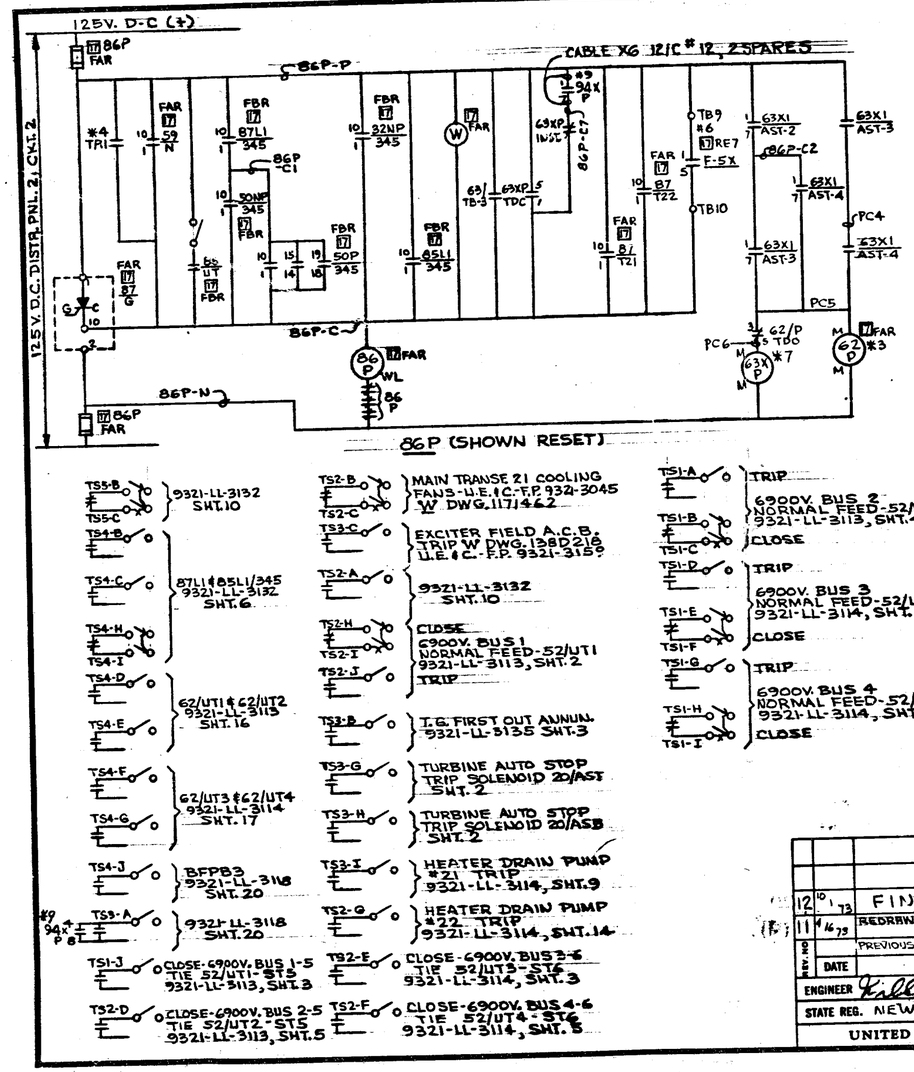


TEST SWITCH	POLES CURRENT	POLES POTENTIAL	NUMBER
TS1	6	4	129A528G01
TS2	4	6	129A513G01
TS3	0	6	129A504G01
TS4	2	8	129A542G01
TS5	8	0	129A517G01

NOTES:

*1. FOR 87/G (GENERATOR NO. 2 PERCENTAGE DIFFERENTIAL RELAY) SEE 9321-F-3011
59/N (GENERATOR NO. 2 GROUND FAULT RELAY) SEE 9321-F-3011
86/UT (UNIT NO. 2 AUXILIARY TRANSF. LOCKOUT RELAY) SEE 9321-LL-3132, SHT. 2.
87/T21 (MAIN POWER TRANSF. NO. 21 PERCENTAGE DIFF. RELAY) SEE 9321-F-3011
87/T22 (MAIN POWER TRANSF. NO. 22 PERCENTAGE DIFF. RELAY) SEE 9321-F-3011
87L1/345 (PRIMARY PILOT WIRE RELAY) SEE 9321-LL-3132, SHT. 6
85L1/345 (PRIMARY PILOT WIRE RECEIVER RELAY) SEE 9321-LL-3132, SHT. 6
50NP/345 (345 KV LINE PRIMARY GND. FAULT DETECTOR) SEE 9321-F-3011
50P/345 (345 KV LINE PRIMARY PHASE FAULT DETECTOR) SEE 9321-F-3011
50P/345 (345 KV LINE PRIMARY DIRECTIONAL GND. FAULT RELAY) SEE 9321-F-3011
63X1/AST (TURBINE AUTO-STOP TRIP) SEE SHT. 2

*2. NUMBERS IN SQUARES REFER TO EQUIPMENT LOCATION FOR LEGEND SEE SHT. 1.

*3. DEV. 62/P, TIME DELAY ON ENERGIZATION, 10-200 SEC., SET AT 60 SEC.

*4. FOR DEVICE TR1 SEE 9321-LL-3132, SHT. 10

*5. DEVICE TS5, H & I POLES, ARE USED WITH DEVICE 86/BU, SHT. 6.

*6. FOR DEVICE F-5X, SEE W DWG. 110E089, SHT. 7

*7. DEV. 63X/P, TIME DELAY ON ENERIZATION, 2.5-50 SEC., SET AT 30 SEC.

*8. FOR DEVICE 63/TB-3 SEE F.P. 9321-3049

*9. SUPPLIED DIRECTLY BY CON ED.

GENERATOR PRIMARY LOCKOUT RELAY

REV.	DATE	DESCRIPTION	ENGR	SUP ENG
12	10 1 73	FINAL ISSUE	JWP	JWP
11	4 16 79	REDRAWN + MISC. REVISIONS	TP	JWP
		PREVIOUS REVISIONS SEE SEPIA IN FILE		

ENGINEER William P. Robinson
STATE REG. NEW YORK NO. 42453
UNITED ENGINEERS & CONSTRUCTORS INC.

WESTINGHOUSE ELECTRIC CORPORATION
FOR
CONSOLIDATED EDISON COMPANY
INDIAN POINT GENERATING STATION - UNIT NO. 2

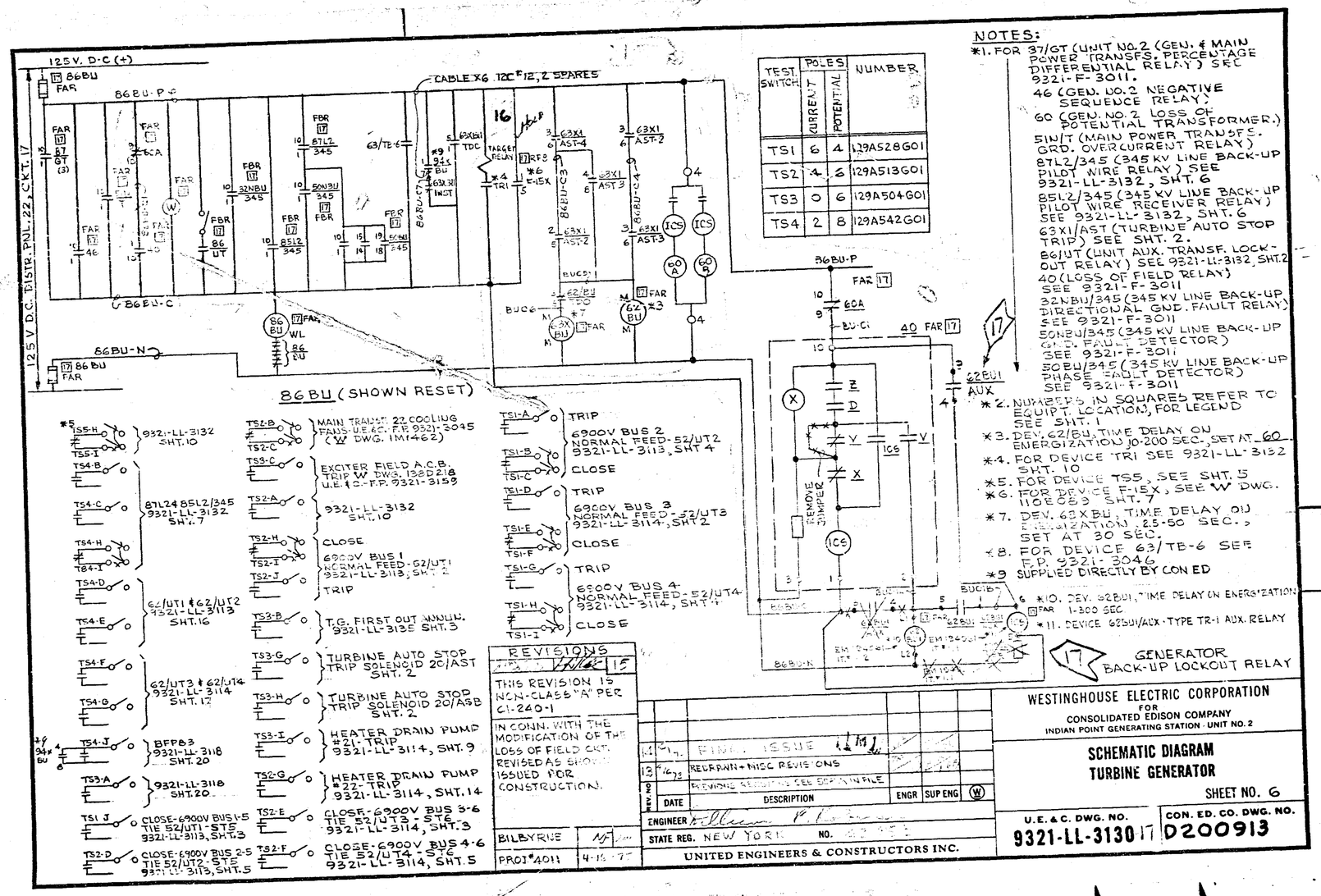
SCHEMATIC DIAGRAM
TURBINE GENERATOR

SHEET NO. 5

U.E.&C. DWG. NO. 9321-LL-3130

CON. ED. CO. DWG. NO. D200913

Docket # 50-247
Control # 7912270232
Date 12-14-79 of Documents
REGULATORY DOCKET FILE



TEST SWITCH	POLES CURRENT	POLES POTENTIAL	NUMBER
TS1	8	4	129A528G01
TS2	4	8	129A513G01
TS3	0	6	129A504G01
TS4	2	8	129A542G01

NOTES:

*1. FOR 37/GT (UNIT NO. 2 (GEN. & MAIN POWER TRANSFS. PERCENTAGE DIFFERENTIAL RELAY) SEE 9321-F-3011.
46 (GEN. NO. 2 NEGATIVE SEQUENCE RELAY)
60 (GEN. NO. 2 LOSS OF POTENTIAL TRANSFORMER.)
51N/T (MAIN POWER TRANSFS. GRD. OVERCURRENT RELAY)
87L2/345 (345 KV LINE BACK-UP PILOT WIRE RELAY) SEE 9321-LL-3132, SHT. 6
85L2/345 (345 KV LINE BACK-UP PILOT WIRE RECEIVER RELAY) SEE 9321-LL-3132, SHT. 6
63X1/AST (TURBINE AUTO STOP TRIP) SEE SHT. 2.
86/UT (UNIT AUX. TRANSF. LOCK-OUT RELAY) SEE 9321-LL-3132, SHT. 2
40 (LOSS OF FIELD RELAY) SEE 9321-F-3011
32NBU/345 (345 KV LINE BACK-UP DIRECTIONAL GND. FAULT RELAY) SEE 9321-F-3011
50NBU/345 (345 KV LINE BACK-UP G.F. FAULT DETECTOR) SEE 9321-F-3011
50BU/345 (345 KV LINE BACK-UP PHASE FAULT DETECTOR) SEE 9321-F-3011
*2. NUMBERS IN SQUARES REFER TO EQUIPT. LOCATION, FOR LEGEND SEE SHT. 1
*3. DEV. 62/BU, TIME DELAY ON ENERGIZATION 10-200 SEC., SET AT 60
*4. FOR DEVICE TRI SEE 9321-LL-3132 SHT. 10
*5. FOR DEVICE TS5, SEE SHT. 5
*6. FOR DEVICE F-15X, SEE W DWG. 110E089 SHT. 7
*7. DEV. 63XBU, TIME DELAY ON ENERGIZATION 2.5-50 SEC., SET AT 30 SEC.
*8. FOR DEVICE 63/TB-6 SEE F.P. 9321-3046
*9 SUPPLIED DIRECTLY BY CON ED
*10. DEV. 62BU1, TIME DELAY ON ENERGIZATION 1-300 SEC
*11. DEVICE 62BU1/AUX-TYPE TR-1 AUX. RELAY

REVISIONS

REV.	DATE	DESCRIPTION	ENGR	SUP ENG	W
15		THIS REVISION IS NON-CLASS "A" PER CI-240-1 IN CONN. WITH THE MODIFICATION OF THE LOSS OF FIELD CKT. REVISED AS SHOWN. ISSUED FOR CONSTRUCTION.			
14	4-16-73	FINAL ISSUE			
13	4-16-73	REDRAWN + MISC REVISIONS			
10		PREVIOUS REVISIONS SEE SUP. IN FILE			

BILBYRNE NF
PROJ #4011 4-16-73

ENGINEER
STATE REG. NEW YORK NO.

UNITED ENGINEERS & CONSTRUCTORS INC.

WESTINGHOUSE ELECTRIC CORPORATION
FOR
CONSOLIDATED EDISON COMPANY
INDIAN POINT GENERATING STATION · UNIT NO. 2

SCHEMATIC DIAGRAM
TURBINE GENERATOR

SHEET NO. 6

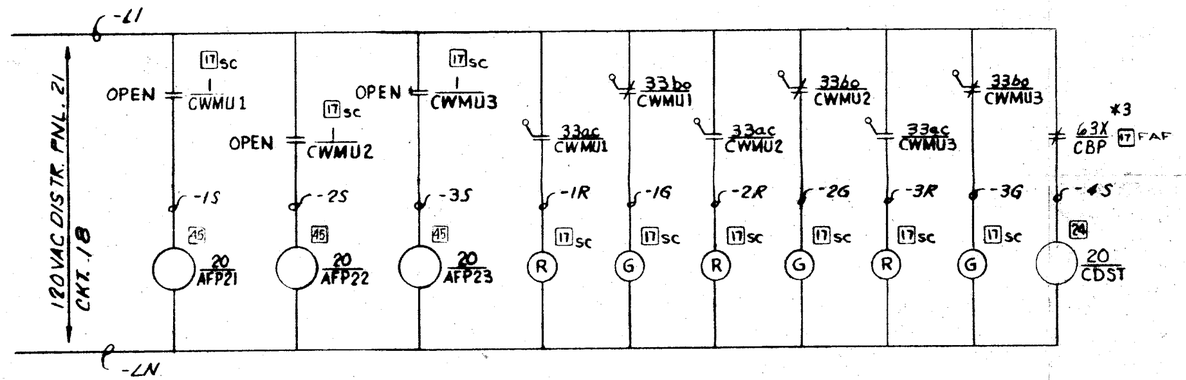
U.E. & C. DWG. NO. 9321-LL-3130 17
CON. ED. CO. DWG. NO. D200913

REVISIONS

REV.	DATE	DESCRIPTION	ENGR	SUP ENG	W
16		THIS REVISION IS NON-CLASS "A" PER CI-240-1 REVISED TO AGREE WITH FIELD CONDITIONS. ISSUED FOR RECORD.			
17	4-16-73	THIS REVISION IS NON-CLASS "A" PER CI-240-1, IN CONN. WITH MODIF. OF LOSS OF FIELD CKT. - MADE CHANGES AT RELAYS 62BU1 & 62 BU1/AUX. AS SHOWN. F/N 4011			

BILBYRNE NF
PROJ #4011 4-16-73

Docket # 50-247
Control # 7912270232
Date 12-14-79 of Document
REGULATORY DOCKET FILE



DEVICE	INSTRUMENTATION NUMBER	FUNCTION
20/AFP21	SOV-1287	ENERGIZE TO OPEN VALVE
20/AFP22	SOV-1288	" " " "
20/AFP23	SOV-1289	" " " "
33/CWMU1	PCV-1187	LIMIT SWITCH
33/CWMU2	PCV-1188	" "
33/CWMU3	PCV-1189	" "
20/CDST	SOV-1229	DE-EN TO CLOSE VALVE

NOTES

*1. WIRE DESIGNATIONS ARE TO BE PREFIXED WITH 21AC-18

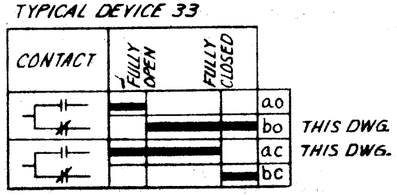
*2. NUMBERS IN SQUARES REFER TO EQUIPMENT LOCATION. FOR LEGEND SEE SHT. 1.

*3. FOR DEVICE 63X/CBP, SEE SHT. 9.

TYPICAL DEVICE 1

CONTACT BLOCK	CIRCUIT POSITION L	CIRCUIT POSITION R
1ST BLOCK (FRONT) TYPE OT2A	NO	NC
CLOSE OPEN	OPERATOR OT2S1 2 POSITION MAINTAINED	

TYPICAL DEVICE 33



AUX. BOILER FEED PUMPS MAKE-UP & CONDENSATE DUMP TO STORAGE TANK

REV. NO.	DATE	DESCRIPTION	ENGR	SUP ENG
4	10/1/73	FINAL ISSUE		
3	8/15/72	RELOCATED 20/AFP21, AFP22 & AFP23		
2	5/6/68	REV. NOTE 1 FOR CONSTRUCTION		
1	2/29/68	ADDED DEV. 63X/CBP		
	7/5/67	FIRST ISSUE - FOR APPROVAL		

ENGINEER William P. Robinson

STATE REG. NEW YORK NO. 42453

UNITED ENGINEERS & CONSTRUCTORS INC.

WESTINGHOUSE ELECTRIC CORPORATION
FOR
CONSOLIDATED EDISON COMPANY
INDIAN POINT GENERATING STATION · UNIT NO. 2

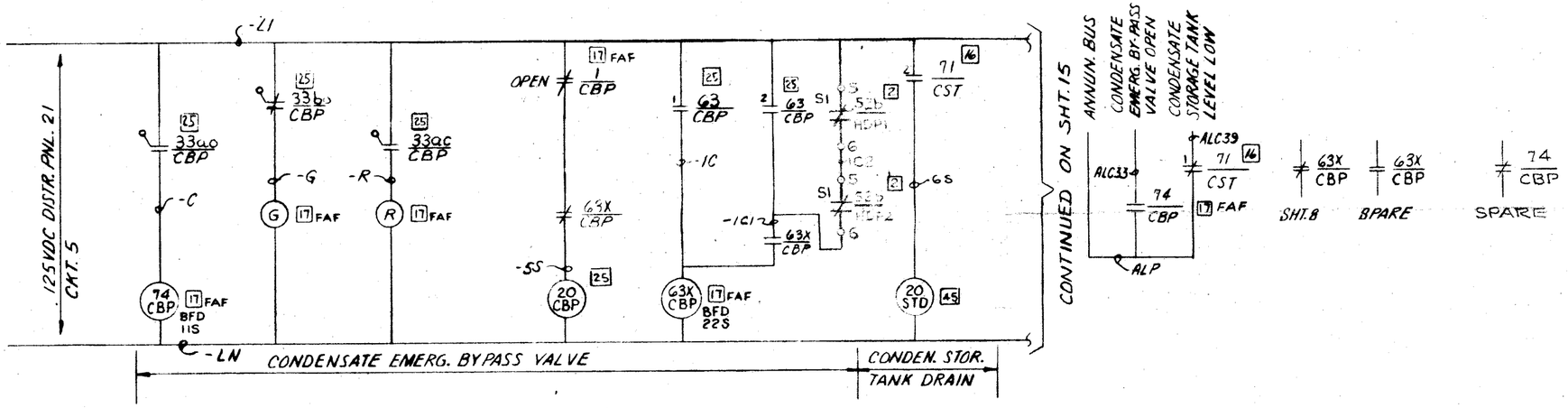
SCHEMATIC DIAGRAM
MISC. SOLENOID VALVES

SHEET NO. 8

U.E.&C. DWG. NO. 9321-LL-3131

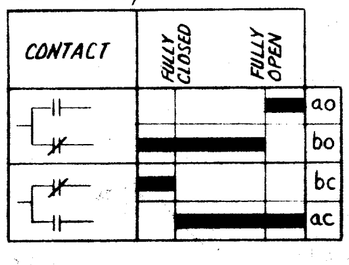
CON. ED. CO. DWG. NO. D200914

Docket # 50-247
Control # 7912270292
Date 12-14-79 of Document:
REGULATORY DOCKET FILE



DEVICE	INSTRUMENTATION NUMBER	FUNCTION
20/CBP	SOV-1125	DE-ENERG. TO OPEN VALVE
33/CBP	FCV-1150	LIMIT SWITCH
63/CBP	DPC-1109-S	*6
71/CST	LIC-1102S	*5
20/STD	SOV-1258	DE-EN TO CLOSE VALVE

DEVICE 33/CBP



NOTES

*1. WIRE DESIGNATIONS ARE TO BE PREFIXED WITH 21DP05-
*2. NUMBERS IN SQUARES REFER TO EQUIPMENT LOCATION. FOR LEGEND SEE SHT. 1.

*4. FOR DEVICE 1 DEVELOPMENT SEE SHT. 1, ARRANGEMENT 2.
*5. DEVICE 71/CST CONTACT 1 CLOSES ON CONDENSATE STORAGE TANK LOW LEVEL, AND CONTACT 2 OPENS ON LO-LO LEVEL.
*6. DEVICE 63/CBP CONTACT 1 CLOSES ON DIFF. PRESS. INCREASE AT ____. CONTACT 2 CLOSES ON INCREASE AT ____ & OPENS ON DECREASE AT ____.
*7. FOR DEVICE 52/HDP1 & 52/HDP2 SEE DWG. 9321-LL-3114, SHT. 9 & 14

REV NO	DATE	DESCRIPTION	ENGR	SUP ENG	W
7	10 1 73	FINAL ISSUE	JAS WMK	WR RBB	
6	5 9 73	ADDED 52b/HDP1, 52b/HPD2 CONTACTS	TP WMK	WR RBB	
5	7 16 70	REVISED PER ECN# 70179	JHJ BCH	JWR RBB	
4	9 2 69	CHANGED 16 TO 5 & ADDED 2	WRR	RJW	
3	4 15 69	ADDED NOTE 7 REV BY PASS VALVE CIRCUIT & EQUIP. SYMB.	WRR	RJW	
2	7 8 68	ADDED LOCATION SYMBOL & RELEASED FOR CONSTRUCTION	WRR	RJW	
1	2 29 68	GENERAL REVISION	WRR	URT	
	7 5 67	FIRST ISSUE - FOR APPROVAL	WRR	URT	

ENGINEER William P. Rolmann
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UNITED ENGINEERS & CONSTRUCTORS INC.

CONDENSATE EMERG. BYPASS & STORAGE TANK LEVEL CONTROL VALVES

WESTINGHOUSE ELECTRIC CORPORATION
FOR
CONSOLIDATED EDISON COMPANY
INDIAN POINT GENERATING STATION - UNIT NO. 2

SCHEMATIC DIAGRAM
MISC. SOLENOID VALVES
SHEET NO. 9

U.E. & C. DWG. NO. 9321-LL-3131
CON. ED. CO. DWG. NO. D200914

Docket # 50-247
Control # 7912200232
Date 12-14-79 of Document:
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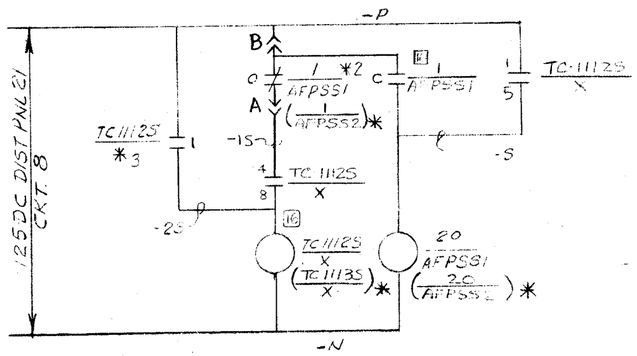
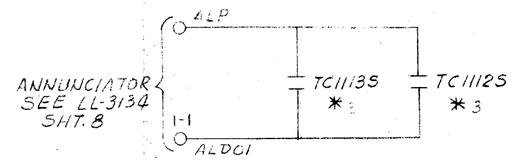


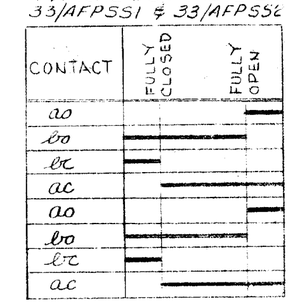
TYPICAL SHOWN FOR SOV-1310 (SEE TABLE)



PCV (SOV)	VALVE	LIMIT SWITCH	TEMP CTL.	WIRE PREFIX	125V D.C. DIST. PNL.
1310A (1310)	20/AFPSS1	33/AFPSS1	TC-11125	1310 -	21 CKT. 8
* 1310B (1311)	20/AFPSS2	33/AFPSS2	TC-11135	1311-	22 CKT. 13

TEMP. CTL.	CONTACT	CONTACT OPERATES @
TC 11125 (TC 11135)	1	130°F
TC 11125 (TC 11135)	2	120°F

TYPICAL FOR VALVE L.S.
33/AFPSS1 & 33/AFPSS2



NOTES

1- NUMBERS IN SQUARES REFER TO EQUIPT. LOCATION, FOR LEGEND SEE SHT. 1

2- FOR DEVICE 1 DEVELOPMENT SEE SHT. 1 ARRANGEMENT 4

3- SEE TABLE THIS SHEET

4- SOV-1310 & 1311-ENERGIZE TO CLOSE PCV 1310A & 1310B

AUXILIARY FEED PUMP 22
STEAM SUPPLY ISOLATION VALVES

REV. NO	DATE	DESCRIPTION	ENGR	SUP ENG	W
1	4/1/73	FINAL ISSUE			
	9/27/73	FIRST ISSUE FOR CONSTRUCTION			

ENGINEER: William P. Robinson
STATE REG. New York NO. 42453
UNITED ENGINEERS & CONSTRUCTORS INC.

WESTINGHOUSE ELECTRIC CORPORATION
FOR
CONSOLIDATED EDISON COMPANY
INDIAN POINT GENERATING STATION - UNIT NO. 2

SCHEMATIC DIAGRAM
MISC. SOLENOID VALVES

SHEET NO. 28

U.E. & C. DWG. NO. 9321-LL-3131

CON. ED. CO. DWG. NO. D 200914

Docket # 50-247
Control # 7912270232
Date 12-14-79 of Document:
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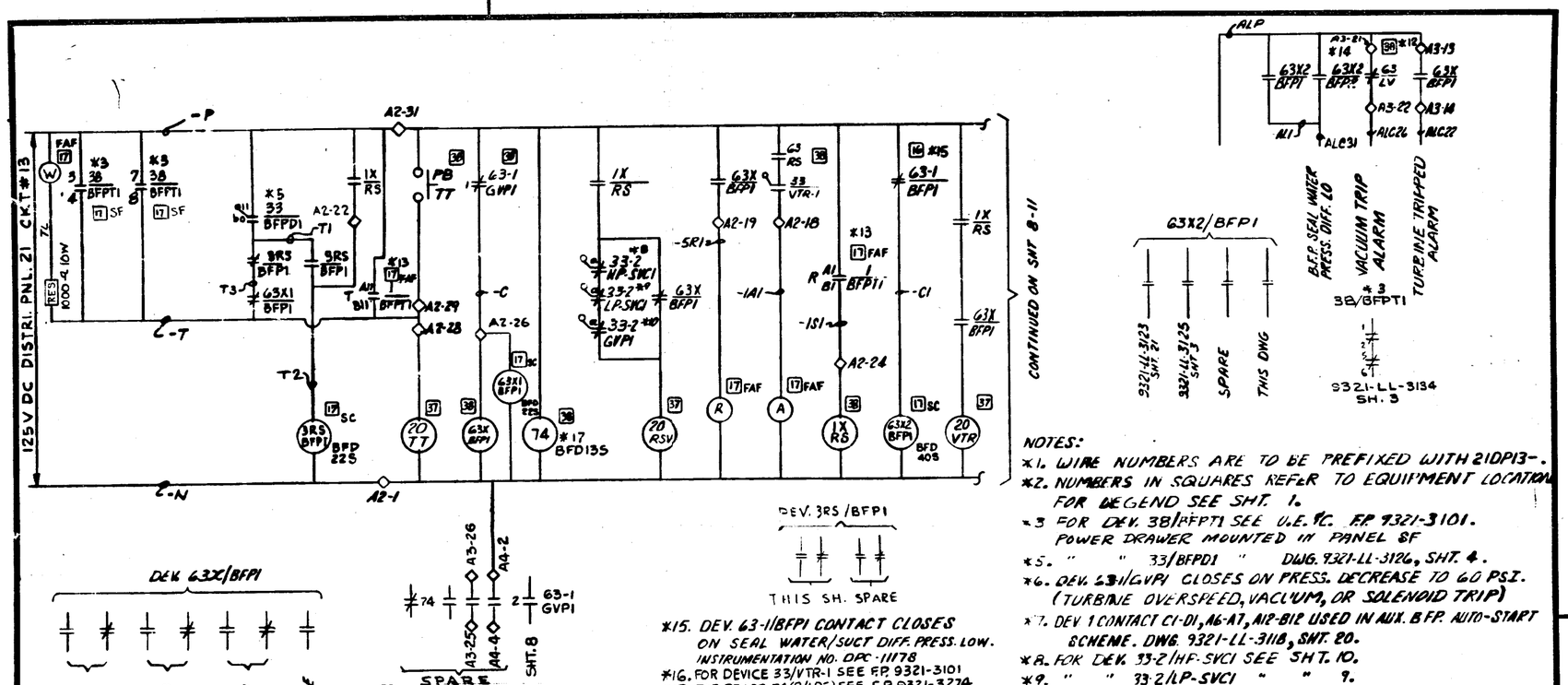


NOTES:

*1. WIRE NUMBERS ARE TO BE PREFIXED WITH 21DP13-.
*2. NUMBERS IN SQUARES REFER TO EQUIPMENT LOCATION. FOR LEGEND SEE SHT. 1.
*3 FOR DEV. 38/BFPT1 SEE U.E. & C. F.P. 9321-3101. POWER DRAWER MOUNTED IN PANEL 8F
*5. " " 33/BFPD1 " DWG. 9321-LL-3126, SHT. 4.
*6. DEV. 63H/GVPI CLOSES ON PRESS. DECREASE TO 60 PSI. (TURBINE OVERSPEED, VACUUM, OR SOLENOID TRIP)
*7. DEV 1 CONTACT C1-D1, A6-A7, A12-B12 USED IN AUX. B.F.P. AUTO-START SCHEME. DWG. 9321-LL-3118, SHT. 20.
*8. FOR DEV. 33-2/HP-SVC1 SEE SHT. 10.
*9. " " 33-2/LP-SVC1 " " 9.
*10. " 33-2/GVPI " " 8.
*11. DEV. 63/RS CLOSES ON PRESS. INCREASE TO 60 PSI, OPENS AT 50 PSI. (CLOSED WHEN OVERSPEED TRIP IS IN RESET POS.)
*12. 63/LV PRESS. SWITCH CLOSES ON DECREASING VACUUM AT 20" Hg (ADJ. TO 10" Hg MIN.)
*13. FOR DEV. 1 DEVELOPMENT SEE SHT. 1, ARRANGEMENT 2.
*14. FOR DEV. 63X2/BFP2, SEE SHT. 12.
*15. DEV. 63-1/BFPI CONTACT CLOSES ON SEAL WATER/SUCT DIFF. PRESS. LOW. INSTRUMENTATION NO. DPC-11178
*16. FOR DEVICE 33/VTR-1 SEE F.P. 9321-3101
*17. FOR DEVICE 74(R/LDC) SEE F.P. 9321-3274

REV.	DATE	DESCRIPTION	ENGR	SUP ENG
15	10/1/73	FINAL ISSUE		
14		ADDED T.B. POINTS & RELAY CONTACTS		
13	5/7/72	[illegible]		
12	[illegible]	REV. PER ECN 70218		
11	6/15	REV. PER ECN 70170. ADDED [illegible] DEV. 3RS & 38 TERMINAL NOS. & 63X1 & ECN # BY (W)		
10	8/26/69	REVISE 63X1 & REMOVE NOTE 17		
9	7/18/69	REV. 63X1/BFPI & ADD NOTE #17		
8	2/3/69	ADDED WIRE NOS.		
7	11/15/68	REV. NOTE 5, ADDED RELAY 3RS & ASSOCIATED CIRCUITRY		
6	9/8/68	MADE 63/LV, N.C., & 74 SPARE ADDED TERM. A2-26. REV. DESCRIPTION OF DEV. 63X1/BFPI — RELEASED FOR CONSTRUCTION		
5	5/6/68	REV. ALARM CKT. & NOTE 15 - ADDED WIRE NOS. & REF. DWG. - FOR CONSTRUCTION		
4	3/15/68	REV. DEV. 63X		
3	2/29/68	ADDED 63X1/BFPI, 63X-1, 20VTR, 33/VTR-1 NOTES 7, 14, 15 & 16. REV. NOTE 4		
2	10/5/67	GENERAL REVISION		
1	7/5/67	GENERAL REVISION		
	4/14/67	FIRST ISSUE FOR APPROVAL		

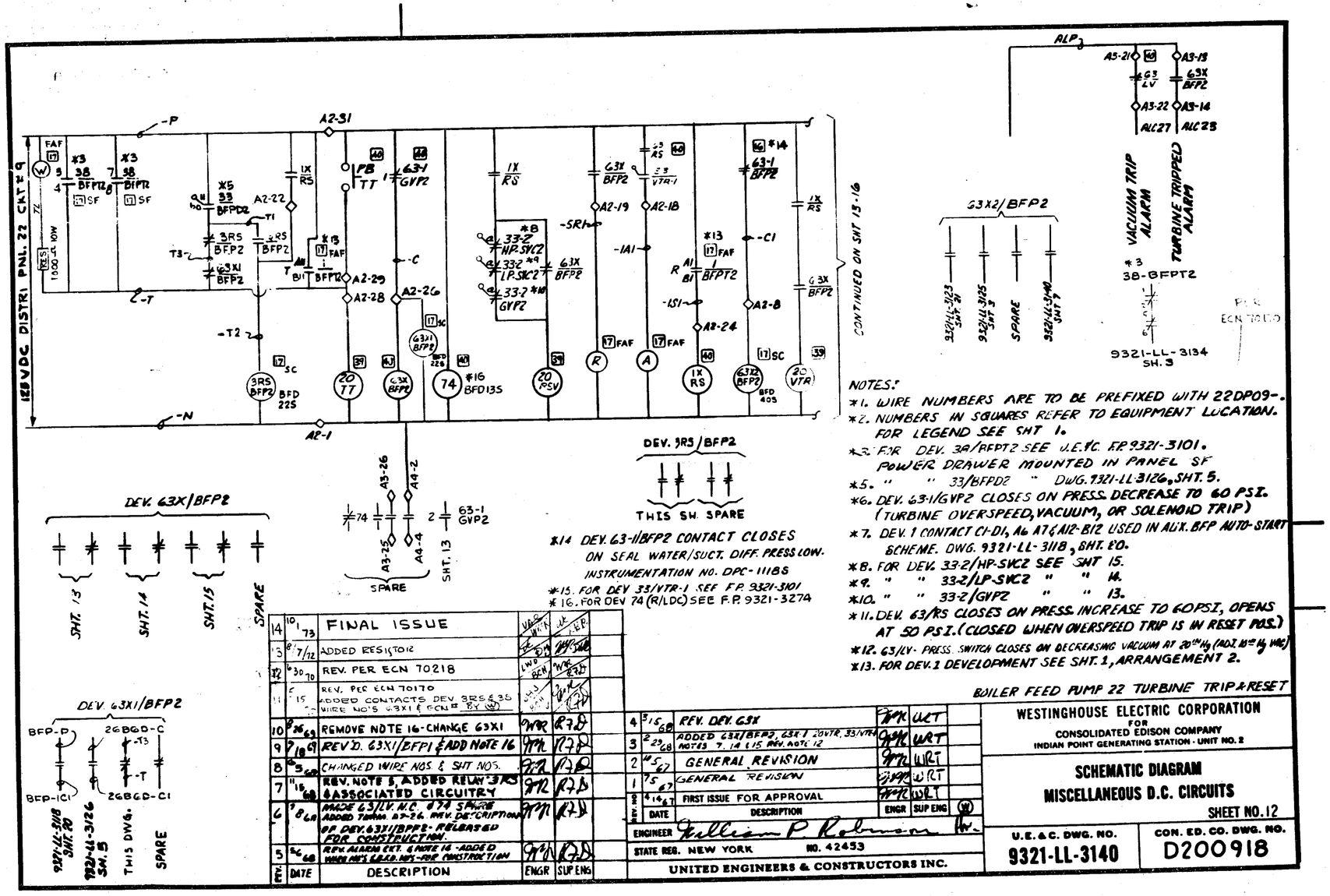
ENGINEER William P. Robinson
STATE REG. NEW YORK NO. 42453
UNITED ENGINEERS & CONSTRUCTORS INC.

WESTINGHOUSE ELECTRIC CORPORATION
FOR
CONSOLIDATED EDISON COMPANY
INDIAN POINT GENERATING STATION · UNIT NO. 2

SCHEMATIC DIAGRAM
MISCELLANEOUS D.C. CIRCUITS
SHEET NO. 7

U.E. & C. DWG. NO. 9321-LL-3140
CON. ED. CO. DWG. NO. D200918

Docket # 50-247
Control # 7912270232
Date 12-14-79 of Document
REGULATORY DOCKET FILE



NOTES:

*1. WIRE NUMBERS ARE TO BE PREFIXED WITH 22DP09-.
*2. NUMBERS IN SQUARES REFER TO EQUIPMENT LOCATION. FOR LEGEND SEE SHT 1.
*3. FOR DEV. 38/BFPT2 SEE U.E.&C. F.P. 9321-3101. POWER DRAWER MOUNTED IN PANEL SF
*5. " " 33/BFPD2 " DWG. 9321-LL-3126, SHT. 5.
*6. DEV. 63-1/GVP2 CLOSES ON PRESS. DECREASE TO 60 PSI. (TURBINE OVERSPEED, VACUUM, OR SOLENOID TRIP)
*7. DEV. 1 CONTACT C1-D1, A6 A7 & A12-B12 USED IN AUX. BFP AUTO-START SCHEME. DWG. 9321-LL-3118, SHT. 20.
*8. FOR DEV. 33-2/HP-SVC2 SEE SHT 15.
*9. " " 33-2/LP-SVC2 " " 14.
*10. " " 33-2/GVP2 " " 13.
*11. DEV. 63/RS CLOSES ON PRESS. INCREASE TO 60 PSI, OPENS AT 50 PSI. (CLOSED WHEN OVERSPEED TRIP IS IN RESET POS.)
*12. 63/LV- PRESS. SWITCH CLOSES ON DECREASING VACUUM AT 20" Hg (ADJ. 10" Hg MIN)
*13. FOR DEV. 1 DEVELOPMENT SEE SHT. 1, ARRANGEMENT 2.
*14 DEV. 63-1/BFP2 CONTACT CLOSES ON SEAL WATER/SUCT. DIFF. PRESS LOW. INSTRUMENTATION NO. DPC-1118S
*15. FOR DEV 33/VTR-1 SEE F.P. 9321-3101
*16. FOR DEV 74 (R/LDC) SEE F.P. 9321-3274

BOILER FEED PUMP 22 TURBINE TRIP & RESET

REV	DATE	DESCRIPTION	ENGR	SUP ENG
14	10/1/73	FINAL ISSUE	VRS/WKN	WK/JEP
13	8/7/72	ADDED RESISTOR	LND/RFN	MM/SWB
12	6/30/70	REV. PER ECN 70218	LND/RFN	WMR/RFD
11	5/15/70	REV. PER ECN 70170 ADDED CONTACTS DEV. 3RS & 3S WIRE NO'S U3X1 & ECN# BY (W)	LND/RFN	[illegible]
10	8/26/69	REMOVE NOTE 16-CHANGE 63X1	WMR	RFD
9	7/10/69	REV D. 63X1/BFP1 & ADD NOTE 16	MM	RFD
8	6/5/69	CHANGED WIRE NOS. & SHT NOS.	MM	RFD
7	11/15/68	REV. NOTE 5, ADDED RELAY 3RS & ASSOCIATED CIRCUITRY	MM	RFD
6	9/8/68	MADE 63/LV N.C. & 74 SPARE ADDED 7 WIRE A7-26. REV. DESCRIPTION OF DEV. 63X1/BFP2- RELEASED FOR CONSTRUCTION.	MM	RFD
5	6/6/68	REM ALARM CKT. & NOTE 14 - ADDED WIRE NO'S & R.E.D. NOS - FOR CONSTRUCTION	MM	RFD
4	5/15/68	REV. DEV. 63X	MM	WRT
3	2/23/68	ADDED 63X/BFP3, 63X-1 20VTR, 33/VTR-1 NOTES 7, 14 & 15 REV. NOTE 12	MM	WRT
2	11/5/67	GENERAL REVISION	MM	WRT
1	7/5/67	GENERAL REVISION	MM	WRT
0	4/14/67	FIRST ISSUE FOR APPROVAL	MM	WRT

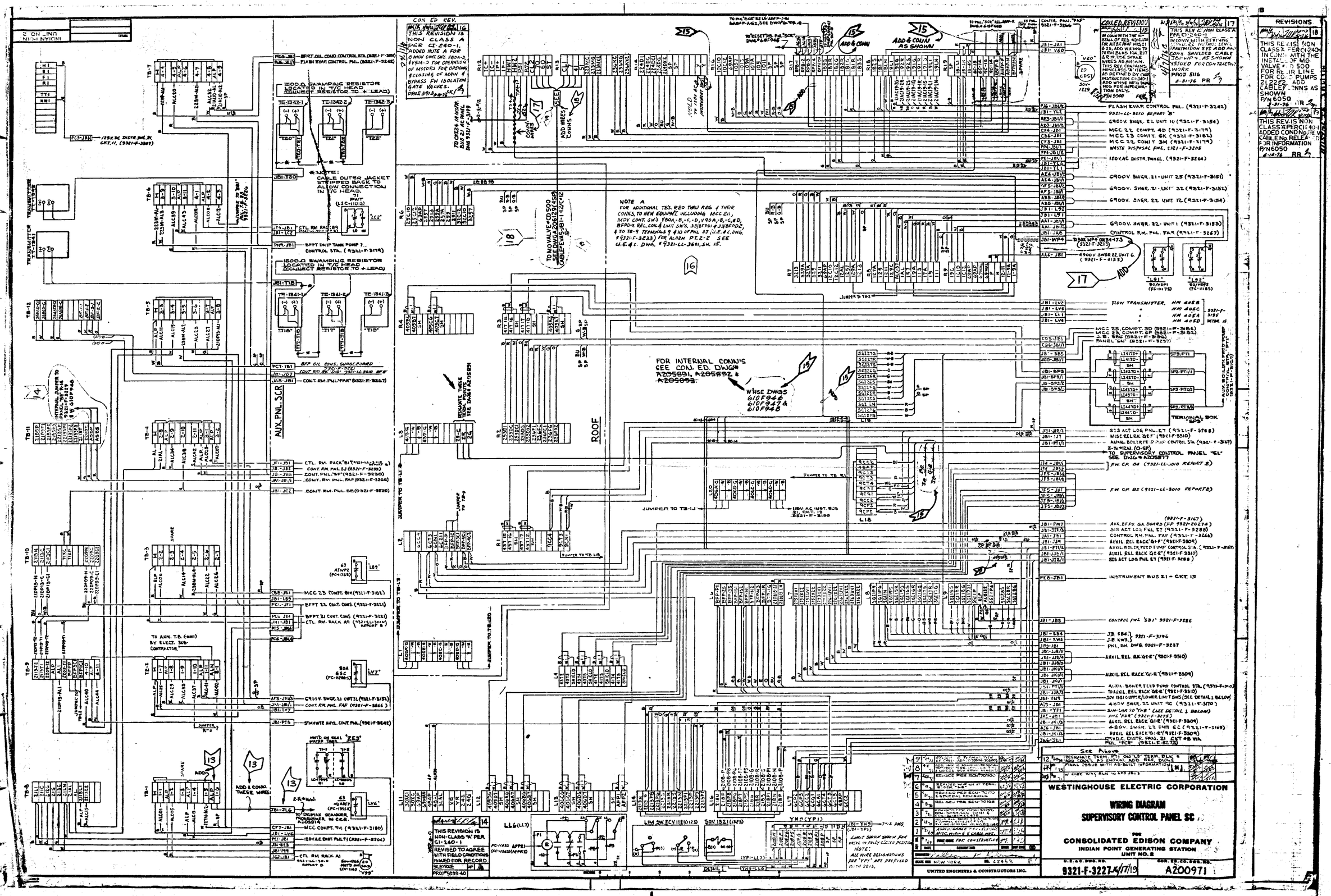
ENGINEER William P. Robinson
STATE REG. NEW YORK NO. 42453
UNITED ENGINEERS & CONSTRUCTORS INC.

WESTINGHOUSE ELECTRIC CORPORATION
FOR
CONSOLIDATED EDISON COMPANY
INDIAN POINT GENERATING STATION - UNIT NO. 2

SCHEMATIC DIAGRAM
MISCELLANEOUS D.C. CIRCUITS
SHEET NO. 12

U.E.&C. DWG. NO. 9321-LL-3140
CON. ED. CO. DWG. NO. D200918

Docket # 50-247
Control # 7912270232
Date 12-14-79
REGULATORY DOCKET FILE of Documents



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Control # 7912270832
Date 12-14-79 of Document
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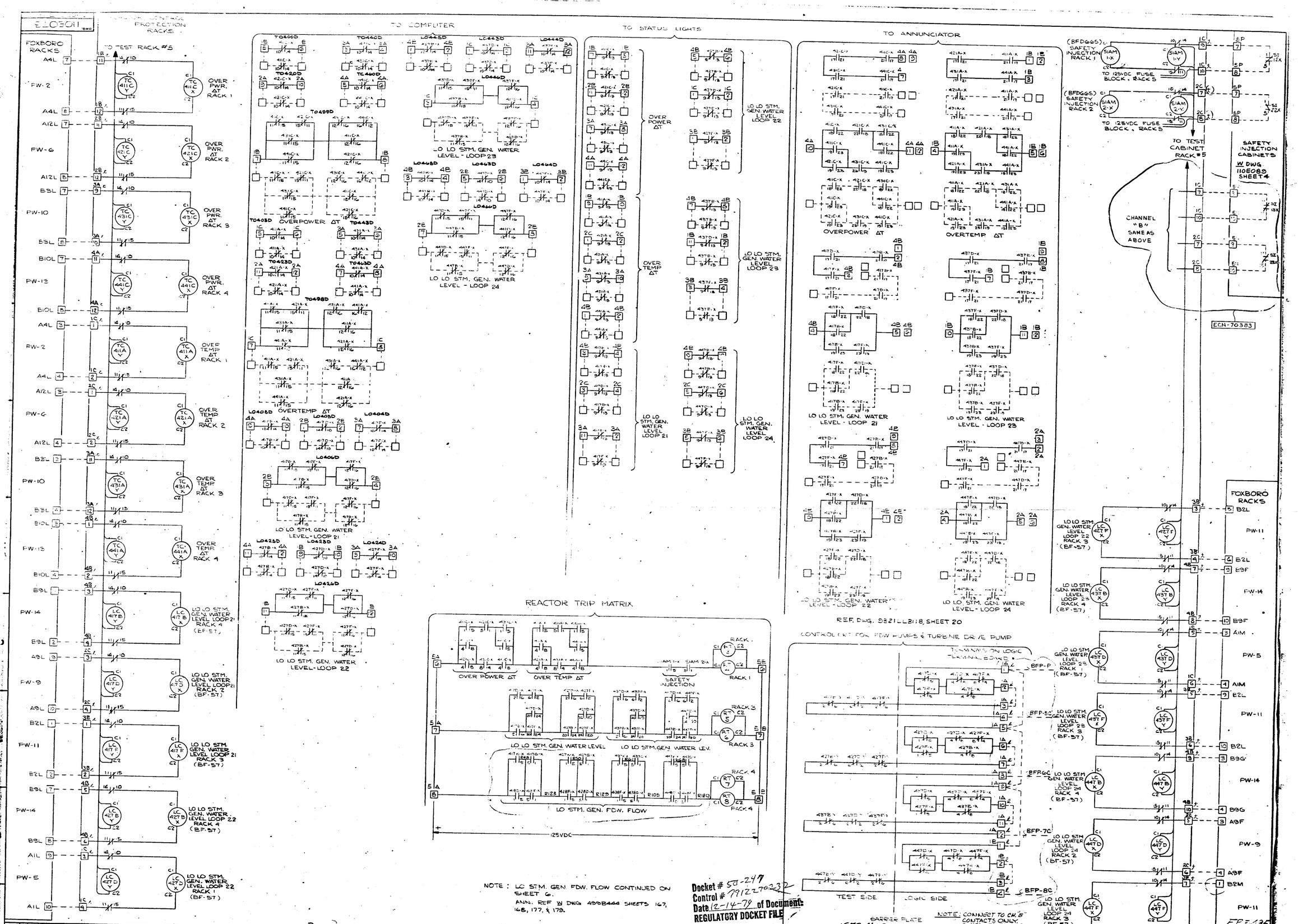
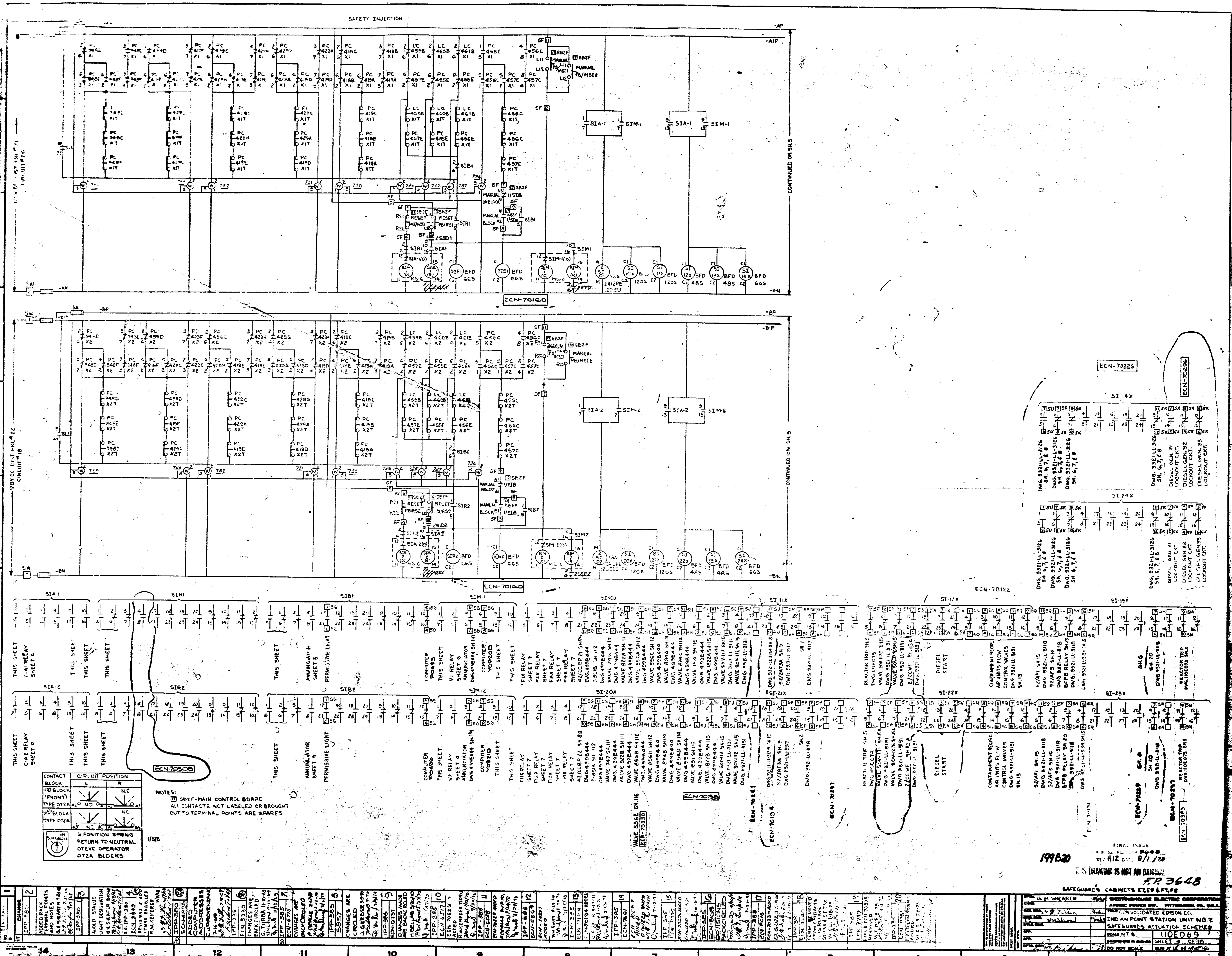
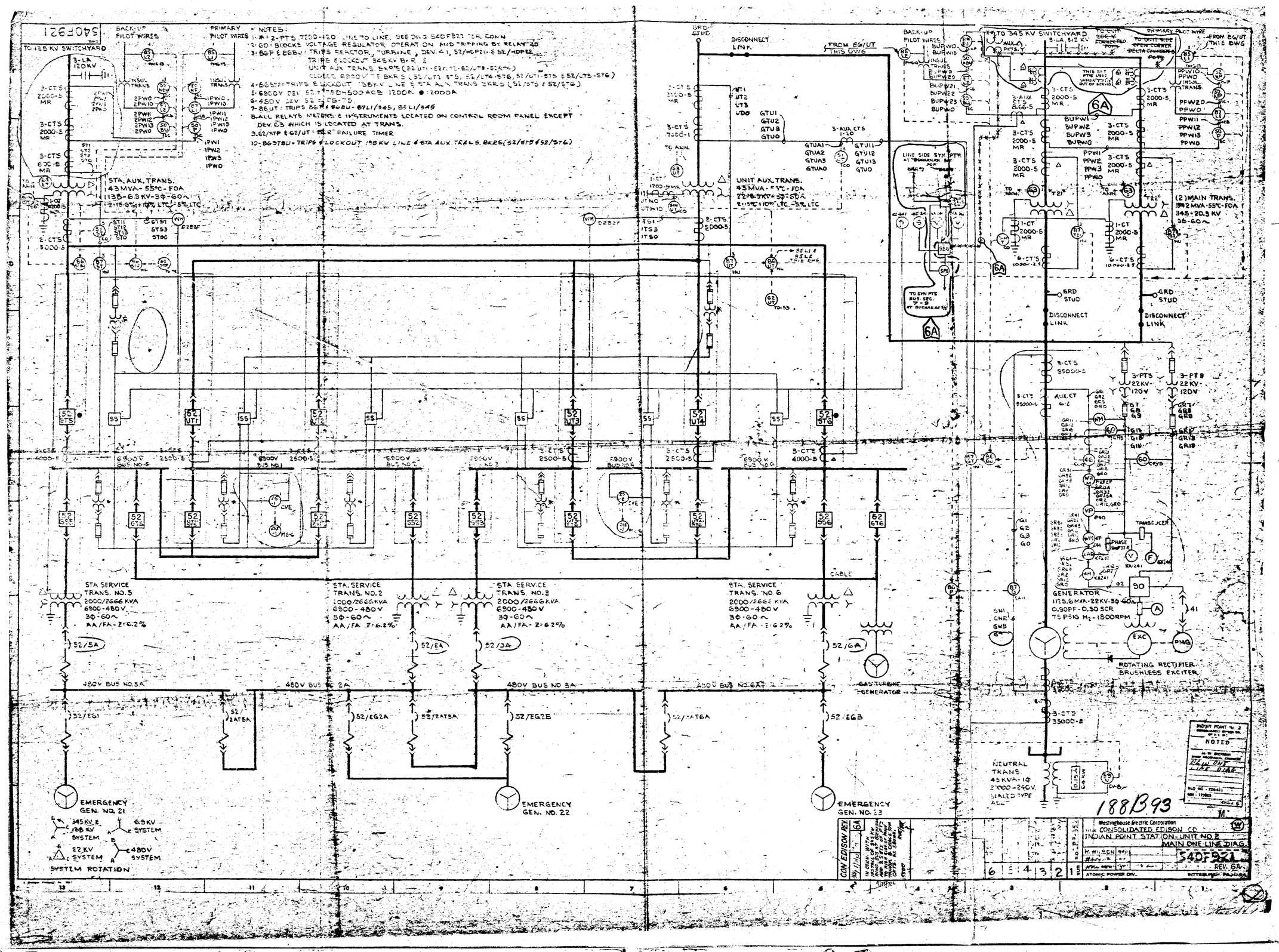
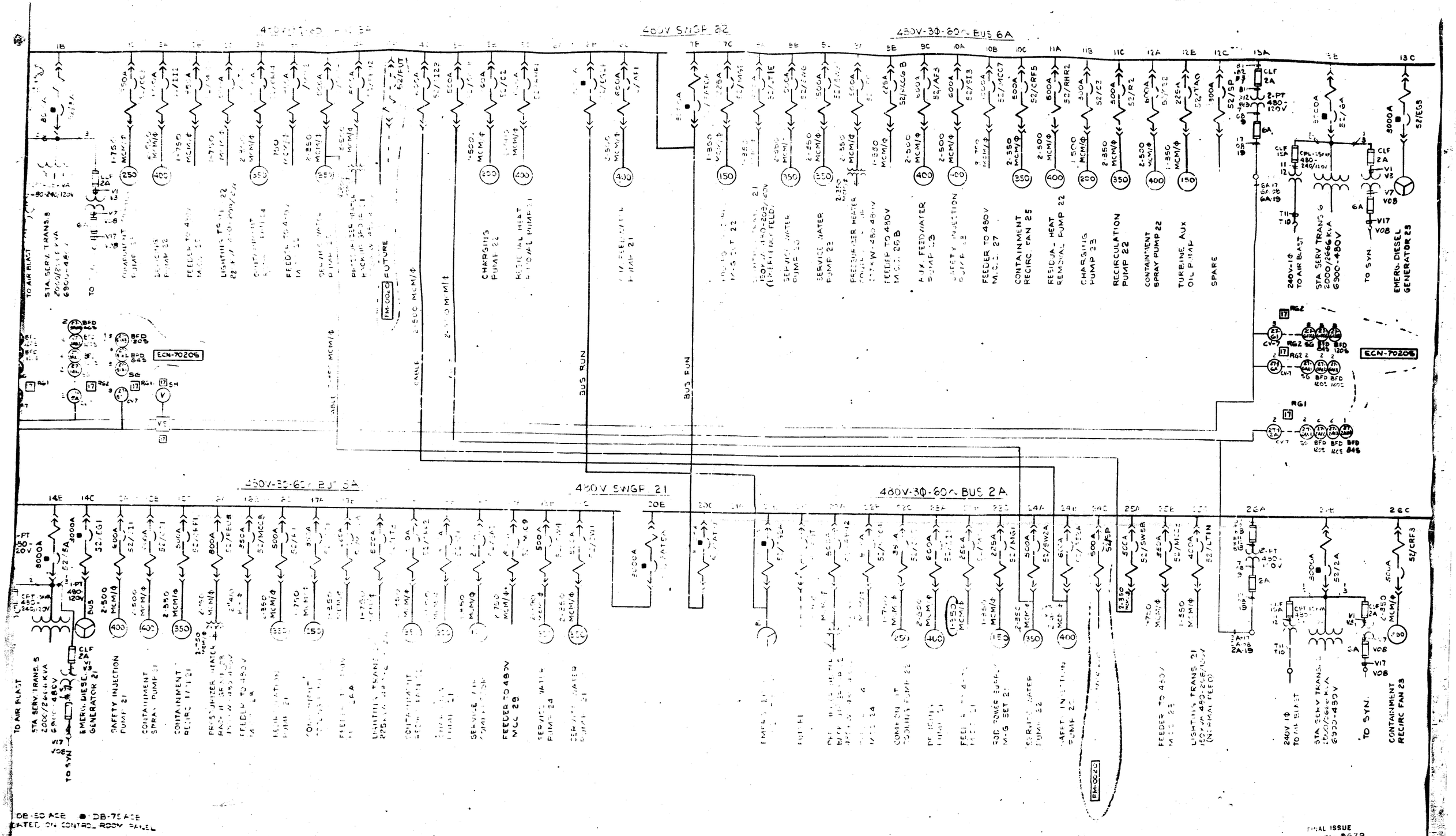

FOXBORO RACKS
TO TEST RACK #5
OVER PWR. ΔT RACK 1
OVER PWR. ΔT RACK 2
OVER PWR. ΔT RACK 3
OVER PWR. ΔT RACK 4
OVER TEMP ΔT RACK 1
OVER TEMP ΔT RACK 2
OVER TEMP ΔT RACK 3
OVER TEMP ΔT RACK 4
LO LO STM. GEN. WATER LEVEL LOOP 21 RACK 4 (BF-57)
LO LO STM. GEN. WATER LEVEL LOOP 21 RACK 2 (BF-57)
LO LO STM. GEN. WATER LEVEL LOOP 21 RACK 3 (BF-57)
LO LO STM. GEN. WATER LEVEL LOOP 22 RACK 4 (BF-57)
LO LO STM. GEN. WATER LEVEL LOOP 22 RACK 1 (BF-57)
TO COMPUTER
OVERPOWER ΔT
OVERTEMP ΔT
LO LO STM. GEN. WATER LEVEL - LOOP 23
LO LO STM. GEN. WATER LEVEL - LOOP 24
LO LO STM. GEN. WATER LEVEL - LOOP 21
LO LO STM. GEN. WATER LEVEL - LOOP 22
TO STATUS LIGHTS
OVER POWER ΔT
OVER TEMP ΔT
LO LO STM. GEN. WATER LEVEL LOOP 21
LO LO STM. GEN. WATER LEVEL LOOP 22
LO LO STM. GEN. WATER LEVEL LOOP 23
LO LO STM. GEN. WATER LEVEL LOOP 24
TO ANNUNCIATOR
OVERPOWER ΔT
OVERTEMP ΔT
LO LO STM. GEN. WATER LEVEL - LOOP 21
LO LO STM. GEN. WATER LEVEL - LOOP 23
LO LO STM. GEN. WATER LEVEL - LOOP 22
LO LO STM. GEN. WATER LEVEL - LOOP 24
REF. DWG. 9321LL3118, SHEET 20
(BFDG65) SAFETY INJECTION RACK 1
(BFDG65) SAFETY INJECTION RACK 2
TO 125VDC FUSE BLOCK, RACK 5
TO TEST CABINET RACK #5
SAFETY INJECTION CABINETS
W DWG. 110E088 SHEET 4
CHANNEL "B" SAME AS ABOVE
ECN-70383
LO LO STM. GEN. WATER LEVEL LOOP 22 RACK 3 (BF-57)
LO LO STM. GEN. WATER LEVEL LOOP 23 RACK 4 (BF-57)
LO LO STM. GEN. WATER LEVEL LOOP 23 RACK 3 (BF-57)
LO LO STM. GEN. WATER LEVEL LOOP 24 RACK 4 (BF-57)
LO LO STM. GEN. WATER LEVEL LOOP 24 RACK 2 (BF-57)
LO LO STM. GEN. WATER LEVEL LOOP 24 RACK 3 (BF-57)
REACTOR TRIP MATRIX
OVER POWER ΔT
OVER TEMP ΔT
SAFETY INJECTION
LO LO STM. GEN. WATER LEVEL
LO LO STM. GEN. WATER LEV.
LO STM. GEN. FDW. FLOW
125VDC
CONTROL KIT FOR FDW PUMPS & TURBINE DRIVE PUMP
TERMINALS ON LOGIC TERMINAL BOARD
TEST SIDE
LOGIC SIDE
BARRIER PLATE
NOTE: CONNECT TO CH. "B" CONTACTS ONLY. CH. "A" CONTACTS ARE CALLED "SPARE".
NOTE: LO STM. GEN. FDW. FLOW CONTINUED ON SHEET 6.
ANN. REF W DWG 4998444 SHEETS 167, 168, 177, & 178.
Docket # 50-247
Control # 7912270232
Date 12-14-79 of Document
REGULATORY DOCKET FILE
1973 M 2811
FP-F-495
PLANT: INDIAN POINT 3 PROJECT
UNITS: 3 SPIN
STATUS: CERTIFIED FOR CONSTRUCTION
CERTIFICATION: LETTER NO. IPP-4280
AUTHORITY: R. F. DEWINE
ENGR. LTR. NO. E-PED-5554
FINAL ISSUE
F.P. No. 9321-01-3005
REV. RT DATE 8/1/73
THIS DRAWING IS NOT AN ORIGINAL
WESTINGHOUSE ELECTRIC CORPORATION
ATOMIC POWER DIV. PITTSBURGH, PA. U.S.A.
TITLE: INDIAN POINT STATION UNIT #2
REACTOR PROTECTION SYSTEM
SCHEMATIC
DFTM. K. SCHILLO
SCALE ~
DIMENSIONS IN INCHES
DO NOT SCALE
110E073
SHEET 5 OF 11
SUB # 277187
IPP-380 CHANGE
IPP-380 ADDED COMPUTER ADDRESSES
IPP-385 CHANGES ARE CIRCLED
IPP-386 CHANGES ARE CIRCLED



Docket # 50-247
Control # 7912270232
Date 12-14-79 of Document
REGULATORY DOCKET FILE



Docket # 50-247
Control # 7912270232
Date 12-14-79 of Document:
REGULATORY DOCKET FILE



Docket # 50-247
Control # 7912270232
Date 12-14-79 of Document
REGULATORY DOCKET FILE

199B10

FINAL ISSUE
F.P. No. 002101-3079
REV. R2 DATE 4/24/78

INDIAN POINT UNIT NUMBER 2
STATUS: CERTIFIED FOR CONSTRUCTION
CERTIFICATION: LETTER NO.: IPP-6410
AUTHORITY: E. U. POWELL
ENGR. LTR. NO.: E-PED-6410

F.P. 307

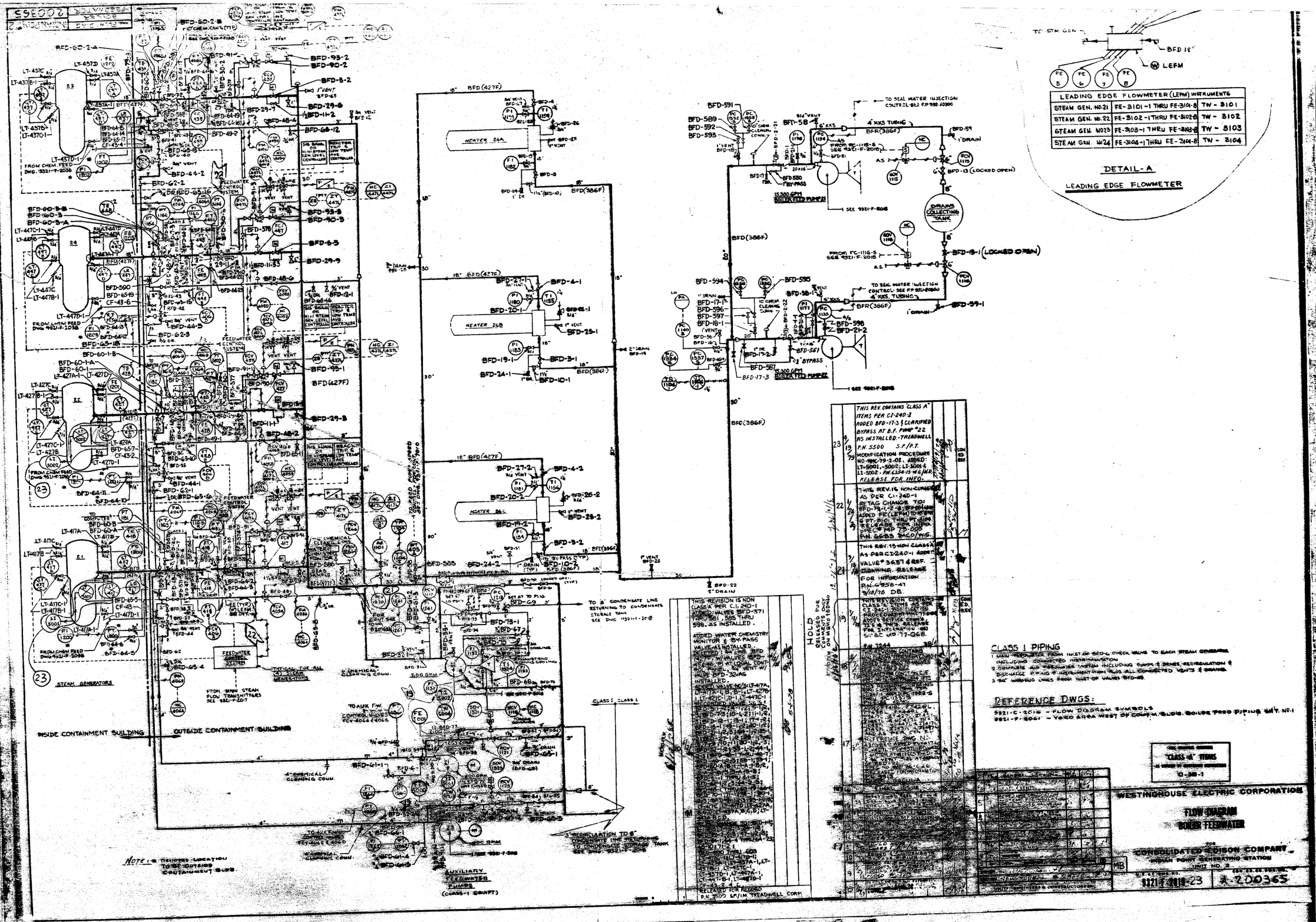
9	8	7	6	5	4	3	2	1	

Westinghouse Electric Corporation
THE CONSOLIDATED EDISON CO. OF N.Y.
INDIAN POINT STATION
480V
ATOMIC POWER DIV.

ATTACHMENT B

LIST OF AUXILIARY FEEDWATER FLOW INDICATION SYSTEM DRAWINGS

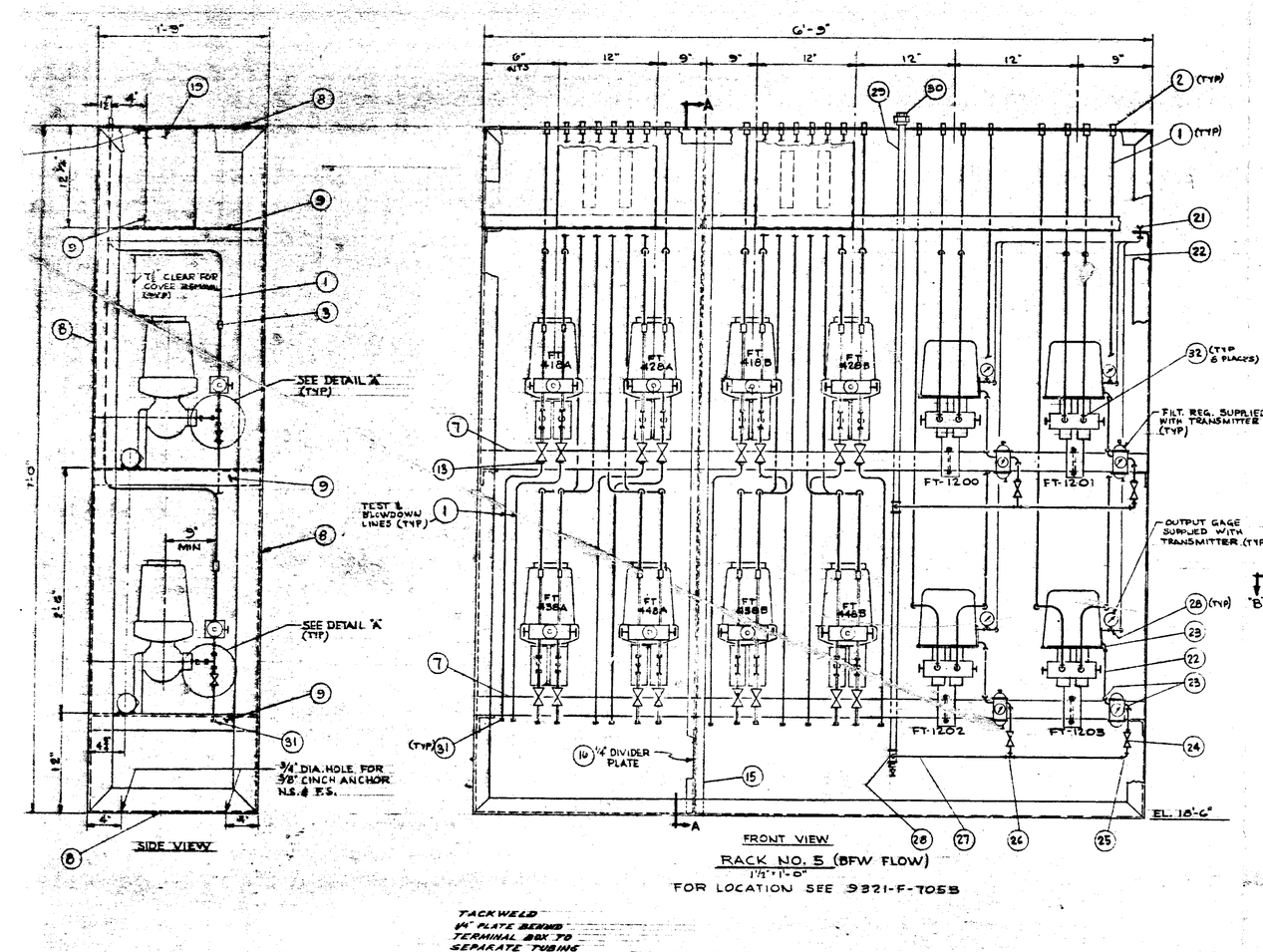
9321-F-2019 Revision 23	Flow Diagram, Boiler Feedwater
9321-F-7003 Revision 11	Transmitter Racks Piping Arrangement - Sheet No. 2, Instrumentation
9321-F-7012 Revision 4	Instrument Piping Schematics-Sheet No. 3, Instrumentation
9321-F-7030 Revision 8	Cabled Tubing Schematic, Instrumentation
F.P. 9321-7058 Revision 0	Outline Drawing, Edge Type Receiver & Press. Gauge
F.P. 9321-7230 Revision 0	Installation Drawing For Differential Pressure Transmitter Model 6E608MA
F.P. 9321-7230 Revision 0	Anderson, Greenwood Manifolds Type M2
F.P. 9321-7231 Revision 0	Overall Dimensions for Differential Pressure Transmitter

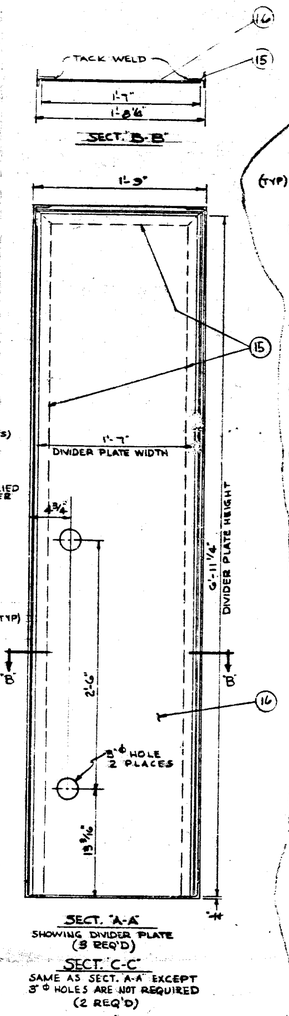


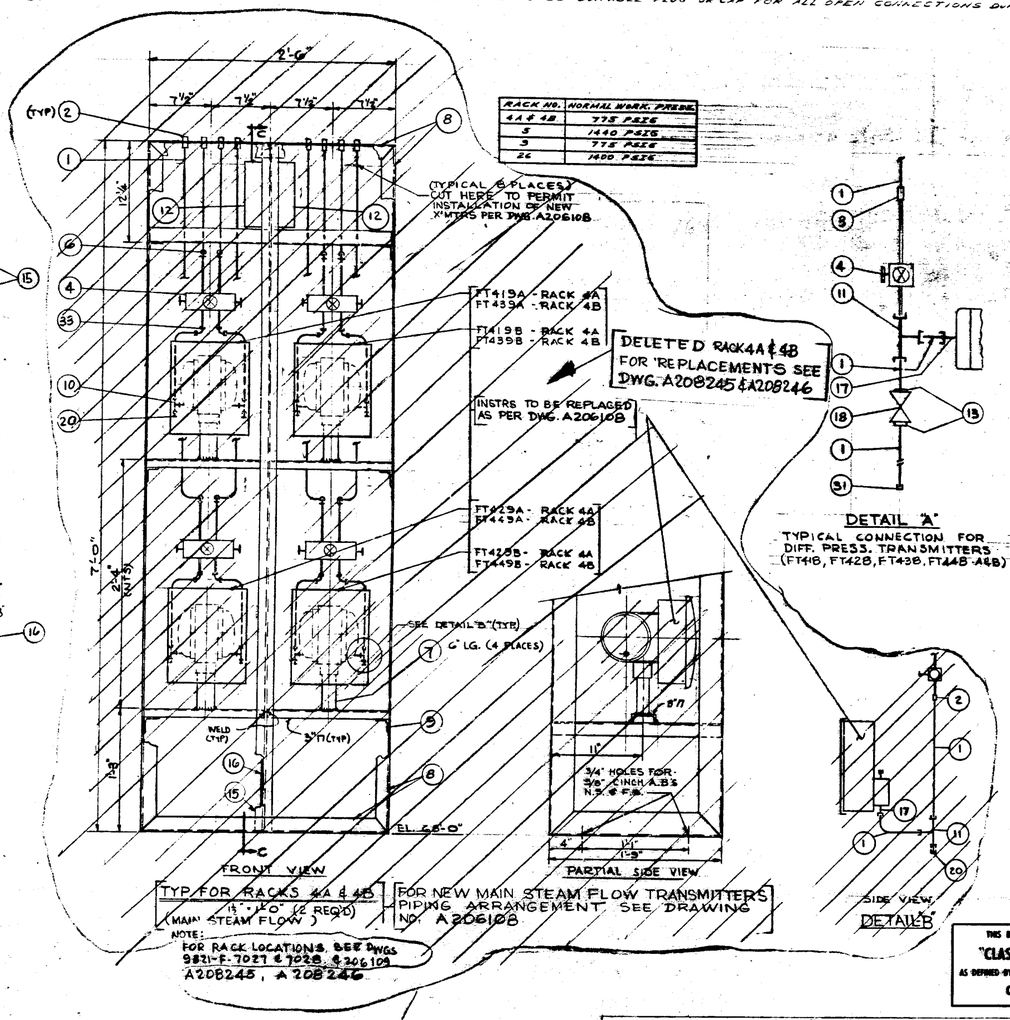
Docket # 50-247
Control # 7912270032
Date 12/14/79
Of Document
REGULATORY DOCKET FILE

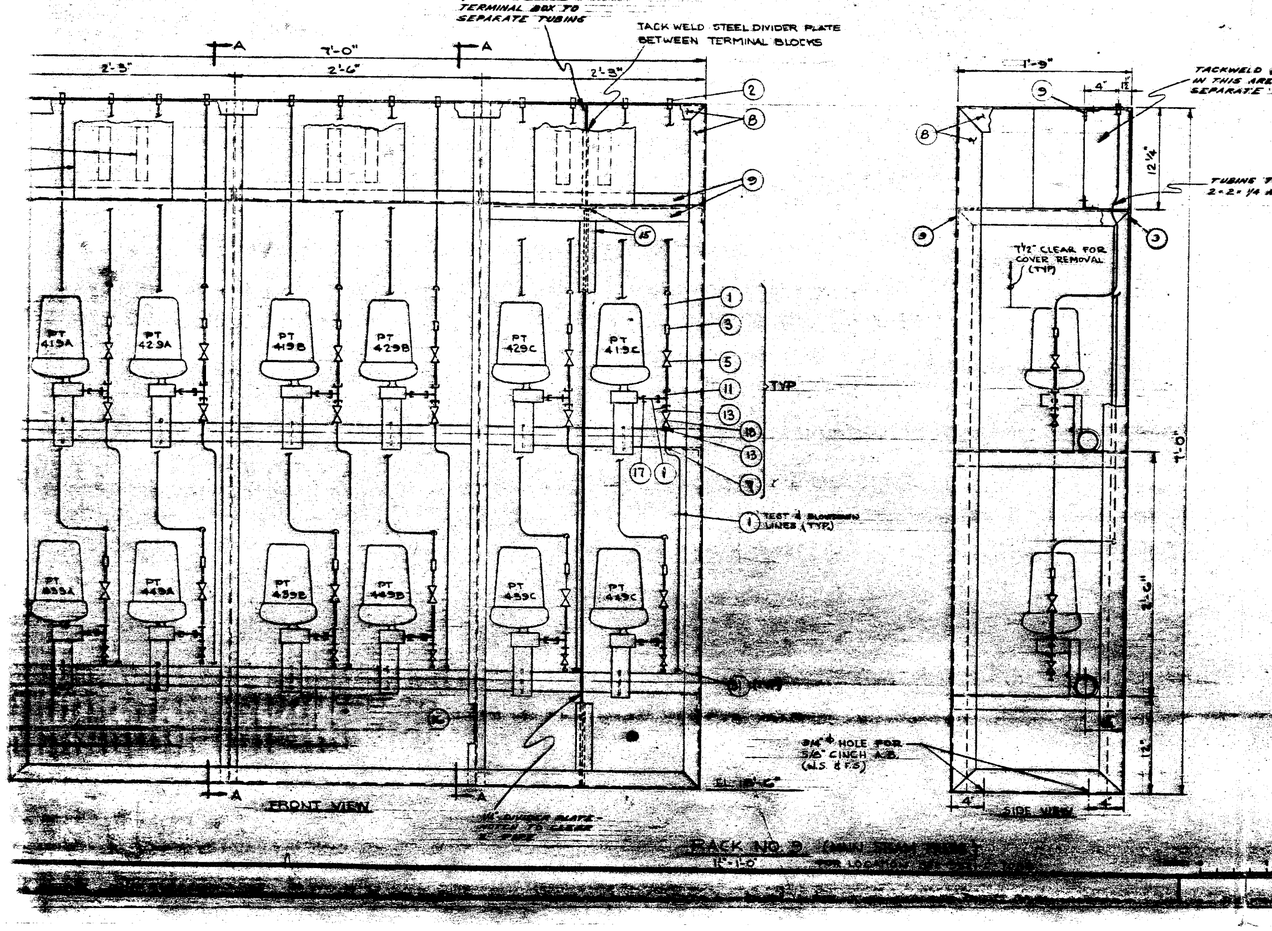
1. RACKS TO BE OF WELDED CONSTRUCTION.
2. ALL TUBING TO BE RUN IN A STRAIGHT & WORKMANSHIP LIKE MANNER AS SUITABLE TO REQUIREMENTS.
3. ALL BULKHEAD FITTINGS SHALL BE TAGGED WITH INSTRUMENT NUMBER.
4. PROVIDE SUITABLE PLUG OR CAP FOR ALL OPEN CONNECTIONS DURING S

RACK NO.	NORMAL WORK. PRESS.
4A & 4B	775 PSIG
5	1440 PSIG
3	775 PSIG
2C	1400 PSIG









MATERIAL LIST:	
ITEM	DESCRIPTION
1	3/8" O.D. x .065 WALL STN. STL. TUBING
2	3/8" O.D. TUBING STN. STL. S.W. BULKHEAD FITTING (CR T
3	3/8" O.D. TUBING STN. STL. S.W. COUPLING
4	KEROTEST #5152N VALVE MANIFOLD (SUPPLIED BY PURCHA
5	KEROTEST #R42XBIN VALVE (SUPPLIED BY PURCHASER)
6	3/8" O.D. TUBE S.W. ELBOW CAJON #6SW-9-316
7	2" SCH. 40 PIPE, STEEL
8	2"x3"x1/4" ANGLE, STEEL
9	2"x2"x1/4" ANGLE, STEEL
10	3/8" x 1/4" MPT x 3/8" TEE, STN. STL., SWAGELOK #600-3-3TA
11	3/8" O.D. TUBE STN. STL. ALL TUBE TEE, SWAGELOK #600-3-3
12	12"x8"x6" NEMA 1 SCREW COVER BOX
13	1/2" I.P.S. x 3/8" O.D. TUBE S.W. REDUCER INSERT, CAJON #8MPW
14	8 PT TERMINAL BLOCK (REFER TO SPECIFICATION)
15	2" CARBON STEEL STRUCTURAL TEE.
16	DIVIDER PLATE, STEEL SHEET, 6'-11 1/4" H x 1'-7" W x 1/4" THICK
17	3/8" O.D. TUBE x 1/4" MPT STN. STL. ADAPTER, SWAGELOK #600-1
18	EDWARDS #352Y VALVE WITH 1/2" S.W. ENDS
19	12x12x6 NEMA 1 ELECTR. ENCLOSURE WITH SCREW-DOWN COVER
20	3/8" O.D. TUBE STN. STL. PLUG, SWAGELOK #600-P-316
21	1/4" BRASS TUBING BULKHEAD FITTING, SWAGELOK #400
22	1/4" O.D. x .032" WALL COPPER TUBING
23	1/4" O.D. TUBE x 1/4" MPT 90° ELBOW, SWAGELOK #400-2-4
24	1/4" FEM NPT TO 1/4" O.D. TUBE BRASS SHUT-OFF VALVE.
25	1/4" BRASS 90° PIPE ELBOW
26	1/4" BRASS PIPE TEE
27	1/4" BRASS PIPE
28	3/4" BRASS PIPE TEE
29	3/4" BRASS PIPE
30	3/4" BRASS PIPE UNION
31	3/8" O.D. STN. STL. TUBING CAP, SWAGELOK # 600-C-
32	3/8" O.D. x 1/2" MPT 90° ELBOW S.S. SWAGELOK # 600-2-6-316
33	3/8" O.D. TUBE STN. STL. UNION ELBOW, SWAGELOK #600-9-316.

REV.	DATE	DESCRIPTION	DR.	CK.
11	2/14/79	THIS REV. CONTAINS CLASS A PER CI-240-1 MODIF. PROCEDURE NO. MMC-79-2-05. DELETED RACK 4A & 4B. RELEASE FOR RECORD. P.N. 50574 GACULA/PACO 9-11-79		
10	9/11/78	THIS REVISION CONTAINS CLASS A CHANGES PER CI-240-1 DELETED TRANSMITTER INSTRS. IN TABULATION RACK 4B (MAIN STEAM FLOW) REF. NO. MMC-78-2-01 RELEASED FOR RECORD P.N. 50357 GACULA/PACO 9-11-78	DSP	WRT
9	8/14/78	FINAL ISSUE	DSP	WRT
8	8/10/78	REVISED RACK NO. 4A & 4B TO REPLACE RACK NO. 3	DSP	WRT
7	7/10/78	AS-BUILT	DSP	WRT
6	7/11/78	ADDED RACK NO. 4A & 4B	DSP	WRT
5	7/6/78	REVISED PER CI-240-1	DSP	WRT
4	5/8/78	REVISED PER CI-240-1	DSP	WRT
3	5/1/78	REVISED PER CI-240-1	DSP	WRT
2	4/26/78	REVISED PER CI-240-1	DSP	WRT
1	3/16/78	ADDED RACK NO. 3	DSP	WRT
REV.	DATE	DESCRIPTION	DR.	CK.

ENGINEER: Wayne R. Thompson
DATE: 3/14/78
SCALE: NONE
DRAWN BY: NEW YORK
NO. 33732
UNITED ENGINEERS & CONSTRUCTORS INC.

WESTINGHOUSE ELECTRIC CORPOR

TRANSMITTER RACKS PIPING ARRANGEMENT SHEET NO. 2 INSTRUMENTATION

FOR

CONSOLIDATED EDISON COMPA

INDIAN POINT GENERATING STATION UNIT NO. 2

M1

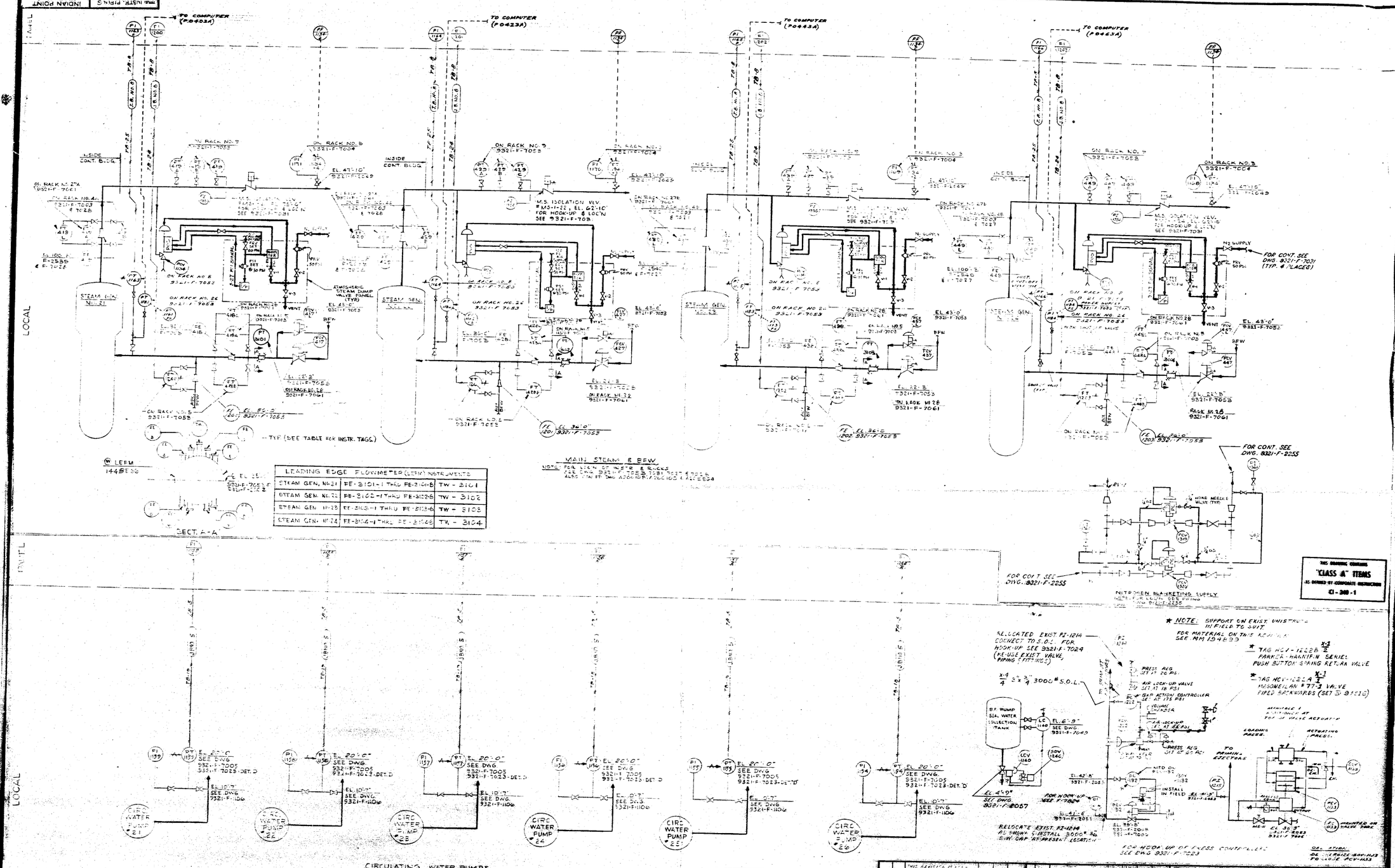
U.E.&C. DWG. NO. 9321-F-7003-19

CON. ED. CO. DWG. A20108

THIS DRAWING "CLASS A" AS DEFINED BY CORPOR CI-240

Docket # 50-247
Control # 7912270232
Date 12-14-78
REGULATORY DOCKET FILE
Of Document

MAIN INSTR. PIPING	INDIAN POINT
SCHEMATIC SH. 3	UNIT NO. 2
INSTRUMENT NO.	A201106



LEADING EDGE FLOWMETER (LEFM) INSTRUMENTS		
STEAM GEN. NO. 21	FE-3101-1 THRU FE-3101-6	TW - 3101
STEAM GEN. NO. 22	FE-3102-1 THRU FE-3102-6	TW - 3102
STEAM GEN. NO. 23	FE-3103-1 THRU FE-3103-6	TW - 3103
STEAM GEN. NO. 24	FE-3104-1 THRU FE-3104-6	TW - 3104

Docket # 50-247
Control # 7912270232
Date 12-14-79 of Document
REGULATORY DOCKET FILE

A20112.4

INDIAN POINT UNIT NO. 2

PANEL FAP: PT-1101, PT-1102, PT-1123; PT-1172, PT-1173; PT-1193; PT-1174, PT-1160, PT-1161, PT-1162; PT-1182, PT-1183; PT-1163, PT-1164, PT-1165, PT-1166

PANEL SBP-B: SEE NOTE 3; SPARE; SPARE; SPARE; SPARE; SPARE; SPARE; SPARE; SPARE; SPARE; SPARE; SPARE; SPARE; SPARE; SPARE; SPARE; SPARE; SPARE; SPARE; SPARE; FT-1121, FT-1122, FT-1123, FT-1124, FT-1125; SPARE, SPARE, SPARE, SPARE, SPARE

PANEL SCF: LT-1164, LT-1164A, LT-1165, LT-1165A, LT-1166, FT-1188; LT-1127, TT-1104-1, TT-1104-2; FT-1102-1, FT-1102-2, FT-1119-1, FT-1119-2; SPARE, FT-1187, SPARE, SPARE; LT-1130, LC-1128, LC-1129; LCV-1128, LCV-1129; SPARE, SPARE; HCV-1118, PT-1260, PT-1261, PT-1262, PT-1263, PT-1264, PT-1265, PT-1126, PT-1205; FT-1200, FT-1201, FT-1202, FT-1203

PANEL SDF: PT-1103, PT-1104, PT-1105, PT-1106, PT-1107, PT-1108, PT-1109, PT-1110, PT-1111, PT-1112, PT-1113, PT-1114; PT-1121, PT-1122, PT-1123, PT-1124, PT-1131-1, PT-1151-2, PT-1151-3; PT-1116, PT-1113, PT-1125, PT-1118; PT-1117, PT-1120

PANEL SEF: LT-1101, LT-1102, LT-1103; LT-1115, LT-1116, LT-1117, LT-1118, LT-1119, LT-1120; LT-1122, LT-1121, LT-1124; PT-1175-2, PCV-1175-1, PT-1175-1, LT-1123, LT-1125, LT-1126

PANEL SJF (CONTROL ROOM EL. 25'-0"): PT-1133, PT-1149, PT-1150, PT-1151; YT-1140, PT-1154, PT-1155, PT-1156, PT-1157, PT-1158, PT-1159; LT-1129; PT-1192, PT-1164

FIELD

14 TUBE BUNDLE (3 SPARES) — JUNCT. BOX NO. 11 — ACCESS TO TUBE BUNDLE SEE DWG. 9321-F-7000, SHT. 1 OF 2, SHT. 2 OF 2

14 TUBE BUNDLE (2 SPARES) — JUNCT. BOX NO. 1 — 10 TUBE BUNDLE

14 TUBE BUNDLE (1 SPARE) — JUNCT. BOX NO. 2 — 8 TUBE BUNDLE

14 TUBE BUNDLE (4 SPARES) — JUNCT. BOX NO. 3 — 8 TUBE BUNDLE

14 TUBE BUNDLE (4 SPARES) — JUNCT. BOX NO. 4 — 8 TUBE BUNDLE

14 TUBE BUNDLE (3 SPARE) — JUNCT. BOX NO. 5 — 8 TUBE BUNDLE

14 TUBE BUNDLE (1 SPARE) — JUNCT. BOX NO. 6 — 8 TUBE BUNDLE

14 TUBE BUNDLE (4 SPARES) — JUNCT. BOX NO. 7 — 8 TUBE BUNDLE

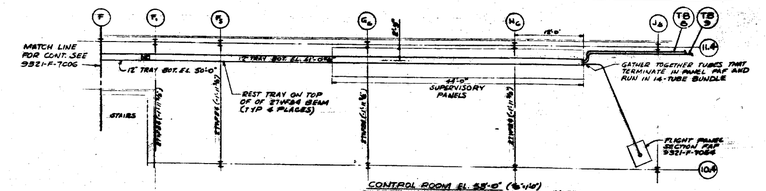
10 TUBE BUNDLE (2 SPARES) — JUNCT. BOX NO. 8 — 14 TUBE BUNDLE — INSTR. RACK NO. 8 — FOR LOCN. SEE F-7045

10 TUBE BUNDLE (2 SPARES) — JUNCT. BOX NO. 9 — 14 TUBE BUNDLE — INSTR. RACK NO. 9 — FOR LOCN. SEE F-7045

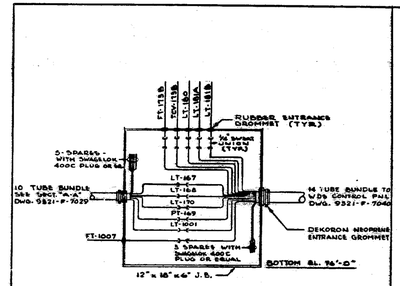
10 TUBE BUNDLE (2 SPARES) — INSTR. RACK NO. 7 — FOR LOCN. SEE F-7045

LOCATED INSIDE ELECT. PENETRATION TUNNEL

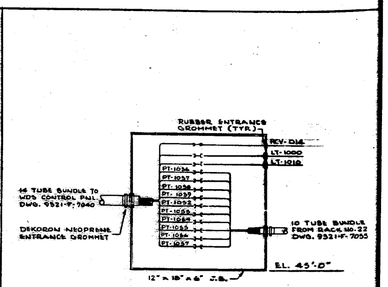
LOCATED ON REAR SIDE OF CONTROL RM. ABOVE PANEL SJF



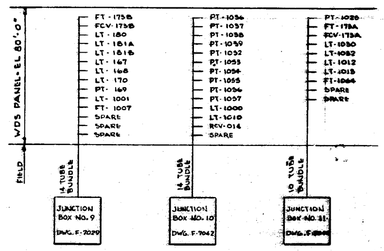
NOTE:
1. INSTR. TRAY SHALL BE FIELD FABRICATED FROM U.C. WHITE CO. "TUBETRACK" ANGLE. FOR FABRICATION DETAILS SEE 9321-F-7016 AND U.E.&C. F.R. 9321-7885.

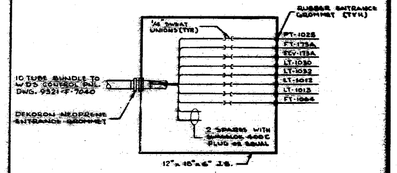


JUNCTION BOX Nº 9



JUNCTION BOX Nº 10





JUNCTION BOX Nº 11

NOTES:
1. FOR JUNCTION BOX DETAILS NO. 1 THRU 8, 4 NO. 10 SEE DWG. 9321-F-7007
2. FOR TUBE BUNDLE ROUTING IN TURBINE HALL SEE DWG. 9321-F-7007 & 7006.
3. FOR TUBE BUNDLE ROUTING OF 7B & 7D SEE DWG. 9321-F-7005, 7006 & 7008.
4. TUBE BUNDLE SHALL BE 14 OR 10 CORRUGATED TUBES WITH INNER MYLAR TAPE SHIELD AND FLAME RESISTANT OUTER PVC JACKET.
5. RUN SPARE TUBES TO DISTEND OF PANEL SBP-B. DO NOT RUN TUBES INTO PANEL.

8		FINAL ISSUE		
7				
6				
5			DSP	CRS
4			DSP	CRS
3			DSP	CRS
2			DSP	CRS
1			DSP	CRS
0			DSP	CRS

DRAWN BY: L. Hellman
DWG. NO. NEW YORK 397932
UNITED ENGINEERS & CONSTRUCTORS INC.

WESTINGHOUSE ELECTRIC CORPORATION

CABLED TUBING SCHEMATIC INSTRUMENTATION

FOR

CONSOLIDATED EDISON COMPANY

INDIAN POINT GENERATING STATION

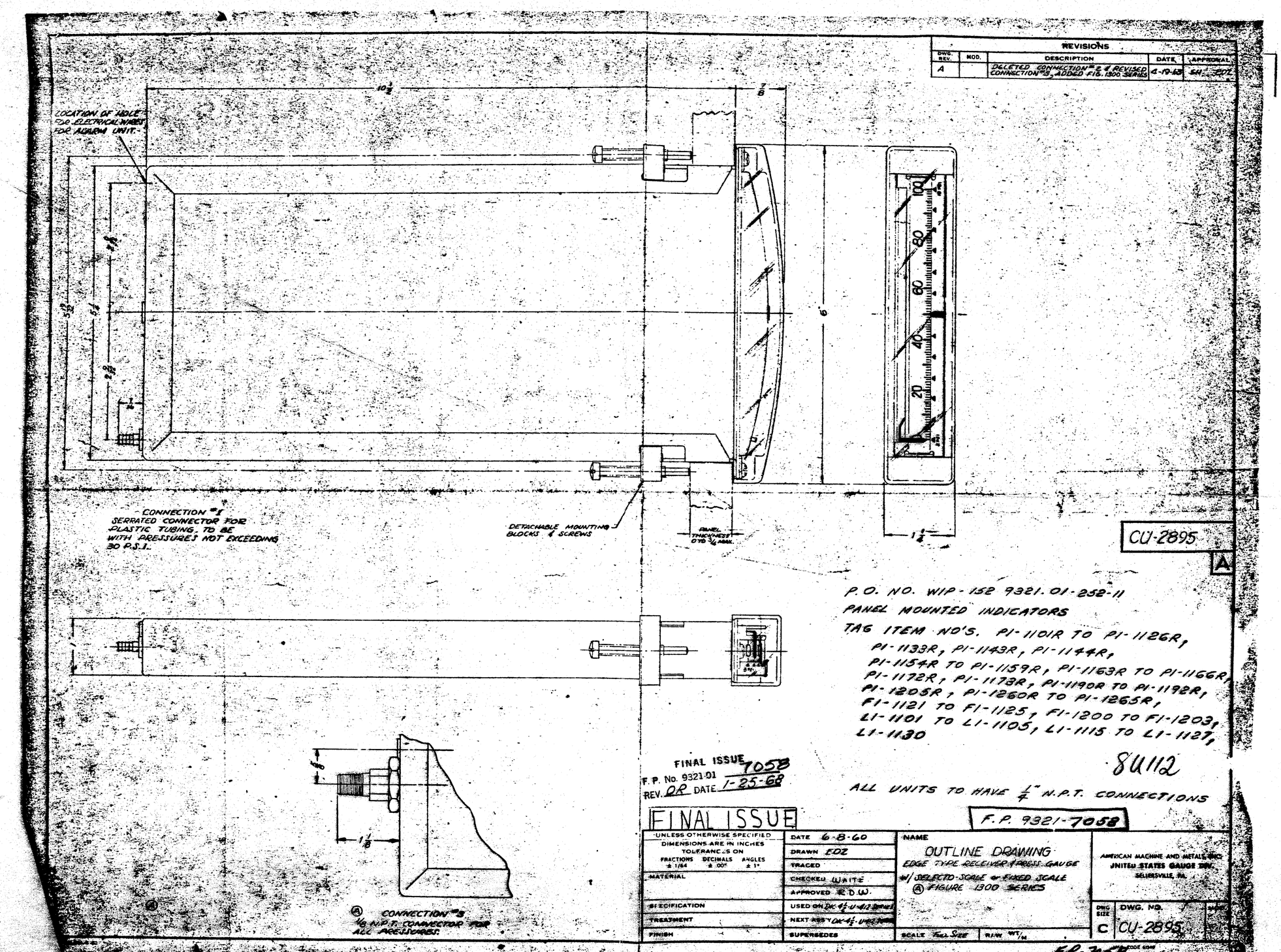
UNIT NO. 2

U.E.&C. DWG. NO. 9321-F-7030-8

DWG. NO. A20112.4

Docket # 50-247
Control # 7912290232
Date 12/14/79
of Documents
REGULATORY DOCKET FILE

REVISIONS				
DWG. REV.	MOD.	DESCRIPTION	DATE	APPROVAL
A		DELETED CONNECTION #2 & REVISED CONNECTION #3, ADDED FIG. 1300 SERIES	4-19-68	SH. 3012



CU-2895

A

P.O. NO. WIP-152 9321.01-252-11

PANEL MOUNTED INDICATORS

TAG ITEM NO'S. PI-1101R TO PI-1126R, PI-1133R, PI-1143R, PI-1144R, PI-1154R TO PI-1159R, PI-1163R TO PI-1166R, PI-1172R, PI-1173R, PI-1190R TO PI-1192R, PI-1205R, PI-1260R TO PI-1265R, FI-1121 TO FI-1125, FI-1200 TO FI-1203, LI-1101 TO LI-1105, LI-1115 TO LI-1127, LI-1130

84112

ALL UNITS TO HAVE 1/4" N.P.T. CONNECTIONS

FINAL ISSUE 7058
F.P. No. 9321-01
REV. OR DATE 1-25-68

FINAL ISSUE

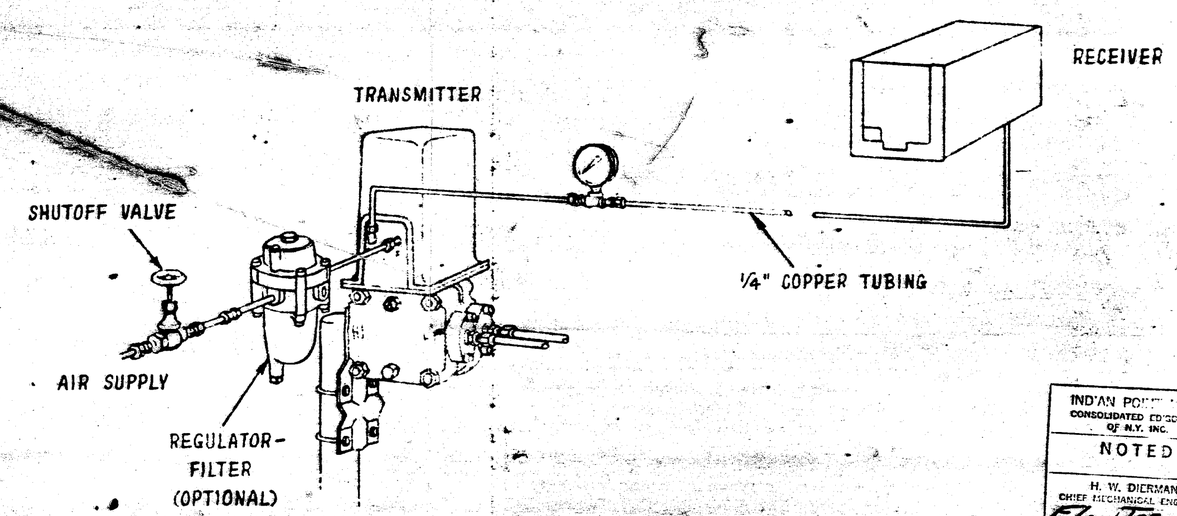
F.P. 9321-7058

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON FRACTIONS ± 1/64 DECIMALS ± .001 ANGLES ± 1°	DATE 6-8-60	NAME OUTLINE DRAWING EDGE TYPE RECEIVER & PRESS. GAUGE W/ SELECTO-SCALE or FIXED SCALE (A) FIGURE 1300 SERIES	AMERICAN MACHINE AND METALS INC. UNITED STATES GAUGE DIV. SELLERSVILLE, PA.
	DRAWN EDZ		
	TRACED		
MATERIAL	CHECKED WAITE		
	APPROVED R.D.W.		
SPECIFICATION	USED ON DK-4½-U-412 Panel		DWG SIZE C — DWG. NO. CU-2895 — REV. A
TREATMENT	NEXT ASS'Y DK-4½-U-412 Panel		
FINISH	SUPERSEDES	SCALE Full Size — RAW WT/M	

F.P. 7058

Docket # 50-247
Control # 7912270232
Date 12-14-79 of Document
REGULATORY DOCKET FILE

CERTIFIED CORRECT FOR
CUSTOMER ORDER # 9321-01-252-23 XXP 303 AND [illegible]
ITEM OR TAG # FT-1200; 01; 02; 03;
MODEL # GE60BMA-1BE-13
Filter Regulator 47277
DATE 2-10-68 BY [illegible]



1. AIR SUPPLY MUST BE REGULATED AT 18 - 22 PSI.
2. INSTRUMENT USES 0.10 SCFM OF AIR UNDER NORMAL OPERATION.
3. AIR MUST BE CLEAN AND DRY. IF REGULATOR IS USED, CLEAN FREQUENTLY.
4. TRANSMISSION LINE MUST BE FREE OF LEAKS.

INDIAN POINT NO. 2
CONSOLIDATED EDISON CO. OF N.Y. INC.
NOTED
H. W. DIERMAN
CHIEF MECHANICAL ENGINEER
FLOW TRANS-MITTER
REQ. NO. - 7D6-411
MM - 170965
ENG. J. G.

30B423
F.P. 9321-7230

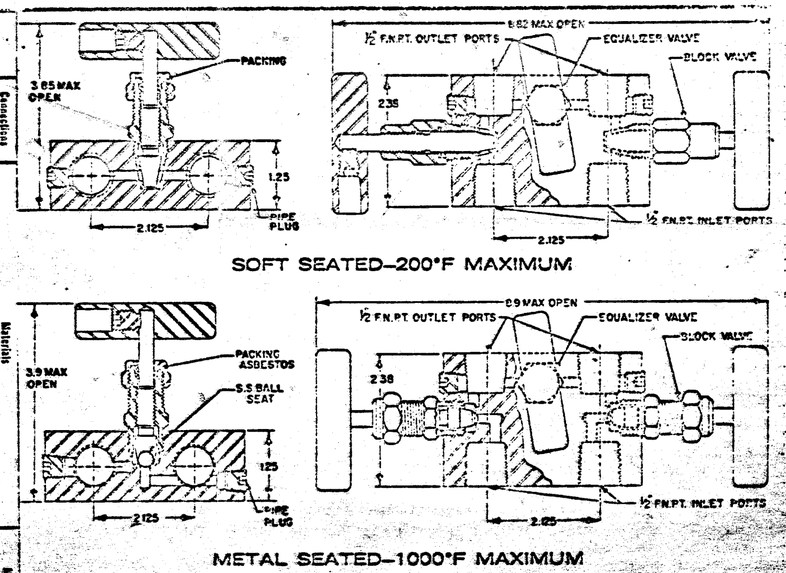
						REVISION	

INSTALLATION DRAWING FOR DIFFERENTIAL PRESSURE TRANSMITTER MODEL GE60BMA.

THE BRISTOL COMPANY
WATERBURY CONN. U.S.A.

DRAWN B.F.H. 8-16-66
TRACED
APPROVED
SCALE
SHEET 122
NO 018116

Docket # 50-247
Control # 7912270232
Date 12-14-79 of Document
MANDATORY DOCKET FILE



36B510 F.P. 9321-7230

Overall Dimensions
Anderson, Greenwood Manifolds
Type M1

DRAWN AGC 1/5/67

THE BRISTOL COMPANY

Scale None

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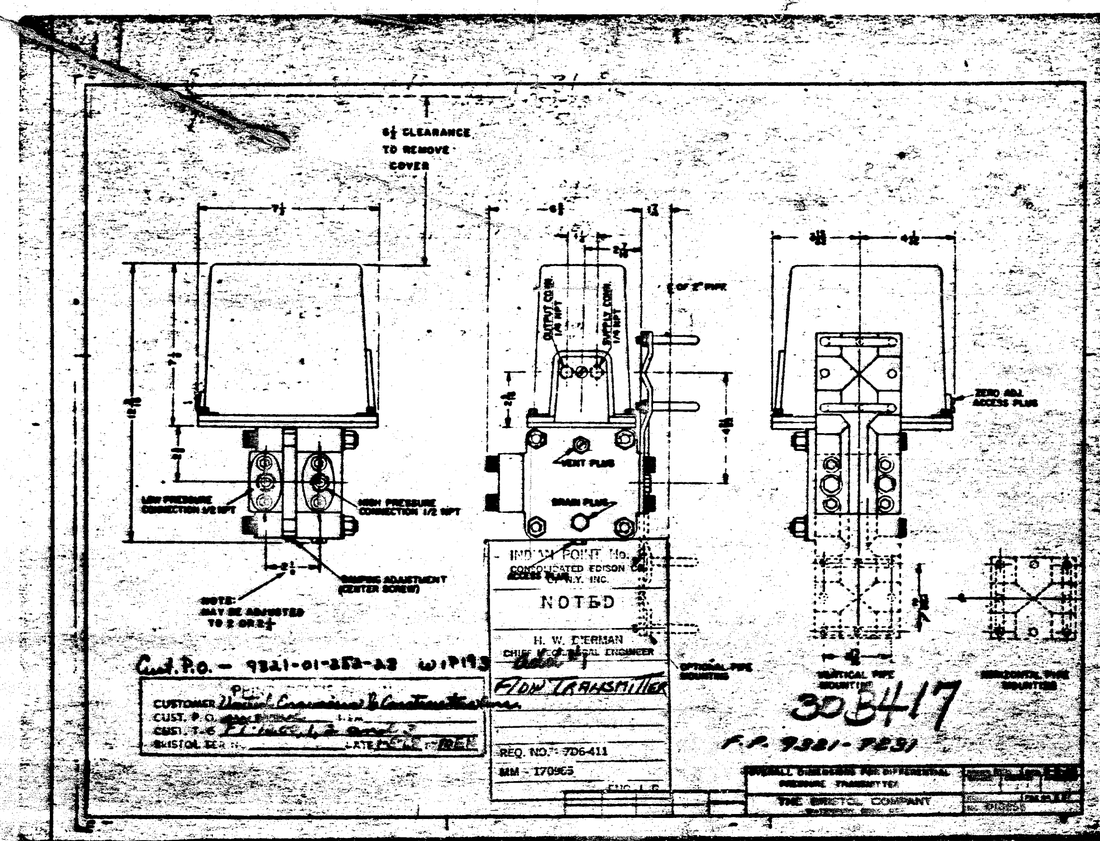
REGULATORY DOCKET FILE



Docket # 50-247
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ATTACHMENT C

LIST OF AUXILIARY FEEDWATER FLOW INDICATION SYSTEM SPECIFICATIONS

1. ACCO, Bristol Division

   Product Data Sheet No. A113.5-2.
   "Pneumatic Differential Pressure Transmitters".

2. United Engineers & Constructors, Inc.

   Specification No. 9321-01-252-23.
   "Specification For Flow Transmitters"

3. United Engineers & Constructors, Inc.

   Specification No. 9321-01-252-11.
   "Specification for Indicators-Panel Mounted".

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   Specification No. 9321-01-252-11. "Specification for Indicators-Panel Mounted".

Auxiliary Boiler Feed Flow Indicators

REV. 3

PNEUMATIC DIFFERENTIAL PRESSURE TRANSMITTERS

FORCE-BALANCE TYPE

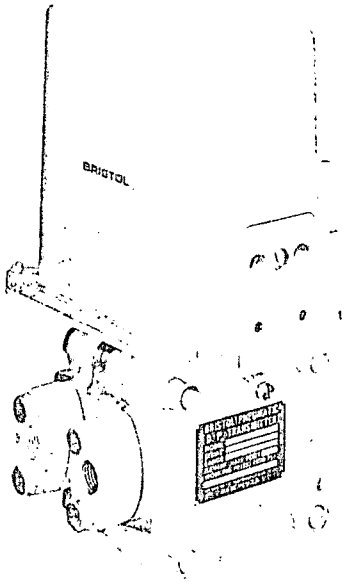

Figure 1. (Photo 6674) Process Connection Adaptor Blocks may be Mounted on Either End of Transmitter Body.

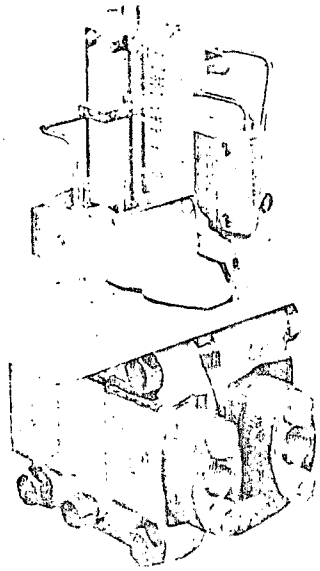

Figure 2. (Photo 6675) Model GE608MA with the Cover Removed. All Adjustments are Readily Accessible.

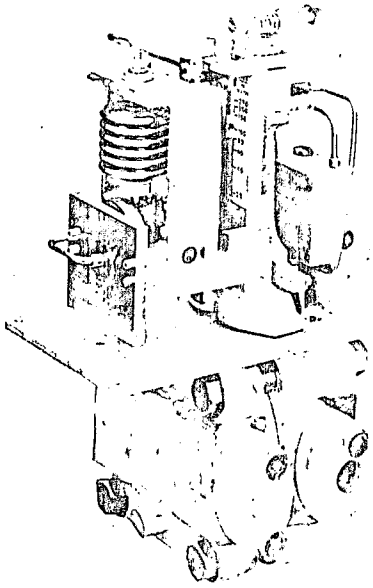

Figure 3. (Photo 6671) Model GE608M2A with the Square Root Extractor. Zero Adjustment at the Top.

FOR FLOW AND LIQUID LEVEL. Bristol Model GE608 Transmitters measure differential pressure, and transmit the measurement as a proportional 3-15 psi air signal which may be used with any 3-15 psi, pneumatic receiver to indicate, record, or control the measured variable.

These are direct-acting transmitters, i.e., an increase in the measured variable causes an increase in output pressure.

Three models are offered with range spans adjustable between the limits shown.

G1E608MA	0-10 to 0-125 in.water.
GE608MA	0-20 to 0-250 in.water.
GE608M2A	0-20 to 0-250 in.water.

Models G1E608MA and GE608MA transmit a 3-15 psi air signal which is proportional to differential pressure. (See Tables No. 1 and No. 2.)

Model GE608M2A transmits a 3-15 psi air signal which is proportional to the square root of the differential, therefore linearly proportional to flow rate. (See Tables No. 3 and 4.)

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Liquid level measurements can be made in open or closed vessels through the use of a biasing attachment. See Figures 9 & 10.) A simple adjustment to the coil spring assembly will bias the measurement range in a positive direction or in a negative direction, depending upon how the attachment has been mounted on the transmitter.

OPERATION. (Refer to Figure 4.) An increase in differential pressure pivots the primary beam in a clockwise direction. Simultaneously, a flapper mounted on the beam is moved closer to the nozzle, increasing the back pressure to the pilot valve. Here the back pressure is amplified to a 3-15 psi output signal.

Pilot valve output pressure to the feedback bellows increases the force applied to the secondary beam. As a result, the secondary beam pivots counterclockwise until a position is reached where the feedback force on the secondary beam balances the differential pressure force on the primary beam. At this point, the output signal from the pilot valve is proportional to the differential pressure.

An important design feature is the mounting of the balancing beam structure directly on the high pressure housing, independent of the base plate. This eliminates any possible calibration shift due to distortion of the base plate or misalignment of the cover.

The differential range of the transmitter is changed by adjusting the fulcrum of the secondary beam. The fulcrum piece is locked to the stainless steel range adjustment screw by a nylon-tipped setscrew, eliminating the calibration shift which often occurs when locknuts are used on the range screw.

When the transmitter is calibrated at the factory, a range marker is locked on the secondary beam for the range specified. A graduated scale is fastened to the permanent upright support, and serves as an approximate indication of the range setting.

External Damping Adjustment. This is a screwdriver adjustment located at the bottom of the measuring element. The adjustment is accessible with no interference from the process connections or mounting bracket. The damping valve cannot be shut off completely, nor can it be opened beyond the sealed stop. The 90% response time can be increased from 1.2 seconds to a maximum of 6.0 seconds.

Pilot Valve Assembly. The pilot valve is conveniently accessible for routine servicing, and can be easily removed and replaced if necessary. Stainless steel mesh screens are provided in the air supply and outlet ports to exclude foreign matter from the valve interior. All air connections are sealed by means of "O" rings and finger-tight knurled jam nuts to insure positive leakproof connections.

GE608M2A Low Limit Cut-off Pilot. Transmitters equipped with a square root extractor are furnished with a special pilot valve which prevents the output signal from going below 3 psi at zero differential (zero to 20% flowrate) the output signal will be between 3 psi and 5.4 psi, but is not a reliable flowrate signal Above 4% differential, the output signal is within ±0.09 psi at any point.

The non-bleed design provides low air consumption (less than 0.15) scfm) and has high capacity (3 to 4 scfm) for fast response to changes in the measured variable. To minimize the effects of supply pressure changes, air to the nozzle is fed through a restriction in the output air chamber, rather than directly from the 20 psi air supply.

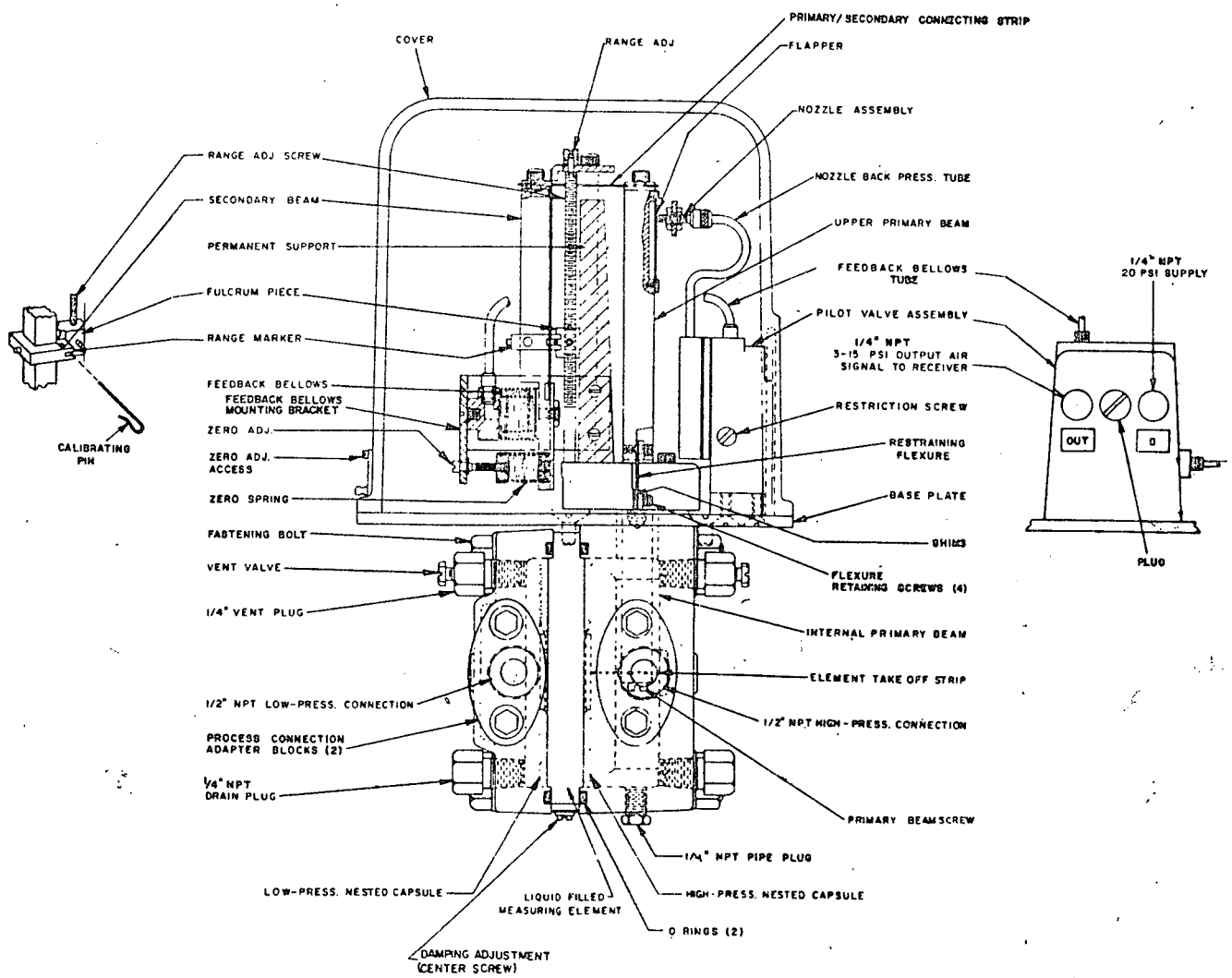

Figure 4. (Dwg. 022416) Construction Arrangement of the Model GE608MA & G1E608MA.

SQUARE ROOT EXTRACTOR. (Figures 3 & 5) The Model GE608M2A transmitter extracts the square root of the differential pressure, and produces a 3-15 psi output signal that is linearly proportional to the flow rate. The transmitter contains a feedback bellows which is continuously positioned so that the balancing force on the secondary beam is a square root function of the differential pressure.

A unique air-cushion bearing eliminates sliding friction in the feedback bellows carriage assembly. The unit is calibrated to produce a linear signal within ±3/4%, between 4% and 100% differential pressure input for ranges up to 100 inches H_2O, and within ±1% for higher ranges.

RANGE BIASING ATTACHMENT Z47. The transmitter may be obtained with this attachment for applications such as liquid level, bi-directional flow, reversed output signal, etc. where it is necessary to bias the range in a positive or a negative direction. Attachment Z47 consists of an adjustable coil spring assembly designed to mount at the top of the transmitter. See Figure 7. The assembly connects to the primary beam when positive bias is required, and to the secondary beam when negative bias is needed. Figure 6 shows the effects of bias on the output signal.

Attachment Z47P - Positive bias (elevated zero) 3 psi output signal at specified negative differential.

Attachment Z47N - Negative bias (suppressed zero) 3 psi output signal at specified positive differential.

Maximum bias is 250 inches water.

RANGE MARKER ATTACHMENT Z60. A positive preset range marker is furnished as a standard feature. The marker is factory-set for the exact range specified, but can be conveniently reset for a range change and locked in the new position. When specified, Model GE608M2A can be furnished with Attachment Z60 for any range between 50 and 250 inches of water.

For applications which require periodic range changes, several range markers can be furnished, factory-set for specific ranges. An alignment pin is used to accurately position the fulcrum for the ranges specified, without removal of the transmitter or need for calibrating equipment.

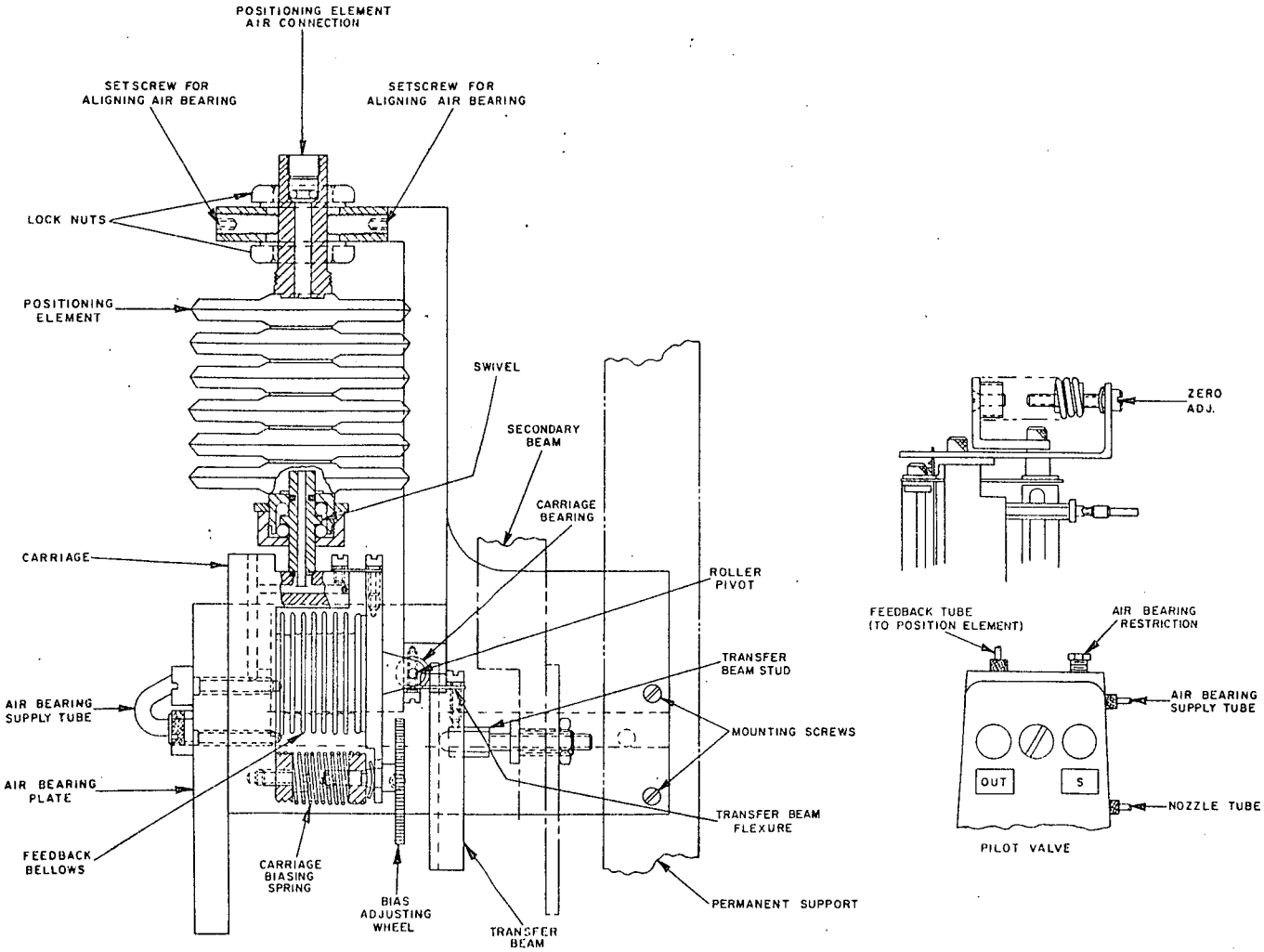

Figure 5. (Dwg. 022418) Detail Drawing of Square Root Extractor Model GE608M2A.

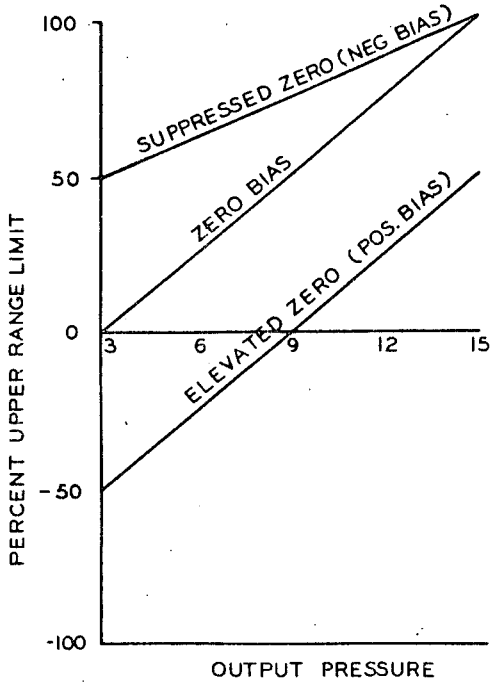

Figure 6. (S.P.D. 6808) Effects of Biasing.

For corrosion protection in alkaline or acid atmosphere applications, the aluminum cover can be furnished with a special epoxy finish. For such applications, specify Attachment Z66.

FLOW APPLICATIONS. When flow rate is to be measured, the Bristol differential pressure transmitter is connected across a primary device such as an orifice plate, flow nozzle, or Venturi tube. As the flow through the primary device increases, the differential pressure increases proportionally to the square of the flow rate. The pneumatic signal from the transmitter increases proportionally with the increase in differential pressure, and is therefore a squared function of flow rate. Figure 8 illustrates this point.

CALIBRATION DATA GE608MA (Po $\Delta \sim$ P)

INPUT	OUTPUT	
% Δ P	Po psi	% Q
zero	3.00	zero
10	4.20	31.62
20	5.40	44.72
30	6.60	54.77
40	7.80	63.25
50	9.00	70.71
60	10.20	77.46
70	11.40	83.67
80	12.60	89.44
90	13.80	94.87
100	15.00	100.00

Table No. 1

INPUT	OUTPUT	
% Δ P	Po psi	% Q
zero	3.00	zero
1.00	3.12	10.00
4.00	3.48	20.00
9.00	4.08	30.00
16.00	4.56	40.00
25.00	6.00	50.00
36.00	7.32	60.00
49.00	8.88	70.00
64.00	10.68	80.00
81.00	12.72	90.00
100.00	15.00	100.00

Table No. 2

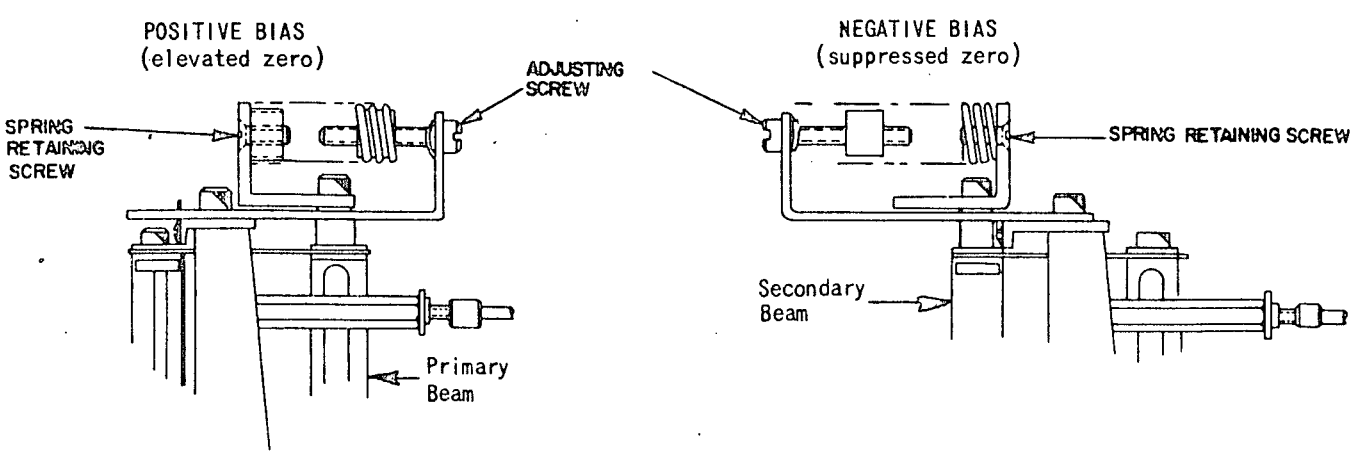

Figure 7. (Dwg. 022420) Biasing Attachment Z47.

Where the 3-15 psi output signal must be linearly proportional to the flow rate, the Model GE608M2A transmitter is used.

CALIBRATION DATA GE608M2A ($Po \sim \sqrt{\Delta P}$)

INPUT	OUTPUT	
% Δ P	Po psi	% Q
zero	3.00	zero
4	5.40	20.00
9	6.60	30.00
16	7.80	40.00
25	9.00	50.00
36	10.20	60.00
49	11.40	70.00
64	12.60	80.00
81	13.80	90.00
100	15.00	100.00

Table No. 3

INPUT	OUTPUT	
% Δ P	Po psi	% Q
zero	3.00	zero
4	5.40	20.00
10	6.79	31.62
20	8.37	44.72
30	9.54	54.77
40	10.59	63.25
50	11.49	70.71
60	12.30	77.46
70	13.04	83.67
80	13.73	89.44
90	14.38	94.87
100	15.00	100.00

Table No. 4

LIQUID-LEVEL APPLICATIONS. Figures 9 and 10 show typical methods for measuring liquid-level. In both instances, it is necessary to bias the range using Attachment Z47. The designations that apply to these illustrations are as follows:

H_x max.	= Upper Range Limit
H_x	= Measured Level
h_1	= High Pressure Leg
h_2	= Low Pressure Leg
G_x	= Specific Gravity Tank Liquid
G_1 & G_2	= Specific Gravity in h_1 & h_2

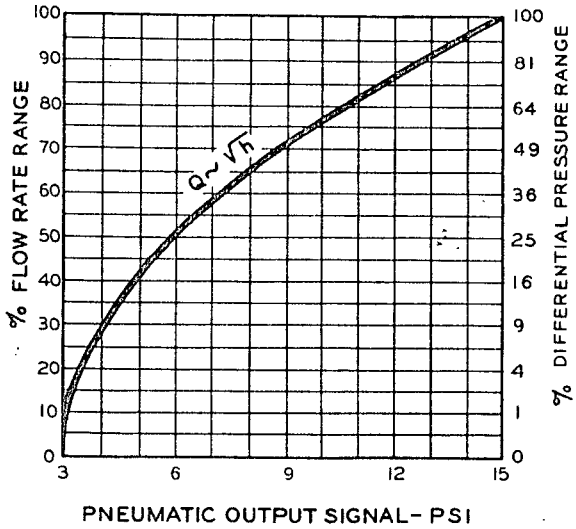

Figure 8. (S.P.D. 4791) Flow vs Pneumatic Output Signal.

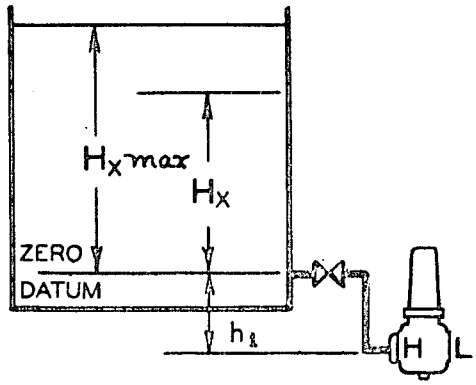

Figure 9. (S.P.D. 4786) Measuring Liquid Level in an Open Tank. Negative Bias Required.

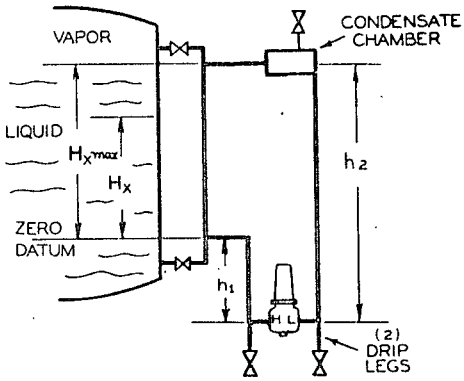

Figure 10. (S.P.D. 4788) Liquid Level Measurement in a Closed Tank. Positive Bias Required.

Figure 9 depicts an open tank application requiring a negative bias. The tank is connected to the high pressure side of the transmitter, and the bias spring is adjusted to balance the liquid head h_1.

Negative Bias = $h_1 G_1$

Range = H_x max. G_x

The effect of negative bias on the output signal is given in the following example. Referring to Figures 6 and 9, assume:

H_x = Tank level

h_1 = Transmitter position 5 feet (60 inches) below tank

h_B = Negative bias spring setting of 60 inches

With 60 inches of head on the high pressure side of the transmitter, the differential is zero, and the output signal is 3 psi.

$$\Delta P = H_x + (h_1 - h_B)$$

where $h_B = h_1$

$$\Delta P = H_x$$

Figure 10 illustrates a closed tank application which requires a positive bias attachment on the transmitter. The lower tank connection is made to the high pressure side of the transmitter, with the upper tank connection being made to the low pressure side of the transmitter. Outside leg h_2 is filled with tank liquid, and the spring assembly of the bias attachment is adjusted to balance the liquid head $h_2 - h_1$.

Positive Bias = $h_2G_2 - h_1G_1$

Range = H_x max. G_x

Output signal at zero level is 3 psi.
Output signal at H_x max. is 15 psi.

An example of reverse differential may be given as follows: (See Figure 6.)

Range = 100'' - 0 - 100'' H_2O

Measured Span = 200'' H_2O

50% Positive Bias = 100'' H_2O

when:

$\Delta P = 0$	Output Signal = 9 psi
$\Delta P = +100''$	Output Signal = 15 psi
$\Delta P = -100''$	Output Signal = 3 psi

SPECIFICATIONS

Differential Range
0-10'' to 0-125'' H_2O (continuously adjustable)
0-20'' to 0-250'' H_2O '' ''

Supply Air Pressure
20 psi, ±2 psi

Output Signal
3 - 15 psi

Supply and Output Pressure Connections
1/4'' NPT. Stainless steel filter screens provided.

Process Connections
1/2'' NPT (2-1/8'' centers). Stainless steel filter screens provided.

Vent and Drain
1/4'' NPT

Range Marker
Factory set. Also Attachment Z60.

Transmitter Body Materials
Carbon steel cadmium-plated, or type 316 SS

Measuring Element
Type 316 SS capsule

Filling Fluid
Silicone oil

Seals
Teflon, neoprene, or viton

Adjustable Damping
5:1 ratio, 1.2 to 6.0 sec. for 90% response.

Zero Adjustment
External

Process Pressure
1500 psi maximum

Process Temperature
-40°to +250°F

Ambient Temperature
-20°to +180°F

Over-Pressure Protection
1500 psi either side

Calibration Tolerance

Range span	GE608MA	±1/2%
	G1E608MA	±1%
	GE608M2A	±3/4%

Ambient Temperature Effect
1/2% of D.P. range for 50°change in ranges of 50'' and higher. 1% of D.P. range for 50°change in ranges below 50''.

Static Pressure Effect
1/2% of differential pressure range for 500 psi (zero shift)

Supply Pressure Effect
Less than 1/4% of range per psi

Volumetric Capacity
8.97 cu. in. ''Hi'' side
3.11 cu. in.''Lo'' side

Volumetric Displacement
0.11 cu. in for 250'' H_2O

Air Consumption
0.15 scfm

Air Capacity
3.0 scfm

Air Pilot Valve
Non-bleed

Zero Suppression (Negative Bias)
0-230'' adjustable.

SPECIFICATIONS (cont'd.)

Zero Elevation (Positive Bias)
Elevation + Range Span $\leq$ 250''

Overall Dimensions (See Figure 11)
12'' high x 7-1/2'' wide x 6-5/8'' deep

Net Weight
Approximately 27 pounds

ATTACHMENTS

Range Biasing
Attachment Z47P - Positive
Z47N - Negative

Range Marker (Multiple Ranges)
Attachment Z60

Stainless Steel Body Bolts
Attachment Z61

Epoxy Coated Cover
Attachment Z66

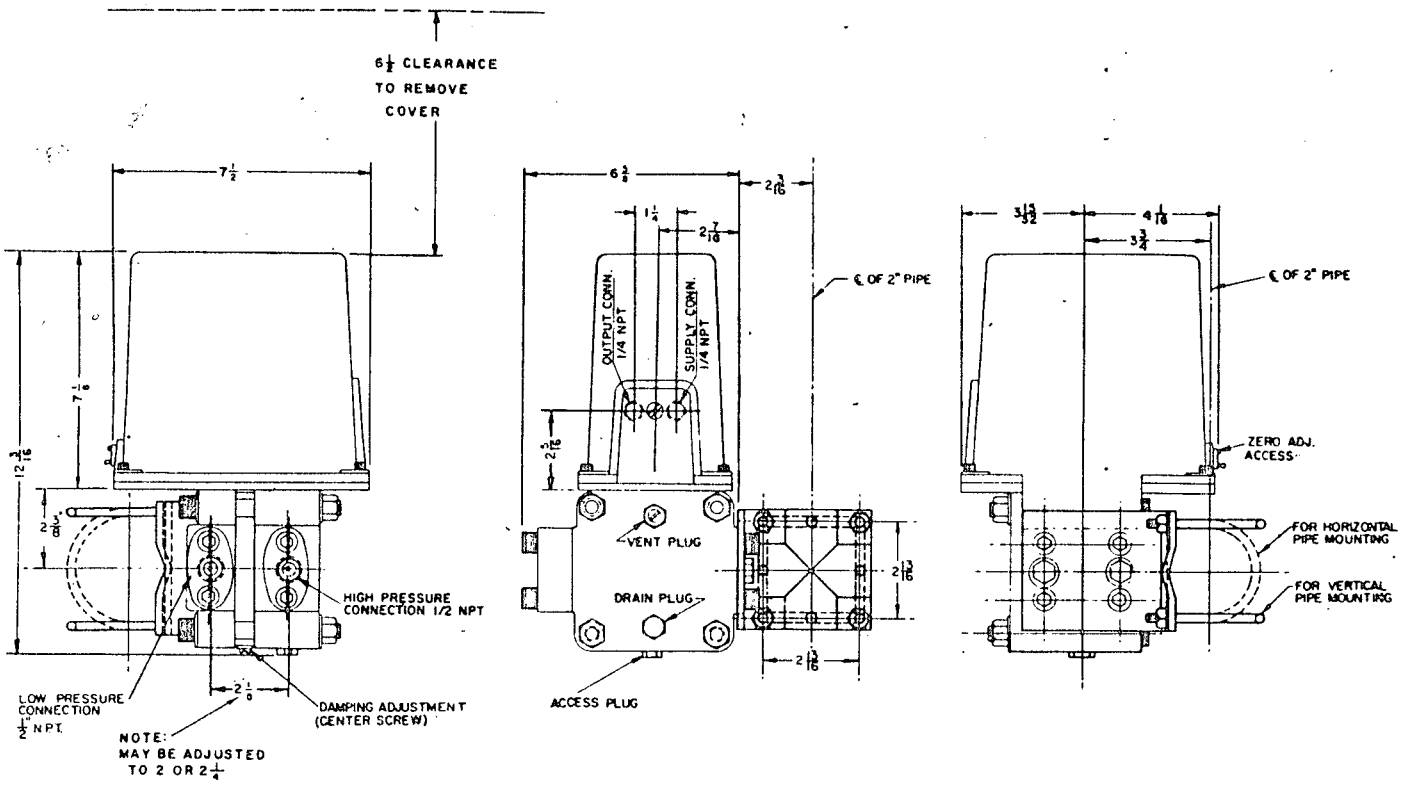

Figure 11. (Dwg. 010855) Overall Dimensions.