

ROUGH DRAFT

AUG 20 1984

DIGRAPH MATRIX ANALYSIS FOR SYSTEMS INTERACTIONS

AT INDIAN POINT UNIT 3

Volume 3 - Appendix B

DMA Digraphs and Reference Drawings

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Prepared for
U. S. Nuclear Regulatory Commission

August 1984

8603270515 860131
PDR ADOCK 05000286
P PDR

Date Received 8/31/27

SPECIAL HANDLING REQUIRED

By: (Circle one or more)

Coders

Availability of Mother = PDR

Availability of Daughter = PDR

Backfit: Yes No

Other: _____

Data Entry

Write Mother's accession number here _____

Expedite: Yes No

Other: _____

DDC

After filming, send aperture cards to PDR

return to Mary Lou Lewis

Change availability to PDR: Yes No

Other: _____

Micrographics

After filming, return to Joyce Foster *Mary Lou Lewis*

Availability of Mother = PDR

Availability of Daughters = PDR

Oversize enclosure Yes No

Availability = PDR

Other: _____

Return to Joyce Foster by _____ ASAP

Control # 0327-01

If there are any questions, contact: JOYCE

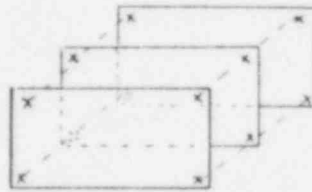
APPENDIX B
DMA DIGRAPHS AND REFERENCE DRAWINGS

FOREWORD

In general, the digraphs in this appendix fall into one of two categories:

- 1) traced directly from P&ID's or
- 2) drawn from a group of drawings and/or system descriptions.

In the case of traced drawings, the P&ID used is included here for visual reference. Three drawings will be grouped together in a plastic insert and when unfolded, will lay out as follows:



The X's on the drawings should be lined up for viewing. In order to view the main hardware alone, the Location Overlay is removed from the stack revealing a tracing from the P&ID. In a few instances, Location Overlays do not exist.

Case 2 yields all other drawings. Since they are not traced from the P&ID's, the P&ID's are not included. The drawing will stand on its own. Some of these drawings are actual hardware models, whereas others are failure criterion representations.

The failure criterion drawings are constructed utilizing written documentation. The analyst uses this material to create these digraphs which represent the number of physical items necessary for a particular situation.

Drawings titled, "Unit Models" (UM's) may refer to more than one plant item. In this case, some symbol should be replaced with the plant item number. This information is given on the drawing.

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B.1 Safety Injection System Drawings

B.1.1 Safety Injection and Recirculation System, Sheet No. 1

- A. Safety Injection and Recirculation System, Sheet No. 1
- B. P&ID, Flow Diagram, Safety Injection System, Sheet No. 1, U.E.&C. Drawing No. 9321-F-27353-14
- C. Location Overlay, Safety Injection and Recirculation, Sheet No. 1

B.1.2 Safety Injection and Recirculation System, Sheet No. 2

- A. Safety Injection and Recirculation System, Sheet No. 2
- B. P&ID, Flow Diagram, Safety Injection System, Sheet No. 2, U.E.&C. Drawing No. 9321-F-27503-11
- C. Location Overlay, Safety Injection and Recirculation, Sheet No. 2

B.1.3 Phase and Pump Interconnection with Pump Criteria
(Multi-Phase)

B.1.4 UM: Motor Operated Valves

- A. MOV856C,E,H,J
- B. Westinghouse #500B971 Wiring Diagram, Sheet 155
- C. MOV1835A,B, and MOV1852A,B
- D. Westinghouse #500B971 Wiring Diagram, Sheet 129
- E. MOV888A,B
- F. Westinghouse #500B971 Wiring Diagram, Sheet 127
- G. MOV856B,G
- H. Westinghouse #500B971 Wiring Diagram, Sheet 128
- I. General Valve

B.1.5 UM: Pumps

- A. SIP31,33
- B. Westinghouse #500B971 Wiring Diagram, Sheet 28
- C. SIP 32
- D. Westinghouse #500B971 Wiring Diagram, Sheet 29
- E. RHRP31,32
- F. Westinghouse #500B971 Wiring Diagram, Sheet 31
- G. RECP31
- H. Westinghouse #500B971 Wiring Diagram, Sheet 24
- I. RECP32
- J. Westinghouse #500B971 Wiring Diagram, Sheet 36

B.2 Safety Injection Actuation Drawings

B.2.1 Low Pressurizer Pressure Trip Logic

- A. Low Pressurizer Pressure Trip Logic
- B. P&ID, Flow Diagram, P.A.S.N.Y. 5651D72, Rev. 2, Sheet No. 9, Logic Diagrams, Pressurizer Trip Signals

B.2.2 Steam Generator Trip Logic

- A. Steam Generator Trip Logic
- B. P&ID, Flow Diagram, P.A.S.N.Y. 5651D72, Rev. 3, Sheet No. 10, Logic Diagrams, Steam Generator Trip Signals

B.2.3 Logic Gate Unit Model

B.2.4 High-High Containment Pressure Trip Logic

- A. High-High Containment Pressure Trip Logic
- B. P&ID, Flow Diagram, P.A.S.N.Y. 5651D72, Rev. 6, Sheet 12, Logic Diagrams, Safeguards Actuation

B.2.5 High Containment Pressure and Manual Trip Logic

- A. High Containment Pressure and Manual Trip Logic
- B. P&ID, Flow Diagram, P.A.S.N.Y. 5651D72a, Rev. 0, Sheet No. 12a, Logic Diagrams, Safeguards Actuation

B.2.6 Safety Injection Actuation Train A

B.2.7 Safety Injection Actuation Train B

B.2.8 Typical Connection to Safety Injection Equipment

B.3 Main Feedwater System Drawings

- B.3.1 Condensate and Main Feed Pump Suction
 - A. Condensate and Main Feed Pump Suction
 - B. P&ID, Flow Diagram, U.E.&C. 9321-F-22703, Rev. 3, Condensate and Main Feed Pump Suction

- B.3.2 Main Feedwater
 - A. Main Feedwater
 - B. P&ID, Flow Diagram, U.E.&C. 9321-F-20193, Rev. 19, Boiler Feedwater

- B.3.3 Heater Drains Tank and Pump
 - A. Heater Drains Tank and Pump
 - B. P&ID, Flow Diagram, U.E.&C. 9321-F-20223, Rev. 7, Heater Drains and Vents

- B.3.4 UM: Main Feed Pump Turbine Control Oil System
 - A. Main Feed Pump Turbine Control Oil System
 - B. Pg. 21-9, System Description 21, Feedwater

- B.3.5 UM: Main Feed Pump Turbine Trip and Reset
 - A. Main Feed Pump Turbine Trip and Reset
 - B. U.E.&C. 9321-LL-31403, Sheet 7

- B.3.6 UM: Governor Valve Positioner
 - A. Governor Valve Positioner
 - B. U.E.&C. 9321-LL-31403, Sheet 8

- B.3.7 UM: Turbine Low Pressure Stop Valve Controller
 - A. Turbine Low Pressure Valve Controller
 - B. U.E.&C. 9321-LL-31403, Sheet 9

B.3.8 UM: Turbine High Pressure Stop Valve Controller

A. Turbine Low Pressure Valve Controller

B. U.E.&C. 9321-LL-31403, Sheet 10

B.4 Auxiliary Feedwater System Drawings

B.4.1 Auxiliary Feed

- A. Auxiliary Feed
- B. P&ID, Flow Diagram, U.E.&C. 9321-F-20193,
Rev. 19, Boiler Feedwater

B.4.2 UM: AFW

- A. AFW Auto Start Circuit
- B. U.E.&C. 9321-LL-31183, Sheet 5, Schematic
Digraph, 480V Switchgear 32
- C. AFW Pump CB 52/AF1
- D. U.E.&C. 9321-LL-31183, Sheet 11, Schematic
Digraph, 480V Switchgear 32

B.5 Isolation and Actuation Logic

B.5.1 Main Feedwater Isolation

- A. Main Feedwater Isolation
- B. P&ID, Flow Diagram, P.A.S.N.Y. 5651072, Sheet 13,
Rev. 5, Logic Diagrams, Feedwater Isolation

B.5.2 Auxiliary Feedwater Actuation

- A. Auxiliary Feedwater Actuation
- B. P&ID, Flow Diagram, P.A.S.N.Y. 5651072,
Sheets 7,8,8a,8b (composite drawing)

B.6 Electrical AC and DC Power, DC Control

B.6.1 Master Flowchart for Electrical Digraphs

- A. Electrical Distribution and Transmission System
- B. Overlay, Electrical Distribution and Transmission System
- C. P&ID, Electrical Distribution and Transmission System, U.E.&C. Drawing No. 9321-F-33853-1

B.6.2 6.9KV Crosstie

- A. UM: Power Supplies to 6.9KV Buses 1,2,3, and 4
- B. UM: Power Supplies to 6.9KV Buses 5 and 6

B.6.3 6.9KV Breakers

- A. UM: Station Auxiliary Xfmr Output Breakers ST5 & ST6
- B. UM: Unit Auxiliary Xfmr Output Breakers UT1, UT2, UT3, UT4
- C. UM: 6.9KV Bus Tie Breakers UT1ST5, UT2ST5, UT3ST6, UT4ST6
- D. UM: Gas Turbine Feed Breakers GT5 and GT6

B.6.4 480V Crosstie

- A. Power Supplies from 6.9KV Buses and D G's to 480V Buses
- B. Appendix "F" Mods to 480V Electrical Distribution System

B.6.5 6.9KV and 480V Breakers

- A. UM: 6.9KV Feed Breaker to Station Service
Xfmrs SS5, 2, 3, 6, 312, 313
- B. UM: 480V Bus Normal Feed Breakers
(5, 2, 3, 6, 312, and 313)
- C. UM: Manual 480V Bus Crosstie Breakers 2AT5A,
3AT6A, 312, and T313
- D. Automatic 480V Crosstie Breaker 2AT3A
- E. UM: Diesel Generator Output Breakers EG3,
EG1, EG2

B.6.6 Diesel Generator Systems

- A. UM: Diesel Engine Starting Air System
- B. U.E.&C. 9321-H-20293, Rev. 4, P&ID, Flow
Diagram, Starting Air to Diesel Generators
- C. UM: Diesel Generator Support Systems
- D. UM: Diesel Engine Fuel Oil Transfer System
- E. UM: Diesel Generator Start Signal
- F. UM: Diesel Generator Exciter
- G. UM: Diesel Engine Cooling From Station Service Water

B.6.7 Relay Logic for 480V Equipment for S.I. or Bus Undervoltage

B.6.8 Motor Control Centers - Power Supplies from 480V Buses to
Motor Control Centers

B.6.9 MCC Feed Breakers - UM: Motor Control Center Feed Breakers

B.6.10 DC Systems

- A. Power Supplies from Motor Control Centers
to DC Trains 31 & 32
- B. UM: Power Supply from MCC to DC Trains (33,34)

B.6.11 118V AC System

- A. UM: Power Supplies to Instrument Buses 31, 32, and 33
- B. Power Supply to Instrument Bus 34

B.6.12 Electrical Component Locations

B.6.13 Break Model

- A. Power Feeds to 480V Buses from 6.9KV Buses and Diesel Generators
- B. 480V Crossties
- C. Station Service Transformer Feed Breaker - Failure to Trip
- D. 480V Bus Feed Breaker - Failure to Trip
- E. Diesel Generator Supply Breakers - Failure to Trip
- F. 480V Manual Crosstie Breakers - Failure to Trip
- G. Breaker 2AT3A - Failure to Trip
- H. DC Power Supply from 480V Bus to DC Power Panel
- I. DC Power Supply from Power Panel to Distribution Panels
- J. DC Crosstie

B.7 Reactor Coolant Pump Seals and CVCS

B.7.1 Reactor Coolant Pump LOCA (Failure Criterion)

- A. Reactor Coolant Pump LOCA, Sheet No. 1
- B. Flow Diagram, System Description No. 1, Fig. 10, Pg. 6

B.7.2 Loss in Seal Water Injection

- A. Loss in Seal Water Injection - PATHSWINJ
- B. P&ID, Flow Diagram, Con. Ed. Co. A202246, Rev. 16, Sheet 1, Chemical and Volume Control System

B.7.3 Flow Out The No. 1 Seal Bypass Line

- A. Flow Out of No. 1 Seal Bypass Line - PATH1BPNJ
- B. P&ID, Flow Diagram, Con. Ed. Co. A202246, Rev. 16, Sheet 1, Chemical and Volume Control System

B.7.4 Flow Out The No. 1 Seal Leakoff Line

- A. Flow Out of No. 1 Seal Leakoff Line - PATH1LONJ
- B. P&ID, Flow Diagram, Con. Ed. Co. A202246, Rev. 16, Sheet 1, Chemical and Volume Control System

B.7.5 Flow Out The Thermal Barrier Heat Exchanger Piping

- A. Flow Out of Thermal Barrier HXR Piping - PATHXRNJ
- B. P&ID, Flow Diagram, Con. Ed. Co. A202230, Sheets 1, Auxiliary Coolant System

B.7.6 Charging Pumps Unit Models

- A. Charging Pumps - Fails to Continue to Run
- B. P&ID, Flow Diagram, Westinghouse 500B971, Rev. 7, Sheets 26, 72, 73, Elementary Wiring Diagram - Charging Pumps 31, 32, 33
- C. Charging Pumps - Fails to Start
- D. P&ID, Flow Diagram, Westinghouse 500B971, Rev. 7, Sheets 26, 72, 73, Elementary Wiring Diagram - Charging Pump 31, 32, 33

B.8 Component Cooling Water System Drawings

B.8.1 Component Cooling System

- A. Component Cooling System, Sheet No. 1
- B. P&ID, Flow Diagram, Auxiliary Coolant System, Sheet No. 1, U.E.&C. 9321-F-27203-13

B.8.2 Component Cooling System

- A. Component Cooling System, Sheet No. 2
- B. P&ID, Flow Diagram, Auxiliary Coolant System, Sheet No. 1, U.E.&C 9321-F-27513-16
- C. Location Overlay, Component Cooling System Digraph

B.8.3 UM: Component Cooling Pump

- A. CCWP31
- B. Westinghouse #500B971 Wiring Diagram, Sheet 27
- C. CCWP32
- D. Westinghouse #500B971 Wiring Diagram, Sheet 45
- E. CCWP33
- F. Westinghouse #500B971 Wiring Diagram, Sheet 46
- G. CCBP31,32,33,34
- H. Westinghouse #500B971 Wiring Diagram, Sheet 51

B.8.4 UM: Motor Operated Valves

- A. MOV1835A,B, and MOV1852A,B
- B. Westinghouse #500B971 Wiring Diagram, Sheet 129

B.9 Service Water System Drawings

B.9.1 Service Water System

- A. Service Water System, Sheet No. 1
- B. P&ID, Flow Diagram, Service Water System,
(Nuclear Steam Supply) U.E.&C 9321-F-27223-21

B.9.2 Service Water System

- A. Service Water System, Sheet No. 2
- B. P&ID, Flow Diagram, Service and Cooling Water
(River Water and Fresh Water)
U.E.&C. 9321-F-20333-14

B.9.3 Failure Criterion for Service Water System

- A. Injection Mode
- B. Recirculation Mode
- C. Feedwater Mode

B.9.4 UM: Service Water Pump

- A. SWP31
- B. Westinghouse #500B971 Wiring Diagram, Sheet 33
- C. SWP32
- D. Westinghouse #500B971 Wiring Diagram, Sheet 42
- E. SWP33
- F. Westinghouse #500B971 Wiring Diagram, Sheet 44
- G. SWP34
- H. Westinghouse #500B971 Wiring Diagram, Sheet 76
- I. SWP35
- J. Westinghouse #500B971 Wiring Diagram, Sheet 34
- K. SWP36
- L. Westinghouse #500B971 Wiring Diagram, Sheet 89

- M. SWP37
- N. Westinghouse #500B971 Wiring Diagram, Sheet 205
- O. SWP38
- P. Westinghouse #500B971 Wiring Diagram, Sheet 206
- Q. SWP39
- R. Westinghouse #500B971 Wiring Diagram, Sheet 207

B.10 Pressure Operated Relief Valve Drawings

B.10.1 Primary Pressure Relief Paths

B.10.2 Switch to PORV Select Mode Unit Model

B.10.3 Pressurizer Pressure Instrumentation and Control

B.10.4 Channel Select Switch Unit Model

B.11 Instrument Air System Drawings

B.11.1 Instrument Air

- A. Instrument Air
- B. P&ID, Flow Diagram, Instrument Air, U.E.&C.
9321-F-20363-19
- C. Location Overlay, Instrument Air Digraph

B.11.2 Instrument Air

- A. Instrument Air Supply to Auxiliary Feedwater
- B. Systems Interaction Study, Flow Diagram,
Figure A-1

B.11.3 UM: Instrument Air Compressor 31 and 32

- A. Instrument Air Compressor 31 and 32
- B. U.E.&C. 9321-LL-31243-8, 480 V Motor
Control Center

B.12 Lube Oil System Drawings

B.12.1 Lube Oil

- A. Lube Oil
- B. P&ID, Flow Diagram, Lube Oil, U.E.&C. 9321-F-20373-8
- C. Location Overlay, Lube Oil Digraph

B.12.2 Boiler Feed Pump Oil Console

- A. Boiler Feed Pump Oil Console
- B. Assumed Configuration from Word Description

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