Georgia Power Company
Route 2, Box 299A
Waynesboro, Georgia 30830
Telephone 404 554-9961
404 724-8114

Southern Company Services, Inc.
Post Office Box 2625
Birmingham, Alabama 35202
Telephone 205 870-6011

Vogtle Project

August 5, 1985

Director of Nuclear Reactor Regulation
Attention: Ms. Elinor G. Adensam, Chief
Licensing Branch #4
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

File: X7BC35
Log: GN-674

NRC DOCKET NUMBERS 50-424 AND 50-425
CONSTRUCTION PERMIT NUMBERS CPPR-108 AND CPPR-1209
VOGTLE ELECTRIC GENERATING PLANT - UNITS 1 AND 2
SER CONFIRMATORY ITEM-15: TMI ITEM-II.F.2

Dear Mr. Denton:

The Inadequate Core Cooling (ICC) Monitoring System installed on Plant Vogtle is a subset of the Plant Safety Monitoring System (PSMS) that provides Regulatory Guide 1.97 Rev. 2 post accident monitoring instrumentation display consolidation. As discussed in the attached response to NUREG-0737, II.F.2, Instrumentation for Detection of Inadequate Core Cooling, the PSMS displays the post accident monitoring instrumentation on seismically qualified flat panel displays. The preliminary ICC monitoring displays are included in Attachment I of the attached response. These displays are characteristic of the latest generation Westinghouse designed ICC monitoring hardware, including the Reactor Vessel Level Instrumentation System (RVLIS), installed or planned to be installed at several NTOL's.

Please note that portions of this transmittal contains copyrighted material. By copy of this letter, Westinghouse will release the NRC from the copyright in order to make a microfilm copy necessary for their records. This is the extent of the copyright release. The non-copyrighted material has been previously published in Appendix 4A of the VEGP FSAR.

If your staff requires any additional information, please do not hesitate to contact me.

Sincerely,

J. A. Bailey

J. A. Bailey
Project Licensing Manager

B001
1/30

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Project Licensing Manager

B001
1/30

JAB/caa
Attachment
xc: D. O. Foster
R. A. Thomas
J. E. Joiner, Esquire
B. W. Churchill, Esquire
M. A. Miller
B. Jones, Esquire (W/o Att.)
L. T. Gucwa
G. Bockhold, Jr
T. Johnson (W/o Att.)
D. C. Teper (W/o Att.)
L. Fowler
W. C. Ramsey
Vogtle Project File

0053V

Response to NUREG-0737, II.F.2

"Instrumentation for Detection of Inadequate Core Cooling"

I. The Inadequate Core Cooling (ICC) Monitoring System installed at Plant Vogtle Project will include the following:

- Core exit thermocouple (T/C) monitoring
- Core subcooling margin monitoring
- Reactor vessel level monitoring

A detailed electrical and layout description of each of the above ICC monitoring subsystems is given below:

A. Core Exit Thermocouple System

The core exit thermocouple monitoring system consists of two redundant independent trains that monitor all 50 of the Plant Vogtle chromel-alumel core exit thermocouples (25 on protection set III and 25 on protection set IV). A layout sketch of the system is shown in Figure I. The core exit thermocouples are mounted at the top of core support plate. They are then routed to four upper head conoseal penetrations. After exiting the conoseal penetrations, the thermocouple wires proceed through a swaglok and then to qualified connectors to facilitate disconnection during removal of the upper head. Upon exiting the reactor vessel

cavity, the cables are routed in a manner consistent with the requirements of Regulatory Guide 1.75 to the in-containment qualified reference junction boxes. Each reference junction box includes three redundant platinum RTD's imbedded in a block of copper to reflect the temperature at the junction of the chromel alumel and copper wire. The uncompensated core exit thermocouple signals (25) and the reference junction box temperatures (3) are routed to Remote Processing Units (RPU) A3 and B3. The signals from both RPU's are routed to both Display Processing Units (DPU) for calculation of the compensated core exit thermocouple value. The value chosen for the reference junction box temperature is a function of the data quality of each of the RTD signals. Following the calculation of all 50 compensated thermocouple values, the information from both DPU's are transmitted to both seismically qualified flat panel Plant Safety Monitoring System (PSMS) displays. The displays are located on Section D of the Plant Vogtle control board as shown in the Vogtle FSAR, Figure 18.1-2. DPUA and display A are powered by train A and DPUB and display B are powered by train B. The cabling between the RPU's, DPU's and displays meet the requirements of Regulatory Guide 1.75.

B. Core Subcooling Margin Monitor

The inputs to the core subcooling margin monitor include the following:

- Wide range RCS pressure (4 channels)
- Core exit compensated thermocouple values (50 channels)
- Reference junction box RTD values (6 channels)

The electrical layout of the subcooling margin monitor is shown in Figure II. One channel of wide range RCS pressure is input into each RPU channel (A2, A3, B2, and B3). Also 25 uncompensated thermocouple channels and the corresponding 3 reference junction box RTD signals are input into RPU's A3 and B3. The outputs of each of the RPU's are routed to each DPU. The RCS subcooling margin is then calculated based upon the wide range RCS pressure and compensated core exit thermocouple readings. The value of RCS pressure utilized in the calculation is a function of the data quality of the pressure readings. The value of core exit thermocouple temperature is based upon the auctioneered high thermocouple quadrant average temperatures. The auctioneered high thermocouple quadrant average temperature is utilized in the calculation of the core subcooling margin for the quadrant average thermocouple temperature more accurately reflects the individual loop bulk temperature. Basing the core subcooling margin calculation on the highest thermocouple reading would not be indicative of the bulk loop temperatures. Use of the auctioneered high thermocouple quadrant average temperature in the calculation of core subcooling margin is consistent with the utilization in the WOG Emergency Response Guidelines (ERG). The WOG ERG's do not specify that core subcooling margin shall be based upon maximum core exit temperature. The WOG ERG's do specify that the core cooling status tree utilize the fifth hottest core exit thermocouple temperature in the implementation of the decision paths, however, core subcooling margin may be calculated using average core exit thermocouple temperatures. The subcooling

margin calculated values are routed to both displays (A and B). The cable routing from sensor input to display meet the requirements of Reg. Guide 1.75. The PSMS displays are the same display panels utilized in displaying the core exit thermocouple information.

C. Reactor Vessel Level Instrumentation System

The Reactor Vessel Water Level System (RVWL) consists of two redundant independent trains that monitor the water level in the reactor vessel.

The wide range RVLIS reading provides an indication of reactor vessel water level from the bottom of the vessel to the top of the vessel during natural circulation conditions. The narrow range RVLIS reading provides an indication of reactor vessel water level from the middle of the hot leg pipe to the top of the reactor vessel head during natural circulation conditions. The dynamic head RVLIS reading provides an indication of reactor core, internals and outlet nozzle pressure drop for any combination of operating reactor coolant pumps. Comparison of the measured pressure drop with the normal, single phase pressure drop provides an approximate indication of the relative void content of the circulating fluid. The inputs to the RVLIS system include the following:

1. Core exit uncompensated thermocouple values (50 channels)
2. Reference junction box RTD values (6 channels)
3. Wide range RCS pressure (4 channels)
4. Differential pressure (6 channels)
5. Reference leg temperature values (14 channels)
6. Reactor coolant pump status (4 channels)

A fluid diagram of one train of the Plant Vogtle RVLIS system is shown in Figure III for the inputs associated solely with the RVLIS system. The electrical block diagram associated with the RVLIS system is shown in Figure IV.

As discussed, the core exit thermocouple readings and reference junction box temperatures are input to RPU's A3 and B3. Also, one wide range RCS pressure channel is input into each RPU (A2, A3, B2, and B3).

In addition, one of two sets of three differential pressure signals (wide range, narrow range, and dynamic head) are input into RPU A3 and B3, respectively. Also seven reference leg compensating temperature inputs from each train of RVLIS are input into RPU's A3 and B3. Finally, to determine the appropriate RVLIS indication, the running status of each reactor coolant pump is input into the non-1E RPU N1.

Both trains of RVLIS readings are routed to both displays (A and B). The cable routing from sensor input to display meet the requirements of Reg. Guide 1.75. The PSMS displays are the same display panels utilized in displaying the core subcooling margin and the core exit thermocouple information.

II. Several analyses have been performed to verify the design of the RVLIS system described in Item I.C. The results of these are discussed in the following documents:

A. Summary Report, Westinghouse Reactor Vessel Level Instrumentation System for Monitoring Inadequate Core Cooling, December 1980 submitted to the NRC via T. M. Anderson to Darrell G. Eisenhut, NS-TMA-2358 dated December 23, 1980.

B. Responses to NRC Request for Additional Information on the Westinghouse RVLIS, Summary Report.

C. Supplemental Information on the Westinghouse RVLIS, submitted to the NRC via E. P. Rahe to L. E. Phillips, NS-EPR-2579 dated March 19, 1982.

In addition to the analyses conducted in the three references above, the hydraulic components of the RVLIS system were installed at the Semiscale Test Facility in Idaho so that transient response characteristics could be obtained during small-break LOCA and other accident conditions. A description of the tests conducted and a discussion of the test results are presented in the following documents:

D. Westinghouse Evaluation of RVLIS Performance at the Semiscale Test Facility, December 1981 submitted to the NRC via E. P. Rahe to L. E. Phillips, NS-EPR-2526 dated December 8, 1981.

E. Westinghouse Evaluation of RVLIS Performance at the Semiscale Test Facility for Test S-UT-8, January 1982 submitted to the NRC via E. P. Rahe to L. E. Phillips, NS-EPR-2542 dated January 13, 1982.

F. Westinghouse Evaluation of RVLIS performance at the Semiscale Test Facility for Test S-IB-7 submitted to the NRC via E. P. Rahe to L. E. Phillips, SED-SA-00081 dated June 28, 1982.

III. A description of the tests conducted on the Westinghouse RVLIS system and the results of the tests are presented in references (D), (E), and (F) listed above.

IV. Response to II.F.2, Attachment I, Design and Qualification Criteria for Pressurized Water Reactor Incore Thermocouples

A. Attachment I to this response, provides the preliminary design of the display package on the PSMS. The display package hierarchy, as summarized in Exhibit 1, includes the following:

1. Top Level Plant Status Summary (Exhibit C-2.0)

2. Four Lower Level Graphic Displays

   a. Core Temperature Map (Exhibit C.3-1)

   b. Pressure-Temperature Operating Limits (Exhibit C-400)

   c. Reactor Vessel Water Level (Exhibit C-5.0)

   d. Nuclear Power (Exhibit C-6.0)

3. Four Pages of Menu Display

   a. Primary Data Trend Menu

   b. Secondary Data Trend Menu

   c. Containment Data Trend Menu

   d. Detailed Data Menu

4. Four Multi-Page Sets of Data

   a. Six Page Set of Primary Data Trends

   b. Five Page Set of Secondary Data Trends

c. Two Page Set of Containment Data Trends

d. Eight Page Set of Detailed Data

B. The following exhibits provide a top down display of the core exit thermocouple information.

1. a. Exhibit C-2.0 - maximum core exit thermocouple temperature.

b. Exhibit C-3.1 - quadrant core exit thermocouple maximum, average and minimum temperature. Also provides a comparison between the RCS hot leg RTD's and the quadrant T/C data.

c. Exhibit C-10.6A - spatially oriented core exit thermocouple map showing each thermocouple temperature.

d. Exhibit C-10.4 and C-10.5 - Alpha numeric listing of core exit thermocouple location, tag designation and temperature reading per quadrant.

e. Exhibit C-7.3A - a two hour trend history of the three core exit thermocouple quadrant maximum temperatures.

C. The following exhibits provide a top down display of the core subcooling margin (based upon core exit thermocouples):

1. a. Exhibit C-2.0 - core subcooling margin based upon core exit thermocouples.

b. Exhibit C-4.0 - RCS pressure - temperature plot exhibiting plant approach to saturation.

c. Exhibit C-10.1 - alpha numeric listing of both trains of core subcooling margin.

d. Exhibit C-7.1 - a two hour trend history of the core subcooling margin.

D. The following exhibits provide a top down display of the RVLIS system.

1. a. Exhibit C-2.0 - displays appropriate RVLIS narrow and wide range and dynamic head readings depending upon RCP status.

b. Exhibit C-5.0 - mimic of analog meters indicating RVLIS narrow, wide and dynamic readings with respect to reactor vessel. Only displays appropriate ranges based upon RCP status.

c. Exhibit C-10.2 and C-10.3 - alpha numeric listing of appropriate ranges for both trains of RVLIS system.

d. Exhibit C-7.6 - a two hour trend history of all three RVLIS ranges. Also presents a trend of RCP status.

E. Trend Capability - In addition to being displayed on the PSMS, the RVLIS readings are recorded on the main control board. Furthermore, the core subcooling margin, core exit thermocouple temperature and the RVLIS indications are trended on the Vogtle Safety Parameter Display System.

F. Alarm Capability - The core exit thermocouple display pages are designed such that any numeric thermocouple readout greater than 1200°F will be displayed in inverse video and flashed at a frequency of 1 hertz.

The core subcooling margin will indicate "SUBCOOL" when the auctioneered high quadrant thermocouple average temperature is at or below the RCS coolant saturation point. "SUBCOOL" and the respective numeric value in degrees F will be displayed in inverse video when the subcooling margin is less than a specified value. "SUPERHEAT" and the respective numeric value in degrees F will be displayed in inverse video and flashed at a frequency of 1 hertz when the auctioneered high quadrant thermocouple average temperature exceeds the coolant saturation temperature.

G. Backup Display - Since the Plant Vogtle PSMS display system features two redundant independent displays, one display console is considered the primary display and the other display console is considered the backup display. As such, the backup display console for ICC monitoring is also a qualified display.

H. Location - The PSMS displays are located on Section D of the Plant Vogtle control board as shown in Figure 18.1-2 of the FSAR.

Insert addition to IV.H

V. Response to II.F.2, Appendix B, Design and Qualification Criteria for Accident Monitoring Instrumentation

A. Equipment Qualification

1. Core Exit Thermocouple Monitoring

Listed below are the appropriate documents indicating the qualification tests conducted on the PSMS subsystems.

Subsystem	Document
a. T/C Connectors and Adaptors	ESE-43B,C
b. Reference Junction Box	ESE-44A
c. Microprocessors	ESE-53
d. Plasma Display	ESE-61B

Insert IV.H

The Plant Vogtle control room design review (CRDR) includes a task analysis, based on the Westinghouse owner group (WOG) Emergency Response Guidelines (ERGs). This analysis will include a review of needed instrumentation and required instrument characteristics to support the operator tasks in the Emergency Operating Procedures (EOPs). The ICCI parameters in the WOG ERG's are incorporated in Vogtle specific EOP's and the use of these procedures is included in the operator training program. The priority of critical safety functions in the WOG ERG's are incorporated in the Vogtle EOP's and associated alarms.

2. Core Subcooling Margin Monitoring

	Subsystem	Document
a.	Wide Range RCS Pressure	ESE-2
b.	Core Exit Thermocouples	See Item Above
c.	Microprocessors	ESE-53
d.	Plasma Display	ESE-61B

3. RVLIS Monitoring System

	Subsystem	Document
a.	Wide Range RCS Pressure	ESE-1A
b.	Differential Pressure	ESE-4
c.	Core Exit Thermocouples	See Item Above
d.	High Volume Pressure Sensor	ESE-48
e.	Hydraulic Isolator	ESE-49
f.	Reference Leg RTD's	ESE-42

g. Microprocessors ESE-53

h. Plasma Display ESE-61B

B. Single Failure Criteria

A detailed discussion of the Reg. Guide 1.97 Post Accident Monitoring Design Basis is presented in Section 7.5 of the Plant Vogtle FSAR. Included in the discussion is a justification for the number of channels selected and the diverse variable identified where necessary. Presented in the Vogtle FSAR, Section 7.5, Table 7.5.2-1 is a detailed description of the characteristics associated with each ICC monitoring system, including range, number of channels, and qualification status.

C. Power Supply - RPU's A1 and A2, DPUA and Display A are powered by inverter power bus I. RPU's B1 and B2, DPUB and display B are powered by inverter power bus II. RPU A3 is powered by inverter power bus III and RPU B3 is powered by inverter power bus IV.

A sketch of signal flows between the protection channels, RPU's, DPU's, and displays is shown in Figure V.

D. Channel Availability and Indication

The operator has access to all ICCI channels at all times pre- and post-accident on several QDPS displays. These include the Exhibit

C-2.0 display, and the detailed data display of Exhibits C-10.1, C-10.2, C-10.3, C-10.4, C-10.5, and C-10.6A. The recording capability of the ICCI channels is indicated in the Plant Vogtle FSAR Table 7.5.2-1.

E. Quality Assurance

All hardware associated with the Plant Vogtle PSMS ICCI monitoring systems meets the applicable portions of the quality assurance regulatory guides.

F. Capability for Sensor Checks

The Plant Vogtle PSMS provides the means for cross checking between channels that bear a known relationship to each other. In addition, the subsystem displays only project a group value based upon a data quality algorithm. Quality codes that may be displayed include GOOD, POOR, BAD and SUSPECT. The operator may access the lower level detailed data lists to determine the reason for other than GOOD data quality group values.

G. Capability for Test and Calibration

See Plant Vogtle FSAR, Section 7.5.2.3.1.3D.

H. Channel Removal from Operation

See Plant Vogtle FSAR, Section 7.5.2.3.1.3E.

I. Access to Setpoints Adjustments, Calibration and Test Points

See Plant Vogtle FSAR, Section 7.5.2.3.1.3F.

J. Information Readout

See Plant Vogtle FSAR, Section 7.5.2.3.1.3G.

K. System Repair

See Plant Vogtle FSAR, Section 7.5.2.3.1.3H.

L. Derivation of System Inputs

See Plant Vogtle FSAR, Section 7.5.2.3.1.3I.

M. Instrumentation Utilization

To the extent practical, the Plant Vogtle PSMS display has been designed and located in such a manner that the operator uses the ICCI displays during both normal operation and post accident situations.

N. Periodic Testing

See Plant Vogtle FSAR, Section 7.5.2.3.1.3J.

VI. Schedule

The Plant Vogtle ICCI monitoring system is to be installed, tested and calibrated prior to fuel load.

VII. Plant Vogtle is adopting the format and content of the Westinghouse Owners Group (WOG) Emergency Response Guidelines for writing the plant specific procedures. Attachment II illustrates the generic WOG Critical Safety Function Status Tree for monitoring the status of plant core cooling. As seen, all variables necessary to implement the core cooling status tree are provided by the Plant Vogtle ICC instrumentation system. The Functional Restoration Guideline, to which the operator is directed based upon the logic dictated by the tree, also utilizes the information provided by the ICC instrumentation. Attachment III provides a listing of the generic WOG guideline FR-C.1 "Response to Inadequate Core Cooling." Note the use of core exit thermocouple temperature in steps 5, 7, 16, and 18. Also note that the RVLIS indication is utilized in steps 6, 16, and 23. A review of Plant Vogtle procedures FR-C.2, "Response to Degraded Core Cooling," and FR-C.3, "Response to Saturated Core Cooling," also demonstrates the extensive use of ICC instrumentation readings.

Attachment IV provides a listing of the generic WOG guideline E-0, "Reactor Trip or Safety Injection". Note the use of core exit thermocouple temperature for calculating RCS subcooling margin in step 25. Similar subcooling margins are utilized throughout the generic guidelines.

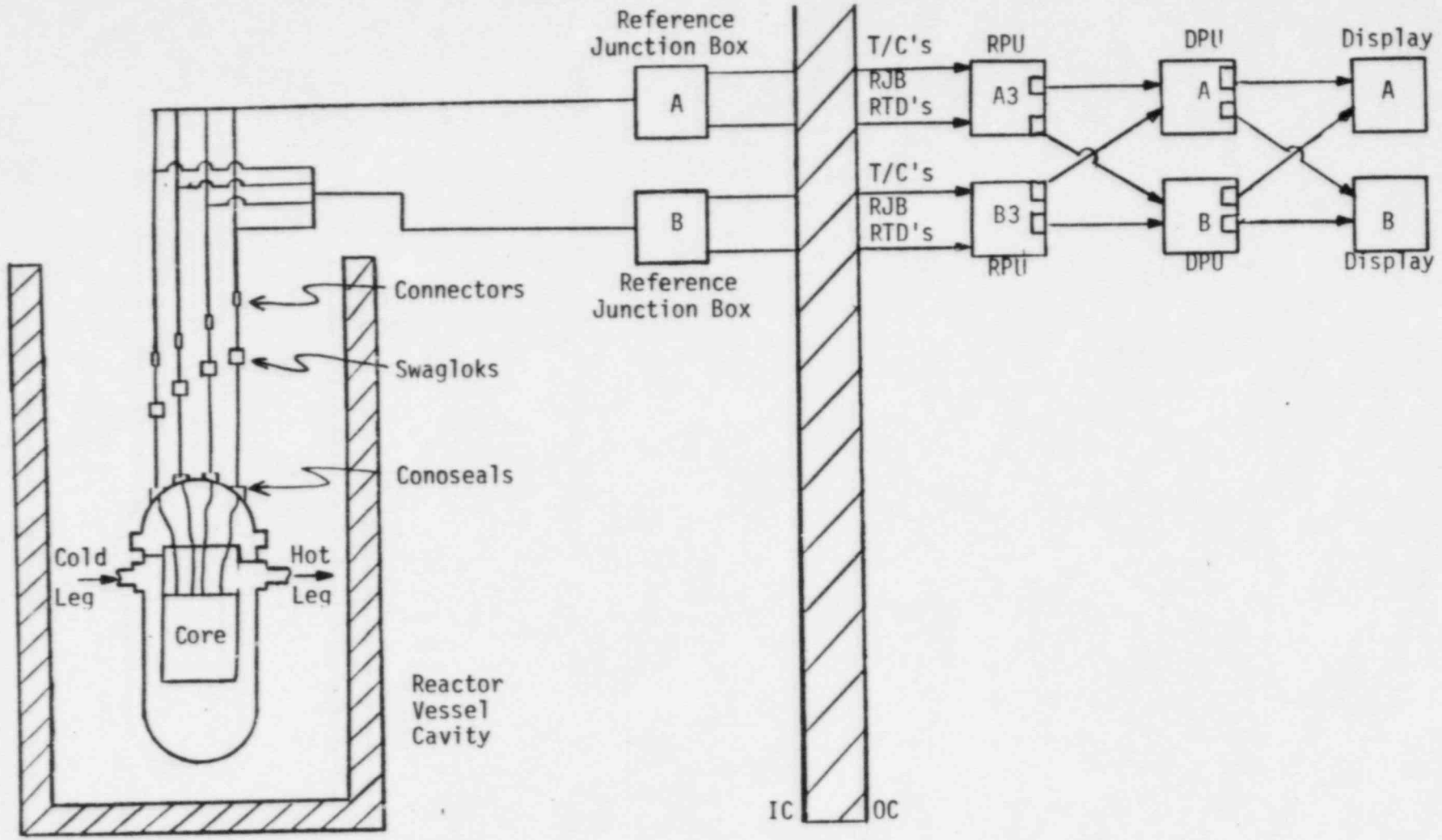


Figure I. Core Exit Thermocouple System

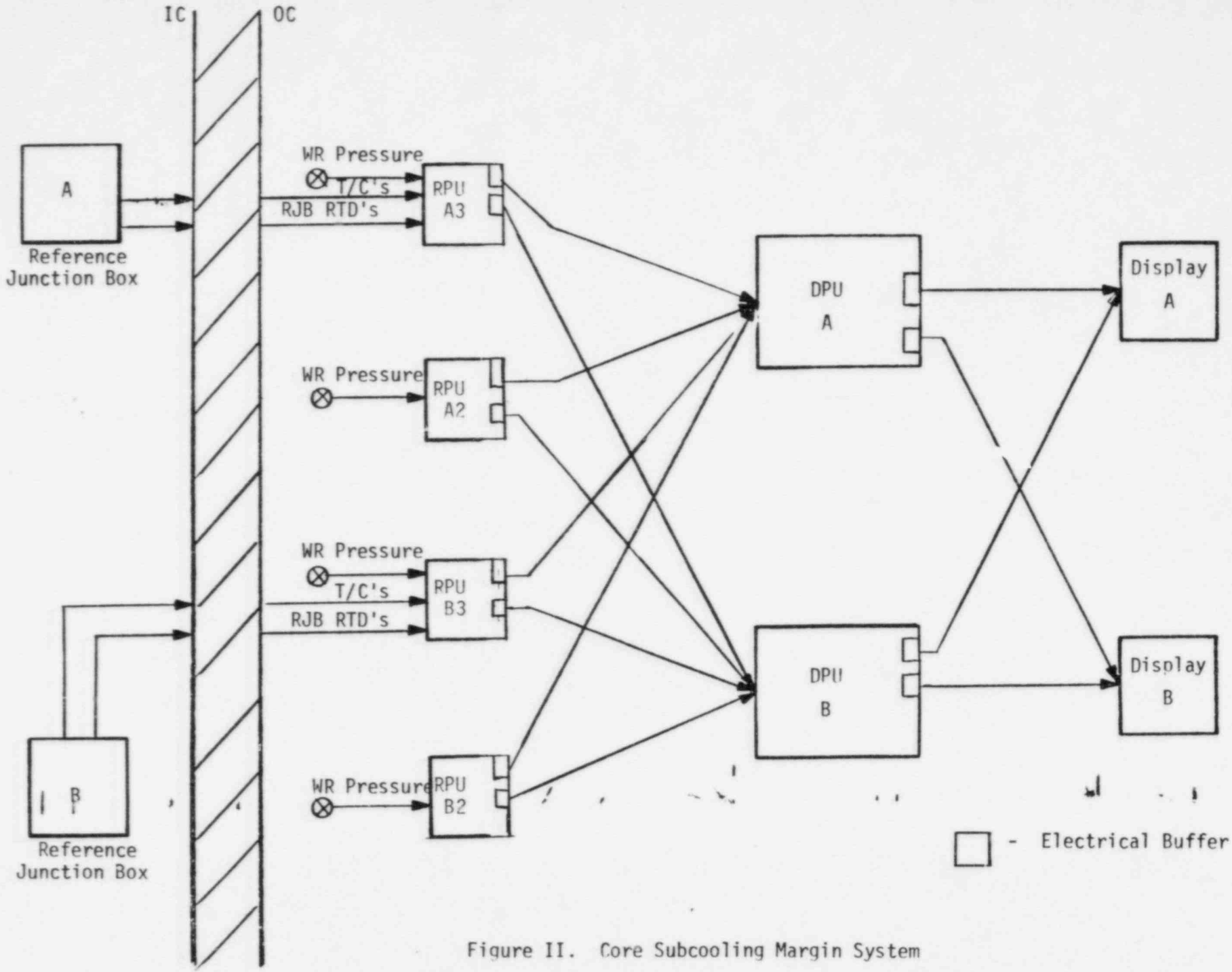


Figure II. Core Subcooling Margin System

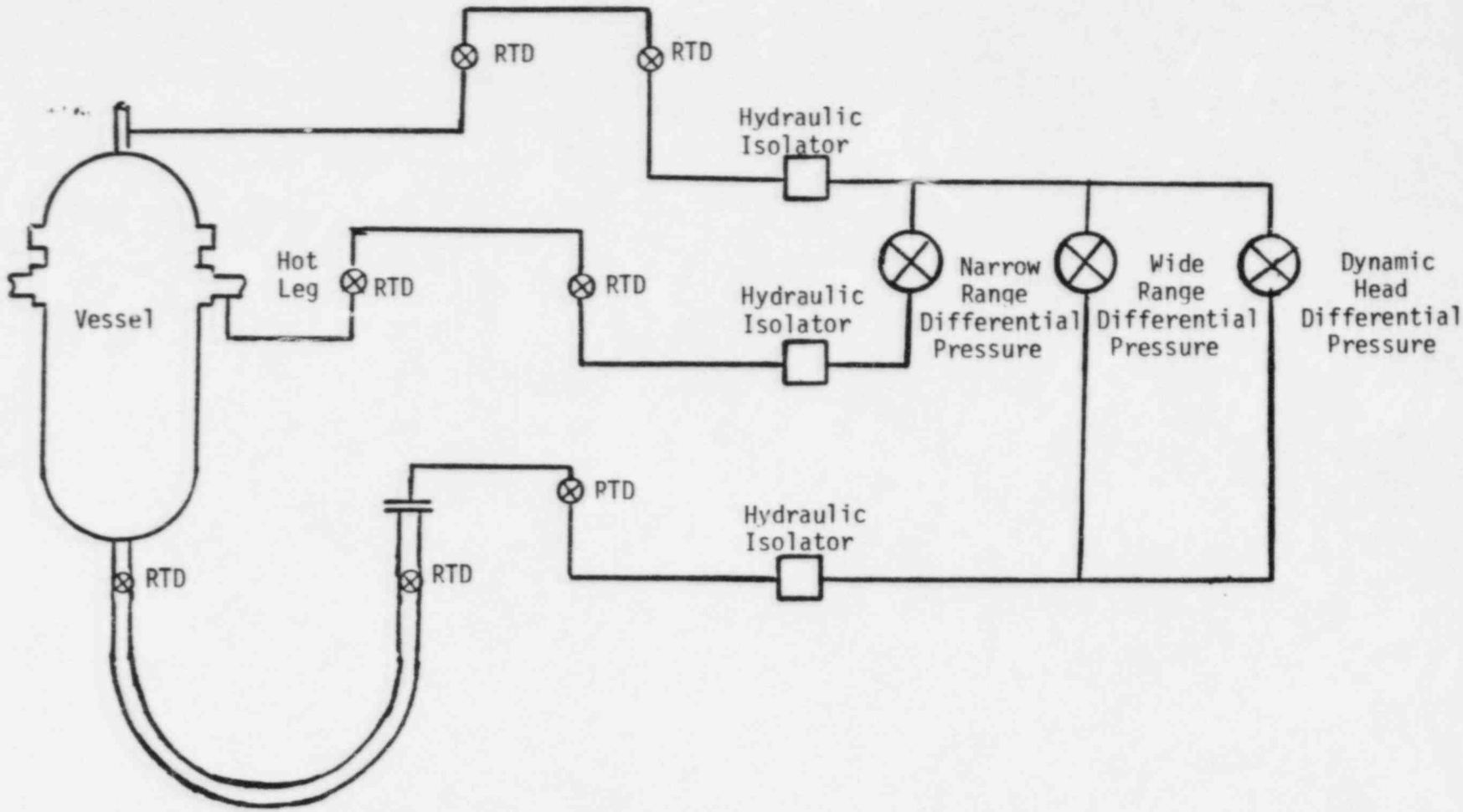


Figure III. Reactor Vessel Level Instrumentation Fluid Layout Drawing

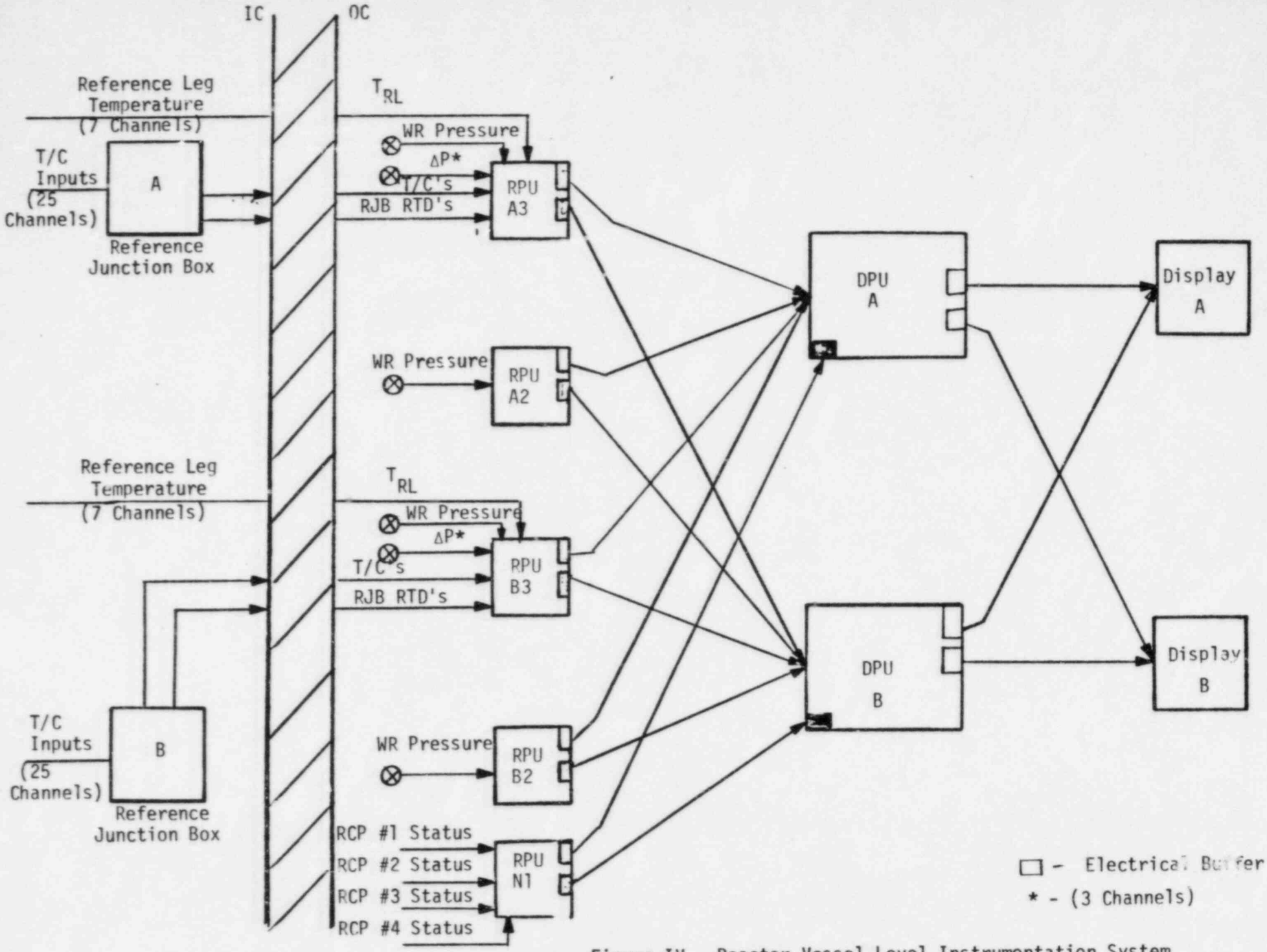


Figure IV. Reactor Vessel Level Instrumentation System

PRELIMINARY

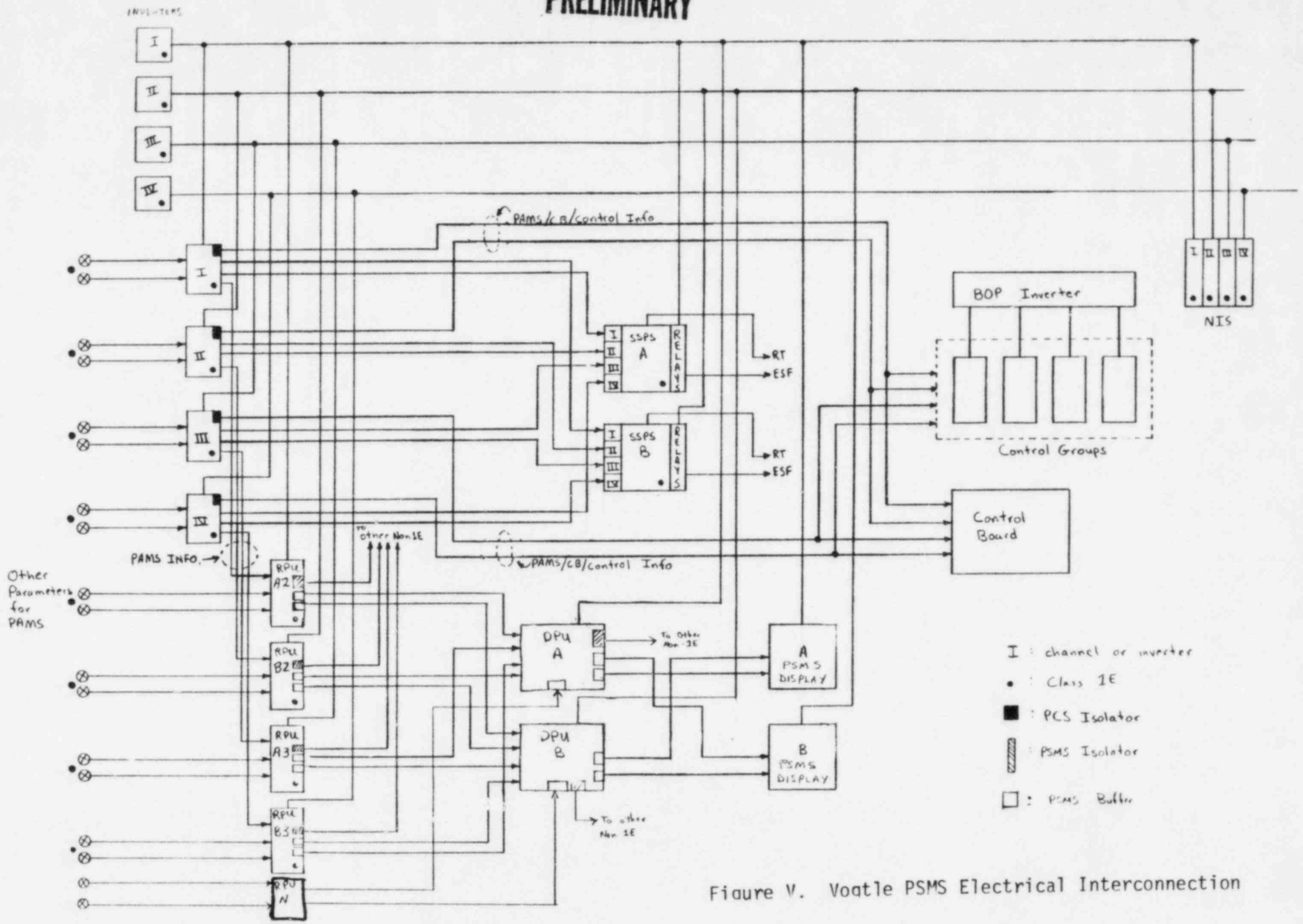


Figure V. Vogtle PSMS Electrical Interconnection

ATTACHMENT I

INFORMATION PACKAGE STRUCTURE
FOR
A.W. VOGTLE PSMS PLASMA DISPLAYS

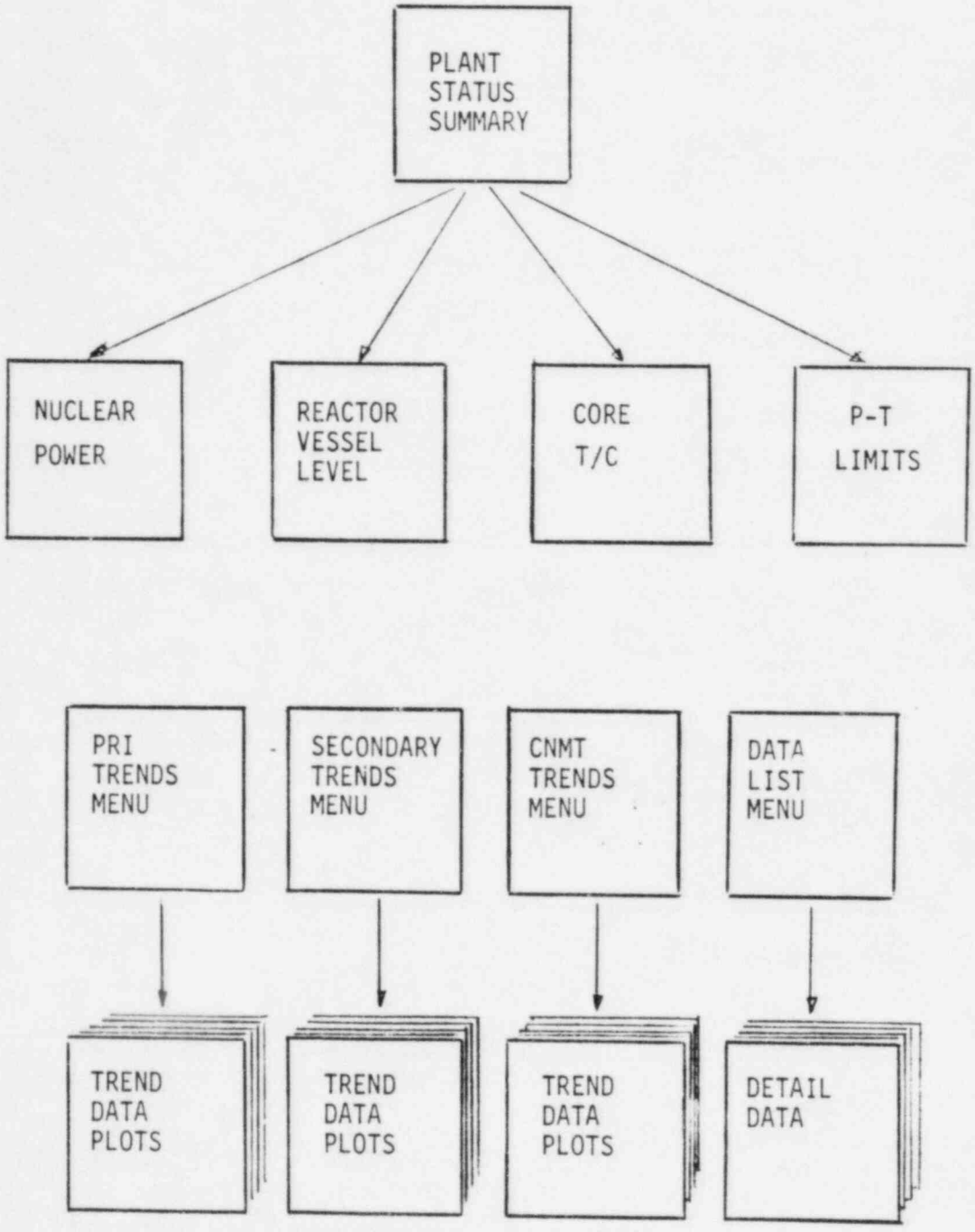
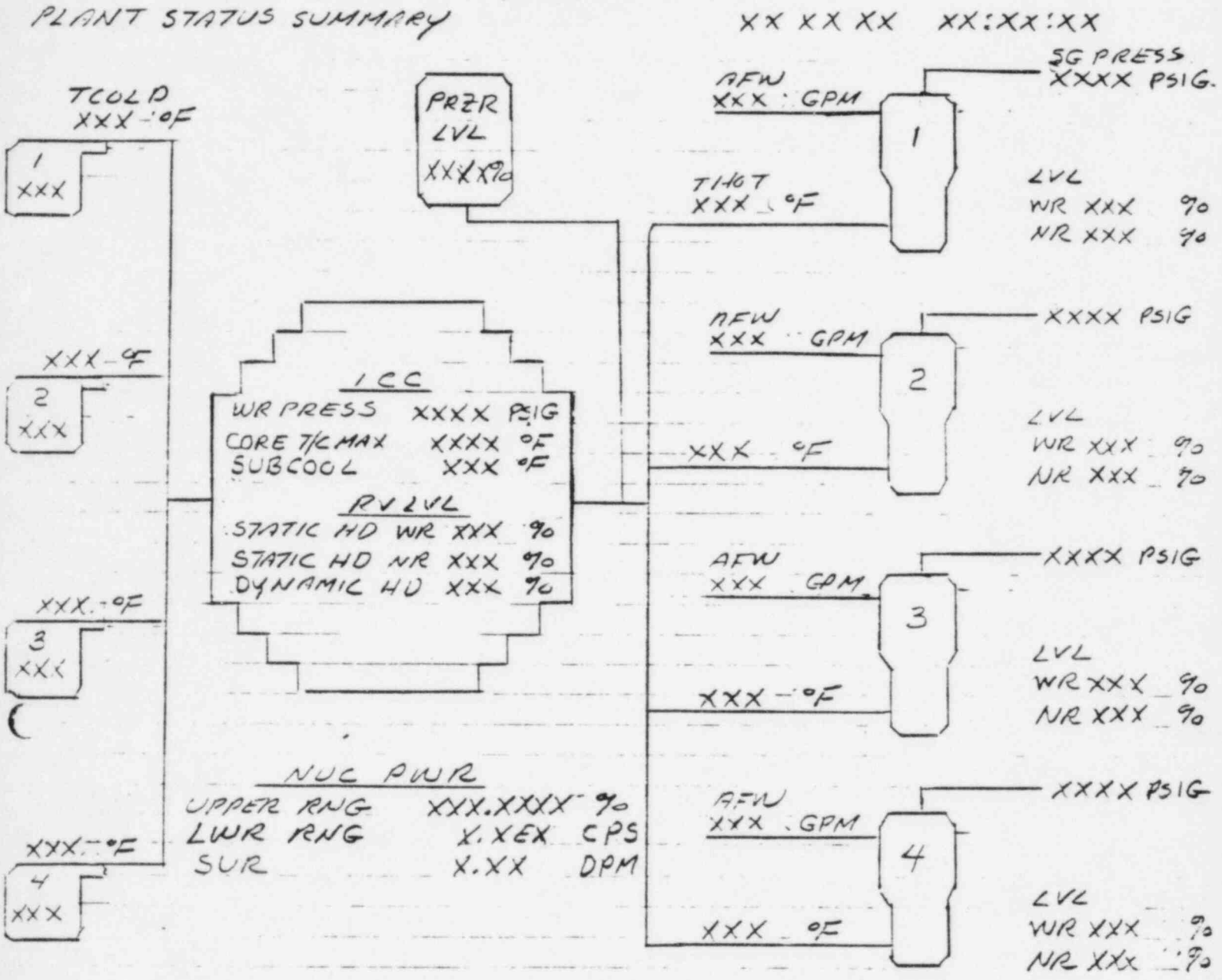


EXHIBIT C-1.0



PLANT		CONTAINMENT		
RWST LVL	XXX %	PRESS	XXX	PSIG
CST TNK 1 LVL	XXX %	XTNO RNG PRESS	XXX	PSIG
CST TNK 2 LVL	XXX %	H2 CONC	XX	%
		WTR LVL	XXX	IN.

EXHIBIT C-2.0
FORMAT

CORE TEMP T/C'S

XXXXXX XX:XX:XX

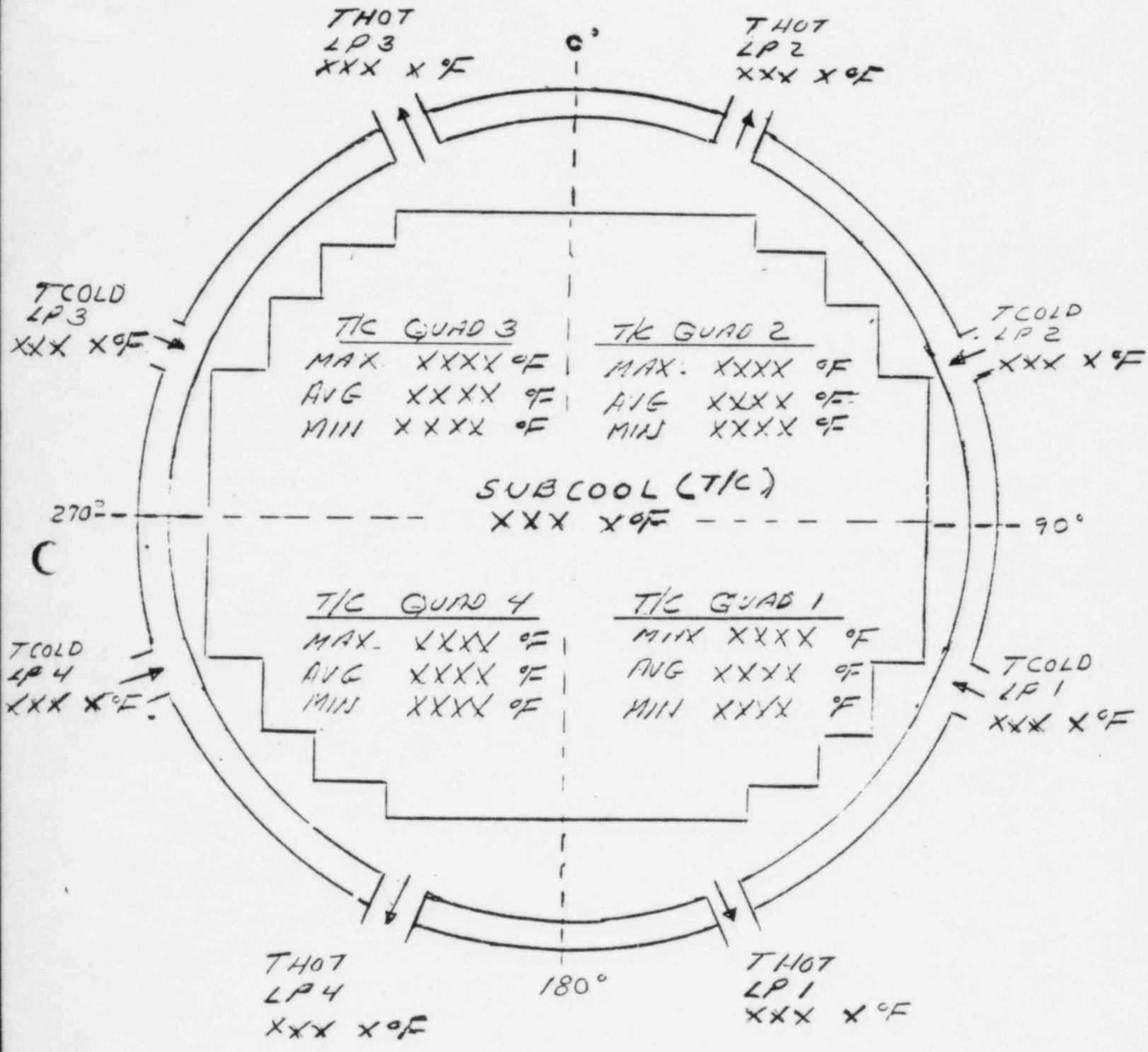
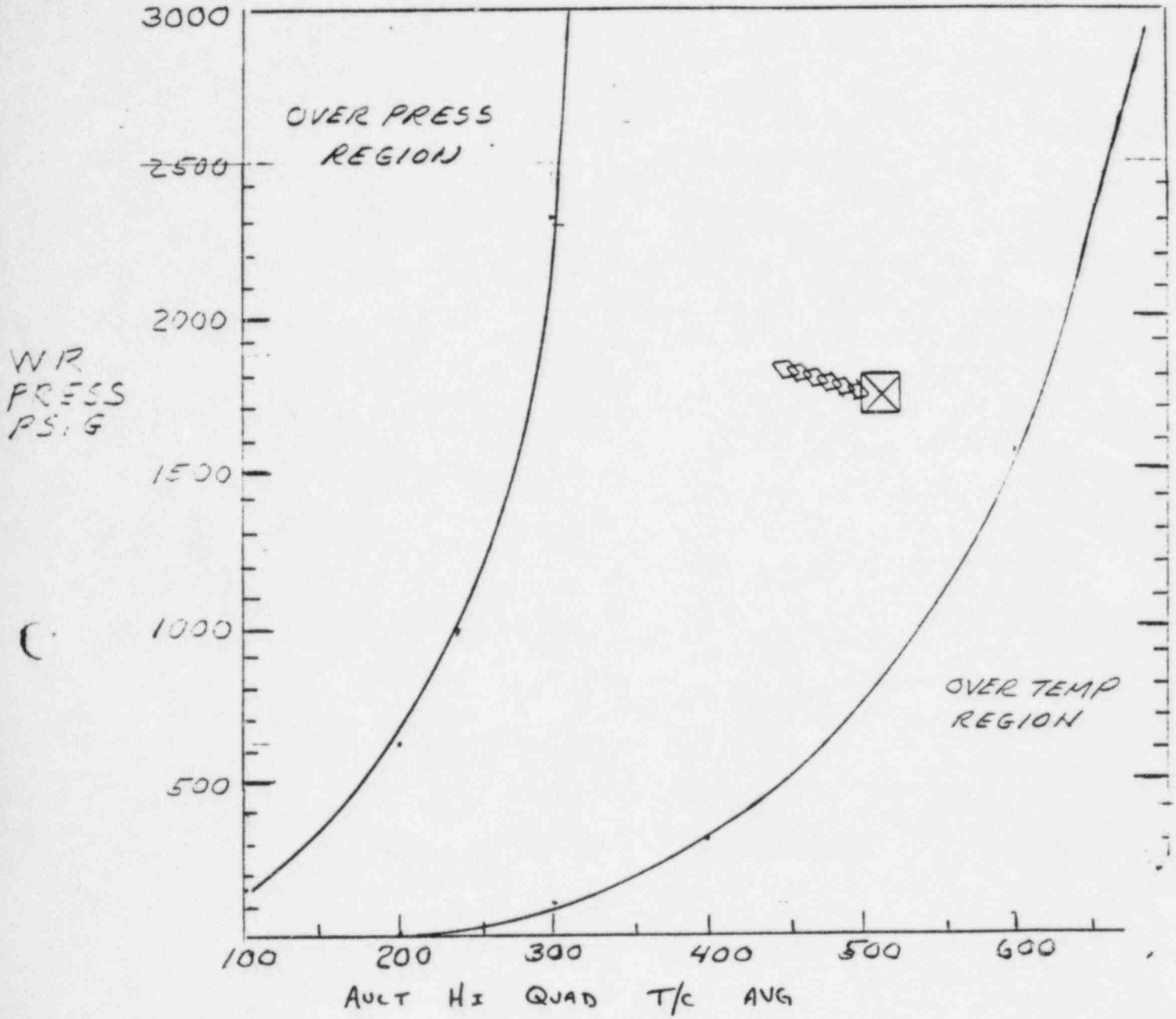


EXHIBIT C-3.1
FORMAT

(APPLICABLE TO VOGTLE UNIT 1)

P-T LIMITS

XX XX XX XX:XX:XX



CORE MAX T/C	XXXX	°F	HEAT UP RATE	XXX °F/HR
WR PRESS	XXXX	PSIG	COOLDOWN RATE	XXX °F/HR
SUBCOOL	XXX	°F		
SUPERHEAT	XX	°F		

☒ CURRENT STATUS ◇ PRIOR STATUS 20 MINUTE UPDATE

EXHIBIT C-4.0
FORMAT

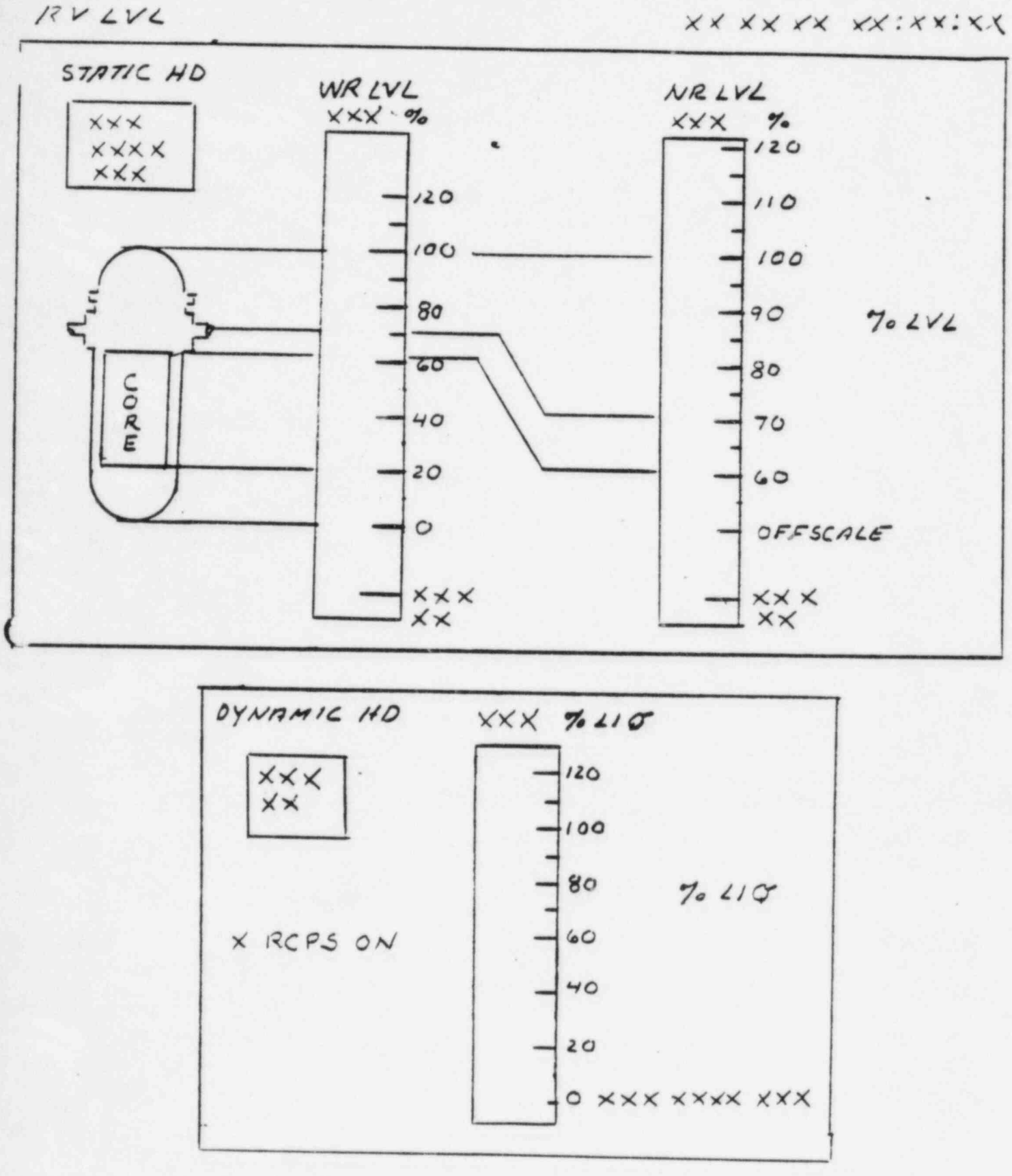
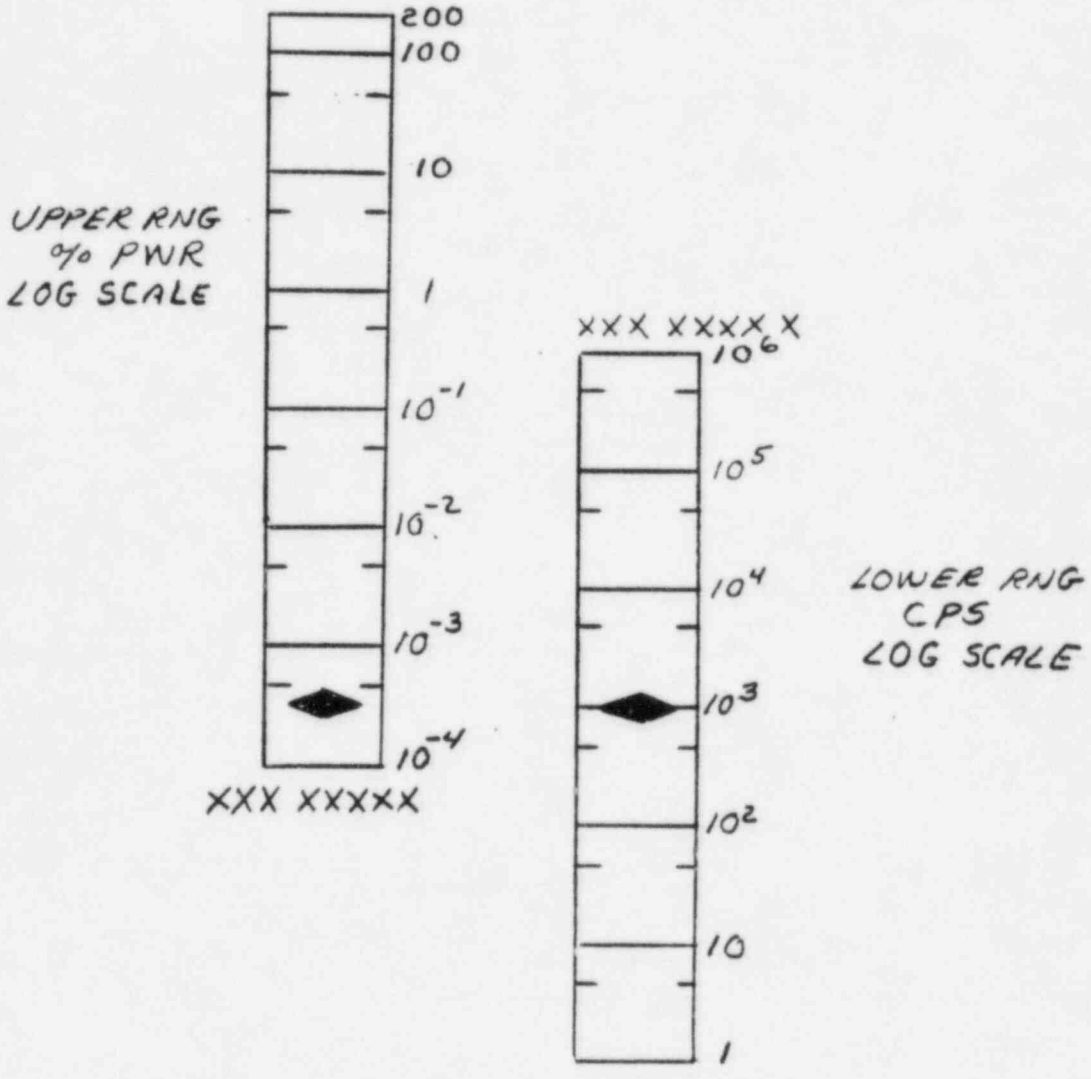


EXHIBIT C-5.0
FORMAT

NUCLEAR POWER
XTND RNG DETECTOR

XX XX XX XX:XX:XX



UPPER RNG LVL	XXX.XXX X	%
LOWER RNG LVL	X.X EXX X	CPS
START UP RATE	X.XX X	DPM

EXHIBIT C-6.0
FORMAT

PRIMARY TRENDS MENU XXXXXX XX:XX:XX

TRENDED PARAMETER	PAGE
WR PRESS SUBCOOL	1
WR THOT/TCOLD	2
CORE MAX T/C	3
NUC PWR	4
PRZR LVL	5
RV LVL	6

EXHIBIT C-7.0
FORMAT

PAGE 1 PRIMARY TRENDS
WR PRESS
SUBCOOL

XX XX XX XX:XX:XX

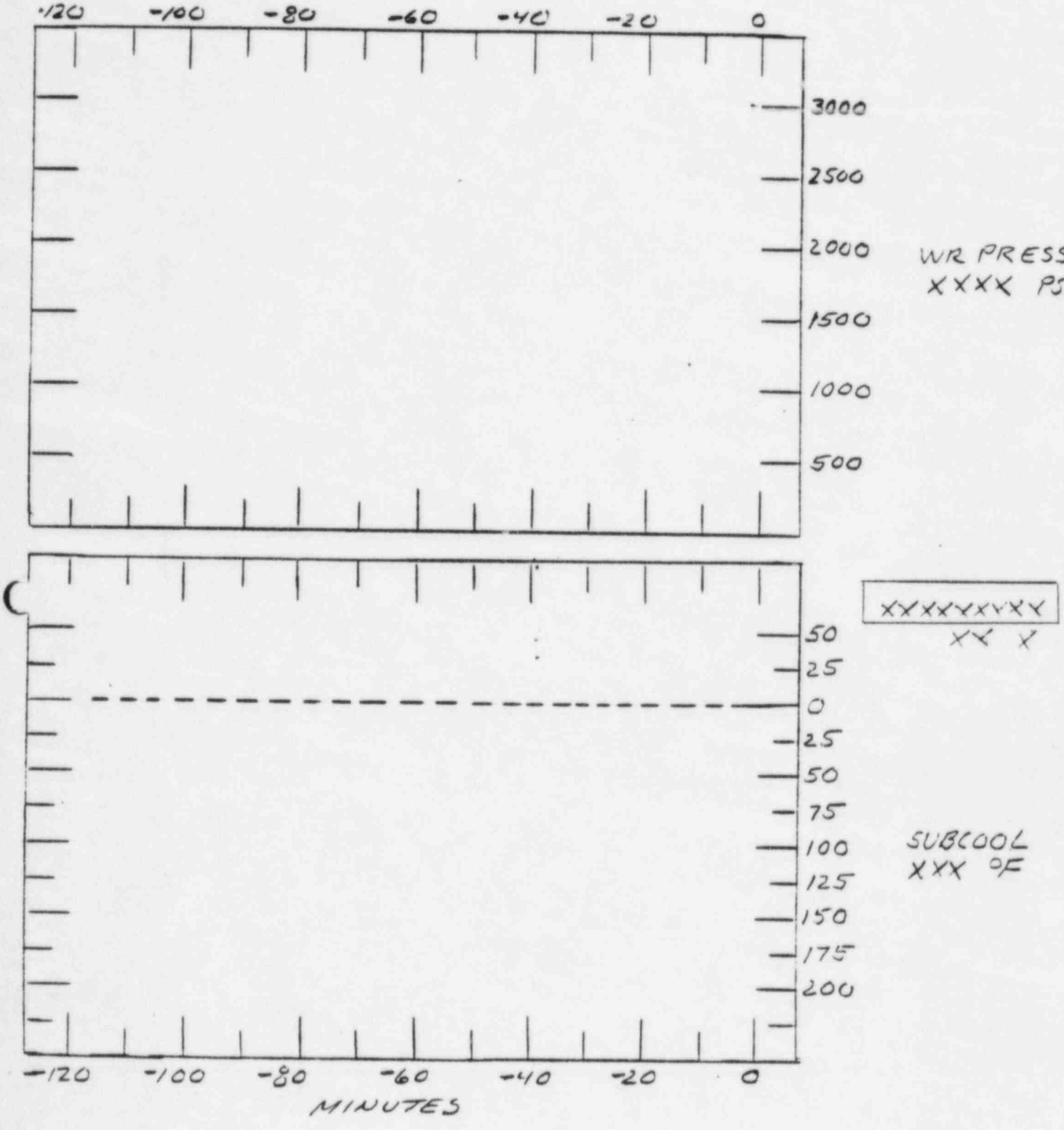


EXHIBIT C-7.1
FORMAT

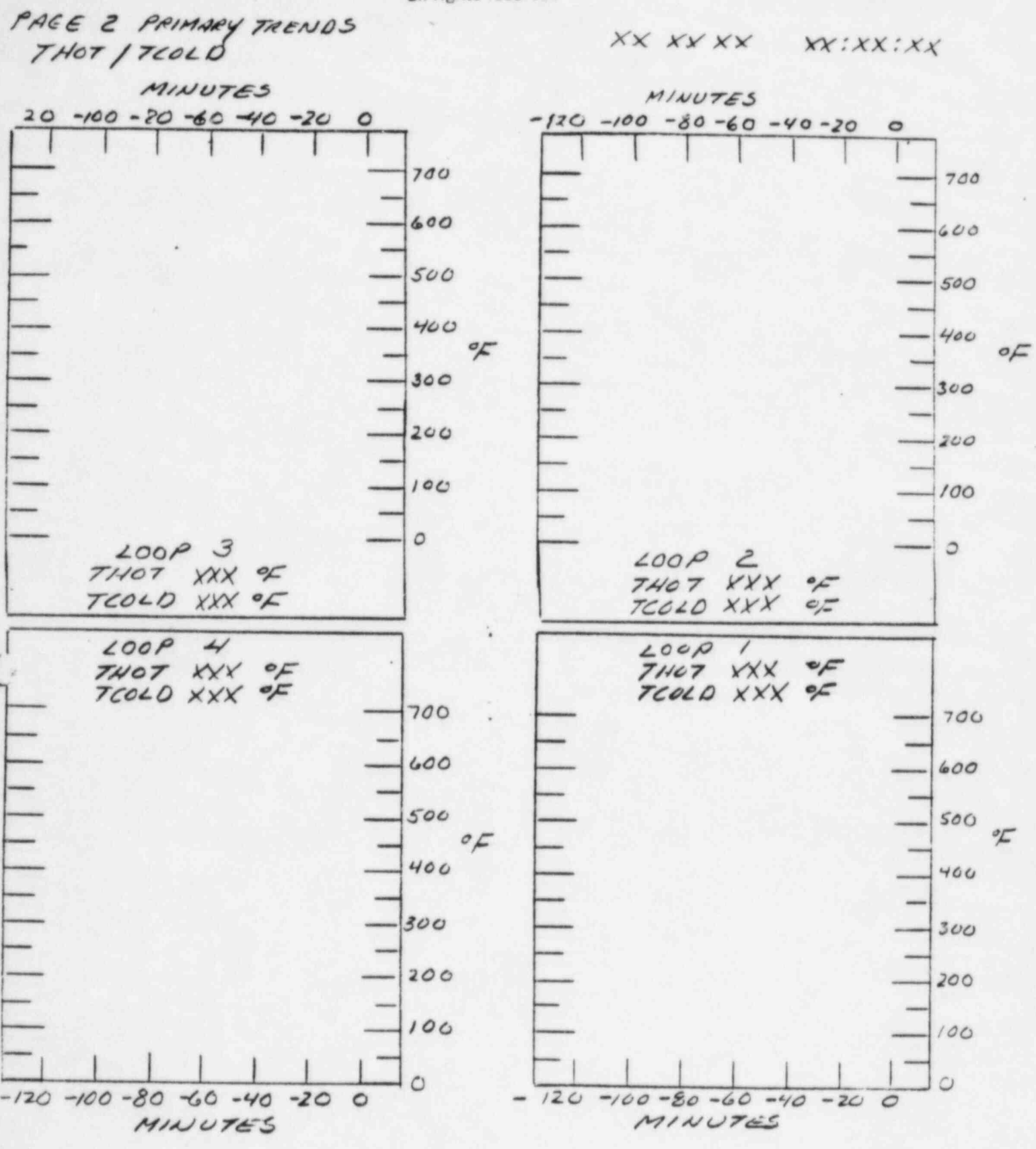


EXHIBIT C-7.2A
(FORMAT)

(APPLICABLE TO VOGTLE PLANT UNIT 1)

PAGE 3 PRIMARY TRENDS
CORE MAX T/C

XX XX XX XX:XX:XX

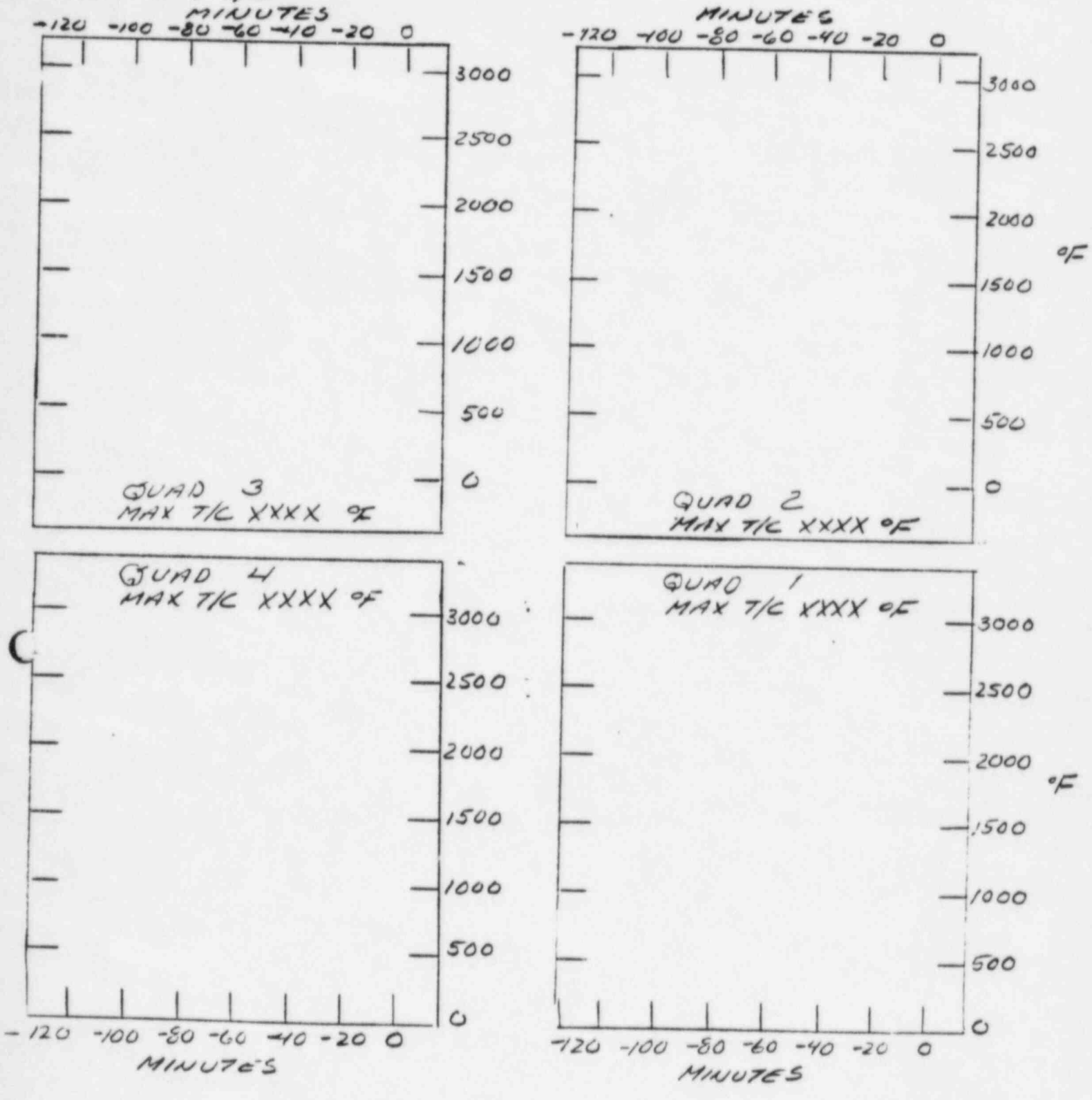


EXHIBIT C-7.3A
FORMAT
(APPLICABLE TO VOGTLE PLANT UNIT 1)

PAGE 4 PRIMARY TRENDS
NUC PWR

XX XX XX XX:XX:XX

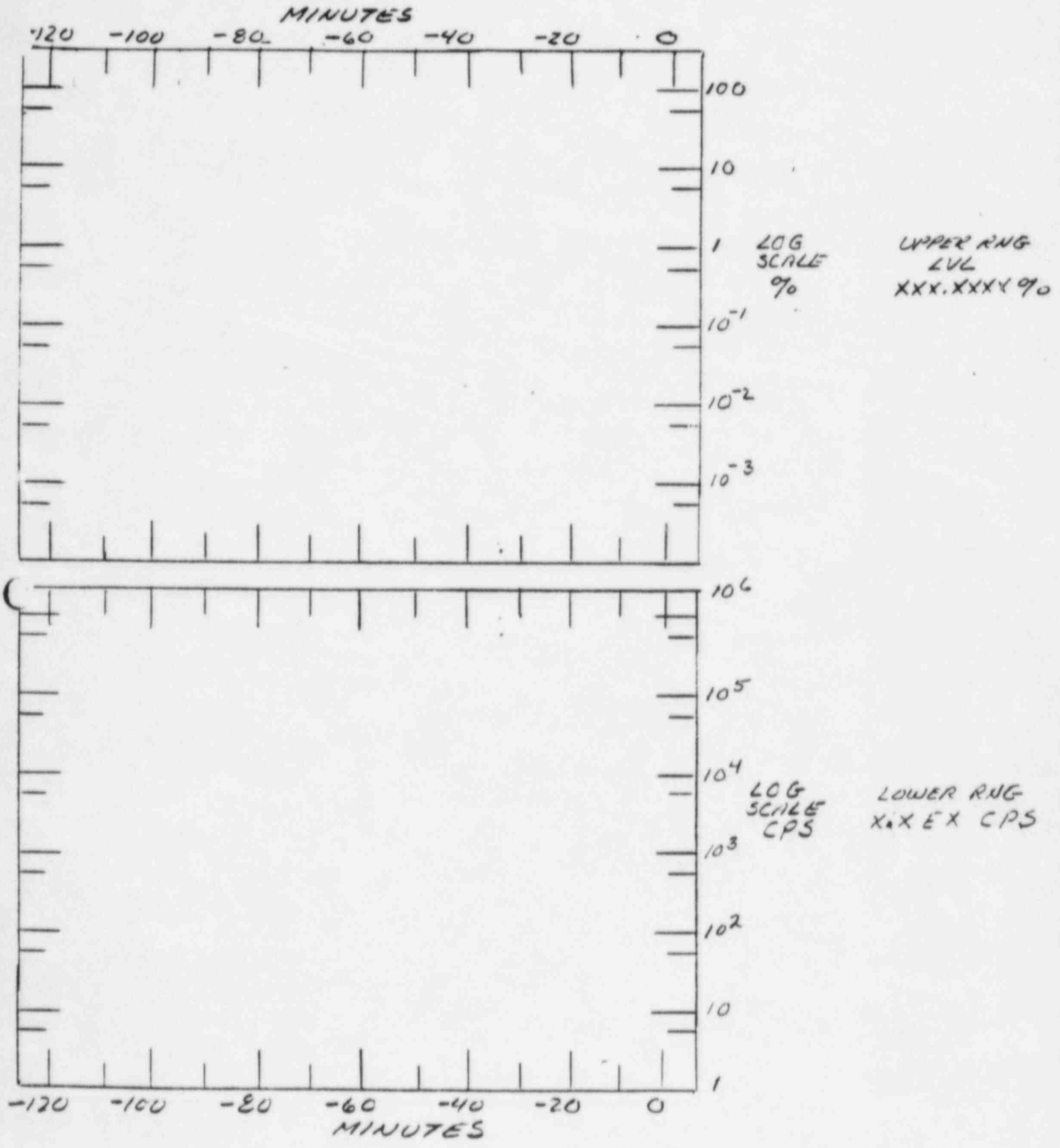


EXHIBIT C-7.4
(FORMAT)

PAGE 5 PRIMARY TRENDS
PRZR LVL

XX XX XX XX:XX:XX

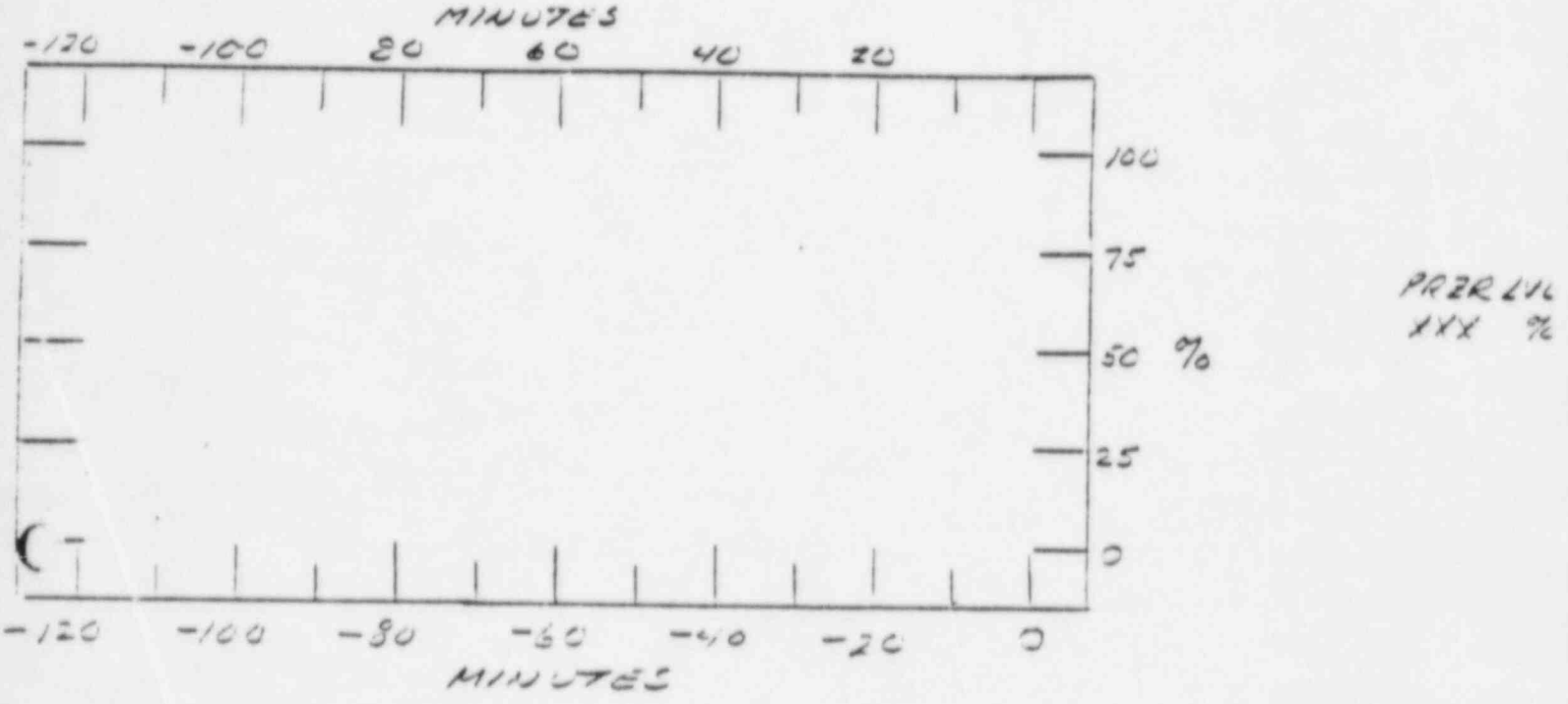


EXHIBIT C-7.5
FORMAT

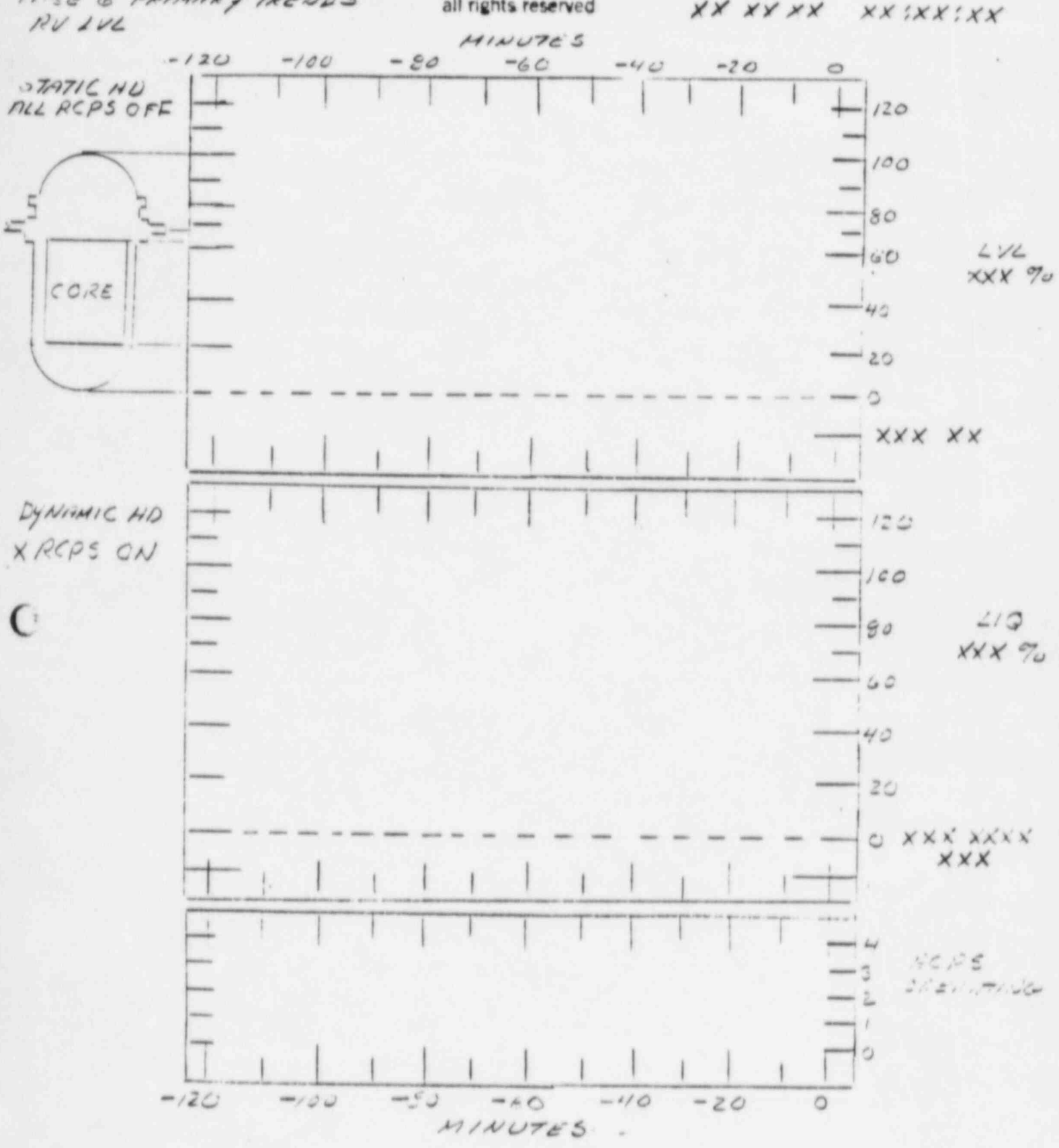


EXHIBIT C-7.6
FORMAT

SECONDARY TRENDS MENU XXXXXX XX:XX:XX

TRENDED PARAMETER	PAGE
SG WR LVL	1
SG NR LVL	2
AFW FLOW	3
SG PRESS	4
CST LVL	5

EXHIBIT C-8.0
FORMAT

PAGE 1 SECONDARY TRENDS
SG WR LVL

XX XX XX XX:XX:XX

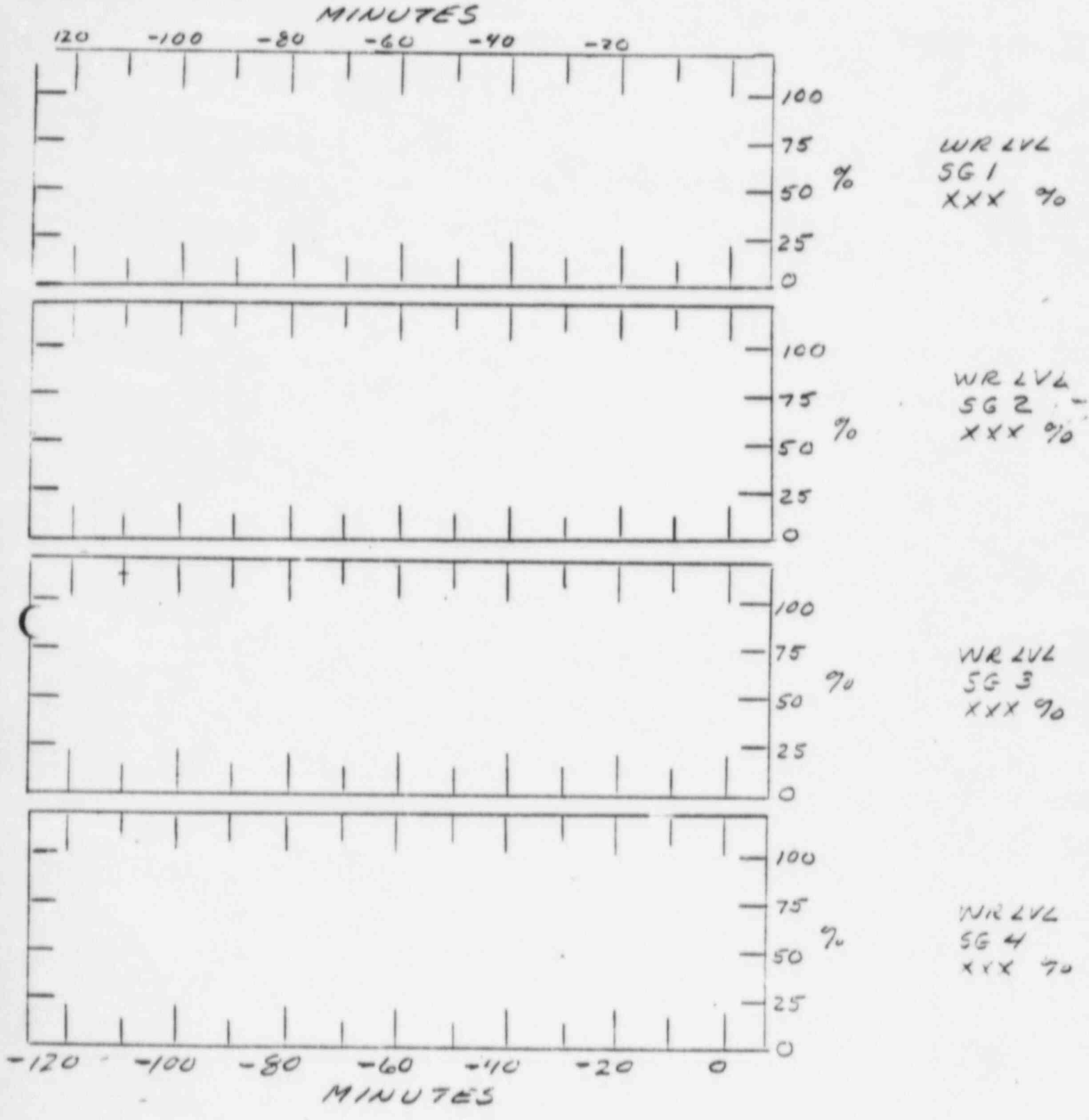


EXHIBIT C-8.1
FORMAT

PAGE 2 SECONDARY TRENDS
SG NR LVL

XX XXXX XX:XX:XX

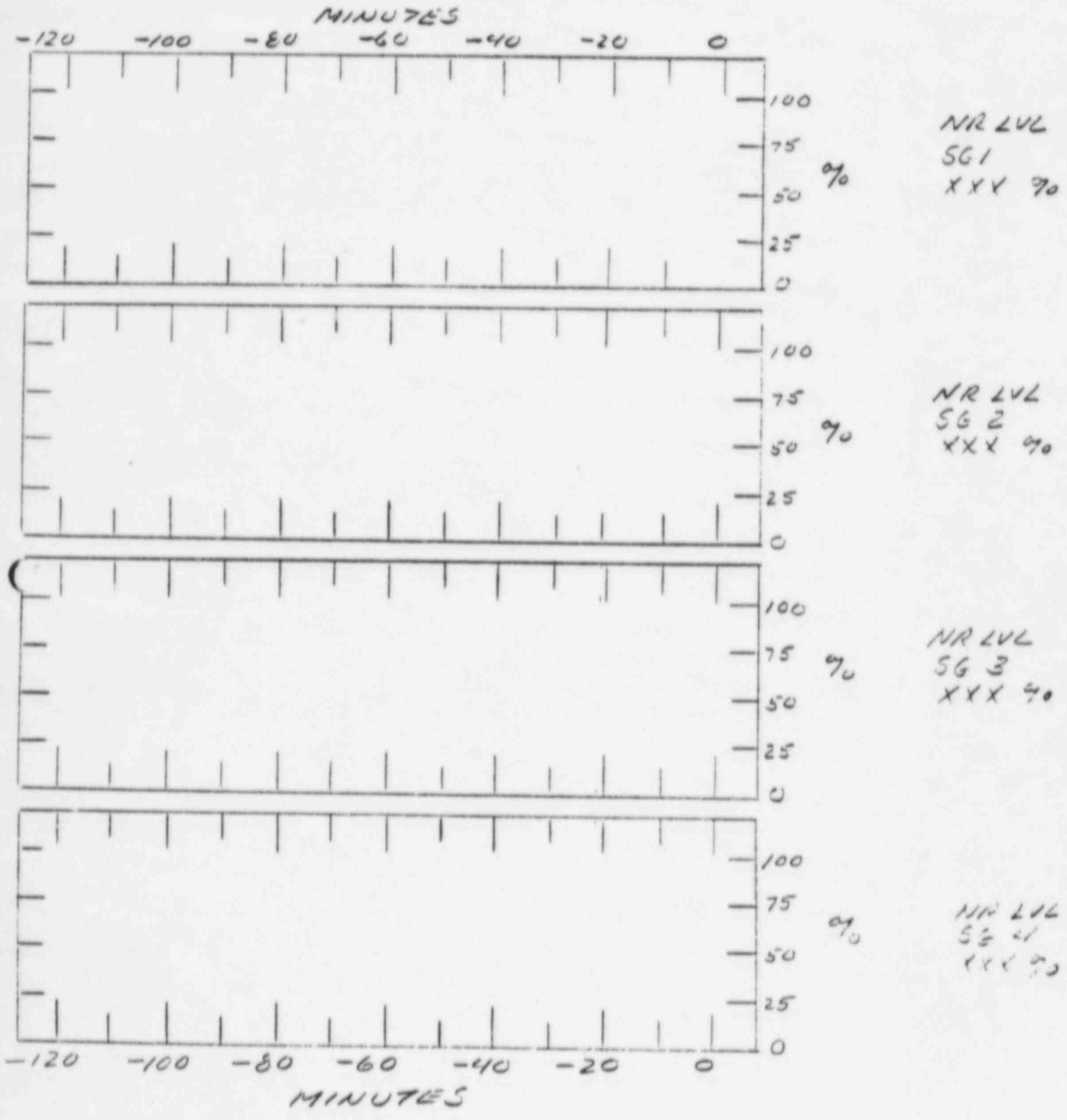


EXHIBIT C-8.2
FORMAT

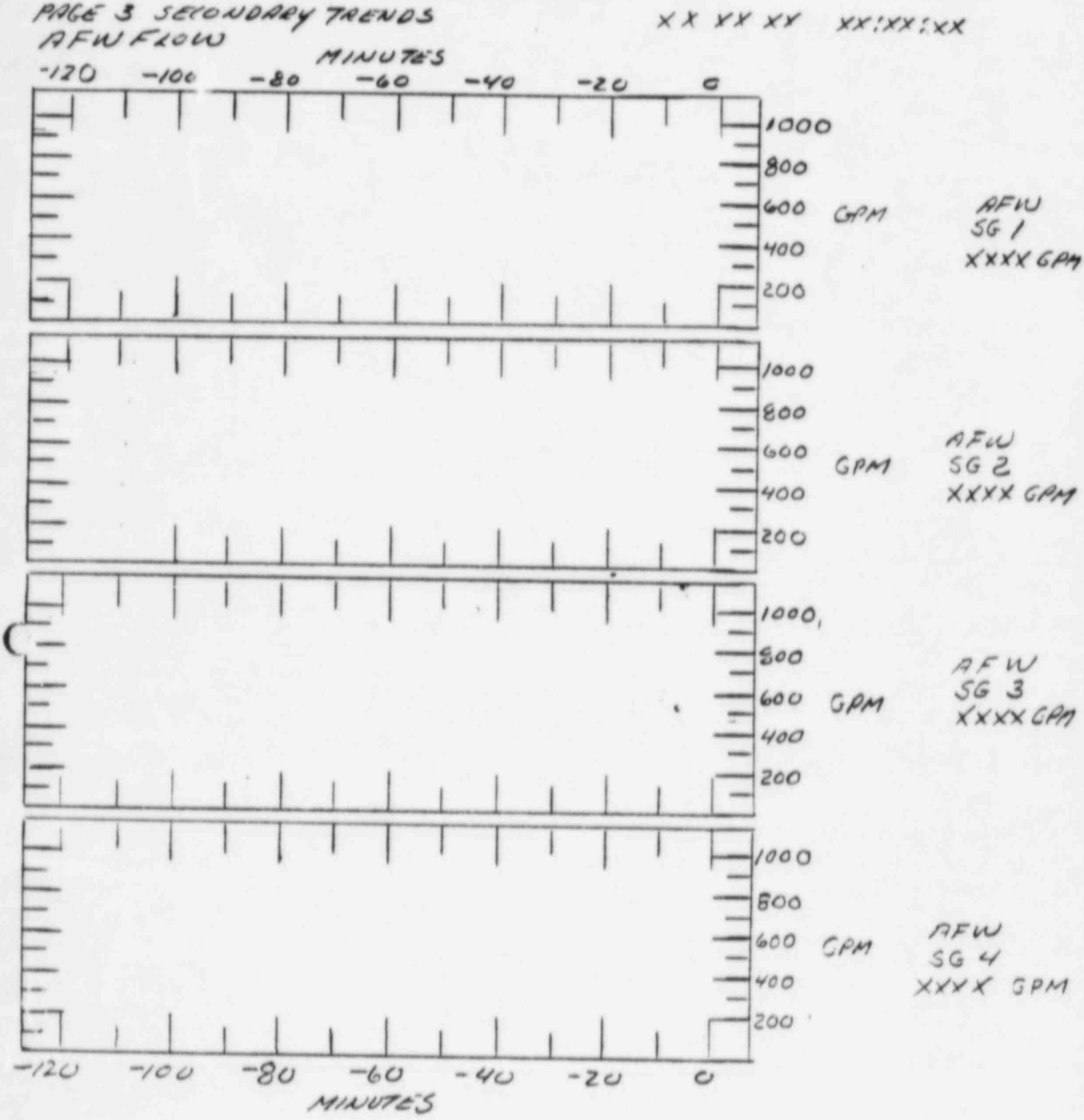


EXHIBIT C-8.3
FORMAT

PAGE 4 SECONDARY TRENDS
SG PRESS

XXXXXX XX:XX:XX

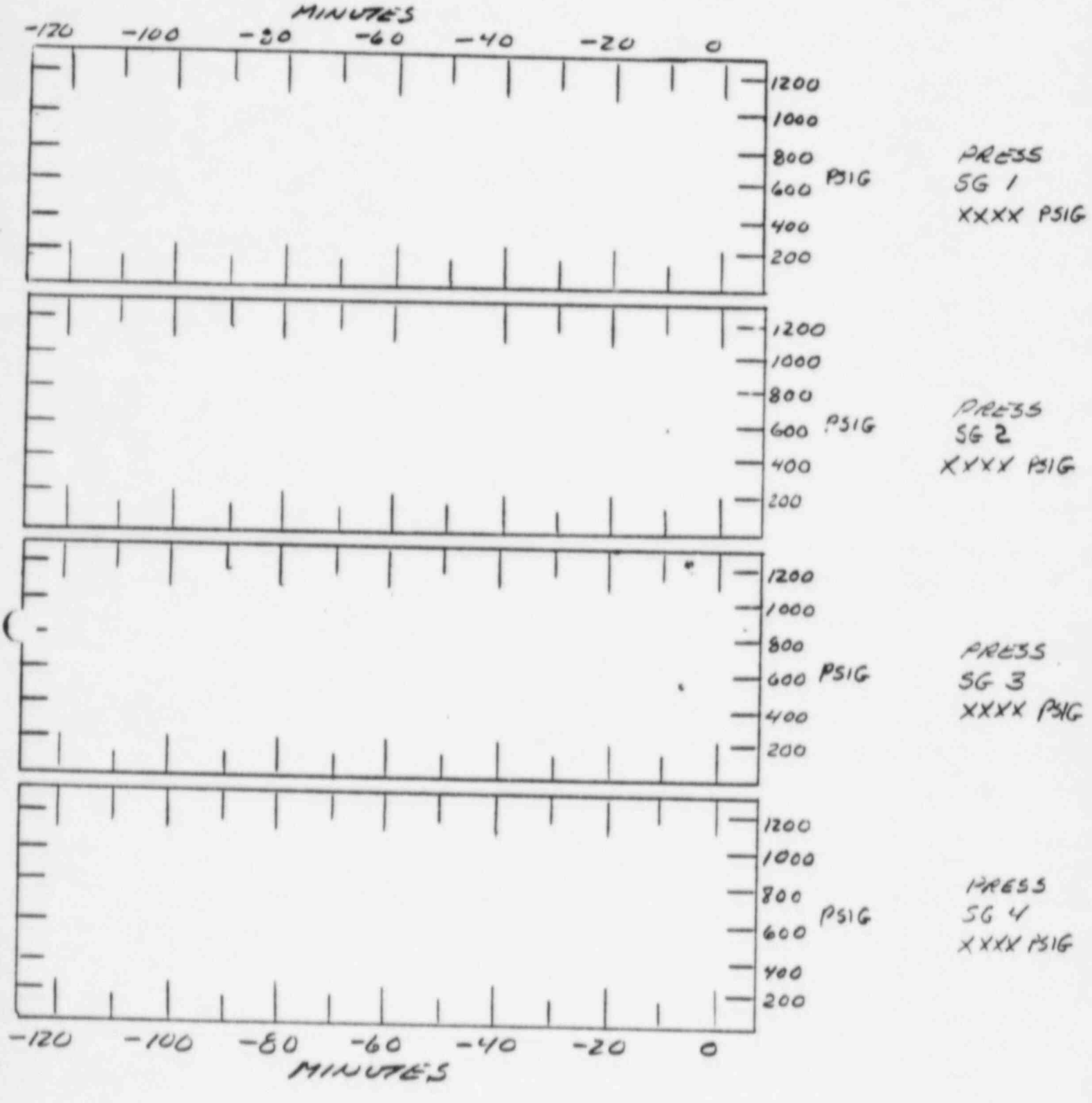


EXHIBIT C-8.4
FORMAT

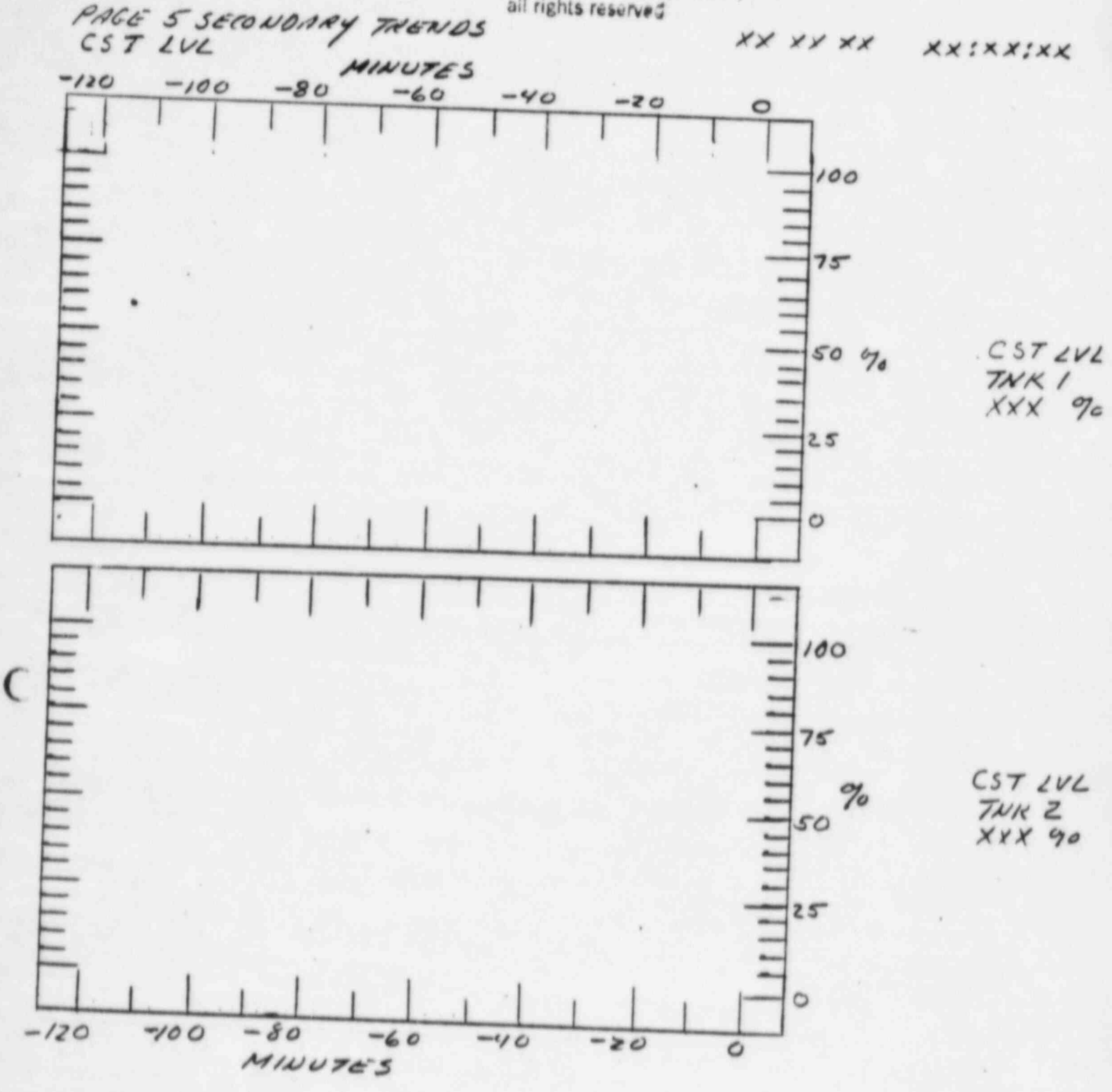


EXHIBIT C-8.5
FORMAT

CNMT TRENDS MENU XX XX XX XX:XX:XX

TRENDED PARAMETER	PAGE
CNMT PRESS	1
XTND RNG PRESS	1
H2 CONC	1
CNMT WTR LVL	2
RWST LVL	2

EXHIBIT C-9.0
FORMAT

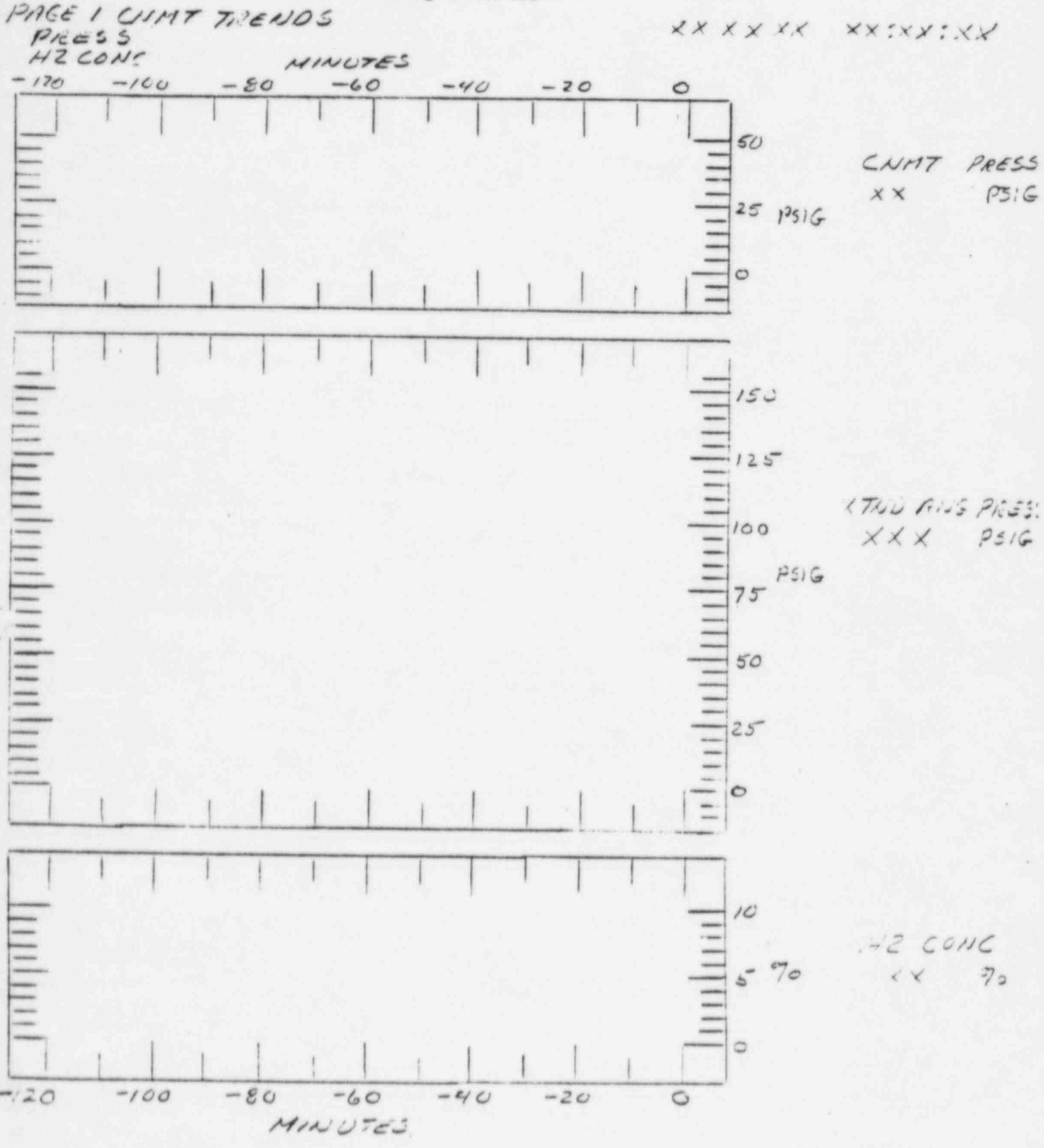


EXHIBIT C-9.1
FORMAT

PAGE 2 CNMT TRENDS

XX XX XX XX:XX:XX

RWST WTR LVL
CNMT XTNO RNG LVL

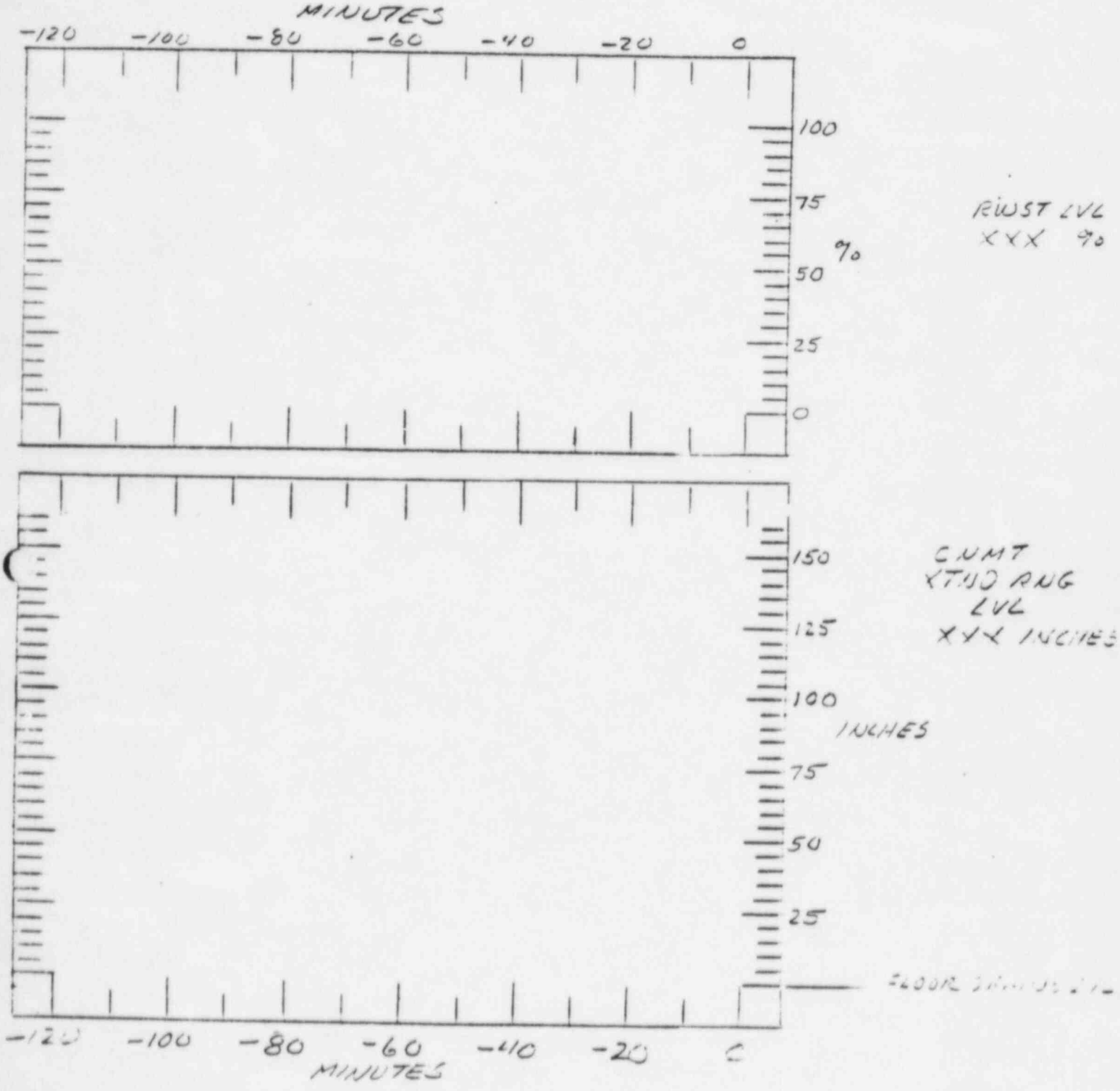


EXHIBIT C-9.2
FORMAT

DETAIL DATA MENU XX XX XX XX:XX:XX

PLANT DATA

PRIMARY

PARAMETER	PAGE
WR PRESS	1
WR THOT	1
WR TCOLD	1
SUBCOOL	1
PRZR LVL	1
RWST LVL	1
RV LVL	1
RVLIS JRN A	2
RVLIS TRN B	3
CORE TEMP T/C	
QUAD 1 & 2	4
QUAD 3 & 4	5
T/C MAP	6

SECONDARY

PARAMETER	PAGE
SG LVL	7
SG PRESS	7
CST LVL	7
AFW	7

CNMT DATA

PARAMETER	PAGE
PRESS	8
H2 CONC	8
WTR LVL	8

EXHIBIT C-10.0
FORMAT

PAGE 1 DETAIL DATA
PRIMARY DATA LIST

XX XX XX XX:XX:XX

WR PRESS

SENSOR	PSIG
PT 408	XXXX
PT 418	XXXX

SUBCOOL / SUPERHEAT

SENSOR	SUBCOOL °F	SUPERHEAT °F
TRN 1	XXX	XX
TRN 2	XXX	XX

WR THOT

LOOP	SENSOR	°F
1	TE 413A	XXX
2	TE 423A	XXX
3	TE 433A	XXX
4	TE 443A	XXX

WR TCOLD

LOOP	SENSOR	°F
1	TE 413B	XXX
2	TE 423B	XXX
3	TE 433B	XXX
4	TE 443B	XXX

PRZR LVL

SENSOR	%
LT 459	XXX
LT 460	XXX
LT 461	XXX

RWST LVL

SENSOR	%
LT 990	XXX
LT 991	XXX
LT 992	XXX
LT 993	XXX

NUC PWR

SENSOR	UPPER RNG LVL	LWR RNG LVL	SUR
TRN A	XXX.XXXX %	X.X EX CPS	X.X DPM
TRN B	XXX.XXXX %	X.X EX CPS	X.X DPM

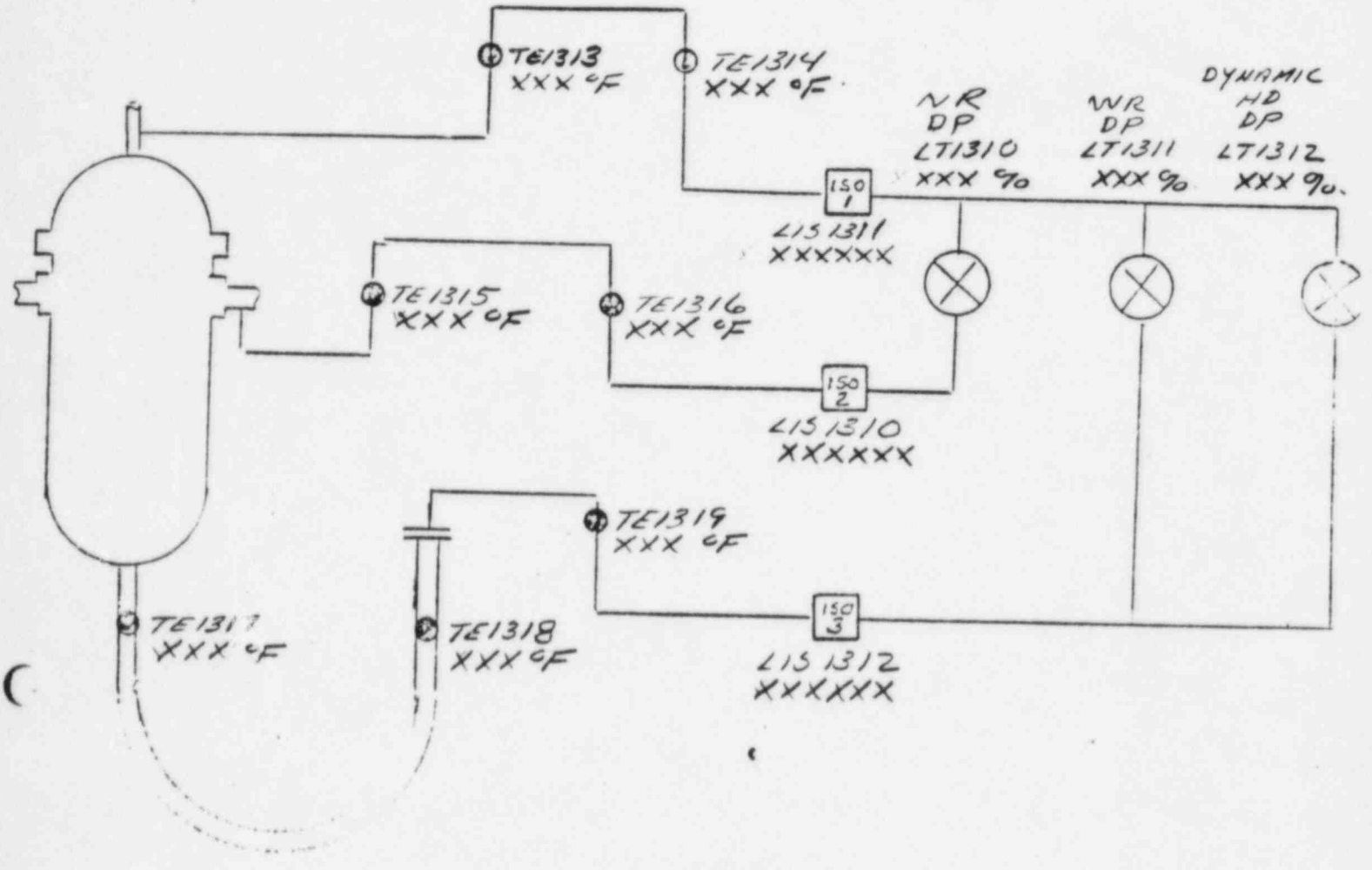
RV LVL

SENSOR	STATIC HO WR	STATIC HO NR	DYNAMIC HO
RVLIS TRN A	XXX % LVL	XXX % LVL	XXX % LIQ
RVLIS TRN B	XXX % LVL	XXX % LVL	XXX % LIQ

EXHIBIT C-10.1

PAGE 2 DETAIL DATA
RVLIS TRAIN A

XX XX XX XX:XX:XX



CORE TEMP T/C AVG XXXX °F
WR PRESS XXXX PSIG

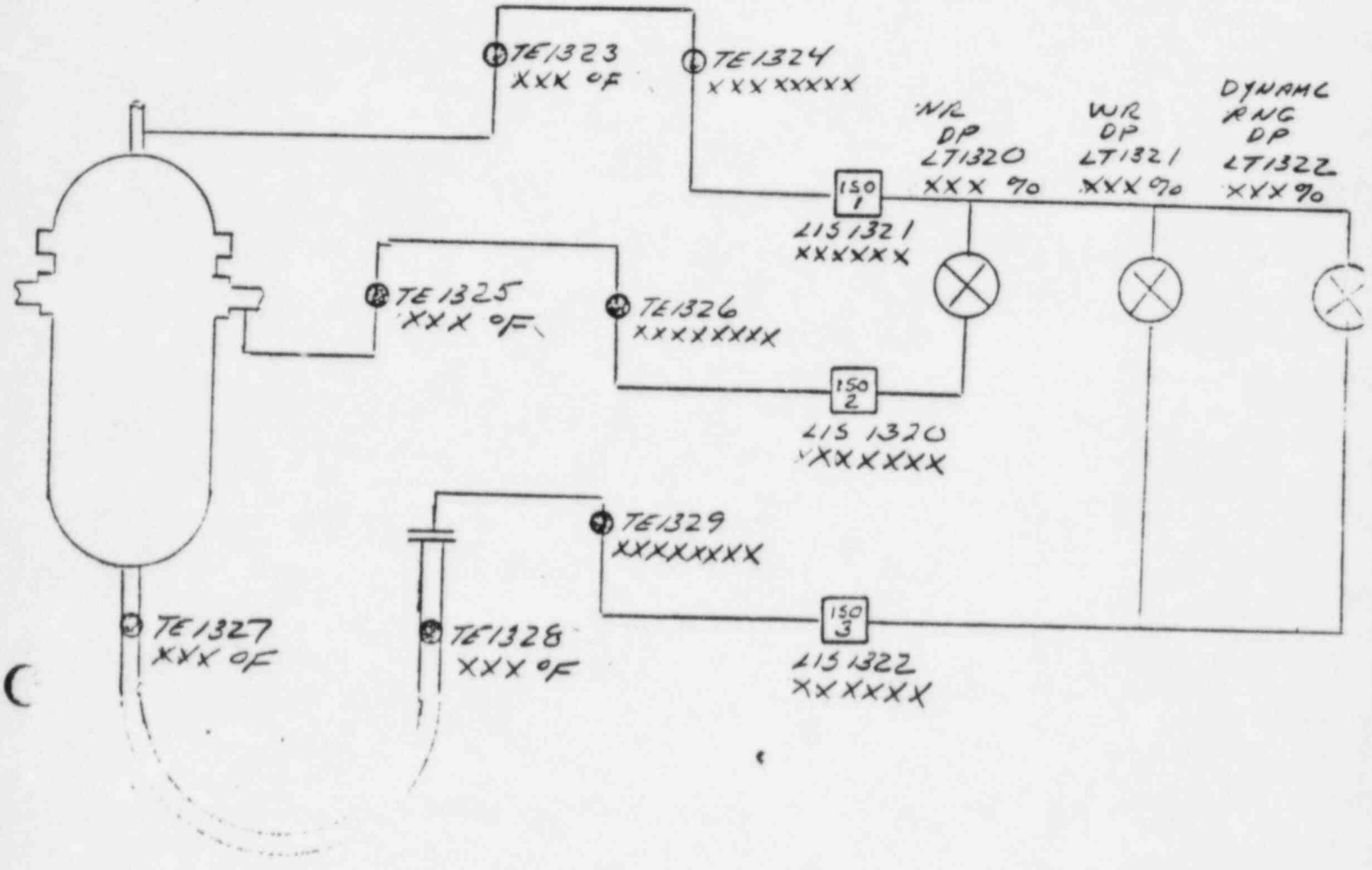
RV LVL XXXX XXX STATIC HD NR XXX % LVL
STATIC HD WR XXX % LVL

RV LVL XXX XX DYNAMIC HD XXX % LVL

EXHIBIT C-10.2
FORMAT

PAGE 3 DETAIL DATA
RVLIS TRAIN B

XX XX XX XX:XX:XX



CORE TEMP T/C AVG XXXX °F

WR PRESS XXXX PSIG

RV LVL XXXX XXX STATIC HD NR XXX %LVL

STATIC HD WR XXX %LVL

RV LVL XXX XX DYNAMIC HD XXX %LVL

EXHIBIT C-10.3
FORMAT

PAGE 4 DETAIL DATA
CORE T/C QUADS 1 & 2

XXXXXX XX:XX:XX

QUAD 1

LOC	SENSOR	°F
H01	TE 10013	XXXX
J02	TE 10014	XXXX
J04	TE 10039	XXXX
J06	TE 10015	XXXX
J08	TE 10040	XXXX
L02	TE 10042	XXXX
L04	TE 10018	XXXX
L06	TE 10043	XXXX
L08	TE 10019	XXXX
N02	TE 10021	XXXX
N04	TE 10046	XXXX
N06	TE 10022	XXXX
N08	TE 10047	XXXX
R06	TE 10049	XXXX
R08	TE 10025	XXXX

THOT LP 1 XXX X °F

QUAD 2

LOC	SENSOR	°F
H15	TE 10038	XXXX
J08	TE 10040	XXXX
J10	TE 10016	XXXX
J12	TE 12041	XXXX
J14	TE 10017	XXXX
L08	TE 10019	XXXX
L10	TE 10044	XXXX
L12	TE 10022	XXXX
L14	TE 10045	XXXX
N08	TE 10047	XXXX
N10	TE 10023	XXXX
N12	TE 10048	XXXX
N14	TE 10024	XXXX
R08	TE 10025	XXXX
R10	TE 10050	XXXX

THOT LP 2 XXX X °F

EXHIBIT C-10.4
FORMAT

PAGE 5 DETAIL DATA XXXXXX XX:XX:XX
CORE T/C QUADS 3 & 4

QUAD 3

LOC	SENSOR	°F
A08	TE10026	XXXX
A10	TE10002	XXXX
C08	TE10004	XXXX
C10	TE10029	XXXX
C12	TE10005	XXXX
C14	TE10030	XXXX
E08	TE10032	XXXX
E10	TE10008	XXXX
E12	TE10033	XXXX
E14	TE10009	XXXX
G08	TE10011	XXXX
G10	TE10036	XXXX
G12	TE10012	XXXX
G14	TE10037	XXXX

THOT LP 3 XXX X °F

QUAD 4

LOC	SENSOR	°F
A06	TE10001	XXXX
A08	TE10026	XXXX
C02	TE10027	XXXX
C04	TE10003	XXXX
C06	TE10028	XXXX
C08	TE10004	XXXX
E02	TE10006	XXXX
E04	TE10031	XXXX
E06	TE10007	XXXX
E08	TE10032	XXXX
G02	TE10034	XXXX
G04	TE10010	XXXX
G06	TE10035	XXXX
G08	TE10011	XXXX
H01	TE10013	XXXX

THOT LP 4 XXX X °F

EXHIBIT C-10.5
FORMAT

PAGE 6 DETAIL DATA
CORE T/C TEMP MAP

XX XXXX XX:XX:XX

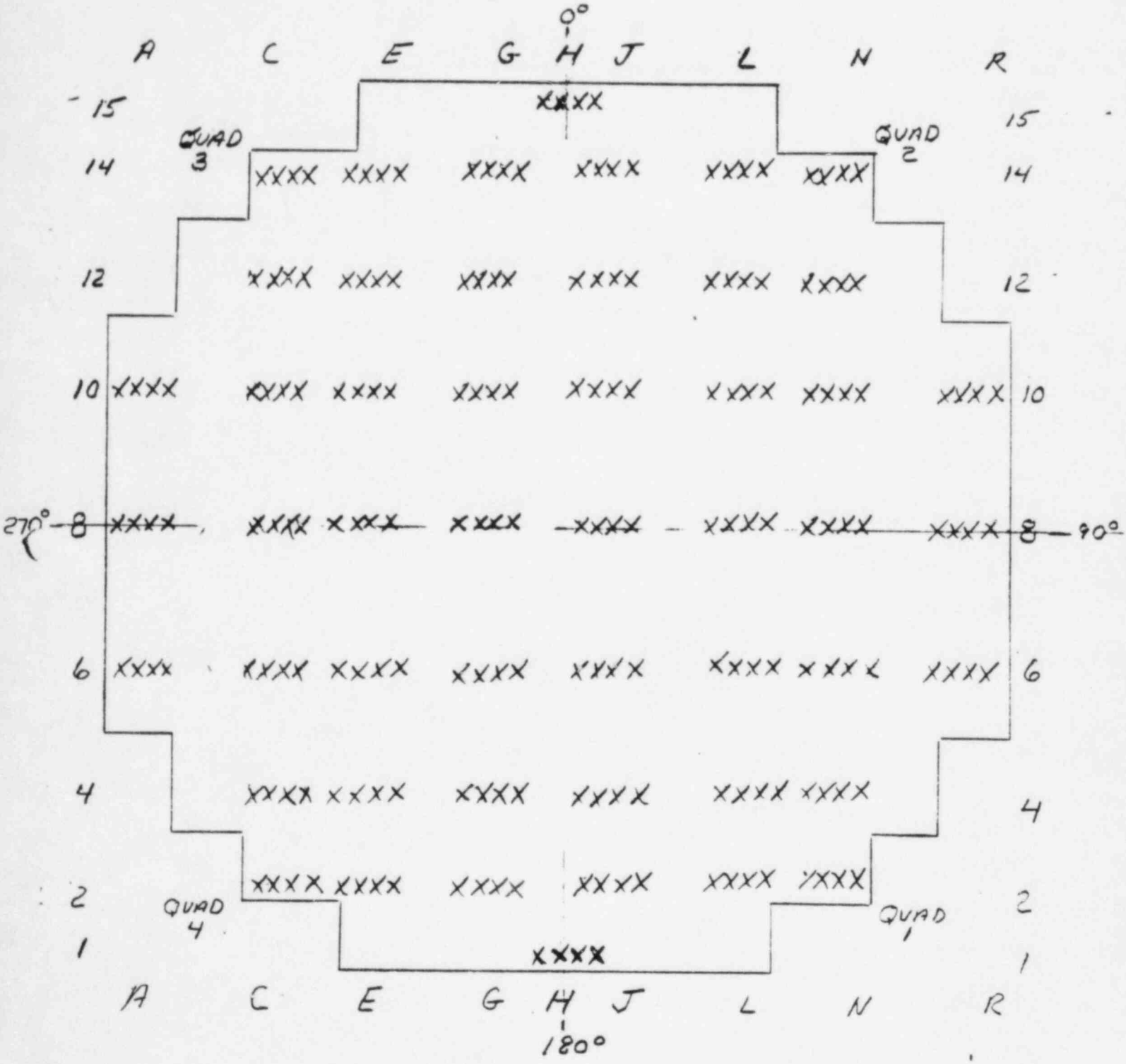


EXHIBIT C-10.6A
FORMAT
(APPLICABLE TO VOGTLE PLANT UNIT 1)

PAGE 7 DETAIL DATA XXXXXX 11:11:XX

SECONDARY DATA LIST

	SG WR LVL SENSOR	%	SG NR LVL SENSOR	%	AFW FLOW SENSOR	GPM
SG1	LT501	XXX	LT517	XXX	FT 5152	XXX
			LT518	XXX	FT15151	XXX
			LT519	XXX		
SG2	LT502	XXX	LT527	XXX	FT 5151	XXX
			LT528	XXX	FT15152	XXX
			LT52[illegible]	XXX		
SG3	LT503	XXX	LT537	XXX	FT 5153	XXX
			LT538	XXX	FT15153	XXX
SG4	LT504	XXX	LT547	XXX	FT 5150	XXX
			LT548	XXX	FT15150	XXX
			LT549	XXX		

SG PRESS

	SENSOR	PSIG		SENSOR	PSIG
SG 1	PT514	XXXX	SG 3	PT534	XXXX
	PT515	XXXX		PT 535	XXXX
	PT516	XXXX		PT536	XXXX
SG 2	PT524	XXXX	SG 4	PT544	XXXX
	PT525	XXXX		PT545	XXXX
	PT526	XXXX		PT546	XXXX

CST LVL

	SENSOR	%		SENSOR	%
TANK 1	LT5101	XXX	TANK 2	LT5111	XXX
	LT5104	XXX		LT5116	XXX

EXHIBIT C-10.7
FORMAT

PAGE E DETAIL DATA
CNTMT DATA LIST

XXXXXX XX:XX:XX

CNTMT PRESS

SENSOR	PSIG
PT934	XX
PT935	XX
PT936	XX
PT937	XX

CNTMT PRESS XTND RNG

SENSOR	PSIG
PT109412	XX
PT109413	XX

CNTMT H2 CONC

TRAIN	SENSOR	%
A	AII 12979	XX
B	AII 12980	XX

CNTMT H2O LVL

SUMPS

	SENSOR	%
SOUTH	LT 7777	XXX
NORTH	LT 7778	XXX
RCIV	LT 7789	XXX

CNTMT XTND RNG

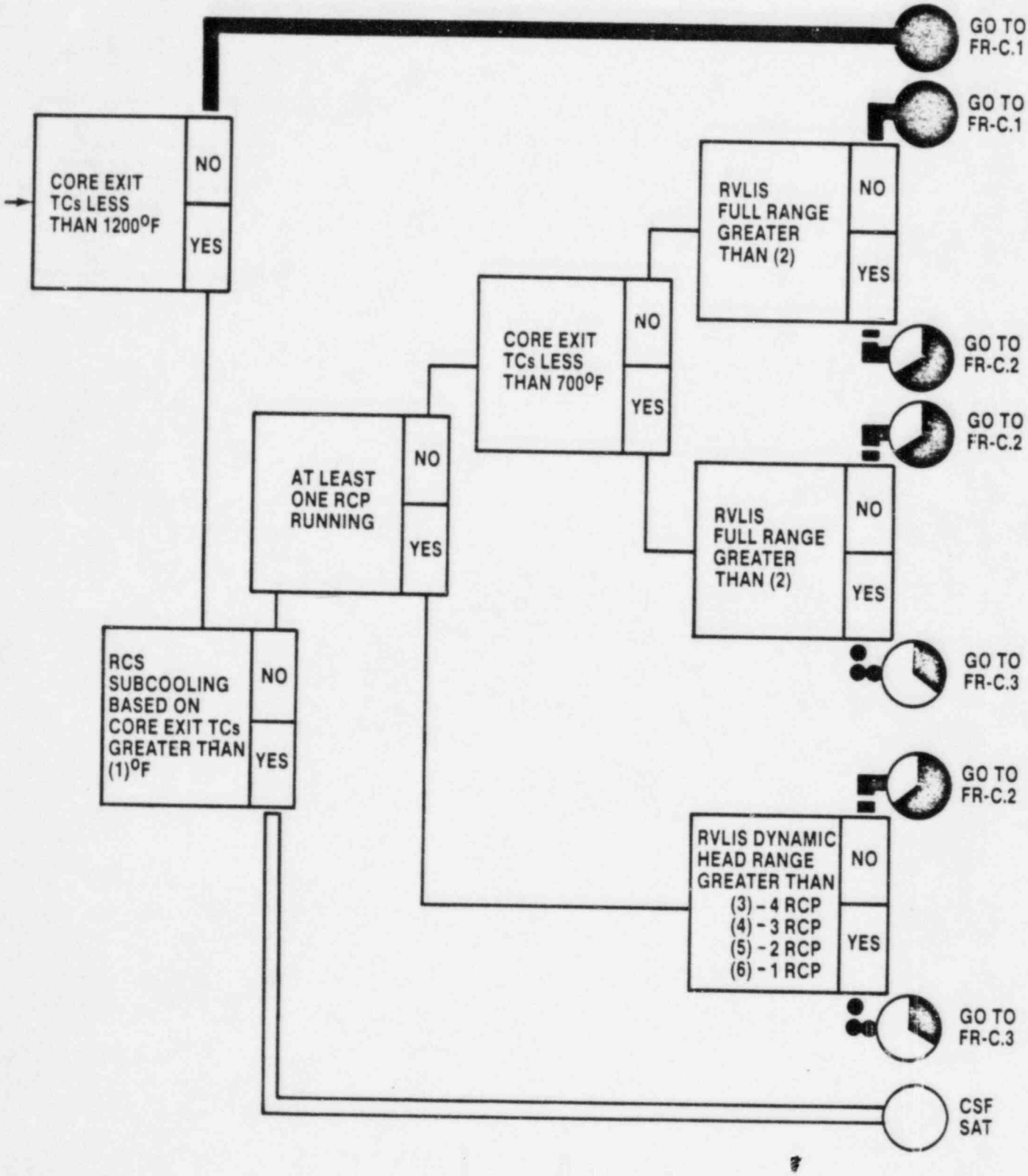
SENSOR	INCHES
LT-764	XXX
LT-765	XXX

EXHIBIT C-10.8

FORMAT

ATTACHMENT II

Number:	Title:	Rev. Issue/Date:
F-0.2	CORE COOLING	HP/LP, REV. 1 1 Sept., 1983



ATTACHMENT III

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
	CAUTION • *If RWST level decreases to less than (1), the SI System should be aligned for cold leg recirculation using ES-1.3, TRANSFER TO COLD LEG RECIRCULATION.* • *Low-head SI pumps should not be run longer than (2) without CCW to the RHR heat exchangers.*	
1	**Verify SI Valve Alignment - PROPER EMERGENCY ALIGNMENT**	Manually align valves as necessary.
2	**Verify SI Flow In All Trains:** • Charging/SI pump flow indicators - CHECK FOR FLOW • High-head SI pump flow indicators - CHECK FOR FLOW • Low-head SI pump flow indicators - CHECK FOR FLOW	Start pumps and align valves as necessary. Try to establish any other high pressure injection: [Enter plant specific list].
3	**Check RCP Support Conditions - AVAILABLE** [Enter plant specific list]	Try to establish support conditions.

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
4	**Check SI Accumulator Isolation Valve Status:**	
	a. Power to isolation valves - AVAILABLE	a. Restore power to isolation valves.
	b. Isolation valves - OPEN	b. Open isolation valves unless closed after accumulator discharge.
5	**Check Core Exit TCs - LESS THAN 1200°F**	Go to Step 8.
6	**Check RVLIS Full Range Indication:**	
	a. Indication - GREATER THAN *(3)*	a. IF increasing, THEN return to Step 1. IF NOT, THEN go to Step 7.
	b. Return to guideline and step in effect	
7	**Check Core Exit TCs:**	
	a. Temperature - LESS THAN 700°F	a. IF decreasing THEN return to Step 1. IF NOT, THEN go to Step 8.
	b. Return to guideline and step in effect	

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

NOTE *This guideline should be continued while obtaining hydrogen sample in Step 8.*

8	**Check Containment Hydrogen Concentration:** a. Obtain a hydrogen concentration measurement: [Enter plant specific means] b. Hydrogen concentration - LESS THAN 6.0% IN DRY AIR c. Hydrogen concentration - LESS THAN 0.5% IN DRY AIR	b. Consult plant engineering staff for additional recovery actions. Go to Step 9. c. Turn on hydrogen recombiner system.

CAUTION
- *Alternate water sources for AFW pumps will be necessary if CST level decreases to less than (4).*
- *A faulted or ruptured SG should not be used in subsequent steps unless no intact SG is available.*

9	**Check Intact SG Levels:** a. Narrow range level - GREATER THAN *(5)*% [*(6)*% FOR ADVERSE CONTAINMENT] b. Control feed flow to maintain narrow range level between *(5)*% [*(6)*% for adverse containment] and 50%	a. Increase total feed flow to restore narrow range level greater than *(5)*% [*(6)*% for adverse containment]. IF total feed flow less then *(7)* gpm, THEN go to Step 18. OBSERVE NOTE PRIOR TO STEP 18.

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
10	**Check RCS Vent Paths:**	
	a. Power to PRZR PORV block valves - AVAILABLE	a. Restore power to block valves.
	b. PRZR PORVs - CLOSED	b. Manually close PRZR PORVs. IF any valve can NOT be closed, THEN manually close its block valve.
	c. Block valves - AT LEAST ONE OPEN	c. Open block valve unless it was closed to isolate an open PRZR PORV.
	d. Other RCS vent paths - CLOSED [Enter plant specific list]	d. Close any open RCS vent path.
	NOTE Partial uncovering of SG tubes is acceptable in the following steps.	
11	**Depressurize All Intact SGs To** *(8)* **PSIG:**	
	a. Dump steam to condenser at maximum rate	a. Dump steam at maximum rate using SG PORVs.
	b. Check SG pressures - LESS THAN *(8)* PSIG	b. IF SG pressure decreasing, THEN return to Step 9. IF NOT, THEN go to Step 18. OBSERVE NOTE PRIOR TO STEP 18.
	c. Check RCS hot leg temperatures - AT LEAST TWO LESS THAN 400°F	c. IF RCS hot leg temperatures decreasing, THEN return to Step 9. IF NOT, THEN go to Step 18. OBSERVE NOTE PRIOR TO STEP 18.
	d. Stop SG depressurization	

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
12	**Check If SI Accumulators Should Be Isolated:**	
	a. At least two RCS hot leg temperatures - LESS THAN 400°F	a. Go to Step 18. OBSERVE NOTE PRIOR TO STEP 18.
	b. Close all SI accumulator isolation valves	b. Vent any unisolated accumulator.
13	**Stop All RCPs**	
14	**Depressurize All Intact SGs To Atmospheric Pressure:**	
	a. Dump steam to condenser at maximum rate	a. Dump steam at maximum rate using SG PORVs.
15	**Verify SI Flow:** • Charging/SI pump flow indicators - CHECK FOR FLOW —OR— • High-head SI pump flow indicators - CHECK FOR FLOW —OR— • Low-head SI pump flow indicators - CHECK FOR FLOW	Continue efforts to establish SI flow. Try to establish any other high pressure injection: [Enter plant specific list]. IF core exit TCs less than 1200°F, THEN return to Step 14. IF NOT, THEN go to Step 18. OBSERVE NOTE PRIOR TO STEP 18.

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
16	**Check Core Cooling:**	
	a. Core exit TCs - LESS THAN 1200°F	a. Go to Step 18. OBSERVE NOTE PRIOR TO STEP 18.
	b. At least two RCS hot leg temperatures - LESS THAN 350°F	b. Return to Step 14.
	c. RVLIS full range indication - GREATER THAN *(9)*	c. Return to Step 14.
17	**Go To E-1, LOSS OF REACTOR OR SECONDARY COOLANT, Step 12**	
	NOTE Normal conditions are desired but not required for starting the RCPs.	
18	**Check Core Exit TCs - LESS THAN 1200°F**	Start RCPs as necessary until core exit TCs less than 1200°F. IF core exit TCs greater than 1200°F and all available RCPs running, THEN open all PRZR PORVs and block valves. IF core exit TCs greater than 1200°F and all PRZR PORVs and block valves open, THEN open all other RCS vent paths to containment.

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
19	**Try To Locally Depressurize All Intact SGs To Atmospheric Pressure:** • Use PORV —OR— • [Enter plant specific means]	Use faulted or ruptured SG.
20	**Check If SI Accumulators Should Be Isolated:**	
	a. Low-head SI pump flow indicators - AT LEAST INTERMITTENT FLOW	a. Return to Step 18.
	b. Close all SI accumulator isolation valves	b. Vent any unisolated accumulator.
21	**Check If RCPs Should Be Stopped:**	
	a. At least two RCS hot leg temperatures - LESS THAN 350°F	a. Go to Step 22.
	b. Stop all RCPs	
22	**Verify SI Flow:** • Charging/SI pump flow indicators - CHECK FOR FLOW —OR— • High-head SI pump flow indicators - CHECK FOR FLOW —OR— • Low-head SI pump flow indicators - CHECK FOR FLOW	Continue efforts to establish SI flow. Try to establish any other high pressure injection: [Enter plant specific list]. Return to Step 18.

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
23	**Check Core Cooling:** • RVLIS full range indication - GREATER THAN *(9)* • At least two RCS hot leg temperatures - LESS THAN 350°F	Return to Step 18.
24	**Go To E-1, LOSS OF REACTOR OR SECONDARY COOLANT, Step 12**	

— END —

FOOTNOTES

(1) *Enter plant specific value corresponding to RWST switchover setpoint in plant specific units.*

(2) *Enter plant specific time.*

(3) *Enter plant specific value which is 3-1/2 feet above the bottom of active fuel in core with zero void fraction, plus uncertainties.*

(4) *Enter plant specific value corresponding to CST low level switchover setpoint in plant specific units.*

(5) *Enter plant specific value showing SG level just in the narrow range, including allowances for normal channel accuracy.*

(6) *Enter plant specific value showing SG level just in the narrow range, including allowances for normal channel accuracy, post accident transmitter errors, and reference leg process errors, not to exceed 50%.*

(7) *Enter the minimum safeguards AFW flow requirement for heat removal, plus allowances for normal channel accuracy (typically one MD AFW pump at SG design pressure).*

(8) *Enter plant specific value which is 200 psig, minus allowances for normal channel accuracy.*

(9) *Enter plant specific value which is above the top of active fuel in core with zero void fraction, plus uncertainties.*

Attachment IV

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
25	**Check If SI Flow Should Be Reduced:**	
	a. RCS subcooling based on core exit TCs - GREATER THAN *(14)*°F	a. DO NOT STOP SI PUMPS. Go to Step 27.
	b. Secondary heat sink: • Total feed flow to SGs - GREATER THAN *(6)* GPM —OR— • Narrow range level in at least one SG - GREATER THAN *(8)*%	b. IF neither condition satisfied, THEN DO NOT STOP SI PUMPS. Go to Step 27.
	c. RCS pressure - STABLE OR INCREASING	c. DO NOT STOP SI PUMPS. Go to Step 27.
	d. PRZR level - GREATER THAN *(15)*%	d. DO NOT STOP SI PUMPS. Try to stabilize RCS pressure with normal PRZR spray. Return to Step 25a.
26	**Go To ES-1.1, SI TERMINATION, Step 1**	