LIMITING CONDITIONS FOR OPERATION AND SURVEILLANCE REQUIREMENTS

8906070201 890601
PDR ADOCK 05000397
P PDC

BASES

LIST OF FIGURES

3/4.2.6 POWER/FLOW INSTABILITY

LIMITING CONDITION FOR OPERATION

3.2.6 Operation with THERMAL POWER/core flow conditions which lay in ~~the crosshatched region~~ Region A of Figure 3.2.6-1 is prohibited.

APPLICABILITY: OPERATIONAL CONDITION 1, when THERMAL POWER is greater than 39% of RATED THERMAL POWER and core flow is less than or equal to 45% of rated core flow.

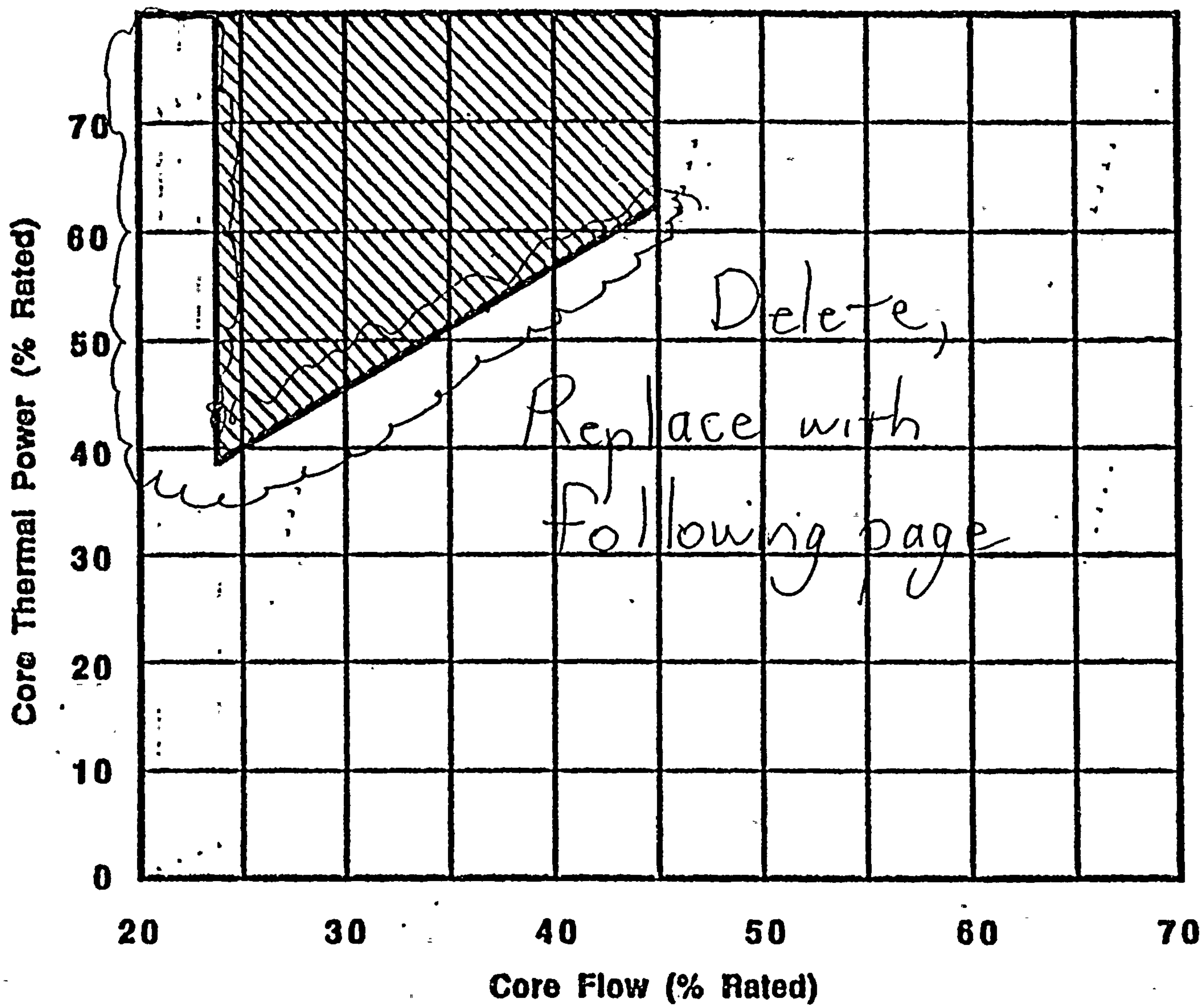
ACTION:

~~IMMEDIATELY~~

With THERMAL POWER/core flow conditions which lay in ~~the crosshatched region~~ Region A of Figure 3.2.6-1, then as soon as practical, but in all cases within 15 minutes, initiate ~~corrective action within 15 minutes to establish a THERMAL POWER/core flow condition which lays outside the crosshatched region within 2 hours.~~ a MANUAL SCRAM.

SURVEILLANCE REQUIREMENTS

4.2.6 The THERMAL POWER/core flow conditions shall be verified to lay outside Region A ~~the crosshatched region~~ of Figure 3.2.6-1 once per 24 hours when operating in the region of APPLICABILITY.



Operating Region Limits of Specification 3.2.6
Figure 3.2.6-1

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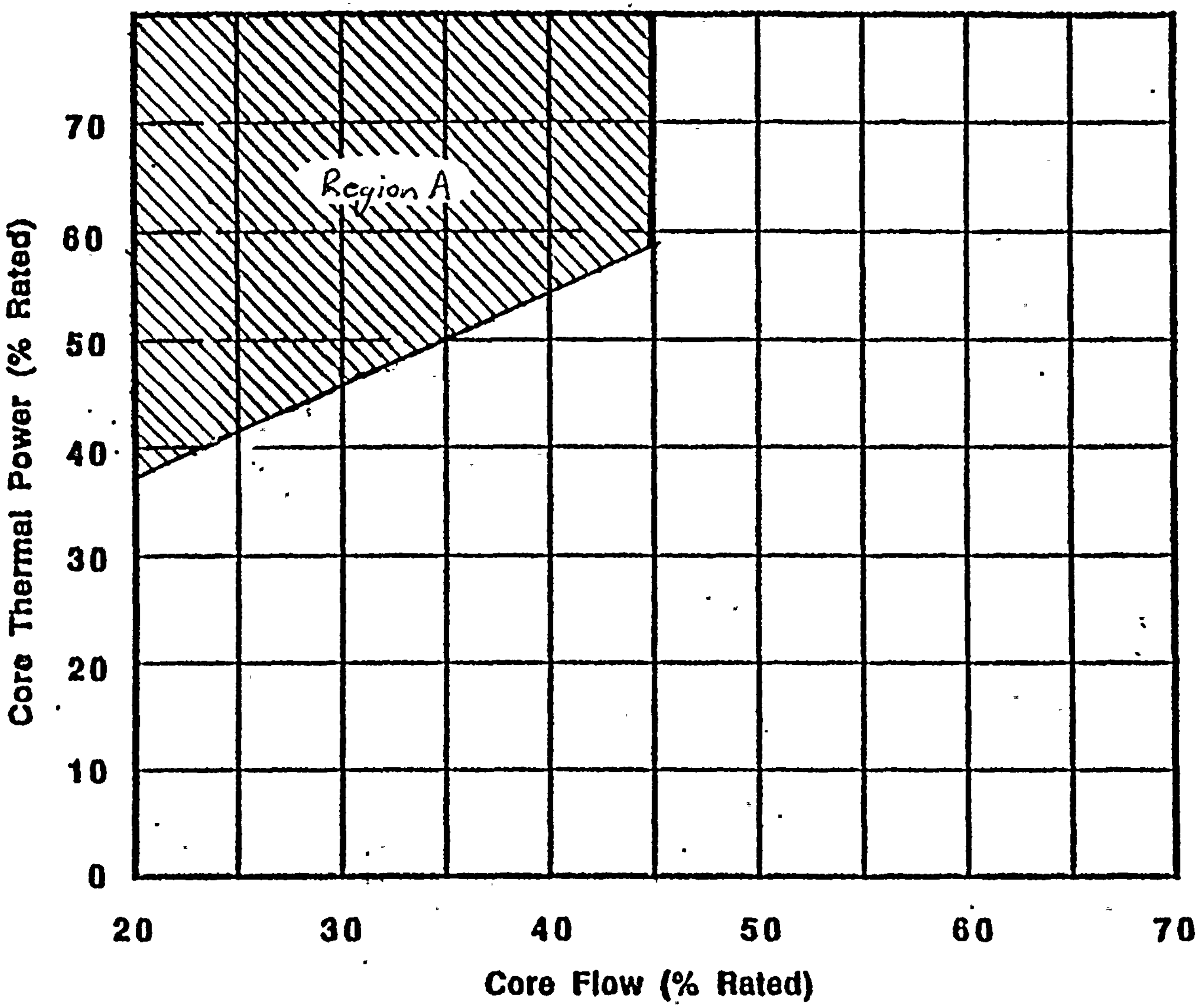

Operating Region Limits of Specification 3.2.6
Figure 3.2.6-1

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3/4.2.7 NEUTRON FLUX NOISE MONITORING

LIMITING CONDITION FOR OPERATION

3.2.7 The APRM and LPRM neutron flux noise levels shall not exceed three (3) times their established baseline values when operating in the region of APPLICABILITY.

APPLICABILITY: OPERATIONAL CONDITION 1 with THERMAL POWER/core flow in Region B of Figure 3.2.7-1, with two reactor coolant system recirculation loops in operation and total core flow less than 45% of rated total core flow, or with one reactor coolant system recirculation loop not in operation.

ACTION:

a. If baseline APRM and LPRM neutron flux noise levels have not been established for the appropriate reactor coolant system condition (one or two loop operation) since the most recent CORE ALTERATION, then:

   Within 2 hours exit the region of APPLICABILITY. Establish baseline APRM and LPRM neutron flux noise levels prior to re-entering Region B of Figure 3.2.7-1.

b. If baseline APRM and LPRM neutron flux noise levels have been established for the appropriate reactor coolant system condition (one or two loop operation) since the most recent CORE ALTERATION, then:

   With the APRM or LPRM neutron flux noise levels greater than three (3) times their established noise levels, initiate corrective action within 15 minutes to restore the noise levels to within the required limits within 2 hours or reduce THERMAL POWER to below the region of APPLICABILITY within the next 2 hours.

SURVEILLANCE REQUIREMENTS

4.2.7.1 The provisions of Specification 4.0.4 are not applicable.

4.2.7.2 The APRM and LPRM neutron flux noise levels shall be determined to be less than or equal to three (3) times their established baseline values:

a. At least once per 8 hours, and

b. Within 30 minutes after completion of a THERMAL POWER increase of greater than or equal to 5% of rated THERMAL POWER.

*Detector levels A and C of one LPRM string per core octant plus detector levels A and C of one LPRM string in the center of the core should be monitored.

3/4.2 POWER DISTRIBUTION LIMITS

3/4.2.7 STABILITY MONITORING - TWO LOOP OPERATION

LIMITING CONDITION FOR OPERATION

3.2.7 The stability monitoring system shall be operable* and the decay ratio of the neutron signals shall be less than .75 when operating in the region of APPLICABILITY.

APPLICABILITY: OPERATIONAL CONDITION 1, with two recirculation loops in operation and THERMAL POWER/core flow conditions which lay in Region ~~B~~ C of Figure 3.2.7-1

ACTION:

a. With decay ratios of any two (2) neutron signals greater than .75 or with two (2) consecutive decay ratios on any single neutron signal greater than .75:
As soon as practical, but in all cases within 15 minutes, ~~IMMEDIATELY~~ initiate action to reduce the decay ratio by either decreasing THERMAL POWER with control rod insertion or increasing core flow with recirculation flow control valve manipulation. The starting or shifting of a recirculation pump for the purpose of decreasing decay ratio is specifically prohibited.

b. With the stability monitoring system inoperable and when operating in the region of APPLICABILITY:
As soon as practical, but in all cases within 15 minutes, ~~IMMEDIATELY~~ initiate action to exit the region of APPLICABILITY by either decreasing THERMAL POWER with control rod insertion or increasing core flow with recirculation flow control valve manipulation. The starting or shifting of a recirculation pump for the purpose of exiting the region of APPLICABILITY when the stability monitoring system is inoperable is specifically prohibited. Exit the region of APPLICABILITY within one (1) hour.

SURVEILLANCE REQUIREMENTS:

4.2.7.1 The provisions of Specification 4.0.4 are not applicable.

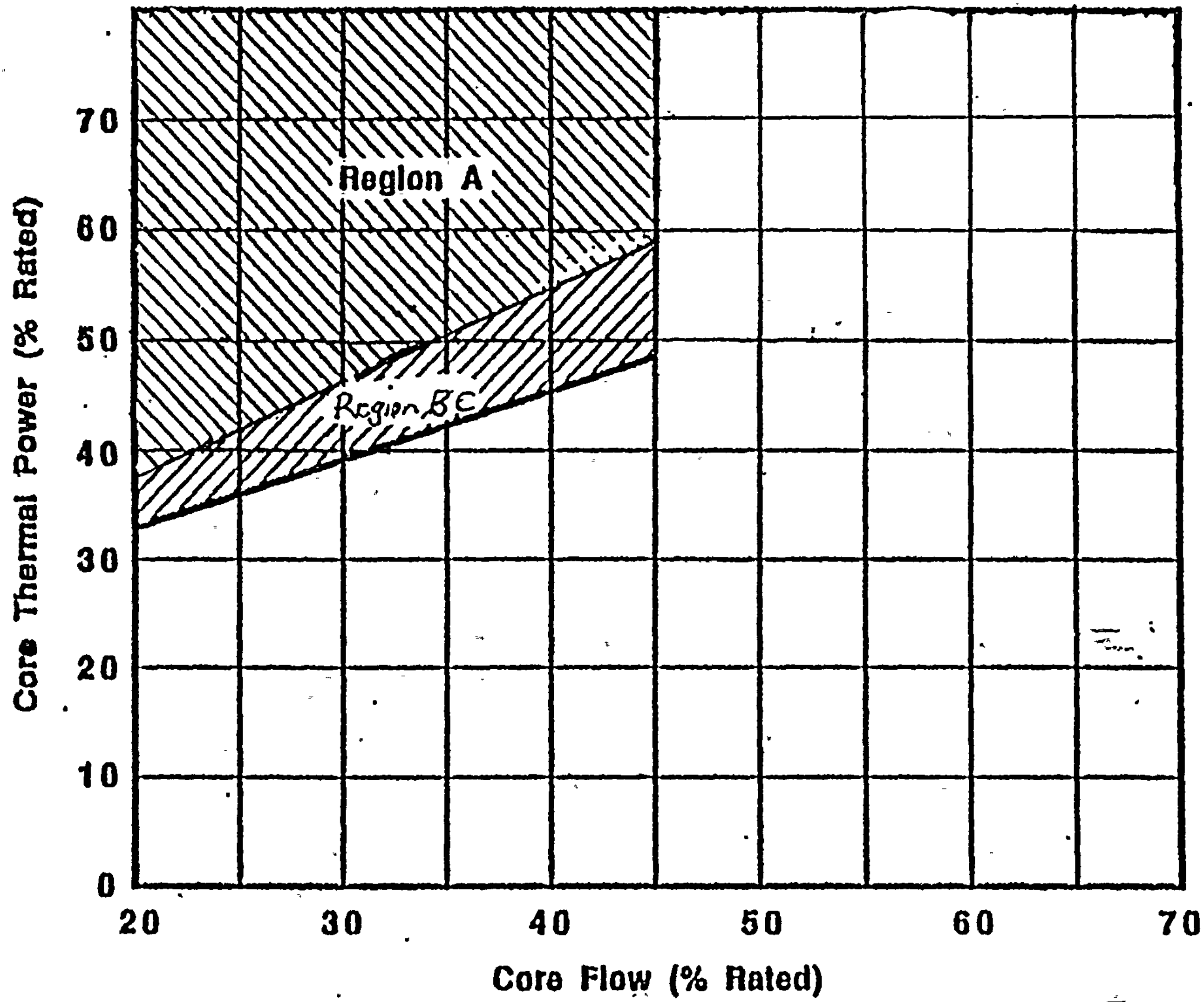
4.2.7.2 The stability monitoring system shall be demonstrated operable* within one (1) hour prior to entry into the region of APPLICABILITY.

4.2.7.3 ~~The~~ D decay ratios and peak-to-peak noise values calculated by ~~from~~ the stability monitoring system shall be monitored ~~following reactivity manipulation~~ when operating in the region of APPLICABILITY.

~~4.2.7.4 The decay ratios from the stability monitoring system shall be demonstrated to be less than 0.75 once every 24 hours when operating in the region of APPLICABILITY.~~

Verify that the stability monitoring system data acquisition and calculational modules are functioning, and that displayed values of signal decay ratio and peak-to-peak noise are being updated.

*Detector levels A and C (or B and D) of one LPRM string in each of the nine core regions (a total of 18 LPRM detectors) shall be monitored. A minimum of four (4) APRMs shall also be monitored.



Operating Region Limits of Specification 3.2.7
Figure 3.2,7-1

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3/4.2 POWER DISTRIBUTION LIMIT

3/4.2.8 STABILITY MONITORING - SINGLE LOOP OPERATION

LIMITING CONDITION FOR OPERATION

3.2.8 The stability monitoring system shall be operable* and the decay ratio of the neutron signals shall be less than .75 when operating in the region of APPLICABILITY.

APPLICABILITY: OPERATIONAL CONDITION 1, with one recirculation loop in operation and THERMAL POWER/core flow conditions lay in Region C of Figure 3.2.8-1.

ACTION:

a. With decay ratios of any two (2) neutron signals greater than .75 or with two (2) consecutive decay ratios on any single neutron signal greater than .75:
As soon as practical, but in all cases within 15 minutes, ~~IMMEDIATELY~~ initiate action to reduce the decay ratio by either decreasing THERMAL POWER with control rod insertion or increasing core flow with recirculation flow control valve manipulation. The starting or shifting of a recirculation pump for the purpose of decreasing decay ratio is specifically prohibited.

b. With the stability monitoring system inoperable and when operating in the region of APPLICABILITY:
As soon as practical, but in all cases within 15 minutes, ~~IMMEDIATELY~~ initiate action to exit the region of APPLICABILITY by decreasing THERMAL POWER via control rod insertion. Exit the region of APPLICABILITY within one (1) hour.

SURVEILLANCE REQUIREMENTS:

4.2.8.1 The provisions of Specification 4.0.4 are not applicable.

4.2.8.2 The stability monitoring system shall be demonstrated operable* within one (1) hour prior to entry into the region of APPLICABILITY.

4.2.8.3 ~~The~~ Decay ratios and peak-to-peak noise values calculated by ~~from~~ the stability monitoring system shall be monitored ~~following reactivity manipulation~~ when operating in the region of APPLICABILITY.

~~4.2.8.4 The decay ratios from the stability monitoring system shall be demonstrated to be less then 0.75 once every 24 hours when operating in the region of APPLICABILITY.~~
Verify that the stability monitoring system data acquisition and calculational modules are functioning, and that displayed values of signal decay ratio and peak-to-peak noise values are being updated.

*Detector levels A and C (or B and D) of one LPRM string in each of the nine core regions (a total of 18 LPRM detectors) shall be monitored. A minimum of four (4) APRMs should also be monitored.

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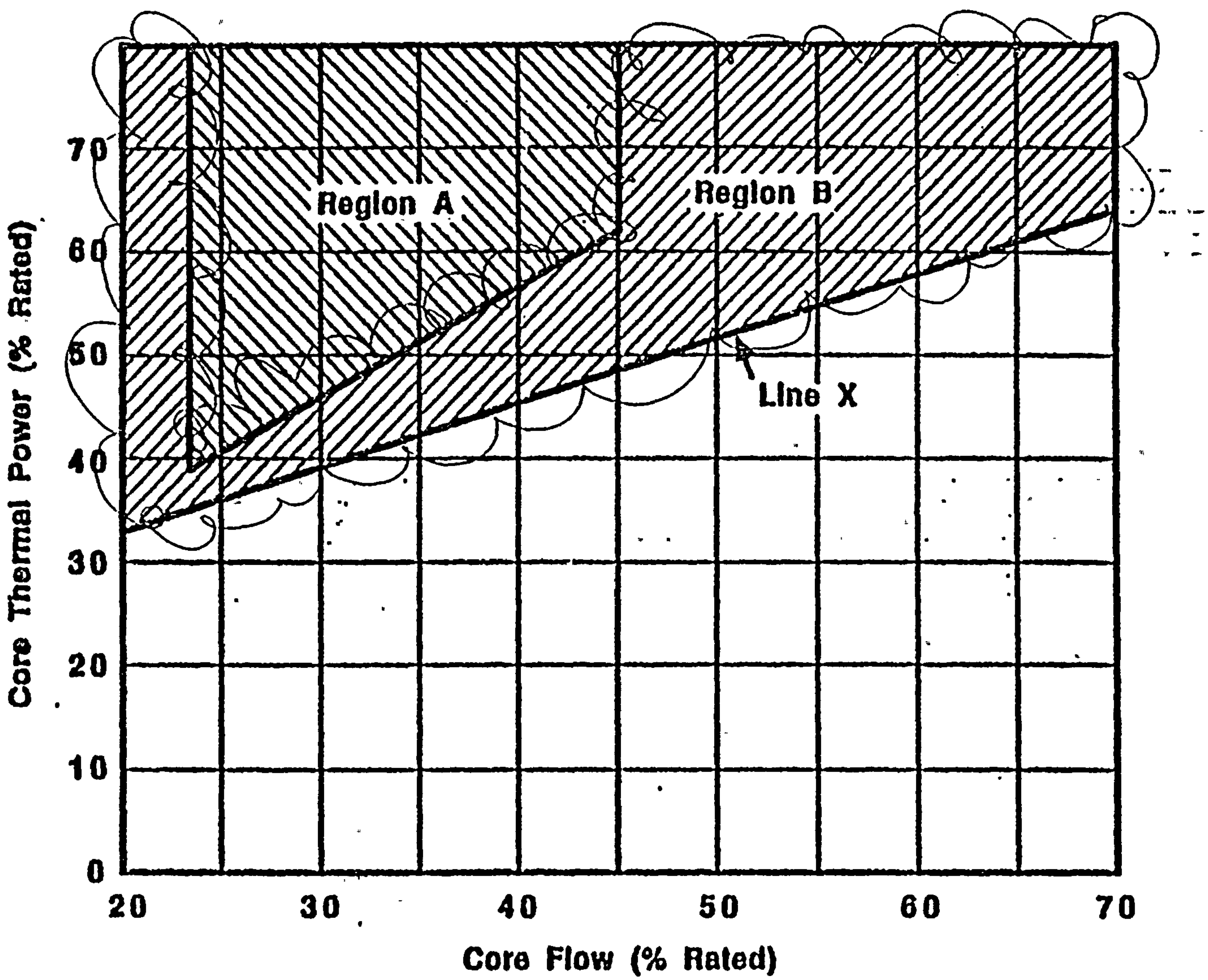
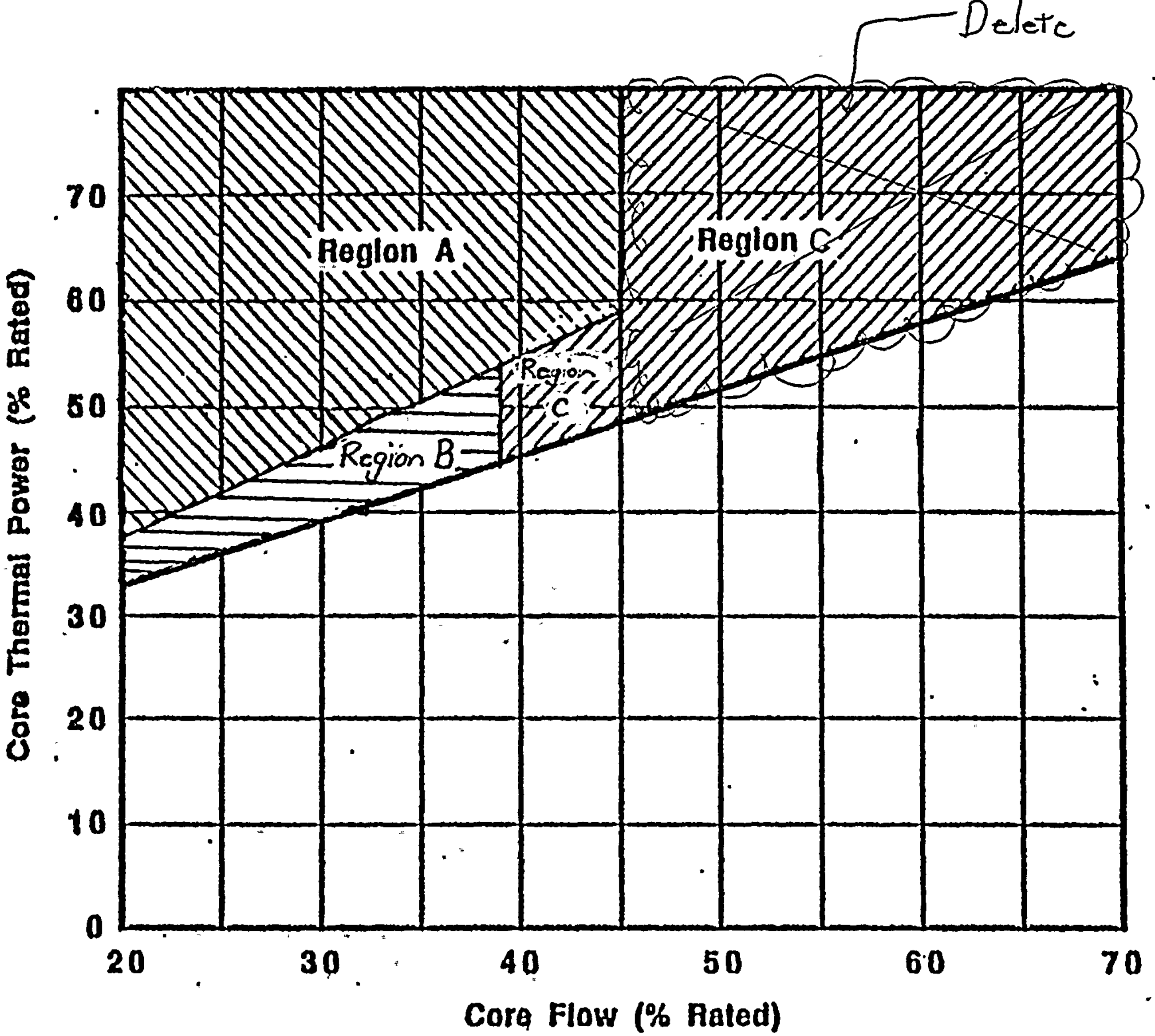


Operating Region Limits of Specification 3.2.7
Figure 3.2.7-1



Operating Region Limits of Specification 3.2.8
Figure 3.2.8-1

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3/4.4 REACTOR COOLANT SYSTEM

3/4.4.1 RECIRCULATION SYSTEM

RECIRCULATION LOOPS

LIMITING CONDITION FOR OPERATION

3.4.1.1 Two reactor coolant system recirculation loops shall be in operation.

APPLICABILITY: OPERATIONAL CONDITIONS 1* and 2*.

ACTION:

a. With one reactor coolant system recirculation loop not in operation:

~~1.~~ Within 15 minutes:

~~a. Verify that core flow is greater than or equal to 39% of rated core flow or that THERMAL POWER/core flow conditions lay below the line in Figure 3.4.1.1-1. With core flow less than 39% of rated core flow and THERMAL POWER/core flow conditions above the line in Figure 3.4.1.1-1, initiate action to reduce THERMAL POWER to below the line in Figure 3.4.1.1-1 or increase core flow to greater than or equal to 39% of rated core flow within the next 4 hours.~~

1. ~~b.~~ Verify that the requirements of LCO 3.2.6 and LCO 3.2.~~1~~8 are met, or comply with the associated ACTION statement(s) ~~within the specified time limits.~~

Insert B →

3. ~~2.~~ Within 4 hours:

a) Place the recirculation flow control system in the Local Manual (Position Control) mode, and

b) Increase the MINIMUM CRITICAL POWER RATIO (MCPR) Safety Limit by 0.01 to 1.07 per Specification 2.1.2, and,

c) Reduce the Maximum Average Planar Linear Heat Generation Rate (MAPLHGR) for General Electric fuel limit to a value of 0.84 times the two recirculation loop operation limit per Specification 3.2.1, and,

d) Reduce the volumetric flow rate of the operating recirculation loop to $\leq$ 41,725** gpm.

*See Special Test Exception 3.10.4.

**This value represents the actual volumetric recirculation loop flow which produces 100% core flow at 100% THERMAL POWER. This value was determined during the Startup Test Program.

INSERT B

2. Verify that THERMAL POWER/core flow conditions lay outside Region B of Figure 3.4.1.1-1.

as soon as practical, but in all cases within 15 minutes,

With THERMAL POWER/core flow conditions which lay in Region B of Figure 3.4.1.1-1, ~~IMMEDIATELY~~ initiate action to exit Region B by either decreasing THERMAL POWER with control rod insertion or increasing core flow with flow control valve manipulation. Within 1 hour exit Region B. The starting or shifting of a recirculation pump for the purpose of exiting Region B is specifically prohibited.

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LIMITING CONDITION FOR OPERATION (Continued)

ACTION: (Continued)

e) Perform Surveillance Requirement 4.4.1.1.2 if THERMAL POWER is ≤ 25%*** of RATED THERMAL POWER or the recirculation loop flow in the operating loop is ≤ 10%*** of rated loop flow.

~~f) Reduce recirculation loop flow in the operating loop until the core plate ΔP noise does not deviate from the established core plate ΔP noise patterns by more than 100%.~~

4 ~~3~~. The provisions of Specification 3.0.4 are not applicable.

5 ~~4~~. Otherwise, be in at least HOT SHUTDOWN within the next 12 hours.

b. With no reactor coolant system recirculation loops in operation, immediately initiate measures to place the unit in at least HOT SHUTDOWN within the next 6 hours.

~~change to All CAPS~~

SURVEILLANCE REQUIREMENTS

4.4.1.1.1 With one reactor coolant system recirculation loop not in operation, at least once per 8 hours verify that:

a. The recirculation flow control system is in the Local Manual (Position Control) mode, and

b. The volumetric flow rate of the operating loop is ≤ 41,725 gpm.**

**This value represents the actual volumetric recirculation loop flow which produces 100% core flow at 100% THERMAL POWER. This value was determined during the Startup Test Program.

***Final values were determined during Startup Testing based upon actual THERMAL POWER and recirculation loop flow which will sweep the cold water from the vessel bottom head preventing stratification.

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SURVEILLANCE REQUIREMENTS (Continued)

~~c. The core plate ΔP noise is less than 200% of the established core plate ΔP noise patterns.~~

c. ~~d.~~ Core flow is greater than or equal to 39% of rated core flow when core THERMAL POWER is greater than the limit specified in Figure 3.4.1.1-1.

4.4.1.1.2 With one reactor coolant system recirculation loop not in operation, within no more than 15 minutes prior to either THERMAL POWER increase or recirculation loop flow increase, verify that the following differential temperature requirements are met if THERMAL POWER is ≤ 25%*** of RATED THERMAL POWER or the recirculation loop flow in the operating recirculation loop is ≤ 10%*** of rated loop flow:

a. ≤ 145°F between reactor vessel steam space coolant and bottom head drain line coolant,

b. ≤ 50°F between the reactor coolant within the loop not in operation and the coolant in the reactor pressure vessel, and

c. ≤ 50°F between the reactor coolant within the loop not in operation and the operating loop.

The differential temperature requirements of Specification 4.4.1.1.2b. and c. do not apply when the loop not in operation is isolated from the reactor pressure vessel.

4.4.1.1.3 Each reactor coolant system recirculation loop flow control valve shall be demonstrated OPERABLE at least once per 18 months by:

a. Verifying that the control valve fails "as is" on loss of hydraulic pressure (at the hydraulic control unit), and

b. Verifying that the average rate of control valve movement is:

1. Less than or equal to 11% of stroke per second opening, and

2. Less than or equal to 11% of stroke per second closing.

***Final values were determined during Startup Testing based upon actual THERMAL POWER and recirculation loop flow which will sweep the cold water from the vessel bottom head preventing stratification.

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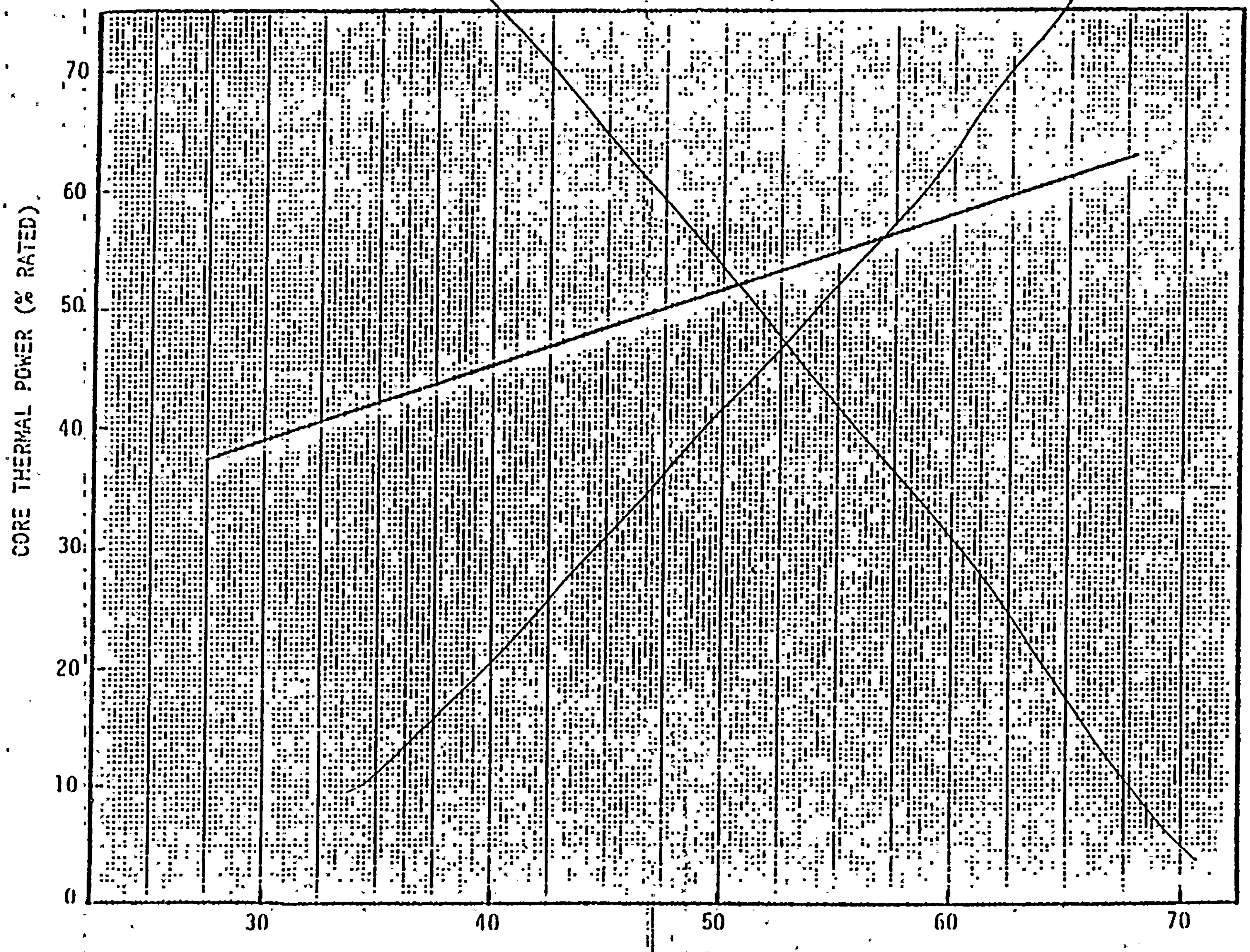
FIGURE 3.4.1.1-1

THERMAL POWER LIMITS OF SPECIFICATION 3.4.1.1-1



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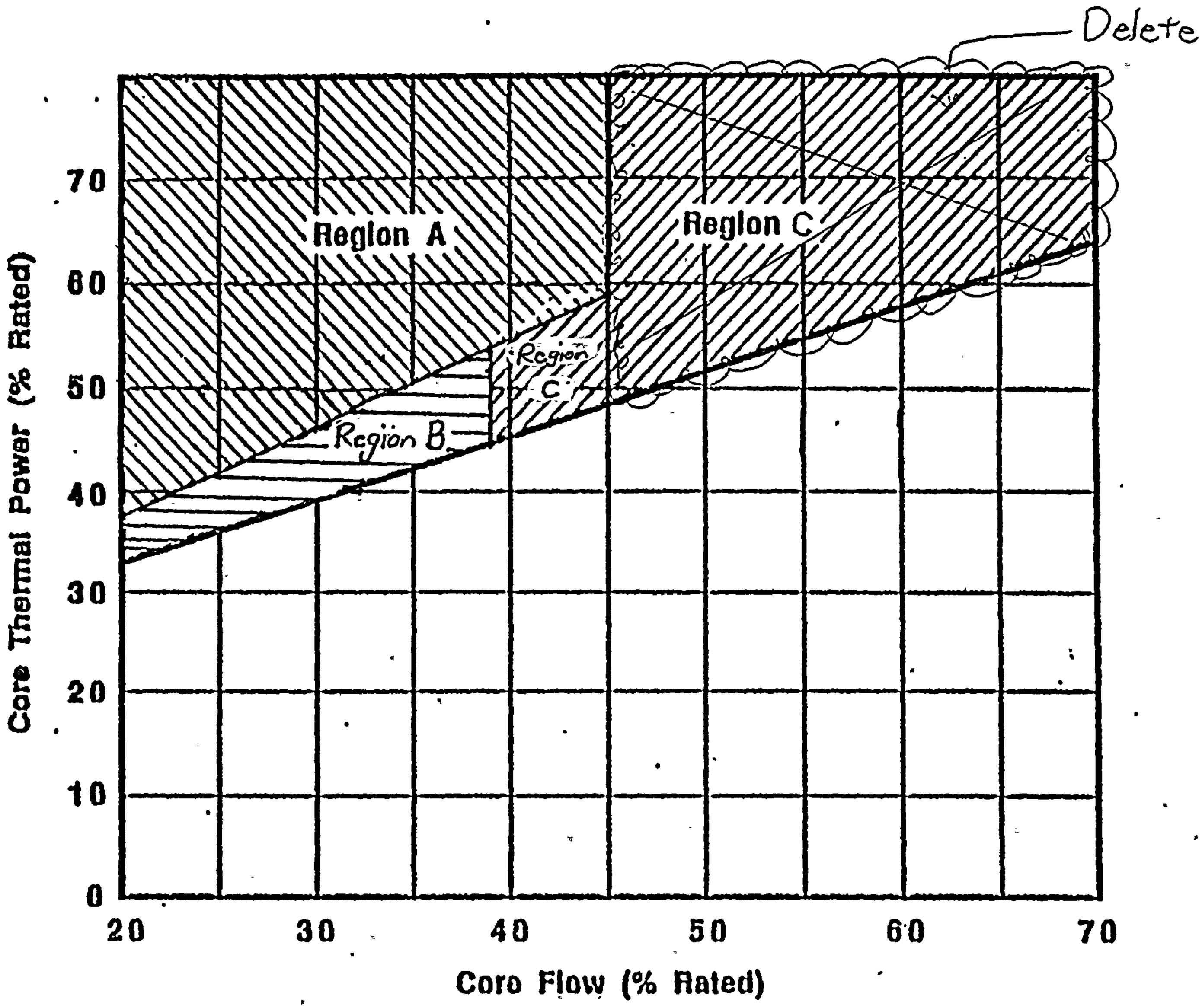

Operating Region Limits of Specification 3.4.1.1
Figure 3.4.1.1-1

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POWER/FLOW INSTABILITY (Continued)

Predicated on the SIL 380 endorsement, WNP-2 has divided the power/flow map on the following boundary lines:

1. 80% rod line
2. 45% core flow line
3. ~~APRM rod block line minus 3% power~~ *100% rod line*
4. Natural Circulation flow line
5. Minimum Forced Circulation for normal recirculation lineup.

(Region A) *the more conservative of either the 100% rodline or a line defining a calculated decay ratio of 0.9* *replace*

This division conforms to the SIL 380 recommendations~~, with a 3% power penalty on the APRM rod block line.~~ For LCO 3.2.6, the region of concern is bounded by ~~the APRM rod block line, minus 3% power,~~ the natural circulation flow line, and the 45% core flow line. Calculated decay ratios between ~~the two flow lines and on the APRM rod block line minus 3%~~ must be less than .9. Operation in the region between the two flow lines and above ~~the rod block line minus 3%~~ is forbidden due to the potential for boiling instabilities.

outside Region A

~~For the ease of annual licensing submittals, a 3% margin from the rod block line is taken to avail the opportunity to submit with no Technical Specification changes under the provisions of 10 CFR 50.59. This 3% provides margin to assure that vendor stability calculations can easily support the allowable operating region. For calculational ease the power boundary is linearized between two points, (24% Flow, 39% Power) and (45% Flow, 62% Power).~~

3/4.2.7 ~~NEUTRON FLUX NOISE~~ *STABILITY* MONITORING *- TWO LOOP OPERATION*

At the high power/low flow corner of the operating domain, a small probability of limit cycle neutron flux oscillations exists depending on combinations of operating conditions (e.g., rod patterns, power shape). To provide assurance that neutron flux limit cycle oscillations are detected and suppressed, APRM and LPRM neutron flux ~~noise levels~~ *signal decay ratios* should be monitored while operating in this region.

Stability tests at operating BWRs were reviewed to determine a generic region of the power/flow map in which surveillance of neutron flux noise levels should be performed. A conservative decay ratio of 0.75 was chosen as the basis for determining the generic region for surveillance to account for the plant to plant variability of decay ratio with core and fuel designs. This generic region has been determined to correspond to a core flow of less than or equal to 45% of rated core flow and a thermal power greater than that ~~specified in Figure 3.4.1.1-1 (Reference).~~ *corresponding to the 80% rodline.*

Insert C

~~Neutron flux noise limits are also established to ensure early detection of limit cycle neutron flux oscillations. BWR cores typically operate with neutron flux noise caused by random boiling and flow noise. Typical neutron flux noise levels of 1-12% of rated power (peak-to-peak) have been reported for the range of low to high recirculation loop flow during both single and dual~~

Replace w the following page

INSERT C

Stability monitoring is performed utilizing the ANNA system. The ANNA system shall be used to monitor APRM and LPRM signal decay ratios when operating in the region of concern.

3/4.2.8 STABILITY MONITORING - SINGLE LOOP OPERATION

The basis for stability monitoring during single loop operation is consistent with that given above for two loop operation. The defined region where surveillance is required is larger for single loop operation due to a potential reduction in the stabilizing effect of forced circulation.

INSERT C

Stability monitoring is performed utilizing the ANNA system. The system shall be used to monitor APRM and LPRM signal decay ratio and peak-to-peak noise values when operating in the region of concern. A minimum number of LPRM and APRM signals are required to be monitored in order to assure that both global (in-phase) and regional (out-of-phase) oscillations are detectable. Decay ratios are calculated from 30 seconds worth of data at a sample rate of 10 samples/second. This sample interval results in some inaccuracy in the decay ratio calculation, but provides rapid update in decay ratio data. A decay ratio of 0.75 is selected as a decay ratio limit for operator response such that sufficient margin to an instability occurrence is maintained. When operating in the region of applicability, decay ratio and peak-to-peak information shall be continuously calculated and displayed. A surveillance requirement to continuously monitor decay ratio and peak-to-peak noise values ensures rapid response such that changes in core conditions do not result in approaching a point of instability.

3/4.2.8 STABILITY MONITORING - SINGLE LOOP OPERATION

The basis for stability monitoring during single loop operation is consistent with that given above for two loop operation. The smaller size of the region of allowable operation, Region C, is due to a limit on the allowed flow above the 80% rodline. When operating above the 80% rodline in single loop operation, the core flow is required to be greater than 39%.

NEUTRON FLUX NOISE MONITORING (Continued)

recirculation loop operation. Stability tests at operating BWRs have demonstrated that when stability related neutron flux limit cycle oscillations occur they result in peak-to-peak neutron flux limit cycles of 5-10 times the typical values. Therefore, actions taken to reduce neutron flux noise levels exceeding three (3) times the typical value are sufficient to ensure early detection of limit cycle neutron flux oscillations.

Typically, neutron flux noise levels show a gradual increase in absolute magnitude as core flow is increased (constant control rod pattern) with two reactor recirculation loops in operation. Therefore, the baseline neutron flux noise level obtained at a specific core flow can be applied over a range of core flows. To maintain a reasonable variation between the low flow and high flow ends of the flow range, the range over which a specific baseline is applied should not exceed 20% of rated core flow with two recirculation loops in operation. Data from tests and operating plants indicate that a range of 20% of rated core flow will result in approximately a 50% increase in neutron flux noise level during operation with two recirculation loops. Baseline data should be taken near the maximum rod line at which the majority of operation will occur. However, baseline data taken at lower rod lines (i.e., lower power) will result in a conservative value since the neutron flux noise level is proportional to the power level at a given core flow.

In the case of single loop operation (SLO), the normal neutron flux noise may increase more rapidly when reverse flow occurs in the inactive jet pumps. This justifies a smaller flow range under high flow SLO conditions. Baseline data should be taken at flow intervals which correspond to less than a 50% increase in APRM neutron flux noise level. If baseline data are not specifically available for SLO, then baseline data with two recirculation loops in operation can be conservatively applied to SLO since for the same core flow SLO will exhibit higher neutron flux noise levels than operation with two loops. However, because of reverse flow characteristics of SLO, the core flow/drive flow relationship is different than the two loop relationship and therefore the baseline data for SLO should be based on the active loop recirculation drive flow, and not the core flow. Because of the uncertainties involved in SLO at high reverse flows, baseline data should be taken at or below the power specified in Figure 3.4.1.1-1. This will result in approximately a 25% conservative baseline value if compared to baseline data taken near the rated rod line and will therefore not result in an overly restrictive baseline value, while providing sufficient margin to cover uncertainties associated with SLO.

PLANT PROCESS COMPUTER REPLACEMENT SYSTEM (PPCRS) OVERVIEW

HARDWARE

The Washington Public Power Supply System Unit 2 Process Computer system consists of a DEC VAX 8200 CPU and peripherals as follows:

- o 12.0 MB Memory
- o Floating Point Processor
- o Battery Backup
- o Disk Controllers
- o RA60 Disk Drive
- o RA81 Disk Drives
- o TS05 Tape Drive with UNIBUS controller
- o UNIBUS Adaptors
- o DMZ-32AP Multipurpose Communication Controllers
- o LA100 Console Terminal
- o VT241, VT340 CRTs and IBM-PS-2
- o Alarm Printers (CITOH 600)

The Telemetry Front End consists of the following:

- o 10 EMR 609-19-0-0-4447A PCM Equipment cases
- o 2 EMR 609-19-0-0-4447B PCM Equipment cases
- o 3 EMR 609-19-0-0-4447C PCM Equipment cases
- o 40 EMR 620-01 Dual signal conditioners
- o 80 EMR 621-03 Thermocouple/EMF, Plug-in
- o 3 EMR 671-01-1 Analog multiplexer
- o 80 EMR 671-01-2 Analog multiplexer
- o 1 EMR 681-01-4-1-3-68.0-255-0 PCM Encoder
- o 2 EMR 681-01-4-1-3-136.0-255-0 PCM Encoder
- o 3 EMR 683-04 Serial to parallel interface
- o 3 EMR 687 Central timing cards
- o 15 EMR 688 Voltage detect cards
- o 1 EMR 741 Time Code Generator/Translator
- o 1 EMR 715 Multiplex Preprocessor
- o 5 EMR 760 Buffered Data Channels

SOFTWARE

Prior to the inclusion of the ANNA system the PPCRS software consists of five major subsystems (1) Front End Setup, (2) Acquisition Control, (3) Real Time Displays, (4) Historical Displays and (5) NSS Calculations and Displays. All of the required setup files and parameter description files necessary to use the system can be viewed built or modified using subsystem 1, the Front End Setup subsystem. Following setup, the starting of data, processing control functions, and stopping data are controlled from subsystem 2, the Acquisition Control subsystem. Data can be monitored as it actively passes thru the system in real time using subsystem 3, the Real Time Display subsystem. Subsystem 4, the Historical Display subsystem, allows the user to analyze data retrieved from the circular history files or alarm files from the disk storage devices. Subsystem 5, The NSS calculation and Display allows the user the ability to review such items as control rod positions LPRM/APRM readings, Heat Balance and TIP information. An overview of the subsystems is included in enclosure 1.

The user accesses all PPCRS functions via a menu tree. The user selects the function desired by typing the appropriate alphabetic character followed by a carriage return, which directs the user to a submenu. If the user enters an alphabetic character followed by a numeric selection, (i.e. F5), then item 5 on submenu F would be executed immediately without responding to submenus.

Each menu has a status block that defines the overall health of the system. Figure 1 shows the status block that was presented to the user prior to the inclusion of the ANNA system. Figure 2 shows the menus available at that time.

With the inclusion of ANNA, a separate menu was included for ANNA functions (Figure 3), the status block was updated (Figure 4) and the main menu provided access to the new functions (Figure 5).

The ANNA system, as stated, is presently functional on the PPCRS computer. In order to optimize its calculational time, procurement is in progress to expand the PPCRS capabilities by adding a second dedicated CPU to perform the required ANNA calculations. The second CPU will be networked to the VAX 8200 and required plant data will be transmitted to the new computer at ten samples per second per point. Post the completion of the calculations the results will be transmitted back to the original computer. Utilizing this philosophy the results will be available to users of both machines in a faster time frame than presently exists. Figures 6 and 7 show the existing and phase two configuration.

FIGURE 1 SYSTEM STATUS BLOCK (PRE-ANNA)

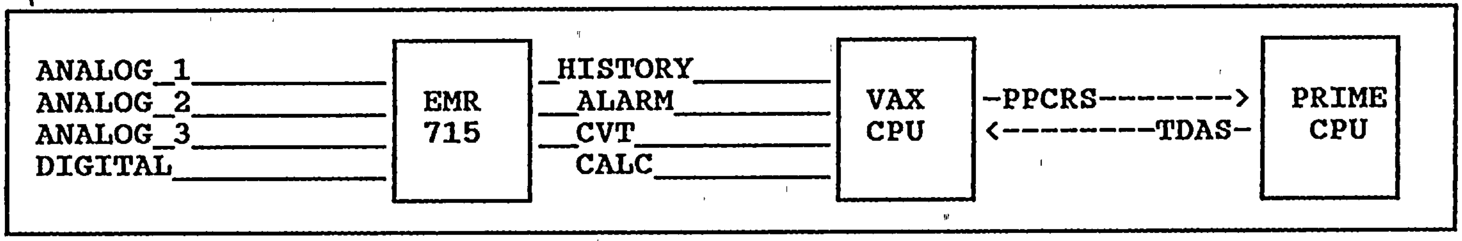
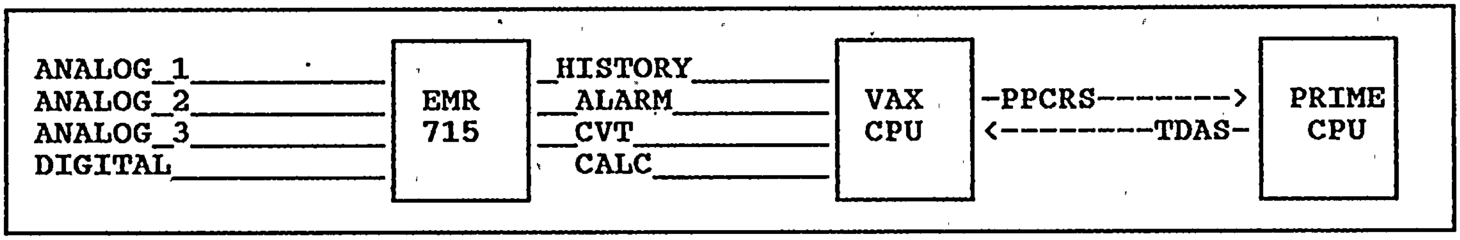


FIGURE 2 PPCRS MENUS (PRE-ANNA)

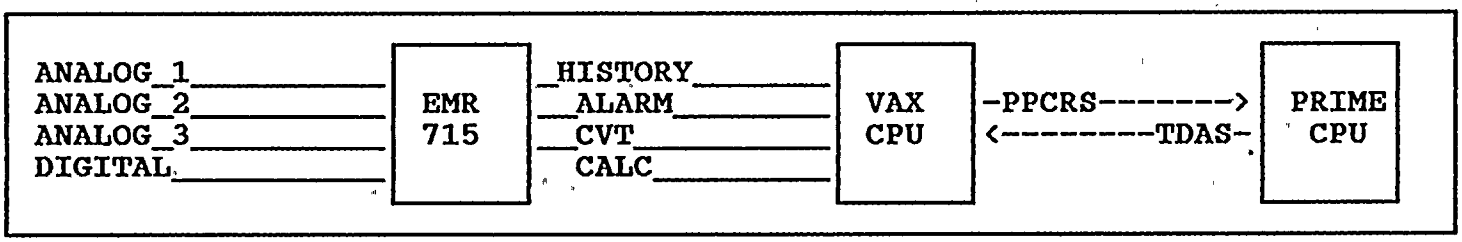
WNP2 MAIN MENU   Terminal ID RTA1:   ADMIN



Fn	Front End Setup Maintenance	Nn	NSS Functions
An	Acquisition Control	Ln	Logging & Report Functions
Rn	Real Time Analysis	Pn	Plant Status Displays
Hn	Historical Analysis		

HE HELP   EX EXIT TO VMS   LO LOGOFF SYSTEM

WNP2 FRONT END SETUP MENU Terminal ID RTA1:   ADMIN



1	Parameter Data Base Functions	5	Dynamic Updates
2	Active/Inactive Links	6	Calibration
3	Load EMR 715 Preprocessor		
4	Prime Computer Data Rate		

HE HELP Information   EX Return to MAIN MENU

ENTER MENU SELECTION

FIGURE 7 SYSTEM STATUS PAGE (PRE ALARM)

ANALOG 1 ANALOG 2 ANALOG 3 DIGITAL	EMR 715	HISTORY ALARM CVT CALC	VAX CPU	PPCRS	TDAS	PRIME CPU

FIGURE 8 USERS MENUS (PRE ALARM)

SNUPPS MAIN MENU   Terminal ID RTA1:   ADMIN

ANALOG 1 ANALOG 2 ANALOG 3 DIGITAL	EMR 715	HISTORY ALARM CVT CALC	VAX CPU	PPCRS	TDAS	PRIME CPU

FR	Front End Setup Maintenance	NR	NPS Functions
AR	Acquisition Control	LP	Logging & Report Functions
RO	Real Time Analysis	PS	Plant Status Display
HA	Historical Analysis		
BF	HELP		LOGOFF SYSTEM

SNUPPS FRONT END SETUP MENU Terminal ID RTA1: ADMIN

ANALOG 1 ANALOG 2 ANALOG 3 DIGITAL	EMR 715	HISTORY ALARM CVT CALC	VAX CPU	PPCRS	TDAS	PRIME CPU

1	Parameter Data Base Functions	5	Dynamic Updates
2	Active/Inactive Bits	6	Calibration
3	Load EMR 715 Preprocessor		
4	Print Computer Data Base		
BF	Help Information	PF	Return to MAIN MENU

FIGURE 9 FRONT END SETUP SELECTION

WNP2 ACQUISITION CONTROL MENU Terminal RTA1: ADMIN

```
ANALOG_1________   EMR   _HISTORY_______   VAX   -PPCRS-------->   PRIME
ANALOG_2________   715   __ALARM________   CPU   <---------TDAS-   CPU
ANALOG_3________         __CVT__________
DIGITAL_________           CALC_________
```

1 START Data Acq. & Derived Processing	6 START Derived Processing
2 STOP Data Acq. & Derived Processing	7 STOP Derived Processing
3 MONITOR Data Acquisition	8 START TDAS Data XFR to PPCRS
4 START PPCRS Data XFR to PRIME	9 STOP TDAS Data XFR to PPCRS
5 STOP PPCRS Data XFR to PRIME	
HE HELP Information	EX Return to MAIN MENU

ENTER MENU SELECTION

WNP2 REAL TIME MENU Terminal ID RTA1: ADMIN

```
ANALOG_1________   EMR   _HISTORY_______   VAX   -PPCRS-------->   PRIME
ANALOG_2________   715   __ALARM________   CPU   <---------TDAS-   CPU
ANALOG_3________         __CVT__________
DIGITAL_________           CALC_________
```

1 GRAPHIC (4 Parameter)	5 SUMMARY DISPLAY/PRINTOUTS
2 FULL Descriptor (4 Parameter)	6 LAST 20 MESSAGES (ACK/NAK)
3 ALARM Monitor (16 Parameter)	
4 ALPHANUMERIC Monitor (32 Parameter)	
HE HELP Information	EX Return to MAIN MENU

ENTER MENU SELECTION

MAIN ... MONITOR MENU   Terminal STAT: ADMIN

ANALOG 1 ANALOG 2 ANALOG 3 DIGITAL	EMR 715	HISTORY ALARM CVT DATA	VAX CPU	PPCPS TDAS	PRIME CPU

1 START Data Acq. & Derived Processing   6 START Derived Processing
2 STOP Data Acq. & Derived Processing   7 STOP Derived Processing
3 MONITOR Data Acquisition   8 START TDAS Data PIPE to PPCPS
4 START EMR Data XFR to PRIME   9 STOP TDAS Data XFR to PPCPS
5 STOP EMR Data XFR to PRIME

HE HELP Information   EX Return to MAIN MENU

ENTER MENU SELECTION

EMIS REAL TIME MENU   Terminal ID STAT: ADMIN

ANALOG 1 ANALOG 2 ANALOG 3 DIGITAL	EMR 715	HISTORY ALARM CVT DATA	VAX CPU	PPCPS TDAS	PRIME CPU

1 GRAPHIC (4 Parameters)   5 SUMMARY DISPLAY/PRINTOUTS
2 LOG Report (4 Parameter)   6 LAST 20 MESSAGES (ACK/NAK)
3 ALARM Monitor (16 Parameters)
4 ALPHANUMERIC Monitor (32 Parameters)

HE Help Information   EX Return to MAIN MENU

ENTER MENU SELECTION

WNP2 HISTORICAL ANALYSIS MENU Terminal RTA1: ADMIN

```
ANALOG_1_________   EMR    _HISTORY_______    VAX    -PPCRS-------->   PRIME
ANALOG_2_________   715    __ALARM________    CPU    <---------TDAS-    CPU
ANALOG_3_________          __CVT__________
DIGITAL__________            CALC_________
```

1 GRAPHIC (4 Parameter)	3 ALPHANUMERIC Monitor (32 Parameter)
2 FULL Descriptor (4 Parameter)	4 SECONDARY File Maintenance

HE HELP Information   EX Return to MAIN MENU

ENTER MENU SELECTION

WNP2 NSS MENU Terminal ID RTA1: ADMIN

```
ANALOG_1_________   EMR    _HISTORY_______    VAX    -PPCRS-------->   PRIME
ANALOG_2_________   715    __ALARM________    CPU    <---------TDAS-    CPU
ANALOG_3_________          __CVT__________
DIGITAL__________            CALC_________
```

1 Control Rod Position Display	5 TIP Data Acquisition
2 Control Rod Status Display	6 Immediate POWERPLEX MON Run
3 LPRM/APRM Readings Display	7 DASEDIT (CR, LPRM, HEAT BAL.)
4 Heat Balance and APRM Calib.	8 Control Rod & Heat Balance Disp.

HE HELP   EX Return to MAIN MENU

ENTER MENU SELECTION

WNP2 ABNORMAL ANALYSIS MENU Terminal RIA1: ADMIN

ANALOG 1 / ANALOG 2 / ANALOG 3 / DIGITAL → EMR 715 → HISTORY / ALARM / CVT / CALC → VAX CPU → FPCRS → PLMS → PLANT CPU

1 OPAL (?? Parameters)   3 UPRANUMERIC Monitor (32 Parameters)

2 File Description (4 Parameter)   4 SECONDARY File Maintenance

HE Help Information   EX Return to MAIN MENU

ENTER MENU SELECTION

WNP2 MSS MENU   Terminal ID RS01: ADMIN

ANALOG 1 / ANALOG 2 / ANALOG 3 / DIGITAL → EMR 715 → HISTORY / ALARM / CVT / CALC → VAX CPU → FPCRS → PLMS → PLANT CPU

1 Control Rod Position Display   5 TIP Data Acquisition

2 Control Rod Status Display   6 Immediate POWERPLEX MON Run

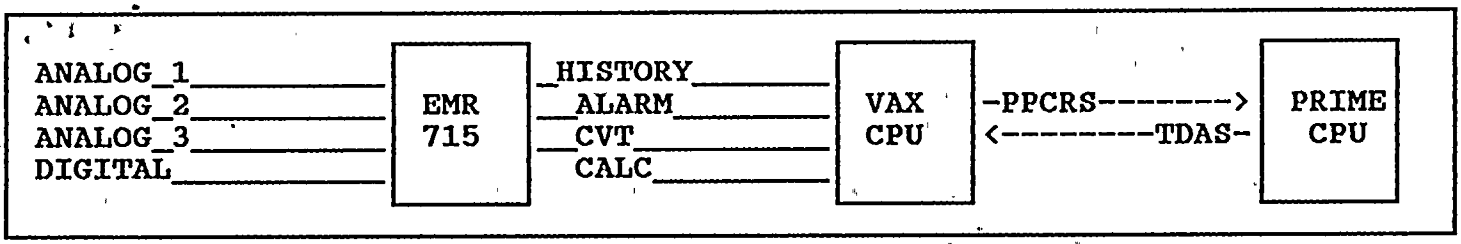
3 LPRM/APRM Readings Display   7 DASP-11 (CR, LPRM, HEAT BAL.)

4 Heat Balance and APRM Calib.   8 Control Rod & Heat Balance Disp.

HE HELP   EX Return to MAIN MENU

ENTER MENU SELECTION

WNP2 LOGGING & REPORT MENU Term.ID RTA1: ADMIN

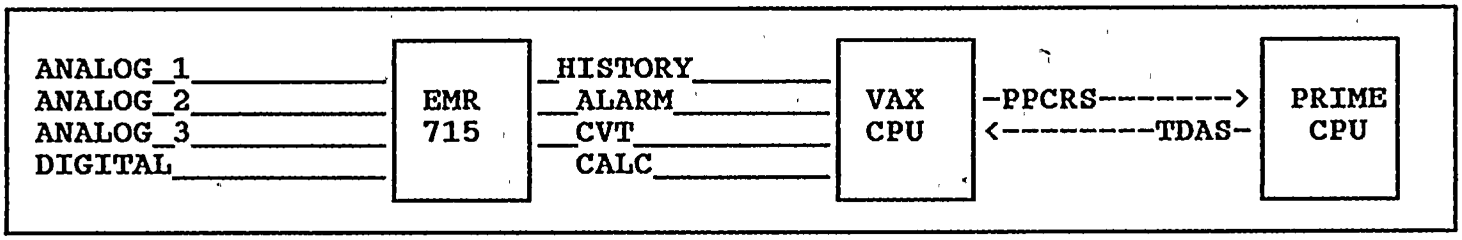


1	Thermal Power & Net Heat-Rate	5
2	Jet Pump Operability	6
3	6 Hour Historical and Delta Data	7
4	APRM/Core Thermal Power CCC	8

HE HELP EX Return to MAIN MENU

ENTER MENU SELECTION

WNP2 PLANT STATUS MENU Term.ID RTA1: ADMIN



1	Reactor Heat Balance Display	6	RHR - Shutdown Cooling Display
2	Steam Cycle Display	7	Main Turbine Display
3	Circulating Water Display	8	Main Generator Display
4	Cooling Tower Display	9	Reactor Heatup/Cooldown Display
5	Power to Flow & Reactor Display		

HE HELP EX Return to MAIN MENU

ENTER MENU SELECTION

WNP-2 [illegible] REPORT MENU Term ID RTA1: ADMIN

ANALOG 1 ANALOG 2 ANALOG 3 DIGITAL	EMR 715	HISTORY ALARM CVT CALC	VAX CPU	PICPS <	TDAS	PRIME CPU

1 Thermal Power & Net Heat Rate 5

2 [illegible] Plant Operability 6

3 [illegible] Electrical and Boiler Data 7

4 APRM/Core Thermal Power Calc 8

HE HELP EX Return to MAIN MENU

ENTER MENU SELECTION

WNP-2 PLANT STATUS MENU Term ID RTA1: ADMIN

ANALOG 1 ANALOG 2 ANALOG 3 DIGITAL	EMR 715	HISTORY ALARM CVT CALC	VAX CPU	PICPS <	TDAS	PRIME CPU

1 Reactor Heat Balance Display
2 Steam Cycle Display
3 Circ and Feed Water Display
4 Cooling Tower Display
5 Recirc Flow & Reactor Display
6 RHR Shutdown Cooling Display
7 Main Turbine Display
8 Main Generator Display
9 Reactor Heatup/Cooldown Display

HE HELP EX Return to MAIN MENU

ENTER MENU SELECTION

FIGURE 3 ANNA MAIN MENU

```
ANALOG_1______  EMR   __HISTORY_____  VAX  --PPCRS---------> PRIME   %PWR =
ANALOG_2______  715   __ALARM_______  CPU  <----------TDAS-- CPU     CTP  =
ANALOG_3______        __CVT_________       ______ANNA                GMWE =
                        CALC________                                 WT   =
```

```
 1  START ANNA Data Acquisition           7  Regional Autocorrelation
 2  STOP  ANNA Data Acquisition           8  Power to Flow Autocorrelations
 3  START ANNA Calc. Monitor              9  ANNA_AR Autoregressive Analysis
 4  STOP  ANNA Calc. Monitor             10  ANNA OPERABILITY Display
 5  Tabular Log                          11  Set Signal Selection and Limits
 6  Decay Ratio/Frequency BAR Graph

         HE HELP                              EX Return to MAIN MENU
```

FIGURE 4
ANNA STATUS INFORMATION
(DAS AND CALC OPERATIONAL)

```
ANALOG_1______  EMR   __HISTORY_____  VAX  --PPCRS---------> PRIME   %PWR =
ANALOG_2______  715   __ALARM_______  CPU  <----------TDAS-- CPU     CTP  =
ANALOG_3______        __CVT_________       ______ANNA                GMWE =
                        CALC________                                 WT   =
```

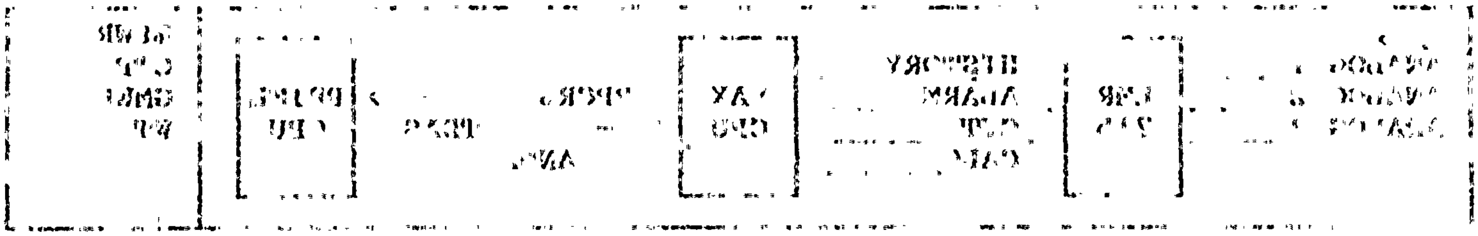
ANNA STATUS INFORMATION
(DAS AND CALC NOT OPERATIONAL & NOT WITHIN APPLICABLE POWER RANGE)

```
ANALOG_1______  EMR   __HISTORY_____  VAX  --PPCRS---------> PRIME   %PWR =
ANALOG_2______  715   __ALARM_______  CPU  <----------TDAS-- CPU     CTP  =
ANALOG_3______        __CVT_________       _N/A__ANNA                GMWE =
                        CALC________                                 WT   =
```

ANNA STATUS INFORMATION
(DAS OPERATIONAL AND CALC NOT OPERATIONAL)

```
ANALOG_1______  EMR   __HISTORY_____  VAX  --PPCRS---------> PRIME   %PWR =
ANALOG_2______  715   __ALARM_______  CPU  <----------TDAS-- CPU     CTP  =
ANALOG_3______        __CVT_________       _DAS__ANNA                GMWE =
                        CALC________                                 WT   =
```

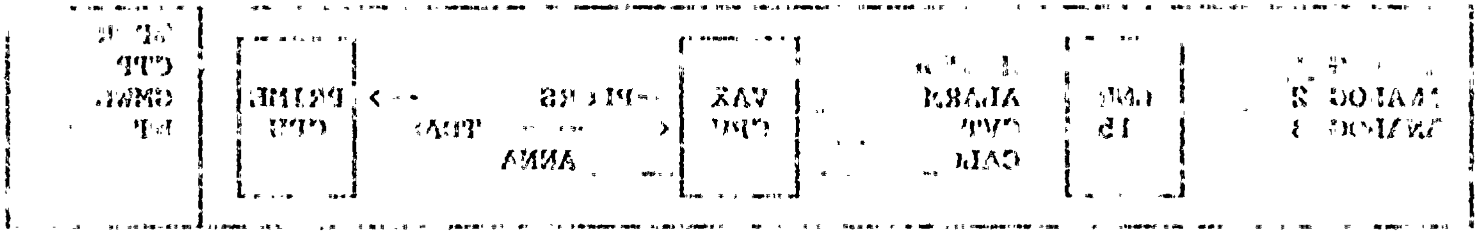
FIGURE . ANNA MAIN MENU



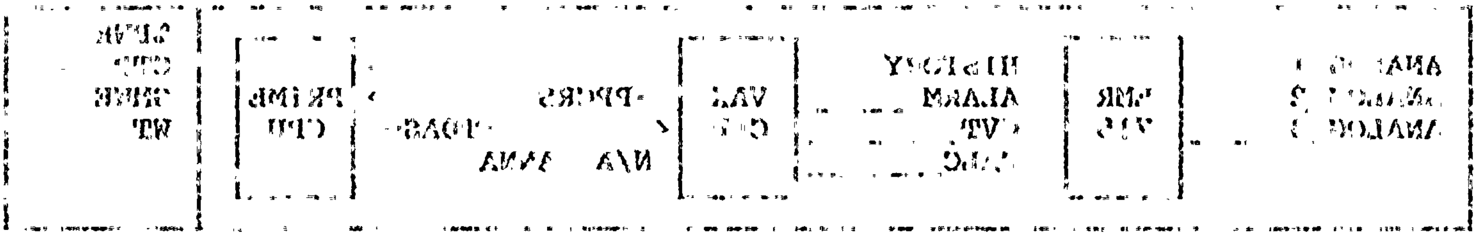
1 START ANNA Data Acquisition	7 Rept and Autocorrelation
2 STOP ANNA Data Acquisition	8 Power to Flow Autocorrelation
3 START ANNA Calc Monitor	9 ANNA AR Autoregressive Analysis
4 STOP ANNA Calc Monitor	10 ANNA OPERABILITY Display
5 Simulator Key	11 Set Signal Selection and Limits
6 Reset Calc/Ex ... by SAR Group	

?E HELP — EX Return to MAIN MENU

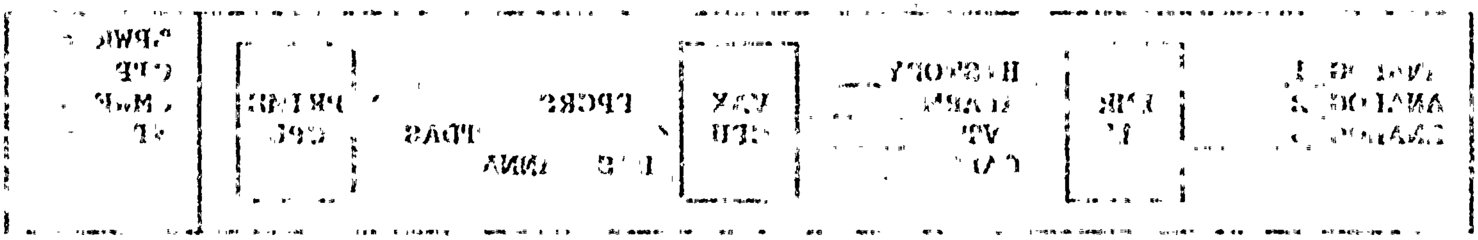
FIGURE 4
ANNA STATUS INFORMATION
(DAS AND CALC OPERATIONAL)



ANNA STATUS INFORMATION
(DAS AND CALC NOT OPERATIONAL & NOT WITHIN APPLICABLE POWER RANGE)



ANNA STATUS INFORMATION
(DAS OPERATIONAL AND CALC NOT OPERATIONAL)



ANNA STATUS INFORMATION
(DAS AND CALC NOT OPERATIONAL AND WITHIN APPLICABLE POWER RANGE)

```
+--------------------------------------------------------------------------+-----------+
|                 +-----+                  +-----+                +-----+  | %PWR =    |
| ANALOG_1______  |     |  __HISTORY_____  |     |                |     |  | CTP  =    |
| ANALOG_2______  | EMR |  __ALARM_______  | VAX | --PPCRS------->|PRIME|  | GMWE =    |
| ANALOG_3______  | 715 |  __CVT_________  | CPU | <---------TDAS--| CPU |  | WT   =    |
|                 |     |    CALC________  |     | _/___ANNA      |     |  |           |
|                 +-----+                  +-----+                +-----+  |           |
+--------------------------------------------------------------------------+-----------+
```

FIGURE 5 PPCRS MAIN MENU (POST INCLUSION OF ANNA)

```
+--------------------------------------------------------------------------+-----------+
|                 +-----+                  +-----+                +-----+  | %PWR =    |
| ANALOG_1______  |     |  __HISTORY_____  |     |                |     |  | CTP  =    |
| ANALOG_2______  | EMR |  __ALARM_______  | VAX | --PPCRS------->|PRIME|  | GMWE =    |
| ANALOG_3______  | 715 |  __CVT_________  | CPU | <---------TDAS--| CPU |  | WT   =    |
|                 |     |    CALC________  |     | ______ANNA     |     |  |           |
|                 +-----+                  +-----+                +-----+  |           |
+--------------------------------------------------------------------------+-----------+
+--------------------------------------------------------------------------------------+
|      Fn   Front End Setup Maintenance           Nn   NSS Functions                    |
|                                                                                      |
|      An   Acquisition Control                   Ln   Logging & Report Functions       |
|                                                                                      |
|      Rn   Real Time Analysis                    Pn   Plant Status Displays            |
|                                                                                      |
|      Hn   Historical Analysis                   Dn   Decay Ratio (ANNA)               |
+--------------------------------------------------------------------------------------+
| HE   HELP            EX   EXIT TO VMS            LO   LOGOFF SYSTEM                    |
+--------------------------------------------------------------------------------------+
```

NMS CPUS INFORMATION
(ONS AND CPUS NOT OPERATIONAL AND WITHIN APPLICABLE POWER RANGE)

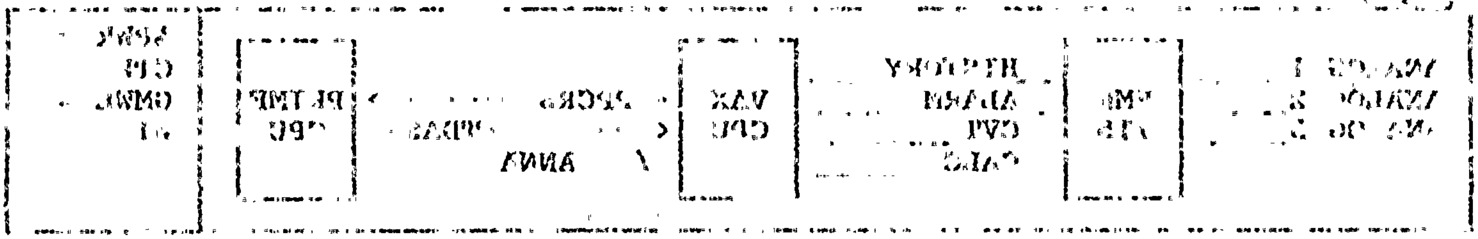
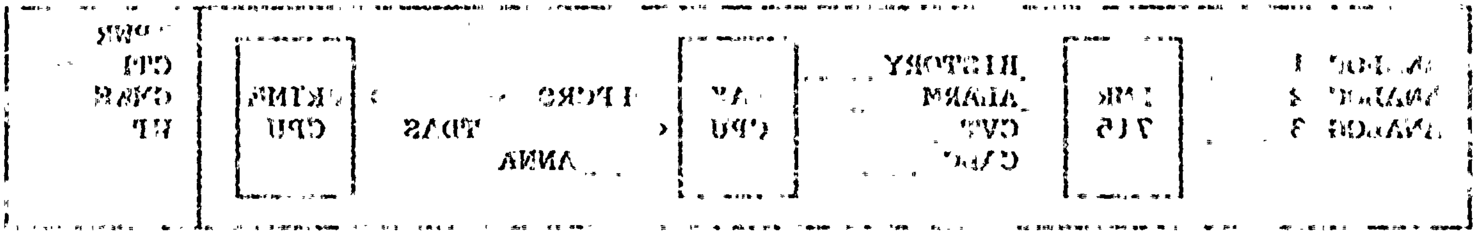


FIGURE 6 PCRS MAIN MENU (POST INCLUSION OF ANNA)

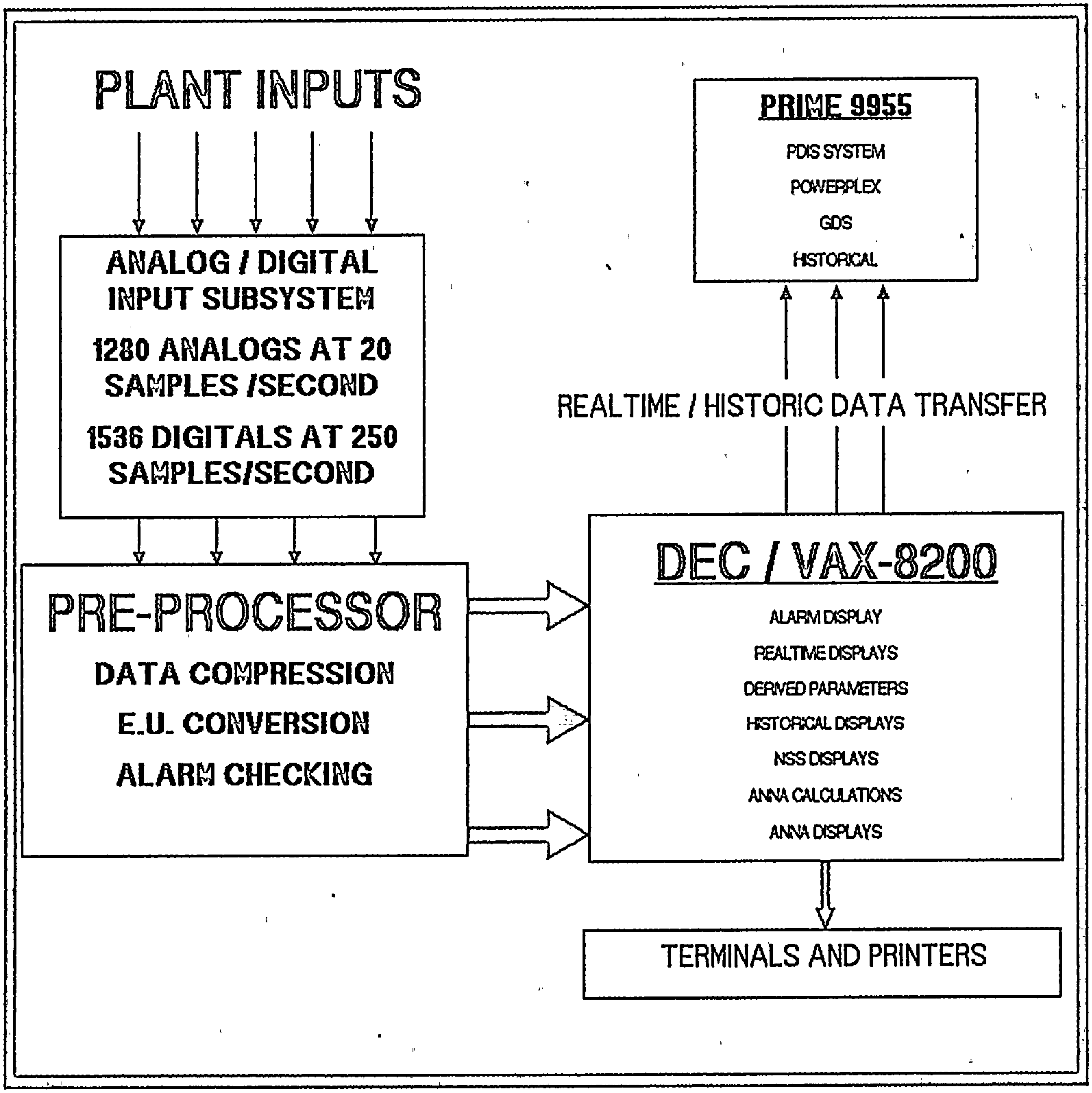


Fn	Front End Setup Maintenance	Mn	NSS Functions
An	Acquisition Control	Ln	Logging & Report Functions
Rn	Real Time Analysis	Pn	Plant Static Displays
Hn	Historical Analysis	Dn	Decay Ratio (ANNA)
HE	HELP	EX EXIT TO VMS	LO LOGOFF SYSTEM

FIGURE 6

PLANT PROCESS COMPUTER REPLACEMENT SYSTEM (PPCRS)

(PRESENT CONFIGURATION)



[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

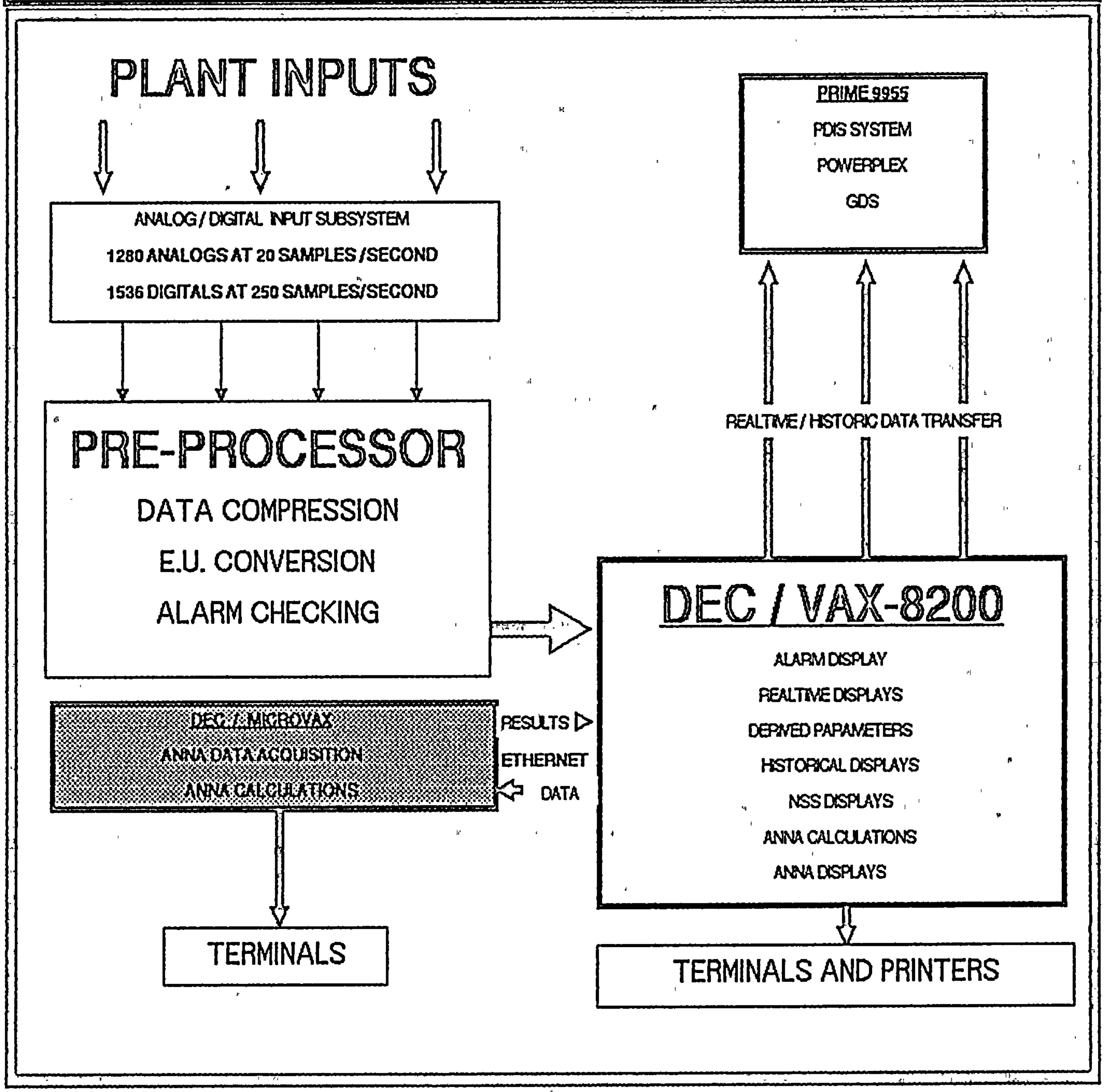
[illegible]

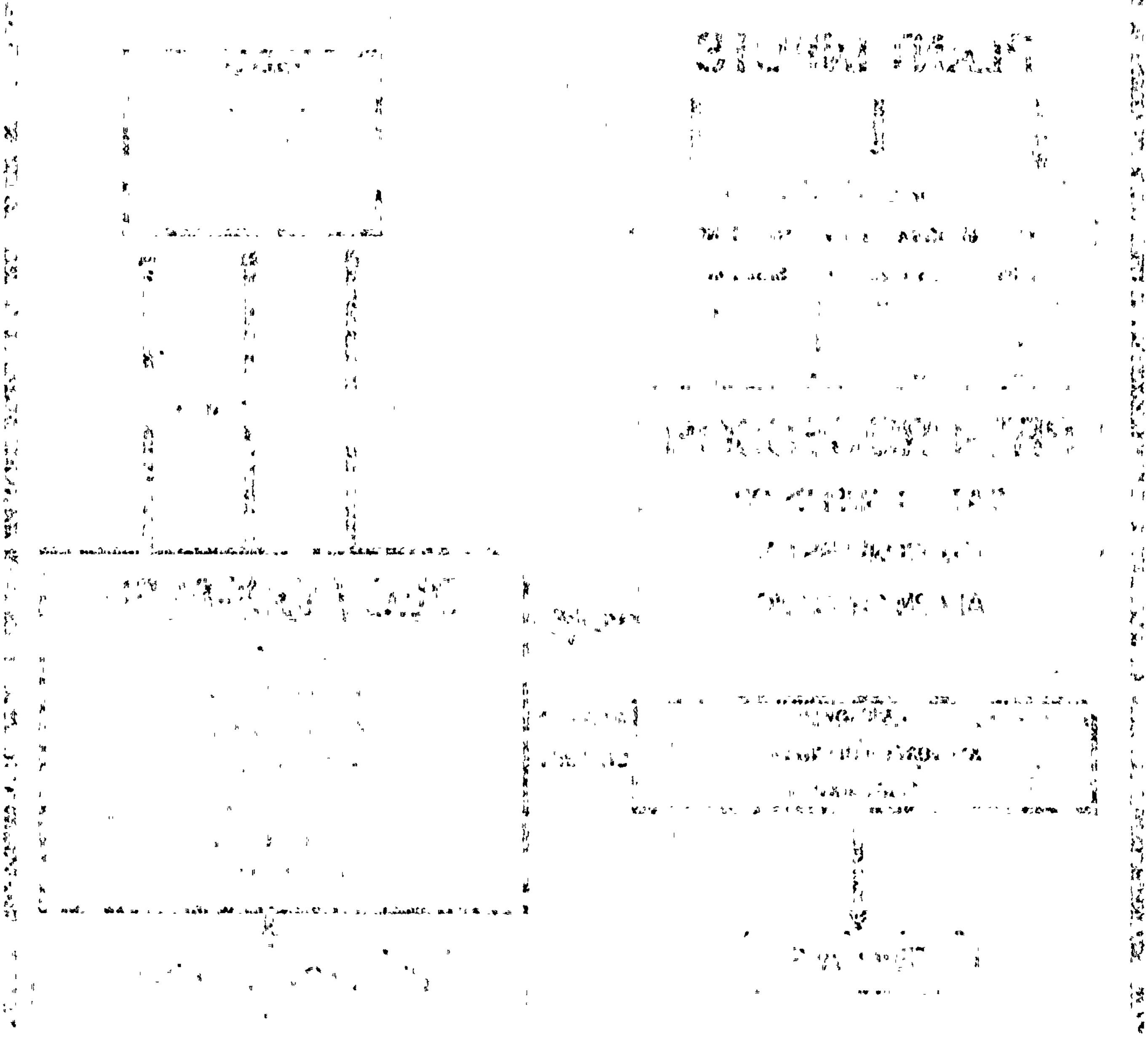
[illegible]

FIGURE 7

PLANT PROCESS COMPUTER REPLACEMENT SYSTEM (PPCRS)

(PHASE TWO CONFIGURATION)





OVERVIEW OF FRONT END SETUP SUBSYSTEM

The Front end setup subsystem creates, edits, and deletes the files necessary to load the telemetry equipment with the user's requested setup. The rate at which information is passed to the PRIME computer from the VAX is controlled from this subsystem.

The FRONT END SETUP subsystem consist of the following functions:

- o Loading the 715 Multiplex preprocessor
- o Setting the preprocessor input links to ACTIVE or INACTIVE
- o Adding, Deleting, Modifying parameter's in the data base which is used for setting up the preprocessor
- o DYNAMICALLY update parameters in the EMR 715 multiplex preprocessor while data acquisition is active.

OVERVIEW OF ACQUISITION CONTROL SUBSYSTEM

The acquisition control subsystem is used to start and stop the taking of data from the EMR 715 multiplex processor into the VAX 8200 computer system, and allow the user to monitor the acquisition of data buffers from the telemetry frontend. Data recorded into the circular history file will be input from preprocessor output port number one. The circular alarm data file's input will be from the preprocessor's output port number two. Data used in constructing the Current Value Table, (CVT), will be received from the preprocessor's output port number three. This subsystem also controls the outputting of selected parameters from the Current Value Table in the VAX 8200 computer to the Prime computer via parallel computer interface.

The ACQUISITION CONTROL subsystem consists of the following functions :

- o START accepting data into the VAX 8200 computer.
- o STOP accepting data into the VAX 8200 computer.
- o MONITOR data buffer acquisition in the VAX 8200 computer.
- o START sending selected parameter data to the Prime computer.
- o STOP sending selected parameter data to the Prime computer.

OVERVIEW OF REAL-TIME DISPLAY SUBSYSTEM

The real-time display subsystem provides the capability to examine data from the preprocessor during data acquisition via the current value table, (CVT), and to display the data on stripcharts and alphanumeric scrolling and non-scrolling displays. The alarm summary function provided receives its data from output port two of the preprocessor and not from the CVT. Operator requested summaries, parameters currently in alarm, etc. will be displayed using a VT241 CRT.

ATTACHMENT [illegible] PAGE [illegible] OF [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

The REAL-TIME DISPLAY subsystem consists of the following functions :

- o 4 parameter GRAPHIC scrolling strip charts on a VT241.
- o 4 parameter FULL Descriptor scrolling display.
- o 16 parameter ALARM Monitoring display using the CVT as the data source
- o 32 parameter ALPHANUMERIC non-scrolling display.
- o Operator ALARM SUMMARY monitoring.

OVERVIEW OF HISTORICAL DISPLAY SUBSYSTEM

The historical display subsystem provides the capability to examine data from the stored secondary circular history files by presenting the data on stripcharts and alphanumeric scrolling and non scrolling displays. This subsystem also provides the capability for the user/analyst to create new secondary files from the current history file, to delete secondary files which already exist, and to list the secondary files which exist.

The HISTORICAL DISPLAY subsystem consists of the following functions :

- o 4 parameter GRAPHIC scrolling strip charts on a VT241.
- o 4 parameter FULL Descriptor scrolling display.
- o 32 parameter ALPHANUMERIC non-scrolling display.
- o SECONDARY file maintenance.

OVERVIEW OF HISTORICAL NSS SUBSYSTEM

The NSS display subsystem provides the capability to calculate and examine information of interest to the reactor engineers, STAs and control room staff.

The NSS DISPLAYS subsystem consists of the following functions:

- o Control Rod Position Display
- o Control Rod Status Display
- o LPRM/APRM Readings Display
- o Heat Balance and APRM Calib.
- o TIP Data Acquisition
- o Immediate POWERPLEX MON Run
- o DASEDIT (CR, LPRM, HEAT BAL.)
- o Control Rod & Heat Balance Disp.

PROPOSED ADVANCED NEUTRON NOISE MONITOR OPERABILITY CHECK PROCEDURE

PURPOSE

The purpose of this test is to demonstrate the operability of the Advanced Neutron Noise Analysis (ANNA) System upon reaching the area of the Power to Flow bounded by 10 to 60 percent Core Flow and 20 to 70 percent Core Thermal Power.

PREREQUISITES

A) PPCRS is operable to support this procedure.

PRECAUTIONS

Successful completion of this procedure is required to demonstrate operability of the stability monitoring system as required by Technical Specification (TS) 4.2.7.2 or TS 4.2.8.2.

MATERIALS, TOOLS AND TEST EQUIPMENT

None

PROCEDURE

Step 1) At the STA PPCRS terminal in the control room demand the Decay Ratio Menu (D). ________

Step 2) If the ANNA status indicator shown in the System Status block of the menu indicates ANNA is not online, start the DAS and/or CALC programs by requesting functions 1 and/or 3. ________

Step 3) Verify the ANNA status indicator shows that the ANNA system is online. ________

Step 4) Initiate function 10, ANNA Operability Display. ________

Step 5) Verify the ANNA Operability Status display is presented as shown similar to figure 1. ________

Step 6) Within 60 seconds verify that the Data Acquisition Status on the display indicates Operable. ________

Step 7) Verify that the time of last calculations is within a minute of the time displayed at the top right of the screen. ________

Step 8) Verify that the ANNA Monitor Status is Active. ________

Step 9) Initiate a hard copy of the screen for inclusion with this completed procedure by entering Ctrl P ________

Step 10) Enter a Ctrl Z and verify the return to the Decay Ratio menu. ________

Step 11) Demand the NSS menu. ________

Step 12) Initiate function 3 the LPRM/APRM Display ________

Step 13) Initiate a hard copy of the display for inclusion with this completed procedure by entering Ctrl P ________

Step 14) Compare the applicable LPRM readings between the outputs from step 9 and 13 and verify agreement within 5 percent of rated readings. ________

Step 15) Test Complete. ________

<u>Figure 1</u>

ANNA CURRENT SCAN VALUES DD-MMM-YYYY HH:MM:SS

APRM		E		LPRM		32-17C		APRM	B	LPRM	32-17C
DR	X.XX	FQ	X.XX	DR	X.XX	FQ	X.XX	%P-P	X.X	%P-P	XX.X

THE ANNA SYSTEM IS OPERATIONAL

DETECTOR	READING	DETECTOR	READING	
LPRM 08-41 A	XX.XX	LPRM 08-41 C	XX.XX	LAST CALCULATION
LPRM 32-49 A	XX.XX	LPRM 32-49 C	XX.XX	DD-MMM-YYYY HH:MM:SS.MS
LPRM 48-41 A	XX.XX	LPRM 48-41 C	XX.XX	
LPRM 16-25 A	XX.XX	LPRM 16-25 C	XX.XX	
LPRM 24-33 A	XX.XX	LPRM 24-33 C	XX.XX	ANNA STATUS
LPRM 48-25 A	XX.XX	LPRM 48-25 C	XX.XX	RUNNING
LPRM 16-17 A	XX.XX	LPRM 16-17 C	XX.XX	
LPRM 32-17 A	XX.XX	LPRM 32-17 C	XX.XX	
LPRM 48-17 A	XX.XX	LPRM 48-17 C	XX.XX	
APRM CH A	XX.XX	APRM CH D	XX.XX	
APRM CH B	XX.XX	APRM CH E	XX.XX	
APRM CH C	XX.XX	APRM CH F	XX.XX	

Ctrl Keys: Z=Exit P=Print

[illegible]