01-204-9

NINE MILE POINT NUCLEAR STATION UNIT #2

OPERATING PROCEDURE

PROCEDURE NO. N2-OP-91A

PROCESS COMPUTER

APPROVALS	SIGNATURES	DATE AND INITIALS REVISION 0	REVISION 1	REVISION 2
Superintendent Operations NMP Unit #2 M.D. Jones	M.D. Jones	6/16/86 Date	9/4/86 MDJ	
Station Superintendent NMP Unit #2 R.B. Abbott	RB Abbott	6/16/86 RBA	9/4/86 RBA	
General Superintendent Nuclear Generation T.J. Perkins		6/17/86 for TJP	9/4/86 RBA for TJP	

FOR INFORMATION

Summary of Pages

Revision 1 (Effective 9/4/86.)

Page	Date
i,1-6,8-12,15-20	February 1991 (TCN-7)
13,14	April 1991 (TCN-8)
7	May 1991 (TCN-9)

THIS PROCEDURE SUPERSEDES N2-IOP-91, Rev. 0
Periodic Review (9/7/90), No Change
NIAGARA MOHAWK POWER CORPORATION
THIS PROCEDURE NOT TO BE USED
AFTER September 1992
SUBJECT TO PERIODIC REVIEW.

.9305110303

9305110303 911031
PDR ADOCK 05000410
S PDR

N2-OP-91A

PROCESS COMPUTER

TABLE OF CONTENTS

REFERENCES

PROCESS COMPUTER

A. TECHNICAL SPECIFICATIONS

1.0 Table 6.2.2-1 Minimum Shift Crew Composition

B. SYSTEM DESCRIPTION

1.0 The Honeyell 4500 Process Computer System provides on-line monitoring of several thousand input points (digital, analog, and pulse) representing significant plant process variables. The system scans digital and analog inputs at specified intervals and issues appropriate alarm indications and messages of monitored analog values that exceed predefined limits or if digital trip signals occur.

The system performs calculations with selected input data, providing the operator with essential plant performance information through a variety of logs, trends, summaries, and other type written data arrays. Computer outputs also include various front panel displays and status indications.

By making a wide range of plant performance data immediately available, the computer greatly increases the speed with which operating personnel can respond to changing plant conditions, thereby contributing significantly to the maintenance of optimum core power distribution, economical utilization of the nuclear fuel, and overall plant operating efficiency.

Equipment is provided as follows to enable operation of the Process Computer interface at various locations.

Control Room

4 CRT Screens and 2 Keyboards - Plant Operator

1 Log Typer

1 Alarm Typer

1 Utility Typer

3 Trend Recorder

5 Digit Decimal Displays

Results Control Center (Computer Room)

CRT Screen and Keyboard - Programmer

B. SYSTEM DESCRIPTION (Cont)

1.0 (Cont)

COS (Computer Operating Subsystem) CRT screen and keyboard

Card Reader

Line Printer

I/O Typer

Results Typer

Remote Shutdown

1 CRT and 1 Keyboard

2.0 The Plant Process Computer System can be broken down to several sub-systems. The following paragraphs will identify these sub-systems and provide a brief description of their function within the system.

2.1 Analog I/O Subsystem

Remote Analog Unit

Remote analog units receive analog process variable instrumentation signals from the plant and make those signals available to the Central Processing System. The unit converts analog signals from plant instrumentation to digital signals conditioned for computer use.

Analog Interface

The system provides an analog interface which serves as a data communication interface between the remote analog units and the Central Processing System (CPS). The interface receives instructions from the running program which dictates which points are to be scanned. The interface responds by providing the CPS with the appropriate scanned value.

2.2 Digital I/O Subsystem

Remote Digital Unit

Remote digital units receive digital process variable instrumentation signals from the plant and make those signals available to the Central Processing System.

B. SYSTEM DESCRIPTION Cont)

2.2 (Cont)

Digital Interface

The system provides a digital interface which serves as a data communication interface between the remote digital units and the Central Processing System. This interface is capable of specifying the direction of data transfer. The interface receives instructions from the running program which dictates points to be scanned. The interface responds by providing the CPS with the appropriate scanned signal. This interface also accommodates digital outputs from the PMS to the Transverse Incore Probe (TIP) system and operator interface devices such as digital displays and trend recorders.

2.3 Pulse/Priority Interrupt Subsystem

Voltage-type pulse-producing devices and contact-type pulse-producing devices provide digital data to the Central Processing System. The pulse input data and computer timing pules are used by the CPS to calculate engineering units. Corresponding to process variables.

2.4 Central Processing System

The functions performed by the Central Processing System are divided into two categories: (1) Operating System functions, and (2) Application System functions. Central Processing System hardware typically consists of one or more central processing units, memory, data transfer controllers, and mass storage capability. A description of the two main functions of the Central Processing System follows:

2.4.1 Operating System Functions

The operating system is that portion of the Central Processing System which controls the operation of the entire PMS. Operating system functions include scanning of process variables, control of memory use, control of data transfer, and monitoring of peripheral devices for failure. In essence, the operating system controls the processing of all programs and data in order to assure maximum efficiency. Operating System functions are not unique to the nuclear power process.

2.4.2 Application System

The Application System is that portion of the Central Processing System which processes inputs from the plant into meaningful indications of plant performance and provides a method of presenting the results to plant personnel. The following specific functions are included in the application system:

B. SYSTEM DESCRIPTION Cont)

2.4.2 (Cont)

a. Status Alarm Monitor

Selected Nuclear Steam Supply System (NSSS) and Balance of Plant (BOP) digital signals are scanned once each second for the purposes of monitoring process variable alarms. Each time an input is scanned it is compared to its previous state and if it is different the program will determine the nature of the change, (e.g., alarm or return-to-normal) and a descriptive message will be logged.

b. Digital Trend

The digital trend function provides an historical perspective on analog data without requiring continuous operator action. The digital trend log function provides printed sets of analog data at fixed but selectable interval rates. These variables are selected by the operator from a list of available signals.

c. Sequence Annunciator

The purpose of the sequence annunciator is to provide a chronological log of rapidly occurring plant instrumentation status changes. The primary objectives are:

- To aid in establishing the cause of a reactor scram trip and identify events which may or may not permit the reactor to return to normal operation.
- To provide an operations record of reactor protection system sensor trips including the identification of the individual trip channel affected, nature of the trip disturbance,and its time of occurrence.
- To provide verification of proper operation and assessment of Emergency Core Cooling System (ECCS) system operation.

d. Post-Data Recall

The purpose of post-data recall is to provide:

- An operations log of analog data history representing the readings of selected analog variables recorded at periodic intervals prior to and immediately after a reactor scram.
- Analog data which can aid the operator in assuring normal response to a scram.
- A printout of the stored data history subsequent to a request by the operator.

B. SYSTEM DESCRIPTION Cont)

2.4.2 (Cont)

e. Core Performance Calculations

The primary purpose of the core performance calculations is to perform those core performance calculations which will help to optimize the core power distribution and/or to streamline the operation of the reactor. Calculations include core power distributions, margins to operating limits, energy and exposure accumulation, and calibration of in-core instrumentation used in performing these calculations.

f. Balance-of-Plant Performance Calculations

The purpose of the balance-of-plant (BOP) performance calculations is to provide evaluations of the status and efficiency of various plant systems not directly related to the nuclear steam supply. Calculations include turbine cycle performance, condenser performance, unit electric performance, and feedwater heater performance.

g. Vessel Temperature Change Rate Calculations

The vessel temperature change rate calculations provide a chronological log of the temperature changes in the reactor vessel over a specified period of time. The function records time and temperature changes (usually resulting from heatup or cooldown). The function will also record on demand by the operator.

3.0 Computer Software

Software is a term used to designate all the programs, subroutines, and functions used with a particular computer system. A program is a set of instructions placed in computer memory that defines a specific functional task and sets forth the logical operations by which the computer is to accomplish the given task. Subroutines and functions are similar sets of instructions defining more circumscribed or generalized procedures which, being utilized for a number of different functional tasks, are placed in the computer memory as discrete entities to be called for as needed by operating programs.

C. OPERATING REQUIREMENTS

1.0 Normal AC Distribution 600V Bus 2NJS-US3, 2NJS-US4 and 2NJS-US6 is energized. (N2-OP-71)

2.0 125VDC Normal Battery SWGR 2BYS-SWG001C is energized. (N2-OP-73A)

D. PRECAUTIONS/LIMITATIONS

NOTE: All computer equipment, except for peripherals is designed for continuous duty from 32°F to 122°F and 5 to 95 percent relative humidity.

1.0 Computer Room environment should be maintained as follows whenever the computer is operating:

a. Clean and dust free (as practical).

b. Temperature between 65°F and 85°F.

c. Humidity between 10% and 90%.

2.0 All Applicable evolutions described in this procedure shall be monitored and controlled in accordance with Radiation Protection Procedures.

3.0 Refer to Technical Specifications Table 6.2.2-1 if the process computer becomes unavailable.

E. START UP PROCEDURE

1.0 Perform System Power Supply Lineup per Table II.

2.0 Consult with Computer Department personnel to energize computer mainframe and peripheral equipment.

F. NORMAL OPERATIONS

The Process Computer needs no operational interface during normal operation in any plant mode. Periodic programs are initiated automatically to update stored plant information, and operators with required information to monitor plant status.

On demand, programs are available to the operator upon request, at the operator's discretion, in any plant operating mode.

Descriptions, and instructions for software applications is provided in GEK 83340, S&W #7.400-5119.

G. SHUTDOWN PROCEDURE

The Process Computer System will not be shutdown except for required maintenance. Shutdown for maintenance will be performed by Computer Department personnel. Refer to Technical Specification Table 6.2.2-1.

H. OFF NORMAL PROCEDURE

1.0 The Process Computer has redundancy built in for power loss, loss of a peripheral equipment (monitor, trend recorder, decimal display and printer) and/or loss of processor. Recovery from any such loss will be automatic via the computer software or manually recover using GEK 83340, S&W #7.400-5119 application software. Notify the Computer Department personnel to have affected component(s) reworked and returned to service.

2.0 Process Computer Initialization

a) During normal hours contact Computer Dept. personnel.
b) During off hours contact on call Computer Dept. personnel, and/or refer to Computer Dept. Procedure N2-COMP-PMS-.02 (located in computer room) for re-initialization.

3.0 Loss of All Annunciators

3.1 Classify the event per S-EAP-2.

3.2 Notify the NRC, the Operations Manager, and the Plant Manager.

3.3 Call in additional plant operators. These operators are to be used to increase the frequency of monitoring plant and equipment status. When they become available they are to be assigned as directed in paragraphs: 3.3.1, 3.3.2, 3.3.3 below.

3.3.1 Assign one licensed operator to continuously walk and monitor the Control Room front panel (i.e. P601, P602, P603, P842 & P824, P851, P852). TCN- 9

3.3.2 Assign one licensed operator to continuously walk and monitor the Control Room back panels, and the Relay Room panels.

3.3.3 Assign operators to perform continuous rounds in the plant, in such a way that as one operator completes a set of rounds another operator starts the same set.

3.4 Write an emergency Work Request to obtain I & C help in determining the cause of this loss of annunciators.

NOTE: It would be difficult to simultaneously loose all of the Control Room annunciators so careful observation and diagnosis is warranted. There are two basic annunciator cabinets in the Relay Room: P858 and P833 act as one for the Balance of Plant annunciators (P842, P851, P852). P630 serves the NSSS annunciators through P601, P602, P603. A loss of both P858/P833 and P630 would be required to loose all annunciators.

H. OFF NORMAL PROCEDURE (Cont)

NOTE: (Cont)

A loss of all annunciators and all associated computer points could occur within either P858/P833 or P630 with any of the following: A loss of external power, a loss of power supplies within the cabinets or a fire within the cabinets.

a. The power sources for P858/P833 are separate from those for P630. Power sources and power supplies are shown on ESK:10IHA10,20,30,40 sh 1 & 2,41,42,43.

i) Divisional 125v DC provides power for some instruments in the field thru the input optical isolators. 125v DC power supplies within the respective cabinets provide power to associated relays which switch on the computer alarms or annunciators through matching output optical isolators. The annunciator drawings listed above clearly show this power for the input and output optical isolators. (Optical isolators are only supplied for signals which cross between divisions or from divisional to non divisional panels and thus, are only provided for a small fraction of the total number of annunciators.) TCN 7.

ii) 125v DC power for the remaining instruments, relays, annunciators, and computer points (Those which are not supplied through optical isolators) comes from power supplies within the respective panels (P858/P833 or P630). It is routed internally to terminal board connections designated AP (Annunciator Power).

iii) The 24v DC is used to power the lamp drivers. A loss of 24v DC could cause the annunciators to remain dark even though the computer alarm points come in as expected.

iv) The 12v DC is used to power the transistors on logic boards within each cabinet.

b. A good candidate for a loss of power within either P858/833 or P630 is prolonged operation with one or more uncorrected positive or negative annunciator grounds. This could lead to shorting of the power supply and subsequent loss do to either over heating and burn out of the power supply or a fire in the cabinet.

c. The cross connections between panels P858/P833 and P630 are unlikely to be the cause of a loss of all annunciators. The cross connections are as follows:

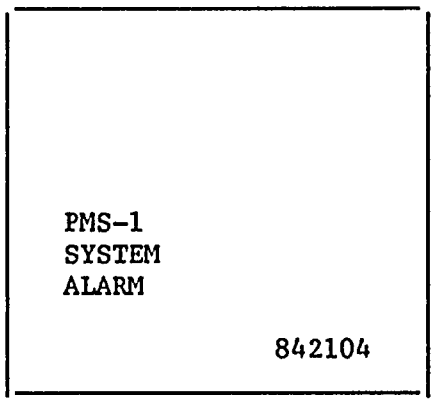
i) a common Master Silence button,

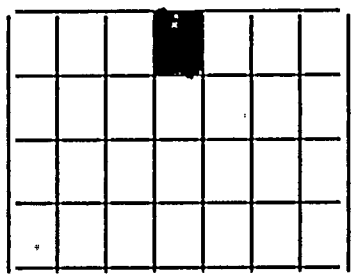
ii) a common Loss of Power annunciator.

I. PROCEDURE FOR CORRECTING ALARM CONDITIONS

1.0 842104 PMS-1 System Alarm

Reflash: No





842104

1.1

Computer Point	Computer Printout	Source
CECBC53	PMS-1 SYSTEM ALARM	Process (PMS-1) Stalled

1.2 Automatic Response

a. NONE

1.3 Corrective Action

NOTE: The process computer is equipped with the feature to initialize the system from the Control Room. This will allow operators to reinitialize the system without having to go to the Computer Room, therefore, decreasing the downtime. The initialization is accomplished with the use of four pushbuttons located in the Control Room on the operator's panel 2CEC-PNL800A. These switches are configured as follows:

```
    S1  :  PERIPHERAL SWAPOVER
*   S2  :  INITIALIZE both Processors
    S3  :  INITIALIZE PMS-1
    S4  :  INITIALIZE PMS-2
```

The use of these buttons depends on the current configuration of the system.

The operator should record all activities and conditions prior to an event that requires the initialization of the computer. This data should be given to computer personnel to assist them in troubleshooting.

* Although S2 was included in the initial design, this button should not be used.

1.3.1 Determine which is the on-line processor and consult with Computer Department personnel to re-establish the desired configuration as necessary.

a. Re-initialize PMS-1:

1. Push S3, initialize PMS-1 pushbutton.

2. Perform OD-15 required options 3 (automatically initiated during system initialization) and option 2. Refer to Section 2 of GEK83340, S&W #7.400-5119.

b. Swapover

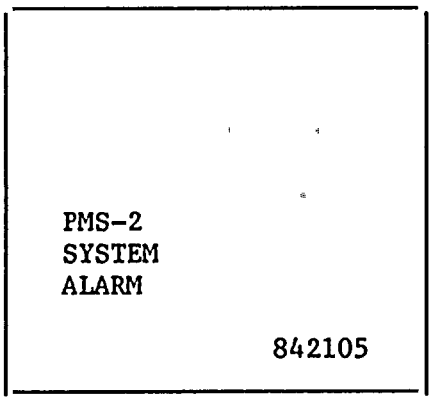
1. Push S1, Peripheral Swapover pushbutton.

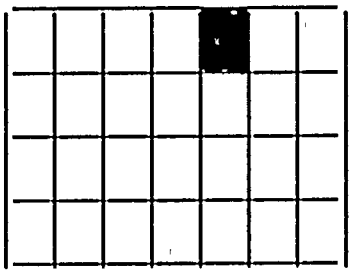
2. Perform OD-15 required options 3 (automatically initiated for PSM-2 during swapover) and option 2. Refer to Section 2 of GEK83340, S&W #7.400-5119.

I. PROCEDURE FOR CORRECTING ALARM CONDITIONS

2.0 842105 PMS-2 System Alarm

Reflash: No





842105

1.1

Computer Point	Computer Printout	Source
CECBC56	PMS-2 SYSTEM ALARM	Processor (PMS-2) stalled

1.2 Automatic Response

a. NONE

1.3 Corrective Action

NOTE: The process computer is equipped with the feature to initialize the system from the Control Room. This will allow operators to reinitialize the system without having to go to the Computer Room, therefore, decreasing the downtime. The initialization is accomplished with the use of four pushbuttons located in the Control Room on the operator's panel 2CEC-PNL800A. These switches are configured as follows:

* S1 : PERIPHERAL SWAPOVER
* S2 : INITIALIZE both Processors
* S3 : INITIALIZE PMS-1
* S4 : INITIALIZE PMS-2

The use of these buttons depends on the current configuration of the system.

The operator should record all activities and conditions prior to an event that requires the initialization of the computer. This data should be given to computer personnel to assist them in troubleshooting.

* Although S2 was included in the initial design, this button should not be used.

2.3.1 Determine which is the on-line processor and consult with Computer Department personnel to re-establish the desired configuration as necessary.

a. Re-initialize PMS-2.

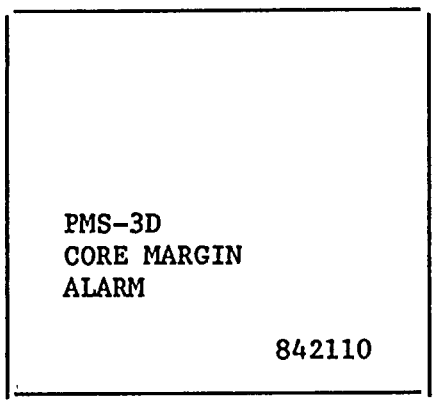
1. Push S4, Initialize PMS-2 pushbutton.

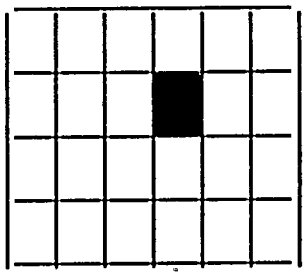
2. Perform OD-15 required Options 3 (automatically initiated during system initialization) and Option 2. Refer to Section 2 of GEK83340, S&W #7.400-5119.

I. PROCEDURE FOR CORRECTING ALARM CONDITIONS (Cont'd)

3.0 842110 PMS-3D Core Margin Alarm

Reflash: No





842110

3.1	Computer Point	Computer Printout	Source	
	CECBC54	3D PCRAT ALARM	3D Monicore Computer	TCN 8

3.2 Automatic Response

a. Computer printout on 2CECCP634 utility typer "Core Margin Warning".

3.3 Corrective Action

a. Notify the SSS and Shift Technical Advisor. TCN 8

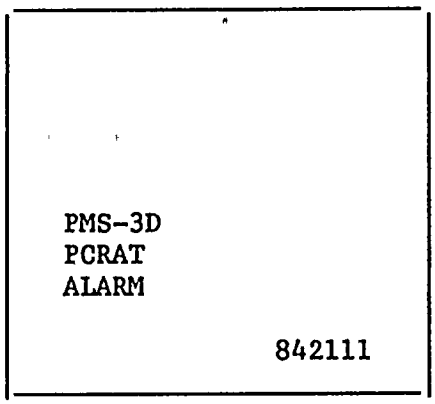
b. STA shall review 3D Monicore output to determine if an immediate power reduction is necessary.

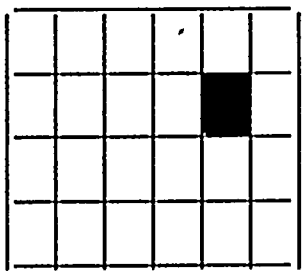
c. STA shall contact On-Call Reactor Engineer for further guidance.

I. PROCEDURE FOR CORRECTING ALARM CONDITIONS (Cont'd)

4.0 842111 PMS-3D PCRAT Alarm

Reflash: No





842111

4.1	Computer Point	Computer Printout	Source
	CECBC55	3D Core Margin Alarm	3D Core PCIOMR Trouble Program

4.2 Automatic Response

a. Computer Printout on 2CECCP634 utility typer "PCRAT Warning".

4.3 Corrective Action

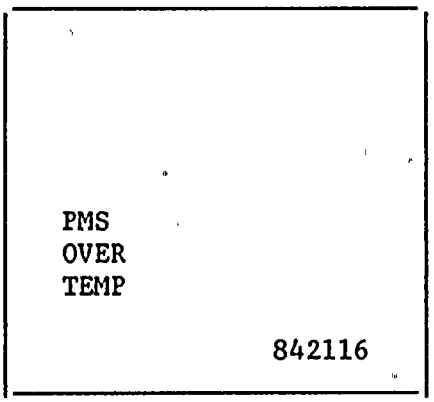
a. Reactor Engineer should be contacted to investigate this further. TCN 8

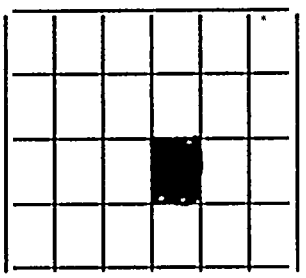
b. Run Periodic Log if Computer Printout requires. TCN 8

I. PROCEDURE FOR CORRECTING ALARM CONDITIONS (Cont'd)

5.0 842116 PMS Over Temperature

Reflash: No





842116

5.1	Computer Point	Computer Printout	Source
	CECTC01	PMS OVER TEMP	Cabinet High Temperature

5.2 Automatic Response

a. NONE

5.3 Corrective Action

NOTE: Power down of a cabinet may result in partial loss of parameters monitored (loss of I/O cabinet) or total loss (PMS-1 or PMS-2).

Contact Computer Department personnel for recovery inst. or redundancy available.

If I/O cabinet is powered down, parameters affected appear in S&W I/O list sorted by Panel No. 2IHC-10.

a. Locate the overtemp cabinet. This is accomplished by finding the cabinet with the "RESET" button lit on the front. This cabinet must be powered down by turning off the breaker. Each cabinet contains a breaker as follows:

Analog Cabinet	-	North Side, Lower Left
Digital Cabinet	-	North Side, Lower Right
Mainframe Cabinets	-	South Side, Lower Left

See Table II, System Power Supply Lineup for remote shutdown of computer cabinets.

TABLE II

SYSTEM POWER SUPPLY LINEUP

COMPONENT NO.	COMPONENT DESCRIPTION	POWER SUPPLY Bus Number	Cubicle/ Breaker	NORMAL POSITION	ACTUAL POSITION	INITIALS/ DATE	REMARKS
2VBS-PNLC100	Vital Bus Distribution Panel Feed (Cont. Bldg. El. 261'0")	2VBB-PNL300	1	ON			
2VBS-PNLC101	Vital Bus Distribution Panel Feed (Cont. Bldg. El. 261'0")	2VBB-PNL300	2	ON			
2CEC-CP600	Central Processor Cab (EXA01)	2VBS-PNLC100	1	ON			
2CEC-CP603	Large Core Storage Cab (LCJ01)	2VBS-PNLC100	2	ON			
2CEC-CP612	Video Cab (XCK01)	2VBS-PNLC100	3	ON			
2CEC-CP608	Mag Tape Cab (MTD01)	2VBS-PNLC100	4	ON			
2CEC-CP619	Analog/Digital Cab (CTA01)	2VBS-PNLC100	5	ON			
2CEC-CP620	Digital Cabinet (DTA01)	2VBS-PNLC100	6	ON			
2CEC-CP607	Shared Memory (SMA01)	2VBS-PNLC100	7	ON			

TABLE II

SYSTEM POWER SUPPLY LINEUP

COMPONENT NO.	COMPONENT DESCRIPTION	POWER SUPPLY Bus Number	Cubicle/ Breaker	NORMAL POSITION	ACTUAL POSITION	INITIALS/ DATE	REMARKS
2CEC-CP624	Digital Cabinet (DTA06)	2VBS-PNLC100	8	ON			
2CEC-CP622	Digital Cabinet (DTA04)	2VBB-PNLC100	9	ON			
2CEC-CP626	Digital Cabinet (DTA08)	2VBS-PNLC100	10	ON			
2CEC-CP625	Digital Cabinet (DTA07)	2VBS-PNLC100	11	ON			
2CEC-CP617	Analog Input Cab (XTA05)	2VBS-PNLC100	12	ON			
2CEC-CP616	Analog Input Cab (XTA04)	2VBS-PNLC100	13	ON			
2CEC-CP618	Analog Input Cab (XTA06)	2VBS-PNLC100	15	ON			
2CEC-CP623	Central Processor Cab (EXA02)	2VBS-PNLC101	1	ON			
2CEC-CP604	Large Core Storage Cab (LCJ02)	2VBS-PNLC101	2	ON			

TABLE II

SYSTEM POWER SUPPLY LINEUP

COMPONENT NO.	COMPONENT DESCRIPTION	POWER SUPPLY Bus Number	Cubicle/ Breaker	NORMAL POSITION	ACTUAL POSITION	INITIALS/ DATE	REMARKS
2CEC-CP656	Mag Tape (MTD02)	2VBS-PNLC101	4	ON			
2CEC-CP623	Digital Cabinet (DTA05)	2VBS-PNLC101	5	ON			
2CEC-CP627	Digital Cabinet (DTA09)	2VBS-PNLC101	6	ON			
2CEC-CP628	Digital Cabinet (DTA10)	2VBS-PNLC101	7	ON			
2CEC-CP610	Digital Cabinet (DTA11)	2VBS-PNLC101	8	ON			
2CEC-CP611	Digital Cabinet (DTA12)	2VBS-PNLC101	9	ON			
2CEC-CP621	Digital Cabinet (DTA02)	2VBS-PNLC101	10	ON			
2CEC-CP640	Digital Cabinet (DTA03)	2VBS-PNLC101	11	ON			
2CEC-CP613	Analog Input Cab (XTA01)	2VBS-PNLC101	12	ON			
2CEC-CP614	Analog Input Cab (XTA02)	2VBS-PNLC101	13	ON			

TABLE II

SYSTEM POWER SUPPLY LINEUP

COMPONENT NO.	COMPONENT DESCRIPTION	POWER SUPPLY Bus Number	- Cubicle/ Breaker	NORMAL POSITION	ACTUAL POSITION	INITIALS/ DATE	REMARKS
2CEC-CP615	Analog Input Cab (XTA03)	2VBS-PNLC101	14	ON			
2CEC-CP657	Switching Cabinet (XCC01)	2VBS-PNLC101	21	ON			