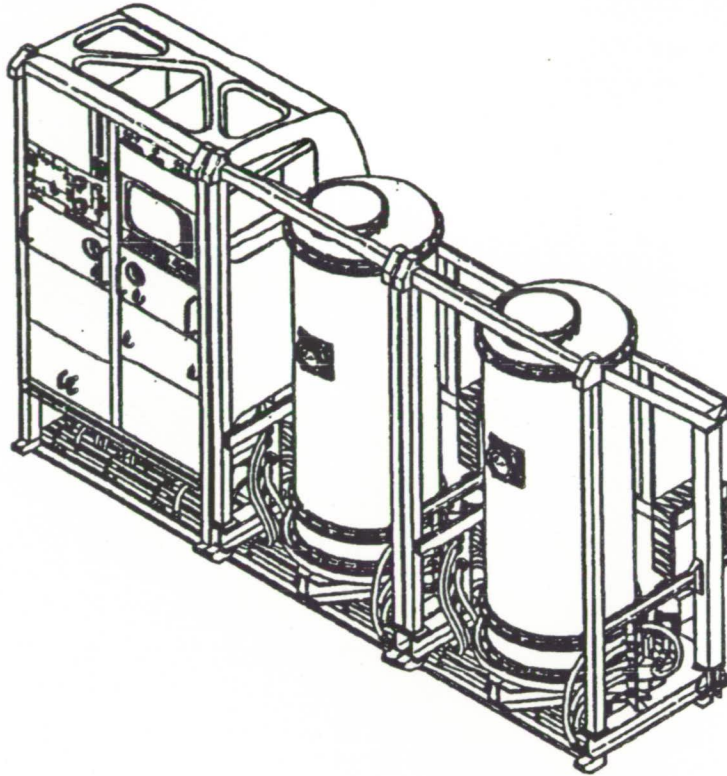


# SPACE STATION FURNACE FACILITY Experiment/Facility Requirements Document (E/FRD)



DR-10  
May 1992

Volume II, Appendix 5  
Final Study Report (DR-8) of  
Space Station Furnace Facility  
Contract No. NAS8-38077

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**EXPERIMENT/FACILITY  
REQUIREMENTS DOCUMENT  
FOR THE  
SPACE STATION  
FURNACE FACILITY**

**DR-10**

**MAY 1992**

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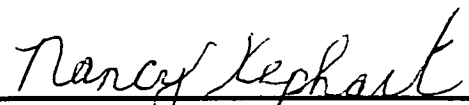
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**DATA REQUIREMENT (DR) - 10**

**EXPERIMENT/FACILITY REQUIREMENTS DOCUMENT FOR THE  
SPACE STATION FURNACE FACILITY**

**SECTION 1: INTEGRATED CONFIGURATION-1**

**MAY 1992**

## FOREWORD

The Space Station Furnace Facility (SSFF) is designed to accommodate and support a variety of furnace modules throughout the operational lifetime of the facility. Since the SSFF will be operational for 30 years, and various furnace modules will be accommodated, the Experiment/Facility Requirements Document (E/FRD) is divided into two separate sections. Section 1 describes the integrated SSFF-to-SSF interface, which includes the SSFF Core subsystem requirements and the furnace module requirements based on the information obtained from the Furnace Developer's Section 2, and Section 2 describes the furnace module-to-SSFF interface. Multiple Section 2s may be required for each E/FRD, depending on how many furnace modules the SSFF will accommodate per mission, since a separate Section 2 will be written for each furnace module. Both sections will be replaced for each mission with the appropriate mission-peculiar furnace module interface requirements since the Core configuration is a function of the furnace module(s).

This E/FRD reflects the Initial Configuration-1 (IC1), which is the initial integration of the SSFF Core and Furnace Module-1 into the SSF U. S. Laboratory Module-A. IC1 is planned for 1997, based on the assumption that Utilization Flight 3 (UF-3) is the carrier. Furnace Module-1 is scheduled to be an upgrade of the present Crystal Growth Furnace (CGF), and Section 2 reflects the requirements of that module.

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## ACRONYM LIST

AA	Avionics Air
CCF	Centralized Core Function
CCOS	Centralized Core Operating System
CCU	Core Control Unit
CdTe	Cadmium Telluride
CGF	Crystal Growth Furnace
cm	Centimeter
CMCU	Core Monitor and Control Unit
CP	Coldplate
CPC	Core Power Conditioners
CPCS	Core Power Conditioners Stimulus
CRW	Crew
CSF	Core-Specific Function
DC	Direct Current
DCF	Distributed Core Function
DCMU	Distributed Core Monitoring Unit
DCOS	Distributed Core Operating System
dia	Diameter
DMS	Data Management System (SSF) Data Management Subsystem (SSFF)
DR	Data Requirement
E/FRD	Experiment/Facility Requirements Document
EAC	Experiment Apparatus Container
EPS	Electrical Power System
ESF	Experiment-Specific Function
Ess	Essential
FAU	Furnace Actuator Unit
FCU	Furnace Control Unit
FDACS	Furnace Data Acquisition and Control System
FDDI	Fiber Distributed Data Interface
FDIR	Fault Detection, Isolation, and Recovery
FDS	Fire Detection and Suppression
FM-1	Furnace Module-1
FO	Functional Objective
ft	Foot

## ACRONYM LIST (Cont.)

ft <sup>2</sup>	Square foot
FTM	Furnace Translation Mechanism
g	Gravity
GaAs	Gallium Arsenide
GDS	Gas Distribution Subsystem
GHE	Gaseous Helium
GN <sub>2</sub>	Gaseous Nitrogen
GND	Ground
GSE	Ground Support Equipment
H/W	Hardware
H <sub>2</sub> O	Water
HDR	High-Density Recorder
HgZnTe	Mercury Zinc Telluride
HRDL	High-Rate Data Link
h	Hour
HX	Heat Exchanger
Hz	Hertz
IC1	Integrated Configuration-1
IROP	Integrated Requirements on Payloads
IFEA	Integrated Furnace Enclosure Apparatus
ISPR	International Standard Payload Rack
ISS	Internal Support Structure
JSC	Johnson Space Center
kg	Kilogram
KSC	Kennedy Space Center
kW	Kilowatt
kWh	Kilowatthour
LAN	Local Area Network
lbm	Pound Mass
LNS	Liquid Nitrogen System
MBPS	Megabytes per Second
MDM	Multiplexer/Demultiplexer
mm	Millimeter
MPAC	Multipurpose Application Console

## ACRONYM LIST (Cont.)

MPLM	Mini-Pressurized Logistics Module
MSFC	Marshall Space Flight Center
MSS	Mechanical Structures Subsystem
NASA	National Aeronautics and Space Administration
NTSC	National Television Standard Committee
OMIS	Operations Management Information System
ORU	Orbital Replacement Unit
PAM	Payload Accommodations Manager
PCDS	Power Conditioning and Distribution Subsystem
PED	Payload Element Developer
PES	Payload Executive Software
PI	Payload Investigator
PIC	Payload Integration Center
PIM	Payload Increment Manager
PLM	Pressurized Logistics Module
POIC	Payload Operations Integration Center
ppm	Parts per Million
psia	Pounds per Square Inch Absolute
PTRD	Payload Training Requirements Document
QD	Quick Disconnect
RFM	Reconfigurable Furnace Module
RPC	Remote Power Controller
RPCM	Remote Power Controller Module
RPDA	Remote Power Distribution Assembly
S/W	Software
SACA	Sample Ampoule/Cartridge Assembly
sec	Second
SEM	Sample Exchange Mechanism
SIP	Sample Insertion Port
SS	Subsystem
SSF	Space Station Freedom
SSFF	Space Station Furnace Facility
STS	Space Transportation System
SW	Software

## ACRONYM LIST (Conc.)

TAT	Training Assessment Team
TBD	To Be Determined
TCS	Thermal Control System (SSF) Thermal Control Subsystem (SSFF)
UF-3	Utilization Flight 3
UPTP	User Payload Training Plan
USL	United States Laboratory
V	Volt
Vdc	Volts Direct Current
VES	Vacuum Exhaust System
W	Watt
$\mu\text{m}$	Micrometer
M $\Omega$	Megohm

## 1.1. FUNCTIONAL OBJECTIVES AND EQUIPMENT IDENTIFICATION

### 1.1.1 SYSTEM DESCRIPTION

The function of the Space Station Furnace Facility (SSFF) is to support materials research into the crystal growth and solidification processes of electronic and photonic materials, metals and alloys, and glasses and ceramics. To support this broad base of research requirements, the SSFF will employ a variety of furnace modules operated, regulated, and supported by a core of common subsystems. Furnace modules may be reconfigured or specifically developed to provide unique solidification conditions for each set of experiments. The SSFF modular approach permits the addition of new or scaled-up furnace modules to support the evolution of the facility as new science requirements are identified. The SSFF Core is of modular design to permit augmentation for enhanced capabilities.

The fully integrated configuration of the SSFF will consist of three racks with the capability of supporting up to two furnace modules per rack. The initial configuration of the SSFF will consist of two of the three racks and one furnace module. This Experiment/Facility Requirements Document (E/FRD) describes the integrated facility requirements for the Space Station Freedom (SSF) Integrated Configuration-1 (IC1) mission. The IC1 SSFF will consist of two racks: the Core Rack, with the centralized subsystem equipment, and the Experiment Rack-1, with Furnace Module-1 and the distributed subsystem equipment to support the furnace. *each*

The IC1 SSFF configuration is shown in Figure 1.1-1. It consists of two double rack replacement structures, the centralized and distributed components to support furnace operations, and Furnace Module-1. The SSFF support functions are provided by the following Core subsystems:

- Power Conditioning and Distribution Subsystem (SSFF PCDS)
- Data Management Subsystem (SSFF DMS)
- Thermal Control Subsystem (SSFF TCS)
- Gas Distribution Subsystem (SSFF GDS)
- Mechanical Structures Subsystem (SSFF MSS)

### 1.1.2 FUNCTIONAL OBJECTIVES

There are 13 functional objectives (FOs) for the SSFF which are structured as one FO for payload checkout: one FO for Core activation; one FO for the distributed equipment activation; eight FOs for experiment sample operations, calibration/bakeout, and vent and purge cycles; one FO for furnace sample loading or shutdown; and one FO for SSFF shutdown. The actual FO numbering is as follows:

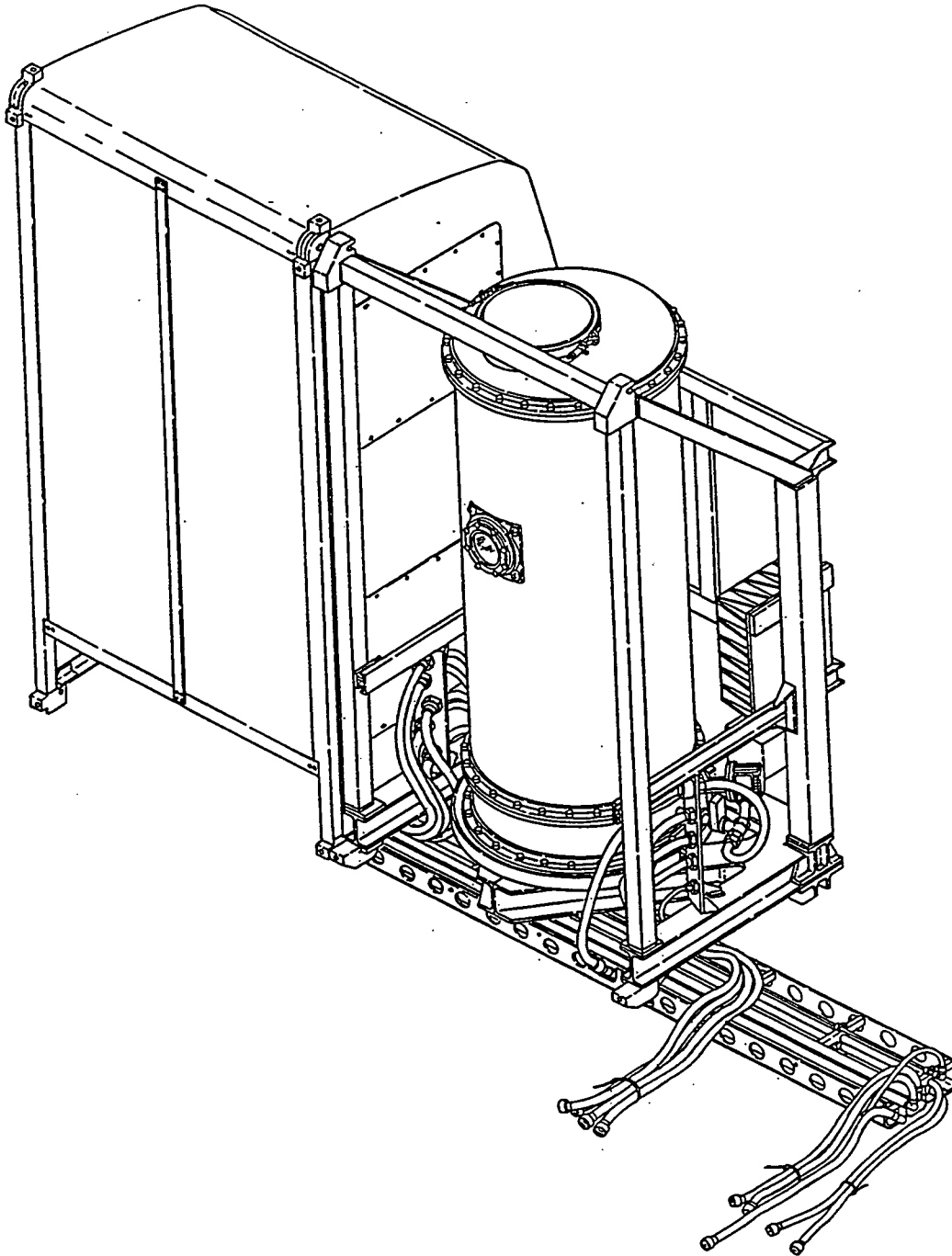


FIGURE 1.1-1. SSFF IC1 CONFIGURATION

FO-0	Payload Checkout
FO-1	Core Activation
FO-2	Distributed Equipment Activation
FO-3	Furnace Module-1 Sample Exchange
FO-4	Furnace Module-1 Vent/Purge
FO-5	Furnace Module-1 Process Sample HgCdTe
FO-6	Furnace Module-1 Process Sample HgZnTe
FO-6A	Furnace Module-1 Process Sample Extended HgZnTe
FO-7	Furnace Module-1 Process Sample CdTe
FO-8	Furnace Module-1 Process Sample GaAs
FO-9	Configure Furnace Module-1 for Sample Loading or Shutdown
FO-10	SSFF Shutdown
FO-11	Furnace Module-1 Process Calibration/Bakeout

Table 1.1-1 shows a listing of the SSFF FOs along with the equipment associated with each step of each FO. Step duration, crew time requirements, and average power requirements for each step of each FO are defined in Table 1.1-2, Functional Objective Requirements Sheets.

### 1.1.3 EQUIPMENT IDENTIFICATION

The SSFF will occupy two double rack locations in the U. S. Laboratory (USL) for IC1. The Core Rack, modified [relative to the International Standard Payload Rack (ISPR)] to permit interconnections to the adjacent experiment rack, will provide mechanical/structural interface for the centralized SSFF subsystem components. Experiment Rack-1 will provide mechanical/structural interface for distributed SSFF subsystem equipment required to support the furnace operation, and Furnace Module-1. Figures 1.1-2 through 1.1-5 show the SSFF centralized and distributed equipment to the Orbital Replacement Unit (ORU) level per subsystem. Figure 1.1-6 shows the Furnace Module-1 equipment. A block diagram of the SSFF is shown in Figure 1.1-7, which identifies and shows the interrelationship of each item of SSFF equipment and the interfaces with SSF and the furnace module.

### 1.1.4 OPERATIONAL FUNCTIONAL FLOWS

Preliminary functional flows are shown in Table 1.1-3 for each FO. Functional flows define the function performed, the performing element, and decisions involved in accomplishing each FO.



TABLE 1.1-1. SSFF FUNCTIONAL OBJECTIVES (Sheet 1 of 17)

FUNCTIONAL OBJECTIVE		EQUIPMENT REQUIRED
NUMBER	TITLE	ITEM
FO-1 Step 1	CCU and CMCU Activation	Core Control Unit Removable Hard Drive CDROM/WORM Drive High-Density Recorder Core Monitor Control Unit Crew Interface CPCS RPCM Essentials Power Supply Voltage and Current Sensors
FO-1 Step 2	SSFF to Ground Link	Core Control Unit Removable Hard Drive CDROM/WORM Drive High-Density Recorder Core Monitor Control Unit Crew Interface CPCS RPCM Essentials Power Supply Voltage and Current Sensors
FO-1 Step 3	Test CMCU	Core Control Unit Removable Hard Drive CDROM/WORM Drive High-Density Recorder Core Monitor Control Unit Crew Interface CPCS RPCM Essentials Power Supply Voltage and Current Sensors
FO-1 Step 4	Configure and Test TCS in Core Rack	Core Control Unit Removable Hard Drive CDROM/WORM Drive High-Density Recorder Core Monitor Control Unit Crew Interface CPCS RPCM Essentials Power Supply Voltage and Current Sensors Shutoff Valves Pump Package Flow Meters Flow Control Valves Temperature Sensors Pressure Transducers

TABLE 1.1-1. SSFF FUNCTIONAL OBJECTIVES (Sheet 2 of 17)

FUNCTIONAL OBJECTIVE		EQUIPMENT REQUIRED
NUMBER	TITLE	ITEM
FO-1 Step 5	Test CPC	Core Control Unit Removable Hard Drive CDROM/WORM Drive High-Density Recorder Core Monitor Control Unit Crew Interface CPCS RPCM Essentials Power Supply Voltage and Current Sensors Shutoff Valves Pump Package Flow Meters Flow Control Valves Temperature Sensors Pressure Transducers Core Power Conditioners
FO-1 Step 6	GDS Test	Core Control Unit Removable Hard Drive CDROM/WORM Drive High-Density Recorder Core Monitor Control Unit Crew Interface CPCS RPCM Essentials Power Supply Voltage and Current Sensors Shutoff Valves Pump Package Flow Meters Flow Control Valves Temperature Sensors Pressure Transducers Latching Solenoid Valves Contamination Monitor
FO-1 Step 7	Activate Camera and Videolink	NOT USED IN ICI
FO-1 Step 8	Core Readiness Check	Core Control Unit Removable Hard Drive CDROM/WORM Drive High-Density Recorder Core Monitor Control Unit Crew Interface CPCS RPCM Essentials Power Supply Voltage and Current Sensors Shutoff Valves Pump Package

TABLE 1.1-1. SSFF FUNCTIONAL OBJECTIVES (Sheet 3 of 17)

FUNCTIONAL OBJECTIVE		EQUIPMENT REQUIRED
NUMBER	TITLE	ITEM
FO-1 Step 8 (Cont.)	Core Readiness Check	Flow Meters Flow Control Valves Temperature Sensors Pressure Transducers
FO-2 Step 1	CCU Powers RPCM/DCMU	Core Control Unit Removable Hard Drive CDROM/WORM Drive High-Density Recorder Core Monitor Control Unit Crew Interface CPCS RPCM Essentials Power Supply Voltage and Current Sensors Shutoff Valves Pump Package Flow Meters Flow Control Valves Temperature Sensors Pressure Transducers Distributed Core Monitoring Unit
FO-2 Step 2	CCU Powers FCU	Core Control Unit Removable Hard Drive CDROM/WORM Drive High-Density Recorder Core Monitor Control Unit Crew Interface CPCS RPCM Essentials Power Supply Voltage and Current Sensors Shutoff Valves Pump Package Flow Meters Flow Control Valves Temperature Sensors Pressure Transducers Distributed Core Monitoring Unit Furnace Control Unit
FO-2 Step 3	FCU Checkout	Core Control Unit Removable Hard Drive CDROM/WORM Drive High-Density Recorder Core Monitor Control Unit Crew Interface CPCS RPCM Essentials Power Supply

TABLE 1.1-1. SSFF FUNCTIONAL OBJECTIVES (Sheet 4 of 17)

FUNCTIONAL OBJECTIVE		EQUIPMENT REQUIRED
NUMBER	TITLE	ITEM
FO-2 Step 3 (Cont.)	FCU Checkout	Voltage and Current Sensors Shutoff Valves Pump Package Flow Meters Flow Control Valves Temperature Sensors Pressure Transducers Distributed Core Monitoring Unit Furnace Control Unit
FO-2 Step 4	FAU Powered	Core Control Unit Removable Hard Drive CDROM/WORM Drive High-Density Recorder Core Monitor Control Unit Crew Interface CPCS RPCM Essentials Power Supply Voltage and Current Sensors Shutoff Valves Pump Package Flow Meters Flow Control Valves Temperature Sensors Pressure Transducers Distributed Core Monitoring Unit Furnace Control Unit Furnace Actuator Unit
FO-2 Step 5	FAU Checkout	Core Control Unit Removable Hard Drive CDROM/WORM Drive High-Density Recorder Core Monitor Control Unit Crew Interface CPCS RPCM Essentials Power Supply Voltage and Current Sensors Shutoff Valves Pump Package Flow Meters Flow Control Valves Temperature Sensors Pressure Transducers Distributed Core Monitoring Unit Furnace Control Unit Furnace Actuator Unit

TABLE 1.1-1. SSFF FUNCTIONAL OBJECTIVES (Sheet 5 of 17)

FUNCTIONAL OBJECTIVE		EQUIPMENT REQUIRED
NUMBER	TITLE	ITEM
FO-2 Step 6	Configure and Test TCS in Furnace Rack	Core Control Unit Removable Hard Drive CDROM/WORM Drive High-Density Recorder Core Monitor Control Unit Crew Interface CPCS RPCM Essentials Power Supply Voltage and Current Sensors Shutoff Valves Pump Package Flow Meters Flow Control Valves Temperature Sensors Pressure Transducer Video Processor Unit Distributed Core Monitoring Unit Furnace Control Unit Furnace Actuator Unit
FO-2 Step 7	GDS Test	Core Control Unit Removable Hard Drive CDROM/WORM Drive High-Density Recorder Core Monitor Control Unit Crew Interface CPCS RPCM Essentials Power Supply Voltage and Current Sensors Shutoff Valves Pump Package Flow Meters Flow Control Valves Temperature Sensors Pressure Transducers Distributed Core Monitoring Unit Furnace Control Unit Furnace Actuator Unit

TABLE 1.1-1. SSFF FUNCTIONAL OBJECTIVES (Sheet 6 of 17)

FUNCTIONAL OBJECTIVE		EQUIPMENT REQUIRED
NUMBER	TITLE	ITEM
FO-2 Step 8	Furnace-Specific Tests	Core Control Unit Removable Hard Drive CDROM/WORM Drive High-Density Recorder Core Monitor Control Unit Crew Interface CPCS RPCM Essentials Power Supply Voltage and Current Sensors Shutoff Valves Pump Package Flow Meters Flow Control Valves Temperature Sensors Pressure Transducers Distributed Core Monitoring Unit Furnace Control Unit Furnace Actuator Unit
FO-3 Step 1	Command Manual Sample Exchange	Core Control Unit Removable Hard Drive CDROM/WORM Drive High-Density Recorder Core Monitor Control Unit Crew Interface CPCS RPCM Essentials Power Supply Voltage and Current Sensors Shutoff Valves Pump Package Flow Meters Flow Control Valves Temperature Sensors Pressure Transducers Distributed Core Monitoring Unit Furnace Control Unit Furnace Actuator Unit

TABLE 1.1-1. SSFF FUNCTIONAL OBJECTIVES (Sheet 7 of 17)

FUNCTIONAL OBJECTIVE		EQUIPMENT REQUIRED
NUMBER	TITLE	ITEM
FO-3 Step 2	Vent/Fill Furnace Module-1	Core Control Unit Removable Hard Drive CDROM/WORM Drive High-Density Recorder Core Monitor Control Unit Crew Interface CPCS RPCM Essentials Power Supply Voltage and Current Sensors Shutoff Valves Pump Package Flow Meters Flow Control Valves Temperature Sensors Pressure Transducers Distributed Core Monitoring Unit Furnace Control Unit Furnace Actuator Unit
FO-3 Step 3	Equalize Furnace Module-1 Pressure	Core Control Unit Removable Hard Drive CDROM/WORM Drive High-Density Recorder Core Monitor Control Unit Crew Interface CPCS RPCM Essentials Power Supply Voltage and Current Sensors Shutoff Valves Pump Package Flow Meters Flow Control Valves Temperature Sensors Pressure Transducers Distributed Core Monitoring Unit Furnace Control Unit Furnace Actuator Unit Manual Valve
FO-3 Step 4	Prep Equipment	Core Control Unit Removable Hard Drive CDROM/WORM Drive High-Density Recorder Core Monitor Control Unit Crew Interface CPCS RPCM Essentials Power Supply

TABLE 1.1-1. SSFF FUNCTIONAL OBJECTIVES (Sheet 8 of 17)

FUNCTIONAL OBJECTIVE		EQUIPMENT REQUIRED
NUMBER	TITLE	ITEM
FO-3 Step 4 (Cont.)	Prep Equipment	Voltage and Current Sensors Shutoff Valves Pump Package Flow Meters Flow Control Valves Temperature Sensors Pressure Transducers Distributed Core Monitoring Unit Furnace Control Unit Furnace Actuator Unit
FO-3 Step 5	Open SIP	Core Control Unit Removable Hard Drive CDROM/WORM Drive High-Density Recorder Core Monitor Control Unit Crew Interface CPCS RPCM Essentials Power Supply Voltage and Current Sensors Shutoff Valves Pump Package Flow Meters Flow Control Valves Temperature Sensors Pressure Transducers Distributed Core Monitoring Unit Furnace Control Unit Furnace Actuator Unit
FO-3 Step 6	Insert Samples	Core Control Unit Removable Hard Drive CDROM/WORM Drive High-Density Recorder Core Monitor Control Unit Crew Interface CPCS RPCM Essentials Power Supply Voltage and Current Sensors Shutoff Valves Pump Package Flow Meters Flow Control Valves Temperature Sensors Pressure Transducers Distributed Core Monitoring Unit Furnace Control Unit Furnace Actuator Unit



TABLE 1.1-1. SSFF FUNCTIONAL OBJECTIVES (Sheet 9 of 17)

FUNCTIONAL OBJECTIVE		EQUIPMENT REQUIRED
NUMBER	TITLE	ITEM
FO-3 Step 7	Close SIP	Core Control Unit Removable Hard Drive CDROM/WORM Drive High-Density Recorder Core Monitor Control Unit Crew Interface CPCS RPCM Essentials Power Supply Voltage and Current Sensors Shutoff Valves Pump Package Flow Meters Flow Control Valves Temperature Sensors Pressure Transducers Distributed Core Monitoring Unit Furnace Control Unit Furnace Actuator Unit
FO-3 Step 8	Open Valves	Core Control Unit Removable Hard Drive CDROM/WORM Drive High-Density Recorder Core Monitor Control Unit Crew Interface CPCS RPCM Essentials Power Supply Voltage and Current Sensors Shutoff Valves Pump Package Flow Meters Flow Control Valves Temperature Sensors Pressure Transducers Distributed Core Monitoring Unit Furnace Control Unit Furnace Actuator Unit Manual Valves
FO-3 Step 9	Command Manual Sample Exchange Off	Core Control Unit Removable Hard Drive CDROM/WORM Drive High-Density Recorder Core Monitor Control Unit Crew Interface CPCS RPCM Essentials Power Supply

TABLE 1.1-1. SSFF FUNCTIONAL OBJECTIVES (Sheet 10 of 17)

FUNCTIONAL OBJECTIVE		EQUIPMENT REQUIRED
NUMBER	TITLE	ITEM
FO-3 Step 9 (Cont.)	Command Manual Sample Exchange Off	Voltage and Current Sensors Shutoff Valves Pump Package Flow Meters Flow Control Valves Temperature Sensors Pressure Transducers Distributed Core Monitoring Unit Furnace Control Unit Furnace Actuator Unit
FO-3 Step 10	Perform Seal Check	Core Control Unit Removable Hard Drive CDROM/WORM Drive High-Density Recorder Core Monitor Control Unit Crew Interface CPCS RPCM Essentials Power Supply Voltage and Current Sensors Shutoff Valves Pump Package Flow Meters Flow Control Valves Temperature Sensors Pressure Transducers Distributed Core Monitoring Unit Furnace Control Unit Furnace Actuator Unit
FO-4 Step 1	GN <sub>2</sub> Purge Furnace	Core Control Unit Removable Hard Drive CDROM/WORM Drive High-Density Recorder Core Monitor Control Unit Crew Interface CPCS RPCM Essentials Power Supply Voltage and Current Sensors Shutoff Valves Pump Package Flow Meters Flow Control Valves Temperature Sensors Pressure Transducers Distributed Core Monitoring Unit Furnace Control Unit Furnace Actuator Unit

TABLE 1.1-1. SSFF FUNCTIONAL OBJECTIVES (Sheet 11 of 17)

FUNCTIONAL OBJECTIVE		EQUIPMENT REQUIRED
NUMBER	TITLE	ITEM
FO-4 Step 2	Argon Backfill	Core Control Unit Removable Hard Drive CDROM/WORM Drive High-Density Recorder Core Monitor Control Unit Crew Interface CPCS RPCM Essentials Power Supply Voltage and Current Sensors Shutoff Valves Pump Package Flow Meters Flow Control Valves Temperature Sensors Pressure Transducers Distributed Core Monitoring Unit Furnace Control Unit Furnace Actuator Unit
FO-4 Step 3	Command Sample Process	Core Control Unit Removable Hard Drive CDROM/WORM Drive High-Density Recorder Core Monitor Control Unit Crew Interface CPCS RPCM Essentials Power Supply Voltage and Current Sensors Shutoff Valves Pump Package Flow Meters Flow Control Valves Temperature Sensors Pressure Transducers Distributed Core Monitoring Unit Furnace Control Unit Furnace Actuator Unit
FO-4 Step 4	TCS Configured	Core Control Unit Removable Hard Drive CDROM/WORM Drive High-Density Recorder Core Monitor Control Unit Crew Interface CPCS RPCM Essentials Power Supply Voltage and Current Sensors

TABLE 1.1-1. SSFF FUNCTIONAL OBJECTIVES (Sheet 12 of 17)

FUNCTIONAL OBJECTIVE		EQUIPMENT REQUIRED
NUMBER	TITLE	ITEM
FO-4 Step 3 (Cont.)	TCS Configured	Shutoff Valves Pump Package Flow Meters Flow Control Valves Temperature Sensors Pressure Transducers Distributed Core Monitoring Unit Furnace Control Unit Furnace Actuator Unit
FO-5 FO-6 FO-6a FO-7 FO-8	Vapor Crystal Growth of HgCdTe Meltback and Regrowth of HgZnTe Meltback and Regrowth of HgZnTe Growth of CdTe by Dir. Solidification Growth of GaAs by Dir. Solidification	All equipment listed below All equipment listed below All equipment listed below All equipment listed below All equipment listed below Core Control Unit Removable Hard Drive CDROM/WORM Drive High-Density Recorder Core Monitor Control Unit Crew Interface CPCS RPCM Essentials Power Supply Voltage and Current Sensors Shutoff Valves Pump Package Flow Meters Flow Control Valves Temperature Sensors Pressure Transducers Distributed Core Monitoring Unit Furnace Control Unit Furnace Actuator Unit Furnace Module-1

TABLE 1.1-1. SSFF FUNCTIONAL OBJECTIVES (Sheet 13 of 17)

FUNCTIONAL OBJECTIVE		EQUIPMENT REQUIRED
NUMBER	TITLE	ITEM
FO-9 Step 1	Verify Furnace in HOME Position	Core Control Unit Removable Hard Drive CDROM/WORM Drive High-Density Recorder Core Monitor Control Unit Crew Interface CPCS RPCM Essentials Power Supply Voltage and Current Sensors Shutoff Valves Pump Package Flow Meters Flow Control Valves Temperature Sensors Pressure Transducers Distributed Core Monitoring Unit Furnace Control Unit Furnace Actuator Unit Furnace Module-1
FO-9 Step 2	Furnace-Specific Tests	Core Control Unit Removable Hard Drive CDROM/WORM Drive High-Density Recorder Core Monitor Control Unit Crew Interface CPCS RPCM Essentials Power Supply Voltage and Current Sensors Shutoff Valves Pump Package Flow Meters Flow Control Valves Temperature Sensors Pressure Transducers Video Processor Unit Distributed Core Monitoring Unit Furnace Control Unit Furnace Actuator Unit Furnace Module-1
FO-9 Step 3	Furnace-Specific Tests	Core Control Unit Removable Hard Drive CDROM/WORM Drive High-Density Recorder Core Monitor Control Unit Crew Interface CPCS

TABLE 1.1-1. SSFF FUNCTIONAL OBJECTIVES (Sheet 14 of 17)

FUNCTIONAL OBJECTIVE		EQUIPMENT REQUIRED
NUMBER	TITLE	ITEM
FO-9 Step 3 (Cont.)	Furnace-Specific Tests	RPCM Essentials Power Supply Voltage and Current Sensors Shutoff Valves Pump Package Flow Meters Flow Control Valves Temperature Sensors Pressure Transducers Distributed Core Monitoring Unit Furnace Control Unit Furnace Actuator Unit Furnace Module-1
FO-10 Step 1	Distributed Equipment Shutdown	Core Control Unit Removable Hard Drive CDROM/WORM Drive High-Density Recorder Core Monitor Control Unit Crew Interface CPCS RPCM Essentials Power Supply Voltage and Current Sensors Shutoff Valves Pump Package Flow Meters Flow Control Valves Temperature Sensors Pressure Transducers
FO-10 Step 2	Verify Experiment Shutdown	Core Control Unit Removable Hard Drive CDROM/WORM Drive High-Density Recorder Core Monitor Control Unit Crew Interface CPCS RPCM Essentials Power Supply Voltage and Current Sensors Shutoff Valves Pump Package Flow Meters Flow Control Valves Temperature Sensors Pressure Transducers Distributed Core Monitoring Unit

TABLE 1.1-1. SSFF FUNCTIONAL OBJECTIVES (Sheet 15 of 17)

FUNCTIONAL OBJECTIVE		EQUIPMENT REQUIRED
NUMBER	TITLE	ITEM
FO-10 Step 3	Shut Down GDS Subsystems	Core Control Unit Removable Hard Drive CDROM/WORM Drive High-Density Recorder Core Monitor Control Unit Crew Interface CPCS RPCM Essentials Power Supply Voltage and Current Sensors Shutoff Valves Pump Package Flow Meters Flow Control Valves Temperature Sensors Pressure Transducers
FO-10 Step 4	DMS Nonessentials Shutdown	Core Control Unit Core Monitor Control Unit RPCM Essentials Power Supply Voltage and Current Sensors Pump Package Flow Meters Flow Control Valves Temperature Sensors Pressure Transducers
FO-10 Step 5	TCS Shutdown	Core Control Unit Core Monitor Control Unit Essentials Power Supply Voltage and Current Sensors
FO-10 Step 6	CCU Shutdown	

TABLE 1.1-1. SSFF FUNCTIONAL OBJECTIVES (Sheet 16 of 17)

FUNCTIONAL OBJECTIVE		EQUIPMENT REQUIRED
NUMBER	TITLE	ITEM
FO-11 Step 1	Activate Calibration/Bakeout	Core Control Unit Removable Hard Drive CDROM/WORM Drive High-Density Recorder Core Monitor Control Unit Crew Interface CPCS RPCM Essentials Power Supply Voltage and Current Sensors Shutoff Valves Pump Package Flow Meters Flow Control Valves Temperature Sensors Pressure Transducers Distributed Core Monitoring Unit Furnace Control Unit Furnace Actuator Unit Furnace Module-1
FO-11 Step 2	Initiate Calibration Process	Core Control Unit Removable Hard Drive CDROM/WORM Drive High-Density Recorder Core Monitor Control Unit Crew Interface CPCS RPCM Essentials Power Supply Voltage and Current Sensors Shutoff Valves Pump Package Flow Meters Flow Control Valves Temperature Sensors Pressure Transducers Distributed Core Monitoring Unit Furnace Control Unit Furnace Actuator Unit Furnace Module-1
FO-11 Step 3	Bakeout Process	Core Control Unit Removable Hard Drive CDROM/WORM Drive High-Density Recorder Core Monitor Control Unit Crew Interface CPCS RPCM



TABLE 1.1-1. SSFF FUNCTIONAL OBJECTIVES (Sheet 17 of 17)

FUNCTIONAL OBJECTIVE		EQUIPMENT REQUIRED
NUMBER	TITLE	ITEM
FO-11 Step 3 (Cont.)	Bakeout Process	Essentials Power Supply Voltage and Current Sensors Shutoff Valves Pump Package Flow Meters Flow Control Valves Temperature Sensors Pressure Transducers Distributed Core Monitoring Unit Furnace Control Unit Furnace Actuator Unit Furnace Module-1

TABLE 1.1-2. FUNCTIONAL OBJECTIVE REQUIREMENTS SHEET (Sheet 1 of 19)

EXPERIMENT NAME: <u>Space Station Furnace Facility</u>		FO NUMBER: <u>0</u>					
FO NAME: <u>Payload Activation</u>		PREREQUISITE: _____					
NO. OF PERFORMANCES: MIN. _____ DES. _____		SEQUENCE: _____					
REQUIRED TIMEFRAME (MET): MIN. _____ MAX. _____		JOINT OPS WITH: _____					
STEP NUMBER		1	2	3	4	5	6
STEP DURATION (MINS:SECS)	MINIMUM						
	MAXIMUM						
	PREFERRED	5:00	5:00	1:00			
STEP DELAY (HRS:MINS)	MINIMUM						
	MAXIMUM						
	PREFERRED						
CREW	NUMBER						
	PREFERRED						
MICROGRAVITY (g's)							
VACUUM VENT							
CONSUMABLES							
AVERAGE POWER REQUIRED (kW)		0.00	0.00	0.00			
ONBOARD COMPUTER SUPPORT	CORE APPLICATIONS						
	EXPERIMENT APPLICATIONS						
DATA	DOWNLINK DIGITAL (MBPS)						
	REAL-TIME (RT) OR DUMP (D)						
	COMMANDING						
	PES (P), ISE (I), MPAC (M), POIC (PC)						
	VIDEO						
	STANDARD/NONSTANDARD NTSC						
	REAL-TIME/DUMP/STORE						
SPECIAL EQUIPMENT OR CONSTRAINTS							
<b>STEP NO.</b>	<b>STEP DESCRIPTION</b>						
1	Open TCS manual valves						
2	Open GDS manual valves						
3	Verify Station services activated at rack						

TABLE 1.1-2. FUNCTIONAL OBJECTIVE REQUIREMENTS SHEET (Sheet 2 of 19)

EXPERIMENT NAME: <u>Space Station Furnace Facility</u>		FO NUMBER: <u>1</u>					
FO NAME: <u>Core Activation</u>		PREREQUISITE: <u>FO-0</u>					
NO. OF PERFORMANCES: MIN. _____ DES. _____		SEQUENCE: _____					
REQUIRED TIMEFRAME (MET): MIN. _____ MAX. _____		JOINT OPS WITH: _____					
STEP NUMBER		1	2	3	4	5	6
STEP DURATION (MINS:SECS)	MINIMUM						
	MAXIMUM						
	PREFERRED	5:00	2:00	1:00	4:00	3:00	7:00
STEP DELAY (HRS:MINS)	MINIMUM						
	MAXIMUM						
	PREFERRED						
CREW	NUMBER						
	PREFERRED						
MICROGRAVITY (g's)							
VACUUM VENT							
CONSUMABLES							
AVERAGE POWER REQUIRED (kW)		1.008	1.008	1.008	1.1479	1.4637	1.2926
ONBOARD COMPUTER SUPPORT	CORE APPLICATIONS						
	EXPERIMENT APPLICATIONS						
DATA	DOWNLINK DIGITAL (MBPS)						
	REAL-TIME (RT) OR DUMP (D)						
	COMMANDING						
	PES (P), ISE (I), MPAC (M), POIC (PC)						
	VIDEO STANDARD/NONSTANDARD NTSC						
	REAL-TIME/DUMP/STORE						
SPECIAL EQUIPMENT OR CONSTRAINTS							
<u>STEP NO.</u>	<u>STEP DESCRIPTION</u>						
1	Activate CCU and CMCU						
2	SSF to ground initial link						
3	Test CMCU						
4	Configure and test TCS in Core						
5	Test CPC						
6	GDS tests in Core						

TABLE 1.1-2. FUNCTIONAL OBJECTIVE REQUIREMENTS SHEET (Sheet 3 of 19)

EXPERIMENT NAME: <u>Space Station Furnace Facility</u>		FO NUMBER: <u>1</u>					
FO NAME: <u>Core Activation</u>		PREREQUISITE: <u>FO-0</u>					
NO. OF PERFORMANCES: MIN. _____ DES. _____		SEQUENCE: _____					
REQUIRED TIMEFRAME (MET): MIN. _____ MAX. _____		JOINT OPS WITH: _____					
<b>STEP NUMBER</b>		<b>7</b>	<b>8</b>				
<b>STEP DURATION (MINS:SECS)</b>	<b>MINIMUM</b>						
	<b>MAXIMUM</b>						
	<b>PREFERRED</b>	3:00	5:00				
<b>STEP DELAY (HRS:MINS)</b>	<b>MINIMUM</b>						
	<b>MAXIMUM</b>						
	<b>PREFERRED</b>						
<b>CREW</b>	<b>NUMBER</b>						
	<b>PREFERRED</b>						
<b>MICROGRAVITY (g's)</b>							
<b>VACUUM VENT</b>							
<b>CONSUMABLES</b>							
<b>AVERAGE POWER REQUIRED (kW)</b>		1.1479	1.1479				
<b>ONBOARD COMPUTER SUPPORT</b>	<b>CORE APPLICATIONS</b>						
	<b>EXPERIMENT APPLICATIONS</b>						
<b>DATA</b>	<b>DOWNLINK DIGITAL (MBPS)</b>						
	<b>REAL-TIME (RT) OR DUMP (D)</b>						
	<b>COMMANDING</b>						
	<b>PES (P), ISE (I), MPAC (M), POIC (PC)</b>						
	<b>VIDEO</b>						
	<b>STANDARD/NONSTANDARD NTSC</b>						
	<b>REAL-TIME/DUMP/STORE</b>						
<b>SPECIAL EQUIPMENT OR CONSTRAINTS</b>							
<b>STEP NO.</b>		<b>STEP DESCRIPTION</b>					
7		Activate camera and test videolink and high rate link (not used during MTC)					
8		Core readiness check					

TABLE 1.1-2. FUNCTIONAL OBJECTIVE REQUIREMENTS SHEET (Sheet 4 of 19)

EXPERIMENT NAME: <u>Space Station Furnace Facility</u>		FO NUMBER: <u>2</u>					
FO NAME: <u>Distributed Equipment</u>		PREREQUISITE: <u>FO-1</u>					
NO. OF PERFORMANCES: MIN. _____ DES. _____		SEQUENCE: _____					
REQUIRED TIMEFRAME (MET): MIN. _____ MAX. _____		JOINT OPS WITH: _____					
STEP NUMBER		1	2	3	4	5	6
STEP DURATION (MINS:SECS)	MINIMUM						
	MAXIMUM						
	PREFERRED	1:00	2:00	2:00	2:00	2:00	5:00
STEP DELAY (HRS:MINS)	MINIMUM						
	MAXIMUM						
	PREFERRED						
CREW	NUMBER						
	PREFERRED						
MICROGRAVITY (g's)							
VACUUM VENT							
CONSUMABLES							
AVERAGE POWER REQUIRED (kW)		1.3220	1.7620	1.7620	2.0988	2.0988	2.1136
ONBOARD COMPUTER SUPPORT	CORE APPLICATIONS						
	EXPERIMENT APPLICATIONS						
DATA	DOWNLINK DIGITAL (MBPS)						
	REAL-TIME (RT) OR DUMP (D)						
	COMMANDING						
	PES (P), ISE (I), MPAC (M), POIC (PC)						
	VIDEO STANDARD/NONSTANDARD NTSC						
	REAL-TIME/DUMP/STORE						
SPECIAL EQUIPMENT OR CONSTRAINTS							
<u>STEP NO.</u>	<u>STEP DESCRIPTION</u>						
1	CCU activates RPCM						
2	CCU activates FCU						
3	FCU checkout						
4	FAU activation						
5	FAU checkout						
6	CCU configuration of TCS						

TABLE 1.1-2. FUNCTIONAL OBJECTIVE REQUIREMENTS SHEET (Sheet 5 of 19)

EXPERIMENT NAME: <u>Space Station Furnace Facility</u>		FO NUMBER: <u>2</u>					
FO NAME: <u>Distributed Equipment</u>		PREREQUISITE: <u>FO-1</u>					
NO. OF PERFORMANCES: MIN. _____ DES. _____		SEQUENCE: _____					
REQUIRED TIMEFRAME (MET): MIN. _____ MAX. _____		JOINT OPS WITH: _____					
<b>STEP NUMBER</b>		<b>7</b>	<b>8</b>				
<b>STEP DURATION (MINS:SECS)</b>	<b>MINIMUM</b>						
	<b>MAXIMUM</b>						
	<b>PREFERRED</b>	:17	12:00				
<b>STEP DELAY (HRS:MINS)</b>	<b>MINIMUM</b>						
	<b>MAXIMUM</b>						
	<b>PREFERRED</b>						
<b>CREW</b>	<b>NUMBER</b>						
	<b>PREFERRED</b>						
<b>MICROGRAVITY (g's)</b>							
<b>VACUUM VENT</b>							
<b>CONSUMABLES</b>							
<b>AVERAGE POWER REQUIRED (kW)</b>		2.1835	2.1336				
<b>ONBOARD COMPUTER SUPPORT</b>	<b>CORE APPLICATIONS</b>						
	<b>EXPERIMENT APPLICATIONS</b>						
<b>DATA</b>	<b>DOWNLINK DIGITAL (MBPS)</b>						
	<b>REAL-TIME (RT) OR DUMP (D)</b>						
	<b>COMMANDING</b>						
	<b>PES (P), ISE (I), MPAC (M), POIC (PC)</b>						
	<b>VIDEO</b>						
	<b>STANDARD/NONSTANDARD NTSC</b>						
	<b>REAL-TIME/DUMP/STORE</b>						
<b>SPECIAL EQUIPMENT OR CONSTRAINTS</b>							
<b>STEP NO.</b>	<b>STEP DESCRIPTION</b>						
7	Checkout GDS components						
8	Furnace specific tests						

TABLE 1.1-2. FUNCTIONAL OBJECTIVE REQUIREMENTS SHEET (Sheet 6 of 19)

EXPERIMENT NAME: <u>Space Station Furnace Facility</u>		FO NUMBER: <u>3</u>					
FO NAME: <u>Manual Sample Exchange</u>		PREREQUISITE: <u>FO-2</u>					
NO. OF PERFORMANCES: MIN. _____ DES. _____		SEQUENCE: _____					
REQUIRED TIMEFRAME (MET): MIN. _____ MAX. _____		JOINT OPS WITH: _____					
STEP NUMBER		1	2	3	4	5	6
STEP DURATION (MINS:SECS)	MINIMUM						
	MAXIMUM						
	PREFERRED	1:00	32:00	10:00	10:00	7:00	20:00
STEP DELAY (HRS:MINS)	MINIMUM						
	MAXIMUM						
	PREFERRED						
CREW	NUMBER						
	PREFERRED	1		1	1	1	1
MICROGRAVITY (g's)							
VACUUM VENT							
CONSUMABLES							
AVERAGE POWER REQUIRED (kW)		2.1336	2.1487	2.1336	2.1336	2.1336	2.1336
ONBOARD COMPUTER SUPPORT	CORE APPLICATIONS						
	EXPERIMENT APPLICATIONS						
DATA	DOWNLINK DIGITAL (MBPS)						
	REAL-TIME (RT) OR DUMP (D)						
	COMMANDING						
	PES (P), ISE (I), MPAC (M), POIC (PC)						
	VIDEO						
	STANDARD/NONSTANDARD NTSC						
	REAL-TIME/DUMP/STORE						
SPECIAL EQUIPMENT OR CONSTRAINTS							
<b>STEP NO.</b>		<b>STEP DESCRIPTION</b>					
1		Command "Manual Sample Exchange" on					
2		Vent/fill furnace module					
3		Equalize furnace module pressure					
4		Prep equipment					
5		Open SIP					
6		Insert samples					

TABLE 1.1-2. FUNCTIONAL OBJECTIVE REQUIREMENTS SHEET (Sheet 7 of 19)

EXPERIMENT NAME: <u>Space Station Furnace Facility</u>		FO NUMBER: <u>3</u>					
FO NAME: <u>Manual Sample Exchange</u>		PREREQUISITE: <u>FO-2</u>					
NO. OF PERFORMANCES: MIN. _____ DES. _____		SEQUENCE: _____					
REQUIRED TIMEFRAME (MET): MIN. _____ MAX. _____		JOINT OPS WITH: _____					
<b>STEP NUMBER</b>		<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b>	
<b>STEP DURATION (MINS:SECS)</b>	<b>MINIMUM</b>						
	<b>MAXIMUM</b>						
	<b>PREFERRED</b>	3:00	3:00	1:00	65:00	4:00	
<b>STEP DELAY (HRS:MINS)</b>	<b>MINIMUM</b>						
	<b>MAXIMUM</b>						
	<b>PREFERRED</b>						
<b>CREW</b>	<b>NUMBER</b>						
	<b>PREFERRED</b>	1	1	1	1	1	
<b>MICROGRAVITY (g's)</b>							
<b>VACUUM VENT</b>							
<b>CONSUMABLES</b>							
<b>AVERAGE POWER REQUIRED (kW)</b>		2.1336	2.1336	2.1336	2.1338	2.1336	
<b>ONBOARD COMPUTER SUPPORT</b>	<b>CORE APPLICATIONS</b>						
	<b>EXPERIMENT APPLICATIONS</b>						
<b>DATA</b>	<b>DOWNLINK DIGITAL (MBPS)</b>						
	<b>REAL-TIME (RT) OR DUMP (D)</b>						
	<b>COMMANDING</b>						
	<b>PES (P), ISE (I), MPAC (M), POIC (PC)</b>						
	<b>VIDEO</b>						
	<b>STANDARD/NONSTANDARD NTSC</b>						
	<b>REAL-TIME/DUMP/STORE</b>						
<b>SPECIAL EQUIPMENT OR CONSTRAINTS</b>							
<b>STEP NO.</b>		<b>STEP DESCRIPTION</b>					
7		Close SIP					
8		Open valves					
9		Command "Manual Sample Exchange" off					
10		Perform seal check					
11		Load list process					



TABLE 1.1-2. FUNCTIONAL OBJECTIVE REQUIREMENTS SHEET (Sheet 8 of 19)

EXPERIMENT NAME: <u>Space Station Furnace Facility</u>		FO NUMBER: <u>4</u>					
FO NAME: <u>Purge Furnace Module</u>		PREREQUISITE: <u>FO-3</u>					
NO. OF PERFORMANCES: MIN. _____ DES. _____		SEQUENCE: _____					
REQUIRED TIMEFRAME (MET): MIN. _____ MAX. _____		JOINT OPS WITH: _____					
STEP NUMBER		1	2	3	4	5	6
STEP DURATION (MINS:SECS)	MINIMUM						
	MAXIMUM						
	PREFERRED	32:00	10:00	2:00	2:00		
STEP DELAY (HRS:MINS)	MINIMUM						
	MAXIMUM						
	PREFERRED						
CREW	NUMBER						
	PREFERRED						
MICROGRAVITY (g's)							
VACUUM VENT							
CONSUMABLES							
AVERAGE POWER REQUIRED (kW)		2.1487	2.1487	2.1336	2.1639		
ONBOARD COMPUTER SUPPORT	CORE APPLICATIONS						
	EXPERIMENT APPLICATIONS						
DATA	DOWNLINK DIGITAL (MBPS)						
	REAL-TIME (RT) OR DUMP (D)						
	COMMANDING PES (P), ISE (I), MPAC (M), POIC (PC)						
	VIDEO STANDARD/NONSTANDARD NTSC						
	REAL-TIME/DUMP/STORE						
SPECIAL EQUIPMENT OR CONSTRAINTS							
<b>STEP NO.</b>		<b>STEP DESCRIPTION</b>					
1		GN2 purge furnace					
2		Argon backfill					
3		Command sample process					
4		TCS configured					

TABLE 1.1-2. FUNCTIONAL OBJECTIVE REQUIREMENTS SHEET (Sheet 9 of 19)

EXPERIMENT NAME: <u>Space Station Furnace Facility</u>		FO NUMBER: <u>5</u>					
FO NAME: <u>Vapor Crystal Growth of HgCdTe</u>		PREREQUISITE: <u>FO-3</u>					
NO. OF PERFORMANCES: MIN. _____ DES. _____		SEQUENCE: _____					
REQUIRED TIMEFRAME (MET): MIN. _____ MAX. _____		JOINT OPS WITH: _____					
STEP NUMBER		1	2	3	4	5	6
STEP DURATION (MINS:SECS)	MINIMUM						
	MAXIMUM						
	PREFERRED	3:00	188:00	60:00	480:00	240:00	21:00
STEP DELAY (HRS:MINS)	MINIMUM						
	MAXIMUM						
	PREFERRED						
CREW	NUMBER						
	PREFERRED						
MICROGRAVITY (g's)							
VACUUM VENT							
CONSUMABLES							
AVERAGE POWER REQUIRED (kW)		2.2536	3.2496	2.5996	2.5996	2.2536	2.536
ONBOARD COMPUTER SUPPORT	CORE APPLICATIONS						
	EXPERIMENT APPLICATIONS						
DATA	DOWNLINK DIGITAL (MBPS)						
	REAL-TIME (RT) OR DUMP (D)						
	COMMANDING PES (P), ISE (I), MPAC (M), POIC (PC)						
	VIDEO STANDARD/NONSTANDARD NTSC REAL-TIME/DUMP/STORE						
SPECIAL EQUIPMENT OR CONSTRAINTS							
<b>STEP NO.</b>	<b>STEP DESCRIPTION</b>						
1	Activate furnace for processing						
2	Activate and process heat cycle						
3	Anneal sample						
4	Initiate vapor crystal growth processing						
5	Cool sample and extract						
6	Cool and stow						

TABLE 1.1-2. FUNCTIONAL OBJECTIVE REQUIREMENTS SHEET (Sheet 10 of 19)

EXPERIMENT NAME: <u>Space Station Furnace Facility</u>		FO NUMBER: <u>6</u>					
FO NAME: <u>Meltback and Regrowth of HgZnTe</u>		PREREQUISITE: <u>FO-3</u>					
NO. OF PERFORMANCES: MIN. _____ DES. _____		SEQUENCE: _____					
REQUIRED TIMEFRAME (MET): MIN. _____ MAX. _____		JOINT OPS WITH: _____					
STEP NUMBER		1	2	3	4	5	6
STEP DURATION (MINS:SECS)	MINIMUM						
	MAXIMUM						
	PREFERRED	3:00	340:00	120:00	125:00	600:00	7390:00
STEP DELAY (HRS:MINS)	MINIMUM						
	MAXIMUM						
	PREFERRED						
CREW	NUMBER						
	PREFERRED						
MICROGRAVITY (g's)							
VACUUM VENT							
CONSUMABLES							
AVERAGE POWER REQUIRED (kW)		2.2536	2.7316	2.6496	2.6496	2.6496	2.6496
ONBOARD COMPUTER SUPPORT	CORE APPLICATIONS						
	EXPERIMENT APPLICATIONS						
DATA	DOWNLINK DIGITAL (MBPS)						
	REAL-TIME (RT) OR DUMP (D)						
	COMMANDING						
	PES (P), ISE (I), MPAC (M), POIC (PC)						
	VIDEO STANDARD/NONSTANDARD NTSC						
	REAL-TIME/DUMP/STORE						
SPECIAL EQUIPMENT OR CONSTRAINTS							
<b>STEP NO.</b>		<b>STEP DESCRIPTION</b>					
1		Activate furnace for processing					
2		Process heat cycle					
3		Initial soak					
4		Translation to growth position					
5		Final soak					
6		Directional solidification					

TABLE 1.1-2. FUNCTIONAL OBJECTIVE REQUIREMENTS SHEET (Sheet 11 of 19)

EXPERIMENT NAME: <u>Space Station Furnace Facility</u>	FO NUMBER: <u>6</u>
FO NAME: <u>Meltback &amp; Regrowth of HgZnTe</u>	PREREQUISITE: <u>FO-3</u>
NO. OF PERFORMANCES: MIN. _____ DES. _____	SEQUENCE: _____
REQUIRED TIMEFRAME (MET): MIN. _____ MAX. _____	JOINT OPS WITH: _____

STEP NUMBER		7	8				
STEP DURATION (MINS:SECS)	MINIMUM						
	MAXIMUM						
	PREFERRED	372:00	115:00				
STEP DELAY (HRS:MINS)	MINIMUM						
	MAXIMUM						
	PREFERRED						
CREW	NUMBER						
	PREFERRED						
MICROGRAVITY (g's)							
VACUUM VENT							
CONSUMABLES							
AVERAGE POWER REQUIRED (kW)		2.3246	2.1946				
ONBOARD COMPUTER SUPPORT	CORE APPLICATIONS						
	EXPERIMENT APPLICATIONS						
DATA	DOWNLINK DIGITAL (MBPS)						
	REAL-TIME (RT) OR DUMP (D)						
	COMMANDING						
	PES (P), ISE (I), MPAC (M), POIC (PC)						
	VIDEO						
	STANDARD/NONSTANDARD NTSC						
	REAL-TIME/DUMP/STORE						
SPECIAL EQUIPMENT OR CONSTRAINTS							

STEP NO.	STEP DESCRIPTION
7	Cool sample
8	Stow sample

TABLE 1.1-2. FUNCTIONAL OBJECTIVE REQUIREMENTS SHEET (Sheet 12 of 19)

EXPERIMENT NAME: <u>Space Station Furnace Facility</u>		FO NUMBER: <u>6A</u>					
FO NAME: <u>Meltback and Regrowth of HgZnTe (Extended)</u>		PREREQUISITE: <u>FO-3</u>					
NO. OF PERFORMANCES: MIN. _____ DES. _____		SEQUENCE: _____					
REQUIRED TIMEFRAME (MET): MIN. _____ MAX. _____		JOINT OPS WITH: _____					
STEP NUMBER		1	2	3	4	5	6
STEP DURATION (MINS:SECS)	MINIMUM						
	MAXIMUM						
	PREFERRED	3:00	340:00	120:00	125:00	600:00	59957:00
STEP DELAY (HRS:MINS)	MINIMUM						
	MAXIMUM						
	PREFERRED						
CREW	NUMBER						
	PREFERRED						
MICROGRAVITY (g's)							
VACUUM VENT							
CONSUMABLES							
AVERAGE POWER REQUIRED (kW)		2.2536	2.7316	2.6496	2.6496	2.6496	2.6496
ONBOARD COMPUTER SUPPORT	CORE APPLICATIONS						
	EXPERIMENT APPLICATIONS						
DATA	DOWNLINK DIGITAL (MBPS)						
	REAL-TIME (RT) OR DUMP (D)						
	COMMANDING						
	PES (P), ISE (I), MPAC (M), POIC (PC)						
	VIDEO						
STANDARD/NONSTANDARD NTSC							
REAL-TIME/DUMP/STORE							
SPECIAL EQUIPMENT OR CONSTRAINTS							
<b>STEP NO.</b>		<b>STEP DESCRIPTION</b>					
1		Activate furnace for processing					
2		Process heat cycle					
3		Initial soak					
4		Translation to growth position					
5		Final soak					
6		Directional solidification					

TABLE 1.1-2. FUNCTIONAL OBJECTIVE REQUIREMENTS SHEET (Sheet 13 of 19)

EXPERIMENT NAME: <u>Space Station Furnace Facility</u>		FO NUMBER: <u>6A</u>					
FO NAME: <u>Meltback and Regrowth of HgZnTe (Extended)</u>		PREREQUISITE: <u>FO-3</u>					
NO. OF PERFORMANCES: MIN. _____ DES. _____		SEQUENCE: _____					
REQUIRED TIMEFRAME (MET): MIN. _____ MAX. _____		JOINT OPS WITH: _____					
STEP NUMBER		7	8				
STEP DURATION (MINS:SECS)	MINIMUM						
	MAXIMUM						
	PREFERRED	372:00	115:00				
STEP DELAY (HRS:MINS)	MINIMUM						
	MAXIMUM						
	PREFERRED						
CREW	NUMBER						
	PREFERRED						
MICROGRAVITY (g's)							
VACUUM VENT							
CONSUMABLES							
AVERAGE POWER REQUIRED (kW)		2.3246	2.1946				
ONBOARD COMPUTER SUPPORT	CORE APPLICATIONS						
	EXPERIMENT APPLICATIONS						
DATA	DOWNLINK DIGITAL (MBPS)						
	REAL-TIME (RT) OR DUMP (D)						
	COMMANDING						
	PES (P), ISE (I), MPAC (M), POIC (PC)						
	VIDEO						
	STANDARD/NONSTANDARD NTSC						
	REAL-TIME/DUMP/STORE						
SPECIAL EQUIPMENT OR CONSTRAINTS							
<u>STEP NO.</u>		<u>STEP DESCRIPTION</u>					
7		Cool sample					
8		Internally stow sample					

TABLE 1.1-2. FUNCTIONAL OBJECTIVE REQUIREMENTS SHEET (Sheet 14 of 19)

EXPERIMENT NAME: <u>Space Station Furnace Facility</u>		FO NUMBER: <u>7</u>					
FO NAME: <u>Growth of CdTe by Directional Solidification</u>		PREREQUISITE: <u>FO-3</u>					
NO. OF PERFORMANCES: MIN. _____ DES. _____		SEQUENCE: _____					
REQUIRED TIMEFRAME (MET): MIN. _____ MAX. _____		JOINT OPS WITH: _____					
STEP NUMBER		1	2	3	4	5	6
STEP DURATION (MINS:SECS)	MINIMUM						
	MAXIMUM						
	PREFERRED	3:00	538:00	120:00	4278:00	438:00	208:00
STEP DELAY (HRS:MINS)	MINIMUM						
	MAXIMUM						
	PREFERRED						
CREW	NUMBER						
	PREFERRED						
MICROGRAVITY (g's)							
VACUUM VENT							
CONSUMABLES							
AVERAGE POWER REQUIRED (kW)		2.2536	3.4786	3.3746	3.2996	2.7244	2.3746
ONBOARD COMPUTER SUPPORT	CORE APPLICATIONS						
	EXPERIMENT APPLICATIONS						
DATA	DOWNLINK DIGITAL (MBPS)						
	REAL-TIME (RT) OR DUMP (D)						
	COMMANDING						
	PES (P), ISE (I), MPAC (M), POIC (PC)						
	VIDEO						
STANDARD/NONSTANDARD NTSC							
REAL-TIME/DUMP/STORE							
SPECIAL EQUIPMENT OR CONSTRAINTS							
<b>STEP NO.</b>		<b>STEP DESCRIPTION</b>					
1		Activate furnace module for processing					
2		Process heat cycle					
3		Soak					
4		Process sample, directional solidification					
5		Cool sample to 400 °C					
6		Cool sample to 200 °C and internally stow sample					

TABLE 1.1-2. FUNCTIONAL OBJECTIVE REQUIREMENTS SHEET (Sheet 15 of 19)

EXPERIMENT NAME: <u>Space Station Furnace Facility</u>		FO NUMBER: <u>8</u>					
FO NAME: <u>Growth of GaAs by Directional Solidification</u>		PREREQUISITE: <u>FO-3</u>					
NO. OF PERFORMANCES: MIN. _____ DES. _____		SEQUENCE: _____					
REQUIRED TIMEFRAME (MET): MIN. _____ MAX. _____		JOINT OPS WITH: _____					
STEP NUMBER		1	2	3	4	5	6
STEP DURATION (MINS:SECS)	MINIMUM						
	MAXIMUM						
	PREFERRED	3:00	45:00	227:00	68:00	720:00	210:00
STEP DELAY (HRS:MINS)	MINIMUM						
	MAXIMUM						
	PREFERRED						
CREW	NUMBER						
	PREFERRED						
MICROGRAVITY (g's)							
VACUUM VENT							
CONSUMABLES							
AVERAGE POWER REQUIRED (kW)		2.2536	2.9916	4.4866	3.4776	3.3926	2.8016
ONBOARD COMPUTER SUPPORT	CORE APPLICATIONS						
	EXPERIMENT APPLICATIONS						
DATA	DOWNLINK DIGITAL (MBPS)						
	REAL-TIME (RT) OR DUMP (D)						
	COMMANDING						
	PES (P), ISE (I), MPAC (M), POIC (PC)						
	VIDEO STANDARD/NONSTANDARD NTSC						
	REAL-TIME/DUMP/STORE						
SPECIAL EQUIPMENT OR CONSTRAINTS							
<b>STEP NO.</b>	<b>STEP DESCRIPTION</b>						
1	Activate furnace module processing						
2	Preheat cycle						
3	Process heat cycle						
4	Soak						
5	Translate furnace/process sample						
6	Cool down to 800 °C						



TABLE 1.1-2. FUNCTIONAL OBJECTIVE REQUIREMENTS SHEET (Sheet 16 of 19)

EXPERIMENT NAME: <u>Space Station Furnace Facility</u>		FO NUMBER: <u>8</u>					
FO NAME: <u>Growth of GaAs by Directional Solidification</u>		PREREQUISITE: <u>FO-3</u>					
NO. OF PERFORMANCES: MIN. _____ DES. _____		SEQUENCE: _____					
REQUIRED TIMEFRAME (MET): MIN. _____ MAX. _____		JOINT OPS WITH: _____					
<b>STEP NUMBER</b>		<b>7</b>					
<b>STEP DURATION (MINS:SECS)</b>	<b>MINIMUM</b>						
	<b>MAXIMUM</b>						
	<b>PREFERRED</b>	466:00					
<b>STEP DELAY (HRS:MINS)</b>	<b>MINIMUM</b>						
	<b>MAXIMUM</b>						
	<b>PREFERRED</b>						
<b>CREW</b>	<b>NUMBER</b>						
	<b>PREFERRED</b>						
<b>MICROGRAVITY (g's)</b>							
<b>VACUUM VENT</b>							
<b>CONSUMABLES</b>							
<b>AVERAGE POWER REQUIRED (kW)</b>		2.2536					
<b>ONBOARD COMPUTER SUPPORT</b>	<b>CORE APPLICATIONS</b>						
	<b>EXPERIMENT APPLICATIONS</b>						
<b>DATA</b>	<b>DOWNLINK DIGITAL (MBPS)</b>						
	<b>REAL-TIME (RT) OR DUMP (D)</b>						
	<b>COMMANDING</b>						
	<b>PES (P), ISE (I), MPAC (M), POIC (PC)</b>						
	<b>VIDEO</b>						
	<b>STANDARD/NONSTANDARD NTSC</b>						
	<b>REAL-TIME/DUMP/STORE</b>						
<b>SPECIAL EQUIPMENT OR CONSTRAINTS</b>							
<b>STEP NO.</b>		<b>STEP DESCRIPTION</b>					
7		Cool down to 200 °C and internally stow					

TABLE 1.1-2. FUNCTIONAL OBJECTIVE REQUIREMENTS SHEET (Sheet 17 of 19)

EXPERIMENT NAME: <u>Space Station Furnace Facility</u>		FO NUMBER: <u>9</u>					
FO NAME: <u>Configure Furnace for Shutdown/Sample Loading</u>		PREREQUISITE: _____					
NO. OF PERFORMANCES: MIN. _____ DES. _____		SEQUENCE: _____					
REQUIRED TIMEFRAME (MET): MIN. _____ MAX. _____		JOINT OPS WITH: _____					
STEP NUMBER		1	2	3	4	5	6
STEP DURATION (MINS:SECS)	MINIMUM						
	MAXIMUM						
	PREFERRED	3:00	5:00	1:00			
STEP DELAY (HRS:MINS)	MINIMUM						
	MAXIMUM						
	PREFERRED						
CREW	NUMBER						
	PREFERRED						
MICROGRAVITY (g's)							
VACUUM VENT							
CONSUMABLES							
AVERAGE POWER REQUIRED (kW)		2.1336	2.1336	2.1336			
ONBOARD COMPUTER SUPPORT	CORE APPLICATIONS						
	EXPERIMENT APPLICATIONS						
DATA	DOWNLINK DIGITAL (MBPS)						
	REAL-TIME (RT) OR DUMP (D)						
	COMMANDING						
	PES (P), ISE (I), MPAC (M), POIC (PC)						
	VIDEO						
	STANDARD/NONSTANDARD NTSC						
	REAL-TIME/DUMP/STORE						
SPECIAL EQUIPMENT OR CONSTRAINTS							
<u>STEP NO.</u>	<u>STEP DESCRIPTION</u>						
1	Verify furnace is in home position						
2	Furnace specific tests						
3	CCU secures power from furnace module						

TABLE 1.1-2. FUNCTIONAL OBJECTIVE REQUIREMENTS SHEET (Sheet 18 of 19)

EXPERIMENT NAME: <u>Space Station Furnace Facility</u>		FO NUMBER: <u>10</u>					
FO NAME: <u>SSFF Shutdown</u>		PREREQUISITE: <u>FO-9</u>					
NO. OF PERFORMANCES: MIN. _____ DES. _____		SEQUENCE: _____					
REQUIRED TIMEFRAME (MET): MIN. _____ MAX. _____		JOINT OPS WITH: _____					
STEP NUMBER		1	2	3	4	5	6
STEP DURATION (MINS:SECS)	MINIMUM						
	MAXIMUM						
	PREFERRED	3:00	3:00	5:00	1:00	1:00	1:00
STEP DELAY (HRS:MINS)	MINIMUM						
	MAXIMUM						
	PREFERRED						
CREW	NUMBER						
	PREFERRED						
MICROGRAVITY (g's)							
VACUUM VENT							
CONSUMABLES							
AVERAGE POWER REQUIRED (kW)		1.1479	1.1479	1.1479	0.5612	0.3102	0.00
ONBOARD COMPUTER SUPPORT	CORE APPLICATIONS						
	EXPERIMENT APPLICATIONS						
DATA	DOWNLINK DIGITAL (MBPS)						
	REAL-TIME (RT) OR DUMP (D)						
	COMMANDING PES (P), ISE (I), MPAC (M), POIC (PC)						
	VIDEO STANDARD/NONSTANDARD NTSC REAL-TIME/DUMP/STORE						
SPECIAL EQUIPMENT OR CONSTRAINTS							
<b>STEP NO.</b>	<b>STEP DESCRIPTION</b>						
1	Distributed Core Eq. shutdown						
2	Verify experiment/furnace shutdown						
3	GDS shutdown						
4	DMS nonessential shutdown						
5	TCS shutdown						
6	CCU shutdown						

TABLE 1.1-2. FUNCTIONAL OBJECTIVE REQUIREMENTS SHEET (Sheet 19 of 19)

EXPERIMENT NAME: <u>Space Station Furnace Facility</u>		FO NUMBER: <u>11</u>					
FO NAME: <u>Furnace Calibration/Bakeout</u>		PREREQUISITE: <u>FO-3</u>					
NO. OF PERFORMANCES: MIN. _____ DES. _____		SEQUENCE: _____					
REQUIRED TIMEFRAME (MET): MIN. _____ MAX. _____		JOINT OPS WITH: _____					
STEP NUMBER		1	2	3	4	5	6
STEP DURATION (MINS:SECS)	MINIMUM						
	MAXIMUM						
	PREFERRED	1:00	TBD	480:00			
STEP DELAY (HRS:MINS)	MINIMUM						
	MAXIMUM						
	PREFERRED						
CREW	NUMBER						
	PREFERRED						
MICROGRAVITY (g's)							
VACUUM VENT							
CONSUMABLES							
AVERAGE POWER REQUIRED (kW)		2.1336	TBD	TBD			
ONBOARD COMPUTER SUPPORT	CORE APPLICATIONS						
	EXPERIMENT APPLICATIONS						
DATA	DOWNLINK DIGITAL (MBPS)						
	REAL-TIME (RT) OR DUMP (D)						
	COMMANDING PES (P), ISE (I), MPAC (M), POIC (PC)						
	VIDEO STANDARD/NONSTANDARD NTSC REAL-TIME/DUMP/STORE						
SPECIAL EQUIPMENT OR CONSTRAINTS							
<b>STEP NO.</b>	<b>STEP DESCRIPTION</b>						
1	Activate calibration/bakeout						
2	Initiate calibration						
3	Bakeout/calibration process						

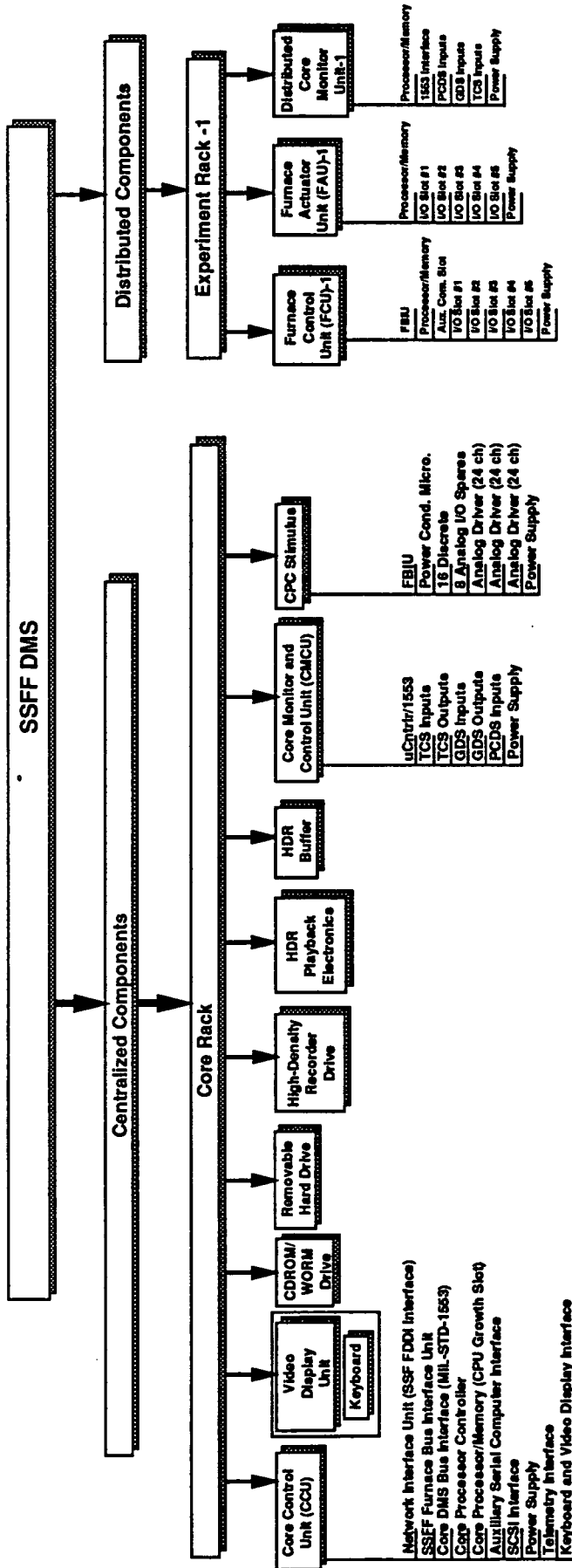
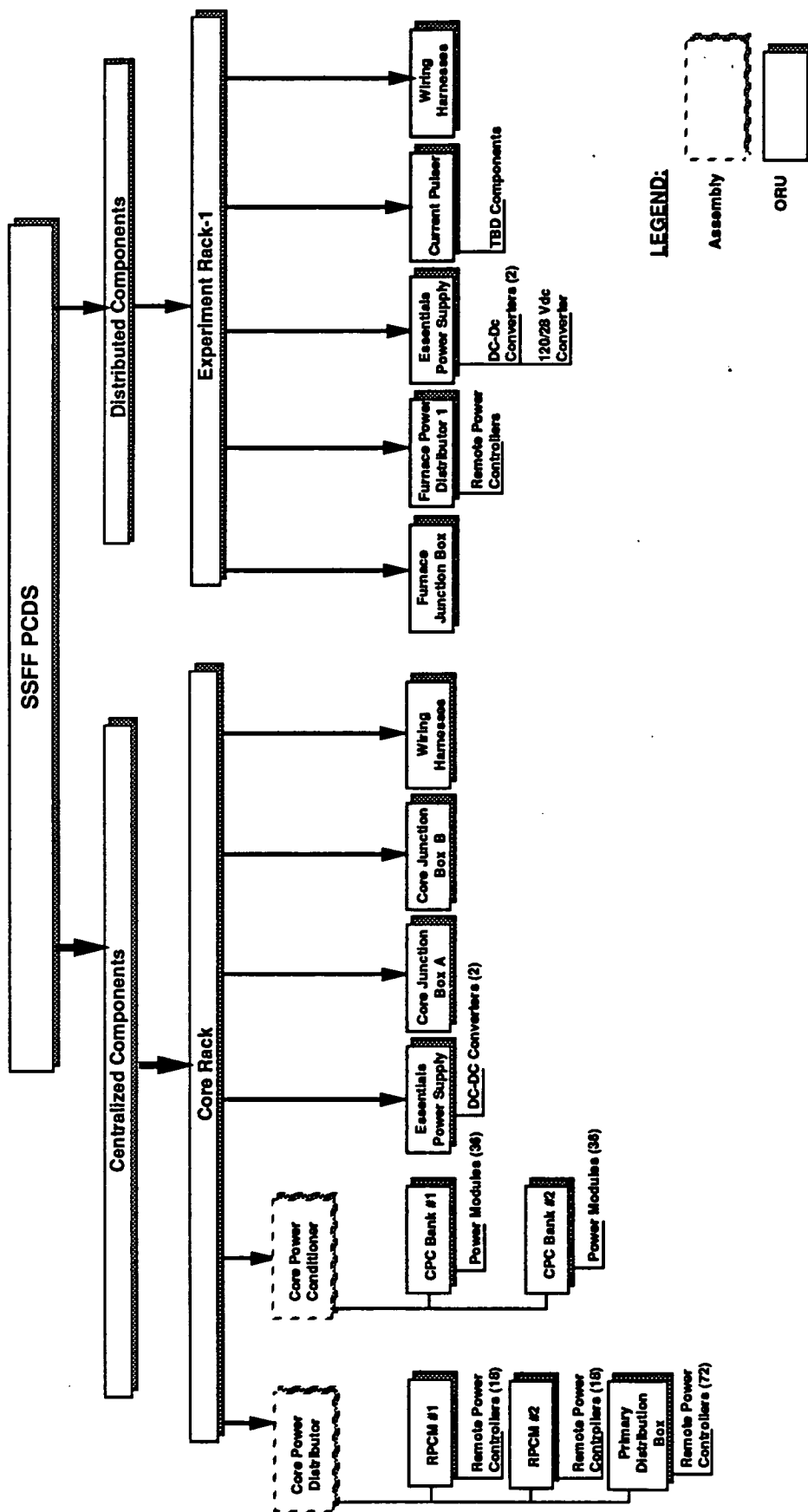


FIGURE 1.1-2. DMS COMPONENT TREE



**LEGEND:**

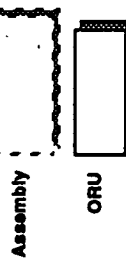


FIGURE 1.1-3. PCDS COMPONENT TREE

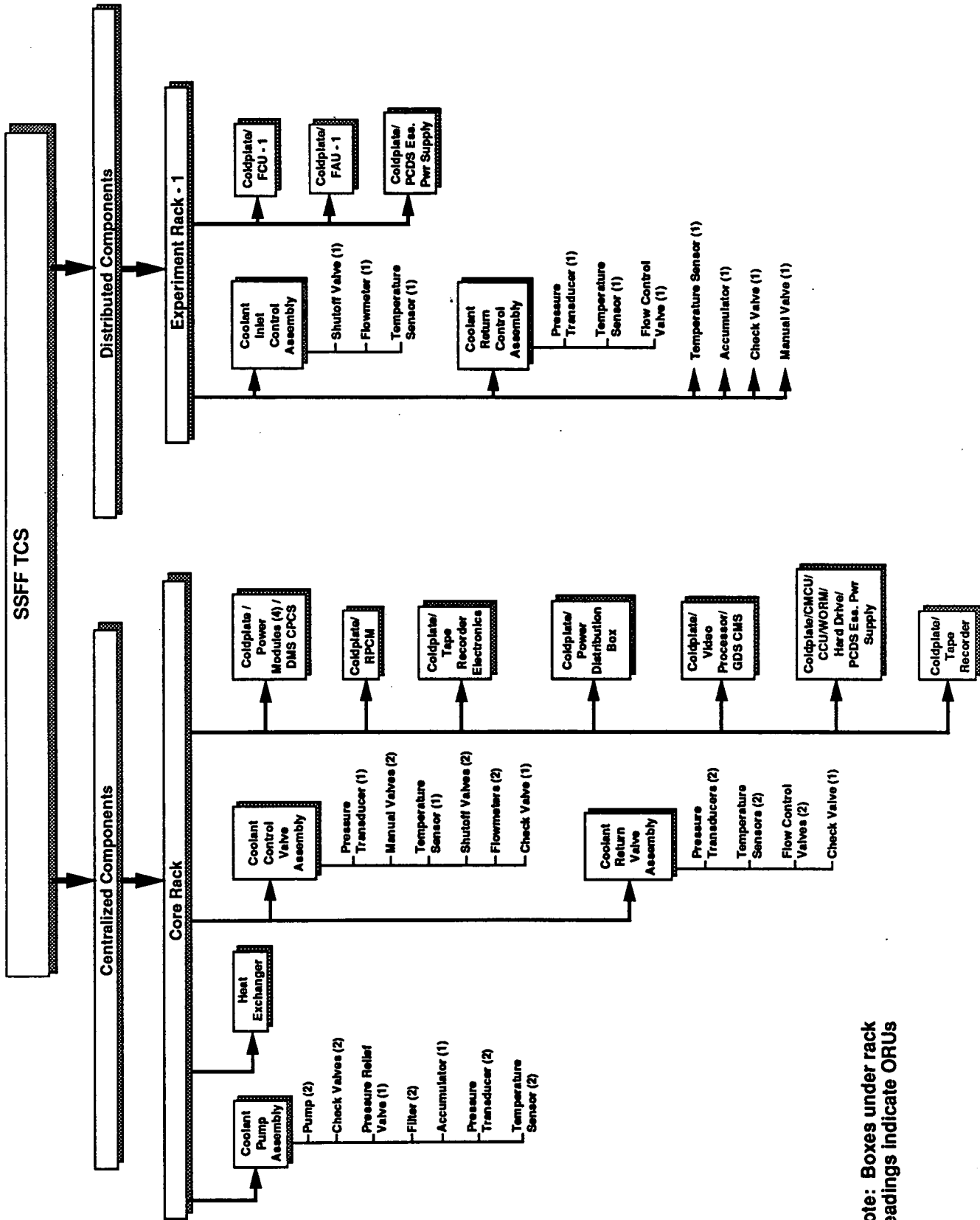


FIGURE 1.1-4. TCS COMPONENT TREE

Note: Boxes under rack headings indicate ORUs

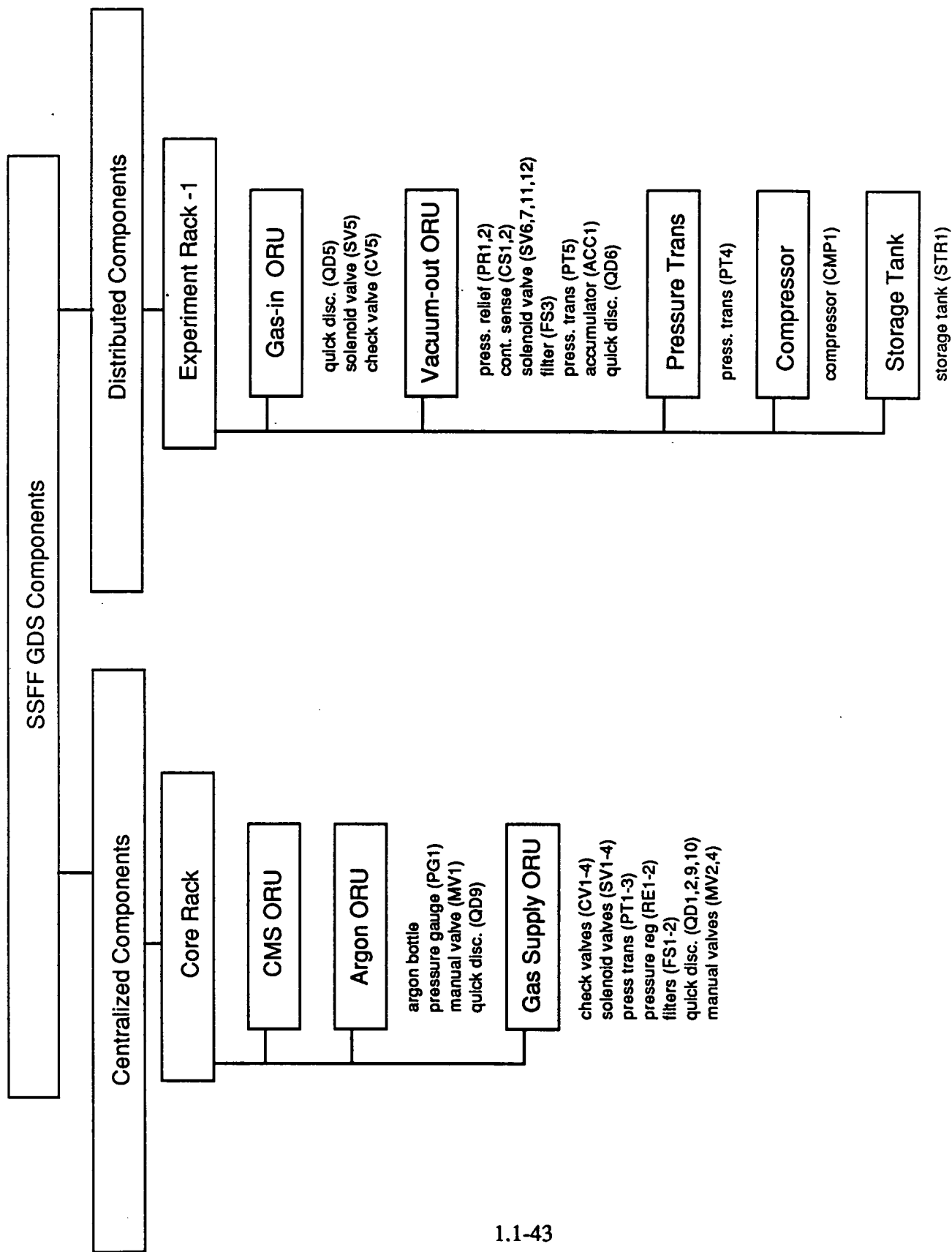


FIGURE 1.1-5. GDS COMPONENT TREE



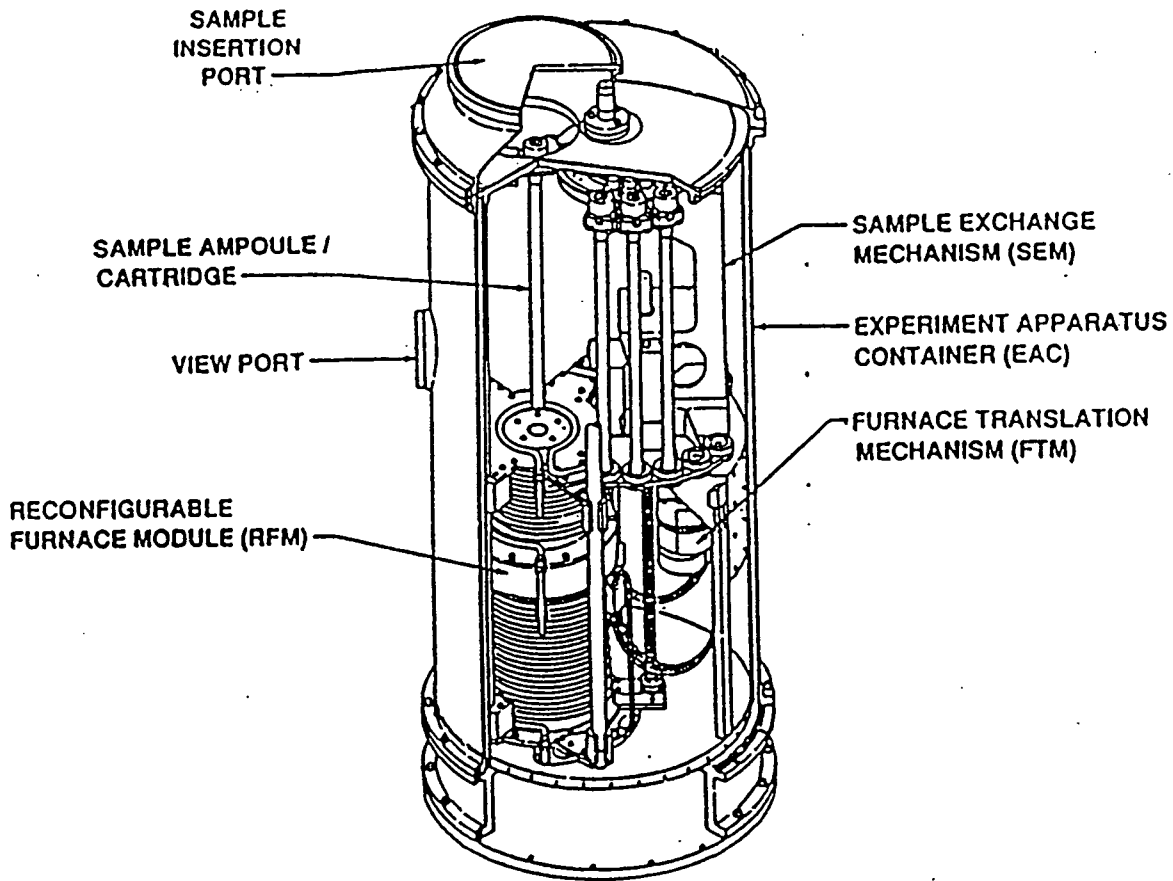
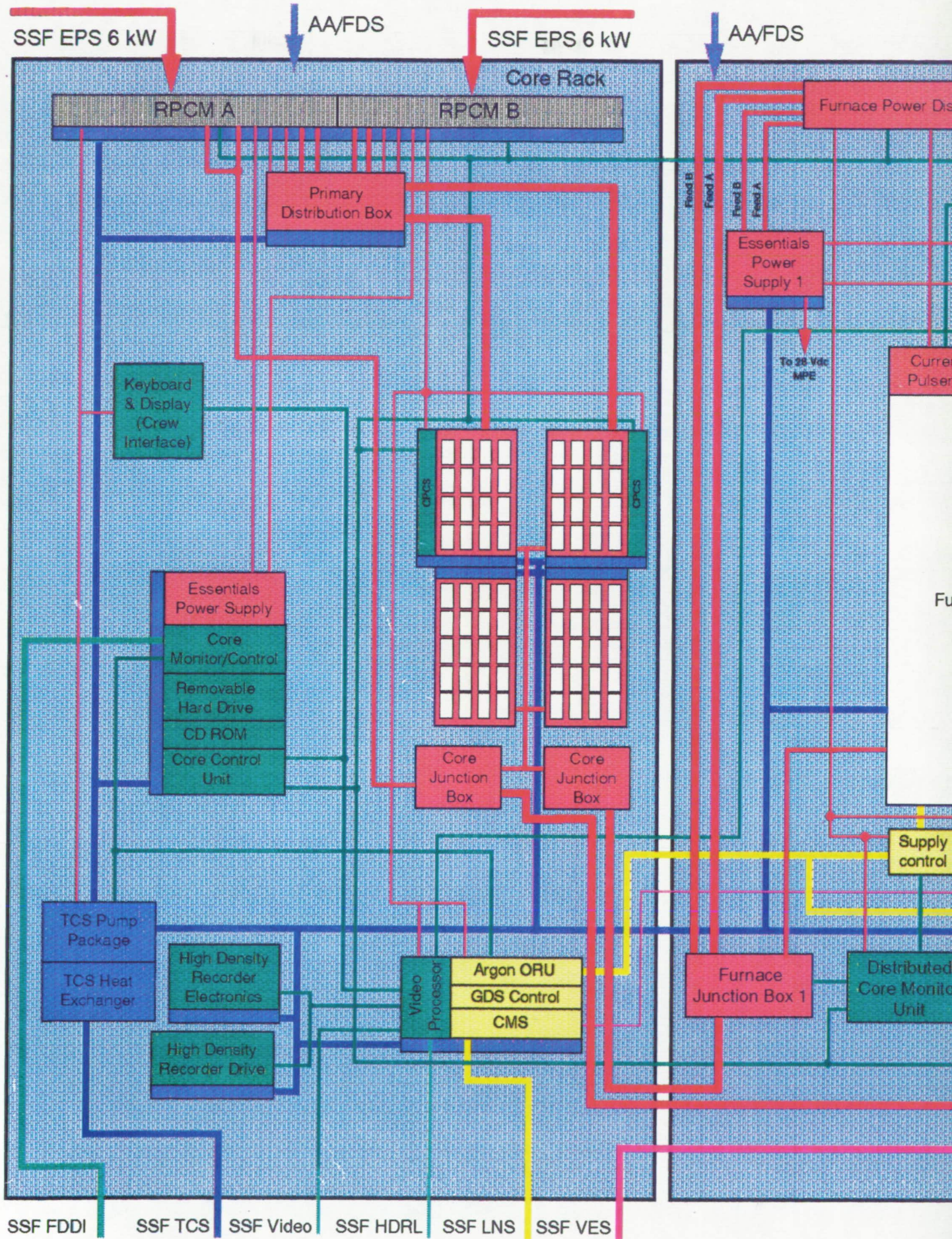


FIGURE 1.1-6. FURNACE MODULE-1 EQUIPMENT PICTORIAL REPRESENTATION



p45.

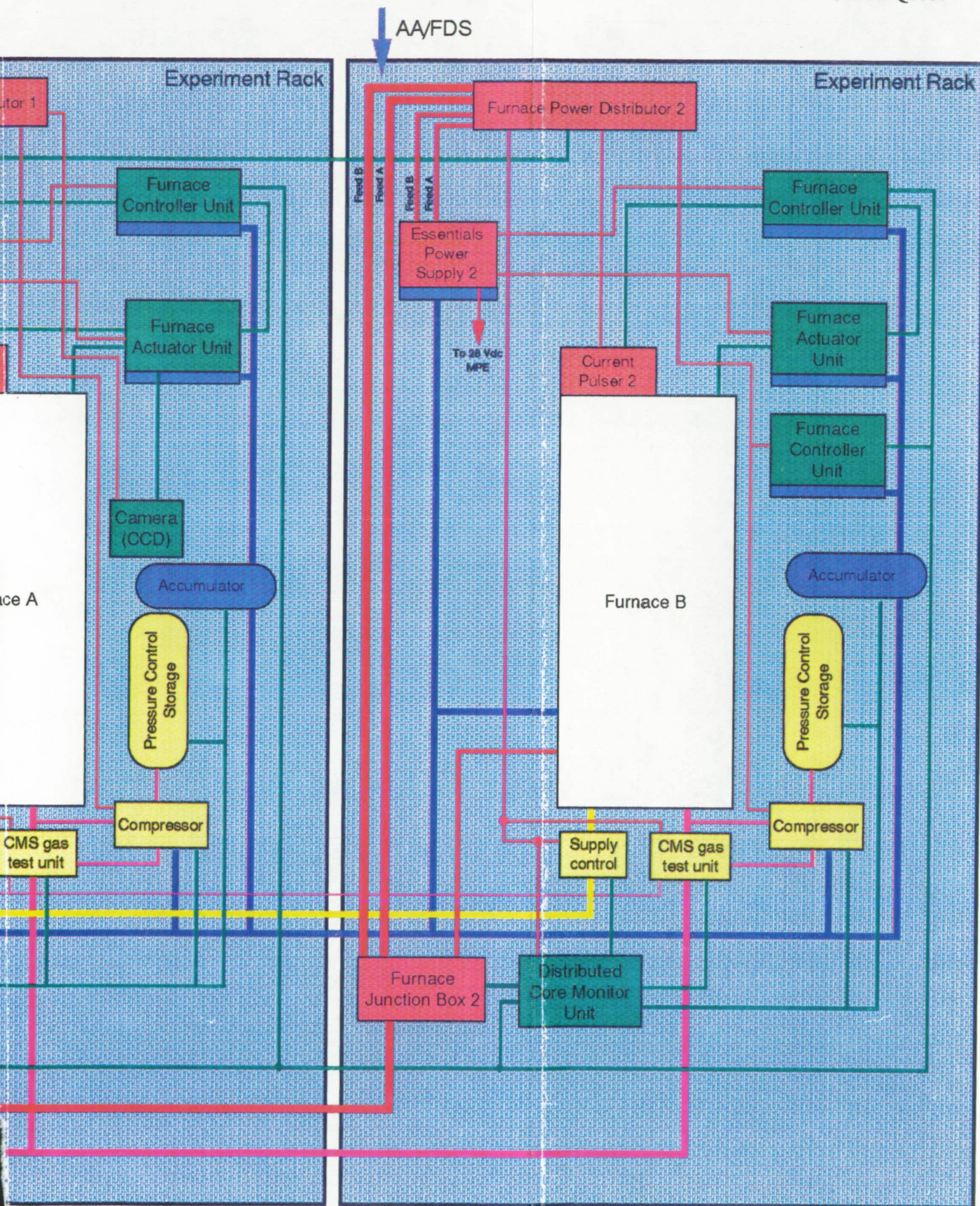


TABLE 1.1-3. SSFF OPERATIONAL FUNCTIONAL FLOW (Sheet 1 of 19)

FO: <u>  0  </u> FO TITLE: <u>  PAYLOAD ACTIVATION AND CHECKOUT  </u>			
GND/PES/CRW FUNCTION	CENTRALIZED SS FUNCTIONS	DISTRIBUTED SS FUNCTIONS	FURNACE MODULE
<p><b>STEP 1</b> OPEN TCS MANUAL VALVE</p> <hr/> <p>CRW</p> <p>↓</p> <p><b>STEP 2</b> OPEN GDS MANUAL VALVE</p> <hr/> <p>CRW</p> <p>↓</p> <p><b>STEP 3</b> VERIFY SSF SERVICES AT RACK</p> <hr/> <p>CRW</p> <p>↓</p> <p>END OF FO-0 PROCEED TO FO-1</p>			

TABLE 1.1-3. SSFF OPERATIONAL FUNCTIONAL FLOW (Sheet 2 of 19)

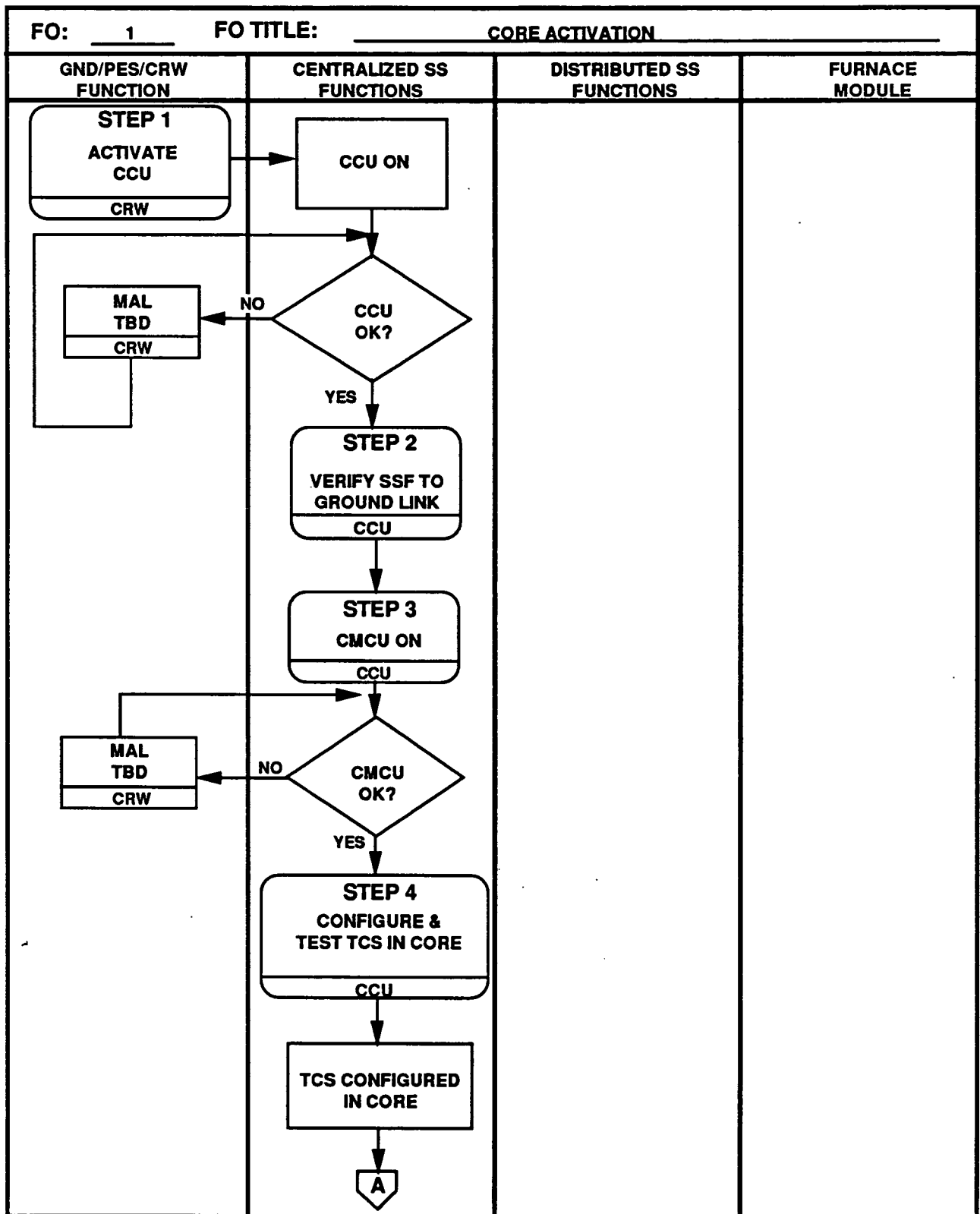


TABLE 1.1-3. SSFF OPERATIONAL FUNCTIONAL FLOW (Sheet 3 of 19)

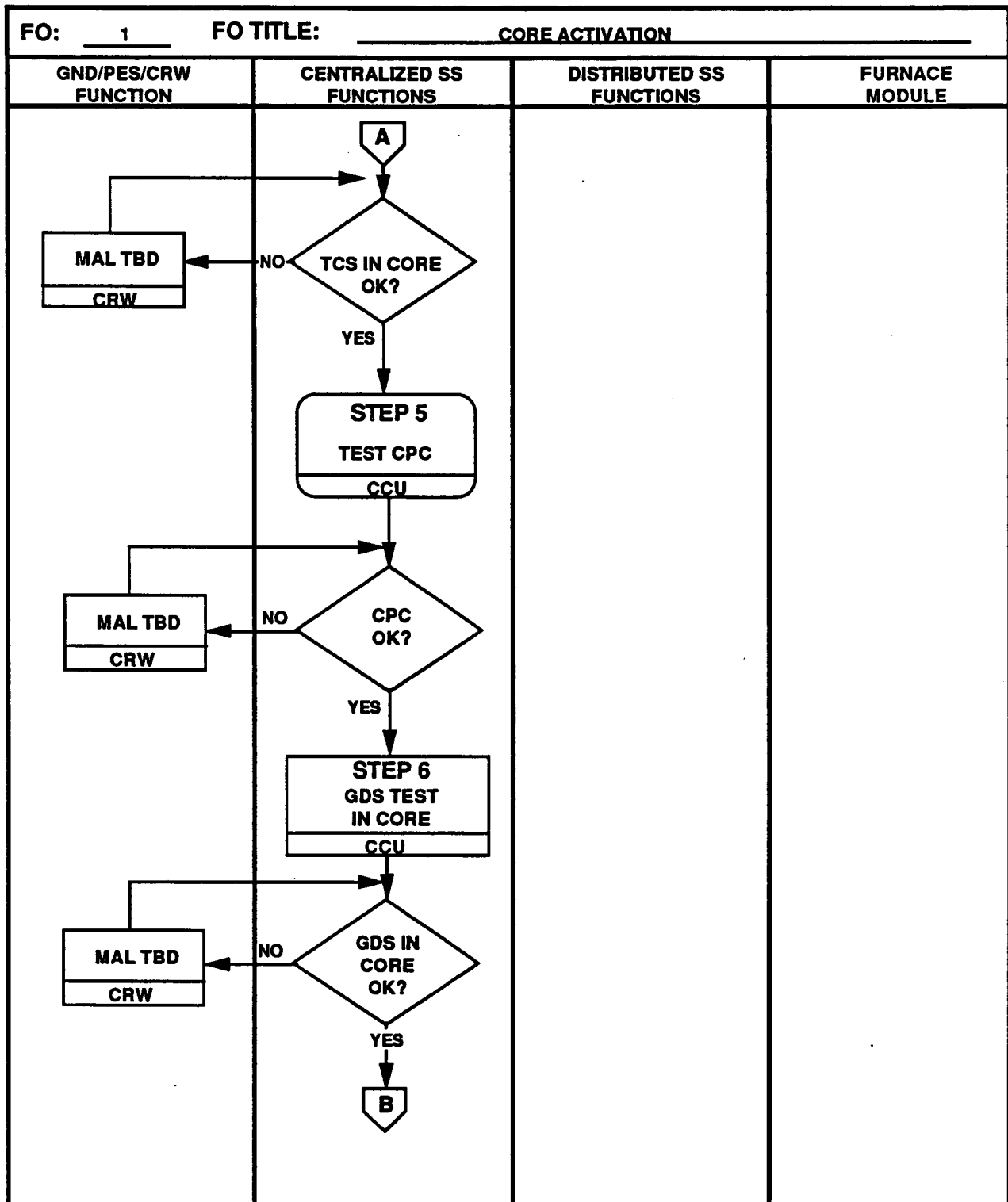


TABLE 1.1-3. SSFF OPERATIONAL FUNCTIONAL FLOW (Sheet 4 of 19)

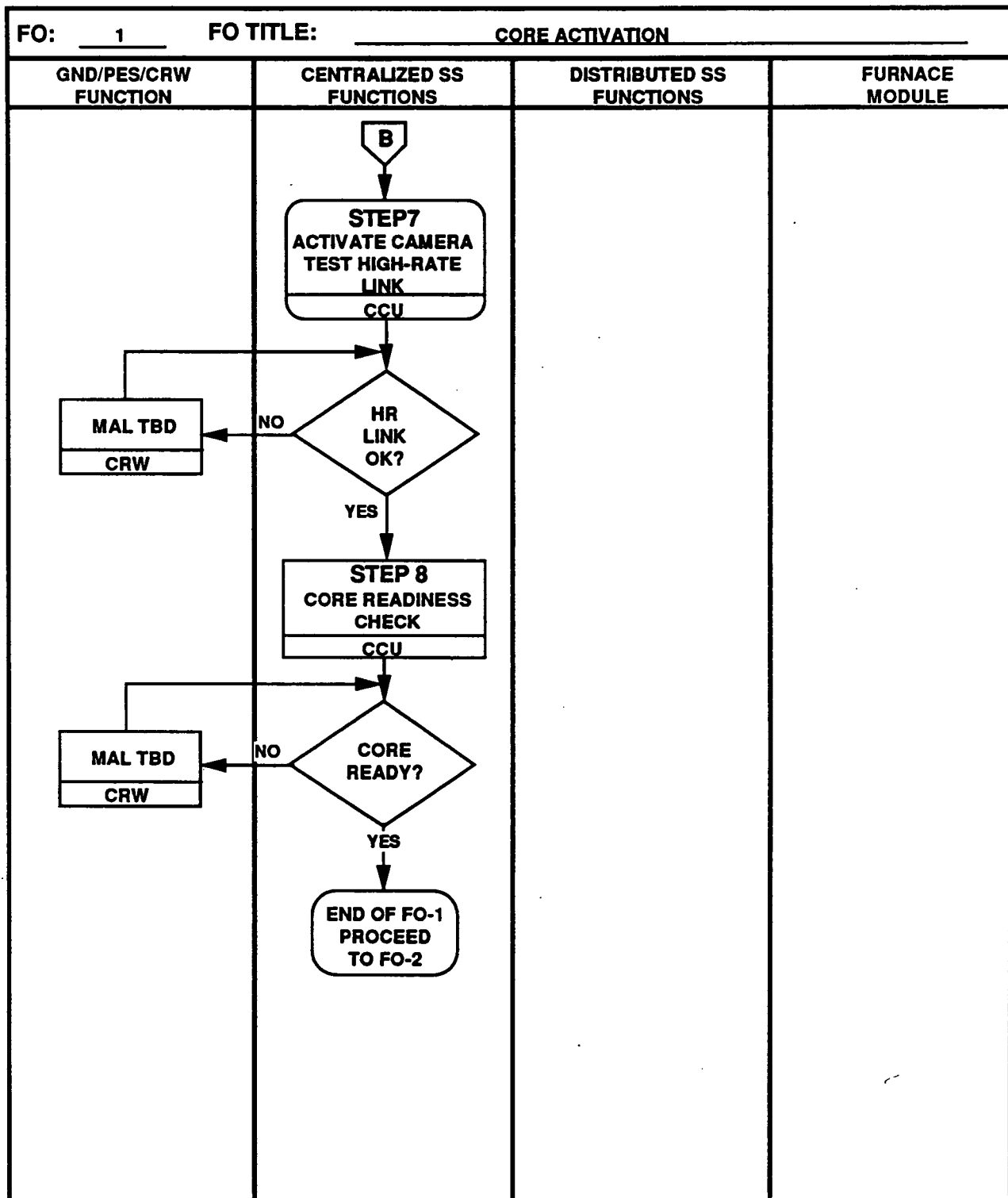


TABLE 1.1-3. SSFF OPERATIONAL FUNCTIONAL FLOW (Sheet 5 of 19)

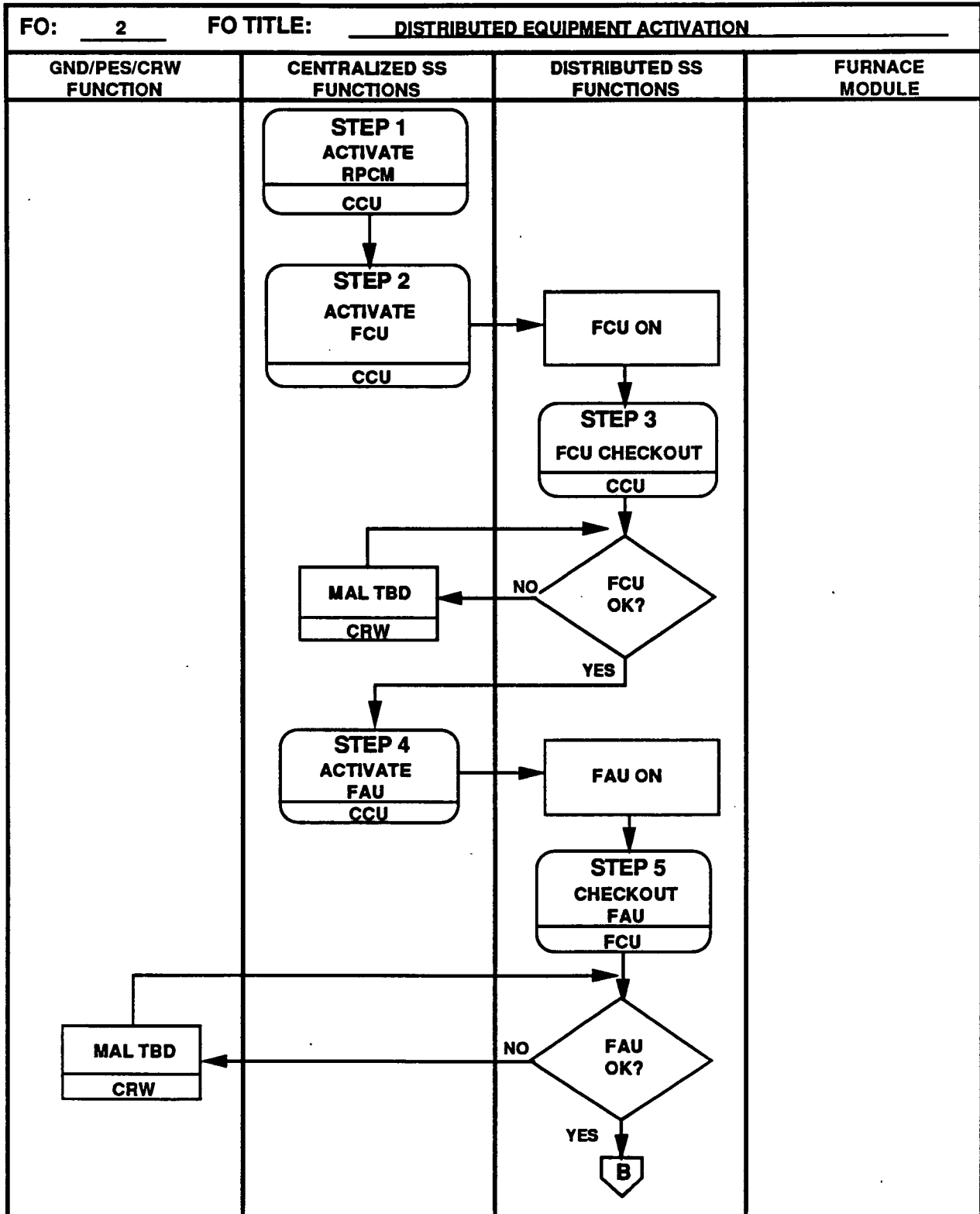




TABLE 1.1-3. SSFF OPERATIONAL FUNCTIONAL FLOW (Sheet 6 of 19)

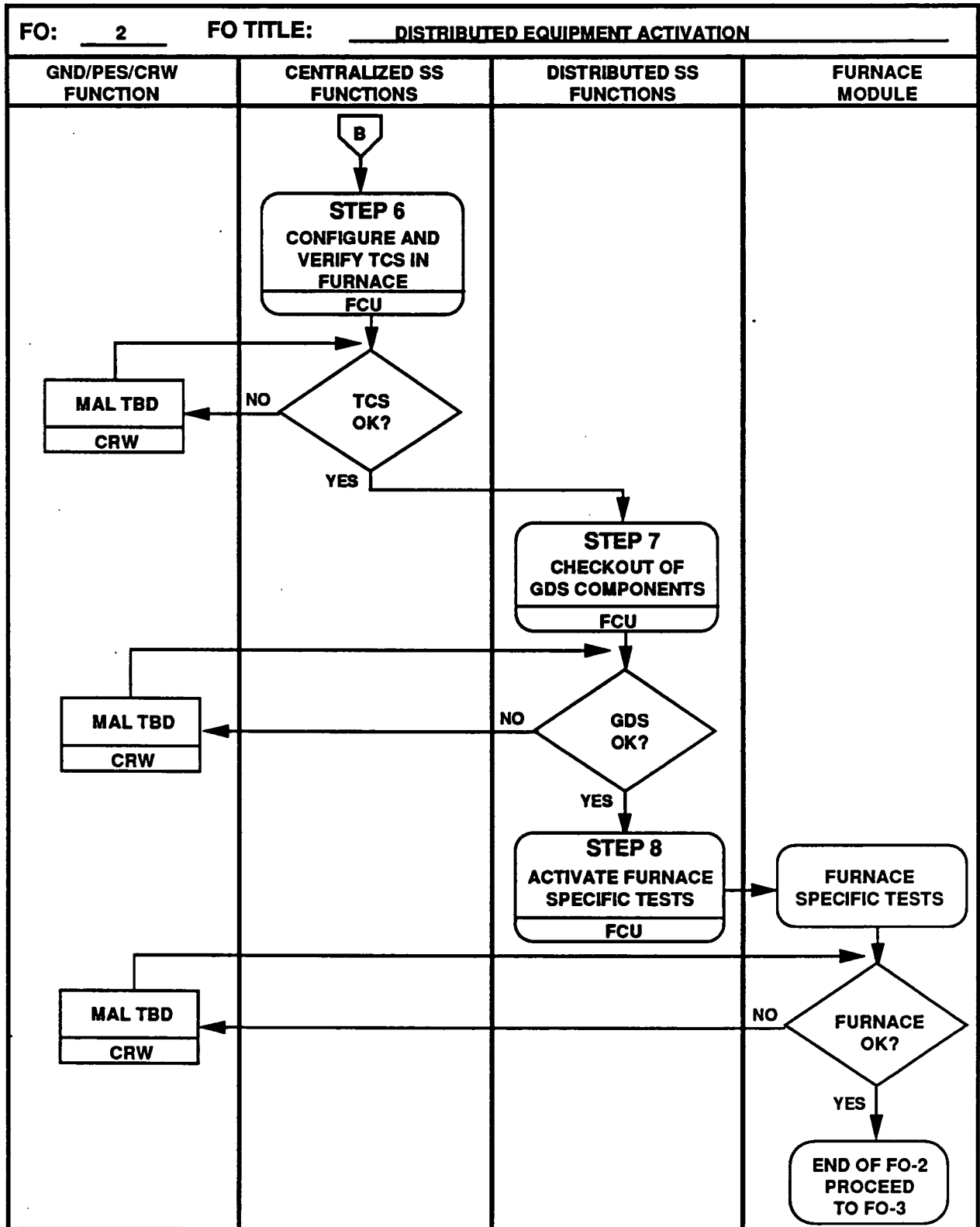


TABLE 1.1-3. SSFF OPERATIONAL FUNCTIONAL FLOW (Sheet 7 of 19)

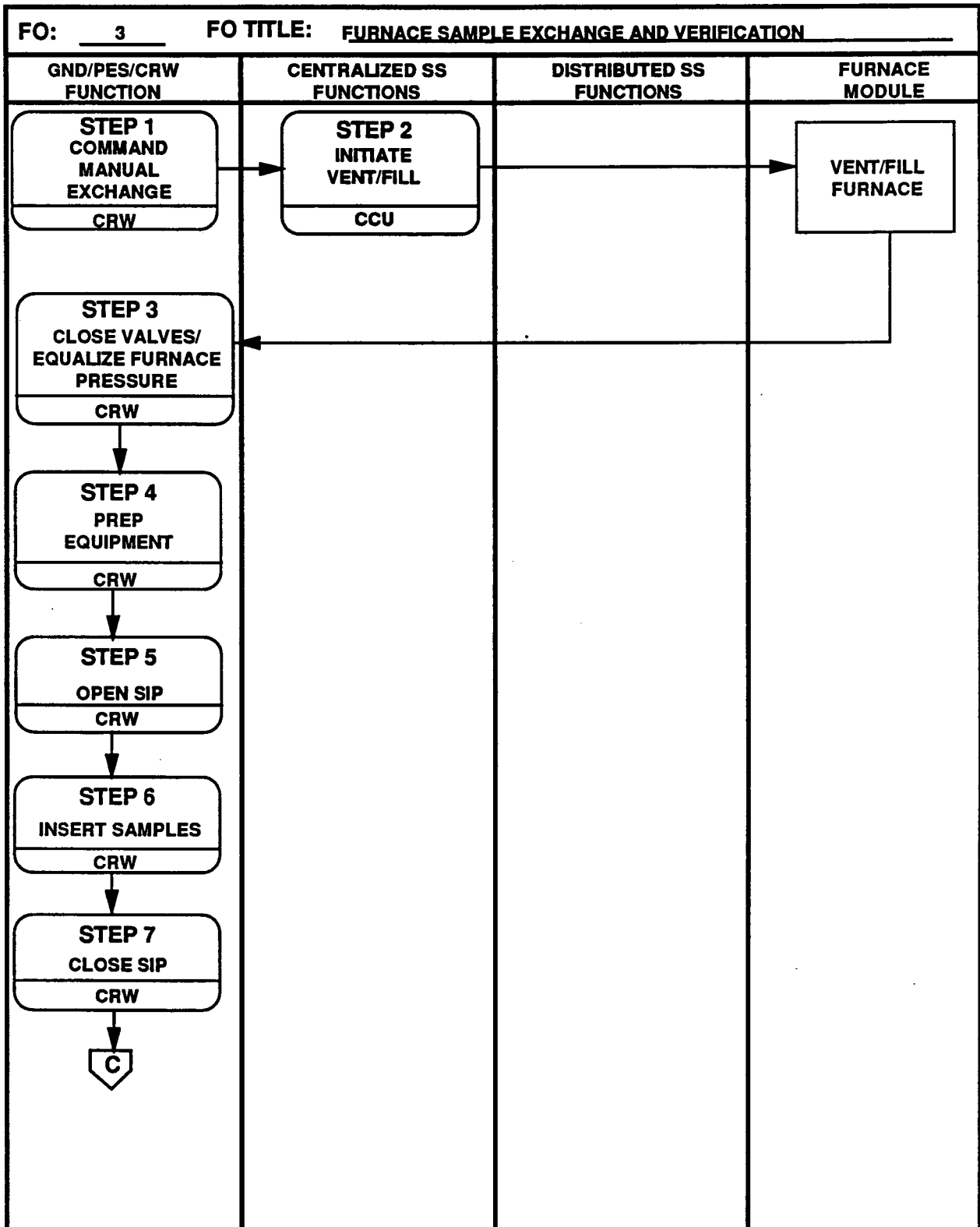


TABLE 1.1-3. SSFF OPERATIONAL FUNCTIONAL FLOW (Sheet 8 of 19)

FO: <u>  3  </u> FO TITLE: <u>  FURNACE SAMPLE EXCHANGE AND VERIFICATION  </u>			
GND/PES/CRW FUNCTION	CENTRALIZED SS FUNCTIONS	DISTRIBUTED SS FUNCTIONS	FURNACE MODULE
<pre> graph TD     C{C} --&gt; S8[STEP 8 OPEN MANUAL VALVES CRW]     S8 --&gt; S9[STEP 9 COMMAND MANUAL EXCHANGE OFF CRW]     S9 --&gt; S10[STEP 10 PERFORM SEAL CHECK CRW]     S10 --&gt; S11[STEP 11 LOAD LIST PROCESS PES]     S11 --&gt; E[END OF FO-3 PROCEED TO FO-4]                     </pre>			

TABLE 1.1-3. SSFF OPERATIONAL FUNCTIONAL FLOW (Sheet 9 of 19)

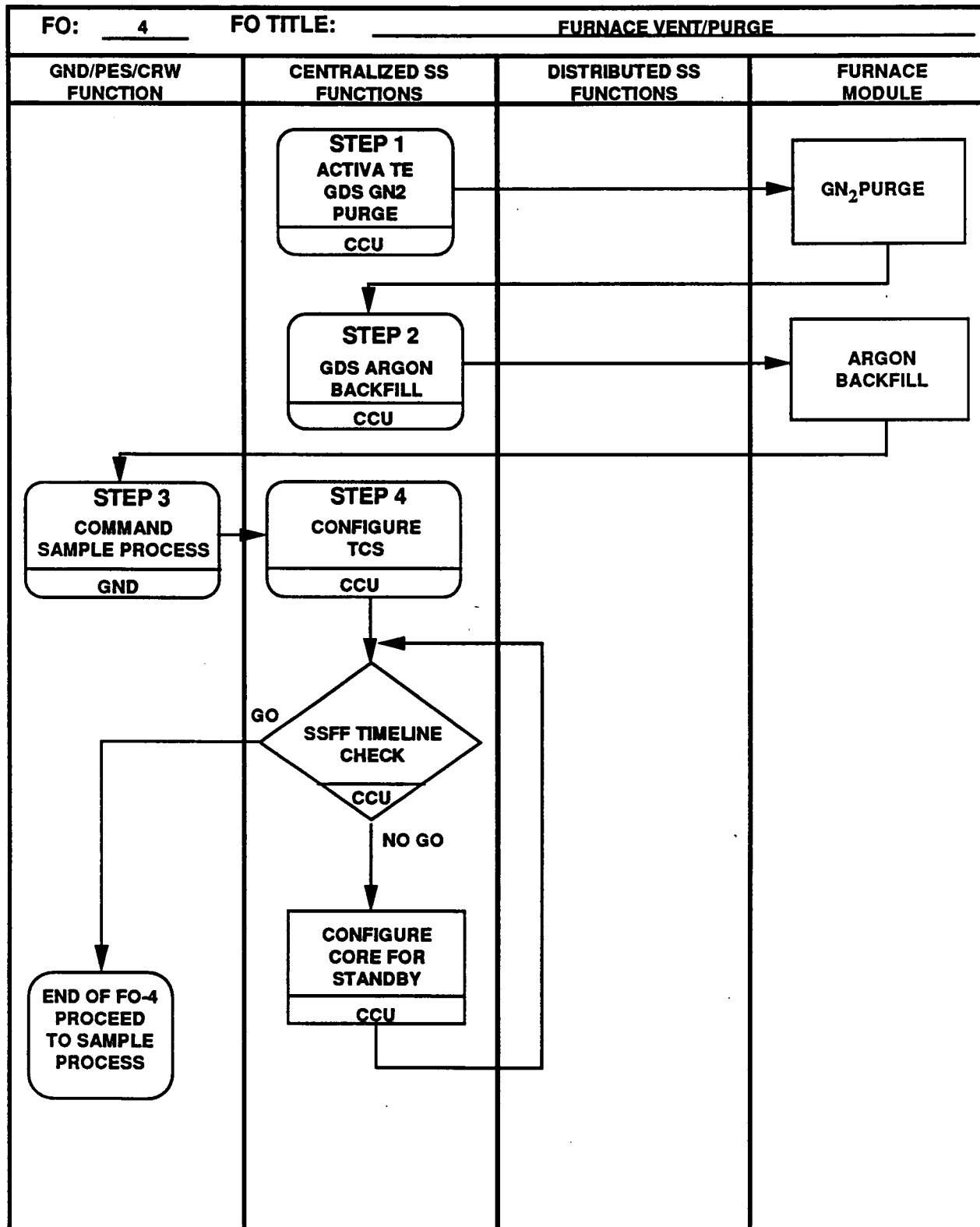


TABLE 1.1-3. SSFF OPERATIONAL FUNCTIONAL FLOW (Sheet 10 of 19)

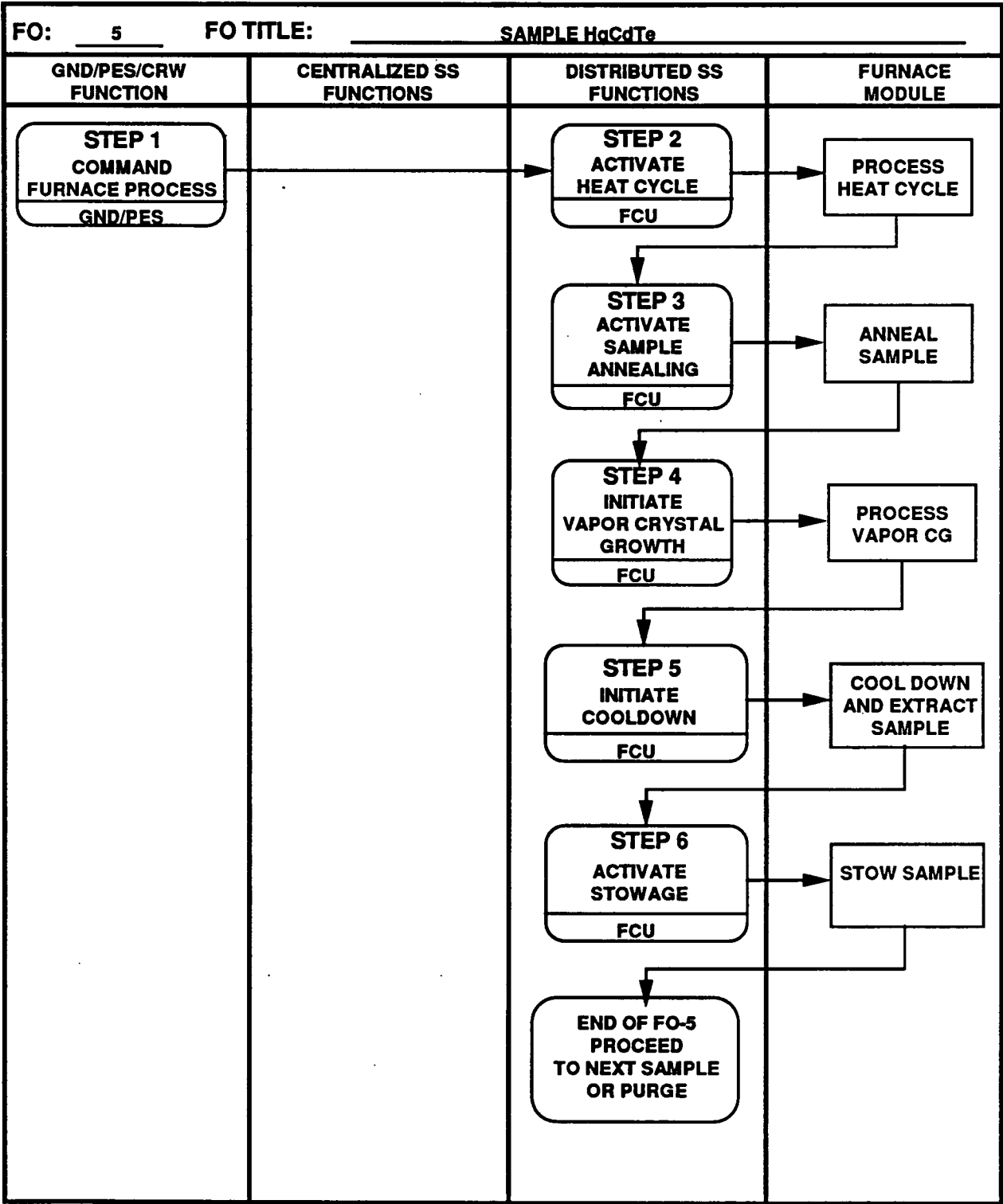


TABLE 1.1-3. SSFF OPERATIONAL FUNCTIONAL FLOW (Sheet 11 of 19)

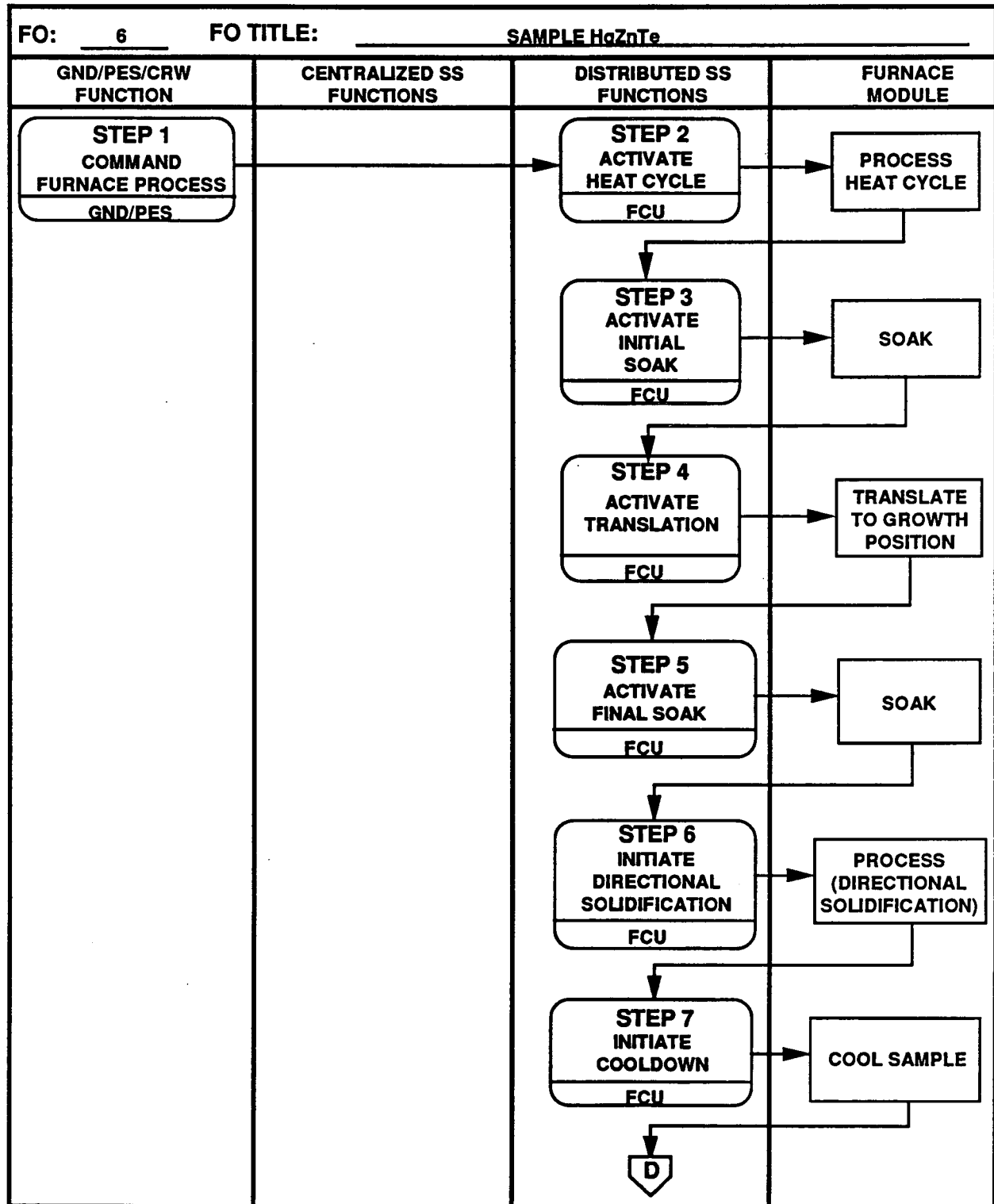


TABLE 1.1-3. SSFF OPERATIONAL FUNCTIONAL FLOW (Sheet 12 of 19)

FO: <u>6</u> FO TITLE: <u>SAMPLE HgZnTe</u>			
GND/PES/CRW FUNCTION	CENTRALIZED SS FUNCTIONS	DISTRIBUTED SS FUNCTIONS	FURNACE MODULE
		<pre> graph TD     D{D} --&gt; S8[STEP 8 ACTIVATE STOWAGE FCU]     S8 --&gt; SM[STOW SAMPLE]     SM --&gt; E[END OF FO-6 PROCEED TO NEXT SAMPLE OR PURGE]             </pre>	

TABLE 1.1-3. SSFF OPERATIONAL FUNCTIONAL FLOW (Sheet 13 of 19)

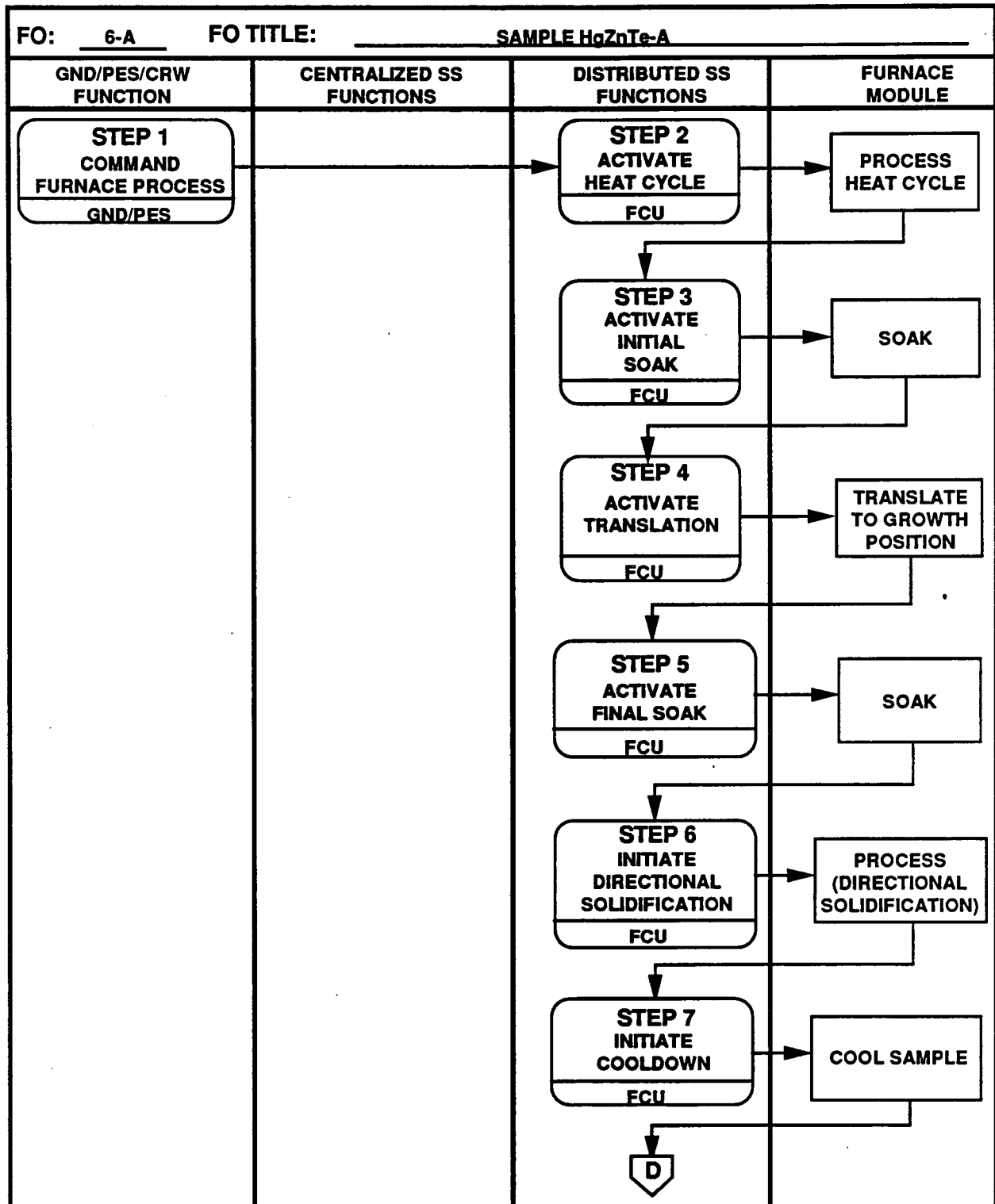




TABLE 1.1-3. SSFF OPERATIONAL FUNCTIONAL FLOW (Sheet 14 of 19)

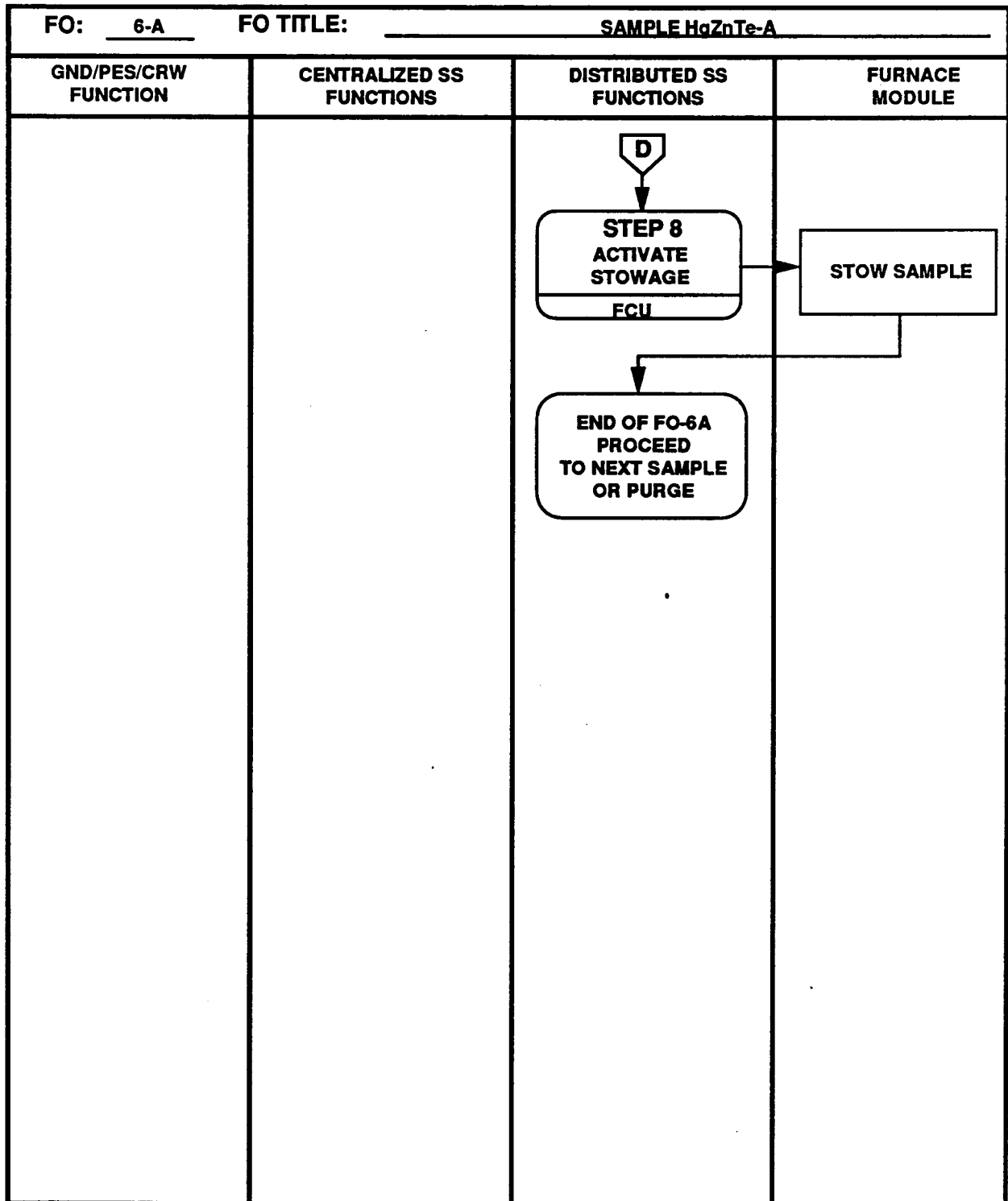


TABLE 1.1-3. SSFF OPERATIONAL FUNCTIONAL FLOW (Sheet 15 of 19)

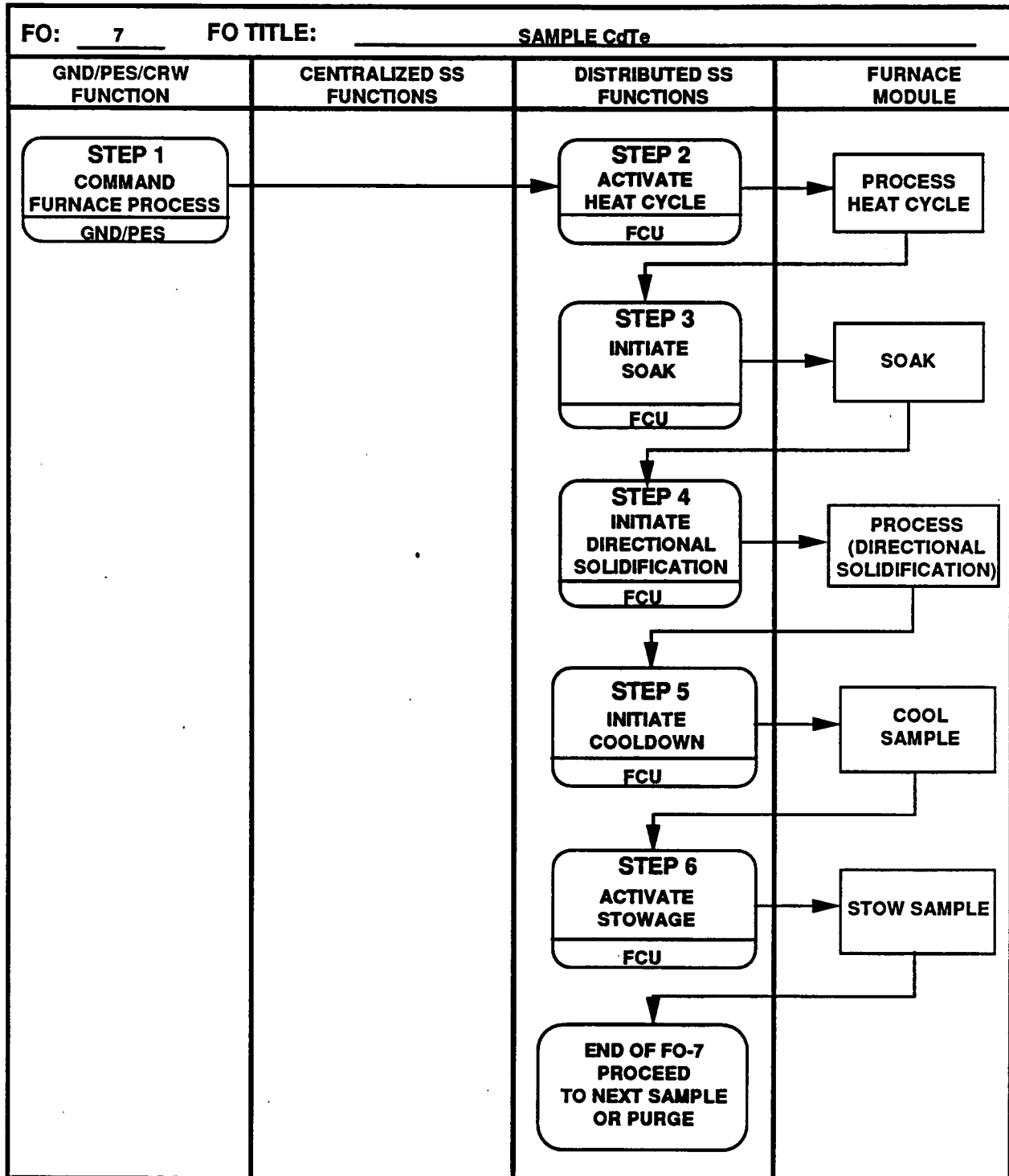


TABLE 1.1-3. SSFF OPERATIONAL FUNCTIONAL FLOW (Sheet 16 of 19)

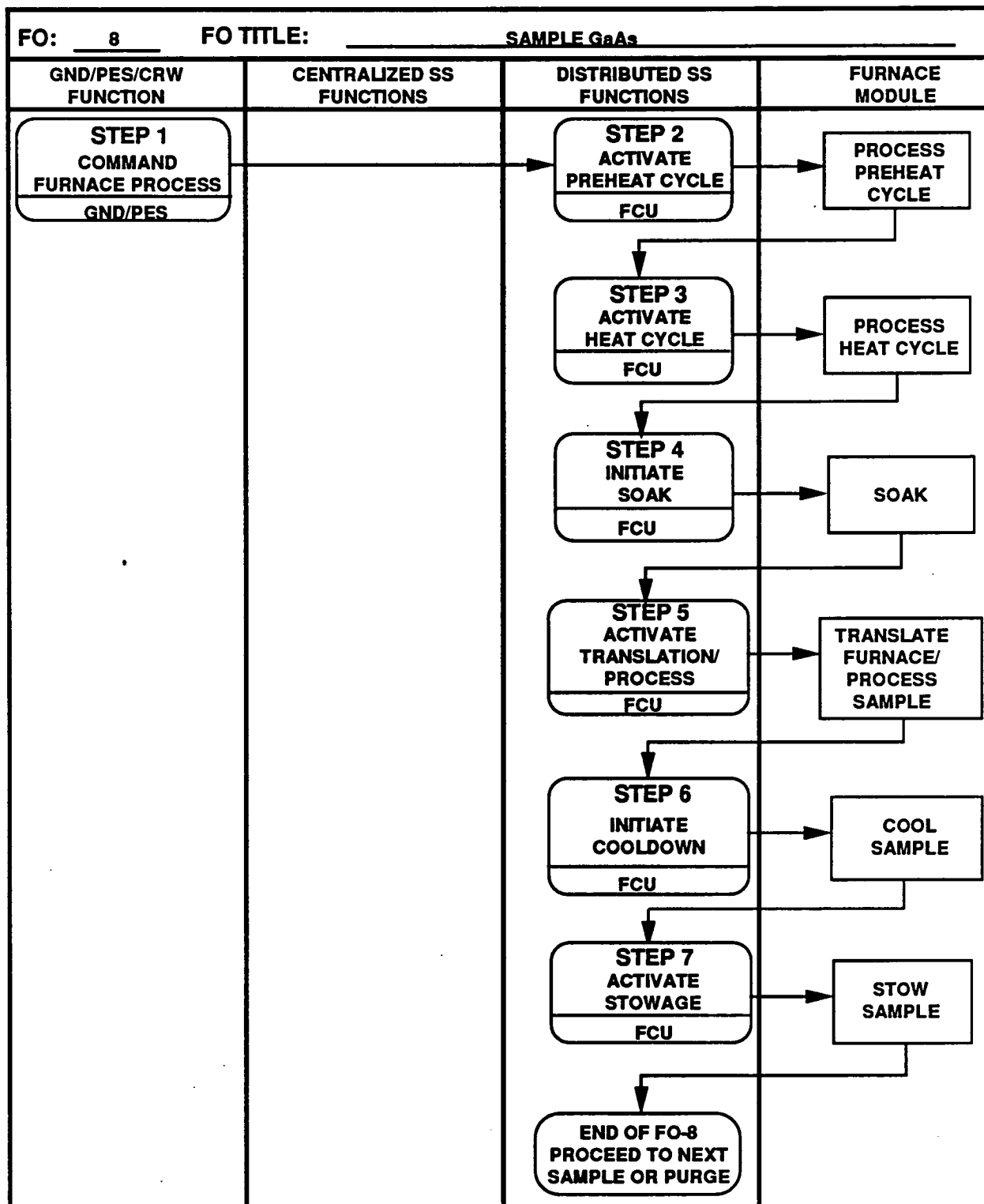


TABLE 1.1-3. SSFF OPERATIONAL FUNCTIONAL FLOW (Sheet 17 of 19)

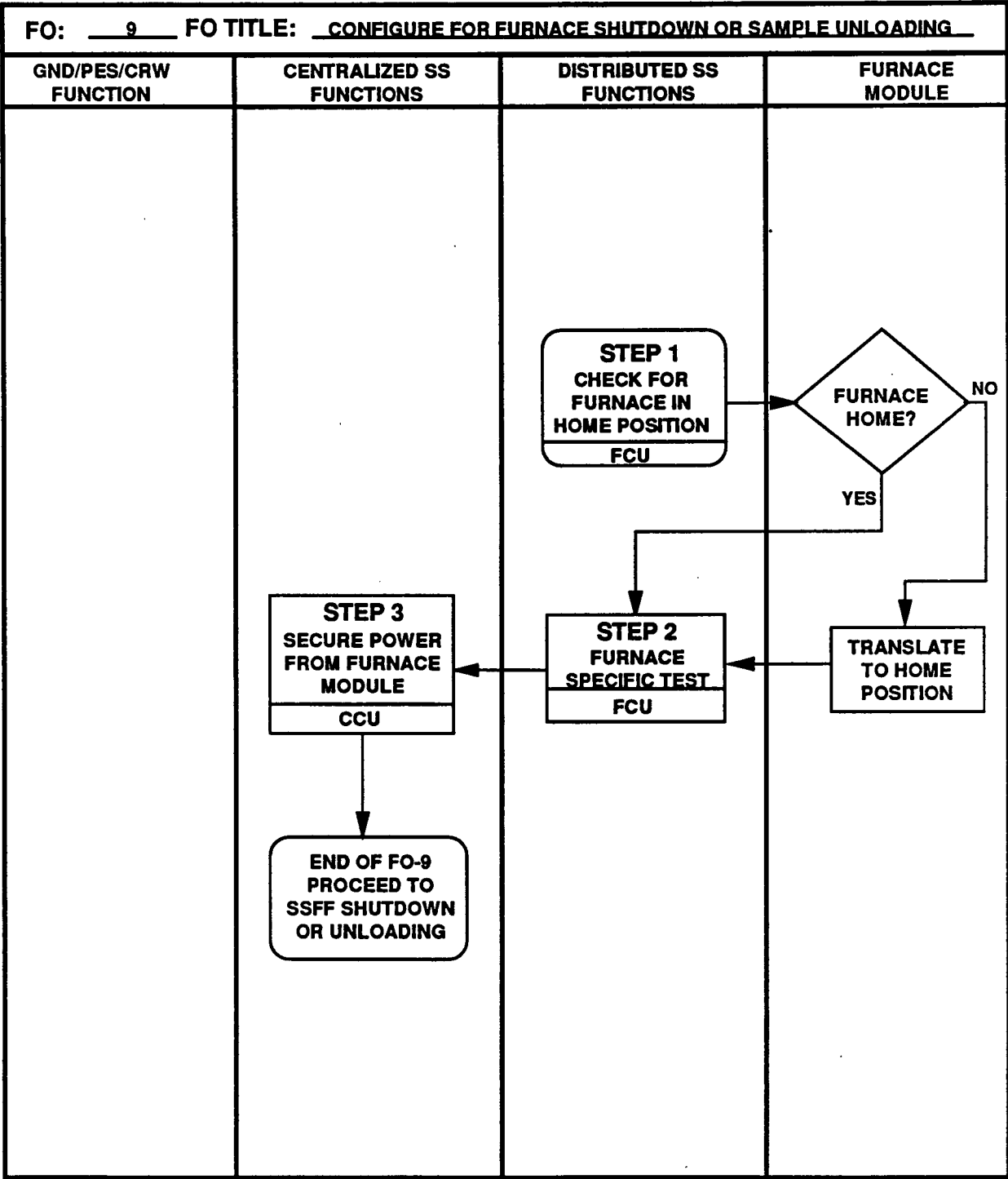


TABLE 1.1-3. SSFF OPERATIONAL FUNCTIONAL FLOW (Sheet 18 of 19)

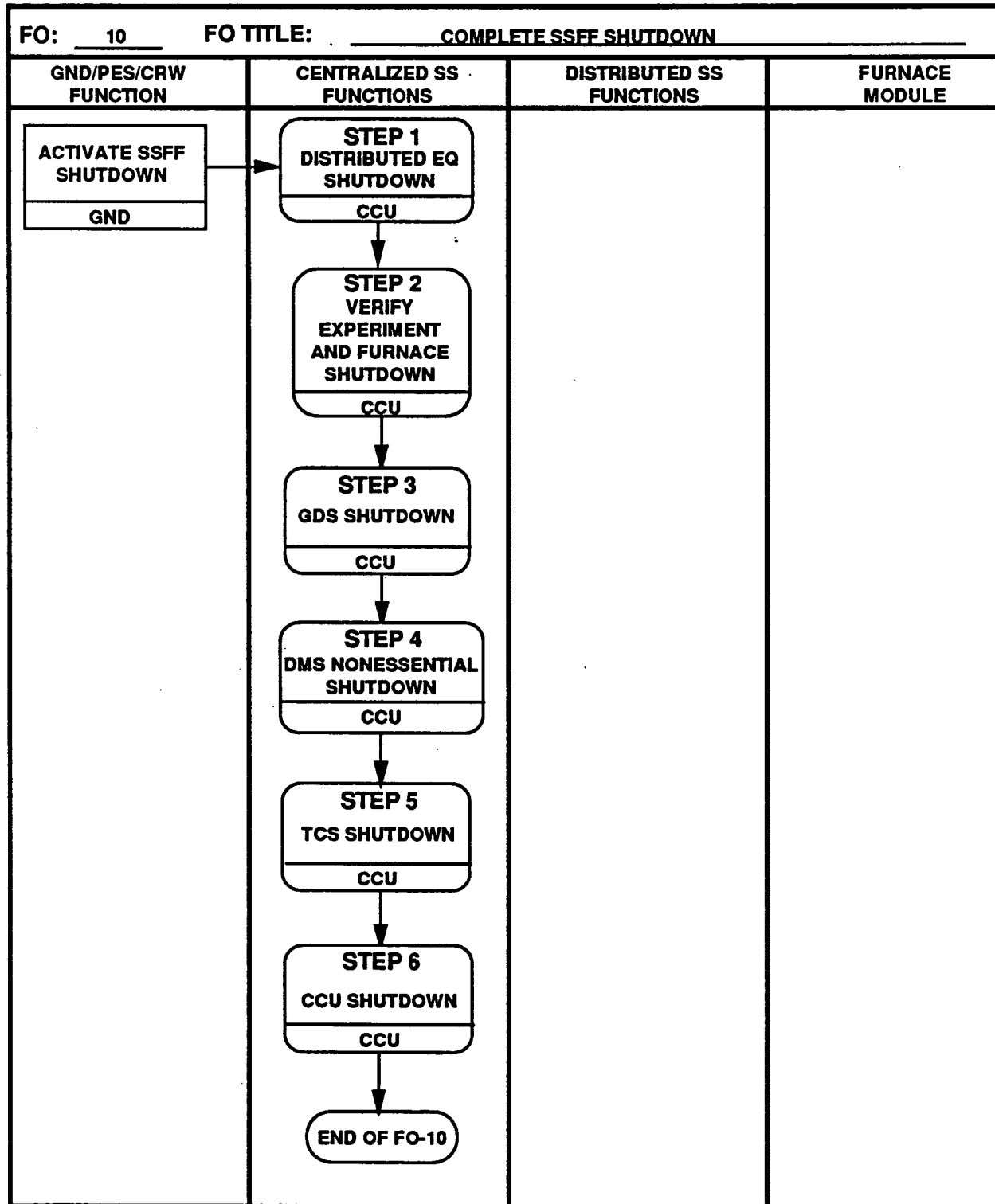
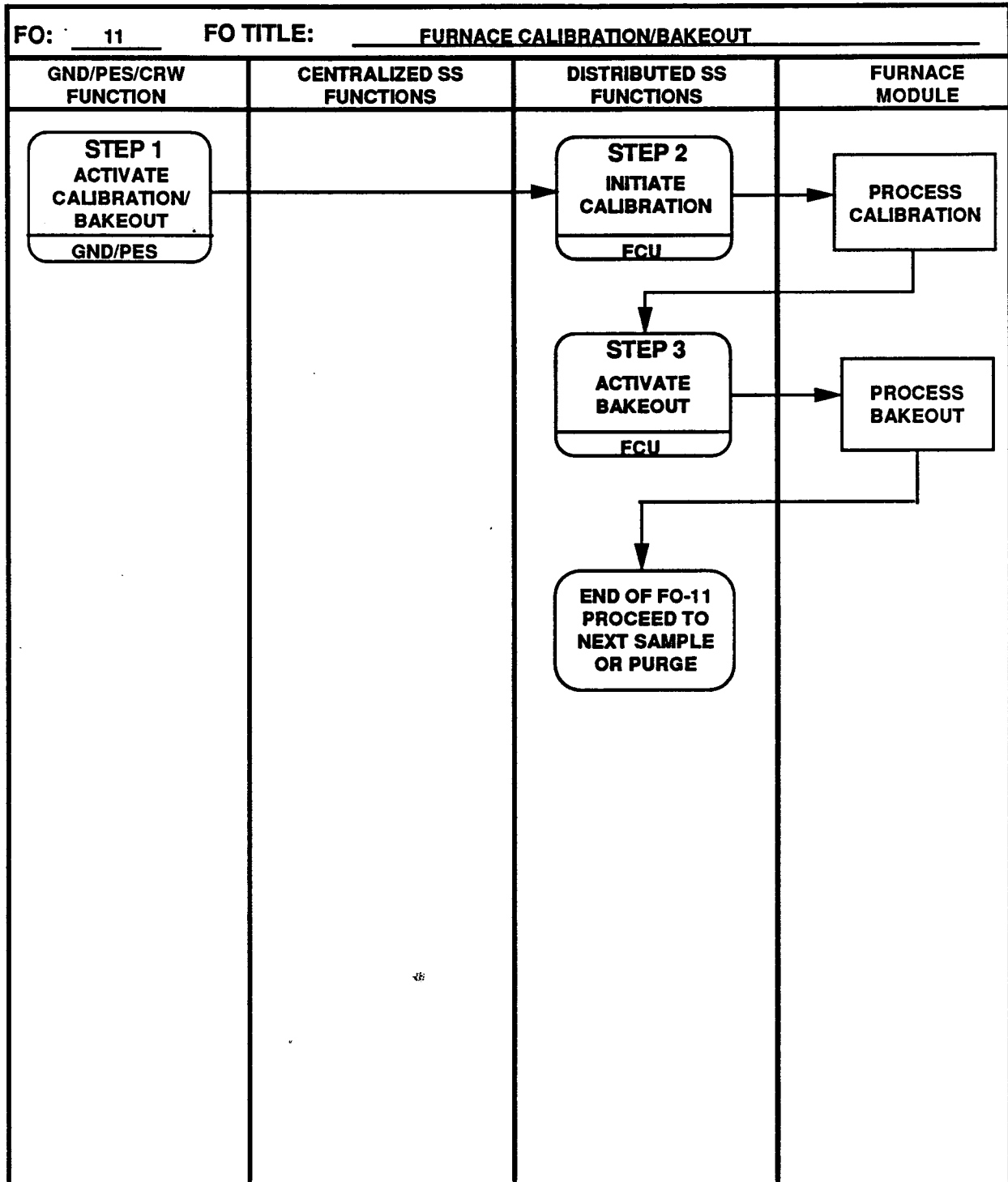


TABLE 1.1-3. SSFF OPERATIONAL FUNCTIONAL FLOW (Sheet 19 of 19)



## 1.2. STRUCTURAL/MECHANICAL

The Integrated Configuration-1 (IC1) Space Station Furnace Facility (SSFF) will be mounted in the U. S. Laboratory (USL) Module-A. The SSFF Core Rack will be mounted in a double rack location, and Experiment Rack-1 will be mounted in an adjacent double rack location. Figure 1.2-1 shows the SSFF system interface with Space Station Freedom (SSF). The physical and functional interfaces defined herein between SSFF and the USL are as follows:

- SSF-to-SSFF Mechanical Structures Subsystem (MSS) Physical Interfaces:
  - SSFF Core Rack to USL Module-A
  - SSFF Experiment Rack-1 to USL Module-A
  - SSFF Interconnect Tray Assembly to USL Module-A
- SSF-to-SSFF Core Rack Services Functional Interfaces:
  - SSF Electrical Power System (EPS) to SSFF Core Rack
  - SSF Data Management Subsystem (DMS) to SSFF Core Rack
  - SSF Thermal Control Subsystem (TCS) to SSFF Core Rack
  - SSF Vacuum Exhaust System (VES) to SSFF Core Rack
  - SSF Liquid Nitrogen System (LNS) to SSFF Core Rack
  - SSF avionics air to SSFF Core Rack
  - SSF fire detection and suppression to SSFF Core Rack
- SSF-to-SSFF Experiment Rack-1 Services Functional Interfaces:
  - SSF avionics air to SSFF Experiment Rack-1
  - SSF fire detection and suppression to SSFF Experiment Rack-1
- Crew Interface

### 1.2.1 EQUIPMENT LIST AND MASS PROPERTIES

Mass properties of the SSFF are shown in Table 1.2-1. Stowage items and their properties are shown in Table 1.2-2.

### 1.2.2 INTERFACE DETAIL

#### 1.2.2.1 SSF-to-SSFF MSS Interface

The SSFF MSS will interface with SSF by physical connections of the Core Rack, Experiment Rack-1, and the MSS Interconnect Tray Assembly. The Core Rack and Experiment Rack-1 are rack replacement structures modified from an International Standard Payload Rack (ISPR), and they attach to the USL at the ISPR pivot points and attach fitting locations. Figure 1.2-2 shows the Core Rack interface with SSF, and Figure 1.2-3 shows the Experiment Rack-1 interface with SSF. Figure 1.2-4 shows the Interconnect Tray Assembly, which provides support for the cabling and plumbing between the Core Rack and Experiment Rack-1. The Interconnect Tray Assembly attaches to the USL in the standoff.

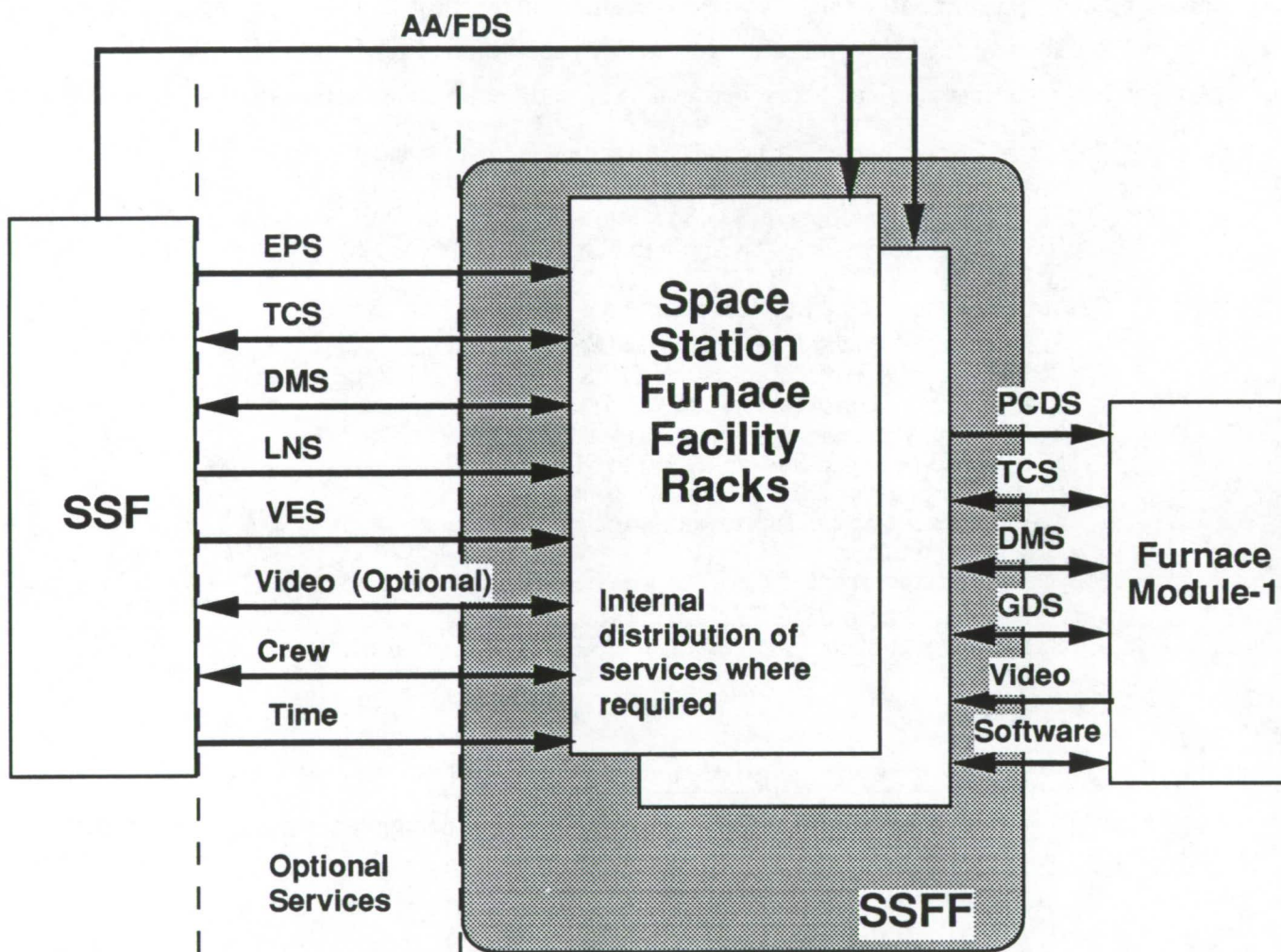


FIGURE 1.2-1. SSFF TO SSF RESOURCE INTERFACES



TABLE 1.2-1. LIST OF EQUIPMENT PROPERTIES (Sheet 1 of 5)

Equipment Nomenclature	Mass (kg)	Mass Maturity (%)		Mounting Preferred	Center of Gravity Station (cm)			Moment of Inertia (kg-m <sup>2</sup> )			Product of Inertia (kg-m <sup>2</sup> )					
		est.	cal.		act.	X	Y	Z	Ix	Iy	Iz	Ixy	Ixz	Iyz		
<b>GAS DISTRIBUTION SUBSYSTEM:</b>																
Centralized Equipment:																
Argon+botlle (1)	17.5	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Latching Sol. Valves (4)	4.0	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Manual Valves, 1/4" (4)	0.9	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Manual Valve, 1" (1)	2.4	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Regulators (2)	1.8	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Filter, 1/4" (2)	0.3	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Pressure Sensors (3)	0.5	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Pressure Gauge (1)	0.5	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Contamin. Monitor (1)	18.0	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Check Valve, 1/4" (4)	0.6	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
QD (with cap), 1/4" (4)	0.4	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
QD (with cap), 1" (2)	3.2	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Plumbing/hose/fittings	6.0	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Distributed Equipment:																
Latch. Sol Valve (6)	6.0	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Press. Relief Valves (2)	0.9	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Filter, 1" (1)	3.6	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Compressor (1)	15.0	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Storage Tank (1)	17.5	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Accumulator (1)	8.0	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Check Valves (2)	0.4	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
CM Sensor (2)	6.0	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Pressure Sensors (3)	0.5	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
QD (with cap), 1/4" (1)	0.1	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
QD (with cap), 1" (1)	1.6	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Check Valve, 1/4" (1)	0.1	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Plumbing/hose/fittings	1.0	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD

TABLE 1.2-1. LIST OF EQUIPMENT PROPERTIES (Sheet 2 of 5)

Equipment Nomenclature	Mass (kg)	Mass Maturity (%)		Mounting Preferred	Center of Gravity Station (cm)			Moment of Inertia (kg-m <sup>2</sup> )			Product of Inertia (kg-m <sup>2</sup> )			
		est.	cal.		act.	X	Y	Z	Ix	Iy	Iz	Ixy	Ixz	Iyz
<b>DATA MANAGE- MENT SUBSYSTEM</b>														
Centralized Equipment: Core Control Unit (1)	29.0	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Hard Drive (1)	22.0	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
CDROM/WORM (1)	7.7	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
High-Density Recorder (1)	57.0	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Core Monitor & Control Unit (1)	20.0	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Crew Interface (1)	23.0	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
CPCS (2)	36.0	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Cabling (AR)	20.0	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Distributed Equipment: Furnace Control Unit (1)	43.5	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Furnace Actuator Unit (1)	29.0	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
DCMU (1)	20.0	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Cabling (AR)	6.5	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
<b>POWER CONDITION- ING AND DISTRIB. SUBSYSTEM</b>														
Centralized Equipment: Core Power Distrib. (1)	42.0	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Core Pwr Conditioner (1)	47.2	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Core Junction Box-A (1)	4.5	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Core Junction Box-B (1)	4.5	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD

TABLE 1.2-1. LIST OF EQUIPMENT PROPERTIES (Sheet 3 of 5)

Equipment Nomenclature	Mass (kg)	Mass Maturity (%)		Mounting Preferred	Center of Gravity Station (cm)			Moment of Inertia (kg-m <sup>2</sup> )			Product of Inertial (kg-m <sup>2</sup> )						
		est.	cal.		act.	X	Y	Z	Ix	Iy	Iz	Ixy	Ixz	Iyz			
<b>POWER CONDITIONING AND DISTRIB. SUBSYSTEM (Cont.)</b>																	
Centralized Equip. (cont.)																	
Essentials Pwr Supp. (1)	3.2	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Volt./Current Sensors (4)	2.0	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Line and Connectors	11.3	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Distributed Equipment:																	
Current Pulsing																	
Equipment (1)	13.6	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Furnace Pwr. Dist. (1)	7.3	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Furnace Junction Box (1)	9.5	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Essentials Pwr Supp. (1)	4.8	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Volt./Current Sens. (66)	33.0	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Line and Connectors	3.4	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
<b>THERMAL CONTROL SUBSYSTEM</b>																	
Centralized Equipment:																	
Heat Exchanger (1)	13.6	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Pump Package (1)	15.9	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Flow Meters (2)	1.5	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Flow Control Valves (2)	3.7	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Temperature Sensors (5)	0.5	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Pressure Transducers (3)	1.5	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Custom Coldplates (4)	24.0	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
-5 Coldplates (2)	3.3	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD

TABLE 2-1. List of Equipment Properties (Sheet 4 of 5)

Equipment Nomenclature	Mass (kg)	Mass Maturity (%)			Mounting Preferred	Center of Gravity Station (cm)			Moment of Inertia (kg-m2)			Product of Inertia (kg-m2)		
		est.	cal.	act.		X	Y	Z	Ix	Iy	Iz	Ixy	Ixz	Iyz
<b>THERMAL CONTROL SUBSYSTEM</b>														
Centralized Equip. (Cont.):														
Pwr Mod CP-Upper (2)	12.0	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Pwr Mod CP-Lower (2)	9.8	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Plumbing (25 m)	13.6	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Quick Disconnects (37)	3.7	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Check Valves (2)	0.1	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Manual Valves (2)	0.3	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Shutoff Valves (2)	3.7	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Water	10.0	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Distributed Equipment:														
Modified -7 CPs (3)	11.7	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Temperature Sensors (3)	0.2	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Pressure Transducer (1)	0.5	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Flow Meter (1)	0.8	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Flow Control Valve (1)	1.9	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Check Valve (1)	0.1	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Manual Valve (1)	0.2	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Shutoff Valve (1)	1.9	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Plumbing (12 m)	6.8	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Quick Disconnects (16)	1.6	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Water	7.0	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD

TABLE 1.2-1. LIST OF EQUIPMENT PROPERTIES (Sheet 5 of 5)

Equipment Nomenclature	Mass (kg)	Mass Maturity (%)		Mounting Preferred	Center of Gravity Station (cm)			Moment of Inertia (kg-m <sup>2</sup> )			Product of Inertia (kg-m <sup>2</sup> )				
		est.	cal.		act.	X	Y	Z	Ix	Iy	Iz	Ixy	Ixz	Iyz	
<b>MECHANICAL STRUCTURES SUBSYSTEM:</b>															
Interconnect Tray	72.7	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Centralized Equipment:															
TCS	22.9	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
PCDS	31.8	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
GDS	21.7	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
DMS	56.2	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Distributed Equipment:															
Exp. Rack-1 MSS	28.4	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
<b>Rack Replacement Structures:</b>															
Core Rack	92.3	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Experiment Rack-1	128.7	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
<b>Furnaces:</b>															
Furnace Module-1	327.0	100	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD

TABLE 1.2-2. STOWAGE LIST

Item	Number Required	Mass Each (kg)	Dimensions (cm) LxWxH or LxDia	Stowage Responsibility		Stowage Phase			Special Requirements
				Ex	PL	L	O	R	
TBD									

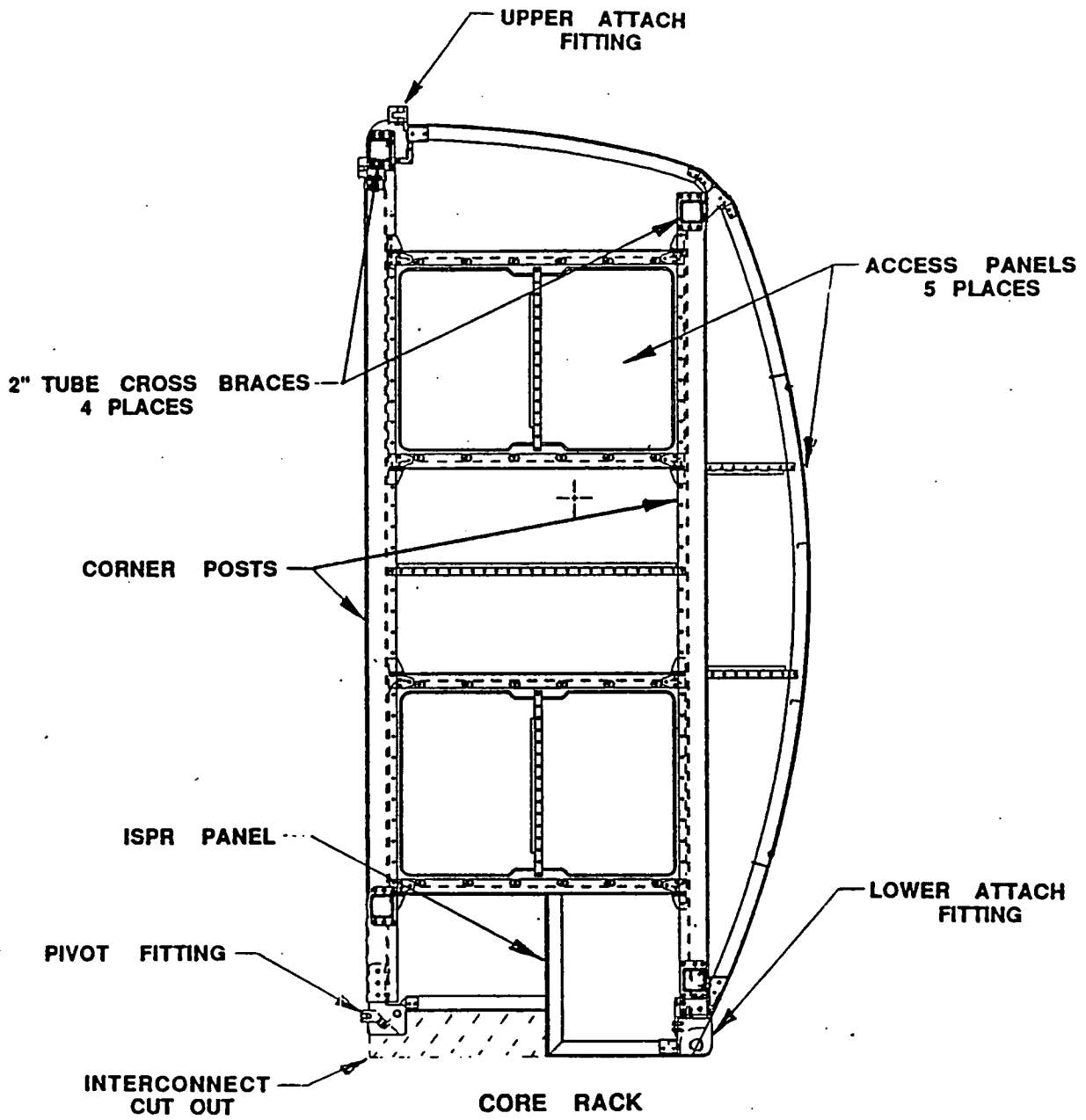


FIGURE 1.2-2. SSF TO SSFF CORE RACK PHYSICAL INTERFACE

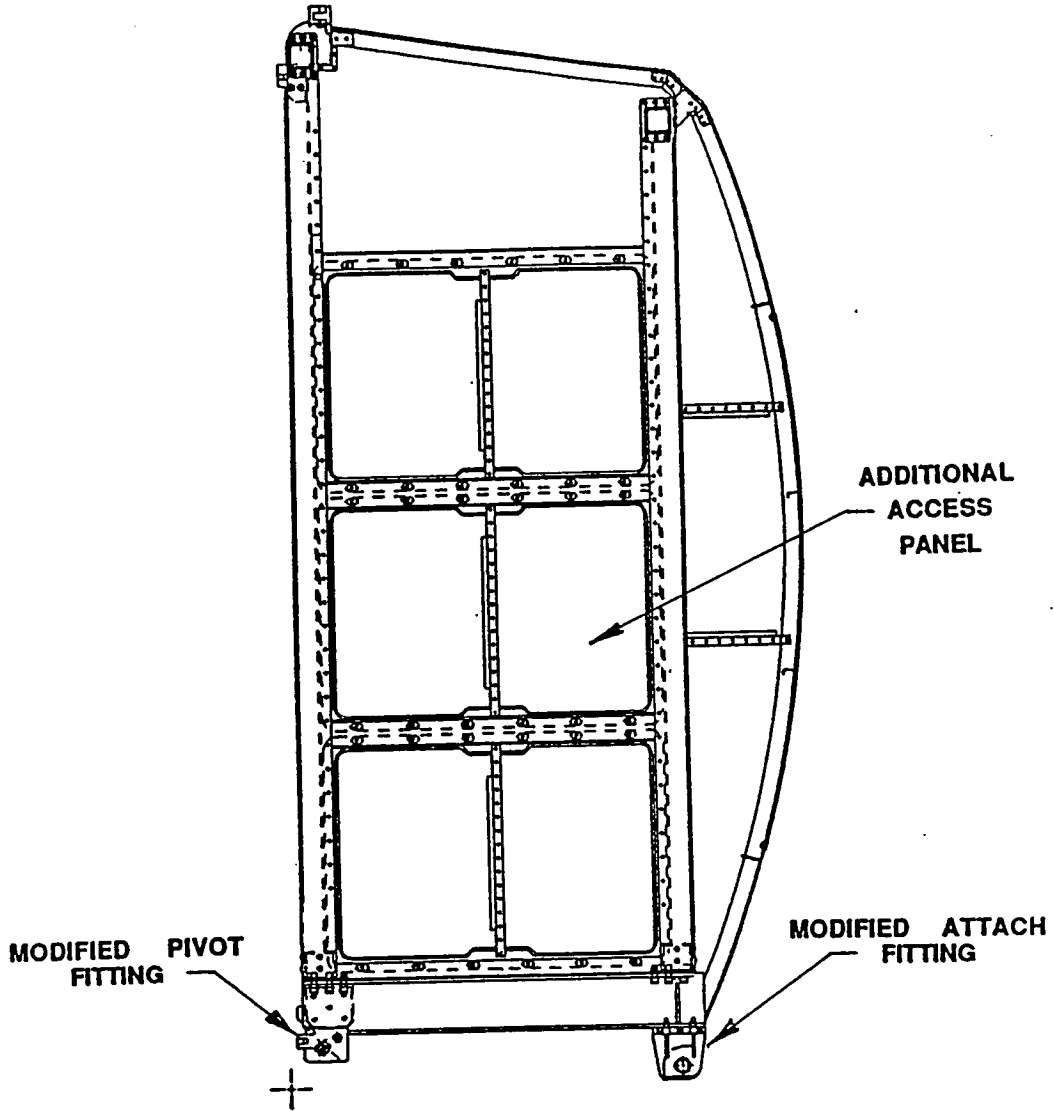


FIGURE 1.2-3. SSF TO SSFF EXPERIMENT RACK-1 PHYSICAL INTERFACE



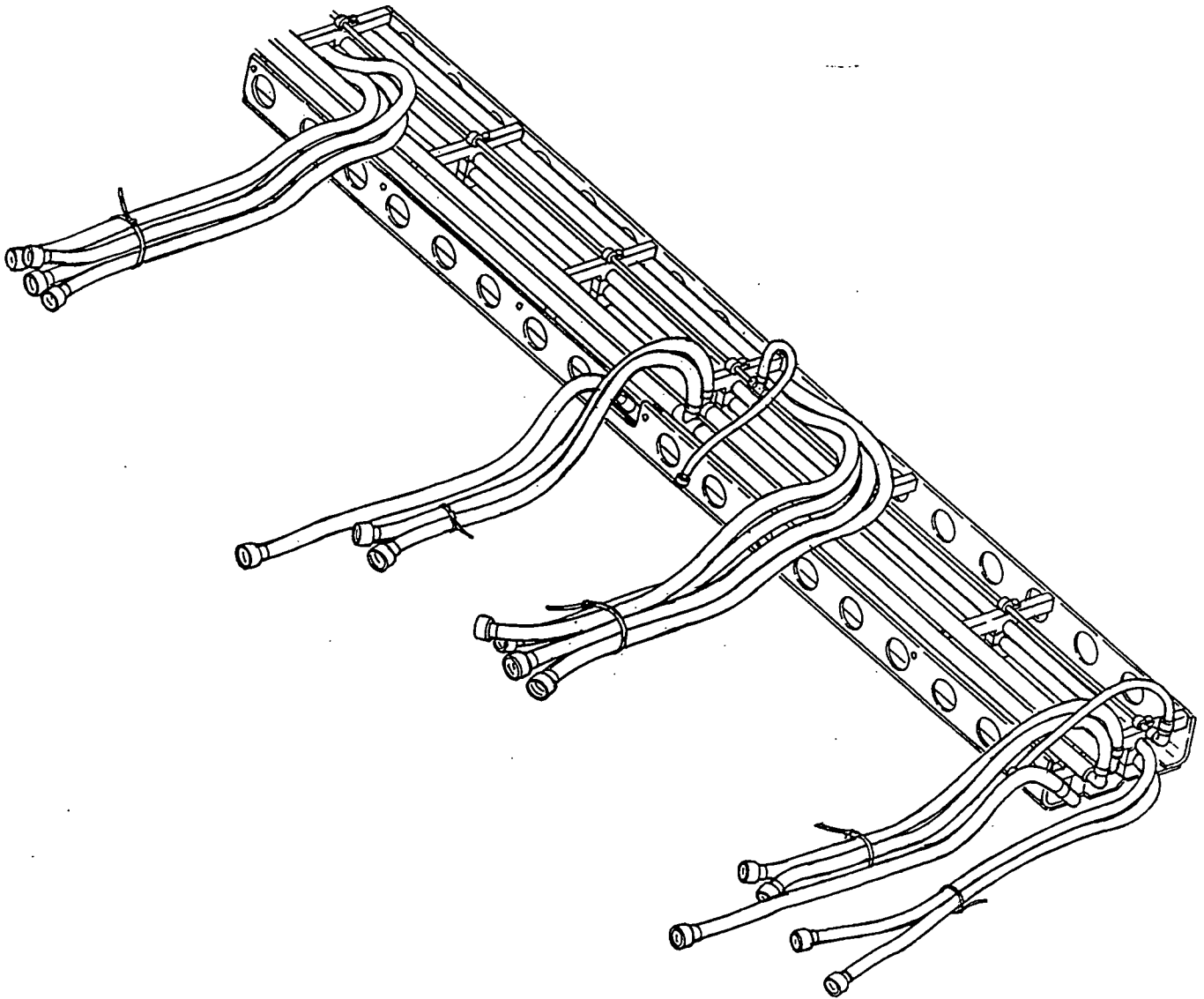


FIGURE 1.2-4. SSFF INTERCONNECT TRAY ASSEMBLY

### **1.2.2.2 SSF-to-SSFF Core Rack Interface**

The SSFF will interface with SSF services in the standoff through an ISPR passthrough rack panel in the Core Rack. Figure 1.2-5 shows this Core Rack panel layout. SSFF subsystems receive the SSF services at the Core Rack, and then those services are routed out to Experiment Rack-1. All SSF services are provided at the Core Rack except avionics air and fire detection and suppression, which are provided at each rack location. Subsystem interfaces with SSF are described below.

**1.2.2.2.1 SSF EPS-to-SSFF Core Rack** - The SSFF Power Conditioning and Distribution Subsystem (PCDS) will interface with the SSF EPS by connecting to two 6-kW, 120-Vdc power buses in the Core Rack.

**1.2.2.2.2 SSF DMS-to-SSFF Core Rack** - The SSFF DMS will interface with the SSF DMS by connecting to the MIL-STD-1553 bus or the payload fiber distributed data interface (FDDI) at the Core Rack panel. The SSFF DMS will also require a high-rate data link (HRDL) interface at the Core Rack panel to accommodate transfer of high-rate data.

**1.2.2.2.3 SSF TCS-to-SSFF Core Rack** - The SSFF TCS will interface with the SSF TCS by connecting to the moderate temperature cooling loop with hoses from a payload rack heat exchanger behind the Core Rack panel.

**1.2.2.2.4 SSF VES-to-SSFF Core Rack** - The SSFF Gas Distribution Subsystem (GDS) will interface with the SSF VES by connecting a vacuum line at the Core Rack panel.

**1.2.2.2.5 SSF LNS-to-SSFF Core Rack** - The SSFF GDS will interface with the SSF LNS by connecting a nitrogen line at the Core Rack panel.

### **1.2.2.3 SSF-to-SSFF Experiment Rack-1 Interface**

The only services provided directly from SSF to Experiment Rack-1 are avionics air and fire detection and suppression. The SSF will interface with SSFF Experiment Rack-1 at the furnace interface panel as shown in Figure 1.2-6. An SSFF-provided hose assembly will connect between this panel and the standoff interface service connection. All other Experiment Rack-1 services will be provided by the SSFF Core Rack.

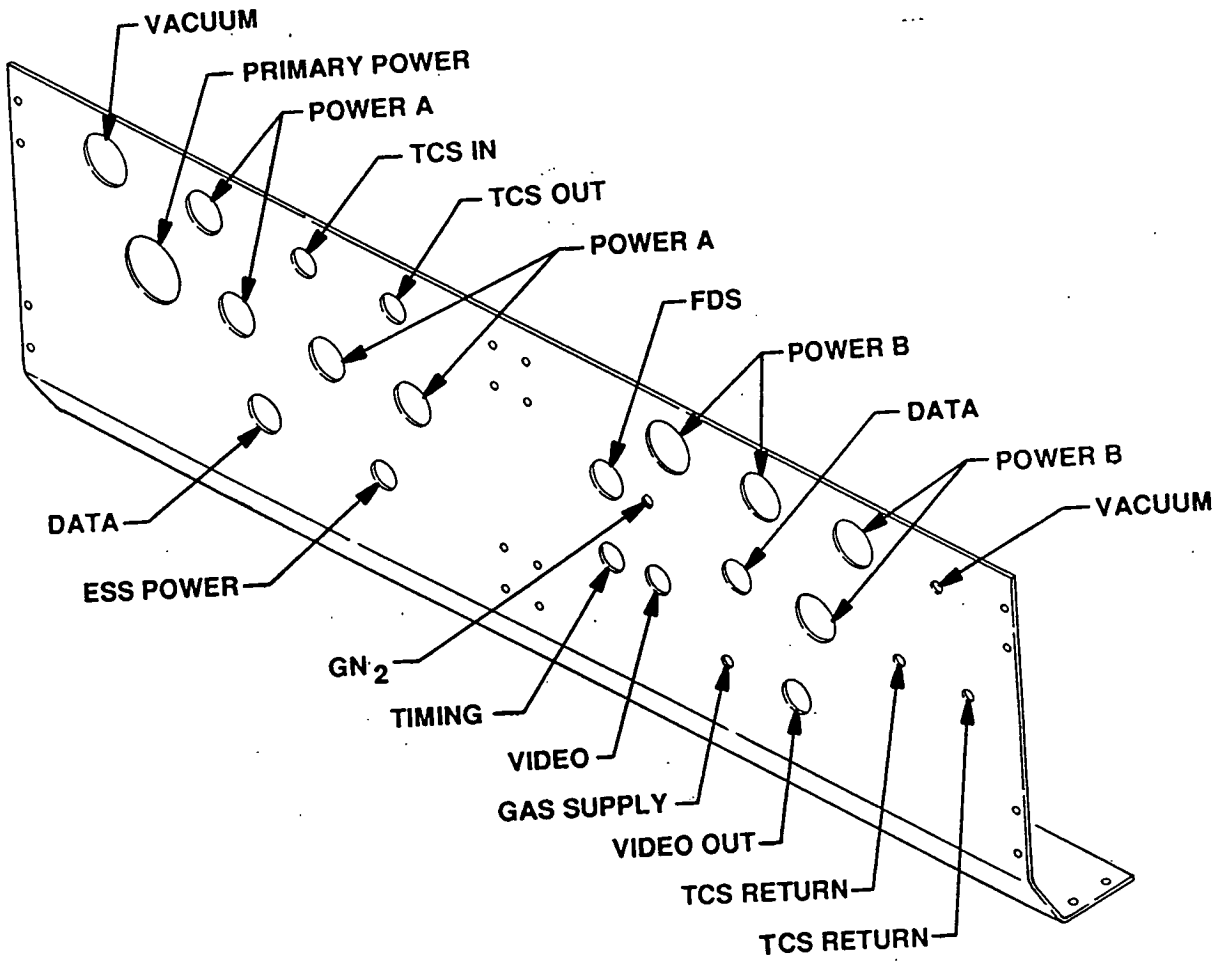


FIGURE 1.2-5. CORE RACK PANEL LAYOUT

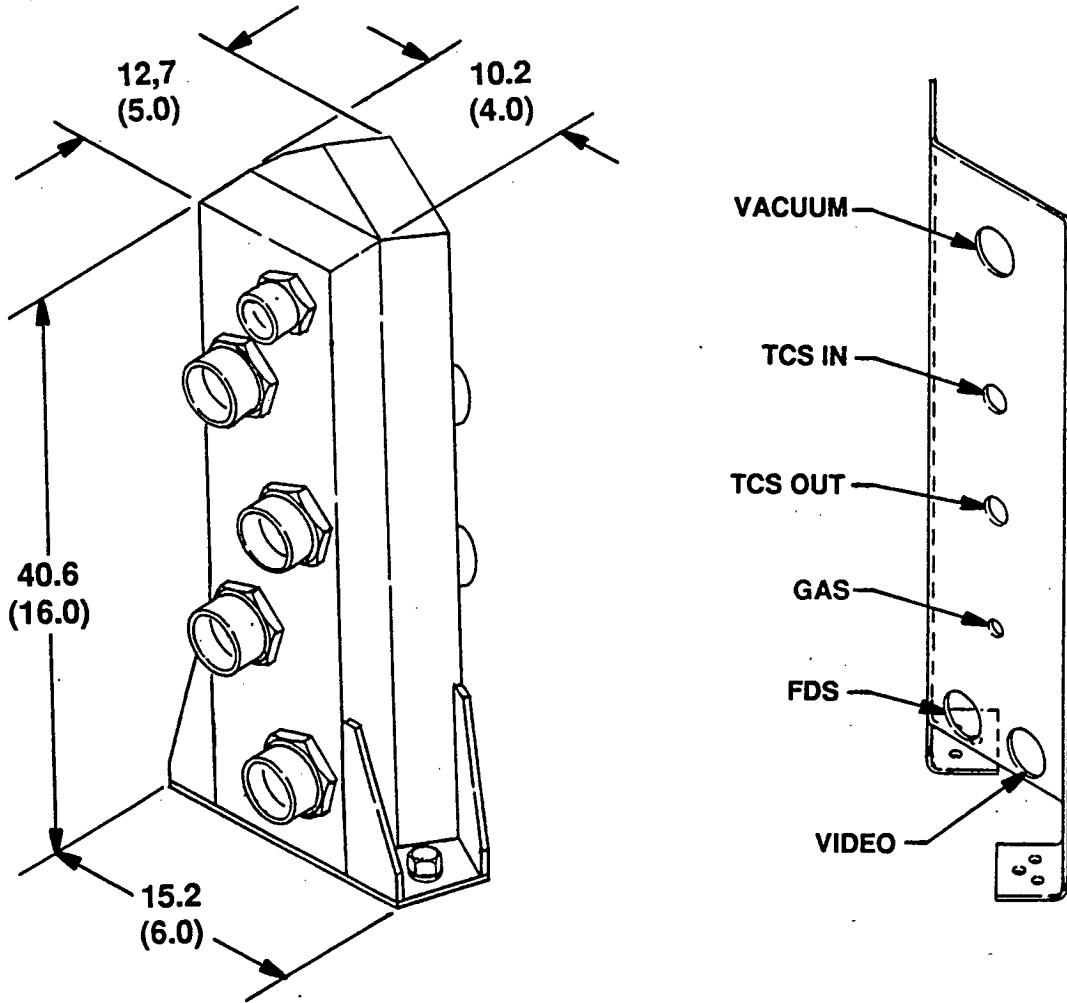


FIGURE 1.2-6. EXPERIMENT RACK-1 PANEL LAYOUTS

#### 1.2.2.4 Crew Interface

A keyboard and display interface will be provided for crew interaction at the Core Rack. This system will have a standard QWERTY-type keyboard which can accept crew input commands for operation or configuration of the SSFF subsystems as required. Experiment sample exchanges will also require crew interface at Furnace Module-1, and opening and closing of manual valves will require crew interface at both rack locations.

### 1.3. POINTING/STABILIZATION AND ALIGNMENT

The Space Station Furnace Facility (SSFF) is required to provide for the alignment of the axis of selected solidification modules to within  $5^\circ$  of the residual g-vector. An acceleration of approximately  $1.8 \times 10^{-6} g_0$  is required to prevent a  $100\text{-}\mu\text{m}$  particle from moving 1 diameter in 1000 sec.

The allowable acceleration level requirements are as follows for a 1-cm diameter sample:

1.  $g \leq 1.0 \times 10^{-6} g_0$  for  $0 \leq f \leq 0.020$  for periods up to 90 days
2.  $g \leq 1.0 \times 10^{-6} g_0 \times \left( \frac{f}{0.020 \text{ Hz}} \right)$  for  $f \geq 0.020$  along residual g-vector
3.  $g' \leq 1.6 \times 10^{-7} g_0 \times \left( \frac{f}{0.020 \text{ Hz}} \right)$  for  $f \geq 0.012$  along any axis perpendicular to the residual g-vector

where,

- $g$  = Acceleration level within the experimental sample fluid (melt, solution, or vapor) and at the solidification/fluid interface.
- $g_0$  = Acceleration at sea level on Earth.
- $g'$  = Acceleration level perpendicular to direction of solidification front or desired fluid motion.
- $f$  = Frequency of periodic accelerations in hertz.

Furnace Module-1 requires that there shall be 1-mm maximum lateral displacement between sample and furnace centerlines at any point along centerlines at any time during processing. This does not include any contribution from the sample's being not straight or out of round. It does include heater assembly and translation system contributions.

## 1.4. ORBITAL REQUIREMENTS AND CONSTRAINTS

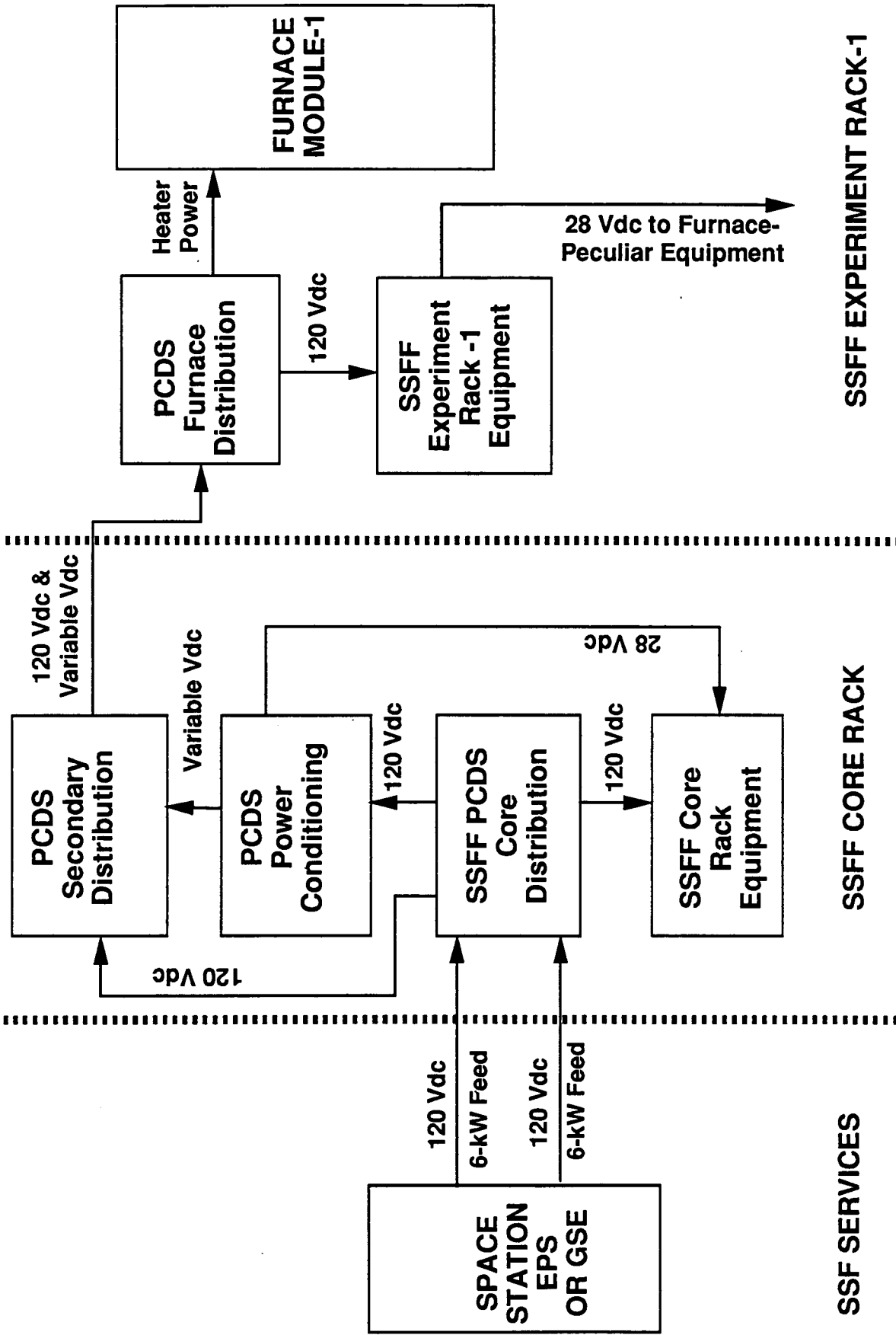
TBD

## 1.5. ELECTRICAL REQUIREMENTS

The Space Station Furnace Facility (SSFF) Power Conditioning and Distribution Subsystem (PCDS) is composed of the equipment necessary to condition and distribute power provided by the Space Station Freedom (SSF) Electrical Power System (EPS) to SSFF subsystems. Figure 1.5-1 shows the PCDS block diagram. The SSFF PCDS will interface with the SSF by connecting to two 6-kW, 120-Vdc power buses. Since 3- and 6-kW SSF payload racks use one bus as a primary feed and the other as an essential feed, 12-kW racks are required to maintain 1 M $\Omega$  of electrical isolation between the two buses at all times (SSF Electric Power Specifications and Standards, SSP 30482). No true essentials bus exists at this time, only the two main buses. This means that a 12-kW rack must tie the two buses together whenever backup essentials power will be required. The two SSFF power buses (Bus A and Bus B) will feed the PCDS via SSF-provided Remote Power Distribution Assemblies (RPDAs) or through an SSFF-designed assembly (similar in function).

The bulk of the power to be distributed by the PCDS will be consumed by the Furnace Module-1 heaters with the remainder serving as housekeeping power to the SSFF subsystems. The Integrated Configuration-1 (IC1) configuration of the SSFF will require maximum peak power from the SSF of 4.6 kW. The operational power profile defining the use of the SSF-provided power by the SSFF during each functional objective (FO) is shown in Figure 1.5-2. The power profile data given here represent power requirement estimates to cover any of the the SSFF-accommodated Furnace Module-1 needs. The power levels defined in Figure 1.5-2 are considered maximums. Time duration for peak power requirements is 72 h. The average power required is 2.7 kW. The total energy requirement is 3800 kWh.





SSFF EXPERIMENT RACK-1

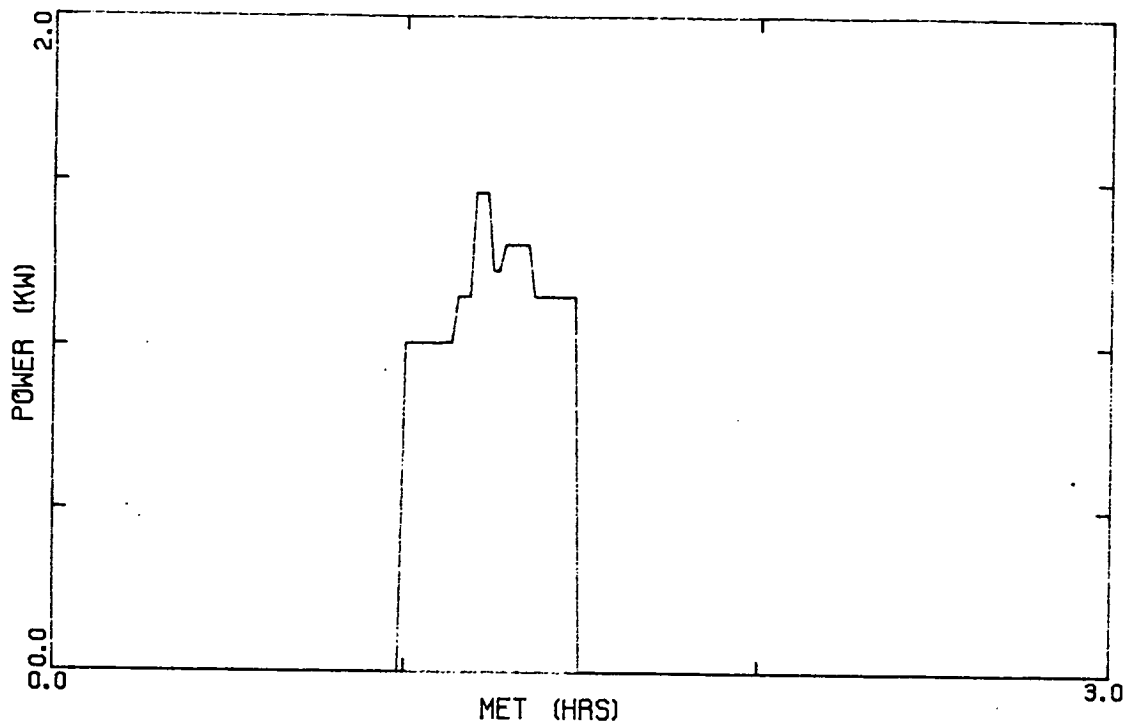
SSFF CORE RACK

SSF SERVICES

FIGURE 1.5-1. PCDS INTERFACE BLOCK DIAGRAM

*Handwritten signature*

# FO-1 CORE ACTIVATION



# FO-2 DIST. EQP. ACT.

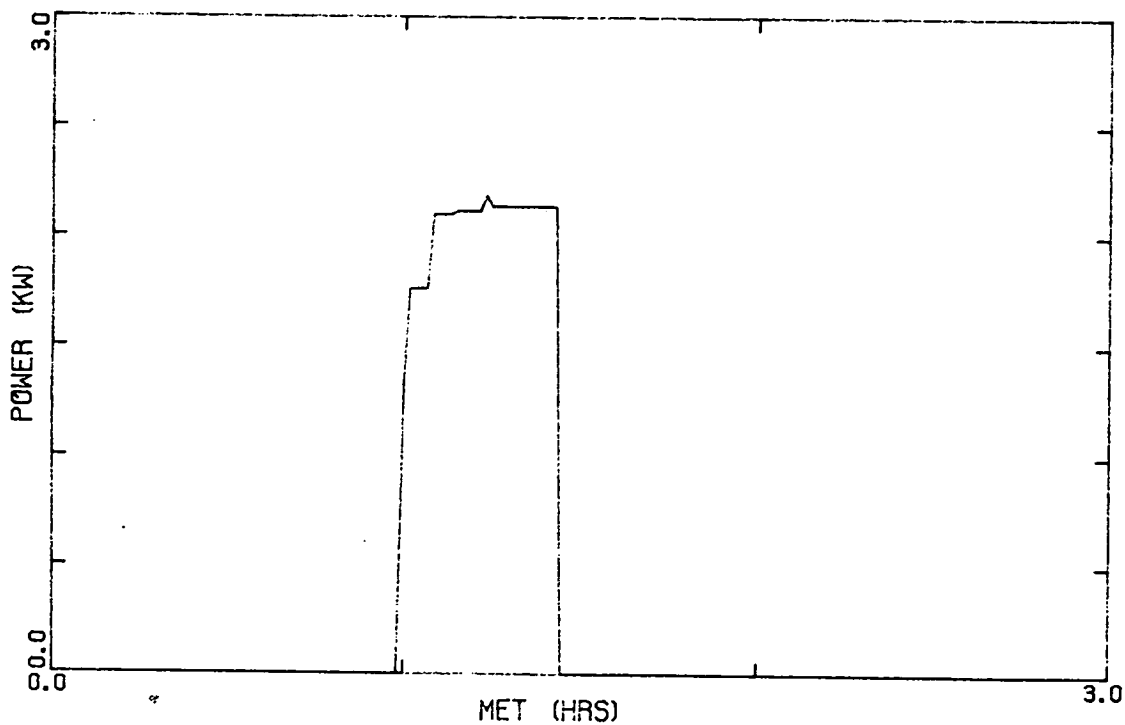
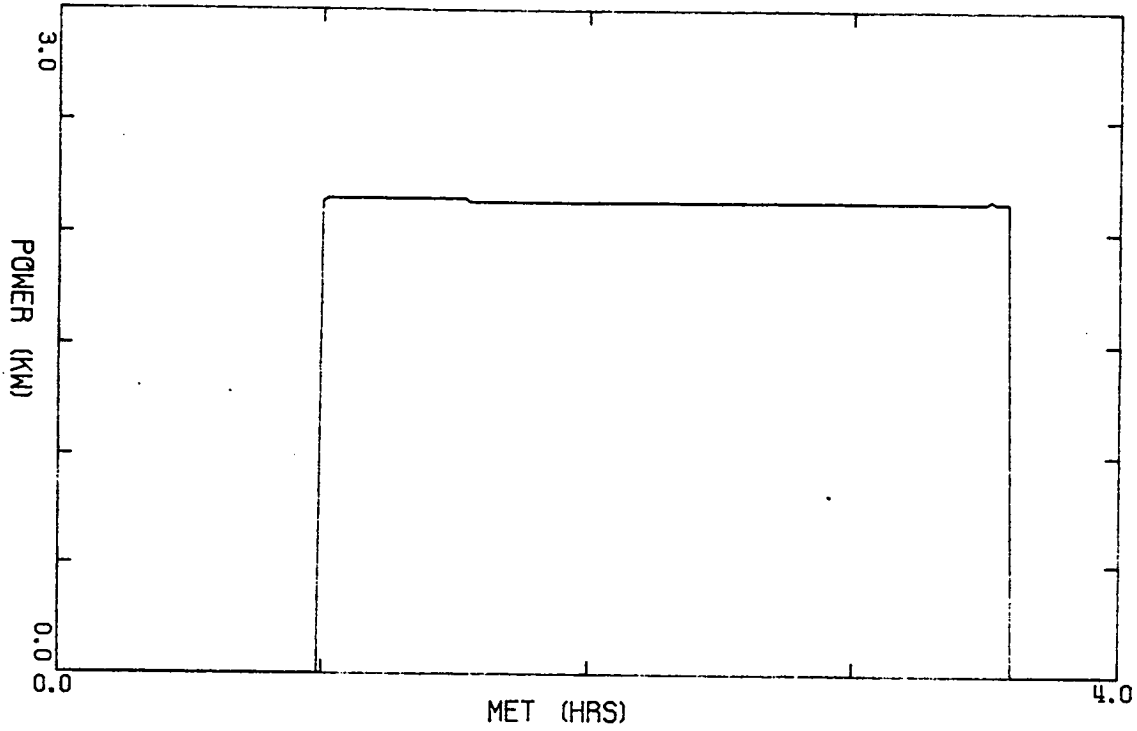


FIGURE 1.5-2. POWER PROFILES BY FUNCTIONAL OBJECTIVES (Sheet 1 of 6)

### F0-3 MSE



### F0-4 VENT/PURGE

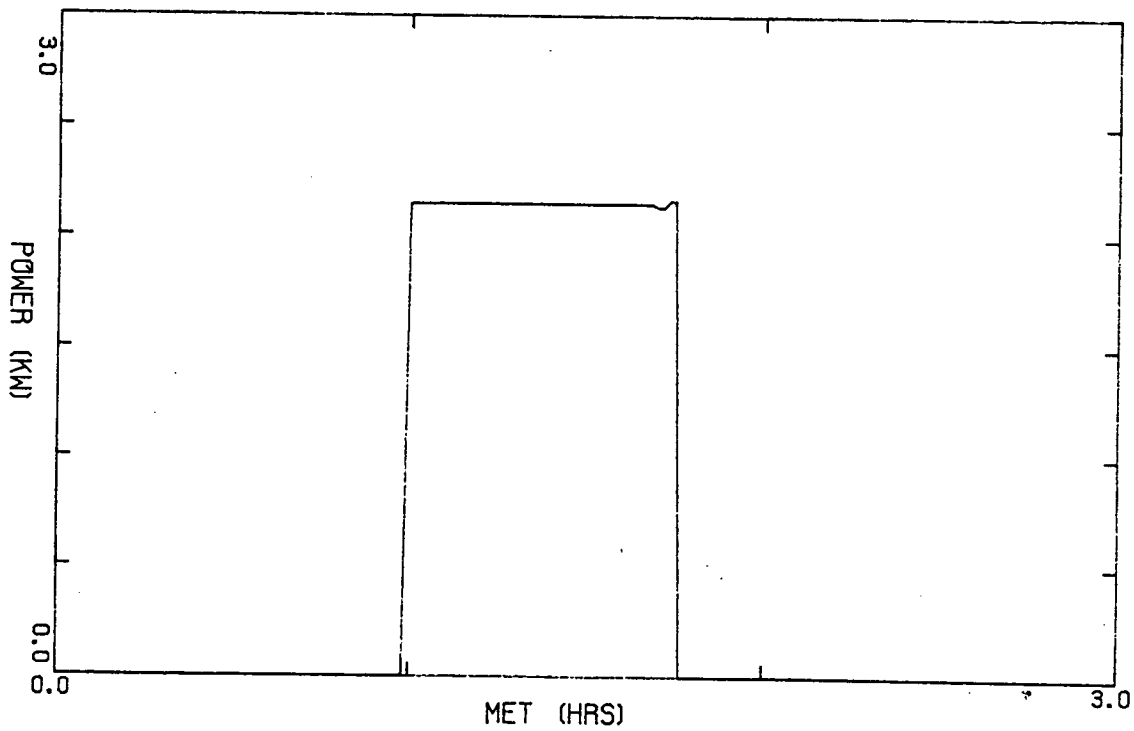
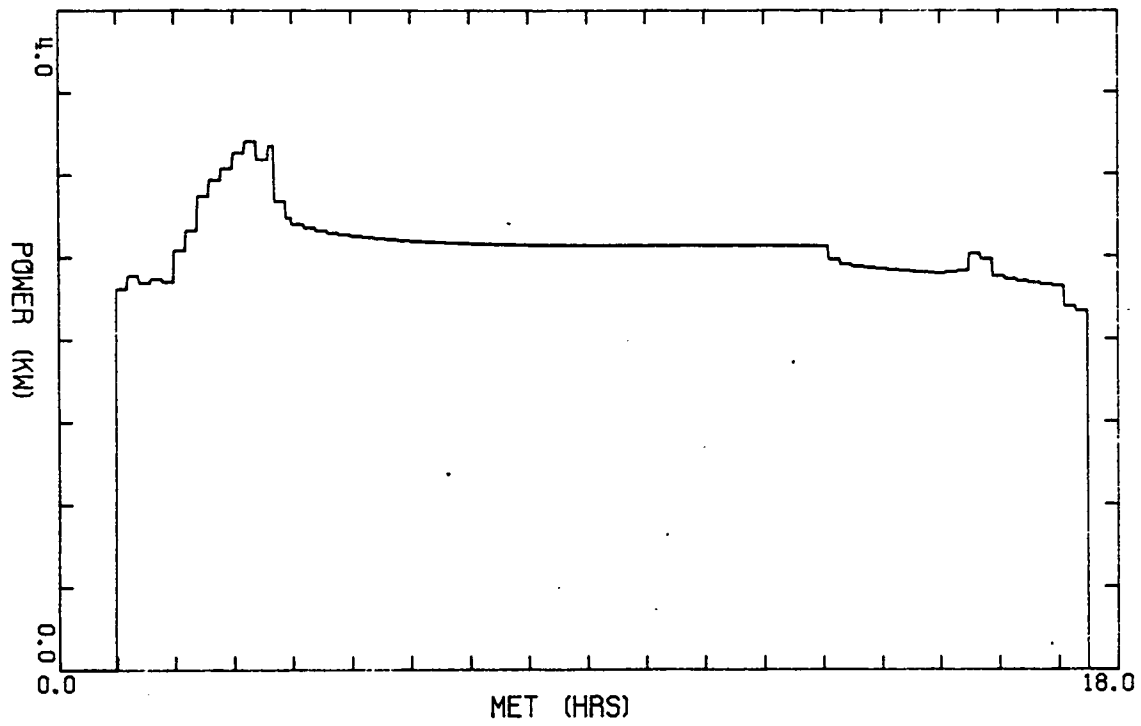


FIGURE 1.5-2. POWER PROFILES BY FUNCTIONAL OBJECTIVES (Sheet 2 of 6)

### F0-5 HgCdTe



### F0-6 HgZnTe

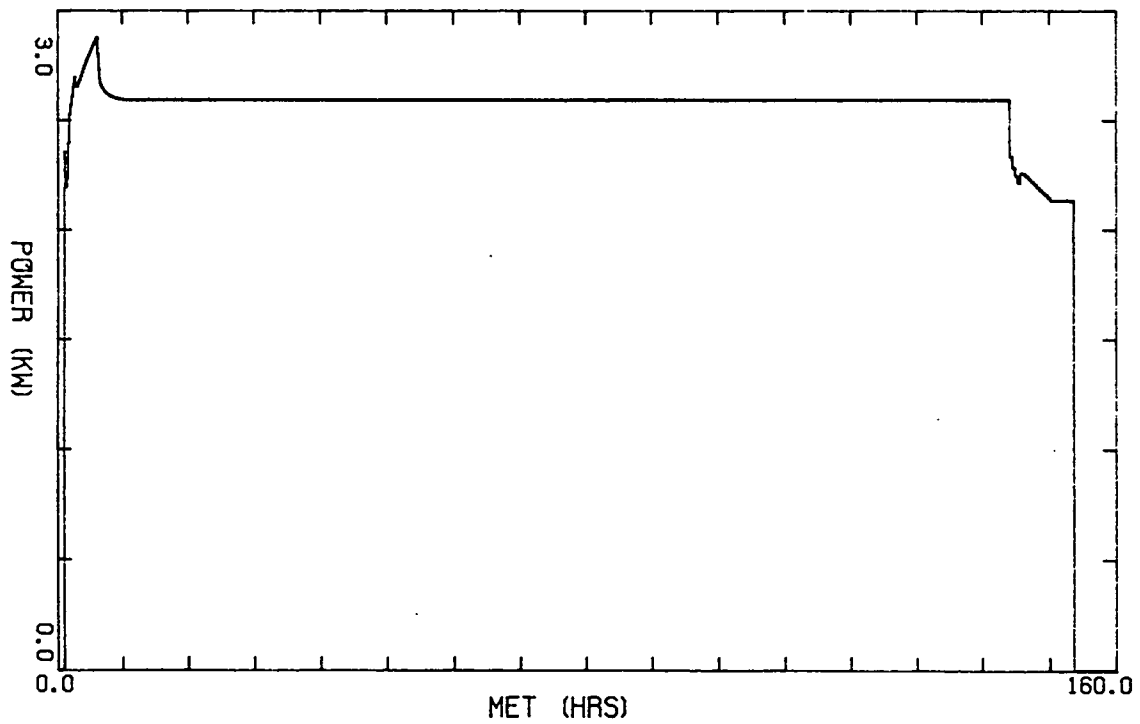
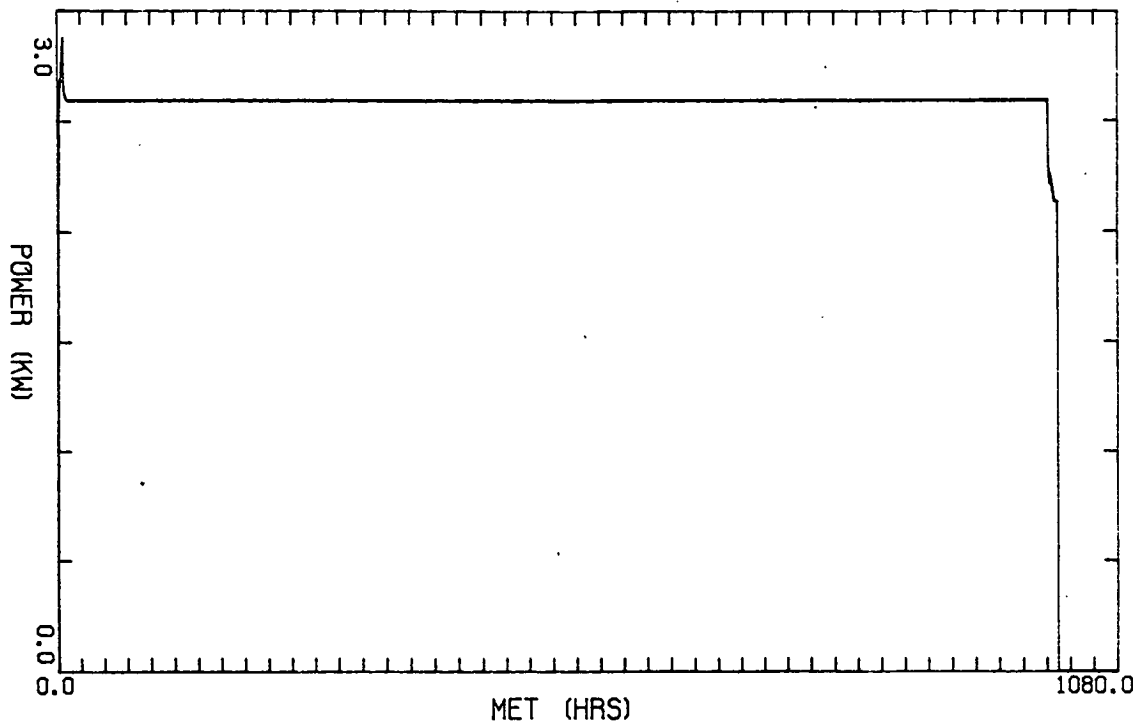


FIGURE 1.5-2. POWER PROFILES BY FUNCTIONAL OBJECTIVES (Sheet 3 of 6)

### F0-6A HgZnTe



### F0-7 CdTe

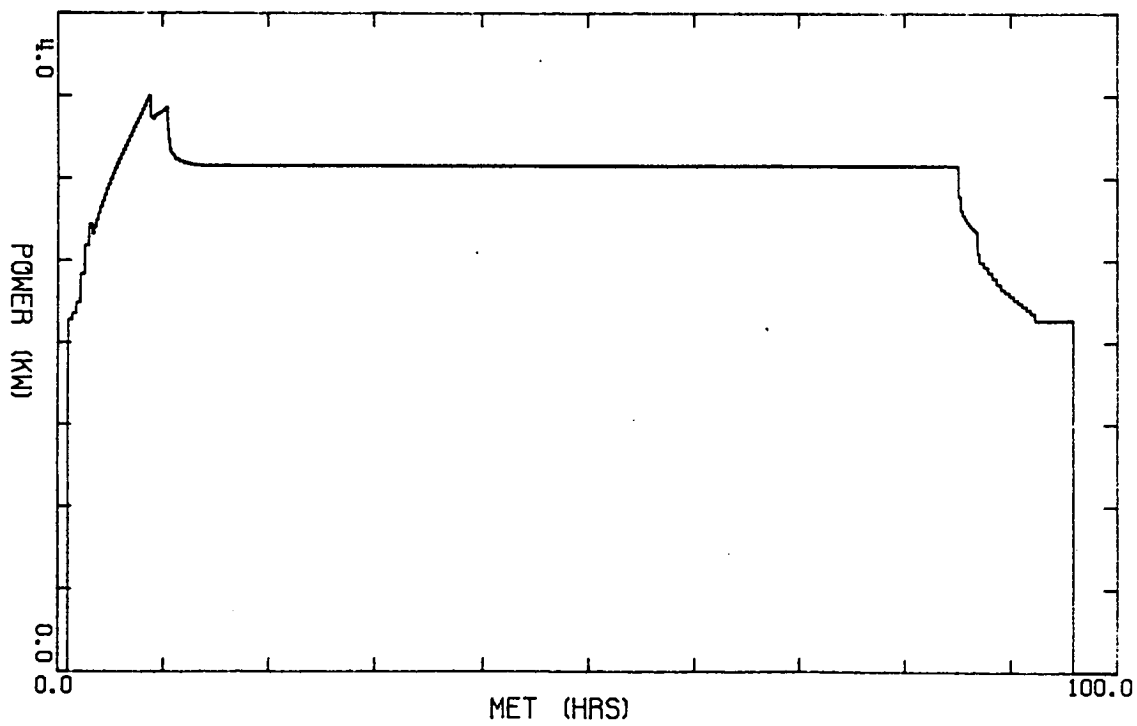
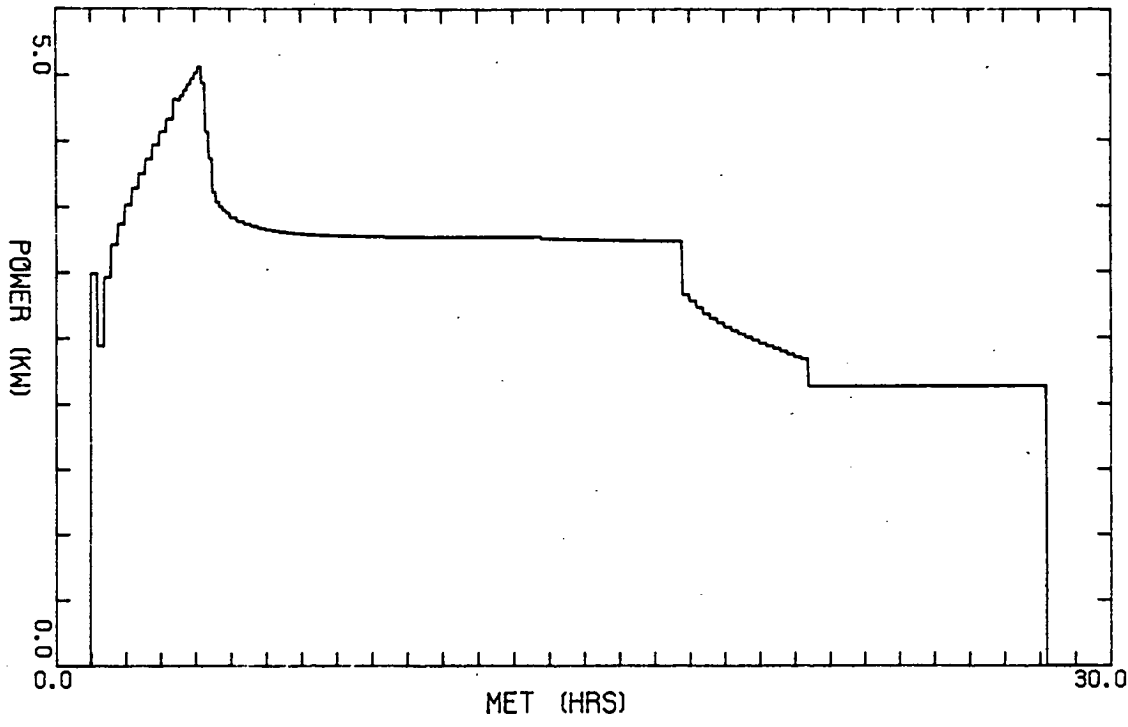


FIGURE 1.5-2. POWER PROFILES BY FUNCTIONAL OBJECTIVES (Sheet 4 of 6)

### F0-8 GaAs



### F0-9 SHUTDN/SAMP UNL

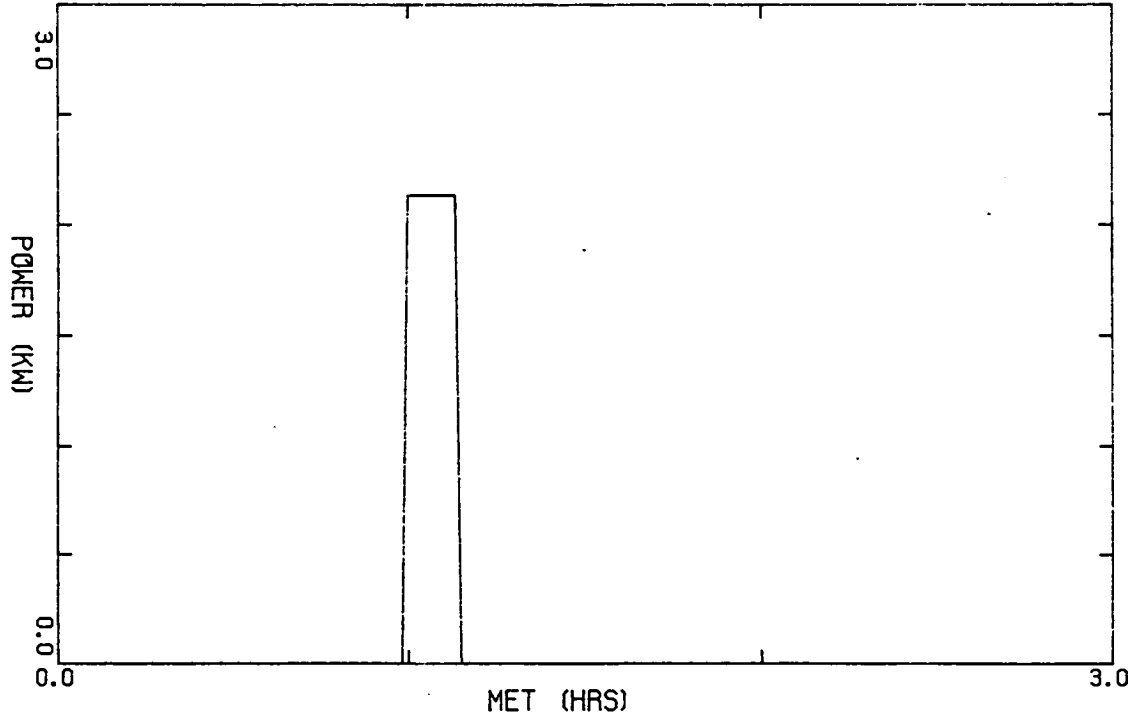


FIGURE 1.5-2. POWER PROFILES BY FUNCTIONAL OBJECTIVES (Sheet 5 of 6)

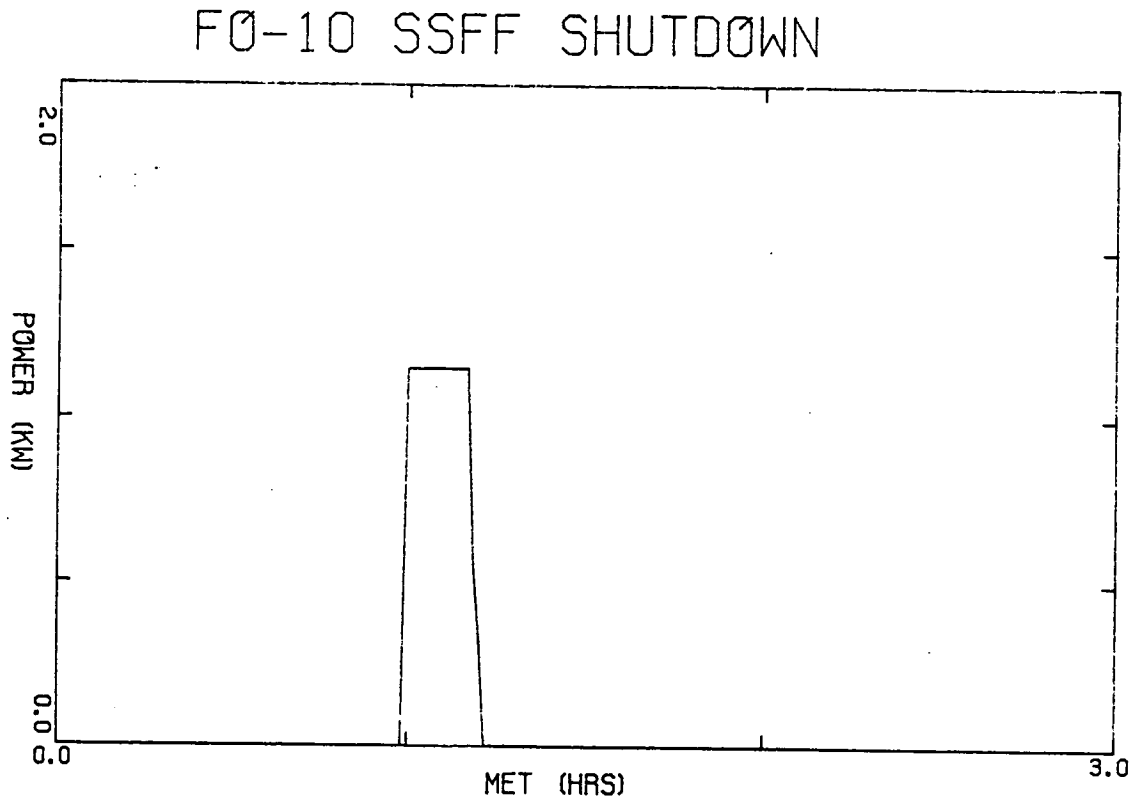


FIGURE 1.5-2. POWER PROFILES BY FUNCTIONAL OBJECTIVES (Sheet 6 of 6)

## 1.6. THERMAL/FLUID REQUIREMENTS

### 1.6.1 HEAT TRANSFER CHARACTERISTICS

The Space Station Furnace Facility (SSFF) Thermal Control System (TCS) water cooling loop will collect heat from Furnace Module-1 and the Core Rack electronics. The collected heat will then be transferred to the Space Station Freedom (SSF) TCS moderate temperature loop via the Core Rack heat exchanger. Figure 1.6-1 shows the TCS block diagram. On-orbit thermal requirements of the SSFF are shown in Table 1.6-1.

The SSFF TCS water cooling loop collects heat from the furnace modules and subsystem electronics. The collected heat is then transferred to the SSF TCS via the Core Rack heat exchanger. Total maximum heat dissipation of the Integrated Configuration-1 (IC1) configuration of SSFF to the SSF TCS is 4518 W.

Avionics air will be required to cool some SSFF subsystem equipment in both racks. Total maximum heat dissipation to avionics air is 371 W in the Core Rack and 366 W in Experiment Rack-1.

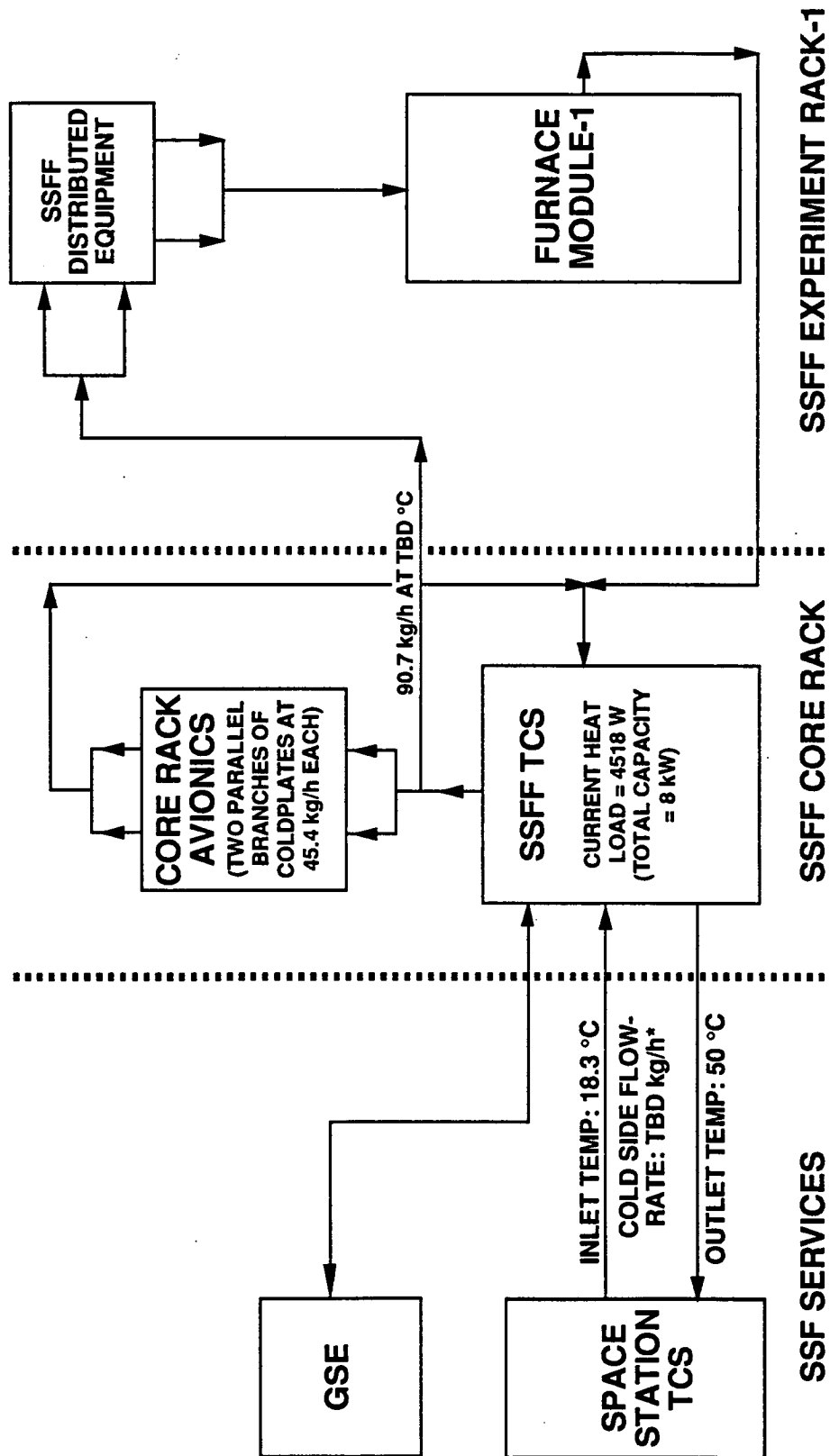
### 1.6.2 FLUID/VENT REQUIREMENTS

The Gas Distribution Subsystem (GDS) provides the distribution of SSF-provided gases and vacuum to Furnace Module-1. It also provides contamination monitoring of waste gases and gaseous argon to Furnace Module-1. The GDS block diagram is shown in Figure 1.6-2.

The IC1 configuration of the SSFF GDS will require 10.4 kg of SSF-provided dry nitrogen at the Core Rack per 90-day mission, supplied at 618 to 756 kPa (90 to 110 psia). This will be regulated down internally in the core to approximately 137 to 240 kPa (20 to 35 psia) for safe pressurization of the furnace enclosures. The GDS will also require the SSF-provided vacuum at the Core Rack, which furnishes the furnace modules access to the  $1 \times 10^{-3}$  torr vacuum line.

Gas and vacuum requirements for the IC1 configuration of SSFF are shown in Table 1.6-2.





\* ALLOCATED TO MATCH LOAD

FIGURE 1.6-1. TCS INTERFACE BLOCK DIAGRAM

TABLE 1.6-1. ON-ORBIT THERMAL REQUIREMENTS (Sheet 1 of 2)

Equipment Item and FO No.	Heat-Sink Type		Cooling Load (W)			Min/Max Temp (°C)			Thermal Capacitance (W-h-°C)	Special Considerations (as applicable)		
	Cabin (nonducted)	Av. Air (ducted)	Exp CP (SSFF)	Exp. HX	Standby	Operate	Peak* or other	Standby			Operate	Non- Operate
FO-1	X		X		134	200			17/43		TBD	
FO-1					1053	1327			18/50		TBD	
FO-2	X		X		310	391			17/43		TBD	
FO-2					1653	1817			18/50		TBD	
FO-3	X		X		323	332			17/43		TBD	
FO-3					1817	1817			18/50		TBD	
FO-4	X		X		332	347			17/43		TBD	
FO-4					1817	1817			18/50		TBD	
FO-5	X		X		317	317			17/43		TBD	
FO-5				X	1817	1817			18/50		TBD	
FO-5				X	232	270			TBD		TBD	
FO-6	X		X		317	317			17/43		TBD	
FO-6				X	1817	1817			18/50		TBD	
FO-6				X	283	285			TBD		TBD	
FO-6A	X		X		317	317			17/43		TBD	
FO-6A				X	1817	1817			18/50		TBD	
FO-6A				X	283	285			TBD		TBD	
FO-7	X		X		317	317			17/43		TBD	
FO-7				X	1817	1817			18/50		TBD	
FO-7				X	525	580			TBD		TBD	
FO-8	X		X		317	317			17/43		TBD	
FO-8				X	1817	1817			18/50		TBD	
FO-8				X	524	697			TBD		TBD	

TABLE 1.6-1. ON-ORBIT THERMAL REQUIREMENTS (Sheet 2 of 2)

Equipment Item and FO No.	Heat-Sink Type		Cooling Load (W)			Min/Max Temp (°C)		Thermal Capacitance (W-h-°C)	Special Considerations (as applicable)			
	Av. Air (nonducted)	Av. Air (ducted)	Exp CP (SSFF)	Exp. HX	Standby	Operate or other	Peak*			Standby	Operate	Non- Operate
FO-9	X					317	317		17/43		TBD	
FO-9				X		1817	1817		18/50		TBD	
FO-10	X					44	121		17/43		TBD	
FO-10				X		465	1026		18/50		TBD	
FO-11	X					317	317		17/43		TBD	
FO-11				X		2000	2016		18/50		TBD	

\* Each FO contains multiple steps; therefore, peak water-cooled load and peak avionics air load may not occur on the same step.

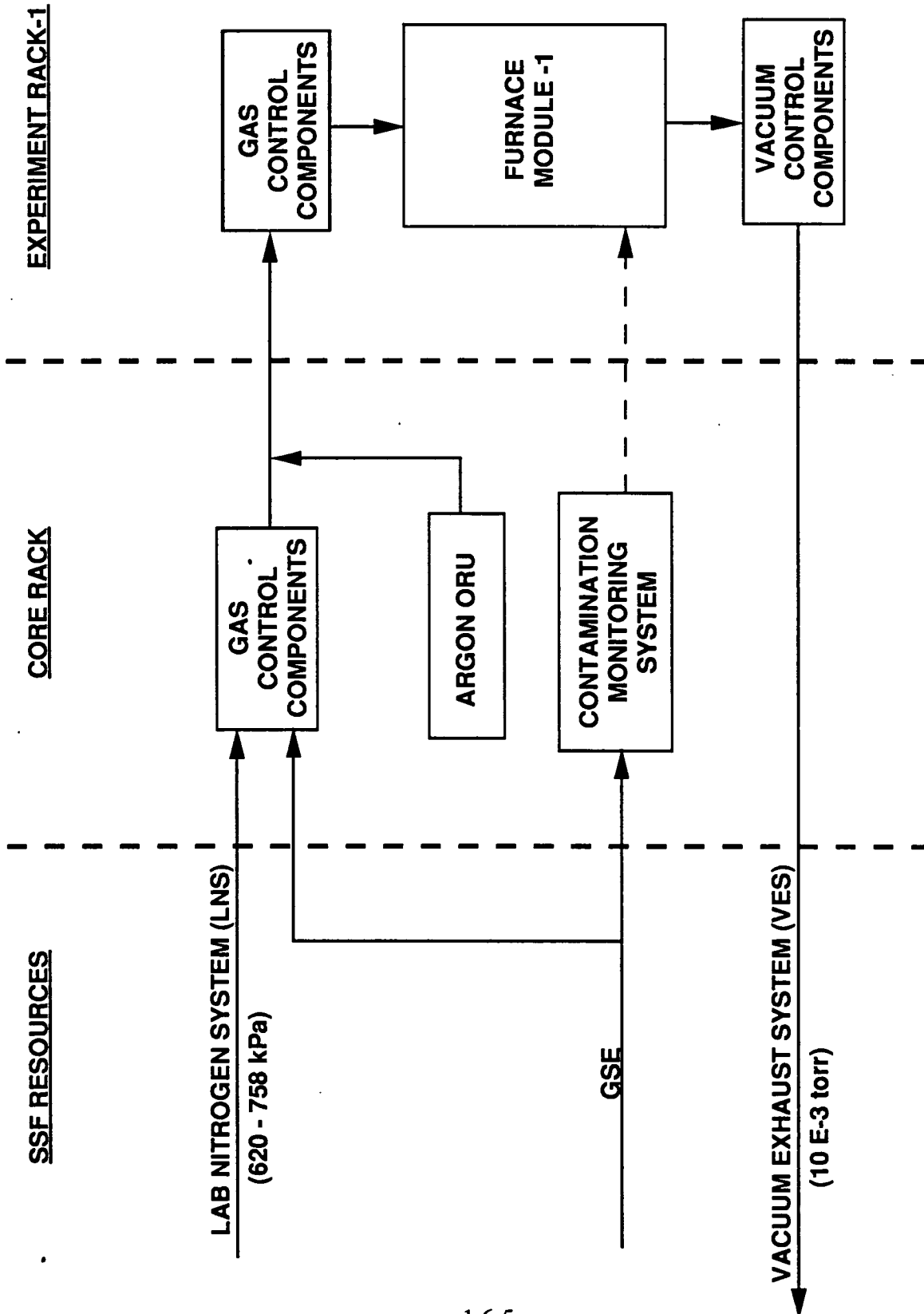


FIGURE 1.6-2. GDS INTERFACE BLOCK DIAGRAM

TABLE 1.6-2. FLUID REQUIREMENTS

Equipment Item and FO No.	Functional Requirement (Pressure, Purge, Vent Vacuum)	Gas or Liquid Parameters					Vent			Special Considerations (as applicable)
		Type	Quantity Stored (kg)	Pressure Limits (N/m <sup>2</sup> )	Flow-rate (kg/h)	Pressure Drop (N/m <sup>2</sup> )	Pressure (Pa)	When Required and Duration	Vacuum Vent Rate: torr-l/sec	
FO-1	N/A									
FO-2	N/A									
FO-3	Purge/vent	GN <sub>2</sub>	1.4 (supp. by SSF)	TBD	TBD	TBD	0.133	TBD	1.2 x 10 <sup>-3</sup>	
FO-4	N <sub>2</sub> purge/vent	GN <sub>2</sub>	1.4	TBD	TBD	TBD	0.133	TBD	1.2 x 10 <sup>-3</sup>	
FO-4	Ar purge/vent	Ar	1.9	TBD	TBD	TBD	0.133	TBD	1.2 x 10 <sup>-3</sup>	
FO-5	N/A									
FO-6	N/A									
FO-6A	N/A									
FO-7	N/A									
FO-8	N/A									
FO-9	Vent						0.133	TBD	1.2 x 10 <sup>-3</sup>	
FO-10	N/A									
FO-11	N/A									

## 1.7. DATA SYSTEM REQUIREMENTS

This section describes the Space Station Furnace Facility (SSFF) Data Management System (DMS) and the data system requirements of the SSFF to Space Station Freedom (SSF). The SSFF DMS contains the electronics for control and monitoring of subsystems associated with SSFF Core and Furnace Module-1 operations, including the Thermal Control Subsystem (TCS), the Power Conditioning and Distribution Subsystem (PCDS), and the Gas Distribution Subsystem (GDS). In addition to these subsystem tasks, the DMS also monitors and controls the unique functions of Furnace Module-1 including closed loop control of heater temperatures via thermocouple inputs (and other sensors), sensing and control of furnace translation (i.e., movement of the relative sample position to the hot/cold zones), and sensing and control of the Furnace Module-1 actuators and effectors. The DMS provides a communications media for the facility, stores digitized experiment data, and provides an interface to the SSF DMS. The SSFF DMS, as shown in Figure 1.7-1, consists of the Core and distributed components. Subsections 1.7.1 through 1.7.5 and Tables 1.7-1 through 1.7-5 define the DMS interface data and resource requirements of the SSFF.

### 1.7.1 SIGNAL INTERFACE DEFINITION

Table 1.7-1 defines the following data signals and control:

- Onboard and uplink commands to the SSFF and SSFF Furnace Module-1
- Routing of SSFF Core housekeeping data
- Routing of Furnace Module-1 housekeeping data
- Routing of Furnace Module-1 science data

### 1.7.2 SIGNAL INTERFACE DEFINITION EXPANSION

Table 1.7-2 is an expansion of the data from Table 1.7-1.

### 1.7.3 EVENT/EXCEPTION MONITORING REQUIREMENTS

Onboard event and exception monitoring requirements for SSFF and Furnace Module-1 are defined in Table 1.7-3.

### 1.7.4 PAYLOAD OPERATIONS INTEGRATION CENTER DISPLAY REQUIREMENTS

The Payload Operations Integration Center (POIC) controls all payload operations and is equipped with consoles for data management, operations control, and mission planning. The data to provide this capability are shown in Table 1.7-4.

### 1.7.5 POIC LIMIT SENSING/EXCEPTION MONITORING REQUIREMENTS

Limit sensing and exception monitoring is provided to the POIC via downlink and is defined in Table 1.7-5.

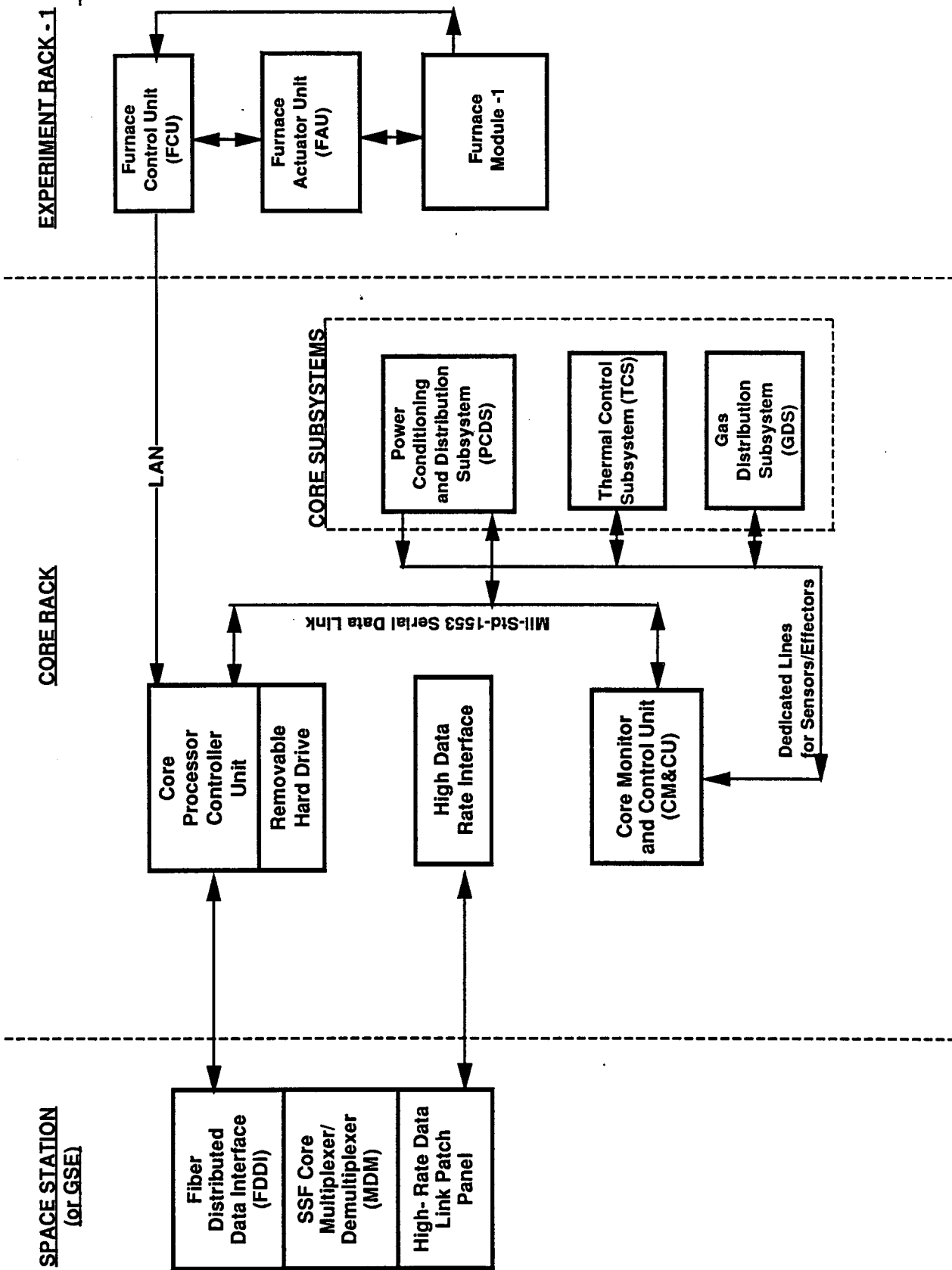


FIGURE 1.7-1. DMS INTERFACE BLOCK DIAGRAM

TABLE 1.7-1. SIGNAL INTERFACE DEFINITION

ENT NO.	DESCRIPTION	IC	DI	NISER	DATA	E	E	C	S	R	RESERVED	8
		M	I	E	I	V	X	A	A	A		
		D	I	N	O							
106	FURNACE MODULE HOUSEKEEPING DATA	SI	1	3	32	NI						
107	SSFF HOUSEKEEPING DATA	SI	1	3	32	NI						
1850	FURNACE SCIENCE DATA	SI	1	3	32	NI						
1851	FURNACE SCIENCE DATA	SI	1	3	32	NI						
1900	SSF CMDs & S/W PATCHES TO SSFF	Y SO	1			NI						
1			2	3	4							
123	456789012345678901234567890123456789012345678901234567890123456789012345678901234567890											



TABLE 1.7-2. SIGNAL INTERFACE DEFINITION EXPANSION (Sheet 1 of 38)

ENTC NO	DESCRIPTION	CU	MIN	MM	S	T	DATA	DESCRIPTION	MON	C	REQ	A	C	R	C	S	I	D	E	I	D	E
001	107	SSFF	HOUSEKEEPING DATA																			
200	106	Go	NoGo Error Override	DI	01		B	00	00	00	00											41 21
201	106	Process	Elapsed Time - Seconds	DG	01	06	U	00	01	00	06											3330 41 2
202	106	CGF	Sytem State	DG	01	03	U	00	07	00	09											3331 41 2
203	106	Sample	Number (Mode)	DG	01	06	U	00	10	00	15											3332 41 2
204	106	Process	Elapsed Time - Hours	DG	01	10	U	01	00	01	09											3333 41 2
205	106	Process	Elapsed Time - Minutes	DG	01	06	U	01	10	01	15											3334 41 2
207	106	IFEA	Water Outlet Temp	AI	01		S	03	00	03	07		Y	Y								3335 41 2
208	106	IFEA	Lower Humidity	AI	01		S	04	00	04	07		Y	Y								3336 41 2
209	106	IFEA	Upper Humidity	AI	01		S	05	00	05	07		Y	Y								3337 41 2
210	106	IFEA	Upper Atmosphere Temp	AI	01		S	12	00	12	07		Y	Y								3338 41 2
211	106	RFM	Cold End Shell Temp	AI	01		S	13	00	13	07		Y	Y								3355 41 2
212	106	RFM	Hot End Shell Temp	AI	01		S	14	00	14	07		Y	Y								3356 41 2
213	106	Ampoule	Alignment Arm Temp	AI	01		S	15	00	15	07		Y	Y								3357 41 2
214	106	SEM	Track Temp	AI	01		S	16	00	16	07		Y	Y								3358 41 2
215	106	IFEA	Absolute Pressure 1	AI	01		S	17	00	17	07		Y	Y								3359 41 2
216	106	IFEA	Absolute Pressure 2	AI	01		S	18	00	18	07		Y	Y								3360 41 2
217	106	Furnace	Linear Position	AI	01		S	19	00	19	07		Y	Y								3361 41 2
218	106	Indexing	CAM Rotary Position	AI	01		S	20	00	20	07		Y	Y								3362 41 2
219	106	Experiment	Main Bus Current	AI	01		S	21	00	21	07		Y	Y								3363 41 2
220	106	Experiment	Main Bus Voltage	AI	01		S	22	00	22	07		Y	Y								3364 41 2
221	106	Water	Outlet Vlv RCCB Off Status	DI	01		B	23	00	23	00		Y	Y								3365 41 2
222	106	Water	Outlet Vlv RCCB On Status	DI	01		B	23	01	23	01		Y	Y								3366 41 2
223	106	IFEA	Coolant Flow #1 Status	DI	01		B	23	02	23	02		Y	Y								3367 41 2
224	106	IFEA	Coolant Flow #2 Status	DI	01		B	23	03	23	03		Y	Y								3368 41 2
225	106	Vacuum	Vent Vlv RCCB Off Status	DI	01		B	23	04	23	04		Y	Y								3369 41 2
226	106	Vacuum	Vent Vlv RCCB On Status	DI	01		B	23	05	23	05		Y	Y								3370 41 2
227	106	Hot	Boost Mod A RCCB Off Status	DI	01		B	23	06	23	06		Y	Y								3371 41 2
228	106	Hot	Boost Mod A RCCB On Status	DI	01		B	23	07	23	07		Y	Y								3372 41 2
229	106	Hot	Boost Mod B RCCB Off Status	DI	01		B	23	08	23	08		Y	Y								3373 41 2
230	106	Hot	Boost Mod B RCCB On Status	DI	01		B	23	09	23	09		Y	Y								3374 41 2

TABLE 1.7-2. SIGNAL INTERFACE DEFINITION EXPANSION (Sheet 2 of 38)

ENTIC N	C U	M N	M S	T I	D A	D E	S C R I P T I O N	M O N I C	REQ A	C I R C	S I D	E T
NO. I O O	D A	G / G	W F E	P	S T A R T	E N D	D A T A V A L U E	E J E	L	D I O	N O.	X A
DESCRIPTION	U E	D I	W D	B T	W D	B T	W D	B T	W D	B T	W D	B T
	L I	S X I	#	#	#	#	#	#	#	#	#	#
	K I	/	D I	/	D I	/	D I	/	D I	/	D I	/
231 106 COLD Main Prim Mod RCCB Off Stat	DI	01			B 23 10 23 10						YI	3374 41 2
232 106 COLD Main Prim Mod RCCB On Stat	DI	01			B 23 11 23 11						YI	3375 41 2
233 106 HotMain Prim Mod A RCCB Off Stat	DI	01			B 23 12 23 12						YI	3376 41 2
234 106 HotMain Prim Mod A RCCB On Stat	DI	01			B 23 13 23 13						YI	3377 41 2
235 106 Water Inlet Valve RCCB Off Stat	DI	01			B 23 14 23 14						YI	3378 41 2
236 106 Water Inlet Valve RCCB On Status	DI	01			B 23 15 23 15						YI	3379 41 2
237 106 PDS Airflow 1 Status	DI	01			B 24 00 24 00			YI			YI	3380 41 2
238 106 SCS Airflow 1 Status	DI	01			B 24 01 24 01			YI			YI	3381 41 2
239 106 PCS Airflow 1 Status	DI	01			B 24 02 24 02			YI			YI	3382 41 2
240 106 PCS Airflow 2 Status	DI	01			B 24 03 24 03			YI			YI	3383 41 2
241 106 Argon Fill Valve RCCB Off Status	DI	01			B 24 04 24 04						YI	3384 41 2
242 106 Argon Fill Valve RCCB On Status	DI	01			B 24 05 24 05						YI	3385 41 2
243 106 PCS Utility RCCB Off Status	DI	01			B 24 06 24 06						YI	3386 41 2
244 106 PCS Utility RCCB On Status	DI	01			B 24 07 24 07						YI	3387 41 2
245 106 Peltier Conn Motor RCCB Off Stat	DI	01			B 24 08 24 08						YI	3388 41 2
246 106 Peltier Conn Motor RCCB On Stat	DI	01			B 24 09 24 09						YI	3389 41 2
247 106 Cold Main Red Mod RCCB Off Stat	DI	01			B 24 10 24 10						YI	3390 41 2
248 106 Cold Main Red Mod RCCB On Status	DI	01			B 24 11 24 11						YI	3391 41 2
249 106 Hot Main Prim Mod B RCCB Off Sta	DI	01			B 24 12 24 12						YI	3392 41 2
250 106 Hot Main Prim Mod B RCCB On Stat	DI	01			B 24 13 24 13						YI	3393 41 2
251 106 Hot Guard Module RCCB Off Status	DI	01			B 24 14 24 14						YI	3394 41 2
252 106 Hot Guard Module RCCB On Status	DI	01			B 24 15 24 15						YI	3395 41 2
253 106 Mech Pulsing Mod RCCB Off Status	DI	01			B 25 00 25 00						YI	3252 41 2
254 106 Mech Pulsing Mod RCCB On Status	DI	01			B 25 01 25 01						YI	3253 41 2
255 106 IFEA ABS Press 2 RCCB Off Status	DI	01			B 25 02 25 02						YI	3396 41 2
256 106 IFEA ABS Press 2 RCCB On Status	DI	01			B 25 03 25 03						YI	3397 41 2
257 106 IFEA ABS Press 1 RCCB Off Status	DI	01			B 25 04 25 04						YI	3398 41 2
258 106 IFEA ABS Press 1 RCCB On Status	DI	01			B 25 05 25 05						YI	3399 41 2
259 106 Vacuum Vent Valve Closed Status	DI	01			B 25 06 25 06						YI	3400 41 2
260 106 Vacuum Vent Valve Open Status	DI	01			B 25 07 25 07						YI	3401 41 2

TABLE 1.7-2. SIGNAL INTERFACE DEFINITION EXPANSION (Sheet 3 of 38)

ENT	C N	DESCRIPTION	CIU	MIN	MAX	S	T	DATA DESCRIPTION	MON	C	REQ	A	C	R	C	S	I	D	E	T		
NO.	O		I	S	O	O	Y															
	R		I	G	I	W	F	E														
	R		I	D	I	W	D	B	T	W	D	B	T	Y								
	.		L	S	X	#	#															
			K	/	D																	
261	106	Argon Fill Valve Closed Status	DI	01	B	25	08	25	08													
262	106	Argon Fill Valve Open Status	DI	01	B	25	09	25	09													
263	106	Hot Main Red Mod A RCCB Off Stat	DI	01	B	25	10	25	10													
264	106	Hot Main Red Mod A RCCB On Stat	DI	01	B	25	11	25	11													
265	106	Water Outlet Valve Normal Stat	DI	01	B	25	12	25	12													
266	106	Water Outlet Valve Bypass Stat	DI	01	B	25	13	25	13													
267	106	Water Inlet Valve Normal Status	DI	01	B	25	14	25	14													
268	106	Water Inlet Valve Bypass Status	DI	01	B	25	15	25	15													
269	106	Fail Safe Brake RCCB Off Status	DI	01	B	26	00	26	00													
270	106	Fail Safe Brake RCCB On Status	DI	01	B	26	01	26	01													
271	106	Core Hold Down Not Retracted	DI	01	B	26	02	26	02													
272	106	Core Hold Down Retracted	DI	01	B	26	03	26	03													
273	106	Core Hold Down Not Extended	DI	01	B	26	04	26	04													
274	106	Core Hold Down Extended	DI	01	B	26	05	26	05													
275	106	Core HD Motor RCCB Off Status	DI	01	B	26	06	26	06													
276	106	Core HD Motor RCCB On Status	DI	01	B	26	07	26	07													
277	106	Step Motor Clutch RCCB Off Stat	DI	01	B	26	08	26	08													
278	106	Step Motor Clutch RCCB On Status	DI	01	B	26	09	26	09													
279	106	Step Motor Drive RCCB Off Stat	DI	01	B	26	10	26	10													
280	106	Step Motor Drive RCCB On Stat	DI	01	B	26	11	26	11													
281	106	Rapid Xlation Clutch RCCB Off St	DI	01	B	26	12	26	12													
282	106	Rapid Xlation Clutch RCCB On St	DI	01	B	26	13	26	13													
283	106	Rapid Xlation Mtr RCCB Off Stat	DI	01	B	26	14	26	14													
284	106	Rapid Xlation Mtr RCCB On Status	DI	01	B	26	15	26	15													
285	106	Furnace Position Not Home	DI	01	B	27	00	27	00													
286	106	Furnace Position Home	DI	01	B	27	01	27	01													
287	106	Furn Extreme Trvl Not Exceeded	DI	01	B	27	02	27	02													
288	106	Furn Extreme Trvl Exceeded	DI	01	B	27	03	27	03													
289	106	Ampoule Alignment Not Retracted	DI	01	B	27	04	27	04													
290	106	Ampoule Alignment Retracted	DI	01	B	27	05	27	05													

TABLE 1.7-2. SIGNAL INTERFACE DEFINITION EXPANSION (Sheet 4 of 38)

ENT C N	NO	O	I	R	DESCRIPTION	C I U	M N	N M	S T	I	DATA DESCRIPTION	MON I C I	REQ A	C I R C I S I D	E T		
NO	O	I	R	DESCRIPTION	C I U	M N	N M	S T	I	DATA DESCRIPTION	MON I C I	REQ A	C I R C I S I D	E T			
NO	O	I	R	DESCRIPTION	C I U	M N	N M	S T	I	DATA DESCRIPTION	MON I C I	REQ A	C I R C I S I D	E T			
291	106	Ampoule	Alignment Not Extended	DI 01					B	27	06	27	106	Y	3430	41	12
292	106	Ampoule	Alignment Extended	DI 01					B	27	07	27	107	Y	3431	41	12
293	106	Ampoule	Align Mtr RCCB Off Stat	DI 01					B	27	08	27	108	Y	3432	41	12
294	106	Ampoule	Align Mtr RCCB On Stat	DI 01					B	27	09	27	109	Y	3433	41	12
295	106	Ampoule	Support Not Retracted	DI 01					B	27	10	27	110	Y	3434	41	12
296	106	Ampoule	Support Retracted	DI 01					B	27	11	27	111	Y	3435	41	12
297	106	Ampoule	Support Not Secure	DI 01					B	27	12	27	112	Y	3436	41	12
298	106	Ampoule	Support Secure	DI 01					B	27	13	27	113	Y	3437	41	12
299	106	Ampoule	Spt Plt Mtr RCCB Off Stat	DI 01					B	27	14	27	114	Y	3438	41	12
300	106	Ampoule	Spt Plt Mtr RCCB On Stat	DI 01					B	27	15	27	115	Y	3439	41	12
301	106	Ampoule	Cold Guard Mod RCCB Off Status	DI 01					B	28	00	28	100	Y	3256	41	12
302	106	Ampoule	Cold Guard Mod RCCB On Status	DI 01					B	28	01	28	101	Y	3257	41	12
303	106	Carousel	Spacer Plt Gap Lim-Not	DI 01					B	28	02	28	102	Y	3440	41	12
304	106	Carousel	Spacer Plt Gap Limit	DI 01					B	28	03	28	103	Y	3441	41	12
305	106	Indexing	Cam Not Stowed	DI 01					B	28	04	28	104	Y	3442	41	12
306	106	Indexing	Cam Stowed	DI 01					B	28	05	28	105	Y	3443	41	12
307	106	Carousel	Trk Extr Left Lim-Not	DI 01					B	28	06	28	106	Y	3444	41	12
308	106	Carousel	Trk Extr Left Limit	DI 01					B	28	07	28	107	Y	3445	41	12
309	106	Carousel	Trk Extr Right Lim-Not	DI 01					B	28	08	28	108	Y	3446	41	12
310	106	Carousel	Trk Extr Right Lim	DI 01					B	28	09	28	109	Y	3447	41	12
311	106	Hot Main	Red Mod B RCCB Off Stat	DI 01					B	28	10	28	110	Y	3258	41	12
312	106	Hot Main	Red Mod B RCCB On Stat	DI 01					B	28	11	28	111	Y	3259	41	12
313	106	SEM Index	Motor RCCB Off Status	DI 01					B	28	12	28	112	Y	3448	41	12
314	106	SEM Index	Motor RCCB On Status	DI 01					B	28	13	28	113	Y	3449	41	12
315	106	SEM Indexing	Jog CCW Status	DI 01					B	28	14	28	114	Y	3450	41	12
316	106	SEM Indexing	Jog CW Status	DI 01					B	28	15	28	115	Y	3451	41	12
317	106	Ampoule	Processing	DI 01					B	29	00	29	100	Y	3452	41	12
318	106	Ampoule	Not Processing	DI 01					B	29	01	29	101	Y	3453	41	12
319	106	System Bus	Relay Off Status	DI 01					B	29	02	29	102	Y	3454	41	12
320	106	System Bus	Relay On Status	DI 01					B	29	03	29	103	Y	3455	41	12

0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	6	7	3	4	4	4	4	4	4	4	4	4	4	4	4	4	4
9	0	3	5	7	8	1	3	5	7	5	6	7	5	6	7	5	6
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

TABLE 1.7-2. SIGNAL INTERFACE DEFINITION EXPANSION (Sheet 5 of 38)

ENT C N	M S	D A	G	U E	L	K	C U	M N	M S I	T I	D A	D E	S C R I	M O N I	C I	Y	Y	Y
NO. O O	D A	G	U E	L	K	DI	DI	SO	OS	O Y	P S	E	END	DATA	VALUE	REQ A	---	---
DESCRIPTION	DESCRIPTION	DESCRIPTION	DESCRIPTION	DESCRIPTION	DESCRIPTION	DESCRIPTION	DESCRIPTION	DESCRIPTION	DESCRIPTION	DESCRIPTION	DESCRIPTION	DESCRIPTION	DESCRIPTION	DESCRIPTION	DESCRIPTION	DESCRIPTION	DESCRIPTION	DESCRIPTION
321 106 Peltier Pulsing Drv RCCB Off St						DI	DI											
322 106 Peltier Pulsing Drv RCCB On Stat						DI	DI											
001 850 Sync																		
002 850 Frame Count (SFID)																		
003 850 Spacelab Experiment ID																		
004 850 Sample Number (Mode)																		
005 850 Mission ID																		
006 850 Furnace Position Not Home																		
007 850 Furnace Position Home																		
008 850 Furn Extreme Trvl Not Exceeded																		
009 850 Furn Extreme Trvl Exceeded																		
010 850 Core Hold Down Not Retracted																		
011 850 Core Hold Down Retracted																		
012 850 Core Hold Down Not Extended																		
013 850 Core Hold Down Extended																		
014 850 Water Outlet Valve Normal Stat																		
015 850 Water Outlet Valve Bypass Stat																		
016 850 Water Inlet Valve Normal Status																		
017 850 Water Inlet Valve Bypass Status																		
018 850 Vacuum Vent Valve Open Status																		
019 850 Vacuum Vent Valve Closed Status																		
020 850 Argon Fill Valve Open Status																		
021 850 Argon Fill Valve Closed Status																		
022 850 Ampoule Support Not Retracted																		
023 850 Ampoule Support Retracted																		
024 850 Ampoule Alignment Not Retracted																		
025 850 Ampoule Alignment Retracted																		
026 850 Ampoule Alignment Not Extended																		
027 850 Ampoule Alignment Extended																		
028 850 SEM Indexing Jog CCW Status																		

TABLE 1.7-2. SIGNAL INTERFACE DEFINITION EXPANSION (Sheet 6 of 38)

ENTIC NO	DESCRIPTION	CU	MN	MS	IT	DATA	DESCRIPTION	MON	CI	REQ	CI	REQ	CI	REQ
NO. IO		M S	S O	G	P	START	END	DATA	VALUE	---	L	E	---	L
R .		D A	G .	I	G	W	F	E	---	T	C	I	R	C
R		G												
.		U	E	I	D	I	W	D	B	T	W	D	B	T
		L												
		K												
0291850	SEM Indexing Jog CW Status		02											
0301850	Ampoule Not Processing		02											
0311850	Ampoule Processing		02											
0321850	Indexing Cam Not Stowed		02											
0331850	Indexing Cam Stowed		02											
0341850	Peltier Connector Not Retracted		02											
0351850	Peltier Connector Retracted		02											
0361850	Peltier Connector Not Extended		02											
0371850	Peltier Connector Extended		02											
0381850	Ampoule 4 Failure 2 Status		02											
0391850	Ampoule 4 Failure 1 Status		02											
0401850	Ampoule 3 Failure 2 Status		02											
0411850	Ampoule 3 Failure 1 Status		02											
0421850	Ampoule 2 Failure 2 Status		02											
0431850	Ampoule 2 Failure 1 Status		02											
0441850	Ampoule 1 Failure 2 Status		02											
0451850	Ampoule 1 Failure 1 Status		02											
0461850	PDS Airflow 1 Status		02											
0471850	PCS Airflow 1 Status		02											
0481850	IFEA ABS Press 2 RCCB Off Status		02											
0491850	IFEA ABS Press 2 RCCB On Status		02											
0501850	Spare RCCB Off Stat		02											
0511850	Spare RCCB On Stat		02											
0521850	IFEA Coolant Flow #1 Status		02											
0531850	SCS Airflow 1 Status		02											
0541850	Cartridge 2 Failure 2 Status		02											
0551850	Cartridge 2 Failure 1 Status		02											
0561850	Cartridge 1 Failure 2 Status		02											
0571850	Cartridge 1 Failure 1 Status		02											
0581850	Ampoule 6 Failure 2 Status		02											

TABLE 1.7-2. SIGNAL INTERFACE DEFINITION EXPANSION (Sheet 7 of 38)

ENTIC NO	DESCRIPTION	MON				REQ									
		MON	C	I	C	REQ	A	---	L						
059 850	Ampoule 6 Failure 1 Status														
060 850	Ampoule 5 Failure 2 Status														
061 850	Ampoule 5 Failure 1 Status														
062 850	Water Outlet Vlv RCCB Off Status														
063 850	Water Outlet Vlv RCCB On Status														
064 850	Vacuum Vent Vlv RCCB Off Status														
065 850	Vacuum Vent Vlv RCCB On Status														
066 850	SEM Index Motor RCCB Off Status														
067 850	SEM Index Motor RCCB On Status														
068 850	Core HD Motor RCCB Off Status														
069 850	Core HD Motor RCCB On Status														
070 850	Hot Boost Mod A RCCB Off Status														
071 850	Hot Boost Mod A RCCB On Status														
072 850	Hot Boost Mod B RCCB Off Status														
073 850	Hot Boost Mod B RCCB On Status														
074 850	Cold Main Prim Mod RCCB Off Stat														
075 850	Cold Main Prim Mod RCCB On Stat														
076 850	HotMain Prim Mod A RCCB Off Stat														
077 850	HotMain Prim Mod A RCCB On Stat														
078 850	Carousel Trk Extr Right Lim-Not														
079 850	Carousel Trk Extr Right Lim														
080 850	Ampoule Support Not Secure														
081 850	Ampoule Support Secure														
082 850	Carousel Trk Extr Left Lim-Not														
083 850	Carousel Trk Extr Left Limit														
084 850	Carousel Spacer Plt Gap Lim-Not														
085 850	Carousel Spacer Plt Gap Limit														
086 850	Ampoule Spt Plt Mtr RCCB Off St														
087 850	Ampoule Spt Plt Mtr RCCB On Stat														
088 850	Ampoule Align Mtr RCCB Off Stat														
0		3	4	4	4	5	5	5	5	6	6	6	7	7	8
3		9	0	3	5	7	8	1	3	5	7	1	2	5	8

TABLE 1.7-2. SIGNAL INTERFACE DEFINITION EXPANSION (Sheet 8 of 38)

ENTIC NO	DESCRIPTION	CU	MN	NM	S	I	T	DATA DESCRIPTION	MON	C	REQ	A	CIRC	SID	E	T
NO.								VALUE								
IR		D	A	G	/	G	P	START	END	DATA	VALUE		L		D	I
IR		U	E					WD	BT	WD	BT	Y		E		D
		L		S	X	#										
		K		/	D											
0891850	Ampoule Align Mtr RCCB On Stat															
0901850	Water Inlet Valve RCCB Off Stat															
0911850	Water Inlet Valve RCCB On Status															
0921850	Argon Fill Valve RCCB Off Status															
0931850	Argon Fill Valve RCCB On Status															
0941850	System Bus Relay Off Status															
0951850	System Bus Relay On Status															
0961850	IFEA Coolant Flow #2 Status															
0971850	PCS Airflow 2 Status															
0981850	Cartridge 6 Failure 2 Status															
0991850	Cartridge 6 Failure 1 Status															
1001850	Cartridge 5 Failure 2 Status															
1011850	Cartridge 5 Failure 1 Status															
1021850	Cartridge 4 Failure 2 Status															
1031850	Cartridge 4 Failure 1 Status															
1041850	Cartridge 3 Failure 2 Status															
1051850	Cartridge 3 Failure 1 Status															
1061850	PCS Utility RCCB Off Status															
1071850	PCS Utility RCCB On Status															
1081850	Step Motor Drive RCCB Off Stat															
1091850	Step Motor Drive RCCB On Stat															
1101850	IFEA ABS Press 1 RCCB Off Status															
1111850	IFEA ABS Press 1 RCCB On Status															
1121850	Peltier Conn Motor RCCB Off Stat															
1131850	Peltier Conn Motor RCCB On Stat															
1141850	Step Motor Clutch RCCB Off Stat															
1151850	Step Motor Clutch RCCB On Status															
1161850	Rapid Xlation Clutch RCCB Off St															
1171850	Rapid Xlation Clutch RCCB On St															
1181850	Rapid Xlation Mtr RCCB Off Stat															



TABLE 1.7-2. SIGNAL INTERFACE DEFINITION EXPANSION (Sheet 9 of 38)

ENT C N	C U	M N S I T	D A T A	D E S C R I P T I O N	M O N C	R E Q A	C I R C S I D E T
NO.   O	I S	G / G	P S T A R T	E N D	D A T A	V A L U E	D I O N O.
R .	I G	W F E	T	T	E E .	E E .	X A
R	D I	W D B T	W D B T	Y	V X C	T D	P B
.	S X	#	#	P	N C O	? E	I L
	/ D			E	T P F		D E
119 850 Rapid Xlration Mtr RCCB On Status		02					41 2
120 850 Fail Safe Brake RCCB Off Status		02					41 2
121 850 Fail Safe Brake RCCB On Status		02					41 2
122 850 Cold Main Red Mod RCCB Off Sta		02					41 2
123 850 Cold Main Red Mod RCCB On Status		02					41 2
124 850 Hot Main Prim Mod B RCCB Off Sta		02					41 2
125 850 Hot Main Prim Mod B RCCB On Stat		02					41 2
126 850 Hot Guard Module RCCB Off Status		02					41 2
127 850 Hot Guard Module RCCB On Status		02					41 2
128 850 Mech Pulsing Mod RCCB Off Status		02					41 2
129 850 Mech Pulsing Mod RCCB On Status		02					41 2
130 850 Hot Main Red Mod A RCCB Off Stat		02					41 2
131 850 Hot Main Red Mod A RCCB On Stat		02					41 2
132 850 Cold Guard Mod RCCB Off Status		02					41 2
133 850 Cold Guard Mod RCCB On Status		02					41 2
134 850 Hot Main Red Mod B RCCB Off Stat		02					41 2
135 850 Hot Main Red Mod B RCCB On Stat		02					41 2
136 850 Peltier Pulsing Drv RCCB Off St		02					41 2
137 850 Peltier Pulsing Drv RCCB On Stat		02					41 2
138 850 Sample to Process #1		02					41 2
139 850 Sample to Process #2		02					41 2
140 850 Sample to Process #3		02					41 2
141 850 Sample to Process #4		02					41 2
142 850 Sample to Process #5		02					41 2
143 850 Sample to Process #6		02					41 2
144 850 Processed Sample #1		02					41 2
145 850 Processed Sample #2		02					41 2
146 850 Processed Sample #3		02					41 2
147 850 Processed Sample #4		02					41 2
148 850 Processed Sample #5		02					41 2
	3 4	4 4 4 4	5 5 5 5	5 5 5 5	6 6 6	7 7 7	8
0 0 0	9 0	3 5 7 8	1 3 5 7	5 6 7	1 2	5 8	0
3 6 7							

TABLE 1.7-2. SIGNAL INTERFACE DEFINITION EXPANSION (Sheet 10 of 38)

ENT C N	I C U	M N	I N M	S T	D A T A	D E S C R I P T I O N	M O N I C	R E Q U I R E D	4	5	6	7	8	9	0		
NO.   O	D I A	G.   /   G	P   S T A R T	E N D	D A T A	V A L U E	---   L	C I R C	S I D	E	T						
IR .	I G	W   F   E	---	T			E   E	D I O	N O.	X	A						
IR	U   E	D   I	W   D   B   T	Y			V   X   C	T	D	P	B						
.	L	S   X	#	#	P		N   C   O	?	E	I	L						
	K	/	D	E			T   P   F			D	E						
149 850 Processed Sample #6																	
150 850 Last Sample Index																	
151 850 GMT Day																	
152 850 GMT Milliseconds of Day																	
153 850 GMT Fractional Milliseconds																	
154 850 Last Command Received Word #0																	
155 850 Last Command Received Word #1																	
156 850 Last Command Received Word #2																	
157 850 Last Command Received Word #3																	
158 850 Last Command Received Word #4																	
159 850 Last Command Received Word #5																	
160 850 Last Command Received Word #6																	
161 850 Last Command Received Word #7																	
162 850 Last Command Received Word #8																	
163 850 Last Command Received Word #9																	
164 850 Last Command Received Word #10																	
165 850 Last Command Received Word #11																	
166 850 Last Command Received Word #12																	
167 850 Last Command Received Word #13																	
168 850 Last Command Received Word #14																	
169 850 Last Command Received Word #15																	
170 850 Last Command Received Word #16																	
171 850 Last Command Received Word #17																	
172 850 Last Command Received Word #18																	
173 850 Last Command Received Word #19																	
174 850 Last Command Received Word #20																	
175 850 Last Command Received Word #21																	
176 850 Last Command Received Word #22																	
177 850 Last Command Received Word #23																	
178 850 Last Command Received Word #24																	
0																	
0																	
3																	
6																	
7																	
8																	
9																	
0																	

TABLE 1.7-2. SIGNAL INTERFACE DEFINITION EXPANSION (Sheet 11 of 38)

ENT	C N	ICIU	MN	MS	IS	TI	DATA	DESCRIPTION	MON	C	REQ	A	C	R	S	I	D	E	T			
NO.	O	D	A	G	/	G	P	START	END	DATA	VALUE	E	E	L	D	I	O	N	O.			
179	850		Last	Command	Received	Word	#25															
180	850		Last	Command	Received	Word	#26															
181	850		Last	Command	Received	Word	#27															
182	850		Last	Command	Received	Word	#28															
183	850		Last	Command	Received	Word	#29															
184	850		Last	Command	Received	Word	#30															
185	850		Last	Command	Received	Word	#31															
186	850			Invalid	Command	Flag																
187	850		User	Requested	Data																	
188	850		ECS	Next	Timeline	Record																
189	850		FHS	Next	Timeline	Record																
190	850		FHS	Cold	Guard	Next	Timeline	Rec														
191	850		FHS	Cold	Zone	Next	Timeline	Rec														
192	850		FHS	Booster	Next	Timeline	Rec															
193	850		FHS	Hot	Zone	Next	Timeline	Rec														
194	850		FHS	Hot	Guard	Next	Timeline	Rec														
195	850		SIDS	Next	Timeline	Record																
196	850		ECS	Current	Segment	Start	Time															
197	850		ECS	Current	Segment	Stop	Time															
198	850		FHS	Current	Segment	Start	Time															
199	850		FHS	Current	Segment	Stop	Time															
200	850		FHS	Cold	Guard	Cur	Seg	Start	Time													
201	850		FHS	Cold	Guard	Cur	Seg	Stop	Time													
202	850		FHS	Cold	Zone	Cur	Seg	Start	Time													
203	850		FHS	Cold	Zone	Cur	Seg	Stop	Time													
204	850		FHS	Booster	Cur	Seg	Start	Time														
205	850		FHS	Booster	Cur	Seg	Stop	Time														
206	850		FHS	Hot	Zone	Cur	Seg	Start	Time													
207	850		FHS	Hot	Zone	Cur	Seg	Stop	Time													
208	850		FHS	Hot	Guard	Cur	Seg	Start	Time													

TABLE 1.7-2. SIGNAL INTERFACE DEFINITION EXPANSION (Sheet 12 of 38)

ENTIC N NO. IO O R . R . . .	C U M S D A I G U E L I K	M N S O G W D I S X /	M M O G W F I I S X /	S I P I W F D I S X /	T I P I E I E I P I E I	DATA DESCRIPTION	MONIC REQ A E E . V X C N C I O T P F	CIRC SID D IO NO. T D ? E	E T X A P B I L D E
209	1850	FHS	Hot Guard	Cur	Seg	Stop Time			4112
210	1850	SIDS	Current Segment	Start	Time				4112
211	1850	SIDS	Current Segment	Stop	Time				4112
212	1850	Experiment	Main Bus	Current					4112
213	1850	Experiment	Main Bus	Voltage					4112
214	1850	IFEA	Lower Humidity						4112
215	1850	IFEA	Upper Humidity						4112
216	1850	IFEA	Absolute Pressure	1					4112
217	1850	IFEA	Absolute Pressure	2					4112
218	1850	IFEA	Lower Atmosphere	Temp					4112
219	1850	IFEA	Upper Atmosphere	Temp					4112
220	1850	IFEA	Water Inlet	Temp					4112
221	1850	IFEA	Water Outlet	Temp					4112
222	1850	RFM	Cold End Shell	Temp					4112
223	1850	RFM	Hot End Shell	Temp					4112
224	1850	RFM	Water Outlet	Temp					4112
225	1850	Sample	1	Temp	1				4112
226	1850	Sample	1	Temp	2				4112
227	1850	Sample	1	Temp	3				4112
228	1850	Sample	1	Temp	4				4112
229	1850	Sample	1	Temp	5				4112
230	1850	Sample	1	Temp	6				4112
231	1850	Sample	2	Temp	1				4112
232	1850	Sample	2	Temp	2				4112
233	1850	Sample	2	Temp	3				4112
234	1850	Sample	2	Temp	4				4112
235	1850	Sample	2	Temp	5				4112
236	1850	Sample	2	Temp	6				4112
237	1850	Sample	3	Temp	1				4112
238	1850	Sample	3	Temp	2				4112
0	0	0							
3	6	7							

TABLE 1.7-2. SIGNAL INTERFACE DEFINITION EXPANSION (Sheet 13 of 38)

ENT	C N	IC	U	MN	S	T	DATA	DESCRIPTION	MON	C	REQ	A	C	R	C	S	I	D	E	T				
NO.	O	I	A	G	/	G	P	START	END	DATA	VALUE	---	L	E	E	.	L	D	I	O	N	O.	X	A
R	.	I	G	W	F	E	---	T	---	T	---	---	---	---	---	---	---	---	---	---	---	---	---	---
R	.	I	D	I	W	D	B	T	W	D	B	T	Y	V	X	C	T	D	P	B	I	L	I	L
.	.	I	S	X	I	#	#	#	#	#	#	#	#	N	C	O	?	E	I	L	I	L	I	L
			/	/	D	/	/	/	/	/	/	/	/	T	P	F	/	/	/	/	/	/	/	/
239	850	Sample	3	Temp	3																			
240	850	Sample	3	Temp	4																			
241	850	Sample	3	Temp	5																			
242	850	Sample	3	Temp	6																			
243	850	Sample	4	Temp	1																			
244	850	Sample	4	Temp	2																			
245	850	Sample	4	Temp	3																			
246	850	Sample	4	Temp	4																			
247	850	Sample	4	Temp	5																			
248	850	Sample	4	Temp	6																			
249	850	Sample	5	Temp	1																			
250	850	Sample	5	Temp	2																			
251	850	Sample	5	Temp	3																			
252	850	Sample	5	Temp	4																			
253	850	Sample	5	Temp	5																			
254	850	Sample	5	Temp	6																			
255	850	Sample	6	Temp	1																			
256	850	Sample	6	Temp	2																			
257	850	Sample	6	Temp	3																			
258	850	Sample	6	Temp	4																			
259	850	Sample	6	Temp	5																			
260	850	Sample	6	Temp	6																			
261	850	Stepping	Motor	Phase	A	Current																		
262	850	Stepping	Motor	Phase	A	Voltage																		
263	850	Stepping	Motor	Phase	B	Current																		
264	850	Stepping	Motor	Phase	B	Voltage																		
265	850	Furnace	Linear	Position																				
266	850	FTS	Stepping	Motor	Temp																			
267	850	Rapid	Translation	Motor	RPM																			
268	850	Cold	Guard	Heater	Current																			

TABLE 1.7-2. SIGNAL INTERFACE DEFINITION EXPANSION (Sheet 14 of 38)

ENT   C   U   M   N   M   S   T   DATA DESCRIPTION   MONIC	NO.	IO	O	D   A   G   /   G   P   START   END   DATA VALUE   REQ   A	IR	IR	.	DESCRIPTION	C   I   R   C   I   S   I   D	E   T   X   A	P   B   I   L   D   E	
NO.	IO	O		DESCRIPTION	C   I   R   C   I   S   I   D	E   T   X   A	P   B   I   L   D   E					
269	850	Cold	Guard	Heater	Voltage	02						4112
270	850	Cold	Main	Primary	Heater	Current	02					4112
271	850	Cold	Main	Primary	Heater	Voltage	02					4112
272	850	Cold	Main	Red	Heater	Current	02					4112
273	850	Cold	Main	Red	Heater	Voltage	02					4112
274	850	Hot	Boost	Heater	Current	02						4112
275	850	Hot	Boost	Heater	Voltage	02						4112
276	850	Hot	Guard	Heater	Current	02						4112
277	850	Hot	Guard	Heater	Voltage	02						4112
278	850	Hot	Main	Primary	Heater	Current	02					4112
279	850	Hot	Main	Primary	Heater	Voltage	02					4112
280	850	Hot	Main	Red	Heater	Current	02					4112
281	850	Hot	Main	Red	Heater	Voltage	02					4112
282	850	Cold	Zone	CJ	Block	Temp 1	02					4112
283	850	Cold	Zone	CJ	Block	Temp 2	02					4112
284	850	Hot	Zone	CJ	Block	Temp 1	02					4112
285	850	Hot	Zone	CJ	Block	Temp 2	02					4112
286	850	Sample	1	CJ	Block	Temp 1	02					4112
287	850	Sample	1	CJ	Block	Temp 2	02					4112
288	850	Sample	2	CJ	Block	Temp 1	02					4112
289	850	Sample	2	CJ	Block	Temp 2	02					4112
290	850	Sample	3	CJ	Block	Temp 1	02					4112
291	850	Sample	3	CJ	Block	Temp 2	02					4112
292	850	Sample	4	CJ	Block	Temp 1	02					4112
293	850	Sample	4	CJ	Block	Temp 2	02					4112
294	850	Sample	5	CJ	Block	Temp 1	02					4112
295	850	Sample	5	CJ	Block	Temp 2	02					4112
296	850	Sample	6	CJ	Block	Temp 1	02					4112
297	850	Sample	6	CJ	Block	Temp 2	02					4112
298	850	Booster	Heater	Control	Temp 1	02						4112

3	4	4	4	4	4	5	5	5	5	7	7	7	8
0	0	0	0	0	0	3	3	3	3	5	5	5	0
3	6	7	9	0	3	5	7	8	1	3	5	7	
6	6	6	6	6	6	6	6	6	6	6	6	6	
7	7	7	7	7	7	7	7	7	7	7	7	7	
8	8	8	8	8	8	8	8	8	8	8	8	8	
0	0	0	0	0	0	0	0	0	0	0	0	0	

TABLE 1.7-2. SIGNAL INTERFACE DEFINITION EXPANSION (Sheet 15 of 38)

ENT	C N	DESCRIPTION	CIU	MN	NS	T	DATA	DESCRIPTION	MON	C	REQ	A	CIRC	SID	E	T	
NO.	O		IS	SO	OS	OY	START	END	VALUE	---	---	---	---	---	---	---	
R	.		IG	G	/	G	P	F	E	---	---	---	---	---	---	---	
R	.		UIE	D	I	WD	BT	WD	BT	Y	V	X	C	T	D	P	
.	.		LI	S	X	I	#	#	#	#	N	C	O	?	E	I	
			KI	/	D	I	#	#	#	#	T	P	F			D	
299	850	Booster Heater Control Temp 2															
300	850	Cold Guard Heater Control Temp 1															
301	850	Cold Guard Heater Control Temp 2															
302	850	Cold Main Prim Htr Cntrl Temp 1															
303	850	Cold Main Prim Htr Cntrl Temp 2															
304	850	Cold Main Red Htr Control Temp 1															
305	850	Cold Main Red Htr Control Temp 2															
306	850	Hot Guard Heater Control Temp 1															
307	850	Hot Guard Heater Control Temp 2															
308	850	Hot Main Prim Htr Control Temp 1															
309	850	Hot Main Prim Htr Control Temp 2															
310	850	Hot Main Red Htr Control Temp 1															
311	850	Hot Main Red Htr Control Temp 2															
312	850	Indexing CAM Rotary Position															
313	850	Ampoule Alignment Arm Temp															
314	850	SEM Track Temp															
315	850	RTD Mux 1 Calibration - High															
316	850	RTD Mux 1 Calibration - Low															
317	850	RTD Mux 2 Calibration - High															
318	850	RTD Mux 2 Calibration - Low															
319	850	RTD Mux 3 Calibration - High															
320	850	RTD Mux 3 Calibration - Low															
321	850	RTD Mux 4 Calibration - High															
322	850	RTD Mux 4 Calibration - Low															
323	850	RTD Mux 5 Calibration - High															
324	850	RTD Mux 5 Calibration - Low															
325	850	RTD Mux 6 Calibration - High															
326	850	RTD Mux 6 Calibration - Low															
327	850	RTD Mux 7 Calibration - High															
328	850	RTD Mux 7 Calibration - Low															





TABLE 1.7-2. SIGNAL INTERFACE DEFINITION EXPANSION (Sheet 17 of 38)

ENT C N	C U	M N	M S	I T	D A	D E	D A	D E	M O N	R E Q	C I R C	S I D	E T
NO. O O	D/A	G	W	F	E	START	END	VALUE	L	E	L	D I O	N O.
R .	D/E	D	I	W	D	B	T	W	D	B	T	W	D
R	L	S	X	#	#	#	#	#	#	#	#	#	#
.	K	/	D	I	#	#	#	#	#	#	#	#	#
359 850 Unused		02											41 2
360 850 Cold Guard Zone Setpoint Temp		02											41 2
361 850 Cold Main Zone Setpoint Temp		02											41 2
362 850 Booster Zone Setpoint Temp		02											41 2
363 850 Hot Main Zone Setpoint Temp		02											41 2
364 850 Hot Guard Zone Setpoint Temp		02											41 2
365 850 Cold Guard Htr Calc Temp 1		02											41 2
366 850 Cold Guard Htr Calc Temp 2		02											41 2
367 850 Unused		02											41 2
368 850 Unused		02											41 2
369 850 Cold Main Prim Htr Calc Temp 1		02											41 2
370 850 Cold Main Prim Htr Calc Temp 2		02											41 2
371 850 Cold Main Red Htr Calc Temp 1		02											41 2
372 850 Cold Main Red Htr Calc Temp 2		02											41 2
373 850 Booster Htr Calc Temp 1		02											41 2
374 850 Booster Htr Calc Temp 2		02											41 2
375 850 Unused		02											41 2
376 850 Unused		02											41 2
377 850 Hot Main Prim Htr Calc Temp 1		02											41 2
378 850 Hot Main Prim Htr Calc Temp 2		02											41 2
379 850 Hot Main Red Htr Calc Temp 1		02											41 2
380 850 Hot Main Red Htr Calc Temp 2		02											41 2
381 850 Hot Guard Htr Calc Temp 1		02											41 2
382 850 Hot Guard Htr Calc Temp 2		02											41 2
383 850 Unused		02											41 2
384 850 Unused		02											41 2
385 850 Cold Guard Zone Act Temp		02											41 2
386 850 Cold Main Zone Act Temp		02											41 2
387 850 Booster Zone Act Temp		02											41 2
388 850 Hot Main Zone Act Temp		02											41 2
0 0 0	3 4	4 4 4 4	4 4 4	5 5 5	5 5 5	5 5 5	5 5 5	5 5 5	6 6 6	7 7 7	7 7 7	7 7 7	8
3 6 7	9 0	3 5 7 8	1 3 5 7	1 3 5 7	1 3 5 7	1 3 5 7	1 3 5 7	1 3 5 7	5 6 7	1 2	5 8	0	

TABLE 1.7-2. SIGNAL INTERFACE DEFINITION EXPANSION (Sheet 18 of 38)

ENTIC N	C U	M N	S I	T	D A	D E	S C R I	P T I O	N	M O N I	C I	RE	Q	A	C I	R C	S I	D	E	T	
NO.   O	D   A	I   G	W	F	E	T	E	E	L	E	L	D	I	O	N	O.	X	A	P	B	I
DESCRIPTION	START	END	DATA VALUE	T	V	X	C	T	D	I	P	E	I	L	I	D	E				
3891850	Hot Guard Zone Act Temp																				
3901850	Cold Guard Zone Delta Temp																				
3911850	Cold Main Zone Delta Temp																				
3921850	Booster Zone Delta Temp																				
3931850	Hot Main Zone Delta Temp																				
3941850	Hot Guard Zone Delta Temp																				
3951850	Cold Guard Zone Uncpld Power																				
3961850	Cold Main Zone Uncpld Power																				
3971850	Booster Zone Uncpld Power																				
3981850	Hot Main Zone Uncpld Power																				
3991850	Hot Guard Zone Uncpld Power																				
4001850	Cold Guard Zone Prop Power																				
4011850	Cold Main Zone Prop Power																				
4021850	Booster Zone Prop Power																				
4031850	Hot Main Zone Prop Power																				
4041850	Hot Guard Zone Prop Power																				
4051850	Cold Guard Zone Int Power																				
4061850	Cold Main Zone Int Power																				
4071850	Booster Zone Int Power																				
4081850	Hot Main Zone Int Power																				
4091850	Hot Guard Zone Int Power																				
4101850	Cold Guard Zone Power																				
4111850	Cold Main Zone Power																				
4121850	Booster Zone Power																				
4131850	Hot Main Zone Power																				
4141850	Hot Guard Zone Power																				
4151850	Cold Guard Htr Calc Voltage																				
4161850	Unused																				
4171850	Cold Main Prim Htr Calc Voltage																				
4181850	Cold Main Red Htr Calc Voltage																				
0																					
3																					

TABLE 1.7-2. SIGNAL INTERFACE DEFINITION EXPANSION (Sheet 19 of 38)

ENTC N	DESCRIPTION	C U	M N	M I	S I	T I	DATA DESCRIPTION	MON C I	REQ A	C I R C	S I D	E T	
NO .		M S	S O	O S	O I	Y I	START	END	DATA VALUE	---	L I	D I O	N O .
R .		D I A	G .	/	G	P	W F E	---	T	E I E .	D I O	N O .	X A
R		U E	I D	I I	W D	B T	W D	B T	Y	V I X	C I	T D	P B
.		L	S	X	#	#	#	#	#	I N	C I O	? E	I L
		K	/	D	I	I	E	E	E	T I P	F	I	D E
419	850 Booster Htr Calc Voltage												41 2
420	850 Unused												41 2
421	850 Hot Main Prim Htr Calc Voltage												41 2
422	850 Hot Main Red Htr Calc Voltage												41 2
423	850 Hot Guard Htr Calc Voltage												41 2
424	850 Unused												41 2
425	850 Cold Guard Htr Act Current												41 2
426	850 Unused												41 2
427	850 Cold Main Prim Htr Act Current												41 2
428	850 Cold Main Red Htr Act Current												41 2
429	850 Booster Htr Act Current												41 2
430	850 Unused												41 2
431	850 Hot Main Prim Htr Act Current												41 2
432	850 Hot Main Red Htr Act Current												41 2
433	850 Hot Guard Htr Act Current												41 2
434	850 Unused												41 2
435	850 Cold Guard Htr Calc Resistance												41 2
436	850 Unused												41 2
437	850 ColdMain Prim Htr Calc Resistance												41 2
438	850 ColdMain Red Htr Calc Resistance												41 2
439	850 Booster Htr Resistance												41 2
440	850 Unused												41 2
441	850 HOTMain Prim Htr Calc Resistance												41 2
442	850 Hot Main Red Htr Calc Resistance												41 2
443	850 Hot Guard Htr Calc Resistance												41 2
444	850 Unused												41 2
445	850 Cold Guard Htr Limited Power												41 2
446	850 Unused												41 2
447	850 Cold Main Prim Htr Limited Power												41 2
448	850 Cold Main Red Htr Limited Power												41 2
		3	4	4	4	4	5	5	5	6	6	7	8
		0	0	0	0	0	1	3	5	7	7	7	8
		3	6	7									0

TABLE 1.7-2. SIGNAL INTERFACE DEFINITION EXPANSION (Sheet 20 of 38)

ENT C N	NO. I O O	R .	R	.	C I U	M N I M	S O I	T	Y	DATA DESCRIPTION	M O N I C I	R E Q I A	C I R C I S I D	E T	
DESCRIPTION	DESCRIPTION	DESCRIPTION	DESCRIPTION	DESCRIPTION	DESCRIPTION	DESCRIPTION	DESCRIPTION	DESCRIPTION	DESCRIPTION	DESCRIPTION	DESCRIPTION	DESCRIPTION	DESCRIPTION	DESCRIPTION	
449	850	Booster Htr Limited Power													4112
450	850	Unused													4112
451	850	Hot Main Prim Htr Limited Power													4112
452	850	Hot Main Red Htr Limited Power													4112
453	850	Hot Guard Htr Limited Power													4112
454	850	Unused													4112
455	850	Cold Guard Htr Des Current													4112
456	850	Unused													4112
457	850	Cold Main Prim Htr Des Current													4112
458	850	Cold Main Red Htr Des Current													4112
459	850	Booster Htr Des Current													4112
460	850	Unused													4112
461	850	Hot Main Prim Htr Des Current													4112
462	850	Hot Main Red Htr Des Current													4112
463	850	Hot Guard Htr Des Current													4112
464	850	Unused													4112
465	850	Cold Guard Zone Saturation Flag													4112
466	850	Cold Main Zone Saturation Flag													4112
467	850	Booster Zone Saturation Flag													4112
468	850	Hot Main Zone Saturation Flag													4112
469	850	Hot Guard Zone Saturation Flag													4112
470	850	Integral Power Fault Time													4112
471	850	Fault Sum Delta Power													4112
472	850	Fault Integral Gain													4112
473	850	Fault Proportional Gain													4112
474	850	Fault Intermediate Calc. Value 1													4112
475	850	Fault Intermediate Calc. Value 2													4112
476	850	Fault Delta Power - Previous													4112
477	850	Fault Delta Power - 2nd Previous													4112
478	850	Faulted Zone													4112
0	0														
3	6														
7															
8															
0															
5															
7															
7															
5															
8															
0															





TABLE 1.7-2. SIGNAL INTERFACE DEFINITION EXPANSION (Sheet 23 of 38)

ENT	C N	DESCRIPTION	ICIU	MN	MS	ST	DATA	DESCRIPTION	MON	C	REQ	A	C	R	C	S	I	D	E	T				
NO.	O		D	G	/	G	P	START	END	DATA	VALUE	---	L	E	E	---	L	D	I	O	N	O.	X	A
R	.		I	W	F	E	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
R	.		D	I	W	D	B	T	W	D	B	T	Y	V	X	C	T	D	I	O	N	O.	X	A
.	.		S	X	#	---	---	---	---	---	---	---	---	N	C	O	?	E	I	L	I	L	I	L
			/	D	---	---	---	---	---	---	---	---	---	T	P	F	---	---	---	---	---	---	---	---
539	850	FF	Vacuum Vent Valve Closed																					
540	850	FF	Vacuum Vent Valve Open																					
541	850	FF	Vacuum Vent Vlv RCCB Off																					
542	850	FF	Vacuum Vent Vlv RCCB On																					
543	850	FF	IFEA ABS Press 2 RCCB Off																					
544	850	FF	IFEA ABS Press 2 RCCB On																					
545	850	FF	IFEA ABS Press 1 RCCB Off																					
546	850	FF	IFEA ABS Press 1 RCCB On																					
547	850	FF	Argon Fill Valve Closed																					
548	850	FF	Argon Fill Valve Open																					
549	850	FF	Argon Fill Valve RCCB Off																					
550	850	FF	Argon Fill Valve RCCB On																					
551	850	FF	SEM Indexing Jog CW Status																					
552	850	FF	SEM Indexing Jog CCW Status																					
553	850	FF	Ampoule 5 Failure 2 Status																					
554	850	FF	Ampoule 5 Failure 1 Status																					
555	850	FF	Ampoule 4 Failure 2 Status																					
556	850	FF	Ampoule 4 Failure 1 Status																					
557	850	FF	Ampoule 3 Failure 2 Status																					
558	850	FF	Ampoule 3 Failure 1 Status																					
559	850	FF	Ampoule 2 Failure 2 Status																					
560	850	FF	Ampoule 2 Failure 1 Status																					
561	850	FF	Ampoule 1 Failure 2 Status																					
562	850	FF	Ampoule 1 Failure 1 Status																					
563	850	FF	Water Outlet Valve Bypass																					
564	850	FF	Water Outlet Valve Normal																					
565	850	FF	Water Outlet Vlv RCCB Off																					
566	850	FF	Water Outlet Vlv RCCB On																					
567	850	FF	Water Inlet Valve Bypass																					
568	850	FF	Water Inlet Valve Normal																					

TABLE 1.7-2. SIGNAL INTERFACE DEFINITION EXPANSION (Sheet 24 of 38)

ENT C N	NO. O O	R .	R .	.	.	C U	M N	M S T	DATA DESCRIPTION	MON C	RE Q A		C R C S I D	E T
											M S	O S O Y		
DESCRIPTION														
569 850 FF	Mech Pulsing Mod	RCCB Off	02											41 2
570 850 FF	Mech Pulsing Mod	RCCB On	02											41 2
571 850 FF	Cartridge 6	Failure 2 Status	02											41 2
572 850 FF	Cartridge 6	Failure 1 Status	02											41 2
573 850 FF	Cartridge 5	Failure 2 Status	02											41 2
574 850 FF	Cartridge 5	Failure 1 Status	02											41 2
575 850 FF	Cartridge 4	Failure 2 Status	02											41 2
576 850 FF	Cartridge 4	Failure 1 Status	02											41 2
577 850 FF	Cartridge 3	Failure 2 Status	02											41 2
578 850 FF	Cartridge 3	Failure 1 Status	02											41 2
579 850 FF	Cartridge 2	Failure 2 Status	02											41 2
580 850 FF	Cartridge 2	Failure 1 Status	02											41 2
581 850 FF	Cartridge 1	Failure 2 Status	02											41 2
582 850 FF	Cartridge 1	Failure 1 Status	02											41 2
583 850 FF	Ampoule 6	Failure 2 Status	02											41 2
584 850 FF	Ampoule 6	Failure 1 Status	02											41 2
585 850 FF	Hot Boost Mod	A RCCB Off	02											41 2
586 850 FF	Hot Boost Mod	A RCCB On	02											41 2
587 850 FF	Cold Main Red Mod	RCCB Off	02											41 2
588 850 FF	Cold Main Red Mod	RCCB On	02											41 2
589 850 FF	Cold Main Prim Mod	RCCB Off	02											41 2
590 850 FF	Cold Main Prim Mod	RCCB On	02											41 2
591 850 FF	Cold Guard Mod	RCCB Off	02											41 2
592 850 FF	Cold Guard Mod	RCCB On	02											41 2
593 850 FF	Peltier Conn	Retracted-Not	02											41 2
594 850 FF	Peltier Conn	Retracted	02											41 2
595 850 FF	Peltier Conn	Extended-Not	02											41 2
596 850 FF	Peltier Conn	Extended	02											41 2
597 850 FF	Peltier Conn	Motor RCCB Off	02											41 2
598 850 FF	Peltier Conn	Motor RCCB On	02											41 2
0	0	0	3	4	4	4	4	4	5	5	5	5	7	8
3	6	7	9	0	3	5	7	8	1	3	5	7	12	8



TABLE 1.7-2. SIGNAL INTERFACE DEFINITION EXPANSION (Sheet 25 of 38)

ENT C N I	ICIU	MIN	IS	T	DATA DESCRIPTION	MON	C	REQ	A	RC	SID	E	T
NO.   O	DIA	G.	/G	P	START	END	DATA VALUE	---	L	---	L	C	RC
R .	IG	W	F	E	---	T	---	---	---	---	---	---	---
R	UE	D	I	WD	BT	WD	BT	Y	V	X	C	T	D
.	L	S	X	I	#	#	#	P	N	C	O	?	E
	K	/	D	/	/	/	/	E	T	P	F	/	E
599 850 FF	Peltier Pulsing	Drv	RCCB	Off									41 2
600 850 FF	Peltier Pulsing	Drv	RCCB	On									41 2
601 850 FF	SCS Airflow	1	Status										41 2
602 850 FF	PDS Airflow	1	Status										41 2
603 850 FF	PCS Airflow	1	Status										41 2
604 850 FF	PCS Airflow	2	Status										41 2
605 850 FF	Hot Main	Red	Mod	B	RCCB	Off							41 2
606 850 FF	Hot Main	Red	Mod	B	RCCB	On							41 2
607 850 FF	Hot Main	Red	Mod	A	RCCB	Off							41 2
608 850 FF	Hot Main	Red	Mod	A	RCCB	On							41 2
609 850 FF	Hot Main	Prim	Mod	B	RCCB	Off							41 2
610 850 FF	Hot Main	Prim	Mod	B	RCCB	On							41 2
611 850 FF	HotMain	Prim	Mod	A	RCCB	Off							41 2
612 850 FF	HotMain	Prim	Mod	A	RCCB	On							41 2
613 850 FF	Hot Guard	Module	RCCB	Off									41 2
614 850 FF	Hot Guard	Module	RCCB	On									41 2
615 850 FF	Hot Boost	Mod	B	RCCB	Off								41 2
616 850 FF	Hot Boost	Mod	B	RCCB	On								41 2
617 850 FF	Hot Main	Prim	Htr	Ctl	Temp	1							41 2
618 850 FF	Cold Main	Red	Htr	Ctl	Temp	1							41 2
619 850 FF	TC Group	A	Calibration	Type	B								41 2
620 850 FF	TC Group	A	Calibration	Type	S								41 2
621 850 FF	TC Group	A	Calibration	Type	K								41 2
622 850 FF	Cold Guard	Heater	Ctl	Temp	2								41 2
623 850 FF	Cold Main	Prim	Htr	Ctl	Temp	2							41 2
624 850 FF	Booster	Heater	Ctl	Temp	2								41 2
625 850 FF	Hot Main	Red	Htr	Ctl	Temp	2							41 2
626 850 FF	Hot Main	Prim	Htr	Ctl	Temp	2							41 2
627 850 FF	Hot Guard	Heater	Ctl	Temp	2								41 2
628 850 FF	TC Group	B	Calibration	Type	B								41 2

TABLE 1.7-2. SIGNAL INTERFACE DEFINITION EXPANSION (Sheet 26 of 38)

ENT C N	C U	M N	M S T	D A	D E S C R I P T I O N	M O N I C	RE Q U I R E D	C I R C I D	E T	
NO. O O	D I A	G / G	P S T A R T	E N D	D A T A V A L U E	E E L	---	D I O N O .	X A	
IR	I G	W F E	---	---	T	V X I C	---	T D	P B	
IR	U E	D I	W D	B T	Y	N C I O	---	? E	I L	
IR	L	S X	#	---	---	T P F	---	---	D E	
IR	K	/	D I	---	---	---	---	---	---	
629 850 FF					TC Group B Calibration Type S					41 2
630 850 FF					TC Group B Calibration Type K					41 2
631 850 FF					IFEA Coolant Flow #2 Status					41 2
632 850 FF					IFEA Coolant Flow #1 Status					41 2
633 850 FF					Sample 4 Temp 1					41 2
634 850 FF					Sample 3 Temp 1					41 2
635 850 FF					Sample 2 Temp 1					41 2
636 850 FF					Sample 1 Temp 1					41 2
637 850 FF					Cold Main Red Htr Ctl Temp 2					41 2
638 850 FF					TC Group D Calibration Type B					41 2
639 850 FF					TC Group D Calibration Type S					41 2
640 850 FF					TC Group D Calibration Type K					41 2
641 850 FF					Cold Guard Heater Ctl Temp 1					41 2
642 850 FF					Cold Main Prim Htr Ctl Temp 1					41 2
643 850 FF					Booster Heater Ctl Temp 1					41 2
644 850 FF					Hot Guard Heater Ctl Temp 1					41 2
645 850 FF					TC Group C Calibration Type B					41 2
646 850 FF					TC Group C Calibration Type S					41 2
647 850 FF					TC Group C Calibration Type K					41 2
648 850 FF					Hot Main Red Htr Ctl Temp 1					41 2
649 850 FF					Sample 2 Temp 4					41 2
650 850 FF					Sample 1 Temp 4					41 2
651 850 FF					Sample 6 Temp 3					41 2
652 850 FF					Sample 5 Temp 3					41 2
653 850 FF					Sample 4 Temp 3					41 2
654 850 FF					Sample 3 Temp 3					41 2
655 850 FF					Sample 2 Temp 3					41 2
656 850 FF					Sample 1 Temp 3					41 2
657 850 FF					Sample 6 Temp 2					41 2
658 850 FF					Sample 5 Temp 2					41 2



TABLE 1.7-2. SIGNAL INTERFACE DEFINITION EXPANSION (Sheet 28 of 38)

ENT C N	C U	MN NM S T	DATA DESCRIPTION	MON C	REQ A	C IRC S ID E T
NO. O O	M S	SO OS O Y	END DATA VALUE	---	L	D I O NO.
R .	D A	G /G	P START	---	L	D I O NO.
R	G	W F E	---	T	E E .	X A
.	U E	D I	WD BT WD BT Y	V X C	T D	P B
	L	S X	#	P	N C O	I L
	K	/ D		E	T P F	D E
689 850 FF		02	Cold Zone CJ Block Temp 2			41 2
690 850 FF		02	Cold Zone CJ Block Temp 1			41 2
691 850 FF		02	Hot Zone CJ Block Temp 1			41 2
692 850 FF		02	Hot Zone CJ Block Temp 2			41 2
693 850 FF		02	RFM Hot End Shell Temp			41 2
694 850 FF		02	RFM Cold End Shell Temp			41 2
695 850 FF		02	IFEA Water Inlet Temp			41 2
696 850 FF		02	IFEA Water Outlet Temp			41 2
697 850 FF		02	RTD Mux 3 Calibration - Low			41 2
698 850 FF		02	RTD Mux 3 Calibration - High			41 2
699 850 FF		02	RTD Mux 2 Calibration - Low			41 2
700 850 FF		02	RTD Mux 2 Calibration - High			41 2
701 850 FF		02	RTD Mux 1 Calibration - Low			41 2
702 850 FF		02	RTD Mux 1 Calibration - High			41 2
703 850 FF		02	IFEA Upper Atmosphere Temp			41 2
704 850 FF		02	IFEA Lower Atmosphere Temp			41 2
705 850 FF		02	FTS Stepping Motor Temp			41 2
706 850 FF		02	SEM Track Temp			41 2
707 850 FF		02	Ampoule Alignment Arm Temp			41 2
708 850 FF		02	Sample 6 CJ Block Temp 2			41 2
709 850 FF		02	Sample 6 CJ Block Temp 1			41 2
710 850 FF		02	Sample 5 CJ Block Temp 2			41 2
711 850 FF		02	Sample 5 CJ Block Temp 1			41 2
712 850 FF		02	Sample 4 CJ Block Temp 2			41 2
713 850 FF		02	Cold Main Red Heater Current			41 2
714 850 FF		02	Cold Main Red Heater Voltage			41 2
715 850 FF		02	Cold Main Primary Heater Cur			41 2
716 850 FF		02	Cold Main Primary Heater Volt			41 2
717 850 FF		02	Cold Guard Heater Current			41 2
718 850 FF		02	Cold Guard Heater Voltage			41 2

0	3	4	4	4	4	4
0	0	0	0	0	0	0
3	6	7	8	7	8	0
9	0	3	5	7	8	1
3	4	4	4	4	4	4
5	5	5	5	5	5	5
6	6	6	6	6	6	6
7	7	7	7	7	7	7
8	8	8	8	8	8	8
1	1	1	1	1	1	1
2	2	2	2	2	2	2
3	3	3	3	3	3	3
4	4	4	4	4	4	4
5	5	5	5	5	5	5
6	6	6	6	6	6	6
7	7	7	7	7	7	7
8	8	8	8	8	8	8
9	9	9	9	9	9	9

TABLE 1.7-2. SIGNAL INTERFACE DEFINITION EXPANSION (Sheet 29 of 38)

ENT C N NO. O O R . R .	DESCRIPTION	C U	M N	M S	I S	T I	DATA DESCRIPTION	M O N	C I	REQ A		C I R C		S I D		E T		
										SO	OS	O	Y	---	---	---	---	---
		D A	G .	/	G	W	F	E	---	---	---	---	---	---	---	---	---	
		U	E	D	I	W	D	B	T	W	D	B	T	W	D	B	T	
		L	S	X	I	#	#	#	#	#	#	#	#	#	#	#	#	
		K	/	D	I	#	#	#	#	#	#	#	#	#	#	#	#	
719	850	FF	RTD	Mux 8	Calibration - Low	02											41	2
720	850	FF	RTD	Mux 8	Calibration - High	02											41	2
721	850	FF	RTD	Mux 7	Calibration - Low	02											41	2
722	850	FF	RTD	Mux 7	Calibration - High	02											41	2
723	850	FF	RTD	Mux 6	Calibration - Low	02											41	2
724	850	FF	RTD	Mux 6	Calibration - High	02											41	2
725	850	FF	RTD	Mux 5	Calibration - Low	02											41	2
726	850	FF	RTD	Mux 5	Calibration - High	02											41	2
727	850	FF	RTD	Mux 4	Calibration - Low	02											41	2
728	850	FF	RTD	Mux 4	Calibration - High	02											41	2
729	850	FF	IFE	A	Lower Humidity	02											41	2
730	850	FF	Rapid	Translation	Motor RPM	02											41	2
731	850	FF	Indexing	CAM	Rotary Position	02											41	2
732	850	FF	Furnace	Linear	Position	02											41	2
733	850	FF	Stepping	Motor	Phase B Cur	02											41	2
734	850	FF	Stepping	Motor	Phase B Volt	02											41	2
735	850	FF	Stepping	Motor	Phase A Cur	02											41	2
736	850	FF	Stepping	Motor	Phase A Volt	02											41	2
737	850	FF	Hot	Main	Red Heater Current	02											41	2
738	850	FF	Hot	Main	Red Heater Voltage	02											41	2
739	850	FF	Hot	Main	Primary Heater Cur	02											41	2
740	850	FF	Hot	Main	Primary Heater Volt	02											41	2
741	850	FF	Hot	Guard	Heater Current	02											41	2
742	850	FF	Hot	Guard	Heater Voltage	02											41	2
743	850	FF	Hot	Boost	Heater Current	02											41	2
744	850	FF	Hot	Boost	Heater Voltage	02											41	2
745	850	FF	SMS	Board	Velocity Reading	02											41	2
746	850	FF	Experiment	Main	Bus Voltage	02											41	2
747	850	FF	Experiment	Main	Bus Current	02											41	2
748	850	FF	IFE	A	Absolute Pressure 2	02											41	2
0	0	0																
3	6	7																
3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
9	0	3	5	7	8	1	3	5	7	5	6	6	7	1	2	5	8	0

TABLE 1.7-2. SIGNAL INTERFACE DEFINITION EXPANSION (Sheet 30 of 38)

ENTR NO.	CIRCUIT	DESCRIPTION	UNIT	M/N	I/S	O/S	T/O	Y	P	START	END	DATA VALUE	REQ	MON	REQ	CIRCUIT	SID	EXT
749	IFEA	Absolute Pressure	1	02														
750	IFEA	Upper Humidity		02														
001	RC SEM	Index Motor RCCB On Stat		02														
002	RC SEM	Index Motor RCCB Off Stat		02														
003	RC	Ampoule Not Processing		02														
004	RC	Ampoule Processing		02														
005	RC	Indexing Cam Not Stowed		02														
006	RC	Indexing Cam Stowed		02														
007	RC	Car Spacer Plt Gap Lim-Not		02														
008	RC	Car Spacer Plt Gap Lim		02														
009	RC	Car Trk Extr Left Limit-Not		02														
010	RC	Car Trk Extr Left Limit		02														
011	RC	Car Trk Extr Right Lim-Not		02														
012	RC	Car Trk Extr Right Lim		02														
013	RC	Ampoule Align Mtr RCCB Off		02														
014	RC	Ampoule Align Mtr RCCB On		02														
015	RC	Ampoule Align Not Extended		02														
016	RC	Ampoule Align Extended		02														
017	RC	Ampoule Align Not Retracted		02														
018	RC	Ampoule Align Retracted		02														
019	RC	Ampoule Spt Plt Mtr RCCB Off		02														
020	RC	Ampoule Spt Plt Mtr RCCB On		02														
021	RC	Ampoule Support Not Secure		02														
022	RC	Ampoule Support Secure		02														
023	RC	Ampoule Support Not Retracted		02														
024	RC	Ampoule Support Retracted		02														
025	RC	Core HD Motor RCCB Off		02														
026	RC	Core HD Motor RCCB On		02														
027	RC	Core Hold Down Not Extended		02														
028	RC	Core Hold Down Extended		02														
0	3	0	0	0	0	4	4	4	4	5	5	5	5	6	6	7	7	7
3	9	0	3	5	7	8	1	3	5	7	5	7	5	6	7	1	2	5

TABLE 1.7-2. SIGNAL INTERFACE DEFINITION EXPANSION (Sheet 31 of 38)

ENT	C N	I C U	M N	M I S	T	D A T A	D E S C R I P T I O N	M O N	C	I	////
NO.	O O	D I A	G /	P	E	S T A R T	E N D	D A T A	V A L U E	---	R E Q
R .		I G	W	F	E	---	T			E	E .
R		U	D	I	W	D	B	T	W	D	V
.		L	S	X	#		#				N
		K	/	D							C
											O
											F
											E
029	851	RC	Core Hold	Down	Not	Retracted					41
030	851	RC	Core Hold	Down	Retracted						41
031	851	RC	Fail Safe	Brake	RCCB	Off					41
032	851	RC	Fail Safe	Brake	RCCB	On					41
033	851	RC	Rapid	Xlation	Clutch	RCCB	Off				41
034	851	RC	Rapid	Xlation	Clutch	RCCB	On				41
035	851	RC	Rapid	Xlation	Mtr	RCCB	Off				41
036	851	RC	Rapid	Xlation	Mtr	RCCB	On				41
037	851	RC	Step	Motor	Clutch	RCCB	Off				41
038	851	RC	Step	Motor	Clutch	RCCB	On				41
039	851	RC	Step	Motor	Drive	RCCB	Off				41
040	851	RC	Step	Motor	Drive	RCCB	On				41
041	851	RC	Furn	Extrime	Trvl	Not Exceeded					41
042	851	RC	Furn	Extrdme	Trvl	Exceeded					41
043	851	RC	Furnace	Position	Not	Home					41
044	851	RC	Furnace	Position	Home						41
045	851	RC	System	Bus	Relay	Off					41
046	851	RC	System	Bus	Relay	On					41
047	851	RC	PCS	Utility	RCCB	Off					41
048	851	RC	PCS	Utility	RCCB	On					41
049	851	RC	SEM	Indexing	Jog	CW Status					41
050	851	RC	SEM	Indexing	Jog	CCW Status					41
051	851	RC	Argon	Fill	Valve	RCCB	Off				41
052	851	RC	Argon	Fill	Valve	RCCB	On				41
053	851	RC	Argon	Fill	Valve	Closed					41
054	851	RC	Argon	Fill	Valve	Open					41
055	851	RC	IFEA	ABS	Press	1	RCCB	Off			41
056	851	RC	IFEA	ABS	Press	1	RCCB	On			41
057	851	RC	IFEA	ABS	Press	2	RCCB	Off			41
058	851	RC	IFEA	ABS	Press	2	RCCB	On			41





TABLE 1.7-2. SIGNAL INTERFACE DEFINITION EXPANSION (Sheet 33 of 38)

ENT C N	ICIU	MIN S T	DATA DESCRIPTION	MON C	REQ A	C R C S I D	E T
NO. O O	DI A	G. /G	P START	END DATA VALUE	E E .L	D I O NO.	X A
R .	I G	W F E	----- T		E E .L	D I O NO.	X A
R	I D	I W D BT	WD BT Y		V X C	T D	P B
.	L	S X	#	P	N C O	? E	I L
	K	/ D		E	T P F		D E
1089 851 RC		02					41 2
1090 851 RC		02					41 2
1091 851 RC		02					41 2
1092 851 RC		02					41 2
1093 851 RC		02					41 2
1094 851 RC		02					41 2
1095 851 RC		02					41 2
1096 851 RC		02					41 2
1097 851 RC		02					41 2
1098 851 RC		02					41 2
1099 851 RC		02					41 2
1100 851 RC		02					41 2
1101 851 RC		02					41 2
1102 851 RC		02					41 2
1103 851 RC		02					41 2
1104 851 RC		02					41 2
1105 851 RC		02					41 2
1106 851 RC		02					41 2
1107 851 RC		02					41 2
1108 851 RC		02					41 2
1109 851 RC		02					41 2
1110 851 RC		02					41 2
1111 851 RC		02					41 2
1112 851 RC		02					41 2
1113 851 RC		02					41 2
1114 851 RC		02					41 2
1115 851 RC		02					41 2
1116 851 RC		02					41 2
1117 851 RC		02					41 2
1118 851 RC		02					41 2
0 0 0	3 4 4 4 4 4	5 5 5 5	5 5 5 5	6 6 6	7 7 7	7 7 7	8 8 8
3 6 7	9 0 3 5 7 8	1 3 5 7	1 3 5 7	5 6 7	1 2 5 8	1 2 5 8	0



TABLE 1.7-2. SIGNAL INTERFACE DEFINITION EXPANSION (Sheet 35 of 38)

ENT NO.	C N O I	DESCRIPTION	IC U				M N M S T				DATA DESCRIPTION				MON C								
			I M S	S O S O Y	P START	E N D	I G	W F E	W D BT	W D BT	I T	I T	R E Q A	I R C S I D	E X T								
149	851	RC	Booster Heater Ctl Temp 1		02																		412
150	851	RC	Hot Guard Heater Ctl Temp 1		02																		412
151	851	RC	Cold Guard Heater Ctl Temp 1		02																		412
152	851	RC	Cold Main Prim Htr Ctl Temp 1		02																		412
153	851	RC	TC Group D Calibration Type S		02																		412
154	851	RC	TC Group D Calibration Type K		02																		412
155	851	RC	Cold Main Red Htr Ctl Temp 2		02																		412
156	851	RC	TC Group D Calibration Type B		02																		412
157	851	RC	Sample 2 Temp 1		02																		412
158	851	RC	Sample 1 Temp 1		02																		412
159	851	RC	Sample 4 Temp 1		02																		412
160	851	RC	Sample 3 Temp 1		02																		412
161	851	RC	Sample 6 Temp 1		02																		412
162	851	RC	Sample 5 Temp 1		02																		412
163	851	RC	Sample 2 Temp 2		02																		412
164	851	RC	Sample 1 Temp 2		02																		412
165	851	RC	Sample 4 Temp 2		02																		412
166	851	RC	Sample 3 Temp 2		02																		412
167	851	RC	Sample 6 Temp 2		02																		412
168	851	RC	Sample 5 Temp 2		02																		412
169	851	RC	Sample 2 Temp 3		02																		412
170	851	RC	Sample 1 Temp 3		02																		412
171	851	RC	Sample 4 Temp 3		02																		412
172	851	RC	Sample 3 Temp 3		02																		412
173	851	RC	Sample 6 Temp 3		02																		412
174	851	RC	Sample 5 Temp 3		02																		412
175	851	RC	Sample 2 Temp 4		02																		412
176	851	RC	Sample 1 Temp 4		02																		412
177	851	RC	Sample 4 Temp 4		02																		412
178	851	RC	Sample 3 Temp 4		02																		412
0	0	0		3	4	4	4	4	4	4	5	5	5	5	5	6	6	6	7	7	7	7	8
3	6	7	9	0	3	5	7	8	1	3	5	7	5	6	7	5	6	7	1	2	5	8	0



TABLE 1.7-2. SIGNAL INTERFACE DEFINITION EXPANSION (Sheet 37 of 38)

ENT C N	M S	M N	M S	T	D A	D E	D E	D E	D E	D E	M O N	C I	RE	Q	A	C	R	C	S	I	D	E	T	
NO.   O   I	D   A	G   /   G	P	S	T	A	R	T	E	END	DATA	VALUE	---	L	E	E	.	D	I	O	N	O.	X	A
DE	DESCRIPTION																							
209	851	RC	Sample 5	CJ	Block	Temp 1																		
210	851	RC	Sample 4	CJ	Block	Temp 2																		
211	851	RC	Sample 6	CJ	Block	Temp 1																		
212	851	RC	Sample 5	CJ	Block	Temp 2																		
213	851	RC	Ampoule	Alignment	Arm	Temp																		
214	851	RC	Sample 6	CJ	Block	Temp 2																		
215	851	RC	FTS	Stepping	Motor	Temp																		
216	851	RC	SEM	Track	Temp																			
217	851	RC	IFE	A	Upper	Atmosphere	Temp																	
218	851	RC	IFE	A	Lower	Atmosphere	Temp																	
219	851	RC	RTD	Mux 1	Calibration	- Low																		
220	851	RC	RTD	Mux 2	Calibration	- Low																		
221	851	RC	RTD	Mux 3	Calibration	- High																		
222	851	RC	RTD	Mux 2	Calibration	- High																		
223	851	RC	RTD	Mux 3	Calibration	- Low																		
224	851	RC	RTD	Mux 4	Calibration	- High																		
225	851	RC	RTD	Mux 3	Calibration	- Low																		
226	851	RC	RTD	Mux 4	Calibration	- High																		
227	851	RC	RTD	Mux 5	Calibration	- Low																		
228	851	RC	RTD	Mux 5	Calibration	- High																		
229	851	RC	RTD	Mux 6	Calibration	- Low																		
230	851	RC	RTD	Mux 6	Calibration	- High																		
231	851	RC	RTD	Mux 7	Calibration	- Low																		
232	851	RC	RTD	Mux 7	Calibration	- High																		
233	851	RC	RTD	Mux 8	Calibration	- Low																		
234	851	RC	RTD	Mux 8	Calibration	- High																		
235	851	RC	Cold	Guard	Heater	Current																		
236	851	RC	Cold	Guard	Heater	Voltage																		
237	851	RC	Cold	Main	Primary	Heater	Cur																	
238	851	RC	Cold	Main	Primary	Heater	Volt																	
0	0	0																						
3	6	7																						

TABLE 1.7-2. SIGNAL INTERFACE DEFINITION EXPANSION (Sheet 38 of 38)

ENT C N		DESCRIPTION	C U	M N	N M	S T	DATA DESCRIPTION				MON I C	REQA							
NO	I O						I G	D A	G . /	P		S T A R T	E N D	D A T A	V A L U E	---	L	E	T
239	851	RC	Cold Main Red Heater Current																
240	851	RC	Cold Main Red Heater Voltage																
241	851	RC	Hot Boost Heater Current																
242	851	RC	Hot Boost Heater Voltage																
243	851	RC	Hot Guard Heater Current																
244	851	RC	Hot Guard Heater Voltage																
245	851	RC	Hot Main Primary Heater Cur																
246	851	RC	Hot Main Primary Heater Volt																
247	851	RC	Hot Main Red Heater Current																
248	851	RC	Hot Main Red Heater Voltage																
249	851	RC	Stepping Motor Phase A Cur																
250	851	RC	Stepping Motor Phase A Volt																
251	851	RC	Stepping Motor Phase B Cur																
252	851	RC	Stepping Motor Phase B Volt																
253	851	RC	Indexing CAM Rotary Position																
254	851	RC	Furnace Linear Position																
255	851	RC	IFEA Lower Humidity																
256	851	RC	Rapid Translation Motor RPM																
257	851	RC	IFEA Absolute Pressure 1																
258	851	RC	IFEA Upper Humidity																
259	851	RC	Experiment Main Bus Current																
260	851	RC	IFEA Absolute Pressure 2																
261	851	RC	SMS Board Velocity Reading																
262	851	RC	Experiment Main Bus Voltage																
263	851		Process Elapsed Time - Seconds																
264	851		Go/NoGo Error Override																
265	851		CGF Sytstem State																
266	851		Auto Pressure Ctl																

3	4	4	4	4	5	5	5	5	5	5	7	7	7	7	8	8	8	8	8	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	6	7																		

TABLE 1.7-3. EVENT/EXCEPTION MONITOR REQUIREMENTS

ENIC N EMR	MONITOR VALUES	M	MESSAGE	ERROR	MESSAGE	MESSAGE	I T O C	I U O I				
U O X O A	LOWER	G	(HIGH/SINGLE)	MSG.	LOW	MSG.	N I U O I	N I U O I	----	----	----	----
M R  P E	LIMIT/											
R B R  P E	EXPT'D	C										
Y E T T	STATE	L										
R  I O												
J O R												
N												
207 106 001	-073		HI WATER TEMP	41 14								
208 106 001	-077		HI HUMIDITY LWR	41 16								
209 106 001	-077		HI HUMIDITY UPR	41 18								
210 106 001	-004		HI ATMOS TEMP	41 1A								
211 106 001	-073		HI CLD END TEMP	41 1C								
212 106 001	-073		HI HOT END TEMP	41 1E								
215 106 001	-009		HI IFEA PRES 1	41 20 LO								
216 106 001	-009		HI IFEA PRES 2	41 22 LO								
219 106 001	+105		HI MAIN CURRENT	41 24								
220 106 001	+076		HI MAIN VOLTAGE	41 26 LO								
223 106 001			LO WATER FLOW	41 28								
224 106 001			LO WATER FLOW	41 2A								
237 106 001			NO AVIONICS AIR	41 2C								
238 106 001			NO AVIONICS AIR	41 2E								
239 106 001			NO AVIONICS AIR	41 30								
240 106 001			NO AVIONICS AIR	41 32								
265 106 001			WTR OUT BYPASS	41 34								
266 106 001			WTR OUT BYPASS	41 36								
267 106 001			WTR IN BYPASS	41 38								
268 106 001			WTR IN BYPASS	41 3A								
287 106 001			EXTRM TRVL LIM	41 3C								
288 106 001			EXTRM TRVL LIM	41 3E								
319 106 001			EXP BUS PWR OFF	41 40								
320 106 001			EXP BUS PWR OFF	41 42								

TABLE 1.7-4. POIC DISPLAY REQUIREMENTS (Sheet 1 of 20)

E N I C N I C T		CALIBRATION COEFFICIENTS/LINEAR SEGMENTS					////		
I N U O	O A Y	A 0	A 1	A 2	A 3	A 4	A 5	E T	
T M R	LP							X A	
R B R	IE							P B	
Y E	B							IL	
R								I B	
	A							D	
	T								
	I								
	O								
	N								
001	850	PC	+0000000+00	+1000000+01				41	6
002	850	PC	+0000000+00	+1000000+01				41	6
003	850	PC	+0000000+00	+1000000+01				41	6
004	850	PC	+0000000+00	+1000000+01				41	6
005	850	PC	+0000000+00	+1000000+01				41	6
138	850	PC	+0000000+00	+1000000+01				41	6
139	850	PC	+0000000+00	+1000000+01				41	6
140	850	PC	+0000000+00	+1000000+01				41	6
141	850	PC	+0000000+00	+1000000+01				41	6
142	850	PC	+0000000+00	+1000000+01				41	6
143	850	PC	+0000000+00	+1000000+01				41	6
144	850	PC	+0000000+00	+1000000+01				41	6
145	850	PC	+0000000+00	+1000000+01				41	6
146	850	PC	+0000000+00	+1000000+01				41	6
147	850	PC	+0000000+00	+1000000+01				41	6
148	850	PC	+0000000+00	+1000000+01				41	6
149	850	PC	+0000000+00	+1000000+01				41	6
150	850	PC	+0000000+00	+1000000+01				41	6
151	850	PC	+0000000+00	+1000000+01				41	6
152	850	PC	+0000000+00	+1000000+01				41	6
153	850	PC	+0000000+00	+1000000+01				41	6
154	850	PC	+0000000+00	+1000000+01				41	6
155	850	PC	+0000000+00	+1000000+01				41	6
156	850	PC	+0000000+00	+1000000+01				41	6
157	850	PC	+0000000+00	+1000000+01				41	6
158	850	PC	+0000000+00	+1000000+01				41	6
159	850	PC	+0000000+00	+1000000+01				41	6
160	850	PC	+0000000+00	+1000000+01				41	6
161	850	PC	+0000000+00	+1000000+01				41	6
162	850	PC	+0000000+00	+1000000+01				41	6
163	850	PC	+0000000+00	+1000000+01				41	6

0	0	0	1	1	4	5	6	7	8
3	5	7	8	9	0	1	2	3	9



TABLE 1.7-4. POIC DISPLAY REQUIREMENTS (Sheet 2 of 20)

E N I C N I C T I	N U O O I A Y I	CALIBRATION COEFFICIENTS/LINEAR SEGMENTS					E T	X A	P B I	L	I B I	D										
		A0	A1	A2	A3	A4															A5	
164	1850	PC	+000000+00	+1000000+01																41	16	
165	1850	PC	+000000+00	+1000000+01																	41	16
166	1850	PC	+000000+00	+1000000+01																	41	16
167	1850	PC	+000000+00	+1000000+01																	41	16
168	1850	PC	+000000+00	+1000000+01																	41	16
169	1850	PC	+000000+00	+1000000+01																	41	16
170	1850	PC	+000000+00	+1000000+01																	41	16
171	1850	PC	+000000+00	+1000000+01																	41	16
172	1850	PC	+000000+00	+1000000+01																	41	16
173	1850	PC	+000000+00	+1000000+01																	41	16
174	1850	PC	+000000+00	+1000000+01																	41	16
175	1850	PC	+000000+00	+1000000+01																	41	16
176	1850	PC	+000000+00	+1000000+01																	41	16
177	1850	PC	+000000+00	+1000000+01																	41	16
178	1850	PC	+000000+00	+1000000+01																	41	16
179	1850	PC	+000000+00	+1000000+01																	41	16
180	1850	PC	+000000+00	+1000000+01																	41	16
181	1850	PC	+000000+00	+1000000+01																	41	16
182	1850	PC	+000000+00	+1000000+01																	41	16
183	1850	PC	+000000+00	+1000000+01																	41	16
184	1850	PC	+000000+00	+1000000+01																	41	16
185	1850	PC	+000000+00	+1000000+01																	41	16
187	1850	PC	+000000+00	+1000000+01																	41	16
188	1850	PC	+000000+00	+1000000+01																	41	16
189	1850	PC	+000000+00	+1000000+01																	41	16
190	1850	PC	+000000+00	+1000000+01																	41	16
191	1850	PC	+000000+00	+1000000+01																	41	16
192	1850	PC	+000000+00	+1000000+01																	41	16
193	1850	PC	+000000+00	+1000000+01																	41	16
194	1850	PC	+000000+00	+1000000+01																	41	16
195	1850	PC	+000000+00	+1000000+01																	41	16
0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
3	5	7	8	9	0	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0

TABLE 1.7-4. POIC DISPLAY REQUIREMENTS (Sheet 3 of 20)

E N I C N I C T		CALIBRATION COEFFICIENTS/LINEAR SEGMENTS										////	
I N U O I A Y		A0	A1	A2	A3	A4	A5						E I T
T M R L P													X A
R B R I E													P B
Y E													L
R													I B
I A													D
T													
I													
O													
N													
196	850	PC	+000000+00	+500000-01									416
197	850	PC	+000000+00	+500000-01									416
198	850	PC	+000000+00	+500000-01									416
199	850	PC	+000000+00	+500000-01									416
200	850	PC	+000000+00	+500000-01									416
201	850	PC	+000000+00	+500000-01									416
202	850	PC	+000000+00	+500000-01									416
203	850	PC	+000000+00	+500000-01									416
204	850	PC	+000000+00	+500000-01									416
205	850	PC	+000000+00	+500000-01									416
206	850	PC	+000000+00	+500000-01									416
207	850	PC	+000000+00	+500000-01									416
208	850	PC	+000000+00	+500000-01									416
209	850	PC	+000000+00	+500000-01									416
210	850	PC	+000000+00	+500000-01									416
211	850	PC	+000000+00	+500000-01									416
212	850	PC	+000000+00	+3663000-01									416
213	850	PC	+000000+00	+9768000-02									416
214	850	PC	+000000+00	+2442000-01									416
215	850	PC	+000000+00	+2442000-01									416
216	850	PC	+000000+00	+7326000-02									416
217	850	PC	+000000+00	+7326000-02									416
218	850	PC	-2419000+03	+2325500+01	+9104500-03	+2442500-06							416
219	850	PC	-2419000+03	+2325500+01	+9104500-03	+2442500-06							416
220	850	PC	-2414600+03	+2297900+00	+1211300-04	-4356500-09							416
221	850	PC	-2414600+03	+2297900+00	+1211300-04	-4356500-09							416
222	850	PC	-2414600+03	+2297900+00	+1211300-04	-4356500-09							416
223	850	PC	-2414600+03	+2297900+00	+1211300-04	-4356500-09							416
224	850	PC	-2414600+03	+2297900+00	+1211300-04	-4356500-09							416
225	850	PC	+1493200+02	+1381000+03	-8505200+01	+9220100+00	-5706400-01	+1394700-02					416
226	850	PC	+1493200+02	+1381000+03	-8505200+01	+9220100+00	-5706400-01	+1394700-02					416
1	1	1	1	1	1	1	1	1	1	1	1	1	1
0	0	0	1	2	4	5	6	7	8				
3	5	7	8	9	0	1	2	3					

TABLE 1.7-4. POIC DISPLAY REQUIREMENTS (Sheet 4 of 20)

LINE NO	UNIT	COEFFICIENTS	SEGMENTS	REMARKS
1227	1850	PC	+1493200+02   +1381000+03   -8505200+01   +9220100+00   -5706400-01   +1394700-02	4116
1228	1850	PC	+1493200+02   +1381000+03   -8505200+01   +9220100+00   -5706400-01   +1394700-02	4116
1229	1850	PC	+1493200+02   +1381000+03   -8505200+01   +9220100+00   -5706400-01   +1394700-02	4116
1230	1850	PC	+1493200+02   +1381000+03   -8505200+01   +9220100+00   -5706400-01   +1394700-02	4116
1231	1850	PC	+1493200+02   +1381000+03   -8505200+01   +9220100+00   -5706400-01   +1394700-02	4116
1232	1850	PC	+1493200+02   +1381000+03   -8505200+01   +9220100+00   -5706400-01   +1394700-02	4116
1233	1850	PC	+1493200+02   +1381000+03   -8505200+01   +9220100+00   -5706400-01   +1394700-02	4116
1234	1850	PC	+1089200+02   +2705600+02   -1504300+00   +1159800-02   +4582500-04   -5337600-06	4116
1235	1850	PC	+1089200+02   +2705600+02   -1504300+00   +1159800-02   +4582500-04   -5337600-06	4116
1236	1850	PC	+1089200+02   +2705600+02   -1504300+00   +1159800-02   +4582500-04   -5337600-06	4116
1237	1850	PC	+1089200+02   +2705600+02   -1504300+00   +1159800-02   +4582500-04   -5337600-06	4116
1238	1850	PC	+1089200+02   +2705600+02   -1504300+00   +1159800-02   +4582500-04   -5337600-06	4116
1239	1850	PC	+1089200+02   +2705600+02   -1504300+00   +1159800-02   +4582500-04   -5337600-06	4116
1240	1850	PC	+1089200+02   +2705600+02   -1504300+00   +1159800-02   +4582500-04   -5337600-06	4116
1241	1850	PC	+1089200+02   +2705600+02   -1504300+00   +1159800-02   +4582500-04   -5337600-06	4116
1242	1850	PC	+1089200+02   +2705600+02   -1504300+00   +1159800-02   +4582500-04   -5337600-06	4116
1243	1850	PC	+1089200+02   +2705600+02   -1504300+00   +1159800-02   +4582500-04   -5337600-06	4116
1244	1850	PC	+1089200+02   +2705600+02   -1504300+00   +1159800-02   +4582500-04   -5337600-06	4116
1245	1850	PC	+1089200+02   +2705600+02   -1504300+00   +1159800-02   +4582500-04   -5337600-06	4116
1246	1850	PC	+1089200+02   +2705600+02   -1504300+00   +1159800-02   +4582500-04   -5337600-06	4116
1247	1850	PC	+1089200+02   +2705600+02   -1504300+00   +1159800-02   +4582500-04   -5337600-06	4116
1248	1850	PC	+1089200+02   +2705600+02   -1504300+00   +1159800-02   +4582500-04   -5337600-06	4116
1249	1850	PC	+1089200+02   +2705600+02   -1504300+00   +1159800-02   +4582500-04   -5337600-06	4116
1250	1850	PC	+1089200+02   +2705600+02   -1504300+00   +1159800-02   +4582500-04   -5337600-06	4116
1251	1850	PC	+1089200+02   +2705600+02   -1504300+00   +1159800-02   +4582500-04   -5337600-06	4116
1252	1850	PC	+1089200+02   +2705600+02   -1504300+00   +1159800-02   +4582500-04   -5337600-06	4116
1253	1850	PC	+1089200+02   +2705600+02   -1504300+00   +1159800-02   +4582500-04   -5337600-06	4116
1254	1850	PC	+1089200+02   +2705600+02   -1504300+00   +1159800-02   +4582500-04   -5337600-06	4116
1255	1850	PC	+1493200+02   +1381000+03   -8505200+01   +9220100+00   -5706400-01   +1394700-02	4116
1256	1850	PC	+1493200+02   +1381000+03   -8505200+01   +9220100+00   -5706400-01   +1394700-02	4116
1257	1850	PC	+1493200+02   +1381000+03   -8505200+01   +9220100+00   -5706400-01   +1394700-02	4116

TABLE 1.7-4. POIC DISPLAY REQUIREMENTS (Sheet 5 of 20)

E N C N CT	I N U O AY	T M R LP	R B R IE	Y E B	R R	CALIBRATION COEFFICIENTS/LINEAR SEGMENTS					E T	X A	P B	L	I B	D	I	L
						A0	A1	A2	A3	A4								
1258	850	PC	+1493200+02	+1381000+03	-8505200+01	+9220100+00	-5706400-01	+1394700-02										4116
1259	850	PC	+1493200+02	+1381000+03	-8505200+01	+9220100+00	-5706400-01	+1394700-02										4116
1260	850	PC	+1493200+02	+1381000+03	-8505200+01	+9220100+00	-5706400-01	+1394700-02										4116
1261	850	PC	+0000000+00	+1743900-02														4116
1262	850	PC	+0000000+00	+5086300-02														4116
1263	850	PC	+0000000+00	+1743900-02														4116
1264	850	PC	+0000000+00	+5086300-02														4116
1265	850	PC	-2566000+01	+1364100+00														4116
1266	850	PC	-2414600+03	+2297900+00	+1211300-04	-4356500-09												4116
1267	850	PC	+0000000+00	+1627600+01														4116
1268	850	PC	+0000000+00	+7326000-02														4116
1269	850	PC	+0000000+00	+1953600-01														4116
1270	850	PC	+0000000+00	+7326000-02														4116
1271	850	PC	+0000000+00	+1953600-01														4116
1272	850	PC	+0000000+00	+7326000-02														4116
1273	850	PC	+0000000+00	+1953600-01														4116
1274	850	PC	+0000000+00	+7326000-02														4116
1275	850	PC	+0000000+00	+1953600-01														4116
1276	850	PC	+0000000+00	+7326000-02														4116
1277	850	PC	+0000000+00	+1953600-01														4116
1278	850	PC	+0000000+00	+7326000-02														4116
1279	850	PC	+0000000+00	+1953600-01														4116
1280	850	PC	+0000000+00	+7326000-02														4116
1281	850	PC	+0000000+00	+1953600-01														4116
1282	850	PC	-2414600+03	+2297900+00	+1211300-04	-4356500-09												4116
1283	850	PC	-2414600+03	+2297900+00	+1211300-04	-4356500-09												4116
1284	850	PC	-2414600+03	+2297900+00	+1211300-04	-4356500-09												4116
1285	850	PC	-2414600+03	+2297900+00	+1211300-04	-4356500-09												4116
1286	850	PC	-2414600+03	+2297900+00	+1211300-04	-4356500-09												4116
1287	850	PC	-2414600+03	+2297900+00	+1211300-04	-4356500-09												4116
1288	850	PC	-2414600+03	+2297900+00	+1211300-04	-4356500-09												4116
1	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
0	0	0	1	1	2	4	0	4	6	2	6	7	3	7	8	7	8	
3	5	7	8	8	9	0	1	1	2	1	5	1	3	3	9	0	9	0

TABLE 1.7.4. POIC DISPLAY REQUIREMENTS (Sheet 6 of 20)

E N I C N I C T I		CALIBRATION COEFFICIENTS/LINEAR SEGMENTS										//////	
N	U O J A Y I	A0	A1	A2	A3	A4	A5						
289	1850 PC	-2414600+03	+2297900+00	+1211300-04	-4356500-09								41 6
290	1850 PC	-2414600+03	+2297900+00	+1211300-04	-4356500-09								41 6
291	1850 PC	-2414600+03	+2297900+00	+1211300-04	-4356500-09								41 6
292	1850 PC	-2414600+03	+2297900+00	+1211300-04	-4356500-09								41 6
293	1850 PC	-2414600+03	+2297900+00	+1211300-04	-4356500-09								41 6
294	1850 PC	-2414600+03	+2297900+00	+1211300-04	-4356500-09								41 6
295	1850 PC	-2414600+03	+2297900+00	+1211300-04	-4356500-09								41 6
296	1850 PC	-2414600+03	+2297900+00	+1211300-04	-4356500-09								41 6
297	1850 PC	-2414600+03	+2297900+00	+1211300-04	-4356500-09								41 6
298	1850 PC	+0000000+00	+1000000+01										41 6
299	1850 PC	+0000000+00	+1000000+01										41 6
300	1850 PC	+0000000+00	+1000000+01										41 6
301	1850 PC	+0000000+00	+1000000+01										41 6
302	1850 PC	+0000000+00	+1000000+01										41 6
303	1850 PC	+0000000+00	+1000000+01										41 6
304	1850 PC	+0000000+00	+1000000+01										41 6
305	1850 PC	+0000000+00	+1000000+01										41 6
306	1850 PC	+0000000+00	+1000000+01										41 6
307	1850 PC	+0000000+00	+1000000+01										41 6
308	1850 PC	+0000000+00	+1000000+01										41 6
309	1850 PC	+0000000+00	+1000000+01										41 6
310	1850 PC	+0000000+00	+1000000+01										41 6
311	1850 PC	+0000000+00	+1000000+01										41 6
312	1850 PC	+0000000+00	+8302800-01										41 6
313	1850 PC	-2414600+03	+2297900+00	+1211300-04	-4356500-09								41 6
314	1850 PC	-2414600+03	+2297900+00	+1211300-04	-4356500-09								41 6
315	1850 PC	+9760000+03	+2442000+00										41 6
316	1850 PC	+9760000+03	+2442000+00										41 6
317	1850 PC	+9760000+03	+2442000+00										41 6
318	1850 PC	+9760000+03	+2442000+00										41 6
319	1850 PC	+9760000+03	+2442000+00										41 6
0	0	1	2	4	5	6	7	1	1	1	1	1	1
3	5	7	8	9	0	2	3	3	3	3	3	3	9

TABLE 1.7-4. POIC DISPLAY REQUIREMENTS (Sheet 7 of 20)

E N I C N I C T	CALIBRATION COEFFICIENTS/LINEAR SEGMENTS										I I I I I	
	A0	A1	A2	A3	A4	A5						
320	850	PC	+9760000+03	+2442000+00								416
321	850	PC	+6810000+02	+2442000-01								416
322	850	PC	+6810000+02	+2442000-01								416
323	850	PC	+9760000+03	+2442000+00								416
324	850	PC	+9760000+03	+2442000+00								416
325	850	PC	+9760000+03	+2442000+00								416
326	850	PC	+9760000+03	+2442000+00								416
327	850	PC	+9760000+03	+2442000+00								416
328	850	PC	+9760000+03	+2442000+00								416
329	850	PC	+6810000+02	+2442000-01								416
330	850	PC	+6810000+02	+2442000-01								416
331	850	PC	+0000000+00	+1000000+01								416
332	850	PC	+0000000+00	+3125000+00								416
333	850	PC	+0000000+00	+2500000+00								416
334	850	PC	+0000000+00	+1000000+01								416
335	850	PC	+0000000+00	+3125000+00								416
336	850	PC	+0000000+00	+2500000+00								416
337	850	PC	+0000000+00	+1000000+01								416
338	850	PC	+0000000+00	+3125000+00								416
339	850	PC	+0000000+00	+2500000+00								416
340	850	PC	+0000000+00	+1000000+01								416
341	850	PC	+0000000+00	+3125000+00								416
342	850	PC	+0000000+00	+2500000+00								416
343	850	PC	+0000000+00	+7096670-04								416
344	850	PC	+0000000+00	+1000000+01								416
345	850	PC	+0000000+00	+1000000+01								416
346	850	PC	+0000000+00	+1000000+01								416
347	850	PC	+0000000+00	+1000000+01								416
348	850	PC	+0000000+00	+1000000+01								416
349	850	PC	+0000000+00	+1000000+01								416
350	850	PC	+0000000+00	+1000000+01								416
0	0	0	1	8	2	9	4	0	1	5	1	7
3	5	7	1	8	2	9	4	0	1	5	1	7
												8
												9
												0
												1
												2
												3
												4
												5
												6
												7
												8
												9
												0

TABLE 1.7-4. POIC DISPLAY REQUIREMENTS (Sheet 8 of 20)

E N C N I C T		CALIBRATION COEFFICIENTS/LINEAR SEGMENTS										////		
I N U O O A Y	I T M R L P	A 0	A 1	A 2	A 3	A 4	A 5						---	
I R B R I E	I Y E I B												X I A	
	I R												P I B I	
	I A												L I	
	I T												I B I	
	I I												D	
	I O													
	I N													
352	850	PC	+000000+00	+1000000+01									41	61
353	850	PC	+000000+00	+1000000+01									41	61
354	850	PC	+000000+00	+1000000+01									41	61
355	850	PC	+000000+00	+1000000+01									41	61
356	850	PC	+000000+00	+1000000+01									41	61
357	850	PC	+000000+00	+1000000+01									41	61
358	850	PC	+000000+00	+1000000+01									41	61
359	850	PC	+000000+00	+1000000+01									41	61
360	850	PC	+000000+00	+1000000+01									41	61
361	850	PC	+000000+00	+1000000+01									41	61
362	850	PC	+000000+00	+1000000+01									41	61
363	850	PC	+000000+00	+1000000+01									41	61
364	850	PC	+000000+00	+1000000+01									41	61
365	850	PC	+000000+00	+1000000+01									41	61
366	850	PC	+000000+00	+1000000+01									41	61
367	850	PC	+000000+00	+1000000+01									41	61
368	850	PC	+000000+00	+1000000+01									41	61
369	850	PC	+000000+00	+1000000+01									41	61
370	850	PC	+000000+00	+1000000+01									41	61
371	850	PC	+000000+00	+1000000+01									41	61
372	850	PC	+000000+00	+1000000+01									41	61
373	850	PC	+000000+00	+1000000+01									41	61
374	850	PC	+000000+00	+1000000+01									41	61
375	850	PC	+000000+00	+1000000+01									41	61
376	850	PC	+000000+00	+1000000+01									41	61
377	850	PC	+000000+00	+1000000+01									41	61
378	850	PC	+000000+00	+1000000+01									41	61
379	850	PC	+000000+00	+1000000+01									41	61
380	850	PC	+000000+00	+1000000+01									41	61
381	850	PC	+000000+00	+1000000+01									41	61
382	850	PC	+000000+00	+1000000+01									41	61
383	850	PC	+000000+00	+1000000+01									41	61
384	850	PC	+000000+00	+1000000+01									41	61
385	850	PC	+000000+00	+1000000+01									41	61
386	850	PC	+000000+00	+1000000+01									41	61
387	850	PC	+000000+00	+1000000+01									41	61
388	850	PC	+000000+00	+1000000+01									41	61
389	850	PC	+000000+00	+1000000+01									41	61
390	850	PC	+000000+00	+1000000+01									41	61
0	0	0	1	2	4	5	6	7	8	9	1	1	1	1
0	0	0	1	2	4	5	6	7	8	9	1	1	1	1
3	5	7	8	9	0	1	2	3	9	0	1	3	9	0

TABLE 1.7-4. POIC DISPLAY REQUIREMENTS (Sheet 9 of 20)

E N I C N I C T I		CALIBRATION COEFFICIENTS/LINEAR SEGMENTS					//////
IN	UJO OJAY						----
T	MIR ILPI						E T I
R	BIR IIEI						X A I
Y	E I B I						P B I
	R I R I						L I
	I A I						I I B I
	T I	A0	A1	A2	A3	A4	I D I
	I I						
	I O I						
	I N I						
391 850 PC +000000+00 +1000000+01							41 6
392 850 PC +000000+00 +1000000+01							41 6
393 850 PC +000000+00 +1000000+01							41 6
394 850 PC +000000+00 +1000000+01							41 6
395 850 PC +000000+00 +1000000+01							41 6
396 850 PC +000000+00 +1000000+01							41 6
397 850 PC +000000+00 +1000000+01							41 6
398 850 PC +000000+00 +1000000+01							41 6
399 850 PC +000000+00 +1000000+01							41 6
400 850 PC +000000+00 +1000000+01							41 6
401 850 PC +000000+00 +1000000+01							41 6
402 850 PC +000000+00 +1000000+01							41 6
403 850 PC +000000+00 +1000000+01							41 6
404 850 PC +000000+00 +1000000+01							41 6
405 850 PC +000000+00 +1000000+01							41 6
406 850 PC +000000+00 +1000000+01							41 6
407 850 PC +000000+00 +1000000+01							41 6
408 850 PC +000000+00 +1000000+01							41 6
409 850 PC +000000+00 +1000000+01							41 6
410 850 PC +000000+00 +1000000+01							41 6
411 850 PC +000000+00 +1000000+01							41 6
412 850 PC +000000+00 +1000000+01							41 6
413 850 PC +000000+00 +1000000+01							41 6
414 850 PC +000000+00 +1000000+01							41 6
415 850 PC +000000+00 +1000000+01							41 6
417 850 PC +000000+00 +1000000+01							41 6
418 850 PC +000000+00 +1000000+01							41 6
419 850 PC +000000+00 +1000000+01							41 6
421 850 PC +000000+00 +1000000+01							41 6
422 850 PC +000000+00 +1000000+01							41 6
423 850 PC +000000+00 +1000000+01							41 6



TABLE 1.7-4. POIC DISPLAY REQUIREMENTS (Sheet 10 of 20)

E N I C N I C T I		CALIBRATION COEFFICIENTS/LINEAR SEGMENTS										I I I I I			
I N U O I A Y	I T M I R I L P											I E I T	I I		
I R B I R I E I	Y E I B											I X I A	I P I B		
I R I R I	I A											I L I	I I B I		
I T	I I	A0	A1	A2	A3	A4	A5					I D I	I I		
I I O I	I N											I I	I I		
425	850 PC	+000000+00	+1000000+01											41 6	
427	850 PC	+000000+00	+1000000+01											41 6	
428	850 PC	+000000+00	+1000000+01											41 6	
429	850 PC	+000000+00	+1000000+01											41 6	
431	850 PC	+000000+00	+1000000+01											41 6	
432	850 PC	+000000+00	+1000000+01											41 6	
433	850 PC	+000000+00	+1000000+01											41 6	
435	850 PC	+000000+00	+1000000+01											41 6	
437	850 PC	+000000+00	+1000000+01											41 6	
438	850 PC	+000000+00	+1000000+01											41 6	
439	850 PC	+000000+00	+1000000+01											41 6	
441	850 PC	+000000+00	+1000000+01											41 6	
442	850 PC	+000000+00	+1000000+01											41 6	
443	850 PC	+000000+00	+1000000+01											41 6	
445	850 PC	+000000+00	+1000000+01											41 6	
447	850 PC	+000000+00	+1000000+01											41 6	
448	850 PC	+000000+00	+1000000+01											41 6	
449	850 PC	+000000+00	+1000000+01											41 6	
451	850 PC	+000000+00	+1000000+01											41 6	
452	850 PC	+000000+00	+1000000+01											41 6	
453	850 PC	+000000+00	+1000000+01											41 6	
455	850 PC	+000000+00	+1000000+01											41 6	
457	850 PC	+000000+00	+1000000+01											41 6	
458	850 PC	+000000+00	+1000000+01											41 6	
459	850 PC	+000000+00	+1000000+01											41 6	
461	850 PC	+000000+00	+1000000+01											41 6	
462	850 PC	+000000+00	+1000000+01											41 6	
463	850 PC	+000000+00	+1000000+01											41 6	
470	850 PC	+000000+00	+1000000+01											41 6	
471	850 PC	+000000+00	+1000000+01											41 6	
472	850 PC	+000000+00	+1000000+01											41 6	
I I I I I	I I I I I	I I I I I	I I I I I	I I I I I	I I I I I	I I I I I	I I I I I	I I I I I	I I I I I	I I I I I	I I I I I	I I I I I	I I I I I	I I I I I	I I I I I
0 0 0	0 0 0	1 1 1	2 2 2	3 3 3	4 4 4	5 5 5	6 6 6	7 7 7	8 8 8	9 9 9	0 0 0	1 1 1	2 2 2	3 3 3	4 4 4
3 5 7	8 8 8	9 9 9	0 0 0	1 1 1	2 2 2	3 3 3	4 4 4	5 5 5	6 6 6	7 7 7	8 8 8	9 9 9	0 0 0	1 1 1	2 2 2

TABLE 1.7-4. POIC DISPLAY REQUIREMENTS (Sheet 11 of 20)

		CALIBRATION COEFFICIENTS/LINEAR SEGMENTS					
IE N I C T	////					////	
IN U O I A Y	----					IE IT	
T M R L P						X A	
R B I R I E						P B	
Y E I B	-----					L	
R I R						I B	
I A						ID	
T		A0	A1	A2	A3	A4	A5
I							
I O							
I N							
473   850   P C   +000000+00   +100000+01							41   6
474   850   P C   +000000+00   +100000+01							41   6
475   850   P C   +000000+00   +100000+01							41   6
476   850   P C   +000000+00   +100000+01							41   6
477   850   P C   +000000+00   +100000+01							41   6
478   850   P C   +000000+00   +100000+01							41   6
479   850   P C   +000000+00   +100000+01							41   6
480   850   P C   +000000+00   +100000+01							41   6
481   850   P C   +000000+00   +100000+01							41   6
482   850   P C   +000000+00   +100000+01							41   6
483   850   P C   +000000+00   +100000+01							41   6
484   850   P C   +000000+00   +100000+01							41   6
485   850   P C   +000000+00   +100000+01							41   6
486   850   P C   +000000+00   +100000+01							41   6
487   850   P C   +000000+00   +100000+01							41   6
488   850   P C   +000000+00   +100000+01							41   6
001   851   P C   +000000+00   +100000+01							41   6
002   851   P C   +000000+00   +100000+01							41   6
003   851   P C   +000000+00   +100000+01							41   6
004   851   P C   +000000+00   +100000+01							41   6
005   851   P C   +000000+00   +100000+01							41   6
006   851   P C   +000000+00   +100000+01							41   6
007   851   P C   +000000+00   +100000+01							41   6
008   851   P C   +000000+00   +100000+01							41   6
009   851   P C   +000000+00   +100000+01							41   6
010   851   P C   +000000+00   +100000+01							41   6
011   851   P C   +000000+00   +100000+01							41   6
012   851   P C   +000000+00   +100000+01							41   6
013   851   P C   +000000+00   +100000+01							41   6
014   851   P C   +000000+00   +100000+01							41   6
015   851   P C   +000000+00   +100000+01							41   6

0	0	0	1	1	2	2	4	5	6	7	7	8	8	9	9	0	1	1	1	1
3	5	7					0	1	2	3	3	3	3	3	3	3	3	3	3	3

TABLE 1.7-4. POIC DISPLAY REQUIREMENTS (Sheet 12 of 20)

ENIC NICTI	CALIBRATION COEFFICIENTS/LINEAR SEGMENTS					////		
IN UO OJAY	A0	A1	A2	A3	A4	A5		
IT MIR JLP								
IR BIR IIE								
YEI IB								
IRI								
IA								
IT								
II								
IO								
IN								
016	1851	PC	+0000000+00	+1000000+01			41	6
017	1851	PC	+0000000+00	+1000000+01			41	6
018	1851	PC	+0000000+00	+1000000+01			41	6
019	1851	PC	+0000000+00	+1000000+01			41	6
020	1851	PC	+0000000+00	+1000000+01			41	6
021	1851	PC	+0000000+00	+1000000+01			41	6
022	1851	PC	+0000000+00	+1000000+01			41	6
023	1851	PC	+0000000+00	+1000000+01			41	6
024	1851	PC	+0000000+00	+1000000+01			41	6
025	1851	PC	+0000000+00	+1000000+01			41	6
026	1851	PC	+0000000+00	+1000000+01			41	6
027	1851	PC	+0000000+00	+1000000+01			41	6
028	1851	PC	+0000000+00	+1000000+01			41	6
029	1851	PC	+0000000+00	+1000000+01			41	6
030	1851	PC	+0000000+00	+1000000+01			41	6
031	1851	PC	+0000000+00	+1000000+01			41	6
032	1851	PC	+0000000+00	+1000000+01			41	6
033	1851	PC	+0000000+00	+1000000+01			41	6
034	1851	PC	+0000000+00	+1000000+01			41	6
035	1851	PC	+0000000+00	+1000000+01			41	6
036	1851	PC	+0000000+00	+1000000+01			41	6
037	1851	PC	+0000000+00	+1000000+01			41	6
038	1851	PC	+0000000+00	+1000000+01			41	6
039	1851	PC	+0000000+00	+1000000+01			41	6
040	1851	PC	+0000000+00	+1000000+01			41	6
041	1851	PC	+0000000+00	+1000000+01			41	6
042	1851	PC	+0000000+00	+1000000+01			41	6
043	1851	PC	+0000000+00	+1000000+01			41	6
044	1851	PC	+0000000+00	+1000000+01			41	6
045	1851	PC	+0000000+00	+1000000+01			41	6
046	1851	PC	+0000000+00	+1000000+01			41	6

TABLE 1.7-4. POIC DISPLAY REQUIREMENTS (Sheet 13 of 20)

E N I C N I C T		CALIBRATION COEFFICIENTS/LINEAR SEGMENTS					////	
N	U O	A0	A1	A2	A3	A4	A5	---
I	R	I	R	I	R	I	R	E T
T	M I R	L P						X A
R	B I R	I E						P B
Y	E	B						L
I	R							I B
I	A							I D
I	T							
I	I							
I	O							
I	N							
047	851	PC	+000000+00	+100000+01				416
048	851	PC	+000000+00	+100000+01				416
049	851	PC	+000000+00	+100000+01				416
050	851	PC	+000000+00	+100000+01				416
051	851	PC	+000000+00	+100000+01				416
052	851	PC	+000000+00	+100000+01				416
053	851	PC	+000000+00	+100000+01				416
054	851	PC	+000000+00	+100000+01				416
055	851	PC	+000000+00	+100000+01				416
056	851	PC	+000000+00	+100000+01				416
057	851	PC	+000000+00	+100000+01				416
058	851	PC	+000000+00	+100000+01				416
059	851	PC	+000000+00	+100000+01				416
060	851	PC	+000000+00	+100000+01				416
061	851	PC	+000000+00	+100000+01				416
062	851	PC	+000000+00	+100000+01				416
063	851	PC	+000000+00	+100000+01				416
064	851	PC	+000000+00	+100000+01				416
065	851	PC	+000000+00	+100000+01				416
066	851	PC	+000000+00	+100000+01				416
067	851	PC	+000000+00	+100000+01				416
068	851	PC	+000000+00	+100000+01				416
069	851	PC	+000000+00	+100000+01				416
070	851	PC	+000000+00	+100000+01				416
071	851	PC	+000000+00	+100000+01				416
072	851	PC	+000000+00	+100000+01				416
073	851	PC	+000000+00	+100000+01				416
074	851	PC	+000000+00	+100000+01				416
075	851	PC	+000000+00	+100000+01				416
076	851	PC	+000000+00	+100000+01				416
077	851	PC	+000000+00	+100000+01				416

0	0	0	1	2	4	5	6	7	8
3	5	7	8	9	0	1	2	3	9

TABLE 1.7-4. POIC DISPLAY REQUIREMENTS (Sheet 14 of 20)

E N I C N I C T I	CALIBRATION COEFFICIENTS/LINEAR SEGMENTS										/ / / / /	
	A0	A1	A2	A3	A4	A5						
0781851	PC	+0000000+00	+1000000+01									41161
0791851	PC	+0000000+00	+1000000+01									41161
0801851	PC	+0000000+00	+1000000+01									41161
0811851	PC	+0000000+00	+1000000+01									41161
0821851	PC	+0000000+00	+1000000+01									41161
0831851	PC	+0000000+00	+1000000+01									41161
0841851	PC	+0000000+00	+1000000+01									41161
0851851	PC	+0000000+00	+1000000+01									41161
0861851	PC	+0000000+00	+1000000+01									41161
0871851	PC	+0000000+00	+1000000+01									41161
0881851	PC	+0000000+00	+1000000+01									41161
0891851	PC	+0000000+00	+1000000+01									41161
0901851	PC	+0000000+00	+1000000+01									41161
0911851	PC	+0000000+00	+1000000+01									41161
0921851	PC	+0000000+00	+1000000+01									41161
0931851	PC	+0000000+00	+1000000+01									41161
0941851	PC	+0000000+00	+1000000+01									41161
0951851	PC	+0000000+00	+1000000+01									41161
0961851	PC	+0000000+00	+1000000+01									41161
0971851	PC	+0000000+00	+1000000+01									41161
0981851	PC	+0000000+00	+1000000+01									41161
0991851	PC	+0000000+00	+1000000+01									41161
1001851	PC	+0000000+00	+1000000+01									41161
1011851	PC	+0000000+00	+1000000+01									41161
1021851	PC	+0000000+00	+1000000+01									41161
1031851	PC	+0000000+00	+1000000+01									41161
1041851	PC	+0000000+00	+1000000+01									41161
1051851	PC	+0000000+00	+1000000+01									41161
1061851	PC	+0000000+00	+1000000+01									41161
1071851	PC	+0000000+00	+1000000+01									41161
1081851	PC	+0000000+00	+1000000+01									41161

TABLE 1.7-4. POIC DISPLAY REQUIREMENTS (Sheet 15 of 20)

E N I C N I C T		CALIBRATION COEFFICIENTS/LINEAR SEGMENTS										///	
N U O O A Y	---											---	
T M R L P												E I T	
R B R I E												X I A	
Y E I B												P I B	
R													L I
		A0	A1	A2	A3	A4	A5						I B I
													D
109 851 PC +0000000+00 +1000000+01													41 6
110 851 PC +0000000+00 +1000000+01													41 6
111 851 PC +0000000+00 +1000000+01													41 6
112 851 PC +0000000+00 +1000000+01													41 6
113 851 PC +0000000+00 +1000000+01													41 6
114 851 PC +0000000+00 +1000000+01													41 6
115 851 PC +0000000+00 +1000000+01													41 6
116 851 PC +0000000+00 +1000000+01													41 6
117 851 PC +0000000+00 +1000000+01													41 6
118 851 PC +0000000+00 +1000000+01													41 6
119 851 PC +0000000+00 +1000000+01													41 6
120 851 PC +0000000+00 +1000000+01													41 6
121 851 PC +0000000+00 +1000000+01													41 6
122 851 PC +0000000+00 +1000000+01													41 6
123 851 PC +0000000+00 +1000000+01													41 6
124 851 PC +0000000+00 +1000000+01													41 6
125 851 PC +0000000+00 +1000000+01													41 6
126 851 PC +0000000+00 +1000000+01													41 6
127 851 PC +0000000+00 +1000000+01													41 6
128 851 PC +0000000+00 +1000000+01													41 6
129 851 PC +0000000+00 +1000000+01													41 6
130 851 PC +0000000+00 +1000000+01													41 6
131 851 PC +0000000+00 +1000000+01													41 6
132 851 PC +0000000+00 +1000000+01													41 6
133 851 PC +0000000+00 +1000000+01													41 6
134 851 PC +0000000+00 +1000000+01													41 6
135 851 PC +0000000+00 +1000000+01													41 6
136 851 PC +0000000+00 +1000000+01													41 6
137 851 PC +0000000+00 +1000000+01													41 6
138 851 PC +0000000+00 +1000000+01													41 6
139 851 PC +0000000+00 +1000000+01													41 6
0 0 0 0 1 1 1 1 1 1 1 1 1 1													1 1
3 5 7													7 8
													9 0
													3
													7
													9 0

TABLE 1.7-4. POIC DISPLAY REQUIREMENTS (Sheet 16 of 20)

E N I C N I C T / I N U O O I A Y / T M R I L P R B I R I E I Y E I B R I R I A T I O N	CALIBRATION COEFFICIENTS/LINEAR SEGMENTS					E T X A P B L I B D I I I I I		
	A0	A1	A2	A3	A4		A5	
1140	851	PC	+0000000+00	+1000000+01			41	16
1141	851	PC	+0000000+00	+1000000+01			41	16
1142	851	PC	+0000000+00	+1000000+01			41	16
1143	851	PC	+0000000+00	+1000000+01			41	16
1144	851	PC	+0000000+00	+1000000+01			41	16
1145	851	PC	+0000000+00	+1000000+01			41	16
1146	851	PC	+0000000+00	+1000000+01			41	16
1147	851	PC	+0000000+00	+1000000+01			41	16
1148	851	PC	+0000000+00	+1000000+01			41	16
1149	851	PC	+0000000+00	+1000000+01			41	16
1150	851	PC	+0000000+00	+1000000+01			41	16
1151	851	PC	+0000000+00	+1000000+01			41	16
1152	851	PC	+0000000+00	+1000000+01			41	16
1153	851	PC	+0000000+00	+1000000+01			41	16
1154	851	PC	+0000000+00	+1000000+01			41	16
1155	851	PC	+0000000+00	+1000000+01			41	16
1156	851	PC	+0000000+00	+1000000+01			41	16
1157	851	PC	+0000000+00	+1000000+01			41	16
1158	851	PC	+0000000+00	+1000000+01			41	16
1159	851	PC	+0000000+00	+1000000+01			41	16
1160	851	PC	+0000000+00	+1000000+01			41	16
1161	851	PC	+0000000+00	+1000000+01			41	16
1162	851	PC	+0000000+00	+1000000+01			41	16
1163	851	PC	+0000000+00	+1000000+01			41	16
1164	851	PC	+0000000+00	+1000000+01			41	16
1165	851	PC	+0000000+00	+1000000+01			41	16
1166	851	PC	+0000000+00	+1000000+01			41	16
1167	851	PC	+0000000+00	+1000000+01			41	16
1168	851	PC	+0000000+00	+1000000+01			41	16
1169	851	PC	+0000000+00	+1000000+01			41	16
1170	851	PC	+0000000+00	+1000000+01			41	16
0	0	0	1	2	9	1	1	1
3	5	7	8	0	4	5	6	7
				0	0	1	2	3
								8
								9
								0
								1
								2
								3
								4
								5
								6
								7
								8
								9

TABLE 1.7-4. POIC DISPLAY REQUIREMENTS (Sheet 17 of 20)

E N I C N I C T I		CALIBRATION COEFFICIENTS/LINEAR SEGMENTS										I / / / /	
N U O O J A Y	T M R L P	A0	A1	A2	A3	A4	A5	I B	I D	L	P B	X A	E T
171	1851	PC	+0000000+00	+1000000+01									1416
172	1851	PC	+0000000+00	+1000000+01									1416
173	1851	PC	+0000000+00	+1000000+01									1416
174	1851	PC	+0000000+00	+1000000+01									1416
175	1851	PC	+0000000+00	+1000000+01									1416
176	1851	PC	+0000000+00	+1000000+01									1416
177	1851	PC	+0000000+00	+1000000+01									1416
178	1851	PC	+0000000+00	+1000000+01									1416
179	1851	PC	+0000000+00	+1000000+01									1416
180	1851	PC	+0000000+00	+1000000+01									1416
181	1851	PC	+0000000+00	+1000000+01									1416
182	1851	PC	+0000000+00	+1000000+01									1416
183	1851	PC	+0000000+00	+1000000+01									1416
184	1851	PC	+0000000+00	+1000000+01									1416
185	1851	PC	+0000000+00	+1000000+01									1416
186	1851	PC	+0000000+00	+1000000+01									1416
187	1851	PC	+0000000+00	+1000000+01									1416
188	1851	PC	+0000000+00	+1000000+01									1416
189	1851	PC	+0000000+00	+1000000+01									1416
190	1851	PC	+0000000+00	+1000000+01									1416
191	1851	PC	+0000000+00	+1000000+01									1416
192	1851	PC	+0000000+00	+1000000+01									1416
193	1851	PC	+0000000+00	+1000000+01									1416
194	1851	PC	+0000000+00	+1000000+01									1416
195	1851	PC	+0000000+00	+1000000+01									1416
196	1851	PC	+0000000+00	+1000000+01									1416
197	1851	PC	+0000000+00	+1000000+01									1416
198	1851	PC	+0000000+00	+1000000+01									1416
199	1851	PC	+0000000+00	+1000000+01									1416
200	1851	PC	+0000000+00	+1000000+01									1416
201	1851	PC	+0000000+00	+1000000+01									1416
0	0	0	1	2	4	5	6	7	8	9	0	1	1
3	5	7	8	9	0	1	2	3	4	5	6	7	8
													9
													0





TABLE 1.7-4. POIC DISPLAY REQUIREMENTS (Sheet 19 of 20)

E N C T	I N U O I A Y	T M R	R B I R	I E	Y E	B	CALIBRATION COEFFICIENTS/LINEAR SEGMENTS					L	B	
							A0	A1	A2	A3	A4			A5
233	1851	PC												4116
234	1851	PC												4116
235	1851	PC												4116
236	1851	PC												4116
237	1851	PC												4116
238	1851	PC												4116
239	1851	PC												4116
240	1851	PC												4116
241	1851	PC												4116
242	1851	PC												4116
243	1851	PC												4116
244	1851	PC												4116
245	1851	PC												4116
246	1851	PC												4116
247	1851	PC												4116
248	1851	PC												4116
249	1851	PC												4116
250	1851	PC												4116
251	1851	PC												4116
252	1851	PC												4116
253	1851	PC												4116
254	1851	PC												4116
255	1851	PC												4116
256	1851	PC												4116
257	1851	PC												4116
258	1851	PC												4116
259	1851	PC												4116
260	1851	PC												4116
261	1851	PC												4116
262	1851	PC												4116
263	1851	PC												4116
0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
3	5	7	8	9	2	4	0	1	5	6	2	7	3	9

TABLE 1.7-4. POIC DISPLAY REQUIREMENTS (Sheet 20 of 20)

E N C N   C T		CALIBRATION COEFFICIENTS/LINEAR SEGMENTS											
I N U O   O   A Y													
I T M   R   L P													
I R B   R   I E													
Y E   B													
R   R													
A   A													
T   T													
I   I													
O   O													
N   N													
2 6 5   8 5 1   P C   + 0 0 0 0 0 0 0 + 0 0   + 1 0 0 0 0 0 0 + 0 1												4 1   6	
0 0 0												1 1	
3 5 7												7 8	
												9 0	
												3 3	
												2 2	
												1 1	
												0 0	
												9 8	
												7 6	
												5 4	
												3 2	
												1 0	
												0 0	

TABLE 1.7-5. POIC LIMIT SENSING/EXCEPTION MONITOR REQUIREMENTS (Sheet 1 of 14)

IC N I	E N O I M T	U R	WARNING VALUES (YELLOW LINE)		CRITICAL VALUES (RED LINE)		EXCEPTION MONITOR MESSAGE	DI STATE CODE	I	I	I	I		
			UPPER LIMIT	LOWER LIMIT	UPPER LIMIT	LOWER LIMIT								
001	850	EM					0	CDAS FAILURE-BITE #1 (Tbl 1)	OK			FAIL	41	7
002	850	EM					0	CDAS FAILURE-BITE #2 (Tbl 1)	OK			FAIL	41	7
003	850	EM					0	PDS PWR OFF (Tbl 1)	ON			OFF	41	7
004	850	EM					1	PDS PWR OFF (Tbl 1)	OFF			ON	41	7
005	850	EM					0	SCS PWR OFF (Tbl 1)	ON			OFF	41	7
006	850						1	SCS PWR OFF (Tbl 1)	YES			NO	41	7
007	850	EM					1	SCS PWR OFF (Tbl 1)	OFF			ON	41	7
008	850	EM					0	CDAS PWR OFF (Tbl 1)	NO			YES	41	7
009	850	EM					1	EXTRM TRAVEL LIMIT EXCEEDED	YES			NO	41	7
010	850	EM					1	CDAS PWR OFF (Tbl 1)	OFF			ON	41	7
011	850	EM					0	EXTRM TRAVEL LIMIT EXCEEDED	YES			NO	41	7
012	850	EM					0	EXTRM TRAVEL LIMIT EXCEEDED	NO			YES	41	7
013	850	EM					1	NO AVIONICS AIR-SCS #2 (Tbl 1)	FAIL			OK	41	7
014	850	EM					1	NO AVIONICS AIR-PDS #2 (Tbl 1)	FAIL			OK	41	7
015	850	EM					1	WATER OUTLET BYPASS	BYPS			NORM	41	7
016	850	EM					0	WATER OUTLET BYPASS	NORM			BYPS	41	7
017	850	EM					1	WATER INLET BYPASS	BYPS			NORM	41	7
018	850	EM					0	WATER INLET BYPASS	NORM			BYPS	41	7
019	850								CLS			OPN	41	7
020	850								OPN			CLS	41	7
021	850								CLS			OPN	41	7
022	850								OPN			CLS	41	7
023	850								CLS			OPN	41	7
024	850								OPN			CLS	41	7
025	850								CLS			OPN	41	7
026	850								OPN			CLS	41	7
027	850								CLS			OPN	41	7
028	850								OPN			CLS	41	7

TABLE 1.7-5. POIC LIMIT SENSING/EXCEPTION MONITOR REQUIREMENTS (Sheet 2 of 14)

C N I	WARNING VALUES (YELLOW LINE)			CRITICAL VALUES (RED LINE)			EXCEPTION MONITOR MESSAGE	DI STATE CODE	I I I I I	
	U R	M R	O Y	U P P E R	L O W E R	U P P E R				L O W E R
0	0	0	0	0	0	0	0	0	0	
029	850							NO	YES	417
030	850							YES	NO	417
031	850							NO	YES	417
032	850							YES	NO	417
033	850							NO	YES	417
034	850							YES	NO	417
035	850							NO	YES	417
036	850							YES	NO	417
037	850							NO	YES	417
038	850							OK	FAIL	417
039	850							OK	FAIL	417
040	850							OK	FAIL	417
041	850							OK	FAIL	417
042	850							OK	FAIL	417
043	850							OK	FAIL	417
044	850							OK	FAIL	417
045	850							OK	FAIL	417
046	850	EM					1 NO AVIONICS AIR - PDS #1	FAIL	OK	417
047	850	EM					1 NO AVIONICS AIR - PCS #1	FAIL	OK	417
048	850							ON	OFF	417
049	850							ON	OFF	417
050	850							ON	OFF	417
051	850							OFF	ON	417
052	850	EM					1 ILO IFEA WATER FLOW #1	FAIL	OK	417
053	850	EM					1 NO AVIONICS AIR - SCS #1	FAIL	OK	417
054	850							OK	FAIL	417
055	850							OK	FAIL	417
056	850							OK	FAIL	417
057	850							OK	FAIL	417
058	850							OK	FAIL	417
059	850							OK	FAIL	417
060	850							OK	FAIL	417
061	850							OK	FAIL	417

TABLE 1.7-5. POIC LIMIT SENSING/EXCEPTION MONITOR REQUIREMENTS (Sheet 3 of 14)

I E N U R	C N O M T O Y	WARNING VALUES (YELLOW LINE)		CRITICAL VALUES (RED LINE)		EXCEPTION MONITOR MESSAGE	DI STATE CODE	I D E	
		U P P E R L I M I T	L O W E R L I M I T	U P P E R L I M I T	L O W E R L I M I T				
062	1850						ON	OFF	4117
063	1850						OFF	ON	4117
064	1850						ON	OFF	4117
065	1850						OFF	ON	4117
066	1850						ON	OFF	4117
067	1850						OFF	ON	4117
068	1850						ON	OFF	4117
069	1850						OFF	ON	4117
070	1850						ON	OFF	4117
071	1850						OFF	ON	4117
072	1850						ON	OFF	4117
073	1850						OFF	ON	4117
074	1850						ON	OFF	4117
075	1850						OFF	ON	4117
076	1850						ON	OFF	4117
077	1850						OFF	ON	4117
078	1850						ON	OFF	4117
079	1850						OFF	ON	4117
080	1850						NO	YES	4117
081	1850						YES	NO	4117
082	1850						NO	YES	4117
083	1850						YES	NO	4117
084	1850						NO	YES	4117
085	1850						CLS	OPN	4117
086	1850						OPN	CLS	4117
087	1850						ON	OFF	4117
088	1850						OFF	ON	4117
089	1850						ON	OFF	4117
090	1850						OFF	ON	4117
091	1850						ON	OFF	4117
092	1850						OFF	ON	4117
093	1850						ON	OFF	4117
094	1850						OFF	ON	4117

TABLE 1.7-5. POIC LIMIT SENSING/EXCEPTION MONITOR REQUIREMENTS (Sheet 4 of 14)

E N O M T	I C N I	WARNING VALUES (YELLOW LINE)		CRITICAL VALUES (RED LINE)		EXCEPTION MONITOR MESSAGE	DI STATE CODE	I D E
		U P P E R L I M I T	L O W E R L I M I T	U P P E R L I M I T	L O W E R L I M I T			
095	850						ON	417
096	850	EM				1 LO IFEA WATER FLOW #2	OFF	417
097	850	EM				1 NO AVIONICS AIR - PCS #2	FAIL	417
098	850						OK	417
099	850						OK	417
100	850						OK	417
101	850						OK	417
102	850						OK	417
103	850						OK	417
104	850						OK	417
105	850						OK	417
106	850	EM				0 PCS UTILITY PWR OFF	ON	417
107	850	EM				1 PCS UTILITY PWR OFF	OFF	417
108	850						ON	417
109	850						OFF	417
110	850						ON	417
111	850						OFF	417
112	850						ON	417
113	850						OFF	417
114	850						ON	417
115	850						OFF	417
116	850						ON	417
117	850						OFF	417
118	850						ON	417
119	850						OFF	417
120	850						ON	417
121	850						OFF	417
122	850						ON	417
123	850						OFF	417
124	850						ON	417
125	850						OFF	417
126	850						ON	417
127	850						OFF	417

TABLE 1.7-5. POIC LIMIT SENSING/EXCEPTION MONITOR REQUIREMENTS (Sheet 5 of 14)

E N U I R	O I M T	N P I E T O R	WARNING VALUES (YELLOW LINE)		CRITICAL VALUES (RED LINE)		EXCEPTION MONITOR MESSAGE	DI STATE CODE	I T X P I D	
			UPPER LIMIT	LOWER LIMIT	UPPER LIMIT	LOWER LIMIT/ EXPECTED STATE				
128	1850							ON	OFF	41 7
129	1850							OFF	ON	41 7
130	1850							ON	OFF	41 7
131	1850							OFF	ON	41 7
132	1850							ON	OFF	41 7
133	1850							OFF	ON	41 7
134	1850							ON	OFF	41 7
135	1850							OFF	ON	41 7
136	1850							ON	OFF	41 7
137	1850							OFF	ON	41 7
186	1850							NO	YES	41 7
200	1850	EM						WAIT	RUN	41 7
212	1850	LS	3740		3740		HI EXP MAIN BUS CURRENT			41 7
213	1850	LS	3358		2396		EXP MAIN BUS VOLTAGE OOL			41 7
214	1850	LS	410				HI IFEA LOWER HUMIDITY			41 7
215	1850	LS	410				HI IFEA UPPER HUMIDITY			41 7
216	1850	LS	1911		887		887 IFEA PRESSURE 1 OOL			41 7
217	1850	LS	1911		887		887 IFEA PRESSURE 2 OOL			41 7
218	1850	LS	1954				HI LOWER ATMOS TEMP			41 7
219	1850	LS	1954				HI UPPER ATMOS TEMP			41 7
220	1850	LS	504				HI IFEA WATER INLET TEMP			41 7
221	1850	LS	827				HI IFEA WATER OUTLET TEMP			41 7
222	1850	LS	827				HI CLD END SHELL TEMP			41 7
223	1850	LS	827				HI HOT END SHELL TEMP			41 7
224	1850	LS	827				HI RFM WATER OUTLET TEMP			41 7
261	1850	LS	2007				HI STEP MTR PHASE A CURRENT			41 7
262	1850	LS	2163				HI STEP MTR PHASE A VOLTAGE			41 7
263	1850	LS	2007				HI STEP MTR PHASE B CURRENT			41 7
264	1850	LS	2163				HI STEP MTR PHASE B VOLTAGE			41 7
266	1850	LS	827				HI FTS STEPPER MOTOR TEMP			41 7
268	1850	LS	3003				HI COLD GUARD HTR CURRENT			41 7
269	1850	LS	1536				HI COLD GUARD HTR VOLTAGE			41 7
270	1850	LS	3003				HI COLD PRIM HTR CURRENT			41 7



TABLE 1.7-5. POIC LIMIT SENSING/EXCEPTION MONITOR REQUIREMENTS (Sheet 6 of 14)

IC NO	WARNING VALUES (YELLOW LINE)	CRITICAL VALUES (RED LINE)	EXCEPTION MONITOR MESSAGE	DI STATE CODE	STATE
1271	850 LS	1536	HI COLD PRIM HTR VOLTAGE	1	4117
1272	850 LS	3003	HI COLD RED HTR CURRENT	1	4117
1273	850 LS	1536	HI COLD RED HTR VOLTAGE	1	4117
1274	850 LS	3003	HI BOOST HTR CURRENT	1	4117
1275	850 LS	3072	HI BOOST HTR VOLTAGE	1	4117
1276	850 LS	3003	HI HOT GUARD HTR CURRENT	1	4117
1277	850 LS	1536	HI HOT GUARD HTR VOLTAGE	1	4117
1278	850 LS	3003	HI HOT PRIM HTR CURRENT	1	4117
1279	850 LS	3072	HI HOT PRIM HTR VOLTAGE	1	4117
1280	850 LS	3003	HI HOT RED HTR CURRENT	1	4117
1281	850 LS	3072	HI HOT RED HTR VOLTAGE	1	4117
1282	850 LS	907	HI CJ TEMP - COLD ZONE #1	1	4117
1283	850 LS	907	HI CJ TEMP - COLD ZONE #2	1	4117
1284	850 LS	907	HI CJ TEMP - HOT ZONE #1	1	4117
1285	850 LS	907	HI CJ TEMP - HOT ZONE #2	1	4117
1286	850 LS	907	HI CJ TEMP-SAMPLE 1 SENSOR 1	1	4117
1287	850 LS	907	HI CJ TEMP-SAMPLE 1 SENSOR 2	1	4117
1288	850 LS	907	HI CJ TEMP-SAMPLE 2 SENSOR 1	1	4117
1289	850 LS	907	HI CJ TEMP-SAMPLE 2 SENSOR 2	1	4117
1290	850 LS	907	HI CJ TEMP-SAMPLE 3 SENSOR 1	1	4117
1291	850 LS	907	HI CJ TEMP-SAMPLE 3 SENSOR 2	1	4117
1292	850 LS	907	HI CJ TEMP-SAMPLE 4 SENSOR 1	1	4117
1293	850 LS	907	HI CJ TEMP-SAMPLE 4 SENSOR 2	1	4117
1294	850 LS	907	HI CJ TEMP-SAMPLE 5 SENSOR 1	1	4117
1295	850 LS	907	HI CJ TEMP-SAMPLE 5 SENSOR 2	1	4117
1296	850 LS	907	HI CJ TEMP-SAMPLE 6 SENSOR 1	1	4117
1297	850 LS	907	HI CJ TEMP-SAMPLE 6 SENSOR 2	1	4117
1313	850 LS	1227	HI ALIGN ARM TEMP	1	4117
1314	850 LS	907	HI SEM TRACK TEMP	1	4117
1465	850			NO	4117
1466	850			NO	4117
1467	850			NO	4117
1468	850			NO	4117
0	0	1	1	1	1
0	0	1	2	2	3
3	5	2	0	8	6
				6	8
				2	1
				7	3
				9	1
				7	8
				2	8
				9	1
				7	3

TABLE 1.7-5. POIC LIMIT SENSING/EXCEPTION MONITOR REQUIREMENTS (Sheet 7 of 14)

E N O I M T N U R O Y	WARNING VALUES (YELLOW LINE)		CRITICAL VALUES (RED LINE)		EXCEPTION MONITOR MESSAGE	DI STATE CODE	E I T X A P B I L D E
	U P P E R L I M I T	L O W E R L I M I T	U P P E R L I M I T	L O W E R L I M I T / E X P E C T E D S T A T E			
4691850						NO	YES 41171
4891850						OK	FAIL 41171
4901850						OK	FAIL 41171
4911850						OK	FAIL 41171
4921850						OK	FAIL 41171
4931850						OK	FAIL 41171
4941850						OK	FAIL 41171
4951850						OK	FAIL 41171
4961850						OK	FAIL 41171
4971850						OK	FAIL 41171
4981850						OK	FAIL 41171
4991850						OK	FAIL 41171
5001850						OK	FAIL 41171
5011850						OK	FAIL 41171
5021850						OK	FAIL 41171
5031850						OK	FAIL 41171
5041850						OK	FAIL 41171
5051850						OK	FAIL 41171
5061850						OK	FAIL 41171
5071850						OK	FAIL 41171
5081850						OK	FAIL 41171
5091850						OK	FAIL 41171
5101850						OK	FAIL 41171
5111850						OK	FAIL 41171
5121850						OK	FAIL 41171
5131850						OK	FAIL 41171
5141850						OK	FAIL 41171
5151850						OK	FAIL 41171
5161850						OK	FAIL 41171
5171850						OK	FAIL 41171
5181850						OK	FAIL 41171
5191850						OK	FAIL 41171
5201850						OK	FAIL 41171

TABLE 1.7-5. POIC LIMIT SENSING/EXCEPTION MONITOR REQUIREMENTS (Sheet 8 of 14)

E N O M T	I C N I	WARNING VALUES (YELLOW LINE)			CRITICAL VALUES (RED LINE)			EXCEPTION MONITOR MESSAGE	IDI STATE CODE	I D E		
		U P P E R L I M I T	L O W E R L I M I T	U P P E R L I M I T	L O W E R L I M I T	U P P E R L I M I T	L O W E R L I M I T				EXPECTED STATE	
1521	850								OK	FAIL	41	7
1522	850								OK	FAIL	41	7
1523	850								OK	FAIL	41	7
1524	850								OK	FAIL	41	7
1525	850								OK	FAIL	41	7
1526	850								OK	FAIL	41	7
1527	850								OK	FAIL	41	7
1528	850								OK	FAIL	41	7
1529	850								OK	FAIL	41	7
1530	850								OK	FAIL	41	7
1531	850								OK	FAIL	41	7
1532	850								OK	FAIL	41	7
1533	850								OK	FAIL	41	7
1534	850								OK	FAIL	41	7
1535	850								OK	FAIL	41	7
1536	850								OK	FAIL	41	7
1537	850								OK	FAIL	41	7
1538	850								OK	FAIL	41	7
1539	850								OK	FAIL	41	7
1540	850								OK	FAIL	41	7
1541	850								OK	FAIL	41	7
1542	850								OK	FAIL	41	7
1543	850								OK	FAIL	41	7
1544	850								OK	FAIL	41	7
1545	850								OK	FAIL	41	7
1546	850								OK	FAIL	41	7
1547	850								OK	FAIL	41	7
1548	850								OK	FAIL	41	7
1549	850								OK	FAIL	41	7
1550	850								OK	FAIL	41	7
1551	850								OK	FAIL	41	7
1552	850								OK	FAIL	41	7
1553	850								OK	FAIL	41	7
0	0	1	2	0	1	2	0	1	6	7	7	8
3	5	2	2	8	1	2	8	6	6	2	9	1

TABLE 1.7-5. POIC LIMIT SENSING/EXCEPTION MONITOR REQUIREMENTS (Sheet 9 of 14)

E N U R	I C N O M T O Y	WARNING VALUES (YELLOW LINE)			CRITICAL VALUES (RED LINE)			EXCEPTION MONITOR MESSAGE	DI STATE CODE	I D E
		U P P E R L I M I T	L O W E R L I M I T	L O W E R L I M I T	U P P E R L I M I T	L O W E R L I M I T	L O W E R L I M I T			
554	850							OK	FAIL	417
555	850							OK	FAIL	417
556	850							OK	FAIL	417
557	850							OK	FAIL	417
558	850							OK	FAIL	417
559	850							OK	FAIL	417
560	850							OK	FAIL	417
561	850							OK	FAIL	417
562	850							OK	FAIL	417
563	850							OK	FAIL	417
564	850							OK	FAIL	417
565	850							OK	FAIL	417
566	850							OK	FAIL	417
567	850							OK	FAIL	417
568	850							OK	FAIL	417
569	850							OK	FAIL	417
570	850							OK	FAIL	417
571	850							OK	FAIL	417
572	850							OK	FAIL	417
573	850							OK	FAIL	417
574	850							OK	FAIL	417
575	850							OK	FAIL	417
576	850							OK	FAIL	417
577	850							OK	FAIL	417
578	850							OK	FAIL	417
579	850							OK	FAIL	417
580	850							OK	FAIL	417
581	850							OK	FAIL	417
582	850							OK	FAIL	417
583	850							OK	FAIL	417
584	850							OK	FAIL	417
585	850							OK	FAIL	417
586	850							OK	FAIL	417

TABLE 1.7-5. POIC LIMIT SENSING/EXCEPTION MONITOR REQUIREMENTS (Sheet 10 of 14)

E N O I R T R Y R I	C N I O M T R M R I E I T I O R	WARNING VALUES (YELLOW LINE)		CRITICAL VALUES (RED LINE)		EXCEPTION MONITOR MESSAGE	DI STATE CODE	E I X P I D
		UPPER LIMIT	LOWER LIMIT	UPPER LIMIT	LOWER LIMIT/ EXPECTED STATE			
587	1850						OK	4117
588	1850						OK	4117
589	1850						OK	4117
590	1850						OK	4117
591	1850						OK	4117
592	1850						OK	4117
593	1850						OK	4117
594	1850						OK	4117
595	1850						OK	4117
596	1850						OK	4117
597	1850						OK	4117
598	1850						OK	4117
599	1850						OK	4117
600	1850						OK	4117
601	1850						OK	4117
602	1850						OK	4117
603	1850						OK	4117
604	1850						OK	4117
605	1850						OK	4117
606	1850						OK	4117
607	1850						OK	4117
608	1850						OK	4117
609	1850						OK	4117
610	1850						OK	4117
611	1850						OK	4117
612	1850						OK	4117
613	1850						OK	4117
614	1850						OK	4117
615	1850						OK	4117
616	1850						OK	4117
617	1850						OK	4117
618	1850						OK	4117
619	1850						OK	4117

TABLE 1.7-5. POIC LIMIT SENSING/EXCEPTION MONITOR REQUIREMENTS (Sheet 11 of 14)

IC N I E N U I R O Y T M I R N P I E T Y E R I O I R I	WARNING VALUES (YELLOW LINE)		CRITICAL VALUES (RED LINE)		EXCEPTION MONITOR MESSAGE	DI STATE CODE	DI STATE CODE
	UPPER LIMIT	LOWER LIMIT	UPPER LIMIT	LOWER LIMIT/ EXPECTED STATE			
62018501						OK	FAIL 41171
62118501						OK	FAIL 41171
62218501						OK	FAIL 41171
62318501						OK	FAIL 41171
62418501						OK	FAIL 41171
62518501						OK	FAIL 41171
62618501						OK	FAIL 41171
62718501						OK	FAIL 41171
62818501						OK	FAIL 41171
62918501						OK	FAIL 41171
63018501						OK	FAIL 41171
63118501						OK	FAIL 41171
63218501						OK	FAIL 41171
63318501						OK	FAIL 41171
63418501						OK	FAIL 41171
63518501						OK	FAIL 41171
63618501						OK	FAIL 41171
63718501						OK	FAIL 41171
63818501						OK	FAIL 41171
63918501						OK	FAIL 41171
64018501						OK	FAIL 41171
64118501						OK	FAIL 41171
64218501						OK	FAIL 41171
64318501						OK	FAIL 41171
64418501						OK	FAIL 41171
64518501						OK	FAIL 41171
64618501						OK	FAIL 41171
64718501						OK	FAIL 41171
64818501						OK	FAIL 41171
64918501						OK	FAIL 41171
65018501						OK	FAIL 41171
65118501						OK	FAIL 41171
65218501						OK	FAIL 41171

TABLE 1.7-5. POIC LIMIT SENSING/EXCEPTION MONITOR REQUIREMENTS (Sheet 12 of 14)

E N O I R	I C M T O Y	WARNING VALUES (YELLOW LINE)		CRITICAL VALUES (RED LINE)		DI STATE CODE	EXCEPTION MONITOR MESSAGE	DI STATE CODE
		U P P E R L I M I T	L O W E R L I M I T	U P P E R L I M I T	L O W E R L I M I T			
1653	850					OK		FAIL   41   7
1654	850					OK		FAIL   41   7
1655	850					OK		FAIL   41   7
1656	850					OK		FAIL   41   7
1657	850					OK		FAIL   41   7
1658	850					OK		FAIL   41   7
1659	850					OK		FAIL   41   7
1660	850					OK		FAIL   41   7
1661	850					OK		FAIL   41   7
1662	850					OK		FAIL   41   7
1663	850					OK		FAIL   41   7
1664	850					OK		FAIL   41   7
1665	850					OK		FAIL   41   7
1666	850					OK		FAIL   41   7
1667	850					OK		FAIL   41   7
1668	850					OK		FAIL   41   7
1669	850					OK		FAIL   41   7
1670	850					OK		FAIL   41   7
1671	850					OK		FAIL   41   7
1672	850					OK		FAIL   41   7
1673	850					OK		FAIL   41   7
1674	850					OK		FAIL   41   7
1675	850					OK		FAIL   41   7
1676	850					OK		FAIL   41   7
1677	850					OK		FAIL   41   7
1678	850					OK		FAIL   41   7
1679	850					OK		FAIL   41   7
1680	850					OK		FAIL   41   7
1681	850					OK		FAIL   41   7
1682	850					OK		FAIL   41   7
1683	850					OK		FAIL   41   7
1684	850					OK		FAIL   41   7
1685	850					OK		FAIL   41   7

TABLE 1.7-5. POIC LIMIT SENSING/EXCEPTION MONITOR REQUIREMENTS (Sheet 13 of 14)

IC N I E N I O N U I R T M I R R B I Y E I R I O I R	WARNING VALUES (YELLOW LINE)		CRITICAL VALUES (RED LINE)		EXCEPTION MONITOR MESSAGE	DI STATE CODE	DI STATE CODE
	UPPER LIMIT	LOWER LIMIT	UPPER LIMIT	LOWER LIMIT/ EXPECTED STATE			
686 850						OK	FAIL 41 7
687 850						OK	FAIL 41 7
688 850						OK	FAIL 41 7
689 850						OK	FAIL 41 7
690 850						OK	FAIL 41 7
691 850						OK	FAIL 41 7
692 850						OK	FAIL 41 7
693 850						OK	FAIL 41 7
694 850						OK	FAIL 41 7
695 850						OK	FAIL 41 7
696 850						OK	FAIL 41 7
697 850						OK	FAIL 41 7
698 850						OK	FAIL 41 7
699 850						OK	FAIL 41 7
700 850						OK	FAIL 41 7
701 850						OK	FAIL 41 7
702 850						OK	FAIL 41 7
703 850						OK	FAIL 41 7
704 850						OK	FAIL 41 7
705 850						OK	FAIL 41 7
706 850						OK	FAIL 41 7
707 850						OK	FAIL 41 7
708 850						OK	FAIL 41 7
709 850						OK	FAIL 41 7
710 850						OK	FAIL 41 7
711 850						OK	FAIL 41 7
712 850						OK	FAIL 41 7
713 850						OK	FAIL 41 7
714 850						OK	FAIL 41 7
715 850						OK	FAIL 41 7
716 850						OK	FAIL 41 7
717 850						OK	FAIL 41 7
718 850						OK	FAIL 41 7



TABLE 1.7-5. POIC LIMIT SENSING/EXCEPTION MONITOR REQUIREMENTS (Sheet 14 of 14)

C N I	WARNING VALUES (YELLOW LINE)			CRITICAL VALUES (RED LINE)			DI STATE CODE	E T A	
	U R O Y	U P P E R L I M I T	L O W E R L I M I T	U P P E R L I M I T	L O W E R L I M I T	0 =			1 =
EXCEPTION MONITOR MESSAGE								I B I	
									I L I
								D E I	
1719850							OK		FAIL
1720850							OK	FAIL	417
1721850							OK	FAIL	417
1722850							OK	FAIL	417
1723850							OK	FAIL	417
1724850							OK	FAIL	417
1725850							OK	FAIL	417
1726850							OK	FAIL	417
1727850							OK	FAIL	417
1728850							OK	FAIL	417
1729850							OK	FAIL	417
1730850							OK	FAIL	417
1731850							OK	FAIL	417
1732850							OK	FAIL	417
1733850							OK	FAIL	417
1734850							OK	FAIL	417
1735850							OK	FAIL	417
1736850							OK	FAIL	417
1737850							OK	FAIL	417
1738850							OK	FAIL	417
1739850							OK	FAIL	417
1740850							OK	FAIL	417
1741850							OK	FAIL	417
1742850							OK	FAIL	417
1743850							OK	FAIL	417
1744850							OK	FAIL	417
1745850							OK	FAIL	417
1746850							OK	FAIL	417
1747850							OK	FAIL	417
1748850							OK	FAIL	417
1749850							OK	FAIL	417
1750850							OK	FAIL	417
1264851							RUN	WAIT	427
1266851							NO	YES	427

## 1.8. FLIGHT SOFTWARE REQUIREMENTS

This section of the Experiment/Facility Requirements Document (E/FRD) defines the Space Station Freedom (SSF) Data Management System (DMS) software functions required to support the Space Station Furnace Facility (SSFF).

The SSFF Core Control Unit (CCU) software will interface to the SSF Payload Executive Software (PES) for DMS services and executive-level control. The SSFF Furnace Control Unit (FCU) and Furnace Actuator Unit (FAU) software provides networking, data processing, storage, and data acquisition and control for Furnace Module-1. The SSFF software external interface diagram is shown in Figure 1.8-1. The SSFF software component tree is shown in Figure 1.8-2. These components will reside in the DMS hardware. The following subsections define the required resources and data handling requirements.

### 1.8.1 COMMAND SUPPORT

The SSF via the PES software will support the issuance of commands and SSFF activation given by the ground, onboard crew, or Tier 1.

### 1.8.2 HEALTH AND STATUS DATA

The PES will acquire health and status data from the SSFF and distribute it to Tier 1 on board and to the Payload Operations Integration Center (POIC) on the ground.

### 1.8.3 ONBOARD STORAGE

The SSF will provide storage for SSFF and/or Furnace Module-1 program loads, operations, status, and science data.

### 1.8.4 DISPLAY

The SSF multipurpose application console (MPAC) will provide backup support of the SSFF crew interface for onboard SSFF configuration and preparations for Furnace Module-1 experiment operations.

### 1.8.5 PROGRAM LOADS AND MODIFICATIONS DOWNLOADING

The SSF software shall support the downloading of SSFF program loads and modifications.

### 1.8.6 ANCILLARY DATA

The SSF shall support requests for ancillary data.

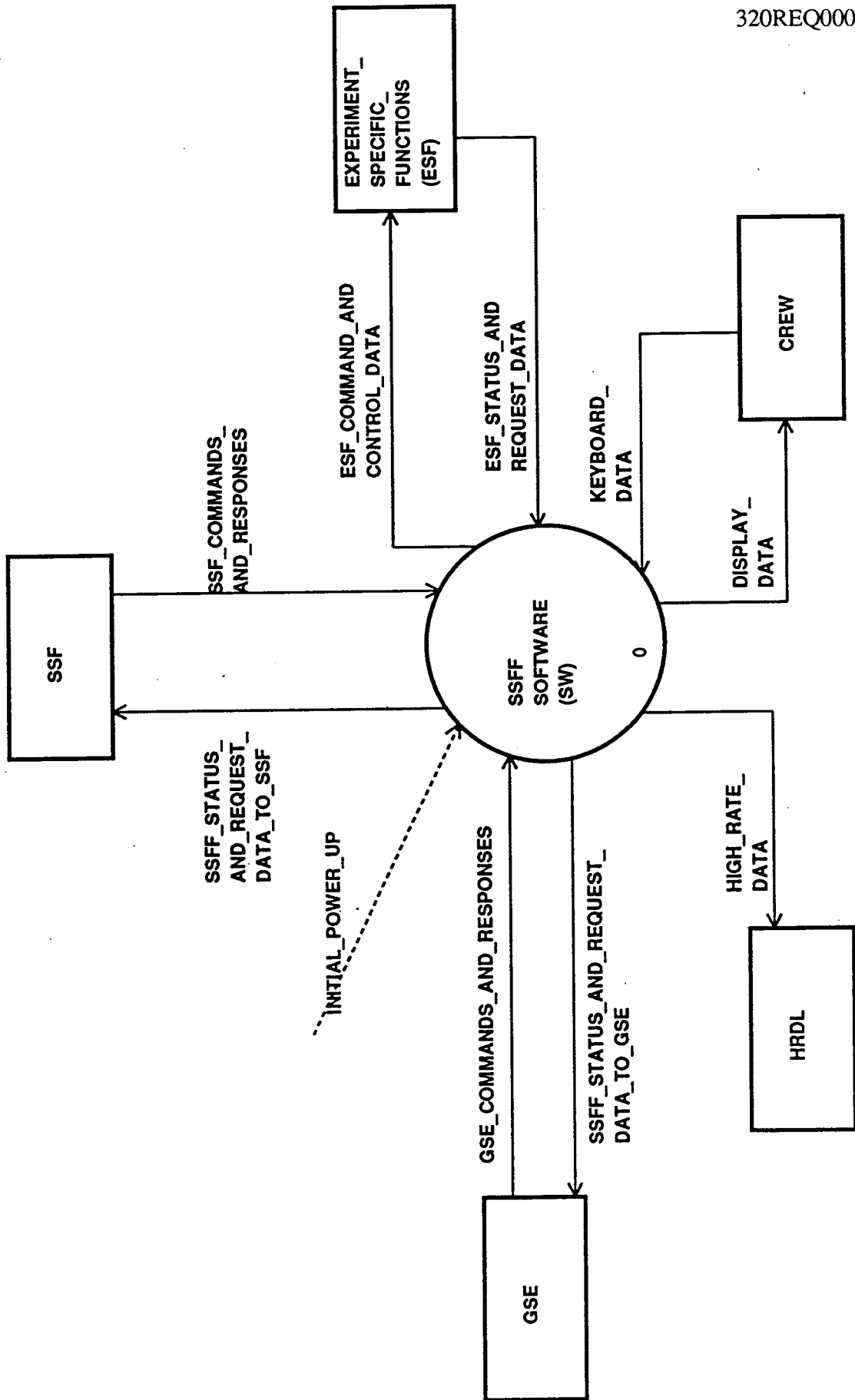


FIGURE 1.8-1. SSFF SOFTWARE EXTERNAL INTERFACE DIAGRAM

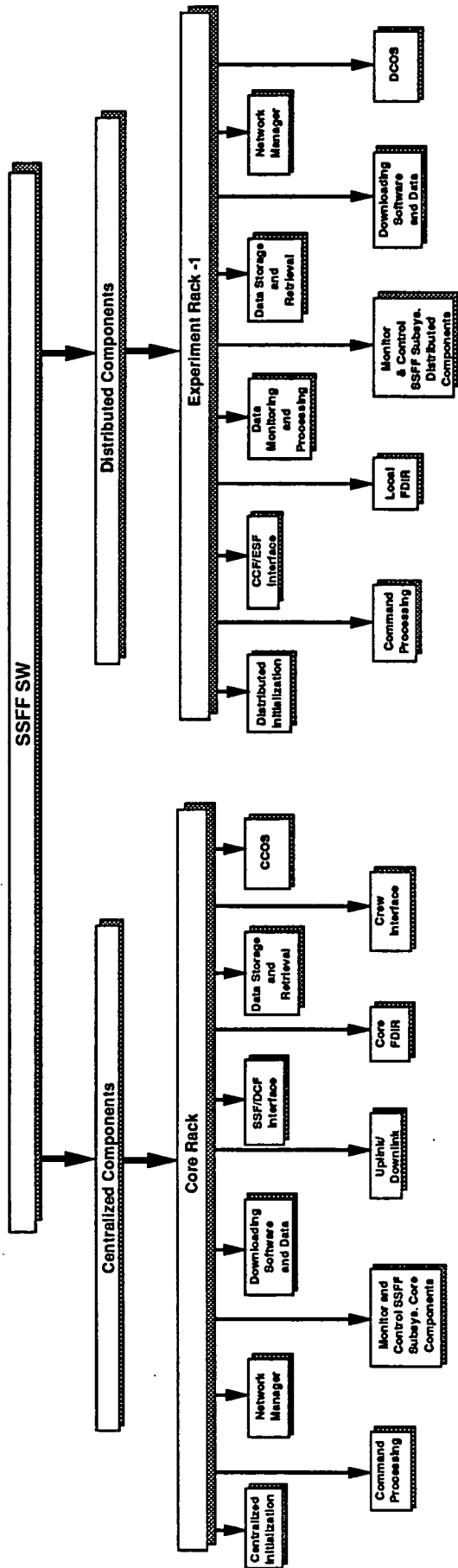


FIGURE 1.8-2. SOFTWARE COMPONENT TREE

## 1.9. PHYSICAL INTEGRATION

### 1.9.1 RACK INTEGRATION AND CHECKOUT

Physical integration during prelaunch consists of checkout and integration of Furnace Module-1, the individual Core Rack and Experiment Rack-1, and finally the SSFF as an integrated system. Interfaces are progressively verified as the buildup of the Space Station Furnace Facility (SSFF) is performed. Following shipment to Kennedy Space Center (KSC), the facility is visually checked for physical integrity, and a limited functional test is performed to ensure operability and Space Station Freedom (SSF) interface compatibility. The prelaunch activities flow is shown in Figure 1.9-1. Table 1.9-1 provides the integration facility requirements for each stage of integration. Table 1.9-2 describes the requirements and activities at each step of the integration process.

#### 1.9.1.1 Core Rack Checkout

Tests, using the appropriate ground support equipment (GSE) including SSF and experiment rack interface simulators, will be performed to verify proper operations of the Core Rack. Testing will include operation of each SSFF subsystem and component to its operational limits, and an integrated SSFF exercising each of the interface functions, through the use of simulators, with the SSF and the experiment rack.

#### 1.9.1.2 Experiment Rack-1 Checkout

The pre-experiment rack checkout will consist of verifying the performance of the SSFF distributed subsystems in Experiment Rack-1 and its interfaces to the Core Rack and Furnace Module-1.

#### 1.9.1.3 Furnace Module-1 Checkout

Furnace Module-1 tests will be used to verify the performance to operational limits with the exception that heater limits will only be to the extent that they prove operability. The Furnace Module-1 interface to Experiment Rack-1 will be verified through the functional performance tests and the physical connects of the experiment rack simulator.

#### 1.9.1.4 Integrated Furnace Rack Checkout

Following integration of Furnace Module-1 into Experiment Rack-1, the rack performance and interfaces will be verified using a Core Rack simulator and test set. Tests will be limited to only those required to verify Furnace Module-1 to Experiment Rack-1 interfaces.

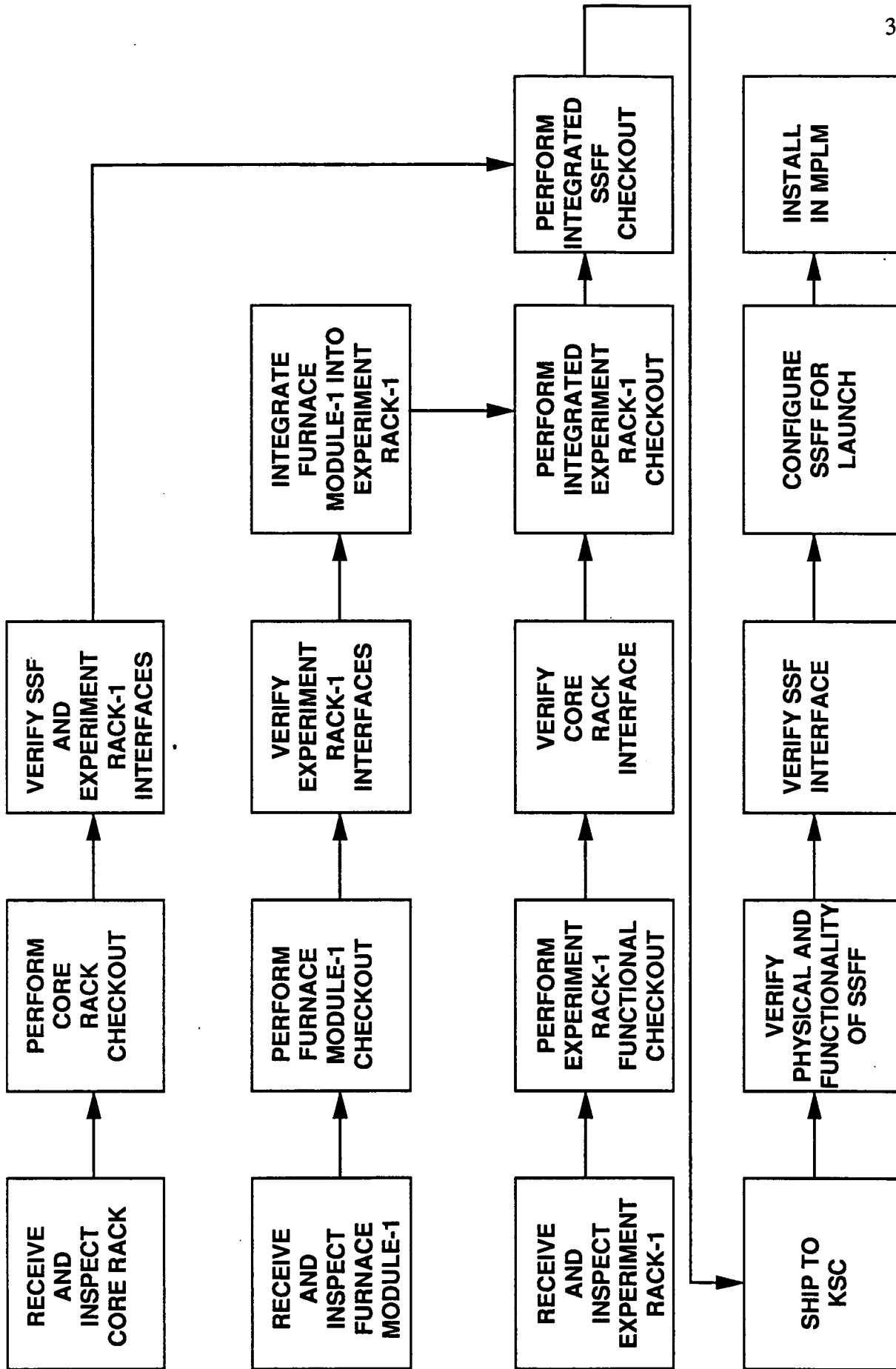


FIGURE 1.9-1. PHYSICAL INTEGRATION FLOW

TABLE 1.9-1. SSFF INTEGRATION GROUND PROCESSING REQUIREMENTS

<input checked="" type="checkbox"/>	Experiment/Facility Preintegration	
<input type="checkbox"/>	Experiment/Facility Preparation	
<input type="checkbox"/>	Postmission Requirements	
<b>Description of Planned Activities:</b>		
Rack Integration, Rack Functional Tests, SSFF Systems Integrated Tests		
Total Floor Space Required Including Space for GSE: <u>2000</u> ft <sup>2</sup>		
Ceiling Height Required: <u>10</u> ft		
Overhead Crane Required: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Hook Height <u>8</u> ft		
Facility Power Required:		
<input checked="" type="checkbox"/>	120 V, 1 F, 60 Hz	
<input type="checkbox"/>	208 V, 3 F, 60 Hz	
<input type="checkbox"/>	Other	
Other Facility Support: Gases		
<input checked="" type="checkbox"/>	GN <sub>2</sub>	Liquids <u>Single Phase</u>
<input type="checkbox"/>	GHe	<u>Precooled</u>
<input checked="" type="checkbox"/>	GA <sub>r</sub> Other	<u>H<sub>2</sub>O</u>
Environment: <input checked="" type="checkbox"/> Standard <input type="checkbox"/> Other		
Hazardous Operations: <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		
Total Anticipated Use Time: <u>45</u> Days		
Other Facility Support Description:		
GSE Test sets including the following interface simulators:		
<ul style="list-style-type: none"> <li>* Furnace Module-to-Experiment</li> <li>* Core Rack-to-Experiment Rack</li> <li>* Experiment Rack-to-Core Rack</li> <li>* SSF-to-Core Rack</li> <li>* Experiment Rack Subsystem-to-Furnace Module</li> </ul>		

TABLE 1.9-2. SSFF INTEGRATION REQUIREMENTS

**Description of Special Alignment, Calibration, Servicing, or Performance Verification and Estimated Time to Perform:**

- \* Vent & Purge test of Furnace Module-1 - 60 min
- \* Calibration of Analog Sensors - 90 min

**Identification of Any Constraints on Experiment/Facility Operations During Tests:**

None Identified

**Description of Time-Critical Operations and Time Constraints:**

None Identified



#### 1.9.1.5 SSFF Facility Checkout

Following checkout of the individual racks, an overall SSFF integrated systems test will be performed. Tests will be limited to verify Core Rack-to-Experiment Rack-1 interfaces and to SSF.

#### 1.9.2 KSC VERIFICATION

Physical integration at KSC will be limited to receiving/inspection of the SSFF hardware complement and to reverification of the physical and functional interfaces with the SSF.

#### 1.9.3 POSTLANDING

Postlanding activities consist of the following: (1) Removing the SSFF equipment and experiment samples from the returning Mini-Pressurized Logistics Module (MPLM); (2) returning the Furnace Module-1 samples to the Payload Investigator; (3) removing the Furnace Module-1 from Experiment Rack-1 and returning it to the PED; and (4) refurbishing Experiment Rack-1. These activities are shown in Table 1.9-3 and Figure 1.9-2.

TABLE 1.9-3. SSFF POSTLANDING GROUND PROCESSING REQUIREMENTS

- Experiment/Facility Preintegration  
 Experiment/Facility Preparation  
 Postmission Requirements

**Description of Planned Activities:**

Remove flight samples from stowage and return to Experimenter.  
 Remove flight rack from MPLM.  
 Remove furnace module from experiment rack and return to PED.  
 Move experiment rack to the rack refurb area and refurbish experiment rack.  
 Ship rack to the rack integration and checkout area.

Total Floor Space Required Including Space for GSE: 2000 ft<sup>2</sup>

Celling Height Required: 10 ft

Overhead Crane Required:  Yes  No Hook Height 8 ft

Facility Power Required: \_\_\_\_\_ 120 V, 1 F, 60 Hz N/A  
 \_\_\_\_\_ 208 V, 3 F, 60 Hz  
 \_\_\_\_\_ Other

Other Facility Support: Gases N/A \_\_\_\_\_ GN<sub>2</sub> Liquids N/A  
 \_\_\_\_\_ GHe \_\_\_\_\_  
 \_\_\_\_\_ Other \_\_\_\_\_

Environment:  Standard \_\_\_\_\_ Other

Hazardous Operations: \_\_\_\_\_ Yes  No

Total Anticipated Use Time: 3 Days

**Other Facility Support Description:**

Module shipping container  
 Rack shipping container  
 Rack rotation stand

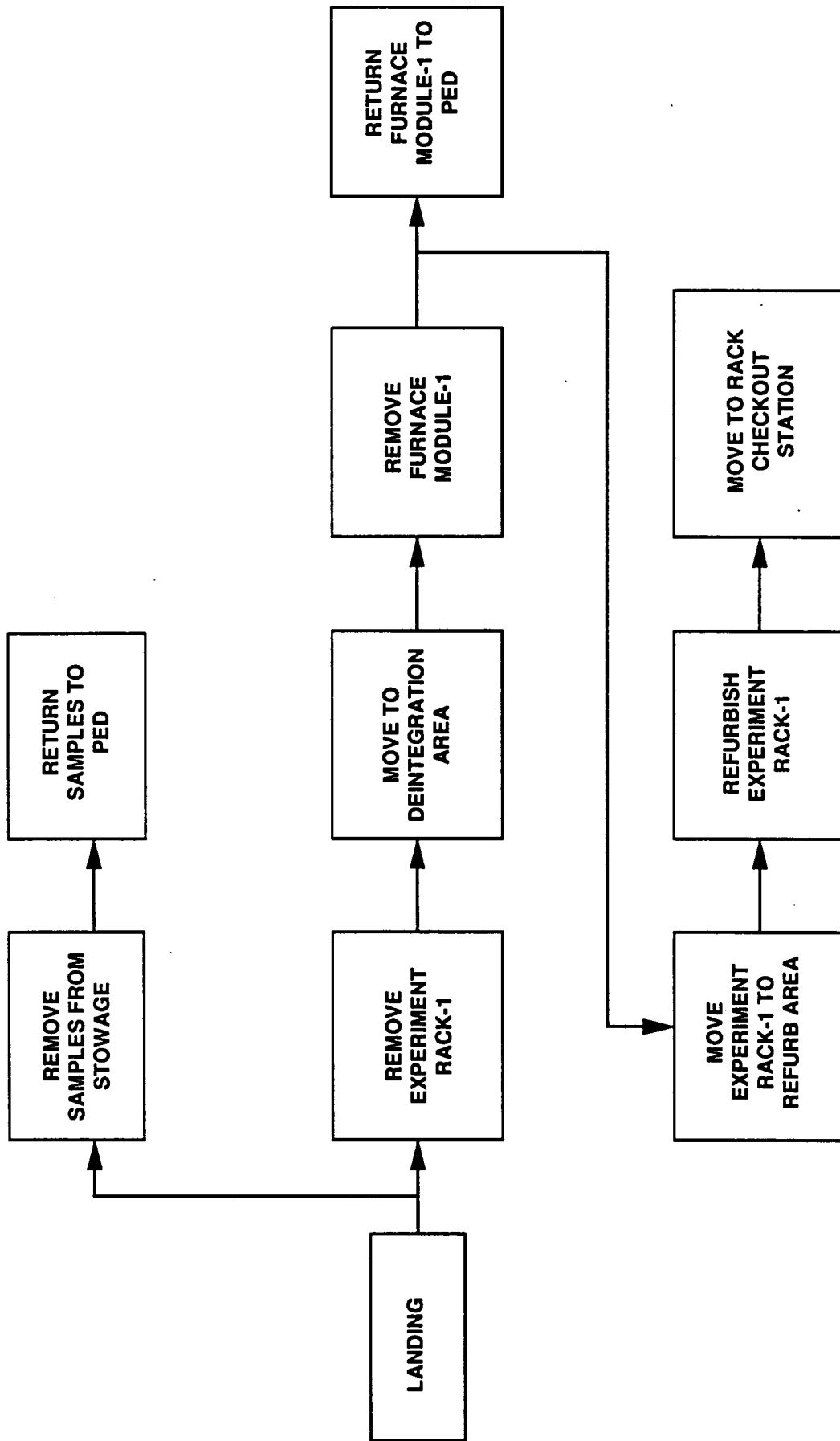


FIGURE 1.9-2. PHYSICAL DEINTEGRATION FLOW

## **1.10. OPERATIONS SUPPORT**

Table 1.10-1 describes the physical and operational support required at the Ground Science Operations Control Center during flight of the Space Station Furnace Facility (SSFF).

TABLE 1.10-1. SSFF MISSION OPERATIONS SUPPORT

**COMMUNICATIONS REQUIREMENTS:****Downlink Data**

TBD

**Uplink Commands/data**

TBD

**Voice Communications**

TBD

**Video**

TBD

**SUPPORT EQUIPMENT:****Description**

TBD

**Dimensions**

TBD

**Power Requirements**

TBD

**Data Interface**

TBD

**REMOTE SITE INTERFACE****Location**

TBD

**Describe interfaces**

TBD

## 1.11. TRAINING OBJECTIVES

Table 1.11-1 correlates the training requirements with the appropriate trainees and trainers, and identifies the source of the training requirements. Table 1.11-2 summarizes the requirements for each training objective.

TABLE 1.11-1. TRAINING PARTICIPATION

Training Objectives	Trainee	Trainer
-PED/PI Defined  TBD		
-PAM and PED/PI Jointly Defined  TBD		
-PAM Defined  TBD		

TABLE 1.11-2. TRAINING OBJECTIVES (Sheet 1 of 4)

NO.	TRAINING OBJECTIVE	TRAINEE	RESPON- SIBILITY	Y/N	SIMULATOR			COMMENTS
					H/W	S/W	PROVIDER	
					FIDELITY	Y/N		
1.0	<b>SCIENCE BACKGROUND</b>							
1.1	Present science basis and significance of the SSFF	payload crew, cadre	PED/PI	N				
1.2	Present operational objectives	payload crew, cadre	PED/PI	N				
1.3	Present SSFF operational theory	payload crew, cadre	PED/PI	N				
1.4	Present operations philosophy	payload crew, cadre	PED/PI	N				
2.0	<b>SSFF SYSTEMS FAMILIARIZATION</b>							
2.1	Characterize the SSFF hardware elements	payload crew, cadre	PED/PI	Y	a	Y	PED/PI	
2.1.1	Rack location of the FM-1, rack location of the Core							
2.1.2	FM-1 and subsystem components							
2.1.3	Module stowage							
2.1.4	DMS							



TABLE 1.11-2. TRAINING OBJECTIVES (Sheet 2 of 4)

NO.	TRAINING OBJECTIVE	TRAINEE	RESPON- SIBILITY	Y/N	SIMULATOR			COMMENTS
					H/W	FIDELITY	S/W	
2.2	Characterize FM-1 software associated with the following:	payload crew, cadre	PED/PI	Y	a	Y	PED/PI	
2.2.1	DMS							
2.2.2	FM-1 command capabilities							
2.2.3	In-flight computer requirements							
2.2.4	Timeline requirements							
2.2.5	Furnace Control Units							
2.3	Characterize FM-1 data collection							
2.3.1	Onboard routing/recording	payload crew, cadre	PED/PI	Y	a	Y	PED/PI	
2.3.2	Downlink data and voice							
2.4	Characterize FM-1 GSE							
2.5	Characterize SSF interface	payload crew, cadre	PED/PI	Y	a	Y	PED/PI	
2.5.1	Power, fluids, and thermal interfaces	payload crew, cadre	PED/PI	Y	a	Y	PED/PI	
2.6	Characterize the following SSFF operational requirements and constraints:	payload crew, cadre	PED/PI	Y			PED/PI	
2.6.1	Specific attitudes or conditions							
2.6.2	Microgravity requirements (limiting crew motion and g-level constraints)							

TABLE 1.11-2. TRAINING OBJECTIVES (Sheet 3 of 4)

NO.	TRAINING OBJECTIVE	TRAINEE	RESPON- SIBILITY	SIMULATOR				COMMENTS
				Y/N	H/W	S/W	PROVIDER	
3.0	<b>FM-1 OPs FAMILIARIZATION</b>							
3.1	Characterize FM-1 nominal operating procedures	payload crew, cadre	PED/PI				PED/PI	
3.1.1	Power on							
3.1.2	Sample changeout							
3.1.3	Power off							
3.1.4	FM-1 safing and stowage							
4.0	<b>FM-1 PROFICIENCY OBJECTIVES</b>							
4.1	Provide proficiency training in FM-1 operations	payload crew, cadre	PI/PAM	Y			PED/PI/ PAM	
4.2	Characterize malfunction/alternate procedures including fault definition	payload crew, cadre	PI/PAM	Y			PED/PI/ PAM	
5.0	<b>INTEGRATED TIMELINE PROFICIENCY</b>							
5.1	Provide additional proficiency training in FM-1 ops as it relates to the joint operations	payload crew, cadre	PI/PAM	Y			PED/PI/ PAM	
5.2	Provide additional training as it pertains to off-nominal procedures for joint operations	payload crew, cadre	PI/PAM	Y			PED/PI/ PAM	
5.3	Provide proficiency training in integrated FM-1 ops including hardware/software, SSF/Orbiter/PI interfaces	payload crew, cadre	PI/PAM	Y			PED/PI/ PAM	

TABLE 1.11-2. TRAINING OBJECTIVES (Sheet 4 of 4)

NO.	TRAINING OBJECTIVE	TRAINEE	RESPON- SIBILITY	SIMULATOR				COMMENTS
				Y/N	H/W	S/W	PROVIDER	
6.0	<b>SIMULATIONS</b>							
6.1	Conduct MSFC simulations in order to develop proficiency in the following: console operations, handover, voice protocols, crew/cadre/MCC interfaces, integrated payload operations, STS/SSF payload contingency operations	payload crew, cadre	PAM	Y			PED/PI/ PAM	
6.2	Conduct joint integrated simulations in order to demonstrate proficiency in the following: console positions, handover, voice protocols, crew/cadre/MCC interfaces, payload operations, furnace contingency operations, data retrieval systems, operational interfaces between ground control facilities, mission flight rules							
7.0	<b>MISSION-INDEPENDENT TRAINING</b>							
7.1	Provide STS/SSF mission-independent training	payload crew	PAM/JSC					
7.2	Provide mission-independent training	cadrePI/Sim Team	PAM	N				

## **1.12. ENVIRONMENTAL CONTAMINATION DATA REQUIREMENTS**

Tables 1.12-1 and 1.12-2 illustrate the environmental contamination data requirements for the Space Station Furnace Facility (SSFF).

TABLE 1.12-1. FLIGHT ENVIRONMENT LIMITS

	SENSITIVITY LIMIT			EXPERIMENT GENERATED							
	OPERATING		NON-OPERATING	OPERATING			NON-OPERATING				
	MIN	MAX		MIN	MAX	MIN	MAX	MIN	MAX		
<b>PARTICULATES</b> Size (micrometers)											
Number/m <sup>3</sup>											
Composition											
<b>GASES</b> Composition											
Concentration											
Pressure (kN/m <sup>2</sup> )											

- <1 micron normal operations
- 0.1 to 50 microns following filter changeout
- <1,000 normal operations
- <100,000 following filter changeout
- Ceramic fibers, copper, steel, platinum, wire insulation, organic particles, and sample-sourced materials, including molybdenum, boron nitride, nickel alloys, quartz, silica, and semiconductor materials
- Cabin air, or inert pressurant with cleaning solvents and/or water contaminant
- TBD
- <101.3 for experiment venting
- 66.7 for vent of inert pressurants

TABLE 1.12-2. EXTERNAL CONTAMINATION SOURCES

Does experiment/facility release (vent, purge) any material overboard on orbit?

Yes \_\_\_\_\_ No  X

PARAMETER	DESCRIPTION
FOs of Occurrence Frequency Duration Composition Phase State (solid, liquid, or gas) Quantity or Rate of Release	

**DATA REQUIREMENT (DR) - 10**

**EXPERIMENT/FACILITY REQUIREMENTS DOCUMENT FOR THE  
SPACE STATION FURNACE FACILITY**

**SECTION 2: FURNACE MODULE-1 INPUT**

**MAY 1992**

## FOREWORD

The Space Station Furnace Facility (SSFF) Core is designed to accommodate and support a variety of furnace modules throughout the operational lifetime of the facility. Since the SSFF will be operational for 30 years, and various furnace modules will be accommodated, the Experiment/Facility Requirements Document (E/FRD) is divided into two separate sections. Section 1 describes the integrated SSFF-to-SSF interface, which includes the SSFF Core subsystem requirements and the furnace module requirements based on the information obtained from the Furnace Developer's Section 2, and Section 2 describes the furnace module-to-SSFF interface. Multiple Section 2s may be required for each E/FRD, depending on how many furnace modules the SSFF will accommodate per mission, since a separate Section 2 will be written for each furnace module. Both sections will be replaced for each mission with the appropriate mission-peculiar furnace module and interface requirements.

This section describes the Furnace Module-1 requirements. Furnace Module-1 is scheduled to be an upgrade of the present Crystal Growth Furnace (CGF), and this section reflects the requirements of that module.



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## 2.1. FUNCTIONAL OBJECTIVES AND EQUIPMENT IDENTIFICATION

### 2.1.1 SYSTEM DESCRIPTION

The function of Furnace Module-1 is to grow crystals of semiconductor materials and metal and alloys using the directional solidification and vapor transport crystal growth techniques in a microgravity environment (at temperatures up to 1600 °C). Directional solidification is achieved by melting the sample and solidifying the same while applying a thermal gradient along the longitudinal axis of the sample and translating the furnace or the sample. In the case of Furnace Module-1, the furnace is translated.

The Furnace Module-1 system is shown in Figure 2.1-1. It consists of the following primary elements: the Sample Ampoule/Cartridge Assembly (SACA), the base ring, and the experiment apparatus container (EAC) in which the reconfigurable furnace module (RFM), the furnace translation mechanism (FTM), the sample exchange mechanism (SEM), the sample insertion port (SIP) and the internal support structure (ISS) are housed. The ISS, in addition to providing the structural support for the RFM, the FTM, and attach hardware for the plumbing, provides an interface for the SEM which will have the capability to hold up to six sample ampoules. The bottom section of the EAC is attached to the base ring, which includes the feedthroughs for power, data, fluid, and vent lines.

The Space Station Furnace Facility (SSFF) Thermal Control Subsystem (TCS) water loop will provide cooling for the RFM outer shell, the FTS stepping motor, and the SEM ampoule holding head.

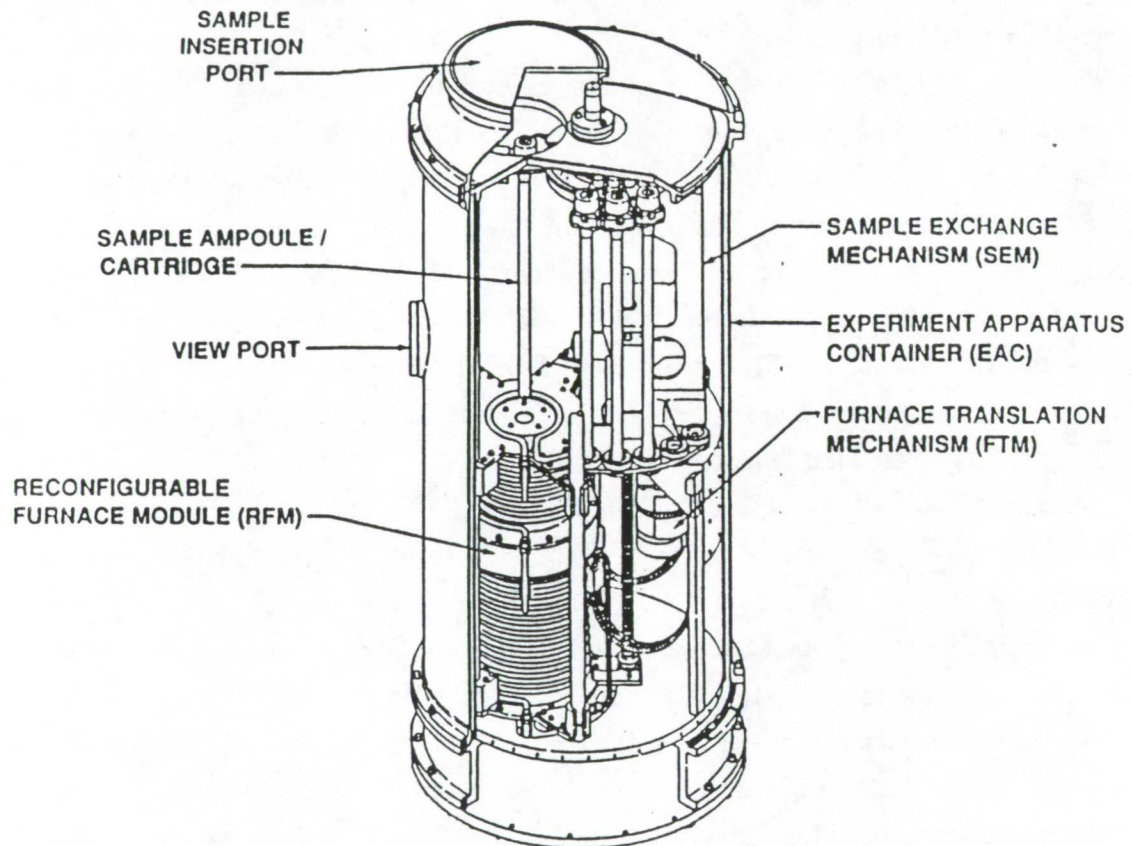
The SSFF Gas Distribution Subsystem (GDS) will supply argon and nitrogen to the EAC in order to provide an inert processing atmosphere for crystal growth.

The SACA consists of a sealed ampoule in which the experiment sample material is contained. The SACA accommodates up to six sample thermocouples and has interfaces for sample ampoule/cartridge failure detection sensors.

At least three levels of containment will be provided during sample processing: The SACA, negative  $\Delta P$  inside the EAC during processing, and the EAC.

At least two levels of containment will be provided during manual sample exchange: The SACA and the flexible glovebox container.

Multiple purge/vent/backfill will be performed prior to manual sample exchange. In addition, a view port is provided on the EAC for visual inspection of the sample ampoules by a crew-member. It is also planned to mount mirrored witness plates inside the EAC to augment



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FIGURE 2.1-1. FURNACE MODULE-1 PICTORIAL REPRESENTATION

visual inspection for detecting any vapor deposition that may have resulted from the sample ampoule/cartridge failure. The design will be compatible with the SSFF.

### 2.1.2 FUNCTIONAL OBJECTIVES

There are nine functional objectives (FOs) for Furnace Module-1 which are structured as one FO for sample exchange, one FO for venting and purging, five FOs for sample processing, one FO for sample loading or shutdown, and one FO for calibration/bakeout. The actual FO numbering is as follows:

- FO-3 Furnace Module-1 Sample Exchange
- FO-4 Furnace Module-1 Vent/Purge
- FO-5 Furnace Module-1 Process Sample HgCdTe
- FO-6 Furnace Module-1 Process Sample HgZnTe
- FO-6A Furnace Module-1 Process Sample Extended HgZnTe
- FO-7 Furnace Module-1 Process Sample CdTe
- FO-8 Furnace Module-1 Process Sample GaAs
- FO-9 Configure Furnace Module-1 for Sample Loading or Shutdown
- FO-11 Furnace Module-1 Process Calibration/Bakeout

Table 2.1-1 shows a listing of the Furnace Module-1 FOs along with the equipment associated with each step of each FO. Step duration, crew time requirements, and average power requirements for each step of each FO are defined in Table 2.1-2, Functional Objective Requirements Sheets.

### 2.1.3 EQUIPMENT IDENTIFICATION

Figure 2.1-2 identifies the Furnace Module-1 components in a block diagram format. Figure 2.1-3 identifies the Furnace Module-1 to SSFF interfaces.

### 2.1.4 OPERATIONAL FUNCTIONAL FLOWS

Preliminary functional flows are shown in Table 2.1-3 for each FO. Functional flows define the function performed, the performing element, and decisions involved in accomplishing each FO.

TABLE 2.1-1. FURNACE MODULE-1 FUNCTIONAL OBJECTIVES (Sheet 1 of 3)

FUNCTIONAL OBJECTIVE		EQUIPMENT REQUIRED
NUMBER	TITLE	ITEM
FO-3	Manual Sample Exchange	Crew Interaction Required
Step 1	Command Manual Exchange	DMS
Step 2	Vent/Fill EAC	GDS
Step 3	Equalize EAC Pressure	GDS, DMS
Step 4	Prep Equipment	
Step 5	Open SIP	EAC
Step 6	Insert Samples	EAC
Step 7	Close Sip	EAC
Step 8	Open Valves	
Step 9	Command Man. Exchange Off	DMS
Step 10	Perform Seal Check	DMS, GDS
Step 11	Load List process	DMS
FO-4	Purge EAC	
Step 1	GN <sub>2</sub> Purge Furnace	DMS, GDS
Step 2	Argon Backfill	DMS, GDS
Step 3	Command Sample Process	DMS
Step 4	TCS Configured	TCS
FO-5	Vapor Crystal Growth of HgCdTe	
Step 1	Activate Furnace for Processing	GDS, TCS, DMS
Step 2	Activate and Process Heat Cycle	GDS, TCS, DMS
Step 3	Anneal Sample	GDS, TCS, DMS
Step 4	Initiate Vapor Crystal Growth Processing	GDS, TCS, DMS
Step 5	Cool Sample and Extract	GDS, TCS, DMS
Step 6	Cool and Stow	



TABLE 2.1-1. FURNACE MODULE-1 FUNCTIONAL OBJECTIVES (Sheet 2 of 3)

FUNCTIONAL OBJECTIVE		EQUIPMENT REQUIRED
NUMBER	TITLE	ITEM
FO-6	Meltback and Regrowth of HgZnTe	
Step 1	Activate Furnace for Processing	GDS, TCS, DMS
Step 2	Process Heat Cycle	GDS, TCS, DMS
Step 3	Initial Soak	GDS, TCS, DMS
Step 4	Translation to Growth Position	GDS, TCS, DMS
Step 5	Final Soak	GDS, TCS, DMS
Step 6	Directional Solidification	GDS, TCS, DMS
Step 7	Cool Sample	GDS, TCS, DMS
Step 8	Stow Sample	GDS, TCS, DMS
FO-6A	Meltback and Regrowth of HgZnTe (extended)	
Step 1	Activate Furnace for Processing	GDS, TCS, DMS
Step 2	Process Heat Cycle	GDS, TCS, DMS
Step 3	Initial Soak	GDS, TCS, DMS
Step 4	Translation to Growth Position	GDS, TCS, DMS
Step 5	Final Soak	GDS, TCS, DMS
Step 6	Directional Solidification	GDS, TCS, DMS
Step 7	Cool Sample	GDS, TCS, DMS
Step 8	Stow Sample	GDS, TCS, DMS
FO-7	Growth of CdTe by Dir. Solidification	
Step 1	Activate Furnace for Processing	GDS, TCS, DMS
Step 2	Process Heat Cycle	GDS, TCS, DMS
Step 3	Soak	GDS, TCS, DMS
Step 4	Process Sample, Directional Solidification	GDS, TCS, DMS
Step 5	Cool Sample to 400 °C	GDS, TCS, DMS
Step 6	Cool Sample to 200 °C and Stow Sample	GDS, TCS, DMS

TABLE 2.1-1. FURNACE MODULE-1 FUNCTIONAL OBJECTIVES (Sheet 3 of 3)

FUNCTIONAL OBJECTIVE		EQUIPMENT REQUIRED
NUMBER	TITLE	ITEM
FO-8	Growth of GaAs by Dir. Solidification	
Step 1	Activate Furnace Processing	GDS, TCS, DMS
Step 2	Preheat Cycle	GDS, TCS, DMS
Step 3	Process Heat Cycle	GDS, TCS, DMS
Step 4	Soak	GDS, TCS, DMS
Step 5	Translate Furnace/Process Sample	GDS, TCS, DMS
Step 6	Cool Down to 800 °C	GDS, TCS, DMS
Step 7	Cool Down to 200 °C and Stow	GDS, TCS, DMS
FO-9	Configure Furnace for Shutdown/Sample Loading	
Step 1	Verify Furnace Is in Home Position	DMS
Step 2	Furnace Specific Tests	DMS
Step 3	Secure Power From Furnace Module	DMS
FO-11	Furnace Calibration/Bakeout	
Step 1	Activate Calibration/Bakeout	DMS
Step 2	Initiate Calibration	DMS
Step 3	Bakeout/Calibration Process	DMS

TABLE 2.1-2. FUNCTIONAL OBJECTIVE REQUIREMENTS SHEET (Sheet 1 of 13)

EXPERIMENT NAME: <u>Space Station Furnace Facility</u>		FO NUMBER: <u>3</u>					
FO NAME: <u>Manual Sample Exchange</u>		PREREQUISITE: <u>FO-2</u>					
NO. OF PERFORMANCES: MIN. _____ DES. _____		SEQUENCE: _____					
REQUIRED TIMEFRAME (MET): MIN. _____ MAX. _____		JOINT OPS WITH: _____					
<b>STEP NUMBER</b>		<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
<b>STEP DURATION (MINS:SECS)</b>	<b>MINIMUM</b>						
	<b>MAXIMUM</b>						
	<b>PREFERRED</b>	1:00	32:00	10:00	10:00	7:00	20:00
<b>STEP DELAY (HRS:MINS)</b>	<b>MINIMUM</b>						
	<b>MAXIMUM</b>						
	<b>PREFERRED</b>						
<b>CREW</b>	<b>NUMBER</b>						
	<b>PREFERRED</b>	1		1	1	1	1
<b>MICROGRAVITY (g's)</b>							
<b>VACUUM VENT</b>							
<b>CONSUMABLES</b>							
<b>AVERAGE POWER REQUIRED (kW)</b>		0	0	0	0	0	0
<b>ONBOARD COMPUTER SUPPORT</b>	<b>CORE APPLICATIONS</b>						
	<b>EXPERIMENT APPLICATIONS</b>						
<b>DATA</b>	<b>DOWNLINK DIGITAL (MBPS)</b>						
	<b>REALTIME (RT) OR DUMP (D)</b>						
	<b>COMMANDING</b>						
	<b>PES (P), ISE (I), MPAC (M), POCC (PC)</b>						
	<b>VIDEO</b>						
	<b>STANDARD/NONSTANDARD NTSC</b>						
	<b>REAL-TIME/DUMP/STORE</b>						
<b>SPECIAL EQUIPMENT OR CONSTRAINTS</b>							
<b>STEP NO.</b>	<b>STEP DESCRIPTION</b>						
1	Command "Manual Sample Exchange" on						
2	Vent/fill furnace module						
3	Equalize furnace module pressure						
4	Prep equipment						
5	Open SIP						
6	Insert samples						

TABLE 2.1-2. FUNCTIONAL OBJECTIVE REQUIREMENTS SHEET (Sheet 2 of 13)

EXPERIMENT NAME: <u>Space Station Furnace Facility</u>		FO NUMBER: <u>3</u>				
FO NAME: <u>Manual Sample Exchange</u>		PREREQUISITE: <u>FO-2</u>				
NO. OF PERFORMANCES: MIN. _____ DES. _____		SEQUENCE: _____				
REQUIRED TIMEFRAME (MET): MIN. _____ MAX. _____		JOINT OPS WITH: _____				
<b>STEP NUMBER</b>		<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b>
<b>STEP DURATION (MINS:SECS)</b>	<b>MINIMUM</b>					
	<b>MAXIMUM</b>					
	<b>PREFERRED</b>	3:00	3:00	1:00	65:00	4:00
<b>STEP DELAY (HRS:MINS)</b>	<b>MINIMUM</b>					
	<b>MAXIMUM</b>					
	<b>PREFERRED</b>					
<b>CREW</b>	<b>NUMBER</b>					
	<b>PREFERRED</b>	1	1	1	1	1
<b>MICROGRAVITY (g's)</b>						
<b>VACUUM VENT</b>						
<b>CONSUMABLES</b>						
<b>AVERAGE POWER REQUIRED (kW)</b>		0	0	0	0	0
<b>ONBOARD COMPUTER SUPPORT</b>	<b>CORE APPLICATIONS</b>					
	<b>EXPERIMENT APPLICATIONS</b>					
<b>DATA</b>	<b>DOWNLINK DIGITAL (MBPS)</b>					
	<b>REALTIME (RT) OR DUMP (D)</b>					
	<b>COMMANDING</b>					
	<b>PES (P), ISE (I), MPAC (M), POCC (PC)</b>					
	<b>VIDEO</b>					
	<b>STANDARD/NONSTANDARD NTSC</b>					
	<b>REAL-TIME/DUMP/STORE</b>					
<b>SPECIAL EQUIPMENT OR CONSTRAINTS</b>						
<b>STEP NO.</b>		<b>STEP DESCRIPTION</b>				
7		Close SIP				
8		Open valves				
9		Command "Manual Sample Exchange" off				
10		Perform seal check				
11		Load list process				

TABLE 2.1-2. FUNCTIONAL OBJECTIVE REQUIREMENTS SHEET (Sheet 3 of 13)

<b>EXPERIMENT NAME:</b> <u>Space Station Furnace Facility</u>		<b>FO NUMBER:</b> <u>4</u>					
<b>FO NAME:</b> <u>Purge Furnace Module</u>		<b>PREREQUISITE:</b> <u>FO-3</u>					
<b>NO. OF PERFORMANCES:</b> MIN. _____ DES. _____		<b>SEQUENCE:</b> _____					
<b>REQUIRED TIMEFRAME (MET):</b> MIN. ____ MAX. _____		<b>JOINT OPS WITH:</b> _____					
<b>STEP NUMBER</b>		<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
<b>STEP DURATION (MINS:SECS)</b>	<b>MINIMUM</b>						
	<b>MAXIMUM</b>						
	<b>PREFERRED</b>	32:00	10:00	2:00	2:00		
<b>STEP DELAY (HRS:MINS)</b>	<b>MINIMUM</b>						
	<b>MAXIMUM</b>						
	<b>PREFERRED</b>						
<b>CREW</b>	<b>NUMBER</b>						
	<b>PREFERRED</b>						
<b>MICROGRAVITY (g's)</b>							
<b>VACUUM VENT</b>							
<b>CONSUMABLES</b>							
<b>AVERAGE POWER REQUIRED (kW)</b>		0	0	0	0		
<b>ONBOARD COMPUTER SUPPORT</b>	<b>CORE APPLICATIONS</b>						
	<b>EXPERIMENT APPLICATIONS</b>						
<b>DATA</b>	<b>DOWNLINK DIGITAL (MBPS)</b>						
	<b>REALTIME (RT) OR DUMP (D)</b>						
	<b>COMMANDING</b>						
	<b>PES (P), ISE (I), MPAC (M), POCC (PC)</b>						
	<b>VIDEO</b>						
	<b>STANDARD/NONSTANDARD NTSC</b>						
	<b>REAL-TIME/DUMP/STORE</b>						
<b>SPECIAL EQUIPMENT OR CONSTRAINTS</b>							
<b>STEP NO.</b>		<b>STEP DESCRIPTION</b>					
1		GN2 purge furnace					
2		Argon backfill					
3		Command sample process					
4		TCS configured					

TABLE 2.1-2. FUNCTIONAL OBJECTIVE REQUIREMENTS SHEET (Sheet 4 of 13)

EXPERIMENT NAME: <u>Space Station Furnace Facility</u>		FO NUMBER: <u>5</u>					
FO NAME: <u>Vapor Crystal Growth of HgCdTe</u>		PREREQUISITE: <u>FO-3</u>					
NO. OF PERFORMANCES: MIN. _____ DES. _____		SEQUENCE: _____					
REQUIRED TIMEFRAME (MET): MIN. _____ MAX. _____		JOINT OPS WITH: _____					
STEP NUMBER		1	2	3	4	5	6
STEP DURATION (MINS:SECS)	MINIMUM						
	MAXIMUM						
	PREFERRED	3:00	188:00	60:00	480:00	240:00	21:00
STEP DELAY (HRS:MINS)	MINIMUM						
	MAXIMUM						
	PREFERRED						
CREW	NUMBER						
	PREFERRED						
MICROGRAVITY (g's)							
VACUUM VENT							
CONSUMABLES							
AVERAGE POWER REQUIRED (kW)		.120	1.116	.466	.466	.120	.120
ONBOARD COMPUTER SUPPORT	CORE APPLICATIONS						
	EXPERIMENT APPLICATIONS						
DATA	DOWNLINK DIGITAL (MBPS) REALTIME (RT) OR DUMP (D)						
	COMMANDING PES (P), ISE (I), MPAC (M), POCC (PC)						
	VIDEO STANDARD/NONSTANDARD NTSC						
	REAL-TIME/DUMP/STORE						
SPECIAL EQUIPMENT OR CONSTRAINTS							
<b>STEP NO.</b>		<b>STEP DESCRIPTION</b>					
1		Activate furnace for processing					
2		Activate and process heat cycle					
3		Anneal sample					
4		Initiate vapor crystal growth processing					
5		Cool sample and extract					
6		Cool and stow					

TABLE 2.1-2. FUNCTIONAL OBJECTIVE REQUIREMENTS SHEET (Sheet 5 of 13)

EXPERIMENT NAME: <u>Space Station Furnace Facility</u>		FO NUMBER: <u>6</u>					
FO NAME: <u>Meltback and Regrowth of HgZnTe</u>		PREREQUISITE: <u>FO-3</u>					
NO. OF PERFORMANCES: MIN. _____ DES. _____		SEQUENCE: _____					
REQUIRED TIMEFRAME (MET): MIN. _____ MAX. _____		JOINT OPS WITH: _____					
STEP NUMBER		1	2	3	4	5	6
STEP DURATION (MINS:SECS)	MINIMUM						
	MAXIMUM						
	PREFERRED	3:00	340:00	120:00	125:00	600:00	7390:00
STEP DELAY (HRS:MINS)	MINIMUM						
	MAXIMUM						
	PREFERRED						
CREW	NUMBER						
	PREFERRED						
MICROGRAVITY (g's)							
VACUUM VENT							
CONSUMABLES							
AVERAGE POWER REQUIRED (kW)		.120	.598	.516	.516	.516	.516
ONBOARD COMPUTER SUPPORT	CORE APPLICATIONS						
	EXPERIMENT APPLICATIONS						
DATA	DOWNLINK DIGITAL (MBPS)						
	REALTIME (RT) OR DUMP (D)						
	COMMANDING						
	PES (P), ISE (I), MPAC (M), POCC (PC)						
	VIDEO						
STANDARD/NONSTANDARD NTSC							
REAL-TIME/DUMP/STORE							
SPECIAL EQUIPMENT OR CONSTRAINTS							
<u>STEP NO.</u>	<u>STEP DESCRIPTION</u>						
1	Activate furnace for processing						
2	Process heat cycle						
3	Initial soak						
4	Translation to growth position						
5	Final soak						
6	Directional solidification						

TABLE 2.1-2. FUNCTIONAL OBJECTIVE REQUIREMENTS SHEET (Sheet 6 of 13)

EXPERIMENT NAME: <u>Space Station Furnace Facility</u>		FO NUMBER: <u>6</u>					
FO NAME: <u>Meltback &amp; Regrowth of HgZnTe</u>		PREREQUISITE: <u>FO-3</u>					
NO. OF PERFORMANCES: MIN. _____ DES. _____		SEQUENCE: _____					
REQUIRED TIMEFRAME (MET): MIN. _____ MAX. _____		JOINT OPS WITH: _____					
<b>STEP NUMBER</b>		<b>7</b>	<b>8</b>				
<b>STEP DURATION (MINS:SECS)</b>	<b>MINIMUM</b>						
	<b>MAXIMUM</b>						
	<b>PREFERRED</b>	372:00	115:00				
<b>STEP DELAY (HRS:MINS)</b>	<b>MINIMUM</b>						
	<b>MAXIMUM</b>						
	<b>PREFERRED</b>						
<b>CREW</b>	<b>NUMBER</b>						
	<b>PREFERRED</b>						
<b>MICROGRAVITY (g's)</b>							
<b>VACUUM VENT</b>							
<b>CONSUMABLES</b>							
<b>AVERAGE POWER REQUIRED (kW)</b>		.191	.061				
<b>ONBOARD COMPUTER SUPPORT</b>	<b>CORE ' APPLICATIONS</b>						
	<b>EXPERIMENT APPLICATIONS</b>						
<b>DATA</b>	<b>DOWNLINK DIGITAL (MBPS)</b>						
	<b>REALTIME (RT) OR DUMP (D)</b>						
	<b>COMMANDING</b>						
	<b>PES (P), ISE (I), MPAC (M), POCC (PC)</b>						
	<b>VIDEO</b>						
	<b>STANDARD/NONSTANDARD NTSC</b>						
	<b>REAL-TIME/DUMP/STORE</b>						
<b>SPECIAL EQUIPMENT OR CONSTRAINTS</b>							
<b>STEP NO.</b>		<b>STEP DESCRIPTION</b>					
7		Cool sample					
8		Stow sample					



TABLE 2.1-2. FUNCTIONAL OBJECTIVE REQUIREMENTS SHEET (Sheet 7 of 13)

EXPERIMENT NAME: <u>Space Station Furnace Facility</u>	FO NUMBER: <u>6A</u>
FO NAME: <u>Meltback and Regrowth of HgZnTe (Extended)</u>	PREREQUISITE: <u>FO-3</u>
NO. OF PERFORMANCES: MIN. _____ DES. _____	SEQUENCE: _____
REQUIRED TIMEFRAME (MET): MIN. _____ MAX. _____	JOINT OPS WITH: _____

STEP NUMBER		1	2	3	4	5	6
STEP DURATION (MINS:SECS)	MINIMUM						
	MAXIMUM						
	PREFERRED	3:00	340:00	120:00	125:00	600:00	59957:00
STEP DELAY (HRS:MINS)	MINIMUM						
	MAXIMUM						
	PREFERRED						
CREW	NUMBER						
	PREFERRED						
MICROGRAVITY (g's)							
VACUUM VENT							
CONSUMABLES							
AVERAGE POWER REQUIRED (kW)		.120	.598	.516	.516	.516	.516
ONBOARD COMPUTER SUPPORT	CORE APPLICATIONS						
	EXPERIMENT APPLICATIONS						
DATA	DOWNLINK DIGITAL (MBPS)						
	REALTIME (RT) OR DUMP (D)						
	COMMANDING						
	PES (P), ISE (I), MPAC (M), POCC (PC)						
	VIDEO						
SPECIAL EQUIPMENT OR CONSTRAINTS							

<u>STEP NO.</u>	<u>STEP DESCRIPTION</u>
1	Activate furnace for processing
2	Process heat cycle
3	Initial soak
4	Translation to growth position
5	Final soak
6	Directional solidification

TABLE 2.1-2. FUNCTIONAL OBJECTIVE REQUIREMENTS SHEET (Sheet 8 of 13)

EXPERIMENT NAME: <u>Space Station Furnace Facility</u>		FO NUMBER: <u>6A</u>					
FO NAME: <u>Meltback and Regrowth of HgZnTe (Extended)</u>		PREREQUISITE: <u>FO-3</u>					
NO. OF PERFORMANCES: MIN. _____ DES. _____		SEQUENCE: _____					
REQUIRED TIMEFRAME (MET): MIN. _____ MAX. _____		JOINT OPS WITH: _____					
<b>STEP NUMBER</b>		<b>7</b>	<b>8</b>				
<b>STEP DURATION (MINS:SECS)</b>	<b>MINIMUM</b>						
	<b>MAXIMUM</b>						
	<b>PREFERRED</b>	372:00	115:00				
<b>STEP DELAY (HRS:MINS)</b>	<b>MINIMUM</b>						
	<b>MAXIMUM</b>						
	<b>PREFERRED</b>						
<b>CREW</b>	<b>NUMBER</b>						
	<b>PREFERRED</b>						
<b>MICROGRAVITY (g's)</b>							
<b>VACUUM VENT</b>							
<b>CONSUMABLES</b>							
<b>AVERAGE POWER REQUIRED (kW)</b>		.191	.061				
<b>ONBOARD COMPUTER SUPPORT</b>	<b>CORE APPLICATIONS</b>						
	<b>EXPERIMENT APPLICATIONS</b>						
<b>DATA</b>	<b>DOWNLINK DIGITAL (MBPS)</b>						
	<b>REALTIME (RT) OR DUMP (D)</b>						
	<b>COMMANDING</b>						
	<b>PES (P), ISE (I), MPAC (M), POCC (PC)</b>						
	<b>VIDEO</b>						
	<b>STANDARD/NONSTANDARD NTSC</b>						
	<b>REAL-TIME/DUMP/STORE</b>						
<b>SPECIAL EQUIPMENT OR CONSTRAINTS</b>							
<b>STEP NO.</b>		<b>STEP DESCRIPTION</b>					
7		Cool sample					
8		Internally stow sample					

TABLE 2.1-2. FUNCTIONAL OBJECTIVE REQUIREMENTS SHEET (Sheet 9 of 13)

EXPERIMENT NAME: <u>Space Station Furnace Facility</u>		FO NUMBER: <u>7</u>					
FO NAME: <u>Growth of CdTe by Directional Solidification</u>		PREREQUISITE: <u>FO-3</u>					
NO. OF PERFORMANCES: MIN. _____ DES. _____		SEQUENCE: _____					
REQUIRED TIMEFRAME (MET): MIN. _____ MAX. _____		JOINT OPS WITH: _____					
STEP NUMBER		1	2	3	4	5	6
STEP DURATION (MINS:SECS)	MINIMUM						
	MAXIMUM						
	PREFERRED	3:00	538:00	120:00	4278:00	438:00	208:00
STEP DELAY (HRS:MINS)	MINIMUM						
	MAXIMUM						
	PREFERRED						
CREW	NUMBER						
	PREFERRED						
MICROGRAVITY (g's)							
VACUUM VENT							
CONSUMABLES							
AVERAGE POWER REQUIRED (kW)		.120	1.345	1.241	1.166	.591	.241
ONBOARD COMPUTER SUPPORT	CORE APPLICATIONS						
	EXPERIMENT APPLICATIONS						
DATA	DOWNLINK DIGITAL (MBPS)						
	REALTIME (RT) OR DUMP (D)						
	COMMANDING PES (P), ISE (I), MPAC (M), POCC (PC)						
	VIDEO STANDARD/NONSTANDARD NTSC REAL-TIME/DUMP/STORE						
SPECIAL EQUIPMENT OR CONSTRAINTS							
<b>STEP NO.</b>		<b>STEP DESCRIPTION</b>					
1		Activate furnace module for processing					
2		Process heat cycle					
3		Soak					
4		Process sample, directional solidification					
5		Cool sample to 400 °C					
6		Cool sample to 200 °C and internally stow sample					

TABLE 2.1-2. FUNCTIONAL OBJECTIVE REQUIREMENTS SHEET (Sheet 10 of 13)

EXPERIMENT NAME: <u>Space Station Furnace Facility</u>		FO NUMBER: <u>8</u>					
FO NAME: <u>Growth of GaAs by directional Solidification</u>		PREREQUISITE: <u>FO-3</u>					
NO. OF PERFORMANCES: MIN. _____ DES. _____		SEQUENCE: _____					
REQUIRED TIMEFRAME (MET): MIN. _____ MAX. _____		JOINT OPS WITH: _____					
STEP NUMBER		1	2	3	4	5	6
STEP DURATION (MINS:SECS)	MINIMUM						
	MAXIMUM						
	PREFERRED	3:00	45:00	227:00	68:00	720:00	210:00
STEP DELAY (HRS:MINS)	MINIMUM						
	MAXIMUM						
	PREFERRED						
CREW	NUMBER						
	PREFERRED						
MICROGRAVITY (g's)							
VACUUM VENT							
CONSUMABLES							
AVERAGE POWER REQUIRED (kW)		.120	.858	2.353	1.344	1.259	.668
ONBOARD COMPUTER SUPPORT	CORE APPLICATIONS						
	EXPERIMENT APPLICATIONS						
DATA	DOWNLINK DIGITAL (MBPS)						
	REALTIME (RT) OR DUMP (D)						
	COMMANDING						
	PES (P), ISE (I), MPAC (M), POCC (PC)						
	VIDEO						
STANDARD/NONSTANDARD NTSC							
REAL-TIME/DUMP/STORE							
SPECIAL EQUIPMENT OR CONSTRAINTS							
<b>STEP NO.</b>		<b>STEP DESCRIPTION</b>					
1		Activate furnace module processing					
2		Preheat cycle					
3		Process heat cycle					
4		Soak					
5		Translate furnace/process sample					
6		Cool down to 800 °C					

TABLE 2.1-2. FUNCTIONAL OBJECTIVE REQUIREMENTS SHEET (Sheet 11 of 13)

EXPERIMENT NAME: <u>Space Station Furnace Facility</u>		FO NUMBER: <u>8</u>					
FO NAME: <u>Growth of GaAs by Directional Solidification</u>		PREREQUISITE: <u>FO-3</u>					
NO. OF PERFORMANCES: MIN. _____ DES. _____		SEQUENCE: _____					
REQUIRED TIMEFRAME (MET): MIN. _____ MAX. _____		JOINT OPS WITH: _____					
STEP NUMBER		7					
STEP DURATION (MINS:SECS)	MINIMUM						
	MAXIMUM						
	PREFERRED	466:00					
STEP DELAY (HRS:MINS)	MINIMUM						
	MAXIMUM						
	PREFERRED						
CREW	NUMBER						
	PREFERRED						
MICROGRAVITY (g's)							
VACUUM VENT							
CONSUMABLES							
AVERAGE POWER REQUIRED (kW)		.120					
ONBOARD COMPUTER SUPPORT	CORE APPLICATIONS						
	EXPERIMENT APPLICATIONS						
DATA	DOWNLINK DIGITAL (MBPS)						
	REALTIME (RT) OR DUMP (D)						
	COMMANDING						
	PES (P), ISE (I), MPAC (M), POCC (PC)						
	VIDEO						
	STANDARD/NONSTANDARD NTSC						
	REAL-TIME/DUMP/STORE						
SPECIAL EQUIPMENT OR CONSTRAINTS							
<u>STEP NO.</u>		<u>STEP DESCRIPTION</u>					
7		Cool down to 200 °C and internally stow					

TABLE 2.1-2. FUNCTIONAL OBJECTIVE REQUIREMENTS SHEET (Sheet 12 of 13)

EXPERIMENT NAME: <u>Space Station Furnace Facility</u>		FO NUMBER: <u>9</u>					
FO NAME: <u>Configure Furnace for Shutdown/Sample loading</u>		PREREQUISITE: _____					
NO. OF PERFORMANCES: MIN. _____ DES. _____		SEQUENCE: _____					
REQUIRED TIMEFRAME (MET): MIN. _____ MAX. _____		JOINT OPS WITH: _____					
STEP NUMBER		1	2	3	4	5	6
STEP DURATION (MINS:SECS)	MINIMUM						
	MAXIMUM						
	PREFERRED	3:00	5:00	1:00			
STEP DELAY (HRS:MINS)	MINIMUM						
	MAXIMUM						
	PREFERRED						
CREW	NUMBER						
	PREFERRED						
MICROGRAVITY (g's)							
VACUUM VENT							
CONSUMABLES							
AVERAGE POWER REQUIRED (kW)		0	0	0			
ONBOARD COMPUTER SUPPORT	CORE APPLICATIONS						
	EXPERIMENT APPLICATIONS						
DATA	DOWNLINK DIGITAL (MBPS)						
	REALTIME (RT) OR DUMP (D)						
	COMMANDING						
	PES (P), ISE (I), MPAC (M), POCC (PC)						
	VIDEO						
STANDARD/NONSTANDARD NTSC							
REAL-TIME/DUMP/STORE							
SPECIAL EQUIPMENT OR CONSTRAINTS							
<b>STEP NO.</b>		<b>STEP DESCRIPTION</b>					
1		Verify furnace is in home position					
2		Furnace specific tests					
3		CCU secures power from furnace module					

TABLE 2.1-2. FUNCTIONAL OBJECTIVE REQUIREMENTS SHEET (Sheet 13 of 13)

EXPERIMENT NAME: <u>Space Station Furnace Facility</u>		FO NUMBER: <u>11</u>					
FO NAME: <u>Furnace Calibration/Bakeout</u>		PREREQUISITE: <u>FO-3</u>					
NO. OF PERFORMANCES: MIN. _____ DES. _____		SEQUENCE: _____					
REQUIRED TIMEFRAME (MET): MIN. _____ MAX. _____		JOINT OPS WITH: _____					
STEP NUMBER		1	2	3	4	5	6
STEP DURATION (MINS:SECS)	MINIMUM						
	MAXIMUM						
	PREFERRED	1:00	1:00	300:00			
STEP DELAY (HRS:MINS)	MINIMUM						
	MAXIMUM						
	PREFERRED						
CREW	NUMBER						
	PREFERRED						
MICROGRAVITY (g's)							
VACUUM VENT							
CONSUMABLES							
AVERAGE POWER REQUIRED (kW)		2.1336	2.1336	2.330			
ONBOARD COMPUTER SUPPORT	CORE APPLICATIONS						
	EXPERIMENT APPLICATIONS						
DATA	DOWNLINK DIGITAL (MBPS)						
	REALTIME (RT) OR DUMP (D)						
	COMMANDING						
	PES (P), ISE (I), MPAC (M), POCC (PC)						
	VIDEO						
STANDARD/NONSTANDARD NTSC							
REAL-TIME/DUMP/STORE							
SPECIAL EQUIPMENT OR CONSTRAINTS							
<u>STEP NO.</u>	<u>STEP DESCRIPTION</u>						
1	Activate calibration/bakeout						
2	Initiate calibration						
3	Bakeout/calibration process						

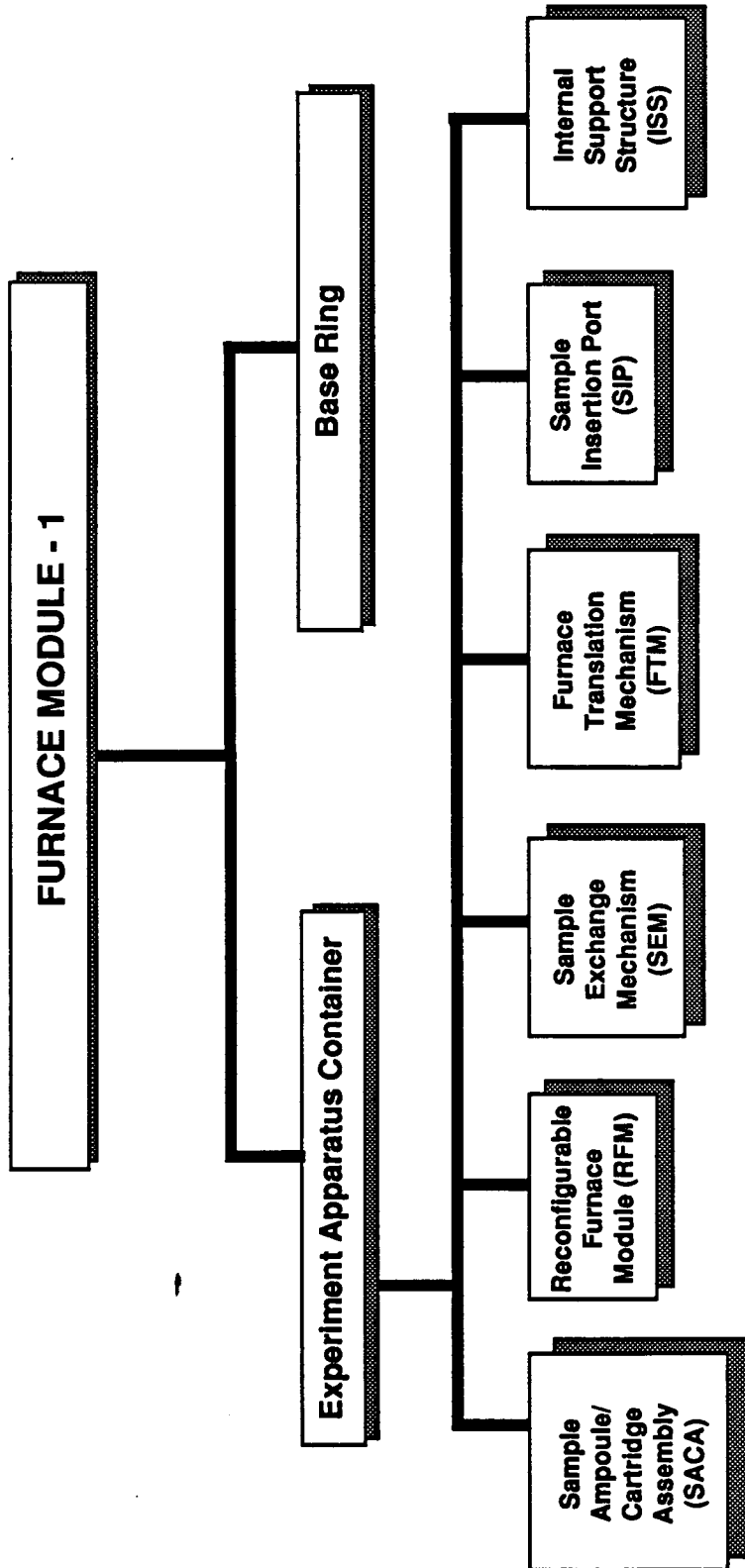


FIGURE 2.1-2. FURNACE MODULE-1 COMPONENT TREE



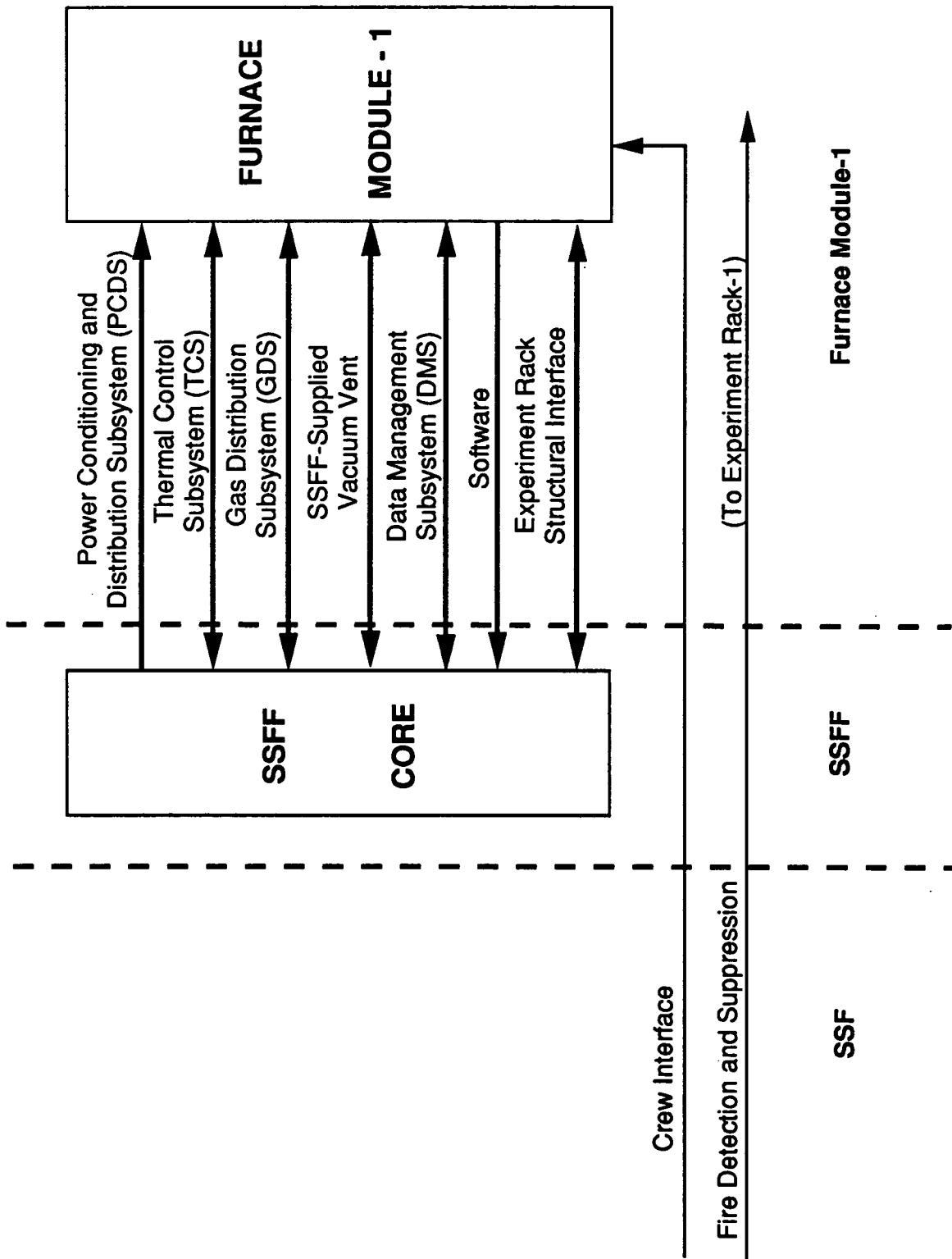


FIGURE 2.1-3. FURNACE MODULE-1 TO SSFF/SSF INTERFACE DIAGRAM

TABLE 2.1-3. FURNACE MODULE-1 OPERATIONAL FUNCTIONAL FLOW (Sheet 1 of 12)

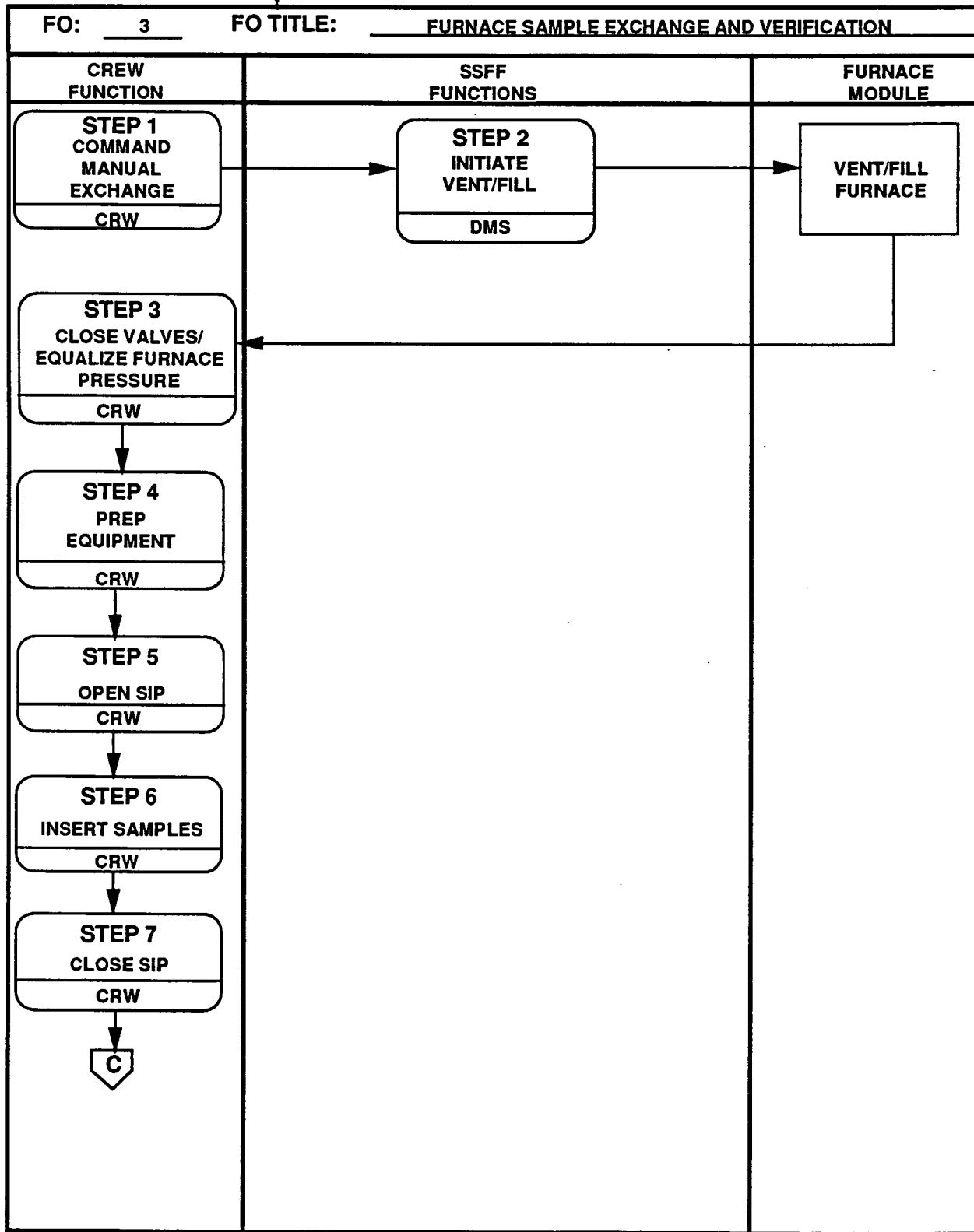


TABLE 2.1-3. FURNACE MODULE-1 OPERATIONAL FUNCTIONAL FLOW (Sheet 2 of 12)

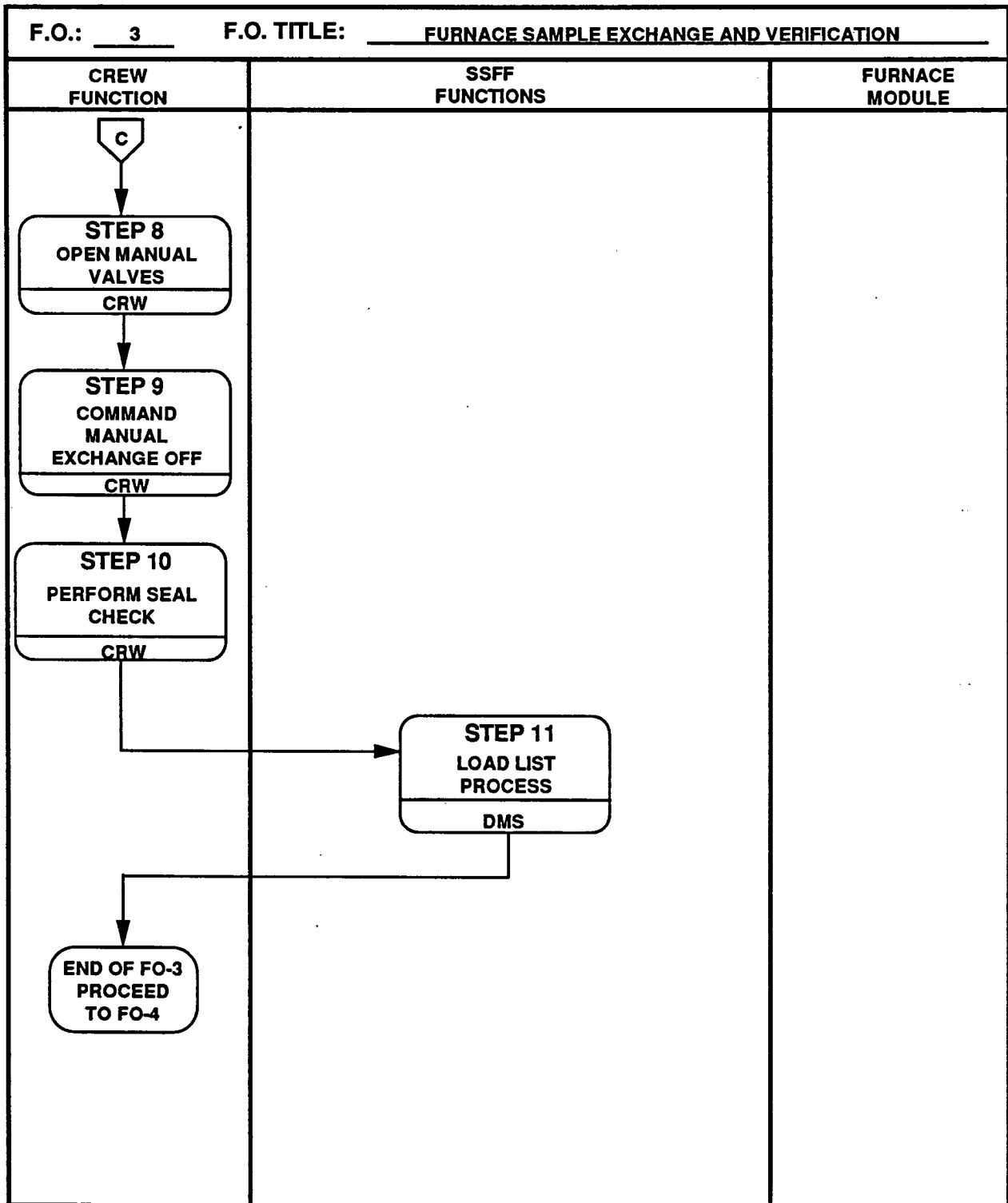


TABLE 2.1-3. FURNACE MODULE-1 OPERATIONAL FUNCTIONAL FLOW (Sheet 3 of 12)

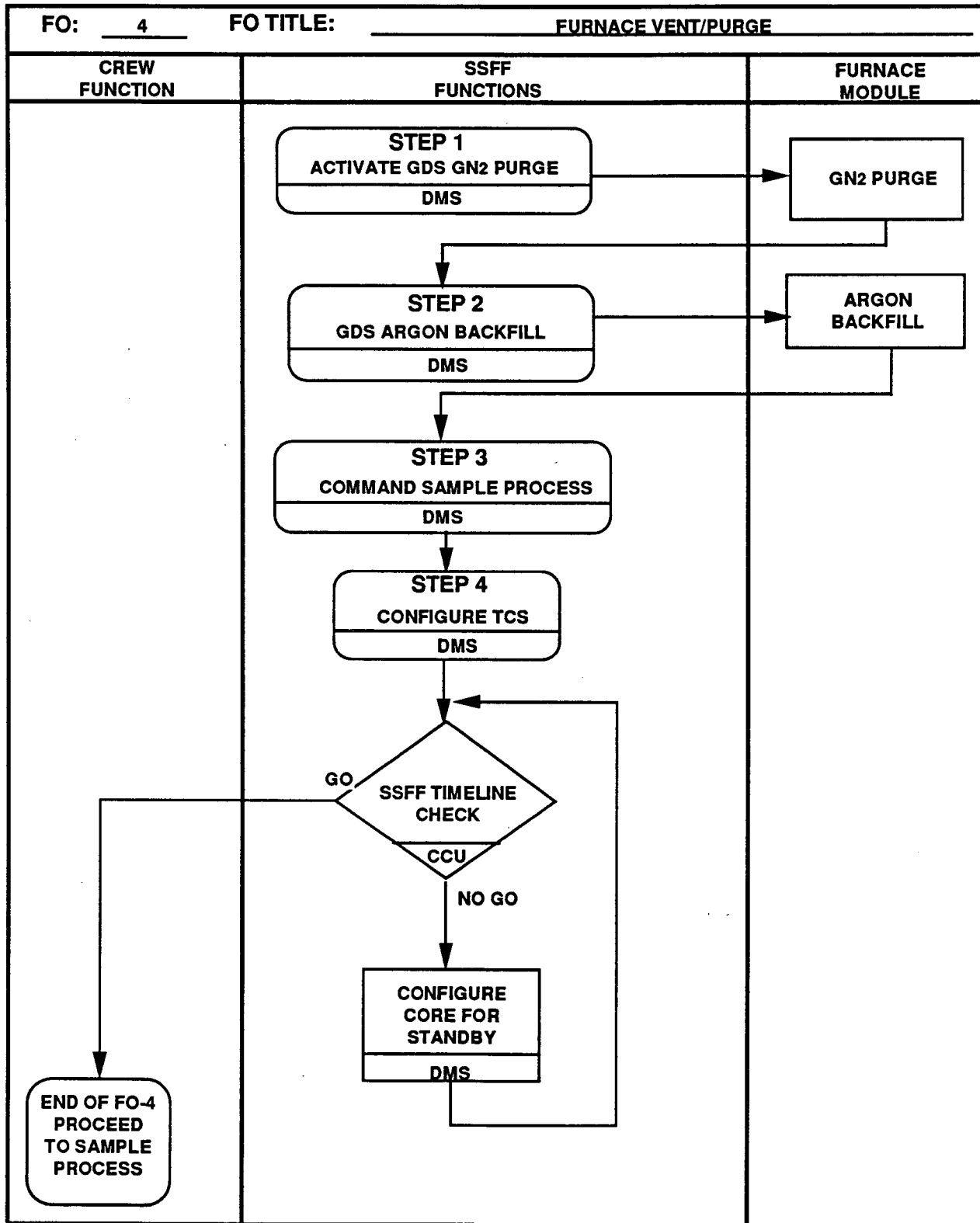


TABLE 2.1-3. FURNACE MODULE-1 OPERATIONAL FUNCTIONAL FLOW (Sheet 4 of 12)

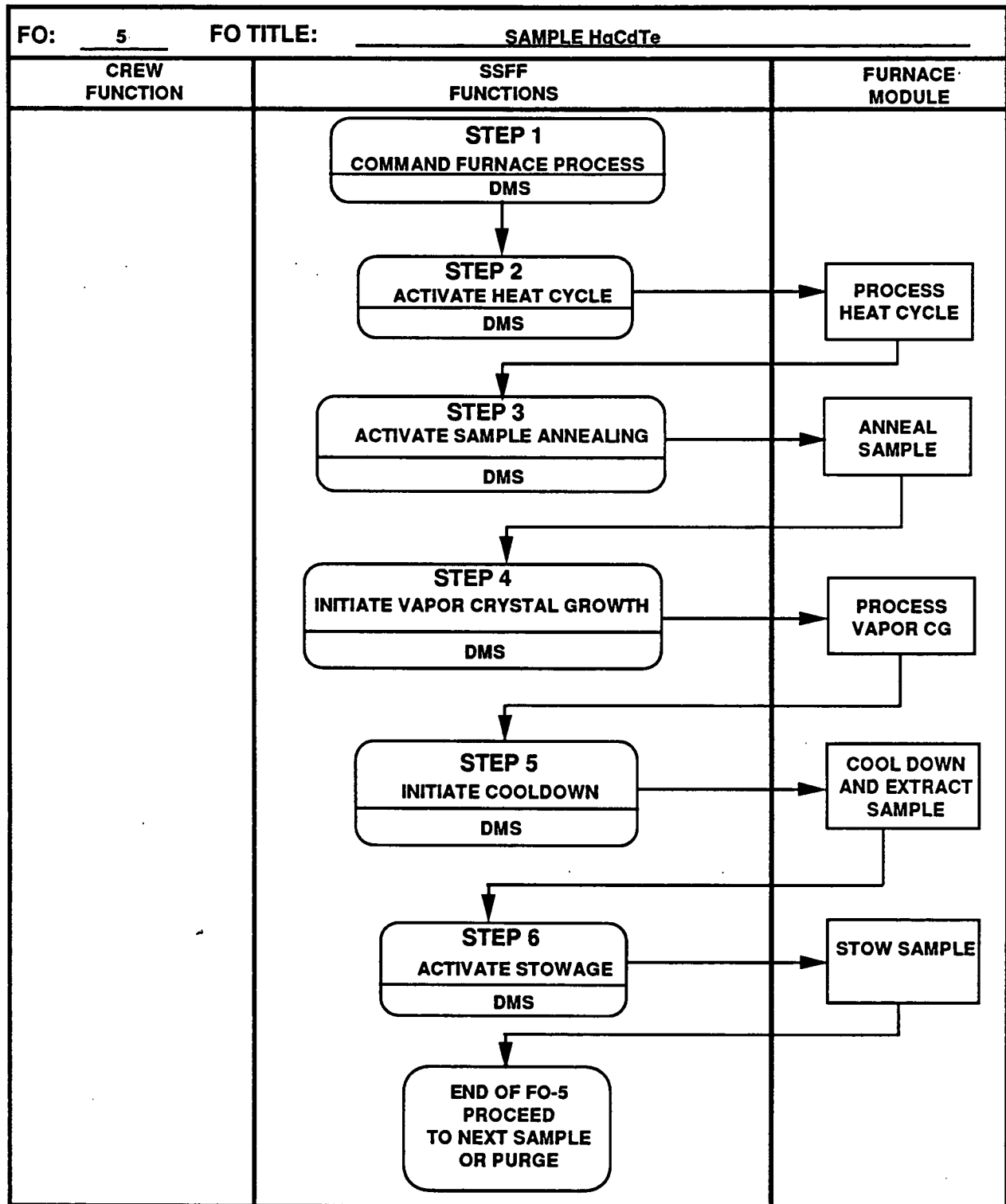


TABLE 2.1-3. FURNACE MODULE-1 OPERATIONAL FUNCTIONAL FLOW (Sheet 5 of 12)

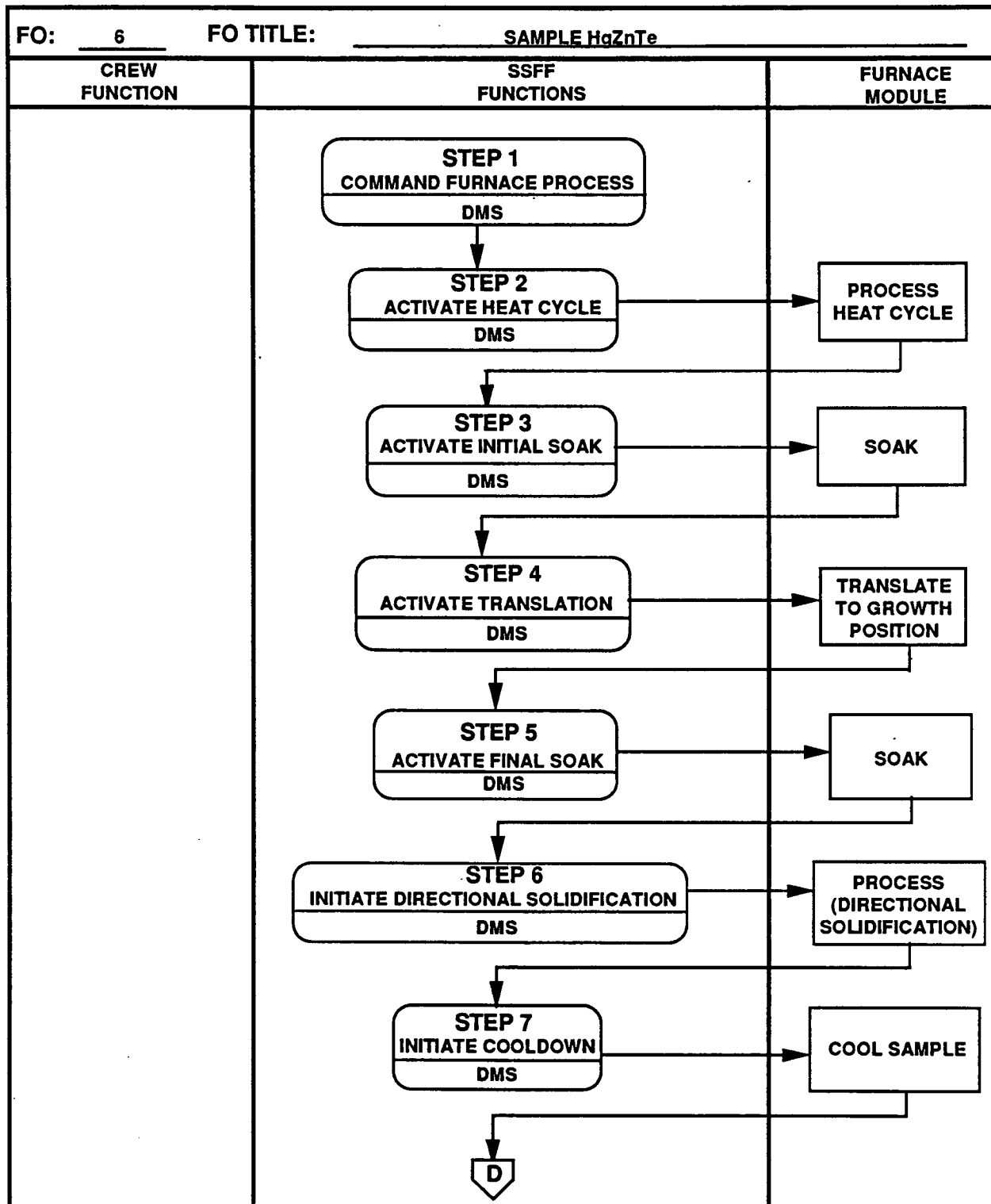


TABLE 2.1-3. FURNACE MODULE-1 OPERATIONAL FUNCTIONAL FLOW (Sheet 6 of 12)

FO: <u>6</u> FO TITLE: <u>SAMPLE HgZnTe</u>		
CREW FUNCTION	SSFF FUNCTIONS	FURNACE MODULE
	<pre> graph TD     D{D} --&gt; S8[STEP 8 ACTIVATE STOWAGE DMS]     S8 --&gt; SM[STOW SAMPLE]     SM --&gt; E[END OF FO-6 PROCEED TO NEXT SAMPLE OR PURGE]             </pre>	

TABLE 2.1-3. FURNACE MODULE-1 OPERATIONAL FUNCTIONAL FLOW (Sheet 7 of 12)

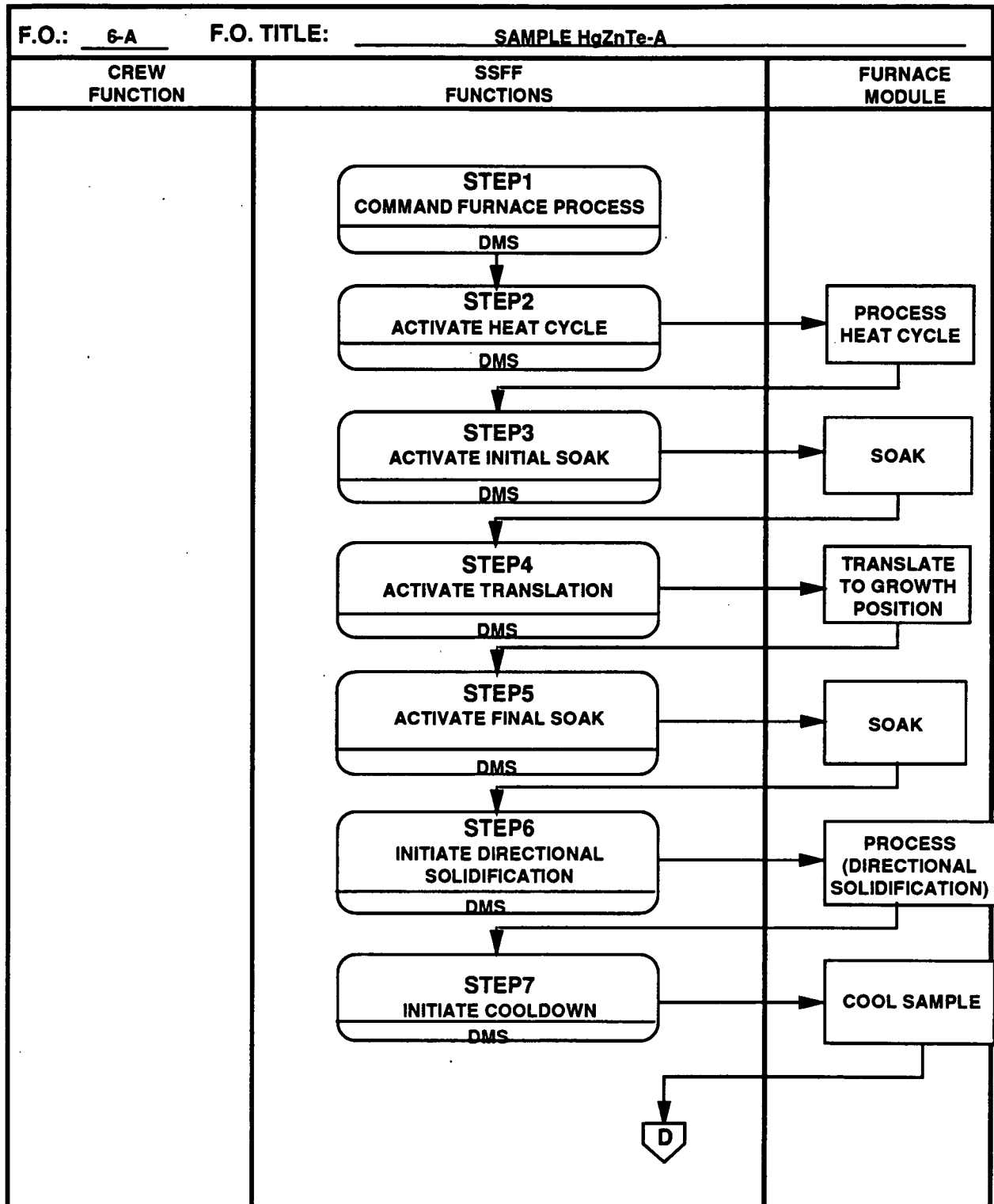




TABLE 2.1-3. FURNACE MODULE-1 OPERATIONAL FUNCTIONAL FLOW (Sheet 8 of 12)

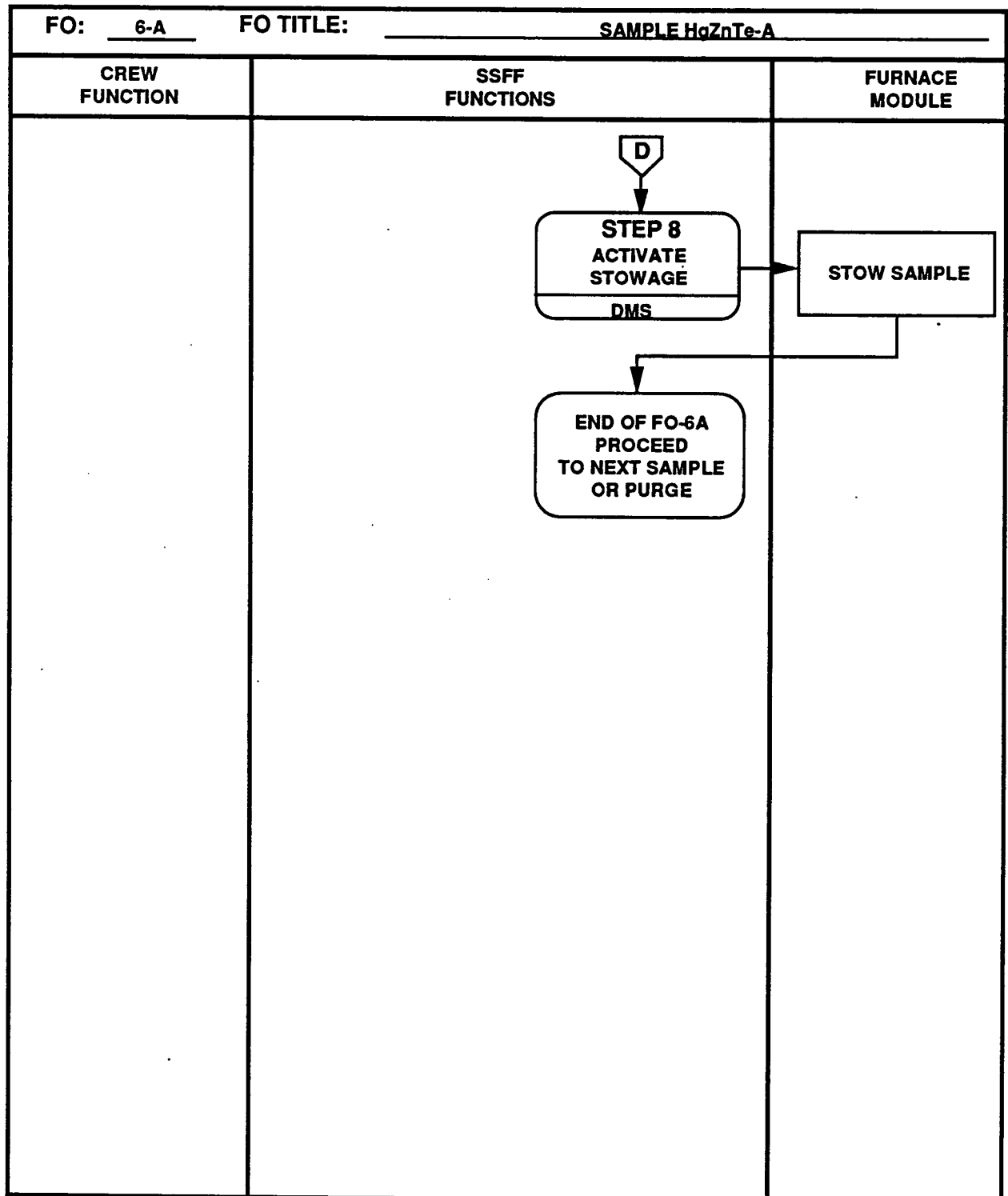


TABLE 2.1-3. FURNACE MODULE-1 OPERATIONAL FUNCTIONAL FLOW (Sheet 9 of 12)

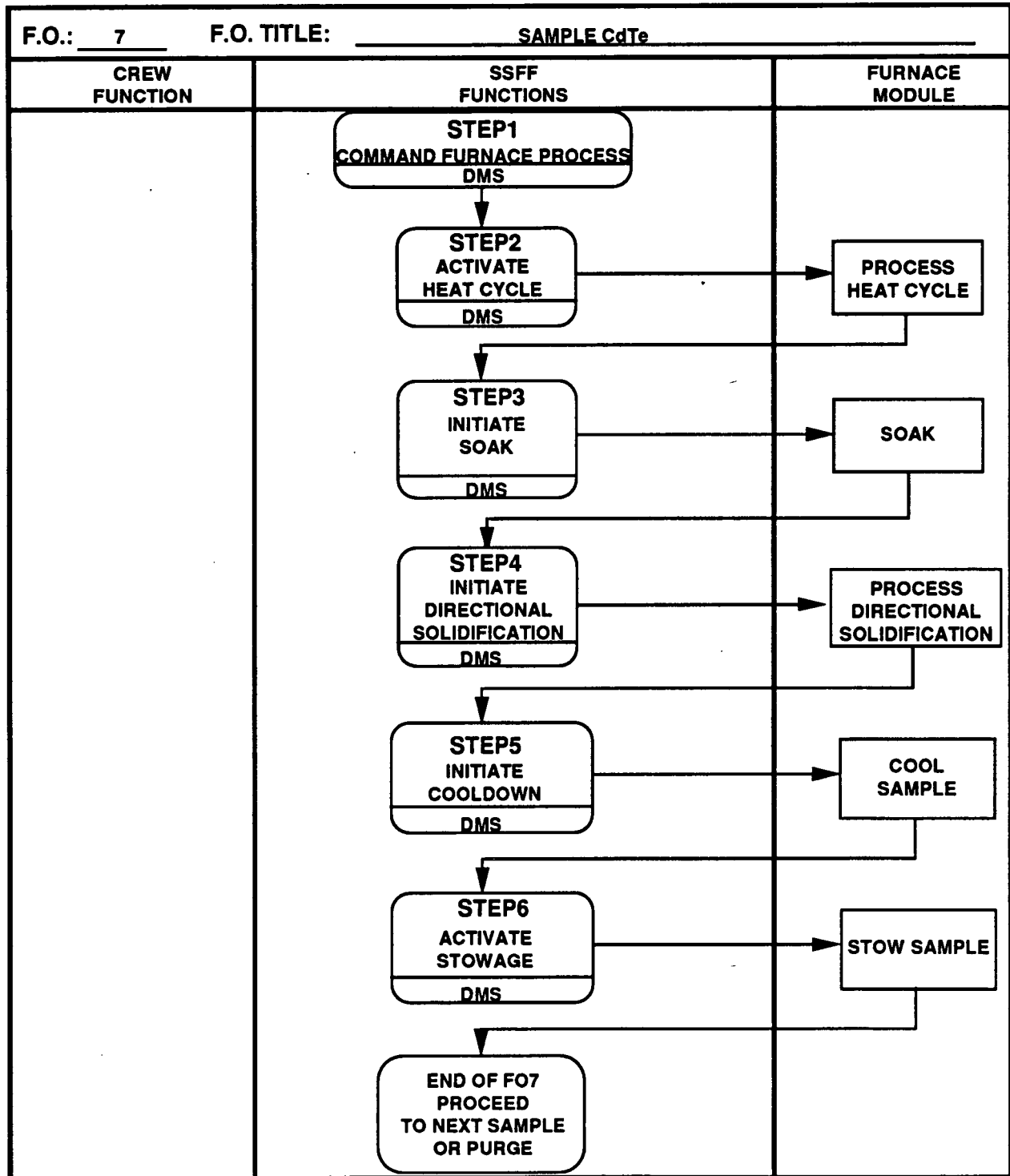


TABLE 2.1-3. FURNACE MODULE-1 OPERATIONAL FUNCTIONAL FLOW (Sheet 10 of 12)

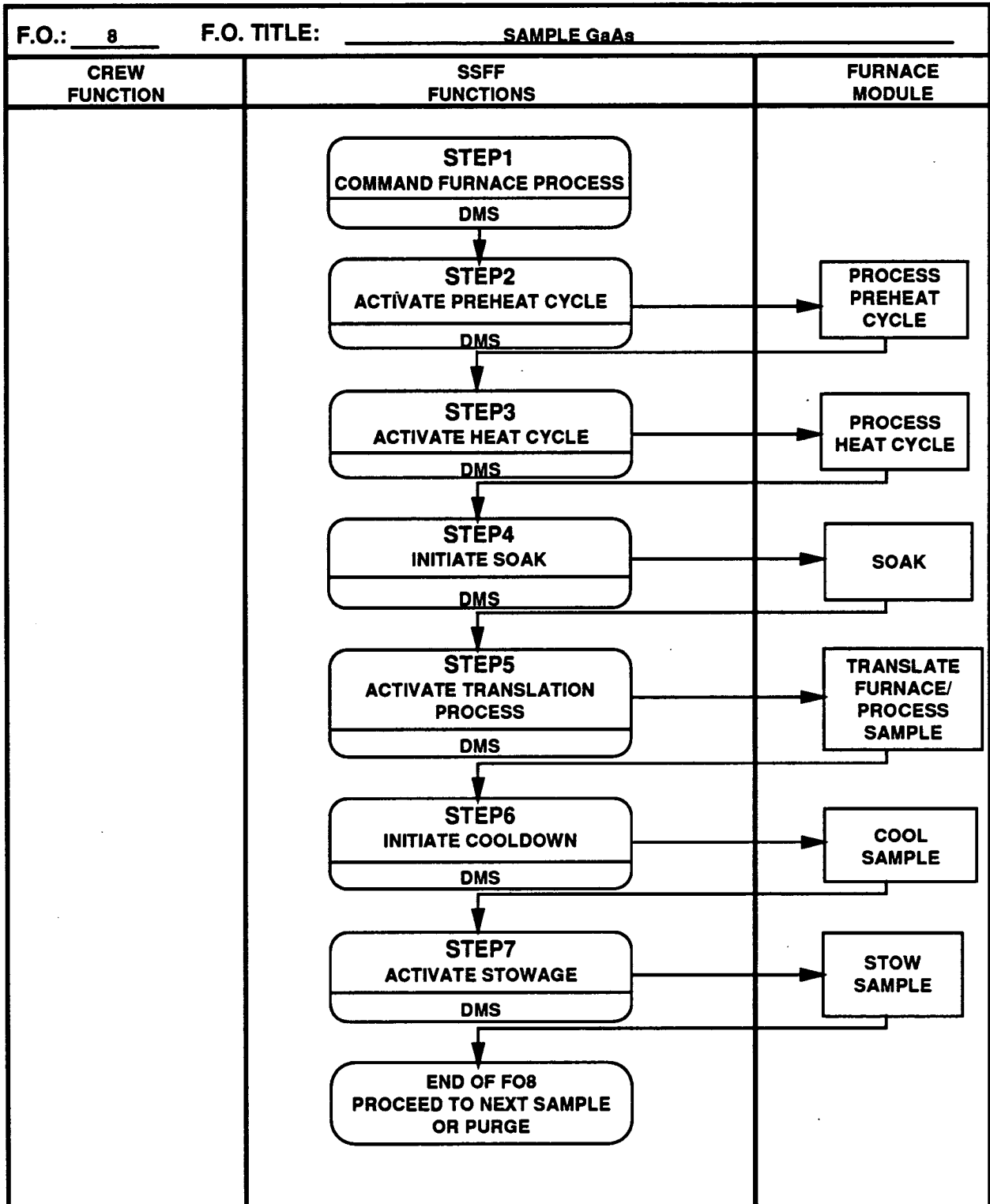


TABLE 2.1-3. FURNACE MODULE-1 OPERATIONAL FUNCTIONAL FLOW (Sheet 11 of 12)

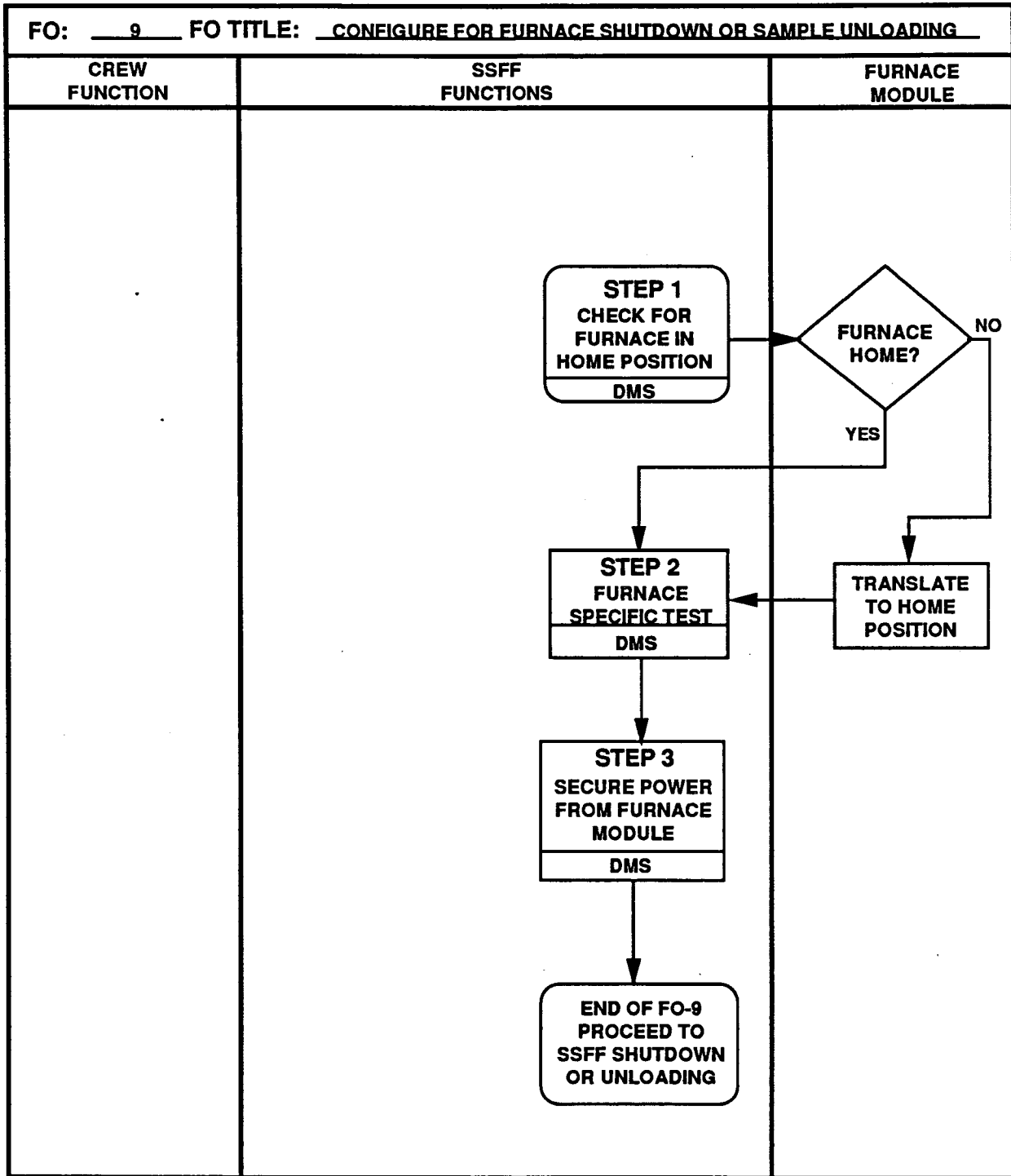
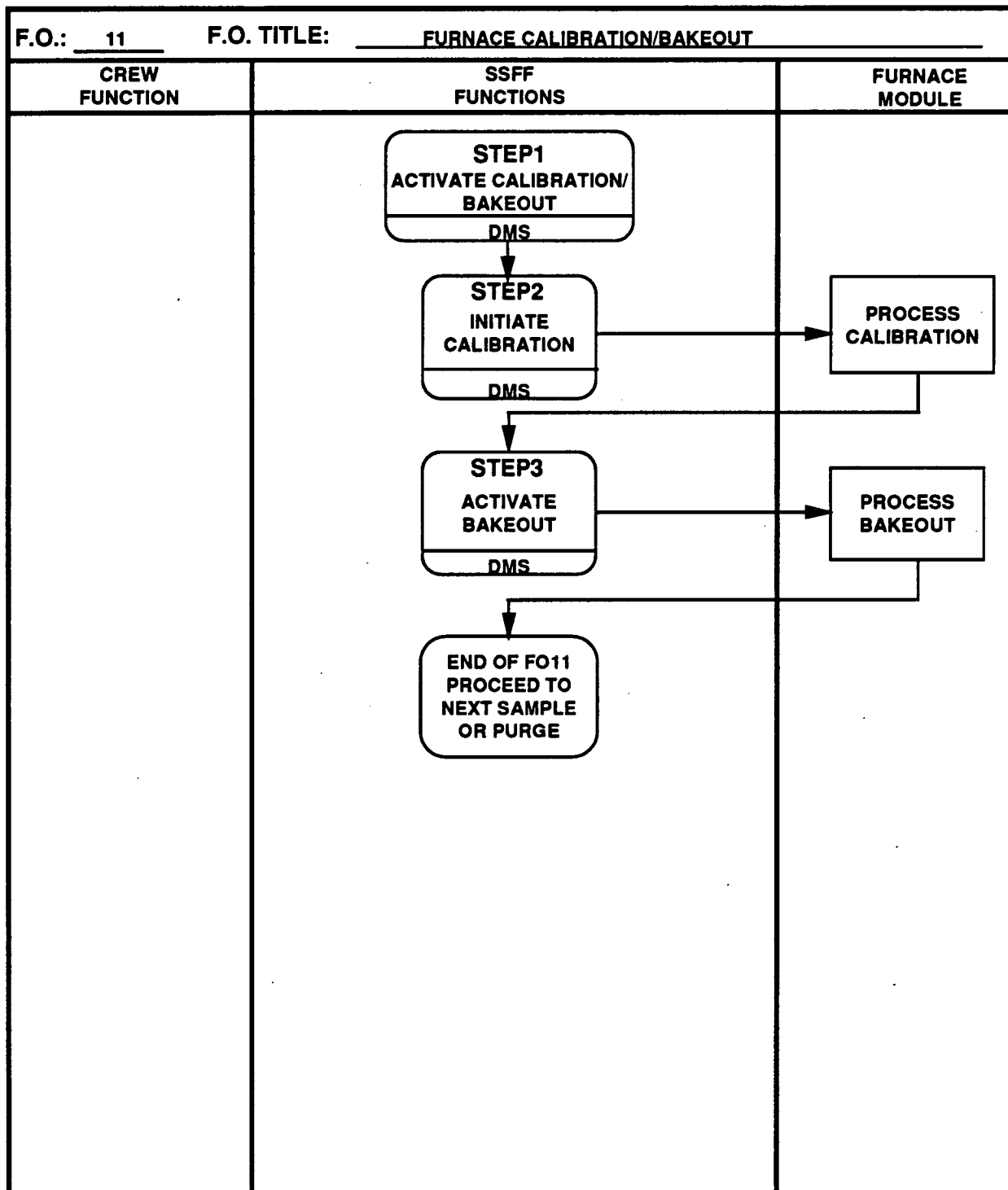


TABLE 2.1-3. FURNACE MODULE-1 OPERATIONAL FUNCTIONAL FLOW (Sheet 12 of 12)



## 2.2. STRUCTURAL/MECHANICAL

Furnace Module-1 will be mounted in the Space Station Furnace Facility (SSFF) Experiment Rack-1. The physical and functional interfaces defined herein between Furnace Module-1 and SSFF, and Furnace Module-1 and Space Station Freedom (SSF) are as follows:

- Furnace Module-1 to SSFF Experiment Rack-1
- Furnace Module-1 cooling jacket to SSFF Thermal Control System (TCS)
- Furnace Module-1 electrical connection to SSFF Power Conditioning and Distribution System (PCDS)
- Furnace Module-1 to SSFF-supplied argon and nitrogen
- Furnace Module-1 to SSFF-supplied vacuum vent
- Furnace Module-1 Data Management System (DMS) connections to SSFF DMS
- Furnace Module-1 software to SSFF software
- Furnace Module-1 to crew interface

### 2.2.1 EQUIPMENT LIST AND MASS PROPERTIES

Mass properties of Furnace Module-1 are shown in Table 2.2-1. Stowage items and their properties are shown in Table 2.2-2.

### 2.2.2 INTERFACE DETAIL

#### 2.2.2.1 Furnace Module-1 to SSFF Experiment Rack-1

The Furnace Module-1 will interface with the experiment rack by way of the experiment apparatus container (EAC) base ring. The EAC connector locations for the TCS, PCDS, argon, nitrogen, vacuum vent, and DMS are identified in Figure 2.2-1. Further information on each of these interfaces is available in this section of this document.

All services will be provided to Furnace Module-1 by the Core Rack, except avionics air and fire detection and suppression, which will be provided at Experiment Rack-1 via the SSFF furnace interface panel. Other furnace-unique services which might be required will be the responsibility of the Furnace Developer and will be located in Experiment Rack-1.

#### 2.2.2.2 Furnace Module-1 Cooling Jacket-to-SSFF TCS

Furnace Module-1 will interface with the SSFF TCS via quick disconnects located at the Furnace Module-1 base ring.

TABLE 2.2-1. LIST OF EQUIPMENT PROPERTIES

Equipment Nomenclature	Mass (kg)	Mass Maturity (%)			Center of Gravity Station (cm)			Moment of Inertia (kg-m <sup>2</sup> )			Product of Inertial (kg-m <sup>2</sup> )			
		est.	cal.	act.	X	Y	Z	I <sub>x</sub>	I <sub>y</sub>	I <sub>z</sub>	I <sub>xy</sub>	I <sub>xz</sub>	I <sub>yz</sub>	
Furnace Module-1	327.0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Utilities Interface Panel	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Interface Cables and Fluid Lines	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD

TABLE 2.2-2. FURNACE MODULE-1 STOWAGE LIST

Item	Number Required	Mass Each (kg)	Dimensions (cm) LxWxH or LxDia	Stowage Responsibility		Stowage Phase			Special Requirements
				Ex	PL	L	O	R	
Sample Ampoule/Cartridge Assembly with Stowage Bag (5 flight and 5 spares)	10	1.60	73.7 x 13.2 dia.			>		>	
Work Bag	TBD	0.07	45.7 x 5.1 dia.			>		>	
Glovebox Cover	1	TBD	TBD			>		>	
Flexible Glovebox	1	TBD	TBD			>		>	
Torque Wrench, 1/4 in. (30-200 in-lb)	1	0.31	24.1 x 2.1 X 1.9			>		>	
Socket, 1/2 in. deep, (1/4-in. drive)	1	0.09	5.1 x 1.7 dia.			>		>	
Extender, 10 in. (1/4-in. drive)	1	0.10	25.4 x 1.3 dia.			>		>	
Hex Head Driver, 5/32 in. (3/8-in. drive)	1	0.01	5.2 x 1.3 dia.			>		>	
Hex Head Driver, 1/4 in. (3/8-in. drive)	1	0.01	5.2 x 1.3 dia.			>		>	
Adapter, 1/4 to 3/8 in. (1/4-in. drive)	1	0.02	2.4 x 1.3 dia.			>		>	
Viton Gloves (pair)	1	0.41	14.0 x 22.9 x 3.8			>		>	
Filter Test Bags	10	0.01	15.2 x 15.2 x 0.5			>		>	
SACA Wrench	1	0.26	76.2 x 5.2 dia.			>		>	
Torque Wrench (0-30 in-lb)	1	0.40	17.8 x 3.2 dia.			>		>	
Transfer Units	10	0.26	20.6 x 9.1 dia.			>		>	



**TBD**

**FIGURE 2.2-1. FURNACE MODULE-1 EAC CONNECTOR LOCATIONS**

#### 2.2.2.3 Furnace Module-1 Electrical Connection-to-SSFF PCDS

The furnace module will interface with the SSFF PCDS via the furnace junction box located within Experiment Rack-1 to the Furnace Module-1 base ring connection.

#### 2.2.2.4 Furnace Module-1 to SSFF-Supplied Argon and Nitrogen

Furnace Module-1 will interface with the SSFF Core Rack-supplied argon and nitrogen through a connection at the Furnace Module-1 base ring.

#### 2.2.2.5 Furnace Module-1 to SSFF-Supplied Vacuum Vent

Furnace Module-1 will interface with the SSF-supplied vacuum vent through a connection at the Furnace Module-1 base ring.

#### 2.2.2.6 Furnace Module-1 DMS Connections-to-SSFF DMS

The furnace module will interface with the SSFF DMS via the Furnace Data Acquisition and Control System (FDACS) located within Experiment Rack-1.

#### 2.2.2.7 Furnace Module-1 Software-to-SSFF Software

The Furnace Module-1 software will require an interface with the SSFF software to support operation of the furnace module. This interface will include (1) downloading software and data to the Furnace Module-1 software; (2) collecting and processing (if necessary) data received from the Furnace Module-1 software; (3) responding to requests for SSFF resources such as power, gas, cooling, etc.; (4) retrieving stored data to be output to Furnace Module-1 for analysis; (5) network management of the local area network (LAN) connected to the Furnace Module-1 processor; (6) fault, detection, isolation, and recovery (FDIR) services; and (6) operating system services. Furnace Module-1 will also require interface from the SSFF software to the furnace heating system, the furnace translation system (if present), the furnace cavity pressure system, and the furnace current pulsing system.

#### 2.2.2.8 Furnace Module-1 to Crew Interface

There are two ways the crew may interface with Furnace Module 1. The first way is through the top end of the EAC where the crew interfaces with the integrated furnace enclosure apparatus (IFEA) via the sample insertion port during manual sample exchange.

The second way the crew may interface with Furnace Module-1 is through the crew interface to the SSFF DMS (display and keyboard). Through the display and keyboard, a crewmember can direct the furnace to perform any number of operations including changing temperature profiles or rotating and loading a different sample into the processing position.

### 2.3. POINTING/STABILIZATION AND ALIGNMENT

Furnace Module-1 requires specific alignment of the center line of the sample during processing. This requirement is that the residual dc acceleration vector (i.e., dc component of the acceleration vector at the sample due to all factors such as drag, orbital mechanics, etc.) should be aligned with the center line of the sample precisely enough that the component of the acceleration perpendicular to the center line is less than  $10^{-7}$ g. The direction of the vector may be required to be from hot zone to cold zone of the furnace or the opposite direction. The required direction will be determined separately for each sample.

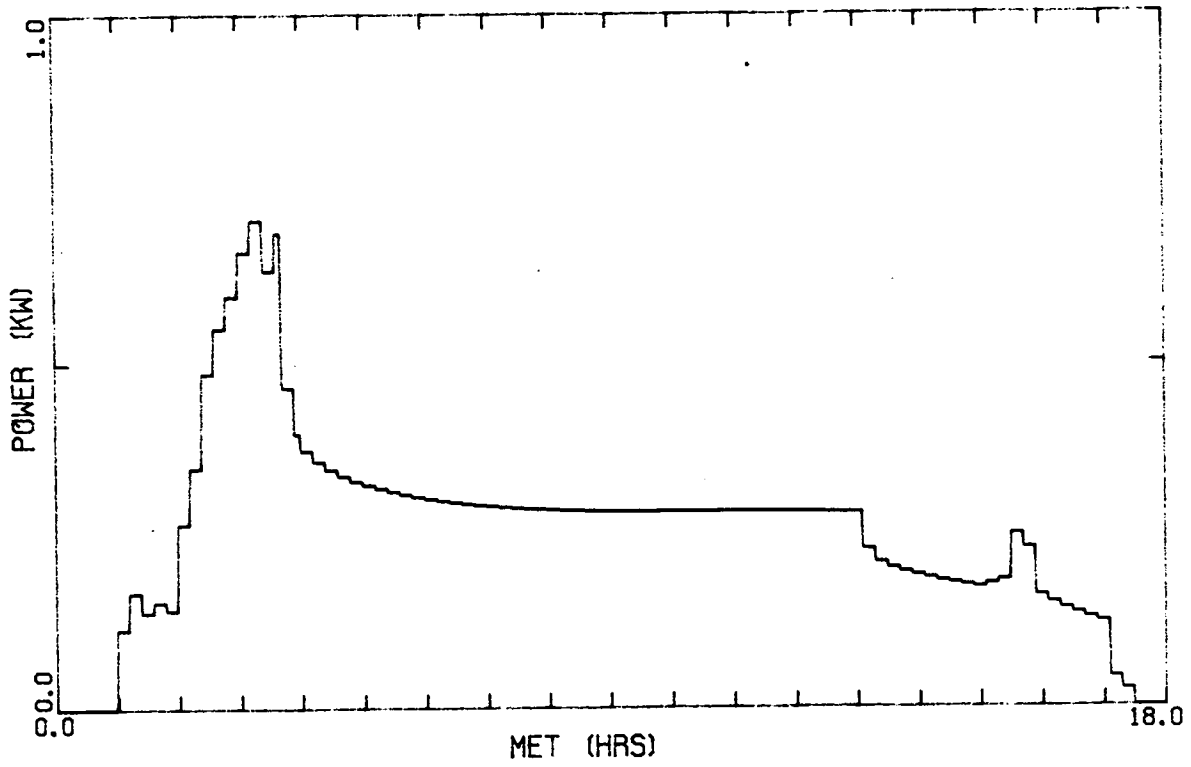
## 2.4. ORBITAL REQUIREMENTS AND CONSTRAINTS

Furnace Module-1 requires specific Orbiter attitudes during processing in order to satisfy the requirement for orienting the reconfiguring furnace module (RFM) axis in relation to the residual dc acceleration vector. Details of the attitude requirements are to meet the requirements of Section 2.3.

## 2.5. ELECTRICAL REQUIREMENTS

All power conditioning will be accomplished by Space Station Furnace Facility (SSFF) prior to any distribution to Furnace Module-1. Furnace Module-1 heaters will interface with the Power Conditioning and Distribution System (PCDS) at the furnace junction boxes. The operational power profile defining the use of the SSFF-provided power to Furnace Module-1 during each functional objective (FO) is shown in Figure 2.5-1. The power profile data shown in these figures represent power requirement estimates to cover any of the the SSFF-accommodated furnace needs. Only FO-5 through FO-8 power profiles are shown since no power is associated with the furnace in FO-3, FO-4, FO-9, or FO-11. The power levels defined in Figure 2.5-1 are considered maximums. Time duration for peak power requirements is 72 h. The maximum peak power required is 1650 W. The average power required is 570 W.

### F0-5 HgCdTe



### F0-6 HgZnTe

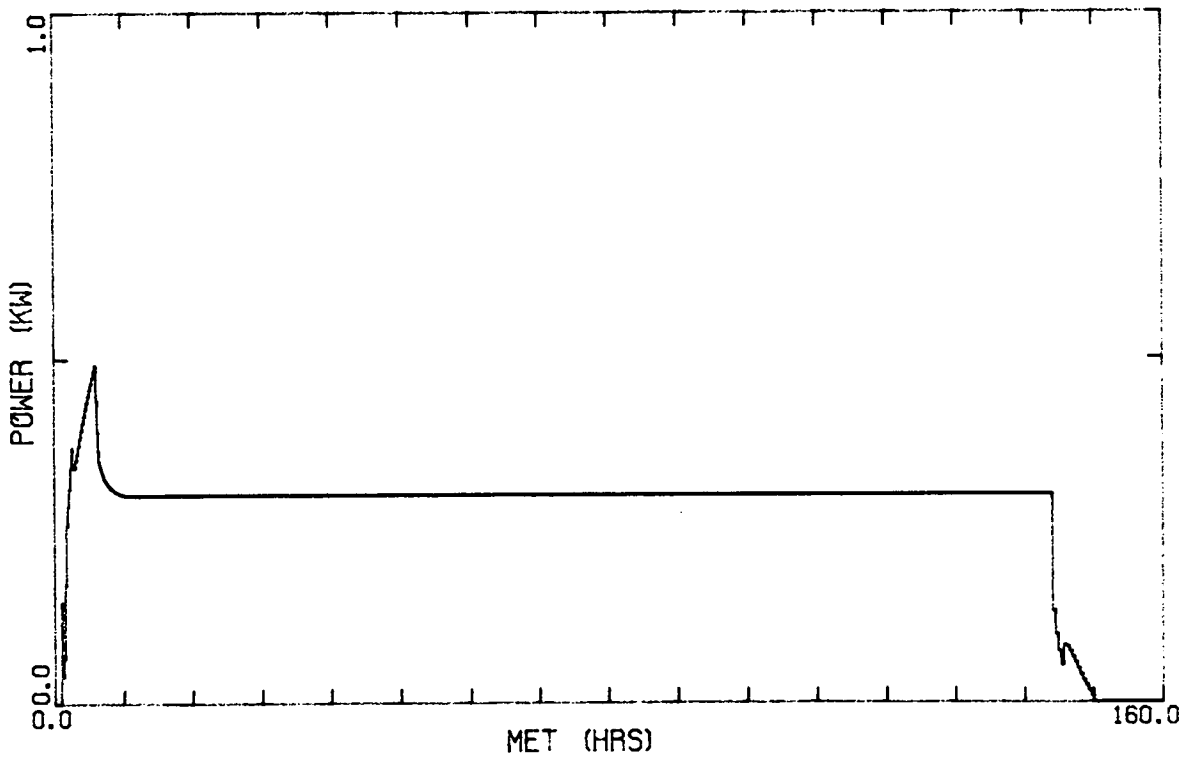
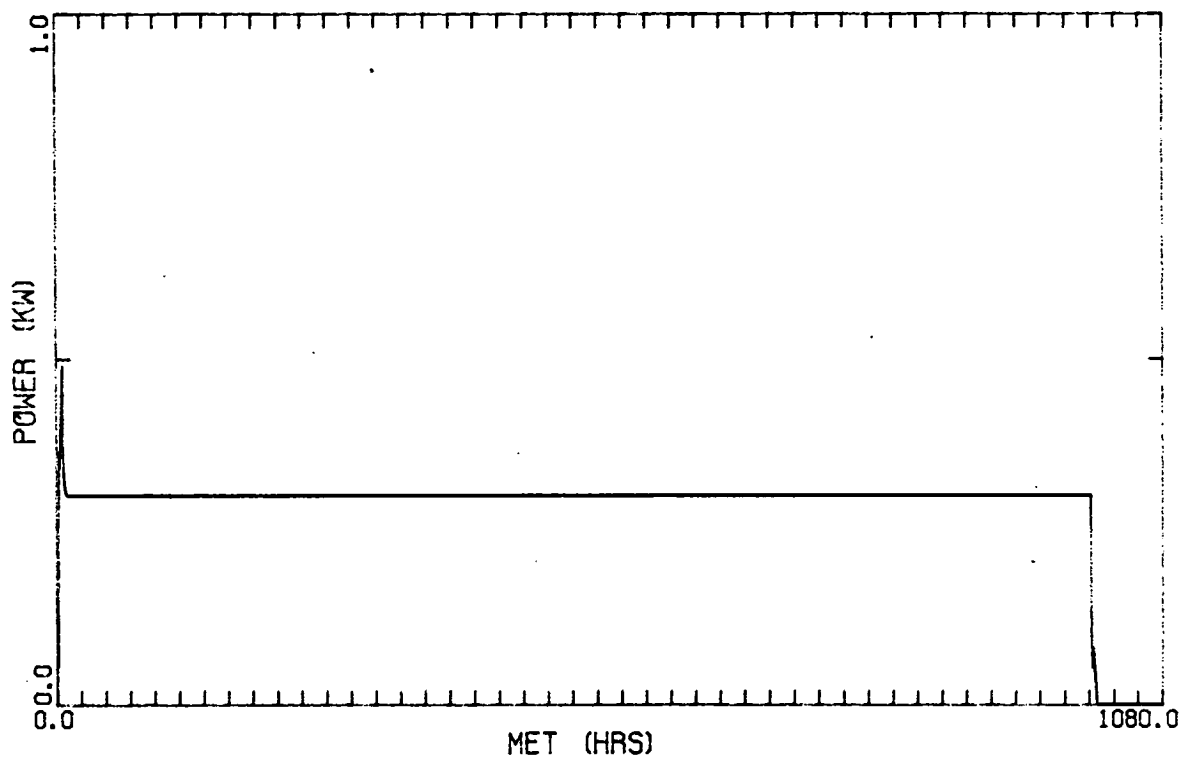


FIGURE 2.5-1. POWER PROFILES BY FO (Sheet 1 of 3)

## F0-6A HgZnTe



## F0-7 CdTe

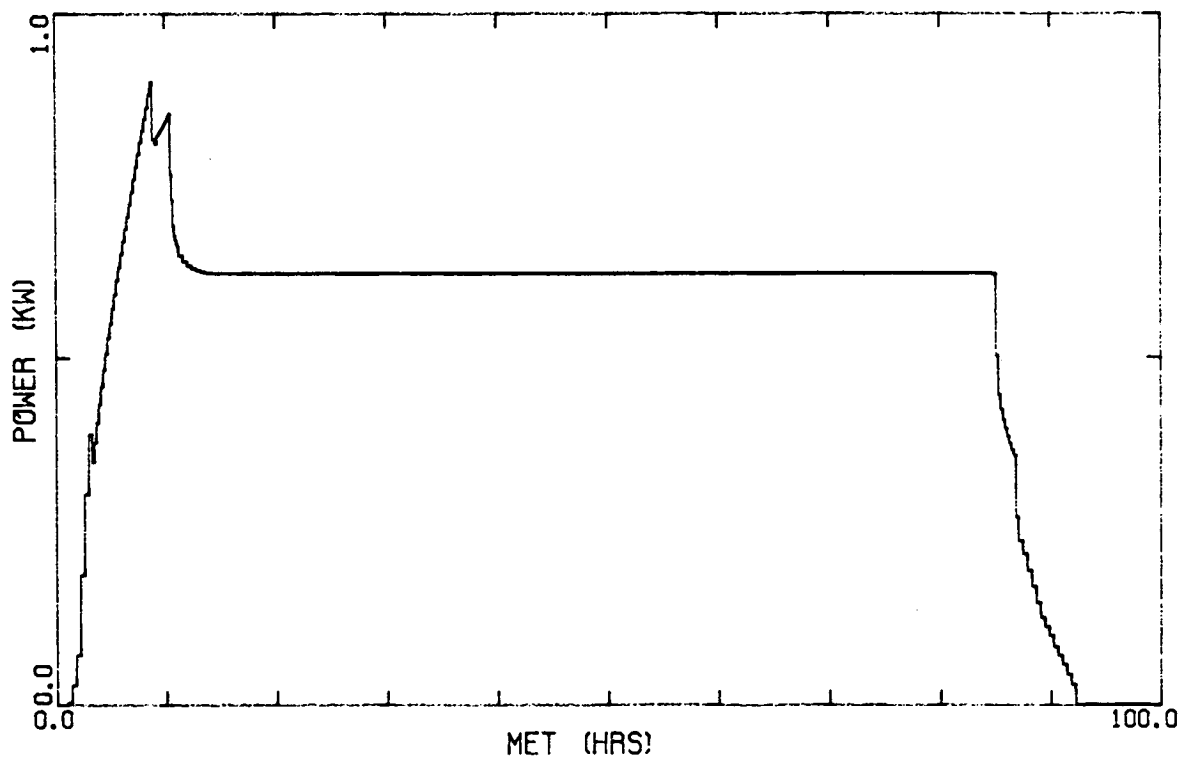


FIGURE 2.5-1. POWER PROFILES BY FO (Sheet 2 of 3)

# FO-8 GaAs

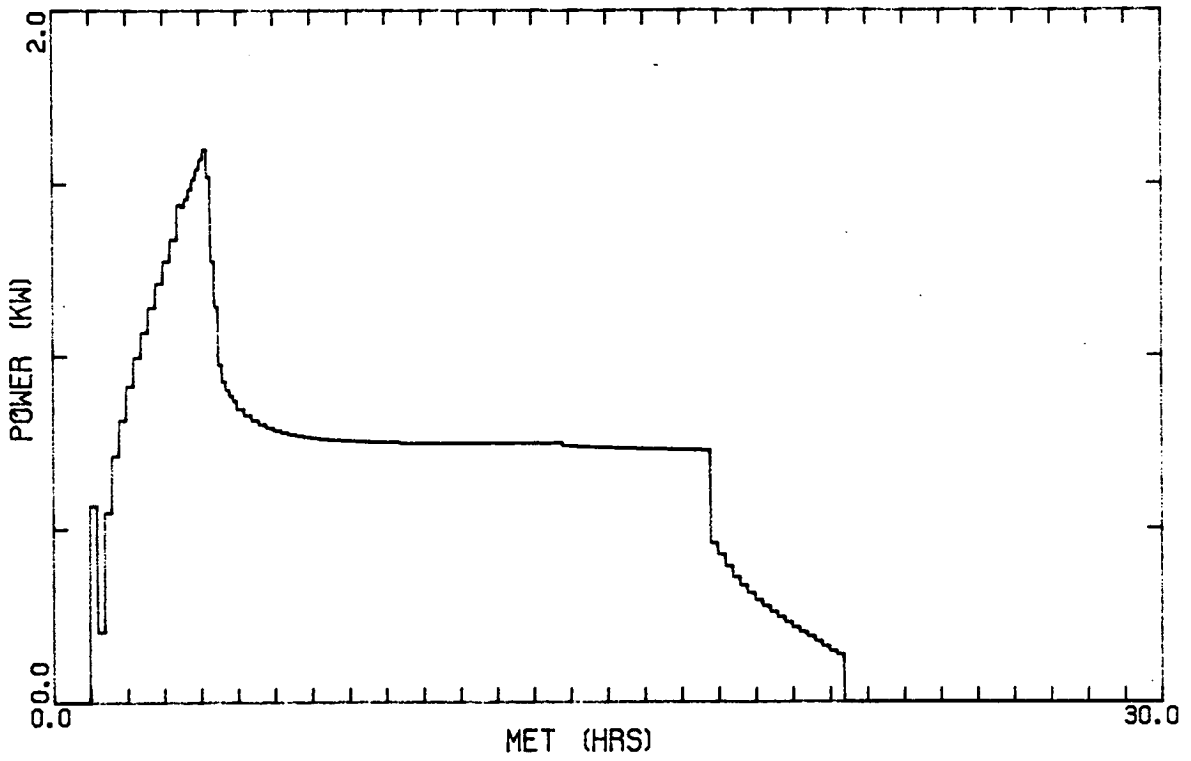


FIGURE 2.5-1. POWER PROFILES BY FO (Sheet 3 of 3)



## 2.6. THERMAL/FLUID REQUIREMENTS

### 2.6.1 HEAT TRANSFER CHARACTERISTICS

Furnace Module-1 utilizes the Space Station Furnace Facility (SSFF) water cooling loop for experiment cooling and will not require avionics air cooling. Thermal requirements for Furnace Module-1 are shown in Table 2.6-1. Maximum water-cooled heat dissipation from Experiment Rack-1 is 1500 W for Furnace Module-1. Required inlet temperature of the cooling water for Furnace Module-1 is 39.9 °C.

### 2.6.2 FLUID/VENT REQUIREMENTS

Furnace Module-1 requires an argon processing atmosphere. Argon required by Furnace Module-1 for the Integrated Configuration-1 (IC1) mission is 7.5 kg. The supplied argon is required to be research grade having the following contaminant levels:

99.9995 % pure	N <sub>2</sub> < 3.0 ppm
CO <sub>2</sub> < 0.5 ppm	N <sub>2</sub> O < 0.1 ppm
CO < 1.0 ppm	O <sub>2</sub> < 1.0 ppm
H <sub>2</sub> < 1.0 ppm	THC < 0.5 ppm
CH <sub>4</sub> < 0.5 ppm	H <sub>2</sub> O < 0.5 ppm
dewpoint = -112 °F	

During nominal operating conditions, the vent products for Furnace Module-1 will be argon and nitrogen. Vent products during off-nominal conditions are TBD. Gas and vacuum requirements for Furnace Module-1 are shown in Table 2.6-2.

Furnace Module-1 has two paths to the SSF Vacuum System. The use of these paths is defined as follows:

- Path One - Active Pressure Control
  - Path one is used for Gas Distribution System (GDS)-controlled, or nominal venting.
  - Path one requires access to the Space Station Freedom (SSF) Vacuum System during the sample processing phases of Furnace Module-1 operations.
  - Venting episodes using path one will be SSF timelined activities. Typical vents will occur every 15 min to 1 h.
- Path Two - Emergency Pressure Relief
  - Path two provides for emergency relief of experiment apparatus container (EAC) overpressure through redundant pressure relief valves.
  - Path two must have access to the SSF Vacuum System during all on-orbit phases after installation into the U.S. Laboratory module.

TABLE 2.6-1. ON-ORBIT THERMAL REQUIREMENTS

Equipment Item and FO No.	Heat Sink Type			Cooling Load (W)		Min/Max Temp. (°C)			Thermal Capacitance (W-h.°C)	Special Considerations (as applicable)	
	Rack Air (nonducted)	Rack Air (ducted)	Exp Coldplate (Module)	SSFF Core HX	Standby	Operate or other	Standby	Operate			Non-Operate
FO-3				X	0	0	0/50	0/50	0/50	TBD	
FO-4				X	0	0	0/50	0/50	0/50	TBD	
FO-5				X	TBD	232	0/50	0/50	0/50	TBD	
FO-6				X	TBD	274	0/50	0/50	0/50	TBD	
FO-6A				X	TBD	283	0/50	0/50	0/50	TBD	
FO-7				X	TBD	525	0/50	0/50	0/50	TBD	
FO-8				X	TBD	524	0/50	0/50	0/50	TBD	
FO-9				X	0	0	0/50	0/50	0/50	TBD	
FO-11				X	0	0	0/50	0/50	0/50	TBD	

TABLE 2.6-2. FLUID REQUIREMENTS

Equipment Item and FO No.	Functional Requirement (Pressure, Purge, Vent Vacuum)	Gas or Liquid Parameters					Vent		Special Considerations (as applicable)	
		Type	Quantity Stored (kg)	Pressure Limits (N/m <sup>2</sup> )	Flow-rate (kg/h)	Pressure Drop (N/m <sup>2</sup> )	Pressure (N/m <sup>2</sup> )	When Required and Duration		Vacuum Vent Rate: torr-1/sec
FO-3 Step 2	Vacuum Vent	Argon	0	$1.38 \times 10^5$	>4.1	TBD	0.133	TBD	$1.2 \times 10^{-3}$	
FO-4 Step 1	Vacuum Vent	Nitrogen	0	$1.38 \times 10^5$	TBD	TBD	0.133	TBD	$1.2 \times 10^{-3}$	
FO-4 Step 2	Pressurize	Argon	0	$1.38 \times 10^5$	>4.1	TBD	0.133	TBD	$1.2 \times 10^{-3}$	
FO-5	N/A									
FO-6	N/A									
FO-6A	N/A									
FO-7	N/A									
FO-8	N/A									
FO-9	Vent		0				0.133	TBD	$1.2 \times 10^{-3}$	
FO-11	N/A									

## 2.7. DATA SYSTEM REQUIREMENTS

Furnace Module-1 will require the use of the Furnace Data Acquisition and Control System (FDACS) consisting of a Furnace Control Unit (FCU) and a Furnace Actuator Unit (FAU), which will monitor and collect data from Furnace Module-1 and provide control stimulus as needed for the positioning of samples. The requirements from the Furnace Module-1 to the SSFF Core are defined in subsections 2.7.1 through 2.7.5 and in Tables 2.7-1 through 2.7-5..

### 2.7.1 SIGNAL INTERFACE DEFINITION

Table 2.7-1 defines the following data signals and control to perform the following data handling and operations functions:

- Furnace Module-1 activation and control
- Acquisition, formatting, and routing of Furnace Module-1 housekeeping data
- Acquisition, formatting, and routing of Furnace Module-1 science data

### 2.7.2 SIGNAL INTERFACE DEFINITION EXPANSION

Table 2.7-2 is an expansion of the input and output data streams identified in Table 2.7-1.

### 2.7.3 EVENT/EXCEPTION MONITORING REQUIREMENTS

Onboard event and exception monitoring requirements for data transmitted to the SSFF are defined in Table 2.7-3.

### 2.7.4 PAYLOAD OPERATIONS INTEGRATION CENTER DISPLAY REQUIREMENTS

The Payload Operations Integration Center (POIC) controls all payload operations and is equipped with consoles for data management, operations control, and mission planning. The data to provide this capability are shown in Table 2.7-4.

### 2.7.5 POIC LIMIT SENSING/EXCEPTION MONITORING REQUIREMENTS

Limit sensing and exception monitoring are provided to the POIC via downlink and are defined in Table 2.7-5.



TABLE 2.7-2. SIGNAL INTERFACE DEFINITION EXPANSION (Sheet 1 of 38)

ENTC NO.	NO.	DESCRIPTION	CIU	MN	NS	SI	TI	DATA	DESCRIPTION	MONIC	REQUI	REQAI	DI	NO.	DI	NO.	DI	NO.		
200	106	Go/NoGo Error Override	DI	101				B00100	00100				YI	3330	41	2				
201	106	Process Elapsed Time - Seconds	DG	101	06			U00101	00106				YI	3331	41	2				
202	106	CGF Syststem State	DG	101	03			U00107	00109				YI	3332	41	2				
203	106	Sample Number (Mode)	DG	101	06			U00110	00115				YI	3333	41	2				
204	106	Process Elapsed Time - Hours	DG	101	10			U01100	01109				YI	3334	41	2				
205	106	Process Elapsed Time - Minutes	DG	101	06			U01110	01115				YI	3335	41	2				
207	106	IFEA Water Outlet Temp	AI	101				S03100	03107				YI	3336	41	2				
208	106	IFEA Lower Humidity	AI	101				S04100	04107				YI	3337	41	2				
209	106	IFEA Upper Humidity	AI	101				S05100	05107				YI	3338	41	2				
210	106	IFEA Upper Atmosphere Temp	AI	101				S12100	12107				YI	3355	41	2				
211	106	RFM Cold End Shell Temp	AI	101				S13100	13107				YI	3356	41	2				
212	106	RFM Hot End Shell Temp	AI	101				S14100	14107				YI	3357	41	2				
213	106	Ampoule Alignment Arm Temp	AI	101				S15100	15107				YI	3358	41	2				
214	106	SEM Track Temp	AI	101				S16100	16107				YI	3359	41	2				
215	106	IFEA Absolute Pressure 1	AI	101				S17100	17107				YI	3360	41	2				
216	106	IFEA Absolute Pressure 2	AI	101				S18100	18107				YI	3361	41	2				
217	106	Furnace Linear Position	AI	101				S19100	19107				YI	3362	41	2				
218	106	Indexing CAM Rotary Position	AI	101				S20100	20107				YI	3363	41	2				
219	106	Experiment Main Bus Current	AI	101				S21100	21107				YI	3364	41	2				
220	106	Experiment Main Bus Voltage	AI	101				S22100	22107				YI	3365	41	2				
221	106	Water Outlet Vlv RCCB Off Status	DI	101				B23100	23100				YI	3250	41	2				
222	106	Water Outlet Vlv RCCB On Status	DI	101				B23101	23101				YI	3251	41	2				
223	106	IFEA Coolant Flow #1 Status	DI	101				B23102	23102				YI	3366	41	2				
224	106	IFEA Coolant Flow #2 Status	DI	101				B23103	23103				YI	3367	41	2				
225	106	Vacuum Vent Vlv RCCB Off Status	DI	101				B23104	23104				YI	3368	41	2				
226	106	Vacuum Vent Vlv RCCB On Status	DI	101				B23105	23105				YI	3369	41	2				
227	106	Hot Boost Mod A RCCB Off Status	DI	101				B23106	23106				YI	3370	41	2				
228	106	Hot Boost Mod A RCCB On Status	DI	101				B23107	23107				YI	3371	41	2				
229	106	Hot Boost Mod B RCCB Off Status	DI	101				B23108	23108				YI	3372	41	2				
230	106	Hot Boost Mod B RCCB On Status	DI	101				B23109	23109				YI	3373	41	2				
0	0		3	4	4	4	4	5	5	5	5	5	6	6	7	7	7	8	8	
3	6	7	9	0	3	5	7	8	1	3	5	7	5	6	7	1	2	5	8	0

TABLE 2.7-2. SIGNAL INTERFACE DEFINITION EXPANSION (Sheet 2 of 38)

ENTIC NO	NO	OR	DESCRIPTION	CICU	MN	IN	MS	S	T	DATA DESCRIPTION	MON	C	REQ	A	C	R	S	I	D	NO	X	A	I	T															
NO.	NO.	NO.		NO.	NO.	NO.	NO.	NO.	NO.		NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.															
OR	OR	OR		OR	OR	OR	OR	OR	OR		OR	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR															
DESCRIPTION																																							
231	106	COLD	Main Prim Mod RCCB Off Stat	DI	01					B 23 10 23 10														Y	3374	41	2												
232	106	COLD	Main Prim Mod RCCB On Stat	DI	01					B 23 11 23 11																Y	3375	41	2										
233	106	HotMain	Prim Mod A RCCB Off Stat	DI	01					B 23 12 23 12																Y	3376	41	2										
234	106	HotMain	Prim Mod A RCCB On Stat	DI	01					B 23 13 23 13																	Y	3377	41	2									
235	106	Water	Inlet Valve RCCB Off Stat	DI	01					B 23 14 23 14																	Y	3378	41	2									
236	106	Water	Inlet Valve RCCB On Status	DI	01					B 23 15 23 15																	Y	3379	41	2									
237	106	PDS	Airflow 1 Status	DI	01					B 24 00 24 00															Y	3380	41	2											
238	106	SCS	Airflow 1 Status	DI	01					B 24 01 24 01																Y	3381	41	2										
239	106	PCS	Airflow 1 Status	DI	01					B 24 02 24 02																Y	3382	41	2										
240	106	PCS	Airflow 2 Status	DI	01					B 24 03 24 03																Y	3383	41	2										
241	106	Argon	Fill Valve RCCB Off Status	DI	01					B 24 04 24 04																	Y	3384	41	2									
242	106	Argon	Fill Valve RCCB On Status	DI	01					B 24 05 24 05																	Y	3385	41	2									
243	106	PCS	Utility RCCB Off Status	DI	01					B 24 06 24 06																	Y	3386	41	2									
244	106	PCS	Utility RCCB On Status	DI	01					B 24 07 24 07																	Y	3387	41	2									
245	106	Peltier	Conn Motor RCCB Off Stat	DI	01					B 24 08 24 08																	Y	3388	41	2									
246	106	Peltier	Conn Motor RCCB On Stat	DI	01					B 24 09 24 09																	Y	3389	41	2									
247	106	Cold	Main Red Mod RCCB Off Stat	DI	01					B 24 10 24 10																	Y	3390	41	2									
248	106	Cold	Main Red Mod RCCB On Status	DI	01					B 24 11 24 11																	Y	3391	41	2									
249	106	Hot	Main Prim Mod B RCCB Off Stat	DI	01					B 24 12 24 12																	Y	3392	41	2									
250	106	Hot	Main Prim Mod B RCCB On Stat	DI	01					B 24 13 24 13																	Y	3393	41	2									
251	106	Hot	Guard Module RCCB Off Status	DI	01					B 24 14 24 14																	Y	3394	41	2									
252	106	Hot	Guard Module RCCB On Status	DI	01					B 24 15 24 15																	Y	3395	41	2									
253	106	Mech	Pulsing Mod RCCB Off Status	DI	01					B 25 00 25 00																	Y	3252	41	2									
254	106	Mech	Pulsing Mod RCCB On Status	DI	01					B 25 01 25 01																	Y	3253	41	2									
255	106	IFEA	ABS Press 2 RCCB Off Status	DI	01					B 25 02 25 02																	Y	3396	41	2									
256	106	IFEA	ABS Press 2 RCCB On Status	DI	01					B 25 03 25 03																	Y	3397	41	2									
257	106	IFEA	ABS Press 1 RCCB Off Status	DI	01					B 25 04 25 04																	Y	3398	41	2									
258	106	IFEA	ABS Press 1 RCCB On Status	DI	01					B 25 05 25 05																	Y	3399	41	2									
259	106	Vacuum	Vent Valve Closed Status	DI	01					B 25 06 25 06																	Y	13400	41	2									
260	106	Vacuum	Vent Valve Open Status	DI	01					B 25 07 25 07																	Y	13401	41	2									
3	4	4	4	4	4																						6	6	6	7	7	7	8	8					
0	0	0	0	0	0																							5	5	5	5	5	5	5	5	7	8	0	
3	6	7																										5	6	7	1	3	5	7					

TABLE 2.7-2. SIGNAL INTERFACE DEFINITION EXPANSION (Sheet 3 of 38)

ENT C NI	ICU	MIN	M	S	T	DATA	DESCRIPTION	MON	C	REQ	A	REQ	C	REQ	A	REQ	C	REQ	A		
NO. O O	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI		
R .	G	/	G	/	P	START	END	DATA	VALUE	E	E	L	E	E	L	E	E	L			
R	I	W	F	I	E	T															
.	D	I	W	D	B	T	W	D	B	T	W	D	B	T	W	D	B	T			
	S	X	I	#		#															
	/	D	I																		
261	106	Argon Fill Valve Closed Status	DI	01	B	25	08	25	08										3402	41	2
262	106	Argon Fill Valve Open Status	DI	01	B	25	09	25	09										3403	41	2
263	106	Hot Main Red Mod A RCCB Off Stat	DI	01	B	25	10	25	10										3254	41	2
264	106	Hot Main Red Mod A RCCB On Stat	DI	01	B	25	11	25	11										3255	41	2
265	106	Water Outlet Valve Normal Stat	DI	01	B	25	12	25	12										3404	41	2
266	106	Water Outlet Valve Bypass Stat	DI	01	B	25	13	25	13										3405	41	2
267	106	Water Inlet Valve Normal Status	DI	01	B	25	14	25	14										3406	41	2
268	106	Water Inlet Valve Bypass Status	DI	01	B	25	15	25	15										3407	41	2
269	106	Fail Safe Brake RCCB Off Status	DI	01	B	26	00	26	00										3408	41	2
270	106	Fail Safe Brake RCCB On Status	DI	01	B	26	01	26	01										3409	41	2
271	106	Core Hold Down Not Retracted	DI	01	B	26	02	26	02										3410	41	2
272	106	Core Hold Down Retracted	DI	01	B	26	03	26	03										3411	41	2
273	106	Core Hold Down Not Extended	DI	01	B	26	04	26	04										3412	41	2
274	106	Core Hold Down Extended	DI	01	B	26	05	26	05										3413	41	2
275	106	Core HD Motor RCCB Off Status	DI	01	B	26	06	26	06										3414	41	2
276	106	Core HD Motor RCCB On Status	DI	01	B	26	07	26	07										3415	41	2
277	106	Step Motor Clutch RCCB Off Stat	DI	01	B	26	08	26	08										3416	41	2
278	106	Step Motor Clutch RCCB On Status	DI	01	B	26	09	26	09										3417	41	2
279	106	Step Motor Drive RCCB Off Stat	DI	01	B	26	10	26	10										3418	41	2
280	106	Step Motor Drive RCCB On Stat	DI	01	B	26	11	26	11										3419	41	2
281	106	Rapid Xlation Clutch RCCB Off St	DI	01	B	26	12	26	12										3420	41	2
282	106	Rapid Xlation Clutch RCCB On St	DI	01	B	26	13	26	13										3421	41	2
283	106	Rapid Xlation Mtr RCCB Off Stat	DI	01	B	26	14	26	14										3422	41	2
284	106	Rapid Xlation Mtr RCCB On Status	DI	01	B	26	15	26	15										3423	41	2
285	106	Furnace Position Not Home	DI	01	B	27	00	27	00										3424	41	2
286	106	Furnace Position Home	DI	01	B	27	01	27	01										3425	41	2
287	106	Furn Extreme Trvl Not Exceeded	DI	01	B	27	02	27	02										3426	41	2
288	106	Furn Extreme Trvl Exceeded	DI	01	B	27	03	27	03										3427	41	2
289	106	Ampoule Alignment Not Retracted	DI	01	B	27	04	27	04										3428	41	2
290	106	Ampoule Alignment Retracted	DI	01	B	27	05	27	05										3429	41	2



TABLE 2.7-2. SIGNAL INTERFACE DEFINITION EXPANSION (Sheet 4 of 38)

ENTC N	ICU	MN	MS	IS	T	DATA DESCRIPTION	MONIC	REQIA	REQUIRE	MONIC	REQIA	REQUIRE						
NO. IO O	IA	G.	/G	P	START	END	DATA VALUE	---	---	---	---	---						
IR .	IG	W	F	E	---	---	---	---	---	---	---	---						
IR	UE	D	I	WD	BT	WD	BT	Y	V	X	C	I						
.	L	S	X	I	#	#	#	P	N	C	I	O						
	K	/	/	D	I	I	E	E	T	P	I	F						
291 106 Ampoule Alignment Not Extended	DI	01			B	27 06	27 06	I				YI	3430	41 2				
292 106 Ampoule Alignment Extended	DI	01			B	27 07	27 07	I				YI	3431	41 2				
293 106 Ampoule Align Mtr RCCB Off Stat	DI	01			B	27 08	27 08	I				YI	3432	41 2				
294 106 Ampoule Align Mtr RCCB On Stat	DI	01			B	27 09	27 09	I				YI	3433	41 2				
295 106 Ampoule Support Not Retracted	DI	01			B	27 10	27 10	I				YI	3434	41 2				
296 106 Ampoule Support Retracted	DI	01			B	27 11	27 11	I				YI	3435	41 2				
297 106 Ampoule Support Not Secure	DI	01			B	27 12	27 12	I				YI	3436	41 2				
298 106 Ampoule Support Secure	DI	01			B	27 13	27 13	I				YI	3437	41 2				
299 106 Ampoule Spt Plt Mtr RCCB Off St	DI	01			B	27 14	27 14	I				YI	3438	41 2				
300 106 Ampoule Spt Plt Mtr RCCB On Stat	DI	01			B	27 15	27 15	I				YI	3439	41 2				
301 106 Cold Guard Mod RCCB Off Status	DI	01			B	28 00	28 00	I				YI	3256	41 2				
302 106 Cold Guard Mod RCCB On Status	DI	01			B	28 01	28 01	I				YI	3257	41 2				
303 106 Carousel Spacer Plt Gap Lim-Not	DI	01			B	28 02	28 02	I				YI	3440	41 2				
304 106 Carousel Spacer Plt Gap Limit	DI	01			B	28 03	28 03	I				YI	3441	41 2				
305 106 Indexing Cam Not Stowed	DI	01			B	28 04	28 04	I				YI	3442	41 2				
306 106 Indexing Cam Stowed	DI	01			B	28 05	28 05	I				YI	3443	41 2				
307 106 Carousel Trk Extr Left Lim-Not	DI	01			B	28 06	28 06	I				YI	3444	41 2				
308 106 Carousel Trk Extr Left Limit	DI	01			B	28 07	28 07	I				YI	3445	41 2				
309 106 Carousel Trk Extr Right Lim-Not	DI	01			B	28 08	28 08	I				YI	3446	41 2				
310 106 Carousel Trk Extr Right Lim	DI	01			B	28 09	28 09	I				YI	3447	41 2				
311 106 Hot Main Red Mod B RCCB Off Stat	DI	01			B	28 10	28 10	I				YI	3258	41 2				
312 106 Hot Main Red Mod B RCCB On Stat	DI	01			B	28 11	28 11	I				YI	3259	41 2				
313 106 SEM Index Motor RCCB Off Status	DI	01			B	28 12	28 12	I				YI	3448	41 2				
314 106 SEM Index Motor RCCB On Status	DI	01			B	28 13	28 13	I				YI	3449	41 2				
315 106 SEM Indexing Jog CCW Status	DI	01			B	28 14	28 14	I				YI	3450	41 2				
316 106 SEM Indexing Jog CW Status	DI	01			B	28 15	28 15	I				YI	3451	41 2				
317 106 Ampoule Not Processing	DI	01			B	29 00	29 00	I				YI	3452	41 2				
318 106 Ampoule Processing	DI	01			B	29 01	29 01	I				YI	3453	41 2				
319 106 System Bus Relay Off Status	DI	01			B	29 02	29 02	I				YI	3454	41 2				
320 106 System Bus Relay On Status	DI	01			B	29 03	29 03	I				YI	3455	41 2				
0 0 0	3	4	4	4	4	5	5	5	5	5	5	6	6	6	7	7	7	8
3 6 7	9	0	3	5	7	8	1	3	5	7	5	6	7	1	2	5	8	0

TABLE 2.7-2. SIGNAL INTERFACE DEFINITION EXPANSION (Sheet 5 of 38)

ENTC NI	CIU	MN	NM	SIT	DATA	DESCRIPTION	MONIC	REQA	CIRC	SID	E	T				
NO. IO OI	DI	SO	IO	O	I											
IR .	IA	G.	/G	P	START	END	DATA	VALUE	---	L						
IR	IG	W	FI	E	---	---	T									
I.	UE	D	I	WD	BT	WD	BT	Y	V	X	C	T				
	LI	S	X	#	#	#	#		N	C	O	I				
	K	/	I	D	I	I	E		T	P	F	I				
1321	106	Peltier Pulsing Drv	RCCB	Off	St	DI	01	IB	29	104	29	104	Y	3260	41	2
1322	106	Peltier Pulsing Drv	RCCB	On	Stat	DI	01	IB	29	105	29	105	Y	3261	41	2
1001	850	Sync					02								41	2
1002	850	Frame Count (SFID)					02								41	2
1003	850	Spacelab Experiment ID					02								41	2
1004	850	Sample Number (Mode)					02								41	2
1005	850	Mission ID					02								41	2
1006	850	Furnace Position Not Home					02								41	2
1007	850	Furnace Position Home					02								41	2
1008	850	Furn Extreme Trvl Not Exceeded					02								41	2
1009	850	Furn Extreme Trvl Exceeded					02								41	2
1010	850	Core Hold Down Not Retracted					02								41	2
1011	850	Core Hold Down Retracted					02								41	2
1012	850	Core Hold Down Not Extended					02								41	2
1013	850	Core Hold Down Extended					02								41	2
1014	850	Water Outlet Valve Normal Stat					02								41	2
1015	850	Water Outlet Valve Bypass Stat					02								41	2
1016	850	Water Inlet Valve Normal Status					02								41	2
1017	850	Water Inlet Valve Bypass Status					02								41	2
1018	850	Vacuum Vent Valve Open Status					02								41	2
1019	850	Vacuum Vent Valve Closed Status					02								41	2
1020	850	Argon Fill Valve Open Status					02								41	2
1021	850	Argon Fill Valve Closed Status					02								41	2
1022	850	Ampoule Support Not Retracted					02								41	2
1023	850	Ampoule Support Retracted					02								41	2
1024	850	Ampoule Alignment Not Retracted					02								41	2
1025	850	Ampoule Alignment Retracted					02								41	2
1026	850	Ampoule Alignment Not Extended					02								41	2
1027	850	Ampoule Alignment Extended					02								41	2
1028	850	SEM Indexing Jog CCW Status					02								41	2

0 0 0  
3 6 7

TABLE 2.7-2. SIGNAL INTERFACE DEFINITION EXPANSION (Sheet 6 of 38)

ENTIC N	I	C	U	M	N	M	S	I	T	DATA DESCRIPTION				MONIC	REQ	A	I						
NO.	I	D	A	G	/	G	P	START	END	DATA	VALUE	---	L	E	---	L	C	R	S	I	D		
IR	.	I	R	I	.	I	.	I	.	I	.	I	.	I	.	I	C	I	R	C	S	I	D
0291850	SEM Indexing Jog CW Status			02																			
0301850	Ampoule Not Processing			02																			
0311850	Ampoule Processing			02																			
0321850	Indexing Cam Not Stowed			02																			
0331850	Indexing Cam Stowed			02																			
0341850	Peltier Connector Not Retracted			02																			
0351850	Peltier Connector Retracted			02																			
0361850	Peltier Connector Not Extended			02																			
0371850	Peltier Connector Extended			02																			
0381850	Ampoule 4 Failure 2 Status			02																			
0391850	Ampoule 4 Failure 1 Status			02																			
0401850	Ampoule 3 Failure 2 Status			02																			
0411850	Ampoule 3 Failure 1 Status			02																			
0421850	Ampoule 2 Failure 2 Status			02																			
0431850	Ampoule 2 Failure 1 Status			02																			
0441850	Ampoule 1 Failure 2 Status			02																			
0451850	Ampoule 1 Failure 1 Status			02																			
0461850	PDS Airflow 1 Status			02																			
0471850	PCS Airflow 1 Status			02																			
0481850	IFEA ABS Press 2 RCCB Off Status			02																			
0491850	IFEA ABS Press 2 RCCB On Status			02																			
0501850	Spare RCCB Off Stat			02																			
0511850	Spare RCCB On Stat			02																			
0521850	IFEA Coolant Flow #1 Status			02																			
0531850	SCS Airflow 1 Status			02																			
0541850	Cartridge 2 Failure 2 Status			02																			
0551850	Cartridge 2 Failure 1 Status			02																			
0561850	Cartridge 1 Failure 2 Status			02																			
0571850	Cartridge 1 Failure 1 Status			02																			
0581850	Ampoule 6 Failure 2 Status			02																			
		3	4	4	4	4	4	4	4	5	5	5	5	5	5	5	6	6	6	6	7	7	
		0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	
		3	6	7						8	8	8	8	8	8	8	9	9	9	9	9	9	

TABLE 2.7-2. SIGNAL INTERFACE DEFINITION EXPANSION (Sheet 7 of 38)

ENT C N	I	CIU	IN	IN	S	I	T	DATA	DESCRIPTION	MONIC	REQ	CIR	SID	E	I	
NO.	O	IA	G.	I	G	P	START	END	DATA VALUE	---	LI	---	---	---	---	
R	R	IG	W	FI	---	---	---	---	T	E	E	---	---	---	---	
I	I	UIE	D	I	WD	BT	WD	BT	Y	V	X	C	T	I	D	
I	I	LI	S	X	#	#	#	#	P	N	C	O	?	E	I	
I	I	KI	/	DI	/	/	/	/	E	T	P	F	/	/	/	
1059	850	Ampoule 6 Failure 1 Status														4112
1060	850	Ampoule 5 Failure 2 Status														4112
1061	850	Ampoule 5 Failure 1 Status														4112
1062	850	Water Outlet Vlv RCCB Off Status														4112
1063	850	Water Outlet Vlv RCCB On Status														4112
1064	850	Vacuum Vent Vlv RCCB Off Status														4112
1065	850	Vacuum Vent Vlv RCCB On Status														4112
1066	850	SEM Index Motor RCCB Off Status														4112
1067	850	SEM Index Motor RCCB On Status														4112
1068	850	Core HD Motor RCCB Off Status														4112
1069	850	Core HD Motor RCCB On Status														4112
1070	850	Hot Boost Mod A RCCB Off Status														4112
1071	850	Hot Boost Mod A RCCB On Status														4112
1072	850	Hot Boost Mod B RCCB Off Status														4112
1073	850	Hot Boost Mod B RCCB On Status														4112
1074	850	Cold Main Prim Mod RCCB Off Stat														4112
1075	850	Cold Main Prim Mod RCCB On Stat														4112
1076	850	HotMain Prim Mod A RCCB Off Stat														4112
1077	850	HotMain Prim Mod A RCCB On Stat														4112
1078	850	Carousel Trk Extr Right Lim-Not														4112
1079	850	Carousel Trk Extr Right Lim														4112
1080	850	Ampoule Support Not Secure														4112
1081	850	Ampoule Support Secure														4112
1082	850	Carousel Trk Extr Left Lim-Not														4112
1083	850	Carousel Trk Extr Left Limit														4112
1084	850	Carousel Spacer Plt Gap Lim-Not														4112
1085	850	Carousel Spacer Plt Gap Limit														4112
1086	850	Ampoule Spt Plt Mtr RCCB Off St														4112
1087	850	Ampoule Spt Plt Mtr RCCB On Stat														4112
1088	850	Ampoule Align Mtr RCCB Off Stat														4112
0	0		3	4	4	4	4	4	5	5	5	5	5	7	7	8
3	6	7	9	0	3	5	7	8	1	3	5	7	5	6	7	8



TABLE 2.7-2. SIGNAL INTERFACE DEFINITION EXPANSION (Sheet 9 of 38)

ENT NO.	NO.	CO	DESCRIPTION	C	U	M	N	M	S	T	DATA DESCRIPTION	MON	C	REQ	A	C	R	C	S	I	D	E	T			
				D	M	A	G	/	G	P	START	END	DATA VALUE	---	L	E	E	.	D	I	O	N	O.			
				I	G	W	F	E	---	T																
				U	E	D	I	W	D	B	T	W	D	B	T	Y	V	X	C	T	D	P	B			
				L	S	X	#																			
				K	/	D																				
119	850	Rapid Xlation Mtr RCCB On Status																						41	2	
120	850	Fail Safe Brake RCCB Off Status																							41	2
121	850	Fail Safe Brake RCCB On Status																							41	2
122	850	Cold Main Red Mod RCCB Off Stat																							41	2
123	850	Cold Main Red Mod RCCB On Status																							41	2
124	850	Hot Main Prim Mod B RCCB Off Stat																							41	2
125	850	Hot Main Prim Mod B RCCB On Stat																							41	2
126	850	Hot Guard Module RCCB Off Status																							41	2
127	850	Hot Guard Module RCCB On Status																							41	2
128	850	Mech Pulsing Mod RCCB Off Status																							41	2
129	850	Mech Pulsing Mod RCCB On Status																							41	2
130	850	Hot Main Red Mod A RCCB Off Stat																							41	2
131	850	Hot Main Red Mod A RCCB On Stat																							41	2
132	850	Cold Guard Mod RCCB Off Status																							41	2
133	850	Cold Guard Mod RCCB On Status																							41	2
134	850	Hot Main Red Mod B RCCB Off Stat																							41	2
135	850	Hot Main Red Mod B RCCB On Stat																							41	2
136	850	Peltier Pulsing Drv RCCB Off St																							41	2
137	850	Peltier Pulsing Drv RCCB On Stat																							41	2
138	850	Sample to Process #1																							41	2
139	850	Sample to Process #2																							41	2
140	850	Sample to Process #3																							41	2
141	850	Sample to Process #4																							41	2
142	850	Sample to Process #5																							41	2
143	850	Sample to Process #6																							41	2
144	850	Processed Sample #1																							41	2
145	850	Processed Sample #2																							41	2
146	850	Processed Sample #3																							41	2
147	850	Processed Sample #4																							41	2
148	850	Processed Sample #5																							41	2

TABLE 2.7-2. SIGNAL INTERFACE DEFINITION EXPANSION (Sheet 10 of 38)

ENT	C N	DESCRIPTION	IC I	M N	M S	I T	D A	D E	S C R I P T	DATA DESCRIPTION	MON I	RE Q	C I R C	S I D	E T	
NO.	O I		I G	W F	E I	START	END	DATA VALUE	E E	L I	D I O	N O.	X A	P B	I L	
149	850	Processed Sample #6	02												41	2
150	850	Last Sample Index	02												41	2
151	850	GMT Day	02												41	2
152	850	GMT Milliseconds of Day	02												41	2
153	850	GMT Fractional Milliseconds	02												41	2
154	850	Last Command Received Word #0	02												41	2
155	850	Last Command Received Word #1	02												41	2
156	850	Last Command Received Word #2	02												41	2
157	850	Last Command Received Word #3	02												41	2
158	850	Last Command Received Word #4	02												41	2
159	850	Last Command Received Word #5	02												41	2
160	850	Last Command Received Word #6	02												41	2
161	850	Last Command Received Word #7	02												41	2
162	850	Last Command Received Word #8	02												41	2
163	850	Last Command Received Word #9	02												41	2
164	850	Last Command Received Word #10	02												41	2
165	850	Last Command Received Word #11	02												41	2
166	850	Last Command Received Word #12	02												41	2
167	850	Last Command Received Word #13	02												41	2
168	850	Last Command Received Word #14	02												41	2
169	850	Last Command Received Word #15	02												41	2
170	850	Last Command Received Word #16	02												41	2
171	850	Last Command Received Word #17	02												41	2
172	850	Last Command Received Word #18	02												41	2
173	850	Last Command Received Word #19	02												41	2
174	850	Last Command Received Word #20	02												41	2
175	850	Last Command Received Word #21	02												41	2
176	850	Last Command Received Word #22	02												41	2
177	850	Last Command Received Word #23	02												41	2
178	850	Last Command Received Word #24	02												41	2
0	0															
3	6															

TABLE 2.7-2. SIGNAL INTERFACE DEFINITION EXPANSION (Sheet 11 of 38)

ENT NO.	C O	DESCRIPTION	C I U	M N	I M	S O	T I Y	DATA	DESCRIPTION	MON	C	/////			
												REQ	A		
IR .	IR											DATA VALUE	REQ		
179	850	Last Command Received Word #25												41	21
180	850	Last Command Received Word #26												41	21
181	850	Last Command Received Word #27												41	21
182	850	Last Command Received Word #28												41	21
183	850	Last Command Received Word #29												41	21
184	850	Last Command Received Word #30												41	21
185	850	Last Command Received Word #31												41	21
186	850	Invalid Command Flag												41	21
187	850	User Requested Data												41	21
188	850	ECS Next Timeline Record												41	21
189	850	FTS Next Timeline Record												41	21
190	850	FHS Cold Guard Next Timeline Rec												41	21
191	850	FHS Cold Zone Next Timeline Rec												41	21
192	850	FHS Booster Next Timeline Rec												41	21
193	850	FHS Hot Zone Next Timeline Rec												41	21
194	850	FHS Hot Guard Next Timeline Rec												41	21
195	850	SIDS Next Timeline Record												41	21
196	850	ECS Current Segment Start Time												41	21
197	850	ECS Current Segment Stop Time												41	21
198	850	FTS Current Segment Start Time												41	21
199	850	FTS Current Segment Stop Time												41	21
200	850	FHS Cold Guard Cur Seg Start Tim												41	21
201	850	FHS Cold Guard Cur Seg Stop Time												41	21
202	850	FHS Cold Zone Cur Seg Start Time												41	21
203	850	FHS Cold Zone Cur Seg Stop Time												41	21
204	850	FHS Booster Cur Seg Start Time												41	21
205	850	FHS Booster Cur Seg Stop Time												41	21
206	850	FHS Hot Zone Cur Seg Start Time												41	21
207	850	FHS Hot Zone Cur Seg Stop Time												41	21
208	850	FHS Hot Guard Cur Seg Start Time												41	21



TABLE 2.7-2. SIGNAL INTERFACE DEFINITION EXPANSION (Sheet 12 of 38)

ENT	IC	U	IM	N	M	S	I	T	DATA DESCRIPTION	MON	C	REQ	A	C	R	C	S	I	D	E	I						
NO.	O	O	I	S	O	I	O	I	VALUE	---	L	---	L	---	L	---	L	---	L	---	L						
IR .	IR	IS	IX	ID	IS	IX	ID	IS	IX	ID	IS	IX	ID	IS	IX	ID	IS	IX	ID	IS	IX						
IR .	IR	IS	IX	ID	IS	IX	ID	IS	IX	ID	IS	IX	ID	IS	IX	ID	IS	IX	ID	IS	IX						
209	850	FHS	Hot	Guard	Cur	Seg	Stop	Time														41	21				
210	850	SIDS	Current	Segment	Start	Time																		41	21		
211	850	SIDS	Current	Segment	Stop	Time																			41	21	
212	850	Experiment	Main	Bus	Current																				41	21	
213	850	Experiment	Main	Bus	Voltage																					41	21
214	850	FEA	Lower	Humidity																						41	21
215	850	FEA	Upper	Humidity																						41	21
216	850	FEA	Absolute	Pressure	1																					41	21
217	850	FEA	Absolute	Pressure	2																					41	21
218	850	FEA	Lower	Atmosphere	Temp																					41	21
219	850	FEA	Upper	Atmosphere	Temp																					41	21
220	850	FEA	Water	Inlet	Temp																					41	21
221	850	FEA	Water	Outlet	Temp																					41	21
222	850	RFM	Cold	End	Shell	Temp																				41	21
223	850	RFM	Hot	End	Shell	Temp																				41	21
224	850	RFM	Water	Outlet	Temp																					41	21
225	850	Sample	1	Temp	1																					41	21
226	850	Sample	1	Temp	2																					41	21
227	850	Sample	1	Temp	3																					41	21
228	850	Sample	1	Temp	4																					41	21
229	850	Sample	1	Temp	5																					41	21
230	850	Sample	1	Temp	6																					41	21
231	850	Sample	2	Temp	1																					41	21
232	850	Sample	2	Temp	2																					41	21
233	850	Sample	2	Temp	3																					41	21
234	850	Sample	2	Temp	4																					41	21
235	850	Sample	2	Temp	5																					41	21
236	850	Sample	2	Temp	6																					41	21
237	850	Sample	3	Temp	1																					41	21
238	850	Sample	3	Temp	2																					41	21

TABLE 2.7-2. SIGNAL INTERFACE DEFINITION EXPANSION (Sheet 13 of 38)

ENTIC N	ICU	MN	IN	MS	IT	DATA	DESCRIPTION	MON	IC	ENTIC N	
NO. O O	M S	SO	IO	O Y	REQ	A					
IR .	G	/G	P	START	END	DATA	VALUE	---	L	C	
IR	I	G	W	F	E	---	T	E	E	---	
.	U	E	D	I	WD	BT	WD	BT	Y	V	
	L	I	S	X	I	#	P	I	N	C	
	K	/	D	I	E	T	I	P	F	?	
239	850	Sample	3	Temp	3					41	2
240	850	Sample	3	Temp	4					41	2
241	850	Sample	3	Temp	5					41	2
242	850	Sample	3	Temp	6					41	2
243	850	Sample	4	Temp	1					41	2
244	850	Sample	4	Temp	2					41	2
245	850	Sample	4	Temp	3					41	2
246	850	Sample	4	Temp	4					41	2
247	850	Sample	4	Temp	5					41	2
248	850	Sample	4	Temp	6					41	2
249	850	Sample	5	Temp	1					41	2
250	850	Sample	5	Temp	2					41	2
251	850	Sample	5	Temp	3					41	2
252	850	Sample	5	Temp	4					41	2
253	850	Sample	5	Temp	5					41	2
254	850	Sample	5	Temp	6					41	2
255	850	Sample	6	Temp	1					41	2
256	850	Sample	6	Temp	2					41	2
257	850	Sample	6	Temp	3					41	2
258	850	Sample	6	Temp	4					41	2
259	850	Sample	6	Temp	5					41	2
260	850	Sample	6	Temp	6					41	2
261	850	Stepping Motor		Phase A	Current					41	2
262	850	Stepping Motor		Phase A	Voltage					41	2
263	850	Stepping Motor		Phase B	Current					41	2
264	850	Stepping Motor		Phase B	Voltage					41	2
265	850	Furnace		Linear	Position					41	2
266	850	FTS		Stepping Motor	Temp					41	2
267	850	Rapid Translation		Motor	RPM					41	2
268	850	Cold Guard		Heater	Current					41	2
0	0	0	0							6	6
3	6	7								5	6
										7	7
										1	2
										7	7
										5	8
										8	0

TABLE 2.7-2. SIGNAL INTERFACE DEFINITION EXPANSION (Sheet 14 of 38)

ENT C N	I C U	M N M I S T	D A T A	D E S C R I P T I O N	M O N I C	R E Q U I	C I R C S I D	E I T
NO. O O	D A	G./G	P S T A R T	E N D	D A T A V A L U E	E E L	D I O N O .	X A
IR .	I G	W F E	---	T		V X C	T D	P B
IR .	U E	D I	W D B T	W D B T	Y	N C I O	? E	I L
l .	L	S X	#	#	P	T P F		D E
l .	K	/	I D	I	E			
269 850 Cold Guard Heater Voltage								41 2
270 850 Cold Main Primary Heater Current								41 2
271 850 Cold Main Primary Heater Voltage								41 2
272 850 Cold Main Red Heater Current								41 2
273 850 Cold Main Red Heater Voltage								41 2
274 850 Hot Boost Heater Current								41 2
275 850 Hot Boost Heater Voltage								41 2
276 850 Hot Guard Heater Current								41 2
277 850 Hot Guard Heater Voltage								41 2
278 850 Hot Main Primary Heater Current								41 2
279 850 Hot Main Primary Heater Voltage								41 2
280 850 Hot Main Red Heater Current								41 2
281 850 Hot Main Red Heater Voltage								41 2
282 850 Cold Zone CJ Block Temp 1								41 2
283 850 Cold Zone CJ Block Temp 2								41 2
284 850 Hot Zone CJ Block Temp 1								41 2
285 850 Hot Zone CJ Block Temp 2								41 2
286 850 Sample 1 CJ Block Temp 1								41 2
287 850 Sample 1 CJ Block Temp 2								41 2
288 850 Sample 2 CJ Block Temp 1								41 2
289 850 Sample 2 CJ Block Temp 2								41 2
290 850 Sample 3 CJ Block Temp 1								41 2
291 850 Sample 3 CJ Block Temp 2								41 2
292 850 Sample 4 CJ Block Temp 1								41 2
293 850 Sample 4 CJ Block Temp 2								41 2
294 850 Sample 5 CJ Block Temp 1								41 2
295 850 Sample 5 CJ Block Temp 2								41 2
296 850 Sample 6 CJ Block Temp 1								41 2
297 850 Sample 6 CJ Block Temp 2								41 2
298 850 Booster Heater Control Temp 1								41 2
0 0 0	3 4 4 4 4 4	5 5 5 5	1 1 1 1 1 1	5 5 5 5	7 7 7 7	6 6 6 6	7 7 7 7	8 8 8 8
3 6 7	9 0 3 5 7 8	1 3 5 7	1 3 5 7	5 5 7	7 7 7	5 6 7	1 2 5 8	0

TABLE 2.7-2. SIGNAL INTERFACE DEFINITION EXPANSION (Sheet 15 of 38)

ENTIC NO.	NO.	DESCRIPTION	ICU	M	N	I	S	T	DATA	DESCRIPTION	MON	C	REQ		CIR	SID	E	T	
													REQ	A					REQ
299	850	Booster Heater Control Temp 2																	
300	850	Cold Guard Heater Control Temp 1																	
301	850	Cold Guard Heater Control Temp 2																	
302	850	Cold Main Prim Htr Cntrl Temp 1																	
303	850	Cold Main Prim Htr Cntrl Temp 2																	
304	850	Cold Main Red Htr Control Temp 1																	
305	850	Cold Main Red Htr Control Temp 2																	
306	850	Hot Guard Heater Control Temp 1																	
307	850	Hot Guard Heater Control Temp 2																	
308	850	Hot Main Prim Htr Control Temp 1																	
309	850	Hot Main Prim Htr Control Temp 2																	
310	850	Hot Main Red Htr Control Temp 1																	
311	850	Hot Main Red Htr Control Temp 2																	
312	850	Indexing CAM Rotary Position																	
313	850	Ampoule Alignment Arm Temp																	
314	850	SEM Track Temp																	
315	850	RTD Mux 1 Calibration - High																	
316	850	RTD Mux 1 Calibration - Low																	
317	850	RTD Mux 2 Calibration - High																	
318	850	RTD Mux 2 Calibration - Low																	
319	850	RTD Mux 3 Calibration - High																	
320	850	RTD Mux 3 Calibration - Low																	
321	850	RTD Mux 4 Calibration - High																	
322	850	RTD Mux 4 Calibration - Low																	
323	850	RTD Mux 5 Calibration - High																	
324	850	RTD Mux 5 Calibration - Low																	
325	850	RTD Mux 6 Calibration - High																	
326	850	RTD Mux 6 Calibration - Low																	
327	850	RTD Mux 7 Calibration - High																	
328	850	RTD Mux 7 Calibration - Low																	

TABLE 2.7-2. SIGNAL INTERFACE DEFINITION EXPANSION (Sheet 16 of 38)

ENT C N	I C U	M N	M I	S I	T I	D A T A	D E S C R I P T I O N	M O N I C	R E Q U I R E D	C I R C	S I D	E I T	
NO.   O O	D I A	G / G	P	S T A R T	E N D	D A T A	V A L U E	---	L	I D I O	N O.	X I A	
	I G	W F E						E E I.				P I B	
	U E	I D I	W D I B T	W D I B T	Y			V X C I		T I D		I L I	
	L	S X I	#	#	P			N C I O		? E		D E I	
	K	/	D I		E			T P F					
329 850 RTD Mux 8 Calibration - High													41 2
330 850 RTD Mux 8 Calibration - Low													41 2
331 850 TC Group A Calibration Type K													41 2
332 850 TC Group A Calibration Type S													41 2
333 850 TC Group A Calibration Type B													41 2
334 850 TC Group B Calibration Type K													41 2
335 850 TC Group B Calibration Type S													41 2
336 850 TC Group B Calibration Type B													41 2
337 850 TC Group C Calibration Type K													41 2
338 850 TC Group C Calibration Type S													41 2
339 850 TC Group C Calibration Type B													41 2
340 850 TC Group D Calibration Type K													41 2
341 850 TC Group D Calibration Type S													41 2
342 850 TC Group D Calibration Type B													41 2
343 850 SMS Board Velocity Reading													41 2
344 850 Cold Guard Zone CJ Block Act Temp													41 2
345 850 Cold Main CJ Block Act Temp													41 2
346 850 Booster Zone CJ Block Act Temp													41 2
347 850 Hot Main Zone CJ Block Act Temp													41 2
348 850 Hot Guard Zone CJ Block Act Temp													41 2
349 850 Total Calculated Power													41 2
350 850 Cold Guard Htr Cmd Current													41 2
351 850 Unused													41 2
352 850 Cold Main Prim Htr Cmd Current													41 2
353 850 Cold Main Red Htr Cmd Current													41 2
354 850 Booster Htr Cmd Current													41 2
355 850 Unused													41 2
356 850 Hot Main Prim Htr Cmd Current													41 2
357 850 Hot Main Red Htr Cmd Current													41 2
358 850 Hot Guard Htr Cmd Current													41 2
0	3	4	4	4	4	5	5	5	5	7	7	7	8
3	9	0	3	5	7	8	1	3	5	7	5	6	8

TABLE 2.7-2. SIGNAL INTERFACE DEFINITION EXPANSION (Sheet 17 of 38)

ENT N	NO.	DESCRIPTION	ICU	MIN	SIT	DATA	DESCRIPTION	MON	REQ	REQ A	CIRC	SID	E	IT																			
NO.	O		DIA	G	I	P	START	END	DATA	VALUE	E	E	L	C	R	C	I	D	I	O	N	O.	X	A									
R	.		I	G	W	F	E		T		E	E	.	D	I	O	N	O.	X	A													
R	.		I	D	I	W	D	B	T	Y	V	X	C	T	D	P	B																
.			L	S	X	#	#	P	N	C	O	?	E	I	L																		
			K	/	D			E	T	P	F			D	E																		
359	850	Unused		02																					41	2							
360	850	Cold Guard Zone Setpoint Temp		02																						41	2						
361	850	Cold Main Zone Setpoint Temp		02																						41	2						
362	850	Booster Zone Setpoint Temp		02																						41	2						
363	850	Hot Main Zone Setpoint Temp		02																						41	2						
364	850	Hot Guard Zone Setpoint Temp		02																						41	2						
365	850	Cold Guard Htr Calc Temp 1		02																						41	2						
366	850	Cold Guard Htr Calc Temp 2		02																						41	2						
367	850	Unused		02																						41	2						
368	850	Unused		02																						41	2						
369	850	Cold Main Prim Htr Calc Temp 1		02																						41	2						
370	850	Cold Main Prim Htr Calc Temp 2		02																						41	2						
371	850	Cold Main Red Htr Calc Temp 1		02																						41	2						
372	850	Cold Main Red Htr Calc Temp 2		02																						41	2						
373	850	Booster Htr Calc Temp 1		02																						41	2						
374	850	Booster Htr Calc Temp 2		02																						41	2						
375	850	Unused		02																						41	2						
376	850	Unused		02																						41	2						
377	850	Hot Main Prim Htr Calc Temp 1		02																						41	2						
378	850	Hot Main Prim Htr Calc Temp 2		02																						41	2						
379	850	Hot Main Red Htr Calc Temp 1		02																						41	2						
380	850	Hot Main Red Htr Calc Temp 2		02																						41	2						
381	850	Hot Guard Htr Calc Temp 1		02																						41	2						
382	850	Hot Guard Htr Calc Temp 2		02																						41	2						
383	850	Unused		02																						41	2						
384	850	Unused		02																						41	2						
385	850	Cold Guard Zone Act Temp		02																						41	2						
386	850	Cold Main Zone Act Temp		02																						41	2						
387	850	Booster Zone Act Temp		02																						41	2						
388	850	Hot Main Zone Act Temp		02																						41	2						
0	0		3	4	4	4	4	5	5	5	5	5	5	7											6	6	6	7	8				
3	6		9	0	3	5	7	8	1	3	5	7														5	6	7	1	2	5	8	0

TABLE 2.7-2. SIGNAL INTERFACE DEFINITION EXPANSION (Sheet 18 of 38)

ENT C NI	CIU	MN	IN	M	S	I	T	DATA	DESCRIPTION	MON C	REQ A	C R	S I	D E	I	T	
NO. O O	D A	G./G	I/P	START	END	DATA	VALUE	---	L	---	L	C R	S I	D E	I	T	
IR	I	G	W	F E	---	T	---	T	E E	---	L	D I	O N	O	X	A	
IR	I	D	I	W	D B	T Y	---	---	V X	C	---	T	D	I	P	B	
..	L	S	X	#	#	#	---	---	N C	O	---	?	E	I	L	I	
	K	/	D	I	---	---	---	---	T P	F	---	---	---	D	E	---	
1389 850 Hot Guard Zone Act Temp																	41 2
1390 850 Cold Guard Zone Delta Temp																	41 2
1391 850 Cold Main Zone Delta Temp																	41 2
1392 850 Booster Zone Delta Temp																	41 2
1393 850 Hot Main Zone Delta Temp																	41 2
1394 850 Hot Guard Zone Delta Temp																	41 2
1395 850 Cold Guard Zone Uncpld Power																	41 2
1396 850 Cold Main Zone Uncpld Power																	41 2
1397 850 Booster Zone Uncpld Power																	41 2
1398 850 Hot Main Zone Uncpld Power																	41 2
1399 850 Hot Guard Zone Uncpld Power																	41 2
1400 850 Cold Guard Zone Prop Power																	41 2
1401 850 Cold Main Zone Prop Power																	41 2
1402 850 Booster Zone Prop Power																	41 2
1403 850 Hot Main Zone Prop Power																	41 2
1404 850 Hot Guard Zone Prop Power																	41 2
1405 850 Cold Guard Zone Int Power																	41 2
1406 850 Cold Main Zone Int Power																	41 2
1407 850 Booster Zone Int Power																	41 2
1408 850 Hot Main Zone Int Power																	41 2
1409 850 Hot Guard Zone Int Power																	41 2
1410 850 Cold Guard Zone Power																	41 2
1411 850 Cold Main Zone Power																	41 2
1412 850 Booster Zone Power																	41 2
1413 850 Hot Main Zone Power																	41 2
1414 850 Hot Guard Zone Power																	41 2
1415 850 Cold Guard Htr Calc Voltage																	41 2
1416 850 Unused																	41 2
1417 850 Cold Main Prim Htr Calc Voltage																	41 2
1418 850 Cold Main Red Htr Calc Voltage																	41 2
0	3	4	4	4	4	4	4	5	5	5	5	5	5	5	5	7	8
3	9	0	3	5	7	8	1	3	5	7	1	2	5	8	0		0

TABLE 2.7-2. SIGNAL INTERFACE DEFINITION EXPANSION (Sheet 19 of 38)

ENT C N	NO. O O	DESCRIPTION	CIU	MN	IN	S	T	DATA	DESCRIPTION	MONIC	REQ	REQ	CIR	SID	E	T	
			MIS	SO	OS	O	I	Y									
			DI	A	G.	I	G	P	START	END	DATA	VALUE	E	E	L		
			IG	W	F	I	E										
			UI	D	I	W	D	I	B	T	W	D	I	B	T	Y	
			LI	S	X	I	#										
			IK	/	I	D	I										
1419	850	Booster Htr Calc Voltage															4112
1420	850	Unused															4112
1421	850	Hot Main Prim Htr Calc Voltage															4112
1422	850	Hot Main Red Htr Calc Voltage															4112
1423	850	Hot Guard Htr Calc Voltage															4112
1424	850	Unused															4112
1425	850	Cold Guard Htr Act Current															4112
1426	850	Unused															4112
1427	850	Cold Main Prim Htr Act Current															4112
1428	850	Cold Main Red Htr Act Current															4112
1429	850	Booster Htr Act Current															4112
1430	850	Unused															4112
1431	850	Hot Main Prim Htr Act Current															4112
1432	850	Hot Main Red Htr Act Current															4112
1433	850	Hot Guard Htr Act Current															4112
1434	850	Unused															4112
1435	850	Cold Guard Htr Calc Resistance															4112
1436	850	Unused															4112
1437	850	ColdMain Prim Htr Calc Resistance															4112
1438	850	ColdMain Red Htr Calc Resistance															4112
1439	850	Booster Htr Resistance															4112
1440	850	Unused															4112
1441	850	HOTMain Prim Htr Calc Resistance															4112
1442	850	Hot Main Red Htr Calc Resistance															4112
1443	850	Hot Guard Htr Calc Resistance															4112
1444	850	Unused															4112
1445	850	Cold Guard Htr Limited Power															4112
1446	850	Unused															4112
1447	850	Cold Main Prim Htr Limited Power															4112
1448	850	Cold Main Red Htr Limited Power															4112
0	0		3	4	4	4	4	4	5	5	5	5	6	6	6	7	8
3	6		9	0	3	5	7	8	1	3	5	7	5	6	7	1	2
																	5
																	8
																	0



TABLE 2.7-2. SIGNAL INTERFACE DEFINITION EXPANSION (Sheet 20 of 38)

ENTIC NO.	DESCRIPTION	CIU	MN	IN	S	I	T	DATA DESCRIPTION	MON	C	REQ	A	C	R	S	I	D	E	T										
NO.		M	S	O	I	O	I	Y	---	---	---	---	---	---	---	---	---	---	---										
R		G	/	G	P	START	END	DATA VALUE	E	E	L	D	I	O	N	O													
R		W	F	I	E	---	---	---	T	V	X	C	T	D	I	P	B	I	L										
.		D	I	WD	BT	WD	BT	Y	P	N	C	O	?	E															
		S	X	#		#			P																				
		/	D	I					E																				
1449	850 Booster Htr Limited Power																			41	2								
1450	850 Unused																				41	2							
1451	850 Hot Main Prim Htr Limited Power																				41	2							
1452	850 Hot Main Red Htr Limited Power																				41	2							
1453	850 Hot Guard Htr Limited Power																				41	2							
1454	850 Unused																				41	2							
1455	850 Cold Guard Htr Des Current																				41	2							
1456	850 Unused																				41	2							
1457	850 Cold Main Prim Htr Des Current																				41	2							
1458	850 Cold Main Red Htr Des Current																				41	2							
1459	850 Booster Htr Des Current																				41	2							
1460	850 Unused																				41	2							
1461	850 Hot Main Prim Htr Des Current																				41	2							
1462	850 Hot Main Red Htr Des Current																				41	2							
1463	850 Hot Guard Htr Des Current																				41	2							
1464	850 Unused																				41	2							
1465	850 Cold Guard Zone Saturation Flag																				41	2							
1466	850 Cold Main Zone Saturation Flag																				41	2							
1467	850 Booster Zone Saturation Flag																				41	2							
1468	850 Hot Main Zone Saturation Flag																				41	2							
1469	850 Hot Guard Zone Saturation Flag																				41	2							
1470	850 Integral Power Fault Time																				41	2							
1471	850 Fault Sum Delta Power																				41	2							
1472	850 Fault Integral Gain																				41	2							
1473	850 Fault Proportional Gain																				41	2							
1474	850 Fault Intermediate Calc. Value 1																				41	2							
1475	850 Fault Intermediate Calc. Value 2																				41	2							
1476	850 Fault Delta Power - Previous																				41	2							
1477	850 Fault Delta Power - 2nd Previous																				41	2							
1478	850 Faulted Zone																				41	2							
0	0 0	3	4	4	4	4	4	4	5	5	5	5	5	5	5	5	5	5	5	6	6	6	6	7	7	7	7	8	8
3	6 7	9	0	3	5	7	8	1	3	5	7	1	2	5	8	0													



TABLE 2.7-2. SIGNAL INTERFACE DEFINITION EXPANSION (Sheet 22 of 38)

ENTIC NO.	NO.	IO	O	R	.	IR	.	K	C	U	M	N	M	S	I	T	D	A	D	E	S	C	R	E	S	I	D	E	T	
DESCRIPTION																														
509	1850	FF																												
510	1850	FF																												
511	1850	FF																												
512	1850	FF																												
513	1850	FF																												
514	1850	FF																												
515	1850	FF																												
516	1850	FF																												
517	1850	FF																												
518	1850	FF																												
519	1850	FF																												
520	1850	FF																												
521	1850	FF																												
522	1850	FF																												
523	1850	FF																												
524	1850	FF																												
525	1850	FF																												
526	1850	FF																												
527	1850	FF																												
528	1850	FF																												
529	1850	FF																												
530	1850	FF																												
531	1850	FF																												
532	1850	FF																												
533	1850	FF																												
534	1850	FF																												
535	1850	FF																												
536	1850	FF																												
537	1850	FF																												
538	1850	FF																												



TABLE 2.7-2. SIGNAL INTERFACE DEFINITION EXPANSION (Sheet 24 of 38)

ENTIC NO.	IO	N		ICU	MN	MIS	T	DATA	DESCRIPTION	MONIC	REQ	A	IC	R	C	S	ID	E	T			
			DESCRIPTION		SO	O	I	O	Y													
				D	A	G	/	G	P	START	END	DATA	VALUE									
				U	E	I	D	I	W	D	B	T	W	D	B	T	Y	V	X			
				L	I	S	X	I	#	#	#	#	#	#	#	#	#	#	#			
				K	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/			
569	1850	FF	Mech Pulsing Mod RCCB Off		02															41	2	
570	1850	FF	Mech Pulsing Mod RCCB On		02																41	2
571	1850	FF	Cartridge 6 Failure 2 Status		02																41	2
572	1850	FF	Cartridge 6 Failure 1 Status		02																41	2
573	1850	FF	Cartridge 5 Failure 2 Status		02																41	2
574	1850	FF	Cartridge 5 Failure 1 Status		02																41	2
575	1850	FF	Cartridge 4 Failure 2 Status		02																41	2
576	1850	FF	Cartridge 4 Failure 1 Status		02																41	2
577	1850	FF	Cartridge 3 Failure 2 Status		02																41	2
578	1850	FF	Cartridge 3 Failure 1 Status		02																41	2
579	1850	FF	Cartridge 2 Failure 2 Status		02																41	2
580	1850	FF	Cartridge 2 Failure 1 Status		02																41	2
581	1850	FF	Cartridge 1 Failure 2 Status		02																41	2
582	1850	FF	Cartridge 1 Failure 1 Status		02																41	2
583	1850	FF	Ampoule 6 Failure 2 Status		02																41	2
584	1850	FF	Ampoule 6 Failure 1 Status		02																41	2
585	1850	FF	Hot Boost Mod A RCCB Off		02																41	2
586	1850	FF	Hot Boost Mod A RCCB On		02																41	2
587	1850	FF	Cold Main Red Mod RCCB Off		02																41	2
588	1850	FF	Cold Main Red Mod RCCB On		02																41	2
589	1850	FF	Cold Main Prim Mod RCCB Off		02																41	2
590	1850	FF	Cold Main Prim Mod RCCB On		02																41	2
591	1850	FF	Cold Guard Mod RCCB Off		02																41	2
592	1850	FF	Cold Guard Mod RCCB On		02																41	2
593	1850	FF	Peltier Conn Retracted-Not		02																41	2
594	1850	FF	Peltier Conn Retracted		02																41	2
595	1850	FF	Peltier Conn Extended-Not		02																41	2
596	1850	FF	Peltier Conn Extended		02																41	2
597	1850	FF	Peltier Conn Motor RCCB Off		02																41	2
598	1850	FF	Peltier Conn Motor RCCB On		02																41	2

TABLE 2.7-2. SIGNAL INTERFACE DEFINITION EXPANSION (Sheet 25 of 38)

ENT	C N	ICU	IMN	IS	IT	DATA	DESCRIPTION	MONIC	REQ	IL	CIRC	SID	E	IT
NO.	O O	IS	ISO	OIO	Y	REQ	IA	---	IL	---	IL	---	IL	---
R .	R .	IG	/G	IP	START	END	DATA	VALUE	---	IL	---	IL	---	IL
..	..	W	IF	E	---	---	T	---	---	---	---	---	---	---
		ID	I	WD	BT	WD	BT	Y	---	---	---	---	---	---
		S	X	I	#	I	P	---	---	---	---	---	---	---
		/	ID	I	---	---	E	---	---	---	---	---	---	---
599	850	FF					Peltier Pulsing Drv RCCB Off							4112
600	850	FF					Peltier Pulsing Drv RCCB On							4112
601	850	FF					SCS Airflow 1 Status							4112
602	850	FF					PDS Airflow 1 Status							4112
603	850	FF					PCS Airflow 2 Status							4112
604	850	FF					PCS Airflow 1 Status							4112
605	850	FF					Hot Main Red Mod B RCCB Off							4112
606	850	FF					Hot Main Red Mod B RCCB On							4112
607	850	FF					Hot Main Red Mod A RCCB Off							4112
608	850	FF					Hot Main Red Mod A RCCB On							4112
609	850	FF					Hot Main Prim Mod B RCCB Off							4112
610	850	FF					Hot Main Prim Mod B RCCB On							4112
611	850	FF					HotMain Prim Mod A RCCB Off							4112
612	850	FF					HotMain Prim Mod A RCCB On							4112
613	850	FF					Hot Guard Module RCCB Off							4112
614	850	FF					Hot Guard Module RCCB On							4112
615	850	FF					Hot Boost Mod B RCCB Off							4112
616	850	FF					Hot Boost Mod B RCCB On							4112
617	850	FF					Hot Main Prim Htr Ctl Temp 1							4112
618	850	FF					Cold Main Red Htr Ctl Temp 1							4112
619	850	FF					TC Group A Calibration Type B							4112
620	850	FF					TC Group A Calibration Type S							4112
621	850	FF					TC Group A Calibration Type K							4112
622	850	FF					Cold Guard Heater Ctl Temp 2							4112
623	850	FF					Cold Main Prim Htr Ctl Temp 2							4112
624	850	FF					Booster Heater Ctl Temp 2							4112
625	850	FF					Hot Main Red Htr Ctl Temp 2							4112
626	850	FF					Hot Main Prim Htr Ctl Temp 2							4112
627	850	FF					Hot Guard Heater Ctl Temp 2							4112
628	850	FF					TC Group B Calibration Type B							4112

TABLE 2.7-2. SIGNAL INTERFACE DEFINITION EXPANSION (Sheet 26 of 38)

ENTIC NO.	NO.	DESCRIPTION	ICU	MN	IN	S	I	T	DATA DESCRIPTION	MON	C	REQ	A	C	R	C	S	I	D	E	T
			DA	SO	IO	Y			END DATA VALUE												
			IA	G	/	G	I	P	START												
			IG	W	F	E															
			UE	I	D	I	WD	BT	WD	BT	Y										
			LI	S	X	I	#														
			K	/	D	I															
629	1850	FF TC Group B Calibration Type S		02																	
630	1850	FF TC Group B Calibration Type K		02																	
631	1850	FF IFEA Coolant Flow #2 Status		02																	
632	1850	FF IFEA Coolant Flow #1 Status		02																	
633	1850	FF Sample 4 Temp 1		02																	
634	1850	FF Sample 3 Temp 1		02																	
635	1850	FF Sample 2 Temp 1		02																	
636	1850	FF Sample 1 Temp 1		02																	
637	1850	FF Cold Main Red Htr Ctl Temp 2		02																	
638	1850	FF TC Group D Calibration Type B		02																	
639	1850	FF TC Group D Calibration Type S		02																	
640	1850	FF TC Group D Calibration Type K		02																	
641	1850	FF Cold Guard Heater Ctl Temp 1		02																	
642	1850	FF Cold Main Prim Htr Ctl Temp 1		02																	
643	1850	FF Booster Heater Ctl Temp 1		02																	
644	1850	FF Hot Guard Heater Ctl Temp 1		02																	
645	1850	FF TC Group C Calibration Type B		02																	
646	1850	FF TC Group C Calibration Type S		02																	
647	1850	FF TC Group C Calibration Type K		02																	
648	1850	FF Hot Main Red Htr Ctl Temp 1		02																	
649	1850	FF Sample 2 Temp 4		02																	
650	1850	FF Sample 1 Temp 4		02																	
651	1850	FF Sample 6 Temp 3		02																	
652	1850	FF Sample 5 Temp 3		02																	
653	1850	FF Sample 4 Temp 3		02																	
654	1850	FF Sample 3 Temp 3		02																	
655	1850	FF Sample 2 Temp 3		02																	
656	1850	FF Sample 1 Temp 3		02																	
657	1850	FF Sample 6 Temp 2		02																	
658	1850	FF Sample 5 Temp 2		02																	

TABLE 2.7-2. SIGNAL INTERFACE DEFINITION EXPANSION (Sheet 27 of 38)

ENT C NI	IC U	MN NM S T	DATA	DESCRIPTION	MON C I	REQ A I	CIRC SID	E T
NO. O O I	M S	SO OS O Y	START	END	DATA VALUE	---	L	X A
IR .	I G	W F E	---	T	E E .	D I O NO.	P B I	I L I
IR	I U E	D I	WD BT	WD BT Y	V X C I	T D	I E I	D E I
.	L	S X I	#	#	N C O I	? E I		
	K	/ D I		E I	T P F I			
1659 850 FF	Sample 4	Temp 2						41 21
1660 850 FF	Sample 3	Temp 2						41 21
1661 850 FF	Sample 2	Temp 2						41 21
1662 850 FF	Sample 1	Temp 2						41 21
1663 850 FF	Sample 6	Temp 1						41 21
1664 850 FF	Sample 5	Temp 1						41 21
1665 850 FF	Sample 6	Temp 6						41 21
1666 850 FF	Sample 5	Temp 6						41 21
1667 850 FF	Sample 4	Temp 6						41 21
1668 850 FF	Sample 3	Temp 6						41 21
1669 850 FF	Sample 2	Temp 6						41 21
1670 850 FF	Sample 1	Temp 6						41 21
1671 850 FF	Sample 6	Temp 5						41 21
1672 850 FF	Sample 5	Temp 5						41 21
1673 850 FF	Sample 4	Temp 5						41 21
1674 850 FF	Sample 3	Temp 5						41 21
1675 850 FF	Sample 2	Temp 5						41 21
1676 850 FF	Sample 1	Temp 5						41 21
1677 850 FF	Sample 6	Temp 4						41 21
1678 850 FF	Sample 5	Temp 4						41 21
1679 850 FF	Sample 4	Temp 4						41 21
1680 850 FF	Sample 3	Temp 4						41 21
1681 850 FF	Sample 4	CJ Block	Temp 1					41 21
1682 850 FF	Sample 3	CJ Block	Temp 2					41 21
1683 850 FF	Sample 3	CJ Block	Temp 1					41 21
1684 850 FF	Sample 2	CJ Block	Temp 2					41 21
1685 850 FF	Sample 2	CJ Block	Temp 1					41 21
1686 850 FF	Sample 1	CJ Block	Temp 2					41 21
1687 850 FF	Sample 1	CJ Block	Temp 1					41 21
1688 850 FF	RFM Water	Outlet Temp						41 21
0 0 0	3 4 4 4 4 4	5 5 5 5	5 5 5 5	5 5 5 5	6 6 6	7 7 7 7	7 7 7 7	8 8 8 8
3 6 7	9 0 3 5 7 8	1 3 5 7	1 3 5 7	1 3 5 7	5 6 7	1 2 5 8	1 2 5 8	0 0 0 0



TABLE 2.7-2. SIGNAL INTERFACE DEFINITION EXPANSION (Sheet 28 of 38)

ENTIC N NO. IO O	DESCRIPTION	C U	M N	M I	S I	T	D A	D E	S C R I P T I O N	M O N I C I	R E Q U I R E D	REMARKS	
IR .		D I A	G .	I / G	P I	S T A R T	E N D	D A T A	V A L U E	---	L	C I R C U I T	
IR .		U E	I D	I W D	B T	W D	B T	Y		V I X I C	T I D	I P B	
		L	S	X I	#	#	#	#		N I C I O	?	I L I	
		K	/	D I						T I P I F		D E I	
6891850 FF	Cold Zone CJ Block Temp 2												4112
6901850 FF	Cold Zone CJ Block Temp 1												4112
6911850 FF	Hot Zone CJ Block Temp 1												4112
6921850 FF	Hot Zone CJ Block Temp 2												4112
6931850 FF	RFM Hot End Shell Temp												4112
6941850 FF	RFM Cold End Shell Temp												4112
6951850 FF	IFEA Water Inlet Temp												4112
6961850 FF	IFEA Water Outlet Temp												4112
6971850 FF	RTD Mux 3 Calibration - Low												4112
6981850 FF	RTD Mux 3 Calibration - High												4112
6991850 FF	RTD Mux 2 Calibration - Low												4112
7001850 FF	RTD Mux 2 Calibration - High												4112
7011850 FF	RTD Mux 1 Calibration - Low												4112
7021850 FF	RTD Mux 1 Calibration - High												4112
7031850 FF	IFEA Upper Atmosphere Temp												4112
7041850 FF	IFEA Lower Atmosphere Temp												4112
7051850 FF	FTS Stepping Motor Temp												4112
7061850 FF	SEM Track Temp												4112
7071850 FF	Ampoule Alignment Arm Temp												4112
7081850 FF	Sample 6 CJ Block Temp 2												4112
7091850 FF	Sample 6 CJ Block Temp 1												4112
7101850 FF	Sample 5 CJ Block Temp 2												4112
7111850 FF	Sample 5 CJ Block Temp 1												4112
7121850 FF	Sample 4 CJ Block Temp 2												4112
7131850 FF	Cold Main Red Heater Current												4112
7141850 FF	Cold Main Red Heater Voltage												4112
7151850 FF	Cold Main Primary Heater Cur												4112
7161850 FF	Cold Main Primary Heater Volt												4112
7171850 FF	Cold Guard Heater Current												4112
7181850 FF	Cold Guard Heater Voltage												4112
0 0 0		3 4	4 4	4 4	5 5	5 5	5 5	5 5	5 5	6 6	6 6	7 7	8
3 6 7		9 0	3 5	7 8	1 3	5 7	1 3	5 7	5 6	7	5 6	7 8	0

TABLE 2.7-2. SIGNAL INTERFACE DEFINITION EXPANSION (Sheet 29 of 38)

ENTC N	NO	IO	O	DESCRIPTION	CIU	MIS	DI	IG	UI	L	K	MIN	M	IN	S	I	T	DATA	DESCRIPTION	MON	C	REQ	A	CIRCSID	E	IT												
							G./G	W	D	S	X	I	W	D	B	F	W	D	B	F	T	Y	#	P	E	T	D	NO.	P	B	I	L	E					
1719	850	FF	RTD	Mux 8 Calibration - Low								02																						41	2			
1720	850	FF	RTD	Mux 8 Calibration - High								02																							41	2		
1721	850	FF	RTD	Mux 7 Calibration - Low								02																								41	2	
1722	850	FF	RTD	Mux 7 Calibration - High								02																									41	2
1723	850	FF	RTD	Mux 6 Calibration - Low								02																									41	2
1724	850	FF	RTD	Mux 6 Calibration - High								02																									41	2
1725	850	FF	RTD	Mux 5 Calibration - Low								02																									41	2
1726	850	FF	RTD	Mux 5 Calibration - High								02																									41	2
1727	850	FF	RTD	Mux 4 Calibration - Low								02																									41	2
1728	850	FF	RTD	Mux 4 Calibration - High								02																									41	2
1729	850	FF	IFE	Lower Humidity								02																									41	2
1730	850	FF	Rapid	Translation Motor RPM								02																									41	2
1731	850	FF	Indexing	CAM Rotary Position								02																									41	2
1732	850	FF	Furnace	Linear Position								02																									41	2
1733	850	FF	Stepping	Motor Phase B Cur								02																									41	2
1734	850	FF	Stepping	Motor Phase B Volt								02																									41	2
1735	850	FF	Stepping	Motor Phase A Cur								02																									41	2
1736	850	FF	Stepping	Motor Phase A Volt								02																									41	2
1737	850	FF	Hot	Main Red Heater Current								02																									41	2
1738	850	FF	Hot	Main Red Heater Voltage								02																									41	2
1739	850	FF	Hot	Main Primary Heater Cur								02																									41	2
1740	850	FF	Hot	Main Primary Heater Volt								02																									41	2
1741	850	FF	Hot	Guard Heater Current								02																									41	2
1742	850	FF	Hot	Guard Heater Voltage								02																									41	2
1743	850	FF	Hot	Boost Heater Current								02																									41	2
1744	850	FF	Hot	Boost Heater Voltage								02																									41	2
1745	850	FF	SMS	Board Velocity Reading								02																									41	2
1746	850	FF	Experiment	Main Bus Voltage								02																									41	2
1747	850	FF	Experiment	Main Bus Current								02																									41	2
1748	850	FF	IFE	Absolute Pressure 2								02																									41	2
0	0	0			3	4	4	4	4	4	4	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5		
3	6	7			9	0	3	5	7	8	1	3	5	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	8		

TABLE 2.7-2. SIGNAL INTERFACE DEFINITION EXPANSION (Sheet 30 of 38)

ENT C N	ICIU	MN	NM	S	I	T	DATA DESCRIPTION	MON	C	REQ	A	CIRC	SID	E	T	
NO. O O	IMIS	ISO	OS	O	Y		DATA VALUE									
IR .	DI A	G .	I	G	P	START	END									
IR .	IG	W	F	E												
I .	IUE	D	I	WD	BT	WD	BT	Y								
I .	LI	S	X	I	#											
I .	IK	/	D	I												
1749	850	FF	IFE	A	Absolute	Pressure	1								41	2
1750	850	FF	IFE	A	Upper	Humidity									41	2
001	851	RC	SEM	Index	Motor	RCCB	On	Stat							41	2
002	851	RC	SEM	Index	Motor	RCCB	Off	Stat							41	2
003	851	RC	Ampoule	Not	Processing										41	2
004	851	RC	Ampoule	Processing											41	2
005	851	RC	Indexing	Cam	Not	Stowed									41	2
006	851	RC	Indexing	Cam	Stowed										41	2
007	851	RC	Car	Spacer	Plt	Gap	Lim	Not							41	2
008	851	RC	Car	Spacer	Plt	Gap	Lim								41	2
009	851	RC	Car	Trk	Extr	Left	Limit	Not							41	2
010	851	RC	Car	Trk	Extr	Left	Limit								41	2
011	851	RC	Car	Trk	Extr	Right	Lim	Not							41	2
012	851	RC	Car	Trk	Extr	Right	Lim								41	2
013	851	RC	Ampoule	Align	Mtr	RCCB	Off								41	2
014	851	RC	Ampoule	Align	Mtr	RCCB	On								41	2
015	851	RC	Ampoule	Align	Not	Extended									41	2
016	851	RC	Ampoule	Align	Extended										41	2
017	851	RC	Ampoule	Align	Not	Retracted									41	2
018	851	RC	Ampoule	Align	Retracted										41	2
019	851	RC	Ampoule	Spt	Plt	Mtr	RCCB	Off							41	2
020	851	RC	Ampoule	Spt	Plt	Mtr	RCCB	On							41	2
021	851	RC	Ampoule	Support	Not	Secure									41	2
022	851	RC	Ampoule	Support	Secure										41	2
023	851	RC	Ampoule	Support	Not	Retracted									41	2
024	851	RC	Ampoule	Support	Retracted										41	2
025	851	RC	Core	HD	Motor	RCCB	Off								41	2
026	851	RC	Core	HD	Motor	RCCB	On								41	2
027	851	RC	Core	Hold	Down	Not	Extended								41	2
028	851	RC	Core	Hold	Down	Extended									41	2
0	0	0														
3	6	7														

C-4

TABLE 2.7-2. SIGNAL INTERFACE DEFINITION EXPANSION (Sheet 31 of 38)

IDENT N NO. O O	DESCRIPTION	ICU	MIN	MSIT	DATA	DESCRIPTION	MON	REQ	DATA VALUE	REQ	DATA VALUE	CIRCSID	IE	IT	
IR .		IA	G./G	IP	START	END	DATA VALUE	---	L	---	L	D	IO	NO.	
IR		UE	ID	I	WD	BT	WD	BT	Y	V	X	C	T	D	
.		LI	S	X	#	#	#	#	#	N	I	C	O	?	
		K	I	D	I	E	I	E	I	T	P	F	I	D	
029	0291851	RC	Core	Hold	Down	Not	Retracted	02						41	2
030	0301851	RC	Core	Hold	Down	Retracted		02						41	2
031	0311851	RC	Fail	Safe	Brake	RCCB	Off	02						41	2
032	0321851	RC	Fail	Safe	Brake	RCCB	On	02						41	2
033	0331851	RC	Rapid	Xlation	Clutch	RCCB	Off	02						41	2
034	0341851	RC	Rapid	Xlation	Clutch	RCCB	On	02						41	2
035	0351851	RC	Rapid	Xlation	Mtr	RCCB	Off	02						41	2
036	0361851	RC	Rapid	Xlation	Mtr	RCCB	On	02						41	2
037	0371851	RC	Step	Motor	Clutch	RCCB	Off	02						41	2
038	0381851	RC	Step	Motor	Clutch	RCCB	On	02						41	2
039	0391851	RC	Step	Motor	Drive	RCCB	Off	02						41	2
040	0401851	RC	Step	Motor	Drive	RCCB	On	02						41	2
041	0411851	RC	Furn	Extrdme	Trvl	Not	Exceeded	02						41	2
042	0421851	RC	Furn	Extrdme	Trvl	Exceeded		02						41	2
043	0431851	RC	Furnace	Position	Not	Home		02						41	2
044	0441851	RC	Furnace	Position	Home			02						41	2
045	0451851	RC	System	Bus	Relay	Off		02						41	2
046	0461851	RC	System	Bus	Relay	On		02						41	2
047	0471851	RC	PCS	Utility	RCCB	Off		02						41	2
048	0481851	RC	PCS	Utility	RCCB	On		02						41	2
049	0491851	RC	SEM	Indexing	Jog	CW	Status	02						41	2
050	0501851	RC	SEM	Indexing	Jog	CCW	Status	02						41	2
051	0511851	RC	Argon	Fill	Valve	RCCB	Off	02						41	2
052	0521851	RC	Argon	Fill	Valve	RCCB	On	02						41	2
053	0531851	RC	Argon	Fill	Valve	Closed		02						41	2
054	0541851	RC	Argon	Fill	Valve	Open		02						41	2
055	0551851	RC	IFEA	ABS	Press	1	RCCB	Off						41	2
056	0561851	RC	IFEA	ABS	Press	1	RCCB	On						41	2
057	0571851	RC	IFEA	ABS	Press	2	RCCB	Off						41	2
058	0581851	RC	IFEA	ABS	Press	2	RCCB	On						41	2

TABLE 2.7-2. SIGNAL INTERFACE DEFINITION EXPANSION (Sheet 32 of 38)

ENTC N	NO. I O	IR .	IR .	I .	I .	ICU	IMN	IS	OS	IO	Y	DATA	DESCRIPTION	MONIC	REQ	A	CIRC	SID	E	IT	
						ID	A	G	/G	P	START	END	DATA	VALUE	---	L					
						U	E	I	D	I	WD	BT	Y								
						L		S	X	#		#									
						K		/	D				E								
059	1851	RC	Vacuum Vent Vlv	RCCB	Off																
060	1851	RC	Vacuum Vent Vlv	RCCB	On																
061	1851	RC	Vacuum Vent Valve	Closed																	
062	1851	RC	Vacuum Vent Valve	Open																	
063	1851	RC	Water Inlet Valve	RCCB	Off																
064	1851	RC	Water Inlet Valve	RCCB	On																
065	1851	RC	Water Inlet Valve	Bypass																	
066	1851	RC	Water Inlet Valve	Normal																	
067	1851	RC	Water Outlet Vlv	RCCB	Off																
068	1851	RC	Water Outlet Vlv	RCCB	On																
069	1851	RC	Water Outlet Valve	Bypass																	
070	1851	RC	Water Outlet Valve	Normal																	
071	1851	RC	Ampoule 1	Failure	2	Status															
072	1851	RC	Ampoule 1	Failure	1	Status															
073	1851	RC	Ampoule 2	Failure	2	Status															
074	1851	RC	Ampoule 2	Failure	1	Status															
075	1851	RC	Ampoule 3	Failure	2	Status															
076	1851	RC	Ampoule 3	Failure	1	Status															
077	1851	RC	Ampoule 4	Failure	2	Status															
078	1851	RC	Ampoule 4	Failure	1	Status															
079	1851	RC	Ampoule 5	Failure	2	Status															
080	1851	RC	Ampoule 5	Failure	1	Status															
081	1851	RC	Ampoule 6	Failure	2	Status															
082	1851	RC	Ampoule 6	Failure	1	Status															
083	1851	RC	Cartridge 1	Failure	2	Status															
084	1851	RC	Cartridge 1	Failure	1	Status															
085	1851	RC	Cartridge 2	Failure	2	Status															
086	1851	RC	Cartridge 2	Failure	1	Status															
087	1851	RC	Cartridge 3	Failure	2	Status															
088	1851	RC	Cartridge 3	Failure	1	Status															
0	0	0																			
3	6	7																			



TABLE 2.7-2. SIGNAL INTERFACE DEFINITION EXPANSION (Sheet 34 of 38)

ENTC N	IC U	IM N	IS O	IO S	Y I	DATA DESCRIPTION	MON C	REQ A	CIRC	SID	E	I	
NO.	ID A	IG	/G	/P	START	END	DATA VALUE	---	L	---	L	---	
IR .	IG	W	F	E	---	---	T	E	E	J	.	D	
IR	IE	D	I	I	WD	BT	WD	B	T	I	P	B	
.	L	S	X	I	#	I	P	N	C	O	?	E	
	K	/	I	D	I	I	E	T	P	F	I	D	
119	1851	RC	Hot	Main	Prim	Mod	B	RCCB	Off			41	2
120	1851	RC	Hot	Main	Prim	Mod	B	RCCB	On			41	2
121	1851	RC	Hot	Main	Red	Mod	A	RCCB	Off			41	2
122	1851	RC	Hot	Main	Red	Mod	A	RCCB	On			41	2
123	1851	RC	Hot	Main	Red	Mod	B	RCCB	Off			41	2
124	1851	RC	Hot	Main	Red	Mod	B	RCCB	On			41	2
125	1851	RC	PCS	Airflow	2	Status						41	2
126	1851	RC	PCS	Airflow	1	Status						41	2
127	1851	RC	SCS	Airflow	1	Status						41	2
128	1851	RC	PDS	Airflow	1	Status						41	2
129	1851	RC	IFEA	Coolant	Flow	#2	Status					41	2
130	1851	RC	IFEA	Coolant	Flow	#1	Status					41	2
131	1851	RC	TC	Group	B	Calibration	Type S					41	2
132	1851	RC	TC	Group	B	Calibration	Type K					41	2
133	1851	RC	Hot	Guard	Heater	Ctl	Temp 2					41	2
134	1851	RC	TC	Group	B	Calibration	Type B					41	2
135	1851	RC	Hot	Main	Red	Htr	Ctl	Temp 2				41	2
136	1851	RC	Hot	Main	Prim	Htr	Ctl	Temp 2				41	2
137	1851	RC	Cold	Main	Prim	Htr	Ctl	Temp 2				41	2
138	1851	RC	Booster	Heater	Ctl	Temp 2						41	2
139	1851	RC	TC	Group	A	Calibration	Type K					41	2
140	1851	RC	Cold	Guard	Heater	Ctl	Temp 2					41	2
141	1851	RC	TC	Group	A	Calibration	Type B					41	2
142	1851	RC	TC	Group	A	Calibration	Type S					41	2
143	1851	RC	Hot	Main	Prim	Htr	Ctl	Temp 1				41	2
144	1851	RC	Cold	Main	Red	Htr	Ctl	Temp 1				41	2
145	1851	RC	TC	Group	C	Calibration	Type K					41	2
146	1851	RC	Hot	Main	Red	Htr	Ctl	Temp 1				41	2
147	1851	RC	TC	Group	C	Calibration	Type B					41	2
148	1851	RC	TC	Group	C	Calibration	Type S					41	2
0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	9	0	3	5	7	8	1	3	5	7	5	7	8
6	7												
7													
8													
9													

TABLE 2.7-2. SIGNAL INTERFACE DEFINITION EXPANSION (Sheet 35 of 38)

ENT N	C U	M N	I S	M N	S I	T I	D A	D E	R I	Q U	R E	Q U	Q U	R E	Q U	C I	R C	I S	I D	E	
149	851	RC	Booster Heater Ctl	Temp 1																	
150	851	RC	Hot Guard Heater Ctl	Temp 1																	
151	851	RC	Cold Guard Heater Ctl	Temp 1																	
152	851	RC	Cold Main Prim Htr	Ctl Temp 1																	
153	851	RC	TC Group D Calibration	Type S																	
154	851	RC	TC Group D Calibration	Type K																	
155	851	RC	Cold Main Red Htr	Ctl Temp 2																	
156	851	RC	TC Group D Calibration	Type B																	
157	851	RC	Sample 2	Temp 1																	
158	851	RC	Sample 1	Temp 1																	
159	851	RC	Sample 4	Temp 1																	
160	851	RC	Sample 3	Temp 1																	
161	851	RC	Sample 6	Temp 1																	
162	851	RC	Sample 5	Temp 1																	
163	851	RC	Sample 2	Temp 2																	
164	851	RC	Sample 1	Temp 2																	
165	851	RC	Sample 4	Temp 2																	
166	851	RC	Sample 3	Temp 2																	
167	851	RC	Sample 6	Temp 2																	
168	851	RC	Sample 5	Temp 2																	
169	851	RC	Sample 2	Temp 3																	
170	851	RC	Sample 1	Temp 3																	
171	851	RC	Sample 4	Temp 3																	
172	851	RC	Sample 3	Temp 3																	
173	851	RC	Sample 6	Temp 3																	
174	851	RC	Sample 5	Temp 3																	
175	851	RC	Sample 2	Temp 4																	
176	851	RC	Sample 1	Temp 4																	
177	851	RC	Sample 4	Temp 4																	
178	851	RC	Sample 3	Temp 4																	



TABLE 2.7-2. SIGNAL INTERFACE DEFINITION EXPANSION (Sheet 36 of 38)

ENT   C   N	M   S	M   N   M   S   I   T	D   A   T   A   D   E   S   C   R   I   P   T   O   N	M   O   N   I   T   I   N   G	R   E   Q   U   I   R   E   D	C   I   R   C   S   I   D   E   T	
NO.   O   I	D   I   A	G.   I   G.   P.	START   END	DATA   VALUE	REQ   A	C   I   R   C   S   I   D   E   T	
IR.	IG.	W   F   I   E	---   ---	T	E   E   .	D   I   O   N   O.	
IR.	U   E	D   I	W   D   I   B   T	Y	V   X   C	T   D	
I.	L	S   X	#	#	N   C   O	?   E	
---	K	I	D	I	E	T   P   F	D   E
179	851	RC	Sample 6 Temp 4	021			412
180	851	RC	Sample 5 Temp 4	021			412
181	851	RC	Sample 2 Temp 5	021			412
182	851	RC	Sample 1 Temp 5	021			412
183	851	RC	Sample 4 Temp 5	021			412
184	851	RC	Sample 3 Temp 5	021			412
185	851	RC	Sample 6 Temp 5	021			412
186	851	RC	Sample 5 Temp 5	021			412
187	851	RC	Sample 2 Temp 6	021			412
188	851	RC	Sample 1 Temp 6	021			412
189	851	RC	Sample 4 Temp 6	021			412
190	851	RC	Sample 3 Temp 6	021			412
191	851	RC	Sample 5 Temp 6	021			412
192	851	RC	Sample 6 Temp 6	021			412
193	851	RC	IFEA Water Inlet Temp	021			412
194	851	RC	IFEA Water Outlet Temp	021			412
195	851	RC	RFM Hot End Shell Temp	021			412
196	851	RC	RFM Cold End Shell Temp	021			412
197	851	RC	Hot Zone CJ Block Temp 1	021			412
198	851	RC	Hot Zone CJ Block Temp 2	021			412
199	851	RC	Cold Zone CJ Block Temp 2	021			412
200	851	RC	Cold Zone CJ Block Temp 1	021			412
201	851	RC	Sample 1 CJ Block Temp 1	021			412
202	851	RC	RFM Water Outlet Temp	021			412
203	851	RC	Sample 2 CJ Block Temp 1	021			412
204	851	RC	Sample 1 CJ Block Temp 2	021			412
205	851	RC	Sample 3 CJ Block Temp 1	021			412
206	851	RC	Sample 2 CJ Block Temp 2	021			412
207	851	RC	Sample 4 CJ Block Temp 1	021			412
208	851	RC	Sample 3 CJ Block Temp 2	021			412
0	0	0		1	1	1	1
3	6	7		3	4	4	4
				1	5	5	5
				3	5	5	7
				1	3	5	7
				1	1	1	1
				5	6	6	7
				6	6	6	7
				7	7	7	8
				1	2	5	8
				0	0	0	0

TABLE 2.7-2. SIGNAL INTERFACE DEFINITION EXPANSION (Sheet 37 of 38)

ENTC NO	DESCRIPTION	CIU	MN	NM	S	T	DATA	DESCRIPTION	MON	CI	REQ	A	C	R	S	I	D	E	I	
NO		MIS	SO	OS	O	I	Y													
IR		DIA	G	/	G	P	START	END	DATA	VALUE										
IR		IG	W	F	I	E			T											
I		UIE	D	I	W	D	I	B	T	Y	V	X	C	T	D					
I		LI	S	X	#		#		P		N	C	O	?	E					
I		KI	/	D	I				E		T	P	F							
209	851RC Sample 5 CJ Block Temp 1																			
210	851RC Sample 4 CJ Block Temp 2																			
211	851RC Sample 6 CJ Block Temp 1																			
212	851RC Sample 5 CJ Block Temp 2																			
213	851RC Ampoule Alignment Arm Temp																			
214	851RC Sample 6 CJ Block Temp 2																			
215	851RC FTS Stepping Motor Temp																			
216	851RC SEM Track Temp																			
217	851RC IFEA Upper Atmosphere Temp																			
218	851RC IFEA Lower Atmosphere Temp																			
219	851RC RTD Mux 1 Calibration - Low																			
220	851RC RTD Mux 1 Calibration - High																			
221	851RC RTD Mux 2 Calibration - Low																			
222	851RC RTD Mux 2 Calibration - High																			
223	851RC RTD Mux 3 Calibration - Low																			
224	851RC RTD Mux 3 Calibration - High																			
225	851RC RTD Mux 4 Calibration - Low																			
226	851RC RTD Mux 4 Calibration - High																			
227	851RC RTD Mux 5 Calibration - Low																			
228	851RC RTD Mux 5 Calibration - High																			
229	851RC RTD Mux 6 Calibration - Low																			
230	851RC RTD Mux 6 Calibration - High																			
231	851RC RTD Mux 7 Calibration - Low																			
232	851RC RTD Mux 7 Calibration - High																			
233	851RC RTD Mux 8 Calibration - Low																			
234	851RC RTD Mux 8 Calibration - High																			
235	851RC Cold Guard Heater Current																			
236	851RC Cold Guard Heater Voltage																			
237	851RC Cold Main Primary Heater Cur																			
238	851RC Cold Main Primary Heater Volt																			
0	0 0	3	4	4	4	4	4	4	5	5	5	5	7	6	6	6	7	7	7	8
3	6 7	9	0	3	5	7	8	1	3	5	7	5	6	7	1	2	5	8	0	

TABLE 2.7-2. SIGNAL INTERFACE DEFINITION EXPANSION (Sheet 38 of 38)

ENT NO.	IC	U	M	N	M	S	I	T	DATA	DESCRIPTION	MON	C	REQ	A	CIR	SID	E	I
NO.	IO	O	I	O	I	O	I	O	I	START	END	DATA	VALUE	---	L	---	L	---
IR	IG	W	FI	E	---	T	---	T	---	T	---	T	---	T	---	T	---	
IR	UI	E	D	I	WD	BT	WD	BT	Y	V	X	C	T	D	P	B	I	
..	LI	S	X	#	#	#	#	#	#	P	N	C	O	?	E	I	L	
	K	/	D	I	/	D	I	/	D	E	T	P	F	/	D	E	I	
1239	851	RC																
1240	851	RC																
1241	851	RC																
1242	851	RC																
1243	851	RC																
1244	851	RC																
1245	851	RC																
1246	851	RC																
1247	851	RC																
1248	851	RC																
1249	851	RC																
1250	851	RC																
1251	851	RC																
1252	851	RC																
1253	851	RC																
1254	851	RC																
1255	851	RC																
1256	851	RC																
1257	851	RC																
1258	851	RC																
1259	851	RC																
1260	851	RC																
1261	851	RC																
1262	851	RC																
1263	851	RC																
1264	851	RC																
1265	851	RC																
1266	851	RC																
0	0	0																
3	6	7																

TABLE 2.7-3. EVENT/EXCEPTION MONITOR REQUIREMENTS

EVENT	EMR	MONITOR VALUES	M	MESSAGE	ERROR	MESSAGE	LOW	ERROR	MESSAGE	LOW	EVENT
207	106	001	-073	HI WATER TEMP	41 14						41 4
208	106	001	-077	HI HUMIDITY LWR	41 16						41 4
209	106	001	-077	HI HUMIDITY UPR	41 18						41 4
210	106	001	-004	HI ATMOS TEMP	41 1A						41 4
211	106	001	-073	HI CLD END TEMP	41 1C						41 4
212	106	001	-073	HI HOT END TEMP	41 1E						41 4
215	106	001	-009	HI IFEA PRES 1	41 20	LO IFEA PRES 1	41 21	300 10 CGF			41 4
216	106	001	-009	HI IFEA PRES 2	41 22	LO IFEA PRES 2	41 23	300 10 CGF			41 4
219	106	001	+105	HI MAIN CURRENT	41 24						41 4
220	106	001	+076	HI MAIN VOLTAGE	41 26	LO MAIN VOLTAGE	41 27	300 10 CGF			41 4
223	106	001		LO WATER FLOW	41 28						41 4
224	106	001		LO WATER FLOW	41 2A						41 4
237	106	001		NO AVIONICS AIR	41 2C						41 4
238	106	001		NO AVIONICS AIR	41 2E						41 4
239	106	001		NO AVIONICS AIR	41 30						41 4
240	106	001		NO AVIONICS AIR	41 32						41 4
265	106	001		WTR OUT BYPASS	41 34						41 4
266	106	001		WTR OUT BYPASS	41 36						41 4
267	106	001		WTR IN BYPASS	41 38						41 4
268	106	001		WTR IN BYPASS	41 3A						41 4
287	106	001		EXTRM TRVL LIM	41 3C						41 4
288	106	001		EXTRM TRVL LIM	41 3E						41 4
319	106	001		EXP BUS PWR OFF	41 40						41 4
320	106	001		EXP BUS PWR OFF	41 42						41 4
0	0	0	1								1
3	6	9	7								7
			2 2 2								2 2 2
			5 6 7								5 6 7
			4 4 4								4 4 4
			3 5 6								3 5 6
			6 6 6								6 6 6
			7 9 2								7 9 2
			7 8								7 8
			9 0								9 0

TABLE 2.7-4. POIC DISPLAY REQUIREMENTS (Sheet 1 of 20)

E N C N I C T		CALIBRATION COEFFICIENTS/LINEAR SEGMENTS										////		
N	U O J A Y	A0	A1	A2	A3	A4	A5						---	
T M R	L P												E T	
R B R	I E												X A	
Y E	B												P B	
R	I R												L	
	A												I B	
	T												D	
	I													
	O													
	N													
001	850	PC	+0000000+00	+1000000+01									41	6
002	850	PC	+0000000+00	+1000000+01									41	6
003	850	PC	+0000000+00	+1000000+01									41	6
004	850	PC	+0000000+00	+1000000+01									41	6
005	850	PC	+0000000+00	+1000000+01									41	6
138	850	PC	+0000000+00	+1000000+01									41	6
139	850	PC	+0000000+00	+1000000+01									41	6
140	850	PC	+0000000+00	+1000000+01									41	6
141	850	PC	+0000000+00	+1000000+01									41	6
142	850	PC	+0000000+00	+1000000+01									41	6
143	850	PC	+0000000+00	+1000000+01									41	6
144	850	PC	+0000000+00	+1000000+01									41	6
145	850	PC	+0000000+00	+1000000+01									41	6
146	850	PC	+0000000+00	+1000000+01									41	6
147	850	PC	+0000000+00	+1000000+01									41	6
148	850	PC	+0000000+00	+1000000+01									41	6
149	850	PC	+0000000+00	+1000000+01									41	6
150	850	PC	+0000000+00	+1000000+01									41	6
151	850	PC	+0000000+00	+1000000+01									41	6
152	850	PC	+0000000+00	+1000000+01									41	6
153	850	PC	+0000000+00	+1000000+01									41	6
154	850	PC	+0000000+00	+1000000+01									41	6
155	850	PC	+0000000+00	+1000000+01									41	6
156	850	PC	+0000000+00	+1000000+01									41	6
157	850	PC	+0000000+00	+1000000+01									41	6
158	850	PC	+0000000+00	+1000000+01									41	6
159	850	PC	+0000000+00	+1000000+01									41	6
160	850	PC	+0000000+00	+1000000+01									41	6
161	850	PC	+0000000+00	+1000000+01									41	6
162	850	PC	+0000000+00	+1000000+01									41	6
163	850	PC	+0000000+00	+1000000+01									41	6
0	0	0	1	2	9	4	0	5	1	6	2	7	3	7
3	5	7	8	9	0	0	0	1	1	2	3	6	7	9

TABLE 2.7-4. POIC DISPLAY REQUIREMENTS (Sheet 2 of 20)

IE N U O J A Y T M R L P R B I R I E Y E R I R A T I O N	CALIBRATION COEFFICIENTS/LINEAR SEGMENTS					E T X I A P I L I D I L I I I		
	A0	A1	A2	A3	A4		A5	
164	850	PC	+000000+00	+1000000+01			41	16
165	850	PC	+000000+00	+1000000+01			41	16
166	850	PC	+000000+00	+1000000+01			41	16
167	850	PC	+000000+00	+1000000+01			41	16
168	850	PC	+000000+00	+1000000+01			41	16
169	850	PC	+000000+00	+1000000+01			41	16
170	850	PC	+000000+00	+1000000+01			41	16
171	850	PC	+000000+00	+1000000+01			41	16
172	850	PC	+000000+00	+1000000+01			41	16
173	850	PC	+000000+00	+1000000+01			41	16
174	850	PC	+000000+00	+1000000+01			41	16
175	850	PC	+000000+00	+1000000+01			41	16
176	850	PC	+000000+00	+1000000+01			41	16
177	850	PC	+000000+00	+1000000+01			41	16
178	850	PC	+000000+00	+1000000+01			41	16
179	850	PC	+000000+00	+1000000+01			41	16
180	850	PC	+000000+00	+1000000+01			41	16
181	850	PC	+000000+00	+1000000+01			41	16
182	850	PC	+000000+00	+1000000+01			41	16
183	850	PC	+000000+00	+1000000+01			41	16
184	850	PC	+000000+00	+1000000+01			41	16
185	850	PC	+000000+00	+1000000+01			41	16
187	850	PC	+000000+00	+1000000+01			41	16
188	850	PC	+000000+00	+1000000+01			41	16
189	850	PC	+000000+00	+1000000+01			41	16
190	850	PC	+000000+00	+1000000+01			41	16
191	850	PC	+000000+00	+1000000+01			41	16
192	850	PC	+000000+00	+1000000+01			41	16
193	850	PC	+000000+00	+1000000+01			41	16
194	850	PC	+000000+00	+1000000+01			41	16
195	850	PC	+000000+00	+1000000+01			41	16

TABLE 2.7-4. POIC DISPLAY REQUIREMENTS (Sheet 3 of 20)

E N I C N I C T I		CALIBRATION COEFFICIENTS/LINEAR SEGMENTS										I I I I I		
I N U O O J A Y	T M I R I L P											E T		
R B I R I E I	Y E I B											X A	P B	
	R I	A 0	A 1	A 2	A 3	A 4	A 5				L	I B		
												D		
1196	1850	PCI	+0000000+00	+5000000-01									41	6
1197	1850	PCI	+0000000+00	+5000000-01									41	6
1198	1850	PCI	+0000000+00	+5000000-01									41	6
1199	1850	PCI	+0000000+00	+5000000-01									41	6
1200	1850	PCI	+0000000+00	+5000000-01									41	6
1201	1850	PCI	+0000000+00	+5000000-01									41	6
1202	1850	PCI	+0000000+00	+5000000-01									41	6
1203	1850	PCI	+0000000+00	+5000000-01									41	6
1204	1850	PCI	+0000000+00	+5000000-01									41	6
1205	1850	PCI	+0000000+00	+5000000-01									41	6
1206	1850	PCI	+0000000+00	+5000000-01									41	6
1207	1850	PCI	+0000000+00	+5000000-01									41	6
1208	1850	PCI	+0000000+00	+5000000-01									41	6
1209	1850	PCI	+0000000+00	+5000000-01									41	6
1210	1850	PCI	+0000000+00	+5000000-01									41	6
1211	1850	PCI	+0000000+00	+5000000-01									41	6
1212	1850	PCI	+0000000+00	+3663000-01									41	6
1213	1850	PCI	+0000000+00	+9768000-02									41	6
1214	1850	PCI	+0000000+00	+2442000-01									41	6
1215	1850	PCI	+0000000+00	+2442000-01									41	6
1216	1850	PCI	+0000000+00	+7326000-02									41	6
1217	1850	PCI	+0000000+00	+7326000-02									41	6
1218	1850	PCI	-2419000+03	+2325500+01	+9104500-03	+2442500-06							41	6
1219	1850	PCI	-2419000+03	+2325500+01	+9104500-03	+2442500-06							41	6
1220	1850	PCI	-2414600+03	+2297900+00	+1211300-04	-4356500-09							41	6
1221	1850	PCI	-2414600+03	+2297900+00	+1211300-04	-4356500-09							41	6
1222	1850	PCI	-2414600+03	+2297900+00	+1211300-04	-4356500-09							41	6
1223	1850	PCI	-2414600+03	+2297900+00	+1211300-04	-4356500-09							41	6
1224	1850	PCI	-2414600+03	+2297900+00	+1211300-04	-4356500-09							41	6
1225	1850	PCI	+1493200+02	+1381000+03	+8505200+01	+9220100+00	-5706400-01	+1394700-02					41	6
1226	1850	PCI	+1493200+02	+1381000+03	+8505200+01	+9220100+00	-5706400-01	+1394700-02					41	6
0	0	0	1	2	9	4	0	1	5	1	6	2	7	8
3	5	7	8	9	0	0	0	1	1	1	2	3	3	9





TABLE 2.7-4. POIC DISPLAY REQUIREMENTS (Sheet 5 of 20)

ENIC NICT	IN UO IAY	CALIBRATION COEFFICIENTS/LINEAR SEGMENTS					/////		
TMR LP	TR BR IE	A0	A1	A2	A3	A4	A5	IE IT	
YE	BR							IX A	
RI	RI							IP BI	
								LI	
								IBI	
								ID	
258	1850	PCI	+1493200+02	+1381000+03	-8505200+01	+9220100+00	-5706400-01	+1394700-02	416
259	1850	PCI	+1493200+02	+1381000+03	-8505200+01	+9220100+00	-5706400-01	+1394700-02	416
260	1850	PCI	+1493200+02	+1381000+03	-8505200+01	+9220100+00	-5706400-01	+1394700-02	416
261	1850	PCI	+000000+00	+1743900-02					416
262	1850	PCI	+000000+00	+5086300-02					416
263	1850	PCI	+000000+00	+1743900-02					416
264	1850	PCI	+000000+00	+5086300-02					416
265	1850	PCI	-2566000+01	+1364100+00					416
266	1850	PCI	-2414600+03	+2297900+00	+1211300-04	-4356500-09			416
267	1850	PCI	+000000+00	+1627600+01					416
268	1850	PCI	+000000+00	+7326000-02					416
269	1850	PCI	+000000+00	+1953600-01					416
270	1850	PCI	+000000+00	+7326000-02					416
271	1850	PCI	+000000+00	+1953600-01					416
272	1850	PCI	+000000+00	+7326000-02					416
273	1850	PCI	+000000+00	+1953600-01					416
274	1850	PCI	+000000+00	+7326000-02					416
275	1850	PCI	+000000+00	+1953600-01					416
276	1850	PCI	+000000+00	+7326000-02					416
277	1850	PCI	+000000+00	+1953600-01					416
278	1850	PCI	+000000+00	+7326000-02					416
279	1850	PCI	+000000+00	+1953600-01					416
280	1850	PCI	+000000+00	+7326000-02					416
281	1850	PCI	+000000+00	+1953600-01					416
282	1850	PCI	-2414600+03	+2297900+00	+1211300-04	-4356500-09			416
283	1850	PCI	-2414600+03	+2297900+00	+1211300-04	-4356500-09			416
284	1850	PCI	-2414600+03	+2297900+00	+1211300-04	-4356500-09			416
285	1850	PCI	-2414600+03	+2297900+00	+1211300-04	-4356500-09			416
286	1850	PCI	-2414600+03	+2297900+00	+1211300-04	-4356500-09			416
287	1850	PCI	-2414600+03	+2297900+00	+1211300-04	-4356500-09			416
288	1850	PCI	-2414600+03	+2297900+00	+1211300-04	-4356500-09			416

TABLE 2.7-4. POIC DISPLAY REQUIREMENTS (Sheet 6 of 20)

IE N I C N I C T	CALIBRATION COEFFICIENTS/LINEAR SEGMENTS										////		
I N U O I A Y											E I T		
I T M R L P											X I A		
R B I R I E											P I B		
Y E I B											L I		
R I R											I B I		
I A											D		
I T	A0	A1	A2	A3	A4	A5							
I I													
I O													
I N													
289	850	PC	-2414600+03	+2297900+00	+1211300-04	-4356500-09						41	16
290	850	PC	-2414600+03	+2297900+00	+1211300-04	-4356500-09						41	16
291	850	PC	-2414600+03	+2297900+00	+1211300-04	-4356500-09						41	16
292	850	PC	-2414600+03	+2297900+00	+1211300-04	-4356500-09						41	16
293	850	PC	-2414600+03	+2297900+00	+1211300-04	-4356500-09						41	16
294	850	PC	-2414600+03	+2297900+00	+1211300-04	-4356500-09						41	16
295	850	PC	-2414600+03	+2297900+00	+1211300-04	-4356500-09						41	16
296	850	PC	-2414600+03	+2297900+00	+1211300-04	-4356500-09						41	16
297	850	PC	-2414600+03	+2297900+00	+1211300-04	-4356500-09						41	16
298	850	PC	+0000000+00	+1000000+01								41	16
299	850	PC	+0000000+00	+1000000+01								41	16
300	850	PC	+0000000+00	+1000000+01								41	16
301	850	PC	+0000000+00	+1000000+01								41	16
302	850	PC	+0000000+00	+1000000+01								41	16
303	850	PC	+0000000+00	+1000000+01								41	16
304	850	PC	+0000000+00	+1000000+01								41	16
305	850	PC	+0000000+00	+1000000+01								41	16
306	850	PC	+0000000+00	+1000000+01								41	16
307	850	PC	+0000000+00	+1000000+01								41	16
308	850	PC	+0000000+00	+1000000+01								41	16
309	850	PC	+0000000+00	+1000000+01								41	16
310	850	PC	+0000000+00	+1000000+01								41	16
311	850	PC	+0000000+00	+1000000+01								41	16
312	850	PC	+0000000+00	+8302800-01								41	16
313	850	PC	-2414600+03	+2297900+00	+1211300-04	-4356500-09						41	16
314	850	PC	-2414600+03	+2297900+00	+1211300-04	-4356500-09						41	16
315	850	PC	+9760000+03	+2442000+00								41	16
316	850	PC	+9760000+03	+2442000+00								41	16
317	850	PC	+9760000+03	+2442000+00								41	16
318	850	PC	+9760000+03	+2442000+00								41	16
319	850	PC	+9760000+03	+2442000+00								41	16
0	0	0	1	2	4	5	6	7	8	9		1	1
3	5	7	8	9	0	1	2	3				7	8
												3	9



TABLE 2.7-4. POIC DISPLAY REQUIREMENTS (Sheet 8 of 20)

E N I C N I C T I I N U O O I A Y I I T M I R I L P I I R B I R I E I Y E I I B I I R I I A I T I I I O I N	CALIBRATION COEFFICIENTS/LINEAR SEGMENTS						I I I I I E I T X I A P I B I L I I B I D I I I I
	A0	A1	A2	A3	A4	A5	
13521850 PCI+0000000+00 +1000000+01							41 6
13531850 PCI+0000000+00 +1000000+01							41 6
13541850 PCI+0000000+00 +1000000+01							41 6
13561850 PCI+0000000+00 +1000000+01							41 6
13571850 PCI+0000000+00 +1000000+01							41 6
13581850 PCI+0000000+00 +1000000+01							41 6
13601850 PCI+0000000+00 +1000000+01							41 6
13611850 PCI+0000000+00 +1000000+01							41 6
13621850 PCI+0000000+00 +1000000+01							41 6
13631850 PCI+0000000+00 +1000000+01							41 6
13641850 PCI+0000000+00 +1000000+01							41 6
13651850 PCI+0000000+00 +1000000+01							41 6
13691850 PCI+0000000+00 +1000000+01							41 6
13701850 PCI+0000000+00 +1000000+01							41 6
13711850 PCI+0000000+00 +1000000+01							41 6
13721850 PCI+0000000+00 +1000000+01							41 6
13731850 PCI+0000000+00 +1000000+01							41 6
13741850 PCI+0000000+00 +1000000+01							41 6
13771850 PCI+0000000+00 +1000000+01							41 6
13781850 PCI+0000000+00 +1000000+01							41 6
13791850 PCI+0000000+00 +1000000+01							41 6
13801850 PCI+0000000+00 +1000000+01							41 6
13811850 PCI+0000000+00 +1000000+01							41 6
13821850 PCI+0000000+00 +1000000+01							41 6
13851850 PCI+0000000+00 +1000000+01							41 6
13861850 PCI+0000000+00 +1000000+01							41 6
13871850 PCI+0000000+00 +1000000+01							41 6
13881850 PCI+0000000+00 +1000000+01							41 6
13891850 PCI+0000000+00 +1000000+01							41 6
13901850 PCI+0000000+00 +1000000+01							41 6
0 0 0	1	2	4	5	6	7	1 1
3 5 7	8	9	0	1	2	3	7 8
							9 0

TABLE 2.7-4. POIC DISPLAY REQUIREMENTS (Sheet 9 of 20)

E N I C N I C T I		CALIBRATION COEFFICIENTS/LINEAR SEGMENTS										I I I I I		
I N U O O A Y	I T M I R I L P											E I T	I	
I R B I R I E I	Y E											X A	A	
R	R											P B	L	
A	A											I B	I	
T	T	A0	A1	A2	A3	A4	A5				I D	I		
I	I											I	I	
O	O											I	I	
I N	I N											I	I	
1391	1850	PC	+000000+00	+1000000+01									41	6
1392	1850	PC	+0000000+00	+1000000+01									41	6
1393	1850	PC	+0000000+00	+1000000+01									41	6
1394	1850	PC	+0000000+00	+1000000+01									41	6
1395	1850	PC	+0000000+00	+1000000+01									41	6
1396	1850	PC	+0000000+00	+1000000+01									41	6
1397	1850	PC	+0000000+00	+1000000+01									41	6
1398	1850	PC	+0000000+00	+1000000+01									41	6
1399	1850	PC	+0000000+00	+1000000+01									41	6
1400	1850	PC	+0000000+00	+1000000+01									41	6
1401	1850	PC	+0000000+00	+1000000+01									41	6
1402	1850	PC	+0000000+00	+1000000+01									41	6
1403	1850	PC	+0000000+00	+1000000+01									41	6
1404	1850	PC	+0000000+00	+1000000+01									41	6
1405	1850	PC	+0000000+00	+1000000+01									41	6
1406	1850	PC	+0000000+00	+1000000+01									41	6
1407	1850	PC	+0000000+00	+1000000+01									41	6
1408	1850	PC	+0000000+00	+1000000+01									41	6
1409	1850	PC	+0000000+00	+1000000+01									41	6
1410	1850	PC	+0000000+00	+1000000+01									41	6
1411	1850	PC	+0000000+00	+1000000+01									41	6
1412	1850	PC	+0000000+00	+1000000+01									41	6
1413	1850	PC	+0000000+00	+1000000+01									41	6
1414	1850	PC	+0000000+00	+1000000+01									41	6
1415	1850	PC	+0000000+00	+1000000+01									41	6
1417	1850	PC	+0000000+00	+1000000+01									41	6
1418	1850	PC	+0000000+00	+1000000+01									41	6
1419	1850	PC	+0000000+00	+1000000+01									41	6
1421	1850	PC	+0000000+00	+1000000+01									41	6
1422	1850	PC	+0000000+00	+1000000+01									41	6
1423	1850	PC	+0000000+00	+1000000+01									41	6

TABLE 2.7-4. POIC DISPLAY REQUIREMENTS (Sheet 10 of 20)

E N I C N I C T	CALIBRATION COEFFICIENTS/LINEAR SEGMENTS					I I I I I
	A0	A1	A2	A3	A4	
I 25   850   P C I + 0 0 0 0 0 0 + 0 0   1 0 0 0 0 0 0 + 0 1						4 1   6
I 27   850   P C I + 0 0 0 0 0 0 + 0 0   1 0 0 0 0 0 0 + 0 1						4 1   6
I 28   850   P C I + 0 0 0 0 0 0 + 0 0   1 0 0 0 0 0 0 + 0 1						4 1   6
I 29   850   P C I + 0 0 0 0 0 0 + 0 0   1 0 0 0 0 0 0 + 0 1						4 1   6
I 31   850   P C I + 0 0 0 0 0 0 + 0 0   1 0 0 0 0 0 + 0 1						4 1   6
I 32   850   P C I + 0 0 0 0 0 0 + 0 0   1 0 0 0 0 0 + 0 1						4 1   6
I 33   850   P C I + 0 0 0 0 0 0 + 0 0   1 0 0 0 0 0 + 0 1						4 1   6
I 35   850   P C I + 0 0 0 0 0 0 + 0 0   1 0 0 0 0 0 + 0 1						4 1   6
I 37   850   P C I + 0 0 0 0 0 0 + 0 0   1 0 0 0 0 0 + 0 1						4 1   6
I 38   850   P C I + 0 0 0 0 0 0 + 0 0   1 0 0 0 0 0 + 0 1						4 1   6
I 39   850   P C I + 0 0 0 0 0 0 + 0 0   1 0 0 0 0 0 + 0 1						4 1   6
I 41   850   P C I + 0 0 0 0 0 0 + 0 0   1 0 0 0 0 0 + 0 1						4 1   6
I 42   850   P C I + 0 0 0 0 0 0 + 0 0   1 0 0 0 0 0 + 0 1						4 1   6
I 43   850   P C I + 0 0 0 0 0 0 + 0 0   1 0 0 0 0 0 + 0 1						4 1   6
I 45   850   P C I + 0 0 0 0 0 0 + 0 0   1 0 0 0 0 0 + 0 1						4 1   6
I 47   850   P C I + 0 0 0 0 0 0 + 0 0   1 0 0 0 0 0 + 0 1						4 1   6
I 48   850   P C I + 0 0 0 0 0 0 + 0 0   1 0 0 0 0 0 + 0 1						4 1   6
I 49   850   P C I + 0 0 0 0 0 0 + 0 0   1 0 0 0 0 0 + 0 1						4 1   6
I 51   850   P C I + 0 0 0 0 0 0 + 0 0   1 0 0 0 0 0 + 0 1						4 1   6
I 52   850   P C I + 0 0 0 0 0 0 + 0 0   1 0 0 0 0 0 + 0 1						4 1   6
I 53   850   P C I + 0 0 0 0 0 0 + 0 0   1 0 0 0 0 0 + 0 1						4 1   6
I 55   850   P C I + 0 0 0 0 0 0 + 0 0   1 0 0 0 0 0 + 0 1						4 1   6
I 57   850   P C I + 0 0 0 0 0 0 + 0 0   1 0 0 0 0 0 + 0 1						4 1   6
I 58   850   P C I + 0 0 0 0 0 0 + 0 0   1 0 0 0 0 0 + 0 1						4 1   6
I 59   850   P C I + 0 0 0 0 0 0 + 0 0   1 0 0 0 0 0 + 0 1						4 1   6
I 61   850   P C I + 0 0 0 0 0 0 + 0 0   1 0 0 0 0 0 + 0 1						4 1   6
I 62   850   P C I + 0 0 0 0 0 0 + 0 0   1 0 0 0 0 0 + 0 1						4 1   6
I 63   850   P C I + 0 0 0 0 0 0 + 0 0   1 0 0 0 0 0 + 0 1						4 1   6
I 70   850   P C I + 0 0 0 0 0 0 + 0 0   1 0 0 0 0 0 + 0 1						4 1   6
I 71   850   P C I + 0 0 0 0 0 0 + 0 0   1 0 0 0 0 0 + 0 1						4 1   6
I 72   850   P C I + 0 0 0 0 0 0 + 0 0   1 0 0 0 0 0 + 0 1						4 1   6

TABLE 2.7-4. POIC DISPLAY REQUIREMENTS (Sheet 11 of 20)

E N I C N I C T I N U O Q A Y T M R L P R B I R I E Y E B R I R A T I O N	CALIBRATION COEFFICIENTS/LINEAR SEGMENTS					I 4 0 0 1 1 2 9 8 1 2 9 0 1 1 5 1 6 2 7 3 1 7 3 9 0	I 4 1 6
	A0	A1	A2	A3	A4		
1473	1850	PC	+000000+00	+1000000+01			1416
1474	1850	PC	+000000+00	+1000000+01			1416
1475	1850	PC	+000000+00	+1000000+01			1416
1476	1850	PC	+000000+00	+1000000+01			1416
1477	1850	PC	+000000+00	+1000000+01			1416
1478	1850	PC	+000000+00	+1000000+01			1416
1479	1850	PC	+000000+00	+1000000+01			1416
1480	1850	PC	+000000+00	+1000000+01			1416
1481	1850	PC	+000000+00	+1000000+01			1416
1482	1850	PC	+000000+00	+1000000+01			1416
1483	1850	PC	+000000+00	+1000000+01			1416
1484	1850	PC	+000000+00	+1000000+01			1416
1485	1850	PC	+000000+00	+1000000+01			1416
1486	1850	PC	+000000+00	+1000000+01			1416
1487	1850	PC	+000000+00	+1000000+01			1416
1488	1850	PC	+000000+00	+1000000+01			1416
1001	1851	PC	+000000+00	+1000000+01			1416
1002	1851	PC	+000000+00	+1000000+01			1416
1003	1851	PC	+000000+00	+1000000+01			1416
1004	1851	PC	+000000+00	+1000000+01			1416
1005	1851	PC	+000000+00	+1000000+01			1416
1006	1851	PC	+000000+00	+1000000+01			1416
1007	1851	PC	+000000+00	+1000000+01			1416
1008	1851	PC	+000000+00	+1000000+01			1416
1009	1851	PC	+000000+00	+1000000+01			1416
1010	1851	PC	+000000+00	+1000000+01			1416
1011	1851	PC	+000000+00	+1000000+01			1416
1012	1851	PC	+000000+00	+1000000+01			1416
1013	1851	PC	+000000+00	+1000000+01			1416
1014	1851	PC	+000000+00	+1000000+01			1416
1015	1851	PC	+000000+00	+1000000+01			1416

TABLE 2.7-4. POIC DISPLAY REQUIREMENTS (Sheet 12 of 20)

E N I C N I C T	CALIBRATION COEFFICIENTS/LINEAR SEGMENTS										I I I I	
	A0	A1	A2	A3	A4	A5	LI	IB	ID	IT		
016 851 PC +000000+00 +1000000+01												41 6
017 851 PC +000000+00 +1000000+01												41 6
018 851 PC +000000+00 +1000000+01												41 6
019 851 PC +000000+00 +1000000+01												41 6
020 851 PC +000000+00 +1000000+01												41 6
021 851 PC +000000+00 +1000000+01												41 6
022 851 PC +000000+00 +1000000+01												41 6
023 851 PC +000000+00 +1000000+01												41 6
024 851 PC +000000+00 +1000000+01												41 6
025 851 PC +000000+00 +1000000+01												41 6
026 851 PC +000000+00 +1000000+01												41 6
027 851 PC +000000+00 +1000000+01												41 6
028 851 PC +000000+00 +1000000+01												41 6
029 851 PC +000000+00 +1000000+01												41 6
030 851 PC +000000+00 +1000000+01												41 6
031 851 PC +000000+00 +1000000+01												41 6
032 851 PC +000000+00 +1000000+01												41 6
033 851 PC +000000+00 +1000000+01												41 6
034 851 PC +000000+00 +1000000+01												41 6
035 851 PC +000000+00 +1000000+01												41 6
036 851 PC +000000+00 +1000000+01												41 6
037 851 PC +000000+00 +1000000+01												41 6
038 851 PC +000000+00 +1000000+01												41 6
039 851 PC +000000+00 +1000000+01												41 6
040 851 PC +000000+00 +1000000+01												41 6
041 851 PC +000000+00 +1000000+01												41 6
042 851 PC +000000+00 +1000000+01												41 6
043 851 PC +000000+00 +1000000+01												41 6
044 851 PC +000000+00 +1000000+01												41 6
045 851 PC +000000+00 +1000000+01												41 6
046 851 PC +000000+00 +1000000+01												41 6

0 0 0 1 2 4 0 1 5 1 6 2 7 3  
 3 5 7 8 9 0 1 2 3 4 5 6 7 8 9 0



TABLE 2.7-4. POIC DISPLAY REQUIREMENTS (Sheet 13 of 20)

E N I C N I C T I		CALIBRATION COEFFICIENTS/LINEAR SEGMENTS										/////									
I N U J O	O J A Y I											E T									
T M I R	I L P											X A									
I R B I R	I E I											P B									
Y E	I B											L									
R	I R											I B									
A	A 0	A 1	A 2	A 3	A 4	A 5						I D									
I	I	I	I	I	I	I						I									
I O	I	I	I	I	I	I						I									
I N	I	I	I	I	I	I						I									
1047	1851	P C I +0000000+00	+1000000+01														41 6				
1048	1851	P C I +0000000+00	+1000000+01															41 6			
1049	1851	P C I +0000000+00	+1000000+01															41 6			
1050	1851	P C I +0000000+00	+1000000+01															41 6			
1051	1851	P C I +0000000+00	+1000000+01															41 6			
1052	1851	P C I +0000000+00	+1000000+01															41 6			
1053	1851	P C I +0000000+00	+1000000+01															41 6			
1054	1851	P C I +0000000+00	+1000000+01															41 6			
1055	1851	P C I +0000000+00	+1000000+01															41 6			
1056	1851	P C I +0000000+00	+1000000+01															41 6			
1057	1851	P C I +0000000+00	+1000000+01															41 6			
1058	1851	P C I +0000000+00	+1000000+01															41 6			
1059	1851	P C I +0000000+00	+1000000+01															41 6			
1060	1851	P C I +0000000+00	+1000000+01															41 6			
1061	1851	P C I +0000000+00	+1000000+01															41 6			
1062	1851	P C I +0000000+00	+1000000+01															41 6			
1063	1851	P C I +0000000+00	+1000000+01															41 6			
1064	1851	P C I +0000000+00	+1000000+01															41 6			
1065	1851	P C I +0000000+00	+1000000+01															41 6			
1066	1851	P C I +0000000+00	+1000000+01															41 6			
1067	1851	P C I +0000000+00	+1000000+01															41 6			
1068	1851	P C I +0000000+00	+1000000+01															41 6			
1069	1851	P C I +0000000+00	+1000000+01															41 6			
1070	1851	P C I +0000000+00	+1000000+01															41 6			
1071	1851	P C I +0000000+00	+1000000+01															41 6			
1072	1851	P C I +0000000+00	+1000000+01															41 6			
1073	1851	P C I +0000000+00	+1000000+01															41 6			
1074	1851	P C I +0000000+00	+1000000+01															41 6			
1075	1851	P C I +0000000+00	+1000000+01															41 6			
1076	1851	P C I +0000000+00	+1000000+01															41 6			
1077	1851	P C I +0000000+00	+1000000+01															41 6			
0	0	0	1	2	9		4	0	1	5	1	6	2	3	7		7	8			
3	5	7	8																		

TABLE 2.7-4. POIC DISPLAY REQUIREMENTS (Sheet 14 of 20)

E N I C N I C T I N U I O C I A Y T M I R L P R B I R I E Y E I B R I A T I O N	CALIBRATION COEFFICIENTS/LINEAR SEGMENTS					I I I I I E T X A P B L I B D I						
	A0	A1	A2	A3	A4		A5					
078	851	PC	+000000+00	+1000000+01							41	16
079	851	PC	+000000+00	+1000000+01							41	16
080	851	PC	+000000+00	+1000000+01							41	16
081	851	PC	+000000+00	+1000000+01							41	16
082	851	PC	+000000+00	+1000000+01							41	16
083	851	PC	+000000+00	+1000000+01							41	16
084	851	PC	+000000+00	+1000000+01							41	16
085	851	PC	+000000+00	+1000000+01							41	16
086	851	PC	+000000+00	+1000000+01							41	16
087	851	PC	+000000+00	+1000000+01							41	16
088	851	PC	+000000+00	+1000000+01							41	16
089	851	PC	+000000+00	+1000000+01							41	16
090	851	PC	+000000+00	+1000000+01							41	16
091	851	PC	+000000+00	+1000000+01							41	16
092	851	PC	+000000+00	+1000000+01							41	16
093	851	PC	+000000+00	+1000000+01							41	16
094	851	PC	+000000+00	+1000000+01							41	16
095	851	PC	+000000+00	+1000000+01							41	16
096	851	PC	+000000+00	+1000000+01							41	16
097	851	PC	+000000+00	+1000000+01							41	16
098	851	PC	+000000+00	+1000000+01							41	16
099	851	PC	+000000+00	+1000000+01							41	16
100	851	PC	+000000+00	+1000000+01							41	16
101	851	PC	+000000+00	+1000000+01							41	16
102	851	PC	+000000+00	+1000000+01							41	16
103	851	PC	+000000+00	+1000000+01							41	16
104	851	PC	+000000+00	+1000000+01							41	16
105	851	PC	+000000+00	+1000000+01							41	16
106	851	PC	+000000+00	+1000000+01							41	16
107	851	PC	+000000+00	+1000000+01							41	16
108	851	PC	+000000+00	+1000000+01							41	16

TABLE 2.7-4. POIC DISPLAY REQUIREMENTS (Sheet 15 of 20)

E N I C N I C T I		CALIBRATION COEFFICIENTS/LINEAR SEGMENTS										I I I I I												
I N U O O J A Y I	I T M I R I L P I	I R B I R I E I	I Y E I B I	I R I	I A I	I T I	I I I	I O I	I N I	I A 0	I A 1	I A 2	I A 3	I A 4	I A 5	I E T	I X A	I P B	I L	I I B	I D	I I		
1109	1851	P C I	+0000000+00	+1000000+01												41	6					41	6	
1110	1851	P C I	+0000000+00	+1000000+01													41	6					41	6
1111	1851	P C I	+0000000+00	+1000000+01													41	6					41	6
1112	1851	P C I	+0000000+00	+1000000+01													41	6					41	6
1113	1851	P C I	+0000000+00	+1000000+01													41	6					41	6
1114	1851	P C I	+0000000+00	+1000000+01													41	6					41	6
1115	1851	P C I	+0000000+00	+1000000+01													41	6					41	6
1116	1851	P C I	+0000000+00	+1000000+01													41	6					41	6
1117	1851	P C I	+0000000+00	+1000000+01													41	6					41	6
1118	1851	P C I	+0000000+00	+1000000+01													41	6					41	6
1119	1851	P C I	+0000000+00	+1000000+01													41	6					41	6
1120	1851	P C I	+0000000+00	+1000000+01													41	6					41	6
1121	1851	P C I	+0000000+00	+1000000+01													41	6					41	6
1122	1851	P C I	+0000000+00	+1000000+01													41	6					41	6
1123	1851	P C I	+0000000+00	+1000000+01													41	6					41	6
1124	1851	P C I	+0000000+00	+1000000+01													41	6					41	6
1125	1851	P C I	+0000000+00	+1000000+01													41	6					41	6
1126	1851	P C I	+0000000+00	+1000000+01													41	6					41	6
1127	1851	P C I	+0000000+00	+1000000+01													41	6					41	6
1128	1851	P C I	+0000000+00	+1000000+01													41	6					41	6
1129	1851	P C I	+0000000+00	+1000000+01													41	6					41	6
1130	1851	P C I	+0000000+00	+1000000+01													41	6					41	6
1131	1851	P C I	+0000000+00	+1000000+01													41	6					41	6
1132	1851	P C I	+0000000+00	+1000000+01													41	6					41	6
1133	1851	P C I	+0000000+00	+1000000+01													41	6					41	6
1134	1851	P C I	+0000000+00	+1000000+01													41	6					41	6
1135	1851	P C I	+0000000+00	+1000000+01													41	6					41	6
1136	1851	P C I	+0000000+00	+1000000+01													41	6					41	6
1137	1851	P C I	+0000000+00	+1000000+01													41	6					41	6
1138	1851	P C I	+0000000+00	+1000000+01													41	6					41	6
1139	1851	P C I	+0000000+00	+1000000+01													41	6					41	6
0	0	0	1	1	2	2	3	3	3	4	4	5	5	6	6	7	7	8	8	9	9	9	9	9

TABLE 2.7-4. POIC DISPLAY REQUIREMENTS (Sheet 16 of 20)

E N I C N I C T I		CALIBRATION COEFFICIENTS/LINEAR SEGMENTS										I I I I I		
I N U O A Y	T M I R L P I											E T I		
R B I R I E I	Y E I B I											X I A		
												P I B I		
		A0	A1	A2	A3	A4	A5					I I B I		
												D I		
												I I		
												I I		
												I I		
												I I		
140	851	PC	+0000000+00	+1000000+01									41	16
141	851	PC	+0000000+00	+1000000+01									41	16
142	851	PC	+0000000+00	+1000000+01									41	16
143	851	PC	+0000000+00	+1000000+01									41	16
144	851	PC	+0000000+00	+1000000+01									41	16
145	851	PC	+0000000+00	+1000000+01									41	16
146	851	PC	+0000000+00	+1000000+01									41	16
147	851	PC	+0000000+00	+1000000+01									41	16
148	851	PC	+0000000+00	+1000000+01									41	16
149	851	PC	+0000000+00	+1000000+01									41	16
150	851	PC	+0000000+00	+1000000+01									41	16
151	851	PC	+0000000+00	+1000000+01									41	16
152	851	PC	+0000000+00	+1000000+01									41	16
153	851	PC	+0000000+00	+1000000+01									41	16
154	851	PC	+0000000+00	+1000000+01									41	16
155	851	PC	+0000000+00	+1000000+01									41	16
156	851	PC	+0000000+00	+1000000+01									41	16
157	851	PC	+0000000+00	+1000000+01									41	16
158	851	PC	+0000000+00	+1000000+01									41	16
159	851	PC	+0000000+00	+1000000+01									41	16
160	851	PC	+0000000+00	+1000000+01									41	16
161	851	PC	+0000000+00	+1000000+01									41	16
162	851	PC	+0000000+00	+1000000+01									41	16
163	851	PC	+0000000+00	+1000000+01									41	16
164	851	PC	+0000000+00	+1000000+01									41	16
165	851	PC	+0000000+00	+1000000+01									41	16
166	851	PC	+0000000+00	+1000000+01									41	16
167	851	PC	+0000000+00	+1000000+01									41	16
168	851	PC	+0000000+00	+1000000+01									41	16
169	851	PC	+0000000+00	+1000000+01									41	16
170	851	PC	+0000000+00	+1000000+01									41	16

TABLE 2.7-4. POIC DISPLAY REQUIREMENTS (Sheet 17 of 20)

E N C N   C T		CALIBRATION COEFFICIENTS/LINEAR SEGMENTS										// / / / /				
I N U O   A Y	T M R   L P											E T				
R B R   I E	Y E   B											X A				
	R   R											P B				
	A   A											L				
	T   A 0	A 1	A 2	A 3	A 4	A 5					I B					
	I   I											D				
	O   O															
	N   N															
171	851	PC	+0000000+00	+1000000+01											4116	
172	851	PC	+0000000+00	+1000000+01											4116	
173	851	PC	+0000000+00	+1000000+01											4116	
174	851	PC	+0000000+00	+1000000+01											4116	
175	851	PC	+0000000+00	+1000000+01											4116	
176	851	PC	+0000000+00	+1000000+01											4116	
177	851	PC	+0000000+00	+1000000+01											4116	
178	851	PC	+0000000+00	+1000000+01											4116	
179	851	PC	+0000000+00	+1000000+01											4116	
180	851	PC	+0000000+00	+1000000+01											4116	
181	851	PC	+0000000+00	+1000000+01											4116	
182	851	PC	+0000000+00	+1000000+01											4116	
183	851	PC	+0000000+00	+1000000+01											4116	
184	851	PC	+0000000+00	+1000000+01											4116	
185	851	PC	+0000000+00	+1000000+01											4116	
186	851	PC	+0000000+00	+1000000+01											4116	
187	851	PC	+0000000+00	+1000000+01											4116	
188	851	PC	+0000000+00	+1000000+01											4116	
189	851	PC	+0000000+00	+1000000+01											4116	
190	851	PC	+0000000+00	+1000000+01											4116	
191	851	PC	+0000000+00	+1000000+01											4116	
192	851	PC	+0000000+00	+1000000+01											4116	
193	851	PC	+0000000+00	+1000000+01											4116	
194	851	PC	+0000000+00	+1000000+01											4116	
195	851	PC	+0000000+00	+1000000+01											4116	
196	851	PC	+0000000+00	+1000000+01											4116	
197	851	PC	+0000000+00	+1000000+01											4116	
198	851	PC	+0000000+00	+1000000+01											4116	
199	851	PC	+0000000+00	+1000000+01											4116	
200	851	PC	+0000000+00	+1000000+01											4116	
201	851	PC	+0000000+00	+1000000+01											4116	
			1	1	1	1	1	1	1	1	1	1	1	1	1	
	0	0	0	1	1	2	4	5	6	7	7	8	8	9	9	
	3	5	7													

TABLE 2.7-4. POIC DISPLAY REQUIREMENTS (Sheet 18 of 20)

E N I C N I C T	CALIBRATION COEFFICIENTS/LINEAR SEGMENTS										I I I I							
	I N U O O J A Y	I T M I R L P	I R B I R I E	Y E I B	R I	R A	T I	I O	I N	A 0		A 1	A 2	A 3	A 4	A 5	I I B I	I I B I
1202	1851	PC	+000000+00	+1000000+01														4116
1203	1851	PC	+000000+00	+1000000+01														4116
1204	1851	PC	+000000+00	+1000000+01														4116
1205	1851	PC	+000000+00	+1000000+01														4116
1206	1851	PC	+000000+00	+1000000+01														4116
1207	1851	PC	+000000+00	+1000000+01														4116
1208	1851	PC	+000000+00	+1000000+01														4116
1209	1851	PC	+000000+00	+1000000+01														4116
1210	1851	PC	+000000+00	+1000000+01														4116
1211	1851	PC	+000000+00	+1000000+01														4116
1212	1851	PC	+000000+00	+1000000+01														4116
1213	1851	PC	+000000+00	+1000000+01														4116
1214	1851	PC	+000000+00	+1000000+01														4116
1215	1851	PC	+000000+00	+1000000+01														4116
1216	1851	PC	+000000+00	+1000000+01														4116
1217	1851	PC	+000000+00	+1000000+01														4116
1218	1851	PC	+000000+00	+1000000+01														4116
1219	1851	PC	+000000+00	+1000000+01														4116
1220	1851	PC	+000000+00	+1000000+01														4116
1221	1851	PC	+000000+00	+1000000+01														4116
1222	1851	PC	+000000+00	+1000000+01														4116
1223	1851	PC	+000000+00	+1000000+01														4116
1224	1851	PC	+000000+00	+1000000+01														4116
1225	1851	PC	+000000+00	+1000000+01														4116
1226	1851	PC	+000000+00	+1000000+01														4116
1227	1851	PC	+000000+00	+1000000+01														4116
1228	1851	PC	+000000+00	+1000000+01														4116
1229	1851	PC	+000000+00	+1000000+01														4116
1230	1851	PC	+000000+00	+1000000+01														4116
1231	1851	PC	+000000+00	+1000000+01														4116
1232	1851	PC	+000000+00	+1000000+01														4116
0	0	0	1	2	9	4	0	1	5	1	6	2	3	7	8	9	0	
3	5	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3

TABLE 2.7-4. POIC DISPLAY REQUIREMENTS (Sheet 19 of 20)

E N C N I C T		CALIBRATION COEFFICIENTS/LINEAR SEGMENTS										I I I							
N U O O A Y	T M R I L P											E T							
R B R I E	Y E I B											X A							
R I R	A	A0	A1	A2	A3	A4	A5				P B								
I I	I O											I B							
I I	I N											I D							
												I							
233	851	PC	+0000000+00	+1000000+01													41	6	
234	851	PC	+0000000+00	+1000000+01														41	6
235	851	PC	+0000000+00	+1000000+01														41	6
236	851	PC	+0000000+00	+1000000+01														41	6
237	851	PC	+0000000+00	+1000000+01														41	6
238	851	PC	+0000000+00	+1000000+01														41	6
239	851	PC	+0000000+00	+1000000+01														41	6
240	851	PC	+0000000+00	+1000000+01														41	6
241	851	PC	+0000000+00	+1000000+01														41	6
242	851	PC	+0000000+00	+1000000+01														41	6
243	851	PC	+0000000+00	+1000000+01														41	6
244	851	PC	+0000000+00	+1000000+01														41	6
245	851	PC	+0000000+00	+1000000+01														41	6
246	851	PC	+0000000+00	+1000000+01														41	6
247	851	PC	+0000000+00	+1000000+01														41	6
248	851	PC	+0000000+00	+1000000+01														41	6
249	851	PC	+0000000+00	+1000000+01														41	6
250	851	PC	+0000000+00	+1000000+01														41	6
251	851	PC	+0000000+00	+1000000+01														41	6
252	851	PC	+0000000+00	+1000000+01														41	6
253	851	PC	+0000000+00	+1000000+01														41	6
254	851	PC	+0000000+00	+1000000+01														41	6
255	851	PC	+0000000+00	+1000000+01														41	6
256	851	PC	+0000000+00	+1000000+01														41	6
257	851	PC	+0000000+00	+1000000+01														41	6
258	851	PC	+0000000+00	+1000000+01														41	6
259	851	PC	+0000000+00	+1000000+01														41	6
260	851	PC	+0000000+00	+1000000+01														41	6
261	851	PC	+0000000+00	+1000000+01														41	6
262	851	PC	+0000000+00	+1000000+01														41	6
263	851	PC	+0000000+00	+5000000-01														41	6
I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	
0	0	0	1	2	4	5	6	7	8	9	0	1	2	3	4	5	6	7	
3	5	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	

TABLE 2.7-4. POIC DISPLAY REQUIREMENTS (Sheet 20 of 20)

E N C N I C T I		C A L I B R A T I O N C O E F F I C I E N T S / L I N E A R S E G M E N T S										I L I B I D					
N U O O A Y												E T					
T M R L P												X A					
R B R I E												P B					
Y E I B												L					
R I R I												I B					
A A												I D					
T I																	
I I																	
O I																	
N I																	
265   851   PC   +0000000+00   +1000000+01												41   6					
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	5	7															



TABLE 2.7-5. POIC LIMIT SENSING/EXCEPTION MONITOR REQUIREMENTS (Sheet 1 of 14)

I E N O M T O Y	C N I R B Y E R I O R	WARNING VALUES (YELLOW LINE)		CRITICAL VALUES (RED LINE)		EXCEPTION MONITOR MESSAGE	DI STATE CODE	I X A I P B I L D	
		U P P E R L I M I T	L O W E R L I M I T	U P P E R L I M I T	L O W E R L I M I T				
001	850	EM				0 CDAS FAILURE-BITE #1 (Tb1 1) OK	FAIL	41 7	
002	850	EM				0 CDAS FAILURE-BITE #2 (Tb1 1) OK	FAIL	41 7	
003	850	EM				0 PDS PWR OFF (Tb1 1)	OFF	41 7	
004	850	EM				1 PDS PWR OFF (Tb1 1)	ON	41 7	
005	850	EM				0 SCS PWR OFF (Tb1 1)	OFF	41 7	
006	850	EM				1 SCS PWR OFF (Tb1 1)	YES	NO	41 7
007	850	EM				0 CDAS PWR OFF (Tb1 1)	ON	OFF	41 7
008	850	EM				1 EXTRM TRAVEL LIMIT EXCEEDED	YES	NO	41 7
008	850	EM				1 CDAS PWR OFF (Tb1 1)	OFF	ON	41 7
009	850	EM				0 EXTRM TRAVEL LIMIT EXCEEDED	YES	NO	41 7
010	850	EM					YES	NO	41 7
011	850	EM				1 NO AVIONICS AIR-SCS #2 (Tb1 1)	FAIL	OK	41 7
012	850	EM					YES	NO	41 7
012	850	EM				1 NO AVIONICS AIR-PDS #2 (Tb1 1)	FAIL	OK	41 7
013	850	EM					NO	YES	41 7
014	850	EM				1 WATER OUTLET BYPASS	BYP	NORM	41 7
015	850	EM				0 WATER OUTLET BYPASS	NORM	BYP	41 7
016	850	EM				1 WATER INLET BYPASS	BYP	NORM	41 7
017	850	EM				0 WATER INLET BYPASS	NORM	BYP	41 7
018	850	EM					CLS	OPN	41 7
019	850	EM					OPN	CLS	41 7
020	850	EM					CLS	OPN	41 7
021	850	EM					OPN	CLS	41 7
022	850	EM					YES	NO	41 7
023	850	EM					NO	YES	41 7
024	850	EM					YES	NO	41 7
025	850	EM					NO	YES	41 7
026	850	EM					YES	NO	41 7
027	850	EM					NO	YES	41 7
028	850	EM					NO	YES	41 7

TABLE 2.7-5. POIC LIMIT SENSING/EXCEPTION MONITOR REQUIREMENTS (Sheet 2 of 14)

I E N O M T	C N I	WARNING VALUES (YELLOW LINE)		CRITICAL VALUES (RED LINE)		EXCEPTION MONITOR MESSAGE	DI STATE CODE	I E T	
		U P P E R L I M I T	L O W E R L I M I T	U P P E R L I M I T	L O W E R L I M I T				
029	850						NO	YES	4117
030	850						YES	NO	4117
031	850						NO	YES	4117
032	850						YES	NO	4117
033	850						NO	YES	4117
034	850						YES	NO	4117
035	850						NO	YES	4117
036	850						YES	NO	4117
037	850						NO	YES	4117
038	850						OK	FAIL	4117
039	850						OK	FAIL	4117
040	850						OK	FAIL	4117
041	850						OK	FAIL	4117
042	850						OK	FAIL	4117
043	850						OK	FAIL	4117
044	850						OK	FAIL	4117
045	850						OK	FAIL	4117
046	850	EM				1 NO AVIONICS AIR - PDS #1	FAIL	OK	4117
047	850	EM				1 NO AVIONICS AIR - PCS #1	FAIL	OK	4117
048	850						ON	OFF	4117
049	850						ON	ON	4117
050	850						ON	OFF	4117
051	850						OFF	ON	4117
052	850	EM				1 LO IFEA WATER FLOW #1	FAIL	OK	4117
053	850	EM				1 NO AVIONICS AIR - SCS #1	FAIL	OK	4117
054	850						OK	FAIL	4117
055	850						OK	FAIL	4117
056	850						OK	FAIL	4117
057	850						OK	FAIL	4117
058	850						OK	FAIL	4117
059	850						OK	FAIL	4117
060	850						OK	FAIL	4117
061	850						OK	FAIL	4117

TABLE 2.7-5. POIC LIMIT SENSING/EXCEPTION MONITOR REQUIREMENTS (Sheet 3 of 14)

IC N IE NO NUR TMR RBI YE R	O MT OY NP IE T O R	WARNING VALUES (YELLOW LINE)		CRITICAL VALUES (RED LINE)		EXCEPTION MONITOR MESSAGE	DI STATE CODE	I E T X A B L E
		UPPER LIMIT	LOWER LIMIT	UPPER LIMIT	LOWER LIMIT/ EXPECTED STATE			
062	850					ON	OFF	417
063	850					OFF	ON	417
064	850					ON	OFF	417
065	850					OFF	ON	417
066	850					ON	OFF	417
067	850					OFF	ON	417
068	850					ON	OFF	417
069	850					OFF	ON	417
070	850					ON	OFF	417
071	850					OFF	ON	417
072	850					ON	OFF	417
073	850					OFF	ON	417
074	850					ON	OFF	417
075	850					OFF	ON	417
076	850					ON	OFF	417
077	850					OFF	ON	417
078	850					YES	NO	417
079	850					NO	YES	417
080	850					YES	NO	417
081	850					NO	YES	417
082	850					YES	NO	417
083	850					NO	YES	417
084	850					CLS	OPN	417
085	850					OPN	CLS	417
086	850					ON	OFF	417
087	850					OFF	ON	417
088	850					ON	OFF	417
089	850					OFF	ON	417
090	850					ON	OFF	417
091	850					OFF	ON	417
092	850					ON	OFF	417
093	850					OFF	ON	417
094	850					ON	OFF	417
000		1	2	1	1	6	7	1
005		2	0	2	3	6	2	8
3					6			9
					8			1
					3			3
					6			8

TABLE 2.7-5. POIC LIMIT SENSING/EXCEPTION MONITOR REQUIREMENTS (Sheet 4 of 14)

E N T R Y R O R	I C N O M T O Y N P R E T O R	WARNING VALUES (YELLOW LINE)			CRITICAL VALUES (RED LINE)			EXCEPTION MONITOR MESSAGE	DI STATE CODE	E X P L D
		U P P E R L I M I T	L O W E R L I M I T	U P P E R L I M I T	L O W E R L I M I T	U P P E R L I M I T	L O W E R L I M I T			
09518501								OFF	ON	4171
09618501EM							1 LO IFEA WATER FLOW #2	FAIL	OK	4171
09718501EM							1 NO AVIONICS AIR - PCS #2	FAIL	OK	4171
09818501								OK	FAIL	4171
09918501								OK	FAIL	4171
10018501								OK	FAIL	4171
10118501								OK	FAIL	4171
10218501								OK	FAIL	4171
10318501								OK	FAIL	4171
10418501								OK	FAIL	4171
10518501								OK	FAIL	4171
10618501EM							0 PCS UTILITY PWR OFF	ON	OFF	4171
10718501EM							1 PCS UTILITY PWR OFF	ON	OFF	4171
10818501								ON	OFF	4171
10918501								OFF	ON	4171
11018501								ON	OFF	4171
11118501								OFF	ON	4171
11218501								ON	OFF	4171
11318501								OFF	ON	4171
11418501								ON	OFF	4171
11518501								OFF	ON	4171
11618501								ON	OFF	4171
11718501								OFF	ON	4171
11818501								ON	OFF	4171
11918501								OFF	ON	4171
12018501								ON	OFF	4171
12118501								OFF	ON	4171
12218501								ON	OFF	4171
12318501								OFF	ON	4171
12418501								ON	OFF	4171
12518501								OFF	ON	4171
12618501								ON	OFF	4171
12718501								OFF	ON	4171

TABLE 2.7-5. POIC LIMIT SENSING/EXCEPTION MONITOR REQUIREMENTS (Sheet 5 of 14)

E N O M T I N U R O Y	I C N I T M R N P	WARNING VALUES (YELLOW LINE)		CRITICAL VALUES (RED LINE)		EXCEPTION MONITOR MESSAGE	DI STATE CODE	I I I I I
		U P P E R L I M I T	L O W E R L I M I T	U P P E R L I M I T	L O W E R L I M I T			
1281850							ON	41171
1291850							OFF	41171
1301850							ON	41171
1311850							OFF	41171
1321850							ON	41171
1331850							OFF	41171
1341850							ON	41171
1351850							OFF	41171
1361850							ON	41171
1371850							OFF	41171
1861850							NO	41171
2001850EM							WAIT	41171
2121850LS		3740		3740		HI EXP MAIN BUS CURRENT		41171
2131850LS		3358		2396		EXP MAIN BUS VOLTAGE OOL		41171
2141850LS		410			819	HI IFEA LOWER HUMIDITY		41171
2151850LS		410			819	HI IFEA UPPER HUMIDITY		41171
2161850LS		1911		887	1979	887 IFEA PRESSURE 1 OOL		41171
2171850LS		1911		887	1979	887 IFEA PRESSURE 2 OOL		41171
2181850LS		1954			2035	HI LOWER ATMOS TEMP		41171
2191850LS		1954			2035	HI UPPER ATMOS TEMP		41171
2201850LS		504			585	HI IFEA WATER INLET TEMP		41171
2211850LS		827			907	HI IFEA WATER OUTLET TEMP		41171
2221850LS		827			907	HI CLD END SHELL TEMP		41171
2231850LS		827			907	HI HOT END SHELL TEMP		41171
2241850LS		827			907	HI RFM WATER OUTLET TEMP		41171
2611850LS		2007			2007	HI STEP MTR PHASE A CURRENT		41171
2621850LS		2163			2163	HI STEP MTR PHASE A VOLTAGE		41171
2631850LS		2007			2007	HI STEP MTR PHASE B CURRENT		41171
2641850LS		2163			2163	HI STEP MTR PHASE B VOLTAGE		41171
2661850LS		827			1067	HI FTS STEPPER MOTOR TEMP		41171
2681850LS		3003			3003	HI COLD GUARD HTR CURRENT		41171
2691850LS		1536			1536	HI COLD GUARD HTR VOLTAGE		41171
2701850LS		3003			3003	HI COLD PRIM HTR CURRENT		41171
0 0	1	2	2	2	2		1	1
3 5	2	0	0	8	8		7	8
							6	9
							2	1
							6	8
							6	3

TABLE 2.7-5. POIC LIMIT SENSING/EXCEPTION MONITOR REQUIREMENTS (Sheet 6 of 14)

E N O I M T	C N I	WARNING VALUES (YELLOW LINE)		CRITICAL VALUES (RED LINE)		EXCEPTION MONITOR MESSAGE	IDI STATE CODE	I T A B L E	
		UPPER LIMIT	LOWER LIMIT	UPPER LIMIT	LOWER LIMIT/ EXPECTED STATE				
271	850	LS	1536		1536	HI COLD PRIM HTR VOLTAGE		141	7
272	850	LS	3003		3003	HI COLD RED HTR CURRENT		141	7
273	850	LS	1536		1536	HI COLD RED HTR VOLTAGE		141	7
274	850	LS	3003		3003	HI BOOST HTR CURRENT		141	7
275	850	LS	3072		3072	HI BOOST HTR VOLTAGE		141	7
276	850	LS	3003		3003	HI HOT GUARD HTR CURRENT		141	7
277	850	LS	1536		1536	HI HOT GUARD HTR VOLTAGE		141	7
278	850	LS	3003		3003	HI HOT PRIM HTR CURRENT		141	7
279	850	LS	3072		3072	HI HOT PRIM HTR VOLTAGE		141	7
280	850	LS	3003		3003	HI HOT RED HTR CURRENT		141	7
281	850	LS	3072		3072	HI HOT RED HTR VOLTAGE		141	7
282	850	LS	827		907	HI CJ TEMP - COLD ZONE #1		141	7
283	850	LS	827		907	HI CJ TEMP - COLD ZONE #2		141	7
284	850	LS	827		907	HI CJ TEMP - HOT ZONE #1		141	7
285	850	LS	827		907	HI CJ TEMP - HOT ZONE #2		141	7
286	850	LS	827		907	HI CJ TEMP-SAMPLE 1 SENSOR 1		141	7
287	850	LS	827		907	HI CJ TEMP-SAMPLE 1 SENSOR 2		141	7
288	850	LS	827		907	HI CJ TEMP-SAMPLE 2 SENSOR 1		141	7
289	850	LS	827		907	HI CJ TEMP-SAMPLE 2 SENSOR 2		141	7
290	850	LS	827		907	HI CJ TEMP-SAMPLE 3 SENSOR 1		141	7
291	850	LS	827		907	HI CJ TEMP-SAMPLE 3 SENSOR 2		141	7
292	850	LS	827		907	HI CJ TEMP-SAMPLE 4 SENSOR 1		141	7
293	850	LS	827		907	HI CJ TEMP-SAMPLE 4 SENSOR 2		141	7
294	850	LS	827		907	HI CJ TEMP-SAMPLE 5 SENSOR 1		141	7
295	850	LS	827		907	HI CJ TEMP-SAMPLE 5 SENSOR 2		141	7
296	850	LS	827		907	HI CJ TEMP-SAMPLE 6 SENSOR 1		141	7
297	850	LS	827		907	HI CJ TEMP-SAMPLE 6 SENSOR 2		141	7
313	850	LS	987		1227	HI ALIGN ARM TEMP		141	7
314	850	LS	827		907	HI SEM TRACK TEMP		141	7
465	850								
466	850								
467	850								
468	850								

TABLE 2.7-5. POIC LIMIT SENSING/EXCEPTION MONITOR REQUIREMENTS (Sheet 7 of 14)

E N O M T	WARNING VALUES (YELLOW LINE)		CRITICAL VALUES (RED LINE)		EXCEPTION MONITOR MESSAGE	DI STATE CODE			
	U R	O Y	U P P E R	L O W E R		0 =	1 =		
T M R	N P	I E	U P P E R	L O W E R					
Y E	T		L I M I T	L I M I T					
R	O		L I M I T	E X P E C T E D					
	R			S T A T E					
469	850					NO	YES	41	7
489	850					OK	FAIL	41	7
490	850					OK	FAIL	41	7
491	850					OK	FAIL	41	7
492	850					OK	FAIL	41	7
493	850					OK	FAIL	41	7
494	850					OK	FAIL	41	7
495	850					OK	FAIL	41	7
496	850					OK	FAIL	41	7
497	850					OK	FAIL	41	7
498	850					OK	FAIL	41	7
499	850					OK	FAIL	41	7
500	850					OK	FAIL	41	7
501	850					OK	FAIL	41	7
502	850					OK	FAIL	41	7
503	850					OK	FAIL	41	7
504	850					OK	FAIL	41	7
505	850					OK	FAIL	41	7
506	850					OK	FAIL	41	7
507	850					OK	FAIL	41	7
508	850					OK	FAIL	41	7
509	850					OK	FAIL	41	7
510	850					OK	FAIL	41	7
511	850					OK	FAIL	41	7
512	850					OK	FAIL	41	7
513	850					OK	FAIL	41	7
514	850					OK	FAIL	41	7
515	850					OK	FAIL	41	7
516	850					OK	FAIL	41	7
517	850					OK	FAIL	41	7
518	850					OK	FAIL	41	7
519	850					OK	FAIL	41	7
520	850					OK	FAIL	41	7

TABLE 2.7-5. POIC LIMIT SENSING/EXCEPTION MONITOR REQUIREMENTS (Sheet 8 of 14)

E N O M T	I C N I	WARNING VALUES (YELLOW LINE)		CRITICAL VALUES (RED LINE)		EXCEPTION MONITOR MESSAGE	IDI STATE CODE			
		U P P E R L I M I T	L O W E R L I M I T	U P P E R L I M I T	L O W E R L I M I T		0=	1=		
IN UR	YO	NP	IE	IT	IR	OR	IR	OT		
521	850						OK	FAIL	41	7
522	850						OK	FAIL	41	7
523	850						OK	FAIL	41	7
524	850						OK	FAIL	41	7
525	850						OK	FAIL	41	7
526	850						OK	FAIL	41	7
527	850						OK	FAIL	41	7
528	850						OK	FAIL	41	7
529	850						OK	FAIL	41	7
530	850						OK	FAIL	41	7
531	850						OK	FAIL	41	7
532	850						OK	FAIL	41	7
533	850						OK	FAIL	41	7
534	850						OK	FAIL	41	7
535	850						OK	FAIL	41	7
536	850						OK	FAIL	41	7
537	850						OK	FAIL	41	7
538	850						OK	FAIL	41	7
539	850						OK	FAIL	41	7
540	850						OK	FAIL	41	7
541	850						OK	FAIL	41	7
542	850						OK	FAIL	41	7
543	850						OK	FAIL	41	7
544	850						OK	FAIL	41	7
545	850						OK	FAIL	41	7
546	850						OK	FAIL	41	7
547	850						OK	FAIL	41	7
548	850						OK	FAIL	41	7
549	850						OK	FAIL	41	7
550	850						OK	FAIL	41	7
551	850						OK	FAIL	41	7
552	850						OK	FAIL	41	7
553	850						OK	FAIL	41	7



TABLE 2.7-5. POIC LIMIT SENSING/EXCEPTION MONITOR REQUIREMENTS (Sheet 9 of 14)

E N O I M T N U I R	WARNING VALUES (YELLOW LINE)		CRITICAL VALUES (RED LINE)		EXCEPTION MONITOR MESSAGE	DI STATE CODE	DI STATE CODE
	UPPER LIMIT	LOWER LIMIT	UPPER LIMIT	LOWER LIMIT/ EXPECTED STATE			
5541850						OK	FAIL 41171
5551850						OK	FAIL 41171
5561850						OK	FAIL 41171
5571850						OK	FAIL 41171
5581850						OK	FAIL 41171
5591850						OK	FAIL 41171
5601850						OK	FAIL 41171
5611850						OK	FAIL 41171
5621850						OK	FAIL 41171
5631850						OK	FAIL 41171
5641850						OK	FAIL 41171
5651850						OK	FAIL 41171
5661850						OK	FAIL 41171
5671850						OK	FAIL 41171
5681850						OK	FAIL 41171
5691850						OK	FAIL 41171
5701850						OK	FAIL 41171
5711850						OK	FAIL 41171
5721850						OK	FAIL 41171
5731850						OK	FAIL 41171
5741850						OK	FAIL 41171
5751850						OK	FAIL 41171
5761850						OK	FAIL 41171
5771850						OK	FAIL 41171
5781850						OK	FAIL 41171
5791850						OK	FAIL 41171
5801850						OK	FAIL 41171
5811850						OK	FAIL 41171
5821850						OK	FAIL 41171
5831850						OK	FAIL 41171
5841850						OK	FAIL 41171
5851850						OK	FAIL 41171
5861850						OK	FAIL 41171

0 0	1	2	0	2	3 3	6	7	1	1
3 5	2	8	0	8	6 8	6	2	9	1 3

TABLE 2.7-5. POIC LIMIT SENSING/EXCEPTION MONITOR REQUIREMENTS (Sheet 10 of 14)

E N I O M T	WARNING VALUES (YELLOW LINE)			CRITICAL VALUES (RED LINE)			EXCEPTION MONITOR MESSAGE	DI STATE CODE	E T X A P B I L D E	
	U P P E R L I M I T	L O W E R L I M I T	U P P E R L I M I T	L O W E R L I M I T	U P P E R L I M I T	L O W E R L I M I T				
587 850								OK	FAIL	41 7
588 850								OK	FAIL	41 7
589 850								OK	FAIL	41 7
590 850								OK	FAIL	41 7
591 850								OK	FAIL	41 7
592 850								OK	FAIL	41 7
593 850								OK	FAIL	41 7
594 850								OK	FAIL	41 7
595 850								OK	FAIL	41 7
596 850								OK	FAIL	41 7
597 850								OK	FAIL	41 7
598 850								OK	FAIL	41 7
599 850								OK	FAIL	41 7
600 850								OK	FAIL	41 7
601 850								OK	FAIL	41 7
602 850								OK	FAIL	41 7
603 850								OK	FAIL	41 7
604 850								OK	FAIL	41 7
605 850								OK	FAIL	41 7
606 850								OK	FAIL	41 7
607 850								OK	FAIL	41 7
608 850								OK	FAIL	41 7
609 850								OK	FAIL	41 7
610 850								OK	FAIL	41 7
611 850								OK	FAIL	41 7
612 850								OK	FAIL	41 7
613 850								OK	FAIL	41 7
614 850								OK	FAIL	41 7
615 850								OK	FAIL	41 7
616 850								OK	FAIL	41 7
617 850								OK	FAIL	41 7
618 850								OK	FAIL	41 7
619 850								OK	FAIL	41 7

TABLE 2.7-5. POIC LIMIT SENSING/EXCEPTION MONITOR REQUIREMENTS (Sheet 11 of 14)

E N O N U R T M R Y E R I	C N O M T O Y N P I E T O R	WARNING VALUES (YELLOW LINE)			CRITICAL VALUES (RED LINE)			EXCEPTION MONITOR MESSAGE	DI STATE CODE	I E T X A P B I L D E
		UPPER LIMIT	LOWER LIMIT	UPPER LIMIT	LOWER LIMIT/ EXPECTED STATE	0=	1=			
620	850							OK	FAIL	417
621	850							OK	FAIL	417
622	850							OK	FAIL	417
623	850							OK	FAIL	417
624	850							OK	FAIL	417
625	850							OK	FAIL	417
626	850							OK	FAIL	417
627	850							OK	FAIL	417
628	850							OK	FAIL	417
629	850							OK	FAIL	417
630	850							OK	FAIL	417
631	850							OK	FAIL	417
632	850							OK	FAIL	417
633	850							OK	FAIL	417
634	850							OK	FAIL	417
635	850							OK	FAIL	417
636	850							OK	FAIL	417
637	850							OK	FAIL	417
638	850							OK	FAIL	417
639	850							OK	FAIL	417
640	850							OK	FAIL	417
641	850							OK	FAIL	417
642	850							OK	FAIL	417
643	850							OK	FAIL	417
644	850							OK	FAIL	417
645	850							OK	FAIL	417
646	850							OK	FAIL	417
647	850							OK	FAIL	417
648	850							OK	FAIL	417
649	850							OK	FAIL	417
650	850							OK	FAIL	417
651	850							OK	FAIL	417
652	850							OK	FAIL	417

TABLE 2.7-5. POIC LIMIT SENSING/EXCEPTION MONITOR REQUIREMENTS (Sheet 12 of 14)

IC N	WARNING VALUES (YELLOW LINE)		CRITICAL VALUES (RED LINE)		DI STATE CODE	E T	X A	P B	I L	D E
	UPPER LIMIT	LOWER LIMIT	UPPER LIMIT	LOWER LIMIT/EXPECTED STATE						
653 850					OK	FAIL	41 7			
654 850					OK	FAIL	41 7			
655 850					OK	FAIL	41 7			
656 850					OK	FAIL	41 7			
657 850					OK	FAIL	41 7			
658 850					OK	FAIL	41 7			
659 850					OK	FAIL	41 7			
660 850					OK	FAIL	41 7			
661 850					OK	FAIL	41 7			
662 850					OK	FAIL	41 7			
663 850					OK	FAIL	41 7			
664 850					OK	FAIL	41 7			
665 850					OK	FAIL	41 7			
666 850					OK	FAIL	41 7			
667 850					OK	FAIL	41 7			
668 850					OK	FAIL	41 7			
669 850					OK	FAIL	41 7			
670 850					OK	FAIL	41 7			
671 850					OK	FAIL	41 7			
672 850					OK	FAIL	41 7			
673 850					OK	FAIL	41 7			
674 850					OK	FAIL	41 7			
675 850					OK	FAIL	41 7			
676 850					OK	FAIL	41 7			
677 850					OK	FAIL	41 7			
678 850					OK	FAIL	41 7			
679 850					OK	FAIL	41 7			
680 850					OK	FAIL	41 7			
681 850					OK	FAIL	41 7			
682 850					OK	FAIL	41 7			
683 850					OK	FAIL	41 7			
684 850					OK	FAIL	41 7			
685 850					OK	FAIL	41 7			

TABLE 2.7-5. POIC LIMIT SENSING/EXCEPTION MONITOR REQUIREMENTS (Sheet 13 of 14)

E N O I C	M O I	N U R	T M R	R B I	Y E R	I E	O	R	WARNING VALUES (YELLOW LINE)			CRITICAL VALUES (RED LINE)			EXCEPTION MONITOR MESSAGE	DI STATE CODE	E T	X A	P B	I L	D E
									UPPER LIMIT	LOWER LIMIT		UPPER LIMIT	LOWER LIMIT/EXPECTED STATE	0=							
686	1850														OK	FAIL	41	7			
687	1850														OK	FAIL	41	7			
688	1850														OK	FAIL	41	7			
689	1850														OK	FAIL	41	7			
690	1850														OK	FAIL	41	7			
691	1850														OK	FAIL	41	7			
692	1850														OK	FAIL	41	7			
693	1850														OK	FAIL	41	7			
694	1850														OK	FAIL	41	7			
695	1850														OK	FAIL	41	7			
696	1850														OK	FAIL	41	7			
697	1850														OK	FAIL	41	7			
698	1850														OK	FAIL	41	7			
699	1850														OK	FAIL	41	7			
700	1850														OK	FAIL	41	7			
701	1850														OK	FAIL	41	7			
702	1850														OK	FAIL	41	7			
703	1850														OK	FAIL	41	7			
704	1850														OK	FAIL	41	7			
705	1850														OK	FAIL	41	7			
706	1850														OK	FAIL	41	7			
707	1850														OK	FAIL	41	7			
708	1850														OK	FAIL	41	7			
709	1850														OK	FAIL	41	7			
710	1850														OK	FAIL	41	7			
711	1850														OK	FAIL	41	7			
712	1850														OK	FAIL	41	7			
713	1850														OK	FAIL	41	7			
714	1850														OK	FAIL	41	7			
715	1850														OK	FAIL	41	7			
716	1850														OK	FAIL	41	7			
717	1850														OK	FAIL	41	7			
718	1850														OK	FAIL	41	7			

TABLE 2.7-5. POIC LIMIT SENSING/EXCEPTION MONITOR REQUIREMENTS (Sheet 14 of 14)

C N I E N O U R M R B I E I R I R	WARNING VALUES (YELLOW LINE)		CRITICAL VALUES (RED LINE)		EXCEPTION MONITOR MESSAGE	DI STATE CODE	I E X P I D
	UPPER LIMIT	LOWER LIMIT	UPPER LIMIT	LOWER LIMIT/ EXPECTED STATE			
17191850						OK	FAIL 4117
17201850						OK	FAIL 4117
17211850						OK	FAIL 4117
17221850						OK	FAIL 4117
17231850						OK	FAIL 4117
17241850						OK	FAIL 4117
17251850						OK	FAIL 4117
17261850						OK	FAIL 4117
17271850						OK	FAIL 4117
17281850						OK	FAIL 4117
17291850						OK	FAIL 4117
17301850						OK	FAIL 4117
17311850						OK	FAIL 4117
17321850						OK	FAIL 4117
17331850						OK	FAIL 4117
17341850						OK	FAIL 4117
17351850						OK	FAIL 4117
17361850						OK	FAIL 4117
17371850						OK	FAIL 4117
17381850						OK	FAIL 4117
17391850						OK	FAIL 4117
17401850						OK	FAIL 4117
17411850						OK	FAIL 4117
17421850						OK	FAIL 4117
17431850						OK	FAIL 4117
17441850						OK	FAIL 4117
17451850						OK	FAIL 4117
17461850						OK	FAIL 4117
17471850						OK	FAIL 4117
17481850						OK	FAIL 4117
17491850						OK	FAIL 4117
17501850						OK	FAIL 4117
12641851						RUN	WAIT 4217
12661851						NO	YES 4217

## 2.8. FLIGHT SOFTWARE REQUIREMENTS

This section of the Experiment/Facility Requirements Document (E/FRD) defines the Space Station Furnace Facility (SSFF) Data Management System (DMS) software functions required to support the Furnace Module-1. Furnace Module-1 will require the SSFF Furnace Control Unit (FCU) and Furnace Actuator Unit (FAU) software to provide networking, data processing, storage and data acquisition and control for Furnace Module-1. The following subsections define the required resources and data handling requirements of Furnace Module-1.

### 2.8.1 COMMAND SUPPORT

The SSFF software will support the issuance of commands by the Furnace Module-1 application software or commands issued by Tier 1 or the SSFF Core Control Unit (CCU).

### 2.8.2 DATA ACQUISITION

The SSFF software will support the acquisition of the Furnace Module-1 data defined in Section 2.7 of this E/FRD.

### 2.8.3 DATA PROCESSING

The SSFF software shall support limited processing of Furnace Module-1 data defined in Section 2.7 of this E/FRD.

### 2.8.4 DATA ROUTING/FORMATTING

The SSFF software shall support formatting and routing of Furnace Module-1 data, defined in Section 2.7 of this E/FRD, to the SSFF CCU.

### 2.8.5 DOWNLOADING APPLICATION SOFTWARE AND DATA

The SSFF software shall support downloading of Furnace Module-1 application software and data.

### 2.8.6 DOWNLOADING ANCILLARY DATA

The SSFF software shall support the retrieval and downloading of ancillary data to the Furnace Module-1 application software.

### 2.8.7 FDIR SUPPORT

The SSFF software shall provide fault detection, isolation, and recovery (FDIR) support for Furnace Module-1.

### 2.8.8 OPERATING SYSTEM SERVICES

The SSFF software shall provide operating system services for the Furnace Module-1 application software.

### 2.8.9 HEALTH AND STATUS DATA

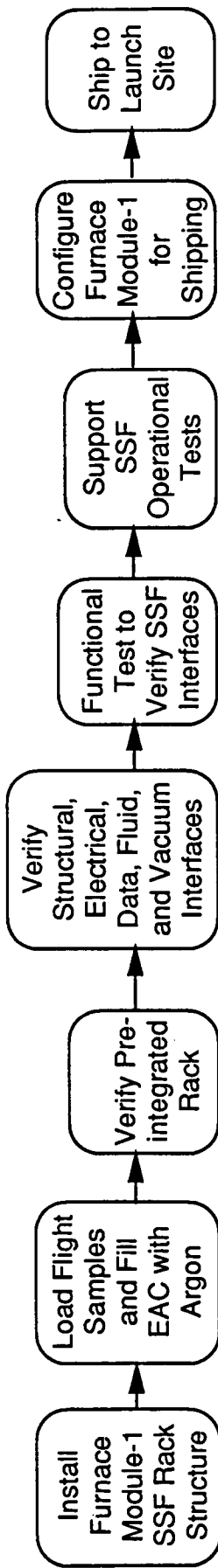
The SSFF shall acquire health and status data from the Furnace Module-1 application software for SSFF storage or transfer to the SSF.



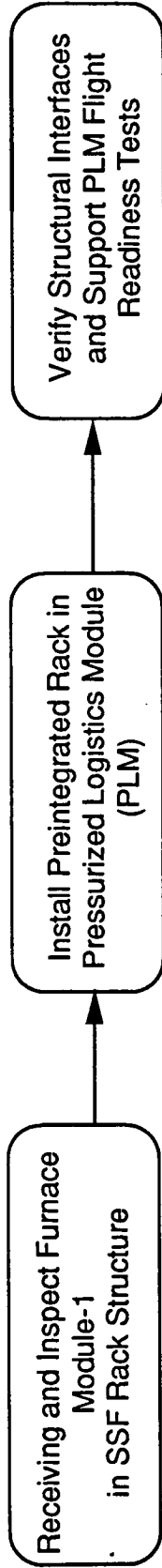
## 2.9. PHYSICAL INTEGRATION

This section describes the Furnace Module-1 integration/deintegration requirements and flow. Figure 2.9-1 illustrates the Furnace Module-1 physical integration activity flow from the beginning of prelaunch site activities, through deintegration after return from space.

Table 2.9-1 provides the integration facility requirements for each stage of integration. Table 2.9-2 describes the requirements and activities at each step of the integration process.



**Prelaunch Site Integration Activities**



**Launch Site Integration Activities**

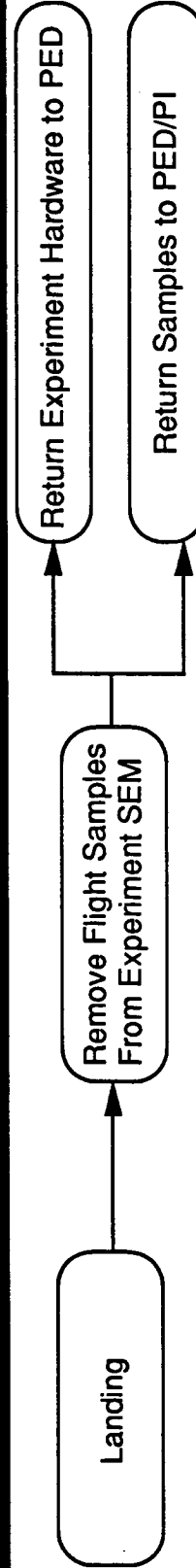
**TBD**

2.9-2

**On-Orbit Integration Activities**

**TBD**

**On-Orbit Deintegration Activities**



**Landing Site Deintegration Activities**

FIGURE 2.9-1. PHYSICAL INTEGRATION FLOW

TABLE 2.9-1. FURNACE MODULE-1 GROUND PROCESSING REQUIREMENTS  
(Sheet 1 of 2)

- (  ) Experiment/Facility Preintegration  
 (  ) Experiment/Facility Preparation  
 (  ) Postmission Requirements

**Description of Planned Activities:**

Functional tests, sample loading, and closeout will be performed after the EAC is mounted on the rotation fixture.

Total Floor Space Required Including Space for GSE: 2000 ft<sup>2</sup>

Celling Height Required: 10 ft

Overhead Crane Required:  Yes  No Hook Height 8 ft

Facility Power Required:  120 V, 1 F, 60 Hz  
 208 V, 3 F, 60 Hz  
 Other 220 V, Single Phase, 60 Hz

Other Facility Support: Gases  GN<sub>2</sub> Liquids Water  
 GHe \_\_\_\_\_  
Argon Other \_\_\_\_\_

Environment:  Standard  Other

Hazardous Operations:  Yes  No

Total Anticipated Use Time: 21 Days

**Other Facility Support Description:**

Mass spectrometer leak test

TABLE 2.9-1. FURNACE MODULE-1 GROUND PROCESSING REQUIREMENTS  
(Sheet 2 of 2)

- (  ) Experiment/Facility Preintegration  
 (  ) Experiment/Facility Preparation  
 (  ) Postmission Requirements

**Description of Planned Activities:**

Functional tests, sample loading, and closeout will be performed after the EAC is mounted on the rotation fixture.

Total Floor Space Required Including Space for GSE: 2000 ft<sup>2</sup>

Ceiling Height Required: 10 ft

Overhead Crane Required:  Yes  No Hook Height 8 ft

Facility Power Required  120 V, 1 F, 60 Hz  
 208 V, 3 F, 60 Hz  
 Other 220 V, Single Phase, 60 Hz

Other Facility Support: Gases  GN<sub>2</sub>  GHe  Other  
 Liquids Water

Environment  Standard  Other

Hazardous Operations:  Yes  No

Total Anticipated Use Time: 3 Days

**Other Facility Support Description:**

Mass spectrometer leak test

TABLE 2.9-2. FURNACE MODULE-1 INTEGRATION REQUIREMENTS

**Description of Special Alignment, Calibration, Servicing, or Performance Verification and Estimated Time to Perform:**

TBD

**Identification of Any Constraints on Experiment/Facility Operations During Tests:**

TBD

**Description of Time-Critical Operations and Time Constraints:**

TBD

## 2.10. OPERATIONS SUPPORT

Table 2.10-1 describes the physical and operational support required at the Ground Science Operations Control Center, during flight of the Space Station Furnace Facility (SSFF). Specifically, this facility has been designated as the Payload Operations and Integration Center (POIC) by the Space Station Freedom (SSF) Program.

TABLE 2.10-1. FURNACE MODULE-1 MISSION OPERATIONS SUPPORT

**COMMUNICATIONS REQUIREMENTS:****Downlink Data**

Three terminals

**Uplink Commands/data**

Three terminals

**Voice Communications**

Access for three

**Video**

Real-time and recorded

**SUPPORT EQUIPMENT:****Description****Dimensions****Power Requirements****Data Interface****REMOTE SITE INTERFACE****Location**

Off-line room for three scientists with access to monitor voice, video, and data.

**Describe interfaces**

## 2.11. TRAINING OBJECTIVES

Presently, the training objectives are TO BE SUPPLIED. The following is a detailed generic explanation of the Integrated Requirements on Payloads (IROP) requirements.

Training required for a successful mission begins with the Principal Investigator (PI)/Payload Element Developer (PED) team identifying the training objectives for each task of the experiment. This section shall identify and describe training objectives, trainees, and instructors necessary for experiment operation. This section shall also identify the hardware and software trainers required to support flight-like training.

There are three categories of personnel who will require training to support the mission. Training objectives will be required for each category. These categories are:

- Crew
- POIC cadre
- PI/PED team

Table 2.11-1 identifies the major training objectives, the trainees, and the organizations responsible for developing and conducting required mission payload training. The Furnace Module-1 PED may develop and conduct the training or identify training to be provided by the Core facility PED and/or POIC training function.

The PI/PED team and the Payload Increment Manager (PIM) shall jointly define the training objectives for training at NASA facilities and for integrated training with other mission experiments.

The PIM shall define the increment-independent training objectives for the POIC cadre and will define the increment-independent training objectives for the crew and PI/PED team for training conducted at Marshall Space Flight Center (MSFC).

The PI/PED and PIM shall provide information detailing training objectives for each operational task. The requirements for a trainer and its fidelity shall also be specified. MSFC POIC will develop increment training requirements based on inputs from each payload flown on a specific increment.

### 2.11.1 PI/PED-DEFINED TRAINING

The Furnace Module-1 (FM-1) PI/PED shall define the training objectives necessary for the crew to understand the required science to operate the furnace module to obtain science data. The FM-1 PI/PED shall also define training objectives required for the POIC cadre and the PIM support of experiment operations. The FM-1 PI/PED will specify the training equipment such as flight-like hardware or trainers required to support the training objectives. Table 2.11-2 will identify the equipment to be supplied by the PI/PED and the equipment requested to be furnished by the SSFP.



TABLE 2.11-1. TRAINING PARTICIPATION

Training Objectives	Trainee	Instructor
<b><u>PI/PED defined</u></b>		
Science Background/ Experiment Objectives	Crew Cadre	SSFF PI/PED
FM-1 Systems Familiarization	Crew Cadre	FM-1 PED
FM-1 Operations	Crew Cadre	FM-1 PED
<b><u>PIM and PI/PED Jointly Defined</u></b>		
Experiment Proficiency Training	Crew Cadre*	PI/PED, PTC
Integrated Training	Crew Cadre*	PI/PED, PTC
Simulations	Crew Cadre	PI/PED, PTC
<b><u>PIM Defined</u></b>		
Increment Independent	Crew Cadre	POIC
POIC Facility Training	Cadre	PI/PED, POIC

\* Limited cadre participation

TABLE 2.11-2. FURNACE MODULE-1 TRAINING OBJECTIVES

TRAINING OBJECTIVE		TRANEES	LEVEL	RESPONSIBILITY	SIMULATOR REQUIRED				COMMENTS
					YES/ NO	H/W FIDELITY	S/W Y/N	PROVIDER	
NO.	DESCRIPTION								
1.0	SCIENCE BACKGROUND	Crew, cadre	c/a	FM-1 P/VPED	NO				Classroom Instruction
1.1	FM-1 Science Basis and Significance	Crew, cadre	c/a	FM-1 P/VPED	NO				
1.2	FM-1 Science Objectives	Crew, cadre	c/a	FM-1 P/VPED	NO				
1.3	FM-1 Science Theory	Crew, cadre	c/a	FM-1 P/VPED	NO				
1.4	FM-1 Experiment Operations Philosophy	Crew, cadre	c/a	FM-1 P/VPED	NO				
2.0	FM-1 SYSTEMS FAMILIARIZATION								
2.1	Hardware	Crew, cadre	b/a	FM-1 P/VPED	YES	a	YES	FM-1 P/VPED	
2.1.1	Rack location								
2.1.2	Instrument Components								
2.1.3	Stowage locations								
2.1.4	FM-1 Command & Display								
2.1.5	DMS Interfaces								
2.2	Software	Crew, cadre	b/a	FM-1 P/VPED	YES	a	YES	FM-1 P/VPED	
2.2.1	DMS								
2.2.2	Displays								
2.2.3	Command Capabilities								
2.2.4	Keyboard/MPAC/uplink Timeline requirements								
2.3	Data Collection	Crew, cadre	b/a	FM-1 P/VPED	YES	a	YES	FM-1 P/VPED	
2.3.1	Onboard								
2.3.2	Downlink								

The PI/PED shall supply objectives for training in the following areas. Other areas may also be included.

- Science Background and Experiment Objectives - Basis and significance of experiment, relationship to precursor experiments, specific objectives of experiment.
- Experiment Systems Familiarization (hardware and software) - Hardware and software elements [both on-orbit and ground support equipment (GSE)] that constitute the experiment system.
- Experiment Operations (nominal, malfunction, in-flight maintenance) - Hands-on training using breadboards, simulators, or flight hardware/software.

The knowledge and skill level for each operational task shall be identified. Tables 2.11-3 and 2.11-4 provide a means of coding the level of proficiency to which the student should be trained in order to accomplish the task. The information will also be used in developing course materials and training equipment.

#### 2.11.2 PIM AND PI/PED JOINTLY DEFINED TRAINING

The PIM and the PI/PED team will jointly define the following training objectives:

- Experiment Proficiency Training - Repetitive exercise of specific experiment operations to develop and maintain operational skills at a flight readiness level.
- Integrated Training - Repetitive exercise of selected portions of the integrated timeline conducted within a simulated mission operations environment and with onboard crew operations as its focus.
- Simulations - Exercise of major portions of the integrated timeline conducted at the highest level of fidelity. Includes all payload elements and may include element of the SSF operations. Exercise crew, POIC cadre, PI/PED team, and SSF operations teams in nominal and contingency operations with emphasis on developing specific skills, strategies, and interactions.

Table 2.11-2 shall be completed using inputs provided by the PIM and PI/PED team. This information is normally obtained from the Increment Training Assessment Team (TAT). The TAT is composed of representatives from POIC, PIM, and PI/PED team who gather, review, and assess mission training needs. The TAT reviews mission documentation and obtains experiment operations and interface requirements for the PIs and from design reviews. It reviews available training equipment and assess the need for development of trainers by the PI/PED team or NASA to accomplish training objectives.

Experiment/PTC/POIC operational training interface needs such as data flow, power and thermal requirements, trainer control and display, and experiment GSE shall be identified in this paragraph.

TABLE 2.11-3. KNOWLEDGE LEVELS

CODE	TRAINEE WILL BE ABLE TO:
a	Recall nomenclature, simple facts, or simple procedures involved in the task or operation.
b	Determine step-by-step procedures for sets of tasks or operations or for accomplishing important decisions.
c	Explain why and when each task or operation must be done.
d	Predict, identify, and solve problems related to the task or operation.

TABLE 2.11-4. SKILL PROFICIENCY LEVELS

CODE	TRAINEE WILL BE ABLE TO:
1	Accomplish most task activities only by being told or shown how.
2	Accomplish most of the behaviors in task or activity, but not necessarily to desired levels of speed or accuracy.
3	Accomplish behaviors in a task or activity at minimum acceptable levels of speed or accuracy.
4	Accomplish all behaviors in an activity at highest levels of speed or accuracy and be able to tell or show others how to do the activities.

Note: This is not a design requirement, but an instrument to document training objectives that present an early need for training equipment and interfaces with the training facility.

### 2.11.3 PIM-DEFINED TRAINING

The PIM will define the following training objectives:

- Increment-Independent Training - Includes training on SSF and payload support systems and subsystems that remain relatively constant from increment to increment. Examples are Data Management System (DMS), SSF overview, SSF Caution and Warning System, etc.
- POIC Facility Training - Classroom and hands-on opportunities for training on specific POIC facilities such as Operations Management Information System (OMIS), communications protocols, and generic POIC procedures.

#### 2.11.3.1 Increment-Independent Training - Crew

The increment-independent training for the crew on SSF systems and procedures shall be defined by Johnson Space Center (JSC) in JSC training documents and shall be provided at JSC/Kennedy Space Center (KSC).

Increment-independent training for the crew to support payload operations shall be defined by the PIM and provided at Marshall Space Flight Center (MSFC).

The training objectives, trainee responsibility, and any required training equipment shall be listed in Table 2.11-2.

#### 2.11.3.2 Increment-Independent Training - PI/PED Team

The increment-independent training required for the PI/PED team to support the increment at MSFC is defined in this E/FRD. Trainee responsibility and required training equipment shall be listed in Table 2.11-2.

#### 2.11.3.3 Increment-Independent Training - POIC Cadre

The increment-independent training required for the POIC cadre to support the increment is defined in the MSFC Increment-Independent Training Plan.

### 2.11.4 TRAINING SIMULATION

Experiment trainers will be developed by the PI/PED based upon analysis of training objectives, available training tools, existing trainers, and availability of training opportunities on flight hardware.

The FM-1 PI/PED shall participate in trainer development by identifying training needs in this document. The PI/PED shall provide detailed data inputs to the TAT and Payload Training

Requirement Document (PTRD) and shall participate in Payload Trainer design acceptance reviews.

Training objectives that require a trainer to accomplish the training task shall be listed in this paragraph outlining the overall desired capabilities.

Examples:

Joystick Operation - Capable of interaction with control panel and trainer software.

Scene Generation - Capable of tracking any predefined target.

#### 2.11.5 TRAINING PARTICIPATION

The PI/PED shall participate as instructor or trainee in formal training programs as outlined in Tables 2.11-1, 2.11-2, 2.11-3 and 2.11-4. Schedules and detailed objectives will be developed and maintained in the User Payload Training Plan (UPTP).

## **2.12. ENVIRONMENTAL CONTAMINATION DATA REQUIREMENTS**

Tables 2.12-1, 2.12-2, and 2.12-3 define the environmental contamination requirements for Furnace Module-1.

TABLE 2.12-1. FLIGHT ENVIRONMENTAL LIMITS

	SENSITIVITY LIMIT			EXPERIMENT GENERATED		
	OPERATING		NONOPERATING	OPERATING		NONOPERATING
	MIN	MAX	MIN	MAX	MIN	MAX
<b>CONTAMINATION MODULE ITEMS</b> A. PARTICULATE SIZE ( $\mu\text{m}$ ), number/ $\text{m}^3$ B. TRACE GASES (type & ppm)  PRESSURE ( $\text{N}/\text{m}^2$ )	N/A	N/A	N/A	N/A	0	0
	N/A	N/A	N/A	N/A	0	0
	N/A	N/A	N/A	N/A	-	-



TABLE 2.12-2. EXTERNAL CONTAMINATION SOURCES

Does experiment/facility release (vent, purge) any material overboard on orbit?

Yes  No

PARAMETER	DESCRIPTION
FOs of Occurrence	ALL
Frequency	TBD
Duration	TBD
Composition	Argon, Nitrogen, Air
Phase State (solid, liquid, or gas)	Gas
Quantity or Rate of Release	7 to 37 lbm*

\* Maximum, assumes active pressure control for four samples and one manual sample exchange.

## TABLE 2.12-3. ON-ORBIT EXTERNAL CONTAMINATION CONTROL SENSITIVITY

To understand and satisfy the on-orbit external contamination limits required by this experiment, please answer the following questions:

1. Is the equipment subject to corona?      Yes       No
  
2. Are the experiment data affected by deposition of contaminants on sensitive surfaces?      Yes       No 
  - If yes, then answer the following:
    - Is the concern for deposition from particles, film/molecular, or both?
    - What is the FOV for receiving deposition from return flux?
    - What is the surface temperature of the sensitive element?
    - What are the limits of deposition in terms of experiment effects (e.g., 10% degradation at 1400 Å)?
    - List the FOs where deposition is a concern.
    - Is a controllable cover provided for non-data-collecting periods?
  
3. Is the experiment affected by induced contamination, such as water, CO<sub>2</sub>, etc., in the FOV of the sensor?      Yes       No 
  - If yes, then answer the following:
    - Is the concern for particles, molecular, or both?
    - Briefly explain the allowable effects on the experiment; qualify the limits if possible (e.g., 10% modification of ambient environment composition; or 10% degradation of 1400 Å waveband; or allowable molecules/cm<sup>2</sup> column density).
    - List the FOs where induced contamination is a concern.