SSU-2000e
Synchronization Supply Unit
and the
SDU-2000e Synchronization Distribution Unit

User Guide

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datum

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Contents

Contents

Contents

List of Figures

List of Tables

Contents

In this Chapter ...

Chapter 1 Introduction

This User Guide provides installation, operation, and maintenance procedures for the SSU-2000e Synchronization Supply Unit (SSU-2000e).

The SSU-2000e, shown in Figure 1-1, provides a Stratum 1 network synchronization solution for central office (CO), end office, customer premises equipment (CPE) sites, controlled equipment vaults (CEV) and telecommunications and data communications network operations. The SSU-2000e family of products consists of:

- SSU-2000e Synchronization Supply Unit
- SSU-2000e family of modules
- SDU-2000e Expansion Shelf (up to four units), shown in Figure 1-2
- Various mounting accessories, cabling accessories and other accessories as described in Appendix C, Antennas

Chapter 2, Product Overview, contains additional information on the SSU-2000e.

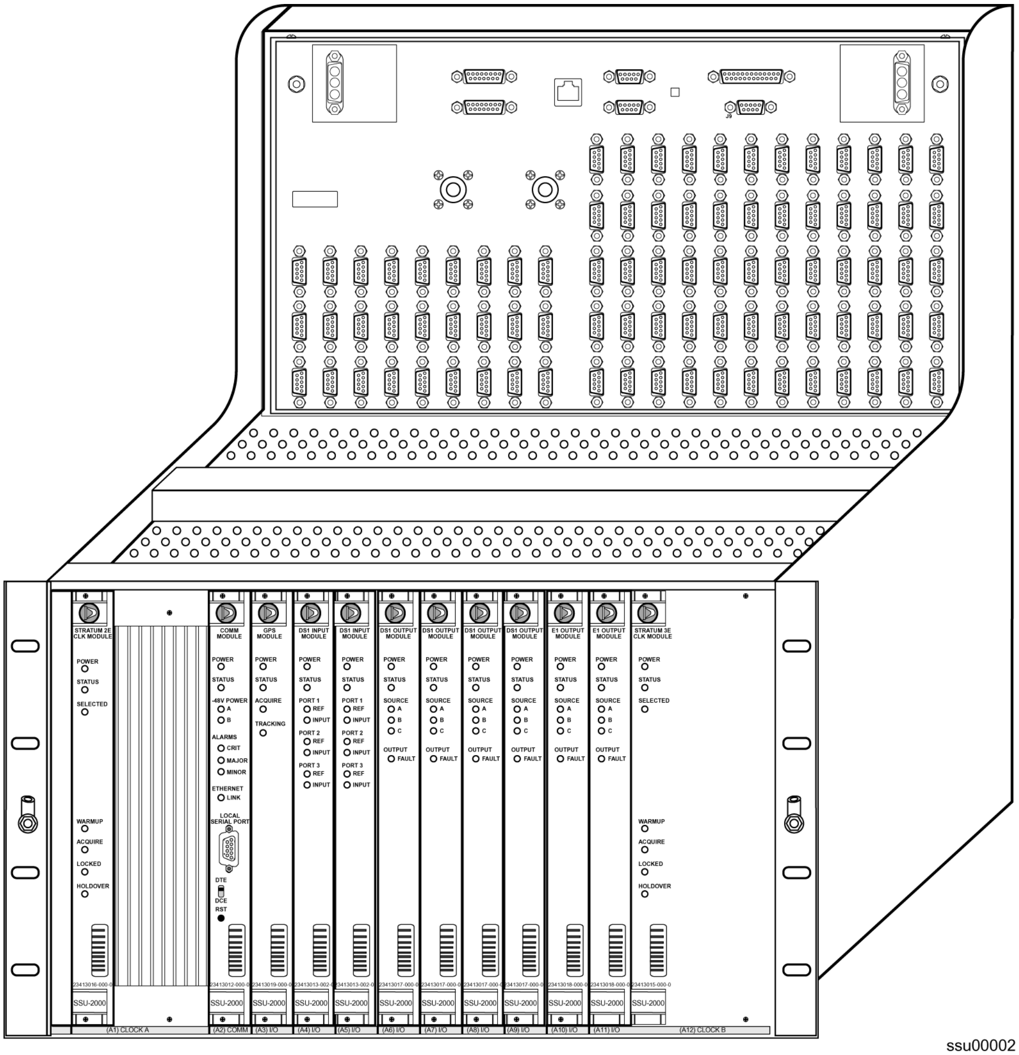


Figure 1-1. SSU-2000e Synchronization Supply System

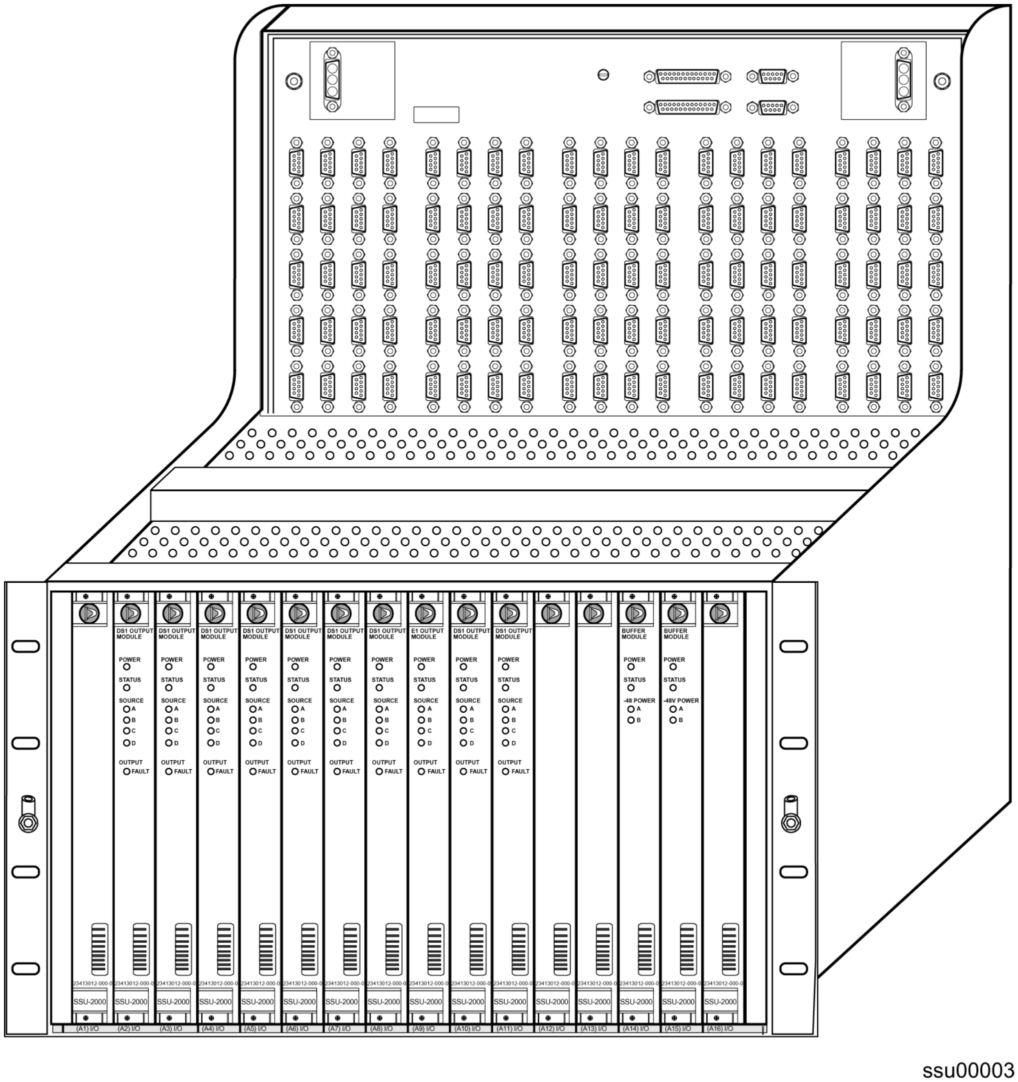


Figure 1-2. SDU-2000e Synchronization Distribution Unit

1.1 What's New in this Manual

Revision B.02 of this *User Guide* contains the following corrections to the B.01 version:

- The warm-up time for the Stratum 2E and Stratum 3 Clock modules is corrected to 20 minutes.
- The Z following the time in certain instances is described as coming from GPS or NTP sources.
- CDMA commands have been deleted.

Revision B.01 of this *User Guide* was not printed.

1.2 Who Should Read This Manual

This *User Guide* is designed for the following categories of users:

- **Systems Engineers –** Chapter 1 provides an introduction to the SSU-2000e, while Chapter 2 provides an overview of the product. Cross references in these sections direct readers to detailed system information in other sections as necessary.
- **Installation Engineers –** Chapter 3 through Chapter 9 and the Appendices provide detailed information and procedures to ensure proper installation, turn-up, operation, configuration, and testing of the SSU-2000e.
- **Maintenance Engineers –** Chapter 7, Chapter 8, and the Appendices provide preventive and corrective maintenance guidelines, as well as procedures for diagnosing and troubleshooting fault indications and alarms.

While Chapter 1 and Chapter 2 are written for non-technical audiences who need information about the SSU-2000e system, others, such as Chapter 3 through Chapter 9 contain detailed information and instructions which are intended to be performed by *qualified personnel only.*

1.3 About This Manual

This guide contains the following sections and appendixes:

- Chapter 1, Introduction – Includes an overview of this manual, the intended audience, the stylistic and typographical conventions used and defines a list of other documents available for the reader.
- Chapter 2, Product Overview – Provides an overview of the SSU-2000e system components, describes the major hardware and software features and provides a listing of system specifications.

- Chapter 3, Installation – Provides unpacking and installation procedures for the SSU-2000e Synchronization Supply Unit and the SDU-2000e Synchronization Distribution Unit.
- Chapter 4, Turn-Up Procedures – Describes the power up procedures required to bring a new system on-line.
- Chapter 5, Operating and Provisioning Procedures – Describes the module LED indicators and provides procedures for connecting to the SSU-2000e for communications. This section also describes how to set up User through Administrator level users, provides procedures for changing software options, and a listing of factory default configuration settings.
- Chapter 6, Commissioning the SSU-2000e – Includes an overview of the checklist-based commissioning tests that should be performed after completing turn up and software configuration to ensure the system is ready for normal operation.
- Chapter 7, Maintenance and Troubleshooting – Provides preventive and corrective maintenance and troubleshooting procedures for the SSU-2000e system.
- Chapter 8, Module Reference Data – Describes the modules in the SSU-2000e family. This section includes LED descriptions, a functional block diagram and a list of specifications for each module.
- Chapter 9, Hardware Configuration Guide – Provides system hardware selection and procurement information for various available SSU-2000e system configurations and optional equipment.
- Appendix A, Alarms and Events – Includes a list and description of the alarms and events that can occur with the SSU-2000e system.
- Appendix B, Communications Protocol – Provides information about the Transaction Language One (TL1), Interactive Command Set (ICS), and Simple Network Management Protocol (SNMP) control languages that are used to communicate with the SSU-2000e software. This section also contains information about Network Time Protocol (NTP) implementation, as well as the available software feature groups.
- Appendix C, Antennas – Lists and describes all antenna configuration options that are available for use with the SSU-2000e system.
- Appendix D, Connector Pinouts – Lists and describes the signal pinouts for the SSU-2000e external connectors.
- Appendix E, Default Settings – Lists and describes the factory defaults for the various modules associated with the SSU-2000e system.
- Appendix F, Regulatory Requirements – This section provides information about safety and EMC standards and requirements for the SSU-2000e.
- Appendix G, Specifications – Provides specifications for the SSU-2000e unit and for its functional components, such as: operating conditions, power inputs, clock inputs and outputs, indicators, and chassis dimensions.

- Appendix H, Reference Materials – Lists associated reference materials in the following categories:
  - American National Standards Institute (ANSI) Documents
  - Generic Requirements
  - Technical Advisories and Framework Technical Advisories
  - Technical References
  - EIA/TIA Documents
  - Other Reference Documents
- Glossary – Includes a list of acronyms and abbreviations, and a definition of terms found in this manual.

1.4 Typographical and Other Conventions

This manual uses the following conventions:

- **Acronyms and Abbreviations** – Terms are spelled out the first time they appear in text. Thereafter, only the acronym or abbreviation is used. In addition, the glossary defines the acronyms and abbreviations.
- **Revision Control** – The title page lists the printing date and versions of the product this guide describes.

Table 1-1. Typographical Conventions

When Text Appears This Way …	It Means …
SSU-2000e User Guide	The title of a document.
CRITICAL PORT-A J1	An operating mode, alarm state, status, or chassis label.
Press the **Enter** key. Press the **Print Scrn** key.	A named keyboard key. The key name is shown as it appears on the keyboard. An explanation of the key's acronym or function immediately follows the first reference to the key, if required.
`SSU-2000` `Username:`	Text in a source file or a system prompt or other text that appears on a screen.
`ENGINE TDATA` **`STATUS`**	A command you enter at a system prompt or text you enter in response to a program prompt. You must enter commands for case-sensitive operating systems exactly as shown.
A *re-timing* application …	A term or a word being emphasized.
Datum ***does not*** recommend …	A word or term given special emphasis so that you do not miss the idea being presented.

1.5 Warnings, Cautions, Recommendations, and Notes

Warnings, Cautions, Recommendations, and Notes are paragraphs that attract attention to essential or critical information in this guide. The types of information included in each are explained below:

WARNING ...

All warnings have this symbol. *Do not* disregard warnings. They are installation, operation or maintenance procedures, practices, or statements, which if not strictly observed, may result in personal injury or loss of life.

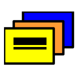
ELECTRICAL SHOCK HAZARD ...

All electrical shock hazard warnings have this symbol. To avoid serious personal injury or death, *do not* disregard electrical shock hazard warnings. They are installation, operation, or maintenance procedures, practices, or statements that if not strictly observed, may result in personal injury or loss of life.

CAUTION ...

All cautions have this form and symbol. *Do not* disregard cautions. They are installation, operation, or maintenance procedures, practices, conditions, or statements, which if not strictly observed, may result in damage to, or destruction of, equipment or may cause a long-term health hazard.

All Electrostatic Discharge (ESD) cautions have this symbol. They are installation, operation, or maintenance procedures, practices, conditions, or statements that if not strictly observed, may result in electrostatic discharge damage to, or destruction of, static sensitive components of the equipment.



RECOMMENDATION ...

All recommendations have this form and symbol. Recommendations indicate manufacturer-tested methods or known functionality. They contain installation, operation, or maintenance procedures, practices, conditions, or statements, which provide you important information for optimum performance results.

NOTE …

All notes have this form and symbol. Notes contain installation, operation, or maintenance procedures, practices, conditions, or statements, that alert you to important information which may make your task easier or increase your understanding.

1.6 Related Documents

See your Datum representative or sales office for a complete list of available documentation.

NOTE …

Datum offers a number of applicable training courses designed to enhance product usability. Contact your Datum representative or sales office for a complete list of courses and outlines.

SynCraft – This Datum application provides monitoring and configuration functionality in a Microsoft Windows graphical user interface.

NOTE …

Contact your Datum Sales Representative for more information on the *SynCraft Graphical User Interface*, P/N 14113245-000-0.

1.7 Where to Find Answers to Product and Document Questions

For additional information about the products described in this manual, please contact your Datum representative or sales office. You may also complete and return the *Reader Comment Form* located in the back of this manual.

We appreciate your suggestions of ways to improve any part of this manual. Please make your suggestions on a copy of the affected page and include it with the comment form.

IN THIS CHAPTER ...

Chapter 2 Product Overview

The SSU-2000e Synchronization Supply Unit (SSU-2000e), shown in Figure 1-1, is a Synchronization Status Messaging (SSM)-compliant Timing Signal Generator (TSG), or Synchronization Supply Unit (SSU) that provides network synchronization signals for the telephone and telecommunications industry. The SSU-2000e features an integral front-access input/output (I/O) adapter panel for ease of access, connections, and maintenance.

The SSU-2000e conforms to specifications for International, European and North American applications as a Primary Reference Source (PRS), Synchronization Supply Unit and Timing Signal Generator. The SSU-2000e allows for the integration of a variety of synchronization reference schemes including GPS and land line DS1/E1. As a slave clock, the SSU-2000e meets or exceeds performance requirements outlined in Telcordia Technologies (formerly Bellcore) ITU-T G.812 Stratum 2 and ETSI Type II Transit Node Clocks.

The SSU-2000e is designed to comply with the application flexibility and redundancy concepts introduced in Telcordia Technologies GR-2830. A selection of hot-pluggable modules and powerful software allow users to easily reconfigure, upgrade, or expand the SSU-2000e to meet a variety of telecommunications synchronization application requirements. The SSU-2000e fully supports Synchronization Status Messaging as defined by ITU, ETSI, and ANSI requirements in accordance with Telcordia Technologies.

The SSU-2000e is fully user-configurable and can be managed through the use of a software interface. Modules can be inserted into or removed from the SSU-2000e while the system is operational without any degradation of output signals. Each module supports the local and remote management of critical, major and minor alarms. Output modules and Clock modules can be configured in redundant pairs, further increasing system availability.

The SSU-2000e has extensive event detection, reporting, alarming and storage capabilities that permit monitoring of the system from external sites. Events are defined as changes in conditions within the unit, or at the interfaces of the unit, which may indicate abnormal operation or a change in the unit's operational status. For example, an event may be a parameter which exceeds a settable threshold. Most events can be assigned by the user to one of the following modes: IGNORE, REPORT, MINOR, MAJOR, or CRITICAL.

2.1 Typical System Configurations

The modular design of the SSU-2000e permits a great deal of flexibility in configuring the system components for a variety of applications. Three of the more common configurations include:

- Time Signal Generator (TSG) configuration
- Primary Reference Source (PRS) configuration
- Monitor only configuration

2.1.1 Timing Signal Generator (TSG) Configuration

The Timing Signal Generator (TSG) configuration shown in Figure 2-1 allows for input of external references, to which the Clock modules are phase and frequency locked. This configuration allows for monitoring of several inputs, and for synchronization of output signals.

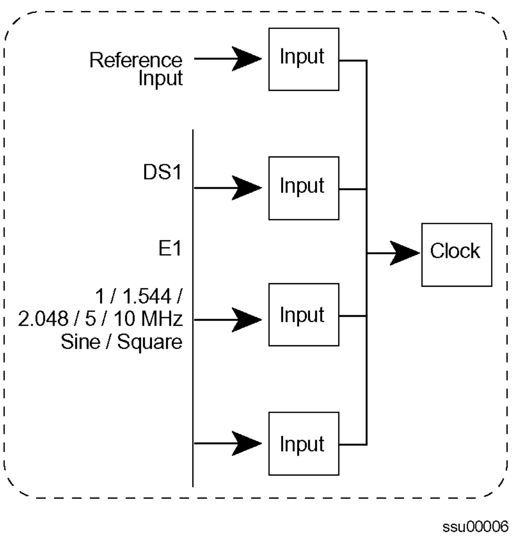


Figure 2-1. SSU-2000e in TSG Configuration

2.1.2 Primary Reference Source (PRS) Configuration

In a Primary Reference Source (PRS) configuration Figure 2-2, the SSU-2000e meets the specifications defined for ETSI Type II Transit Node Clocks in American National Standards Institute (ANSI) T1.101-1999. ANSI defines a Primary Reference Source as “equipment that provides a timing signal whose long term accuracy is maintained at $1x10^{-11}$ or better, with verification to Universal Coordinated Time (UTC), and whose timing signal may be used as the basis of reference for the control of other clocks within a network”. If standard Input modules are installed in the remaining input slots, this configuration also allows for monitoring of up to 24 external signals, such as DS1, E1, Composite Clock, various clock frequencies, etc. Time-of-day functionality is available via an Ethernet port employing NTP.

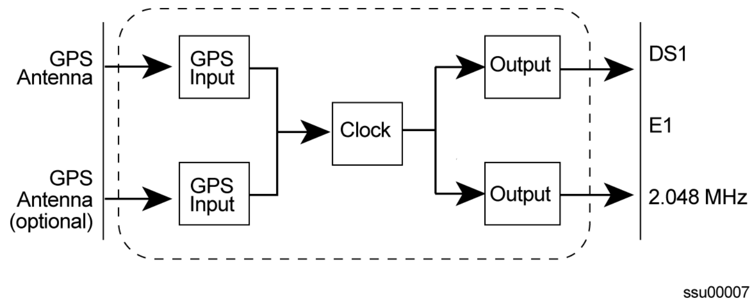


Figure 2-2. SSU-2000e Configured as a Primary Reference Source

2.1.3 SSU-2000e Configured as a Monitor Only System

The SSU-2000e can also be configured as a monitor only system (Figure 2-3) in which one of the inputs is designated as the reference, and a Clock module is locked directly to this signal. The remaining input signals are then compared to the phase-locked oscillators (and indirectly to the designated input reference).

The SSU-2000e continuously monitors incoming timing signal integrity. The operator defines input acceptance criteria and sets parameters for alarming. If a reference signal is acceptable (within the performance limits set by the operator), the SSU-2000e phase locks to the signal on a priority basis.

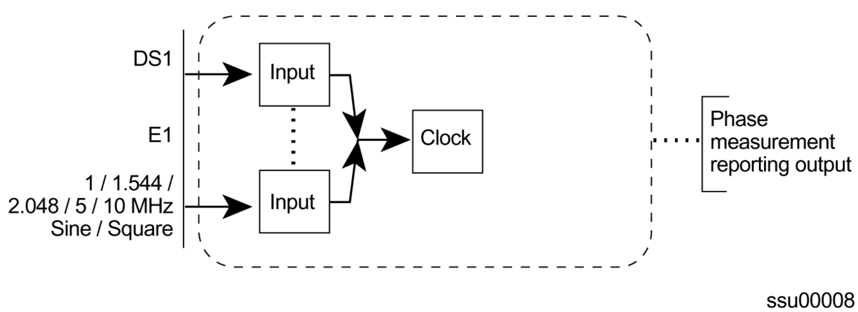


Figure 2-3. SSU-2000e Configured as a Monitor Only System

2.2 System Architecture

The SSU-2000e system is a Timing Signal Generator that controls, monitors, generates, and distributes network synchronization signals. The I/O signals can be DS1, E1, Composite Clock (CC), sinusoids, or square waves. The SSU-2000e continuously monitors incoming timing signal integrity. The operator defines input acceptance criteria and sets parameters for alarming. If a reference signal is acceptable (within the performance limits set by an operator), the SSU-2000e frequency-locks to the signal on a priority basis. System holdover and filtering performance is dependent on the quality of oscillators used in the SSU-2000e's internal Clock modules (Stratum 2E or Stratum 3E).

A variety of hot-plugable modules and system software allow users to easily configure, upgrade, or expand the SSU-2000e system to meet a variety of telecommunications synchronization application requirements. Modules can be inserted or removed from the SSU-2000e while the system is operational without degradation of output signals. Each module supports the management of critical, major, and minor alarms. Output modules and Clock modules can be configured in redundant pairs for increased reliability.

A simplified system block diagram for the SSU-2000e is shown in Figure 2-4.

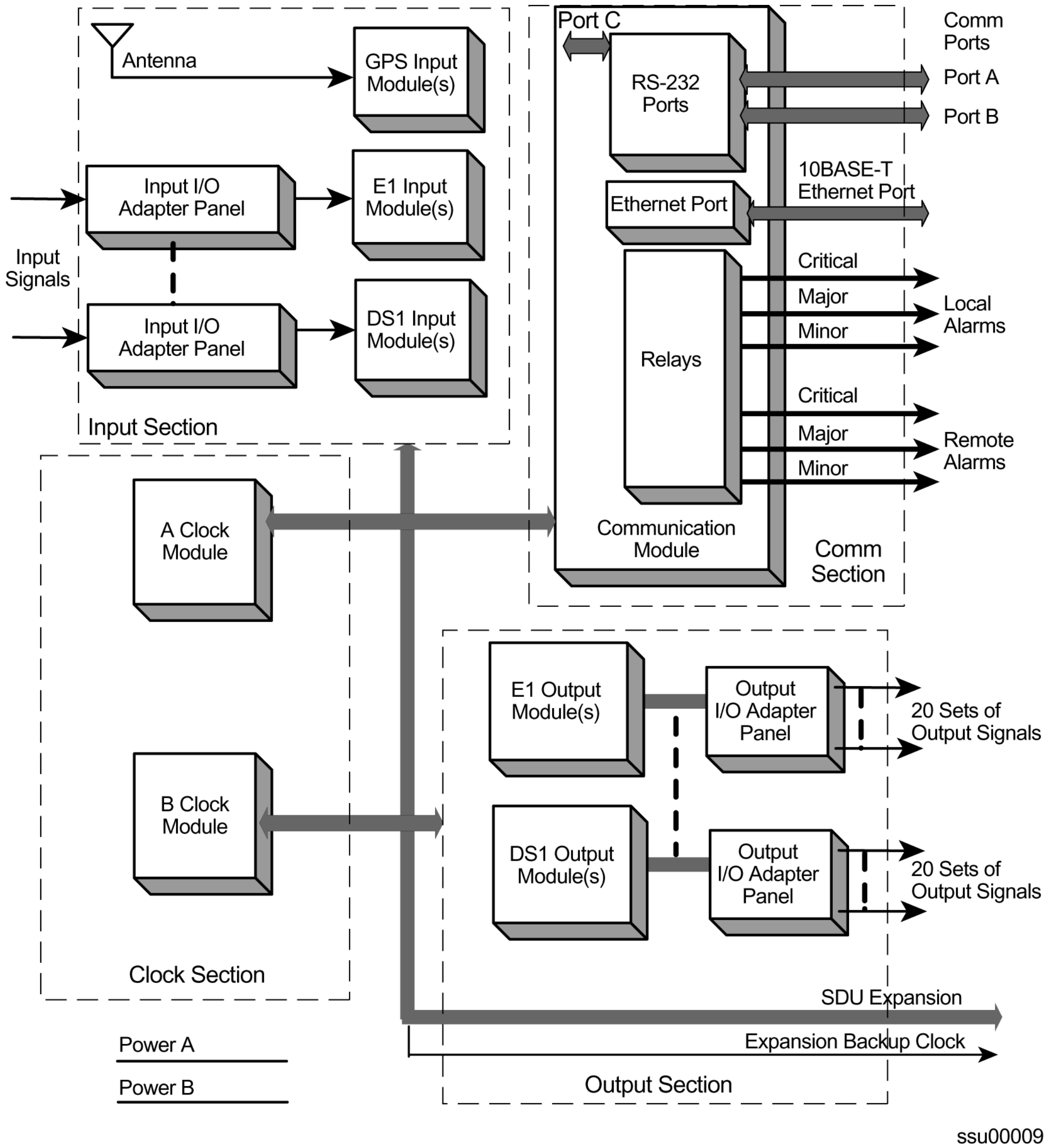


Figure 2-4. SSU-2000e System Block Diagram

As indicated in Figure 2-4, the SSU-2000e consists of four major sections:

- Input section
- Clock section
- Output section
- Communications section

2.2.1 Input Section

The input section consists of one or more (maximum of 3) Input modules that are connected to reference signals and are tested for signal integrity. The Input modules make phase measurements between the input signal and the clock oscillator(s). From these phase measurements the Input modules compute frequency offset and wander of the input signals. Wander is reported in terms of Maximum Time Interval Error (MTIE) and Time Deviation (TDEV). The data is then stored for use in the SSU-2000e and reported through the Communications module. One or two of the Input modules may be GPS modules that use the satellite-based Global Positioning System signals as a synchronization reference. The input signal types supported are:

- DS1/Clock (unframed)
- E1/Clock (unframed)
- GPS

Input Reference Selection and Reference Switching

The ICS command **REF** is used to determine what type of reference input selection and reference switching is used. The **mode** is based on either the *Priority settings* or on the *PQL values* (refer to the **REF** command in Section B.3, Interactive Command Set. After the reference switching mode has been selected, the Input module reads and processes the Priority level and PQL value to determine the traceability of inputs. This traceability information is then used by the Clock modules in selecting a reference signal and for embedding the SSM into the system's outputs. If *Priority mode* is selected, then the unit will select an input reference first based on the user defined priority settings on each input, then on the PQL (quality level, SSM) values for equal priorities. If *PQL mode* is selected, then the inputs reference selection is first based on the PQL levels that are assigned or read (SSM's) at the inputs, then based on the priority levels as assigned to the inputs. In either case, error codes such as Loss of Signal (LOS), Out of Frame (OOF), MTIE, TDEV, and Phase performance data collected at the inputs are used to disqualify inputs (prevent input selection) based on user defined thresholds.

If the Input module is configured for provisioned mode, it will report the provisioned SSM. If configured for automatic mode, the Input module uses the most recent valid SSM. If a valid SSM is not received, the module uses the provisioned SSM.

Also included in the **REF** command are options for AutoReturn, AutoSwitch, or OFF. When set to OFF, only manual switching is allowed, and failure of the selected input changes operation of the clocks to holdover mode. When set to AutoSwitch, reference selection is automatic on failure of the selected input, and AutoReturn allows automatic switching with automatic return to the highest priority or PQL input.

2.2.2 Output Section

The output section is implemented with one or more Output modules (up to 6, in the main chassis and up to 46 outputs in a fully expanded system with four SDU-2000e expansion chassis). Each Output module type provides 20 independent or 10 paired output synchronization signals. Output modules are available to support the following formats:

- DS1, SF (D4) and ESF
- E1
- 2048 kHz
- Composite Clock (CC) (64/8 kHz)
- Other typical clock frequencies

2.2.3 Clock Section

The clock section consists of one or two Clock modules that provide the internal reference signals for generating TSG output timing signals. The primary Clock module (Clock A) is configured as the master clock and is normally a higher stratum level than the back-up clock (Clock B). If a problem occurs in Clock A, the control is automatically passed to the backup Clock module (Clock B). The frequency of each clock is locked to a valid reference input signal (one that is free from input faults while meeting acceptable frequency and MTIE specifications).

The SSU-2000e controls clock frequency by adjusting the control value of the Direct Digital Synthesis (DDS) function in each Clock module. The adjustments are processor-controlled and based on measurements performed and computed in the Input module(s). Internal Clock modules may be Stratum 2E and Stratum 3E. Outputs can be maintained by the active input reference signal if both clocks should ever fail or be removed from the system.

2.2.4 Communications Section

The Communications section (Communications module) consists of hardware and software that allows the user to configure, monitor, and control the SSU-2000e system and generate local and remote alarms when fault conditions are detected. The SSU-2000e can continue to function seamlessly without the Communications module (Clock modules assume the system controller function), but all communications and alarm reporting functions would be interrupted.

The master controller function for the SSU-2000e can reside in either the Communications module or in either of the Clock modules. The priority of the selection of the module that will provide the master controller function rests with the Communications module, Clock A, and Clock B, in that order. In the event of removal of the module designated as the master controller, that function automatically and seamlessly switches to the next module in priority order.

The Communications module communicates with the other modules in the SSU-2000e to read configuration data, set operational parameters, and determine what type of modules are installed. When a module is replaced, the controller loads the correct operational parameters into the replacement module.

The Communications module is installed in slot A2 and provides an interface between the user and the SSU-2000e system. This interface allows the user to display and control much of the activity in the SSU-2000e system and within the optional SDU-2000e expansion system. The Communications module supports three serial ports and one Ethernet port, and allows communication over each of them independently in one of several possible modes (ICS, TL1, SNMP, or packet).

The software in the Communications module allows for on-site reprogramming of the flash ROM and all programmable logic devices. The software on all other module types installed in the SSU-2000e system can be updated by downloading it through the Communications module.

When the Communications module is installed, it performs an initial software verification test. If the module is being installed in the SSU-2000e with power already applied and with other modules installed, the Communications module reads the configuration of the modules in the SSU-2000e and the modules in all installed SDU-2000e expansion shelves. This information is saved in nonvolatile memory on the Communications module. If power is applied to the SSU-2000e after the Communications module is installed, it initializes before any of the other modules and provides configuration information to the individual modules.

Note …

The Clock modules also store configuration information and can download this information to the various modules if the Communications module is not installed in the system.

2.2.4.1 Alarms and Events

The SSU-2000e has extensive event detection, reporting, and alarm generation and storage capabilities that permit monitoring of the system from external sites.

Alarms are conditions within the unit or at the interfaces of the unit which may indicate abnormal operation or a change in the unit's operational status. For example, an alarm may be a parameter which exceeds a settable threshold. Most alarms can be assigned by the user to one of the following modes: IGNORE, REPORT, MINOR, MAJOR, or CRITICAL.

All Alarms detected in the SSU-2000e system are reported by three methods including:

- Display on the module LEDs
- Indicated by relay contact closures on the back of the SSU-2000e chassis
- Transmitted on all communications ports

All Alarm indications clear when the condition(s) that caused them no longer exist. In a case where a module in alarm is unplugged from the system, the **CONFIG xAY REMOVE** command must be issued to clear the module's active alarms. In addition, normal operating status is indicated by green LEDs on the modules.

Events are conditions within the unit, or at the interfaces of the unit, which may indicate abnormal operation or a change in the unit's operational status. Recurring events may be escalated to alarm status and may require action by the user. Conversely, alarms may be de-escalated and corrected automatically.

Although every alarm is considered to be an event, not every event is an alarm. For example, a *login* is recorded as an event but is not considered to be an alarm. In this case, no action is required by the user.

2.2.4.2 Ignore Mode

IGNORE means that appropriate information on the event is transmitted on all of the communications ports when the event occurs, and on demand, but no alarm is generated. For example, the status of the SSM at each input port and at the output ports is reported when it changes and when the user sends an inquiry but no alarm is generated.

2.2.4.3 Report Mode

The REPORT mode option is used to report alarm indications only.

An ALARM command is available in the SSU-2000e firmware that allows a user to view the current status of alarm indications on the unit and set alarm delay intervals and activation levels. Only active alarm indications are displayed unless an option is specified.

The DELAY option sets the length of time in seconds an alarm must be active before generating a hardware indication. This option also allows user to set the level of any alarms:

IGNORE – ignore any alarm indication

REPORT – report only alarm indications

MINOR – sets alarm level to MINOR

MAJOR – sets alarm level to MAJOR

CRITICAL – sets alarm level to CRITICAL

See Appendix B, Communications Protocol, for information on the **DELAY** option.

2.2.4.4 Alarm Mode

ALARM is set by the user to one of three levels of alarm severity, including MINOR, MAJOR and CRITICAL. In general, events which are classified as ALARMS are those for which user or Craft intervention is required.

MINOR and MAJOR alarms have the capability of elevation to the next higher level after a user settable time period. The unit should is capable of generating reports to include: local oscillator being switched, log in/out, restart, board removed/inserted, events cleared, PLL loop control, user image clear /set, phase samples, frequency control, and a keep-alive output every five minutes. See Appendix B, Communications Protocol, for information on commands.

Alarms and all events are reported over the communication ports and contain details of the event in a single message including the time of the event. All ALARM indications clear when the conditions that caused them, no longer exist. In addition, normal operating status is indicated by green LEDs on the front panel of modules.

2.2.4.5 Fail Mode (Critical)

In the FAIL mode, the SSU-2000e removes the failed module from service or usability to prevent interruption of the system. For example, a FAIL event detected in Clock A would cause a switchover from Clock A to Clock B, effectively removing Clock A from the system. The FAIL event is reported on all communications ports and an alarm is generated.

2.3 System Components

The fully expanded SSU-2000e system contains the following physical components:

- SSU Main Chassis populated with various combinations of Clock, Input, Output and Communications modules
- Up to four SDU-2000e Expansion shelves containing buffer and Output modules

Note …

For additional information about each of the module types, see Chapter 8, Module Reference Data. Also see Chapter 9, Hardware Configuration Guide for component part numbers and guidelines for configuring a new system.

2.3.1 SSU-2000e Main Shelf (Chassis)

The SSU-2000e main shelf (shown in Figure 2-5) contains a metal chassis and a motherboard with provisions for supporting up to 12 hot-plugable modules. Filler panels are available for use in chassis that are not fully populated.

2.3.1.1 Module Assignments

All SSU-2000e modules are equipped with card ejectors and plug in from the front of the chassis. Each module is secured in the chassis with captive fasteners. The module assignments for the SSU-2000e main chassis are listed in Table 2-1 and shown in Figure 2-5.

Table 2-1. Module Slot Locations

Slot	Module
A1	Clock Module A
A2	Communications Module
A3-A5	Input Module
A6-A11	Output Module
A12	Clock Module B

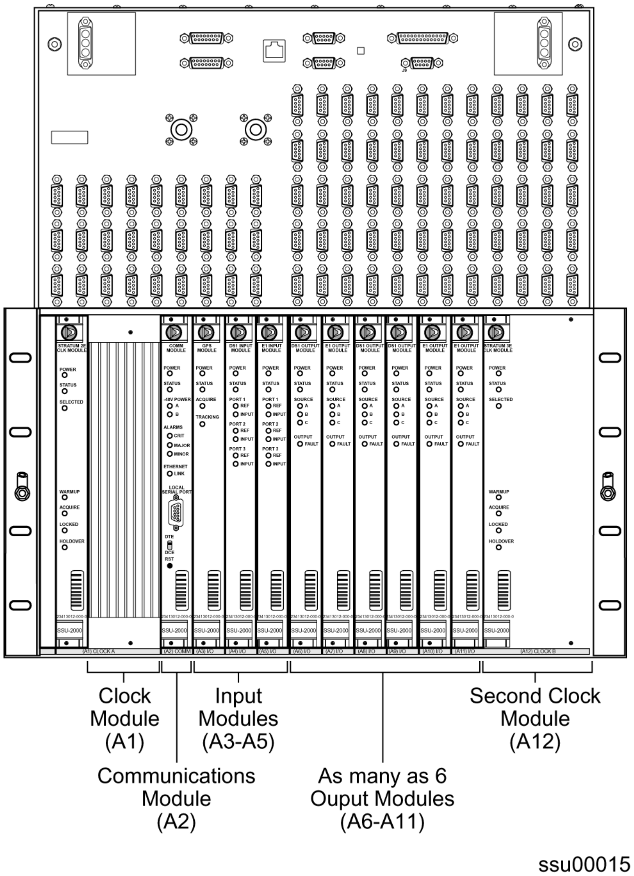


Figure 2-5. SSU-2000e Module Chassis Slot Assignments

As indicated in Figure 2-5, the SSU-2000e modules are assigned slots A1 through A12, numbered left to right as viewed from the front of the chassis. The first or left-most slot, A1, is assigned to the primary Clock module (Clock A). Slot A2 is assigned to the Communications module and slots A3 through A11 are assigned to various combinations of Input modules and Output modules. Slot A12 is reserved for the B Clock module.

2.3.1.2 Main Shelf Connections

All connections to and from the SSU-2000e are made on the upper front panel of the SSU-2000e main shelf, as shown in Figure 2-6.

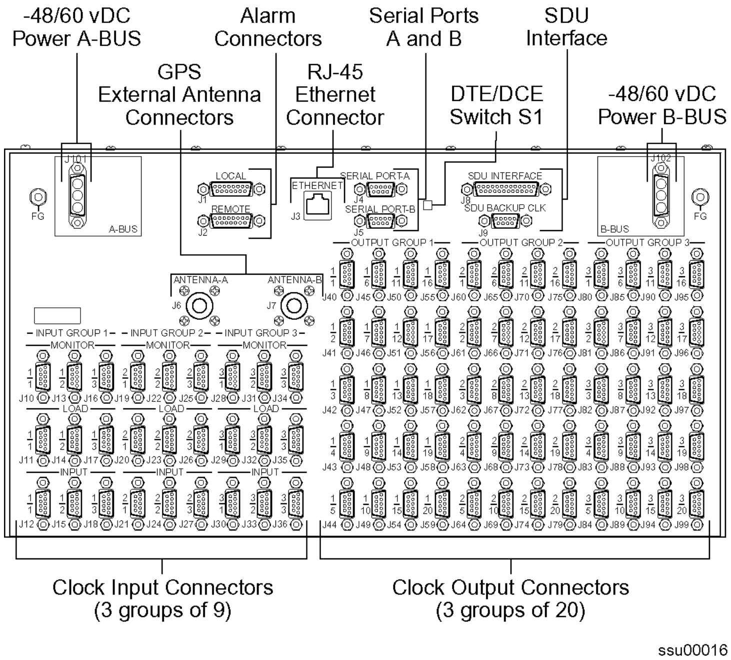


Figure 2-6. SSU-2000e Upper Front Panel Connections

The SSU-2000e main shelf contains the following connection features:

- **Three groups of Clock input connectors** – each group of nine Clock input connectors (9-pin, Micro-D female) is associated with a specific Input module slot.
- **Three groups of 20 output connectors** – each group of 20 outputs connect through internal summing circuits to two Output modules. In the event of the failure of one module, the second module continues supplying output signals. The first module can be electrically disconnected from the output circuitry with relays activated by the software.
- **Dual set of power terminals and dual set of grounding lugs** – used to connect external power and grounding to the SSU-2000e system.
- **Three communication ports** – two serial port connections, Serial Port-A and Serial Port-B, and one RJ-45 ethernet connector (10baseT). Another serial communication port, Serial Port-C, is available on the front of the Communications module.
- **DTE/DCE switch** – this 2PDT slide switch (S1) allows the user to select either data terminal equipment (DTE – default, connection to PC) or data communication equipment (DCE – connection to modem) type of serial port interface for SERIAL PORT-A and SERIAL PORT-B. The right position is labeled *A* and the left position is labeled *B*.
- **Local and remote alarm connectors** – each 15-pin Micro-D female connector is electrically connected to the relays on the Communications module.
- **Two antenna connectors** – used to attach radio receiver antennas.

- **SDU-2000e optional interface connector** – up to four expansion shelf can be connected in daisy-chain fashion to an SSU-2000e. A termination plug must be installed on this connector if not using the output signal expansion shelf system.
- **SDU Backup Clock (D-Clock) connector** – supplies a backup clock to any attached expansion shelf.

Clock Input Connectors

The upper half of the SSU-2000e contains three groups of nine Clock input connectors, as shown in Figure 2-7. Each group of nine connectors includes three monitor connectors, three load connectors and three input connectors. Connections for Input Group 1 are made in connectors J10 through J18. Connections for Input Group 2 are made in connectors J19 through J27, and the connections for Input Group 3 are made in connectors J28 through J36.

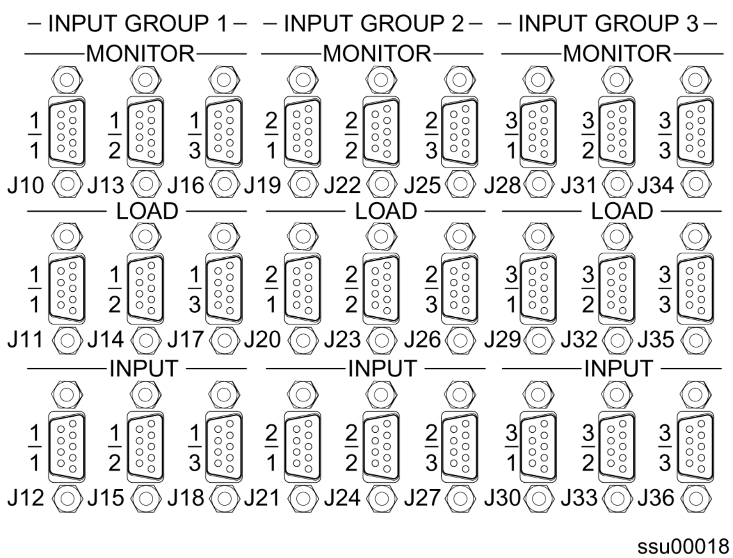


Figure 2-7. Clock Input Connector Groups

The three input groups map directly to the Input modules installed in slots A3 through A5 as listed in Table 2-2.

Table 2-2. Clock Input Connector to Input Module Relationship

Slot Label (Name)	Plug-in Module Slot	Module Input Port	Connector Reference Description		
			Monitor	Load	Input
INPUT-1	A3	1	J10	J11	J12
		2	J13	J14	J15
		3	J16	J17	J16

Table 2-2. Clock Input Connector to Input Module Relationship (Continued)

Slot Label (Name)	Plug-in Module Slot	Module Input Port	Connector Reference Description		
			Monitor	Load	Input
INPUT-2	A4	1	J19	J20	J21
		2	J22	J23	J24
		3	J25	J26	J27
INPUT-3	A5	1	J28	J29	J30
		2	J31	J32	J33
		3	J34	J35	J36

The Load and Input connectors are cross-wired as four wire, east-west connections. The Input connectors are used to connect the clock reference inputs to the associated input ports on the installed Input modules. Termination plugs are available to install in the load connectors if the reference signal is to be terminated.

The Monitor connectors are connected as 20 dB monitors to each attached clock reference input signal, as shown in Figure 2-8.

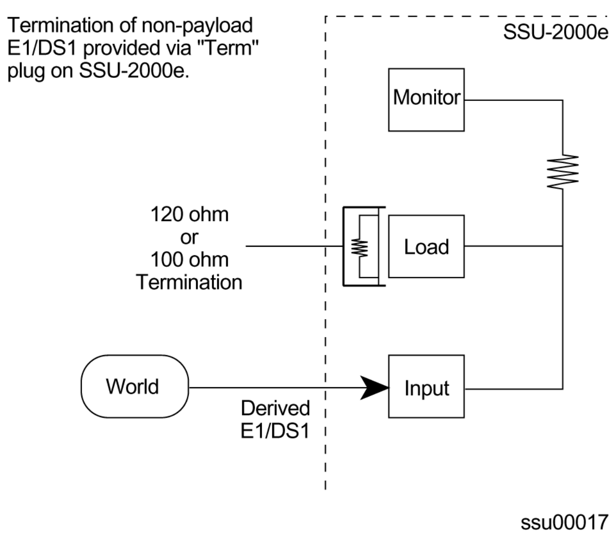


Figure 2-8. SSU-2000e Input Connector Scheme

Output Clock Connectors

The SSU-2000e connector panel contains three groups of 20 summed output clock connectors. The groups are labeled OUTPUT GROUP 1 that are installed in A6 and A7, OUTPUT GROUP 2 that are installed in A8 and A9, and OUTPUT GROUP 3 that are installed in A10 and A11. See Table 2-3 for additional information.

The signal outputs from each pair of Output modules are summed internal to the unit and all outputs are connected to the output connectors through software-controlled relays in the Output modules. If one of a redundant pair of Clock modules fails, the software can electrically disconnect the faulty module without interrupting the clock outputs.

Table 2-3. Clock Output Connector to Output Module Relationship

Slot Label (Name)	Plug-in Module Slot	Group	Output Connector (Module Port) Reference Description
OUTPUT-1	A6	1	J40 (1) through J59 (20)
OUTPUT-2	A7		
OUTPUT-3	A8	2	J60 (1) through J79 (20)
OUTPUT-4	A9		
OUTPUT-5	A10	3	J80 (1) through J99 (20)
OUTPUT-6	A11		

Alarm Closure Contacts

The SSU-2000e shelf has two filtered DA15P male connectors that are electrically tied to the alarm relay contacts on the Communications module. One connector (labeled J1) is designated the local alarm connector and the second connector (labeled J2) is the remote alarm connector.

Each connector provides connections for normally open (NO), common or wiper (COM) and normally closed (NC) for each of the following alarm categories:

- **CRITICAL** – Indicates an immediate, service-affecting condition that requires immediate user intervention, such as loss of the Communications module, loss of input power to the shelf, and so forth.

  When a critical alarm condition is detected, the CRITICAL ALARM relay is activated (the alarm condition) and the CRITICAL ALARM indicator (LED) on the front of the Communications module turns red unless both power inputs are interrupted. In this case the unit is not running.

- **MAJOR** – Indicates a condition that may require immediate user intervention.

  When a major alarm condition is detected, the major alarm relay at the back of the SSU-2000e is activated and the MAJOR ALARM indicator (LED) on the front of the Communications module turns red.

- **MINOR** – Indicates the unit performance may be degrading.

  The minor alarm relay is activated and the MINOR ALARM indicator (LED) turns on.

Table 2-4 lists the local and remote alarm connector pin assignments.

Table 2-4. Local and Remote Alarm Connector Pin Assignments

Signal	Pin
MINOR – Normally Open Contact	7
MINOR – Wiper Contact	15
MINOR – Normally Closed Contact	8
MAJOR – Normally Open Contact	4
MAJOR – Wiper Contact	12
MAJOR – Normally Closed Contact	5
CRITICAL – Normally Open Contact	1
CRITICAL – Wiper Contact	9
CRITICAL – Normally Closed Contact	2
Frame Ground	10
Frame Ground	11
Frame Ground	13
Not Used	3
Not Used	6

NOTE …

In an alarm condition or loss of DC power, the contact between the NO and COM closes and the contact between the NC and COM opens.

Main Shelf Power Connections

The main shelf accepts redundant –48/60 vDC power inputs from external supplies and makes these inputs available to the modules through the motherboard connectors.

There is no power ON/OFF switch on the SSU-2000e because power to the shelf is controlled by external power supplies.

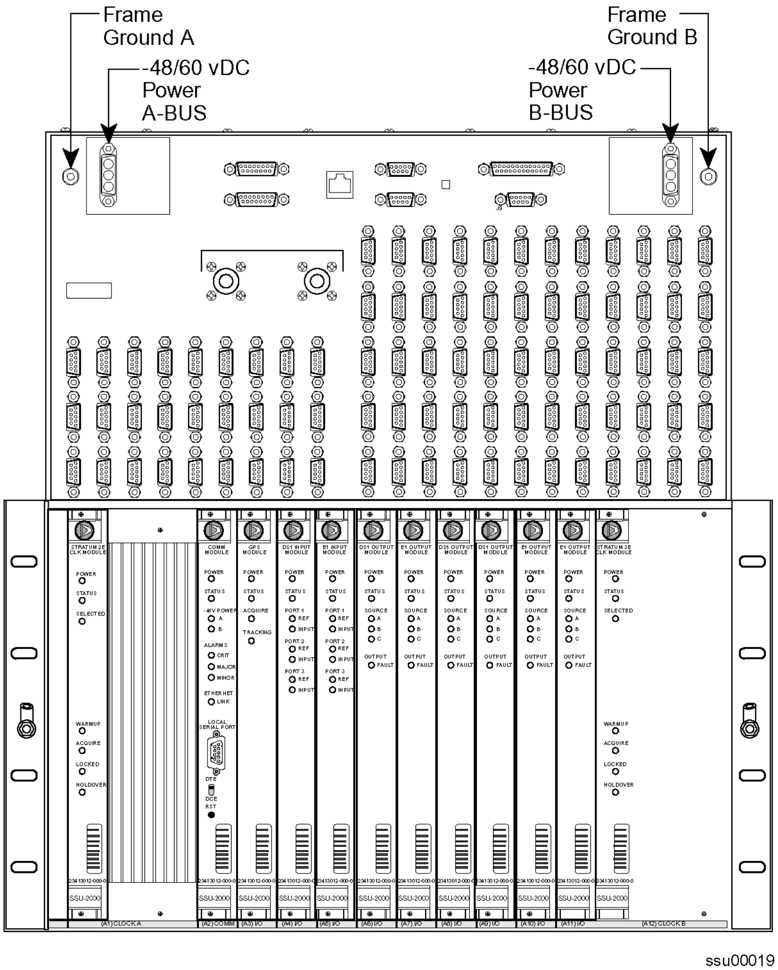


Figure 2-9. SSU-2000e Power Connections

All power supplies for the SSU-2000e are implemented on the individual modules which increases system availability by eliminating a single point of failure in the power supply area. On each plug-in module, diodes combine the two power sources and provide protection from reversal of the power connections on the shelf (+ and – reversed).

The SSU-2000e operates in an integrated ground environment. Two frame ground connections are provided at opposite corners of the front panel on M5 studs. One banana jack receptacle is provided on each rack mounting ear.

Antenna Connectors

The SSU-2000e contains two N-type connectors labeled ANTENNA A (J6) and ANTENNA B (J7) to connect two external radio antennas used with the optional GPS Input modules. These two connectors are wired into I/O slots A3 and A5, respectively. A variety of GPS antennas are available as accessories for the SSU-2000e as described in Appendix C, Antennas.

Main Shelf Communications Ports

The SSU-2000e main shelf contains four communication ports including:

- Two EIA-232 communication ports (Port A, J4 and Port B, J5) on the upper front panel
- One shielded RJ-45 ethernet connector J3 (10baseT) on the upper front panel for network connection
- One EIA-232 port on the face of the Communications module (Local Port)

The user interface provides various levels of password-protected access for configuration and detailed performance monitoring and diagnostics. Use either the ASCII interactive command set or the TL1 user interface to configure and view detailed performance monitoring, see Appendix B, Communications Protocol. The operator assigns an interface type to the remote EIA-232 ports, either interactive or TL1. When assigned, this information is retained in NVRAM.

Port C on the Communications module is always in Interactive mode when the module restarts.

Serial Port Pinouts

Figure 2-10 shows the EIA-232 connector pin assignments for serial ports, A, B, and L.

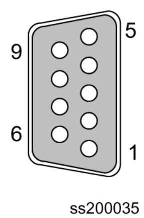


Figure 2-10. Serial Port Connector Pins

Table 2-5 describes the EIA-232 connector pin assignments for serial ports, A, B, and C.

Table 2-5. Serial Port Connector Pin Assignments

Signal	Pin
DCD (Data Carrier Detect) Control Line	1
RXD (Received Data)	2
TXD (Transmitted Data)	3
DTR (Data Terminal Ready Control Line)	4
Ground	5
DSR (Data Set Ready Control Line)	6

Table 2-5. Serial Port Connector Pin Assignments (Continued)

Signal	Pin
RTS (Request to Send Control Line	7
CTS (Clear to Send Control Line)	8
RI (Ring Indicator Control Line)	9

NOTE …

The DCE setting allows direct connection of the unit to a standard PC communications port using a 1:1 cable. The DTE setting requires a null modem cable. If connecting to a modem, use DTE.

Ethernet Connector Pinouts

The ethernet (10baseT) pinouts are provided in Table 2-6.

Table 2-6. Ethernet Connector Pinouts

Signal Name	Pins
TX+ (Positive Side of Transmitted Data)	1
TX- (Negative Side of Transmitted Data)	2
RX+ (Positive Side of Received Data)	3
RX- (Negative Side of Received Data)	6
Not Used	4,5,7,8

2.4 Communications Protocol

This section summarizes the methods of controlling the SSU-2000e and the available software features, depending upon the system functionality required.

2.4.1 Software Interface

There are three methods of controlling the SSU-2000e. The three control interfaces available are:

- **TL1** – The Transaction Language One (TL1) control language, perhaps the dominant telecommunications industry ASCII command line interface, provides a standard man machine language.

- **ICS** – The Interactive Command Set (ICS) control language provides a more readable ASCII command line interface than TL1 with an instructional help facility.
- **SNMP** – The Simple Network Management Protocol (SNMP) protocol is based on a client server query-response mode.

2.4.2 Software Versions

There are four different versions of software available for the SSU-2000e, see Table 2-7. The functionality and commands that are available vary from one version of software version to the next, depending on the specific features of the software package, see Appendix B, Communications Protocol, for more information.

Table 2-7. Communications Module Software Versions

Part Number	Version	TL1	ICS	NTP	SNMP
14113012-000-0	Basic System Load	X	X		
14113012-001-0	Basic w/NTP Support	X	X	X	
14113012-002-0	Basic w/SNMP Support	X	X		X
14113012-003-0	Basic w/SNMP & NTP Support	X	X	X	X

2.4.3 Basic System Load

The basic system load includes all TL1 and ICS support software.

- TL1 provides command sets to support all operation, administration, maintenance, and provisioning tasks required to maintain and control an SSU-2000e system. These tasks include configuring and provisioning security, monitoring system performance, configuring hardware, locating and handling faults, and performing equipment diagnosis and testing. Refer to Section B.2, TL1 Command Interface, for more information.
- ICS also provides command sets to support all operation, administration, maintenance, and provisioning tasks required to maintain and control an SSU-2000e system from a terminal connected to one of the SSU-2000e RS-232 serial ports. ICS commands are designed in a more readable interface for users with an instructional help facility. Refer to Section B.3, Interactive Command Set, for more information.

2.4.4 Adding NTP Support

The Network Time Protocol (NTP) is used to synchronize the time of a computer client or server to another server or reference time source, such as a GPS receiver or local timing source.

The SSU-2000 implements the NTP v.3 (RFC 1305) version. It can run as a server application and a client application. In addition, a broadcast mode may be implemented as either a server or client. The NTP server always runs and the client and broadcast modes are enabled independently by assignment of addresses and setting of timers. Refer to Section B.4, NTP Support, for more information.

2.4.5 Adding SNMP

The Simple Network Management Protocol (SNMP) protocol is based on a client-server query-response mode. A manager is the client generating the queries, while an agent is the server generating the responses.

The SSU-2000e SNMP is an SNMP V2 agent that requires Ethernet connectivity. If SNMP is present, port 161 becomes the port of standard SNMP interactive communications, while port 162 becomes the trap port. Since the SSU-2000e SNMP supports all exiting functions, full system control of the SSU-2000e is maintained through SNMP.

The SSU-2000e implements an SNMP agent. A Management Information Base (MIB) Browser or the SNMP Manager is used to access, retrieve, and query information defined by the MIB.

All reports, queries, autonomous messages, control, provisioning, and administration (except for communication port parameters, Set User ID/Password, Set IP assignments, Reset connection, and SNMP community settings) are available through SNMP. Refer to Section B.5, SNMP Protocol, for more information.

2.4.6 Graphical User Interface

SynCraft – This is a software interface program that is available to provide monitoring and configuration functionality in a Microsoft Windows graphical user interface. Contact your Datum Sales Representative for more information on the *SynCraft Graphical User Interface*, P/N 14113245-000-0.

For more information on control interfaces and the software commands available for each, see Appendix B, Communications Protocol.

2.5 Operation Overview

After initial installation and configuration is completed, the SSU-2000e is capable of unattended operation. After power-up, where the external power supplies are turned on so that they supply power to the main shelf, the SSU-2000e performs a self-diagnostic test routine and properly initializes the hardware. Any active Alarms are time tagged and reported as Events. All Events are time tagged and the last 500 Events are stored in NVRAM. All Events can be cleared by the user with the appropriate access level. Several optional levels of password protection are available for system protection as described in Chapter 4, Turn-Up Procedures, of this guide.

After the internal oscillators on any installed Clock modules have warmed up, the SSU-2000e enters the ACQUIRE mode to phase lock the oscillators to the external references. After the SSU-2000e reaches the LOCKED mode on at least one of the Clock modules, any change of state is reported as an Event.

2.6 Indicators and Control

All modules installed in the SSU-2000e main shelf and the SDU-2000e expansion shelf contain status indicator lamps for displaying status. The LED indicators for each module are described in Chapter 8, Module Reference Data. In addition, the Communications module collects status information from all installed modules, sets the alarm relays, and sends communications status alerting users of any Events that exceed alarm thresholds.

The user controls these operating limits and collects measurement data through the use of a peripheral device connected to one of three EIA-232 ports, or through the optional Ethernet connector on the front of the unit.

2.7 SDU-2000e Expansion Shelf

The SDU-2000e Synchronization Distribution Unit (Figure 1-2) is an expansion chassis that attaches to an SSU-2000e Synchronization Supply Unit and is used to generate additional output signals. The expansion chassis uses the framing and synchronization features of the SSU-2000e main chassis to drive an array of Output modules. Communication with the expansion chassis is performed through one of the three serial ports, or through the ethernet port on the main chassis front panel.

Each expansion shelf in the system can support an additional 10 summed pair Output modules, 2048 kHz, Composite Clock (CC) or framed 2048 kbit/s (E1) or DS1 Output modules in any combination. Each pair of Output modules produce 20 redundant or protected outputs. Each expansion chassis can provide 100 summed (1:1 protected) output signals. Up to four expansion chassis can be daisy chained together to produce 400 summed output signals for large scale system applications.

All output signals generated by the Output modules in each expansion shelf conform to specifications for International, European and North American applications as a primary reference source (PRS) and slave clock (SSU/TSG). The SSU-2000e which drives the SDU-2000e expansion chassis allows the integration of a variety of synchronization reference schemes including GPS and land line 2048 kbit/s (E1)/DS1 network sources.

The expansion chassis is designed to be compatible with international environmental, safety and electromagnetic compliant (EMC) standards for -48/60 vDC powered telecommunication transmission equipment installed in telecommunication centers with inside telecom signal connections. The farthest expansion chassis may be located up to 61 meters from the SSU-2000e main shelf.

Figure 2-11 shows a simplified functional block diagram of the SDU-2000e expansion chassis.

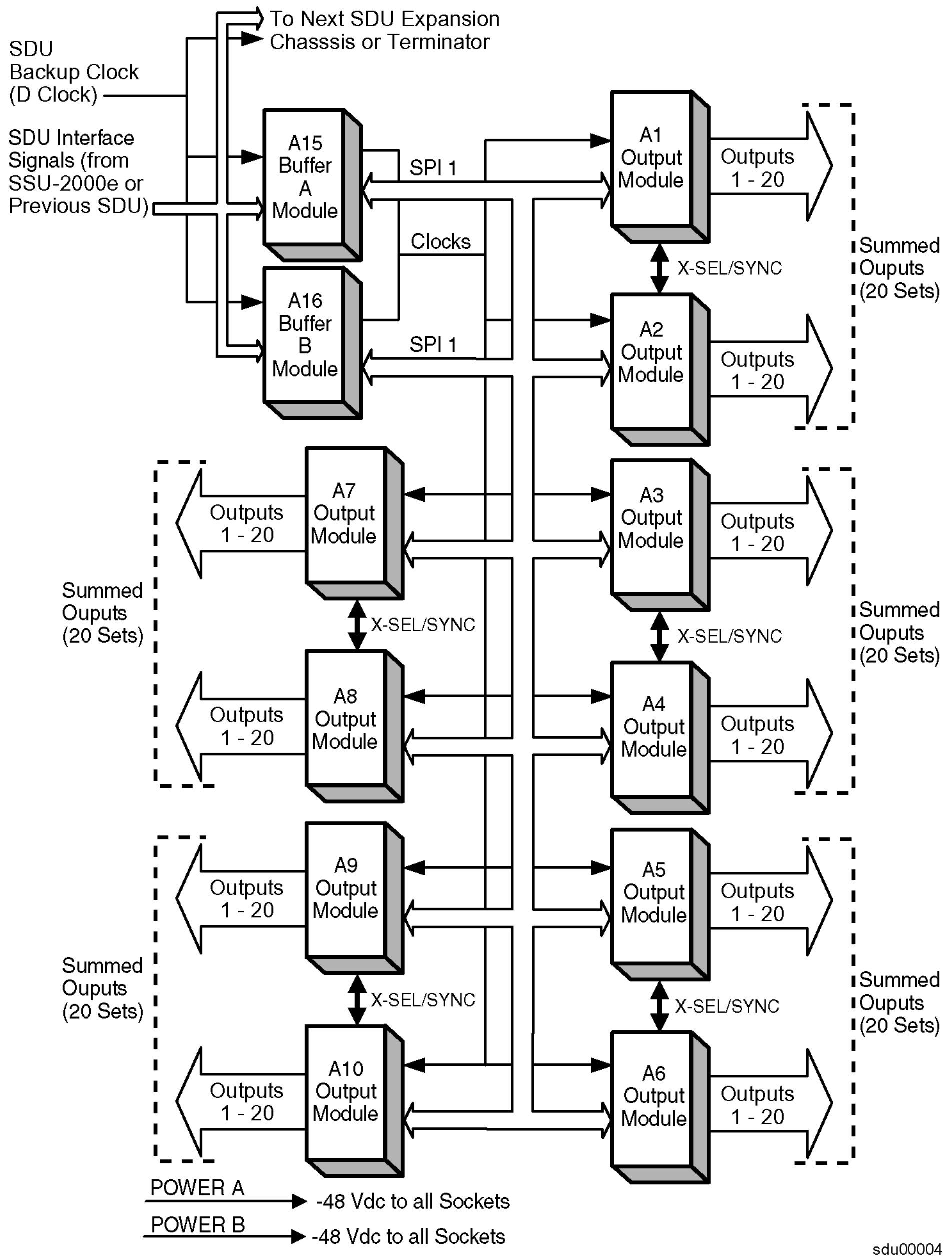


Figure 2-11. SDU-2000e Block Diagram

2.7.1 Functional Overview

The SDU-2000e interfaces with the SSU-2000e main shelf in two-way communications through the SSU/SDU interface cables and receives synchronization clocks that are buffered and used to produce the differential output signals at the connector panel, as shown in the functional block diagram in Figure 2-11. A second interface cable supplies the SDU-2000e chassis with a backup clock (D Clock) which can sustain the expansion shelf even if the main cable is accidently disconnected. An address switch on the connector panel of the expansion shelf identifies each additional shelf to the main shelf for status and firmware downloading purposes.

Each expansion shelf extends the expansion bus and D clock to the next chassis in the daisy chain. The last expansion shelf uses a set of termination plugs on the Expansion Bus Connector and the Backup-Clock Connector.

Each expansion shelf can support any combination of up to ten 2048 kHz, Composite Clock (CC), or framed 2048 kbit/s (E1) or DS1 modules, each capable of generating 20 output signals for distribution to large networks. Each Output module generates a phase-locked signal of 1.544 Mbps (DS1) or 2048 kbit/s (E1) using one of three 4 KHz clocks supplied by the clock oscillators in the SSU-2000e main shelf. The phase locked clock signal is buffered and summed with a companion Output module in redundant pairs to generate a set of 20 independent output clock signals for distribution to large networks.

Output modules are available to support the following formats:

- 2048 Kbit/s (E1)
- DS1, SF (D4) and ESF
- 2048 kHz
- Composite Clock (64/8 kHz)

2.7.2 Expansion Shelf Features

The SDU-2000e expansion shelf consists of the following major components and is shown in Figure 2-12.

- Expansion chassis
- One or two Buffer Modules; where two provide a more robust system
- Up to 10 Output modules, which can be a combination of Output module types
- Connector panel with five groups of output connectors, SDU interface connector group, dual power connectors, dual frame ground connectors, and a shelf address switch

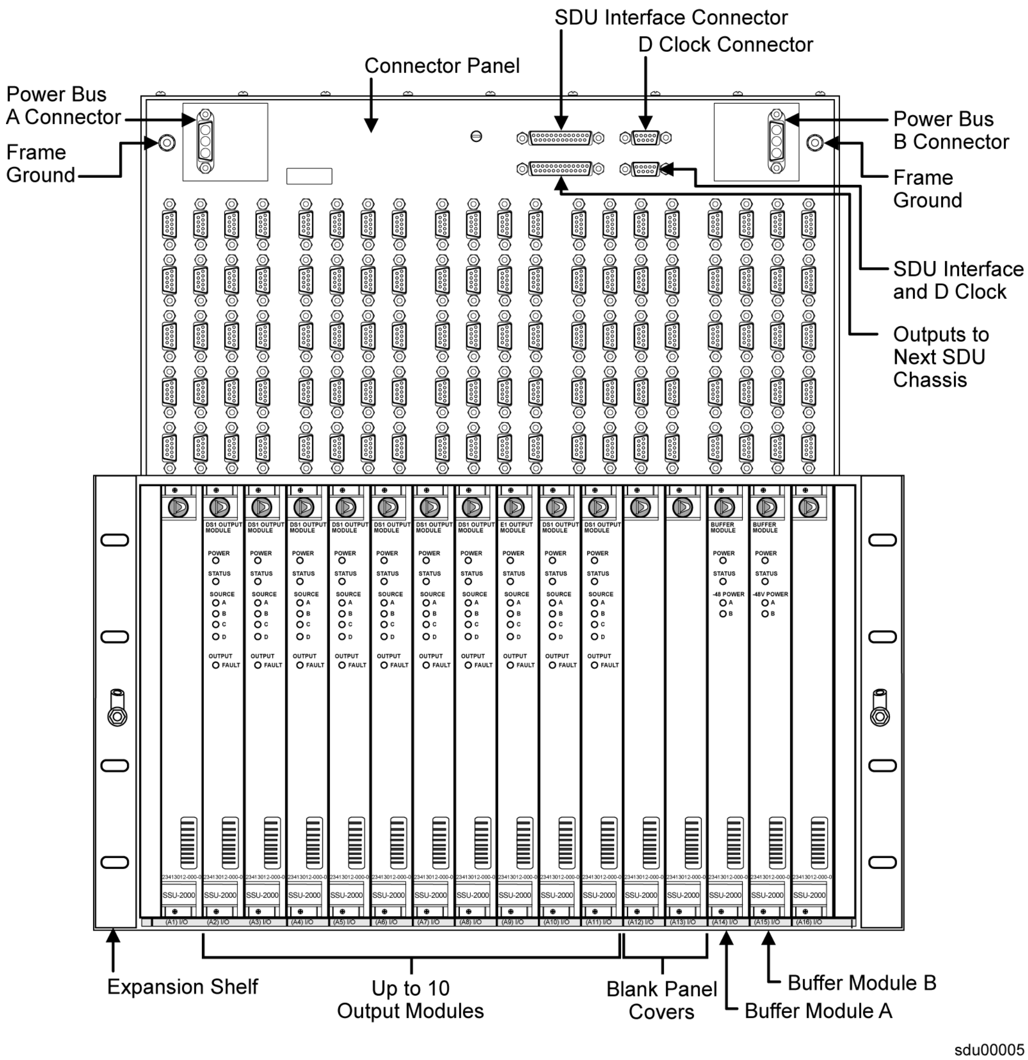


Figure 2-12. SDU-2000e Expansion Chassis Components

2.7.2.1 Clock Source

The clock inputs for the first SDU-2000e expansion chassis in an SSU-2000e system are supplied by the A and B Clock modules in the main chassis. A multi-pin connector on the front panel of the SSU-2000e (labeled J8 EXPANSION) provides the reference signals from the main shelf Clock modules for use by the SDU-2000e expansion shelves.

2.7.2.2 SDU Backup Clock

For redundancy, a backup clock, labeled SDU BACKUP CLK, is supplied to each expansion chassis to allow each expansion chassis to continue operating if the main expansion bus (cable) is accidently disconnected or dislodged.

The SDU Backup Clock terminals, labeled J104 and J106, are 9 Pin D-type female connectors that are connected in parallel. Connector J104 is used to connect to a source unit, such as the SSU-2000e or to connector J106 on another expansion shelf. Connector J106 drives an additional SDU-2000e shelf, or it is terminated using an SDU backup clock terminator.

When installing an expansion chassis, move the clock terminator from J9 on the SSU-2000e, or connector J106 from a previous SDU-2000e expansion chassis, and install the terminator on J106 of the last expansion chassis in the daisy chain, see Figure 2-13.

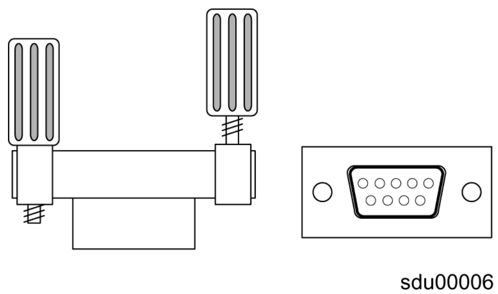


Figure 2-13. Backup Clock Terminator, Side and Front Views

2.7.3 Expansion Shelf Addressing

Each SDU-2000e expansion chassis must be correctly configured for its position in the daisy chain. The main shelf's address is one. The SDU shelf address selector is numbered from two to five. Set the first expansion shelf address to two. Set the address on additional shelves sequentially from three to five.

Table 2-8. Shelf Addressing

Shelf	Address
Main Shelf	1
Expansion Shelf 1	2
Expansion Shelf 2	3
Expansion Shelf 3	4
Expansion Shelf 4	5

2.7.4 Buffered Clocks

The signals that are provided by the main shelf Clock modules to the buffer modules in the expansion shelf are isolated versions of the signals used by the Output modules in the main chassis. This prevents the expansion shelf and its cabling from affecting the outputs of the main shelf.

2.7.5 SDU Module Features

The SDU-2000e expansion chassis family of modules include the E1 Output module, DS1 Output module, 2048 kHz Output module, Composite Clock module, and Buffer modules. The SDU-2000e expansion chassis may have up to 12 modules installed.

- One or two Buffer modules, assigned to chassis slots A15 and A16
- One to ten Output modules; a mixture of Output module types, where each group of two modules must be identical

The last two module slots in the expansion shelf, labeled A15 and A16, contain the Buffer modules that buffer the corresponding Clock and Communications modules in the main unit. The buffered signals from these modules are distributed through the motherboard to 10 Output modules.

Other common module features include:

- Any module can be inserted or removed while power is applied without affecting the operation of other modules in the system
- All modules are individually fused to protect the system in case of a short circuit on any one module
- The SSU-2000e and the SDU-2000e share common Output modules
- All modules have front panel LED status indicators
- All modules are equipped with ejector tabs for ease of installation and removal
- All modules are secured in place with captive screws to provide module security and reduce the occurrence of unauthorized removal
- All modules, except the Buffer module, have an integrated CPU with firmware and are software configurable through the SSU-2000e, see Section 9.1, Configuring a Conventional SSU/TSG System, for additional information
- Each module slot has two associated hybrid DIN connectors on the chassis backplane. The hybrid contacts of these connectors are used for Power, Logic Ground, and Frame Ground connections
- Each module slot has three pins connected together on each Hybrid DIN connector that allows the system firmware to detect module removal and insertion. This capability provides plug-and-play capability.

2.7.6 Connector Panel Features

The expansion chassis provides front-accessible connections for external power, grounding, clock inputs, and output connections. All modules plug in from the front of the chassis. Figure 2-14 shows the SDU-2000e connection features.

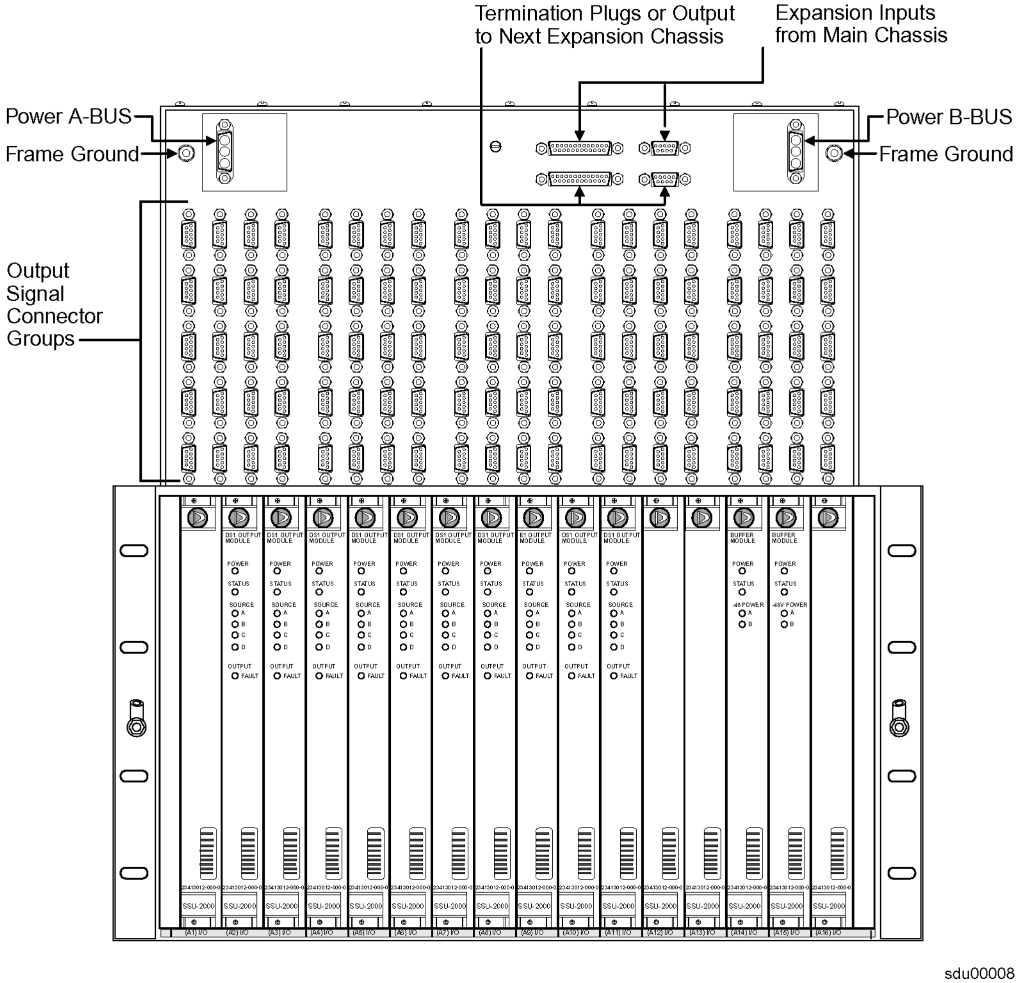


Figure 2-14. SDU-2000e Connection Features

2.7.6.1 Power Input and Grounding

The SDU-2000e expansion chassis has redundant –48/60 vDC power input connections, labeled A-BUS and B-BUS (J101 and J102). Both the A-BUS and B-BUS are fed to the individual module slots through the chassis backplane.

2.7.6.2 Expansion Connectors

Up to four SDU-2000e expansion shelves can be attached to the SSU-2000e main shelf. The two terminators (SSU Expansion Terminator and SDU Backup Clock Terminator) must be moved from the SSU-2000e chassis (connectors J8 and J9) to connectors J105 and J106, respectively, on the last expansion chassis in the daisy chain. A simplified expansion cabling diagram is shown in Figure 2-15.

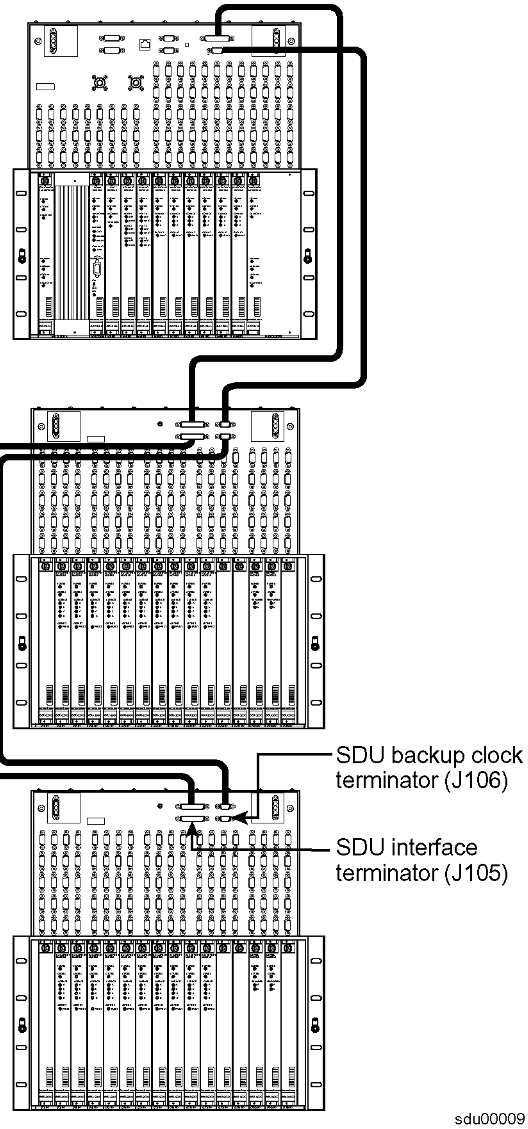


Figure 2-15. Expansion Chassis Cabling

2.7.6.3 Output Module Redundancy Configurations

For each A/B pair of Output modules, the outputs of module B are connected to the corresponding outputs of module A. This provides for 1:1 output protection (1:1 redundancy).

2.7.7 Controls and Indicators

All modules installed in the SDU-2000e expansion shelf contain LED status indicators for displaying status. Any faults from the installed modules are sent to the SSU-2000e Communications module through the buffer modules; the appropriate alarm relays are set and communication status is sent to alert users of any events that exceed specified alarm thresholds.

Table 2-9 lists the system-level specifications for the SDU-2000e.

Table 2-9. SDU-2000e System Specifications

Specification	Description
System Specifications	
Architecture	▪ 2 Buffer modules and 10 mixed Output modules ▪ Expansion drive for up to three additional expansion chassis ▪ Maximum of four expansion shelves per system ▪ Maximum of 61 meters between the SSU-2000e and the farthest expansion chassis
Output Section	
Port	▪ 20 Ports per Output module pair
Distribution Capacity	▪ 100 summed outputs per chassis
Signal Type	▪ DS1 ▪ 2048 Kbit/s (E1) ▪ 1 MHz, 1.544 MHz, 2.048 MHz (G703/Sec. 13) ▪ 5 MHz ▪ Composite Clock (CC)
Expansion Chassis Mechanical	
Height	500 mm
Depth	229 mm
Width	530 mm with mounting ears for ETSI racks/cabinet
Environmental	
Operating Temperature Range	0°C to 50°C
Storage Temperature	20°C to 75°C
Relative Humidity	80% Non-condensing over specified temperature range
Altitude	60 m below sea level to 4000 m above sea level
Power	
Input Power	▪ Redundant Inputs: 38 to 72 vDC, 3.0 A (maximum) + 0.1 A per Distribution Module ▪ Either positive or negative ground
Grounds	–48/60 V return DC Isolated from frame and logic grounds. Integrated frame and logic ground.
Power Connections	A-BUS and B-BUS (–48/60 vDC) Input power connectors (J101 and J102) on opposite sides of the connector panel.

IN THIS CHAPTER ...

Chapter 3 Installation

This chapter provides guidelines and procedures for installing the SSU-2000e Synchronization Supply Unit, which are divided into the following sections.

- Section 3.1, Unpacking and Inspection provides instruction and precautions required for unpacking and inspecting the system. Section 3.2, Preliminary Procedures includes a pre-installation checklist and considerations while installing the system.
- Section 3.3, Installing the SSU-2000e, and Section 3.4, Installing SSU-2000e Modules provides instruction for a complete system installation.
- Section 3.8, Installation Checklist finishes the system installation procedure.

3.1 Unpacking and Inspection

The SSU-2000e is packaged to protect it from normal shock, vibration, and handling damage. To avoid damaging the unprotected unit, caution is advised during unpacking and installation.

CAUTION ...

To avoid damage to unprotected components, use proper static control precautionary measures when handling the modules. Protect the equipment against electrostatic discharge (ESD) by using a protective wrist-strap attached to ground and normal equipment grounding.

To unpack and inspect the SSU-2000e, perform the following steps.

1. Unpack all equipment carefully and check it against the purchase order.

2. Inspect the equipment for shipping damage, including bent or loose hardware, broken connectors, or other visible defects. Notify Datum and the carrier who delivered the equipment if you suspect damage occurred during transit.

RECOMMENDATION …

Keep all packaging materials in the event the system or components must be returned or shipped to another location.

3.2 Preliminary Procedures

Make sure that the following preparations are in place before installation.

- Ensure that standard installation tools and materials are available, see Section 3.2.1, Installation Tools and Materials. If any items are missing, contact Datum Customer Service at (512) 721-4032 or (866) 638-7962 (866 NET-SYNC) during our normal business hours (8 a.m. to 5 p.m. CST), or (512) 721-4000 after hours and on weekends.

- Ensure that the system location does not cause electromagnetic interference with other equipment in the area, see Section 3.2.2, Electromagnetic Interference Considerations.

- Ensure that adequate ventilation space is available in rack or equipment cabinet to safely operate the system, see Section 3.2.3, Ventilation Considerations.

- Ensure that the mounting rack or equipment cabinet is properly grounded and has power available, see Section 3.3.2, Making Ground Connections.

WARNING...

Before beginning the SSU-2000e installation, be sure to remove the A-BUS and B-BUS fuses from the rear of the unit. The unit is not equipped with a power on/off switch and both fuses must be removed to ensure the system is not accidentally powered up.

CAUTION...

To avoid electrostatic discharge (ESD) damage to equipment, follow the ESD precautions as listed in this guide.

RECOMMENDATION...

Follow all applicable local building codes when installing the SSU-2000e.

3.2.1 Installation Tools and Materials

The following required standard tools and materials are required, but not supplied for installing the SSU-2000e system.

- Standard tool kit
- Cable ties or acceptable cable clamps
- 1.31 mm^2 (minimum) wire for –48V, RTN, and frame ground
- 0.326 mm^2 shielded twisted pair wire-wrap cable (Amp #640433-7 or equivalent)
- Screws, flat washers, and locking washers for mounting the equipment rack
- DA3W3P mating connectors for mounting the power input
- Digital Voltmeter (DVM)

3.2.2 Electromagnetic Interference Considerations

Electromagnetic interference (EMI) from one instrument can adversely affect the operation of nearby equipment. To prevent the SSU-2000e from interfering with other equipment, it must be installed and operated as described in the following paragraphs.

All cables connected to the SSU-2000e should be shielded with metal connector shells. The connectors on the front of the chassis are shielded, with the shields connected to frame ground. Follow local procedures for shield grounding. The screws on all cables must be securely fastened to their corresponding connectors on the unit.

CAUTION ...

To maintain EMC compliance, use only properly shielded cabling on all telecom signal wiring, including I/O, clocks, and Ethernet connections. Ensure that connections are properly grounded at both ends.

While the unit is in operation, there must be a module or blank filler panel installed in every slot. Ensure that the captive screws located at the top and bottom of the module panel are properly secured.

3.2.3 Ventilation Considerations

There should be at least 76 mm of free space below the bottom chassis.

CAUTION …

To avoid excessive heat build-up resulting in equipment damage, provide proper ventilation and cooling of the equipment.

3.3 Installing the SSU-2000e

WARNING …

To avoid serious personal injury or death, exercise caution when working near high voltage lines. In particular:

- Use extreme caution when installing the GPS antenna near, under or around high voltage lines.
- Follow local building electrical codes for grounding the antenna system that is used with the SSU-2000e unit.

CAUTION …

For continued fire protection fuse the interface “A” power feeds at the power distribution source for (5A ⎓ 60vDC).

This unit must be grounded. Refer all servicing to qualified personnel.

The SSU-2000e shelf is passive and contains all the necessary interconnecting signals to support a combination of plug-in modules. For example, the SSU-2000e may be configured to contain two Clock modules, a Communications module, three Input modules, and six Output modules configured with three pairs of summed outputs.

The SSU-2000e shelf also provides specific connections for the following:

- Grounding, see Section 3.3.2, Making Ground Connections
- External Power Inputs, see Section 3.3.3, Making Power Connections
- Communications Interfaces, see Section 3.3.4, Communication Interface
- Alarm Contact Closures, see Section 3.3.5, Local and Remote Alarm Contact Closures
- Clock Inputs, see Section 3.3.7, Clock Inputs
- Clock Outputs, see Section 3.3.8, Clock Outputs

All SSU-2000e modules are equipped with card ejectors and plug in from the front of the chassis. Each module is secured in the chassis with captive screws.

3.3.1 Mounting Instructions

The SSU-2000e may be mounted on either an standard ETSI mounting rack or 300 mm deep equipment cabinet. The SSU-2000e chassis occupies 500 mm vertically, 229 mm depth, and a width of 431.8 mm. Included are 530 mm ETSI compatible rack mounting ears. Optional 480 mm rack mounting ears are available for 19-inch EIA racks and cabinets.

The front panel of the chassis mounts flush to the rack or at distances of 100.5 mm from the front of the rack. An SSU-2000e equipment cabinet mounting diagram is shown in Figure 3-1.

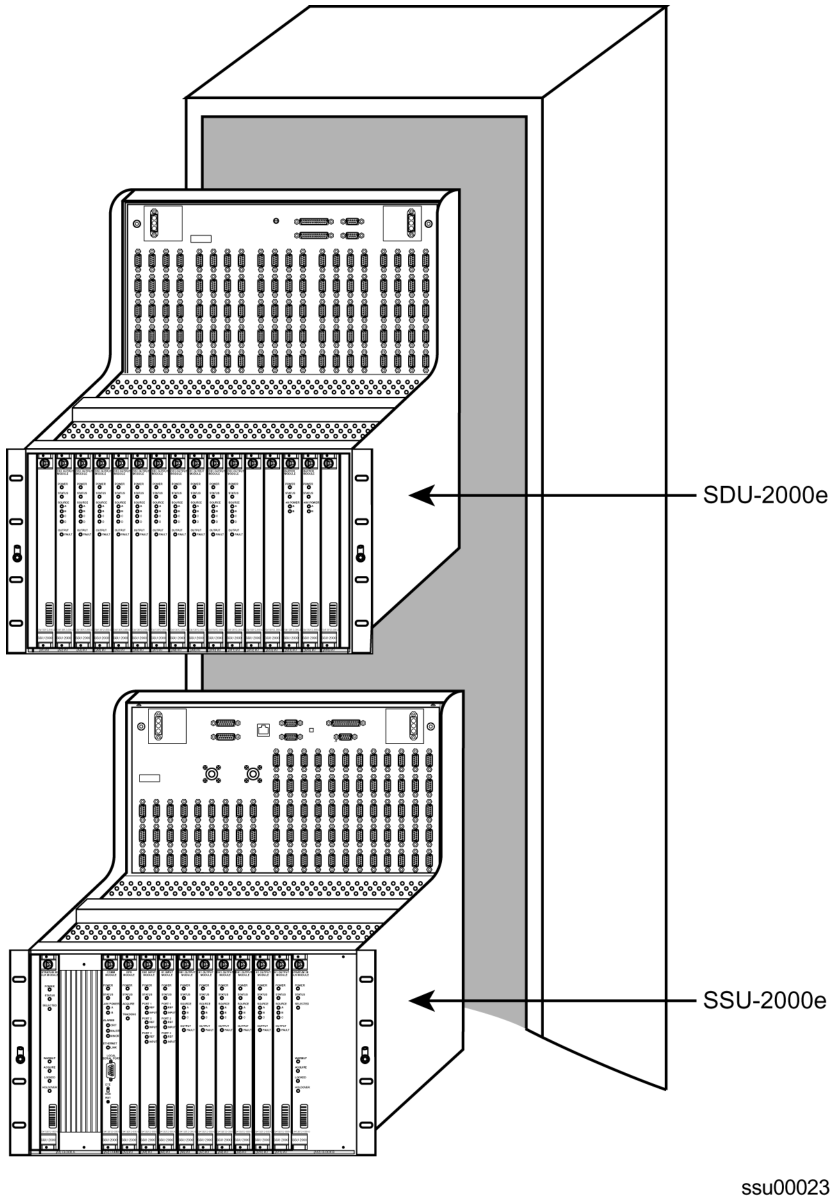


Figure 3-1. Equipment Mounting Cabinet

To install the SSU-2000e in the mounting rack:.

1. Attach a mounting bracket to each side of the chassis by aligning two columns (three holes per column) of the bracket with the holes on the side of the chassis. Use appropriate screws for attaching the mounting bracket. Ensure that both brackets are attached at equal distances from the front of the unit.

2. Mount the instrument to the front of the rack rails with the appropriate number of screws and washers for the rack.

3. If not using expansion shelves, verify that the BUS Termination Assembly is inserted into connector J8 of the main shelf and an SDU Backup Clock terminator is attached to connector J9. See Section 3.3.6, SDU-2000e Interface Option for more information.

RECOMMENDATION ...

To aid in viewing and when connecting cables, install the SSU-2000e chassis at eye level whenever possible.

3.3.2 Making Ground Connections

After installing the SSU-2000e in a suitable equipment cabinet, connect the chassis to a proper earth ground. This can best be accomplished by running a cable from the frame ground lug and connecting it to the equipment cabinet. Keep this cable as short as possible. Frame ground connections are made through two M5 studs labeled *FG* located next to the power connectors in the upper right corners of the shelf. Frame and logic ground are connected together on the backplane to form a multi-point ground system.

Using a digital voltmeter, measure between the ground and chassis and verify that no voltage potential exists between them.

3.3.3 Making Power Connections

The SDU-2000e Main shelf has redundant –48/60 vDC power input connections, labeled J101 A-BUS and J102 B-BUS. The A-BUS connection is a DA3W3P connector located in the upper left corner and the B-BUS connection is another DA3W3P connector located in the upper right corner.

Refer to Figure 3-2 for power connections. Pin 1 of each connector is not used. Pin 2 of each connector is –48/60 vDC and pin 3 is the Return. The –48/60 vDC power inputs have feed-through Pi-filters on each line through the front panel and DC Isolated from Frame and Logic ground. The power return connections are connected to Frame and Logic ground. Both the A-BUS and B-BUS power are fed to the individual module slots through the backplane.

To connect the power input, perform the following steps:

1. Attach 1.29 mm^2 (minimum) stranded wire to two DA3W3P connectors (supplied) as shown in Figure 3-2.

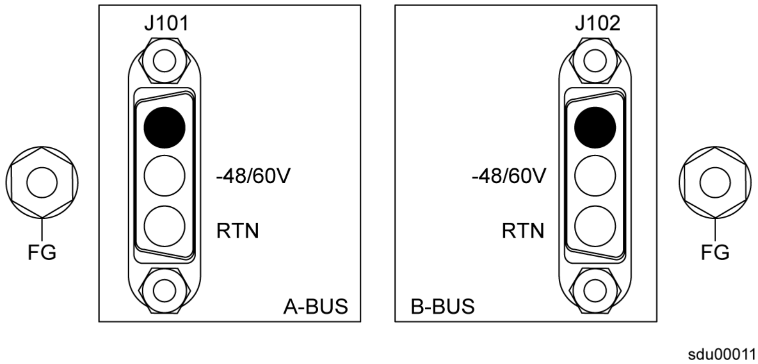


Figure 3-2. SSU-2000e Power Input Connector

2. Locate the A-bus and B-bus power terminal blocks on upper corners the front panel.

3. Attach the connectors to the A-bus and B-bus terminal blocks.

3.3.4 Communication Interface

The SSU-2000e shelf has connections for three communication interfaces: two EIA-232, serial ports and one Ethernet port. There is also a 2PDT slide switch, labeled S1, associated with the serial ports. Refer to Table 3-1 for the serial and Ethernet communications port assignments.

NOTE ...

A third RS-232 serial port may be connected via the Communications module. Refer to Chapter 8, Module Reference Data, for more information on the Communications Module.

Table 3-1. Communications Port Assignments

Port #	Function	Protocol
Serial Ports (RS-232)		
A (J4)	This port is user selectable as either an ICS or a TL1 interface. The port defaults to ICS upon initialization	ICS (Default), TL1
B (J5)	This port is user selectable as either an ICS or a TL1 interface. The port defaults to ICS upon initialization	ICS (Default), TL1
Local (Comms Module)	This port is user selectable as either an ICS or a TL1 interface. The port defaults to ICS upon initialization	ICS (Default), TL1

Table 3-1. Communications Port Assignments (Continued)

Port #	Function	Protocol
Ethernet Ports (Telnet)		
23	This port is user selectable as either an ICS or a TL1 interface. The port defaults to ICS upon initialization	ICS (Default), TL1
123	This port is designated for NTP only	NTP
161	This port is designated for SNMP Interactive	SNMP Interactive
162	This port is designated for SNMP Trap transmission	SNMP Trap
2000	This port is designated for TL1 only	TL1

Making EIA-232 Serial Port Connections

Both EIA-232 serial port connections are made through filtered DE9S female connectors on the front panel. These ports allow connection to a dumb terminal or PC using a terminal emulation software package for remote monitoring and control. One port is in connector J4 and is labeled SERIAL PORT-A, the other port is in connector J5 and is labeled SERIAL PORT-B. When connecting to these ports, use a shielded cable EIA-232 direct connect cable with the cable shield connected to pin 1, see Figure 3-3.

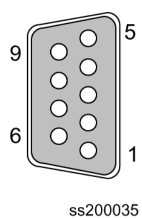


Figure 3-3. DE9 Connector Detail

The default EIA-232 settings for both serial ports are 9600 baud, no parity, 8 data bits, 1 stop bit, echo on, ASCII mode, and handshaking disabled.

Using the EIA-232 Serial Port DTE and DCE Switch

The serial port DTE and DCE switch is located on the right side of the serial ports A and B on the front panel. Each port may be configured as either DCE (default, connection to PC) or DTE (connection to modem). The upper position is labeled A and the lower position is labeled B as shown in Figure 3-4.

NOTE …

The DCE setting allows direct connection of the unit to a standard PC communication port using a 1:1 cable. The DTE setting requires a null modem cable. If connecting to a modem, use DTE.

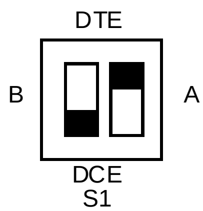


Figure 3-4. Serial Port DTE and DCE Switch

Changing Communications Settings

The default EIA-232 settings for both serial ports (Port A, J4 and Port B, J5) are 9600 baud, no parity, 8 data bits, 1 stop bit, echo on, ASCII mode, and handshaking disabled. To change these settings, perform the following steps.

1. Connect the serial communication cable from the DE-9 female connector on the PC or laptop to the interface remote terminal PORT-A (J5).
2. Verify that the slide switch is set to the appropriate equipment type, either data terminal equipment (DTE) or data communications equipment (DCE).
3. Connect a PC or laptop with terminal emulation software (such as Microsoft HyperTerminal) or ASCII terminal to the port.
4. Log in to the SSU-2000e at user level 2 or higher.
5. Use the COMM command to change the communications settings for the port. Refer to Appendix B.2 for a complete description of the Transition Language One (TL1) command interface mode and the Interactive Command Set (ICS) ASCII mode.

Making an Ethernet Connection

The Ethernet 10-Base-T connection is a shielded RJ-45 receptacle, labeled Ethernet 10baseT (J3) on the front panel. The RJ-45 is the standard 10-Base-T connector.

Connect to the SSU-2000e through the Ethernet connection by locating the shielded Ethernet 10baseT receptacle (J3) on the front connectivity panel and connecting a standard unshielded twisted pair (UTP) Ethernet RJ-45 cable to the receptacle at J3.

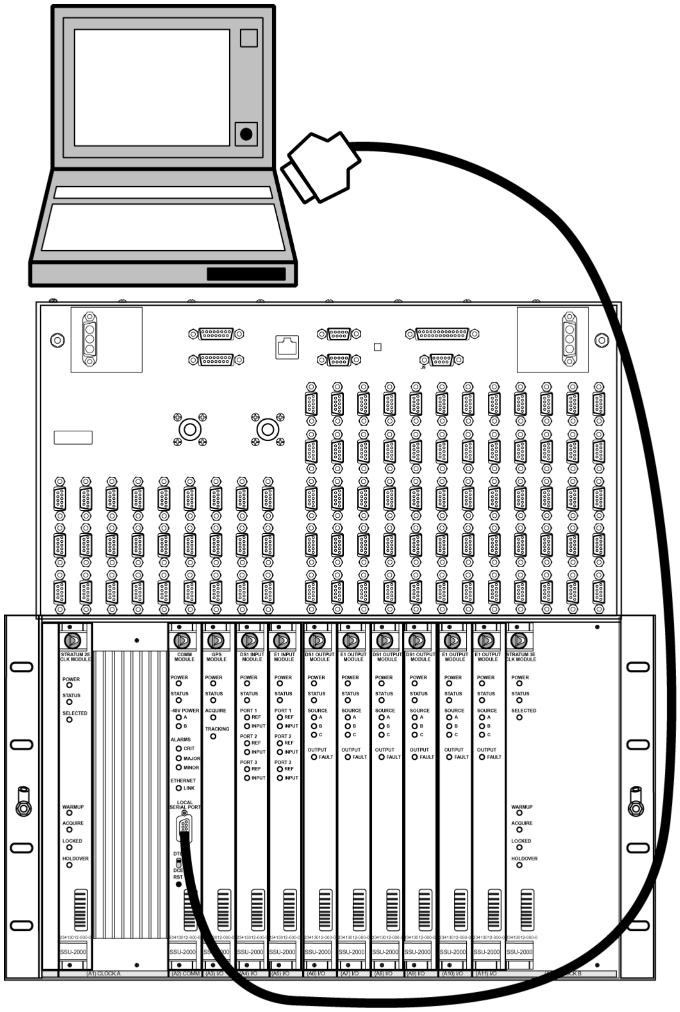
Table 3-2 lists the Ethernet communications port signal connections.

Table 3-2. Ethernet Connector (J3) Pinouts

Name	Pin
TX+ (Positive Side of Transmitted Data)	1
TX– (Negative Side of Transmitted Data)	2
RX+ (Positive Side of Received Data)	3
RX– (Negative Side of Received Data)	6
Not Used	4,5,7,8

Making Communications Module Connections

The Communications module serves as the user interface to the SSU-2000e. This module's command interface supports three EIA-232-C serial connections and one Ethernet interface for communication with the SSU-2000e. Figure 3-5 shows an example of connecting to the local port on the front of the communication module. The PC or terminal must be configured for 8 data bits, no parity, 1 stop bit, and 9600 baud rate.



ssu00026

Figure 3-5. Communications Module Serial Connection

Communication control input and output requirements are listed in Table 3-3.

Table 3-3. Communication Requirements for Control Input and Output

Parameter	Requirements
EIA-232	
EIA-232, 2 each	1 (PORT-A J15) designated as remote 1 (COMMS J1) designated as local
Type	Remote PORT-A is DTE or DCE, switch selectable. Local COMMS (J1) is fixed DCE.
Connector	9 pin D-Type female connector

Table 3-3. Communication Requirements for Control Input and Output

Parameter	Requirements
Ethernet	
Ethernet (10baseT)	TCP/IP Telnet connections for communication and control Telnet session ICS Port Network Time Protocol (NTP) for Time of Day
Connector	RJ-45

3.3.5 Local and Remote Alarm Contact Closures

The SSU-2000e Shelf has two filtered DA15P male connectors for local and remote alarm contact closure connections, as shown in Figure 3-6. The local connections are made on J1 and the remote connections are made on J2. The connectors are labeled ALARM CLOSURES, LOCAL (J1) and REMOTE (J2). They each have connections for normally open (NO), common or wiper (COM), and normally closed (NC) for each of these alarm categories: CRITICAL, MAJOR and MINOR.

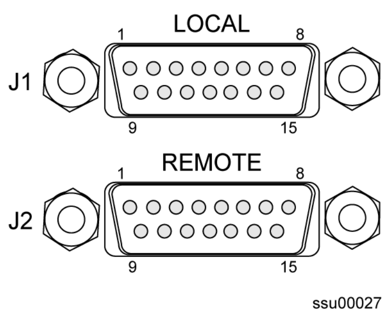


Figure 3-6. Alarm Contact Closures and Pin Assignments

Alarm contact pin assignments are listed in Table 3-8.

Table 3-4. Alarm Contact Pin Assignments

Signal	Pin
MINOR – Normally Open Contact	7
MINOR – Wiper Contact	15
MINOR – Normally Closed Contact	8
MAJOR – Normally Open Contact	4
MAJOR – Wiper Contact	12
MAJOR – Normally Closed Contact	5
CRITICAL – Normally Open Contact	1
CRITICAL – Wiper Contact	9
CRITICAL – Normally Closed Contact	2
Frame Ground	10
Frame Ground	11
Frame Ground	13
Not Used	3
Not Used	6

NOTE …

In an alarm condition or with the loss of DC power, the contact between the NO and COM closes, and the contact between the NC and COM opens.

3.3.6 SDU-2000e Interface Option

The SSU-2000e Main shelf has interface connectors to connect an SDU-2000e Expansion shelf. These connections are made through connector J8, a DB25S female connector with locking post, labeled SDU INTERFACE, and connector J9, a DE9S female with locking post, labeled SDU BACKUP CLK. If you are using an SDU-2000e Expansion shelf, refer to Section 3.5, Installing the SDU-2000e, for installation procedures.

If an SDU-2000e Expansion shelf is not being installed, the J8 and J9 connectors on the SSU-2000e must have the expansion and backup clock terminators installed. Figure 3-7 and Figure 3-8 shows the SSU-2000e Expansion (P/N 12013049-000-0) and backup clock (551021-0040) Terminators.

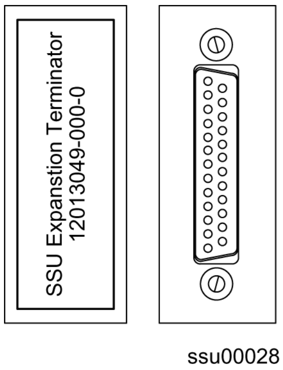


Figure 3-7. SSU Expansion Terminator (J8)

NOTE ...

The signals on connectors J8 and J9 are in differential pairs. Each pair is terminated with a series 1000 pf capacitor (J8) and a 120 ohm resistor (J9) on external plug-on terminators with locking slide latch.

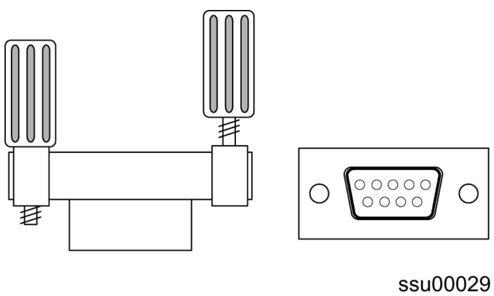


Figure 3-8. SSU Backup Clock Terminator (J9) Side and Front View

3.3.7 Clock Inputs

The SSU-2000e Main shelf has nine sets of reference clock input connections on DE9P male connectors for connecting input telecom signals. There are three connectors in each set; each set is arranged vertically and labeled top to bottom Monitor, Load, and Input, as shown in Figure 3-9. There are three sets associated with each input module, creating three groups for a total of 27 connectors.

Connections for group one are made in connectors J10 through J18, group two in connectors J19 through J27, and group three in connectors J28 through J36. The Load and Input connectors are cross-wired as four-wire east-west connections. The Input connector is used for the reference input to the unit. The Load connector is used for termination of the input in a two-wire input connection and is used as a bridge or bypass connector in a four-wire or bridging connection. The Monitor connector is connected as a 20dB monitor to the reference input signal.

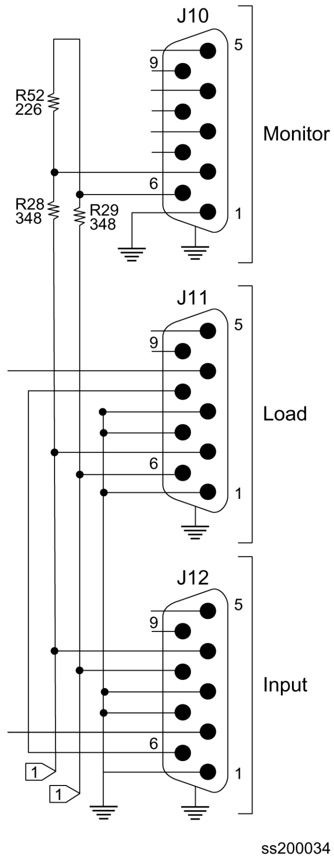


Figure 3-9. Clock Input Connector Pinout

Figure 3-10 shows the non-payload E1 (2048 kbit/s) and DS1 (1544 kbit/s) input termination.

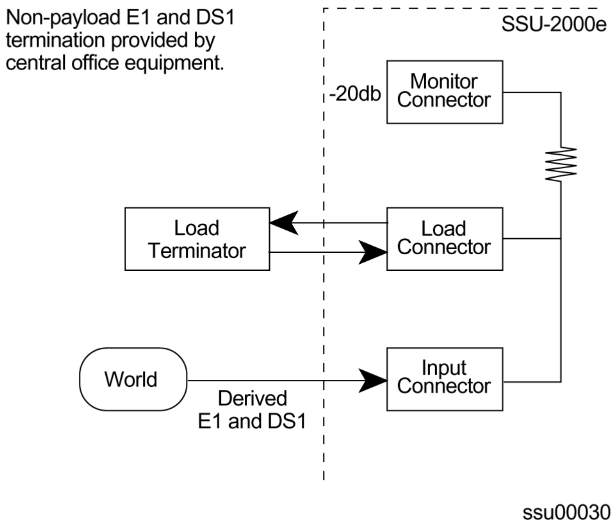


Figure 3-10. Non-Payload E1 and DS1 Input Termination

Figure 3-11 shows the *through payload* E1 and DS1 input termination.

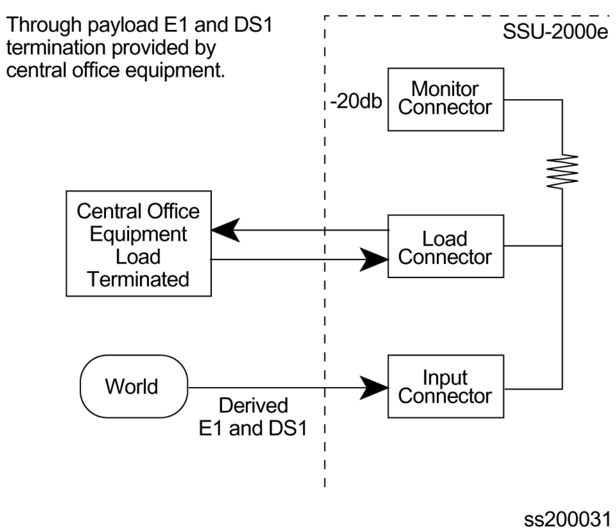


Figure 3-11. Through Payload E1 and DS1 Input Termination

Each connector is associated with a specific input plug-in module slot. Table 3-5 describes the relationship between the connectors and the Input module slot connectors. The signal connections on these connectors are set up in differential pairs as Tip and Ring connections. Plugs are available for termination of input reference.

Table 3-5. Input Module Slot to Connector Relationship

Slot Label (Name)	Plug-in Module Slot	Module Input Port	Connector Reference Description		
			Monitor	Load	Input
INPUT-1	A3	1	J10	J11	J12
		2	J13	J14	J15
		3	J16	J17	J16
INPUT-2	A4	1	J19	J20	J21
		2	J22	J23	J24
		3	J25	J26	J27
INPUT-3	A5	1	J28	J29	J30
		2	J31	J32	J33
		3	J34	J35	J36

3.3.8 Clock Outputs

The SSU-2000e main shelf has three groups of summed clock output connections on DE9P male connectors for connecting output telecom signals, see Figure 3-12. There are twenty connectors in each group for a total of sixty output connections. The connectors in each group are arranged vertically in a five by four matrix and labeled from top to bottom, and from left to right. Connections for group one are made in connectors J40 through J59, connections for group two are made in connectors J60 through J79, and connections for group three are made in connectors J80 through J99.

Each connector is associated with a specific pair of output plug-in module slots. Table 3-6 describes the relationship between the connectors and the Output module slot connectors. The signal connections on these connectors are set up in differential pairs as Tip (pin 6) and Ring (pin 2) connections, with pin 1 as ground.

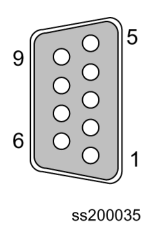


Figure 3-12. Clock Output Connector Pinout

Table 3-6. Output Module Slot to Connector Relationship

Slot Label (Name)	Plug-in Module Slot	Group	Output Connector (Module Port) Reference Description
OUTPUT-1	A6	1	J40 (1) through J59 (20)
OUTPUT-2	A7		
OUTPUT-3	A8	2	J60 (1) through J79 (20)
OUTPUT-4	A9		
OUTPUT-5	A10	3	J80 (1) through J99 (20)
OUTPUT-6	A11		

3.4 Installing SSU-2000e Modules

The SSU-2000e main shelf has twelve plug-in module slots. The module slots are numbered from left to right looking at the front of the shelf, A1 through A12. Each module slot has a specific address as listed in Table 3-7. Each module slot has two hybrid DIN connectors associated with it on the backplane. The hybrid contacts of these connectors are used for power, logic ground, frame ground, and radio frequency (RF) connections. Each module slot has three pins connected together on each Hybrid DIN connector which are used for module removal detection. Signals on the back panel are configured as differential pairs unless they are considered static, or because of the signal type, they are required to be single ended.

Table 3-7. Module Slot Addresses

Module Type	Slot	Address
Clock Module A	A1	1A01
Communications Module	A2	1A02
I/O Module	A3	1A03
I/O Module	A4	1A04
I/O Module	A5	1A05
I/O Module	A6	1A06
I/O Module	A7	1A07
I/O Module	A8	1A08
I/O Module	A9	1A09

Table 3-7. Module Slot Addresses (Continued)

Module Type	Slot	Address
I/O Module	A10	1A10
I/O Module	A11	1A11
Clock Module B	A12	1A12

CAUTION …

To avoid equipment damage due to poor ventilation and EMI considerations, each slot in the SSU-2000e must be filled. Filler panels are available from Datum for unpopulated slots.

3.4.1 Handling Modules

When handling the modules, observe the following precautions:

- Use proper static control precautions when handling modules. Protect the equipment against electrostatic discharge (ESD) by using a grounded protective wrist strap and normal equipment grounding.

NOTE …

Two frame ground connectors, one on each mounting bracket on the sides of the unit, provides a ground connection for the protective wrist straps.

- Avoid touching component leads and the module's edge connectors.
- Avoid placing the module on any ungrounded surface.
- Avoid allowing the module to come in contact with insulated surfaces.

CAUTION …

To avoid the possibility of the lithium battery exploding if replaced incorrectly in the Communications or Clock modules, ***do not*** replace the battery. Return the entire module to Datum Service Department for battery replacement and disposal.

3.4.2 Installing Modules

The following procedure is common for all modules in the SSU-2000e and SDU-2000e.

NOTE ...

Modules can be removed and installed while system power is applied without damage to the modules and without affecting system operation, unless otherwise indicated.

Install the modules by performing the following steps.

1. Align the module card edges with the plastic card guides of the selected slot.
2. Slide the module into the chassis until it seats fully into its rear panel edge connector.
3. Tighten the captive screws located at the top and bottom of the module front panel.

CAUTION ...

Ensure that you have completely inserted the module into the system and that you have securely tightened the captive screws. A partially inserted module can become easily damaged and cause intermittent failures.

NOTE ...

To ensure proper operation, ensure that terminators are installed on the J8 and J9 connectors, if the SDU-2000e expansion unit is not being installed.

3.5 Installing the SDU-2000e

This section provides guidelines and procedures for installing and cabling the SDU-2000e expansion chassis to the SSU-2000e main chassis. Before proceeding with the SDU-2000e installation, ensure that the procedures in Section 3.2, Preliminary Procedures, have been performed.

The SDU-2000e chassis occupies 500 mm of vertical space, has a depth of 229 mm, and a width of 431.8 mm. Included are 530 mm ETSI compatible rack mounting ears. Optional 480 mm rack mounting ears are available for 480 mm EIA racks and cabinets. The SDU-2000e may be mounted on either a standard ETSI mounting rack or 300 mm deep equipment cabinet.

CAUTION ...

To avoid excessive heat build-up resulting in equipment damage, ensure that there is at least 76 mm of free space below the bottom chassis.

3.5.1 Rack Mounting the SDU-2000e

The front panel of the chassis mounts flush to the rack or at distances of 100.5 mm from the front of the rack. An SDU-2000e equipment cabinet mounting diagram is shown in Figure 3-13. To install the SDU-2000e in the rack, perform the following:

1. Determine and locate the appropriate mounting brackets to be used.

2. Attach a mounting bracket to each side of the chassis by aligning two columns (three holes per column) of the bracket with the holes on the side of the chassis. Use the appropriate screws to attach the mounting bracket. Ensure that both brackets are attached at equal distances from the front of the unit.

3. Mount the instrument to the front of the rack rails using the appropriate number of screws and washers for the rack.

4. If not connecting additional expansion shelves, verify that the Bus Termination Assembly is inserted into the last SDU Interface (J105) and last SDU Backup Clock (J106) of the main SDU-2000e shelf, see Figure 2-12.

CAUTION ...

To maintain EMC compliance, use only properly shielded cabling on all telecom signal wiring, including I/O, clocks, and Ethernet connections. Ensure that connections are appropriately grounded at both ends.

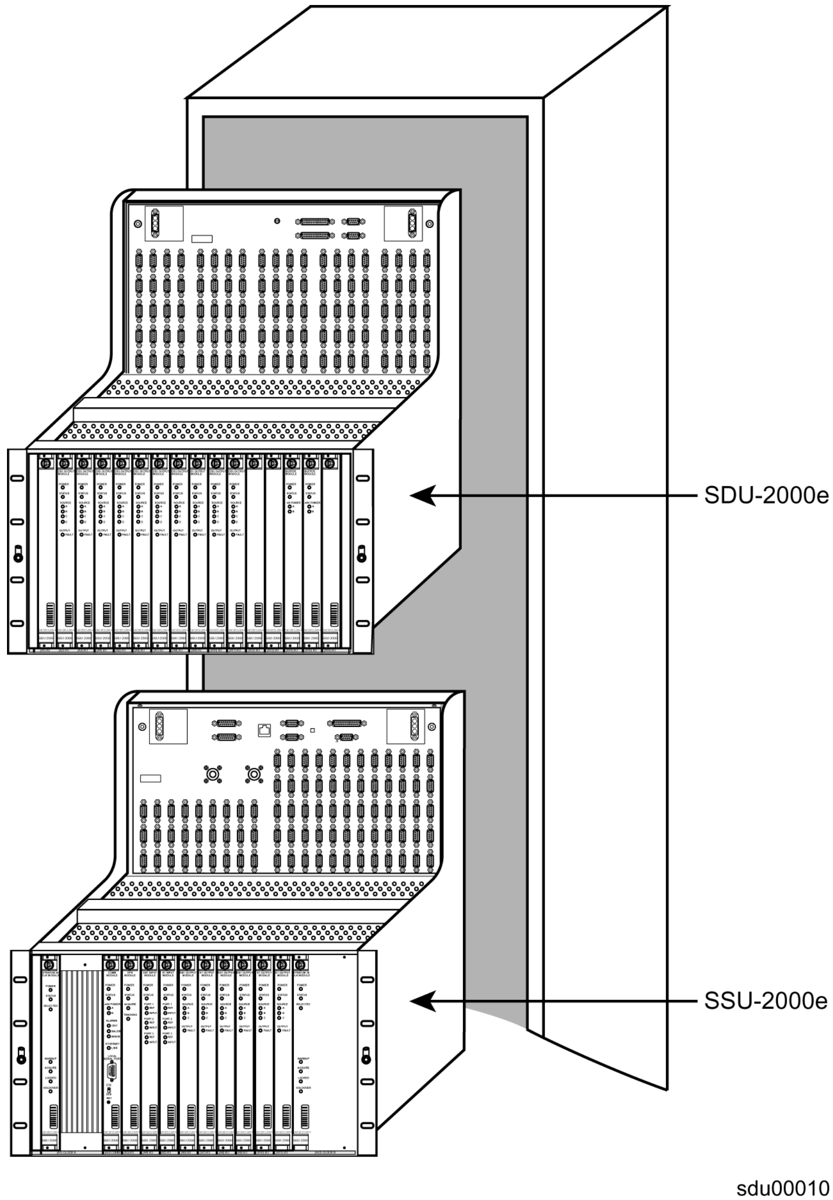


Figure 3-13. Equipment Mounting Cabinet

RECOMMENDATION ...

To aid in viewing and when connecting cable install the SDU-2000e chassis at eye level, whenever possible.

3.5.2 Making Ground Connections

The procedures for making ground connections for the SDU-2000e are the same as for the SSU-2000e. Refer to Section 3.3.2, Making Ground Connections, and follow the procedures for grounding the SDU-2000e.

3.5.3 Making Power Connections

The procedures for making power connections for the SDU-2000e are the same as for the SSU-2000e. Refer to Section 3.3.3, Making Power Connections, and follow the procedures to connect power to the SDU-2000e.

3.5.4 SDU Installation Connections

The SDU-2000e Expansion Chassis has interface connections on the front panel for connecting to an SSU-2000e Synchronous Supply Unit. Connections include the SDU Interface (J103 and J105) and the SDU Backup Clock Terminal (J104 and J106). Figure 2-12 shows SDU-2000e expansion unit cabling.

SDU-2000e Interface Connector

Connection to the SSU-2000e is made through the SDU Interface Connectors. The SDU Interface Connections, J103 and J105, are 25 Pin D-Type female connectors with locking posts. The signals are differential pairs and connected in parallel. One connector is used to connect to a source unit, and the other is used for either a terminator or for feeding an additional SDU-2000e shelf. Up to four SDU-2000e shelves can be daisy-chained together. See Figure 2-12 for expansion unit cabling.

Figure 3-14 shows an SSU-2000e Expansion Terminator (12013049-000-0). Install this terminator to the last expansion chassis in the daisy chain.

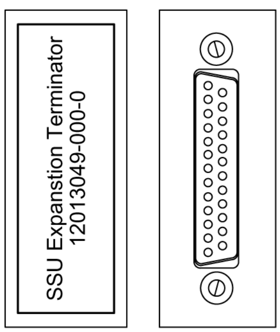


Figure 3-14. SSU-2000e Expansion Terminator

SDU Backup Clock Terminal

The SDU Backup Clock terminals (J104 and J106) are 9 pin D-type female connectors labeled SDU BACKUP CLK. They are connected in parallel. If the SDU is first in the daisy chain, J104 is used to connect to a source unit (SSU-2000e) and J106 is used to connect to an additional SDU-2000e shelf.

Install the backup clock terminator on the SDU BACKUP CLK connector J106 on the last expansion chassis in the daisy chain, see Figure 3-15.

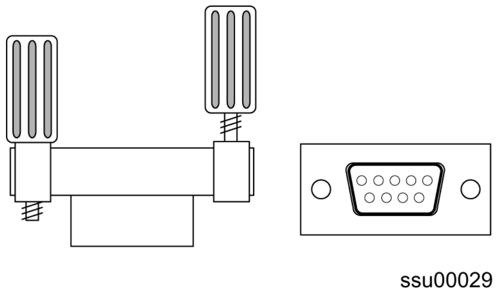


Figure 3-15. Backup Clock Terminator, Side and Front View

3.5.5 Setting the Shelf Address

Each SDU-2000e expansion chassis must be correctly configured for its position in the daisy chain. The shelf address selector is located on the top center of the expansion chassis connector panel, see Figure 3-16. The settings range from 2 to 5. Using a common screwdriver, set the first expansion chassis to 2. If more expansion chassis are added, set them sequentially up to 5.

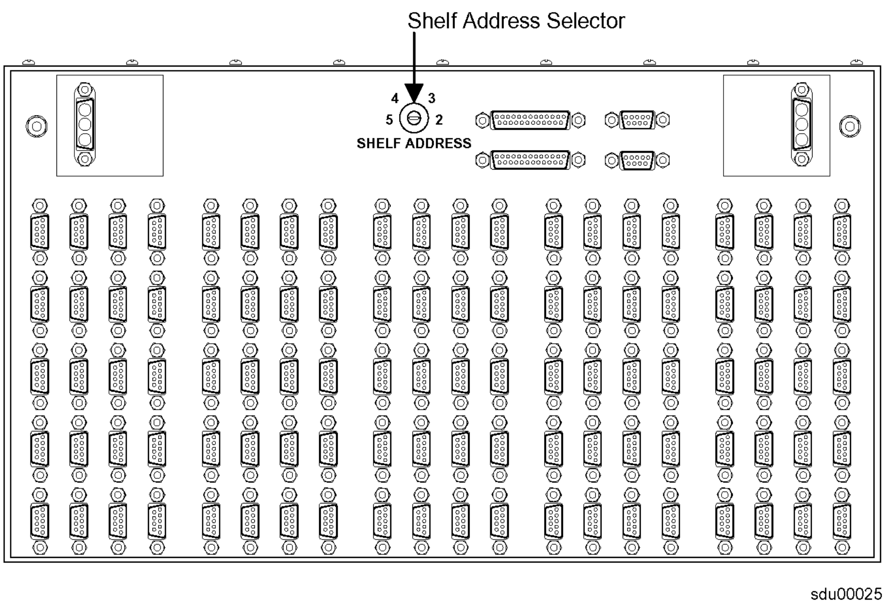


Figure 3-16. Shelf Address Selector

3.6 SDU Clock Outputs

The SDU-2000e Shelf has five groups of summed clock output connections on DE9P male connectors for connecting output telecom signals. There are twenty connectors in each group for a total of 100 outputs. The connectors in each group are arranged vertically in a five by four matrix and are labeled from top to bottom and left to right. Connections for group one are made using J1 through J20, connections for group two are made using J21 through J40, connections for group three are made using J41 through J60, connections for group four are made using J61 through J80, and connections for group five are made using J81 through J100.

Each connector is associated with a specific pair of output plug-in module slots, see Table 3-9 below for the plug-in module slot connector relationship. The signal connections on these connectors are set up in differential pairs as Tip and Ring connections, see Table 3-8.

Table 3-8. Clock Output DE9 Connector Pin Assignments

Pin	Signal
2	Tip
6	Ring
1	Sleeve
3,4,5, and 7-9	Unused

Table 3-9. Output Module Slot to Connector Relationship

Slot Label (Name)	Plug-in Module Slot	Group	Output Connector (Module Port) Reference Description
OUTPUT-1	A1	1	J1 (1) through J20 (20)
OUTPUT-2	A2		
OUTPUT-3	A3	2	J21 (1) through J40 (20)
OUTPUT-4	A4		
OUTPUT-1	A5	3	J41 (1) through J60 (20)
OUTPUT-2	A6		

Table 3-9. Output Module Slot to Connector Relationship (Continued)

OUTPUT-3	A7	4	J61 (1) through J80 (20)
OUTPUT-4	A8		
OUTPUT-5	A9	5	J81 (1) through J100 (20)
OUTPUT-6	A10		

3.7 Installing SDU Modules

The SDU-2000e shelf has twelve plug-in module slots located on the front of the chassis. The module slots are numbered from left to right looking at the front of the shelf, A1 through A12. Each module slot has a specific address defined in Table 3-10 below. Each module slot has two hybrid DIN connectors associated with it on the backplane. The hybrid contacts of these connectors are used for power, logic ground, and frame ground connections. Each module slot has 3 pins connected together on each hybrid DIN connector which are used for module removal detection. Use the precautions in Section 3.4.1, Handling Modules, when handling modules in the SDU-2000e. Install modules in the SDU-2000e using the procedures in Section 3.4.2, Installing Modules.

NOTE …

To avoid damaging the shelf, never insert Output modules in slots A15 and A16. Buffer modules are always inserted these slots.

Table 3-10. SDU2000e Shelf Slot and Address Assignments

Slot-A	Address	Module Types	Comments
1, 2	1, 2	Output, Pair 1	Paired Outputs
3, 4	3, 4	Output, Pair 2	Paired Outputs
5, 6	5, 6	Output, Pair 3	Paired Outputs
7, 8	7, 8	Output, Pair 4	Paired Outputs
9, 10	9, 10	Output, Pair 5	Paired Outputs
	11 - 14	Not Used	In ETSI SDU
	15 - 18	Not Used	Reserved for future I/O (23” shelf)
11, 12	19, 20	Buffers	Expansion Buffers
	0	All	Addresses all modules in the Shelf

CAUTION …

To avoid equipment damage due to poor ventilation and EMI considerations, each slot in the SDU-2000e must contain either a module or blank filler panel. Filler panels are available from Datum for unpopulated slots.

3.8 Installation Checklist

Perform the following steps to ensure that the SSU-2000e is correctly installed.

1. Unpack all equipment carefully and check it against the purchase order.
2. Ensure the SSU-2000e chassis is securely attached to mounting rack.
3. Ground the SSU-2000e chassis using the frame ground lug.
4. Measure between the ground and chassis and verify that no voltage potential exists.
5. If an SDU-2000e Expansion chassis is not being installed, ensure that the connectors J8 and J9 to the SSU-2000e are connected to a proper terminator.
6. Connect office alarms to the REMOTE and LOCAL terminals with 1.024 mm^2 wire.
7. Using proper handling techniques, insert modules and filler panels in their designated slots.
8. Connect primary power to the A-BUS and secondary power to the B-BUS.
9. Measure the voltage at POWER A (and POWER B if used), and verify that it ranges from –38 vDC to –72 vDC (–48 vDC nominal).
10. Perform the procedures in Chapter 4, Turn-Up Procedures.
11. Verify that all modules are receiving power and generating regulated DC outputs by checking that their POWER indicators (LEDs) are lit, see the topic "SSU-2000e Normal System Indications During Turn-Up" in Section 4.2, SSU-2000e Turn-Up Procedures.
12. To ensure that both power inputs are valid, verify on the Communications or Buffer modules that the green POWER indicator on the front of the Communications module is on. Also verify that the –48V Power A and B LEDs are both green. If all these indicators are not green, refer to Table 3-11 for the module color code indications. Refer to Chapter 7, Maintenance and Troubleshooting, if you are unable to obtain the correct indications.

Table 3-11. Communications and Buffer Module LED Indications

LED	State	Indication
Power	On	At least one –48V Power Supply is connected
Power	Off	No –48V Power Supply A or B connected
–48V Power Supply A or B	On (Green)	Power Supply is connected
–48V Power Supply A or B	Off	No –48V Power Supply connected to the power supply input LED that is not lit
–48V Power Supply A or B	On (Amber)	–48V Power polarity is reversed on the power supply that the amber LED is lit

IN THIS CHAPTER ...

Chapter 4 Turn-Up Procedures

This chapter describes the turn-up procedures for the SSU-2000e system and bringing the system on-line after completing system installation.

4.1 Applying Power to the SSU-2000e

The SSU-2000e is **not** equipped with a Power switch. Power to the SSU-2000e is controlled by two 5-amp fuses, one each for Power A and Power B, located in the power distribution control panel.

4.2 SSU-2000e Turn-Up Procedures

To power-up the shelf, insert the two fuses, one each for Power A and Power B, into the appropriate slot in the power distribution control panel.

SSU-2000e Normal System Indications During Turn-Up

As the system powers up and begins normal operation, the LEDs on the front of each of the installed modules go through a sequence as follows:

- **Clock Module 2E** – The POWER LED turns green when the fuses are installed in the main chassis and stays green. The STATUS LED blinks green and amber for approximately 10 to 15 seconds and then stays green. The SELECTED LED turns green on the selected clock module after the ACQUIRE LED on the clock module turns green. The WARMUP LED turns amber for approximately 30 seconds to 5 minutes then turns off and the ACQUIRE LED turns green. The ACQUIRE LED stays green 10 to 15 minutes until the module locks onto a signal, then the LED turns off. The LOCKED LED then turns green and stays green.

- **Clock Module 3E** – The POWER LED turns green when power is applied to the unit and stays green. STATUS LED blinks green and amber for approximately 10 to 15 seconds and then stays green. The SELECTED LED turns green on the selected clock module after the ACQUIRE LED turns green. The WARMUP LED turns amber for approximately 30 seconds to 20 minutes then turns off and ACQUIRE turns green. The ACQUIRE LED stays green until the module locks onto a signal (10 to 15 minutes); then the LED turns off. The LOCKED LED turns green and stays green.

- **Communications Module** – The POWER LED turns green when power is applied to the unit and stays green. The STATUS LED blinks green and amber for approximately 10 to 15 seconds and then stays green. The –48V POWER LEDs A and B turn green to indicate that the power supplies are connected. If one of these LEDs are amber, the polarity of that power connection is reversed and needs to be switched. The three ALARM LEDs clear after approximately 1 minute. After initialization, if there are any alarms, it takes approximately 30 seconds to register and the ALARM LED turns amber. The ETHERNET LINK LED blinks green for approximately 30 seconds and stays green.

- **Input Module** – The POWER LED turns green when power is applied to the unit and remains green while the system is powered up. The STATUS LED blinks green and amber for approximately 10 to 15 seconds and then stays green. The PORT 1 REF LED blinks for approximately 5 to 10 seconds and turns green for the reference input and off for the others. The INPUT LED blinks for approximately 5 to 10 seconds and turns green for every valid input or amber for invalid inputs.

- **Output Module** – The POWER LED turns green when power is applied to the unit and stays green. The STATUS LED blinks green and amber for approximately 10 to 15 seconds and then stays green. The SOURCE LED turns green for the source clock, amber for an enabled clock that is not present and off for an enabled clock that is present (but not the source clock).

4.3 SDU-2000e Turn-Up Procedures

This section describes the procedures for powering up the SDU-2000e system and bringing the system on-line after completion of the system installation. After completion of the turn-up procedures, complete the commissioning tests in Section 6.5, Commissioning the SDU 2000e, to ensure that the system is functioning properly.

4.3.1 SDU-2000e Power Control

The SDU-2000e expansion chassis is ***not*** equipped with a Power switch. Power to the SDU-2000e is controlled by two external power supplies that provide –48/60 vDC to the SDU-2000e main chassis (A-BUS and B-BUS) at connectors J101 and J102. To power-up the shelf, turn the power on to both power supplies.

4.3.2 Normal System Indications During Turn-Up

As the system powers up and begins normal operation, the indicators on the front of all installed Output modules should go through the following sequence:

- The POWER indicator turns green when power is applied to the unit and stays green.
- The STATUS indicator blinks green and amber for approximately 10 to 15 seconds and then stays green.
- The SOURCE indicator turns green for source clock, amber for *not* source clocks, and off for non-existent clocks.

The POWER indicator and both –48/60 vDC indicators on the installed Buffer modules should turn green and stay green.

4.4 After Turn-Up

After completing the turn up procedures:

- Assign a System Administrator and any additional users to the system using the procedures in Section 5.3, Adding the Administrator User to the System.
- Make any required changes to the factory default configuration settings as described in Chapter 5, Operating and Provisioning Procedures.
- Complete the commissioning tests in Chapter 6, Commissioning the SSU-2000e, to ensure that the system is functioning properly.
- Refer to Chapter 7, Maintenance and Troubleshooting to clear any system alarms that might occur.

This completes the turn-up procedures. See Chapter 5, Operating and Provisioning Procedures, for instructions on connecting to the SSU-2000e and assigning a system administrator and additional users (system is password protected). Then refer to Chapter 6, Commissioning the SSU-2000e, for test procedures to ensure the system is functioning properly, or to Chapter 7, Maintenance and Troubleshooting, to clear any persistent system alarms.

IN THIS CHAPTER ...

Chapter 5 Operating and Provisioning Procedures

This chapter provides operating instructions and software provisioning procedures for the SSU-2000e system. Section 5.1, Controls and Indicators, describes the SSU-2000e operating controls and indicators; Section 5.2, Establishing a Connection to the SSU-2000e, describes the procedure for connecting to the SSU-2000e. Section 5.3, Adding the Administrator User to the System, describes how to set up the Administrative user. Section 5.4, Adding Users to the System describes how to add general users. Section 5.5, Checking Alarm Status, describes how you can use the communications interfaces to check the status of alarms. Section 5.6, Overview of the SSU-2000e Security System, describes the different types of users you can define and their associated security levels. Section 5.7, Restoring Factory Defaults describes the various software options available with the SSU-2000e, identifies all factory default settings and provides a procedure for restoring the SSU-2000e to factory defaults.

5.1 Controls and Indicators

This section describes the LED indicators in the system and the operating controls.

5.1.1 SSU-2000e Status LED Indicators

All modules used in the SSU-2000e main chassis and in the optional SDU-2000e expansion chassis contain status LED indicators that provide a visual indication of module status. The Communications module provides both system and individual module status whereas all other modules provide individual module status only. For more information on individual module status LED indicators, refer to Section 4.2, SSU-2000e Turn-Up Procedures, and Chapter 8, Module Reference Data.

5.1.2 SSU-2000e Operating Controls

The SSU-2000e contains three hardware operating controls:

- Two DCE/DTE select switches associated with the three RS-232 ports. One switch is located on the front of the Communications module and the second switch is located on the SSU-2000e back panel. The DTE position is for connection to a PC and the DCE position is for connection to a modem.
- Reset (RST) switch on the Communications module.

5.2 Establishing a Connection to the SSU-2000e

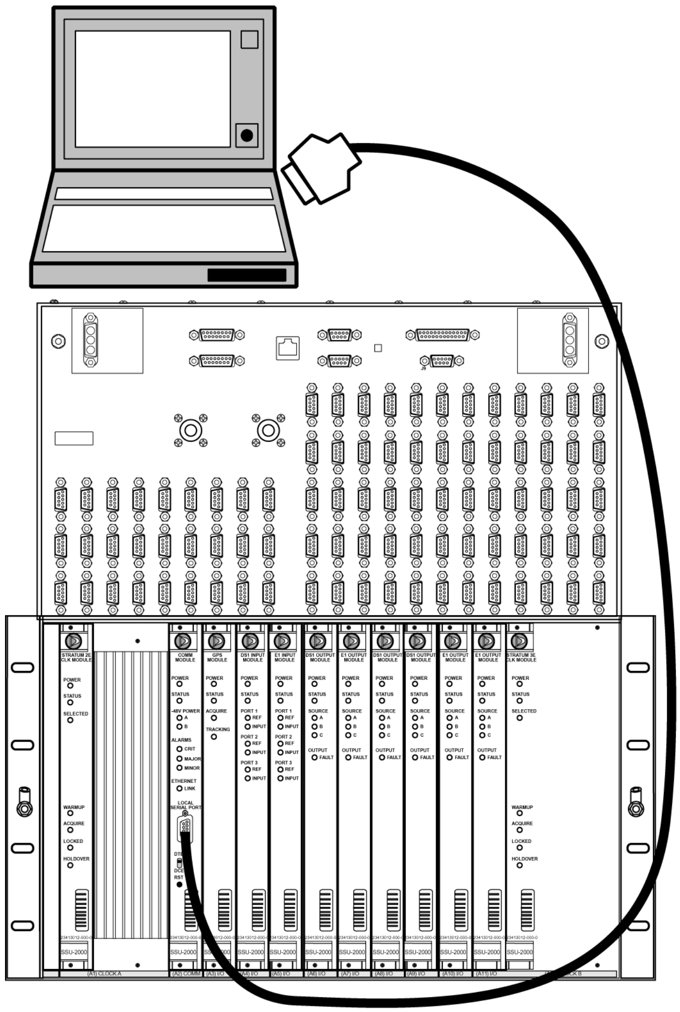
Set up either an Ethernet telnet session (if the SSU-2000e is connected to a LAN) or a direct serial connection using a dumb terminal or a PC with terminal emulation software. For a direct connect via serial port, see Section 5.2.1, Communicating by Serial Port. If the SSU-2000e is connected to an Ethernet LAN, use the procedure described in Section 5.2.2, Communicating by Ethernet. Refer to Table 5-1 for the serial and Ethernet communications port assignments.

Table 5-1. Communications Port Assignments

Port #	Function	Protocol
Serial Ports (RS-232)		
A (J4)	This port is user selectable as either an ICS or a TL1 interface. The port defaults to ICS upon initialization	ICS (Default), TL1
B (J5)	This port is user selectable as either an ICS or a TL1 interface. The port defaults to ICS upon initialization	ICS (Default), TL1
Local (Comms Module)	This port is user selectable as either an ICS or a TL1 interface. The port defaults to ICS upon initialization	ICS (Default), TL1
Ethernet Ports (Telnet)		
23	This port is user selectable as either an ICS or a TL1 interface. The port defaults to ICS upon initialization	ICS (Default), TL1
123	This port is designated for NTP only	NTP
161	This port is designated for SNMP Interactive	SNMP Interactive
162	This port is designated for SNMP Trap transmission	SNMP Trap
2000	This port is designated for TL1 only	TL1

5.2.1 Communicating by Serial Port

Three RS-232-C ports are available on the SSU-2000e for communication with the system. Attach either a dumb terminal or a PC with terminal emulation software to one of the ports as shown in Figure 5-1 (this example shows connecting to the local port on the front of the Communications module). The PC or terminal must be configured for 8 data bits, no parity, 1 stop bit, and 9600 baud rate.



ssu00026

Figure 5-1. Direct Connection Using the Serial Port

5.2.2 Communicating by Ethernet

To communicate with the SSU-2000e using an Ethernet LAN, you must first configure the Ethernet port. This section describes how to configure the Ethernet port and then connect to the SSU-2000e using the Ethernet port.

Configuring the Ethernet Port

Use the following procedures to configure the SSU-2000e Ethernet parameters (IP Address, Subnet Mask, and Gateway Address).

1. Establish a direct serial connection to the SSU-2000e as described in Section 5.2.2, Communicating by Ethernet.

2. At the system prompt, type **`ip addr`** followed by the IP address expressed in dotted decimal notation (for example, 192.168.18.1), and press **Enter**.

3. Type **`ip mask`** followed by the mask in dotted decimal notation (for example, 255.255.0.0 for a class B network, or 255.255.255.0 for a class C network), and press **Enter**.

4. Type **`ip gate`** followed by the IP address of the gateway (expressed in dotted decimal notation, for example, 192.168.0.1), and press **Enter**.

5. Type **restart 1A02** to restart the Communications module and press **Enter**.

6. The system responds with, Are you sure? Type **YES.**

7. Type **ip** and press **Enter** to verify that the information is correct.

8. Type **bye** and press **Enter** to log off the system.

Connecting through the Ethernet LAN

1. Connect the SSU-2000e to a LAN using category 3, 4 or 5 cabling with RJ45 terminations on both ends (See Chapter 3, Installation, for installation details).

2. Plug one end of the network cable into the Ethernet 10baseT jack located on the rear of the SSU-2000e and the other end of the cable into the network interface jack.

3. Telnet from your PC to the IP address assigned to the SSU-2000e system.

4. Type your user name and press the **Enter** key.

5. Enter your assigned password and press **Enter**. If you have not yet been assigned as a user to the system, contact the System Administrator for your SSU-2000e system.

5.3 Adding the Administrator User to the System

An Administrator user must be added to the system when you log in for the first time. The Administrator user performs initial setup and can assign user privileges and access codes as needed, as well as configuring all system parameters at this access level. Refer to Section B.2.2, User Access Levels, for more information on user access levels.

CAUTION …

You must add the administrator user and password before adding any other users. If you add a user that is not at the administrator security level before adding the administrator, you will not be able to log into the unit at that level again without a service call.

Perform the following steps to add the administrator user to the system.

1. Type **`admin`** at the username prompt for the first-time system login (otherwise enter your username) and press **Enter**. The system prompts for a password.

2. Press the **Enter** key for the first-time system login (otherwise enter your password and press **Enter**). The system prompt appears.

3. Type **`user add`** and press **Enter**. The system prompts you for a user name.

4. Enter a “username” and press **Enter**. The name you enter will be the log-in name for the system administrator. The system prompts you for a password.

5. Enter a “password” and press **Enter**. The password you enter will be the log-in password for the system administrator. The system prompts you for an access level.

6. Type **`4`** and press **Enter**. This selects the administrator access level. The system prompt appears.

7. Type **`bye`** and press **Enter** to log off the system.

8. Log back in as the new system administrator to verify that the account exists (repeat steps 4 and 5).

9. Type **`bye`** and press **Enter** to log off the system.

5.4 Adding Users to the System

Only an administrator-level user can add new users to the SSU-2000e system. Perform the following steps to add a user to the system.

1. Type the administrator’s user name and press **Enter**.

2. Type the administrator’s password and press **Enter**. The system prompt appears.

3. Type **`user add`** and press **Enter**. The system prompts for the new username.

4. Enter the new user name and press **Enter**. The system prompts for a the new user’s password.

5. Enter the new user's password and press **Enter**. The system prompts for an access level.

6. Enter the appropriate user access level and press **Enter**. Refer to Section B.2.2, User Access Levels, for more information on user access levels.

7. Type **`bye`** to log off the system and press **Enter**.

8. Log back in using the new user's username and password to verify that the account exists.

9. Type **`bye`** and press **Enter** to log off the system.

5.5 Checking Alarm Status

All alarm indication lights should be extinguished and the POWER indication lights should be green after completing the power up sequence. The valid input reference alarm clears, rubidium lock clears, frequency alarms clear, and the ACQUIRE LED is ON. Use the following procedure with the STATUS and ALARM commands to verify that the unit is operational.

1. Log in to the SSU-2000e system and press **Enter**.

2. Type **`alarm`** and press **Enter** to verify that there are no active alarms.

3. Type **`bye`** and press **Enter** to log off the system.

5.6 Overview of the SSU-2000e Security System

The security system built into the SSU-2000e contains a hierarchy of user levels that permit an increasing level of access to system parameters. This allows the system administrator to add users that can, for example, view but not change system parameters; other users can view and change system parameters.

The users assigned to each security level have a different set of options available, for instance, a User-level user does not have as many options available as a Technician-level user.

Table 5-2 summarizes each security level, ID number, and the privileges available at each level. To determine your security level, contact the System Administrator.

For a first-time installation, the default login is at the administrator level. When adding users, add the administrator-level user and password first to avoid a service call. Users at the administrator level set up other users and their level of security. For more information on user security and access levels, see Section B.2.2, User Access Levels.

Table 5-2. User Access (Security) Levels

Level	ID	Description
Idle	0	Security level 0 is available when no user is logged in. This level allows **Idle** users to view a list of available commands (HELP), syntax, software version number, unit id, or to login.
User	1	User-level users can: ▪ Perform level 0 functions ▪ View information about the current configuration and operation ▪ Change communication settings such as line termination and echo Changes made by users at this level remain in effect only until the user logs out.
Technician	2	Technician-level users (CRAFT persons) can: ▪ Perform level 0 through 1 functions ▪ Read or set all installation functions
Supervisor	3	Supervisor-level users can: ▪ Perform level 0 through 2 functions ▪ Read or set all functions
Administrator	4	Administrator-level users can: ▪ Perform level 0 through 3 functions ▪ View and set software configurations ▪ Add, delete, or modify the user table ▪ Log off any user from any port

5.6.1 Factory Default (Basic) Configuration

Prior to shipping, Datum-Austin loads all required operational software. The SSU-2000e ships with a factory default (basic) configuration and often does not require further configuration. Refer to Appendix E, Default Settings, for a list of the factory default settings and the default Priority Quality Level (PQL) values.

5.6.2 Changing Factory Defaults

Use the following steps to change the factory default or any configuration settings in the SSU-2000e. The following example changes an alarm from minor to major.

1. Log in to the system using one of the methods described in Section 5.2, Establishing a Connection to the SSU-2000e. The system prompts for a user name.

2. Type your user name and press **Enter**. The system prompts you for a password.

3. Type your password and press **Enter**.

4. Type **`alarm 1A12 03`** (1=shelf; 12=slot; 03=alarm number), and press **Enter**.

5. Type **`alarm 1A12`** and verify that 03 changed to major, and press **Enter**.

6. Type **`bye`** and press **Enter** to log off the system.

5.6.3 Adding or Enabling a Module

Use this procedure when replacing one type of module with a different type of module in the same slot. The following example procedure adds a module to shelf 1, slot 12.

1. Insert the module into slot 12 of the main shelf.

2. Log on to the system using one of the methods described in Section 5.2, Establishing a Connection to the SSU-2000e. The system prompts for a user name.

3. Type your user name and press **Enter**. The system prompts you for a password.

4. Type your password and press **Enter**. The system prompt appears.

5. Type **`config 1A12 enable`** and press **Enter**.

6. Type **`config`** and press **Enter** to verify that the module is registered.

7. Type **`bye`** and press **Enter** to log off the system.

5.6.4 Disabling a Module

Use this command to temporarily disable a module without removing it from the system. The following example procedure disables the module in shelf 1, slot 12.

1. Log in to the system using one of the methods described in Section 5.2, Establishing a Connection to the SSU-2000e. The system prompts for a user name.

2. Type your user name press **Enter**. The system prompts for a password.

3. Type your password and press **Enter**. The system prompt appears.

4. Type **`config 1A12 disable`** and press **Enter** to disable the module.

5. Type **`bye`** and press **Enter** to log off the system.

5.6.5 Removing a Module

Use this procedure to permanently remove a module from the system. If a module has been unplugged from the system, this command can also be used to clear the module’s active alarms. The following example procedure removes the module in shelf 1, slot 12 from the registry.

1. Log in to the system using one of the methods described in Section 5.2, Establishing a Connection to the SSU-2000e. The system prompts for a user name.
2. Type your user name press **Enter**. The system prompts for a password.
3. Type your password and press **Enter**.The system prompt appears.
4. Remove the module.
5. Type `config 1A12 remove` and press **Enter**.
6. Type `config` and press **Enter** to verify that the module is not in the registry.
7. Type `bye` and press **Enter** to log off the system.

5.6.6 Customizing Other Configuration Options

The SSU-2000e allows the user to change any or all configuration settings, depending on the access level. Use the following procedures to customize the system for a particular environment.

1. Log in to the system using one of the methods described in Section 5.2, Establishing a Connection to the SSU-2000e. The system prompts for a user name.
2. Type your user name press **Enter**. The system prompts for a password.
3. Type your password and press **Enter**. The system prompt appears.
4. Use the commands listed in Section B.3, Interactive Command Set to configure the system.

RECOMMENDATION …

Do not perform any command whose function you do not understand. This could result in system improper provisioning of the network.

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5. Type **setup save** and press **Enter** to save the current configuration as the user default setting.
6. Type **bye** and press **Enter** to log off the system.

5.7 Restoring Factory Defaults

Use the following procedure to reset the configuration to the factory default.

1. Log in to the system using one of the methods described in Section 5.2, Establishing a Connection to the SSU-2000e. The system prompts for a user name.

2. Type your user name press **Enter**. The system prompts for a password.

3. Type your password and press **Enter**.

4. Type **setup xAY factory** and press **Enter**.

5. Type **bye** and press **Enter** to log off the system.

IN THIS CHAPTER ...

Chapter 6 Commissioning the SSU-2000e

The commissioning tests for the SSU-2000e system are checklist-based operational tests performed by field engineers at the installation site after completing the installation, system turn-up, and provisioning to verify that the system is correctly installed and configured and is operating properly. After performing these tests, the system is ready to be placed in service.

Record the results on the data sheet provided in Section 6.4, Commissioning Test Data Sheet.

6.1 Readiness to Test Checklist

Before performing the commissioning tests in the following section, ensure that all items in the SSU-2000e Readiness Checklist in Table 6-1 have been performed. Record the results in the Checked column.

Table 6-1. SSU-2000e Readiness Checklist

Task Required for System Readiness	Checked
The SSU-2000e is installed in the rack with a minimum of 76 mm clearance between the bottom of the lowest shelf and the floor, or from other equipment in the rack.	
The SSU-2000e main shelf has minimum of 25.4 mm clearance between the top of the shelf and an adjacent shelf.	
An SSU-2000e Clock module is installed in shelf slot A1 and/or A12 as required.	
An SSU-2000e Communication module is installed in slot A2.	
At least one Input module is installed in I/O slots A3 through A11.	

Table 6-1. SSU-2000e Readiness Checklist (Continued)

Task Required for System Readiness	Checked
Optional: A GPS Input module is installed in slot A3 or A5 and the correct type of Radio antenna is attached to the corresponding Radio antenna connector in the front panel. See Appendix C.3, Antenna Installation, for more information.	
At least one Output module is installed in shelf slot A4 through A10, unless the monitor only configuration is being used, or an SDU-2000e Synchronization Distribution Unit expansion shelf is installed.	
An SSU Expansion Terminator, P/N 12013049-000-0, must be installed in connector J8 if an SDU-2000e expansion chassis is *not* being used. A terminator must also be installed in connector J105 on the last expansion chassis used in the system.	
An SDU Backup Clock Terminator, P/N 12013xxx-000-0, must be installed in connector J9 if an SDU-2000e expansion chassis is *not* being used. A terminator must be installed in connector J106 on the last expansion chassis used in the system.	
External power supplies (–48/60 vDC inputs) are connected to the A and B Power input connectors on the SSU-2000e main shelf and all installed expansion shelves.	
The selected set of critical, major and minor alarms connectors on the front panel of the SSU-2000e are connected to the customer's alarm circuitry.	
At least one reference input is connected to each Input module in the SSU-2000e main shelf.	
Power-up has been performed, user configuration setup and saved, and IP addresses are assigned for the Ethernet interface.	
A System Administrator and user access levels have been assigned to the SSU-2000e, see Section 5.3, Adding the Administrator User to the System.	
If the Ethernet connection is being used, the Ethernet connection on the front panel of the SSU-2000e is connected into the LAN.	

6.2 Equipment Requirements

The following equipment is required to perform the commissioning tests:

- Digital Voltmeter (DVM)
- Communications analyzer to check for correct framing, Sync Status Messaging (SSM), and line coding
- Oscilloscope with correct load terminations and cables to verify outputs

NOTE …

If the communications analyzer has the ability to test the pulse mask, an oscilloscope is not required.

- PC or laptop with serial port and TCP/IP connectivity and terminal emulation software such as Microsoft HyperTerminal or ASCII terminal
- If testing stability and accuracy of output against another primary reference source (PRS), a phase recorder will also be required

6.3 Commissioning Tests

The following paragraphs contain the SSU-2000e commissioning test procedures. These procedures consist of the following:

- Testing the Ethernet Communications Interface
- Testing the RS-232 Ports
- Testing the Minor alarms
- Testing the Major alarms
- Testing the Critical alarms
- Testing the Reference Input Signals
- Testing the Output signals

6.3.1 Testing the Ethernet Communications Interface

If an Ethernet connection to a network has been installed, use the following procedure to test the ethernet connection.

1. Telnet from the PC to the IP address assigned to the SSU-2000e system.
2. Log in by typing your assigned "username" and "password" and press **Enter.** The system should respond with the SSU-2000e prompt.
3. Type `bye` and press **Enter** to log off the system.

6.3.2 Testing the EIA-232 Ports

To test the EIA-232 port A:

1. Connect the PC or terminal to EIA-232 Port A as described in Chapter 5, Operating and Provisioning Procedures.
2. Type **HELP** and press **Enter**.
3. Verify that the system responds to the command.
4. Exit the serial communication session. Move the direct connect cable to each of the remaining two serial ports and repeat steps 2 and 3.

6.3.3 Testing The Minor Alarms

To test the Minor alarm relay closures and software:

1. Enter the **ALARM** command and set Power A to the alarm level to MINOR.
2. Remove Power A input by removing the A-bus fuse (or the fuse that supplies Power A).
3. Verify that the MINOR alarm indicator is ON.
4. Verify that a MINOR alarm is reported to the communications terminal.
5. Type **EVENTS** and press **Enter**; verify that a MINOR alarm was logged in the event log.
6. Replace the fuse to restore Power A to the unit.
7. Verify that the alarm clears, is reported and logged.

6.3.4 Testing the Major Alarms

To test the Major alarm relay closures and software:

1. Enter the **ALARM** command and set Power A alarm level to MAJOR.
2. Remove Power A input by removing A-bus fuse (or fuse that supplies Power A).
3. Verify that the MAJOR alarm indicator is ON.
4. Verify that the MAJOR alarm is reported to the communications terminal.
5. Enter **EVENTS** command and verify a MAJOR alarm was logged in the event log.
6. Replace the fuse to restore Power A to the unit.
7. Verify that the alarm clears, is reported and logged.

6.3.5 Testing the Critical Alarms

To test the Critical alarm relay closures and software:

1. Type **ALARM** and press **Enter**.
2. Set the Power A alarm level to **CRITICAL**.
3. Remove Power A input by removing A-bus fuse (or fuse that supplies Power A).
4. Verify that the **CRITICAL** alarm indicator is ON.
5. Verify that the CRITICAL alarm is reported to the communications terminal.
6. Enter **EVENTS** command and verify a CRITICAL alarm was logged in the event log.
7. Replace the fuse to restore Power A to the unit.
8. Verify that the alarm clears, is reported and logged.
9. Enter the **ALARM** command and restore Power A to the original alarm level.

6.3.6 Testing the Reference Signals and Selection

To test the reference signals and selection:

1. Type **INPUT** and press **Enter** to verify each input signal is present with no alarms. Each reference input is listed by module position and port number, status, phase A and B readings, input PQL, signal alarms, and MTIE alarms.
2. The status should be **OK** and the Priority Quality Level (PQL) should indicate the received Sync Status Message (SSM) level or the provisioned value. The phase values will be dependent on the received signal. The signal alarms should be **present** (///// (no alarms present, F indicates an alarm) and the MTIE alarms should all be **OK**.
3. Type **REF** and press **Enter** to determine the current selection of input reference signal. Disconnect this input signal and verify a Loss Of Signal (LOS) is reported for the input, and the unit selects an alternate input for the reference signal.
4. Reconnect the input signal and verify that the LOS condition is cleared and the reference input is selected according to the system configuration. This depends on the setting for Revertive Selection, Input Priorities, and Reference Selection mode.
5. Type **EVENT** and press **Enter**; verify that the alarms and events created are recorded in the event log.

6.3.7 Testing the Clock Section

To test the clock section:

1. Type **CLK** and press **Enter** to verify each clock is operating properly.

   The system displays the clocks by module position (1A1 for Clock A and 1A12 for Clock B) and the status for each clock (SEL for the selected clock and OK for the standby clock).

2. Verify that the PLL mode for each clock is **LOCK** at this time, and that the Tau value is at the maximum time constant set for each clock, dependent on the clock type of ST2 or ST3E.

   The PQL should be the level the clock is supplying to the Output modules, dependent on the reference input when in lock mode. The frequency offset will be dependent on the clock type, typically less than $2E^{-10}$ for ST2 and $1E^{-6}$ for ST3E. This only indicates the uncorrected frequency offset of the oscillator which is being removed by the clock DDS circuitry.

   The sigma value indicates the stability of the clock, which should be less than $1E^{-9}$.

6.3.8 Testing the Output Section

To test the output section:

1. Type **OUTPUT** and press **Enter** to verify that each Output module is operating with no alarms. This command displays the Output modules by position with module status OK and the selected clock. The clock status indicates the presence or absence of the four possible clocks A, B, C (bypass), or D (expansion shelf only).

2. Verify that any outputs configured for redundant pairs are so indicated in the status report. The PQL will indicate the output SSM level for all ports and is supplied by the selected clock.

3. Verify that all output ports (which are intended to be active) indicate Y in the port status.

6.3.9 Testing the System Stability and Accuracy (Optional)

Perform this test only if a PRS (primary reference source) and the necessary test equipment is available. If the above tests have been passed, the system output will meet the stability and accuracy of the reference input.

1. Connect one of the system outputs and the PRS signal to the test equipment to monitor the stability and accuracy. This test should be allowed to run for 24 hours to collect sufficient data to verify the system output meets specifications.

2. Process the collected 24 hour data and verify that the frequency and stability (MTIE and TDEV) meet the specifications.

This completes the commissioning tests. The system is ready to be placed in service.

6.4 Commissioning Test Data Sheet

Complete the following test data sheet as an indicator of operational readiness of the SSU-2000e.

Table 6-2. Commissioning Test Data Sheet - SSU

Test	Pass	Fail
Ethernet communications		
EIA-232 Port A communications		
EIA-232 Port B communications		
EIA-232 Port C communications (on front of Communications module)		
MINOR Alarms		
MAJOR Alarms		
CRITICAL Alarms		
Reference Signals and Selection		
Clock Section		
Output Section		
System Stability and Accuracy (optional)		

6.5 Commissioning the SDU 2000e

The SDU-2000e expansion chassis commissioning tests are checklist-based operational tests performed by field engineers at the installation site after completing installation, system power-up, and provisioning to verify that the system is correctly installed, configured, and operating properly. After testing and verification of system functionality, the system is ready to be placed in service.

6.5.1 Readiness to Test Checklist

Before performing the commissioning tests in the following section, ensure that all items in the SDU-2000e Readiness Checklist, Table 6-3, have been performed. Record the results in the Checked column.

Table 6-3. SDU-2000e Readiness Checklist

Task	Checked
An SDU-2000e is installed in the rack with a minimum of 76 mm clearance between the bottom of the lowest shelf and the floor, or from other equipment in the rack	
Output modules are installed in shelf slots A1 through A10, and blank filler panels are installed for all unpopulated slots	
An SDU-2000e Buffer module is installed in chassis slot A15 and A16 as required. One Buffer module is required, and a second module is optional	
An SDU Expansion Terminator (P/N 12013049-000-0) must be installed in connector J105 of the last expansion chassis used in the system	
An SDU Backup Clock Terminator (P/N 12013*xxx*-000-0) must be installed in connector J106 of the last expansion chassis used in the system	
The Shelf Address switch is correctly set to identify each expansion chassis location in the system. Addresses *2* through *5* correspond to shelves *1* through *4*	
External power supplies (-48/60 vDC inputs) are connected to the A and B Power input connectors (J101 and J102) on each installed SDU-2000e expansion chassis	
Power-up has been performed on the SSU-2000e and SDU-2000e system	

6.5.2 Equipment Requirements

The following equipment is required to perform the commissioning tests:

- Digital Voltmeter (DVM)
- Communications analyzer to check for correct framing, Synchronous Status Messaging (SSM), and line coding
- Oscilloscope with correct load terminations and cables to verify outputs

NOTE …

If the communications analyzer has the ability to test the pulse mask, an oscilloscope is not required.

- PC or laptop with serial port and TCP/IP connectivity and terminal emulation software such as Microsoft HyperTerminal or ASCII terminal
- If testing stability and accuracy of output against another primary reference source (PRS), a phase recorder will also be required

6.5.3 Commissioning Tests

Perform the SDU-2000e commissioning test procedures on the following:

- Testing the Output alarms
- Testing the SSU-2000e output signals

Testing the Output Alarms

Use the following steps to test the output alarm and reporting software.

1. Remove **Power A** input power (A-BUS) in connector J101.
2. Verify that the **–**48/60 V POWER A indicator (LED) on the Buffer modules turns off.
3. Type **`EVENTS`** and pressing **Enter** to verify that an alarm is reported to the SSU-2000e system**.** An alarm should be logged into the event log at this time.
4. Replace the A-BUS connector to restore POWER A to the unit.
5. Verify that the alarm clears, and that it is reported and logged into the event log.
6. Verify that the –48/60 V POWER A LED on the Buffer modules is lit green.
7. Repeat Steps 1 through 6 for Power B input power (B-BUS) in connector J102.

Testing the Output Section

Use the following steps to test the output section.

1. Type **OUTPUT** and press **Enter** to verify each Output module is operating without alarms. This command displays the Output modules by position with module status OK and the selected clock. The clock status will indicate the presence or absence of the four possible clocks A, B, C for bypass, or D for the expansion shelf only.
2. Verify that any outputs configured for redundant pairs are indicated in the status report. The Priority Quality Level (PQL) will indicate the output SSM level for all ports and is supplied by the selected clock.
3. Verify that all output ports (which are intended to be active) indicate Y in the port status.

Testing the System Stability and Accuracy (Optional)

Perform this test *only if* a primary reference source (PRS) and the necessary test equipment is available.

If the above tests have been passed, the system output will meet the stability and accuracy of the reference input.

1. Connect one of the system outputs and the PRS signal to the test equipment to monitor the stability and accuracy. This test should be allowed to run for 24 hours to collect sufficient data to verify the system output meets specifications.

2. Process the collected 24 hour data and verify that the frequency and stability (MTIE and TDEV) meet the specifications.

This completes the commissioning tests. The system is ready to be placed in service.

6.5.4 Commissioning Test Data Sheet

Complete the Commissioning Test Data Sheet (Table 6-4) as an indicator of operational readiness of the SDU-2000e.

Table 6-4. Commissioning Test Data Sheet - SDU

Test	Pass	Fail
EIA-232 Port A communications		
MINOR Alarms		
MAJOR Alarms		
CRITICAL Alarms		
Output Section		
System Stability and Accuracy (optional)		

IN THIS CHAPTER ...

Chapter 7 Maintenance and Troubleshooting

This chapter provides preventive and corrective maintenance procedures, equipment re-ordering/ return procedures and troubleshooting procedures for the SSU-2000e system.

NOTE ...

Datum offers a 24-hour technical support line and a 2-hour response time for each trouble call. For Customer Service, call: (512) 721-4032 or (866) 638-7962 (866 NET-SYNC) during normal business hours (8 a.m. to 5 p.m. CST), or (512) 721-4000 after hours and on weekends, Fax: (512) 251-9685, or E-mail: austinsupport@datum.com.

7.1 Responding to Alarms

The SSU-2000e monitors various system parameters and stores this information as alarms and event messages which is extremely useful in troubleshooting the system. If an alarm occurs, follow the troubleshooting procedures in Section 7.4, Troubleshooting, to clear the alarm.

7.2 Preventive Maintenance

The SSU-2000e requires no preventive maintenance. Care should be taken to ensure the unit is not exposed to hazards such as direct sunlight, open windows, or extreme heat. See Section 3.2.2, Electromagnetic Interference Considerations, for other conditions that may cause damage.

Should the unit require cleaning, the exterior chassis may be wiped off using a soft cloth dampened with mild soapy water.

CAUTION…

To avoid damage to the system, under no circumstances should the interior chassis of the SSU-2000e be allowed to come in contact with water.

CAUTION …

To avoid damage to the system, never attempt to vacuum the interior of the SSU-2000e.

CAUTION …

To avoid the possibility of the lithium battery exploding in the Communications module of Clock modules, ***do not*** replace the battery. Return the entire module to Datum Service Department for battery replacement and disposal.

CAUTION …

To avoid electrostatic discharge (ESD) and damage to the internal circuitry, never attempt to vacuum the interior of the SDU-2000e. If damaged, return the unit to the Datum Service Department for corrective service.

CAUTION …

To avoid personal injury and electrostatic discharge (ESD) damage to equipment, follow the ESD precautions as listed in this guide.

7.3 Corrective Maintenance

The SSU-2000e and SDU-2000e have a modular design; field service is limited to replacing the FRUs (field replaceable units) as identified in Table 7-1 and Table 7-2. This table also outlines possible component problems and corrective action. Refer to Section 7.5, Re-ordering Information, for information on re-ordering, re-packing, or returning equipment to the factory.

CAUTION …

To maintain EMC compliance, use only properly shielded cabling on all telecom signal wiring, including I/O, clocks, and Ethernet connections. Ensure that connections are appropriately grounded at both ends.

WARNING ...

To avoid serious personal injury or death, exercise caution when working near high voltage lines. In particular:

- Use extreme caution when installing the GPS antenna near, under or around high voltage lines.
- Follow local building electrical codes for grounding the antenna system that is used with the SSU-2000e unit.

CAUTION ...

For continued fire protection, fuse the interface “A” power feeds at the power distribution source for (5A ⎓ 60vDC).
This unit must be grounded. Refer all servicing to qualified personnel.

CAUTION ...

For continued EMC compliance, replace all deformed module gaskets with the same type.
Clean gaskets and mating surfaces.
Secure all modules with captive screws.

Table 7-1. SSU Corrective Action Table

Component	Corrective Action	Part Number
Motherboard or Main Chassis Fault	Contact Datum Customer Service	25413140-000-0
Defective Cable	Replace defective cable	See Chapter 9, Hardware Configuration Guide
Module Fault(s)	1. Check that module(s) is seated correctly. 2. Address any fault LED lights. 3. If present, press RST button on Comm module. 4. Check both Power A and Power B inputs for a tripped breaker or blown fuse on the input power control panel. 5. Replace module. 6. If unable to correct the problem, contact Datum Customer Service.	All Modules

Table 7-1. SSU Corrective Action Table (Continued)

Component	Corrective Action	Part Number
Module Replacement		
Communications Module 2E Clock Module 3E Clock Module E1 Output Module 1-Port DS1 Input Module 3-Port DS1 Input Module DS1 Output Module 1-Port E1 Input Module 3-Port E1 Input Module		23413012-000-0 23413016-000-0 23413015-000-0 23413018-000-0 23413013-001-0 23413013-002-0 23413017-000-0 23413014-001-0 23413014-002-0

Table 7-2. SDU Corrective Action Table

Component	Corrective Action	Part Number
Motherboard or Main Chassis Fault	Contact Datum Customer Service	25413141-000-0
Defective Cable	Replace defective cable	805SCSI-0050 (1 m cable; other lengths available
Module Fault(s)	1. Check that module(s) is seated correctly. 2. Address any fault LED lights. 3. If present, press RST button on Comm module. 4. Check both Power A and Power B inputs for a tripped breaker or blown fuse on the input power control panel. 5. Replace module. 6. If unable to correct the problem, contact Datum Customer Service.	All Modules
Module Replacement		
Buffer Module E1 Output Module DS1 Output Module 2048 kHz Output Module Composite Clock Output Module		25413022-000-0 23413018-000-0 23413017-000-0 23413159-000-0 23413158-000-0

7.4 Troubleshooting

The SSU-2000e incorporates many alarms and event messages to alert that a possible problem exists. These alarm and event message reports can be accessed via the Comm module serial ports using a dumb terminal or PC. Communication may also be established using the RJ-45 Ethernet connector (ETHERNET 10-BASE-T) on the connector interface panel of the chassis. Section 5.2.1, Communicating by Serial Port, outlines the procedures for connecting to the SSU-2000e using the Comm module serial ports. Section 5.2.2, Communicating by Ethernet, outlines the procedures for connecting via the Ethernet connection. Appendix A, Alarms and Events, details event and alarm descriptions, default event and alarm levels, status messages and corrective action.

NOTE ...

Datum offers a 24-hour technical support line and a 2-hour response time for each trouble call. For Customer Service, Call: (512) 721-4032 during our normal business hours (8 a.m. to 5 p.m. CST), or (512) 721-4000 after hours and on weekends, Fax: (512) 251-9685, or E-mail: austinsupport@datum.com

7.4.1 Establishing a Connection

NOTE ...

An SSU-2000e Administrator must be appointed prior to connecting to the system. The Administrator will assign User privileges and access codes. See Section 5.3, Adding the Administrator User to the System, for more details.

To perform troubleshooting on the SSU-2000e, you must establish a serial connection to a terminal, laptop or PC with terminal emulation software. This is done using port A or B (located on the back panel), or the Local, located on the front panel of the communications module. If the SSU-2000e is connected to a LAN, an Ethernet telnet session may be established. Refer to Section 5.2.1, Communicating by Serial Port, to establish a serial connection and Section 5.2.2, Communicating by Ethernet, to establish an Ethernet connection.

7.4.2 Troubleshooting Guide

This section describes troubleshooting procedures for the SSU-2000e. Table 7-4 details event and alarm descriptions, default event and alarm levels, status messages and corrective actions.

NOTE ...

All event and alarm levels are user-configurable. Events and alarm levels listed in Table 7-4 are factory defaults.

The modular design of the SSU-2000e offers a high level of stability and reliability. After installation and self-diagnostics, the majority of events and alarms can be attributed to fluctuations in signal quality, which may be self-clearing. Others may be caused by faulty hardware and software configurations. Regardless of the cause, hardware seldom needs to be replaced. If corrective action has been taken and the problem persists, call Customer Service.

NOTE …

Datum offers a 24-hour technical support line and a 2-hour response time for each trouble call. For Customer Service, call (512) 721-4032 during our normal business hours (8 a.m. to 5 p.m. CST), or (512) 721-4000 after hours and on weekends.

When a Comm module is installed and functioning properly, it monitors the SSU-2000e and logs unit events into non-volatile memory for inspection at a later date. Events are conditions within the unit, or at the interfaces of the unit, which may indicate abnormal operation or a change in the unit's operational status. Although every alarm is considered to be an event, not every event is an alarm. For example, a login is recorded as an event but is not considered to be an alarm. In this case, no action is required by the user. Recurring events may be escalated to alarm status and may require action by the user. Conversely, alarms may be de-escalated and corrected automatically. Section 7.3, Corrective Maintenance, explains how to interpret status messages and take corrective action if needed.

7.4.3 Interpreting Status Messages

The SSU-2000e provides two types of status messages: alarm and event. The following sections describe these messages.

Alarm Messages

With the exception of loss of power alarms (on main chassis and expansion unit), all alarms are module alarms. Table A-1 lists each module with corresponding alarm descriptions, alarm levels, status messages, and corrective action. Since a "no fault" alarm requires no action, the "Corrective Action" category applies only to fault messages requiring user intervention.

Event Messages

Table A-2 lists event messages categorized by module. Each section lists status messages associated with each module and an event description of each message.

Figure 7-1 shows the structure of a typical Alarm and Event report status messages.

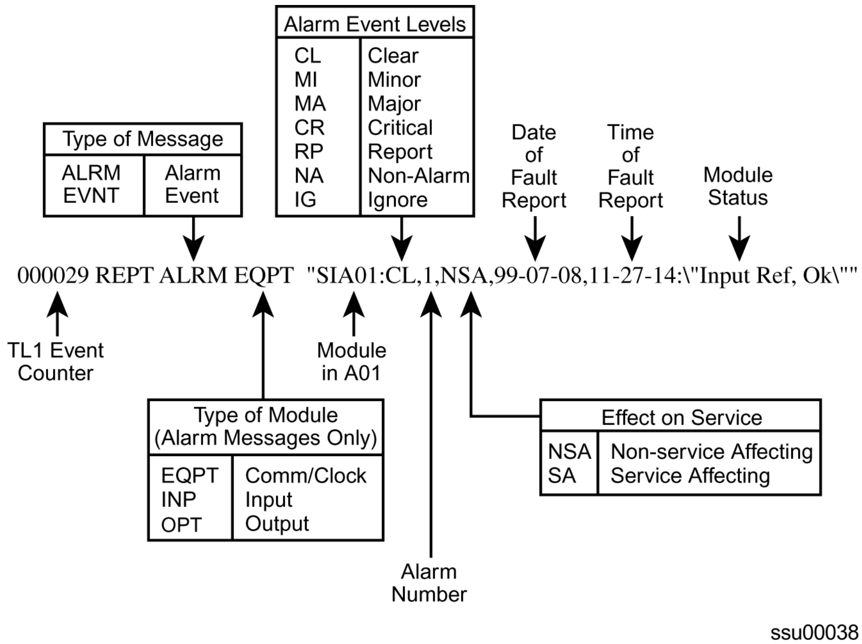


Figure 7-1. Alarm and Event Status Breakdown

7

Table 7-3 outlines SSU-2000e troubleshooting procedures.

Table 7-3. SSU-2000e Troubleshooting Procedures

Symptom	Probable Cause	Troubleshooting Procedure/ Corrective Action
No LED lit on any module	No power to unit	Check to ensure that UPS (if applicable) is operating correctly.
	Both A and B fuses are blown	Remove both fuses and replace.
	Loss of ground	Re-attach ground wires.
	Loose power cabling to unit	Check that power cables to unit are securely fastened.
	Main shelf is faulty	Contact Datum Customer Service.
Unable to communicate with system	Loose cabling	Check that cabling is securely fastened.
	Bad peripheral device configuration	Check that communication device is properly configured (refer to Section 7.4.1, Establishing a Connection, for more information).
	Improperly installed or faulty Comms module	1. Re-seat the Comms module. 2. Press the RST button located on the front panel of module. 3. If problem is not rectified, call Datum Customer Service.
	Software emulator is configured to Com1, but cable is physically attached to Com2	Either attach cable to Com1 or re-configure software emulator to Com2.
	Software emulator is set to 9600 baud, but system baud rate is 19,200.	Change to the software emulator to 19,200 baud.
	Bad serial port(s)	Connect to another serial port. If none of the ports are functional, call Datum Customer Service.
Status LED on input module is amber	Firmware compromised	Press the RST button on front panel of Input module.

Table 7-3. SSU-2000e Troubleshooting Procedures (Continued)

Symptom	Probable Cause	Troubleshooting Procedure/ Corrective Action
Fault LED on output module is lit	Loose module	Reseat module.
	Loss of signal to output module	Reseat or replace input module (or clock module if necessary).
	Line fault	Remove the Tx Cable
	Improper redundancy configuration	Adjust accordingly. Main chassis: ▪ left slot = even ▪ right slot = odd Expansion chassis: ▪ left slot = odd ▪ right slot = even
Fault LED on output module is flashing amber	Fault on distribution cabling	Verify cabling is connected properly. Replace cabling.
No LED lit on modules	Power supply failure	Check connection to power supply.
	Blown fuse	Replace module.
No alarms being reported when there is an alarmed condition	Compromised firmware	Press RST on Comms module front panel.
	Faulty Comms module	Replace Comms module.
	Alarmed module is faulty	Replace module.
Loss of power from expansion chassis	No power to unit	Check to ensure that UPS (if applicable) is operating correctly.
	Both A and B fuses on expansion chassis unit are blown	Remove fuses and replace.
	Loss of ground	Re-attach ground wires.
	Loose power cabling to expansion unit	Check that power cables to unit are securely fastened.
	Expansion shelf is faulty	Call Customer Service.
Loss of signal from expansion chassis	D clock not connected while loose SDU cable to the expansion shelf	Check SDU cable and connect D clock.
Any source LED on the output module amber	Loss of clock signal	Ensure clock modules are inserted properly.
	Clock modules are in warm-up mode	No action necessary.

7

Table 7-3. SSU-2000e Troubleshooting Procedures (Continued)

Symptom	Probable Cause	Troubleshooting Procedure/ Corrective Action
Any LED on input module amber	No signal to the input panel	Ensure signals are properly routed to the input panel.
	No input signal on cable connected to input panel	Replace *no-signal* cable with signaled cable.
	I/O input adapter panel is not connected to the input module	Connect the I/O input adapter panel to the input module.
No output signal on the output panel	Port is not turned on	Use the interactive command to turn the port on.
	The I/O output adapter panel is not connected to the output module	Connect the I/O output adapter panel to the output module.

7.4.4 Troubleshooting the SDU-2000e

The buffer module in the SDU-2000e collects status information from the Output modules and relays status messages to the SSU-2000e. The status messages alert the SSU-2000e when a possible problem exists; they can be accessed through the SSU-2000e using a terminal or PC using a terminal emulation software. Refer to Section 5.2, Establishing a Connection to the SSU-2000e, for more information on connecting to an SSU-2000e for troubleshooting. Table 7-4 outlines troubleshooting procedures for the SDU-2000e.

NOTE …

If fault isolation and corrective action have been performed and the problem persists, contact Datum Customer Service. Datum offers a 24-hour technical support line and a 2-hour response time for each trouble call. For Datum Customer Service, Call: 001-512-721-4000, Fax: 001-512-251-9685, or E-mail: austinsupport@datum.com

Table 7-4. SDU-2000e Troubleshooting Procedures

Symptom	Probable Cause	Troubleshooting Procedure/ Corrective Action
Output module Fault indicator is on	Loose module	Re-seat module.
Output module Fault indicator is flashing Amber	Fault on distribution cabling	Verify that cabling is connected properly. Replace cabling as needed.

Table 7-4. SDU-2000e Troubleshooting Procedures (Continued)

Symptom	Probable Cause	Troubleshooting Procedure/ Corrective Action
Output module Source indicator amber	Loss of clock signal	Ensure cabling to main chassis is secure and correctly installed.
	Clock modules in main chassis are in Warm-up mode	No action necessary.
Indicators on any module are not illuminated	No power to unit	Verify that there is power to BUS-A and BUS-B, and that the power inputs are providing the required –48/60 vDC to the unit.
	Loss of ground	Re-attach ground wires.
	Loose power cabling to unit	Check that power cables to unit are securely fastened.
	Expansion shelf is faulty	Contact Datum Customer Service.
Loss of signal to/from expansion chassis	Loose SDU cable to the expansion chassis Both clocks not connected	Check SDU cable. Connect one or both clocks.

7

7.5 Re-ordering Information

To re-order any module or accessory, contact the Sales Department at Datum. Supply the module or accessory name and its Part Number along with the purchase order number. A current list of SSU-2000e system components modules/accessories and their part numbers is provided in Chapter 9, Hardware Configuration Guide. For additional information, contact the Sales Department at Datum using the contact information provided at the front of this guide.

7.5.1 Equipment Return Procedure

To return equipment to the factory or local representative for repair:

1. Call Datum Customer Service at 512-721-4000 to obtain a Return Material Authorization before returning the product for service.

2. Provide a description of the problem, product item number, serial number, and warranty expiration date.

3. Provide the return shipping information (customer field contact, address, telephone number, and so forth.)

4. Ship the product to Datum, transportation prepaid and insured, with the Return Material Authorization (RMA) number and serial numbers clearly marked on the outside of the container to:

   Datum, Inc.
   15811 Vision Drive
   Pflugerville, TX 78660

   Attention: Service Department

7.5.2 Repacking

Use standard packing procedures to protect the SSU-2000e or any of the SSU-2000e modules during shipment. Connectors should be protected with connector covers or the instrument should be wrapped in plastic before packaging. Custom foam packing material is preferred because it conforms to the shape of the instrument. Take special care to protect the front and rear panels.

In this Chapter ...

Chapter 8 Module Reference Data

This chapter contains reference information for the following modules available for use in the SSU-2000e system.

The module types include:

- Stratum 2E Clock Module
- Stratum 3E Clock Module
- Communications Module
- 1-Port and 3-Port E1 Input Modules
- 1-Port and 3-Port DS1 Input Modules
- GPS Input Module
- 2048 kHz Output Module
- E1 Output Module
- DS1 Output Module
- Composite Clock Output Module

8.1 Stratum 2E Clock Module

This section provides user reference information for the Stratum 2E Clock module.

8.1.1 Stratum 2E Clock Module Functional Overview

The Stratum 2E Clock module uses a Rubidium oscillator and meets or exceeds the performance requirements for and ITU and ETSI Type II Transit Node clocks and ANSI and Telcordia Technologies (Bellcore) Stratum 2 clocks.

The Clock module reads measurement data from the Input modules, provides frequency control of the oscillators through DDS circuitry, and generates a reference signal used by the input and Output modules.

A typical SSU-2000e system contains dual redundant Clock modules. Each Clock module maintains phase synchronization with the redundant Clock module. Its hardware and software also provides for temperature compensation, an initial offset adjustment, and frequency adjustment resolution of 1×10^{-13} or better.

With redundant Clock modules, one is selected as the master and the other as backup, with automatic switching on module removal or failure.

The master Clock module controls the provisioning of the input and Output modules and downloads module configuration information to all modules (except for the Communications module), requests measurement data and status from the Input modules, and sets the Output modules to use currently selected clock signals. The Clock modules maintain an internal time-of-day clock that is used to time stamp events to within 0.1 second of detection of the event.

This module provides an 8 kHz signal used by the Input modules and a 4 kHz signal used by the Output modules. Each Clock module provides one set of signals for use by the modules in the main chassis, and a separate set for the expansion shelves.

8.1.2 Stratum 2E Clock Module Functional Block Diagram

A simplified block diagram of the Stratum 2E Clock module is shown in Figure 8-1.

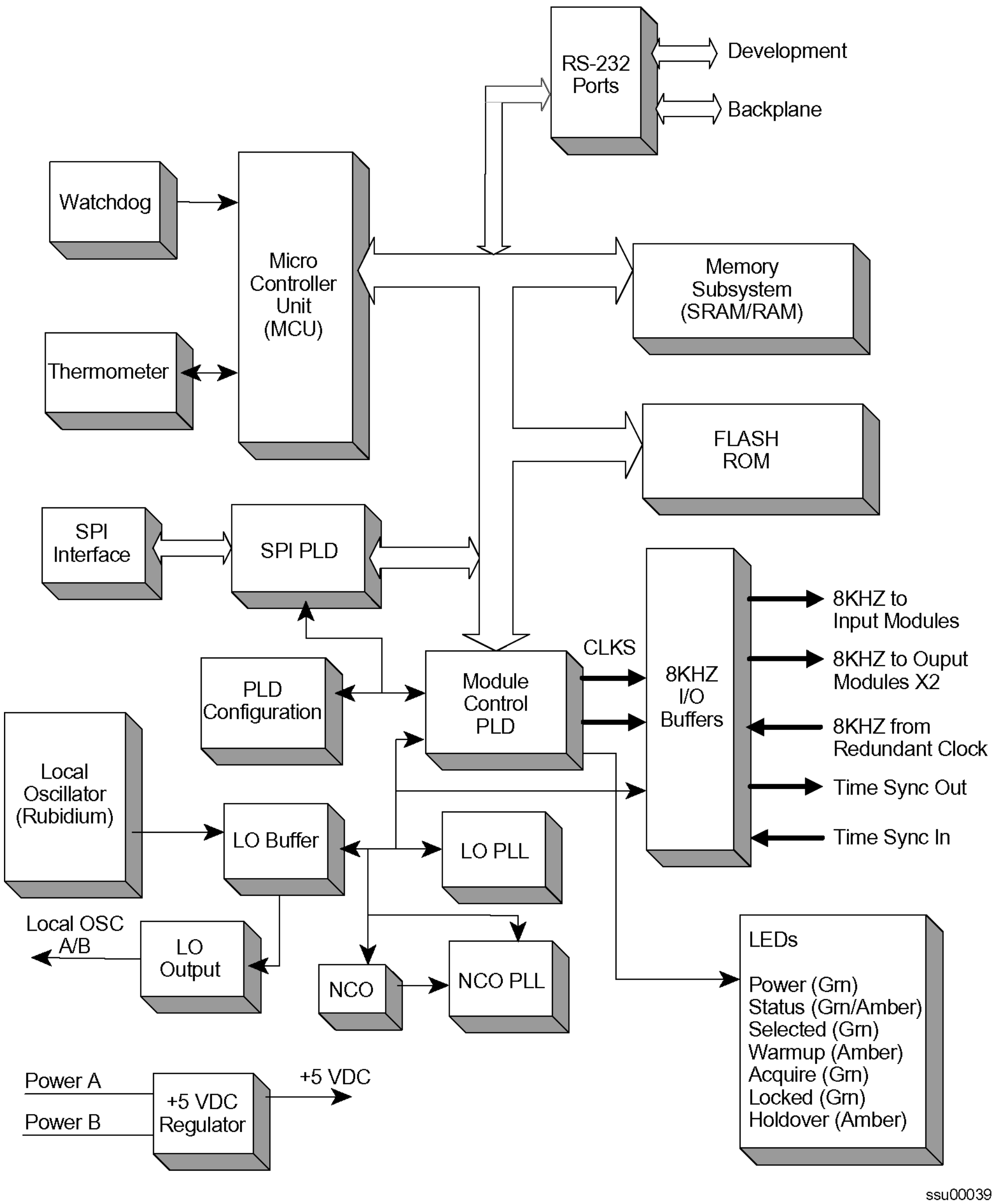


Figure 8-1. Stratum 2E Clock Module Block Diagram

8.1.3 Stratum 2E Clock Module Status LED Indicators

The Stratum 2E Clock module status LED indicators are shown in Figure 8-2 and are described in Table 8-1.

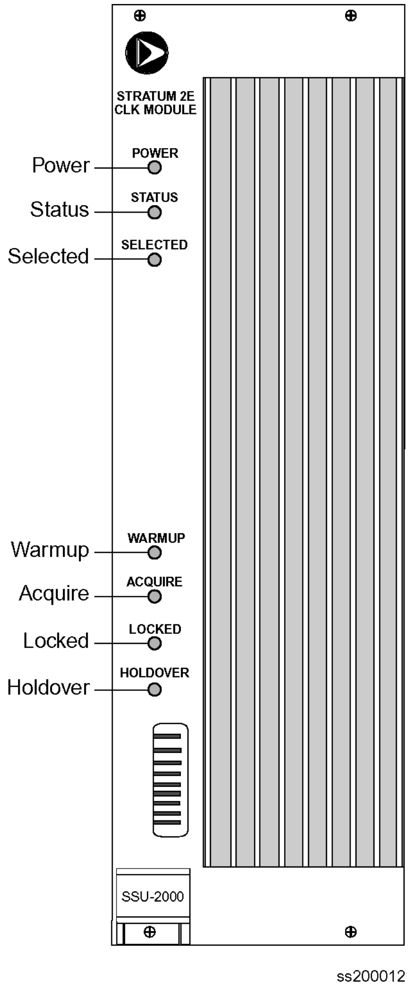


Figure 8-2. Stratum 2E Clock Module Status LED Indicators

Table 8-1. Stratum 2E Clock Module Status LED Indicators

Indicator	Color	Description
Power	Green	On = The clock module is receiving power Off = No Power Present
Status	Green/ Amber	On (Green) = No faults detected On (Amber) Blinking = Clock module is downloading firmware On (Amber) = Unknown Clock module status or fault detected
Selected	Green	On = Module selected for providing outputs Off = Module not selected

Table 8-1. Stratum 2E Clock Module Status LED Indicators (Continued)

Indicator	Color	Description
Warmup	Amber	On = Clock module is in warm-up mode Off = Clock module has completed warmup
Acquire	Green	On = Clock module is acquiring a lock on a signal Off = Not acquiring a lock on a signal
Locked	Green	On = Clock module is locked on a signal Off = Clock module is not locked on a signal
Holdover	Amber	On = Clock module is in holdover mode of operation, downloading firmware from the communication module (cannot be selected during this period) Off = Clock module is not in holdover

8.1.4 Stratum 2E Clock Module Functional Specifications

Table 8-2 lists the specifications for the Stratum 2E Clock module.

Table 8-2. Stratum 2E Clock Module Specifications

Performance Characteristic	Specification
Free Running Accuracy	Within ±5 x 10^{-10} the first year Within ±5 x 10^{-9} after 10 years
Holdover Stability (Rubidium LO) 0 to 24 hrs, @ +10 to +50 °C 0 to 24 hrs, @ 0 to +50 °C 30 days @ +10 to +40 °C 30 days @ 0 to +50 °C	 ±9 x 10E-11 ±1 x 10-10 ±1.5 x 10E-10 ±1.7 x 10E-10
Numeric Controlled Oscillator (NCO) PLL lock range	±2 x 10E-4
Tuning Resolution (Locked Mode)	<1 x 10E-13
Warm-up Time (Warm-up Mode)	20 minutes
Wander Output (Holdover)	Includes effects of all SSU-2000e modules: Compliant with clock levels per ITU-T G.812, T1.101-1999, and Telcordia Technologies GR-378-CORE and GR-1244-CORE. Meets SONET requirements per T1.105. Meets or exceeds performance requirements for ITU-T G.812 Type II and ETSI Transit Node clocks and T1.101 and Telcordia Technologies (Bellcore) Stratum 2 clocks.
Jitter (Locked or Holdover)	< 4 ns p-p (measured at the CLKA/BIN 8 kHz output)

8.1.5 Stratum 2E Clock Module Configuration Data

Table 8-3 contains a listing of software configuration options and factory defaults for the Stratum 2E Clock module.

Table 8-3. Stratum 2E Clock Module Options/Defaults

Setting	Default	Range
Warmup Time	1200 seconds	900 to 3600 seconds
Min Tau Limit	300 seconds	Constant
Max Tau Limit	10000 seconds	Constant
Min Tau	300 seconds	In the range specified in Min/Max Tau limits
Max Tau	9000 seconds	In the range specified in Min/Max Tau limits
Clk Switch AR	On	On/Off
Input Switch	AutoReturn (AR)	AR (2)/AS On (1)/AS Off (0)
Input Selection Mode	Priority	Priority (0)/Pql (1)
Local Oscillator (LO)	On	On/Off
Frequency Offset	57 ppb	Constant
Elevation Time	86400 seconds	60 to 500,000 seconds

8.2 Stratum 3E Clock Module

This section provides user reference information for the Stratum 3E Clock module used in the SSU-2000e. This module provides a lower cost backup clock solution for the system.

8.2.1 Stratum 3E Clock Module Functional Overview

The Stratum 3E Clock module meets or exceeds the performance requirements for ITU and ETSI Type III Local Node clocks and ANSI and Telcordia Technologies (Bellcore) Stratum 3E clocks.

The Stratum 3E Clock module receives measurement data from the Input modules, provides frequency control of the outputs through DDS circuitry, and generates a reference signal for use by the Input and Output modules. The Stratum 3E Clock module communicates with the Communications module and the Stratum 2E Clock module to maintain phase synchronization with the redundant Clock module. The Stratum 3E Clock module's hardware and software provides for temperature compensation, aging compensation for the Quartz oscillator, an initial offset adjustment, and frequency adjustment resolution of 1 x 10^{-13} or better.

When serving as the master clock, the Stratum 3E Clock module controls the operation of the Input and Output modules and downloads module configuration information to all modules, requests measurement data and status from the Input modules, and sets the Output modules to use currently selected Clock signals. The Stratum 3E Clock module also contains a battery powered clock that maintains the clock for timestamping events. The Clock module software reads the clock on startup and sets the clock when the system time is changed. The timestamp is referenced as the number of seconds since 00:00:00 January 1, 1980.

8.2.2 Stratum 3E Clock Module Functional Block Diagram

A simplified block diagram of the Stratum 3E Clock module is in Figure 8-3.

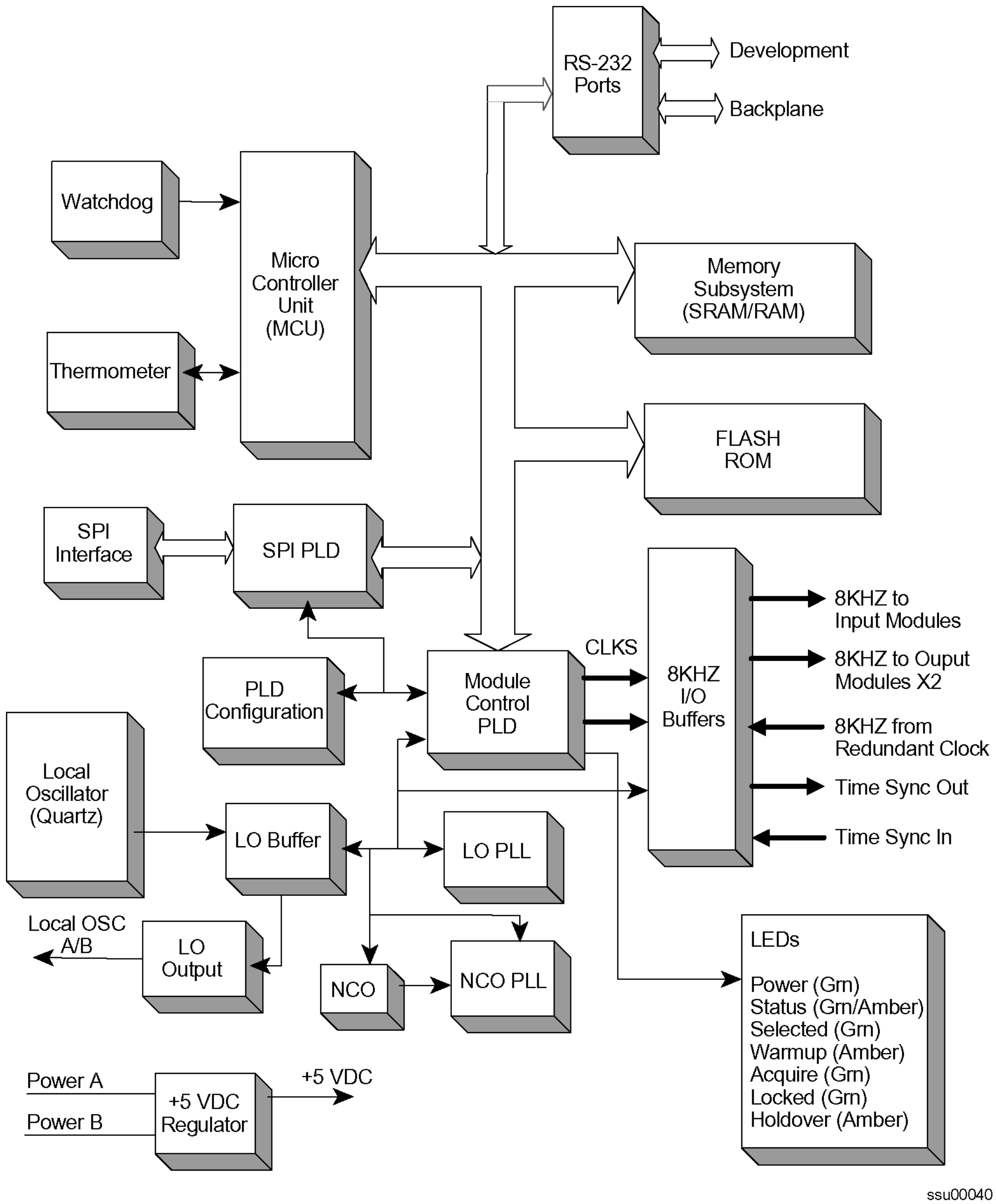


Figure 8-3. Stratum 3E Clock Module Block Diagram

8.2.3 Stratum 3E Clock Module Status LED Indicators

The Stratum 3E Clock module status LED indicators are shown in Figure 8-4 and are described in Table 8-4.

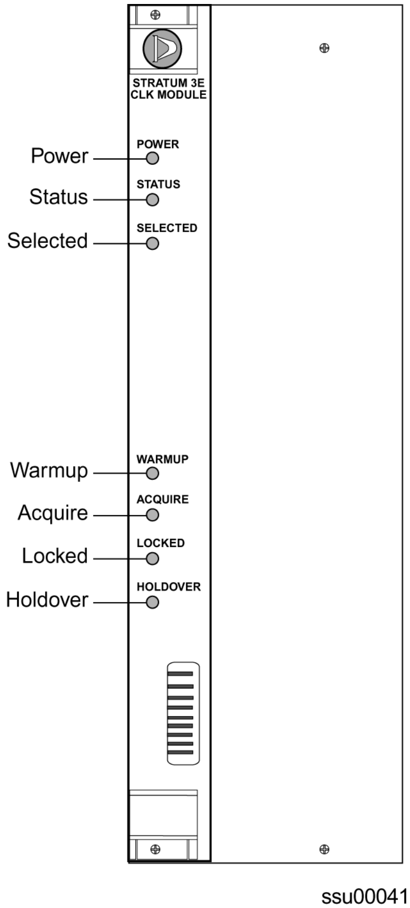


Figure 8-4. Stratum 3E Clock Module Status LED Indicators

Table 8-4. Stratum 3E Clock Module Status LED Indicators

Indicator	Color	Description
Power	Green	On = The clock module is receiving power Off = No Power Present
Status	Green/Amber	On (Green) = No faults detected On (Amber) Blinking = Clock module is downloading firmware On (Amber) = Unknown Clock module status or fault detected
Selected	Green	On = Module selected for providing outputs Off = Module not selected

Table 8-4. Stratum 3E Clock Module Status LED Indicators (Continued)

Indicator	Color	Description
Warmup	Amber	On = Clock module is in warm-up mode Off = Clock module has completed warmup
Acquire	Green	On = Clock module is acquiring a lock on a signal Off = Not acquiring a lock on a signal
Locked	Green	On = Clock module is locked on a signal Off = Clock module is not locked on a signal
Holdover	Amber	On = Clock module is in holdover mode of operation, downloading firmware from the communication module (cannot be selected during this period) Off = Clock module is not in holdover

8.2.4 Stratum 3E Clock Module Functional Specifications

Specifications for the Stratum 3E Clock module are provided in Table 8-5.

Table 8-5. Stratum 3E Clock Module Functional Specifications

Performance Characteristic	Specification
Free Running Accuracy	Within $\pm 2.5 \times 10^{-7}$, the first year (vendor spec) Within $\pm 3.7 \times 10^{-6}$ after 20 years (vendor spec)
Holdover Stability 0 to 24 hrs, @ +10 to +50 °C 0 to 24 hrs, @ 0 to +50 °C	 $\pm 5 \times 10^{-9}$ $\pm 1 \times 10^{-8}$
Numeric Controlled Oscillator (NCO) PLL lock range	$\pm 2 \times 10^{-4}$
Tuning Resolution (Locked Mode)	$<1 \times 10^{-13}$
Warm-up Time (Warm-up Mode)	20 minutes
Wander Output (Holdover)	Includes effects of all SSU-2000e modules: Exceeds requirements of (ANSI) T1.101-1994, T1.105.09, ITU G.811, T1X1.3 (proposed new limits for wander generation), and G.823
Jitter (Locked or Holdover)	< 4 ns p-p (measured at the CLKA/BIN 8 kHz output)

8.2.5 Stratum 3E Clock Module Configuration Data

The Stratum 3E Clock module is software configurable via one of the serial or Ethernet ports. The default values and the ranges for the configurable parameters are listed in Table 8-6.

Table 8-6. Stratum 3E Clock Default Values and Ranges

Setting	Default	Range
Warmup Time	1200 seconds	900-3600 seconds
Min Tau Limit	300 seconds	Constant
Max Tau Limit	500 seconds	Constant
Min Tau	300 seconds	In the range specified in Min/Max Tau limits
Max Tau	450 seconds	In the range specified in Min/Max Tau limits
Clk Switch AR	On	On/Off
Input Switch	AutoReturn (AR)	AR (2)/AS On (1)/ AS Off (0)
Input Selection Mode	Priority	Priority (0)/Pql (1)
Local Oscillator (LO)	On	On/Off
Frequency Offset	57 ppb	Constant
Elevation Time	86400 seconds	60 to 500,000 seconds

8.3 Communications Module

This section provides reference information on the Communications module that functions as a master controller for the SSU-2000e system.

8.3.1 Communications Module Functional Overview

The Communications module installs in slot A2 and provides an interface between the user and the SSU-2000e system. This interface allows users to display and control much of the activity in the SSU-2000e system and the optional SDU-2000e expansion system. The Communications module supports three serial ports (including one local craft port) and one Ethernet port, and allows communication over each of them independently in one of several possible modes (ASCII mode, TL1 mode, and packet mode).

The software in the Communications module allows reprogramming of the flash ROM and reconfiguration of all programmable logic devices, while installed at the user’s location. The Communications module also allows for this same capability for the input and Clock modules. The software on all other module types installed in the SSU-2000e system can be updated by downloading it through the Communications module.

When the Communications module is installed, it performs an initial software verification test to verify operation. If the module is installed in the SSU-2000e with power already applied and with other modules installed, the Communications module reads the configuration of the modules in the SSU-2000e and the modules in all installed SDU-2000e expansion shelves. This information is saved in nonvolatile memory on the Communications module. If power is applied to the SSU-2000e after the Communications module is installed, it initializes before any other module and provides configuration information to the individual modules.

The master controller function for the SSU-2000e can reside in the Communications module or in either of the Clock modules. The priority of the selection of the module that will provide the master controller function rests with the Communications module, Clock A, and Clock B, in that order. In the event of removal of the module designated as the master controller, that function automatically and seamlessly switches to the next module in priority order.

All man/machine communications are controlled by the Communications module. This module then communicates with the other modules in the SSU-2000e to read configuration data, set operational parameters, and determine what type of modules are installed. When a module is replaced, the controller loads the correct operational parameters into the replacement module.

8.3.2 Communications Module Functional Block Diagram

A simplified block diagram of the Communications module is shown in Figure 8-5.

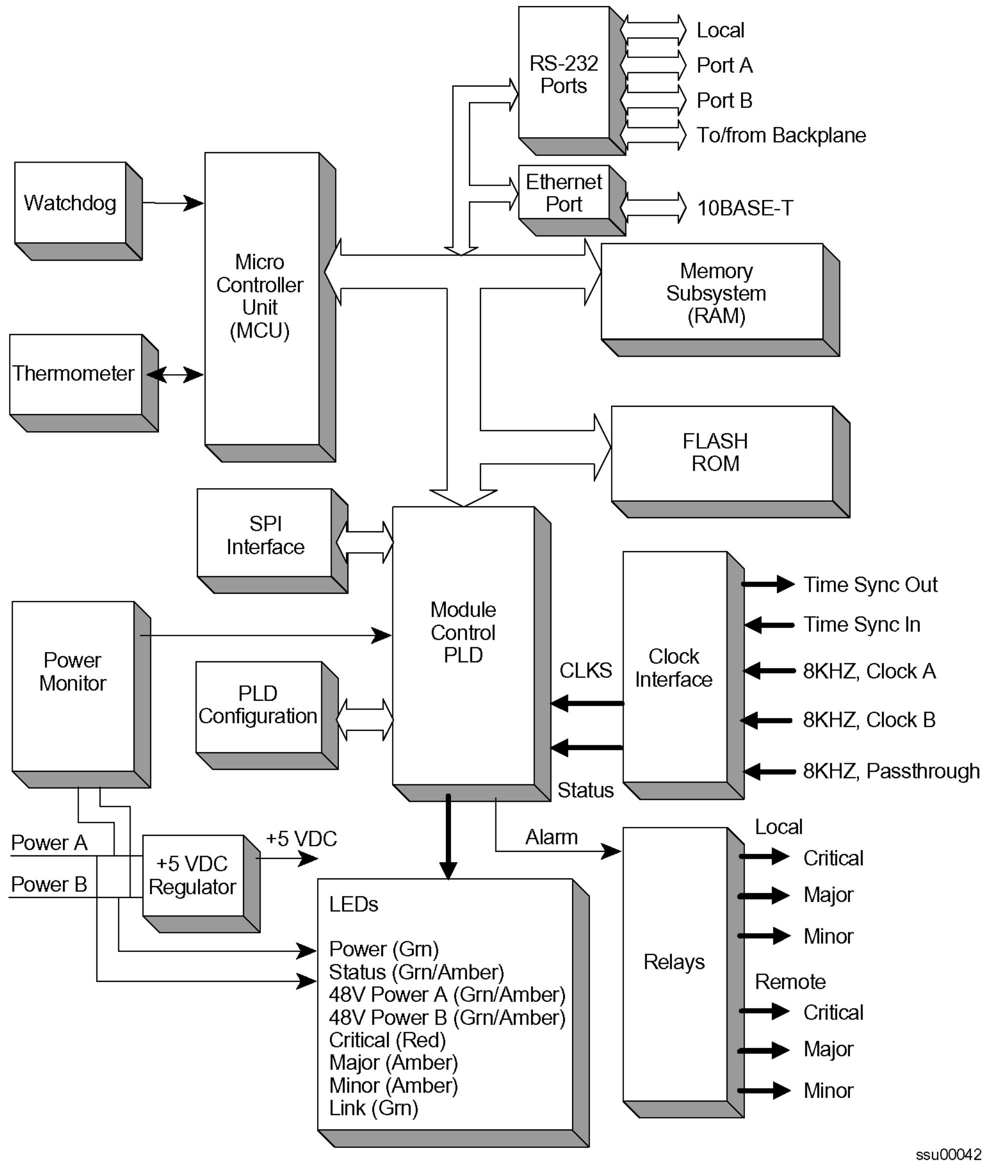


Figure 8-5. Communications Module Block Diagram

8.3.3 Communications Module Status LED Indicators

The communications module contains a group of eight status LED indicators that convey visual status to the user, as shown in Figure 8-6 and described in Table 8-7.

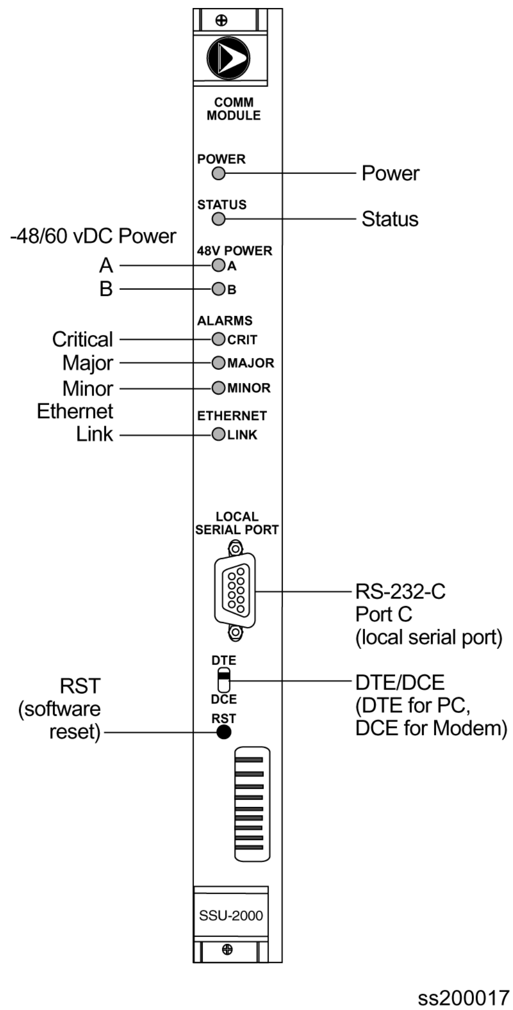


Figure 8-6. Communications Module Status LED Indicators

Table 8-7. Communications Module Status LED Indicators

Indicator	Color	Description
Power	Green	On = The module is receiving power Off = No Power Present
Status	Green/Amber	On (Green) = No faults detected On (Amber) Blinking = Module is downloading firmware On (Amber) = Module fault detected

Table 8-7. Communications Module Status LED Indicators (Continued)

Indicator	Color	Description
–48vDC Power A and B	Green	On = Power connected Off = Power not connected
Critical Alarm	Red	On = System alarm is set to Critical Off = No critical system alarm
Major Alarm	Amber	On = Major system alarm Off = No major system alarm
Minor Alarm	Amber	On = Minor system alarm Off = No minor system alarm
Ethernet Link	Green	On = Physical Ethernet connection is made Off = No physical Ethernet connection

8.3.4 Communications Module Alarm Logic

Events are an indication that something has occurred within the unit. Alarms are a subset of events. All alarms are events, but not all events are alarms. All events log the following information:

- Timestamp
- Event type
- Event/alarm level
- Condition that caused the event

8.3.4.1 Communications Module Event Log

The Communications module maintains an event history of the last 500 events in non-volatile RAM that can be retrieved by the user. In the interactive mode, the Communications module always returns the events with the last generated event output last.

Using one of the available communication ports, a user can request the following:

- List of events by a given type of REPORT or ALARM
- List of events based upon a start and stop time
- Users can also clear the event log

Interactive mode ports can request:

- Latest event logged
- A number of last events be displayed

- All information currently logged in the history buffer

8.3.4.2 Alarm Levels

The Communications module alarm logic incorporates three alarm levels:

- CRITICAL Alarms – Class of alarms that require immediate user intervention. When a critical alarm condition is detected, the CRITICAL ALARM relay at the back of the SSU-2000e is activated and the CRITICAL ALARM LED on the front of the Communications module lights red.

- MAJOR Alarms – Class of alarms that may require immediate user intervention. When a major alarm condition is detected, the major alarm relay at the back of the SSU-2000e is activated and the MAJOR ALARM LED on the front of the Communications module lights red.

- MINOR Alarms – Class of alarms that indicate the unit performance is degrading. The minor relay is activated and the MINOR ALARM indicator lights.

Alarms are elevated from MINOR to MAJOR to CRITICAL on a per module basis with a user settable time, from 60 to 500,000 seconds; the default is 86,400 seconds (one day). The elevation time is stored in each module.

The user can select delay periods for software alarms from 0 to 86400 seconds. Changing the delay period generates an event. The setting is stored in each module. Note: if the original value is set to IMMED (–1), it means this error delay is not allowed to change and will happen immediately.

Table 8-8 lists and describes the Communications module alarms.

Table 8-8. Communications Module Alarms

ID	Description	Alarm Level	Error Delay Default	Error Delay Settable
0x0	Backplane Communication Errors	MINOR	5 sec	Yes
0x1	Mastership Problems	MINOR	5 sec	Yes
0x2	Loss of Power A	MINOR	Immediate	No
0x3	Loss of Power B	MINOR	Immediate	No
0x4	SPI Watchdog Timeout	MAJOR	Immediate	No

8.3.5 Communications Module Configuration Data

Table 8-9 lists the factory default settings and ranges for the communication module software configuration options.

Table 8-9. Communications Module Configuration Data

Configuration Setting	Factory Default
Unit Name	SSU-2000e
Module Information configurations	**Current Configuration** – the configuration that is currently in use **User Default Configuration** – configuration the user specifies as the default if the current configuration is invalid or not present **Factory Configuration** – the factory default configuration
User List configurations	Maximum of 25 users including four built-in users
EIA-232-C Port Comm Port Timeout	All three comm ports are set to 9600 baud, Interactive Mode, CRLF, and Echo on. Five minutes for all (Interactive Mode). (**Note:** the unit should have one user added. i.e. Not in the INITUSERTABLE state). If it is in the INITUSERTABLE state, no timeout is applied. No Timeout is assigned for the TL1 Mode
Ethernet IP Address	IP Address 0.0.0.0 Gateway Address 0.0.0.0 Network Mask 255.255.255.0

8.3.6 RS-232 Ports

The Communications module implements four RS-232 ports that provide for local and remote communications with the SSU-2000e system.

A user interface (software resident in the Communications module) provides various levels of password-protected access for configuration and detailed performance monitoring and diagnostics. Use either the interactive command set (see Appendix C) or the TL1 user interface (see Appendix D) for configuration and detailed performance monitoring.

The ports include:

- **Port A and Port B** – Tied to external connectors on the back of the SSU-2000e main chassis.
- **One local port** – Tied to the connector on the front of the Communications module.
- **Backplane communications port** – Communicates with other modules in the system.

8.3.7 Ethernet Port

The Communications module implements one Ethernet port (ETHERNET 10-BASE-T) that is routed to an RJ-45 connector on the back of the main chassis. Refer to Chapter 2 , Main Shelf Communications Ports, for more information.

8.4 1-Port and 3-Port E1 Input Modules

This section describes the 1-Port and 3-Port E1 Input modules that may be installed in an SSU-2000e system.

8.4.1 E1 Input Module Functional Overview

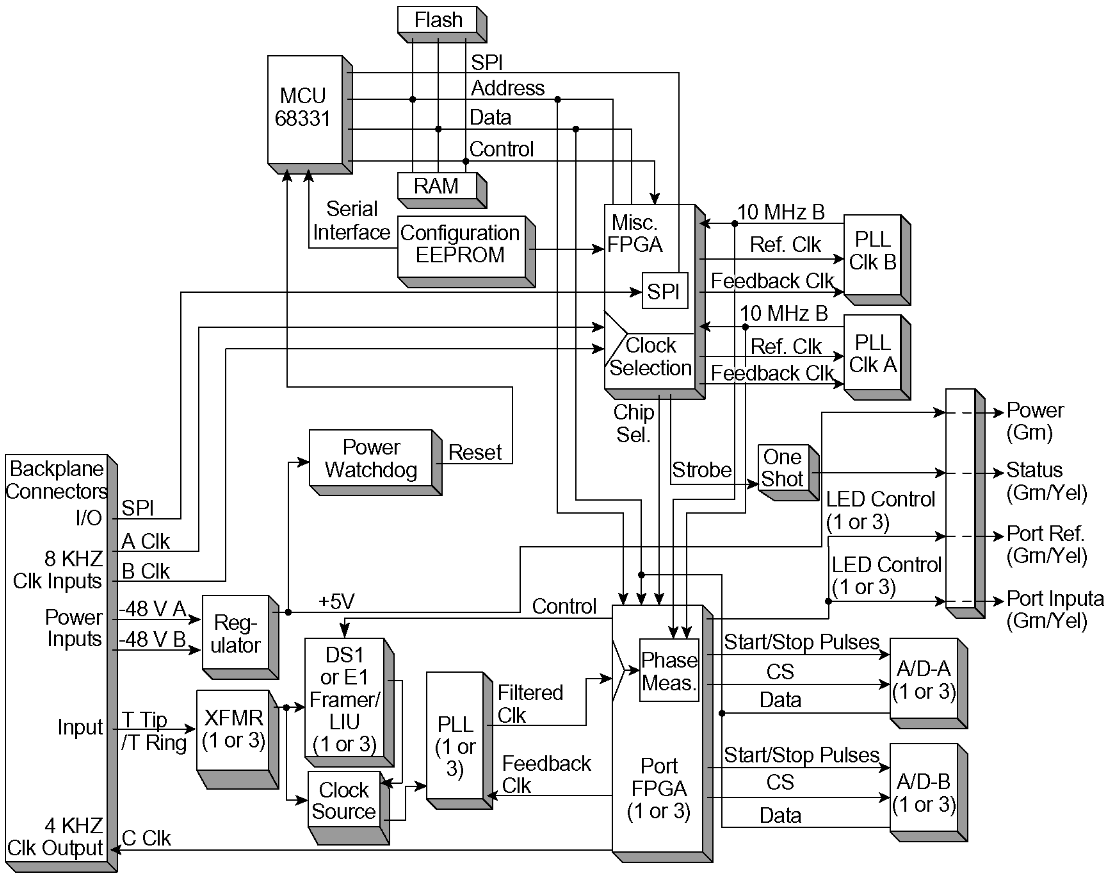
The 1-Port and 3-port E1 Input modules receive signals and performs phase measurement comparisons with the Clock modules that are installed in the SSU-2000e. The Clock modules use this information to phase and frequency lock to the incoming signal. The data may also be used for monitoring the frequency of incoming signals.

The input ports accept one (1-Port Input modules), or three (3-Port Input modules) of the following signals: sine or square wave, with frequency of 1, 1.544, 2.048, 5 or 10 MHz, or framed communication type E1. If the input signal is a communications type, the module monitors for Alarm Indication Signaling (AIS), Bipolar Violations (BPVs), Loss of Signal (LOS) and Out Of Frame (OOF) errors. In addition, the module extracts Synchronization Status Messages (SSMs) from the incoming data.

The E1 Input module receives signals and performs phase measurement comparisons (at a sampling rate of 40 Hz) with the Clock modules that are installed in the SSU-2000e. The Clock modules use this information to phase lock to the incoming signal. The data may also be used for monitoring the frequency of incoming signals.

8.4.2 1-Port and 3-Port E1 Input Modules Functional Block Diagram

A simplified block diagram of the E1 X-Port Input modules is shown in Figure 8-7.



Module I/N	Framer/LIU	# of Ports
23413013-001-0	DS1	1
23413013-002-0	DS1	3
23413014-001-0	E1	1
23413014-002-0	E1	3

ssu00055

Figure 8-7. 1-Port and 3-Port E1 Input Modules Block Diagram

8.4.2.1 Phase Measurement Averages

The Input module also maintains averages of past phase measurements including:

- 7000 100-second averages
- 700 1000-second averages
- 70 10000-second averages

To account for momentary jumps in phase, the Input module uses a phase buildout algorithm for phase jumps greater than or equal to 1 microsecond per tenth of a second. To prevent confusing frequency offsets with phase jumps, the phase buildout algorithm does not buildout more than eight consecutive samples. If the phase is *built out*, the Input module sends an event message to the Communications module.

The firmware running in the E1 Input module performs the following functions:

- Determines module type (distinguishes between E1 and DS1 frame chips)
- Supports unframed clock signals at the following rates: 1 MHz, 1.544 MHz, 2.048 MHz, 5.0 MHz, 10.0 MHz
- Enables/disables the Input module on command (when disabled, it does not report any alarms or measurement data and blinks the STATUS LED repeatedly)
- Enables or disables individual ports on command (disabled ports clear all existing alarms and do not report any additional alarms or measurement data)
- Maintains a provisioned SSM for each port
- Stores a priority for each port

8.4.2.2 Three-Sigma Test

The Input module uses a three-sigma test as part of the phase averaging algorithm in order to avoid the use of erroneous phase readings. In such tests, the standard deviation sigma of the phase readings is maintained. Any reading which falls more than three sigma above or below the mean is considered erroneous.

8.4.2.3 MTIE Calculation

MTIE is a measurement of the relative noisiness of an input signal. The Input module automatically (without user intervention) calculates MTIE for its inputs in accordance with the specifications in (ANSI) T1.101 and reported on demand for a 24 hour period.

MTIE data is retrieved on hour boundaries, though the stop time used may be current time. Reported time periods include: 0.05, 0.1, 1.0, 10.0, 100.0, 1000.0, 10000.0, and 100000.0 seconds.

8.4.2.4 MTIE Alarms

The Input module monitors the ongoing MTIE calculations and logs an alarm if the MTIE calculation for any of several window sizes exceeds user settable masks.

The Input module software maintains two alarm masks, each with thresholds at 10, 100, 1000, 10,000, and 100,000 seconds. MTIE readings which violate either mask at any point cause an alarm at a user-settable level (Minor, Major, or Critical).Refer to Section 5.6.2, Changing Factory Defaults, for more information on setting alarm levels.

Although MTIE is continuously calculated against both clocks, MTIE alarms are logged only if the measurements against the currently selected clock violate one of the MTIE alarm masks.

8.4.2.5 TDEV Calculation

The Input module automatically (without user intervention) calculates TDEV (the measurement of the frequency components in a series of phase readings) for all its inputs and reports on the past 24 hours of TDEV history. TDEV is retrieved on hour boundaries, though the stop time used may be the current time.

Reported time periods include: 0.05, 0.10, 0.30, 0.60, 1.0, 2.0, 3.0, 6.0, 10.0, 30.0, 60.0, 100.0, 300.0, 600.0, 1000.0, 3000.0, 6000.0, and 10000.0 seconds.

The E1 Input module also contains provisions for *zeroing* the phase readings for one channel in response to a command from the Communications module. Once the phase is zeroed, all subsequent phase measurements are expressed in terms of how much they differ from the reading at the time the phase was zeroed.

Zeroing the phase invalidates all past phase averages, TDEV, and MTIE.

8.4.2.6 Sync Status Messages

The E1 Input module reads and processes Sync Status Messages (in accordance with T1X1.3 TR33, (ANSI) T1.101-1999, and Telcordia Technologies GR-253 and 378-CORE and with applicable parts of ITU-T G.781) to determine the traceability of inputs. This traceability information is then used by the Clock modules in selecting a reference signal and is embedded into the system's outputs.

For E1 inputs, an SSM is valid if three consecutive matching SSMs are received.

8.4.2.7 SSM Selection Criteria

If the E1 Input module is configured for provisioned mode, it will use the provisioned SSM. If configured for automatic mode, the Input module uses the most recent valid SSM. If a valid SSM is not received, the module uses the provisioned SSM.

8.4.2.8 E1 Input Module Alarm Modes

The E1 Input module responds to various alarm conditions according to user-settable alarm levels. Each level is associated with a set of actions (or non-actions) as shown in Table 8-10.

Table 8-10. E1 Input Module Alarm Modes

Alarm Mode	Action	Alarm Elevation
IGNORE	Do nothing	Cannot be elevated to a higher severity level
REPORT	Generate event message	Cannot be elevated to a higher severity level
MINOR	Generate event message	Elevate to MAJOR if the alarm condition persists beyond the user-settable elevation time limit
MAJOR	Generate event message	Elevate to Critical if the alarm condition persists beyond the user-settable elevation time limit
CRITICAL	▪ Generate event message ▪ Fault Port	Cannot be elevated as there is no higher severity level

8.4.2.9 E1 Input Module Hardware Alarms

The following alarms are generated when hardware problems occur:

- External Clock Signal PLL Unlocked
  - Report event message and perform any other actions as required by the user-settable severity level
  - Fault channel, even if severity is less than MAJOR
  - Monitor PLL for recovery

- Input Signal PLL Unlocked
  - Report event message and perform other actions as required by severity
  - Fault port, regardless of severity
  - Monitor PLL for recovery

- Phase Measurement Circuitry Fault
  - Report event message and perform any other required actions
  - Fault Port
  - Monitor phase hardware for recovery

8.4.2.10 E1 Input Signal Glitches

The following alarms are caused by problems with the formatting or content of the incoming input signal:

- Errors Tracked:
  - Framed signals: LOS, AIS, OOF, BPV and CRC
  - Unframed signals: LOS

- Error and Clear Counters

The E1 Input module maintains a count of the number of consecutive errored seconds for each error type for each port. Once the *error count* exceeds a user-settable limit, the input signal which has experienced the errors is said to be *in episode*. Refer to Section 5.6.2, Changing Factory Defaults, for more information on setting the *error count*.

The Input module maintains a count of the number of consecutive seconds in which the input signal for each port was free of each type of error. This *clear count* must exceed a user-settable limit before the input signal is no longer in episode. Refer to Section 5.6.2, Changing Factory Defaults, for more information on setting the *clear count*.

8.4.2.11 E1 Input Signal Glitch Handling

For LOS (loss of signal) and before going into episode:

- *Coast* over brief occurrences of LOS, reporting the last known good phase measurements for the port until signal returns or the signal goes into episode.

- The duration of a *brief* occurrence of LOS is defined by the value of the error count for LOS. The default is 10 seconds.

Once in episode:

- Log LOS alarm, taking appropriate action per the assigned severity level
- Invalidate current phase measurements
- Others (AIS, BPV, CRC, and OOF)

Once in episode, the system takes appropriate action according to the severity level assigned to the alarm.

LOS Phase Considerations:

- Phase reading not valid when in episode
- Zero phase reading when episode ends
- If signal returns before the port goes into episode, normalize subsequent phase measurements to show continuous phase numbers before and after the loss of signal.
- Others
- Phase reading valid

8.4.2.12 Hierarchy of Signal Glitches

- LOS
- AIS
- OOF
- BPV/CRC

The Input module does not report lower alarms if upper alarms are active.

8.4.2.13 Cesium Fault

- Facilitates compatibility with older Hewlett Packard units
- Only valid if port one is configured to receive an unframed input signal
- User can select high or low logic level as alarmed
- If the hardware indicates that the cesium fault level matches the *alarmed* setting, log an AIS alarm against port 1
- Clear the alarm when the hardware's cesium fault level no longer matches the alarmed level

8.4.2.14 Input Measurement Problems

If the MTIE values for a selected clock exceed either of the MTIE masks, the Input module takes appropriate action according to the severity level associated with the MTIE alarms. If a received SSM has a lower PQL than the provisioned value assigned to the port and the port has SSMs enabled, the Input module performs the action required by the alarm mode.

8.4.2.15 E1 Input Module Events Reported

The E1 Input module reports the event types listed in Table 8-11 when they occur:

Table 8-11. E1 Input Module Event Reporting

Event	Parameter One	Parameter Two
Module installed	–	–
Module enabled	–	–
Module disabled	–	–
Module restarted	Delay before restart (in seconds)	–
Input Signal Episode, Alarm, and Faults	–	–
Hardware Faults	–	–
Received SSM Changed	New PQL	Old PQL
Phase Buildout	Phase value being built out	*Corrected* phase value
Configuration Changes	New Value (if necessary)	Old Value (if not implied by new value)
Input phase zeroed	–	–

8.4.3 E1 Input Module Status LED Indicators

The E1 Input module is equipped with a set of status LED indicators that indicate module and incoming signal status. These LEDs are shown in Figure 8-8 (3-Port model illustrated) and described in Table 8-12.

8

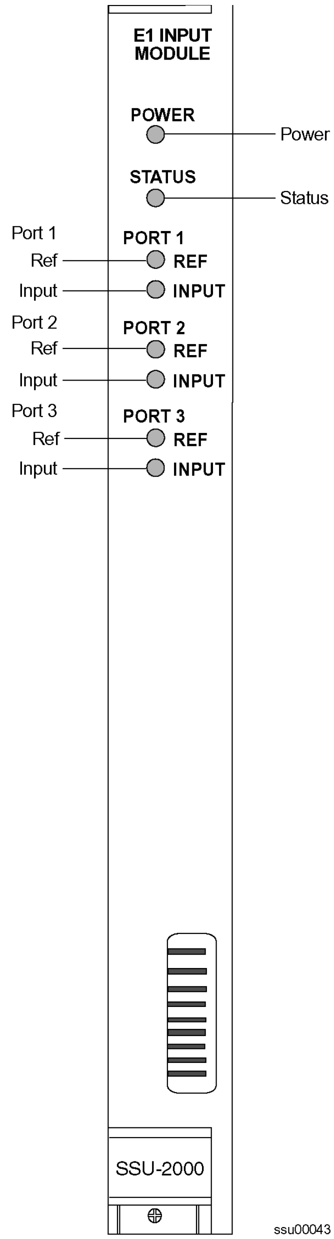


Figure 8-8. E1 Input Module Status LED Indicators

Table 8-12. E1 Input Module Status LED Indicators

Indicator	Color	Description
POWER	Green	On = The module is receiving +5 vDC
STATUS	Green/Amber	Green = Unit is in Normal mode of operation; no faults Amber = Fault condition detected Amber (blinking) = Module is downloading software
PORT 1 REF	Green/Amber	On (Green) = Selected On (Amber) = Not good and ignored Off = Ignored or good and not selected
PORT 1 INPUT	Green/Amber	On (Green) = Selected On (Amber) = Not good and ignored Off = Ignored or good and not selected
PORT 2 REF	Green/Amber	On (Green) = Selected On (Amber) = Not good and ignored Off = Ignored or good and not selected
PORT 2 INPUT	Green/Amber	On (Green) = Selected On (Amber) = Not good and ignored Off = Ignored or good and not selected
PORT 3 REF	Green/Amber	On (Green) = Selected On (Amber) = Not good and ignored Off = Ignored or good and not selected
PORT 3 INPUT	Green/Amber	On (Green) = Selected On (Amber) = Not good and ignored Off = Ignored or good and not selected

8.4.4 E1 Input Module Configuration

The E1 input module maintains factory default and current user configuration information in nonvolatile memory. This information is retrieved at power up and modified by commands from the communication module. In the event that the current user configuration cannot be used, the module automatically reverts to factory defaults.

8.4.5 E1 Input Module Software Options

The factory settings and ranges for all E1 Input module software parameters are listed in Table 8-13.

Table 8-13. E1 Input Module Configuration

Configuration Setting	Factory Default	Range
Framing Enabled	On/On/Off	On/Off
Input Frequency (for unframed signals)	10 MHz	1 MHz, 1.544 MHz, 2.048 MHz, 5 MHz, 10 MHz
Framing Type	CCS	CAS or CCS
Zero Suppression	On	On/Off
CRC	Off	On/Off
SSM	Off	On/Off
Provisioned PQL	3/4/3	1–16
Priority	0	0 to 10 (0 = Monitor)
E1 Bit Position	8	4 to 8
Cesium Fault Nominal	Low	Low/High/Off
Input Signal Error Limit	10 seconds	1 to 100 for LOS and AIS, 1 to 10000 for BPV, CRC and OOF
MTIE T10 Limit1	325/1000/325	0 to 100000
MTIE T10 Limit2	330/1010/330	0 to 100000
MTIE T100 Limit1	550/2000/550	0 to 100000
MTIE T100 Limit 2	560/2010/560	0 to 100000
MTIE T1000 Limit1	1010/2000/1010	0 to 100000
MTIE T1000 Limit2	1020/2010/1020	0 to 100000
MTIE T10000 Limit 1	1100/2835/1100	0 to 100000
MTIE T10000 Limit 2	1110/2840/1110	0 to 100000
MTIE Limit 1 Alarm Mode	Minor	Ignore, Report, Minor, Major, or Critical
MTIE Limit 2 Alarm Mode	Major	Ignore, Report, Minor, Major, or Critical
Alarm Initial Severity	Minor (except LOS and level 2 MTIE, which are Major)	Ignore, Report, Minor, Major, or Critical
Alarm Initial Delay	0 seconds	0 to 86400 seconds
Alarm Elevation Time	86400 seconds	0 to 500000 seconds
Port Status	Disabled	Enabled/Disabled
Port Name		Any user-selected string from 0 to 20 characters

8.5 1-Port and 3-Port DS1 Input Modules

This section describes the 1-Port and 3-Port DS1 Input modules that may be installed in an SSU-2000e system.

The 1-Port and 3-port DS1 Input modules receive signals and perform phase measurement comparisons with the Clock modules that are installed in the SSU-2000e. The Clock modules use this information to phase and frequency lock to the incoming signal. The data may also be used for monitoring the frequency of incoming signals.

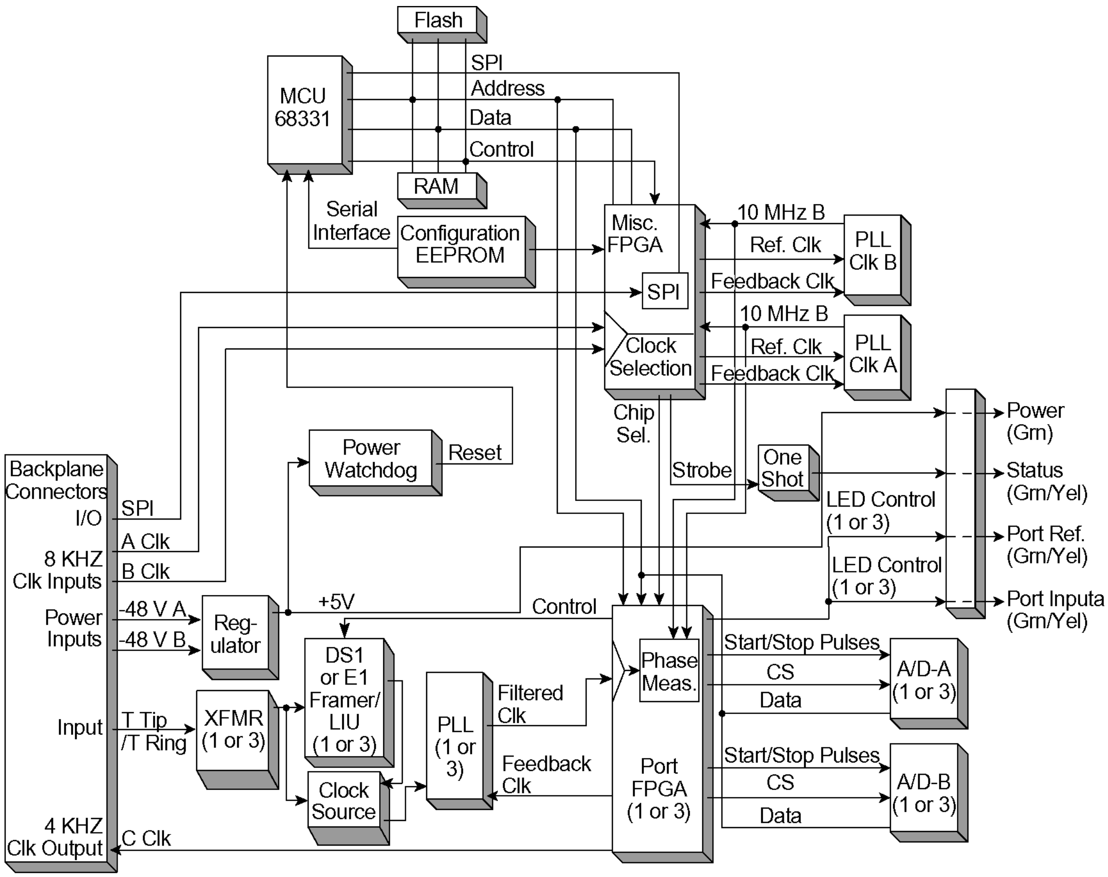
The input ports accept one (1-Port Input modules), or three (3-Port Input modules) of the following signals: sine or square wave, with frequency of 1, 1.544, 2.048, 5 or 10 MHz, or framed communication type DS1. If the input signal is a communications type, the module monitors for Alarm Indication Signaling (AIS), Bipolar Violations (BPVs), Loss of Signal (LOS) and Out Of Frame (OOF) errors. In addition, the module extracts Synchronization Status Messages (SSMs) from the incoming data.

8.5.1 DS1 Input Module Functional Overview

The DS1 Input module (1-port and 3-port versions) consists of a microcontroller and firmware, SRAM for data storage, FLASH (contains the firmware), input signal ports, and other support circuitry. The primary function of these modules is to perform time-interval-measurements on Clock module A and Clock module B, using the reference input signals. These measurements are used to adjust the frequency of the oscillators on the two Clock modules.

8.5.2 1-Port and 3-Port DS1 Input Modules Functional Block Diagram

A simplified block diagram of the DS1 X-Port Input modules is shown in Figure 8-9.



Module I/N	Framer/LIU	# of Ports
23413013-001-0	DS1	1
23413013-002-0	DS1	3
23413014-001-0	E1	1
23413014-002-0	E1	3

ssu00055

Figure 8-9. 1-Port and 3-Port DS1 Input Module Block Diagram

8.5.2.1 Phase Measurement Averages

The Input module also maintains averages of past phase measurements including:

- 1000 one-second averages
- 1000 100-second averages
- 100 1000-second averages
- 10 10000-second averages

To account for momentary jumps in phase, the Input module uses a phase buildout algorithm for phase jumps greater than or equal to 1 microsecond per tenth of a second. To prevent confusing frequency offsets for phase jumps, the phase buildout algorithm does not buildout more than eight consecutive samples. If the phase is *built out*, the Input module sends an event message to the Communications module.

8.5.2.2 Three-Sigma Test

The Input module uses a three-sigma test as part of the phase averaging algorithm in order to avoid the use of erroneous phase readings. In such tests, the standard deviation sigma of the phase readings is maintained. Any reading which falls more than three sigma above or below the mean is considered erroneous.

8.5.2.3 MTIE Calculation

MTIE is a measurement of the relative noisiness of an input signal. The Input module automatically (without user intervention) calculates MTIE for its inputs in accordance with the specifications in (ANSI) T1.101 and reported on demand for a 24 hour period.

MTIE data is retrieved on hour boundaries, though the stop time used may be current time. Reported time periods include 0.05, 0.1, 1.0, 10.0, 100.0, 1000.0, 10000.0, and 100000.0 seconds.

8.5.2.4 MTIE Alarms

The Input module monitors the ongoing MTIE calculations and logs an alarm if the MTIE calculation for any of several window sizes exceeds user settable masks.

The Input module software maintains two alarm masks, each with thresholds at 10, 100, 1000, 10,000, and 100,000 seconds. MTIE readings which violate either mask at any point cause an alarm at a user-settable level (Minor, Major, or Critical). Refer to Section 5.6.2, Changing Factory Defaults, for more information on setting alarm levels.

Although MTIE is continuously calculated against both clocks, MTIE alarms are logged only if the measurements against the currently selected clock violate one of the MTIE alarm masks.

8.5.2.5 TDEV Calculation

The Input module automatically (without user intervention) calculates TDEV (the measurement of the frequency components in a series of phase readings) for all its inputs and reports on the past 24 hours of TDEV history. TDEV is retrieved on hour boundaries, though the stop time used may be current time.

Reported time periods include 0.05, 0.10, 0.30, 0.60, 1.0, 2.0, 3.0, 6.0, 10.0, 30.0, 60.0, 100.0, 300.0, 600.0, 1000.0, 3000.0, 6000.0, and 10,000.0 seconds.

The input card also contains provisions for *zeroing* the phase readings for one channel in response to a command from the Communications module. Once the phase is zeroed, all subsequent phase measurements are expressed in terms of how much they differ from the reading at the time the phase was zeroed.

Zeroing the phase invalidates all past phase averages, TDEV, and MTIE.

8.5.2.6 Sync Status Messages

The Input module reads and processes Sync Status Messages (in accordance with specifications (ANSI) T1.403 for DS1 signals), to determine the traceability of inputs. This traceability information is then used by the Clock modules in selecting a reference signal and embedded into the system's outputs.

For a DS1 input signal, an SSM is considered valid only after seven of the last ten received SSMs match. For DS1 signals, the Input module logs an alarm (user settable level) if ten seconds elapse and no SSM is detected.

8.5.2.7 SSM Selection Criteria

If the Input module is configured for provisioned mode, it will use the provisioned SSM. If configured for automatic mode, the Input module uses the most recent valid SSM. If a valid SSM is not received, the module uses the provisioned SSM. Refer to Section 5.6.2, Changing Factory Defaults, for more information on SSM settings.

8

8.5.2.8 DS1 Input Module Alarm Modes

The Input module responds to various alarm conditions according to user-settable alarm levels. Each level is associated with a set of actions (or non-actions) as shown in Table 8-14.

Table 8-14. DS1 Input Module Alarm Modes

Alarm Mode	Action	Alarm Elevation
IGNORE	Do nothing	Cannot be elevated to a higher severity level
REPORT	Generate event message	Cannot be elevated to a higher severity level
MINOR	Generate event message	Elevate to MAJOR if the alarm condition persists beyond the user-settable elevation time limit
MAJOR	Generate event message	Elevate to Critical if the alarm condition persists beyond the user-settable elevation time limit
CRITICAL	▪ Generate event message ▪ Fault Port	Cannot be elevated as there is no higher severity level

8.5.2.9 DS1 Input Module Hardware Alarms

The following alarms are generated when hardware problems occur:

- External Clock Signal PLL Unlocked
  - Report event message and perform any other actions as required by the user-settable severity level
  - Fault channel, even if severity is less than MAJOR
  - Monitor PLL for recovery

- Input Signal PLL Unlocked
  - Report event message and perform other actions as required by severity
  - Fault port, regardless of severity
  - Monitor PLL for recovery

- Phase Measurement Circuitry Fault
  - Report event message and perform any other required actions
  - Fault Port
  - Monitor phase hardware for recovery

8.5.2.10 DS1 Input Signal Glitches

The following alarms are caused by problems with the formatting or content of the incoming input signal:

- Errors Tracked:
  - Framed signals: LOS, AIS, OOF, BPV and CRC
  - Unframed signals: LOS

- Error and Clear Counters

The Input module maintains a count of the number of consecutive errored seconds for each error type for each port. Once this *error count* exceeds a user-settable limit, the input signal which has experienced the errors is said to be *in episode*.

The Input module maintains a count of the number of consecutive seconds in which the input signal for each port was free of each type of error. This *clear count* must exceed a user-settable limit before the input signal is no longer in episode.

8.5.2.11 DS1 Input Signal Glitch Handling

For LOS (loss of signal) and before going into episode:

- *Coast* over brief occurrences of LOS, reporting the last known good phase measurements for the port until signal returns or the signal goes into episode.
- The duration of a *brief* occurrence of LOS is defined by the value of the error count for LOS.

Once in episode:

- Log LOS alarm, taking appropriate action per the assigned severity level
- Invalidate current phase measurements

- Others (AIS, BPV, CRC, and OOF)

- Once in episode, take appropriate action according to the severity level assigned to the alarm

LOS Phase Considerations:

- Phase reading not valid when in episode
- Zero phase reading when episode ends
- If signal returns before the port goes into episode, normalize subsequent phase measurements to show continuous phase numbers before and after the loss of signal.
- Others
- Phase reading valid

8.5.2.12 Hierarchy of Signal Glitches

The following alarms are listed in the order of most to least severe:

- LOS
- AIS
- OOF
- BPV/CRC

The Input module does not report lower level alarms if higher level alarms are active.

8.5.2.13 Cesium Fault

- Facilitates compatibility with older Hewlett Packard units
- Only valid if port one is configured to receive an unframed input signal
- User can select high or low logic level as alarmed
- If the hardware indicates that the cesium fault level matches the *alarmed* setting, log an AIS alarm against port 1.
- Clear the alarm when the hardware's cesium fault level no longer matches the alarmed level.

8.5.2.14 Input Measurement Problems

If the MTIE values for a selected clock exceed either of the MTIE masks, the Input module takes appropriate action according to the severity level associated with the MTIE alarms. If a received SSM has a lower PQL than the provisioned value assigned to the port and the port has SSMs enabled, the Input module performs the action required by the alarm mode. The action depends on the alarm mode set by the user or the default settings. Refer to the Alarm command in Section B.3, Interactive Command Set, for more information on alarm settings.

8.5.2.15 DS1 Input Module Events Reported

The 3-Port DS1 Input module reports the event types listed in Table 8-15 when they occur:

Table 8-15. DS1 Input Module Event Reporting

Event	Parameter One	Parameter Two
Card installed	–	–
Card enabled	–	–
Card disabled	–	–
Card restarted	Delay before restart (in seconds)	–
Input Signal Episode, Alarm, and Faults	–	–
Hardware Faults	–	–
Received SSM Changed	New PQL	Old PQL
Phase Buildout	Phase value being built out	*Corrected* phase value
Configuration Changes	New Value (if necessary)	Old Value (if not implied by new value)
Input phase zeroed	–	–

8.5.3 DS1 Input Module Status LED Indicators

The DS1 Input module is equipped with eight status LEDs that indicate module status. These LEDs are shown in Figure 8-10 and are listed and described in Table 8-16.

8

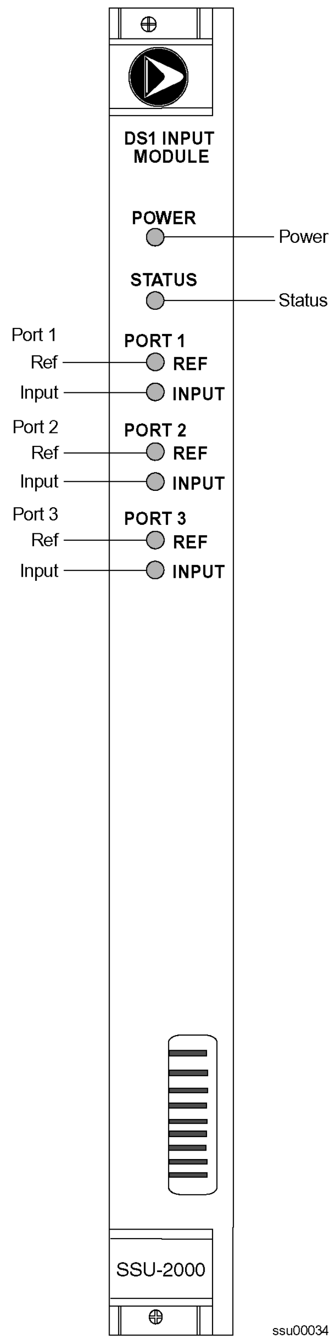


Figure 8-10. DS1 Input Module Status LED Indicators

Table 8-16. DS1 Input Module Status LED Indicators

Indicator	Color	Description
POWER	Green	On = The module is receiving +5 vDC
STATUS	Green/Amber	Green = Unit is in Normal mode of operation; no faults Amber= Fault condition detected
PORT 1 REF	Green/Amber	On (Green) = Selected On (Amber) = Not good and ignored Off = Ignored or good and not selected
PORT 1 INPUT	Green/Amber	On (Green) = Selected On (Amber) = Not good and ignored Off = Ignored or good and not selected
PORT 2 REF	Green/Amber	On (Green) = Selected On (Amber) = Not good and ignored Off = Ignored or good and not selected
PORT 2 INPUT	Green/Amber	On (Green) = Selected On (Amber) = Not good and ignored Off = Ignored or good and not selected
PORT 3 REF	Green/Amber	On (Green) = Selected On (Amber) = Not good and ignored Off = Ignored or good and not selected
PORT 3 INPUT	Green/Amber	On (Green) = Selected On (Amber) = Not good and ignored Off = Ignored or good and not selected

8.5.4 DS1 Input Module Configuration

The DS1 input module maintains factory default and current user configuration information in nonvolatile memory. This information is retrieved at power up and can be modified by commands from the Communications module. In the event that the current user configuration cannot be used, the module automatically reverts to factory defaults.

8.5.5 DS1 Input Module Software Options

The factory settings and ranges for all DS1 Input module software parameters are listed in Table 8-17.

Table 8-17. DS1 Input Module Configuration

Configuration Setting	Factory Default	Range
Framing Enabled	On/On/Off	On/Off
Input Frequency (for unframed signals)	10MHz	1MHz, 1.544MHz, 2.048MHz, 5MHz, 10MHz
Framing Type	ESF	D4 or ESF
Zero Suppression	On	On/Off
CRC	Off	On/Off
SSM	Off	On/Off
Provisioned PQL	3/4/3	1–16
Priority	0	0–10 (0 = Monitor)
Cesium Fault Nominal	Low	Low/High/Off
Input Signal Error Limit	10 seconds	1–100 for LOS and AIS 1–10000 for BPV, CRC, and OOF
MTIE T10 Limit1	325/1000/325	0 to 100000
MTIE T10 Limit2	330/1010/330	0 to 100000
MTIE T100 Limit1	550/2000/550	0 to 100000
MTIE T100 Limit 2	560/2010/560	0 to 100000
MTIE T1000 Limit1	1010/2000/1010	0 to 100000
MTIE T1000 Limit2	1020/2010/1020	0 to 100000
MTIE T10000 Limit 1	1100/2835/1100	0 to 100000
MTIE T10000 Limit 2	1110/2840/1110	0 to 100000
MTIE Limit 1 Alarm Mode	Minor	Ignore, Report, Minor, Major, or Critical
MTIE Limit 2 Alarm Mode	Major	Ignore, Report, Minor, Major, or Critical
Alarm Initial Severity	Minor (except LOS and level 2 MTIE, which are Major)	Ignore, Report, Minor, Major, or Critical
Alarm Initial Delay	0 seconds	0 to 86400 seconds
Alarm Elevation Time	86400 seconds	0 to 500000 seconds
Port Status	Disabled	Enabled/Disabled
Port Name		Any user-selected string from 0 to 20 characters

8

8.6 GPS Input Module

This section provides a description and reference information for the GPS Input module, which is used to provide a timing reference signal to phase and frequency lock the internal clocks and to produce phase locked output signals.

8.6.1 GPS Input Module Functional Overview

The module consists of a microcontroller and firmware, SRAM for data storage, FLASH which contains the firmware, a GPS receiver (Radio), and other support circuitry. The primary function of this module is to perform time-interval measurements on Clock module A and Clock module B, using the 1PPS provided by the radio. These measurements are used to adjust the frequency of the oscillators on those modules.

In addition, this module supports the network time protocol (NTP), which is a function provided by the Communications module. Time-of-day from the Radio is transferred to the Communications module for distribution to *clients* connected to the same network. The Communications module's internal 1PPS is synchronized to the 1PPS from the Radio.

The GPS Input module monitors and reports the status and performance of the module and the received radio signals. The module communicates with the Communications module to receive user configuration commands and to report status and performance back to the Clock modules for frequency control.

8.6.2 GPS Input Module Functional Block Diagram

A simplified block diagram of the GPS Input module is shown in Figure 8-11.

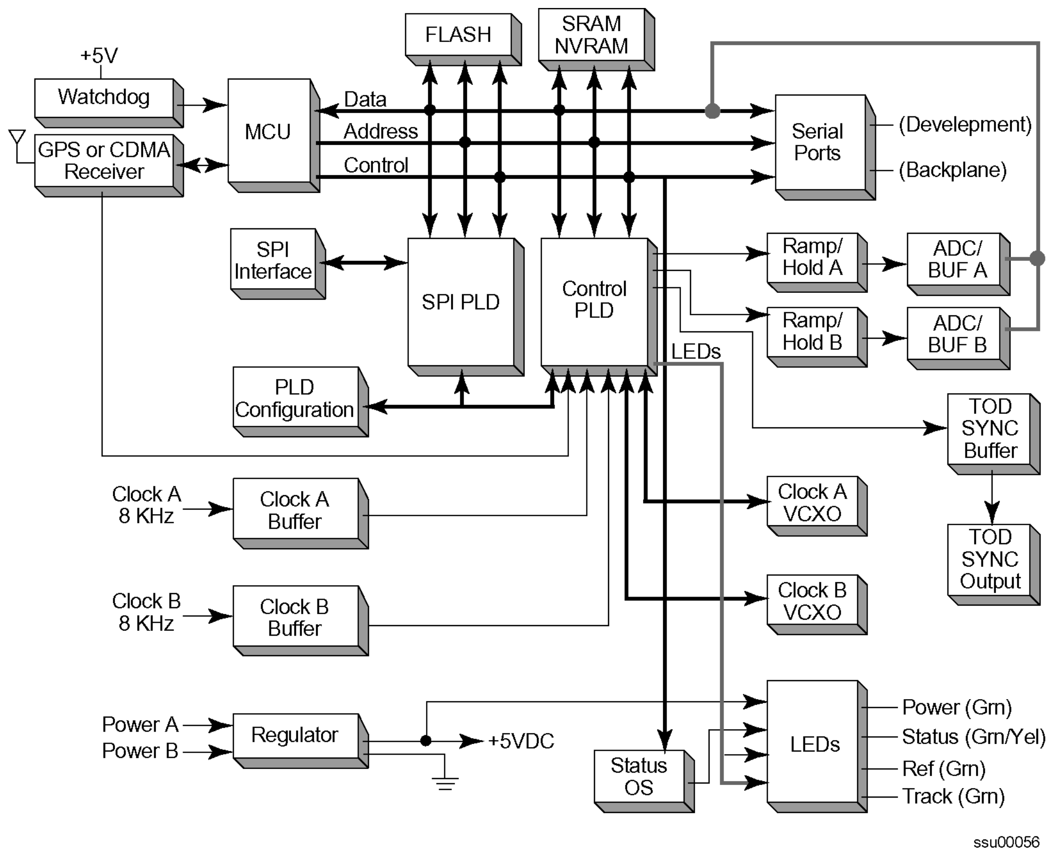


Figure 8-11. GPS Input Module Block Diagram

8.6.3 GPS Input Module Status LED Indicators

The GPS Input module is equipped with four status LEDs as shown in Figure 8-12. The LED status assignments are listed and described in Table 8-18.

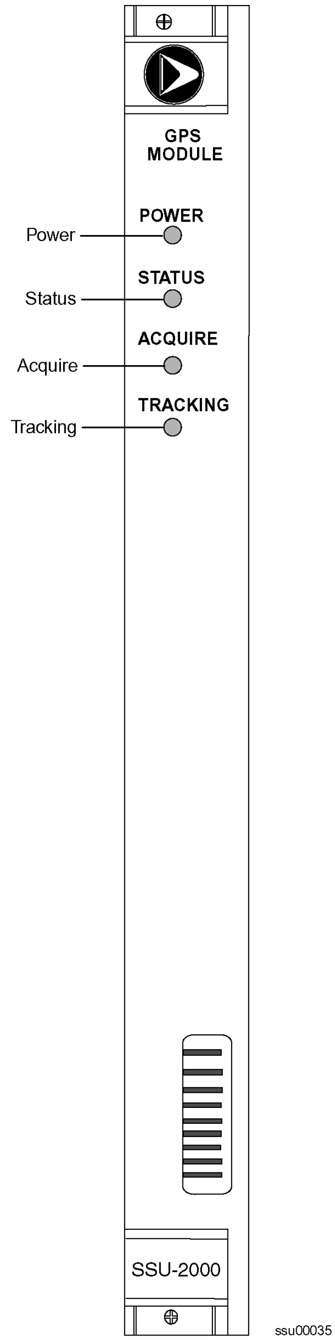


Figure 8-12. GPS Input Module Status LED Indicators

Table 8-18. GPS Input Module Status LED Indicators

Indicator	Color	Description
POWER	Green	On = The module is receiving +5 vDC Off = No power to the module
STATUS	Green	On = Unit is in Normal mode of operation; no faults Off = Fault condition detected (firmware timed out)
ACQUIRE	Green	On = Selected as the clock reference Off = Not selected as clock reference
TRACKING	Green	On = RADIO is tracking Off = Tracking problem without antenna fault Blinking = Antenna fault

8.6.4 GPS Input Module Configuration Settings

The configuration settings for the GPS Input module is provided in Table 8-19.

Table 8-19. GPS Input Module Configuration Settings

Configuration Setting	Factory Default	Range
Position (GPS only) Latitude Longitude Height Averages PDOP Pos Mode	 0 0 0 300 0 Calc	 +/– 90 degrees +/–180 degrees –60 to 4000 meters 10 to 3600 1 to 10 User/Calc
Min Elevation for position	5	0 to 50 degrees
Min PDOP for position	3	1 to 10
Min Elevation for timing	10	0 to 50 degrees
Module Status	Enabled	Enabled/Disabled
Priority	0	0 to 10
Sigma limit	25	10 to 1000 µS
PQL	2	1 to 16
Disabled SV list	None	Up to 31 SV numbers
Min PDOP for position	3	1 to 10

8.7 2048 kHz Output Module

This section describes the 2048 kHz Output module.

8.7.1 2048 kHz Output Module Functional Overview

The 2048 kHz Output module receives a set of three (four if installed in an expansion chassis) 4 kHz clocks from the Clock modules and uses these clocks to develop an 8.192 MHz phase-locked signal. This phase-locked signal is then used to generate 20 sets of 2048 kHz clock outputs.

The 20 sets of 2048 kHz TTIP and TRING signal pairs represent a transformer-coupled symmetrical pair. Each output can be turned on/off independently of other channels; relays on each output allow for disconnecting the driver output from the output pins. Each output signal is monitored for a failed output on an independent basis. An output signal is designated failed when the level falls below 0.75 volts base to peak.

In a non-redundant configuration a failed output will not be turned off, as some equipment may tolerate a wide range of level and still operate. In a redundant operation a failed output will be turned off in one module at a time, to try to isolate the source of the problem. The outputs meet the criteria set forth in ITU-T CC for signal type, amplitude, and waveshape.

8.7.2 2048 kHz Output Module Functional Block Diagram

A simplified block diagram of the 2048 kHz Output module is shown in Figure 8-13.

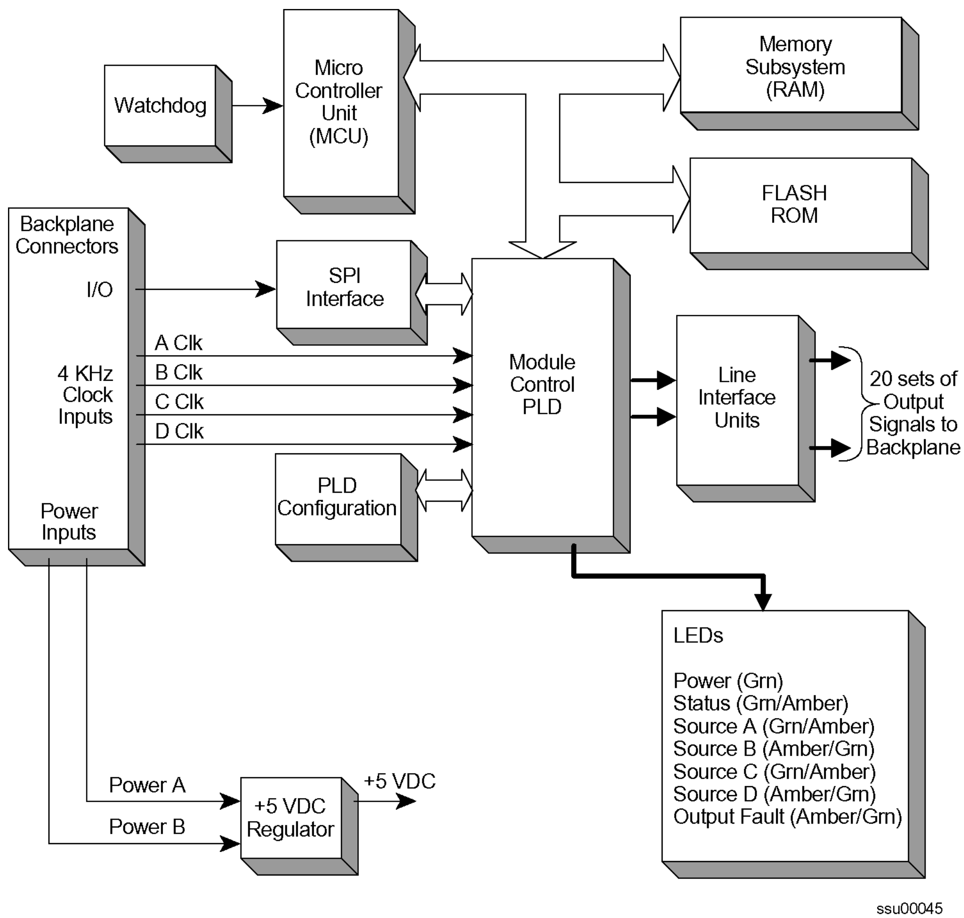


Figure 8-13. 2048 kHz Output Module Block Diagram

8.7.3 2048 kHz Output Module Status LED Indicators

The 2048 kHz Output module has seven status LED indicators along the front edge of the module that are used for visually conveying status information to the user. The LEDs are shown in Figure 8-14 and described in Table 8-20.

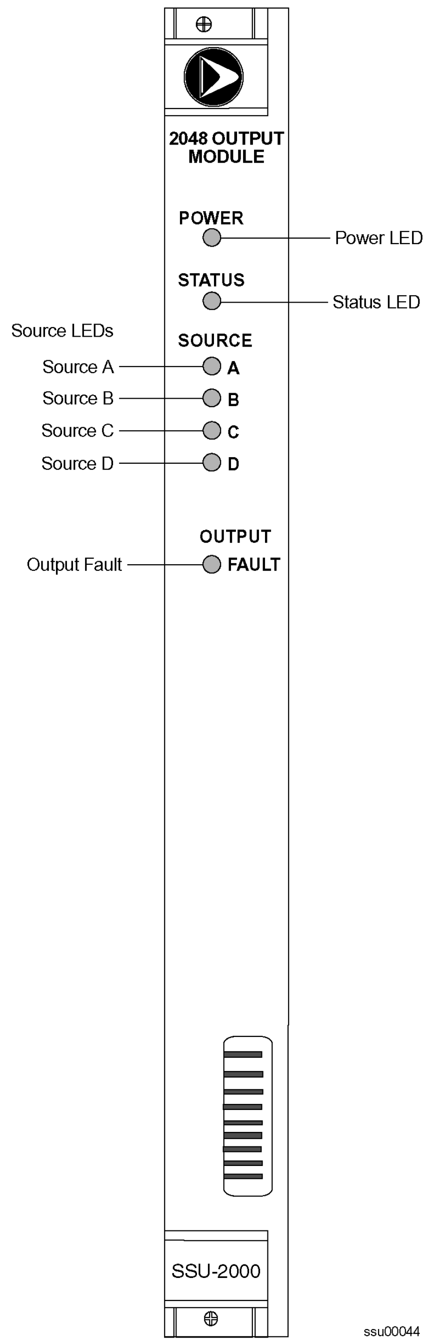


Figure 8-14. 2048 kHz Output Module Status LED Indicators

Table 8-20. 2048 kHz Output Module Status LED Indicators

Indicator	Color	Description
POWER	Green	On = +5vDC power available on the Output module Off = +5 vDC not present on the module
STATUS	Green/Amber	On (Green) = module functioning correctly Blinking Amber = Output module is downloading firmware On (Amber) = Output module failure
SOURCE A	Green/Amber	On (Green) = Source A is the selected source clock On (Amber) = Faulty or missing A source clock Off = Source A is ignored or good and not selected
SOURCE B	Green/Amber	On (Green) = Source B is the selected source clock On (Amber) = Faulty or missing B source clock Off = Source B is ignored or good and not selected
SOURCE C	Green/Amber	On (Green) = Source C is the selected source clock On (Amber) = Faulty or missing source C clock Off = Source C is ignored or good and not selected
SOURCE D	Green/Amber	On (Green) = Source D is the selected source clock On (Amber) = Faulty or missing source D clock Off = Source D is ignored or good and not selected
OUTPUT FAULT	Amber	On = Module has detected one or more faulty outputs Off = All output signals are good

Specifications for the 2048 kHz Output module are provided in Table 8-21.

Table 8-21. 2048 kHz Output Module Specifications

Performance Characteristic	Specification
Frequency	2048 kHz
Waveshape	Per ITU-T CC (Oct. 98) Table 11 and Figure 20
Pulse Amplitude	1.0 to 1.9 Vpk, 1.5 Vpk nominal into 120Ω 0.75 to 1.5 Vpk, 1.0 Vpk nominal into 75Ω
Jitter	≤0.01 UIpp, 20 Hz to 100 kHz
Number of Outputs	20 Independent

8.8 E1 Output Module

This section provides user-reference data for the E1 Output module that is used in both the SSU-2000e main chassis and in the optional SDU-2000e expansion shelf.

8.8.1 E1 Output Module Overview

The E1 Output module uses one of three 4 kHz clocks from the SSU-2000e main chassis backplane to generate a phase-locked signal of 2.048 Mbps. If the unit is inserted into an SDU-2000e expansion shelf, a fourth 4 kHz clock (D-clock) is available. The phase-locked 2.048 Mbps signal is used to generate a set of 20 output signals for distribution to large networks.

In addition, the phase-locked 2.048 Mbps signal is used to clock the frame generator (or framer) for insertion of proper framing bits.

A micro controller unit on the E1 Output module communicates with other boards in the main shelf and performs Output module configuration. The module’s memory subsystem (EEPROM, RAM and serial EEPROM) stores the executable image, the PLD image and other configuration and temporary information for an on-module microprocessor.

The E1 Output modules may be used individually or configured for operation as redundant pairs in the shelf.

8.8.2 E1 Output Module Functional Block Diagram

A simplified block diagram of the E1 Output module is shown in Figure 8-15.

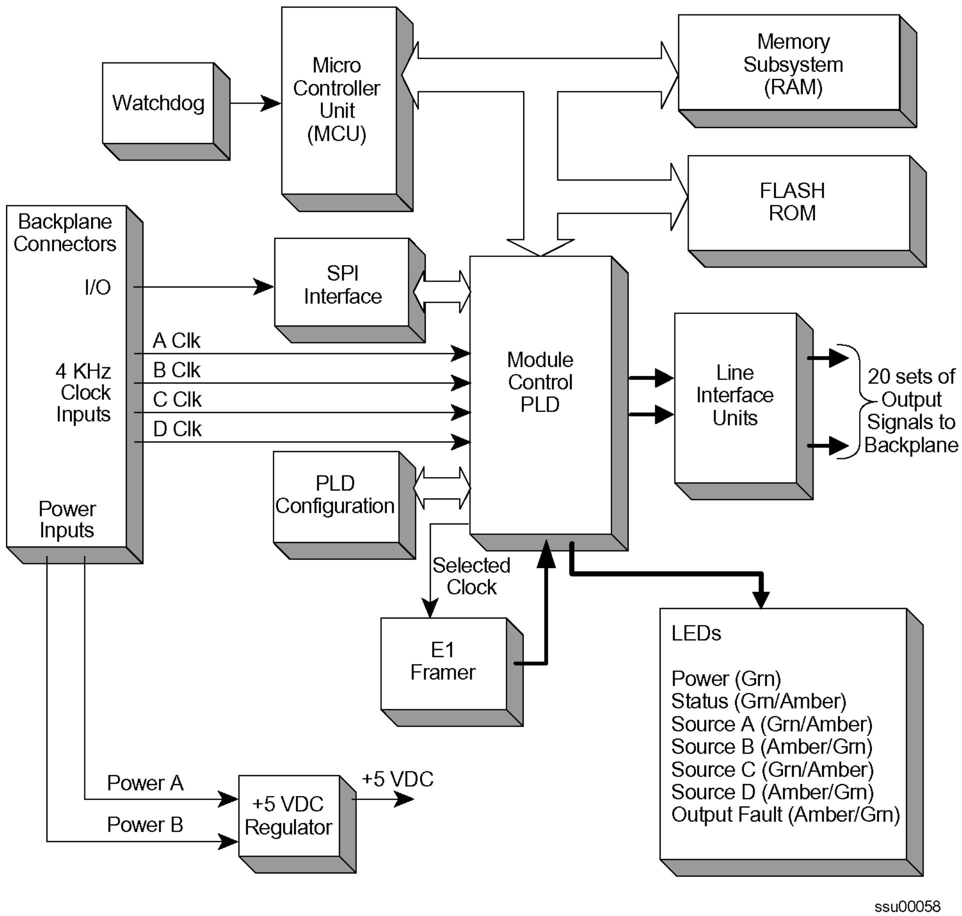


Figure 8-15. E1 Output Module Block Diagram

8.8.3 E1 Output Module Status LED Indicators

The E1 Output module has seven status LED indicators along the front edge of the module that are used for visually conveying status information to the user. The LEDs are shown in Figure 8-16 and are described in Table 8-22.

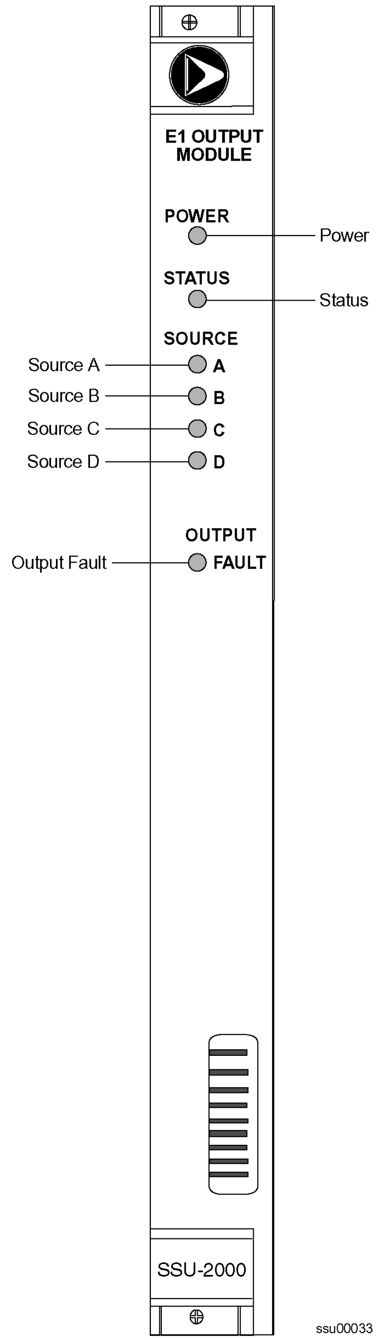


Figure 8-16. E1 Output Module Status LED Indicators

Table 8-22. E1 Output Module Status LED Indicators

Indicator	Color	Description
POWER	Green	On = +5vDC power available on the Output module Off = +5 vDC not present on the module
STATUS	Green/Amber	On (Green) = module functioning correctly Blinking Amber = Output module is downloading firmware On (Amber) = Output module failure
SOURCE A	Green/Amber	On (Green) = Source A is the selected source clock On (Amber) = Faulty or missing A source clock Off = Source A is ignored or good and not selected
SOURCE B	Green/Amber	On (Green) = Source B is the selected source clock On (Amber) = Faulty or missing B source clock Off = Source B is ignored or good and not selected
SOURCE C	Green/Amber	On (Green) = Source C is the selected source clock On (Amber) = Faulty or missing source C clock Off = Source C is ignored or good and not selected
SOURCE D	Green/Amber	On (Green) = Source D is the selected source clock On (Amber) = Faulty or missing source D clock Off = Source D is ignored or good and not selected
OUTPUT FAULT	Amber	On = Module has detected one or more faulty outputs Off = All output signals are good

8

8.8.4 E1 Output Module Performance Specifications

The E1 Output module performance specifications are provided in Table 8-23.

Table 8-23. E1 Output Module Performance Specifications

Performance Characteristic	Specification
Signal	Alternate Mark Inversion (AMI)
Waveshape	Per ITU-T CC (10/98)
Risetime	<100 ns
Pulse Width	244 ns, nominal into 120Ω
Pulse Interval	488 ns, nominal
Duty Cycle	50%
Pulse Amplitude	2.2 to 3.3 Vpp
Jitter	< 0.01 UI
Number of Outputs	20

8.9 DS1 Output Module

This section provides user-reference data for the DS1 Output module that is used in both the SSU-2000e main chassis and in the optional SDU-2000e expansion shelf.

8.9.1 DS1 Output Module Overview

The DS1 Output module generates a phase-locked signal of 1.544 Mbps using one of three 4 kHz clocks from the backplane of the SSU-2000e main shelf (A, B, and C clocks). If the module is inserted into the SDU-2000e Synchronization Distribution Unit (expansion shelf), a fourth 4 kHz clock (D clock) is available. The phase-locked signal generates a set of 20 output signals for distribution to large networks. In addition, the signal clocks the frame generator (or framer) for insertion of proper framing bits.

A microcontroller unit on the DS1 Output module communicates with other boards in the main shelf and performs Output module configuration. The module’s memory subsystem (EEPROM, RAM and serial EEPROM) stores the executable image, the PLD image and other configuration and temporary information for an on-module microprocessor.

The DS1 Output modules may be used individually or configured for operation as redundant pairs in the shelf.

8.9.2 DS1 Output Module Functional Block Diagram

A simplified block diagram of the DS1 Output module is shown in Figure 8-17.

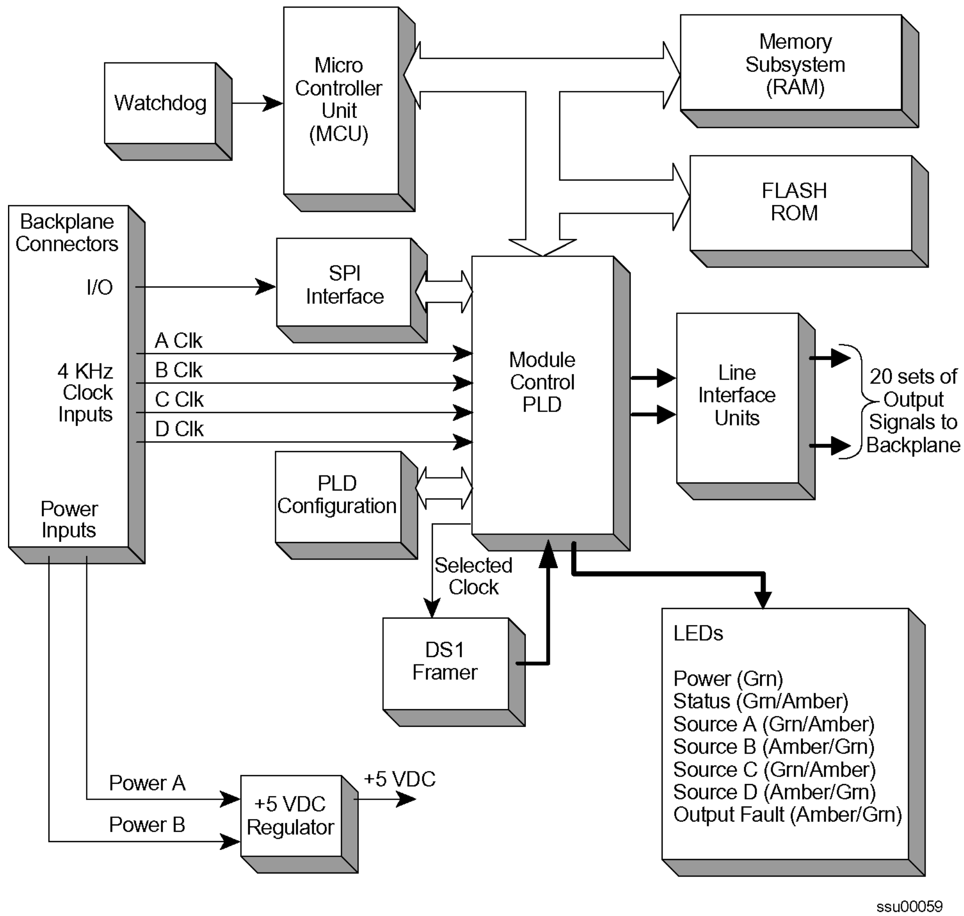


Figure 8-17. DS1 Output Module Block Diagram

8.9.3 DS1 Output Module Status LED Indicators

The DS1 Output module status LED indicators are shown in Figure 8-18 and are described in Table 8-24.

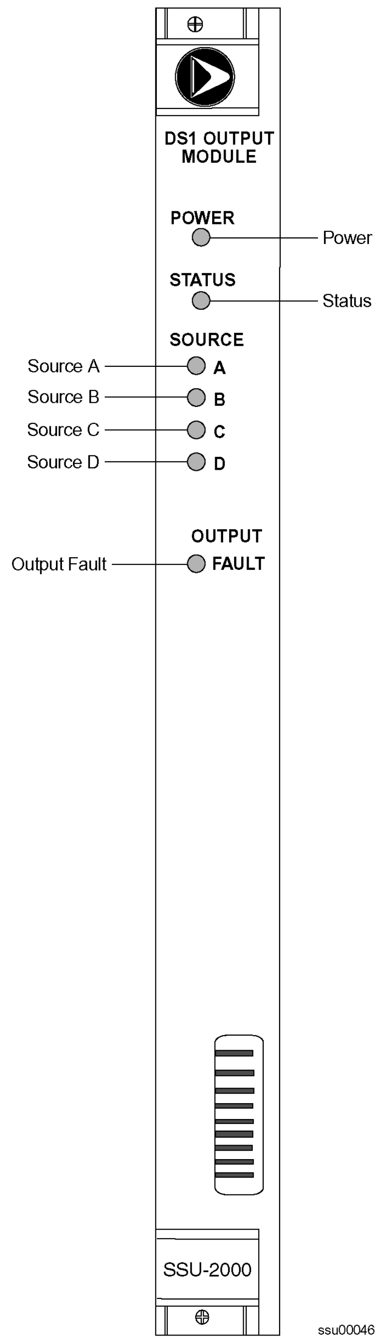


Figure 8-18. DS1 Output Module Status LED Indicators

Table 8-24. DS1 Output Module Status LED Indicators

Indicator	Color	Description
POWER	Green	On = +5 vDC power available on the Output module Off = +5 vDC not present on the module
STATUS	Green/Amber	On (Green) = module functioning correctly Blinking Amber = Output module is downloading firmware On (Amber) = Output module failure
SOURCE A	Green/Amber	On (Green) = Source A is the selected source clock On (Amber) = Faulty or missing A source clock Off= Source A is ignored or good and not selected
SOURCE B	Green/Amber	On (Green) = Source B is the selected source clock On (Amber) = Faulty or missing B source clock Off= Source B is ignored or good and not selected
SOURCE C	Green/Amber	On (Green) = Source C is the selected source clock On (Amber) = Faulty or missing source C clock Off = Source C is ignored or good and not selected
SOURCE D	Green/Amber	On (Green) = Source D is the selected source clock On (Amber) = Faulty or missing source D clock Off = Source D is ignored or good and not selected
OUTPUT FAULT	Amber	On = Module has detected one or more faulty outputs Off = All output signals are good

8

8.9.4 DS1 Output Module Specifications

The DS1 Output module specifications are provided in Table 8-25.

Table 8-25. DS1 Output Module Performance Specifications

Performance Characteristic	Specification
Signal	Alternate Mark Inversion (AMI)
Waveshape	Per (ANSI) T1.102 and ITU Rec. G.703
Risetime	<100 ns
Pulse Width	324 ns, nominal into 100Ω
Pulse Interval	648 ns, nominal
Duty Cycle	50%
Pulse Amplitude	2.6 to 3.6 Vpp
Jitter	< 0.01 UI
Number of Outputs	20

8.10 Composite Clock Output Module

This section provides user-reference data for the Composite Clock Output module used in both the SSU-2000e main chassis and in the optional SDU-2000e expansion shelf.

8.10.1 Composite Clock Output Module Overview

The Composite Clock Output module is one of several Output module types that may be installed in an SSU-2000e main shelf or expansion shelf to generate 20 signal pairs (TTIP and TRING signal pairs). Each output is a transformer-coupled symmetrical pair. Each output pair can be turned off independently of other channels; relays on each output allow for disconnecting the driver output from the output pins. These outputs are independently configurable for duty cycle (50/50 or 62.5/37.5) and phase delay from 0 to 3.4 μsec in 8 or more steps. Refer to Section 5.6.2, Changing Factory Defaults, for more information on duty cycle settings.

The outputs are byte and polarity phase aligned with the selected 4 kHz clock. Each output signal is monitored for a failed output on an independent basis. An output is said to be failed when either the polarity pulse falls below 2.1 volts base to peak, when polarity reversal can no longer be detected, or when return to zero cannot be detected.

The outputs of the Composite Clock Output module meet the criteria set forth in Bellcore GR-378-CORE and TR-TSY-000458 for signal type, amplitude, and waveshape. ITU-T Rec. G.703 Centralized Clock is partially supported (50/50 duty cycle) except only the Bellcore signal levels are generated.

NOTE …

External, customer-supplied padding can be affixed to attenuate the output level to meet Composite Clock specifications.

8.10.2 Composite Clock Output Module Functional Block Diagram

A simplified block diagram of the Composite Clock Output module is shown in Figure 8-19.

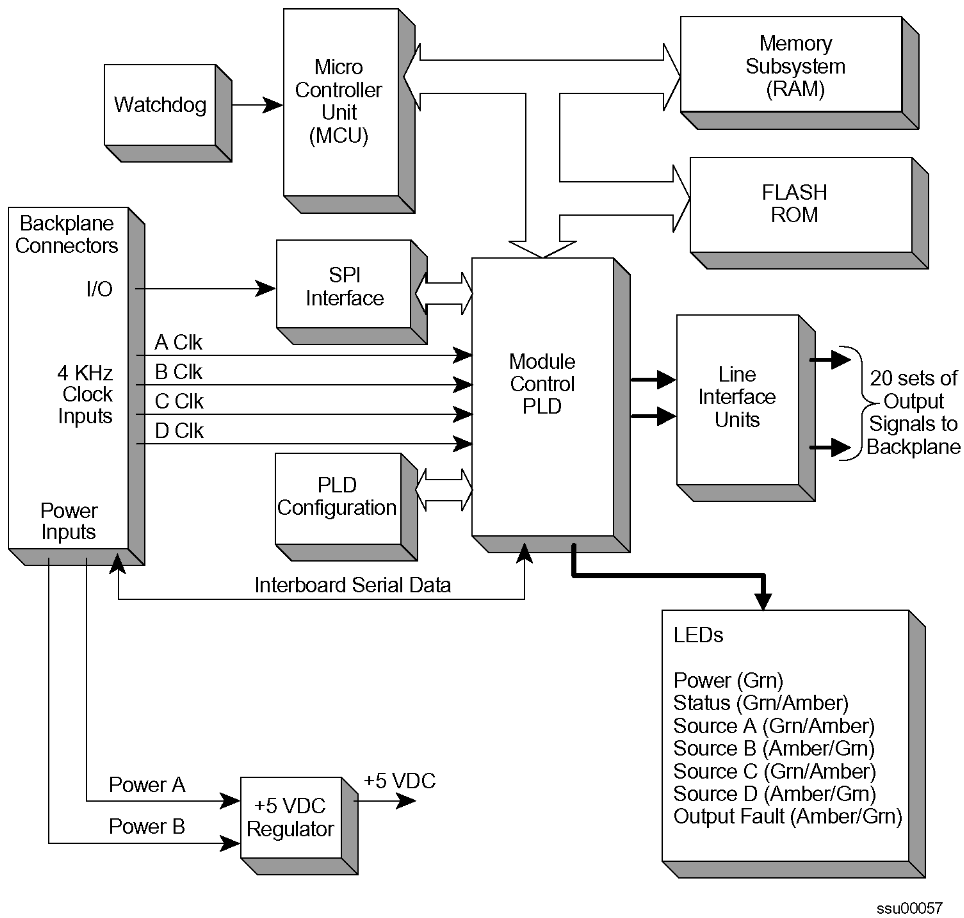


Figure 8-19. Composite Clock Output Module Block Diagram

8.10.3 Composite Clock Output Module Status LED Indicators

The Composite Clock Output module status LED indicators are shown in Figure 8-20 and described in Table 8-26.

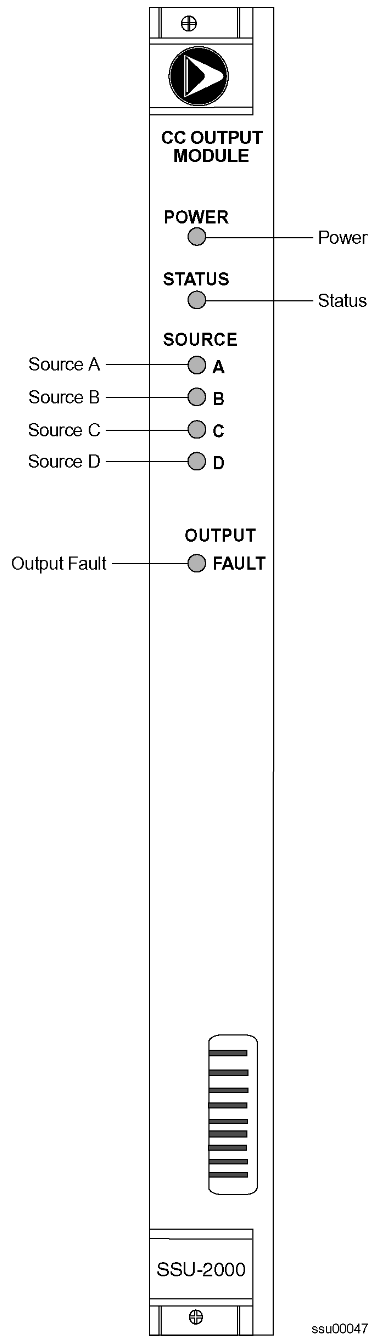


Figure 8-20. Composite Clock Output Module Status LED Indicators

Table 8-26. Composite Clock Output Module Status LED Indicators

Indicator	Color	Description
POWER	Green	On = +5 vDC power available on the Output module Off = +5 vDC not present on the module
STATUS	Green/Amber	On (Green) = module functioning correctly Blinking (Amber) = Output module is downloading firmware On (Amber) = Output module failure
SOURCE A	Green/Amber	On (Green) = Source A is the selected source clock On (Amber) = Faulty or missing A source clock Off = Source A is ignored or good and not selected
SOURCE B	Green/Amber	On (Green) = Source B is the selected source clock On (Amber) = Faulty or missing B source clock Off = Source B is ignored or good and not selected
SOURCE C	Green/Amber	On (Green) = Source C is the selected source clock On (Amber) = Faulty or missing source C clock Off = Source C is ignored or good and not selected
SOURCE D	Green/Amber	On (Green) = Source D is the selected source clock On (Amber) = Faulty or missing source D clock Off = Source D is ignored or good and not selected
OUTPUT FAULT	Amber	On = Module has detected one or more faulty outputs Off = All output signals are good

8

8.10.4 Composite Clock Output Module Specifications

The functional specifications for the Composite Clock Output module are provided in Table 8-27.

Table 8-27. Composite Clock Output Module Specifications

Characteristic	Specification
Signal	Bipolar, Return to Zero, Alternate Mark Inversion (AMI)
Waveshape	Per Bellcore GR-378-CORE Table 6-2 & Figure 6-1
Rise/Fall time	<500 ns
Pulse Width	9.8 µs ±2% for 62.5/37.5 duty cycle 7.8 µs ±2% for 50/50 duty cycle
Pulse Interval	15.6 µs, nominal
Duty Cycle	62.5/37.5 or 50/50 selectable
Pulse Amplitude	2.7 to 5.5 Vpk, 3.5 Vpk nominal into 133Ω
Number of Outputs	20 Independent Channels

8.10.5 Buffer Module Indicators

The Buffer module indicators (LEDs) are shown in Figure 8-21 and are described in Table 8-28.

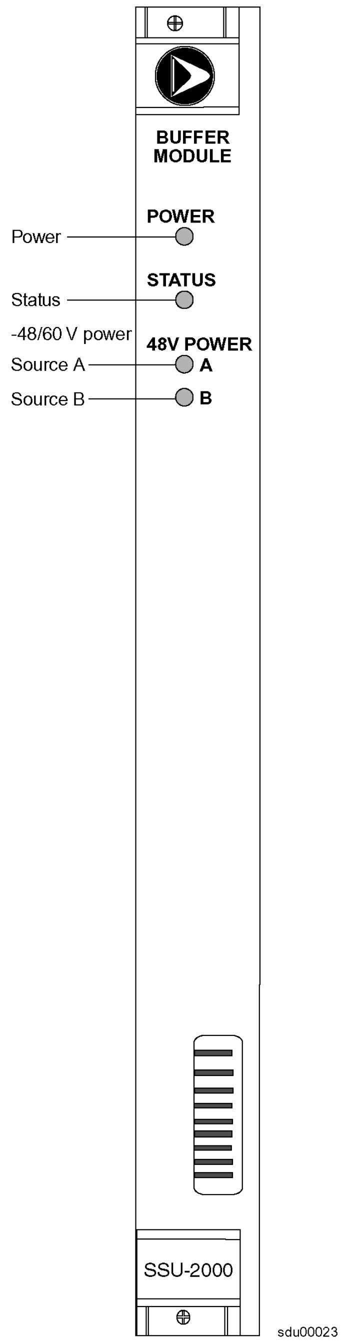


Figure 8-21. Buffer Module Indicators

Table 8-28. Buffer Module LED Indicators

Indicator	Color	Description
POWER	Green	On = Receiving +5 vDC power Off = Loss of +5 vDC power
STATUS	Green/Amber	On (Green) = Normal mode of operation; no faults Blinking Amber = Downloading firmware On (Amber) = Unknown status, or a fault has been detected
–48V Power A	Green/Amber	On (Green) = Receiving input power from Power A On (Amber) = Power connections reversed Off = Loss of input Power A
–48V Power B	Green/Amber	On (Green) = Receiving input power from Power B On (Amber) = Power connections reversed Off = Loss of input Power B

IN THIS CHAPTER ...

Chapter 9 Hardware Configuration Guide

The SSU-2000e's modular construction and powerful plug and play features allow the system to be configured into a variety of telecommunications configurations, depending on which modules are installed. Some of the more common configurations include:

- SSU/TSG system
- Primary Reference Source (PRS) system
- Monitor-only system

9.1 Configuring a Conventional SSU/TSG System

The SSU/TSG configuration allows for input of external references to which the Clock modules are phase locked. This configuration allows for monitoring of several inputs and for synchronization of output signals. Figure 9-1 shows a TSG configuration.

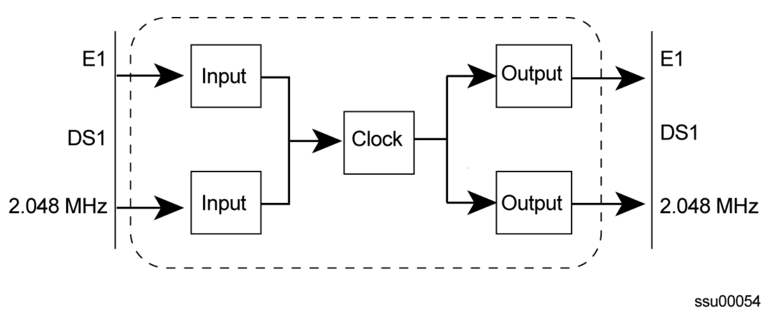


Figure 9-1. Timing Sync Generator (TSG) System Configuration

The TSG configuration consists of the following:

- SSU-2000e main chassis
- Communications Module
- Up to three E1/DS1 Input modules
- One or two Clock Module(s) (2E/3E)
- Up to three E1 and/or DS1 Output Module pairs
- Corresponding number of Output I/O adapter panels and SCSI output cables
- 1.0-inch wide filler panels and a 3-1/2” wide filler panel as necessary

9.2 Configuring a Primary Reference Source (PRS) System

In a Primary Reference Source (PRS) configuration, the SSU-2000e meets the specifications defined in American National Standards Institute (ANSI) T1.101-1994. ANSI defines a Primary Reference Source as “equipment that provides a timing signal whose long-term accuracy is maintained at $1x10^{-11}$ or better, with verification to Universal Coordinated Time (UTC), and whose timing signal is used as the basis of reference for the control of other clocks within a network”. If standard Input modules are installed in the remaining input slots, this configuration also allows for monitoring of other external signals, such as DS1, E1, composite clock, and various clock frequencies. Time-of-day functionality is available via the Ethernet port employing NTP. Figure 9-2 shows a PRS configuration.

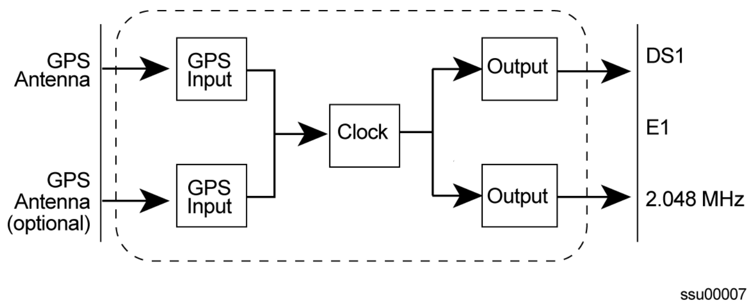


Figure 9-2. SSU-2000e Configured as PRS System

The SSU-2000e PRS configuration consists of the following:

- SSU-2000e main chassis
- Communications Module
- One or two GPS Input Modules
- One Clock Module (2E or 3E)
- Up to three E1 and/or DS1 Output Module pairs
- 1.0-inch wide filler panels and a 3-1/2” wide filler panel as necessary

9.3 Configuring a Monitor Only System

In a monitor-only configuration, no output signals are required. One of the inputs is designated as the reference, and the SSU-2000e Clock module is locked directly to this signal. All remaining input signals are then compared to the phase-locked oscillators (and indirectly to the designated input reference). The SSU-2000e can support up to 27 inputs in this type of configuration. Figure 9-3 shows a monitor only configuration.

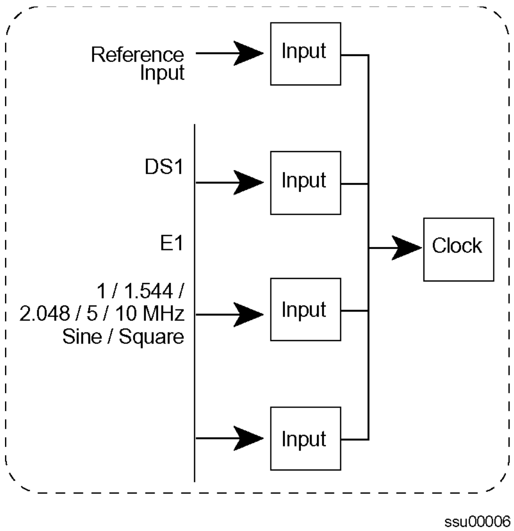


Figure 9-3. SSU-2000e Configured as Monitor Only System

A monitor only configuration consists of the following:

- SSU-2000e main chassis with SDU Termination Plug
- Communications Module
- Up to three Input Modules (1-Port or 3-Port DS1 or E1)
- Stratum 2E Clock Module
- Stratum 3E Clock Module
- 1.0-inch wide filler panels and a 3-1/2” wide filler panel as necessary

9.4 SSU-2000e Configuration Chart

A fully-populated SSU-2000e main shelf is shown in Figure 9-4. Table 9-1 contains a listing of all SSU-2000e components, provides the associated Datum part numbers and provides other configuration data required to procure a custom system.

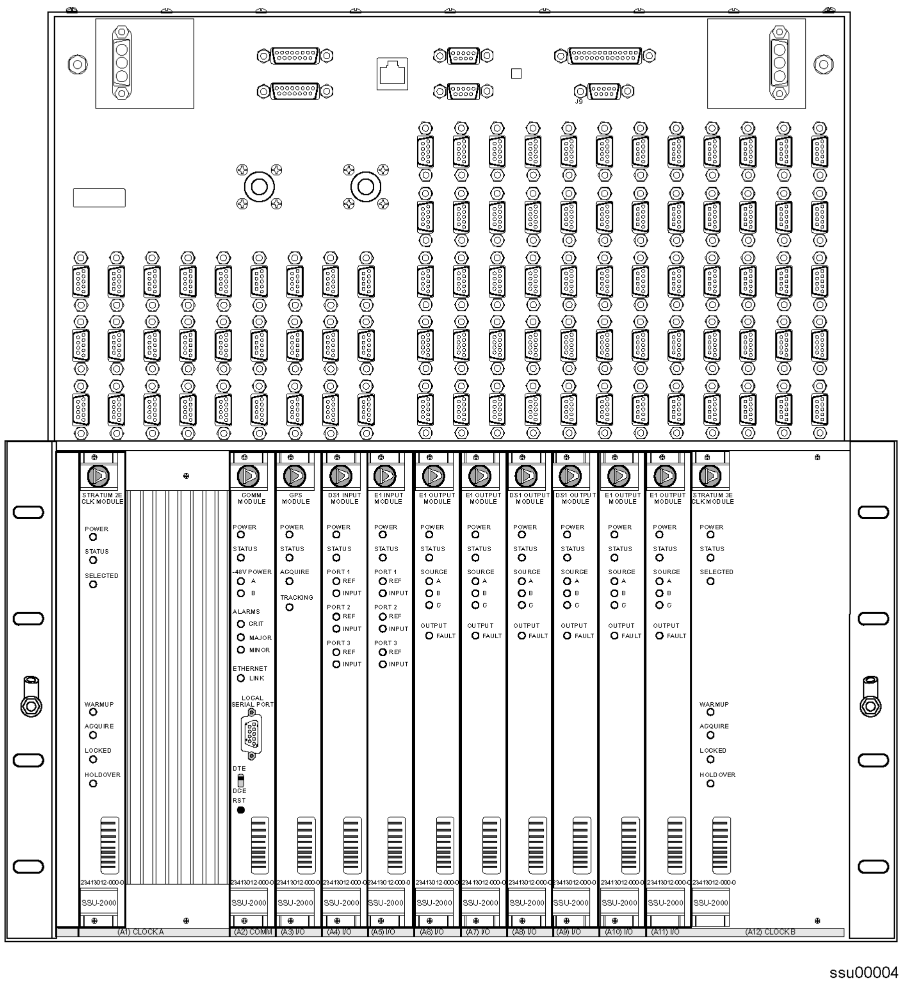


Figure 9-4. SSU-2000e Main Shelf, Front View

Table 9-1. SSU-2000e System Components

Item	Description	Datum Part No.	Notes
SSU-2000e Main Shelf and Associated Hardware			
1	SSU-2000e Main Shelf (Chassis) with SDU termination plug and SSU-2000e Synchronization Supply Unit User Guide	25413140-000-0	1. Required for all systems. 2. If an expansion chassis (SDU-2000e) is not attached to J8, an SSU Expansion Terminator, P/N 12013049-000-0 must be installed on the SSU-2000e chassis, connector J8. Otherwise, the terminator must be installed on the last expansion chassis in the system. 3. Requires minimum of one Comms module, one Clock module, one Input module, one Output module, and eight filler panels (including one wide panel).
2	Bracket, rack ear, 530mm	00413140-001-1	Two each provided with the main shelf.
3	Bracket, rack ear, 480mm	00413140-000-1	Two each required per main shelf (must specify 23” rack).
Clock Modules			
4	Stratum 2E Rb Clock Module	23413016-000-0	1. Minimum of one Clock module per system (item 4 or item 5) 2. Redundant configuration with automatic switching in case of clock failure requires two Clock modules. 3. The system will operate with 2E/3E clocks combined. 2E clock must be installed in chassis slot A1.
5	3E Clock Module	23413015-000-0	1. Minimum of one Clock module per system (item 4 or item 5) 2. Redundant configuration with automatic switching in case of clock failure requires two Clock modules. 3. The system will operate with 2E/3E clocks combined. 2E clock must be installed in chassis slot A1.
Communications Module			
6	Communications Module	23413012-000-0	One required per SSU-2000e system.

9

Table 9-1. SSU-2000e System Components (Continued)

Item	Description	Datum Part No.	Notes
Input Modules			
7	3-Port DS1 Input Module	23413013-002-0	Accepts up to three DS1 or clock signals.
8	1-Port DS1 Input Module	23413013-001-0	1. Accepts one DS1 or clock signal. 2. Requires use of four-port SSU I/O Adapter (one adapter can handle up to four one-port DS1 or ES1 Input Modules).
9	3-Port E1 Input Module	23413014-002-0	Any combination of three G.703/9, G.703/13, or clock inputs.
10	1-Port E1 Input Module	23413014-001-0	Any G.703/9, G.703/13, or clock input.
11	GPS Input Module	23413019-000-0	One radio input signal
12	Input signal terminator 120 Ω (DS1)	5511021-0038	As required
13	Input signal terminator 100 Ω (E1)	5511021-0039	As required
14	Input signal terminator 75Ω (Coaxial cable)	5511021-0041	As required
Output Modules			
15	E1 Output Module	23413018-000-0	1. Minimum of one Output module required. 2. Each Output module provides 20 single output signals or 20 redundant signals (if desired) in even/odd slots.
16	DS1 Output Module	23413017-000-0	1. Minimum of one Output module required. 2. Each Output module provides 20 single output signals or 20 redundant signals (if desired) in even/odd slots.
17	2048 kHz Output Module	23413159-000-0	1. Installed in sets of two. 2. Each Output module pair provides 20 sets of summed output signals (redundant configuration). 3. Maximum of 6 redundant output modules can be installed in main shelf (60 summed outputs). 4. Applications requiring more than 60 output clocks require SDU-2000e Expansion Shelf (Item 16 below).

Table 9-1. SSU-2000e System Components (Continued)

Item	Description	Datum Part No.	Notes
18	Composite Clock Output Module	23413158-000-0	1. Installed in sets of two. 2. Each Output module pair provides 20 sets of summed output signals (redundant configuration). 3. Maximum of 6 redundant output modules can be installed in main shelf (60 summed outputs). 4. Applications requiring more than 60 output clocks require SDU-2000e Expansion Shelf (see Section 9.5, SDU-2000e Configuration Chart).
19	Adapter, 9-pin to wire-wrap	22013085-000-0	One DE9 I/O connector to wire wrap adapter for each DE9 I/O connector (optional).
Blank Filler Panels			
20	Clock Module Filler Panel (8.1mm wide)	10913022-000-0	Panels are required in all unused clock slots.
21	Standard Module Filler Panel (1.5mm wide)	10913021-000-0	Panels are required in all unused SSU-2000e and SDU-2000e chassis slots.The 1.5mm panel fits all unused slots in Expansion Chassis and all except A1 and A12 (the two end slots) in the Main chassis.

9

9.5 SDU-2000e Configuration Chart

The SSU-2000e and SDU-2000e modular construction and the plug-and-play features allow the system to be available in a variety of telecommunications configurations. Adding one or more expansion chassis to a new or existing SSU-2000e system is a relatively simple process.

In this section, expansion chassis components and associated Datum part numbers are provided to help with configuring an expansion system.

A fully-populated SDU-2000e expansion shelf is shown in Figure 9-4. Table 9-1 contains a listing of all SDU-2000e components and associated Datum part numbers. This table also provides other configuration data required to design a custom system.

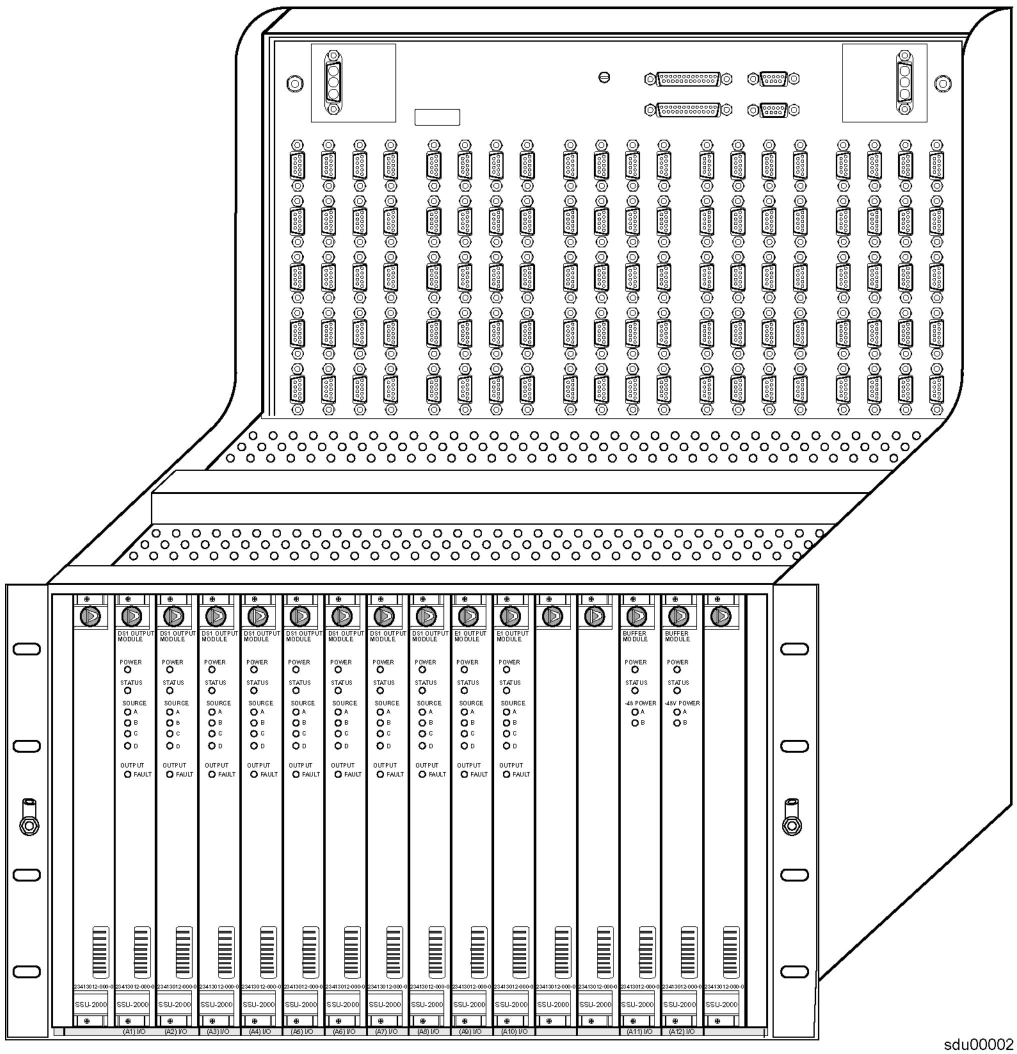


Figure 9-5. SDU-2000e Expansion Shelf, Front View

Table 9-2. SDU-2000e System Components

Item No.	Description	Datum Part Number	Notes
SDU-2000e Expansion Shelf and Associated Hardware			
1	SDU-2000e Expansion Shelf (Chassis)	25413141-000-0	1. Required for all expansion systems. 2. The **SSU Expansion Terminator** and **SDU Backup Clock Terminator** must be moved from the SSU-2000e chassis, connectors J8 and J9 to connectors J105 and J106, respectively, on the last expansion chassis in the daisy chain. 3. Requires minimum of one buffer module (two required for redundancy) and one or more (maximum of ten) Output modules. 4. Unpopulated slots in the chassis require a filler panel.
Buffer Module			
2	Buffer Module	23413122-000-0	One minimum required per SDU-2000e expansion chassis; two required for robust configuration.
Output Modules			
3	E1 Output Module	23413018-000-0	1. Installed in sets of two. 2. Each Output module pair provides 20 sets of summed Output signals (redundant configuration). 3. Maximum of 10 redundant Output modules can be installed in expansion shelf.
4	DS1 Output Module	23413017-000-0	1. Installed in sets of two. 2. Each Output module pair provides 20 sets of summed output signals (redundant configuration). 3. Maximum of 10 redundant Output modules can be installed in expansion shelf.
5	2048 kHz Output Module	23413159-000-0	1. Installed in sets of two. 2. Each Output module pair provides 20 sets of summed output signals (redundant configuration). 3. Maximum of 10 redundant Output modules can be installed in expansion shelf.

9

Table 9-2. SDU-2000e System Components (Continued)

Item No.	Description	Datum Part Number	Notes
6	Composite Clock Output Module	23413158-000-0	1. Installed in sets of two. 2. Each Output module pair provides 20 sets of summed output signals (redundant configuration). 3. Maximum of 10 redundant Output modules can be installed in expansion shelf.
Blank Filler Panels			
7	Standard Module Filler Panel (1.5mm wide)	10913021-000-0	Panels are required in all unused SDU-2000e chassis slots.
RS-232 Cabling			
8	Cable, RS-232 Shielded, DB9P to DB9S, 5 ft. (1.5 m)	551026-0038	Used for communication with the SSU-2000e.

IN THIS APPENDIX ...

Appendix A Alarms and Events

This appendix describes the alarms and events that the SSU-2000e generates, and provides some troubleshooting information for dealing with these alarms and events. After an SSU-2000e Communications module is installed and functioning properly, it monitors the SSU-2000e and logs unit events into non-volatile memory for inspection at a later date. Events are conditions within the unit or at the interfaces of the unit which may indicate abnormal operation or a change in the unit's operational status. Recurring events may be escalated to alarm status and may require action by the user. Conversely, alarms may be de-escalated and corrected automatically.

Although every alarm is considered to be an event, not every event is an alarm. For example, a *login* is recorded as an event but is not considered to be an alarm. In this case, no action is required by the user.

The following sections list all alarm and event messages by their designated numbers, a description of each, and any corrective action to clear the alarm or condition, if necessary. Refer to Section 7.4, Troubleshooting, for more information on troubleshooting procedures.

NOTE ...

Datum offers a 24-hour technical support line and a 2-hour response time for each trouble call. For Customer Service, Call: (512) 721-4032 or (866) 638-7962 (866 NET-SYNC) during our normal business hours (8 a.m. to 5 p.m. CST), or (512) 721-4000 after hours and on weekends, Fax: (512) 251-9685, or E-mail: austinsupport@datum.com

Figure A-1 shows the structure of a typical Alarm and Event report status messages.

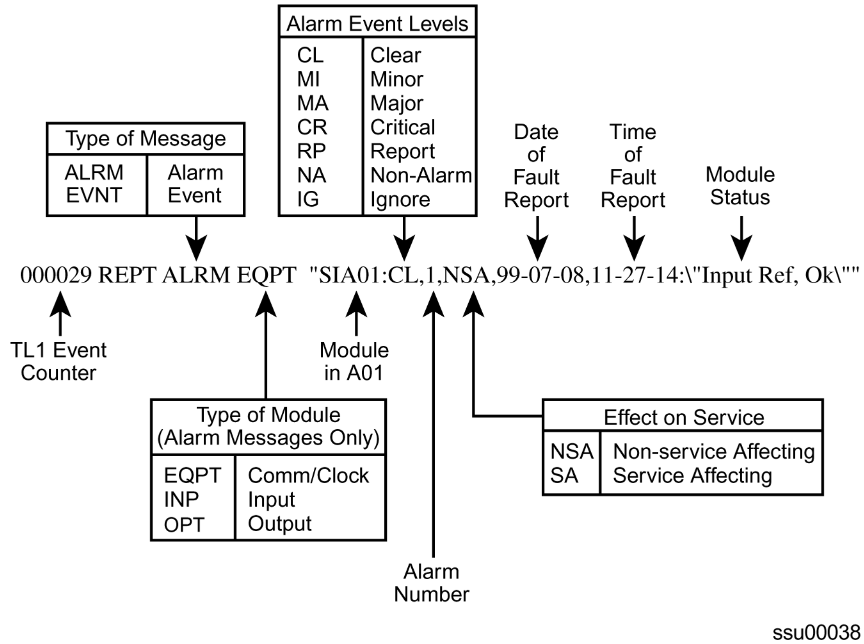


Figure A-1. Alarm and Event Message Breakdown

A.1 Alarm Messages

With the exception of loss of power alarms (on main chassis and expansion unit) all alarms are module alarms. Table A-1 lists each module with corresponding alarm descriptions, alarm levels, status messages, and corrective action. Since a “no fault” alarm requires no action, the “Corrective Action” category applies only to fault messages requiring user intervention

Table A-1. Module Alarm Messages

Alarm Description	Alarm Number	Default Alarm Level	Status Messages	Description/Corrective Action
Clock Module Alarms				
Status of module-to-module communication	0	Minor	▪ Communication Ok ▪ Communication Bad	Unable to communicate with other modules. Re-seat modules.
Input reference available status	1	Minor	▪ Ok ▪ Invalid	If input reference is not available, perform the following: ▪ Check the Input reference settings ▪ Check the Input port’s status ▪ Check that the phase value is valid ▪ Ensure that the Input port priority is set ▪ Verify that the PQL value is equal to or greater than the clock PQL value When the Input reference is recovered, the alarm is cleared.
Frequency mode degradation	2	Minor	▪ Ok ▪ Holdover	Invalid reference input causes holdover. Verify input setup.
Frequency control parameters within specification	3	Major	▪ Ok ▪ Out of Range	The reference input frequency is above the clock pull-in range. Restart or replace Clock module.
Output frequency status within specification	4	Minor	▪ Ok ▪ Degraded	Output exceeded pull-in range of oscillator. Select new input reference.
Clock module usable as the output reference	5	Minor	▪ Ok ▪ Invalid	Clock mode has warmed up.
Status of the numerically controlled oscillator phase lock loop	6	Minor	▪ Ok ▪ Not Locked	Alarm will clear within one minute after module is installed. If alarm persists, re-seat modules.

A

Table A-1. Module Alarm Messages (Continued)

Alarm Description	Alarm Number	Default Alarm Level	Status Messages	Description/Corrective Action
Status of the local oscillator phase lock loop	7	Minor	▪ Ok ▪ Not Locked	Alarm will clear within one minute after module is installed. If alarm persists, re-seat module.
Status of the rubidium's internal phase lock loop	8	Minor	▪ Ok ▪ Not Locked	Only available with Stratum 2E Rubidium module. If alarm persists, re-seat module.
Status of the hardware configuration	9	Minor	▪ Ok ▪ Failed	Call Datum Customer Service. Return module to factory.
Communications Module Alarms				
Module-to-module communication	0	Minor	▪ Ok ▪ Bad	Unable to communicate with other modules. Re-seat modules.
Indication of output controller mastership	1	Minor	▪ Ok ▪ Bad	Identifies master output controller. No action necessary.
Status of Power A	2	Minor	▪ Ok ▪ Lost	▪ Verify that the fuse for Power A is properly installed and not OPEN ▪ Verify that Power Bus A is providing –48 vDC to the unit. If power is not connected to the Power A input and there is no plan to connect power, enter the command `AL 10-1 IG` at the prompt.
Status of Power B	3	Minor	▪ Ok ▪ Lost	▪ Verify that the fuse for Power B is properly installed and not OPEN ▪ Verify that Power Bus B is providing –48 vDC to the unit. If power is not connected to the Power B input and there is no plan to connect power, enter the command `AL 10-1 IG` at the prompt.
Status of module's serial peripheral interface hardware (SPI watchdog timeout)	4	Minor	▪ Ok ▪ Timeout	Unable to communicate with other modules. Re-seat module.

Table A-1. Module Alarm Messages (Continued)

Alarm Description	Alarm Number	Default Alarm Level	Status Messages	Description/Corrective Action
DS1/E1 Input Module Alarms				
Loss of signal fault status	0	Minor	▪ Ok ▪ Active	Verify signal is connected. May be cleared by disabling port.
Alarm indication signal fault status	1	Minor	▪ Ok ▪ Active	Verify input signal is good. Port can be disabled.
Out of frame signal fault status	2	Minor	▪ Ok ▪ Active	Change frame type: ▪ DS1-ESF or D4 ▪ E1-CAS or CCS
Bipolar violation signal fault status	3	Minor	▪ Ok ▪ Active	Verify port ZS is on. Verify signal is good.
Cyclic redundancy code error fault status	4	Minor	▪ Ok ▪ Active	Verify port CRC is off. Verify signal is good.
Maximum time interval error fault status limit 1	5	Minor	▪ Ok ▪ Exceeded	MTIE limit 1 has been exceeded.
Maximum time interval error fault status limit 2	6	Minor	▪ Ok ▪ Exceeded	MTIE limit 2 has been exceeded.
Received PQL below provision PQL status	7	Minor	▪ Ok ▪ Below Prov	Received SSM (PQL) is below provisioned PQL.
No SSM status	8	Minor	▪ Ok ▪ Lost	Set port SSM to Off to clear.
Module boot problem	9	Minor	▪ Ok ▪ Failed	Re-seat module.
Clock PLL not locked	10	Minor	▪ Ok ▪ Not Locked	Re-seat module.
Input PLL not locked	11	Minor	▪ Ok ▪ Not Locked	Verify input frequency setting. Re-seat module.
Phase measurement hardware fault	12	Minor	▪ Ok ▪ Bad	Re-seat module.
Frequency measurement range exceeded	13	Minor	▪ Ok ▪ Exceeded	Input frequency is greater than threshold. Monitor frequency and if persistent, check source.
Hardware configuration fault	14	Major	▪ Ok ▪ Failed	Call Datum Customer Service. Return module to factory.

Table A-1. Module Alarm Messages (Continued)

Alarm Description	Alarm Number	Default Alarm Level	Status Messages	Description/Corrective Action
GPS Input Module Alarms				
Hardware configuration fault	0	Major	▪ Ok ▪ Failed	Call Datum Customer Service. Return module to factory
GPS Engine tracking status	1	Minor	▪ Ok ▪ Not Tracking	No visible satellites seen at startup.
Antenna connection status	2	Minor	▪ Ok ▪ Not Connected	Verify that: ▪ The antenna is connected ▪ The cable and connectors are not damaged ▪ The antenna placement is correct
Antenna condition fault	3	Minor	▪ Ok ▪ Shorted	Ring out the cable to ensure that the center conductor is not shorted to the sleeve, then verify that: ▪ The antenna cable is connected properly ▪ The cable and connectors are not damaged
GPS Engine hardware fault	4	Minor	▪ Ok ▪ Bad	Re-seat module. If problem persists, call Datum Customer Service.
Engine system fault	5	Minor	▪ Ok ▪ Bad	If alarm doesn't clear after 30 minutes, call Datum Customer Service.
Position unknown fault	6	Minor	▪ Ok ▪ Unknown	If alarm doesn't clear after 1 hour, call Datum Customer Service.
Clock PLL status fault	7	Minor	▪ Ok ▪ Not Locked	▪ Reseat module. ▪ Ensure that the GPS priority level is set to 1. ▪ If problem persists, call Datum Customer Service.
Manufacturing item number fault	8	Minor	▪ Ok ▪ Unknown	Call Datum Customer Service Return module to factory.
System software fault	9	Minor	▪ Ok ▪ Failed	Re-seat module. If problem persists, call Datum Customer Service.
Phase hardware fault	10	Minor	▪ Ok ▪ Bad	Re-seat module. If problem persists, call Datum Customer Service.

Table A-1. Module Alarm Messages (Continued)

Alarm Description	Alarm Number	Default Alarm Level	Status Messages	Description/Corrective Action
DS1/E1 Output Module Alarms				
Redundant module status	0	Major	▪ Ok ▪ Failed	Output alignment problem. Disable module, then re-enable.
Mismatched DS1/ E1 modules in redundant configuration	1	Major	▪ Ok ▪ Invalid	A redundant pair has one DSI module and one E1 module. Replace with correct module.
Loss of clock source A	2	Major	▪ Ok ▪ Lost	Clock module in slot A1 is in warm-up mode or has other problems
Loss of clock source B	3	Major	▪ Ok ▪ Lost	Clock module in slot A12 is in warm-up mode or has other problems.
Loss of clock source C	4	Major	▪ Ok ▪ Lost	Reference signal is in LOS and both clocks have been removed or are in warm-up.
Clock below minimum clock level	5	Major	▪ Ok ▪ Below	Clock A or B is below Output module setting.
Clock not selected for output	6	Major	▪ Selected ▪ Not Selected	No clocks, no output.
Output port fault (displayed as hex value)	7	Major	▪ Ok ▪ Active	Indicates which output port is in fault (typically shorted). Remove short and re-enable port.
VCXO status	8	Major	▪ Ok ▪ Lost	VCXO problems, re-seat or replace module.
Output PLL status	9	Major	▪ Ok ▪ Lost	No clocks or VCXO. Re-seat and check clocks.
Configuration status	10	Major	▪ Ok ▪ Failed	Redundant configuration mismatch. Re-seat or replace with correct module.
Hardware configuration fault	11	Major	▪ Ok ▪ Failed	Call Datum Customer Service. Return module to factory.
Loss of clock source D	12	Major	▪ Ok ▪ Lost	Only in SDU-2000e. Loss of backup clock. Check cable.

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Table A-1. Module Alarm Messages (Continued)

Alarm Description	Alarm Number	Default Alarm Level	Status Messages	Description/Corrective Action
Composite Clock Output Module Alarms				
Redundant module status	0	Major	▪ Ok ▪ Failed	Output alignment problem. Disable module, then re-enable.
Mismatched DS1/ E1 modules in redundant configuration	1	Major	▪ Ok ▪ Invalid	A redundant pair has one DSI module and one E1 module. Replace with correct module.
Loss of clock source A	2	Major	▪ Ok ▪ Lost	Clock module in slot A1 is in warm-up mode or has other problems.
Loss of clock source B	3	Major	▪ Ok ▪ Lost	Clock module in slot A12 is in warm-up mode or has other problems.
Loss of clock source C	4	Major	▪ Ok ▪ Lost	Reference signal is in LOS and both clocks have been removed or are in warm-up.
Loss of clock source D	5	Major	▪ Ok ▪ Lost	Only in SDU. Loss of backup clock. Check cable.
Clock below minimum clock level	6	Major	▪ Ok ▪ Below	Clock A or B is below Output module setting.
Clock not selected for output	7	Major	▪ Selected ▪ Not Selected	No clocks, no output.
VCXO status	8	Major	▪ Ok ▪ Lost	VCXO problems, re-seat or replace module.
Output PLL status	9	Major	▪ Ok ▪ Lost	No clocks or VCXO. Re-seat and check clocks.
Configuration status	10	Major	▪ Ok ▪ Failed	Redundant configuration mismatch. Re-seat or replace with correct module.
Internal port fault, Active 4000	11	Major	▪ Ok ▪ Active	Driver chip indicated a port fault on port 2 (4000 Hex).
External port fault, Active A000	12	Major	▪ Ok ▪ Active	External port fault on ports 2 and 4 (A000 Hex).
Hardware configuration fault	13	Major	▪ Ok ▪ Failed	Call Datum Customer Service. Return to factory.

Table A-1. Module Alarm Messages (Continued)

Alarm Description	Alarm Number	Default Alarm Level	Status Messages	Description/Corrective Action
2048 kHz Output Module Alarms				
Redundant module status	0	Major	▪ Ok ▪ Failed	Output alignment problem. Disable module, then re-enable.
Mismatched DS1/ E1 modules in redundant configuration	1	Major	▪ Ok ▪ Invalid	A redundant pair has one DSI module and one E1 module. Replace with correct module.
Loss of clock source A	2	Major	▪ Ok ▪ Lost	Clock module in slot A1 is in warm-up mode or has other problems.
Loss of clock source B	3	Major	▪ Ok ▪ Lost	Clock module in slot A12 is in warm-up mode or has other problems.
Loss of clock source C	4	Major	▪ Ok ▪ Lost	Reference signal is in LOS and both clocks have been removed or are in warm-up.
Loss of clock source D	5	Major	▪ Ok ▪ Lost	Only in SDU. Loss of backup clock. Check cable.
Clock below minimum clock level	6	Major	▪ Ok ▪ Below	Clock A or B is below Output module setting.
Clock not selected for output	7	Major	▪ Selected ▪ Not Selected	No clocks, no output.
VCXO status	8	Major	▪ Ok ▪ Lost	VCXO problems, re-seat or replace module.
Output PLL status	9	Major	▪ Ok ▪ Lost	No clocks or VCXO. Re-seat and check clocks.
Configuration status	10	Major	▪ Ok ▪ Failed	Redundant configuration mismatch. Re-seat or replace with correct module.
Internal port fault, Active 4000	11	Major	▪ Ok ▪ Active	Driver chip indicated a port fault on port 2 (4000 Hex).
Hardware configuration fault	13	Major	▪ Ok ▪ Failed	Call Datum Customer Service. Return module to factory.

A

A.2 Event Messages

Table A-2 lists event messages categorized by module. Each section lists status messages associated with each module and an event description of each message.

Table A-2. Module Event Messages

Event Message	Event #	Event Description
Clock Module Events		
Install, Clock Module	129	Module installation
Remove, Clock Module	130	Module removal
Enable, Clock Module, COML\	131	Module enabled
Disable, Clock Module, COML\	132	Module disabled
Restart, in 5 seconds, COML\	133	User requesting for a module to reboot
Cannot Enable, Clock Module, COML\	134	Inability to enable module
Clk Select	144	Which Clock module is selected to generate output
Software phase lock loop (Soft PLL, Acquire/Lock/Hold)	145	Software Phase Lock Loop in Acquire, Lock, or Holdover status
Inp Select, 1A04-02\	146	An Input has been selected as Reference
Output Pql, 2 (PQL value 1 to 5 ST2, or 8 ST3)	147	The Output PQL has been set to the value shown
CLK C Sel, 1A04-02\	148	A reference Input has been selected as an output source
Warmup Chg, 1800 sec, COML\	194	The user has changed the Oscillator warmup time setting
Start tc, 240, COML\	195	The user has changed the Starting Time Constant (TAU) of the Oscillator
Dflt tc, 10000, COML\	196	The user has changed the Default Time Constant (TAU) of the Oscillator
Clk AR< On, COML\	199	The user has changed the Clock Auto-Return (ON | OFF)
Inp Switch, AR On, COML\	200	The user has changed Input Auto-Return (ON | OFF)
LO, Dis, COML\	201	The user has changed the Local Oscillator Output (ON | OFF) on the LO Output connector
Inp Sel Mode, PQL, COML\	202	Reference selection mode (Priority Quality Level)
Err Delay, (1), 300 sec, COML\	251	The user has changed Alarm Delay time
Alm Level, (2), Maj, COML\	252	The user has changed Alarm level (IGNORE, REPORT, MINOR, MAJOR, CRITICAL)
Elevate Time, 7200 sec, COML\	253	The user has changed alarm elevation time
Setup, User Default, COML\	254	The user has set the module's configuration

Table A-2. Module Event Messages (Continued)

Event Message	Event #	Event Description
Communications Module Events		
KeepAlive, SSU2000	105	The Keep Alive function has been enabled/ disabled
Install, Comm Module\	129	Module Installation
Remove, Comm Module\	130	Module Removal
Enable, Comm Module, COML\	131	The Comms Module has been Enabled
Disable, Comm Module, COML\	132	The Comms Module has been Disabled
Restart, in 5 seconds, COML\	133	Module reboot (Warm boot)
Log In, JAY, COML, level: 2\	144	User at indicated level has logged in on the indicated port
Log Out, JOHN, COML, level: 2\	145	User at indicated level has logged out from the indicated port
Auto Out, SMITH, COML, level: 3:\	146	System automatically logging out a user
Msg, <HELLO USER>, COML\	147	Message sent from a user
Not Acknowledged, 1A01\	148	Module configuration could not be obtained
Module Status, Bad, 1A04\	150	Module did not boot properly
UTC TIME, Valid/Invalid	151	Time of startup, when NTP is enabled but GPS time is not being used
TODSYNC, TIMEOUT	152	Time of day (TOD) was requested by the Comms module, no response from the GPS module
Upgrade Image, Start/Complete	153	System firmware upgrade was started or completed
Upgrade, 1A01	154	Module's firmware upgrade has started
Upgrade ACK, 1A01	155	Module's firmware upgrade was completed
Upgrade NAK, 1A01	156	Module's firmware upgrade was not completed
Hdw Config Err, 1A06	157	Call Datum Customer Service.Return to factory
NTP Mode, Client/Broadcast/BClient/ Local	158	The SSU is configured with NTP running in a NTP Client, Broadcast, or Broadcast Client server mode; Local is displayed when NTP server is initialized. If GPS is not installed or setup, or NTP has not been configured NTP remains in Local mode and uses Comms module time
Reset, Clk-B, COML\	159	The clock listed was reset by the user
InitUserTable, TOM, COML\	192	Administrator initialized user database
Add User, Andy, COML\	193	Administrator added a user to user database
Mod User, DON, COML\	194	User/Administrator modified user database
Del User, TESTUSER, COML\	195	Administrator deleted user from user database
Pql Table, DS1, pql (5)=ST2, COML\	196	PQL database has been modified
Pql Table Dflt, COML\	197	PQL database has been set to factory defaults

A

Table A-2. Module Event Messages (Continued)

Event Message	Event #	Event Description
Communications Module Events (Continued)		
Unit Name, AUSTIN, COML\	198	The SSU name has been changed
NTP Peer Add, 192.5.41.40, Client, COML\	199	NTP client was added at the IP address shown
NTP Peer Del, 192.5.41.40, Client, COML\	200	NTP client was deleted at the IP address shown
NTP Brd Timer, 64 seconds, COML\	201	The NTP broadcast server timer has been set to the interval shown
SNMP User, ADD, id=1, COML\	202	An SNMP user has been added in the position of the user table shown
SNMP Mode, Ena, COML\	203	An SNMP Mode has been enabled
SNMP Manager, Init, 192.5.41.3, COML\	204	An SNMP Manager has been initialized at the IP address shown
Evt Blocked, SET, 2A02, COML\	205	SNMP events (Traps) will not be generated from the module shown
SNMP Trap, ALM, COML\	206	The SNMP Trap Port has been set to send traps on alarms only by the user
Chg KeepAlive, ALL, 15 minute, COML\	207	The Keep Alive timer has been set to the interval shown
Err Delay, (1), 300 sec, COML\	251	An alarm delay time change
Alm Level, (2), Rep, COML\	252	An alarm level change
Elevate Time, 3600 sec, COML\	253	An alarm elevation time change
Setup, Save, COML\	254	User defaults change or save
DS1/E1 Input Module Events		
Install, Input Module\	129	Module Installation
Remove, Input Module\	130	Module Removal
Enable, Input Module, COML\	131	The Input module has been enabled
Disable, Input Module, COML\	132	The Input module has been disabled
Restart, in 5 seconds, COML\	133	Module re-boot
Cannot Enable, Input Module, COML\	134	Internal firmware conflict. Restart module, if the problem persists, call Datum Customer Service
Zero Phase, B, COML\	144	User has forced the phase to be cleared
Rcv Pql Chg, 3\	145	Input has received a different PQL
Pha Buildout, 334000, 335000\	146	Input performed phase buildout and difference in Phase that cause PBO
DS1 Framer, ESF, COML\	193	An Input framer setup change
E1 Framer, CCS, COML\	194	An Input framer setup change
Freq, 10 MHz, COML\	195	User changed input framer setup
ZS, On, COML\	196	User changed input framer setup

Table A-2. Module Event Messages (Continued)

Event Message	Event #	Event Description
DS1/E1 Input Module Events (Continued)		
SSM, Off, COML\	197	User changed input SSM capability
CRC, On, COMl\	198	User changed input framer setup
Port, Dis, COML\	199	User Enabled | Disabled input port
SSM, Auto, COML\	200	User changed SSM setup
Priority, 5, COML\	201	User changed input priority level
SSM Bit, 4, COML\	202	User changed SSM Bit location (E1 only)
Prov PQL, 5, COML\	203	User changed input provisioned PQL
MTIE, T100, L1, 550, COML\	204	User changed input MTIE limits (L1 | L2)
Gain, On, COML\	205	User changed the input gain control
CSFlt, Off, COML\	206	User changed input Cesium Fault control
Err Cnt, BPV, 16, COML\	207	Signal Alarm Error Count (LOS, AIS, OOF, BPV, or CRC)
Clr Cnt, OOF, 5, COML\	208	Current Signal Alarm Clear Count (LOS, AIS, OOF, BPV, or CRC)
Freq Err Limit, Clk-A, 100	209	The frequency error limit settings have been changed
Freq Clr Limit, Clk-A, 800	210	The frequency clear limit settings have been changed
MTIE Clr Limit, T100, L1, 500, COML\	211	The MTIE error limit settings have been changed
MTIE Limit, DS1, COML, Setting	212	The MTIE clear limit settings have been changed
PBO, Report, COML\ (Disable|Event|Report|None)	213	Phase Build-out system response has been changed to the indicated setting
Freq Tau, Clk-A, 400, COML\	214	The frequency TAU limits have been set
Err Delay, (0), 10 sec, COML\	251	An alarm delay time change
Alm Level, (2), Maj, COML\	252	An alarm level change
Elevate Time, 86400 sec, COML\	253	An alarm elevation time change
Setup, Save, COML\	254	User defaults have been set and saved
GPS Input Module Events		
Install, GPS Module\	129	Module Installation
Remove, GPS Module\	130	Module Removal
Enable, GPS Module\	131	The Input module has been enabled
Disable, GPS Module\	132	The Input module has been disabled
Restart, in 5 seconds, COML\	133	Module re-boot
Cannot Enable, GPS Module, COML\	134	Inability to enable module

Table A-2. Module Event Messages (Continued)

Event Message	Event #	Event Description
GPS Input Module Events (Continued)		
Zero Phase, B, COML\	144	User has forced the phase to be cleared
Priority, 3, COML\ (0 to 10)	193	User has changed the Priority level on the GPS Input module to the level shown
Prov PQL, 2, COML\	194	User has changed the Priority quality level to the level shown
ElMask, Pos 10, COML\	195	User has changed the elevation mask on the Input module to the level shown
Satellite Ignore, 3, COML\	197	User has set the GPS engine to ignore the satellite number indicated
Position, 300 Avg, COML\ Position, 300 AvgCnt, COML\	198	The position has been calculated, AvgCnt=10 to 1000
Tracking Mode, On, COML\	199	User specified GPS positioning mode has been set
Pos Set by Rec, Information Locked, COML\	200	User specified GPS positioning mode has been set to Calc and the position has been recalculated and locked in
Engine Set Time, GPS	201	System time has been set to UTC by the GPS module
PDOP, 2, COML\	203	User has changed the PDOP on the GPS Input module to the setting shown
Err Delay, (0), 10 sec, COML\	251	An alarm delay time change
Alm Level, (2), Maj, COML\	252	An alarm level change
Elevate Time, 86400 sec, COML\	253	An alarm elevation time change
Setup, Save, COML\	254	User defaults have been set and saved
Output Module Events		
Install, Output Module\	129	Module Installation
Remove, Output Module\	130	Module Removal
Enable, Output Module, COML\	131	Output module has been enabled
Disable, Output Module, COML\	132	Output module has been disabled
Restart, in 5 seconds, COML\	133	Module re-boot
Cannot Enable, Output Module, COML\	144	Output module cannot be enabled
Frame Mode, ESF, COML\	193	Output framing type change
ZS, On, COML\	194	User changed output framing type
DS1 LEN, [0-5], len=133 ft., COML\	195	User changed output line length (DS1 only)
CRC, On, COML\	199	User has changed output framing type
SSM Bit, 8, COML\	201	User has changed output SSM bit position (E1 only)

Table A-2. Module Event Messages (Continued)

Event Message	Event #	Event Description
Output Module Events (Continued)		
Min Clk Level, ACQ, COML\	202	User has changed Minimum Clock Level to turn on outputs
Bypass, On, COML\	203	User has changed Bypass mode of operation
DutyCycle, Port= [0-1], 50/50, COML\	204	CC signal duty cycle settings have been changed for the port shown
Delay, Port= [0-3], 4000ft, COML\	205	CC signal phase offset settings have been changed for the port shown
FltMode, ON, COML\	206	Fault recovery strategy has been changed
Alm Level, (0), Maj, COML\	252	An alarm level change
Elevate Time, 86400 sec, COML\	253	An alarm elevation time change
Setup, User Default, COML\	254	User defaults have been set and saved

IN THIS APPENDIX ...

Appendix B Communications Protocol

This appendix provides information about the Transaction Language One (TL1), Interactive Command Set (ICS), and Simple Network Management Protocol (SNMP) control languages that are used to communicate with the SSU-2000e.

B.1 SSU-2000e Control Languages

Software embedded in the SSU-2000e hardware allows operators to query and manage an SSU-2000e unit from a local or remote management terminal using one of three control interfaces. These management agents allow operators to change factory default settings, set or restore stored configuration settings, configure and provision the SSU-2000e system to meet the requirements of a unique environment, and perform maintenance and troubleshooting.

The SSU-2000e unit supports three control interfaces. Each grants access to command functions according to the security levels assigned to users. The control interfaces are:

- **TL1** – The Transaction Language One (TL1) control language, perhaps the dominant telecommunications industry ASCII command line interface, provides a standard man-machine language. The TL1 language is defined in Bellcore document TR-NWT-000831, Issue 3, Revision 1, December 1993.
- **ICS** – The Interactive Command Set (ICS) control language also called the ASCII command set, can be used to control the SSU-2000e from a terminal connected to one of the SSU-2000e RS-232 serial ports.
- **SNMP** – The Simple Network Management Protocol (SNMP) protocol is based on a client server query-response mode and is supported by Ethernet only.

There are four main executables (software versions) available for the SSU-2000e as shown in Table B-2. They are the Basic System Load, Basic with NTP Support, Basic with SNMP Support, and Basic with SNMP and NTP Support. This section provides information about the TL1 and ICS control languages for all four versions of software.

- Section B.2, TL1 Command Interface, defines the TL1 command and response specifications.
  - Table B-5 defines the TL1 *retrieve* commands, access identifier (AID) code, description and use of the command function, and the response message format for each.
  - Table B-6 defines the TL1 *set* commands, access identifier (AID) code, description and use of the command function, and the response message format for each.
  - Table B-7 defines *other* TL1 commands for logging onto and off the SSU-2000e system, and for activating, disconnecting, and removing modules from the SSU-2000e unit.
- Section B.3, Interactive Command Set, defines the ICS commands, responses, and events.
- Section B.4, NTP Support, gives a description of NTP support functionality.
- Section B.5, SNMP Protocol, identifies SNMP command functions, as well as features supported in this software version.

RECOMMENDATION …

To ensure optimal system performance using the Communications module main executable software shown in Table B-2, Datum recommends that the module hardware and software used be at the minimum revision levels as shown in Table B-1.

Table B-1. Module and Software Revision Levels

Module Part #	Module Name	Software Revision Level	Hardware Revision level
23413013-001-0	DS1 1 Port Input Module	B	B
23413014-001-0	E1 1 Port Input Module	B	B
23413013-002-0	DS1 3 Port Input Module	B	B
23413014-002-0	E1 3 Port Input Module	B	B
23413019-000-0	GPS Input Module	A	A
23413016-000-0	Clock Module (STR 2E)	B	A
23413015-000-0	Clock Module (STR 3E)	B	A
23413017-000-0	DS1 Output Module	A	C
23413018-000-0	E1 Output Module	A	C
23413159-000-0	2048 KHz Output Module	A	A

Table B-1. Module and Software Revision Levels (Continued)

Module Part #	Module Name	Software Revision Level	Hardware Revision level
23413158-000-0	CC Output Module	A	A
23413012-000-0	Communications Module	A	E
23413012-001-0	Communications Module	A	E

Table B-2. Communications Module Software

Part Number	Software Version
24113012-000-0	Basic System Load
24113012-001-0	Basic + NTP Support
24113012-002-0	Basic + SNMP Support
24113012-003-0	Basic + NTP and SNMP Support

B.2 TL1 Command Interface

Telcordia Technologies (formerly Bellcore) specified the TL1 command interface to be used as a standard man-machine language for controlling telecommunications network elements. TL1 provides command sets to support all operation, administration, maintenance, and provisioning tasks required to maintain and control an SSU-2000e system. These tasks include configuring and provisioning security, monitoring system performance, configuring hardware, locating and handling faults, and performing equipment diagnosis and testing.

NOTE …

To communicate with the SSU-2000e unit, you must first connect a terminal to one of the three SSU-2000e EIA-232-C serial communication ports. After setting up the Ethernet port, you can also communicate with the SSU-2000e using an Ethernet Telnet session.

To set up an SSU-2000e port for TL1 communications:

1. Log on to one of the SSU-2000e EIA-232 serial ports using a Supervisor-level (or higher) user name and password.

2. Set port A, B, or L to TL1 mode. For example, to set the local port (COML) to TL1 mode, at the system prompt, type:

```
COMM L MODE TL1
```

- The communications mode settings for the COMM A and COMM B ports (located on the rear of the unit) are stored in non-volatile RAM, and remain in effect even after restarting the SSU-2000e unit.
- The communications mode settings for the COMM L (local) port (located on the front of the unit) always default to ASCII mode on startup.
- When connecting via Ethernet, a Telnet session to port 2000 (decimal) will open in TL1 mode and remain until the session is terminated. Once connected in TL1 mode, the user must log in using the ACT-USER command with a user name and password (if security is active on the unit).

To close the serial port for TL1 communications:

Type **EXIT,** then press **Enter**, or command or send three **ESC**ape characters from the management terminal. This logs you out and returns the port to the default communications mode.

To log off the user and exit from an Ethernet connection:

- Type **EXIT,** then press **Enter**, or disconnect the Telnet session, or
- Type **CANC-USER,** then press **Enter** to log out and return the port communication setting to security level 0. This command does not change the communications mode.

NOTE …

The automatic time-out is disabled for the port when you are communicating in TL1 mode using one of the serial communications ports or the Ethernet port.

B.2.1 TL1 Command and Response Conventions

This section describes general and specific conventions for expressing TL1 command and response parameters for the four types of operations application messages:

- **Input Command Message** – This message determines the action that the SSU-2000e will take. For a detailed description of input command messages and conventions, see Section B.2.1.1, Input Command Message Conventions.
- **In-Process Acknowledgment** – The in-process acknowledgment (IP) response message is sent in response to a command that the SSU-2000e is unable to respond to within two seconds. For a detailed description of in-process acknowledgment response messages and conventions, see Section B.2.1.2, In-Process Acknowledgment Response Message Conventions.
- **Output response message** – The output response message indicates whether the command was complied with (**COMPLD**) or denied (**DENY**). For a detailed description of output response messages and conventions, see Section B.2.1.3, Output Response Message Conventions.

- **Autonomous response or report message** – The autonomous response or report message is an output generated by the SSU-200 due to an event, such as an alarm, or a change in status in the system. For a detailed description of autonomous response or report messages and conventions, see Section B.2.1.4, Autonomous Report Conventions.

TL1 General Conventions – TL1 uses English-like acronyms and shorthand or abbreviations in a format that can be read and composed by humans.

Follow these general conventions for entering all TL1 parameters:

- Enter all command characters in upper-case. In the command syntax, lower-case characters indicate parameters that you must supply.
- All commands must contain the **cmd**, **tid**, and **ctag** fields.
- You may omit trailing commas in the parameters field.
- Terminate command lines with a terminating semicolon (**;**) and an end-of-line designator (`<cr><lf>` or `<cr lf>`). The SSU-2000e executes the command when it receives the terminating semicolon in the command entry.
- ^ is a blank that must appear in a command or response.
- **:** is a block separator character.
- **::** indicates a null field for a block.
- **;** indicates the end of the message.
- **<cr>** and **<lf>** or **<cr lf>** indicate the ASCII carriage return (CR) and line feed (LF) codes used as a line terminator and may be used separately or combined.
- The ASCII cancel code character (hex 18) can be used to cancel a partially sent command and clear the input buffer.

B

B.2.1.1 Input Command Message Conventions

Command messages entered and sent by the user determine the action that the SSU-2000e will take. Command messages are input messages, and are always followed by an acknowledgment or output response message.

The format for the input command message is:

```
cmd:tid:[aid]:ctag[:[gb]:<other>;<cr lf>
```

where:

- **cmd** (Command) is a descriptive string of letters that represents the input command (Table B-5 through Table B-7). The command string consists of a standard TL1 command verb, followed by one or two command modifiers. The modifiers identify the subject of the command verb and each may be as many as five characters. If two modifiers are used, they must be separated by dashes: **verb- mod1- mod2**.

- **tid** (Target Identifier) represents the name assigned to the SSU-2000e. The assigned name must be either null or match the name assigned to the SSU-2000e. If the **tid** is not null, it may must begin with a letter and may contain as many as 20 alpha-numeric characters. See the **SET-NAME** command in Table B-6.

NOTE ...

The system does not generate a response for entries without a valid **tid**.

- **aid** (Access Identifier) is an optional field that represents the shelf, module, and port within the SSU-2000e to which the command is addressed or to which the response applies. The **aid** must be null (**::**, indicating ALL or not used), ALL (indicating all modules and ports related to the command type), or the **aid** assigned to an entity in the SSU-2000e. The **aid** allows aliases for clock and buffer modules.

  Follow these conventions for entering the **aid** field:

	SxAy-z
or	**ALL**
or	**SxBUF-w**
or	**SxCLK-w**

  where:

x	SSU-2000e main (1) or expansion unit (shelf) number (2-5)
A	placeholder used to separate the shelf number form the slot position
y	SSU-2000e slot position (1-16)
z	port number (1-20)
ALL	all modules or ports to which the command applies
w	buffer module A or B or Clock module A or B

  Specify multiple **aid**s using the ampersand (**&**)
  Use a single ampersand (**&**) to indicate **aid**1 and **aid**2
  Use a double ampersand (**&&**) to indicate a range from **aid**1 to **aid**2
  The **y** or **z** part of the **aid** also uses the ampersand (**&**)

- **ctag** (Correlation Tag) field is a six-digit alpha-numeric message identifier code that is received with the command and returned in the response, for correlation of message and response within the operating system. The **ctag** can be any combination of six alpha-numeric characters randomly generated by the user.

- **gb** (General Block) is an field that is not used by the SSU-2000e but that you must indicate by a double colon, that is, by preceding any parameters following the **ctag** field with double colons (**::**).

- **other** is a field that is used for commands that require other information. The format for this field is specified in the individual command descriptions.

B.2.1.2 In-Process Acknowledgment Response Message Conventions

Each command received by the SSU-2000e with a valid **tid** generates a response when the terminating semicolon is received, followed by an output response message or the output response.

The SSU-2000e sends the in-process acknowledgment (IP) only if it is unable to respond to the command within two seconds. The requested response is then sent in full when the SSU-2000e data is available.

The in-process acknowledgment response always begins with a carriage return and two line feed characters, and ends with the header line containing the source identifier (**sid)**, defined below, and the **date^time** stamp.

The format for the IP acknowledgment message is:

```
<cr lf lf>
^^^sid^date^time <cr lf>
IP^ctag <cr lf>
<
```

where:

- **sid** (Source Identifier) is the returned ID, and is the same as the **tid** in the input command message to which the IP acknowledgment is responding.
- **date** is the current year, month, and day date in the SSU-2000e system in the format: YY-MM-DD.
- **time** is the current hours, minutes, and seconds timestamp information in the SSU-2000e system in the 24-hour format: HH-MM-SS.
- **IP** is the in-process response message that the SSU-2000e sends in response to a command only if the SSU is unable to respond to the command within two seconds. The SSU sends the requested response in full when the data is available.
- **ctag** (Correlation Tag) field is a six-digit alpha-numeric message identifier code that is received with the command and returned in the response, for correlation of message and response within the operating system.
- The IP acknowledgment response always terminates with the less-than character (<). The semicolon appears after the requested output response message is sent.

B.2.1.3 Output Response Message Conventions

The output response indicates whether the SSU-2000e complied with (**COMPLD**) or denied (**DENY**) the input command.

The COMPLD Output Response Message Conventions – If the message is received correctly and can be processed by the SSU-2000e within two seconds, the complied message is sent with data that was requested in the input command message. The requested data is included in the response message lines and is always enclosed in quotation marks.

B

The format for a complied (**COMPLD**) output response message is:

```
<cr lf lf>

^^^sid^date^time <cr lf>
M^^ctag^COMPLD <cr lf>
[^^^"response message" <cr lf>]
[...]
;
```

where:

- **sid** (Source Identifier) is the returned ID, and is the same as the **tid** in the input command message to which the IP acknowledgment is responding
- **date** is the current year, month, and day date in the SSU-2000e system in the format: YY-MM-DD
- **time** is the current hours, minutes, and seconds timestamp information in the SSU-2000e system in the 24-hour format: HH-MM-SS
- **ctag** (Correlation Tag) field is a six-digit alpha-numeric message identifier code that is received with the command and returned in the response, for correlation of message and response within the operating system
- **COMPLD** is the complied message

"response message" is the response message. The response message line for complied messages always begins with 3 spaces (^^^) followed by the response message enclosed in quotation marks, and terminated by <cr lf>. Multiple lines of response messages are allowed. Each command response is terminated by a semicolon following the last <cr lf>.

The DENY Output Response Message Conventions – The **DENY** response contains a four-character error code (**ercd**) that describes the reason for the denied response. For example, the error code **ICNV** indicates *Input Command Not Valid*. See error codes in Table B-3.

The SSU-2000e sends the **DENY** response if:

- the **cmd** is not valid
- the **aid** is not valid
- the **ctag** is not valid, indicated by a response containing the **ctag** set to a single zero character (0)
- the unit is unable to comply with the request for the reason indicated by the **ercd**

The format for a denied (**DENY**) output response message is:

```
<cr lf lf>
^^^sid^date^time <cr lf>
M^^ctag^DENY <cr lf>
```

^^^ercd <cr lf>

where:

- **sid** (Source Identifier) is the returned ID, and is the same as the **tid** in the input command message to which the IP acknowledgment is responding
- **date** is the current year, month, and day date in the SSU-2000e system in the format: YY-MM-DD.
- **time** is the current hours, minutes, and seconds timestamp information in the SSU-2000e system in the 24-hour format: HH-MM-SS
- **ctag** (Correlation Tag) field is a six-digit alpha-numeric message identifier code that is received with the command and returned in the response, for correlation of message and response within the operating system
- **DENY** is the deny message
- **ercd** (Error Code) is a four-character error code that explains the reason for the deny, and is one of the following defined codes (other error codes may be defined and used, if required):

Table B-3. Denied Response Error Codes

Error Code	Definition
ICNV	Command Not Valid
IIAC	Invalid **aid** Code
IICT	Invalid **ctag**
IITA	Invalid Target Identifier
IPEX	Extra Parameter
IPMS	Parameter Missing
IPNV	Parameter Not Valid
SDNR	Data Not Ready

B

B.2.1.4 Autonomous Report Conventions

The SSU-2000e unit sends autonomous reports in response to a detected alarm condition or status change. These reports are similar to the **RTRV-ALARM** command responses, but contain an alarm code rather than the complied line.

The format for an autonomous report is:

```
<cr lf lf>
^^^sid^date^time <cr lf>
almcde^atag^REPT^mod1[^mod2] <cr lf>
^^^"response message" <cr lf>
```

where:

- **sid** (Source Identifier) is the returned ID, and is the same as the **tid** in the input command message to which the IP acknowledgment is responding
- **date** is the current year, month, and day date in the SSU-2000e system in the format: yy-mm-dd
- **time** is the current hours, minutes, and seconds timestamp information in the SSU-2000e system in the 24-hour format: hh-mm-ss(Z). The Z, if present, indicates that the SSU-2000e has acquired the time from either GPS or NTP; the Z stands for Zulu time, which is the same as UTC.
- **almcde** (Alarm Code) is sent with autonomous reports to indicate the severity level of the reported alarm or event. The alarm code is one of these four two-character codes:

  *C = critical alarm
  ** = major alarm
  *^ = minor alarm
  A^ = non-alarm event

- **atag** (Alarm Correlation Tag) is a six-digit correlation tag that is incremented each time a message is sent
- **REPT** (Report) indicates an autonomous report
- **mod1** (Modifier 1) indicates whether the report is for an alarm (**ALRM**) or an event (**EVNT)**
- **mod2** (Modifier 2) indicates the cause for the report, such as input signal fault (INP) or hardware module faults (EQPT)
- **"response message"** is the response message. The format for the response message line is:

  ```
  ^^^"[aid]:ntfcncde,condtype,srveff,ocrdat,ocrtm[:condscr]" <cr lf>
  ```

where:

- **ntfcncde** (Notification Code) is an optional field that further describes the alarm or event in an output response or autonomous report, if required. The notification code is one of these two-character codes:
  CR Critical alarm;
  MJ Major alarm;
  MN Minor alarm:
  CL Cleared alarm;
  NA Event (not an alarm)

- **condtype** (Condition Type) indicates the type of alarm or event that the message is reporting
- **srveff** (Service Affecting or Not Service Affecting) indicates whether the response message affects service: **SA** (Service Affecting response) or **NSA** (Not Service Affecting response)
- **ocrdat** (Occurrence Date) indicates the date of occurrence in the format YY-MM-DD (year, month, day)
- **ocrtm** (Occurrence Time) indicates the time of the occurrence in the format HH-MM-SS (hours, minutes, seconds)
- **condscr** (Condition Description) is an optional text string which is sent with the alarm or event and which indicates the alarm or event condition

B.2.2 User Access Levels

The SSU-2000e security system software allows management of operating limits and functions according to user security level. Your security level determines the options available to you.

Each security level accessing the system has a different set of options available, for instance, a user does not have as many options available as a technician.

The password security level determines the options available. Each incremental security level incorporates all of the options from the lower numbered security levels and additional options at that level. For instance, a **User** does not have as many options available as a **Technician**. To determine your security level, contact your Administrator.

Table B-4 summarizes each security access level, ID number, and the operator privileges for each level. To determine your security level, contact your Administrator.

Table B-4. User Access (Security) Levels

Level	ID	Description
Idle	0	Security level 0 is available when no user is logged in. This level allows **Idle** users to view a list of available commands (HELP), syntax, software version number, unit id, or to login.
User	1	Security level 1 allows **User** users perform level 0 functions and to view information about the current configuration and operation, and change communication settings such as line termination and echo. Changes made by the user remain in effect only until **the** user logs out.
Technician	2	Security level 2 allows **Technician** users (CRAFT persons) to perform levels 0 through 1 functions, and to read or set all installation functions.
Supervisor	3	Security level 3 allows **Supervisor** users to perform levels 0 through 2 functions, and to read or set all functions.
Administrator	4	Security level 4 allows **Administrator** users to perform levels 0 through 3 functions, view and set software configurations, add, delete, or modify the user table, or log off any user from any port.

B.2.3 Retrieve Commands and Responses

This section contains a table which provides an alphabetical listing of TL1 retrieve commands, a description of the command which provides the valid aid codes to use in the command, and an example and description of the components of message lines. Table B-5 lists the TL1 retrieve commands.

Table B-5. TL1 Retrieve Commands

Command	Description
RTRV-ALARM:[tid]:[aid]:ctag; **or** **RTRV-ALM:[tid]:[aid]:ctag;**	Valid aid code: **ALL, SxAy[-z]** This command reports all active alarms from the SSU-2000e unit or designated modules with an aid indicating which module or port is generating the alarm. The response is the complied message followed by the alarm report message(s). There may be none or multiple lines in the report, one for each active alarm. There is no report message for modules or ports that have no alarm condition. The format for each response message line, using the definitions above, is: `^^^"aid:ntfcncde,condtype,srveff,\”condstr\”" <cr lf>` where: ▪ **ntfcncde** = Notification Code (**CR**, **MJ**, **MN**, **CL**) ▪ **condtype** = Condition Type (event number) ▪ **srveff** = service affecting flag (**SA, NSA**) ▪ **condstr** = condition description string.

Table B-5. TL1 Retrieve Commands (Continued)

Command	Description
RTRV-CONF:[tid]:[aid]:ctag;	Valid **aid** code: **ALL**, **SxAy** This command returns the configuration (inventory management) information for the addressed module(s). The response is the complied message followed by the response message(s). For an **aid** of ALL a one line summary for each module is returned in the following format: `^^^"aid:status[,desc,item,rev,serial]" <cr lf>` where: ▪ **status** = configuration status **{OK|BAD|RMVD|EMPTY}** ▪ The additional fields are present only if **status** = **OK**. ▪ **desc** = text name of the module; ▪ **item** = Datum-Austron Item Number; ▪ **rev** = hardware revision level; ▪ **serial** = item serial number. If an **aid** is used in the command and the status is **OK**, then two or more additional message lines are returned with the following format: `^^^"aid:svcdat,svctim,mandat,”\userdat\”" <cr lf>` `^^^"aid:cnt,\”revstr\” " <cr lf>` where: ▪ **svcdat** = in-service date for the module, in the format YY-MM-DD (year, month, day); ▪ **svctim** = in-service time, as determined from when the module was installed in the system, in the format HH-MM-SS (hours, minutes, seconds). ▪ **mandat** = manufacture date of YY-MM-DD reported by the module; ▪ **userdat** = any additional information entered for the module in a text string. Successive lines contain these fields: ▪ **cnt** = software version count (from 0 to 5) ▪ **revstr** = revision string returned by the module, generally as **X.yy [YY-MM-DD],** where **X** = major revision number, **yy** = minor revision, and the optional date = the date the version was created, if available. If no additional software is registered on the module, there are no software revision lines present.

Table B-5. TL1 Retrieve Commands (Continued)

Command	Description
RTRV-DATA-GPS:[tid]:[aid]: ctag;	Valid aid code: **S1A3** or **S1A5** (for a GPS module) This command returns the current tracking data for the specified GPS input. If the input specified is not a GPS module a **DENY** error message is returned. The format for the valid response message is as many as eight lines in this format: `^^^"aid:chan,prn,snr,status"<cr lf>` Each line displays information for one of the satellites currently being tracked: ▪ **chan** indicates the channel number used to track the corresponding **sv** ▪ **prn** = satellite vehicle number ▪ **snr** = signal-to-noise ratio or signal strength ▪ **status** = the currently tracking status, where: **SRC** = searching, **COD** = code locking, **FRQ** = frequency locking, **TIM** = setting time, **EPH** = retrieving Ephemeris data. and **OK** = satellite being used in the timing solution.

Table B-5. TL1 Retrieve Commands (Continued)

Command	Description
RTRV-DATA-GPS-AVAIL:[tid]:[aid]:ctag;	Valid aid code: **S1A3** or **S1A5** (for units with GPS module) This command returns the current tracking data for the specified GPS input. If the input specified is not a GPS module a **DENY** error message is returned. The format for the valid response message is as many as 12 lines in the format: `^^^"aid:prn,health,asimuth,elevation”<cr lf>` where: Each line displays information for one of the satellites currently being tracked ▪ **prn** = satellite vehicle number ▪ **health** = current health of the satellite: **H** (healthy) or **U** (unhealthy) ▪ **azimuth** and **elevation** = calculated orientation of the satellite
RTRV-DATA-FREQ:[tid]:[aid]:ctag;	Valid aid code: **ALL, S1Ay[-z]** This command returns the current frequency measurements for the specified input(s). The format of the response message is: `^^^"aid:freqa,freqb”<cr lf>` where: ▪ **freqa** = frequency of the port versus clock A ▪ **freqb** = frequency of the port versus clock B
RTRV-DATA-INPUT:[tid]:[aid]:ctag;	Valid aid code: **ALL**, **S1Ay[-z]** This command returns the current **LOS**, **AIS**, **OOF**, **BPV**, **CRC** Error and Clear counts for the specified inputs. The format of the response message is: `^^^"aid:loserr,losclr,aiserr,aisclr,ooferr,` `oofclr,bpverr,bpvclr,crcerr,crcclr”<cr lf>` where: ▪ **???err** and **???clr** are the erred second count and cleared second counts for each of the signal faults as listed above.

Table B-5. TL1 Retrieve Commands (Continued)

Command	Description
RTRV-DATA-MTIE:[tid]:aid: ctag[::[clksrc][,start][,stop];	Valid aid code: **S1Ay-z** This command returns the MTIE data for an input port. The command requires an **aid** to identify the input port to report data from. It then has the **ctag** and a null field followed by optional parameters which contain a clock identifier and the start and stop times for the measurement. If no clock source [**CLK-A**|**CLK-B**] is specified, the current output clock is used. The response is the complied message followed by the requested data. The format for each response message line is: `^^^"aid:ocrdat,ocrtm,MTIE,clksrc,temper,monval”<cr lf>` where: ▪ **ocrdat**, **ocrtm** = the beginning date and time the data was collected. ▪ **clksrc** = clock A or B used for the measurements. ▪ **tmper** = time period for the measurement data, given in seconds. The maximum **tmper** values for MTIE are **0.05**, **0.1**, **1**, **10**, **100**, **1000, 10000**, and **100000**. ▪ **monval** = data value for the time period, given in nanoseconds. ▪ **start** = start time specifies the start date and time for data in the format **MM-DD,HH-MM**. If the date is null but followed by a time, the command defaults to the current date. If the start time is null, but preceded by a date, the command defaults to the current time. If the start date and time are null, the command defaults to the start of the data. The comma must be present to indicate a null start time. ▪ **stop** = stop time specifies the stop date and time for data in the format **MM-DD,HH-MM**. If the date is null but followed by a time, the command defaults to the current date. If the stop time is null but preceded by a date, the command defaults to the current time. If the stop date and time is null, the command defaults to the end of the data. Only the values available in the interval between the **start** and **stop** times are output.

Table B-5. TL1 Retrieve Commands (Continued)

Command	Description
RTRV-DATA-MTIE-HIST:[tid]:aid:ctag[::[clksrc][,count];	Valid aid code: **S1Ay-z** This command returns the Historical MTIE data for an input port. The Historical MTIE data is the 24-hour MTIE data stored every day at midnight. There are 99 Historical MTIE records stored. The command requires an **aid** to identify the input port to report data from. The optional parameters are the clock identifier and the number of day(s) of MTIE history to be retrieved from the current day (day 0). If no clock source **[CLK-A|CLK-B]** is specified, the current output clock will be used. The response will be the complied message followed by the requested data. The format for each response message line is: `^^^"aid:ocrdat,ocrtm,MTIE,clksrc,monval1,monval2,..,monval8"<cr lf>` The **ocrdat** and **ocrtm** will be the beginning date and time the data was collected. The **clksrc** is the clock A or B used for the measurements. The **monval** are the data value for the time period, given in nanoseconds. There are eight of monvals in sequence, and the time periods in sequence are 0.05, 0.1, 1, 10, 100, 1000, 10000, and 100000.

B

Table B-5. TL1 Retrieve Commands (Continued)

Command	Description
RTRV-DATA-PHASE:[tid]:aid:ctag[::tmper[,clksrc[,start][,stop]]];	Valid aid code: **S1Ay-z** Returns phase data from phase history buffers. The command requires an **aid** to identify the input to report data from. ▪ **ctag** is followed by a null field ▪ **tmper** = optional parameter containing the averaging time period for data to be returned: [**100**|**1000**|**10000**] with the default of **100** if not specified ▪ **clksrc** = [**CLK-A**|**CLK-B**] or **both** (on separate message lines) if not specified The format for each response message line is: `^^^"aid:ocrdat,ocrtm,PHA,clksrc,tmper,(monval)"<cr lf>` where: ▪ **ocrdat**, **ocrtm** are the actual date and time the data was collected ▪ **clksrc** is [**CLK-A**|**CLK-B**] indicating the clock used for the measurements ▪ **tmper** = time period of the measurement data, given as xSEC where **x** = time in seconds ▪ **monval** = +/– phase values versus clock for the specified input given in nanoseconds enclosed in ( ) ▪ **start** = start time specifies the start date and time for data in the format **MM-DD,HH-MM**. If the date is null but followed by a time, the command defaults to the current date. If the start time is null, but preceded by a date, the command defaults to the current time. If the start date and time are null, the command defaults to the start of the data. The comma must be present to indicate a null start time. ▪ **stop** = stop time specifies the stop date and time for data in the format **MM-DD,HH-MM**. If the date is null but followed by a time, the command defaults to the current date. If the stop time is null but preceded by a date, the command defaults to the current time. If the stop date and time is null, the command defaults to the end of the data. There is one line for each data point in the specified time between start and stop times. Only the number of values currently available is returned. The maximum stored points for 100 second time period is 7000; the maximum stored points for 1000 second time period is 700; the maximum stored points for 10000 second time period is 70. If a start and stop time is not specified, the default is current value.

Table B-5. TL1 Retrieve Commands (Continued)

Command	Description
RTRV-DATA-TDEV:[tid]:aid: ctag[::[clksrc][,start][,stop];	Valid aid code: **S1Ay-z** This command returns TDEV data for an input port. This command requires an **aid** to identify the input port to report data from. It then has the **ctag** and a null field followed by optional parameters which contain a clock identifier **clksrc** [**CLK-A**|**CLK-B**] and the start and stop times for the measurement. If no clock source is specified, the current output clock is used. The response is the complied message followed by the requested data. The format for each response message line is: `^^^"aid:ocrdat,ocrtm,TDEV,clksrc,temper,monval”<cr lf>` where: ▪ **ocrdat**, **ocrtm** = the beginning date and time the data was collected. ▪ **clksrc** = clock used for the measurements. ▪ **tmper** = time period for the measurement data, given in seconds. ▪ **monval** = data value for the time period, given in nanoseconds. The maximum **tmper** values for TDEV are **0.1**, **0.3**, **0.6**, **1.0**, **3.0**, **6.0**, **10.0**, **30.0**, **60.0**, **100.0**, **300.0**, **600.0**, **1000.0**, **3000.0**, **6000.0**, and **10000.0** ▪ **start** = start time specifies the start date and time for data in the format **MM-DD,HH-MM**. If the date is null but followed by a time, the command defaults to the current date. If the start time is null, but preceded by a date, the command defaults to the current time. If the start date and time are null, the command defaults to the start of the data. The comma must be present to indicate a null start time. ▪ **stop** = stop time specifies the stop date and time for data in the format **MM-DD,HH-MM**. If the date is null but followed by a time, the command defaults to the current date. If the stop time is null but preceded by a date, the command defaults to the current time. If the stop date and time is null, the command defaults to the end of the data. Only the values available in the interval between the start and stop times is output.

Table B-5. TL1 Retrieve Commands (Continued)

Command	Description
RTRV-DATA-TDEV-HIST:[tid]:aid:ctag [::[clksrc][,count];	Valid aid code: **S1Ay-z** This command returns the Historical **TDEV** data for an input port. The Historical **TDEV** data is the 24-hour **TDEV** data stored every day at midnight. There are 99 Historical **TDEV** records stored. The command ***requires*** an aid to identify the input port to report data from. The optional parameters are the clock identifier and the number of day(s) of **MTIE** history to be retrieved from the current day (day 0). If no clock source **[CLK-A|CLK-B]** is specified, the current output clock will be used. The response will be the complied message followed by the requested data. The format for each response message line is: `^^^"aid:ocrdat,ocrtm,TDEV,clksrc,monval1,..,monval16”<cr lf>` The **ocrdat** and **ocrtm** will be the beginning date and time the data was collected. The **clksrc** is the clock used for the measurements. The **monval** are the data value for the time period, given in nanoseconds. There are 16 of monvals in sequence, and the time periods in sequence are 0.1, 0.3, 0.6, 1.0, 3.0, 6.0, 10.0, 30.0, 60.0, 100.0, 300.0, 600.0, 1000.0, 3000.0, 6000.0, and 10000.0.

Table B-5. TL1 Retrieve Commands (Continued)

Command	Description
RTRV-EVENT:[tid]:[aid]:ctag::[count],[start],[stop];	Valid aid code: ALL, SxAy This command returns stored event data. **aid** (or aid range) is optional and may be used to limit the report to specified modules. With an aid of **ALL** or null, all event data between **start** and **stop** time is returned. **count** specifies the number of previous events to display [**1** to **500**]. **start** and **stop** = an optional time interval for events to be retrieved. The start and stop times are specified in the format **MM-DD,HH-MM** (month. day. time in hours and minutes). One line containing the time stamp and event message is returned for each event in the log. The format for event log report is: `^^^"aid:ntfcncde,condtype,srveff,ocrdat,ocrtm:condscr" <cr lf>` where: ▪ **ntfcncde** = Notification Code (**CR**, **MJ**, **MN**, **CL**, **NA**) ▪ **condtype** = Condition Type (event number) ▪ **srveff** = service affecting flag: **SA** = service affecting, **NSA** = non-service affecting ▪ **ocrdat** = occurrence date ▪ **ocrtm** = occurrence time ▪ **condstr** = condition description string ▪ **start** = start time specifies the start date and time for data in the format **MM-DD,HH-MM**. If the date is null but followed by a time, the command defaults to the current date. If the start time is null, but preceded by a date, the command defaults to the current time. If the start date and time are null, the command defaults to the start of the data. The comma must be present to indicate a null start time. ▪ **stop** = stop time specifies the stop date and time for data in the format **MM-DD,HH-MM**. If the date is null but followed by a time, the command defaults to the current date. If the stop time is null but preceded by a date, the command defaults to the current time. If the stop date and time is null, the command defaults to the end of the data.

Table B-5. TL1 Retrieve Commands (Continued)

Command	Description
RTRV-EVENT-ALARM:[tid]:[aid]:ctag::[count],[start],[stop];	Valid aid code: **ALL**, **SxAy** This command returns only alarm information from the stored event data. The format for event log reports is: **^^^"aid:ntfcncde,condtype,srveff,ocrdat,ocrtm:condscr" <cr lf>** where: ▪ **ntfcncde** = Notification Code (**CR**, **MJ**, **MN**, **CL**) ▪ **condtype** = Condition Type (event number) ▪ **srveff** = service affecting flag (**SA, NSA**) ▪ **ocrdat** occurrence date ▪ **ocrtm** = occurrence time ▪ **condstr** = condition description string ▪ **start** = start time specifies the start date and time for data in the format **MM-DD,HH-MM**. If the date is null but followed by a time, the command defaults to the current date. If the start time is null, but preceded by a date, the command defaults to the current time. If the start date and time are null, the command defaults to the start of the data. The comma must be present to indicate a null start time. ▪ **stop** = stop time specifies the stop date and time for data in the format **MM-DD,HH-MM**. If the date is null but followed by a time, the command defaults to the current date. If the stop time is null but preceded by a date, the command defaults to the current time. If the stop date and time is null, the command defaults to the end of the data.
RTRV-EVENT-REPORT:[tid]:[aid]:ctag::[count],[start],[stop];	Valid aid code: **ALL**, **SxAy** This command returns only reports (non-alarm) information from the stored event data. These have a **ntfcncde** of **NA**. The format for event log reports is: **^^^"aid:ntfcncde,condtype,srveff,ocrdat,ocrtm:condscr" <cr lf>** where: ▪ **ntfcncde** = Notification Code (**NA**) ▪ **condtype** = Condition Type (event number) ▪ **srveff** = service affecting flag (**SA, NSA**) ▪ **ocrdat** = occurrence date ▪ **ocrtm** = occurrence time ▪ **condstr** = condition description string ▪ **start** = the start time ▪ **stop** = the stop time

Table B-5. TL1 Retrieve Commands (Continued)

Command	Description
RTRV-GPS-POS:[tid]:[aid]: ctag;	Valid aid code: **S1A3** or **S1A5** (must be a GPS module) This command returns the settings position mask for the GPS module designated by the aid. The format for each response message line is: `^^^"aid:lat,lon,hgt,pdop,mode,avg,posel,timel" <cr lf>` where: ▪ **lat** = current latitude of the receiver in the format **(DD)-MM-SS:SS** ▪ **lon** = current longitude of the receiver in the format **(DD)-MM-SS.SS** ▪ **hgt** = current height of the receiver in meters ▪ **pdop** = current Position Dilution of Precision or pdop mask [**1** through **10**]. Pdop is a measurement that indicates the geometry of the GPS satellites that the SSU-2000e unit is tracking. Lower values indicate better geometry. ▪ **mode** = GPS positioning mode is user-specified or calculated: [**User**|**Calc**]. If the positioning mode is set to **User**, the configuration setting is sent to the GPS engine and the mode is set to a fixed position. When the positioning mode is set to **Calc**, the elevation mask setting for positioning is sent to the engine, the engine is set to positioning mode, and 10 positions are averaged and compared to the configuration setting. If there is an error of greater than 300 meters, the unit recalculates the position based on the averaging count. If there is not such an error, the unit uses the stored position. The SSU-2000e generates an event when the GPS module calculates a new position, and stores the new position in NVRAM as the current position and changes the engine mode to fixed position. ▪ **avg** = current GPS position averaging count. Setting the averaging count generates an event and starts a new position fix automatically. ▪ **posel** = minimum satellite elevation to use for positioning ▪ **timel** = the minimum satellite elevation to use for timing
RTRV-HDR:[tid]::ctag;	Valid aid code: none. This command is used to verify system connectivity. It may also be used to retrieve the unit name (**sid**) and **date** and **time**. The only action taken by the SSU-2000e is to respond with the complied message.

B

Table B-5. TL1 Retrieve Commands (Continued)

Command	Description
RTRV-INPUT-REF:[tid]::ctag;	Valid aid code: None This command returns the current input reference, reference switch mode, and reference selection mode. The format of the response message is: `^^^"port,swtmode,selmode<cr lf>` where: ▪ **swtmode** = auto return (revertive) selection, auto switch (but not revertive), or no auto switching **[AR|AS|OFF]** ▪ **selmode =** reference selection: **[PRI|PQL]** for priority quality level or status message selection of inputs. If the input port is not a valid reference the **DENY** response is returned.
RTRV-INV:[tid]::ctag;	See **RTRV-INVENTORY** command.
RTRV-INVENTORY:[tid]::ctag;	Valid aid code: None This command returns the inventory management information for the addressed module(s). The response will be the complied message followed by the response message(s). A summary for each module and shelf are returned in the following format: **^^^"aid:desc,hw_part,hw_rev,hw_serial,sw_part,sw_rev" <cr lf>** Where **desc** is the text name of the module, **hw_part** is the Datum hardware part Number, **hw_rev** is the hardware revision level, **hw_serial** is the hardware serial number, **sw_part** field reports the software part number (i.e. 141xxxxx-xxx-x), and the **sw_rev** field reports the software revision level. The aid reported is the shelf address. The **desc** and **hw_part** are per the following table: **aid** — **desc** — **hw_part** S2-S5 — SSU-2000e SSU-2000e (M3) — 25413140-000-0 25413140-001-0 S2-S5 — SSU-2000e SSU-2000e (M3) — 25413141-000-0 25413141-001-0
RTRV-NAME:[tid]:[aid]:ctag;	Valid AID codes: **S1A2** or any I/O module or port. This command returns the name assigned to Input or Output ports. One name of as many as 20 characters is returned for each port designated by the **aid**. The format for each response message line is: `^^^"aid:”name”" <cr lf>` When the **aid** is **S1A2,** the name is that of the unit. When the **aid** is an I/O module or port, the name is the assigned port name.

Table B-5. TL1 Retrieve Commands (Continued)

Command	Description
RTRV-NETYPE:[tid]::ctag;	Valid aid code: none. This command serves the same purposes as **RTRV-HDR** with an element type message added. The response message for retrieve network element type is: **^^^"SSU2000" <cr lf>**
RTRV-PING:::ctag::ip;	Valid aid code: none. This command allows for a remote host to be pinged via TCP/IP. The **ip** parameter shall be given in the **nnn.nnn.nnn.nnn** format, where **nnn** is a number between 0 and 255. The response message for retrieve ping is **COMPLD** if the ping was successful or **DENY** (**SDNR**) if unsuccessful.
RTRV-PRMTR-AIS:tid:[aid]:ctag; **RTRV-PRMTR-BPV:tid:[aid]:ctag;** **RTRV-PRMTR-CRC:tid:[aid]:ctag;** **RTRV-PRMTR-LOS:tid:[aid]:ctag;** **RTRV-PRMTR-OOF:tid:[aid]:ctag;**	Valid AID codes: **SxAy[-z]** This command returns the erred and cleared second thresholds for the signal faults. The format for each response message line is: `^^^"aid:prmtr,errcnt,clcnt"<cr lf>` where: ▪ **prmtr** = signal fault **LOS**, **AIS**, **OOF**, **BPV**, or **CRC**; ▪ **errcnt** = setting for the error threshold; ▪ **clcnt** = setting for the clear threshold.
RTRV-PRMTR-ALARM:[tid]:[aid]:ctag;	Valid AID codes: **SxAy[-z]** This command returns the alarm settings for the specified module, or ALL alarms if no **aid** is specified. The format for each response message line is: `^^^"aid:almnum,level,startdelay,cleardelay"<cr lf>` where: ▪ **aid** = module or input port ▪ **almnum** = alarm number ▪ **level** = Ignore, Report, Minor, Major, or Critical: **[IGN|RPT|MIN|MAJ|CRT]** ▪ **startdelay** = delay time or errored seconds count for start of the alarm ▪ **cleardelay** = cleared seconds count for clearing of the alarm. Delay numbers are reported only if they are settable for the alarm; otherwise they are reported as **IMMED** (immediate).

B

Table B-5. TL1 Retrieve Commands (Continued)

Command	Description
RTRV-PRMTR-CCOUT:[tid]:[aid]:ctag;	Valid aid code: **ALL**, **SxAy[-z]** This command returns the settings for the composite clock port designated by the **aid**. If a port is specified in the request, the format for each response message line is: **^^^"aid:mode,level,bypass,pstate,duty,pcomp"<cr lf>** where: ▪ **aid** = port access identifier ▪ **mode** = **CC** (composite clock) ▪ **level** = minimum clock level to enable outputs on the module **[WARM | ACQ | LOCK]** ▪ **bypass** = allows Clock C selection: **[ON | OFF]** ▪ **pstate** = port state **[ON | OFF]** ▪ **duty** = duty cycle of the modules outputs [1|0] where **1** = 5/8 and **0** = 50/50 ▪ **pcomp** = phase compensation [1 through 7] When no port is specified by the **aid**, then the response is four lines as follows: `^^^"aid: mode,level,bypass"<cr lf>` `^^^"aid:pstate1,pstate2,pstate3,…pstate20”<cr lf>` `^^^"aid:duty1,duty2,duty3,…duty20”<cr lf>` `^^^"aid:pcomp1,pcomp2,pcomp3,…,pcomp20”<cr lf>` Line1 contains: ▪ **aid** = module access identifier ▪ **mode** = **CC** ▪ **level** = minimum clock level to enable outputs on the module **[WARM | ACQ | LOCK]** ▪ **bypass** = allow Clock C selection: **[ON | OFF]** Line 2 contains: ▪ **aid** = module access identifier ▪ **pstate# port state [1| 0] (1 = ON, 0 = OFF)**, where # = port number 1 through 20 Line 3 contains: ▪ **aid** = module access identifier ▪ **duty#** = duty cycle of the module outputs [**1**|**0**], where: **1** = 5/8 **0** = 50/50 ▪ # = port number **1** through **20** Line 4 contains: ▪ **aid** = module access identifier ▪ **pcomp#** = phase compensation **1** through **7** ▪ # = port number **1** through **20**

Table B-5. TL1 Retrieve Commands (Continued)

Command	Description
RTRV-PRMTR-CLK:[tid]:[aid]:ctag;	Valid aid code: **ALL** or **S1A1** or **S1A12** This command returns the settings for the clock designated by the **aid**, or both clocks for **ALL**. The format for each response message line is: `^^^"aid:warmup,mintau,maxtau,clkar" <cr lf>` where: ▪ **warmup** = warmup delay time ▪ **mintau** = starting time constant ▪ **maxtau** = final time constant value in seconds for the clock ▪ **clkar** = current setting for the clock Auto-Return mode **[OFF | ON]**
RTRV-PRMTR-CLKOUT:[tid]:[aid]:ctag;	Valid aid code: **ALL**, **SxAy[-z]** This command returns the output port setting when a port **aid** is specified. The format for the response message is: `^^^"aid:mode,level,bypass,fltmode,pstate" <cr lf>` where: ▪ **aid** = module access identifier ▪ **mode** = **CLK** ▪ **level** = **[WARM|ACQ|LOCK]** for the clock level where outputs are turned on, ▪ **bypass** = allow Clock C selection: **[ON|OFF]** ▪ **fltmode** = determines if outputs are set to fault **[OFF | ON | AUTO]** when signal levels drop below the threshold output level ▪ **pstate** = port state **[1 | 0]** (where **1** = ON and **0** = OFF). When no port is specified by the **aid**, then the response is two lines as follows: `^^^"aid:mode,level,bypass,fltmode" <cr lf>` `^^^"aid:pstate1,pstate2,pstate3,…,pstate20" <cr lf>` where: Line 1 contains: ▪ **mode** = **CLK** ▪ **level** = **[WARM|ACQ|LOCK]** for the clock level where outputs are turned on, ▪ **bypass** = **[ON|OFF]** for allowing Clock C selection ▪ **fltmode** = determines if outputs are set to fault **[OFF | ON | AUTO]** when signal levels drop below the threshold output level. Succeeding lines contain: ▪ **aid** = access identifier of module ▪ **pstate#** = port state **[1 | 0]**, where: **# =** port number 1 through 20, and a result of **1** = **ON** and **0** = **OFF**.

B

Table B-5. TL1 Retrieve Commands (Continued)

Command	Description
RTRV-PRMTR-COMM:[tid]:[aid]:ctag;	Valid aid code: **ALL**, **COML**, **COMA**, **COMB**, **TELNET**, or **TL1** This command returns the current internet protocol settings for the unit. When a serial port is specified, the format of the response message is: `^^^"aid:baud,echo,eol,mode,tout"<cr lf>` where: ▪ **aid** = communication port **[COML | COMA | COMB]** ▪ **baud** = communications baud rate **[19200 | 9600 | 4800 | 2400 | 1200].** ▪ **echo** = whether the port operates in full-duplex or half-duplex **[ON | OFF]** ▪ **eol** = end-of-line character to be used when the unit transmits ASCII data **[CR | LF | CRLF]** ▪ **mode** = mode of communication **[ASCII | TL1]** ▪ **tout** = inactivity timeout period before the session is logged out **[value | NEVER]**. When a Telnet port is specified, some data fields are null, and the format of the response message is: `^^^"aid:,,,,tout"<cr lf>`
RTRV-PRMTR-ELTIME:[tid]:[aid]:ctag;	Valid aid code: **SxAy** This command returns the time for alarm elevation, from **60** seconds to **500,000** seconds. A setting of 0 (zero) means no elevation for the alarm. When an alarm has been at MINOR or MAJOR level continuously for elevtime seconds, then it is elevated to the next level. Delay may be set for each module or ALL modules, and applies to all alarms created by the module. `^^^"aid:elevtime" <cr lf>` where: ▪ **Elevtime** = alarm elevation time for the specified module.
RTRV-PRMTR-FREQ:[tid]:[aid]:ctag;	Valid aid code: **ALL**, **S1Ay-z** This command returns the MTIE threshold settings for the input port designated by the **aid**. The format for the response message is: `^^^"aid:freq,fae,fac,fbe,fbc" <cr lf>` where: ▪ **aid** = access identifier of the port ▪ **fae** = frequency error threshold for A ▪ **fac** = clear threshold for A ▪ **fbe** = error threshold for B ▪ **fbc =** clear threshold for B

Table B-5. TL1 Retrieve Commands (Continued)

Command	Description
RTRV-PRMTR-GPS:[tid]: [aid]:ctag;	Valid aid code: **S1A3** or **S1A5** (must be a GPS module) This command returns the settings for the GPS module designated by the **aid**. The format for each response message line is: `^^^"aid:pri,pql,sigma" <cr lf>` where: ■ **pri** = priority setting of **[0 through 10, with 0 = MON]** ■ **pql** = priority quality level **[1 through 16]** ■ **sigma** = limit of the noise measurement [**10 to 1000** µs**].**
RTRV-PRMTR-INPUT:[tid]: [aid]:ctag;	Valid aid code: **ALL**, **S1Ay[-z]** This command returns the settings for the input designated by the **aid**. This reports the Input module settings. The format for the response message is: `^^^"aid:pstate,pri,pql,mode,ssm,zs,crc,gain,csflt,` `bit" <cr lf>` where: ■ **aid** = port **aid** ■ **pstate** = port enabled state [**ON** | **OFF**] ■ **pri** = priority **1** (highest) through **10** (lowest) or **MON** for monitor ■ **pql** = provisioned priority quality level of **1** through **16** ■ **mode** = framing type or clock frequency in MHz: **[ESF|D4|CCS|CAS|1|1.544|2.048|5|10]** ■ **ssm**, **zs**, **crc**, and **gain** = **[ON|OFF]** ■ **csflt** = **[HI|LO|OFF|NA]** ■ **bit** = bit number **4** through **8** of the Time Slot 0 word used for the E1 sync status message.
RTRV-PRMTR-IP:[tid]::ctag;	Valid aid code: None This command returns the current Internet protocol settings for the unit. The format of the response message is: `^^^"aaa.aaa.aaa.aaa,mmm.mmm.mmm.mmm,` `ggg.ggg.ggg.ggg"<cr lf>` where: ■ **aaa.aaa.aaa.aaa** = IP address of unit ■ **mmm.mmm.mmm.mmm** = IP mask of unit ■ **ggg.ggg.ggg.ggg** = IP gateway of unit

Table B-5. TL1 Retrieve Commands (Continued)

Command	Description
RTRV-PRMTR-KEEPALIVE:[tid]::ctag;	Valid aid code: None The Keep-alive function causes autonomous messages to be transmitted at a user selectable interval. This command returns the current TL1 and SNMP keep alive settings for the unit. The format of the response message is: `^^^"tl1_time,snmp_time "<cr lf>` where **tl1_time** is the TL1 session timer in minutes, **snmp_time** is the SNMP session timer in minutes. Times set to zero indicate keep alive is disabled.
RTRV-PRMTR-MTIE:[tid]:[aid]:ctag;	Valid aid code: **ALL**, **S1Ay-z** This command returns the MTIE threshold settings for the input port designated by the **aid**. The format for the response message is: `^^^"aid:MTIE,EL1,t10,t100,t1000,t10000,t100000" <cr lf>` `^^^"aid:MTIE,EL2,t10,t100,t1000,t10000,t100000" <cr lf>` `^^^"aid:MTIE,CL1,t10,t100,t1000,t10000,t100000" <cr lf>` `^^^"aid:MTIE,CL2,t10,t100,t1000,t10000,t100000" <cr lf>` The first line contains the **aid** of the port and the error threshold settings for EL1 The second line contains the **aid** of the port and the error threshold settings for EL2. The third line contains the **aid** of the port and the clear threshold settings for CL1 The fourth line contains the **aid** of the port and the clear threshold settings for CL2. There are always four lines returned for each input port, one for each limit.
RTRV-PRMTR-NTP:[tid]::ctag;	Valid aid code: None This command returns the current network timing protocol settings for the unit. The format of the response message is: `^^^ip1,mode,interval"<CR LF>` `^^^ip2,mode,interval"<CR LF>` `^^^ip3,mode,interval"<CR LF>` Where **ip** is the server ip used by the client or broadcast client or broadcast server. **Mode** is the operating mode for the given ip, the mode can be **CLIENT** meaning that the SSU will automatically request the time from the server, **BCLIENT** which means that the server designated by the ip is a broadcast server, and **BROADCAST** which means the SSU is set up as a broadcast server. The **interval** is used when the SSU is setup as a broadcast server; the broadcast interval is defined to be either 32/64/128/512/1024 seconds. The SSU is automatically configured as an NTP server with the address specified in the **SET-PRMTR-IP** command. There can be up to three NTP IP's listed.

Table B-5. TL1 Retrieve Commands (Continued)

Command	Description
RTRV-PRMTR-OUTPUT:[tid]:[aid]:ctag;	Valid aid code: **ALL**, **SxA[y[-z]]** Returns the output port setting when a port **aid** is specified. The format for the response message is: `^^^"aid: mode,level,bypass,zs,crc,bit,pstate,len" <cr lf>` The first line contains these fields: ▪ **aid** of the port ▪ **mode** = output signal mode, **[ESF|D4|CCS|CAS]** ▪ **level** = **[WARM|ACQ|LOCK]** for the clock level where outputs are turned on ▪ **bypass** = allow Clock C selection: **[ON|OFF]** ▪ **zs =** zero suppression ▪ **crc** = error checking crc are [**ON**|**OFF**] ▪ **bit** = SSM bit [**4** through **8**] for E1 sync status messages ▪ **pstate** = port enabled state [**ON** | **OFF**] ▪ **len** = line length setting of [**133**|**266**|**399**|**533**|**655**] for DS1 outputs When no port is specified by the **aid**, the response is: `^^^"aid:mode,level,bypass,zs,crc,bit" <cr lf>` `^^^"aid:pstate1,pstate2,pstate3,…pstate20" <cr lf>` `^^^"aid:len1,len2,len3,…,len20" <cr lf>` Line 1 contains: ▪ **aid** = module access identifier ▪ **mode** = outputs signal mode: [**ESF**|**D4**|**CCS**|**CAS**] ▪ **level** = clock level: [**WARM**|**ACQ**|**LOCK**] when outputs are turned on ▪ **bypass** = allow Clock C selection: [**ON**|**OFF**] ▪ **zs** = zero suppression: [**ON**|**OFF**] ▪ **crc** = error checking: [**ON**|**OFF**] ▪ **bit** = SSM bit [**4** through **8**] for E1 sync status messages. Line 2 contains: ▪ **aid** = port access identifier ▪ **pstate#** = port enabled state [**1** | **0**] (**1** = **ON** and **0** = **OFF**) for all 20 output ports. The third line contains: ▪ **aid** = access identifier of the port ▪ **len#** = line length setting of [**133**|**266**|**399**|**533**|**655**] for all 20 DS1 output ports.

Table B-5. TL1 Retrieve Commands (Continued)

Command	Description
RTRV-PRMTR-PBO:[tid]::ctag;	Valid aid code: none This command returns the Phase Build-Out (PBO) settings for the system. All Input modules will use this setting. The format for each response message line is: **^^^"aid:pbo_mode" <cr lf>** where this **aid** is specified as ALL (i.e. all DS1/E1 Input modules). The **pbo_mode** is [DIS| EVT| REP| NONE]. ▪ **DIS** indicates the PBO function has been disabled. ▪ **EVT** indicates the PBO function is enabled. PBO events are displayed and stored in the COMM module event buffer. ▪ **REP** indicates the PBO function is enabled. ▪ **PBO** events are displayed, but the event is not stored in the COMM module event buffer. ▪ **NONE** indicates the PBO function is enabled. The PBO event is neither displayed nor stored in the COMM module event buffer.
RTRV-PRMTR-SNMP-MODE:[tid]::ctag;	Valid aid code: none This command returns the current SNMP mode. The format for each response message line is: **^^^"mode,trap_filter" <cr lf>** Values for **mode** are as follows: ▪ **ENA** Enables SNMP operation in the system ▪ **DIS** Disables SNMP operation in the system Values for **trap_filter** are as follows: ▪ **ALM** Only alarms cause Traps to be transmitted ▪ **ALL** All events and alarms cause the transmission of Traps
RTRV-PRMTR-SNMP-USER:[tid]::ctag;	Valid aid code: none This command returns the current SNMP user list. The format for each response message line is: **^^^"read_community,level" <cr lf>** where **read_community** is the assigned Read Community String used by SNMP and **level** is the access level assigned to that user. No Write Community String will be displayed. This is only accessible by Level 4 user.
RTRV-PRMTR-SNMP-MANAGER:[tid]::ctag;	Valid aid code: none This command returns the SNMP Manager list. The format for each response message line is: **^^^"ip_address" <cr lf>** where **ip_address** is the assigned SNMP Manager IP address.

Table B-5. TL1 Retrieve Commands (Continued)

Command	Description
RTRV-REF:[tid]::ctag;	Valid aid code: None This command returns the current input reference port and output clock source. The format of the response message is: **^^^"port,clksrc" <cr lf>** where: ▪ **port** = input reference port designated by aid ▪ **clksrc** = selected clock source [**CLK-A**|**CLK-B**|**NA**] for outputs
RTRV-STATUS-ALARM:[tid]:[aid]:ctag;	Valid aid code: **SxAy** This command returns the current status of all alarms. The format for the response message is: **^^^"aid:almnum,stat" <cr lf>** where: ▪ **aid** = module or input port ▪ **almnum** = alarm number for that **aid** ▪ **status** = current state of each alarm condition [**OK**|**BAD**]
RTRV-STATUS-CLK:[tid]:[aid]:ctag;	Valid aid code: **ALL** or **S1A1** or **S1A12** This command returns the clock status, loop mode, current time constant value and current priority quality level (**pql**). Two message lines are returned if **aid** = **ALL**, one for each Clock module (if both installed). The format for each response line is: `^^^"aid:mstat,mode,tau,pql" <cr lf>` where: ▪ **aid** = which Clock module status is being displayed ▪ **mstat** = module status {**OK**|**SEL**|**DIS**|**FLT**} ▪ **clock mode** = [**WARM**|**ACQ**|**LOCK**|**HOLD**] ▪ **tau** = current time constant in seconds for the clock control loop ▪ **pql** = Stratum Level of the clock
RTRV-STATUS-INPUT:[tid]:[aid]:ctag;	Valid aid code: **ALL**, **S1Ay[-z]** This command returns the condition (current operating mode and readings) of the input ports. The format of each response line is: `^^^"aid:mstat,pstate,(pha),(phb),pql" <cr lf>` where: ▪ **mstat** = module status {**OK** | **DIS** | **FLT**} ▪ **pstate** = the port state {**OK** | **DIS** | **FLT**} ▪ **pha** and **phb** = current 1 second phase values in nanoseconds, or **NA** if not available ▪ **pql** = current pql level (read or provisioned) being reported by the port, if available. One line is returned for each port designated by the **aid**.

Table B-5. TL1 Retrieve Commands (Continued)

Command	Description
RTRV-STATUS-NTP:[tid]::ctag;	Valid aid code: None This command returns the current network timing protocol status for the unit. The format of the response message is: `^^^ip1,offset,delay,dispersion"<CR LF>` `^^^ip2,offset,delay,dispersion"<CR LF>` `^^^ip3,offset,delay,dispersion"<CR LF>` where **ip** is the server IP address used by the client or broadcast client or broadcast server. **Offset** is the number of seconds (partial seconds) that the local time was adjusted by. **Delay** is the calculated delay in the communication path. **Dispersion** is a value that indicates the accuracy of the offset/delay settings. There can up to three NPT IP addresses listed.

Table B-5. TL1 Retrieve Commands (Continued)

Command	Description
RTRV-STATUS-OUTPUT:[tid]:[aid]:ctag;	Valid aid code: **ALL**, **SxAy[-z]** This command returns the condition (current operating mode and status) of an Output module or port. The format of each port response line is: `^^^"aid:mstat,red,clksrc,pql,pstate" <cr lf>` where: ▪ The first line contains the port **aid**. ▪ **mstat** = module status [**OK**|**DIS**|**FLT**]: where **OK** indicates normal operation, and **DIS** or **FLT** indicate all outputs are turned off ▪ **red** = redundant [**NA** | **SxAy**]: where **NA** = non-redundant, and the **aid** = the redundant module identifier ▪ **clksrc** = clock which is generating the output: [**CLK-A**|**CLK-B**|**CLK-C**|**CLK-D**] ▪ **pql** = possible Priority Quality Level (SSM) being generated ▪ **pstate** = port status [**1**|**0**|**F**], where 1 = enabled, 0 = disabled, and F= faulted Multiple message lines are returned if aid specifies one or more Output modules as follows: `^^^"aid:mstat,red,clksrc,pql" <cr lf>` `^^^”aid:p1,p2,p3,…p20” <cr lf>` where: The first line contains the module **aid**. ▪ **mstat** = module status is [**OK**|**DIS**|**FLT**], where **OK** = normal operation, and **DIS** or **FLT** = all outputs are turned off ▪ **red** = [**NA** | **SxAy**], where: **NA** = non-redundant, and **SxAy** = redundant module **aid** ▪ **clksrc** = clock generating the output: [**CLK-A** |**CLK-B** |**CLK-C** |**CLK-D**] ▪ **pql** = Priority Quality Level (SSM) being generated The second line contains: ▪ **aid** = module identifier ▪ **pstate** = port status: [1|0|F], where **1** = enabled, **2** = disabled, **F** = faulted for all 20 outputs
RTRV-USER:[tid]::ctag;	Valid aid code: None This command returns the current user list. The format of the response message is: `^^^"username,level" <cr lf>` where: ▪ **username** = assigned user ▪ **level** = access level assigned to that user. No password information is displayed. This command is only accessible by Level 4 (Administrator) users.

B.2.4 TL1 Set Commands

This section contains a table which provides an alphabetical listing of TL1 set commands, a description of the command which provides the valid aid codes to use in the command, and an example and description of the components of message lines.

The TL1 set commands allow operators to set data and time or parameters for the SSU-2000e unit. The unit responds to set commands with a complied message or a deny message that indicates the cause for the failure. There is no response message line for the set commands. Table B-6 provides a listing of the TL1 set commands.

Table B-6. TL1 Set Commands

Command	Description
SET-CLK:[tid]:[aid]:ctag;	Valid aid code: **None** or **Any** clock This command changes the current output clock to the one designated in the **aid**. If the **aid** is invalid or the clock is not available for use or clock A/R is on, the **DENY** response is returned. Empty fields leave parameters unchanged.
SET-CLK-AR:[tid]::ctag::ar;	Valid aid code: none The command sets the clock mode of returning or not returning after faults are cleared. The **ar** parameter changes the current clock selection mode to [**ON | OFF**] for revertive or non-revertive operation. Empty fields leave parameters unchanged.
SET-CLK-MODE:[tid]:[aid]: ctag::mode;	Valid aid code: **ALL**, **Clock** This command is used to change the clock loop mode to **ACQ | LOCK | HOLD**. If no **aid** is specified then both clocks are changed.
SET-DAT:[tid]::ctag::date^time;	Valid aid code: none. This command always has a null **aid** and the **<other>** field contains the date and time. The format of the date and time is **YY-MM-DD^HH:MM:SS** where the ^ may be a space character or a comma separating the date and time, and the colons in the time may be dashes. The SSU-2000e system clock is set to the received date and time and a complied message is returned, with the new date/time in the header.

Table B-6. TL1 Set Commands (Continued)

Command	Description
SET-GPS-POS:[tid]:[aid]:ctag::[(lat)],[(lon)],[(hgt)],[pdop],[avg],[posel],[timel];	Valid aid code: **S1A3** or **S1A5** (must be a GPS module) This command sets the position mask for the GPS module designated by the **aid**. The settings for this command include: **lat** = set the latitude [**+/- 90deg**], formatted **(DD)-MM-SS.SS** where: ▪ + = North ▪ – = South **lon** = set longitude [**+/-180 deg**] formatted as **(DD)-MM-SS.SS** where: ▪ + = East ▪ – = West ▪ **hgt** = set height [**+/- 10000.0** meters] ▪ **pdop** = set the pdop [**1** to **10**] ▪ **avg** = set position averaging value [**10** to **3600**] ▪ **posel** = set the minimum satellite elevation to use for positioning [**0** to **50** deg] ▪ **timel** = set the minimum satellite elevation to use for timing [**0** to **50** deg].
SET-INPUT-REF:[tid]::ctag::port[,swtmode][,selmode];	Valid aid code: None This command sets the current input reference to the designated input port. ▪ **swtmode** = [**AR**|**AS**|**OFF**] for auto return (revertive) selection, auto switch (but not revertive), or no auto switching ▪ **selmode** = reference selection: [**PRI**|**PQL**] for priority or status message selection of inputs If the input port is not a valid reference the DENY response is returned.
SET-MTIE-MASK:[tid]:[aid]:ctag::mask;	Valid aid code: **ALL, SxAy-[z]**. This command will set the MTIE mask for the given input to predefined settings, such that **mask** can be set to **PRS | DS1 | G811 | G823**. The MTIE mask settings include both Limit 1 and Limit 2 and set and clear thresholds. For user defined thresholds use the SET-PRMTR-MTIE command.
SET-NAME:[tid]:[aid]:ctag::name;	Valid aid code: none, **S1A2**, or I/O port **aid**. This command with no **aid** or **S1A2** (Communications Module) assigns a new name to the unit. The **tid** (if used) must match the original name, which is returned in the response **sid**. The new unit name must be used as the **tid** (and **sid**) for all following commands. For an **aid** designating an Input or Output port the name is assigned to the port. The name for unit or port may be null or as many as 20 characters beginning with a letter.

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Table B-6. TL1 Set Commands (Continued)

Command	Description
SET-PHASE-ZERO:[tid]:[aid]: ctag[::clksrc];	Valid aid code: none or Input port **aid**. This command sets the input phase to zero for the designated port(s) or all input ports with an **aid** of null or **ALL**. If **clksrc** is specified [**CLK-A**|**CLK-B**] only the one phase value is set to zero; otherwise both values are set to zero.
SET-PRMTR-ALARM:[tid]:aid: ctag::almnum,level [,errcnt],[clrcnt];	Valid aid code: **ALL**, **SxAy** This command assigns the alarm number specified. ▪ **almnum** = alarm level [**IGN**|**RPT**|**MIN**|**MAJ**|**CRT**] ▪ start delay time or erred seconds count ▪ **errcnt** and clear delay time for the indicated alarm number ▪ **clrcnt** on the modules specified by the **aid**.
SET-PRMTR-AIS:tid:[aid]:ctag ::[errcnt],[clrcnt]; **SET-PRMTR-BPV:tid:[aid]:ctag ::[errcnt],[clrcnt];** **SET-PRMTR-CRC:tid:[aid]:ctag ::[errcnt],[clrcnt];** **SET-PRMTR-LOS:tid:[aid]:ctag ::[errcnt],[clrcnt];** **SET-PRMTR-OOF:tid:[aid]:ctag ::[errcnt],[clrcnt];**	Valid aid code: **ALL**, **SxAy-[z]** This command sets the input error and clear parameters of [**AIS**|**BPV**|**CRC**|**LOS**|**OOF**] for the designated input. ▪ **errcnt** and **clrcnt** = number of seconds to delay [**0**|...|**100**] before reporting the condition for **LOS** and **AIS** input errors ▪ **errcnt** and **clrcnt** = number of seconds to delay [**0**|...|**100000**] before reporting the condition for **OOF**, **BPV**, and **CRC** input errors With the **aid** of **ALL** the specified parameters are set for all inputs.
SET-PRMTR-CCOUT:[tid]:[aid] :ctag::[pstate],[mode],[level], [bypass],[duty],[pcomp];	Valid aid code: **ALL**, **SxA[y[-z]]** **pstate** sets the output port [**ON**|**OFF**] ▪ **mode** = ignored ▪ **level** = the condition where outputs are turned on [**WARM** |**ACQ** | **LOCK**] ▪ **bypass** = allow Clock C selection: [**ON**|**OFF**] ▪ **duty**= set duty cycle to use **5/8** or **50/50** [**1** | **0**] ▪ **pcomp** = set phase compensation delay to [**0** through **8**], where **0** = No compensation and **8** = 4000 ft. The resolution of pcomp values is 500 ft. Setting the status for a module (no port –z) sets all ports [**ON**|**OFF**]. Empty fields leave parameters unchanged.

Table B-6. TL1 Set Commands (Continued)

Command	Description
SET-PRMTR-CLK:[tid]:[aid]: ctag::[warmup],[mintau], [maxtau];	Valid aid code: **S1A1**, **S1A12**, **CLK-A**, **CLK-B** This command sets the designated clock warmup time. ▪ **warmup = warmup time constant Set to 1200 seconds** ▪ **mintau** = starting time constant Stratum 2E and 3E = 300 seconds ▪ **maxtau** = final time constant value Stratum 2E = 10000 seconds Stratum 2E = 500 seconds The **aid** may be specified to indicate which clock, or left null to set both clocks identically. Empty fields leave parameters unchanged.
SET-PRMTR-CLKOUT:[tid]:[aid]: ctag::[pstate],[mode],[level], [bypass],[fltmode];	Valid aid code: **ALL**, **SxA[y[-z]]** ▪ **pstate** = sets output port state: [**ON**|**OFF**] ▪ **mode** = ignored ▪ **level** = set the clock mode: [**WARM**|**ACQ**|**LOCK**] ▪ **bypass** = allow Clock C selection [**ON**|**OFF**] when outputs are turned on ▪ **fltmode** = allow output level to be monitored for fault thresholds: [**OFF | ON | AUTO**]. Setting the status for a module (no port –z) sets all ports [**ON**|**OFF**]. Empty fields leave parameters unchanged.
SET-PRMTR-COMM:[tid]:[aid]: ctag::[baud],[echo],[eol], [mode],[tout];	Valid aid code: **ALL**, **COML**, **COMA**, **COMB**, **TELNET**, or **TL1** where: ▪ **aid** = set the communication port [**ALL | COML | COMA | COMB**] ▪ **baud** = set the communications baud rate [**19200 | 9600 | 4800 | 2400 | 1200**] ▪ **echo** = set unit to use full or half duplex [**ON | OFF**] ▪ **eol** = set end-of-line character(s) sent by the unit [**CR | LF | CRLF**] ▪ **mode** = set the mode of communication to [**ASCII | TL1**] ▪ **tout** = set the inactivity timeout period [**5** to **43200 | NEVER**].
SET-PRMTR-ELTIME:[tid]:[aid]: ctag::elevtime;	Valid aid code: **SxAy** This command sets the time for alarm elevation, from 60 seconds to 500,000 seconds. A setting of 0 (zero) means no elevation for the alarm. When an alarm has been at MINOR or MAJOR level continuously for **ELTIME** seconds, then it is elevated to the next level. This may be set for each module or ALL modules, and applies to all alarms created by the module.

B

Table B-6. TL1 Set Commands (Continued)

Command	Description
SET-PRMTR-FREQ:[tid]:[aid]:ctag::[fae],[fac],[fbe],[fbc];	Valid aid code: **ALL**, **S1Ay[-z]** This command sets the input Frequency alarm thresholds. ▪ **fae** = error threshold for input versus A clock ▪ **fac** = clear threshold for input versus Clock A ▪ **fbe** = error threshold for input versus B clock ▪ **fbc** = clear threshold for input versus Clock B, for the designated input. The maximum settings for these limits is 10000000 in units of ps/s. Empty fields are unchanged.
SET-PRMTR-GPS:[tid]:[aid]:ctag::pri],[pql],[sigma];	Valid **aid** code: **S1A3** or **S1A5** (for a unit with GPS module) ▪ **pri** = set the priority setting of [**0** through **10**, with **0** = **MON**] ▪ **pql** = set the priority quality level [**1** through **16**] ▪ **sigma** = set the limit of the noise measurement [**10** to **1000** µs].
SET-PRMTR-INPUT:[tid]:[aid]:ctag::[pstate],[pri],[pql],[mode],[ssm],[zs],[crc],[gain],[csflt],[bit];	Valid aid code: **ALL**, **S1Ay[-z]** This command sets: ▪ **pstate** = port state [**ON**|**OFF**] (port enable/disable) ▪ **pri** = port priority [**1**|**2**|…|**10**|**MON**] where **MON** is monitor only mode, and **1** through **10** are priorities from **1** (highest) to **10** (lowest) ▪ **pql** = provisioned priority quality level of [**1**|…|**16**}. ▪ **mode** = [**ESF**|**D4**|**CCS**|**CAS**|**1**|**1.544**|**2.048**|**5**|**10**] for framing mode or clock frequency. DENY with ICNV returned if mode setting does not match module type (DS1 or E1). ▪ **ssm** = reading or ignoring incoming sync status messages [**ON**|**OFF**] ▪ **zs** = zero suppression ▪ **crc** = error checking ▪ **gain** = input gain = [**ON**|**OFF**] **ssm**, **zs**, **crc**, and **gain** are ignored for clock modes. ▪ **Csflt** = external cesium fault alarm input [**HI**|**LO**|**OFF**] ▪ **bit** = bit number 4-8 of the Time Slot 0 word used for the E1 sync status message. For DS1 input, the bit value is ignored. With an **aid** of **ALL** (or null) the specified parameters are set for all inputs. Empty fields leave parameters unchanged. If mode is set to a framed type then frequency is set to correct frequency for type DS1 (1.544) or E1 (2.048)

Table B-6. TL1 Set Commands (Continued)

Command	Description
SET-PRMTR-IP:[tid]::ctag::[addr],[mask],[gate];	Valid aid code: None where: ▪ **addr** = IP address of SSU-2000e unit ▪ **mask** = IP mask of SSU-2000e unit ▪ **gate** = IP gateway of SSU-2000e unit. All IP numbers shall be in the **###.###.###.###** format.
SET-PRMTR-KEEPALIVE:[tid]::ctag::[tl1_time],[snmp_time];	Valid aid code: None This command will support a “keep alive” mode whereby based upon a user settable time an event will be generated by the SSU2000 to alert the upstream support system that the SSU2000 and associated communication path is functional. Where **tl1_time** is the TL1 session keep alive in minutes, **snmp_time** is the SNMP session keep alive in minutes. The minimum settable time is one minute, and the maximum is 60 minutes. If zero minute is specified, the keep alive is disabled.
SET-PRMTR-MTIE:[tid]:[aid]:ctag::{EL1|EL2|CL1|CL2},[t10],[t100],[t1k],[t10k],[t100k];	Valid aid code: **ALL**, **S1Ay[-z]** This command sets the input MTIE alarm thresholds EL1or EL2 and the clear thresholds CL1 or CL2 for the designated input. Threshold settings t10 through t100k are the error limits in nanoseconds for the measurement time period. With the **aid** of **ALL** (or null) the specified parameters are set for all inputs.
SET-PRMTR-NTP:[tid]::ctag::mode,ip,interval;	Valid aid code: none This command sets the NTP client and NTP broadcast mode of operation. **Mode** can be set to **client | bclient | broadcast | del | clrall**. **Client mode** will request the time from the time server (as defined by the **ip,** internet protocol address), this time will be used to set the time in the SSU. **Bclient mode** will accept time from a broadcast server that is specified by the **ip** parameter. **Broadcast mode** is used to configure the SSU as a broadcast time server at the specified **ip**, the broadcast **interval** (in seconds) defines the rate at which the time will be broadcast by the server. The **del mode** allows the specified ip to be deleted from the list of peers, there is a maximum of three ip’s that can be assigned for all peer modes combined. **Clrall** deletes all peer addresses. If three ip’s have been defined and a fourth ip is defined the system will return a **DENY**, this would require that one of the three ip’s be deleted prior to adding the new ip.

B

Table B-6. TL1 Set Commands (Continued)

Command	Description
SET-PRMTR-OUTPUT: [tid]:[aid]:ctag::[pstate],[mode], [level],[bypass],[zs],[crc],[len], [bit];	Valid aid code: **ALL**, **SxA[y[-z]]** This command sets the output port parameters. where: ▪ **pstate** = enabled or disabled [**ON**|**OFF**] ▪ mode = signal mode [**ESF**|**D4**|**CCS**|**CAS**] ▪ **level** = outputs are turned on [**WARM** |**ACQ** |**LOCK**] ▪ For framed outputs: ▪ **zs** = zero suppression ▪ **crc** = error checking [ON|OFF] ▪ **len** = line length setting of [**133**|**266**|**399**|**533**|**655**] for DS1 outputs ▪ **bit** = ssm bit [**4**| through [**8**] for E1 sync status messages ▪ **bypass** = allow Clock C selection [ON|OFF] Setting the status for a module (no port –z) sets all ports [**ON**|**OFF**]. Empty fields leave parameters unchanged.
SET-PRMTR-PBO:[tid]::ctag:: pbo_mode;	Valid aid code: none The **pbo_mode** is **[DIS| EVT| REP| NONE]**. **DIS** shall disable the phase buildout (PBO) function. **EVT** shall enable the PBO function. The PBO event is displayed and stored in the COMM module event buffer. **REP** shall enable the PBO function. The PBO event is displayed, but the event is not stored in the COMM module event buffer. NONE shall enable the PBO function. The PBO event is neither displayed nor stored in the COMM module event buffer.
SET-PRMTR-SETUP: [tid]:[aid]:ctag::[factory | user | save];	Valid aid code: **ALL, SxA[y[-z]]** This command sets or saves the configuration of the specified module. **Factory** will restore the module configuration to factory defaults. Any time the configuration has changed from the factory configuration, these configurations become the current configurations. **Save** will store the current configuration. If changes are then made to the current configuration and the user would like to return to the previously stored configuration. The **user** parameter will reload the previously saved configuration.

Table B-6. TL1 Set Commands (Continued)

Command	Description
SET- PRMTR -SNMP-MODE:[tid]::ctag::[mode],[trap_filter];	Valid aid code: None This command sets the SNMP mode and trap filter parameters. Values for **mode** are as follows: ▪ **ENA** Enables SNMP operation in the system ▪ **DIS** Disables SNMP operation in the system Values for **trap_filter** are as follows: ▪ **ALM** Only alarms cause Traps to be transmitted ▪ **ALL** All events and alarms cause the transmission of Traps Empty fields leave parameters unchanged.
SET-PRMTR-SNMP-USER:[tid]::ctag::mode,[rd_community],[wr_community],[level];	Valid aid code: none This command allows changes to the SNMP security of the system. **mode** = **{ADD| DEL| MOD| INIT}** where: **ADD** requires a **rd_community** and **wr_community**. **Level** defaults to 1 if not entered. **DEL** only requires a username to delete the user from the table. **MOD** requires a username, a new password, and new user level. **INIT** requires no additional parameters and clears all entries in the table.
SET- PRMTR -SNMP-MANAGER:[tid]::ctag::mode,[ip];	Valid aid code: none This command allows changes to the SNMP manager table entries. **mode** = **{ADD| DEL| INIT}** where: ▪ **ADD** requires an ip address. ▪ **DEL** only requires an ip address to delete the entry from the table. ▪ **INIT** requires no additional parameters and clears all entries in the table.
SET-USER:[tid]::ctag::mode,[username],[password],[userlevel];	Valid aid code: none This command allows changes to the security of the system. **mode** = {**ADD|DEL|INIT**} where: ▪ **ADD** requires a **username** and **password.** ▪ **DEL** only requires a user name to delete the user from the table. ▪ **INIT** requires no additional parameters and clears all entries in the table except for the default Guest and Admin entries. **userlevel** (1 through 4), defaults to **1** if not entered.

B

B.2.5 Other TL1 Commands

Table B-7 summarizes the TL1 commands for activating (enabling), disconnecting (disabling), removing or restarting modules, and for logging in or out of the SSU-2000e system.,

Table B-7. Other TL1 Commands

Commands	Descriptions
ACT-MODULE:[tid]:aid:ctag;	Valid aid codes: **ScAy** This command activates (enables) a module (not a specific port.
ACT-USER:[tid]:uid:ctag::pwd;	Valid aid codes: none, requires user name instead. This command logs in the **username uid** with **password pwd**.
CANC-USER:[tid]::ctag;	Valid aid codes: None. This command logs off the TL1 user and returns to security level 0.
DISC-MODULE:[tid]:aid:ctag;	Valid aid codes; **SxAy**. This command disconnects (disables) a module (not a specific port).
EXIT:[tid]::ctag;	Valid aid codes: None. This command logs off the user and returns an RS-232 port to ASCII mode or disconnects an Ethernet session to end TL1 communication.
RMV-MODULE:[tid]:aid”ctag;	Valid aid codes: **SxAy**. This command removes module configuration information from the database of the SSU-2000e unit.
RST-MODULE:[tid]:aid:ctag;	Valid aid codes: **SxAy**. This command restarts (reboots) the specified module.
RST-CLOCK:[tid]:aid:ctag;	Valid aid codes: **S1A1, S1A1**2 This command resets the specified Clock module via hardware. This reset is more drastic than the restart in that it does not give the clock time to switch to the secondary clock if it was the primary clock.

B.3 Interactive Command Set

The Interactive Command Set (ICS), also called the ASCII command set, can be used to control the SSU-2000e from a terminal connected to one of the SSU-2000e RS-232 serial ports.

This section describes ICS command conventions, the prompts, line editing functions, and command syntax for ICS commands. The ICS command functions and features are organized by user security access levels and are listed alphabetically, see Section B.3.6, ICS Commands.

NOTE …

If you are unable to access command features using your current security access level, contact your SSU-2000e administrator user for assistance.

B.3.1 General Conventions

The following are ICS command general conventions:

- Braces { } indicate multiple options. When entering options in the ICS command, enter one option from the options listed in the braces. Options within braces { } are separated by a pipe (|).
- Brackets [ ] indicate that the enclosed information is optional.
- *Italics* indicate variable options.
- The variable **xAy-z** indicates the **aid**, or access identifier. This variable specifies the shelf and slot location for hardware components, in this format:

  xAy-z

  where:

  x Slot number of the unit:
  1 = the slot position for the main shelf or unit
  2-5 = slot positions for expansion shelves, numbering from left to right

  APlace holder or slot separator

  ySlot number, beginning with one, and numbering from left to right for each shelf

  zPort number for a module

B.3.2 ICS Prompts

ICS uses the SSU-2000e unit name followed by command prompt. The prompt is either **+>** or ->:

- The **+>** prompt indicates that the last output string is an event.
- The **->** prompt indicates that the last output string is a response to a command or end-of-line.

B.3.3 Line Editing

The ICS interface supports these line-editing functions:

- Press **ESC** (Escape) to clear the ICS command buffer.
- Press **Backspace** to delete the last character entered.
- Enter **Ctrl + C** to stop all output and flush the transmit buffers.
- Input and output end-of-line (EOL) characters function independently. The ICS interface automatically adjusts to changes in incoming EOLs.

B.3.4 Logon Requirements

The ICS interface features an optional logon requirement:

- If the user list is empty and no passwords have been set for default users, logon is not required and the software defaults to the Administrator user.
- After a user name has been added or a password has been entered for the Administrator user, a user name and logon password is required.
- While communicating with the SSU-2000e using an EIA-232-C connection, if the communications port requires a user name and logon password, only these commands are available until an operator logs on: **ID**, **INFO**, **LOGIN**, **HELP**, and **DOY**. In this state, the port displays autonomous events but does not allow a query of event history until the operator logs on.
- While communicating with the SSU-2000e using Telnet, if the communications port requires a user name and password to log on, the interface does not allow commands to be performed or events to be displayed until the operator logs on. For example, events are stored in the event history but are not displayed on ports to which no user is logged on.

B.3.5 Command Syntax

The ICS interface follows these conventions for expressing command syntax:

- All lowercase letters are converted to uppercase.
- **Command** is any valid command consisting of only uppercase letters, excluding the `<Data Separator>` and `<Command Separator>` codes, in this format:

  `Command [<Data Separator> <data>...] [<Command Separator>] or EOL`

  where:

  `<Data Separator>` is any of the following:

>	(hex 20) space character. Multiple spaces are converted to a single space character.
<data>	The data input for the command. This can be any combination of printable ASCII codes and is specified in the command description section. Use double quotes (" ") to imply literal input. *All* data within the quotes is accepted as a single data entry, allowing you to enter complex input strings. The ICS interface does not convert uppercase characters in quotes to uppercase.

  <Command Separator> is a semicolon (;).

- The interface responds to any input line terminator. Possible terminators are **CR**, **LF**, or **CRLF**. When the interface receives any of these terminators, the input is terminated and the entered command line is processed.
- The ICS interface uses the following single-character commands:

/	executes the previous command if it is used as the first character on a line.
?	alias of the HELP command.

- Command descriptions follow this format:

Command	The command name as it appears in the system.
Description	Brief description of the command functionality.
Operation	Level 1: Gives the options and operations for Level 1 (Operator) Level 2: Gives the options and operations for Level 2 (Technician) Level 3: Gives the options and operations for Level 3 (Supervisor) Level 4: Gives the options and operations for Level 4 (Administrator)
Remarks	Includes comments on the command operation.
Related	Shows any commands related to this command. This command may affect other commands or be affected by other commands.
Restrictions	Special restrictions on the use or operation of this command.

- Command syntax follows these conventions:

{ }	Signifies more than one parameters choice; one must be entered. Options are separated by vertical bars.
|	Pipe or vertical bar, used to separate multiple parameters or options.
[ ]	Signifies optional parameters.
italics	Signifies variable data.
c	Signifies character data (any printable ASCII character).

- Terminology:

shelf	The actual shelf number of the unit in the system: 1 indicates the main shelf; 2 through 5 indicate expansion shelves.
slot	The actual slot number in the shelf. Slot numbers begin at 1 and number from left to right in the shelf.
port	The actual port number in the slot. The port number begins at 1.
Comm port	An EIA-232-C, Telnet, or Ethernet TL1 communications port.

- Module selection follows these conventions. Each module selection in a unit is defined as: **xAy**.

  Where:

x	Shelf number (starting from 1);
A	Place holder indicating the slot separator;
y	Slot number (starting from 1, left to right, defined by each shelf).

- Port selection follows these conventions. Each port of a module is addressed as: **xAy-z**.

  Where:

xAy	same as defined for module selection.
z	Indicates the port number, starting from 1, left to right

- Legal module and port names follow the conventions illustrated by these examples:
  - 1A5-3 indicates shelf 1, slot 5, port 3.
  - 1A5 indicates a module in shelf 1, slot 5.
- The ICS interface allows aliases for modules. Aliases follow the conventions shown in these examples. For example, assuming a 19 inch chassis, these aliases apply:

CLK-A = Clock A, 1A1
CLK-B = Clock B, 1A12
2BUF-A = Shelf 2, Buffer A, 2A15
2BUF-B = Shelf 2, Buffer B, 2A16
3BUF-A = Shelf 3, Buffer A, 3A15
3BUF-B = Shelf 3, Buffer B, 3A16
4BUF-A = Shelf 4, Buffer A, 4A15
4BUF-B = Shelf 4, Buffer B, 4A16
5BUF-A = Shelf 5, Buffer A, 5A15
5BUF-B = Shelf 5, Buffer B, 5A16

- Communications port names follow these conventions:
  - For the EIA-232C serial port
    L = Local RS232 port (i.e., COML = local EIA-232 port)
    A = Serial Port A (i.e., COMA is Serial Port A)
    B = Serial Port B (i.e, COMB is Serial Port B)
  - For the Telnet port:
    TELA = Telnet session one
    TELB = Telnet session two
    TELC = Telnet session three
    TELD = Telnet session four
  - For the Ethernet TL1 port:
    TL1A = Ethernet TL1 session one
    TL1B = Ethernet TL1 session two
- The interface uses ISO 8601 Date and Time Format:

  Date and Time format: yyyy-mm-ddThh:mm:ss
  (example: 1998-02-19T11:03:03)
  Date format: yyyy-mm-dd
  Time format Thh:mm:ss+

B.3.6 ICS Commands

This section provides an alphabetical listing of all ICS commands. For each command, the section provides the following information:

- Command name as it appears in the system
- Description of command function
- Operation of this command at security levels 0 through 4, with descriptions of syntax and command functions for each level
- Remarks and comments about the command operation
- Related Commands lists other commands that may affect or be affected by the command.
- Restrictions describes any special restrictions on the use or operation of the command.

ALARM

Use this command to provide the current alarm status and access to the alarm settings.

Level 0 Not applicable

Level 1 **ALARM [{ALL| xAy[-z]}]**

Use this command to view the current alarm status for the module that you specify. Only active alarms display, unless an option is passed.

If you do not specify a parameter, each active alarm status stored in the Communications Module is displayed. If you type **ALL**, the current status of all alarms for all modules through the SPI command displays.

Output from the command includes the alarm number (internal number used for alarm identification), a text description of the alarm, the current status, the current alarm level (elevated alarms are indicated with an asterisk*), and the delay time for the alarm.

Example:

SSU_2000->alarm 1A2

2001-05-24T18:23:38Z ID: SSU2000 Name: SSU_2000

Input	#	Alarm	Status	Level(*=Elev)	Delay
1A02	(00)	Communication	Ok	Minor	5 sec
1A02	(01)	Mastership	Ok	Minor	30 sec
1A02	(02)	Power-A	Ok	Minor	Immed

Level 2 Same as Level 1 operation, with the following additions:

ALARM TEST {MINOR| MAJOR| CRITICAL}

Options are:

TEST Use this option to test and activate alarm relay/ LED for one second. This has no effect on alarm status.

MINOR Use this option to set the MINOR alarm relay/ LED.

MAJOR Use this option to set the MAJOR alarm relay/ LED.

CRITICAL Use this option to set the CRITICAL alarm relay/ LED.

B

Level 3	Same as Level 2 operation, with the following additions:

ALARM xAy[-z] # DELAY time

ALARM xAy[-z] # {IGNORE| REPORT| MINOR| MAJOR| CRITICAL}

Use this command to set up the expected operation for the specified alarm number. Only one alarm number can be passed if you enter additional information.

The additional parameters that you can use are:

#	Alarm number
DELAY	A supervisor can use this parameter to enter the amount of time that an alarm condition must be active before an actual alarm condition is generated. If an alarm is specified to be Immediate, no delay time can be entered. (Delay times are in seconds). Valid delays to use are: 0 to 86,400 seconds (1 day). If the original value is set to -1 (Immediate) for this command, delay time cannot be set by the user.
IGNORE	Use this option to set the alarm status level to IGNORE. This means that no action is taken for an alarm condition.
REPORT	Use this option to set the alarm status level to REPORT. This means that a report-only message occurs for an alarm condition.
MINOR	Use this option to set the alarm status level to MINOR.
MAJOR	Use this option to set the alarm status level to MAJOR.
CRITICAL	Use this option to set the alarm status level to CRITICAL.

Level 4	Same as Level 3 operation.
Remarks	Use of this command implies that the operator is querying the state of the unit. All information is presented as concisely and completely as possible. Each alarm is listed on a separate line.
Related	ELEVTIME, STATUS
Restrictions	None

BYE

Use this command to log off.

Level 0	Not applicable
Level 1	**BYE** Use this command to log off the system. If passwords are enabled, the logon header displays and you are prompted for a user name.
Level 2	Same as Level 1 operation
Level 3	Same as Level 1 operation
Level 4	Same as Level 1 operation
Remarks	This command implies that the operator has completed the session and wants to return the SSU-2000e to an Idle state.
Related	LOGIN
Restrictions	None

CLK

Use this command to view the clock status and access the clock operating parameters.

Level 0 Not applicable

Level 1 **CLK [xAy]**

If you do not specify a parameter, the status for both CLOCK A and CLOCK B in the unit displays. If you specify a particular clock address, the clock status and setup information for that clock display.

Concise status information: Status (**Fail**/ **Disable**/ **Selected**/ **OK**), Software Phase Locked Loop Mode, Current Tau, PQL Value, Freq Offset, Sigma.

Detailed status information: Same as concise status information, with the addition of Current Max Tau.

Concise setup information: Minimum tau, maximum tau, Clk Freq, clock switching method (such as, AutoReturn or Not), input switching method (AutoReturn On, AutoSwitch On, or AutoSwitch Off), input selection mode (Priority or PQL), and Local Oscillator output is On or Off.

Detailed setup information: Same as concise setup information, with the following additions: Freq.Offset limit, warm-up time, minimum tau limit, and maximum tau limit. The alarm level and delay time are handled by the ALARM command. The alarm elevation time is handled by the ELEVTIME command.

Example:

SSU_2000->clk

```
2001-05-24T18:24:21Z ID: SSU2000 Name: SSU_2000
CLOCK STATUS
Loc# Status Mode Tau   Pql Freq off Sigma
---- ------ ---- ----- --- --------- ---------
1A01 Sel    LOCK 3330  5   9.22E-11  2.49E-10
1A12 Ok     LOCK 333   5   -7.55E-09 2.75E-10
```

Level 2 Same as Level 1 operation

CLK xAy MODE {ACQUIRE | LOCKED | HOLD}

CLK xAy SELECT

Options are:

MODE {ACQUIRE | LOCKED| HOLD}
Use this option to set the current PLL operation parameters.

ACQUIRE Use this option to force re-acquisition of the software PLL loop.

LOCKED Use this option to put the software PLL mode into the lock state.

HOLD Use this option to put the software PLL mode into the manual holdover state.

SELECT Use this option to allow the operator to specify the clock reference.

Level 3 Same as Level 2 operation, with the following additions:

CLK {AR| ON | OFF}

CLK [xAy] WARMUP value

CLK [xAy] {MINTAU | MAXTAU} value

Options are:

AR {ON | OFF} Use this option to enable or disable the clock AutoReturn mode.

WARMUP Use this option to set the clock warm up time in seconds.

MINTAU Use this option to set the minimum tau value.

MAXTAU Use this option to set the maximum tau value.

Level 4 Same as Level 3 operation

Remarks None

Related SETUP, STATUS

Restrictions None

B

COMM

Use this command to view and change the current communication port settings.

Level 0 Not applicable

Level 1 **COMM [{L | A | B}]**

Use this command to view the current settings for the specified communications port. If you do not specify a communications port, all communications ports are assumed. The communications port settings include baud rate, character echo, current output line termination, current session mode, and time-out value.

COMM BAUD {1200| 2400| 4800| 9600| 19200}

COMM ECHO {ON | OFF}

COMM EOL {CR| LF| CRLF}

Use this option to change the setting for the port over which you are communicating. If your security access level is Level 1, the setup changes are not stored in non-volatile RAM.

Options are:

BAUD Use this option to set the current baud rate setting. Only the baud rates shown are valid.

ECHO Use this option to enable or disable character echo on the terminal.

EOL {CR| LF| CRLF} Use this option to set the current End-Of-Line termination for output line.

CR Use this option to set the line termination to carriage return (0xD).

LF Use this option to set line termination to line feed (0xA).

CRLF Use this option to set the line termination to carriage return, followed by a line feed.

Level 2 Same as Level 1 operation, with the following additions:

COMM {L | A | B} BAUD {1200| 2400| 4800| 9600| 19200}

COMM {L | A | B} ECHO {ON | OFF}

COMM {L | A | B} EOL {CR| LF| CRLF}

COMM {L| A | B} MODE {ASCII| TL1}

COMM {L| A | B | TELNET | TL1} TIMEOUT {[5-43200] | NEVER}

Use this option to change the setting for a specified communications port. The setup changes are stored in non-volatile RAM.

Options are:

MODE {ASCII| TL1}Use this option to set the current mode to either ASCII (interactive) or TL1.

TIMEOUT Use this option to set a communications port automatic logout-time-out value. Values are in seconds. NEVER disables automatic logout.

Level 3 Same as Level 2 operation

Level 4 Same as Level 3 operation

Remarks None

Related None

Restrictions BAUD, ECHO, AND EOL are only applicable to RS-232-C. The communications port must be specified to set any parameter.

B

CONFIG

Use this command to view the current hardware configuration of the unit.

Level 0 Not applicable

Level 1 **CONFIG [xAy]**

If you do not provide parameters, the current hardware inventory displays with each slot on one line (concise information). If you provide parameters, more detailed hardware and software inventory management information displays in multiple lines (detailed information).

Concise information: Concise Information includes slot location, module name, item number, hardware revision number, manufacture date, and serial number. If shelf address, 1- 5, it will display shelf description and shelf part number (254xxxxx-xxx-x).

Detailed information: Includes all the concise information described in the above. It also includes configured revisions (if supported by module), in-service time (if supported by module), and the feature list (if supported by module, for example: the COMM Module returns NTP and SNMP features).

If the xAy is 1-5, the shelf information is displayed. The **description** and **shelf_part** are per Table B-8.

Table B-8. Shelf Configuration Information

Shelf	Description	Shelf Part
1	SSU-2000	25413020-000-0
2-5	SSU-2000e	25413140-000-0, 25413140-001-0
1	SDU-2000	25413023-000-0
2-5	SDU-2000e	25413141-000-0, 25413141-001-0

CONFIG SW

This command will display *software* part number (141xxxxx-xxx-x) and revision number.

Level 2 Same as Level 1 operation, with the following additions:

CONFIG xAy {REMOVE| DISABLE| ENABLE}

Options are:

REMOVE Use this option to remove module entries from the registry. A module is removable only if it is physically absent.

DISABLE Use this option to mark a module inactive to be removed from the system.

ENABLE Use this option to restore a previously disabled module to be active in the system.

Level 3 Same as Level 2 operation

Level 4 Same as Level 3 operation

Remarks None

Related None

Restrictions None

The following are examples of the **CONFIG** command message format:

SSU_2000->CONFIG

```
2001-06-21T15:10:34Z ID: SSU2000 Name: JWANG
Loc# Name                 HW Part #      HW Rev   Date    Serial #
---- -------------------- -------------- -------- ------- -------------------
1    SSU-2000             25413020-000-0
1A01 Clock Stratum 2E     23413016-000-0 A        30NOV99 990705398000615020
1A02 Communication        23413012-000-0 A        03NOV99 990705398000614573
1A03 Input GPS            23413019-000-0 A        18DEC99 1234567890005
1A05 Input GPS            23413019-000-0 A        29FEB00 990705398000728324
1A06 Input E1 3Port       23413014-002-0 B        03DEC99 990705398000661713
1A07 Input DS1 3Port      23413013-002-0 B        26JAN00 1234567890
1A08 Input DS1 1Port      23413013-001-0 B.02     21APR00 990705398000736077
1A09 Input DS1 3Port      23413013-002-0 B.02     27MAR00 990705398000736527
1A10 Output DS1           23413017-000-0 D        30NOV99 990705398000613606
1A11 Output DS1           23413017-000-0 B        02MAR00 990705398000613453
1A12 Clock Stratum 3E     23413015-000-0 A        09MAR00 990705398000734493
2    SDU-2000             25413023-000-0
2A01 Output E1            23413018-000-0 D        05JAN00 990705398000650816
2A02 Output E1            23413018-000-0 D        13JAN00 990705398000650793
2A03 Output DS1           23413017-000-0 D        15JAN99 1234567890
2A04 Output DS1           23413017-000-0 D        15JAN99 1234567890
```

SSU_2000->CONFIG SW

```
2001-06-21T15:10:45Z ID: SSU2000 Name: JWANG
Loc# Name                 SW Part #      SW Rev   Date
---- -------------------- -------------- -------- -------
1A01 Clock Stratum 2E     14113015-000-0 B.06     20JUN01
1A02 Communication        14113012-003-0 A.00     21JUN01
1A03 Input GPS            14113019-000-0 A.04     21JUN01
1A05 Input GPS            14113019-000-0 A.04     21JUN01
1A06 Input E1 3Port       14113013-000-0 B.04     20OCT00
1A07 Input DS1 3Port      14113013-000-0 B.04     20OCT00
1A08 Input DS1 1Port      14113013-000-0 B.04     20OCT00
1A09 Input DS1 3Port      14113013-000-0 B.04     20OCT00
1A10 Output DS1           14113017-000-0 A.06     19APR01
1A11 Output DS1           14113017-000-0 A.06     19APR01
1A12 Clock Stratum 3E     14113015-000-0 B.06     20JUN01
2A01 Output E1            14113017-000-0 A.06     19APR01
2A02 Output E1            14113017-000-0 A.06     19APR01
2A03 Output DS1           14113017-000-0 A.06     19APR01
2A04 Output DS1           14113017-000-0 A.06     19APR01
2A05 Output E1            14113017-000-0 A.06     19APR01
2A08 Output Comp Clock    14113158-000-0 A.02     09OCT00
2A09 Output Comp Clock    14113158-000-0 A.02     09OCT00
```

DATE

Use this command to view and set the current date.

Level 0	Not applicable
Level 1	**DATE** Use this command to view the current date set within the unit. The date format that displays is: **yyyy-mm-dd**
Level 2	Same as Level 1 operation
Level 3	Same as Level 2 operation, with the following additions: **DATE yyyy-mm-dd** Use this option to set the current date.
Level 4	Same as Level 3 operation
Remarks	None
Related	TIME, DOY
Restrictions	None

B

DOY

Use this command to view the Julian date and the year in the unit.

Level 0	This command returns the day of the year and the current year.
Level 1	Same as level 0 operation
Level 2	Same as level 0 operation
Level 3	Same as level 0 operation
Level 4	Same as level 0 operation
Remarks	This command is used to display the current day of the year and the year in the unit. This command is used for the generation of backdoor passwords and, for this reason, is always a hidden command.
Related	LOGIN
Restrictions	This command is always hidden and does not display in the online Help.

ELEVTIME

Use this command to read and set the current time-outs for alarm elevation.

Level 0 Not applicable

Level 1 **ELEVTIME [xAy]**

If you do not specify a parameter, all module elevation times within the unit display.

Level 2 Same as Level 1 operation.

Level 3 Same as Level 2 operation, with the following additions:

ELEVTIME [xAy] time

Supervisors use this command to read and set the current time-out length for alarm elevation. The unit is required to elevate MINOR and MAJOR alarms to the next level after a user settable time period. Time is in seconds and can be from 60 seconds (1 minute) to 500,000 seconds.

Level 4 Same as Level 3 operation

Remarks The default value for the elevation time is 86,400 seconds (24 hours).

Related ALARM, SETUP

Restrictions None

The following is an example of the **ELEVTIME** command message format:

SSU_2000->ELEVTIME

```
SSU_2000->elevtime
2001-06-18T20:44:50Z ID: SSU2000 Name: SSU_2000
1A01 elevation time is 86400 seconds
1A02 elevation time is 86400 seconds
1A03 elevation time is 86400 seconds
1A04 elevation time is 86400 seconds
1A05 elevation time is 86400 seconds
1A08 elevation time is 86400 seconds
1A09 elevation time is 86400 seconds
```

B

ENGINE

Use this command to read or set the current settings for the GPS engine.

Level 0 Not applicable

Level 1 **ENGINE xAy [ELMASK| POS| AVAIL]**

ELMASK Use this option to read current elevation masks for the GPS engine.

POS Use this option to read the current antenna position (latitude and longitude).

AVAIL Use this option to show current satellite availability.

Level 2 Same as Level 1 operation

Level 3 **ENGINE xAy [PMASK mask] [TMASK mask]**

ENGINE xAy POS [lat lon ht] [AVG n]

ENGINE xAy TDATA [ON| OFF| CLR]

ENGINE xAy PDOP {1-10}

PMASK mask Use this option to read and set the current elevation masks for the GPS engine. The masks change to avoid attempting to track satellites that are below a portion of the sky that might be blocked by the terrain.

PMASK Use this option to set the positioning mask level. Lower mask levels provide the unit position with a better PDOP.

TMASK mask Use this option to set the mask level to be used when not in survey mode. This is usually set to a higher level than positioning because of timing degradation of the GPS signals at low elevations. Valid mask levels are from 0 to 60 degrees

POS Use this option to read and set the current antenna position. In addition, you can set the maximum number of averages to perform on the position calculations.

POS [lat lon ht] [AVGn]

Same as Level 1 operation, with the addition of being able to set the current position and or the number of averages to use when calculating a position.

Options are:

lat Antenna latitude. The decimal point determines the input format. For example, the format is dd:mm:ss.ss for entering 30:27:49.8 seconds.

lon Antenna longitude. The format is dd:mm:ss.ss.

height Antenna height; +/- 10,000.0 meters.

AVG n Number (n) of averages for the calculated position fixes. Range is 10 to 1,000. Setting this places the unit into survey mode. The frequency control is placed into holdover during survey mode.

AVAIL Shows the current satellite availability

A table is generated with the following information:

- **SV** Satellite PN code ID.
- **Elev** Current elevation above the horizon of the satellite, in degrees.
- **Azmth** Azimuth of the satellite, in degrees.
- **Hlth** Health of the satellite, either H or U. Unhealthy can also mean that the user has set the receiver to ignore the satellite.

NOTE...

Only satellites that are above the current elevation mask are shown.

PDOP Sets the current Position Dilution of Precision or pdop mask (1 through 10). Pdop is a measurement that indicates the geometry of the GPS satellites that the SSU-2000e unit is tracking. Lower values indicate better geometry.

TDATA Provides tracking information for the engine

Available options are:

ON Tracking data displays on that communications port.

OFF Tracking data does not display on that communications port.

CLR No tracking data displays on any communications port.

Level 4 Same as Level 3 operation

Remarks

ELMASK Default values for the masks are 5 degrees for the positioning mask and 10 degrees for time.

POS Only set the position if you know the accurate position. The software automatically verifies the position on restart. The unit averages 10 position fixes and compares them to the fixed position.

If the position is within 100m RMS, no position updates are performed. If the position error is > 100m RMS, an event is generated stating that the position is being recalculated, and the position is recalculated and updated in the NVRAM. Similarly, setting the AVG time puts the unit back into survey mode, which generates an event that the position is being recalculated.

TDATA Engine reports are asynchronous outputs, which means they can occur at any time, not necessarily at the time the command is issued.

Related None

Restrictions None

The following is an example of the **ENGINE** command message format:

SSU_2000->ENGINE

```
2001-06-18T20:46:20Z ID: SSU2000 Name: SSU_2000
GPS Module: 1A03
GPS MOT Engine: 2.2, APR 24 1998
Lat: +30:27:15.89, Lon: -097:39:45.88, Ht: 230.81 m (3D) PDOP: 2.7, 300
ave
GPS Module: 1A05
GPS MOT Engine: 2.2, APR 24 1998
Lat: +30:27:15.75, Lon: -097:39:45.85, Ht: 233.43 m (3D) PDOP: 2.8, 10 ave
```

EVENTS

Use this command to read and control current event log information.

Level 0 Not applicable

Level 1 **EVENTS [ALARM| REPORT] [#events_display | ALL]**

EVENTS [ALARM| REPORT] [startdate [starttime]] [stopdate [stoptime]]

EVENTS [ALARM| REPORT] starttime [stopdate] [stoptime]

EVENTS If you do not specify any options, only the last event prints.

Other options are:

ALARM Use this option to show alarm events only. The alarm event is defined as any event ID less than 32.

REPORT Use this option to show report events only. Any events excluding alarm events (for example: any event ID is greater 32).

#event_display Use this option to show the maximum number of events to display. Zero returns all events.

ALL Use this option to show all the events stored in the buffer.

[startdate] [starttime]
Use this option to specify the start time and date for displaying events within a time period.

[stopdate] [stoptime]
Use this option to specify the stop time and date for displaying events within a time period

? Use this option to display the event count.

NOTE...

If you specify times and dates, events that occurred after the starting date and time and before the ending date and time display. Specified dates have the format yyyy-mm-dd, and specified times have the format hh:mm:ss.

Specified dates and times are not provided in ISO timestamp format, and are separated by a space. Start time and stop time default to the current time of day. Stop date defaults to the current date. Start date defaults to the current date, minus 24 hours.

Example:

SSU_2000+>events alarm

```
      Time Stamp       Which   Type Event            Description
--------------------- ------- ---- ---------------- --------------------
2001-05-24T18:27:00Z  1A04-03 Maj  LOS              Active
2001-05-24T18:27:29Z  1A01 Rep Soft PLL,            HOLD
2001-05-24T18:27:29Z  1A01 Min Freq Mode,           Holdover
```

Level 2 Same as Level 1 operation

Level 3 Same as Level 2 operation, with the following additions:

EVENTS CLR

This option clears the event list.

Level 4 Same as Level 3 operation

Remarks Events are stored in non-volatile memory. They are retained on startup.

Related ALARM

Restrictions None

FREQUENCY

Use this command to display the input frequency data from a selected input port.

Level 0	Not applicable
Level 1	**FREQUENCY [xAy] [{A| B}]** Use this command to view the frequency measurement from a selected Input module. If you do not provide a parameter, frequency measurement on the selected clock to all inputs displays. Options are: A| B Clock A or Clock B
Level 2	Same as Level 1 operation
Level 3	Same as Level 1 operation
Level 4	Same as Level 1 operation
Remarks	None
Related	INPUT, PHASE
Restrictions	None

The following is an example of the **FREQUENCY** command message format:

SSU_2000->FREQUENCY

```
1A04-01 FreqA:2001-06-18T20:54:19, 0
1A04-02 FreqA:2001-06-18T20:54:19, 1
1A04-03 FreqA:2001-06-18T20:54:19, 1
1A09-01 FreqA:2001-06-18T20:54:19, 3
1A09-02 FreqA:2001-06-18T20:54:19, 2
1A09-03 FreqA:2001-06-18T20:54:19, 1
```

B

HELP

Use this command to access online Help.

Level 0 **HELP**

Use this command to access the online Help menus. If you specify you want to view Help for a specific command, the Help menu for that command displays.

Remarks Only commands that are valid for the user level are displayed in the Help menu. The Help menu does not display any command that you cannot perform at your current logon level. If the first entered character is?, then ICS displays the main Help screen.

Related None

Restrictions None

The following is an example of the **HELP** command message format:

SSU_2000->HELP

Level 4 commands:

```
ALARM       BYE         CLK         COMM        CONFIG      DATE
ELEVTIME    ENGINE      EVENTS      FREQ        HELP        ID
INFO        INPUT       IONAME      IP          KEEPALIVE   MSG
MTIE        NAME        NTP         OUTPUT      PBO         PHASE
PING        PQLTABLE    REF         RESET       RESTART     SETUP
SNMP        STATUS      SYSTIME     TDEV        TIME        USERS
VER         WHO
```

ID

Use this command to display the fixed unit ID for the system.

Level 0	Displays SSU2000e
Level 1	Same as Level 0 operation
Level 2	Same as Level 0 operation
Level 3	Same as Level 0 operation
Level 4	Same as Level 0 operation
Remarks	This command is used by test systems to tell the type of instrument connected. This is different from the NAME command in that the NAME information is settable by the user. The unit ID is also returned on any status type command.
Related	NAME
Restrictions	None

The following is an example of the **ID** command message format:

SSU_2000->ID
Unit ID: SSU2000

INFO

Use this command to view information necessary to return a product for service. This includes the unit ID, software version(s), shipping address, and phone number for Datum, Inc.

Level 0	**INFO** Displays information as follows (assume COMMS Version A, Bootloader A): Unit ID: SSU2000 Main Code: A.01, 10FEB99 Copyright 1997-99 Datum 15811 Vision Drive Pflugerville, Texas 78660 Ph: (512) 721-4032 Fax: (512) 721-4033
Level 1	Same as Level 0 operation
Level 2	Same as Level 0 operation
Level 3	Same as Level 0 operation
Level 4	Same as Level 0 operation
Remarks	This command provides a method for you to have all service information available for a unit.
Related	ID, VER
Restrictions	None

INPUT

Use this command to access to the input status, hardware configuration, and alarm settings.

Level 0 Not applicable

Level 1 **INPUT [xAy[-z]] [STATUS| SETUP]**

If you do not provide a parameter, all the Input module status information in the unit displays. If a specified input address is provided, that input status and setup information displays.

Options are:

STATUS Use this command to display input status information.
SETUP Use this command to display input setup information.

Status information: status, phase A/B values, PQL, hardware alarm (**LOS**, **AIS**, **OOF**, **BPV**, **CRC**) statuses, MTIE status.

Setup information: port (Enable or Disable), framed signal (D4 or ESF if DS1, CAS or CCS if E1), unframed signal (if specified as CLK), zero suppression (ON or OFF), CRC (ON or OFF), SSM (ON or OFF), PQL provision value (1-16), priority (0-10), high gain (ON or OFF), cesium fault indication level (High, Low, OFF), MTIE mask limits, hardware alarm (LOS, AIS, OOF, BPV, CRC) error count and clear error count setting.

If E1: SSM bit position (4 through 8)

The alarm level and delay time are handled by the **ALARM** command. The alarm elevation time is handled by the **ELEVTIME** command.

Example:
SSU_2000+>input

```
2001-07-16T12:57:14Z ID: SSU2000 Name: SSU_2000
INPUT STATUS                      L A O B C
                                  O I O P R  -MTIE1-   -MTIE2-   FREQ
Loc#    Sta PhaseA   PhaseB   Pql S S F V C  A    B    A    B    A   B
------- --- -------- -------- --- --------- ---- ---- ---- ---- --- ---
1A04-01 Dis NA       NA       4    / / / /  Ok   Ok   Ok   Ok   Ok  Ok
1A04-02 Dis NA       NA       4    / / / /  Ok   Ok   Ok   Ok   Ok  Ok
1A04-03 Dis NA       NA       4    / / / /  Ok   Ok   Ok   Ok   Ok  Ok
1A06-01 Sel -1       -2       4    / / / /  Ok   Ok   Ok   Ok   Ok  Ok
1A06-02 Dis NA       NA       4    / / / /  Ok   Ok   Ok   Ok   Ok  Ok
1A06-03 Dis NA       NA       4    / / / /  Ok   Ok   Ok   Ok   Ok  Ok
1A08-01 Dis NA       NA       4    / / / /  Ok   Ok   Ok   Ok   Ok  Ok
GPS STATUS
Loc#    Sta PhaseA   PhaseB   Pql UTC
------- --- -------- -------- --- ---
1A03-01 Ok  -143     -145     2   Yes
1A05-01 Ok  -149     -149     2   YesLevel 2Same as Level 1 operation
```

Level 3 Same as Level 2 operation, with the following additions:

INPUT xAy[-z] {ESF | D4| CCS | CAS |1MHZ | 1.544MHZ | 2.048MHZ | 5MHZ | 10MHZ}

INPUT xAy[-z] {ZS | SSM | CRC} {ON | OFF}
INPUT xAy[-z] PRIORITY {0-10}
INPUT xAy[-z] {ENABLE| DISABLE}
INPUT xAy[-z] SSM {4 | 5 | 6 | 7 | 8}
INPUT xAy[-z] PQL {1-16}
INPUT xAy[-z] MTIE [{EL1| EL2| CL1| CL2}] {T10| T100| T1K| T10K| T100K} value
INPUT xAy[-z] MTIE {PRS| DS1| G.811| G.823}
INPUT xAy[-1] GAIN {ON| OFF}
INPUT xAy[-z] CSFLT {HIGH| LOW| OFF}
INPUT xAy[-z] {LOS| AIS| OOF| BPV| CRC} {SET| CLR} value
INPUT xAy[-z] FREQ {A| B} {SET | CLR} value

Allows the user to change the setting of a specified Input module.

Options are:

ESF/ D4 Set the T1 framing mode: **ESF** or **D4.**

CCS/ CAS Set the E1 framing mode: **CCS** or **CAS.**

1MHZ | 1.544MHZ | 2.048MHZ | 5MHZ | 10MHZ

Sets the basic Input module clock frequency when input is not running in framing mode. Only the clock frequencies shown are valid. If the module is a T1 frame signal, the CLK rate is 1.544MHZ; if it is E1 frame signal, the CLK rate is 2.048MHZ automatically.

ZS {ON | OFF}Enables or disables Zero Suppression

For DS1:

B8ZS (zero suppression on) or **AMI** (zero suppression off)

For E1:

HDB3 (zero suppression on) or **AMI** (zero suppression off)

SSM {ON | OFF}
Enables or disables Sync Status Message reading

CRC {ON | OFF}
Enables or disables CRC checking

PRIORITY {0-10}
Sets Input priority level, where: 0 = monitor. 1 - highest priority, and 10 =lowest priority

ENABLE Enables a specified input port

DISABLE Disables a specified input port. This clears all alarms associated with an input and disables setting of further alarms or use of the input measurements.

SSM {4 | 5 | 6 | 7 | 8}
Sets the E1 SSM bit Position

PQL {2 | 3 | 4 | 5 | 6 | 8}
Sets a Priority Quality Level (PQL) to a specified input port

MTIE [{EL1| EL2| CL1| CL2}] {T10| T100| T1K| T10K| T100K} value

Sets MTIE Limit 1 or Limit 2 for 10/ 100/ 1,000/ 10,000/ 100,000 seconds threshold. If L1 or L2 are not provided, both limits are implied. The Limit Range is [0.100,000].

B

EL1 MTIE Error Limit 1

EL2 MTIE Error Limit 2

CL1 MTIE Clear Limit 1

CL2 MTIE Clear Limit 2

T10 MTIE 10-second period

T100 MTIE 100-second period

T1K MTIE 1000-second period

T10K MTIE 10000-second period

T100K MTIE 100000-second period

MTIE {PRS| DS1| G.811| G.823}

Sets MTIE Limit 1 or Limit 2 for predefined values

ANSI Specification– **PRS, DS1**

ITU Specification – **G.811, G.823**

GAIN{ON | OFF}
Enables or disables input gain setting for port one

CSFLT {HIGH| LOW| OFF}
Sets cesium fault logic level

HIGH High. Alarm is active when the fault is a high logic level

LOW Low. Alarm is active when the fault is a low logic level

OFF Default. Cesium Fault is ignored (not the AIS).

{LOS| AIS| OOF| BPV| CRC} {SET| CLR} value
Sets Error Count (SET) or sets Clear Count (CLR) of a given input hardware alarm signal. These signals are LOS/ AIS/ OOF/ BPV/ CRC.

FREQ Sets Frequency limits on Clock A or Clock B

SET Sets Freq Error Count

CLR Sets Freq Clear Count

TAU Set frequency tau. (default is 400), range is 10-1000

Level 4 Same as Level 3 operation

Remarks None

Related SETUP, STATUS

Restrictions None

IONAME

Use this command to set an alias name for each input or output port.

Level 0 Not applicable

Level 1 **IONAME [xAy]**

Use this command to display a previously specified name associated with each I/O port.

Example:

SSU_2000->ioname

```
2001-05-24T18:28:23Z ID: SSU2000 Name: SSU_2000
1A05-01 GPS Input
```

Level 2 Same as Level 1 operation

Level 3 Same as Level 2 operation, with the following additions:

IONAME xAy-z[&&z] {CLR| “io_port_name”}

Use this option to set a name associated with each I/O port. No control characters are allowed. Multiple spaces between words reduce to one blank character. The port alias can contain up to 20 characters.

Level 4 Same as Level 3 operation

Remarks None

Related None

Restrictions CLR is an operand, and cannot be used as an I/O port name.

B

IP

Use this command to view current Internet Protocol (IP) address information and access related values.

Level 0 Not applicable

Level 1 **IP**

Use this command to display the current IP address, subnet mask, gateway address, and the Ethernet hardware address.

Example:

SSU_2000->ip

```
The IP Address is 255.25.52.5
The Subnet Mask is 255.255.255.0
The Default Gateway is 0.0.0.0
The Ethernet Address is 00A06E000CCC
```

Level 2 Same as Level 1 operation

Level 3 Same as Level 2 operation, with the following additions:

IP {ADDR | MASK | GATE} ip_dotted_address

ADDR Change the Internet Protocol (IP) address

MASK Change the subnet mask

GATE Change gateway address

Level 4 Same as Level 3 operation

Remarks When you change a network address, you must restart the Communications Module in order for the changes to take effect.

Related None

Restrictions The IP address is in the decimal dotted address format (for example: 192.168.70.224). No name server is allowed.

KEEPALIVE

Use this command to support a "keep alive" mode that, based on a user settable time an event is generated by the SSU2000 to alert the upstream support system that the SSU2000 and associated communication path is functional.

Level 0: NA

Level 1: **KEEPALIVE**

Allows users to display keep alive settable time

Level 2: Same as level 1 operation

Level 3: Same as Level 2 operation with the following additions:

KEEPALIVE [TL1 | SNMP] [time]

The above options are:

TL1	Sets the TL1 session keep alive time
SNMP	Sets the SNMP session keep alive time
time	Settable in minutes, minimum is 1 minute, maximum is 60 minutes. If 0 minutes are specified, it means 'keep alive' is disabled

Level 4: Same as level 3 operation

Remarks: None

Related: None

Restrictions: The ICS session in RS232 or telnet is not affected

LOGIN

Use this command to change the active logon name and access level. The user is logged on as the new user name and access level when the password is verified.

Level 0	**LOGIN** [user name] If you do not provide a user name, the system prompts you for one. When you enter a user name, the system prompts you for a password. The password entry is echoed as '*' characters. If the user name and password match an entry in the user table, the user is logged on at the assigned access level. After five minutes (default) of inactivity on the port, the user is automatically logged off.
Level 1	Same as Level 0 operation
Level 2	Same as Level 0 operation
Level 3	Same as Level 0 operation
Level 4	Same as Level 0 operation
Remarks	Use this command to access various levels of the system. This is the only way to change access levels for a port and provides a back door entry. This entry is based on a random number generation based from the current day of year information from the unit. DATUM can provide the password of the day. This process helps to prevent lost or forgotten user passwords. The password generation for each day is unique, so that if a password is given out for a specific day, it changes the next day for security measures. The administrator level user name is ADMIN. There is also a GUEST entry, with a null password, that is always present to gain access to Level 1.
Related	BYE, USERS, DOY, COMM
Restrictions	If no user passwords have been entered, this command is not listed in help.

MSG

Use this command to access the messaging facilities.

Level 0	Not applicable
Level 1	Not applicable
Level 2	**MSG "message to send"**
	Use this command to broadcast a message on all active communication sessions. The maximum length of each message is 60 characters.

NOTE …

The MSG is implemented as an event. It displays a full message in an autonomous event. But, it only saves 20 characters in the event log when a user tries to query it later.

Level 3	Same as Level 2 operation
Level 4	Same as Level 3 operation
Remarks	The string must be entered
Related	None
Restrictions	None

MTIE

Use this command to display the MTIE data from a selected input port.

Level 0 Not applicable

Level 1 **MTIE xAy-z [{A | B}] startdate [starttime] [stopdate [stoptime]]**

MTIE xAy-z [{A | B}] starttime [stopdate] [stoptime]

MTIE xAy-z [{A | B}] HISTORY [count]

Where:

A| B = CLK A or CLK B; the default is the selected clock output.

starttime This option is used to specify the start time of a specific period of time to be displayed.

stopdate This option is used to specify the date ending a specific period of time to be displayed.

stoptime This option is used to specify the stop time of a specific period of time to be displayed.

If the **starttime**, **stopdate**, and **stoptime** are not specified the system defaults to a 24 hour period.

HISTORY [count] Displays the one-day MTIE history for the last number of days specified in the count parameter.

This command displays the MTIE information calculated on the Input module with a specified clock. A **start time** and **stop time** are required to perform an MTIE calculation. If these are not specified in the command line, the **start time** defaults to the last 24 hours, the **stop time** defaults to the current time.

NOTE ...

If you specify times and dates, the MTIE that occurred after the starting date and time and before the ending date and time displays.

Specified dates have the format **yyyy-mm-dd**, and specified times have the format **hh:mm:ss**. Specified dates and times are not provided in ISO timestamp format, and must be separated by a space. **Starttime** and **stoptime** both default to the current time of day. **Stopdate** defaults to the current date. **Startdate** defaults to the current date, minus 24 hours.

MTIE xAy-z [{A| B}] HISTORY [count]

A| B specifies Clock A or Clock B. The default is the selected clock output. This command displays the one-day MTIE history for the last one to 100 days.

Level 2 Same as Level 1 operation

Level 3 Same as Level 2 operation

Level 4 Same as Level 3 operation

Remarks Since MTIE involves intensive calculations, you can only specify one port.

Related None

Restrictions None

Example:

SSU_2000+>mtie 1A10-02

```
MTIE for 1A09-01, on Clock A:
Start Time: 2001-06-24T19:00:00
Stop Time:  2001-06-25T18:20:00
The MTIE (     0.05 sec) is 5
The MTIE (     0.10 sec) is 5
The MTIE (     1.00 sec) is 6
The MTIE (    10.00 sec) is 7
The MTIE (   100.00 sec) is 12
The MTIE (  1000.00 sec) is 13
The MTIE ( 10000.00 sec) is 22
The MTIE (100000.00 sec) is 22
2001-06-25T18:20:49   1A05 Rep Pos Set by Rec, Information Locked, TL1A
```

B

NTP

Use this command to provide access to the NTP in the unit. It can run as a server application, a client application, and in broadcast mode. The server always runs and the client and broadcast modes are enabled independently by assigning an address and setting a timer.

Level 0: NA

Level 1: **NTP**

Displays the NTP data: root delay, root dispersion, peer delay, peer dispersion, and peer offset.

Level 2: Same as level 1 operation.

Level 3: **NTP ADDPEER {CLIENT| BROADCAST| BCLIENT} ip_dotted_address**

NTP DELPEER ip_dotted_address

NTP CLRALL

NTP BTIMER {32|64|128|256|512|1024}

The above options are:

ADDPEER Add NTP peers (servers) to enable broadcast or client mode

CLIENT The IP for NTP server in client mode

BROADCAST The subnet mask for broadcasting mode

BCLIENT The IP for NTP server in broadcast client mode

DELPEER Removes NTP servers from the peer table

CLRALL Clear all the NTP peer addresses in the unit

BTIMER Set the broadcast timer for 32/64/128/256/512/1024 seconds interval

Level 4: Same as level 3 operation

Remarks: None

Related: None

Restrictions: The maximum number of peers is three. Users can assign a newly created peer to client or broadcast. Normally two peers are used for clients and one peer is for broadcasting (depending upon user requirements).

NAME

Use this command to view and set the unit name.

Level 0	Not applicable
Level 1	**NAME** Use this command to display the unit name.
Level 2	Same as Level 1 operation
Level 3	**NAME *unit _name*** Sets the current unit name. You can use up to 20 characters for the unit name. This name is for identification purposes only.
Level 4	Same as Level 3 operation
Remarks	The name displays as part of the prompt
Related	Valid names must start with a letter. If TL1 is to be used, care must be taken in the assignment of the unit name as it is the Target Identification (TID) for that mode.
Restrictions	None

OUTPUT

Use this command to view or set the Output module status.

Level 0 Not applicable

Level 1 **OUTPUT [xAy]**

If you do not provide a parameter, all the Output module status information in the unit displays. If you provide an output address, the output status and setup information for that Output module displays.

- **Status Information**: Output module status, selected clock, all four clock statuses, redundant partner, output PQL value, and output port status
- **Setup Information**: Framer type, zero suppression (On or Off), minimum clock level, PLL mask (On or Off)
  - If DS1: line length
  - If E1: CRC (On or Off), SSM bit position (4-8)
- The alarm level is handled by the ALARM command. The alarm elevation time is handled by ELEVTIME command.

Example:

SSU_2000->output

```
2001-05-24T18:29:00Z ID: SSU2000 Name: SSU_2000
OUT STA  Clk Clk Stat               Port Status       1 1 1 1 1 1 1 1 1 1 2
Loc# Sta Sel  A B C D Rednt M/S Pql  1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0
---- --- --- -------- ----- --- --- ---------------------------------------
2A01 Ok  A   /Y/Y/Y/Y None      2   / / / / / / / / / / / / / / / / / / / /
2A02 Ok  A   /Y/Y/Y/Y None      2   / / / / / / / / / / / / / / / / / / / /
2A03 Ok  A   /Y/Y/Y/Y None      2   / / / / / / / / / / / / / / / / / / / /
2A04 Ok  A   /Y/Y/Y/Y None      2   / / / / / / / / / / / / / / / / / / / /
2A05 Ok  A   /Y/Y/Y/Y None      2   / / / / / / / / / / / / / / / / / / / /
2A08 Ok  A   /Y/Y/Y/Y None      2   / / / / / / / / / / / / / / / / / / / /
3A08 Ok  A   /Y/Y/Y/Y None      2   / / / / / / / / / / / / / / / / / / / /
3A11 Ok  A   /Y/Y/Y/Y 3A12  (S) 2   / / / / / / / / / / / / / / / / / / / /
3A12 Ok  A   /Y/Y/Y/Y 3A11  (M) 2   / / / / / / / / / / / / / / / / / / / /
1A06 Ok  A   /Y/Y/Y/N 1A07  (M) NA  / / / / / / / / / / / / / / / / / / / /
1A07 Ok  A   /Y/Y/Y/N 1A06 (S) NA  / / / / / / / / / / / / / / / / / / / /
```

Level 2 Same as Level 1 operation

Level 3 Same as Level 2 operation, with the following additions:

OUTPUT xAy {ESF | D4| CCS| CAS}

OUTPUT xAy-z[&&z] {ENABLE| DISABLE}

OUTPUT xAy-z[&&z] {133FT| 266FT| 399FT| 533FT| 655FT}

OUTPUT xAy {CRC| ZS} {ON| OFF}

OUTPUT xAy SSM {4| 5| 6| 7| 8}

OUTPUT xAy LEVEL {ACQ| LOCK}

OUTPUT xAy BYPASS {ON| OFF}

OUTPUT xAy-z[&&z] DUTYCYCLE_CC {63/37| 50/50}

OUTPUT xAy-z[&&z] COMP_CC {0ft|500ft|1000ft|1500ft|2000ft|2500ft|3000ft|3500ft}

OUTPUT xAy FLTMODE_2048 {ON| OFF| AUTO}

Changes settings of a given Output module

Options are:

ESF/D4 Use this option to set the T1 framing mode: ESF or D4.

CCS/CAS Use this option to set the E1framing mode: CCS or CAS.

ENABLE Use this option to enable output ports.

DISABLE Use this option to disable output ports.

133FT| 266FT| 399FT| 533FT| 655FT

Sets the line-length parameters for the output line driver.

CRC {ON| OFF} Enables or disables the CRC setting

ZS {ON| OFF} Enables or disables the zero suppression setting

SSM {4| 5| 6| 7| 8} Sets the E1 SSM bit Position

B

	LEVEL {ACQ| LOCK}	Sets the minimum clock level to be ACQUIRE or LOCK mode. The Output module turns off the output port if the level is below the minimum clock level.
	BYPASS {ON| OFF}	Enables or disables the bypass mode to support Clock C
	DUTYCYCLE__CC	Sets the Composite Clock output 63/37 or 50/50 duty cycles
	COMP_CC	Sets current line compensation for the Composite Clock output
	FLTMODE_2048	Allows the user to turn the output on or off when the output level exceeds 2.1v threshold
Level 4	Same as Level 3 operation	
Remarks	None	
Related	SETUP, STATUS	
Restrictions	None	

PBO

Use this command to gain access to the phase buildout (PBO) in the Input module.

Level 0: NA

Level 1: PBO

Display the PBO current mode from each input

Level 2: Same as Level 2 operation.

Level 3: **PBO [DISABLE| REPORT| EVENT| NONE]**

The options are:

DISABLE	PBO disabled
REPORT	PBO Enabled, the PBO events sent out and displayed, but not stored in the COMM event buffer
EVENT	PBO Enabled, the PBO events sent out and displayed, but not stored in the COMM event buffer
NONE	PBO Enabled, but no PBO events displayed

Level 4: Same as level 3 operation

Remarks: None

Related: INPUT, PHASE

Restrictions: None

PHASE

Use this command to access phase history data.

Level 0 Not applicable

Level 1 **PHASE [xAy[-z]] [{A| B}] {T1 | T100| T1K| T10K} [count]**

Use this command to view the 100/ 1,000/ 10,000 seconds phase history information. One second phase is not stored in phase history. If you do not provide a parameter, phase information displays for the selected clock to all inputs that last stored the point.

Example:

SSU_2000->phase

```
The current phase values with T1:
1A03-01  PhA:2001-05-24T18:29:00, 3
1A04-01  PhA:2001-05-24T18:29:09, 1
1A04-02  PhA:2001-05-24T18:29:09, 1
1A04-03  PhA:2001-05-24T18:29:09, 3
1A05-01  PhA:2001-05-24T18:29:12, 5
1A09-01  PhA:2001-05-24T18:29:12, 1
1A09-02  PhA:2001-05-24T18:29:12, 2
1A09-03  PhA:2001-05-24T18:29:12, NA
1A10-01  PhA:2001-05-24T18:29:13, 1
1A10-02  PhA:2001-05-24T18:29:13, 3
1A10-03  PhA:2001-05-24T18:29:13, 2
1A11-01  PhA:2001-05-24T18:29:14, NA
1A11-02  PhA:2001-05-24T18:29:14, 2
1A11-03  PhA:2001-05-24T18:29:14, NA
```

Level 2 Same as Level 2 operation, with the following additions:

PHASE [xAy[-z]] ZERO [{A| B}]

Use this command to zero the phase error for the desired input port. If you do not provide a parameter, all inputs on both clocks are zeroed.

Level 3 Same as Level 2 operation

Level 4 Same as Level 3 operation

Remarks None

Related STATUS, INPUT

Restrictions None

PING

Use this command to view network ping (diagnostic) capabilities.

Level 0	Not applicable
Level 1	Not applicable
Level 2	**PING ip_dotted_address** Use this command to determine if the unit is connected to the network. This command transmits a packet to the specified address and waits for a response. If a response is received, the unit displays a successful command completion message. If no response is received, the unit times-out and prints an unsuccessful command completion message.
Level 3	Same as Level 2 operation
Level 4	Same as Level 2 operation
Remarks	No name server is available. The Internet Protocol (IP) address is formatted as a decimal dotted address.
Related	None
Restrictions	None

PQLTABLE

Use this command to display or change user-defined Priority Quality Level (PQL) code and text string.

Level 0 Not applicable

Level 1 **PQLTABLE**

Use this command to displays the PQL table setting.

Level 2 Same as Level 1 operation

Level 3 Same as Level 2 operation, with the following additions:

PQLTABLE FACTORY

PQLTABLE pql# [{DS1| E1}] UNUSED

PQLTABLE pql# [{DS1| E1}] [SSM n] [DESC str] [STD {ON| OFF}]

Use this command to read or set current PQL translation table information. This table provides the translation from the internal Priority Quality Level (PQL) to the Synchronization Status Message (SSM) for the various framing types.

Options are:

FACTORY Use this option to set factory defaults for the table. Both DS1 and E1 are affected.

Pql# PQL number for the entry. The range is 1 to 16.

DS1 | E1 Use this option to specify which entry to affect. If you do not specify this information, both entries are assumed.

UNUSED Marks this entry as unused in the table

SSM *n* Use this option to set the SSM value to use for the framing type by specifying a hex number, preceded by ***0x***.

DESC str Use this option to set the descriptive text string for this entry. Use a maximum of 14 characters. You can enclose the string in double quotes to allow entry of spaces and lower-case letters.

STD {ON| OFF} Use this option to set or clear this entry as the standard input type. Only *standard* entries are matched for input.

Level 4 Same as Level 3 operation

Remarks None

Related None

Restrictions None

Example:

SSU_2000->pqltable

```
2001-06-21T15:23:06Z ID: SSU2000 Name: JWANG
    DS1                      E1
PQL SSM  S Text Desc         SSM  S Text Desc
--- ---- - ---------------- ---- - ----------------
  1 --                       --
  2 0x04 s PRS               0x02
  3 0x04                     0x02 s PRC/G.811
  4 0x08 s STU               0x00 s STU
  5 0x0C s St2               0x04   Type II
  6 0x78 s Type V            0x04 s G.812 Transit
  7 --     Type I            --     Type I
  8 0x7C s St3E              0x08   Type III
  9 0x10   Type VI           0x08 s G.812 Local
 10 0x10 s St3               0x0B   Type IV
 11 0x22                     0x0B s G.813 Opt1
 12 0x22 s SMC               0x0F   G.813 Opt2
 13 0x28 s St4               0x0F
 14 0x40 s Reserved          0x0F
 15 0x30 s DUS               0x0F s DUS
 16 0x7E   Unassigned        0x0F   Unassigned
```

B

REF

Use this command to access the input reference selection modes and settings.

Level 0 Not applicable

Level 1 **REF**

Use this command to display the current input reference port and selected clock.

Level 2 Same as Level 1 operation

Level 3 Same as Level 2 operation, with the following additions:

REF xAy-z

REF {AR| AS | OFF}

REF {PRIORITY| PQL}

Use the first command **REF xAy-z** to select a given input port as current input reference.

NOTE...

If the Clock module is already selected as an input reference and is not in AS OFF mode, this command has no effect. If both clocks are gone or in warm-up mode, this command can set an initial input reference port used as the Clock C pass through. Other commands allow you to set input switch methods and input selection modes.

Options are:

{AR}	Use this option to enable the input AutoReturn switch mode.
{AS}	Use this command to enable the input AutoSwitch switch mode.
{OFF}	Use this command when no switch is used.
PRIORITY	Use this option to set the PRIORITY as the input selection mode.

NOTE...

Input reference selection order proceeds from highest (1) to lowest (10) priority valid input port. If there are equal priorities, the PQL value is used to distinguish between them.

NOTE...

Input reference selection order proceeds from highest (1) to lowest (16) PQL valid input port. If there are equal PQL values, then the priority is used to distinguish between them.

PQL Sets the PQL value as the input selection mode

Level 4 Same as Level 3 operation

Remarks None

Related INPUT, CLK, STATUS

Restrictions None

Example:

SSU_2000->ref

```
2001-06-18T21:29:56Z ID: SSU2000 Name: SSU_2000
Input Reference:
  1A03-01
Bypass Clock C Selected:
  1A04-01
Clock Selected:
  1A01
```

RESET

Use this command to reset the Clock module through Comm Module.

Level 0: NA

Level 1: NA

Level 2: NA

Level 3: **RESET {xAy}**

Resets a given Clock module. It must have an operand to indicated Clock A or Clock B. Any other operand is invalid. This command requires the whole entry ‘RESET’ be entered to verify that the user really wants to restart that module. This command requires a confirmation (**YES | NO**). If confirmation failed, it takes no action.

Level 4: Same as level 3 operation

Remarks: None

Related: RESTART

Restrictions: This command uses the COMM module PLD’s CLK A/B reset bit to reset the Clock module. The software is required to hold the RESET bit for at least for 4 seconds and then writes a zero for that RESET bit.

RESTART

Use this command to restart the software for a specified module.

Level 0	Not applicable
Level 1	Not applicable
Level 2	Not applicable
Level 3	**RESTART [xAy]** Use this command to restart the module. If you do not provide a parameter, the command refers to the Communications Module. This command requires the whole entry **RESTART** to be entered to verify that you want to restart the module. This command requires a confirmation (YES | NO). If confirmation fails, no action is required.
Level 4	Same as Level 3 operation
Remarks	None
Related	None
Restrictions	This command is based on the target module. It has the SPI software RESTART command support. This command assumes that the target module is working properly. If the target module does not work, this command has no effect.

SETUP

Use this command to view the current settings from non-volatile RAM in the entire unit. This includes any user settable information that is currently stored in NVRAM.

The main purpose of this command is to allow for a dump of current configuration of a unit so that you can compare site configurations. In addition, this command allows for storage and restoration of user settings, and the restoration of factory settings.

Level 0 Not applicable

Level 1 **SETUP [xAy]**

If you do not specify a parameter, all setup information of every module in the unit displays. If a specified address operand is provided, setup detail information for the target module displays. Module alarm Level is handled by the ALARM command. The alarm elevation time is handled by the ELEVTIME command. For each target module, refer to INPUT, CLK, or OUTPUT for a description.

- If BUFFER is specified as the module, the command displays nothing.
- If the Communications Module is specified as the module, the command displays: IP address, IP mask, gateway address, communications port settings, total number of users stored, and maximum number of events stored. You can view events from the event log by using the **EVENTS** command. You can view alarms from each module by using the **ALARM** command.

Level 2 Same as Level 1 operation

Level 3 Same as Level 2 operation, with the following additions:

SETUP [xAy] {FACTORY| USER | SAVE}

SETUP 1A2 CONNECTION FACTORY

Options are:

FACTORY Use this option to restore the current setting from the factory settings. If addressed as COMM, connection and user list are not included.

USER Use this option to restore the current setting from user default settings. If addressed as COMM, connection and user list are not included.

SAVE Use this option to save the current setting as the user setting. If addressed as COMM, connection and user list are not included.

CONNECTION FACTORY

Use this command to restore the current connection configuration in the Communications Module.

NOTE …

Restore the user list to factory settings by using the **USER INITUSERTABLE** command.

Level 4	Same as Level 3 operation
Remarks	This command provides a way for the unit to save default settings that the user prefers for operation. The target module restores user defaults in the event that current nonvolatile RAM information in the target module is lost. If user information is not present, or unusable, the target module restores the current factory settings. If the factory settings are also not usable, the software initializes non-volatile RAM with the current program defaults and transfers those setting into non-volatile RAM as the new factory settings.
Related	INPUT, CLK, OUTPUT, EVENTS, ALARM
Restrictions	None

B

SNMP

Use this command to provide access to SNMP user list and provide the SNMP manager IP addresses.

Level 0: NA

Level 1: **SNMP [USER | MANAGER]**

If this command is used with any operand, it will display the valid SNMP user names and their associated access levels. It also displays the SNMP enabled/disabled mode, and SNMP manager IP addresses.

USER	Displays the valid SNMP user names and their associated access levels
MANAGER	Displays the SNMP manager table contents

Level 2: Same as level 1 operation

Level 3: Same as level 2 operation, with the following additions:

SNMP [DISABLE | ENABLE]

SNMP TRAP {ALARM | ALL}

The above options are:

DISABLE	Disables the SNMP agent
ENABLE	Enables the SNMP agent and allow MIB manager to see the view
TRAP	Allows user set filter for SNMP trap (event port)
ALARM	Only Alarm Traps sent out
ALL	All Traps sent out

Level 4: Same as level 3 operation, with the following additions:

SNMP USER [{INIT | ADD | MODIFY | DELETE}]

SNMP MANAGER [INIT | {ADD | DELETE}] [ip_address]

The above options are:

USER	SNMP User Table
INIT	Clears the whole SNMP user table and only leave the built-in users in the systems. This option clear the table.

ADD Adds the SNMP user “read community” to the system. If the user exists in the system this option exits with an error. After the read community string is entered, this command prompts for a write community. Write Community entries are echoed as ‘*’. Valid write community characters are all upper alphanumerical characters. After the write community string is entered, this command prompts for the user level.

MODIFY Modifies the write community and/ or the access level for the given user. If the user id is not in the system, this command exits with an error. Once the user is entered, this option performs identically to the ‘ADD’ option.

DELETE Deletes the user from system. If the user id is not in the system, this command exits with an error.

NOTE …

Except for the first built-in entry, **Read** community: ‘public’ and **Write** community: ‘private’, all user added community strings are upper case. Maximum is five SNMP user entries which includes the built-in user.

MANAGER SNMP Manager Table

INIT Initializes the SNMP Manager Table to all null IP address

ADD Adds an SNMP Manager IP address into the SNMP Manager Table

DELETE Deletes an SNMP Manager IP address from the SNMP Manager Table

Remarks: The length of read community string and write community string are limited to 10 characters to satisfy TL1 requirements.

Related: USERS

Restrictions: None

STATUS

Use this command to view the current status of the unit. The status includes a count of the current active alarms and related information, which provides a quick view of unit performance.

Level 0 Not applicable

Level 1 **STATUS [xAy]**

If you do not provide a parameter, all status information from every module in the unit displays. If a specified address operand is provided, status detail information for that target module displays. For each target module, refer to INPUT, CLK, or OUTPUT for a description.

- If the Communications Module is specified, the bus connection profile displays within 900 seconds.
- If the buffer module is specified, nothing displays.

Level 2 Same as Level 1 operation

Level 3 Same as Level 1 operation

Level 4 Same as Level 1 operation

Remarks None

Related CLK, OUTPUT, INPUT, EVENTS

Restrictions None

SYSTIME

Use this command to view the length of time in ISO format that the devices have had power applied.

Level 0	Not applicable
Level 1	**SYSTIME [xAy]** If you do not provide a parameter, length of time for all modules displays.
Level 2	Same as Level 1 operation
Level 3	Same as Level 1 operation
Level 4	Same as Level 1 operation
Remarks	None
Related	None
Restrictions	None

Example:

SSU_2000->systime

```
2001-06-18T21:31:57Z ID: SSU2000 Name: SSU_2000
1A01 0T09:13:35
1A02 5T03:25:59
1A03 4T04:06:37
1A04 3T06:26:05
1A05 4T04:05:48
1A08 4T03:30:10
1A09 9T01:43:29
1A10 9T01:43:31
1A11 9T01:43:32
1A12 0T09:12:35
2A01 9T01:30:59
2A02 0T05:32:39
2A03 9T01:30:53
```

B

TDEV

Use this command to view TDEV information from the selected input port.

Level 0 Not applicable

Level 1 **TDEV xAy-z [{A| B}] startdate [starttime] [stopdate [stoptime]]**

TDEV xAy-z [{A| B}] starttime [stopdate] [stoptime]

Use this command to display the TDEV information calculated on the Input modules. A|B specifies Clock A or Clock B. The default is the selected clock output.

To perform a TDEV calculation, start and a stop time are required. If none are specified in the command line, the time defaults to the last 24 hours. If the stop time is not specified, the current time is assumed.

This command displays the returned TDEV values and the window sizes for which they are valid. The command also displays the start and stop time for TDEV calculation.

NOTE...

If you specify times and dates, TDEV displays that occurred after the starting date and time and before the ending date and time. Specified dates have the format yyyy-mm-dd, and specified times have the format hh:mm:ss.

Specified dates and times are not provided in ISO timestamp format, and are separated by a space. Start time and stop time both default to the current time of day. Stop date defaults to the current date. Start date defaults to the current date, minus 24 hours.

TDEV xAy-z [{A| B}] HISTORY [count]

A|B specifies Clock A or Clock B. The default is the selected clock output. This command displays the one-day TDEV history for the last one to 100 days.

Level 2 Same as Level 1 operation

Level 3 Same as Level 2 operation

Level 4 Same as Level 3 operation

Remarks Since TDEV is an intensive calculation, you can only specify one port.

Related None

Restrictions None

Example:

SSU_2000->tdev 1a9-1

```
TDEV for 1A09-01, on Clock A:
Start Time: 2001-06-19T01:00:00
Stop Time:  2001-06-19T13:57:00
The TDEV (    0.10 sec) is 0.56
The TDEV (    0.30 sec) is 0.33
The TDEV (    0.60 sec) is 0.24
The TDEV (    1.00 sec) is 0.18
The TDEV (    3.00 sec) is 0.11
The TDEV (    6.00 sec) is 0.09
The TDEV (   10.00 sec) is 0.07
The TDEV (   30.00 sec) is 0.06
The TDEV (   60.00 sec) is 0.07
The TDEV (  100.00 sec) is 0.09
The TDEV (  300.00 sec) is 0.14
The TDEV (  600.00 sec) is 0.19
The TDEV ( 1000.00 sec) is 0.24
The TDEV ( 3000.00 sec) is 0.62
The TDEV ( 6000.00 sec) is 1.22
The TDEV (10000.00 sec) is 1.60
```

TIME

Use this command to access the timekeeping facilities.

Level 0	Not applicable
Level 1	**TIME** Use this command to view the current time within the unit. The time is displayed in the following format: **SSU_2000->time** T18:29:41Z
Level 2	Same as Level 1 operation
Level 3	**TIME [T]hh:mm:ss** Use this command to set the current time within the unit.
Level 4	Same as Level 3 operation
Remarks	None
Related	DATE
Restrictions	None

USERS

Use this command to access the user list.

Level 0 Not applicable

Level 1 **USERS**

USERS [MODIFY]

The option is:

MODIFY This option changes password. This does not allow for change of user name or access level.

If this option is not provided, valid user names and their associated access levels display.

Level 2 Same as Level 1 operation

Level 3 Same as Level 2 operation

Level 4 Same as Level 3 operation, with the following additions:

USERS INITUSERTABLE

USERS [{ADD | MODIFY | DELETE}]

USERS LOGOFF comm_port

Options are:

INITUSERTABLE Use this option to clear the user table and leave only the built-in (default) system users. This option requires users to confirm their intention to clear the user table by entering the complete **INITUSRTABLE** command.

ADD Use this option to add a user to the system. If the user exists in the system, this option exits with an error. After the user ID is entered, you are prompted for a password. Password entries are echoed as '*'. Valid password characters are upper case, alphanumeric characters. After you enter the password, you are prompted for the user level (1 through 4).

MODIFY Use this option to modify the password and access level for a user. If the user ID is not in the system, this command exits with an error. After you enter the user, this option performs identically to the **ADD** option.

B

DELETE Use this option to delete the user from the SSU-2000e system. If the user ID is not in the system, this command exits with an error.

LOGOFF comm_port Allows the ADMIN user to free the other communications port so that it can be reconfigured. The user on the other port is immediately logged off, terminating any data that might have been entered. The valid port names are **L**, **A**, **B**, **TELA**, **TELB**, **TELC**, **TELD**, **TL1A**, and **TL1B**.

Remarks TL1 requires user names and passwords to be limited to 10 characters.

Related LOGIN, BYE

Restrictions Non

VER

Use this command to view the current software version for the Communications Module.

Level 0	Not applicable
Level 1	**VER** This command views information as follows (assumes Communications Module Main Code Version A). Current Version: ■ Main Code: A.01, 10FEB99
Level 2	Same as Level 1 operation
Level 3	Same as Level 1 operation
Level 4	Same as Level 1 operation
Remarks	None
Related	INFO
Restrictions	None

WHO

Use this command to view current ports that have users and the port connections.

Level 0 Not applicable

Level 1 **WHO**

Use this command to view who is logged on all active communication ports. User name and the communication port name display.

Level 2 Same as Level 1 operation

Level 3 Same as Level 1 operation

Level 4 Same as Level 1 operation

Remarks None

Related USERS, LOGIN

Restrictions None

Example:

SSU_2000->who

```
2001-06-18T21:37:59Z ID: SSU2000 Name: SSU_2000
You are ADMIN, with access level 4, connected to TELB
ADMIN is connected to COML
ADMIN is connected to COMA
ADMIN is connected to COMB
ADMIN is connected to TELA
```

B.4 NTP Support

The Network Time Protocol (NTP) is used to synchronize the time of a computer client or server to another server or reference time source, such as a GPS receiver or local timing source.

The SSU-2000e implements the NTP v.3 (RFC 1305) version. It can run as a server application and a client application. In addition, a broadcast mode may be implemented as either a server or client. The NTP server always runs and the client and broadcast modes are enabled independently by assignment of addresses and setting of timers.

B.4.1 SERVER MODE

The NTP server application always runs at port 123 (default NTP port) of the unit IP address and responds to requests for time in the NTP format. If the unit has time set from GPS then it indicates it is a primary time source by a 0 in the LI field and a 1 in the STR field. It the unit has time set by the client application then it indicates it is a secondary source by putting a 0 in the LI field and the source server STR + 1 in the STR field.

If the unit time has not been set by one of the above then it indicates that time is not valid by setting the LI field to 3. Once the unit time has been set by either radio or client then LI = 0. Setting time by the keyboard sets (or leaves) LI = 3, since this is not an accurate time setting. If the time has been set, and the unit switches to a non-radio reference, then the STR becomes the PQL value for the selected reference input. If the unit enters holdover mode then the STR becomes the PQL of the selected Clock. (PQL is an internal representation of the received or assigned SSM value of the reference. See the SSU-2000 documentation for details.)

B.4.2 CLIENT MODE

If a valid time server IP other than 0.0.0.0 (default) is assigned AND a client timer other than 0 (default) is set AND no radio time is available, then the unit will request time from port 123 of the assigned server IP at the designated time interval (32 to 1024 seconds). Once time is set by the client mode then the server will have LI = 0 and STR = the time source STR + 1. A second server IP may be entered and the NTP protocol will check both servers and select the best source per the NTP specifications. An NTP response received in the client mode overrides the time set by keyboard and changes the LI field to 0 as indicated above.

B.4.3 BROADCAST MODE

If a broadcast address mask other than 255.255.255.255 (default) is assigned AND a broadcast timer other that 0 (default) is set, then the unit will send NTP time broadcasts to all devices within the subnet defined by the mask, at the designated time interval (600 to 86400 seconds). The LI and STR fields will be set as described in the server mode above.

If a broadcast client address other than 0.0.0.0 (default) is assigned, then the unit will listen for NTP broadcast from that address, and set time accordingly on receipt of the broadcast.

The ICS commands for setting up NTP are described as follows:

Command: **NTP**

Use this command to provide access to the NTP in the unit. It can run as a server application, a client application, or in a broadcast mode. The client and broadcast modes are enabled independently by assigning an address and setting a timer.

Operation:

Level 0: N/A

Level 1: **NTP**

Displays the NTP data: root delay, root dispersion, peer delay, peer dispersion, and peer offset.

Level 2: Same as level 1 operation.

Level 3: **NTP ADDPEER {CLIENT| BROADCAST| BCLIENT} ip_dotted_address**

NTP DELPEER ip_dotted_address

NTP CLRALL

NTP BTIMER {32|64|128|256|512|1024}

Where the above options are:

ADDPEER: Add NTP peers (servers) to enable broadcast or client mode

CLIENT: The IP address for the NTP server in client mode

BROADCAST: The subnet mask for broadcasting mode

BCLIENT: The IP for NTP server in broadcast client mode

DELPEER: Remove NTP servers from the peer table

CLRALL: Clear all the NTP peer addresses in the unit

BTIMER: Set the broadcast timer for 32/64/128/256/512/1024 seconds interval

Level 4: Same as level 3 operation.

Example: If the SSU2000 has a GPS module installed and the module is locked with satellites, it then has UTC time. The SSU-2000 is automatically an NTP SERVER at Stratum Level 1. When the system (with GPS module installed and UTC time) is a SERVER, it cannot operate as a client.

If the system is an NTP server, you can set your system for broadcast mode by the commands:

NTP ADD BROADCAST XXX.XXX.XXX.255 and NTP BTIMER NNNN

Note: The broadcast mode only works with class C networks with no gateway.

Example: If your unit IP address is 172.16.18.20, then the broadcast mask may be 172.16.18.255.

Your system can be configured as a client (if you don’t have a GPS module installed) by the command:

NTP ADD CLIENT XXX.XXX.XXX.XXX

This is the most common mode to get timing packets.

If your system is not a server, it can also be configured as a broadcast client to receive timing packets from a broadcast server by the command:

NTP ADD BCLIENT XXX.XXX.XXX.XXX

For more information on these and other NTP commands, refer to Section B.2, TL1 Command Interface, and Section B.3, Interactive Command Set.

B.5 SNMP Protocol

The SSU-2000e SNMP is an SNMP V2 agent that requires Ethernet connectivity. If SNMP is present, port 161 becomes the port of standard SNMP interactive communications, while port 162 becomes the trap port. Since the SSU-2000e SNMP supports all exiting functions, full system control of the SSU-2000e is maintained through SNMP.

The SSU-2000e implements an SNMP agent. A Management Information Base (MIB) Browser or the SNMP Manager is used to access, retrieve, and query information defined by the MIB.

All reports, queries, autonomous messages, control, provisioning, and administration (except for communication port parameters, Set User ID/Password, Set IP assignments, Reset connection, and SNMP community settings) are available through SNMP. Refer to the Datum MIB Specification (I/N 12613250-000-2) for further information. Refer to Section B.2.4, TL1 Set Commands, and Section B.3.6, ICS Commands, for specific information on the following commands.

B.5.1 User and Manager Tables

ICS and TL1 commands allow users to:

- Add up to five SNMP user names in the SNMP user table
- Delete/display SNMP user names (read community string) and their associated access levels

TL1: SET-PRMTR-SNMP-USER: [tid]::ctag::mode,[rd_community],[wr_community],[level];

and

RTRV-PRMTR-SNMP-USER:[tid]::ctag;

ICS: **SNMP [USER | MANAGER]**

- The factory default setting for *read community string* is "public"
- The factory default setting for *write community string* is "private"
- Disable/enable SNMP

TL1: SET- PRMTR -SNMP-MODE:[tid]::ctag::[mode],[trap_filter];

and

RTRV-PRMTR-SNMP-MODE:[tid]::ctag;

ICS: **SNMP [DISABLE | ENABLE]**

- Add/delete the SNMP manager IP address for traps (up to four managers in the SNMP manager table)

TL1: SET- PRMTR -SNMP-MANAGER:[tid]::ctag::mode,[ip];

and

RTRV-PRMTR-SNMP-MANAGER:[tid]::ctag;

ICS: **SNMP TRAP {ALARM | ALL**}

B.5.2 Keep Alive Support

SNMP supports a "keep alive" mode based on a user-settable time. An event is generated to alert the upstream support system that the SSU-2000e and associated paths are functional. This mode is only supported in TL1 and SNMP sessions, not in ICS, Telnet, or Hyperterminal sessions. The factory default mode is set to *Disabled*.

TL1: SET-PRMTR-KEEPALIVE:[tid]::ctag::[tl1_time],[snmp_time];

and

KEEPALIVE:[tid]::ctag;

ICS: **KEEPALIVE [TL1 | SNMP] [time]**

B

B.5.3 Shelf Information

Each shelf and distribution unit's description, part number, and revision level can be displayed. Using the following commands with specific options the hardware information can be displayed. Refer to Section B.2.4, TL1 Set Commands, and Section B.3.6, ICS Commands, for more information.

TL1: **RTRV-CONF:[tid]:[aid]:ctag;**

ICS: **CONFIG xAy {REMOVE| DISABLE| ENABLE}**

B.5.4 Software Information

Individual module software, part number, and associated revision level can be displayed. Using the following commands with specific options the software information can be displayed. Refer to Section B.2.4, TL1 Set Commands and Section B.3.6, ICS Commands, for more information.

TL1: **RTRV-CONF:[tid]:[aid]:ctag;**

ICS: **CONFIG SW**

B.5.5 Communications Module Software Version

There are four main executables (software versions) available depending on the features-added functions required for the specific application, see Table B-9.

Table B-9. Communications Module Software Versions

Part Number	Software Version
24113012-000-0	Basic System Load
24113012-001-0	Basic + NTP Support
24113012-002-0	Basic + SNMP Support
24113012-003-0	Basic + NTP and SNMP Support

In this Appendix ...

Appendix C Antennas

This appendix provides information about optional antennas, antenna kits, part numbers, and installation procedures for connecting GPS antennas to the SSU-2000e.

C.1 Ordering Information

To order any accessory, contact the Datum Sales Department at the following address and phone number, and supply the accessory name and part number (P/N):

Datum, Inc.
P.O. Box 14766
Austin, TX 78761-4766 USA
Attention: Sales Department

Phone: (512) 721-4325
Fax: (512) 251-9685
Monday-Friday
9:00 A.M - 5:00 P.M., CST
or E-mail: austinsupport@datum.com

C.2 Antenna Kits and Accessories

This section provides a list of antenna kits and accessories as well as descriptions and associated part numbers.

C.2.1 GPS Antenna with Internal LNA

Datum offers three versions of GPS antennas with 26dB, 40dB, and 48dB internal Low Noise amplifiers (LNAs). These antennas which are compatible with most commercial GPS receivers, receive, amplify, and filter the L1 (1575.42) signal from GPS NAVSTAR satellites. With the appropriate antenna (see Table C-1), inline amplifier, and coaxial cable, the antenna functions properly up to 305 meters from the radio receiver. The tables and figure listed below provide information about the antenna:

- Table C-1 lists the item number and provides a brief description of each antenna.
- Figure C-1 shows an illustration of the GPS antenna with internal LNA.
- Table C-2 provides specification information for GPS antenna with internal LNA.
- Table C-3 through Table C-5 lists the item numbers and provides a brief description of the antenna accessories available for the GPS series antennas.

Table C-1. GPS Antennas with Internal LNA

Item Number	Description
13813148-026-0	26 dB L1 GPS Antenna Kit 3/61 m.
13813148-040-0	40 dB L1 GPS Antenna Kit 30.5/122 m.
13813148-048-0	48 dB L1 GPS Antenna Kit 76/183 m.
13813148-068-0	68 dB L1 GPS Antenna Kit 198/305 m.

Figure C-1 shows the GPS antenna with internal LNA.

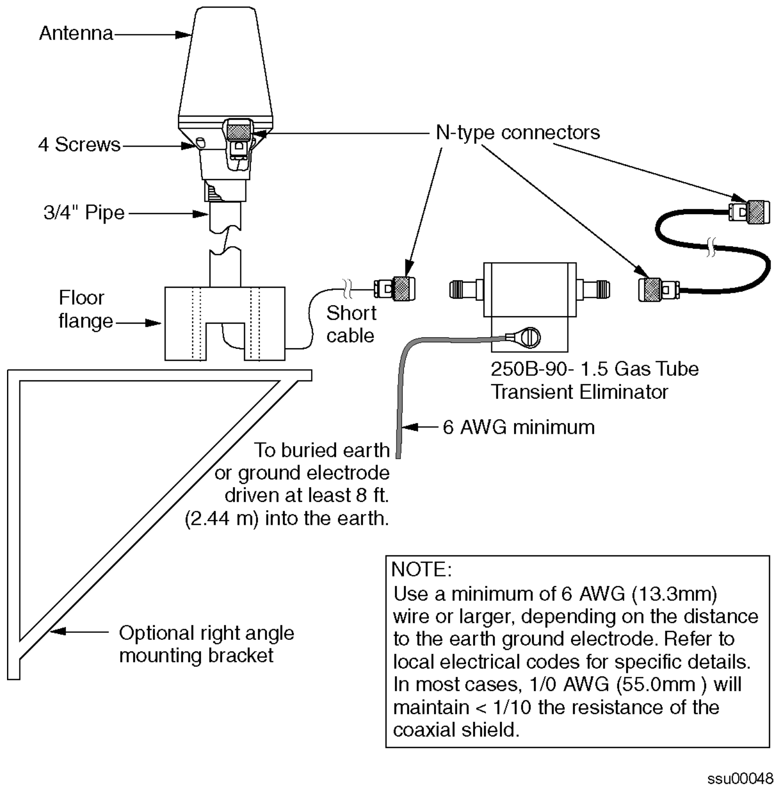

Figure C-1. GPS Antenna with Internal LNA

Table C-2 provides specifications for GPS antennas with internal LNA.

Table C-2. GPS Antennas with Internal LNA Specifications

Characteristic	Specification
Mechanical	
Mounting	4 holes, 4.445 cm x 4.445 cm centers, 0.635 cm mounting holes
Diameter	88.9 mm
Height	328.7 mm, including pipe mount
Weight	1.4 kg
Environmental	
Temperature	–40°C to +75°C
Relative Humidity	100% Non-Immersed
Altitude	60 meters below sea level to 3,962 meters above sea level

C

Table C-2. GPS Antennas with Internal LNA Specifications (Continued)

Characteristic	Specification
Electrical	
Power	4.7 to 28 vDC (5 vDC Nominal)
Element	Right Hand Circular
Carrier	L1 (1575.42 MHz)
Bandwidth	10 MHz
Noise Figure	< 2.5 dB
Output Impedance	50 ohms
Gain 26 dB 40 dB 48 dB 68 dB	 26.5 dB ± 3 dB 40 dB minimum 48 dB minimum 48dB minimum with a 20dB amplifier

Table C-3 through Table C-5 provides accessories for GPS antennas with internal LNA.

Table C-3. 26dB Antenna Accessories

Item Number	Description
12013076-xxx-0 (xxx = length)	Cable, LMR-400, 3 m. to maximum of 482 m.
773000-0008	Transient Eliminator, 90 Volts, 1.5 GHz, N-Type
12013076-010-0	Cable, LMR-400, 3 m., N-Type
400302-0500	Roll, 3M 2150 Weatherproof Tape
12813080-000-0	Crimper Kit, LMR-400 (crimp tool, 2150 tape, LMR preptool, 10 each crimp N-type connectors)

Table C-4. 40dB Antenna Accessories

Item Number	Description
12013076-xxx-0 (xxx = length)	Cable, LMR-400, 21 m. to maximum of 113 m.
773000-0008	Transient Eliminator, 90 Volts, 1.5 GHz, N-Type
12013076-010-0	Cable, LMR-400, 9 m., N-Type
551100-6013	Adapter, Right Angle Female to Right Angle Male
12010210-000-0	Bracket Assembly, Antenna Mount Right Angle
400302-0500	Roll, 3M 2150 Weatherproof Tape
12813080-000-0	Crimper Kit, LMR-400 (crimp tool, 2150 tape, LMR preptool, 10 each crimp N-type connectors)

Table C-5. 48dB and 68dB Antenna Accessories

Item Number	Description
12013076-xxx-0 (xxx = length)	Cable, LMR-400, 67 m. to maximum of 295 m.
773000-0008	Transient Eliminator, 90 Volts, 1.5 GHz, N-Type
12013076-010-0	Cable, LMR-400, 9 m., N-Type
551100-6013	Adapter, Right Angle Female to Right Angle Male
12010210-000-0	Bracket Assembly, Antenna Mount Right Angle
570704-0001	GPS L1 inline amplifier, N-Type (required for lengths > 198 m.)
11013077-000-0	GPS L1 Amplifier Assembly (amplifier, transient eliminator, adapter, mounting plate)
400302-0500	Roll, 3M 2150 Weatherproof Tape
12813080-000-0	Crimper Kit, LMR-400 (crimp tool, 2150 tape, LMR preptool, 10 each crimp N-type connectors)

C.2.2 Transient Eliminators

Datum offers the FCC-250B-90-1.5NFNF Transient Eliminator for installations that require antenna coaxial lead-in protection. The FCC-250B-90-1.5NFNF Transient Eliminator passes DC power and frequencies in the 1.5 GHz range with non-downconverter L1 GPS antennas. In most installations, the transient eliminator mounts near the point at which the antenna lead enters the facility. Table C-6 provides the transient eliminator specifications.

Table C-6. FCC-250B-90-1.5NFNF Specifications

Characteristic	Specification
Type	Gas
Response Time	< 2 nanoseconds
Impedance	50 ohms
Insertion Loss	< 0.25dB @ 1,575 MHz
VSWR	< 1.6:1 @ 1,575 MHz
DC Breakdown Voltage	90 Volts
Dissipation Capacity	10,000 Amperes, impulse 8/20 µsec
Connector Type	N-Type
Temperature	-55° C to + 70°C
Relative Humidity	100% Non-immersed Altitude 60 meters below sea level to 3,962 meters above sea level

C.2.3 GPS L1 Inline Amplifier

The GPS L1 Inline Amplifier (item number 570704-0001) option used to boost the signal from the antenna for installation. The amplifier uses LMR-400 cables longer than 198 meters and receives power from the GPS radio receiver through the antenna coaxial cable connections. Table C-7 provides environmental, mechanical, and electrical specifications for the amplifier.

Table C-7. GPS L1 Inline Amplifier Specifications

Characteristic	Specification
Environmental	
Temperature	–40° C to +80° C
Mechanical	
Connectors, (In/Out)	N-Type
Gain	> 20 dB, 25 dB typical
Dimensions, includes connectors	Height: 28.5 mm Width: 50.8 mm Length: 88.9 mm
Electrical	
Power	+4.5 vDC to +30 vDC
Current	10 mA, typical
Input/Output Impedance (bandwidth at 3dB points)	50 ohms
Isolation	> 35 dB

C.2.4 GPS L1 Inline Amplifier Assembly

This assembly (item number 11013077-000-0) mounted on an aluminum plate is designed with mounting holes to allow for several mounting configurations. The assembly consists of a GPS inline amplifier, a 90 v L1 Transient Eliminator, and an adapter for connectivity.

C.2.5 Antenna Coaxial Cables

Datum provides a low-loss LMR-400, or equivalent, coaxial cable with N-type connectors on both ends.

- Table C-8 lists the optional antenna coaxial cables
- Table C-9 lists the optional antenna coaxial cable crimper kits
- Table C-10 provides antenna cable specifications

Table C-8. Optional Antenna Coaxial Cables

Item Number	Description
12012995-xxx-0	Cable, UHF/VHF (B-9913), with N-Type Connectors
12012994-xxx-0	Cable, UHF/VHF (B-89913), with N-Type Connectors
12012992-xxx-0	Cable, RG-213/U, with N-Type Connectors
12013076-xxx-0	Cable, LMR-400 or equivalent, with N-Type Connectors
NOTE: Contact your factory sales office for available cable lengths and specific cable item number.	

Table C-9. Optional Antenna Coaxial Cable Crimper Kits

Item Number	Description
12813059-000-0	Crimp Kit for RG213 (10 each N-Type Connectors, crimp tool, weatherproof tape)
12813060-000-0	Crimp Kit for 9913 (10 each N-Type Connectors, crimp tool, weatherproof tape)
12813080-000-0	Crimp Kit for LMR-400 or equivalent (10 ea. N-Type connector, crimp tool, weatherproof tape)

Table C-10. Antenna Cable Specifications

Cable Type	Measured Loss (@1.575 GHz dB per meter)	DC Resistance (ohms per meter)	Type Center Conductor	Flammability
RG213/U (Beldon 8267)	0.305	0.0098	2.62 mm^2 Stranded	U/L CSA
UHF/VHF (Beldon 9913)	0.190	0.0088	5.26 mm^2	
UHF/VHF (Beldon 89913)	0.291	0.0088	5.26 mm^2	Plenum U/L CSA
LMR-400	0.167	Shield – 0.00165 Center – 0.00139	2.77 mm^2 Solid	

C.3 Antenna Installation

This section provides complete installation procedures for GPS site preparation. Before beginning installation, review Section C.3.1.1, Antenna System Grounding and Cable Lead-In Protection and gather the necessary tools and materials described.

C.3.1 Antenna Connection Overview

The SSU-2000e chassis has two antenna connections located on the front panel. The antenna connections are made via isolated TNC connector J6 labeled ANTENNA-A and isolated TNC connector J7 labeled ANTENNA-B. The TNCs are DC isolated and AC bypassed to frame ground. These connections are used for radio receiver antenna connections only. The antenna connections (J6 and J7) are connected via the backplane to module slots 3 and 5. When installing GPS antennas, the installed modules must correspond to these connections (for instance, slot 3 to ANTENNA-A and Slot 5 to ANTENNA- B). Installation procedures for GPS antennas are outlined below. Table C-11 outlines the antenna signal connections.

Table C-11. Antenna Signal Connections

Signal Name	From	To
Ant-A	A3 P5-A	J6-A
Ant-A-RTN	A3 P5-B	J6-B
Ant-B	A5 P5-A	J7-A
Ant-B-RTN	A5 P5-B	J7-B

C.3.1.1 Antenna System Grounding and Cable Lead-In Protection

In addition to determining where to locate and mount the antenna and cabling, a grounding scheme should be developed. The purpose of the grounding scheme is to provide some protection against voltage surges and static discharge. If transient eliminators are used, they also need to be connected to the perimeter ground system or bulkhead entrance panel that is connected to the perimeter ground system.

CAUTION …

Observe these precautions to ensure proper grounding of the antenna:

- Allow no sharp bends in the ground conductors.
- Ensure that no painted surface insulates the transient eliminator or grounding clamps.
- Ensure that ground conductors are bonded to the metal enclosure box (if used) and do not enter through an access hole.
- Do not use soldered connections for grounding purposes.
- Secure all grounding connections with mechanical clamp type connectors.

Before installing the GPS antenna, decide upon a grounding scheme to use to provide protection against voltage surges and static discharge. Observe these guidelines:

- In general, follow local building codes when selecting a grounding scheme, wire size, and installation used in the grounding scheme.
- Connect transient eliminators, if part of the grounding scheme, to earth ground through a conductor.

NOTE …

Do not connect the outside transient eliminator ground to the inside equipment rack ground. Doing so can defeat the protection afforded by the transient eliminator.

Datum makes no recommendation as to whether to install transient eliminators. Datum can provide suitable transient connectors as an option.

- Use 5.26 mm^2 (minimum) copper ground wire.

NOTE …

Larger ground conductors provide better transient elimination, that is, the larger the ground conductor, the less likely the chance of transients.

- Never connect antenna systems to the same earth ground connector as heating and cooling systems, elevator or pump motors, or other motors or machinery which can induce noise in the antenna system.

C.3.1.2 Antenna Installation Tools and Materials

These standard tools and materials are not supplied in the antenna kit, but may be required for installing the GPS antenna. For a list of antenna kit contents, see Table C-1.

- Four each 6 mm fasteners for installing the antenna floor flange
- Extra cable ties or acceptable cable clamps
- 5.26 mm^2 (minimum) copper ground wire
- Eight foot ground electrode
- Custom mounting plates, U-bolts, masonry bolt, and so forth, as needed for mounting to a tower, roof, or wall of a building.
- A cable puller may be required for installing the antenna coaxial cable
- Digital voltmeter (DVM)

CAUTION …

To prevent damage to connectors, use caution while pulling cable.

C.3.2 GPS Antenna Installation Procedures

This section provides installation procedures for installing the GPS antenna.

NOTE …

Follow local building electrical codes when installing the GPS antenna.

C.3.2.1 Preparing to Install the GPS Antenna

Before beginning to install the antenna, determine a grounding scheme, and consider the factors that affect the location and environment chosen for the antenna installation. These factors are addressed in the warnings, cautions, and recommendations that follow.

CAUTION …

To avoid damage to the GPS antenna, *do not* place the antenna where high-power radio signals are beamed directly at the unit. Such signals can damage the preamplifier of the GPS antenna.

WARNING ...

To avoid serious injury to personnel or damage to equipment, exercise caution when working near high voltage lines. In particular:

- Use extreme caution when installing the GPS antenna near, under, or around high voltage lines.
- Follow local building electrical codes for grounding using the frame ground lugs integrated with the SSU-2000e chassis.
- The in-line amplifier receives 5 vDC power from the GPS radio receiver, and is supplied on the center conductor of the LMR-400 or equivalent coaxial cable. If the application requires an in-line amplifier, mount the amplifier/plate assembly where the transient eliminator would normally be mounted.
- Datum does not recommend cutting the antenna cables provided in the GPS Antenna Kit.

RECOMMENDATION ...

Consider the following location and environment influences before installing the GPS antenna:

- If possible, provide the antenna with an unobstructed 360-degree view of the sky from the horizon.
- In general, do not allow obstructions that obscure the horizon (as viewed from the antenna) by more than 10 degrees.
- Locate the antenna well away from, and preferably, in a plane above electrical equipment such as elevators, air conditioners, or other machinery.
- To reduce the risk of lightning damage, *do not* place the antenna at the highest point of the building.
- Locate the GPS antenna at least 3.66 meters from metallic objects, if possible.
- Locate the antenna high enough to avoid drifted snow.
- Locate the transient eliminator in a protected area to avoid contact with standing water.
- Locate the antenna within 9.2 meters of the point at which the antenna cable enters the building.
- Allow at least 3.05 meters of separation distance between GPS antennas.
- Surfaces above the plane of the unit that are between the antenna and the horizon can produce reflected (multi-path) signals, which can degrade the performance of the radio receiver.

C.3.2.2 Cutting Antenna Cables

RECOMMENDATION …

Datum ***does not*** recommend cutting the antenna cables provided in the GPS Antenna Kits. If you must cut the cables, please ensure that the following requirements are met.

Be aware of these cable and connector requirements before cutting antenna cables:

Cable Requirements – The total cable length from the radio receiver to the antenna ***must not*** be shorter than the minimum cable lengths indicated in the GPS Antenna Kits (see Table C-1).

Connector Requirements – The cables provided with the GPS Antenna Kit have factory installed crimped connectors. If you cut these cables, you must supply and add a connector. Datum recommends that you use only crimp-style N-type connectors in the Datum Crimper Kit for this application (see Table C-9).

C.3.2.3 Selecting the Proper Gain Antenna

C

When installing the GPS radio receiver, it is important to select the proper gain antenna and coaxial cable that accounts for the insertion loss between the antenna and the radio receiver to avoid under-driving or over-driving the radio receiver antenna input. The gain required at 1575 MHz for a GPS radio receiver input is the manufacturer's specification for the radio receiver to acquire satellites, with some level of signal degradation allowed.

L1 Antenna gains are usually specified as the minimum effective gain. Such antenna gains can have 4.5-10 dB more signal strength at different satellite azimuths and elevations, depending on their reception pattern. The GPS engine requires a signal level at the antenna connector input of the chassis to be between 13.8 dB and 36.8 dB. This tolerance allows for the signal loss of the internal coaxial cable and connectors. The optimal signal level at the radio receiver input is 25.3 dB.

All antenna kits include the GPS L1 antenna, mounting pipe, floor flange, transient eliminator, pre-assembled coaxial cable (for antenna to transient eliminator), roll of 3M 2150 weatherproof tape, and a right angle adapter. All chassis, antennas, transient eliminators, and in-line amplifiers have N-type connectors.

All antenna kits supplied use LMR-400, or equivalent, low-loss coaxial cable. Other types of coaxial cable are available for GPS antenna applications; however, it is imperative that you calculate the specific cable loss to ensure a signal level between 13.8 dB and 36.8 dB at the antenna connector input. The L1 signal loss of LMR-400 is 1.67 dB/meter. The L1 signal loss of a 90 v transient eliminator is typically 0.25 dB.

C.3.2.4 GPS Antenna With a Low Noise Amplifier, Marine 26, 40, or 50

The 26, 40, or 48 dB GPS Antenna with a Low Noise Amplifier (LNA) receives the GPS signal from each satellite, and amplifies the 1,575 MHz (L1) signal and feeds it to the SSU-2000e unit. The amplified L1 signal and 5 vDC power are carried over the coaxial antenna cable connecting the units. The antenna is housed in a weatherproof package suitable for permanent installation in an exposed location.

The antenna-to-radio receiver cable should be kept to the shortest reasonable length. For additional transient eliminator protection requirements, you can install a 250B-90 Gas Tube transient eliminator in series with the antenna coaxial cable.

C.3.2.5 Installing the Transient Eliminator

If you are installing a transient eliminator, follow these guidelines:

- Transient eliminators should be installed in accordance with your antenna system grounding scheme.
- Mount the transient eliminator within 9 meters of the GPS antenna.
- If required, mount a second transient eliminator near the GPS antenna.

To install the transient eliminator:

NOTE …

Step 6 below cannot be done if the cable is cut (as described in Step 1).

1. If necessary, cut the coaxial cable and install mating connectors (see Warning in Section C.3.2.2, Cutting Antenna Cables).
2. Using the DVM, measure the resistance between the center conductor and shield to verify that the center conductor and shield are not shorted together.
3. Connect the longer GPS antenna coaxial cable to the transient eliminator.
4. Connect the ground wire between the transient eliminator and the proper grounding zone (building ground, master ground bar, or other) for the mounting location.

RECOMMENDATION …

Datum does not recommend soldered connections for grounding purposes. All grounding connections should be secured with mechanical clamp connectors.

5. Wrap the connectors with weatherproof tape for added protection.
6. Verify that the antenna coaxial cable center conductor is not shorted to the shield of the cable.

C.3.2.6 Cabling the GPS Antenna

To route the coaxial cable of the mounted antenna (see Figure C-1):

1. Loosen the four screws securing the top of the antenna in place to gain access to the antenna connector.

2. Route the shorter antenna coaxial cable from the antenna through the floor flange (in the lower half of the antenna base) to the unit.

CAUTION …

To avoid damage to the connectors, do not use the connectors to pull the cable. If at all possible, avoid bundling the coaxial cable with other cables (and possible noise sources). Use appropriate cable-pulling devices when pulling the coaxial cable through conduit or a weather head.

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3. Connect the cable to the antenna and run the cable from the antenna through the slot of the floor flange.

CAUTION …

To avoid damage to internal solder connections, *do not* over-tighten the connector.

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4. Replace the four screws to secure the top of the antenna in place with the cable connected.

C.3.2.7 Mounting the GPS Antenna

To mount the GPS antenna:

- To mount the antenna to any stable flat surface, use the floor flanges supplied in the GPS Antenna Kit. The mounting surface and the local building codes determine the type and number of fasteners, screws, bolts, and so forth, that may be required.
- To mount the antenna on the side of a building or tower, use the optional right angle mounting bracket (Item Number 12010210-000-0, available from Datum).
- To secure the coaxial cable to the mast, use one or more 20.32 cm cable ties or appropriate cable clamps.

C.3.2.8 Connecting the GPS Antenna

Before connecting the GPS antenna to the SSU-2000e unit, see Section C.3.2, GPS Antenna Installation Procedures.” Then follow the instructions below.

1. Before connecting the antenna coaxial cable to the radio receiver, test the DC resistance between the center conductor and the shield using an ohmmeter. The reading should be greater than 1000 ohms but less then 40 Megohms for an active GPS antenna.

If the actual reading is incorrect, you may have a shorted or open cable or transient eliminator (if installed). Therefore, apply the same measurements directly to the GPS antenna. This requires disconnecting the antenna cable at the antenna.

NOTE …

The open-circuit range of an individual ohmmeter can cause readings to vary among meters.

2. Secure the free end of the antenna cable to the antenna connector using the right angle adapter provided with the antenna cable.

RECOMMENDATION …

Datum recommends coiling excess cable to avoid gain mismatch between the GPS antenna and the radio receiver. Coiling the excess cable also allows you to use the factory-installed crimped connector.

C.3.3 Antenna Installation Completeness Checklist

To verify that antenna installation is complete:

- Verify that all power and ground wires are installed correctly and securely.
- Verify that all input and output cables are properly installed
- Ensure that there are no sharp bends in the cable.
- Check that all antenna connectors are secure, tight, and weatherproofed.
- After power up of the unit, ensure that the unit is tracking. If not, refer to Appendix A.1 for troubleshooting procedures or contact Datum Customer service for more information.

C.4 Optional Accessories

Table C-12 provides a list of optional accessories which may be used to mount or install the SSU-2000e.

Table C-12. Optional Accessories

Item Number	Description
00413102-001-1	Bracket, rack ear, 58.42 cm, 2 each required (not included with unit)
22013085-000-0	9 pin-D wire-wrap adapter (not included with unit)
551026-0038	Cable RS-232 shielded DB9P to DB9S, 1.5 m

IN THIS APPENDIX ...

Appendix D Connector Pinouts

All the connectors in the following sections are located on the front panel of the SSU-2000e, as shown in Figure D-1.

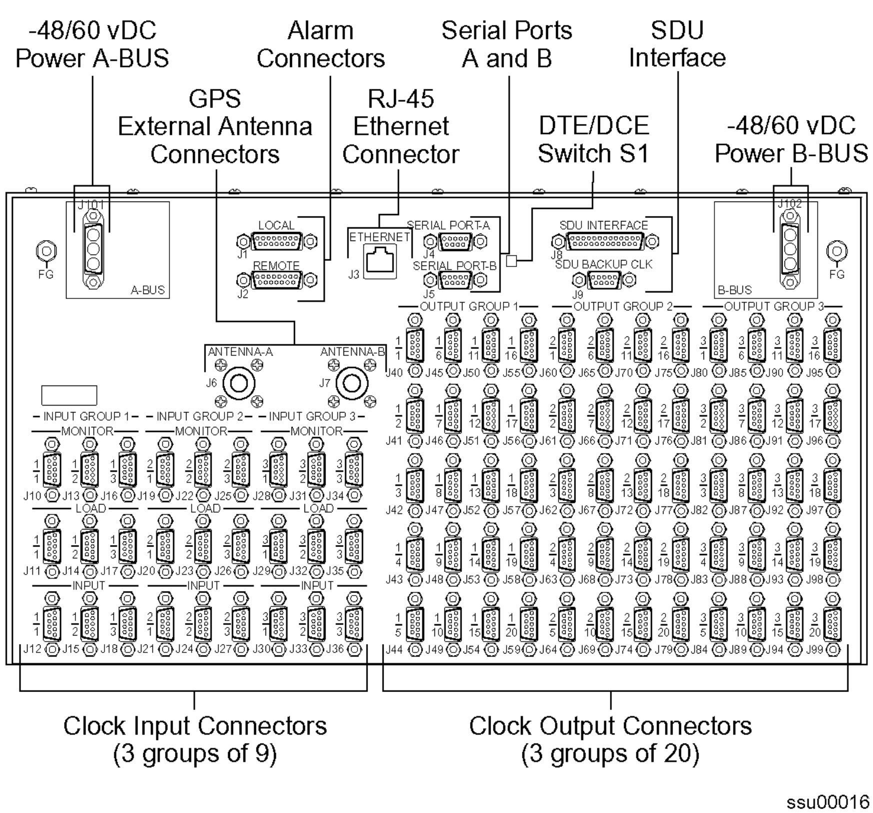

Figure D-1. SSU-2000e Front Panel

D.1 Signal Names and Definitions

D.1.1 Power and Ground

Figure D-2 shows the power and ground connectors used on the SSU-2000e. Table D-2 outlines signal names and definitions for power, return, and ground.

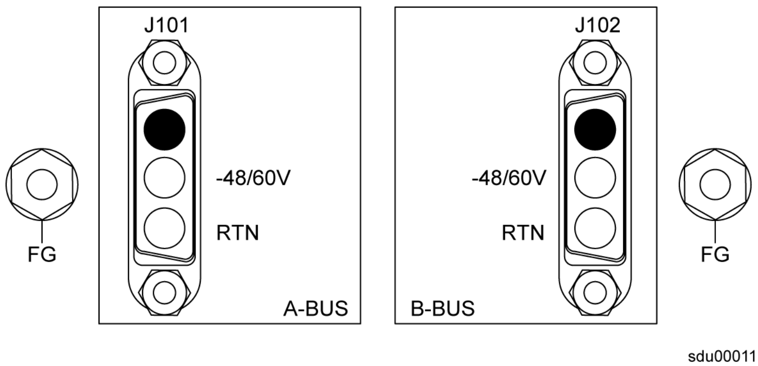

Figure D-2. Power, Return, and Ground Connection Pinouts

Table D-1. Signal Names and Definitions for Power and Ground

Name	Description
APWR	–48V from Power Bus A
ARTN	–48V Return from Power Bus A
BPWR	–48V from Power Bus B
BRTN	–48V Return from Power Bus B
LG	Logic Ground, Return for Non-Isolated Signals
FG	Frame Ground Safety Ground for Shelf

D.1.2 Communication Interfaces

Figure shows the communications connectors used on the SSU-2000e. Table D-2 outlines signal names, definitions, and locations for Communication Interfaces.

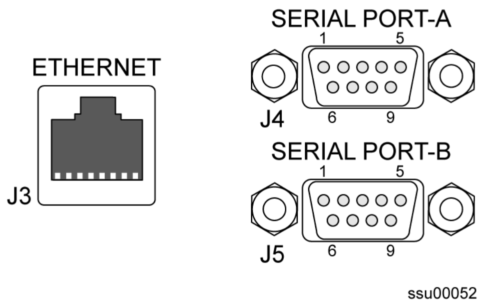

Figure D-3. Communications Connector Pinouts

Table D-2. Signal Names and Locations for Communications Interfaces

Name	Description	Connector-Pin
DCD-A	Serial Port A, Data Carrier Detect Control Line	J4-1
DSR-A	Serial Port A, Data Set Ready Control Line	J4-6
RXD-A	Serial Port A, Received Data	J4-2
RTS-A	Serial Port A, Request to Send Control Line	J4-7
TXD-A	Serial Port A, Transmitted Data	J4-3
CTS-A	Serial Port A, Clear to Send Control Line	J4-8
DTR-A	Serial Port A, Data Terminal Ready Control Line	J4-4
RI-A	Serial Port A, Ring Indicator Control Line	J4-9
RTN-A	Serial Port A, Signal Return	J4-5
DCD-B	Serial Port B, Data Carrier Detect Control Line	J5-1
DSR-B	Serial Port B, Data Set Ready Control Line	J5-6
RXD-B	Serial Port B, Received Data	J5-2
RTS-B	Serial Port B, Request to Send Control Line	J5-7
TXD-B	Serial Port B, Transmitted Data	J5-3
CTS-B	Serial Port B, Clear to Send Control Line	J5-8

D

Table D-2. Signal Names and Locations for Communications Interfaces

Name	Description	Connector-Pin
DTR-B	Serial Port B, Data Terminal Ready Control Line	J5-4
RI-B	Serial Port B, Ring Indicator Control Line	J5-9
RTN-B	Serial Port B, Signal Return	J5-5
TX+	Ethernet 10-Base-T, Positive Side of Transmitted Data	J3-1
TX-	Ethernet 10-Base-T, Negative Side of Transmitted Data	J3-2
RX+	Ethernet 10-Base-T, Positive Side of Received Data	J3-3
RX-	Ethernet 10-Base-T, Negative Side of Received Data	J3-6

D.1.3 Antenna Signal Connections A3 and A5

Table D-3 outlines the antenna signal connections for A3 and A5.

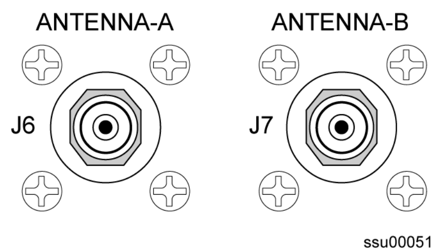

Figure D-4. Antenna Signal Connectors

Table D-3. Antenna Signal Connections A3 and A5

Type	Name	From	Pin	Connection	To	Pin
Antenna	ANT-A	A3	P5-A (Ctr)	Slot Dependent	J6	A
	ANT-A-RTN	A3	P5-B (Shld)	Slot Dependent	J6	B
	ANT-B	A5	P5-A (Ctr)	Slot Dependent	J7	A
	ANT-B-RTN	A5	P5-B (Shld)	Slot Dependent	J7	B

D.1.4 Alarm Contact Closures

Table D-4 outlines signal names, definitions, and locations for alarm contact closures. The local connections are made on J1 and the remote connections are made on J2.Both connectors have connections for normally open (NO), common or wiper (COM), and normally closed (NC) for each of these alarm categories: CRITICAL, MAJOR and MINOR.

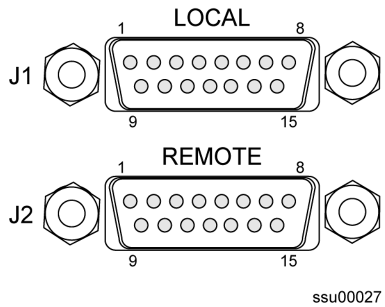

Figure D-5. Alarm Contact Closures and Pin Assignments

Table D-4. Alarm Contact Pin Assignments

Signal	Pin
MINOR – Normally Open Contact	7
MINOR – Wiper Contact	15
MINOR – Normally Closed Contact	8
MAJOR – Normally Open Contact	4
MAJOR – Wiper Contact	12
MAJOR – Normally Closed Contact	5
CRITICAL – Normally Open Contact	1
CRITICAL – Wiper Contact	9
CRITICAL – Normally Closed Contact	2
Frame Ground	10
Frame Ground	11
Frame Ground	13
Not Used	3
Not Used	6

D

D.1.5 Input Signal Definitions

Refer to Table D-5 for the DE9 input connector signal definitions.

Two-Wire Connections

Refer to Table D-5 and the following comments for the signal logic flow of a two-wire connection:

- “In” East → Pass Through → “Out” West on the Input connector
- Termination on Load connector
- Monitor the input through the Monitor connector

Bridged and Four-Wire Connections

The SSU-2000e is designed to accommodate East/West signal functionality. In East/West signal terminology, East refers to wiring connections made to and from the outside world. West refers to wiring connections made to and from office equipment. Refer to the following comments for the signal logic flow of a four-wire connection:

- “In” East → Pass Through → “Out” West on the Input connector
- “In” West → Pass Through → “Out” East on the Load connector
- Monitor the output from the Monitor connector

Figure D-6 shows a typical block diagram for a four-wire system connection.

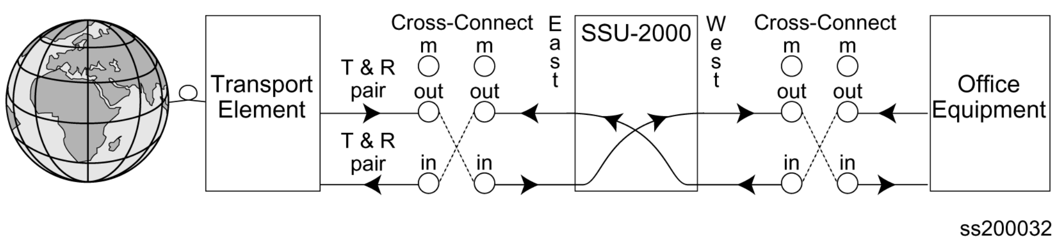

Figure D-6. Four-Wire Connection Block Diagram

Figure D-7 shows a typical wiring diagram for a DE9 four-wire system connection.

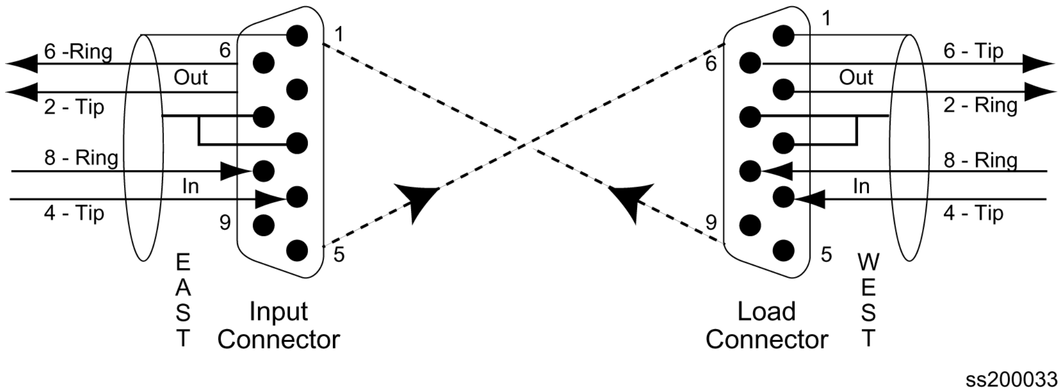

Figure D-7. Input and Load DE9 Connectivity

The circuit illustrated in Figure D-7 is common for all three input connector groups. These circuits are internally connected from an East connection (World facing), to the West connector (office equipment facing). This routing accommodates normal cross-connect methodology for Bridged and four-wire connections.

The signal connections on these connectors are also set up in differential pairs as Tip and Ring connections, with each connector associated with a specific input and output. The East input signal is routed through pins 4 (Tip) and 8 (Ring) of all Input connectors, passed straight through to the West output pins 2 (Tip) and 6 (ring) of all Load connectors. The Shield/Sleeve is connected on all connectors to pin 1 as well as pins 3 and 7.

If installation is an integrated ground environment, shields are grounded at the SSU-2000e. If installation is in an isolated environment, ensure that the far end shield is not grounded at the client equipment. Ensure that all local grounding practices are complied with.

Table D-5 lists the Input signal connections for Input connector groups 1 through 3.

Table D-5. Input Signal DE9 Connections

Input Group	Signal	Connector-Pin	Port # and Signal	Connector-Pin
1	1/1 Tip East Input	J12-4	1/1 Tip West Output	J12-2
1	1/1 Ring East Input	J12-8	1/1 Ring West Output	J12-6
1	1/1 Sleeve East Input	J12-1, 3, 7	1/1 Sleeve West Output	J12-1, 3, 7
1	1/1 Tip East Output	J11-2	1/1 Tip West Input	J11-4
1	1/1 Ring East Output	J11-6	1/1 Ring West Input	J11-8
1	1/1 Sleeve East Output	J11-1,3, 7	1/1 Sleeve West Input	J11-1, 3, 7
1	1/1 Tip Input Monitor	J10-2	1/1 Ring Input Monitor	J10-6

D

Table D-5. Input Signal DE9 Connections (Continued)

Input Group	Signal	Connector-Pin	Port # and Signal	Connector-Pin
1	1/2 Tip East Input	J15-4	1/2 Tip West Output	J15-2
1	1/2 Ring East Input	J15-8	1/2 Ring West Output	J15-6
1	1/2 Sleeve East Input	J15-1, 3, 7	1/2 Sleeve West Output	J15-1, 3, 7
1	1/2 Tip East Output	J14-2	1/2 Tip West Input	J14-4
1	1/2 Ring East Output	J14-6	1/2 Ring West Input	J14-8
1	1/2 Sleeve East Output	J14-1,3, 7	1/2 Sleeve West Input	J14-1, 3, 7
1	1/2 Tip Input Monitor	J13-2	1/2 Ring Input Monitor	J13-6
1	1/3 Tip East Input	J18-4	1/3 Tip West Output	J18-2
1	1/3 Ring East Input	J18-8	1/3 Ring West Output	J18-6
1	1/3 Sleeve East Input	J18-1, 3, 7	1/3 Sleeve West Output	J18-1, 3, 7
1	1/3 Tip East Output	J17-2	1/3 Tip West Input	J17-4
1	1/3 Ring East Output	J17-6	1/3 Ring West Input	J17-8
1	1/3 Sleeve East Output	J17-1,3, 7	1/3 Sleeve West Input	J17-1, 3, 7
1	1/3 Tip Input Monitor	J16-2	1/3 Ring Input Monitor	J16-6
2	2/1 Tip East Input	J21-4	2/1 Tip West Output	J21-2
2	2/1 Ring East Input	J21-8	2/1 Ring West Output	J21-6
2	2/1 Sleeve East Input	J21-1, 3, 7	2/1 Sleeve West Output	J21-1, 3, 7
2	2/1 Tip East Output	J20-2	2/1 Tip West Input	J20-4
2	2/1 Ring East Output	J20-6	2/1 Ring West Input	J20-8
2	2/1 Sleeve East Output	J20-1,3, 7	2/1 Sleeve West Input	J20-1, 3, 7
2	2/1 Tip Input Monitor	J19-2	2/1 Ring Input Monitor	J19-6
2	2/2 Tip East Input	J24-4	2/2 Tip West Output	J24-2
2	2/2 Ring East Input	J24-8	2/2 Ring West Output	J24-6
2	2/2 Sleeve East Input	J24-1, 3, 7	2/2 Sleeve West Output	J24-1, 3, 7
2	2/2 Tip East Output	J23-2	2/2 Tip West Input	J23-4
2	2/2 Ring East Output	J23-6	2/2 Ring West Input	J23-8
2	2/2 Sleeve East Output	J23-1,3, 7	2/2 Sleeve West Input	J23-1, 3, 7
2	2/2 Tip Input Monitor	J22-2	2/2 Ring Input Monitor	J22-6

Table D-5. Input Signal DE9 Connections (Continued)

Input Group	Signal	Connector-Pin	Port # and Signal	Connector-Pin
2	2/3 Tip East Input	J27-4	2/3 Tip West Output	J27-2
2	2/3 Ring East Input	J27-8	2/3 Ring West Output	J27-6
2	2/3 Sleeve East Input	J27-1, 3, 7	2/3 Sleeve West Output	J27-1, 3, 7
2	2/3 Tip East Output	J26-2	2/3 Tip West Input	J26-4
2	2/3 Ring East Output	J26-6	2/3 Ring West Input	J26-8
2	2/3 Sleeve East Output	J26-1,3, 7	2/3 Sleeve West Input	J26-1, 3, 7
2	2/3 Tip Input Monitor	J25-2	2/3 Ring Input Monitor	J25-6
3	3/1 Tip East Input	J30-4	3/1 Tip West Output	J30-2
3	3/1 Ring East Input	J30-8	3/1 Ring West Output	J30-6
3	3/1 Sleeve East Input	J30-1, 3, 7	3/1 Sleeve West Output	J30-1, 3, 7
3	3/1 Tip East Output	J29-2	3/1 Tip West Input	J29-4
3	3/1 Ring East Output	J29-6	3/1 Ring West Input	J29-8
3	3/1 Sleeve East Output	J29-1,3, 7	3/1 Sleeve West Input	J29-1, 3, 7
3	3/1 Tip Input Monitor	J28-2	3/1 Ring Input Monitor	J28-6
3	3/2 Tip East Input	J33-4	3/2 Tip West Output	J33-2
3	3/2 Ring East Input	J33-8	3/2 Ring West Output	J33-6
3	3/2 Sleeve East Input	J33-1, 3, 7	3/2 Sleeve West Output	J33-1, 3, 7
3	3/2 Tip East Output	J32-2	3/2 Tip West Input	J32-4
3	3/2 Ring East Output	J32-6	3/2 Ring West Input	J32-8
3	3/2 Sleeve East Output	J32-1,3, 7	3/2 Sleeve West Input	J32-1, 3, 7
3	3/2 Tip Input Monitor	J31-2	3/2 Ring Input Monitor	J31-6
3	3/3 Tip East Input	J36-4	3/3 Tip West Output	J36-2
3	3/3 Ring East Input	J36-8	3/3 Ring West Output	J36-6
3	3/3 Sleeve East Input	J36-1, 3, 7	3/3 Sleeve West Output	J36-1, 3, 7
3	3/3 Tip East Output	J35-2	3/3 Tip West Input	J35-4
3	3/3 Ring East Output	J35-6	3/3 Ring West Input	J35-8
3	3/3 Sleeve East Output	J35-1,3, 7	3/3 Sleeve West Input	J35-1, 3, 7
3	3/3 Tip Input Monitor	J34-2	3/3 Ring Input Monitor	J34-6

D.1.6 Output Signal Definitions

There are three groups of Output connectors: Output Groups 1, 2, and 3. Output connections are made from pin 2 (Tip), pin 6 (Ring), and pins 1, 3, or 7 (Shield/Sleeve) of all the connectors in all three Output connector groups. Refer to Table D-6 for the signal definitions of connectors J40 through J99 and their associated pin numbers. If installation is an integrated ground environment, shields are grounded at the SSU-2000. If installation is in an isolated environment, ensure that the far end shield is not grounded at the client equipment. (Ensure that all local grounding practices are complied with.)

Table D-6 lists the signal connections for all DE9 Output connectors (J40 through J99).

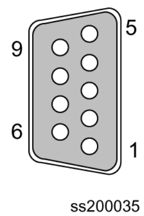

Figure D-8. DE9 Connector Pinout

Table D-6. Output Signal DE9 Connections

Signal	Pin
Output Tip	2
Output Ring	6
Output Sleeve	1

D.2 Shelf Module Slot Addressing and Size Assignments

Table D-7 outlines the shelf module slot addressing and size assignments.

Table D-7. Shelf Module Slot Addressing and Size Assignments

Slot-A	Address	Module Types	Comments
1	1	Clock	Clock A
2	2	Com	Communications
3	3	I/O or Receiver	Input, non-redundant Output, or a Receiver Module
4	4	I/O, Pair A	Input or Output, paired with 5
5	5	I/O, Pair A or Receiver	Input, Output, paired with 4, or a Receiver Module
6, 7	6, 7	I/O, Pair B	Inputs, or paired Outputs
8, 9	8, 9	I/O, Pair C	Inputs or paired Outputs
10, 11	10, 11	I/O, Pair D	Inputs or paired Outputs
	12 - 15	I/O, Extras	Reserved for future I/O (2.3 @ shelf)
12	17	Clock	Clock B
	0	All	Addresses all modules in the Shelf

D.2.1 SDU-2000e Expansion Interface

Table D-8 outlines signal names, definitions, and locations for alarm contact closures.

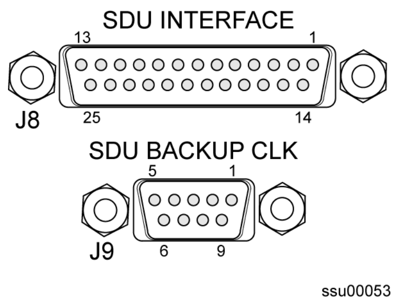

Figure D-9. SDU Interface and Backup Clock Connector Pinout

Table D-8. Signal Names and Locations for SDU-2000e Interface

Name	Description	Connector-Pin
SCLK2+/-	SPI Clock Signal, generated by SPI Master	J8-1&14
MOSI2+/-	SPI Master Out / Slave In Data line	J8-2&15
MISO2+/-	SPI Master In / Slave Out Data line	J8-3&16
SS2+/-	SPI Slave Select line, generated by SPI Master	J8-5&18
SBUSY2+/-	SPI Slave Busy line, generated by SPI Slave	J8-4&17
SRQ2+/-	SPI Service Request line, generated by SPI Slave	J8-6&19
CLKAOUT2+/-	Clock A to Output Modules (synced 4 kHz)	J8-7&20
CLKBOUT2+/-	Clock B to Output Modules (synced 4 kHz)	J8-8&21
CLKC2+/-	Pass-through Clock from Input to Output Modules (4 kHz	J8-9&22
CLKD2+/-	Selected Clock via TBNC/BNO to SDU-2000e (Backup 4 kHz)	J9-A&B
EXPSP1+/-	Spare Connection to SDU-2000e	J8-11&24
EXPSP2+/-	Spare Connection to SDU-2000e	J8-12&25
SOUT2+/-	SPI Slave Shelf Select Request, generated by SDU SPI Slave	J8-10&23
LG	Logic Ground Connection	J8-13

D.3 I/O Connector Grounding

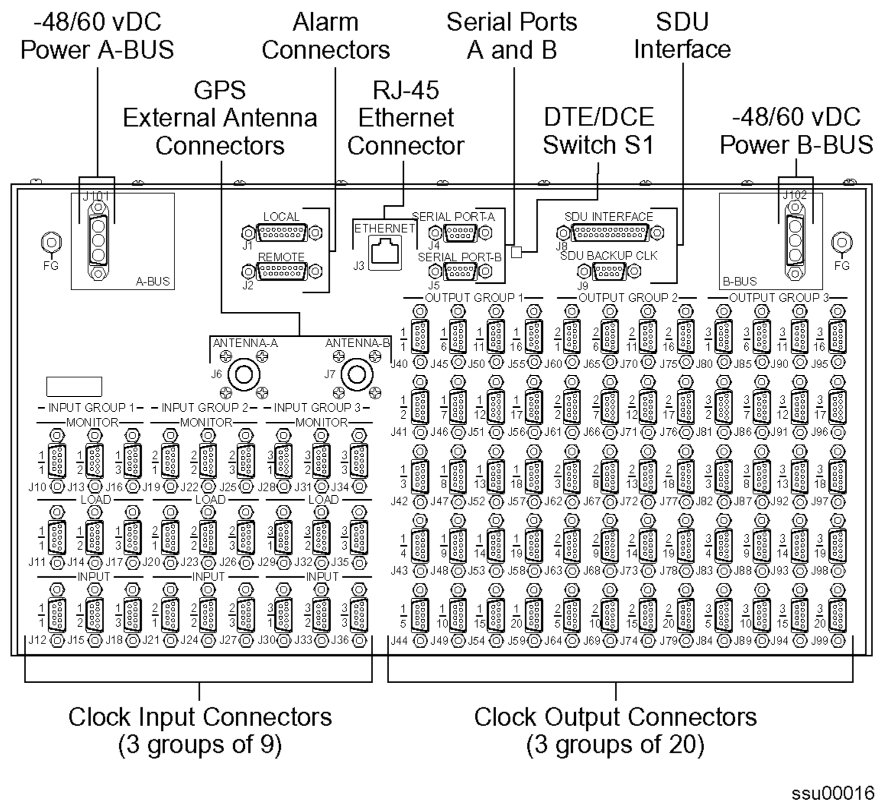

Figure D-10. SSU-2000e Front Panel Connectors

Table D-9 outlines I/O connector grounding.

Table D-9. I/O Connector Grounding

Name	Connector Type	Reference Description	Termination Type
Local OSC-A	BNC	J1	Body/Shield: Connected to Frame Ground Plane
Local OSC-B	BNC	J2	Body/Shield: Connected to Frame Ground Plane
Ethernet 10-Base-T	RJ45	J3	Body/Shield: Connected to Frame Ground Plane
Serial Port-A	DE9S	J4	Body/Shield: Connected to Frame Ground Plane
Serial Port-B	DE9S	J5	Body/Shield: Connected to Frame Ground Plane
ANTENNA-A	TNC	J6	Shield: 0.01 µf Bypass to Frame Ground Plane
ANTENNA-B	TNC	J7	Shield: 0.01 µf Bypass to Frame Ground Plane

Table D-9. I/O Connector Grounding (Continued)

Name	Connector Type	Reference Description	Termination Type
SDU Interface	DB25S	J8	Body/Shield: Connected to Frame Ground Plane
SDU Backup Clk	TBNC/BNO	J9	Shield: Connected to Frame Ground Plane
I/0-1	Micro D50S	J10	Body/Shield: Connected to Frame Ground Plane
I/0-2	Micro D50S	J11	Body/Shield: Connected to Frame Ground Plane
I/0-3	Micro D50S	J12	Body/Shield: Connected to Frame Ground Plane
I/0-4	Micro D50S	J13	Body/Shield: Connected to Frame Ground Plane
I/0-5	Micro D50S	J14	Body/Shield: Connected to Frame Ground Plane
I/0-6	Micro D50S	J15	Body/Shield: Connected to Frame Ground Plane
I/0-7	Micro D50S	J16	Body/Shield: Connected to Frame Ground Plane
I/0-8	Micro D50S	J17	Body/Shield: Connected to Frame Ground Plane
I/0-9	Micro D50S	J18	Body/Shield: Connected to Frame Ground Plane
RESET	TBNC/BNO	J19	Shield: 0.01 µf Bypass to Frame Ground Plane
LG (Logic Ground)	Stake-On	TB3 & TB4	Terminal: 1.0 µf Bypass to Frame Ground Plane

In this Appendix ...

Appendix E Default Settings

This appendix contains tables that list the factory default settings for the SSU-2000e. If you make any changes to the factory default settings, record them in Table E-11 for future reference. Use the “SETUP” command to verify settings.

E.1 Communications Module Default Settings

Table E-1 lists settings and factory defaults for the SSU-2000e Communications Module.

Table E-1. Communications Module Factory Default Settings

Setting	Factory Default
Communications Module Defaults	
Unit Name	SSU_2000
Module configurations	Current Configuration = the configuration that is currently in use User Default Configuration = configuration the user specifies as the default if the current configuration is invalid or not present Factory Configuration = the factory default configuration
User List configurations	Maximum of 25 users including four built-in users

Table E-1. Communications Module Factory Default Settings (Continued)

Setting	Factory Default
EIA-232-C Port Comm Port Timeout	All comm ports are set to 9600 baud, Interactive Mode, CRLF, and Echo on Five minutes for all (Interactive Mode). (Note: the unit should have one user added, i.e. Not in the INITUSERTABLE state). If it is in the INITUSERTABLE state, no timeout is applied. No Timeout is assigned for the TL1 Mode
Ethernet IP Address	IP Address 0.0.0.0 Gateway Address 0.0.0.0 Network Mask 255.255.255.0

E.2 Stratum 2E and 3E Clock Module Default Settings

The Stratum 2E and 3E Clock Module are software configurable via one of the serial or ethernet ports. Table E-2 lists settings and factory defaults for the Clock Module.

Table E-2. Stratum 2E and 3E Clock Module Default Settings

Setting	Factory Default
Stratum 2E and 3E Clock Module Defaults	
Warmup Time	1200 seconds
Min Tau Limit	300 seconds
Max Tau Limit	If 2E, 10000 seconds If 3E, 500 seconds
Min Tau	300 seconds
Max Tau	If 2E, 9000 seconds If 3E, 450 seconds
Clk Switch AR	On
Input Switch	AutoReturn (AR)
Input Selection Mode	Priority
Local Oscillator (LO)	On
Elevation Time	86400 seconds

E.3 DS1 and E1 Input Module Default Configuration

The DS1 Input Module or E1 Input Module maintains factory default and current user configuration information in nonvolatile memory. This information is retrieved at power up and is modified by commands from the Communications Module.The DS1 Input Module or E1 Input Module maintains factory default and current user configuration information in nonvolatile memory. This information is retrieved at power up and is modified by commands from the Communications Module.

When the current user configuration cannot be used, the Input module settings automatically revert to factory defaults. Table E-3 lists factory default settings and ranges for all DS1 Input Module or E1 Input Module software parameters.

Table E-3. DS1 and E1 Input Module Default Configuration

Configuration Setting	Factory Default	Range
Input Frequency (for unframed signals)	1.544 for DS1 Input Module 2.048 MHz for E1 Input Module	1, 1.544, 2.048, 5, or 10 MHz
Framing Type	ESF for DS1 Input Module CCS for E1 Input Module	D4 or ESF for DS1 Input Module CAS or CCS for E1 Input Module
Zero Suppression	On	On Off
CRC	Off	On Off
SSM	Off	On Off
Provisioned PQL	4 for DS1 Input Module **Note:** PQL 4=STU 4 for E1 Input Module	2,3,4,5,6, or 8
Priority	0	0 to 10 (0 = Monitor)
E1 SSM Bit Position	8 (Not applicable for DS1 Input Module)	4 to 8
Cesium Fault Nominal	Off	Low High Off
Gain	Off	On or Off (20 dB)

E

Table E-3. DS1 and E1 Input Module Default Configuration (Continued)

Configuration Setting	Factory Default	Range
Input Signal Error Limit (LOS, AIS, OOF, BPV, CRC)	Defaults are: **LOS:** 10 seconds (Err Cnt) 5 seconds (Clr Cnt) **AIS:** 12 seconds (Err Cnt) 5 seconds (Clr Cnt) **OOF:** 14 seconds (Err Cnt) 5 seconds (Clr Cnt) **BPV, CRC:** 16 seconds (Err Cnt) 5 seconds (Clr Cnt)	1 to 100 for LOS and AIS 1 to 10,000 for BPV, CRC and OOF
MTIE Limits (See Table E-4 and Table E-5)	See Table E-4 and Table E-5	1 to 10,000
MTIE Limit 1 Alarm Mode	MINOR	IGNORE, REPORT, MINOR, MAJOR OR CRITICAL
MTIE Limit 2 Alarm Mode	MAJOR	IGNORE, REPORT, MINOR, MAJOR OR CRITICAL
Alarm Initial Severity	MINOR (except LOS and Level 2 MTIE, which are MAJOR)	IGNORE, REPORT, MINOR, MAJOR OR CRITICAL
Alarm Initial Delay	0 seconds	0 to 86,400 seconds
Alarm Elevation Time	86,400 seconds	0 to 500,000 seconds
Port Status	Disabled	Enabled/Disabled
Port Name	Not applicable	Any user selected string from 0 to 20 characters
Freq Alarm Mode	MINOR	IGNORE, REPORT, MINOR, MAJOR, or CRITICAL
Freq Threshold	ST2E-16,000 ST3E-4,600,000	10 to 25,000,000 psec/sec
Freq Tau	400 seconds	10 to 1000 seconds

E.3.1 MTIE Limits for the DS1 Input Module

Table E-4 provides MTIE limits for the DS1 Input Module configuration and factory defaults and settings.

Table E-4. DS1 Input Module – MTIE Limits

Time (seconds)	Set Limit L1 (Unit)	Set Limit L2 (Unit)	Clear Limit L1 (Unit)	Clear Limit L2 (Unit)
10	260	325	230	290
100	440	550	400	490
1,000	810	1,010	730	910
10,000	880	1,100	790	990
100,000	1,600	2,000	1,440	1,800

E.3.2 MTIE Limits for the E1 Input Module

Table E-5 provides MTIE limits for the E1 Input Module configuration settings and factory defaults and ranges.

Table E-5. E1 Input Module – MTIE Limits

Time (seconds)	Set Limit L1 (Unit)	Set Limit L2 (Unit)	Clear Limit L1 (Unit)	Clear Limit L2 (Unit)
10	80	100	70	90
100	800	1000	700	900
1,000	1,600	2,000	1,400	1,800
10,000	1,170	2,835	2,000	2,500
100,000	4,260	5,330	3,800	4,800

E.4 DS1 and E1 Output Module Default Settings

Table E-6 lists settings and factory defaults for the SSU-2000e DS1and E1 Output Module.

Table E-6. DS1 and E1 Output Module Default Settings

Setting	Factory Default	Range
DS1 Output Module		
Enable/Disable Outputs	Disabled	Settable for each output port
Minimum Clock Level	Acquire	Acquire/Lock
Bypass Mode	ON	ON - Clock C is selected if it is the only one available OFF - Clock C is not selected even if no other clock is available
Framing	ESF	D4/ESF
Line Length	0-133 ft	133-266 ft 266-399 ft 399-533 ft 533-655 ft
Zero Suppression	ON	ON – B825 OFF – AMI
E1 Output Module		
Enable/Disable Outputs	Disabled	Settable for each output port
Minimum Clock Level	Acquire	Acquire/Lock
Bypass Mode	ON	ON – Clock C will be selected if it is the only one available OFF – Clock C will not be selected even if no other clock is available
Framing	CAS	CCS/CAS
Zero Suppression	ON	ON - HDB3 OFF - AMI
CRC	ON	ON/OFF
SSM Bit Selection	Default SSM bit selection -8	Possible SSM bit selection 4,5,6,7, and 8

E.5 GPS Input Module Default Settings

The GPS Input Module maintains factory default and current user configuration settings. The configuration settings for the GPS Input Module are provided in Table E-7.

Table E-7. GPS Input Module Default Configuration Settings

Setting	Factory Default	Range
Position Latitude (+=North, -+ South) Longitude (+=East, -+ West) Height Averages PDOP Pos Mode	 0 0 0 300 0 Calc	 +/- 90 degrees +/-180 degrees -60 to 4,000 meters 10 to 3600 1 to 10 User/Calc
Min Elevation for position	5	0 to 50 degrees
Min PDOP for position	3	1 to 10
Min Elevation for timing	10	0 to 50 degrees
Module Status	Enabled	Enabled, Disabled
Priority	0	0 to 10
Sigma limit	25	10 to 1000 µS
PQL	2	1 to 16
Disabled SV list	Not applicable	Up to 31 SV numbers

E.6 2048 kHz Output Module Default Settings

The 2048 kHz Output Module maintains factory default and current user configuration settings. The configuration settings for the 2048 kHz Output Module are provided in Table E-8.

Table E-8. 2048 kHz Output Module Configuration

Configuration Setting	Factory Default	Range
Port State	Dis	DIS, ENA
Min Clock	Acq	Acq, Lock
Framing	Not applicable	Not applicable

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Table E-8. 2048 kHz Output Module Configuration (Continued)

Configuration Setting	Factory Default	Range
Zero Sup.	Not applicable	Not applicable
CRC	Not applicable	Not applicable
SSM	Not applicable	Not applicable
PQL	4	Not applicable
Bypass	On	On, Off
Fault Action	On	Off, On, Auto
Other	Not applicable	Not applicable

E.7 Composite Clock Output Module Default Settings

The Composite Clock Output Module maintains factory default and current user configuration settings. The configuration settings for the Composite Clock Output Module are shown in Table E-9.

Table E-9. Composite Clock Output Module Configuration

Configuration Setting	Factory Default	Range
Port State	Dis	DIS, ENA
Min Clock	Acq	Acq, Lock
Framing	Not applicable	Not applicable
Zero Sup.	Not applicable	Not applicable
CRC	Not applicable	Not applicable
SSM	Not applicable	Not applicable
Pql	4	Not applicable
Bypass	On	On, Off
Fault Action	On	Off, On, Auto
Other	Duty Cycle of 5/8	Duty Cycle of 5/8 or 50/50

E.8 Priority Quality Level (PQL) Table Default Settings

The configuration settings for the PQL table are provided in Table E-10.

Table E-10. Default PQL Values

DS1				E1		
PQL	**SSM**	**S**	**DS1 Description**	**SSM**	**S**	**E1 Description**
1	–		Unused	–		Unused
2	0x04	S	ST2	0x02		
3	0x04			0x02	S	PRC/G.811
4	0x08	S	STU	0x00	S	STU
5	0x0C	S	ST2	0x04		Type II
6	0x78	S		0x04	S	Type V
7	–		Unused	–		Unused
8	0x7C	S	ST3E	0x08		Type III
9	0x10			0x08	S	Type VI
10	0x10	S	ST3	0x0B		Type IV
11	0x22			0x0B	S	G.813 Opt 1
12	0x22	S	SMC	0x0F		G.813 Opt 2
13	0x28	S	ST4	0x0F		
14	0x40	S	Reserved	0x0F		
15	0x30	S	DUS	0x0F	S	DUS
16	0x7E	S		0x0F		

E

E.9 User Changes to Factory Defaults

Use Table E-11 to record any user changes to the factory default settings.

Table E-11. User Changes to Factory Default Settings

Setting	Factory Default	User Configuration Changes
Communications Module Defaults		
Unit Name	SSU_2000	
Module Information configurations	Current Configuration = the configuration that is currently in use User Default Configuration = configuration the user specifies as the default if the current configuration is invalid or not present Factory Configuration = the factory default configuration	
User List configurations	Maximum of 25 users including four built-in users	
EIA-232-C Port Comm Port Timeout	All three comm ports are set to 9600 baud, Interactive Mode, CRLF, and Echo on Five minutes for all (Interactive Mode). (Note: the unit should have one user added, i.e. not in the INITUSERTABLE state). If it is in the INITUSERTABLE state, no timeout is applied. No Timeout is assigned for the TL1 Mode	
Ethernet IP Address	IP Address 0.0.0.0 Gateway Address 0.0.0.0 Network Mask 255.255.255.0	
Clock Module Defaults		
Warmup Time	1200 seconds	
Min Tau Limit	300 seconds	
Max Tau Limit	If 2E, 10000 seconds If 3E, 500 seconds	
Min Tau	300 seconds	
Max Tau	If 2E, 9000 seconds If 3E, 450 seconds	
Clk Switch AR	On	
Input Switch	AutoReturn (AR)	

Table E-11. User Changes to Factory Default Settings (Continued)

Setting	Factory Default	User Configuration Changes
Input Selection Mode	Priority	
Local Oscillator (LO)	On	
Elevation Time	86400 seconds	
Warmup Time	1200 seconds	
Min Tau Limit	300 seconds	
Max Tau Limit	If 2E, 10000 seconds If 3E, 500 seconds	
Min Tau	300 seconds	
Max Tau	If 2E, 9000 seconds If 3E, 450 seconds	
Clk Switch AR	On	
Input Switch	AutoReturn (AR)	
Input Selection Mode	Priority	
Local Oscillator (LO)	On	
Elevation Time	86400 seconds	
Warmup Time	1200 seconds	

In this Appendix ...

Appendix F Regulatory Requirements

This appendix provides information about safety and EMC standards and requirements for the SSU-2000e.

The SSU-2000e system is designed to meet these safety and EMC requirements:

- EMC requirements of GR-1089-CORE Issue 2, 12-1997
- SELV equipment requirements for product safety as specified in UL 1950/CSA C22.2, 7-1995

In this Appendix ...

Appendix G Specifications

This appendix provides specifications for the SSU-2000e unit and for its functional components, such as operating conditions, power inputs, clock inputs and outputs, indicators, EMC and safety standards, and chassis dimensions.

G.1 General Specifications

The operating limits for the unit are set to factory default settings as listed in Appendix E, Default Settings.

Table G-1 details the general specifications for the fully populated unit configured with SSU function. Inputs apply only to the SSU function.

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Table G-1. General Specifications

Characteristics	Specification
General	
Architecture	▪ Main Shelf: two Clock modules, one Communication module, three Input modules, and six Output modules ▪ Expansion Shelf: 10 Output modules and two Buffer modules ▪ Up to four Expansion Shelves per system
Long Term Frequency (Accuracy)	Stratum 1 PRS per (ANSI) T1.101 and ITU-T G.811
Clock Performance	Meets requirements of the Telcordia Technologies (formerly Bellcore) document GR-1244-CORE

Table G-1. General Specifications (Continued)

Characteristics	Specification
Reference Signals	Determined by the type of Input module: ▪ GPS navigation signal ▪ DS1 – D4 or ESF ▪ E1 – CAS or CCS ▪ Clock – 1 MHz, 1.544 MHz, 2048 kHz, 5 MHz, 10 MHz
Sync Status Messaging (SSM)	Compliant with SSM specifications per T1X1.3 TR33, (ANSI) T1.101-1999, and Telcordia Technologies GR-253 and 378-CORE and with applicable parts of ITU-T G.781
Event Log	Stores at least 500 event history including timestamp, event type, event/alarm level, and condition causing the event; stores the last 10 events in non-volatile memory.
Configuration Data	Firmware stores factory configuration, customer configuration, current configuration, and module identification information, and provides a command which can be used to restore saved settings.
Alarm Levels	Commands can set alarm level to IGNORE, REPORT, MINOR, MAJOR and CRITICAL. MINOR and MAJOR alarms can be elevated to the next higher level after a user-defined time period.
Communications Ports	Three RS-232 Serial Ports: ▪ Serial PORT-A (J4) ▪ Serial PORT-B (J5) ▪ Comms Module Serial Port One Ethernet Port: ▪ Ethernet port (10BaseT)
Communication Management	
Management Interface	▪ Simple fault, visual and contact closures ▪ ICS ▪ TL1 ▪ SNMP
Input Section	
Ports	▪ Maximum of 9 ▪ 1 or 3 ports per Input module ▪ Reference or monitoring capability
Signal Type	2048 kbit/s (E1), DS1,1 MHz, 1.544 Mhz, 2.048 MHz (CC/Sec. 13), 5 MHz, 10 MHz (user settable)
GPS	Integrated (single or dual)
SSM	Fully supported
Selection Mode	Priority and PQL (user settable)

Table G-1. General Specifications (Continued)

Characteristics	Specification
Performance Measurement	
Resolution	1 ns
Sampling Rate	40 Hz (GPS 1 Hz)
MTIE and TDEV	DS1 and E1 only
Clocks	
Type (Holdover)	▪ Stratum 2E Rubidium ▪ Stratum 3E Quartz
Control	▪ DDS (Direct Digital Synthesis) technology ▪ Integrated CPU
Output Section	
Ports	▪ 20 Ports per Output module pair
Signal Type	▪ 2048 kbit/s (E1) ▪ DS1 ▪ 2.048 MHz ▪ Composite Clock (CC)
Distribution Capacity	
SSU-2000e Main Shelf	▪ Up to six E1/DS1 Output modules (three redundant pairs) in Main shelf ▪ 20 summed outputs per Output module pair ▪ Maximum of 60 summed outputs per Main shelf
SDU-2000e Expansion Shelf	▪ Up to four Expansion Shelves ▪ Up to 10 Output modules (five redundant pairs) per expansion shelf with 20 outputs per module pair ▪ Maximum of 100 redundant (summed) outputs per expansion shelf
Alarm Closures	
MINOR	Contact closure (NC or NO) 1 Amp Form C
MAJOR	Contact closure (NC or NO) 1 Amp Form C
CRITICAL	Contact closure (NC or NO) 1 Amp Form C
Chassis Power and Ground	
Power Connections	A and B input connections at opposite-upper sides of the connector panel
DC	-40.5 to -74.99 vDC, (-48/60 vDC nominal)
DC Power @ -48/60vDC	< 240 watts, per chassis
Ground	–48/60 vDC return, terminated frame and logic grounds

Table G-1. General Specifications (Continued)

Characteristics	Specification
Chassis Mechanical	
Width	431.8 mm (w/ears)
Depth	245 mm
Height	495.3 mm
Weight (provisioned)	~ 13.4 kg
Chassis Environmental	
Temperature	+1.7°C to +49°C @ 8.3°C max rate of change per hour GR-1244-CORE Sec. 2.2
Relative Humidity Operational	5% to 85% Non-condensing GR-63-CORE Sec. 4.1.2 ETS 300 019-1 Class 3.1
Temperature Operational Short Term Non-Stratum performance	–5°C to +50°C @ 30°C max per hour rate of change Duration <96 hours GR-63-CORE Sec. 4.1.2 ETS 300 019-1 Class 3.1
Relative Humidity Operational Short Term	5% to 90% Non-condensing. Duration <96 hours GR-63-CORE Sec. 4.1.2 ETS 300 019-1 Class 3.1
Temperature Storage	-25°C to +55°C Duration <12 months GR-63-CORE Sec. 4.1.1 ETS 300 019-1 Class 1.2
Relative Humidity Storage	5% to 100% Non-condensing. Duration <12 months GR-63-CORE Sec. 4.1.1 ETS 300 019-1 Class 1.2
Temperature Transporting	–40°C to +70°C Duration <3 months GR-63-CORE Sec. 4.1.1 ETS 300 019-1 Class 2.3
Relative Humidity Transporting	5% to 100% Non-condensing. Duration <3 months GR-63-CORE Sec. 4.1.1 ETS 300 019-1 Class 2.3
Heat Dissipation	GR-63-CORE Sec. 4.1.4
Altitude	60 m below to 4000 m above sea level GR-63-CORE Sec. 4.1.3
Airborne Contaminants	GR-63-CORE Sec. 4.5.2.1
Shock Operational	ETS 300 019-2-3 Class T3.1
Sinusoidal Vibration Operational	GR-63-CORE Sec. 4.4.3
Seismic Vibration	GR-63-CORE Sec. 4.4.1 Earthquake Zone 4 ETS 300 019-2-3-A1

Table G-1. General Specifications (Continued)

Characteristics	Specification
Shock Transporting	ETS 300 019-2-2 Class T2.2
Sinusoidal Vibration Transporting	GR-63-CORE Sec. 4.4.4 fig. 4-3
Random Vibration Transporting	ETS 300 019-2-2 Class 2.1, 2.2, 2.3, and 2.3 special
Packaged Equipment Shock	GR-63-CORE Sec. 4.3.1.2
Unpackaged Equipment Shock	GR-63-CORE Sec. 4.3.2
Electrical Safety	GR-1089-CORE Sec. 7
Material/Component Fire Resistance	GR-1089-CORE Sec. 4.2.3.
EMC	
Immunity/Resistibility ESD	EN 300 386-2 V1.1.3 Sec. 5.2.1.1 & 5.2.1.4 and GR-1089-CORE Sec. 2
Immunity Radiated	EN 300 386-2 V1.1.3 Sec. 5.2.1.2 GR-1089-CORE Sec. 3.3.1 & 3.3.2
Immunity Fast Transient	EN 300 386-2 V1.1.3 Sec. 5.2.3.1 & 5.2.5.1
Immunity Surges	EN 300 386-2 V1.1.3 Sec. 5.2.3.2
Immunity Radio Freq. Conducted	EN 300 386-2 V1.1.3 Sec. 5.2.3.3 & 5.2.5.2 GR-1089-CORE Sec. 3.3.3
Emissions Radiated	EN 300 386-2 V1.1.3 Sec. 5.2.1.3 GR-1089-CORE Sec. 3.2.1 & 3.2.2
Emissions Radio Freq. Disturbance voltage	EN 300 386-2 V1.1.3 Sec. 5.2.5.3 GR-1089-CORE Sec. 3.2.4
Interface A (Power Input)	ETS 300 132-2 Part 2: Operated by direct current (dc)
Low-Impedance Plane (Grounding)	ETS 300 253 GR-1089-CORE Sec. 9
Intra-building Lighting	GR-1089-CORE Sec. 4.5.9
Antenna Output & Receiver Input	EN 61000-4-5 – 1 kV tested combination wave generator (1.2/50—8/20 μs) 12 Ω impedance.

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Table G-1. General Specifications (Continued)

Characteristics	Specification
Outdoor Operational Conditions	
(GPS Antenna Only)	ETS 300 019-1 Class 4.1E
GPS PRS Performance and Antenna Environmental	
GPS Performance	Compliant with Stratum 1 PRS (Primary Reference Source) per (ANSI) T1.101-1999, ITU-T G.811, and Telcordia Technologies (Bellcore) GR-2830-CORE.
Temperature	-40°C to +75°C
Relative Humidity	100% Non-Immersed
Altitude	60 m below sea level to 4000 m above sea level

G.2 Operating Conditions Specifications

The SSU-2000e operates at specified parameters in the operating conditions summarized in Table G-2.

Table G-2. Normal Operating Conditions

Parameter	Minimum	Maximum	Units	Notes
Supply Voltage	-40.5	-74.99	Volts	1
Temperature	0	50	°C	2
Temperature Rate of Change	—	8.3	°C/Hr	
Relative Humidity	5	85	%	3
Altitude	-60	4000	meters	4

NOTES:

1. ETSI requirements for SELV equipment limits feasible maximum specification.
2. Inlet air temperature, limited convection 4.5 meters/min.
3. Non-condensing.
4. The maximum operation ambient temperature shall be reduced by 2×C for every 300 meters altitude above 1500 meters.

The unit is not damaged when exposed to the levels specified in Table G-3, but performance is degraded. The unit returns to specified performance upon returning to specified operating conditions.

Table G-3. Exceptional Operating Conditions

Parameter	Minimum	Maximum	Units	Notes
Supply Voltage: (-48/60 vDC) Positive ground	–40.5	–75	Volts, DC	
Temperature	–5	50	°C	1
Relative Humidity	5	90	%	2

NOTES:

1. At 30°C max/hour rate of change.
2. Non-condensing.

G.3 Power Input and Grounding Specifications

Table G-4 provides power input specifications

Table G-4. Power Input Specifications

Parameter	Specification
Supply Power	–40.5 to –74.99 vDC (–48/60 vDC nominal)[1]
Power, Maximum	240 watts at start-up
Power, Typical	< 100 watts at normal operation
Connector	3 pin D-Type

NOTES:

1. 48/60 vDC return connected to the common ground plane.

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G.4 Input Signal Specifications

Table G-5 details the input signal specifications.

Table G-5. Input Signal Specifications

Parameter	Specification
DS1 Signals	
Framing	D4/SF or ESF (User Selectable)
Bit Rate	1544 kbit/s
Format	AMI or B8ZS (per ITU-T G.703 Sec. 5 & (ANSI) T1.102)
Amplitude Range	+3 to -24 dBDSX
Jitter and Wander Tolerance	Meets the requirements of Bellcore GR-1244-CORE, Sec. 4
Input Error Threshold	0 to 255 Intervals per hour (AIS, LOS, OOF, BPV, CRC)
Input Impedance	3.3 kΩ (External termination)
E1 Signals	
Type	G.703 Sec. 9 Framed E1
Bit Rate	2048 kbit/s
Format	CAS or CCS (per ITU-TG.703 Sec. 2 & (ANSI) T1.102 DS1A CRC4 enabled/disabled AMI or HDB3)
Amplitude Range	+3 to –27 dBTLO
Jitter and Wander Tolerance	Meets the requirements of ITU-T G.823
Input Error Threshold	0 to 255 Intervals per hour (AIS, LOS, LOF, BPV, CRC)
Type	G.703 Sec. 9 Framed E1
Input Termination	External

G.5 Output Signal Specifications

Table G-6 details the input signal specifications.

Table G-6. Output Signal Specifications

Parameter	Specification
DS1 Signals	
Framing (user selectable)	Outputs: D4/Super Frame (SF) or Extended Super Frame (ESF), user selectable
Signal Waveshape Rise Time Pulse Width Pulse Interval Duty Cycle	Framed, all ones, Alternate Mark Inversion (AMI) Per (ANSI) T1.102 and ITU Rec. G.703 < 100 nsec < 324 nsec, nominal 648 nsec, nominal 50%
Pulse Amplitude	2.4 to 3.6 volts peak into 100 Ω
Output Jitter	< 0.03 UI
Number of Outputs	20 per module
Termination Impedance	100 Ω ± 5%
E1 Signals	
Framing (user selectable)	CAS, CCS
Signal Waveshape Rise Time Pulse Width Pulse Interval Duty Cycle	Framed, all ones, Alternate Mark Inversion (AMI) Per ITU Rec. G.703 Sec. 9 < 100 nsec < 244 nsec, nominal 488 nsec, nominal 50%
Pulse Amplitude	2.4 to 3.6 volts peak into 120 Ω 1.9 to 2.8 volts peak into 75 Ω
Output Jitter	< 0.03 UI
Number of Outputs	20 per module
Termination Impedance	120 Ω ± 5%

Table G-6. Output Signal Specifications (Continued)

Parameter	Specification	
Composite Clock Signals (64 kbit/s)		
Signal Waveshape	Rectangular (62.5% or 50/50 duty cycle), software selectable, per G.703 Sec. 4 and GR-378	
Duty Cycle	**5/8 (62.5%)**	**50/50**
Rise Time	< 500 nsec	< 500 nsec
Pulse Width	9.8 µS ±5%	7.8125 µS ±5%
Pulse Interval	15.625 µS ±5%	15.625 µS ±5%
Amplitude	2.7 to 5.5 V peak	1.0 ±0.1 V
Termination Impedance	133 Ω ±5%	110 Ω
Number of Outputs	20 per module	
2048 kHz Clock Signals		
Signal Waveshape	Per ITU Rec. G.703 Sec. 13 Square wave	
Rise Time	< 50 nsec	
Fall Time	< 50 nsec	
Duty Cycle	50% ±5%	
Amplitude	1.0 to 1.9 volts peak into 120 Ω 0.75 to 1.5 volts peak into 75 Ω	
Jitter	< 0.03 UI	
Number of Outputs	20 per module	
Termination Impedance	120 Ω ± 5% or 75 Ω ± 5%	

G.6 Chassis Dimensions

The overall dimensions of the unit are 495.3 mm high x 431.8 mm wide (w/ears) x 245 mm deep. Installers can mount the unit in a standard ETSI cabinet. The mounting holes in the rack mounting ears are spaced to meet ETSI and are closed to meet earthquake requirements.

IN THIS APPENDIX ...

Appendix H Reference Materials

NOTE ...

Bellcore, or Bell Communications Research, is now Telcordia Technologies, Inc. Many reference documents listed in this section were originally published by Bellcore, but are now available from Telcordia Technologies, Inc.

H.1 American National Standards Institute (ANSI) Documents

1.(ANSI) T1.101–1999, *Synchronization Interface Standards for Digital Networks.*

2. (ANSI) T1.101-199x, revision of T1X1.3/98-002R2, *Synchronization Interface Standard.*

3. (ANSI) T1.102–1993, *Digital Hierarchy-Electrical Interfaces.*

4. (ANSI) T1.105–1995, *Synchronous Optical Network (SONET) - Basic Description including Multiplex Structure, Rates and Formats*.

5. (ANSI) T1.105.01–1995, *Synchronous Optical Network (SONET) - Automatic Protection Switching*.

6. (ANSI) T1.105.03–1994, *Synchronous Optical Network (SONET) - Jitter at Network Interfaces*.

7. (ANSI) T1.105.03a-1995, *Synchronous Optical Network (SONET) - Jitter at Network Interfaces - DS1 Supplement.*

8. (ANSI) T1.105.03b-1997, *Synchronous Optical Network (SONET) - Jitter at Network Interfaces - DS3 Supplement.*

9. (ANSI) T1.105.04–1995, *Synchronous Optical Network (SONET): Data Communication Channel Protocols and Architectures.*Family of Requirements

10. FR–476, *OTGR Section 6: Network Maintenance: Access and Testing* (Bellcore, 1997 Edition) *(A subset of OTGR, FR–439).*

11. FR–480, *OTGR Section 10: User System Interface* (Bellcore, 1997 Edition). *(A subset of OTGR, FR–439*).

H.2 Generic Requirements

1. GR–63–CORE, *Network Equipment-Building System (NEBS) Requirements: Physical Protection*, Issue 1 (Bellcore, October 1995). (A module of LSSGR, FR–64, TSGR, FR–440, and NEBSFR, FR-2063.)

2. GR–78–CORE, *Generic Requirements for the Physical Design and Manufacture of Telecommunications Products and Equipment,* Issue 1 (Bellcore, September 1997). (A module of RQGR, FR–796 and NEBSFR, FR–2063.)

3. GR-378-CORE, *Generic Requirements for Timing Signal Generators,* Issue 2 (Bellcore, February 1999).

4. GR–474–CORE, *OTGR Section 4: Network Maintenance: Alarm and Control for Network Elements*, Issue 1 (Bellcore, December 1997). (A module of OTGR, FR–439.)

5. GR–499–CORE, *Transport Systems Generic Requirements (TSGR): Common Requirements,* Issue 1 (Bellcore, December 1995). (A module of TSGR, FR–440.)

6. GR–831–CORE, *OTGR Section 12.1: Operations Application Messages - Language for Operations Application Messages,* Issue 1 (Bellcore, November 1996). (A module of OTGR, FR–439.)

7. GR–1089–CORE, Issue 2, Revision 1, 2-1999, Electromagnetic Compatibility and Electrical Safety– Generic Criteria for Network Telecommunications Equipment

H.3 Technical Advisories and Framework Technical Advisories

1. TA–NPL–000286 (not available).

2. TA–NPL–000464, *Generic Requirements and Design Considerations for Optical Digital Signal Cross-Connect Systems*, Issue 1 (Bellcore, September 1987).

3. TA–NWT–000487 (see GR–487–CORE).

4. TA–NWT–000782, *SONET Digital Switch Trunk Interface Criteria*, Issue 2 (Bellcore, October 1992).

5. TA–NWT–000983, *Reliability Assurance Practices for Optoelectronic Devices in Loop Applications*, Issue 2 (Bellcore, December 1993).

6. TA–TSV–001294, *Generic Requirements for Element Management Layer (EML) Functionality and Architecture,* Issue 1 (Bellcore, December 1992).

7. FA–NWT–001345, *Framework Generic Requirements for Element Manager (EM) Applications for SONET Subnetworks,* Issue 1 (Bellcore, September 1992).

8. TA–NWT–001385, *Generic Requirements for Optoelectronic Devices in Fiber Optic Systems,* Issue 1 (Bellcore, April 1993) plus Bulletin 1, January 1994.

9. TR–TSY–000825, *OTGR Section 10.A: User System Interface* **-** *User System Language*, Issue 2 (Bellcore, February 1988). (A module of OTGR, FR–NWT–000439.)

10. TR–TSY–000827, *OTGR Section 11.1: Generic Operations Interfaces: Non-OSI Communications Architecture,* Issue 1 (Bellcore, November 1988). (A module of OTGR, FR–439.)

11. TR–NWT–000835, *OTGR Section 12.5: Network Element and Network System Security Administration Messages,* Issue 3 (Bellcore, January 1993). (A module of OTGR, FR–439.)

12. TR–OPT–000839 (see GR–839–CORE).

13. TR–NWT–000917, *SONET Regenerator (SONET RGTR) Equipment Generic Criteria,* Issue 1 (Bellcore, December 1990). (A module of TSGR, FR–440.) TR–NWT–000930, *Generic Requirements for Hybrid Microcircuits Used in Telecommunications Equipment,* Issue 2 (Bellcore, September 1993). (A module of RQGR, FR–796.)

14. TR–NWT–001112, *Broadband-ISDN User to Network Interface and Network Node Interface Physical Layer Generic Criteria,* Issue 1 (Bellcore, June 1993).

15. TA–NPL–000286 (not available).

16. TA–NPL–000464, *Generic Requirements and Design Considerations for Optical Digital Signal Cross-Connect Systems*, Issue 1 (Bellcore, September 1987).

17. TA–NWT–000487 (see GR–487–CORE).

18. TA–NWT–000782, *SONET Digital Switch Trunk Interface Criteria*, Issue 2 (Bellcore, October 1992).

19. TA–NWT–000983, *Reliability Assurance Practices for Optoelectronic Devices in Loop Applications*, Issue 2 (Bellcore, December 1993).

20. TA–TSV–001294, *Generic Requirements for Element Management Layer (EML) Functionality and Architecture,* Issue 1 (Bellcore, December 1992).

21. FA–NWT–001345, *Framework Generic Requirements for Element Manager (EM) Applications for SONET Subnetworks,* Issue 1 (Bellcore, September 1992).

22. TA–NWT–001385, *Generic Requirements for Optoelectronic Devices in Fiber Optic Systems,* Issue 1 (Bellcore, April 1993) plus Bulletin 1, January 1994.

H.4 Technical References

1. TR–NWT–000057, *Functional Criteria for Digital Loop Carrier Systems*, Issue 2 (Bellcore, January 1993). (A module of TSGR, FR–440.)

2. TR–NWT–000078 (see GR–78–CORE).

3. TR–NWT–000170, *Digital Cross-Connect System (DSC 1/0) Generic Criteria*, Issue 2 (Bellcore, January 1993).

4. TR–NWT–000357, *Generic Requirements for Assuring the Reliability of Components Used in Telecommunication Systems*, Issue 2 (Bellcore, October 1993). (A module of RQGR, FR–796.)

5. TR–NWT–000418, *Generic Reliability Assurance Requirements for Fiber Optic Transport Systems,* Issue 2 (Bellcore, December 1992). (A module of RQGR, FR–796.)

6. TR–NWT–000468, *Reliability Assurance Practices for Optoelectronic Devices in Central Office Applications*, Issue 1 (Bellcore, December 1991). (A module of RQGR, FR–796.)

7. TR–NWT–000496, *SONET Add-Drop Multiplex Equipment (SONET ADM) Generic Criteria*, Issue 3 (Bellcore, May 1992). (A module of TSGR, FR–440.)

8. TR–NWT–000835, *OTGR Section 12.5: Network Element and Network System Security Administration Messages,* Issue 3 (Bellcore, January 1993). (A module of OTGR, FR–439.)TR–OPT–000839 (see GR–839–CORE).TR–NWT–000917, *SONET Regenerator (SONET RGTR) Equipment Generic Criteria,* Issue 1 (Bellcore, December 1990). (A module of TSGR, FR–440.)

9. TR–NWT–000930, *Generic Requirements for Hybrid Microcircuits Used in Telecommunications Equipment*, Issue 2 (Bellcore, September 1993). (A module of RQGR, FR–796.)

10. TR–NWT–001112, *Broadband-ISDN User to Network Interface and Network Node Interface Physical Layer Generic Criteria,* Issue 1 (Bellcore, June 1993).

11. TR–TSY–000191, *Alarm Indication Signal Requirements and Objectives*, Issue 1 (Bellcore, May 1986). (A module of TSGR, FR–440.)

12. TR–TSY–000454 (see GR–454–CORE).

13. TR–TSY–000458, *Digital Signal Zero, "A" (DS-0A 64 kb/s) Systems Interconnection,* Issue 1 (Bellcore, December 1989).

14. TR–TSY–000782, *SONET Digital Switch Trunk Interface Criteria,* Issue 2 (Bellcore, September 1989). (A module of LSSGR, FR–64, and TSGR, FR–440.)

15. TR–TSY–000824, *OTGR Section 10.1: User System Interface - User System Access,* Issue 2 (Bellcore, February 1988). (A module of OTGR, FR–439.)

16. TR–TSY–000825, *OTGR Section 10.A: User System Interface - User System Language,* Issue 2 (Bellcore, February 1988). (A module of OTGR, FR–NWT–000439.)

17. TR–TSY–000827, *OTGR Section 11.1: Generic Operations Interfaces: Non-OSI Communications Architecture,* Issue 1 (Bellcore, November 1988). (A module of OTGR, FR–439.)

18. TR-TSY-001003, *Generic Requirements for Embedded DC-to-DC Converters,* Bellcore Technical Reference.

H.5 EIA/TIA Documents

1. EIA/TIA–455–170, *Cutoff Wavelength of Single-Mode Fiber by Transmitted Power.*

2. EIA/TIA–492, *Generic Specification for Optical Waveguide Fiber.*

3. EIA/TIA–559, *Single-Mode Fiber Optic System Transmission Design.*

4. FOTP–127, *Spectral Characterization of Multimode Laser Diodes.*

5. OFSTP–2, *Effective Transmitter Output Power Coupled into Single-Mode Fiber Optic Cable.*

6. OFSTP–3, *Fiber Optic Terminal Receiver Sensitivity and Maximum Receiver Input Power.*

7. OFSTP–10, *Measurement of Dispersion Power Penalty in Single-Mode Systems.*

8. OFSTP–11, *Measurement of Single Reflection Power Penalty for Fiber Optic Terminal Equipment.*These publications are available from:
EIA/TIA Standards Sales Office
2001 Pennsylvania, NW
Washington, DC 20006
(202) 457-4963

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H.6 Other Reference Documents

1. ETS 300 132-2, *European Telecommunication Standard, ETS 300 132-2, Equipment Engineering (EE); Power supply interface at the input to telecommunications equipment; Part 2: Operated by direct current (dc).*

2. ETS 300 132-2, *DC system voltage requirements.*

3. ETS 300 253, *Earthing system requirements.*

4. FCC Part 15 Class A/GR 1089-CORE, *EMC requirements*.

5. IEC 654-4, *Airborne contaminants*.

6. IEC 68-2-10, *Mould growth*.

7. IEC 68-2-27, *Testing method, shock*.

8. IEC 68-2-29, *Testing method, shock*.

9. IEC 68-2-36, *Testing method, random vibration*.

10. IEC 917-2-2, *Dimensions for subracks and plug-in units*.

11. ISO 1043-1:1987, *Symbols for marking of polymers*.

12. ISO 1043-2:1988, *Symbols for marking of polymers*.

13. ISO 11469:1993, *Marking of polymers*.

14. ITU-T K21, *EMC immunity requirements*.

15. UL 1950/CSA C22.2 No 950-95, *Safety requirements*.

16. EN 300 386-2 class B, *EMC requirements.*

17. EN 60950, *Safety requirements*.

18. ETS 300 019 series, *ETSI environmental conditions and tests.*

19. ETS 300 119-2, *ETSI requirements for racks and cabinets.*

20. IEC 950/EN60950, *European Safety Requirements*, August 1993.

21. ITU-T Rec G.703.

22. RFC 1305, Network Time Protocol (Version 3), *Specification, Implementation and Analysis*.

23. T1 Technical Report No. 33, *A technical report on synchronization network management using synchronization status messages*, 1994.

24. EN 300 386-2 V1.1.3 (1997-12), Electo-magnetic Compatibility and Radio Spectrum Matters (ERM); Telecommunications Equipment Electro-Magnetic Compatibility (EMC) requirements; Part 2: Product Family Standard.

25. ETS 300 386-1 (1994) sub clause 6.4.2 & 7.2.3, Equipment Engineering (EE); Telecommunications Network Equipment Electro-Magnetic Compatibility (EMC) Requirements; Part 1: Product Family Overview, Compliance criteria and test levels.

26. EN 55022 (1994), Limits and Methods of Measurement of Radio Disturbance Characteristics of Information Technology Equipment.

27. EN 61000-4-2 (1995), Electromagnetic Compatibility (EMC); Part 4: Testing and Measurement Techniques; Section 2: Electrostatic Discharge Immunity Test; Basic EMC publication.

28. EN 61000-4-3 (1996), Electromagnetic Compatibility (EMC); Part 4: Testing and Measurement Techniques; Section 3: Radiated, Radio Frequency, Electromagnetic Field Immunity Test.

29. EN 61000-4-4 (1995), Electromagnetic Compatibility (EMC); Part 4: Testing and Measurement Techniques; Section 4: Electrical Fast Transient/Burst Immunity Test; Basic EMC publication.

30. EN 61000-4-5 (1995), Electromagnetic Compatibility (EMC); Part 4: Testing and Measurement Techniques; Section 5: Surge Immunity Test.

31. EN 61000-4-6 (1996), Electromagnetic Compatibility (EMC); Part 4: Testing and Measurement Techniques; Section 6: Conducted Disturbances Induced by Radio Frequency Fields.

Glossary

1 PPS
One pulse per second, which equates to approximately 86,400 times per day.

10Base-T
Ethernet local area network (LAN) using twisted pair wiring, the most commonly installed LAN.

absolute time
A specific date and time of day. Absolute time is entered and displayed using the HH:MM:SS DD-MMM-YYYY format. START and END Times may be entered as absolute times.

Access Identifier (AID)
A part of the TL1 protocol which identifies the shelf, module, and port within the SSU-2000. The AID is used in the message display area of the **SynCraft:SSU-2000** window to display SSU-2000 event and alarm messages, and in the SynCraft dialog box titles and labels to identify the SSU-2000 system main and expansion shelves, modules, and module ports.

acquire
The act of gaining control of a piece of equipment needed in a receiver.

ACS
Acronym: Advanced Control Solutions

address
A number used by the computer operating system and software to identify a storage location in memory or on a storage device such as a disk. Also, a unique address value associated with a given device on the data highway or on an Ethernet circuit.

ADSL
Acronym: Asymmetric Digital Subscriber Line.

AID
Acronym: TL1 protocol Access Identifier

AIS
Acronym: Alarm Indication Signal.

AIS
Alarm Indication Signal - A code transmitted downstream in a digital network that shows that an upstream failure has been detected and alarmed.

Alarm Indication Signal (AIS)
Signal transmitted downstream to inform that an upstream failure has been detected. Replaces normal traffic signal when a maintenance alarm indication is activated.

Alternate Mark Inversion (AMI)
Signaling protocol in which ones are indicated by either a positive or a negative pulse, and zeros by no pulse. The ones alternate between positive going and negative going.

American National Standards Institute (ANSI)
Standards-setting, non-government organization that develops and publishes standards for transmission codes, protocols, and high-level languages for *voluntary* use in the United States.

American Standard Code for Information Interchange (ASCII)
A standard digital encoding scheme for data: a 7-bit binary code represents numbers, letters, symbols, and control codes.

AMI
Acronym: Alternate Mark Inversion.

Ampere
The unit of measurement of electric current or the flow of electrons, mathematically equal to watts divided by volts.

ANSI
Acronym: American National Standards Institute.

ASCII
Acronym: American Standard Code for Information Interchange.

assembler language
See assembler code

Asymmetric Digital Subscriber Line (ADSL)
High-speed transmission technology developed by Telcordia and standardized by ANSI as T1.413. ADSL uses existing UTP copper wires from a telecommunications central office to the subscriber premises and involves ADSL modems at both ends to send high speed digital signals asymmetrically (that is, send more information in one direction).

Asynchronous Transfer Mode (ATM)
Very high speed transmission technology using high bandwidth, low-delay, connection-oriented, packet-like switching and multiplexing techniques in which each 53-byte fixed-size cell is presented to the network on a start-stop basis (asynchronously).

audit trail
A record of changes made to a database and to the system where the database resides. The record includes the type of change, when the change was made and who made it.

B8ZS
Acronym: Bipolar with 8 Zero Substitution.

Backdoor Logon
A logon which provides a way of getting into a password-protected system without an assigned password.

Balun
Balanced/unbalanced, refers to an impedance-matching device used to connect balanced twisted-pair cabling with unbalanced coaxial cable.

Bellcore
See *Telcordia Technologies*.

Binary with 8 Zero Substitution (B8ZS)
Zero suppression scheme associated with DS1.

Bipolar
In digital transmission, an electrical line-signaling method in which the mark value alternates between positive and negative polarities.

Bipolar Violation (BPV)
In the digital line coding system that inverts the polarity of alternate one bits, a bipolar violation (BPV) indicates the presence on the carrier line of two consecutive "one" bits of the same polarity.

B-ISDN
Acronym: Broadband Integrated Services Digital Network. Also BISDN.

BITS
Acronym: Building Integrated Timing Supply.

BITS Clock
See *Building Integrated Timing Supply.*

BPV
Acronym: Bipolar Violation - In AMI signaling, occurs when two consecutive ones are indicated with the same polarity.

Broadband
Used in Wide Area Network (WAN) terminology to indicate a transmission facility providing bandwidth that is greater than 45 Mbit/s (T3), generally fiber optic systems, and contrasted with narrowband and wideband.

Broadband Integrated Services Digital Network (B-ISDN or BISDN)
Broadband ISDN. Loosely defined term that refers to circuits capable of transmitting more than one basic rate ISDN.

Building Integrated Timing Supply (BITS)

As defined in T1.101, the BITS is the master timing supply for an entire building, which is a master clock and its ancillary equipment. This is the most accurate and stable clock in the building, (i.e., the lowest stratum number of the clocks in the building.) The BITS supplies synchronization sources to all other clocks and timing sources in that building. The BITS therefore is realized by the main TSG, the PRS (if deployed), and any sub-tending TSGs within a building or Central Office. Sub-tending TSGs are slave or expansion TSGs operated from the main or master TSG.

CAS/CCS

Acronym: See Channel Associated Signaling/Common Channel Signaling.

CBR

Acronym: See *Constant Bit Rate*.

CDMA

Acronym: See Code Division Multiple Access.

Central Office

In telephony, the Local Exchange Carrier (LEC) switching facility. Also called Local Exchange or wire center. Refers to Class 5 switching office, at which subscribers' local loops terminate; handles a specific geographic area, identified by the first three digits of the local telephone number.

CEV

Controlled Environment Vault - A temperature- and humidity-controlled housing for electronic or optical equipment.

Channel Associated Signaling/Common Channel Signaling (CAS/CCS)

Framing modes associated with E1 signaling.

Clock

Internal timing device that creates a signal, generated by an oscillator. The oscillator creates a uniform electrical frequency from which digital pulses can be created. The clock signal provides a timing reference or base for sampling of signal elements in a transmission link; creates signals to be used in a transmission system to control the timing of certain functions; generate periodic, precisely spaced signals that can be used for timing, relating processor operations, or generating interrupts. The clock may be locked to an external reference signal.

Clock accuracy

The level of agreement of the frequency of a clock with the ideal frequency, specified as the magnitude of the fractional frequency offset from the ideal frequency. The fractional frequency offset is defined as the difference between the actual and ideal frequency divided by the ideal frequency. The frequency in this definition is generally the frequency averaged over a sufficiently long observation time (typically on the order of one hour to one day) to adequately determine the frequency.

Clock Module

A module that provides the "clock" functions defined for ***Clock accuracy*** (above). Usually, two clock modules are deployed in a TSG or SSU.

Clock signal
Uniform electrical frequency from which digital pulses can be created to provide a reference for transmission signal elements and for timing functions.

Clocking
In synchronous communication, a periodic signal used to synchronize transmission and reception of data and control characters.

CO
Acronym: Central Office.

Code Division Multiple Access (CDMA)
New form of digital cellular phone service. CDMA is a spread spectrum technology that combines the original information signal with a correlating code, resulting in a signal which occupies a much greater bandwidth than the original but allows several simultaneous conversations to share the same frequency allocation.

CODEC
COder/DECoder - Device that converts analog signals to digital signals for transmission on digital lines. It also reconverts (digital to analog).

Communications Module (COMM)
A module within an SSU or TSG that supports user interaction with an SSU or TSG by means of information equipment such as a PC.

Computer Communication Protocol Interface (CCPI)
A Binary interface developed by Datum to provide a common binary interface to Datum equipment, and used to download software or PLD images to the unit.

Configuration
The arrangement of modules and parameter settings within a device.

Constant Bit Rate (CBR)
Data service in which bits are conveyed regularly in time and at a constant rate, carefully timed between source or transmitter and sink or receiver. The data transfer rates established by a timing source or clock.

Controller
SPI interface controller. The Controller is one of the modules that can be Master, typically either a Clock or Comm module.

CRC
Acronym: Cyclic Redundancy Checking.

CRC4
Cyclic Redundancy Checking protocol used with E1 signaling.

CRC6
Cyclic Redundancy Checking protocol used with DS1 signaling.

Critical Alarm
A critical alarm is a message that calls attention to an alarm condition that is potentially traffic-affecting, and may require immediate corrective action. Alarm message that signifies that the output reference is invalid or that the output modules have no clock source. A critical alarm activates the major alarm relays and the CRITICAL LED.

CSU
Channel Service Unit - A customer premises equipment (CPE) device used to terminate a DS1 or DS0 [56/64 Kbit/s] digital circuit. The CSU must comply with FCC rules and store error information provided by the Extended Super Frame (ESF). The CSU also performs line-conditioning, protection, loop-back and timing functions.

Cyclic Redundancy Checking (CRC)
A data validation process in which a CRC character, whose value depends on the hexadecimal value of the number of ones in the data block, is added to the data block at the end of a transmission by the transmitting device. The receiving device makes a similar calculation and compares the results to determine if there was a mistake in the transmission.

D4
In DS1 digital transmission technology, D4 is the fourth-generation channel bank or interface between the T1 transmission system and an analog premises device. D4 and ESF are the framing modes associated with DS1 signaling. D4 utilizes superframes for information transfer; ESF uses extended superframes. D4 framing is also called ***SF.***

Data Communications Equipment (DCE)
Protocol which resolves interface issues between DTE and network. As defined in the RS-232 specification equipment to which DTE is connected, often to enable access to network facilities.

Data terminal equipment (DTE)
Generally end-user devices, such as terminals and computers, that connect to DCE, which either generates or receives the data carried by the network. The RS-232, V.35 and X.21 connections are common DCE to DTE interfaces. The major difference between a DCE and a DTE is that pins two and three are reversed.

DCE
Acronym: See Data Communications Equipment.

DCS
Acronym: Digital Cross-Connect System. *Also DACS (Digital Automatic Cross-Connect System)*.

DDS
Acronym: Direct Digital Synthesis.

Dense Wavelength Division Multiplexing (DWDM)
Higher-capacity version of Wavelength Division Multiplexing (WDM), a means of increasing capacity of fiber-optic data transmission systems by multiplexing multiple wavelengths of light onto the same optical fiber.

Digital Cross Connect (DCS) System
Specialized type of high-speed data channel switch. Standard voice switches switch transmission paths in response to dialing instructions. DCD systems depend on separate, specific instructions, from an operator at a console or from a program, that are given independently of system calls, and that direct the connection of one line to another line.

Digital Service, Level 1 (DS1)
A 1.544 Mb/s digital signal consisting of 24 DS0s and a framing bit (193 bits per frame, transmitted 8000 frames per second. May be carried on a T1 facility of other transmission medium.

Digital Service, Level 3 (DS3)
A 44.736 Mbit/s signal, which may consist of 28 DS1 signals multiplexed together.

Digital Subscriber Line Access Multiplexer (DSLAM)
Technology which concentrates traffic in ADSL implementations through Time Division Multiplexing (TDM) at the central office or remote line shelf.

Direct Digital Synthesis (DDS)
The technique of generating signals at a precise frequency using digital methods to select the output frequency as a fraction of the input clock frequency.

DLCP
DownLoad Communication Protocol. A subset of the Datum Computer Communication Protocol (CCPI) that is used when downloading new program/ PLD images to the unit.

Download
Receive data into a computer or ROM from another computer, as for example, receiving updated software from a host computer into Flash ROM.

DS1
Acronym: Digital Service, Level 1.

DS3
Acronym: Digital Service, Level 3.

DSLAM
Acronym: Digital Subscriber Line Access Multiplexer.

DTE
Acronym: Data Terminal Equipment.

DTE/DCE Switch
2PDT slide switch located on the back panel of SSU-200 which allows user to select either DTE (default, connection to PC) or DCE (connection to modem) type serial port connections.

DWDM
Acronym: Dense Wavelength Division Multiplexing.

E1
A digital circuit with standardized characteristics that operates at 2.048 Mbit/s. This standard is widely used in Europe as the rough equivalent of a DS1 (E1 provides thirty 64 Kbit/s channels, six more than a DSS1).

E3
A digital circuit with standardized characteristics that operates at 34 Maps. this standard is widely used in Europe for inter-carrier communications as the rough equivalent of a DS3.

Earth Ground
The connection of an electrical system to earth. This connection is necessary to provide lightning and static protection and to establish the zero-voltage reference for the system.

EIA-232
See *RS-232*.

Electromagnetic compatibility (EMC)
The ability of equipment or systems to be used in their intended environments within designed efficiency levels without causing or receiving degradation due to unintentional EMI (electromagnetic interference). EMI can be reduced by using proper shielding techniques and grounding.

Electromagnetic Interference (EMI)
Electromagnetic interference. Radiation leakage outside of a transmission medium that results (mainly) for the use of high-frequency wave energy. May be reduced by shielding.

EMC
Acronym: ElectroMagnetic Compatibility.

EMI
Acronym: ElectroMagnetic Interference.

ESD
Acronym: ElectroStatic Discharge

ESF
Acronym: Extended SuperFrame format.

Ethernet

A LAN and baseband protocol based on a packet frame that operates at 10 Mbit/s over coaxial cable and allow terminals, concentrators, workstations, and hosts to communicate.

Ethernet Address

12 hexadecimal numbers, unique to the system, which identifies a device.

ETSI

Acronym: See European Telecommunications Standards Institute

European Telecommunications Standards Institute (ETSI)

European counterpart to the American National Standards Institute (ANSI), founded in 1988 as a result of an initiative of the European Commission, established to produce telecommunications standards for users, manufacturers, suppliers, administrations, and Post Telephone and Telegraph (PTT) administrations.

Event History

Historical records of activities for a device, usually comprised of event messages indicating a change in the physical or logical state of the device and a timestamp.

Extended SuperFrame Format (ESF)

A modification of the Superframe (sometimes called D4) framing scheme for DS1. ESF extends the framing pattern from 12 frames to 24 frames. A frame is 192 data bits and one frame bit. The 24 frame bits are a unique pattern of 1s and 0s that allows for terminal alignment, frame count, CRC bits, and a 2 Kbit/s data channel. Framing allows receiving equipment to identify the start and sequence of data in the binary 1.544 million bits per second DS1 stream.

Facilities Data Link (FDL)

ESF allows 4 Kbit/s to be used for a facilities data link which supports the communication of various types of monitoring or diagnostic network information used for provisioning and maintenance. Series-21 units use FDL for PQL settings.

Fault

Hard failure or performance degradation serious enough to threaten network function.

FlashROM

Flash Read Only Memory - contains software known as firmware. FlashROM can be erased and reprogrammed but persists when power to the device is turned off. FlashROM can be updated by downloading new firmware into the FlashROM (also called Flash Memory).

FLL

Acronym: Frequency Lock Loop.

Frame Generator

Frame generators use certain input timing signals to generate a digital signal having a specific frame format, such as DS1 (ESF or SF). They also accept input PQL from the reference input and convert it to the appropriate sync status message (SSM) for output.

Frame Ground (FG)
Connected to the equipment chassis to provides protective grounding.

Framing
A specified pattern of bits which can be used by the receiver to identify the time slots allocated to each sub-channel in multiplexed digital channels. Framing bits may also carry alarm signals and other overhead information.

Framing Error
Error which occurs when a receiver does not interpret frame bits correctly.

Frequency
Rate at which waveform alternates. Frequency measurements are calculated from phase measurements over time.

Frequency Lock Loop (FLL)
Mechanism whereby a generated signal is locked to a precise frequency relationship with a reference clock signal. See also *Phase Lock Loop (PLL)*.

FTP
File Transfer Protocol. An application-level data communications program that transfers files. Files are identified, located, segmented, tagged with a header and passed to the next protocol level for transmission. The name comes from TCP but the function is a typical application level program.

Gbit/s
Acronym: Gigabits per second.

Generic Requirement (GR)
A document providing criteria to telecommunication technology, equipment, and operation. A prevalent example is a Telcordia (formerly Bellcore) document type that replaces Framework Technical Advisory (FA), Technical Advisory (TA), and Technical Reference (TR) document types. The GR is a living document representing Telcordia Technologies' current view of a technology.

GHz
Unit of frequency (gigaHertz) equal to one billion Hertz or one thousand megaHertz or cycles per second.

Global Positioning System (GPS)
System of satellites, that transmits its position and time (derived from on-board celestial navigation equipment and atomic clocks), and a pseudo random noise (PRN) code.

GR
Acronym: Generic Requirement.

Graphical User Interface (GUI)

A communication method between a computer and users that depends on graphical objects such as windows, menus, and icons. Users access software functions by manipulating the graphical objects using a pointing device or keyboard commands.

GUI

Acronym: See Graphical User Interface.

Hertz (Hz)

A unit of frequency equal to one cycle per second (cps). One kilohertz equals 1000 cps; one megahertz equals 1 million cps; one gigahertz equals 1 billion cps.

High-Density Bipolar of Order 3

Zero suppression scheme associated with E1. It does not allow more than three consecutive zeros.

Holdover Mode

Mode of operation in which an internal clock provides the synchronization reference in the event that the internal reference is lost and another suitable reference is not available.

ICS

Acronym: Interactive Command Set.

IEEE 802.3

The standard for Carrier Sense Multiple Access with Collision Detection is one of the most used LAN protocols.

Impedance

The opposition to an electrical wave based on frequency, resistance, inductance, and capacitance. Measured in ohms. Impedance is said to be matched when all components of a communications channel present the same (normally standardized) average impedance to the communications signal.

Institute of Electrical and Electronics Engineers (IEEE)

Professional society whose goal is to advance “the theory and practice of electrical, electronics, and computer engineering and computer science,” and a significant standards-making body for telecommunications and computing.

Interactive ASCII Mode

Command set for interaction with telecommunications interfaces via an ASCII terminal (or other serial or network device), and composed of the commands, parameters, responses, and events that are typed at the system prompt or displayed in the user interface.

Interactive Command Set (ICS)

A set of commands, responses, and events forming an interface with an SSU or TSG or other equipment with which users can interact by means of a computer or terminal that is connected by a serial cable to the equipment.

International Standards Organization

Paris-based standard organization that define communications and computing standards. Example standards are ISO 7776 High-Level Data Link Control Procedures X.25, and ISO 9001, a rigorous quality assurance standard

International Telecommunications Union (ITU)

United Nations agency responsible for establishing standardized communications procedures and practices, particularly known for allocation of radio frequencies, including those used by satellites.

International Telecommunications Union, Telecommunications Services Sector (ITU-T)

Permanent organ of the ITU, responsible for studying technical, operating, and tariff questions, and for issuing recommendations of each with a view to standardizing telecommunications on a worldwide basis.

Internet Protocol (IP)

The Internet Protocol (IP) address, internally represented as a 32-bit unsigned value, unique to the network, and consisting of three parts: IP address, internet gateway address, and network mask. All parts take the same form as that of the IP address. The network mask is the specification as to which bits are to be interpreted as the network address, and is a 32-bit value with ones in all bit positions that are to be interpreted as the network position.

The IP Address consists of three parts: IP address, gateway address, and network mask.

- The IP address is Internet protocol address internally represented as a 32-bit unsigned value. For example, the IP dotted address 192.168.70.224 is internally represented as IP address 0xC0A846E0.
- The gateway address is the Internet gateway address. The format is the same as described for the IP address. The network mask is the specification as to which bits are to be interpreted as the network address.
- The network mask is a 32-bit value with ones in all bit position that are to be interpreted as the network position. For example, the network dotted mask 255.255.255.0 represented as network mask as 0xFFFFFF00. The IP address must be unique in the network.

IP

Acronym: See Internet Protocol.

IP Address

The IP Address consists of three parts: IP address, gateway address, and network mask. The IP address is Internet protocol address internally represented as a 32-bit unsigned value. For example, the IP dotted address 192.168.70.224 is internally represented as IP address 0xC0A846E0. The gateway address is the Internet gateway address. The format is the same as described for the IP address. The network mask is the specification as to which bits are to be interpreted as the network address. The network mask is a 32-bit value with ones in all bit position that are to be interpreted as the network position. For example, the network dotted mask 255.255.255.0 represented as network mask as 0xFFFFFF00. The IP address must be unique in the network.

ITU

Acronym: International Telecommunications Union.

ITU-T
Acronym: International Telecommunications Union, Telecommunications Services Sector.

IXC
Acronym: IntereXchange Carrier.

Jumper
Strictly speaking, a wire connection between equipment and cable on a distribution frame. This term has come to be used for the adapters located on a chassis, to which standard connections are made to the internal logic and circuits.

kHz
Abbreviation: See kiloHertz.

Kilohertz
Refers to a unit of frequency equal to 1,000 Hertz.

LG
Logic Ground

Light Emitting Diode (LED)
A semiconductor device that emits incoherent light formed by the P-N function. Light intensity is roughly proportional to electrical current flow. A principal light source for optical-fiber transmission used mainly with multi-mode fiber. Also used for visual identification.

LIU
Acronym: Line Interface Units

LNA
Low Noise Amplifier

Local Area Network (LAN)
A user-owned, user-operated, high-volume data transmission facility connecting servers within a confined area. Run by software such as NetWare or Appletalk. Physical transfer is performed by the access method (Ethernet, etc.).

Local Oscillator (LO)
The internal oscillator.

Local Terminal (LT)
Computer, laptop, or ASCII terminal which is connected to a network element by a direct serial connection.

Locked Mode
Operational mode in which the processor controls DDS on the clock input signals in order to maintain the output frequency with respect to the input reference. The processor measures the phase of each input and adjusts the control value based on the phase changes of the reference. The processor also monitors all input signals for MTIE, frequency, and input signal errors such as Loss of Signal (LOS) or Out of Frame (OOF).

Log On
Process by which users identify and authenticate themselves to a network system or interface. Users typically enter their username and password.

Loss of Frame (LOF)
Generic term which is used specifically in different signal domains. For example, in the SONET domain, LOS is a condition that indicates that a valid framing pattern could not be obtained.

Loss of Signal (LOS)
Generic term which is used specifically in different signal domains. For example, in the SONET domain, LOS is a loss of signal condition which is detected physically at the receiver

LT
Acronym: Local Terminal.

MAJOR Alarm
Alarm message that indicates a failure or malfunction of important circuits and requires immediate attention. As an example, it is an alarm message which signifies that the output signals are not synchronized to an input signal.

Master
SPI interface master. The master is the only module that originates the SPI transfer.

Maximum Time Interval (MTIE)
A peak-to-peak measure of the longer-term phase-time variations of the significant instants of a signal.

Mbit/s
Acronym: Megabits per second.

MegaHertz (MHZ)
Refers to a frequency equal to one million Hertz, or cycles per second.

MINOR Alarm
Alarm message which signifies a condition that is not fatal to synchronization, but which could lead to more significant problems.

Modem
Modulator/Demodulator - An electronic device used to allow a computer to send and receive data.

MTIE
Acronym: Maximum Time Interval Error.

NCO
Acronym: Numeric Controlled Oscillator

Network Element (NE)
Processor controlled entities of the telecommunications network that primarily provides switching and transport network functions and contains network operations functions.

Network Time Protocol (NTP)
NTP is a 64-bit protocol quantifying the absolute time (time of day). The reference scale is Universal Time Coordinated (UTC). It counts the seconds since the year 1900 with a resolution of 232 picoseconds.

NFOEC
Acronym: National Fiber Optic Engineers Conference.

Non-Volatile Random Access Memory (NVRAM)
RAM that does not lose its memory when power to it is turned off, and typically used to store software configuration settings.

NTP
Acronym: Network Time Protocol.

Numeric Controlled Oscillator
A component used in the DDS circuitry.

NVRAM
Acronym: Nonvolatile Random Access Memory.

OAM&P
Acronym: Operation, Administration, Maintenance, and Provisioning.

OC-N
Acronym: Optical Carrier, Level number. Example OC-12–Optical Carrier, Level 12.

OOF
Acronym: Out of Frame.

Open Systems Interconnection (OSI)

Standard protocol model developed by the Organization for Standardization for communication between systems created by different vendors, the goal of which is to create an open systems networking environment in which any system can share data with any other system on that or a linked network. The model organizes the communications process into seven categories and places the categories in a layered sequence based on the relation of each to the user. In this model, layers 7 through 4 treat the end to end communications between the message source and the message destination; layers 3 through 1 treat network access.

Organization for Standardization (ISO, IOS)

Often called International Standards Organization, this voluntary, non-treaty, non-governmental organization located in Geneva was chartered by the United Nations to define and publish international standards for all fields other than electrical and electronic engineering.

Oscillator

An electronic device used to produce repeating signals of a given amplitude or frequency.

Out of Frame Error (OOF)

Designates an error condition in framing bits, declared when two of four or two of five framing bits are missed.

Output Module

Provides output sources from the SSU or TSG, or similar equipment.

Output Port

An output port is a point of access for signals to be transmitted from equipment. In the case of Synchronization Equipment (SE), an output port provides synchronization signals of a specific format. There are typically multiple output ports per output module. (See *Port*.)

Password

Word or string of characters which a user or system administrator associates with a username, and which is entered by the user during the login in process to authenticate the username login to the network.

Phase Lock Loop (PLL)

Mechanism whereby a generated clock signal is locked to a precise phase relationship to a reference clock signal. A signal that is phase locked is also frequency locked. In some equipment, the receiver uses a PLL to derive timing signal information by locking the local clock source to the external timing signal. See also *Frequency Lock Loop (FLL)*.

Phase Measurement

Phase measurements determine the difference in phase between the input signals and the reference clock.

PLD

Acronym: Programmable Logic Device (also called LCA or FPGA.)

PLL
Acronym: Phase Lock Loop.

Port
A point of access into a computer, an network, or other electronic device. The physical or logical interface through which one gains access.

PPS
Acronym: Pulses Per Second. See *1 PPS*.

PQL
Acronym: Priority Quality Level.

Primary Reference Clock (PRC)
Any device that provides a PRS quality output signal. PRC is the ETSI and ITU name for a PRS.

Primary Reference Receiver (PRR)
A radio receiver that provides a PRS quality output signal.

Primary Reference Source (PRS)
Timing signal with ANSI Stratum 1, or ITU and ETSI PRC accuracy and stability.

Master clocking source in a system or network from which other distributed devices derive their clocking and which enables the system or network to maintain synchronization.

Priority Quality Level (PQL)
Used internally in to represent the Synchronization Quality Level. See SPI interface document (12613087-000-2).

Priority Quality Level (PQL)
PQL settings provide an internal representation of traceability of signal presented at the input ports. The PQL settings can be managed by means of an editable translation table in which PQLs are assigned for provisioning Synchronization Status Messages. PQL information is carried in the FDL of the ESF.

PRR
Acronym: Primary Reference Receiver.

PRS
Acronym: Primary Reference Source

Rack
Aluminum or steel rack onto which equipment is mounted. The telecommunication industry standard rack size is 19 inches (48.26 cm) or 23 inches (58.42 cm) wide at the front. Telecommunication equipment is mounted on the rack and cables are laid in and fastened to the rack.

Rack mounting ears

Adjustable brackets which attach to the sides of the equipment chassis to allow a 19-inch (48.26 cm) chassis to be mounted in a standard 23-inch (58.42) rack.

Rb oscillator

Rubidium oscillator, typically used in Stratum 2 or Stratum 2E clock modules.

RJ-45

The 9-pin connector used for data transmission over flat or twisted standard telephone wire. Flat wire is used for serial data communications up to 19.2 Kbps to PBXs, modems, printers, or printer buffers. Twisted wire is used for connecting to a 10Base-T local area network. Connectors are keyed or non-keyed. Keyed male connectors have a *key* or small square bump on the end; keyed female connectors are shaped to accommodate the key.

RS-232

Also known as EIA/TIA-232-E. A set of standards specifying electrical, functional, and mechanical interfaces for communicating serially between computers, terminals, and modems. The interface established by EIA to specify functions of interchange circuits, electrical characteristics, and connectors.

RS-232-C

The industry standard for a 25-pin interface that connects computers with various forms of peripheral equipment; i.e., modems, printers, etc.

RS-232-D

An EIA-specified physical interface, with associated electrical signaling, between data circuit-terminating equipment (DCE) and data terminal equipment (DTE); the most commonly employed interface between computers and modems.

SDH

Acronym: Synchronous Digital Hierarchy.

SDU

Acronym: Synchronization Distribution Unit.

SE

Acronym: Synchronization Element.

SEM

Acronym: Synchronization Element Manager.

SNMP

Acronym: Simple Network Management Protocol.

SPI

A hardware and software interface that is used to communicate to any devices connected to a Telecom or network unit.

Serial Transmission
The sequential transmission of the bits constituting an entity of data over a data circuit.

Shielding
Protective enclosure surrounding a transmission medium, such as coaxial cable, designated to minimize electromagnetic leakage.

Simple Network Management Protocol (SNMP)
A system control interface that is based on a client server query-response mode. A manager is the client generating the queries, while an agent is the server generating the responses.

Slave Clock
A clock which is normally locked to a reference timing signal. Also referred to as *subtending*.

SONET
Acronym: Synchronous Optical NETwork.

SPI
Acronym: Serial Peripheral Interface.

SSM
Acronym: Synchronization Status Message.

SSP-IDCS
Acronym: Software Switching Platform Integrating DCS.

SSU
Acronym: Synchronization Supply Unit.

ST2E Rb Clock
Stratum 2E Rubidium clock module. Uses the Rubidium oscillator and meets or exceeds the performance requirements for ANSI and Telcordia Technologies (Bellcore) Stratum 2, ITU Type II and ETSI clocks.

Stratum 1
Stratum 1 is the highest quality or performance level in terms of accuracy and stability of a frequency source specified in T1.101, and refers to a Primary Reference Source.

Stratum Levels
Standard T1.101 defines levels of performance of clocks in a synchronized network in terms of accuracy and stability. Stratum 1 is the highest level of performance and stratum 4 is the lowest.

Synchronization
Timing of network transmissions by a master clock.

Synchronization Element Manager (SEM)
Software interface for managing performance, configuration, security, fault, alarm, and event reporting for synchronization elements.

Synchronization Status Message (SSM)
Sync Status Messages - Defined bits used to transmit the traceability of the sync reference signal and the quality of the clock being used to sync the outputs.

Synchronization Status Message (SSM)
Method by which synchronization network elements can communicate the traceability of their synchronization quality levels. SSMs take the form of identifiers embedded within the reference signals, and are used as synchronization sources for Timing Signal Generators (TSGs) and other network elements (NEs). The identifiers carry information about the quality of the synchronization source to which the particular synchronization signal is traceable. Identifiers also indicate whether the signal is available for use as a synchronization source. SSMs are especially useful in avoiding timing loops, while allowing the TSG or NE to autonomously reconfigure to the most suitable synchronization source available.

Synchronization Supply Unit (SSU)
Equipment that performs the function of reference timing signal selection, processing, and distribution that provides the frequency characteristics of slave clocks for telecommunications synchronization.

Synchronous Digital Hierarchy (SDH)
The ITU-T standard for synchronous data transport on optical interfaces, similar to the SONET standard.

Tbit/s
Acronym: TeraBits per second. 10^{12} bits/sec

TCP/IP
Acronym: Transmission Control Protocol/Internet Protocol.

TDEV
Acronym: Time Deviation.

TDM
Acronym: Time Division Multiplex.

Telcordia Technologies
Current name of the organization that was formerly Bellcore.

Time Deviation (TDEV)
A measure of the longer-term expected phase-time variations (wander) of a signal as a function of integration time. TDEV also provides information on the spectral content of the phase-time noise of a signal.

Time Division Multiplex (TDM)
Technology for sharing communication path between multiple sources, accomplished by transmitting a number of separate data, voice, or video signals simultaneously over one communications medium by sampling data, quickly interleaving sample (pieces of each signal), transmitting samples one after another, and reconstructing at the end. The goal is to pack more conversations of all data types onto fewer phone lines, in effect, substituting electronic capability for more copper line.

Time of Day (TOD)
Time and date information.

Timing Signal Generator (TSG)
Device which generates and distributes network synchronization signals, generally in a variety of waveforms.

Tip and Ring
Two wires, positive and negative, needed for a connection.

TL1
Acronym: Transaction Language One.

Transaction Language One (TL1)
A Telcordia interface standard used in the telecommunications industry for O, A, M, & P functionality.

Transmission Control Protocol/Internet Protocol (TCP/IP)
Two of the protocols from a suite of networking standards developed by the U.S. Department of Defense in the 1970s to support a global system of interconnected networks.

TSG
Acronym: Timing Signal Generator.

Turn up
Power up or on.

Universal Time Coordinated (UTC)
Time scale maintained by cooperating international agencies including the US Naval observatory, the Bureau International des Poids et Mesures, and the International Earth Rotation Service. UTC is the standard official time and forms the basis of a coordinated dissemination of standard frequencies and time signal.

Username
The name by which each user is known in the network administration. Each user must enter a username when logging in to identify the user to the network. Each username is also associated with a password, which validates the username, and an access level which determines the degree of access granted to the user.

VCXO

A crystal oscillator (Voltage Controlled Crystal Oscillator) whose clock frequency is determined by the magnitude of the voltage presented at its input. Such oscillators are typically a component of a hardware PLL or FLL.

Voice/Video over Internet Protocol (VoIP)

The VoIP Forum was established in 1996 by Cisco Systems as a working group of the International Multimedia Teleconferencing Consortium (IMTC).

VoIP SynCBR

Acronym: Voice/Video over IP Sync Constant Bit Rate.

Volt

A unit of measurement of electromotive force. A voltage is always expressed as the potential difference in available energy between two points. One volt is the force required to produce a current of one ampere through a resistance or impedance of one ohm. See *Direct Current*.

Watchdog Timer

Mechanism used to trigger an event or an escape from a process unless a timer is periodically reset. For example, a time may indicate the maximum period of time that a network connection will remain open before expiring.

Index

Numerics

A

B

C

| C—C |

Index

D

Index

E

F

G

Index

H

I

K

| L—O |

L

M

N

O

Index

P

W

Z

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