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

User Guide

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How to Use This Guide

This section describes the format, layout, and purpose of this guide.

In This Preface

- Purpose of This Guide
- Who Should Read This Guide
- Structure of This Guide
- Conventions Used in This Guide
- Warnings, Cautions, Recommendations, and Notes
- Related Documents and Information
- Where to Find Answers to Product and Document Questions
- What's New In This Guide

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Purpose of This Guide

The *SSU-2000 User's Guide* describes the procedures for unpacking, installing, using, maintaining, and troubleshooting the Symmetricom SSU-2000 Synchronization Supply Unit (SSU-2000). It also includes appendixes that describe alarms and events, the languages that you use to communicate with the SSU-2000, default values, and other information.

Who Should Read This Guide

Chapter 1, Product Overview, is written for non-technical audiences who need general information about the product. Chapter 2, Installing the SSU-2000, and subsequent chapters contain technical information about the product. Other chapters and appendixes describe installation, maintenance, and configuration instructions or details primarily intended for qualified maintenance personnel.

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

- **Systems Engineers** – Chapter 1 provides an introduction to the SSU-2000, Cross-references in this chapter direct you to detailed system information in other chapters as appropriate.
- **Installation Engineers** – Chapter 2 through Chapter 9 and the Appendices provide detailed information and procedures to ensure proper installation, turn-up, operation, configuration, and testing of the SSU-2000.
- **Maintenance Engineers** – Chapter 5 and the Appendices provide preventive and corrective maintenance guidelines, as well as procedures for diagnosing and troubleshooting fault indications and alarms.

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

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Structure of This Guide

This guide contains the following sections and appendixes:

Chapter, Title	Description
Chapter 1, Product Overview	Provides an overview of the product, describes the major hardware and software features, and lists the system specifications.
Chapter 2, Installing the SSU-2000	Contains procedures for unpacking and installing the product, and for powering up the unit.
Chapter 3, Provisioning and Operating the SSU-2000	Describes the ICS and TL1 commands required to provision the SSU-2000 after installing the unit.
Chapter 4, Commissioning	Provides 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 5, Maintenance and Troubleshooting	Contains preventive and corrective maintenance, and troubleshooting procedures for the product.
Chapter 6, Clock Module Reference Data	Provides detailed information on the Communications module and the various Clock modules available for use in the SSU-2000.
Chapter 7, Input Module Reference Data	Contains detailed information on the Input modules available for use in the SSU-2000.
Chapter 8, Output Module Reference Data	Describes the Output modules available for use in the SSU-2000 and in the SDU-2000.
Chapter 9, Hardware Configuration Guide	Describes how to configure the SSU-2000 in several modes, and lists part number for shelves, modules, and accessories.
Appendix A, Alarms and Events	Lists the alarms and events that appear on the console and provides basic indications of the source of the alarm.
Appendix B, Communications Protocol	Describes how to use the CRAFT software interface with the TimeProvider.
Appendix C, Antennas	Provides procedures for installing a GPS antenna and connecting it to the SSU-2000.
Appendix D, Connector Pinouts	Lists the pinout of the connectors on the rear panel of the SSU-2000.
Appendix E, Default Settings	Includes a list of the factory default values for hardware and software parameters.
Appendix F, Specifications	Lists the specifications for the SSU-2000
Appendix G, Reference Materials	Contains a listing of standards related to synchronizing telecommunications networks.

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Chapter, Title	Description
Appendix H, Updating Clock Module Software	Contains procedures for updating the software in the Clock modules using Downloader.exe and SynCraft.
Index	Provides references to individual topics within this guide.

Conventions Used in This Guide

This guide 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.
- **Revision Control** – The title page lists the printing date and versions of the product this guide describes.
- **Typographical Conventions** – This guide uses the typographical conventions described in the table below.

When text appears this way...	... it means:
SSU-2000 User's Guide	The title of a document.
SSU **CRITICAL** **IOC1**	An operating mode, alarm state, status, or chassis label.
Select **File**, **Open**...	Click the Open option on the File menu.
Press **Enter** Press **;**	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` `Username:`	Text in a source file or a system prompt or other text that appears on a screen.
`PING` `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 word or term being emphasized.
Symmetricom ***does not*** recommend...	A word or term given special emphasis.

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Warnings, Cautions, Recommendations, and Notes

Warnings, Cautions, Recommendations, and Notes attract attention to essential or critical information in this guide. The types of information included in each are explained in the following examples.



Warning: To avoid serious personal injury or death, *do not* disregard warnings. All warnings use this symbol. Warnings are installation, operation, or maintenance procedures, practices, or statements, that if not strictly observed, may result in serious personal injury or even death.



Caution: To avoid personal injury, *do not* disregard cautions. All cautions use this symbol. Cautions are installation, operation, or maintenance procedures, practices, conditions, or statements, that if not strictly observed, may result in damage to, or destruction of, the equipment. Cautions are also used to indicate a long-term health hazard.



ESD Caution: To avoid personal injury and electrostatic discharge (ESD) damage to equipment, *do not* disregard ESD cautions. All ESD cautions use this symbol. ESD cautions are installation, operation, or maintenance procedures, practices, conditions, or statements that if not strictly observed, may result in possible personal injury, electrostatic discharge damage to, or destruction of, static-sensitive components of the equipment.



Electrical Shock Caution: To avoid electrical shock and possible personal injury, do not disregard electrical shock cautions. All electrical shock cautions use this symbol. Electrical shock cautions are practices, procedures, or statements, that if not strictly observed, may result in possible personal injury, electrical shock damage to, or destruction of components of the equipment.



Recommendation: All recommendations use this symbol. Recommendations indicate manufacturer-tested methods or known functionality. Recommendations contain installation, operation, or maintenance procedures, practices, conditions, or statements, that provide important information for optimum performance results.



Note: All notes use this 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.

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Related Documents and Information

Other helpful documents and software tools are listed below. See your Symmetricom representative or sales office for a complete list of available documentation.

- SynCraft management software
- TimePictra management software



Note: Symmetricom offers training courses designed to enhance your knowledge of the SSU-2000. Contact your local representative or sales office for a complete list of courses and outlines.

Where to Find Answers to Product and Document Questions

For additional information about the products described in this guide, please contact your Symmetricom representative or your local sales office. You can also contact us on the web at www.symmetricom.com.

What's New In This Guide

Revision D.01 of this guide corrects information in Initial Provisioning, on page 96 and in High-Density Wire-Wrap Output Panels, on page 223, and adds the command RTRV-PRMTR-OUT422, on page 299. A new appendix, Appendix H, Updating Clock Module Software, describes how to upgrade the Clock module software.

Revision D of this guide contains the following new information:

- New format and typography to make the text easier to read
- New section for provisioning the SSU-2000 at startup, see Initial Provisioning, on page 96
- New sections for the RS-422 Output module, the 2048 kHz Output module, and the Type 1 Clock module
- Expanded command information in Appendix B, Communications Protocol.
- Expanded Index

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Chapter 1 Product Overview

This chapter describes the SSU-2000, and provides a theory of operation for the unit. The SDU-2000 expansion shelf is introduced and described.

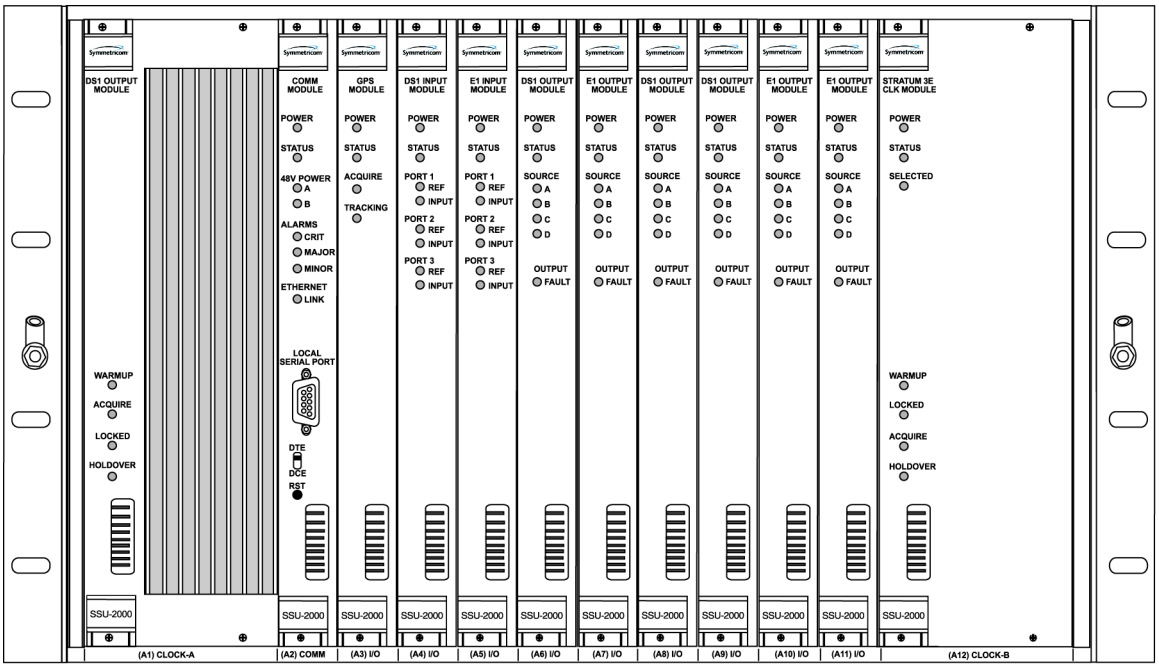
In This Chapter

- Overview
- Typical System Configurations
- System Architecture
- System Components
- Communications Protocol
- Overview of SSU-2000 Operation
- Indicators and Controls
- SDU-2000 Synchronization Distribution Unit

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Overview

The SSU-2000 Synchronization Supply Unit (SSU-2000), shown in Figure 1-1, is a high-performance, Synchronization Status Messaging (SSM)-compliant Timing Signal Generator (TSG) or Synchronization Supply Unit that provides network synchronization signals for the telephone and telecommunications industry.



ss200006

Figure 1-1. SSU-2000 Synchronization Supply Unit

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

The SSU-2000 is designed to comply with the application flexibility and redundancy concepts introduced in Telcordia Technologies (formerly Bellcore) GR-2830. A selection of hot-swappable modules and powerful software allow users to easily reconfigure, upgrade, or expand the SSU-2000 to meet a variety of telecommunications synchronization application requirements.

The SSU-2000 fully supports Synchronization Status Messaging (SSM) as defined by ANSI, Telcordia Technologies, ITU, and ETSI.

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

The SSU-2000 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 user-set threshold (usually 2 thresholds are provided). Each event can be assigned by the user to one of four modes, including IGNORE, REPORT, ALARM, or FAIL.

Typical System Configurations

The modular design of the SSU-2000 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

Timing Signal Generator (TSG) Configuration

The Timing Signal Generator (TSG) configuration shown in Figure 1-2 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.

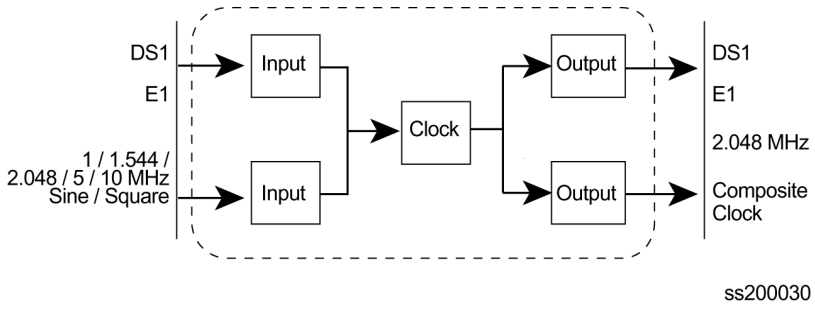


Figure 1-2. SSU-2000 Configured as a TSG

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Primary Reference Source (PRS) Configuration

In a Primary Reference Source (PRS) configuration (Figure 1-3), the SSU-2000 meets the specifications defined 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, and various clock frequencies. Time-of-day functionality is available through an Ethernet port employing NTP.

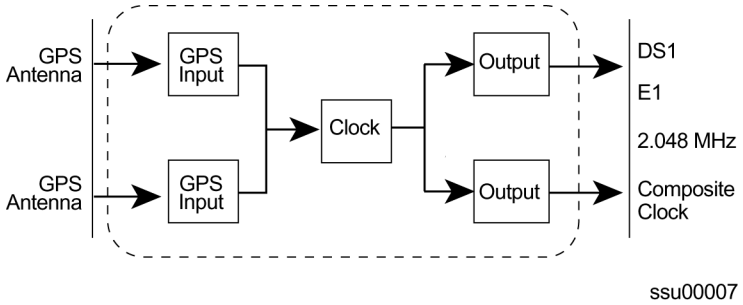


Figure 1-3. SSU-2000 Configured as a Primary Reference Source

SSU-2000 Configured as a Monitor-Only System

The SSU-2000 can also be configured as a monitor-only system (Figure 1-4) 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-2000 continuously monitors the integrity of the incoming timing signal. The operator defines input acceptance criteria and sets parameters for alarming. When the incoming signal is acceptable (within the performance limits set by the operator), the SSU-2000 phase-locks to the signal on a priority basis.

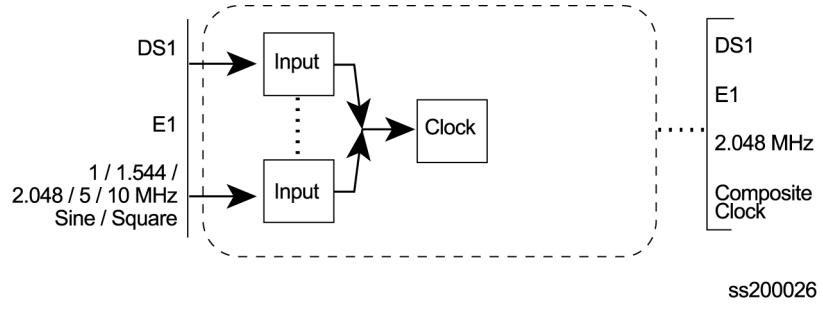


Figure 1-4. SSU-2000 Configured as a Monitor-Only System

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System Architecture

The SSU-2000 system is a Timing Signal Generator that generates, monitors, controls, and distributes network synchronization signals. These signals can be DS1, E1, Composite Clock (CC), sinusoids, or square waves. The SSU-2000 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-2000 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-2000's internal clock modules (Stratum 2E or Stratum 3E).

A selection of hot-swappable modules and powerful software allows users to easily configure, upgrade, or expand the SSU-2000 shelf to meet a variety of telecommunications synchronization application requirements. Modules can be inserted or removed from the SSU-2000 while the shelf is operational without any 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 block diagram for the SSU-2000 is shown in Figure 1-5.

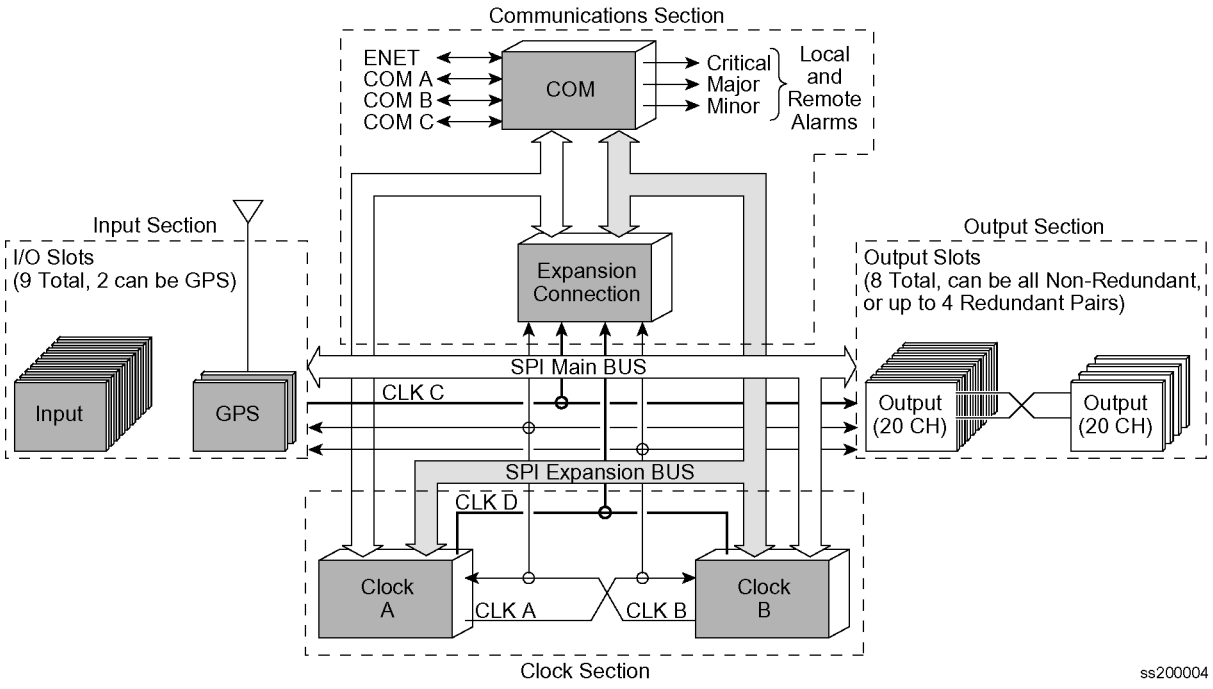


Figure 1-5. Block Diagram of the SSU-2000

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As indicated in Figure 1-5, the SSU-2000 consists of four major sections:

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

Input Section

The input section consists of one to nine Input modules to which you connect reference signals that are tested for signal integrity; the Input modules are described in Chapter 7, Input Module Reference Data. You provision each input using the ICS INPUT and REF commands or the TL1 SET-PRMTR-INPUT and SET-INPUT-REF commands.

The Input modules measure the phase between the input signal and the clock oscillator(s). From these phase measurements, the DS1/E1 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-2000 and reported through the Communications module. You can install one or two GPS Input 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
- Composite Clock

Selecting the Input

Many factors influence which input reference the SSU-2000 uses:

- Priority
- PQL/SSM
- Switching mode
- User-assigned Input State
- Active alarms on an input

You can provision the SSU-2000 to automatically select the highest-quality input signal, or you can manually select the input signal you want to use. Two factors determine the quality of the input: the user-defined Priority level, and the PQL/ SSM. These factors are used to determine which input is used, and what happens if that input becomes disqualified.

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Priority Level

You can assign a Priority level to each input; this value helps determine which input is used as the system reference. The range is 0 to 10; the lower the Priority level, the higher the priority. Use the TL1 command SET-PRMTR- INPUT or the ICS command INPUT to provision this parameter. See Setting the Input Selection Mode, on page 33, for details on using the Priority level.

SSMs and Quality Level

Synchronization Status Messages (SSMs) may be included in the bit stream of the incoming signal to indicate its quality level. To read the incoming SSM, you must provision the input to read the SSM; for E1 signals, you must also provision the bit position of the incoming SSM. Use the TL1 command SET-PRMTR-INPUT or the ICS command INPUT to provision these parameters.

If the incoming signal does not include SSMs, or if you disable them, then you can provision the Quality Level to an appropriate value. The PQL value is used in the same manner as the incoming SSM to determine which input is used when the active input is disqualified. SSMs are described in more detail in Synchronization Status Messages (SSMs), on page 53.

Setting the Reference Switching Mode

Telcordia GR-378 and GR-1244 define two reference selection modes: Revertive and Non-revertive. In the Revertive mode, if an input used as the system reference is disqualified (for any reason), the reference switches to the next-highest input and reverts to the initial input when that input is re-qualified. In this mode, the reference switches two times: once when the disqualifying event occurs, and again when the initial input is re-qualified. In the Non-revertive mode, the system reference switches to the next-highest input but does not revert to the initial input when the initial input is re-qualified. The system reference switches only once when the disqualifying event occurs.

The ICS command REF and the TL1 command SET-INPUT-REF allows you to set the reference switching mode to AutoReturn, AutoSwitch, or OFF. The AutoReturn mode is Revertive, and enables automatic switching with automatic return to the input with the highest Priority or PQL level. The AutoSwitch mode is Non-revertive; the reference automatically switches to the next-highest input on failure of the selected input. When set to OFF, only manual switching is allowed. If the selected reference input is disqualified for any reason, the clock enters the Holdover mode and you must correct the fault and re-provision the reference input.

Setting the Input Selection Mode

The ICS command REF and the TL1 command SET-INPUT-REF determine what type of reference input selection and reference switching is used. You can set the input selection to either Priority or PQL. The reference switching mode is either Autoreturn, Autoswitch, or No switching.

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After you select the reference switching mode, 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 outputs.

If you select *Priority* mode, the SSU-2000 selects the input reference with the highest user-defined Priority setting; if all inputs have the same Priority level, then the input with the highest PQL (quality level, SSM) is used.

If you select *PQL* mode, the SSU-2000 selects the input reference with the highest assigned PQL level or associated SSM; if all inputs have the same PQL/SSM value, then the input with the highest Priority levels is used. 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.

In either mode, when the Priority and PQL values are equal for each input, the physical location of the Input module determines the priority for selecting the input reference. Port 1 on the Input module in the leftmost slot has the highest priority; the priority decreases to port 1 on the Input module in the rightmost slot. Port 2 on the module in the leftmost slot has the next lower priority, decreasing to Port 2 on the Input module in the rightmost slot. Port 3 on the module in the leftmost slot has the next lower priority, and Port 3 on the module in the rightmost slot has the lowest priority.

If the Input module is configured for provisioned mode, it reports the user-assigned SSM. If it is configured for automatic mode, the Input module uses the most recent valid SSM. If a valid SSM is not received, the module uses the user-assigned SSM.

Setting an Input Alarm Strategy

You can provision the SSU-2000 to elevate input alarms to the next higher level after a specified amount of time. You can also specify that an alarm clears automatically after a specified period of time without the alarm condition. For more information on alarms, see Alarms and Events, on page 36.

Bypass Clock (Clock C)

In the event that both Clock modules fail, an input connected to a D1, E1, or Composite Clock Input module can serve as the system reference. The input must be a valid reference, and it must have a Priority setting. When the Bypass clock is the active reference, then the output signal is not filtered and any wander or jitter on the input signal appears on the outputs. The Bypass clock is intended only for short-term use; you should resolve the failures on the Clock modules as quickly as possible.

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Output Section

The output section contains from one to six (three redundant pairs) Output modules in the main shelf and up to 56 (28 redundant pairs) Output modules in a fully expanded system with four SDU-2000 expansion shelves. Each Output module type provides 20 independent 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

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 back-up 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-2000 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). Clock modules may be Stratum 2E and Stratum 3E. Outputs are maintained by the active input reference signal if both clocks should ever fail or be removed from the system.

Communications Section

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

The master controller function for the SSU-2000 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.

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The Communications module communicates with the other modules in the SSU-2000 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 provides an interface between the user and the SSU-2000 system. This interface allows the user to display and control much of the activity in the SSU-2000 system and within the optional SDU-2000 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 (ASCII, TL1, or packet).

The software in the Communications module allows for on-site reprogramming of the flash ROM and reconfiguration of all programmable logic devices. 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-2000 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-2000 with power already applied and with other modules installed, the Communications module reads the configuration of the modules in the SSU-2000 and the modules in all installed SDU-2000 expansion shelves. This information is saved in nonvolatile memory in the Communications module. If power is applied to the SSU-2000 after the Communications module is installed, it initializes before of 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 removed from the shelf.

Alarms and Events

The SSU-2000 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 generated when a parameter which exceeds a user-set 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-2000 system are reported by three methods, including:

- Display on the module LEDs
- Relay contact closures on the rear panel of the SSU-2000 main shelf
- Messages transmitted on all communications ports

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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, a 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. See the `Config` command in Appendix B, Communications Protocol.

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.

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.

Report Mode

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

An ALARM command is available in the SSU-2000 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 the 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.

Alarm Mode

The user sets an alarm to one of three levels of alarm severity: MINOR, MAJOR or CRITICAL. In general, events which are classified as ALARMS are those for which user intervention is required. MINOR and MAJOR alarms can be elevated automatically to the next higher level after a user-set time period.

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The unit 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 5 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.

Fail Mode

In the FAIL mode, the SSU-2000 removes the failed module from service or usability to prevent interruption of the system. For example, a FAIL event detected in Clock A causes 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.

System Components

A fully expanded SSU-2000 installation contains the following physical components:

- SSU-2000 Main shelf populated with various combinations of Clock, Input, Output and Communications modules
- Input and Output Adapter panels
- Up to four SDU-2000 Expansion shelves containing Buffer and Output modules



Note: For additional information about each of the module types, see Chapter 6, Clock Module Reference Data, Chapter 7, Input Module Reference Data, and Chapter 8, Output Module Reference Data. See Chapter 9, Hardware Configuration Guide, for component part numbers and guidelines for configuring a new system.

SSU-2000 Main Shelf (Chassis)

The SSU-2000 main shelf (shown in Figure 1-6) contains a metal chassis and a motherboard with provisions for supporting up to 12 hot-swappable modules. Filler panels are available for use in shelves that are not fully populated.

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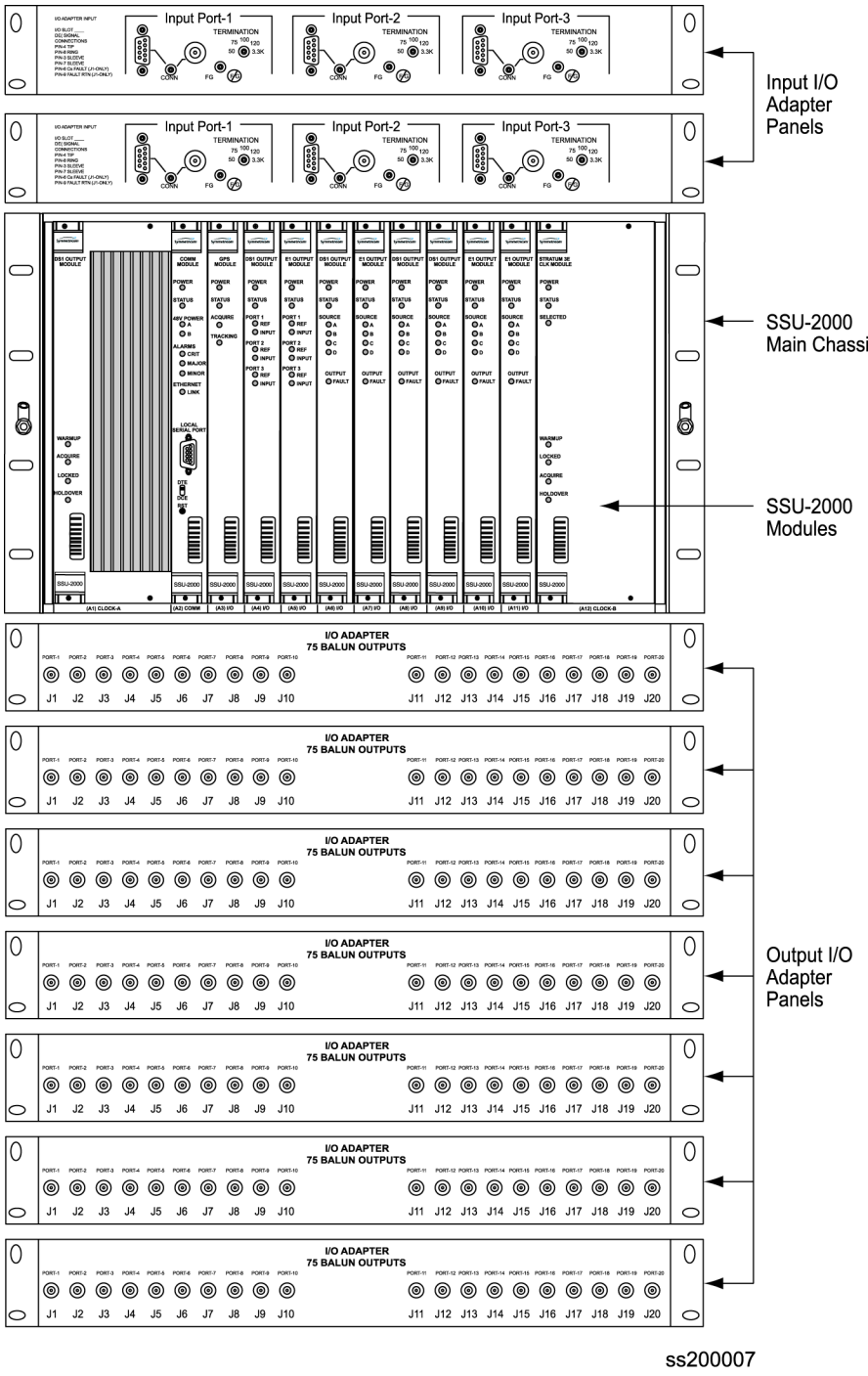


Figure 1-6. Components in a Typical SSU-2000 Installation

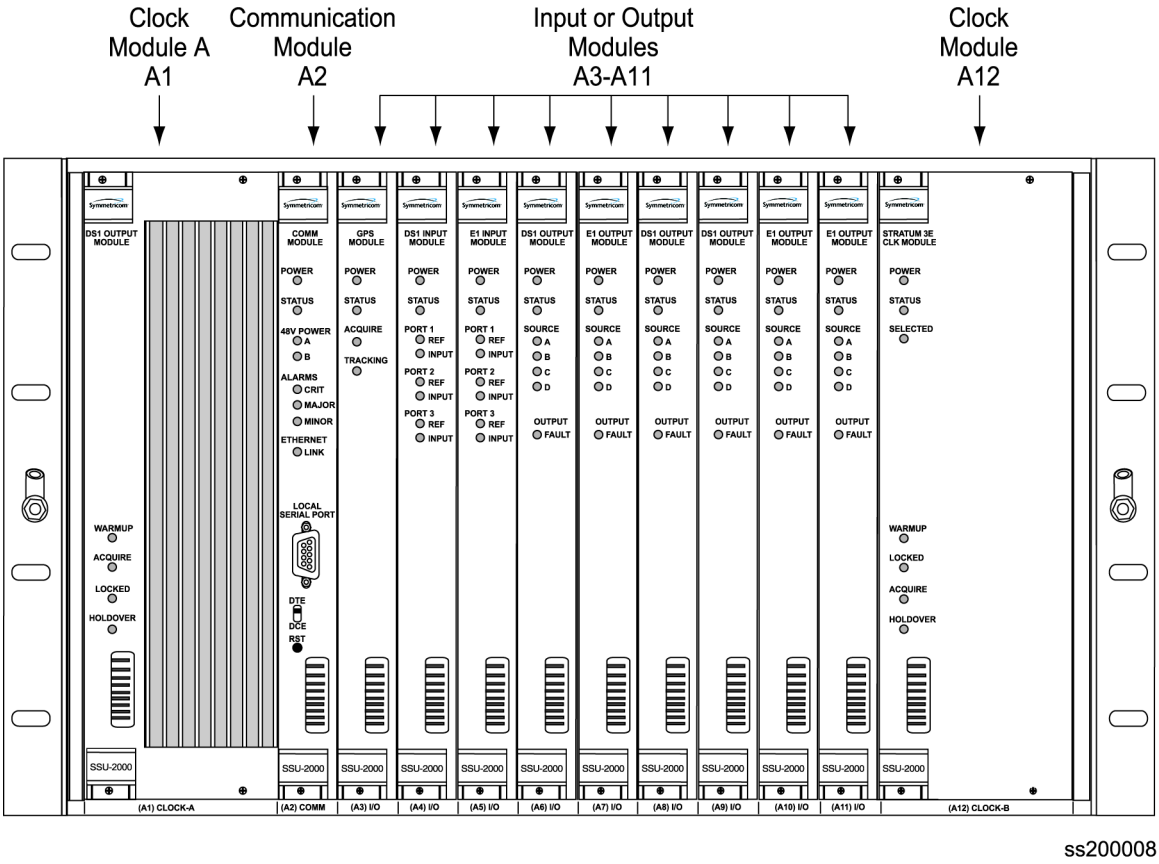
Module Assignments

All SSU-2000 modules are equipped with card ejectors and plug in from the front of the shelf. Each module is secured in the shelf with captive fasteners.The module assignments for the SSU-2000 main shelf are listed in Table 1-1 and are shown in Figure 1-7.

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Table 1-1. Slot Assignments for Specific Modules

Slot	Module
A1	Clock Module A
A2	Communications Module
A3-A11	Input or Output Modules
A12	Clock Module B



ss200008

Figure 1-7. Slot Numbering Assignments

As indicated in Figure 1-7, the SSU-2000 modules are installed in slots A1 through A12, numbered left to right as viewed from the front of the shelf. 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 secondary clock module (Clock B).

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Main Shelf Connections

The rear panel of the main shelf contains the connection terminal strips, BNC connectors, and SCSI-II connectors that are used to connect the SSU-2000 to other system components. These connection features are described in Figure 1-8.

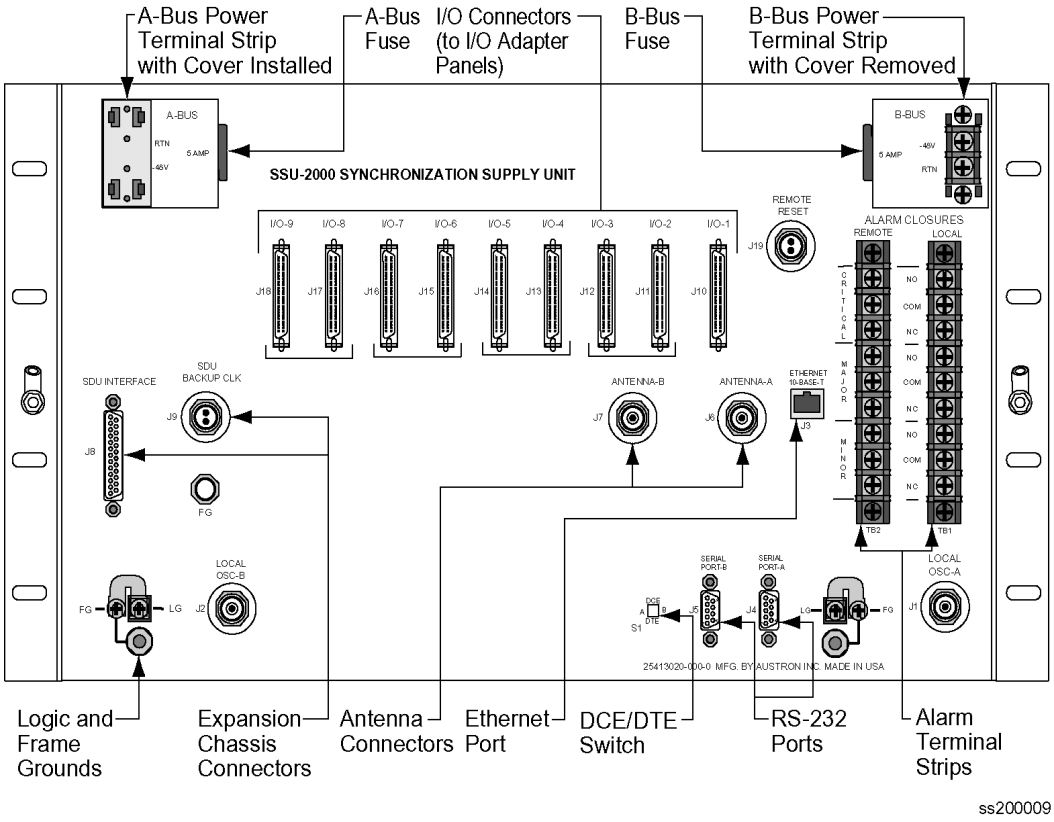


Figure 1-8. Rear Panel of the SSU-2000 Main Shelf

The SSU-2000 main shelf connection features include:

- I/O connectors (I/O-1 through I/O-9)- 50-Pin, Micro-D female connectors (SCSI-II type) used for connecting the I/O adapter panels to the SSU-2000. Each I/O connector is associated with a specific I/O module slot. I/O adapter panels are available to convert the 50-Pin, Micro-D female connectors to telecommunications standard Balun (balanced/unbalanced) or DE9 connectors, see Appendix D, Connector Pinouts, for additional details
- Dual set of power terminals and dual set of grounding lugs for connecting external power and grounding to the SSU-2000 system
- Three communications ports including two serial port connections (Serial Port-A and Serial Port-B) and one RJ-45 Ethernet connector (Ethernet 10-Base-T). Another serial communication port is also available on the front of the Communications module
- DTE/DCE switch is a 2PDT slide switch (S1) that allows the user to select either DTE or DCE type of serial port interface.

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- Reference inputs and clock outputs
- Local and remote alarm contact closures, divided into three classes:
  - CRITICAL Alarms – Indicates an immediate service-affecting condition that requires immediate user intervention (such as loss of Communications module, loss of input power to the shelf, etc.). When a critical alarm condition is detected, the CRITICAL ALARM relay is activated (alarm condition) and the CRITICAL ALARM LED on the front of the Communications module lights red unless power was interrupted. In this case the unit no longer has power.
  - MAJOR Alarms – Indicates a condition that may require immediate user intervention. When a major alarm condition is detected, the major alarm relay on the rear panel of the SSU-2000 is activated and the MAJOR ALARM LED on the front of the Communications module lights red.
  - MINOR Alarms – Indicates that the unit performance is degrading. The minor relay is activated and the MINOR ALARM indicator lights.
- Two local oscillator connections – Local OSC-A and Local OSC-B are normally used as outputs to feed other equipment but can also be used as inputs when the shelf is configured with plug-in modules as a monitor only.
- Two antenna connectors – used to attach radio receiver antennas. The A antenna connector (J6) connects to slot 1A3; the B antenna connector (J7) connects to slot 1A5
- Interface connector for the optional SDU-2000 Synchronization Distribution Unit (output signal expansion system). Up to four expansion shelf can be connected in daisy-chain fashion to an SSU-2000 shelf. A termination plug must be installed on this connector if not using the expansion shelf.
- SDU Backup Clock (D-clock) that can be used in the expansion shelf in the event of the loss of clock A or B. The shelf also has optional rack mounting ears for mounting in 19 inch EIA, 23 inch EIA and AT&T, and ETSI racks and cabinets.

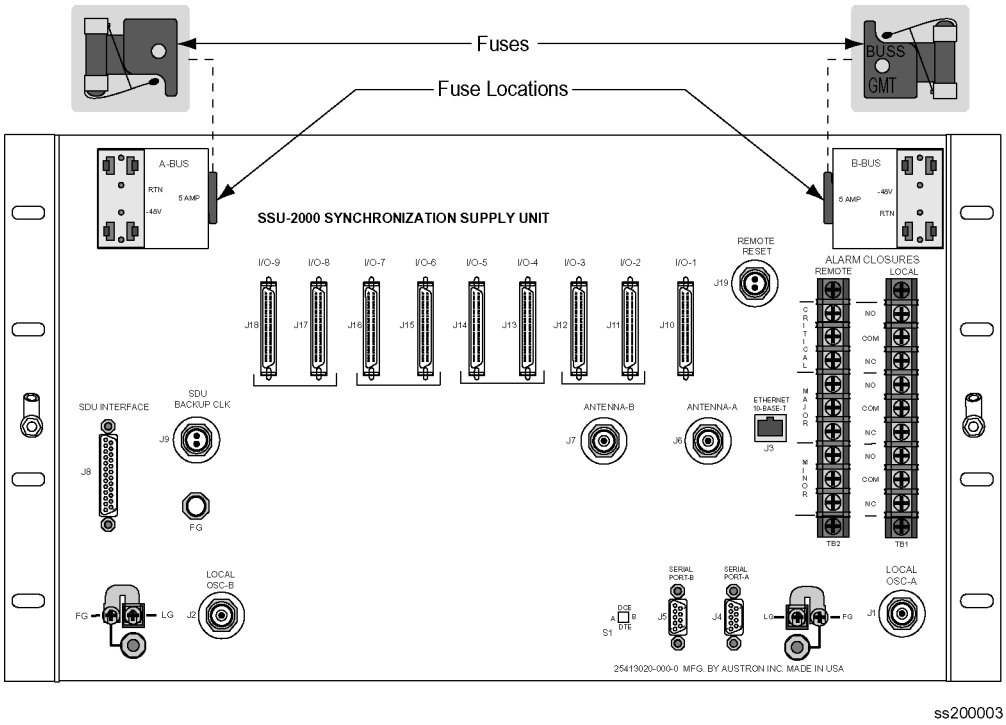
Main Shelf Power Distribution

The main shelf accepts redundant –48 vDC power inputs from external supplies and makes these inputs available to the modules via the motherboard connectors anytime the 5-Amp fuses are installed on the rear of the SSU-2000 main shelf.

An On/Off switch is not provided, preventing anyone from accidently shutting down the system. To shut down the system, the two fuses (Power Supply A and Power Supply B fuses) must be physically removed from the rear panel of the shelf (see Figure 1-9). If only one fuse is removed, the system senses the loss of the power input and switches to the second power input.

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All power supplies for the SSU-2000 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). Screw type lugs on the rear of the shelf are used for logic and shelf ground connections.



ss200003

Figure 1-9. Location of Power Fuses on the Rear Panel

Antenna Connectors

The SSU-2000 contains two TNC connectors to allow for connection of a radio antenna. Connector J6 is wired into I/O slot A3 and connector J7 is wired into I/0 slot A5 (the only slots that can be used for installing a Radio input module). A variety of GPS antennas are available as accessories for the SSU-2000, see Appendix C, Antennas.

Communication Ports

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

- Two RS-232 communication ports (Port A and Port B) on the rear panel of the main shelf
- One RS-232 port on the face of the Communications module (Port C)
- One RJ-45 Ethernet connector on the rear panel of the SSU-2000 (Ethernet 10-Base-T) for network connection

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A user interface (software residing in the Communications module) provides various levels of password-protected access for configuration, detailed performance monitoring, and diagnostics. Refer to Appendix B, Communications Protocol, for more information on configuration and detailed performance monitoring. Remote EIA-232-C ports can be assigned their own interface type, either Interactive Command Set (ICS) or TL1 that is retained in NVRAM. The Local port (Port C on the Communications module) is always in ICS mode when the Communications module restarts.

Main Shelf Power Connections

The SSU-2000 main shelf contains provisions for connecting redundant –48 vDC external power inputs (designated A and B input power). The power supplies, located on the internal modules, can accept input power in the range of –37 to –72 vDC.

Each power input to the main shelf is accomplished using a 2-connection terminal strip, with the negative side fused. Both connections are isolated from frame and signal grounds.In the event of the loss of either the A or B input, the system senses the loss of power, reports the loss of the power input and continues normal operation on the remaining power input. If both power supply inputs are lost, the Critical Alarm relay de-energizes to the alarm state and a Critical alarm is reported.

Main Shelf Frame/Logic Grounds

Screw type lugs on the rear of the shelf are used for logic and shelf ground connections. Grounding for integrated or isolated ground planes are supported by two user-configured hardware straps.

SSU-2000 Family of Modules

The SSU-2000 family of modules includes the following:

- Stratum 2E Clock Module
- Stratum 3E Clock Module
- Type 1 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
- RS-422 Output Module
- E1 Output Module
- DS1 Output Module
- Composite Clock Output Module

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Some of the 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.
- All modules have front panel status LEDs.
- All modules are equipped with ejector tabs for ease of installation and removal and secured in place with captured screws to provide module security and reduce the occurrence of unauthorized removal.
- All SSU-2000 modules have an integrated CPU with firmware and are software configurable.

Each module slot also has three pins connected together on its assigned Hybrid DIN connector which permits the system to detect when a particular module is removed. More information is available for each of these modules in Chapter 7, Input Module Reference Data.

Clock and Communications Modules

Stratum 2E Clock Module

The Stratum 2E Clock module uses a Rubidium oscillator and meets the requirements of ANSI and Telcordia Industries (Bellcore) for Stratum 2 clocks. This clock also meets the ITU-T and ETSI specifications for Type II Transit Node clocks.

The module reads measurement data from the input modules, provide frequency control of its oscillator through DDS circuitry, and generates a reference signal used by the input and output modules. The clock module also maintains phase synchronization with the redundant clock module. For more information, see Stratum 2E Clock Module, on page 128.

Stratum 3E Clock Module

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

The Stratum 3E Clock Module reads measurement data from the Input modules, provide frequency control of the oscillators through DDS circuitry, and generates a reference signal used by the Input and Output modules. The Clock module maintains phase synchronization with the redundant Clock module. Its hardware and software also provides for temperature compensation, aging compensation for quartz oscillators, an initial offset adjustment, and frequency adjustment resolution of 1×10^{-13} or better. For more information, see Stratum 3E Clock Module, on page 132.

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Type 1 Clock Module

The Type I Clock module uses a quartz oscillator which meets or exceeds the performance requirements for ITU and ETSI Type I Slave clocks.

The Type I Clock module reads measurement data from the Input modules, provides frequency control of the oscillator through DDS circuitry, and generates reference signals used by the Input and Output modules. For more information, see Type 1 Clock Module, on page 136.

Communications Module

The Communications module serves as the user interface to the SSU-2000. The module command interface supports three EIA-232-C connections and one Ethernet interface for communication with the SSU-2000 system. This module also logs the unit events into non-volatile memory for inspection at a later date and reports alarms as they occur. For more information, see Communications Module, on page 140.

Input Modules

1-Port and 3-Port DS1/E1 Input Modules

The DS1 and E1 Input modules are available with both 1-Port and 3-Port configurations. These modules receive signals and perform phase measurement comparisons with the Clock modules that are installed in the SSU-2000. 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 DS1 and E1 Input modules accept the following signals: sine or square wave (with frequency of 1, 1.544, 2.048, 5 or 10 MHz) or framed communications type DS1 or E1. If the input signal is a communications type, the module monitors the following errors:

- Alarm Indication Signaling (AIS)
- Bipolar Violations (BPV)
- Cyclic Redundancy Check (CRC)
- Loss of Signal (LOS)
- Out Of Frame (OOF)

The module also extracts Synchronization Status Messages (SSM) from incoming data. For more information, see 1-Port and 3-Port E1 Input Modules, on page 148, and 1-Port and 3-Port DS1 Input Modules, on page 157.

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GPS Input Module

The GPS Input module is a one-port card that can only be installed in the SSU-2000 main shelf. The module is used to correct the frequency of the oscillator on the Clock module. It monitors and reports the status and performance of the module and radio signals that it receives. See GPS Input Module, on page 166, for more information.

You must install this module in slot A3 or A5; the antenna connectors J6 and J7 on the rear panel are connected to these slots, respectively.

Composite Clock Input Module

The Composite Clock Input module conditions a composite clock input signal that is used to control the frequency of the Clock modules. For more information, see Composite Clock Input Module, on page 169.

When the SSU-2000 is in the Subtending mode, the module also produces a 4 kHz synchronization signal that determines the phase of the composite clock signals generated by Composite Clock Output modules. This signal ensures that the phase of the composite clock output signals follows the phase of the composite clock input reference signal.

Output Modules

E1 Output Module

The E1 Output module uses one of three 4 kHz clocks from the SSU-2000 main shelf backplane to generate a phase-locked signal of 2.048 MHz. If the unit is inserted into an SDU-2000 expansion shelf, a fourth 4 kHz clock (D clock) is available. The phase-locked 2.048 MHz signal is used to generate a set of 20 output signals for distribution to large networks. See E1 Output Module, on page 178, for more information.

DS1 Output Module

The DS1 Output module generates a phase-locked signal of 1.544 MHz using one of three 4 kHz clocks from the backplane of the SSU-2000 main shelf. If the module is inserted into the SDU-2000 Synchronization Distribution Unit (expansion shelf), a fourth 4 kHz clock is available. The phase-locked signal generates a set of 20 output signals for distribution to large networks. DS1 Output Module, on page 182, contains detailed information on the module.

Composite Clock Output Module

The Composite Clock (CC) Output module can be installed in the SSU-2000 to generate and monitor CC signals, monitor input reference signals, accept new configuration data, and report status. This module provides 20 signal pairs (TTIP and TRING signal pairs), which are referenced to the selected clock signal. For more information, see Composite Clock Output Module, on page 185.

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E1/2048 kHz Output Module

The E1/2048 kHz Output module can be installed in the SSU-2000 to generate and monitor 20 independent E1/2048kHz output signals. If the module is inserted into an SDU-2000 expansion shelf, a fourth 4 kHz clock (D clock) is available. If the input signal PQL drops below a user-specified level, then the outputs can be squelched. For more information, see E1/2048 kHz Output Module, on page 189.

2048 kHz Output Module

The 2048 kHz Output module plugs into selected input/output slots in the SSU-2000 main shelf or one of the output slots on the expansion shelf. The module generates and monitors 20 independent 2048 kHz signals that are referenced to a selected clock module. The 2048 kHz Output module receives a set of three (four if installed in an expansion shelf) 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. For more information, see 2048 kHz Output Module, on page 196.

RS-422 Output Module

The RS-422 Output module generates 10 balanced square-wave outputs (TTIP and TRING signal pairs) and 10 single-ended (Ring) square-wave outputs. Each output can be turned off independently of other ports; relays on each output disconnect the driver output from the output pins. A squelch feature turns off selected ports when the input signal falls below predetermined quality levels. See RS-422 Output Module, on page 202.

Line Retiming Unit LRU

The LRU is comprised of a Line Re-timing Module (LRM) and a Cut-Through Assembly (CTA). The LRU is available in both a two-port (Dual) and four-port (Quad) version. For more information, see Line Retiming Unit (LRU), on page 208.

The DS1 LRU inserts DS1 signals on both sides of a DSX-1 panel in a Central Office. Side 1 of the DS1 re-timer provides “3R” (Re-shape, Re-amplify, and Re-time) for the DS1 signal to a client Network Element. When the LRU receives a DS1 data stream, it re-times the data with the transmit clock signal. The clock signal is inserted into the DS1 line route between two DS1 path-terminating elements. Side one is the direction in which timing is applied. Side 1 contains the DS1 line performance reporting and AIS generator. AIS is not generated when the port is set to Unused/Off. Side 2 provides “2R”, which Re-shapes and Re-amplifies (regenerates) the DS1 signal from the client Network Element. Side 2 does not provide performance monitoring or AIS generation.

Configuring Redundant Output Modules

For an A/B pair of Output modules (in a redundancy configuration), it is possible to connect all of the outputs of Module B to the corresponding outputs of Module A, providing 1:1 output protection (1:1 redundancy). Figure 1-10 shows the SSU-2000 input/output connectors.

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This requires the use of a user-installed Output Summer connector. Using this connector, you can configure Output pairs I/O-2–I/O-3, I/O-4–I/O-5, I/O-6–I/O-7, and I/O-8–I/O-9 in redundant mode. See Installing Output Summer Adapters, on page 70, for more information on making redundant connections.

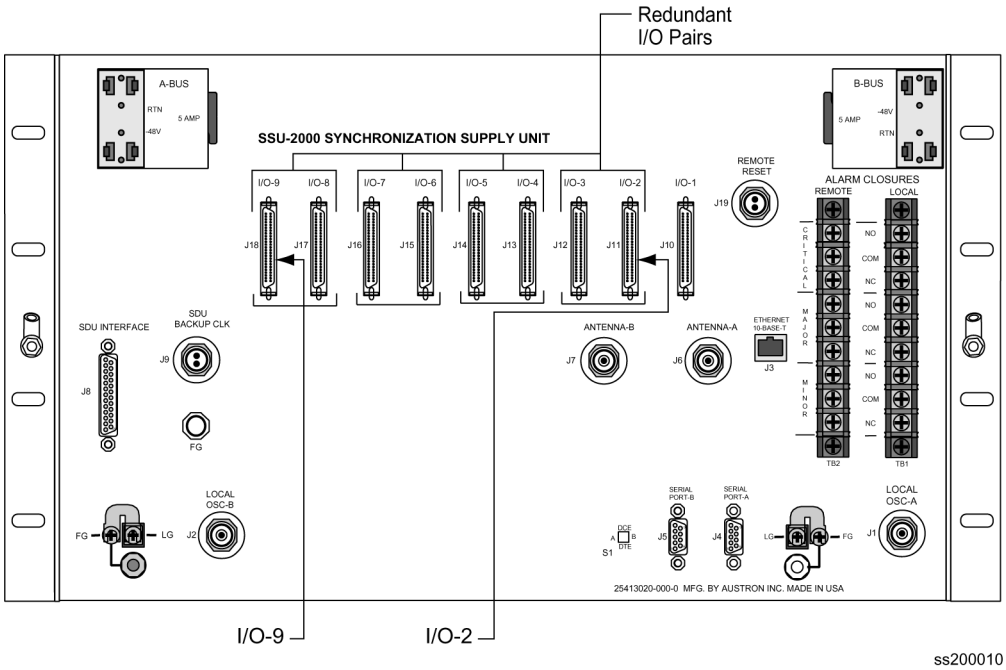


Figure 1-10. SSU-2000 Input/Output Connectors

Input and Output Adapter Panels

All Input and Output module signals connect to/from the rear panel of the main shelf (and expansion shelf) using 50-pin SCSI II type connectors.

To adapt signals from 50-pin SCSI connectors to conventional BNC (Balun) and 9-pin D-sub connections, you use Input and Output Adapter panels (I/O Adapter panels) that install in the rack either directly above or directly below the main or one of four possible expansion shelf.

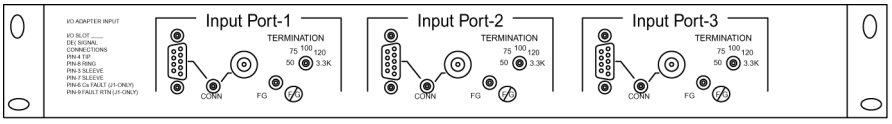
All SSU-2000 connections are made on the rear of the Adapter panels; the connections to the telecommunications system are on the front of the Adapter panels.

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There are four adapter panels available for use with the SSU-2000 Input and Output modules including:

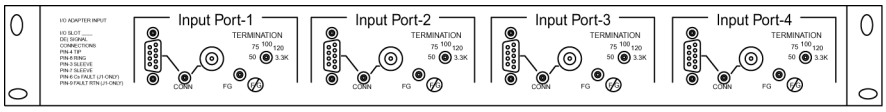
- Input I/O adapter for 3-port Input modules (DS1 or E1) – one adapter panel is required for each 3-port Input module used in the system.
- Input I/O adapter for 1-port Input modules (DS1 or E1) – one adapter panel serves up to four 1-port Input modules.
- Output I/O adapter for Output modules (75 ohm Balun Outputs) – one adapter panel accommodates one output module (non-redundant) or one pair of redundant modules.
- Output I/O adapter for Output modules (D9 outputs) – one adapter panel accommodates one Output module (non-redundant) or one pair of redundant modules.

These adapter panels are shown in Figure 1-11 and described in greater detail in Chapter 7, Input Module Reference Data, and Chapter 8, Output Module Reference Data.



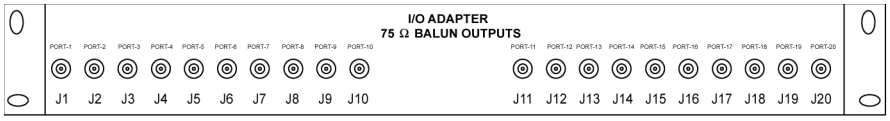
ss200018

I/O Adapter for 3-Port Input Module



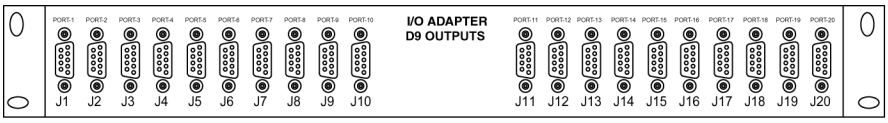
ss200019

I/O Adapter for 1-Port Input Module



ss200020

75 Ohm Balun I/O Adapter for Output Module



ss200021

DE9 I/O Adapter for Output Module

Figure 1-11. I/O Adapter Panels for Input and Output Modules

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Communications Protocol

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

Software Interface

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

TL1 – Transaction Language One

TL1 provides command sets to support all operation, administration, maintenance, and provisioning tasks required to maintain and control an SSU-2000 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 TL1 Command Interface, on page 268, for more information.

ICS – Interactive Command Set

ICS also provides command sets to support all operation, administration, maintenance, and provisioning tasks required to maintain and control an SSU-2000 system from a terminal connected to one of the SSU-2000 RS-232 serial ports. ICS commands are designed in a more readable interface for users with an instructional help facility. Refer to Interactive Command Set, on page 318, for more information.

NTP – Network Time Protocol

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 NTP Support, on page 385, for more information.

SNMP – Simple Network Management Protocol

The SSU-2000 offers two versions of SNMP: v2 and v3. SNMP v3 software offers additional security with authentication and privacy parameters. The security feature allows secure transactions to provide protection against modification of information, masquerade, and message stream modification.

Simple Network Management Protocol (SNMP) 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.

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The SSU-2000 SNMP is an SNMP 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-2000 SNMP supports all existing functions, full system control of the SSU-2000 is maintained through SNMP.

The SSU-2000 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 SNMP Protocol, on page 387, for more information.

Software Versions

There are six different versions of software available for the SSU-2000, as indicated in Table 1-2. 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 and are described in Appendix B, Communications Protocol.

Table 1-2. Versions of Software for the Communications Module

Version	TL1	ICS	NTP	SNMP v2	SNMP v3
Basic System Load	X	X			
Basic w/NTP Support	X	X	X		
Basic w/SNMP v2 Support	X	X		X	
Basic w/SNMP v2 and NTP Support	X	X	X	X	
Basic w/SNMP v3 Support	X	X			X
Basic w/SNMP v3 and NTP Support	X	X	X		X

Graphical User Interface

SynCraft is a software interface program that is available to provide monitoring and configuration functionality in a Microsoft Windows graphical user interface. Contact your Symmetricom sales representative for more information on the SynCraft Graphical User Interface, part number 14113245-000-0.

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Overview of SSU-2000 Operation

After initial installation and configuration is completed, the SSU-2000 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-2000 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 remotely accessed and cleared by a user with the appropriate security level. Several optional levels of password protection are available for system protection as described in Overview of the SSU-2000 Security System, on page 93.

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

Synchronization Status Messages (SSMs)

The SSU-2000 supports input and output SSMs. SSMs provide a method for providing clock quality information to any equipment that uses synchronization inputs. Table 1-3 describes the ANSI SSM values and the traceability associated with each value. Table 1-4 describes the ITU SSM values and the traceability associated with each value.

Table 1-3. ANSI SSM Quality Level Definitions

Description	Quality Level	Abbreviation
Stratum 1 Traceable	1	PRS
Synchronized – traceability unknown	2	STU | UNK
Stratum 2 traceable	3	ST2
Transit Node traceable	4	TNC | TYPE I
Stratum 3E traceable	5	ST3E | TYPE III
Stratum 3 traceable	6	ST3 | TYPE IV
SONET Minimum Clock traceable (20 ppm clock)	7	SMC
Stratum 4 traceable	8	ST4
Do Not Use for synchronization	9	DUS

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Table 1-4. ITU SSM Quality Level Definitions

Description	Quality Level	Abbreviation
Primary Reference Clock	2	PRC
Transit Node	4	SSUT
Local Node	8	SSUL
Synchronization Equipment Clock	11	SEC
Do Not Use for synchronization	15	DNU

The SSU-2000 handles SSMs in accordance with T1X1.3 TR33, T1.101-1999, GR-253, and 379-CORE.

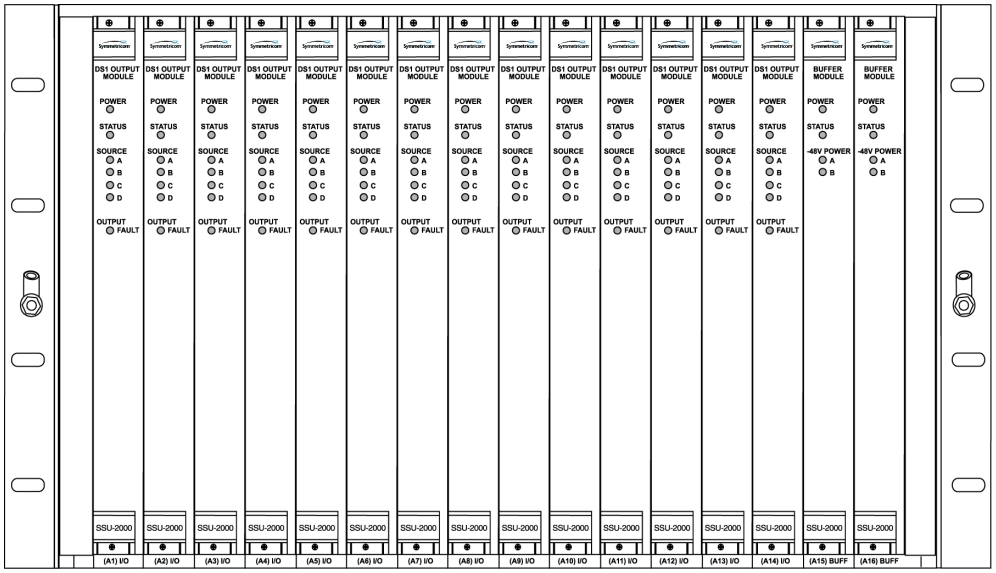
Indicators and Controls

All modules installed in the SSU-2000 main shelf and the SDU-2000 expansion shelf contain status indicator lamps for displaying status. The LED indicators for each module are described in Chapter 6, Clock Module Reference Data, Chapter 7, Input Module Reference Data, and Chapter 8, Output 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.

SDU-2000 Synchronization Distribution Unit

Up to four SDU-2000 Synchronization Distribution Units (expansion shelves) can be attached to the SSU-2000 for output expansion (Figure 1-12 and Figure 1-13). Each expansion shelf contains two Buffer modules and 14 output modules (can be a combination of output modules). Four expansion shelves can hold up to 56 Output modules capable of generating an additional 1120 synchronized clock outputs for system distribution. Each expansion shelf is connected to the main shelf with redundant clock cables to protect against cable faults.

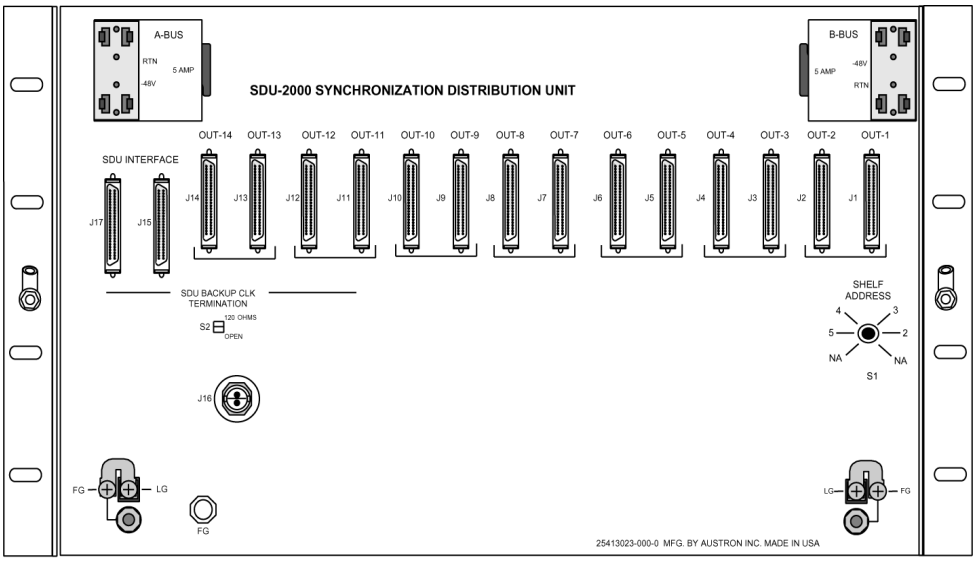
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ss200022

Figure 1-12. Front View of the SDU-2000 Expansion Shelf

The SDU-2000 Expansion shelf is designed to be compatible with international environmental, safety and electromagnetic compliance (EMC) standards for –48/60 vDC powered telecommunication transmission equipment installed in telecommunication centers with inside telecom signal connections. The farthest Expansion shelf may be located up to 200 feet (61 meters) from the SSU-2000 main shelf.



ss200027

Figure 1-13. Rear VIew of the SDU-2000 Expansion Shelf

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Functional Overview

Figure 1-14 shows a simplified functional block diagram of the SDU-2000 Expansion shelf. The SDU-2000 interfaces with the SSU-2000 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 Figure 1-14. A second interface cable supplies the SDU-2000 Expansion shelf 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 shelf 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-2000 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)
- RS-422

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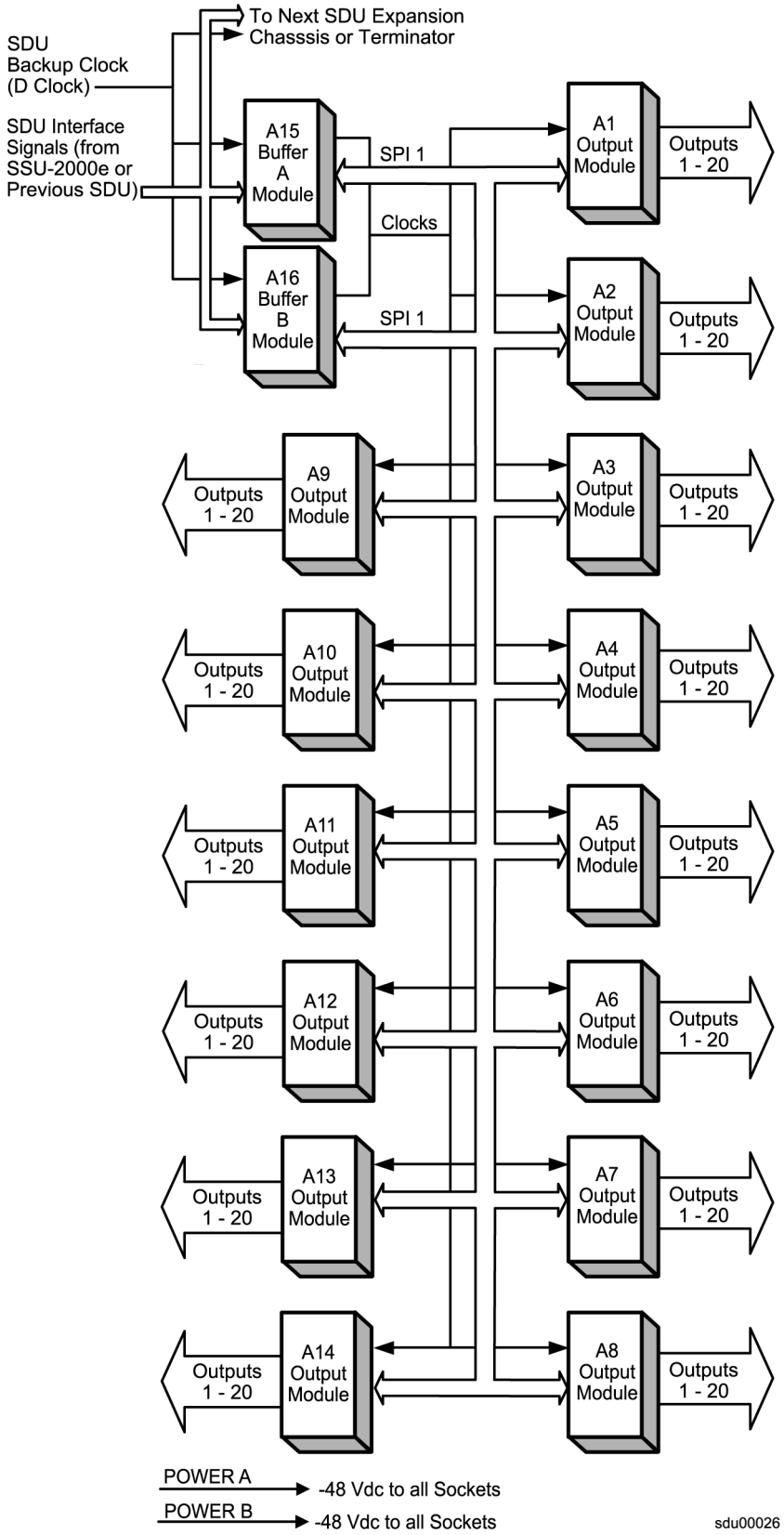


Figure 1-14. SDU-2000 Block Diagram

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Expansion Shelf Features

The SDU-2000 expansion shelf consists of the following major components.

- Expansion shelf
- One or two Buffer modules; where two provide a more robust system
- Up to 14 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.

Clock Source

The clock inputs for the first SDU-2000 expansion shelf in an SSU-2000 system are supplied by the A and B Clock modules in the main shelf. A multi-pin connector on the rear panel of the SSU-2000 (labeled J8 SDU Interface) provides the reference signals from the main shelf Clock modules for use by the SDU-2000 expansion shelves. The clock source is usually connected to J15.

SDU Backup Clock

For redundancy, a backup clock is supplied to each expansion shelf to allow it to continue operating if the main expansion bus (cable) is accidently disconnected or dislodged. The SSU-2000 provides a backup clock (Clock D) to the SDU Backup Clock terminal, labeled J16. Using a Tee-connector, Connector J16 feeds an additional SDU-2000 shelf.

When installing an expansion shelf, move the clock terminator from J9 on the SSU-2000 or connector J16 from a previous SDU-2000 expansion shelf, and install the terminator on J16 of the last expansion shelf in the daisy chain.

Setting the Expansion Shelf Address

Each SDU-2000 Expansion shelf must be correctly configured for its position in the daisy chain. The main shelf's address is 1. The SDU shelf address selector is numbered from two to five. Set the first expansion shelf address to 2. Set the address on additional shelves sequentially, as shown in Table 1-5.

Table 1-5. Expansion Shelf Addresses

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

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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 shelf. This prevents the expansion shelf and its cabling from affecting the outputs of the main shelf.

SDU Module Features

The SDU-2000 expansion shelf supports all Output modules available for the main shelf, and Buffer modules. The SDU-2000 expansion shelf can support up to 14 Output modules.

- One or two Buffer modules, assigned to slots A15 and A16
- One to 14 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 shelf. The buffered signals from these modules are distributed through the motherboard to the 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-2000 and the SDU-2000 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-2000. See Configuring a Conventional SSU/TSG System, on page 226, 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.

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Connector Panel Features

The expansion shelf provides connections for external power, grounding, clock inputs, and output connections. All modules plug in from the front of the shelf.

Controls and Indicators

All modules installed in the SDU-2000 expansion shelf contain LED status indicators for displaying status. Any faults from the installed modules are sent to the SSU-2000 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.

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Chapter 2 Installing the SSU-2000

This chapter provides guidelines and procedures for installing and powering up the SSU-2000 Synchronization Supply Unit.

In This Chapter

- Unpacking and Inspecting the Shelf
- Preliminary Procedures
- Rack Mounting the SSU-2000
- Grounding and Power Input
- Making Connections
- Making Alarm Connections
- Connecting Antennas
- Connecting an SDU-2000 Expansion Shelf
- Remote Reset
- Handling Modules
- Installation Checklist
- Powering Up the SSU-2000
- Normal System Indications During Turn-Up
- After Turn Up

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Unpacking and Inspecting the Shelf

The SSU-2000 is packaged to protect it from normal shock, vibration and handling damage. Care should be taken during unpacking and installation to avoid damaging the unprotected unit.



Caution: To avoid damage, use proper static control precautions when handling modules! Protect the equipment against ESD (Electrostatic Discharge) by using a grounded protective wrist strap and normal equipment grounding.

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 Symmetricom and the carrier who delivered the equipment if you suspect that it was damaged in transit.

If any items are missing, contact Symmetricom Global Services.



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

Preliminary Procedures

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

- Ensure that standard installation tools and materials are available, see Installation Tools and Materials, on page 63.
- Ensure that the system location does not cause electromagnetic interference with other equipment in the area, see Electromagnetic Interference (EMI) Considerations, on page 63.
- Ensure that adequate ventilation space is available in the rack or equipment cabinet to safely operate the shelf, see Ventilation Considerations, on page 64.
- Ensure that the mounting rack or equipment cabinet is properly grounded and has power available, see Making Ground Connections, on page 67.



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

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



Recommendation: Symmetricom recommends that you follow all applicable local building electrical codes when installing the SSU-2000.

Installation Tools and Materials

The following required standard tools and materials (not supplied) are required for installing the SSU-2000:

- Standard tool kit
- Cable ties or acceptable cable clamps
- 16 AWG (minimum) wire for –48V, RTN, and frame ground
- 18 AWG wire for connecting office alarms
- 22 AWG shielded twisted pair wire-wrap cable (Amp #640433-7 or equivalent)
- Wire-wrap tool
- No. 10 screws, flat washers, and locking washers for mounting the equipment rack
- Digital Voltmeter
- Straight-through RS-232 cable
- Laptop or PC with a terminal emulation program such as HyperTerminal or ProComm Plus

Electromagnetic Interference (EMI) Considerations

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

All cables connected to the SSU-2000 should be shielded with metal connector shells. The connectors on the rear panel of the shelf 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 rear of the unit. While the unit is in operation, there must be a module or blank panel installed in every slot. Also, the captive screws, located at the top and bottom of the module panel, must be properly secured.

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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.

Ventilation Considerations

For proper ventilation, there should be at least 2 RU (3 inches, 7.6 cm) of free space above and below the shelf.

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

Rack Mounting the SSU-2000

The SSU-2000 shelf, when installed, occupies 10.5 in (26.7 cm) of vertical rack space, has a depth of 12 in (30.5 cm), and a width of 19 in (48.3 cm). When installing more than one SSU-2000, each unit must have at least one inch (2.5 cm) of clearance above and below to ensure proper cooling. There should be at least three inches (7.6 cm) of free space below the bottom shelf. It is recommended that at least one I/O adapter panel be inserted between each unit.

Caution: Failure to provide proper ventilation can result in excessive heat build-up resulting in equipment damage. Symmetricom suggests that you insert an I/O adapter panel between shelves. See Figure 2-1.

SSU-2000 Shelf

The shelves mount flush to the rack or at distances of either 2 inches (5.1 cm) or 5 inches (12.7 cm) from the front of the rack. An SSU-2000 rack mounting diagram is shown in Figure 2-1.

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

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

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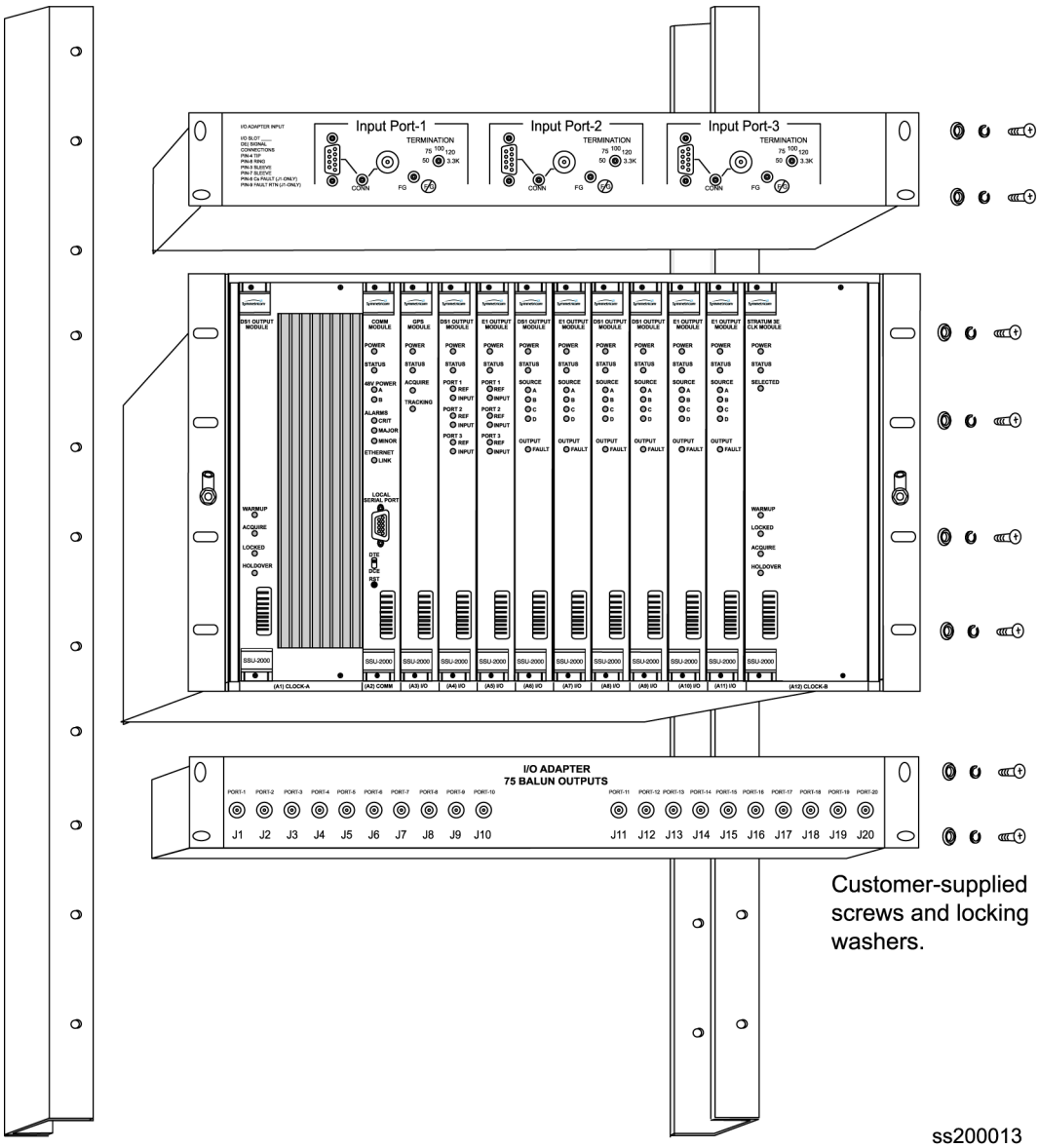


Figure 2-1. Shelf and I/O Adapter Rack Mounting

3. If not using expansion shelves, verify that the Bus Termination Assembly is inserted into J9 on the rear panel of the main shelf.

Recommendation: When possible, install the shelf at eye level to aid in viewing and connecting cables.

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I/O Adapter Panels

The procedure for attaching the four types of I/O adapter panels to the rack are identical. The location of the I/O adapter panels is limited only by the length of the interconnecting cable. Input adapter cables are restricted to one meter. Output adapter cables are available in lengths from one to two meters in increments of 0.1 meter; see Chapter 9, Hardware Configuration Guide, for part numbers.

1. The I/O adapter panels may be mounted flush to the top or bottom of the shelf. Use suitable screws for attaching the I/O adapter panel. Ensure that both brackets are attached at equal distances from the front of the unit.

2. Mount the panels to the front of the rack rails with four screws and washers.



Recommendation: Although I/O adapters may be located as necessary, Symmetricom recommends that you mount the Input I/O adapter panels above the shelf to accommodate the shorter cable length; mount the Output I/O adapter panels below the shelf.

Grounding and Power Input

The SSU-2000 shelf has redundant -48VDC power input connections labeled A-BUS and B-BUS. The A-BUS connection is a 2-position #6 terminal block in the upper left corner of the rear panel, and the B-BUS connection is a 2-position #6 terminal block in the upper right corner of the rear panel. The terminal positions are labeled –48V and RTN. The –48V side of each bus is fused with a 5 Amp fuse. The –48V power inputs are DC Isolated from frame ground and logic ground. Both the A-BUS and B-BUS are fed to the individual module slots via the backplane. Refer to Figure 2-4 for a view of the SSU-2000 rear panel.



Caution: For continued fire protection, replace fuse with specified type and rating. Fuse: GMT-5 (5A @ 60vDC).
This unit must be grounded.
Refer all servicing to qualified personnel.



Caution: To avoid equipment damage, ensure that the power terminal covers are installed after connecting the –48V power.



Caution: To provide proper I/O connector grounding, ensure that when removing or installing Summer Output connectors that all screws are tightened securely.

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Making Ground Connections

After the SSU-2000 is installed in a suitable rack, connect the shelf to a proper earth ground.

1. Run a cable from the frame ground (FG) lug to earth ground.

   Keep this cable as short as possible. Frame ground connections are made using two #8-32 studs labeled FG on each side of the lower rear panel. There are also provisions for making logic ground connections when required by a specific customers installation. These connections are labeled LG and are located next to the FG studs and are strapped together with a jumper, as shown in Figure 2-2. The jumper strap can be removed to isolate the frame and logic grounds. Logic ground is AC bypassed to frame ground by capacitor C1 on the backplane.



Note: To isolate frame ground from logic ground, remove the two jumpers connecting Frame Ground to Logic Ground. Once the connections to LG have been opened, secure the jumpers to the rear panel by tightening the FG screws. If desired, either of the LG terminals may be used to connect a separate Logic Ground cable.

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

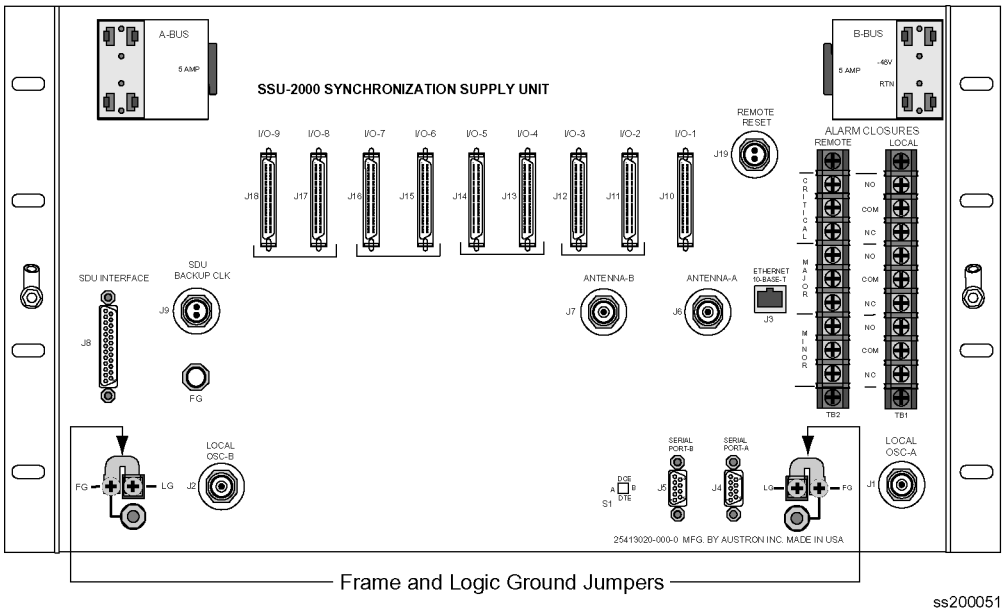
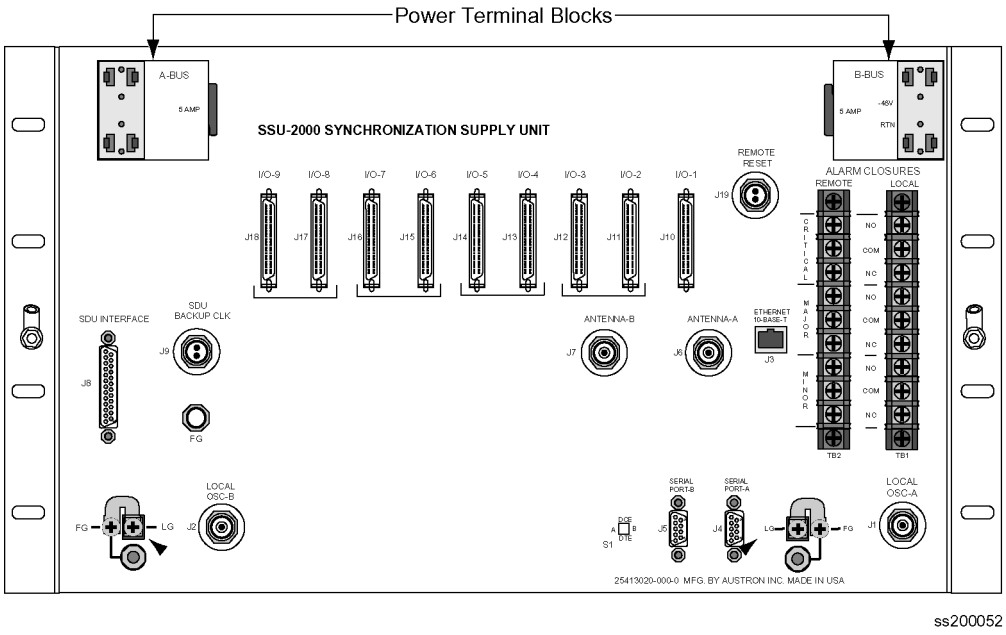


Figure 2-2. Frame and Logic Ground Jumpers

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Power Input

1. Locate the power terminal blocks on the rear panel, as shown in Figure 2-3.
2. Remove both 5 A fuses. You will replace them at the end of the installation procedure.
3. Using 16 AWG (minimum) stranded wire, connect primary power to the A-BUS screws and the secondary power to the B-BUS screws. Symmetricom recommends that you use a #6 spade lug termination for each power lead.



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Figure 2-3. Power Terminal Blocks

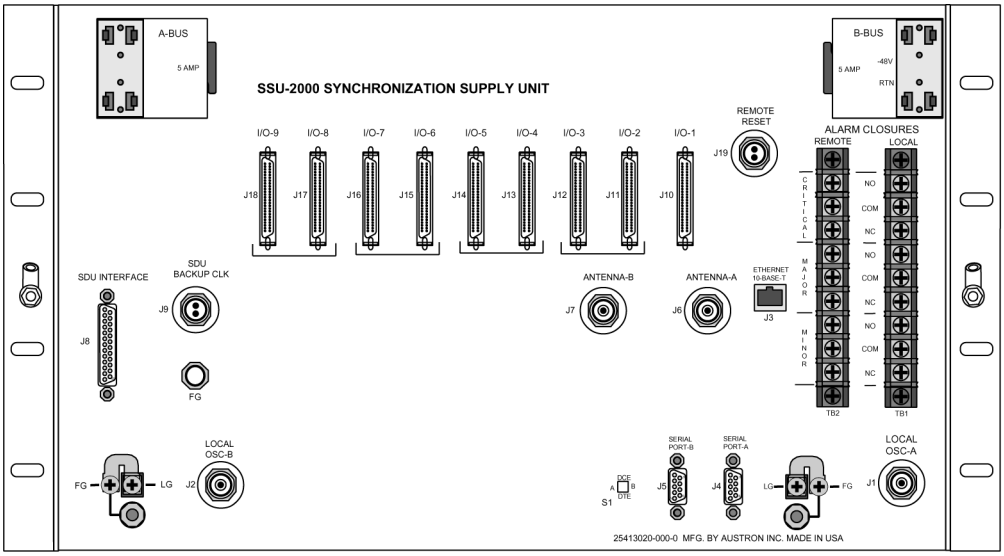
Making Connections

Making I/O Connections

The SSU-2000 shelf has I/O interface connections for connecting the SSU-2000 to the corresponding I/O adapter panels. Refer to Chapter 7, Input Module Reference Data, and Chapter 8, Output Module Reference Data, for information regarding the different type I/O adapter panels available and the associated cables used to connect the SSU-2000 to the I/O adapter panels. Figure 2-4 shows the rear panel of the SSU-2000.

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All I/O connections are made through the nine 50-Pin Micro-D female connectors, J10 through J18. Each connector is associated with a specific chassis slot. Table 2-1 lists the relationship between the I/O slot and the rear panel connector. Connectors J10 through J18 are labeled I/O-1 through I/O-9. The signal connections on these I/O connectors are set up in differential pairs as Tip and Ring connections.



ss200014

Figure 2-4. SSU-2000 Rear Panel

Table 2-1. I/O Module Slot to I/O Connector Relationship

Label (Name)	Chassis Slot	I/O Connector
I/O-1	A3	J10
I/O-2	A4	J11
I/O-3	A5	J12
I/O-4	A6	J13
I/O-5	A7	J14
I/O-6	A8	J15
I/O-7	A9	J16
I/O-8	A10	J17
I/O-9	A11	J18

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Installing Output Summer Adapters

To create an A/B pair of Output modules in a redundancy configuration, you need to install Output Summer adapters (part number 22013070-000-0) on the corresponding outputs as shown in Figure 2-5. All Module A outputs are summed with the corresponding outputs of Module B, providing 1:1 output protection (1:1 redundancy). Output pairs in slots A4/A5, A6/A7, A8/A9, and A10/A11 are available for configuration in redundant mode using Output Summer connectors. The pinout of the Output Summer adapter is the same as the I/O interface connectors (see Table D-7).

To install the Output Summer adapter:

1. Remove the two retaining screws on each connector that the Output Summer adapter is to be installed on.



Caution: To avoid possible electrostatic discharge problems after *removing* an Output Summer adapter, you must replace the screws securing the I/O connectors on the rear panel of the SSU-2000.

2. Install Output Summer adapters on all I/O connector pairs that require redundancy, see Figure 2-5.

3. Tighten all Output Summer adapters screws securely.

4. Connect 50-pin Micro-D output cables between the I/O Adapter panel and the Output Summer adapter as required.

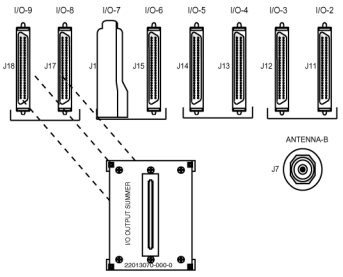


Figure 2-5. Installing the Output Summer Adapter

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Making Communication Connections

The rear panel of the SSU-2000 shelf has connections for three communications interfaces, two EIA-232 Serial Port connections, and one Ethernet connection. These ports allow communication between the SSU-2000 and a terminal or PC. Each port is configured independently.



Note: A third EIA-232 serial port may be connected to the Communications module. Refer to Communications Module, on page 140, for more information.

Refer to Table 2-2 for the serial and Ethernet communications port assignments.

Table 2-2. Communications Port Assignments

Port #	Function	Protocol
Serial Ports (EIA-232)		
A (J4)	User-selectable as either an ICS or a TL-1 interface. The port defaults to ICS upon initialization	ICS (Default), TL-1
B (J5)	User-selectable as either an ICS or a TL-1 interface. The port defaults to ICS upon initialization	ICS (Default), TL-1
Local (Comms Module)	User-selectable as either an ICS or a TL-1 interface. The port defaults to ICS upon initialization	ICS (Default), TL-1
Ethernet Ports (Telnet)		
23	User-selectable as either an ICS or a TL-1 interface. The port defaults to ICS upon initialization	ICS (Default), TL-1
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 TL-1 only	TL-1

EIA232 Serial Port Connections

Both RS-232 serial port connections are made through filtered DE9S female connectors on the rear panel. These ports allow connection to a terminal or PC for remote monitoring and control. One is on connector J4 and is labeled Serial Port A, the other is on connector J5 and is labeled Serial Port B. When connecting to these ports, use a shielded direct-connect cable with the shield connected to pin 1.

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Serial Port DTE/DCE Switch

The serial port DTE/DCE switch is located on the lower right side of the rear panel, as shown in Figure 2-6. Each port (A and B) may be configured as either DCE (default, connection to PC) or DTE (connection to modem). The right switch controls port A and the left switch controls port B.

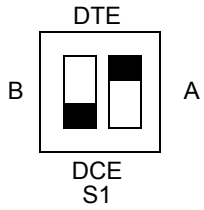
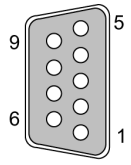


Figure 2-6. DPDT Slide Switch

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. To change these settings, connect the SSU-2000 to a terminal device or PC using a serial communications program protocol. See Communicating by Serial Port, on page 91, for more information.

Table 2-3 shows the EIA-232 Connector pin assignments for the SSU-2000 DE9 communications connectors.

Table 2-3. EIA-232 Connector Pin Assignments

Signal	Pin	Pin	Signal	Connector Orientation DE9S
FG	Shield	5	Logic Return	
	9	4	DSR	
CTS	8	3	TXD	
RTS	7	2	RXD	
DTR	6	1	DCD	

Making Ethernet Connections

The Ethernet 10-Base-T connection is located on the rear panel connector J3, which is a shielded RJ45 receptacle labeled Ethernet 10-Base-T. See Communicating by Ethernet, on page 92, for more information on connecting and using the Ethernet port.

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Local Oscillator Outputs

The SSU-2000 has two Local Oscillator (LO) connections on the rear panel. These connections are made using the BNC connector J1 labeled LOCAL OSC-A and the BNC connector J2 labeled LOCAL OSC-B. The bodies of these BNCs are connected to frame ground.

Making Alarm Connections

The SSU-2000 has two alarm terminal blocks located on the rear panel for attaching external circuits to the SSU-2000, and are shown in Figure 2-7. Both blocks are nine-position, #6 filtered terminal blocks. The local connections are made on TB1 and the remote connections are made on TB2. The terminal blocks are labeled Alarm Closures, Local and Remote. The connections are labeled NO (normally open), COM (common or wiper) and NC (normally closed) for each of the alarm categories CRITICAL, MAJOR and MINOR.

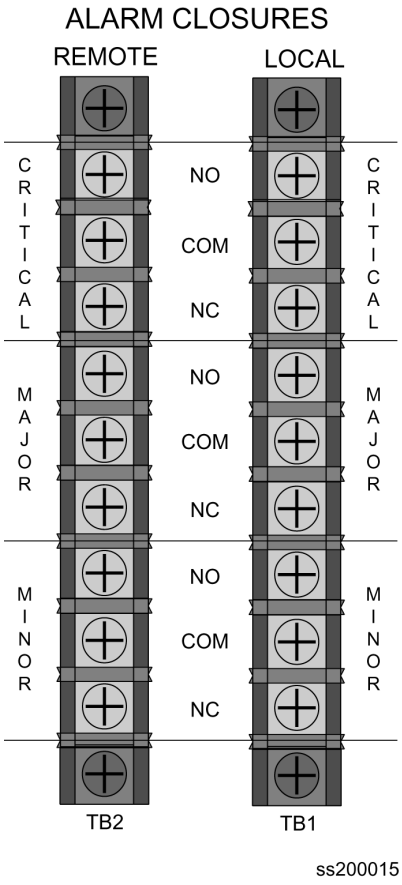


Figure 2-7. Alarm Terminal Blocks

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Alarm Relays

The Communications module contains six Form C relays used for alarm reporting. The relays provide contact closures for Local Critical, Local Major, Local Minor, Remote Critical, Remote Major, and Remote Minor alarm conditions. Switching capacity is up to 1 ampere, with a voltage up to 72 vDC. When the module is installed, all relays are in the “no alarm” condition (corresponding ALARMS LEDs are off). Each Remote/Local relay pair is controlled by the same control bit in the LCA that controls the LEDs. Table 2-4 shows the default state of each relay pair (energized/de-energized), the “no alarm”, and “alarm” connections.

Table 2-4. Alarm Relay Connections

REM/LOC Pair	Condition (default shown first)	Connection: TB1/TB2
CRITICAL	Energized: no alarm De-energized: alarm	COM – NC COM – NO
MAJOR	De-energized: no alarm Energized: alarm	COM – NC COM – NO
MINOR	De-energized: no alarm Energized: alarm	COM – NC COM – NO

Perform the following steps to ensure proper alarm connections to the SSU-2000.

1. Remove both fuses from the rear panel.
2. Locate the ALARM terminal blocks connectors labeled MAJOR ALARMS (TB1) and MINOR ALARMS (TB2) on the rear panel.
3. Connect office alarms to the REMOTE and LOCAL terminals with 18 AWG wire.
4. Verify that correct wiring connections have been made.
5. Reinstall both fuses.



Caution: For continued fire protection, replace fuse with specified type and rating. Fuse: GMT-5 (5A @ 60vDC).
This unit must be grounded.
Refer all servicing to qualified personnel.



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.

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Connecting Antennas

The SSU-2000 shelf has two antenna connections on the rear panel. The antenna connections are made via isolated TNC connector J6 labeled ANTENNA-A and Isolated TNC connector J7 labeled ANTENNA-B. These TNCs are DC isolated and AC bypassed to frame ground. These connections are used for radio receiver antenna connections only. Refer to Appendix C, Antennas, for installation procedures and additional instructions.



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 using the frame ground lugs integrated with the SSU-2000 shelf.

Connector J6 is wired to slot A3 in the shelf, and Connector J7 is wired to slot A5.

Connecting an SDU-2000 Expansion Shelf

The SSU-2000 Main shelf has two interface connectors to connect an SDU-2000 Expansion shelf. You can connect up to four SDU-2000 shelves in a daisy-chain fashion using the Expansion Interface cable (part number 12013050-xxx-0 and the Backup Clock cable (12013115-xxx-0). These connections are made through connector J8, a DB25S female connector with locking post, labeled SDU INTERFACE, and connector J9, a BNO connector labeled SDU BACKUP CLK. These connectors are on the rear panel of the SSU-2000, and are shown in Figure 2-8. The corresponding connectors on the rear panel of the SDU-2000 are shown in Figure 2-9.

All signals on J8 are in differential pairs; each pair is terminated by installing the Expansion Terminator (part number 12013049-000-0), which has a series 0.001 μF capacitor and 120 Ω resistor. The SDU backup clock signal on connector J9 is a differential pair; it is terminated with 120 Ω using switch S2 on the rear panel.

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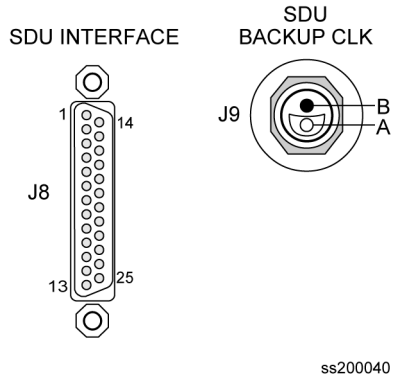


Figure 2-8. SDU Interface (J8) and Backup Clock (J9) Connectors

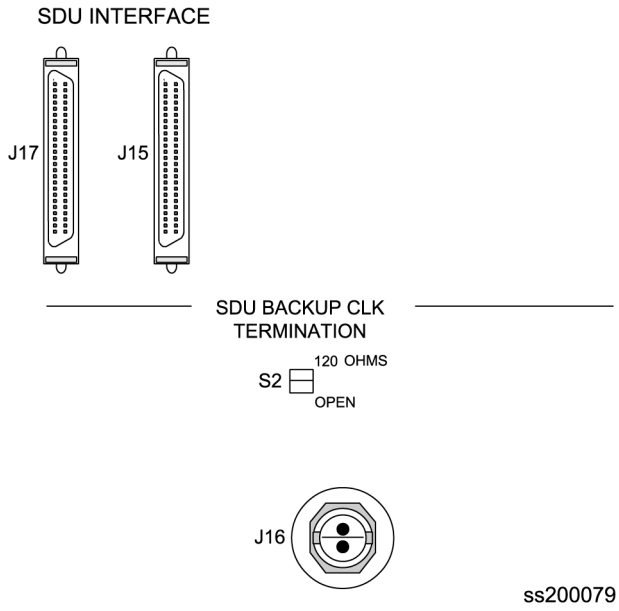


Figure 2-9. SDU Interface (J17 and J15) and Backup Clock (J16) Connectors

If you are not installing an SDU-2000 Expansion shelf, you *must* install the Expansion Terminator on J8 on the rear panel. Figure 2-10 shows the SSU-2000 Expansion Terminator.

Install the SDU-2000 Expansion shelf using the procedure described in Rack Mounting the SSU-2000, on page 64. Then install power and ground connections using the procedure described in Grounding and Power Input, on page 66.

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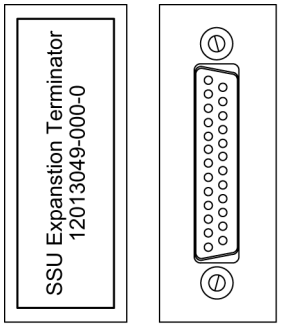


Figure 2-10. SSU Interface (J8) Expansion Terminator

Connecting a Single SDU-2000 Expansion Shelf

To connect a single SDU-2000 to the SSU-2000 main shelf, use the following procedure. Figure 2-11 shows the wiring diagram for a single SDU-2000 installation.

1. Remove the Expansion Terminator (part number 12013040-000-0, if installed) from J8 on the rear panel of the SSU-2000. Set the terminator aside for use in step 3, below.

2. Attach one end of the Expansion Cable (part number 12013050-xxx-0; the xxx indicates the length of the cable) to J8 on the rear panel of the SSU-2000.

3. Attach the other end of the Expansion Cable to either J17 or J15 on the rear panel of the SDU-2000.

   If you are installing only one SDU-2000, then attach the Expansion Terminator to either J15 or J17, whichever is available.

4. Attach one end of the Backup Clock cable (part number 12013115-xxx-0; the xxx indicates the length of the cable) to J9 on the rear panel of the SSU-2000.

Caution: To avoid damage to the J9 connector or the BNO tee connector, be sure to align its internal pins with the mating connector. The tee connector does not rotate once it is installed. If J9 is damaged, you will have to replace the entire shelf.

5. Install a BNO tee connector (part number 551095-0001) on J16 on the rear panel of the SDU-2000.

6. Attach the other end of the Backup Clock cable to the tee connector on J16.

7. Set the Clock Termination switch S2 to the 120 Ohms position.

8. Set the Shelf Address switch S1 to the 2 position.

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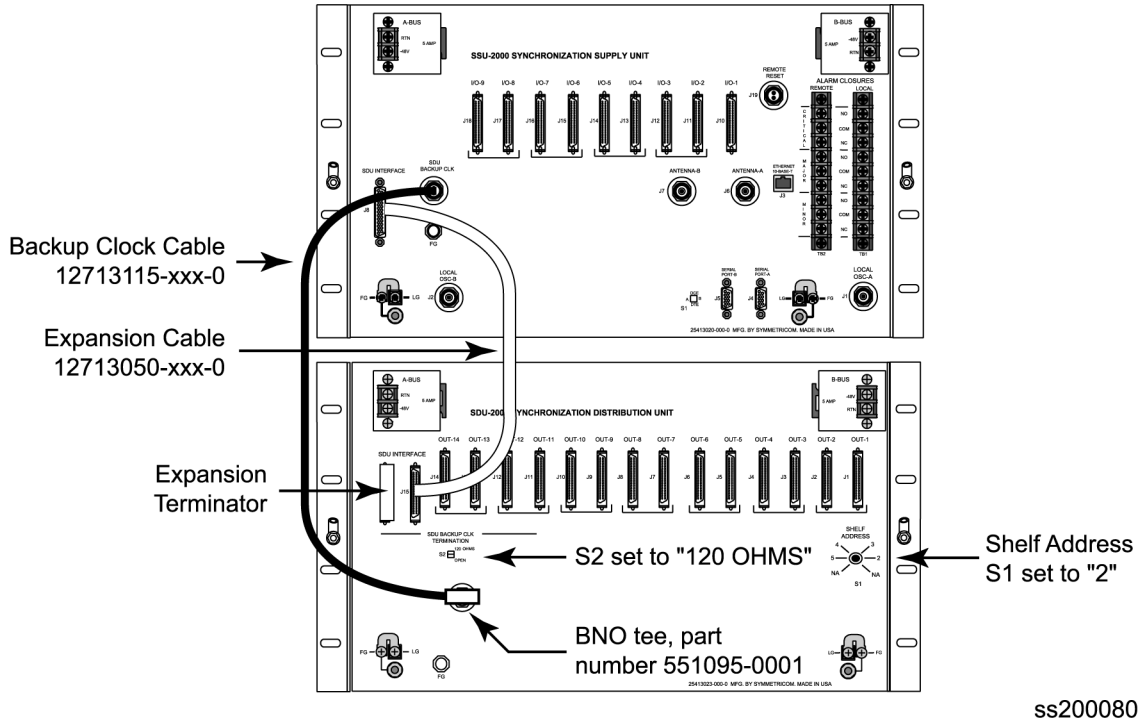


Figure 2-11. Wiring Diagram for a Single SDU-2000 Shelf

Connecting Additional SDU-2000 Expansion Shelves

To connect additional SDU shelves to an SDU, use the following procedure. Figure 2-12 illustrates the wiring for a system with three SDU-2000 shelves.

1. Remove the Expansion Terminator (if installed) from J17 or J15 on the rear panel of the SDU-2000.

2. Attach one end of the Expansion Cable (part number 12013050-xxx-0; the xxx indicates the length of the cable) to either J17 or J15 on the rear panel of the first SDU-2000 shelf, whichever is available.

3. Attach the other end of the Expansion Cable to either J17 or J15 on the rear panel of the second SDU-2000 shelf.

   If you are not installing a third SDU-2000, then attach the Expansion Terminator to either J17 or J15 of the second shelf, whichever is available.

4. Set the Clock Termination switch S2 on the rear panel of the first SDU-2000 to the Open position.

Caution: To avoid damage to the BNO tee connector, be sure to align its internal pins with the mating connector. The tee connector does not rotate once it is installed.

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Note: Perform step 5 below only if a BNO tee connector is not installed on J16 on the first SDU-2000 shelf. If a tee connector is installed, skip to step 6.

5. Remove the Backup Clock cable from J16 on the rear panel of the first SDU-2000 shelf. Install a BNO tee connector (part number 551095-0001) to J16. Reconnect the Backup Clock cable to the tee connector.

6. Install a BNO tee connector (part number 551095-0001) to J16 on the rear panel of the second SDU-2000 shelf.

7. Attach one end of a second Backup Clock cable (part number 12013115-xxx-0; the xxx indicates the length of the cable) to the tee connector on J16 of the first SDU-2000 shelf

8. Attach the other end of the Backup Clock cable to the tee connector on J16 on the second SDU-2000 shelf.

9. Set the Clock Termination switch S2 on the rear panel of the second SDU-2000 to the 120 Ohms position.

Note: For installations with multiple SDU-2000 shelves, set S2 on all shelves to Open, except for the last shelf in the chain; set S2 on this shelf to 120 Ohms.

10. Set the Shelf Address switch S1 on the rear panel of the second SDU-2000 shelf to the 3 position.

Note: For installations with multiple SDU-2000 shelves, set S1 on each shelf to the number corresponding to the shelf's position in the chain.

Remote Reset

The SSU-2000 shelf has a remote reset input which can be used to remotely initiate system firmware reset if the need should arise. The remote reset connections are made via connector J19, which is a BNO connector labeled REMOTE RESET. A contact closure across the two pins resets the firmware.

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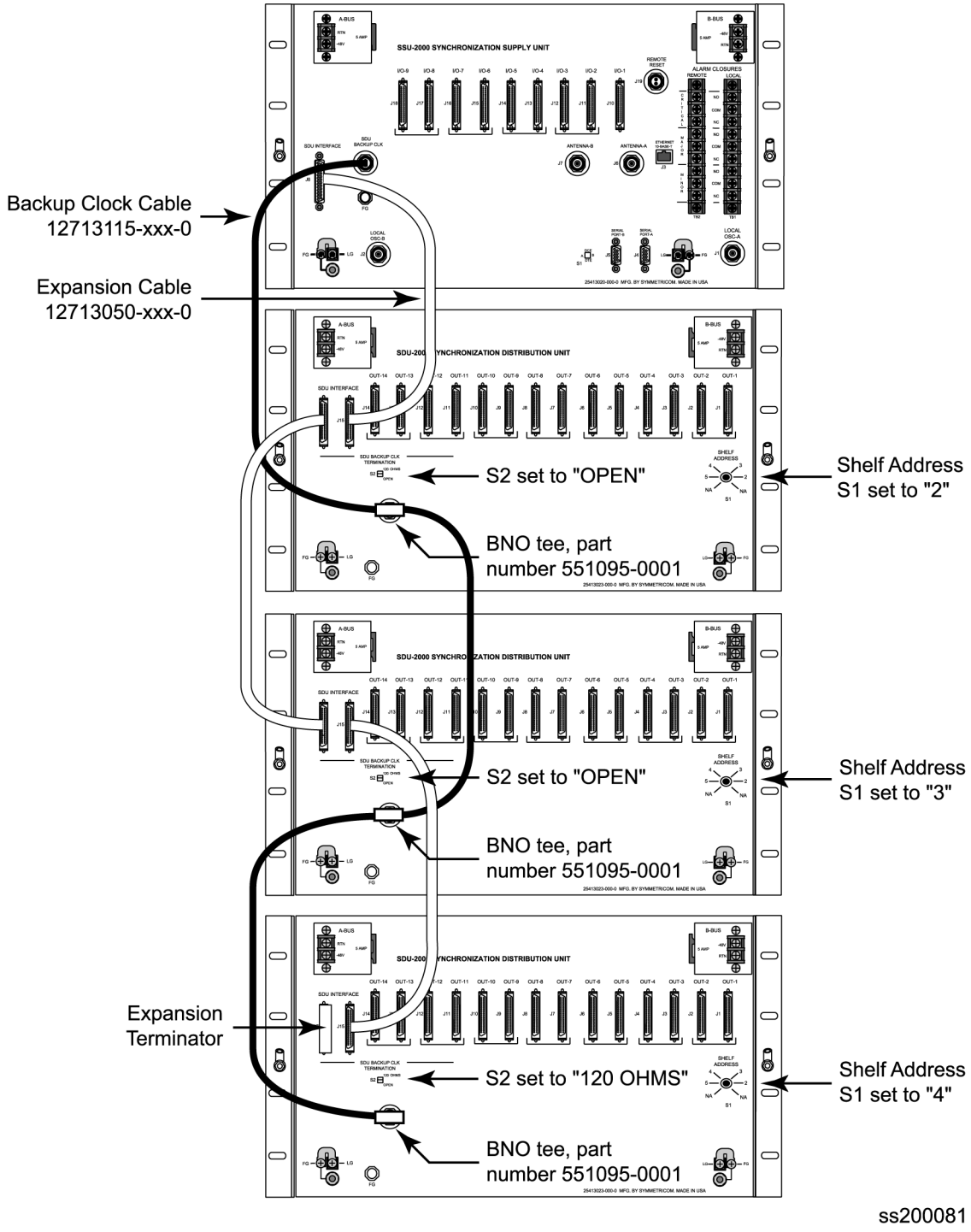


Figure 2-12. Wiring Diagram for Multiple SDU-2000 Shelves

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Handling Modules

The SSU-2000 shelf has twelve plug-in module slots, numbered A1 through A12, from left to right looking at the front of the shelf. Each module slot has a specific address and 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 RF connections. Each module slot has three pins connected together on each hybrid DIN connector which are to detect module removal.



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

Take the following precautions when handling any of the modules:

1. Use proper static control precautions when handling modules! Protect the equipment against ESD (electrostatic discharge) by using a grounded protective wrist strap and normal equipment grounding. Two ground connectors are provided on the side of the unit to connect these straps to frame ground (one on each mounting bracket).

2. Avoid touching component leads and edge connectors.

3. Avoid placing the module on an ungrounded surface.

4. Avoid allowing the module to come in contact with insulated surfaces.

Installing a Module

This procedure is common for all modules.



Note: Modules can be removed and inserted while system power is supplied without damaging modules or affecting system operation.



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.

To install a module:

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1. Align the module card edges with the plastic card guides of the selected slot.

2. Slide the module into the shelf 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: To avoid possible damage and intermittent failures, ensure that you have completely inserted the module into the system and that you have securely tightened the captive screws.

4. Enable the module using either ICS or TL1 commands. The example commands are for slot 3 in the main shelf.

   ICS command:
   Type `CONFIG 1A3 ENABLE`, then press **Enter**.

   TL1 command:
   `ACT-MODULE::S1A3:123;`

Exchanging a Module

Use this procedure to exchange one type of module with the same type or a different type of module in the same slot. The example commands are for slot 3 in the main shelf.

1. Connect to the SSU-2000 using one of the methods described in Establishing a Connection With the SSU-2000, on page 90. The system prompts for a user name.

2. Log in to the system using your user name and password.

3. Disable the module using either ICS or TL1 commands. The example commands are for slot 3 in the main shelf.

   ICS command:
   Type `CONFIG 1A3 DISABLE`, then press **Enter**.

   TL1 command:
   `DISC-MODULE::S1A3:123;`

4. Loosen the captive screws located at the top and bottom of the module front panel.

5. Pull up on the top extractor and down on the bottom extractor to unseat the module from the connector on the backplane.

6. Slide the module out of the shelf.

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7. Insert the new module into slot 3 of the main shelf. Tighten the captive screws on the front panel of the module. Wait for the "`module installed`" message to appear.



Note: Be sure that the I/O Adapter port is of the proper type and impedance for the new module.



Caution: To avoid possible damage and intermittent failures, ensure that you have completely inserted the module into the system and that you have securely tightened the captive screws.

8. Enable the module using either TL1 or ICS commands:

   ICS command:
   Type `CONFIG 1A3 ENABLE`, then press **Enter**.

   TL1 command:
   `ACT-MODULE::S1A3:123;`

9. Verify that the module is entered in the registry:

   ICS command:
   Type `CONFIG`, then press **Enter**.

   TL1 command:
   `RTRV-INV:::123;`

Disabling a Module

Use this command to temporarily disable a module without removing it from the SSU-2000 registry. All outputs from the disabled module will turn off, unless a summer adapter is installed on the I/O connector on the rear panel of the shelf. The example commands are for slot 3 in the main shelf.

1. Connect to the SSU-2000 using one of the methods described in Establishing a Connection With the SSU-2000, on page 90. The system prompts for a user name.

2. Log in to the system using your user name and password.

3. Disable the module using either ICS or TL1 commands:

   ICS command:
   Type `CONFIG 1A3 DISABLE`, then press **Enter**.

   TL1 command:
   `DISC-MODULE::S1A3:123;`

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Removing Modules

This procedure describes how to permanently remove a module from the shelf.



Note: Modules can be removed and inserted while system power is supplied without damaging modules or affecting system operation.

1. Connect to the SSU-2000 using one of the methods described in Establishing a Connection With the SSU-2000, on page 90. The system prompts for a user name.

2. Log in to the system using your user name and password.

3. Disable the module using either ICS or TL1 commands. The example commands are for slot 3 in the main shelf.

   ICS command:
   Type `CONFIG 1A3 DISABLE`, then press **Enter**.

   TL1 command:
   `DISC-MODULE::S1A3:123;`

4. Loosen the captive screws located at the top and bottom of the module front panel.

5. Pull up on the top extractor and down on the bottom extractor to unseat the module from the connector on the backplane.

6. Slide the module out of the shelf.

7. Install a blank filler panel to cover the empty slot.

8. Remove the module from the registry using either ICS or TL1 commands:

   ICS command:
   Type `CONFIG 1A3 REMOVE`, then press **Enter**.

   TL1 command:
   `RMV-MODULE::S1A3:123;`

9. Verify that the module is not in the registry:

   ICS command:
   Type `CONFIG`, then press **Enter**.

   TL1 command:
   `RTRV-INV:::123;`

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Installation Checklist

1. Unpack all equipment carefully and check it against the purchase order.
2. Remove the A-BUS and B-BUS fuses from the rear of the unit.
3. Ensure shelf and I/O adapters are securely attached to the mounting rack.
4. Ground the SSU-2000 using the Frame Ground lug.
5. Measure between ground and chassis and verify no voltage exists between them.
6. If an SDU-2000 Expansion shelf is not being installed, ensure that the J8 connection is connected to a terminator.
7. Connect office alarms to the REMOTE and LOCAL terminals with 18 AWG wire.
8. Insert modules and filler panels in designated slots. Use proper handling technique.
9. Connect primary power to A-BUS screws and secondary power to B-BUS screws.
10. Measure voltage at POWER A and POWER B (if used) and verify it is –38 to –72 vDC.
11. Insert the A-BUS and B-BUS fuses into the holders on the rear panel of the SSU-2000.
12. Verify all modules are receiving power and generating regulated DC outputs by checking that their POWER indicators are lit.
13. 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 2-5 for the module color code indications. Refer to Chapter 5, Maintenance and Troubleshooting, if you are unable to obtain the correct indications.

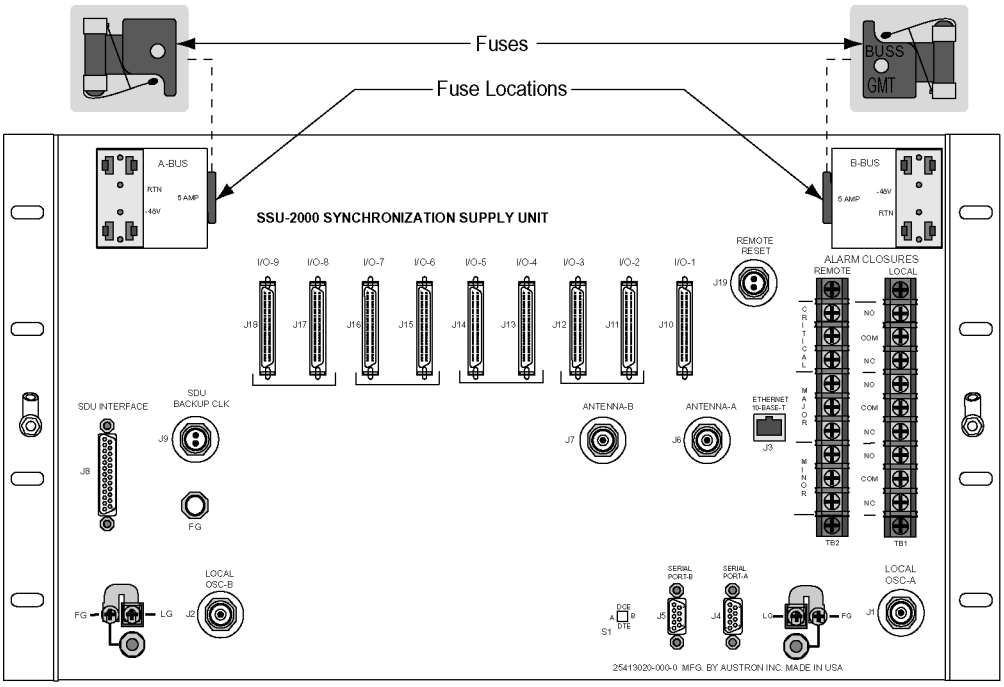
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Table 2-5. Communications and Buffer Module LED Indications

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
–48V Power Supply A or B	On (Amber)	–48V Power polarity is reversed

Powering Up the SSU-2000

The SSU-2000 is *not* equipped with a Power switch. Power to the SSU-2000 is controlled by two 5-amp fuses located on the rear of the SSU-2000 main chassis as shown in Figure 2-13. To power down the shelf, remove *both* fuses.



ss200003

Figure 2-13. SSU-2000 Power Fuses

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SSU-2000 Main Shelf

To power up the SSU-2000 main shelf, insert the two fuses into the fuse slots on the rear panel of the SSU-2000 main chassis (see Figure 2-13).

SDU-2000 Expansion Shelf

The SDU-2000 expansion shelf is *not* equipped with a Power switch. Power to the SDU-2000 is controlled by two external power supplies that provide –48/60 vDC to the SDU-2000 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.

Normal System Indications During Turn-Up

This section describes the procedures for bringing the SSU-2000 on-line after completion of the system installation. After completion of the turn-up procedures, complete the commissioning tests in Chapter 4, Commissioning to ensure that the shelf is functioning properly.

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

- Stratum 2E Clock Module – The POWER LED turns green and stays green when the fuses are installed in the Main chassis. The STATUS LED blinks green and amber for approximately 10 to 15 seconds and then stays green. The WARMUP LED turns amber for approximately 30 seconds to 5 minutes; it then turns off and the ACQUIRE LED turns green. The ACQUIRE LED stays green for 10 to 15 minutes until the module locks onto a signal, then the LED turns off. The SELECTED LED turns green on the selected clock module after the ACQUIRE LED on the clock module turns green. The LOCKED LED then turns green and stays green.
- Stratum 3E Clock Module – 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 WARMUP LED turns amber for 30 seconds to approximately 20 minutes, then it turns off and the ACQUIRE LED turns green. The ACQUIRE LED stays green until the module locks onto a signal (10 to 15 minutes); then the LED extinguishes. The SELECTED LED turns green on the selected clock module after the ACQUIRE LED turns green. The LOCKED LED turns green and stays green.

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- 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 ~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 not valid 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.

After Turn Up

This completes the turn-up procedures. After completing the turn-up procedures perform the following:

- Assign a System Administrator and any additional users to the system using the procedures in Adding An Administrator-Level User to the System, on page 94.
- Make any required changes to the factory default configuration settings as described in Initial Provisioning, on page 96.
- Complete the commissioning tests in Chapter 4, Commissioning, to ensure that the system is functioning properly.
- Refer to Chapter 5, Maintenance and Troubleshooting, to clear any system alarms that might occur.

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Chapter 3 Provisioning and Operating the SSU-2000

This chapter provides operating instructions and software provisioning procedures for the SSU-2000 system.

In This Chapter

- Controls and Indicators
- Establishing a Connection With the SSU-2000
- Overview of the SSU-2000 Security System
- Adding An Administrator-Level User to the System
- Adding Users to the System
- Initial Provisioning
- Checking Alarm Status
- Factory Default (Basic) Configuration

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Controls and Indicators

SSU-2000 Status LED Indicators

All modules used in the SSU-2000 main chassis and in the optional SDU-2000 Expansion shelf 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 Chapter 6, Clock Module Reference Data, Chapter 7, Input Module Reference Data, and Chapter 8, Output Module Reference Data.

SSU-2000 Operating Controls

The SSU-2000 contains four hardware operating controls:

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

All other controls on the SSU-2000 are software-based. To provision the settings, you must first connect to the SSU-2000 using a serial port or the Ethernet port.

Establishing a Connection With the SSU-2000

You can connect to the SSU-2000 using either a serial connection or an Ethernet connection. To connect via a serial port, see Communicating by Serial Port, on page 91. If the SSU-2000 is connected to an Ethernet LAN, use the procedure described in Connecting through the Ethernet LAN. Refer to Table 3-1 for the serial and Ethernet communications port assignments.

Table 3-1. Communications Port Assignments

Port #	Function	Protocol
Serial Ports (EIA-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

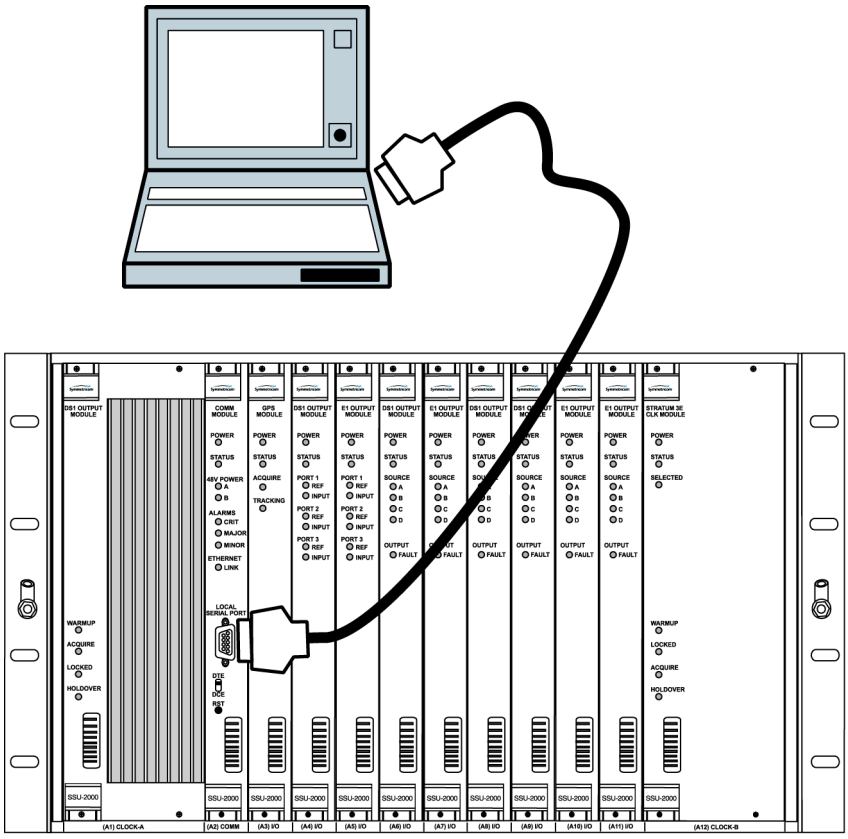
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Table 3-1. Communications Port Assignments (Continued)

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

Communicating by Serial Port

Three EIA-232 ports are available on the SSU-2000. Attach a PC with terminal emulation software to one of the ports as shown in Figure 3-1 (this example shows connecting to the local port on the front of the Communications module).



ss200016

Figure 3-1. Direct Connection Using the Serial Port

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1. Connect one end of the cable to the serial port on the computer or terminal and the other to the appropriate connector on the SSU-2000.

2. Set the DTE/DCE switch on the rear panel of the SSU-2000 for the type of cable (straight-through or modem).

3. Configure the emulation software for 8 data bits, no parity, 1 stop bit, and 9600 baud rate.

4. Start the terminal emulation software and press **Enter**. The system prompt `->` should appear. If it does not, recheck each step in this procedure.

5. For the initial installation, create an Administrator-level user as described in Adding An Administrator-Level User to the System, on page 94, before proceeding with the Ethernet setup.

Communicating by Ethernet

To communicate with the SSU-2000 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-2000 using the Ethernet port.

Configuring the Ethernet Port

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

1. Establish a direct serial connection to the SSU-2000 as described in Communicating by Serial Port, on page 91.

2. Provision the IP, Gateway, and Subnet addresses for the SSU-2000. The IT department or site administrator for your location can recommend specific addresses for these parameters. Use the format xxx.xxx.xxx.xxx for the address.

   ICS commands:
   Type `IP ADDR [ip address]` then press **Enter**.
   Type `IP GATEWAY [gate address]` then press **Enter**.
   Type `IP SUBNET [subnet address]` then press **Enter**.

   TL1 command:
   `SET-PRMTR-IP:::123::[ip address],[gate address],[subnet address];`

3. Restart the Communications module:

   ICS command:
   Type `restart 1A02`, then press **Enter**.

   TL1 command:
   `RST-MODULE::S1A2:123;`

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4. Verify that the information is correct:

   ICS command:
   Type `ip`, then press **Enter**.

   TL1 command:
   `RTRV-PRMTR-IP:::123;`

Connecting through the Ethernet LAN

After the Ethernet port is configured, use the following procedure to connect to it:

1. Ensure that the SSU-2000 is connected to a LAN. See Making Ethernet Connections, on page 72 for details.

2. Telnet from your PC to the IP address assigned to the SSU-2000.

3. Type your user name and press the **Enter** key. If you are not assigned as a user in the system, contact the System Administrator.

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

Overview of the SSU-2000 Security System

The SSU-2000 security system software 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 example, a User-level user does not have as many options available as a Technician-level user.

Table 3-2 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 User Access Levels, on page 276.

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Table 3-2. 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

Adding An Administrator-Level User to the System

An Administrator-level user must be added to the user list when you log in for the first time. This user performs initial setup and can assign user privileges and passwords as needed, as well as configuring all system parameters. Refer to User Access Levels, on page 276, for more information on user access levels.



Caution: You must add an Administrator-level 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 an Administrator-level user to the system.

1. Establish a direct serial connection to the SSU-2000 as described in Communicating by Serial Port, on page 91.

2. 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.

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

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

5. 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.

6. 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.

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

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

9. Type `login` followed by the administrator’s user name and password and press **Enter**. This verifies that the account exists.

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

Adding Users to the System

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

1. Connect a computer to the SSU-2000 using the procedure in Establishing a Connection With the SSU-2000, on page 90. The `SSU-2000>` prompt appears.

2. Log in to the SSU-2000 using the administrator’s name and password.

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

4. Enter the new username and press **Enter**. The system prompts for 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 access level (0 through 4) and press **Enter**. Refer to Overview of the SSU-2000 Security System, on page 93, for more information.

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

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.

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Logging Into the SSU-2000

To log into the SSU-2000:

1. Connect a computer to the SSU-2000 using the procedure in Establishing a Connection With the SSU-2000, on page 90. The `SSU-2000>` prompt appears.

2. Use one of the following commands:

   ICS command:
   Type `login` followed by the administrator's user name and press **Enter**. The system prompts for a password. Type the administrator's password and press **Enter**. The system prompt `SSU-2000>` appears.

   TL1 command:
   Type `ACT-USER::uid:123::pwd;`
   where `uid` and `pwd` are the administrator's user id and password, respectively; 123 is an arbitrary ctag value.

Logging Off of the SSU-2000

Use one of the following commands to log off of the SSU-2000:

ICS command:
Type `bye` and press **Enter**.

TL1 command:
`CANC-USER:::123;`

Initial Provisioning

After you have established communications with the SSU-2000, you must provision the unit so it can track the input signals and start generating outputs. This sections contains general instructions for initial provisioning of the SSU-2000, and are not intended to cover all combinations of Input and Output modules. You may need to alter the commands in this section to match the configuration of your SSU-2000.

Provisioning General Parameters

This section describes how to provision the reference mode and the auto-return mode, set the IP address, and name the unit.

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1. Log in to the SSU-2000 using the procedure in Logging Into the SSU-2000, on page 96.

2. Provision the reference selection mode. The default is Priority, which is the most widely used mode. See Selecting the Input, on page 32, for information on selecting the appropriate mode.

   ICS command:
   Type `REF MODE PRI`, then press **Enter**.

   TL1 command:
   Type `SET-INPUT-REF:::123::port,PRI;`
   where 123 is an arbitrary ctag value and `port` is the selected input port in the format S1Ax[-z], where x is the slot number (3–12) and z is the port (1–3).

   Repeat this command for all inputs.

3. Provision the clocks to enable auto-return (revertive) mode. Symmetricom generally recommends that auto-return be set to On, unless both clocks are of the same Stratum level. See Setting the Reference Switching Mode, on page 33, for more information on revertive and non-revertive modes.

   ICS command:
   Type `CLK AR ON`, then press **Enter**.

   TL1 command:
   `SET-CLK-AR:::123::ON;`

4. Assign a name, if desired, to the SSU-2000. You can assign a `[name]` of up to 20 characters, starting with a letter; the name is returned as the `tid` in responses from the unit.

   ICS command:
   Type `NAME [name]`, then press **Enter**.

   TL1 command:
   `SET-NAME:S1A2::123::[name];`
   You can also use this command to assign a name to inputs and outputs.

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 Clock module to shelf 1, slot 12.

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

2. Log into the SSU-2000 using the procedure in Logging Into the SSU-2000, on page 96.

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3. Enable the module:

   ICS command:
   Type `config 1A12 enable`, then press **Enter**.

   TL1 command:
   `ACT-MODULE::S1A12:123;`

4. Verify that the module is registered:

   ICS command:
   Type `config` and press **Enter**.

   TL1 command:
   `RTRV-CONF::S1A12:123;`

5. Log off the SSU-2000 when you're finished.

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 into the SSU-2000 using the procedure in Logging Into the SSU-2000, on page 96.

2. Disable the module:

   ICS command:
   Type `config 1A12 disable` and press **Enter**.

   TL1 command:
   `DISC-MODULE::S1A12:123;`

3. Log off the SSU-2000 when you're finished.

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 B Clock module in shelf 1, slot 12 from the registry.

1. Log into the SSU-2000 using the procedure in Logging Into the SSU-2000, on page 96.

2. Remove the module from the database:

   ICS command:
   Type `config 1A12 remove` and press **Enter**.

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TL1 command:
`RMV-MODULE::S1A12:123;`

3. Verify that the module is not in the registry:

   ICS command:
   Type `config` and press **Enter**.

   TL1 command:
   `RTRV-CONF::1A12:123;`

4. Log off the SSU-2000 when you're finished.

Provisioning GPS Input Modules

This section describes how to enable GPS Input modules, if they are installed. You must assign a priority level to each module. You can install GPS Input modules only in slot 3 and slot 5 of the main SSU-2000 shelf.

1. Log into the SSU-2000 using the procedure in Logging Into the SSU-2000, on page 96.

2. Enable the modules:

   ICS command:
   Type `INPUT 1A3 ENABLE`, then press **Enter**.
   Type `INPUT 1A5 ENABLE`, then press **Enter**, if a module is present in slot 5.

   TL1 command:
   See the command in step 2, below.

3. Set the priority level for each module.

   ICS command:
   Type `INPUT 1A3 PRI 1` then press **Enter**.
   Type `INPUT 1A5 PRI 1` then press **Enter**, if a module is present in slot 5.

   TL1 command:
   `SET-PRMTR-INPUT::S1A3:123::ON,1;`
   enables the module in slot 3 and sets its Priority to 1.
   `SET-PRMTR-INPUT::S1A5:123::ON,1;`
   enables the module in slot 5 and sets its Priority to 1.

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Provisioning Other Input Modules

This section describes how to enable and provision other types of Input modules such as DS1, E1, or Composite Clock. You must enable and provision each input port as appropriate for the input signal. You can install these Input modules in any slot in the main SSU-2000 shelf.

1. Log into the SSU-2000 using the procedure in Logging Into the SSU-2000, on page 96.

2. Enable the modules:

   ICS command:
   Type `INPUT xAy-z ENABLE`, then press **Enter**
   where x is the shelf number, y is the slot number, and z is the port number. Repeat this command for each port and each slot.

   TL1 command:
   See the command in step 3, below.

3. Set the priority level for each port. Set the input Priority to a value from 0 to 10; 0 indicates that the port is Monitor-only and is never selected as a reference signal. 1 is highest priority, and 10 is lowest.

   ICS command:
   Type `INPUT 1Ay-z PRI [pri]`, then press **Enter**
   where y is the slot number, z is the port number, and [pri] is the priority value. Repeat this command for each port and each slot.

   TL1 commands:
   `SET-PRMTR-INPUT::S1Ay[-z]:123::ON,[pri];`
   where y is the slot number and z is the port number. This command sets the Priority to the value (1–10) you enter. Repeat this command for each port and slot.

   `SET-PRMTR-CCINP::S1Ay[-z]:123::ON,[pri];`
   for Composite Clock Input modules, This command enables the module (y) and port (z) and sets its Priority to the value (1–10) you enter. Repeat this command for each CC Input port and slot.

4. Disable all slots and/or ports with no connected input signal to prevent spurious alarms.

   ICS command:
   Type `INPUT 1Ay-z DISABLE` then press **Enter**, where y is the slot number and z is the port number. Repeat this command for each unused slot and port.

   TL1 command:
   `SET-PRMTR-INPUT::S1Ay[-z]:123::OFF;`
   where y is the slot number and z is the port number. Repeat this command for each unused slot and port.

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5. Set the framing type for each input port. Provision DS1 signals to either ESF or D4; provision E1 signals to CAS or CCS.

   ICS command:
   Type `INPUT 1Ay-z FRAME ESF|D4`, then press **Enter**
   where y is the slot number and z is the port number. Select either ESF or D4 as appropriate. Repeat this command as needed for each slot and port.

   TL1 command:
   See Step 8, below.

6. Provision the Zero Suppress for each input port to On or Off as appropriate.

   ICS command:
   Type `INPUT 1Ay-z ZS ON|OFF` then press **Enter**
   where y is the slot number and z is the port number.

   TL1 command:
   See Step 8, below.

7. Provision the Cyclic Redundancy Check (CRC) for each input port to On or Off.

   ICS command:
   Type `INPUT 1Ay-z CRC ON|OFF` then press **Enter**
   where y is the slot number and z is the port number.

   TL1 command:
   See Step 8, below.

8. Provision the Synchronization Status Message (SSM) for each input port to On or Off. When set to On, the SSU-2000 reads and interprets the SQL on the reference. If the reference does not include an SSM, the SQL is defined as STU.

   ICS command:
   Type `INPUT 1Ay-z SSM ON|OFF` then press **Enter**, where y is the slot number and z is the port number.
   For E1 signals, you must define the bit position:
   Type `INPUT 1Ay-z SSM [4-8]` then press **Enter**.

   TL1 commands:
   `SET-PRMTR-INPUT::S1Ay[-z]:123::,,,ESF|D4|CCS|CAS|1|1.544|2.048|5|10,ssm,zs,crc,,bit;`
   where y is the slot number and z is the port number; the numbers indicate the input frequency in megaHertz; ssm, zs, and crc are ON or OFF, as appropriate. Bit indicates the position (4–8) of the SSM in E1 signals.

   `SET-PRMTR-CCINP::S1Ay[-z]:123::,,,zs;`
   for Composite Clock Input modules, ZS is ON or OFF, as appropriate.

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9. Provision the MTIE limits for each input port according to ANSI (PRS or DS1) or ITU (G.811 or G.823) specifications.

   ICS command:
   Type `INPUT 1Ay-z MTIE PRS|DS1|G.811|G.823` then press **Enter**
   where y is the slot number and z is the port number.

   TL1 command:
   N/A

10. Assign a name, if desired, to each input port. You can assign a name of up to 20 characters.

    ICS command:
    Type `IONAME 1Ay-z [name]` then press **Enter**
    where y is the slot number and z is the port number.

    TL1 command:
    `SET-NAME::SxAy[-z]:123:name;`

Provisioning Output Modules

This section describes how to enable and provision Output modules. such as DS1, E1, or Composite Clock. You must enable and provision each output port as appropriate. You can install Output modules in any slot in the main SSU-2000 shelf and in the SDU-2000 Expansion Shelf.

1. Log into the SSU-2000 using the procedure in Logging Into the SSU-2000, on page 96.

2. Enable the modules.

   ICS command:
   Type `OUTPUT xAy-z ENABLE`, then press **Enter**
   where x is the shelf number, y is the slot number and z is the port number.
   Repeat this command for each slot and port.

   TL1 command:
   `SET-PRMTR-OUTPUT::SxA[y[-z]]:123::ON;`
   where x is the shelf number, y is the slot number, and z is the port number.
   Repeat this command for each shelf, port, and slot.

3. Provision the output module as appropriate.

   ICS command:
   Refer to the OUTPUT command description in Interactive Command Set, on page 318, for details on all command options.

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TL1 command:
Refer to the SET-PRMTR-OUT commands for the various Output modules in TL1 Command Interface, on page 268.

4. DIsable unused output ports to prevent spurious alarms. Repeat this command for each unused port and slot.

   ICS command:
   Type `OUTPUT xAy-z DISABLE`, then press **Enter**
   where x is the shelf number, y is the slot number, and z is the port number.

   TL1 command:
   `SET-PRMTR-OUTPUT::SxAy[-z]:123::OFF;`
   where x is the shelf number, y is the slot number, and z is the port number.

5. If a DS1 input signal is not available, bypass the Clock C source for all output modules.

   ICS command:
   Type `OUTPUT BYPASS OFF`, then press **Enter**.

   TL1 command:
   `SET-PRMTR-OUTPUT::SxAy[-z]:123::,,,OFF;`
   where x is the shelf number, y is the slot number, and z is the port number.
   Repeat this command for each shelf and Output module.

Saving the Provisioning Setup

After you provision each module, you can save the setup in the Communications module memory.

ICS command:
Type `SET SAVE`, then press **Enter**.

TL1 command:
`SET-PRMTR-SETUP::ALL:123::SAVE;`

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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 into the SSU-2000 using the procedure in Logging Into the SSU-2000, on page 96.

2. Verify that there are no active alarms:

   ICS command:
   Type `alarm` and press **Enter**

   TL1 command:
   `RTRV-ALM::ALL;`

3. Log off the SSU-2000 when you're finished.

Factory Default (Basic) Configuration

The SSU-2000 is shipped from the factory with all required operational software. The factory default (basic) configuration 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.

Changing Factory Defaults

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

1. Log into the SSU-2000 using the procedure in Logging Into the SSU-2000, on page 96.

2. Set the alarm value:

   ICS command:
   Type `alarm 1A2 03 MAJOR` and press **Enter**.

   TL1 command:
   `SET-PRMTR-ALARM::S1A2:123:3,MAJ;`

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

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Restoring Factory Defaults

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

1. Log into the SSU-2000 using the procedure in Logging Into the SSU-2000, on page 96.

2. Restore the configuration to the factory default values:

   ICS command:
   Type `setup xAy factory` and press **Enter**.

   TL1 command:
   `SET-PRMTR-SETUP::SxA[y[-z]]:123::FACTORY;`

3. Log off the SSU-2000 when you're finished.

Customizing Other Configuration Options

The SSU-2000 allows you to change any or all configuration settings. Use the following procedures to customize the system for a particular environment.

1. Log into the SSU-2000 using the procedure in Logging Into the SSU-2000, on page 96.

2. Use the commands listed in TL1 Command Interface, on page 268, or Interactive Command Set, on page 318, to configure the system.



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

3. Save the current configuration as the user default setting:

   ICS command:
   Type `setup save` and press **Enter**.

   TL1 command:
   `SET-PRMTR-SETUP:::123::SAVE;`

4. Log off the SSU-2000 when you're finished.

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Chapter 4 Commissioning

The commissioning tests for the SSU-2000 are checklist-based operational tests that field engineers perform at the installation site after completion of installation, system turn-up, and provisioning to verify that the system is correctly installed, configured and operating properly. At this point, the system is ready to be placed in service.

Record the results on the data sheet provided in Commissioning Test Data Sheet, on page 114.

In This Chapter

- Readiness to Test Checklist
- SSU-2000 Commands
- Equipment Requirements
- Commissioning Tests
- Commissioning Test Data Sheet

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Readiness to Test Checklist

Before performing the commissioning tests in this section, ensure that all items in the Readiness Checklist (Table 4-1) have been performed.

Table 4-1. SSU-2000 Readiness Checklist

Step	Task	Checked
1	The SSU-2000 is installed in the rack with a minimum of 3 inches (7.6 cm) of clearance between the bottom of the lowest chassis and the floor or other equipment. An I/O Adapter panel can be installed adjacent to the bottom of the chassis without restricting the necessary cooling airflow.	
2	The SSU-2000 main chassis has a minimum of 1 inch of clearance between the top of the chassis and an adjacent chassis (except that an SSU-2000 I/O Adapter panel can be installed adjacent to the chassis with no clearance since it does not impact airflow).	
3	A Clock Module is installed in slot A1 and A12 as required (Stratum 2E must be in slot A1, if used).	
4	A Communications module is installed in slot A2.	
5	At least one Input module is installed in the chassis.	
6	An Input I/O Adapter panel is installed above the SSU-2000 and cabled to the corresponding I/O connector on the rear panel of the SSU-2000.	
7	If using the optional GPS Input module, it is installed in slot A3 or A5 and a Radio antenna is attached to the corresponding Radio antenna connector on the rear panel of the shelf.	
8	At least one Output module is installed in chassis slot A4 through A10 (unless the monitor-only configuration is being used)	
9	One Output I/O adapter panel is installed near the SSU-2000 main chassis for *each* Output module (or redundant pair) in the main chassis.	
10	One Output I/O adapter panel is installed adjacent to an SDU-2000 Expansion shelf for each output module (or redundant pair) installed in an optional SDU-2000 Expansion shelf.	
11	An SDU Termination Plug is installed on the SDU Connector (if the optional SDU-2000 Expansion shelf is not installed)	
12	–48 vDC inputs from external power supplies are connected to the A and B Power terminal strips on the rear panel of the SSU-2000 shelf.	
13	The selected set of critical, major and minor alarms terminals on the rear panel of the SSU-2000 are connected to the customer's alarm circuitry.	
14	At least one reference input is connected to each input module in the SSU-2000 main chassis.	
15	Two fuses are installed in the SSU-2000 main chassis.	

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Table 4-1. SSU-2000 Readiness Checklist (Continued)

Step	Task	Checked
16	Turnup has been performed on the SSU-2000 system, user configuration setup and saved and IPs assigned for the Ethernet interface.	
17	A System Administrator and user access levels have been assigned to the SSU-2000 (see Chapter 4, Operating and Provisioning Procedures).	
18	If the Ethernet connection is being used, the ethernet connection on the rear panel of the SSU-2000 is connected into the local area network.	

SSU-2000 Commands

Several SSU-2000 commands may be useful while performing the following tests. These include:

- CONFIG – reports the modules installed in the system with part numbers and other information
- SETUP – reports current settings for the module options
- STATUS – reports the current operating status of all modules in the system

Each of these commands can also be used with a module ID# (slot position) to obtain additional detail for a module. The CLK, INPUT, and OUTPUT commands provide status for only the indicated type modules, and can also be used with the module ID# to obtain detailed information.

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.

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Commissioning Tests

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

- Testing the Ethernet Communications Interface
- Testing the RS-232 Ports
- Testing the SSU-2000 Minor alarms
- Testing the SSU-2000 Major alarms
- Testing the SSU-2000 Critical alarms
- Testing the Reference Input Signals
- Testing the SSU-2000 Output signals

Testing the Ethernet Communications Interface

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

1. Telnet from the PC to the IP address assigned to the SSU-2000. The system prompts for a user name.

2. Type your assigned username and password and press **Enter.** The system prompt appears.

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

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 Establishing a Connection With the SSU-2000, on page 90.

2. Type `HELP` and press **Enter**.

3. Verify a response to the command entered.

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.

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Testing The MINOR Alarms

To test the MINOR alarm relay closures and software:

1. Set the Power A alarm level to MINOR:

   ICS format: `ALARM 1A02 MINOR`

   TL1 format: `SET-PRMTR-ALARM::S1A2:::02,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 the MINOR alarm is reported to the communications terminal.

5. Verify that a MINOR alarm was logged in the event log:

   ICS format: `EVENT ALARM`

   TL1 format: `RTRV-EVENT::S1A2;`

6. Replace the fuse to restore Power A to the unit.

7. Verify that the alarm clears, is reported and logged.

Testing the MAJOR Alarms

To test the MAJOR alarm relay closures and software:

1. Set the Power A alarm level to MAJOR:

   ICS format: `ALARM 1A02 MAJOR`

   TL1 format: `SET-PRMTR-ALARM::S1A2:::02,MAJOR;`

2. Remove Power A input by removing the A-bus fuse (or the 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. Verify that a MAJOR alarm was logged in the event log:

   ICS format: `EVENT ALARM`

   TL1 format: `RTRV-EVENT::S1A2;`

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6. Replace the fuse to restore Power A to the unit.

7. Verify that the alarm clears, is reported and logged.

Testing the CRITICAL Alarms

To test the CRITICAL alarm relay closures and software:

1. Set the Power A alarm level to CRITICAL:

   ICS format: `ALARM 1A02 CRITICAL`

   TL1 format: `SET-PRMTR-ALARM::S1A2:::02,CRITICAL;`

2. Remove Power A input by removing the A-bus fuse (or the fuse that supplies Power A).

3. Verify that the CRITICAL alarm indicator is ON.

4. Verify that the CRITICAL alarm is reported to the communications terminal.

5. Verify that a CRITICAL alarm was logged in the event log:

   ICS format: `EVENT ALARM`

   TL1 format: `RTRV-EVENT::S1A2;`

6. Replace the fuse to restore Power A to the unit.

7. Verify that the alarm clears, is reported and logged.

8. Type `ALARM` and press **Enter** to restore Power A to the original alarm level.

Testing the Reference Signals and Selection

To test the reference signals and selection:

1. Type `INPUT` to verify each input signal is present with no alarms. Each reference input will be listed by module position and port number, status, phase A and B readings, input PQL, signal alarms, and MTIE alarms.

   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 ***/////*** (no alarms present, F indicates an alarm) and the MTIE alarms should all be **OK**.

2. 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.

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3. 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.

4. Type `EVENT` and press **Enter**; verify that the alarms and events created are recorded in the event log.

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 in **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 $1E^{-9}$.

Testing the Output Section

To test the output section:

1. Type `OUTPUT` and press **Enter** to verify each output module is operating with no alarms. This will display 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 (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.

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Testing the System Stability and Accuracy (Optional)

This test is only to be performed 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.

Commissioning Test Data Sheet

The following test data sheet should be completed as an indicator of operational readiness of the SSU-2000.

Table 4-2. Commissioning Test Data Sheet

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)		

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Chapter 5 Maintenance and Troubleshooting

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

In This Chapter

- Responding to SSU-2000 Alarms
- Preventive Maintenance
- Corrective Maintenance
- Troubleshooting
- Re-ordering Information

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Responding to SSU-2000 Alarms

The SSU-2000 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 Troubleshooting, on page 119, to clear the alarm.

Preventive Maintenance

The SSU-2000 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 Electromagnetic Interference (EMI) Considerations, on page 63, 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 unit, under no circumstances should the interior chassis of the SSU-2000 be allowed to come in contact with water.



Caution: To avoid damage to the unit, never attempt to vacuum the interior of the SSU-2000.



Caution: To avoid the possibility of the lithium battery exploding in the Communications module or Clock modules, ***do not*** replace the battery. Return the entire module to Symmetricom Global Services 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 Symmetricom Global Services for corrective service.



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

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Corrective Maintenance

The SSU-2000 and SDU-2000 have a modular design and field service is limited to replacing the FRUs (field replaceable units) identified in Table 5-1 and Table 5-2. These tables also outline possible component problems and corrective action. Refer to Re-ordering Information, on page 125, for information on re-ordering, re-packing, or returning equipment to the factory.



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-2000.



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



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.

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Table 5-1. SSU Corrective Action Table

Component	Corrective Action	Part Number
Motherboard or Main Chassis Fault	Contact Symmetricom Global Services.	25413020-000-0
Defective Cable	Replace defective cable.	See Chapter 9, Hardware Configuration Guide
Module Fault(s)	a. Check that module(s) is seated correctly. b. Address any fault LED lights. c. If present, press RST button on Comms module. d. Check both Power A and Power B inputs for a tripped breaker or blown fuse on the input power control panel. e. Replace module. f. If unable to correct the problem, contact Symmetricom Global Services.	All Modules
Module Replacement		
Communications Module 2E Clock Module 3E Clock Module Type 1 Clock Module 1-Port DS1 Input Module 3-Port DS1 Input Module 1-Port E1 Input Module 3-Port E1 Input Module CC Input Module GPS Input Module DS1 Output Module E1 Output Module CC Output Module 2048 kHz Output Module RS 422 Output Module	See Handling Modules, on page 81	23413012-000-0 23413016-000-0 23413015-000-0 23413015-001-0 23413013-001-0 23413013-002-0 23413014-001-0 23413014-002-0 23413279-000-0 23413017-000-0 23413018-000-0 23413158-000-0 23413159-000-0 23413287-000-0

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Table 5-2. SDU Corrective Action Table

Component	Corrective Action	Part Number
Motherboard or Main Chassis Fault	Contact Symmetricom Global Services.	25413023-000-0
Defective Cable	Replace defective cable.	805SCSI-0050 (1 m cable; other lengths available)
Module Fault(s)	a. Check that module(s) is seated correctly. b. Address any fault LED lights. c. If present, press RST button on Comms module. d. Check both Power A and Power B inputs for a tripped breaker or blown fuse on the input power control panel. e. Replace module. f. If you are unable to correct the problem, contact Symmetricom Global Services.	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

Troubleshooting

The SSU-2000 incorporates many alarms and event messages to alert that a possible problem exists. These alarm and event message reports can be accessed via the Communications 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. Communicating by Serial Port, on page 91, outlines the procedures for connecting to the SSU-2000 using the Comms module serial ports. Communicating by Ethernet, on page 92, 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

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Establishing a Connection



Note: An SSU-2000 Administrator must be appointed prior to connecting to the system. The Administrator will assign User privileges and access codes. See Chapter 3, Provisioning and Operating the SSU-2000, for more details.

To perform troubleshooting on the SSU-2000, 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 rear panel), or the Local, located on the front panel of the communications module. If the SSU-2000 is connected to a LAN, an Ethernet telnet session may be established. Refer to Communicating by Serial Port, on page 91, to establish a serial connection and Communicating by Ethernet, on page 92 to establish an Ethernet connection.

Troubleshooting Guide

This section describes troubleshooting procedures for the SSU-2000. Table 5-3 details common system faults and the corrective action to correct the problem.

The modular design of the SSU-2000 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 Symmetricom Global Services.

When a Comms module is installed and functioning properly, it monitors the SSU-2000 and logs unit events into non-volatile memory for user 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. Corrective Maintenance, on page 117, explains how to interpret status messages and take corrective action if needed.

Interpreting Status Messages

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

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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-6 lists event messages categorized by module. Each section lists status messages associated with each module and an event description of each message.

Figure 5-1 shows the structure of a typical Alarm and Event report status messages.

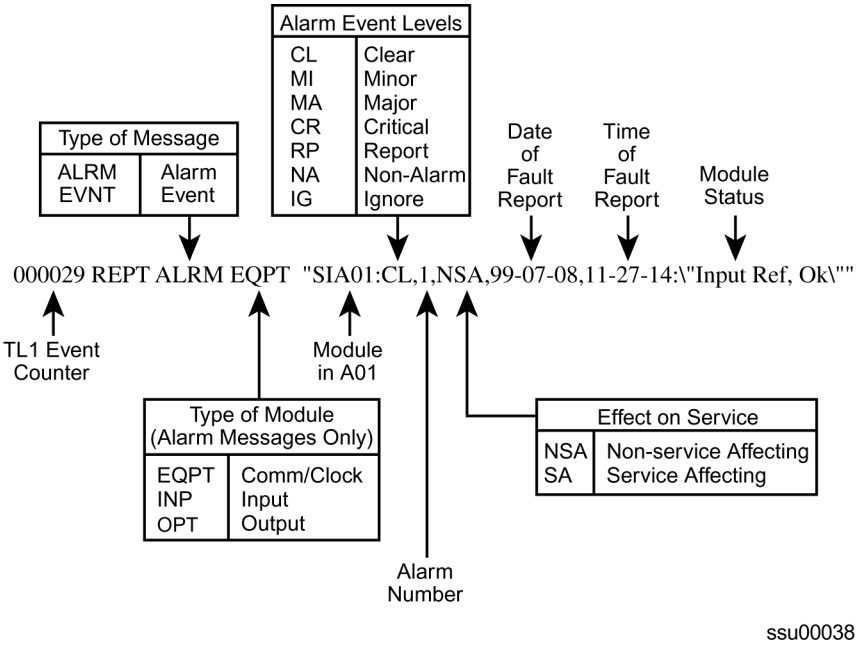


Figure 5-1. Alarm and Event Status Breakdown

Table 5-3 outlines troubleshooting procedures for the SSU-2000.

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Table 5-3. SSU-2000 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 Symmetricom Global Services.
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 Establishing a Connection, on page 120, for more information).
	Improperly installed or faulty Comms module	Re-seat the Comms module. Press the RST button located on the front panel of module. If problem is not rectified, call Symmetricom Global Services.
	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 Symmetricom Global Services.
Status LED on Input module is amber	Firmware compromised	Re-seat the Input module. If problem is not rectified, call Symmetricom Global Services.

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Table 5-3. SSU-2000 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 shelf: ■ left slot = even ■ right slot = odd Expansion shelf: ■ 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 shelf	No power to unit	Check to ensure that UPS (if applicable) is operating correctly.
	Both A and B fuses on Expansion shelf are blown	Remove fuses and replace.
	Loss of ground	Re-attach ground wires.
	Loose power cabling to Expansion shelf	Check that power cables to unit are securely fastened.
	Expansion shelf is faulty	Call Symmetricom Global Services.
Loss of signal from Expansion shelf	D clock not connected; loose SDU cable to the expansion shelf	Check SDU cable and connect D clock.
Any amber source LED on the Output module	Loss of clock signal	Ensure clock modules are inserted properly.
	Clock modules are in warmup mode	No action necessary.

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Table 5-3. SSU-2000 Troubleshooting Procedures (Continued)

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

Troubleshooting the SDU-2000

The buffer module in the SDU-2000e collects status information from the Output modules and relays status messages to the SSU-2000. The status messages alert the SSU-2000 when a possible problem exists; they can be accessed through the SSU-2000 using a terminal or PC using a terminal emulation software. Refer to Establishing a Connection With the SSU-2000, on page 90, for more information on connecting to an SSU-2000 for troubleshooting. Table 5-4 outlines troubleshooting procedures for the SDU-2000.



Note: If fault isolation and corrective action have been performed and the problem persists, contact Symmetricom Global Services.

Table 5-4. 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.
Output module Source indicator is 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.

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Table 5-4. SDU-2000e Troubleshooting Procedures (Continued)

Symptom	Probable Cause	Troubleshooting Procedure/Corrective Action
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 Symmetricom Global Services.
Loss of signal to/from expansion shelf	Loose SDU cable to the expansion shelf	Check SDU cable.
	Both clocks not connected	Connect one or both clocks.

Re-ordering Information

To re-order any module or accessory, contact the Symmetricom Sales Department. Supply the module or accessory name and its part number along with the purchase order number. A current list of SSU-2000 system components and modules/ accessories and their part numbers is provided in Table 9-3. Accessories are described in Appendix E, Default Settings.

Equipment Return Procedure

You should return the equipment to Symmetricom only after you have exhausted the troubleshooting procedures described earlier in this chapter, or if Symmetricom Global Services has advised you to return the unit.



Note: Please retain the original packaging of the unit for re-shipping the product as needed. If the original packaging has been discarded, contact Symmetricom Global Services (SGS) for assistance.

Repacking the Unit

Return all units in the original packaging. If the original packaging is not available, contact Symmetricom Global Services. Use standard packing procedures for products being returned for repair to protect the equipment during shipment. Connectors should be protected with connector covers or the equipment should be wrapped in plastic before packaging. Ensure that the front and rear panels are protected when packaged.

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Equipment Return Procedure

To return equipment to Symmetricom for repair:

1. Call Symmetricom Global Services (SGS) at 888-367-7966 (toll-free in USA only), 408-428-7907, or +44 (0) 1189 699 799 in Europe, Middle East, or Africa to obtain a return material authorization number (RMA) before returning the product for service. Retain this RMA number for future reference.

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 Symmetricom, transportation prepaid and insured, with the Return Material Authorization (RMA) number and item numbers or part numbers clearly marked on the outside of the container to:

   Attn: Global Services
   Symmetricom, Inc.
   Aguadilla Site
   Montana Industrial Park
   Street B, Lot 52
   Aguadilla, PR 00603
   Tel: 787-658-3535
   Fax: 787-658-3560

   Repaired equipment is returned to you with shipping costs prepaid by Symmetricom.

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Chapter 6 Clock Module Reference Data

This chapter contains reference information for the Clock and Communications modules available for use in the SSU-2000.

In This Chapter

- Stratum 2E Clock Module
- Stratum 3E Clock Module
- Type 1 Clock Module
- Communications Module

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Stratum 2E Clock Module

This section provides user reference information for the Stratum 2E Clock module (part number 23413016-000-0) used in the SSU-2000.

Functional Overview

The Stratum 2E Clock module uses a Rubidium oscillator and meets or exceeds the performance requirements for ITU and ETSI Type I Transit and Type II Local 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 reference signals used by the input and Output modules.

A typical SSU-2000 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 x 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 operation 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.

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Functional Block Diagram

A simplified block diagram of the Stratum 2E Clock module is shown in Figure 6-1.

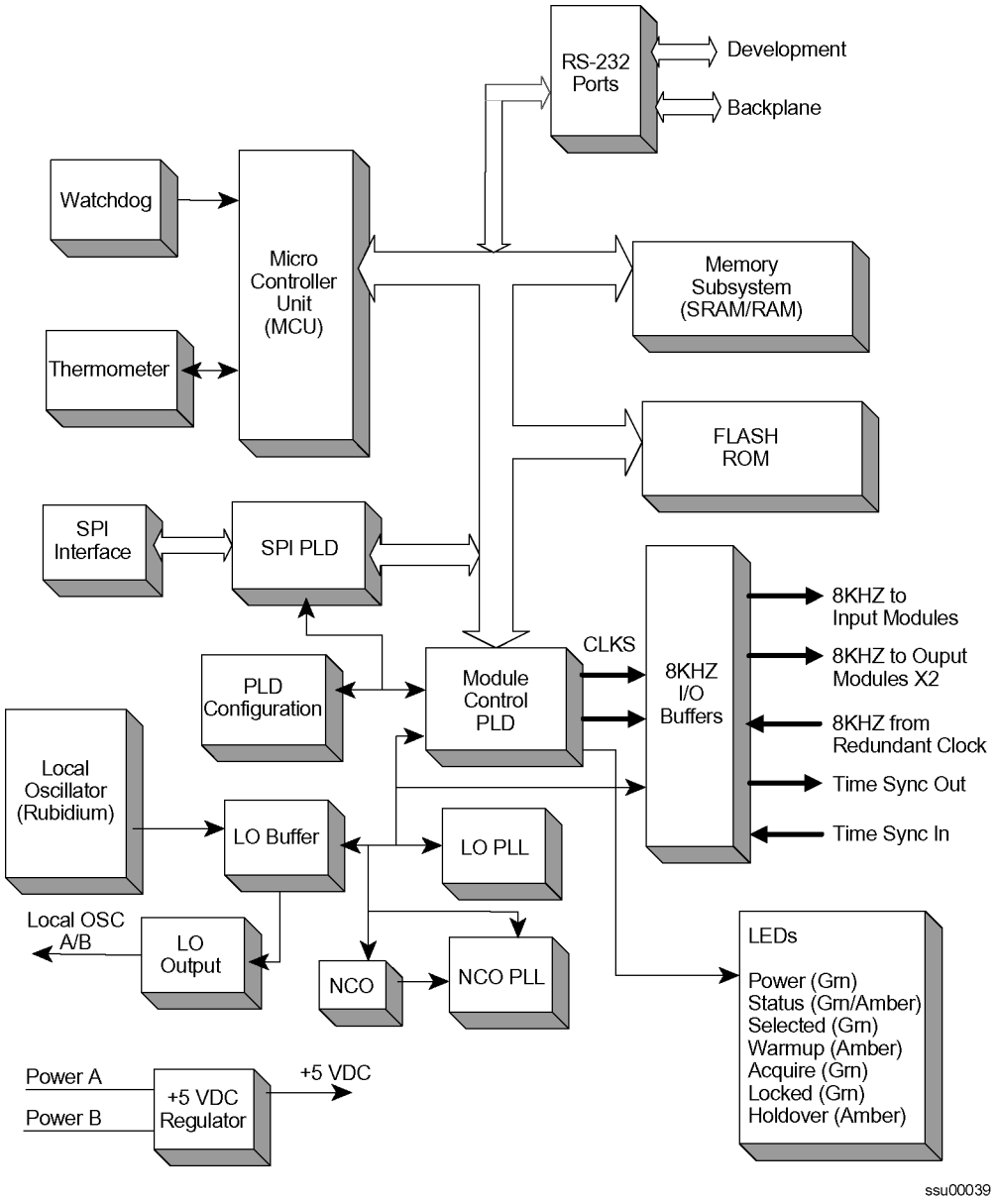


Figure 6-1. Block Diagram of the Stratum 2E Clock Module

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Status LED Indicators

The status LED indicators on the Stratum 2E Clock module are illustrated in Figure 6-2 and are described in Table 6-1.

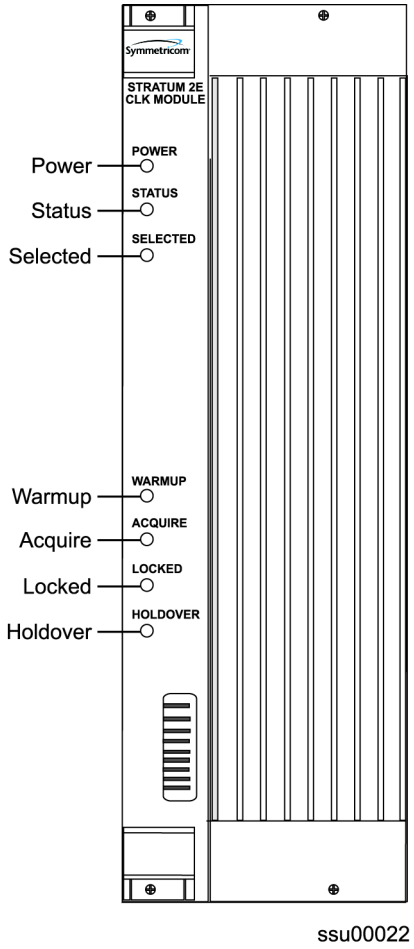


Figure 6-2. Front Panel of the Stratum 2E Clock Module

Table 6-1. 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

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Table 6-1. 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 Off = Clock module is not in Holdover mode

Functional Specifications

Table 6-2 lists the specifications for the Stratum 2E Clock module.

Table 6-2. Stratum 2E Clock Module Specifications

Performance Characteristic	Specification
Free Running Accuracy	Within $\pm 5 \times 10^{-10}$ the first year Within $\pm 5 \times 10^{-9}$ 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	 $\pm 9 \times 10^{-11}$ $\pm 1 \times 10^{-10}$ $\pm 1.5 \times 10^{-10}$ $\pm 1.7 \times 10^{-10}$
Numeric Controlled Oscillator (NCO) PLL lock range	$\pm 5 \times 10^{-4}$
Tuning Resolution (Locked Mode)	$<1 \times 10^{-13}$
Warm-up Time (Warm-up Mode)	20 minutes
Wander Output (Holdover)	Includes effects of all SSU-2000 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 8kHz output)

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Stratum 3E Clock Module

This section provides user reference information for the Stratum 3E Clock module (part number 23413015-000-0) used in the SSU-2000. This module provides a lower cost backup clock solution for the system.

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 1×10^{-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.

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Functional Block Diagram

A simplified block diagram of the Stratum 3E Clock module is provided in Figure 6-3.

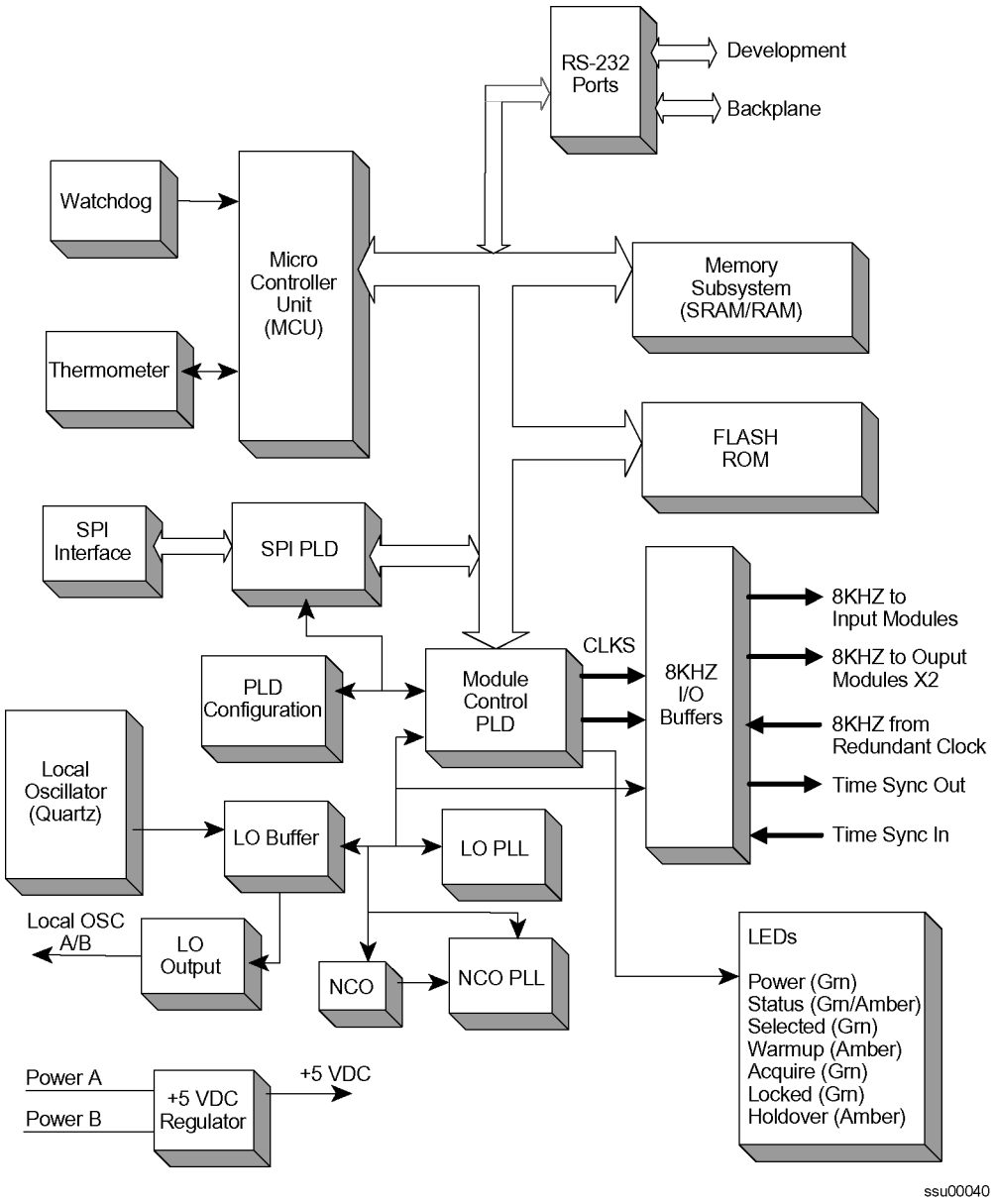


Figure 6-3. Block Diagram of the Stratum 3E Clock Module

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Status LED Indicators

The status LED indicators on the Stratum 3E Clock module are illustrated in Figure 6-4 and listed and are described in Table 6-3.

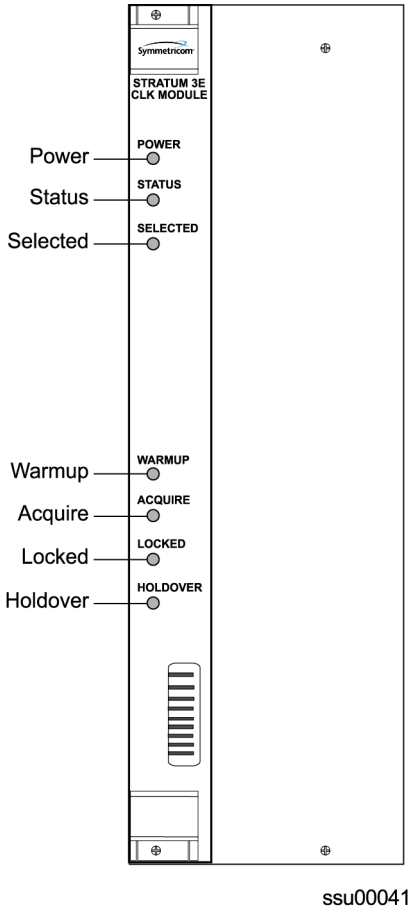


Figure 6-4. Front Panel of the Stratum 3E Clock Module

Table 6-3. 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
WARMUP	Amber	On = Clock module is in warm-up mode Off = Clock module has completed warmup

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Table 6-3. Stratum 3E Clock Module Status LED Indicators (Continued)

Indicator	Color	Description
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 Off = Clock module is not in holdover mode

Performance Specifications

Specifications for the Stratum 3E Clock module are provided in Table 6-4.

Table 6-4. Stratum 3E Clock Module Performance Specifications

Performance Characteristic	Specification
Free Running Accuracy	Within ±2.5 x 10^{-7}, the first year (vendor spec) Within ±3.7 x 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	 ±5 x 10^{-9} ±1 x 10^{-8}
Numeric Controlled Oscillator (NCO) PLL lock range	±5 x 10^{-4}
Tuning Resolution (Locked Mode)	<1 x 10^{-13}
Warm-up Time (Warm-up Mode)	20 minutes
Wander Output (Holdover)	Includes effects of all SSU-2000 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)

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Type 1 Clock Module

This section provides operating instructions and software provisioning procedures for the Type 1 Clock module (part number 23413015-001-0), designed for use in the SSU-2000 Synchronization Supply Unit.

Functional Overview

The Type 1 Clock module uses a quartz oscillator which meets or exceeds the performance requirements for ITU and ETSI Type 1 Slave clocks. The Clock module reads measurement data from the Input modules, provides frequency control of the oscillator through DDS circuitry, and generates reference signals used by the Input and Output modules.

A typical SSU-2000 shelf contains dual redundant Clock modules. Each Clock module maintains phase synchronization with the redundant Clock module. Its hardware and software also provides 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 operation 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, and provides the system Priority Quality Level (PQL) to all Output modules configured to generate Synchronization Status Messages (SSMs). 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.

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Functional Block Diagram

A simplified block diagram of the Type 1 Clock module is shown in Figure 6-5.

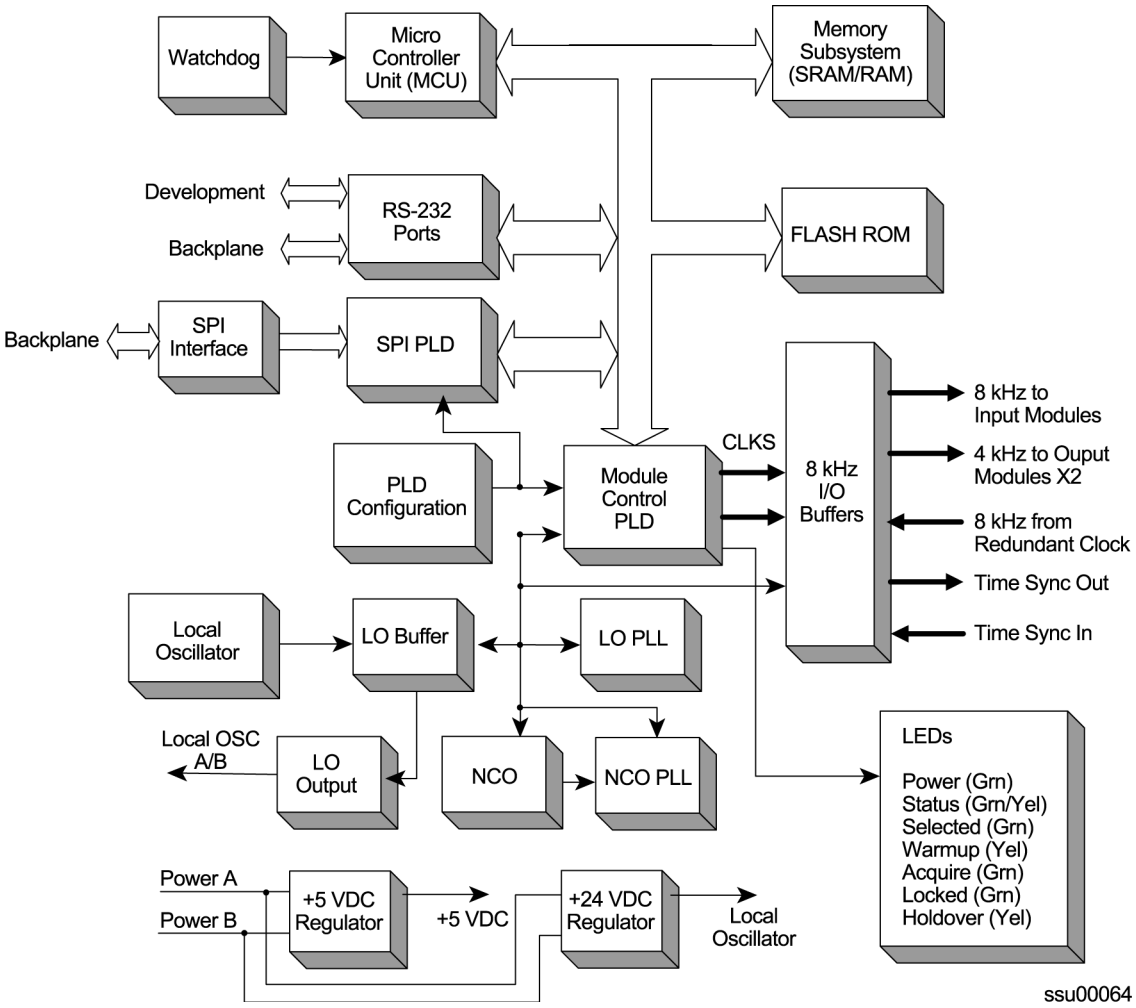


Figure 6-5. Block Diagram of the Type 1 Clock Module

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Status LED Indicators

The status LED indicators on the Type 1 Clock module are illustrated in Figure 6-6 and are described in Table 6-5.

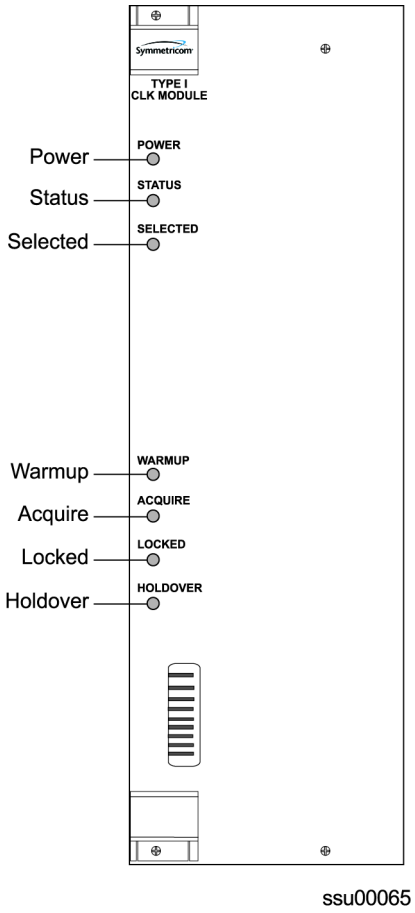


Figure 6-6. Front Panel of the Type 1 Clock Module

Table 6-5. Type 1 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 clock signals for output generation. Off = Module not selected
Warmup	Amber	On = Clock module is in warm-up mode Off = Clock module has completed warmup

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Table 6-5. Type 1 Clock Module Status LED Indicators (Continued)

Indicator	Color	Description
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 Off = Clock module is not in Holdover mode

Functional Specifications

Table 6-6 lists the specifications for the Type 1 Clock module.

Table 6-6. Type 1 Clock Module Specifications

Performance Characteristic	Specification
Holdover Stability 0 to 24 hrs @ –5 to +45°C	±2 x 10^{-9} (after 30 days operation)
Numeric Controlled Oscillator (NCO) PLL lock range	±5 x 10^{-4}
Tuning Resolution (Locked Mode)	<1 x 10^{-13}
Warm-up Time (Warm-up Mode)	20 minutes
Wander Output (Holdover)	Includes effects of all SSU-2000 modules: Compliant with clock levels per ITU-T G.812, Type 1 and ETSI EN300 462-4
Jitter (Locked or Holdover)	< 4 ns p-p (measured at the CLKA/BIN 8 kHz output)

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Communications Module

This section provides reference information on the Communications module (part number 23413012-000-0) that functions as a master controller for the SSU-2000.

Functional Overview

The Communications module installs in slot A2 and provides an interface between the user and the SSU-2000. This interface allows users to display and control much of the activity in the SSU-2000 shelf and the optional SDU-2000 expansion shelf. 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 for reprogramming of its flash ROM and for reconfiguring of all programmable logic devices, while installed at the user's location. The Communications module also allows for this same capability for all other modules installed in the SSU-2000 shelf 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-2000 with power already applied and with other modules installed, the Communications module reads the configuration of the modules in the main shelf and in all installed expansion shelves. This information is saved in nonvolatile memory on the Communications module. If power is applied to the SSU-2000 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-2000 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 is 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-2000 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.

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Functional Block Diagram

A simplified block diagram of the Communications module is shown in Figure 6-7.

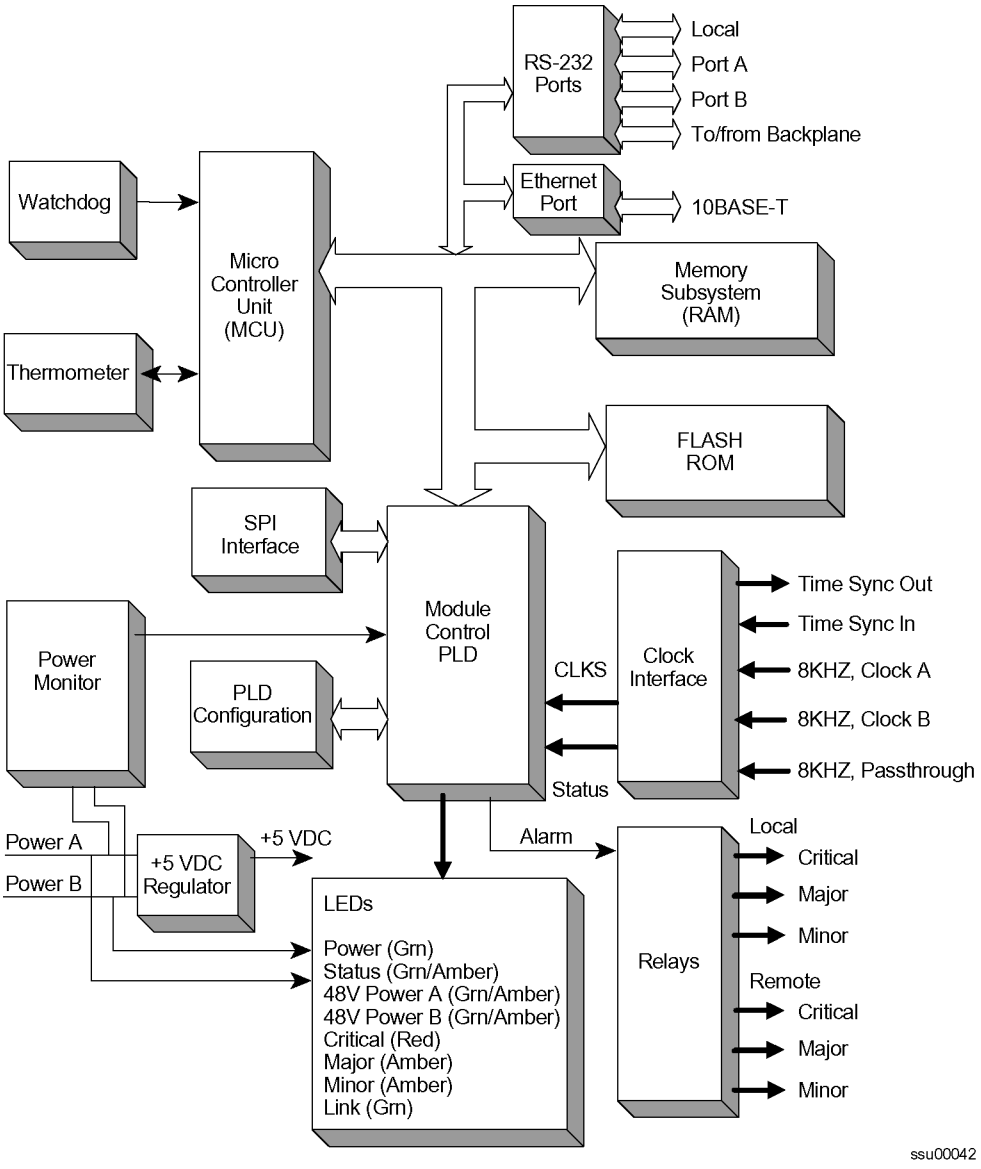


Figure 6-7. Block Diagram of the Communications Module

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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 6-8 and described in Table 6-7.

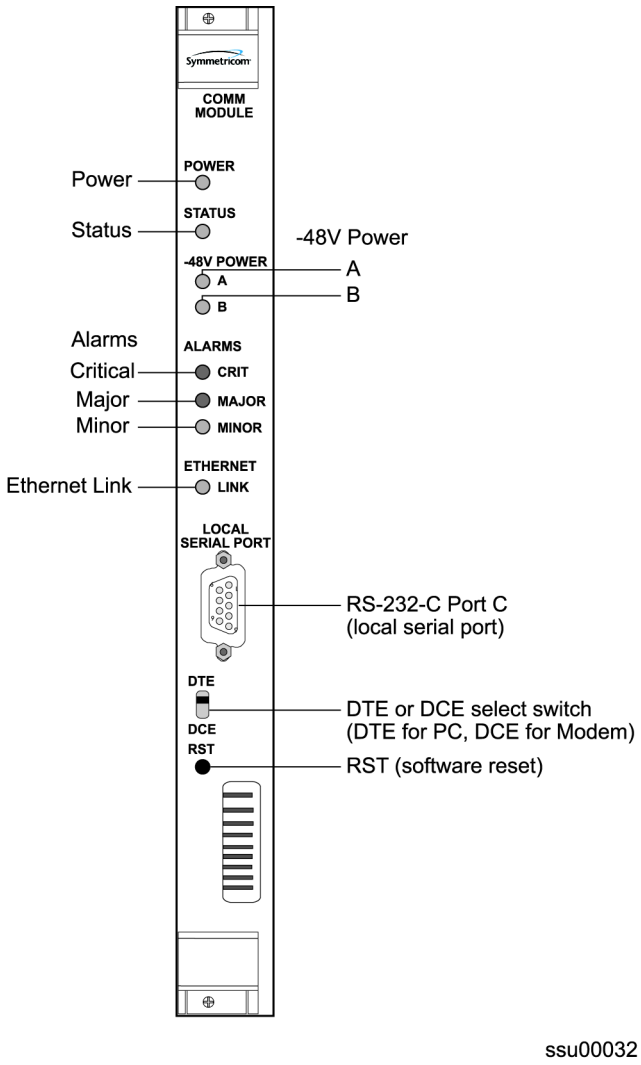


Figure 6-8. Front Panel of the Communications Module

Table 6-7. 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

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Table 6-7. 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

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

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
- 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

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Alarm Levels

The Communications module alarm logic incorporates three alarm levels:

- CRITICAL Alarms – This class of alarms requires immediate user intervention. When a critical alarm condition is detected, the CRITICAL ALARM relay at the rear panel of the SSU-2000 is activated and the CRITICAL ALARM LED on the front of the Communications module lights red.
- MAJOR Alarms – A class of alarms that may require immediate user intervention. When a major alarm condition is detected, the major alarm relay on the rear panel of the SSU-2000 is activated and the MAJOR ALARM LED on the front of the Communications module lights red.
- MINOR Alarms – A 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-set time, from 60 to 500,000 seconds, default is (86,400 seconds or one day). The elevation time is kept 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 6-8 lists the Communications module alarms.

Table 6-8. 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	Immed	No
0x3	Loss of Power B	MINOR	Immed	No
0x4	SPI Watchdog Timeout	MAJOR	Immed	No

EIA-232 Ports

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

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 or the TL1 user interface for configuring and detailed performance monitoring, see Appendix B, Communications Protocol.

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The ports include:

- Port A and Port B – Tied to external connectors on the rear panel of the SSU-2000 Main chassis.
- One local port – Tied to the connector on the front panel of the Communications module.
- Backplane communications port – Used to communicate with other modules in the system.

Ethernet Port

The Communications module implements one Ethernet port (10-BASE-T) that is routed to an RJ-45 connector on the rear panel of the main chassis. For more information on Ethernet settings, see Communicating by Ethernet, on page 92.

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Chapter 7 Input Module Reference Data

This chapter contains reference information for the Input modules available for use in the SSU-2000.

In This Chapter

- 1-Port and 3-Port E1 Input Modules
- 1-Port and 3-Port DS1 Input Modules
- GPS Input Module
- Composite Clock Input Module
- Input Adapter Panels

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1-Port and 3-Port E1 Input Modules

This section describes the 1-Port (part number 23413014-001-0) and 3-Port (part number 23413014-002-0) E1 Input modules that may be installed in an SSU-2000 or SDU-2000 shelf.

Functional Overview

The 1-Port and 3-Port E1 Input modules receive signals and perform phase measurement comparisons with the Clock modules that are installed in the SSU-2000. 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 modules accept either one or three of the following signals: sine or square wave with a 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 Violation (BPV), Loss of Signal (LOS) and Out Of Frame (OOF) errors. In addition, the module extracts Synchronization Status Messages (SSMs) from the incoming framed signals.

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-2000. 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.

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Functional Block Diagram

A simplified block diagram of the 1- and 3-Port E1 Input module is shown in Figure 7-1.

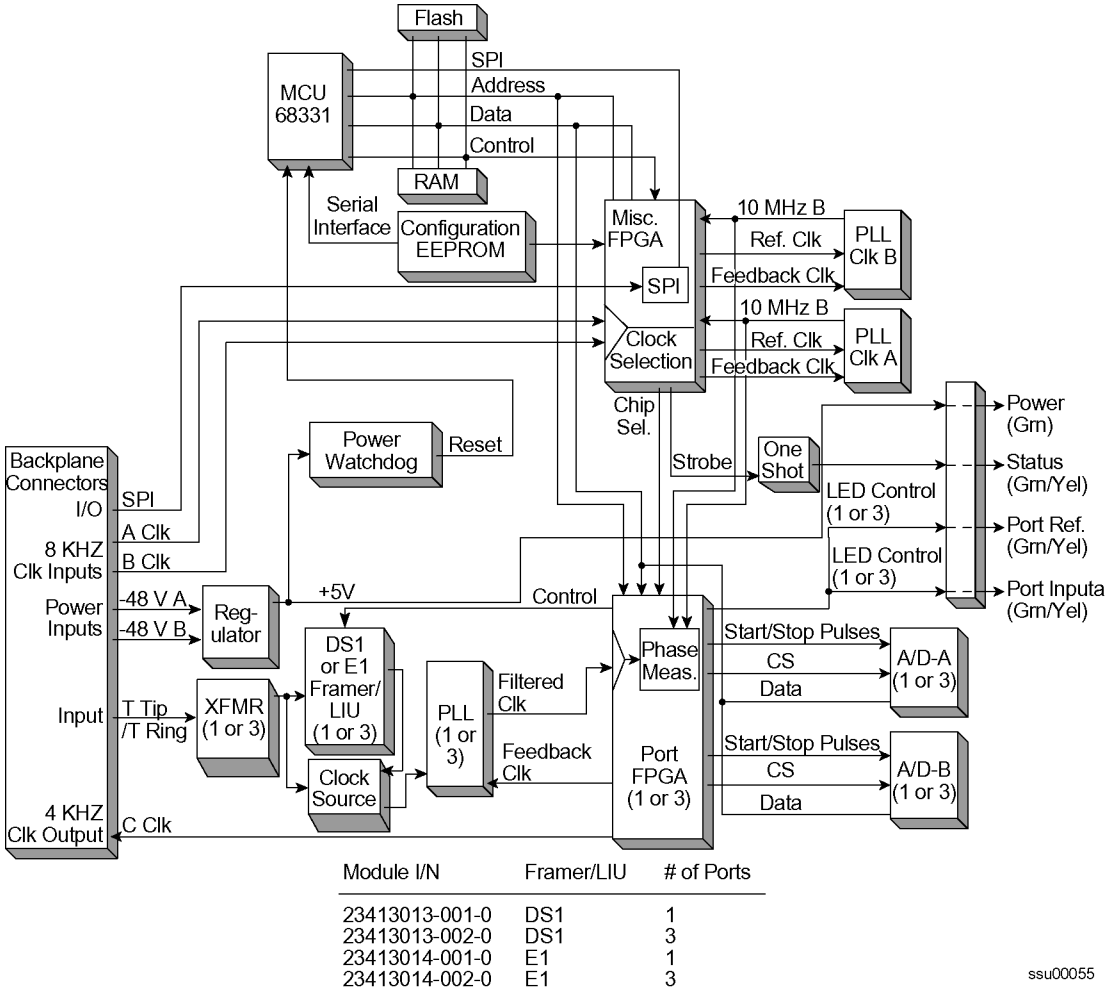


Figure 7-1. Block Diagram of the 1-Port and 3-Port E1 Input Modules

Phase Measurement Averages

The Input module 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 build out algorithm does not build out more than eight consecutive samples. If the phase is build out, the Input module sends an event message to the Communications module.

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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

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.

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.

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-set 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-set level (Minor, Major, or Critical). Refer to Changing Factory Defaults, on page 104, 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.

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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 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.

Sync Status Messages

The E1 Input module reads and processes Sync Status Messages (in accordance with specification ITU-T Composite Clock (CC) for E1 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 E1 inputs, an SSM is valid if three consecutive matching SSMs are received.

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. Refer to DS1 and E1 Input Module Default Settings, on page 426, for more information on provisioning SSMs.

E1 Input Module Alarm Modes

The E1 Input module responds to various alarm conditions according to user-set alarm levels. Each level is associated with a set of actions as follows:

Table 7-1. E1 Input Module Alarm Modes

Alarm Mode	Action	Alarm Elevation
IGNORE	Do nothing	Cannot be elevated to a higher severity level
REPORT	Do nothing	Cannot be elevated to a higher severity level
MINOR	Generate event message	Elevate to Major if the alarm condition persists beyond the user-set elevation time limit
MAJOR	Generate event message	Elevate to Critical if the alarm condition persists beyond the user-set elevation time limit
CRITICAL	■ Generate event message ■ Fault Port	Cannot be elevated to a higher severity level

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Alarms Caused by Hardware Problems

The following alarms are generated due to hardware problems:

- External Clock Signal PLL Unlocked
  - Report event message and perform any other actions as required by the user-set 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

Alarms Caused by Faulty Input Signals

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

- 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 this error count exceeds a user-set limit, the input signal which has experienced the errors said to be in episode. Refer to Changing Factory Defaults, on page 104, 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 is *free* of each type of error. This clear count must exceed a user-set limit before the input signal is no longer in episode. Refer to Changing Factory Defaults, on page 104, for more information on setting the clear count.

Handling Input Signal Faults

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.

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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

Hierarchy of Alarm Signals

- LOS
- AIS
- OOF
- BPV/CRC

The Input module does not report alarms below the level of an active alarm.

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

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.

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E1 Input Module Events Reported

The E1 Input module reports the event types listed in Table 7-2 when they occur:

Table 7-2. E1 Input Module Event Reporting

Event	Parameter One	Parameter Two
Module installed	–	–
Module enabled	–	–
Module disabled	–	–
Module restarted	Delay before restart (in s)	–
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	–	–

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 7-2 (3-port model illustrated) and described in Table 7-3.

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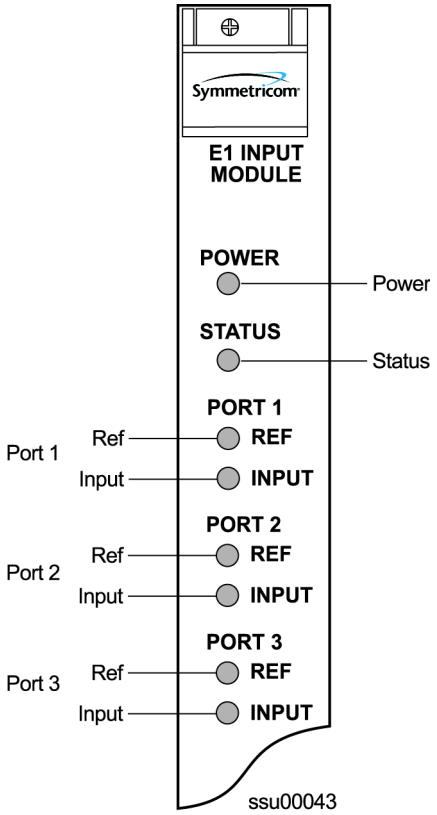


Figure 7-2. Front Panel of the E1 Input Module

Table 7-3. 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
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

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Table 7-3. E1 Input Module Status LED Indicators (Continued)

Indicator	Color	Description
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

Software Options

The factory settings and ranges for all E1 Input module software parameters are listed in Table 7-4.

Table 7-4. 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

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Table 7-4. E1 Input Module Configuration (Continued)

Configuration Setting	Factory Default	Range
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

1-Port and 3-Port DS1 Input Modules

This section describes the 1-Port (part number 23413013-001-0) and 3-Port (part number 23413013-002-0) DS1 Input modules that may be installed in an SSU-2000.

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-2000. 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.

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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.

Functional Block Diagram

A simplified block diagram of the 1- and 3-Port DS1 Input modules is shown in Figure 7-3.

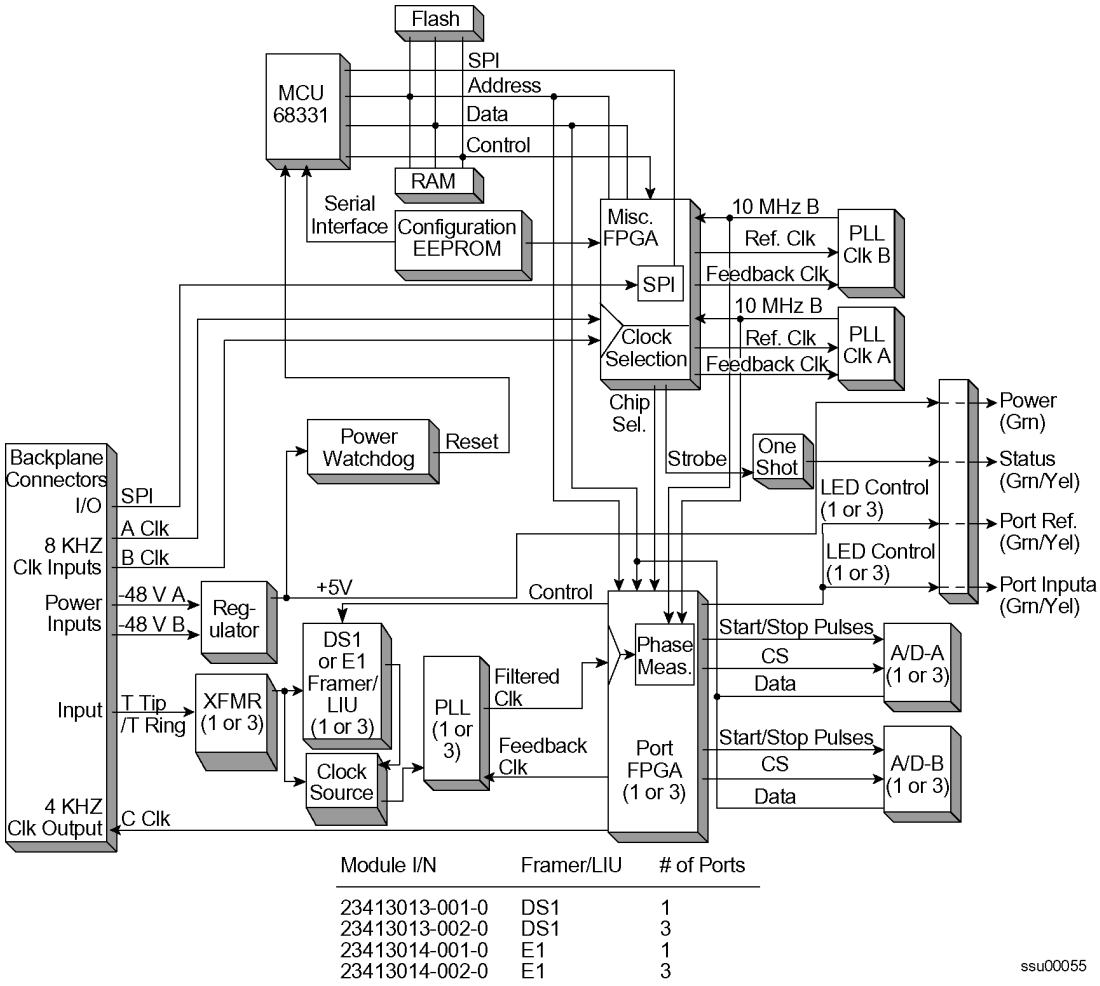


Figure 7-3. Block Diagram of the 1-Port and 3-Port DS1 Input Module

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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 build out algorithm does not build out more than eight consecutive samples. If the phase is *built out*, the Input module sends an event message to the Communications module.

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.

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.

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-set masks.

The Input module software maintains two alarm masks, each with thresholds at 10, 100, 1000, and 10000 seconds. MTIE readings which violate either mask at any point cause an alarm at a user-set level. Refer to Changing Factory Defaults, on page 104, 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.

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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 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.

Synchronization Status Messages

The Input module reads and processes Synchronization 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. See

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-set level) if 10 seconds elapse and no SSM is detected.

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 Changing Factory Defaults, on page 104, for more information on SSM settings.

DS1 Input Module Alarm Modes

The Input module responds to various alarm conditions according to user-set alarm levels. Each level is associated with a set of actions (or non-actions) as shown in Table 7-5.

Table 7-5. DS1 Input Module Alarm Modes

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

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Alarms Caused by Hardware Problems

The following alarms are generated due to hardware problems:

- External Clock Signal PLL Unlocked
  - Report event message and perform any other actions as required by the user-set 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

Handling Input Signal Faults

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

- 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-set 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-set limit before the input signal is no longer in episode.

Handling Input Signal Faults

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

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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

Hierarchy of Signal Faults

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

- LOS
- AIS
- OOF
- BPV/CRC

The Input module does not report alarms below the level of an active alarm.

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

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. Refer to the ALARM command in Interactive Command Set, on page 318, for more information on alarm settings.

DS1 Input Module Events Reported

The 3-Port DS1 Input module reports the event types listed in Table 7-6 when they occur. See Event Messages, on page 256, for more information on events.

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Table 7-6. DS1 Input Module Event Reporting

Event	Parameter One	Parameter Two
Card installed	–	–
Card enabled	–	–
Card disabled	–	–
Card restarted	Delay before restart (in s)	–
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	–	–

Status LED Indicators

The DS1 Input module is equipped with eight status LEDs that indicate module status. These LEDs are shown in Figure 7-4 and are described in Table 7-7.

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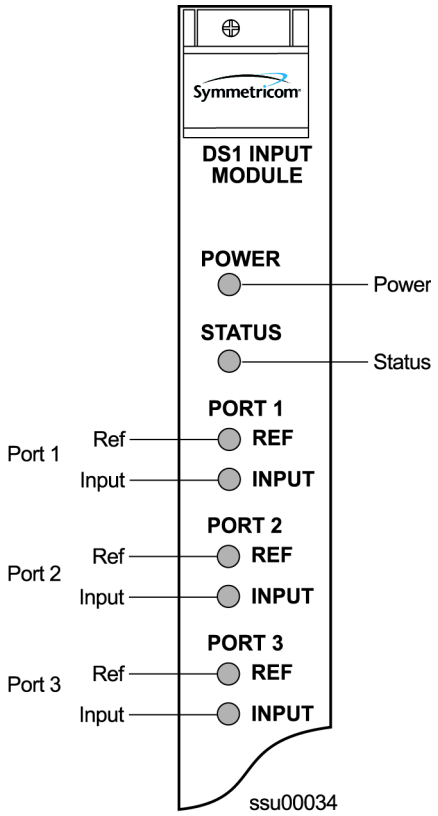


Figure 7-4. Front Panel of the DS1 Input Module

Table 7-7. 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

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Table 7-7. DS1 Input Module Status LED Indicators (Continued)

Indicator	Color	Description
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

Configuration Options

The factory settings and ranges for all DS1 Input module software parameters are listed in Table 7-8.

Table 7-8. DS1 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, 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 to 16
Priority	0	0 to 10 (0 = Monitor)
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

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Table 7-8. DS1 Input Module Configuration (Continued)

Configuration Setting	Factory Default	Range
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

GPS Input Module

This section provides user-reference data for the GPS Input module (part number 23413019-000-0) that is used in the SSU-2000 main chassis to provide a timing reference signal to phase and frequency lock the internal clocks and to produce phase locked output signals.

Functional Overview

The module consists of a Micro-controller and firmware, SRAM for data storage, FLASH (which contains the firmware), a GPS receiver (radio), 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 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 modules monitor and report the status and performance of the module and the received radio signals. Each module type communicates with the Communications module to receive user configuration commands and to report status and performance back to the Clock modules for frequency control.

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Functional Block Diagram

A simplified block diagram of the GPS Input module is shown in Figure 7-5.

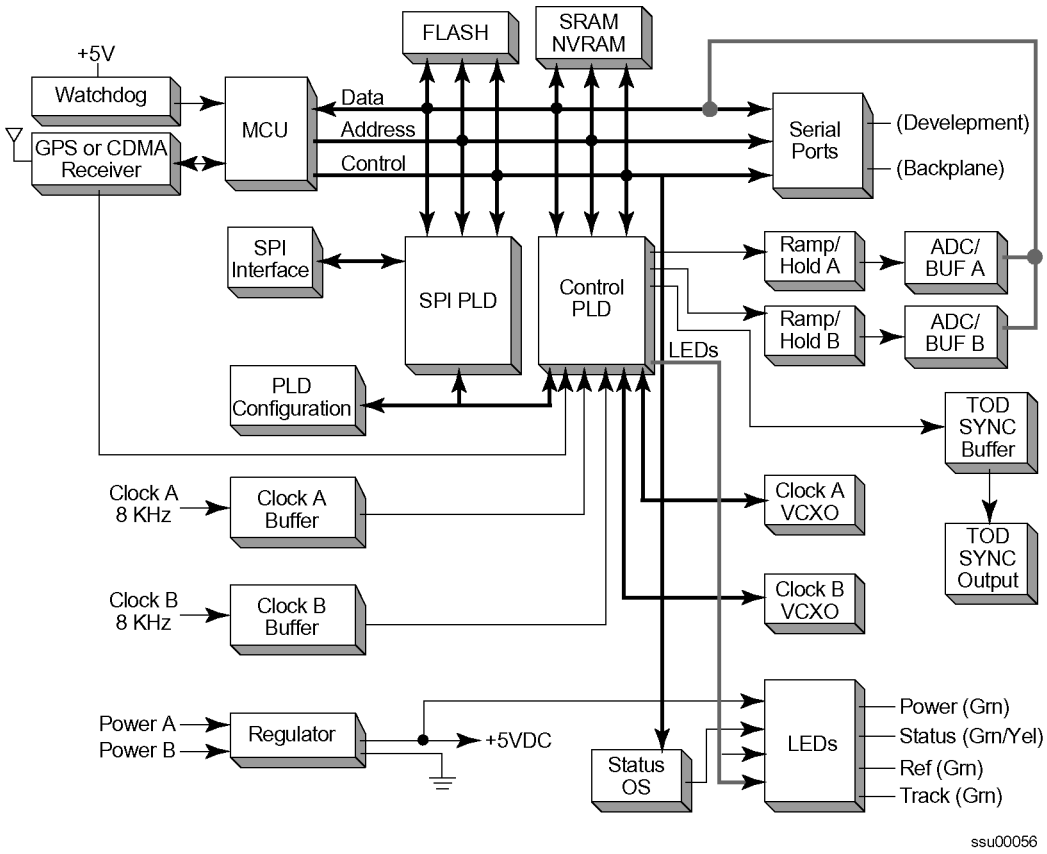


Figure 7-5. Block Diagram of the GPS Input Module

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Status LED Indicators

The GPS Input module is equipped with four status LEDs as shown in Figure 7-6. The LED status assignments are described in Table 7-9.

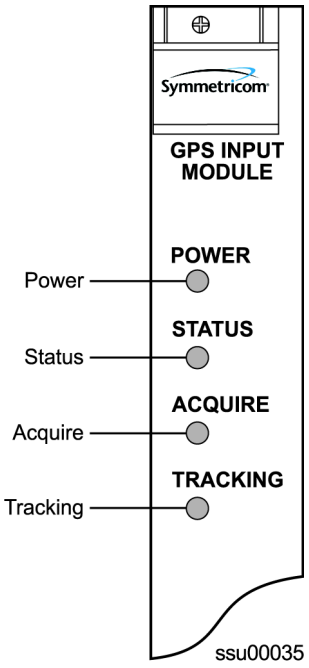


Figure 7-6. Front Panel of the GPS Input Module

Table 7-9. GPS 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 (firmware timed out)
ACQUIRE	Green/Amber	On (Green) = Selected as the clock reference Off = Not selected as clock reference
TRACKING	Green/Amber	On (Green) = Radio is tracking On (Amber) = Tracking problem without antenna fault Blinking (Amber) = Antenna fault

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Configuration Data

The configuration settings for the GPS Input module are listed in Table 7-10.

Table 7-10. GPS Input Module Configuration Settings

Configuration Setting	Factory Default	Range
Position (GPS only) Latitude Longitude Altitude 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

Composite Clock Input Module

This section provides operating instructions and software provisioning procedures for the Composite Clock Input module (part number 23413279-000-0), designed for use in the SSU-2000 Synchronization Supply Unit.

Functional Overview

The Composite Clock Input module conditions a composite clock input signal that is used to control the frequency of the Clock modules. When the SSU-2000 is in the Subtending mode, it also produces a 4 kHz synchronization signal, which determines the phase of the composite clock signals generated by Composite Clock Output modules. This signal ensures that the phase of the composite clock output signals follows the phase of the composite clock input reference signal. The module consists of a micro-controller and firmware, SRAM for data storage, FLASH memory that contains the firmware, and other support circuitry.

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The module monitors and reports module status and conditions. Events are generated for Loss of Signal (LOS) and Bipolar Violation (BPV) density. Each module communicates with the Communications module to receive user configuration commands and to report status and performance for the Clock modules for frequency control.

Functional Block Diagram

A simplified block diagram of the Composite Clock Input module is shown in Figure 7-7.

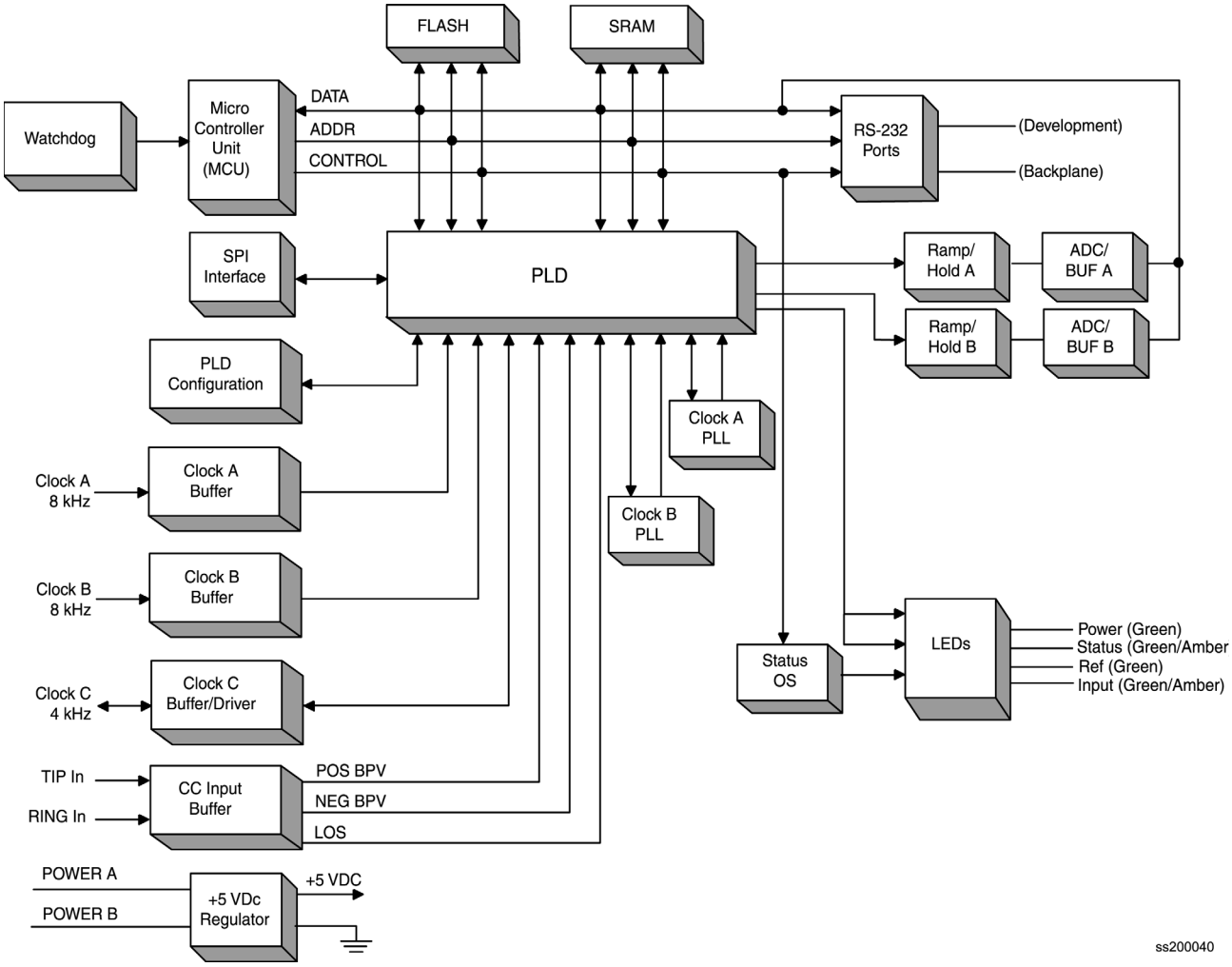


Figure 7-7. Block Diagram of the Composite Clock Input Module

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Status LED Indicators

The CC Input module is equipped with four status LEDs as shown in Figure 7-8. The LED status assignments are described in Table 7-9.

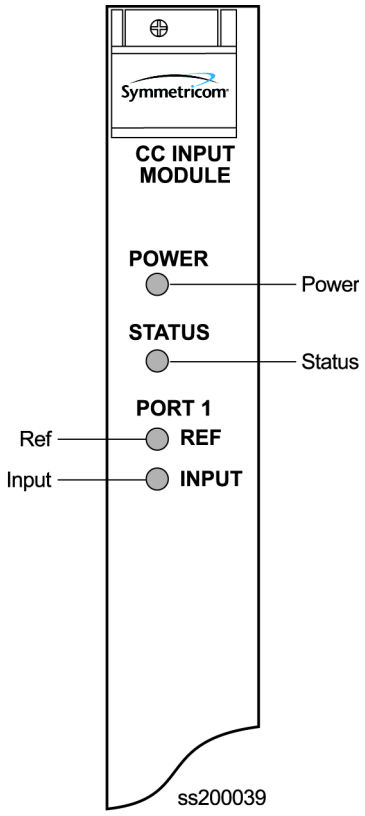


Figure 7-8. Front Panel of the Composite Clock Input Module

Table 7-11. Composite Clock 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 Blinking = Disabled or firmware upgrade in progress
REF	Green	On = Selected as the input reference Off = Not selected as input reference
INPUT	Green/Amber	On (Green) = Valid reference is connected On (Amber) = Internal port fault Blinking (Amber) = External port fault (LOS, BPV density)

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Factory Default (Basic) Configuration

The configuration settings for the Composite Clock Input module are listed in Table 7-12.

Table 7-12. Composite Clock Input Module Configuration Settings

Configuration Setting	Factory Default	Range
Provisioned PQL	4	1 – 16
Priority	0	1 – 10 (0 = Monitor)
Input Signal Error Limit	LOS = 1, BPV = 1	LOS: 1 – 100 BPV: 1 – 100000
Input Signal Clear Limit	LOS = 5, BPV = 5	LOS: 1 – 100 BPV: 1 – 100000
Alarm Elevation Time	86400 seconds	0 – 500000 seconds
Port Status	Enabled	Enabled/Disabled
Port Name	None (blank)	Any string from 0 – 20 characters

Input Adapter Panels

This section describes the input adapters available to connect typical telecommunications signals to the rear panel of the SSU-2000 and SDU-2000.

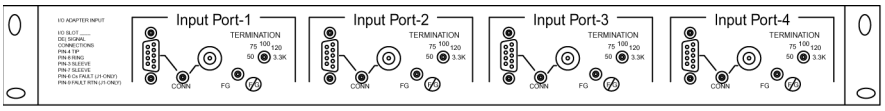
Input Adapter Panel for 1-Port Input Module

Symmetricom offers three Input Adapter panels for use with 1-port Input modules. Each panel has the following common features:

- Accommodates up to four separate input signals
- Switch-selected inputs allow for DE9 and another connector type
- Switchable input termination impedance
- Switch-selected link between signal and frame ground (when a frame ground is connected to the lug on the rear panel)
- 1-m SCSI connection cable is included with the Adapter

The Input Adapter (part number 22013069-001-0) used with a 1-Port Input module is shown in Figure 7-9. Each port has a switch-selected BNC and a DE9 connector, and the input termination impedance is switch-selectable between 50, 75, 100, 120, or 2.2 kΩ.

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ss200019

Figure 7-9. Input I/O Adapter for One-Port Input Modules

The Input Adapter (part number 22013069-002-0) has a switch-selected Siemens 1.6/5.6 mm connector and a DE9 connector; the input termination impedance is switch-selectable between 50, 75, 100, 120, or 2.2 kΩ.

The Input Adapter (part number 22013069-003-0) has a switch-selected Siemens 1.0/2.3 mm connector and a DE9 connector; the input termination impedance is switch-selectable between 50, 75, 100, 120, or 2.2 kΩ.

The rear panel of the Input adapter contains four SCSI-II type connectors that connect to each Input module connection on the rear panel of the shelf via a supplied 1-m input cable. A frame ground lug is supplied to connect a frame ground connection.

The pinout for the DB9 connector is listed in Table 7-13.

Table 7-13. Pinout for the I-Port Input Adapter

Pin	Description
3	Sleeve
4	Tip
7	Sleeve
8	Ring[1]
9	Flt Return[2]

Note:
1 When connected to J1 on the rear panel, Pin 8 is Cs Fault.
2 Only when connected to J1 on the rear panel.

Input Adapter Panel for 3-Port Input Modules

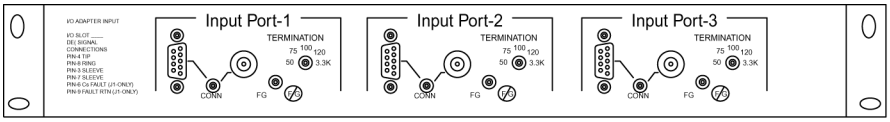
Symmetricom offers three Input Adapter panels for use with 3-port Input modules. Each panel has the following common features:

- Accommodates up to three separate input signals
- Switch-selected inputs allow for DE9 and another connector type
- Switchable input termination impedance

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- Switch-selected link between signal and frame ground (when a frame ground is connected to the lug on the rear panel)
- 1-m SCSI connection cable is included with the Adapter

The Input I/O Adapter (part number 22013066-001-0) used with the 3-Port Input module is shown in Figure 7-10. Each port has a switch-selected BNC and a DE9 connector, and the input termination impedance is switch-selectable between 50, 75, 100, 120, or 2.2 kΩ.



ss200018

Figure 7-10. I/O Adapter for 3-Port Input Modules

The Input Adapter (part number 22013066-002-0) has a switch-selected Siemens 1.6/5.6 mm connector and a DE9 connector; the input termination impedance is switch-selectable between 50, 75, 100, 120, or 2.2 kΩ.

The Input Adapter (part number 22013066-003-0) has a switch-selected Siemens 1.0/2.3 mm connector and a DE9 connector; the input termination impedance is switch-selectable between 50, 75, 100, 120, or 2.2 kΩ.

The rear panel of the Input adapter contains three SCSI-II type connectors that connect to each Input module connection on the rear panel of the shelf via a supplied 1-m input cable. A frame ground lug is supplied to connect a frame ground connection.

The pinout for the DB9 connector is listed in Table 7-14.

Table 7-14. Pinout for the 3-Port Input Adapter

Pin	Description
3	Sleeve
4	Tip
7	Sleeve
8	Ring[1]
9	Flt Return[2]

Note:
1 When connected to J1 on the rear panel, Pin 8 is Cs Fault.
2 Only when connected to J1 on the rear panel.

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Input Wire-Wrap Adapters

Symmetricom offers a range of input wire-wrap adapters for use with any of the SSU-2000 Input modules. Table 7-15 lists the part numbers and the description for the input wire-wrap adapters, an example of which is shown in Figure 7-11. These adapters connect directly to the I/O ports on the rear panel of the SSU-2000 or SDU-2000 shelf.

Table 7-15. Input Wire-Wrap Adapters

Part Number	Description
22013186-000-0	Bridging
22013186-001-0	133 Ω impedance
22013186-002-0	120 Ω impedance
22013186-003-0	100 Ω impedance
22013186-004-0	75 Ω impedance
22013186-005-0	50 Ω impedance
22013186-006-0	Port 1=110 Ω Port 2 unused, Port 3=100 Ω
22013186-007-0	Port 1=133 Ω Port 2 unused, Port 3=100 Ω

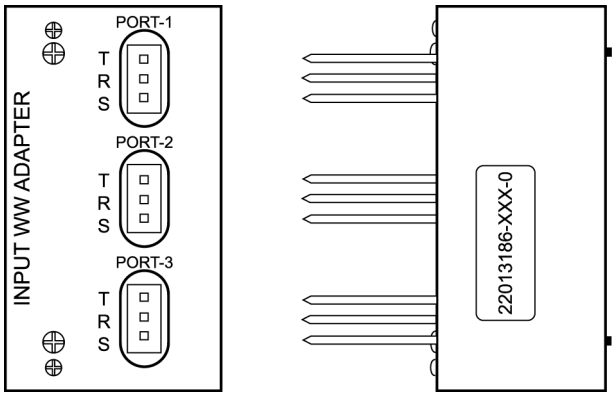


Figure 7-11. Input Wire-Wrap Adapter

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Chapter 8 Output Module Reference Data

This chapter contains reference information for the Output modules available for use in the SSU-2000 and SDU-2000.

In This Chapter

- E1 Output Module
- DS1 Output Module
- Composite Clock Output Module
- E1/2048 kHz Output Module
- 2048 kHz Output Module
- RS-422 Output Module
- Line Retiming Unit (LRU)
- Buffer Module
- Output Adapter Panels

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E1 Output Module

This section provides user-reference data for the E1 Output module (part number 23413018-000-0) that is used in both the SSU-2000 main shelf and in the optional SDU-2000 Expansion shelf.

Functional Overview

The E1 Output module uses one of three 4 kHz clocks from the SSU-2000 main chassis backplane to generate a phase-locked signal of 2.048 Mbps. If the unit is inserted into an SDU-2000 expansion shelf, a fourth 4kHz 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.

A microcontroller 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.

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Functional Block Diagram

A simplified block diagram of the E1 Output module is shown in Figure 8-1.

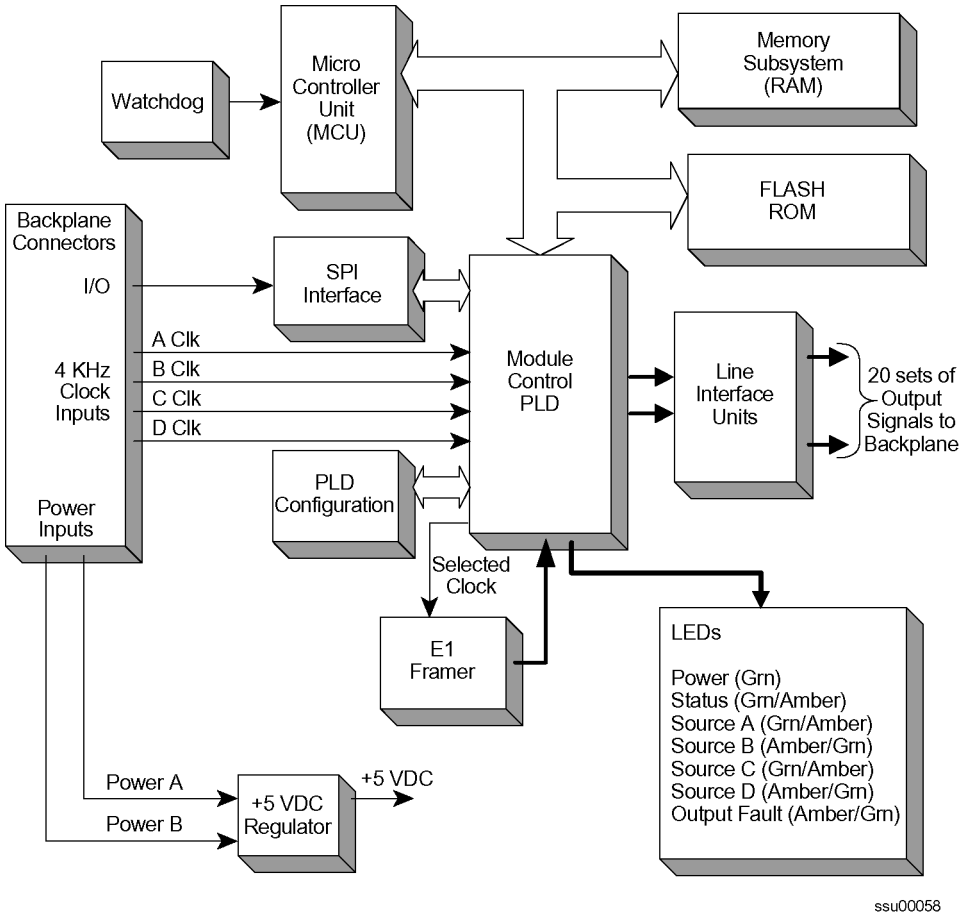


Figure 8-1. Block Diagram of the E1 Output Module

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Status LED Indicators

The E1 Output module has seven status LED indicators on the front panel of the module that are used for visually conveying status information to the user. The LEDs are shown in Figure 8-2 and described in Table 8-1.

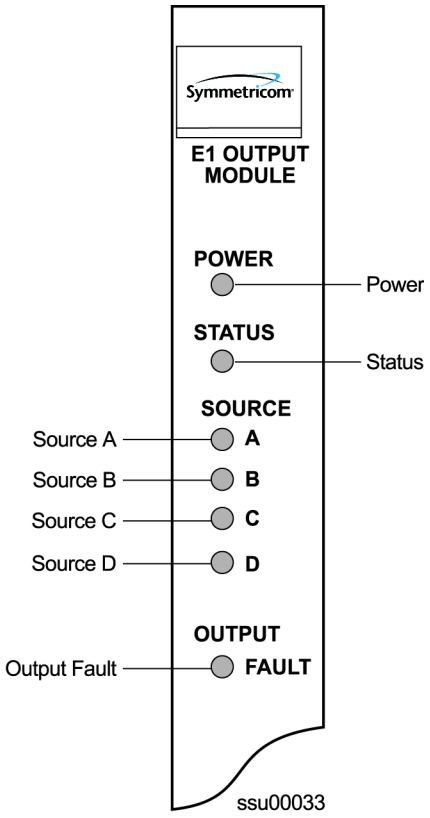


Figure 8-2. Front Panel of the E1 Output Module

Table 8-1. E1 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) = Clock A in slot 1 is the selected source clock On (Amber) = Faulty or missing Clock A Off = Clock A is good and not selected
SOURCE B	Green/Amber	On (Green) = Clock B in slot 13 is the selected source clock On (Amber) = Faulty or missing Clock B Off = Clock B is good and not selected

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Table 8-1. E1 Output Module Status LED Indicators (Continued)

Indicator	Color	Description
SOURCE C	Green/Amber	On (Green) = The Bypass clock (Clock C) is the selected source clock. See Bypass Clock (Clock C), on page 34 On (Amber) = Faulty or missing Bypass clock Off = Bypass clock is ignored, or good and not selected
SOURCE D	Green/Amber	On (Green) = The Expansion clock (Clock D) is the selected source clock. The module is in an Expansion shelf On (Amber) = Faulty or missing Expansion clock Off = Expansion clock 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

Performance Specifications

The E1 Output Module performance specifications are provided in Table 8-2.

Table 8-2. E1 Output Module Performance Specifications

Performance Characteristic	Specification
Signal	Alternate Mark Inversion (AMI)
Waveshape	Per ITU-T CC (10/98)
Rise time	<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

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DS1 Output Module

This section provides user-reference data for the DS1 Output module (part number 23413017-000-0) used in both the SSU-2000 main shelf and in the optional SDU-2000 Expansion shelf.

Functional Overview

The DS1 Output module generates a phase-locked signal of 1.544 MHz using one of three 4 kHz clocks from the backplane of the SSU-2000 main shelf (A, B, and, C clocks). If the module is inserted into the SDU-2000 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. A simplified block diagram of the DS1 Output module is shown in Figure 8-3.

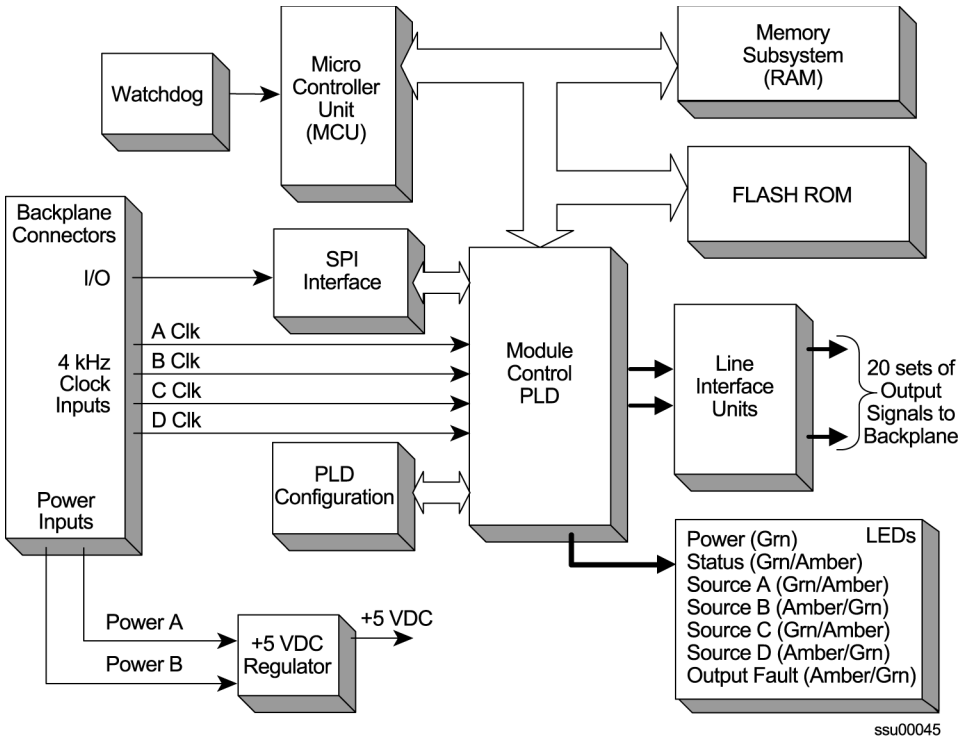


Figure 8-3. Block Diagram of the DS1 Output Module

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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.

Status LED Indicators

The DS1 Output module status LED indicators are shown in Figure 8-4 and are described in Table 8-3.

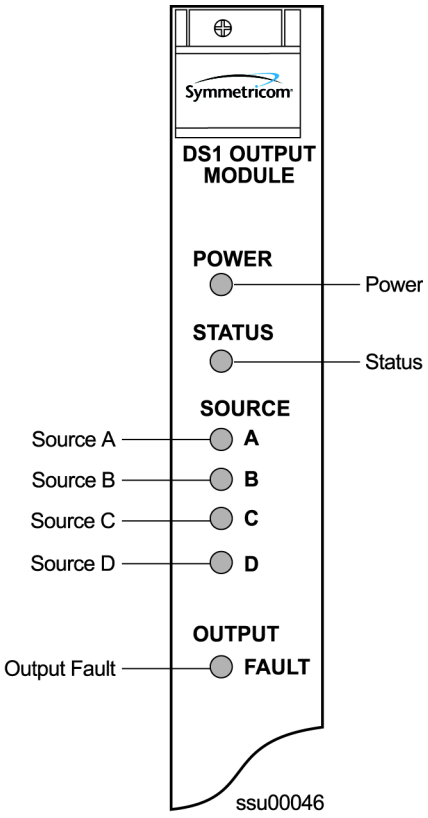


Figure 8-4. Front Panel of the DS1 Output Module

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Table 8-3. 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) = Clock A in slot 1 is the selected source clock On (Amber) = Faulty or missing Clock A Off = Clock A is good and not selected
SOURCE B	Green/Amber	On (Green) = Clock B in slot 13 is the selected source clock On (Amber) = Faulty or missing Clock B Off = Clock B is good and not selected
SOURCE C	Green/Amber	On (Green) = The Bypass clock (Clock C) is the selected source clock. See Bypass Clock (Clock C), on page 34 On (Amber) = Faulty or missing Bypass clock Off = Bypass clock is ignored, or good and not selected
SOURCE D	Green/Amber	On (Green) = The Expansion clock (Clock D) is the selected source clock. The module is in an Expansion shelf On (Amber) = Faulty or missing Expansion clock Off = Expansion clock 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

Performance Specifications

The DS1 Output module specifications are provided in Table 8-4.

Table 8-4. DS1 Output Module Performance Specifications

Performance Characteristic	Specification
Signal	Alternate Mark Inversion (AMI)
Waveshape	Per (ANSI) T1.102 and ITU Rec. G.703
Rise time	<100 ns
Pulse Width	324 ns, nominal into 100Ω
Pulse Interval	648 ns, nominal
Duty Cycle	50%
Pulse Amplitude	2.4 to 3.6 Vpp
Jitter	< 0.01 UI

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Composite Clock Output Module

This section provides reference data for the Composite Clock Output module (part number 23413158-000-0) used in both the SSU-2000 main shelf and in the optional SDU-2000 Expansion shelf.

Composite Clock Output Module Overview

The Composite Clock Output module generates 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 Changing Factory Defaults, on page 104, 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.

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Functional Block Diagram

A simplified block diagram of the Composite Clock Output module is shown in Figure 8-5.

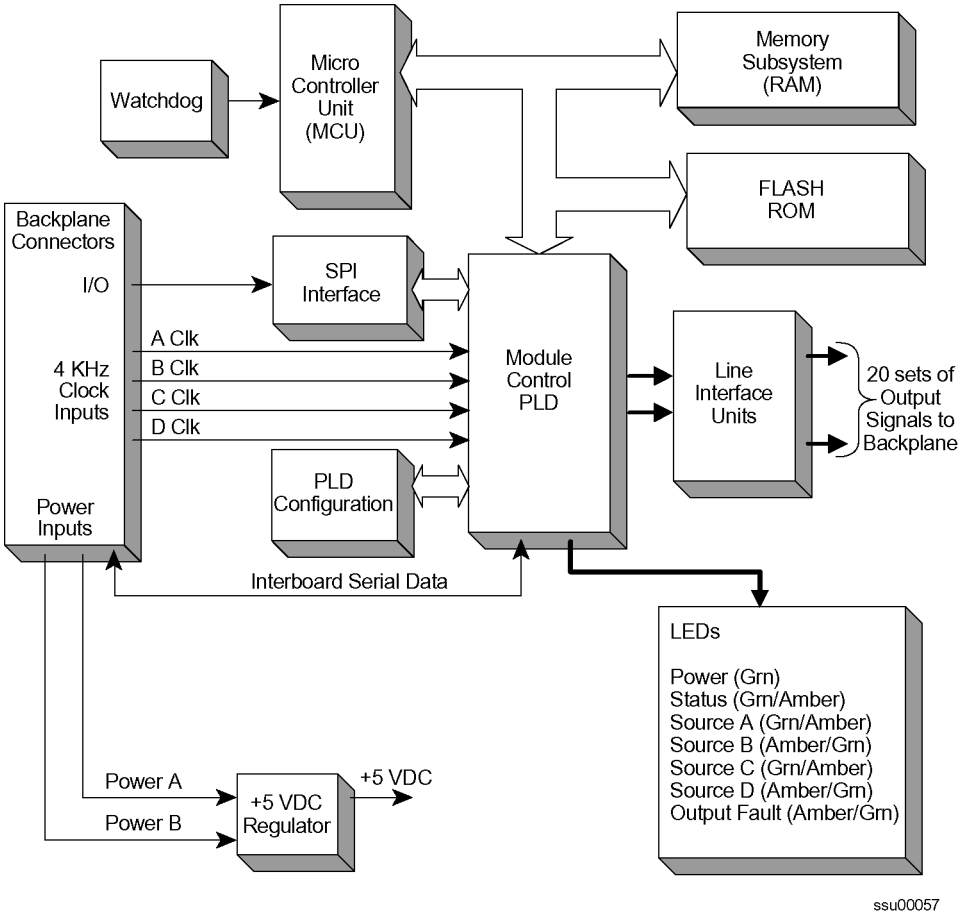


Figure 8-5. Block Diagram of the Composite Clock Output Module

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Status LED Indicators

The Composite Clock Output module status LED indicators are shown in Figure 8-6 and described in Table 8-5.

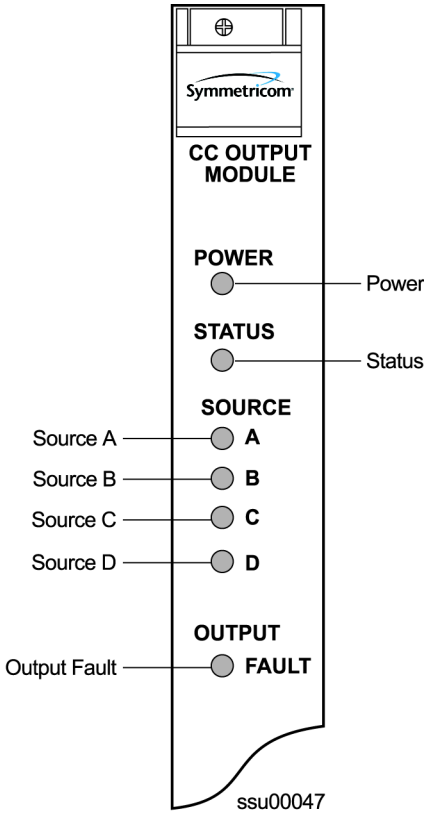


Figure 8-6. Front Panel of the Composite Clock Output Module

Table 8-5. Composite Clock Output Module Status LED Indicators

Indicator	Color	Description
POWER	Green	On = +5 vDC power available on the Output 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) = Clock A in slot 1 is the selected source clock On (Amber) = Faulty or missing Clock A Off = Clock A is good and not selected
SOURCE B	Green/Amber	On (Green) = Clock B in slot 13 is the selected source clock On (Amber) = Faulty or missing Clock B Off = Clock B is good and not selected

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Table 8-5. Composite Clock Output Module Status LED Indicators (Continued)

Indicator	Color	Description
SOURCE C	Green/Amber	On (Green) = The Bypass clock (Clock C) is the selected source clock. See Bypass Clock (Clock C), on page 34 On (Amber) = Faulty or missing Bypass clock Off = Bypass clock is ignored, or good and not selected
SOURCE D	Green/Amber	On (Green) = The Expansion clock (Clock D) is the selected source clock. The module is in an Expansion shelf On (Amber) = Faulty or missing Expansion clock Off = Expansion clock 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

Performance Specifications

The performance specifications for the Composite Clock Output module are provided in Table 8-6.

Table 8-6. Composite Clock Output Module Performance Specifications

Performance Characteristic	Specification
Signal	Bipolar, Return to Zero, Alternate Mark Inversion (AMI)
Waveshape	Per Bellcore GR-378-CORE Table 6-2 and 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 133 Ω
Number of Outputs	20 Independent Channels

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E1/2048 kHz Output Module

This section provides reference data for the E1/2048 kHz Output module (part number 23413292-000-0) designed for use in the SSU-2000 Synchronization Supply Unit.

Functional Overview

The E1/2048 kHz Output module generates 20 outputs that are software- selectable for either E1 or 2048 kHz output signals. Each output port can be turned off independently of other ports; relays on each port disconnect the driver output from the output pins. A squelch feature turns off selected ports when the system PQL falls below predetermined quality levels.

The E1 signal has a multiframe format, with Channel Associated Signaling (CAS) and CRC4 always turned on. These default settings do not affect functionality. The Synchronization Status Message (SSM) is always available, and is repeated in bits positions 4, 5, 6, 7, and 8 of time slot 0 of the odd frames. Zero suppression can be turned on or off as required. When zero suppression is off, the signal has Alternate Mark Inversion (AMI) encoding. When zero suppression is on, HDB3 encoding is used.

Provisioning the Signal Type

You use software commands to set the signal type on each port of the E1/2048 kHz Output module. To view or provision the output frequency using ICS commands, see OUTPUT, on page 359.

To view the output frequency setting, use the TL1 command `RTRV-PRMTR-OUTE12048`, described in Retrieve Commands and Responses, on page 277. To provision the output parameters, use the TL1 command `SET-PRMTR-OUTE12048`, described in TL1 Set Commands, on page 307.

Output Squelching

The E1/2048 kHz Output module allows you to selectively turn off (squelch) the outputs during periods of degraded performance.

This feature allows you to turn off any of the 20 output ports on redundant or non-redundant modules. The SSU-2000 uses the system Priority Quality Level (PQL) to determine when the system is operating within specified limits; if the outputs become degraded, the module automatically turns off the assigned ports.

To enable the squelching feature, you must provision a “threshold” PQL value using the OUTPUT command (for ICS mode) or the SET-PRMTR-OUTE12048 command (for TL1 mode). A threshold PQL value of zero disables the squelch function. Threshold PQL values above zero enable the squelch function; when the system PQL is greater than the threshold PQL, the output is squelched.

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For example, you can provision output ports 1 through 5 for a threshold PQL of 3 and you can disable squelching for ports 6 through 20 (PQL is set to 0). In this example, if the system PQL is 1, 2, or 3, ports 1 through 20 generate outputs. If the system PQL changes to 4 or higher, outputs on ports 1 through 5 are squelched (turned off) and ports 6 through 20 continue to generate outputs. The response from the Output Status command appears as shown below:

```
SSU+>out 2a10
OUT STATUS     Clk Clk Stat            Port Status      1 1 1 1 1 1 1 1 1 1 2
Loc# Type  Sta Sel  A B C D Redt PQL  1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0
---- ----  --- --- -------- ---- --- ------------------------------------
2A10 E12M  Ok  A   / / /N/Y      4   /S/S/S/S/S/ / / / / / / / / / / / / /

OUTPUT SETUP
Loc# Type ZS   Bypass
---- ---- ---- ------
2A10 E12M On   On
CRC, CAS, and SSM are enabled.
SSM are available in all 5-bit (4-8) positions.
Signal:
P[ 1]= 2048, P[ 2]= 2048, P[ 3]= 2048, P[ 4]= 2048, P[ 5]= 2048,
P[ 6]= 2048, P[ 7]= 2048, P[ 8]= 2048, P[ 9]= 2048, P[10]= 2048,
P[11]= E1,   P[12]= E1,   P[13]= E1,   P[14]= E1,   P[15]= E1,
P[16]= E1,   P[17]= E1,   P[18]= E1,   P[19]= E1,   P[20]= E1,
Squelch:
P[ 1]=    3, P[ 2]=    3, P[ 3]=    3, P[ 4]=    3, P[ 5]=    3,
P[ 6]=    0, P[ 7]=    0, P[ 8]=    0, P[ 9]=    0, P[10]=    0,
P[11]=    0, P[12]=    0, P[13]=    0, P[14]=    0, P[15]=    0,
P[16]=    0, P[17]=    0, P[18]=    0, P[19]=    0, P[20]=    0,
```

When the System PQL transitions to a PQL that crosses the user-defined Output-Squelching PQL threshold, the SSU generates a major alarm. The alarm message for Squelch indicates which port(s) are in alarm due to the PQL threshold being crossed. In the example Alarm message below, Port 20 of the E1/2048 kHz Output module is in alarm.

```
2002-12-12T10:25:26 2A10 Maj Squelch, Below Prov, 00001
```

A five-digit hexadecimal number (consisting of 20 bits) at the end of the alarm message identifies the affected port(s). Each digit represents four of the 20 ports on the module; the first digit represents ports 1 through 4, the second digit represents ports 5 through 8, and so on, as shown in Figure 8-7.

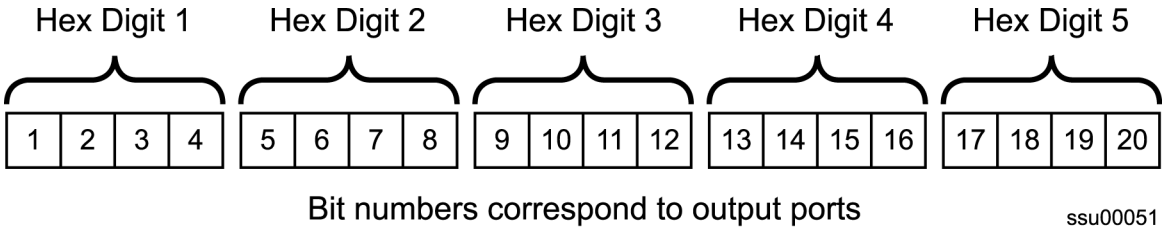


Figure 8-7. Using the Hex Number to Identify Output Ports

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Table 8-7 lists the failed output port number(s) for each possible hex digit. In the above alarm message, the hex number is 00001. To determine the port in alarm, locate the second row (corresponding to Hex Value 1) in Table 8-7. The right-most column has an X, which corresponds to Port 20 (read across from Digit 5).

As another example, if the hex number is A501F, then the following ports are squelched: 1 and 3 (corresponding to the A in Digit 1), 6 and 8 (corresponding to the 5 in Digit 2), 16 (corresponding to the 1 in Digit 4), and 17 through 20 (corresponding to the F in Digit 5).

Table 8-7. Identifying Failed Ports from the Hex Digit

Hex Value Digit 1 Digit 2 Digit 3 Digit 4 Digit 5	**Port** 1 5 9 13 17	**Port** 2 6 10 14 18	**Port** 3 7 11 15 19	**Port** 4 8 12 16 20
0	–	–	–	–
1	–	–	–	X
2	–	–	X	–
3	–	–	X	X
4	–	X	–	–
5	–	X	–	X
6	–	X	X	–
7	–	X	X	X
8	X	–	–	–
9	X	–	–	X
A	X	–	X	–
B	X	–	X	X
C	X	X	–	–
D	X	X	–	X
E	X	X	X	–
F	X	X	X	X

Use the Alarm command to display the alarm information for a given module; the display includes all E1/2048 kHz Output module alarms, including Alarm #10, Squelching. Use the ALARM command (described in ICS Commands, on page 322) or the `SET-PRMTR-OUTE12048` command (described in TL1 Set Commands, on page 307) to provision these alarms to Ignore, Report Only, Minor Alarm, Major Alarm (default), or a Critical Alarm.

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```
SSU+>al 2a10
2002-07-04T10:25:31 ID: SSU2000 Name: SSU
Output    #   Alarm               Status          Level(*=Elev) Ports
------- ---- ------------------ --------------- ------------- ---------
1A06    (00) Hdw Config         Ok              Major
1A06    (01) Configuration      Ok              Major
1A06    (02) Clk-A              Ok              Major
1A06    (03) Clk-B              Ok              Major
1A06    (04) Clk-C              Ok              Major
1A06    (05) Clk-D              Ok              Major
1A06    (06) Clk Selected       Ok              Major
1A06    (07) VCXO               Ok              Major
1A06    (08) PLL                Ok              Major
1A06    (09) Sync               Ok              Major
1A06    (10) Squelch            Ok              Major
1A06    (11) PortFlt            Ok              Major
SSU->
```

Provisioning the Squelch Parameter

To view or provision the squelch using ICS commands, see OUTPUT, on page 359.

To provision the squelch using TL1 commands, see TL1 Set Commands, on page 307.



Note: For ports set to E1, the frame mode is always CAS, the CRC is always enabled, and the SSM is sent to all five bit positions (4 through 8). You cannot change these settings.

Bypass Clock (Clock C) Alarms

The SSU-2000 has many configuration options. In order for the system to generate the CLK-C used by the E1/2048 kHz Output module, you must install one of the following Input modules and connect an input signal to the module: DS1, E1, or CC.

If the SSU-2000 has only GPS Input module(s), then set the Bypass mode to OFF to prevent the Output modules from generating the CLK-C alarm (alarm 4).

Output Fault Handling

When an output fault occurs, a port fault alarm occurs. Fault recovery is automatic; when the fault is no longer present, normal operation continues. To prevent “bouncing,” or reporting errors continuously, the module increments an error counter each time a port fault occurs. If the error count exceeds a preset threshold, then the faulty port is disabled. You must disable and then enable the port using software commands to return it to normal service. The error counter automatically resets when there are no errors in 24 hours.

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The port status message indicates the state of each port. The letter code for each port is as follows:

- F – port fault
- N – port is disabled
- blank – port is in normal service

The following example shows port 5 with an internal port fault, port 7 with an external port fault, and ports 10, 11, and 12 disabled.

```
SSU+>out
OUT STATUS Clk Clk Stat                Port Status       1 1 1 1 1 1 1 1 1 1 2
Loc# Type Sta Sel  A B C D   Redt PQL  1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0
---- ---- --- ---  --------  ---- ---  ---------------------------------------
1A06 E12M Ok  A    / / /N/N       4   / / / / /I/ /E/ / /N/N/N/ / / / / / / / /
```

Functional Block Diagram

A simplified block diagram of the E1/2048 kHz Output module is shown in Figure 8-8.

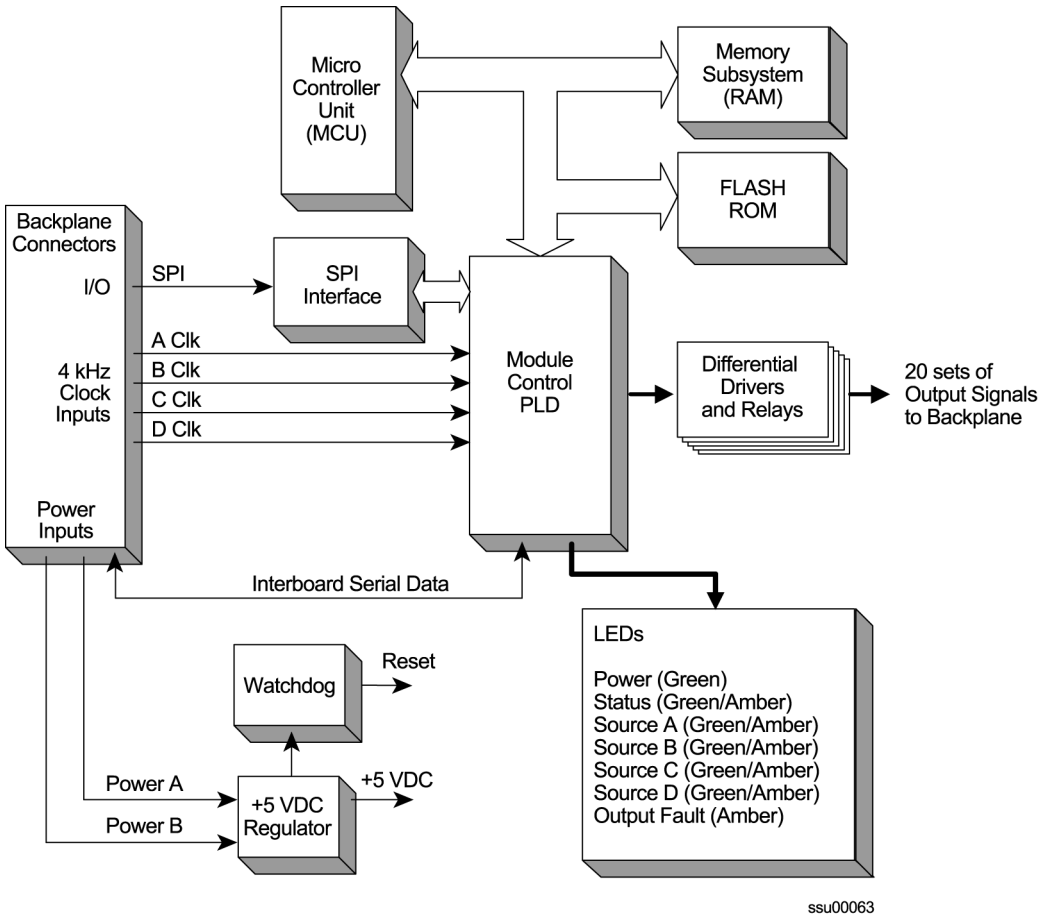


Figure 8-8. Block Diagram of the E1/2048 kHz Output Module

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E1/2048 kHz Output Module Status Indicators

The E1/2048 module has seven status indicators on ten front panel of the module that are used for visually conveying status information to the user. The LEDs are shown in Figure 8-9 and described in Table 8-8.

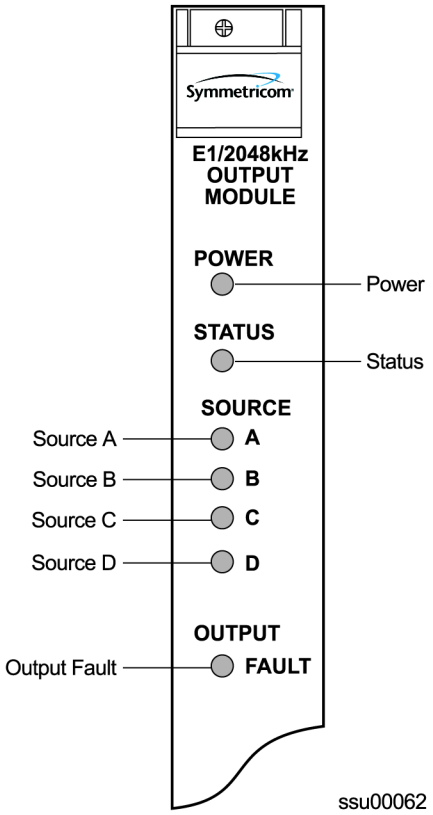


Figure 8-9. Front Panel of the E1/2048 kHz Output Module

Table 8-8. E1/2048 kHz 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) = Output module functioning correctly Blinking Amber = Output module is downloading firmware or the module is disabled On (Amber) = Output module failure
SOURCE A	Green/Amber	On (Green) = Clock A in slot 1 is the selected source clock On (Amber) = Faulty or missing Clock A Off = Clock A is good and not selected

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Table 8-8. E1/2048 kHz Output Module Status LED Indicators (Continued)

Indicator	Color	Description
SOURCE B	Green/Amber	On (Green) = Clock B in slot 13 is the selected source clock On (Amber) = Faulty or missing Clock B Off = Clock B is good and not selected
SOURCE C	Green/Amber	On (Green) = The Bypass clock (Clock C) is the selected source clock. See Bypass Clock (Clock C), on page 34 On (Amber) = Faulty or missing Bypass clock Off = Bypass clock is ignored, or good and not selected
SOURCE D	Green/Amber	On (Green) = The Expansion clock (Clock D) is the selected source clock. The module is in an Expansion shelf On (Amber) = Faulty or missing Expansion clock Off = Expansion clock 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

E1/2048 kHz Output Signal Specifications

Specifications for the E1/2048 kHz Output signals are provided in Table 8-9.

Table 8-9. E1/2048 kHz Output Module Specifications

Signal	120 Ω	75 Ω
E1		
Specification	ITU-T G.703/9 (10/98)	ITU-T G.703/9 (10/98)
Signal	AMI or HDB3	AMI or HDB3
Format	CAS and CRC4 on	CAS and CRC4 on
Cable	Twisted pair, 120 Ω	Coaxial, 75 Ω
Maximum Peak Voltage	3.3 V	2.61 V
Minimum Peak Voltage	2.7 V	2.13 V
2048 kHz		
Specification	ITU-T G.703/9 (10/98)	ITU-T G.703/9 (10/98)
Signal	Clock	Clock
Format	None	None
Cable	Twisted pair, 120 Ω	Coaxial, 75 Ω
Maximum Peak Voltage	1.90 V	1.50 V
Minimum Peak Voltage	1.00V	0.75 V

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2048 kHz Output Module

This section provides reference data for the 2048 kHz Output module (part number 23413159-000-0). It also contains default provisioning settings, and procedures for connecting to the SSU-2000 in order to enable, provision, and disable the module.

Functional Overview

The 2048 kHz Output module receives a set of three (four if installed in an expansion shelf) 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 signal pairs TTIP and TRING 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 non-redundant configuration a failed output will not be turned off, as some equipment may tolerate a wide range of level and still be operating. In redundant operation a failed output will be turned off in one module at a time to try and isolate the source of the problem. The outputs meet the criteria set forth in ITU-T G.703 for signal type, amplitude, and waveshape.

Output Squelching

A new feature, available with Revision C of the firmware for the 2048 kHz Output module, allows you to selectively turn off (squelch) the outputs during periods of degraded performance. To use this feature, the Communications module must have Revision D or later firmware.

This feature allows you to turn off any of 20 output ports on redundant or non-redundant modules. The SSU-2000 uses the system Priority Quality Level (PQL) to determine when the system is operating within specified limits; if the outputs become degraded, then the system automatically turns off the affected ports.

To enable the squelching feature, you must provision a “threshold” PQL value using the ICS OUTPUT command or the TL1 SET-PRMTR-CLKOUT command. A threshold PQL value of zero disables the squelch function. Threshold PQL values above zero enable the squelch function; when the system PQL is greater than the threshold PQL, the output is squelched.

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For example, you can provision output ports 1 through 5 for a threshold PQL of 3 and you can disable squelching for ports 6 through 20 (PQL is set to 0). In this example, if the system PQL is 1, 2, or 3, then ports 1 through 20 generate 2048 kHz outputs. If the system PQL changes to 4 or higher, then outputs on ports 1 through 5 are squelched (disabled) and ports 6 through 20 continue to generate 2048 kHz outputs. The response from the Output Status command appears as shown below:

```
SSU+>out 2a10
2002-12-03T15:30:14 ID: SSU2000 Name:SSU
Module Name: Output 2048 kHz
OUT STATUS    Clk Clk Stat           Port Status      1 1 1 1 1 1 1 1 1 2
Loc# Type Sta Sel  A B C D Redt Pql 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0
---- ---- --- ---  -------- ---- --- ----------------------------------------
2A10 2048 Ok  A    /Y/Y/N/Y      4  /S/S/S/S/S/ / / / / / / / / / / / / / /

OUTPUT SETUP
Loc# Type ZS   MinClk Bypass
---- ---- ---- ------ ------
2A10 2048 NA   ACQ    Off
Output fault action: Leave On
Squelch Level:
P[ 1]= 3, P[ 2]= 3, P[ 3]= 3, P[ 4]= 3, P[ 5]= 3,
P[ 6]= 0, P[ 7]= 0, P[ 8]= 0, P[ 9]= 0, P[10]= 0,
P[11]= 0, P[12]= 0, P[13]= 0, P[14]= 0, P[15]= 0,
P[16]= 0, P[17]= 0, P[18]= 0, P[19]= 0, P[20]= 0,
```

When the System PQL transitions to a PQL that crosses the user-defined Output-Squelching PQL threshold, the SSU generates an alarm. The alarm message for Alarm #14, Squelch, indicates which port(s) are in alarm due to the PQL threshold being crossed. In the example Alarm message below, Port 20 of the 2048 kHz Output module is in alarm.

```
2002-12-12T10:25:26 2A10 Maj Squelch, Below Prov, 00001
```

A five-digit hexadecimal number (consisting of 20 bits) at the end of the alarm message identifies the affected port(s). Each digit represents four of the 20 ports on the module; the first digit represents ports 1 through 4, the second digit represents ports 5 through 8, and so on, as shown in Figure 8-10.

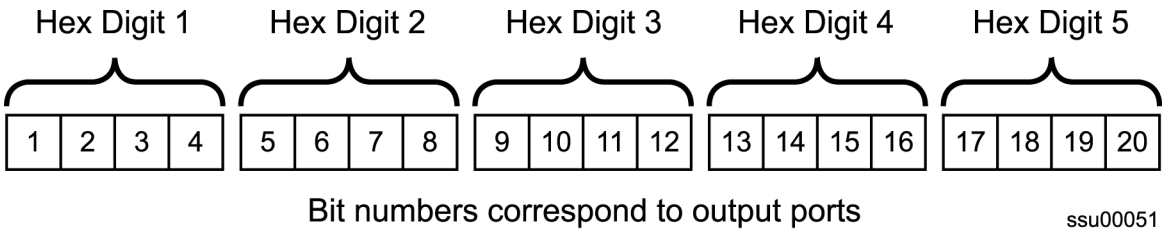


Figure 8-10. Using the Hex Number to Identify Output Ports

Table 8-10 lists the failed output port number(s) for each possible hex digit. In the above alarm message, the hex number is 00001. To determine the port in alarm, locate the second row (corresponding to Hex Value 1) in Table 8-10. The right-most column has an X, which corresponds to Port 20 (read across from Digit 5).

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As another example, if the hex number is A501F, then the following ports are squelched: 1 and 3 (corresponding to the A in Digit 1), 6 and 8 (corresponding to the 5 in Digit 2), 16 (corresponding to the 1 in Digit 4), and 17 through 20 (corresponding to the F in Digit 5).

Table 8-10. Identifying Failed Ports from the Hex Digit

Hex Value Digit 1 Digit 2 Digit 3 Digit 4 Digit 5	**Port** 1 5 9 13 17	**Port** 2 6 10 14 18	**Port** 3 7 11 15 19	**Port** 4 8 12 16 20
0	–	–	–	–
1	–	–	–	X
2	–	–	X	–
3	–	–	X	X
4	–	X	–	–
5	–	X	–	X
6	–	X	X	–
7	–	X	X	X
8	X	–	–	–
9	X	–	–	X
A	X	–	X	–
B	X	–	X	X
C	X	X	–	–
D	X	X	–	X
E	X	X	X	–
F	X	X	X	X

Use the Alarm command to display the alarm information for a given module to display all 2048 kHz Output module alarms, including Alarm #14, Squelching. Use the Alarm command to provision these alarms to be Ignored or to generate a Report Only, Minor Alarm, Major Alarm (default), or a Critical Alarm.

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```
SSU+>al 2a10
2002-12-12T10:25:31 ID: SSU2000 Name: SSU
Output  #    Alarm               Status          Level(*=Elev) Ports
------- ---- ------------------- --------------- ------------- ---------
2A10    (00) Redundant           Ok              Major
2A10    (01) Module Match        Ok              Major
2A10    (02) Clk-A               Ok              Major
2A10    (03) Clk-B               Ok              Major
2A10    (04) Clk-C               Ok              Major
2A10    (05) Clk-D               Ok              Major
2A10    (06) Clk Level           Ok              Major
2A10    (07) Clk Selected        Ok              Major
2A10    (08) VCXO                Ok              Major
2A10    (09) PLL                 Ok              Major
2A10    (10) Configuration       Ok              Major
2A10    (11) IntPortFlt          Ok              Major
2A10    (13) Hdw Config          Ok              Major
2A10    (14) Squelch Below Prov                  Major         00001
SSU->
```

Provisioning the Squelch Parameter

To view or provision the squelch using ICS commands, see OUTPUT, on page 359. To provision the squelch using TL1 commands, see TL1 Set Commands, on page 307.

Functional Block Diagram

A simplified block diagram of the 2048 kHz Output module is shown in Figure 8-11.

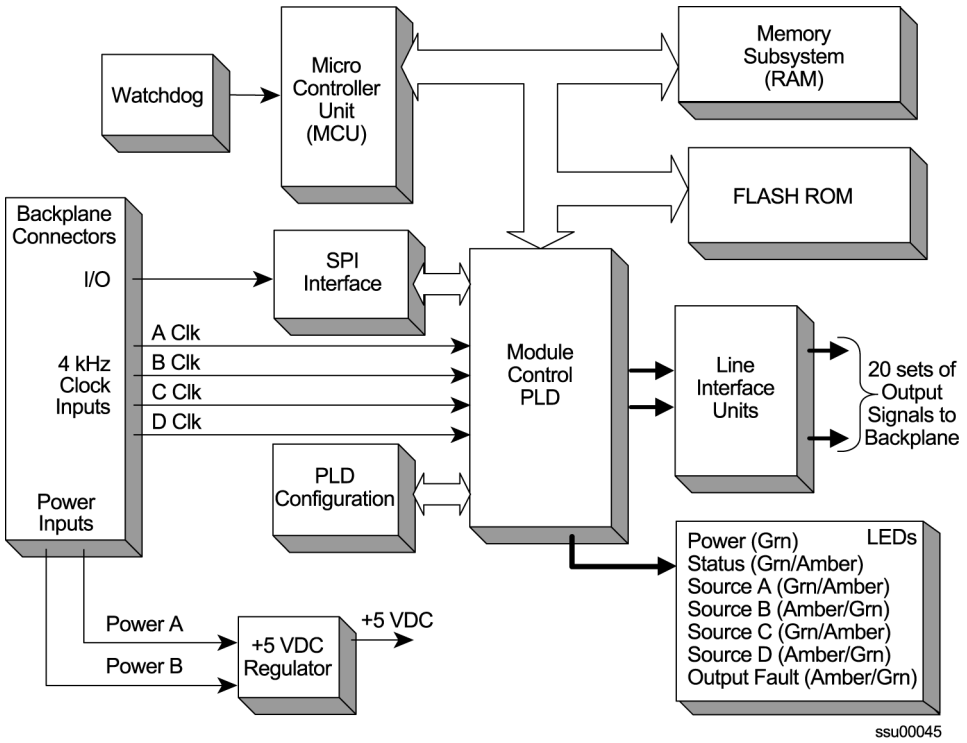


Figure 8-11. Block Diagram of the 2048 kHz Output Module

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2048 kHz Output Module Status Indicators

The 2048 kHz Output module has seven status indicators on the front panel of the module that are used for visually conveying status information to the user. The LEDs are shown in Figure 8-12 and described in Table 8-11.

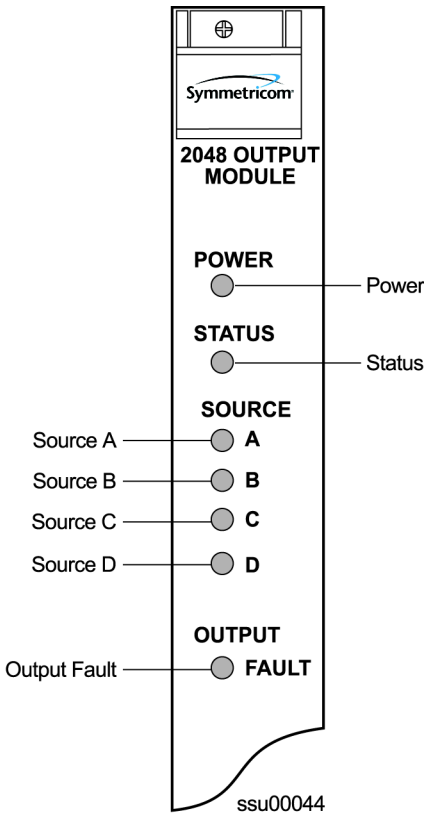


Figure 8-12. Front Panel of the 2048 kHz Output Module

Table 8-11. 2048 kHz 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) = Clock A in slot 1 is the selected source clock On (Amber) = Faulty or missing Clock A Off = Clock A is good and not selected
SOURCE B	Green/Amber	On (Green) = Clock B in slot 13 is the selected source clock On (Amber) = Faulty or missing Clock B Off = Clock B is good and not selected

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Table 8-11. 2048 kHz Output Module Status LED Indicators (Continued)

Indicator	Color	Description
SOURCE C	Green/Amber	On (Green) = The Bypass clock (Clock C) is the selected source clock. See Bypass Clock (Clock C), on page 34 On (Amber) = Faulty or missing Bypass clock Off = Bypass clock is ignored, or good and not selected
SOURCE D	Green/Amber	On (Green) = The Expansion clock (Clock D) is the selected source clock. The module is in an Expansion shelf On (Amber) = Faulty or missing Expansion clock Off = Expansion clock 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

Performance Specifications

Specifications for the 2048 kHz Output module are provided in Table 8-12.

Table 8-12. 2048 kHz Output Module Specifications

Performance Characteristic	Specification
Frequency	2048 kHz
Waveshape	Per ITU-T G.703 (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

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RS-422 Output Module

This section provides reference data for the RS-422 Output module (part number 23413287-000-0) designed for use in the SSU-2000 Synchronization Supply Unit.

Functional Overview

The RS-422 Output module generates 10 balanced square-wave outputs (TTIP and TRING signal pairs) and 10 single-ended (Ring) square-wave outputs. Each output can be turned off independently of other ports; relays on each output disconnect the driver output from the output pins. A squelch feature turns off selected ports when the input signal falls below predetermined quality levels.

You can provision the output port frequency from 8 kHz to 4096 kHz in 8 kHz increments. The frequency selected for port 1 (balanced) is also present on port 11 (single-ended); the frequency selected for port 2 determines the frequency for port 12, and so on.

The RS-422 Output module can be used individually or it can be configured for operation as redundant pairs in the shelf. When redundant modules are installed and the frequency is changed on one module, the redundant module turns its output off, changes to the new frequency and locking in phase with it, and then turns its output

Provisioning Output Frequencies

You use software commands to set the frequency of each port on the RS-422 Output module. Commands are available in both ICS and TL-1 modes. To provision the output frequency using ICS, see OUTPUT, on page 359. The TL1 commands RTRV-PRMTR-OUT422 and SET-PRMTR-OUT422 are described in TL1 Command Interface, on page 268.



Note: You can set frequencies on port 1 through port 10. Port 11 follows the frequency setting of port 1. Port 12 follows the frequency setting of port 2, etc. Ports 1 and 11, 2 and 12, ... 10 and 20 have the same frequency setting.

Output Squelching

The RS-422 Output module allows you to selectively turn off (squelch) the outputs during periods of degraded performance. To use this feature, the Communications module must have Revision D or later firmware.

This feature allows you to turn off any of 20 output ports on redundant or non-redundant modules. The SSU-2000 uses the system Priority Quality Level (PQL) to determine when the system is operating within specified limits; if the outputs become degraded, the module automatically turns off the affected ports.

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To enable the squelching feature, you must provision a “threshold” PQL value using the OUTPUT command (for ICS mode) or the SET-PRMTR-CLKOUT command (for TL-1 mode). A threshold PQL value of zero disables the squelch function. Threshold PQL values above zero enable the squelch function; when the system PQL is greater than the threshold PQL, the output is squelched.

For example, you can provision output ports 1 through 5 for a threshold PQL of 3 and you can disable squelching for ports 6 through 20 (PQL is set to 0). In this example, if the system PQL is 1, 2, or 3, ports 1 through 20 generate outputs. If the system PQL changes to 4 or higher, outputs on ports 1 through 5 are squelched (disabled) and ports 6 through 20 continue to generate outputs. The response from the Output Status command appears as shown below:

```
SSU+>out 2a10
2003-07-04T15:30:14 ID: SSU2000 Name:SSU
Module Name: Output RS-422
OUT STATUS    Clk Clk Stat           Port Status      1 1 1 1 1 1 1 1 1 1 2
Loc# Type Sta Sel  A B C D Redt Pql 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0
---- ---- --- --- ------- ---- --- ---------------------------------------
2A10 ???? Ok  A   /Y/Y/N/Y     4   /S/S/S/S/S/ / / / / / / / / / / / / / /
OUTPUT SETUP
Loc# Type ZS   MinClk Bypass
---- ---- ---- ------ ------
2A10 ???? NA   ACQ    Off
Output fault action: Leave On
Squelch Level:
P[ 1]= 3, P[ 2]= 3, P[ 3]= 3, P[ 4]= 3, P[ 5]= 3,
P[ 6]= 0, P[ 7]= 0, P[ 8]= 0, P[ 9]= 0, P[10]= 0,
P[11]= 0, P[12]= 0, P[13]= 0, P[14]= 0, P[15]= 0,
P[16]= 0, P[17]= 0, P[18]= 0, P[19]= 0, P[20]= 0,
```

When the System PQL transitions to a PQL that crosses the user-defined Output-Squelching PQL threshold, the SSU generates an alarm. The alarm message for Alarm #14, Squelch, indicates which port(s) are in alarm due to the PQL threshold being crossed. In the example Alarm message below, Port 20 of the RS-422 Output module is in alarm.

```
2002-12-12T10:25:26 2A10 Maj Squelch, Below Prov, 00001
```

A five-digit hexadecimal number (consisting of 20 bits) at the end of the alarm message identifies the affected port(s). Each digit represents four of the 20 ports on the module; the first digit represents ports 1 through 4, the second digit represents ports 5 through 8, and so on, as shown in Figure 8-13.

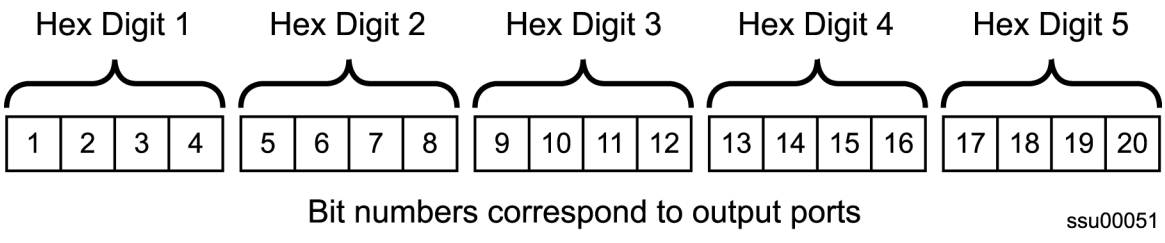


Figure 8-13. Using the Hex Number to Identify Output Ports

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Table 8-13 lists the failed output port number(s) for each possible hex digit. In the above alarm message, the hex number is 00001. To determine the port in alarm, locate the second row (corresponding to Hex Value 1) in Table 8-13. The right-most column has an X, which corresponds to Port 20 (read across from Digit 5).

As another example, if the hex number is A501F, then the following ports are squelched: 1 and 3 (corresponding to the A in Digit 1), 6 and 8 (corresponding to the 5 in Digit 2), 16 (corresponding to the 1 in Digit 4), and 17 through 20 (corresponding to the F in Digit 5).

Table 8-13. Identifying Failed Ports from the Hex Digit

Hex Value Digit 1 Digit 2 Digit 3 Digit 4 Digit 5	**Port** 1 5 9 13 17	**Port** 2 6 10 14 18	**Port** 3 7 11 15 19	**Port** 4 8 12 16 20
0	–	–	–	–
1	–	–	–	X
2	–	–	X	–
3	–	–	X	X
4	–	X	–	–
5	–	X	–	X
6	–	X	X	–
7	–	X	X	X
8	X	–	–	–
9	X	–	–	X
A	X	–	X	–
B	X	–	X	X
C	X	X	–	–
D	X	X	–	X
E	X	X	X	–
F	X	X	X	X

Use the Alarm command to display the alarm information for a given module; the display includes all RS-422 Output module alarms, including Alarm #14, Squelching. Use the Alarm command to provision these alarms to Ignore, Report Only, Minor Alarm, Major Alarm (default), or a Critical Alarm.

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```
SSU+>al 2a10
2002-07-04T10:25:31 ID: SSU2000 Name: SSU

Output  #    Alarm              Status          Level(*=Elev) Ports
------- ---- ------------------ --------------- ------------- ---------
2A10    (00) Hdw Config         Ok              Major
2A10    (01) COnfiguration      Ok              Major
2A10    (02) Clk-A              Ok              Major
2A10    (03) Clk-B              Ok              Major
2A10    (04) Clk-C              Ok              Major
2A10    (05) Clk-D              Ok              Major
2A10    (06) Clk Selected       Ok              Major
2A10    (07) VCXO               Ok              Major
2A10    (08) PLL                Ok              Major
2A10    (09) PortFlt Active     Ok              Major
SSU->
```

Provisioning the Squelch Parameter

To view or provision the squelch using ICS commands, see OUTPUT, on page 359. To provision the squelch using TL1 commands, see TL1 Set Commands, on page 307.

Functional Block Diagram

A simplified block diagram of the RS-422 Output module is shown in Figure 8-14.

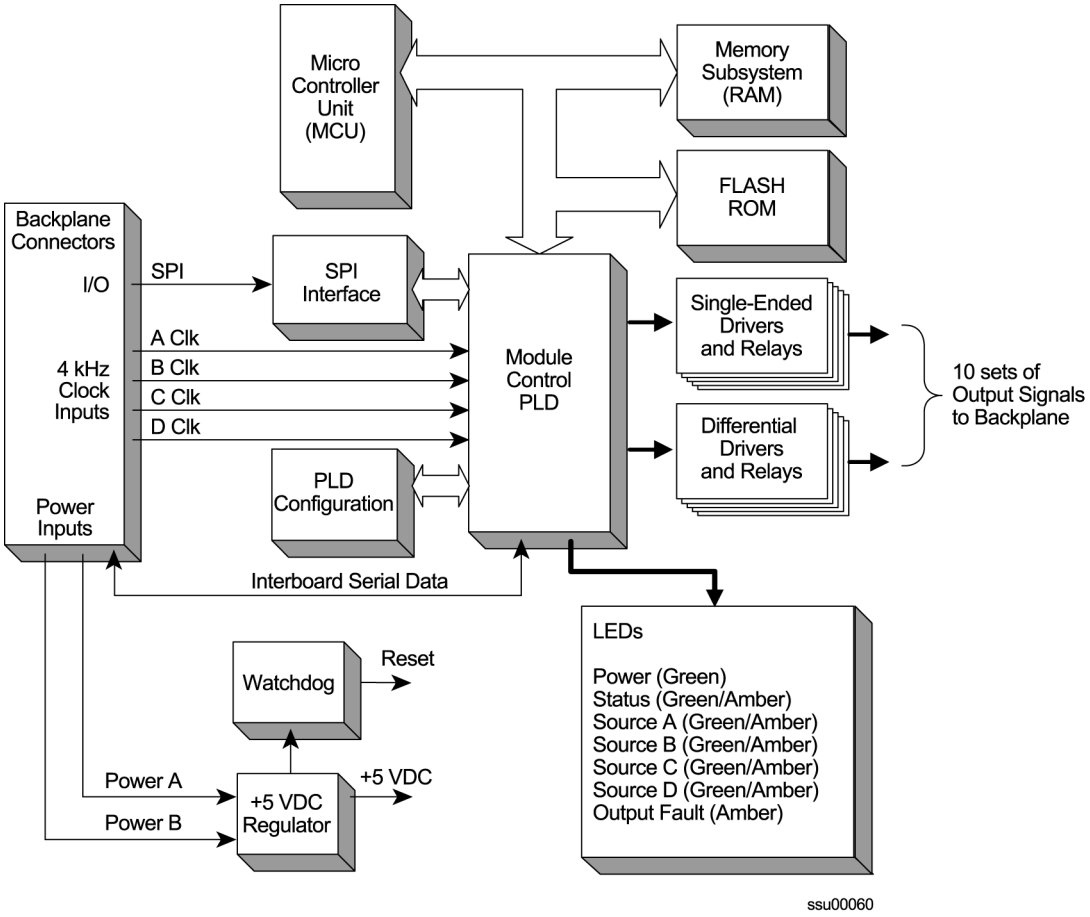


Figure 8-14. Block Diagram of the RS-422 Output Module

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Status Indicators

The RS-422 Output module has seven LED status 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 8-15 and described in Table 8-14.

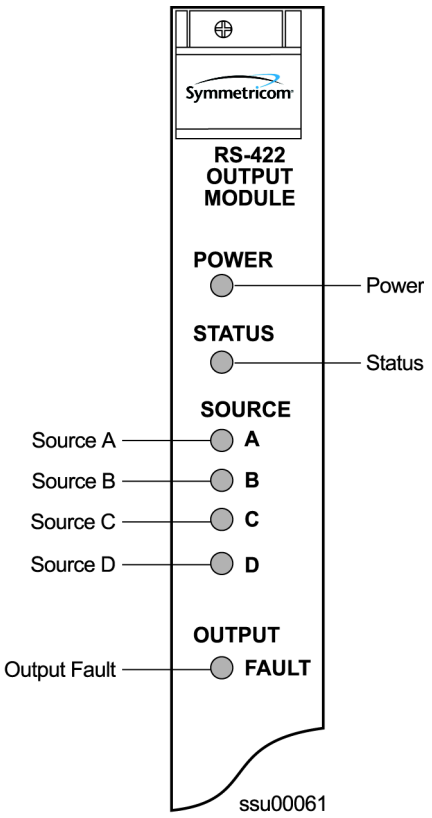


Figure 8-15. Front Panel of the RS-422 Output Module

Table 8-14. RS-422 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) = Output module functioning correctly Blinking Amber = Output module is downloading firmware On (Amber) = Output module failure
SOURCE A	Green/Amber	On (Green) = Clock A in slot 1 is the selected source clock On (Amber) = Faulty or missing Clock A Off = Clock A is good and not selected
SOURCE B	Green/Amber	On (Green) = Clock B in slot 13 is the selected source clock On (Amber) = Faulty or missing Clock B Off = Clock B is good and not selected

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Table 8-14. RS-422 Output Module Status LED Indicators (Continued)

Indicator	Color	Description
SOURCE C	Green/Amber	On (Green) = The Bypass clock (Clock C) is the selected source clock. See Bypass Clock (Clock C), on page 34 On (Amber) = Faulty or missing Bypass clock Off = Bypass clock is ignored, or good and not selected
SOURCE D	Green/Amber	On (Green) = The Expansion clock (Clock D) is the selected source clock. The module is in an Expansion shelf On (Amber) = Faulty or missing Expansion clock Off = Expansion clock 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

Performance Specifications

Specifications for the RS-422 Output module are provided in Table 8-15.

Table 8-15. RS-422 Output Module Performance Specifications

Performance Characteristic	Specification
Frequency	8 kHz to 4096 kHz, in 8 kHz increments
Format/level	Per TIA/EIA-422V
Waveshape	Differential square wave, 50/50 duty cycle Single-ended square wave, 50/50 duty cycle
Rise/Fall time	< 50 ns
Jitter	<0.03 UI up to 1.96 MHz
Number of Outputs	10 differential 10 single-ended

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Line Retiming Unit (LRU)

This section provides information on the installation and operation of the DS1 Line Re-timing Unit (LRU) designed for operation in the SSU-2000 Synchronization Supply Unit and the SDU-2000 Expansion shelf. It provides a list of new TL1 and ICS commands for the LRU along with some examples of how to use the commands.

The LRU is comprised of a Line Re-timing Module (LRM) and a Cut-Through Assembly (CTA). The LRU is available in both a two-port (Dual) and four-port (Quad) version. LRU part numbers are as follows:

- Dual CTA 22013300-000-0
- Quad CTA 22013300-001-0
- Dual LRM 23413301-000-0
- Quad LRM 23413301-001-0

The DS1 LRU inserts timing on DS1 signals that are typically connected to both sides of a DSX-1 panel in a Central Office. Side 1 of the DS1 re-timer provides “3R” (Re-shape, Re-amplify, and Re-time) for the DS1 signal to a client Network Element. When the LRU receives a DS1 data stream, it re-times the data with the transmit clock signal. The clock signal is inserted into the DS1 line route between two DS1 path-terminating elements. Side one is the direction in which timing is applied. Side 1 contains the DS1 line performance reporting and AIS generator. AIS is not generated when the port is set to Unused/Off. Side 2 provides “2R”, which Re-shapes and Re-amplifies (regenerates) the DS1 signal from the client Network Element. Side 2 does not provide performance monitoring or AIS generation.



Note: Side 1 is the “3R” port, and is sometimes known as East. Side 2 is the “2R” port, and is sometimes known as West.

The LRM is installed into an SSU-2000 plug-in module slot and is configured as an output. The CTA plugs into the LRM’s corresponding rear panel connector and provides a path for the DS1 signal if the unit loses power, or if the main re-timing module is removed. Figure 8-16 illustrates Symmetricom’s recommended installation configuration.

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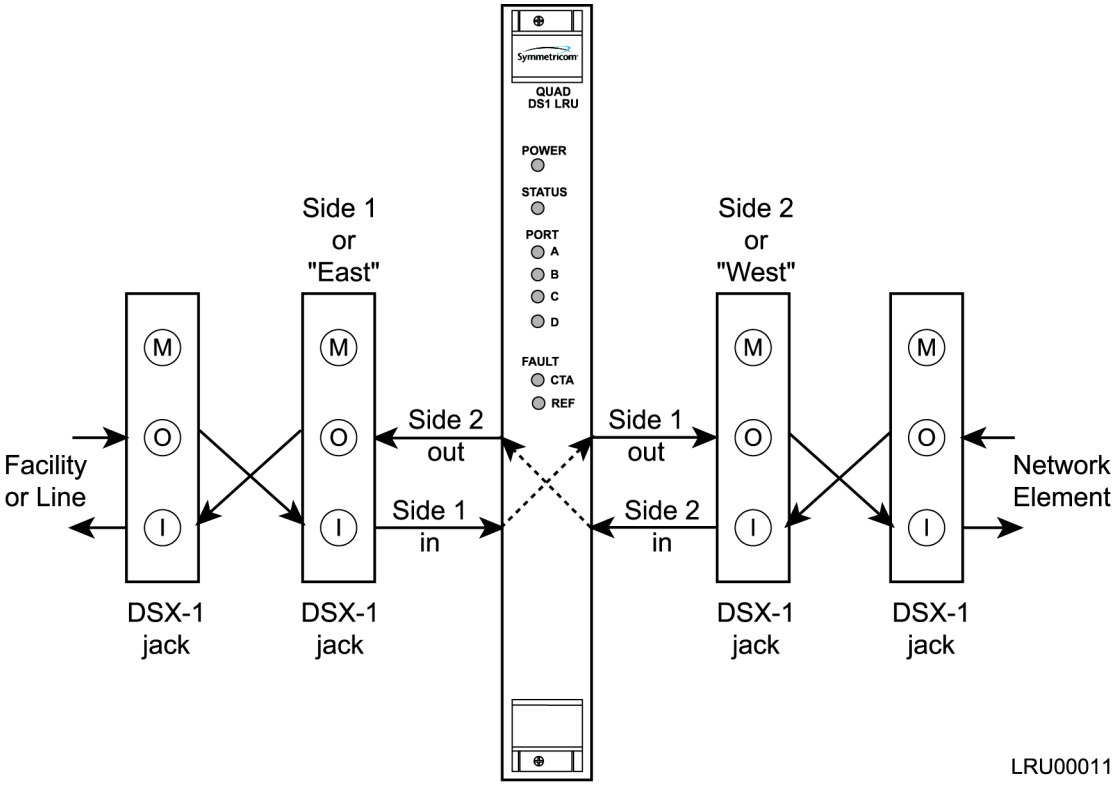


Figure 8-16. Recommended Installation Schematic for the LRU

Functional Overview

The Line Re-timing Module (LRM) consists of the following functional blocks:

- Power input regulation
- Microcontroller unit
- Memory (FLASH and RAM)
- LED indicators (module and port status)

Figure 8-17 is a block diagram of the DS1 LRU module.

Power Regulation

The SSU-2000 power input voltage range is from –37.5 vDC to –72 vDC. The input voltage (regulated to –37.5 vDC) is converted to outputs of +5 vDC, +3.3 vDC, and +1.5 vDC.

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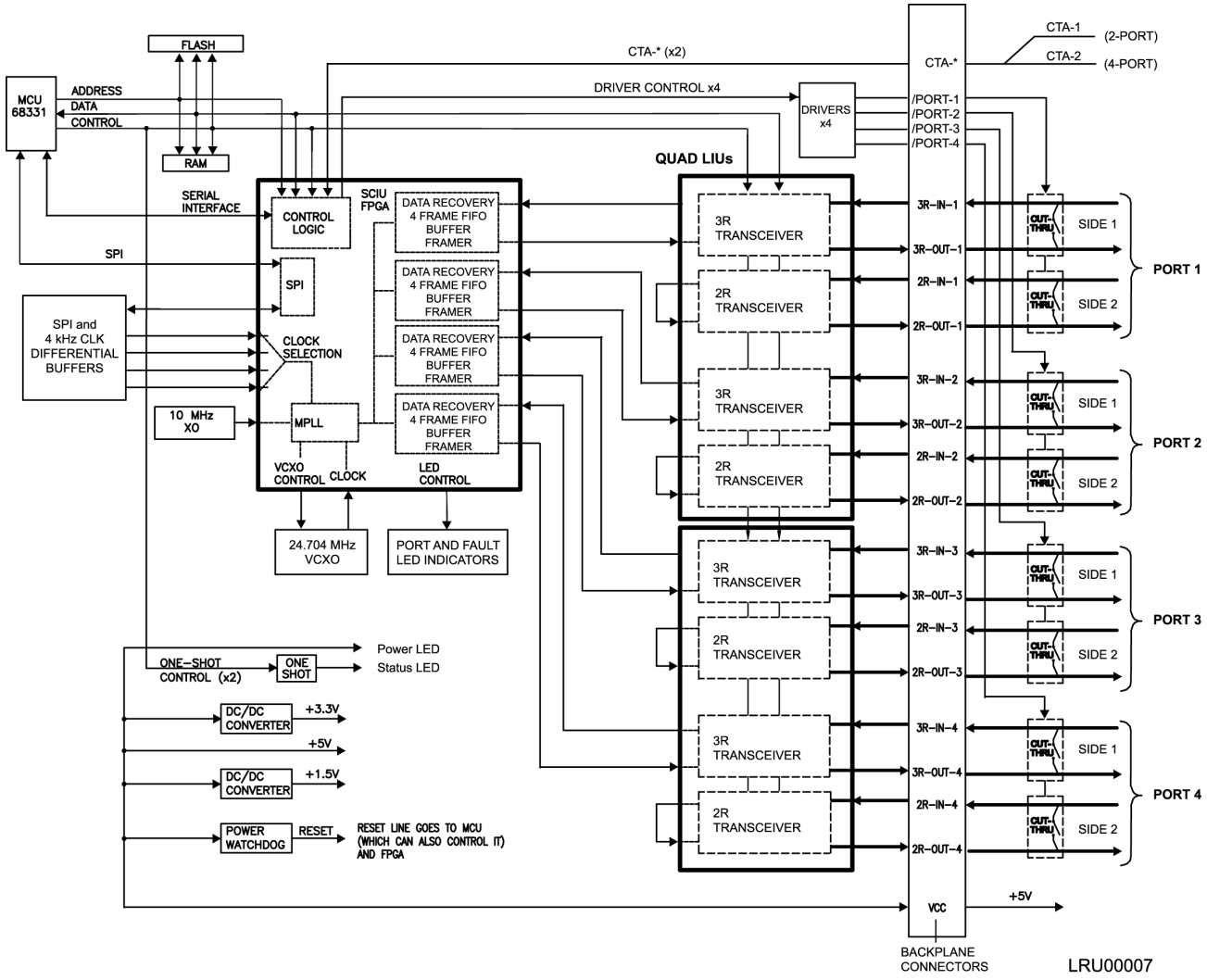


Figure 8-17. Block Diagram of the DS1 LRU Module

Micro-controller Unit (MCU)

The micro-controller unit (MCU) supports the Motorola Serial Peripheral Interface (SPI) protocol and performs interface functions with the other boards in the shelf (via the SPI bus), configuration of the LRM, and monitoring. The SPI allows module provisioning and generates events based on module status, clock reference status, and port status.

An internal MCU one-shot watchdog timer monitors the MCU for activity and controls the STATUS LED. It is responsible for placing the CTA into bypass, re-starting the MCU, and re-initializing the module when the module malfunctions.

Memory

The module's on-board memory stores the executable image, the FPGA image, and any persistent or non-persistent information that the processor may need. The module has 512 Kilobytes of RAM for dynamic memory storage with 256 Kilobytes of FLASH memory used to store the program code and configuration information for the FPGA.

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Status Indicators

Eight LEDs on the front panel of the module show the current operating status of the module. The front panel LEDs are shown in Figure 8-18 and are described in Table 8-16.

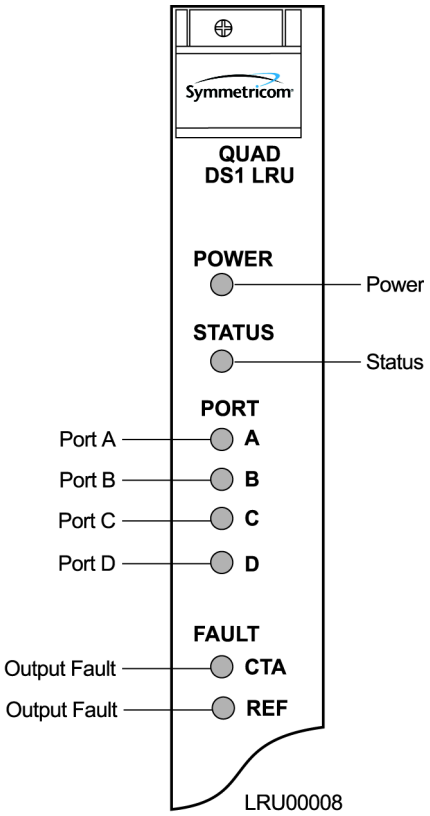


Figure 8-18. Front Panel of the DS1 LRU Four Port Module

Table 8-16. DS1 LRU Module Status LED Indicators

Indicator	Color	Description
POWER	Green	On = +5 vDC power available on the module Off = +5 vDC not present on the module
STATUS	Green/Amber	On (Green) = Module functioning correctly On (Amber) = Module failure
PORT 1, 2, 3, and 4	Green/Amber	On (Green) = Selected On (Amber) = Not good and ignored Off = Ignored or good and not selected

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Table 8-16. DS1 LRU Module Status LED Indicators (Continued)

Indicator	Color	Description
FAULT CTA	Green/Amber	On (Green) = CTA connected On (Amber) = CTA not connected or CTA mismatch Off = CTA not connected and alarm set to ignore
FAULT REF	Green/Amber	On (Green) = Clock reference selected On (Amber) = Clock reference not selected

Installing the Line Re-timing Unit

This section contains procedures for installing the Line Re-timing Module (LRM) and the Cut-Through Assembly (CTA) in an SSU-2000 and in an SDU-2000.

Installing the Line Re-Timing Module in the SSU-2000

The SSU-2000 shelf has twelve plug-in module slots. The slots are numbered A1 through A12, from left to right looking at the front of the shelf. When you install a Line Re-timing Module into an SSU-2000, Symmetricom recommends that you use only slots A6, A7, A8, or A9 as shown in Figure 8-19. Using only the specified slots allows you to maintain redundant configuration options on other modules.

Note: You can install and remove modules while system power is supplied without damaging modules or affecting system operation.

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.

Use the following steps to install a Line Re-timing Module in an SSU-2000.

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: To avoid possible damage or intermittent failure, ensure that you have completely inserted the module into the shelf and that you have securely tightened the captive screws. A partially inserted module can easily become damaged and cause intermittent failures.

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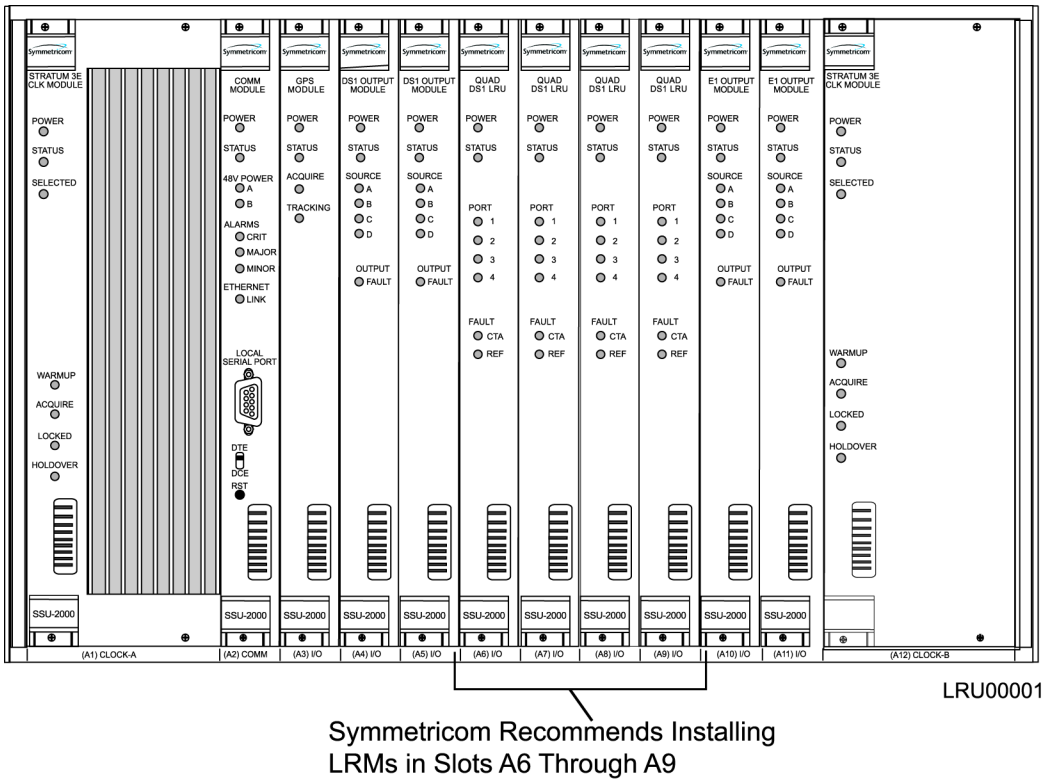


Figure 8-19. SSU-2000 Recommended Slots for LRM Installation

Installing the LRM in the SDU-2000

The SDU-2000 shelf has sixteen plug-in module slots. The slots are numbered A1 through A16, from left to right looking at the front of the shelf. When you install a Line Re-timing Module into an SDU-2000, Symmetricom recommends that you use only slots A5 through A12 as shown in Figure 8-20. Using only the specified slots allows you to maintain redundant configuration options on other modules.

Note: Modules can be removed and inserted while system power is supplied without damaging modules or affecting system operation.

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.

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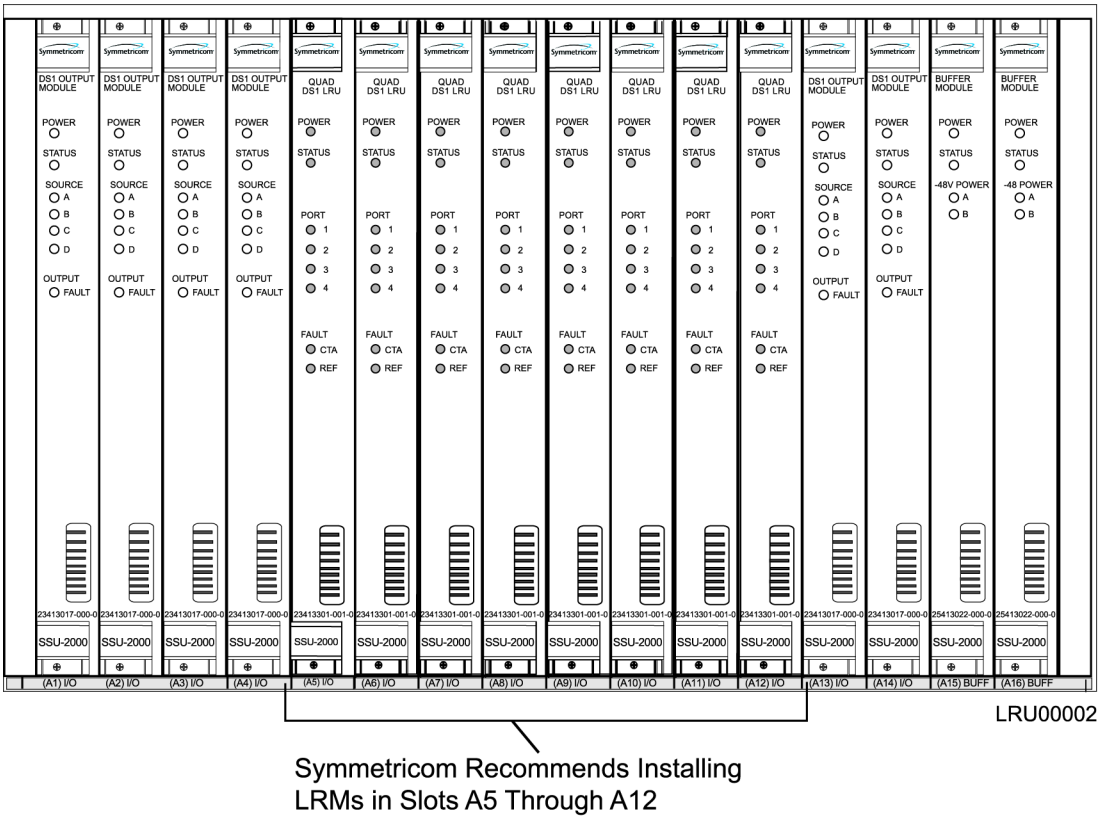


Figure 8-20. SDU-2000 Recommended Slots for LRM Installation

Use the following steps to install a Line Re-timing Module in an SDU-2000.

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 the edge connector.
3. Tighten the captive screws located at the top and bottom of the front panel.

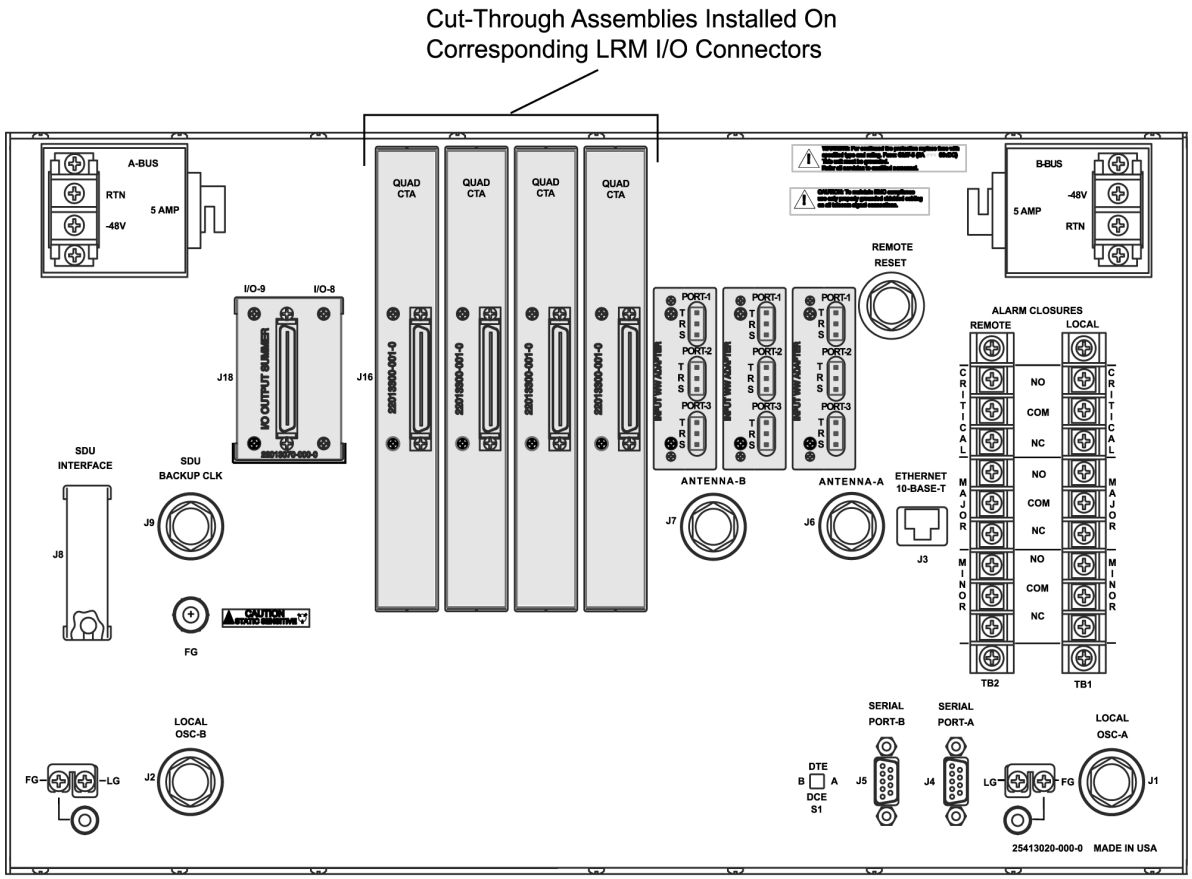
Caution: To avoid possible damage or intermittent failure, ensure that you have completely inserted the module into the shelf and that you have securely tightened the captive screws. A partially inserted module can easily become damaged and cause intermittent failures.

Installing a Cut-Through Assembly in the SSU-2000

The SSU-2000 shelf has I/O interface connections on the rear panel for connecting the SSU-2000 to the corresponding I/O adapter panels. The LRM I/O connections are made from the 50-pin Micro-D female connectors on the SSU-2000 rear panel, through the CTA, and to the adapter panel using the appropriate cable. Connectors J10 through J18 on the rear panel are labeled I/O-1 through I/O-9; each connector is associated with a specific I/O plug-in module slot. Symmetricom recommends using connectors J13 through J16, which correspond to module slots A6 through A9 respectively (see Figure 8-21).

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Caution: To avoid signal faults, do not install a Cut-Through Assembly on top of a Summer Adapter.



LRU00003

Figure 8-21. Installing the Cut-Through Assembly in the SSU-2000

Use the following steps to install the Cut-Through Assembly on an SSU-2000. Refer to Table 8-17 for a description of the SSU-2000 and CTA I/O connector pin functions and to Figure 8-23 for pin orientation.

1. Remove the two screws on each I/O connector that a CTA is to be installed on.

Caution: To avoid possible electrostatic discharge problems after removing a CTA connector, you must replace the screws securing the I/O connectors on the rear panel of the SSU-2000.

2. Install CTA connectors on all outputs corresponding to installed LRMs.

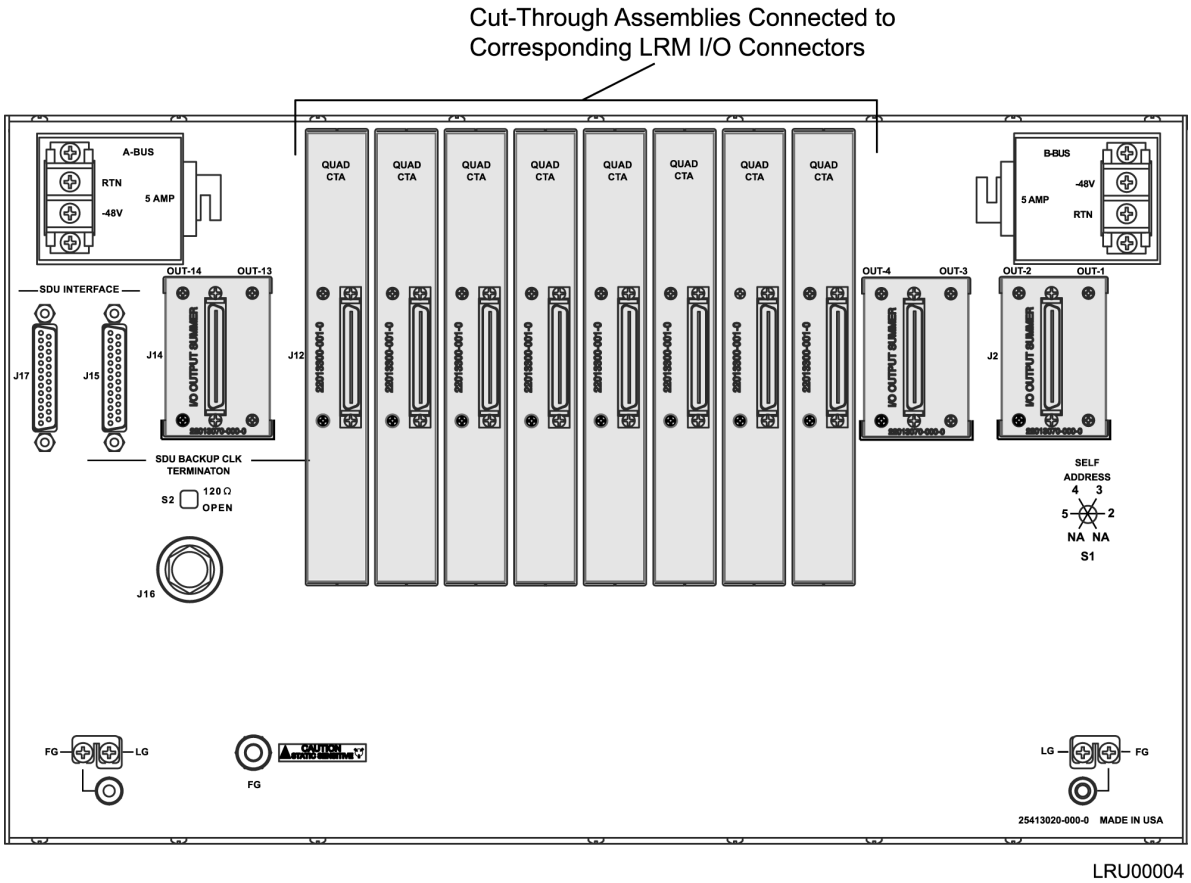
3. Tighten all CTA connector screws securely.

4. Connect 50-pin Micro-D output cables as required for your application.

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Installing a CTA in the SDU-2000

The SDU-2000 shelf has I/O interface connections on the rear panel for connecting the SDU-2000 to the corresponding I/O adapter panels. The LRM I/O connections are made from the 50-pin Micro-D female connectors on the rear panel of the SDU-2000, through the CTA, and to the adapter panel using the appropriate cable. Connectors J1 through J14 are labeled OUT-1 through OUT-14 and each connector is associated with a specific I/O plug-in module slot. Symmetricom recommends using connectors J5 through J12, which correspond to module slots A5 through A12 respectively (see Figure 8-22).



LRU00004

Figure 8-22. Installing the Cut-Through Assembly in the SDU-2000

Use the following steps to install the Cut-Through Assembly on an SDU-2000. Refer to Table 8-17 for a description of the SSU-2000 and CTA I/O connector pin functions and to Figure 8-23 for pin orientation.

Caution: To avoid possible electrostatic discharge problems after removing a CTA connector, you must replace the screws securing the I/O connectors on the rear panel of the SDU-2000.

1. Remove the two screws on each I/O connector that a CTA is to be installed on.

2. Install CTA connectors on all outputs corresponding to installed LRMs.

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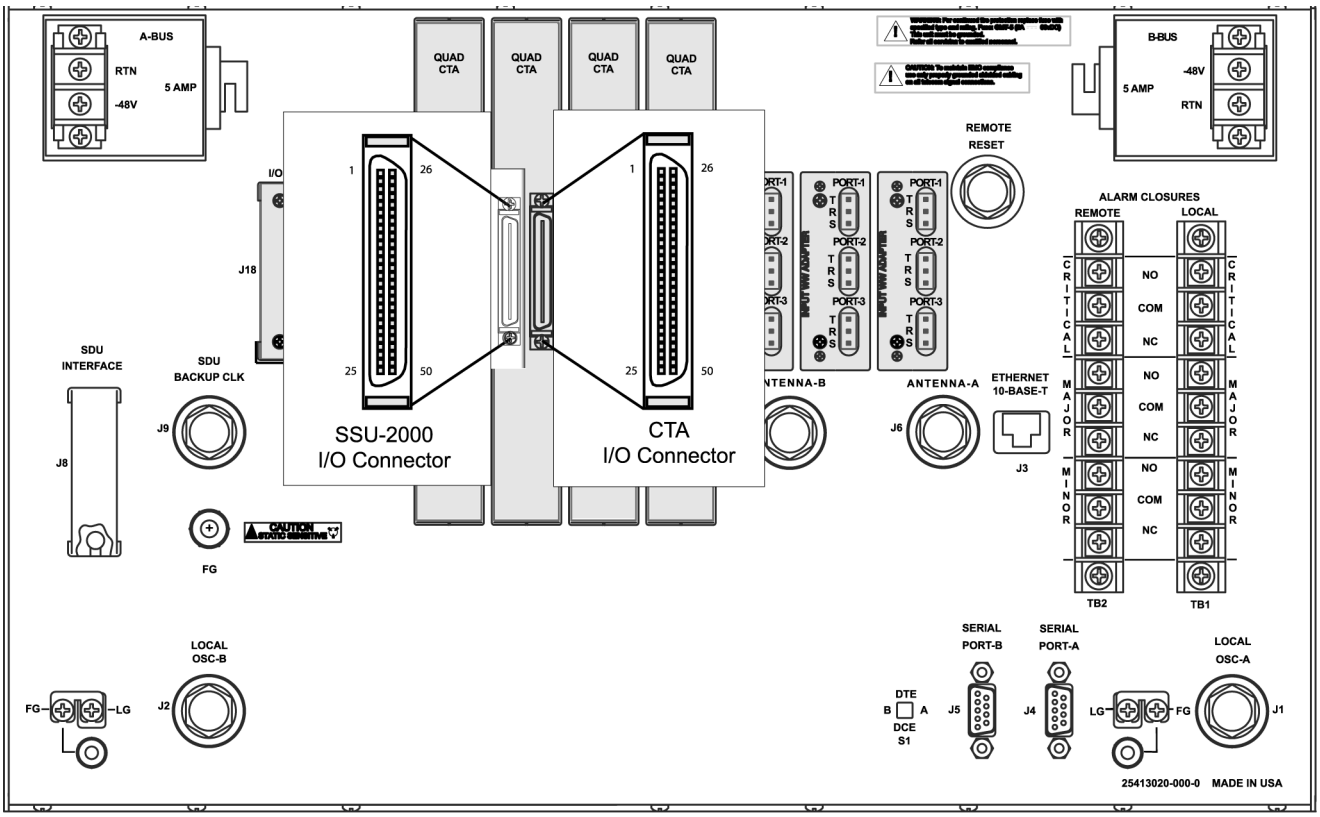
3. Tighten all CTA connector screws securely.

4. Connect the 50-pin Micro-D output cables as required for your application.

Table 8-17. SSU-2000 and CTA I/O Pin Description

Pin Number	Function (LRU Applications Only)	CTA Pin Function	Pin Number	Function (LRU Applications Only)	CTA Pin Function
1	Not Connected	Not Connected	26	Not Connected	Not Connected
2	3R-ITIP-1	3R-ITIP-1	27	3R-IRING-1	3R-IRING-1
3	Not Connected	Not Connected	28	Not Connected	Not Connected
4	3R-OTIP-1	3R-OTIP-1	29	3R-ORING-1	3R-ORING-1
5	2R-ITIP-1	2R-ITIP-1	30	2R-IRING-1	2R-IRING-1
6	2R-OTIP-1	2R-OTIP-1	31	2R-ORING-1	2R-ORING-1
7	RELAY SINK PORT-1	Not Connected	32	RELAY SINK PORT-2	Not Connected
8	3R-ITIP-2	3R-ITIP-2	33	3R-IRING-2	3R-IRING-2
9	3R-OTIP-2	3R-OTIP-2	34	3R-ORING-2	3R-ORING-2
10	2R-ITIP-2	2R-ITIP-2	35	2R-IRING-2	2R-IRING-2
11	2R-OTIP-2	2R-OTIP-2	36	2R-ORING-2	2R-ORING-2
12	CTA-1 (2-PORT)	Not Connected	37	5vDC	Not Connected
13	Not Connected	Not Connected	38	Not Connected	Not Connected
14	3R-ITIP-3	3R-ITIP-3	39	3R-IRING-3	3R-IRING-3
15	3R-OTIP-3	3R-OTIP-3	40	3R-ORING-3	3R-ORING-3
16	2R-ITIP-3	2R-ITIP-3	41	2R-IRING-3	2R-IRING-3
17	2R-OTIP-3	2R-OTIP-3	42	2R-ORING-3	2R-ORING-3
18	RELAY SINK PORT-3	Not Connected	43	RELAY SINK PORT-4	Not Connected
19	3R-ITIP-4	3R-ITIP-4	44	3R-IRING-4	3R-IRING-4
20	3R-OTIP-4	3R-OTIP-4	45	3R-ORING-4	3R-ORING-4
21	2R-ITIP-4	2R-ITIP-4	46	2R-IRING-4	2R-IRING-4
22	2R-OTIP-4	2R-OTIP-4	47	2R-ORING-4	2R-ORING-4
23	Not Connected	Not Connected	48	DO NOT CONNECT	Not Connected
24	CTA-2 (4-PORT)	Not Connected	49	5vDC	Not Connected
25	FRAME GROUND	Not Connected	50	FRAME GROUND	Not Connected

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LRU00009

Figure 8-23. Orientation of t he SSU-2000 I/O and CTA I/O Connector Pins

Installing the Optional Wire-Wrap Panel Overlay

The adapter panel identification overlay is a user-installed label that identifies each port's side 1 and side 2 wire-wrap pins (see Figure 8-24).

Note: The label must be installed before you make the wire-wrap connections.

Use the following steps to install the wire-wrap identification overlay on the Puleo adapter panel.

1. Identify the appropriate twenty-pin groups for your application.
2. Align the label's holes with the panel's selected twenty-pin groups.
3. Carefully push the label over the pins until it is flush with the panel. The label is secured in place by the physical wire-wrap connections and is not glued to the panel.

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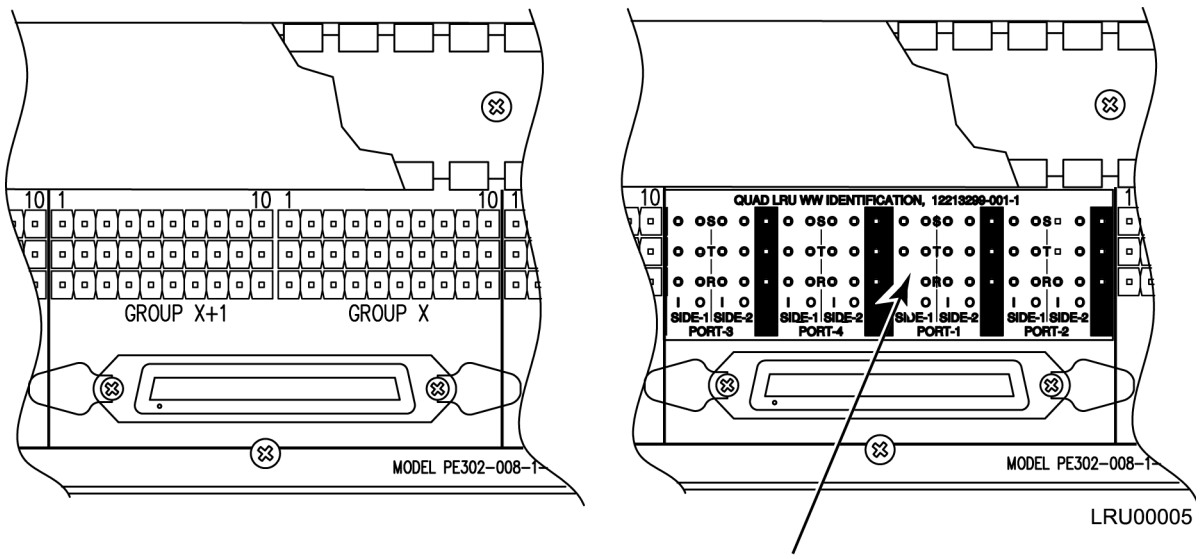


Figure 8-24. Wire-wrap Identification Overlay

Specifications

Table 8-9 lists specifications for the Line Re-timing Module.

Table 8-18. Line Re-timing Module Specifications

Performance Characteristic	Specification
Power	–38 vDC to –74.9 vDC, Power A/B, 10 watts max.
Termination	100Ω
Waveshape	Per ANSI T1.102 and ITU-T G.703, October 1998
Signal	DS1
Number of Ports	2 or 4

Provisioning the LRM

The following information provides examples of how to use ICS and TL1 commands to provision an LRM in an SSU-2000. Refer to TL1 Command Interface, on page 268, and Interactive Command Set, on page 318, for details on ICS and TL1 commands.

Examples

The following ICS commands enable port 2 on an LRM in slot 8 of shelf 3, set the line build-out to 399 feet, and set the slip error threshold to 6:

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`LRM 3A8-2 ENABLE` then press **Enter**

`LRM 3A8-2 LBO 399` then press **Enter**

`LRM 3A8-2 SLIP 6` then press **Enter**

```
SET-PRMTR-LRM::S3A8-2:::ON,399,6,,;
```

The following ICS commands enable port 3 of an LRM in slot 11 of shelf 2 and enables a FAULT strategy,:

`LRM 2A11-3 FLT AIS` then press **Enter**

```
SET-PRMTR-LRM::S2A11-3:::ON,,,,,AIS;
```

The following ICS commands set the circuit ID of port 4 on an LRM in slot 7 of shelf 1 to 1A7-4:

`LRM 1A7-4 CID 1A7-4` then press **Enter**

```
SET-PRMTR-LRMCID::S1A7-4:::1A7-4;
```

Alarms and Events

The LRM generates the alarms and events listed in Table A-4 and Table A-9, respectively.

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Buffer Module

This section describes the Buffer module (part number 25413022-000-0) used in the SDU-2000 Expansion shelf. The Buffer module buffers the backplane and clock signals sent from the main shelf; the modules are installed in slots 15 and 16 of the SDU-2000. Symmetricom recommends a minimum of one Buffer module in each expansion shelf; a second Buffer module provides redundancy.

Status Indicators

The Buffer module indicators (LEDs) are shown in Figure 8-25 and described in Table 8-19.

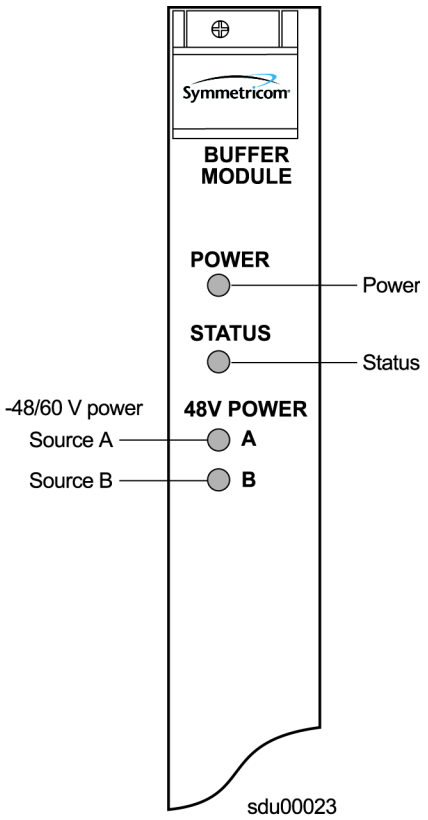


Figure 8-25. Front Panel of the Buffer Module

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Table 8-19. 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

Output Adapter Panels

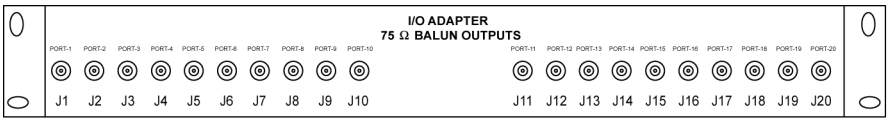
Balun Output Adapter Panel

Symmetricom offers three Balun Output Adapter panels for use with 2048 kHz and E1 Output modules. One adapter panel is required for each Output module in the shelf. You need one Output cable (see Adapter Accessories, on page 224, for a list of available cables) to connect the Adapter panel to the shelf.

The Balun Output Adapter panel (part number 22013068-001-0) uses BNC connectors. Figure 8-26 shows an I/O Adapter with Balun outputs.

The Balun Output I/O Adapter panel (part number 22013068-002-0) uses Siemens 1.6/5.6 mm connectors.

The Balun Output I/O Adapter panel (part number 22013068-003-0) uses Siemens 1.0/2.3 mm connectors.



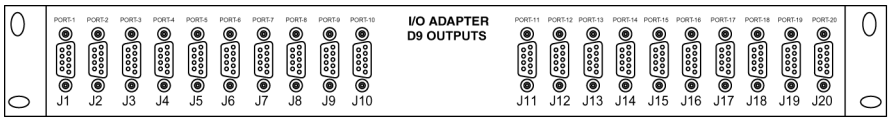
ss200020

Figure 8-26. Balun Output I/O Adapter Panel for Output Module

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DE9 Output Adapter Panel

The DE9 Output Adapter panel (part number 22013067-001-0) for the DS1 and E1 Output module is shown in Figure 8-27. One Adapter panel accommodates the 20 output signals generated by one Output module. You need one Output cable (see Adapter Accessories, on page 224, for a list of available cables) to connect the Adapter panel to the shelf.



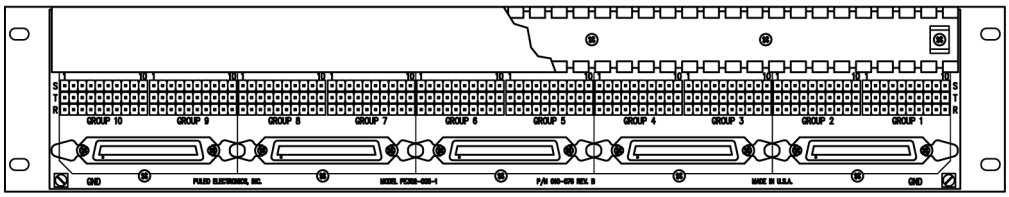
ss200021

Figure 8-27. Output I/O Adapter Panel, DE9 Outputs

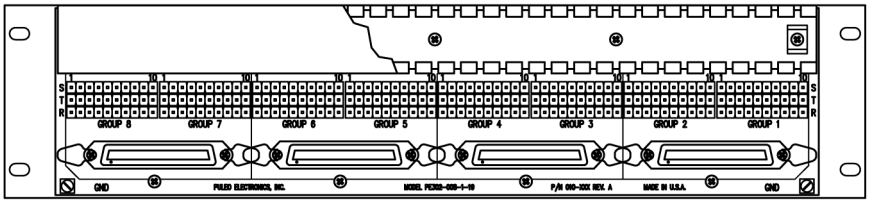
High-Density Wire-Wrap Output Panels

Symmetricom offers two high-density wire-wrap panels that can be used for any of the Output modules. You need four Output cables (see Adapter Accessories, on page 224, for a list of available cables) to connect the 80-output Adapter panel to the shelf and five Output cables to connect the 100-output Adapter panel to the shelf. All necessary cables are delivered with the panel.

Figure 8-28 illustrates the two high-density wire-wrap output panels.



23" High Density Wire Wrap Panel (100 Outputs)



19" High Density Wire Wrap Panel (80 Outputs)

tsg00022

Figure 8-28. High-Density Wire-Wrap Output Panel

The part number for the 23-inch, 100-output wire-wrap panel is 12813171-000-0; the part number for the 19-inch, 80-output wire-wrap panel is 12813282-000-0.

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Adapter Accessories

Symmetricom provides a number of accessories to ensure a complete and professional installation. Table 8-20 lists the cables available.

Table 8-20. Adapter Cables

Part Number	Description
805SCSI-0050	Cable, 50-pin SCSI, 1.0 m long
805SCSI-0150	Cable, 50-pin SCSI, 1.1 m long
805SCSI-0250	Cable, 50-pin SCSI, 1.2 m long
805SCSI-0350	Cable, 50-pin SCSI, 1.3 m long
805SCSI-0450	Cable, 50-pin SCSI, 1.4 m long
805SCSI-0550	Cable, 50-pin SCSI, 1.5 m long
805SCSI-0650	Cable, 50-pin SCSI, 1.6 m long
805SCSI-0750	Cable, 50-pin SCSI, 1.7 m long
805SCSI-0850	Cable, 50-pin SCSI, 1.8 m long
805SCSI-0950	Cable, 50-pin SCSI, 1.9 m long
805SCSI-2050	Cable, 50-pin SCSI, 2.0 m long
805SCSI-TLCO	Cable, 50-pin SCSI, to 50-pin TELCO connector

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Chapter 9 Hardware Configuration Guide

This chapter describes how to configure the SSU-2000 into a variety of telecommunications configurations, depending on which modules are installed.

In This Chapter

- Configuring a Conventional SSU/TSG System
- Configuring a Primary Reference Source (PRS) System
- Configuring a Monitor-Only System
- SSU-2000 Configuration Chart

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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.

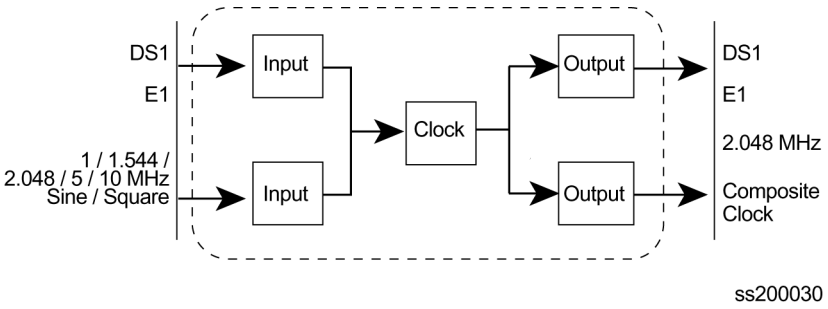


Figure 9-1. Time Sync Generator (TSG) System Configuration

The TSG configuration consists of the following:

- SSU-2000 main chassis
- Communications Module
- One or more E1/DS1 input modules
- Corresponding number of Input I/O adapter panels and input I/O cables
- One or two Clock Module(s) (2E/3E)
- One or more E1 and/or DS1 Output Module(s)
- Corresponding number of Output I/O adapter panels and SCSI output cables
- Seven 1.0-inch wide filler panels and one 3-1/2” wide filler panel

Configuring a Primary Reference Source (PRS) System

In a Primary Reference Source (PRS) configuration, the SSU-2000 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.

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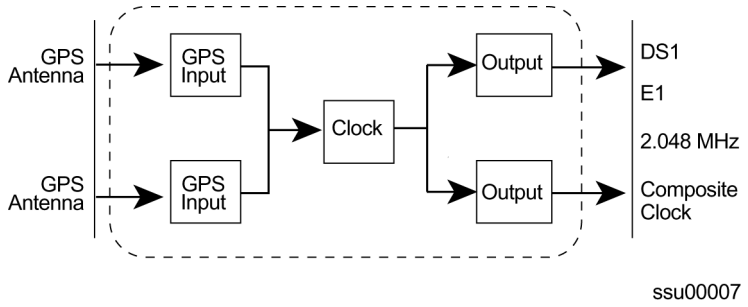


Figure 9-2. SSU-2000 Configured as PRS System

The SSU-2000 PRS configuration consists of the following:

- SSU-2000 main chassis
- Communications Module
- One or two GPS Input Modules
- One Clock Module (2E or 3E)
- One or more E1 and/or DS1 Output Modules
- One Input Adapter Panel and I/O cable
- One Output Adapter Panel and SCSI Output cable
- Seven 1.0-inch wide filler panels and one 3-1/2” wide filler panel

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-2000 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-2000 can support up to 27 inputs in this type of configuration. Figure 9-3 shows a monitor only configuration.

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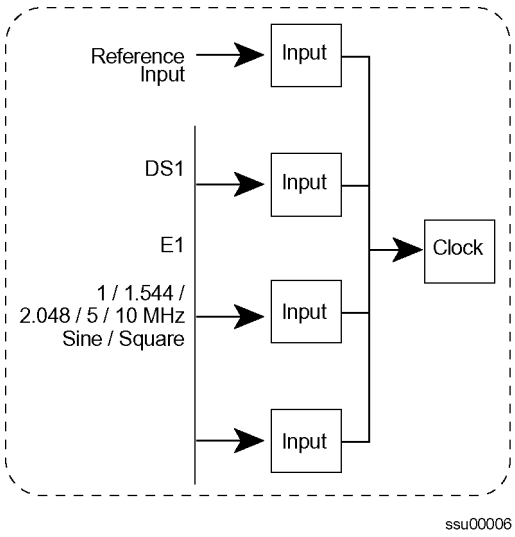


Figure 9-3. SSU-2000 Configured as Monitor-Only System

A monitor only configuration consists of the following:

- SSU-2000 main chassis with SDU Termination Plug
- Communications Module
- One or more Input Modules (one-port or three port DS1 or E1)
- Stratum 2E Clock Module
- Stratum 3E Clock Module
- One (or more) input adapter panel(s) and I/O cable; one three port input adapter required for each three-port input module in the system; one four-port input adapter required for each set of four One-Port Input Modules

Configuring a Subtending SSU

The SSU-2000 configured as a Subtending Synchronization Supply Unit (SSU) provides remote phase synchronization and holdover capabilities to telecom network elements, such as digital switches, Digital Access Crossover Systems (DACS), and channel banks for customers with very large equipment offices. For further information on Subtending SSUs, refer to Section 7 of Telcordia Specification GR-378-CORE.

The Subtending SSU configuration is designed in accordance with the Building Integrated Timing Supply (BITS) concept for intraoffice synchronization distribution. The BITS concept provides a synchronization hierarchy that is traceable back to one master clock (SSU), or redundant master clock pairs, referred to as the BITS. The BITS provides DS1 and Composite Clock (CC) timing to all synchronized clocks in the office, which provides timing inputs for all remote (subtending) SSUs.

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The Subtending SSU configuration provides Composite Clock (CC) and DS1 outputs that are frequency-locked and phase-aligned to the CC reference signal. If the CC input signal fails, the Clock module provides holdover.

This section contains an introduction to the hardware and software that is specific to a Subtending SSU configuration.

Functional Description

The SSU-2000 configured as a Subtending SSU broadens the Symmetricom SSU-2000 family of products by providing subtending clock functionality when referenced to a master TSG/BITS equipped with a Stratum 3E or better clock. The following combination of hardware and software configuration meets Subtending SSU criteria described in Section 7 of Telcordia Specification GR-378-CORE.

Hardware – Use the Subtending SSU when there is a need for more timing outputs or longer distribution paths than can be supplied by a single TSG. The Subtending SSU receives redundant Composite Clock (CC) reference signals directly from the Master BITS Clock. The CC signals are used for primary and secondary inputs and the SSU phase-locks to the selected reference to ensure proper DS0 phase alignment throughout the office. If both CC reference inputs fail, the shelf provides Stratum 3E holdover stability. If both 3E Clock modules fail, the Subtending SSU uses the CC reference input for clock bypass operation.

Input Reference Signals – The Subtending SSU configuration requires at least one CC input signal for phase alignment of the CC output signals. The selected CC input provides measured phase information to each Clock module, where it is used to control the clock's frequency and establish the holdover value for the Clock modules. The operator can manually or automatically select the reference. Switching references can occur repeatedly without accumulating phase or frequency error. Restoring the primary reference source can return the unit to tracking the primary signal.

Software – The Subtending SSU software contains a command that allows the user to select either the normal SSU mode or the subtending mode of operation.

A Communications module with Subtending SSU software installed identifies the Input, Output, and Clock modules that are provisioned in the system.

Input Section

The Input section consists of one or more CC Input modules connected to CC signals from a Master BITS shelf. Other input modules (DS1, etc.) may be installed, but in the Subtending mode these inputs are used for monitoring only, and are never selected as reference inputs for phase and frequency control of the outputs.

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The CC Input modules make phase measurements between the input signal and the clock oscillator(s). From these phase measurements on the selected input, the Clock modules compute frequency offset correction and holdover value. The selected Input module also generates a 4 kHz “C” clock that is used to align the phase of the CC output signals.

Operating Mode

The operating mode of the SSU is set with the ICS command OPERMODE [NORMAL| SUBTENDING]. In Normal mode, the unit operates as specified in Chapter 1, Product Overview. In the Subtending mode, the unit uses only the CC inputs as reference sources. The bipolar violation (BPV) occurrences in the selected input are used to generate a signal output for phase alignment of the CC output signals. In addition, phase measurements on the selected input are used to control the average frequency of the outputs. If there is a significant difference in the BPV alignment between the selected CC input and any secondary CC inputs, the unit issues a warning that the reference signals are not phase aligned. It is the operator’s (or installer’s) responsibility to ensure that the CC inputs are from the same (master) BITS and that they are wired correctly to maintain the same polarity. A valid CC input is required when starting the Subtending mode in order to align the phase of the CC outputs.

Selecting Input References and Switching References

In the Subtending mode, the unit selects the highest priority valid CC input available. If the selected input is lost, the unit switches to any alternate CC input as specified by priority assignments; the phase and frequency of the CC outputs follow the new reference signal. If all CC inputs are invalid, the output phase continues at the last valid alignment before the input was lost; the frequency is established by the learned holdover values in the Clock modules. When a valid CC input is re-established, the CC output is immediately aligned to the selected input signal. A CC input is invalid when it is in LOS or it has invalid BPV occurrences. LOS is declared when the Input module is unable to track the expected 64 kHz input; an invalid BPV event occurs when the expected 8000 BPVs per second varies by more than ±10%.

Output Section

The output section operates exactly the same in Subtending mode as in Normal mode, except for the CC Output modules. In the Subtending mode, the CC outputs are phase aligned with the selected CC input reference signal. The output section consists of up to 120 channels from six Output modules (60 channels from 3 redundant pairs) that reside in the main shelf and up to 1120 channels from 56 modules (560 channels from 28 redundant pairs) in a fully expanded system with four SDU-2000 expansion shelves. Each Output module type provides 20 independent output synchronization signals.

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Output modules are available to support the following formats:

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

Setting Subtending Parameters

The SSU-2000 software includes the following new command that allows you to enable and disable the Subtending mode. For additional information on general syntax and usage, refer to Appendix B, Communications Protocol.

OPERMODE

This command allows you to view and change the operating mode of the SSU-2000.

Level 0	Not applicable
Level 1	Not applicable
Level 2	Not applicable
Level 3	`OPERMODE [SUBTENDING|NORMAL]`

If you do not specify a parameter, the system displays the current mode.

`SUBTENDING`	Sets the SSU to Subtending mode.
`NORMAL`	Sets the SSU to normal TSG operation.

Level 4	Same as Level 3 operation.
Restrictions	See Changing to Subtending SSU Mode, on page 232, for hardware and software requirements.

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Changing to Subtending SSU Mode

To change an SSU-2000 to a Subtending SSU, you must verify that the proper hardware is present, and you must install the appropriate software. The minimum software versions for the modules is listed in Table 9-1.

Table 9-1. Minimum Software Versions for Subtending Operation

Module	Minimum Revision Level
Communications: Basic Load Basic + NTP Basic + SNMP Basic + NTP + SNMP	 D.00 B.00 B.00 B.00
Clock (ST2 or ST3E)	C.00
Composite Clock Input	A.00
Composite Clock Output	PLD: B.00 S/W: B.00

Required Hardware

The Subtending SSU mode *requires* the following modules in the shelf:

- CC Input module
- CC Output module

All other available modules can be used in the Subtending SSU mode. The shelf must contain the appropriate Clock module(s), Communications module, and Input and Output modules.

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Installing Software

The Subtending SSU requires the software listed in Table 9-2:

Table 9-2. Files Required for Upgrading the Firmware

Item Number to be Upgraded	Description	File for Module Firmware Upgrade	File for Module PLD/FPGA Upgrade
23413012-000-0 23413012-001-0 23413012-002-0 23413012-003-0	Comms Module	01200D00.DN1 01201B00.DN1 01202B00.DN1 01203B00.DN1	SCOMFPGA.DN9
23413015-000-0	Stratum 3E Clock Module	01500C00.DN1	SCLKFPGA.DN9
23413016-000-0	Stratum 2 Clock Module	01500C00.DN1	SCLKFPGA.DN9
23413279-000-0	CC Input Module	27900A00.DN1	SSUCCINP.DN9
23413158-000-0	CC Output Module	15800B00.DN1	SSUCCOUT.DN9

To install the software you need to use either the SynCraft application or the SSU-2000 Download application

Using the SynCraft Application

To use the SynCraft application to install software, refer to the on-line documentation provided within the program.

Changing From Subtending SSU Mode

To change a Subtending SSU back to the normal mode:

1. Log in to the SSU-2000 and press the **Enter** key. The system prompt appears.
2. Type `opermode normal` and press the **Enter** key. The system responds with:

```
2002-08-15-T15:57:56Z ID: SSU2000 Name: SSU_2000
The SSU2000 is in Normal Mode
```

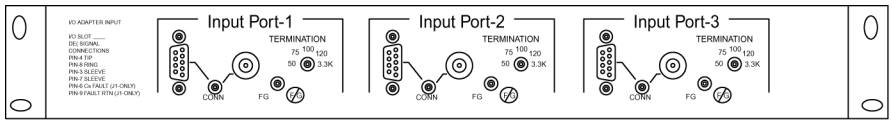
3. Type `bye` and press the **Enter** key to log off.

No hardware changes are necessary.

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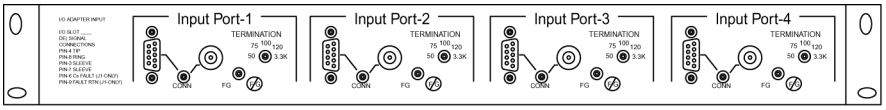
SSU-2000 Configuration Chart

A fully-populated SSU-2000 main shelf is shown in Figure 1-1. Figure 9-4 shows the I/O adapter panels used with the SSU-2000 input and output modules. Figure 9-5 shows the SDU-2000 Synchronization Distribution Unit (output expansion shelf) used with the SSU-2000. Table 9-3 contains a listing of all SSU-2000 components, provides the associated Symmetricom part numbers and provides other configuration data required to procure a custom system.



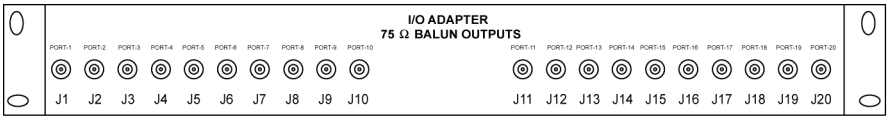
ss200018

I/O Adapter for 3-Port DS1 or E1 Input Module



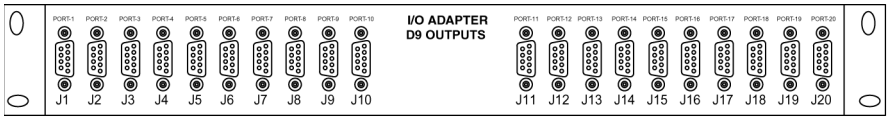
ss200019

I/O Adapter for 1-Port DS1 or E1 Input Module



ss200020

75 Ohm Balun I/O Adapter for DS1 or E1 Output Module

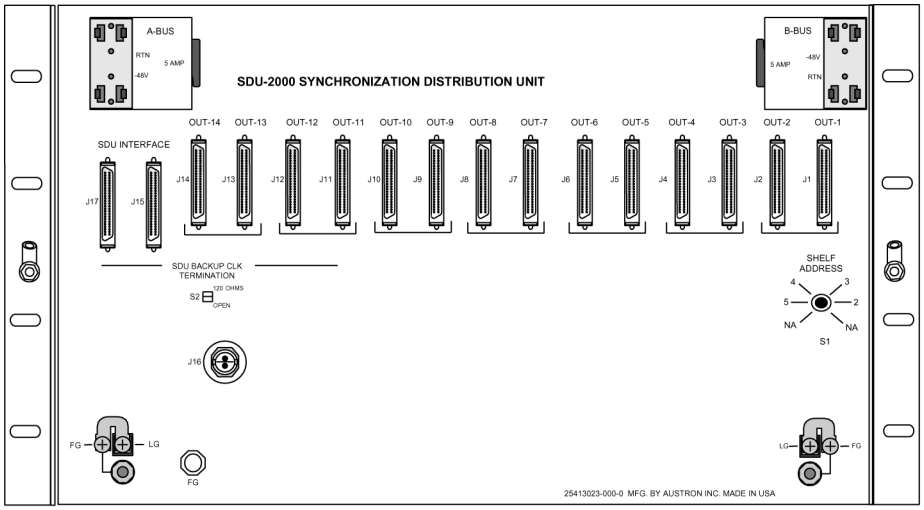


ss200021

DE9 I/O Adapter for DS1 or E1 Output Module

Figure 9-4. SSU-2000 I/O Adapter Panels

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ss200027

Figure 9-5. SDU-2000 Synchronization Distribution Unit

Table 9-3. SSU-2000 System Components

Item	Description	Part Number	Notes
SSU-2000 Main Shelf and Associated Hardware			
1.	SSU-2000 Main Shelf (Chassis) with SDU termination plug and *SSU-2000 User's Guide* (12713030-002-2)	25413020-000-0	Required for all systems. Requires minimum of one Comms module, one Clock module, one Input module, one Output module, one Input Adapter panel and one Output adapter panel and 8 Filler panels (including one wide panel).If an Expansion shelf (SDU-2000) is not installed, SSU Expansion Terminator, part number 12013049-000-0 must be installed on J8 on the SSU-2000 chassis. Otherwise, the terminator must be installed on the last Expansion shelf in the system.
2.	Bracket, rack ear, 19"	00413102-000-1	Two each provided with the main shelf.
3.	Bracket, rack ear, 23", 2 each required	00413020-001-1	Two each required per main shelf (must specify 23" rack).
Clock Modules			
4.	Stratum 2E Rb Clock Module	23413016-000-0	Minimum of one Clock module per system (item 4, 5, or 6). Redundant configuration with automatic switching in case of clock failure requires two Clock modules. The system will operate with 2E/3E clocks combined. 2E clock must be installed in chassis slot A1.

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Table 9-3. SSU-2000 System Components (Continued)

Item	Description	Part Number	Notes
5.	Stratum 3E Clock Module	23413015-000-0	Minimum of one Clock module per system (item 4, 5, or 6). Redundant configuration with automatic switching in case of clock failure requires two Clock modules. The system will operate with 2E/3E clocks combined. 2E clock must be installed in chassis slot A1.
6.	Type I Clock Module	23413015-001-0	Minimum of one Clock module per system (item 4, 5, or 6). Redundant configuration with automatic switching in case of clock failure requires two Clock modules.
Communications Module			
7.	Communications Module	23413012-000-0	One required per SSU-2000 system.
Input Modules, I/O Adapter Panels and Input Cabling			
8.	3-Port DS1 Input Module	23413013-002-0	1. Accepts up to 3 DS1 or Clock signals. 2. Requires use of 3-Port I/O adapter (one per 3-Port Input module).
9.	1-Port DS1 Input Module	23413013-001-0	1. Accepts one DS1 or Clock signal. 2. Requires use of 4-Port I/O Adapter (one adapter can handle up to four 1-port DS1 or ES1 Input modules).
10.	3-Port E1 Input Module	23413014-002-0	1. Any combination of three G.703/9, G.703/13, or Clock inputs. 2. Requires use of 3-Port I/O adapter (one per input module in system.
11.	1-Port E1 Input Module	23413014-001-0	Requires use of 4-Port I/O Adapter (one adapter serves up to four 1-Port Input modules).
12.	GPS Input Module	23413019-000-0	1. Supports NTP provided by the Communications module. 2. Time-of-day provided by the Radio.
13.	CC Input Module	23413279-000-0	1. Accepts one Composite Clock signal. 2. Requires use of 133 Ω Input adapter panel.

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Table 9-3. SSU-2000 System Components (Continued)

Item	Description	Part Number	Notes
14.	3-Port SSU I/O Input Adapter Panel	22013066-001-0	1. Use with 3-port DS1 or E1 Input Module. 2. Each port has DE9 and BNC connectors (switch selectable) and selectable termination (50, 75, 100, 120 or 3.3 kΩ). 3. Typically, 100 Ω termination for DS1 signals, 120 Ω for E1 signals, 50 and 75 Ω termination for 2,048 MHz or sine wave signals. 4. Includes 1-m SCSI cable for connection to SSU-2000.
15.	3-Port SSU I/O Input Adapter Panel	22013066-002-0	1. Use with 3-port DS1 or E1 Input module. 2. Each port has DE9 and Siemens 1.6/ 5.6 mm connectors (switch selectable) and selectable termination (50, 75, 100, 120 or 3.3 kΩ). 3. Typically, 100 Ω termination for DS1 signals, 120 Ω for E1 signals, 50 and 75 Ω termination for 2,048 MHz or sine wave signals. 4. Includes 1-m SCSI cable for connection to SSU-2000.
16.	3-Port SSU I/O Input Adapter Panel	22013066-003-0	1. Use with 3-port DS1 or E1 Input module. 2. Each port has DE9 and Siemens 1.0/ 2.3 mm connectors (switch selectable) and selectable termination (50, 75, 100, 120 or 3.3 kΩ). 3. Typically, 100 Ω termination for DS1 signals, 120 Ω for E1 signals, 50 and 75 Ω termination for 2,048 MHz or sine wave signals. 4. Includes 1-m SCSI cable for connection to SSU-2000.
17.	4-Port SSU I/O Adapter Panel	22013069-001-0	1. One adapter panel serves up to four 1-port input modules. 2. Each port has DE9 and BNC connectors (switch selectable) and selectable termination (50, 75, 100, 120 or 3.3 kΩ). 3. Typically, 100 Ω termination for DS1 signals, 120 Ω for E1 signals, 50 and 75 Ω termination for 2,048 MHz or sine wave signals. 4. Includes 1-m SCSI cable for connection to SSU-2000.

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Table 9-3. SSU-2000 System Components (Continued)

Item	Description	Part Number	Notes
18.	4-Port SSU I/O Adapter Panel	22013069-002-0	1. One adapter panel serves up to four 1-port Input modules. 2. Each port has DE9 and Siemens 1.6/5.6 mm connectors (switch selectable) and selectable termination (50, 75, 100, 120 or 3.3 kΩ). 3. Typically, 100 Ω termination for DS1 signals; 120 Ω for E1 signals; 50 and 75 Ω termination for 2,048 MHz or sine wave signals. 4. Includes SCSI cable for connection to SSU-2000.
19.	4-Port SSU I/O Adapter Panel	22013069-003-0	1. One adapter panel serves up to four 1-port Input modules. 2. Each port has DE9 and Siemens 1.0/2.3 mm connectors (switch selectable) and selectable termination (50, 75, 100, 120 or 3.3 kΩ). 3. Typically, 100 Ω termination for DS1 signals; 120 Ω for E1 signals; 50 and 75 Ω termination for 2,048 MHz or sine wave signals. 4. Includes SCSI cable for connection to SSU-2000.
20.	SCSI Cable, 1 m	805SCSI-0050	Connects I/O Adapter to rear panel of the shelf.
Output Module, Output I/O Adapter Panels and Output Cables			
21.	E1 Output Module	23413018-000-0	1. Minimum of one Output module of any type required. 2. Each Output module provides 20 single output signals or 20 redundant signals (if desired) in even/odd slots. 3. Each Output module or redundant pair requires one Output I/O adapter panel. 4. Each two redundant Output modules require one Output Summer connector (part number 22013070-000-0).

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Table 9-3. SSU-2000 System Components (Continued)

Item	Description	Part Number	Notes
22.	DS1 Output Module	23413017-000-0	1. Minimum of one Output module of any type required. 2. Each Output module provides 20 single output signals or 20 redundant signals (if desired) in even/odd slots. 3. Each Output module or redundant pair requires one Output I/O adapter panel. 4. Each two redundant Output modules require one Output Summer connector (part number 22013070-000-0).
23.	2048 kHz Output Module	23413159-000-0	1. Minimum of one Output module of any type required. 2. Each Output module provides 20 single phase-locked 2048 kHz clock output signals or 20 redundant phase-locked 2048 kHz clock output signals (if desired) in even/odd slots. 3. Each Output module or redundant pair requires one Output I/O adapter panel. 4. Each two redundant Output modules require one Output Summer connector (part number 22013070-000-0).
24.	Composite Clock Output Module	23413158-000-0	1. Minimum of one Output module of any type required. 2. Each Output module provides 20 single byte and polarity phase aligned independently configurable duty cycle (50/50 or 62.5/37.5) and phase delay from 0 to 3.4 msec CC output signals or 20 redundant (if desired) signals of the same type in even/odd slots. 3. Each output module or redundant pair requires one Output I/O adapter panel. 4. Each two redundant Output modules require one Output Summer connector (part number 22013070-000-0).
25.	SSU I/O Adapter Panel, DS1 100/75 Ω Balun Outputs, BNC connectors	22013068-001-0	1. One adapter required per Output module (or redundant pair of Output modules). 2. Requires separate I/O cable, 50 pin SCSI – see item 30. 3. Optional ears for 21-inch or 23-inch rack.

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Table 9-3. SSU-2000 System Components (Continued)

Item	Description	Part Number	Notes
26.	SSU I/O Adapter Panel, DS1 120/75 Ω Balun Outputs, Siemens 1.6/5.6 mm connectors	22013068-002-0	1. One adapter required per Output module (or redundant pair of Output modules). 2. Requires separate I/O cable, 50 pin SCSI – see item 30. 3. Optional ears for 21-inch or 23-inch rack.
27.	SSU I/O Adapter Panel, DS1 120/75 Ω Balun Outputs, Siemens 1.0/2.3 mm connectors	22013068-003-0	1. One adapter required per Output module (or redundant pair of Output modules). 2. Requires separate I/O cable, 50 pin SCSI – see item 30. 3. Optional ears for 21-inch or 23-inch rack.
28.	I/O Adapter Assembly, 9-pin D Outputs (DE9)	22013067-001-0	1. One adapter required per DS1 Output module (or redundant pair Output modules). 2. Requires separate I/O cable, 50 pin-SCSI – see item 30. 3. Optional ears for 21-inch or 23-inch rack.
29.	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).
30.	I/O Cable, 50 pin 1 m I/O Cable, 50 pin 1.1 m I/O Cable, 50 pin 1.2 m I/O Cable, 50 pin 1.3 m I/O Cable, 50 pin 1.4 m I/O Cable, 50 pin 1.5 m I/O Cable, 50 pin 1.6 m I/O Cable, 50 pin 1.7 m I/O Cable, 50 pin 1.8 m I/O Cable, 50 pin 1.9 m I/O Cable, 50 pin 2 m	805SCSI-0050 805SCSI-0150 805SCSI-0250 805SCSI-0350 805SCSI-0450 805SCSI-0550 805SCSI-0650 805SCSI-0750 805SCSI-0850 805SCSI-0950 805SCSI-2050	1. One cable (1 to 2 meters in length) required for each Output module or redundant pair of Output modules in the system. 2. Same cables used for Main shelf and Expansion shelf.
31.	805SCSI-TELCO	Cable, 50-pin SCSI to 50-pin TELCO connector	
32.	805SCSI-TLCOR	Cable, 50-pin SCSI, to 50-pin TELCO connector right angle	

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Table 9-3. SSU-2000 System Components (Continued)

Item	Description	Part Number	Notes
		SDU-2000 Expansion Shelf	
33.	SDU-2000 Synchronization Distribution Unit Expansion Shelf, comes with D-clock cable	25413023-000-0	1. Up to 4 expansion shelves can be attached to one SSU-2000 main shelf. 2. Requires minimum of 1 Buffer module (2 recommended) and up to 14 Output modules (no Input modules). 3. Output modules interchangeable between Expansion shelf and Main shelf. 4. Last Expansion shelf requires SDU termination plug (shipped with Main shelf).
34.	Buffer Module	25413022-000-0	1 or 2 required per SDU-2000 expansion shelf (install in slots A15 and A16).
		Blank Filler Panels	
35.	Clock Module Filler Panel (3.2 in. wide)	10913022-000-0	Filler panels are required in all unused clock slots.
36.	Standard Module Filler Panel (1 in. wide)	10913021-000-0	Filler panels are required in all unused SSU-2000 and SDU-2000 I/O slots.The 1-inch panel fits all unused slots in an Expansion shelf and all except A1 and A12 (two end slots) in the Main shelf.
		EIA-232 Cable	
37.	Cable, EIA-232 Shielded, DB9P to DB9S, 5 ft. (1.5 m)	551026-0038	Used for communication with the SSU-2000.

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Appendix A Alarms and Events

This appendix describes the alarms and events that the SSU-2000 generates, and provides some troubleshooting information for dealing with these alarms and events.

In This Appendix

- Alarm Messages
- Event Messages

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Alarm Messages

After the Communications module is installed and functioning properly, it monitors the SSU-2000 and logs events into non-volatile memory, where you can inspect it 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.

Figure A-1 shows the structure of a typical Alarm message.

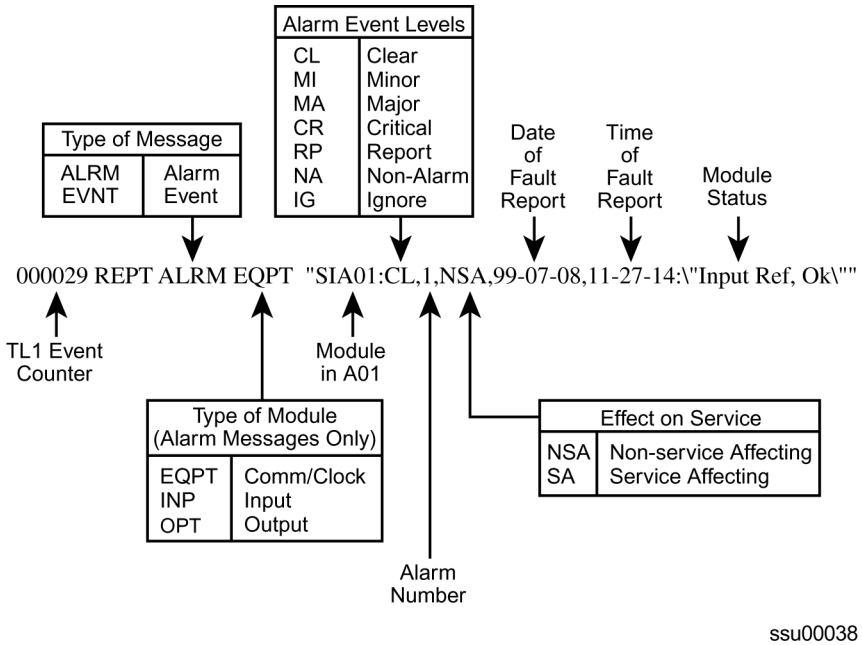


Figure A-1. Alarm and Event Message Structure

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 "Description/Corrective Action" category applies only to fault messages requiring user intervention.

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Table A-1. Clock Module Alarm Messages

Alarm Description	Alarm Number	Default Alarm Level	Status Messages	Description/ Corrective Action
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	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 recovers, the alarm clears.
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 over the clock pull-in range.
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 clears within one minute after module is installed. If alarm persists, re-seat modules.
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.

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Table A-1. Clock Module Alarm Messages (Continued)

Alarm Description	Alarm Number	Default Alarm Level	Status Messages	Description/ Corrective Action
Status of the rubidium's internal phase lock loop (ST2E clock only)	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 Symmetricom Global Services. Return to factory.

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Table A-2. Communications Module Alarm Messages

Alarm Description	Alarm Number	Default Alarm Level	Status Messages	Description/ Corrective Action
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 no power is connected to the Power A input and there is no plan to connect power, issue 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 no power is 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.

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Table A-3. Input Module Alarm Messages

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. To extinguish, disable 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.
CRC error fault status	4	Minor	■ Ok ■ Active	Verify port CRC is off. Verify signal is good.
MTIE fault status limit 1	5	Minor	■ Ok ■ Exceeded	MTIE limit 1 has been exceeded.
MTIE fault status limit 2	6	Minor	■ Ok ■ Exceeded	MTIE limit 2 has been exceeded.
Received PQL below provisioned 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 greater than threshold. Monitor frequency; if persistent, check source.

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Table A-3. Input Module Alarm Messages (Continued)

Alarm Description	Alarm Number	Default Alarm Level	Status Messages	Description/ Corrective Action
Hardware configuration fault	14	Major	■ Ok ■ Failed	Call Symmetricom Global Services. Return to factory.
GPS Input Module Alarms				
Hardware configuration fault	0	Major	■ Ok ■ Failed	Call Symmetricom Global Services. Return 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 is placed correctly
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	Reseat module. If problem persists, call Symmetricom Global Services.
Engine system fault	5	Minor	■ Ok ■ Bad	If alarm doesn't clear after 30 minutes, call Symmetricom Global Services.
Position unknown fault	6	Minor	■ Ok ■ Unknown	If alarm doesn't clear after 1 hour, call Symmetricom Global Services.

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Table A-3. Input Module Alarm Messages (Continued)

Alarm Description	Alarm Number	Default Alarm Level	Status Messages	Description/ Corrective Action
Clock PLL status fault	7	Minor	■ Ok ■ Not Locked	Ensure that the GPS priority level is set to 1. Reseat module. If problem persists, call Symmetricom Global Services.
Manufacturing item number fault	8	Minor	■ Ok ■ Unknown	Call Symmetricom Global Services. Return to factory.
System software fault	9	Minor	■ Ok ■ Failed	Reseat module. If problem persists, call Symmetricom Global Services.
Phase hardware fault	10	Minor	■ Ok ■ Bad	Reseat module. If problem persists, call Symmetricom Global Services.
Composite Clock Input Module				
Loss of Signal (LOS)	00	Major	■ Ok Active	No CC signal
Bipolar Violation (BPV) fault	03	Major	■ Ok Active	Invalid BPV density
Hardware configuration fault	05	Major	■ Ok Failed	Call Symmetricom Global Services. Return to factory
Clock PLL fault	06	Major	■ Ok Not Locked	One of the clock PLLs is not locked
Phase hardware fault	07	Major	■ Ok Bad	The phase measurements are invalid or missing
Phase 3 sigma fault	08	Minor	■ Ok Bad	The input signal is unstable
BPV Alignment	09	Major	■ Ok Active	The BPV alignment does not match the reference

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Table A-4. LRM Alarm Messages

Alarm Description	Alarm Number	Default Alarm Level	Status Messages	Range	Description/ Corrective Action
Side 1 Loss of signal fault status	0	Minor	■ Ok ■ Fault	Minor	Verify signal is connected. Can be cleared by disabling port.
Side 1 Alarm indication signal fault status	1	Report	■ Ok ■ Fault	Ignore Report Minor	Verify input signal is good. Port can be disabled.
Side 1 Loss of frame signal fault status	2	Report	■ Ok ■ Fault	Ignore Report Minor	Change frame type: D4 ESF
Side 1 Bipolar violation signal fault status	3	Report	■ Ok ■ Fault	Ignore Report Minor	Verify port ZS is on. Verify signal is good
Side 1 Slip signal fault status	4	Report	■ Ok ■ Fault	Ignore Report Minor	Accumulated slip value exceeded threshold setting
Side 2 Loss of signal fault status	5	Report	■ Ok ■ Fault	Ignore Report	Verify signal on side 2 is connected. Can be cleared by disabling port.
Reference PLL fault	10	Minor	■ Ok ■ Fault	Minor	Verify clock reference source is good. Reference PLL is unlocked
CTA Fuse	11	Minor	■ Ok ■ Fault	Ignore Report Minor	Verify CTA fuse is good
CTA	12	Minor	■ OK ■ Fault	Ignore Report Minor	CTA present/not present Mismatch Dual/Quad

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Table A-5. Output Module Alarm Messages

Alarm Description	Alarm Number	Default Alarm Level	Status Messages	Description/ Corrective Action
DS1/E1 Output Module				
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 DS1 module and one E1 module. Replace 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). Repair 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 module.
Hardware configuration fault	11	Major	■ Ok ■ Failed	Call Symmetricom Global Services. Return to factory.
Loss of clock source D	12	Major	■ Ok ■ Lost	Only in SDU. Loss of backup clock. Check cable.

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Table A-5. Output Module Alarm Messages (Continued)

Alarm Description	Alarm Number	Default Alarm Level	Status Messages	Description/ Corrective Action
Composite Clock Output Module				
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 DS1 module and one E1 module. Replace 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 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	Indication of external port fault on ports 2 and 4 (A000 Hex).
Hardware configuration fault	13	Major	■ Ok ■ Failed	Call Symmetricom Global Services. Return to factory.

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Table A-5. Output Module Alarm Messages (Continued)

Alarm Description	Alarm Number	Default Alarm Level	Status Messages	Description/ Corrective Action
2048 kHz Output Module				
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 DS1 module and one E1 module. Replace 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 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 Symmetricom Global Services. Return to factory.

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Table A-5. Output Module Alarm Messages (Continued)

Alarm Description	Alarm Number	Default Alarm Level	Status Messages	Description/ Corrective Action
RS-422 Output Module				
Hardware configuration status	0	Major	■ Ok ■ Failed	Module is installed in an incorrect slot.
Configuration mismatch	1	Major	■ Ok ■ Invalid	Incorrect software loaded into 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.
No clock selected	6	Major	■ Ok ■ Below	No clocks or no clock output
VCXO status	7	Major	■ Selected ■ Not selected	VCXO problems, re-seat or replace module.
Output PLL status	8	Major	■ Ok ■ Lost	No clocks or VCXO. Re-seat and check clocks.
Output fault	9	Major	■ Ok ■ Failed	Call Symmetricom Global Services. Return to factory

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Event Messages

Table A-6 lists event messages categorized by module. Each section lists status messages associated with each module and an event description of each message.

Table A-6. Clock Module Event Messages

Event Message	Event #	Event Description
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 – PQL)

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Table A-6. Clock Module Event Messages (Continued)

Event Message	Event #	Event Description
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 change
Setup, User Default, COML\	254	The user has set the module's configuration

Table A-7. Communications Module Event Messages

Event Message	Event #	Event Description
KeepAlive, SSU2000	105	The Keep Alive function has been enabled/ disabled
Install, Comms Module\	129	Module installation
Remove, Comms Module\	130	Module removal
Enable, Comms Module, COML\	131	The Comms module has been enabled
Disable, Comms 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 indicated port
Log Out, JOHN, COML, level: 2\	145	User at indicated level has logged out from 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

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Table A-7. Communications Module Event Messages (Continued)

Event Message	Event #	Event Description
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 Symmetricom Global Services. 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, DAVID, COML\	192	Administrator initialized user database
Add User, FRANK, COML\	193	Administrator added a user to user database
Mod User, FRANK, 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
Unit Name, AUSTIN, COML\	198	The SSU name has been changed
NTP Peer Add, 192.5.41.40, Client, COML\	199	A NTP client was added at the IP address shown
NTP Peer Del, 192.5.41.40, Client, COML\	200	A 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	A SNMP user has been added in the position of the user table shown
SNMP Mode, Ena, COML\	203	A SNMP Mode has been enabled
SNMP Manager, Init, 192.5.41.3, COML\	204	A 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

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Table A-7. Communications Module Event Messages (Continued)

Event Message	Event #	Event Description
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

Table A-8. Input Module Event Messages

Event Message	Event #	Event Description
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 Symmetricom Global Services
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
SSM, Off, COML\	197	User changed input SSM capability
CRC, On, COMl\	198	User changed input framer setup

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Table A-8. Input Module Event Messages (Continued)

Event Message	Event #	Event Description
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/CDMA Module\	129	Module Installation
Remove, GPS/CDMA Module\	130	Module Removal
Enable, GPS/CDMA Module\	131	The input module has been enabled
Disable, GPS/CDMA Module\	132	The input module has been disabled

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Table A-8. Input Module Event Messages (Continued)

Event Message	Event #	Event Description
Restart, in 5 seconds, COML\	133	Module re-boot
Cannot Enable, GPS/CDMA Module, COML\	134	Inability to enable module
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
CDMA FREQ, 882.750 MHz, COML\	204	User has changed the CDMA frequency being used
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
Composite Clock Input Module		
Install, CC Input Module\	129	Module installation
Remove, CC Input Module\	130	Module removal
Enable, CC Input Module\COML	131	The CC Input module has been enabled
Disable, CC Input Module\COML	132	The CC Input module has been disabled

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Table A-8. Input Module Event Messages (Continued)

Event Message	Event #	Event Description
Restart, in 5 seconds, COML\	133	Module re-boot
Cannot Enable, CC Input Module, COML\	134	Module cannot be enabled due to configuration error
Zero Phase, B, COML\	144	User has forced the phase to be cleared
Out of Window, Positive BPV	146	Positive BPV reversed
Sync Clock C, Start	147	Start syncing clock C to selected clock
Subtending On	148	Subtending mode is enabled
Port, Dis, COML\	199	User has disabled the input
Priority 5, COML\	201	User has changed the Priority setting
Prov PQL, 4, COML\	203	User has changed the PQL to the setting shown
Err Cnt, BPV, 16, COML\	207	User has changed the BPV error threshold
Clr Cnt, BPV, 5, COML\	208	User has changed the BPV clear threshold
IoName, Chg	224	User has changed the port name
Err Delay, (0), 10 sec, COML\	251	User has changed the alarm delay time
Alm Level, (2), Maj, COML\	252	User has changed the alarm level
Elevate Time, 86400 sec, COML\	253	User has changed the alarm elevation time
Setup, Save, COML\	254	User defaults have been set and saved

Table A-9. LRM Event Messages

Event Message	Event #	Event Description
Install, LRM Module	129	Module Installed
Remove, LRM Module	130	Module Removed
Enable, LRM Module, COML	131	Module Enabled
Disable, LRM Module, COML	132	Module Disabled
Restart, in 5 seconds, COML	133	User request for a module to reboot
CTA, Not Installed	145	Assembly not installed
Signal Path	146	Signal is through re-timer module or cut-through
Port Cntl, Port[2-3], Disable, COML	193	Port control on ports 2 and 3 disabled

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Table A-9. LRM Event Messages (Continued)

Event Message	Event #	Event Description
LBO, Port[2-3], 266 ft, COML	194	Line build out on ports 2 and 3 set to 266 ft.
SlipCount, Port[2-3], 4, COML	196	Slip count on ports 2 and 3 set to 4
BpvErr, Port[2-3], Clr, COML	197	Clear BPV accumulated error count
RefFlt, Port[2-3], Off, COML	198	Reference Fault Strategy for CTA Action disabled
Circuit ID, Set	199	Port Circuit ID set
Err Delay, (0), 10 sec, COML	251	An alarm delay time change
Alm Level, (1), Min, COML	252	An alarm level change
Setup, Factory, COML	254	User defaults have been set and saved

Table A-10. Output Module Event Messages

Event Message	Event #	Event Description
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)
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

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Table A-10. Output Module Event Messages (Continued)

Event Message	Event #	Event Description
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

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Appendix B Communications Protocol

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

In This Appendix

- SSU-2000 Control Languages
- TL1 Command Interface
- Interactive Command Set
- NTP Support
- SNMP Protocol

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SSU-2000 Control Languages

Software embedded in the SSU-2000 hardware allows operators to query and manage an SSU-2000 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-2000 to meet the requirements of a unique environment, and perform maintenance and troubleshooting.

The SSU-2000 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-2000 from a terminal connected to one of the SSU-2000 EIA-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 six main executables (software versions) available for the SSU-2000 as shown in Table B-2. This section provides information about the TL1 and ICS control languages for all versions of software.

- TL1 Command Interface, on page 268, 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-2000, and for activating, disconnecting, and removing modules from the SSU-2000.
- Interactive Command Set, on page 318, defines the ICS commands, responses, and events.
- NTP Support, on page 385, describes NTP support functionality.

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- SNMP Protocol, on page 387, 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, Symmetricom 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 Number	Module Name	Software Revision Level	Hardware Revision level
23413013-001-0	DS1 1-Port Input Module	B	B
23413013-002-0	DS1 3-Port Input Module	B	B
23413014-001-0	E1 1-Port Input Module	B	B
23413014-002-0	E1 3-Port Input Module	B	B
23413019-000-0	GPS Input Module	A	A
23413279-000-0	CC Input Module	A	A
23413016-000-0	Clock Module (STR 2E)	B	A
23413015-000-0	Clock Module (STR 3E)	B	A
23413015-001-0	Clock Module (Type 1)	A	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
23413158-000-0	CC Output Module	A	A
23413287-000-0	RS-422 Output Module	A	A
23413292-000-0	E1/2048 kHz Output Module	A	A
23413012-000-0	Communications Module	A	E
23413012-001-0	Communications Module	A	E

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Table B-2. Communications Module Software Versions

Version	TL1	ICS	NTP	SNMP v2	SNMP v3
Basic System Load	X	X			
Basic w/NTP Support	X	X	X		
Basic w/SNMP v2 Support	X	X		X	
Basic w/SNMP v2 and NTP Support	X	X	X	X	
Basic w/SNMP v3 Support	X	X			X
Basic w/SNMP v3 and NTP Support	X	X	X		X

TL1 Command Interface

Telcordia Technologies (formerly Bellcore) specifies the TL1 command interface for use 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-2000. 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-2000, you must first connect a terminal to one of the three EIA-232-C serial communication ports and then provision the Ethernet port (see Communicating by Ethernet, on page 92). Then you can communicate with the SSU-2000 using an Ethernet telnet session.

To set up an SSU-2000 port for TL1 communications:

1. Log on to one of the SSU-2000 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 panel) are stored in non-volatile RAM, and remain in effect even after restarting the SSU-2000.

   The communications mode settings for the COMM L (local) port (located on the Communications module) always default to ASCII mode on startup.

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When connecting via Ethernet, a telnet session to port 2000 (decimal) opens in TL1 mode and remains until the session is terminated. Once connected in TL1 mode, you 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 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.

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-2000 will take. For a detailed description of input command messages and conventions, see Input Command Message Conventions, on page 270.
- **In-Process Acknowledgment** – The in-process acknowledgment (IP) response message is sent in response to a command that the SSU-2000 is unable to respond to within two seconds. For a detailed description of in-process acknowledgment response messages and conventions, see In-Process Acknowledgment Response Message Conventions, on page 271.
- **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 Output Response Message Conventions, on page 272.
- **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 Autonomous Report Conventions, on page 274.

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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-2000 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.

Input Command Message Conventions

Command messages entered and sent by the user determine the action that the SSU-2000 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-2000. The assigned name must be either null or match the name assigned to the SSU-2000. If the tid is not null, it may must begin with a letter and may contain up to 20 alphanumeric characters. See the SET-NAME command in Table B-6.

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Note: The SSU-2000 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-2000 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-2000. 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-2000 main (1) or expansion shelf (2-5) number
`A` placeholder to separate the shelf number form the slot position
`y` SSU-2000 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 aids using the ampersand (&)
Use a single ampersand (&) to indicate aid1 and aid2
Use a double ampersand (&&) to indicate a range from aid1 to aid2
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-2000 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.

In-Process Acknowledgment Response Message Conventions

Each command received by the SSU-2000 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-2000 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-2000 data is available.

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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 in the SSU-2000 in the format: YY-MM-DD.
- `time` is the current hours, minutes, and seconds timestamp information in the SSU-2000 in the 24-hour format: HH-MM-SS.
- `IP` is the in-process response message that the SSU-2000 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.

Output Response Message Conventions

The output response indicates whether the SSU-2000 complied with (COMPLD) or denied (DENY) the input command.

COMPLD Output Response Message Conventions – If the message is received correctly and can be processed by the SSU-2000 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.

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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 in the SSU-2000 in the format: YY-MM-DD
- `time` is the current hours, minutes, and seconds timestamp information in the SSU-2000 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>.

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*. The error codes are listed in Table B-3.

The SSU-2000 sends the **DENY** response when:

- 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>
```


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where:

- `sid` (Source Identifier) is the returned ID, and is the same as the tid in the input command message
- `date` is the current year, month, and day in the SSU-2000 in the format: YY-MM-DD.
- `time` is the current hours, minutes, and seconds timestamp information in the SSU-2000 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

Autonomous Report Conventions

The SSU-2000 sends autonomous reports in response to a detected alarm condition or status change. You can select one of two formats for autonomous messages: GR-831 or GR-833. Use the RTRV-PRMTR-TL1FORMAT command to select which format is generated. These reports are similar to the RTRV-ALARM command responses, but contain an alarm code rather than the complied line.

The GR-831 format for an autonomous alarm report is:

```
<cr lf lf>
^^^sid^date^time <cr lf>
alrmcde^atag^REPT^ALM^[AIDTYPE]<cr lf>
^^^”aid:ntfcncde,condtype,srveff,ocrdat,ocrtm:condscr”<cr lf>
```


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The GR-831 format for an autonomous event report is:

```
<cr lf lf>
^^^sid^date^time <cr lf>
alrmcde^atag^REPT^EVT<cr lf>
^^^”aid:ntfcncde,condtype,srveff,ocrdat,ocrtm:condscr”<cr lf>
```

where:

- `sid` is the source ID, and is the assigned name of the unit sending the message
- `date` is the current date in the format: YY-MM-DD
- `time` is the current timestamp information in the 24-hour format HH-MM-SS
- `alrmcde` (Alarm Code) indicates 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
- `AIDTYPE` indicates the cause for the report, such as input signal fault (INP or T1) or module hardware 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)

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- `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

The GR-833 format for an autonomous alarm report is:

```
<cr lf lf>
^^^sid^date^time <cr lf>
alrmcde^atag^REPT^ALM^[AIDTYPE]<cr lf>
^^^"aid:ntfcncde,condtype,srveff,ocrdat,ocrtm:condscr"<cr lf>
```

where the terms are identified in this section.

The GR-833 format for an autonomous event report is:

```
<cr lf lf>
^^^sid^date^time <cr lf>
alrmcde^atag^REPT^EVT<cr lf>
^^^"aid:condtype,condeff,ocrdat,ocrtm,,,,:condscr"<cr lf>
```

where:

- `condeff` defines the effect of the event on the system, as follows:
  - CL indicates that a standing condition has been cleared
  - SC indicates that a standing condition is raised
  - TC indicates a transition of a condition.

  If any alarm listed in Appendix A, Alarms and Events, is set to Not Alarmed (NA), then `condeff` is set to SC when the alarm becomes active and CL when the alarm is cleared.
- Other terms are identified in this section

User Access Levels

The SSU-2000 system software allows you to set up a list of users with one of five access levels; each level has an increasing level of access to system functions and commands. Each incremental access level incorporates all of the options from the lower numbered access levels and additional options at that level. For instance, a User-level user does not have as many options available as a Technician-level user.

An Administrator-level user assigns the access level to each user when the user id and password is created. Adding Users to the System, on page 95, describes the procedure for adding users to the system. Table B-4 summarizes each access level, ID number, and the operator privileges for each level.

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Table B-4. User Access Levels

Level	ID	Description
Idle	0	Access level 0 is available when no user is logged in. This level allows Idle-level users to view a list of available commands (HELP), syntax, software version number, unit id, or to login.
User	1	Users at the User level can execute level 0 commands and view information about the current configuration and operation, and change communication settings such as line termination and echo. Changes made by a User-level user remain in effect only until the user logs out.
Technician	2	Users at the Technician level (CRAFT persons) can perform levels 0 through 1 functions, and can read or set all installation functions.
Supervisor	3	Supervisor-level users can execute all commands at levels 0 through 2, and can read or set all functions.
Administrator	4	Administrator-level users can execute all levels of commands; they can view and set software configurations; they can also add, delete, or modify the user table, or log off any user from any port.

Retrieve Commands and Responses

This section contains 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-2000 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.

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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` = 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
	date (optional) = the date the version was created, if available
	If no additional software is registered on the module, there are no software revision lines present.

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Table B-5. TL1 Retrieve Commands (Continued)

Command	Description
`RTRV-DATA-CDMA:[tid]:[aid]:ctag;`	Valid aid code: `S1A3` or `S1A5` (for a CDMA module). This command returns the current tracking data for the specified CDMA input. If the input specified is not a CDMA module, a DENY response is returned. The format for the valid response message is: `^^^"aid:freq,snr,status"<cr lf>` where: ■ `freq` indicates the number of the frequency table that is displayed with RTRV-CDMA-FREQ; ■ `snr` = signal-to-ratio or signal strength measurement; ■ `status` = tracking status of the CDMA engine, where: OK = tracking SRC = searching for base frequency ACQ = acquiring signal.
`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 response is returned. The format for the valid response message is up to 8 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 OK = satellite being used in the timing solution.

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Table B-5. TL1 Retrieve Commands (Continued)

Command	Description
`RTRV-DATA-GPS-AVAIL:[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 response is returned. The format for the valid response message is as many as 12 lines in the format: `^^^"aid:prn,health,azimuth,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.

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Table B-5. TL1 Retrieve Commands (Continued)

Command	Description
`RTRV-DATA-LRMBPV:[tid]:[aid]:ctag;`	Valid aid code: `ALL`, `SxA[y[-z]]` This command returns the BPV data (current operating mode and status) of an LRM module or port. The format of response message is: `^^^"aid:ttime,60srate,24hrate,es,ses,sesr" <cr lf>` where: ■ module `aid` and the port ■ `ttime` accumulates how much time (integer) in seconds since the last BPV Clear command was issued ■ `60srate` = BPV error rate (float value) per second in a 60-second window ■ `24hrate` = BPV error rate (float value) per second in an 86400-second window ■ `es` indicates (integer) that the BPV accumulates BPV Errored Seconds (BPV-ES) when any seconds have a BPV error ■ `ses` indicates (integer) that the BPV accumulates BPV Severely Errored Seconds (BPV-SES) when any seconds have a severely BPV error ■ `sesr` = BPV Severely Errored Ratio (float value).

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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` and `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.

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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>` where: ■ `ocrdat` and `ocrtm` = beginning date and time the data was collected ■ `clksrc` = clock A or B used for the measurements ■ `monval?` = the data value for the time period, given in nanoseconds. There are eight monvals in sequence, and the time periods in sequence are 0.05, 0.1, 1, 10, 100, 1000, 10000, and 100000.

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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` and `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 parentheses
	■ `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.

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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` and `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.

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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 is 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 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.

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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.

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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

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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-2000 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 a greater than 300 meter error, 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-2000 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-2000 is to respond with the complied message.

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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;`
or
`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 hardware part number
	■ `hw_rev` is the hardware revision level
	■ `hw_serial` is the hardware serial number
	■ `sw_part` field is the software part number (i.e. 141xxxxx-xxx-x)
	■ `sw_rev` field is 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-2000 SSU-2000 (M3) 25413140-000-0
	25413140-001-0
	S2-S5 SSU-2000 SSU-2000 (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 up to 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.

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Table B-5. TL1 Retrieve Commands (Continued)

Command	Description
`RTRV-NETYPE:[tid]::ctag;`	Valid aid code: none. This command serves the same purpose as RTRV-HDR with an element type message added. The response message for 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 ###.###.###.### format, where ### 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).

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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>`
	Line 1 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

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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]

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Table B-5. TL1 Retrieve Commands (Continued)

Command	Description

`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,squelch" <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).
	■ `squelch` = threshold value [0|1|...|16] (where 0 = disabled). If the reference clock PQL exceeds this value, then the output is turned 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,…,pstate20" <cr lf>`
	`^^^"aid:squelch1,squelch2,…,squelch20" <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
	Line 2 contains:
	■ `aid` = access identifier of module
	■ `pstate#` = port state [1|0] 1 = ON and 0 = OFF, and # = port number 1 through 20
	Line 3 contains:
	■ `aid` = access identifier of module
	■ `squelch#` = squelch value [0|1...|16] and # = port number 1 through 20

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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 serial 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` = determines if 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 DS1/E1 input port designated by the aid. The format for the response message is: `^^^"aid:freq,fae,fac,fbe,fbc,fatau,fbtay" <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 C ■ fatau = frequency error for A ■ fbtau = frequency error for B

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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 – 16] ■ `sigma` = limit of the noise measurement [10 – 1000 ms]
`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

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Table B-5. TL1 Retrieve Commands (Continued)

<table>
<tr><th>Command</th><th>Description</th></tr>
<tr><td>RTRV-PRMTR-KEEPALIVE:[tid]::ctag;</td><td>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 = TL1 session timer in minutes
■ snmp_time = SNMP session timer in minutes.
Times set to zero indicate keep-alive is disabled</td></tr>
<tr><td>RTRV-PRMTR-LRM:[tid]:[aid]:ctag;</td><td>Valid aid code: ALL, SxA[y[-z]]
This command returns the LRM port setting. The format of each port response line is:
^^^"aid:enable,lbo,slip,flt" <cr lf>
where:
■ aid of the port,
■ enable = {ON|OFF} to enable or disable a port
■ lbo = Line Build-Out length setting of {133|266|399|533|655} feet for DS1 outputs
■ slip = slip error threshold in any 24 hour period
■ flt = {AIS|SQUELCH}. It defines side 1 output generation when the LRU has a loss of signal on side 1 input, loss of all reference sources (PLL unlock), or if the input signal’s frequency has exceeded the LRU’s ability to retime data.
<table><tr><th>Fault</th><th>CTA Installed</th><th>CTA Not Installed</th></tr><tr><td>Side 1 LOS</td><td>FLT STRATEGY</td><td>FLT STRATEGY</td></tr><tr><td>PLL Unlock</td><td>CTA Engaged</td><td>FLT STRATEGY</td></tr><tr><td>Excessive Input Frequency</td><td>FLT STRATEGY</td><td>FLT STRATEGY</td></tr></table></td></tr>
<tr><td>RTRV-PRMTR-LRMCID:[tid]:[aid]:ctag;</td><td>Valid aid code: ALL, SxA[y[-z]]
This command returns the LRM port circuit id. The format of each port response line is:
^^^"aid:cid" <cr lf>
The line contains the aid of the port, cid is a string from 0-43 characters circuit id</td></tr>
</table>

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Table B-5. TL1 Retrieve Commands (Continued)

Command	Description

`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 con-figured as an NTP server with the address specified in the SET-PRMTR-IP command. There can be up to three NTP ips listed.

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Table B-5. TL1 Retrieve Commands (Continued)

Command	Description

`RTRV-PRMTR-OUT422:[tid]:[aid]:ctag;`	Valid aid code: `ALL`, `SxA[y[-z]]`
	This command returns the settings for the CC port specified by the aid. The format for each response message line is:
	`^^^"aid:mode,bypass,fltmode,pstate,frequency "<cr lf>`
	where:
	■ `aid` = aid for the module
	■ `mode` = 422
	■ `bypass` = [ON|OFF] for allowing Clock C selection
	■ `fltmode` = [ON|OFF|AUTO] if output is set to fault if signal levels fall below the threshold output level
	■ `pstate` = port enabled state [ON|OFF]
	■ `frequency` = [0|1|...|512] where 0 (Reserved) = 4 kHz, 1 = 8 kHz, 2 = 16 kHz ... 512 = 4096 kHz. The resolution of frequency values is 8 kHz.
	When the aid does not specify a port, the response is:
	`^^^"aid:mode,bypass,fltmode"<cr lf>`
	`^^^"aid:pstate1,pstate2,...pstate20"<cr lf>`
	`^^^"aid:freq1,freq2,...freq20" <cr lf>`
	where:
	Line 1 contains:
	■ `aid` = aid for the module
	■ `mode` = 422
	■ `bypass` = [ON|OFF] for allowing Clock C selection
	■ `fltmode` = [ON|OFF] for allowing Clock C selection
	Line 2 contains:
	■ `aid` = aid for the module
	■ `pstate#` = port enabled state [0|1] (0 is Off, 1 is On) and `#` is the port number 1 through 20
	Line 3 contains:
	■ `aid` = aid for the module
	■ `freq#` = is the output frequency [0|1|...|512] where 0 (Reserved) = 4 kHz, 1 = 8 kHz, 2 = 16 kHz...512 = 4096 kHz and `#` is the port number 1 through 20

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Table B-5. TL1 Retrieve Commands (Continued)

Command	Description

`RTRV-PRMTR-OUTE12048:[tid]:[aid]:ctag;`	Valid aid code: `ALL`, `SxA[y[-z]]`
	This command returns the settings for the port specified by the aid. The format for each response message line is:
	`^^^"aid:mode,bypass,zs,signal,pstate, squelch"<cr lf>`
	where:
	■ `aid` = aid for the module
	■ `mode` = CAS
	■ `bypass` = [ON|OFF] for allowing Clock C selection
	■ `zs` (zero suppression) = [ON|OFF]
	■ `signal` = port signal type [E1|2048]
	■ `pstate` = port enabled state [ON|OFF
	■ `squelch` = PQL threshold value [0|1|2|...|16]; when a reference clock PQL value exceeds this threshold, then the port output is disabled. Zero indicates the function is disabled.
	When the aid does not specify a port, the response is:
	`^^^"aid:mode,bypass,zs"<cr lf>`
	`^^^"aid:signal1,signal2,...signal20"<cr lf>`
	`^^^"aid:pstate1,pstate2,...pstate20"<cr lf>`
	`^^^"aid:squelch1,squelch2,...squelch20" <cr lf>`
	where:
	Line 1 contains:
	■ `aid` = aid for the module
	■ `mode` = CAS
	■ `bypass` = [ON|OFF] for allowing Clock C selection
	■ `zs` = zero suppression: [OFF|ON]
	Line 2 contains:
	■ `aid` = aid for the module
	■ `signal#` = signal type [0|1] (0 is 2048, 1 is E1) and `#` is the port number 1 through 20
	Line 3 contains:
	■ `aid` = aid for the module
	■ `pstate#` = port enabled state [0|1] (0 is Off, 1 is On) and `#` is the port number 1 through 20
	Line 4 contains:
	■ `aid` = aid for the module
	■ `squelch#` = squelch value [0|1|...|16] and `#` is the port number 1 through 20

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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>`
	where:
	■ `aid` = 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 the aid does not specify a port, the response is:
	`^^^"aid:mode,level,bypass,zs,crc,bit" <cr lf>`
	`^^^"aid:pstate1,pstate2,…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) and `#` is the port number 1 through 20
	Line 3 contains:
	■ `aid` = access identifier of the port
	■ `len#` = line length setting of [133|266|399|533|655] for all 20 DS1 output ports and `#` is the port number 1 through 20

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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 is displayed. This is only accessible by Level 4 users.
`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

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Table B-5. TL1 Retrieve Commands (Continued)

Command	Description
`RTRV-PRMTR-SNMPV3-NOTIFICATION:[tid]::ctag;`	Valid aid code: `none` This command returns the current SNMPv3 notification type. The format for each response message line is: `^^^"notification" <cr lf>` where: `notification` is {V2|V3|ALL} SNMPv2, SNMPv3, or both types when event occurred
`RTRV-PRMTR-SNMPV3-USER:[tid]::ctag;`	Valid aid code: `none` This command returns the current SNMPv3 user list. The format for each response message line is: `^^^"username,level" <cr lf>` where: ■ `username` = user identification string used by SNMPv3, ■ `level` = access level assigned to that user. No authentication or privacy key is displayed.
`RTRV-PRMTR-SNMPV3-MANAGER:[tid]::ctag;`	Valid aid code: `none` This command returns the SNMPv3 Manager list. The format for each response message line is: `^^^"ip,username" <cr lf>` where `ip` and `username` are the assigned SNMPv3 Manager IP address and username.
`RTRV-PRMTR-TL1FORMAT:[tid]::ctag;`	Valid aid code: None This command returns the setting for the format of autonomous reports. The format of the response message is: `^^^"aid:mode" <cr lf>` where: ■ `aid` = module or input port ■ `mode` = format of the autonomous report [GR831|GR833]
`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 the aid ■ `clksrc` = selected clock source [CLK-A|CLK-B|NA] for outputs

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Table B-5. TL1 Retrieve Commands (Continued)

Command	Description
`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.

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Table B-5. TL1 Retrieve Commands (Continued)

Command	Description

`RTRV-STATUS-LRM:[tid]:[aid]:ctag;`	Valid aid code: `ALL`, `SxA[y[-z]]`
	This command returns the condition (current operating mode and status) of an LRM module or port. The format of response messages are:
	`^^^"aid:mstat,clksrc,ctaid" <cr lf>`
	`^^^"aid:pstat,frame,los,ais,lof,bpv,slip, slipcount,los_side2" <cr lf>`
	Line 1 contains:
	■ `aid` = module or port
	■ `mstat` = {ENA|DIS} where ENA indicates the module is enabled, and DIS indicates the module is disabled
	■ `clksrc` indicates which clock {A|B|C|D|NONE} is the reference
	■ `ctaid` indicates if the CTA is installed or not {NONE|DUAL|QUAD} where NONE indicates there is no CTA installed, DUAL indicates Dual (2 Port) CTA installed, and QUAD indicates Quad (4 Port) CTA installed.
	Line 2 contains:
	■ `aid` = module or port
	■ `pstat` = {OK|CUT|DIS} for port status where OK indicates this port is enabled and functioning correctly, CUT indicates that this port is in cut-through mode, and DIS indicates that this port is disabled and not in cut-through mode.
	■ `frame` = {D4|ESF|NONE}
	■ `los`, `ais`, `lof`, `bpv`, and `slip` are the current second error condition {F|OK} where F indicates an error has occurred
	■ `slipcount` indicates the slips in a 24 hours period
	■ `los_side2` (the LOS of Side 2) is {F|OK} where F indicates an error occurred.

`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` = the server IP address used by the client or broadcast client or broadcast server
	■ `offset` = the number of seconds (partial seconds) that the local time was adjusted by
	■ `delay` = the calculated delay in the communication path
	■ `dispersion` = a value that indicates the accuracy of the offset/delay settings. There can up to three NTP IP addresses listed

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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 users.

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TL1 Set Commands

This section 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 you to set data and time or parameters for the SSU-2000. 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 lists 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-2000 clock is set to the received date and time and a complied message is returned, with the new date/time in the header.

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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 and – = South ■ `lon` = set longitude [±180 deg] formatted as (DD)-MM-SS.SS, where + = East, and – = 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 autoreturn (revertive) selection, autoswitch (non-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, then 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 commands following. 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.
`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.

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Table B-6. TL1 Set Commands (Continued)

Command	Description
`SET-PRMTR-ALARM:[tid]:aid:ctag::almnum,level[,errcnt],[clrcnt];`	Valid aid code: `ALL`, `SxAy` This command assigns an alarm level to the alarm number specified. ■ `almnum` = alarm number. See Alarm Messages, on page 244 for a list of alarm numbers. ■ `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
	When aid is set to 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 the module to [ON|OFF] Empty fields leave parameters unchanged.
`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 ■ `maxtau` = final time constant value ST2E tau range = [300–10000] ST3E tau range = [150–1200] The aid may be specified to indicate which clock; set to null to set both clocks identically. Empty fields leave parameters unchanged.

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Table B-6. TL1 Set Commands (Continued)

Command	Description
`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]. Omitting the port aid (no `-z` in the aid sets all ports on the module to [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 – 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.
`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 10 000 000 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]

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Table B-6. TL1 Set Commands (Continued)

Command	Description
`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 [ON|OFF] For DS1: On = B8ZS, Off = AMI For E1: On = HDB3, Off = AMI ■ `crc` = error checking [ON|OFF] ■ `gain` = input gain = [ON|OFF]. When set to ON, 20 dB gain is applied to the input signal. 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 SSM. 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).
`SET-PRMTR-IP:[tid]::ctag::[addr],[mask],[gate];`	Valid aid code: None where: ■ `addr` = IP address of SSU-2000 ■ `mask` = IP mask of SSU-2000 ■ `gate` = IP gateway of SSU-2000 All IP numbers are in the **###.###.###.###** format.
`SET-PRMTR-KEEPALIVE:[tid]::ctag::[tl1_time],[snmp_time];`	Valid aid code: None This command supports a “keep alive” mode whereby based upon a user settable time the SSU-2000 generates an event to alert the upstream support system that the SSU-2000 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.

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Table B-6. TL1 Set Commands (Continued)

<table>
<tr><th>Command</th><th>Description</th></tr>
<tr><td>SET-PRMTR-LRM:[tid]:[aid]:
ctag::[enable],[lbo],
[slip],[bpv],[flt];</td><td>Valid aid code: ALL, SxA[y[-z]]
This command sets the LRM port
enable = {ON|OFF} for enabled or disabled
lbo = line build-out setting in feet {133|266|399|533| 655} for DS1 outputs
slip = {0|1–255} allows you to set the slip error threshold in any 24 hour period. If the value is zero, the slip accumulated error counts are cleared.
bpv = {CLR|NOP}. CLR clears the BPV error count and accumulated error ratio. NOP is an empty field with no operation
flt = {AIS|SQUELCH}. It defines side 1 output generation when the LRU has a loss of signal on side 1 input, loss of all reference sources (PLL unlock), or if the input signal’s frequency has exceeded the LRU’s ability to retime data.
<table>
<tr><th>Fault</th><th>CTA Installed</th><th>CTA Not Installed</th></tr>
<tr><td>Side 1 LOS</td><td>FLT STRATEGY</td><td>FLT STRATEGY</td></tr>
<tr><td>PLL Unlock</td><td>CTA Engaged</td><td>FLT STRATEGY</td></tr>
<tr><td>Excessive Input Frequency</td><td>FLT STRATEGY</td><td>FLT STRATEGY</td></tr>
</table>
</td></tr>
<tr><td>SET-PRMTR-LRMCID:
[tid]:[aid]:ctag::[cid];</td><td>Valid aid code: ALL, SxA[y[-z]]
This command sets the LRM port circuit id (CID). CID is a 0 to 43 character string with all ASCII printable characters.</td></tr>
<tr><td>SET-PRMTR-MTIE:[tid]:[aid]:
ctag::{EL1|EL2|CL1|CL2},
[t10],[t100],[t1k],[t10k],
[t100k];</td><td>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.</td></tr>
</table>

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Table B-6. TL1 Set Commands (Continued)

Command	Description
`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 accepts time from a broadcast server that is specified by the ip parameter. `Broadcast` mode configures 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 deletes the specified ip from the list of peers; up to 3 ip's can be assigned for all peer modes combined. `Clrall` deletes all peer addresses. If 3 ip's have been defined and a 4th ip is defined, the system returns a DENY message; you must delete one of the 3 ip's prior to adding the new ip.
`SET-PRMTR-OUTE12048:[tid]:[aid]:ctag::[pstate],[bypass],[zs],[signal],[squelch];`	Valid aid code: `ALL`, `SxA[y[-z]]` This command sets the output parameters for the E1/2048 kHz Output module. where: ■ `pstate` = [ON|OFF] to enable or disable the port ■ `bypass` = [ON|OFF] for allowing Clock C selection ■ `zs` for framed outputs = [ON|OFF ■ `signal` = [E1|2048] ■ `squelch` = [0|1|2|...|16] turn on/off the output if a reference clock PQL value exceeds the squelch value. 0 disables the squelch function. Empty fields leave parameters unchanged.

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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] feet 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` disables the phase buildout (PBO) function. ■ `EVT` enables the PBO function. The PBO event is displayed and stored in the COMM module event buffer. ■ `REP` enables the PBO function. The PBO event is displayed, but the event is not stored in the COMM module event buffer. ■ `NONE` enables 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` restores the module configuration to factory defaults. Any time the configuration has changed from the factory configuration, these configurations become the current configurations. `Save` stores the current configuration. The `user` parameter reloads the previously saved configuration.
`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.

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Table B-6. TL1 Set Commands (Continued)

Command	Description
`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-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 parmeters and clears all entries in the table
`SET-PRMTR-SNMPV3-MANAGER:[tid]::ctag::mode,[ip], [username];`	Valid aid code: `none` This command allows changes to the SNMPv3 manager table entries. mode = {ADD|DEL|MOD|INIT} where: ■ ADD requires an IP address and username ■ DEL requires an IP address to delete the entry from the table ■ DEL requires an IP address to key the entry and modify its username in the table ■ INIT requires no additional parameters and clears all entries in the table
`SET-PRMTR-SNMPV3-NOTIFICATION:[tid]::ctag::[notification];`	Valid aid code: `none` This command sets the SNMP v3 notification type. ■ `notification` = {V2|V3|ALL} to set SNMP notification to SNMPv2, SNMPv3, or both types when an event occurs

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Table B-6. TL1 Set Commands (Continued)

Command	Description
`SET-PRMTR-SNMPV3-USER:[tid] ::ctag::mode,[username], [authAlgorithm],[auth], [priv],[level];`	Valid aid code: `none` This command allows changes to the SNMPv3 security system. `mode` = {ADD|DEL|MOD|INIT} where: ■ `username` = user identification (up to 20 characters) ■ `authAlgorithm` = authentication {MD5|SHA} algorithm (HMAC-MD5 or HMAC-SHA) ■ `auth` = authentication key with 16 characters if MD5 and 20 character if SHA ■ `priv` = privacy key with 16 characters ■ `level` = user access level 1 through 3 The requirements of each field depends upon the first parameter “mode” you are choosing ■ ADD requires entering all fields ■ DEL only requires a username to delete the user from the table ■ MOD requires a username and all necessary fields you want to modify. The AuthAlgorithm field is ignored. Users cannot modify the authentication algorithm. To change the authentication algorithm, delete the user first and then add the user again using a different authentication algorithm. ■ INIT requires no additional parameters and clears all entries in the table.
`SET-PRMTR-TL1FORMAT: [tid]::ctag::mode;`	Valid aid code: none This command sets the format of autonomous messages. mode = {GR831|GR833} where: ■ GR831 = format specified by GR831 ■ GR833 = format specified by GR833. See Autonomous Report Conventions, on page 274, for more information.
`SET-USER:[tid]::ctag:: mode,[username], [password],[userlevel];`	Valid aid code: none This command allows changes to the user list. `mode` = {ADD|DEL|INIT} where: ■ `ADD` requires a `username` and `password` ■ `DEL` only requires a username 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

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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-2000.,

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 code: None This command logs off the TL1 user and returns to security level 0.
`DISC-MODULE:[tid]:aid:ctag;`	Valid aid code; `SxAy` This command disconnects (disables) a module (not a specific port).
`EXIT:[tid]::ctag;`	Valid aid code: None This command logs off the user and returns an EIA-232 port to ASCII mode or disconnects an Ethernet session to end TL1 communication.
`RMV-MODULE:[tid]:aid”ctag;`	Valid aid code: `SxAy` This command removes module configuration information from the database of the SSU-2000.
`RST-MODULE:[tid]:aid:ctag;`	Valid aid code: `SxAy` This command restarts (reboots) the specified module.
`RST-CLOCK:[tid]:aid:ctag;`	Valid aid codes: `S1A1`, `S1A12` 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.

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Interactive Command Set

The Interactive Command Set (ICS), also called the ASCII command set, can be used to control the SSU-2000 from a terminal connected to one of the SSU-2000 EIA-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.



Note: If you are unable to access command features using your current security access level, contact your SSU-2000 administrator user for assistance.

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[&&z]` indicates the aid, or access identifier. This variable specifies the shelf and slot location for hardware components, in this format: `xAy-z[&&z]`.

where:

- x Shelf number of the unit:
  1 = the SSU-2000 main shelf
  2-5 = the SDU-2000 expansion shelves, numbered from left to right
- A Place holder or slot separator
- y Slot number of the shelf, beginning with 1, and incrementing from left to right for each shelf
- z Port number of the module
  1 or 1–3 for Input modules
  1–20 for Output modules
- [&&z] Optional extension for multiple ports. For example, to configure ports 1 through 10 of a module in slot 5 of shelf 2, use `2A5-1&&10` as the aid.

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ICS Prompts

ICS uses the SSU-2000 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.

Line Editing

The ICS interface supports these line-editing functions:

- Press **ESC** (Escape) to clear the ICS command buffer.
- Press the **Backspace** key to delete the last character entered.
- Press **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.

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-2000 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-2000 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.

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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.

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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

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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+

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.

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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

2003-05-24T18:23:38Z 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` Sets the MINOR alarm relay/LED

`MAJOR` Sets the MAJOR alarm relay/LED

`CRITICAL` Sets the CRITICAL alarm relay/LED

Level 3 Same as Level 2 operation, with the following additions:

`ALARM xAy[-z] # DELAY time`

`ALARM xAy[-z] # {IGNORE|REPORT|MINOR|MAJOR|CRITICAL}`

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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. See Alarm Messages, on page 244 for a list of alarm numbers
`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 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`	Sets the alarm status level to IGNORE. This means that no action is taken for an alarm condition.
`REPORT`	Sets the alarm status level to REPORT. This means that a report-only message occurs for an alarm condition.
`MINOR`	Sets the alarm status level to MINOR.
`MAJOR`	Sets the alarm status level to MAJOR.
`CRITICAL`	Sets 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

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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-2000 to an Idle state.
Related	LOGIN
Restrictions	None

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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 displays.

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

2003-05-24T18:24:21Z 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, with the following additions:

`CLK xAy MODE {ACQUIRE|LOCKED|HOLD}`

`CLK xAy SELECT`

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Options are:

`MODE {ACQUIRE|LOCKED|HOLD}`
Sets the current PLL operation parameters.

`ACQUIRE` Forces re-acquisition of the software PLL loop.

`LOCKED` Use this option to put the software PLL mode into the lock state.

`HOLD` Puts the software PLL mode into the manual holdover state.

`SELECT` Allows 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}` Enables or disables the clock autoreturn mode (see Input Section, on page 32, for information on autoreturn).

`WARMUP` Sets the clock warm up time in seconds.

`MINTAU` Sets the minimum tau value.

`MAXTAU` Sets the maximum tau value.

Level 4 Same as Level 3 operation

Remarks None

Related SETUP, STATUS

Restrictions None

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CLS

Use this command to clear the terminal screen.

Level 0	Not applicable
Level 1	`CLS`
Level 2	Same as Level 1 operation.
Level 3	Same as Level 1 operation.
Level 4	Same as Level 1 operation.
Remarks	This command is for aesthetic purposes only.

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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` Sets the current baud rate setting. Only the baud rates shown are valid.

`ECHO` Enables or disables character echo on the terminal.

`EOL {CR| LF| CRLF}` Sets the current End-Of-Line termination for output line.

`CR` Sets the line termination to carriage return (0xD).

`LF` Sets the line termination to line feed (0xA).

`CRLF` Sets 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}
```


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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}`
: Sets the current mode to either ASCII (interactive) or TL1.

`TIMEOUT`
: Sets the 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 EIA-232. The communications port must be specified to set any parameter.

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CONFIG

Use this command to view the current hardware configuration of the SSU-2000.

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 is 1- 5, it displays shelf description and shelf part number (254xxxxx-xxx-x).

Detailed information: Includes all the concise information described 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 number are listed in Table B-8.

Table B-8. Shelf Configuration Information

Shelf	Description	Shelf Part Number
1	SSU-2000	25413020-000-0
2-5	SSU-2000	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 displays the *software* part number (141xxxxx-xxx-x) and revision number.

`CONFIG ADAPTER`

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This command displays the input adapter part number and its description for each Input module. This command is valid only if the SSU-2000 software and hardware support this function.

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 VER

Restrictions None

The following are examples of the `CONFIG` command message format:

Example 1

```
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
```


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Example 2

```
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
```


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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

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DOY

Use this command to view the Julian date and the year.

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 displays the current day of the year and the year in the unit.
Related	DATE, LOGIN, USERS
Restrictions	This command is always hidden and does not display in the online Help.

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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
2003-06-18T20:44:50Z 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
```


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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]`

Options are:

`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}`

`ENGINE xAy FREQ [{ADD|DEL} freqval]`

Options are:

`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.

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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-2000 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.

`FREQ {ADD|DEL} freq`
Allows for adding or deleting a CDMA pilot frequency value and freqval = pilot frequency in MHz (decimal based, for example: 3.4328).

Level 4 Same as Level 3 operation

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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
```


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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.

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.

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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

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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

Example:

```
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
```


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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 The Help menu displays only commands that are valid for the current user level. The Help menu does not display any command that you cannot perform at your current logon level. If the first entered character is ?, then the main Help screen appears.

Related None

Restrictions None

Example:

```
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
```


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ID

Use this command to display the fixed unit ID for the system.

Level 0	Displays `SSU2000`
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

Example:

```
SSU_2000->ID
Unit ID: SSU2000
```


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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 Symmetricom.

Level 0	`INFO` Displays information as follows (assume COMMS Version A, Bootloader A):

```
SSU_2000->info
Unit ID: SSU2000
Main Code:  D.00, 25AUG03
Symmetricom Technical Support
1-888-367-7966 toll free USA
1-408-428-7907 worldwide
Support@Symmetricom.com
SSU_2000->
```

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 displays all service information available for the unit.
Related	ID, VER
Restrictions	None

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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, the command displays all the input module status information in the unit. If a specified input address is provided, that input status and setup information appears.

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
```


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```
GPS STATUS
Loc#    Sta PhaseA   PhaseB   Pql UTC
------- --- -------- -------- --- ---
1A03-01 Ok  -143     -145      2  Yes
1A05-01 Ok  -149     -149       2  Yes
```

Level 2 Same 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|TAU} value
```

Allows you to change the setting of a specified Input module.

Options are:

`ESF|D4` Sets the T1 framing mode: ESF or D4.

`CCS|CAS` Sets the E1 framing mode: CCS or CAS.

`1MHZ|1.544MHZ|2.048MHZ|5MHZ|10MHZ`
Sets the Input module clock frequency when input is not running in framing mode. Only the clock frequencies shown are valid. If the module is a framed T1 signal, the CLK rate is 1.544MHz; if it is a framed E1 signal, the CLK rate is 2.048MHz automatically.

`ZS {ON|OFF}` Enables or disables Zero Suppression
For DS1: On = B8ZS, Off = AMI
For E1: On = HDB3, Off = AMI

`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 the specified input port

`DISABLE` Disables the specified input port. This clears all alarms associated with an input and disables setting of further alarms or use of the input measurements.

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`SSM {4|5|6|7|8}` Sets the E1 SSM bit position

`PQL {2|3|4|5|6|8}` Sets the Priority Quality Level (PQL) for the 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].

- `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` Alarm active when the fault is a high logic level.
- `LOW` Alarm active when the fault is a low logic level.
- `OFF` Default. Cesium Fault is ignored (not the AIS).

`{AIS|BPV|CRC|LOS|OOF}{SET|CLR} value`
Sets Error Count (SET) or sets Clear Count (CLR) of the specified input hardware alarm signal. Range is 1 to 100.

`FREQ {A|B}{SET|CLR|TAU} value`
Sets Frequency limits on Clock A or Clock B

- `SET` Sets Frequency Error Count
- `CLR` Sets Frequency Clear Count
- `TAU` Set frequency tau (default is 400), range is 10 to 1000

Level 4 Same as Level 3 operation

Remarks None

Related REF, SETUP, STATUS

Restrictions None

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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.

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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`

Options are:

`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.

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KEEPALIVE

Use this command to support a “keep alive” mode that generates a recurring event, based on a user settable time, to alert the upstream support system that the SSU-2000 and associated communication path is functional.

Level 0: NA

Level 1: `KEEPALIVE`

Displays the “keep alive” time, the length of time between automatic events that are generated for upstream support systems.

Level 2: Same as level 1 operation

Level 3: Same as Level 2 operation with the following additions:

`KEEPALIVE [TL1|SNMP] [time]`

Options are:

`TL1`	Sets the TL1 session keep alive time
`SNMP`	Sets the SNMP session keep alive time
`time`	Value 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

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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. If you lose the password, contact Symmetricom Global Services to generate a new one. There is 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.

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LRM

Use this command to display the Line Retiming Unit status and settings.

Level 0 Not applicable

Level 1: `LRM [xAy]`

Level 2: Same as level 1 operation.

Level 3: Same as Level 2 operation, with the following additions. Use this command to change the settings of the specified LRM module.

```
LRM xAy-z[&&z] {ENABLE|DISABLE}
LRM xAy-z[&&z] LBO {133FT|266FT|399FT|533FT|655FT}
LRM xAy-z[&&z] SLIP {CLR|threshold_count}
LRM xAy-z[&&z] BPV {CLR}
LRM xAy-z[&&z] CID {CLR|"circuit_id"}
LRM xAy-z FLT {SQUELCH|AIS}
```

Options are:

ENABLE/DISABLEEnable/Disable LRM ports

LBO Line Built-Out

SLIP Clear SLIP accumulation counter or set 24 hour slip threshold count

BPV Clear BPV accumulation counter

CID Clear or Set Circuit ID

FLT Defines side 1 output generation when the LRU has a loss of signal on side 1 input, loss of all reference sources (PLL unlock), or if the input signal's frequency has exceeded the LRU's ability to retime data. The FAULT strategy can be provisioned to AIS or Squelch.

Fault	CTA Installed	CTA Not Installed
Side 1 LOS	FAULT STRATEGY	FAULT STRATEGY
PLL Unlock	CTA Engaged	FAULT STRATEGY
Excessive Input Frequency	FAULT STRATEGY	FAULT STRATEGY

Level 4: Same as level 3 operation

Related: SETUP, STATUS, OUTPUT

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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

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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]
```

Options are:

A| B — CLK A or CLK B; the default is the selected clock output.

`starttime` — Specifies the start time of a specific period of time to be displayed.

`stopdate` — Specifies the date ending a specific period of time to be displayed.

`stoptime` — Specifies 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.

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```
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
```


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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

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NTP

Use this command to provide access to the NTP in the SSU-2000. NTP 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}
```

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).

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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] {E1|2048}
OUTPUT xAy-z[&&z] {ENABLE|DISABLE}
OUTPUT xAy LEVEL {ACQ|LOCK}
```


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```
OUTPUT xAy BYPASS {ON|OFF}
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-z[&&z] DUTYCYCLE {63/37|50/50}
OUTPUT xAy-z[&&z] COMPENSATE {275ft|550ft|825ft|
1100ft|1375ft|1650ft|1925ft|2200ft}
OUTPUT xAy FLTMODE {ON|OFF|AUTO}
OUTPUT xAy-z[&&z] {SQUELCH {{0-16}|DISABLE}
OUTPUT xAy-z[&&z] FREQUENCY {8...4096} in 8 kHz steps
OUTPUT xAy ISOLATE {ON|OFF}
```

Options are:

`ESF|D4` Sets the T1 framing mode: ESF or D4.

`CCS|CAS` Sets the E1 framing mode: CCS or CAS.

`E1|2048` Sets the signal type for the E1/2048 kHz Output module

`ENABLE|DISABLE`
Enable or disable the specified output ports. If the module is one of a redundant pair, this command only affects the specified module's ports.

`LEVEL {ACQ|LOCK}`
Sets the minimum clock level to 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.

`133FT|266FT|399FT|533FT|655FT`
Sets the line-length parameters for the output line driver. For DS1 Output modules.

`CRC {ON|OFF}` Enables or disables the CRC setting. For E1 and E1/2048 kHz Output modules.

`ZS {ON|OFF}`Enables or disables the zero suppression setting. For the DS1, E1, and E1/2048 kHz Output modules.

`SSM {4|5|6|7|8}`
Sets the E1 SSM bit Position. For E1 and E1/2048 kHz Output modules.

`DUTYCYCLE` Sets the Composite Clock output to 63/37 or 50/50 duty cycles. For CC Output module.

`COMPENSATE`Sets current line compensation for the Composite Clock output. For CC Output module.

`FLTMODE` Allows the user to turn the output on or off when the output level exceeds 2.1v threshold. Used for the 2048 kHz and RS-422 Output modules.

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`SQUELCH {2048|E1-2048}`
: Turns the output on or off depending on the current PQL and the threshold. 0 disables the squelch.

`ISOLATE`
: When set to On, validates the signal characteristics using isolated ones. When set to Off, restores the isolated condition and returns to normal operation. This command generates a confirmation request (Yes/No); if confirmation is No, then no action. For DS1 Output module.

Level 4 Same as Level 3 operation

Remarks None

Related SETUP, STATUS

Restrictions None

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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]`

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

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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

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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

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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 display 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

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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
```


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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 removed or in warm-up mode, this command can set an initial input reference port for use 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 (Revertive) switching mode.

`{AS}` Use this command to enable the input autoswitch (Non-revertive) switching mode.

`{OFF}` Use this command when no switching 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 the inputs have equal Priority level, the PQL value is used to distinguish between them.

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Note: Input reference selection order proceeds from highest (1) to lowest (16) PQL valid input port. If the inputs have 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
```


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RESET

Use this command to reset the clock module through the Comm Module.

Level 0: NA

Level 1: NA

Level 2: NA

Level 3: `RESET {xAy}`

Resets the specified clock module. It must have an operand to indicate 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, no action occurs.

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.

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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.

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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 to the previously-saved user setting. 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.

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`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

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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.

Options are:

`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}
```

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]
```

Options are:

`USER` SNMP User Table

`INIT` Clears the whole SNMP user table and only leaves the built-in users in the systems. This option clears the table.

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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 capital cases. Maximum is five SNMP user entries which includes the built-in user.

Note:

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

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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 a 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

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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
```


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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

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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
```


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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

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TL1FORMAT

Use this command to view and set the format of autonomous messages. The format can be either GR831-compliant, or GR833-compliant.

Level 0 Not applicable

Level 1 `TL1FORMAT`

Use this command to view the current format of autonomous messages. The response is displayed in the following format:

```
SSU_2000->GR831
```

Level 2 Same as Level 1 operation

Level 3 `TL1FORMAT [GR831|GR833]`

Use this command to set the format of autonomous messages.

Options are:

`GR831`	Generates GR-831 compliant events on all TL1 sessions
`GR833`	Generates GR-833 compliant events on all TL1 sessions

Level 4 Same as Level 3 operation

Remarks None

Related None

Restrictions None

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USERS

Use this command to access the user list.

Level 0 Not applicable

Level 1

```
USERS
```

```
USERS [MODIFY]
```

Options are:

`MODIFY` This option changes the user's 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 commport
```

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.

`DELETE` Use this option to delete the user from the SSU-2000. If the user ID is not in the system, this command exits with an error.

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`LOGOFF commport`

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 None

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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

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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
```


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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.

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.)

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.

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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}
```

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

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`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 TL1 Command Interface, on page 268, and Interactive Command Set, on page 318.

SNMP Protocol

This section describes the two versions of SNMP that the SSU-2000 supports. The Communications module software determines the version of SNMP used by the SSU-2000. See Table B-9 for the part number for the various software loads that are available.

SNPMP v2 Details

SNMP is based on a client-server query-response mode that requires an Ethernet connection. A manager application (software installed on a computer) is the client generating the queries, and an agent (software on the SSU-2000) is the server generating responses.

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If SNMP is present, port 161 becomes the port of standard SNMP interactive communications and port 162 becomes the trap port. Since the SSU-2000 SNMP supports all existing functions, full system control of the SSU-2000 can be maintained through SNMP.

All reports, queries, and autonomous messages are available through SNMP. All control and provisioning and some administration is available through SNMP. You cannot use SNMP to:

- change communication port parameters
- set a user ID and Password
- set IP assignments
- reset a connection
- change SNMP authentication and privacy settings

Refer to the MIB Specification (part number 12613250-000-2) for further information. Refer to TL1 Command Interface, on page 268, and Interactive Command Set, on page 318, for specific information on the following commands.

SNMP v3 Details

Symmetricom's implementation of SNMP v3 does not allow remote user configuration. Users and user levels must be set by an administrator (level 4 access) using TL1 or ICS commands only. The administrator can add up to five users to the SNMP user table and set the users to access level 1 (user), access level 2 (technician), or access level 3 (supervisor).

User levels are based on authentication and privacy settings. There are two authentication protocols: HMAC-MD5-96 and HMAC-SHA-96. The HMAC-MD5-96 authentication key is 16 characters long and the HMAC-SHA-96 authentication key is 20 characters long. The privacy protocol is CBC-DES with a 16-character key. All keys are uppercase.

A user with no authentication and no privacy only has access to the "system" object in the Management Information Base (MIB).

A user with authentication, but no privacy can only view the SSU-2000 MIB.

A user with authentication and privacy and has full access to the MIB in accordance with the specification.

Management Information Base

The Management Information Base (MIB) is a virtual database of managed objects, their object identifiers, and variables. Typical SSU-2000 MIB object identifiers include the SSU-2000 system, its modules, module features, input ports, output ports, etc. and variables include settings and measurements.

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The MIB is controlled by the SSU-2000's SNMP agent. The SNMP agent is a server program that sends SSU-2000 status (stored in the MIB database) to the network manager when the manager transmits `GET` or `GET NEXT` commands. The manager can also transmit `SET` commands that instruct the agent to set MIB variables to new values. The `TRAP` command sets up a communication link that allows the server to send the manager indications of MIB occurrences, such as a fault condition.

Enabling SNMP

To use the TL1 command to enable SNMP and have the unit transmit all alarms and events, type:

```
SET-PRMTR-SNMP-MODE:::::ENA,ALL;
```

To use the ICS command to enable SNMP and have the unit transmit all alarms and events, type:

`SNMP ENABLE` and press **ENTER**.

Adding a User

TL1 Command

To use the TL1 command to add user XYZ with MD5 authentication using algorithm HMAC-MD5 with the 16 character authentication key, a 16 character privacy key, and user level 3, type:

```
SET-PRMTR-SNMPV3-USER:::::ADD,XYZ,MD5,123456789ABCDEFG,
123456789ABCDEFG,3;
```



Note: Valid authentication key and privacy key characters include numbers, upper and lowercase letters, and the character set ":;<=>?@". The semicolon functions properly only in ICS mode, and the colon must be enclosed in quotes in TL1 mode, as "`USER:NAME`" `or` "`PASS:WORD`". To enter lowercase letters, enclose the input in quotes, as "`UserName`" `or` "`PassWord`". *Do not* use spaces in usernames.

ICS Command

To use the ICS command to add user XYZ with MD5 authentication using algorithm HMAC-MD5 with the 16 character authentication key, a 16 character privacy key, and user level 3, type:

`SNMP USER ADD XYZ` and press **ENTER**.

At the prompt, type `123456789ABCDEFG` (a 16 character authentication key) and press **ENTER**.

At the prompt, type `123456789ABCDEFG` (a 16 character privacy key) and press **ENTER**.

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At the prompt, type `3` and press **ENTER**.



Note: Valid authentication key and privacy key characters include numbers, upper and lowercase letters, and the character set ":;<=>?@". The semicolon functions properly only in ICS mode, and the colon must be enclosed in quotes in TL1 mode, as "`USER:NAME`" `or` "`PASS:WORD`". To enter lowercase letters, enclose the input in quotes, as "`UserName`" `or` "`PassWord`". *Do not* use spaces in usernames.

Adding a Manager IP Address

You can add up to four managers in the SNMP manager table.

TL1 Command

To use the TL1 command to add an SNMP manager IP address for traps with username XYZ, type:

```
SET-PRMTR-SNMPV3-MANAGER:::::ADD,192.100.100.100,XYZ;
```

ICS Command

To use the ICS command to add an SNMP manager IP address and username, type:

`SNMP MANAGER ADD 192.100.100.100 XYZ` then press **ENTER**.

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;
  ```


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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}`

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-2000 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]`

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 TL1 Command Interface, on page 268, and Interactive Command Set, on page 318, for more information.

TL1: `RTRV-CONF:[tid]:[aid]:ctag;`

ICS: `CONFIG xAy {REMOVE|DISABLE|ENABLE}`

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 TL1 Command Interface, on page 268, and Interactive Command Set, on page 318, for more information.

TL1: `RTRV-CONF:[tid]:[aid]:ctag;`

ICS: `CONFIG SW`

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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 v2 Support
24113012-003-0	Basic + NTP and SNMP v2 Support
24113012-004-0	Basic + SNMP v3 Support
24113012-005-0	Basic + NTP and SNMP v3 Support

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Appendix C Antennas

This appendix provides information about optional antennas, antenna kits, part numbers and installation procedures for connecting GPS antennas to the SSU-2000.

In This Appendix

- Ordering Information
- Antenna Kits and Accessories
- Installing Antennas
- Optional Accessories

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Ordering Information

To order any accessory, contact the Symmetricom Sales Department at the following address and phone number, and supply the accessory name and part number:

Symmetricom, Inc.
2300 Orchard Parkway
San Jose, CA 95131-1017

U.S.A. Call Center: 1-888-367-7966 (from inside U.S.A. only - toll-free)
1-408-428-7907

Europe, Middle East, and Africa (EMEA) Call Center: +44 (0) 1189 699 799

Fax: 408-428-7998

E-mail: info@symmetricom.com

Internet: http://www.symmetricom.com

Antenna Kits and Accessories

This section provides a list of antenna kits and accessories as well as descriptions and associated part numbers.

GPS Antenna with Internal LNA

Symmetricom offers three versions of GPS antennas with 26, 40, 48, and 68 dB 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.

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Table C-1. GPS Antennas with Internal LNA

Part Number	Description
990-13091-006	26 dB Antenna with 6 m (23.6 ft) cable
990-13091-013	26 dB Antenna with 13 m (51.2 ft) cable
990-13091-033	26 dB Antenna with 33 m (130 ft) cable
990-13150-048	26 dB Antenna with 48 m (189 ft) cable
990-13073-063	40 dB Antenna with 63 m (248 ft) cable
990-13073-120	40 dB Antenna with 120 m (472 ft) cable
990-13074-150	48 dB Antenna with 150 m (590 ft) cable
990-13074-180	48 dB Antenna with 180 m (716 ft) cable
990-13074-230	48 dB Antenna with 230 m (905 ft) cable and 20 dB Amplifier
990-13074-300	48 dB Antenna with 300 m (1181 ft) cable and 20 dB Amplifier

Figure C-1 shows the GPS antenna with internal LNA.

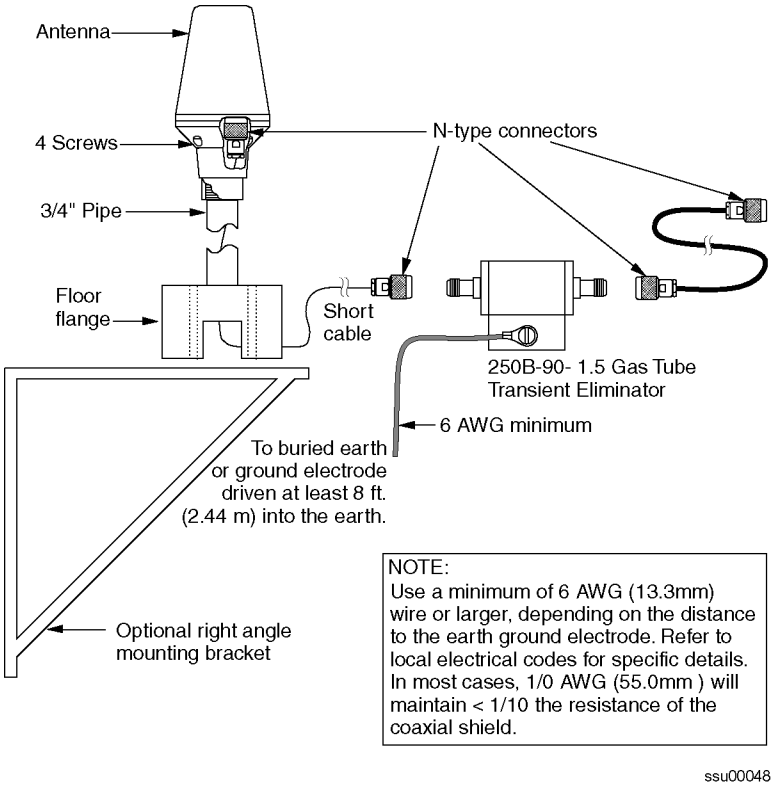


Figure C-1. GPS Antenna with Internal LNA

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Table C-2 provides specifications for GPS antennas with internal LNA.

Table C-2. Specificatios for GPS Antennas with Internal LNA

Characteristic	Specification
Mechanical	
Mounting	4 holes, 1.75 in x 1.75 in (4.445 cm x 4.445 cm) centers, 0.25 in (0.635 cm) mounting holes
Diameter	3.5 in (88.9 cm)
Height	12.94 in (328.7 cm), including pipe mount
Weight	< 3 lbs (1.4 kg)
Environmental	
Temperature	–40 °C to +75 °C
Relative Humidity	100% Non-Immersed
Altitude	200 ft. (60 m) below sea level to 13,000 ft. (3962 m) above sea level
Electrical	
Power	4.7 to 28 vDC (5 vDC Nominal)
Element	Right Hand Circular
Carrier	L1 (1545.42 MHz)
Bandwidth	10 MHz
Noise Figure	< 2.5 dB
Output Impedance	50 ohms
Gain Marine 26 Marine 40 Marine 50	 26.5 dB ± 3 dB 40 dB minimum 48 dB minimum

Table C-3 through Table C-5 list the available accessories for GPS antennas with internal LNA.

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Table C-3. 26dB L1 GPS Antenna Accessory Kit

Part Number	Description
12013076-xxx-0 (xxx = length)	Cable, LMR-400, 10 ft. to maximum of 190 ft. (Customer specified length)
773000-0008	Transient Eliminator, 90 Volts, 1.5 GHz, N-Type
12013076-010-0	Cable, LMR-400, 10 ft., Right Angle
400302-0500	Roll, 3M 2150 Weatherproof Tape

Table C-4. 40dB L1 GPS Antenna Accessory Kit

Part Number	Description
12013076-xxx-0 (xxx = length)	Cable, LMR-400, 70 ft. to maximum of 370 ft. (Customer specified length)
773000-0008	Transient Eliminator, 90 Volts, 1.5 GHz, N-Type
12013076-030-0	Cable, LMR-400, 30 ft., Right Angle
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 L1 GPS Antenna Accessory Kit

Part Number	Description
12013076-xxx-0 (xxx = length)	Cable, LMR-400, 220 ft. to maximum of 970 ft. (Customer specified length)
773000-0008	Transient Eliminator, 90 Volts, 1.5 GHz, N-Type
12013076-010-0	Cable, LMR-400, 30 ft., Right Angle
551100-6013	Adapter, Right Angle Female to Right Angle Male
12010210-000-0	Bracket Assembly, Antenna Mount Right Angle
570704-0001 (68 dB Output Only)	GPS L1 inline amplifier, Right Angle (required for lengths > 650 ft.)
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)

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Transient Eliminators

Symmetricom 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 Ω
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 200 ft. (60 m) below sea level to 13,000 ft. (3962 m) above sea level

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 650 feet 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.

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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: 1.12 inches (2.8 cm) Width: 2.0 inches (5.1 cm) Length: 3.5 inches (8.9 cm)
Electrical	
Power	+4.5 vDC to +30 vDC
Current	10 mA, typical
Input/Output Impedance (bandwidth at 3dB points)	50 Ω
Isolation	> 35 dB

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.

Antenna Coaxial Cables

Symmetricom provides several low-loss cable types, as well as LMR-400 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

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Table C-8. Optional Antenna Coaxial Cables

Part Number	Description
12012992-xxx-0	Cable, RG-213/U, with N-Type Connectors
12012994-xxx-0	Cable, UHF/VHF (B-89913), with N-Type Connectors
12012995-xxx-0	Cable, UHF/VHF (B-9913), with N-Type Connectors
12013076-xxx-0	Cable, LMR-400 or equivalent, with N-Type Connectors

Contact your factory sales office for available cable lengths and specific cable item number.

Table C-9. Optional Antenna Coaxial Cable Crimper Kits

Part 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 foot)	DC Resistance (ohms per foot)	Type Center Conductor	Flammability
RG213/U (Beldon 8267)	0.093 dB	0.0030	Stranded 13 AWG	U/L CSA
RG213/U (Beldon 8267)	0.093 dB	0.0030	Stranded 2.62 mm^2	U/L CSA
UHF/VHF (Beldon 9913)	0.058 dB	0.0027	Solid 10 AWG	
UHF/VHF (Beldon 9913)	0.058 dB	0.0027	5.26 mm^2	
UHF/VHF (Beldon 89913)	0.089 dB	0.0027	Solid 10 AWG	Plenum U/L CSA
UHF/VHF (Beldon 89913)	0.089 dB	0.0027	5.26 mm^2	Plenum U/L CSA

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Table C-10. Antenna Cable Specifications (Continued)

Cable Type	Measured Loss (@1.575 GHz dB per foot)	DC Resistance (ohms per foot)	Type Center Conductor	Flammability
LMR-400	0.051 dB	Shield – 0.00165 Center – 0.00139	0.109 inch Solid	
LMR-400	0.051 dB	Shield – 0.00165 Center – 0.00139	0.27686 cm^2 Solid	

Installing Antennas

This section provides complete installation procedures for GPS site preparation. Before beginning the installation, review Antenna System Grounding and Cable Lead-In Protection, on page 402, and gather the necessary tools and materials described.

Antenna Connection Overview

The SSU-2000 chassis has two antenna connections located on the rear panel. The antenna connections are made via isolated TNC connectors J6 and J7, labeled ANTENNA-A and ANTENNA-B, respectively. The connectors 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

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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: To ensure proper grounding, observe these precautions when installing 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.
- 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.

Symmetricom makes no recommendation as to whether to install transient eliminators. Symmetricom can provide suitable transient connectors as an option.

- Use #10 AWG (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.

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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 0.25 inch (6 mm) fasteners for installing the antenna floor flange
- Extra cable ties or acceptable cable clamps
- #10 AWG (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.

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.

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.

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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 on the SSU-2000 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.
- Symmetricom 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 12 feet 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 30 feet of the point at which the antenna cable enters the building.
- Allow at least 10 feet 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.

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Cutting Antenna Cables

Recommendation: Symmetricom recommends that you coil 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.

Recommendation: Symmetricom *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. Symmetricom recommends that you use only crimp-style N-type connectors in the Crimper Kit for this application (see Table C-9).

Selecting the Proper Gain Antenna

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 chassis, antennas, transient eliminators, and in-line amplifiers have N-type connectors.

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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.

GPS Antenna With a Low Noise Amplifier, 26, 40, 48, or 68 dB

The Marine 26, 40, 48, or 68 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-2000. 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.

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 in the following procedure cannot be done if you cut the cable (as described in Step 1).

1. If necessary, cut the coaxial cable and install mating connectors (see the Warning in Cutting Antenna Cables, on page 405).

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.

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Recommendation: Symmetricom 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.

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 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.

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.

4. Replace the four screws to secure the top of the antenna in place with the cable connected.

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 (part number 12010210-000-0).
- To secure the coaxial cable to the mast, use one or more 8-inch cable ties or appropriate cable clamps.

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Connecting the GPS Antenna

Before connecting the GPS antenna to the SSU-2000, see GPS Antenna Installation Procedures, on page 403. 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 between 1000 Ω and 40 MΩ 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: Symmetricom 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.

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.
- Verify that all antenna connectors are secure, tight, and weatherproofed.

Optional Accessories

Table C-12 provides a list of optional accessories which may be used to mount or install the SSU-2000.

Table C-12. Optional Accessories

Part Number	Description
00413102-001-1	Bracket, rack ear, 23”, 2 each required (not included with unit)
22013085-000-0	9 pin-D wire-wrap adapter (not included with unit)
551026-0038	Cable EIA-232 shielded DB9P to DB9S, 5 ft. (1.5 m)

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Appendix D Connector Pinouts

This appendix describes the pinouts for each of the connectors on the SSU-2000 chassis.

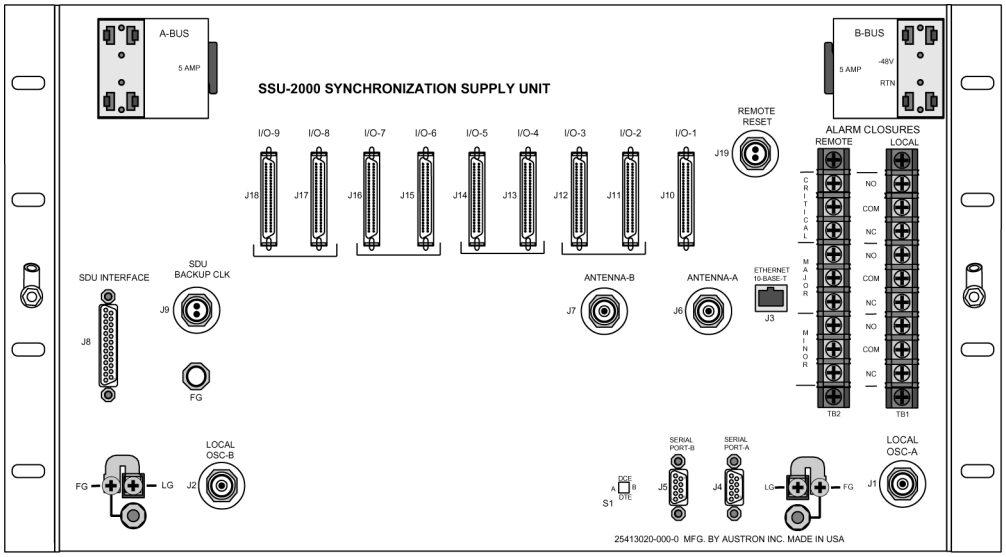
In This Appendix

- Signal Names and Definitions
- Shelf Module Slot Addressing and Size Assignments
- I/O Connector Grounding

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Signal Names and Definitions

All the connectors in the following sections are located on the rear panel of the SSU-2000, as shown in Figure D-1.



ss200014

Figure D-1. SSU-2000 Rear Panel

Power and Ground

Figure D-2 shows the power and ground connections for the SSU-2000 chassis. Table D-1 outlines signal names and definitions for power and ground.

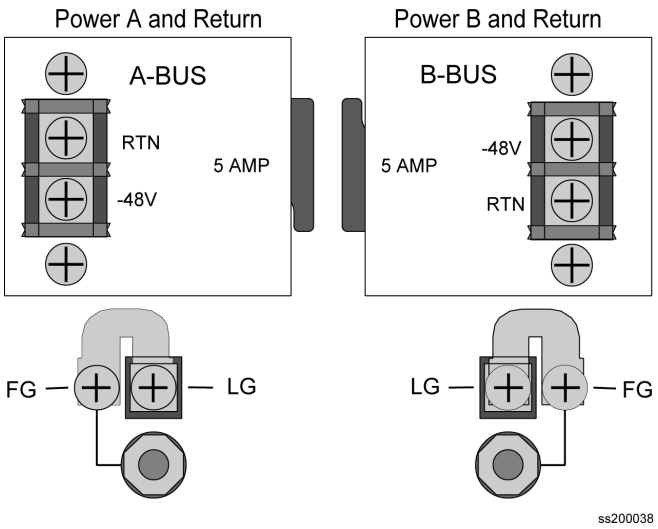


Figure D-2. Power and Ground Connection Pinouts (Covers Removed)

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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

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Communication Interfaces

Figure D-3 shows the communications interfaces on the rear panel of the SSU-2000. Table D-2 describes the signal names, definitions, and pinouts of Communications connectors.

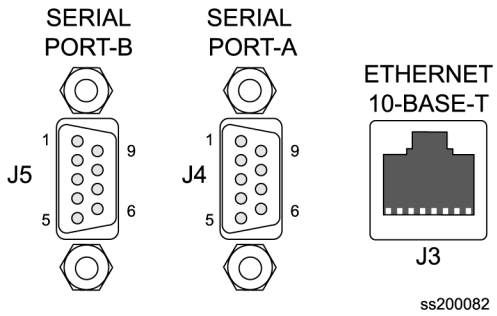


Figure D-3. Communications Interface Pinout

Table D-2. Pinouts of 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
DTR-B	Serial Port B, Data Terminal Ready Control Line	J5-4
RI-B	Serial Port B, Ring Indicator Control Line	J5-9

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Table D-2. Pinouts of Communications Interfaces (Continued)

Name	Description	Connector–Pin
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

Local OSC and Antennas

Figure D-4 illustrates the location of the oscillator and antenna connectors. Table D-3 describes the pinouts of local Oscillators and antenna connectors.

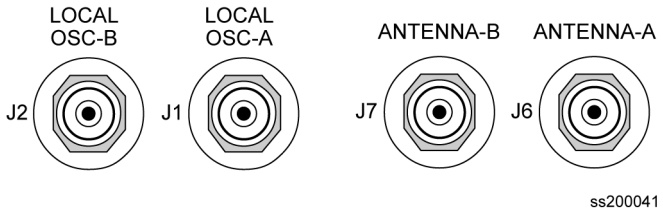


Figure D-4. Local Oscillator and Antenna Connectors

Table D-3. Signal Names and Locations of Local OSC and Antennas

Name	Description	Connector–Pin
LO-A+	Local Oscillator A, Positive Side of Signal	J1-A (Ctr)
LO-A-	Local Oscillator A, Negative Side of Signal	J1-B (Shld)
LO-B+	Local Oscillator B, Positive Side of Signal	J2-A (Ctr)
LO-B-	Local Oscillator B, Negative Side of Signal	J2-B (Shld)
ANT-A	Antenna A, Center Conductor (Received Signal & Ant. Power)	J6-A (Ctr)
ANT-A-RTN	Antenna A, Return	J6-B (Shld)
ANT-B	Antenna B, Center Conductor (Received Signal & Ant. Power)	J7-A (Ctr)
ANT-B-RTN	Antenna A, Return	J7-B (Shld)

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Alarm Contact Closures

Figure D-5 illustrates the alarm closure connectors on the rear panel of the SSU-2000 chassis. Table D-4 outlines signal names, definitions, and locations of alarm contact closures.

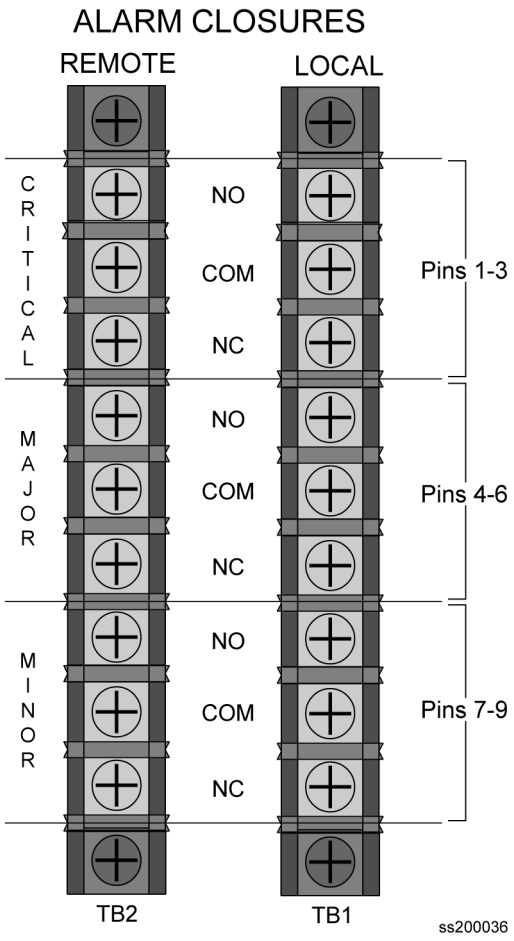


Figure D-5. Alarm Connector Pinout

Table D-4. Signal Names and Locations of Alarms

Name	Description	Connector–Pin
LCRT-NO	Local Critical Alarm, Normally Open Contact	TB1-1
LCRT-COM	Local Critical Alarm, Common Contact	TB1-2
LCRT-NC	Local Critical Alarm, Normally Closed Contact	TB1-3
LMAJ-NO	Local Major Alarm, Normally Open Contact	TB1-4
LMAJ-COM	Local Major Alarm, Common Contact	TB1-5
LMAJ-NC	Local Major Alarm, Normally Closed Contact	TB1-6

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Table D-4. Signal Names and Locations of Alarms (Continued)

Name	Description	Connector–Pin
LMIN-NO	Local Minor Alarm, Normally Open Contact	TB1-7
LMIN-COM	Local Minor Alarm, Common Contact	TB1-8
LMIN-NC	Local Minor Alarm, Normally Closed Contact	TB1-9
RCRT-NO	Remote Critical Alarm, Normally Open Contact	TB2-1
RCRT-COM	Remote Critical Alarm, Common Contact	TB2-2
RCRT-NC	Remote Critical Alarm, Normally Closed Contact	TB2-3
RMAJ-NO	Remote Major Alarm, Normally Open Contact	TB2-4
RMAJ-COM	Remote Major Alarm, Common Contact	TB2-5
RMAJ-NC	Remote Major Alarm, Normally Closed Contact	TB2-6
RMIN-NO	Remote Minor Alarm, Normally Open Contact	TB2-7
RMIN-COM	Remote Minor Alarm, Common Contact	TB2-8
RMIN-NC	Remote Minor Alarm, Normally Open Contact	TB2-9

SDU-2000 Expansion Interface

Figure D-6 illustrates the SDU Interface and the Backup Clock Connector, located on the rear panel of the SSU-2000. Table D-5 outlines signal names, definitions, and locations of the SDU Expansion interface and backup clock connectors.

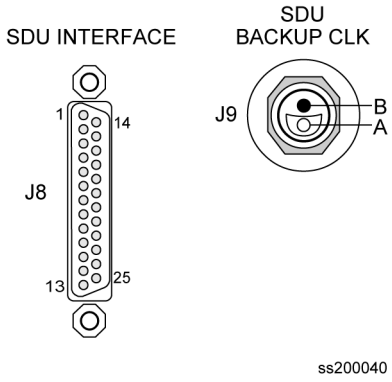


Figure D-6. SDU Interface and Backup Clock Connector Pinouts

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Table D-5. Signal Names and Locations for SDU-2000 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-2000 (Backup 4 kHz)	J9-A
CLKD2–	Selected Clock via TBNC/BNO to SDU-2000 (Backup 4 kHz)	J9-B
EXPSP1+/–	Spare Connection to SDU-2000	J8-11&24
EXPSP2+/–	Spare Connection to SDU-2000	J8-12&25
SOUT2+/–	SPI Expansion Shelf Select Request, generated by SDU SPI Slave	J8-10&23
LG	Logic Ground Connection	J8-13

50-Pin Connector Input and Output Signals

Table D-6 corresponds the 50-pin I/O signal connectors to the appropriate I/O slot location. The connectors J10 through J18 are hard wired through the backplane to I/O slots A3 through A11.

Table D-6. I/O Slot Locations

Rear Panel Connector	I/O Slot Location
J10	A3
J11	A4
J12	A5
J13	A6
J14	A7
J15	A8

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Table D-6. I/O Slot Locations (Continued)

Rear Panel Connector	I/O Slot Location
J16	A9
J17	A10
J18	A11

Note: The pin assignments for J10 through J18 are identical. The pin assignments outlined in Table D-7 refer to all nine of these connectors.

Table D-7 outlines input and output signal definitions on connectors J10 through J18, which are the nine 50-pin connectors located on the rear panel of the SSU-2000 Main shelf.

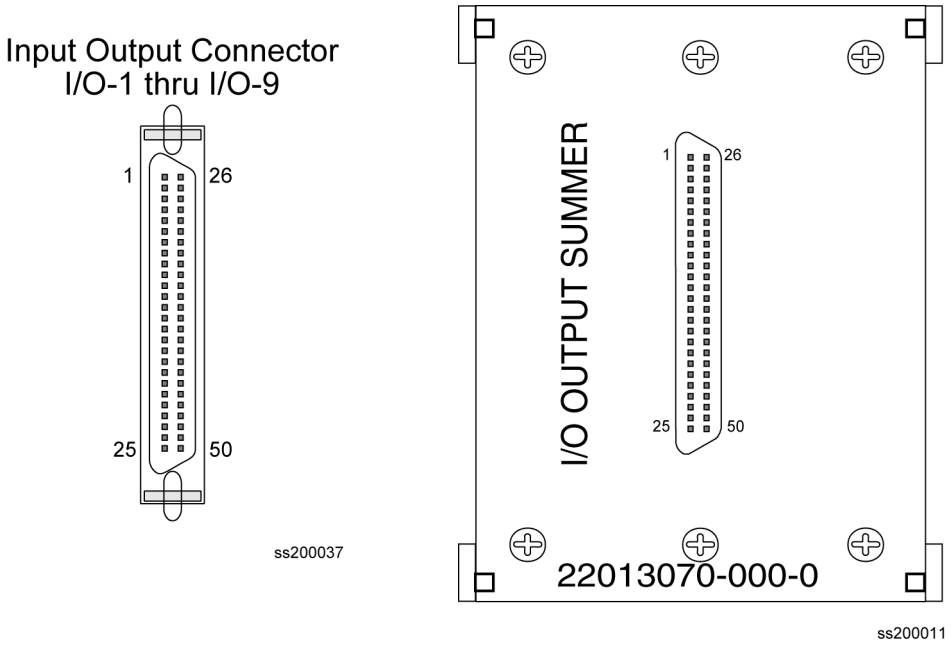


Figure D-7. I/O Connector and Summer Adapter Pinouts

Table D-7. 50 Pin Connector Input/Output Signal Names and Location

Name	Description	Connector Pin #
Cs Fault	Logic Level Input Indicating Problem with Cs Reference	1
Cs Fault RTN	Return Line for Cs Fault Signal	26
ITIP 01	Tip Connection of Input Signal # 1	3

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Table D-7. 50 Pin Connector Input/Output Signal Names and Location (Continued)

Name	Description	Connector Pin #
IRING 01	Ring Connection of Input Signal # 1	28
ITIP 02	Tip Connection of Input Signal # 2	13
IRING 02	Ring Connection of Input Signal # 2	38
ITIP 03	Tip Connection of Input Signal # 3	23
IRING 03	Ring Connection of Input Signal # 3	48
OTIP 01	Tip Connection of Output Signal # 1	2
ORING 01	Ring Connection of Output Signal # 1	27
OTIP 02	Tip Connection of Output Signal # 2	4
ORING 02	Ring Connection of Output Signal # 2	29
OTIP 03	Tip Connection of Output Signal # 3	5
ORING 03	Ring Connection of Output Signal # 3	30
OTIP 04	Tip Connection of Output Signal # 4	6
ORING 04	Ring Connection of Output Signal # 4	31
OTIP 05	Tip Connection of Output Signal # 5	7
ORING 05	Ring Connection of Output Signal # 5	32
OTIP 06	Tip Connection of Output Signal # 6	8
ORING 06	Ring Connection of Output Signal # 6	33
OTIP 07	Tip Connection of Output Signal # 7	9
ORING 07	Ring Connection of Output Signal # 7	34
OTIP 08	Tip Connection of Output Signal # 8	10
ORING 08	Ring Connection of Output Signal # 8	35
OTIP 09	Tip Connection of Output Signal # 9	11
ORING 09	Ring Connection of Output Signal # 9	36
OTIP 10	Tip Connection of Output Signal # 10	12
ORING 10	Ring Connection of Output Signal # 10	37
OTIP 11	Tip Connection of Output Signal # 11	14
ORING 11	Ring Connection of Output Signal # 11	39
OTIP 12	Tip Connection of Output Signal # 12	15
ORING 12	Ring Connection of Output Signal # 12	40
OTIP 13	Tip Connection of Output Signal # 13	16

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Table D-7. 50 Pin Connector Input/Output Signal Names and Location (Continued)

Name	Description	Connector Pin #
ORING 13	Ring Connection of Output Signal # 13	41
OTIP 14	Tip Connection of Output Signal # 14	17
ORING 14	Ring Connection of Output Signal # 14	42
OTIP 15	Tip Connection of Output Signal # 15	18
ORING 15	Ring Connection of Output Signal # 15	43
OTIP 16	Tip Connection of Output Signal # 16	19
ORING 16	Ring Connection of Output Signal # 16	44
OTIP 17	Tip Connection of Output Signal # 17	20
ORING 17	Ring Connection of Output Signal # 17	45
OTIP 18	Tip Connection of Output Signal # 18	21
ORING 18	Ring Connection of Output Signal # 18	46
OTIP 19	Tip Connection of Output Signal # 19	22
ORING 19	Ring Connection of Output Signal # 19	47
OTIP 20	Tip Connection of Output Signal # 20	24
ORING 20	Ring Connection of Output Signal # 20	49

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Shelf Module Slot Addressing and Size Assignments

Table D-8 outlines the shelf module slot addressing and size assignments.

Table D-8. 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 GPS Receiver module
4	4	I/O, Output Pair A	Input or Output, paired with 5
5	5	I/O, Output Pair A or Receiver	Input, Output, paired with 4, or a GPS Receiver module
6, 7	6, 7	I/O, Output Pair B	Inputs or paired Output modules
8, 9	8, 9	I/O, Output Pair C	Inputs or paired Output modules
10, 11	10, 11	I/O, Output Pair D	Inputs or paired Outputs modules
	12 - 15	I/O, Extras	Reserved for future I/O
12	17	Clock	Clock B
	0	All	Addresses all modules in the Shelf

I/O Connector Grounding

Table D-9 outlines I/O connector grounding for all connectors.

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

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Table D-9. I/O Connector Grounding (Continued)

Name	Connector Type	Reference Description	Termination Type
ANTENNA A	TNC	J6	Shield: 0.01μF Bypass to Frame Ground Plane
ANTENNA B	TNC	J7	Shield: 0.01μF Bypass to Frame Ground Plane
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: 0.01μF Bypass to Frame Ground Plane
LG (Logic Ground)	Stake-On	TB3 & TB4	Terminal: 1.0μF Bypass to Frame Ground Plane

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Appendix E Default Settings

This appendix contains tables that list the factory default settings for the SSU-2000. 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.

In This Appendix

- Communications Module Default Settings
- Stratum 2E and 3E Clock Module Default Settings
- DS1 and E1 Input Module Default Settings
- GPS Input Module Default Settings
- DS1 and E1 Output Module Default Settings
- 2048 kHz Output Module Default Settings
- E1/2048 kHz Output Module Default Settings
- Composite Clock Output Module Default Settings
- RS-422 Output Module Default Settings
- Priority Quality Level (PQL) Table Default Settings
- User Changes to Factory Defaults

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Communications Module Default Settings

Table E-1 lists settings and factory defaults for the SSU-2000 Communications Module.

Table E-1. Communications Module Factory Default Settings

Setting	Factory Default
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; that is, 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

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	Range
Warmup Time	1200 s	900 to 3600 s
Min Tau Limit	300 s	Constant
Max Tau Limit	2E: 10000 s 3E: 500 s	Constant
Min Tau	1000 s	In the range specified in Min/Max Tau limits
Max Tau	If 2E, 9000 s If 3E, 450 s	In the range specified in Min/Max Tau limits

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Table E-2. Stratum 2E and 3E Clock Module Default Settings (Continued)

Setting	Factory Default	Range
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 500000 seconds

Stratum 1 Clock Module

Table E-3 lists the software configuration options and factory defaults for the Type 1 Clock module.

Table E-3. Type 1 Clock Module Options/Defaults

Setting	Default	Range
Warmup Time	1200 seconds	900-3600 seconds
Min Tau	330 seconds	150 – 1200 seconds
Max Tau	450 seconds	150 – 1200 seconds
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)	OFF	On/Off
Alarm Elevation Time	86400 seconds	60 to 500,000 seconds; 0 disables alarm

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DS1 and E1 Input Module Default Settings

The DS1 Input Module and E1 Input modules maintain 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-4 lists factory default settings and ranges for all DS1 Input module or E1 Input module software parameters.

Table E-4. 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 MHz, 1.544 MHz, 2.048 MHz, 5 MHz, 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)
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

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Table E-4. DS1 and E1 Input Module Default Configuration (Continued)

Configuration Setting	Factory Default	Range
MTIE Limits	See Table E-5 and Table E-6	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

MTIE Limits for the DS1 Input Module

Table E-5 provides MTIE limits for the DS1 Input Module configuration and factory defaults and settings.

Table E-5. DS1 Input Module – MTIE Limits

Time (seconds)	Set Limit L1 (ns)	Set Limit L2 (ns)	Clear Limit L1 (ns)	Clear Limit L2 (ns)
10	260	325	230	290
100	440	550	400	490
1000	810	1010	730	910
10000	880	1100	790	990
100000	1600	2000	1440	1800

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MTIE Limits for the E1 Input Module

Table E-6 provides MTIE limits for the E1 Input Module configuration settings and factory defaults and ranges.

Table E-6. E1 Input Module – MTIE Limits

Time (seconds)	Set Limit L1 (ns)	Set Limit L2 (ns)	Clear Limit L1 (ns)	Clear Limit L2 (ns)
10	80	100	70	90
100	800	1000	700	900
1000	1600	2000	1400	1800
10000	1170	2835	2000	2500
100000	4260	5330	3800	4800

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

Configuration Setting	Factory Default	Range
Position (GPS only) 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 US

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Table E-7. GPS Input Module Default Configuration (Continued)Settings

Configuration Setting	Factory Default	Range
PQL	2	1 to 16
Disabled SV list	Not applicable	Up to 31 SV numbers
Min PDOP for position	3	1 to 10

Line Retiming Module Default Settings

Table E-8 lists settings and factory defaults for the Line Re-timing Module.

Table E-8. Line Re-timing Module Configuration

Configuration Setting	Factory Default	Range
Slips Threshold	Error = 4, Clear <4	1 to 255 (in any 24 hour period)
Fault Strategy	AIS	AIS SQUELCH
Port Enable	Enabled	Enabled Disabled
Port LBO	1 (0-133 ft)	1 = 0–133 ft 2 = 133–266 ft 3 = 266–399 ft 4 = 399–533 ft 5 = 533–655 ft
Circuit ID	None (blank)	String from 0-43 characters (only valid TL1 characters are supported)

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DS1 and E1 Output Module Default Settings

Table E-9 lists settings and factory defaults for the SSU-2000 DS1 and E1 Output modules.

Table E-9. 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 – B8ZS 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 is 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	8	Possible SSM bit selection 4, 5, 6, 7, and 8

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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-10.

Table E-10. 2048 kHz Output Module Configuration

Setting	Factory Default	Range
Port State	Disabled	Disabled/Enabled
Min Clock	Acquire	Acquire/Lock
Framing	Not applicable	Not applicable
Zero Suppression	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

E1/2048 kHz Output Module Default Settings

The factory default setting and range for all E1/2048 kHz Output module software parameters are listed in Table E-11.

Table E-11. E1/2048 kHz Output Module Configuration

Configuration Setting	Factory Default	Range
Port State	Enabled	Disabled/Enabled
Bypass	On	On/Off
Signal Type	E1	E1/2048
Zero suppression	On	On/Off
Squelching	0	1–16, 0 is disabled

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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 provided in Table E-12.

Table E-12. Composite Clock Output Module Configuration

Configuration Setting	Factory Default	Range
Port State	Disabled	Disabled/Enabled
Min Clock	Acquire	Acquire/Lock
Framing	Not applicable	Not applicable
Zero Suppression	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
Duty Cycle	5/8	5/8 or 50/50

RS-422 Output Module Default Settings

The factory default setting and range for all RS-422 Output module software parameters are listed in Table E-13.

Table E-13. RS-422 Output Module Configuration

Configuration Setting	Factory Default	Range
Port State	Disabled	Disabled/Enabled
Min Clock	Acquire	Acquire/Lock
Framing	Not applicable	Not applicable
Bypass	On	On/Off
Fault Action	On	Off/On/Auto
Duty Cycle	50/50	5/8 or 50/50

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Priority Quality Level (PQL) Table Default Settings

The configuration settings for the PQL table are provided in Table E-14.

Table E-14. Default PQL Values

DS1				E1		
PQL	**SSM**	**S**	**DS1 Description**	**SSM**	**S**	**E1 Description**
1	0x08			0x00		
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	0x0C		Type I	0x04		Type I
7	0x78	S	Type V	0x04	S	G.812 Transit
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 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	0x40			0x0F		

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User Changes to Factory Defaults

Use Table E-11 to record any changes you make to the factory default settings.

Table E-15. User Changes to Factory Default Settings

Setting	Factory Default	User 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	

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Table E-15. User Changes to Factory Default Settings (Continued)

Setting	Factory Default	User Changes
Clk Switch AR	On	
Input Switch	AutoReturn (AR)	
Input Selection Mode	Priority	
Local Oscillator (LO)	On	
Frequency Offset	57 ppb	
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	
Frequency Offset	57 ppb	
Elevation Time	86400 seconds	
Warmup Time	1200 seconds	

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Appendix F Specifications

This appendix provides specifications for the SSU-2000 and for its functional components, such as operating conditions, power inputs, clock inputs and outputs, indicators, EMC and safety standards, and chassis dimensions.

In This Appendix

- SSU-2000 Shelf Specifications
- SDU-2000 Shelf Specifications

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SSU-2000 Shelf Specifications

General Specifications

The operating limits for the unit are set to factory default settings as listed in Appendix E, Default Settings.

Table F-1 details the general specifications for a fully populated unit configured with SSU function. Inputs apply only to the SSU function.

Table F-1. General Specifications

Characteristics	Specification
General	
Architecture	Main Shelf: 2 clocks, 1 Communications module and 9 mixed I/O modules Expansion Shelf: 14 output modules and 2 buffer modules Up to 4 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
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 board 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.

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Table F-1. General Specifications (Continued)

Characteristics	Specification
Communications Ports	Three EIA-232 Serial Ports: Serial PORT-A (J4) Serial PORT-B (J5) Comms Module Serial Port One Ethernet Port Ethernet port (10 Base T)
Communication Management	
Management Interface	Simple fault, visual and contact closures ICS TL1 SNMP
Input Section	
Ports	Maximum of 27; 1 or 3 ports per Input module Reference or monitoring capability
Signal Type	DS1, E1, 2048 kHz (G.703 Sec.13), 1.544 MHz, 2.048 MHz, 1, 5, and 10 MHz Clocks (user-settable)
GPS	Integrated (single or dual)
Sync Status Messaging (SSM)	Fully supported
Selection Mode	Priority and PQL (user settable)
Performance Measurement	
Resolution	1 ns
Sampling Rate	40 Hz
MTIE and TDEV	Exceeds latest ANSI, ITU-T and Telcordia Technologies standards
Clock	
Type (Holdover)	Stratum 2E Rubidium Stratum 3E Quartz
Control	DDS (Direct Digital Synthesis) technology Integrated CPU
Output Section	
Port	20 Ports per module for DS/E1, 2048 kHz, and Composite clock
Signal Type	DS1 E1 2.048 MHz (G703 Sec.13) Composite Clock (CC)

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Table F-1. General Specifications (Continued)

Characteristics	Specification
Distribution Capacity	
Main Shelf	Up to 9 DS1/E1 output modules in Main Shelf 20 outputs per output module
SDU-2000 Expansion	Up to 4 Expansion Shelves Up to 14 output modules per expansion shelf with 20 outputs per module Maximum of 1120 outputs in 4 expansion shelves
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 Grounds	
Power Connections	A & B Input connections at opposite upper sides of the rear panel
DC	–38 to –72.5 vDC, (–48 vDC nominal)
DC Power @ -48 vDC	< 240 watts, per chassis
Fuse Type/Rating	2 fuses; GMT-5A
Grounds	–48V return DC, isolated from frame and logic grounds.
Chassis Mechanical	
Width	17 inches (43.2 cm)
Depth	11.5 inches (29.2 cm)
Height	10.5 inches (26.7 cm)
Weight (provisioned)	~ 27 lbs (12.3 kg)
Chassis Environmental	
Temperature Operational Stratum Levels	+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

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Table F-1. General Specifications (Continued)

Characteristics	Specification
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
Chassis Environmental	
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	200 ft. below to 13,000 ft 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
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. 4.2.3.1
EMC	
Immunity/Resistibility ESD	EN 300 386-2 V1.1.3 Sec. 5.1.1.1 & 5.1.1.4 GR-1089-CORE Sec. 2
Immunity Radiated	EN 300 386-2 V1.1.3 Sec. 5.1.1.2 GR-1089-CORE Sec. 3.3.1 & 3.3.2
Immunity Fast Transient	EN 300 386-2 V1.1.3 Sec. 5.1.3.1 & 5.1.5.1
Immunity Surges	EN 300 386-2 V1.1.3 Sec. 5.1.3.2

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Table F-1. General Specifications (Continued)

Characteristics	Specification
Immunity Radio Freq. Conducted	EN 300 386-2 V1.1.3 Sec. 5.1.3.3 & 5.1.5.2 GR-1089-CORE Sec. 3.3.3
Emissions Radiated	EN 300 386-2 V1.1.3 Sec. 5.1.1.3 GR-1089-CORE Sec. 3.2.1 & 3.2.2
Emissions Radio Freq. Disturbance voltage	EN 300 386-2 V1.1.3 Sec. 5.1.5.3 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
I/O Adapter Panels	
Width	■ 19" EIA Standard rack mount ■ Optional rack ears for mounting in 23" EIA & AT&T racks and ETSI 530mm racks/cabinet
Height	1.75 in. (4.4 cm)
Depth	2.0 in. (5.0 cm) (including connector extension)
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	200 ft. below sea level to 13,000 ft. above sea level

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Operating Conditions Specifications

The unit operates at specified parameters in the operating conditions summarized in Table F-2.

Table F-2. Normal Operating Conditions

Parameter	Minimum	Maximum	Units	Notes
Supply Voltage	–38	–65	Volts DC	
Temperature	0	50	°C	1
Temperature Rate of Change	–	8.3	°C/Hr	
Relative Humidity	5	85	%	2
Altitude	-200 ft.	13,000 ft.	feet	3

Inlet air temperature, limited convection 15 ft./min.
Non-condensing over specified temperature range.
The maximum operation ambient temperature shall be reduced by 2°C for every 984 ft. altitude above 4,921 ft.

The unit is not damaged when exposed to the levels specified in Table F-3, but performance is degraded. The unit returns to specified performance upon returning to specified operating conditions.

Table F-3. Exceptional Operating Conditions

Parameter	Minimum	Maximum	Units	Notes
Supply Voltage: (48 vDC)	–38	–75	Volts, DC	1
Temperature	–5	50	°C	2
Relative Humidity	5	90	%	3

1. The unit is not damaged if the polarity on the power leads is reversed.
2. At 30°C max/hour rate of change.
3. Non-condensing.

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Power Input and Grounding Specifications

Table F-4 provides power input specifications.

Table F-4. Power Input Specifications

Parameter	Specification
Supply power	–38 to –72.2 Vdc (–48 Vdc nominal)[1, 2, 3]
Power, maximum	< 240 watts at power on
Power, typical	< 100 watts at normal operation
Connector	#6 Ring Terminal Block

1. Reversing the input polarity does not damage the unit.
2. Isolated power inputs are user-settable for positive or negative grounding schemes.
3. The 48 vDC return is connected to the common ground plane at power source.

Input Signal Specifications

Table F-5 details the input signal specifications.

Table F-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 (ANSI) T1.102 & ITU-T G.703 Sec. 5)
Amplitude Range	+3 to –24 dBDSX
Jitter and Wander Tolerance	Meets the requirements of Bellcore GR-1244-CORE, Section 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

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Table F-5. Input Signal Specifications (Continued)

Parameter	Specification
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

Output Signal Specifications

Table G-6 details the input signal specifications.

Table F-6. Output Signal Specifications

Parameter	Specification
DS1 Signals	
Framing (user selectable)	Outputs: D4/Super Frame (SF) or Extended Super Frame (ESF)
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

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Table F-6. Output Signal Specifications (Continued)

Parameter	Specification
Number of Outputs	20 per module
Termination Impedance	120 Ω ± 5%
Composite Clock Signals (64 kbit/s)	
Signal Waveshape Duty Cycle Rise Time Pulse Width Pulse Interval Amplitude Termination Impedance	Rectangular (62.5% or 50/50 duty cycle), software selectable, per G.703 Sec. 4 and GR-378 **5/8 (62.5%)** **50/50** < 500 nsec < 500 nsec 9.8 µS ±5% 7.8125 µS ±5% 15.625 µS ±5% 15.625 µS ±5% 2.7 to 5.5 V peak 1.0 ±0.1 V 133 Ω ±5% 110 Ω
Number of Outputs	20 per module
2048 kHz Clock Signals	
Signal Waveshape Rise Time Fall Time Duty Cycle	Per ITU Rec. G.703 Sec. 13 Square wave < 50 nsec < 50 nsec 50% ±5%
Amplitude	1.0 to 1.9 volts peak into 120 Ω .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 75Ω ± 5%

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SDU-2000 Shelf Specifications

Table F-7 lists the system-level specifications for the SDU-2000.

Table F-7. SDU-2000 System Specifications

Specification	Description
System Specifications	
Architecture	2 Buffer modules and 10 mixed Output modules Expansion drive for up to three additional expansion shelves Maximum of four expansion shelves per system Maximum of 61 m (200 ft) between the SSU-2000 main shelf and the farthest expansion shelf
Output Section	
Port	■ 20 ports per Output module pair
Distribution Capacity	■ 100 summed outputs per shelf
Signal Type	■ DS1 ■ 2048 Kbit/s (E1) ■ 1 MHz, 1.544 MHz, 2.048 MHz (G703/Sec. 13) ■ 5 MHz ■ Composite Clock (CC)
Expansion Shelf Mechanical	
Height	10.5 in (26.7 cm)
Depth	11.5 in (29.2 cm)
Width	17 in (43.2 cm) without mounting ears
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	196 ft (60 m) below sea level to 13123 ft (4000 m) above sea level

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Table F-7. SDU-2000 System Specifications (Continued)

Specification	Description
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	–48V 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 (#6 terminal block) on opposite sides of the connector panel.

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Appendix G Reference Materials

This appendix lists the standards and other reference materials that apply to the SSU-2000.

In This Appendix

- (ANSI) T1.101–1999, Synchronization Interface Standards for Digital Networks.
- Generic Requirements
- Technical Advisories and Framework Technical Advisories
- Technical References
- EIA/TIA Documents
- Other Reference Documents

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American National Standards Institute (ANSI) Documents

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.

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*).

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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

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).

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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).

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2. TR–NWT–000078 (see GR–78–CORE).

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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.)

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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).

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18. TR-TSY-001003, *Generic Requirements for Embedded DC-to-DC Converters,* Bellcore Technical Reference.

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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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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*.

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16. EN 300 386-2 class B, *EMC requirements.*

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18. ETS 300 019 series, *ETSI environmental conditions and tests.*

19. ETS 300 119-2, *ETSI requirements for racks and cabinets.*

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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), Electro-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.

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Appendix H Updating Clock Module Software

This appendix provides procedures for updating the software in the SSU-2000.

In This Appendix

- Overview
- Updating Software Using the Downloader Program
- Updating Software Using SynCraft

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Overview

This Appendix describes how to load software into the Communications module in the SSU-2000. You normally load software in one of the following instances:

- Symmetricom releases updated software
- You want to add a software-based function (SNMP or NTP) to your current configuration
- Software in your shelf has become corrupt

This Appendix contains two procedures for loading software into the SSU-2000. Use the Downloader program to download the software via a local RS-232 port when a craft person is at the location of the SSU shelf. Use the SynCraft application when the SSU is connected to an Ethernet network and you have previously installed the SynCraft application.

Updating Software Using the Downloader Program

Use the procedure in this section to install software in the SSU-2000 through either of the serial ports on the rear panel or the serial port on the Communications module.

Materials/Equipment Required

- Portable computer with serial port
- Serial (RS-232) cable
- Compressed source file (contact your Symmetricom agent for the appropriate version)

This procedure assumes you use the files delivered with the SSU-2000/SSU-2000e Clock Modules Software Release Document Release F.00 – 01500F00.dnl.

1. Create a new directory on the hard drive of the computer. Name this directory ClkF00 (or as appropriate for different versions).

2. Copy the compressed source file to the new directory.

3. Unzip the source file and verify that the following files are present in the directory.

   – Dwnload.exe

   – Dwnconf.dat

   – Dwnhelp.H16

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- 01500F00.dnl
- SW_Download_Notice8-99.dpf
- SW_License7-01.pdf
- 12713020-002-2.pdf
- 12713140-002-2.pdf
- SRD-SSU-2000-Clk-F00.pdf
- readme.txt

4. Connect the serial cable between the computer and the front panel COMM-L or the rear panel COMM-A or COMM-B port on the SSU-2000.

5. Start the DWNLOAD.EXE program. A window similar to Figure H-1 appears.

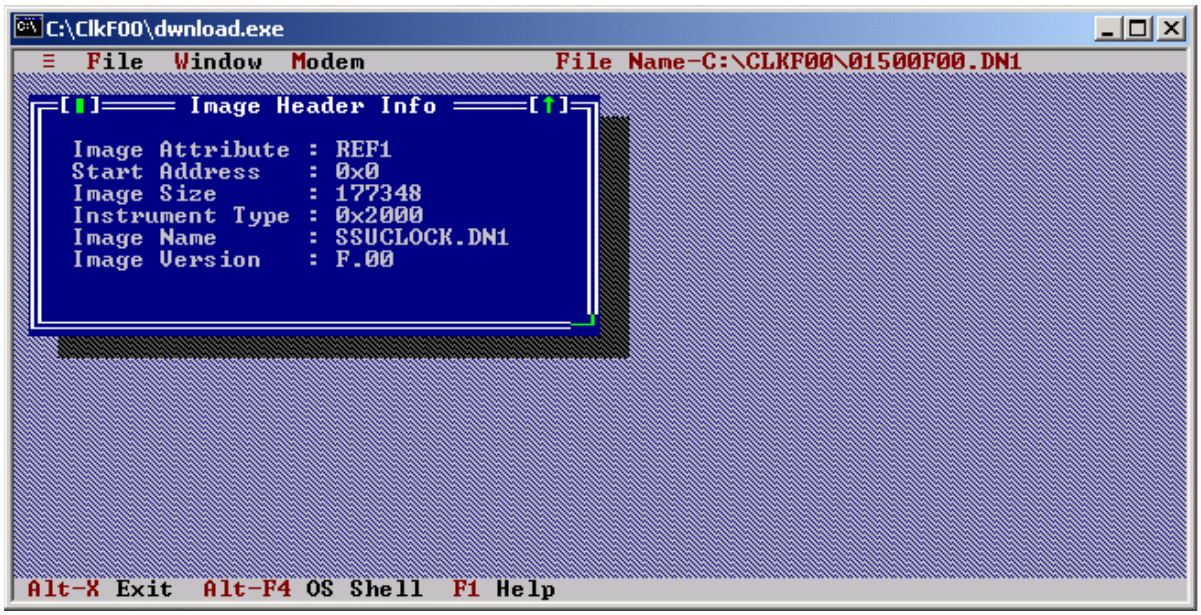


Figure H-1. DOWNLOAD.EXE Main Window

6. Select the File menu (or press Alt+F), and select the Setup (or press the P key) option. The Connection Settings dialog box appears, as shown in Figure H-2.

- Set the Com Port to the port on the computer, typically COM1
- Set the Connection to Direct
- Leave the Phone/Msg String blank
- Set Handshaking to None
- Set the Baud Rate to 9600 (default on the SSU-2000)
- Set the Instrument to SSU

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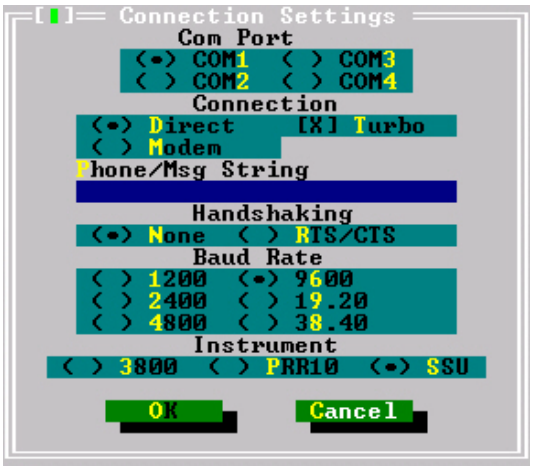


Figure H-2. Connection Settings Dialog Box

7. Select OK to save the settings.

8. Select the File menu (or press Alt+F), and select the Terminal (or press the T key) option. A terminal emulation window appears, as shown in Figure H-3.

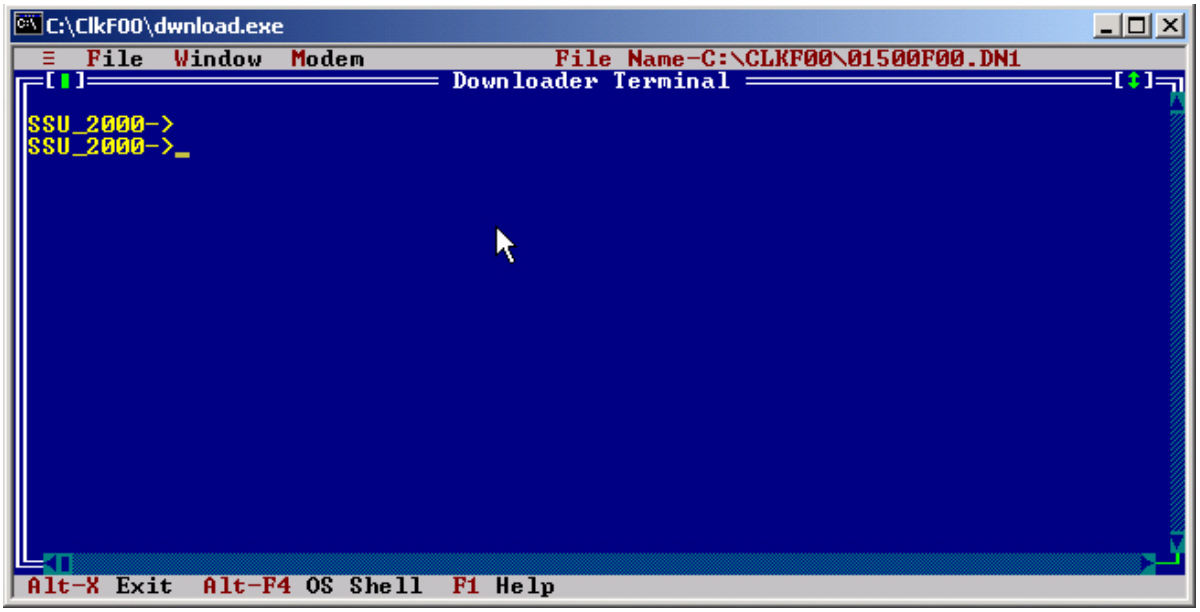


Figure H-3. Terminal Emulation Window

9. Press the **ESC** key. The SSU-2000 prompt appears, as shown in Figure H-3.

10. Type `WHO` and press **Enter**. A message similar to the following appears:

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```
SSU_2000->WHO
2004-06-09T09:15:24Z ID: SSU2000 Name: SSU_2000
You are ADMIN, with access level 4, connected to COML
ADMIN is connected to COMA
ADMIN is connected to COMB
```

Note the line starting with “You are...” and the reported access level. You *must* log in to the SSU-2000 with a level 4 user name and password to continue with this procedure. Contact the system administrator for the SSU-2000 if you do not know the level 4 user name and password.

11. Type `CONFIG 1A1` and press **Enter** to determine the current revision level of the software in the Clock module in slot A1. A message similar to the following appears:

```
SSU_2000->CONFIG 1A1
2004-06-09T09:15:54Z ID: SSU2000 Name: SSU_2000
Name: Clock Stratum 2E
In service time: 2004-01-30T15:27:38
Serial #: 990705398000614917
Hardware Part #: 23413016-000-0  Rev: A.07   Date: 17APR02
Software Part #: 14113015-000-0  Rev: E.00   Date: 11JUL03
Configured Revisions:
  0: E.00 11JUL03
  1: A.0
```

where 0 is the Clock module software revision

12. Repeat step 11 for the Clock module in slot A12 by typing `CONFIG 1A12` and then pressing Enter. Note the Clock module software revision.

13. If the Clock module software revision is F.00, then skip to step 25 to exit this procedure. The Clock module software is up to date.

    If the Clock module software revision is B.03 through E.00, then in non-redundant systems the outputs automatically select the by-pass clock source (Clock C) during the software upgrade. All provisioning is preserved. Skip to step 16.

    If the Clock module software revision is A.00 through B.02, then all Clock module data reverts to factory defaults during the software upgrade. Perform steps 14 and 15 below and record the results when you restore the provisioning in the upgraded Clock module.

14. Type `SETUP 1A1` and press **Enter** to display the current provisioning of the Clock module in slot A1.

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```
SSU_2000->SETUP 1A1
2004-06-09T09:16:01Z ID: SSU2000 Name: SSU_2000
Module Name: Clock Stratum 2E
CLK         Min    Max        CLK INP INP
LOC# Type   Tau    Tau    MHz AR  SWT Sel
---- ----- ------ ------ --- --- --- ----
1A01 ST2E   300    9000   10  On  AR  Prio
Warmup = 1200 seconds
Tau Range = 300 to 10000 seconds
```

Record the current values in Table H-1. The text shown in parentheses is the command you use to restore the provisioning after upgrading the software.

Table H-1 Slot 1 Clock Module Provisioning

Value	Restore Command	Current Value
Min Tau	`CLK 1A1 MINTAU`	
Max Tau	`CLK 1A1 MAXTAU`	
CLK AR	`CLK AR`	
INP SWT	`REF`	
INP Sel	`REF`	
LO	`CLK 1A1 LO` [1]	
Warmup	`CLK 1A1 WARMUP`	

Note:
[1]Not shown if using later Communications module software

15. Repeat step 14 for the Clock module in slot A12 by typing `SETUP 1A12`, then pressing **Enter**. Record the current values in Table H-2. The text shown in parentheses is the command you use to restore the provisioning after upgrading the software.

Table H-2 Slot 12 Clock Module Provisioning

Value	Restore Command	Current Value
Min Tau	`CLK 1A12 MINTAU`	
Max Tau	`CLK 1A12 MAXTAU`	
CLK AR	`CLK AR`	
INP SWT	`REF`	
INP Sel	`REF`	

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Table H-2 Slot 12 Clock Module Provisioning (Continued)

Value	Restore Command	Current Value
LO	`CLK 1A12 LO` [1]	
Warmup	`CLK 1A12 WARMUP`	

Note:
[1]Not shown if using later Communications module software

16. Type `REF` and press **Enter** to display which Clock module is supplying outputs.

```
SSU_2000->REF
2004-06-09T09:17:23Z ID: SSU2000 Name: SSU_2000
The SSU is in Normal Mode
Input Reference: 1A04-03
Clock C Source: 1A04-03
Clock Selected: 1A01
System PQL Value: 2
```

You will first upgrade the Clock module that is *not* selected (1A12 in this example).

17. In the Download window, select the File menu (or press Alt+F), and select the Location (or press the L key) option. The Target Location dialog box appears, as shown in Figure H-4.



Figure H-4. The Target Location Dialog Box

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Select **C1** for the first chassis, and then select **S12** for the second Clock module. Click **OK** to close the dialog box.

18. Select the File menu (or press Alt+F), and select the Download option (or press the D key). The Download File dialog box appears, as shown in Figure H-5.

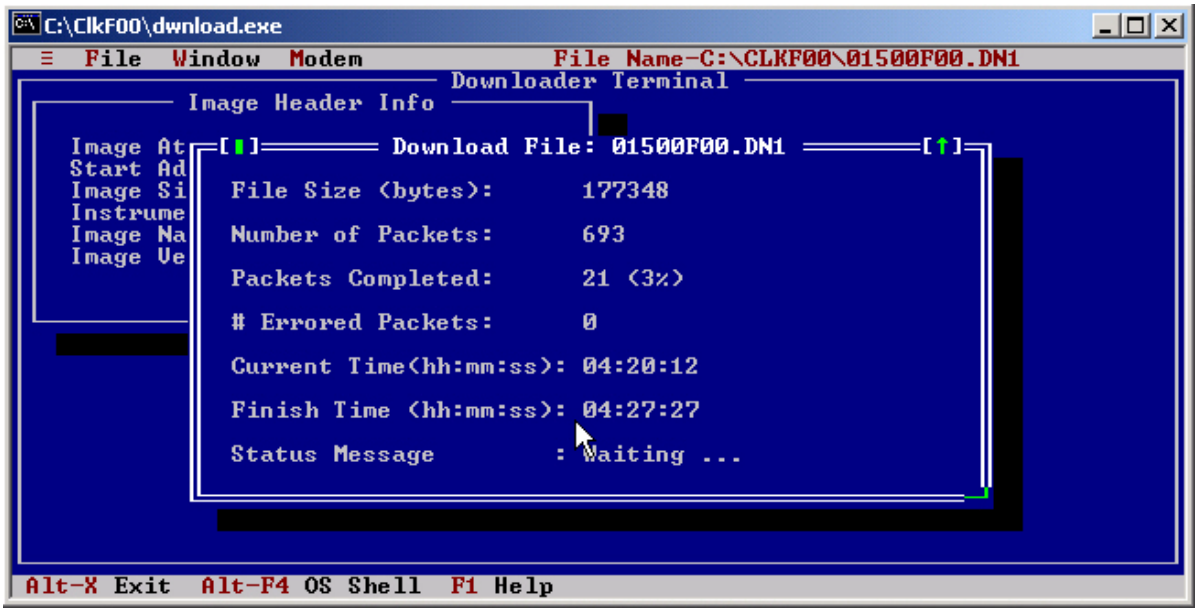


Figure H-5. The Download File Dialog Box

The software is first transferred to the Communications module, and the Status LED flashes green and yellow. Once the Communications module validates the new software, it transfers it to the Clock module. During this time the Status LED on both the Communications and Clock modules flash green and yellow.

Figure H-6 describes the error messages that could occur and possible recovery steps.

19. When the download is complete, an Information window appears that says the download is complete. Click OK or press the **Enter** key to continue.

The LEDs on the Clock module indicate progress after it is reset: it cycles through the Warmup and Acquire modes and then enters the Lock mode. Event messages from the SSU-2000 appear on the Downloader window as shown in Figure H-7. The SSU-2000 prompt appears after the event messages are complete.

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This error message indicates that the Download program can not communicate with the SSU-2000. Check that the serial port is in the ASCII (or ICS) mode. Ensure that no other programs are using the serial port (for example, HyperTerm or Procomm). Restart at step 17.



This error message indicates that the user name and password is either invalid or is not at level 4. Contact the system administrator for the SSU-2000 and obtain the proper user name and password. Restart at step 9.



This error message indicates that the Download program is unable to verify that the target is an SSU-2000. This error occurs if there is a communications problem with the port. Ensure that the SSU-2000 has a good ground connected at the LG log on the shelf. This message can also indicate that the image file has been corrupted.



This error message indicates that the Download program is set up for the wrong type of unit. Return to step 7 and ensure that Instrument is set to SSU. Restart at step 17.

Figure H-6. Error Messages

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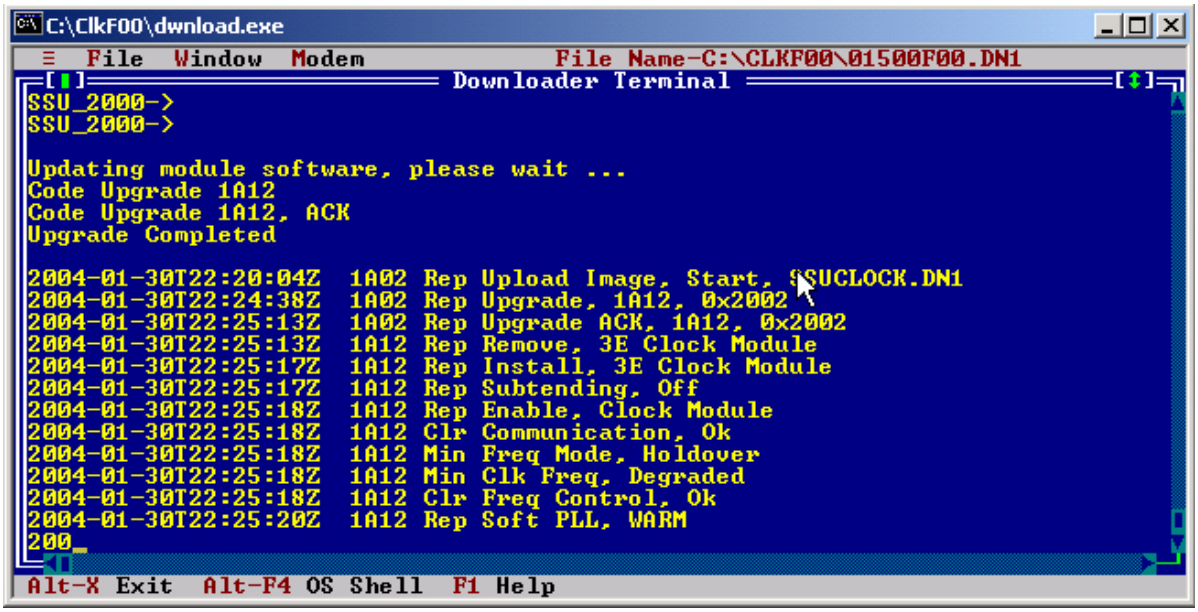


Figure H-7. Event Messages

20. Type `CONFIG 1A12` (or `1A1`, depending on which Clock module you're updating), then press **Enter**. A message similar to the following appears:

```
SSU_2000->CONFIG 1A1
2004-06-09T09:15:54Z ID: SSU2000 Name: SSU_2000
Name: Clock Stratum 3E
In service time: 2004-01-30T15:27:38
Serial #: 990705398000990707
Hardware Part #: 23413015-000-0  Rev: A.06   Date: 19DEC00
Software Part #: 14113015-000-0  Rev: F.00   Date: 19NOV03
Configured Revisions:
  0: F.00 19NOV03
  1: A.0
```

21. Verify that the Configured Revision for 0: is reported as F.00. If any other revision is reported, then verify that you requested the configuration for the correct Clock module (1A1 or 1A12). If you requested the configuration for the correct Clock module and it the Configured Revision is *not* F.00, then repeat the download process starting at step 17.

22. Type `ALARM`, then press **Enter**. A response similar to the one below appears.

```
SSU_2000->ALARM
2004-06-09T09:45:47Z ID: SSU2000 Name: SSU_2000
Clock    #   Alarm           Status    Level (*=Elev)
------- ---- --------------- --------- -------------
1A12    (04) Clk Freq        Degraded   Minor
```

Wait approximately 45 minutes for the Clk Freq Degraded alarm to clear before continuing. The response when no alarms are active appears as follows:

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```
SSU_2000->ALARM
2004-06-09T10:22:40Z ID: SSU2000 Name: SSU_2000
No Alarms active
```

23. To update the software in the second Clock module, repeat the procedure above, starting at step 17. Substitute the address of the second Clock module (1A1 or 1A12) as appropriate.

24. If your Clock module was at Revision Level B.03 or higher, the upgrade procedure is complete.

    If your Clock module was at Revision Level A.00 through B.02, provision the module to the original parameters you recorded in Table H-1 and Table H-2. After restoring the original parameters, save the setup using the `SETUP 1A01 SAVE` and `SETUP 1A12 SAVE` commands.

25. Close the Download utility program by pressing the Alt+X keys.

Updating Software Using SynCraft

Use this procedure to install software on the SSU-2000 through the Ethernet port. This procedure assumes that the shelf is installed, powered, and connected to an Ethernet network.

Materials/Equipment Required

- Compressed source file (contact your Symmetricom agent for the appropriate version)
- SynCraft connection to the SSU-2000

This procedure assumes you use the files delivered with the SSU-2000/SSU-2000e Clock Modules Software Release Document Release F.00 – 01500F00.dnl.

1. Create a new directory on the hard drive of the computer. Name this directory ClkF00 (or as appropriate for different versions).
2. Copy the compressed source file to the new directory.
3. Unzip the source file and verify that the following files are present in the directory.
   - Dwnload.exe
   - Dwnconf.dat
   - Dwnhelp.H16
   - 01500F00.dnl

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- SW_Download_Notice8-99.dpf
- SW_License7-01.pdf
- 12713020-002-2.pdf
- 12713140-002-2.pdf
- SRD-SSU-2000-Clk-F00.pdf
- readme.txt

4. Open SynCraft and then open a connection to the SSU-2000.

5. Select the Main Shelf, and then select the first Clock module. A screen similar to the one shown in Figure H-8 appears.

   Observe the Software Revision shown in the Inventory Summary section. Also observe the Clock Status shown in the Clock Status section; it should be Selected or Standby.

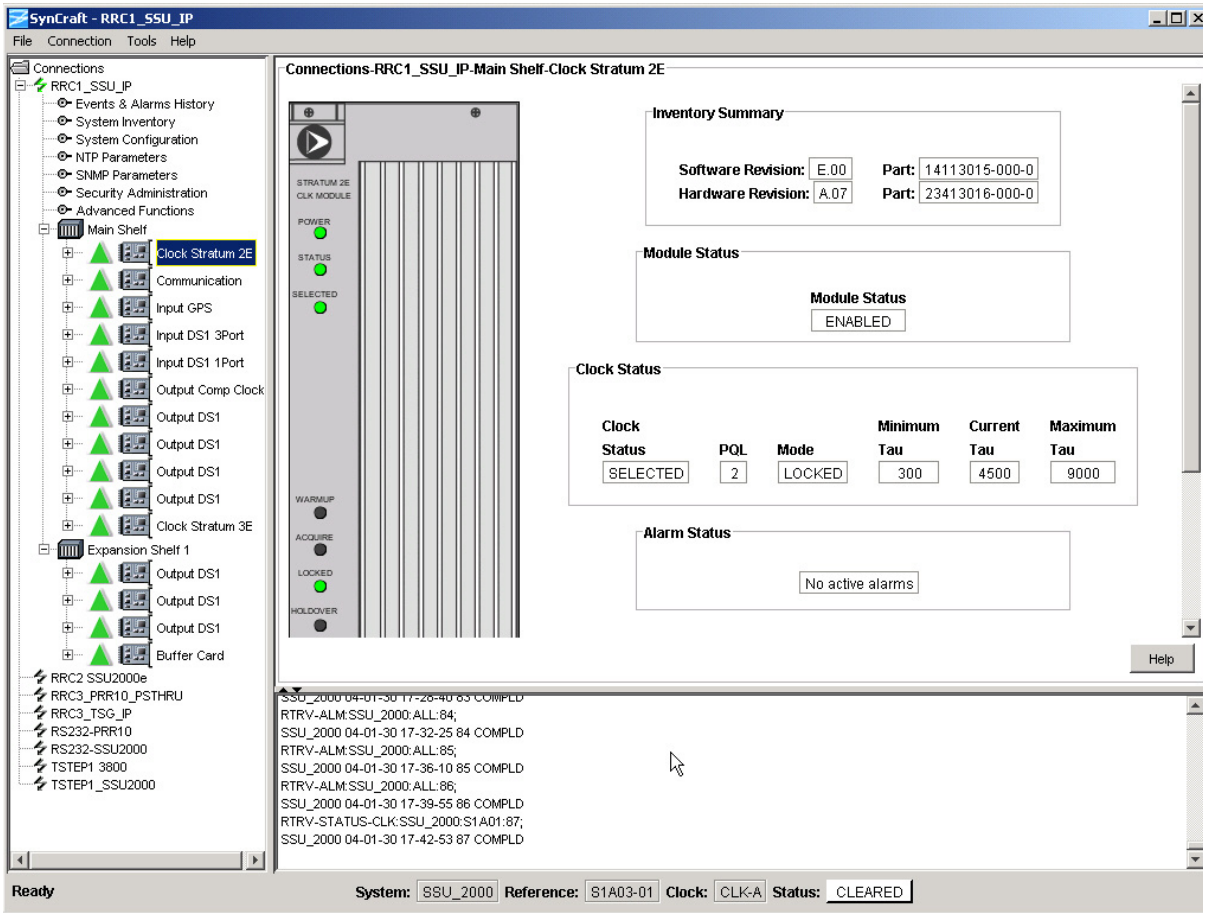


Figure H-8. Stratum 2E Clock Module in SynCraft Window

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6. Select the Main Shelf, and then select the first Clock module. A screen similar to the one shown in Figure H-9 appears.

   Observe the Software Revision shown in the Inventory Summary section. Also observe the Clock Status shown in the Clock Status section; it should be Selected or Standby.

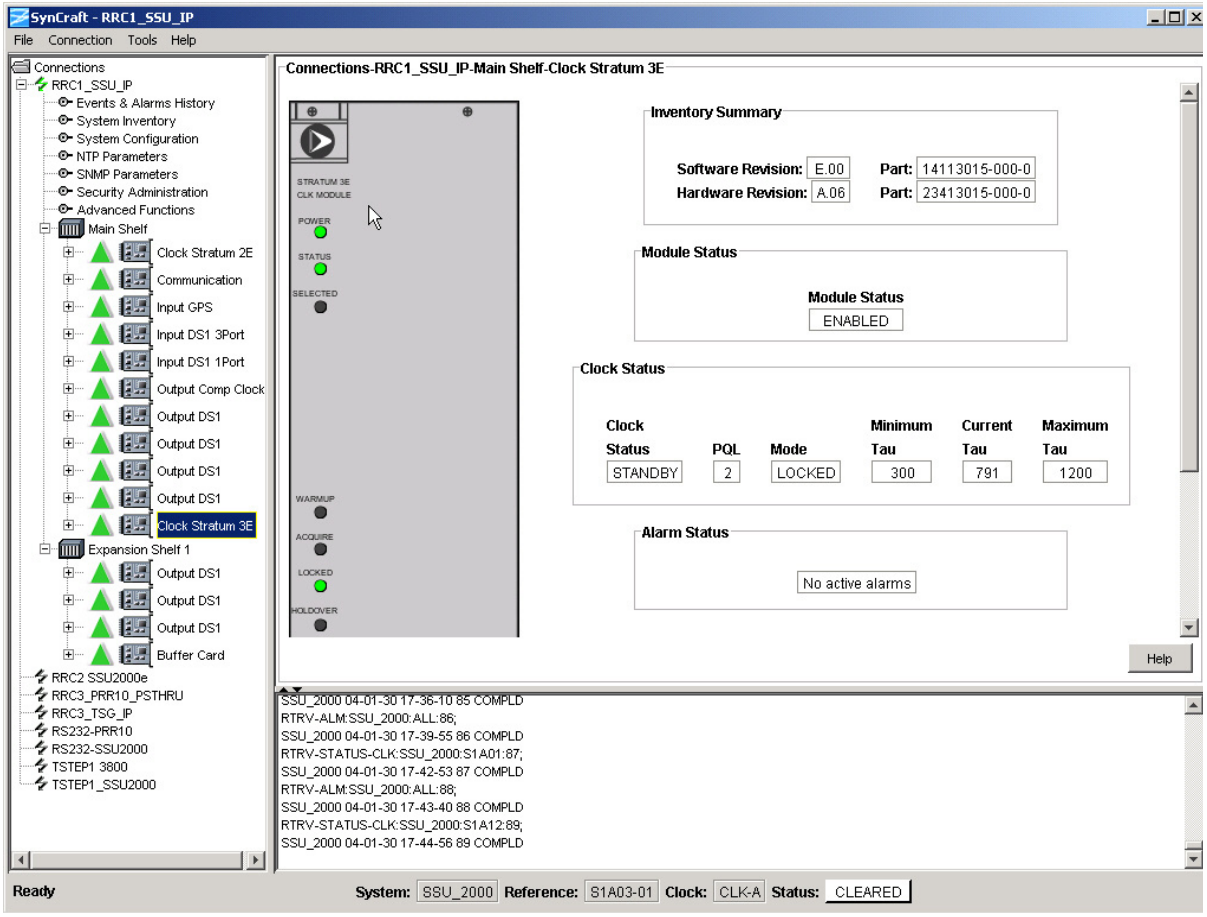


Figure H-9. Stratum 3E Clock Module in SynCraft Window

7. If the Software Revision is F.00, then skip to step XX to exit this procedure. The Clock module software is up to date.

   If the Clock module software revision is B.03 through E.00, then in non-redundant systems the outputs automatically select the by-pass clock source (Clock C) during the software upgrade. All provisioning is preserved. Skip to step 11.

   If the Clock module software revision is A.00 through B.02, then all Clock module data reverts to factory defaults during the software upgrade. Perform steps 8 through 10 below and record the results when you restore the provisioning in the upgraded Clock module.

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8. Select the System Configuration screen in the menu. A display similar to that in Figure H-10 appears.

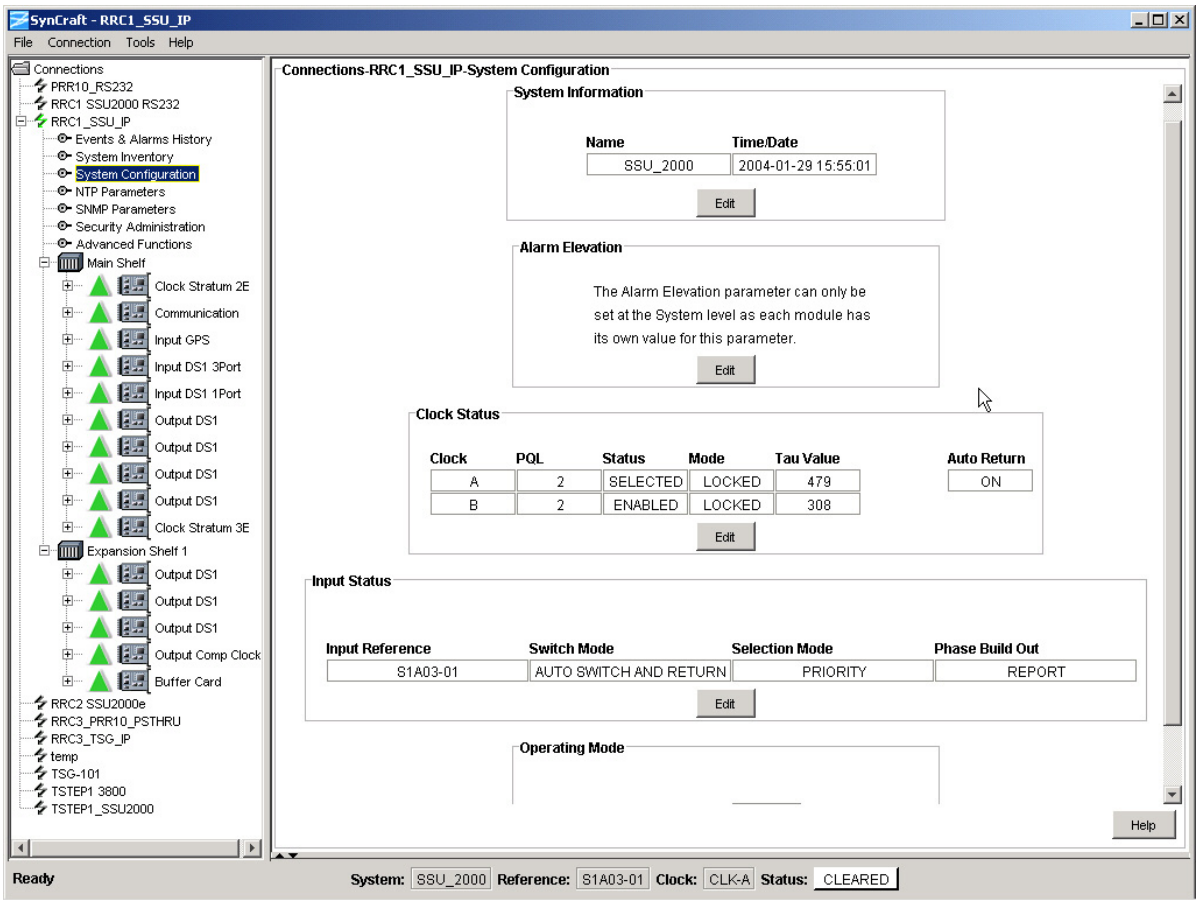


Figure H-10. System Configuration Screen

Using information from the screen, fill in the Value column in Table H-3.

Table H-3. Current System Provisioning Parameters

Parameter	Value
Clock Status – Auto Return (On or Off)	
Input Status – Switch Mode (Auto Switch and Return, Auto Switch, or Off)	
Input Status – Selection Mode (Priority or PQL)	

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9. Select the Main Shelf and then select the first Clock module in the menu. Expand the Clock module and select Module Configuration. A display similar to that in Figure H-11 appears.

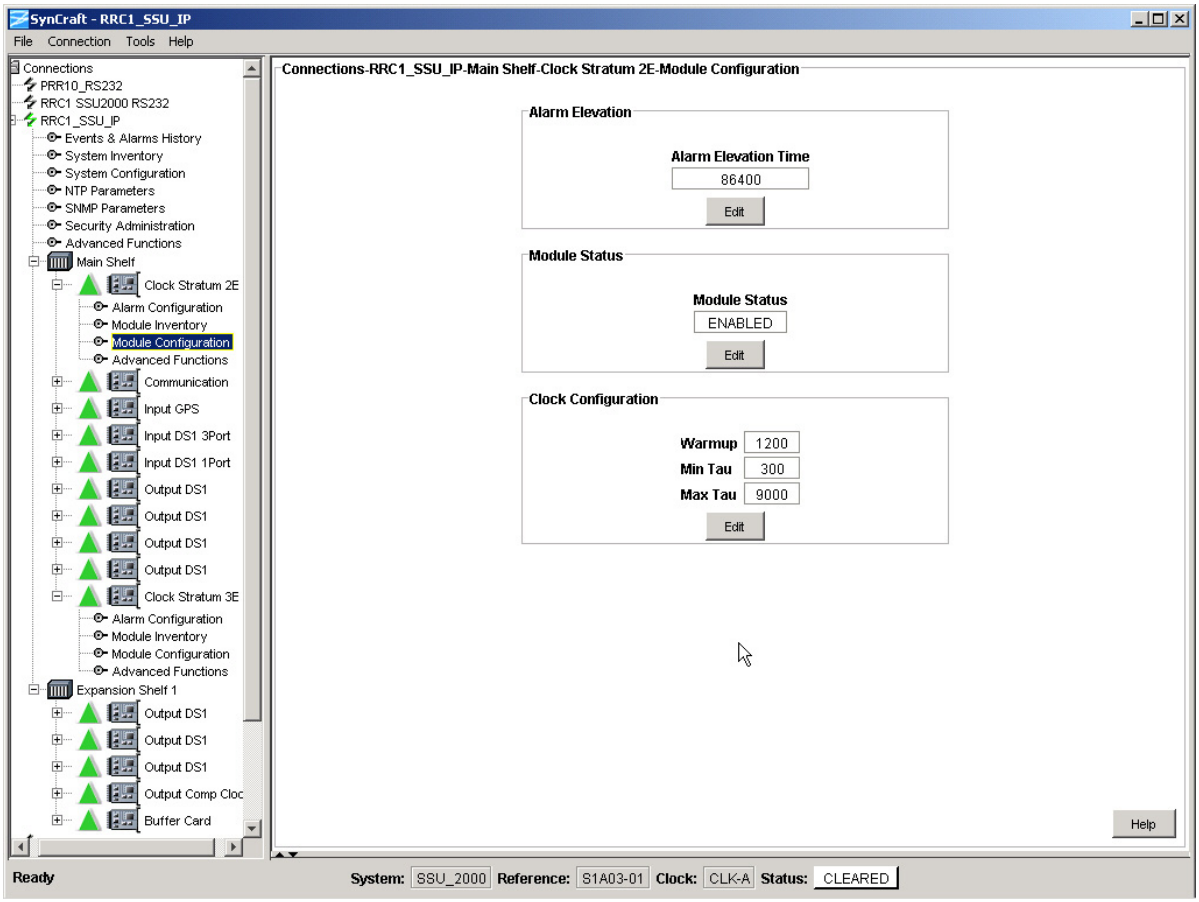


Figure H-11. Primary Clock Module Configuration Screen

Using information from the screen, fill in the Value column in Table H-4.

Table H-4. Current Primary Clock Provisioning Parameters

Parameter	Value
Clock Configuration – Warmup	
Clock Configuration – Min Tau	
Clock Configuration – Max Tau	

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10. Select the Main Shelf and then select the secondary Clock module in the menu. Expand the Clock module and select Module Configuration. A display similar to that in Figure H-12 appears.

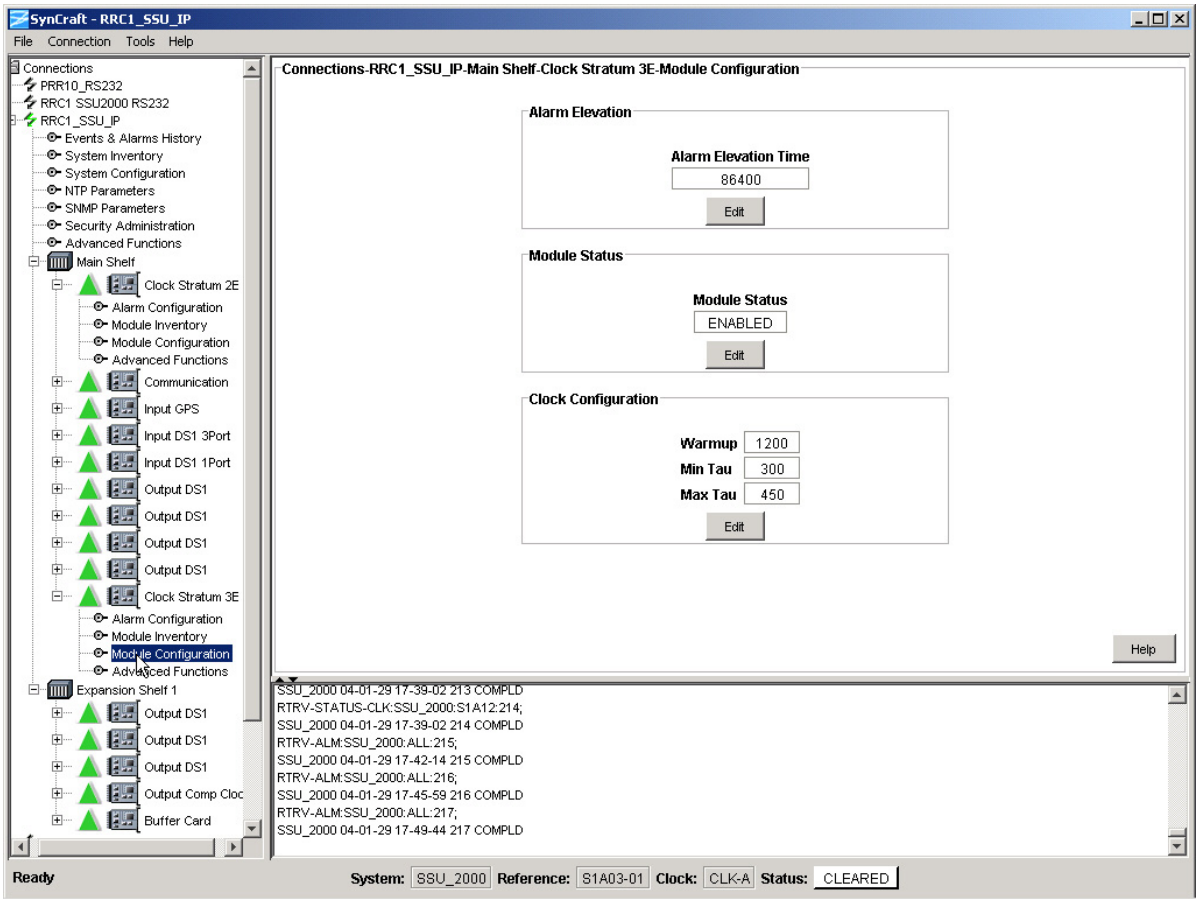


Figure H-12. Secondary Clock Module Configuration Screen

Using information from the screen, fill in the Value column in Table H-5.

Table H-5. Current Secondary Clock Provisioning Parameters

Parameter	Value
Clock Configuration – Warmup	
Clock Configuration – Min Tau	
Clock Configuration – Max Tau	

11. Select Tools from the Main menu, then select the Firmware Upload...SSU2000 Firmware Upload option.

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12.Navigate to the ClkF00 directory you created in step 1 of this procedure.

13.Ensure that the name of the SSU-2000 you want to upgrade appears in the Connection Name drop-down list, as shown in Figure H-13.

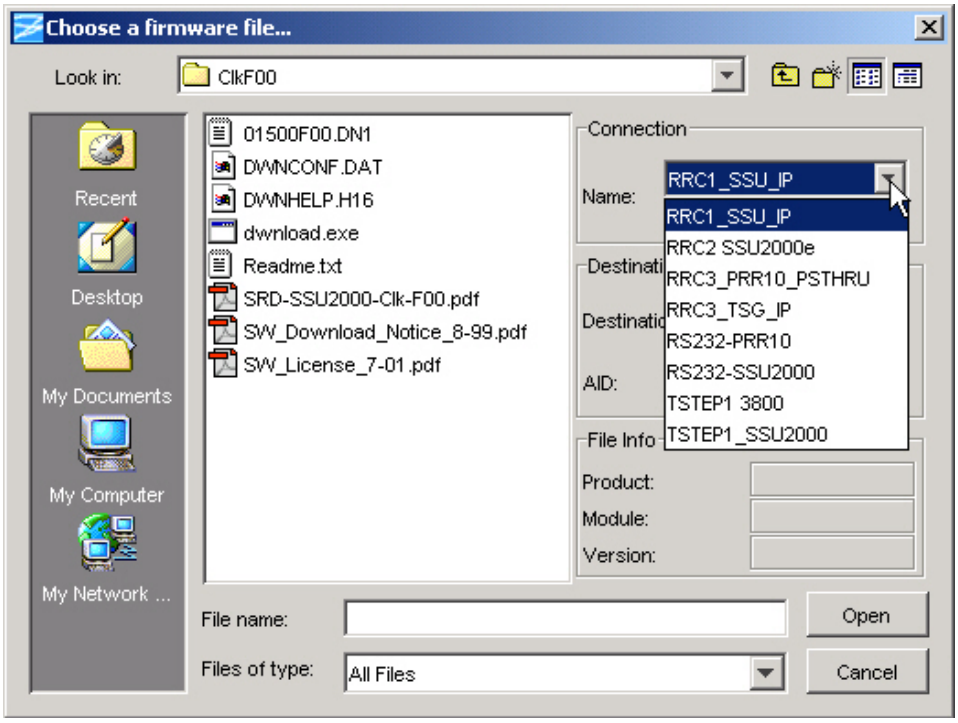


Figure H-13. Selecting the SSU-2000 to be Upgraded

14.Select Specific Module in the Destination drop-down box.



Recommendation: The “All Like Modules” option in the Destination drop-down box automatically upgrades both Clock modules in sequence. Symmetricom recommends that you select All Like Modules only for new installations where the SSU-2000 is not yet supplying timing signals to Network Elements.

15.Type the AID of the Clock module that is *not* supplying outputs in the AID field. This is the Clock module in Standby, determined in steps 5 and 6 above. The AID for the Primary clock is S1A1 and the AID for the Secondary clock is S1A12.

16.Highlight (single-click) the 01500F00.DN1 file. Observe that the File Info fields contain the following information: Product: SSU-2000; Module: Clock Stratum 2E; Version:F.00.

The Module field *always* contains Clock Stratum 2E; this file updates Type 1, Stratum 2E, and Stratum 3E Clock modules.

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17. Click Open; the Software License Agreement window opens. Read the license agreement. If you accept the agreement, click Accept. If you do not accept the agreement, click Decline. This ends the upload process.

18. Some versions of SynCraft may display an Enter User Information dialog box, as shown in Figure H-14. Enter a valid Level 4 username and password. Contact the System Administrator for the SSU-2000 if you do not know a valid Level 4 username and password. Click OK. The download process starts.

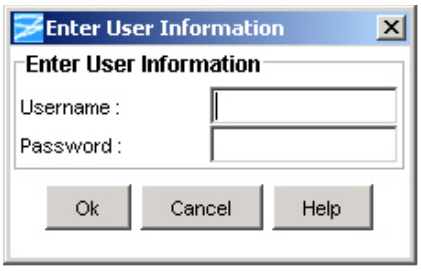


Figure H-14. Enter User Information Dialog Box

SynCraft stores the existing software to a temporary location, loads the new software, and calculates a checksum. If the checksum is not correct, the SSU-2000 resumes normal operation with the existing software. If the checksum is correct, the Communications module transfers the new software to the selected module. The Status LED on the Communications module and the selected module flashes yellow and green during the transfer. After the new software is validated, the dialog box shown in Figure H-15 appears.

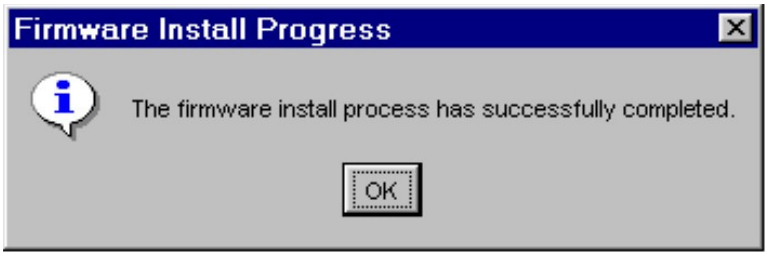


Figure H-15. Successful Installation Dialog Box

19. Click OK to complete the update and close the connection with the SSU-2000.

20. Wait five minutes and open a connection to the SSU-2000 you just upgraded. Select the Main shelf and then the newly-upgraded Clock module. A screen similar to Figure H-16 appears.

    Verify that the Software Revision shown in the Inventory Summary section is F.00. If it is not, verify that you have obtained the status for the correct Clock module. If the correct Clock module is selected and the Software Revision is not F.00, then repeat the download starting at step 11.

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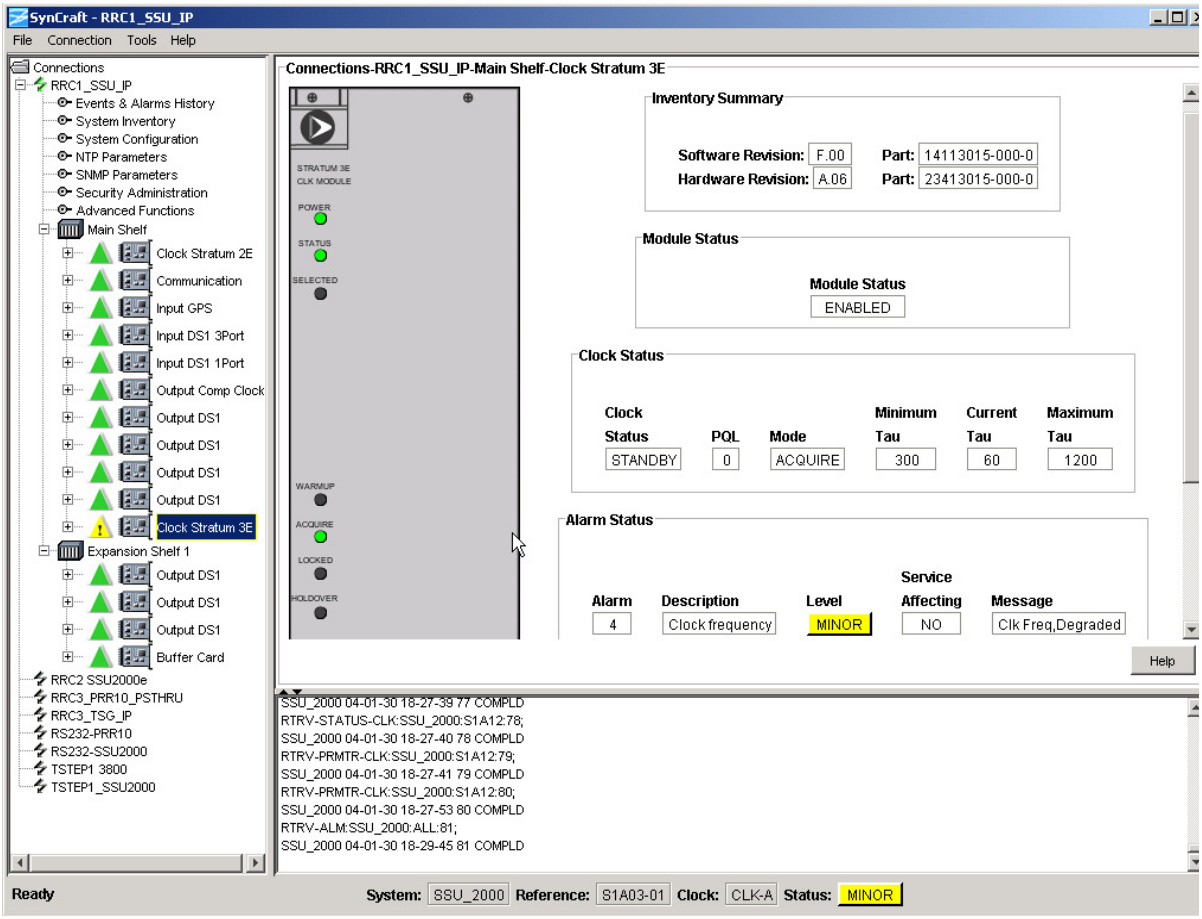


Figure H-16. Upgraded Clock Module Status

Observe that the Clock module displays a Clock Frequency Degraded alarm in the Alarm Status section. Wait for this alarm to clear (approximately 45 minutes) before continuing with the next step of this procedure.

21. Repeat the download procedure for the other Clock module starting at step 6. Use the appropriate AID for the Clock module.

22. If the Clock module software was at Revision Level A.00 through B.02, then perform steps 8 through 10 using the Edit button to return the parameters to the settings you recorded.

    If the Clock module software was at Revision Level B.03 or higher, the software upgrade is complete.

23. Close SynCraft by selecting File, then Exit on the main menu.

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