



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

User Guide
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Contents

How to Use This Guide

Purpose of This Guide	22
Who Should Read This Guide.	22
Structure of This Guide	22
Conventions Used in This Guide.	24
Warnings, Cautions, Recommendations, and Notes	25
Related Documents and Information.	26
Where to Find Answers to Product and Document Questions	26
What's New in this Guide	26

Chapter 1 Product Overview

Overview	28
Typical System Configurations	29
Timing Signal Generator (TSG) Configuration	30
Primary Reference Source (PRS) Configuration	30
SSU-2000e Configured as a Monitor-Only System	31
System Architecture	31
Input Section	33
Output Section	35
Clock Section	36
Communications Section	36
Alarms and Events.	37
System Components.	39
SSU-2000e Main Shelf (Chassis)	39
SSU-2000e Family of Modules	48
Clock and Communications Modules	49
Input Modules	50
Output Modules.	51
Communications Protocol.	53
Software Interface.	53
Software Versions.	54
Basic System Load	54
Adding NTP Support.	55
Adding SNMP	55
Graphical User Interface.	55

Overview of SSU-2000e Operation	56
Synchronization Status Messages (SSMs)	56
Indicators and Controls	57
SDU-2000e Synchronization Distribution Unit	57
Functional Overview	60
Expansion Shelf Features	60
Setting the Expansion Shelf Address	62
Buffered Clocks	63
SDU Module Features	63
Connector Panel Features	64
Controls and Indicators	65

Chapter 2 Installing the SSU-2000e

Unpacking and Inspecting the Shelf	68
Preliminary Procedures	68
Installation Tools and Materials	69
Electromagnetic Interference (EMI) Considerations	69
Ventilation Considerations	70
Rack Mounting the SSU-2000e	70
Mounting Instructions	71
Making Ground and Power Connections	72
Making Ground Connections	72
Making Power Connections	72
Making Communications Connections	73
Making EIA-232 Serial Port Connections	74
Changing Communications Settings	75
Making Ethernet Connections	75
Making Communications Module Connections	76
Making Alarm Connections	77
SDU-2000e Interface Option	78
Clock Inputs	79
Clock Outputs	82
Installing SSU-2000e Modules	83
Handling Modules	84
Installing a Module	84
Connecting Antennas	85

Installing the SDU-2000e	85
Rack Mounting the SDU-2000e	86
Making Ground Connections	86
Making Power Connections	86
SDU Installation Connections	87
Setting the Shelf Address	89
SDU Clock Outputs	89
Installing SDU Modules	90
Installation Checklist	91
Applying Power to the SSU-2000e	92
SSU-2000e Turn-Up Procedures	92
SDU-2000e Turn-Up Procedures	93
SDU-2000e Power Control	94
Normal System Indications During Turn-Up	94
After Turn-Up	94

Chapter 3 Provisioning and Operating the SSU-2000e

Controls and Indicators	96
SSU-2000e Status LED Indicators	96
SSU-2000e Operating Controls	96
Establishing a Connection to the SSU-2000e	96
Communicating by Serial Port	97
Communicating by Ethernet	98
Overview of the SSU-2000e Security System	99
Adding An Administrator User to the System	100
Adding Users to the System	101
Logging Into the SSU-2000e	101
Logging Off of the SSU-2000e	102
Initial Provisioning	102
Provisioning General Parameters	102
Adding or Enabling a Module	103
Disabling a Module	104
Removing a Module	104
Provisioning GPS Input Modules	105
Provisioning Other Input Modules	105
Provisioning Output Modules	108
Saving the Provisioning Setup	108
Checking Alarm Status	109

Factory Default (Basic) Configuration	109
Changing Factory Defaults	109
Restoring Factory Defaults	110
Customizing Other Configuration Options	110

Chapter 4 Commissioning the SSU-2000e

Readiness to Test Checklist	112
Equipment Requirements	113
Commissioning Tests	113
Testing the Ethernet Communications Interface	113
Testing the EIA-232 Ports	114
Testing The Minor Alarms	114
Testing the Major Alarms	115
Testing the Critical Alarms	115
Testing the Reference Signals and Selection	116
Testing the Clock Section	116
Testing the Output Section	117
Testing the System Stability and Accuracy (Optional)	117
Commissioning Test Data Sheet	118
Commissioning the SDU 2000e	118
Readiness to Test Checklist	119
Equipment Requirements	119
Commissioning Tests	120
Commissioning Test Data Sheet	121

Chapter 5 Maintenance and Troubleshooting

Responding to Alarms	124
Preventive Maintenance	124
Corrective Maintenance	125
Troubleshooting	127
Establishing a Connection	127
Troubleshooting Guide	128
Interpreting Status Messages	128
Troubleshooting the SDU-2000e	132
Re-ordering Information	133
Equipment Return Procedure	133
Repacking	133
Equipment Return Procedure	133

Chapter 6 Clock Module and Communications Module Reference Data

Stratum 2E Clock Module	136
Functional Overview	136
Functional Block Diagram	137
Status LED Indicators	138
Functional Specifications	139
Configuration Data	140
Stratum 3E Clock Module	141
Functional Overview	141
Functional Block Diagram	142
Status LED Indicators	143
Performance Specifications	144
Configuration Data	145
Type I Clock Module	145
Functional Overview	145
Functional Block Diagram	146
Status LED Indicators	147
Functional Specifications	148
Configuration Data	148
Communications Module.	149
Functional Overview	149
Functional Block Diagram	151
Status LED Indicators	152
Alarm Logic	153
Configuration Data	154
EIA-232 Ports	155
Ethernet Port.	155

Chapter 7 Input Module Reference Data

1-Port and 3-Port E1 Input Modules	158
Functional Overview	158
Functional Block Diagram	159
Status LED Indicators	165
E1 Input Module Configuration	166
Software Options	166

1-Port and 3-Port DS1 Input Modules	167
Functional Overview	168
Functional Block Diagram	168
Status LED Indicators	174
Configuration Options	175
Software Options	175
GPS Input Module	176
GPS Input Module Functional Overview	176
Functional Block Diagram	177
Status LED Indicators	178
Configuration Settings	179
Composite Clock Input Module	179
Functional Overview	179
Functional Block Diagram	180
Status LED Indicators	181
Factory Default (Basic) Configuration	182

Chapter 8 Output Module Reference Data

E1 Output Module	184
Functional Overview	184
Functional Block Diagram	185
Status LED Indicators	186
Performance Specifications	187
DS1 Output Module	188
Functional Overview	188
Functional Block Diagram	188
Status LED Indicators	189
Performance Specifications	190
Composite Clock Output Module	191
Composite Clock Output Module Overview	191
Functional Block Diagram	192
Status LED Indicators	193
Composite Clock Output Module Specifications	194

E1/2048 kHz Output Module	195
Functional Overview	195
Provisioning the Signal Type	195
Output Squelching	195
Bypass Clock (CLK-C) Alarms	198
Functional Block Diagram	199
E1/2048 kHz Output Module Status Indicators	200
E1/2048 kHz Output Signal Specifications	201
E1/2048 kHz Output Module Software Options	202
2048 kHz Output Module	202
Functional Overview	202
Output Squelching	203
Functional Block Diagram	206
Status LED Indicators	207
Performance Specifications	208
RS-422 Output Module	209
Functional Overview	209
Provisioning Output Frequencies	209
Output Squelching	209
Functional Block Diagram	213
Status Indicators	214
Performance Specifications	215
Software Options	215
Buffer Module	216
Status LED Indicators	216

Chapter 9 Hardware Configuration Guide

Configuring a Conventional SSU/TSG System	220
Configuring a Primary Reference Source (PRS) System	220
Configuring a Monitor-Only System	221
SSU-2000e Configuration Chart	222
SDU-2000e Configuration Chart	226

Appendix A Alarms and Events

Alarm Messages	230
Event Messages	242

Appendix B Communications Protocol

SSU-2000e Control Languages	250
TL1 Command Interface	252
TL1 Command and Response Conventions	253
User Access Levels	260
Retrieve Commands and Responses	261
TL1 Set Commands	290
Other TL1 Commands	300
Interactive Command Set	301
General Conventions	301
ICS Prompts	302
Line Editing	302
Logon Requirements	302
Command Syntax	303
ICS Commands	305
NTP Support	368
Server Mode	368
Client Mode	368
Broadcast Mode	369
SNMP Protocol	370
SNMP v2 Details	370
SNMP v3 Details	371
Management Information Base	371
Enabling SNMP	372
Adding a User	372
Adding a Manager IP Address	373
User and Manager Tables	373
Keep Alive Support	374
Shelf Information	374
Software Information	374
Communications Module Software Version	375

Appendix C Antennas

Ordering Information	378
Antenna Kits and Accessories	378
GPS Antenna with Internal LNA	378
Transient Eliminators	382
GPS L1 Inline Amplifier	383
GPS L1 Inline Amplifier Assembly	383
Antenna Coaxial Cables	383

Installing Antennas	384
Antenna Connection Overview	385
GPS Antenna Installation Procedures	387
Antenna Installation Completeness Checklist	392
Optional Installation Accessories	392

Appendix D Connector Pinouts

Signal Names and Definitions	394
Cable Adapters	394
Power and Ground	398
Communication Interfaces	399
Antenna Signal Connections A3 and A5	400
Alarm Contact Closures	400
Input Signal Definitions	402
Output Signal Definitions	405
Shelf Module Slot Addressing and Size Assignments	406
SDU-2000e Expansion Interface	407
I/O Connector Grounding	408

Appendix E Default Settings

Communications Module Default Settings	412
Stratum 2E 3E and Type 1 Clock Module Default Settings	412
DS1 and E1 Input Module Default Configuration	413
MTIE Limits for the DS1 Input Module	415
MTIE Limits for the E1 Input Module	415
DS1 and E1 Output Module Default Settings	416
GPS Input Module Default Settings	417
2048 kHz Output Module Default Settings	417
E1/2048 kHz Output Module	418
Composite Clock Input Module Default Settings	419
Composite Clock Output Module Default Settings	420
Priority Quality Level (PQL) Table Default Settings	420
User Changes to Factory Defaults	421

Appendix F Specifications

General Specifications	426
Operating Conditions Specifications	431
Power Input and Grounding Specifications	432
Input Signal Specifications	432
Output Signal Specifications	433
SDU-2000e Shelf Specifications	435
Chassis Dimensions	436

Appendix G Reference Materials

American National Standards Institute (ANSI) Documents	438
Generic Requirements	438
Technical Advisories and Framework Technical Advisories	439
Technical References	440
EIA/TIA Documents	442
Other Reference Documents	442

Figures

1-1	SSU-2000e Synchronization Supply Unit	28
1-2	SSU-2000e in TSG Configuration	30
1-3	SSU-2000e Configured as a Primary Reference Source.	30
1-4	SSU-2000e Configured as a Monitor Only System	31
1-5	Block Diagram of the SSU-2000e	32
1-6	SSU-2000e Module Chassis Slot Assignments.	40
1-7	SSU-2000e Upper Front Panel Connections.	41
1-8	Clock Input Connector Groups.	42
1-9	SSU-2000e Input Connector Scheme	43
1-10	SSU-2000e Power Connections	46
1-11	Serial Port Connector Pins.	47
1-12	SDU-2000e Synchronization Distribution Unit.	58
1-13	SDU-2000e Block Diagram	59
1-14	SDU-2000e Expansion Chassis Components	61
1-15	Backup Clock Terminator, Side and Front Views.	62
1-16	SDU-2000e Connection Features	64
1-17	Expansion Chassis Cabling	65
2-1	Equipment Mounting Cabinet.	71
2-2	SSU-2000e Power Input Connector.	73
2-3	DE9 Connector Detail	74
2-4	Serial Port DTE and DCE Switch.	75
2-5	Communications Module Serial Connection	76
2-6	Alarm Contact Closures and Pin Assignments	77
2-7	SSU Expansion Terminator (J8).	79
2-8	SSU Backup Clock Terminator (J9) Side and Front View	79
2-9	Clock Input Connector Pinout	80
2-10	Non-Payload E1 and DS1 Input Termination	80
2-11	Through Payload E1 and DS1 Input Termination.	81
2-12	Clock Output Connector Pinout	82
2-13	Equipment Mounting Cabinet.	87
2-14	SSU-2000e Expansion Terminator.	88
2-15	Backup Clock Terminator, Side and Front View.	88
2-16	Shelf Address Selector	89
3-1	Direct Connection Using the Serial Port	97
5-1	Alarm and Event Status Breakdown	129
6-1	Block Diagram of the Stratum 2E Clock Module	137
6-2	Front Panel of the Stratum 2E Clock Module.	138

6-3	Block Diagram of the Stratum 3E Clock Module	142
6-4	Front Panel of the Stratum 3E Clock Module.	143
6-5	Block Diagram of the Type I Clock Module	146
6-6	Front Panel of the Type I Clock Module.	147
6-7	Block Diagram of the Communications Module.	151
6-8	Front Panel of the Communications Module	152
7-1	Block Diagram of the 1-Port and 3-Port E1 Input Modules	159
7-2	Front Panel of the E1 Input Module	165
7-3	Block Diagram of the 1-Port and 3-Port DS1 Input Module	168
7-4	Front Panel of the DS1 Input Module	174
7-5	Block Diagram of the GPS Input Module	177
7-6	Front Panel of the GPS Input Module	178
7-7	Block Diagram of the Composite Clock Input Module	180
7-8	Front Panel of the Composite Clock Input Module	181
8-1	Block Diagram of the E1 Output Module	185
8-2	Front Panel of the E1 Output Module	186
8-3	Block Diagram of the DS1 Output Module	188
8-4	Front Panel of the DS1 Output Module	189
8-5	Block Diagram of the Composite Clock Output Module	192
8-6	Front Panel of the Composite Clock Output Module	193
8-7	Using the Hex Number to Identify Output Ports.	197
8-8	Block Diagram of the E1/2048 kHz Output Module	199
8-9	Front Panel of the E1/2048 kHz Output Module	200
8-10	Using the Hex Number to Identify Output Ports.	204
8-11	Block Diagram of the 2048 kHz Output Module.	206
8-12	Front Panel of the 2048 kHz Output Module	207
8-13	Using the Hex Number to Identify Output Ports.	211
8-14	Block Diagram of the RS-422 Output Module	213
8-15	Front Panel of the RS-422 Output Module.	214
8-16	Front Panel of the Buffer Module.	216
9-1	Timing Sync Generator (TSG) System Configuration	220
9-2	SSU-2000e Configured as PRS System	221
9-3	SSU-2000e Configured as Monitor Only System.	221
9-4	SSU-2000e Main Shelf, Front View	222
9-5	SDU-2000e Expansion Shelf, Front View	226
A-1	Alarm and Event Message Structure	230
C-1	GPS Antenna with Internal LNA	379

D-1	SSU-2000e Front Panel	394
D-2	Wire-Wrap Adapter	395
D-3	BNC to SubD 9-Pin Adapter	396
D-4	Power, Return, and Ground Connection Pinouts	398
D-5	Communications Connector Pinouts	399
D-6	Antenna Signal Connectors	400
D-7	Alarm Contact Closures and Pin Assignments	401
D-8	Four-Wire Connection Block Diagram	402
D-9	Input and Load DE9 Connectivity	403
D-10	DE9 Connector Pinout	406
D-11	SDU Interface and Backup Clock Connector Pinout	407
D-12	SSU-2000e Front Panel Connectors	408

Tables

1-1	Module Slot Locations	39
1-2	Clock Input Connector to Input Module Relationship	42
1-3	Clock Output Connector to Output Module Relationship	44
1-4	Local and Remote Alarm Connector Pin Assignments	45
1-5	Serial Port Connector Pin Assignments	47
1-6	Ethernet Connector Pinouts	48
1-7	Communications Module Software Versions	54
1-8	ANSI SSM Quality Level Definitions	56
1-9	ITU SSM Quality Level Definitions	57
1-10	Expansion Shelf Addressing	62
2-1	Communications Port Assignments	74
2-2	Ethernet Connector (J3) Pinouts	76
2-3	Communication Requirements for Control Input and Output	77
2-4	Alarm Contact Pin Assignments	78
2-5	Input Module Slot to Connector Relationship	81
2-6	Output Module Slot to Connector Relationship	82
2-7	Module Slot Addresses	83
2-8	Clock Output DE9 Connector Pin Assignments	90
2-9	Output Module Slot to Connector Relationship	90
2-10	Module Slot Addresses	91
2-11	Power LED Indications	92
3-1	Communications Port Assignments	96
3-2	User Access (Security) Levels	99
4-1	SSU-2000e Readiness Checklist	112
4-2	Commissioning Test Data Sheet - SSU	118
4-3	SDU-2000e Readiness Checklist	119
4-4	Commissioning Test Data Sheet - SDU	121
5-1	SSU Corrective Action Table	126
5-2	SDU Corrective Action Table	126
5-3	SSU-2000e Troubleshooting Procedures	129
5-4	SDU-2000e Troubleshooting Procedures	132
6-1	Stratum 2E Clock Module Status LED Indicators	138
6-2	Stratum 2E Clock Module Specifications	139
6-3	Stratum 2E Clock Module Options/Defaults	140
6-4	Stratum 3E Clock Module Status LED Indicators	143
6-5	Stratum 3E Clock Module Performance Specifications	144

6-6	Stratum 3E Clock Default Values and Ranges.	145
6-7	Type I Clock Module Status LED Indicators.	147
6-8	Type I Clock Module Specifications	148
6-9	Type I Clock Module Options/Defaults.	149
6-10	Communications Module Status LED Indicators	152
6-11	Communications Module Alarms	154
6-12	Communications Module Configuration Data	154
7-1	E1 Input Module Alarm Modes.	161
7-2	E1 Input Module Event Reporting	164
7-3	E1 Input Module Status LED Indicators	165
7-4	E1 Input Module Configuration	166
7-5	DS1 Input Module Alarm Modes	170
7-6	DS1 Input Module Event Reporting	173
7-7	DS1 Input Module Status LED Indicators.	174
7-8	DS1 Input Module Configuration	175
7-9	GPS Input Module Status LED Indicators	178
7-10	GPS Input Module Configuration Settings	179
7-11	Composite Clock Input Module Status LED Indicators	181
7-12	Composite Clock Input Module Configuration Settings	182
8-1	E1 Output Module Status LED Indicators	186
8-2	E1 Output Module Performance Specifications	187
8-3	DS1 Output Module Status LED Indicators	190
8-4	DS1 Output Module Performance Specifications.	190
8-5	Composite Clock Output Module Status LED Indicators	193
8-6	Composite Clock Output Module Performance Specifications.	194
8-7	Identifying Failed Ports from the Hex Digit.	197
8-8	E1/2048 kHz Output Module Status LED Indicators	200
8-9	E1/2048 kHz Output Module Specifications.	201
8-10	E1/2048 kHz Output Module Configuration	202
8-11	Identifying Failed Ports from the Hex Digit.	204
8-12	2048 kHz Output Module Status LED Indicators	207
8-13	2048 kHz Output Module Specifications	208
8-14	Identifying Failed Ports from the Hex Digit.	211
8-15	RS-422 Output Module Status LED Indicators.	214
8-16	RS-422 Output Module Performance Specifications	215
8-17	RS-422 Output Module Configuration	215
8-18	Buffer Module Status LED Indicators.	217
9-1	SSU-2000e System Components	223
9-2	SDU-2000e System Components	227

A-1	Clock Module Alarm Messages	231
A-2	Communications Module Alarm Messages	232
A-3	DS1/E1 Input Module Alarm Messages	233
A-4	GPS Input Module Alarm Messages	234
A-5	Composite Clock Input Module Alarm Messages	236
A-6	DS1/E1 Output Module Alarm Messages	236
A-7	Composite Clock Output Module Alarm Messages	237
A-8	2048 kHz Output Module Alarm Messages	239
A-9	E1/2048 kHz Output Module Alarm Messages	240
A-10	RS-422 Output Module Alarm Messages	241
A-11	Module Event Messages	242
B-1	Module and Software Revision Levels	251
B-2	Communications Module Software Versions	252
B-3	Denied Response Error Codes	258
B-4	User Access Levels	261
B-5	TL1 Retrieve Commands	261
B-6	TL1 Set Commands	290
B-7	Other TL1 Commands	300
B-8	Shelf Configuration Information	314
B-9	Communications Module Software Versions	375
C-1	GPS Antennas with Internal LNA	379
C-2	GPS Antennas with Internal LNA Specifications	380
C-3	26dB Antenna Accessories	380
C-4	40dB Antenna Accessories	381
C-5	48dB and 68dB Antenna Accessories	381
C-6	FCC-250B-90-1.5NFNF Specifications	382
C-7	GPS L1 Inline Amplifier Specifications	383
C-8	Optional Antenna Coaxial Cable Crimper Kits	384
C-9	Antenna Cable Specifications	384
C-10	Antenna Signal Connections	385
C-11	Optional Accessories	392
D-1	Input and Output Adapter Connectors	395
D-2	Input/Output Wire-Wrap Adapter Pinouts (22013085-000-0)	396
D-3	Input Adapter Pinouts (121-00581-01)	396
D-4	Output Adapter Pinouts (121-00581-02)	397
D-5	Input/Output Transformer Adapter Pinouts (551019-0005)	397
D-6	Output Adapter Pinouts (551019-0006)	397
D-7	Input Adapter Pinouts (551019-0007)	398
D-8	Signal Names and Definitions for Power and Ground	398
D-9	Signal Names and Locations for Communications Interfaces	399

D-10	Antenna Signal Connections A3 and A5	400
D-11	Alarm Contact Pin Assignments	401
D-12	Input Signal DE9 Connections	403
D-13	Output Signal DE9 Connections	406
D-14	Shelf Module Slot Addressing and Size Assignments	406
D-15	Signal Names and Locations for SDU-2000e Interface	407
D-16	I/O Connector Grounding	408
E-1	Communications Module Factory Default Settings	412
E-2	Stratum 2E and 3E Clock Module Default Settings	412
E-3	DS1 and E1 Input Module Default Configuration	413
E-4	DS1 Input Module – MTIE Limits	415
E-5	E1 Input Module – MTIE Limits	415
E-6	DS1 and E1 Output Module Default Settings	416
E-7	GPS Input Module Default Configuration Settings	417
E-8	2048 kHz Output Module Configuration	417
E-9	E1/2048 kHz Output Module Configuration	418
E-10	Composite Clock Input Module Configuration	419
E-11	Composite Clock Output Module Configuration	420
E-12	Default PQL Values	420
E-13	User Changes to Factory Default Settings	421
F-1	General Specifications	426
F-2	Normal Operating Conditions	431
F-3	Exceptional Operating Conditions	431
F-4	Power Input Specifications	432
F-5	Input Signal Specifications	432
F-6	Output Signal Specifications	433
F-7	SDU-2000e System Specifications	435

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](#)

Purpose of This Guide

The *SSU-2000e User's Guide* describes the procedures for unpacking, installing, using, maintaining, and troubleshooting the Symmetricom SSU-2000e Synchronization Supply Unit (SSU-2000e). It also includes appendixes that describe alarms and events, the languages that you use to communicate with the SSU-2000e, 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-2000e](#), 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's Guide* is designed for the following categories of users:

- **Systems Engineers** – [Chapter 1](#) provides an overview of the SSU-2000e. 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 Appendixes provide detailed information and procedures to ensure proper installation, turn-up, operation, configuration, and testing of the SSU-2000e.
- **Maintenance Engineers** – [Chapter 5](#) and the Appendixes 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-2000e system, others, such as [Chapter 2](#) through [Chapter 9](#) contain detailed information and instructions which are intended to be performed by *qualified personnel only*.

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-2000e	Contains procedures for unpacking and installing the product, and for powering up the unit.
Chapter 3, Provisioning and Operating the SSU-2000e	Describes the ICS and TL1 commands required to provision the SSU-2000e after installing the unit.
Chapter 4, Commissioning the SSU-2000e	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 and Communications Module Reference Data	Provides detailed information on the Communications module and the various Clock modules available for use in the SSU-2000e.
Chapter 7, Input Module Reference Data	Contains detailed information on the Input modules available for use in the SSU-2000e.
Chapter 8, Output Module Reference Data	Describes the Output modules available for use in the SSU-2000e and in the SDU-2000e.
Chapter 9, Hardware Configuration Guide	Describes how to configure the SSU-2000e 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 software interface with the SSU-2000e.
Appendix C, Antennas	Provides procedures for installing a GPS antenna and connecting it to the SSU-2000e.
Appendix D, Connector Pinouts	Lists the pinout of the connectors on the rear panel of the SSU-2000e.
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-2000e
Appendix G, Reference Materials	Contains a listing of standards relating to synchronizing telecommunications networks.
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:
<i>SSU-2000e User's Guide</i>	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 <i>re-timing</i> application	A word or term being emphasized.
Symmetricom does not recommend...	A word or term given special emphasis.

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.

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-2000e. 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 C 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-2000e at startup, see [Initial Provisioning](#), on page 102
- 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

Chapter 1 Product Overview

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

In This Chapter

- [Overview](#)
- [Typical System Configurations](#)
- [System Architecture](#)
- [System Components](#)
- [Communications Protocol](#)
- [Overview of SSU-2000e Operation](#)
- [Indicators and Controls](#)
- [SDU-2000e Synchronization Distribution Unit](#)

Overview

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

- SSU-2000e Synchronization Supply Unit
- SSU-2000e family of modules
- SDU-2000e Expansion Shelf (up to four units), shown in [Figure 1-12](#)
- Various mounting accessories, cabling accessories and other accessories as described in [Appendix C, Antennas](#)

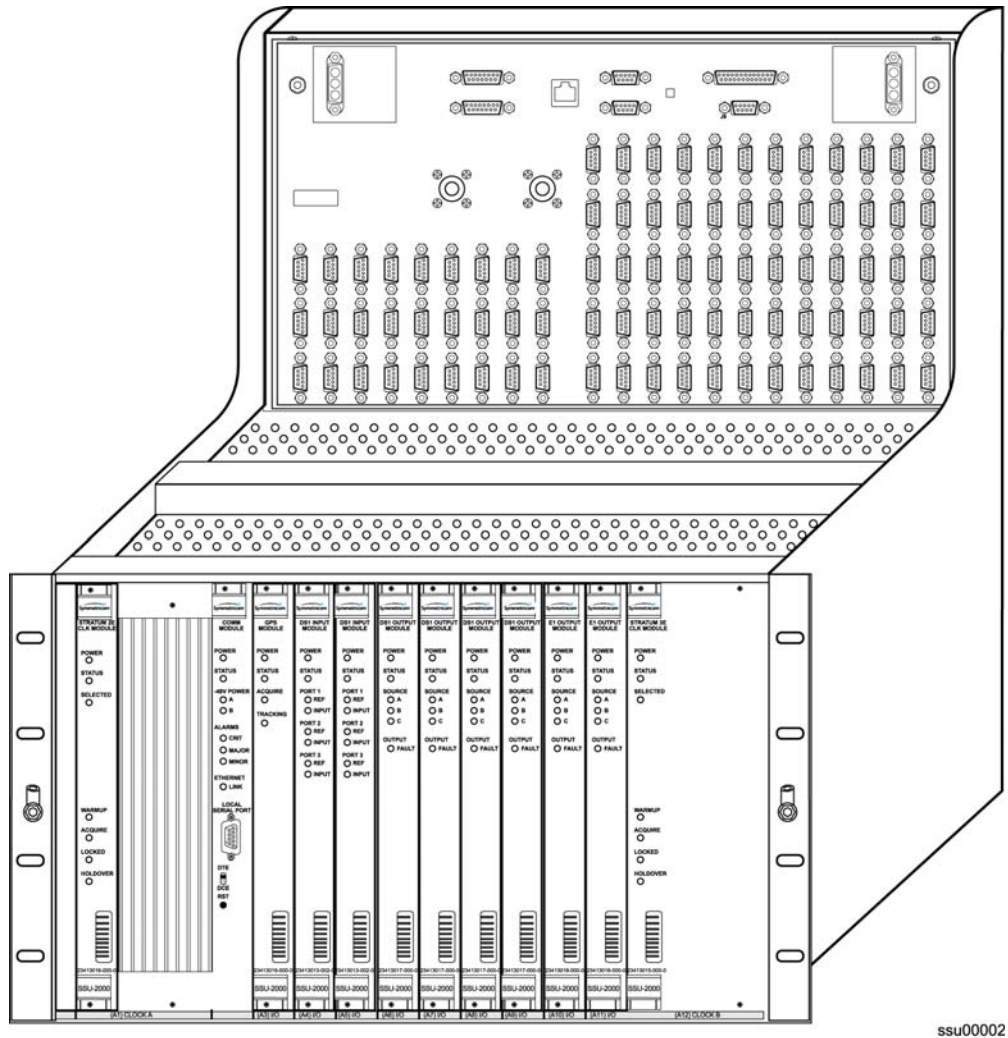


Figure 1-1. SSU-2000e Synchronization Supply Unit

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

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

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

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

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

Typical System Configurations

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

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

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.

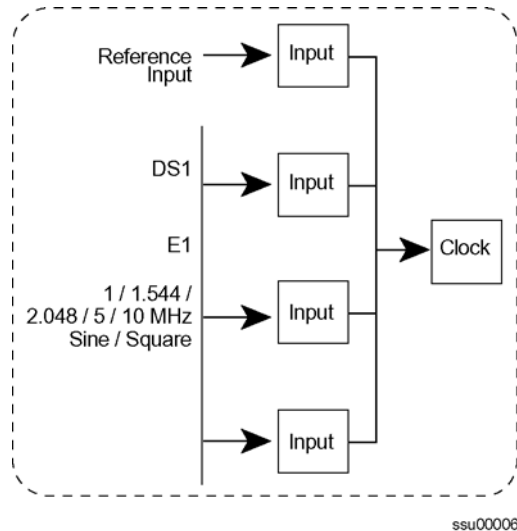


Figure 1-2. SSU-2000e in TSG Configuration

Primary Reference Source (PRS) Configuration

In a Primary Reference Source (PRS) configuration ([Figure 1-3](#)), the SSU-2000e meets the specifications defined for ETSI Type II Transit Node Clocks in American National Standards Institute (ANSI) T1.101-1999. ANSI defines a Primary Reference Source as “equipment that provides a timing signal whose long term accuracy is maintained at $1 \times 10E^{-11}$ 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.

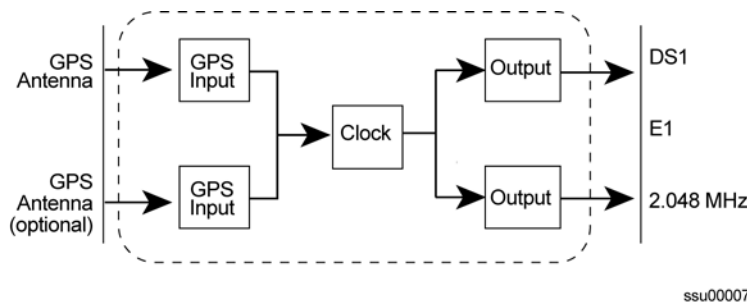


Figure 1-3. SSU-2000e Configured as a Primary Reference Source

SSU-2000e Configured as a Monitor-Only System

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

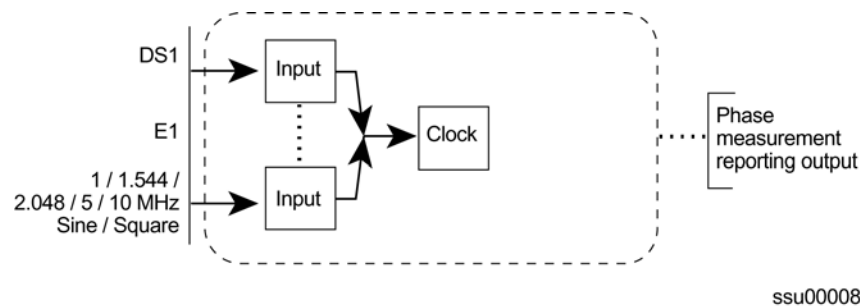


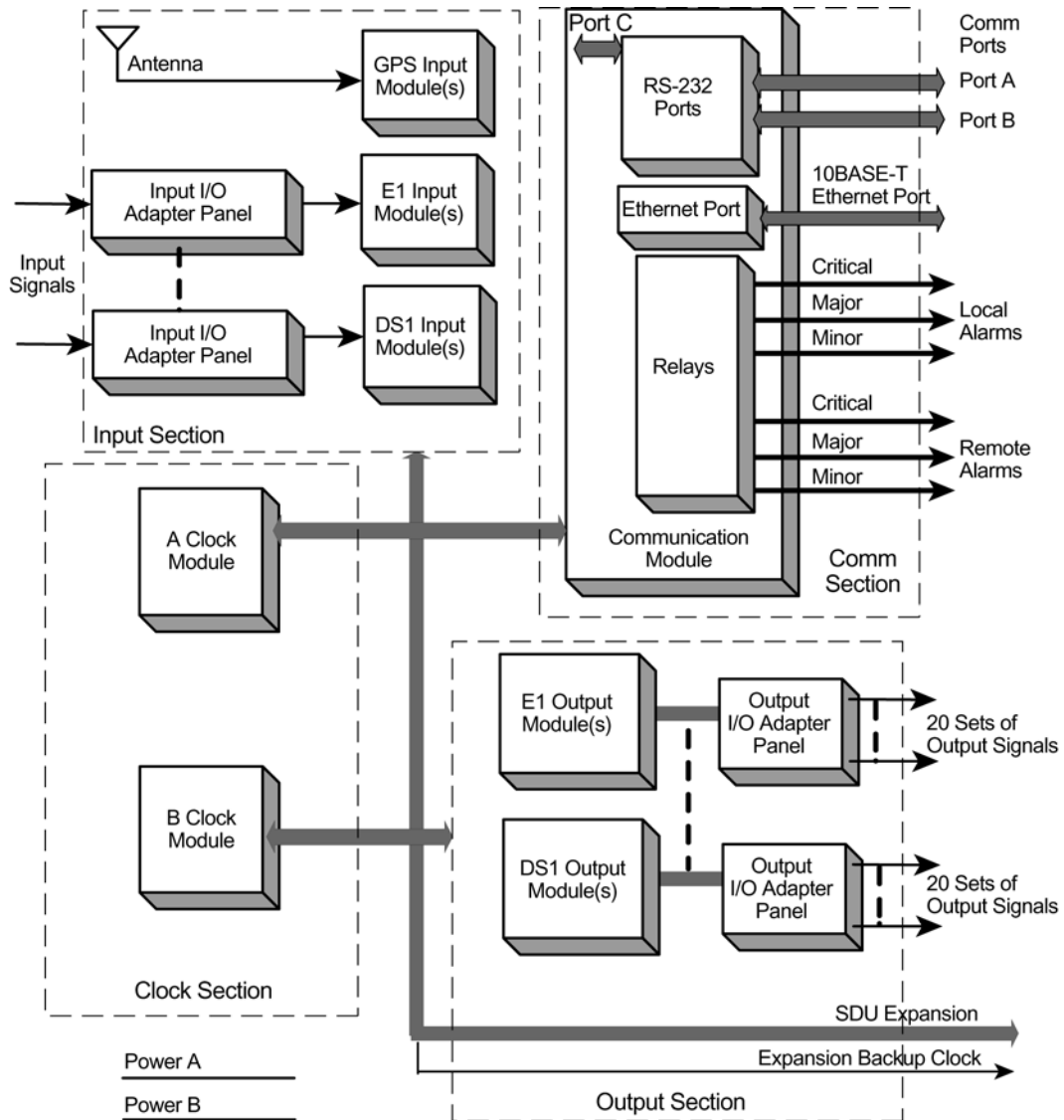
Figure 1-4. SSU-2000e Configured as a Monitor Only System

System Architecture

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

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

A simplified system block diagram for the SSU-2000e is shown in [Figure 1-5](#).



ssu00009

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

As indicated in [Figure 1-5](#), the SSU-2000e consists of four major sections:

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

Input Section

The input section consists of one or more (maximum of three) Input modules that are connected to reference signals and 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 make phase measurements between the input signal and the clock oscillator(s). From these phase measurements, the Input modules compute frequency offset and wander of the input signals. Wander is reported in terms of Maximum Time Interval Error (MTIE) and Time Deviation (TDEV). The data is then stored for use in the SSU-2000e and reported through the Communications module. 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-2000e uses:

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

You can provision the SSU-2000e 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.

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 these parameters.

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 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 56.

Setting the Reference Switching Mode

There are two reference selection modes available: 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.

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-2000e 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-2000e 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-2000e 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 37.

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.

Output Section

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

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

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-2000e controls clock frequency by adjusting the control value of the Direct Digital Synthesis (DDS) function in each Clock module. The adjustments are processor-controlled and based on measurements performed and computed in the input module(s). Internal clock modules may be Stratum 2E and Stratum 3E. Outputs 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-2000e system and generate local and remote alarms when fault conditions are detected. The SSU-2000e can continue to function seamlessly without the Communications module (Clock modules assume the system controller function), but all communications and alarm reporting functions are interrupted.

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

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

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

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

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



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

Alarms and Events

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

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

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

- Display on the module LEDs
- Relay contact closures on the back of the SSU-2000e chassis
- Messages transmitted on all communications ports

All Alarm indications clear when the condition(s) that caused them no longer exist. In a case where a module in alarm is unplugged from the system, the ICS command CONFIG xAy REMOVE clears the module's active alarms. See [CONFIG](#), on page 317. 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 [CONFIG](#), on page 317.

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

The DELAY option sets the length of time in seconds an alarm must be active before generating a hardware indication. This option also allows 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 the 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 or Craft intervention is required. MINOR and MAJOR alarms can be elevated automatically to the next higher level after a user-settable time period.

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 (Critical)

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

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

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



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

SSU-2000e Main Shelf (Chassis)

The SSU-2000e 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 chassis that are not fully populated.

Module Assignments

All SSU-2000e modules are equipped with card ejectors and plug in from the front of the chassis. Each module is secured in the chassis with captive fasteners. The module assignments for the SSU-2000e main chassis are listed in [Table 1-1](#) and shown in [Figure 1-6](#).

Table 1-1. Module Slot Locations

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

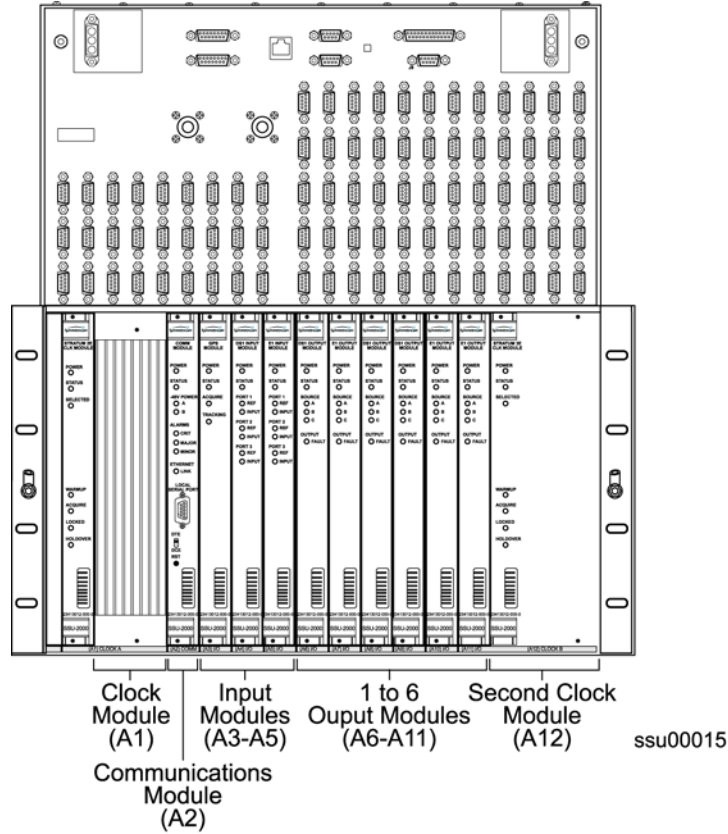


Figure 1-6. SSU-2000e Module Chassis Slot Assignments

As indicated in [Figure 1-6](#), the SSU-2000e modules are assigned slots A1 through A12, numbered left to right as viewed from the front of the chassis. The first or left-most slot, A1, is assigned to the primary Clock module (Clock A). Slot A2 is assigned to the Communications module and slots A3 through A11 are assigned to various combinations of Input modules and Output modules. Slot A12 is reserved for the B Clock module.

Main Shelf Connections

All connections to and from the SSU-2000e are made on the upper front panel of the SSU-2000e main shelf, as shown in [Figure 1-7](#).

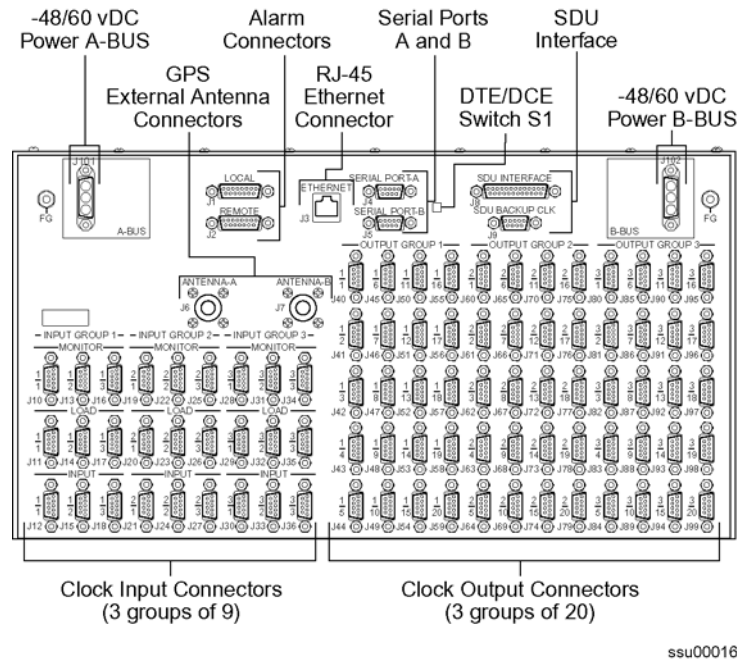


Figure 1-7. SSU-2000e Upper Front Panel Connections

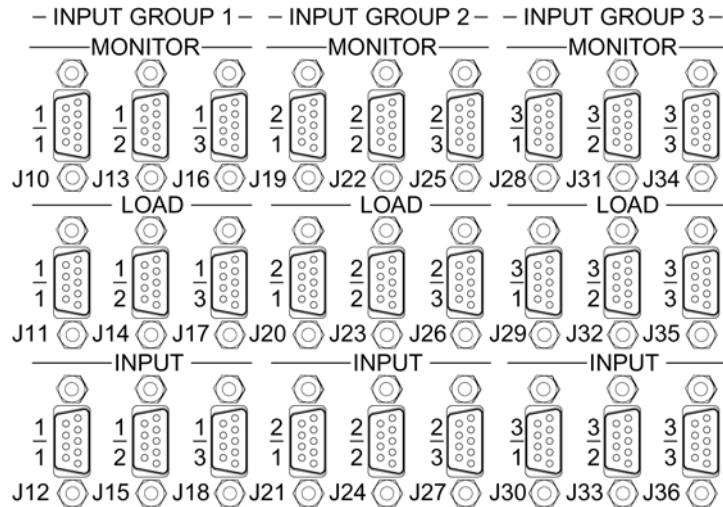
The SSU-2000e main shelf contains the following connection features:

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

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

Clock Input Connectors

The upper half of the SSU-2000e contains three groups of nine Clock input connectors, as shown in Figure 1-8. Each group of nine connectors includes three monitor connectors, three load connectors and three input connectors. Connections for Input Group 1 are made in connectors J10 through J18. Connections for Input Group 2 are made in connectors J19 through J27, and the connections for Input Group 3 are made in connectors J28 through J36.



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Figure 1-8. Clock Input Connector Groups

The three input groups map directly to the Input modules installed in slots A3 through A5 as listed in Table 1-2.

Table 1-2. Clock Input Connector to Input Module Relationship

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

Table 1-2. Clock Input Connector to Input Module Relationship (Continued)

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

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

The Monitor connectors are connected as 20 dB monitors to each attached clock reference input signal, as shown in [Figure 1-9](#).

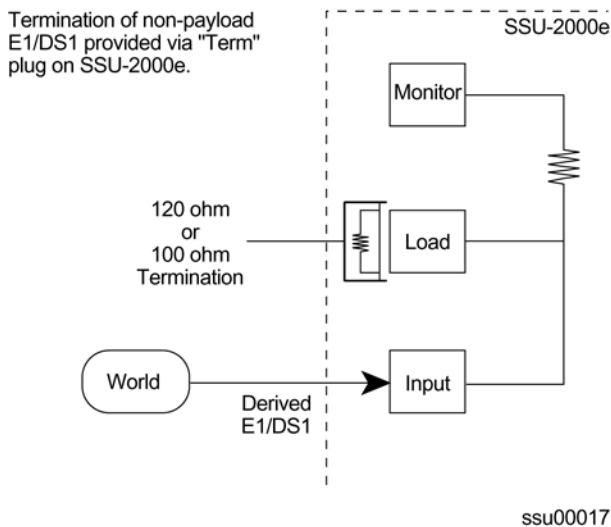


Figure 1-9. SSU-2000e Input Connector Scheme

Output Clock Connectors

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

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

Table 1-3. Clock Output Connector to Output Module Relationship

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

Alarm Closure Contacts

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

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

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

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

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

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

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

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

Table 1-4 lists the local and remote alarm connector pin assignments.

Table 1-4. Local and Remote Alarm Connector Pin Assignments

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



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

Main Shelf Power Connections

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

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

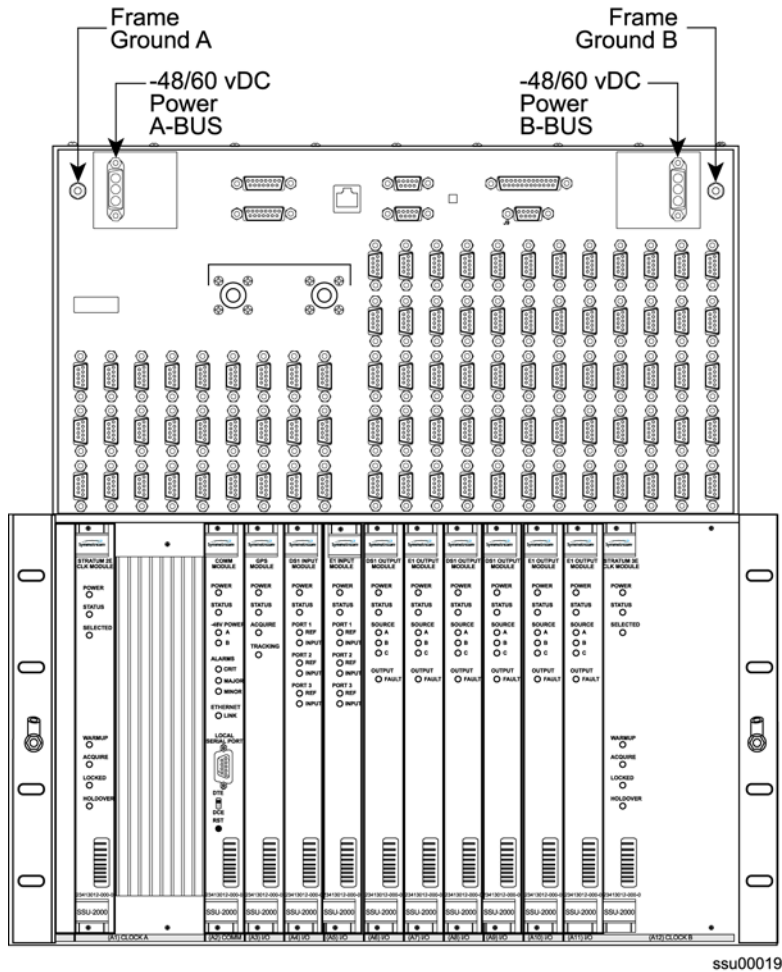


Figure 1-10. SSU-2000e Power Connections

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

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

Antenna Connectors

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

Main Shelf Communications Ports

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

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

The user interface provides various levels of password-protected access for configuration and detailed performance monitoring and diagnostics. Use either the ASCII interactive command set or the TL1 user interface to configure and view detailed performance monitoring, see [Appendix B, Communications Protocol](#). The operator assigns an interface type to the remote EIA-232 ports, either interactive or TL1. When assigned, this information is retained in NVRAM. The Local port on the Communications module is always in Interactive mode when the module restarts.

Serial Port Pinouts

[Figure 1-11](#) shows the EIA-232 connector pin assignments for the serial ports.

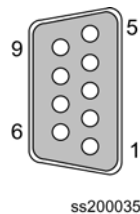


Figure 1-11. Serial Port Connector Pins

[Table 1-5](#) describes the EIA-232 connector pin assignments for the serial ports.

Table 1-5. Serial Port Connector Pin Assignments

Signal	Pin
DCD (Data Carrier Detect) Control Line	1
RXD (Received Data)	2
TXD (Transmitted Data)	3
DTR (Data Terminal Ready Control Line)	4
Ground	5
DSR (Data Set Ready Control Line)	6
RTS (Request to Send Control Line)	7
CTS (Clear to Send Control Line)	8
RI (Ring Indicator Control Line)	9



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

Ethernet Connector Pinouts

The Ethernet (10baseT) pinouts are provided in [Table 1-6](#).

Table 1-6. Ethernet Connector Pinouts

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

SSU-2000e Family of Modules

The SSU-2000e 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
- Composite Clock Input Modules
- E1 Output Module
- DS1 Output Module
- Composite Clock Output Module
- E1/2048 kHz Output Module
- 2048 kHz Output Module
- RS-422 Output Module
- Buffer Modules

Some of the features common to each module 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 status LEDs on their front panel.
- All modules are equipped with ejector tabs for ease of installation and removal and secured in place with captive screws to provide module security and reduce the occurrence of unauthorized removal.
- All SSU-2000e 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 6, Clock Module and Communications Module Reference Data](#), [Chapter 7, Input Module Reference Data](#), and [Chapter 8, Output Module Reference Data](#).

Clock and Communications Modules

Stratum 2E Clock Module

The Stratum 2E Clock module uses a Rubidium oscillator and meets the ITU-T and ETSI specifications for Type II Transit Node clocks. This clock also meets the requirements of ANSI and Telcordia Industries (Bellcore) for Stratum 2 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 138.

Stratum 3E Clock Module

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

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 143.

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 I Clock Module](#), on page 147.

Communications Module

The Communications module serves as the user interface to the SSU-2000e. The module command interface supports three EIA-232-C connections and one Ethernet interface for communication with the SSU-2000e 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 151.

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-2000e. The Clock modules use this information to phase and frequency lock to the incoming signal. The data may also be used for monitoring the frequency of incoming signals.

The 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 160, and [1-Port and 3-Port DS1 Input Modules](#), on page 169.

GPS Input Module

The GPS Input module is a one-port card that can only be installed in the SSU-2000e 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 178, 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 181.

When the SSU-2000e 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-2000e main shelf backplane to generate a phase-locked signal of 2.048 MHz. If the unit is inserted into an SDU-2000e expansion shelf, a fourth 4 kHz clock (D clock) is available. The phase-locked 2.048 MHz signal is used to generate a set of 20 output signals for distribution to large networks. See [E1 Output Module](#), on page 186, 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-2000e main shelf. If the module is inserted into the SDU-2000e 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 190, contains detailed information on the module.

Composite Clock Output Module

The Composite Clock (CC) Output module can be installed in the SSU-2000e 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 193.

E1/2048 kHz Output Module

The E1/2048 kHz Output module can be installed in the SSU-2000e to generate and monitor 20 independent E1/2048kHz output signals. If the module is inserted into an SDU-2000e 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 197.

2048 kHz Output Module

The 2048 kHz Output module plugs into selected input/output slots in the SSU-2000e 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 204.

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 211.

Buffer Module

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-2000e. Symmetricom recommends a minimum of one Buffer module in each expansion shelf; a second Buffer module provides redundancy.

Communications Protocol

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

Software Interface

There are four methods of controlling the SSU-2000e. The interfaces 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-2000e system. These tasks include configuring and provisioning security, monitoring system performance, configuring hardware, locating and handling faults, and performing equipment diagnosis and testing. Refer to [TL1 Command Interface](#), on page 254, 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-2000e system from a terminal connected to one of the SSU-2000e EIA-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 304,

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-2000e implements the NTP v.3 (RFC 1305) version. It can run as a server application and a client application. In addition, a broadcast mode may be implemented as either a server or client. The NTP server always runs and the client and broadcast modes are enabled independently by assignment of addresses and setting of timers. Refer to [NTP Support, on page 371](#), for more information.

SNMP – Simple Network Management Protocol

The SSU-2000e 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.

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

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

All reports, queries, autonomous messages, control, provisioning, and administration (except for communication port parameters, Set User ID/Password, Set IP assignments, Reset connection, and SNMP community settings) are available through SNMP. Refer to [SNMP Protocol](#), on page 373, for more information.

Software Versions

There are six different versions of software available for the SSU-2000e, see [Table 1-7](#). The functionality and commands that are available vary from one version of software version to the next, depending on the specific features of the software package, see [Appendix B, Communications Protocol](#), for more information.

Table 1-7. 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

Basic System Load

The basic system load includes all TL1 and ICS support software. TL1 provides command sets to support all operation, administration, maintenance, and provisioning tasks required to maintain and control an SSU-2000e system. These tasks include configuring and provisioning security, monitoring system performance, configuring hardware, locating and handling faults, and performing equipment diagnosis and testing. Refer to [TL1 Command Interface](#), on page 254, for more information.

ICS also provides command sets to support all operation, administration, maintenance, and provisioning tasks required to maintain and control an SSU-2000e system from a terminal connected to one of the SSU-2000e EIA-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 304, for more information.

Adding NTP Support

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

The SSU-2000e implements the NTP v.3 (RFC 1305) version. It can run as a server application and a client application. In addition, a broadcast mode may be implemented as either a server or client. The NTP server always runs and the client and broadcast modes are enabled independently by assignment of addresses and setting of timers. Refer to [NTP Support, on page 371](#), for more information.

Adding SNMP

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

The SSU-2000e SNMP is an SNMP V3 agent that requires Ethernet connectivity. If SNMP is present, port 161 becomes the port of standard SNMP interactive communications, while port 162 becomes the trap port. Since the SSU-2000e SNMP supports all exiting functions, full system control of the SSU-2000e is maintained through SNMP.

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

All reports, queries, autonomous messages, control, provisioning, and administration (except for communication port parameters, Set User ID/Password, Set IP assignments, Reset connection, and SNMP community settings) are available through SNMP. Refer to [SNMP Protocol](#), on page 373, for more information.

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

Overview of SSU-2000e Operation

After initial installation and configuration is completed, the SSU-2000e is capable of unattended operation. After power-up, where the external power supplies are turned on so that they supply power to the main shelf, the SSU-2000e performs a self-diagnostic test routine and properly initializes the hardware. Any active Alarms are time tagged and reported as Events. All Events are time tagged and the last 500 Events are stored in NVRAM. All Events can be cleared by the user with the appropriate access level. Several optional levels of password protection are available for system protection as described in [Chapter 2, Installing the SSU-2000e](#).

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

Synchronization Status Messages (SSMs)

The SSU-2000e supports input and outputs SSMs. SSMs provide clock quality information to any equipment that uses synchronization inputs. [Table 1-8](#) describes the ANSI SSM values and the traceability associated with each value. [Table 1-9](#) describes the ITU SSM values and the traceability associated with each value.

Table 1-8. 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

Table 1-9. 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-2000e handles SSMs in accordance with T1X1.3 TR33, T1.101-1999, GR-253, and 379-CORE.

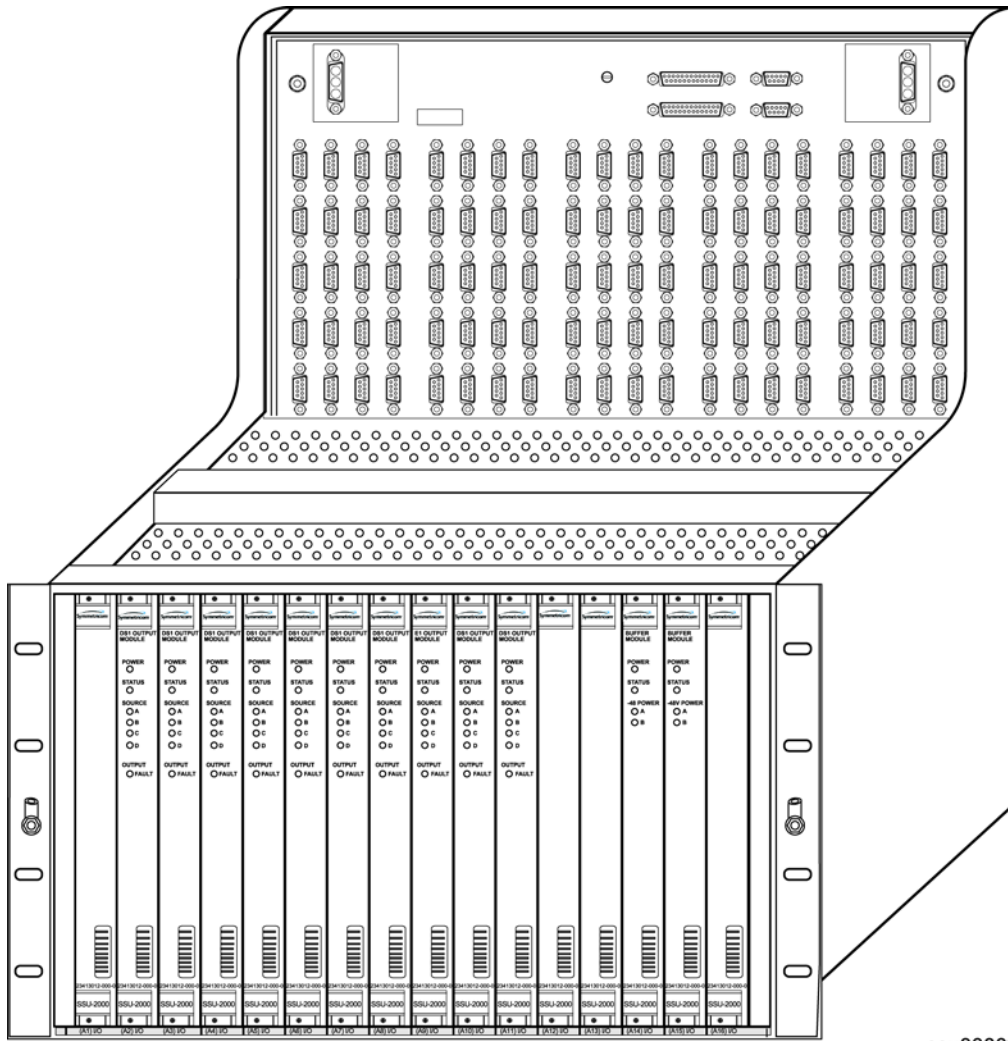
Indicators and Controls

All modules installed in the SSU-2000e main shelf and the SDU-2000e expansion shelf contain status indicator lamps for displaying status. The LED indicators for each module are described in [Chapter 6, Clock Module and Communications 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.

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

SDU-2000e Synchronization Distribution Unit

The SDU-2000e Synchronization Distribution Unit ([Figure 1-12](#)) is an expansion chassis that attaches to an SSU-2000e Synchronization Supply Unit and is used to generate additional output signals. The expansion chassis uses the framing and synchronization features of the SSU-2000e main chassis to drive an array of Output modules. Communication with the expansion chassis is performed through one of the three serial ports, or through the ethernet port on the main chassis front panel.



ssu00003

Figure 1-12. SDU-2000e Synchronization Distribution Unit

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

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

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

Figure 1-13 shows a simplified functional block diagram of the SDU-2000e expansion chassis.

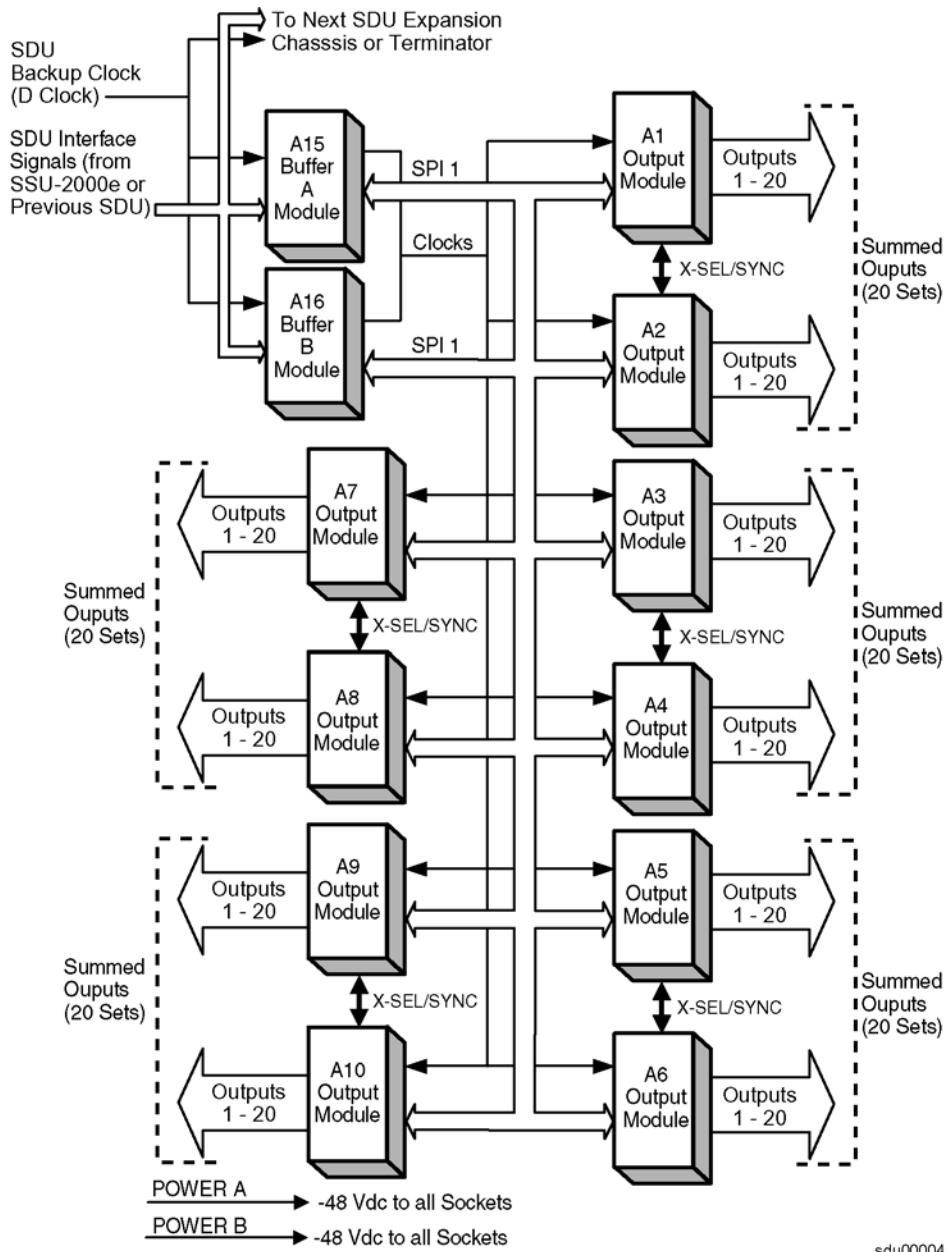


Figure 1-13. SDU-2000e Block Diagram

Functional Overview

The SDU-2000e interfaces with the SSU-2000e main shelf in two-way communications through the SSU/SDU interface cables and receives synchronization clocks that are buffered and used to produce the differential output signals at the connector panel, as shown in the functional block diagram in [Figure 1-13](#). A second interface cable supplies the SDU-2000e chassis with a backup clock (D Clock) which can sustain the expansion shelf even if the main cable is accidentally disconnected. An address switch on the connector panel of the expansion shelf identifies each additional shelf to the main shelf for status and firmware downloading purposes.

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

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

Output modules are available to support the following formats:

- 2048 Kbit/s (E1)
- DS1, SF (D4) and ESF
- 2048 kHz
- Composite Clock (64/8 kHz)
- RS-422

Expansion Shelf Features

The SDU-2000e expansion shelf consists of the following major components and is shown in [Figure 1-14](#).

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

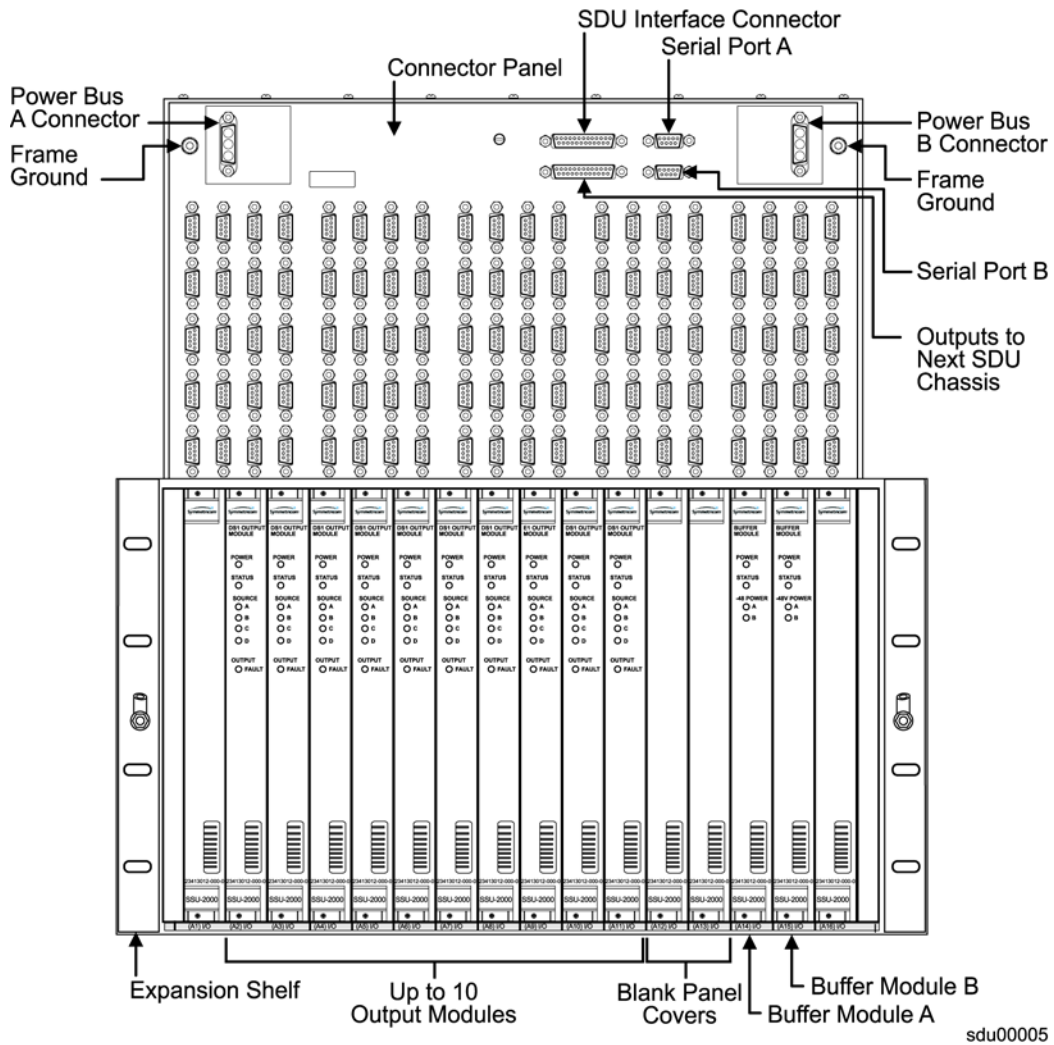


Figure 1-14. SDU-2000e Expansion Chassis Components

Clock Source

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

SDU Backup Clock

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

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

When installing an expansion chassis, move the clock terminator from J9 on the SSU-2000e, or connector J106 from a previous SDU-2000e expansion chassis, and install the terminator on J106 of the last expansion chassis in the daisy chain, see [Figure 1-15](#).

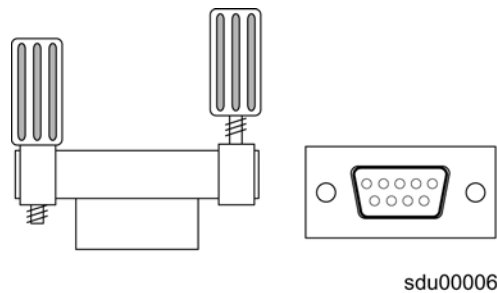


Figure 1-15. Backup Clock Terminator, Side and Front Views

Setting the Expansion Shelf Address

Each SDU-2000e expansion chassis 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 1-10](#).

Table 1-10. Expansion Shelf Addressing

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

Buffered Clocks

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

SDU Module Features

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

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

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

Other common module features include:

- Any module can be inserted or removed while power is applied without affecting the operation of other modules in the system
- All modules are individually fused to protect the system in case of a short circuit on any one module
- The SSU-2000e and the SDU-2000e share common Output modules
- All modules have front panel LED status indicators
- All modules are equipped with ejector tabs for ease of installation and removal
- All modules are secured in place with captive screws to provide module security and reduce the occurrence of unauthorized removal
- All modules, except the Buffer module, have an integrated CPU with firmware and are software configured through the SSU-2000e, see [Configuring a Conventional SSU/TSG System](#), on page 222, 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.

Connector Panel Features

The expansion chassis provides front-accessible connections for external power, grounding, clock inputs, and output connections. All modules plug in from the front of the chassis. [Figure 1-16](#) shows the SDU-2000e connection features.

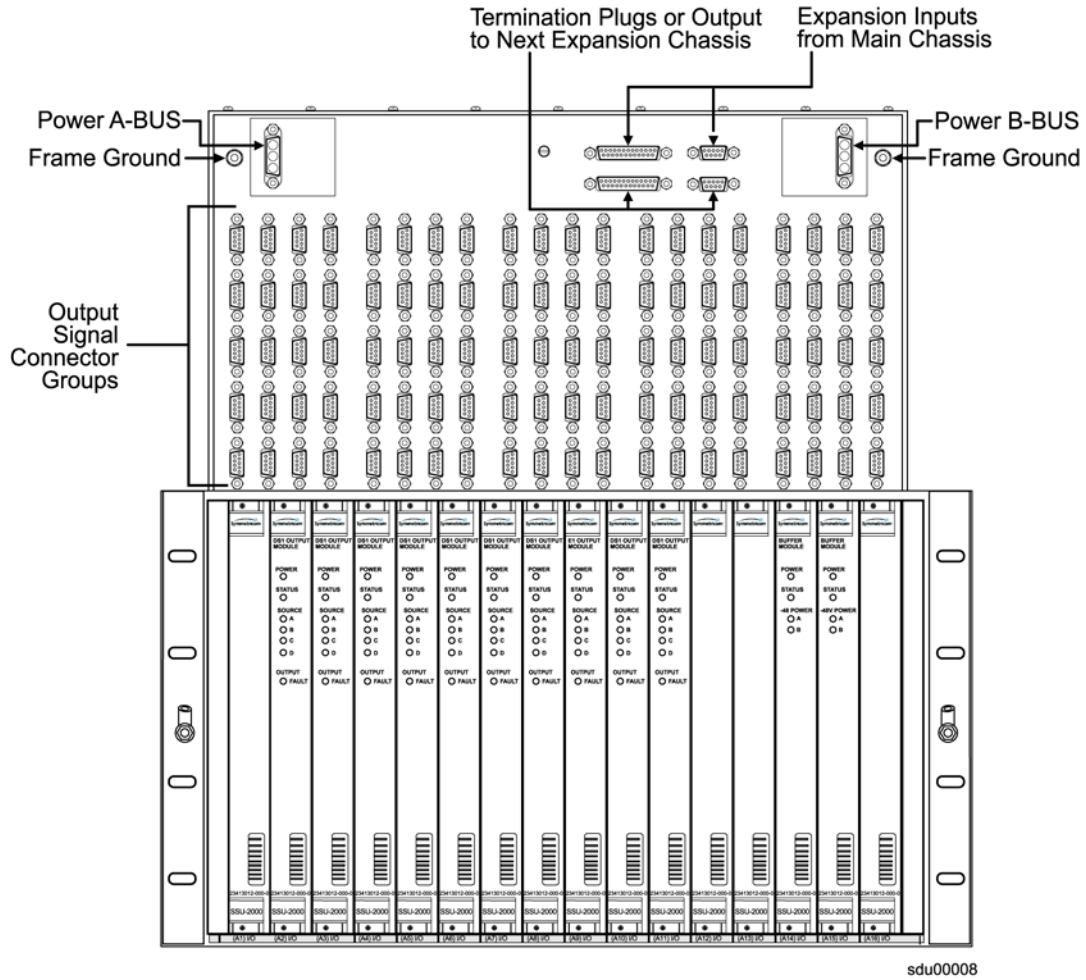


Figure 1-16. SDU-2000e Connection Features

Power Input and Grounding

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

Expansion Connectors

Up to four SDU-2000e expansion shelves can be attached to the SSU-2000e main shelf. The two terminators (SSU Expansion Terminator and SDU Backup Clock Terminator) must be moved from the SSU-2000e chassis (connectors J8 and J9) to connectors J105 and J106, respectively, on the last expansion chassis in the daisy chain. A simplified expansion cabling diagram is shown in [Figure 1-17](#).

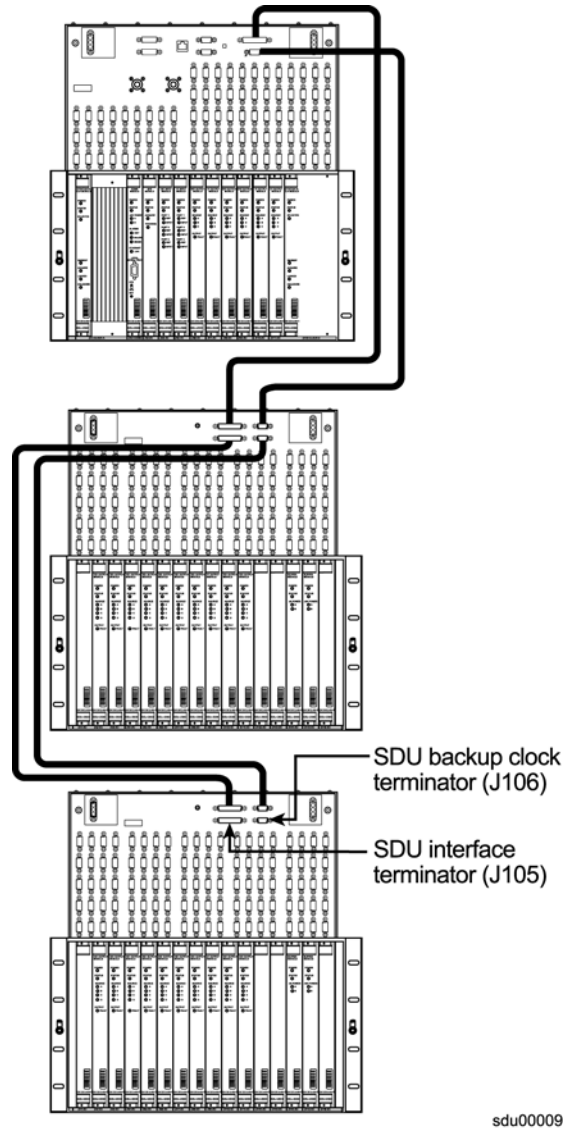


Figure 1-17. Expansion Chassis Cabling

Output Module Redundancy Configurations

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

Controls and Indicators

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

Chapter 2 Installing the SSU-2000e

This chapter provides guidelines and procedures for installing the SSU-2000e Synchronization Supply Unit and bringing the unit on-line after installing it.

In This Chapter

- Unpacking and Inspecting the Shelf
- Preliminary Procedures
- Rack Mounting the SSU-2000e
- Making Ground and Power Connections
- Making Communications Connections
- Making Alarm Connections
- Installing SSU-2000e Modules
- Connecting Antennas
- Installing the SDU-2000e
- SDU Clock Outputs
- Installing SDU Modules
- Installation Checklist
- Applying Power to the SSU-2000e
- SSU-2000e Turn-Up Procedures
- SDU-2000e Turn-Up Procedures
- After Turn-Up

Unpacking and Inspecting the Shelf

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



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

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 damage occurred during transit.

If any items are missing, contact Symmetricom Global Services.



Recommendation: Keep all packaging materials in the event the system 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 69.
- Ensure that the system location does not cause electromagnetic interference with other equipment in the area, see [Electromagnetic Interference \(EMI\) Considerations](#), on page 69.
- Ensure that adequate ventilation space is available in rack or equipment cabinet to safely operate the system, see [Ventilation Considerations](#), on page 70.
- Ensure that the mounting rack or equipment cabinet is properly grounded and has power available, see [Making Ground Connections](#), on page 72.



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



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



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

Installation Tools and Materials

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

- Standard tool kit
- Cable ties or acceptable cable clamps
- 1.31 mm² (minimum) wire for –48V, RTN, and frame ground
- 0.326 mm² shielded twisted pair wire-wrap cable (Amp #640433-7 or equivalent)
- Screws, flat washers, and locking washers for mounting the equipment rack
- DA3W3P mating connectors for mounting the power input
- Digital Voltmeter (DVM)
- Straight-through RS-232 cable
- Laptop computer 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-2000e from interfering with other equipment, it must be installed and operated as described in the following paragraphs.

All cables connected to the SSU-2000e should be shielded with metal connector shells. The connectors on the front of the chassis are shielded, with the shields connected to frame ground. Follow local procedures for shield grounding. The screws on all cables must be securely fastened to their corresponding connectors on the unit. While the unit is in operation, there must be a module or blank filler panel installed in every slot. Ensure that the captive screws located at the top and bottom of the module panel are properly secured.



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

Ventilation Considerations

For proper ventilation, there should be at least 76 mm (2 RU) of free space 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-2000e

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



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

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



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

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

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

- Grounding, see [Making Ground Connections](#), on page 72
- External Power Inputs, see [Making Power Connections](#), on page 72
- Communications Interfaces, see [Making Communications Connections](#), on page 73
- Alarm Contact Closures, see [Making Alarm Connections](#), on page 77
- Clock Inputs, see [Clock Inputs](#), on page 79
- Clock Outputs, see [Clock Outputs](#), on page 82

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

Mounting Instructions

The SSU-2000e may be mounted in either a 300 mm or 600 mm deep equipment cabinet. The SSU-2000e chassis occupies 500 mm vertically, 229 mm depth, and a width of 431.8 mm. Included are 530 mm ETSI compatible rack mounting ears. Optional 480 mm rack mounting ears are available for 480 mm EIA racks and cabinets.

The front panel of the chassis mounts flush to the rack or at a distance of 25 mm from the front of the rack. An SSU-2000e equipment cabinet mounting diagram is shown in [Figure 2-1](#).

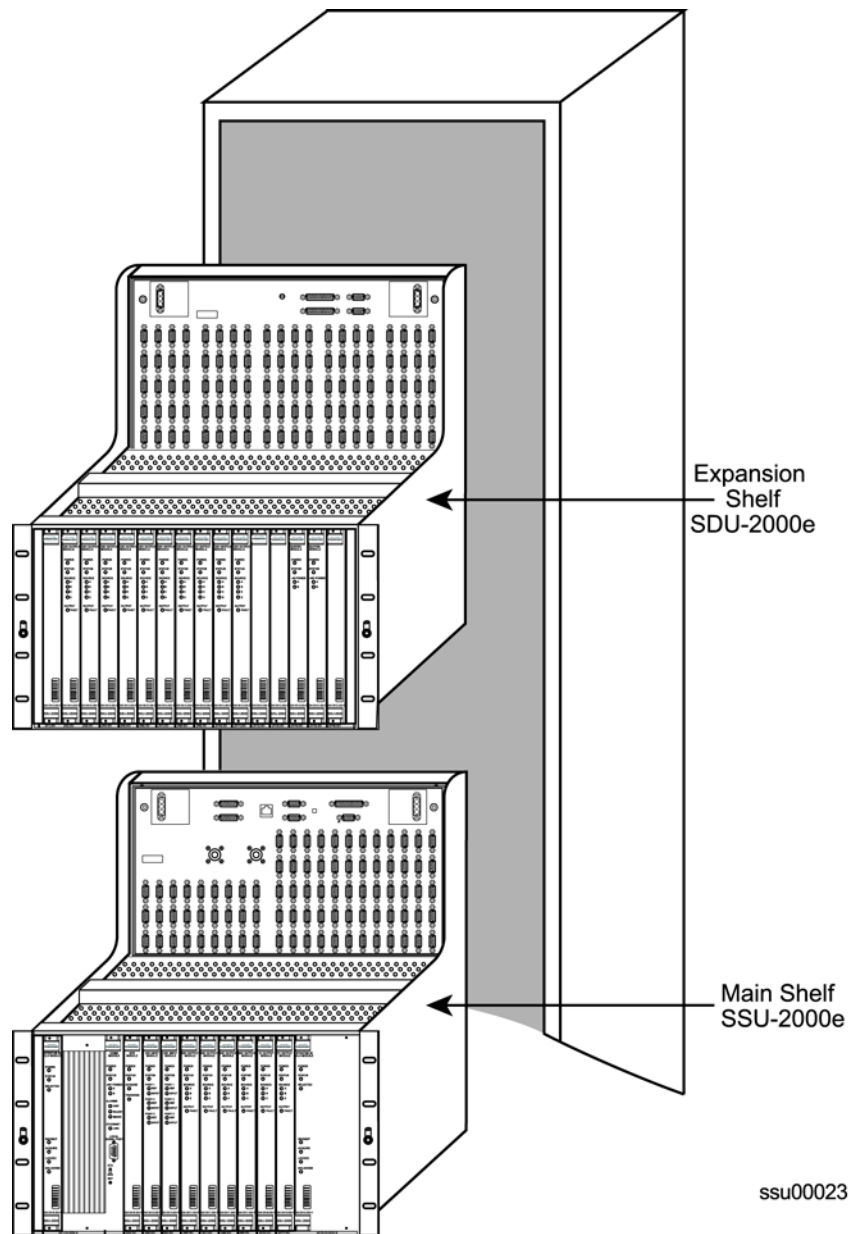


Figure 2-1. Equipment Mounting Cabinet

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

1. Attach a mounting bracket to each side of the chassis by aligning two columns (three holes per column) of the bracket with the holes on the side of the chassis. Use appropriate screws for attaching the mounting bracket. Ensure that both brackets are attached at equal distances from the front of the unit.
2. Mount the instrument to the front of the rack rails with the appropriate number of screws and washers for the rack.
3. If not using expansion shelves, verify that the BUS Termination Assembly is inserted into connector J8 of the main shelf and an SDU Backup Clock terminator is attached to connector J9. See [SDU-2000e Interface Option](#), on page 78 for more information.



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

Making Ground and Power Connections

Making Ground Connections

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

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

Making Power Connections

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

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

To connect the power input, perform the following steps:

1. Attach 1.29 mm^2 (minimum) stranded wire to two DA3W3P connectors (supplied) as shown in [Figure 2-2](#).
2. Attach the connectors to the A-bus and B-bus power terminal blocks on the upper corners of the front panel.

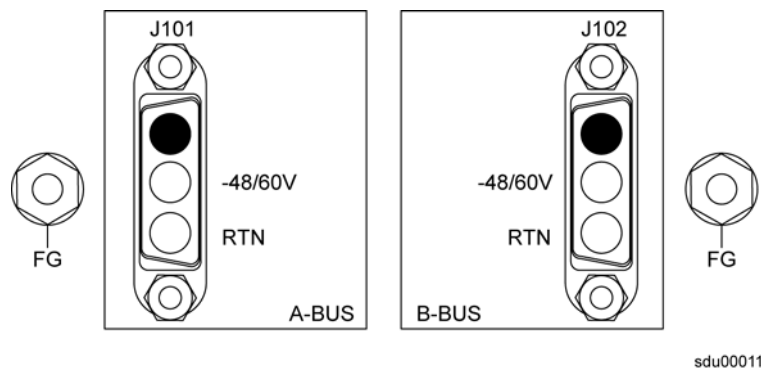


Figure 2-2. SSU-2000e Power Input Connector

Making Communications Connections

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



Note: A third EIA-232 serial port may be connected via the Communications module. Refer to [Chapter 6, Clock Module and Communications Module Reference Data](#), for more information on the Communications Module.

Table 2-1. 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
Ethernet Ports (Telnet)		
23	This port is user selectable as either an ICS or a TL1 interface. The port defaults to ICS upon initialization	ICS (Default), TL1
123	This port is designated for NTP only	NTP
161	This port is designated for SNMP Interactive	SNMP Interactive
162	This port is designated for SNMP Trap transmission	SNMP Trap
2000	This port is designated for TL1 only	TL1

Making EIA-232 Serial Port Connections

Both EIA-232 serial port connections are made through filtered DE9S female connectors on the front panel. These ports allow connection to a dumb terminal or PC using a terminal emulation software package for remote monitoring and control. One port is in connector J4 and is labeled SERIAL PORT-A, the other port is in connector J5 and is labeled SERIAL PORT-B. When connecting to these ports, use a shielded cable EIA-232 direct connect cable with the cable shield connected to pin 1, see [Figure 2-3](#).

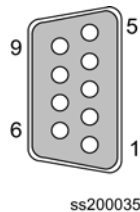


Figure 2-3. DE9 Connector Detail

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

Using the EIA-232 Serial Port DTE and DCE Switch

The serial port DTE and DCE switch is located on the right side of the serial ports A and B on the front panel. Each port may be configured as either DCE (default, connection to PC) or DTE (connection to modem). The upper position is labeled A and the lower position is labeled B as shown in [Figure 2-4](#).



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

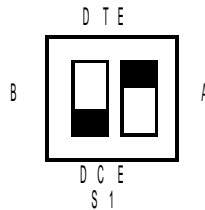


Figure 2-4. Serial Port DTE and DCE Switch

Changing Communications Settings

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

1. Connect the serial communication cable from the DE-9 female connector on the PC or laptop to the interface remote terminal PORT-A (J5).
2. Verify that the slide switch is set to the appropriate equipment type, either data terminal equipment (DTE) or data communications equipment (DCE).
3. Connect a PC or laptop with terminal emulation software (such as Microsoft HyperTerminal) or ASCII terminal to the port.
4. Log in to the SSU-2000e at user level 2 or higher.
5. Use the COMM command to change the communications settings for the port. Refer to [TL1 Command Interface](#), on page 254 for a complete description of the Transition Language One (TL1) command interface mode and the Interactive Command Set (ICS) ASCII mode.

Making Ethernet Connections

The Ethernet 10-Base-T connection is a shielded RJ-45 receptacle, labeled Ethernet 10baseT (J3) on the front panel. The RJ-45 is the standard 10-Base-T connector. To attach the SSU-2000e to an Ethernet network, connect a standard unshielded twisted pair (UTP) Ethernet RJ-45 cable to J3 on the front panel.

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

Table 2-2. Ethernet Connector (J3) Pinouts

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

Making Communications Module Connections

The Communications module serves as the user interface to the SSU-2000e. This module's command interface supports three EIA-232-C serial connections and one Ethernet interface for communication with the SSU-2000e. Figure 2-5 shows an example of connecting to the local port on the front of the communication module. The PC or terminal must be configured for 8 data bits, no parity, 1 stop bit, and 9600 baud rate.

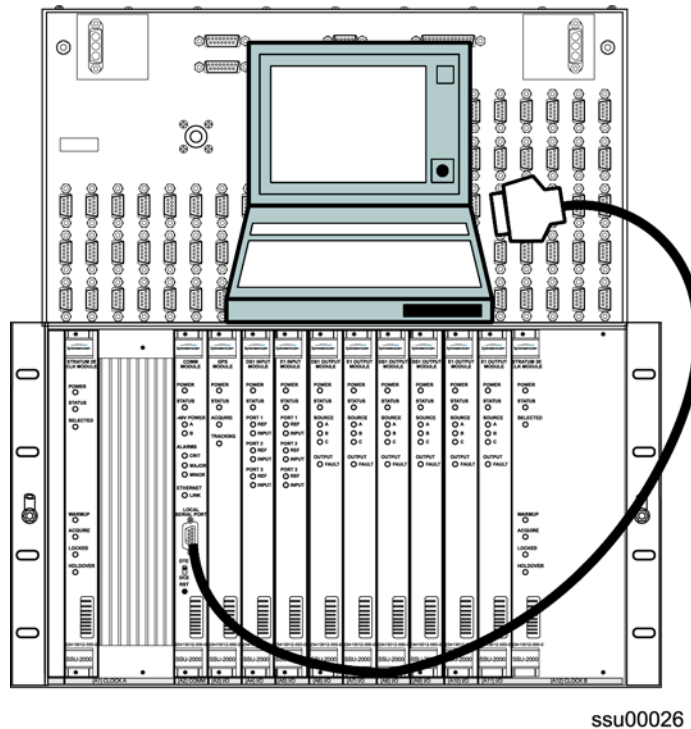


Figure 2-5. Communications Module Serial Connection

Communication control input and output requirements are listed in [Table 2-3](#).

Table 2-3. Communication Requirements for Control Input and Output

Parameter	Requirements
EIA-232	
EIA-232, 2 each	1 (PORT-A J15) designated as remote 1 (COMMS J1) designated as local
Type	Remote PORT-A is DTE or DCE, switch selectable. Local COMMS (J1) is fixed DCE.
Connector	9 pin D-Type female connector
Ethernet	
Ethernet (10baseT)	TCP/IP Telnet connections for communication and control Telnet session ICS Port Network Time Protocol (NTP) for Time of Day
Connector	RJ-45

Making Alarm Connections

The SSU-2000e Shelf has two filtered DA15P male connectors for local and remote alarm contact closure connections, as shown in [Figure 2-6](#). The local connections are made on J1 and the remote connections are made on J2. The connectors are labeled ALARM CLOSURES, LOCAL (J1) and REMOTE (J2). They each have connections for normally open (NO), common or wiper (COM), and normally closed (NC) for each of these alarm categories: CRITICAL, MAJOR and MINOR.

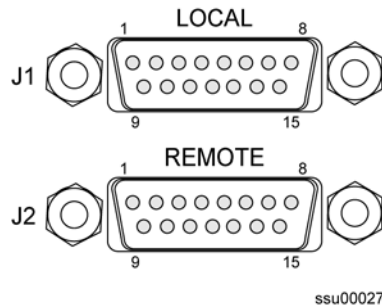


Figure 2-6. Alarm Contact Closures and Pin Assignments

Alarm contact pin assignments are listed in [Table 2-8](#).

Table 2-4. Alarm Contact Pin Assignments

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



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

SDU-2000e Interface Option

The SSU-2000e Main shelf has interface connectors to connect an SDU-2000e Expansion shelf. The connections on the expansion shelf are through connectors J103 and J105, which are DB25S female connectors with locking post, labeled SDU INTERFACE, and connectors J104 and J106, which are DE9S female with locking post, labeled SDU BACKUP CLK. If you are using an SDU-2000e Expansion shelf, refer to [Installing the SDU-2000e](#), on page 85, for installation procedures.

If an SDU-2000e Expansion shelf is not being installed, the J8 and J9 connectors on the SSU-2000e must have the expansion and backup clock terminators installed. [Figure 2-7](#) and [Figure 2-8](#) shows the SSU-2000e Expansion (P/N 12013049-000-0) and backup clock (551021-0040) Terminators.

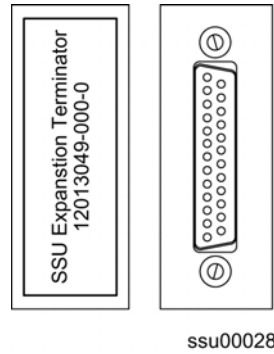


Figure 2-7. SSU Expansion Terminator (J8)



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

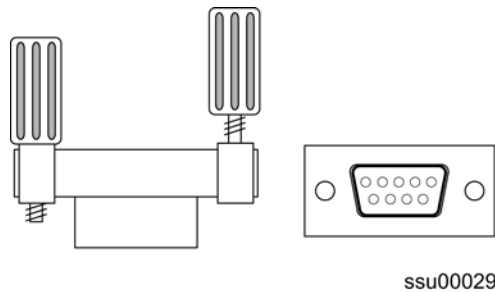


Figure 2-8. SSU Backup Clock Terminator (J9) Side and Front View

Clock Inputs

The SSU-2000e Main shelf has nine sets of reference clock input connections on DE9P male connectors for connecting input telecom signals. There are three connectors in each set; each set is arranged vertically and labeled top to bottom Monitor, Load, and Input, as shown in [Figure 2-9](#). There are three sets associated with each input module, creating three groups for a total of 27 connectors.

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

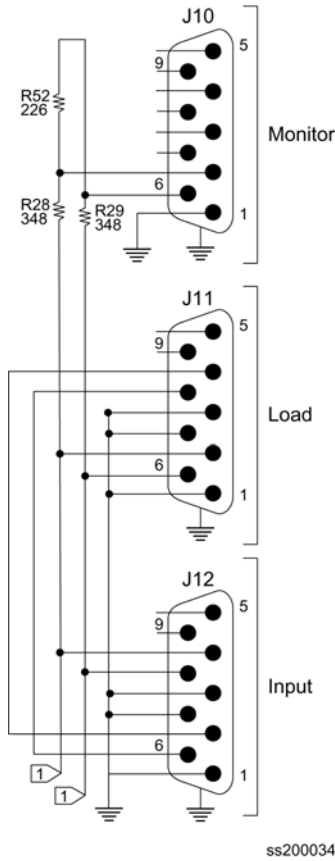


Figure 2-9. Clock Input Connector Pinout

Figure 2-10 shows the non-payload E1 (2048 kbit/s) and DS1 (1544 kbit/s) input termination.

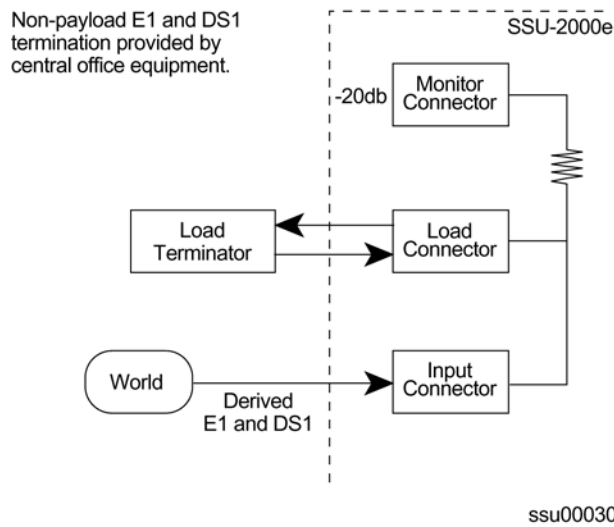


Figure 2-10. Non-Payload E1 and DS1 Input Termination

Figure 2-11 shows the *through payload* E1 and DS1 input termination.

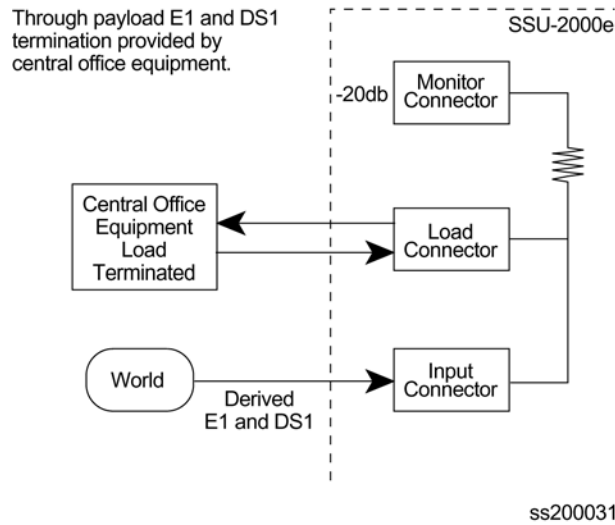


Figure 2-11. Through Payload E1 and DS1 Input Termination

Each connector is associated with a specific input plug-in module slot. Table 2-5 describes the relationship between the connectors and the Input module slot connectors. The signal connections on these connectors are set up in differential pairs as Tip and Ring connections. Plugs are available for termination of input reference.

Table 2-5. Input Module Slot to Connector Relationship

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

Clock Outputs

The SSU-2000e main shelf has three groups of summed clock output connections on DE9P male connectors for connecting output telecom signals, see [Figure 2-12](#). There are twenty connectors in each group for a total of sixty output connections. The connectors in each group are arranged vertically in a five by four matrix and labeled from top to bottom, and from left to right. Connections for group one are made in connectors J40 through J59, connections for group two are made in connectors J60 through J79, and connections for group three are made in connectors J80 through J99.

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

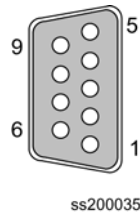


Figure 2-12. Clock Output Connector Pinout

Table 2-6. Output Module Slot to Connector Relationship

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

Installing SSU-2000e Modules

The SSU-2000e main shelf has twelve plug-in module slots. The module slots are numbered from left to right looking at the front of the shelf, A1 through A12. Each module slot has a specific address as listed in [Table 2-7](#). Each module slot has two hybrid DIN connectors associated with it on the backplane. The hybrid contacts of these connectors are used for power, logic ground, frame ground, and radio frequency (RF) connections. Each module slot has three pins connected together on each Hybrid DIN connector which are used for module removal detection. Signals on the back panel are configured as differential pairs unless they are considered static, or because of the signal type, they are required to be single ended.

Table 2-7. Module Slot Addresses

Module Type	Slot	Address
Clock Module A	A1	1A01
Communications Module	A2	1A02
I/O Module	A3	1A03
I/O Module	A4	1A04
I/O Module	A5	1A05
I/O Module	A6	1A06
I/O Module	A7	1A07
I/O Module	A8	1A08
I/O Module	A9	1A09
I/O Module	A10	1A10
I/O Module	A11	1A11
Clock Module B	A12	1A12



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

Handling Modules

When handling the modules, observe the following precautions:

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



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

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



Caution: To avoid the possibility of the lithium battery exploding if replaced incorrectly in the Communications or Clock modules, **do not** replace the battery. Return the entire module to Symmetricom Global Services for battery replacement and disposal.

Installing a Module

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



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

Install the modules by performing the following steps.

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



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



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

Connecting Antennas

The SSU-2000e chassis has two antenna connections located on the front panel. The antenna connections are made via a Type-N connector J6 labeled ANTENNA-A and isolated TNC connector J7 labeled ANTENNA-B. 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 injury to personnel or damage to equipment, exercise caution when working near high voltage lines. In particular:

- Use extreme caution when installing the GPS antenna near, under, or around high voltage lines.
 - Follow local building electrical codes for grounding using the frame ground lugs integrated with the SSU-2000e chassis.
 - The in-line amplifier receives 5 vDC power from the GPS radio receiver, and is supplied on the center conductor of the LMR-400 or equivalent coaxial cable. If the application requires an in-line amplifier, mount the amplifier/plate assembly where the transient eliminator would normally be mounted.
 - Symmetricom does not recommend cutting the antenna cables provided in the GPS Antenna Kit.
-

Installing the SDU-2000e

This section provides guidelines and procedures for installing and cabling the SDU-2000e expansion chassis to the SSU-2000e main chassis. Before proceeding with the SDU-2000e installation, ensure that the procedures in [Preliminary Procedures](#), on page 68, have been performed.

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



Caution: To avoid excessive heat build-up resulting in equipment damage, ensure that there is at least 76 mm (2 RU) of free space below the chassis.

Rack Mounting the SDU-2000e

The front panel of the chassis mounts flush to the rack or at distances of 100.5 mm from the front of the rack. An SDU-2000e equipment cabinet mounting diagram is shown in [Figure 2-13](#). To install the SDU-2000e in the rack, perform the following:

1. Determine and locate the appropriate mounting brackets to be used.
2. Attach a mounting bracket to each side of the chassis by aligning two columns (three holes per column) of the bracket with the holes on the side of the chassis. Use the appropriate screws to attach the mounting bracket. Ensure that both brackets are attached at equal distances from the front of the unit.
3. Mount the instrument to the front of the rack rails using the appropriate number of screws and washers for the rack.
4. If not connecting additional expansion shelves, verify that the Bus Termination Assembly is inserted into the last SDU Interface (J105) and last SDU Backup Clock (J106) of the main SDU-2000e shelf, see [Figure 2-14](#).



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.



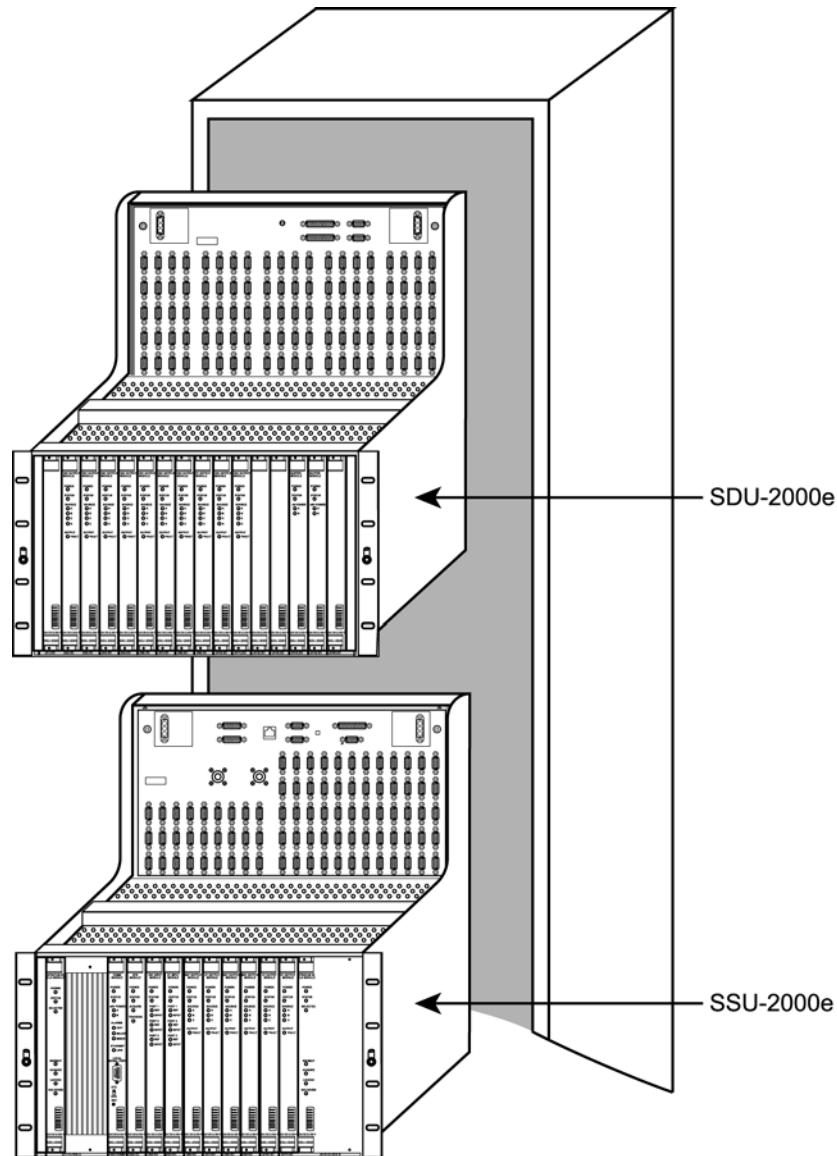
Recommendation: To aid in viewing and when connecting cable install the SDU-2000e chassis at eye level, whenever possible.

Making Ground Connections

The procedures for making ground connections for the SDU-2000e are the same as for the SSU-2000e. Refer to [Making Ground Connections](#), on page 72, and follow the procedures for grounding the SDU-2000e.

Making Power Connections

The procedures for making power connections for the SDU-2000e are the same as for the SSU-2000e. Refer to [Making Power Connections](#), on page 72, and follow the procedures to connect power to the SDU-2000e.



sdu00010

Figure 2-13. Equipment Mounting Cabinet

SDU Installation Connections

The SDU-2000e Expansion Chassis has interface connections on the front panel for connecting to an SSU-2000e Synchronous Supply Unit. Connections include the SDU Interface (J103 and J105) and the SDU Backup Clock Terminal (J104 and J106). [Figure 2-14](#) shows SDU-2000e expansion unit cabling.

SDU-2000e Interface Connector

Connection to the SSU-2000e is made through the SDU Interface Connectors. The SDU Interface Connections, J103 and J105, are 25 Pin D-Type female connectors with locking posts. The signals are differential pairs and connected in parallel. One connector is used to connect to a source unit, and the other is used for either a terminator or for feeding an additional SDU-2000e shelf. Up to four SDU-2000e shelves can be daisy-chained together. See [Figure 2-14](#) for expansion unit cabling.

[Figure 2-14](#) shows an SSU-2000e Expansion Terminator (part number 12013049-000-0). Install this terminator to the last expansion chassis in the daisy chain.

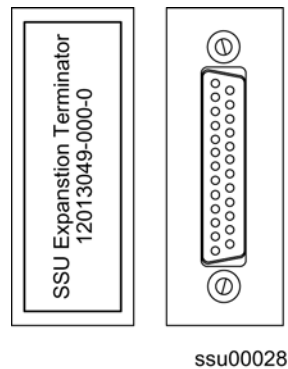


Figure 2-14. SSU-2000e Expansion Terminator

SDU Backup Clock Terminal

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

Install the backup clock terminator on the SDU BACKUP CLK connector J106 on the last expansion chassis in the daisy chain, see [Figure 2-15](#).

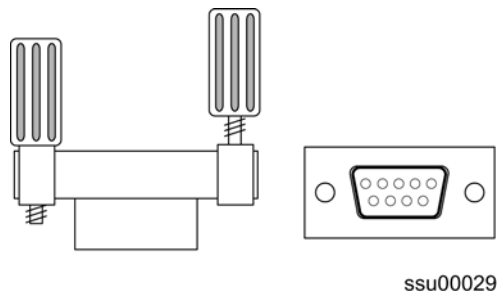
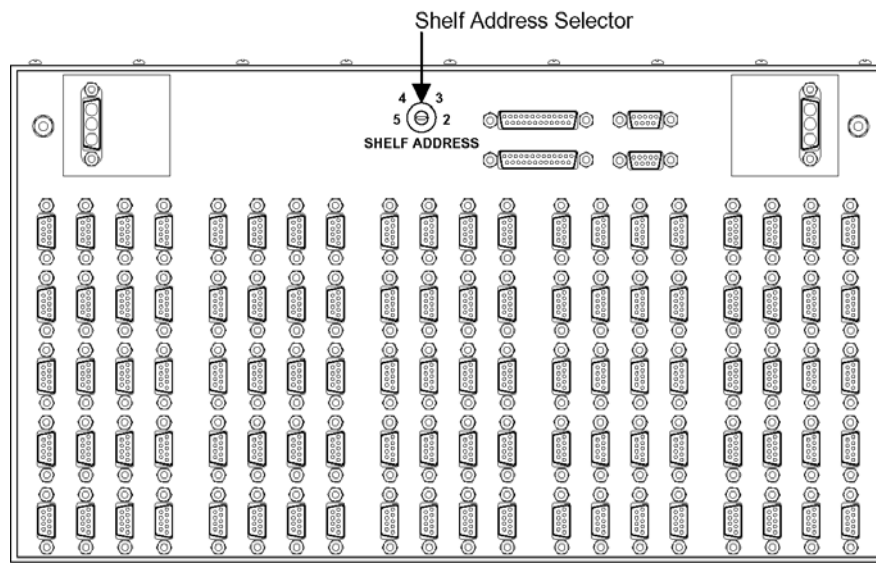


Figure 2-15. Backup Clock Terminator, Side and Front View

Setting the Shelf Address

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



sdu00025

Figure 2-16. Shelf Address Selector

SDU Clock Outputs

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

Each connector is associated with a specific pair of output plug-in module slots, see [Table 2-9](#) below for the plug-in module slot connector relationship. The signal connections on these connectors are set up in differential pairs as Tip and Ring connections, see [Table 2-8](#).

Table 2-8. Clock Output DE9 Connector Pin Assignments

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

Table 2-9. Output Module Slot to Connector Relationship

Slot Label (Name)	Plug-in Module Slot	Group	Output Connector (Module Port) Reference Description
OUTPUT-1	A1	1	J1 (1) through J20 (20)
OUTPUT-2	A2		
OUTPUT-3	A3	2	J21 (1) through J40 (20)
OUTPUT-4	A4		
OUTPUT-1	A5	3	J41 (1) through J60 (20)
OUTPUT-2	A6		
OUTPUT-3	A7	4	J61 (1) through J80 (20)
OUTPUT-4	A8		
OUTPUT-5	A9	5	J81 (1) through J100 (20)
OUTPUT-6	A10		

Installing SDU Modules

The SDU-2000e shelf has 12 plug-in module slots located on the front of the chassis. The module slots are numbered from left to right looking at the front of the shelf, A1 through A12. Each module slot has a specific address defined in [Table 2-10](#) below. Each module slot has two hybrid DIN connectors associated with it on the backplane. The hybrid contacts of these connectors are used for power, logic ground, and frame ground connections. Each module slot has three pins connected together on each hybrid DIN connector which are used to detect module removal. Use the precautions in [Handling Modules](#), on page 84, when handling modules in the SDU-2000e. Install modules in the SDU-2000e using the procedures in [Installing a Module](#), on page 84.



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

Table 2-10. Module Slot Addresses

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



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

Installation Checklist

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

1. Unpack all equipment carefully and check it against the purchase order.
2. Ensure the SSU-2000e chassis is securely attached to mounting rack.
3. Ground the SSU-2000e chassis using the frame ground lug.
4. Measure between the ground and chassis and verify that no voltage exists.
5. If an SDU-2000e Expansion chassis is not being installed, ensure that the connectors J8 and J9 to the SSU-2000e are connected to a proper terminator.
6. Connect office alarms to the REMOTE and LOCAL terminals with 1.024 mm² wire.
7. Using proper handling techniques, insert modules and filler panels in appropriate slots.
8. Connect primary power to the A-BUS and secondary power to the B-BUS terminals.

9. Measure the voltage at POWER A (and POWER B if used), and verify that it is between -38 vDC and -72 vDC (-48 vDC nominal).
10. Perform the procedures in [SSU-2000e Turn-Up Procedures](#), on page 92.
11. Verify that all modules are receiving power and generating regulated DC outputs by checking that their POWER indicators (LEDs) are lit, see [Normal System Indications During Turn-Up](#), on page 94.
12. To ensure that both power inputs are valid, verify that the green POWER indicator on the front of the Communications module is on. Also verify that the -48 V Power A and B LEDs are both green. If all these indicators are not green, refer to [Table 2-11](#) for the LED color code indications. Refer to [Chapter 5, Maintenance and Troubleshooting](#), if you are unable to obtain the correct indications.

Table 2-11. Power LED Indications

LED	State	Indication
Power	On	At least one -48 V power supply is connected
Power	Off	No -48 V power supply A or B connected
-48 V Power Supply A or B	On (Green)	Power supply is connected
-48 V Power Supply A or B	Off	No -48 V power supply connected to the inputs indicated by the LED
-48 V Power Supply A or B	On (Amber)	Polarity is reversed on the inputs indicated by the LED

Applying Power to the SSU-2000e

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

SSU-2000e Turn-Up Procedures

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

SSU-2000e Normal Indications During Turn-Up

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:

- **Clock Module 2E** – The POWER LED turns green when the fuses are installed in the main chassis and stays green. The STATUS LED blinks green and amber for approximately 10 to 15 seconds and then stays green. The SELECTED LED turns green on the selected clock module after the ACQUIRE LED on the clock module turns green. The WARMUP LED turns amber for approximately 30 seconds to 5 minutes then turns off and the ACQUIRE LED turns green. The ACQUIRE LED stays green 10 to 15 minutes until the module locks onto a signal, then the LED turns off. The LOCKED LED then turns green and stays green.
- **Clock Module 3E** – The POWER LED turns green when power is applied to the unit and stays green. STATUS LED blinks green and amber for approximately 10 to 15 seconds and then stays green. The SELECTED LED turns green on the selected clock module after the ACQUIRE LED turns green. The WARMUP LED turns amber for approximately 30 seconds to 20 minutes then turns off and ACQUIRE turns green. The ACQUIRE LED stays green until the module locks onto a signal (10 to 15 minutes); then the LED turns off. The LOCKED LED turns green and stays green.
- **Communications Module** – The POWER LED turns green when power is applied to the unit and stays green. The STATUS LED blinks green and amber for 10 to 15 seconds and then stays green. The –48V POWER LEDs A and B turn green to indicate that the power supplies are connected. If one of these LEDs are amber, the polarity of that power connection is reversed and needs to be switched. The three ALARM LEDs clear after approximately 1 minute. After initialization, if there are any alarms, it takes approximately 30 seconds to register and the ALARM LED turns amber. The ETHERNET LINK LED blinks green for approximately 30 seconds and stays green.
- **Input Module** – The POWER LED turns green when power is applied to the unit and remains green while the system is powered up. The STATUS LED blinks green and amber for approximately 10 to 15 seconds and then stays green. The PORT 1 REF LED blinks for approximately 5 to 10 seconds and turns green for the reference input and off for the others. The INPUT LED blinks for 5 to 10 seconds and turns green for every valid input or amber for invalid inputs.
- **Output Module** – The POWER LED turns green when power is applied to the unit and stays green. The STATUS LED blinks green and amber for 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).

SDU-2000e Turn-Up Procedures

This section describes the procedures for powering up the SDU-2000e system and bringing the system on-line after completion of the system installation. After completing the turn-up procedures, perform the tests in [Commissioning the SDU 2000e](#), on page 120, to ensure that the system is functioning properly.

SDU-2000e Power Control

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

Normal System Indications During Turn-Up

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

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

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

After Turn-Up

After completing the turn up procedures:

- Assign a System Administrator and any additional users to the system using the procedures in [Adding An Administrator User to the System](#), on page 100.
- Make any required changes to the factory default configuration settings as described in [Chapter 3, Provisioning and Operating the SSU-2000e](#).
- Complete the commissioning tests in [Chapter 4, Commissioning the SSU-2000e](#), to ensure that the system is functioning properly.
- Refer to [Chapter 5, Maintenance and Troubleshooting](#) to clear any system alarms that might occur.

This completes the turn-up procedures. See [Chapter 3, Provisioning and Operating the SSU-2000e](#), for instructions on connecting to the SSU-2000e and assigning a system administrator and additional users (system is password protected). Then refer to [Chapter 4, Commissioning the SSU-2000e](#), for test procedures to ensure the system is functioning properly, or to [Chapter 5, Maintenance and Troubleshooting](#), to clear any persistent system alarms.

Chapter 3 Provisioning and Operating the SSU-2000e

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

In This Chapter

- [Controls and Indicators](#)
- [Establishing a Connection to the SSU-2000e](#)
- [Overview of the SSU-2000e Security System](#)
- [Adding Users to the System](#)
- [Initial Provisioning](#)
- [Checking Alarm Status](#)
- [Factory Default \(Basic\) Configuration](#)

Controls and Indicators

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

SSU-2000e Status LED Indicators

All modules used in the SSU-2000e main chassis and in the optional SDU-2000e expansion chassis contain status LED indicators that provide a visual indication of module status. The Communications module provides both system and individual module status whereas all other modules provide individual module status only. For more information on individual module status LED indicators, refer to [SSU-2000e Turn-Up Procedures](#), on page 92, and [Chapter 6, Clock Module and Communications Module Reference Data](#), [Chapter 7, Input Module Reference Data](#), and [Chapter 8, Output Module Reference Data](#).

SSU-2000e Operating Controls

The SSU-2000e contains three hardware operating controls:

- Two DCE/DTE select switches associated with the three EIA-232 ports. One switch is located on the front of the Communications module and the second switch (S1) is located on the SSU-2000e connection panel. The DTE position is for connection to a PC and the DCE position is for connection to a modem.
- Reset (RST) switch on the Communications module.

Establishing a Connection to the SSU-2000e

Set up either an Ethernet telnet session (if the SSU-2000e is connected to a LAN) or a direct serial connection using a dumb terminal or a PC with terminal emulation software. For a direct connect via serial port, see [Communicating by Serial Port](#), on page 97. If the SSU-2000e is connected to an Ethernet LAN, use the procedure described in [Communicating by Ethernet](#), on page 98. Refer to [Table 3-1](#) for the serial and Ethernet communications port assignments.

Table 3-1. Communications Port Assignments

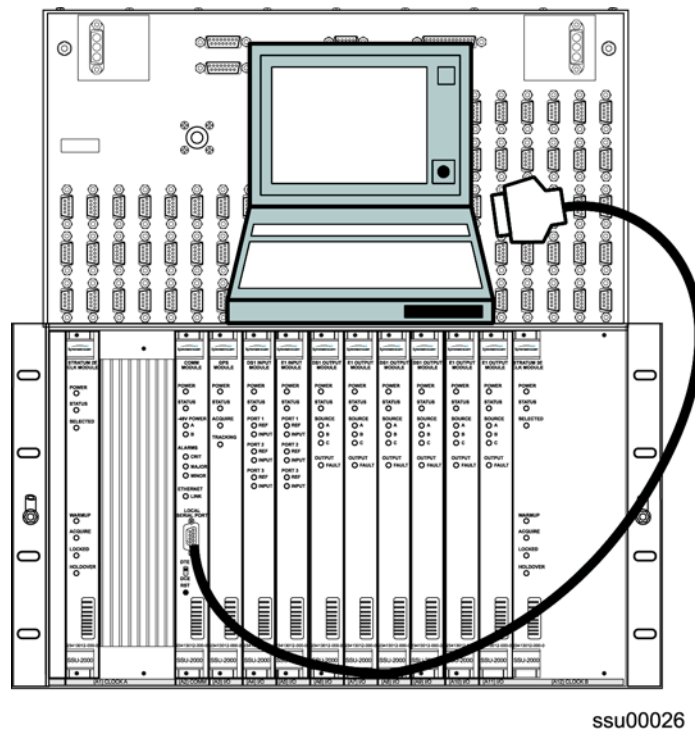
Port #	Function	Protocol
Serial Ports (EIA-232)		
A (J4)	This port is user selectable as either an ICS or a TL1 interface. The port defaults to ICS upon initialization	ICS (Default), TL1
B (J5)	This port is user selectable as either an ICS or a TL1 interface. The port defaults to ICS upon initialization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

Table 3-1. Communications Port Assignments (Continued)

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

Communicating by Serial Port

You communicate with the SSU-2000e using one of three EIA-232-C ports. Attach either a dumb terminal or 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).



ssu00026

Figure 3-1. Direct Connection Using the Serial Port

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 S1 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 User to the System](#), on page 100, before proceeding with the Ethernet setup.

Communicating by Ethernet

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

Configuring the Ethernet Port

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

1. Establish a direct serial connection to the SSU-2000e as described in [Communicating by Serial Port](#), on page 97.
2. Provision the IP, Gateway, and Subnet addresses for the SSU-2000e. The IT department or site administrator for your location can recommend specific addresses for these parameters. Use the format xxx.xxx.xxx.xxx to enter the address parameter.

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;
```

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

1. Ensure that the SSU-2000e is connected to a LAN. See [Making Ethernet Connections](#), on page 75 for details.
2. Telnet from your PC to the IP address assigned to the SSU-2000e.
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 for your SSU-2000e.
4. Enter your assigned password and press **Enter**. The system prompt appears.

Overview of the SSU-2000e Security System

The SSU-2000e 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 instance, 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 262.

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: <ul style="list-style-type: none">■ 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: <ul style="list-style-type: none">■ Perform level 0 through 1 functions■ Read or set all installation functions
Supervisor	3	Supervisor-level users can: <ul style="list-style-type: none">■ Perform level 0 through 2 functions■ Read or set all functions
Administrator	4	Administrator-level users can: <ul style="list-style-type: none">■ 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 User to the System

You must add an Administrator-level user to the user list when you log in for the first time. The Administrator user performs initial setup and can assign user privileges and access codes as needed, as well as configure all system parameters. Refer to [Overview of the SSU-2000e Security System](#), on page 99, for more information on user access levels.



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

Perform the following steps to add an Administrator-level user to the system.

1. Connect a computer to the SSU-2000e using the procedure in [Communicating by Serial Port](#), on page 97. The `SSU-2000e>` prompt appears.
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.

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 to verify that the account exists (repeat steps 4 and 5).
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-2000e user list. Perform the following steps to add a user to the system.

1. Connect a computer to the SSU-2000e using the procedure in [Communicating by Serial Port](#), on page 97. The `SSU-2000e>` prompt appears.
2. Log in to the SSU-2000e 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 user name and press **Enter**. The system prompts for a the new user’s password.
5. Enter the new user’s password and press **Enter**. The system prompts for an access level.
6. Enter the appropriate user access level (0 through 4) and press **Enter**. Refer to [User Access Levels](#), on page 262, for more information on user access levels.
7. Type `bye` to log off the system and press **Enter**.
8. Log back in using the new user’s username and password to verify that the account exists.
9. Type `bye` and press **Enter** to log off the system.

Logging Into the SSU-2000e

To log in to the SSU-2000e:

1. Connect a computer to the SSU-2000e using the procedure in [Establishing a Connection to the SSU-2000e](#), on page 96. The `SSU-2000e>` 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-2000e>` appears.

TL1 command:

```
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-2000e

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

ICS command:

Type `bye` and press **Enter**.

TL1 command:

```
CANC-USER:::123;
```

Initial Provisioning

After you have established communications with the SSU-2000e, you must provision the unit so it can track the input signals and start generating outputs. This section contains general instructions for initial provisioning of the SSU-2000e, 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-2000e.

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.

1. Log into the SSU-2000e using the procedure in [Logging Into the SSU-2000e](#), on page 102.
2. Provision the reference selection mode. The default is Priority, which is the most widely used mode. See [Selecting the Input](#), on page 33, for information on selecting the appropriate mode.

ICS command:

Type `REF MODE PRI`, then press **Enter**.

TL1 command:

`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 [Selecting the Input](#), on page 33, in [Chapter 1, Product Overview](#), 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-2000e. 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-2000e using the procedure in [Logging Into the SSU-2000e](#), on page 102.

3. Enable the module:

ICS command:

Type `config 1A12 enable` and 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-2000e 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-2000e using the procedure in [Logging Into the SSU-2000e](#), on page 102.
2. Disable the module:

ICS command:

Type `config 1A12 disable` and press **Enter**.

TL1 command:

`DISC-MODULE::S1A12:123;`

3. Log off the SSU-2000e 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-2000e using the procedure in [Logging Into the SSU-2000e](#), on page 102.
2. Remove the module from the database:

ICS command:

Type `config 1A12 remove` and press **Enter**.

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-2000e when you're finished.

Provisioning GPS Input Modules

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

1. Log into the SSU-2000e using the procedure in [Logging Into the SSU-2000e](#), on page 102.

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.

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-2000e shelf.

1. Log into the SSU-2000e using the procedure in [Logging Into the SSU-2000e](#), on page 102.

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 lAy-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 lAy-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 port and slot.

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-2000e 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 command:

```
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 and 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::S1Ax[-y]:123::,,zs;
```

for Composite Clock Input modules, ZS is ON or OFF, as appropriate.

9. Provision the MTIE limits for each input port according to ITU (G.811 or G.823) or ANSI (PRS or DS1) 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 xAy [name]` then press **Enter**, where x is the slot number and y is the port number.

TL1 command:

`SET-NAME::123:SxAy: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-2000e shelf and in the SDU-2000e Expansion Shelf.

1. Log into the SSU-2000e using the procedure in [Logging Into the SSU-2000e](#), on page 102.
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 304 for details on all command options.

TL1 command:

Refer to the SET-PRMTR-OUT commands for the various Output modules in [TL1 Command Interface](#), on page 254.

4. Disable unused output ports to prevent spurious alarms. Repeat this command for each shelf, 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;`

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 to verify that the unit is operational.

1. Log into the SSU-2000e using the procedure in [Logging Into the SSU-2000e](#), on page 102.
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-2000e when you're finished.

Factory Default (Basic) Configuration

The SSU-2000e 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-2000e. The following example changes the Power A alarm on the Comms module from Minor to Major.

1. Log into the SSU-2000e using the procedure in [Logging Into the SSU-2000e](#), on page 102.
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. Log off the SSU-2000e when you're finished.

Restoring Factory Defaults

Use the following procedure to reset the specified module's configuration to the factory default.

1. Log into the SSU-2000e using the procedure in [Logging Into the SSU-2000e](#), on page 102.
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-2000e when you're finished.

Customizing Other Configuration Options

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

1. Log into the SSU-2000e using the procedure in [Logging Into the SSU-2000e](#), on page 102.
2. Use the commands listed in [Interactive Command Set](#), on page 304, or in [TL1 Command Interface](#), on page 254, to configure the system.



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

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-2000e when you're finished.

Chapter 4 Commissioning the SSU-2000e

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

In This Chapter

- [Readiness to Test Checklist](#)
- [Equipment Requirements](#)
- [Commissioning Tests](#)
- [Commissioning Test Data Sheet](#)
- [Commissioning the SDU 2000e](#)

Readiness to Test Checklist

Before performing the commissioning tests in the following section, ensure that all items in the SSU-2000e Readiness Checklist in [Table 4-1](#) have been performed. Record the results in the Checked column.

Table 4-1. SSU-2000e Readiness Checklist

Task Required for System Readiness	Checked
The SSU-2000e is installed in the rack with a minimum of 76 mm clearance between the bottom of the lowest shelf and the floor, or from other equipment in the rack.	
The SSU-2000e main shelf has minimum of 25.4 mm clearance between the top of the shelf and an adjacent shelf.	
An SSU-2000e Clock module is installed in shelf slot A1 and/or A12 as required.	
An SSU-2000e Communication module is installed in slot A2.	
At least one Input module is installed in I/O slots A3 through A11.	
<i>Optional:</i> A GPS Input module is installed in slot A3 or A5 and the correct type of Radio antenna is attached to the corresponding Radio antenna connector in the front panel. See Installing Antennas , on page 386, for more information.	
At least one Output module is installed in shelf slot A4 through A10, unless the monitor only configuration is being used, or an SDU-2000e Synchronization Distribution Unit expansion shelf is installed.	
An SSU Expansion Terminator, P/N 12013049-000-0, must be installed in connector J8 if an SDU-2000e expansion chassis is <i>not</i> being used. A terminator must also be installed in connector J105 on the last expansion chassis used in the system.	
An SDU Backup Clock Terminator, P/N 12013xxx-000-0, must be installed in connector J9 if an SDU-2000e expansion chassis is <i>not</i> being used. A terminator must be installed in connector J106 on the last expansion chassis used in the system.	
External power supplies (–48/60 vDC inputs) are connected to the A and B Power input connectors on the SSU-2000e main shelf and all installed expansion shelves.	
The selected set of critical, major and minor alarms connectors on the front panel of the SSU-2000e are connected to the customer's alarm circuitry.	
At least one reference input is connected to each Input module in the SSU-2000e main shelf.	
Power-up has been performed, user configuration setup and saved, and IP addresses are assigned for the Ethernet interface.	
A System Administrator and user access levels have been assigned to the SSU-2000e, see Adding An Administrator User to the System , on page 100.	
If the Ethernet connection is being used, the Ethernet connection on the front panel of the SSU-2000e is connected into the LAN.	

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

Commissioning Tests

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

- Testing the Ethernet Communications Interface
- Testing the EIA-232 Ports
- Testing the Minor alarms
- Testing the Major alarms
- Testing the Critical alarms
- Testing the Reference Input Signals
- Testing the 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-2000e system.
2. Log in by typing your assigned “username” and “password” and press **Enter**. The system should respond with the SSU-2000e prompt.
3. Type **bye** and press **Enter** to log off the system.

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 to the SSU-2000e](#), on page 96.
2. Type **HELP** and press **Enter**.
3. Verify that the system responds to the command.
4. Exit the serial communication session. Move the direct connect cable to each of the remaining two serial ports and repeat steps 2 and 3.

Testing The Minor Alarms

To test the Minor alarm relay closures and software:

1. Set the Power A alarm level to MINOR:

ICS command: ALARM 1A02 MINOR

TL1 command: SET-PRMTR-ALARM::S1A2:::MINOR;

2. Remove Power A input by removing the A-bus fuse (or the fuse that supplies Power A).
3. Verify that the MINOR alarm indicator is ON.
4. Verify that a MINOR alarm is reported to the communications terminal.
5. Verify that a MINOR alarm is logged in the event log:

ICS command: EVENT ALARM

TL1 command: 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 command: ALARM 1A02 MAJOR

TL1 command: SET-PRMTR-ALARM::S1A2:::MAJOR;

2. Remove Power A input by removing A-bus fuse (or fuse that supplies Power A).
3. Verify that the MAJOR alarm indicator is ON.
4. Verify that the MAJOR alarm is reported to the communications terminal.
5. Verify that a MAJOR alarm is logged in the event log:

ICS command: EVENT ALARM

TL1 command: 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 Critical Alarms

To test the Critical alarm relay closures and software:

1. Set the Power A alarm level to CRITICAL:

ICS command: ALARM 1A02 CRITICAL

TL1 command: SET-PRMTR-ALARM::S1A2:::CRITICAL;

2. Remove Power A input by removing A-bus fuse (or 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 is logged in the event log:

ICS command: EVENT ALARM

TL1 command: 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. Enter the command 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` and press **Enter** to verify each input signal is present with no alarms. Each reference input is listed by module position and port number, status, phase A and B readings, input PQL, signal alarms, and MTIE alarms.
2. The status should be **OK** and the Priority Quality Level (PQL) should indicate the received Sync Status Message (SSM) level or the provisioned value. The phase values will be dependent on the received signal. The signal alarms should be **present** (no alarms present, F indicates an alarm) and the MTIE alarms should all be **OK**.
3. Type `REF` and press **Enter** to determine the current selection of input reference signal. Disconnect this input signal and verify a Loss Of Signal (LOS) is reported for the input, and the unit selects an alternate input for the reference signal.
4. Reconnect the input signal and verify that the LOS condition is cleared and the reference input is selected according to the system configuration. This depends on the setting for Revertive Selection, Input Priorities, and Reference Selection mode.
5. Type `EVENT` and press **Enter**; verify that the alarms and events created are recorded in the event log.

Testing the Clock Section

To test the clock section:

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

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

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

The PQL should be the level the clock is supplying to the Output modules, dependent on the reference input when in lock mode. The frequency offset is dependent on the clock type, typically less than 2×10^{-10} for ST2 and 1×10^{-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 1×10^{-9} .

Testing the Output Section

To test the output section:

1. Type `OUTSTAT` and press **Enter** to verify that each Output module is operating with no alarms. This command displays the Output modules by position with module status OK and the selected clock. The clock status indicates the presence or absence of the four possible clocks A, B, C (bypass), or D (expansion shelf only).
2. Verify that any outputs configured for redundant pairs are so indicated in the status report. The PQL will indicate the output SSM level for all ports and is supplied by the selected clock.
3. Verify that all output ports (which are intended to be active) indicate Y in the port status.

Testing the System Stability and Accuracy (Optional)

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

1. Connect one of the system outputs and the PRS signal to the test equipment to monitor the stability and accuracy. This test should be allowed to run for 24 hours to collect sufficient data to verify the system output meets specifications.
2. Process the collected 24 hour data and verify that the frequency and stability (MTIE and TDEV) meet the specifications.

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

Commissioning Test Data Sheet

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

Table 4-2. Commissioning Test Data Sheet - SSU

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

Commissioning the SDU 2000e

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

Readiness to Test Checklist

Before performing the commissioning tests in the following section, ensure that all items in the SDU-2000e Readiness Checklist, [Table 4-3](#), have been performed. Record the results in the Checked column.

Table 4-3. SDU-2000e Readiness Checklist

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

Equipment Requirements

The following equipment is required to perform the commissioning tests:

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

Commissioning Tests

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

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

Testing the Output Alarms

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

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

Testing the Output Section

Use the following steps to test the output section.

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

Testing the System Stability and Accuracy (Optional)

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

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

1. Connect one of the system outputs and the PRS signal to the test equipment to monitor the stability and accuracy. This test should be allowed to run for 24 hours to collect sufficient data to verify the system output meets specifications.
2. Process the collected 24 hour data and verify that the frequency and stability (MTIE and TDEV) meet the specifications.

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

Commissioning Test Data Sheet

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

Table 4-4. Commissioning Test Data Sheet - SDU

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

Chapter 5 Maintenance and Troubleshooting

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

In This Chapter

- [Responding to Alarms](#)
- [Preventive Maintenance](#)
- [Corrective Maintenance](#)
- [Troubleshooting](#)
- [Re-ordering Information](#)

Responding to Alarms

The SSU-2000e monitors various system parameters and stores this information as alarms and event messages which is extremely useful in troubleshooting the system. If an alarm occurs, follow the troubleshooting procedures in [Troubleshooting](#), on page 129, to clear the alarm.

Preventive Maintenance

The SSU-2000e requires no preventive maintenance. Care should be taken to ensure the unit is not exposed to hazards such as direct sunlight, open windows, or extreme heat. See [Electromagnetic Interference \(EMI\) Considerations](#), on page 69, for other conditions that may cause damage.

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



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



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



Caution: To avoid the possibility of the lithium battery exploding in the Communications module of Clock modules, **do not** replace the battery. Return the entire module to 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 the 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.

Corrective Maintenance

The SSU-2000e and SDU-2000e have a modular design; field service is limited to replacing the FRUs (field replaceable units) as identified in [Table 5-1](#) and [Table 5-2](#). This table also outlines possible component problems and corrective action. Refer to [Re-ordering Information](#), on page 135, for information on re-ordering, re-packing, or returning equipment to the factory.



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



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

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



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

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



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

Table 5-1. SSU Corrective Action Table

Component	Part Number	Corrective Action
Motherboard or Main Chassis Fault	25413140-000-0	Contact Symmetricom Global Services
Defective Cable	See Chapter 9, Hardware Configuration Guide	Replace defective cable
Module Fault(s)	All Modules	<ol style="list-style-type: none"> 1. Check that module(s) is seated correctly. 2. Address any fault LED lights. 3. If present, press RST button on Comm module. 4. Check both Power A and Power B inputs for a tripped breaker or blown fuse on the input power control panel. 5. Replace module. 6. If unable to correct the problem, contact Symmetricom Global Services.

Module Replacement

Communications Module 2E Clock Module 3E Clock Module Type I Clock Module E1 Output Module 1-Port DS1 Input Module 3-Port DS1 Input Module DS1 Output Module 1-Port E1 Input Module 3-Port E1 Input Module CC Output Module 2048 kHz Output Module RS-422 Output Module	23413012-000-0 23413016-000-0 23413015-000-0 23413015-001-0 23413018-000-0 23413013-001-0 23413013-002-0 23413017-000-0 23413014-001-0 23413014-002-0 23413158-000-0 23413159-000-0 23413287-000-0	See Handling Modules , on page 84
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Table 5-2. SDU Corrective Action Table

Component	Part Number	Corrective Action
Motherboard or Main Chassis Fault	25413141-000-0	Contact Symmetricom Global Services
Defective Cable	805SCSI-0050 (1 m cable; other lengths available)	Replace defective cable

Table 5-2. SDU Corrective Action Table (Continued)

Component	Part Number	Corrective Action
Module Fault(s)	All Modules	<ol style="list-style-type: none"> 1. Check that module(s) is seated correctly. 2. Address any fault LED lights. 3. If present, press RST button on Comm module. 4. Check both Power A and Power B inputs for a tripped breaker or blown fuse on the input power control panel. 5. Replace module. 6. If unable to correct the problem, contact Symmetricom Global Services.
Module Replacement		
Buffer Module	25413022-000-0	
E1 Output Module	23413018-000-0	
DS1 Output Module	23413017-000-0	
2048 kHz Output Module	23413159-000-0	
CC Output Module	23413158-000-0	

Troubleshooting

The SSU-2000e incorporates many alarms and event messages to alert that a possible problem exists. These alarm and event message reports can be accessed via the 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 97, outlines the procedures for connecting to the SSU-2000e using the Communications module serial ports. [Communicating by Ethernet](#), on page 98, 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.

Establishing a Connection



Note: An SSU-2000e Administrator must be appointed prior to connecting to the system. The Administrator will assign User privileges and access codes. See [Adding An Administrator User to the System](#), on page 100, for more details.

To perform troubleshooting on the SSU-2000e, you must establish a serial connection to a terminal, laptop or PC with terminal emulation software. This is done using port A or B (located on the back panel), or the Local, located on the front panel of the communications module. If the SSU-2000e is connected to a LAN, an Ethernet telnet session may be established. Refer to [Communicating by Serial Port](#), on page 97, to establish a serial connection and [Communicating by Ethernet](#), on page 98, to establish an Ethernet connection.

Troubleshooting Guide

This section describes troubleshooting procedures for the SSU-2000e. [Table 5-4](#) details event and alarm descriptions, default event and alarm levels, status messages and corrective actions.



Note: All event and alarm levels are user-configurable. Events and alarm levels listed in [Table 5-4](#) are factory defaults.

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

When a Communications module is installed and functioning properly, it monitors the SSU-2000e and logs unit events into non-volatile memory for inspection at a later date. Events are conditions within the unit, or at the interfaces of the unit, which may indicate abnormal operation or a change in the unit's operational status. 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 127, explains how to interpret status messages and take corrective action if needed.

Interpreting Status Messages

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

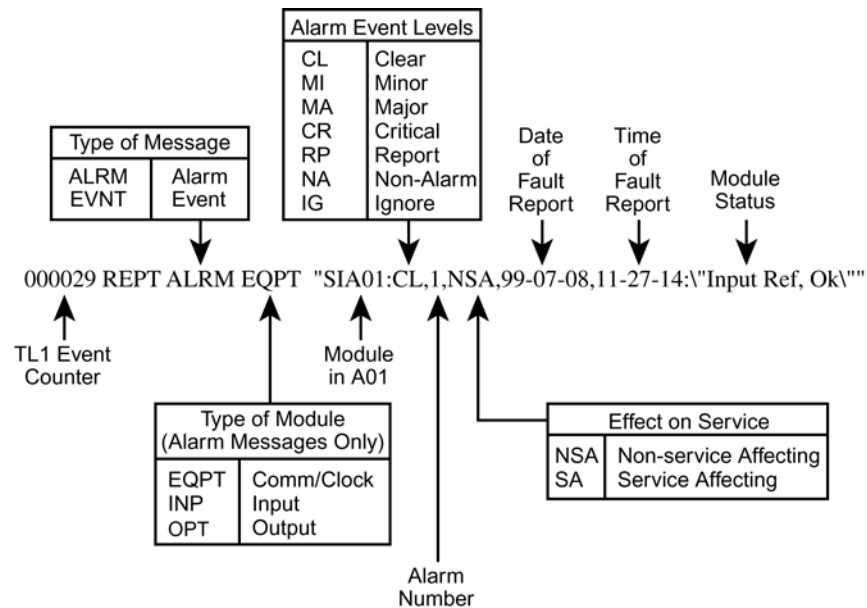
Alarm Messages

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

Event Messages

Table A-11 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.



ssu00038

Figure 5-1. Alarm and Event Status Breakdown

Table 5-3 outlines SSU-2000e troubleshooting procedures.

Table 5-3. SSU-2000e Troubleshooting Procedures

Symptom	Probable Cause	Troubleshooting Procedure/Corrective Action
No LED lit on any module	No power to unit	Check to ensure that UPS (if applicable) is operating correctly.
	Both A and B fuses are blown	Remove both fuses and replace.
	Loss of ground	Re-attach ground wires.
	Loose power cabling to unit	Check that power cables to unit are securely fastened.
	Main shelf is faulty	Contact Symmetricom Global Services.

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

Symptom	Probable Cause	Troubleshooting Procedure/Corrective Action
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 129, 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	Press the RST button on front panel of Input module.
Fault LED on output module is lit	Loose module	Reseat module.
	Loss of signal to output module	Reseat or replace input module (or clock module if necessary).
	Line fault	Remove the Tx Cable
	Improper redundancy configuration	Adjust accordingly. Main chassis: <ul style="list-style-type: none"> ■ left slot = even ■ right slot = odd Expansion chassis: <ul style="list-style-type: none"> ■ 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.

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

Symptom	Probable Cause	Troubleshooting Procedure/Corrective Action
No alarms being reported when there is an alarmed condition	Compromised firmware	Press RST on Comms module front panel.
	Faulty Comms module	Replace Comms module.
	Alarmed module is faulty	Replace module.
Loss of power from expansion chassis	No power to unit	Check to ensure that UPS (if applicable) is operating correctly.
	Both A and B fuses on expansion chassis unit are blown	Remove fuses and replace.
	Loss of ground	Re-attach ground wires.
	Loose power cabling to expansion unit	Check that power cables to unit are securely fastened.
	Expansion shelf is faulty	Call Customer Service.
Loss of signal from expansion chassis	D clock not connected while loose SDU cable to the expansion shelf	Check SDU cable and connect D clock.
Any source LED on the output module amber	Loss of clock signal	Ensure clock modules are inserted properly.
	Clock modules are in warm-up mode	No action necessary.
Any LED on input module amber	No signal to the input panel	Ensure signals are properly routed to the input panel.
	No input signal on cable connected to input panel	Replace <i>no-signal</i> cable with signaled cable.
	I/O input adapter panel is not connected to the input module	Connect the I/O input adapter panel to the input module.
No output signal on the output panel	Port is not turned on	Use the interactive command to turn the port on.
	The I/O output adapter panel is not connected to the output module	Connect the I/O output adapter panel to the output module.

Troubleshooting the SDU-2000e

The buffer module in the SDU-2000e collects status information from the Output modules and relays status messages to the SSU-2000e. The status messages alert the SSU-2000e when a possible problem exists; they can be accessed through the SSU-2000e using a terminal or PC using a terminal emulation software. Refer to [Establishing a Connection to the SSU-2000e](#), on page 96, for more information on connecting to an SSU-2000e for troubleshooting. [Table 5-4](#) outlines troubleshooting procedures for the SDU-2000e.

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

Re-ordering Information

To re-order any module or accessory, contact the Sales Department at Symmetricom. Provide the module or accessory name and its item number along with a purchase order number. A current list of SSU-2000e system components modules/accessories and their part numbers is provided in [Chapter 9, Hardware Configuration Guide](#).

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

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

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 277 500 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:

Maintenance and Troubleshooting
Re-ordering Information

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.

Chapter 6 Clock Module and Communications Module Reference Data

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

In This Chapter

- [Stratum 2E Clock Module](#)
- [Stratum 3E Clock Module](#)
- [Type I Clock Module](#)
- [Communications Module](#)

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-2000e.

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 a reference signal used by the input and Output modules.

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

Functional Block Diagram

A simplified block diagram of the Stratum 2E Clock module is shown in [Figure 6-1](#).

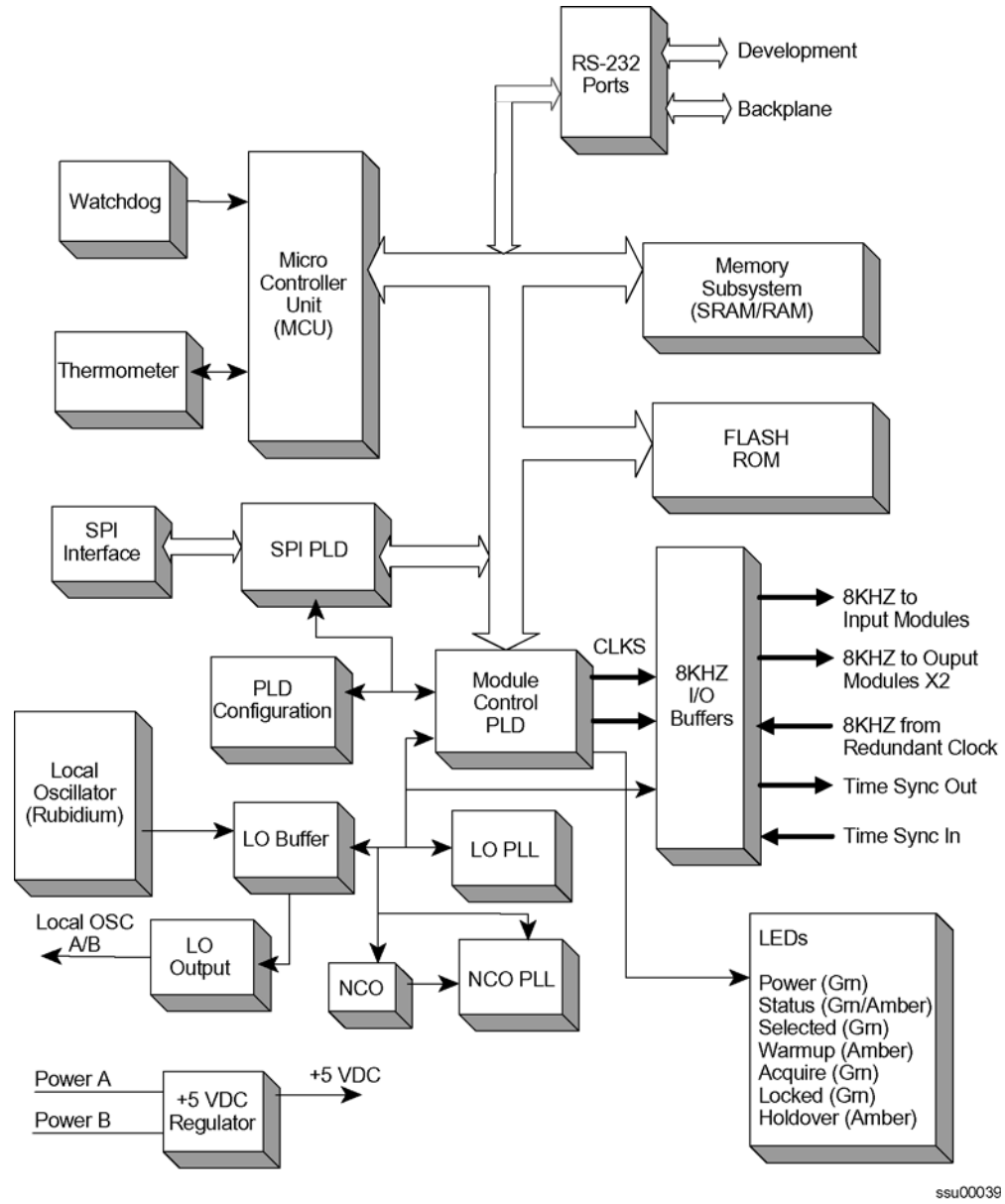


Figure 6-1. Block Diagram of the Stratum 2E Clock Module

Status LED Indicators

The Stratum 2E Clock module status LED indicators are illustrated in [Figure 6-2](#) and are described in [Table 6-1](#).

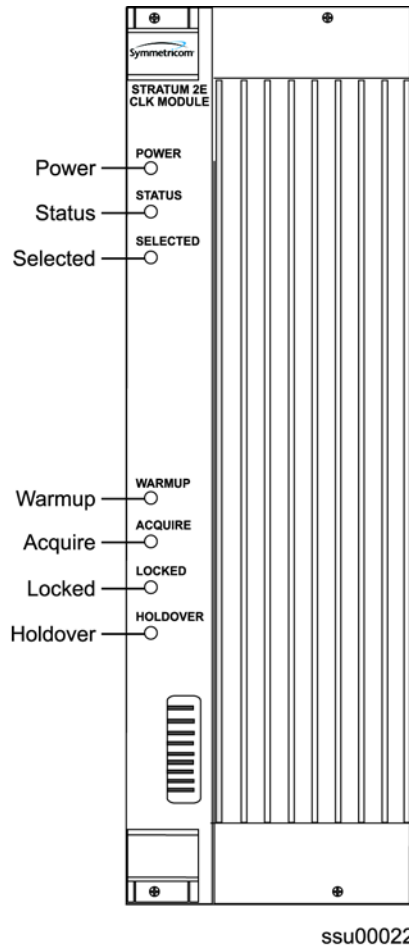


Figure 6-2. Front Panel of the Stratum 2E Clock Module

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

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, downloading firmware from the communication module (cannot be selected during this period) Off = Clock module is not in holdover

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 $\pm 5 \times 10E^{-10}$ the first year Within $\pm 5 \times 10E^{-9}$ 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	$\pm 9 \times 10E^{-11}$ $\pm 1 \times 10E^{-10}$ $\pm 1.5 \times 10E^{-10}$ $\pm 1.7 \times 10E^{-10}$
Numeric Controlled Oscillator (NCO) PLL lock range	$\pm 2 \times 10E^{-4}$
Tuning Resolution (Locked Mode)	$< 1 \times 10E^{-13}$
Warm-up Time (Warm-up Mode)	20 minutes
Wander Output (Holdover)	Includes effects of all SSU-2000e modules: Compliant with clock levels per ITU-T G.812, T1.101-1999, and Telcordia Technologies GR-378-CORE and GR-1244-CORE. Meets SONET requirements per T1.105. Meets or exceeds performance requirements for ITU-T G.812 Type II and ETSI Transit Node clocks and T1.101 and Telcordia Technologies (Bellcore) Stratum 2 clocks.
Jitter (Locked or Holdover)	< 4 ns p-p (measured at the CLKA/BIN 8 kHz output)

Configuration Data

Table 6-3 contains a listing of software configuration options and factory defaults for the Stratum 2E Clock module.

Table 6-3. Stratum 2E Clock Module Options/Defaults

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

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-2000e. This module provides a lower cost backup clock solution for the system.

Functional Overview

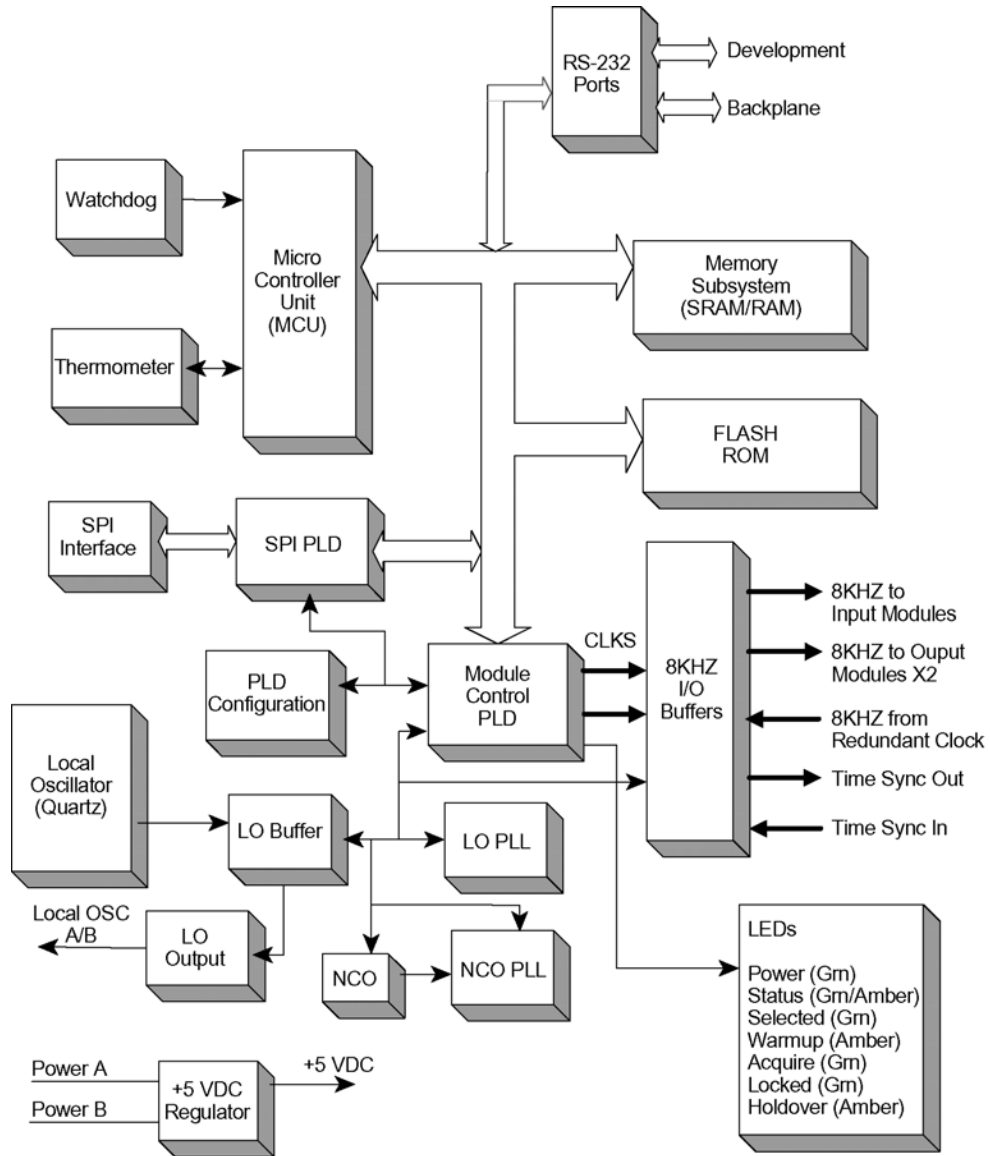
The Stratum 3E Clock module meets or exceeds the performance requirements for ITU and ETSI Type III Local Node clocks and ANSI and Telcordia Technologies (Bellcore) Stratum 3E clocks.

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 $1 \times 10E^{-13}$ 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.

Functional Block Diagram

A simplified block diagram of the Stratum 3E Clock module is provided in [Figure 6-3](#).



ssu00040

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

Status LED Indicators

The Stratum 3E Clock module status LED indicators are illustrated in [Figure 6-4](#) and are listed in [Table 6-4](#).

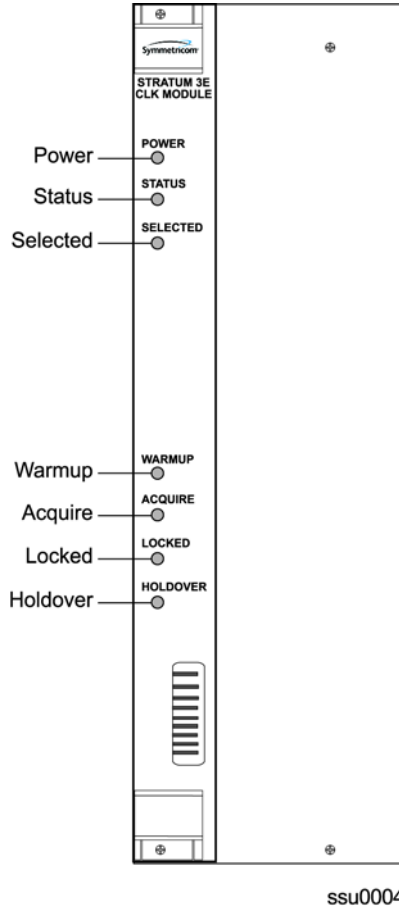


Figure 6-4. Front Panel of the Stratum 3E Clock Module

Table 6-4. Stratum 3E Clock Module Status LED Indicators

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

Table 6-4. 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, downloading firmware from the communication module (cannot be selected during this period) Off = Clock module is not in holdover

Performance Specifications

Specifications for the Stratum 3E Clock module are provided in [Table 6-5](#).

Table 6-5. Stratum 3E Clock Module Performance Specifications

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

Configuration Data

The Stratum 3E Clock module is software configurable through one of the serial or Ethernet ports. The default values and the ranges for the configurable parameters are listed in [Table 6-6](#).

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

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

Type I Clock Module

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

Functional Overview

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 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-2000e 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.

Functional Block Diagram

A simplified block diagram of the Type I Clock module is shown in [Figure 6-5](#).

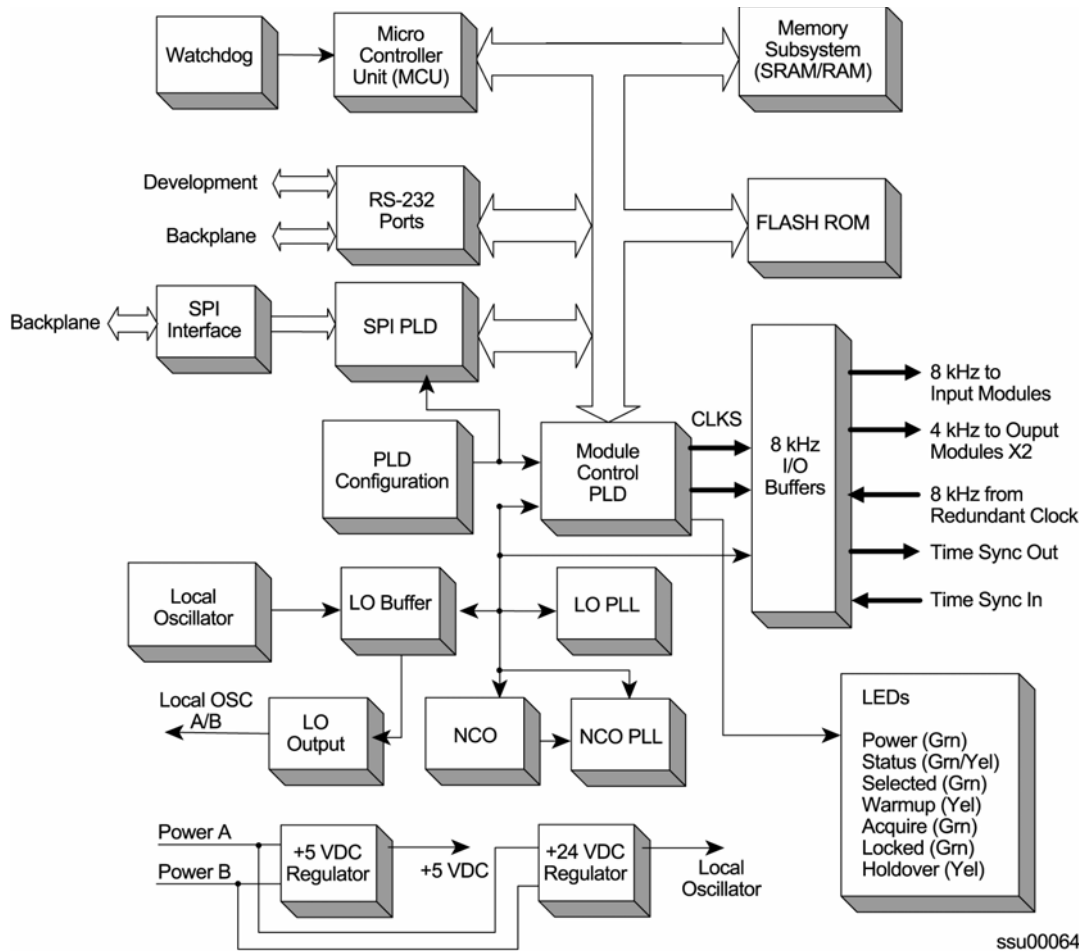


Figure 6-5. Block Diagram of the Type I Clock Module

Status LED Indicators

The status LED indicators on the Type I Clock module are illustrated in [Figure 6-6](#) and are described in [Table 6-7](#).

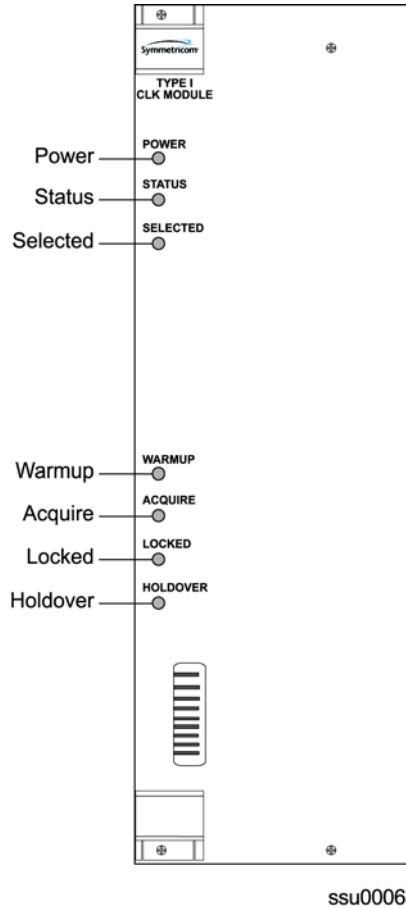


Figure 6-6. Front Panel of the Type I Clock Module

Table 6-7. Type I 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

Table 6-7. Type I 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 6-8 lists the specifications for the Type I Clock module.

Table 6-8. Type I Clock Module Specifications

Performance Characteristic	Specification
Holdover Stability 0 to 24 hrs @ -5 to +45°C	$\pm 2 \times 10^{-9}$ (after 30 days operation)
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-2000e modules: Compliant with clock levels per ITU-T G.812, Type I and ETSI EN300 462-4
Jitter (Locked or Holdover)	< 4 ns p-p (measured at the CLKA/BIN 8 kHz output)

Configuration Data

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

Table 6-9 contains a listing of software configuration options and factory defaults for the Type I Clock module.

Table 6-9. Type I 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)/PqI (1)
Local Oscillator (LO)	OFF	On/Off
Alarm Elevation Time	86400 seconds	60 to 500,000 seconds; 0 disables alarm

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-2000e system.

Functional Overview

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

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

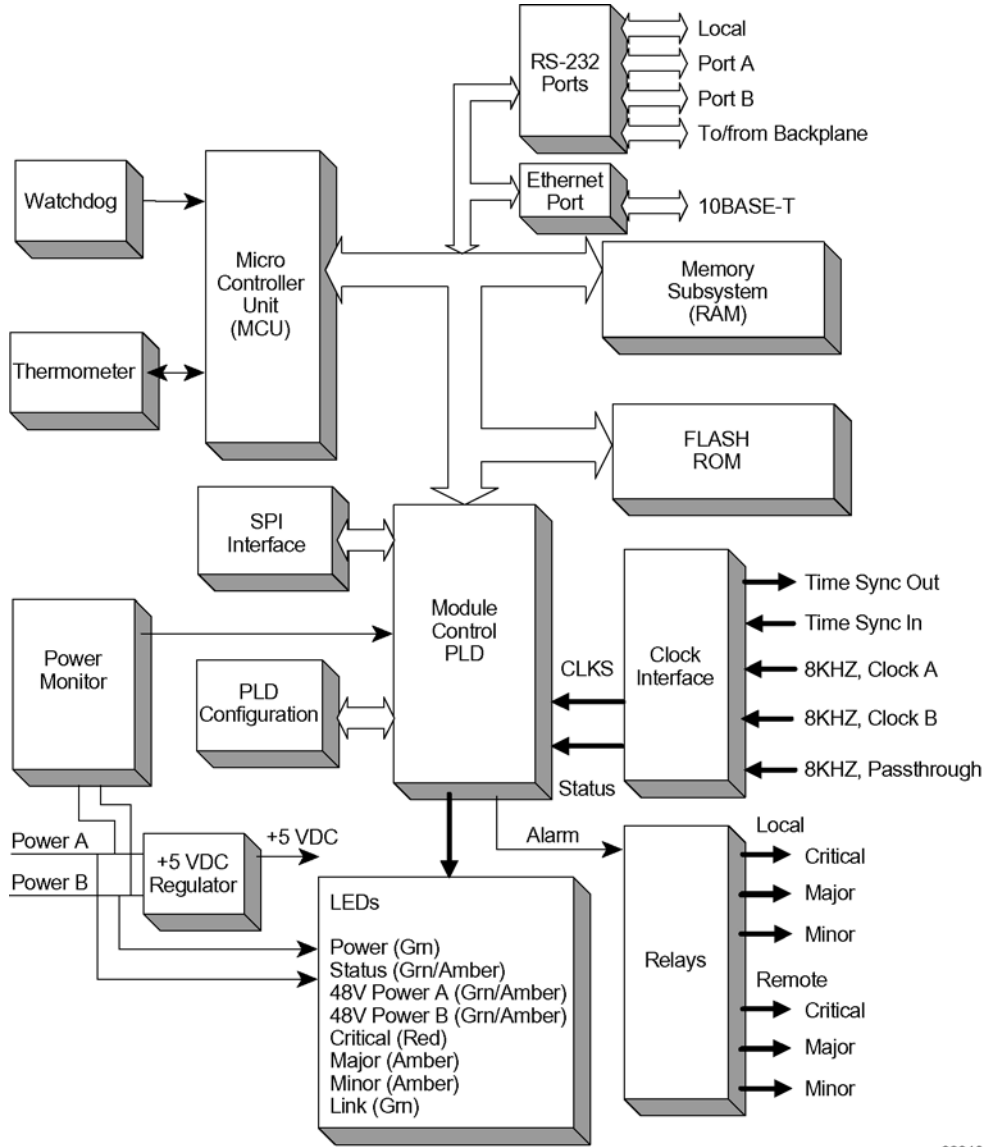
When the Communications module is installed, it performs an initial software verification test to verify operation. If the module is installed in the SSU-2000e with power already applied and with other modules installed, the Communications module reads the configuration of the modules in the SSU-2000e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

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

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

Functional Block Diagram

A simplified block diagram of the Communications module is shown in [Figure 6-7](#).

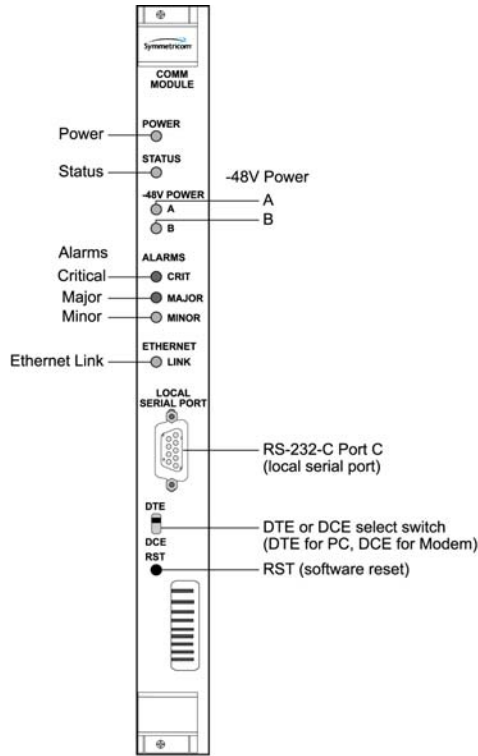


ssu00042

Figure 6-7. Block Diagram of the Communications Module

Status LED Indicators

The Communications module contains a group of eight status LED indicators that convey visual status to the user, as shown in [Figure 6-8](#) and described in [Table 6-10](#).



ssu00032

Figure 6-8. Front Panel of the Communications Module

Table 6-10. 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
-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

Table 6-10. Communications Module Status LED Indicators (Continued)

Indicator	Color	Description
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

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

Alarm Levels

The Communications module alarm logic incorporates three alarm levels:

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

- **MAJOR Alarms** – A class of alarms that may require immediate user intervention. When a major alarm condition is detected, the major alarm relay at the back of the SSU-2000e is activated and the MAJOR ALARM LED on the front of the Communications module lights red.
- **MINOR Alarms** – 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; the default is 86,400 seconds, or one day. The elevation time is stored in each module.

The user can select delay periods for software alarms from 0 to 86400 seconds. Changing the delay period generates an event. The setting is stored in each module.



Note: If the original value is set to IMMED (-1), it means this error delay is not allowed to change and will happen immediately.

Table 6-11 lists the Communications module alarms.

Table 6-11. Communications Module Alarms

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

Configuration Data

Table 6-12 lists the factory default settings and ranges for the communication module software configuration options.

Table 6-12. Communications Module Configuration Data

Configuration Setting	Factory Default
Unit Name	SSU-2000e
Module Information configurations	<p>Current Configuration – the configuration that is currently in use</p> <p>User Default Configuration – configuration the user specifies as the default if the current configuration is invalid or not present</p> <p>Factory Configuration – the factory default configuration</p>

Table 6-12. Communications Module Configuration Data (Continued)

Configuration Setting	Factory Default
User List configurations	Maximum of 25 users including four built-in users
EIA-232-C Port	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.
Comm Port Timeout	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

EIA-232 Ports

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

A user interface (software resident in the Communications module) provides various levels of password-protected access for configuration and detailed performance monitoring and diagnostics. Use either the interactive command set (see [Interactive Command Set](#), on page 304) or the TL1 user interface (see [TL1 Command Interface](#), on page 254) for configuring and detailed performance monitoring.

The ports include:

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

Ethernet Port

The Communications module implements one Ethernet port (ETHERNET 10-BASE-T) that is routed to an RJ-45 connector on the back of the main chassis. For more information on Ethernet settings, see [Communicating by Ethernet](#), on page 98.

Chapter 7 Input Module Reference Data

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

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](#)

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-2000e system.

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-2000e. The Clock modules use this information to phase and frequency lock to the incoming signal. The data may also be used for monitoring the frequency of incoming signals.

The input ports accept one (1-Port Input module), or three (3-Port Input modules) 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 data.

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

Functional Block Diagram

A simplified block diagram of the 1- and 3-Port Input module is shown in [Figure 7-1](#).

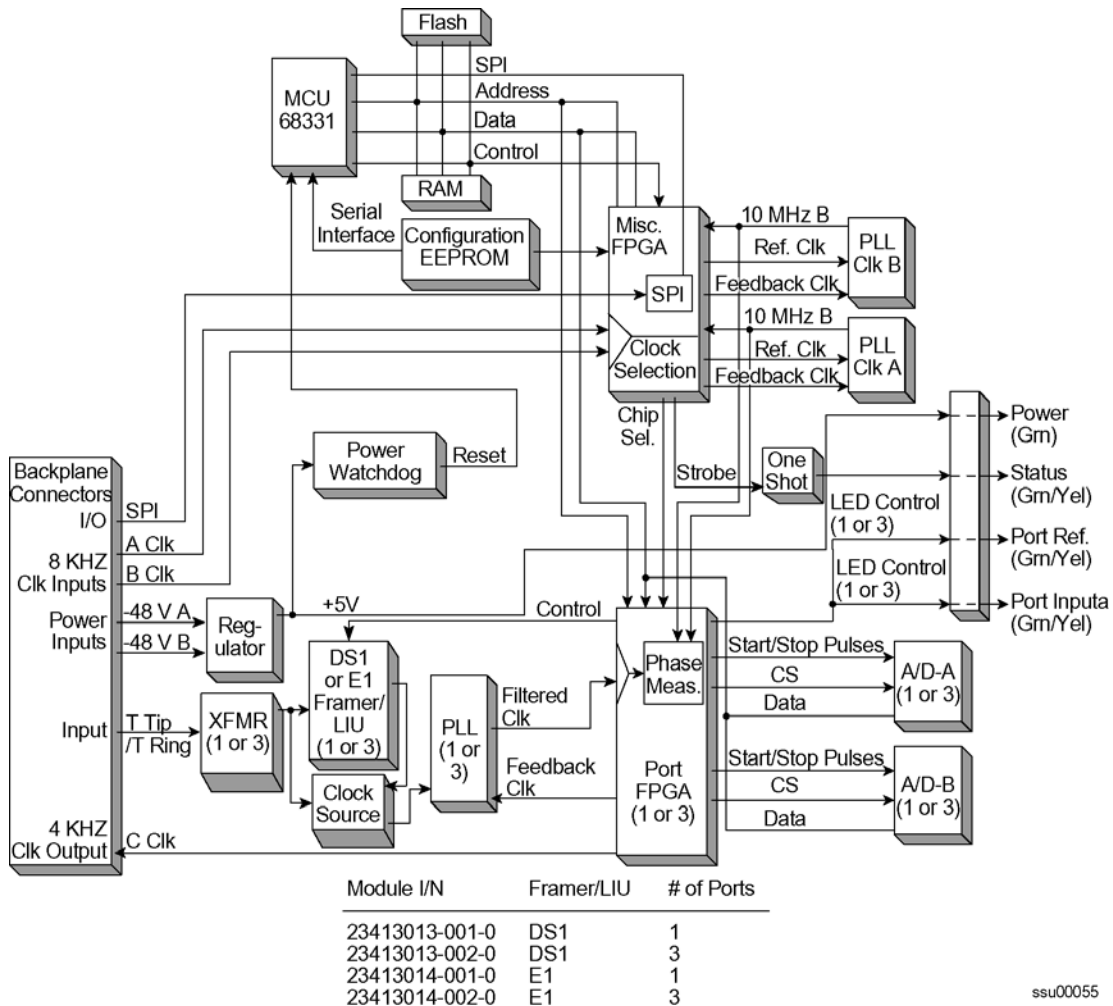


Figure 7-1. Block Diagram of the 1-Port and 3-Port E1 Input Modules

Phase Measurement Averages

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

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

To account for momentary jumps in phase, the Input module uses a phase buildout algorithm for phase jumps greater than or equal to 1 microsecond per tenth of a second. To prevent confusing frequency offsets with phase jumps, the phase 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.

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 110, 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.

TDEV Calculation

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

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

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

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

Sync Status Messages

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

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 (or non-actions) as shown in [Table 7-1](#).

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	<ul style="list-style-type: none"> ■ Generate event message ■ Fault Port 	Cannot be elevated to a higher severity level

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 Configuration](#), on page 415, for more information on provisioning SSMs

Alarms Caused by Hardware Problems

The following alarms are generated due to hardware problems occur:

- 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 is said to be *in episode*. Refer to [Changing Factory Defaults](#), on page 110, for more information on setting the *error count*.

The Input module maintains a count of the number of consecutive seconds in which the input signal for each port was free of each type of error. This *clear count* must exceed a user-set limit before the input signal is no longer in episode. Refer to [Changing Factory Defaults](#), on page 110, 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.

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 the input 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.

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 Seconds)	–
Input Signal Episode, Alarm, and Faults	–	–
Hardware Faults	–	–
Received SSM Changed	New PQL	Old PQL
Phase Buildout	Phase value being built out	<i>Corrected</i> 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](#).

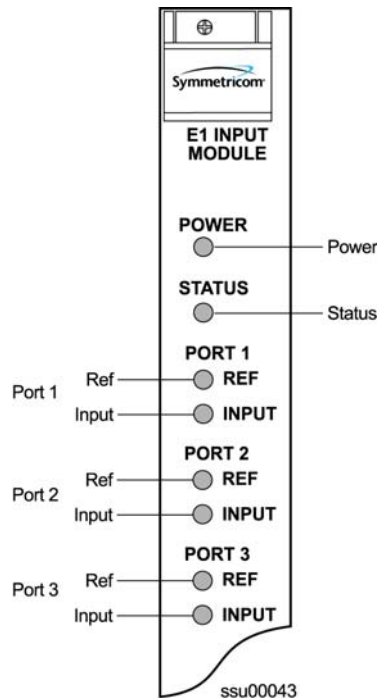


Figure 7-2. Front Panel of the E1 Input Module

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 Amber (blinking) = Module is downloading software
PORT 1 REF	Green/Amber	On (Green) = Selected On (Amber) = Not good and ignored Off = Ignored or good and not selected
PORT 1 INPUT	Green/Amber	On (Green) = Selected On (Amber) = Not good and ignored Off = Ignored or good and not selected
PORT 2 REF	Green/Amber	On (Green) = Selected On (Amber) = Not good and ignored Off = Ignored or good and not selected

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

Indicator	Color	Description
PORT 2 INPUT	Green/Amber	On (Green) = Selected On (Amber) = Not good and ignored Off = Ignored or good and not selected
PORT 3 REF	Green/Amber	On (Green) = Selected On (Amber) = Not good and ignored Off = Ignored or good and not selected
PORT 3 INPUT	Green/Amber	On (Green) = Selected On (Amber) = Not good and ignored Off = Ignored or good and not selected

E1 Input Module Configuration

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

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

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

Configuration Setting	Factory Default	Range
Input Signal Error Limit	10 seconds	1 to 100 for LOS and AIS, 1 to 10000 for BPV, CRC and OOF
MTIE T10 Limit1	325/1000/325	0 to 100000
MTIE T10 Limit2	330/1010/330	0 to 100000
MTIE T100 Limit1	550/2000/550	0 to 100000
MTIE T100 Limit 2	560/2010/560	0 to 100000
MTIE T1000 Limit1	1010/2000/1010	0 to 100000
MTIE T1000 Limit2	1020/2010/1020	0 to 100000
MTIE T10000 Limit 1	1100/2835/1100	0 to 100000
MTIE T10000 Limit 2	1110/2840/1110	0 to 100000
MTIE Limit 1 Alarm Mode	Minor	Ignore, Report, Minor, Major, or Critical
MTIE Limit 2 Alarm Mode	Major	Ignore, Report, Minor, Major, or Critical
Alarm Initial Severity	Minor (except LOS and level 2 MTIE, which are Major)	Ignore, Report, Minor, Major, or Critical
Alarm Initial Delay	0 seconds	0 to 86400 seconds
Alarm Elevation Time	86400 seconds	0 to 500000 seconds
Port Status	Disabled	Enabled/Disabled
Port Name		Any user-selected string from 0 – 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-2000e.

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

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

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 Input modules is shown in [Figure 7-3](#).

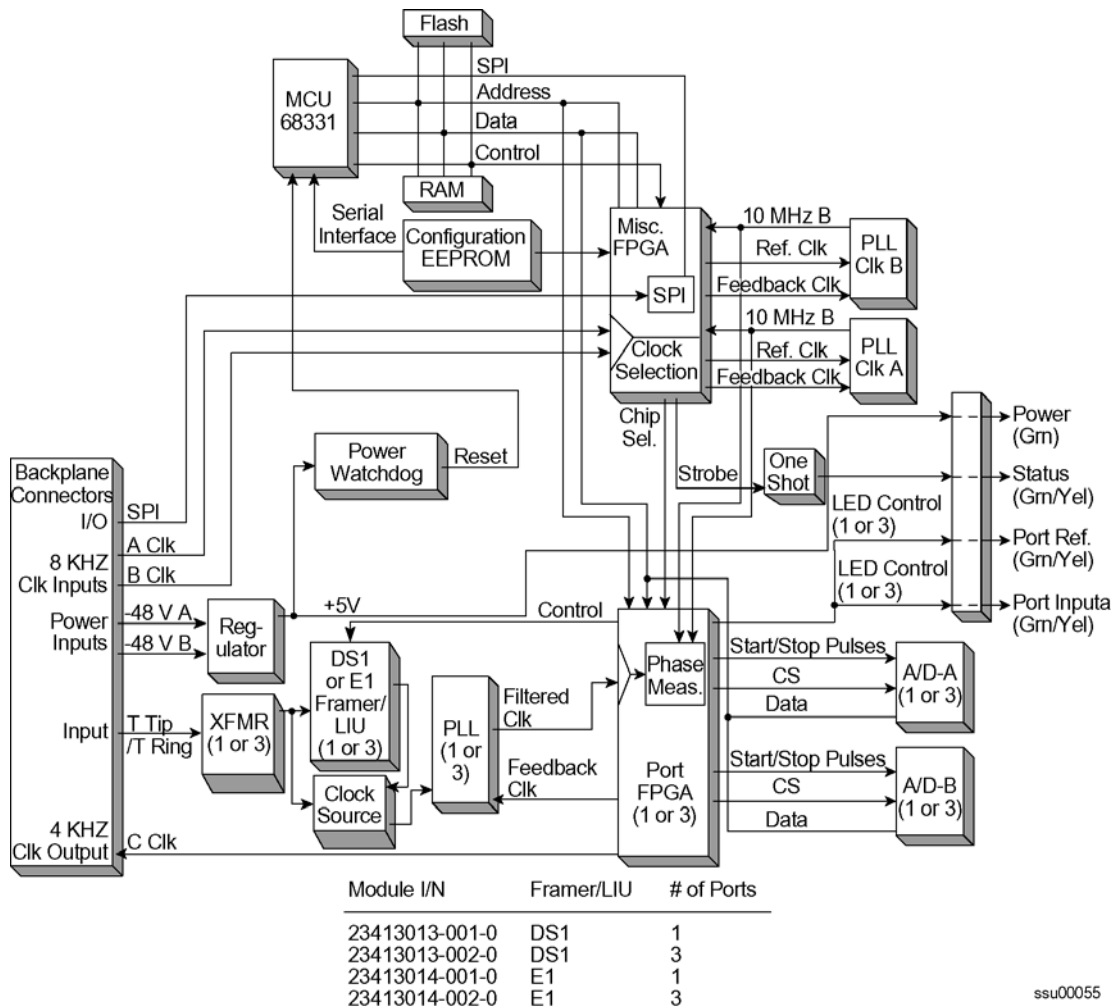


Figure 7-3. Block Diagram of the 1-Port and 3-Port DS1 Input Module

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, 10,000, and 100,000 seconds. MTIE readings which violate either mask at any point cause an alarm at a user-settable level (Minor, Major, or Critical). Refer to [Changing Factory Defaults](#), on page 110, 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.

TDEV Calculation

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

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

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

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

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.

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 110, 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	Generate event message	Cannot be elevated to a higher severity level
MINOR	Generate event message	Elevate to MAJOR if the alarm condition persists beyond the user-settable elevation time limit

Table 7-5. DS1 Input Module Alarm Modes (Continued)

Alarm Mode	Action	Alarm Elevation
MAJOR	Generate event message	Elevate to Critical if the alarm condition persists beyond the user-settable elevation time limit
CRITICAL	<ul style="list-style-type: none"> ■ Generate event message ■ Fault Port 	Cannot be elevated as there is no higher severity level

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
- 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. The action depends on the alarm mode set by the user or the default settings. Refer to the Alarm command in [Interactive Command Set](#), on page 304, 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:

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 Seconds)	–
Input Signal Episode, Alarm, and Faults	–	–
Hardware Faults	–	–
Received SSM Changed	New PQL	Old PQL
Phase Buildout	Phase value being built out	<i>Corrected</i> 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](#).

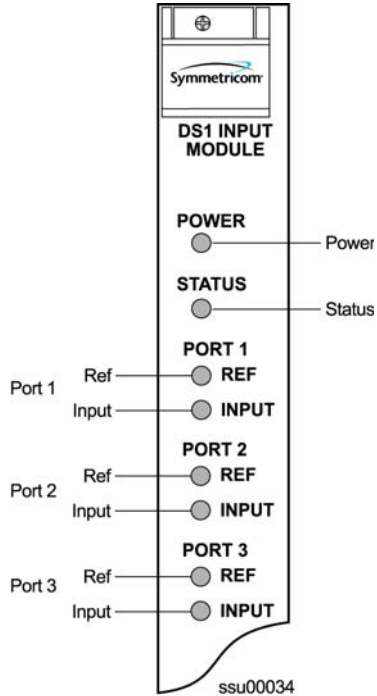


Figure 7-4. Front Panel of the DS1 Input Module

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

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

Software 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)	10MHz	1MHz, 1.544MHz, 2.048MHz, 5MHz, 10MHz
Framing Type	ESF	D4 or ESF
Zero Suppression	On	On/Off
CRC	Off	On/Off
SSM	Off	On/Off
Provisioned PQL	3/4/3	1–16
Priority	0	0–10 (0 = Monitor)
Cesium Fault Nominal	Low	Low/High/Off
Input Signal Error Limit	10 seconds	1–100 for LOS and AIS 1–10000 for BPV, CRC, and OOF
MTIE T10 Limit1	325/1000/325	0 to 100000
MTIE T10 Limit2	330/1010/330	0 to 100000

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

Configuration Setting	Factory Default	Range
MTIE T100 Limit1	550/2000/550	0 to 100000
MTIE T100 Limit 2	560/2010/560	0 to 100000
MTIE T1000 Limit1	1010/2000/1010	0 to 100000
MTIE T1000 Limit2	1020/2010/1020	0 to 100000
MTIE T10000 Limit 1	1100/2835/1100	0 to 100000
MTIE T10000 Limit 2	1110/2840/1110	0 to 100000
MTIE Limit 1 Alarm Mode	Minor	Ignore, Report, Minor, Major, or Critical
MTIE Limit 2 Alarm Mode	Major	Ignore, Report, Minor, Major, or Critical
Alarm Initial Severity	Minor (except LOS and level 2 MTIE, which are Major)	Ignore, Report, Minor, Major, or Critical
Alarm Initial Delay	0 seconds	0 to 86400 seconds
Alarm Elevation Time	86400 seconds	0 to 500000 seconds
Port Status	Disabled	Enabled/Disabled
Port Name		Any user-selected string from 0 – 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. For information on antenna kits and accessories, including part numbers and installation procedures, refer to [Appendix C, Antennas](#).

GPS Input Module 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 module is to perform time-interval measurements on Clock module A and Clock module B, using the 1PPS provided by the radio. These measurements are used to adjust the frequency of the oscillators on those modules.

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

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

Functional Block Diagram

A simplified block diagram of the GPS Input module is shown in [Figure 7-5](#).

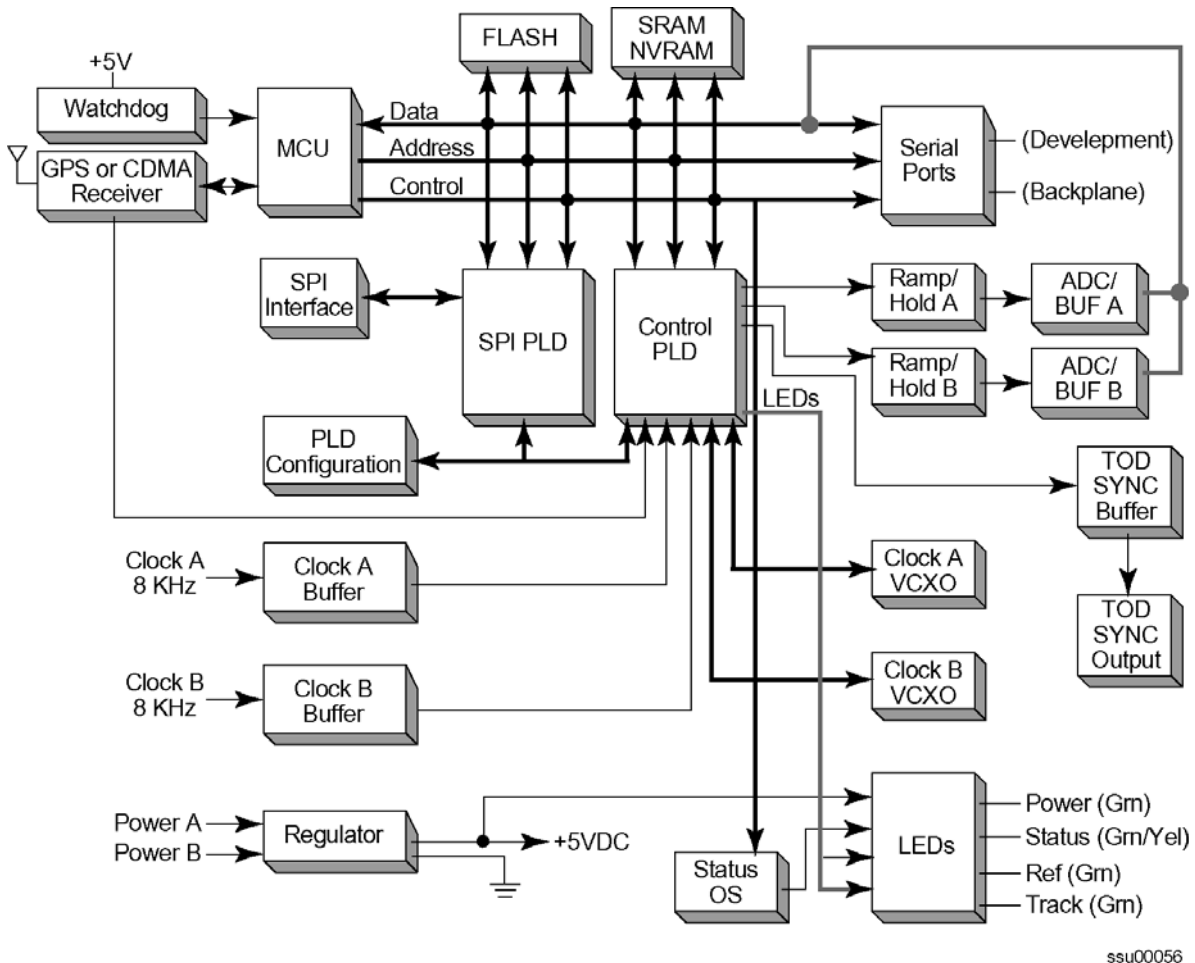


Figure 7-5. Block Diagram of the GPS Input Module

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](#).

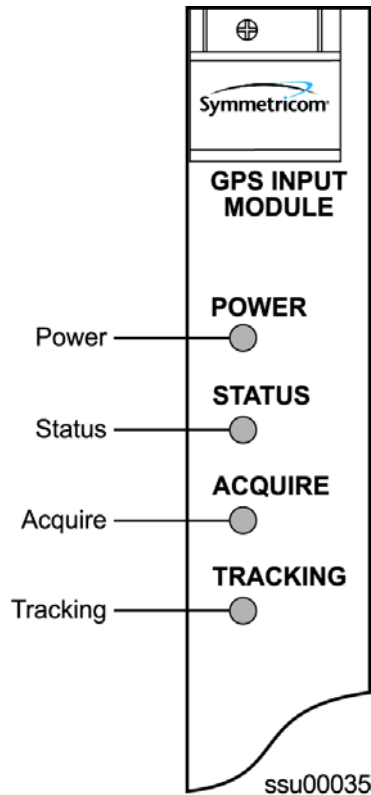


Figure 7-6. Front Panel of the GPS Input Module

Table 7-9. GPS Input Module Status LED Indicators

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

Configuration Settings

The configuration settings for the GPS Input module is provided in [Table 7-10](#).

Table 7-10. GPS Input Module Configuration Settings

Configuration Setting	Factory Default	Range
Position (GPS only)		
Latitude	0	± 90 degrees
Longitude	0	±180 degrees
Altitude	0	-60 to 4000 meters
Averages	300	10 to 3600
PDOP	0	1 to 10
Pos Mode	Calc	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 μ S
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-2000e 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-2000e 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.

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](#).

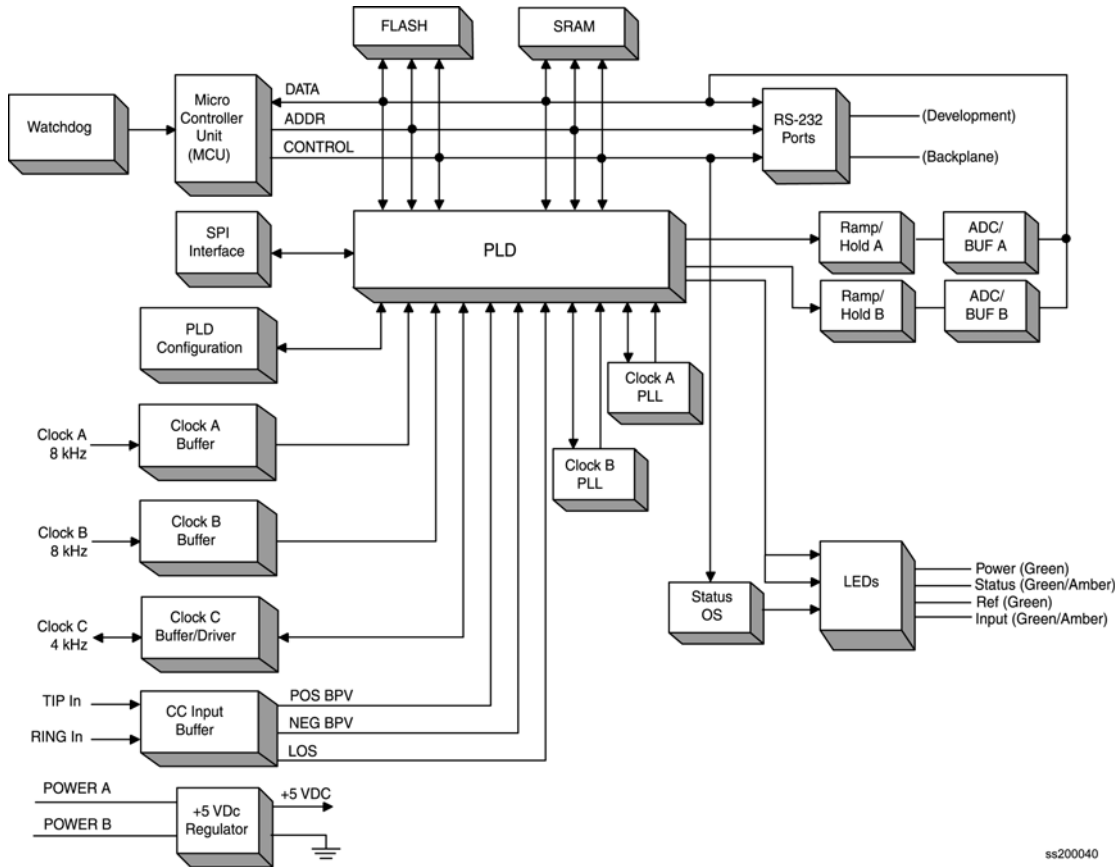


Figure 7-7. Block Diagram of the Composite Clock Input Module

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](#).

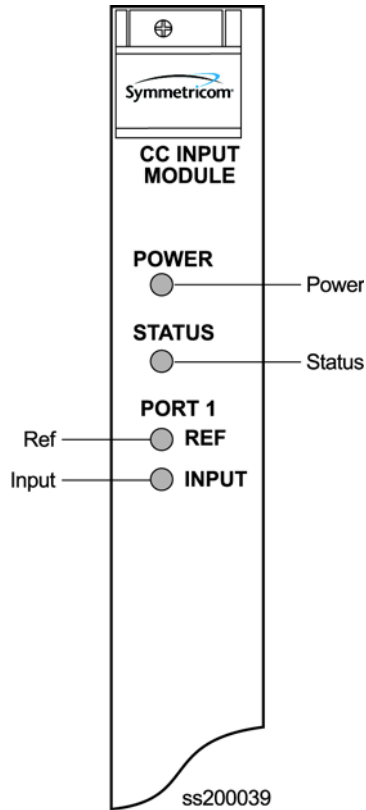


Figure 7-8. Front Panel of the Composite Clock Input Module

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)

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

Chapter 8 Output Module Reference Data

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

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](#)
- [Buffer Module](#)

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-2000e main chassis and in the optional SDU-2000e expansion shelf.

Functional Overview

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

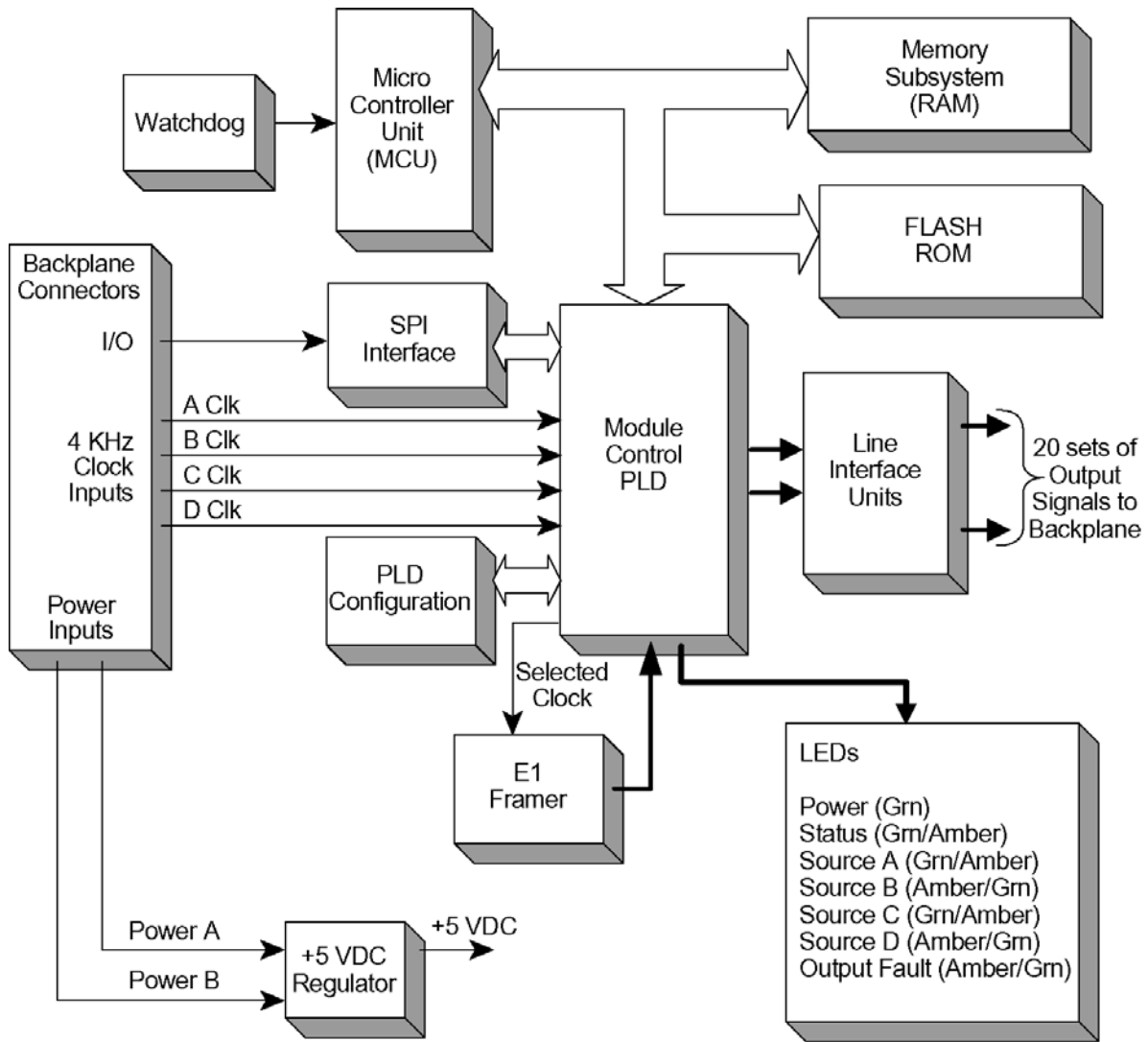
In addition, the phase-locked 2.048 Mbps signal is used to clock the frame generator (or framer) for insertion of proper framing bits.

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

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

Functional Block Diagram

A simplified block diagram of the E1 Output module is shown in [Figure 8-1](#).



ssu00058

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

Status LED Indicators

The E1 Output module has seven status LED indicators along the front edge of the module that are used for visually conveying status information to the user. The LEDs are shown in [Figure 8-2](#) and described in [Table 8-1](#).

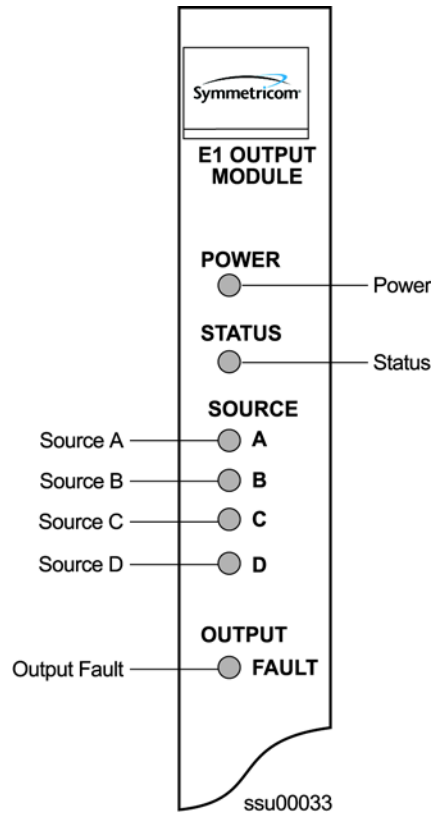


Figure 8-2. Front Panel of the E1 Output Module

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) = Source A is the selected source clock On (Amber) = Faulty or missing A source clock Off = Source A is ignored or good and not selected
SOURCE B	Green/Amber	On (Green) = Source B is the selected source clock On (Amber) = Faulty or missing B source clock Off = Source B is ignored or good and not selected

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

Indicator	Color	Description
SOURCE C	Green/Amber	On (Green) = Source C is the selected source clock On (Amber) = Faulty or missing source C clock Off = Source C is ignored or good and not selected
SOURCE D	Green/Amber	On (Green) = Source D is the selected source clock On (Amber) = Faulty or missing source D clock Off = Source D is ignored or good and not selected
OUTPUT FAULT	Amber	On = Module has detected one or more faulty outputs Off = All output signals are good

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)
Risetime	<100 ns
Pulse Width	244 ns, nominal into 120Ω
Pulse Interval	488 ns, nominal
Duty Cycle	50%
Pulse Amplitude	2.2 to 3.3 Vpp
Jitter	< 0.01 UI
Number of Outputs	20

DS1 Output Module

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

Functional Overview

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

Functional Block Diagram

A simplified block diagram of the DS1 Output module is shown in [Figure 8-3](#).

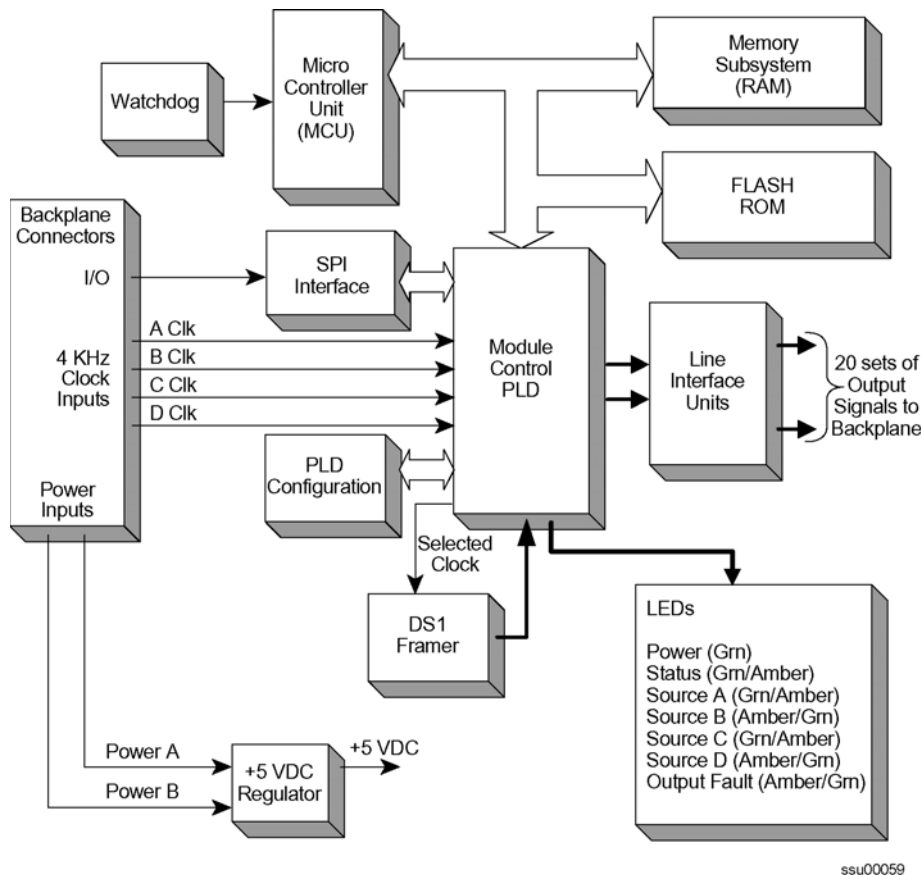


Figure 8-3. Block Diagram of the DS1 Output Module

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](#).

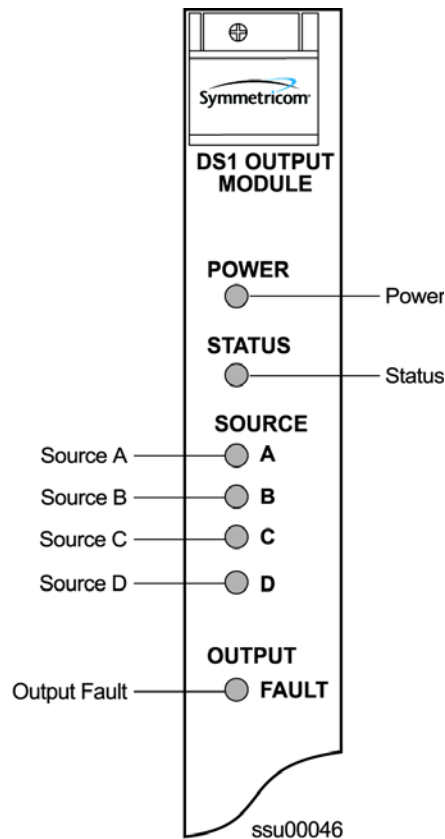


Figure 8-4. Front Panel of the DS1 Output Module

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 35 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 ITU Rec. G.703 and ANSI T1.102
Risetime	<100 ns
Pulse Width	324 ns, nominal into 100Ω
Pulse Interval	648 ns, nominal
Duty Cycle	50%
Pulse Amplitude	2.6 to 3.6 Vpp
Jitter	< 0.01 UI
Number of Outputs	20

Composite Clock Output Module

This section provides user-reference data for the Composite Clock Output module (part number 23413158-000-0) used in both the SSU-2000e main chassis and in the optional SDU-2000e 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 μ sec in 8 or more steps. Refer to [Changing Factory Defaults](#), on page 110, 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.

Functional Block Diagram

A simplified block diagram of the Composite Clock Output module is shown in [Figure 8-5](#).

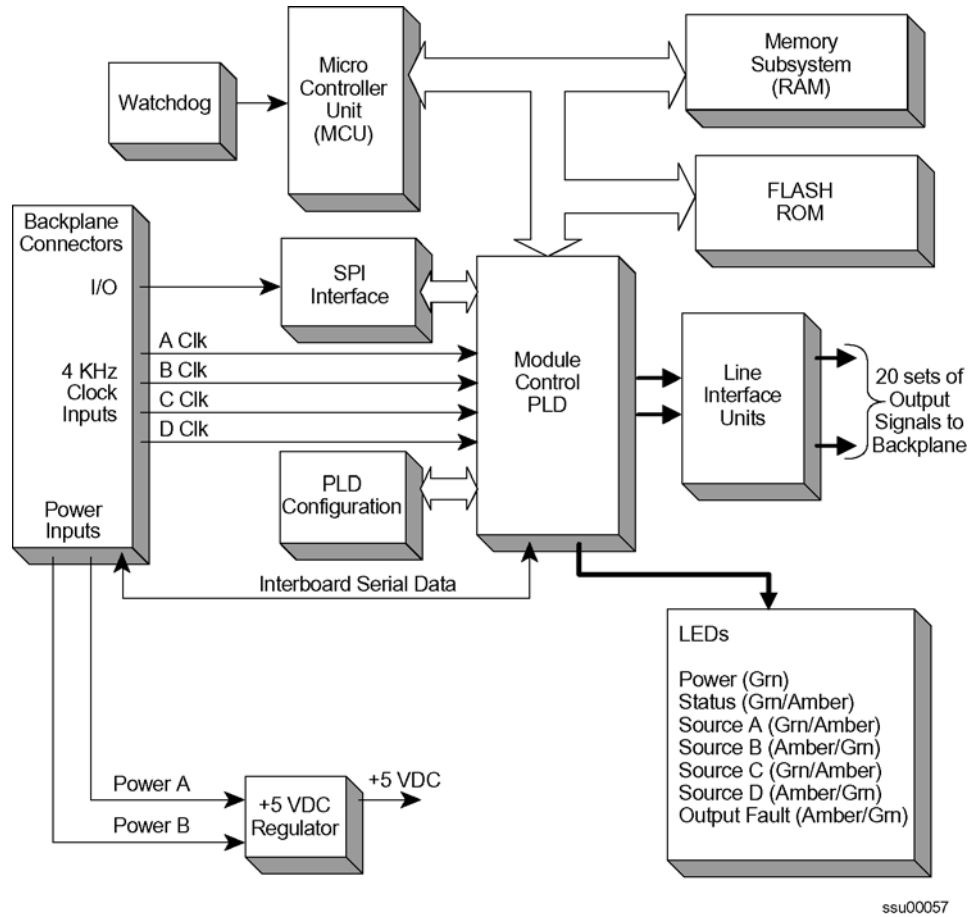


Figure 8-5. Block Diagram of the Composite Clock Output Module

Status LED Indicators

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

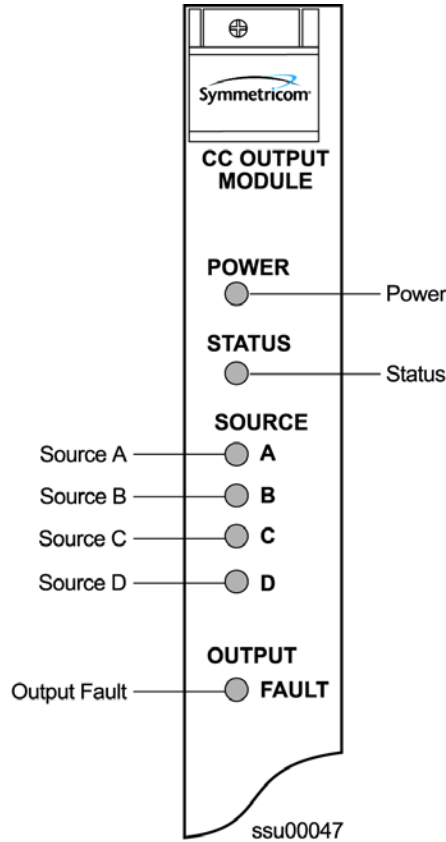


Figure 8-6. Front Panel of the Composite Clock Output Module

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

Indicator	Color	Description
POWER	Green	On = +5 vDC power available on the Output module Off = +5 vDC not present on the module
STATUS	Green/Amber	On (Green) = Module functioning correctly Blinking Amber = Output module is downloading firmware On (Amber) = Output module failure
SOURCE A	Green/Amber	On (Green) = Source A is the selected source clock On (Amber) = Faulty or missing A source clock Off = Source A is ignored or good and not selected
SOURCE B	Green/Amber	On (Green) = Source B is the selected source clock On (Amber) = Faulty or missing B source clock Off = Source B is ignored or good and not selected

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

Indicator	Color	Description
SOURCE C	Green/Amber	On (Green) = Source C is the selected source clock On (Amber) = Faulty or missing source C clock Off = Source C is ignored or good and not selected
SOURCE D	Green/Amber	On (Green) = Source D is the selected source clock On (Amber) = Faulty or missing source D clock Off = Source D is ignored or good and not selected
OUTPUT FAULT	Amber	On = Module has detected one or more faulty outputs Off = All output signals are good

Composite Clock Output Module 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 & Figure 6-1
Rise/Fall time	<500 ns
Pulse Width	9.8 μ s \pm 2% for 62.5/37.5 duty cycle 7.8 μ s \pm 2% for 50/50 duty cycle
Pulse Interval	15.6 μ s, 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

E1/2048 kHz Output Module

This section provides operating instructions and software provisioning procedures for the Symmetricom E1/2048 kHz Output module (part number 23413292-000-0) designed for use in the SSU-2000e 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 345.

To view the output frequency setting, use the TL1 command `RTRV-PRMTR-OUTE12048`, described in [Retrieve Commands and Responses](#), on page 263. To provision the output parameters, use the TL1 command `SET-PRMTR-OUTE12048`, described in [TL1 Set Commands](#), on page 293.

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-2000e uses the system Priority Quality Level (PQL) to determine when the system is operating within specified limits; if the outputs become degraded, the system 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). The syntax for each command is shown below. 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 (turned off) and ports 6 through 20 continue to generate outputs. The response from the Output Status command appears as shown in the following example.

```
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 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](#).

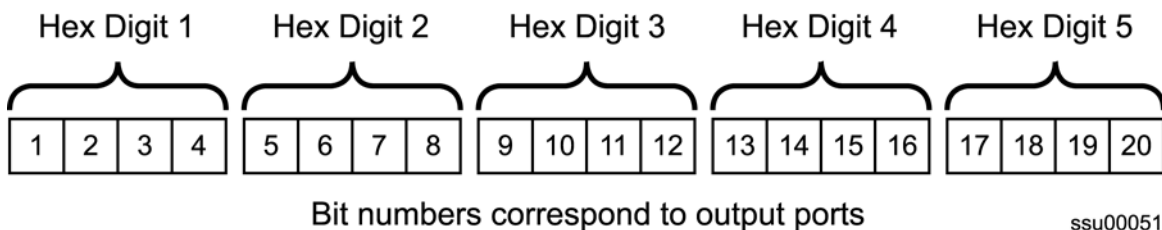


Figure 8-7. Using the Hex Number to Identify Output Ports

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	Port	Port	Port	Port
Digit 1	1	2	3	4
Digit 2	5	6	7	8
Digit 3	9	10	11	12
Digit 4	13	14	15	16
Digit 5	17	18	19	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 308) or the SET-PRMTR-OUTE12048 command (described in [TL1 Set Commands](#), on page 293) to provision these alarms to Ignore, Report Only, Minor Alarm, Major Alarm (default), or a Critical Alarm.

```
SSU->a1 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 345. To provision the squelch using TL1 commands, see [TL1 Set Commands](#), on page 293.



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 (CLK-C) Alarms

The SSU-2000e 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-2000e 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.

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](#).

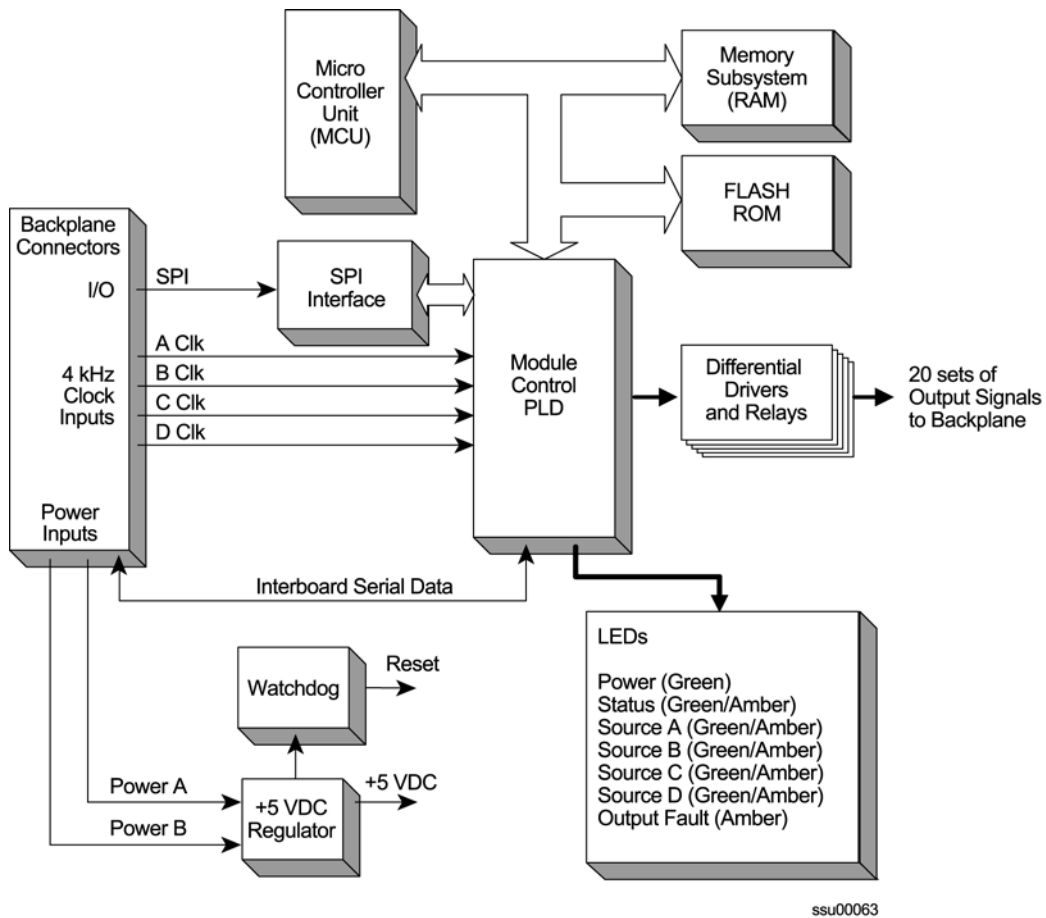


Figure 8-8. Block Diagram of the E1/2048 kHz Output Module

E1/2048 kHz Output Module Status Indicators

The E1/2048 module has seven 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 8-12](#) and described in [Table 8-8](#).

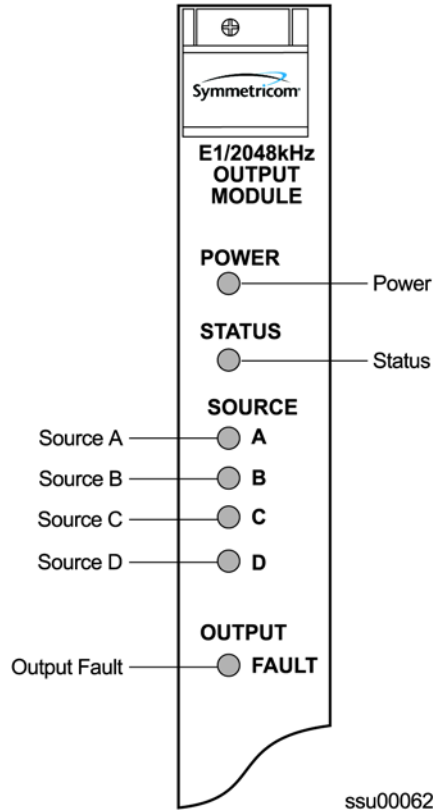


Figure 8-9. Front Panel of the E1/2048 kHz Output Module

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) = Source A is the selected source clock On (Amber) = Faulty or missing A source clock Off = Source A is good and not selected
SOURCE B	Green/Amber	On (Green) = Source B is the selected source clock On (Amber) = Faulty or missing B source clock Off = Source B is good and not selected

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

Indicator	Color	Description
SOURCE C	Green/Amber	On (Green) = Source C is the selected source clock On (Amber) = Faulty or missing source C clock Off = Source C is ignored, or good and not selected
SOURCE D	Green/Amber	On (Green) = Source D is the selected source clock On (Amber) = Faulty or missing source D clock Off = Source D is ignored, or good and not selected
OUTPUT FAULT	Amber	On = Module has detected one or more faulty outputs Off = All output signals are good

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

E1/2048 kHz Output Module Software Options

The factory default setting and range for all E1/2048 kHz Output module software parameters are listed in [Table 8-10](#).

Table 8-10. 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

2048 kHz Output Module

This section provides operating instructions and software provisioning procedures for the 2048 kHz Output module (part number 23413159-000-0). It also contains default provisioning settings, and procedures for connecting to the SSU-2000e 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-2000e 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 OUTPUT command (for ICS mode) or the SET-PRMTR-CLKOUT command (for TL1 mode). The syntax for each command is shown below. 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, 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 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](#).

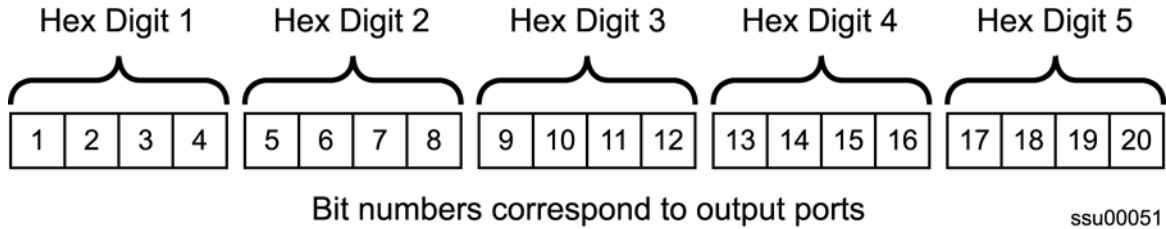


Figure 8-10. Using the Hex Number to Identify Output Ports

[Table 8-11](#) 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 8-11](#). 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 8-11. Identifying Failed Ports from the Hex Digit

Hex Value	Port	Port	Port	Port
Digit 1	1	2	3	4
Digit 2	5	6	7	8
Digit 3	9	10	11	12
Digit 4	13	14	15	16
Digit 5	17	18	19	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

Table 8-11. Identifying Failed Ports from the Hex Digit (Continued)

Hex Value	Port	Port	Port	Port
Digit 1	1	2	3	4
Digit 2	5	6	7	8
Digit 3	9	10	11	12
Digit 4	13	14	15	16
Digit 5	17	18	19	20
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.

```
SSU+>a1 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 345.

To provision the squelch using TL1 commands, see [TL1 Set Commands](#), on page 293.

Functional Block Diagram

A simplified block diagram of the 2048 kHz Output module is shown in [Figure 8-11](#).

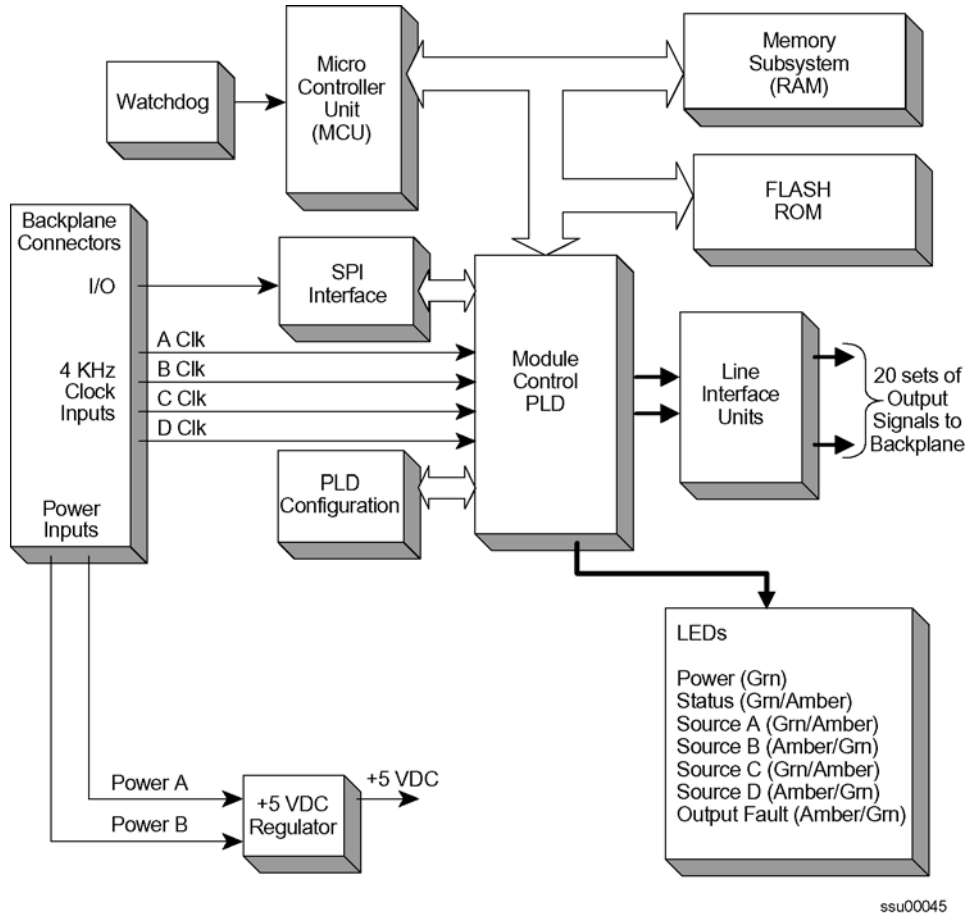


Figure 8-11. Block Diagram of the 2048 kHz Output Module

Status LED Indicators

The 2048 kHz Output module has seven status LED indicators along the front edge of the module that are used for visually conveying status information to the user. The LEDs are shown in [Figure 8-12](#) and described in [Table 8-12](#).

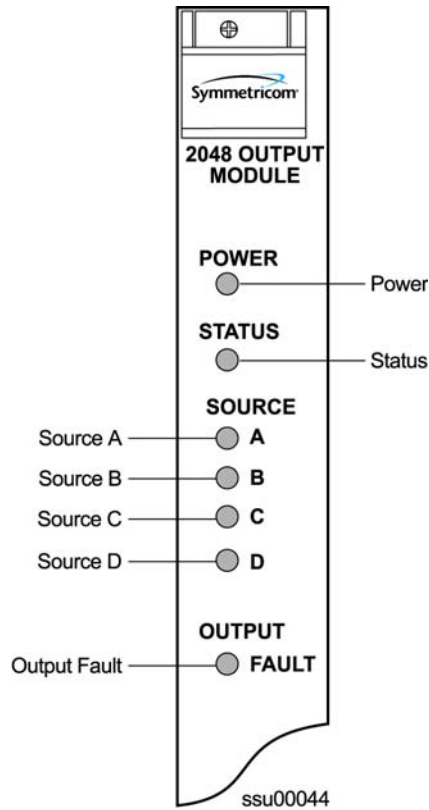


Figure 8-12. Front Panel of the 2048 kHz Output Module

Table 8-12. 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) = Source A is the selected source clock On (Amber) = Faulty or missing A source clock Off = Source A is ignored or good and not selected
SOURCE B	Green/Amber	On (Green) = Source B is the selected source clock On (Amber) = Faulty or missing B source clock Off = Source B is ignored or good and not selected

Table 8-12. 2048 kHz Output Module Status LED Indicators (Continued)

Indicator	Color	Description
SOURCE C	Green/Amber	On (Green) = Source C is the selected source clock On (Amber) = Faulty or missing source C clock Off = Source C is ignored or good and not selected
SOURCE D	Green/Amber	On (Green) = Source D is the selected source clock On (Amber) = Faulty or missing source D clock Off = Source D is ignored or good and not selected
OUTPUT FAULT	Amber	On = Module has detected one or more faulty outputs Off = All output signals are good

Performance Specifications

Specifications for the 2048 kHz Output module are provided in [Table 8-13](#).

Table 8-13. 2048 kHz Output Module Specifications

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

RS-422 Output Module

This section provides operating instructions and software provisioning procedures for the RS-422 Output module (part number 23413287-000-0) designed for use in the SSU-2000e 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.

The user 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 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 locking in phase with it, and then turns its output back on.

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 345. The TL1 commands RTRV-PRMTR-OUT422 and SET-PRMTR-OUT422 are described in [TL1 Command Interface](#), on page 254.



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-2000e uses the system Priority Quality Level (PQL) to determine when the system is operating within specified limits; if the outputs become degraded, the system automatically turns off the affected ports.

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). The syntax for each command is shown below. 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.

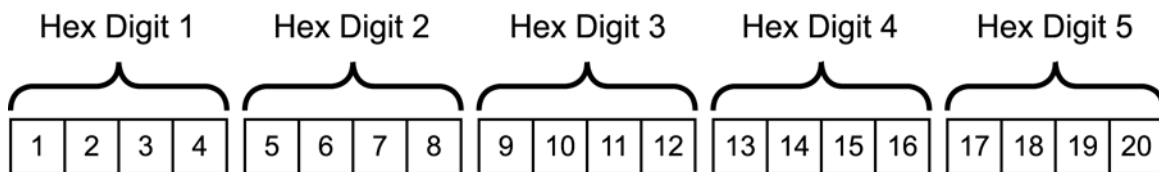
For example, you can provision output ports 1 through 5 for a threshold PQL of 3 and you can disable squelching for ports 6 through 20 (PQL is set to 0). In this example, if the system PQL is 1, 2, or 3, ports 1 through 20 generate outputs. If the system PQL changes to 4 or higher, outputs on ports 1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

```
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](#).



Bit numbers correspond to output ports

ssu00051

Figure 8-13. Using the Hex Number to Identify Output Ports

Table 8-14 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 8-14. 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 8-14. Identifying Failed Ports from the Hex Digit

Hex Value	Port	Port	Port	Port
Digit 1	1	2	3	4
Digit 2	5	6	7	8
Digit 3	9	10	11	12
Digit 4	13	14	15	16
Digit 5	17	18	19	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. Refer to [Chapter B, Communications Protocol](#) for more information on using the Alarm command.

```
SSU+>a1 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 345.

To provision the squelch using TL1 commands, see [TL1 Set Commands](#), on page 293.

Functional Block Diagram

A simplified block diagram of the RS-422 Output module is shown in Figure 8-14.

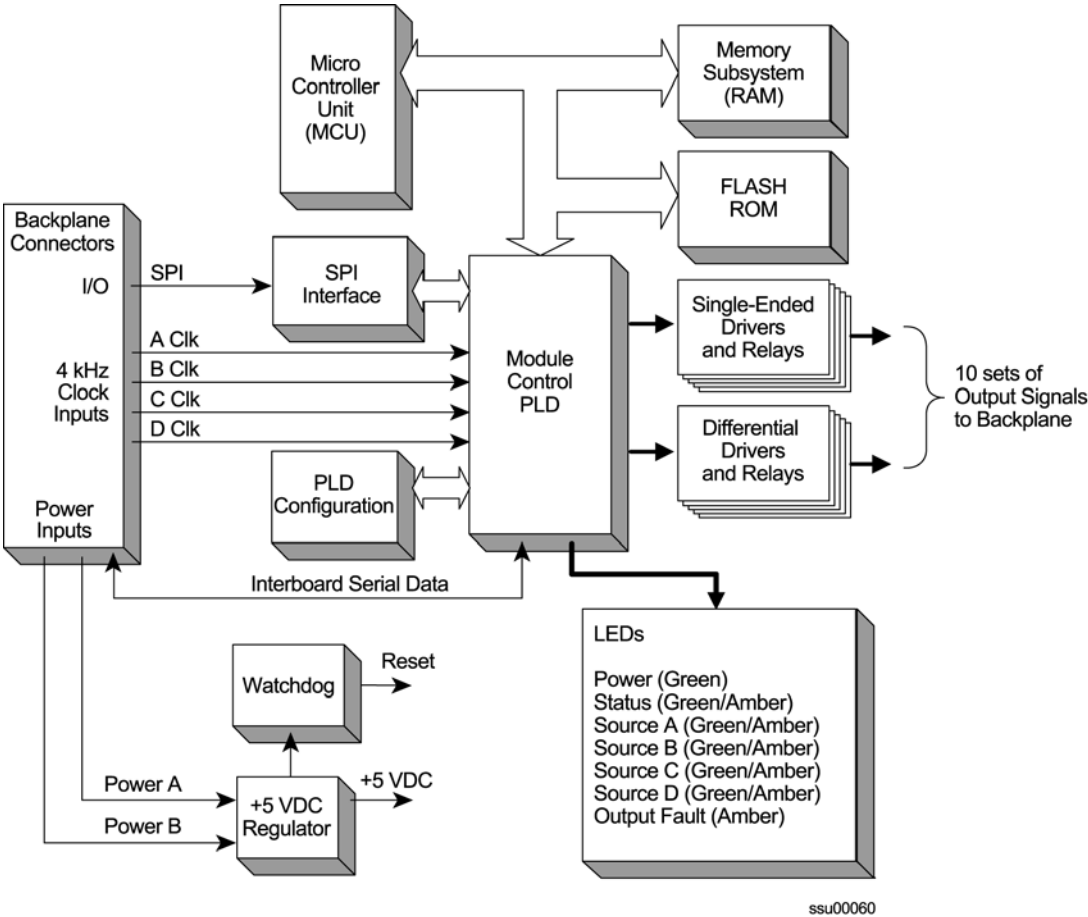


Figure 8-14. Block Diagram of the RS-422 Output Module

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](#).

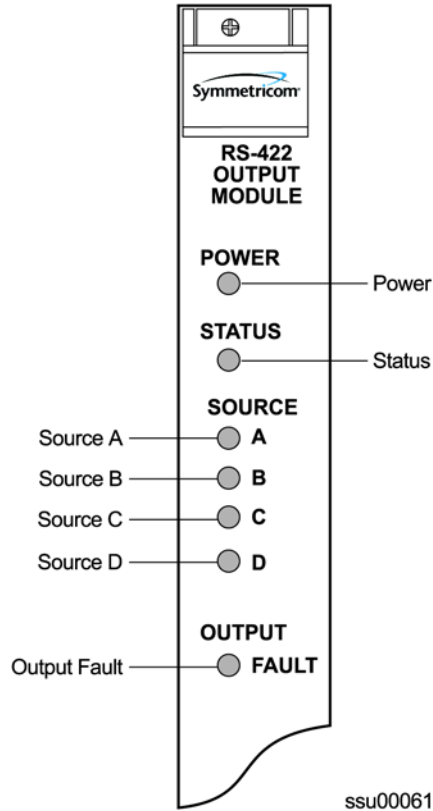


Figure 8-15. Front Panel of the RS-422 Output Module

Table 8-15. 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) = Source A is the selected source clock On (Amber) = Faulty or missing A source clock Off = Source A is ignored or good and not selected
SOURCE B	Green/Amber	On (Green) = Source B is the selected source clock On (Amber) = Faulty or missing B source clock Off = Source B is ignored or good and not selected

Table 8-15. RS-422 Output Module Status LED Indicators (Continued)

Indicator	Color	Description
SOURCE C	Green/Amber	On (Green) = Source C is the selected source clock On (Amber) = Faulty or missing source C clock Off = Source C is ignored or good and not selected
SOURCE D	Green/Amber	On (Green) = Source D is the selected source clock On (Amber) = Faulty or missing source D clock Off = Source D is ignored or good and not selected
OUTPUT FAULT	Amber	On = Module has detected one or more faulty outputs Off = All output signals are good

Performance Specifications

Specifications for the RS-422 Output module are provided in [Table 8-12](#).

Table 8-16. 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

Software Options

The factory default setting and range for all RS-422 Output module software parameters are listed in [Table 8-16](#).

Table 8-17. 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

Table 8-17. RS-422 Output Module Configuration (Continued)

Configuration Setting	Factory Default	Range
Bypass	On	On/Off
Fault Action	On	Off/On/Auto
Other	Duty Cycle of 50/50	50/50

Buffer Module

This section describes the Buffer module (part number 25413022-000-0) used in the SDU-2000e 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-2000e. Symmetricom recommends a minimum of one Buffer module in each expansion shelf; a second Buffer module provides redundancy.

Status LED Indicators

The Buffer module indicators (LEDs) are shown in [Figure 8-16](#) and described in [Table 8-16](#).

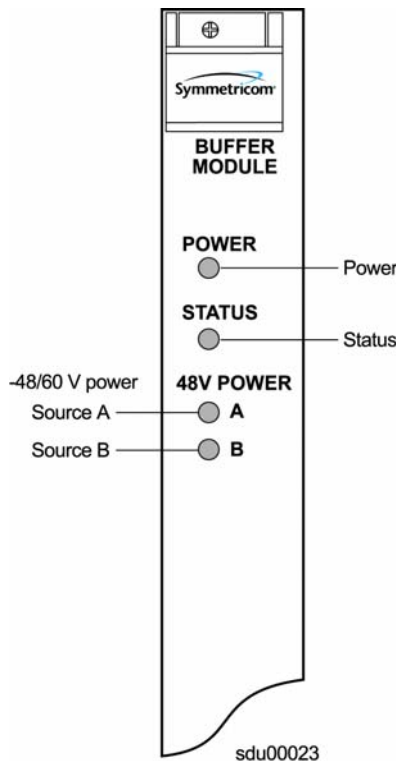


Figure 8-16. Front Panel of the Buffer Module

Table 8-18. Buffer 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
-48V Power A	Green/Amber	On (Green) = Receiving input power from Source A On (Amber) = Power connections reversed Off = Loss of Source A
-48V Power B	Green/Amber	On (Green) = Receiving input power from Source B On (Amber) = Power connections reversed Off = Loss of Source B

Output Module Reference Data
Buffer Module

Chapter 9 Hardware Configuration Guide

This chapter describes how to configure the SSU-2000e 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-2000e Configuration Chart](#)
- [SDU-2000e Configuration Chart](#)

Configuring a Conventional SSU/TSG System

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

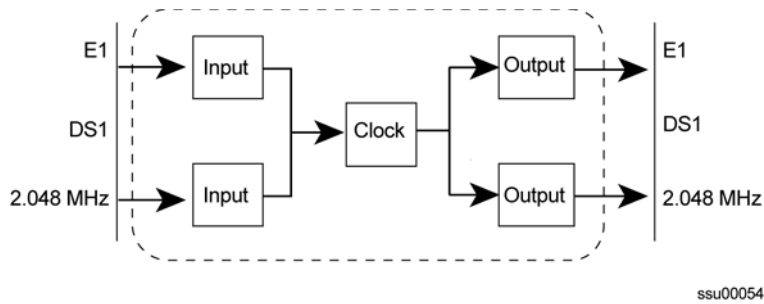


Figure 9-1. Timing Sync Generator (TSG) System Configuration

The TSG configuration consists of the following:

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

Configuring a Primary Reference Source (PRS) System

In a Primary Reference Source (PRS) configuration, the SSU-2000e meets the specifications defined in American National Standards Institute (ANSI) T1.101-1994. ANSI defines a Primary Reference Source as “equipment that provides a timing signal whose long-term accuracy is maintained at $1 \times 10E^{-11}$ or better, with verification to Universal Coordinated Time (UTC), and whose timing signal is used as the basis of reference for the control of other clocks within a network”. If standard Input modules are installed in the remaining input slots, this configuration also allows for monitoring of other external signals, such as DS1, E1, composite clock, and various clock frequencies. Time-of-day functionality is available via the Ethernet port employing NTP. Figure 9-2 shows a PRS configuration.

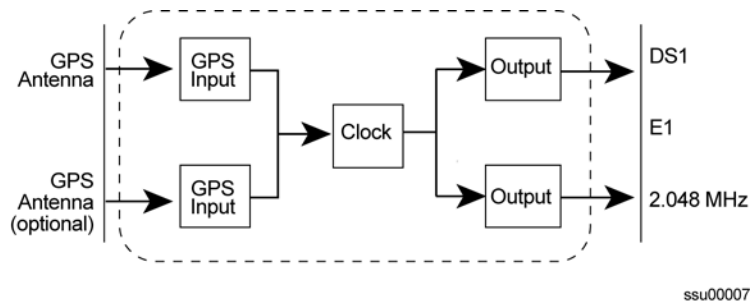


Figure 9-2. SSU-2000e Configured as PRS System

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

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

Configuring a Monitor-Only System

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

Figure 9-3 shows a monitor only configuration.

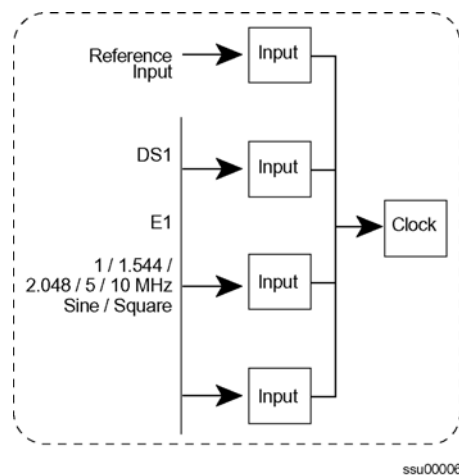


Figure 9-3. SSU-2000e Configured as Monitor Only System

A monitor only configuration consists of the following:

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

SSU-2000e Configuration Chart

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

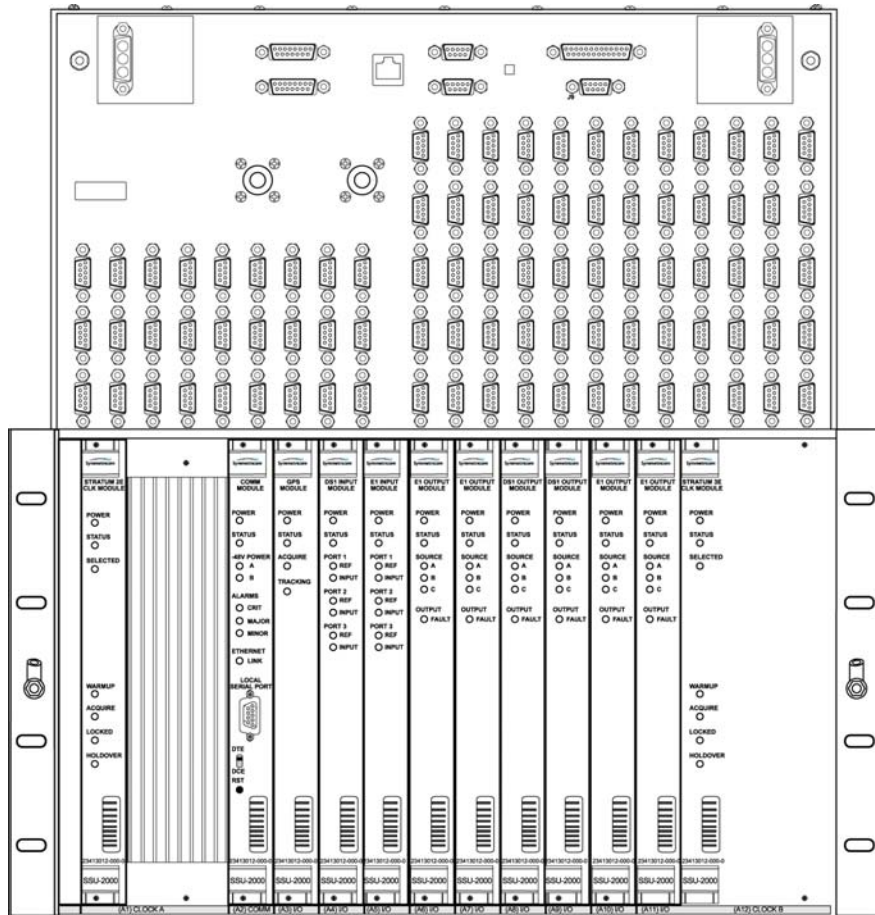


Figure 9-4. SSU-2000e Main Shelf, Front View

Table 9-1. SSU-2000e System Components

Item	Description	Symmetricom Part No.	Notes
SSU-2000e Main Shelf and Associated Hardware			
1	SSU-2000e Main Shelf (Chassis) with SDU termination plug and SSU-2000e Synchronization Supply Unit User Guide	25413140-000-0	<p>Required for all systems.</p> <p>If an expansion chassis (SDU-2000e) is not attached to J8, an SSU Expansion Terminator, P/N 12013049-000-0 must be installed on the SSU-2000e chassis, connector J8. Otherwise, the terminator must be installed on the last expansion chassis in the system.</p> <p>Requires minimum of one Comms module, one Clock module, one Input module, one Output module, and eight filler panels (including one wide panel).</p>
2	Bracket, rack ear, 530mm	00413140-001-1	Two each provided with the main shelf.
3	Bracket, rack ear, 480mm	00413140-000-1	Two each required per main shelf (must specify 23" rack).
Clock Modules			
4	Stratum 2E Rb Clock Module	23413016-000-0	<ol style="list-style-type: none"> 1. Minimum of one Clock module per system (item 4 or item 5) 2. Redundant configuration with automatic switching in case of clock failure requires two Clock modules. 3. The system will operate with 2E/3E clocks combined. 2E clock must be installed in chassis slot A1.
5	3E Clock Module	23413015-000-0	<ol style="list-style-type: none"> 1. Minimum of one Clock module per system (item 4 or item 5) 2. Redundant configuration with automatic switching in case of clock failure requires two Clock modules. 3. The system will operate with 2E/3E clocks combined. 2E clock must be installed in chassis slot A1.
Communications Module			
6	Communications Module	23413012-000-0	One required per SSU-2000e system.

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

Item	Description	Symmetricom Part No.	Notes
Input Modules			
7	3-Port DS1 Input Module	23413013-002-0	Accepts up to three DS1 or clock signals.
8	1-Port DS1 Input Module	23413013-001-0	<ol style="list-style-type: none"> 1. Accepts one DS1 or clock signal. 2. Requires use of four-port SSU I/O Adapter (one adapter can handle up to four one-port DS1 or ES1 Input Modules).
9	3-Port E1 Input Module	23413014-002-0	Any combination of three G.703/9, G.703/13, or clock inputs.
10	1-Port E1 Input Module	23413014-001-0	Any G.703/9, G.703/13, or clock input.
11	GPS Input Module	23413019-000-0	One radio input signal
12	Input signal terminator 120Ω (DS1)	5511021-0038	As required
13	Input signal terminator 100Ω (E1)	5511021-0039	As required
14	Input signal terminator 75Ω (Coaxial cable)	5511021-0041	As required
Output Modules			
15	E1 Output Module	23413018-000-0	<ol style="list-style-type: none"> 1. Minimum of one Output module required. 2. Each Output module provides 20 single output signals or 20 redundant signals (if desired) in even/odd slots.
16	DS1 Output Module	23413017-000-0	<ol style="list-style-type: none"> 1. Minimum of one Output module required. 2. Each Output module provides 20 single output signals or 20 redundant signals (if desired) in even/odd slots.
17	2048 kHz Output Module	23413159-000-0	<ol style="list-style-type: none"> 1. Installed in sets of two. 2. Each Output module pair provides 20 sets of summed output signals (redundant configuration). 3. Maximum of 6 redundant output modules can be installed in main shelf (60 summed outputs). 4. Applications requiring more than 60 output clocks require SDU-2000e Expansion Shelf (Item 16 below).

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

Item	Description	Symmetricom Part No.	Notes
18	Composite Clock Output Module	23413158-000-0	<ol style="list-style-type: none"> 1. Installed in sets of two. 2. Each Output module pair provides 20 sets of summed output signals (redundant configuration). 3. Maximum of 6 redundant output modules can be installed in main shelf (60 summed outputs). 4. Applications requiring more than 60 output clocks require SDU-2000e Expansion Shelf (see SDU-2000e Configuration Chart, on page 228).
19	Adapter, 9-pin to wire-wrap	22013085-000-0	One DE9 I/O connector to wire wrap adapter for each DE9 I/O connector (optional).
Blank Filler Panels			
20	Clock Module Filler Panel (8.1cm wide)	10913022-000-0	Panels are required in all unused clock slots.
21	Standard Module Filler Panel (1.5cm wide)	10913021-000-0	Panels are required in all unused SSU-2000e and SDU-2000e chassis slots. The 1.5cm panel fits all unused slots in Expansion Chassis and all except A1 and A12 (the two end slots) in the Main chassis.

SDU-2000e Configuration Chart

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

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

A fully-populated SDU-2000e expansion shelf is shown in [Figure 9-5](#). [Table 9-1](#) contains a listing of all SDU-2000e components and associated Symmetricom part numbers. This table also provides other configuration data required to design a custom system.

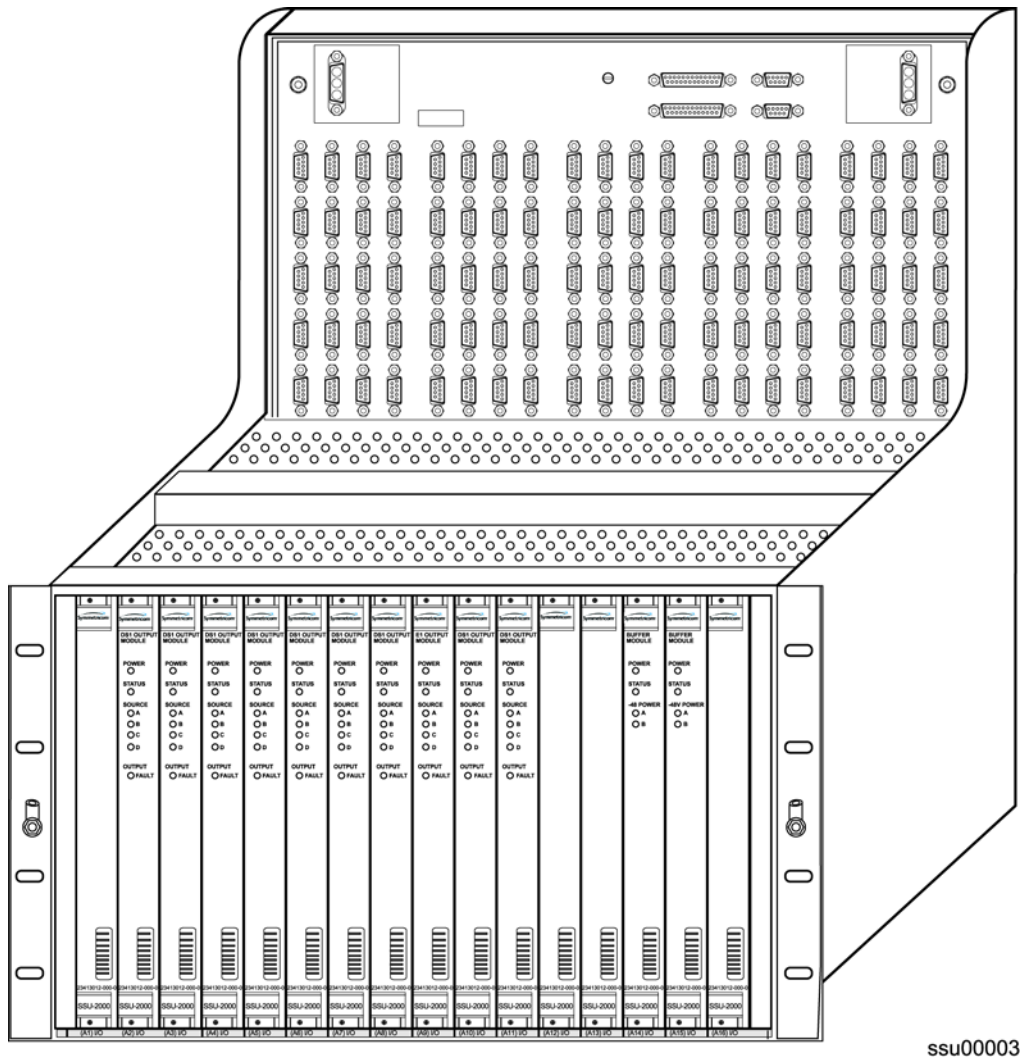


Figure 9-5. SDU-2000e Expansion Shelf, Front View

Table 9-2. SDU-2000e System Components

Item No.	Description	Symmetricom Part Number	Notes
SDU-2000e Expansion Shelf and Associated Hardware			
1	SDU-2000e Expansion Shelf (Chassis)	25413141-000-0	<ol style="list-style-type: none"> 1. Required for all expansion systems. 2. The SSU Expansion Terminator and SDU Backup Clock Terminator must be moved from the SSU-2000e chassis, connectors J8 and J9 to connectors J105 and J106, respectively, on the last expansion chassis in the daisy chain. 3. Requires minimum of one buffer module (two required for redundancy) and one or more (maximum of ten) Output modules. 4. Unpopulated slots in the chassis require a filler panel.
Buffer Module			
2	Buffer Module	23413122-000-0	One minimum required per SDU-2000e expansion chassis; two required for robust configuration.
Output Modules			
3	E1 Output Module	23413018-000-0	<ol style="list-style-type: none"> 1. Installed in sets of two. 2. Each Output module pair provides 20 sets of summed Output signals (redundant configuration). 3. Maximum of 10 redundant Output modules can be installed in expansion shelf.
4	DS1 Output Module	23413017-000-0	<ol style="list-style-type: none"> 1. Installed in sets of two. 2. Each Output module pair provides 20 sets of summed output signals (redundant configuration). 3. Maximum of 10 redundant Output modules can be installed in expansion shelf.

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

Item No.	Description	Symmetricom Part Number	Notes
5	2048 kHz Output Module	23413159-000-0	<ol style="list-style-type: none"> 1. Installed in sets of two. 2. Each Output module pair provides 20 sets of summed output signals (redundant configuration). 3. Maximum of 10 redundant Output modules can be installed in expansion shelf.
6	Composite Clock Output Module	23413158-000-0	<ol style="list-style-type: none"> 1. Installed in sets of two. 2. Each Output module pair provides 20 sets of summed output signals (redundant configuration). 3. Maximum of 10 redundant Output modules can be installed in expansion shelf.
Blank Filler Panels			
7	Standard Module Filler Panel (1.5cm wide)	10913021-000-0	Panels are required in all unused SDU-2000e chassis slots.
EIA-232 Cabling			
8	Cable, EIA-232 Shielded, DB9P to DB9S, 5 ft. (1.5 m)	551026-0038	Used for communication with the SSU-2000e.

Appendix A Alarms and Events

This appendix describes the alarms and events that the SSU-2000e generates, and provides some troubleshooting information for dealing with these alarms and events.

In This Appendix

- [Alarm Messages](#)
- [Event Messages](#)

Alarm Messages

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

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

The following sections list all alarm and event messages by their designated numbers, a description of each, and any corrective action to clear the alarm or condition, if necessary. Refer to [Troubleshooting](#), on page 129, for more information on troubleshooting procedures.

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

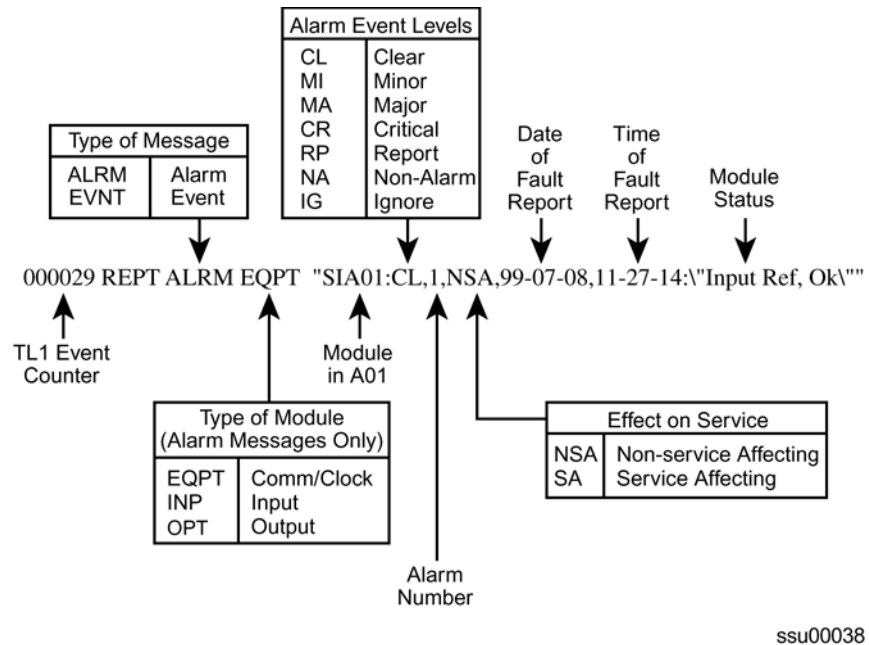


Figure A-1. Alarm and Event Message Structure

With the exception of loss of power alarms (on main chassis and expansion unit) all alarms are module alarms. The following tables list 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.

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	<ul style="list-style-type: none"> ■ Communication Ok ■ Communication Bad 	Unable to communicate with other modules. Re-seat modules.
Input reference available status	1	Minor	<ul style="list-style-type: none"> ■ Ok ■ Invalid 	<p>If input reference is not available, perform the following:</p> <ul style="list-style-type: none"> ■ 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 <p>When the Input reference is recovered, the alarm is cleared.</p>
Frequency mode degradation	2	Minor	<ul style="list-style-type: none"> ■ Ok ■ Holdover 	Invalid reference input causes holdover. Verify input setup.
Frequency control parameters within specification	3	Major	<ul style="list-style-type: none"> ■ Ok ■ Out of Range 	The reference input frequency is above the clock pull-in range. Restart or replace Clock module.
Output frequency status within specification	4	Minor	<ul style="list-style-type: none"> ■ Ok ■ Degraded 	Output exceeded pull-in range of oscillator. Select new input reference.
Clock module usable as the output reference	5	Minor	<ul style="list-style-type: none"> ■ Ok ■ Invalid 	Clock mode has warmed up.
Status of the numerically controlled oscillator phase lock loop	6	Minor	<ul style="list-style-type: none"> ■ Ok ■ Not Locked 	Alarm will clear within one minute after module is installed. If alarm persists, re-seat modules.
Status of the local oscillator phase lock loop	7	Minor	<ul style="list-style-type: none"> ■ Ok ■ Not Locked 	Alarm will clear within one minute after module is installed. If alarm persists, re-seat module.

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	8	Minor	<ul style="list-style-type: none"> ■ Ok ■ Not Locked 	Only available with Stratum 2E Rubidium module. If alarm persists, re-seat module.
Status of the hardware configuration	9	Minor	<ul style="list-style-type: none"> ■ Ok ■ Failed 	Call Symmetricom Global Services. Return module to factory.

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	<ul style="list-style-type: none"> ■ Ok ■ Bad 	Unable to communicate with other modules. Re-seat modules.
Indication of output controller mastership	1	Minor	<ul style="list-style-type: none"> ■ Ok ■ Bad 	Identifies master output controller. No action necessary.
Status of Power A	2	Minor	<ul style="list-style-type: none"> ■ Ok ■ Lost 	<ul style="list-style-type: none"> ■ Verify that the fuse for Power A is properly installed and not OPEN ■ Verify that Power Bus A is providing -48 vDC to the unit. If power is not connected to the Power A input and there is no plan to connect power, enter the command <code>AL 10-1 IG</code> at the prompt.

Table A-2. Communications Module Alarm Messages (Continued)

Alarm Description	Alarm Number	Default Alarm Level	Status Messages	Description/Corrective Action
Status of Power B	3	Minor	<ul style="list-style-type: none"> ■ Ok ■ Lost 	<ul style="list-style-type: none"> ■ Verify that the fuse for Power B is properly installed and not OPEN ■ Verify that Power Bus B is providing –48 vDC to the unit. If power is not connected to the Power B input and there is no plan to connect power, enter the command AL 10-1 IG at the prompt.
Status of module's serial peripheral interface hardware (SPI watchdog timeout)	4	Minor	<ul style="list-style-type: none"> ■ Ok ■ Timeout 	Unable to communicate with other modules. Re-seat module.

Table A-3. DS1/E1 Input Module Alarm Messages

Alarm Description	Alarm Number	Default Alarm Level	Status Messages	Description/Corrective Action
Loss of signal fault status	0	Minor	<ul style="list-style-type: none"> ■ Ok ■ Active 	Verify signal is connected. May be cleared by disabling port.
Alarm indication signal fault status	1	Minor	<ul style="list-style-type: none"> ■ Ok ■ Active 	Verify input signal is good. Port can be disabled.
Out of frame signal fault status	2	Minor	<ul style="list-style-type: none"> ■ Ok ■ Active 	Change frame type: <ul style="list-style-type: none"> ■ DS1-ESF or D4 ■ E1-CAS or CCS
Bipolar violation signal fault status	3	Minor	<ul style="list-style-type: none"> ■ Ok ■ Active 	Verify port ZS is on. Verify signal is good.
Cyclic redundancy code error fault status	4	Minor	<ul style="list-style-type: none"> ■ Ok ■ Active 	Verify port CRC is off. Verify signal is good.
Maximum time interval error fault status limit 1	5	Minor	<ul style="list-style-type: none"> ■ Ok ■ Exceeded 	MTIE limit 1 has been exceeded.

Table A-3. DS1/E1 Input Module Alarm Messages (Continued)

Alarm Description	Alarm Number	Default Alarm Level	Status Messages	Description/Corrective Action
Maximum time interval error fault status limit 2	6	Minor	<ul style="list-style-type: none"> ■ Ok ■ Exceeded 	MTIE limit 2 has been exceeded.
Received PQL below provision PQL status	7	Minor	<ul style="list-style-type: none"> ■ Ok ■ Below Prov 	Received SSM (PQL) is below provisioned PQL.
No SSM status	8	Minor	<ul style="list-style-type: none"> ■ Ok ■ Lost 	Set port SSM to Off to clear.
Module boot problem	9	Minor	<ul style="list-style-type: none"> ■ Ok ■ Failed 	Re-seat module.
Clock PLL not locked	10	Minor	<ul style="list-style-type: none"> ■ Ok ■ Not Locked 	Re-seat module.
Input PLL not locked	11	Minor	<ul style="list-style-type: none"> ■ Ok ■ Not Locked 	Verify input frequency setting. Re-seat module.
Phase measurement hardware fault	12	Minor	<ul style="list-style-type: none"> ■ Ok ■ Bad 	Re-seat module.
Frequency measurement range exceeded	13	Minor	<ul style="list-style-type: none"> ■ Ok ■ Exceeded 	Input frequency is greater than threshold. Monitor frequency and if persistent, check source.
Hardware configuration fault	14	Major	<ul style="list-style-type: none"> ■ Ok ■ Failed 	Call Symmetricom Global Services. Return module to factory.

Table A-4. GPS Input Module Alarm Messages

Alarm Description	Alarm Number	Default Alarm Level	Status Messages	Description/Corrective Action
Hardware configuration fault	0	Major	<ul style="list-style-type: none"> ■ Ok ■ Failed 	Call Symmetricom Global Services. Return module to factory
GPS Engine tracking status	1	Minor	<ul style="list-style-type: none"> ■ Ok ■ Not Tracking 	No visible satellites seen at startup.

Table A-4. GPS Input Module Alarm Messages (Continued)

Alarm Description	Alarm Number	Default Alarm Level	Status Messages	Description/Corrective Action
Antenna connection status	2	Minor	<ul style="list-style-type: none"> ■ Ok ■ Not Connected 	Verify that: <ul style="list-style-type: none"> ■ The antenna is connected ■ The cable and connectors are not damaged ■ The antenna placement is correct
Antenna condition fault	3	Minor	<ul style="list-style-type: none"> ■ Ok ■ Shorted 	Ring out the cable to ensure that the center conductor is not short-ed to the sleeve, then verify that: <ul style="list-style-type: none"> ■ The antenna cable is connected properly ■ The cable and connectors are not damaged
GPS Engine hardware fault	4	Minor	<ul style="list-style-type: none"> ■ Ok ■ Bad 	Re-seat module. If problem persists, call Symmetricom Global Services.
Engine system fault	5	Minor	<ul style="list-style-type: none"> ■ Ok ■ Bad 	If alarm doesn't clear after 30 minutes, call Symmetricom Global Services.
Position unknown fault	6	Minor	<ul style="list-style-type: none"> ■ Ok ■ Unknown 	If alarm doesn't clear after 1 hour, call Symmetricom Global Services.
Clock PLL status fault	7	Minor	<ul style="list-style-type: none"> ■ Ok ■ Not Locked 	<ul style="list-style-type: none"> ■ Reseat module. ■ Ensure that the GPS priority level is set to 1. ■ If problem persists, call Symmetricom Global Services.
Manufacturing item number fault	8	Minor	<ul style="list-style-type: none"> ■ Ok ■ Unknown 	Call Symmetricom Global Services. Return module to factory.
System software fault	9	Minor	<ul style="list-style-type: none"> ■ Ok ■ Failed 	Re-seat module. If problem persists, call Symmetricom Global Services.
Phase hardware fault	10	Minor	<ul style="list-style-type: none"> ■ Ok ■ Bad 	Re-seat module. If problem persists, call Symmetricom Global Services.

Table A-5. Composite Clock Input Module Alarm Messages

Alarm Description	Alarm Number	Default Alarm Level	Status Messages	Description/Corrective Action
Loss of signal fault status	0	Major	<ul style="list-style-type: none"> ■ Ok ■ Active 	Verify signal is connected. May be cleared by disabling port.
Bipolar violation signal fault status	3	Major	<ul style="list-style-type: none"> ■ Ok ■ Active 	Verify port ZS is on. Verify signal is good.
Hardware configuration fault	5	Major	<ul style="list-style-type: none"> ■ Ok ■ Failed 	Call Symmetricom Global Services. Return module to factory
Clock PLL not locked	6	Major	<ul style="list-style-type: none"> ■ Ok ■ Not Locked 	Re-seat module.
Phase measurement hardware fault	7	Major	<ul style="list-style-type: none"> ■ Ok ■ Bad 	Re-seat module.
Phase3Sigma	8	Minor	<ul style="list-style-type: none"> ■ Ok ■ Fault 	Phase 3 error exceeded 3 sigma.
Phase Polarity	9	Report	<ul style="list-style-type: none"> ■ Ok ■ Event 	Ensure unselected CC port phase is the same as the selected CC port.

Table A-6. DS1/E1 Output Module Alarm Messages

Alarm Description	Alarm Number	Default Alarm Level	Status Messages	Description/Corrective Action
Redundant module status	0	Major	<ul style="list-style-type: none"> ■ Ok ■ Failed 	Output alignment problem. Disable module, then re-enable.
Mismatched DS1/E1 modules in redundant configuration	1	Major	<ul style="list-style-type: none"> ■ Ok ■ Invalid 	A redundant pair has one DS1 module and one E1 module. Replace with correct module.
Loss of clock source A	2	Major	<ul style="list-style-type: none"> ■ Ok ■ Lost 	Clock module in slot A1 is in warm-up mode or has other problems
Loss of clock source B	3	Major	<ul style="list-style-type: none"> ■ Ok ■ Lost 	Clock module in slot A12 is in warm-up mode or has other problems.

Table A-6. DS1/E1 Output Module Alarm Messages (Continued)

Alarm Description	Alarm Number	Default Alarm Level	Status Messages	Description/Corrective Action
Loss of clock source C	4	Major	<ul style="list-style-type: none"> ■ 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	<ul style="list-style-type: none"> ■ Ok ■ Below 	Clock A or B is below Output module setting.
Clock not selected for output	6	Major	<ul style="list-style-type: none"> ■ Selected ■ Not Selected 	No clocks, no output.
Output port fault (displayed as hex value)	7	Major	<ul style="list-style-type: none"> ■ Ok ■ Active 	Indicates which output port is in fault (typically shorted). Remove short and re-enable port.
VCXO status	8	Major	<ul style="list-style-type: none"> ■ Ok ■ Lost 	VCXO problems, re-seat or replace module.
Output PLL status	9	Major	<ul style="list-style-type: none"> ■ Ok ■ Lost 	No clocks or VCXO. Re-seat and check clocks.
Configuration status	10	Major	<ul style="list-style-type: none"> ■ Ok ■ Failed 	Redundant configuration mismatch. Re-seat or replace with correct module.
Hardware configuration fault	11	Major	<ul style="list-style-type: none"> ■ Ok ■ Failed 	Call Symmetricom Global Services. Return module to factory.
Loss of clock source D	12	Major	<ul style="list-style-type: none"> ■ Ok ■ Lost 	Only in SDU-2000e. Loss of backup clock. Check cable.

Table A-7. Composite Clock Output Module Alarm Messages

Alarm Description	Alarm Number	Default Alarm Level	Status Messages	Description/Corrective Action
Redundant module status	0	Major	<ul style="list-style-type: none"> ■ Ok ■ Failed 	Output alignment problem. Disable module, then re-enable.
Mismatched DS1/E1 modules in redundant configuration	1	Major	<ul style="list-style-type: none"> ■ Ok ■ Invalid 	A redundant pair has one DSI module and one E1 module. Replace with correct module.

Table A-7. Composite Clock Output Module Alarm Messages (Continued)

Alarm Description	Alarm Number	Default Alarm Level	Status Messages	Description/Corrective Action
Loss of clock source A	2	Major	<ul style="list-style-type: none"> ■ Ok ■ Lost 	Clock module in slot A1 is in warm-up mode or has other problems.
Loss of clock source B	3	Major	<ul style="list-style-type: none"> ■ Ok ■ Lost 	Clock module in slot A12 is in warm-up mode or has other problems.
Loss of clock source C	4	Major	<ul style="list-style-type: none"> ■ 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	<ul style="list-style-type: none"> ■ Ok ■ Lost 	Only in SDU. Loss of backup clock. Check cable.
Clock below minimum clock level	6	Major	<ul style="list-style-type: none"> ■ Ok ■ Below 	Clock A or B is below Output module setting.
Clock not selected for output	7	Major	<ul style="list-style-type: none"> ■ Selected ■ Not Selected 	No clocks, no output.
VCXO status	8	Major	<ul style="list-style-type: none"> ■ Ok ■ Lost 	VCXO problems, re-seat or replace module.
Output PLL status	9	Major	<ul style="list-style-type: none"> ■ Ok ■ Lost 	No clocks or VCXO. Re-seat and check clocks.
Configuration status	10	Major	<ul style="list-style-type: none"> ■ Ok ■ Failed 	Redundant configuration mismatch. Re-seat or replace with correct module.
Internal port fault, Active 4000	11	Major	<ul style="list-style-type: none"> ■ Ok ■ Active 	Driver chip indicated a port fault on port 2 (4000 Hex).
External port fault, Active A000	12	Major	<ul style="list-style-type: none"> ■ Ok ■ Active 	External port fault on ports 2 and 4 (A000 Hex).
Hardware configuration fault	13	Major	<ul style="list-style-type: none"> ■ Ok ■ Failed 	Call Symmetricom Global Services. Return to factory.

Table A-8. 2048 kHz Output Module Alarm Messages

Alarm Description	Alarm Number	Default Alarm Level	Status Messages	Description/Corrective Action
Redundant module status	0	Major	<ul style="list-style-type: none"> ■ Ok ■ Failed 	Output alignment problem. Disable module, then re-enable.
Mismatched DS1/E1 modules in redundant configuration	1	Major	<ul style="list-style-type: none"> ■ Ok ■ Invalid 	A redundant pair has one DSI module and one E1 module. Replace with correct module.
Loss of clock source A	2	Major	<ul style="list-style-type: none"> ■ Ok ■ Lost 	Clock module in slot A1 is in warm-up mode or has other problems.
Loss of clock source B	3	Major	<ul style="list-style-type: none"> ■ Ok ■ Lost 	Clock module in slot A12 is in warm-up mode or has other problems.
Loss of clock source C	4	Major	<ul style="list-style-type: none"> ■ 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	<ul style="list-style-type: none"> ■ Ok ■ Lost 	Only in SDU. Loss of backup clock. Check cable.
Clock below minimum clock level	6	Major	<ul style="list-style-type: none"> ■ Ok ■ Below 	Clock A or B is below Output module setting.
Clock not selected for output	7	Major	<ul style="list-style-type: none"> ■ Selected ■ Not Selected 	No clocks, no output.
VCXO status	8	Major	<ul style="list-style-type: none"> ■ Ok ■ Lost 	VCXO problems, re-seat or replace module.
Output PLL status	9	Major	<ul style="list-style-type: none"> ■ Ok ■ Lost 	No clocks or VCXO. Re-seat and check clocks.
Configuration status	10	Major	<ul style="list-style-type: none"> ■ Ok ■ Failed 	Redundant configuration mismatch. Re-seat or replace with correct module.
Internal port fault, Active 4000	11	Major	<ul style="list-style-type: none"> ■ Ok ■ Active 	Driver chip indicated a port fault on port 2 (4000 Hex).
Hardware configuration fault	13	Major	<ul style="list-style-type: none"> ■ Ok ■ Failed 	Call Symmetricom Global Services. Return module to factory.

Table A-9. E1/2048 kHz Output Module Alarm Messages

Alarm Description	Alarm Number	Default Alarm Level	Status Messages	Description/Corrective Action
Hardware configuration fault	0	Major	<ul style="list-style-type: none"> ■ Ok ■ Failed 	Call Symmetricom Global Services. Return module to factory.
Configuration status	1	Major	<ul style="list-style-type: none"> ■ Ok ■ Failed 	Redundant configuration mismatch. Re-seat or replace with correct module.
Loss of clock source A	2	Major	<ul style="list-style-type: none"> ■ Ok ■ Lost 	Clock module in slot A1 is in warm-up mode or has other problems.
Loss of clock source B	3	Major	<ul style="list-style-type: none"> ■ Ok ■ Lost 	Clock module in slot A12 is in warm-up mode or has other problems.
Loss of clock source C	4	Major	<ul style="list-style-type: none"> ■ 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	<ul style="list-style-type: none"> ■ Ok ■ Lost 	Only in SDU. Loss of backup clock. Check cable.
Clock not selected for output	6	Major	<ul style="list-style-type: none"> ■ Selected ■ Not Selected 	No clocks, no output.
VCXO status	7	Major	<ul style="list-style-type: none"> ■ Ok ■ Lost 	VCXO problems, re-seat or replace module.
Output PLL status	8	Major	<ul style="list-style-type: none"> ■ Ok ■ Lost 	No clocks or VCXO. Re-seat and check clocks.
Sync	9	Major	<ul style="list-style-type: none"> ■ Ok ■ Fault 	Fail to sync with master module in redundant pair
Squelching	10	Major	<ul style="list-style-type: none"> ■ Ok ■ Below Prov 	PQL Below Provision
Output Port Fault	11	Major	<ul style="list-style-type: none"> ■ Ok ■ Fault 	Output Port failure

Table A-10. RS-422 Output Module Alarm Messages

Alarm Description	Alarm Number	Default Alarm Level	Status Messages	Description/Corrective Action
Hardware configuration status	0	Major	<ul style="list-style-type: none"> ■ Ok ■ Failed 	Module is installed in an incorrect slot.
Configuration mismatch	1	Major	<ul style="list-style-type: none"> ■ Ok ■ Invalid 	Incorrect software loaded into module.
Loss of clock source A	2	Major	<ul style="list-style-type: none"> ■ Ok ■ Lost 	Clock module in slot A1 is in warm-up mode or has other problems.
Loss of clock source B	3	Major	<ul style="list-style-type: none"> ■ Ok ■ Lost 	Clock module in slot A12 is in warm-up mode or has other problems.
Loss of clock source C	4	Major	<ul style="list-style-type: none"> ■ 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	<ul style="list-style-type: none"> ■ Ok ■ Lost 	Only in SDU. Loss of backup clock. Check cable.
No clock selected	6	Major	<ul style="list-style-type: none"> ■ Ok ■ Below 	No clocks or no clock output
VCXO status	7	Major	<ul style="list-style-type: none"> ■ Selected ■ Not selected 	VCXO problems, re-seat or replace module.
Output PLL status	8	Major	<ul style="list-style-type: none"> ■ Ok ■ Lost 	No clocks or VCXO. Re-seat and check clocks.
Output fault	9	Major	<ul style="list-style-type: none"> ■ Ok ■ Failed 	Call Symmetricom Global Services. Return to factory

Event Messages

Table A-11 lists event messages categorized by module. Each section lists status messages associated with each module and an event description of each message.

Table A-11. Module Event Messages

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

Table A-11. Module Event Messages (Continued)

Event Message	Event #	Event Description
Inp Sel Mode, PQL, COML\	202	Reference selection mode (Priority Quality Level)
Err Delay, (1), 300 sec, COML\	251	The user has changed Alarm Delay time
Alm Level, (2), Maj, COML\	252	The user has changed Alarm level (IGNORE, REPORT, MINOR, MAJOR, CRITICAL)
Elevate Time, 7200 sec, COML\	253	The user has changed alarm elevation time
Setup, User Default, COML\	254	The user has set the module's configuration
Communications Module Events		
KeepAlive, SSU2000	105	The Keep Alive function has been enabled/disabled
Install, Comm Module\	129	Module Installation
Remove, Comm Module\	130	Module Removal
Enable, Comm Module, COML\	131	The Comms Module has been Enabled
Disable, Comm Module, COML\	132	The Comms Module has been Disabled
Restart, in 5 seconds, COML\	133	Module reboot (Warm boot)
Log In, JAY, COML, level: 2\	144	User at indicated level has logged in on the indicated port
Log Out, JOHN, COML, level: 2\	145	User at indicated level has logged out from the indicated port
Auto Out, SMITH, COML, level: 3:\	146	System automatically logging out a user
Msg, <HELLO USER>, COML\	147	Message sent from a user
Not Acknowledged, 1A01\	148	Module configuration could not be obtained
Module Status, Bad, 1A04\	150	Module did not boot properly
UTC TIME, Valid/Invalid	151	Time of startup, when NTP is enabled but GPS time is not being used
TODSYNC, TIMEOUT	152	Time of day (TOD) was requested by the Comms module, no response from the GPS module
Upgrade Image, Start/Complete	153	System firmware upgrade was started or completed
Upgrade, 1A01	154	Module's firmware upgrade has started
Upgrade ACK, 1A01	155	Module's firmware upgrade was completed

Table A-11. Module Event Messages (Continued)

Event Message	Event #	Event Description
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, TOM, COML\	192	Administrator initialized user database
Add User, Andy, COML\	193	Administrator added a user to user database
Mod User, DON, COML\	194	User/Administrator modified user database
Del User, TESTUSER, COML\	195	Administrator deleted user from user database
Pql Table, DS1, pql (5)=ST2, COML\	196	PQL database has been modified
Pql Table Dflt, COML\	197	PQL database has been set to factory defaults
Unit Name, AUSTIN, COML\	198	The SSU name has been changed
NTP Peer Add, 192.5.41.40, Client, COML\	199	NTP client was added at the IP address shown
NTP Peer Del, 192.5.41.40, Client, COML\	200	NTP client was deleted at the IP address shown
NTP Brd Timer, 64 seconds, COML\	201	The NTP broadcast server timer has been set to the interval shown
SNMP User, ADD, id=1, COML\	202	An SNMP user has been added in the position of the user table shown
SNMP Mode, Ena, COML\	203	An SNMP Mode has been enabled
SNMP Manager, Init, 192.5.41.3, COML\	204	An SNMP Manager has been initialized at the IP address shown
Evt Blocked, SET, 2A02, COML\	205	SNMP events (Traps) will not be generated from the module shown
SNMP Trap, ALM, COML\	206	The SNMP Trap Port has been set to send traps on alarms only by the user

Table A-11. Module Event Messages (Continued)

Event Message	Event #	Event Description
Chg KeepAlive, ALL, 15 minute, COML\	207	The Keep Alive timer has been set to the interval shown
Err Delay, (1), 300 sec, COML\	251	An alarm delay time change
Alm Level, (2), Rep, COML\	252	An alarm level change
Elevate Time, 3600 sec, COML\	253	An alarm elevation time change
Setup, Save, COML\	254	User defaults change or save
DS1/E1 Input Module Events		
Install, Input Module\	129	Module Installation
Remove, Input Module\	130	Module Removal
Enable, Input Module, COML\	131	The Input module has been enabled
Disable, Input Module, COML\	132	The Input module has been disabled
Restart, in 5 seconds, COML\	133	Module re-boot
Cannot Enable, Input Module, COML\	134	Internal firmware conflict. Restart module, if the problem persists, call 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, COMI\	198	User changed input framer setup
Port, Dis, COML\	199	User Enabled Disabled input port
SSM, Auto, COML\	200	User changed SSM setup
Priority, 5, COML\	201	User changed input priority level
SSM Bit, 4, COML\	202	User changed SSM Bit location (E1 only)
Prov PQL, 5, COML\	203	User changed input provisioned PQL
MTIE, T100, L1, 550, COML\	204	User changed input MTIE limits (L1 L2)

Table A-11. Module Event Messages (Continued)

Event Message	Event #	Event Description
Gain, On, COML\	205	User changed the input gain control
CSFit, Off, COML\	206	User changed input Cesium Fault control
Err Cnt, BPV, 16, COML\	207	Signal Alarm Error Count (LOS, AIS, OOF, BPV, or CRC)
Clr Cnt, OOF, 5, COML\	208	Current Signal Alarm Clear Count (LOS, AIS, OOF, BPV, or CRC)
Freq Err Limit, Clk-A, 100	209	The frequency error limit settings have been changed
Freq Clr Limit, Clk-A, 800	210	The frequency clear limit settings have been changed
MTIE Clr Limit, T100, L1, 500, COML\	211	The MTIE error limit settings have been changed
MTIE Limit, DS1, COML, Setting	212	The MTIE clear limit settings have been changed
PBO, Report, COML\ (Disable Event Report None)	213	Phase Build-out system response has been changed to the indicated setting
Freq Tau, Clk-A, 400, COML\	214	The frequency TAU limits have been set
Err Delay, (0), 10 sec, COML\	251	An alarm delay time change
Alm Level, (2), Maj, COML\	252	An alarm level change
Elevate Time, 86400 sec, COML\	253	An alarm elevation time change
Setup, Save, COML\	254	User defaults have been set and saved
GPS Input Module Events		
Install, GPS Module\	129	Module Installation
Remove, GPS Module\	130	Module Removal
Enable, GPS Module\	131	The Input module has been enabled
Disable, GPS Module\	132	The Input module has been disabled
Restart, in 5 seconds, COML\	133	Module re-boot
Cannot Enable, GPS Module, COML\	134	Inability to enable module
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

Table A-11. Module Event Messages (Continued)

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

Table A-11. Module Event Messages (Continued)

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

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-2000e.

In This Appendix

- [SSU-2000e Control Languages](#)
- [TL1 Command Interface](#)
- [Interactive Command Set](#)
- [NTP Support](#)
- [SNMP Protocol](#)

SSU-2000e Control Languages

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

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

- **TL1** – The Transaction Language One (TL1) control language, perhaps the dominant telecommunications industry ASCII command line interface, provides a standard man-machine language. The TL1 language is defined in Bellcore document TR-NWT-000831, Issue 3, Revision 1, December 1993.
- **ICS** – The Interactive Command Set (ICS) control language also called the ASCII command set, can be used to control the SSU-2000e from a terminal connected to one of the SSU-2000e 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-2000e 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 254, defines the TL1 command and response specifications.
 - [Table B-5](#) defines the TL1 *retrieve* commands, access identifier (aid) code, description and use of the command function, and the response message format for each.
 - [Table B-6](#) defines the TL1 *set* commands, access identifier (aid) code, description and use of the command function, and the response message format for each.
 - [Table B-7](#) defines *other* TL1 commands for logging onto and off the SSU-2000e, and for activating, disconnecting, and removing modules from the SSU-2000e.
- [Interactive Command Set](#), on page 304, defines the ICS commands, responses, and events.
- [NTP Support](#), on page 371, describes NTP support functionality.

- [SNMP Protocol](#), on page 373, 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

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-2000e. These tasks include configuring and provisioning security, monitoring system performance, configuring hardware, locating and handling faults, and performing equipment diagnosis and testing.



Note: To communicate with the SSU-2000e, 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 98). Then you can communicate with the SSU-2000e using an Ethernet telnet session.

To set up an SSU-2000e port for TL1 communications:

1. Log on to one of the SSU-2000e EIA-232 serial ports using a Supervisor-level (or higher) user name and password.
2. Set port A, B, or L to TL1 mode. For example, to set the local port (COML) to TL1 mode, at the system prompt, type:

```
COMM L MODE TL1
```

The communications mode settings for the COMM A and COMM B ports (located on the rear panel) are stored in non-volatile RAM, and remain in effect even after restarting the SSU-2000e.

The communications mode settings for the COMM L (local) port (located on the Communications module) always defaults to ASCII mode on startup.

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-2000e will take. For a detailed description of input command messages and conventions, see [Input Command Message Conventions](#), on page 256.
- **In-Process Acknowledgment** – The in-process acknowledgment (IP) response message is sent in response to a command that the SSU-2000e is unable to respond to within two seconds. For a detailed description of in-process acknowledgment response messages and conventions, see [In-Process Acknowledgment Response Message Conventions](#), on page 257.
- **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 258.
- **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 260.

TL1 General Conventions

TL1 uses English-like acronyms and shorthand or abbreviations in a format that can be read and composed by humans.

Follow these general conventions for entering all TL1 parameters:

- Enter all command characters in upper-case. In the command syntax, lower-case characters indicate parameters that you must supply.
- All commands must contain the `cmd`, `tid`, and `ctag` fields.
- You may omit trailing commas in the parameters field.
- Terminate command lines with a terminating semicolon (;) and an end-of-line designator (`<cr><lf>` or `<cr lf>`). The SSU-2000e executes the command when it receives the terminating semicolon in the command entry.
- `^` is a blank that must appear in a command or response
- `:` is a block separator character
- `::` indicates a null field for a block
- `;` indicates the end of the message
- `<cr>` and `<lf>` or `<cr lf>` indicate the ASCII carriage return (CR) and line feed (LF) codes used as a line terminator and may be used separately or combined
- The ASCII cancel code character (hex 18) can be used to cancel a partially sent command and clear the input buffer.

Input Command Message Conventions

Command messages entered and sent by the user determine the action that the SSU-2000e will take. Command messages are input messages, and are always followed by an acknowledgment or output response message.

The format for the input command message is:

```
cmd:tid:[aid]:ctag[:[gb]:<other>;<cr lf>
```

where:

- `cmd` (Command) is a descriptive string of letters that represents the input command (Table B-5 through Table B-7). The command string consists of a standard TL1 command verb, followed by one or two command modifiers. The modifiers identify the subject of the command verb and each may be as many as five characters. If two modifiers are used, they must be separated by dashes:
`verb- mod1- mod2.`
- `tid` (Target Identifier) represents the name assigned to the SSU-2000e. The assigned name must be either null or match the name assigned to the SSU-2000e. If the `tid` is not null, it may must begin with a letter and may contain as many as 20 alpha-numeric characters. See the SET-NAME command in Table B-6.



Note: The SSU-2000e does not generate a response for entries without a valid tid.

- `aid` (Access Identifier) is an optional field that represents the shelf, module, and port within the SSU-2000e to which the command is addressed or to which the response applies. The aid must be null (`::`, indicating ALL or not used), ALL (indicating all modules and ports related to the command type), or the aid assigned to an entity in the SSU-2000e. The aid allows aliases for clock and buffer modules.

Follow these conventions for entering the aid field:

```
SxAy-z
OR ALL
OR SxBUF-w
OR SxCLK-w
```

where:

```
x  SSU-2000e main (1) or expansion shelf (2-5) number
A  placeholder to separate the shelf number form the slot position
y  SSU-2000e slot position (1-16)
z  port number (1-20)
ALL all modules or ports to which the command applies
w  buffer module A or B or clock module A or B
```

Specify multiple 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 a field that is not used by the SSU-2000e but that you must indicate by a double colon, that is, by preceding any parameters following the ctag field with double colons (`::`).
- `other` is a field that is used for commands that require other information. The format for this field is specified in the individual command descriptions.

In-Process Acknowledgment Response Message Conventions

Each command received by the SSU-2000e with a valid tid generates a response when the terminating semicolon is received, followed by an output response message or the output response.

The SSU-2000e sends the in-process acknowledgment (IP) only if it is unable to respond to the command within two seconds. The requested response is then sent in full when the SSU-2000e data is available.

The in-process acknowledgment response always begins with a carriage return and two line feed characters, and ends with the header line containing the source identifier (**sid**), defined below, and the **date^time** stamp.

The format for the IP acknowledgment message is:

```
<cr lf lf>  
^^^sid^date^time <cr lf>  
IP^ctag <cr lf>  
<
```

where:

- **sid** (Source Identifier) is the returned ID, and is the same as the tid in the input command message to which the IP acknowledgment is responding.
- **date** is the current year, month, and day in the SSU-2000e in the format: YY-MM-DD.
- **time** is the current hours, minutes, and seconds timestamp information in the SSU-2000e in the 24-hour format: HH-MM-SS.
- **IP** is the in-process response message that the SSU-2000e sends in response to a command only if the SSU is unable to respond to the command within two seconds. The SSU sends the requested response in full when the data is available.
- **ctag** (Correlation Tag) field is a six-digit alpha-numeric message identifier code that is received with the command and returned in the response, for correlation of message and response within the operating system.
- The IP acknowledgment response always terminates with the less-than character (<). The semicolon appears after the requested output response message is sent.

Output Response Message Conventions

The output response indicates whether the SSU-2000e 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-2000e within two seconds, the complied message is sent with data that was requested in the input command message. The requested data is included in the response message lines and is always enclosed in quotation marks.

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-2000e in the format: YY-MM-DD
- `time` is the current hours, minutes, and seconds timestamp information in the SSU-2000e 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-2000e 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>
```

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-2000e in the format: YY-MM-DD.
- `time` is the current hours, minutes, and seconds timestamp information in the SSU-2000e 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-2000e 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:ntfncnde,condtype,srveff,ocrdat,ocrtm:condscr"<cr lf>
```

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)

- `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-2000e 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 a User, on page 375](#), 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.

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;	<p>Valid aid code: ALL, SxAy[-z]</p> <p>This command reports all active alarms from the SSU-2000e or designated modules with an aid indicating which module or port is generating the alarm. The response is the compiled message followed by the alarm report message(s).</p> <p>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:</p> <pre>^^^"aid:ntfcncde,condtype,srveff,\"condstr\""</pre> <p><cr lf></p> <p>where:</p> <ul style="list-style-type: none"> ntfcncde = Notification Code (CR, MJ, MN, CL) condtype = Condition Type (event number) srveff = service affecting flag (SA, NSA) condstr = condition description string.

Table B-5. TL1 Retrieve Commands (Continued)

Command	Description
<p>RTRV-CONF:[tid]:[aid]:ctag;</p>	<p>Valid aid code: ALL, SxAy</p> <p>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:</p> <pre>^^^"aid:status[,desc,item,rev,serial]" <cr lf></pre> <p>where:</p> <ul style="list-style-type: none"> ■ 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 <p>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:</p> <pre>^^^"aid:svcdat,svctim,mandat,"\userdat\" " <cr lf></pre> <pre>^^^"aid:cnt,"\revstr\" " <cr lf></pre> <p>where:</p> <ul style="list-style-type: none"> ■ 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 <p>Successive lines contain these fields:</p> <ul style="list-style-type: none"> ■ 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 <p>If no additional software is registered on the module, there are no software revision lines present.</p>

Table B-5. TL1 Retrieve Commands (Continued)

Command	Description
<p>RTRV-DATA-CDMA:[tid]:[aid]: ctag;</p>	<p>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:</p> <ul style="list-style-type: none"> ■ 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.
<p>RTRV-DATA-GPS:[tid]:[aid]: ctag;</p>	<p>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:</p> <ul style="list-style-type: none"> ■ 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.

Table B-5. TL1 Retrieve Commands (Continued)

Command	Description
<pre>RTRV-DATA-GPS-AVAIL:[tid]: [aid]:ctag;</pre>	<p>Valid aid code: S1A3 or S1A5 (for a GPS module)</p> <p>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.</p> <p>The format for the valid response message is as many as 12 lines in the format: <code>^^^"aid:prn,health,azimuth,elevation"<cr lf></code> where:</p> <p>Each line displays information for one of the satellites currently being tracked;</p> <ul style="list-style-type: none"> ■ prn = satellite vehicle number ■ health = current health of the satellite: H (healthy) or U (unhealthy) ■ azimuth and elevation = calculated orientation of the satellite
<pre>RTRV-DATA-FREQ:[tid]:[aid]: ctag;</pre>	<p>Valid aid code: ALL, S1Ay[-z]</p> <p>This command returns the current frequency measurements for the specified input(s).</p> <p>The format of the response message is: <code>^^^"aid:freqa,freqb"<cr lf></code> where:</p> <ul style="list-style-type: none"> ■ freqa = frequency of the port versus clock A ■ freqb = frequency of the port versus clock B
<pre>RTRV-DATA-INPUT:[tid]:[aid]: ctag;</pre>	<p>Valid aid code: ALL, S1Ay[-z]</p> <p>This command returns the current LOS, AIS, OOF, BPV, CRC Error and Clear counts for the specified inputs.</p> <p>The format of the response message is: <code>^^^"aid:loserr,losclr,aiserr,aisclr,ooferr, oofclr,bpvrr,bpvclr,crcerr,crcclr"<cr lf></code> where:</p> <ul style="list-style-type: none"> ■ ???err and ???clr are the erred second count and cleared second counts for each of the signal faults as listed above.

Table B-5. TL1 Retrieve Commands (Continued)

Command	Description
<p>RTRV-DATA-LRMBPV:[tid]:[aid]: ctag;</p>	<p>Valid aid code: ALL, SxA[y[-z]]</p> <p>This command returns the BPV data (current operating mode and status) of an LRM module or port. The format of response message is:</p> <pre>^^^"aid:ttime,60srate,24hrate,es,ses,sesr" <cr lf></pre> <p>where:</p> <ul style="list-style-type: none"> ■ 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).

Table B-5. TL1 Retrieve Commands (Continued)

Command	Description
<pre>RTRV-DATA-MTIE:[tid]:aid:ctag [::[clksrc][,start][,stop];</pre>	<p>Valid aid code: s1Ay-z</p> <p>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.</p> <p>The response is the complied message followed by the requested data. The format for each response message line is:</p> <pre>^^^"aid:ocrdat,ocrtm,MTIE,clksrc,temper,monval" <cr lf></pre> <p>where:</p> <ul style="list-style-type: none"> ■ ocrdat and ocrtm = the beginning date and time the data was collected. ■ clksrc = clock A or B used for the measurements. ■ temper = time period for the measurement data, given in seconds. The maximum temper 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. <p>Only the values available in the interval between the start and stop times are output.</p>

Table B-5. TL1 Retrieve Commands (Continued)

Command	Description
<pre>RTRV-DATA-MTIE-HIST:[tid]:aid: ctag[:,clksrc][,count];</pre>	<p>Valid aid code: S1Ay-z</p> <p>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:</p> <pre>^^^"aid:ocrdat,ocrtm,MTIE,clksrc,monval1,monval2, ..., monval8"<cr lf></pre> <p>where:</p> <ul style="list-style-type: none"> ■ 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.

Table B-5. TL1 Retrieve Commands (Continued)

Command	Description
<pre>RTRV-DATA-PHASE:[tid]:aid: ctag[:tmper[,clksrc[,start] [,stop]]];</pre>	<p>Valid aid code: s1Ay-z</p> <p>Returns phase data from phase history buffers. The command requires an aid to identify the input to report data from.</p> <ul style="list-style-type: none"> ■ 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 <p>The format for each response message line is: <code>^^^"aid:ocrdat,ocrtm,PHA,clksrc,tmper,(monval)"</code> <code><cr lf></code></p> <p>where:</p> <ul style="list-style-type: none"> ■ 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.

Table B-5. TL1 Retrieve Commands (Continued)

Command	Description
<pre>RTRV-DATA-TDEV:[tid]:aid:ctag [::[clksrc][,start] [,stop]];</pre>	<p>Valid aid code: s1Ay-z</p> <p>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:</p> <pre>^^^"aid:ocrdat,ocrtm,TDEV,clksrc,temper,monval" <cr lf></pre> <p>where:</p> <ul style="list-style-type: none"> ■ ocrdat and ocrtm = the beginning date and time the data was collected ■ clksrc = clock used for the measurements ■ temper = time period for the measurement data, given in seconds ■ monval = data value for the time period, given in nanoseconds. The maximum temper 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. <p>Only the values available in the interval between the start and stop times is output.</p>

Table B-5. TL1 Retrieve Commands (Continued)

Command	Description
<pre>RTRV-DATA-TDEV-HIST:[tid]:aid: ctag[::[clksrc][,count];</pre>	<p>Valid aid code: S1Ay-z</p> <p>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:</p> <pre>^^^"aid:ocrdat,ocrtm,TDEV,clksrc,monval1,... monval16"<cr lf></pre> <p>The ocrdat and ocrtm will be the beginning date and time the data was collected. The clksrc is the clock used for the measurements. The monval are the data value for the time period, given in nanoseconds. There are 16 of monvals in sequence, and the time periods in sequence are 0.1, 0.3, 0.6, 1.0, 3.0, 6.0, 10.0, 30.0, 60.0, 100.0, 300.0, 600.0, 1000.0, 3000.0, 6000.0, and 10000.0.</p>

Table B-5. TL1 Retrieve Commands (Continued)

Command	Description
<pre>RTRV-EVENT:[tid]:[aid]:ctag:: [count],[start],[stop];</pre>	<p>Valid aid code: ALL, SxAy</p> <p>This command returns stored event data.</p> <ul style="list-style-type: none"> ■ 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. <p>The format for event log report is:</p> <pre>^^^"aid:ntfcncde,condtype,srveff,ocrdat,ocrtm: condscr" <cr lf></pre> <p>where:</p> <ul style="list-style-type: none"> ■ ntfcncde = Notification Code (CR, MJ, MN, CL, NA) ■ condtype = Condition Type (event number) ■ srveff = service affecting flag: SA = service affecting, NSA = non-service affecting ■ ocrdat = occurrence date ■ ocrtm = occurrence time ■ condstr = condition description string ■ start = start time specifies the start date and time for data in the format MM-DD,HH-MM. If the date is null but followed by a time, the command defaults to the current date. If the start time is null, but preceded by a date, the command defaults to the current time. If the start date and time are null, the command defaults to the start of the data. The comma must be present to indicate a null start time. ■ stop = stop time specifies the stop date and time for data in the format MM-DD,HH-MM. If the date is null but followed by a time, the command defaults to the current date. If the stop time is null but preceded by a date, the command defaults to the current time. If the stop date and time is null, the command defaults to the end of the data.

Table B-5. TL1 Retrieve Commands (Continued)

Command	Description
<p>RTRV-EVENT-ALARM:[tid]:[aid]: ctag::[count],[start],[stop];</p>	<p>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: <ul style="list-style-type: none"> ■ 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. </p>
<p>RTRV-EVENT-REPORT:[tid]:[aid]: ctag::[count],[start],[stop];</p>	<p>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: <ul style="list-style-type: none"> ■ 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 </p>

Table B-5. TL1 Retrieve Commands (Continued)

Command	Description
<p>RTRV-GPS-POS:[tid]:[aid]:ctag;</p>	<p>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,pose1,timel" <cr lf> where:</p> <ul style="list-style-type: none"> ■ 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]. P dop is a measurement that indicates the geometry of the GPS satellites that the SSU-2000e 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-2000e generates an event when the GPS module calculates a new position, and stores the new position in NVRAM as the current position and changes the engine mode to fixed position. ■ avg = current GPS position averaging count. Setting the averaging count generates an event and starts a new position fix automatically. ■ pose1 = minimum satellite elevation to use for positioning ■ timel = the minimum satellite elevation to use for timing
<p>RTRV-HDR:[tid]::ctag;</p>	<p>Valid aid code: none. This command is used to verify system connectivity. It may also be used to retrieve the unit name (sid) and date and time. The only action taken by the SSU-2000e is to respond with the complied message.</p>

Table B-5. TL1 Retrieve Commands (Continued)

Command	Description									
<p>RTRV-INPUT-REF:[tid]::ctag;</p>	<p>Valid aid code: None</p> <p>This command returns the current input reference, reference switch mode, and reference selection mode. The format of the response message is:</p> <pre>^^^"port,swtmode,selmode<cr lf></pre> <p>where:</p> <ul style="list-style-type: none"> ■ 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. <p>If the input port is not a valid reference the DENY response is returned.</p>									
<p>RTRV-INV:[tid]::ctag; or RTRV-INVENTORY:[tid]::ctag;</p>	<p>Valid aid code: None</p> <p>This command returns the inventory management information for the addressed module(s). The response will be the compiled message followed by the response message(s). A summary for each module and shelf are returned in the following format:</p> <pre>^^^"aid:desc,hw_part,hw_rev,hw_serial,sw_part,s w_rev" <cr lf></pre> <p>where:</p> <ul style="list-style-type: none"> ■ 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. 141xxxx-xxx-x) ■ sw_rev field is the software revision level <p>The aid reported is the shelf address.</p> <p>The desc and hw_part are per the following table:</p> <table border="1" data-bbox="737 1381 1382 1545"> <thead> <tr> <th>aid</th> <th>desc</th> <th>hw_part</th> </tr> </thead> <tbody> <tr> <td>S2-S5</td> <td>SSU-2000e SSU-2000e (M3)</td> <td>25413140-000-0 25413140-001-0</td> </tr> <tr> <td>S2-S5</td> <td>SSU-2000e SSU-2000e (M3)</td> <td>25413141-000-0 25413141-001-0</td> </tr> </tbody> </table>	aid	desc	hw_part	S2-S5	SSU-2000e SSU-2000e (M3)	25413140-000-0 25413140-001-0	S2-S5	SSU-2000e SSU-2000e (M3)	25413141-000-0 25413141-001-0
aid	desc	hw_part								
S2-S5	SSU-2000e SSU-2000e (M3)	25413140-000-0 25413140-001-0								
S2-S5	SSU-2000e SSU-2000e (M3)	25413141-000-0 25413141-001-0								
<p>RTRV-NAME:[tid]:[aid]:ctag;</p>	<p>Valid AID codes: S1A2 or any I/O module or port.</p> <p>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:</p> <pre>^^^"aid:"name"" <cr lf></pre> <p>When the aid is S1A2, the name is that of the unit.</p> <p>When the aid is an I/O module or port, the name is the assigned port name.</p>									

Table B-5. TL1 Retrieve Commands (Continued)

Command	Description
RTRV-NETYPE:[tid]::ctag;	<p>Valid aid code: none.</p> <p>This command serves the same purpose as RTRV-HDR with an element type message added. The response message for is:</p> <pre>^^^"SSU2000" <cr lf></pre>
RTRV-PING:::ctag::ip;	<p>Valid aid code: none.</p> <p>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.</p>
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;	<p>Valid AID codes: SxAy[-z]</p> <p>This command returns the erred and cleared second thresholds for the signal faults.</p> <p>The format for each response message line is:</p> <pre>^^^"aid:prmtr,errcnt,clcnt"<cr lf></pre> <p>where:</p> <ul style="list-style-type: none"> ■ 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;	<p>Valid AID codes: SxAy[-z]</p> <p>This command returns the alarm settings for the specified module, or ALL alarms if no aid is specified.</p> <p>The format for each response message line is:</p> <pre>^^^"aid:almnum,level,startdelay,cleardelay"<cr lf></pre> <p>where:</p> <ul style="list-style-type: none"> ■ 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).

Table B-5. TL1 Retrieve Commands (Continued)

Command	Description
<p>RTRV-PRMTR-CCOUT:[tid]:[aid]: ctag;</p>	<p>Valid aid code: ALL, SxAy[-z]</p> <p>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: <code>^^^"aid:mode,level,bypass,pstate,duty,pcomp"<cr lf></code> where: <ul style="list-style-type: none"> ■ 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: <code>^^^"aid: mode,level,bypass"<cr lf></code> <code>^^^"aid:pstate1,pstate2,pstate3,...pstate20"<cr lf></code> <code>^^^"aid:duty1,duty2,duty3,...duty20"<cr lf></code> <code>^^^"aid:pcomp1,pcomp2,pcomp3,...,pcomp20"<cr lf></code> Line1 contains: <ul style="list-style-type: none"> ■ 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: <ul style="list-style-type: none"> ■ aid = module access identifier ■ pstate# port state [1 0] (1 = ON, 0 = OFF), where # = port number 1 through 20 Line 3 contains: <ul style="list-style-type: none"> ■ 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: <ul style="list-style-type: none"> ■ aid = module access identifier ■ pcomp# = phase compensation 1 through 7 ■ # = port number 1 through 20 </p>

Table B-5. TL1 Retrieve Commands (Continued)

Command	Description
RTRV-PRMTR-CLK:[tid]:[aid]: ctag;	<p>Valid aid code: ALL or S1A1 or S1A12</p> <p>This command returns the settings for the clock designated by the aid, or both clocks for ALL.</p> <p>The format for each response message line is: ^^"aid:warmup, mintau, maxtau, clkar" <cr lf></p> <p>where:</p> <ul style="list-style-type: none"> ■ 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]

Table B-5. TL1 Retrieve Commands (Continued)

Command	Description
<p>RTRV-PRMTR-CLKOUT:[tid]:[aid]: ctag;</p>	<p>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: <code>^^^"aid:mode,level,bypass,fltmode,pstate,squelch" <cr lf></code> where: <ul style="list-style-type: none"> ■ 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: <code>^^^"aid:mode,level,bypass,fltmode" <cr lf></code> <code>^^^"aid:pstate1,pstate2,...,pstate20" <cr lf></code> <code>^^^"aid:squelch1,squelch2,...,squelch20" <cr lf></code> where: Line 1 contains: <ul style="list-style-type: none"> ■ 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: <ul style="list-style-type: none"> ■ aid = access identifier of module ■ pstate# = port state [1 0] 1 = ON and 0 = OFF, and # = port number 1 through 20 Line 3 contains: <ul style="list-style-type: none"> ■ aid = access identifier of module ■ squelch# = squelch value [0 1... 16] and # = port number 1 through 20 </p>

Table B-5. TL1 Retrieve Commands (Continued)

Command	Description
<p>RTRV-PRMTR-COMM:[tid]:[aid]: ctag;</p>	<p>Valid aid code: ALL, COML, COMA, COMB, TELNET, or TL1</p> <p>This command returns the current serial protocol settings for the unit.</p> <p>When a serial port is specified, the format of the response message is:</p> <pre>^^^"aid:baud,echo,eol,mode,tout"<cr lf></pre> <p>where:</p> <ul style="list-style-type: none"> ■ 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] <p>When a Telnet port is specified, some data fields are null, and the format of the response message is:</p> <pre>^^^"aid:,,,tout"<cr lf></pre>
<p>RTRV-PRMTR-ELTIME:[tid]:[aid]: ctag;</p>	<p>Valid aid code: SxAy</p> <p>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.</p> <pre>^^^"aid:elevtime" <cr lf></pre> <p>where:</p> <ul style="list-style-type: none"> ■ elevtime = alarm elevation time for the specified module.
<p>RTRV-PRMTR-FREQ:[tid]:[aid]: ctag;</p>	<p>Valid aid code: ALL, S1Ay-z</p> <p>This command returns the MTIE threshold settings for the DS1/E1 input port designated by the aid.</p> <p>The format for the response message is:</p> <pre>^^^"aid:freq,fae,fac,fbe,fbcfatau,fbtau" <cr lf></pre> <p>where:</p> <ul style="list-style-type: none"> ■ 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 ■ fbttau = frequency error for B

Table B-5. TL1 Retrieve Commands (Continued)

Command	Description
<pre>RTRV-PRMTR-GPS:[tid]:[aid]: ctag;</pre>	<ul style="list-style-type: none"> ■ 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: <ul style="list-style-type: none"> ■ <code>^^^"aid:pri,pql,sigma" <cr lf></code> where: <ul style="list-style-type: none"> ■ <code>pri</code> = priority setting of [0 through 10, with 0 = MON] ■ <code>pql</code> = priority quality level [1 – 16] ■ <code>sigma</code> = limit of the noise measurement [10 – 1000 ms]
<pre>RTRV-PRMTR-INPUT:[tid]:[aid]: ctag;</pre>	<p>Valid aid code: ALL, S1Ay[-z]</p> <p>This command returns the settings for the input designated by the aid. This reports the input module settings.</p> <p>The format for the response message is: <code>^^^"aid:pstate,pri,pql,mode,ssm,zs,crc,gain,csflt,bit" <cr lf></code></p> <p>where:</p> <ul style="list-style-type: none"> ■ <code>aid</code> = port aid ■ <code>pstate</code> = port enabled state [ON OFF] ■ <code>pri</code> = priority 1 (highest) through 10 (lowest) or MON for monitor ■ <code>pql</code> = provisioned priority quality level of 1 through 16 ■ <code>mode</code> = framing type or clock frequency in MHz: [ESF D4 CCS CAS 1 1.544 2.048 5 10] ■ <code>ssm</code>, <code>zs</code>, <code>crc</code>, and <code>gain</code> = [ON OFF] ■ <code>csflt</code> = [HI LO OFF NA] ■ <code>bit</code> = bit number 4 through 8 of the Time Slot 0 word used for the E1 sync status message
<pre>RTRV-PRMTR-IP:[tid]::ctag;</pre>	<p>Valid aid code: None</p> <p>This command returns the current Internet Protocol settings for the unit.</p> <p>The format of the response message is: <code>^^^"aaa.aaa.aaa.aaa,mmm.mmm.mmm.mmm,ggg.ggg.ggg.ggg" <cr lf></code></p> <p>where:</p> <ul style="list-style-type: none"> ■ <code>aaa.aaa.aaa.aaa</code> = IP address of unit ■ <code>mmm.mmm.mmm.mmm</code> = IP mask of unit ■ <code>ggg.ggg.ggg.ggg</code> = IP gateway of unit

Table B-5. TL1 Retrieve Commands (Continued)

Command	Description												
RTRV-PRMTR-KEEPALIVE:[tid]:: ctag;	<p>Valid aid code: None</p> <p>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: ^^^"t11_time,snmp_time "<cr lf></p> <p>where:</p> <ul style="list-style-type: none"> ■ t11_time =TL1 session timer in minutes ■ snmp_time = SNMP session timer in minutes. <p>Times set to zero indicate keep alive is disabled</p>												
RTRV-PRMTR-LRM:[tid]:[aid]: ctag;	<p>Valid aid code: ALL, SxA[y[-z]]</p> <p>This command returns the LRM port setting. The format of each port response line is: ^^^"aid:enable,lbo,slip,flt" <cr lf></p> <p>where:</p> <ul style="list-style-type: none"> ■ 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 border="1" data-bbox="703 1194 1406 1417"> <thead> <tr> <th data-bbox="703 1194 930 1245">Fault</th> <th data-bbox="930 1194 1169 1245">CTA Installed</th> <th data-bbox="1169 1194 1406 1245">CTA Not Installed</th> </tr> </thead> <tbody> <tr> <td data-bbox="703 1245 930 1291">Side 1 LOS</td> <td data-bbox="930 1245 1169 1291">FLT STRATEGY</td> <td data-bbox="1169 1245 1406 1291">FLT STRATEGY</td> </tr> <tr> <td data-bbox="703 1291 930 1337">PLL Unlock</td> <td data-bbox="930 1291 1169 1337">CTA Engaged</td> <td data-bbox="1169 1291 1406 1337">FLT STRATEGY</td> </tr> <tr> <td data-bbox="703 1337 930 1417">Excessive Input Frequency</td> <td data-bbox="930 1337 1169 1417">FLT STRATEGY</td> <td data-bbox="1169 1337 1406 1417">FLT STRATEGY</td> </tr> </tbody> </table>	Fault	CTA Installed	CTA Not Installed	Side 1 LOS	FLT STRATEGY	FLT STRATEGY	PLL Unlock	CTA Engaged	FLT STRATEGY	Excessive Input Frequency	FLT STRATEGY	FLT STRATEGY
Fault	CTA Installed	CTA Not Installed											
Side 1 LOS	FLT STRATEGY	FLT STRATEGY											
PLL Unlock	CTA Engaged	FLT STRATEGY											
Excessive Input Frequency	FLT STRATEGY	FLT STRATEGY											
RTRV-PRMTR-LRMCID:[tid]:[aid]: ctag;	<p>Valid aid code: ALL, SxA[y[-z]]</p> <p>This command returns the LRM port circuit id. The format of each port response line is: ^^^"aid:cid" <cr lf></p> <p>The line contains the aid of the port, cid is a string from 0–43 characters circuit id</p>												

Table B-5. TL1 Retrieve Commands (Continued)

Command	Description
<p>RTRV-PRMTR-MTIE:[tid]:[aid]: ctag;</p>	<p>Valid aid code: ALL, S1Ay-z</p> <p>This command returns the MTIE threshold settings for the input port designated by the aid. The format for the response message is:</p> <pre>^^^"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></pre> <p>The first line contains the aid of the port and the error threshold settings for EL1.</p> <p>The second line contains the aid of the port and the error threshold settings for EL2.</p> <p>The third line contains the aid of the port and the clear threshold settings for CL1.</p> <p>The fourth line contains the aid of the port and the clear threshold settings for CL2.</p> <p>There are always four lines returned for each input port, one for each limit.</p>
<p>RTRV-PRMTR-NTP:[tid]::ctag;</p>	<p>Valid aid code: None</p> <p>This command returns the current network timing protocol settings for the unit. The format of the response message is:</p> <pre>^^^ip1,mode,interval"<cr lf> ^^^ip2,mode,interval"<cr lf> ^^^ip3,mode,interval"<cr lf></pre> <p>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.</p>

Table B-5. TL1 Retrieve Commands (Continued)

Command	Description
<p>RTRV-PRMTR-OUT422:[tid]: [aid]:ctag;</p>	<p>Valid aid code: ALL, SxA[y[-z]]</p> <p>This command returns the settings for the CC port specified by the aid. The format for each response message line is:</p> <pre>^^^"aid:mode,bypass,fltmode,pstate,frequency "<cr lf></pre> <p>where:</p> <ul style="list-style-type: none"> ■ 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. <p>When the aid does not specify a port, the response is:</p> <pre>^^^"aid:mode,bypass,fltmode"<cr lf> ^^^"aid:pstate1,pstate2,...pstate20"<cr lf> ^^^"aid:freq1,freq2,...freq20" <cr lf></pre> <p>where:</p> <p>Line 1 contains:</p> <ul style="list-style-type: none"> ■ aid = aid for the module ■ mode = 422 ■ bypass = [ON OFF] for allowing Clock C selection ■ fltmode = [ON OFF] for allowing Clock C selection <p>Line 2 contains:</p> <ul style="list-style-type: none"> ■ 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 <p>Line 3 contains:</p> <ul style="list-style-type: none"> ■ 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

Table B-5. TL1 Retrieve Commands (Continued)

Command	Description
<p>RTRV-PRMTR-OUTE12048:[tid]: [aid]:ctag;</p>	<p>Valid aid code: ALL, SxA[y[-z]]</p> <p>This command returns the settings for the port specified by the aid. The format for each response message line is: <code>^^^"aid:mode,bypass,zs,signal,pstate, squelch"</code> <code>"<cr lf></code></p> <p>where:</p> <ul style="list-style-type: none"> ■ 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. <p>When the aid does not specify a port, the response is: <code>^^^"aid:mode,bypass,zs"<cr lf></code> <code>^^^"aid:signal1,signal2,...signal20"<cr lf></code> <code>^^^"aid:pstate1,pstate2,...pstate20"<cr lf></code> <code>^^^"aid:squelch1,squelch2,...squelch20" <cr lf></code></p> <p>where:</p> <p>Line 1 contains:</p> <ul style="list-style-type: none"> ■ aid = aid for the module ■ mode = CAS ■ bypass = [ON OFF] for allowing Clock C selection ■ zs = zero suppression: [OFF ON] <p>Line 2 contains:</p> <ul style="list-style-type: none"> ■ aid = aid for the module ■ signal# = signal type [0 1] (0 is 2048, 1 is E1) and # is the port number 1 through 20 <p>Line 3 contains:</p> <ul style="list-style-type: none"> ■ 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 <p>Line 4 contains:</p> <ul style="list-style-type: none"> ■ aid = aid for the module ■ squelch# = squelch value [0 1 ... 16] and # is the port number 1 through 20

Table B-5. TL1 Retrieve Commands (Continued)

Command	Description
<p>RTRV-PRMTR-OUTPUT:[tid]: [aid]:ctag;</p>	<p>Valid aid code: ALL, SxA[y[-z]]</p> <p>Returns the output port setting when a port aid is specified. The format for the response message is:</p> <pre>^^^"aid:mode,level,bypass,zs,crc,bit,pstate,len" <cr lf></pre> <p>where:</p> <ul style="list-style-type: none"> ■ 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 <p>When the aid does not specify a port, the response is:</p> <pre>^^^"aid:mode,level,bypass,zs,crc,bit" <cr lf></pre> <pre>^^^"aid:pstate1,pstate2,...pstate20" <cr lf></pre> <pre>^^^"aid:len1,len2,len3,...,len20" <cr lf></pre> <p>Line 1 contains:</p> <ul style="list-style-type: none"> ■ 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 <p>Line 2 contains:</p> <ul style="list-style-type: none"> ■ aid = port access identifier ■ pstate# = port enabled state [1 0] (1 = ON and 0 = OFF) and # is the port number 1 through 20 <p>Line 3 contains:</p> <ul style="list-style-type: none"> ■ 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

Table B-5. TL1 Retrieve Commands (Continued)

Command	Description
<p>RTRV-PRMTR-PBO:[tid]::ctag;</p>	<p>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].</p> <ul style="list-style-type: 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.
<p>RTRV-PRMTR-SNMP-MODE:[tid]::ctag;</p>	<p>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:</p> <ul style="list-style-type: none"> ■ ENA Enables SNMP operation in the system ■ DIS Disables SNMP operation in the system <p>Values for trap_filter are as follows:</p> <ul style="list-style-type: none"> ■ ALM Only alarms cause Traps to be transmitted ■ ALL All events and alarms cause the transmission of Traps
<p>RTRV-PRMTR-SNMP-USER:[tid]::ctag;</p>	<p>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.</p>
<p>RTRV-PRMTR-SNMP-MANAGER:[tid]::ctag;</p>	<p>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</p>

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: <ul style="list-style-type: none"> ■ 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: <ul style="list-style-type: none"> ■ 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: <ul style="list-style-type: none"> ■ port = input reference port designated by the aid ■ clksrc = selected clock source [CLK-A CLK-B NA] for outputs

Table B-5. TL1 Retrieve Commands (Continued)

Command	Description
<p>RTRV-STATUS-ALARM:[tid]:[aid]: ctag;</p>	<p>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: <ul style="list-style-type: none"> ■ aid = module or input port ■ almnum = alarm number for that aid ■ status = current state of each alarm condition [OK BAD] </p>
<p>RTRV-STATUS-CLK:[tid]:[aid]: ctag;</p>	<p>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: <ul style="list-style-type: none"> ■ 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 </p>
<p>RTRV-STATUS-INPUT:[tid]:[aid]: ctag;</p>	<p>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: <ul style="list-style-type: none"> ■ 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. </p>

Table B-5. TL1 Retrieve Commands (Continued)

Command	Description
<p>RTRV-STATUS-LRM:[tid]:[aid]: ctag;</p>	<p>Valid aid code: ALL, SxA[y[-z]]</p> <p>This command returns the condition (current operating mode and status) of an LRM module or port. The format of response messages are:</p> <pre>^^^"aid:mstat,clksrc,ctaid" <cr lf> ^^^"aid:pstat,frame,los,ais,lof,bpv,slip, slipcount,los_side2" <cr lf></pre> <p>Line 1 contains:</p> <ul style="list-style-type: none"> ■ 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. <p>Line 2 contains:</p> <ul style="list-style-type: none"> ■ 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.
<p>RTRV-STATUS-NTP:[tid]::ctag;</p>	<p>Valid aid code: None</p> <p>This command returns the current network timing protocol status for the unit. The format of the response message is:</p> <pre>^^^ip1,offset,delay,dispersion" <cr lf> ^^^ip2,offset,delay,dispersion" <cr lf> ^^^ip3,offset,delay,dispersion" <cr lf></pre> <p>where:</p> <ul style="list-style-type: none"> ■ 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

Table B-5. TL1 Retrieve Commands (Continued)

Command	Description
<p>RTRV-STATUS-OUTPUT:[tid]:[aid]: ctag;</p>	<p>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: <code>^^^"aid:mstat,red,clksrc,pql,pstate" <cr lf></code> where: The first line contains the port aid.</p> <ul style="list-style-type: none"> ■ 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 <p>Multiple message lines are returned if aid specifies one or more output modules as follows: <code>^^^"aid:mstat,red,clksrc,pql" <cr lf></code> <code>^^^"aid:p1,p2,p3,...p20" <cr lf></code> where: The first line contains the module aid.</p> <ul style="list-style-type: none"> ■ 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 <p>The second line contains:</p> <ul style="list-style-type: none"> ■ aid = module identifier ■ pstate = port status: [1 0 F], where 1 = enabled, 2 = disabled, F = faulted for all 20 outputs
<p>RTRV-USER:[tid]::ctag;</p>	<p>Valid aid code: None This command returns the current user list. The format of the response message is: <code>^^^"username,level" <cr lf></code> where:</p> <ul style="list-style-type: none"> ■ username = assigned user ■ level = access level assigned to that user. <p>No password information is displayed. This command is only accessible by Level 4 users.</p>

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-2000e. 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-2000e clock is set to the received date and time and a complied message is returned, with the new date/time in the header.

Table B-6. TL1 Set Commands (Continued)

Command	Description
<pre>SET-GPS-POS:[tid]:[aid]:ctag ::[(lat)],[(lon)],[(hgt)], [pdop],[avg],[pose1],[time1] ;</pre>	<p>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:</p> <ul style="list-style-type: none"> ■ lat = set the latitude [\pm 90deg], formatted (DD)-MM-SS.SS, where + = North and - = South ■ lon = set longitude [\pm180 deg] formatted as (DD)-MM-SS.SS, where + = East, and - = West ■ hgt = set height [\pm 10000.0 meters] ■ pdop = set the pdop [1 to 10] ■ avg = set position averaging value [10 to 3600] ■ pose1 = set the minimum satellite elevation to use for positioning [0 to 50 deg] ■ time1 = set the minimum satellite elevation to use for timing [0 to 50 deg]
<pre>SET-INPUT-REF:[tid]::ctag:: port[,swtmode][,selmode];</pre>	<p>Valid aid code: None This command sets the current input reference to the designated input port.</p> <ul style="list-style-type: none"> ■ 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 <p>If the input port is not a valid reference, then the DENY response is returned.</p>
<pre>SET-MTIE-MASK:[tid]:[aid]: ctag::mask;</pre>	<p>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.</p>
<pre>SET-NAME:[tid]:[aid]:ctag:: name;</pre>	<p>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.</p>
<pre>SET-PHASE-ZERO:[tid]:[aid]: ctag[::clksrc];</pre>	<p>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.</p>

Table B-6. TL1 Set Commands (Continued)

Command	Description
<pre>SET-PRMTR-ALARM:[tid]:aid: ctag::almnum,level [,errcnt],[clrcnt];</pre>	<p>Valid aid code: ALL, SxAy</p> <p>This command assigns an alarm level to the alarm number specified.</p> <ul style="list-style-type: none"> ■ almnum = alarm number. See Alarm Messages, on page 232 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.
<pre>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];</pre>	<p>Valid aid code: ALL, SxAy-[z]</p> <p>This command sets the input error and clear parameters of [AIS BPV CRC LOS OOF] for the designated input.</p> <ul style="list-style-type: none"> ■ 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 <p>When aid is set to ALL, the specified parameters are set for all inputs.</p>
<pre>SET-PRMTR-CCOUT:[tid]:[aid]: ctag::[pstate],[mode], [level],[bypass],[duty], [pcomp];</pre>	<p>Valid aid code: ALL, SxA[y[-z]]</p> <ul style="list-style-type: none"> ■ 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] <p>Empty fields leave parameters unchanged.</p>
<pre>SET-PRMTR-CLK:[tid]:[aid]: ctag::[warmup],[mintau], [maxtau];</pre>	<p>Valid aid code: S1A1, S1A12, CLK-A, CLK-B</p> <p>This command sets the designated clock warmup time.</p> <ul style="list-style-type: none"> ■ warmup = warmup time constant; set to 1200 seconds ■ mintau = starting time constant; Stratum 2E and 3E = 300 seconds ■ maxtau = final time constant value Stratum 2E = 10000 seconds Stratum 2E = 500 seconds <p>The aid may be specified to indicate which clock; set to null to set both clocks identically.</p> <p>Empty fields leave parameters unchanged.</p>

Table B-6. TL1 Set Commands (Continued)

Command	Description
<pre>SET-PRMTR-CLKOUT:[tid]:[aid] :ctag::[pstate],[mode], [level],[bypass],[fltmode];</pre>	<p>Valid aid code: ALL, SxA[y[-z]]</p> <ul style="list-style-type: none"> ■ pstate = sets output port state: [ON OFF] ■ mode = ignored ■ level = set the clock mode: [WARM ACQ LOCK] ■ bypass = allow Clock C selection [ON OFF] when outputs are turned on ■ fltmode = allow output level to be monitored for fault thresholds: [OFF ON AUTO]. Setting the status for a module (no port -z) sets all ports on the module to [ON OFF]. <p>Empty fields leave parameters unchanged.</p>
<pre>SET-PRMTR-COMM:[tid]:[aid]: ctag::[baud],[echo],[eol], [mode],[tout];</pre>	<p>Valid aid code: ALL, COML, COMA, COMB, TELNET, or TL1 where:</p> <ul style="list-style-type: none"> ■ 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
<pre>SET-PRMTR-ELTIME:[tid]:[aid] :ctag::elevtime;</pre>	<p>Valid aid code: SxAy</p> <p>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.</p> <p>This may be set for each module or ALL modules, and applies to all alarms created by the module.</p>
<pre>SET-PRMTR-FREQ:[tid]:[aid]: ctag::[fae],[fac],[fbe], [fbc];</pre>	<p>Valid aid code: ALL, S1Ay[-z]</p> <p>This command sets the input Frequency alarm thresholds.</p> <ul style="list-style-type: none"> ■ 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 <p>The maximum settings for these limits is 10 000 000 in units of ps/s. Empty fields are unchanged.</p>
<pre>SET-PRMTR-GPS:[tid]:[aid]: ctag::pri],[pql],[sigma];</pre>	<p>Valid aid code: S1A3 or S1A5 (for a unit with GPS module)</p> <ul style="list-style-type: none"> ■ 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]

Table B-6. TL1 Set Commands (Continued)

Command	Description
<pre>SET-PRMTR-INPUT:[tid]:[aid]: ctag::[pstate],[pri],[pql], [mode],[ssm],[zs],[crc], [gain],[csflt],[bit];</pre>	<p>Valid aid code: ALL, S1Ay[-z]</p> <p>This command sets:</p> <ul style="list-style-type: none"> ■ 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. <p>SSM, zs, crc, and gain are ignored for clock modes.</p> <ul style="list-style-type: none"> ■ 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. <p>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).</p>
<pre>SET-PRMTR-IP:[tid]::ctag:: [addr],[mask],[gate];</pre>	<p>Valid aid code: None</p> <p>where:</p> <ul style="list-style-type: none"> ■ addr = IP address of SSU-2000e ■ mask = IP mask of SSU-2000e ■ gate = IP gateway of SSU-2000e <p>All IP numbers are in the ###.###.###.### format.</p>
<pre>SET-PRMTR-KEEPALIVE:[tid]:: ctag::[t11_time], [snmp_time];</pre>	<p>Valid aid code: None</p> <p>This command supports a “keep alive” mode whereby based upon a user settable time the SSU-2000e generates an event to alert the upstream support system that the SSU-2000e and associated communication path is functional.</p> <p>Where t11_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.</p>

Table B-6. TL1 Set Commands (Continued)

Command	Description												
<pre>SET-PRMTR-LRM:[tid]:[aid]: ctag::[enable],[lbo], [slip],[bpv],[flt];</pre>	<p>Valid aid code: ALL, SxA[y[-z]]</p> <p>This command sets the LRM port</p> <p>enable = {ON OFF} for enabled or disabled</p> <p>lbo = line build-out setting in feet {133 266 399 533 655} for DS1 outputs</p> <p>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.</p> <p>bpv = {CLR NOP}. CLR clears the BPV error count and accumulated error ratio. NOP is an empty field with no operation</p> <p>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 retune data.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 25%;">Fault</th> <th style="width: 25%;">CTA Installed</th> <th style="width: 25%;">CTA Not Installed</th> </tr> </thead> <tbody> <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> </tbody> </table>	Fault	CTA Installed	CTA Not Installed	Side 1 LOS	FLT STRATEGY	FLT STRATEGY	PLL Unlock	CTA Engaged	FLT STRATEGY	Excessive Input Frequency	FLT STRATEGY	FLT STRATEGY
Fault	CTA Installed	CTA Not Installed											
Side 1 LOS	FLT STRATEGY	FLT STRATEGY											
PLL Unlock	CTA Engaged	FLT STRATEGY											
Excessive Input Frequency	FLT STRATEGY	FLT STRATEGY											
<pre>SET-PRMTR-LRMCID: [tid]:[aid]:ctag::[cid];</pre>	<p>Valid aid code: ALL, SxA[y[-z]]</p> <p>This command sets the LRM port circuit id (CID). CID is a 0 to 43 character string with all ASCII printable characters.</p>												
<pre>SET-PRMTR-MTIE:[tid]:[aid]: ctag::{EL1 EL2 CL1 CL2}, [t10],[t100],[t1k],[t10k], [t100k];</pre>	<p>Valid aid code: ALL, S1Ay[-z]</p> <p>This command sets the input MTIE alarm thresholds EL1 or EL2 and the clear thresholds CL1 or CL2 for the designated input.</p> <p>Threshold settings t10 through t100k are the error limits in nanoseconds for the measurement time period.</p> <p>With the aid of ALL (or null) the specified parameters are set for all inputs.</p>												

Table B-6. TL1 Set Commands (Continued)

Command	Description
<pre>SET-PRMTR-NTP:[tid]::ctag:: mode,ip,interval;</pre>	<p>Valid aid code: none</p> <p>This command sets the NTP client and NTP broadcast mode of operation.</p> <p>Mode can be set to [client bclient broadcast del clrall]</p> <p>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.</p> <p>Bclient mode accepts time from a broadcast server that is specified by the ip parameter.</p> <p>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.</p> <p>The del mode deletes the specified ip from the list of peers; there is a maximum of 3 ip's that can be assigned for all peer modes combined.</p> <p>Clrall deletes all peer addresses. If three ip's have been defined and a fourth ip is defined, the system returns a DENY message; you must delete one of the three ip's prior to adding the new ip.</p>
<pre>SET-PRMTR-OUTE12048:[tid]: [aid]:ctag::[pstate], [bypass],[zs],[signal], [sqlch];</pre>	<p>Valid aid code: ALL, SxA[y[-z]]</p> <p>This command sets the output parameters for the E1/2048 kHz Output module.</p> <p>where:</p> <ul style="list-style-type: none"> ■ 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] ■ sqlch = [0 1 2 ... 16] turn on/off the output if a reference clock PQL value exceeds the sqlch value. 0 disables the sqlch function. <p>Empty fields leave parameters unchanged.</p>

Table B-6. TL1 Set Commands (Continued)

Command	Description
<pre>SET-PRMTR-OUTPUT:[tid]:[aid] :ctag::[pstate],[mode], [level],[bypass],[zs],[crc], [len],[bit];</pre>	<p>Valid aid code: ALL, SxA[y[-z]]</p> <p>This command sets the output port parameters.</p> <p>where:</p> <ul style="list-style-type: none"> ■ pstate = enabled or disabled [ON OFF] ■ mode = signal mode [ESF D4 CCS CAS] ■ level = outputs are turned on [WARM ACQ LOCK] <p>For framed outputs:</p> <ul style="list-style-type: none"> ■ 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] <p>Setting the status for a module (no port -z) sets all ports [ON OFF]. Empty fields leave parameters unchanged.</p>
<pre>SET-PRMTR-PBO:[tid]::ctag:: pbo_mode;</pre>	<p>Valid aid code: none</p> <p>The pbo_mode is [DIS EVT REP NONE].</p> <ul style="list-style-type: 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.
<pre>SET-PRMTR-SETUP:[tid]:[aid]: ctag::[factory user save];</pre>	<p>Valid aid code: ALL, SxA[y[-z]]</p> <p>This command sets or saves the configuration of the specified module.</p> <p>Factory restores the module configuration to factory defaults. Any time the configuration has changed from the factory configuration, these configurations become the current configurations.</p> <p>Save stores the current configuration.</p> <p>The user parameter reloads the previously saved configuration.</p>
<pre>SET-PRMTR-SNMP-MODE:[tid]:: ctag::[mode], [trap_filter];</pre>	<p>Valid aid code: None</p> <p>This command sets the SNMP mode and trap filter parameters.</p> <p>Values for mode are as follows:</p> <ul style="list-style-type: none"> ■ ENA Enables SNMP operation in the system ■ DIS Disables SNMP operation in the system <p>Values for trap_filter are as follows:</p> <ul style="list-style-type: none"> ■ ALM Only alarms cause Traps to be transmitted ■ ALL All events and alarms cause the transmission of Traps <p>Empty fields leave parameters unchanged.</p>

Table B-6. TL1 Set Commands (Continued)

Command	Description
<pre>SET-PRMTR-SNMP-MANAGER:[tid] ::ctag::mode,[ip];</pre>	<p>Valid aid code: none</p> <p>This command allows changes to the SNMP manager table entries.</p> <p>mode = {ADD DEL INIT}</p> <p>where:</p> <ul style="list-style-type: none"> ■ 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
<pre>SET-PRMTR-SNMP-USER:[tid]:: ctag::mode,[rd_community], [wr_community],[level];</pre>	<p>Valid aid code: none</p> <p>This command allows changes to the SNMP security of the system.</p> <p>mode = {ADD DEL MOD INIT}</p> <p>where:</p> <ul style="list-style-type: none"> ■ 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 parms and clears all entries in the table
<pre>SET-PRMTR-SNMPV3-MANAGER: [tid]::ctag::mode,[ip], [username];</pre>	<p>Valid aid code: none</p> <p>This command allows changes to the SNMPv3 manager table entries.</p> <p>mode = {ADD DEL MOD INIT}</p> <p>where:</p> <ul style="list-style-type: none"> ■ 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
<pre>SET-PRMTR-SNMPV3- NOTIFICATION:[tid]::ctag:: [notification];</pre>	<p>Valid aid code: none</p> <p>This command sets the SNMP v3 notification type.</p> <ul style="list-style-type: none"> ■ notification = {V2 V3 ALL} to set SNMP notification to SNMPv2, SNMPv3, or both types when an event occurs

Table B-6. TL1 Set Commands (Continued)

Command	Description
<pre>SET-PRMTR-SNMPV3-USER:[tid]: :ctag::mode,[username], [authAlgorithm],[auth], [priv],[level];</pre>	<p>Valid aid code: none</p> <p>This command allows changes to the SNMPv3 security system.</p> <p>mode = {ADD DEL MOD INIT}</p> <p>where:</p> <ul style="list-style-type: none"> ■ 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 <p>The requirements of each field depends upon the first parameter “mode” you are choosing</p> <ul style="list-style-type: none"> ■ 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. If you must 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.
<pre>SET-PRMTR-TL1FORMAT: [tid]::ctag::mode;</pre>	<p>Valid aid code: none</p> <p>This command sets the format of autonomous messages.</p> <p>mode = {GR831 GR833}</p> <p>where:</p> <ul style="list-style-type: none"> ■ GR831 = format specified by GR831 ■ GR833 = format specified by GR833. <p>See Autonomous Report Conventions, on page 260, for more information.</p>
<pre>SET-USER:[tid]::ctag::mode, [username],[password], [userlevel];</pre>	<p>Valid aid code: none</p> <p>This command allows changes to the user list.</p> <p>mode = {ADD DEL INIT}</p> <p>where:</p> <ul style="list-style-type: none"> ■ 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

Other TL1 Commands

Table B-7 summarizes the TL1 commands for activating (enabling), disconnecting (disabling), removing or restarting modules, and for logging in or out of the SSU-2000e.,

Table B-7. Other TL1 Commands

Commands	Descriptions
ACT-MODULE:[tid]:aid:ctag;	Valid aid codes: SxAy 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-2000e.
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.

Interactive Command Set

The Interactive Command Set (ICS), also called the ASCII command set, can be used to control the SSU-2000e from a terminal connected to one of the SSU-2000e 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-2000e 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-2000e main shelf
2-5 = the SDU-2000e 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.

ICS Prompts

ICS uses the SSU-2000e 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-2000e using an EIA-232-C connection, if the communications port requires a user name and logon password, only these commands are available until an operator logs on: ID, INFO, LOGIN, HELP, and DOY. In this state, the port displays autonomous events but does not allow a query of event history until the operator logs on.
- While communicating with the SSU-2000e using Telnet, if the communications port requires a user name and password to log on, the interface does not allow commands to be performed or events to be displayed until the operator logs on. For example, events are stored in the event history but are not displayed on ports to which no user is logged on.

Command Syntax

The ICS interface follows these conventions for expressing command syntax:

- All lowercase letters are converted to uppercase.
- Command is any valid command consisting of only uppercase letters, excluding the <Data Separator> and <Command Separator> codes, in this format:

```
Command [<Data Separator> <data>...][<Command Separator>] OR EOL
```

where:

- <Data Separator> is any of the following:
 - > (hex 20) space character. Multiple spaces are converted to a single space character.
 - <data> The data input for the command. This can be any combination of printable ASCII codes and is specified in the command description section. Use double quotes (" ") to imply literal input. *All* data within the quotes is accepted as a single data entry, allowing you to enter complex input strings. The ICS interface does not convert uppercase characters in quotes to uppercase.
 - <Command Separator> is a semicolon (;)
- The interface responds to any input line terminator. Possible terminators are CR, LF, or CRLF. When the interface receives any of these terminators, the input is terminated and the entered command line is processed.

The ICS interface uses the following single-character commands:

- / executes the previous command if it is used as the first character on a line.
- ? alias of the HELP command.

Command descriptions follow this format:

- **Command** The command name as it appears in the system.
- **Description** Brief description of the command functionality.
- **Operation**
 - Level 1: Gives the options and operations for Level 1 (Operator)
 - Level 2: Gives the options and operations for Level 2 (Technician)
 - Level 3: Gives the options and operations for Level 3 (Supervisor)
 - Level 4: Gives the options and operations for Level 4 (Administrator)
- **Remarks** Includes comments on the command operation.
- **Related** Shows any commands related to this command. This command may affect other commands or be affected by other commands.
- **Restrictions** Special restrictions on the use or operation of this command.

Command syntax follows these conventions:

- { } Signifies more than one parameters choice; one must be entered.
Options are separated by vertical bars.
- | Pipe or vertical bar, used to separate multiple parameters or options.
- [] Signifies optional parameters.
- italics* Signifies variable data.
- c Signifies character data (any printable ASCII character).

Terminology:

- shelf The actual shelf number of the unit in the system: 1 indicates the main shelf; 2 through 5 indicate expansion shelves.
- slot The actual slot number in the shelf. Slot numbers begin at 1 and number from left to right in the shelf.
- port The actual port number in the slot. The port number begins at 1.
Comm port An EIA-232-C, Telnet, or Ethernet TL1 communications port.

Module selection follows these conventions. Each module selection in a unit is defined as: xAy , where:

- x Shelf number (starting from 1);
- A Place holder indicating the slot separator;
- y Slot number (starting from 1, left to right, defined by each shelf).

Port selection follows these conventions. Each port of a module is addressed as: $xAy-z$, where:

- xAy same as defined for module selection.
- z Indicates the port number, starting from 1, left to right

Legal module and port names follow the conventions illustrated by these examples:

- 1A5-3 indicates shelf 1, slot 5, port 3.
- 1A5 indicates a module in shelf 1, slot 5.

The ICS interface allows aliases for modules. Aliases follow the conventions shown in these examples. For example, assuming a 19 inch chassis, these aliases apply:

- CLK-A = Clock A, 1A1
- CLK-B = Clock B, 1A12
- 2BUF-A = Shelf 2, Buffer A, 2A15
- 2BUF-B = Shelf 2, Buffer B, 2A16
- 3BUF-A = Shelf 3, Buffer A, 3A15

3BUF-B = Shelf 3, Buffer B, 3A16
4BUF-A = Shelf 4, Buffer A, 4A15
4BUF-B = Shelf 4, Buffer B, 4A16
5BUF-A = Shelf 5, Buffer A, 5A15
5BUF-B = Shelf 5, Buffer B, 5A16

Communications port names follow these conventions:

For the EIA-232C serial port
L = Local RS232 port (i.e., COML = local EIA-232 port)
A = Serial Port A (i.e., COMA is Serial Port A)
B = Serial Port B (i.e., COMB is Serial Port B)

For the Telnet port:
TELA = Telnet session one
TELB = Telnet session two
TELC = Telnet session three
TELD = Telnet session four

For the Ethernet TL1 port:
TL1A = Ethernet TL1 session one
TL1B = Ethernet TL1 session two

The interface uses ISO 8601 Date and Time Format:

Date and Time format: yyyy-mm-ddThh:mm:ss
(example: 1998-02-19T11:03:03)
Date format: yyyy-mm-dd
Time format Thh:mm:ss+

ICS Commands

This section provides an alphabetical listing of all ICS commands. For each command, the section provides the following information:

- Command name as it appears in the system
- Description of command function
- Operation of this command at security levels 0 through 4, with descriptions of syntax and command functions for each level
- Remarks and comments about the command operation
- Related Commands lists other commands that may affect or be affected by the command.
- Restrictions describes any special restrictions on the use or operation of the command.

ALARM

Use this command to provide the current alarm status and access to the alarm settings.

- Level 0 Not applicable
- Level 1 ALARM [{ALL| xAy[-z]}]

Use this command to view the current alarm status for the module that you specify. Only active alarms display, unless an option is passed.

If you do not specify a parameter, each active alarm status stored in the Communications Module is displayed. If you type ALL, the current status of all alarms for all modules through the SPI command displays.

Output from the command includes the alarm number (internal number used for alarm identification), a text description of the alarm, the current status, the current alarm level (elevated alarms are indicated with an asterisk*), and the delay time for the alarm.

Example:

```
SSU_2000->alarm 1A2
```

```
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}
```

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 232 for a list of alarm numbers
DELAY	<p>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.</p> <p>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.</p>
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

BYE

Use this command to log off.

Level 0 Not applicable

Level 1 BYE

Use this command to log off the system. If passwords are enabled, the logon header displays and you are prompted for a user name.

Level 2 Same as Level 1 operation

Level 3 Same as Level 1 operation

Level 4 Same as Level 1 operation

Remarks This command implies that the operator has completed the session and wants to return the SSU-2000e to an Idle state.

Related [LOGIN](#)

Restrictions None

CLK

Use this command to view the clock status and access the clock operating parameters.

Level 0 Not applicable

Level 1 CLK [xAy]

If you do not specify a parameter, the status for both CLOCK A and CLOCK B in the unit displays. If you specify a particular clock address, the clock status and setup information for that clock 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
```


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 33, 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

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.

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}
```

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.

CONFIG

Use this command to view the current hardware configuration of the SSU-2000e.

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-2000e	25413140-000-0, 25413140-001-0
1	SDU-2000	25413023-000-0
2-5	SDU-2000e	25413141-000-0, 25413141-001-0

CONFIG SW

This command displays the *software* part number (141xxxxx-xxx-x) and revision number.

CONFIG ADAPTER

This command displays the input adapter part number and its description for each Input module. This command is valid only if the SSU-2000e 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

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

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

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.

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
```

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.

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). P dop is a measurement that indicates the geometry of the GPS satellites that the SSU-2000e 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

Remarks

- ELMASK** Default values for the masks are 5 degrees for the positioning mask and 10 degrees for time.
- POS** Only set the position if you know the accurate position. The software automatically verifies the position on restart. The unit averages 10 position fixes and compares them to the fixed position.
- If the position is within 100m RMS, no position updates are performed. If the position error is > 100m RMS, an event is generated stating that the position is being recalculated, and the position is recalculated and updated in the NVRAM. Similarly, setting the AVG time puts the unit back into survey mode, which generates an event that the position is being recalculated.
- TDATA** Engine reports are asynchronous outputs, which means they can occur at any time, not necessarily at the time the command is issued.

Related None

Restrictions None

The following is an example of the `ENGINE` command message format:

```
SSU_2000->ENGINE
```

```
2001-06-18T20:46:20Z ID: SSU2000 Name: SSU_2000
GPS Module: 1A03
GPS MOT Engine: 2.2, APR 24 1998
Lat: +30:27:15.89, Lon: -097:39:45.88, Ht: 230.81 m (3D) PDOP:
2.7, 300 ave
GPS Module: 1A05
GPS MOT Engine: 2.2, APR 24 1998
Lat: +30:27:15.75, Lon: -097:39:45.85, Ht: 233.43 m (3D) PDOP:
2.8, 10 ave
```

EVENTS

Use this command to read and control current event log information.

Level 0 Not applicable

Level 1 `EVENTS [ALARM|REPORT] [#events_display|ALL]`

`EVENTS [ALARM|REPORT] [startdate [starttime]] [stopdate [stoptime]]`

`EVENTS [ALARM|REPORT] starttime [stopdate] [stoptime]`

`EVENTS` If you do not specify any options, only the last event prints.

Options are:

`ALARM` Use this option to show alarm events only. The alarm event is defined as any event ID less than 32.

`REPORT` Use this option to show report events only. Any events excluding alarm events (for example: any event ID is greater 32).

`#event_display`
Use this option to show the maximum number of events to display. Zero returns all events.

`ALL` Use this option to show all the events stored in the buffer.

`[startdate] [starttime]`
Use this option to specify the start time and date for displaying events within a time period.

`[stopdate] [stoptime]`
Use this option to specify the stop time and date for displaying events within a time period

`?` Use this option to display the event count.



Note: If you specify times and dates, events that occurred after the starting date and time and before the ending date and time display. Specified dates have the format yyyy-mm-dd, and specified times have the format hh:mm:ss.

Specified dates and times are not provided in ISO timestamp format, and are separated by a space. Start time and stop time default to the current time of day. Stop date defaults to the current date. Start date defaults to the current date, minus 24 hours.

Example:

SSU_2000+>events alarm

Time Stamp	Which	Type	Event	Description
2001-05-24T18:27:00Z	1A04-03	Maj	LOS	Active
2001-05-24T18:27:29Z	1A01	Rep	Soft PLL,	HOLD
2001-05-24T18:27:29Z	1A01	Min	Freq Mode,	Holdover

Level 2 Same as Level 1 operation

Level 3 Same as Level 2 operation, with the following additions:

EVENTS CLR

This option clears the event list.

Level 4 Same as Level 3 operation

Remarks Events are stored in non-volatile memory. They are retained on startup.

Related [ALARM](#)

Restrictions None

FREQUENCY

Use this command to display the input frequency data from a selected input port.

Level 0 Not applicable

Level 1 `FREQUENCY [xAY][{A|B}]`

Use this command to view the frequency measurement from a selected input module. If you do not provide a parameter, frequency measurement on the selected clock to all inputs displays.

Options are:

A|B Clock A or Clock B

Level 2 Same as Level 1 operation

Level 3 Same as Level 1 operation

Level 4 Same as Level 1 operation

Remarks None

Related [INPUT](#), [PHASE](#)

Restrictions None

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
```


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				

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
```

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

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
```

```
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.

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

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.

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.

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-2000e 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

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.

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/DISABLE Enable/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](#)

MSG

Use this command to access the messaging facilities.

Level 0	Not applicable
Level 1	Not applicable
Level 2	MSG "message to send"

Use this command to broadcast a message on all active communication sessions. The maximum length of each message is 60 characters.



Note: The MSG is implemented as an event. It displays a full message in an autonomous event. But, it only saves 20 characters in the event log when a user tries to query it later.

Level 3	Same as Level 2 operation
Level 4	Same as Level 3 operation
Remarks	The string must be entered
Related	None
Restrictions	None

MTIE

Use this command to display the MTIE data from a selected input port.

Level 0 Not applicable

Level 1 `MTIE xAy-z [{A|B}] startdate [starttime][stopdate
[stoptime]]`

`MTIE xAy-z [{A|B}] starttime [stopdate][stoptime]`

`MTIE xAy-z [{A|B}] HISTORY [count]`

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.

```
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
```

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

NTP

Use this command to provide access to the NTP in the SSU-2000e. 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).


```
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.

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

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

PHASE

Use this command to access phase history data.

Level 0 Not applicable

Level 1 PHASE [xAy[-z]][{A|B}]{T1|T100|T1K|T10K}[count]

Use this command to view the 100/ 1,000/ 10,000 seconds phase history information. One second phase is not stored in phase history. If you do not provide a parameter, phase information displays for the selected clock to all inputs that last stored the point.

Example:

```
SSU_2000->phase
```

```
The current phase values with T1:
1A03-01 PhA:2001-05-24T18:29:00, 3
1A04-01 PhA:2001-05-24T18:29:09, 1
1A04-02 PhA:2001-05-24T18:29:09, 1
1A04-03 PhA:2001-05-24T18:29:09, 3
1A05-01 PhA:2001-05-24T18:29:12, 5
1A09-01 PhA:2001-05-24T18:29:12, 1
1A09-02 PhA:2001-05-24T18:29:12, 2
1A09-03 PhA:2001-05-24T18:29:12, NA
1A10-01 PhA:2001-05-24T18:29:13, 1
1A10-02 PhA:2001-05-24T18:29:13, 3
1A10-03 PhA:2001-05-24T18:29:13, 2
1A11-01 PhA:2001-05-24T18:29:14, NA
1A11-02 PhA:2001-05-24T18:29:14, 2
1A11-03 PhA:2001-05-24T18:29:14, NA
```

Level 2 Same as Level 2 operation, with the following additions:

```
PHASE [xAy[-z]] ZERO [{A|B}]
```

Use this command to zero the phase error for the desired input port. If you do not provide a parameter, all inputs on both clocks are zeroed.

Level 3 Same as Level 2 operation

Level 4 Same as Level 3 operation

Remarks None

Related [STATUS](#), [INPUT](#)

Restrictions None

PING

Use this command to view network ping (diagnostic) capabilities.

Level 0 Not applicable

Level 1 Not applicable

Level 2 `PING ip_dotted_address`

Use this command to determine if the unit is connected to the network. This command transmits a packet to the specified address and waits for a response. If a response is received, the unit displays a successful command completion message. If no response is received, the unit times-out and prints an unsuccessful command completion message.

Level 3 Same as Level 2 operation

Level 4 Same as Level 2 operation

Remarks No name server is available. The Internet Protocol (IP) address is formatted as a decimal dotted address.

Related None

Restrictions None

PQLTABLE

Use this command to display or change user-defined Priority Quality Level (PQL) code and text string.

Level 0 Not applicable

Level 1 PQLTABLE

Use this command to 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

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

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.



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
```

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.

RESTART

Use this command to restart the software for a specified module.

Level 0 Not applicable

Level 1 Not applicable

Level 2 Not applicable

Level 3 `RESTART [xAy]`

Use this command to restart the module. If you do not provide a parameter, the command refers to the Communications Module.

This command requires the whole entry RESTART to be entered to verify that you want to restart the module. This command requires a confirmation (YES|NO). If confirmation fails, no action is required.

Level 4 Same as Level 3 operation

Remarks None

Related None

Restrictions This command is based on the target module. It has the SPI software RESTART command support. This command assumes that the target module is working properly. If the target module does not work, this command has no effect.

SETUP

Use this command to view the current settings from non-volatile RAM in the entire unit. This includes any user settable information that is currently stored in NVRAM.

The main purpose of this command is to allow for a dump of current configuration of a unit so that you can compare site configurations. In addition, this command allows for storage and restoration of user settings, and the restoration of factory settings.

Level 0 Not applicable

Level 1 `SETUP [xAy]`

If you do not specify a parameter, all setup information of every module in the unit displays. If a specified address operand is provided, setup detail information for the target module displays. Module alarm Level is handled by the ALARM command. The alarm elevation time is handled by the ELEVTIME command. For each target module, refer to INPUT, CLK, or OUTPUT for a description.

If BUFFER is specified as the module, the command displays nothing.

If the Communications Module is specified as the module, the command displays: IP address, IP mask, gateway address, communications port settings, total number of users stored, and maximum number of events stored. You can view events from the event log by using the EVENTS command. You can view alarms from each module by using the ALARM command.

Level 2 Same as Level 1 operation

Level 3 Same as Level 2 operation, with the following additions:

```
SETUP [xAy] {FACTORY|USER|SAVE}
```

```
SETUP 1A2 CONNECTION FACTORY
```

Options are:

FACTORY Use this option to restore the current setting from the factory settings. If addressed as COMM, connection and user list are not included.

USER Use this option to restore the current setting 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.

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

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.

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.

MANAGER	SNMP Manager Table
INIT	Initializes the SNMP Manager Table to all null IP address
ADD	Adds an SNMP Manager IP address into the SNMP Manager Table
DELETE	Deletes an SNMP Manager IP address from the SNMP Manager Table

Remarks: The length of read community string and write community string are limited to 10 characters to satisfy TL1 requirements.

Related: [USERS](#)

Restrictions: None

STATUS

Use this command to view the current status of the unit. The status includes a count of the current active alarms and related information, which provides a quick view of unit performance.

Level 0 Not applicable

Level 1 STATUS [xAy]

If you do not provide a parameter, all status information from every module in the unit displays. If a specified address operand is provided, status detail information for that target module displays. For each target module, refer to INPUT, CLK, or OUTPUT for a description.

If the Communications module is specified, the bus connection profile displays within 900 seconds.

If 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

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->systemtime
```

```
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
```

TDEV

Use this command to view TDEV information from the selected input port.

Level 0 Not applicable

Level 1 `TDEV xAy-z [{A| B}] startdate [starttime] [stopdate
[stoptime]]`

`TDEV xAy-z [{A| B}] starttime [stopdate] [stoptime]`

Use this command to display the TDEV information calculated on the input modules. A|B specifies Clock A or Clock B. The default is the selected clock output.

To perform a TDEV calculation, start and a stop time are required. If none are specified in the command line, the time defaults to the last 24 hours. If the stop time is not specified, the current time is assumed.

This command displays the returned TDEV values and the window sizes for which they are valid. The command also displays the start and stop time for TDEV calculation.



Note: If you specify times and dates, TDEV displays that occurred after the starting date and time and before the ending date and time. Specified dates have the format yyyy-mm-dd, and specified times have the format hh:mm:ss.

Specified dates and times are not provided in ISO timestamp format, and are separated by a space. Start time and stop time both default to the current time of day. Stop date defaults to the current date. Start date defaults to the current date, minus 24 hours.

`TDEV xAy-z [{A|B}] HISTORY [count]`

A|B specifies Clock A or Clock B. The default is the selected clock output. This command displays the one-day TDEV history for the last one to 100 days.

Level 2 Same as Level 1 operation

Level 3 Same as Level 2 operation

Level 4 Same as Level 3 operation

Remarks Since TDEV is an intensive calculation, you can only specify one port.

Related None

Restrictions None

Example:

```
SSU_2000->tdev 1a9-1
```

```
TDEV for 1A09-01, on Clock A:  
Start Time: 2001-06-19T01:00:00  
Stop Time: 2001-06-19T13:57:00  
The TDEV ( 0.10 sec) is 0.56  
The TDEV ( 0.30 sec) is 0.33  
The TDEV ( 0.60 sec) is 0.24  
The TDEV ( 1.00 sec) is 0.18  
The TDEV ( 3.00 sec) is 0.11  
The TDEV ( 6.00 sec) is 0.09  
The TDEV ( 10.00 sec) is 0.07  
The TDEV ( 30.00 sec) is 0.06  
The TDEV ( 60.00 sec) is 0.07  
The TDEV ( 100.00 sec) is 0.09  
The TDEV ( 300.00 sec) is 0.14  
The TDEV ( 600.00 sec) is 0.19  
The TDEV ( 1000.00 sec) is 0.24  
The TDEV ( 3000.00 sec) is 0.62  
The TDEV ( 6000.00 sec) is 1.22  
The TDEV (10000.00 sec) is 1.60
```

TIME

Use this command to access the timekeeping facilities.

Level 0 Not applicable

Level 1 `TIME`

Use this command to view the current time within the unit. The time is displayed in the following format:

```
SSU_2000->time
```

```
T18:29:41Z
```

Level 2 Same as Level 1 operation

Level 3 `TIME [T]hh:mm:ss`

Use this command to set the current time within the unit.

Level 4 Same as Level 3 operation

Remarks None

Related [DATE](#)

Restrictions None

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

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-2000e. If the user ID is not in the system, this command exits with an error.

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

VER

Use this command to view the current software version for the Communications module.

Level 0 Not applicable

Level 1 VER

This command views information as follows (assumes Communications Module Main Code Version A). Current Version:

Main Code: A.01, 10FEB99

Level 2 Same as Level 1 operation

Level 3 Same as Level 1 operation

Level 4 Same as Level 1 operation

Remarks None

Related [INFO](#)

Restrictions None

WHO

Use this command to view current ports that have users and the port connections.

Level 0 Not applicable

Level 1 WHO

Use this command to view who is logged on all active communication ports. User name and the communication port name display.

Level 2 Same as Level 1 operation

Level 3 Same as Level 1 operation

Level 4 Same as Level 1 operation

Remarks None

Related [USERS](#), [LOGIN](#)

Restrictions None

Example:

```
SSU_2000->who
```

```
2001-06-18T21:37:59Z ID: SSU2000 Name: SSU_2000
You are ADMIN, with access level 4, connected to TELB
ADMIN is connected to COML
ADMIN is connected to COMA
ADMIN is connected to COMB
ADMIN is connected to TELA
```

NTP Support

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

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

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. If 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-2000e 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.

Broadcast Mode

If a broadcast address mask other than 255.255.255.255 (default) is assigned AND a broadcast timer other than 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

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-2000e 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 254, and [Interactive Command Set](#), on page 304.

SNMP Protocol

This section describes the two versions of SNMP that the SSU-2000e supports. The Communications module software determines the version of SNMP used by the SSU-2000e. See [Table B-9](#) for the part number for the various software loads that are available.

SNMP 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-2000e) is the server generating responses.

If SNMP is present, port 161 becomes the port of standard SNMP interactive communications and port 162 becomes the trap port. Since the SSU-2000e SNMP supports all existing functions, full system control of the SSU-2000e 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 254, and [Interactive Command Set](#), on page 304, for specific information on the following commands.

SNMP v3 Details

Symmetricon'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-2000e 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-2000e MIB object identifiers include the SSU-2000e system, its modules, module features, input ports, output ports, etc. and variables include settings and measurements.

The MIB is controlled by the SSU-2000e's SNMP agent. The SNMP agent is a server program that sends SSU-2000e 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**.

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;
```

```
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-2000e and associated paths are functional. This mode is only supported in TL1 and SNMP sessions, not in ICS, Telnet, or Hyperterminal sessions. The factory default mode is set to *Disabled*.

```
TL1:SET-PRMTR-KEEPALIVE:[tid]::ctag::[tll_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 254, and [Interactive Command Set](#), on page 304, 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 254, and [Interactive Command Set](#), on page 304, for more information.

```
TL1:RTRV-CONF:[tid]:[aid]:ctag;
```

```
ICS:CONFIG SW
```

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

Appendix C Antennas

This appendix provides information about optional antennas, antenna kits, part numbers and installation procedures for connecting GPS antennas to the SSU-2000e.

In This Appendix

- [Ordering Information](#)
- [Antenna Kits and Accessories](#)
- [Installing Antennas](#)
- [Optional Installation Accessories](#)

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 (P/N):

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 277 500

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

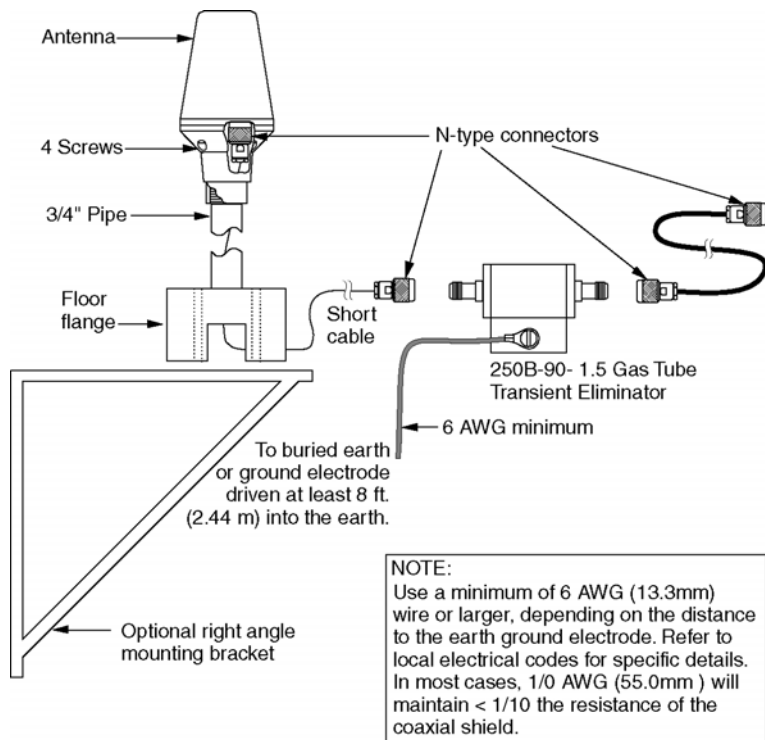
Symmetricom offers three versions of GPS antennas with 26, 40, and 48 dB internal Low Noise amplifiers (LNAs). These antennas, which are compatible with most commercial GPS receivers, receive, amplify, and filter the L1 (1575.42) signal from GPS NAVSTAR satellites. With the appropriate antenna (see [Table 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 part number and provides a brief description of each antenna
- [Figure C-1](#) illustrates 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 part numbers and provides a brief description of the antenna accessories available for the GPS series antennas

Table C-1. GPS Antennas with Internal LNA

Part Number	Description
990-13150-006	Antenna Kit 6M 26dB Antenna
990-13150-013	Antenna Kit 13M 26dB Antenna
990-13150-033	Antenna Kit 33M 26dB Antenna
990-13150-048	Antenna Kit 48M 26dB Antenna
990-13150-063	Antenna Kit 63M 40dB Antenna
990-13150-120	Antenna Kit 120M 40dB Antenna
990-13150-150	Antenna Kit 150M 48dB Antenna
990-13150-180	Antenna Kit 180M 48dB Antenna
990-13150-230	Antenna Kit 230M 48dB Antenna/20dB Amp
990-13150-300	Antenna Kit 300M 48dB Antenna/20dB Amp

Figure C-1 shows the GPS antenna with internal LNA.



ssu00048

Figure C-1. GPS Antenna with Internal LNA

[Table C-2](#) provides specifications for GPS antennas with internal LNA.

Table C-2. GPS Antennas with Internal LNA Specifications

Characteristic	Specification
Mechanical	
Mounting	4 holes, 4.445 cm x 4.445 cm centers, 0.635 cm mounting holes
Diameter	88.9 mm
Height	328.7 mm, including pipe mount
Weight	1.4 kg
Environmental	
Temperature	-40°C to +75°C
Relative Humidity	100% Non-Immersed
Altitude	60 meters below sea level to 3,962 meters above sea level
Electrical	
Power	4.7 to 28 vDC (5 vDC Nominal)
Element	Right Hand Circular
Carrier	L1 (1575.42 MHz)
Bandwidth	10 MHz
Noise Figure	< 2.5 dB
Output Impedance	50 ohms
Gain	
26 dB	26.5 dB ± 3 dB
40 dB	40 dB minimum
48 dB	48 dB minimum
68 dB	48dB minimum with a 20dB amplifier

[Table C-3](#) through [Table C-5](#) provides accessories for GPS antennas with internal LNA.

Table C-3. 26dB Antenna Accessories

Part Number	Description
58521A-xxx-0 (xxx = length)	Cable, LMR-400, 3 m. to maximum of 61 m.
773000-0008	Transient Eliminator, 90 Volts, 1.5 GHz, N-Type

Table C-3. 26dB Antenna Accessories

Part Number	Description
58521A-xxx-0 (xxx = length)	Cable, LMR-400, 3 m., N-Type
400302-0500	Roll, 3M 2150 Weatherproof Tape
12813080-000-0	Crimper Kit, LMR-400 (crimp tool, 2150 tape, LMR preptool, 10 each crimp N-type connectors)

Table C-4. 40dB Antenna Accessories

Part Number	Description
58521A-xxx-0 (xxx = length)	Cable, LMR-400, 21 m. to maximum of 113 m.
773000-0008	Transient Eliminator, 90 Volts, 1.5 GHz, N-Type
58521A-xxx-0 (xxx = length)	Cable, LMR-400, 9 m., N-Type
551100-6013	Adapter, Right Angle Female to Right Angle Male
12010210-000-0	Bracket Assembly, Antenna Mount Right Angle
400302-0500	Roll, 3M 2150 Weatherproof Tape
12813080-000-0	Crimper Kit, LMR-400 (crimp tool, 2150 tape, LMR preptool, 10 each crimp N-type connectors)

Table C-5. 48dB and 68dB Antenna Accessories

Part Number	Description
58521A-xxx-0 (xxx = length)	Cable, LMR-400, 67 m. to maximum of 295 m.
773000-0008	Transient Eliminator, 90 Volts, 1.5 GHz, N-Type
58521A-xxx-0 (xxx = length)	Cable, LMR-400, 9 m., N-Type
551100-6013	Adapter, Right Angle Female to Right Angle Male
12010210-000-0	Bracket Assembly, Antenna Mount Right Angle
570704-0001	GPS L1 inline amplifier, N-Type (required for lengths > 198 m.)
11013077-000-0	GPS L1 Amplifier Assembly (amplifier, transient eliminator, adapter, mounting plate)

Table C-5. 48dB and 68dB Antenna Accessories (Continued)

Part Number	Description
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)

Transient Eliminators

Symmetricon offers the FCC-250B-90-1.5NFNF Transient Eliminator for installations that require antenna coaxial lead-in protection. The FCC-250B-90-1.5NFNF Transient Eliminator passes DC power and frequencies in the 1.5 GHz range with non-downconverter L1 GPS antennas. In most installations, the transient eliminator mounts near the point at which the antenna lead enters the facility. [Table C-6](#) provides the transient eliminator specifications.

Table C-6. FCC-250B-90-1.5NFNF Specifications

Characteristic	Specification
Type	Gas
Response Time	< 2 nanoseconds
Impedance	50 ohms
Insertion Loss	< 0.25dB @ 1,575 MHz
VSWR	< 1.6:1 @ 1,575 MHz
DC Breakdown Voltage	90 Volts
Dissipation Capacity	10,000 Amperes, impulse 8/20 μsec
Connector Type	N-Type
Temperature	-55°C to + 70°C
Relative Humidity	100% Non-immersed Altitude 60 meters below sea level to 3,962 meters above sea level

GPS L1 Inline Amplifier

The GPS L1 Inline Amplifier (part number 570704-0001) option used to boost the signal from the antenna for installation. The amplifier uses LMR-400 cables longer than 198 meters and receives power from the GPS radio receiver through the antenna coaxial cable connections. [Table C-7](#) provides environmental, mechanical, and electrical specifications for the amplifier.

Table C-7. GPS L1 Inline Amplifier Specifications

Characteristic	Specification
Environmental	
Temperature	-40° C to +80° C
Mechanical	
Connectors, (In/Out)	N-Type
Gain	> 20 dB, 25 dB typical
Dimensions, includes connectors	Height: 28.5 mm Width: 50.8 mm Length: 88.9 mm
Electrical	
Power	+4.5 vDC to +30 vDC
Current	10 mA, typical
Input/Output Impedance (bandwidth at 3dB points)	50 ohms
Isolation	> 35 dB

GPS L1 Inline Amplifier Assembly

This assembly (part 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

Symmetricon provides a low-loss LMR-400, or equivalent, coaxial cable with N-type connectors on both ends.

- [Table C-8](#) lists the optional antenna coaxial cable crimper kits
- [Table C-9](#) provides antenna cable specifications

Table C-8. 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 each N-Type connector, crimp tool, weatherproof tape)

Table C-9. Antenna Cable Specifications

Cable Type	Measured Loss (@1.575 GHz dB per meter)	DC Resistance (ohms per meter)	Type Center Conductor	Flammability
RG213/U (Beldon 8267)	0.305	0.0098	2.62 mm ² Stranded	U/L CSA
UHF/VHF (Beldon 9913)	0.190	0.0088	5.26 mm ²	
UHF/VHF (Beldon 89913)	0.291	0.0088	5.26 mm ²	Plenum U/L CSA
LMR-400	0.167	Shield – 0.00165 Center – 0.00139	2.77 mm ² Solid	

Installing Antennas

This section provides complete installation procedures for GPS site preparation. Before beginning installation, review [Antenna System Grounding and Cable Lead-In Protection](#), on page 387 and gather the necessary tools and materials described.

Antenna Connection Overview

The SSU-2000e chassis has two antenna connections located on the front panel. The antenna connections are made via a Type-N connector J6 labeled ANTENNA-A and isolated TNC connector J7 labeled ANTENNA-B. 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-10](#) outlines the antenna signal connections.

Table C-10. 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

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.



Caution: To avoid possible damage from transients, **do not** connect the outside transient eliminator ground to the inside equipment rack ground.

Symmetricon makes no recommendation as to whether to install transient eliminators. Symmetricon can provide suitable transient connectors as an option.

- Use 5.26 mm² (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.

Antenna Installation Tools and Materials

These standard tools and materials are not supplied in the antenna kit, but may be required for installing the GPS antenna. For a list of antenna kit contents, see [Table C-1](#).

- Four each 6 mm fasteners for installing the antenna floor flange
- Extra cable ties or acceptable cable clamps
- 5.26 mm² (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.



Warning: To avoid serious injury to personnel or damage to equipment, exercise caution when working near high voltage lines. In particular:

- Use extreme caution when installing the GPS antenna near, under, or around high voltage lines.
 - Follow local building electrical codes for grounding using the frame ground lugs integrated with the SSU-2000e chassis.
 - The in-line amplifier receives 5 vDC power from the GPS radio receiver, and is supplied on the center conductor of the LMR-400 or equivalent coaxial cable. If the application requires an in-line amplifier, mount the amplifier/plate assembly where the transient eliminator would normally be mounted.
 - 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 3.66 meters from metallic objects, if possible.
- Locate the antenna high enough to avoid drifted snow.
- Locate the transient eliminator in a protected area to avoid contact with standing water.
- Locate the antenna within 9.2 meters of the point at which the antenna cable enters the building.
- Allow at least 3.05 meters of separation distance between GPS antennas.
- Surfaces above the plane of the unit that are between the antenna and the horizon can produce reflected (multi-path) signals, which can degrade the performance of the radio receiver.

Cutting Antenna Cables



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 Symmetricom Crimper Kit for this application (see [Table C-8](#)).

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 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 Low Noise Amplifier, Marine 26, 40, or 48 dB

The 26, 40, or 48 dB GPS Antenna with a Low Noise Amplifier (LNA) receives the GPS signal from each satellite, and amplifies the 1,575 MHz (L1) signal and feeds it to the SSU-2000e unit. The amplified L1 signal and 5 vDC power are carried over the coaxial antenna cable connecting the units. The antenna is housed in a weatherproof package suitable for permanent installation in an exposed location.

The antenna-to-radio receiver cable should be kept to the shortest reasonable length. For additional transient eliminator protection requirements, you can install a 250B-90 Gas Tube transient eliminator in series with the antenna coaxial cable.

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 the cable is cut (as described in [Step 1](#)).

1. If necessary, cut the coaxial cable and install mating connectors (see [Warning in Cutting Antenna Cables](#)).
2. Using the DVM, measure the resistance between the center conductor and shield to verify that the center conductor and shield are not shorted together.
3. Connect the longer GPS antenna coaxial cable to the transient eliminator.
4. Connect the ground wire between the transient eliminator and the proper grounding zone (building ground, master ground bar, or other) for the mounting location.



Recommendation: 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 antenna connector.
2. Route the shorter antenna coaxial cable from the antenna through the floor flange (in the lower half of the antenna base) to the unit.



Caution: To avoid damage to the connectors, do not use the connectors to pull the cable. If at all possible, avoid bundling the coaxial cable with other cables (and possible noise sources). Use appropriate cable-pulling devices when pulling the coaxial cable through conduit or a weather head.

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, available from Symmetricom).
- To secure the coaxial cable to the mast, use one or more 20 cm cable ties or appropriate cable clamps.

Connecting the GPS Antenna

Before connecting the GPS antenna to the SSU-2000e unit, see [GPS Antenna Installation Procedures](#), on page 389. Then follow the instructions below.

1. Before connecting the antenna coaxial cable to the radio receiver, test the DC resistance between the center conductor and the shield using an ohmmeter. The reading should be greater than 1000 ohms but less than 40 Megohms for an active GPS antenna.

If the actual reading is incorrect, you may have a shorted or open cable or transient eliminator (if installed). Therefore, apply the same measurements directly to the GPS antenna. This requires disconnecting the antenna cable at the antenna.



Note: The open-circuit range of an individual ohmmeter can cause readings to vary among meters.

2. Secure the free end of the antenna cable to the antenna connector using the right angle adapter provided with the antenna cable.



Recommendation: 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
- Ensure that there are no sharp bends in the cable.
- Verify that all antenna connectors are secure, tight, and weatherproofed.
- After power up of the unit, ensure that the unit is tracking. If not, refer to [Appendix](#) for troubleshooting procedures or contact Symmetricom Global Services for more information.

Optional Installation Accessories

[Table C-11](#) provides a list of optional accessories which may be used to mount or install the SSU-2000e.

Table C-11. Optional Accessories

Part Number	Description
00413102-001-1	Bracket, rack ear, 58.42 cm, 2 each required (not included with unit)
22013085-000-0	9 pin-D wire-wrap adapter (not included with unit)
551026-0038	Cable EIA-232 shielded DB9P to DB9S, 1.5 m

Appendix D Connector Pinouts

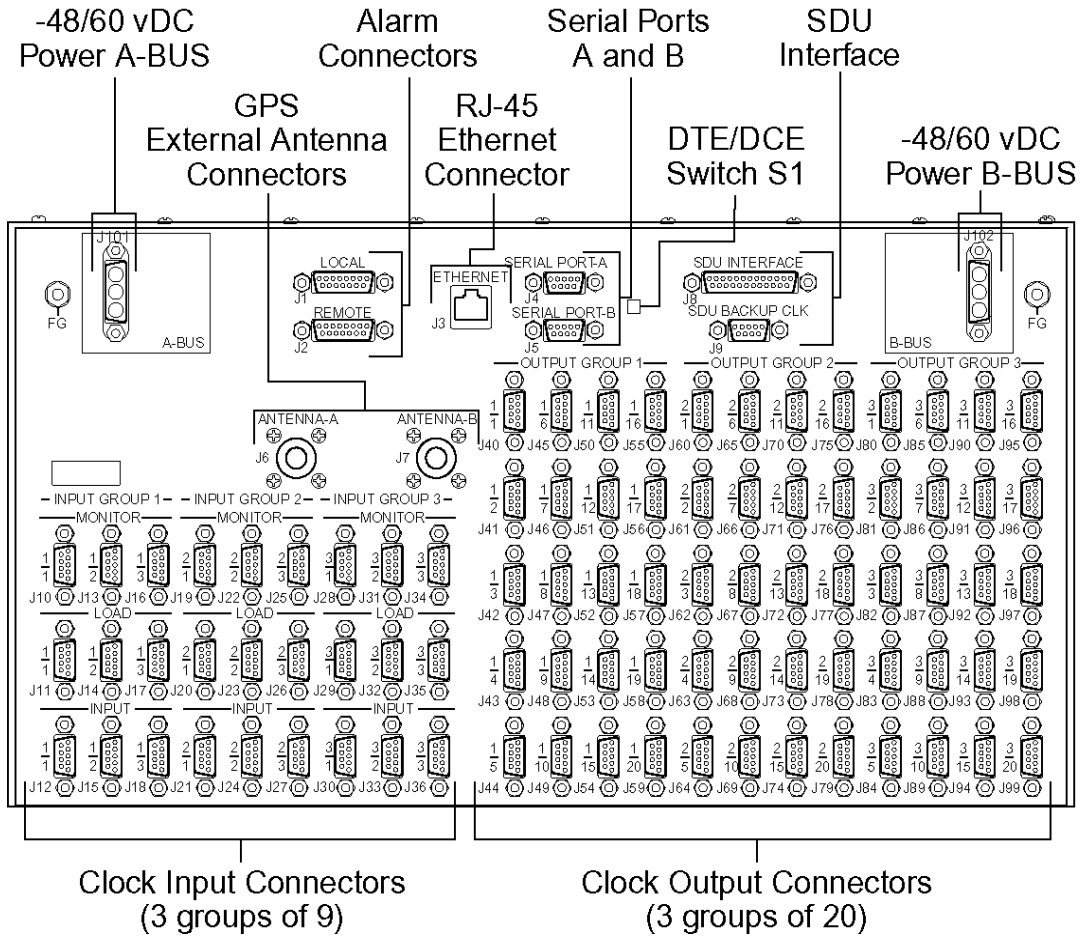
This Appendix describes the pinouts for each of the connectors on the SSU-2000e chassis.

In This Appendix

- [Signal Names and Definitions](#)
- [Shelf Module Slot Addressing and Size Assignments](#)
- [I/O Connector Grounding](#)

Signal Names and Definitions

All the connectors in the following sections are located on the front-access input/output (I/O) adapter panel of the SSU-2000e, as shown in [Figure D-1](#).



ssu00016

Figure D-1. SSU-2000e Front Panel

Cable Adapters

[Table D-1](#) provides a list of wire-wrap and BNC to SubD 9-pin adapter connectors.

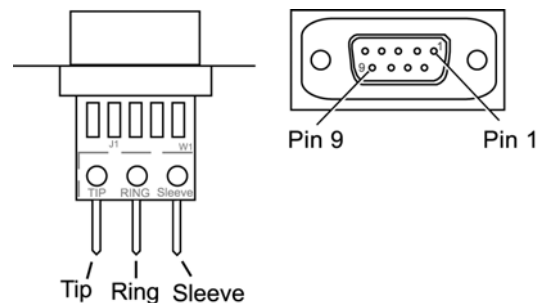
Table D-1. Input and Output Adapter Connectors

Input/Output Adapter	Part Number	Description
SubD 9-Pin to Wire-Wrap	22013085-000-0	Input/Output wire-wrap connector
BNC to SubD 9-Pin Input	121-00581-01	Shielding: 360 degrees internal shielding Contacts: Brass Contact plating: 30 micro-inches gold over 70 micro-inches nickel
BNC to SubD 9-Pin Output	121-00581-02	Shielding: 360 degrees internal shielding Contacts: Brass Contact plating: 30 micro-inches gold over 70 micro-inches nickel
BNC/SubD 9-Pin Input/Output	551019-0005	Input/Output connector with transformer from SUBD9 (120 Ω) balanced to BNC (75 Ω) unbalanced
BNC to SubD 9-Pin Output	551019-0006	Hood has 360° internal shielding, 100% shielded
BNC to SubD 9-Pin Input	551019-0007	Hood has 360° internal shielding, 100% shielded



Note: Adapters 551019-0006 and 551019-0007 are being discontinued and will be replaced with adapters 121-00581-01 and 121-00581-02 respectively.

Figure D-2 shows the wire-wrap to SubD 9-pin adapter connector pin locations used on the SSU-2000e. Table D-2 outlines signal names and pinouts.



ssu00066

Figure D-2. Wire-Wrap Adapter

Table D-2. Input/Output Wire-Wrap Adapter Pinouts (22013085-000-0)

Signal	SubD Pin Number	Wire-Wrap Pin
SLEEVE IN/OUT	1	SLEEVE
TIP IN/OUT	2	TIP
SLEEVE IN/OUT	3	SLEEVE
TIP IN/OUT	4	TIP
RING IN/OUT	6	RING
SLEEVE IN/OUT	7	SLEEVE
RING IN/OUT	8	RING

Figure D-3 shows the BNC and SubD 9-pin adapter connector pin locations used on the SSU-2000e. Table D-3 outlines signal names and pinouts.

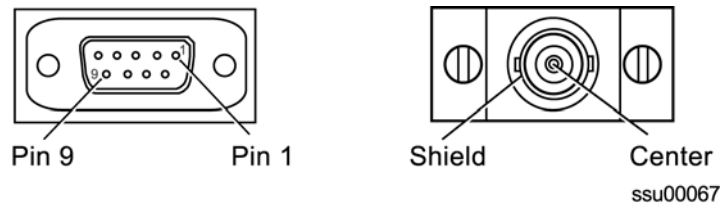


Figure D-3. BNC to SubD 9-Pin Adapter

Table D-3. Input Adapter Pinouts (121-00581-01)

Signal	SubD Pin Number	BNC Connection
SLEEVE IN	3	SHIELD
TIP IN	4	SHIELD
SLEEVE IN	7	SHIELD
RING IN	8	CENTER

Refer to Figure D-3 for the BNC and SubD 9-pin adapter connector pin locations used on the SSU-2000e. Table D-4 outlines signal names and pinouts.

Table D-4. Output Adapter Pinouts (121-00581-02)

Signal	SubD Pin Number	BNC Connection
SLEEVE OUT	1	SHIELD
TIP OUT	2	SHIELD
RING OUT	6	CENTER

Refer to [Figure D-3](#) for the BNC and Sub-D 9-pin adapter connector pin locations used on the SSU-2000e. [Table D-5](#) outlines signal names and pinouts.

Table D-5. Input/Output Transformer Adapter Pinouts (551019-0005)

Signal	SubD Pin Number	BNC Connection
GND	1	TIP = CENTER RING = SHIELD
OUTPUT A	2	
GND	3	
INPUT B	4	
OUTPUT B	6	
GND	7	
INPUT A	8	

Refer to [Figure D-3](#) for the BNC and Sub-D 9-pin adapter connector pin locations used on the SSU-2000e. [Table D-6](#) outlines signal names and pinouts.

Table D-6. Output Adapter Pinouts (551019-0006)

Signal	SubD Pin Number	BNC Connection
SLEEVE OUT	1	SHIELD
TIP OUT	2	SHIELD
RING OUT	6	CENTER

Refer to [Figure D-3](#) for the BNC and Sub-D 9-pin adapter connector pin locations used on the SSU-2000e. [Table D-7](#) outlines signal names and pinouts.

Table D-7. Input Adapter Pinouts (551019-0007)

Signal	SubD Pin Number	BNC Connection
SLEEVE IN	3	SHIELD
TIP OUT	4	SHIELD
SLEEVE IN	7	SHIELD
RING OUT	8	CENTER

Power and Ground

Figure D-4 shows the power and ground connectors used on the SSU-2000e. Table D-9 outlines signal names and definitions for power, return, and ground.

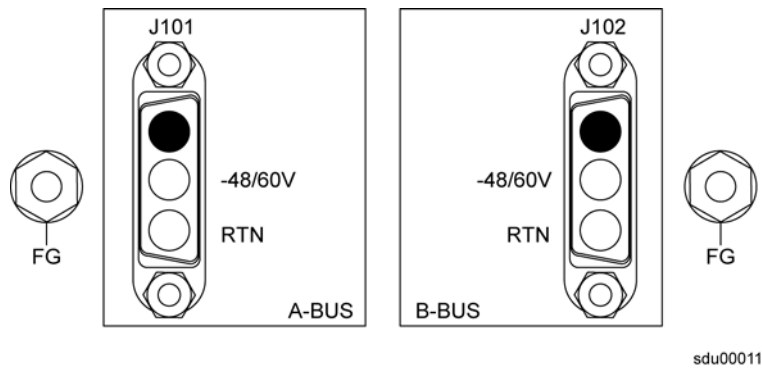


Figure D-4. Power, Return, and Ground Connection Pinouts

Table D-8. 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

Communication Interfaces

Figure D-5 shows the communications connectors used on the SSU-2000e. Table D-9 outlines signal names, definitions, and locations for Communication Interfaces.

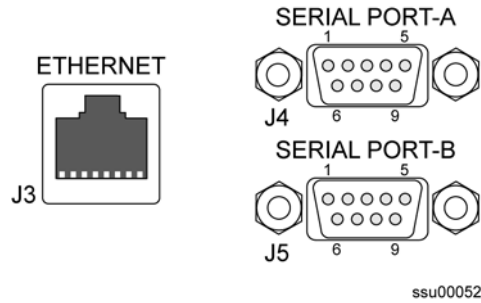


Figure D-5. Communications Connector Pinouts

Table D-9. Signal Names and Locations for Communications Interfaces

Name	Description	Connector-Pin
DCD-A	Serial Port A, Data Carrier Detect Control Line	J4-1
DSR-A	Serial Port A, Data Set Ready Control Line	J4-6
RXD-A	Serial Port A, Received Data	J4-2
RTS-A	Serial Port A, Request to Send Control Line	J4-7
TXD-A	Serial Port A, Transmitted Data	J4-3
CTS-A	Serial Port A, Clear to Send Control Line	J4-8
DTR-A	Serial Port A, Data Terminal Ready Control Line	J4-4
RI-A	Serial Port A, Ring Indicator Control Line	J4-9
RTN-A	Serial Port A, Signal Return	J4-5
DCD-B	Serial Port B, Data Carrier Detect Control Line	J5-1
DSR-B	Serial Port B, Data Set Ready Control Line	J5-6
RXD-B	Serial Port B, Received Data	J5-2
RTS-B	Serial Port B, Request to Send Control Line	J5-7
TXD-B	Serial Port B, Transmitted Data	J5-3
CTS-B	Serial Port B, Clear to Send Control Line	J5-8
DTR-B	Serial Port B, Data Terminal Ready Control Line	J5-4
RI-B	Serial Port B, Ring Indicator Control Line	J5-9

Table D-9. Signal Names and Locations for 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

Antenna Signal Connections A3 and A5

Table D-10 outlines the antenna signal connections for A3 and A5.

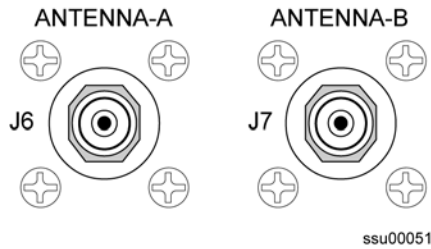


Figure D-6. Antenna Signal Connectors

Table D-10. Antenna Signal Connections A3 and A5

Type	Name	From	Pin	Connection	To	Pin
Antenna	ANT-A	A3	P5-A (Ctr)	Slot Dependent	J6	A
	ANT-A-RTN	A3	P5-B (Shld)	Slot Dependent	J6	B
	ANT-B	A5	P5-A (Ctr)	Slot Dependent	J7	A
	ANT-B-RTN	A5	P5-B (Shld)	Slot Dependent	J7	B

Alarm Contact Closures

Table D-11 outlines signal names, definitions, and locations for alarm contact closures. The local connections are made on J1 and the remote connections are made on J2. Both connectors have connections for normally open (NO), common or wiper (COM), and normally closed (NC) for each of these alarm categories: CRITICAL, MAJOR and MINOR.

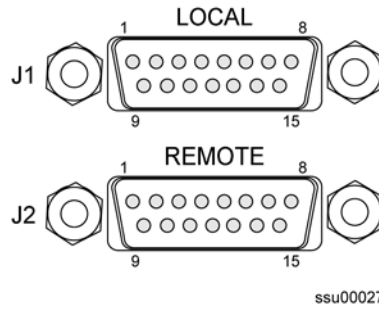


Figure D-7. Alarm Contact Closures and Pin Assignments

Table D-11. Alarm Contact Pin Assignments

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

Input Signal Definitions

Refer to [Table D-12](#) for the DE9 input connector signal definitions.

Two-Wire Connections

Refer to [Table D-12](#) and the following comments for the signal logic flow of a two-wire connection:

- “In” East → Pass Through → “Out” West on the Input connector
- Termination on Load connector
- Monitor the input through the Monitor connector

Bridged and Four-Wire Connections

The SSU-2000e is designed to accommodate East/West signal functionality. In East/West signal terminology, East refers to wiring connections made to and from the outside world. West refers to wiring connections made to and from office equipment. Refer to the following comments for the signal logic flow of a four-wire connection:

- “In” East → Pass Through → “Out” West on the Input connector
- “In” West → Pass Through → “Out” East on the Load connector
- Monitor the output from the Monitor connector

[Figure D-8](#) shows a typical block diagram for a four-wire system connection.

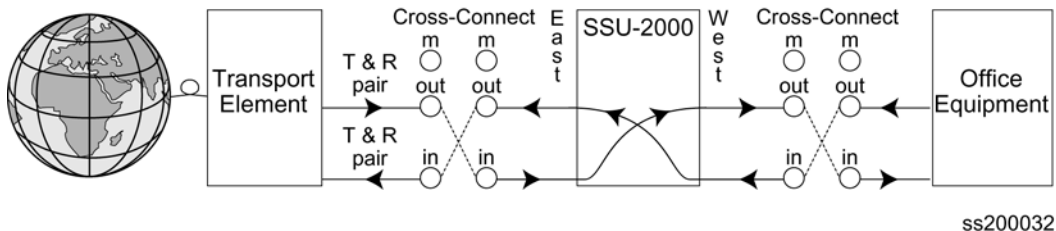
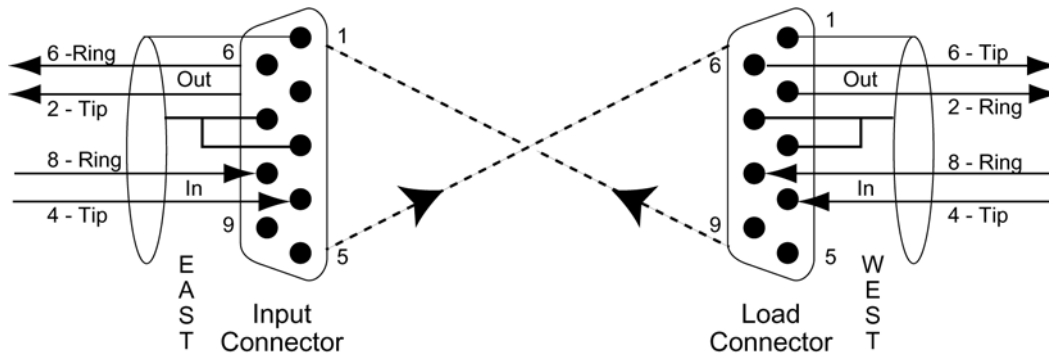


Figure D-8. Four-Wire Connection Block Diagram

[Figure D-9](#) shows a typical wiring diagram for a DE9 four-wire system connection. This circuit is common for all three input connector groups. These circuits are internally connected from an East connection (World facing), to the West connector (office equipment facing). This routing accommodates normal cross-connect methodology for Bridged and four-wire connections.

The signal connections on these connectors are also set up in differential pairs as Tip and Ring connections, with each connector associated with a specific input and output. The East input signal is routed through pins 4 (Tip) and 8 (Ring) of all Input connectors, passed straight through to the West output pins 2 (Tip) and 6 (ring) of all Load connectors. The Shield/Sleeve is connected on all connectors to pin 1 as well as pins 3 and 7.



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Figure D-9. Input and Load DE9 Connectivity

If installation is an integrated ground environment, shields are grounded at the SSU-2000e. If installation is in an isolated environment, ensure that the far end shield is not grounded at the client equipment. Ensure that all local grounding practices are complied with.

Table D-12 lists the Input signal connections for Input connector groups 1 through 3.

Table D-12. Input Signal DE9 Connections

Input Group	Signal	Connector and Pin	Port # and Signal	Connector and Pin
1	1/1 Tip East Input	J12-4	1/1 Tip West Output	J12-2
1	1/1 Ring East Input	J12-8	1/1 Ring West Output	J12-6
1	1/1 Sleeve East Input	J12-1, 3, 7	1/1 Sleeve West Output	J12-1, 3, 7
1	1/1 Tip East Output	J11-2	1/1 Tip West Input	J11-4
1	1/1 Ring East Output	J11-6	1/1 Ring West Input	J11-8
1	1/1 Sleeve East Output	J11-1,3, 7	1/1 Sleeve West Input	J11-1, 3, 7
1	1/1 Tip Input Monitor	J10-2	1/1 Ring Input Monitor	J10-6
1	1/2 Tip East Input	J15-4	1/2 Tip West Output	J15-2
1	1/2 Ring East Input	J15-8	1/2 Ring West Output	J15-6
1	1/2 Sleeve East Input	J15-1, 3, 7	1/2 Sleeve West Output	J15-1, 3, 7
1	1/2 Tip East Output	J14-2	1/2 Tip West Input	J14-4
1	1/2 Ring East Output	J14-6	1/2 Ring West Input	J14-8
1	1/2 Sleeve East Output	J14-1,3, 7	1/2 Sleeve West Input	J14-1, 3, 7
1	1/2 Tip Input Monitor	J13-2	1/2 Ring Input Monitor	J13-6
1	1/3 Tip East Input	J18-4	1/3 Tip West Output	J18-2

Table D-12. Input Signal DE9 Connections (Continued)

Input Group	Signal	Connector and Pin	Port # and Signal	Connector and Pin
1	1/3 Ring East Input	J18-8	1/3 Ring West Output	J18-6
1	1/3 Sleeve East Input	J18-1, 3, 7	1/3 Sleeve West Output	J18-1, 3, 7
1	1/3 Tip East Output	J17-2	1/3 Tip West Input	J17-4
1	1/3 Ring East Output	J17-6	1/3 Ring West Input	J17-8
1	1/3 Sleeve East Output	J17-1,3, 7	1/3 Sleeve West Input	J17-1, 3, 7
1	1/3 Tip Input Monitor	J16-2	1/3 Ring Input Monitor	J16-6
2	2/1 Tip East Input	J21-4	2/1 Tip West Output	J21-2
2	2/1 Ring East Input	J21-8	2/1 Ring West Output	J21-6
2	2/1 Sleeve East Input	J21-1, 3, 7	2/1 Sleeve West Output	J21-1, 3, 7
2	2/1 Tip East Output	J20-2	2/1 Tip West Input	J20-4
2	2/1 Ring East Output	J20-6	2/1 Ring West Input	J20-8
2	2/1 Sleeve East Output	J20-1,3, 7	2/1 Sleeve West Input	J20-1, 3, 7
2	2/1 Tip Input Monitor	J19-2	2/1 Ring Input Monitor	J19-6
2	2/2 Tip East Input	J24-4	2/2 Tip West Output	J24-2
2	2/2 Ring East Input	J24-8	2/2 Ring West Output	J24-6
2	2/2 Sleeve East Input	J24-1, 3, 7	2/2 Sleeve West Output	J24-1, 3, 7
2	2/2 Tip East Output	J23-2	2/2 Tip West Input	J23-4
2	2/2 Ring East Output	J23-6	2/2 Ring West Input	J23-8
2	2/2 Sleeve East Output	J23-1,3, 7	2/2 Sleeve West Input	J23-1, 3, 7
2	2/2 Tip Input Monitor	J22-2	2/2 Ring Input Monitor	J22-6
2	2/3 Tip East Input	J27-4	2/3 Tip West Output	J27-2
2	2/3 Ring East Input	J27-8	2/3 Ring West Output	J27-6
2	2/3 Sleeve East Input	J27-1, 3, 7	2/3 Sleeve West Output	J27-1, 3, 7
2	2/3 Tip East Output	J26-2	2/3 Tip West Input	J26-4
2	2/3 Ring East Output	J26-6	2/3 Ring West Input	J26-8
2	2/3 Sleeve East Output	J26-1,3, 7	2/3 Sleeve West Input	J26-1, 3, 7
2	2/3 Tip Input Monitor	J25-2	2/3 Ring Input Monitor	J25-6
3	3/1 Tip East Input	J30-4	3/1 Tip West Output	J30-2
3	3/1 Ring East Input	J30-8	3/1 Ring West Output	J30-6

Table D-12. Input Signal DE9 Connections (Continued)

Input Group	Signal	Connector and Pin	Port # and Signal	Connector and Pin
3	3/1 Sleeve East Input	J30-1, 3, 7	3/1 Sleeve West Output	J30-1, 3, 7
3	3/1 Tip East Output	J29-2	3/1 Tip West Input	J29-4
3	3/1 Ring East Output	J29-6	3/1 Ring West Input	J29-8
3	3/1 Sleeve East Output	J29-1,3, 7	3/1 Sleeve West Input	J29-1, 3, 7
3	3/1 Tip Input Monitor	J28-2	3/1 Ring Input Monitor	J28-6
3	3/2 Tip East Input	J33-4	3/2 Tip West Output	J33-2
3	3/2 Ring East Input	J33-8	3/2 Ring West Output	J33-6
3	3/2 Sleeve East Input	J33-1, 3, 7	3/2 Sleeve West Output	J33-1, 3, 7
3	3/2 Tip East Output	J32-2	3/2 Tip West Input	J32-4
3	3/2 Ring East Output	J32-6	3/2 Ring West Input	J32-8
3	3/2 Sleeve East Output	J32-1,3, 7	3/2 Sleeve West Input	J32-1, 3, 7
3	3/2 Tip Input Monitor	J31-2	3/2 Ring Input Monitor	J31-6
3	3/3 Tip East Input	J36-4	3/3 Tip West Output	J36-2
3	3/3 Ring East Input	J36-8	3/3 Ring West Output	J36-6
3	3/3 Sleeve East Input	J36-1, 3, 7	3/3 Sleeve West Output	J36-1, 3, 7
3	3/3 Tip East Output	J35-2	3/3 Tip West Input	J35-4
3	3/3 Ring East Output	J35-6	3/3 Ring West Input	J35-8
3	3/3 Sleeve East Output	J35-1,3, 7	3/3 Sleeve West Input	J35-1, 3, 7
3	3/3 Tip Input Monitor	J34-2	3/3 Ring Input Monitor	J34-6

Output Signal Definitions

There are three groups of Output connectors: Output Groups 1, 2, and 3. Output connections are made from pin 2 (Tip), pin 6 (Ring), and pins 1, 3, or 7 (Shield/Sleeve) of all the connectors in all three Output connector groups. Refer to [Table D-13](#) for the signal definitions of connectors J40 through J99 and their associated pin numbers. If installation is an integrated ground environment, shields are grounded at the SSU-2000e. If installation is in an isolated environment, ensure that the far end shield is not grounded at the client equipment. (Ensure that all local grounding practices are complied with.)

[Table D-13](#) lists the signal connections for all DE9 Output connectors (J40 through J99).

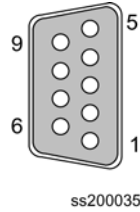


Figure D-10. DE9 Connector Pinout

Table D-13. Output Signal DE9 Connections

Signal	Pin
Output Tip	2
Output Ring	6
Output Sleeve	1

Shelf Module Slot Addressing and Size Assignments

Table D-14 outlines the shelf module slot addressing and size assignments.

Table D-14. 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 GPS Receiver	Input, non-redundant Output, or a Receiver Module
4	4	I/O, Pair A	Input or Output, paired with 5
5	5	I/O, Pair A or GPS Receiver	Input, Output, paired with 4, or a Receiver Module
6, 7	6, 7	I/O, Pair B	Inputs, or paired Outputs
8, 9	8, 9	I/O, Pair C	Inputs or paired Outputs
10, 11	10, 11	I/O, Pair D	Inputs or paired Outputs
	12 - 15	I/O, Extras	Reserved for future I/O (2.3 @ shelf)
12	17	Clock	Clock B
	0	All	Addresses all modules in the Shelf

SDU-2000e Expansion Interface

Table D-15 outlines signal names, definitions, and locations for alarm contact closures.

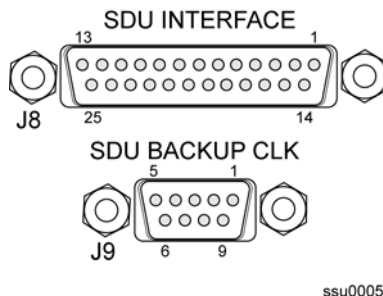
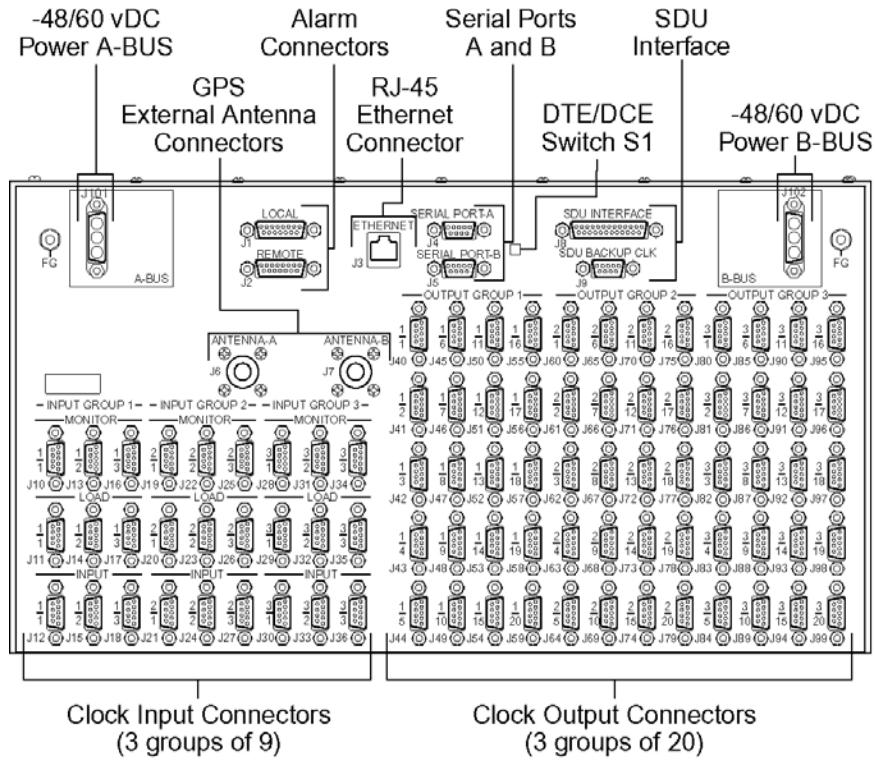


Figure D-11. SDU Interface and Backup Clock Connector Pinout

Table D-15. Signal Names and Locations for SDU-2000e Interface

Name	Description	Connector-Pin
SCLK2+/-	SPI Clock Signal, generated by SPI Master	J8-1&14
MOSI2+/-	SPI Master Out / Slave In Data line	J8-2&15
MISO2+/-	SPI Master In / Slave Out Data line	J8-3&16
SS2+/-	SPI Slave Select line, generated by SPI Master	J8-5&18
SBUSY2+/-	SPI Slave Busy line, generated by SPI Slave	J8-4&17
SRQ2+/-	SPI Service Request line, generated by SPI Slave	J8-6&19
CLKAOUT2+/-	Clock A to Output Modules (synced 4 kHz)	J8-7&20
CLKBOUT2+/-	Clock B to Output Modules (synced 4 kHz)	J8-8&21
CLKC2+/-	Pass-through Clock from Input to Output Modules (4 kHz)	J8-9&22
CLKD2+/-	Selected Clock via TBNC/BNO to SDU-2000e (Backup 4 kHz)	J9-A&B
EXPSP1+/-	Spare Connection to SDU-2000e	J8-11&24
EXPSP2+/-	Spare Connection to SDU-2000e	J8-12&25
SOUT2+/-	SPI Slave Shelf Select Request, generated by SDU SPI Slave	J8-10&23
LG	Logic Ground Connection	J8-13

I/O Connector Grounding



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Figure D-12. SSU-2000e Front Panel Connectors

Table D-16 outlines I/O connector grounding.

Table D-16. I/O Connector Grounding

Name	Connector Type	Reference Description	Termination Type
Local OSC-A	BNC	J1	Body/Shield: Connected to Frame Ground Plane
Local OSC-B	BNC	J2	Body/Shield: Connected to Frame Ground Plane
Ethernet 10-Base-T	RJ45	J3	Body/Shield: Connected to Frame Ground Plane
Serial Port-A	DE9S	J4	Body/Shield: Connected to Frame Ground Plane
Serial Port-B	DE9S	J5	Body/Shield: Connected to Frame Ground Plane
ANTENNA-A	TNC	J6	Shield: 0.01 μ f Bypass to Frame Ground Plane
ANTENNA-B	TNC	J7	Shield: 0.01 μ f Bypass to Frame Ground Plane

Table D-16. I/O Connector Grounding (Continued)

Name	Connector Type	Reference Description	Termination Type
SDU Interface	DB25S	J8	Body/Shield: Connected to Frame Ground Plane
SDU Backup Clk	TBNC/BNO	J9	Shield: Connected to Frame Ground Plane
I/O-1	Micro D50S	J10	Body/Shield: Connected to Frame Ground Plane
I/O-2	Micro D50S	J11	Body/Shield: Connected to Frame Ground Plane
I/O-3	Micro D50S	J12	Body/Shield: Connected to Frame Ground Plane
I/O-4	Micro D50S	J13	Body/Shield: Connected to Frame Ground Plane
I/O-5	Micro D50S	J14	Body/Shield: Connected to Frame Ground Plane
I/O-6	Micro D50S	J15	Body/Shield: Connected to Frame Ground Plane
I/O-7	Micro D50S	J16	Body/Shield: Connected to Frame Ground Plane
I/O-8	Micro D50S	J17	Body/Shield: Connected to Frame Ground Plane
I/O-9	Micro D50S	J18	Body/Shield: Connected to Frame Ground Plane
RESET	TBNC/BNO	J19	Shield: 0.01 μ f Bypass to Frame Ground Plane
LG (Logic Ground)	Stake-On	TB3 & TB4	Terminal: 1.0 μ f Bypass to Frame Ground Plane

Appendix E Default Settings

This appendix contains tables that list the factory default settings for the SSU-2000e. If you make any changes to the factory default settings, record them in [Table E-13](#) for future reference. Use the “SETUP” command to verify settings.

In This Appendix

- [Communications Module Default Settings](#)
- [Stratum 2E 3E and Type 1 Clock Module Default Settings](#)
- [DS1 and E1 Input Module Default Configuration](#)
- [DS1 and E1 Output Module Default Settings](#)
- [GPS Input Module Default Settings](#)
- [2048 kHz Output Module Default Settings](#)
- [E1/2048 kHz Output Module](#)
- [Composite Clock Input Module Default Settings](#)
- [Composite Clock Output Module Default Settings](#)
- [Priority Quality Level \(PQL\) Table Default Settings](#)
- [User Changes to Factory Defaults](#)

Communications Module Default Settings

[Table E-1](#) lists settings and factory defaults for the SSU-2000e Communications Module.

Table E-1. Communications Module Factory Default Settings

Setting	Factory Default
Unit Name	SSU_2000e
Module configurations	Current Configuration = the configuration that is currently in use User Default Configuration = configuration the user specifies as the default if the current configuration is invalid or not present Factory Configuration = the factory default configuration
User List configurations	Maximum of 25 users including four built-in users
EIA-232-C Port Comm Port Timeout	All comm ports are set to 9600 baud, Interactive Mode, CRLF, and Echo on Five minutes for all (Interactive Mode). (Note: the unit should have one user added, i.e. Not in the INITUSERTABLE state). If it is in the INITUSERTABLE state, no timeout is applied. No Timeout is assigned for the TL1 Mode
Ethernet IP Address	IP Address 0.0.0.0 Gateway Address 0.0.0.0 Network Mask 255.255.255.0

Stratum 2E 3E and Type 1 Clock Module Default Settings

The Stratum 2E and 3E Clock Module are software configured 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	Clock Module Factory Default		
	Stratum 2E	Stratum 3E	Type 1
Warmup Time	1200 seconds	1200 seconds	1200 seconds
Min Tau Limit	300 seconds	300 seconds	150 seconds
Max Tau Limit	10000 seconds	1200 seconds	1200 seconds
Min Tau	1000 seconds	300 seconds	150 seconds
Max Tau	9000 seconds	325 seconds	155 seconds

Table E-2. Stratum 2E and 3E Clock Module Default Settings (Continued)

Setting	Clock Module Factory Default		
Clk Switch AR	On	On	On
Input Switch	AutoReturn (AR)	AutoReturn (AR)	AutoReturn (AR)
Input Selection Mode	Priority	Priority	Priority
Local Oscillator (LO)	Off	Off	Off
Frequency Offset (Freq. Range)	Set $4.0 \times 10E^{-8}$ Clr $3.5 \times 10E^{-8}$	Set $9.8 \times 10E^{-6}$ Clr $9.3 \times 10E^{-6}$	Set $2.5 \times 10E^{-7}$ Clr $2.0 \times 10E^{-7}$
Elevation Time	86400 seconds	86400 seconds	86400 seconds
PQL Setting	5	8	6

DS1 and E1 Input Module Default Configuration

The DS1 Input Module or E1 Input Module maintains factory default and current user configuration information in nonvolatile memory. This information is retrieved at power up and is modified by commands from the Communications Module. The DS1 Input Module or E1 Input Module maintains factory default and current user configuration information in nonvolatile memory. This information is retrieved at power up and is modified by commands from the Communications Module.

When the current user configuration cannot be used, the Input module settings automatically revert to factory defaults. [Table E-3](#) lists factory default settings and ranges for all DS1 Input Module or E1 Input Module software parameters.

Table E-3. DS1 and E1 Input Module Default Configuration

Configuration Setting	Factory Default	Range
Input Frequency (for unframed signals)	1.544 for DS1 Input Module 2.048 MHz for E1 Input Module	1, 1.544, 2.048, 5, or 10 MHz
Framing Type	ESF for DS1 Input Module CCS for E1 Input Module	D4 or ESF for DS1 Input Module CAS or CCS for E1 Input Module
Zero Suppression	On	On Off
CRC	Off	On Off
SSM	Off	On Off

Table E-3. DS1 and E1 Input Module Default Configuration (Continued)

Configuration Setting	Factory Default	Range
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
MTIE Limits (See Table E-4 and Table E-5)	See Table E-4 and Table E-5	1 to 10,000
MTIE Limit 1 Alarm Mode	MINOR	IGNORE, REPORT, MINOR, MAJOR OR CRITICAL
MTIE Limit 2 Alarm Mode	MAJOR	IGNORE, REPORT, MINOR, MAJOR OR CRITICAL
Alarm Initial Severity	MINOR (except LOS and Level 2 MTIE, which are MAJOR)	IGNORE, REPORT, MINOR, MAJOR OR CRITICAL
Alarm Initial Delay	0 seconds	0 to 86,400 seconds
Alarm Elevation Time	86,400 seconds	0 to 500,000 seconds
Port Status	Disabled	Enabled/Disabled
Port Name	Not applicable	Any user selected string from 0 to 20 characters
Freq Alarm Mode	MINOR	IGNORE, REPORT, MINOR, MAJOR, or CRITICAL

Table E-3. DS1 and E1 Input Module Default Configuration (Continued)

Configuration Setting	Factory Default	Range
Freq Threshold	ST2E-16,000 ST3E-4,600,000	10 to 25,000,000 psec/sec
Freq Tau	400 seconds	10 to 1000 seconds

MTIE Limits for the DS1 Input Module

Table E-4 provides MTIE limits for the DS1 Input Module configuration and factory defaults and settings.

Table E-4. DS1 Input Module – MTIE Limits

Time (seconds)	Set Limit L1 (Unit)	Set Limit L2 (Unit)	Clear Limit L1 (Unit)	Clear Limit L2 (Unit)
10	260	325	230	290
100	440	550	400	490
1,000	810	1,010	730	910
10,000	880	1,100	790	990
100,000	1,600	2,000	1,440	1,800

MTIE Limits for the E1 Input Module

Table E-5 provides MTIE limits for the E1 Input Module configuration settings and factory defaults and ranges.

Table E-5. E1 Input Module – MTIE Limits

Time (seconds)	Set Limit L1 (Unit)	Set Limit L2 (Unit)	Clear Limit L1 (Unit)	Clear Limit L2 (Unit)
10	80	100	70	90
100	800	1000	700	900
1,000	1,600	2,000	1,400	1,800
10,000	1,170	2,835	2,000	2,500
100,000	4,260	5,330	3,800	4,800

DS1 and E1 Output Module Default Settings

Table E-6 lists settings and factory defaults for the SSU-2000e DS1 and E1 Output Module.

Table E-6. DS1 and E1 Output Module Default Settings

Setting	Factory Default	Range
DS1 Output Module		
Enable/Disable Outputs	Disabled	Settable for each output port
Minimum Clock Level	Acquire	Acquire/Lock
Bypass Mode	ON	ON - Clock C is selected if it is the only one available OFF - Clock C is not selected even if no other clock is available
Framing	ESF	D4/ESF
Line Length	0-133 ft.	133-266 ft. 266-399 ft. 399-533 ft. 533-655 ft.
Zero Suppression	ON	ON – B825 OFF – AMI
E1 Output Module		
Enable/Disable Outputs	Disabled	Settable for each output port
Minimum Clock Level	Acquire	Acquire/Lock
Bypass Mode	ON	ON – Clock C will be selected if it is the only one available OFF – Clock C will not be selected even if no other clock is available
Framing	CAS	CCS/CAS
Zero Suppression	ON	ON – HDB3 OFF – AMI
CRC	ON	ON/OFF
SSM Bit Selection	Default SSM bit selection -8	Possible SSM bit selection 4, 5, 6, 7, and 8

GPS Input Module Default Settings

The GPS Input Module maintains factory default and current user configuration settings. The configuration settings for the GPS Input Module are provided in [Table E-7](#).

Table E-7. GPS Input Module Default Configuration Settings

Setting	Factory Default	Range
Position		
Latitude (+=North, -= South)	0	+/- 90 degrees
Longitude (+=East, -= West)	0	+/-180 degrees
Height	0	-60 to 4,000 meters
Averages	300	10 to 3600
PDOP	0	1 to 10
Pos Mode	Calc	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 mS
PQL	2	1 to 16
Disabled SV list	Not applicable	Up to 31 SV numbers

2048 kHz Output Module Default Settings

The 2048 kHz Output Module maintains factory default and current user configuration settings. The configuration settings for the 2048 kHz Output Module are provided in [Table E-8](#).

Table E-8. 2048 kHz Output Module Configuration

Configuration Setting	Factory Default	Range
Port State	Dis	DIS, ENA
Min Clock	Acq	Acq, Lock
Framing	Not applicable	Not applicable

Table E-8. 2048 kHz Output Module Configuration (Continued)

Configuration Setting	Factory Default	Range
Zero Sup.	Not applicable	Not applicable
CRC	Not applicable	Not applicable
SSM	Not applicable	Not applicable
PQL	4	Not applicable
Bypass	On	On, Off
Fault Action	On	Off, On, Auto
Other	Not applicable	Not applicable

E1/2048 kHz Output Module

The E1/2048 kHz Output Module maintains factory default and current user configuration settings. The configuration settings for the E1/2048 kHz Output Module are provided in [Table E-9](#).

Table E-9. E1/2048 kHz Output Module Configuration

Configuration Setting	Factory Default	Range
Signal Type (Per Port)	E1	E1 2048
Zero Suppression	ON	ON OFF
Port Output (Per Port)	Enable	Enable Disable
Bypass	Enable	Enable Disable
Port Label (Per Port)	Null	0 thru 20 ASCII printable characters and zero is string terminator.
Alarm Elevation	86400 seconds	1 thru 500,000 seconds 0 is disabled
Squelching (Per Port)	0	1 thru 16 0 is disabled

Composite Clock Input Module Default Settings

The Composite Clock Output Module maintains factory default and current user configuration settings. The configuration settings for the Composite Clock Output Module are shown in [Table E-10](#).

Table E-10. Composite Clock Input Module Configuration

Configuration Setting	Factory Default	Range
Provisioned PQL	4	1-16
Priority	0	0 - 10 (0 = Monitor)
LOS Input Signal Error/Clear Limit	Error = 1, Clear = 5	1 - 100 for LOS
BPV Input Signal Error/Clear Limit	Error = 1, Clear = 5	1 - 100K for BPV
LOS Alarm (00)	Major	Ignore, Report, Minor, Major or Critical
BPV Alarm (03)	Major	Ignore, Report, Minor, Major or Critical
Hardware Alarms (5-7)	Major	Ignore, Report, Minor, Major or Critical
Phase 3 Sigma (8)	Minor, 5 Second Delay	Ignore, Report, Minor, Major or Critical
Phase Polarity (9)	Report, 15 Second Delay, (This alarm only applied to unselected CC input port)	Ignore, Report, Minor, Major or Critical
Alarm Elevation Time	86400 seconds	0 - 500000 seconds
Port Status	Enabled	Enabled/Disabled
Port Name	None (blank)	Any string from 0-20 characters

Composite Clock Output Module Default Settings

The Composite Clock Output Module maintains factory default and current user configuration settings. The configuration settings for the Composite Clock Output Module are shown in [Table E-11](#).

Table E-11. Composite Clock Output Module Configuration

Configuration Setting	Factory Default	Range
Port State	Dis	DIS, ENA
Min Clock	Acq	Acq, Lock
Framing	Not applicable	Not applicable
Zero Sup.	Not applicable	Not applicable
CRC	Not applicable	Not applicable
SSM	Not applicable	Not applicable
Pql	4	Not applicable
Bypass	On	On, Off
Fault Action	On	Off, On, Auto
Other	Duty Cycle of 5/8	Duty Cycle of 5/8 or 50/50

Priority Quality Level (PQL) Table Default Settings

The configuration settings for the PQL table are provided in [Table E-12](#).

Table E-12. Default PQL Values

PQL	DS1			E1		
	SSM	S	DS1 Description	SSM	S	E1 Description
1	–		Unused	–		Unused
2	0x04	S	ST2	0x02		
3	0x04			0x02	S	PRC/G.811
4	0x08	S	STU	0x00	S	STU
5	0x0C	S	ST2	0x04		Type II

Table E-12. Default PQL Values (Continued)

DS1				E1		
PQL	SSM	S	DS1 Description	SSM	S	E1 Description
6	0x78	S		0x04	S	Type V
7	–		Unused	–		Unused
8	0x7C	S	ST3E	0x08		Type III
9	0x10			0x08	S	Type VI
10	0x10	S	ST3	0x0B		Type IV
11	0x22			0x0B	S	G.813 Opt 1
12	0x22	S	SMC	0x0F		G.813 Opt 2
13	0x28	S	ST4	0x0F		
14	0x40	S	Reserved	0x0F		
15	0x30	S	DUS	0x0F	S	DUS
16	0x7E	S		0x0F		

User Changes to Factory Defaults

Use [Table E-13](#) to record any user changes to the factory default settings.

Table E-13. User Changes to Factory Default Settings

Setting	Factory Default	User Configuration Changes
Communications Module Defaults		
Unit Name	SSU_2000e	
Module Information configurations	Current Configuration = the configuration that is currently in use User Default Configuration = configuration the user specifies as the default if the current configuration is invalid or not present Factory Configuration = the factory default configuration	
User List configurations	Maximum of 25 users including four built-in users	

Table E-13. User Changes to Factory Default Settings (Continued)

Setting	Factory Default	User Configuration Changes
EIA-232-C Port Comm Port Timeout	All three comm ports are set to 9600 baud, Interactive Mode, CRLF, and Echo on Five minutes for all (Interactive Mode). (Note: the unit should have one user added, i.e. not in the INITUSERTABLE state). If it is in the INITUSERTABLE state, no timeout is applied. No Timeout is assigned for the TL1 Mode	
Ethernet IP Address	IP Address 0.0.0.0 Gateway Address 0.0.0.0 Network Mask 255.255.255.0	
Clock Module Defaults		
Warmup Time	1200 seconds	
Min Tau Limit	300 seconds	
Max Tau Limit	If 2E, 10000 seconds If 3E, 500 seconds	
Min Tau	300 seconds	
Max Tau	If 2E, 9000 seconds If 3E, 450 seconds	
Clk Switch AR	On	
Input Switch	AutoReturn (AR)	
Input Selection Mode	Priority	
Local Oscillator (LO)	On	
Elevation Time	86400 seconds	
Warmup Time	1200 seconds	
Min Tau Limit	300 seconds	
Max Tau Limit	If 2E, 10000 seconds If 3E, 500 seconds	
Min Tau	300 seconds	
Max Tau	If 2E, 9000 seconds If 3E, 450 seconds	
Clk Switch AR	On	
Input Switch	AutoReturn (AR)	

Table E-13. User Changes to Factory Default Settings (Continued)

Setting	Factory Default	User Configuration Changes
Input Selection Mode	Priority	
Local Oscillator (LO)	On	
Elevation Time	86400 seconds	
Warmup Time	1200 seconds	

Default Settings
User Changes to Factory Defaults

Appendix F Specifications

This appendix provides specifications for the SSU-2000e unit and for its functional components, such as operating conditions, power inputs, clock inputs and outputs, indicators, EMC and safety standards, and chassis dimensions.

In This Appendix

- [General Specifications](#)
- [Operating Conditions Specifications](#)
- [Power Input and Grounding Specifications](#)
- [Input Signal Specifications](#)
- [Output Signal Specifications](#)
- [SDU-2000e Shelf Specifications](#)
- [Chassis Dimensions](#)

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 the *fully populated* unit configured with SSU function. Inputs apply only to the SSU function.

Table F-1. General Specifications

Characteristics	Specification
General	
Architecture	<ul style="list-style-type: none"> ■ Main Shelf: two Clock modules, one Communication module, three Input modules, and 60 Output modules ■ Expansion Shelf: 10 Output modules and two Buffer modules ■ Up to four Expansion Shelves per system
Long Term Frequency (Accuracy)	Stratum 1 PRS per ITU-T G.811 and ANSI T1.101
Clock Performance	Meets requirements of the Telcordia Technologies (formerly Bellcore) document GR-1244-CORE
Reference Signals	Determined by the type of Input module: <ul style="list-style-type: none"> ■ 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 applicable parts of ITU-T G.781 SSM specifications and with specifications of T1X1.3 TR33, ANSI T1.101-1999, and Telcordia Technologies GR-253 and 378-CORE.
Event Log	Stores at least 500 event history including timestamp, event type, event/alarm level, and condition causing the event; stores the last 10 events in non-volatile memory.
Configuration Data	Firmware stores factory configuration, customer configuration, current configuration, and module identification information, and provides a command which can be used to restore saved settings.
Alarm Levels	Commands can set alarm level to IGNORE, REPORT, MINOR, MAJOR and CRITICAL. MINOR and MAJOR alarms can be elevated to the next higher level after a user-defined time period.

Table F-1. General Specifications (Continued)

Characteristics	Specification
Communications Ports	Three EIA-232 Serial Ports: <ul style="list-style-type: none"> ■ Serial PORT-A (J4) ■ Serial PORT-B (J5) ■ Comms Module Serial Port One Ethernet Port: <ul style="list-style-type: none"> ■ Ethernet port (10BaseT)
Communication Management	
Management Interface	<ul style="list-style-type: none"> ■ Simple fault, visual and contact closures ■ ICS ■ TL1 ■ SNMP
Input Section	
Ports	<ul style="list-style-type: none"> ■ Maximum of 9 ■ 1 or 3 ports per Input module ■ Reference or monitoring capability
Signal Type	2048 kbit/s (E1), DS1, 1 MHz, 1.544 Mhz, 2.048 MHz (CC/Sec. 13), 5 MHz, 10 MHz (user settable)
GPS	Integrated (single or dual)
SSM	Fully supported
Selection Mode	Priority and PQL (user settable)
Performance Measurement	
Resolution	1 ns
Sampling Rate	40 Hz (GPS 1 Hz)
MTIE and TDEV	DS1 and E1 only
Clocks	
Type (Holdover)	<ul style="list-style-type: none"> ■ Stratum 2E Rubidium ■ Stratum 3E Quartz
Control	<ul style="list-style-type: none"> ■ DDS (Direct Digital Synthesis) technology ■ Integrated CPU
Output Section	
Ports	<ul style="list-style-type: none"> ■ 20 Ports per Output module pair

Table F-1. General Specifications (Continued)

Characteristics	Specification
Signal Type	<ul style="list-style-type: none"> ■ 2048 kbit/s (E1) ■ DS1 ■ 2.048 MHz ■ Composite Clock (CC)
Distribution Capacity	
SSU-2000e Main Shelf	<ul style="list-style-type: none"> ■ Up to six E1/DS1 Output modules (three redundant pairs) in Main shelf ■ 20 summed outputs per Output module pair ■ Maximum of 60 summed outputs per Main shelf
SDU-2000e Expansion Shelf	<ul style="list-style-type: none"> ■ Up to four Expansion Shelves ■ Up to 10 Output modules (five redundant pairs) per expansion shelf with 20 outputs per module pair ■ Maximum of 100 redundant (summed) outputs per expansion shelf
Alarm Closures	
MINOR	Contact closure (NC or NO) 1 Amp Form C
MAJOR	Contact closure (NC or NO) 1 Amp Form C
CRITICAL	Contact closure (NC or NO) 1 Amp Form C
Chassis Power and Ground	
Power Connections	A and B input connections at opposite-upper sides of the connector panel
DC	-40.5 to -74.99 vDC, (-48/60 vDC nominal)
DC Power @ -48/60vDC	< 240 watts, per chassis
Ground	-48/60 vDC return, terminated frame and logic grounds
Chassis Mechanical	
Width	431.8 mm (w/ears)
Depth	245 mm
Height	495.3 mm
Weight (provisioned)	~ 13.4 kg
Chassis Environmental	
Temperature	+1.7°C to +49°C @ 8.3°C max rate of change per hour GR-1244-CORE Sec. 2.2
Relative Humidity Operational	5% to 85% Non-condensing GR-63-CORE Sec. 4.1.2 ETS 300 019-1 Class 3.1

Table F-1. General Specifications (Continued)

Characteristics	Specification
Temperature Operational Short Term Non-Stratum performance	–5°C to +50°C @ 30°C max per hour rate of change Duration <96 hours GR-63-CORE Sec. 4.1.2 ETS 300 019-1 Class 3.1
Relative Humidity Operational Short Term	5% to 90% Non-condensing. Duration <96 hours GR-63-CORE Sec. 4.1.2 ETS 300 019-1 Class 3.1
Temperature Storage	-25°C to +55°C Duration <12 months GR-63-CORE Sec. 4.1.1 ETS 300 019-1 Class 1.2
Relative Humidity Storage	5% to 100% Non-condensing. Duration <12 months GR-63-CORE Sec. 4.1.1 ETS 300 019-1 Class 1.2
Temperature Transporting	–40°C to +70°C Duration <3 months GR-63-CORE Sec. 4.1.1 ETS 300 019-1 Class 2.3
Relative Humidity Transporting	5% to 100% Non-condensing. Duration <3 months GR-63-CORE Sec. 4.1.1 ETS 300 019-1 Class 2.3
Heat Dissipation	GR-63-CORE Sec. 4.1.4
Altitude	60 m below to 4000 m above sea level GR-63-CORE Sec. 4.1.3
Airborne Contaminants	GR-63-CORE Sec. 4.5.2.1
Shock Operational	ETS 300 019-2-3 Class T3.1
Sinusoidal Vibration Operational	GR-63-CORE Sec. 4.4.3
Seismic Vibration	GR-63-CORE Sec. 4.4.1 Earthquake Zone 4 ETS 300 019-2-3-A1
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.

Table F-1. General Specifications (Continued)

Characteristics	Specification
EMC	
Immunity/Resistibility ESD	EN 300 386-2 V1.1.3 Sec. 5.2.1.1 & 5.2.1.4 and GR-1089-CORE Sec. 2
Immunity Radiated	EN 300 386-2 V1.1.3 Sec. 5.2.1.2 GR-1089-CORE Sec. 3.3.1 & 3.3.2
Immunity Fast Transient	EN 300 386-2 V1.1.3 Sec. 5.2.3.1 & 5.2.5.1
Immunity Surges	EN 300 386-2 V1.1.3 Sec. 5.2.3.2
Immunity Radio Freq. Conducted	EN 300 386-2 V1.1.3 Sec. 5.2.3.3 & 5.2.5.2 GR-1089-CORE Sec. 3.3.3
Emissions Radiated	EN 300 386-2 V1.1.3 Sec. 5.2.1.3 GR-1089-CORE Sec. 3.2.1 & 3.2.2
Emissions Radio Freq. Disturbance voltage	EN 300 386-2 V1.1.3 Sec. 5.2.5.3 GR-1089-CORE Sec. 3.2.4
Interface A (Power Input)	ETS 300 132-2 Part 2: Operated by direct current (dc)
Low-Impedance Plane (Grounding)	ETS 300 253 GR-1089-CORE Sec. 9
Intra-building Lighting	GR-1089-CORE Sec. 4.5.9
Antenna Output & Receiver Input	EN 61000-4-5 – 1 kV tested combination wave generator (1.2/50—8/20 ms) 12 Ω impedance.
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 ITU-T G.811, ANSI T1.101-1999, and Telcordia Technologies (Bellcore) GR-2830-CORE.
Temperature	-40°C to +75°C
Relative Humidity	100% Non-Immersed
Altitude	60 m below sea level to 4000 m above sea level

Operating Conditions Specifications

The SSU-2000e 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	-40.5	-74.99	Volts	1
Temperature	0	50	°C	2
Temperature Rate of Change	—	8.3	°C/Hr.	
Relative Humidity	5	85	%	3
Altitude	-60	4000	meters	4

Note:

1. ETSI requirements for SELV equipment limits feasible maximum specification.
2. Inlet air temperature, limited convection 4.5 meters/min.
3. Non-condensing over the specified temperature range.
4. The maximum operation ambient temperature shall be reduced by 2xC for every 300 meters altitude above 1500 meters.

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: (-48/60 vDC) Positive ground	-40.5	-74.99	Volts, DC	
Temperature	-5	50	°C	1
Relative Humidity	5	90	%	2

Note:

1. At 30°C max/hour rate of change.
2. Non-condensing.

Power Input and Grounding Specifications

Table F-4 provides power input specifications

Table F-4. Power Input Specifications

Parameter	Specification
Supply Power	-40.5 to -74.99 vDC (-48/60 vDC nominal) ¹
Power, Maximum	240 watts at start-up
Power, Typical	< 100 watts at normal operation
Connector	3 pin D-Type

Note:

1. 48/60 vDC return connected to the common ground plane.

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 ITU-T G.703 Sec. 5 & ANSI T1.102)
Amplitude Range	+3 to -24 dBDSX
Jitter and Wander Tolerance	Meets the requirements of Bellcore GR-1244-CORE, Sec. 4
Input Error Threshold	0 to 255 Intervals per hour (AIS, LOS, OOF, BPV, CRC)
Input Impedance	3.3 k Ω (External termination)

Table F-5. Input Signal Specifications (Continued)

Parameter	Specification
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 dBTL0
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 F-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), user selectable
Signal Waveshape	Framed, all ones, Alternate Mark Inversion (AMI) Per ITU Rec. G.703 and ANSI T1.102 and
Rise Time	< 100 nsec
Pulse Width	< 324 nsec, nominal
Pulse Interval	648 nsec, nominal
Duty Cycle	50%
Pulse Amplitude	2.4 to 3.6 volts peak into 100 V
Output Jitter	< 0.03 UI
Number of Outputs	20 per module
Termination Impedance	100 Ω \pm 5%

SDU-2000e Shelf Specifications

Table F-7 lists the system-level specifications for the SDU-2000e.

Table F-7. SDU-2000e System Specifications

Specification	Description
System Specifications	
Architecture	2 Buffer modules and 10 mixed Output modules Expansion drive for up to three additional expansion chassis Maximum of four expansion shelves per system Maximum of 61 meters between the SSU-2000e and the farthest expansion chassis
Output Section	
Port	20 Ports per Output module pair
Distribution Capacity	100 summed outputs per chassis
Signal Type	DS1 2048 Kbit/s (E1) 1 MHz, 1.544 MHz, 2.048 MHz (G703/Sec. 13) 5 MHz Composite Clock (CC)
Expansion Chassis Mechanical	
Height	500 mm
Depth	229 mm
Width	431.8 mm without ETSI racks 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	60 m below sea level to 4000 m above sea level
Power	
Input Power	Redundant Inputs: 38 to 72 vDC, 3.0 A (maximum) + 0.1 A per Distribution Module Either positive or negative ground

Table F-7. SDU-2000e System Specifications (Continued)

Specification	Description
Grounds	–48/60 V return DC Integrated frame and logic ground.
Power Connections	A-BUS and B-BUS (–48/60 vDC) Input power connectors (J101 and J102) on opposite sides of the connector panel.

Chassis Dimensions

The overall dimensions of the unit are 495.3 mm high x 431.8 mm wide (w/ears) x 245 mm deep. Installers can mount the unit in a standard ETSI cabinet. The mounting holes in the rack mounting ears are spaced to meet ETSI and are closed to meet earthquake requirements.

Appendix G Reference Materials



Note: Bellcore, or Bell Communications Research, is now Telcordia Technologies, Inc. Many reference documents listed in this section were originally published by Bellcore, but are now available from Telcordia Technologies, Inc.

In This Appendix

- [American National Standards Institute \(ANSI\) Documents](#)
- [Generic Requirements](#)
- [Technical Advisories and Framework Technical Advisories](#)
- [Technical References](#)
- [EIA/TIA Documents](#)
- [Other Reference Documents](#)

American National Standards Institute (ANSI) Documents

1. (ANSI) T1.101–1999, *Synchronization Interface Standards for Digital Networks*.
2. (ANSI) T1.101-199x, revision of T1X1.3/98-002R2, *Synchronization Interface Standard*.
3. (ANSI) T1.102–1993, *Digital Hierarchy-Electrical Interfaces*.
4. (ANSI) T1.105–1995, *Synchronous Optical Network (SONET) - Basic Description including Multiplex Structure, Rates and Formats*.
5. (ANSI) T1.105.01–1995, *Synchronous Optical Network (SONET) - Automatic Protection Switching*.
6. (ANSI) T1.105.03–1994, *Synchronous Optical Network (SONET) - Jitter at Network Interfaces*.
7. (ANSI) T1.105.03a-1995, *Synchronous Optical Network (SONET) - Jitter at Network Interfaces - DS1 Supplement*.
8. (ANSI) T1.105.03b-1997, *Synchronous Optical Network (SONET) - Jitter at Network Interfaces - DS3 Supplement*.
9. (ANSI) T1.105.04–1995, *Synchronous Optical Network (SONET): Data Communication Channel Protocols and Architectures*. Family of Requirements
10. FR–476, *OTGR Section 6: Network Maintenance: Access and Testing* (Bellcore, 1997 Edition) (A subset of OTGR, FR–439).
11. FR–480, *OTGR Section 10: User System Interface* (Bellcore, 1997 Edition). (A subset of OTGR, FR–439).

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).
7. FA-NWT-001345, *Framework Generic Requirements for Element Manager (EM) Applications for SONET Subnetworks*, Issue 1 (Bellcore, September 1992).
8. TA-NWT-001385, *Generic Requirements for Optoelectronic Devices in Fiber Optic Systems*, Issue 1 (Bellcore, April 1993) plus Bulletin 1, January 1994.
9. TR-TSY-000825, *OTGR Section 10.A: User System Interface - User System Language*, Issue 2 (Bellcore, February 1988). (A module of OTGR, FR-NWT-000439.)
10. TR-TSY-000827, *OTGR Section 11.1: Generic Operations Interfaces: Non-OSI Communications Architecture*, Issue 1 (Bellcore, November 1988). (A module of OTGR, FR-439.)

11. TR–NWT–000835, *OTGR Section 12.5: Network Element and Network System Security Administration Messages*, Issue 3 (Bellcore, January 1993). (A module of OTGR, FR–439.)
12. TR–OPT–000839 (see GR–839–CORE).
13. TR–NWT–000917, *SONET Regenerator (SONET RGTR) Equipment Generic Criteria*, Issue 1 (Bellcore, December 1990). (A module of TSGR, FR–440.)
TR–NWT–000930, *Generic Requirements for Hybrid Microcircuits Used in Telecommunications Equipment*, Issue 2 (Bellcore, September 1993). (A module of RQGR, FR–796.)
14. TR–NWT–001112, *Broadband-ISDN User to Network Interface and Network Node Interface Physical Layer Generic Criteria*, Issue 1 (Bellcore, June 1993).
15. TA–NPL–000286 (not available).
16. TA–NPL–000464, *Generic Requirements and Design Considerations for Optical Digital Signal Cross-Connect Systems*, Issue 1 (Bellcore, September 1987).
17. TA–NWT–000487 (see GR–487–CORE).
18. TA–NWT–000782, *SONET Digital Switch Trunk Interface Criteria*, Issue 2 (Bellcore, October 1992).
19. TA–NWT–000983, *Reliability Assurance Practices for Optoelectronic Devices in Loop Applications*, Issue 2 (Bellcore, December 1993).
20. TA–TSV–001294, *Generic Requirements for Element Management Layer (EML) Functionality and Architecture*, Issue 1 (Bellcore, December 1992).
21. FA–NWT–001345, *Framework Generic Requirements for Element Manager (EM) Applications for SONET Subnetworks*, Issue 1 (Bellcore, September 1992).
22. TA–NWT–001385, *Generic Requirements for Optoelectronic Devices in Fiber Optic Systems*, Issue 1 (Bellcore, April 1993) plus Bulletin 1, January 1994.

Technical References

1. TR–NWT–000057, *Functional Criteria for Digital Loop Carrier Systems*, Issue 2 (Bellcore, January 1993). (A module of TSGR, FR–440.)
2. TR–NWT–000078 (see GR–78–CORE).
3. TR–NWT–000170, *Digital Cross-Connect System (DSC 1/0) Generic Criteria*, Issue 2 (Bellcore, January 1993).

4. TR-NWT-000357, *Generic Requirements for Assuring the Reliability of Components Used in Telecommunication Systems*, Issue 2 (Bellcore, October 1993). (A module of RQGR, FR-796.)
5. TR-NWT-000418, *Generic Reliability Assurance Requirements for Fiber Optic Transport Systems*, Issue 2 (Bellcore, December 1992). (A module of RQGR, FR-796.)
6. TR-NWT-000468, *Reliability Assurance Practices for Optoelectronic Devices in Central Office Applications*, Issue 1 (Bellcore, December 1991). (A module of RQGR, FR-796.)
7. TR-NWT-000496, *SONET Add-Drop Multiplex Equipment (SONET ADM) Generic Criteria*, Issue 3 (Bellcore, May 1992). (A module of TSGR, FR-440.)
8. TR-NWT-000835, *OTGR Section 12.5: Network Element and Network System Security Administration Messages*, Issue 3 (Bellcore, January 1993). (A module of OTGR, FR-439.) TR-OPT-000839 (see GR-839-CORE). TR-NWT-000917, *SONET Regenerator (SONET RGTR) Equipment Generic Criteria*, Issue 1 (Bellcore, December 1990). (A module of TSGR, FR-440.)
9. TR-NWT-000930, *Generic Requirements for Hybrid Microcircuits Used in Telecommunications Equipment*, Issue 2 (Bellcore, September 1993). (A module of RQGR, FR-796.)
10. TR-NWT-001112, *Broadband-ISDN User to Network Interface and Network Node Interface Physical Layer Generic Criteria*, Issue 1 (Bellcore, June 1993).
11. TR-TSY-000191, *Alarm Indication Signal Requirements and Objectives*, Issue 1 (Bellcore, May 1986). (A module of TSGR, FR-440.)
12. TR-TSY-000454 (see GR-454-CORE).
13. TR-TSY-000458, *Digital Signal Zero, "A" (DS-0A 64 kb/s) Systems Interconnection*, Issue 1 (Bellcore, December 1989).
14. TR-TSY-000782, *SONET Digital Switch Trunk Interface Criteria*, Issue 2 (Bellcore, September 1989). (A module of LSSGR, FR-64, and TSGR, FR-440.)
15. TR-TSY-000824, *OTGR Section 10.1: User System Interface - User System Access*, Issue 2 (Bellcore, February 1988). (A module of OTGR, FR-439.)
16. TR-TSY-000825, *OTGR Section 10.A: User System Interface - User System Language*, Issue 2 (Bellcore, February 1988). (A module of OTGR, FR-NWT-000439.)
17. TR-TSY-000827, *OTGR Section 11.1: Generic Operations Interfaces: Non-OSI Communications Architecture*, Issue 1 (Bellcore, November 1988). (A module of OTGR, FR-439.)

- 18.TR-TSY-001003, *Generic Requirements for Embedded DC-to-DC Converters*, Bellcore Technical Reference.

EIA/TIA Documents

1. EIA/TIA-455-170, *Cutoff Wavelength of Single-Mode Fiber by Transmitted Power*.
2. EIA/TIA-492, *Generic Specification for Optical Waveguide Fiber*.
3. EIA/TIA-559, *Single-Mode Fiber Optic System Transmission Design*.
4. FOTP-127, *Spectral Characterization of Multimode Laser Diodes*.
5. OFSTP-2, *Effective Transmitter Output Power Coupled into Single-Mode Fiber Optic Cable*.
6. OFSTP-3, *Fiber Optic Terminal Receiver Sensitivity and Maximum Receiver Input Power*.
7. OFSTP-10, *Measurement of Dispersion Power Penalty in Single-Mode Systems*.
8. OFSTP-11, *Measurement of Single Reflection Power Penalty for Fiber Optic Terminal Equipment*. These publications are available from:
EIA/TIA Standards Sales Office
2001 Pennsylvania, NW
Washington, DC 20006
(202) 457-4963

Other Reference Documents

1. ETS 300 132-2, *European Telecommunication Standard, ETS 300 132-2, Equipment Engineering (EE); Power supply interface at the input to telecommunications equipment; Part 2: Operated by direct current (dc)*.
2. ETS 300 132-2, *DC system voltage requirements*.
3. ETS 300 253, *Earthing system requirements*.
4. FCC Part 15 Class A/GR 1089-CORE, *EMC requirements*.
5. IEC 654-4, *Airborne contaminants*.
6. IEC 68-2-10, *Mould growth*.
7. IEC 68-2-27, *Testing method, shock*.

8. IEC 68-2-29, *Testing method, shock*.
9. IEC 68-2-36, *Testing method, random vibration*.
10. IEC 917-2-2, *Dimensions for subracks and plug-in units*.
11. ISO 1043-1:1987, *Symbols for marking of polymers*.
12. ISO 1043-2:1988, *Symbols for marking of polymers*.
13. ISO 11469:1993, *Marking of polymers*.
14. ITU-T K21, *EMC immunity requirements*.
15. UL 1950/CSA C22.2 No 950-95, *Safety requirements*.
16. EN 300 386-2 class B, *EMC requirements*.
17. EN 60950, *Safety requirements*.
18. ETS 300 019 series, *ETSI environmental conditions and tests*.
19. ETS 300 119-2, *ETSI requirements for racks and cabinets*.
20. IEC 950/EN60950, *European Safety Requirements*, August 1993.
21. ITU-T Rec G.703.
22. RFC 1305, *Network Time Protocol (Version 3), Specification, Implementation and Analysis*.
23. T1 Technical Report No. 33, *A technical report on synchronization network management using synchronization status messages*, 1994.
24. EN 300 386-2 V1.1.3 (1997-12), *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*.

Other Reference Documents

- 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.

Index

Symbols

- && in the aid, ICS [304](#)
- && in the aid, TL1 [257](#)
- ? as Help command, ICS [306](#)

Numerics

- 1-Port DS1 Input module [50](#), [169](#)
- 1-Port E1 Input module [50](#), [160](#)
- 2048 kHz Output module [52](#), [204](#)
 - alarms [238](#)
 - block diagram [208](#)
 - default settings [419](#), [420](#)
 - events [249](#)
 - front panel [209](#)
 - specifications [210](#)
- 250B-90 gas tube, installation [391](#)
- 3-Port DS1 Input module [50](#), [169](#)
- 3-Port E1 Input module [50](#), [160](#)
- 3-sigma test [162](#), [171](#)

A

- access identifier
 - ICS [304](#)
 - TL1 [257](#)
- access level
 - changing, ICS [367](#)
 - changing, TL1 [302](#)
 - overview [262](#)
- access level see security system
- access levels
 - adding a user [101](#)
 - adding the administrator [100](#)
- accessories [380](#)
 - antenna [380](#)
 - coaxial cables, item numbers [385](#)
 - crimper kit [383](#), [383–386](#), [390](#)
 - GPS antenna [382–383](#)
 - transient eliminators [391](#)
 - GPS L1 amplifier
 - assembly [385](#)
 - L1 amplifier part number [385](#)
 - miscellaneous [394](#)
- acquire
 - clock level, affecting outputs, ICS [346](#)
 - clock level, affecting outputs, TL1 [300](#)
- activating a module

- ICS [333](#)
 - TL1 [303](#)
- activating a user. See logging in
- adding a module [103](#)
- adding a user, ICS procedure [101](#)
- address, IP
 - retrieving, ICS [336](#)
 - retrieving, TL1 [282](#)
 - setting, example [98](#)
 - setting, ICS [336](#)
 - setting, TL1 [297](#)
- address, shipping [135](#)
- addressing
 - expansion shelf [62](#)
- administrator
 - adding an administrator-level user [100](#)
 - user level [263](#)
- aid
 - ICS [304](#)
 - TL1 [257](#)
- AIS
 - error threshold, retrieving, TL1 [277](#)
 - error/clear count, retrieving, ICS [332](#)
 - error/clear count, retrieving, TL1 [266](#)
 - error/clear count, setting, ICS [334](#)
 - error/clear count, setting, TL1 [295](#)
- alarm
 - contact connector [403](#)
 - relay contacts, Communications module [44](#)
- Alarm Indication Signaling. See AIS
- alarm modes [38](#)
- alarms [171](#)
 - 2048 kHz Output module [241](#)
 - alarm correlation tag [261](#)
 - categories [44](#)
 - CC Input module [238](#)
 - checking current [110](#)
 - Clock module [233](#)
 - closures [430](#)
 - Communications module [234](#)
 - Composite Clock Output module [239](#)
 - connections [77](#)
 - connections, general [44](#)
 - connections, pin assignments [45](#)
 - critical [44](#)
 - critical, setting, ICS [310](#)
 - critical, setting, TL1 [295](#)
 - DS1 Input module [235](#)
 - DS1 Output module [238](#)
 - E1 Input module [235](#)

- E1 Output module [238](#)
 - E1/2048 kHz Output module [242](#)
 - elevation time, retrieving, ICS [322](#)
 - elevation time, retrieving, TL1 [281](#)
 - elevation time, setting, ICS [310](#)
 - elevation time, setting, TL1 [296](#)
 - error/clear count, setting, ICS [334](#)
 - error/clear count, setting, TL1 [295](#)
 - frequency alarm thresholds, setting, TL1 [296](#)
 - GPS Input module [236](#)
 - hex digits [198](#), [206](#), [212](#)
 - ignoring, ICS [310](#)
 - ignoring, TL1 [295](#)
 - input, reporting [165](#)
 - levels defined [428](#)
 - major [44](#)
 - major, setting, ICS [310](#)
 - major, setting, TL1 [295](#)
 - minor [44](#)
 - minor, setting, ICS [310](#)
 - minor, setting, TL1 [295](#)
 - MTIE [162](#)
 - report-level, setting, ICS [310](#)
 - report-level, setting, TL1 [295](#)
 - response message codes [261](#)
 - retrieving settings, TL1 [277](#)
 - retrieving, ICS [309](#), [326](#)
 - retrieving, TL1 [263](#), [274](#)
 - RS-422 Output module [243](#)
 - setting, ICS [309](#)
 - setting, TL1 [295](#)
 - SNMP, enabling, ICS [359](#)
 - status, retrieving, ICS [309](#)
 - status, retrieving, TL1 [290](#)
 - testing, ICS [309](#)
 - alarms and events [37](#)
 - almcde, TL1 [261](#)
 - altitude specifications
 - GPS antenna [382](#)
 - operating conditions [433](#)
 - AMI
 - enabling/disabling, ICS [333](#)
 - enabling/disabling, TL1 [297](#)
 - amplifier assembly GPS L1 [383](#)
 - ANSI T1.101 [428](#)
 - ANSI Tau Limit 1/2, setting, ICS [334](#)
 - antenna
 - connections [41](#)
 - connections, general [46](#)
 - descriptions [381](#)
 - exposed location installation [391](#)
 - GPS
 - bracket assembly [383](#)
 - connecting [393](#)
 - incorrect reading [393](#)
 - mounting [393](#)
 - GPS, installing [389](#)
 - installing GPS [391](#)
 - optional coaxial cables [385](#)
 - antenna connector [402](#)
 - antenna-to-radio receiver cable
 - length [391](#)
 - architecture
 - specifications, system [428](#)
 - architecture SSU-2000e [31](#)
 - ASCII mode
 - returning to [303](#)
 - selecting, ICS [316](#)
 - selecting, TL1 [296](#)
 - atag, TL1 [261](#)
 - autonomous reports
 - setting format, ICS [366](#)
 - setting format, TL1 [302](#)
 - autonomous reports, TL1 [260](#)
 - autoreturn [34](#)
 - setting, ICS [313](#)
 - setting, TL1 [293](#)
 - status, retrieving current, ICS [353](#)
 - status, retrieving current, TL1 [279](#)
 - autoswitch [34](#)
 - setting, ICS [353](#)
 - setting, TL1 [294](#)
 - status, retrieving current, ICS [353](#)
 - status, retrieving current, TL1 [279](#)
-
- B
- B8ZS
 - enabling/disabling, ICS [333](#)
 - enabling/disabling, TL1 [297](#)
 - backup clock connector J9 [409](#)
 - backup clock connector pinout [409](#)
 - bandwidth
 - GPS antenna specifications [382](#)
 - basic system load [54](#)
 - baud rate
 - retrieving, ICS [315](#)
 - retrieving, TL1 [281](#)
 - setting, ICS [315](#)
 - setting, TL1 [296](#)
 - Bellcore see Telcordia Technologies
 - Bipolar Violations. See BPV
 - block diagram
 - 2048 kHz Output module [208](#)
 - CC Input module [182](#)
 - Communications module [153](#)
 - Composite Clock Output module [194](#)

- DS1 Input module [170](#)
- DS1 Output module [190](#)
- E1 Input module [161](#)
- E1 Output module [187](#)
- E1/2048 kHz Output module [201](#)
- GPS Input module [179](#)
- RS-422 Output module [215](#)
- SDU-2000e [59](#)
- SSU-2000e [32](#)
- Stratum 2E Clock module [139](#)
- stratum 3E Clock module [144](#)
- board identification data, stored in firmware [428](#)
- BPV
 - error threshold, retrieving, TL1 [277](#)
 - error/clear count, retrieving, ICS [332](#)
 - error/clear count, retrieving, TL1 [266](#)
 - error/clear count, setting, ICS [334](#)
 - error/clear count, setting, TL1 [295](#)
 - retrieving LRU data, TL1 [267](#)
- bracket assembly, GPS antenna [383](#)
- broadcast mode, NTP [372](#)
- broadcasting a message, ICS [340](#)
- Buffer module [52](#)
- buffered clocks [63](#)
- bypass clock [35](#)
- bypass, outputs, ICS [346](#)
- bypass, outputs, TL1 [300](#)

C

- cable
 - antenna-to-radio receiver, length [391](#)
 - appropriate cable-pulling devices [392](#)
 - coaxial
 - GPS antenna [383](#)
 - GPS antenna, figure [381](#)
 - grounding [387](#)
 - low-loss, LMR-400, used in kits [391](#)
 - optional cables [385](#)
 - requirements [390](#)
 - signal loss [391](#)
 - coaxial cutting [390](#)
 - installation, GPS antenna [391](#)
 - shorted or open [393](#)
- calculating MTIE [171](#)
- calculating TDEV [172](#)
- canceling a user [303](#)
- CAS
 - input, setting mode, ICS [333](#)
 - input, setting mode, TL1 [297](#)
 - output, setting mode, TL1 [300](#)
 - outputs, setting mode, ICS [346](#)
- cautions defined [25](#)
- CCS
 - input, setting mode, ICS [333](#)
 - input, setting mode, TL1 [297](#)
 - output, setting mode, TL1 [300](#)
- Cesium fault, DS1 Input module [175](#)
- Cesium fault, enabling, ICS [334](#)
- Cesium fault, enabling, TL1 [297](#)
- chassis
 - dimensions [430](#)
 - specifications [428–431](#)
- chassis slot assignments, SSU-2000e [40](#)
- checking current alarms [110](#)
- checklist
 - installation procedure [91](#)
 - pre-installation antenna [389](#)
 - pre-installation, SSU-2000e [68](#)
 - pre-installation, tools and materials [69](#)
 - system readiness [114](#)
- clearing the screen, ICS [314](#)
- client mode, NTP [371](#)
- Clock
 - connection, backup [42](#)
 - connections, input [41](#), [79](#)
 - connections, output [43](#), [82](#)
 - control specifications [429](#)
 - output pin assignments [82](#)
 - output slots [82](#)
 - performance [428](#)
- clock [312](#)
 - autoreturn, setting, ICS [313](#)
 - autoreturn, setting, TL1 [293](#)
 - current, retrieving, TL1 [292](#)
 - frequency error/clear count, setting, ICS [334](#)
 - loop mode, changing [293](#)
 - overview [36](#)
 - resetting, ICS [355](#)
 - resetting, TL1 [303](#)
 - SDU backup [61](#)
 - selecting manually, ICS [313](#)
 - setting parameters, TL1 [296](#)
 - status, retrieving, ICS [312](#)
 - status, retrieving, TL1 [279](#), [290](#)
 - status, setting, ICS [313](#)
 - switching active, TL1 [293](#)
 - warmup time, setting, TL1 [295](#)
- Clock C [35](#), [200](#)
 - bypass enabling/disabling, ICS [346](#)
 - bypass enabling/disabling, TL1 [300](#)
- clock input connector pinout [80](#)
- clock input connectors [42](#)
- Clock module
 - alarms [233](#)

- default settings [414](#)
- events [244](#)
- Clock module STR 2E [138–141](#)
- Clock module STR 3E [143–146](#)
- clock output connector pinout [82](#)
- clock section, SSU-2000e [36](#)
- clock source [61](#)
- clocks
 - buffered [63](#)
- cmd string, TL1 [256](#)
- coaxial cables, see cable
- command format
 - ICS [304](#)
 - TL1 [256](#)
- command string, TL1 [256](#)
- command syntax
 - ICS [306](#)
 - TL1 [256](#)
- Commands
 - ICS see ICS commands
 - TL1 see TL1 commands
- common ground plane, vDC return [434](#)
- communication
 - connections [41](#)
 - connections, general [47](#)
 - EIA-232 changes, procedure [75](#)
 - management interface, specifications [429](#)
- communication interface
 - connections [73](#)
 - expansion shelf, procedure [78](#)
 - SDU-2000e, procedure [78](#)
- communication parameters
 - setting, ICS [315](#)
 - setting, TL1 [296](#)
- communication section, SSU-2000e [36](#)
- communications
 - ping command, ICS [350](#)
 - port assignments [96](#)
 - ports, defined [429](#)
 - protocol [53](#)
 - requirements, input control [77](#)
 - requirements, output control [77](#)
 - restoring factory defaults, ICS [358](#)
- communications connector pinout [401](#)
- communications interface
 - setting up [73](#)
- Communications module [50, 151–157](#)
 - alarms [234](#)
 - connections [76](#)
 - default settings [414](#)
 - events [245](#)
 - restoring factory configuration, ICS [358](#)
 - software loads [54](#)
 - software part numbers [54, 254](#)
 - software revision, retrieving, ICS [369](#)
- communications ports [47](#)
- complied message, TL1 [258](#)
- components
 - SDU chassis [61](#)
- Composite Clock Input module [181](#)
 - alarms [238](#)
 - block diagram [182](#)
 - factory default settings [184](#)
 - front panel [183](#)
 - overview [51](#)
- Composite Clock Output module [51, 193, 196](#)
 - alarms [238](#)
 - default settings [421, 422](#)
 - events [249](#)
 - front panel [195](#)
 - retrieving parameters, TL1 [278](#)
 - retrieving/setting parameters, ICS [346](#)
 - setting parameters, TL1 [295](#)
- condscr, TL1 [262](#)
- condtype, TL1 [261](#)
- configuration
 - changing defaults [110](#)
 - customizing options [111](#)
 - data specifications [428](#)
 - Ethernet port [98](#)
 - factory default [110](#)
 - hardware, mounting procedure [71](#)
 - loading factory/user, ICS [357](#)
 - loading factory/user, TL1 [300](#)
 - monitor only [223](#)
 - monitor only illustration [31](#)
 - PRS illustration [30](#)
 - restoring factory defaults [111](#)
 - retrieving, ICS [317](#)
 - saving, TL1 [300](#)
 - SDU-2000e [228](#)
 - SSU-2000e [224](#)
 - TSG illustration [30](#)
- Configuration Settings [181](#)
- connecting the GPS antenna [393](#)
- connections
 - alarm closure [44](#)
 - alarm status [41](#)
 - alarm, pin assignments [45](#)
 - antenna, general [46](#)
 - backup clock [42](#)
 - clock input signals [41](#)
 - clock input, procedure [79](#)
 - clock output, procedure [82](#)
 - communication interface [73](#)
 - communication ports [41](#)

- communication, general 47
 - DCE/DTE 75
 - DE9 four wire 404
 - DTE/DCE 41
 - east and west 43
 - EIA-232, functional description 74
 - EIA-232, pin assignments 47
 - EIA-232, procedure 74
 - Ethernet, pin assignments 76
 - ethernet, pin assignments 48
 - features, main shelf 41
 - functional description 43
 - ground, use of 46
 - grounding lugs, rack 41
 - groups, input 42
 - input 43
 - input group map 42
 - input module references 42
 - input power, procedure 73
 - load 43
 - main shelf 40
 - monitoring 43
 - normally closed 77
 - normally open 77
 - optional interface 42
 - output module references 44
 - power A label 72
 - power B label 72
 - power, general 45
 - power, pin assignments 73
 - power, specifications 430
 - procedure, ethernet 75
 - slot references 42, 44
- connector
- A3 and A5 402
 - communications 401
 - crimp-style 390
 - DE9 408
 - DE9 four wire 404
 - DE9 input 405
 - input signal 405
 - J10-J36 42, 405
 - J1-J2 45, 402
 - J3-J5 47, 401
 - J40-J99 44, 408
 - J6-J7 46, 402
 - output 408
 - requirements 390
- connector panel 64
- connector pin assignment
- backup clock 409
 - clock input 80
 - clock output 82
 - communications 401
 - DE9 408
 - SDU 409
- connectors
- clock input 42
 - expansion 64
 - output clock 43
- contact closures, alarms 430
- contacting Symmetricom 380
- Control
- overview 57
- control
- clocks, specifications 429
- correlation tag 257
- correlation tag, TL1 258
- CRC
- error threshold, retrieving, TL1 277
 - error/clear count, retrieving, ICS 332
 - error/clear count, retrieving, TL1 266
 - error/clear count, setting, ICS 334
 - error/clear count, setting, TL1 295
 - input, enabling/disabling, ICS 333
 - input, enabling/disabling, TL1 297
 - output, enabling/disabling, ICS 346
 - output, enabling/disabling, TL1 300
- crimper kit 390
- coaxial cable 386
 - GPS antenna 383, 386
- critical alarm
- setting, ICS 310
- ctag, TL1 257, 258
- cutting coaxial cables, requirements 390
- Cyclical Redundancy Check. See CRC
-
- D
- D4
- input, setting mode, ICS 333
 - input, setting mode, TL1 297
 - output, setting mode, ICS 346
 - output, setting mode, TL1 300
- damage
- connectors 389
 - preamplifier 389
 - shipping 68
 - solder connections 393
- date
- retrieving, ICS 320
 - setting, ICS 320
 - setting, TL1 293
- day of year, retrieving, ICS 321
- dc power, chassis 430
- DCE/DTE
- connections 41
 - signal requirements 75
- DDS see direct digital synthesis

- DE9 connections
 - four wire [404](#)
 - DE9 connector [408](#)
 - DE9 connector pinout [408](#)
 - default configuration
 - restoring [111](#)
 - Default settings
 - 2048 kHz Output module [419](#), [420](#)
 - Clock module [414](#)
 - Communications module [414](#)
 - Composite Clock Output module [421](#), [422](#)
 - DS1 MTIE limits [417](#)
 - E1 MTIE limits [417](#)
 - E1/DS1 Input module [415](#)
 - E1/DS1 Output module [418](#)
 - EIA-232 [74](#)
 - GPS Input module [419](#)
 - PQL values [422](#)
 - user change table [423](#)
 - default settings
 - 2048 kHz Output module [204](#)
 - 2048kHz Output module [217](#)
 - NTP port [371](#)
 - RS-422 Output module [217](#)
 - delay time
 - alarms, retrieving, TL1 [277](#)
 - alarms, setting, ICS [310](#)
 - deny response [259](#)
 - Digital voltmeter [69](#)
 - dimensions, chassis [430](#)
 - direct digital synthesis (DDS) [36](#)
 - disabling a module, TL1 [303](#)
 - disabling a port, ICS [333](#)
 - distribution capacity [430](#)
 - documentation, related [26](#)
 - DS1
 - phase measurement averages [171](#)
 - DS1 Input module [169](#), [175](#), [177](#)
 - alarm modes [172](#)
 - alarms [235](#)
 - Cesium fault [175](#)
 - default settings [415](#)
 - events [247](#)
 - front panel [176](#)
 - DS1 Output module [51](#), [190](#), [192](#)
 - alarms [238](#)
 - default settings [418](#)
 - events [249](#)
 - DS1/E1 Input modules [50](#)
 - DTE/DCE
 - connections [41](#)
 - signal requirements [75](#)
 - switch settings [75](#)
 - DTE/DCE switch, serial port [75](#)
 - duty cycle, setting
 - CC Output module, ICS [346](#)
 - CC Output module, TL1 [295](#)
 - DVM see digital volt meter
-
- E
 - E1
 - input framing mode, ICS [333](#)
 - input framing mode, TL1 [297](#)
 - output framing mode, TL1 [300](#)
 - E1 Input module [160–168](#)
 - alarms [235](#)
 - default settings [415](#)
 - events [247](#)
 - E1 Input module Alarm Modes [163](#)
 - E1 Input module Hardware Alarms [164](#)
 - E1 Output module [51](#), [186](#), [189](#)
 - alarms [238](#)
 - default settings [418](#)
 - events [249](#)
 - front panel [188](#)
 - E1/2048 kHz Output module [52](#), [197](#)
 - block diagram [201](#)
 - front panel [202](#)
 - parameters, retrieving, TL1 [286](#)
 - parameters, setting, TL1 [299](#)
 - parameters, setting/retrieving, ICS [334](#)
 - selecting output, ICS [346](#)
 - selecting output, TL1 [299](#)
 - specifications [203](#)
 - E1/DS1 Input modules [50](#)
 - East
 - connections [43](#)
 - echo
 - retrieving, ICS [315](#)
 - retrieving, TL1 [281](#)
 - setting, ICS [315](#)
 - setting, TL1 [296](#)
 - EIA-232 [57](#)
 - changes procedure, communication [75](#)
 - connections, functional description [74](#)
 - connections, pin assignments [47](#)
 - connections, procedure [74](#)
 - connector pin assignments [47](#)
 - default settings [74](#)
 - EIA-232 port
 - active users, retrieving, ICS [370](#)
 - setting parameters, ICS [315](#)
 - setting parameters, TL1 [296](#)
 - settings, retrieving, ICS [315](#)
 - settings, retrieving, TL1 [281](#)
 - electrical specifications

- GPS antenna [382](#)
- GPS L1 inline amplifier [385](#)
- electromagnetic interference considerations [69](#)
- Electrostatic discharge [84](#)
- elevation time
 - alarms, ICS [322](#)
 - alarms, retrieving, TL1 [281](#)
 - alarms, setting, TL1 [296](#)
- Elevtime command, ICS [322](#)
- email address, Symmetricom [380](#)
- EMI considerations [69](#)
- EMI precautions, considerations [69](#)
- environmental specifications
 - GPS antenna [432](#)
 - with internal LNA [382](#)
 - GPS L1 inline amplifier [385](#)
- EOL
 - retrieving, ICS [315](#)
 - retrieving, TL1 [281](#)
 - setting, ICS [315](#)
 - setting, TL1 [296](#)
- equipment, returning [135](#)
- error code
 - deny response, TL1 [260](#)
- error counts, inputs [164](#), [266](#)
- error threshold, retrieving, TL1 [277](#)
- ESD see electrostatic discharge
- ESF
 - input, setting mode, ICS [333](#)
 - input, setting mode, TL1 [297](#)
 - output, setting mode, TL1 [300](#)
 - outputs, setting mode, ICS [346](#)
- Ethernet
 - connections procedure [75](#)
 - connections, pin assignments [48](#), [76](#)
 - ping command, ICS [350](#)
 - ping command, TL1 [277](#)
- Ethernet port [74](#)
 - active users, retrieving, ICS [370](#)
 - assignment [96](#)
 - configuring [98](#)
 - connector [75](#)
 - protocol [96](#)
- event
 - log, specifications [428](#)
- Events [175](#)
 - E1 Input module [166](#)
- events
 - clearing, ICS [327](#)
 - Clock module [244](#)
 - Communications module [245](#)
 - DS1 Input module [247](#)

- E1 Input module [247](#)
- GPS Input module [248](#)
- Output module [249](#)
 - retrieving, ICS [326](#)
 - retrieving, TL1 [273](#)
- events and alarms [37](#)
- expansion connectors [64](#)
- expansion shelf
 - communication interface, procedure [78](#)
- expansion shelf addressing [62](#)

F

- factory configuration command
 - TL1 [300](#)
- factory default settings [428–436](#)
- fail mode [39](#)
- fax number, Symmetricom [380](#)
- filler (blank) panel
 - clock [227](#)
 - standard [227](#)
- fire protection
 - fusing [70](#), [127](#)
- forced logoff
 - ICS [368](#)
- format
 - autonomous report, TL1 [260](#)
 - complied message [259](#)
 - deny response [259](#)
 - ICS command [304](#)
 - in-process message [257](#)
 - TL1 command [256](#)
- framing mode
 - inputs, setting, ICS [333](#)
 - setting, TL1 [297](#)
- frequency
 - input, setting, ICS [333](#)
 - output, setting, RS-422 Output module [211](#)
- frequency alarm, setting thresholds, TL1 [296](#)
- frequency limits
 - clocks, setting, ICS [334](#)
- frequency measurements
 - retrieving, ICS [328](#)
 - retrieving, TL1 [266](#)
- front panel
 - CC Input module [183](#)
 - CC Output module [195](#)
 - DS1 Input module [176](#)
 - E1 Output module [188](#)
 - E1/2048 kHz Output module [202](#)
 - RS-422 Output module [216](#)
- front view, SSU-2000e [28](#)
- functional description

- connections [43](#)
- EIA-232 connections [74](#)
- output signal [44](#)
- power [46](#)
- fuse replacement
 - warning [70](#), [127](#)

G

- gain, inputs, adding, ICS [334](#)
- gain, inputs, adding, TL1 [297](#)
- gate IP address
 - setting, ICS [336](#)
 - setting, TL1 [297](#)
- GPS
 - configuring, ICS [323](#)
 - configuring, TL1 [296](#)
 - elevation mask, ICS [323](#)
 - position mask, setting, TL1 [294](#)
 - position, retrieving, ICS [323](#)
 - position, retrieving, TL1 [275](#)
 - retrieving satellite availability [266](#)
 - retrieving status [265](#)
 - settings, retrieving via TL1 [282](#)
 - settings, retrieving, ICS [323](#)
 - specifications, input section [429](#)
- GPS antenna
 - accessories [382](#)
 - caution near high voltage lines [85](#), [389](#)
 - connecting [393](#)
 - connections [41](#)
 - crimper kit [383](#)
 - environmental specifications [432](#)
 - installation [389](#), [392](#)
 - recommendations [390](#)
 - tools and materials [388](#)
 - low noise amplifier [391](#)
 - mounting [393](#)
 - transient eliminator [383](#)
 - with an LNA installation [391](#)
 - with internal LNA [380](#), [381](#)
- GPS Input module [178](#), [180](#), [181](#)
 - alarms [236](#)
 - default settings [419](#)
 - events [248](#)
 - overview [51](#)
- GPS L1 amplifier [385](#)
 - assembly [385](#)
 - specifications [385](#)
- GPS L1 amplifier assembly [383](#)
- GPS NAVSTAR satellites [380](#)
- GPS radio receiver [391](#)
- GR831/833 format
 - retrieving, ICS [366](#)

- retrieving, TL1 [289](#)
- setting, ICS [366](#)
- specifying, TL1 [302](#)
- GR-831/833 response format [260](#)
- graphical user interface [55](#)
- ground
 - DVM measurement, use of [72](#)
 - power, specifications [430](#)
 - precautions, considerations [72](#)
 - rack connections [41](#), [46](#)
- grounding [70](#), [85](#), [127](#), [389](#)
 - I/O connector [410](#)
 - scheme [387](#)
- Groups
 - input map [42](#)
- guest login [338](#)
- GUI. See graphical user interface

H

- Hardware
 - mounting procedure, configuration [71](#)
- hardware configuration, retrieving, ICS [317](#)
- HDB3
 - enabling/disabling, ICS [333](#)
 - enabling/disabling, TL1 [297](#)
- header, retrieving, TL1 [275](#)
- help, ICS [329](#)

I

- I/O connector grounding [410](#)
- ICS
 - aid [304](#)
 - command syntax [306](#)
 - line editor [305](#)
 - mode, selecting [316](#)
 - overview [53](#)
 - prompts [305](#)
- ICS commands
 - alphabetical list [308–370](#)
- ID, displaying, ICS [330](#)
- Idle security level users [100](#)
- Idle-level users [263](#)
- ignore mode [38](#)
- ignoring alarms, ICS [310](#)
- inactivity timeout
 - setting, ICS [316](#)
 - setting, TL1 [296](#)
- incorrect reading, GPS [393](#)
- indicators overview [57](#)
- Info command, ICS [331](#)
- inline amplifier (GPS) [380](#)

- in-process message, TL1 [257](#)
 - input
 - communication requirements [77](#)
 - connections [43](#)
 - pin assignments, slots [81](#)
 - termination, non-payload, E1/DS1 [80](#)
 - through payload termination, E1/DS1 [81](#)
 - input connections [43](#)
 - Input modules
 - connection references [42](#)
 - input reference
 - overview [33](#)
 - retrieving current, ICS [353](#)
 - retrieving current, TL1 [276](#)
 - setting, ICS [353](#)
 - setting, TL1 [294](#)
 - Input section
 - SSM, specifications [429](#)
 - input section
 - GPS, specifications [429](#)
 - ports, specifications [429](#)
 - selection mode, specifications [429](#)
 - signal type, specifications [429](#)
 - input section, SSU-2000e [33](#)
 - Input selection mode [34](#)
 - Input/output
 - I/O [396](#)
 - inputs
 - CAS, setting mode, ICS [333](#)
 - CAS, setting mode, TL1 [297](#)
 - CCS, setting mode, ICS [333](#)
 - CCS, setting mode, TL1 [297](#)
 - configuring, ICS [332](#)
 - configuring, TL1 [297](#)
 - D4, setting mode, ICS [333](#)
 - D4, setting mode, TL1 [297](#)
 - error counts [164](#), [266](#)
 - ESF, setting mode, ICS [333](#)
 - ESF, setting mode, TL1 [297](#)
 - frequency measurements [266](#)
 - frequency, retrieving, ICS [328](#)
 - gain, adding, ICS [334](#)
 - gain, adding, TL1 [297](#)
 - GPS, retrieving settings, TL1 [282](#)
 - group maps [42](#)
 - MTIE data, retrieving [268](#)
 - MTIE threshold, retrieving, TL1 [281](#)
 - naming, ICS [335](#)
 - phase data, retrieving [270](#)
 - port, disabling, ICS [333](#)
 - port, enabling, ICS [333](#)
 - PQL, setting, ICS [334](#)
 - PQL, setting, TL1 [297](#)
 - priority mode, setting, TL1 [297](#)
 - priority, setting, ICS [333](#)
 - reference port, retrieving, ICS [353](#)
 - reference port, retrieving, TL1 [289](#)
 - settings, retrieving, TL1 [282](#)
 - status, retrieving, ICS [332](#)
 - status, retrieving, TL1 [290](#)
 - TDEV data, retrieving, TL1 [271](#)
 - TDEV history retrieving, TL1 [272](#)
 - insertion loss, GPS radio receiver installation [391](#)
 - inspecting
 - procedure [68](#)
 - installation
 - checklist, procedure [91](#)
 - EMI considerations [69](#)
 - modules, precautions [84](#)
 - modules, procedure [83](#)
 - preparing site [386](#)
 - procedure, general [70](#)
 - procedure, main shelf [72](#)
 - procedure, overview [67](#)
 - SSU-2000e system [67](#)
 - tools and materials [69](#)
 - installing
 - completeness checklist [394](#)
 - GPS antenna [389](#)
 - transient eliminators [391](#)
 - figure [391](#)
 - installing modules [84](#)
 - interface connections, optional [42](#)
 - interfaces defined, remote, local, Ethernet [429](#)
 - interference, electromagnetic [69](#)
 - internet address, Symmetricom [380](#)
 - inventory, retrieving [276](#)
 - IP address
 - retrieving, ICS [336](#)
 - retrieving, TL1 [282](#)
 - See also Ethernet port
 - setting, ICS [336](#)
 - setting, TL1 [297](#)
 - item number
 - antennas [381](#)
 - ITU Tau Limit 1/2, setting, ICS [334](#)
 - ITU-T G.811 [428](#)
-
- ## K
- keepalive
 - retrieving, ICS [337](#)
 - retrieving, TL1 [283](#)
 - setting, ICS [337](#)
 - setting, TL1 [297](#)
 - SNMP, overview [377](#)

L

L1 antenna gains, minimum [391](#)
 L1 signal loss [391](#)
 LED Indicators [180](#)
 E1 Input module [167](#)
 LED indicators [57](#), [65](#)
 2048 kHz Output module [209](#)
 LEDs
 CC Input module [183](#)
 CC Output module [195](#)
 DS1 Input module [176](#)
 E1 Output module [188](#)
 E1/2048 kHz Output module [202](#)
 RS-422 Output module [216](#)
 testing [309](#)
 line build-out
 LRU, ICS [339](#)
 LRU, TL1 [283](#)
 line length
 DS1 outputs, ICS [346](#)
 DS1 outputs, TL1 [300](#)
 Line Retiming Unit
 port circuit ID, retrieving, TL1 [283](#)
 port circuit ID, setting, TL1 [298](#)
 retrieving BPV data [267](#)
 retrieving settings, TL1 [283](#)
 setting values, ICS [339](#)
 setting values, TL1 [298](#)
 status, retrieving, ICS [339](#)
 status, retrieving, TL1 [291](#)
 line termination, ICS [315](#)
 LMR-400, supplied in kits [391](#)
 load connections [43](#)
 local building codes [388](#)
 lock
 clock level, affecting outputs. ICS [346](#)
 locked mode [56](#)
 logging in
 ICS [305](#), [338](#)
 TL1 [303](#)
 logging off
 ICS [311](#)
 TL1 [303](#)
 logoff
 forced, ICS [368](#)
 logon
 ICS [305](#), [338](#)
 TL1 [303](#)
 long term frequency, specifications [428](#)
 LOS
 error threshold, retrieving, TL1 [277](#)

 error/clear count, retrieving, ICS [332](#)
 error/clear count, retrieving, TL1 [266](#)
 error/clear count, setting, ICS [334](#)
 error/clear count, setting, TL1 [295](#)

Loss of Signal. See LOS

low noise amplifier
 See GPS antenna

M

main shelf
 communications ports [47](#)
 connection features [41](#)
 connections [40](#)
 connections, upper half [42](#)
 installation procedure [72](#)
 module assignments [39](#)
 power connections [45](#)
 terminator [78](#)
 major alarm
 setting, ICS [310](#)
 Marine antenna with low noise amplifier [391](#)
 mask IP address
 setting, ICS [336](#)
 setting, TL1 [297](#)
 master controller function [36](#), [152](#)
 materials and tools
 GPS antenna installation [388](#)
 mechanical specifications
 chassis [428–431](#)
 GPS antenna [382](#)
 GPS L1 inline amplifier [385](#)
 message, sending, ICS [340](#)
 minor alarm
 setting, ICS [310](#)
 modes
 alarm [38](#)
 fail [39](#)
 ignore [38](#)
 report [38](#)
 module
 activating, TL1 [303](#)
 disabling, ICS [318](#)
 disabling, TL1 [303](#)
 enabling, ICS [318](#)
 factory settings, loading, ICS [357](#)
 loading factory/user configuration, ICS [357](#)
 removing [303](#)
 restarting, ICS [356](#)
 restarting, TL1 [303](#)
 saving user configuration, ICS [357](#)
 saving user configuration, TL1 [300](#)
 status, retrieving, TL1 [292](#)
 module assignments [39](#)

- module slot assignment [408](#)
 - modules
 - 2048 kHz Output module [204](#)
 - 2E Clock module [49](#)
 - adding or enabling [103](#)
 - Buffer [52](#)
 - CC Output module [193](#)
 - Clock module STR 2E [138–141](#)
 - Clock module STR 3E [143–146](#)
 - Communication module, configuration data [156](#)
 - Communications module [50, 147, 151–157](#)
 - Composite Clock Input [51, 181](#)
 - Composite Clock Output [51](#)
 - Composite Clock Output module [196](#)
 - composite clock output module, specifications [196](#)
 - disabling [104](#)
 - DS1 Input module [50, 169, 177](#)
 - DS1 Input module, factory defaults [177](#)
 - DS1 Output [51](#)
 - DS1 Output module [190, 192](#)
 - DS1 output module [190](#)
 - DS1 output module, block diagram [190](#)
 - DS1 output module, status LEDs [191](#)
 - E1 Input module [50, 160–168](#)
 - E1 Input module, configuration data [168](#)
 - E1 input module, configuration data [177](#)
 - E1 input module, factory defaults [168](#)
 - E1 Input module, software options [168](#)
 - E1 Output module [51, 186, 189](#)
 - factory configuration command, TL1 [300](#)
 - GPS Input module [51, 178, 180](#)
 - installation precautions [84](#)
 - installation, procedure [83](#)
 - installing, procedure [84](#)
 - inventory, retrieving [276](#)
 - overview [48](#)
 - removing [104](#)
 - retrieving status, ICS [361](#)
 - RS-422 Output [52](#)
 - status, retrieving, TL1 [290](#)
 - Stratum 3E Clock module [49](#)
 - Type 1 Clock [50](#)
 - user setting, saving, ICS [357](#)
 - monitoring connections [43](#)
 - monitor-only configuration [31](#)
 - mounting
 - bracket assembly [383](#)
 - configurations, GPS L1 inline amplifier [385](#)
 - GPS antenna [393](#)
 - specifications [382](#)
 - procedure, system hardware [71](#)
 - MTIE [171](#)
 - alarms [171](#)
 - calculation [171](#)
 - historical data, retrieving, ICS [341](#)
 - historical data, retrieving, TL1 [269](#)
 - Limit 1/2, setting, ICS [334](#)
 - mask, setting, TL1 [294](#)
 - retrieving data [268](#)
 - retrieving data, ICS [341](#)
 - specifications, performance [429](#)
 - threshold setting, ICS [334](#)
 - threshold, retrieving, TL1 [281, 284](#)
 - threshold, setting, TL1 [298](#)
 - MTIE Calculation [162](#)
-
- ## N
- N type connectors [391](#)
 - name, setting
 - ICS [343](#)
 - TL1 [294](#)
 - NC normally closed connections [77, 402](#)
 - network element type, retrieving, TL1 [277](#)
 - Network Time Protocol. See [NTP](#)
 - NO normally open connections [77, 402](#)
 - non-operating conditions [433](#)
 - non-revertive mode [34](#)
 - setting, ICS [353](#)
 - setting, TL1 [294](#)
 - notes defined [25](#)
 - notification code [261](#)
 - ntfncnde, TL1 [261](#)
 - NTP [53, 371–373](#)
 - adding [55](#)
 - broadcast mode [372](#)
 - broadcast mode, setting, ICS [344](#)
 - broadcast mode, setting, TL1 [299](#)
 - client mode [371](#)
 - protocol, retrieving [284](#)
 - server mode [371](#)
 - status, retrieving, ICS [344](#)
 - status, retrieving, TL1 [291](#)
-
- ## O
- ocrdat, TL1 [261](#)
 - ocrtm, TL1 [262](#)
 - on-line help, ICS [329](#)
 - OOF
 - error threshold, retrieving, TL1 [277](#)
 - error/clear count, retrieving, ICS [332](#)
 - error/clear count, retrieving, TL1 [266](#)
 - error/clear count, setting, ICS [334](#)
 - error/clear count, setting, TL1 [295](#)
 - operating
 - conditions [433](#)
-

Operation

overview [56](#)

ordering

GPS antenna accessories [382–383](#)

Out of Frame. See OOF

output

communications requirements [77](#)

connections, clock [43](#)

output clock connectors [43](#)

Output module

connection references [44](#)

events [249](#)

output section

ports, specifications [429](#)

signal type, specifications [430](#)

Output section, SSU-2000e [35](#)

output signal

connections [41](#)

functional description [44](#)

outputs

bit position, SSM, setting, TL1 [300](#)

bypass, ICS [346](#)

bypass, TL1 [300](#)

CAS, setting mode, ICS [346](#)

CAS, setting mode, TL1 [300](#)

CCS, setting mode, ICS [346](#)

CCS, setting mode, TL1 [300](#)

clock source, retrieving [289](#)

configuring, ICS [346](#)

configuring, TL1 [300](#)

D4, setting mode, ICS [346](#)

D4, setting mode, TL1 [300](#)

enabling/disabling per clock level, ICS [346](#)

enabling/disabling per clock level, TL1 [300](#)

ESF, setting mode, ICS [346](#)

ESF, setting mode, TL1 [300](#)

failed, identifying [199](#), [206](#)

naming, ICS [335](#)

port settings, retrieving, TL1 [287](#)

RS-422 Output module, frequency [211](#)

squelching, 2048 kHz Output module [205](#)

squelching, E1/2048 kHz Output module [197](#)

squelching, RS-422 Output module [211](#)

status, retrieving, ICS [345](#)

status, retrieving, TL1 [292](#)

overview

indicators and control [57](#)

installation procedure [67](#)

operation [56](#)

P

packaging for shipment [135](#)

part numbers

crimper kit, GPS antenna [383](#)

shelves, retrieving, ICS [317](#)

parts, reordering [135](#)

password

maximum length [368](#)

modifying, ICS [367](#)

performance

SSU-2000e specifications [29](#), [428](#)

phase

history, retrieving, ICS [349](#)

setting to zero, ICS [349](#)

setting to zero, TL1 [294](#)

phase buildout

enabling/disabling, ICS [348](#)

enabling/disabling, TL1 [300](#)

settings, retrieving, TL1 [288](#)

phase buildout, description [161](#)

phase data [270](#)

input, retrieving, TL1 [290](#)

phase zeroing [163](#)

pin assignments

alarm connection [45](#)

EIA-232, serial port [47](#)

ethernet [48](#)

Ethernet connections [76](#)

input, slots [81](#)

output, slots [82](#)

power connections [73](#)

ping

ICS [350](#)

TL1 [277](#)

pinouts

alarm contact connector [403](#)

antenna connector [402](#)

antennas [401](#)

communications [400](#)

communications connectors [401](#)

DE9 connector [405](#)

DE9 output connector [408](#)

I/O connector grounding [410](#)

input signal connector [405](#)

output connector [408](#)

power and ground connectors [400](#)

SDU backup clock connector [409](#)

SDU interface connector [409](#)

serial port [47](#)

port

123, Ethernet [371](#)

active users, retrieving, ICS [370](#)

comm, naming conventions, ICS [308](#)

comm, selecting mode, ICS [316](#)

comm, selecting TL1 mode [254](#)

comm, selecting, mode, TL1 [296](#)

- comm, setting parameters, ICS 315
 - comm, setting parameters, TL1 296
 - input, disabling, ICS 333
 - input, enabling, ICS 333
 - input, enabling/disabling, TL1 297
 - input, retrieving status, ICS 332
 - input, retrieving status, TL1 290
 - port circuit ID, retrieving, TL1 283
 - ports
 - retrieving name, TL1 276
 - specifications, input section 429
 - specifications, output section 429
 - position of GPS receiver, ICS 323
 - position of GPS receiver, TL1 275
 - power
 - chassis, specifications 430
 - connections 41
 - connections, general 45
 - connections, pin assignments 73
 - connections, specifications 430
 - functional description 46
 - GPS antenna specifications 382
 - ground, specifications 430
 - input and grounding 64
 - input connections, procedure 73
 - input specifications 434
 - Power A connections, label 72
 - power and ground connectors
 - pinout 400
 - Power B connections, label 72
 - power connections
 - main shelf 45
 - power-up 56
 - PQL
 - and squelching outputs 197, 205
 - input, retrieving, TL1 290
 - inputs, setting, ICS 334
 - retrieving translation table, ICS 351
 - translating to SSM, ICS 351
 - PQL mode
 - setting, ICS 353
 - setting, TL1 297
 - PQL values see Priority Quality Level values
 - preamplifier damage 389
 - Precautions
 - module installation 84
 - ventilation considerations 70
 - precautions
 - grounding considerations 72
 - pre-installation
 - antenna checklist 389
 - procedure, checklist 68
 - pre-installation checklist antenna 389
 - prepare site, installation 386
 - preparing site 386
 - primary reference source configuration 30
 - Priority level 33
 - priority mode
 - overview 34
 - setting, ICS 353
 - setting, TL1 297
 - Priority Quality Level values, default settings 422
 - Procedure
 - clock input connections 79
 - clock output connections 82
 - EIA-232 connections 74
 - expansion shelf, communication interface 78
 - installation checklist 91
 - installation, general 70
 - module installation 83
 - SDU-2000e, communication interface 78
 - unpacking 68
 - procedure
 - EIA-232 changes, communication 75
 - inspecting 68
 - installation, main shelf 72
 - mounting, system hardware 71
 - power input connections 73
 - pre-installation, SSU-2000e 68
 - product overview, SSU-2000e 27
 - prompts, ICS 305
 - protocol, communications 53
 - provisioning
 - general parameters, ICS and TL1 examples 102
 - GPS Input modules, ICS and TL1 examples 105
 - Other Input modules, ICS and TL1 examples 106
 - Output modules, ICS and TL1 examples 108
 - saving the setup 109
 - PRS configuration 30
 - PRS configuration illustration 30
-
- Q
- quality level
 - input, retrieving, TL1 290
 - input, setting, ICS 334
 - input, setting, TL1 297
-
- R
- radio receiver insertion loss 391
 - readiness
-

- checklist, system [114](#)
- reading incorrect, GPS [393](#)
- recommendations defined [25](#)
- Reference switching [34](#)
- reference switching
 - autoreturn and autoswitching, ICS [353](#)
 - autoreturn and autoswitching, TL1 [294](#)
- related documentation [26](#)
- relative humidity
 - GPS antenna [382](#)
 - operating conditions [433](#)
- relays, testing [309](#)
- reloading user configuration
 - ICS [357](#)
 - TL1 [300](#)
- removing a module, ICS [318](#)
- reordering parts [135](#)
- repacking [135](#)
- repacking equipment [135](#)
- report mode [38](#)
- reporting input alarms [165](#)
- reports
 - retrieving, ICS [326](#)
 - retrieving, TL1 [274](#)
- requirements
 - communication control, input/output [77](#)
 - terminator, SSU expansion [79](#)
- requirements, connector [390](#)
- resetting a clock
 - ICS [355](#)
 - TL1 [303](#)
- resolution
 - specifications, performance [429](#)
- restarting a module
 - ICS [356](#)
 - TL1 [303](#)
- Retrieve commands, TL1 [263–292](#)
- Return Authorization [135](#)
- returning equipment [135](#)
- revertive mode [34](#)
 - setting, ICS [353](#)
 - setting, TL1 selecting the reference, TL1 [294](#)
- RMA number see returning equipment
- RS-422 Output module [52](#)
 - block diagram [215](#)
 - default settings [217](#)
 - front panel [216](#)
 - specifications [217](#)
- RS422 Output module
 - parameters, retrieving, TL1 [285](#)
- rubidium oscillator [49](#)

S

- sales department, Symmetricom [380](#)
- sampling rate
 - specifications, performance [429](#)
- satellite availability, retrieving [266](#)
- satellite tracking data, retrieving [265](#)
- satellites
 - azimuths and elevations, antenna gains [391](#)
 - elevation mask, ICS [323](#)
 - gain required [391](#)
 - GPS NAVSTAR [380](#)
- saving user configuration
 - ICS [357](#)
 - TL1 [300](#)
- screen, clearing, ICS [314](#)
- SDU
 - chassis components [61](#)
 - SDU backup clock [61](#)
 - SDU connector pinout [409](#)
 - SDU-2000e
 - communication interface, procedure [78](#)
 - interface connector [409](#)
 - setting address [62](#)
 - specifications [65](#)
 - synchronization distribution unit [57](#)
 - system specifications [437](#)
- security system
 - user levels
- security system overview [262](#)
- selecting the system reference [34](#)
- selection mode
 - specifications, input section [429](#)
- serial port [74](#)
 - active users, retrieving, ICS [370](#)
 - assignment [96](#)
 - pin assignments [47](#)
 - protocol [96](#)
 - setting parameters, ICS [315](#)
 - setting parameters, TL1 [296](#)
 - settings, retrieving, ICS [315](#)
 - settings, retrieving, TL1 [281](#)
- serial port pinouts [47](#)
- server mode, NTP [371](#)
- Set commands, TL1 [293–302](#)
- setting parameters, ICS [312](#)
- setting the time
 - ICS [365](#)
 - TL1 [293](#)
- shelf, see chassis [430](#)
- shipping

- containers 135
- shipping address 135
- sid 258
- signal degradation allowed 391
- signal requirements
 - DCE/DTE 75
- signal strength, antenna gains 391
- signal type
 - specifications, input section 429
 - specifications, output section 430
- Simple Network Management Protocol. See SNMP
- site preparation 386
- slots
 - connection references 42, 44
 - input pin assignments 81
 - output, pin assignments 82
- SNMP
 - adding 55
 - alarms, ICS 359
 - commands, ICS 359
 - enable.disable, ICS 359
 - keepalive, setting, TL1 297
 - manager list, modifying, ICS 360
 - manager list, modifying, TL1 301
 - manager list, retrieving 288
 - manager list, retrieving, ICS 359
 - mode, retrieving 288
 - mode, setting, TL1 300
 - overview 53
 - user list, modifying, ICS 360
 - user list, modifying, TL1 301
 - user list, retrieving, ICS 359
 - user list, retrieving, TL1 288
- SNMPv3
 - manager list, changing, TL1 301
 - notification type, retrieving 289
 - notification, setting, TL1 301
 - user list, changing, TL1 302
 - user list, retrieving 289
 - user list, retrieving, TL1 289
- software
 - version, identifying, ICS 317
 - versions 54
- Software OptionsDS1 Input module 177
- solder connections, damage to 393
- soldered connections 392
- source identifier 258
- specifications
 - 2048 kHz Output module 210
 - ANSI T1.101 428
 - architecture, system 428
 - chassis power 430
 - clock inputs and outputs 427
 - clock performance 428
 - clock, control 429
 - communications ports 429
 - configuration data 428
 - dc power, chassis 430
 - E1/2048 kHz Output module 203
 - event log 428
 - expansion shelf, distribution capacity 430
 - functional components 427
 - GPS antenna with internal LNA 382
 - GPS L1 amplifier 385
 - GPS navigation signal 428
 - GPS, input section 429
 - ground, power 430
 - ITU-T G.811 428
 - long term frequency 428
 - main shelf, distribution capacity 430
 - management interface, communication 429
 - mechanical, chassis 428–431
 - MTIE, performance 429
 - ports, input section 429
 - ports, output section 429
 - power 434
 - power, connections 430
 - reference signals 428
 - resolution, performance 429
 - RS-422 Output module 217
 - sampling rate, performance 429
 - SDU-2000e, distribution capacity 430
 - selection mode, input section 429
 - signal type, input section 429
 - signal type, output section 430
 - SSM, input section 429
 - SSM, system 428
 - SSU-2000e, distribution capacity 430
 - system 437
 - system architecture 428
 - TDEV, performance 429
 - transient eliminators 384
- squelch
 - 2048 kHz Output module 205
 - E1/2048 kHz Output module 197
 - RS-422 Output module 211
- srveff, TL1 261
- SSM 34, 163, 172
 - bit position, input, TL1 297
 - bit position, output, ICS 346
 - bit position, output, TL1 300
 - enabling/disabling, ICS 333
 - enabling/disabling, TL1 297
 - input E1 bit position, ICS 334
 - translating from PQL, ICS 351
- SSM see Synchronization Status Messaging
- SSM Selection Criteria 164

SSU-2000
 displaying ID, ICS 330
 name, setting
 TL1 294
 name, setting, ICS 343
SSU-2000e
 architecture 31
 block diagram 32
 Clock section 36
 communication section 36
 connections 40
 connections, upper half 42
 distribution capacity, specifications 430
 front view 28
 functional component specifications 427
 input section 33
 installation 67
 installation procedure 72
 main shelf 39
 modules 48
 Output section 35
 product overview 27
 system 28
 system components 39
 terminator, expansion 78
static discharge 387
status
 GPS satellite 265
 modules, retrieving, ICS 361
status indicators
 2048 KHz Output module 209
 Composite Clock Input module 183
 E1 Output module 188
Stratum 2E Clock module 49
Stratum 3E Clock module 49
structure of this guide 23
summed pair 58
Supervisor-level users 263
supply power 434
supply voltage specifications 433
Symmetricom
 contact information 331
sync status messages 163
Synchronization Status Messaging 29, 172, 428
 specifications, input section 429
 specifications, system 428
Syncraft 55
system architecture
 specifications, system 428
system components 39
system configurations 29
system hardware, mounting procedure 71

system load
 basic 54
system modules 39
system readiness checklist 114
system reference, selecting 34
system time, retrieving, ICS 362

T

T1
 input framing mode, ICS 333
 input framing mode, TL1 297
target identifier
 TL1 256
tau
 clock frequency, setting, ICS 334
 clock, retrieving, TL1 290
 clock, setting, ICS 313
TDEV 163, 172
 calculation 163, 172
 data, retrieving, ICS 363
 data, retrieving, TL1 271
 history, retrieving, ICS 363
 history, retrieving, TL1 272
 specifications, performance 429
Technician-level users 263
Telcordia Technologies (formerly Bellcore)
 GR-1244 34
 GR-1244-CORE 428
 GR-378 34
 TR-NWT-000831 252
Telnet ports. See Ethernet port
temperature see environmental
specifications
termination
 input through payload, E1/DS1 81
 non-payload input, E1/DS1 80
termination plugs 60
terminator
 requirements, SSU expansion 79
 SSU expansion 78
Three-Sigma Test 162
three-sigma test 162
tid
 TL1 256
time
 retrieving, ICS 365
 setting, ICS 365
 setting, TL1 293
timeout
 retrieving, TL1 281
 setting, ICS 316
 setting, TL1 296

TL1

- && in the aid [257](#)
- adding a user [302](#)
- aid [257](#)
- almcde [261](#)
- autonomous report format, setting, ICS [366](#)
- autonomous report format, setting, TL1 [302](#)
- autonomous reports [260](#)
- cmd [256](#)
- command syntax [256](#)
- complied message [258](#)
- ctag [258](#)
- deny response [259](#)
- general conventions [256](#)
- GR-831/833 format [260](#)
- in-process message [257](#)
- input command [256](#)
- mode, selecting, ICS [254](#), [316](#)
- overview [53](#), [254](#)
- retrieving alarms [263](#)
- setting up a port [254](#)
- sid [258](#)
- tid [256](#)
- tools and materials
 - antenna installation [388](#)
 - system installation [69](#)
- transient eliminators [384](#)
 - GPS antenna accessories [382](#), [383](#)
 - GPS L1 amplifier assembly [383](#)
 - GPS, incorrect reading [393](#)
 - grounding scheme [387](#)
 - installing [391](#)
 - protection requirements [391](#)
 - specifications [384](#)
- translating PQL to SSM values, ICS [351](#)
- troubleshooting [127](#)
 - alarms [232](#)
 - events [244](#)
- TSG configuration [30](#)
- Type 1 Clock module [50](#)
 - block diagram [148](#)
 - functional overview [147](#)

U

- unit ID, retrieving [330](#)
- unpacking [68](#)
- unpacking and inspection [68](#)
- use of
 - DVM, ground measurement [72](#)
 - ground, integrated environment [46](#)
 - grounding lugs, rack [41](#)
- user

- access levels [262](#)
- activating, TL1 [303](#)
- active, retrieving, ICS [370](#)
- adding, ICS [367](#)
- adding, ICS procedure [101](#)
- adding, TL1 [302](#)
- clearing the list of users, ICS [367](#)
- clearing the list of users, TL1 [302](#)
- deleting, ICS [367](#)
- deleting, TL1 [302](#)
- forced logoff, ICS [368](#)
- logging in, ICS [338](#)
- logging off, TL1 [303](#)
- maximum name length [368](#)
- user access levels
 - adding a user [101](#)
 - adding the administrator [100](#)
- user access levels see security system
- user configuration
 - reloading, ICS [357](#)
 - reloading, TL1 [300](#)
 - saving, ICS [357](#)
 - saving, TL1 [300](#)
- user list, retrieving [292](#)
- user security levels
 - described [100](#)
- User-level users [263](#)

V

- vDC return, common ground plane [434](#)
- ventilation precautions, considerations [70](#)
- version
 - software, retrieving, ICS [369](#)
- voltage surges [387](#)

W

- warmup
 - clock level, affecting outputs, TL1 [300](#)
- warm-up time, clock, setting, ICS [313](#)
- warnings defined [25](#)
- web address [26](#)
- West connections [43](#)
- wire-wrap adapter [394](#)

Z

- zero suppression
 - input, enabling/disabling, ICS [333](#)
 - input, enabling/disabling, TL1 [297](#)
 - output, enabling/disabling, ICS [346](#)
 - output, enabling/disabling, TL1 [300](#)
- zeroing phase [163](#)

