TimeProvider 1000 and 1100 Edge Clock

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How to Use This Guide

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

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Purpose of This Guide

The TimeProvider User's Guide describes the procedures for unpacking, installing, using, maintaining, and troubleshooting the Symmetricom TimeProvider. It also includes appendixes that describe default values and how to install the included software application SynCraft.

Who Should Read This Guide

Chapter 1, Overview of the TimeProvider, and Chapter 2, Engineering and Ordering Procedures, are written for non-technical audiences who need general information about the product. Chapter 3, Installing the TimeProvider 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.

Structure of This Guide

This guide contains the following sections and appendixes:

Chapter, Title	Description
Chapter 1, Overview of the TimeProvider	Provides an overview of the product, describes the major hardware and software features, and lists the system specifications.
Chapter 2, Engineering and Ordering Procedures	Lists the part number and ordering procedure for all TimeProvider parts and accessories.
Chapter 3, Installing the TimeProvider	Contains procedures for unpacking and installing the product.
Chapter 4, Provisioning the TimeProvider	Describes the TL1 commands required to provision the TimeProvider after installing the unit.
Chapter 5, Testing the TimeProvider	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 6, Maintaining and Troubleshooting the TimeProvider	Contains preventive and corrective maintenance, and troubleshooting procedures for the product.
Chapter 7, Specifications of the TimeProvider	Lists the specifications for the TimeProvider
Appendix A, Factory Default Values	Includes a list of the factory default values for hardware and software parameters.

Chapter, Title	Description
Appendix B, CRAFT Software Reference	Describes how to use the CRAFT software interface with the TimeProvider.
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:
TimeProvider User's Guide	The title of a document.
SSU CRITICAL IOC1	An operating mode, alarm state, status, or chassis label.
Select **File**, **Open**...	Click the Open option on the File menu.
Press **Enter** Press **;**	A named keyboard key. The key name is shown as it appears on the keyboard. An explanation of the key's acronym or function immediately follows the first reference to the key, if required.
`TimeProvider` `Username:`	Text in a source file or a system prompt or other text that appears on a screen.
`PING` `STATUS`	A command you enter at a system prompt or text you enter in response to a program prompt. You must enter commands for case-sensitive operating systems exactly as shown.
A *re-timing* application	A word or term being emphasized.
Symmetricom ***does not*** recommend...	A word or term given special emphasis.
Structure of This Guide, on page 14	The blue text, when viewed in a pdf file, indicates a hyperlink to the indicated text.

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.

- TimeCraft management software – Help files within the application
- TimePictra management software – See the User's manual provided on the system CD
- *TimeProvider TL1 Reference Guide*, part number 097-58001-01
- Software Release Notice, part number 097-58001-24

> **Note:** Symmetricom offers a number of applicable training courses designed to enhance product usability. 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

No Revision F of this guide has been issued. Revision G of this guide includes the following new information:

- Added SNMP – Simple Network Management Protocol, on page 28.
- Corrected the Transit Node traceable row in Table 1-4.
- Added the Synchronized - Traceability Unknown row to Table 1-5.
- Revised Ordering an NTP or SNMP License, on page 51, to include SNMP.
- Updated Table 3-10 to include the latest firmware release.
- Renamed IP Subnet address to Subnet mask and removed IP Host entries from Table 4-4.
- Removed the shims from the drawing in Figure 3-23 and the text in step 5 on page 74.

- Added the latest firmware revisions to Table 3-10.

- Revised the order of the steps in Starting the TimeProvider for the First Time, on page 88.

- Revised the text in the first paragraph of Logging In for the First Time, on page 89.

- Added the 115200 baud rate to Setting the Baud Rate, on page 91, and Table 6-5.

- Corrected the length of the password in Managing the User List, on page 96.

- Added metric values to the table in Provisioning the LBO, on page 121.

- Corrected the EXDSC alarm description in Table 4-3.

- Added the GPSCLRDEL and GPSFLTDEL keywords to the table in Provisioning System-Level Alarms, on page 130.

- Added Provisioning SNMP Parameters, on page 136.

- Added the GPSCLRDEL and GPSFLTDEL keywords to Table 4-4.

- Added "GPS faults" to the list in Detecting Input Errors, on page 151.

- Added GPSCLRDEL and GPSFLTDEL to Table 6-5, Table 6-8, and Table A-4.

Chapter 1 Overview of the TimeProvider

This chapter describes the TimeProvider product.

In This Chapter

- Overview
- Operating Modes
- Performance Monitoring
- NTP Operation
- SNMP – Simple Network Management Protocol
- Physical Description
- Functional Description
- System Power
- Communication Ports
- Reference Input Signals
- Clock Performance
- Output Signals
- Alarms
- Synchronization Status Messages (SSMs)
- SmartClock
- BesTime

Overview

The TimeProvider is Synchronization Supply Unit (SSU) designed specifically to meet the needs at the network edge. In small offices where core office synchronization solutions are critical, an edge clock like the TimeProvider is ideal because of its compact size and flexibility. Using the integrated GPS features, you can use the TimeProvider in a "small" Central Office to act as a Primary Reference Source (PRS).

The TimeProvider's unique design incorporates the input, output, and clock functions in a single card, available with either a Rubidium or quartz oscillator. This allows you to simplify the storage inventory required for future expansion needs. The TimeProvider shelf requires only three plug-in cards to operate with full redundancy: dual Input/Output/Clock cards (IOCs) and a single Information Management Card (IMC), which serves as a communications/alarm interface. When dual IOCs are installed, you can mix any combination of Rubidium and quartz oscillators (for example, Rb/Rb, Rb/Qz, or Qz/Qz) to the needs of the network. The main shelf provides up to 32 redundant universal timing outputs; an optional Expansion Panel provides an additional 32 redundant outputs.

Using Symmetricom's SmartClock™ technology design, the oscillators within the IOCs are enhanced with improved performance and accuracy. Using intelligent firmware algorithms, SmartClock "learns" the effects of the ageing of the clock while it is locked to a reference signal and stores this information in its memory. If the reference signals are lost or disqualified, SmartClock uses the stored data to compensate for frequency changes while the TimeProvider continues to distribute highly stable synchronization signals.

The TimeProvider also uses Symmetricom's BesTime$^®$ algorithm when the GPS input is activated. By using other inputs as references, Bestime calculates and determines a weighting factor for each of the inputs and ensembles them in the overall timing scheme to provide very accurate timing outputs. In the event of GPS signal loss, BesTime continues to predict GPS timing information to provide reliable system timing outputs and holdover performance, ensuring that system reliability is maintained. See BesTime, on page 43 for more information.

Shelves

The TimeProvider is available in two shelf models. Each shelf supports up to 32 redundant output channels.

- The TimeProvider 1000 is a 175 mm tall ETSI shelf that meets the requirements of ETSI 300 119-4 January 1994. Figure 1-1 shows the TimeProvider 1000 shelf.

- The TimeProvider 1100 is a 130 mm tall rear-access shelf; indicators are on the front panel and connections are available on the rear panel. Figure 1-2 shows the front panel of the TimeProvider 1100.

Figure 1-1.   TimeProvider 1000 ETSI-style Shelf

Figure 1-2.   TimeProvider 1100 Rear Access Shelf

Expansion Panel

The TimeProvider has an optional Expansion Panel that doubles (to 64) the number of output channels available. Figure 1-3 shows the rear-access version of the Expansion Panel. The Expansion Panel receives timing signals from the TimeProvider main shelf through an expansion cable. The Expansion Panel provides four groups (A through D) of eight signals; each group is automatically provisioned to the same output signal type as the corresponding group on the main shelf.
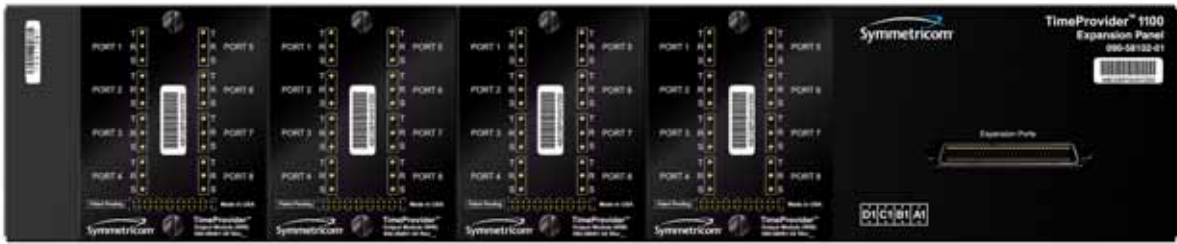
Figure 1-3.   TimeProvider 1100 Expansion Panel

Inputs

The TimeProvider accepts the following types of input signals:

■ Primary Reference Signals (PRS): 1.544 MHz, 2.048 MHz, 5 MHz, 6.312 MHz, or 10 MHz

■ Span input signals:

– E1 or 2.048 MHz analog; user-selectable CAS or CCS framing

– T1 D4, Extended Superframe (ESF)

– 1.544 and 6.312 MHz

– Composite Clock, including Japan Composite Clock (JCC) and Japan Composite Clock with 400 Hz (JCC4) signals

■ GPS input:

– GPS signal from the stand-alone TimeProvider Interface Unit (TPIU)

– GPS signal into the TPIU integrated with the IMC (IMC/TPIU card)

The TimeProvider qualifies the input reference signals and detects the following errors: Loss of Signal (LOS), Alarm Indication Signal (AIS), Loss of Framing, and Synchronization Status Messages (SSM) where applicable. Reference Input Signals, on page 34, describes the inputs in more detail.

Outputs

The TimeProvider produces a variety of outputs to meet different signal standards. Output signal types include 8 kHz, 1.544 MHz, 2.048 MHz, 6.312 MHz, E1, T1, CC, JCC, JCC4, and TIA/EIA-B-422 (1.544 and 2.048 MHz). The E1 and T1 signals can be provisioned with standard framing that meets G.703 formats. The SSM bit location is user-selectable on E1 outputs; CRC4 must be enabled in order to provide output SSMs. These outputs are available through one of several different connector panels. See Output Signals, on page 39, for more information on output signals.

The TimeProvider outputs are arranged into four groups of eight outputs per group in the Main shelf and four groups of eight outputs per group in the optional Expansion panel. Each group is labeled A, B, C, and D, and can be configured independently.

Communication

Three communications ports provide access to the TimeProvider: Ethernet, local Craft serial port, and a Remote serial port. These ports are described in detail in Communication Ports, on page 34.

Clocks

The TimeProvider's clock design includes a highly stable ovenized Quartz crystal or Rubidium oscillator with Direct Digital Synthesis (DDS) to produce accurate synchronization outputs. In a dual-IOC configuration, the clock function is redundant to provide protection, and you can mix and choose any combination of Quartz and Rubidium oscillator to meet the needs of the network. Each IOC qualifies the input signal and filters jitter and wander noise elements that may exist. In the event that all input references are lost or disqualified, the TimeProvider's clock design, together with the SmartClock technology, goes into holdover mode with the oscillator providing the system reference.

The Rubidium IOC meets Stratum 2/Type II performance; the Quartz IOC meets Stratum 3E/Type I performance.

Operating Modes

You can configure the TimeProvider to operate in one of three modes: Synchronization Supply Unit (SSU), Subtending (SUB) as defined by Telcordia GR-378 Section 7, or Primary Reference Receiver (PRR) when the GPS input is available. Each mode is unique in its operation, and is defined in the following paragraphs.

SSU Mode

This is the TimeProvider's default operating mode. You can select the system reference from any valid input on the PRS, INP1, INP2, or GPS connectors.

The GPS input operates as another input reference to the TimeProvider and is treated in the same manner as all other input references (PRS, INP1, or INP2). If the GPS input is active but later becomes disqualified, then the TimeProvider switches to the next available input reference according to the switching rules (Priority, SSM, etc.). If there are no other qualified inputs, then the TimeProvider enters the holdover state until an input is requalified.

In the SSU mode, the INP1 and INP2 inputs cannot be provisioned to receive Composite Clock (CC) signals, including JCC or JCC4. The method of selecting the system reference is described in Selecting the Input, on page 35.

SUB Mode

This mode allows the TimeProvider to operate as a Remote shelf where phase is critical. When you select the SUB mode, INP1 and INP2 are automatically set for CC inputs (including JCC and JCC4). Outputs provisioned for CC are phase-aligned with the selected CC input reference. Other output types comply with G.703 and GR-1244.

To configure the TimeProvider for Subtending mode, see Setting the System Mode, on page 105.

PRR Mode

In PRR mode, the GPS is automatically selected as the system reference input. This requires that you connect a GPS signal to the TimeProvider through either:

- the standalone TPIU (used with Antenna Kits 990-58545-01 or 990-58545-02) or

- the integrated IMC/TPIU card (used with Antenna Kits 990-58545-03 or 990-58545-04)

This mode complies with ITU-T G.811 and Telcordia GR-2830 requirements for Primary Reference Receivers/Clocks. Valid signals on the PRS, INP1, or INP2 connectors are used in conjunction with BesTime to extend compliance with GR-2830/G.811 standards.

The PRR mode uses Symmetricom's BesTime servo control that allows the TimeProvider to continue providing outputs in case GPS tracking is lost, the GPS data loses integrity, or if the IMC is removed from the shelf. BesTime, on page 43 provides more information on the BesTime technology.

To configure the TimeProvider for PRR mode, see Setting the System Mode, on page 105.

Performance Monitoring

The TimeProvider can monitor and qualify all enabled input signals based on phase measurements. It measures the phase differences between the inputs and the output of the corrected clock. From these phase measurements, the TimeProvider computes frequency offset and wander of the input signals. Wander is reported in terms of Maximum Time Interval Error (MTIE) and Time Deviation (TDEV) and creates phase, MTIE, TDEV, and Fractional Frequency Offset (FFOFF) reports. Performance data is automatically gathered on all enabled or monitored inputs.

Using MTIE and FFOFF data, the TimeProvider qualifies inputs based on these metrics. You can specify thresholds to disqualify inputs and generate corresponding alarms, causing the TimeProvider to switch references or enter the Holdover mode.

For more information on performance monitoring, see Using Performance Monitoring, on page 116. The *TimeProvider TL1 Reference Guide* contains a section describing the TL1 commands related to performance monitoring.

Phase Measurements

The IOC measures and transfers 1-second phase data with 100 ns resolution from each enabled input to the IMC or IMC/TPIU every 10 seconds. This phase data is averaged to a 1 ns resolution, which is used to produce a 1-minute phase data sample. The 1 ns data sample is the basis for MTIE, TDEV, and FFOFF calculations. The phase data is not used to qualify an input reference source.

TL1 commands are available to display the 60 most recent phase data (at 100 pS resolution) measurements, the previous 86400 1 ns data averages, and the previous 10080 samples of 1-minute 1 ns-resolution data.

MTIE Calculations

MTIE is a measure of the relative noisiness of an input signal that relates to frequency offsets and phase transients. The TimeProvider automatically calculates MTIE for each enabled input from the 600 most recent 1-second phase updates. From this calculation, you can retrieve MTIE values for 1, 5, 10, 50, 100, and 500-second windows. You can set an alarm threshold for each of these windows; if the MTIE value exceeds this threshold and the alarm level is set to Minor or higher, the TimeProvider generates an alarm.

You can use the automatic MTIE calculations to qualify each input with user-defined qualification thresholds. If an input exceeds the threshold, then the input reference automatically switches to the next-best input.

You can also set thresholds using pre-defined masks according to ANSI T1.101 (for PRS inputs), ITU-T G.811 (for PRC inputs), or ITU-T G.812 (for Type I and Type II/III inputs). The TimeProvider performs a second MTIE calculation using the previous 24-hour period; this calculation is not used to qualify inputs.

TDEV Calculations

TDEV is a measure of the relative noisiness of an input signal that relates to its spectral content. The TDEV for each enabled input is automatically calculated from the previous 24-hour period. The TDEV value is used for monitoring only and is not used for qualifying an input signal.

You can retrieve the TDEV values for the following integration times: 1, 5, 10, 100, 500, 1000, 5000, and 7200 (84000/12) seconds.

FFOFF Calculations

FFOFF is a measure of the frequency deviation of the input signal against the system reference, expressed as a ratio. The TimeProvider automatically calculates FFOFF for each enabled input from the 600 most recent 1-second phase updates.

You can use the automatic FFOFF calculations to qualify each input with user-defined qualification thresholds. If an input exceeds the threshold and the alarm level is set to Minor or higher, then the input reference automatically switches to the next-best input.

The TimeProvider stores historical FFOFF measurements for each enabled input every 60 seconds. You can retrieve FFOFF data for the prior 24 hours, depending on the number of faults that have occurred.

NTP Operation

The Network Timing Protocol (NTP) function is implemented in the IMC card or IMC/TPIU card. You can activate the NTP feature by issuing a unique key generated by Symmetricom, based on the serial number of the IMC card or the IMC/TPIU card, or you can order the TimeProvider with the NTP option factory-installed and activated. Once activated, the NTP function cannot be deactivated.

NTP operates in all three operating modes of the TimeProvider. In the Subtending mode, the NTP server is supported when the system reference is a signal other than GPS. The NTP data is transmitted by the Ethernet port on the shelf, and meets the following standards and specifications:

- NTP V3

- MD5 Authentication (RFC 1321)

- NTP Leap Second correction based on GPS

- NTP supports a 10baseT connection under a 40% loading condition, and can handle up to 100 requests per second (RPS) on average

- Typical unencrypted response time from the TimeProvider on an unloaded network is < 10 ms

- Typical encrypted (MD5) response time from the TimeProvider on an unloaded network is < 50 ms

- The client time accuracy is typically 2 ms between the internal NTP clocks of two machines on the same 10 Mb/s Ethernet LAN with a 40% loading condition

Note: NTP over a LAN topology depends on network congestion, and can be up to 50 ms accuracy.

The NTP implementation in the TimeProvider supports full NTP server and client mode operations, and works with or without GPS reference signals. The TimeProvider supports the following NTP modes:

- Mode 1: GPS available, Server mode – The NTP application defaults to GPS as the master time reference; only NTP Server mode is supported.

- Mode 2: GPS available, No Client mode – NTP Client mode is not supported when GPS is available; only NTP Server mode is supported.

- Mode 3: GPS not available, Client mode – When GPS is not available, the TimeProvider will go into client mode to search for time references from user-programmed timeservers with valid IP addresses.

  The user can input up to eight IP addresses of other timeservers. If there are multiple timeservers, the TimeProvider performs an ensembling of all the timeservers to determine the system time based on the averaging of all the valid timeservers. The user can also manually select which of the timeservers available to be the prime. The user can set how often to request an update from each individual timeserver from the eight IP addresses, ranging from 16 seconds to 1024 seconds, incrementing in powers of 2.

  At any instance in client mode, the time reference within the TimeProvider is totally derived from the ensembling of the timeservers, and is not reliant on the IOC for time ticks.

- Mode 4: GPS not available, Server mode – The TimeProvider can be enabled or disabled for server mode operation. This mode is supported only when the Client mode has found and validated the time stamp from the ensembling of the timeservers.

MD5 authentication is included in the NTP implementation. The user can enable or disable the MD5 feature, and is available in server and client modes. Client configuration for MD5 operation requires Server IP, MD5 Authentication Key, and Key ID.

The user can enter an MD5 Authentication Key of up to 32 ASCII characters that is not case-sensitive. In addition, there is also a key ID ranging from 0 to 65534 in the MD5 authentication process. When MD5 is enabled and a client requests NTP information but the MD5 key cannot be authenticated or is missing the MD5 key altogether in the request, then the TimeProvider does not process the client's request. The TimeProvider does not provide any response or events in these two scenarios.

If MD5 is disabled, a client request is returned with the proper NTP time stamp regardless of whether the client has an MD5 key attached in the request.

SNMP – Simple Network Management Protocol

The TimeProvider 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 TimeProvider 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 TimeProvider SNMP supports all existing functions, full system control of the TimeProvider is maintained through SNMP.

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

All reports, queries, autonomous messages, control, provisioning, and administration (except for communication port parameters, Set User ID/Password, Set IP assignments, Reset connection, and SNMP community settings) are available through SNMP. Refer to the *TimeProvider TL1 Reference Guide* for more information.

Physical Description

The TimeProvider consists of a shelf, plug-in cards, connector adapter panels for the cards, cables, hardware, and software. The TimeProvider is available in two configurations: front access (Model 1000) and rear access (Model 1100), as shown in Figure 1-1 and Figure 1-2.

Figure 1-4 illustrates the location of the connectors, cards, and modules in the TimeProvider 1000.

Ethernet Connector   Remote Serial Connector   GPS Connector   Expansion Connector   Output Modules   Power Connector

Power Connector   IOC 1   Input Module   IMC   Local Craft Connector   IOC 2
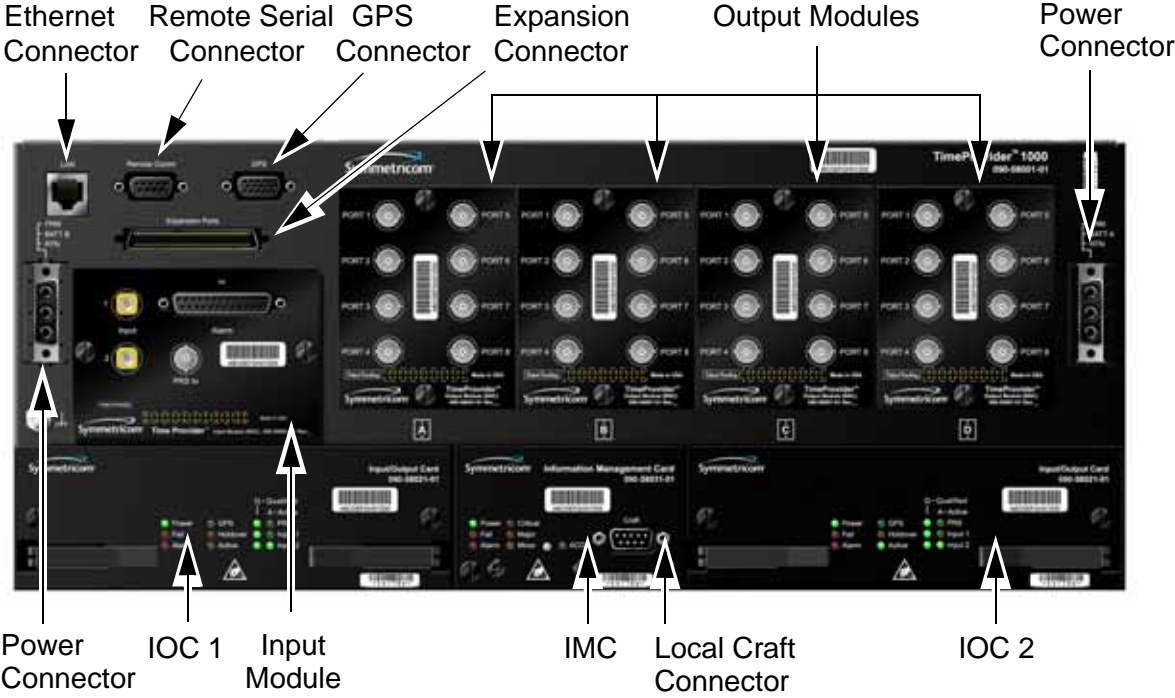
Figure 1-4.   Front Panel of the TimeProvider 1000

Figure 1-5 illustrates the location of the connectors, cards, and modules on the rear panel of the TimeProvider 1100. The chassis in Figure 1-5 is the older version that uses a 3-pin power connector.

Power Connector   Remote Serial Connector   Expansion Connector   GPS Connector   Ethernet Connector   Power Connector

Output Modules   Input Module
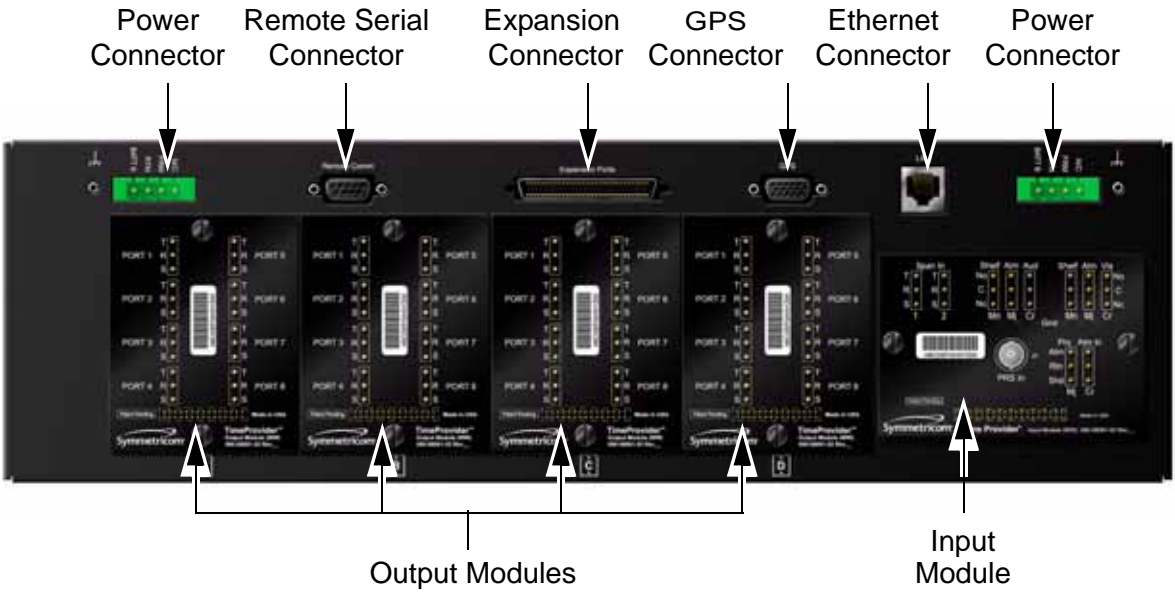
Figure 1-5.   Rear Panel of the TimeProvider 1100 – Old Version

Figure 1-6 illustrates the location of the connectors, cards, frame ground lugs, and modules on the rear panel of the TimeProvider 1100. The chassis in Figure 1-6 is the newer version that uses a terminal block for power connections.
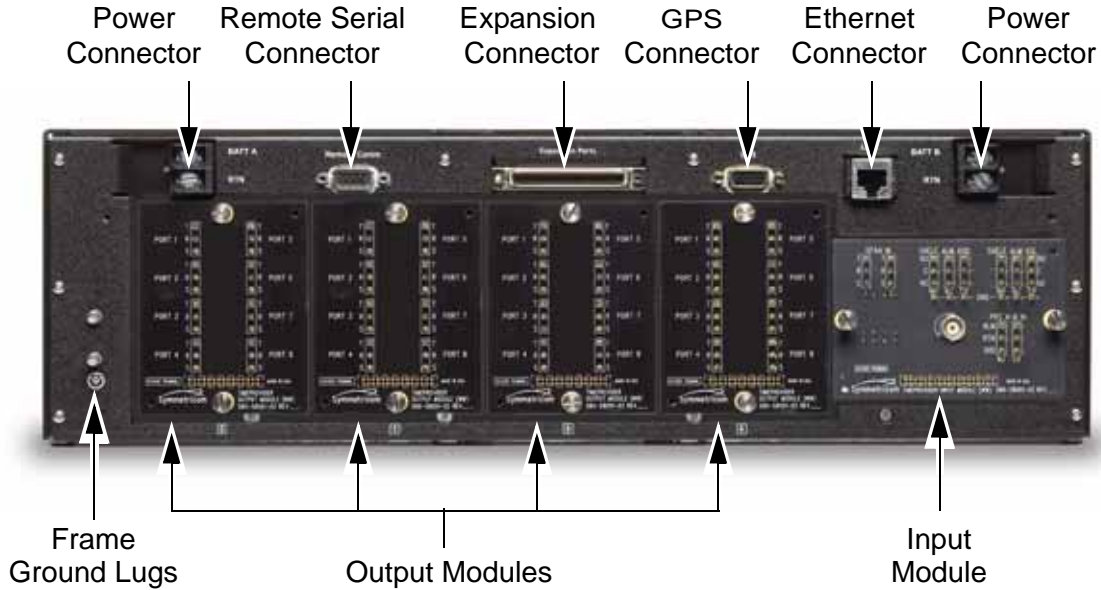
Figure 1-6.   Rear Panel of the TimeProvider 1100 – New Version

Functional Description

The TimeProvider consists of a main shelf and slots for two IOCs and one IMC. One plug-in Input module and up to four plug-in Output modules complete the main shelf, which provides up to 32 outputs. The optional Expansion Panel can provide up to 32 additional outputs, to provide a total of 64 outputs.

This section describes the components and block diagram of the TimeProvider. The block diagram, shown in Figure 1-7, contains the following major blocks:

- Shelf

- Input module

- IMC or integrated IMC/TPIU

- IOC

- Output module

- Expansion Panel required for ports 33 through 64

- TimeProvider Interface Unit (TPIU)
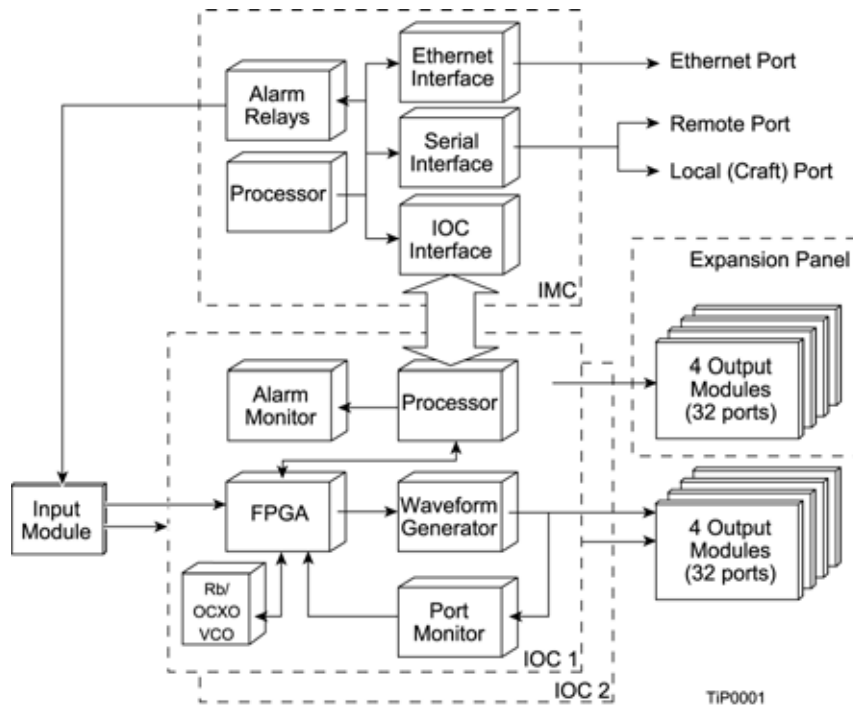
Figure 1-7.   Block Diagram of the TimeProvider

Shelf

Both the front-access and rear-access shelf provides a chassis for mounting the Input module, one IMC or one IMC/TPIU, two IOCs, and up to four Output modules. A backplane provides connections between the modules.

Input Module

The Input module receives the incoming reference signals and contains the alarm input/output connector. A variety of connector modules allows you to select the connector style and input impedance to match the wiring system at the installation site.

Information Management Card (IMC)

The Information Management Card, known as the IMC, contains a processor that manages communications between the two IOCs and the serial and Ethernet communications ports. It also provides communication to the GPS receiver in the antenna; if the IMC fails or is removed, GPS operations cease.

Integrated Information Management Card with TimeProvider Interface Unit (IMC/TPIU)

For users who use the GPS feature, the integrated IMC/TPIU combines the features of the IMC card with the TPIU into the same size footprint as a stand-alone IMC card (see the descriptions of the IMC and TPIU). The IMC/TPIU reduces rack space requirements by eliminating the rack mounted stand-alone TPIU. Functionally, the IMC/TPIU supports the same functions as the IMC card, controlling all communication channels within the TimeProvider and managing GPS control processes. If the IMC/TPIU fails or is removed, GPS operations cease.

Input/Output and Clock Module (IOC)

The TimeProvider operates with one or two IOCs. A second IOC in the shelf provides protection should the primary IOC fail. The IOC accepts the incoming reference signal and decodes the SSM, if present.

With the system properly provisioned and a reference signal selected, the local oscillator in the IOC operates in one of the following states:

- Warm-up – For up to 20 minutes after applying power to the shelf, the IOC operates in warm-up mode.

- Fast-lock – After warm-up is complete, the IOC enters the fast-lock state, where it quickly frequency-locks the local oscillator to the reference input.

- Normal lock – After the IOC has completed the fast-lock cycle, it enters the normal lock mode, in which the TimeProvider uses the proper amount of filtering for the selected mode. When set to the SSU mode and locked to an active input traceable to a Primary Reference Source (PRS), the TimeProvider complies with the G.811 and GR-2830-CORE standards.

- Holdover – If the reference signal is lost, then the clock enters the holdover mode. The accuracy of the TimeProvider output is then dependent on the quality level of the oscillator in the IOC.

- Free-run – If the IOC starts without a system reference, the TimeProvider enters the free-run state after warm-up. If a reference is applied, then the TimeProvider enters the fast-lock and then the normal-lock states.

- Bridging – In the event that all input references are lost, the TimeProvider goes into the bridging mode where the outputs continue to provide accurate timing outputs for a user-defined amount of time. If the inputs have not been requalified before the bridging time has elapsed, then the TimeProvider enters the holdover mode.

After the IOC has been in the Normal lock mode for at least three days, SmartClock holdover mode becomes available. Compared to the normal holdover mode, this mode provides a superior output quality.

Output Module

The Output module provides the output connectors for the TimeProvider. Like the Input module, each Output module uses one of a variety of connectors that match the wiring system at the installation site. Making Output Connections, on page 66, describes the Output Modules available for the TimeProvider and the Expansion Panel.

Expansion Panel

The Expansion Panel provides up to 32 additional outputs that the TimeProvider can generate. See Expansion Panel, on page 21 and Rack Mounting, on page 56 for more information.

TimeProvider Interface Unit

The TimeProvider Interface Unit (TPIU) provides power, communication, and a composite timing reference signal between the antenna and the TimeProvider main shelf. The TPIU is an external, stand-alone rack mounted assembly included in Antenna Kits 990-58545-01 and 990-58545-02. The TPIU can be used only with IMC card 090-58031-01. During antenna installation, you can use the LEDs on the TPIU to detail the status of the received power and antenna communication. See Making GPS Connections, on page 71 for more information.

System Power

The TimeProvider main shelf has redundant –48v DC inputs. The inputs are diode or'd; in the event that one supply fails, the other takes over. The –48v returns are isolated from the chassis and circuit grounds. A 5 A fuse on the IOC protects the TimeProvider; the shelf is protected from damage in case the connections are reversed.

The power supply range is from –36 to –72 V DC. The power requirements vary according to the type of IOC installed; Table 1-1 lists the power requirements.

Table 1-1. Typical Power Consumption

IOC Type	Max Power (W) per IOC	Typical Power (W) per IOC
Crystal	40	30
Rubidium	60	40 (70 with two Rb IOCs)

The procedure for installing power is described in Making Power Connections, on page 61.

Communication Ports

The TimeProvider contains three communications ports that allow you to provision, monitor, and troubleshoot the shelf. The Ethernet and Remote serial ports are located on the shelf, and the local Craft serial port is located on the IMC. You communicate with the TimeProvider using the TL1 protocol.

You can select one of four security levels for each user; each level has varying levels of access to provisioning parameters. See Defining the Security Parameters, on page 94.

Ethernet

An Ethernet connector provides connectivity to an Ethernet local area network. Each main shelf has a unique internet protocol (IP) address. Once the IP address is set and a connection is made to a LAN, you can access the TimeProvider on an intranet.

The Ethernet port supports up to 10 simultaneous connections to port 5000.

Local Craft Serial Port

This EIA-232 port supports local control; you can configure the TimeProvider with TL1 commands using a terminal or personal computer (PC) with terminal emulation software or Symmetricom's craft software, SynCraft. The connector is located on the front panel of the IMC or IMC/TPIU card. The default specifications are 9600-8-N-1. The Local port is configured as a DCE interface.

Remote Serial Port

The Remote serial connector can be used in the same manner as the local Craft serial port. The Remote port has additional control support to manage an external modem for remote access. The Remote port is configured as a DTE interface.

Reference Input Signals

The Input module accepts one or two E1, 2.048 MHz analog, T1, and Composite Clock (including JCC and JCC4) inputs on ports INP1 and INP2. The CC inputs are used solely for Subtending mode; if you provision INP1 or INP2 to a CC type, then Subtending mode is automatically enabled. You can also connect a 2.048, 5, or 10 MHz or Japan-specific 1.544 MHz or 6.312 MHz input reference signal on the PRS port. The TimeProvider accepts full-level signals or bridged signals (–20 dB); the inputs are terminated per G.703. You can also connect a GPS antenna via the TimeProvider Interface Unit (TPIU) to the GPS Input port on the shelf, or via the integrated IMC/TPIU card.

Make the input connections using the procedures described in Making Input Connections, on page 63, then provision the inputs using the software commands described in Provisioning the Input Reference, on page 108.

Input State

You can provision each input to one of three states:

- **Disabled** – the input is not used

- **Monitor** – the system monitors the input for signal faults and performance data, but it cannot be selected as the system reference

- **Enabled** – the system monitors the input for signal faults and performance data. The input can be selected as the system reference in SSU or SUB mode or as a backup reference in PRR mode.

Selecting the Input

Many considerations influence which system reference you choose:

- SSM or User-assigned Quality Level

- User-assigned Priority Level

- Switching mode

- User-assigned Input State

- Active alarms on an input

You can provision the TimeProvider to automatically select the highest-quality input based on priority and performance qualification, or you can manually select the input signal you want to use. If that signal becomes disqualified for any reason, the local oscillator goes into the Holdover mode.

Revertive Switching

Telcordia GR-378 and GR-1244 define two reference selection modes: Revertive and Non-revertive. In the revertive mode, when an input used as the system reference is disqualified (for any reason), if that input returns, it reverts to the system reference when the disqualifying reason is removed. The system reference switches two times: once when the disqualifying event occurs, and again when the input is no longer disqualified. In the non-revertive mode, the system reference does not revert to the initial input when the reason for disqualification is removed. The system reference switches only once when the disqualifying event occurs.

Quality Level and Priority Level

When the REFMODE parameter is provisioned to AUTO, the system reference switches when the input signal is disqualified. When the input signal is re-qualified, the TimeProvider can either keep the current reference or switch back to the re-qualified signal. When the REFMODE parameter is set to FORCED, then the reference does not switch and remains locked to that reference and the local oscillator enters Holdover mode if the input is not re-qualified. You may also

provision the REFMODE parameter to FORCED to select an input as the system reference regardless of the priority levels of other outputs. If this input is lost or is disqualified, then the REFMODE automatically changes to AUTO and the next available reference based on priority and QLEVEL becomes the system reference. If no other input references are available, the TimeProvider enter the Holdover mode.

The QLEVEL (Setting the Input Quality Level, on page 112) and the PRIORITY (Setting the Input Priority Level, on page 113) parameters work together with SSMs to determine the switching strategy for the inputs when the unit is in the SSU mode. If the active/primary input becomes unavailable, the switching strategy determines which input to use: the TimeProvider uses the input with the next highest QLEVEL. If all inputs have the same QLEVEL, then the TimeProvider uses the input with the highest PRIORITY.

To provision the TimeProvider as non-revertive, you must provision the user-assigned Priority Level on all inputs to the same value. To provision the TimeProvider as revertive, you provision any one of the inputs to a different Priority Level.

If the original primary input becomes available again, the REFMODE, QLEVEL and PRIORITY parameters determine whether the TimeProvider switches back to that input. If REFMODE is set to AUTO, then the reference switches according to the QLEVEL and PRIORITY settings. If the QLEVEL and/or PRIORITY parameter of the original input is higher than the current input, the TimeProvider *reverts* back to the original input. If the QLEVEL parameter is the same for all inputs, then the TimeProvider does not revert back to the original input.

SSMs and Quality Level

Synchronization Status Messages (SSMs) can be included in the bit stream of the incoming signal to indicate its quality level. You must provision the input to read the SSM, and you must provision the bit position of the incoming SSM.

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 QLEVEL 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 41.

SSU Mode
Table 1-2 illustrates which input is the active system reference under several different input conditions when the TimeProvider is in the SSU mode.

Table 1-2. SSU-Based Reference Selection Scenarios

Sequence	QLevel on PRS	QLevel on INP1	QLevel on INP2	Active Reference	
				Non-Revertive[1]	**Revertive[2]**
1	2	2	2	PRS	INP1
2	4	2	2	INP1	INP1
3	4	4	2	INP2	INP2
4	4	4	4	INP2	INP1
5	4	4	2	INP2	INP2
6	4	2	2	INP2	INP1
7	2	2	2	INP2	INP1
8	2	2	LOS	PRS	INP1
9	2	LOS	2	PRS	PRS
10	LOS	LOS	2	INP2	INP2
11	LOS	LOS	LOS	Holdover	Holdover
12	LOS	LOS	2	INP2	INP2
13	2	LOS	2	INP2	PRS
14	2	2	2	INP2	INP1

Note:
[1]Non-revertive example. Priority Levels set to: PRS = 3, INP1 = 3, and INP2 = 3
[2]Revertive example. Priority Levels set to: PRS = 2, INP1 = 1, and INP2 = 2

Subtending Mode

Table 1-3 illustrates which input is the active system reference under several different input conditions when the TimeProvider is in the Subtending mode.

Table 1-3. Subtending-Based Reference Selection Scenarios

Sequence	QLevel on INP1	QLevel on INP2	Active Reference	
			Non-Revertive[1]	**Revertive[2]**
1	1	1	INP1	INP1
2	2	1	INP2	INP2
3	2	2	INP2	INP1
4	2	1	INP2	INP2
5	1	1	INP2	INP1
6	1	LOS	INP1	INP1

Table 1-3. Subtending-Based Reference Selection Scenarios (Continued)

Sequence	QLevel on INP1	QLevel on INP2	Active Reference	
			Non-Revertive[1]	Revertive[2]
7	LOS	LOS	Holdover	Holdover
8	LOS	1	INP2	INP2
9	1	1	INP2	INP1

Note:

[1]Non-revertive example. Priority Levels set to: INP1 = 3, and INP2 = 3
[2]Revertive example. Priority Levels set to: INP1 = 1, and INP2 = 2

GPS Inputs

Symmetricom provides a complete GPS antenna system for the TimeProvider. This includes the Symmetricom GPS Antenna, the TimeProvider Interface Unit (TPIU), and associated cables. An integrated IMC/TPIU is available for installations where rack space is at a premium. Figure 1-8 illustrates the TPIU, and Figure 1-9 illustrates the integrated IMC/TPIU. See Making GPS Connections, on page 71 for more information on installing the GPS Antenna and the TPIU or IMC/TPIU.

Figure 1-8. The TimeProvider Interface Unit (TPIU)
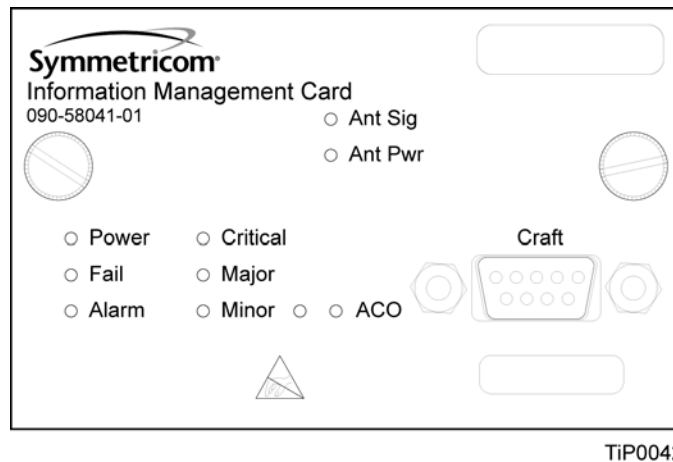
Figure 1-9. The Integrated IMC/TPIU

Clock Performance

Two IOCs are available:

- A Rubidium-based version that meets ST2/Type II standards. This IOC meets or exceeds the ST2 requirements in ANSI T1.101 and Telcordia GR-1244, as well as the ITU-T G.812 Type II specification.

- A Quartz-based version that meets ST3E/Type I standards. This IOC meets or exceeds the ST3E requirements in ANSI T1.101 and Telcordia GR-1244, as well as the ITU-T G.812 TYPE III specification and ITU-T G.812 Type I specification.

Output Signals

The main shelf has 32 output connections arranged in four groups of eight outputs; each group is labeled A through D. The optional Expansion Panel also has four groups of eight outputs that correspond to each group in the main shelf; using the Expansion Panel, the TimeProvider supports up to 64 outputs. The outputs are "universal:" you can select from E1, 2.048 MHz, T1, 8 kHz, CC, JCC, JCC4, 1.544 MHz, and 6.312 MHz. You can provision E1 and T1 signals with standard framing and G.703 formats. Additionally, TIA/EIA B-422 (1.544 and 2.048 MHz) output signals are available using the TIA/EIA B-422 Output module; this module can be installed only in the main shelf and cannot be installed in the Expansion panel.

The output types provisioned in each group of the Master shelf are automatically provisioned in the corresponding group of the Expansion panel and cannot be configured differently.

When you install a Retimer module or a TIA/EIA B-422 Output module in a main shelf output group, then you can provision the corresponding group in the Expansion panel to any desired output type.

The TimeProvider uses interchangeable Output modules, allowing you to select the connector and termination impedance. Output modules are available with the following connectors and output impedance:

- BNC – 75 Ω

- DB9 (4 connectors, 2 outputs per connector) – 120 Ω

- DB9 (8 connectors, 1 output per connector) – 120 Ω

- Metric (Siemens) 1.6/5.6 – 75 Ω

- Metric (Siemens) 1.0/2.3 – 75 Ω

- Wirewrap – 100 Ω/133Ω

- BT43 – 75 Ω

- TIA/EIA B-422 Wirewrap – 100 Ω (installed in main shelf only)

Each Output module plugs into a slot labeled A through D on the main shelf and on the Expansion Panel and provides connectors and terminations for eight outputs. Make the output connections using the procedures described in Making Output Connections, on page 66. You can install the TIA/EIA B-422 Output module in any of the four groups on the Main shelf only. You provision the output signal type for each Output module using the software commands described in Provisioning the Outputs, on page 118.

Retimer Modules

Symmetricom provides E1 and T1 Retimer modules for the TimeProvider. Each module supports two full E1 or T1 circuits (signal types cannot be mixed on a single Retimer module). The Retimer modules plug into one of the four slots for Output modules in the main shelf. Retimer modules cannot be used in an Expansion Panel. The TimeProvider meets system NEBS Level 3 and CE Class B requirements for all configurations with a Retimer module.

The E1 Retimer module is only available with BNC connectors. The T1 Retimer module is available only with wire-wrap connections.

Each Retimer module consists of two bi-directional circuits. Side 1 of the circuit provides Reamplifying, Reshaping, and Retiming, or 3R. Side 2 of the circuit provides Reamplifying and Reshaping only. Both Side 1 and Side 2 line interfaces accept signals that are up to 16 dB down from DSX levels.

The TimeProvider generates an alarm when the Retimer exceeds a user-selected slip rate. The default alarm level is NA (No Alarm), and the default slip rate is 4 slips in a 24-hour period. A TL1 command allows you to clear the slip counter associated with each Retimer port.

Should the TimeProvider or the Retimer module ever fail, a "cut-thru" capability provides a relay bypass of the retiming circuit. The cut-thru feature automatically engages under any of the following conditions:

- User command – Disabling a port using TL1 commands

- Retiming failure – A failure in the electronics (for example, power supply), or if the module is physically removed from the shelf

- All IOCs in the TimeProvider fail – IOC fault, physical removal, or shelf-level power failure

When a cut-thru condition is detected, an autonomous event or alarm is generated; the default alarm level is MN (Minor).

Alarms

The TimeProvider uses alarms to notify you when certain conditions are deteriorating below user-specified levels. These alarms are indicated by shelf and card status lamps (LEDs) and by TL1 messages reported over the serial/EIA-232 or LAN communication ports. In addition, the input panel has a connector that provides contact closures to activate external alarms.

You can provision the alarm level for most alarms to one of the following levels: non-reportable (NR), non-alarm event (NA), minor (MN), major (MJ), or critical (CR). Alarms related to the inputs are special cases; you can only provision input alarms for minor, major, or critical. To help prevent spurious or transient input alarms, a delay timer (FLTDELAY) allows you to provision a waiting period that starts after the alarm condition occurs; the alarm is set at the end of the period. A similar timer (CLRDELAY) clears the alarm after the alarm condition is no longer present.

> **Recommendation:** To prevent Non-Service Affecting LOS alarms, Symmetricom recommends that you provision unused inputs to the Disabled state.

For more information on connecting alarms, see Making Alarm Connections, on page 70. For information on provisioning alarm levels, see Provisioning the Alarm Levels, on page 126.

Synchronization Status Messages (SSMs)

The TimeProvider supports input and output SSMs. SSMs provide a method for providing clock quality information to any equipment that uses synchronization inputs. Table 1-4 describes the ANSI SSM values and the traceability associated with each value. Table 1-5 describes the ITU SSM values and the traceability associated with each value.

Table 1-4. 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 | TYPE II
Transit Node traceable	4	TNC | TYPE V
Stratum 3E traceable	5	ST3E | TYPE III
Stratum 3 traceable	6	ST3 | TYPE IV

Table 1-4. ANSI SSM Quality Level Definitions (Continued)

Description	Quality Level	Abbreviation
SONET Minimum Clock traceable (20 ppm clock)	7	SMC
Stratum 4 traceable (32 ppm clock)	8	ST4
Do Not Use for synchronization	9	DUS

Table 1-5. ITU SSM Quality Level Definitions

Description	Quality Level	Abbreviation
Synchronized – Traceability Unknown	0	UNK
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 TimeProvider handles SSMs in accordance with T1X1.3 TR33, T1.101-1999, GR-253, and GR-378.

Input SSMs

The TimeProvider extracts and decodes the SSM (if present) on the available inputs. Using this information, the TimeProvider can automatically select the input with the higher quality level.

You can manually provision the input quality level for those signals that do not have SSM information or you can provision INP1 and INP2 to read the SSM on the input; in either case the quality level of the reference input becomes the system's quality level, which is passed through to the outputs in the output SSM. If the IOC enters the Free-run or Holdover mode, the system's quality level is determined by the CLKTYPE parameter for the local oscillator on the selected IOC module. You can provision the CLKTYPE parameter to Type I, Type II, ST2, or ST3E.

Output SSMs

You must provision the TimeProvider's outputs according to the type of SSM operation you are using:

- For ANSI SSM operation, set the output type to Extended SuperFrame (ESF) for ANSI SSM operation.

- For ITU SSM operation, set the output type to Channel Associated Signaling (CAS) or Common Channel Signaling (CCS) with CRC4 framing. The SSM bit location can be set by the user.

These output formats automatically generate SSMs. The quality level of the TimeProvider's output depends on the quality level of the input signal or the quality level of the local oscillator. During normal operation, when a qualified input is used as the active timing reference, the TimeProvider copies the input's quality level to all DS1 ESF outputs and E1 CAS4 or CCS4 outputs. T1 SSM messages are mapped to the corresponding equivalent E1 SSM message and vice versa.

If the IOC is operating in Holdover mode for any reason, the SSM quality is the internal level of the oscillator installed in the IOC.

SmartClock

The TimeProvider uses Symmetricom's SmartClock technology, which predicts frequency changes due to aging of the local oscillator in the IOC; this offsets this deterministic behavior by steering the output with a corrected deviation.

The TimeProvider begins the learning process as soon as you apply a valid external reference source. The SmartClock technology is enabled after 24 hours of continuous lock; the TimeProvider then issues an event message similar to this:

```
IOC1,EQPT,NA,SCAVAIL,NSA,04-12-14,12:13:14:\"SMARTCLOCK ALGORITHM, ENABLED\"
```

If you reset the IOC or if the oscillator becomes less stable (for example, due to extreme temperature swings), the TimeProvider disables SmartClock and issues an event message similar to this:

```
IOC1,EQPT,NA,SCAVAIL,NSA,04-12-17,15:16:17:\"SMARTCLOCK ALGORITHM, DISABLED\"
```

The TimeProvider automatically restarts SmartClock, which then begins to determine a new aging rate for the oscillator.

BesTime

The TimeProvider uses Symmetricom's BesTime algorithm when it is in the PRR mode to provide enhanced GR-2830-CORE performance during bridging or holdover situations. BesTime minimizes the effect of transients on the reference signal on the outputs of the TimeProvider by comparing them against the system reference to produce the most stable outputs from the TimeProvider.

The BesTime algorithm is based on Symmetricom's patented use of multiple-input phase-locked loops (MPLLs) to generate a correction signal for the local oscillator (LO) in the IOC. With GPS as the primary input signal in PRR mode, the signals on the PRS, INP1 and INP2 inputs may be enabled and used in the BesTime ensembling algorithm to generate output signals derived from the optimum weighting of each input.

Two weighting algorithms - tracking and holdover - determine which of the inputs are used as the ensembled reference. The tracking algorithm is used during normal operation. If the GPS becomes disqualified, BesTime uses the holdover weighting algorithm to determine what the GPS input would have been had it not been lost. You can use the RTRV-BESTIME-STATS command to view the current weighting for each input.

The BesTime control loops are designed so that the short-term (under 10 minutes) stability is controlled by the LO, medium-term (10 minutes to several hours) stability is controlled by the ensembled reference, and long-term stability and accuracy is determined by the GPS control input.

The control loops can use either measurement data or prediction data. The inputs are measured for phase, frequency, and drift transients. When the input to either loop is determined to be valid, then the measured data is used to generate the correction signal to the local oscillator. If BesTime detects a transient on the input, it switches to the prediction data before the transient can start to affect the correction signal.

Normal Tracking

During normal GPS tracking, the GPS input provides the source of long-term stability for all inputs to the ensembling algorithm. The ensembling improves the medium-term stability of the output signals.

GPS Holdover

If GPS signals are lost, then all inputs to the ensembling algorithm have lost their source of long-term traceability. BesTime substitutes the inputs with calibration predictions with respect to GPS. Each input is weighted according to the estimated prediction error over 24 hours.

Chapter 2 Engineering and Ordering Procedures

This chapter describes the items available with the TimeProvider, and lists the part number for each item.

In This Chapter

- Shelf
- Expansion Panel
- Input Modules
- Output Modules
- IMC and IOC Modules
- GPS Antenna
- Ordering and Parts List
- Ordering the Cable Management Option
- Ordering an NTP or SNMP License

Shelf

The TimeProvider is available in two configurations: Model 1000 Front Access and Model 1100 Rear Access.

Model 1000 Front Access

The ETSI-style shelf (990-58001-01) complies with ETSI 300-119 shelf projections. Each shelf accepts one IMC or IMC/TPIU and one or two IOCs; the shelf also supports one Input module and from one to four Output modules. Each Output module terminates eight output timing signals. Alarms terminate on wire-wrap or DB-25 connectors, depending on the Input module used. The minimum configuration is one IMC or IMC/TPIU and one IOC for non-protected operation. Using two IOC modules provides protection in case one of the IOC modules fail. See Table 2-5 for part numbers for front-access shelf systems.

Model 1100 Rear Access

The NEBS-style shelf (990-58101-01) accepts one IMC or IMC/TPIU and one or two IOCs; the shelf also supports one Input module and from one to four Output modules. Each Output module terminates eight output timing signals. Alarms terminate on wire-wrap or DB-25 connectors, depending on the Input module used. The minimum configuration is one IMC or IMC/TPIU and one IOC for non-protected operation. Using two IOC modules provides protection in case one of the IOC modules fail. See Table 2-5 for part numbers for rear-access shelf systems.

Expansion Panel

The available Expansion Panel provides additional outputs from the main shelf. Like the main shelf, it comes in two configurations: Model 1000 Front Access and Model 1100 Rear Access. The Expansion Panel supports up to 32 additional output channels. Both panel kits contain rack mounting ears and extenders for 19-inch and 23-inch racks.

Front Access

The front-access Expansion Panel (part number 990-58002-01) provides an additional 32 outputs, for a system total of 64 outputs. The ETSI-style Expansion Panel supports up to four additional Output Modules with various connector types; each Output Module provides up to eight output signals. See Table 2-2 for part numbers for Output modules.

Rear Access

The rear-access Expansion Panel (part number 990-58102-01) provides an additional 32 outputs, for a system total of 64 outputs. The NEBS-style Expansion Panel supports up to four additional Output Modules with various connector types; each Output Module provides up to eight output signals. See Table 2-2 for part numbers for Output modules.

Input Modules

Six Input modules are available to match the wiring scheme and termination impedance requirements at the installation site. Select one of these Input modules for use with your TimeProvider system. Table 2-1 lists the Input modules available for the TimeProvider.

Table 2-1. Input Modules Available for the TimeProvider

Part Number	Description
090-58061-01	BNC Input module
090-58061-02	Wire-wrap Input module
090-58061-03	DB9 Input module
090-58061-04	SMZ/BT43 Input module
090-58061-05	Metric (Siemens) 1.0/2.3 Input module
090-58061-06	Metric (Siemens) 1.6/5.6 Input module

Output Modules

Symmetricom has eight Output modules available for the TimeProvider that allow you to select the proper termination for your application. You can install any combination of up to four Output modules in the main shelf or in the available Expansion Panel. Table 2-2 lists the Output modules available for the TimeProvider.

Table 2-2. Output Modules and Accessories Available for the TimeProvider

Part Number	Description
090-58091-01	BNC Output module
090-58091-02	Wire-wrap Output module
090-58071-02	WW Output module for TIA/EIA-B-422 (installed in Main shelf only)

Table 2-2. Output Modules and Accessories Available for the TimeProvider (Continued)

Part Number	Description
090-58091-03	DB9 Output module – four connectors
090-58091-04	SMZ/BT43 Output module
090-58091-05	Metric (Siemens) 1.0/2.3 Output module
090-58091-06	Metric (Siemens) 1.6/5.6 Output module
090-58091-07	DB9 Output module – eight connectors
090-58081-02	T1 Retimer module spare, WW (installed in the main shelf only)
090-58082-01	E1 Retimer module spare, BNC (installed in the main shelf only
090-58091-99	Blank module (cover for any unused Output module locations)
093-58091-07	Backshell and pin kit for the DB9 Output module (8 sets)

IMC and IOC Modules

Symmetricom has several modules available for the TimeProvider that provide varying levels of clock stability. You can install any combination of IOC modules in the main shelf (Rb-Rb, Rb-Qtz, Qtz-Qtz, Qtz-Rb). Table 2-3 lists the IOC and IMC modules available for the TimeProvider.

Table 2-3. IOC and IMC Modules Available for the TimeProvider

Part Number	Description
090-58021-01	Quartz IOC, single-oven
090-58022-01	Rubidium IOC
090-58031-01	IMC
090-58041-01	IMC with Integrated TimeProvider Interface Unit (IMC/TPIU)
090-58021-99	Blank Clock Module cover

GPS Antenna

The following table identifies the parts available for the GPS antenna.

Table 2-4. GPS Parts and Accessories

Part Number	Description
990-58545-01	TimeProvider Integrated GPS Antenna Kit, Rear Access, for use with IMC card (090-58031-01, sold separately) Kit includes the following items: ■　090-58545-01 – TimeProvider GPS Antenna ■　090-58545-21 – TPIU Assembly ■　090-58544-03 – Rear access TPIU interconnect cable, 1 m (3 ft) with right-angle connectors ■　093-72010-71 – Antenna mounting hardware ■　043-00018-01 Lightning suppressor
990-58545-02	TimeProvider Integrated GPS Antenna Kit, Front Access, for use with IMC card (090-58031-01, sold separately) Kit includes the following items: ■　090-58545-01 – TimeProvider GPS Antenna ■　090-58545-21 – TPIU Assembly ■　090-58543-03 – Front access TPIU interconnect cable, 1 m (3 ft) with straight connectors ■　093-72010-71 – Antenna mounting hardware ■　043-00018-01 Lightning suppressor
990-58545-03	TimeProvider GPS Antenna Kit, Rear Access, for use with the integrated IMC/TPIU (090-58041-01, sold separately) Kit includes the following items: ■　090-58545-01 – TimeProvider GPS Antenna ■　060-58041-03 – Rear access converter cable, 1 m (3 ft) with right-angle connectors ■　093-72010-71 – Antenna mounting hardware ■　043-00018-01 Lightning suppressor
990-58545-04	TimeProvider GPS Antenna Kit, Front Access, for use with the integrated IMC/TPIU (090-58041-01, sold separately) Kit includes the following items: ■　090-58545-01 – TimeProvider GPS Antenna ■　060-58042-03 – Front access converter cable, 1 m (3 ft) with straight connectors ■　093-72010-71 – Antenna mounting hardware ■　043-00018-01 Lightning suppressor
090-58545-01	TimeProvider GPS Antenna
090-58545-21	Standalone TPIU for Front or Rear Access shelf

Table 2-4. GPS Parts and Accessories (Continued)

Part Number	Description
090-58041-01	IMC with TimeProvider Interface Unit card (IMC/TPIU)
060-58041-03	Right angle converter cable, 1 m (3 ft). For use with IMC/TPIU card.
060-58042-03	Straight converter cable, 1 m (3 ft). For use with IMC/TPIU card.
060-58543-03 060-58543-10 060-58543-20 060-58543-50	Front Access TPIU Interconnect cable, 1 m (3 ft) Front Access TPIU Interconnect cable, 3 m (10 ft) Front Access TPIU Interconnect cable, 6 m (20 ft) Front Access TPIU Interconnect cable, 15 m (50 ft) **Note:** These cables for use with IMC (090-58031-01) and with standalone TPIU (090-58545-21).
060-58544-03 060-58544-10 060-58544-20 060-58544-50	Rear Access TPIU Interconnect cable, 1 m (3 ft) Rear Access TPIU Interconnect cable, 3 m (10 ft) Rear Access TPIU Interconnect cable, 6 m (20 ft) Rear Access TPIU Interconnect cable, 15 m (50 ft) **Note:** These cables for use with IMC (090-58031-01) and with standalone TPIU (090-58545-21).
060-58545-01 060-58545-02 060-58545-05 060-58545-10 060-58545-20 060-58545-30 060-58545-50 060-58545-60 060-58545-80 060-58545-99	RG-58 cable, 3 m (10 ft) RG-58 cable, 6 m (20 ft) RG-58 cable, 15 m (50 ft) RG-58 cable, 30 m (100 ft) RG-58 cable, 60 m (200 ft) RG-58 cable, 90 m (300 ft) RG-58 cable, 150 m (500 ft) RG-58 cable, 180 m (600 ft) RG-58 cable, 240 m (800 ft) RG-58 cable, 300 m (1000 ft) **Note:** Order two (2) cable per installation: one cable from antenna to lightning suppressor and one cable from lightning suppressor to the TimeProvider system.
154-00023-01	Crimp tool for RG-58 cable
371-001	TNC connectors for RG-58 cable

Ordering and Parts List

Use Table 2-5 to identify the available TimeProvider shelf types. The front and rear access main shelf includes a free copy of the TimeCraft craft GUI (990-46770-99) with each system. All IOCs, IMCs, and Input and Output Connector modules are sold separately.

Table 2-5. TimeProvider Shelves

Model	Outputs	Part Number
1000 Front Access Main Shelf	8 to 32 (1 to 4 Output Connector modules)	990-58001-01
1000 Front Access Expansion Panel	33 to 64 (1 to 4 Output Connector modules)	990-58002-01
1100 Rear Access Main Shelf	8 to 32 (1 to 4 Output Connector modules)	990-58101-01
1100 Rear Access Expansion Panel	33 to 64 (1 to 4 Output Connector modules)	990-58102-01

Ordering the Cable Management Option

Symmetricom offers a cable management kit made of ABS plastic to ensure a neat installation. This kit is 1 RU (Rack Unit) high, and includes two cable trays per kit. The part number is 093-55595-11.

Ordering an NTP or SNMP License

To enable the NTP or SNMP option within the TimeProvider system, you must enter a key into the IMC or IMC/TPIU card. This key is unique to each system and is based on the serial number of the IMC or IMC/TPIU card.

- To order the NTP option with a new TimeProvider system, or for an already-installed unit, include part number 920-58000-01.

- To order the SNMP option with a new TimeProvider system, or for an already-installed unit, include part number 920-58002-01.

For an already-installed system, you must also provide the serial number of the IMC or IMC/TPIU card with the order to generate the required password.

Once the order is received, a certificate will be issued to the user to indicate the password with the associated TL1 command to activate the NTP option.

Chapter 3 Installing the TimeProvider

This chapter describes the procedures for installing the TimeProvider shelf and the available Expansion Panel.

In This Chapter

- Getting Started
- Unpacking the Unit
- Rack Mounting
- Making Connections
- Installing Connections to the Ethernet Port
- Installation Check List
- Powering Up the Shelf
- Working With Cards
- Firmware Features

Getting Started

Before beginning the installation, complete the pre-installation check described in Pre-Installation Check, on page 54, perform the site survey in Performing a Site Survey, on page 54, and gather the necessary tools and materials described in Gathering the Tools, on page 55.

> ⚠ **Caution:** All telecom signal wiring (including I/O, clocks and Ethernet) must be installed with shielded cabling only and appropriately grounded.
>
> Cabling shall be installed in compliance with intra-building surge, lightning, and EMC requirements.

This section describes the preliminary activities you need to perform before you install the TimeProvider.

Pre-Installation Check

Before installing the TimeProvider, ensure that the following preparations are in place:

- The equipment rack is grounded properly
- A fused power panel is present (–48 V DC at 5 Amp)

Performing a Site Survey

Physical Space

The TimeProvider is designed to mount in a 19-inch (48 cm) rack. Rack ears are available to mount the shelf in a 23-inch (58 cm) rack. The ETSI front-access shelf is 6.875 inches tall (177 mm), or 4 RU (Rack Units, where 1 RU = 1.75 in/44.45 mm). For ventilation, plan on leaving a 1 RU space below the shelf. The NEBS rear-access shelf is 5.25 inches tall (133 mm), or 3 RU. For ventilation, plan for a 2 RU space above the shelf and a 1 RU space below the shelf.

The Expansion Panel also mounts in a 19-inch (48 cm) rack, and it is 3.5 inches (89 mm, or 2 RU) tall. The Expansion Panel does not require ventilation spaces above or below it.

You can mount the shelf so that it protrudes 2 inches (5 cm) or 5 inches (12.7 cm) from the front of the rack, or you can mount it flush with the front of the rack.

Be sure that the installation site is secured. Access to the location can only be gained by service personnel or users who have been instructed about the reasons for the restrictions applied to the location and about any precautions that shall be taken. Access is through use of a tool or lock and key, or other means of security, and is controlled by the authority responsible for the location.

Environmental Requirements

To prevent the unit from interfering with other equipment, install and operate the unit according to the following guidelines:

- Use only shielded cable for all signal wiring, including I/O, clocks and Ethernet, and ground appropriately at both ends, or as required by local standards.

- Secure all cable screws to their corresponding connectors.

⚠️ **Caution:** To avoid interference to the TimeProvider, you must consider the electromagnetic compatibility (EMC) of nearby equipment when preparing to install the TimeProvider.

Electromagnetic interference can adversely affect the operation of nearby equipment.

Gathering the Tools

These standard tools and materials are not supplied, but may be required for installing the TimeProvider:

- Standard tool kit

- ESD wrist strap

- Cable ties, waxed string or acceptable cable clamps

- No. 16 AWG (minimum) wire (1.31 mm^2) for –48 V DC, return, and Frame Ground

- Telecom signal wiring (including I/O, clock, and Ethernet) uses shielded cabling of the appropriate impedance required by the specific signal type

- Mating connectors for terminating signal wiring

- For wire-wrap connections only: No. 22 AWG (0.326 mm^2) shielded twisted pair wire-wrap cable of the appropriate impedance for the specific signal requirements

- Wire-wrap tool (wire-wrap modules only)

- Fasteners for mounting the equipment in rack

- Digital Voltmeter (DVM) for verifying power connections

- Soldering iron and solder for alarm connectors and the ETSI-version power connectors

- DB-9 M to DB-9 F cable for connecting to the local Craft port

- Laptop computer with communications software such as HyperTerminal, ProComm Plus, etc. for provisioning the TimeProvider

- Optional dual-channel oscilloscope with 100 MHz minimum bandwidth for verifying input and output signals and waveforms

---

Unpacking the Unit

The TimeProvider and accessories are packaged to protect from normal shock, vibration, and handling damage.

> **Caution:** To avoid electrostatic discharge (ESD) damage to parts that are packaged with the TimeProvider, observe the following procedures.

Unpack and inspect the unit as follows:

1. Wear a properly grounded protective wrist strap or other ESD device.

2. Inspect the container for signs of damage. If the container appears to be damaged, notify both the carrier and your Symmetricom distributor. Retain the shipping container and packing material for the carrier to inspect.

3. Open the container, being careful to cut only the packaging tape.

4. Locate and set aside the printed information and paperwork that is included in the container.

5. Remove the unit from the container and place it on an anti-static surface.

6. Locate and set aside small parts which may be packed in the container.

7. Remove the accessories from the container.

8. Remove the anti-static packaging from the unit and accessories.

9. Verify that the model and item number shown on the shipping list agrees with the model and item number on the equipment. The item number can be found on a label affixed to the TimeProvider. Contact your Symmetricom distributor if the model or item number *do not* match.

For a complete listing of TimeProvider item numbers and configuration options, contact your Symmetricom distributor.

Rack Mounting

The installation procedure described in this section provides general guidelines for installing the shelf and the optional Expansion panel and Cable Management tray. Always follow applicable local electrical codes.

Main Shelf

The main shelf (Model 1000 and 1100) mounts to either a 19-inch or 23-inch rack using reversible mounting ears.

Expansion Panel

The optional Expansion panel uses a bracket to position the panel at the same depth as the shelf; expansion brackets are used for 23-inch racks.

Cable Management Tray

The optional Cable Management tray (093-55595-11) allows you to neatly bundle input and output cables from the rear-access TimeProvider Model 1100. A sample installation with the cable management tray is shown in Figure 3-2.

1. Attach the rack mounting ears to the shelf using 8-32 x 3/8-inch screws. Ensure that the ears are attached at equal distances from the front of the unit, as shown in Figure 3-1 or Figure 3-2.

2. Mount the shelf to the front of the equipment rack rails with four screws and associated hardware. Use the proper screws for the equipment rack.

3. Mount the optional Expansion panel and/or Cable Management tray as shown in the following figures.
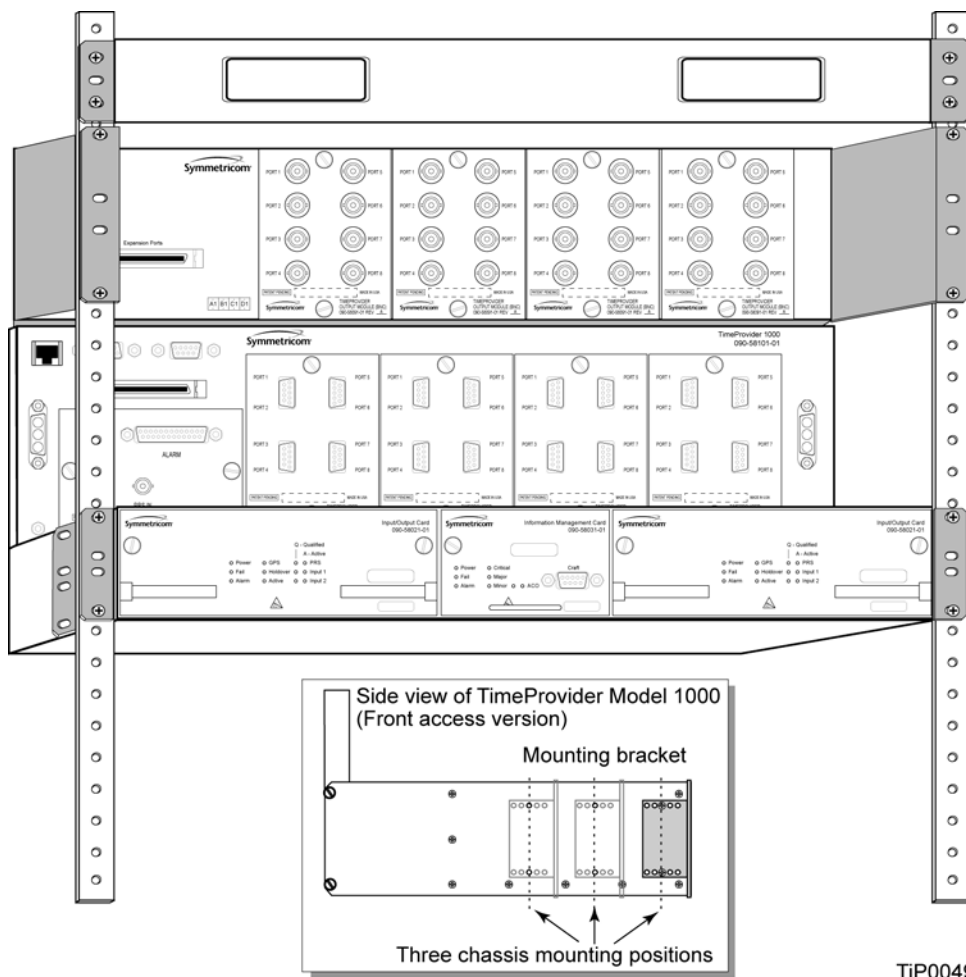
Figure 3-1.   Installing the Model 1000 Shelf, Expansion Panel, and Cable Management tray – 19-inch Rack

Mount the Expansion Panel to the rear rails of the rack

Mount the Cable Management Tray (093-55595-11) above the TimeProvider

Side view of TimeProvider Model 1100 (Rear access version)

Mounting bracket

Three chassis mounting positions

TiP0048
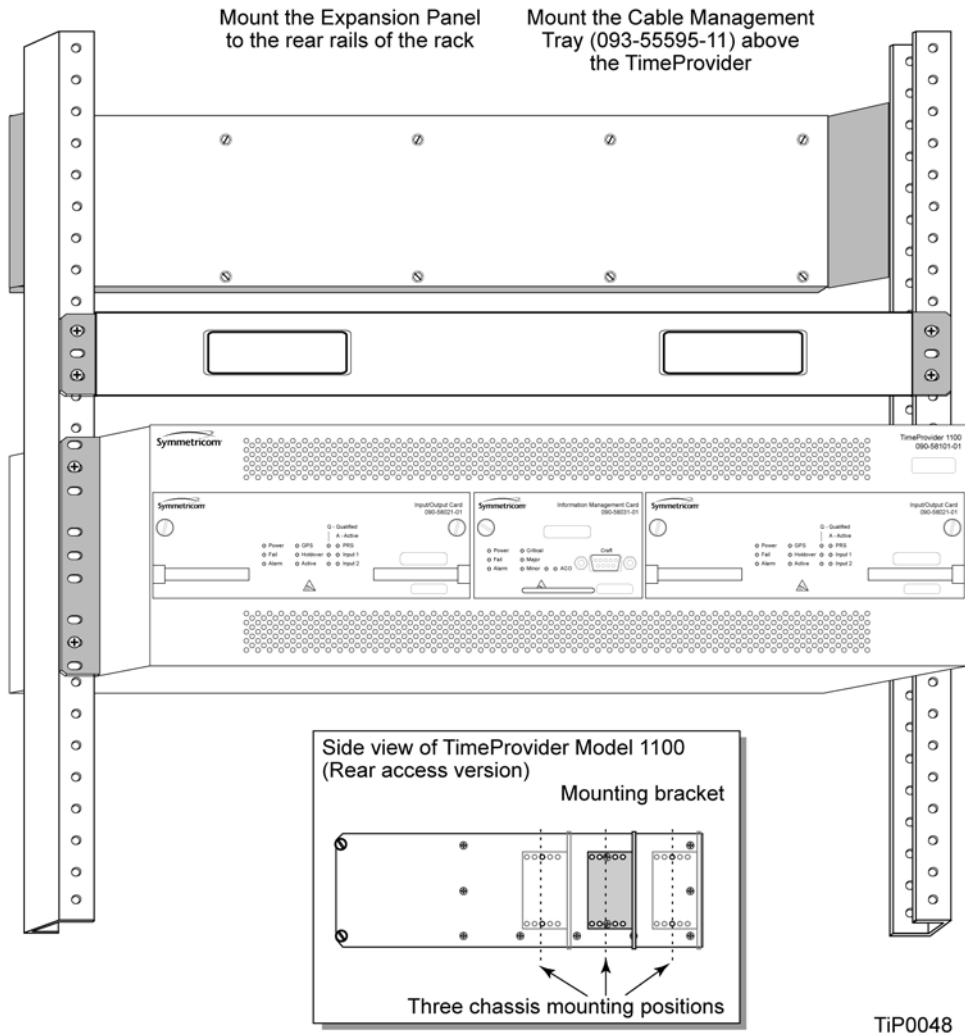
Figure 3-2.   Installing the Model 1100 Shelf, Cable Management tray, and Expansion Panel – 19-inch Rack
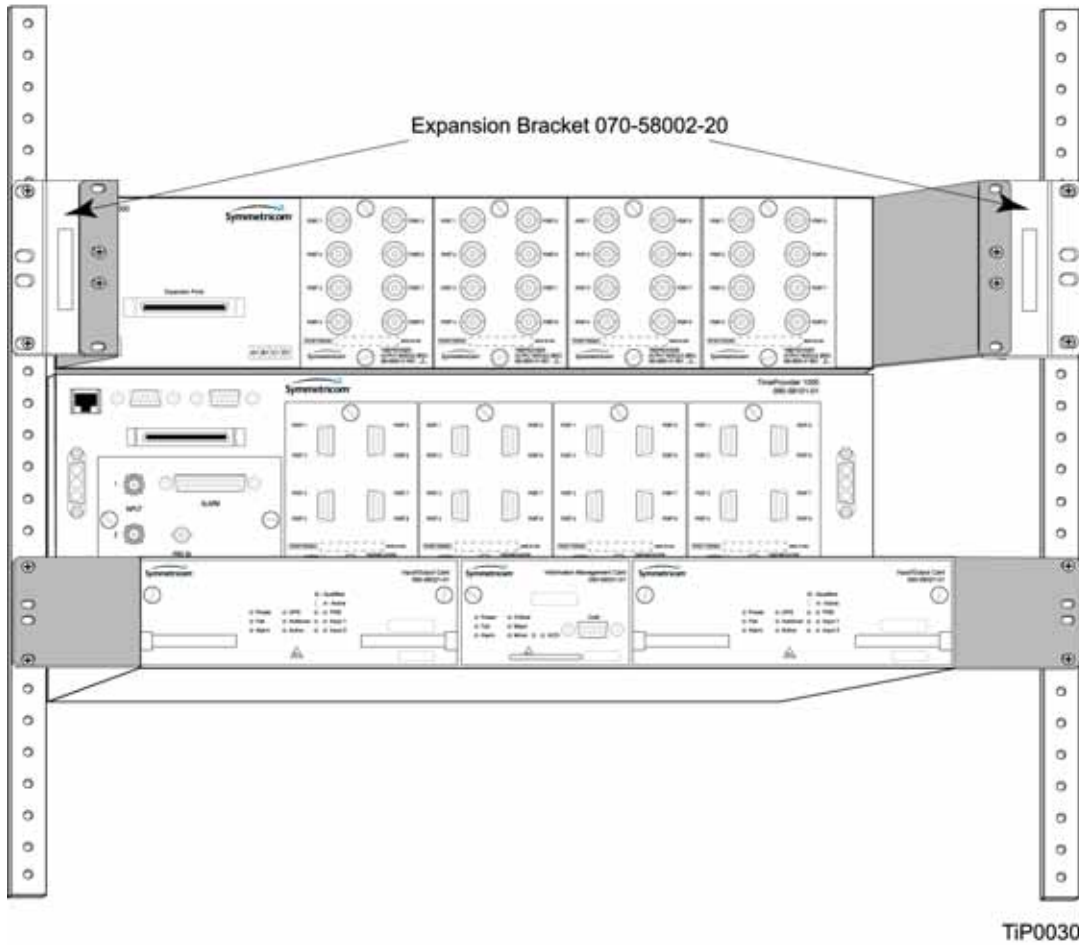
Figure 3-3.   Installing the Model 1000 Shelf and Expansion Panel – 23-inch Rack
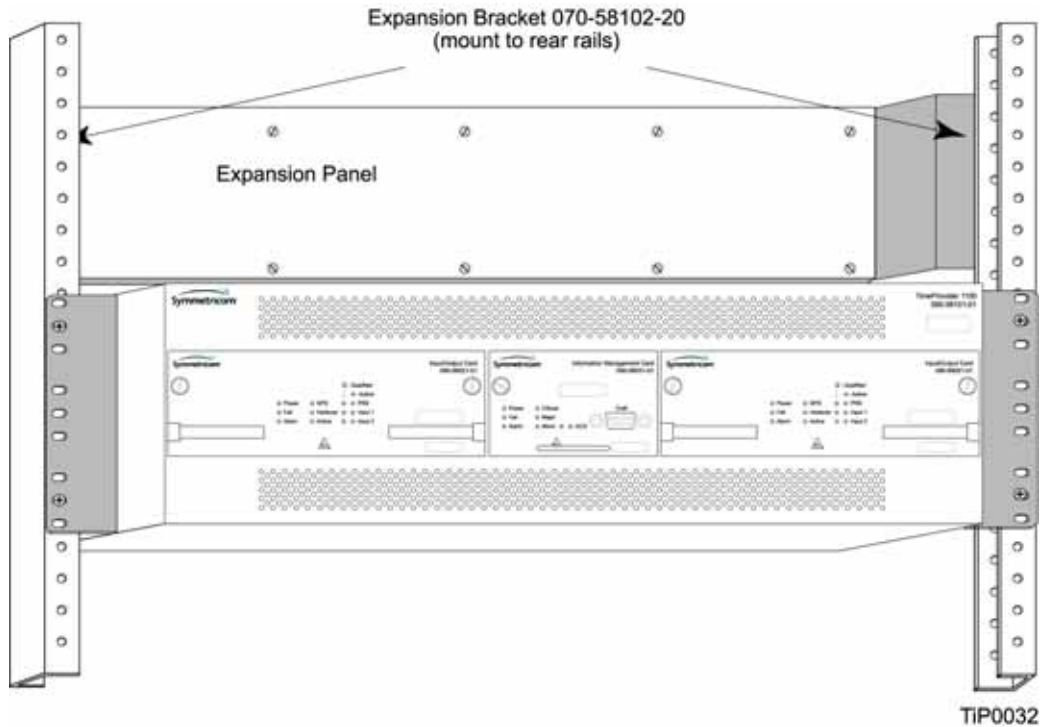
Figure 3-4.   Installing the Model 1100 Shelf and Expansion Panel – 23-inch Rack

Making Connections

Making Ground Connections

Use the procedure in this section for both the main shelf and the Expansion panel. After installing the TimeProvider shelf and/or the Expansion panel into the rack, make the grounding connections as follows.

> **Recommendation:** Although there are a number of methods for connecting the equipment to earth ground, Symmetricom recommends running a cable of the shortest possible length from the ground lug to earth ground.

Front Access Shelf

To connect Chassis Ground on the front access chassis, connect a cable from the frame ground lug on the left side of the front panel to the proper grounding zone or master ground bar.

Rear Access Shelf

To connect Chassis Ground on the rear access shelf, insert a grounding terminal block to one of the ground posts located on the lower left side at the rear of the shelf to the proper grounding zone or master ground bar.

Expansion Panel

All connections to the Expansion Panel, including chassis ground, are made using the interconnection cable.

Making Power Connections

⚡ **Electrical Shock Caution:** To avoid possible injury from shock, make sure that the fuses are removed from the fuse panel or power supply before connecting or applying power to the unit.

⚠ **Warning:** For continued fire protection, replace power supply fuse(s) with the specified type and a 5 A rating. There are no user-serviceable fuses in the TimeProvider shelf.

This unit must be grounded.

Refer all servicing to qualified personnel.

To install the TimeProvider power connections:

1. Assemble a power connector appropriate for the type of shelf. Table 3-1 lists the pin-out for each type of connector.

   Rear-access shelf: Crimp a No. 16 AWG (minimum) wire (1.31 mm^2) to a spade lug, then slide the spade lug under the terminal and tighten.

   Front-access shelf: Assemble the power connector as shown in Figure 3-6. Solder a No. 16 AWG (1.31 mm^2) (minimum) wire to each pin. Slip the appropriate grommet over the wires, and screw the shell together.

2. Attach the connector to the Power A and Power B connectors on the shelf.

Table 3-1. Power Connections

Model 1100 Rear Access (NEBS) Shelf		Model 1000 Front Access (ETSI) Shelf	
Signal	**Terminal**	**Signal**	**Terminal**
48 Volt Negative Lead	1	Frame Ground	1
48 Volt Positive Lead (return)	2	48 Volt Negative Lead	2
		48 Volt Positive Lead (return)	3

Rear Access Shelf

Pin 1: -48 V DC Battery

Pin 2: -48 V DC RTN

TiP0043

Front Access Shelf

Pin 1: Frame ground

Pin 2: -48 V DC negative lead

Pin 3: Return

TiP0004
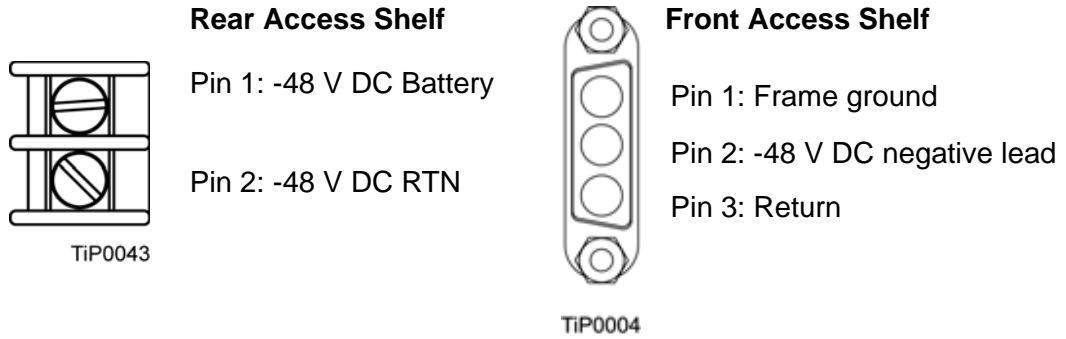
Figure 3-5.   Power Terminal Connectors

Rubber grommet
appropriate for cable

Shell

Pins

Connector

TiP0025
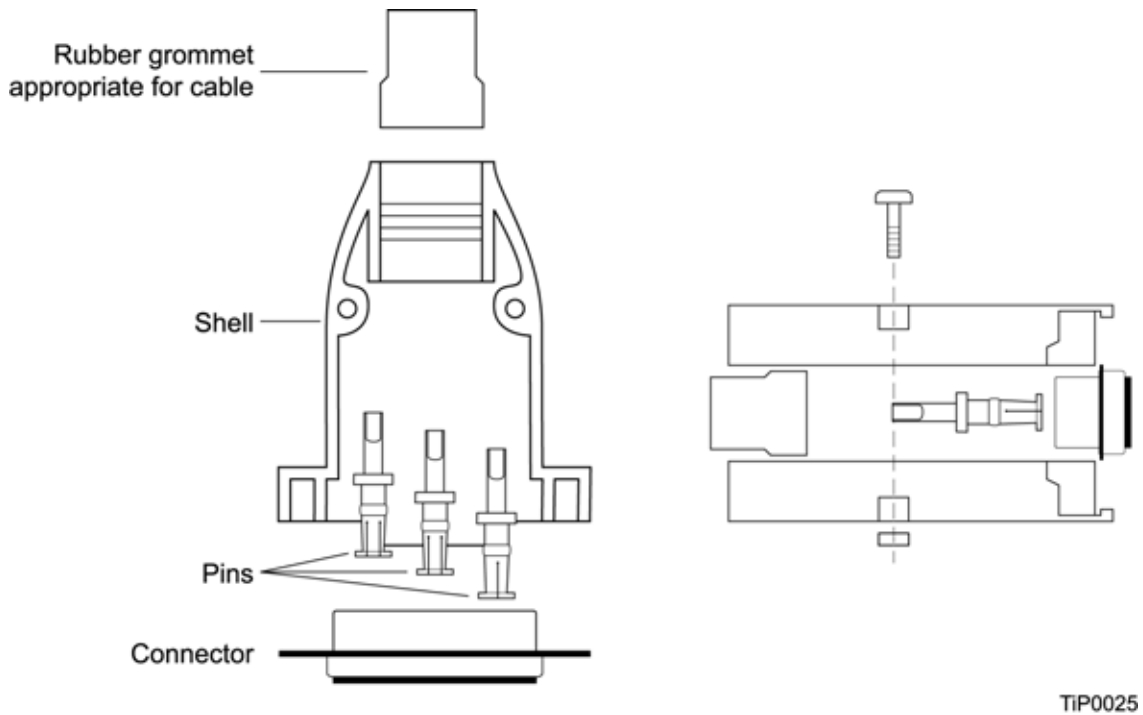
Figure 3-6.   Assembling the ETSI (Front Access) Power Connector

Expansion Panel

All connections to the Expansion Panel, including power, are made using the interconnection cable, part number 060-58002-03.

Verifying Power and Grounding Connections

To verify power and grounding connections:

1. Using a DVM, measure the voltage between pins 1 and 2 on the rear access (NEBS) connector or between pins 2 and 3 of the front access (ETSI) connector.

2. Verify that voltage is –36 to –72 V DC. The inputs are protected against reverse polarity.

Making Input Connections

You connect the input signals to the TimeProvider using one of the Input modules listed in Table 3-2. Connect the Input module to the shelf before you attach cables.

Table 3-2. Input Connector Modules Available for the IOC

Item Number	Description	Alarm Connector	Reference
090-58061-01	BNC Input module	DB-25 (see Table 3-6)	Figure 3-7
090-58061-02	Wire-wrap Input module	Wire-wrap	Figure 3-8
090-58061-03	DB9 Input module	DB-25 (see Table 3-6)	Figure 3-9
090-58061-04	BT43 Input module	DB-25 (see Table 3-6)	Figure 3-10
090-58061-05	Metric (Siemens) 1.0/2.3 Input module	DB-25 (see Table 3-6)	Figure 3-11
090-58061-06	Metric (Siemens) 1.6/5.6 Input module	DB-25 (see Table 3-6)	Figure 3-11

Installing the Input Module

Attach the Input module to the shelf and secure it by tightening the screws on each side of the module.
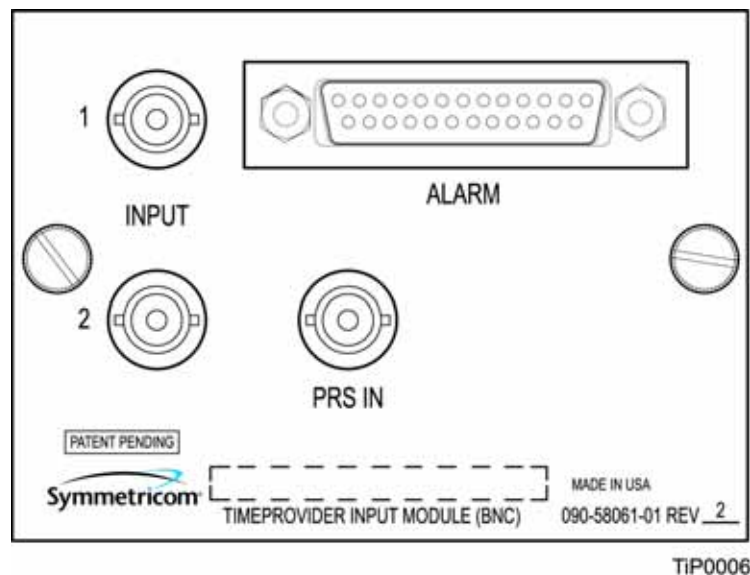
Figure 3-7.   BNC Input Module
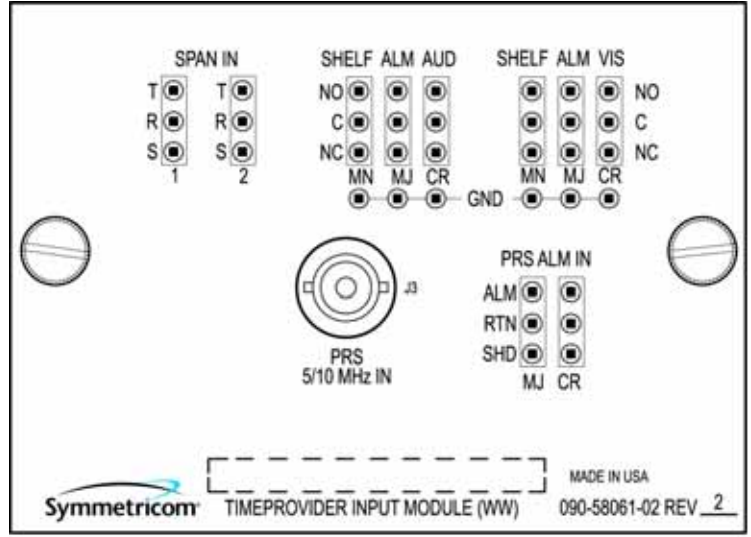
Figure 3-8.   Wire-Wrap Input Module
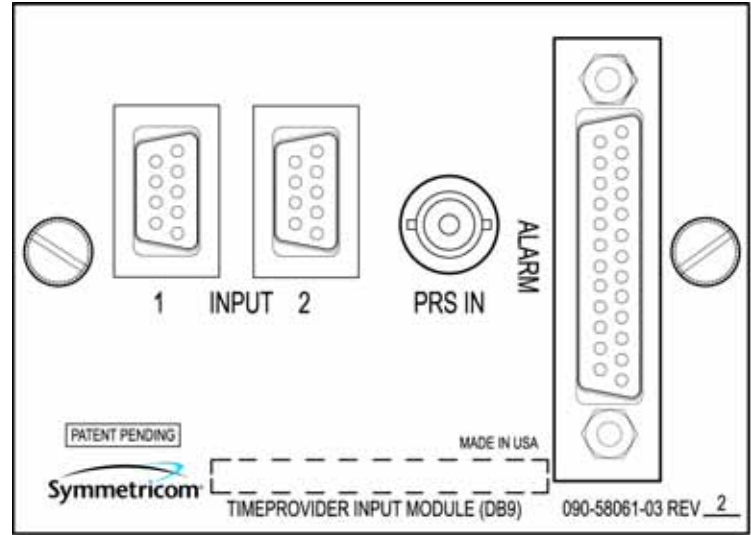
Figure 3-9.   DB9 Input Module

The pinout for the DB9 Input module is shown in Table 3-3.

Table 3-3. Pinout for the DB9 Input Module

Pin	Description
3	Chassis ground
4	Span Input Tip
8	Span Input Ring
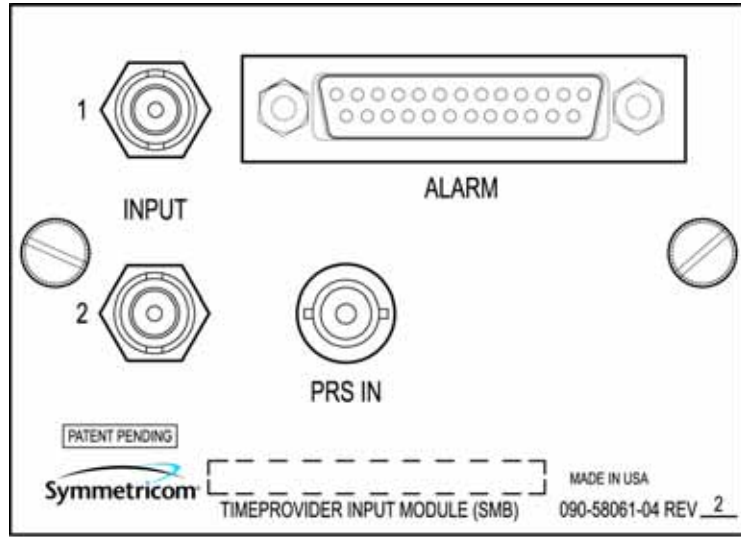
Figure 3-10.   BT43 Input Module
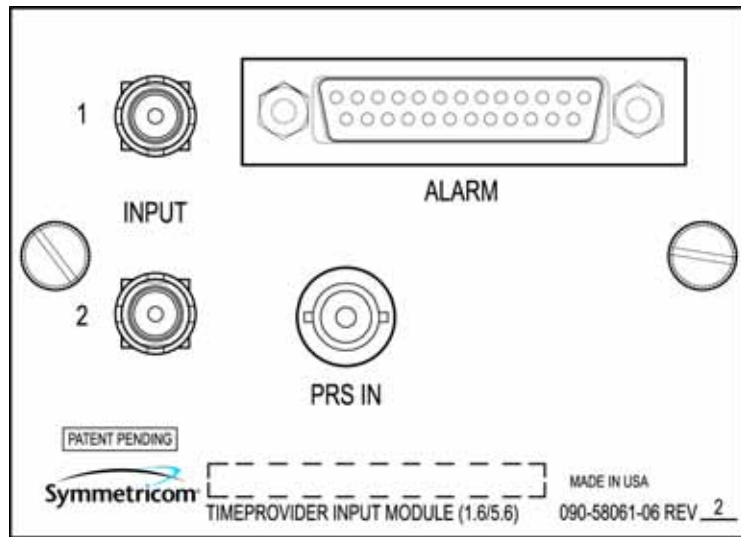
Figure 3-11.   Metric (Siemens) Input Module

Making Output Connections

You make the output signal connections using one of the Output modules listed in Table 3-4. Attach the module to the shelf before you connect cables.

Table 3-4. Output Connector Modules

Item Number	Description	Reference
090-58091-01	BNC Output module	Figure 3-12
090-58091-02	Wire-wrap Output module	Figure 3-12
090-58091-03	DB9 Output module – four connectors	Figure 3-13
090-58091-07	DB9 Output module – eight connectors	Figure 3-13
090-58091-04	SMZ/BT43 Output module	Figure 3-14
090-58091-05	Metric (Siemens) 1.0/2.3 Output module	Figure 3-14
090-58091-06	Metric (Siemens) 1.6/5.6 Output module	Figure 3-14
090-58071-02	Wire-wrap TIA/EIA-B-422 Output module	Figure 3-15

Installing the Output Module

Attach the Output module to the shelf and secure it using the screws at the top and bottom of the module.

Table 3-5 lists the pinout for the DB9 four-connector Output module (090-58091-03), and the DB9 eight-connector Output module (090-58091-07) which are shown in Figure 3-13.

Table 3-5. Pinout for the DB9 Output Module

4-Connector Output Module		8-Connector Output Module	
Pin	Description	Pin	Description
1	Port A Tip	1	Chassis Ground
2	Port A Ring	2	Tip (or Ring)
4, 5, and 6	Chassis Ground	6	Ring (or Tip)
8	Port B Tip	3, 4, 5	Not used
9	Port B Ring	7, 8, 9	Not used
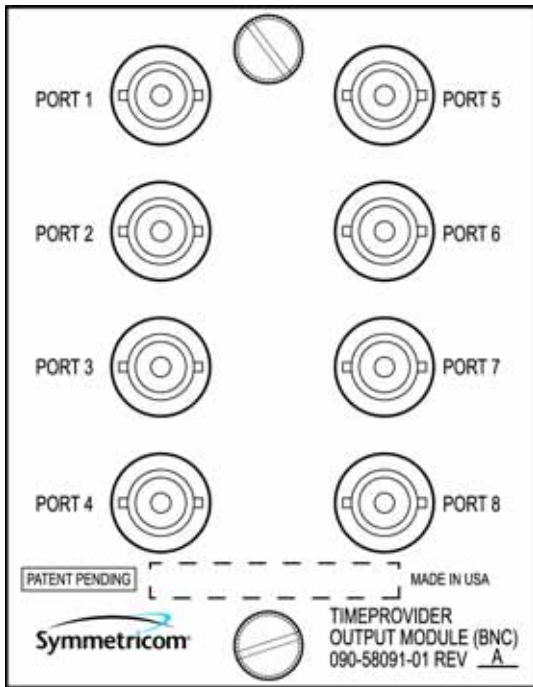
TiP0010
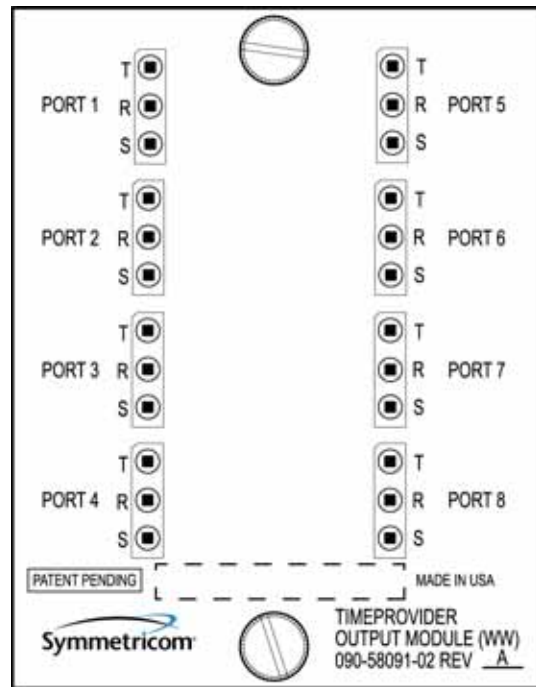
TiP0016

Figure 3-12.   BNC and Wire-Wrap Output Modules
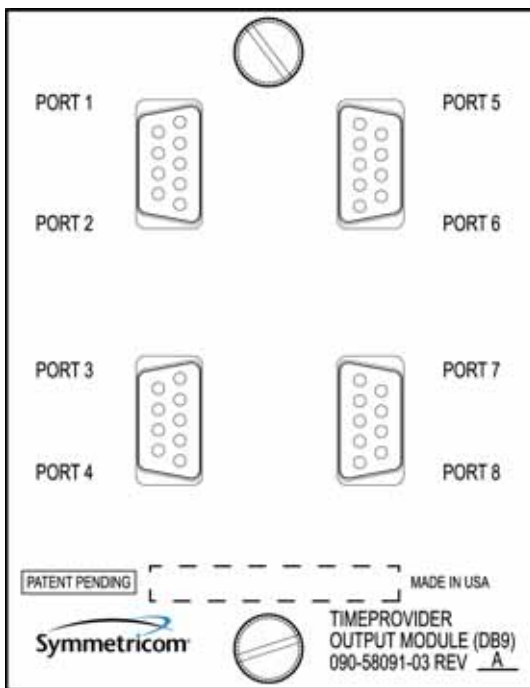
TiP0011
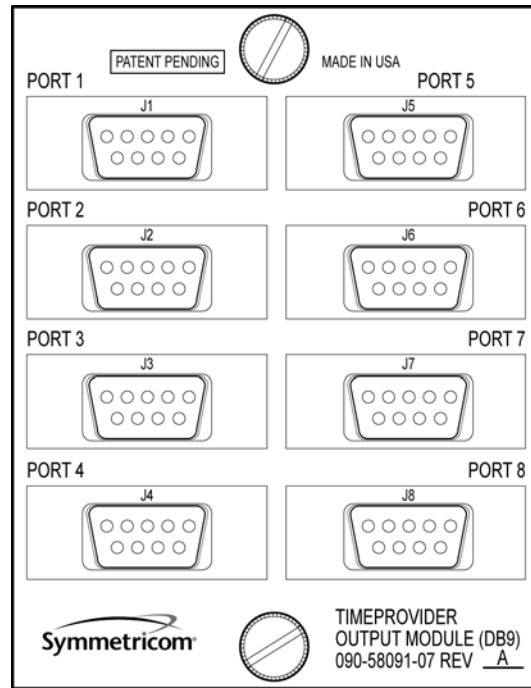
TiP0044

Figure 3-13.   DB9 Output Modules

TiP0017   TiP0018
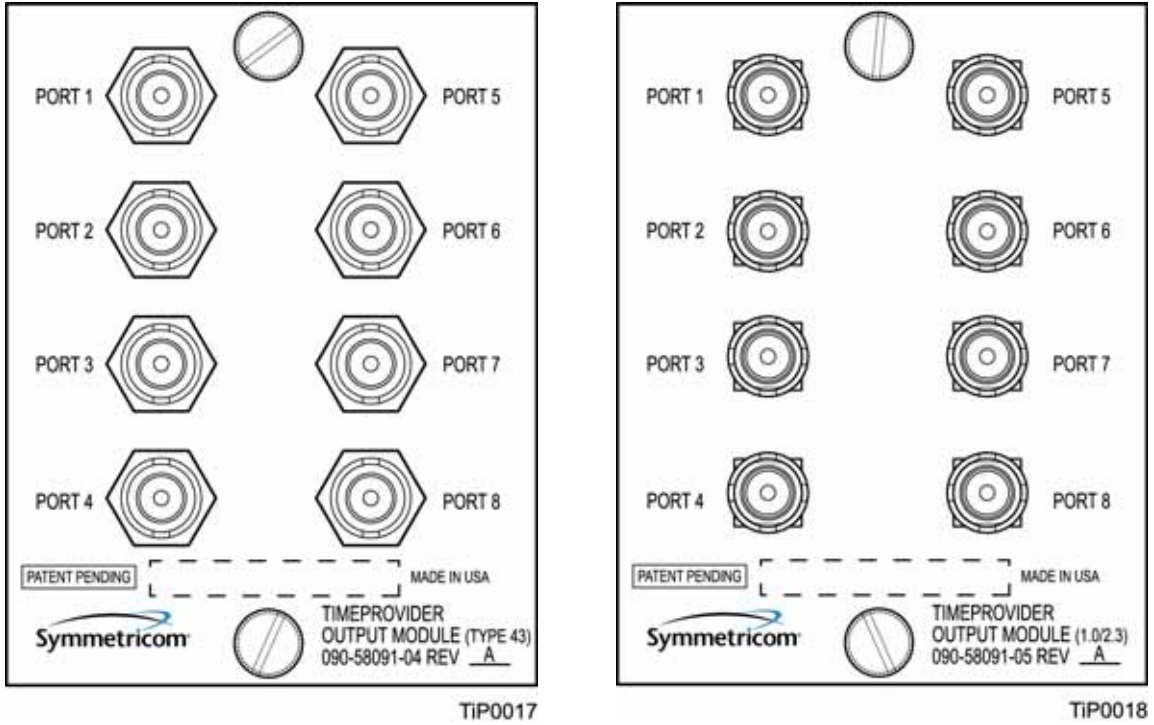
Figure 3-14.   BT43 and Metric (Siemens) Output Modules

TiP0041
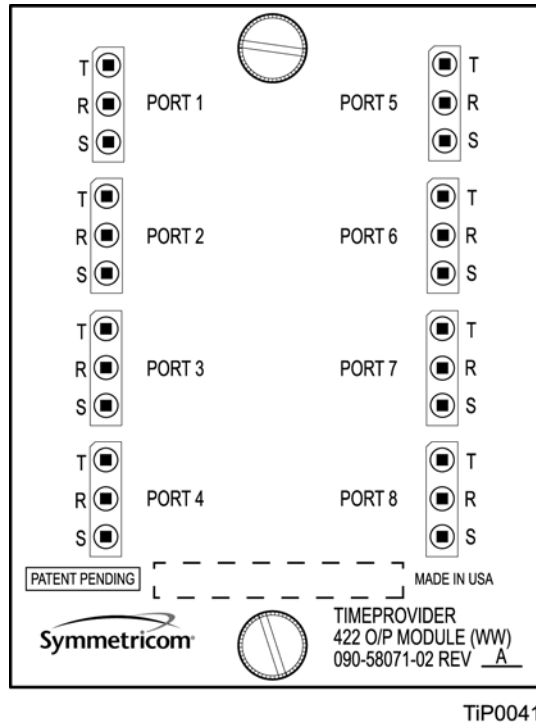
Figure 3-15.   B-422 Output Module

Making Retimer Connections

The front panel of the E1 Retimer module and T1 Retimer module (shown in Figure 3-16) indicates the input and output connections for a typical installation. Side 1 of the Retimer provides 3R (Re-shape, Re-amplify, and Re-time) for the E1 or T1 signal to a client Network Element.
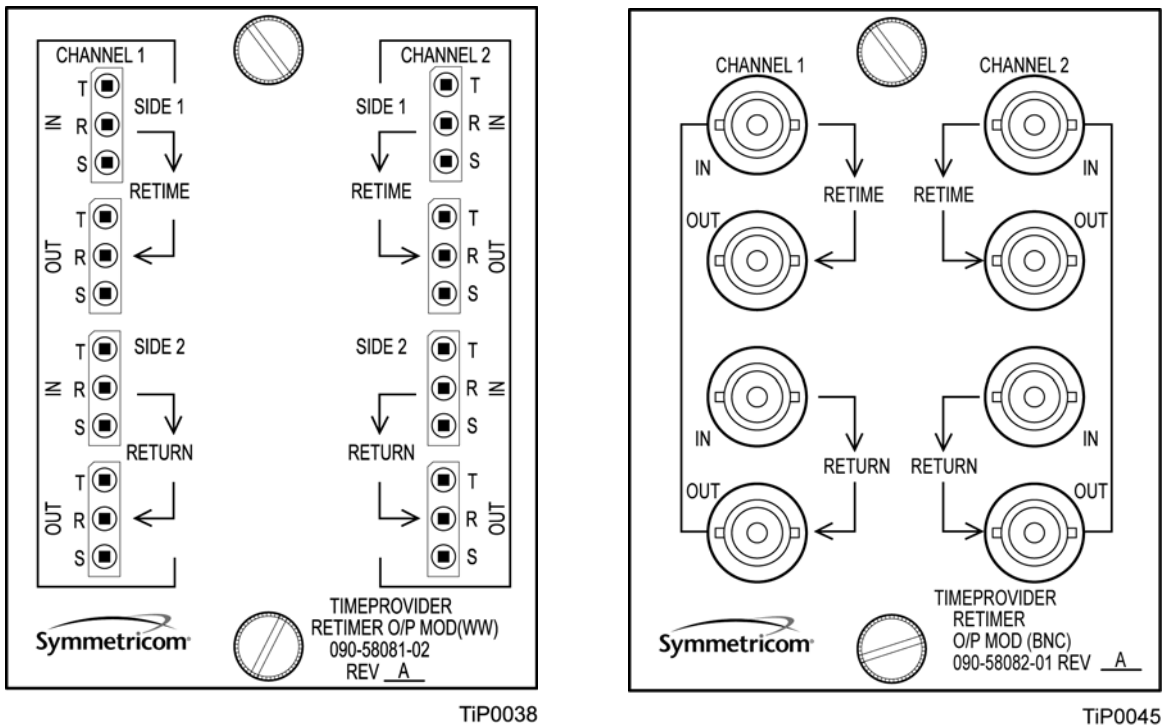
Figure 3-16.   Front Panel of the T1 (wire-wrap) and E1 (BNC) Retimer Modules

Figure 3-17 illustrates a sample schematic for connecting a Retimer connected to both sides of a DSX-1 panel in a Central Office.
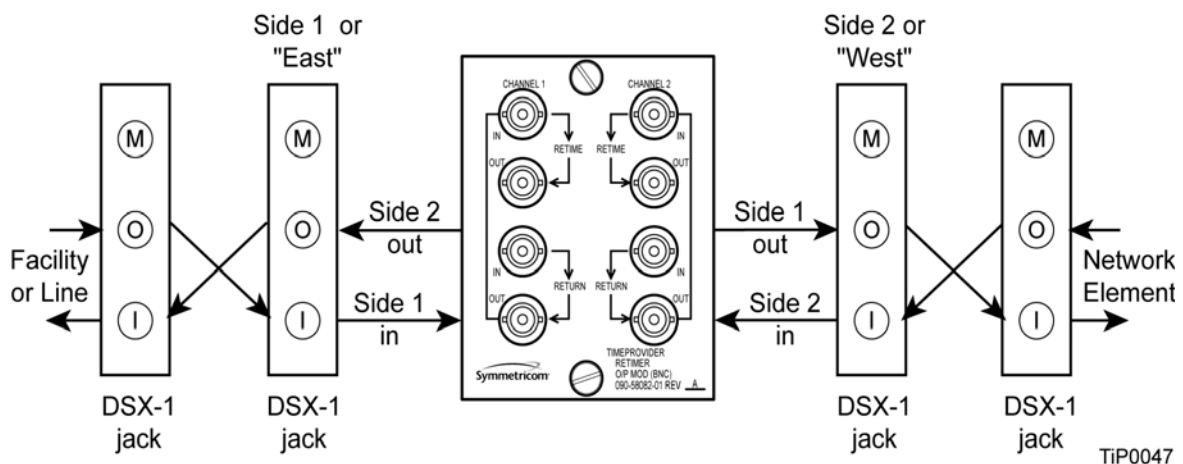
Figure 3-17.   Sample Installation Schematic for a Retimer

Making Alarm Connections

To install alarm connections on the Input Module, use a customer-supplied DB-25 connector to build an alarm connection to the TimeProvider. Table 3-6 lists the pinout for the DB-25 Alarm connector found on all the Input modules (except the wire-wrap version).

Table 3-6. Alarm Connector Pinout

Pin	Description
1	No Connection
2	Minor Normally Closed (NC) Audible
3	Minor Common Audible
4	Minor NC Visual
5	Minor Common Visual
6	Major NC Audible
7	Major Common Audible
8	Major NC Visual
9	Major Common Visual
10	Critical NC Audible
11	Critical Common Audible
12	Critical NC Visual
13	Critical Common Visual
14	Ground
15	Minor Normally Open (NO) Audible
16	Critical PRS Input NO
17	Minor NO Visual
18	Critical PRS Input Common
19	Major NO Audible
20	Major PRS Input NO
21	Major NO Visual
22	Major PRS Input Common
23	Critical NO Audible
24	No Connection
25	Critical NO Visible

Pin 1 ──────► ○○○○○○○○○○○○○
○○○○○○○○○○○○○ ◄────── *Pin 25*

TiP0012
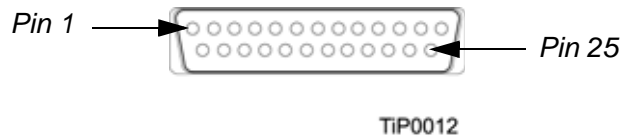
Figure 3-18.   DB-25 Alarm Connector (Front View)

Making GPS Connections

To connect a GPS signal to the TimeProvider, you must install a GPS antenna with either the standalone TimeProvider Interface Unit (TPIU) and an IMC or the integrated IMC/TPIU card using the procedures in this section.

Installing the GPS Antenna

These installation procedures are to be used in support of local company procedures and the Installation Job Specification.

Prior to installing the antenna, you should plan the site, antenna location, lightning suppressor location, cable route, and all other details. Use Figure 3-19 as a guide to locating the antenna.

Antenna position

No single obstruction more
than 12.5% of field of view

Total obstructions
no more than 25%
of field of view

Antenna
field of view

Obstructions
toward Pole
if possible

10°
Mask Angle*

10°
Mask Angle

Horizon

Equator

Pole

* An angle of 10° masks objects up to about 3.5 ft above the
horizon at 20 ft from the antenna (illustration at right).

10°   3.5 ft

20 ft

TiP0024
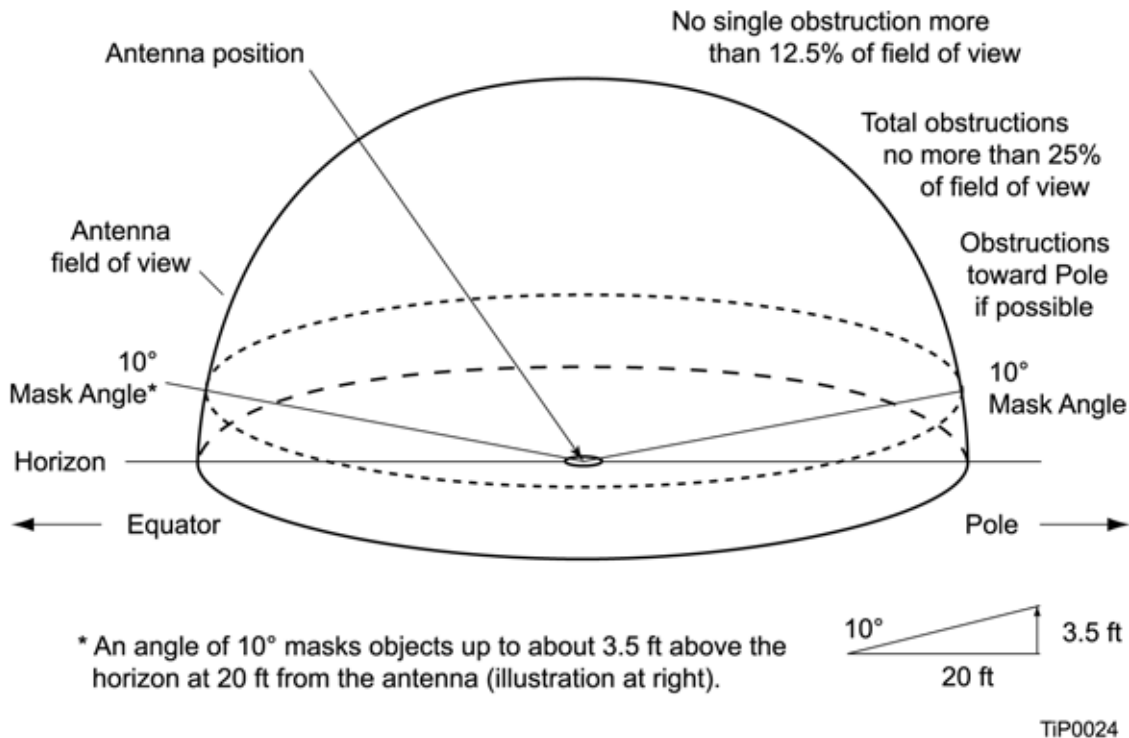
Figure 3-19.   Locating the GPS Antenna

To install the antenna, refer to Figure 3-20, and perform the procedure in this section. Ensure all user-supplied materials are available. The maximum distance between the antenna and the shelf is 1000 feet (304 m).

Warning: To prevent arcing, ensure that the lightning suppressor is installed away from electrical devices and cabling.

Warning: To prevent possible damage to the TimeProvider, use only the lightning suppressor supplied with the antenna kit.

Note: Use the following antenna installation instructions as a guideline only. Install the antenna using company-approved techniques, and follow all appropriate local building and electrical codes.

Note: To achieve optimum results, the TimeProvider GPS rooftop antenna requires a minimum cable length of 8 meters (27 feet) from the antenna to the TimeProvider system; this overall length includes the cable section to the lightning suppressor.

Recommendation: Symmetricom recommends that you use one of the following grounding points:

- Valid roof ring ground system.
- Cad weld to building structural steel.
- Central office ground plate within 15 m of antenna cable entrance into building.

Order two cables, or a single cable run can be made from the antenna to the TimeProvider shelf. The cable can then be cut at the lightning suppressor location, and TNC connectors attached to the cut ends of the cable. The "xx" in the part number indicates the cable length.
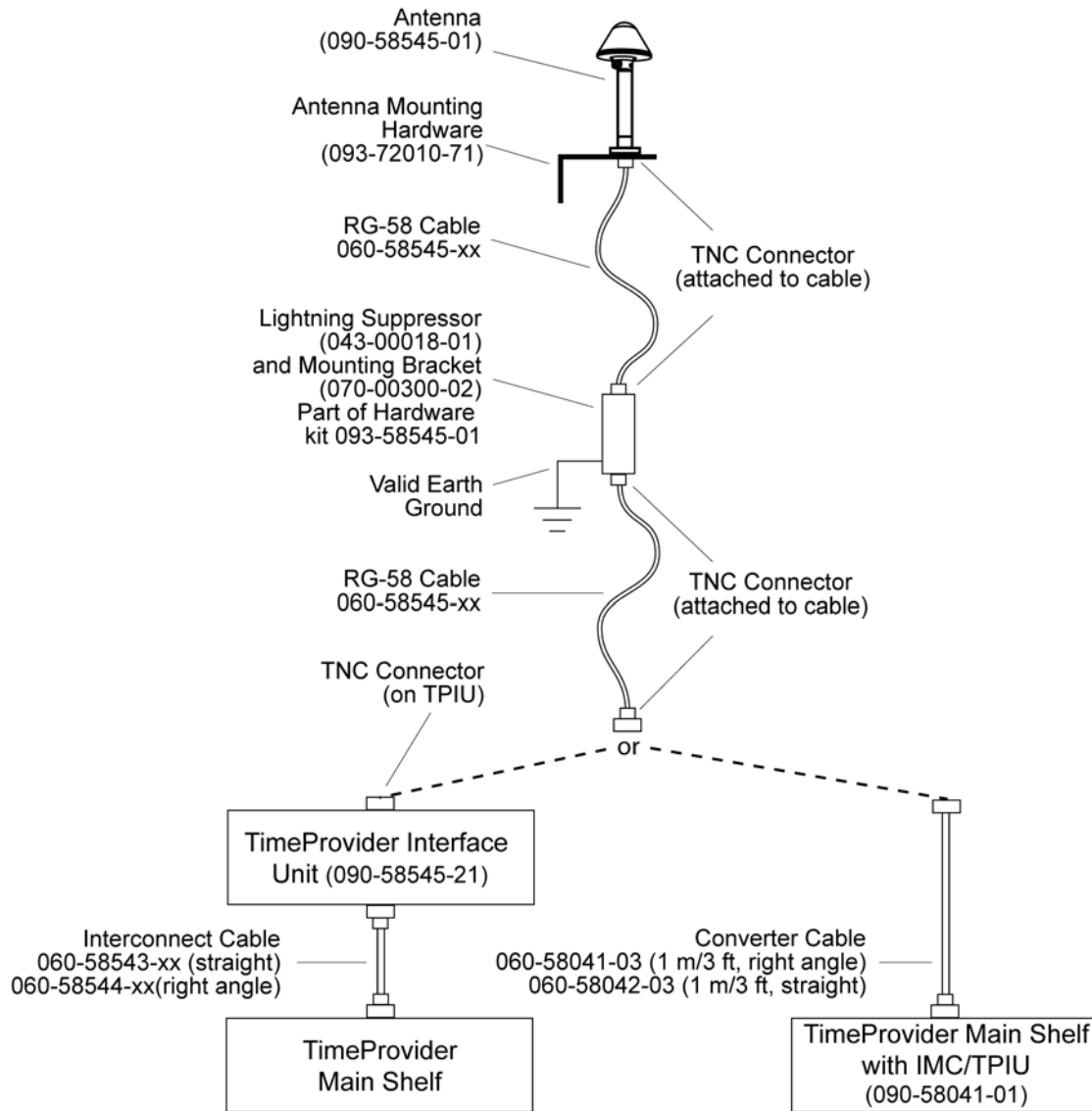
Figure 3-20. Antenna-to-Shelf Cabling

To install the antenna:

1. Attach the antenna mounting bracket to a 1-inch (2.5 cm) diameter pipe or wood post.

   – If you are mounting the bracket to a pipe, assemble as shown in Figure 3-21. Slide the two V-bolts over the pipe, and through the mounting bracket slots; then place the provided four washers and four nuts over the V-bolts, against the mounting bracket. Leave the V-bolts loose enough to allow for final adjustments.
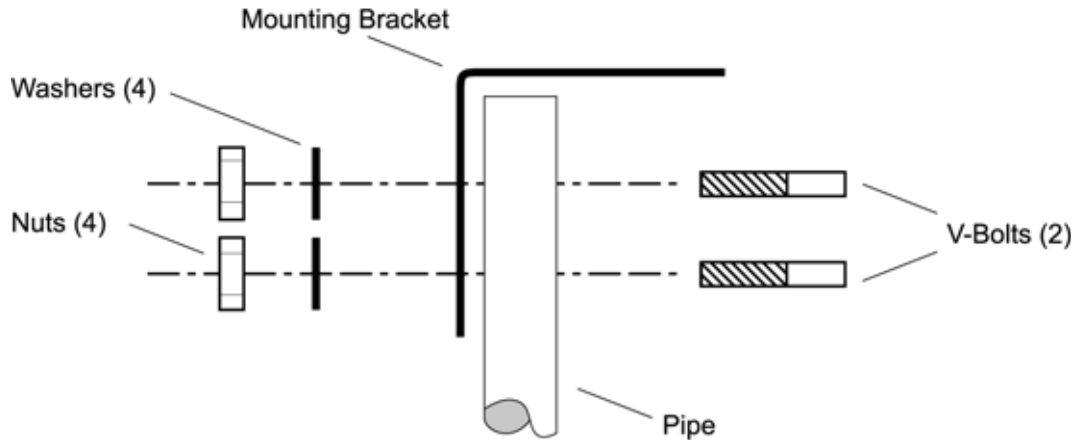
Figure 3-21. Installing the Antenna Bracket on a Pipe

- If you are mounting the bracket to a wood post, assemble as shown in Figure 3-22. Install the provided two self-tapping screws in two diagonally positioned mounting bracket slots, and attach to the post.
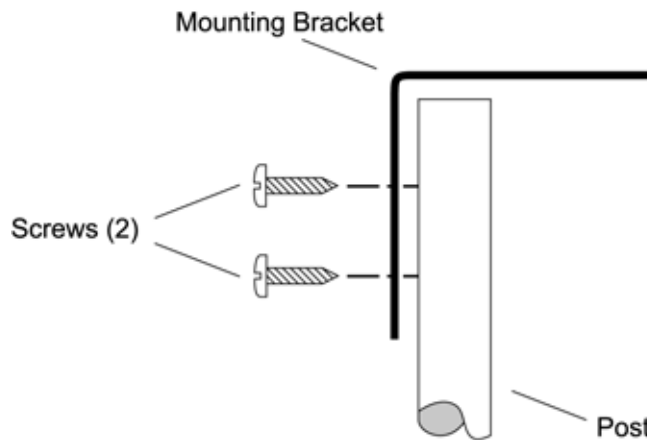
Figure 3-22. Installing the Antenna Bracket on a Post

Mount the antenna and mast assembly to the "L" bracket.

2. Connect the mast to the flange using PVC glue.

3. Feed an RG58 (060-58545-xx) cable through the bottom of the mast as illustrated. See Table 2-4 for specific cable lengths.

4. Connect the cable to the antenna "pigtail" and pull the cable back through the mast.

5. Mount the antenna to the mast.

6. Mount the antenna and mast assembly to the "L" bracket using the supplied nuts, bolts, and washers, as shown in Figure 3-23.
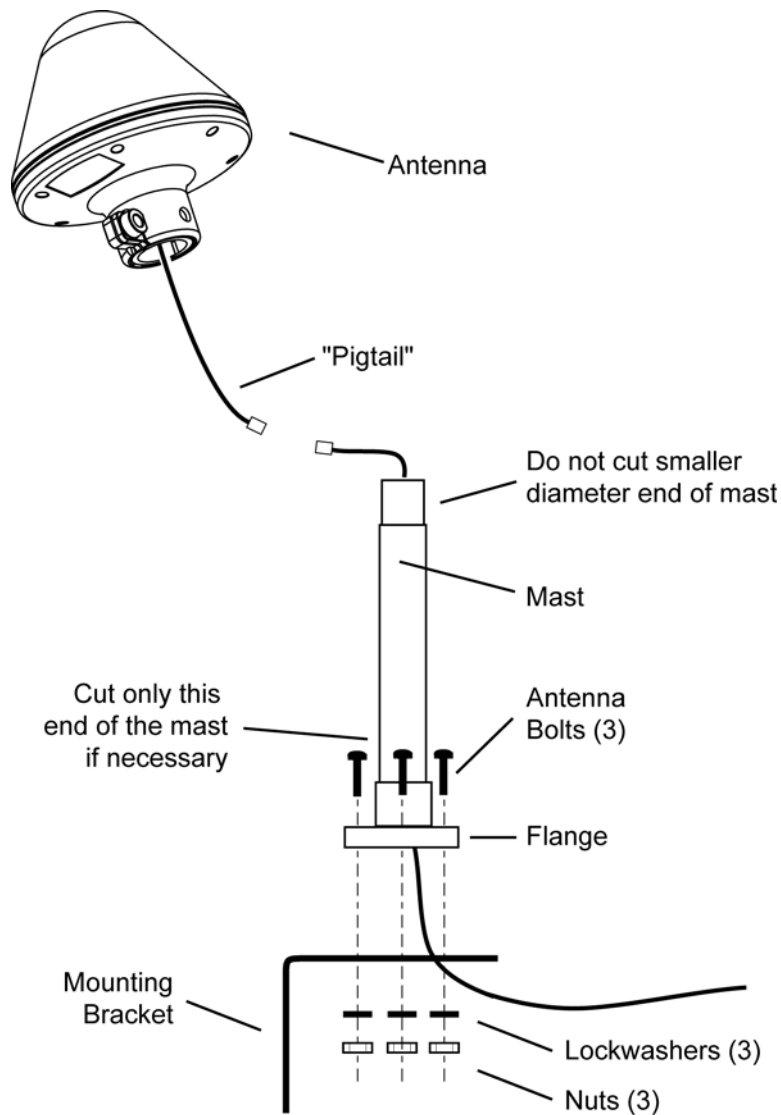
Figure 3-23. Attaching the Antenna to the Bracket

7. Using a plumb line or bubble level, ensure the antenna is within 5° of vertical (perpendicular to the horizon), and tighten the mounting bracket bolts.

8. Bolt the lightning suppressor mounting plate to a flange that is attached to a valid earth ground. The roof ring ground system, a Central Office grounding plate, and building structural steel are examples of valid earth ground points. If the mounting plate cannot be bolted to a valid earth ground, bolt the mounting plate to a point within 15 feet (4.6 m) of the chosen valid earth ground. If the mounting plate is to be installed in a nonmetallic junction box, perform the installation and bolt the assembly near the chosen valid earth ground.

> **Note:** A junction box must have inside dimensions of at least 7 cm by 7 cm by 4 cm to hold the mounting plate and attached components.

9. Assemble the lightning suppressor as shown in Figure 3-24.
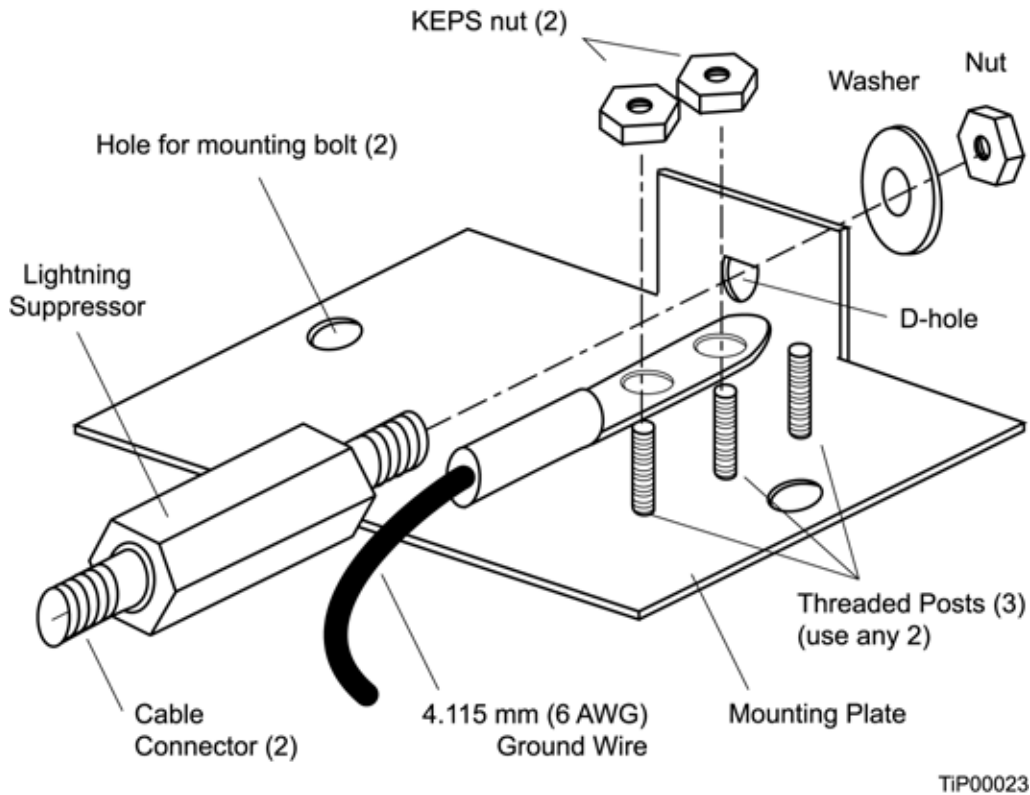
Figure 3-24.   Assembling the Lightning Suppressor

10. Install 1.5 inch (3.8 cm) nonmetallic conduit from the antenna to the lightning suppressor, and from the lightning suppressor to the cable entrance into the building.

11. Install a user-supplied bracket, preferably non-metallic, to support the vertical section of conduit to the antenna.

12. Route the antenna cable through the conduit, and connect the cable to the lightning suppressor. See Table 2-4 for specific cable lengths.

13. If the lightning suppressor is not mounted directly to a valid earth ground, crimp a length of 4.115 mm (6 AWG) ground cable to the two-hole terminal, slide the terminal over any two of the three threaded posts on the lightning suppressor mounting plate, and attach the terminal to the mounting plate with two KEPS nuts. Use the two posts that allow the least bending of the cable.

14. Connect an RG58 (060-58545-xx) cable between the lightning suppressor and the TPIU. See Table 2-4 for specific cable lengths.

    If you are using the integrated IMC/TPIU, install the appropriate converter cable (060-58041-03, 1 m/3 ft, right angle connector or 060-58042-03, 1 m/3 ft, straight connector) to the DB15 GPS connector on the main shelf. Connect the other end of the converter cable to the RG58 cable from the lightning suppressor.

15. Install fire-stopping material in all holes opened in the roof and/or walls during this procedure.

16. Check all connections for tightness to prevent arcing and intermittent operation.

17. Coat all exposed connectors with an electrically conductive antioxidant compound (e.g. Kopr-Shield spray).

Installing the Integrated IMC/TPIU

You install the integrated IMC/TPIU in the IMC slot in either TimeProvider main shelf, as shown in Figure 1-4. Use the installation procedure described in Replacing the IMC or IMC/TPIU, on page 163.

Installing the TPIU

You mount the TPIU on a rack near the TimeProvider main shelf. Symmetricom supplies the connecting cable (060-58543-xx or 060-58544-xx) in several lengths, as listed in Table 2-4. The Integrated GPS Antenna kit (990-58545-01 or 990-58545-02) is delivered with a 1m/3 ft. interconnect cable. Mount the TPIU to the rear rails of the rack using the provided rack ears. Install the TPIU so that the front panel is on the same side as the Output modules. Figure 3-25 and Figure 3-26 illustrate alternate mounting schemes.

To connect the TPIU to the shelf, attach the DB15 interconnect cable (060-58543-03 or 060-58544-03) to the connector labeled "GPS" on the TimeProvider shelf. This connector is on the front panel of the Model 1000 and on the rear panel of the Model 1100. Connect the other end of the cable to the DB15 connector on the TPIU.

To use the GPS signal, set the TimeProvider to the PRR mode, as described in Provisioning the IOC, on page 105, or enable the GPS input when in SSU mode.
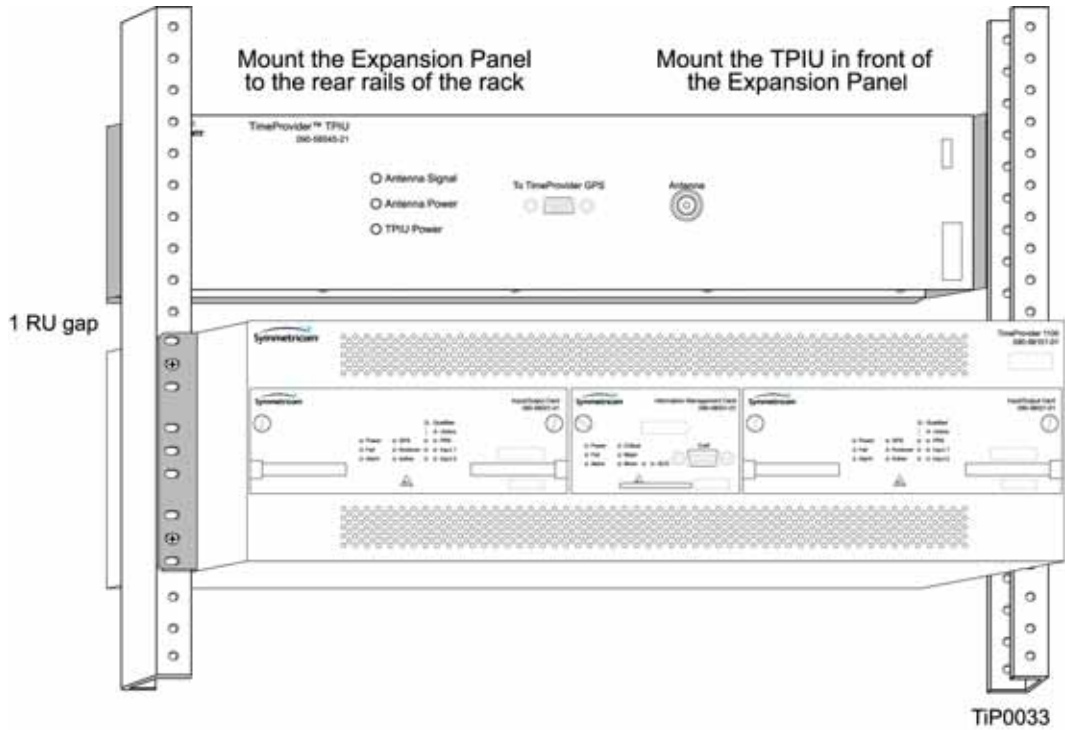
Figure 3-25.   Mounting the TPIU and Expansion Panel on the Same Rack Ears
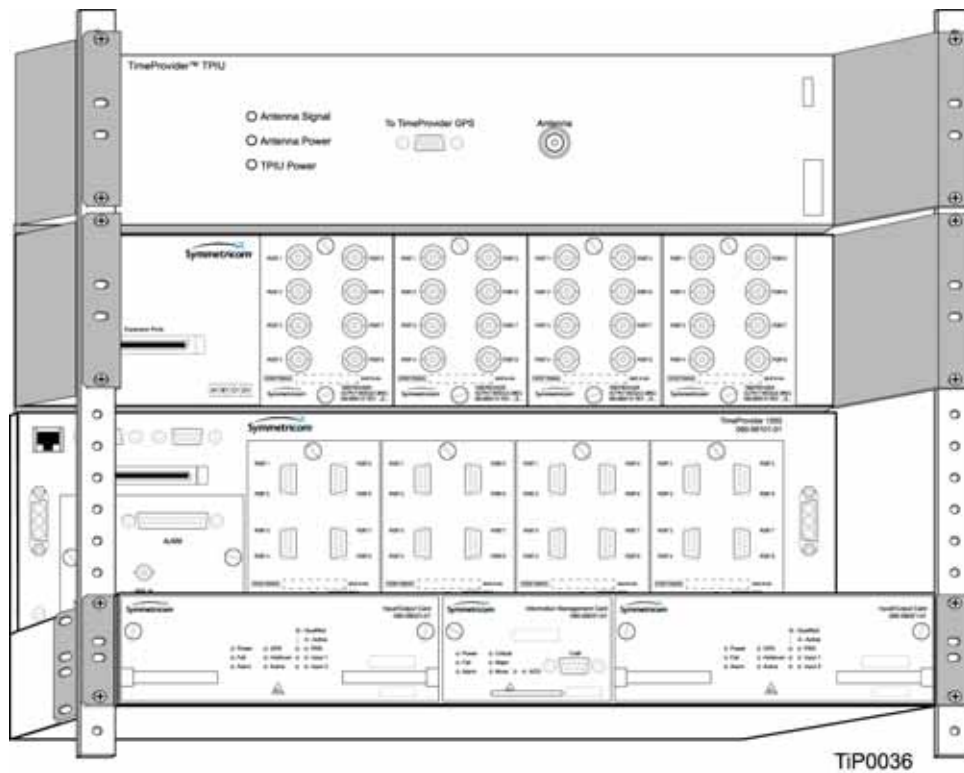
Figure 3-26.   Mounting the TPIU with a Model 1000 ETSI-Style Shelf

Making Communications Connections

The TimeProvider has one Ethernet and two serial ports available. The Ethernet connector is on the front panel of the Front Access shelf and on the rear panel of the Rear Access shelf; the local Craft serial port is on the faceplate of the IMC or IMC/TPIU, and the Remote port is on the shelf.

The local Craft serial port is used for control and monitoring of the unit, and is configured as a DCE device. The Remote port can be used for remote dial-in connection to the unit, and is configured as a DTE device.

Connecting to the Local Craft and Remote Serial Ports

To connect a device to the local Craft or the Remote serial port, perform the following steps:

1. Connect a 9-pin serial cable to the desired port.

2. Connect the other end of the cable to the serial port of the PC or terminal device. Use the procedure described in Starting the TimeProvider for the First Time, on page 88, to connect to the TimeProvider.

The default settings for the local Craft serial port are DCE, 9600 Baud, 8 bits, no parity, 1 stop bit, echo on, and handshaking disabled. Table 3-7 lists the signal connections for the serial ports.

Table 3-7. Connector Pinouts for the Serial Ports

Local Craft Connector		Remote Connector	
Signal	**Pin**	**Signal**	**Pin**
Local CD	1	CD	1
Local RD (Received Data)	2	RD	3
Local TD (Transmitted Data)	3	TD	2
Local DTR (Data Terminal Ready)	4	DTR	6
Ground	5	GND	5
Local DSR (Data Set Ready)	6	DCE	4
Local RTS (Request to Send)	7	RTS	8
Local CTS (Clear to Send)	8	CTS	7
Local RI (Ring Indicator)	9	RI	9

The default settings for the Remote serial port are DTE, 9600 Baud, 8 bits, 1 stop bit, no parity (also known as 8-1-N), echo on, and handshaking disabled. The local port settings revert to factory default values when you reset the IMC.

Changing Communications Settings

To change the communication settings for the local or remote serial ports:

1. Connect a PC or laptop with terminal emulation software, such as Windows® Hilgraeve HyperTerminal© or ProComm Plus™ to the port and log in. For a complete description of this procedure, see Setting Communications Parameters, on page 91.

2. Use the ED-EQPT command to change the communications settings for the port as required. See Setting Communications Parameters, on page 91, and also refer to the *TimeProvider TL1 Reference Guide* for a description of TL1 commands.

Installing Connections to the Ethernet Port

You can connect a PC or terminal to the TimeProvider using the LAN connector for local monitoring or control, or you can connect the TimeProvider to a network for monitoring and control from a remote site.

> **Note:** The TimeProvider can be controlled through a TCP/IP network connection, but before you can use it, you must configure the Ethernet settings using a serial connection. Refer to Setting Ethernet Parameters, on page 93.

Direct Ethernet Connection

You use a direct Ethernet connection when a service technician is on-site. You must configure the Ethernet settings using TL1 commands over a serial connection before you can use the Ethernet connection. Use the direct connection to troubleshoot a LAN connection.

To connect the TimeProvider to a PC or terminal, perform the following steps:

1. Connect an RJ-45 Ethernet crossover cable to the LAN connector on the shelf.

2. Connect the other end of the cable to the PC or terminal.

3. Start a terminal emulation program such as HyperTerminal or ProComm Plus. Configure the program for a telnet session and enter the IP address of the TimeProvider. Use Port 5000 to connect.

4. Type ; (semicolon). If the TimeProvider responds with a Deny response, you have established communications. If you do not receive the Deny response, check the connections, the cable, and the program settings.

Network Connection

You can use a network connection for routine monitoring and control of the TimeProvider from a remote site. Perform the following steps to connect the TimeProvider to a network.

1. Connect one end of an RJ-45 cable to the LAN outlet. Connect the other end of the cable to the LAN connector on the TimeProvider.

2. To connect the PC or laptop to the LAN, connect one end of the RJ-45 cable to the Ethernet port of the PC or laptop. Connect the other end of the cable to the LAN outlet.

3. Use a remote monitoring software application such as SynCraft or TimePictra to connect to and monitor the TimeProvider. See Appendix B, CRAFT Software Reference, for more information on installing and using SynCraft.

Table 3-8 lists the Ethernet communications port signal connections.

Table 3-8. Ethernet Communications Port Signal Connections

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

Installation Check List

To verify that the installation of the TimeProvider is complete, perform the following checks and procedures in Table 3-9.

Table 3-9. Installation Completeness Checklist

Operation/Indication	Complete
Verify that all power and ground wires are installed correctly and securely.	
Verify that all communications cables are properly installed.	
Verify that all input and output cables are properly installed.	

Powering Up the Shelf

There is no power switch on the TimeProvider. When you apply power to the unit, it enters the warm-up state. See Starting the TimeProvider for the First Time, on page 88, for more information on powering up the shelf.

Working With Cards

This section describes how to install, remove, and handle the cards associated with the TimeProvider.

Properly Handling Cards

When handling any of the cards, observe the following precautions:

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

- Avoid touching component leads and edge connectors.

- Avoid placing the card on an ungrounded surface.

- Avoid allowing the card to come in contact with insulated surfaces.

Inserting Cards

This procedure is common for all cards.

> **Note:** Cards can be removed and inserted while system power is supplied without damaging modules; however, system performance may be affected.

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

To insert a card into the shelf:

1. Align the card edges within the guides of the selected slot.

2. Slide the card into the chassis and press firmly until it seats fully into its backplane edge connector.

3. Tighten the captive screws located on each side of the panel.

> **Caution:** To avoid possible damage or intermittent failures, ensure that you have completely inserted the card into the chassis and that you have securely tightened the captive screws.

Removing Cards

To remove an IOC, lift the tabs on the front panel and slide it out of the shelf. Be sure to place the card on a static-free surface.

To remove the IMC or IMC/TPIU, loosen the captive screws and pull on the U-shaped handle.

To remove the Input, or Output modules, loosen and then pull out on the captive screws.

Firmware Features

Table 3-10 describes the features provided in recent releases of the operating firmware for the IOC and IMC.

Table 3-10. Firmware Feature Matrix

IMC Release	IOC Release	Features Added
1.01.04	1.01.02	■ E1/T1/2.048 MHz signals ■ Quartz IOC ■ SSMs
1.02.01	1.02.12	■ GPS ■ Rubidium IOC ■ Japanese input/output signals ■ Composite Clock signals
1.03.03	1.03.04	■ T1 Retimer ■ Input/output port labeling ■ Enhanced event log management
1.04.02	1.04.02	■ NTP ■ TIA/EIA-B-422 output signals ■ Integrated IMC with TPIU (IMC/TPIU) ■ Programmable E1 SSM bit position ■ Programmable CAS/CCS framing on inputs and outputs
1.04.02	1.04.06	■ E1 Retimer ■ 8-Port DB9 Output module ■ Improved Pull-in/Hold-in range
1.05.04	1.05.00	■ SNMP

Chapter 4 Provisioning the TimeProvider

This chapter describes the procedures for provisioning the TimeProvider and the available Expansion Panel. Use the procedures in this chapter after you have installed the TimeProvider (see Chapter 3, Installing the TimeProvider).

For detailed information on the syntax and format for each available TL1 command, refer to the *TimeProvider TL1 Reference Guide*, part number 097-58001-01.

In This Chapter

- TL1 Overview
- Starting the TimeProvider for the First Time
- Setting Communications Parameters
- Defining the Security Parameters
- Managing the User List
- Using SynCraft
- Provisioning the IOC
- Provisioning the Input Reference
- Provisioning the Outputs
- Provisioning NTP Parameters
- Provisioning Alarms
- Provisioning SNMP Parameters
- System Commands
- Saving Provisioning Data

TL1 Overview

The TimeProvider uses the TL1 syntax; this chapter and the *TimeProvider TL1 Reference Guide* describes command lines and responses. For a complete description of the TL1 syntax, refer to Telcordia (Bellcore) Technical Reference TR-NWT-00831 and TR-NWT-00833.

TL1 Command Structure

The TL1 commands you issue to the TimeProvider use the following structure:

```
verb-modifier:|tid|:|aid|:[<ctag>]::|<keyword>|=<value||;
```

where:
: (colon) is a block separator
, (comma) is a parameter field separator
; (semicolon) is the terminating character for commands and responses
[ ] (square brackets) indicate optional parameters

Adjacent colons indicate unused fields. If an unused field is the last parameter in the list, for example the general block or the parameter block, you can omit the colon and simply type the semicolon.

If you enter a space in the command string, the TimeProvider ignores it.

TL1 commands are not case-sensitive.

Table 4-1 describes the syntax used in this manual.

Table 4-1. TL1 Syntax Conventions

Symbol	Description
^	Space character (ASCII 0x20)
<cr>	Carriage return (ASCII 0x0D)
<lf>	Line feed (ASCII 0x0A)
[...]	Optional command parameter or data
< ... >	ASCII characters sent in commands or returned in response
(...)	Numeric data that can be positive or negative

TL1 Response Format

Normal Response

For each TL1 command described in this chapter there is a normal response, an in-process response, or an error response. The TimeProvider response is always upper-case. The format of a normal response is:

```
<cr><lf><lf>
^^^sid^date^time<cr><lf>
M ^ctag^COMPLD<cr><lf>
;
```

The time and date is in the Telcordia GR-833 format. A sample normal response is:

```
    TIMEPROVIDER 03-08-28 11:23:54
M 1 COMPLD
;
```

In-Process Response

The TimeProvider sends an in-process response only if it cannot respond to the command within two seconds. The response terminates with a less-than character (<) with no semicolon until after the TimeProvider sends the requested output response message. The format of the in-process message is:

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

A sample in-process response is:

```
    TIMEPROVIDER 03-08-28 11:24:15
IP^2
<
```

Error Response

If you mis-type a command or issue an invalid command, the TimeProvider sends an error message. The format of the error response is:

```
<cr><lf><lf>
^^^sid^date^time<cr><lf>
M ^ctag^DENY<cr><lf>
^^^<errcde><cr><lf>
;
```

A sample error message is shown below:

```
    TIMEPROVIDER 08-28-03 11:32:12
M 3 DENY
    ICNV
;
```

The TL1 command may generate an event message specific to the command. This event message accompanies the command description in this chapter.

Autonomous Messages

In addition to the TL1 response messages described in the above sections, the TimeProvider returns Autonomous Messages to report alarms, configuration changes, or condition changes. Frequently, an Autonomous Message is returned at approximately the same time as the TL1 response message that is associated with a command, because the command happens to change the unit's state. Autonomous Messages are not directly correlated with commands, and therefore they do not contain a correlation tag (ctag).

The TimeProvider can generate an Autonomous Message at any time, whether to report that a user-initiated change has occurred, to report that an active alarm condition exists, or to report that an alarm has been cleared. The format of the Autonomous message is as follows; note that the text REPT identifies the response as a Autonomous Message.

```
<cr><lf><lf>
    sid date time <cr><lf>
almcde atag REPT reptype aidtype<cr><lf>
  aid,aditype:ntfcncde,condtype,srveff,ocrdat,ocrtim:condscr
"<cr><lf>
;
```

Refer to the *TimeProvider TL1 Reference Guide* for more information on Autonomous Messages.

Starting the TimeProvider for the First Time

The TimeProvider is delivered with a copy of SynCraft, Symmetricom's network management application. Before you can use SynCraft or other network management software, you *must* provision the following parameters, as described in this section and in :

- Source ID (sid)
- Date and time
- Ethernet parameters
- Security-level user

, provides procedures and instructions to get started using the SynCraft application.

Powering Up the TimeProvider

To power up the TimeProvider, perform one of the following tasks, as appropriate:

- Connect the power leads from the power supply (see Making Power Connections, on page 61)
- Install the fuse in the fuse panel
- Turn on the power supply

LED Indications on Power-up

The LEDs on the IMC, IOC, and TPIU (if present) illuminate in the following sequence:

The LEDs on the TPIU remain off until the Master shelf has completed its power-on testing and the GPS input has been enabled. The TPIU and Antenna Power LEDs light green and the Antenna Signal LED lights red. When the Master shelf completes its power-on testing, the Antenna Signal LED lights green, indicating that the TPIU is receiving a valid signal from the antenna.

Logging In for the First Time

To log in to the TimeProvider for the first time, you must create a username and password using the TL1 commands described below. Once you create a username and password, you can connect to the TimeProvider using the SynCraft application as described in Using SynCraft, on page 102, or using the TL1 commands in this section.

1. Connect a straight-through DB-9-to-DB-9 serial cable to the local Craft port located on the front panel of the IMC or IMC/TPIU card. Connect the other end of the cable to a computer.

2. Start a terminal emulation program such as HyperTerminal or ProComm Plus. Configure the program for 9600 baud, 8 data bits, No parity, and 1 stop bit, which are the TimeProvider's default communication parameter values.

3. Type ; (semicolon). If the TimeProvider responds with a Deny response, you have established communications. If you do not receive the Deny response, check the connections, the cable, and the program settings.

Changing the Echo Mode

To view the keystrokes you enter in the terminal emulation program, you need to set the Echo mode to Enable. Issue the following command:

```
ED-EQPT::COML:TS1000::ECHO=ENABLE;
```

The TimeProvider responds with:

```
    TIMEPROVIDER 07-08-24 10:15:04
M   TS1000 COMPLD
    ;
```

This command is described in detail in Changing the Echo Mode, on page 89.

Setting the Source ID <sid>

Use the SET-SID command to change the name of the TimeProvider. This name appears in normal and error response messages sent by the unit. The default is TimeProvider.

```
SET-SID:::TS1000::SIDCHG=TP-SSU;
```

This command sets the <sid> to TP-SSU. Symmetricom recommends that you use unique names for each TimeProvider in the network. Record the name you chose for the TimeProvider in Table 4-4.

If you include the "_" (underscore) character in the name, then the TimeProvider returns the SID in quote marks.

The TimeProvider responds with:

```
    TP-SSU 07-08-24,10:22:03
A 1167 REPT EVT
    "IMC,EQPT:NA,SIDCHG,NSA,07-08-24,10-22-03:\"SYSTEM'S
SOURCE ID HAS CHANGED,TP-SSU\""
;
```

Setting the Response Format

Release 3.2 of the TimeProvider provides two formats for the autonomous and response messages: Legacy and GR833. Use the following TL1 command to set the response format to GR833:

```
ED-EQPT::SYS:TS1000::EVTFORMAT=GR833;
```

The TimeProvider responds with:

```
    TP-SSU 07-08-24,10:24:13
A 1167 REPT EVT
    "SYS,BROADCAST,TC,07-08-24,10-24-13:\"AUTONOMOUS MESSAGE
FORMAT HAS CHANGED,GR833\""
;
```

Setting the Date and Time

Use the following TL1 command to set the date and time in the IMC.

```
ED-DAT::SYS:TS1000::DATCHG=07-08-24;
```

The TimeProvider responds with:

```
    TP-SSU 07-08-24 10:25:28
A 1168 REPT EVT
    SYS,EQPT:NA,DATCHG,NSA,03-10-24,10-25-28:\"SYSTEM DATE
HAS CHANGED,2007-08-24\""
;
```

Setting Ethernet Parameters

Set up the Ethernet port, if you are using it, by following the procedure in Setting Ethernet Parameters, on page 93.

Setting User Security

Set up the user security (usernames and passwords), if you are using it, by following the procedure in Defining the Security Parameters, on page 94.

Setting Communications Parameters

If you want to change the communications parameter values, use the ED-EQPT command. The following sections describe the commands for performing each individual task. For detailed information on the ED-EQPT command, see the *TimeProvider TL1 Reference Guide*. Record the values you provision in Table 4-4.

Setting RS-232 Parameters

This section describes how to set the baud rate, the handshaking mode, and echo modes on the local and remote ports. The default values are 9600 baud, No flow control, echo mode disabled, tidquiet disabled.

Setting the Baud Rate

Use the ED-EQPT command to provision the baud rate on the Local or Remote port.

```
ED-EQPT:[<tid>]:<aid>:[<ctag>]::<keyword>=<value>;
```

This command has a default access level of ADMIN.

<aid>	<keyword>	<value>	Description	Default value
COMp p = L | R	BAUD	2400 | 9600 | 19200 | 28800 | 38400 | 57600 | 115200	Baud rate	9600

Sample Command
```
ED-EQPT::COML:TS1000::BAUD=9600;
```

This command sets the local Craft communications port to 9600 baud.

Normal Response
```
    TIMEPROVIDER 03-10-24 10:10:25
M  TS1000 COMPLD
;
```

Setting the Handshaking (Flow) Mode

Use the ED-EQPT command to provision the handshaking mode on the local Craft or Remote port to None, Hardware, Software, or Hardware/Software.

```
ED-EQPT:[<tid>]:<aid>:[<ctag>]::<keyword>=<value>;
```

This command has a default access level of ADMIN.

<aid>	<keyword>	<value>	Description	Default value
COMp p = L | R	FLOW	NONE | SW | HW | SWHW	Flow control	NONE

Sample Command

```
ED-EQPT::COML:TS1000::FLOW=HW;
```

Normal Response

```
   TIMEPROVIDER 03-10-24 10:12:33
M  TS1000 COMPLD
;
```

Setting the Echo Mode

Use the ED-EQPT command to provision the echo mode on the local Craft or Remote port to On or Off. When set to ENABLE, characters you type at the keyboard also appear on the monitor. If one keystroke generates two characters on the monitor, set this parameter to DISABLE.

You can also use ED-EQPT to echo the <tid> in the response from the TimeProvider.

```
ED-EQPT:[<tid>]:<aid>:[<ctag>]::<keyword>[=<value>];
```

This command has a default access level of ADMIN.

<aid>	<keyword>	<value>	Description	Default value
COMp p = L | R	ECHO	ENABLE | DISABLE	Input echo	DISABLE
	TIDQUIET	ENABLE | DISABLE	Enables or disables the echo of the <tid>. This is a session setting.	DISABLE

Sample Command

```
ED-EQPT::COML:TS1000::ECHO=ENABLE;
```

Normal Response

```
   TIMEPROVIDER 03-10-24 10:15:04
M  TS1000 COMPLD
;
```

Setting Ethernet Parameters

Before you can begin using the Ethernet port, you *must* provision the addresses using the local Craft or Remote serial port.

> **Note:** To avoid unexpected interruptions in NTP service, you must restart the IMC card after you change either the Subnet Mask or the IP Address when NTP is active.

If you are not planning to use the Ethernet port, you do not have to provision the parameters in this section.

Setting the IP Addresses

Use the ED-EQPT command to provision the following IP addresses for the TimeProvider:

- IP Gateway address

- IP address

- IP subnet Mask

```
ED-EQPT:[<tid>]:<aid>:[<ctag>]::<keyword>=<value>;
```

This command has a default access level of ADMIN.

<aid>	<keyword>	<value>	Description	Default
COMI	IPGATE	1.0.0.1 254.255.255.254	IP address of the default gateway	127.0.0.1
	IPADDR	1.0.0.1 254.255.255.254	IP address of the Network Element	127.0.0.1
	IPSUBNET	1.0.0.1 255.255.255.254	Subnet mask IP address	255.255. 255.0

Sample Command
```
ED-EQPT::COMI:TS1000::IPGATE=127.0.0.1;
```

This command sets the IP Gate address to 127.0.0.1. Use an appropriate gateway address for your network, and record the address in Table 4-4.

Autonomous Message
```
    TP-SSU 03-10-24 10:15:04
A 1169 REPT EVT
   "COMI:NA,IPGATE,NSA,03-10-24 10-15-04:\"IP GATEWAY
ADDRESS HAS CHANGED\""
;
```

Checking Communication Links

Two commands allow you to check the communication links from a computer or network to the TimeProvider: PING and RTRV-HDR.

Ping

Use the PING command to check an Ethernet connection to the TimeProvider.

```
PING:[<tid>]::[<ctag>]::<ipaddr>;
```

This command has a default access level of USER.

<ipaddr>	Value	Description
IP address of host to be pinged	1.0.0.1 – 254.254.254.254	Pings the host system

Sample Command
```
PING:::TS1000::192.168.12.10;
```

Normal Response
```
   TP-SSU 03-05-15 09:59:09
M  TS1000 COMPLD
"Host 192.168.12.10 is alive. Roundtrip time was 165 ms"
;
```

Retrieve Header

Use the RTRV-HDR command to display the response header, which includes the system identification <sid>, date, and time. You can also use this command to verify that the communication link to the TimeProvider is working properly.

This command has a default access level of NONE.

Sample Command
```
RTRV-HDR:::TS1000;
```

Normal Response
```
   TP-SSU 03-05-15 09:59:25
M  TS1000 COMPLD
;
```

Defining the Security Parameters

The TimeProvider supports users at the following four access levels:

- **None** – Anyone with access to a serial or Ethernet port on the TimeProvider can issue commands set to this access level. If no Security-level users are defined, then anyone connected to the TimeProvider can issue every command available

- **User** – Users entered into the user list at the User level can issue commands set at the User access level

- **Admin** – Users entered into the user list at the Admin level can issue commands set at the Admin access level

- **Security** – Users at this access level can issue every command available

You can edit the commands available at each access level using the ED-CMD-SECU command. You can display the current access level for each command by issuing the RTRV-CMD-SECU command. See the *TimeProvider TL1 Reference Guide* for details on these commands. Record the values you provision in Table 4-4.

The first person to log into the TimeProvider is automatically assigned the Security access level (described in Defining a User at the Security Access Level, on page 95); this person normally performs the initial provisioning and defines users and their appropriate access levels.

Defining a User at the Security Access Level

Recommendation: To avoid a possible service call to unlock the TimeProvider, Symmetricom recommends that you enable the security feature by defining a user at the Security access level.

TimeProvider Access Levels

The security measures built into the TimeProvider are based on a list of users authorized to access the unit. Each user has their own password and is assigned to one of the following access levels: NONE, USER, ADMIN, or SECURITY. Users can issue the TL1 commands available at their access level. Managing the User List, on page 96, describes how to manage the user list.

If you do not define a Security-level user, the security features are not enabled and an unauthorized user could gain access to the TimeProvider and compromise the security of your network.

Note: The factory default security setting is None, which allows all users to access the system.

If you define a user at a level other than Security *before* you define a Security-level user, you cannot execute Security-level commands. You will need to contact Symmetricom Global Services (see Obtaining Technical Assistance, on page 187) to correct this problem.

Recommendation: Symmetricom recommends that you record and store the Security-level user's name and password in a secure location.

Adding a User at the Security Access Level

To define a user at the Security access level, issue the following TL1 command. The user and password you create is the same user and password used to access the TimeProvider using the SynCraft application (see Using SynCraft, on page 102).

Sample Command

```
ENT-USER-SECU::DEPTHEAD:TS1000::TP01!,SECURITY;
```

This sample command creates a user with the name DEPTHEAD and a password of TP01!; this user is at the Security access level. See Adding a User, on page 98, for more information on the ENT-USER-SECU command.

Autonomous Message

```
    TP-SSU 03-05-15 09:59:09
A 1166 REPT EVT
    "IMC:NA,USRADD,NSA,03-05-15,09-59-09:\"USER HAS BEEN ADDED\""
;
```

Logging In

You can now log in using the ACT-USER command and the new user name and password to continue with the provisioning process.

Sample Command

```
ACT-USER::DEPTHEAD:TS1000::TP01!;
```

Normal Response

```
    TP-SSU 03-05-15 09:59:15
M  TS1000 COMPLD
;
```

Users with the Security access level can issue any of the TL1 commands described in this chapter and in the *TimeProvider TL1 Reference Guide*.

Managing the User List

Use the procedures in this section to manage the users that are authorized to access the TimeProvider.

Logging In

Use the following TL1 command to log existing users into the system.

```
ACT-USER:[<tid>]:<uid>:[<ctag>]::<pid>;
```

This command has a default access level of NONE.

Parameter	<uid>	Value	Description
<uid>	<username>	Up to 20 case-insensitive characters	Assigned user name
<pid>	password	Up to 20 case-sensitive characters. Must include at least two non- alphabetic and one special character (any printing character other than a letter, number, comma, colon, or semicolon. For case-sensitive passwords, enclose the <pid> in quotes, for example "sYmm!23"	Assigned password

Sample Command

```
ACT-USER::TECHNICIAN:TS1000::TECH01!;
```

This command logs in the user named Technician.

Autonomous Message

```
    TP-SSU 03-10-24 10-18-24
A 1170 REPT EVT
    "IMC:NA,LOGIN,NSA,03-10-24 10-18-24:\"USER LOGGED IN,
TECHNICIAN\""
;
```

Error Response

```
    TP-SSU 03-10-24 10-18-24
M 04 DENY
    <errcode>
    "UNAUTHORIZED ACCESS TO THIS SYSTEM IS PROHIBITED."
;
```

Logging Out

Use the following TL1 command to terminate a session and log out of the system. Security-level users can terminate any other user. The username is not case-sensitive, but it must be spelled exactly as assigned.

```
CANC-USER:[<tid>]:[<uid>]:[<ctag>];
```

This command has a default access level of USER.

<uid>	Value	Description
null		Terminates the current user's session and logs the user off the system
<uid>	Up to 20 case-insensitive characters	Allows a user at the ADMIN or SECURITY level to terminate another user's session

Sample Command

```
CANC-USER::TECHNICIAN:TS1000;
```

This command logs out the user named Technician.

Autonomous Message

```
   TP-SSU 03-10-24 10:25:31
A 1171 REPT EVT
   "IMC,EQPT:NA,LOGOUT,NSA,03-10-24 10-25-31:\"USER LOGGED
OUT,TECHNICIAN\""
;
```

Adding a User

You can store up to 20 users in the TimeProvider's user list. Each user has a name of up to 20 case-insensitive alphanumeric characters, a password of up to 20 case-sensitive characters, and one of the four defined access levels.

Use the following TL1 command to add a user to the user list. If more than 20 users are defined in the user list, the DENY response is sent. Only a Security-level user can add to the user list.

```
ENT-USER-SECU:[<tid>]:<uid>:[<ctag>]::<pid>,<uap>;
```

This command always has an access level of SECURITY.

Parameter	Value	Description
<uid>	<username>	Up to 20 case-insensitive alphanumeric characters
<pid>	<user password>	Up to 20 case-sensitive characters. You must include at least two non-alphabetic and one special character (other than a letter, number, comma, colon, or semicolon). For case-sensitive passwords, enclose the <pid> in quotes.
<uap>	NONE | USER | ADMIN | SECURITY	The access level for the user specified by the <uid>

Sample Command

```
ENT-USER-SECU::TECHNICIAN:TS1000::TECH01!,USER;
```

This command creates a user named TECHNICIAN with a password of TECH01! at the User access level.

Autonomous Message

```
   TP-SSU 03-10-24 10:28:24
A 1172 REPT EVT
   "IMC:NA,USRADD,NSA,03-10-24 10-28-24:\"USER HAS BEEN
ADDED\""
;
```

Changing the Current User's Password

The ED-PID command changes the specified user's password.

```
ED-PID:[<tid>]:[<uid>]:[<ctag>]::<oldpid>,<newpid>;
```

This command has a default access level of USER.

Keyword	Value	Description
<uid>	<username>	Up to 20 case-insensitive alphanumeric characters
<oldpid>	Must match existing value or DENY is issued for the command	Old password for the specified user
<newpid>	Up to 20 case-sensitive characters	New password for the specified user

Sample Command
```
ED-PID::TECHNICIAN:TS1000::TECH01!,#Tech02;
```

This command changes the current user's password from TECH01! to #Tech02.

Autonomous Message
```
   TP-SSU 03-10-24 10:30:01
A 1173 REPT EVT
   "IMC:NA,PIDCHG,NSA,03-10-24 10-30-01:\"USER PASSWORD HAS
CHANGED\""
;
```

Displaying a User's Access Level

Use the following TL1 command to display the access level for a specified user or for all users.

```
RTRV-USER-SECU::[<uid>]:[<ctag>];
```

This command always has an access level of SECURITY.

Parameter	Description
<uid>	Assigned user name. Displays the access level of the specified user.
null	Displays the access level for all assigned user names.

The response format is:

```
<cr><lf><lf>
^^^sid^date^time<cr><lf>
M ^ctag^COMPLD<cr><lf>
^^^"username,access"<cr><lf>
^^^"username,access"<cr><lf>
        .
        .
^^^"username,access"<cr><lf>
;
```

Response	Value	Description
<username>	Up to 20 case- insensitive characters	Assigned user name
<access>	NONE | USER | ADMIN | SECURITY	Access level

Sample Command

```
RTRV-USER-SECU::TS1000;
```

Normal Response

```
   TP-SSU 03-10-24 10:31:31
M TS1000 COMPLD
   "TECHNICIAN,USER"
   "DEPTHEAD,SECURITY"
   "DAVID,ADMIN"
;
```

Editing a User's Access Level

Use the following TL1 command to change the access level for a specified user.

```
ED-USER-SECU:[<tid>]:<uid>:[<ctag>]::<keyword>=<value>;
```

This command always has an access level of SECURITY.

Parameter	<keyword>	<value>	Description
<uid>		Up to 20 case-insensitive characters	Assigned user name
	ACCLVL	NONE | USER | ADMIN | SECURITY	New access level for the specified user

Sample Command

```
ED-USER-SECU::TECHNICIAN:TS1000::ACCLVL=ADMIN;
```

This command changes the access level for the TECHNICIAN user to ADMIN.

Autonomous Message
```
    TP-SSU 03-10-24 10:33:04
A 1174 REPT EVT
    "IMC,EQPT:NA,ACCLVL,NSA,03-10-24 10-33-04:\"USER ACCESS
LEVEL HAS CHANGED\""
;
```

Deleting A User

Use the following TL1 command to delete a specified user from the user list.

```
DLT-USER-SECU:[<tid>]:<uid>:[<ctag>];
```

This command has a default access level of SECURITY.

Parameter	Value	Description
<uid>	Up to 20 case-insensitive characters	Assigned user name

Sample Command
```
DLT-USER-SECU::TECHNICIAN:TS1000;
```

This command deletes the TECHNICIAN user from the user list.

Autonomous Message
```
    TP-SSU 03-10-24 10:35:54
A 1175 REPT EVT
    "IMC:EQPT:NA,USRDEL,NSA,03-10-24 10-35-54:\"USER HAS BEEN
DELETED\""
;
```

Retrieving Current Users

Use the RTRV-USER command to display a list of all currently connected users. The TimeProvider supports up to 10 TCP simultaneous connections, as well as one local and one remote serial connection. If a user is logged on, the username appears in the response.

```
RTRV-USER:[<tid>]::[<ctag>];
```

This command has a default access level of USER.

Sample Command
```
RTRV-USER;
```

Normal Response
```
    TP-SSU 03-10-24 10:37:14
M ^04^COMPLD
    TECHNICIAN
;
```

Using SynCraft

SynCraft is Symmetricom's craft user interface. It is delivered with the TimeProvider, and it provides a convenient GUI (graphical user interface) for managing the TimeProvider and other Symmetricom products.

You install SynCraft using the procedures in Appendix B, CRAFT Software Reference.

Starting SynCraft

To start the SynCraft application, double click it's icon, or select **Start**, **Programs**, **Symmetricom**, **SynCraft**. The SynCraft window appears, as shown in Figure 4-1.
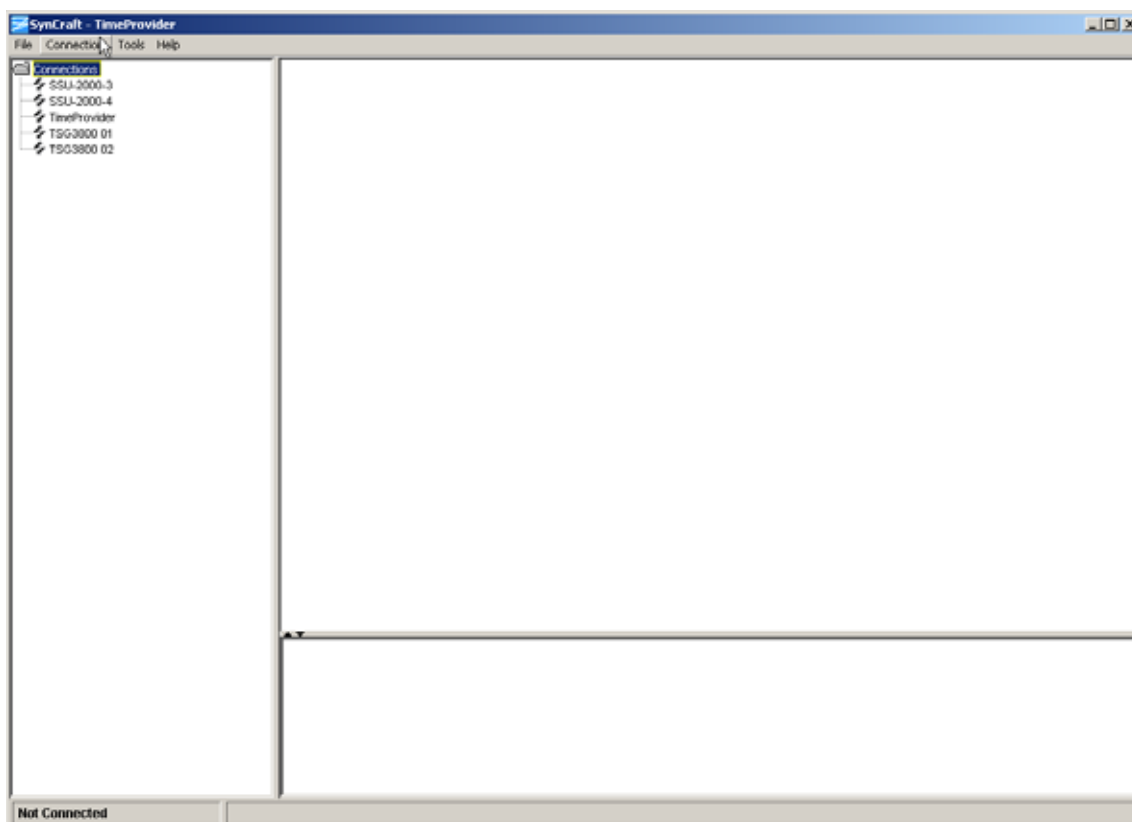
Figure 4-1.   The SynCraft Main Window

Creating a Connection

To create a connection to the TimeProvider, select **Connection**, **New Connection**. The Create New Connection window appears, as shown in Figure 4-2.

Figure 4-2.   The Create New Connection Window

Fill in each field as appropriate for your installation, then click **Save**.

- Name – the name of the connection as used by SynCraft

- Type – select TimeProvider from the drop-down list

- SiD – enter the Source ID for the unit

- Username – enter a user name in the TimeProvider's userid list

- Password – enter the password for the user. If this is the first log-in attempt, the user level is automatically defined to be at the Security level.

- Type – select TCP/IP for use with an Ethernet connection

- IP address – enter the unit's IP address

- Port – enter 5000 for use with an Ethernet connection

Opening a Connection

To open a connection to the TimeProvider, right-click the name of the connection in the network element list in the left column of the SynCraft window. Select **Open Connection** from the drop-down list that appears; the Logical View appears in the main SynCraft window, as shown in Figure 4-3.

For more information on using SynCraft, refer to the on-line help provided by selecting **Help**, **TimeProvider Help** on the main SynCraft menu.
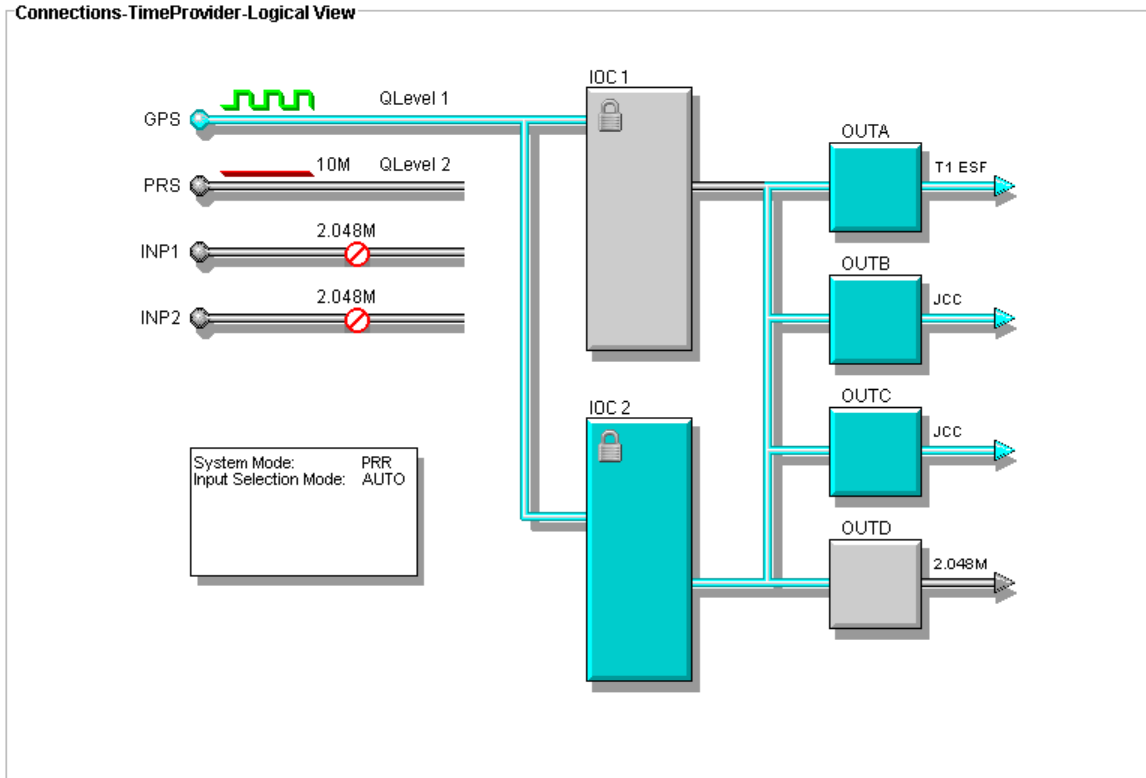
Figure 4-3.   Logical View of the TimeProvider

Closing a Connection

To close the connection to the TimeProvider, right-click the name of the connection in the network element list and select **Close Connection** from the drop-down list, or select **Connection**, **Close Connection** on the main SynCraft menu.

Provisioning the IOC

This section describes how to provision the IOC.

Setting the System Mode

The SET-SYS-MODE command allows you to provision the operating mode of the TimeProvider to one of the following:

- SSU – Synchronization Supply Unit: provides filtering compliant with G.812 and GR-1244

- SUB – Subtending mode: provides composite clock input tracking compliant with GR-378

- PRR – Primary Reference Receiver mode: provides ITU-T G.811 and Telcordia GR-2830 requirements for Primary Reference Receivers/Clocks

In the SSU mode, you can select the system reference from signals on the GPS, PRS, INP1, or INP2 connectors.

In the SUB mode, the PRS input is set to Monitor only; you can select the system reference from signals on the INP1 or INP2 connectors. You can provision these inputs to Composite Clock signal types only when the TimeProvider is in SUB mode.

In the PRR mode, the antenna provides GPS signals as the primary reference. When enabled and qualified, the PRS, INP1, and INP2 signals are used as part of the BesTime algorithm only to enhance the stability of the output signals. If the GPS input is lost when in PRR mode, the TimeProvider enters the Holdover mode even if qualified signals are present on the other inputs.

Setting the System Mode
Use the SET-SYS-MODE command to provision the TimeProvider's operating mode. See Operating Modes, on page 23, for more information on how the operating mode affects the TimeProvider's inputs and outputs.

```
SET-SYS-MODE:[<tid>]::[<ctag>]::<keyword>=<value>;
```

This command has a default access level of ADMIN.

<keyword>	<value>	Description	Default value
SYSMODE	SSU	Set the TimeProvider to SSU operating mode ■ PRS – Priority 1 and Enabled ■ INP1 – Priority 2 and Enabled ■ INP2 – Priority 3 and Enabled ■ GPS – Disabled and can be enabled	SSU

<keyword>	<value>	Description	Default value
SYSMODE (cont'd)	SUB	Set the TimeProvider to Subtending operating mode ■ PRS – Monitor only and Disabled, cannot be Enabled ■ INP1 – Priority 1 and Enabled ■ INP2 – Priority 2 and Enabled ■ GPS – Monitor only and Disabled, cannot be Enabled	SSU
	PRR	Set the TimeProvider to Primary Reference Receiver mode ■ PRS – Enabled as Backup Reference, can be set to Monitor or Disabled ■ INP1 – Enabled as Backup Reference, can be set to Monitor or Disabled ■ INP2 – Enabled as Backup Reference, can be set to Monitor or Disabled ■ GPS – Enabled and Priority 1	

Sample Command

```
SET-SYS-MODE:::TS1000::SYSMODE=SUB;
```

Sets the system mode to Subtending (SUB). The inputs are set as described in the table above. Record the mode in Table 4-4.

Autonomous Message

```
   TP-SSU 03-10-24 10:40:10
A 1176 REPT EVT
   "SYS,EQPT:NA,SYSMODE,NSA,03-10-24 10-40-10:\"SYSTEM MODE
OF OPERATION HAS CHANGED,SUB\""
;
```

Retrieving the Current System Mode

Use the RTRV-SYS-MODE command to retrieve the current system mode: SSU, SUB, or PRR.

```
RTRV-SYS-MODE:[<tid>]::[<ctag>];
```

This command has a default access level of USER.

Sample Command

```
RTRV-SYS-MODE:::TS1000;
```

Normal Response

```
   TP-SSU 03-10-24 10:37:54
M  TS1000 COMPLD
   SSU
;
```

Setting the IOC Parameters

Use the ED-EQPT command to provision each IOC. This command allows you to select which IOC is Active and which is Standby; to switch the Active and Standby IOCs; to place a IOC "In Service" or "Out of Service"; and to define the oscillator type to Type I or ST3E for a quartz-based IOC or to Type II or ST2 for a Rubidium IOC.

```
ED-EQPT:[<tid>]:<aid>:[<ctag>]::<keyword>=<value>;
```

Note: Type I and ST3E cannot be defined to a Rubidium IOC, and Type II and ST2 cannot be defined to a quartz-based IOC.

This command has a default access level of ADMIN.

<aid>	<keyword>	<value>	Description	Default value
IOCm m = 1 | 2	IOCMODE	ACTIVE | STANDBY	Sets the mode of the specified IOC. For redundant systems, changing the state of one IOC forces the other IOC to the alternate state	ACTIVE
	IOCACTV	n/a	Sets the Standby IOC to Active	n/a
IOCm m = 1 | 2 (cont'd)	IOCSTATE	INSRV	Places an "Out of Service" IOC in the "In Service" mode (restarts)	INSERV
		OOSRV	Places an "In Service" IOC in the "Out of Service" mode. An Out of Service IOC cannot generate outputs or monitor inputs and does not generate alarms	
	CLKTYPE	ST2/TYPEII | ST3E/TYPEI	Defines the Local Oscillator type. Selects the type of clock used to generate SSMs in Holdover mode	TYPEI

Sample Command
```
ED-EQPT::IOC1:TS1000::IOCSTATE=INSERV;
```

This command places IOC 1 in the "In Service" mode. Use this command when you have taken an IOC out of service and are now ready to put it back in service.

Autonomous Message
```
   TP-SSU 03-10-24 10:42:40
A 1177 REPT EVT
   "IOC1,EQPT:NA,IOCSTATE,NSA,03-10-24 10-42-40:\"IOC STATE
HAS CHANGED,INSRV\"
   ;
```

Provisioning the Input Reference

You need to know the following information about the input reference signal before you can provision the Input Reference signals:

■ Input selection mode

■ Interface type

■ Frame type/frequency

■ Quality level

■ Priority level

■ SSMs and bit position

■ CRC

Setting the Input State

Use the ED-EQPT command to provision the inputs to the TimeProvider. You can enable, disable, or place an input in Monitor mode (where the input is monitored, but cannot be selected as the system reference).

```
ED-EQPT:[<tid>]:<aid>:[<ctag>]::<keyword>=<value>;
```

This command has a default access level of ADMIN.

<aid>	<keyword>	<value>	Description	Default value
PRS INPp (p = 1 | 2) GPS	INSTATE	ENABLE	Enables the specified input	ENABLE GPS = DISABLE
		MONITOR	Places the specified input in Monitor Only mode	
		DISABLE	Disables the specified input	

Sample Command
```
ED-EQPT::INP1:TS1000::INSTATE=MONITOR;
```

This command places Input 1 in the Monitor mode.

Autonomous Message
```
   TP-SSU 03-10-24 10:44:21
A 1178 REPT EVT
   "INP1,T1:NA,INSTATE,NSA,03-10-24 10-44-21:\"INPUT STATE
HAS CHANGED,MONITOR\""
   ;
```

Setting the GPS Parameters

After you install the GPS antenna, you must provision the parameters using the
ED-EQPT command.

```
ED-EQPT:[<tid>]:<aid>:[<ctag>]::<keyword>=<value>;
```

This command has a default access level of ADMIN.

<aid>	<keyword>	<value>	Description	Default value
GPS	MODE	AUTO	The antenna position (latitude, longitude, and elevation) is automatically computed or recomputed and set	AUTO
		MANUAL	The position (latitude, longitude, and elevation) is set manually using the POS keyword	
GPS (cont'd)	POS **Note:** The position can only be set when Mode is MANUAL	LAT	dd-mm-ss.ssN or dd-mm-ss.ssS	n/a
		LONG	dd-mm-ss.ssE or dd-mm-ss.ssW	
		ELEV	hhhh.hh height in m	
	ELEVMASK	5 to 45	The elevation mask, below which the TimeProvider will not track or acquire a satellite	10

Sample Command
```
ED-EQPT::GPS:TS1000::MODE=AUTO;
```

This command sets the GPS location mode to Automatic. The location of the GPS
antenna is determined from multiple satellite fixes.

Autonomous Message
```
   TP-SSU 03-10-24 10:45:15
A 1179 REPT EVT
   "GPS,EQPT:NA,FRMTYPE,NSA,03-10-24 10-45-15:\"GPS MODE HAS
CHANGED,AUTO\""
;
```

To manually set the location of the receiver, you must enter the latitude, the
longitude, and the altitude (in m) in the same command, using commas to separate
the parameters.

Sample Command
```
ED-EQPT::GPS:TS1000::POS=30-28-34.0N,97-50-16.0W,333.0;
```

Autonomous Message

```
   TP-SSU 03-10-24 10:45:15
A 1179 REPT EVT
   "GPS,EQPT:NA,FRMTYPE,NSA,03-10-24 10-45-15:\"GPS LOCATION
HAS CHANGED,MANUAL\""
   ;
```

Setting the Input Frequency

Use the ED-SYNC command to provision the input PRS frequency.

```
ED-SYNC:[<tid>]:<aid>:[<ctag>]::<keyword>=<value>;
```

This command has a default access level of ADMIN.

<aid>	<keyword>	<value>	Description	Default value
PRS	FRMTYPE	1.544 M | 2M | 5M | 6.312 M | 10M	Provisions the input frequency of the PRS input	2M

Sample Command

```
ED-SYNC::PRS:TS1000::FRMTYPE=5M;
```

Autonomous Message

```
   TP-SSU 03-10-24 10:46:01
A 1179 REPT EVT
   "PRS,EQPT:NA,FRMTYPE,NSA,03-10-24 10-46-01:\"INPUT
FRAMING TYPE HAS CHANGED,5M\""
   ;
```

Setting the Input Frame Type

Use the ED-SYNC command to provision the type of framing present on the input signal.

```
ED-SYNC:[<tid>]:<aid>:[<ctag>]::<keyword>=<value>;
```

If you provision the TimeProvider to the Subtending mode (see Setting the System Mode, on page 105), then the input frame type is automatically set to Composite Clock type signals. You can set the FRMTYPE to CC, JCC, or JCC4 when the TimeProvider is in the Subtending mode.

When using E1 signals in the SSU mode, you can enter either CAS or CCS in the FRMTYPE keyword. The TimeProvider accepts both CCS and CAS inputs without a fault (if the input is fault-free).

This command has a default access level of ADMIN.

<aid>	<keyword>	<value>	Description	Default value
INPp p = 1 | 2	FRMTYPE	2M (2.048 MHz) | CAS | CCS | D4 | ESF | 1.544M | 6.312M | CC | JCC | JCC4	Provisions the frame signal type used by the input.	2M (E1) ESF (T1)

Sample Command

```
ED-SYNC::INP1:TS1000::FRMTYPE=ESF;
```

Autonomous Message

```
    TP-SSU 03-10-24 10:50:05
A 1181 REPT EVT
    "INP1,T1:NA,FRMTYPE,NSA,03-10-24 10-50-05:\"INPUT FRAMING
TYPE HAS CHANGED,ESF\""
    ;
```

Controlling Automatic Reference Switching

The TimeProvider can determine which input reference signal has the highest quality. When the active reference signal falls below a preset quality level, the TimeProvider can automatically switch to the next highest input reference signal. To use this feature, you must enable Automatic switching.

You can also use the performance monitoring features to automatically switch the input reference signal when user-defined performance thresholds are crossed. See Setting MTIE and FFOFF Thresholds, on page 116 for more information on setting and using performance monitoring commands.

Automatic Return to a Higher Priority Reference

When the REFMODE parameter is provisioned to AUTO, the system reference switches when the input signal is disqualified. When the input signal is re-qualified, the TimeProvider can either keep the current reference or switch back to the re-qualified signal. The first case, keeping the current reference, is also known as "non-revertive" mode; the second case, switching back to the re-qualified input, is known as revertive mode.

The QLEVEL (see Setting the Input Quality Level, on page 112) and the PRIORITY (see Setting the Input Priority Level, on page 113) parameters work together with SSMs to determine the switching strategy for the inputs when the unit is in the SSU mode. If the active/primary input becomes unavailable, the switching strategy determines which input to use: the TimeProvider uses the input with the next highest QLEVEL. If all inputs have the same QLEVEL, then the TimeProvider uses the input with the highest PRIORITY.

To provision the TimeProvider as non-revertive, you must provision the user-assigned Priority Level on *all* inputs to the same value (1, 2, 3, or 4). To provision the TimeProvider as revertive, you provision any one of the inputs to a higher or lower Priority Level, with 1 being the highest priority.

If the original primary input becomes available again, the REFMODE, QLEVEL and PRIORITY parameters determine whether the TimeProvider switches back to that input. If the QLEVEL and/or PRIORITY parameter of the original input is higher than the current input, the TimeProvider *reverts* back to the original input. If the QLEVEL parameter is the same for all inputs, then the TimeProvider does not revert back to the original input.

Enabling Automatic Switching

Use the ED-SYNC command to set the reference selection to Automatic or Forced. When set to Automatic, then the QLEVEL and PRIORITY parameters determine the switching strategy to be revertive or non-revertive. When set to Forced, then the TimeProvider uses the input selected with the INPREF keyword (see Manually Selecting the Reference, on page 114).

```
ED-SYNC:[<tid>]:<aid>:[<ctag>]::<keyword>=<value>;
```

This command has a default access level of ADMIN.

<aid>	<keyword>	<value>	Description	Default value
SYS	REFMODE	AUTO | FORCED	Sets the reference selection mode	AUTO

Sample Command
```
ED-SYNC::SYS:TS1000::REFMODE=AUTO;
```

Autonomous Message
```
   TP-SSU 03-10-24 10-52-25
A 1182 REPT EVT
   "SYS,EQPT:NA,REFMODE,NSA,03-10-24 10-52-25:\"SYSTEM
REFERENCE MODE HAS CHANGED,AUTO\""
   ;
```

Setting the Input Quality Level

Use the ED-SYNC command to set the quality level (QLEVEL) of the specified input. You set the QLEVEL when using inputs that do not have an associated SSM, or when you want to set an alarm threshold for inputs that have SSMs. The QLEVEL determines the TimeProvider's output SSM.

If you provision QLEVEL below the quality level of the local oscillator in the IOC, then the TimeProvider disqualifies the input with the INPQL alarm. An INPQL alarm also occurs if the incoming SSM indicates that the input signal is below the quality level of the local oscillator or if the incoming SSM is below the provisioned level.

Normally, you provision the QLEVEL for each input to be either unique or all the same. If you set all QLEVEL for inputs to unique values, then you have set up a revertive switching strategy. If you set all inputs to the same value, then you have set up a non-revertive switching strategy.

```
ED-SYNC:[<tid>]:<aid>:[<ctag>]::<keyword>=<value>;
```

This command has a default access level of ADMIN.

<aid>	<keyword>	<value>	Description	Default value
PRS INPp (p = 1 | 2) GPS	QLEVEL	1 = PRC 2 = UNK/STU 3 = TYPE II/ST2 4 = TYPE I 5 = TYPE V/TNC 6 = TYPE III/ST3E 7 = TYPE IV/ST3 8 = G.813OPT3/SMC 9 = DUS	Sets the Quality Level for the specified input	2

Sample Commands

```
ED-SYNC::PRS:::QLEVEL=1;
ED-SYNC::INP1:::QLEVEL=1;
ED-SYNC::INP2:::QLEVEL=1;
```

This series of commands sets the QLEVEL for all inputs to the same level; if you also provision the PRIORITY level to the same value, then you have set up a non-revertive switching strategy.

Autonomous Message

```
   TP-SSU 03-10-24 10:54:44
A 1183 REPT EVT
   "PRS,EQPT:NA,QLEVEL,NSA,003-10-24 10-54-44:\"USER
ASSIGNED QUALITY LEVEL HAS CHANGED,1\""
;
```

Setting the Input Priority Level

The PRIORITY level works together with the QLEVEL parameter (described in Setting the Input Quality Level, on page 112) to determine the switching strategy. The PRIORITY level is the second factor the TimeProvider uses to determine which input to use when the original primary input becomes unavailable.

Use the ED-SYNC command to set the PRIORITY level of the selected reference.

```
ED-SYNC:[<tid>]:<aid>:[<ctag>]::<keyword>=<value>;
```

This command has a default access level of ADMIN.

<aid>	<keyword>	<value>	Description	Default value
PRS INPp (p = 1 | 2) GPS	PRIORITY	2 | 3 | 4	Sets the priority for the selected input	GPS = 1 PRS = 2 INP1 = 3 INP4 = 4

Sample Command

```
ED-SYNC::PRS:TS1000::PRIORITY=2;
ED-SYNC::INP1:TS1000::PRIORITY=2;
ED-SYNC::INP2:TS1000::PRIORITY=2;
```

These commands set the PRIORITY for each input to the same value; if you also provision the QLEVEL to the same value, then you set up a non-revertive switching strategy.

Autonomous Message

```
    TP-SSU 03-10-24 10:56:00
A 1184 REPT EVT
    "PRS,EQPT:NA,PRIORITY,NSA,03-10-24 10-56-00:\"PRIORITY
HAS CHANGED,2\""
;
```

Manually Selecting the Reference

Use the ED-SYNC command to manually select the reference. To select the reference, you must first set the REFMODE keyword to FORCED, as described in Controlling Automatic Reference Switching, on page 111.

```
    ED-SYNC:[<tid>]:<aid>:[<ctag>]::<keyword>=<value>;
```

This command has a default access level of ADMIN.

<aid>	<keyword>	<value>	Description	Default value
SYS	INPREF	GPS	PRS	INP1	INP2	Sets the specified input to be the system reference	PRS

Sample Command

```
ED-SYNC::SYS:TS1000::INPREF=PRS;
```

This command forces the signal on the PRS input to be the reference signal. The REFMODE keyword must be set to FORCED for this command to take effect.

Autonomous Message

```
    TP-SSU 03-10-24 10:58:30
A 1185 REPT EVT
    "SYS,EQPT:NA,INPREF,NSA,03-10-24 10-58-30:\"SYSTEM
REFERENCE INPUT HAS CHANGED, PRS\""
;
```

Provisioning the SSM

Before you can read Synchronization Status Messages (SSMs) on certain input signals, you need to provision the TimeProvider to read the incoming SSM and identify the bit position of the SSM. SSMs are on the following types of input signals:

- E1, CAS4, CCS4

- T1, ESF

Reading SSMs

To enable the use of SSMs, you must first provision the TimeProvider to read SSMs on the input. Use the ED-SYNC command to enable the specified input to read SSMs.

```
ED-SYNC:[<tid>]:<aid>:[<ctag>]::<keyword>=<value>;
```

This command has a default access level of ADMIN.

<aid>	<keyword>	<value>	Description	Default value
INPp p = 1 | 2	SSMENA	ENABLE | DISABLE	Provisions the T1 ESF or E1 (CAS/CCS) input to read the received SSM	ENABLE

Sample Command
```
ED-SYNC::INP1:TS1000::SSMENA=ENABLE;
```

Autonomous Message
```
   TP-SSU 03-10-24 11:02:28
A 1186 REPT EVT
   "INP1,T1:NA,SSMENA,NSA,03-10-24 11-02-28:\"INPUT READING
OF SSM HAS CHANGED,ENABLE\""
;
```

Defining the SSM Bit Position

After you enable an E1 (CAS/CAS) input to read SSMs, you must then define the bit containing the SSM.

```
ED-SYNC:[<tid>]:<aid>:[<ctag>]::<keyword>=<value>;
```

This command has a default access level of ADMIN.

<aid>	<keyword>	<value>	Description	Default value
INPp p = 1 | 2	SSMBIT	4 | 5 | 6 | 7 | 8	Provisions the E1 (CAS/CCS) SSM bit position.	8

Sample Command
```
ED-SYNC::INP1:TS1000::SSMBIT=4;
```

This command sets the SSM bit to position 4 in the E1 input string on Input 1.

Autonomous Message
```
    TP-SSU 03-10-24 11:05:18
A 1187 REPT EVT
    “INP1,T1:NA,SSMBIT,NSA,03-10-24 11-05-18:\"E1 SSM BIT HAS
CHANGED,4\””
    ;
```

Enabling CRC4

Use the ED-SYNC command to enable or disable the use of CRC4 on E1 inputs.

```
ED-SYNC:[<tid>]:<aid>:[<ctag>]::<keyword>=<value>;
```

This command has a default access level of ADMIN.

<aid>	<keyword>	<value>	Description	Default value
INPp p = 1 | 2	CRCENA	ENABLE | DISABLE	Provisions the use of CRC4 on E1 inputs	DISABLE

Sample Command
```
ED-SYNC::INP1:TS1000::CRCENA=ENABLE;
```

Normal Response
```
    TP-SSU 03-10-24 11:06:57
A 1188 REPT EVT
    “INP1,T1:NA,CRCENA,NSA,03-10-24 11-06-57:\"INPUT CRC HAS
CHANGED,ENABLE\””
    ;
```

Using Performance Monitoring

You can set thresholds for alarms and for qualifying inputs using MTIE and FFOFF data. For more information on performance monitoring, see Performance Monitoring, on page 24.

Setting MTIE and FFOFF Thresholds
Use the SET-TH command to set the alarm thresholds for each input and each MTIE window.

```
SET-TH:[<tid>]:<aid>:[<ctag>]::<keyword>=<value>;
```

This command has a default access level of ADMIN.

<aid>	<keyword>	<value>	Description
GPS, PRS, INP1, INP2	MASK	DEFAULT GPS-R PRS DS1 OCN PRC TYPEI TYPEII	Set the MTIE-x and FFOFF-60 thresholds to predefined settings. Table 4-2 describes the values for each setting.
	MTIE-1	1 to 5 000 000	1-second MTIE observation threshold in ns
GPS (cont'd)	MTIE-5	1 to 5 000 000	5-second MTIE observation threshold in ns
	MTIE-10	1 to 5 000 000	10-second MTIE observation threshold in ns
	MTIE-50	1 to 5 000 000	50-second MTIE observation threshold in ns
	MTIE-100	1 to 5 000 000	100-second MTIE observation threshold in ns
	MTIE-500	1 to 5 000 000	500-second MTIE observation threshold in ns
	FFOFF-60	100 to 10 000 000	Set FFOFF threshold for 60-second calculation period, in ps/s

Table 4-2. Default Mask Parameters

	MTIE-1	MTIE-5	MTIE-10	MTIE-50	MTIE-100	MTIE-500	FFOFF-60
Default	10 000	50 000	100 000	500 000	1 000 000	5 000 000	10 000 000
GPS-R	150	150	150	150	150	155	50 000
PRS	10	10	12	25	39	155	1000
DS1	302	312	325	325	550	1002	12 000
OCN	600	1000	1000	1000	1000	1002	370 000
PRC	25	25	25	25	39	155	1000
TYPE I	750	750	1000	2000	2000	2000	2900
TYPE II	302	312	325	425	1000	1000	1000

Sample Command

```
SET-TH::GPS:TS1000::MASK=GPS-R;
```

This command sets the GPS input performance monitoring threshold to a mask value of GPS-R.

Autonomous Message

```
    TP-SSU 03-10-24 11:09:12
A 1189 REPT EVT
    "GPS,EQPT:THRCHG,THRCHG,03-04-05 15-17-57,,,,:\"PM
THRESHOLD HAS CHANGED,MASK,GPS-R \""
;
```

Setting Alarm Levels for Performance Monitoring Faults

Once you set a threshold for performance monitoring faults, you can set the alarm level to indicate that a fault has occurred. Use the SET-ATTR command to set the alarm level.

```
    SET-ATTR:[<tid>]:<aid>:[<ctag>]::<keyword>=<value>;
```

This command has a default access level of ADMIN.

<aid>	<keyword>	<value>	Description
GPS, PRS, INP1, INP2	MTIE	NR | NA | MN | MJ | CR	The alarm level when the specified input has exceeded at least one of the MTIE thresholds
	FFOFF	NR | NA | MN | MJ | CR	The alarm level when the specified input has exceeded the FFOFF threshold

Sample Command

```
SET-ATTR::GPS:TS1000::MTIE=MJ;
```

This command sets the GPS input to report a Major alarm when the MTIE performance threshold is exceeded.

Autonomous Message

```
    TP-SSU 03-05-15 09:59:09
A 1189 REPT EVT
    "GPS,EQPT:ALMCHG,ALMCHG,03-04-05 15-17-57,,,,:\"ALARM
PARAMETER HAS CHANGED,GPS,MJ\""
;
```

Provisioning the Outputs

This section describes the commands you use to provision the outputs of the TimeProvider. You provision outputs in groups of 8 (or 16 if the Expansion Panel is used) channels: each group corresponds to the location (A through D) of the Output module in the main shelf or Expansion Panel.

Enabling and Disabling the Outputs

Use the ED-EQPT command to enable or disable the output signal. This command affects the specified group of eight output channels, or sixteen output channels if the Expansion panel is also used; individual channels cannot be enabled or disabled.

```
ED-EQPT:[<tid>]:<aid>:[<ctag>]::<keyword>=<value>;
```

This command has a default access level of ADMIN.

<aid>	<keyword>	<value>	Description	Default value
OUTg g = A | B | C | D	OUTSTATE	ENABLE	Enable the specified output group	ENABLE
		DISABLE	Disable the specified output group	

Sample Command

```
ED-EQPT::OUTA:TS1000::OUTSTATE=DISABLE;
```

This command disables output group A and turns off all 8 channels, or 16 channels if the Expansion Panel is also used.

Autonomous Message

```
   TP-SSU 03-10-24 11-09-12
A 1189 REPT EVT
   "OUTA,EQPT:NA,OUTSTATE,NSA,03-10-24 11-09-12:\"OUTPUT
GROUP STATE HAS CHANGED,DISABLE\""
   ;
```

Provisioning the Output Framing Type

Use the ED-SYNC command to provision the output framing type.

CAS and CCS are available for E1 output framing. D4 and ESF are available for T1 output framing.

```
ED-SYNC:[<tid>]:<aid>:[<ctag>]::<keyword>=<value>;
```

This command has a default access level of ADMIN.

<aid>	<keyword>	<value>	Description	Default value
OUTg g = A | B | C | D	FRMTYPE	8K | 1.544M | 2M | 6.312M | CAS | CCS | D4 | ESF | CC | JCC | JCC4 | ISOLATED_1 |	Provisions the output framing	2M

Sample Command

```
ED-SYNC::OUTA:TS1000::FRMTYPE=CAS;
```

This command provisions output group A to an E1, CAS framing format.

Autonomous Message

```
   TP-SSU 03-10-24 11:11:18
A 1190 REPT EVT
   "OUTA,EQPT:NA,FRMTYPE,NSA,03-10-24 11-11-18:\"OUTPUT
FRAMING TYPE HAS CHANGED,CAS\""
   ;
```

Provisioning Retimer Parameters

You use several TL1 commands to provision the E1 and T1 Retimers available for the TimeProvider. The ED-EQPT command with the RTMSTATE keyword allows you to enable and disable Retimer modules and individual ports; the SLIPCLR keyword allows you to clear a Slip alarm. The ED-SYNC command with the RTMLBO keyword allows you to set the line build-out length; the FREEFLT and HOLDFLT keywords allow you to enable or disable the cut-through mode when the clock enters Free-run or Holdover mode.

Enabling and Disabling the Retimers

Use the ED-EQPT command to enable or disable the specified Retimer group. Individual channels cannot be enabled or disabled.

```
ED-EQPT:[<tid>]:<aid>:[<ctag>]::<keyword>=<value>;
```

This command has a default access level of ADMIN.

<aid>	<keyword>	<value>	Description	Default value
RTMg g = A | B | C | D	RTMSTATE	ENABLE	Enable the specified Retimer group	ENABLE
		DISABLE	Disable the specified Retimer group	

Sample Command

```
ED-EQPT::RTMA:TS1000::RTMSTATE=DISABLE;
```

This command disables the Retimer in group A and turns off both ports.

Autonomous Message
```
    TP-SSU 03-10-24 11-09-12
A 1189 REPT EVT
    "OUTA,EQPT:NA,OUTSTATE,NSA,03-10-24 11-09-12:\"OUTPUT
GROUP STATE HAS CHANGED,DISABLE\""
;
```

Provisioning the LBO

Use the ED-SYNC command to set the line build-out (LBO) for each port (1 or 2) on the Retimer module.

```
    ED-SYNC:[<tid>]:<aid>:[<ctag>]::<keyword>=<value>;
```

This command has a default access level of ADMIN.

<aid>	<keyword>	<value>	Description	Default value
RTMg[-p] g = A | B | C | D p= 1 | 2 **Note**: The RTM-LBO parameter is valid only for T1 signals; for the E1 Retimer, the IPNV (Invalid Parameter) DENY code is returned.	RTMLBO	0	Sets the line build-out length to 0 to 133 ft (0 to 40 m)	0
		1	Sets the line build-out length to 133 to 266 ft (40 to 81 m)	
		2	Sets the line build-out length to 266 to 399 ft (80 to 121 m)	
		3	Sets the line build-out length to 399 to 533 ft (121 to 162 m)	
		4	Sets the line build-out length to 533 to 650 ft (162 to 198 m)	

Sample Command
```
ED-EQPT::RTMA-1:TS1000::RTMLBO=2;
```

This command sets the line build-out length for port 1 in Retimer group A to 266 to 399 ft (80 to 121 m).

Autonomous Message
```
    TP-SSU 03-10-24 11-09-12
A 1189 REPT EVT
    "RTMA,EQPT:NA,OUTSTATE,NSA,03-10-24 11-09-12:\"LBO HAS
CHANGED,2\""
;
```

Provisioning Cut-thru Mode

Use the ED-SYNC command to set the cut-thru mode for each port (1 or 2) on the Retimer module. You can enable cut-thru mode when the local oscillator (LO) enters either the free-run or holdover mode.

```
ED-SYNC:[<tid>]:<aid>:[<ctag>]::<keyword>=<value>;
```

This command has a default access level of ADMIN.

<aid>	<keyword>	<value>	Description	Default value
RTMg[-p] g = A | B | C | D p= 1 | 2	FREEFLT	CUTTHRU	Cut-thru mode is engaged when the LO enters free-run mode.	RETIME
		RETIME	Cut-thru mode is not engaged when the LO enters free-run mode.	
	HOLDFLT	CUTTHRU	Cut-thru mode is engaged when the LO enters holdover mode.	RETIME
		RETIME	Cut-thru mode is not engaged when the LO enters holdover mode.	

Sample Command

```
ED-EQPT::RTMA-1:TS1000::FREEFLT=CUTTHRU;
```

This command sets the Retimer to enter cut-thru mode when the local oscillator enters free-run mode.

Autonomous Message

```
   TP-SSU 03-10-24 11-09-12
A 1189 REPT EVT
   "RTMA,EQPT:NA,OUTSTATE,NSA,03-10-24 11-09-12:\"CUTTHRU
STATE HAS CHANGED,CUTTHRU\""
;
```

Provisioning NTP Parameters

This section describes how to enable and provision the Network Time Protocol (NTP) feature in the TimeProvider. There are TL1 commands that allow you to:

- Activate the NTP feature
- Edit the NTP parameters

Additional NTP commands are described in the *TimeProvider TL1 Reference Guide*.

Activating NTP

You use the ACT-FEATURE command to enable the NTP feature on the TimeProvider. You should contact your Symmetricom Sales representative and order part number 920-58000-01 to obtain the key to activate the NTP feature.

```
ACT-FEATURE:[<tid>]:<fid>:[<ctag>]::<key>;
```

This command has a default access level of ADMIN.

Parameter	<value>	Description
<fid>	NTP	The feature to be enabled.
<key>	Up to 20 case-sensitive characters; must be within quotes to be case-sensitive.	Key to enable the feature

Sample Command
```
ACT-FEATURE::NTP:TS1000::"ABcdEFgh123456";
```

This command enables the NTP feature within the TimeProvider, and uses an activation code provided by Symmetricom.

Normal Response
```
    TP-SSU 03-05-15 09-59-09
M 1166 COMPLD
    "IMC Serial#=ABC123"
    "NTP activated"
;
```

Autonomous Message
```
    TP-SSU 03-05-15 09-59-09
A 1166 REPT EVT EQPT
    "IMC,EQPT:FEATURE,TC,03-05-15 09-59-09,,,,:\"System
Feature has been enabled\""
;
```

Editing NTP Peer Server Parameters

You use the ED-EQPT command to edit the NTP peer server parameters after the NTP function is activated. When you set the <func> value to ADD or DELETE, you must include the <keyid>, <minpoll>, <maxpoll> and <preferred> values.

```
ED-EQPT:[<tid>]:NTP:[<ctag>]::SERVER,<func>,<serverIP>,
[<keyid>,<minpoll>,<maxpoll>,<preferred>];
```

This command has a default access level of ADMIN.

<aid>	<keyword>	<value>	Description	Default value
NTP	FUNC	Add | Delete | Modify	IP address to be added, deleted, or modified	NA
	SERVERIP	0.0.0.0	NTP Server IP address	1.0.0.1 to 254.255.255.254
	KEYID	1 to 65534	Authentication ID	0
	MAXPOLL	16 | 32 | 64 | 128 | 256 | 512 | 1024	Maximum amount of time in seconds between server time requests	1024
	MINPOLL	16 | 32 | 64 | 128 | 256 | 512 | 1024	Minimum amount of time in seconds between server time requests	16
	PREFERRED	YES | NO	NTP Preferred server	NO

Sample Command

```
ED-EQPT::NTP:TP1000::SERVER,ADD,192.168.10.1,1,64,1024,NO;
```

This command adds the server mask of 192.168.10.1, sets the Authentication ID to 1, the max poll to 64, the min poll to 1024, and the preferred to No.

Normal Response

```
   TP-SSU 03-05-15 10-04-32
A 1166 REPT EVT
   "NTP,EQPT:SERVER,TC,03-05-15 10-04-32,,,,:\NTP SERVER
CONFIGURATION HAS CHANGED,192.168.10.1,0,16,1024,NO"
   ;
```

Enabling NTP Authentication

You use the ED-EQPT command to enable or disable MD5 authentication for NTP. When you enable authentication, the TimeProvider as the NTP server includes the authentication value in an encrypted portion of the time transmission (you use the KEYGEN keyword to set the authentication key). An NTP client that has the same authentication key value can then *authenticate* the identity of the NTP server. Authentication is optional.

```
ED-EQPT:[<tid>]:NTP:[<ctag>]::AUTHEN=<value>;
```

This command has a default access level of ADMIN.

<aid>	<keyword>	<value>	Description	Default value
NTP	AUTHEN	ENABLE	Enables NTP Authentication	DISABLE
		DISABLE	Disables NTP Authentication	

Sample Command
```
ED-EQPT::NTP:TP1000::AUTHEN=ENABLE;
```

This command enables authentication in NTP transmissions from the TimeProvider.

Normal Response
```
    TP-SSU 03-05-15 10-04-32
A 1166 REPT EVT
    "NTP,EQPT:SERVER,TC,03-05-15 10-04-32,,,,:\NTP
AUTHENTICATION,ENABLED"
;
```

Setting the NTP Authentication Key

When you enable NTP MD5 authentication, you must create an authentication key and authentication ID. These values must be the same for the server and each client in order to perform authentication. The ED-EQPT command allows you to add, delete, or modify the authentication key and key ID.

```
ED-EQPT:[<tid>]:NTP:[<ctag>]::KEYGEN,<func>,<keyID>[,<key>];
```

This command has a default access level of ADMIN.

<aid>	<parameter>	<value>	Description	Default value
NTP	FUNC	ADD | DELETE | MODIFY	The function to be performed on the key.	N/A
	KEYID	1 to 65534	Authentication ID	1
	KEY	32-character ASCII variable	Authentication key	null

Sample Command
```
ED-EQPT::NTP:TP1000::KEYGEN,ADD,998,ABC123;
```

This command generates the key in NTP timestamps sent by the TimeProvider.

Normal Response
```
    TP-SSU 03-05-15 10-04-32
A 1166 REPT EVT
    "NTP,EQPT:SERVER,TC,03-05-15 10-04-32,,,,:\NTP
AUTHENTICATION HAS CHANGED"
;
```

Provisioning Alarms

This section describes how you provision and manage alarms in the TimeProvider. There are TL1 commands that allow you to:

- Provision individual alarm levels

- Provision system-wide alarm levels

- Display current alarm settings

- Display current alarms

- Display alarm status

Alarms are displayed on the IMC or IMC/TPIU LEDs; they also appear on the relay contact closures on the Input module.

Provisioning the Alarm Levels

Use the SET-ATTR command to set the alarms associated with the IMC and IOC. You can use this command to reset all alarm levels to the factory default values, and to allow the TimeProvider to escalate alarms. Table 4-3 lists the alarms, a brief description of each alarm, and it's default parameters.

```
SET-ATTR:[<tid>]:<aid>:[<ctag>]::<keyword>[=<value>];
```

This command has a default access level of ADMIN.

<aid>	<keyword>	<value>	Description
SYS	ELEVTIME	ENABLE | DISABLE (default)	Allow alarms to escalate from Minor to Major and from Major to Critical
	FACTORY		Set the alarm levels to factory default values

<aid>	<keyword>	<value>	Description
SYS IMC IOC PRS INPp (p = 1 | 2)	Alarm ID	NR = Not Reported NA = A non-alarm event MN = Minor alarm MJ = Major alarm CR = Critical alarm CLEAR = Clears an active alarm; if the condition persists, then the alarm is reissued	See the definitions for the Alarm ID in the following table

Table 4-3. Alarm Conditions and Defaults

Alarm ID	Description of Alarm Condition	Possible Alarm Levels	Error Delay Default	Error Delay Editable?	Default Level SSU Mode	SUB Mode
<td colspan="7" align="center">**<aid> = SYS**</td>
PWRA	Loss of A power	MN | MJ | CR	IMMED	No	MJ	MJ
PWRB	Loss of B power	MN | MJ | CR	IMMED	No	MJ	MJ
EXPFAIL	Connection to the Expansion Panel is lost	NR | NA | MN | MJ | CR	IMMED	No	MJ	MJ
EXTALM	External alarm generated by external equipment	NR | NA | MN | MJ | CR	IMMED	No	MN	MN
<td colspan="7" align="center">**<aid> = IMC**</td>
IOC1COMM	Comm alarm with IOC 1	NR | NA | MN | MJ | CR	IMMED	No	MN	MN
IOC2COMM	Comm alarm with IOC 2	NR | NA | MN | MJ | CR	IMMED	No	MN	MN
<td colspan="7" align="center">**<aid> = IOC**</td>
IOC1COMM	Comm alarm from IMC module to IOC1 module	NR | NA | MN | MJ | CR	IMMED	No	MN	MN
IOC2COMM	Comm alarm from IMC module to IOC2 module	NR | NA | MN | MJ | CR	IMMED	No	MN	MN
IOC1TO2 COMM	Comm alarm from IOC1 to IOC2	NR | NA | MN | MJ | CR	IMMED	No	MN	MN
IOC2TO1 COMM	Comm alarm from IOC2 to IOC1	NR | NA | MN | MJ | CR	IMMED	No	MN	MN
IOCFAIL	Summary alarm of IOC failures; for example, calibration was unsuccessful	MN | MJ | CR	IMMED	No	MJ	MJ

Table 4-3. Alarm Conditions and Defaults (Continued)

Alarm ID	Description of Alarm Condition	Possible Alarm Levels	Error Delay Default	Error Delay Editable?	Default Level	
					SSU Mode	SUB Mode
CLKWARM	Local oscillator on the specified IOC is in Warm-up mode	MN | MJ	IMMED	No	MN	MN
CLKFREE	Local oscillator on specified IOC is in Free-run mode	MN | MJ | CR	IMMED	No	MJ	MJ
CLKBRDG	Local oscillator on specified IOC is in Bridging mode	MN | MJ | CR	IMMED	No	MJ	MJ
CLKHOLD	Local oscillator on specified IOC is in Holdover mode	MN | MJ | CR	IMMED	No	MJ	MJ
<aid> = PRS						
INPDISQ	Specified input has been disqualified or qualified as a possible system reference.	MN | MJ | CR	FLT DELAY	Yes	MN	MN
INPLOS	Specified input has Loss Of Signal.[1]	MN | MJ | CR	IMMED	No	MN	MN
INPFRQ	Specified input has calculated received frequency that exceeds the pull-in range of the LO.This alarm condition disqualifies the input as a possible reference.[2]	NR | NA | MN | MJ | CR	IMMED	No	MN	NR
INPPHASE	Specified input port's phase measurement exceeds usable value.	NR | NA | MN | MJ | CR	IMMED	No	MN	MN
EXDSC	Input has had excessive discontinuities, indicated by more than 3 signal faults (OOF, BPV, CRC, or AIS) within a 5-minute window. The alarm clears when the 5-minute window contains less than 3 signal faults.	NR | NA | MN | MJ | CR	IMMED	No	MN	MN

Table 4-3. Alarm Conditions and Defaults (Continued)

Alarm ID	Description of Alarm Condition	Possible Alarm Levels	Error Delay Default	Error Delay Editable?	Default Level	
					SSU Mode	SUB Mode
<aid> = INP1 or INP2						
INPDISQ	Specified input has been disqualified or qualified as a possible system reference.	MN | MJ | CR	FLT DELAY	Yes	MN	MN
INPAIS	The specified input is receiving an Alarm Indication Signal.[1]	MN | MJ | CR	IMMED	No	MN	MN
INPLOS	The specified input has Loss of Signal.[1]	MN | MJ | CR	IMMED	No	MN	MN
INPOOF	The specified input is receiving an Out of Frame signal.[1]	MN | MJ | CR	IMMED	No	MN	MN
INPFRQ	Specified input port's calculated received frequency exceeds the pull-in range of the LO. This alarm condition disqualifies the input as a possible reference.[2]	NR | NA | MN | MJ | CR	IMMED	No	MN	NR
INPPHASE	Specified input port's phase measurement exceeds usable value.	NR | NA | MN | MJ | CR	IMMED	No	MN	MN
INPQL	The received SSM is of lesser quality than the provisioned QLEVEL for a specified input. This alarm occurs when you provision the input's QLEVEL below the quality level of the LO.	NR | NA | MN | MJ | CR	IMMED	No	MN	MN
EXDSC	Input has had excessive discontinuities, indicated by more than 3 signal faults (OOF, BPV, CRC, or AIS) within a 5-minute window. The alarm clears when the 5-minute window contains less than 3 signal faults.	NR | NA | MN | MJ | CR	IMMED	No	MN	MN

Note:
1   When the fault is detected, the input is immediately removed from the possible reference list. The fault must be continuously present for the period specified by FLTDELAY before the alarm is set. After the alarm is set, it clears once the input signal is fault-free for the period specified by CLRDELAY.
2   Once INPFREQ is set, the alarm clears when the input frequency is within the defined pull-in range

Sample Command

```
SET-ATTR::SYS:TS1000::ELEVTIME=ENABLE;
```

This command allows alarms to automatically escalate to the next higher alarm level after the time period specified in the FLTDELAY keyword has elapsed (see Provisioning System-Level Alarms, on page 130, for more details).

Sample Command

```
SET-ATTR::SYS:TS1000::EXPFAIL=NA;
```

This command disables the Expansion Fail alarm that occurs if you are not using an Expansion Panel with the TimeProvider.

Provisioning System-Level Alarms

You use the ED-SYNC command to provision system-level alarms. The CLRDELAY and FLTDELAY parameters are system-wide; the parameters cannot be set for individual alarms.

```
ED-SYNC:[<tid>]:<aid>:[<ctag>]::<keyword>=<value>;
```

This command has a default access level of ADMIN.

<aid>	<keyword>	<value>	Description	Default value
SYS	CLRDELAY	0 to 1000 s	Sets the time delay to declare a valid input after an alarm condition clears	10 s
	FLTDELAY	1 to 15 s	Sets the time delay before a fault is declared due to LOS, AIS, or OOF alarms on the input	5 s
	FREEFLT	ON|SQUELCH | AIS	Determines the action when the LO enters the Free-Run mode	SQUELCH
	HOLDFLT	ON|SQUELCH | AIS	Determines the action when the LO enters the Holdover mode	ON

<aid>	<keyword>	<value>	Description	Default value
SYS (cont'd)	GPSCLRDEL	0 to 1000 s	Sets the time delay to declare GPS is valid after an alarm condition clears	5
	GPSFLTDEL	1 to 1000 s	Sets the time delay before a GPS fault is declared	1

Sample Command

```
ED-SYNC::SYS:TS1000::CLRDELAY=5;
```

This command declares a faulted input to be valid five seconds after the alarm condition has cleared.

Autonomous Message

```
   TP-SSU 03-10-24 11:18:00
A 1192 REPT EVT
   "SYS,EQPT:NA,CLRDELAY,NSA,03-10-24 11-18-00:\"INPUT CLEAR
DELAY HAS CHANGED\""
;
```

Retrieving Current Alarm Settings

You can display the current settings for any alarm using the RTRV-ATTR command.

```
RTRV-ATTR:[<tid>]:<aid>:[<ctag>][::<keyword>];
```

This command always has an access level of USER.

<aid>	<keyword>	Description
SYS	ELEVTIME	ENABLE | DISABLE
SYS IMC IOC PRS INPp (p = 1 | 2)	Alarm ID	The Alarm ID is described in Provisioning the Alarm Levels, on page 126
ALL (or null)	ALL (or null)	Returns all of the alarm attributes

Response Format

```
<cr><lf><lf>
    sid date time<cr><lf>
M   ctag COMPLD<cr><lf>
    "<aid>:event id,alarm level"<cr><lf>
    "<aid>:event id,alarm level"<cr><lf>
     .
      .
    "<aid>:event id,alarm level"<cr><lf>
;
```

Field	Description
<aid>	The aid specified in the command
event id	The identifier of the alarm whose level is displayed
alarm level	The value indicates the alarm level that is generated by an alarm event: NR = Not Reported NA = A non-alarm event MN = Minor alarm MJ = Major alarm CR = Critical alarm

Sample Command

```
RTRV-ATTR::SYS:TS1000;
```

This command causes the TimeProvider to return the alarm levels associated with all system-level alarms.

Normal Response

```
    TP-SSU 03-10-24 11:21:20
M   TS1000 COMPLD
    "SYS:IOC1EQPT,NA"
    "SYS:IOC2EQPT,NA"
    "SYS:PWRA,MJ"
    "SYS:PWRB,MJ"
    "SYS:EXTALM1,MJ"
    "SYS:EXTALM2,CR"
    "SYS:EXPFAIL,MJ"
;
```

Retrieving Current Alarms

You can display the current active alarms using the RTRV-ALM command.

```
RTRV-ALM:[<tid>]:<aid>:[<ctag>];
```

This command has a default access level of USER.

<aid>	Description
ALL (or null) SYS IMC IOCm (m = 1 | 2) PRS INPp (p = 1 | 2) OUTg (g = A | B | C | D)	Access identifiers

Normal Response Format

```
<cr><lf><lf>
^^^sid^date^time<cr><lf>
M^<ctag>^COMPLD
^^^"<aid>,aidtype:ntfcncde,condtype,srveff,ocrdat,ocrtim
<:condscr>"<cr><lf>*
;
```

where * indicates zero or more of the preceding element

Value	Description
<aid>	Access identifier
aidtype	Access identifier type EQPT – alarm associated with operation of the system T1 – alarm associated with inputs or outputs
ntfcncde	Notification code: MN – Minor alarm MJ – Major alarm CR – Critical alarm
condtype	Condition type – keyword associated with the command
srveff	Service affecting indicator
ocrdat	Occurrence date of the alarm
ocrtim	Occurrence time of the alarm
condscr	Optional condition description – text string enclosed in quotation marks

Sample Command

```
RTRV-ALM:::TS1000;
```

This command causes the TimeProvider to return all current alarms.

Normal Response

```
   TP-SSU 03-10-24 11:22:11
M  TS1000 COMPLD
   "SYS,EQPT:MJ,PWRA,NSA,03-10-24 11-22-11:\"POWER A FAILED\""
   "SYS,EQPT:MJ,EXPFAIL,SA,03-10-24 11-22-11:\"EXPANSION CONNECTIVITY FAILED\""
   "IOC2,EQPT:MJ,CLKFREE,SA,03-10-24 11-25-15:\"CLOCK ENTERED FREE-RUN MODE\""
   "INP1,T1:MN,INPLOS,NSA,03-10-24 11-25-16:\"LOS FAULT\""
   "INP2,T1:MN,INPDISQ,NSA,03-10-24 11-25-17:\"INPUT DISQUALIFIED AS POSSIBLE
REFERENCE\""
   "INP2,T1:MN,INPLOS,NSA,03-10-24 11-25-17:\"LOS FAULT\""
;
```

Displaying Alarm Status

The RTRV-COND command displays information about the current summary alarm status of components within the TimeProvider. The active IOC reports alarms for the Input, Output, and Expansion Panel.

```
        RTRV-COND:[<tid>]:<aid>:[<ctag>];
```

This command always has an access level of USER.

<aid>	Description
ALL (or null)	Access Identifiers

Normal Response Format

```
<cr><lf><lf>
^^^sid^date^time<cr><lf>
M ^ctag^COMPLD<cr><lf>
^^^"SYS:<pwra>,<pwrb>,<expstatus>,<extfault>,<ioc1eqpt>,
<ioc2eqpt>,<sysqlevel>,<lastdat>,<lasttim>"<cr><lf>
^^^"IMC:<ioc1comm>,<ioc2comm>"<cr><lf>
[^^^"IOC1:<iocstatus>,<ioccomm>,<imccomm>"<cr><lf>]
[^^^"IOC2:<iocstatus>,<ioccomm>,<imccomm>"<cr><lf>]
^^^"GPS:<gpsstatus>"<cr><lf>
^^^"PRS:<prsstatus>"<cr><lf>
^^^"INP1:<inpstatus>"<cr><lf>
^^^"INP2:<inpstatus>"<cr><lf>
^^^"OUTA:<outstatus>"<cr><lf>
^^^"OUTB:<outstatus>"<cr><lf>
^^^"OUTC:<outstatus>"<cr><lf>
^^^"OUTD:<outstatus>"<cr><lf>
;
```

<aid>	Description
SYS	Displays the connectivity status of the Expansion Panel and any alarms associated with the Expansion Panel <pwra> – PWRA-OK | PWRA-FAIL <pwrb> – PWRB-OK | PWRB-FAIL <expstatus> – OK | ALM <extfault> – OK | ALM
IMC	Displays all conditions related to the Information Management module <ioc1comm> – IOC1COMM-OK | IOC1COMM-FAIL <ioc2comm> – IOC2COMM-OK | IOC2COMM-FAIL
IOCm m = 1 | 2	Displays the current setup and conditions related to the system-level function of the IOC module <iocstatus> – OK | ALM (IOCFAIL) <ioccomm> – IOC1TO2COMM-OK | IOC1TO2COMM-FAIL IOC2TO1COMM-OK | IOC2TO1COMM-FAIL <imccomm> – IMC1COMM-OK | IMC1COMM-FAIL | IMC2COMM-OK | IMC2COMM-FAIL
GPS	Displays GPS Input state and any alarm events associated with GPS input <gpsstatus> – OK | ALM
PRS	Displays PRS Input state and any alarm events associated with PRS input <prsstatus> – OK | ALM
INPp p = 1 | 2	Displays Input state and any alarm events associated with Inputs 1 or 2 <inpstatus> – OK | ALM
OUTg g = 1 | 2 | 3 | 4	Displays output status; this reflects the state of IOCFAIL of the active IOC <outstatus> – OK | ALM

Sample Command

```
RTRV-COND::IOC:TS1000;
```

Normal Response

```
    TP-SSU 03-10-24 11:27:28
M  TS1000 COMPLD
    "SYS,PWRA-OK,PWRB-OK,OK,OK"
;
```

Clearing Alarms

Clearing the Office (Audible) Alarm

Use the following TL1 command to turn off (squelch) the audible office alarm. The office alarm reactivates when a new alarm occurs.

```
        OPR-ACO-ALL:[<tid>]::[<ctag>];
```

This command has a default access level of USER.

Sample Command

```
OPR-ACO-ALL:::TS1000;
```

Normal Response

```
    TP-SSU 03-10-24 11:26:47
M   TS1000 COMPLD
    "IMC,EQPT:NA,ACO,NSA,03-10-24 11-26-47:\"AUDIO ALARM IS
DEACTIVATED"
    ;
```

Provisioning SNMP Parameters

The Simple Network Management Protocol (SNMP) implemented in the
TimeProvider supports SNMP v1, v2C, and v3. You can add up to 20 SNMP users
(also known as communities or principals); these users cannot have the same name
as TL1 users.

Activating SNMP

You use the ACT-FEATURE command to enable the SNMP feature on the
TimeProvider. You should contact your Symmetricom Sales representative and
order part number 920-58002-01 to obtain the key to activate the SNMP feature.

```
ACT-FEATURE:[<tid>]:<fid>:[<ctag>]::<key>;
```

This command has a default access level of ADMIN.

Parameter	<value>	Description
<fid>	SNMP	The feature to be enabled.
<key>	Up to 20 case-sensitive characters; must be within quotes to be case-sensitive.	Key to enable the feature

Sample Command

```
ACT-FEATURE::SNMP:TS1000::"ABcdEFgh123456";
```

This command enables the SNMP feature within the TimeProvider, and uses an
activation code provided by Symmetricom.

Normal Response

```
    TP-SSU 03-05-15 09-59-09
M 1166 COMPLD
    "IMC Serial#=ABC123"
    "SNMP activated"
    ;
```

> *Autonomous Message*
> ```
>     TP-SSU 03-05-15 09-59-09
> A 1166 REPT EVT EQPT
>     "IMC,EQPT:FEATURE,TC,03-05-15 09-59-09,,,,:\"System
> Feature has been enabled\""
> ;
> ```

Adding a User

You use the Enter User Security command to add an SNMP user to the TimeProvider:

Changing A User's Security Parameters

You use the Edit User Security command to change the security parameters, such as authentication protocol, authentication password, and privacy password.

Displaying the Connected Users

You use the Retrieve User Security command to view the users connected to the TimeProvider.

Deleting a User

You use the Delete User Security command to delete TL1 and SNMP users from the TimeProvider.

Setting Up SNMP Traps, Informs, and Notifications

You can set up to five users to send out a trap, and up to five managers to receive the trap. You must also set up the timeout and retrry parameters for each user/manager.

SNMP v1
To set up Traps, create an SNMP v1 community using the ENT-USER-SECU command. Add a MGRx and SENDERx using the ED-EQPT command. There is no Inform capability in SNMP v1. The engineid parameter in the ENT-USER-SECU command is ignored; the IFTOUTx and IFRETRYx parameters are not used.

SNMP v2C
To set up Notifications, create an SNMP v2C community using the ENT-USER-SECU command. Add a MGRx and SENDERx using the ED-EQPT command. Set the IFTOUTx and IFRETRYx parameters to 0.

To set up Informs, create an SNMP v2C community using the ENT-USER-SECU command. Add a MGRx and SENDERx using the ED-EQPT command. Set the IFTOUTx and IFRETRYx parameters to a nonzero value.

SNMP v3

To set up Notifications, create an SNMP v3 user with or without MD5 or SHA using the ENT-USER-SECU command. DO not add the engineid. Add a MGRx and SENDERx using the ED-EQPT command. Set the IFTOUTx and IFRETRYx parameters to 0.

To set up Informs, create an SNMP v3 user with or without MD5 or SHA using the ENT-USER-SECU command. Include the engineid of the manager engine. Add a MGRx and SENDERx using the ED-EQPT command. Set the IFTOUTx and IFRETRYx parameters to a nonzero value.

System Commands

This section describes the TL1 commands you use to perform the following routine operations with the TimeProvider:

- Displaying events

- Displaying the current configuration

- Restarting the TimeProvider

Displaying Events

The RTRV-LOG command displays all the events in the event log in chronological order (first in - first out). The event log contains the 500 most recent alarmed and non-alarmed events. Alarms with an alarm level of NONE are not stored in the log.

```
RTRV-LOG:[<tid>]:[<aid>]:[<ctag>][::<keyword>=<value>];
```

This command has a default access level of USER.

<aid>	<keyword>	Description
ALL (or null) IMC IOC IOCm (m = 1 | 2) GPS PRS INPp (p = 1 | 2) OUTg (g = A | B | C | D)	All (or null)	Displays both events and alarms stored in the log for the specified aid
	EVT	Displays events stored in the log for the specified event
	ALM	Displays alarms stored in the log for the specified event

Sample Command
```
RTRV-LOG::INP1:TS1000::ALM;
```

This command causes the TimeProvider to return all alarms stored in the log for Input 1.

Normal Response

```
    TP-SSU 03-10-24 11:28:02
M 2 COMPLD
    "INP1,T1:MJ,ALM,NSA,03-10-24 11-26-47"
;
```

Normal Response Format

```
<cr><lf><lf>
^^^sid^date^time<cr><lf>
M^<ctag>^COMPLD
^^^"<aid>,<aidtype>:ntfcncde,condtype,srveff,ocrdat,ocrtim
<:condscr>"<cr><lf>*
;
```

where * indicates zero or more of the preceding element

Displaying the Configuration of the TimeProvider

Use the following TL1 command to display the current equipment parameters. You can display the parameters for the following components: SYS, COM, IOC, GPS, PRS, INP, and OUT.

```
        RTRV-EQPT:[<tid>]:<aid>:[<ctag>]::<keyword>;
```

This command has a default access level of USER.

Response	Description
<aid>	The access identifier for the equipment component (SYS, COM, IMC, IOC, GPS, PRS, INP, or OUT)
<keyword>	The specific equipment parameter you requested See the *TimeProvider TL1 Reference Guide* for details on the available keywords.
<value>	The current setting of the requested equipment parameter.

Sample Command

```
RTRV-EQPT::IOC1:TS1000::IOCMODE;
```

This command causes the TimeProvider to return the current operating mode for IOC1.

Normal Response

```
    TP-SSU 03-10-24 11:30:42
M  TS1000 COMPLD
    "IOC1:IOCMODE,ACTIVE"
;
```

Normal Response Format
```
<cr><lf><lf>
^^^sid^date^time<cr><lf>
M ^ctag^COMPLD<cr><lf>
^^^"<aid>:<keyword>,<value>"<cr><lf>
;
```

Restarting the TimeProvider

Use the INIT-SYS command to reset the specified module or to clear all information stored in non-volatile memory. All users logged in to the TimeProvider are logged out and the user list is cleared.

> **Caution:** This command causes the local oscillator in the specified IOC to enter the Warm-up mode; the outputs remain in the holdover mode until the local oscillator locks on to the input reference signal.
>
> All SYS parameters are reset, including the entire user list. You must create a new security-level user after issuing this command with the SYS:FACTORY aid and keyword.

```
INIT-SYS:[<tid>]:<aid>:[<ctag>]::<keyword>;
```

This command has a default access level of ADMIN.

<aid>	<keyword>	Description
SYS	FACTORY	Resets the SID, security, communication ports, and alarm settings to factory defaults (see Appendix A, Factory Default Values)
IMC IOCm m = 1 | 2	RESET	Performs a soft reset on the card and clears all alarms. Does not affect the SID, security, communication ports, and alarm settings

Sample Command
```
INIT-SYS::IOC1:::RESET;
```

Autonomous Message
```
   TP-SSU 03-10-24 11:31:52
A 1193 REPT EVT
   "IOC,EQPT:MN,RESET,NSA,03-10-24 11-30-42:\"MODULE HAS
BEEN RESET\""
;
```

Saving Provisioning Data

Symmetricom recommends that you keep an electronic version and/or a written version of the provisioning changes you make to the TimeProvider.

Electronically Backing up Provisioning Data

Copy the contents of the IOC into the IMC memory by issuing the CPY-MEM command as follows. See the *TimeProvider TL1 Reference Guide* for more information on the CPY-MEM command.

```
CPY-MEM:::TS1000::IOC,IMC,IOC;
```

Copy the contents of the IMC into the IOC memory by issuing the CPY-MEM command as follows:

```
CPY-MEM:::TS1000::IMC,IOC,IMC;
```

This command may take more than two seconds to execute; if it does, then the In-Process response is issued. This command also logs off all users connected to the TimeProvider.

If two IOCs are in the shelf, the Active IOC automatically saves its data in the Standby IOC.

Provisioning Worksheet

Use Table 4-4 to record the values you provisioned into the TimeProvider.

Table 4-4. Provisioning Record

Section	Parameter	User-Defined Value
Setting the Source ID <sid>, on page 90	Source ID (<sid>)	
Setting RS-232 Parameters, on page 91	Baud rate	
	Handshaking mode	
	Echo mode	
Setting Ethernet Parameters, on page 93	IP Gate address	
	IP address	
	Subnet mask	
Setting the System Mode, on page 105	System mode	
Setting the IOC Parameters, on page 107	Oscillator type, IOC1	
	Oscillator type, IOC2	

Table 4-4. Provisioning Record (Continued)

Section	Parameter	User-Defined Value
Setting the Input State, on page 108	Input mode, PRS	
	Input mode, INP1	
	Input mode, INP2	
	Input mode, GPS	
Setting the GPS Parameters, on page 109	GPS Mode	
	GPS Position	
	GPS Elevmask	
Setting the Input Frequency, on page 110	Frequency, PRS	
Setting the Input Frame Type, on page 110	Frame type, INP1	
	Frame type, INP2	
Controlling Automatic Reference Switching, on page 111	Reference mode	
Setting the Input Quality Level, on page 112	QLEVEL, PRS	
	QLEVEL, INP1	
	QLEVEL, INP2	
	QLEVEL, GPS	
Setting the Input Priority Level, on page 113	PRIORITY, PRS	
	PRIORITY, INP1	
	PRIORITY, INP2	
	PRIORITY, GPS	
Manually Selecting the Reference, on page 114	INPREF	
Provisioning the SSM, on page 115	SSMBIT, INP1	
	SSMBIT, INP2	
Enabling CRC4, on page 116	CRCENA, INP1	
	CRCENA, INP2	
Enabling and Disabling the Outputs, on page 119	OUTSTATE, OUTA	
	OUTSTATE, OUTB	
	OUTSTATE, OUTC	
	OUTSTATE, OUTD	

Table 4-4. Provisioning Record (Continued)

Section	Parameter	User-Defined Value
Provisioning the Output Framing Type, on page 119	FRMTYPE, OUTA	
	FRMTYPE, OUTB	
	FRMTYPE, OUTC	
	FRMTYPE, OUTD	
Enabling and Disabling the Retimers, on page 120	RTMSTATE, RTMA	
	RTMSTATE, RTMB	
	RTMSTATE, RTMC	
	RTMSTATE, RTMD	
Provisioning the LBO, on page 121	RTMLBO, RTMA-1	
	RTMLBO, RTMA-2	
	RTMLBO, RTMB-1	
	RTMLBO, RTMB-2	
	RTMLBO, RTMC-1	
	RTMLBO, RTMC-2	
	RTMLBO, RTMD-1	
	RTMLBO, RTMD-2	
Provisioning Cut-thru Mode, on page 122	FREEFLT, RTMA-1	
	FREEFLT, RTMA-2	
	FREEFLT, RTMB-1	
	FREEFLT, RTMB-2	
	FREEFLT, RTMC-1	
	FREEFLT, RTMC-2	
	FREEFLT, RTMD-1	
	FREEFLT, RTMD-2	

Table 4-4. Provisioning Record (Continued)

Section	Parameter	User-Defined Value
Provisioning Cut-thru Mode, on page 122 (cont'd)	HOLDFLT, RTMA-1	
	HOLDFLT, RTMA-2	
	HOLDFLT, RTMB-1	
	HOLDFLT, RTMB-2	
	HOLDFLT, RTMC-1	
	HOLDFLT, RTMC-2	
	HOLDFLT, RTMD-1	
	HOLDFLT, RTMD-2	
Editing NTP Peer Server Parameters, on page 123	KEYID	
	MAXPOLL	
	MINPOLL	
	PREFERRED	
	SERVERIP	
Setting the NTP Authentication Key, on page 125	FUNC	
	KEYID	
	KEY	
Provisioning the Alarm Levels, on page 126	ELEVTIME	
Provisioning System-Level Alarms, on page 130	CLRDELAY	
	FLTDELAY	
	FREEFLT	
	HOLDFLT	
	GPSCLRDEL	
	GPSFLTDEL	

Chapter 5 Testing the TimeProvider

This chapter describes a basic acceptance test for the TimeProvider product.

In This Chapter

- Testing the TimeProvider
- Verifying Normal Operation
- Testing Alarm Conditions
- Testing the Communication Ports
- Testing the Outputs
- Test Record

Testing the TimeProvider

Perform the tests described in this chapter after you install (see Chapter 3, Installing the TimeProvider) and provision (see Chapter 4, Provisioning the TimeProvider) the TimeProvider. Record the results in the Test Record in Test Record, on page 153. These tests verify the operation of the TimeProvider and are not mandatory for operating the unit.

Test Overview

This chapter describes four tests that verify the operation of the TimeProvider:

- Verify normal operation
- Test alarm conditions
- Test communication ports
- Perform output checks

Test Equipment

To perform the tests in this chapter, you need the following equipment:

- Volt-ohmmeter
- Oscilloscope
- Communications analyzer

Verifying Normal Operation

The LEDs on the IMC and the IOC(s) indicate the status of the TimeProvider. Table 5-1 shows the condition of the LED indicators on the front panel of the IOC under normal operating conditions.

Table 5-1. LED Conditions for the IOC

LED Name	Condition	Description
Power	Green	Power is On
Fail	Off	No failure
Alarm	Off	No alarm
Active	Green Off	Card is active Card is in standby mode

Table 5-1. LED Conditions for the IOC (Continued)

LED Name	Condition	Description
Holdover	Off	Tracking at least one input
PRS	Q LED Green, A LED Green Q LED Green, A LED Off Q LED Red, A LED Off	Enabled, qualified, and active Enabled, qualified, and not active Enabled and not qualified
Input 1	Q LED Green, A LED Green Q LED Green, A LED Off Q LED Red, A LED Off	Enabled, qualified, and active Enabled, qualified, and not active Enabled and not qualified
Input 2	Q LED Green, A LED Green Q LED Green, A LED Off Q LED Red, A LED Off	Enabled, qualified, and active Enabled, qualified, and not active Enabled and not qualified
GPS	Off Green Amber Red	1 PPS signal is not present 1 PPS signal is active Bridging mode fault Loss of 1 PPS signal, TPIU fault, or antenna fault

Table 5-2 shows the condition of the LED indicators on the front panel of the IMC under normal operating conditions.

Table 5-2. LED Conditions for the IMC and IMC/TPIU

LED Name	Condition	Description
Power	Green	Power is On
Fail	Off	No failure
Alarm	Off	No alarm
Critical	Off	No Critical alarms
Major	Off	No Major alarms
Minor	Off	No Minor alarms
ACO	Off	Alarm cutoff disabled

Testing Alarm Conditions

Testing the IOC Operating Modes

Warm-up Mode

The IOC enters and remains in the Warm-up mode for approximately 30 minutes after you apply power to the shelf, or when you install the IOC into the shelf. The following actions occur when an IOC enters the Warm-up mode:

- The Power LED on the IOC flashes green

- An event is generated and stored in the event log

To verify that an IOC is in warm-up mode:

1. Apply an appropriate signal to the INP1, INP2, and/or PRS inputs.

2. Visually inspect the Power LED on the appropriate IOC. The LED is flashing green in the Warm-up mode.

3. Type `RTRV-ALM::IOC1;` (or `RTRV-ALM::IOC2;`). The TimeProvider responds with a complied message indicating that the designated IOC is in alarm.

Locked Mode

The IOC enters and remains in the locked mode after it has completed the warm-up cycle. The following actions occur when an IOC enters the Locked mode:

- The Power LED on the IOC is green

- An event is generated and stored in the event log

To verify that an IOC is in locked mode:

1. Visually inspect the Power LED on the appropriate IOC. The LED is continually green when the IOC is tracking at least one input.

2. Type `RTRV-LOG::IOC1:::EVT;` (or `RTRV-LOG::IOC2:::EVT;`). The TimeProvider responds with a list of events related to the specified IOC. Look for the entry with the text "Clock entered lock mode."

Testing the Reference Switching

To test the ability of the TimeProvider to switch references, you perform a two-step test:

- Connect appropriate reference inputs to the TimeProvider.
- Create a fault on the selected reference signal and observe that the TimeProvider changes to the appropriate secondary input.

To test the reference switching:

1. Connect a suitable reference signal to the PRS input and a second reference signal to the INP1 input. Wait for the Qualified LEDs for both inputs to turn green and for the Active LED to light on the PRS input.

2. Issue the `ED-EQPT::PRS:::INSTATE=DISABLE;` command to disable the PRS input and force the TimeProvider to switch to the INP1 reference.

3. Observe that the Active LED changes from the original input to the secondary input (PRS to INP1 or INP1 to PRS).

Testing the Non-Revertive Operating Mode

When the TimeProvider is in the non-revertive operating mode, the input reference signal does not revert to the original input after it recovers from an error condition.

The TimeProvider is in non-revertive mode when the QLEVEL parameter for INP1, INP2, and PRS inputs is set to the same value, and the PRIORITY parameters for the same inputs are set to the same level.

To test the non-revertive operating mode, perform the following steps:

1. Define the non-revertive mode by setting the QLEVEL and PRIORITY parameters to appropriate values. See Setting the Input Quality Level, on page 112, and Setting the Input Priority Level, on page 113, for further information.

2. Provision and connect appropriate reference inputs to the TimeProvider.

3. Create a fault on the selected reference signal and observe that the TimeProvider changes to the appropriate secondary input.

4. Remove the fault on the initial reference signal and observe that the TimeProvider does not revert to that initial reference input. The event log indicates that the reference signal is no longer in fault.

Testing the Revertive Operating Mode

When the TimeProvider is in the revertive operating mode, the input reference signal reverts to the original input after it recovers from an error condition.

The TimeProvider is in the revertive mode when the QLEVEL parameter for INP1, INP2, and PRS inputs are set to different values, and the PRIORITY parameters for the same inputs are also set to different values.

To test the revertive operating mode, perform the following steps:

1. Define the revertive mode by setting the QLEVEL and PRIORITY parameters to appropriate values. See Setting the Input Quality Level, on page 112, and Setting the Input Priority Level, on page 113, for further information.

2. Provision and connect appropriate reference inputs to the TimeProvider.

3. Create a fault on the selected reference signal and observe that the TimeProvider changes to the appropriate secondary input.

4. Remove the fault on the initial reference signal and observe that the TimeProvider reverts to the initial reference input. The event log and the LEDs indicate that the input is no longer in fault, and that the reference has changed.

Testing the Power Alarms

To test the ability of the TimeProvider to detect and report problems with the battery power, you perform a two-step test:

- Connect power to the TimeProvider on both Batt A and Batt B terminals
- Remove power from one terminal and observe that the TimeProvider issues the appropriate alarm

When power is lost from the Batt A or Batt B terminal, the factory default alarm is Major.

1. Connect the appropriate power supply to both the Batt A and Batt B connectors. The TimeProvider enters the Warm-up mode.

2. Remove power from either the Batt A or Batt B terminal. Observe that the Major LED on the IMC is red. Verify that a Major alarm is included in the event log.

Detecting Input Errors

You can provision the TimeProvider to perform a variety of functions when an input error occurs. Possible errors include:

- AIS - Alarm Indication Signal
- LOS - Loss of Signal
- OOF - Out of Frame
- Loss of Alignment
- Excessive wander
- Input is disqualified
- GPS faults

The TimeProvider reports these and other errors on the front panel alarm LEDs, in an autonomous event message, and via devices connected to the alarm relays. You can provision each error to a specific alarm level (Minor, Major, or Critical).

Setting an Alarm Strategy

You can set up the input alarms to prevent spurious input errors from triggering an alarm. The FLTDELAY keyword parameter sets a period from 1 to 15 seconds that an input error must be present before the alarm is issued. You can provision the alarm to clear from 1 to 1000 seconds after the input error clears using the CLRDELAY keyword parameter. Use the ED-SYNC command syntax described in Provisioning System-Level Alarms, on page 130 to provision the FLTDELAY and CLRDELAY keywords.

Testing the Communication Ports

The TimeProvider has three communication ports. This section describes how to test each port; if you do not plan to use a port, then you can skip the corresponding test.

- Local Craft serial port
- Remote serial port
- Ethernet port

Testing the Local Craft Serial Port

The local Craft serial port is on the faceplate of the IMC or IMC/TPIU, and is configured as a DCE device. The default settings for the local Craft serial port are 9600 Baud, 8 bits, no parity, 1 stop bit, echo on, and handshaking disabled.

To connect a device to the local Craft port, perform the following steps:

1. Connect a straight-through serial cable to the local Craft port. Connect the other end of the cable to a computer.

2. Start a terminal emulation program such as HyperTerminal or ProComm Plus. Configure the program for 9600 baud, 8 data bits, No parity, and 1 stop bit.

3. Type ; (semicolon). If the TimeProvider responds with a Deny response, you have established communications. If you do not receive the Deny response, check the connections, the cable, and the program settings.

Testing the Remote Serial Port

The Remote port is for remote dial-in connection to the unit, and is configured as a DTE device. The default settings for the Remote serial port are 9600 Baud, 8 bits, no parity, 1 stop bit, echo on, and handshaking disabled.

To connect a device to the Remote port, perform the following steps:

1. Connect a null-modem serial cable to the Remote port. Connect the other end of the cable to a computer.

2. Start a terminal emulation program such as HyperTerminal or ProComm Plus. Configure the program for 9600 baud, 8 data bits, No parity, and 1 stop bit.

3. Type ; (semicolon). If the TimeProvider responds with a Deny response, you have established communications. If you do not receive the Deny response, check the connections, the cable, and the program settings.

Testing the Ethernet Port

You use a direct connection when a service technician is on-site. You must configure the Ethernet settings using a serial connection before using the Ethernet connection; the procedure is described in Setting Ethernet Parameters, on page 93.

To connect the TimeProvider to a PC or terminal using Ethernet, perform the following steps:

1. Connect an RJ-45 Ethernet cable to the LAN connector on the shelf.

2. Connect the other end of the cable to the PC or terminal.

3. Start a terminal emulation program such as HyperTerminal or ProComm Plus. Configure the program for a telnet session and enter the IP address with port 5000 of the TimeProvider.

4. Type ; (semicolon). If the TimeProvider responds with a Deny response, you have established communications. If you do not receive the Deny response, check the connections, the cable, and the program settings.

Testing the Outputs

The TimeProvider supports up to 32 output signals on four output groups. You can provision the output signal to the following types: 2M, CAS, CCS, D4, ESF, CC, JCC, JCC4, 1.544 MHz, 6.312 MHz, 8 kHz, or ISOLATED_1.

To test the outputs, connect the communications analyzer to the output under test and observe that the waveforms meet or exceed the specifications for that signal type.

Test Record

Use Table 5-3 to record the results of the tests performed on the TimeProvider.

Table 5-3. Record of Test Results

Test	Results (Pass/Fail)	Date	Initials
Verifying Normal Operation			
IOC Operating Modes			
Reference Switching			
Non-Revertive Mode			
Revertive Mode			
Power Alarms			
Input Errors			
Local Serial Port			
Remote Serial Port			
Ethernet Port			
Outputs			

Chapter 6 Maintaining and Troubleshooting the TimeProvider

This chapter describes maintenance and troubleshooting procedures for the TimeProvider.

In This Chapter

- Preventive Maintenance
- Safety Considerations
- ESD Considerations
- Diagnosing the IOC
- Diagnosing the IMC
- Diagnosing the External TPIU
- Replacing Output Modules
- Replacing the Input Module
- Troubleshooting the TimeProvider
- Repairing the TimeProvider
- Obtaining Technical Assistance
- Upgrading the Firmware
- Returning the TimeProvider
- Manual Updates

Preventive Maintenance

The TimeProvider shelf requires minimal preventive maintenance. Take care to ensure the unit is not exposed to hazards such as direct sunlight, open windows, water, or extreme heat. See Environmental Requirements in Pre-Installation Check, on page 54, for electromagnetic compatibility conditions that may cause damage.

Caution: To avoid electromagnetic discharge damage to the circuitry, never attempt to vacuum the TimeProvider main shelf or expansion shelf.

Caution: To avoid damage, under no circumstances should the interior chassis of the TimeProvider be allowed to come in contact with water.

Table 6-1 lists preventive maintenance measures to be performed periodically. Do not disassemble components just for the purpose of inspection.

Table 6-1. Preventive Maintenance

Item	Inspection	Corrective Action	Interval
Chassis	Inspect for dirt or foreign material	Clean the exterior of chassis with a soft dry cloth	Periodically
Cables	Inspect for pinched, worn or damaged cable	Replace pinched, worn or damaged cable at the first opportunity	Periodically
Connectors	Inspect for loose or damaged connector	Tighten loose connectors. If damaged, replace the connector and/or cable at the first opportunity	Periodically

Safety Considerations

Follow your company's safety guidelines and policies when working on or around live equipment.

ESD Considerations

Maintenance personnel should wear ESD wrist straps when installing or working on all TimeProvider equipment and cards. Plug the user-supplied wrist strap into the TimeProvider shelf. Place IMC and IOC cards as well as the Input and Output panels into static-free bags when not in use.

Diagnosing the IOC

Reading LED Conditions

Table 6-2 shows the function of the LED indicators on the front panel of the IOC.

Table 6-2. LED Conditions for the IOC

LED Name	Condition	Description
Power	Green Off Flashing Green	Power is On Power is Off Warming Up
Fail	Red Off	Card failure No failure
Alarm	Red Off	Card alarm No alarm
Active	Green Off	Card is active Card is in standby mode
Holdover	Off Amber Red	Tracking at least one input Not tracking in PRR mode; Bridging Mode engaged Tracking no inputs
PRS	Q LED Off A LED Off Q LED Amber A LED Off Q LED Green A LED Green Q LED Green A LED Off Q LED Red A LED Off	Disabled Enabled, in process of qualifying Enabled, qualified, and active Enabled, qualified, and not active Enabled and not qualified
Input 1	Q LED Off A LED Off Q LED Amber A LED Off Q LED Green A LED Green Q LED Green A LED Off Q LED Red A LED Off Q LED Flashing GreenA LED Off	Disabled Enabled, in process of qualifying Enabled, qualified, and active Enabled, qualified, and not active Enabled and not qualified Enabled and not qualified: Tip-Ring reversed
Input 2	Q LED Off A LED Off Q LED Amber A LED Off Q LED Green A LED Green Q LED Green A LED Off Q LED Red A LED Off Q LED Flashing GreenA LED Off	Disabled Enabled, in process of qualifying Enabled, qualified, and active Enabled, qualified, and not active Enabled and not qualified Enabled and not qualified: Tip-Ring reversed
GPS	Off Green Amber Red	Disabled Enabled and GPS qualified Enabled and in Bridging mode Enabled and GPS disqualified (except in Bridging mode)

Interpreting Error Messages

Error messages appear on the console as they occur, and include the time and date of occurrence. Refer to the event codes described in Table 6-5 and to the alarm codes described in Table 6-7.

Compatibility Alarm

If you receive a COMPAT alarm, then one or more of the installed hardware and/or software components is not compatible with other components. Refer to the Software Release Notice (097-58001-22) for a list of compatible components and firmware revision levels. If necessary, update the firmware in one or more components using the procedures in Upgrading the Firmware, on page 187.

Removing the IOC

You can remove either of two IOCs in a shelf without affecting outputs. If you need to remove the only IOC in a shelf, or remove both IOCs from a shelf, outputs are interrupted and will resume once one IOC has achieved lock on an input signal.

IOC Memory

The IOC stores its configuration and the configuration of the redundant IOC, if it is installed. This configuration information is stored in non-volatile memory, and is retained even if the IOC is removed from the shelf. The IOC also stores the configuration of the IMC. The configuration of the IMC is stored in volatile memory and is lost if the IOC is removed from the shelf.

Removing the Only IOC

To remove the only IOC in a shelf, use the following procedure. Output signals will be interrupted; they will resume once the IOC has achieved lock on an input signal.

1. Save the contents of the IOC memory in the IMC by issuing the following command:

        CPY-MEM:::::IOC,IMC,IOC;

    This command may take more than two seconds to execute; if it does, then the In-Process response is issued. See the *TimeProvider TL1 Reference Guide* for more information on the CPY-MEM command.

2. Issue the following command to take the IOC out of service:

        ED-EQPT::IOCm:::IOCSTATE=OOSRV;

    where m is 1 or 2, and determines which IOC you take out of service.

3. Attach a wrist grounding strap and connect it to the TimeProvider chassis.

4. Loosen the captive retaining screws and pull out on them to unseat the IOC from the shelf.

Warning: To avoid possible electrostatic damage to the IOC, place it in a static-free bag or on a static-free surface.

5. Place the IOC in a static-free bag or on a static-free surface.

6. Install a new IOC using the appropriate procedure in Replacing the IOC, on page 160.

Removing a Redundant IOC

To remove one IOC when two IOCs are in a shelf, use the following procedure.

Note: To avoid generating unnecessary alarms, be sure to take the IOC out of service before removing it.

Caution: To avoid a loss of output signals, do not take the only IOC in a shelf out of service.

1. Issue the following command to take the IOC out of service:

```
ED-EQPT::IOCm:::IOCSTATE=OOSRV;
```

where m is 1 or 2, and depends on the slot in which the IOC is installed (1 is the left slot and 2 is the right slot).

An IOC that is out of service cannot be selected to generate or monitor outputs. An out-of-service IOC does not generate alarms.

2. Attach a wrist grounding strap and connect it to the TimeProvider chassis.

3. Loosen the captive retaining screws and pull out on them to unseat the IOC from the shelf.

Warning: To avoid possible electrostatic damage to the IOC, place it in a static-free bag or on a static-free surface.

4. Place the IOC in a static-free bag or on a static-free surface.

5. Install a new IOC using the appropriate procedure in Replacing the IOC, on page 160.

Removing Two IOCs

To remove both IOCs in a shelf, use the following procedure.

1. Save the contents of the Active IOC memory in the IMC by issuing the following command.

```
CPY-MEM:::::IOC,IMC,IOC;
```

This command may take more than two seconds to execute; if it does, then the In-Process response is issued. See the *TimeProvider TL1 Reference Guide* for more information on the CPY-MEM command.

2. Issue the following TL1 command to take the Standby IOC out of service:

```
ED-EQPT::IOCm:::IOCSTATE=OOSRV;
```

where m is 1 or 2, and corresponds to the location of the Standby IOC (1 is the left slot and 2 is the right slot).

> ⚠ **Caution:** Output signals are turned off when you place the second IOC out of service.

3. Attach a wrist grounding strap and connect it to the TimeProvider chassis.

4. Loosen the captive retaining screws and pull out on them to unseat the IOC from the shelf.

> ⚠ **Warning:** To avoid possible electrostatic damage to the IOC, place it in a static-free bag or on a static-free surface.

5. Place the IOC in a static-free bag or on a static-free surface.

6. Repeat Steps 2, 3, and 4 for the Active IOC.

7. Install new IOCs using the appropriate procedure in Replacing the IOC, on page 160.

Replacing the IOC

This section contains procedures for replacing IOC in three circumstances;

- Replacing the only IOC in a shelf
- Replacing one of two IOCs in a shelf
- Replacing both IOCs in a shelf

Replacing the Only IOC

To replace the only IOC in a shelf, use the following procedure. Output signals will resume once the IOC has achieved lock on an input signal. This procedure assumes that you have stored the contents of the IOC memory in the IMC using the CPY-MEM command.

1. Attach a wrist grounding strap and connect it to the TimeProvider chassis.

2. Install the IOC into the shelf and tighten the captive retaining screws.

3. Copy the contents of the IOC memory stored in the IMC by issuing the following command.

   ```
   CPY-MEM:::::IMC,IOC,IOC;
   ```

   This command may take more than two seconds to execute; if it does, then the In-Process response is issued. See the *TimeProvider TL1 Reference Guide* for more information on the CPY-MEM command.

   If you have not stored the contents of the IOC memory in the IMC, then provision the IOC using the procedures and commands described in Chapter 4, Provisioning the TimeProvider.

4. Wait for the IOC to reboot and qualify the reference inputs.

Replacing a Redundant IOC

To replace either of two IOCs in a shelf, use the following procedure. Output signals will not be affected by this procedure. You can also use this procedure to add an IOC to a shelf that has only one IOC.

1. Install the IOC into the shelf and tighten the captive retaining screws.

2. Wait for the IOC to reboot and qualify the reference inputs. During this time the Active IOC updates the new IOC's memory with current values.

Replacing Both IOCs

Use this procedure to replace both IOCs in a shelf. Output signals will resume when the Active IOC has warmed up and qualified the reference signals. This procedure assumes that you have stored the contents of the IOC memory in the IMC using the CPY-MEM command.

1. Attach a wrist grounding strap and connect it to the TimeProvider chassis.

2. Install the IOC into the left slot of the shelf and tighten the captive retaining screws. This IOC will become the Active IOC.

3. Wait for the IOC to reboot.

4. Retrieve the contents of the IOC memory stored in the IMC by issuing the following command.

```
CPY-MEM:::::IMC,IOC,IOC;
```

This command may take more than two seconds to execute; if it does, then the In-Process response is issued. See the *TimeProvider TL1 Reference Guide* for more information on the CPY-MEM command.

If you have not stored the contents of the IOC memory in the IMC, then provision the IOC using the procedures and commands described in Chapter 4, Provisioning the TimeProvider.

5. Issue the following TL1 command to place the IOC in service:

```
ED-EQPT::IOC1:::IOCSTATE=INSRV;
```

6. Install the IOC into the right slot of the shelf and tighten the captive retaining screws. This IOC will become the Standby IOC.

7. Wait for the IOC to reboot and qualify the reference inputs. During this time the Active IOC updates the new IOC's memory with current values.

8. Issue the following TL1 command to place the Standby IOC in service:

```
ED-EQPT::IOC2:::IOCSTATE=INSRV;
```

Diagnosing the IMC

Reading LED Conditions

Table 6-3 shows the function of the LED indicators on the front panel of the IMC and IMC/TPIU.

Table 6-3. LED Conditions for the IMC and IMC/TPIU

LED Name	Condition	Description
Power	Green Off	Power is On Power is Off
Fail	Red Off	Card failure No failure
Alarm	Red Off	Card alarm No alarm
Critical	Red Off	Critical system alarm No alarm

Table 6-3. LED Conditions for the IMC and IMC/TPIU (Continued)

LED Name	Condition	Description
Major	Red Off	Major system alarm No alarm
Minor	Yellow Off	Minor system alarm No alarm
Alarm Cutoff (ACO)	Green Off	On Off
Antenna Power (IMC/TPIU only)	Green Red Off	Internal TPIU is communicating with Antenna Internal TPIU has lost communication with Antenna GPS is disabled
Antenna Signal (IMC/TPIU only)	Green Red Off	Antenna is communicating with the internal TPIU Master shelf is powering up Antenna has lost communication with the internal TPIU

Interpreting Error Messages

Error messages appear on the console as they occur, and include the time and date of occurrence. Refer to the event codes described in Table 6-5 and to the alarm codes described in Table 6-7.

Replacing the IMC or IMC/TPIU

You can remove the IMC or the IMC/TPIU from the shelf and replace it without affecting outputs.

1. Save the contents of the IMC memory in an IOC by issuing the following command:

       CPY-MEM:::::IMC,IOC,IMC;

   This command may take more than two seconds to execute; if it does, then the In-Process response is issued. See the *TimeProvider TL1 Reference Guide* for more information on the CPY-MEM command.

2. Attach a wrist grounding strap and connect it to the TimeProvider chassis.

3. Remove the IMC by loosening the captive screws and pulling the IMC from the shelf using the U-shaped handles.

> **Warning:** To avoid possible electrostatic damage to the IMC, place it in a static-free bag or on a static-free surface.

4. Place the IMC in a static-free bag or on a static-free surface.

5. Insert another IMC into the shelf and tighten the captive screws.

> **Note:** If the replacement IMC has a different software load than the original IMC, you cannot log in to the TimeProvider using the existing username and password. You must create a new username and password using the `ENT-USER-SECU` command.

6. Reload the IMC memory from the IOC by issuing the following command:

```
CPY-MEM:::::IOC,IMC,IMC;
```

Diagnosing the External TPIU

Table 6-4 shows the function of the LED indicators on the front panel of the standalone TPIU.

Table 6-4. LED Conditions for the External TPIU

LED Name	Condition	Description
TPIU Power	Green Off	Interconnection cable is connected Interconnection cable is disconnected or GPS input is disabled
Antenna Power	Green Red Off	TPIU is communicating with Antenna TPIU has lost communication with Antenna Interconnection cable is disconnected or GPS input is disabled
Antenna Signal	Green Red Off	Antenna is communicating with the TPIU Master shelf is powering up or antenna is powering up Antenna has lost communication with the TPIU

Diagnosing the Retimer Module

The Retimer module is transparent to framing errors, bipolar violations, and data errors; these errors are passed through to the downstream Network Element. If an incorrect signal type is inserted into the Retimer module (for example, if an E1 signal is connected into a T1 Retimer), the module may report a large slip count. Verify that the proper signal is inserted into the Retimer module.

Chapter 6 Maintaining and Troubleshooting the TimeProvider
Replacing Output Modules

Replacing Output Modules

The TimeProvider supports up to four Output modules on the shelf, and up to four additional Output modules on the Expansion Panel. A variety of Output modules is available to support different wiring schemes (see Making Output Connections, on page 66, for a description of the available Output modules).

To remove an Output module:

7. Disable the outputs on the Output module by issuing the command:

```
ED-EQPT::OUTg:::OUTSTATE=DISABLE;
```

where g is the output group you are disabling (A, B, C, or D)

8. Attach a wrist grounding strap and connect it to the TimeProvider chassis.

9. Remove the output connections.

10. Remove the Output module by loosening the captive screws and pulling the module off the shelf.

> **Warning:** To avoid possible electrostatic damage to the Output module, place it in a static-free bag or on a static-free surface.

11. Place the module in a static-free bag or on a static-free surface.

To install an Output module:

1. Install the Output module on the connector on the shelf and tighten the captive screws.

2. Install the output signal connections to the Output module. After you install the connections, you can remove the protective ground strap from your wrist.

3. Enable the outputs on the Output module by issuing the command:

```
ED-EQPT::OUTg:::OUTSTATE=ENABLE;
```

where g is the output group you are enabling (A, B, C, or D)

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Replacing the Input Module

The Input module contains connectors for the input signals and the alarm output connector.

To remove the Input module:

1. Disable the inputs by issuing the following commands, as appropriate:

   ```
   ED-EQPT::PRS:::INSTATE=DISABLE;
   ED-EQPT::INPp:::INSTATE=DISABLE;
   ```

   where p is 1 to disable INP1 or 2 to disable INP2

2. Wait for the TimeProvider to enter the Holdover state before proceeding.

3. Attach a wrist grounding strap and connect it to the TimeProvider chassis.

4. Remove the input connections.

5. Remove the alarm connections.

6. Remove the Input module by loosening the captive screws and pulling the module off the shelf.

Warning: To avoid possible electrostatic damage to the Input module, place it in a static-free bag or on a static-free surface.

To install the Input module:

1. Install the Input module on the connector on the shelf and tighten the captive screws.

2. Install the input signal connections.

3. Install the alarm connections. After you install the connections, you can remove the protective ground strap from your wrist.

4. Enable the inputs by issuing the following commands as appropriate:

   ```
   ED-EQPT::PRS:::INSTATE=ENABLE;
   ED-EQPT::INPp:::INSTATE=ENABLE;
   ```

   where p is 1 to enable INP1 or 2 to enable INP2

Troubleshooting the TimeProvider

Using Events to Troubleshoot

You can provision most events to generate an alarm; alarm levels include Critical (CR), Major (MJ), Minor (MN), Event, (NA), and Not Reported (NR). Table 6-5 lists the event ID and the description of events for the IMC, IOC, and IOC Input.

Table 6-5. Event Codes

Event ID	Keyword Description	AID TYPE	Default Value/ Keyword	Description of Values
IMC Event Codes				
ACCLVL	The user's system access level has changed in the database	EQPT	SECURITY (when no users have been assigned to the system)	NONE – User has access to all commands; no Security has been assigned USER – User can access User-level commands ADMIN – User can access Admin-level commands SECURITY – User can access all commands
ACO	Audio alarm has been deactivated	EQPT	N/A	N/A
ALMCHG	The IMC alarm parameters have changed	EQPT	N/A	Alarm keywords and values are listed in Table 6-7. When the user changes a value, the ALMCHG event is generated and contains the keyword and value
AOMERGE	Enable/Disable autonomous event generation for the current session	EQPT	ENABLE	ENABLE – Autonomous messages are displayed in the current session DISABLE – Autonomous messages are not displayed in the current session
BAUD	The IMC serial port baud rate has changed	EQPT	9600	2400 | 9600 | 19200 | 28800 | 38400 | 57600
CMDCHG	The command access level has changed	EQPT	ACCLVL-USER	NONE | USER | ADMIN | SECURITY

Table 6-5. Event Codes (Continued)

Event ID	Keyword Description	AID TYPE	Default Value/ Keyword	Description of Values
ECHO	The current sessions' echo setting has changed	EQPT	DISABLE	ENABLE – User's keystrokes are echoed DISABLE – User's keystrokes are not echoed
FLOW	The IMC serial port flow control has changed	EQPT	NONE	NONE – No flow control SW – Software flow control (XON/XOFF) HW – Hardware flow control (CTS/RTS) SWHW – Both hardware and software flow control used
FWFAIL	Firmware upgrade of IMC or IOC was not successful	EQPT	n/a	n/a
FWOK	Firmware upgrade of IMC or IOC was successful	EQPT	n/a	n/a
INACTTIME	The communication inactivity timeout has been set. If no activity within the specified time, the session closes	EQPT	0	0 – Disable timeout 100 to 10000 seconds
INITLOG	The event log has been initialized	EQPT	n/a	n/a
IPADDR	The IMC Ethernet address has been changed	EQPT	127.0.0.1	1.0.0.1 to 254.255.255.254
IPGATE	The IMC Ethernet gateway address has been changed	EQPT	127.0.0.1	1.0.0.1 to 254.255.255.254
IPSUB	The IMC Ethernet subnet mask has been changed	EQPT	255.255.255.0	n/a
ISDIFF	Indicates that the CRC of two Istate images stored on separate modules are different	EQPT	n/a	n/a

Table 6-5. Event Codes (Continued)

Event ID	Keyword Description	AID TYPE	Default Value/ Keyword	Description of Values
ISEQ	Indicates that the CRC of two Istate images stored on separate modules are equal	EQPT	n/a	n/a
LOGECHO	The system echoes the login or logout events	EQPT	ENABLE	ENABLE – The login/logout events are echoed DISABLE – The login/logout events are not echoed
LOGIN	A user has logged in to the system	EQPT	n/a	n/a
LOGOUT	A user has logged out of the system	EQPT	n/a	n/a
PIDCHG	A user's password has changed in the database	EQPT	pid	User Password – up to 20 alphanumeric characters
RESET	The IMC has been reset by user command	EQPT	n/a	n/a
SIDCHG	The source ID has changed in the database	EQPT	n/a	20-character name used to identify the network element
UIDCHG	A user's name has changed in the database	EQPT	uid	User Identification – up to 20 characters
USRADD	A user has been added to the database	EQPT	uid pid uap	uid – assigned user name pid – assigned user password uap – assigned user access level
USRDEL	A user has been deleted from the database	EQPT	uid	uid – username
XFERFAIL	Transfer of the IMC Istate to the IOC, transfer of the IOC Istate to the IMC, or transfer of the IOC Istate to the redundant IOC was not successful	EQPT	n/a	n/a

Table 6-5. Event Codes (Continued)

Event ID	Keyword Description	AID TYPE	Default Value/ Keyword	Description of Values
XFEROK	Transfer of the IMC Istate to the IOC, transfer of the IOC Istate to the IMC, or transfer of the IOC Istate to the redundant IOC was successful	EQPT	n/a	n/a
IOC Event Codes				
CLKTYPE	The specified IOC clock has been set to the specified value. This value is used to define the IOCs pull-in range and SSM generation in Holdover mode	EQPT	TYPEI	ST3E | TYPE I ST2 | TYPE II
INPREF	The specified input has been set as the system reference	EQPT	PRS	PRS | INP1 | INP2
IOCMODE	The specified IOC has become Active	EQPT	ACTIVE	ACTIVE | STANDBY
IOCSTATE	The specified IOC has been inserted into the system. The IOC is automatically placed In-Service	EQPT	INSRV	INSRV – In service
	The specified IOC has been taken out of service. The IOC can no longer generate alarms, be provisioned, or accept queries			OOSRV – Out of service
	Communication between the IMC and IOC has failed			COMMFLT – Communications fault
	The specified IOC has been removed from the system			UNEQUIPPED

Table 6-5. Event Codes (Continued)

Event ID	Keyword Description	AID TYPE	Default Value/ Keyword	Description of Values
RESET	The indicated IOC is being restarted after a user-requested reset. All alarms are cleared, if it was Active, it becomes Standby	EQPT	n/a	n/a
SYSMODE	The system mode of operation has been changed	EQPT	SSU	SSU – Sync Supply Unit mode SUB – Subtending mode PRR – Primary Reference Receiver mode
IOC Clock Events				
CLKFSTLK	The local oscillator in the specified IOC is in Fast-Lock mode	EQPT	n/a	n/a
CLKLOCK	The local oscillator in the specified IOC is in Lock mode	EQPT	n/a	n/a
SCAVAIL	The specified IOC is in SmartClock mode	EQPT	OFF	OFF – SmartClock is not available ON – SmartClock is available
IOC Input Events				
CRCENA	Indicates whether the E1 (CAS/CCS) inputs are using CRC4 checking. If the E1 input is provisioned to read SSMs, then this value is Enabled	T1	DISABLE	ENABLE	DISABLE

Table 6-5. Event Codes (Continued)

Event ID	Keyword Description	AID TYPE	Default Value/ Keyword	Description of Values
FRMTYPE	Indicates the type of input framing or the input frequency. Sets the input framing type	T1	Output = 2M	1.544M – 1.544 MHz 2M – 2048 kHz 6.312M – 6.312 MHz CAS – CAS Input CCS – CCS Input ESF – Extended SuperFrame input CC – Composite Clock input ISOLATED_1 – Generates an isolated one test pattern for T1 outputs JCC – Japan Composite Clock JCC4 – Japan Composite Clock with 400 Hz
OUTSTATE	The specified output state has changed	T1	DISABLE	ENABLE – The output generates the defined signal type DISABLE – Disables the output and clears all active alarms associated with the input
RQLEVEL	The received quality level on the specified input has changed	T1	n/a	Displays the prior quality level followed by the new quality level
SYS Events				
CLRDELAY	Time, in seconds, before a faulted signal indicates it is valid as a system reference	EQPT	5 s	0 to 1000 s
ELEVTIME	Indicates that Alarm elevation time (1440 min.) is enabled or disabled	EQPT	DISABLE	ENABLE | DISABLE
FACTORY	Indicates that the unit has been reset to Factory default. All modules installed in the system are reset	EQPT	n/a	n/a
FLTDELAY	Time, in seconds, before faulted signal indicates it is not valid as a system reference	EQPT	10 s	1 to 15 s

Table 6-5. Event Codes (Continued)

Event ID	Keyword Description	AID TYPE	Default Value/ Keyword	Description of Values
FREEFLT	Indicates if the Output Fault is issued when the local oscillator enters Free-Run mode.	EQPT	SQUELCH	ON – In fault mode, generate outputs based on system SSM AIS – In fault mode, generate AIS outputs SQUELCH – In fault mode, outputs are turned off
GPSCLR DEL	The time, in seconds, after a cleared GPS fault can be used.	EQPT	5 s	0 to 1000 s
GPSFLTDEL	Time, in seconds, before a GPS fault indicated it is not valid	EQPT	1 second	1 to 1000 s
HOLDFLT	Indicates if the Output Fault is issued when the local oscillator enters Holdover mode	EQPT	ON	ON – In fault mode, generate outputs based on system SSM AIS – In fault mode, generate AIS outputs SQUELCH – In fault mode, outputs are turned off
INPREF	Indicates if the system automatically selects another reference input. Operator has enabled the selected reference input (REFMODE must be set to FORCED)	T1	PRS	PRS – PRS input is selected as reference INP1 – INP1 is selected as reference INP2 – INP2 is selected as reference
LOCTIM	The local system time offset has changed	EQPT	(00)-00	(hh) – hours offset ±12 mm – minutes offset 00 to 59
REFMODE	Indicates if the system reference can be selected automatically or by the user	EQPT	AUTO	AUTO – System uses QLEVEL and Priority to select the system reference FORCED – User selects the system reference. If the selected reference fails, this value reverts to AUTO mode
TIMCHG	The system time has been changed	EQPT	hh-mm-ss	hh – hours (24-hour clock) mm – minutes ss – seconds

Table 6-6 describes the alarm codes and their set and clear conditions.

Table 6-6. Set and Clear Conditions for Alarms

Alarm ID	Set Alarm Conditional Description	Clear Alarm Conditional Description
SYS Codes		
COMPAT	System components are incompatible	System components are compatible
EXPFAIL	Expansion connectivity failed	Expansion connectivity restored
PWRA	Power A Failed	Power A Restored
PWRB	Power B Failed	Power B Restored
EXTALM1	External Alarm 1 set	External Alarm 1 cleared
EXTALM2	External Alarm 2 set	External Alarm 2 cleared
IOC1EQPT	IOC1 removed from the shelf	IOC1 reinstalled
IOC2EQPT	IOC2 removed from the shelf	IOC2 reinstalled
IMC Codes		
IOC1COMM	IMC to IOC1 communication failed	IMC to IOC1 communication established
IOC2COMM	IMC to IOC2 communication failed	IMC to IOC2 communication established
IMCFAIL	Summary alarm of BIST faults	
IOC1 Codes		
IOC1COMM	IOC1 to IMC communication failed	IOC1 to IMC communication established
IOC1TO2COMM	IOC1 to IOC2 communication failed	IOC1 to IOC2 communication established
IOCFAIL	IOC hardware failure	IOC hardware restored
BTBCKUP	BesTime backup reference disqualified	BesTime backup sources qualified
CLKBRDG	Clock is in Bridging mode	Clock exited Bridging mode
CLKFREE	Clock entered Free-run mode	Clock exited Free-run mode
CLKHOLD	Clock entered Holdover mode	Clock exited Holdover mode
CLKWARM	Clock entered Warm-up mode	Clock exited Warm-up mode
SYNTHEOR	Output generator exceeded pull-in range	Output generator within pull-in range
IOC2 Codes		
IOC2COMM	IOC2 to IMC communication failed	IOC2 to IMC communication established
IOC2TO1COMM	IOC2 to IOC1 communication failed	IOC2 to IOC1 communication established
IOCFAIL	IOC hardware failure	IOC hardware restored

Table 6-6. Set and Clear Conditions for Alarms (Continued)

Alarm ID	Set Alarm Conditional Description	Clear Alarm Conditional Description
BTBCKUP	BesTime backup reference disqualified	BesTime backup sources qualified
CLKBRDG	Clock entered Bridging mode	Clock exited Bridging mode
CLKFREE	Clock entered Free-run mode	Clock exited Free-run mode
CLKHOLD	Clock entered Holdover mode	Clock exited Holdover mode
CLKWARM	Clock entered Warm-up mode	Clock exited Warm-up mode
SYNTHEOR	Output generator exceeded pull-in range	Output generator within pull-in range
GPS Codes		
ANTCOMM	GPS antenna communication fault	GPS antenna comm fault cleared
GPSPOS	GPS antenna position unknown	GPS antenna position known
GPSPWR	GPS power fault	GPS power fault cleared
GPSSYS	GPS system fault	GPS system OK
GPSTRK	GPS is not tracking satellites	GPS is tracking satellites
INPDISQ	GPS input is disqualified	GPS input is enabled
INPLOS	LOS fault	LOS fault cleared
INPFRQ	Frequency threshold exceeded	Frequency within threshold
INPPHASE	Phase error exceeded threshold	Phase error within threshold
EXDSC	Excessive discontinuity fault	Excessive discontinuity cleared
FFOFF	FFOFF exceeded threshold	FFOFF within threshold
MTIE	MTIE exceeded threshold	MTIE within threshold
TPIUSIG	TPIU signal fault	TPIU signal fault cleared
PRS and INP[p] Codes		
INPDISQ	Input disqualified as possible reference	Input qualified as possible reference
INPAIS	AIS fault	AIS fault cleared
INPLOS	LOS fault	LOS fault cleared
INPOOF	OOF fault	OOF fault cleared
INPFRQ	Frequency threshold exceeded	Frequency within threshold
INPPHASE	Phase error exceeded threshold	Phase error within threshold
INPQL	Quality Level (SSM) exceeded threshold	Quality Level (SSM) within threshold

Table 6-6. Set and Clear Conditions for Alarms (Continued)

Alarm ID	Set Alarm Conditional Description	Clear Alarm Conditional Description
INPTRR	Tip/ring reversal on CC input	Tip/ring connection correct on CC input
EXDSC	Excessive discontinuity fault	Excessive discontinuity cleared
MTIE	MTIE exceeded threshold	MTIE within threshold
OUT[g] Codes		
OUTFAIL	Output fault	Output fault cleared
SYNTHEOR	Output generator exceeds pull-in range	Output generator within pull-in range
SYNTHFAIL	Output generator failed	Output generator restored
E422[g] Codes		
E422EQPT	EIA-422 Output module is unequipped	EIA-422 Output module is equipped
E422FAULT	EIA-422 Output module has a fault	EIA-422 Output module fault cleared
RTMg[-p] Codes		
RTMEQPT	Retimer module is unequipped	Retimer module is equipped
S1LOS	Side 1 LOS fault	Side 1 LOS fault cleared
S2LOS	Side 2 LOS fault	Side 2 LOS fault cleared
EXSLIP	Slip rate threshold exceeded	Slip rate within threshold
RTMFAULT	Retimer module has a fault	Retimer module fault cleared

Using Alarm Codes to Troubleshoot

Table 6-7 lists the alarm codes generated by the TimeProvider. Unless specified, each alarm has a default Error Delay of Immediate, and you cannot edit the Error Delay.

Table 6-7. Alarm Codes

Event ID	Description	AID TYPE	Service Affecting	Alarm Level		
				SSU Mode	PRR Mode	SUB Mode
AID = SYS						
COMPAT	System components (hardware or software) are incompatible.	EQPT	NSA	MJ	MJ	MJ

Table 6-7. Alarm Codes (Continued)

Event ID	Description	AID TYPE	Service Affecting	Alarm Level		
				SSU Mode	PRR Mode	SUB Mode
EXTALM 1	External alarm 1 – monitors alarms generated by external equipment.	EQPT	NSA	MJ	MJ	MJ
EXTALM 2	External alarm 2 – monitors alarms generated by external equipment.	EQPT	NSA	CR	CR	CR
EXPN EQPT	Output Expansion Panel has been removed or installed	EQPT	NSA	MJ	MJ	MJ
PWRA	Loss of power on PWRA.	EQPT	NSA	MJ	MJ	MJ
PWRB	Loss of power on PWRB.	EQPT	NSA	MJ	MJ	MJ
IOC1 EQPT	The IOC has been physically inserted or removed from the shelf.	EQPT	NSA	MJ	MJ	MJ
IOC2 EQPT	The IOC has been physically inserted or removed from the shelf.	EQPT	NSA	MJ	MJ	MJ
AID = IMC						
IOC1 COMM	Communication alarm with IOC1.	EQPT	NSA	MN	MN	MN
IOC2 COMM	Communication alarm with IOC2.	EQPT	NSA	MN	MN	MN
IMCFAIL	Summary alarm of IMC BIST faults.	EQPT	SA	MJ	MJ	MJ
AID = IOC1						
IOC1 COMM	Communication alarm with IMC and IOC1.	EQPT	NSA	MN	MN	MN
IOC1TO2 COMM	Communication alarm from IOC1 to IOC2.	EQPT	NSA	MN	MN	MN
IOCFAIL	Summary alarm for IOC hardware failures not specified in other alarms.	EQPT	SA	MJ	MN	MJ
BTBCK UP	All BesTime backup sources are unusable to the BesTime engine.	EQPT	NSA	NA	NA	NA

Table 6-7. Alarm Codes (Continued)

Event ID	Description	AID TYPE	Service Affecting	Alarm Level		
				SSU Mode	PRR Mode	SUB Mode
CLK BRDG	Local oscillator in the specified IOC is in Bridging mode.	EQPT	NSA	NA	NA	MJ
CLK HOLD	Local oscillator in the specified IOC is in Holdover mode.	EQPT	SA	MJ	MJ	MJ
CLK FREE	Local oscillator in the specified IOC is in the Free-run mode.	EQPT	SA	MJ	MJ	MJ
CLK WARM	Local oscillator in the specified IOC is in the Warm-up mode.	EQPT	SA	MN	MN	MN
SYNTH EOR	Synthesizer generating the output frequency has reached a defined End-of-Range for the oscillator.	EQPT	SA	MJ	MJ	MJ
AID = IOC2						
IOC2 COMM	Communication alarm with IMC and IOC2.	EQPT	NSA	MN	MN	MN
IOC2TO1 COMM	Communication alarm from IOC2 to IOC1.	EQPT	NSA	MN	MN	MN
IOCFAIL	Summary alarm for IOC hardware failures not specified in other alarms.	EQPT	SA	MJ	MJ	MJ
BTBCKUP	All BesTime backup sources are unusable to the BesTime engine.	EQPT	NSA	NA	NA	NA
CLK BRDG	Local oscillator in the specified IOC is in Bridging mode.	EQPT	NSA	NA	NA	MJ
CLK HOLD	Local oscillator in the specified IOC is in Holdover mode.	EQPT	SA	MJ	MJ	MJ
CLK FREE	Local oscillator in the specified IOC is in the Free-run mode.	EQPT	SA	MJ	MJ	MJ
CLK WARM	Local oscillator in the specified IOC is in the Warm-up mode.	EQPT	SA	MN	MN	MN
SYNTH EOR	Synthesizer generating the output frequency has reached a defined End- of-Range for the oscillator.	EQPT	SA	MJ	MJ	MJ
AID = GPS						

Table 6-7. Alarm Codes (Continued)

Event ID	Description	AID TYPE	Service Affecting	Alarm Level		
				SSU Mode	PRR Mode	SUB Mode
ANT COMM	GPS antenna fault due to loss of communications.	EQPT	NSA	MN	MN	MN
GPS POS	The GPS antenna position is unknown.	EQPT	NSA	NA	NA	NA
GPS PWR	The current to the TPIU is either too high or too low.	T1	NSA	MN	MN	MN
GPSSYS	An error occurred with BIST, TRAIM, and/or UTC/ ephemeris data.	EQPT	NSA	MN	MN	MN
GPSTRK	The GPS engine is not tracking any satellites.	EQPT	NSA	MN	MN	MN
INPDISQ	The specified input has been disqualified or qualified as a possible system reference. The fault condition must be continuously present for the FLTDELAY period before disqualifying the input as a possible reference. Once set, this alarm clears when the input is fault-free for the CLRDELAY period.	T1	NSA	MN	MN	MN
INPLOS	The 1 PPS signal has a LOS fault. The fault must be continuously present for the FLTDELAY period before disqualifying the input as a possible reference. Once set, this alarm clears when the input is fault-free for the CLRDELAY period.	T1	NSA	MN	MN	MN
INPFRQ	The specified input port's calculated received frequency is exceeding the pull-in range of the LO. This condition disqualifies the input as a possible reference. Once set, this alarm clears when the input frequency is within the defined pull-in range limits.	T1	NA	NA	NA	NA

Table 6-7. Alarm Codes (Continued)

Event ID	Description	AID TYPE	Service Affecting	Alarm Level		
				SSU Mode	PRR Mode	SUB Mode
INP PHASE	The specified input port has an excessive phase measurement that disqualifies it from being used.	T1	NSA	MN	MN	MN
EXDSC	The input has had excessive discontinuities, indicated by more than 3 signal faults of the same type within a 5-minute window. The alarm clears when the window contains less than 3 alarms of the same type.	T1	NSA	MN	MN	MN
FFOFF	The specified input port has exceeded the Fractional Frequency Offset threshold.	T1	NSA	MN	MN	MN
MTIE	The specified input port has exceeded at least 1 of the MTIE alarm thresholds.	T1	NSA	MN	MN	MN
TPIUSIG	The interface to the TPIU has a connectivity issue.	T1	NSA	MN	MN	MN
AID = PRS						
INPDISQ	The specified input port has been disqualified or qualified as a possible system reference. The fault condition must be continuously present for the FLTDELAY period before disqualifying the input as a possible reference. Once set, this alarm clears when the input is fault-free for the CLRDELAY period.	T1	NSA	MN	MN	MN
INPLOS	The specified input port has a LOS. When detected, the input is immediately removed as a possible reference. The LOS must be continuously present for the FLTDELAY period before disqualifying the input as a possible reference. The alarm clears when the input signal is fault-free for the CLRDELAY period.	T1	NSA	MN	MN	MN

Table 6-7. Alarm Codes (Continued)

Event ID	Description	AID TYPE	Service Affecting	Alarm Level		
				SSU Mode	PRR Mode	SUB Mode
INPFRQ	The specified input port's calculated received frequency exceeds the pull-in range of the LO. This alarm disqualifies an input as a system reference. Once set, this alarm clears when the input frequency is within the defined pull-in range limits.	T1	NSA	MN	MN	MN
INP PHASE	The specified input port has an excessive phase measurement that disqualifies it from being used.	T1	NSA	MN	MN	MN
EXDSC	The specified input has had excessive discontinuities, indicated by more than 3 signal faults of the same type within a 5-minute window. The alarm clears when the window contains less than 3 alarms of the same type.	T1	NSA	MN	MN	MN
FFOFF	The specified input port has exceeded the Fractional Frequency Offset threshold.	T1	NSA	MN	MN	MN
MTIE	The specified input port has exceeded at least 1 of the MTIE alarm thresholds.	T1	NSA	MN	MN	MN
AID = INP1 or INP2						
INPDISQ	The specified input port has been disqualified as a possible system reference. The fault condition must be continuously present for the FLTDELAY period before disqualifying the input as a possible reference. Once set, this alarm clears when the input is fault-free for the CLRDELAY period.	T1	NSA	MN	MN	MN

Table 6-7. Alarm Codes (Continued)

Event ID	Description	AID TYPE	Service Affecting	Alarm Level		
				SSU Mode	PRR Mode	SUB Mode
INPAIS	The specified input port has an AIS. When detected, the input is immediately removed as a possible reference. The AIS must be continuously present for the FLTDELAY period before disqualifying the input as a possible reference. Once set, this alarm clears when the input signal is fault-free for the CLRDELAY period.	T1	NSA	MN	MN	MN
INPLOS	The specified input port has a LOS. When detected, the input is immediately removed as a possible reference. The LOS must be continuously present for the FLTDELAY period before disqualifying the input as a possible reference. The alarm clears when the input signal is fault-free for the CLRDELAY period.	T1	NSA	MN	MN	MN
INPOOF	The specified input port has an OOF. When detected, the input is immediately removed as a possible reference. The OOF must be continuously present for the FLTDELAY period before disqualifying the input as a possible reference. The alarm clears when the input signal is fault-free for the CLRDELAY period.	T1	NSA	MN	MN	MN
INPFRQ	The specified input port's calculated received frequency exceeds the pull-in range of the LO. This alarm disqualifies an input as a system reference. Once set, this alarm clears when the input frequency is within the defined pull-in range limits.	T1	NSA	MN	MN	NR
INP PHASE	Specified input port has an excessive phase measurement that disqualifies it.	T1	NSA	MN	MN	MN

Table 6-7. Alarm Codes (Continued)

Event ID	Description	AID TYPE	Service Affecting	Alarm Level		
				SSU Mode	PRR Mode	SUB Mode
INPQL	The received SSM on the specified input is of lesser quality than the local oscillator's QLEVEL.	T1	NSA	MN	MN	MN
INPTRR	Specified input port has a Tip/Ring reversal on its connection to the system.	T1	NSA	MN	MN	MN
EXDSC	Specified input port has excessive discontinuities, indicated by more than 3 signal faults of the same time within 5 minutes. Alarm clears when there are less than 3 faults in a 5 minute period.	T1	NSA	MN	MN	MN
MTIE	The specified input port has exceeded at least 1 of the MTIE alarm thresholds.	T1	NSA	MN	MN	MN
AID = E422A, E422B, E422C, E422D						
E422 FAULT	The EIA-422 Output is not functioning properly.	T1	NSA	NA	NA	NA
AID = RTMA[-p], RTMB[-p], RTMC[-p], RTMD[-p]						
S1LOS	LOS on Side 1	T1	NSA	MN	MN	Mn
S2LOS	LOS on Side 2	T1	NSA	NA	NA	NA
EXSLIP	Excessive Slip Rate	T1	NSA	NA	NA	NA
RTM FAULT	The Retimer module is not functioning properly.	T1	NSA	NA	NA	NA

Table 6-8 describes the conditions that generate the associated event.

Table 6-8. Conditions Causing an Event

Event ID	Condition
ACCLVL	User Access Level has changed
ACO	Audio alarm is deactivated
IMC Codes	
ALMCHG	Alarm parameter has changed <keyword>,<alarm>
AOMERGE	Autonomous event reporting has changed <state>
BAUD	Serial port baud rate has changed <value>
CMDCHG	Command access level has changed <command>
ECHO	Serial port echo mode has changed <state>
FLOW	Serial port flow control has changed <state>
FWFAIL	Firmware upgrade unsuccessful
FWOK	Firmware upgrade successful
IMCBIST	User has requested the IMC to perform a Built-in Self Test
INACTTIME	Communications timeout has changed <value>
INITLOG	Event log has been cleared
IPADDR	IP address has changed <value>
IPGATE	Gateway IP address has changed <value>
IPHOST1	The IMC Ethernet address for element host manager has changed <value>
IPHOST2	The IMC Ethernet address for element host manager has changed <value>
IPHOST3	The IMC Ethernet address for element host manager has changed <value>
IPHOST4	The IMC Ethernet address for element host manager has changed <value>
IPSUB	Subnet mask IP address has changed <value>
ISDIFF	Configuration images are different
ISEQ	Configuration images are the same
LOGECHO	Login event has changed <state>
LOGIN	User logged in <username>
LOGOUT	User logged out <username>
PIDCHG	User password has changed
RESET	Module has been reset

Table 6-8. Conditions Causing an Event (Continued)

Event ID	Condition
SIDCHG	Source ID has been changed <value>
UIDCHG	User's name has been changed
USRADD	User has been added
USRDEL	Specified user has been deleted, or all users have been deleted
XFERFAIL	Configuration transfer failed <fromdev> <todev>
XFEROK	Configuration transfer successful <fromdev> <todev>
GPS Codes	
MODE	User has set or requested system position, or position has been automatically found <mode>
POS	User has set or requested Lat/Lon/Ht of GPS antenna <location>
ELEVMASK	User has set or requested the GPS Elevation Mask <mask>
IOC Codes	
CCALIGN	User has cleared the INTPRR alarm, or has cleared the alarm and forced the alignment between the CC output and a CC input
CLKTYPE	Clock type has changed <state>
INPREF	Specified input is selected as system reference <input>
IOCMODE	IOC mode is <mode>
IOCSTATE	IOC state has changed <state>
RESET	Module has been reset
SYSMODE	System mode of operation has changed <state>
IOC Clock Events	
CLKFSTLK	Clock entered Fast-lock mode
CLKLOCK	Clock entered Lock mode
SCAVAIL	SmartClock algorithm <value>
IOC Input Events	
CRCENA	Input CRC has changed <value>
FRMTYPE	Input framing type has changed <value>
INSTATE	Input state has changed <value>
PMCLR	Performance data has been cleared
PRIORITY	Priority has changed <value>

Table 6-8. Conditions Causing an Event (Continued)

Event ID	Condition
RQLEVEL	Received quality level has changed <value>
QLEVEL	Quality Level has changed <value>
SSMBIT	E1 SSM bit has changed <bit position>
SSENA	Input reading of SSM has changed <value>
MTIE-1	MTIE 1-second threshold has been exceeded
MTIE-5	MTIE 5-second threshold has been exceeded
MTIE-10	MTIE 10-second threshold has been exceeded
MTIE-50	MTIE 50-second threshold has been exceeded
MTIE-100	MTIE 100-second threshold has been exceeded
MTIE-500	MTIE 500-second threshold has been exceeded
IOC Output Events	
FRMTYPE	Output framing type has changed <value>
FREEFLT	Free-run output fault strategy has changed <value>
HOLDFLT	Holdover output fault strategy has changed <state>
OUTSTATE	Output group state has changed <value>
SYS Events	
CLRDELAY	Input clear delay has changed <value>
ELEVTIME	Alarm elevation time has changed <state>
FACTORY	Provisioned to factory defaults
FLTDELAY	Input fault delay has changed <value>
GPSCLRDEL	GPS fault delay has changed <value>
GPSFLTDEL	GPS fault delay has changed <value>
INPREF	System reference input has changed <value>
LOCTIM	System's local time offset has changed <time offset>
REFMODE	System reference mode has changed <mode>
TIMCHG	System time has changed <time>
UTC	UTC time has been set by GPS <time>

Repairing the TimeProvider

Repairing the TimeProvider is limited to replacing cards. Refer to Working With Cards, on page 82, for information on how to properly handle cards and modules to prevent electrostatic or physical damage.

To remove an IOC, loosen the captive screws and lift the removal tabs on each side of the card, then slide the module out of the shelf. To remove the IMC, loosen the captive screws and pull the module out of the shelf using the U-shaped handle on the front panel. Place the module on an anti-static surface or in an anti-static bag.

To remove an Input or Output module, loosen the captive screws and then pull the module using the captive screw. Place the module on an anti-static surface or in an anti-static bag.

> **Warning:** To avoid possible electrostatic damage to the module or panel, place it in a static-free bag or on a static-free surface.

Obtaining Technical Assistance

If you have technical questions about the TimeProvider, call Symmetricom Global Services (SGS) at 888-367-7966 (toll-free in USA only), 408-428-7907, or +49 700 3288 6435 in Europe, Middle East, or Africa. You can also email your technical questions to support@symmetricom.com or emeasupport@symmetricom.com.

Upgrading the Firmware

You can upgrade the firmware in the IMC or IOC using TL1 commands and software available from Symmetricom. Only users with Admin-level or Security-level access can execute the command. The command places the management module in the firmware download mode and terminates all sessions except the session performing the upgrade. During the upgrade process, no new sessions are allowed. Refer to the *TL1 Reference Guide* for details on the upgrade process.

> **Caution:** To avoid a possible service call, do not issue any additional TL1 commands to the TimeProvider, do not remove power from the TimeProvider, and do not remove an IOC or IMC from the shelf during the firmware upgrade process (minimum 30 minutes). Doing so could corrupt the flash memory in a card, disabling the TimeProvider.

Use the following TL1 command to download the firmware.

```
ACT-SWDL:[<tid>]:<aid>:[<ctag>];
```

After you issue the command, you have 60 seconds to begin transferring the upgrade file using the Ymodem transfer protocol. If you do not start the transfer within 60 seconds, the command times out and you will have to issue the `ACT-SWDL` command again. You can use the SynCraft application to transfer the upgrade file; be sure to follow the recommendations in the Caution, above.

The system downloads the firmware using the Ymodem protocol; if the IMC firmware is upgraded, the processor in the IMC is reset.

<aid>	Description
IMC	Downloads a new firmware image to the IMC. If the IMC or IOC provisioning has changed in the newly upgraded firmware, you may need to issue the CPY-MEM command from an in-service IOC to the IMC before the IMC is fully functional. See the *TimeProvider TL1 Reference Guide* for more details.
IOC	Downloads a new firmware image to the IOC. Symmetricom recommends that redundant IOCs use the same firmware revision. The Active IOC enters Standby mode, putting the second IOC in Active mode. After acknowledging the changeover, the IMC starts the firmware transfer to the Standby IOC. After the download, the Standby IOC must achieve Lock (CLKLOCK) mode before changing again to Active mode. The Standby IOC is then upgraded. If the first IOC upgrade is not successful, the entire process is aborted and an SROF error message is generated. The IOC restarts with the existing firmware.
IOCm m = 1 | 2	Downloads the IOC firmware image from the Active IOC to the Standby IOC. This command does not require Ymodem or SynCraft to transfer an image file from the computer to the TimeProvider.

Sample Command

```
ACT-SWDL::IMC:TP1000;
```

If the image transfer takes more than 60 seconds to start, the error response is SROF and the IMC returns to normal operation. You will need to start the download process again to perform the upgrade.

If the header information in the referenced file is not correct, the error response is SROF, followed by a message that says the firmware upgrade was not successful.

If the file header is correct, the TimeProvider responds with a message stating that it is beginning the firmware upgrade, followed by a message stating the upgrade was successful.

Upgrading the IMC

To upgrade the software in the IMC, use the following procedure. You must have the upgrade software available on diskette or other media, as well as a Ymodem file-transfer program such as SynCraft available before you begin the procedure. Outputs are not affected during the IMC upgrade procedure.

1. Log in to the TimeProvider with an Admin- or Security-level user id and password.

2. Back up the contents of the IMC memory in an IOC by issuing the following command:

```
CPY-MEM:::::IMC,IOC,IMC;
```

3. To start the download, issue the command

```
ACT-SWDL::IMC:TP1000;
```

   The TimeProvider issues an In-Process response, the TL1 connection closes, and the TimeProvider waits to receive the upgrade software using the Ymodem protocol.

4. Use a Ymodem file transfer program such as SynCraft to transfer the upgrade software to the TimeProvider. You must start the transfer within 60 seconds or the TimeProvider issues a Deny response.

   The TimeProvider validates the received file, updates the flash memory and reboots the IMC if the file is valid. If the file is not valid, the TimeProvider issues a Deny response.

5. The COMPLD message appears after a successful transfer.

Upgrading the IOC

This section contains procedures for upgrading a shelf with a single IOC and for upgrading a shelf with redundant IOCs.

Upgrading Single IOCs

To upgrade the software in a single IOC, use the procedure in this section. Outputs from the TimeProvider will be interrupted for up to 30 minutes until the upgraded IOC enters the Locked mode.

1. Log in to the TimeProvider with an Admin- or Security-level user id and password.

2. Save the contents of the IOC memory in the IMC by issuing the command:

```
CPY-MEM:::::IOC,IMC,IOC;
```

3. To start the download, issue the command

```
ACT-SWDL::IMC:TP1000;
```

The TimeProvider issues an In-Process response, the TL1 connection closes, and the TimeProvider waits to receive the upgrade software using the Ymodem protocol.

4. Use a Ymodem file transfer program such as SynCraft to transfer the upgrade software to the TimeProvider. You must start the transfer within 60 seconds or the TimeProvider issues a Deny response. The new software is loaded into the IOC, after which it is rebooted and enters the Warm-up mode for up to 30 minutes.

5. The COMPLD message appears after a successful transfer.

6. Restore the contents of the IOC memory from the IMC by issuing the command:

```
CPY-MEM:::::IMC,IOC,IOC;
```

Upgrading Redundant IOCs

To avoid output interruptions, the TimeProvider must be in the following state:

- Two installed and communicating IOCs
- Both IOCs are in the Locked mode
- Both IOCs are In Service
- Both IOCs are alarm-free
- One IOC is Active

If any of these conditions are not present, then the outputs are interrupted for up to 30 minutes until the upgraded IOC enters the Locked mode.

To upgrade the software in both IOCs, use the following procedure:

1. Log in to the TimeProvider with an Admin- or Security-level user id and password.

2. Back up the contents of the IOC memory in the IMC by issuing the command:

```
CPY-MEM:::::IOC,IMC,IOC;
```

3. Start the download by issuing the command:

```
ACT-SWDL::IMC;
```

The TimeProvider issues an In-Process response, the TL1 connection closes, and the TimeProvider waits to receive the upgrade software using the Ymodem protocol.

4. Use a Ymodem file transfer program such as SynCraft to transfer the upgrade software to the TimeProvider. You must start the transfer within 60 seconds or the TimeProvider issues a Deny response.

   The active IOC (IOC1 for example) goes into Standby mode and the Standby IOC (IOC2, in this example) goes into Active mode. The new software is loaded into IOC1, after which it is rebooted and enters the Warm-up mode for up to 30 minutes.

   When IOC1 enters the Locked mode, it becomes the Active IOC again (IOC2 goes into Standby). The new software is loaded into IOC2, after which it is rebooted and enters the Warm-up mode for up to 30 minutes.

5. The COMPLD message appears after a successful transfer.

Upgrading One IOC From the Other

To upgrade the software in one IOC to match the software in the other IOC, issue the command:

```
ACT-SWDL::IOCn:TP1000;
```

where n = 1 or 2, and identifies the IOC that receives the software from the other IOC

You cannot upgrade the software in the Active IOC.

Returning the TimeProvider

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 for re-shipping the product. If the original packaging is not available, contact Symmetricom Global Services (SGS) for assistance.

Repacking the Unit

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

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 +49 700 3288 6435 in Europe, Middle East, or Africa to obtain a return material authorization number (RMA) before returning the product for service.

   You can request an RMA on the internet at https://www.symmetricom.com/Support/req_repair.htm.

   Retain the assigned 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 the address given with the RMA.

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

Manual Updates

From time to time, this manual may be updated. The current version of the manual is available for downloading in pdf format at Symmetricom's website at www.symmetricom.com. After you download a manual, you can view it on your computer screen or you can print it out.

Note: If you are downloading a manual for the first time, you need to register on Symmetricom's website. If you are currently registered, log in and download the manual update.

Chapter 7 Specifications of the TimeProvider

This chapter describes the specifications of the TimeProvider.

In This Chapter

- Communications Ports
- Clocks
- Inputs
- Outputs
- Alarms
- Power
- Roof Antenna
- Mechanical
- Environmental

Communications Ports

Serial Ports

Two EIA-232 serial ports are available: the local Craft port and the Remote port. Specifications are listed in Table 7-1.

Table 7-1. Serial Port Specifications

Specification	Factory Default	Available
Local Craft Port		
Baud rate	9600	2400, 9600, 19200, 28800, 34800, 57600, 115200
Word length	8 bits	8 bits
Parity	None	None, Odd, Even
Stop bits	1	1
Echo	Off	Off, On
Software flow control XON/XOFF	Off	Off, On
Hardware flow control CTS/RTS	Off	Off, On
RS-232 configuration	DCE	DCE
Remote Port		
Baud rate	9600	2400, 9600, 19200, 28800, 34800, 57600, 115200
Word length	8 bits	8 bits
Parity	None	None, Odd, Even
Stop bits	1	1
Echo	Off	Off, On
Software flow control XON/XOFF	Off	Off, On
Hardware flow control CTS/RTS	Off	Off, On
Handshake DTR/DSR	On	On
RS-232 configuration	DTE	DTE

LAN Port

The Ethernet 10BaseT port supports 10 full-duplex telnet sessions over TCP/IP. To minimize response delays, Symmetricom recommends that you keep four or fewer sessions open at any one time.

Clocks

The clocks in the TimeProvider are controlled with Direct Digital Synthesis technology for calibration-free operation and precise frequency control.

Type I Clock

The Type I clock in the TimeProvider is compliant with ITU-T G.812 (06/98) and EN300 462-4-1 (see ICS proforma Compliance Annex B).

Type II Clock

The Type II clock in the TimeProvider complies with G.812 (06/98).

Type III Clock

The Type III clock in the TimeProvider complies with G.812 (06/98).

Type ST2 Clock

The Stratum 2 clock in the TimeProvider complies with ETSI 300 462-4, ANSI T1.101-1999, and Telcordia GR-378/1244-CORE.

Type ST3E Clock

The Stratum 3E clock in the TimeProvider complies with ETSI 300 462-4, ANSI T1.101-1999, and Telcordia GR-378/1244-CORE.

SSM Compliance

The TimeProvider complies with the following SSM standards: ANSI T1.101-1999, GR-253 Core Issue 3, September 2000, ITU-T G.704 10.98, and T1X1.3 TR33.

Holdover

Table 7-2 lists the holdover characteristics of the Clock cards available for the TimeProvider.

Table 7-2. Holdover Characteristics

Card Type	Holdover Performance PRR Mode	Holdover Performance SSU Mode
Single Oven 090-58021-01	GR-2830-CORE Issue 2 Office PRS	GR-1244-CORE Issue 2 ST3E or ITU-G.812 Type I (6/98)
Rubidium 090-58022-01	GR-2830-CORE Issue 2 Office PRS	GR-1244-CORE Issue 2 ST2 or ITU-G.812 (6/98) Type II

Hold-in and Pull-in Range

Table 7-3 lists the default values for the Hold-in range and Pull-in range for the Clock cards available for the TimeProvider.

Table 7-3. Hold-in and Pull-in Range

Clock Type	Hold-in Range	Pull-in Range
Type I (Quartz IOC only)	9.8 E-6	9.3 E-6
Type II/ST2 (Rb IOC only)	4.0 E-8	3.5 E-8
Type III/ST3E (Quartz IOC only)	9.8 E-6	9.3 E-6

According to GR-1244, hold-in is the process by which an NE and its clocks maintain lock to the active reference as the frequency of that reference varies arbitrarily slowly. Thus, the hold-in range is the largest band of input signal frequency for which the NE and its clocks will maintain lock. As is the case for the pull-in range, the hold-in range is generally specified so that an NE/clock of a given stratum level will maintain lock with a reference that is traceable to a clock of the same stratum level.

According to GR-1244, pull-in is the process during which an NE's clocks become locked to a reference. In turn, an NE's pull-in range is the largest band of input reference signal frequency for which its clocks will acquire lock. In general, pull-in requirements are intended to assure that any NE/clock will always be able to lock to a reference signal that is traceable to a clock of equal (or higher) quality. Therefore, for a given stratum level the minimum pull-in range is generally the same as the maximum acceptable free-run frequency offset.

Inputs

Front Access and Rear Access shelves contain three card slots: two for IOC cards and one for an IMC or integrated IMC/TPIU card.

Each IOC supports three input ports: two span inputs and one PRS input.

Input supported:

- PRS Input port: 2048 kHz G.703/13, 1.544/5/6.312/10 MHz sine or square

- Input ports 1 and 2: 2048 kbit/s,G.703/9, 2048 kHz G 703/13, DS1, 1.544/5/6.312/10 MHz sine or square, CC/JCC/JCC4 composite clock

Table 7-4. Input Signal Specifications

Parameter	Specification
PRS Inputs	
Frequency Japan Frequency	2.048 MHz, 5 MHz, 10 MHz 1.544 MHz, 6.312 MHz
Amplitude Japan Amplitude	1 V RMS $\pm$3 dB −17 dBm to +5 dBm
Termination Impedance	75 Ω
T1 Inputs	
Framing	D4/SF or ESF (User Selectable)
Bit Rate	1544 kbit/s
Format	AMI or B8ZS (per (ANSI) T1.102 & ITU-T G.703 Sec. 5)
Amplitude Range	+3 to −24 dB DSX
Jitter and Wander Tolerance	Meets the requirements of Bellcore GR-1244-CORE, Section 4.
E1 Inputs	
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 dB DSX
Jitter and Wander Tolerance	Meets the requirements of ITU-T G.823
Type	G.703 Sec. 9 Framed E1

Outputs

The TimeProvider supports up to 32 outputs. The optional Expansion Panel provides an additional 32 outputs. You can provision the outputs in groups of eight.

Sync Status Messages: Compliant with SSM specification ITU-T G.704, T1X1.3 TR33, ANSI T1.101-1999, and Telcordia GR-253-CORE

Table 7-5. Output Signal Specifications

Parameter	Specification
T1 Signals	
Framing (user selectable)	D4/Super Frame (SF) Extended Super Frame (ESF)
Signal Waveshape	Framed, all ones, Alternate Mark Inversion (AMI) per (ANSI) T1.102 and ITU Rec. G.703
Pulse Amplitude	2.4 to 3.6 volts peak into 100 V
Output Jitter	< 0.03 UI
Termination Impedance	100 Ω ± 5% balanced
E1 Signals	
Framing (user selectable)	CAS, CCS
Signal Waveshape	Framed, all ones, Alternate Mark Inversion (AMI) Per ITU Rec. G.703 Sec. 9
Pulse Amplitude	2.4 to 3.6 volts peak into 120 Ω 1.9 to 2.8 volts peak into 75 Ω
Output Jitter	< 0.03 UI
Termination Impedance	120 Ω ± 5% balanced; 75 Ω ± 5% unbalanced
CC Signals	
Amplitude	2.7 to 3.3 V_p
Waveform	Bipolar RTZ; all 1s with BPV every eighth pulse
Termination Impedance	133 Ω ± 5% balanced
JCC Signals	
Amplitude	1.0 V_p ±0.1 V
Termination Impedance	110 Ω

Table 7-5. Output Signal Specifications (Continued)

Parameter	Specification
JCC4 Signals	
Amplitude	1.0 V$_p$ ±0.1 V
Termination Impedance	110 Ω
8k Signals	
Amplitude	4 V p-p ± 10%
Termination Impedance	100 Ω
1.544 MHz Signals	
Amplitude	0 dBm ± 3 dB
Wave Shape	Sine wave
Termination Impedance	75 Ω
6.312 MHz Signals	
Amplitude	0 dBm ± 3 dB
Wave Shape	Sine wave
Termination Impedance	75 Ω
TIA/EIA-B-422 Signals	
Amplitude	2 to 6 V p-p
Termination Impedance	100 Ω balanced
Wave Shape	Square wave, 50% duty cycle
Connector type	Wire-wrap
Jitter	< 0.03 UI
Cable Length Drive	80 m (266 ft), using 24 AWG twisted pair

Alarms

Input Alarms

The PRS input is inhibited when a contact closure (less than 1 Ω) is present across the PRS Alarm In connection.

Output Alarms

The output alarm connector is on the Input module, and can be either a DB25 connector or wire-wrap pins. See Making Alarm Connections, on page 70, for a pinout diagram of the DB-25 connector. Table 7-6 describes the contact closure for the alarm outputs.

Table 7-6. Output Alarm Specifications

Alarm	Description
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

Power

Dual power supplies from –36 to –72 V DC. Table 7-7 lists the maximum and typical power consumption using crystal and Rubidium IOCs.

Table 7-7. Typical Power Consumption

IOC Type	Max Power (W) per IOC	Typical Power (W) per IOC
Crystal	40	30
Rubidium	60	40 (70 with two Rb IOCs)

Symmetricom recommends a 5 A fuse for the power supply to the TimeProvider shelf.

Roof Antenna

The specifications for the antenna for GPS operation are described in Table 7-8.

Table 7-8. Antenna Specifications

Parameter	Specification
Type	Active, with proprietary 2-way time transfer technology
Cable length	Minimum 28 ft (8 m) from antenna to shelf Maximum 1000 ft (305 m) from antenna to shelf
Dimensions	Height: 6.5 in (16.5 cm) Diameter: 5.9 in (15 cm)
Weight	1.7 lb (0.77 kg)
Operating Temperature	-35 to 75°C
Storage Temperature	-40 to 80°C
Operating Humidity	0 to 100% relative humidity

Mechanical

TimeProvider 1000 Front-Access Shelf

Size: 431.8 mm wide x 175 mm high x 254 mm deep (17 in wide x 6.875 in high x 10 in deep)

Weight: 9.0 pounds (4.1 kg) with two IOC modules and four Output modules

TimeProvider 1100 Rear-Access Shelf

Size: 431.8 mm wide x 133 mm high x 254 mm deep (17 in wide x 5.25 in high x 10 in deep)

Weight: 9.0 pounds (4.1 kg) with two IOC modules and four Output modules

Environmental

Operating Temperature: –5 to 55 °C

Storage Temperature: –25 to 55 °C, duration < 12 months

Operating Humidity: 5% to 85% non-condensing

Storage Humidity: 5% to 100% non-condensing, duration < 12 months

Altitude: –60 to 4000 m (–196 ft. to 13132 ft.)

Clock operation: ETSI EN 300 019-1-3 V2.1.2 Class 3.1

Appendix A Factory Default Values

This Appendix describes the factory default values for user-settable parameters.

In This Appendix

- Default Command Access Levels
- Alarm Default Values
- Default Equipment Parameters
- Default Input Parameters
- Default Output Parameters
- Default Retimer Parameters

Default Command Access Levels

This section describes the default access level for the TL1 commands described in this guide. Table A-1 also describes whether you can edit the default command access level using the ED-CMD-SECU command (see the *TimeProvider TL1 Reference Guide* for details on this command). For a complete list of commands and their access levels, see the *TimeProvider TL1 Reference Guide.*

Table A-1. Default Access Levels for TL1 Commands

Command	Default Access Level	Editable?
RTRV-USER-SECU	Security	Yes
ENT-USR-SECU	Security	No
ED-USER-SECU	Security	No
ED-PID	Security	Yes
ENT-PID	User	Yes
DLT-SECU	Security	Yes
DLT-USR-SECU	Security	Yes
RTRV-CMD-SECU	Admin	Yes
ED-CMD-SECU	Admin	No
CPY-MEM	Admin	Yes
RTRV-DAT	User	Yes
ED-DAT	Admin	Yes
RTRV-EQPT	User	Yes
ED-EQPT	Admin	Yes
RTRV-SYNC	User	Yes
ED-SYNC	Admin	Yes
RTRV-ATTR	User	Yes
SET-ATTR	Admin	Yes
RTRV-LOG	User	Yes
INIT-LOG	Admin	Yes
INIT-SYS	Admin	Yes
RTRV-SYS-MODE	User	Yes
SET-SYS-MODE	Admin	Yes
OPR-ACO-ALL	User	Yes

Table A-1. Default Access Levels for TL1 Commands (Continued)

Command	Default Access Level	Editable?
SET-SID	Admin	Yes
RTRV-ALM	User	Yes
RTRV-COND	User	Yes
RTRV-CRAFT	User	Yes
RTRV-HDR	None	Yes
RTRV-INV	User	Yes
ACT-USER	None	No
RTRV-USER	User	Yes
CANC-USER	User	No
PING	User	Yes
GEN-EVT	User	Yes

Alarm Default Values

This section describes the default values for alarms in the TimeProvider. Table A-2 includes the default error delay, which is set using the FLTDELAY keyword in the ED-SYNC command (see Provisioning System-Level Alarms, on page 130).

Table A-2. Default Alarm Settings

Alarm ID	Default Error Delay	Error Delay Editable?	Default Alarm Level		
			SSU Mode	PRR Mode	SUB Mode
System-wide Alarms					
COMPAT	IMMED	No	MJ	MJ	MJ
EXTALM1	IMMED	No	MJ	MJ	MJ
EXTALM2	IMMED	No	CR	CR	CR
EXPFAIL	IMMED	No	MJ	MJ	MJ
PWRA	IMMED	No	MJ	MJ	MJ
PWRB	IMMED	No	MJ	MJ	MJ
IOC1EQPT	IMMED	No	MJ	MJ	MJ
IOC2EQPT	IMMED	No	MJ	MJ	MJ

Table A-2. Default Alarm Settings (Continued)

Alarm ID	Default Error Delay	Error Delay Editable?	Default Alarm Level		
			SSU Mode	**PRR Mode**	**SUB Mode**
IMC-related Alarms					
IOC1COMM	IMMED	No	MN	MN	MN
IOC2COMM	IMMED	No	MN	MN	MN
IMCFAIL	IMMED	No	MJ	MJ	MJ
IOC1-related Alarms					
IOC1COMM	IMMED	No	MN	MN	MN
IOC1TO2COMM	IMMED	No	MN	MN	MN
IOCFAIL	IMMED	No	MJ	MJ	MJ
BTBCKUP	IMMED	No	NA	NA	NA
CLKBRDG	IMMED	No	NA	NA	NA
CLKFREE	IMMED	No	MJ	MN	MJ
CLKHOLD	IMMED	No	MJ	MJ	MJ
CLKWARM	IMMED	No	MN	MN	MN
SYNTHEOR	IMMED	No	MJ	MJ	MJ
IOC2-related Alarms					
IOC2COMM	IMMED	No	MN	MN	MN
IOC2TO1COMM	IMMED	No	MN	MN	MN
IOCFAIL	IMMED	No	MJ	MJ	MJ
BTBCKUP	IMMED	No	NA	NA	NA
CLKBRDG	IMMED	No	NA	NA	NA
CLKFREE	IMMED	No	MJ	MN	MJ
CLKHOLD	IMMED	No	MJ	MJ	MJ
CLKWARM	IMMED	No	MN	MN	MN
SYNTHEOR	IMMED	No	MJ	MJ	MJ
GPS-related Alarms					
ANTCOMM	IMMED	No	MN	MN	MN
GPSPOS	FLTDELAY	Yes	NA	NA	NA
GPSPWR	IMMED	No	MN	MN	MN

Table A-2. Default Alarm Settings (Continued)

Alarm ID	Default Error Delay	Error Delay Editable?	Default Alarm Level		
			SSU Mode	**PRR Mode**	**SUB Mode**
GPSSYS	FLTDELAY	Yes	MN	MN	MN
GPSTRK	FLTDELAY	Yes	MN	MN	MN
INPDISQ	FLTDELAY	Yes	MN	MN	MN
INPLOS	IMMED	No	MN	MN	MN
INPFRQ	NA	NA	NA	NA	NA
INPPHASE	IMMED	No	MN	MN	MN
EXDSC	IMMED	No	MN	MN	MN
FFOFF	IMMED	No	MN	MN	MN
MTIE	IMMED	No	MN	MN	MN
TPIUSIG	IMMED	No	MN	MN	MN
PRS-related Alarms					
INPDISQ	FLTDELAY	Yes	MN	MN	MN
INPLOS	IMMED	No	MN	MN	MN
INPFRQ	IMMED	No	MN	MN	NR
INPPHASE	IMMED	No	MN	MN	MN
EXDSC	IMMED	No	MN	MN	MN
FFOFF	IMMED	No	MN	MN	MN
MTIE	IMMED	No	MN	MN	MN
INP1 or INP2-related Alarms					
INPDISQ	FLTDELAY	Yes	MN	MN	MN
INPAIS	IMMED	No	MN	MN	MN
INPLOS	IMMED	No	MN	MN	MN
INPOOF	IMMED	No	MN	MN	MN
INPFRQ	IMMED	No	MN	MN	NR
INPPHASE	IMMED	No	MN	MN	MN
INPQL	IMMED	No	MN	MN	MN
EXDSC	IMMED	No	MN	MN	MN
MTIE	IMMED	No	MN	MN	MN

Table A-2. Default Alarm Settings (Continued)

Alarm ID	Default Error Delay	Error Delay Editable?	Default Alarm Level		
			SSU Mode	**PRR Mode**	**SUB Mode**
E422-related alarms					
E422FAULT	IMMED	No	NA	NA	NA
RTM-related Alarms					
S1LOS	IMMED	No	MN	MN	MN
S2LOS	IMMED	No	NA	NA	NA
EXSLIP	IMMED	No	NA	NA	NA
RTMFAULT	IMMED	No	NA	NA	NA

Default Equipment Parameters

Table A-3. Default Equipment Parameters

Parameter	Default Value
System-Level Parameter (<aid>=SYS)	
INACTTIME	0 (no timeout)
LOGECHO	ENABLE
ELEVTIME	DISABLE
SYSMODE	SSU
Local/Remote Comm Port Parameters (<aid>=COMp)	
AOMERGE	ENABLE
BAUD	9600
ECHO	DISABLE
FLOW	NONE
TIDQUIET	DISABLE
Ethernet Parameters (<aid>=COMl)	
AOMERGE	ENABLE
IPGATE	127.0.0.1
IPADDR	127.0.0.1

Table A-3. Default Equipment Parameters (Continued)

Parameter	Default Value
IPSUBNET	255.255.255.0
ECHO	DISABLE
TIDQUIET	DISABLE
IOC Parameters (<aid>=IOCm)	
IOCMODE	ACTIVE
CLKTYPE	TYPEI
IOCSTATE	INSRV

Default Input Parameters

Table A-4. Default Input Parameters

Parameter	Default Value
Input Parameters (<aid>=SYS)	
CLRDELAY	5 seconds
FLTDELAY	5 seconds
REFMODE	AUTO
INPREF	PRS
FREEFLT	SQUELCH
HOLDFLT	ON
GPSCLRDEL	5 s
GPSFLTDEL	1 s
Input Parameters (<aid>=PRS)	
INSTATE	ENABLE
FRMTYPE	2M (2048 kHz)
Input Parameters (<aid>=INPp)	
INSTATE	ENABLE
SPANTYPE	E1

Table A-4. Default Input Parameters (Continued)

Parameter	Default Value
FRMTYPE	2M (for E1 span type) ESF (for T1 span type)
CRCENA	DISABLE
SSMENA	DISABLE
SSMBIT	8
Input Parameters (<aid>=PRS, INPp)	
QLEVEL	2
PRIORITY	PRS=1 INP1=1 INP2=1

Default Output Parameters

Table A-5. Default Output Parameters

Parameter	Default Value
Output Parameters (<aid>=OUTg)	
OUTSTATE	DISABLE
FRMTYPE	2M
E422 Output Parameters (<aid>=E422g)	
CKTID	Null
OUTSTATE	DISABLE
FRMTYPE	1.544M
FREEFLT	SQUELCH
HOLDFLT	ON

Default Retimer Parameters

Table A-6. Default Retimer Parameters

Parameter	Default Value
Retimer Parameters (<aid>=RTMg)	
CKTID	NULL
RTMSTATE	ENABLE
RTMLBO	0
FREEFLT	RETIME
HOLDFLT	RETIME
RTMSLIP	4

Appendix B CRAFT Software Reference

This Appendix describes how to install the SynCraft software you can use to provision the TimeProvider.

In This Appendix

- Overview
- System Requirements
- Installing SynCraft

Overview

SynCraft is a craft application for provisioning and managing the TimeProvider and other Network Elements via an Ethernet connection or a serial connection.

System Requirements

The following is the minimum computer configuration for a Windows NT 4.0 system:

- Pentium III 200 MHz platform

- 128 MB RAM

- 200 MB hard disk

- CD-ROM drive

- 1024 x 768 accelerated graphics

- 15" VGA monitor

Software

You can run the SynCraft application under the following operating systems:

- Windows XP

- Windows 2000 SP3 or later

- Windows NT 4 SP5 or later

- Windows ME5

- Windows 98 Second Edition

- Windows XP Professional Service Pack 1

You can download the following items from the Microsoft web site:

- Windows NT 4 Service Pack 5

- Windows 2000 Service Pack 3

- Windows XP Service Pack 1

Documentation

To access the help files and associated documentation for SynCraft, press F1 at any time while in the application.

Installing SynCraft

To install SynCraft on your computer, use the following procedure. You may need Administrator-level privileges on the computer to install this product.

1. Insert the SynCraft CD into the CD-ROM drive. If the Auto-Run feature is not enabled, then open the SynCraft folder on the CD and double-click the SynCraftSetup.exe icon. The Installation Wizard appears.

2. Follow the instructions that appear in the Installation Wizard.

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