TimeSource 3500
GPS Primary Reference Source

Symmetricom, Inc.
2300 Orchard Parkway
San Jose, CA 95131-1017
U.S.A.

http://www.symmetricom.com

Contents

How to Use This Guide

Chapter 1   Description

Chapter 2   Engineering and Ordering

Chapter 3   Installation

Chapter 4   TL1 Reference

Chapter 5 Troubleshooting

Chapter 6   Specifications

Figures

Tables

How to Use This Guide

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

In This Preface

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

Purpose of This Guide

The *TimeSource 3500 User's Guide* describes the procedures for unpacking, installing, using, maintaining, and troubleshooting the Symmetricom TimeSource 3500 GPS Primary Reference Source. It also describes the alarms and events, the languages that you use to communicate with the TimeSource 3500, default values, and other information.

Who Should Read This Guide

Chapter 1, Description, is written for non-technical audiences who need general information about the product. Subsequent chapters contain technical information about the product that describes installation, maintenance, and configuration instructions or details primarily intended for qualified maintenance personnel.

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

- **Systems Engineers** – Chapter 1 provides an introduction to the TimeSource 3500. Cross-references in this chapter direct you to detailed system information in other chapters as appropriate.

- **Installation Engineers** – Chapter 2 through Chapter 6 provide detailed information and procedures to ensure proper installation, power-up, operation, configuration, testing, and troubleshooting of the TimeSource 3500.

- **Maintenance Engineers** – Chapter 5 provides preventive and corrective maintenance guidelines, as well as procedures for diagnosing and troubleshooting fault indications and alarms.

While Chapter 1 is written for non-technical audiences who need information about the TimeSource 3500 system, other chapters contain detailed information and instructions which are intended to be performed by *qualified personnel only*.

Structure of This Guide

This guide contains the following sections:

Chapter, Title	Description
Chapter 1, Description	Includes an overview of the global positioning system, and provides a physical and functional description of the unit.
Chapter 2, Engineering and Ordering	Provides information to assist in planning the installation and ordering a system appropriate for a specific site.
Chapter 3, Installation	Provides the sequential order of procedures for installation and power-up.

Chapter, Title	Description
Chapter 4, TL1 Reference	Provides information for using the TL1 language.
Chapter 5, Troubleshooting	Provides troubleshooting information using front-panel lamps and error messages. It also describes how to replace a card, return equipment, get technical and/or sales assistance, and obtain manual updates.
Chapter 6, Specifications	Provides equipment specifications.
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:
TimeSource 3500 User's Guide	The title of a document.
TS3500 **CRITICAL**	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.
`TS3500` `Username:`	Text in a source file or a system prompt or other text that appears on a screen.
`ed-eqpt` `rtrv-eqpt`	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.

When text appears this way...	... it means:
bridging mode	A word or term being emphasized.
Symmetricom **does not** recommend...	A word or term given special emphasis.

Warnings, Cautions, Recommendations, and Notes

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

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

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

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

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

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

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

Related Documents and Information

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

- TimeScanCraft software

- TimePictra / TimeScan management software

Note: Symmetricom offers training courses designed to enhance your knowledge of the TimeSource 3500. Contact your local representative or sales office for a complete list of courses and outlines.

Where to Find Answers to Product and Document Questions

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

What's New In This Guide

Revision L of this guide contains the following new information:

- Added a new IF converter for the window antenna, on pages 49, 50, and 61.

- Added the section Success Rate, on page 35.

Chapter 1 Description

This chapter provides an overview of the global positioning system, and a physical and functional description.

In This Chapter

- Overview
- Global Positioning System
- Physical Description
- Functional Description

Overview

The TimeSource 3500, shown in Figure 1-1, is a Primary Reference Source (PRS) that receives and processes signals from GPS satellites, and outputs Stratum 1 synchronization signals traceable to UTC. TimeSource 3500 applications include synchronization for central offices, wireless base stations, transmission nodes, and other cases where a primary reference source can improve the performance of a telecommunications network infrastructure.

Figure 1-1.   TimeSource 3500

The TimeSource 3500 is also ideal for installation in environments where receiving GPS signals is difficult. Examples of environments hostile to GPS signals include urban canyons which have a very limited view of the sky because of blockage from nearby buildings, and high interference zones where GPS signals are jammed by competing over-the-air signals.

The TimeSource 3500 creates timing outputs by ensembling signals from several sources. The sources include GPS signals, an onboard rubidium local oscillator, and optional T1 signals. Timing outputs created from the ensemble are composed of the most stable and least noisy parts of each input. The performance of the T1 sources can be monitored and classified using standard measures. Synchronization outputs are delivered in a framed, all-ones, T1 format, a 10 MHz signal, a 1 pps signal, a composite clock format (optional), and a choice of time of day (TOD) formats.

The TimeSource 3500 minimizes timing impairments, such as jitter and wander, that are created by network and transmission systems. The synchronization timing is traceable to the GPS, which provides the highest level of synchronization for telephony networks. The TimeSource 3500 with its GPS input is a stand-alone office PRS. With the optional inputs ensembled, holdover is extended if GPS signals are disrupted.

Global Positioning System

The United States Government developed the GPS navigation system. It is a satellite-based, radio navigation aid designed to provide global, all-weather, precise navigation and timing capability to users 24 hours a day.

The satellites, circling the earth at approximately 12,550 statute miles, are arranged in 6 orbits with 4 operational satellites in each orbit. Each satellite has an orbital period of approximately 12 hours. This configuration assures that a minimum of 4 satellites, and as many as 12, are in view anywhere in the world at all times.

The TimeSource 3500 tracks all satellites within its field of view. The performance of each tracked satellite is observed and compared to the others, and available for use in the timing solution. A satellite with unacceptable performance data is dropped from the timing solution.

GPS antennas must have line-of-sight access to the transmitting satellites. Any structure that interferes with, or blocks, the view of the satellites disrupts the reception of the signals, and can adversely impact the timing performance of a receiver.

The TimeSource 3500 bridges frequent GPS outage periods with BesTime algorithms, its ultra-stable Rubidium local oscillator and advanced holdover technology. The technology anticipates the outages and uses BesTime-generated predictor values to optimize the performance of timing without direct satellite input.

Physical Description

The TimeSource 3500 consists of a shelf, a plug-in card, an antenna, cables, hardware, and software. Optional system configurations include eight additional T1 outputs, eight additional composite clock outputs, two IRIG-B TOD timing outputs, or eight mixed E1/T1 outputs.

The shelf (Figure 1-2) occupies two rack mounting units (RU), and can be mounted in a 19 inch rack or a 23 inch rack. One RU (1.75 in.) of air space above the TimeSource 3500 is required for proper ventilation. Other than a communications connector on the front panel, all connectors are at the rear of the shelf.

Four types of antennas are available:

- roof antenna for installation outdoors, usually on a roof

- mechanical antenna for installation indoors, mounted on a window sill or wall for reception through a window

- self-adhesive antenna for installation indoors, adhered directly to a window

- wall antenna for installation outdoors, through a hole in the wall

Air space (required for proper ventilation)

3.25 in.

17.25 in.
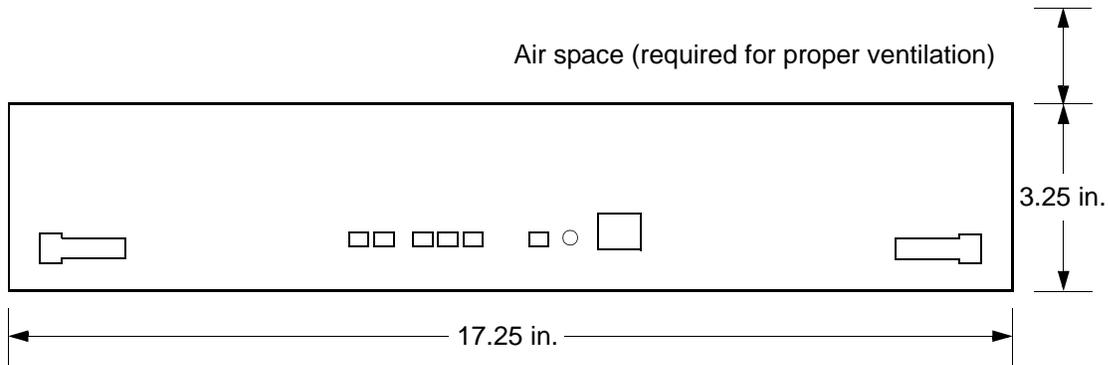
Figure 1-2.   Shelf

Roof Antenna

The roof antenna (Figure 1-3) is encased in weather-resistant plastic housing for outdoor installation, usually on a roof. A single coaxial cable carries signals and power between the antenna and the shelf.

5.9 in.

18.86 in.

1.83 in.
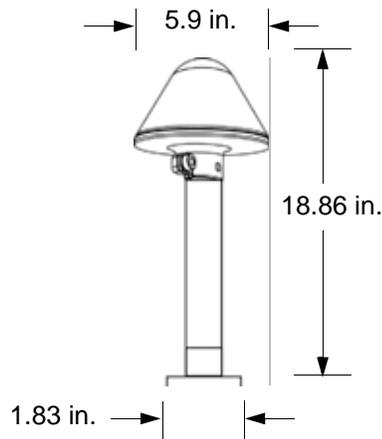
Figure 1-3.   Roof Antenna

Mechanical Window Antenna

The mechanical window antenna (Figure 1-4) may be attached to a window sill or wall, in any position that allows the antenna to be moved flush against the window. The antenna can be swung away from the window for window maintenance, and returned to its original position.

A single length of coaxial cable carries signals and power between the antenna assembly and the shelf.
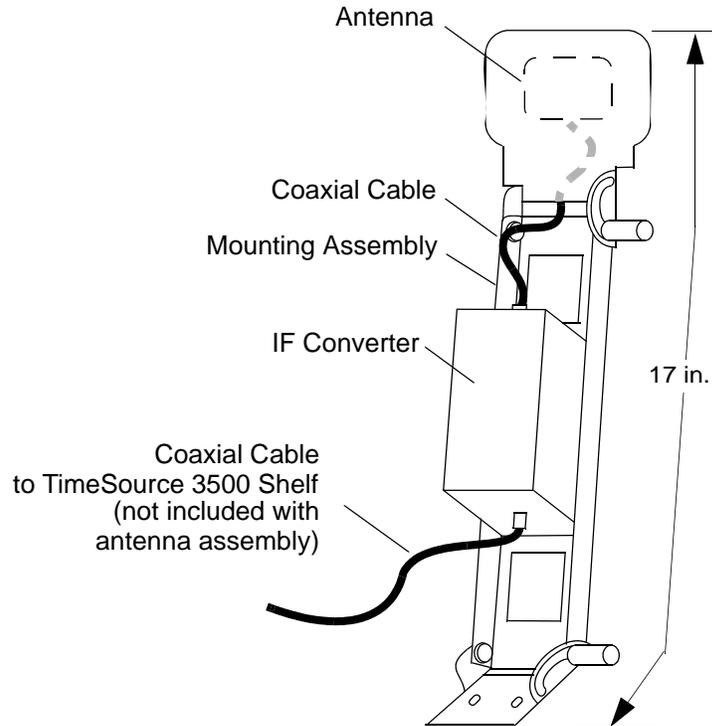
Figure 1-4.   *Mechanical Window Antenna*

Self-Adhesive Window Antenna

The self-adhesive window antenna assembly (Figure 1-5) consists of the antenna and two pieces of self-stick hook-and-loop fabric fasteners (Velcro brand or equivalent). The hook-and-loop fabric attaches directly to a window. Coaxial cables carry signals and power between the antenna and the IF converter, and between the IF converter and the shelf.

Figure 1-5.   *Self-Adhesive Window Antenna*

Wall Antenna

The wall antenna (Figure 1-6) is mounted on the outside of a building wall. The antenna attaches magnetically to the mounting bracket. The cable from the antenna is routed through a hole drilled in the wall. Coaxial cables carry signals and power between the antenna and the IF converter, and between the IF converter and the shelf.
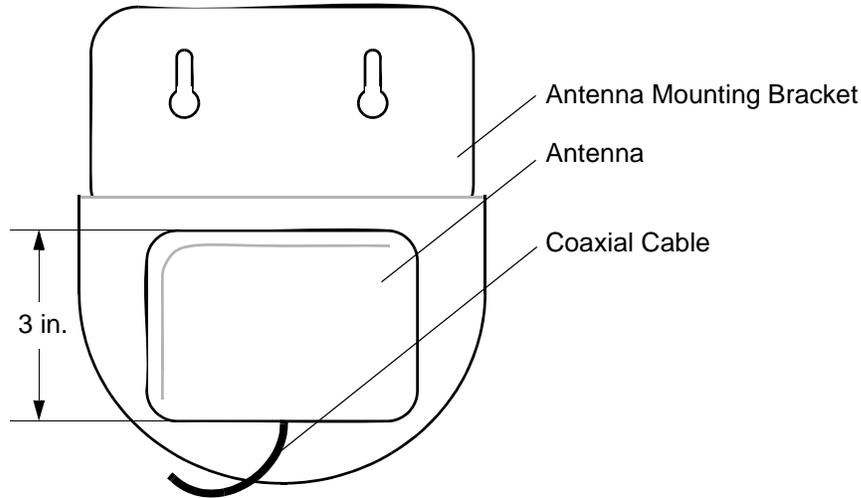
Figure 1-6.   Wall Antenna

Functional Description

Overview

Figure 1-7 shows the main functions of the TimeSource 3500. The center of the TimeSource 3500 is the BesTime Ensemble Timing Generator, which uses the BesTime algorithm to analyze the phase and frequency relationships, individually and collectively, of the timing sources. Each type of timing source has a particular characteristic that gives it an advantage over other sources, as listed in Table 1-1.

The BesTime algorithm uses the best characteristic of each source to produce an output signal with greater overall accuracy and stability than any single source. The contribution of a source is based on its deviation from the weighted average of all the sources. The more accurate a source, the more weight it has in the final output. Every source is under constant evaluation and its contribution subject to periodic adjustment. The output is essentially the best performance of the best source.
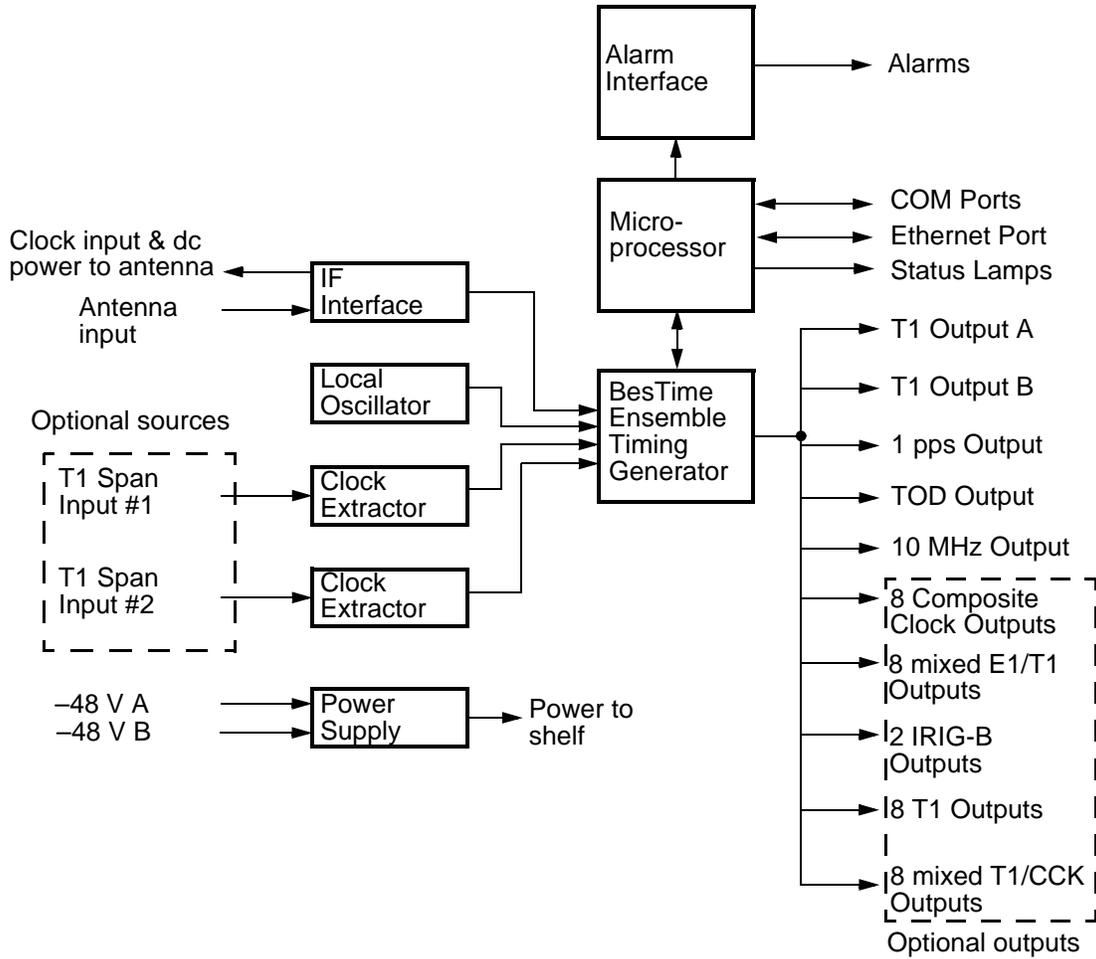
Figure 1-7.   Block Diagram

Table 1-1. Timing Source Characteristics

Source	Characteristic
Local Oscillator	Short term stability
T1 Line	Intermediate term stability
GPS Signal	Long term stability

Antenna

The antenna types include a roof antenna, mechanical window antenna, self-adhesive window antenna, or wall antenna. All antennas include a GPS receiver, amplifier, and intermediate-frequency (IF) downconverter.

The GPS Receiver extracts a clock signal from the GPS satellite signals. The receiver can process the signals from all satellites in view, while simultaneously using the Earth location of the receiver and other factors to determine an accurate clock signal.

An internal amplifier provides signal gain.

The downconverter converts the L1-band GPS signal to IF for long-distance transport on the coaxial antenna cable. The antenna cable provides current from the shelf to the antenna, and transports GPS satellite IF signals from the antenna to the shelf.

Antenna Installation and Lightning Protection

The TimeSource 3500 standard wall antenna kits do not include lightning protectors. When the antenna is installed on the side of the building, the antenna is in the zone of protection and is protected from lightning strikes as described in the Standard for the Installation of Lightning Protection Systems (NFPA 780), 2000 edition.

The zone of protection shall include the space not intruded by a rolling sphere having a radius of 150 ft (45.72 meters). Where the sphere is tangent to earth and resting against a strike termination device, all space in the vertical plane between the two points of contact and under the sphere shall be considered to be in the zone of protection. A zone of protection shall also be formed where such a sphere is resting on two or more strike termination devices and shall include the space between those devices (see Figure 1-8). All possible placements of the sphere shall be considered when determining the zone of protection using the rolling sphere model.
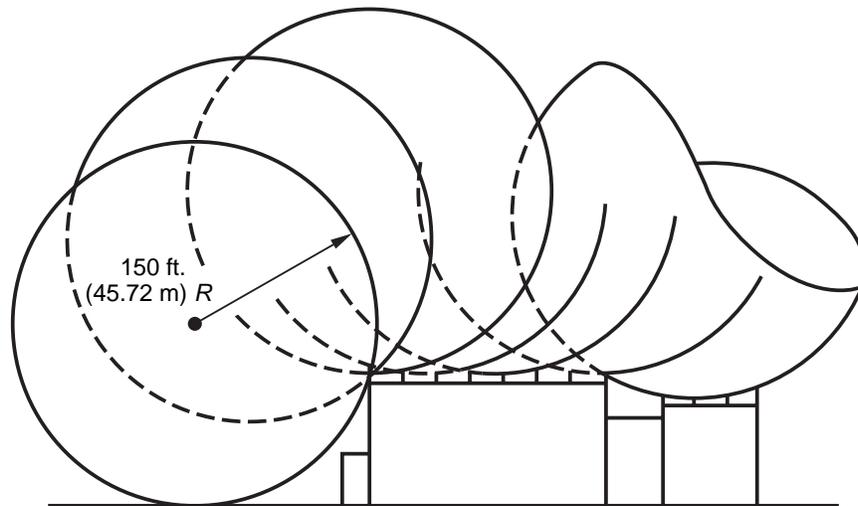
Figure 1-8.   Zone of Protection

For structure heights exceeding 150 ft (45.72 m) above earth or above a lower strike termination device, the zone of protection shall be considered to be the space in the vertical plane between the points of contact and under the sphere where the sphere is resting against a vertical surface of the structure and the lower strike termination device or earth. The zone of protection shall be limited to the space above the horizontal plane of the lowest terminal unless it can be extended by further analysis, such as in rolling the sphere to be tangent to earth.

If the wall antenna is installed outside the zone of protection, Symmetricom offers an outdoor and/or indoor lightning protector kits for these installations. Refer to Chapter 2, Engineering & Ordering, for more information on these kits.

IF Interface

An IF interface accepts the signals from the antenna/IF converter, and provides the clock information to the BesTime Ensemble Timing Generator.

GPS Receiver

The GPS Receiver continuously tracks up to eight satellites, using both carrier and code lock. The recovered pseudo-range measurement data is processed to determine precise time and frequency state estimates for the local oscillator. The receiver software is optimized to track and update state estimates, when as few as one satellite is in view.

Local Oscillator

A rubidium oscillator, based on a digitally controlled servo-loop, provides an ultra-stable local oscillator signal, which is sent to the BesTime Ensemble Timing Generator.

Clock Extractors

A clock extractor circuit extracts a timing signal from each external reference source. (External sources, other than the GPS antenna, are optional.) The extracted timing signal is sent to the BesTime Ensemble Timing Generator.

Power Supply

A power converter filters and converts –48 volts dc power supplied to the shelf into the voltages required by the circuitry.

NTP TimeServer

The TimeServer is a Simple Network Time Protocol (SNTP) device. The SNTP TimeServer function is provided via the TimeSource Ethernet interface and associated IP address. User software requests UTC time of day via NTP protocol. The TimeSource SNTP server responds with current UTC time. The TimeServer is compatible with the SNTP RFC-1769 format.

To enable the SNTP feature, a password must be entered using the ED-EQPT TL1 command. If a user makes a fourth attempt of an incorrect password entry, the TimeServer will lock out the user for 1 hour.

Network Time Protocol Password Activation

Use of the Network Time Protocol (NTP) feature requires activation with a password. Activation is accomplished through receipt of a Network Time Protocol Activation Certificate from Symmetricom. This certificate contains the unit purchase order number, unit model number, unit activation date, unit serial number, and unit activation key. The unit activation key is the password that enables the NTP feature. To activate the NTP feature, enter the TL1 command printed on the activation certificate. Once activated, this feature will be permanently enabled. To order the NTP feature, contact the local Symmetricom sales representative.

BesTime Ensemble Timing Generator

Clock signals from the GPS antenna (via the IF interface), local oscillator, and optional T1 span lines are used as sources by the BesTime algorithms in the BesTime Ensemble Timing Generator. The signals are analyzed for MDEV, TDEV, and other phase and frequency characteristics.

The BesTime Ensemble Timing Generator uses mathematical models to analyze each clock. The ensemble algorithms use the comparisons and analyses to generate a highly stable timing signal, which uses the best qualities of all inputs.

Eight Mixed T1/E1/2.048 MHz Outputs (990-72050-06 Systems Only)

This feature enables a user to mix any combination of E1 and T1 outputs. A user can also use any combination of framing. For E1, CCS, CAS, CCS with CRC4, and CAS with CRC4 can be used per G.703 table 6. For T1, D4 or ESF can be used per ANSI T1.101. In addition, there is support for analog (2.048 MHz) per G.703 table 10 and support for synchronization status messaging (SSM) per TR-33 for E1 and T1.

Eight Mixed T1/CCK Outputs (990-72050-07 Systems Only)

This feature enables a user to mix any combination of T1 and CCK outputs. For T1, D4 or ESF framing can be used per ANSI T1.101. Support for SSM is per TR-33 for T1.

T1 Outputs

The BesTime Ensemble Timing Generator provides the timing for the T1 timing signal available at the T1 OUT A and B connectors in a framed, all-ones format, which can be set to ESF or D4 framing.

Additional T1 Outputs (990-72050-02 Systems Only)

This option provides eight additional T1 outputs. The outputs are available at the OPTIONS I/O wire-wrap pins on the rear panel. These outputs function the same as the standard T1 outputs.

TOD Output

The BesTime Ensemble Timing Generator provides the timing for the TOD timing signal available at the RJ-45 connector, which provides time code to devices compatible with NTP Type 4 or Cisco ASCII format.

IRIG-B TOD Outputs (990-72050-05 Systems Only)

This option provides two additional TOD outputs in IRIG-B format. The outputs are available at a BNC output module on the OPTIONS I/O wire-wrap pins mounted on the rear panel.

The BesTime Ensemble Timing Generator provides the timing for the TOD timing signal, which provides timing code to devices compatible with IRIG-B.

1 PPS Output

The BesTime Ensemble Timing Generator provides the timing for the
1 pulse-per-second timing signal available at the 1 PPS connector, which can be
used for application-specific requirements. This signal is not squelched during an
alarm.

10 MHz Output

The BesTime Ensemble Timing Generator provides timing for the 10 MHz timing
signal available at the 10 MHZ connector, which can be used for local cellular
frequency or testing purposes. This signal is not squelched during an alarm.

Composite Clock Outputs
(990-72050-03 Systems Only)

This option provides eight composite clock signals. The outputs are available at the
OPTIONS I/O wire-wrap pins on the rear panel.

Alarm Interface

The microprocessor delivers alarms to normally open dry-contact type connections.
Alarms are also indicated by the front-panel status lamps.

Communication Ports

Three serial communication ports carry TL1 commands, responses, and
autonomous messages between the TimeSource 3500 and an external terminal.

Ethernet

TimeSource 3500 has six Ethernet ports to carry TL1 commands, responses, and
autonomous messages between the TimeSource 3500 and an external terminal, or
an Element Manager, or both. The user can configure the IP address, subnet mask,
and gateway address for the Ethernet ports.

Four ports (5001, 5002, 5003, and 5004) are configured to act as though a
serial-port communication terminal were connected to them. These ports
communicate TL1 commands, responses and autonomous messages.

Two additional ports communicate with Element Managers, which may have NMS,
OSMF, or similar software. An Element Manager establishes a connection with one
port (5551) for TL1 commands and responses. Another port (5550) establishes a
connection to an Element Manger, sends autonomous messages, and closes the
connection when finished.

Passthrough

The Passthrough feature of the TimeSource 3500 allows the unit to front a DCD product to provide one management interface for a user site. Passthrough allows a user to do the following:

■ COM1 or COM2 is connected to the DCD product

■ The user port can be any unused port, including the Ethernet port

■ Messages can pass from a user to the DCD product and from the DCD product to a user through the TimeSource 3500

■ The TID (SID for DCD) is used to identify commands that go to the DCD product. The TimeSource 3500 passes any TID not its own through to the DCD product. In the reverse direction, all commands received from the DCD product are passed through to the user.

Note: The TID of the TL1 command must be the SID of MIS.

■ DCD is fully managed except for firmware download.

■ GUI interfaces to the DCD product are not supported through the Passthrough, only TL1 responses are available.

Figure 1-9 shows a TimeSource 3500 Passthrough setup.
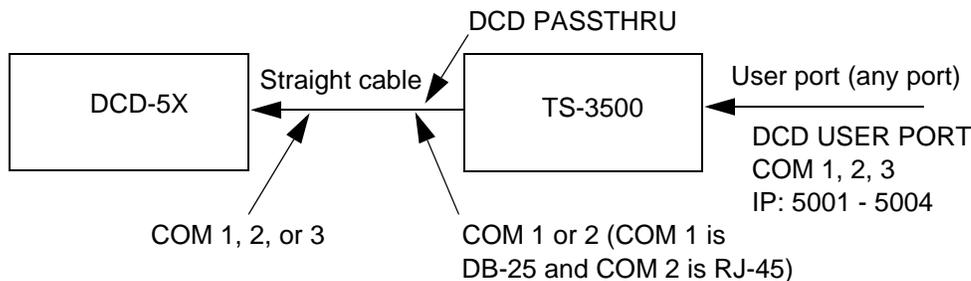
Figure 1-9.   TimeSource 3500 Passthrough Function

Alarm Programmability

Releases of TimeSource (1.05.03 and above) allow the user to provision the alarm escalation parameters that were hardcoded in the previous releases of TS3000.hex. The defaults for this release remain the same as were previously hardcoded. This feature can be used to set the programmability for such alarms as GPS, HOLDOVER, and SPAN-X.

The TS3500 alarms can be programmed for GPS and HOLDOVER types of events. The SPAN-X alarms can be programmed for AIS, ERROR, and LOS types of events.

The user can set the parameters for SEVERITY1 and SERAFF1 which initially come into effect when the condition is detected. The user can also set the parameters for SEVERITY2 and SERAFF2 which come into effect after TIME (another user programmable parameter).

The system also allows the user to set a parameter to define how outputs should behave in an alarm condition (see ALMOUT and ALMCOND settings). Outputs can be set to AIS, Squelch, or SSM when Holdover alarm severity is set to minor or major. AIS, Squelch, or SSM is not evoked if Holdover severity is set to event (factory default for initial severity). Outputs can also be set to ignore alarm conditions.

Startup

When the TimeSource starts up, the CRIT lamp lights. The CRIT lamp remains on for approximately 60 seconds and then shuts off.

During startup, the TimeSource performs several self-tests to verify the integrity of the hardware and software. Neither communication nor outputs are possible at this time, and the CRIT lamp is switched on. Once the self-tests are done, a connection to the system can be made and the events viewed.

Two events are initially provided. These events are:

- "Power Up Restart"

- "Settling Period"

In the "Power Up Restart" event, which lasts for approximately 2 minutes, the system does additional checks and starts all the various tasks within the system.

The "Settling Period" event is an informational message that lasts until the TimeSource's BesTime engine reaches the highest possible stable point. The time taken to reach this point depends on satellite availability, type of oscillator, ambient temperature, etc. and may take up to 20 hours to clear. Since "Settling Period" is independent of the quality of the output and is the normal behavior of the system, it is generated as an event rather than an alarm. If "Settling Period" is not cleared after 24 hours, another "Settling Period" event is generated as a marker. This is still Non-Service-Affecting.

As soon as the "Power Up Restart" message is cleared, the "BT3 Warmup" event is generated. This is also an informational message that lasts till the time it takes the system to acquire the satellites, warm up the oscillator, and start giving out valid outputs. It may take up to 2 hours for the message to clear, but typically takes approximately 40 minutes. During the "BT3 Warmup" time, the outputs will generally

be squelched. If the outputs are enabled using the TL1 command
(ED-EQPT::TS3500:ctag:::ALMCOND=ALW;) they may not be within the PRS
mask. In case the system is not able to acquire sufficient number of satellites and/or
discipline the oscillator within 2 hours, the event escalates into a Non Service
Affecting Minor alarm.

Once the warm up is complete, the system generates valid outputs and the event is
cleared.

Bridging/Holdover Behavior

In the TimeSource 3500, alarms are designed with a built-in hysteresis. This means
that an alarm is not announced as soon as some error condition is detected. There
is a pre-integration time during which the error must persist in order for the alarm to
be announced. On the flip side, the error must be clear for a certain time for an
alarm condition to be cleared. This ensures that intermittent conditions are not
flagged unnecessarily.

During the normal working of the TimeSource 3500, it is a very common occurrence
that the GPS satellites may not be visible during certain parts of the day, depending
on the installation of the antenna. This is particularly true with wall and, especially,
window antenna installations. The TimeSource 3500 has been designed to work
around this situation.

The TimeSource 3500 enters "Bridging" mode when all satellite locks are lost.
There is no TL1 annunciation that the system has entered "Bridging" mode. This is
"Non Service Affecting" and the outputs are not affected. The system runs off its
internal oscillator and the outputs are kept within the GR-2830 PRC mask by the
BesTime engine.

When "Bridging" mode persists for more than 30 minutes, the system enters
"Holdover" mode and a "Holdover" event is generated. This may or may not affect
the outputs depending on the alarm integration parameters that can be set by the
user.

The system allows the user to set various parameters for GPS error, Holdover error,
and SPAN error conditions. These parameters are:

- Initial Severity

- Initial Service Affecting state

- Integration Time

- Final Severity

- Final Service Affecting state

The system also allows the user to set a parameter to define how outputs should behave in an alarm condition (see ALMOUT and ALMCOND settings). Outputs can be set to AIS, Squelch, or SSM when Holdover alarm severity is set to minor or major. AIS, Squelch, or SSM is not evoked if Holdover severity is set to event (factory default for initial severity). Outputs can also be set to ignore alarm conditions.

When the "Holdover" event is announced, it is announced with the Initial Severity and Initial Service Affecting state. If the "Holdover" event persists for the length of the Integration Time, the alarm is escalated to the Final Severity and Final Service Affecting state.

The "Holdover" event/alarm is cleared when the satellites are visible again.

Time Figure of Merit

Time Figure of Merit (TFOM) is a moving 24 hour measurement reported in nanosecond (ns) against an ideal model. TFOM has a frequency component used to measure GPS wander caused by multipath and a time loop component used to measure long term oscillator wander.

The TFOM alarm threshold is set to 500 ns and is not user configurable. A TFOM below 500 ns indicates a stable clock well within PRS output performance specifications. A TFOM between 500 ns and 800 ns is an early warning of a clock becoming unstable and in danger of going out of PRS specification. When the TFOM exceeds 800 ns, the clock is no longer meeting the stratum 1 MTIE mask.

TFOM is most useful for installations where the antenna has a limited view to the sky. This is defined as any installation where fewer than 4 satellites are in view for greater than 1 hour per day on average. This is typical for installations where the antenna is mounted in a window or on an outside wall of a building, but can also include rooftop installations with partial sky view blockage. TFOM's primary use is to help troubleshoot multipath issues associated with antenna placement and incorrect latitude, longitude, and/or altitude (location) data entry.

Installations with full view to the sky see 4 satellites 23+ hours a day, seven days a week. It is relatively easy to filter out multipath signals using multiple satellites and simple voting schemes. In addition, rooftop antennas are mounted vertically and all signals below the horizon are obvious multipath interference and can be masked out of the system. With 4 satellites in view, the GPS timing receiver will provide an error-free lock on its location through an automatic survey function.

With wall/window installations, voting schemes become less effective as the number of satellites in view drop. Also, wall/window antennas are mounted horizontally and are prone to seeing multipath signals reflected off nearby structures and the ground. Wall/window installations also require the manual input of location data, creating the potential for errors and the need to detect these errors.

The TimeSource has unique algorithms to account for, and defeat, the added multipath complications and location data entry error possibilities of wall/window antenna installations. Large amounts of multipath or major errors in location data entry are easier to identify and are detected over a relatively short period of time. These short-term errors are normally reported via the TimeSource tracking success rate parameter.

Small amounts of multipath or minor errors in location data entry are difficult to identify because they mimic a true signal or an expected satellite behavior pattern. Single satellite reception over limited periods of time complicates the ability for the internal TimeSource algorithms to filter out these ghost signals and longer periods of time are needed to sort them out. TFOM tracks and reports these long-term errors.

At time of installation, marginal or unacceptable TFOM readings can indicate the need to adjust the antenna placement, the mask angle, and/or the location data. Relatively small changes in the antenna placement can improve the ability of the system to see satellites and therefore improve performance. The mask angle can be adjusted to block out lower elevation portions of the sky if there is good visibility at higher elevations, thereby reducing multipath. Correct location data is very helpful in identifying and tracking satellites.

In addition, a clock may be stable for many weeks, months, or years but could degrade because of changes in its environment. TFOM is useful in detecting these infrequent subtle changes including:

- Maturing foliage or seasonal foliage changes

- Installation of new transmitters nearby (i.e. wireless base station)

- New building construction

- Variations in the day-to-day temperature of the CO

Success Rate

Success rate is a moving 24 hour window indicating the TimeSource's ability to lock to and use the GPS as part of the system's timing solution. This metric is reported as a percentage (%) ratio of the total good minutes that the system uses GPS in a day (maximum 1440 minutes/day). Success rate can range in value from 0% to 100%.

Success rate is determined by totaling all good minutes of satellite(s) visibility that the system is using and dividing by the total maximum possible minutes in a day; when satellites are not being used in the solution usually because of low satellite visibility or multipath effects, the minutes are not counted in the good minutes category.

The success rate of a rooftop antenna configuration will generally be higher than a wall/window antenna configuration due to the fact that rooftop installations will have a better view of the sky than wall/window installations which typically may see only portions of the sky with fewer satellites.

TFOM (Merit) was discussed in detail in the preceding section, and this metric plays a key role in the calculation of Success Rate. When TFOM is greater than 500 ns, this is a warning that the system clock is becoming unstable and maybe going out of PRS specification. Success Rate uses this as a threshold, so when the TFOM value is equal to or below 500 ns, minutes will be calculated within the good minutes category. Conversely, when the TFOM value is above 500 ns, these minutes will not be considered as good minutes.

Chapter 2 Engineering and Ordering

This chapter provides information to assist in planning the installation and ordering a system appropriate for a specific site.

In This Chapter

- Antenna Guidelines
- Shelf Considerations
- Systems
- Antennas
- User-Supplied Tools and Materials

Antenna Guidelines

Perform a site survey as described in the following procedure before ordering the system. Use the guidelines and considerations in the Roof/Window/Wall Antenna Location and Cabling Guidelines sections that follow this procedure and in Shelf Considerations, on page 45.

Site Survey

1. Determine the shelf location.

2. Determine the best location for mounting the antenna (less than 1,000 ft of cable from the shelf). Use the guidelines and considerations in the Roof Antenna Location and Cabling Guidelines in the next section.

3. If a roof-mounted antenna is installed, determine the location of the grounding point for the lightning suppressor, then determine the location of the lightning suppressor. The cable length between the lightning suppressor and the grounding point must be less than 15 ft. If the grounding point is inside the building, the cable length between the grounding point and the cable entry must be less than 50 ft. Valid lightning suppressor grounding points are:

   ■ Valid ring ground system (usually for roof-mounted lightning suppressors)

   ■ Structural steel of building (for interior-mounted or exterior-mounted lightning suppressors, attach with a cad weld)

   ■ Central Office ground plate (usually for interior-mounted lightning suppressors)

4. If a roof-mounted antenna is installed, two lengths of cable are required. Plan the cable route and measure the length of cable required between the antenna and the lightning suppressor, and between the lightning suppressor and the shelf.

5. If a window or wall-mounted antenna is installed, plan the cable route and measure the length of cable required between the antenna and the shelf.

6. Determine the two separate –48 V power sources for the shelf. If only one –48 V power source is available, it must be cabled to both TimeSource 3500 power inputs.

Roof Antenna Location and Cabling Guidelines

Electrical Shock Caution: To avoid electrical shock and possible personal injury, do not select an antenna location near high-voltage sources. Install the antenna in an easily maintainable location.

The ideal roof antenna location provides a clear, unobstructed view of the sky from the zenith to the horizon line, and 360 degrees around the horizon.

A compromise often must be made between location and satellite field of view. With a smaller field of view, the TimeSource 3500 can use fewer satellites in the solution for GPS derived time. The TimeSource 3500 will operate with an average of one satellite in view for 40 percent of the time in a day.

Signals closer to the horizon are often subject to multipath effects, which degrade the timing solution. The TimeSource 3500 can be set to ignore, or mask, all signals from the horizon up to a chosen angle of elevation (mask angle). (See Figure 2-1).
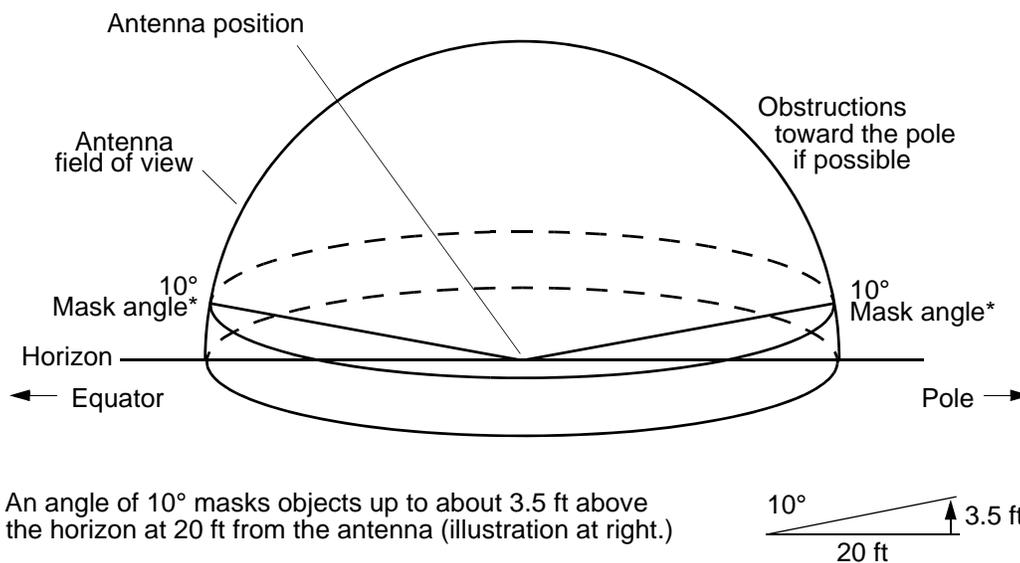
* An angle of 10° masks objects up to about 3.5 ft above the horizon at 20 ft from the antenna (illustration at right.)

Figure 2-1.   Antenna Field of View

Due to the geometry of the GPS satellite orbits, more satellites are visible in the direction of the equator than the poles. If possible, place the antenna so that the antenna has a clear view toward the equator (toward the south in the northern hemisphere, or toward the north in the southern hemisphere). Up to 60 degrees of arc, centered at the pole, may be blocked with little effect in the temperate latitudes. This note is less applicable in latitudes nearer the equator.

The total of obstructions above the mask angle should not obscure more than 25 percent of the total field of view (90 degrees of azimuth) (Figure 2-2).
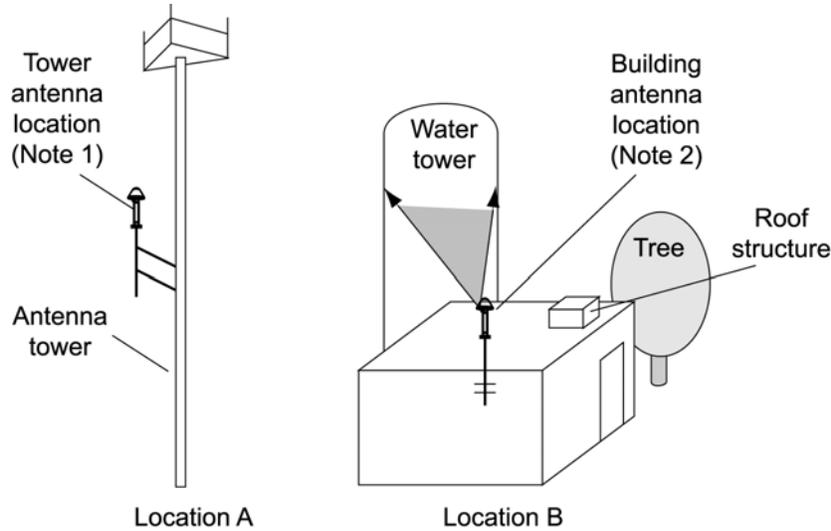
Figure 2-2.   Antenna Location Examples

Notes:

1. Place the antenna high enough on the tower that obstructions are below the mask angle; mount the antenna more than 3 feet away from the tower, and far below the interference of the antennas at the top of the tower. Tower mounting is the least desirable location because of the potential for severe multipath, and difficulty in troubleshooting and maintenance.
2. Place the antenna high enough that the roof structure and tree are below the mask angle, and the water tower does not block more than 12.5 percent of the sky.

No single obstruction should block a large portion (45 degrees of azimuth) of the view.

The most important obstructions are within 1/4 mile (400 yards) of the antenna. Obstructions may include, but are not limited to, towers, buildings, other construction, trees, and high-voltage power lines.

Attempt to avoid locating the antenna within 30 degrees azimuth of the transmission direction of any transmitting antenna in the area, even if the transmitting antenna operates at a different frequency. A transmitting antenna may cause the GPS antenna to become overloaded and reduce its reception capabilities.

The minimum horizontal distance from other receiving antennas is 3 feet.

To reduce multipath signal distortions, the minimum horizontal distance from vertical reflective structures (e.g., heating ducts, equipment housings, etc.) is twice the height of the structure, and no less than 10 feet (Figure 2-3).

Do not locate the antenna underneath high power lines. If this cannot be avoided, ensure the antenna is placed at least twice as far from the power line as the power line is high (to avoid danger to personnel and multipath effects).

Cables must be run as straight as possible. All cables should be routed in accordance with local company practices.

Note: Keep all impedances as low as possible, otherwise the grounding scheme may be defeated.

Observe the following guidelines during the placement and installation of the cables:

■ Route cables as straight as possible (bends in the cable increase impedance at lightning frequencies), in accordance with local company practices.

■ Any opening where conduit enters the building must be waterproofed per local company practices.

■ Treat all exposed connections with an electrically conductive anti-corrosion compound (Kopr-Shield or equivalent).

Caution: Avoid small-radius turns and unnecessary turns.
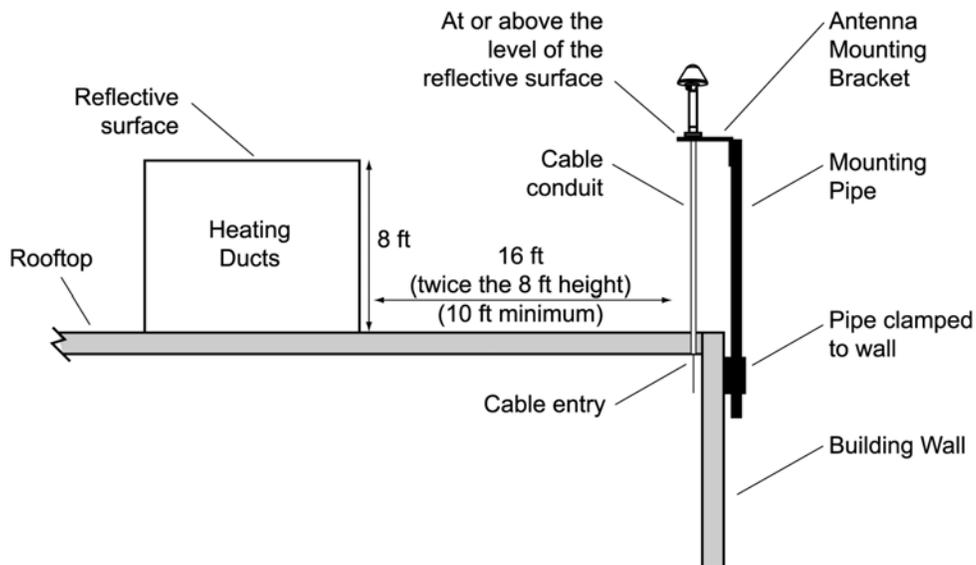
Figure 2-3.   Sample Rooftop Antenna Mount

Chapter 2 Engineering and Ordering
Antenna Guidelines

> **Note:** Figure 2-3 is an example only. Not all parts are available from Symmetricom.

Roof Antenna Earth Ground Location Guidelines

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, or if the mounting plate is to be installed in a nonmetallic junction box, bolt the mounting plate to a point within 15 feet of the valid earth ground.

Roof Antenna Cable Choices

The antenna assembly uses the same coaxial cable for power and antenna signals. The length of cable is determined by circumstances of the installation and site.

Symmetricom offers RG-59/U plenum-rated coaxial cable (20 AWG [0.812 mm], 75 ohm coaxial) with male TNC connectors attached, in the following lengths:

- 10 feet (060-72010-01)
- 20 feet (060-72010-02)
- 50 feet (060-72010-05)
- 100 feet (060-72010-10)
- 200 feet (060-72010-20)
- 300 feet (060-72010-30)
- 500 feet (060-72010-50)
- 600 feet (060-72010-60)
- 800 feet (060-72010-80)
- 1000 feet (060-72010-99)

Two cables are required: one to connect the antenna to the lightning suppressor, and another to connect the lightning suppressor to the TimeSource 3500 Shelf.

Optionally, one length of coaxial cable may be ordered, which must be cut and prepared with end-connectors at the point where the suppressor is located.

The following items, which must be ordered separately, are available for this type of installation:

- TNC connector kit (093-72010-98) includes:
    - TNC connectors for RG-59/U cables (8)
    - Rubber boots (8)
    - TNC adapter connectors (2)

- TNC crimp tool (154-00023-01)

Window and Wall Antenna Location Guidelines

When selecting a window or wall in which to install the antenna, select the window or wall which has the maximum unobstructed view of the sky. Do not select a window or wall which has the view of the sky obstructed by trees, buildings, or towers. The smaller the field of view, the fewer the number of satellites that can be used in the timing solution for GPS derived time. The consequence of this is that the timing generator may experience holdover more often and may eventually go into alarm.

Due to the geometry of the GPS satellite orbits, more satellites are visible in the direction of the equator than the poles. If possible, select a window or wall which has a clear view toward the equator (toward the south in the northern hemisphere, or toward the north in the southern hemisphere). This guideline is less applicable in latitudes nearer the equator and more important nearer the poles.

Certain parts of the sky are blocked from view. These obstructions usually exist from the horizon line and up, for example, a building or mountain. The processor inside the GPS receiver processes every piece of the sky, whether it is blocked or not. If unproductive parts of the sky are masked from the processor's view, the processing time is reduced, and the timing solution can be achieved more quickly.

Note: A band of the sky from the horizon up to a point where a view of the sky begins is called a mask angle. The mask angle typically should not exceed 10 degrees (if the mask angle is set too high, too little of the sky is available to the receiver). Determine the mask angle for the selected antenna location (Figure 2-4) and make a note of it. The mask angle, in degrees, will be entered during the initial setup.

TimeSource 3500
Antenna

10° mask angle*

3.5 ft

20 ft

Note: TimeSource 3500 does not detect satellites in the masked area.
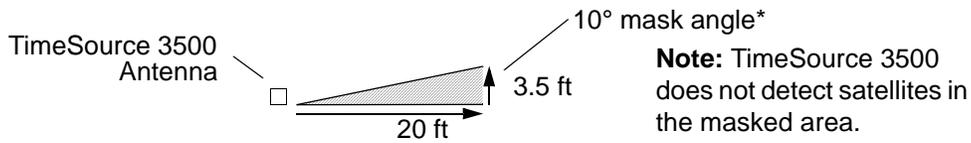
*An angle of 10° masks objects up to about 3.5 ft above the horizon at 20 ft from the antenna.

Figure 2-4.   Antenna Mask Angle

Window and Wall Antenna Cable Choices

A window or wall antenna includes an attached coaxial cable terminating in a male SMA connector.

A separate cable is required to connect the IF converter to the TimeSource 3500 shelf. Two types of plenum-rated cable are available.

The cables with longer length capabilities (060-72010-xx) are RG-59/U (20 AWG [0.812 mm], 75 ohm coaxial) with male TNC connectors attached to each end. Assembled cables are available in the following lengths:

- 10 feet (060-72010-01)
- 20 feet (060-72010-02)
- 50 feet (060-72010-05)
- 100 feet (060-72010-10)
- 200 feet (060-72010-20)
- 300 feet (060-72010-30)
- 500 feet (060-72010-50)
- 600 feet (060-72010-60)
- 800 feet (060-72010-80)
- 1000 feet (060-72010-99)

The more flexible cables (060-72050-xx) are Mini RG-59/U (20 AWG [0.812 mm], 75 ohm coaxial) with male TNC connectors attached to each end. Assembled cables are available in the following lengths:

- 50 feet (060-72050-05)
- 100 feet (060-72050-10)
- 200 feet (060-72050-20)
- 500 ft (060-72050-50)

IRIG-B TOD (990-72050-05 System Only)

If using the IRIG-B TOD outputs (990-72050-05 TimeSource 3500 System), right-angle BNC connectors are provided to prevent small radius turns in the IRIG-B TOD cables. The right-angle BNC connectors may be attached to the IRIG-B BNC adapter (also provided) BNC connectors, to direct the cables from the shelf as desired.

For each IRIG-B TOD output, a user-supplied cable with BNC connectors on each end is installed between the adapter and the network elements requiring IRIG-B TOD timing.

RJ-422–to–RS-232 TOD Converter

If using time-of-day (TOD), and the device receiving the time code accepts an RS-232 signal instead of an RS-422 signal (for example, a Cisco router), an RJ-422–to–RJ-232 TOD Converter Kit is required (ordered separately, part number 093-72000-98).

The RJ-422–to–RJ-232 TOD Converter Kit consists of a mounting plate with a female RJ-45 connector, a female DB-25 connector, a TOD converter, and two screws.

Install the converter anywhere (for example, on unused space on a rack) within 1,000 cable feet of the TimeSource 3500 shelf, and within 50 cable feet of the device receiving the time code.

The user must supply two cables. One cable is a Category 5 four-pair RS-422 cable, 1,000 feet maximum, with RJ-45 connectors on each end. Route this cable between the TimeSource 3500 Shelf and the converter.

The other cable is an RS-232 data communications cable, 50 feet maximum, with a 25-pin male D-type connector and another connector determined by the device receiving the time code. Route this cable between the converter and the device receiving the time code.

Shelf Considerations

The TimeSource 3500 Shelf can be mounted in a 19 inch rack or a 23 inch rack. The shelf is shipped with supplied mounting ears positioned for flush mounting on a 23 inch rack. Attach the mounting ears, as shown in Figure 2-5, for flush mounting or 5 inch offset mounting. Attach the long side of the mounting ear to the shelf for a 23 inch rack, and attach the short side of the mounting ears to the shelf for a 19 inch rack. Mount the shelf in the rack according to standard company practices. Leave one RU (1.75 inches) of air space above the TimeSource 3500 Shelf for proper ventilation. Mount the shelf in the rack according to standard company practices.

Note: Two screws can be used in each mounting ear if the holes in the rack are spaced 1.75 inches apart.

Rear of rack

Top of shelf

A. Flush mounting – 19 in. rack

Rear of rack

Top of shelf

B. Flush mounting – 23 in. rack

Rear of rack

Top of shelf

C. 5 in. offset – 19 in. rack

Rear of rack

Top of shelf

D. 5 in. offset – 23 in. rack
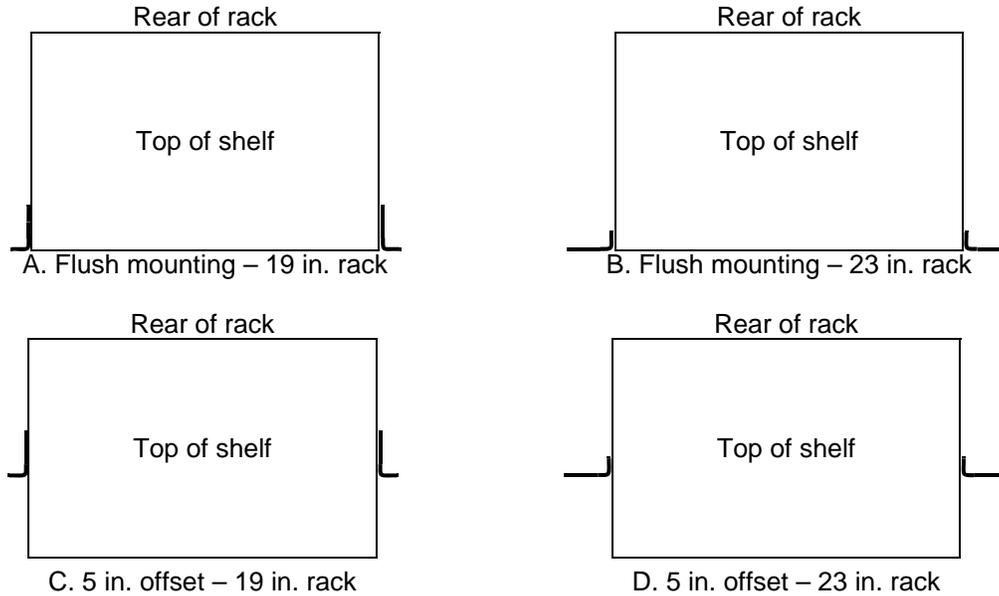
Figure 2-5.   Rack Mounting Options

Systems

The TimeSource 3500 Systems available are listed below. The antenna must be ordered separately.

Standard System (Two T1 Outputs)

This system (990-72050-01) includes:

- TimeSource 3000 Shelf (090-72000-01)
- TimeSource 3500 card (090-72050-01)
- Hardware kit (093-72050-87)
- System software CD (992-72050-xx) Version 1.05.04 or higher
- TimeScan Craft (keyless version) software CD (992-46750-xx) Version 7.2.0 or higher

With Eight Additional T1 Outputs

This system (990-72050-02) includes:

- TimeSource 3000 Shelf (090-72000-01)
- TimeSource 3500 card with additional T1 outputs
  (090-72050-02)
- Hardware kit (093-72050-87)
- System software CD (992-72050-xx) Version 1.05.04 or higher
- TimeScan Craft (keyless version) software CD (992-46750-xx) Version 7.2.0 or higher

With Eight Additional Mixed E1/T1 Outputs

This system (990-72050-06) includes:

- TimeSource 3000 Shelf (090-72000-01)
- TimeSource 3500 card with mixed E1/T1 outputs
  (090-72050-06)
- Hardware kit (093-72050-87)
- System software CD (992-72050-xx) Version 1.05.04 or higher
- TimeScan Craft (keyless version) software CD (992-46750-xx) Version 7.2.0 or higher

With Eight Additional Mixed T1/CCK Outputs

This system (990-72050-07) includes:

- TimeSource 3000 Shelf (090-72000-01)
- TimeSource 3500 card with mixed T1/CCK outputs
  (090-72050-07)
- Hardware kit (093-72050-87)
- System software CD (992-72050-xx)
  Version 1.06.02 or higher
- TimeScan Craft (keyless version) software CD (992-46750-xx) Version 7.2.0 or higher

With Eight Composite Clock Outputs

This system (990-72050-03) includes:

- TimeSource 3000 Shelf (090-72000-01)
- TimeSource 3500 card with composite clock outputs
  (090-72050-03)
- Hardware kit (093-72050-87)
- System software CD (992-72050-xx)
  Version 1.05.04 or higher
- TimeScan Craft (keyless version) software CD (992-46750-xx) Version 7.2.0 or
  higher

With Two IRIG-B TOD Outputs

This system (990-72050-05) includes:

- TimeSource 3000 Shelf (090-72000-01)
- TimeSource 3500 card with IRIG-B TOD outputs
  (090-72050-05)
- IRIG-B BNC adapter board (090-72100-06)
- Two right-angle BNC connectors (121-00530-01)
- Hardware kit (093-72050-87)
- System software CD (992-72050-xx)
  Version 1.05.04 or higher
- TimeScan Craft (keyless version) software CD (992-46750-xx) Version 7.2.0 or
  higher

Antennas

The antennas available are listed below. A TimeSource 3500 System must be
ordered separately.

Roof Antenna

Antenna and mounting hardware kit (990-72050-96) includes:

- IF antenna assembly (090-72010-71)
- Mounting hardware kit (093-72010-71) (x1) which includes:
  - Shim, 070-72010-75 (x2)

- – Mast, 070-72010-76 (x1)
- – Flange, 070-72010-77 (x1)
- – Bolts, Pan Head Phillips Screw, 8 - 32 x ¾ inch, 125-83253-12 (x3)
- – #8 Flat washers, 400111-0002 (x3)
- – #8 Split Lock Washer, 125-00521-08 (x3)
- – #8 Nut, 400160-0003 (x3)
- Rooftop antenna installation kit (093-72050-96) includes:
  - – Mounting bracket for surge suppressor (070-00300-02)
  - – Surge suppressor (143-00018-01)
  - – Antenna cable bracket kit (093-00001-01)
  - – Miscellaneous installation parts

Mechanical Window Antenna

This antenna kit (990-72050-97) comes as a fully assembled antenna with the following major components:

- Antenna, with cable and SMA connector attached (090-72050-90)
- IF converter for window antenna gain (090-72050-72)
- Mechanical chassis (074-72050-97)

Self-Adhesive Window Antenna

This antenna kit (990-72050-98) includes:

- Antenna (090-71010-87)
- IF converter for window antenna gain (090-72050-72)
- Self-adhesive window antenna installation kit (093-72050-98) includes:
  - – RG316 cable, 10 feet (060-00062-01)
  - – Cable tie mounts (128-00302-02) and cable ties (128-00500-05)

Wall Antenna

Order one of these two available wall antenna kits based on the users antenna cable length installation requirements:

This antenna kit (990-72050-99) includes:

- IF converter for wall antenna gain (090-72050-71)

- Wall antenna kit (093-72050-99) includes:
    - Antenna, with 19 feet of cable and SMA connector attached (112-00013-01)
    - Antenna mounting bracket (070-00383-02)
    - Clamp tie mounts (128-00302-02) and cable ties (128-00500-05)

OR

This antenna kit (990-72050-95) includes:

- IF converter for wall antenna gain (090-72050-71)
- Wall antenna kit (093-72050-95) includes:
    - Antenna, with 6 feet of cable and SMA connector attached (112-00013-03)
    - Antenna mounting bracket (070-00383-02)
    - Clamp tie mounts (128-00302-02) and
      cable ties (128-00500-05)

Optional Wall Antenna Lightning Suppressors

There are two available wall antenna lightning suppressors, one for indoor mounting and one for outdoor. Order one of these two optional lightning suppressors if necessary.

- Wall antenna indoor lightning suppressor kit (093-72050-94) (optional) includes:
    - Mounting bracket (070-00300-02)
    - Surge protector (143-00018-01)
    - RG59 cable, 2 feet (060-72010-92)
- Wall antenna L1 outdoor lightning suppressor kit (093-72050-93) (optional) includes:
    - Mounting bracket (070-00300-03)
    - Surge protector (143-00018-02)
    - RG316 cable, 10 feet, SMA(m)-SMA(m) (060-00062-01)

User-Supplied Tools and Materials

Ensure that the user-supplied tools and materials listed below are on hand for installation, as applicable.

For Roof Antenna Installation

- 1 inch diameter galvanized metal pipe, used as a mast to mount the antenna. Mast should be long enough to position the antenna above any metal object on the roof.

- Screws to attach the lightning suppressor mounting plate.

- Plumb line or bubble level.

- Nonmetallic junction box for lightning suppressor (optional if lightning suppressor mounted indoors).

- 1 inch diameter PVC pipe as conduit for outdoor cables.

- PVC fittings appropriate to the installation and cable route.

- Appropriate tools and materials for cutting and shaping PVC pipe.

- PVC glue

- 6 AWG ground wire.

- Spade lugs for 6 AWG ground wire.

- Crimp tool for 6 AWG spade lugs.

- Hardware to attach the ground wire to a valid earth ground.

- Fire-stopping material to seal conduit hole in roof or wall.

- Electrically conductive antioxidant compound (Kopr-Shield or equivalent) to coat exposed connections to prevent oxidation.

- Tool to cut cable, if installation requires custom lengths of cable.

- Phillips Screwdriver

- Wrench

- 1/4 inch hex Allen wrench

For Mechanical Window Antenna Installation

- Drill with bit of appropriate size and type to make pilot holes for the mounting screws

- 2 screws of appropriate size and type to attach the foot of the mechanical chassis to a window sill or wall near a window.

- Screwdriver

- Cable ties or other method of securing cable

- GPS handheld receiver, personal computer with GPS location software, or other method of determining latitude, longitude, and altitude

For Self-Adhesive Window Antenna Installation

- Drill with bit of appropriate size and type to make pilot holes for the mounting screws

- 4 screws of appropriate size and type to attach the IF converter to a wall or other mounting surface.
- Screwdriver
- GPS handheld receiver, personal computer with GPS location software, or other method of determining latitude, longitude, and altitude

For Wall Antenna Installation

- Ladder, or safe method of reaching the antenna location on the exterior wall
- Drill with bits of appropriate size and type to make pilot holes for the antenna mounting bracket screws, and to make a hole through the wall for the antenna cable
- 2 screws of appropriate size and type to attach the antenna mounting bracket to an exterior wall.
- Screwdriver
- Electrically conductive antioxidant compound (Kopr-Shield or equivalent) to coat exposed connections to prevent oxidation
- Fire stopping material to seal the hole in the wall
- GPS handheld receiver, personal computer with GPS location software, or other method of determining latitude, longitude, and altitude

For Shelf Installation

- A Phillips-head screwdriver for installing the TimeSource 3500 Shelf in a rack
- Four screws to mount the shelf in a rack

Outputs, Power, and Miscellaneous

- RG-58 coaxial cable for 1 PPS, 10 MHZ outputs
- Ethernet 10BaseT cable for Ethernet port
- Category 5 four-pair RS-422 cable, with RJ-45 connector for the TOD output, RS-422–to–RS-232 TOD converter
- RS-232 cable with DB-25 connector for the RS-422–to–RS-232 TOD converter
- RS-232 cable with DB-9 connector for COM2 port
- 6 AWG ground wire
- 16 AWG green insulated ground wire
- 16 AWG red insulated wire
- 16 AWG black insulated wire
- T1 cables

Chapter 3 Installation

This chapter is the sequential order of procedures for installation and power-up.

In This Chapter

- Unpacking
- Antenna
- Shelf
- Power-Up
- Installing Firmware with TimeWizard
- Factory-Set Values

Unpacking

Use the procedures in the order they appear in this chapter to install the TimeSource 3500. If any difficulties are encountered during the installation process, contact Symmetricom's Customer Technical Assistance Center (CTAC). Refer to the Technical Assistance section of the Troubleshooting chapter for telephone numbers.

CTAC includes Product Technical Support for technical information, and Customer Service for information about an order, RMAs, and other information.

ESD Caution: To avoid damage from electrostatic discharge (ESD), when handling electronic equipment, use local office procedures, including:

- Use grounded wrist straps connected to equipment frame ground when handling cards.
- Store cards only in antistatic packaging provided by the factory

Note: Save packing material. *All equipment returned must be packed in the original packing material.* Contact Customer Service if additional packaging is needed.

Unpack equipment carefully; check for completeness against the purchase order. Notify Symmetricom if items are missing.

Inspect equipment for shipping damage, including bent or loose hardware, and broken connectors.

If equipment was damaged in transit, contact Customer Service to request an RMA, and notify the carrier.

Antenna

Roof Antenna

Installation procedures are to follow local company procedures and the Installation Job Specification.

Prior to installing the antenna, the site, antenna location, lightning suppressor location, lightning suppressor grounding point, cable route, and all other details should have been planned.

To install the antenna, refer to Figure 3-1 and perform the following procedure. Ensure all user-supplied materials are available.

⚠️ **Warning:** To prevent arcing, Ensure that the lightning suppressor is placed away from electrical devices and cabling.

Notes:

1. Recommended grounding points:
   - Valid roof ring ground system.
   - Cad weld to building structural steel.
   - Central office ground plate within 50 feet of antenna cable entrance into building.
2. Order two cables or a single cable run can be made from the antenna to the TimeSource 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.
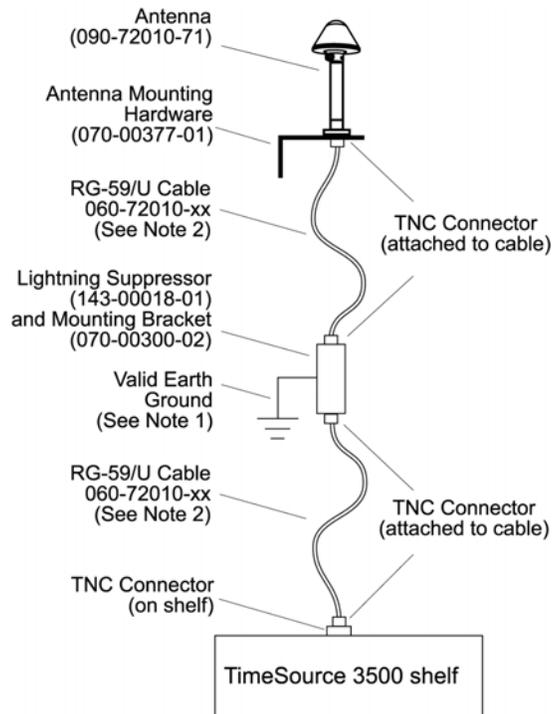
Figure 3-1.   Roof Antenna-to-Shelf Cabling

Roof Antenna Mounting and Cable Connection Procedure

1. Attach the antenna mounting bracket to a pipe (1 in. diameter) or a wood post.

■ If mounting the bracket to a pipe, 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.
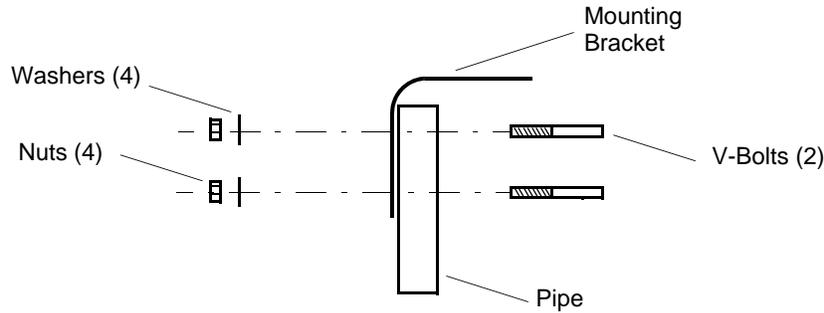
Figure 3-2.   Mounting Antenna Bracket to a Pipe

■ If mounting the bracket to a wood post, use the provided two self-tapping screws in two diagonally positioned mounting bracket slots, and attach to the post

.
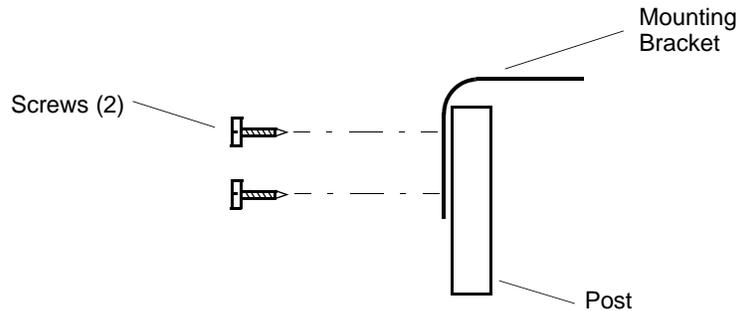
Figure 3-3.   Mounting Antenna Bracket to a Wood Post

2. Use the following steps to assemble the mast and mount the antenna.

■ Assemble the mast to the flange using PVC glue (user to supply).

■ Feed the cable through the bottom of the mast as illustrated.

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

■ Mount the antenna to the mast using the supplied shims.

■ Mount the antenna and mast assembly to the "L" bracket using the supplied nuts, bolts, and washers.
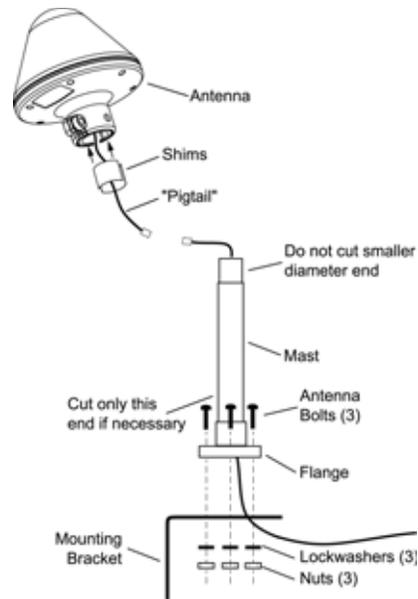
Figure 3-4.   Antenna Mast Assembly

3. 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.

4. 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 ft 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.

5. Slide the longer bolt of the lightning suppressor through the D-hole, and attach with a nut and a washer (provided).
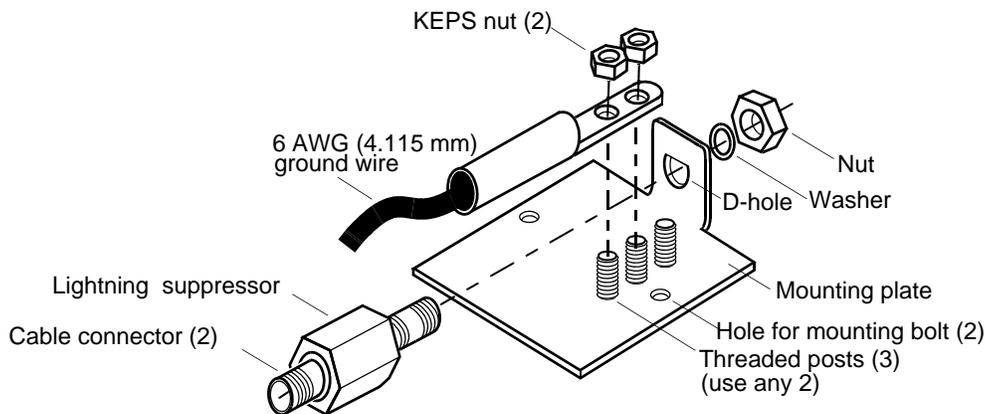
Figure 3-5.   Mounting the Lightning Suppressor

6. Install 1 in. nonmetallic conduit from the antenna to the lightning suppressor, and from the lightning suppressor to the cable entrance into the building.

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

8. Connect a cable to the antenna, route the cable through the conduit, and connect the cable to the lightning suppressor.

9. Connect a cable to the other end of the lightning suppressor, route the cable through the conduit into the building, and route the cable through the building to the TimeSource 3500 Shelf location.

10. If the lightning suppressor was not mounted directly to a valid earth ground, crimp a length of 6 AWG (4.115 mm) ground cable to the two-hole terminal, slide the terminal over 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 6 AWG (4.115 mm) ground cable.

11. Attach the other end of the cable to a valid earth ground.

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

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

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

Mechanical Window Antenna

Installation procedures are to follow local company procedures and the Installation Job Specification.

Prior to installing the antenna, the site, antenna location, cable route, and all other details should have been planned.

For best results, choose a window facing the equator (facing south in the northern hemisphere, facing north in the southern hemisphere), and with the fewest obstructions of the sky.

To install the antenna, refer to Figure 3-6 and perform the following procedure.

Components of
990-72050-97
antenna
assembly

Antenna

Antenna-to-IF cable

IF Converter

Antenna Assembly
990-72050-97

TNC Connector
(on IF converter)

TNC Connector
(Attached to cable)

IF-to-shelf cable

RG-59/U Cable
060-72010-xx
(10 feet to 1,000 feet) or

Mini RG-59 Cable
060-72050-xx
(50 feet to 500 feet)

TNC Connector
(Attached to cable, and on shelf)

TimeSource 3500 Shelf
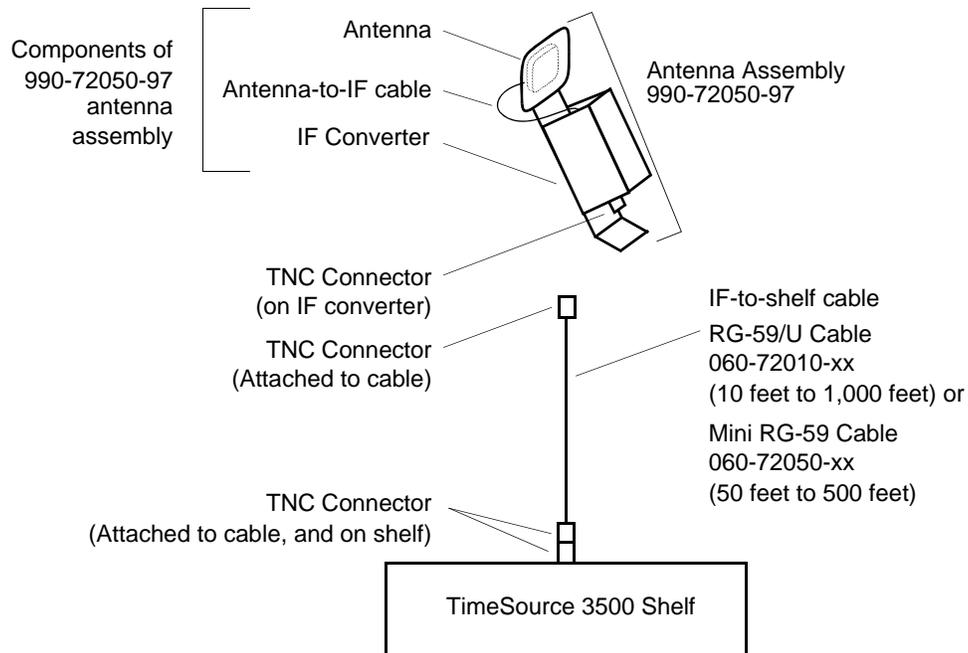
Figure 3-6.   Mechanical Window Antenna-to-Shelf Cabling

Mechanical Window Antenna Mounting and Cable Connection Procedure

Prerequisite

Observe all guidelines, considerations, Dangers, Warnings, Cautions, and Notes in the Engineering and Ordering chapter.

Symmetricom Parts

- Mechanical Window Antenna Kit (990-72050-97)

- A length of RG-59/U plenum-rated coaxial cable (060-72010-xx), or

- A length of Mini RG-59/U plenum-rated coaxial cable (060-72050-xx)

User-Supplied Materials

- Drill with bit of appropriate size and type to make pilot holes for the mounting screws

- Two screws of appropriate size and type to attach the foot of the mechanical chassis to a window sill or wall near a window

- Screwdriver

- Cable ties or other method of securing cable

- GPS handheld receiver, personal computer with GPS location software, or other method of determining latitude, longitude, and altitude

1. At the window chosen in Chapter 2, Engineering and Ordering, attach the base of the mechanical window antenna to the chosen location (sill, wall, etc.) using user-supplied screws (Figure 3-7).

2. Use the pivots on the mechanical window antenna to place the antenna section flat against the window.

3. Tighten the pivot screws to secure the antenna (Figure 3-8).

4. Connect the antenna cable to the IF downconverter on the mechanical window antenna assembly and route the cable to the TimeSource 3500 Shelf location.

5. Secure the cable using local company procedures.

6. Check all connections for tightness to prevent intermittent operation.

Use 2 user-supplied screws to attach to wall or window sill
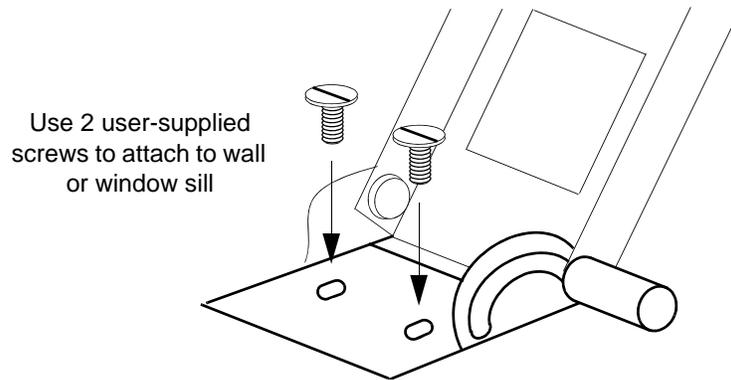
Figure 3-7.   Attaching the Mechanical Window Antenna

Place the antenna against the window by moving the chassis on these pivots.

Tighten these pivot screws to lock antenna position.
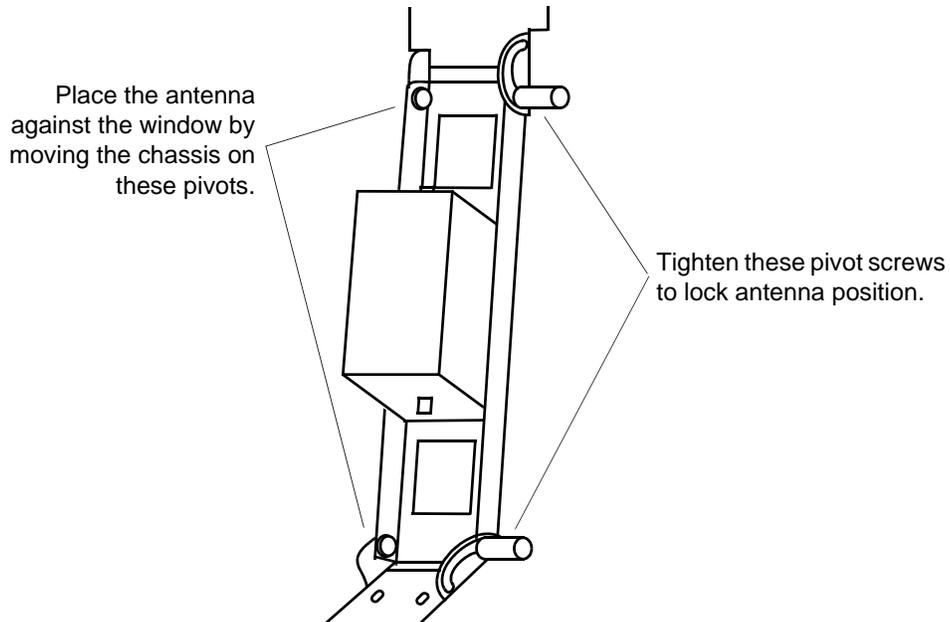
Figure 3-8.   Mechanical Window Antenna Pivot Screws

Self-Adhesive Window Antenna

Prior to installing the antenna, the site, antenna location, cable route, and all other details should have been planned.

Installation procedures are to follow local company procedures and the Installation Job Specification.

For best results, choose a window facing the equator (facing south in the northern hemisphere, facing north in the southern hemisphere), and with the fewest obstructions of the sky.

To install the antenna, refer to Figure 3-9 and perform the following procedure.
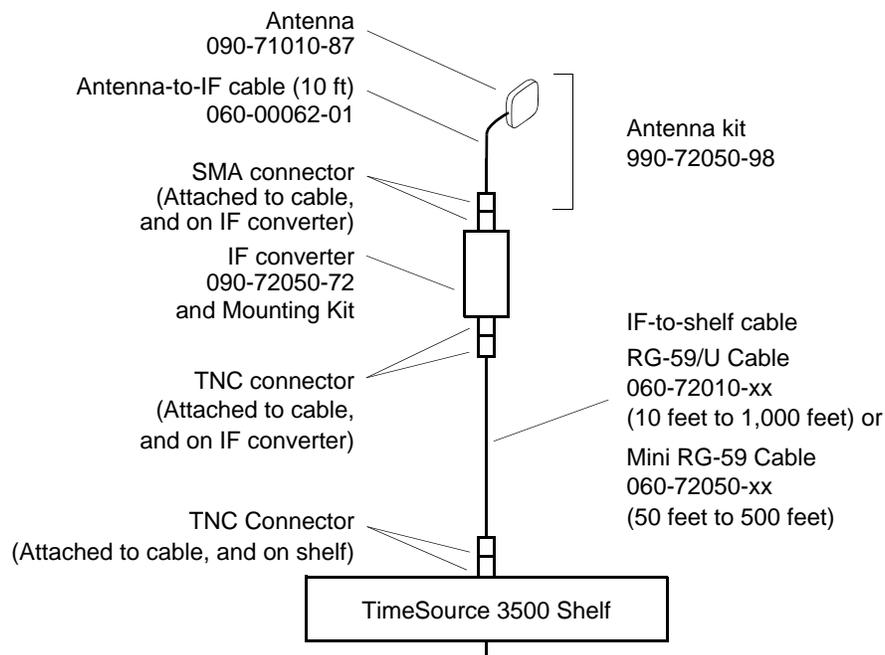
Figure 3-9.   Self-Adhesive Window Antenna-to-Shelf Cabling

Self-Adhesive Window Antenna Mounting and Cable Connection Procedure

Prerequisite
Observe all guidelines, considerations, Dangers, Warnings, Cautions, and Notes in the Engineering and Ordering chapter.

Symmetricom Parts
- Self-Adhesive Window Antenna kit (990-72050-98)
- A length of RG-59/U plenum-rated coaxial cable (060-72010-xx), or
- A length of Mini RG-59/U plenum-rated coaxial cable (060-72050-xx)

User-Supplied Materials

- Drill with bit of appropriate size and type to make pilot holes for the mounting screws

- Four screws of appropriate size and type to attach the IF converter to a wall or other mounting surface

- Screwdriver

- GPS handheld receiver, personal computer with GPS location software, or other method of determining latitude, longitude, and altitude

1. Peel off the backing of one of the self-adhesive hook-and-loop strips and stick the strip to the antenna (Figure 3-10).

2. Attach the hook-and-loop side of the other strip to the hook-and-loop side of the strip on the antenna.

3. Peel off the backing and stick the antenna to the position on the window selected in Chapter 2, Engineering and Ordering, on page 37.

4. Use user-supplied screws to mount the IF downconverter to a suitable wall or other structure (Figure 3-11). Be sure the distance along the cable route between the IF downconverter and the antenna is no more than 10 ft.

5. Route and connect the antenna cable to the antenna side of the IF downconverter.

6. Connect a cable to the TimeSource 3500 shelf side of the IF downconverter and route the cable to the shelf location.

7. Secure the cable using local company procedures.

8. Check all connections for tightness to prevent intermittent operation.

Attach the
hook-and-loop fabric
pieces together.

Stick the
antenna to the
window.
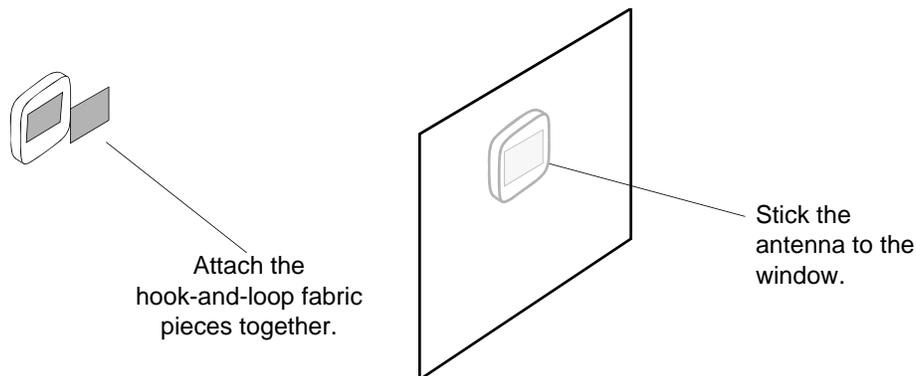
Figure 3-10.   Attaching the Self-Adhesive Window Antenna to a Window

Use 4 user-supplied
screws to attach to a
wall or other structure.
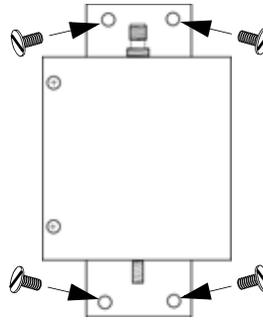
Figure 3-11.   Attaching the IF Converter

Wall Antenna

Prior to installing the antenna, the site, antenna location, cable route, and all other details should have been planned.

Installation procedures are to follow local company procedures and the Installation Job Specification.

For best results, choose a wall facing the equator (facing south in the northern hemisphere, facing north in the southern hemisphere), and with the fewest obstructions of the sky.

To mount the antenna through the wall, refer to Figure 3-12 and perform the following procedure.

Antenna Mounting Bracket
070-00383-02

Antenna
112-00013-01

SMA connector
(Attached to cable,
and on IF converter)

IF converter
090-72050-71
and Mounting Kit

TNC connector
(Attached to cable,
and on IF converter)

TNC Connector
(Attached to cable, and on shelf)

Antenna kit
990-72050-95 (w/ 6' antenna cable) or
990-72050-99 (w/19' antenna cable)

IF-to-shelf cable
RG-59/U Cable
060-72010-xx
(10 feet to 1,000 feet) or
Mini RG-59 Cable
060-72050-xx
(50 feet to 500 feet)

TimeSource 3500 Shelf

Figure 3-12.   Wall Antenna-to-Shelf Cabling

Wall Antenna Installation Procedure

Prerequisite

Observe all guidelines, considerations, Dangers, Warnings, Cautions, and Notes in the Engineering and Ordering chapter.

Symmetricom Parts

- Wall Antenna (990-72050-95 with 6' antenna cable or 990-72050-99 with 19' antenna cable)

- Wall Antenna Indoor Lightning Suppressor Kit (093-72050-94) (optional)

- Wall Antenna Outdoor Lightning Suppressor Kit (093-72050-93) (optional)

- A length of RG-59/U plenum-rated coaxial cable (060-72010-xx), or

- A length of Mini RG-59/U plenum-rated coaxial cable (060-72050-xx)

User-Supplied Materials

- Ladder, or safe method of reaching the antenna location on the exterior wall

- Drill with bits of appropriate size and type to make pilot holes for the antenna mounting bracket screws, and to make a hole through the wall for the antenna cable

- Two screws of appropriate size and type to attach the antenna mounting bracket to an exterior wall

- Screwdriver

- Electrically conductive antioxidant compound (Kopr-Shield or equivalent) to coat exposed connections to prevent oxidation

- Fire-stopping material to seal the hole in the wall

- GPS handheld receiver, personal computer with GPS location software, or other method of determining latitude, longitude, and altitude

1. Attach the IF downconverter (Figure 3-12) inside the building to a suitable wall or other structure. Be sure the distance along the cable route between the IF converter and the antenna is no more than 6 ft. or 19 ft depending on wall antenna length used. Include allowances for the drip loop and local company procedures for cable routing.

2. Use Figure 3-13 to determine the spacing of the 2 holes for mounting the bracket, and the distance to the hole for passing the cable into the building.

3. Drill a 25/64-inch (0.390625-inch) hole in the wall for the antenna cable. The diameter of the hole should be larger than the outer diameter of the SMA connector on the antenna cable, which will pass through the hole from the antenna to the inside of the building.

4. Drill two pilot holes for the user-supplied screws or bolts that attach the mounting bracket to the outside wall.

5. Using two screws or bolts, mount the antenna bracket assembly to the outside wall.

6. Place the magnetic side of the antenna on the outside of the mounting bracket.

7. Push the SMA connector of the antenna cable through the hole drilled in the wall in Step 3. Be sure the antenna cable forms a drip loop between the antenna and the cable entry into the building (Figure 3-14).

8. Route the antenna cable to the antenna side of the IF converter and connect the cable.

9. Connect a cable to the TimeSource 3500 shelf side of the IF converter and route the cable to the shelf location.

10. Secure the cable using local company procedures.

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

12. Check all connections for tightness to prevent intermittent operation.

13. If no optional Lightning Suppressors are to be installed, the Wall Antenna Installation Procedure, on page 64 is completed here.

14. If the optional Wall Antenna Indoor Lighting Suppressor Kit (093-72050-94) is not required, then go to Step 23. Otherwise, proceed with the next step.

15. Mount the indoor lightning suppressor mounting bracket to the inside wall.

16. Mount and secure the lightning suppressor in the lightning suppressor mounting bracket as shown in Step 17.

17. Slide the longer bolt of the lightning suppressor through the D-hole, and attach with a nut and a washer (provided).

KEPS nut (2)

6 AWG (4.115 mm)
ground wire

Nut

D-hole   Washer

Lightningsuppressor

Cable connector (2)

Mounting plate

Hole for mounting bolt (2)
Threaded posts (3)
(use any 2)
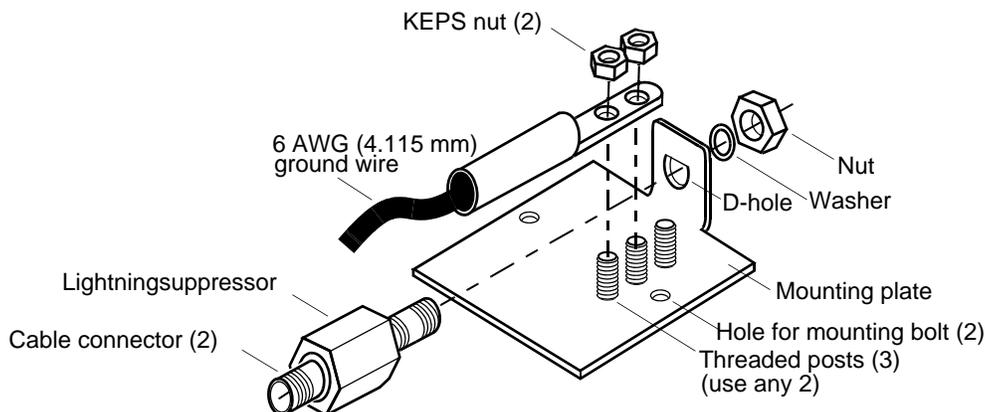
18. If the lightning suppressor was not mounted directly to a valid earth ground, crimp a length of 6 AWG (4.115 mm) ground cable to the two-hole terminal, slide the terminal over two of the three threaded posts on the lightning suppressor mounting plate, and attach the terminal to the mounting plate with two KEPS nuts. Use the two posts that allow the least bending of the 6 AWG (4.115 mm) ground cable.

19. Attach the other end of the cable to a valid earth ground.

20. Route the wall antenna cable to the antenna side of the IF converter and connect the cable.

21. Connect the IF converter to the lightning suppressor using the two-foot RG-59 cable provided.

22. Connect the user provided RG-59 cable from the lightning suppressor to the TimeSource 3500 shelf.

23. If the optional Wall Antenna Outdoor Lighting Suppressor Kit (093-72050-93) is not required, the Wall Antenna Installation Procedure, on page 64 is completed here. Otherwise, proceed with the next step.

24. Mount the outdoor lightning suppressor mounting bracket to the outside wall shown in Figure 3-15.

25. Mount and secure the lightning suppressor in the lightning suppressor mounting bracket as shown in Step 28.

26. Slide the longer bolt of the lightning suppressor through the D-hole, and attach with a nut and a washer (provided).

KEPS nut (2)

6 AWG (4.115 mm) ground wire

Nut

D-hole   Washer

Lightningsuppressor

Cable connector (2)

Mounting plate

Hole for mounting bolt (2)
Threaded posts (3)
(use any 2)
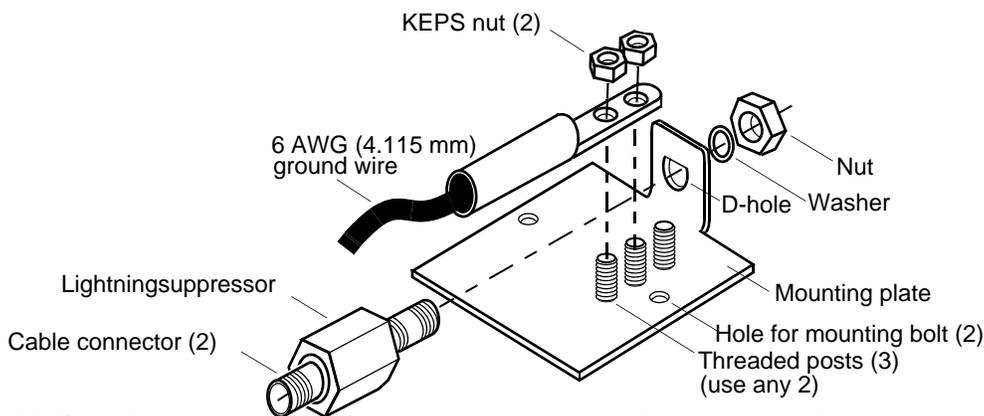
27. If the lightning suppressor was not mounted directly to a valid earth ground, crimp a length of 6 AWG (4.115 mm) ground cable to the two-hole terminal, slide the terminal over two of the three threaded posts on the lightning suppressor mounting plate, and attach the terminal to the mounting plate with two KEPS nuts. Use the two posts that allow the least bending of the 6 AWG (4.115 mm) ground cable.

28. Attach the other end of the cable to a valid earth ground. Attaching to an earth ground located outside the building is the most desirable.

29. Route the wall antenna cable to the antenna side of the outdoor lightning suppressor and connect the cable.

30. Route the RG 316 10 ft cable provided from the outdoor lightning suppressor through the wall to the IF converter and connect both ends.

31. Connect the user provided RG-59 cable from the IF converter to the TimeSource 3500 shelf.

32. Install fire-stopping material in all holes opened in the roof and/or walls during this procedure.
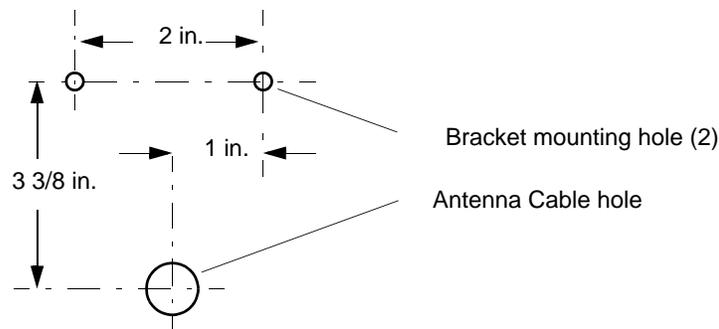
Figure 3-13.   Hole Spacing
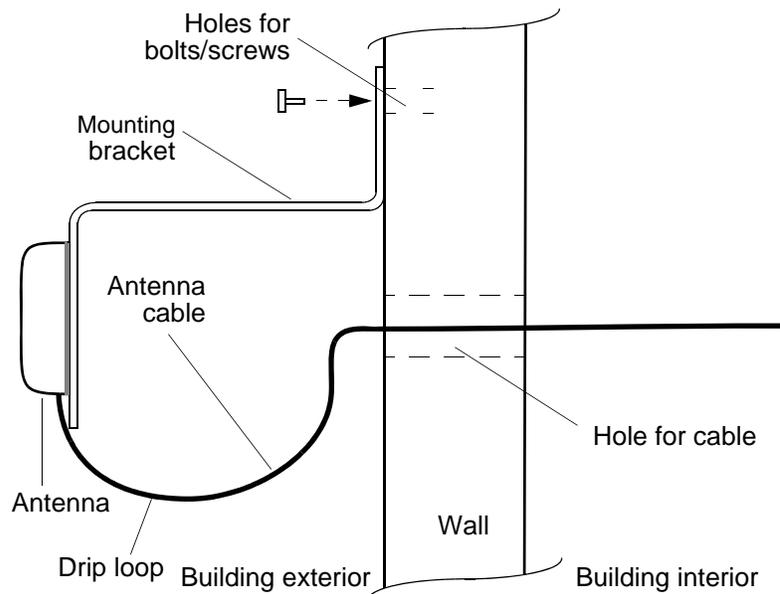
Figure 3-14.   Wall Antenna Mounting
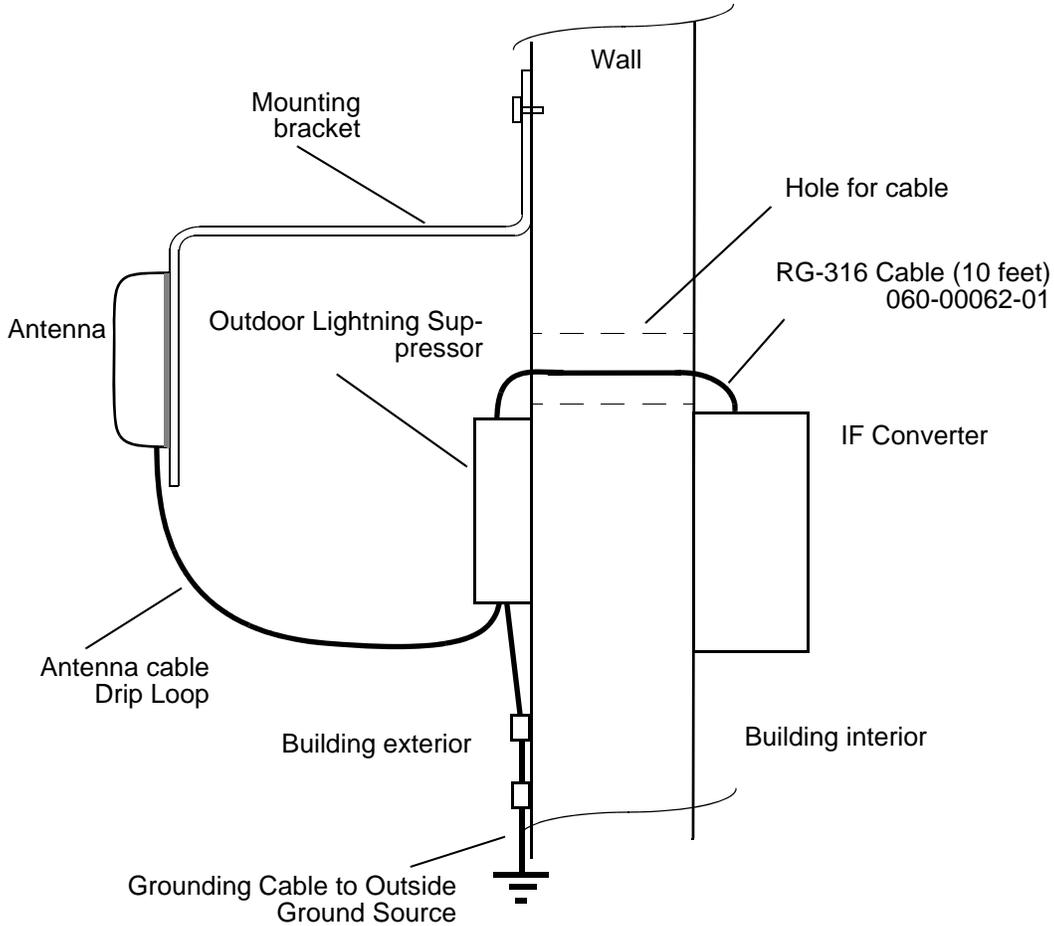
Figure 3-15.   Wall Antenna Outdoor Lightning Suppressor Mounting

Shelf

Rack Mounting

The shelf is shipped with the ears positioned for flush mounting in a 23 inch rack (Figure 3-16B). The ears can be positioned in the front of the shelf for flush mounting (Figure 3-16A, and Figure 3-16B), or in the middle of the shelf for 5 inch offset mounting (Figure 3-16C and Figure 3-16D). Leave 1 RU (1.75 inches) of air space above the TimeSource 3500 Shelf for proper ventilation. Mount the shelf in the rack according to standard company practices.

Note: Two screws may be used in both mounting ears if the holes in the rack are spaced 1.75 inches apart.

Rear of rack

Top of shelf

A. Flush mounting – 19 in. rack

Rear of rack

Top of shelf

B. Flush mounting – 23 in. rack

Rear of rack

Top of shelf

C. 5 in. offset – 19 in. rack

Rear of rack

Top of shelf

D. 5 in. offset – 23 in. rack
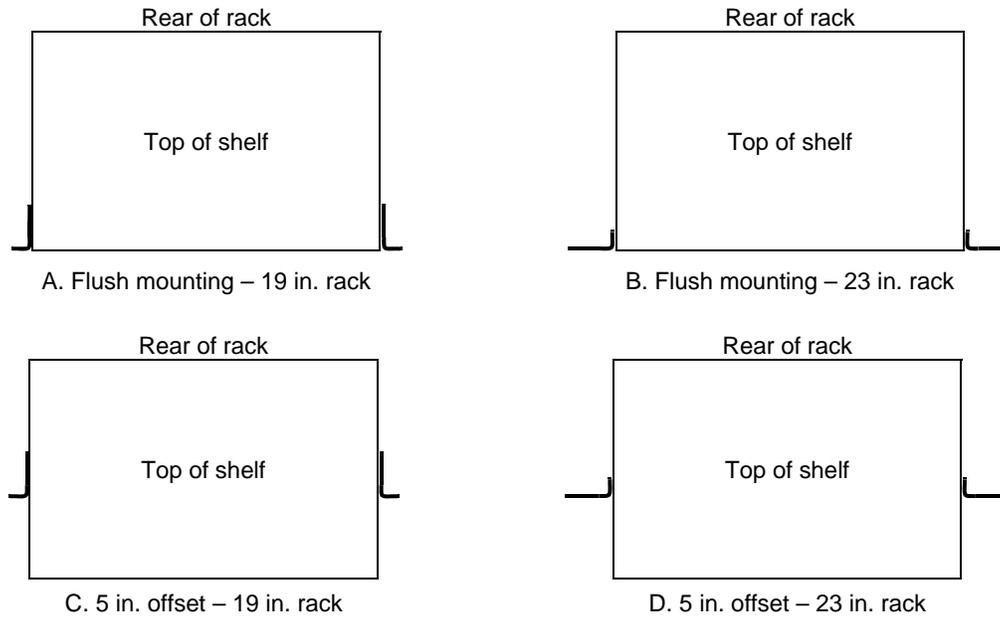
Figure 3-16.   Rack Mounting Options

Power and Signal Cabling

ESD Caution: To avoid electrostatic discharge (ESD) damage, wear an ESD wrist strap when making connections to the connector panel. Failure to observe this warning may result in equipment damage.

ESD Caution: To avoid equipment damage, do not pierce, peel, or otherwise violate the integrity of the faceplate overlay. The faceplate on the card contains a plastic overlay bonded to the metal plate with an adhesive. The overlay is an integral part of the ESD protection. Failure to observe this warning may result in equipment damage.

The Craft connection is made at the shelf front panel. All other connections are made at the shelf rear panel.

Figure 3-17 shows the rear panel connectors. Figure 3-18 shows the front panel connector. All connectors can be located using these illustrations.
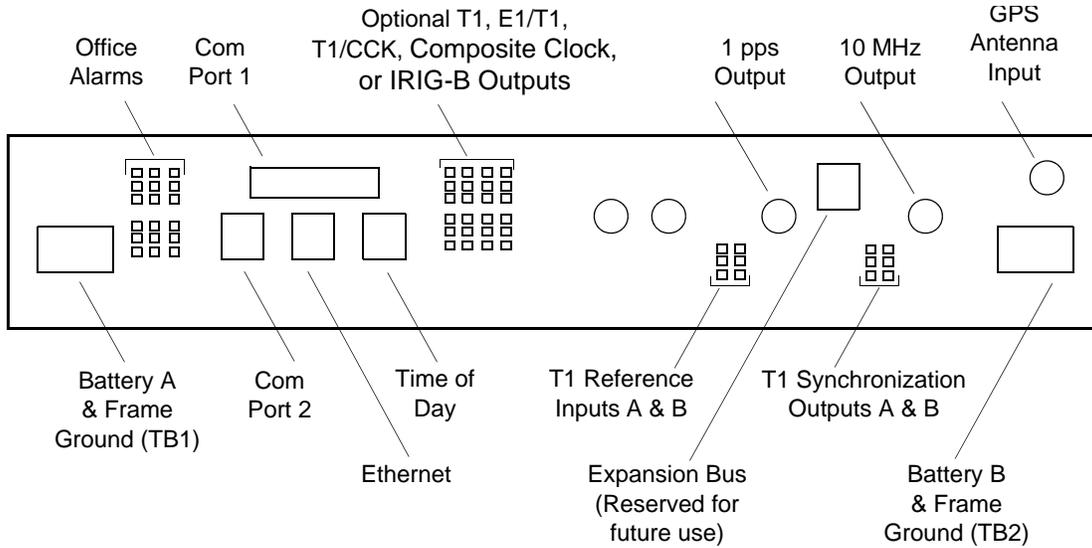
Figure 3-17.   Rear Panel
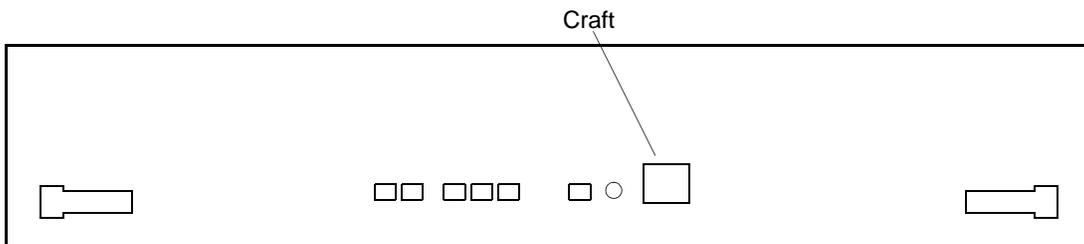
Figure 3-18.   Front Panel Connector

Frame Ground

Frame ground connections are made on power terminal blocks TB1 and TB2. Refer to Figure 3-17 for the location of the terminals on the rear of the shelf, and refer to Figure 3-19 for the terminal connections.
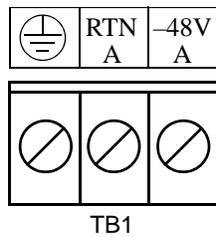
A. TB1 Connections
(Office Battery A)
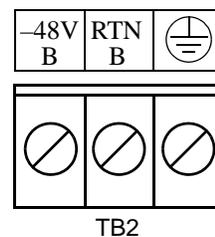
B. TB2 Connections
(Office Battery B)

Figure 3-19.   Battery Connections

Remove the protective covers from the terminal blocks.

Ensure the frame ground wires are long enough to reach from the shelf rear panel to the frame ground connection. Use one 16 AWG (1.47 mm) green insulated wire to connect the ⏚ terminal of power terminal block TB1 to the frame ground, and use another 16 AWG (1.47 mm) green insulated wire to connect the ⏚ terminal of TB2 to frame ground.

Make the ground connection, following one of the methods described below, depending on whether a ground rod is installed:

With ground rod

Solder the frame ground connection to the 6 AWG (4.115 mm) frame ground rod run vertically on each side of the rack. Two methods are acceptable:

- Crimp an appropriate-size spade lug (user-supplied) to the 16 AWG (1.47 mm) wire, bend the lug around the 6 AWG (4.115 mm) rod, and solder.

- Strip enough insulation from the 16 AWG (1.47 mm) wire to permit three complete turns around the 6 AWG (4.115 mm) rod, and solder.

> **Note:** When soldering, use a 25 watt soldering iron to ensure the 6 AWG (4.115 mm) rod is heated sufficiently to prevent a cold solder connection.

If the power is not to be connected immediately, replace the protective covers on the terminal blocks.

Without ground rod

Crimp the supplied spade lug to the 16 AWG (1.47 mm) wire, and screw the lug to a screw hole on the rack. Remove the paint and sand the area around the screw hole to ensure proper conductivity. Coat the connection with an electrically conductive antioxidant compound, for example, Kopr-Shield spray.

Crimp the supplied spade lug to the other end of the 16 AWG (1.47 mm) wire, and connect it to the ⏚ terminals on TB1 and TB2 (Figure 3-19).

If the power is not to be connected immediately, replace the protective covers on the terminal blocks.

Power

> **Caution:** To avoid electrical shock and possible personal injury, power source protective fusing must be provided as part of the installation. This equipment is intended for installation in a restricted access location.

> ⚠️ **Caution:** To avoid damage to the system, do not apply power to the TimeSource 3500 before instructed in this procedure. Before connecting the power cables to the TimeSource 3500, ensure the fuses are removed from the fuse panel that supplies power to the power cables.

> 📝 **Note:** Input power is reverse polarity protected; there are no user replaceable fuses in the TimeSource 3500.

Power connections are made on power terminal blocks TB1 and TB2. Refer to Figure 3-17 for the location of the terminals on the rear of the shelf, and refer to Figure 3-19 for the terminal connections.

Remove the protective covers from the terminal blocks, if covered.

Ensure the power wires are long enough to reach from the shelf rear panel to the office battery source connection.

Use two 18 AWG (1.024 mm) stranded wires for the power connection, one with red insulation (–48V), and the other with black insulation (RTN). Crimp a supplied spade lug to each wire.

Connect the power wires with red insulation to the –48V wire receptacles on TB1 and TB2. Connect the power wires with black insulation to the RTN wire receptacles on TB1 and TB2.

Replace the protective covers on the terminal blocks.

> 📝 **Note:** Two separate office battery supplies (–48V A and –48V B) are recommended. If separate office battery supplies are not available, connect a single office battery to both inputs (TB1 and TB2) to avoid a standing battery-failure alarm.

Alarms Output

Connect the TimeSource 3500 alarms to the office alarm panel at the critical (CR), major (MJ), and minor (MN) wire-wrap pins. See Figure 3-17 for the location of the alarm pins, and Figure 3-20 for the connections.

Connect at the upper group of pins (AUD) for audible alarms and at the lower group of pins (VIS) for visible alarms. Connect the alarm circuit between the NO and C pins for normally open contacts, or between the NC and C pins for normally closed contacts.
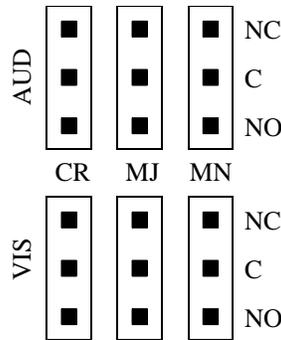
Figure 3-20. Alarm connections

GPS Antenna

Use the supplied 90 degree adapter to connect the coaxial cable from the lightning suppressor or IF downconverter to the TNC connector labeled GPS ANT. Refer to Figure 3-17 for the connector location.

Additional T1 Outputs (990-72050-02 System Only)

Connect up to eight optional T1 outputs at the OPTIONS I/O wire-wrap pins. See Figure 3-17 for the connector location, and Figure 3-21 for the connections.

> **Note:** The shield pin is capacitively coupled to ground, therefore, the shield must be connected at the source end. The shield may also be connected at the TimeSource 3500 end for additional longitudinal noise protection.
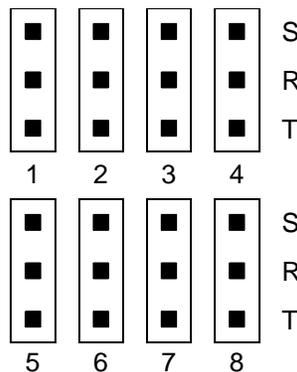
Figure 3-21.   OPTIONS I/O Wire-Wrap Pin Connections

Eight Mixed T1/E1/2.048 MHz Outputs (990-72050-06 System Only)

Connect up to eight optional mixed E1/T1 outputs at the OPTIONS I/O wire-wrap pins. Refer to Figure 3-17 for the connector location and Figure 3-21 for the connections.

Mixed T1/CCK Outputs (990-72050-07 System Only)

Connect up to eight optional mixed T1/CCK outputs at the OPTIONS I/O wire-wrap pins. Refer to Figure 3-17 for the connector location and Figure 3-21 for the connections.

Composite Clock Outputs (990-72050-03 System Only)

Connect up to eight optional composite clock outputs at the OPTIONS I/O wire-wrap pins. Refer to Figure 3-17 for the connector location and Figure 3-21 for the connections.

IRIG-B TOD Outputs (990-72050-05 System Only)

Connect one or two optional IRIG-B TOD outputs at the OPTIONS I/O wire-wrap pins. See Figure 3-17 for the connector locations, and Figure 3-22 for the connections.

Use the following procedure to install the IRIG-B BNC adapter, and make the IRIG-B TOD connections.
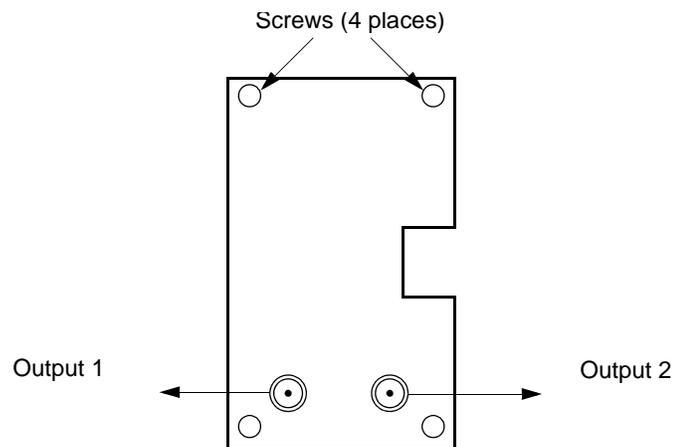
Figure 3-22.   IRIG-B TOD BNC Output Connections

IRIG-B TOD Output Installation Procedure

1. Position the IRIG-B adapter onto the rear of the shelf so that the OPTIONS I/O wire-wrap pins project through holes in the adapter card.

2. Secure the adapter onto the shelf, using the four screws integral to the adapter (see Figure 3-22).

3. To prevent small radius turns in the IRIG-B TOD output cables, secure the provided right-angle BNC connectors to the adapter BNC connectors, to direct the cables from the shelf as desired.

4. Connect the IRIG-B TOD outputs from the BNC connectors on the IRIG-B adapter to network elements requiring IRIG-B TOD timing.

1 PPS Output

Connect a user-supplied RG-58 coaxial cable from the connector labeled TTL PPS to the equipment that will use the 1 pulse-per-second TTL output signal. See Figure 3-17 for the connector location.

10 MHz Output

Connect a user-supplied RG-58 coaxial cable from the connector labeled 10 MHz to the equipment that will use the 10 MHz output signal. See Figure 3-17 for the connector location.

Ethernet

Connect a user-supplied Ethernet cable from the network to the 10base-T Ethernet connector labeled E-NET. See Figure 3-17 for the connector location, and Table 3-1 for the connector pinouts.

Table 3-1. Ethernet 10base-T RJ-45 Connector Pinouts

Pin	Signal	Abbreviation	Direction
1	Transmit data +	TXD +	From TimeSource 3500
2	Transmit data –	TXD –	From TimeSource 3500
3	Receive data +	RXD +	To TimeSource 3500
4	—	—	—
5	—	—	—
6	Receive data –	RXD –	To TimeSource 3500
7	—	—	—
8	—	—	—

Time of Day Output

Connect a time of day (TOD) output at the female RJ-45 connector labeled TOD. See Figure 3-17 for the connector location, and Table 3-2 for the connector pinouts.

Table 3-2. TOD Connector Pinouts

Pin	Signal	Abbreviation	Direction
1	1 pps A	TOD PPS +	From TimeSource 3500
2	1 pps B	TOD PPS –	From TimeSource 3500
3	12 V power source	TOD P12V	—
4	Receive data B	TOD RXD –	To TimeSource 3500
5	Receive data A	TOD RXD +	To TimeSource 3500
6	Circuit ground	TOD GND	—
7	Transmit data A	TOD TXD +	From TimeSource 3500
8	Transmit data B	TOD TXD –	From TimeSource 3500

Note: Pins not listed are reserved for future use.

If the device receiving the time code (for example, Cisco router) accepts an RS-232 cable instead of an RS-422 cable, use the following procedure to install the RS-422–to–RS-232 TOD converter.

Note: Before performing the RS-422–to–RS-232 TOD Converter Installation Procedure, on page 77, ensure that the appropriate Cisco router or NTP Type 4 compatible device is installed, and power applied, per manufacturer's instructions.

RS-422–to–RS-232 TOD Converter Installation Procedure

1. Secure the provided mounting plate to the RS-422–to–RS-232 TOD converter, using the two provided screws. The plate may be attached to the top or front of the converter, depending on the desired surface (for example, a rack or cabinet) to which the converter will be mounted (see Figure 3-23).

Notes:

1. Due to distance constraints, the converter must be placed no more than 1000 ft from the TimeSource 3500 Shelf, and no more than 50 ft from the device receiving the time code.
2. The converter dimensions are 3 in. by 2.5 in by 1 in.
3. The mounting plate dimensions are 3 in by 2 in.

---

2. Secure the converter to the desired surface, using the slots in the plate and user-supplied bolts.

3. Install a user-supplied Category 5 four-pair RS-422 cable, with RJ-45 connectors on each end, between the TimeSource 3500 Shelf and the converter (see Figure 3-24).

4. Install a user-supplied RS-232 cable, with DB-25 connectors on each end, between the converter and the device receiving the time code (see Figure 3-24). See Table 3-3 for the DB-25 connector pinouts.
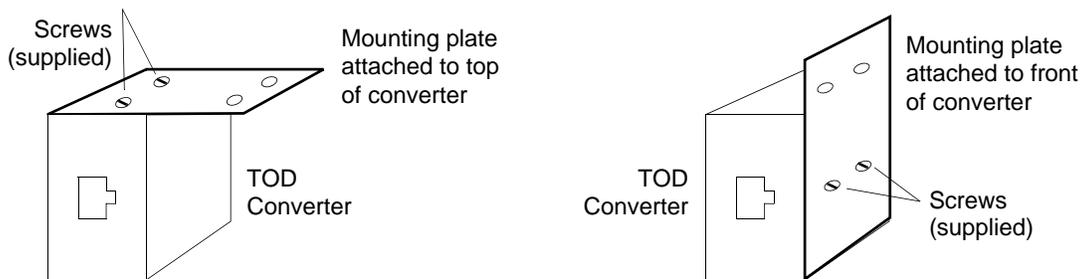
Figure 3-23.   RS-422–to–RS-232 TOD Converter Mounting Plate
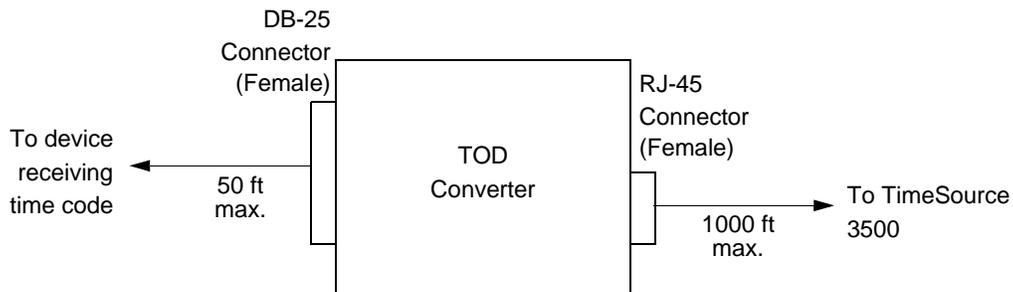
Figure 3-24.   RS-422–to–RS-232 TOD Converter Connections

Table 3-3. Converter DB-25 Connector Pinouts

Pin	Signal
1	Frame ground
3	Data output (RS-232)
5	1 pps (RS-232)
7	Signal ground

Note: Pins not listed are reserved for future use.

T1 Reference Inputs

Warning: To prevent equipment damage, do not connect the T1 input line directly to an outside facility. T1 input circuits do not provide lightning protection,

T1 reference sources, traceable to an independent Stratum 1 source, can be connected to further increase holdover stability, or to be monitored by the TimeSource 3500. In either case, connect the cables to the wire-wrap pins labeled SPAN IN A and SPAN IN B. Connect the tip wire to the pin labeled T, the ring wire to the pin labeled R, and the shield (if connected at the TimeSource 3500) to the pin labeled S. See Figure 3-17 for the location of the connectors and pins, and Figure 3-25 for the wire-wrap connections.

Note: The shield pin is capacitively coupled to ground, therefore, the shield must be connected at the source end. The shield may also be connected at the TimeSource 3500 end for additional longitudinal noise protection.
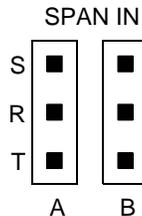
Figure 3-25.   T1 Input Connections

T1 Synchronization Outputs

⚠️ **Warning:** To prevent equipment damage, do not connect the T1 output line directly to an outside facility. T1 output circuits do not provide lightning protection,

Connect the T1 synchronization outputs at the wire-wrap pins labeled T1 OUT A and T1 OUT B. Connect the tip wire to the pins labeled T, the ring wire to the pins labeled R, and the shield to the pins labeled S. See Figure 3-17 for the location of the pins, and Figure 3-26 for the connections.

Note: The shield pin is provided to ground the cable shield at the shelf, if required. Normally, the shield is grounded at the source. Grounding the shield at both ends is not recommended unless one end is capacitively coupled to ground.

T1 OUT

```
        ┌───┬───┐
  S     │ ■ │ ■ │
  R     │ ■ │ ■ │
  T     │ ■ │ ■ │
        └───┴───┘
          A   B
```
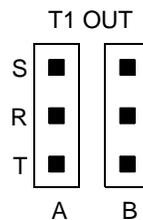
Figure 3-26.   T1 Output Connections

Communication Port 1

To provide an RS-232 link for TL1 command access to the TimeSource 3500, connect to port 1 at the female 25-pin D connector labeled COM1. See Figure 3-17 for the location of the connector. See Table 3-4 for the connector pinouts.

Note: The COM1 connector transmits data on pin 2, and receives data on pin 3. Be sure the other equipment receives data from the transmitting pin, and transmits data to the receiving pin.

Table 3-4. COM1 Pinouts

Pin	Signal	Abbreviation	Direction
2	Transmit data	TXD	From TimeSource 3500
3	Receive data	RXD	To TimeSource 3500
4	Request to send	RTS	From TimeSource 3500

Table 3-4. COM1 Pinouts (Continued)

Pin	Signal	Abbreviation	Direction
5	Clear to send	CTS	To TimeSource 3500
7	Signal ground	GND	—
20	Data terminal ready	DTR	From TimeSource 3500

Note: Pins not listed are reserved for future use.

Communication Port 2

To provide an RS-232 link for TL1 command access to the TimeSource 3500, connect to port 2 at the female RJ-45 connector labeled COM2. See Figure 3-17 for the location of the connector, and Table 3-5 for the connector pinouts.

Note: The COM2 connector transmits data on pin 2, and receives data on pin 3. Be sure the other equipment receives data from the transmitting pin, and transmits data to the receiving pin.

Table 3-5. COM2 Connector Pinouts

Pin	Signal	Abbreviation	Direction
2	Transmit data	TXD	From TimeSource 3500
3	Receive data	RXD	To TimeSource 3500
5	Signal ground	GND	—
6	Data terminal ready	DTR	From TimeSource 3500
7	Clear to send	CTS	To TimeSource 3500
8	Request to send	RTS	From TimeSource 3500

Note: Pins not listed are reserved for future use.

Craft Port

To provide an RS-232 link for TL1 command access to the TimeSource 3500, connect to the craft port at the female RJ-45 connector labeled Craft on the front panel. A Craft-port-to-PC cable is supplied with the TimeSource 3500 for making this connection. See Figure 3-18 for the location of the connector, and Table 3-6 for the connector pinouts.

Note: The Craft connector transmits data on pin 2, and receives data on pin 3. Be sure the other equipment receives data from the transmitting pin, and transmits data to the receiving pin.

Table 3-6. Craft Pinouts

Pin	Signal	Abbreviation	Direction
2	Transmit data	TXD	From TimeSource 3500
3	Receive data	RXD	To TimeSource 3500
5	Signal ground	GND	—
6	Data terminal ready	DTR	From TimeSource 3500

Note: Pins not listed are reserved for future use.

Power-Up

To power the TimeSource 3500, use the following procedure. Before starting this procedure, be sure the antenna, shelf, and all connections appropriate for this installation have been installed, and that the host computer is set to communicate with the TimeSource 3500.

Note: If using the TimeScan Craft software program for the power-up procedure, see the TimeScan Craft manual for the appropriate TimeScan commands to use in place of the TL1 commands in the .

Power-Up Procedure

Test Equipment

- Grounding wrist strap

- Digital multimeter (Fluke 77 or equivalent)

- Laptop computer with communications software (e.g., Windows Hyperterminal, ProComm Plus, CrossTalk)

1. On the computer connected to the TimeSource 3500, start a VT100 terminal mode session via communication software that supports the Y-modem protocol (such as Hyperterminal, or a commercial package such as PROCOMM PLUS or CrossTalk).

2. On the computer connected to the TimeSource 3500, set the communication software to communicate with the port that is connected to the TimeSource 3500.

3. On the computer connected to the TimeSource 3500, set the RS-232 communication parameters to 8 data bits, no parity bit, 1 stop bit, and 9600 baud.

4. On the computer connected to the TimeSource 3500, connect the computer communication port to the COM1, COM2, or Craft port on the TimeSource 3500. A craft port-to-PC communication cable is provided in the hardware kit for this purpose.

5. Ensure that the TimeSource 3500 plug-in card is not installed in the shelf.

6. Ensure that all fuses that supply power to the TimeSource 3500 Shelf are removed from the fuse panel.

7. At the shelf end of the battery leads, use the multimeter to measure the voltage between the following:

Test Point	Test Point	Result
–48V A lead	–48V B lead	0 V
–48V A lead	TB1: RTN A	0 V
–48V A lead	TB1: ⏚	0 V
–48V B lead	TB2: RTN B	0 V
–48V B lead	TB2: ⏚	0 V

8. Attach a grounding wrist strap to the wrist, and plug the other end into the ground jack at the upper-right corner of the front of the plug-in card.

9. Pull out the latching levers at each end of the front panel so that the levers are pointing directly out from the front panel.

10. Push the card into the shelf until the latching levers begin to move in.

11. Push the latching levers flat against the front panel to complete the card insertion.

12. Tighten the knurled screw above each latching lever to secure the card in the shelf.

13. Unplug and remove the grounding wrist strap.

14. Install the battery source fuse(s) in the rack fuse bay that supplies power to the TimeSource 3500. The TimeSource 3500 enters its warm-up mode after approximately 60 s when power is applied. During the warm-up period, the following conditions exist:

- Status GPS lamp is green

- Status SYS lamp is off

- T1 outputs are squelched, sending AIS (factory setting), or sending an SSM message, as specified in the ED-EQPT command

- Composite clock outputs (if equipped) are squelched

- Additional eight T1 outputs (if equipped) are squelched, sending AIS (factory setting), or sending an SSM message, as specified in the ED-EQPT command

- Two IRIG-B outputs (if equipped) are squelched

- 10 MHz and 1 pps outputs are on (unreliable while Status SYS lamp is off)

- TOD output is not enabled (factory setting)

Notes:

1. The CRIT lamp and other alarm indication lamps may light. The host computer may display transient and standing alarm condition messages. Ignore alarms while the Status SYS lamp is off during warm-up, unless alarms apply to inputs and outputs that were previously entered.

2. TL1 commands may be entered during warm-up. Inputs and outputs can be enabled, and system parameters can be set or changed.

---

15. If using the TimeScan Craft software program for the power-up procedure, see the TimeScan Craft manual for the appropriate TimeScan commands to use in place of the TL1 commands in this procedure.

   Use the Activate User command to log onto the system.

   ```
   ACT-USER::TELECOM:<ctag>::TS3000!!;
   ```

16. Skip this step if the current unit is equipped with a roof antenna.

   Use the Edit Equipment command to change the antenna locating mode to manual and to enter the latitude, longitude, and altitude. In manual mode, the

survey process used to determine the antenna's exact position starts with this information.

⚠️ **Caution:** Enter data carefully. When entering degrees, an error of a single degree will cause the system location accuracy to be off by as much as 60 mi.

```
ED-EQPT::GPS:<ctag>:::ANTMODE=MANUAL,MANLAT=a-b-c-d,
MANLONG=e-f-g-h,MANELEVALT=i;
```

a = north (a = N) or south (a = S) of the equator
b = degrees of latitude (b = 0 to 179)
c = minutes of the degree (c = 0 to 59)
d = decimal fraction of the minute (d = 000 to 999)
e = east (e = E) or west (e = W) of the Greenwich Meridian
f = degrees of longitude (f = 0 to 179)
g = minutes of the degree (g = 0 to 59)
h = decimal fraction of the minute (h = 000 to 999)
i = elevation, or altitude, of the antenna in meters

Example command to set the latitude, longitude, and altitude of the antenna:

```
ED-EQPT::GPS:<ctag>:::ANTMODE=MANUAL,MANLAT=N-37-19-016,
MANLONG=W-121-59-246,MANELEVALT=12;
```

Notes:

1. The TimeSource 3500 can find its position on the earth without latitude, longitude, and altitude entered, but the process may take several hours, and may not result in the position accuracy (within 1/8 mi) required for the system to perform to specification. It is recommended that the information be obtained and manually entered by the user.

2. Latitude, longitude, and altitude data can be obtained through the use of a GPS hand-held receiver (user supplied). Location mapping software is also available for personal computers, which can be used to obtain latitude and longitude. When the entered figures are within 1/8 mi of the actual coordinates, the TimeSource 3500 typically delivers UTC traceable timing within 1 h of applying power. Warm-up times vary greatly depending on the window location and antenna placement.

3. Obtain latitude, longitude, and altitude outdoors when using a GPS hand-held receiver, to ensure an accurate reading. Do not use the GPS hand-held receiver inside the building near the window or wall where the antenna will be installed. GPS hand-held receivers do not provide an accurate location reading when used indoors.

---

17. If UTC time is desired, skip to Step 18. Use the Edit Date command to set the local date and time.

```
ED-DAT:::<ctag>::yyyy-mm-dd,hh-mm-ss:MODE=LOCAL;
```

yyyy = year (yyyy = 1998 to 2096)
mm = month (mm = 01 to 12)
dd = day (dd = 01 to 31)
hh = hours (hh = 00 to 23)
mm = minutes (mm = 00 to 59)
ss = seconds (ss = 00 to 59)

Example command to set local time:

```
ED-DAT:::123::2000-06-15,14-25-00:MODE=LOCAL;
```

18. If UTC time is not desired, skip to Step 19. Use the Edit Date command to set the system for UTC time.

```
ED-DAT:::<ctag>::yyyy-mm-dd:MODE=UTC;
```

yyyy = year (yyyy = 1998 to 2096)
mm = month (mm = 01 to 12)
dd = day (dd = 01 to 31)

Example command to set UTC time:

```
ED-DAT:::123::2000-06-15:MODE=UTC;
```

19. Use the Retrieve Equipment command to identify whether and how the inputs have been provisioned.

```
RTRV-EQPT::ALL:<ctag>;
```

Notes:

1. Observe those results with an <aid> of SPAN-a. If MONITOR=ALW appears for an input, that input has previously been entered. If ENSEMBLER=ALW appears for an input, that input has been set to be ensembled.
2. Note the results of the Retrieve Equipment command to set the remaining parameters in this procedure.
3. Factory default settings are found at the end of this Power Up procedure section.

20. If the results of Step 19 indicate the span inputs (if used) are set as desired, skip to Step 21. Use the Enter Equipment command to monitor each available span input, and to specify whether those inputs are to be ensembled.

```
ENT-EQPT::SPAN-a:<ctag>:::ENSEMBLER=b;
```

a = span input (a = A or B)
b = whether this input is ensembled (b = ALW ensembles the input)
b = INH inhibits the input from being ensembled)

21. Use the Edit Equipment command to set the output signal framing format for the two standard T1 outputs, and set the mode for each T1 output during an alarm.

```
ED-EQPT::T1-a:<ctag>:::FRAMING=b,ALMOUT=c;
```

a = T1 output (a = A or B)
b = framing format (b = ESF or D4)
c = T1 output during alarm (c = AIS, SQUELCH, or SSM) (for SSM, framing format must be ESF)

22. If not using a 990-72050-02 system, skip this step. Use the Edit Equipment command to set the output signal framing format for each additional T1 output, and set the mode for each T1 output during an alarm.

```
ED-EQPT::OPT-a:<ctag>:::FRAMING=b,ALMOUT=c;
```

a = T1 output module port (a = 1 to 8)
b = framing format (b = ESF or D4)
c = T1 output during alarm (c = AIS, SQUELCH, or SSM) (for SSM, framing format must be ESF)

23. If not using performance monitoring, skip to Step 24. Use the Initialize Register command to reset the performance monitoring data to zero for all input spans.

```
INIT-REG-EQPT::ALL:<ctag>::ALL;
```

24. If not using Ethernet, go to Step 28. Use the Edit Equipment command while connected to COM1, COM2, or the CRAFT port to set the IP address, subnetwork mask, and gateway address for the current TimeSource 3500 unit, as required for proper operation in the managed element network. (These parameters affect all Ethernet ports. The Ethernet port should be closed and all users logged off before issuing this command.)

```
ED-EQPT::TS3500:<ctag>:::IPNE=a,IPSUBNET=a,IPGATE=a;
```

IPNE = a = This unit's IP address in the form a.a.a.a (each a is an independent value of 0 to 255)

IPSUBNET = a = Subnet mask in the form a.a.a.a (each a is an independent value of 0 to 255)

IPGATE = a = Gateway IP address in the form a.a.a.a (each a is an independent value of 0 to 255)

25. Ports 5001, 5002, 5003 and 5004 on the TimeSource 3500 are used as though they were serial TL1 communication ports. The following values are set at the factory and appear at reset:

MONMSG = INH (monitors only the current port for messages)

KEEPALIVE = 0 (does not send a COMPLD message to keep connection open)

ENDOFTEXT = 0 (does not include an end-of-text code with a TL1 message)

ECHO = ALW (echoes characters back to the sending terminal)

COMPRI = ALW1 (normal communication, including autonomous messages)

AUTOLOGOFF = 20 (does not log off the user during inactivity)

SWCONTROL = INH (uses no flow control)

If these values require change, use the Edit Communications command to set communications parameters for TL1 communications.

```
ED-COM::COM-a:<ctag>:::[MONMSG=b[,]][KEEPALIVE=c[,]]
[ENDOFTEXT=d[,]][ECHO=b[,]][COMPRI=e[,]][AUTOLOGOFF=c[,]][SW
CONTROL=b];
```

COM-a = User IP port (a = 5001, 5002, 5003 or 5004)

MONMSG = b = Monitors messages on all ports (b = ALW), or current port
(b = INH)

KEEPALIVE = c = Inactive minutes until the unit sends a COMPLD message to keep the connection from being closed (c = 0 to 255)

ENDOFTEXT = d = Hex code added to responses before semicolon (d = 0 (disabled) to 9F)

ECHO = b = Echoes characters received so they appear on the user's screen as typed (b = ALW), or inhibits echo (b = INH)

COMPRI = e = Sets the communication port capabilities as follows:

– ALW0 = normal communication, no autonomous messages

– ALW1=normal communication, autonomous messages

– ALW2 = autonomous messages received, logged on or not

– INH = closes connection and keeps port from use (command must go to another port) (if the port is in use, this command also logs off the user)

AUTOLOGOFF = c = Inactive minutes until the unit logs off the user, keeping the connection open (c = 0 to 255)

SWCONTROL = b = uses software (XON/XOFF) flow control (b = ALW), or no flow control (b = INH)

26. If not using an Element Manager, skip to Step 28. If not using a separate port to send autonomous messages to an Element Manager, skip to Step 27. Use the Edit Equipment command to set the IP address and port address of the Element Manager. Port 5550 connects to this address when the TimeSource 3500 develops a TL1 autonomous message, sends any messages, and closes the connection. An alternate Element Manager may be set up in case port 5550 cannot make a connection to the primary Element Manager.

```
ED-EQPT::TS3500:<ctag>:::IPEM1=a,IPEM1PORT=b[,IPEM2=a]
[,IPEM2PORT=b][,IPINACT=c];
```

IPEM1 = a = Primary Element Manager's IP address in the form a.a.a.a (each a is an independent value of 0 to 255)

IPEM1PORT = b = Primary Element Manager's Ethernet port address (b = 0 to 65535)

IPEM2 = a = Alternate Element Manager's IP address in the form a.a.a.a (each a is an independent value of 0 to 255)

IPEM2PORT = b = Alternate Element Manager's Ethernet port address (b = 0 to 65535)

IPINACT = c = Disconnects from the Element Manager if an autonomous message is not developed during this number of 100-ms units of inactivity (0 to 10,000, where 0 deactivates the timer)

27. Use the Edit Communications command to set the communications parameters of port 5551. An Element Manager connects to port 5551 for TL1 command and response messages. The following values for port 5551 are set at the factory and appear at reset:

MONMSG = INH (monitors only the current port for messages)

KEEPALIVE = 0 (does not send a COMPLD message to keep connection open)

ENDOFTEXT = 0 (does not include an end-of-text code with a TL1 message)

ECHO = INH (does not echo characters received)

COMPRI = ALW1 (normal communication, including autonomous messages)

AUTOLOGOFF = 20 (does not log off the user during inactivity)

SWCONTROL = INH (uses no flow control)

If these values require change, use the Edit Communications command to set communications parameters for TL1 communications.

```
ED-COM::COM-5551:<ctag>:::[MONMSG=b[,]][KEEPALIVE=c[,]]
[ENDOFTEXT=d[,]][ECHO=b[,]][COMPRI=e[,]][AUTOLOGOFF=c[,]]
[SWCONTROL=b];
```

MONMSG = b = Monitors messages on all ports (b = ALW), or current port (b = INH)

KEEPALIVE = c =Inactive minutes until the unit sends a COMPLD message to keep the connection from being closed (c = 0 to 255)

ENDOFTEXT = d = Hex code added to responses before semicolon (d = 0 (disabled) to 9F)

ECHO =b = Echoes characters received so they appear on the user's screen as typed (b = ALW), or inhibits echo (b = INH)

COMPRI = e = Sets the communication port capabilities as follows:

– ALW0 = normal communication, no autonomous messages

– ALW1 = normal communication, autonomous messages

– ALW2 = autonomous messages received, logged on or not

– INH = closes connection and keeps port from use (command must go to another port) (if the port is in use, this command also logs off the user)

AUTOLOGOFF = c = Inactive minutes until the unit logs off the user, keeping the connection open (c = 0 to 255)

SWCONTROL = b = uses software (XON/XOFF) flow control (b = ALW), or no flow control (b = INH)

28. If the results of Step 19 indicate the antenna cable delay and elevation mask are set as desired, skip to Step 29. Use the Edit Equipment command to set the length of cable between the antenna and the TimeSource 3500 Shelf. This number should have been recorded during installation. Use the same command to set the antenna elevation mask angle.

```
ED-EQPT::GPS:<ctag>:::ANTCBLDLY=a,ANTELEVMASK=b;
```

a = antenna cable delay in meters (a = 0 to 330)

b = antenna elevation mask angle in degrees (b = 0 to 45) (see note below)

> **Note:** The antenna elevation mask is that portion of the sky from which the TimeSource 3500 masks out satellite signals, measured as an angle of elevation from the horizon. Reflections or other anomalies may disturb signals received from an area of the sky that has obstructions, usually the area near the ground. Masking that part of the sky may allow the receiver to acquire GPS signals more quickly and accurately. Factory setting is 10.

29. If not using the TOD output, skip to Step 30. Use the Edit Equipment command to set the TOD output.

```
ED-EQPT::TS3500:<ctag>:::TOD=b;
```

b = TOD format (b = Cisco or NTP4)

30. Use the Edit Equipment command to allow or inhibit alarm conditioning on the outputs. Inhibiting the alarm conditioning forces the TimeSource 3500 to continue to output valid timing signals while in major alarm. This may be useful when testing, troubleshooting, or in installations where a TimeSource 3500 that is in major alarm may produce better timing signals than other sources (for example, offices without additional holdover clocks in a distribution shelf).

```
ED-EQPT::TS3500:<ctag>:::ALMCOND=b;
```

b = alarm conditioning of the outputs (b = ALW or INH)

31. Use the Copy Memory command to copy the database from volatile to nonvolatile memory within the TimeSource 3500.

```
CPY-MEM:[tid]:TS3500:<ctag>::WKG,,AUX:DATA;
```

> **Note:** Although the database is automatically copied to nonvolatile memory once per hour, it is recommended that the Copy Memory command be executed each time the database is changed.

32. When the GPS signals have been acquired and the outputs are stable enough to output a signal, the TimeSource enters a settling period. During the settling period, the following conditions exist:

- Status GPS lamp is green

- Status SYS lamp is green

- Any Span lamp is green when its input is connected, entered, contains valid framing, and is usable for ensembling

- All outputs are functioning according to specifications or in a slightly degraded mode

- A TL1 autonomous "settling period" event message exists.

Notes:

1. In roof antenna installations, the nominal time to reach normal operation (output a PRS signal) is 20 min. If normal operation has not been reached after 40 min, refer to the Troubleshooting chapter.
2. The settling period is the condition where this clock is beyond the warm-up state but not yet in steady state operation. Steady state operation is indicated by the clearing of the "settling period" event.
3. In window or wall antenna installations, the nominal time to reach normal operation (output a PRS signal) is variable, depending on the view of the sky and the satellite positions at the time of power-up, and may take up to several hours. If normal operation is not reached, refer to the Troubleshooting chapter.
4. The TimeSource 3500 develops and sends timing within the PRS specification during normal operation and during any event (other than settling period) or minor alarm, but not during a major or critical alarm.

Installing the Firmware

There are two methods of installing firmware on the TimeSource 3500. The first method is manual and is required if you have to install the DEVn.hex files, or when the installation is performed over a remote connection to the TimeSource. To install the firmware manually, follow the steps in Installing Firmware Manually, on page 92.

The second method is with TimeWizard, a Windows Wizard-like application that automates the installation process using a local connection to the TimeSource. Using TimeWizard is recommended when installing the TS3000.hex or the GPS.hex file. To install the firmware release using TimeWizard, follow the steps in Installing Firmware with TimeWizard, on page 96.

Estimated Installation Time

Installing this firmware release takes approximately 50 minutes at 9600 baud.

Requirements

The hardware, software, and documentation required to operate this firmware release is listed as follows.

Hardware

A PC with the following minimum items is required.

- 90 MHz Pentium
- 8 MB RAM
- One available serial communications port
- CD-ROM drive
- Minimum 10 MB of hard drive space if using the TimeWizard PC software

Software

The software listed below is required for the PC.

- Windows 95/98/NT 4.0/2000/XP operating system (required)
- One of the following:
  - *For manual installation*: Terminal emulation software with Y-modem capability
  - *Installation with TimeWizard*: TimeWizard PC software

> **Note:** Refer to the section below for information on when it is appropriate to install the firmware using the manual installation procedure or TimeWizard.

Installing Firmware Manually

Use the following procedure when DEVn.hex files must be installed or when using a remote connection to download files. If no DEVn.hex files will be installed, use the procedure in .

Requirements

- A computer with a CD-ROM drive, has a hard drive with at least 2 megabytes of disk space available, and has an ASCII terminal emulation program capable of a Y-modem batch transfer of files. The computer must have an RS-232 connection to the shelf with the following settings: local echo off, 8 data bits, no parity, and 1 stop bit, or an ethernet connection that allows for remote download using applications such as HyperTerminal or Procomm.
- The TimeSource 3500 CD-ROM labeled 092-72050-06

This procedure installs the firmware in the TimeSource 3500 using the manual installation method. This procedure assumes that the TimeSource 3500 Shelf is installed and powered.

■ In this procedure, ignore all responses and alarms not specifically mentioned.

■ Some events may be present after the power-up/restart event clears. These events will clear within 5 minutes.

■ After installing this firmware release, the system performance may enter the degraded region of the PRS mask for up to 1 hour, if the units have not been in service or alarm free for more than 24 hours.

1. Insert the TimeSource 3500 CD-ROM labeled 092-72050-06 into the computer.

2. Create a new directory on the hard drive of the computer.

3. Copy the `TS3000.hex`, `GPS.hex`, and `DEVx.hex` files from the TimeSource 3500 CD-ROM to the directory created in the previous step. A system requires a specific DEVx.hex file:

   – 090-72050-01 systems (no module) require the `DEV1.hex` file

   – 090-72050-02 systems (eight T1 outputs module) require the `DEV5.hex` file

   – 090-72050-03 systems (eight composite clock outputs module) require the `DEV1.hex` file

   – 090-72050-05 systems (two IRIG-B outputs module) require the `DEV3.hex` file

   – 090-72050-06 systems (eight mixed E1/T1 outputs module) require the `DEV9.hex` file

   – 090-72050-07 systems (mixed T1/CC daughterboard) require the `DEV11.hex` file

4. Remove the TimeSource 3500 CD-ROM from the computer.

5. At the computer, from the terminal emulation program, press the semicolon (;) key.

   Requirement: The computer shows one of the following:

    "C"

   or

     a TL1 deny message

6. If "C" was the response in the previous step, continue with the next step. If "C" was not the response in the previous step, skip to Step 9.

7. Activate a Y-modem transfer of the `TS3000.hex` file from the directory created in Step 2 to the TimeSource 3500. The download may take up to 35 minutes.

8. After the terminal emulation software indicates that the transfer has been completed, wait 90 seconds, then enter ";".

   If the result is "C", the transfer was incomplete; repeat Step 7. If the result is a deny response, the transfer has been completed; continue with the next step.

9. Enter the following command:

   ```
   ACT-USER::<uid>:<ctag>::<pid>;
   ```

   Note: If you do not know the <uid> parameter (user identifier or user name) or <pid> parameter (private identifier or password), ask your system administrator.

   Requirement: When completed, the following is displayed:

   ```
       TS3000 <date> <time>
   M   <ctag> COMPLD
       /* LINK: x, CMD: ACT-USER::<uid>:<ctag>::<pid> */

   ;
   ```

10. Determine the versions of the operating system firmware, the GPS receiver firmware, and the hardware option firmware currently installed by entering the following command:

    ```
    RTRV-INVENTORY:[<tid>]:TS3500:<ctag>;
    ```

    Requirement: The following is displayed:

    ```
        TS3000 <date> <time>
    M   <ctag> COMPLD
        "TS3500:::::<CARD=TS3500>
        TYPE=T1
        PART=x,
        SERIAL=x,
        SOFTVER_TS3500=x,
        SOFTVER_GPS=x,
        SOFTVER_DEV=x"
        /* LINK: x, CMD: RTRV-INVENTORY:[<tid>]:TS3500:<ctag> */
    ;
    ```

    The versions of firmware for the operating system (SOFTVER_TS3500=x), the GPS receiver (SOFTVER_GPS=x), and the hardware option (SOFTVER_DEV=x) are shown near the bottom of the response.

11. Determine if the latest firmware versions are installed by comparing the results of the previous step with the firmware versions in this firmware release. This firmware release includes the following:

Firmware	**TL1 response for the version in this release**
Operating System firmware	SOFTVER_TS3000=1.07.02
GPS Receiver firmware	SOFTVER_GPS=1.02.05
Plus firmware for one of the following:	
Hardware for 090-72050-01 (DEV1)	SOFTVER_DEV=1.03.02
Hardware for 090-72050-02 (DEV5)	SOFTVER_DEV=1.03.02-1.01.01
Hardware for 090-72050-03 (DEV1)	SOFTVER_DEV=1.03.02
Hardware for 090-72050-05 (DEV3)	SOFTVER_DEV=1.03.02-1.01.01
Hardware for 090-72050-06 (DEV9)	SOFTVER_DEV=1.03.02-1.01.01
Hardware for 090-72050-07 (DEV11)	SOFTVER_DEV=1.03.02-1.01.01

12. If no further downloading is required, skip to Step 19. To download files, continue with the next step.

> **Notes:**
>
> 1. If any alarms are present, clear them.
> 2. For an in-service system, ensure system has been in service for a minimum of 24 hours before downloading. Systems that have not been in service and alarm-free for 24 hours could have outputs removed from service for 40 to 50 minutes.

13. Based on the results of Step 11, determine the names of the firmware files to download, then the <aid> associated with that firmware from the following:

Firmware	**<aid>**	**File Name**
Operating System firmware	TS3000	`TS3000.hex`
GPS Receiver firmware	GPS	`GPS.hex`
Plus firmware for one of the following (if upgrade is necessary):		
Hardware (for 090-72050-01)	DEV1	`DEV1.hex`
Hardware (for 090-72050-02)	DEV5	`DEV5.hex`
Hardware (for 090-72050-03)	DEV1	`DEV1.hex`
Hardware (for 090-72050-05)	DEV3	`DEV3.hex`
Hardware (for 090-72050-06)	DEV9	`DEV9.hex`
Hardware (for 090-72050-07)	DEV11	`DEV11.hex`

The <aid> and file name will be used in the next two steps.

The DEV files are not upgraded from the previous release, and downloading any of the DEV files will take the system out of service for 40 to 50 minutes. Do not download a DEVn.hex file unless the currently installed file is corrupted or new hardware is installed.

14. Enter the following command with the <aid> determined in the previous step:

```
CPY-MEM::<aid>:ctag::AUX,,WKG:PGM;
```

Note: The Y-modem transfer in the next step must be started within 60 seconds of entering the `CPY-MEM` command in this step, or the system times out and the `CPY-MEM` command must be re-entered.

15. Activate a Y-modem transfer of the appropriate file (from Step 13) from the directory created in Step 2 to the TimeSource 3500.

16. After the terminal emulation software indicates that the transfer has been completed, wait 90 seconds.

    Requirement: Either a TL1 completed message or a TL1 deny message is displayed.

    If the `TS3000.hex` or `DEVn.hex` file was downloaded, the user is logged off. If the GPS.hex file was downloaded, the user remains logged on.

17. If a deny message was displayed in the previous step, repeat Step 14 through Step 16. If a completed message was displayed in the previous step, continue with the next step.

18. If additional files require downloading:

    – If the `TS3000.hex` or `DEVn.hex` file was downloaded and another file requires downloading, repeat Step 9 through Step 17.

    – If the `GPS.hex` file was downloaded and another file requires downloading, repeat Step 10 through Step 17.

    If no additional files require downloading, continue with the next step.

19. Delete all files in the directory created in Step 2.

20. Delete the directory created in Step 2.

Installing Firmware with TimeWizard

The TimeWizard Software Installation application was created to facilitate installing software upgrades using a local connection to the TimeSource 3500. The following procedure shows how to install the TimeWizard application and how to use TimeWizard to download software upgrades.

TimeWizard Installation and Operation

Use this procedure to install the firmware in the TimeSource 3500 to configure the GPS and Holdover alarms, using the TimeWizard application.

Requirements
- A PC running Windows 95/98/NT 4.0/2000/XP.

- The TimeSource 3500 CD labeled 092-72050-06.

> **Note:** When ordering a TimeSource 3500 CD, specify item number 992-72050-06.

Installation

1. Connect the TimeSource 3500 to the PC with a serial cable.

2. Insert the TimeSource 3500 CD labeled 092-72050-06 into the PC's CD-ROM drive.

    If AutoRun is enabled on the PC, the CD should automatically launch the Install Shield wizard for installation of the TimeWizard application. If Install Shield launches, continue with Step 5. If Install Shield does not automatically launch, continue with the next step.

3. The Windows Explorer, double-click "setup.exe" in the root directory of the CD to start the Install Shield wizard.

4. Follow the prompts in the Install Shield wizard to install TimeWizard in the preferred directory.

    Continue with the next step after the TimeWizard installation is complete.

5. From the Windows desktop, click Start $\Rightarrow$ Programs $\Rightarrow$ TimeWizard to start the TimeWizard application. When TimeWizard starts, the "TimeWizard" main screen appears:
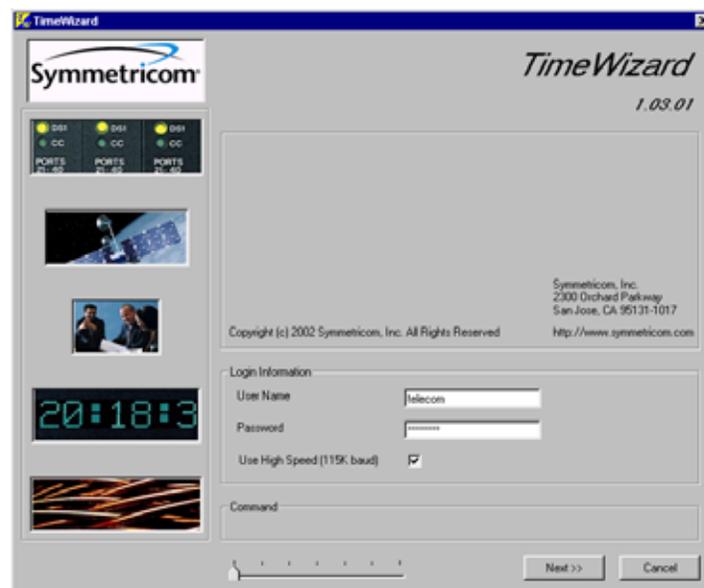
6. The version of TimeWizard that is installed is indicated at the top right of the screen. The progress indicator at the bottom of the screen shows which of the seven screens you are currently viewing.

> **Note:** The factory default TimeSource username of "telecom" and password of "TS3000!!" appear in the Login Information area of the screen.

7. If the user name or password of the TimeSource have been changed, enter the proper user name or password, otherwise, continue with the next step.

8. To select the high-speed download option, in which the firmware download takes place at approximately 12 times the default speed of 9600 baud, select the Use High Speed (115K baud) check-box, then click the Next>> button to progress to the next screen.

   If you do not wish to use the high-speed download option, leave the Use High Speed (115K baud) check-box unselected and click the Next>> button.

> **Note:** In most cases, it is desirable to proceed with the Use High Speed (115K baud) check-box selected. In certain instances, as when the PC's communications port does not support a 115K baud rate, de-select the Use High Speed (115K baud) check-box before proceeding. If the 115K baud rate is selected, the user should proceed thorough all the menus to the end of the TimeWizard application in order to reset the baud rate back to 9600. If at any point the TimeWizard application is aborted early by the user without going thorough all the menus, then the baud rate is set to 115K.

Download the GPS.hex Firmware

> **Note:** If you are not downloading GPS.hex firmware, click the Next>> button again to advance to the "Download TS3000.hex" screen, then skip to Step 14.

9. After the Next>> button is clicked in the previous step, the "Download GPS.hex" screen appears:

The versions of the GPS.hex and TS3000.hex firmware that are currently installed in the TimeSource are shown in the GPS.hex Ver and TS3000.hex Ver fields. Current satellite information is shown in the GPS Status field.

10. Click the ver Unknown button to open the Load GPS File dialog box:
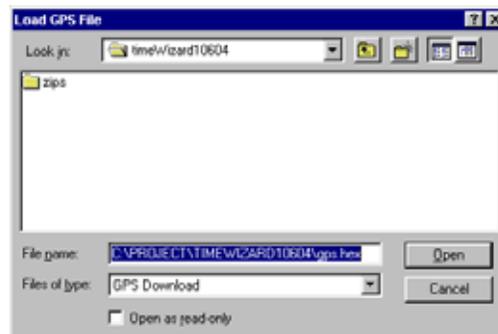
11. In the Load GPS File dialog box, navigate to the GPS.hex firmware file to be downloaded, then click the Open button.

    After the Open button is clicked, the message "Verifying version for C:\directory\Gps.hex (approx 10 secs)" appears in the Command area of the screen. Once TimeWizard has verified that the version of the firmware is correct, the text on the ver Unknown button changes to show the version of the firmware to be downloaded.

    After TimeWizard verifies the firmware version, select the Download GPS.hex check-box, then click the Next>> button to start the firmware download operation.

12. When the firmware download operation starts, the Download Progress dialog box appears:
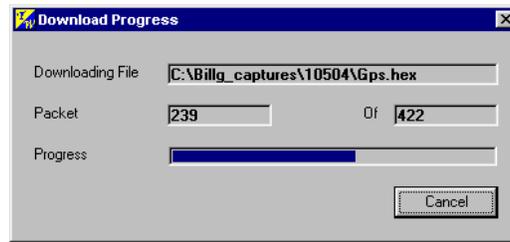
As the download operation proceeds, the value in the Packet field increases, and the Progress bar shows the progress of the operation. When the firmware download is complete, the Download Progress dialog box closes.

After the Download Progress dialog box closes, continue with the next step.

Notes:

1. The firmware download operation can be aborted at any time by clicking the Cancel button in the Download Progress dialog box.
2. If the download fails for any reason, a screen appears with instructions to contact Symmetricom. If this happens, exit the application, check the cable connections, and restart TimeWizard.

13. After the Download Progress dialog box closes, continue to monitor the messages reported in the Commands area of the screen.

After the firmware file finishes downloading from the PC to the TimeSource, the TimeSource requires more time to complete the firmware upgrade process. During this time, it should not be interrupted. When the firmware upgrade is fully complete, TimeWizard automatically advances to the next screen.

After the screen automatically advances, continue with the next step.

Download the TS3000.hex Firmware

Note: If you are not downloading TS3000.hex firmware, click the Next>> button again, then skip to Step 19.

14. The "Download TS3000.hex" screen appears very similar to the "Download GPS.hex" screen shown in Step 9, and contains the same information.

15. Click the ver Unknown button to open the Load TS3000 File dialog box, which appears very similar to the dialog box shown in Step 10.

16. In the Load TS3000 File dialog box, navigate to the TS3000.hex firmware file to be downloaded, then click the Open button.

    After the Open button is clicked, the message `"Verifying version for C:\directory\ts3000.hex (approx 30 secs)"` appears in the Command area of the screen. Once TimeWizard has verified that the version of the firmware is correct, the text on the ver Unknown button changes to show the version of the firmware to be downloaded.

    After TimeWizard verifies the firmware version, select the Download TS3000.hex check-box, then click the Next>> button to start the firmware download operation.

17. When the firmware download operation starts, the Download Progress dialog box appears.

    As the download operation proceeds, the value in the Packet field increases, and the Progress bar shows the progress of the operation. When the firmware download is complete, the Download Progress dialog box closes.

    After the Download Progress dialog box closes, continue with the next step.

Notes:

1. The firmware download operation can be aborted at any time by clicking the Cancel button in the Download Progress dialog box.
2. If the download fails for any reason, a screen appears with instructions to contact Symmetricom. If this happens, exit the application, check the cable connections, and restart TimeWizard.

---

18. After the Download Progress dialog box closes, continue to monitor the messages reported in the Commands area of the screen.

    After the firmware file finishes downloading from the PC to the TimeSource, the TimeSource requires more time to complete the firmware upgrade process. During this time, it should not be interrupted. When the firmware upgrade is fully complete, TimeWizard automatically advances to the next screen.

Note: After the TS3000.hex download operation successfully completes, the TimeSource reboots so that it can use the newly installed firmware. Upon rebooting, the system's output might enter the degraded region of the PRS mask for up to one hour. For systems equipped with a Rubidium internal oscillator, the system output will be within the PRS mask if the unit has been in service and alarm free for more than 24 hours. Systems with Rubidium oscillators are the 090-72050-xx and the 090-72060-xx.

After the screen automatically advances, continue with the next step.

Verify the Firmware Versions

19. The "Status Information" screen appears as follows:
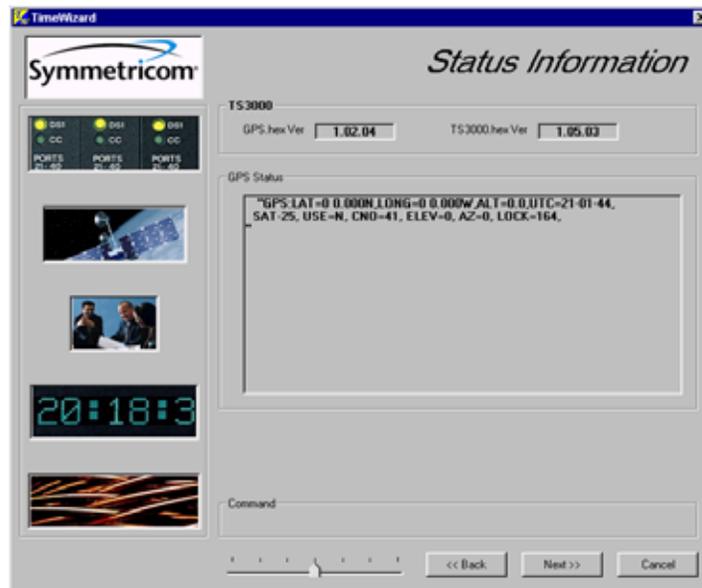
Verify that GPS.hex Ver and TS3000.hex Ver fields show that the correct versions of the GPS.hex and TS3000.hex firmware are now installed, then click the Next>> button.

Setup the Alarm Parameters

20. When the Next>> button is clicked, the "Set the Alarm Parameters" screen appears:

The Load and Save buttons allow a file to be generated that saves the alarm parameters in a file called TS3Kconf.sym as default. The file name for a configuration can be saved by selecting the Save button and providing a file name. The Load button allows the user to load a saved file that will automatically configure the Alarm Parameters screen.

This screen allows the parameters for GPS and Holdover alarm conditions to be modified. If you do not want to modify any of the alarm parameters, click the Next>> button and continue with Step 22. Otherwise, continue with the next step.

21. Choose the alarm parameters as desired. A description of each setting follows:

Setting	Description
Severity 1	The initial severity of the alarm.
Service Affecting 1	The initial service affecting status of the alarm condition.
Time to Severity 2	If the Escalate Alarm check-box is selected, the alarm will be escalated to the severity and service affecting status selected under Severity 2 and Service Affecting 2, after the time period selected under Hours and Mins has been reached. If the Escalate Alarm check-box is not selected, the alarm will not be escalated.
Severity 2	The severity of the alarm after it has been escalated.
Service Affecting 2	The service affecting status of the alarm condition after the alarm has been escalated.

When you are finished modifying the alarm parameters, click the Next>> button.

22. When the Next>> button is clicked, the "View the Alarm Parameters" screen appears:
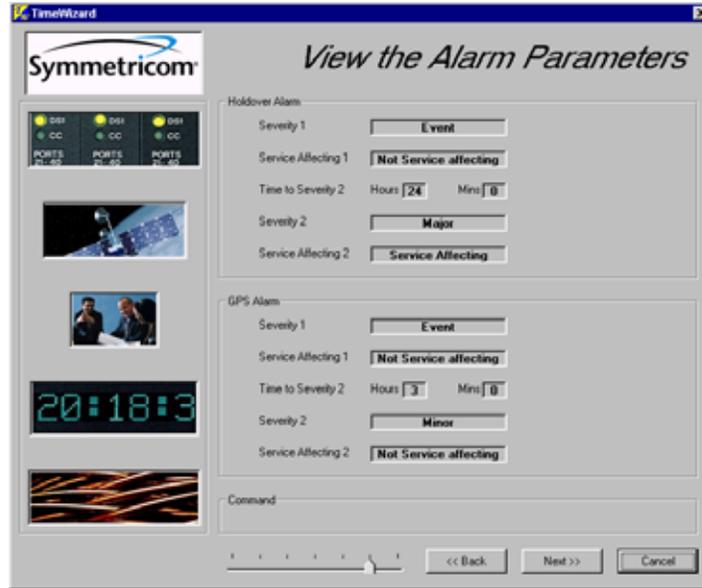
This screen confirms the alarm parameter settings from the previous screen.

If the settings are correct, click the Next>> button to continue. If the settings are not correct, click the <<Back button to return to the "Set the Alarm Parameters" screen, and correct the settings.

Save the Log File, if Desired

23. When the Next>> button is clicked, the "Exit Application" screen appears:
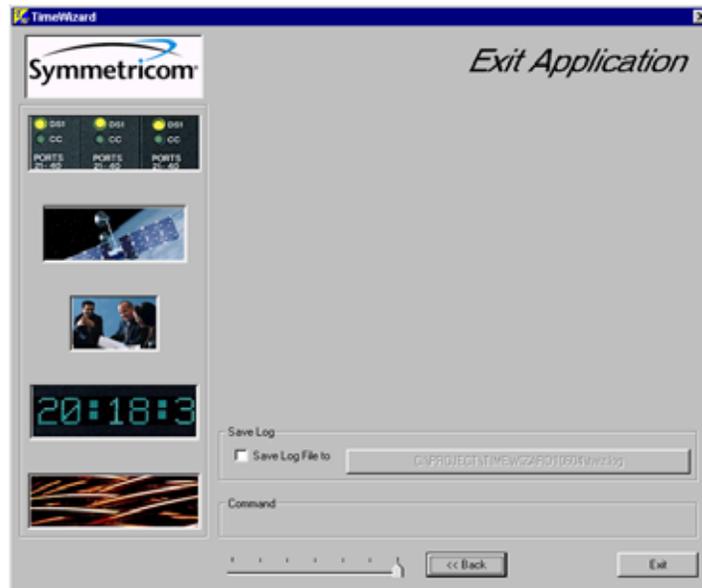
This screen allows you to save the log file from the download operation, or exit TimeWizard without saving the log file.

If you do not wish to save the log file, ensure that the Save Log File to check-box is not selected, then click the Exit button to complete the TimeWizard firmware installation procedure. To save the log file, continue with the next step.

24. Select the Save Log File to check-box, then click the button that is adjacent to the check-box to invoke the Save Log File dialog box:
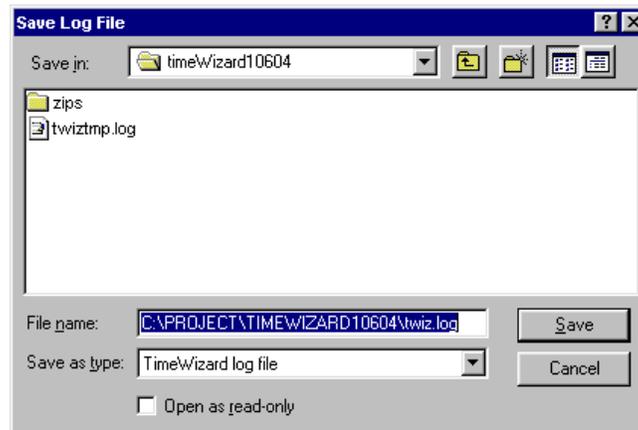
25. In the Save Log File dialog box, navigate to the location to where the log file is to be stored, enter a name for the log file into the File Name field, then click the Save button to save the log file.

26. Click the Exit button to complete the TimeWizard firmware installation procedure.

Factory-Set Values

The parameter values initially set at the factory are shown in Table 3-7.

Table 3-7. Parameter Factory Settings

<aid>	Parameter Setting
TS3500	TOD=NONE ALMCOND=ALW IPNE=0.0.0.0 IPSUBNET=255.255.255.255 IPGATE=0.0.0.0 IPEM1=0.0.0.0 IPEM1PORT=0 IPEM2=0.0.0.0 IPEM2PORT=0 IPINACT=0 DCDPASSTHRU=INH DCDUSERPORT=2
TS3500 HOLDOVER ALARM	TIME=72-0 SEV1=EV SEV2=MJ SAFF1=NSA SAFF2=SA
TS3500 GPS ALARM	TIME=10-0 SEV1=EV SEV2=MN SAFF1=NSA SAFF2=NSA
GPS	ANTCBLDLY=0 ANTELEVMASK=10 ANTMODE=AUTO MANLAT=N-0-0-0 MANLONG=W-0-0-0 MANELEV=0
SPAN-A, SPAN-B	ENSEMBLER=INH MONITOR=INH SSM=INH
SPAN-A, SPAN-B LOS ALARM	TIME=24-0 SEV1=EV SEV2=MN SAFF1=NSA SAFF2=NSA

Table 3-7. Parameter Factory Settings (Continued)

<aid>	Parameter Setting
SPAN-A, SPAN-B AIS ALARM	TIME=24-0 SEV1=EV SEV2=MN SAFF1=NSA SAFF2=NSA
SPAN-A, SPAN-B ERROR ALARM	TIME=24-0 SEV1=EV SEV2=MN SAFF1=NSA SAFF2=NSA
T1-A, T1-B	FRAMING=ESF ALMOUT=AIS
COM-1, COM-2, COM-3	BAUD=9600 MONMSG=INH KEEPALIVE=0 ENDOFTEXT=00 ECHO=ALW COMPRI=ALW1 AUTOLOGOFF=20 HWCONTROL=INH SWCONTROL=INH PARITY=NONE STOP=1
COM-5001, COM-5002, COM-5003, COM-5004	MONMSG=INH KEEPALIVE=0 ENDOF TEXT=00 ECHO=ALW COMPRI=ALW1 AUTOLOGOFF=20 SWCONTROL=INH

Table 3-7. Parameter Factory Settings (Continued)

<aid>	Parameter Setting
COM-5551	MONMSG=INH KEEPALIVE=0 ENDOFTEXT=00 ECHO=INH COMPRI=ALW1 AUTOLOGOFF=20 SWCONTROL=INH
OPT-1, OPT-2, OPT-3, OPT-4, OPT-5, OPT-6, OPT-7, OPT-8 (990-72050-02, 990-72050-06, and 990-72050-07 systems only)	FRAMING=ESF ALMOUT=AIS

Chapter 4 TL1 Reference

This chapter provides information for using the TL1 language.

In This Chapter

- Conventions
- Command Format
- Response Format
- Parameters
- Autonomous Messages
- Tasks/Commands
- Commands

Conventions

Uppercase letters in a command designate parameter values which must be entered as shown. Lowercase letters in a command are the parameter name, and the specific values that must be entered for the parameter. Parameters, on page 112 of this chapter describes the parameters and the values where a value is the same for all parameters. Parameter values for a particular command are listed with the command. The system accepts either uppercase, lowercase, or a mixture of both, but upper and lower case cannot be mixed within a parameter block.

The following symbols are used in the input and response messages:

[ ]   encloses an optional parameter

{ }   encloses a group of parameters, at least one of which must be
      entered

| separates alternatives in a group of parameters, at least one of
      which must be entered

^   indicates a space (used in the description of the response format,
      but not used in the command responses)

–   separates command code fields

:   separates parameter blocks

,   separates parameters within a block

;   terminates a command, and causes execution

" " encloses text to be parsed by a machine

/* */ encloses comments for humans

< > encloses a TL1 named variable

\" \" encloses a description of a condition

...   indicates the previous line in a response may be repeated as
      required

Command Format

A command consists of a command code of up to three fields separated by hyphens, followed by parameter blocks separated by colons. Figure 4-1 shows the command format. Parameter blocks consist of one or more parameters separated by commas.

Parameter blocks may be null (contain no parameters), or contain one or more parameters. Two colons occur next to each other if a parameter block is null.

Multiple parameters in a parameter block are separated by commas. Two commas occur next to each other if a parameter is null.

Entering a semicolon at the end of the command indicates that the command statement is completed to the interpreter, and executes the command.
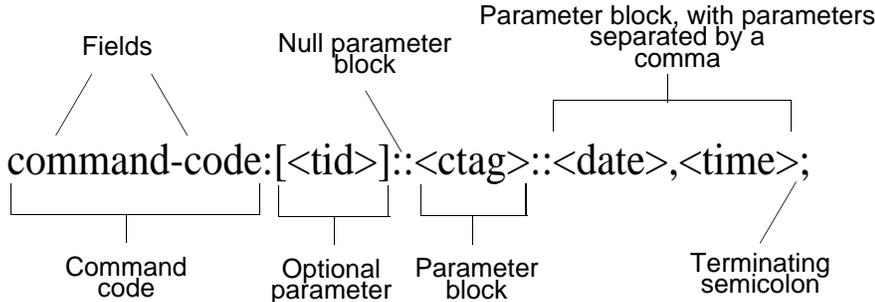
Figure 4-1.   Command Format

Response Format

When a command is received and processed, a response is returned. All responses include a source identifier (<sid>), the date, the time, an M to indicate that it is a response to a command, and the correlation tag (<ctag>) that was entered with the command.

Figure 4-2 shows the completed response format. COMPLD indicates that the command was completed without error.

Figure 4-3 shows the denied response format. DENY indicates that the command was denied due to an error. The <errcde> parameter indicates the corresponding error type, or cause of the error.

```
                    ^^^<sid>^<date>^<time>
                    M^^<ctag>^COMPLD
                    ^^^/*LINK:<link>,CMD:<command>*/
                    ;
```

Figure 4-2.   Completed Response Format

```
                    ^^^<sid>^<date>^<time>
                    M^^<ctag>^DENY
                    ^^^<errcde>
                    ^^^/*  <error message>  */
                    ^^^/*LINK:<link>,CMD:<command>*/
                    ;
```

Figure 4-3.   Deny Response Format

Parameters

The parameters that may be used in commands, responses, and messages are defined in Table 4-1. When a parameter uses the same values in every instance, those values are listed with the parameter in the table. When the context requires different values for a parameter, the value is listed with the parameter in the applicable commands, responses, and messages.

Table 4-1. Parameter Definitions

Parameter	Definition
<aid>	Access identifier for the object of the command or message. It may have more than one part.
<almcde>	Alarm code. Identifies the severity of the alarm based on its priority of action. If multiple alarms are reported, almcde is the highest severity of those reported.
<atag>	Automatic message tag. It is incremented by one for each autonomous message. The <atag> value is a whole number from 001 through 999, which is reset to 001 at reset or when it rolls over.
<command>	Echo of the entered command.
<conddescr>	Text description of the condition. The <conddescr> value is limited to 64 characters starting and ending with a back slash and a double quotation mark (\"). Refer to the Troubleshooting chapter of this manual for the list of values.
<condeff>	Effect on the condition of the equipment.

Table 4-1. Parameter Definitions (Continued)

Parameter	Definition
<condtype>	Type of alarm condition.
<ctag>	Correlation tag used to correlate input and response messages. The ctag contains 1 to 6 characters. It must be included in a command, and the same ctag is returned in the response.
<date>	Date in the 6-digit form: yy-mm-dd (command) or yy:mm:dd (response or message), where yy is the year, mm is the month (01 to 12), and dd is the day of the month (01 to 31). For example, May 3, 2004 is 04-05-03.
<errcde>	Four-character mnemonic error code, which is one of the following: EFON = equipment feature option not provided ENEQ = not equipped ICNV = command not valid IDNV = invalid data in command IDRG = invalid data range in command IIAC = invalid aid in command IICT = invalid correlation tag IIDT = invalid data parameter in command IISP = invalid syntax or punctuation IITA = invalid tid PIUI = invalid or duplicate uid or pid (privileged users only) RALB = All units of requested type are busy RCBY = circuit is busy SCSN = invalid command sequence SDBE = internal database error SNIS = not in service SNVS = not in a valid state SRCN = requested condition currently exists SRQN = request invalid SWFA = working unit failed
<error message>	Error code text message.
<link>	Communication link identifier.
<modifier>	Equipment initiating the alarm or event message, which is one of the following: TS3500 = system software GPS = GPS receiver software SPAN-x = T1 span input
<mondat>	Date of the performance monitoring data.
<montm>	Time of the performance monitoring data.
<montype>	Data type of the performance monitoring data.

Table 4-1. Parameter Definitions (Continued)

Parameter	Definition
<monval>	Value of the performance monitoring data.
<ntfcncde>	Notification code showing the alarm severity, which is one of the following: CR = critical MJ = major MN = minor
<ocrdat>	Occurrence date in the 6-digit form: yy-mm-dd (command) or yy:mm:dd (response or message), where yy is the year, mm is the month (01 to 12), and dd is the day of the month (01 to 31). For example, May 3, 2004 is 04-05-03.
<ocrtm>	Occurrence time in the 6-digit form: hh-mm-ss (command) or hh:mm:ss (response or message), where hh is hours (00 to 23), mm is minutes (00 to 59), and ss is seconds (00 to 59). For example, 2:34 pm is 14:34:00.
<pid>	Private identifier, factory-set to "TS3000!!". It is the initial password for the TELECOM <uid>. Passwords are encrypted when stored in the TimeSource 3500, and are never transmitted from the shelf. The pid contains a case-insensitive string of 8 to 10 ASCII characters, and must include at least one letter, one numeral, and one special character from the following: ! " $ % & ' ( ) * + - . / < > ? @
<sid>	Source identifier of the equipment sending the message. The <sid> may contain a maximum of 20 characters (limited to letters, digits, and hyphens), and may begin with a letter. The <sid> is recommended to be the equipment's CLLI code.
<spec_block>	Replaced by a number of parameters within the command. Parameters are in the format <name>=<value>, may be entered in any order, and must be separated by a comma.
<srveff>	Identifies whether the alarm condition is service affecting: SA = service affecting NSA = not service affecting
<tid>	Target identifier of the equipment to which the command is directed. The tid must be a valid TL1 identifier of a maximum of 20 characters (limited to letters, digits, and hyphens) beginning with a letter. The <tid> is recommended to be the target's CLLI code, and can also be used as the <sid>. The <tid> can be null if the OS directly interfaces to the target. The <tid> can be omitted only if connection is made directly to a single TimeSource 3500 Shelf.

Table 4-1. Parameter Definitions (Continued)

Parameter	Definition
<time>	Current time in the six-digit form: hh-mm-ss (command) or hh:mm:ss (response or message), where hh is hours (00 to 23), mm is minutes (00 to 59), and ss is seconds (00 to 59). For example, 5:11:49 a.m. is 05:11:49.
<uap>	User access level, used by a system administrator to assign a given level of access to system users. User access level ranges from 1 to 5, with 1 being the lowest access level, and 5 being the highest access level.
<uid>	User identifier, factory-set to TELECOM. The <uid> contains alphanumeric, case-insensitive strings of 6 to 10 characters provisioned as valid login IDs.
<uout>	User inactivity password which indicates the number of days a system user has not logged on to the system. The user inactivity timeout range is 0 to 180 days, with 0 indicating no timeout.
<utc>	Universal Coordinated Time (UTC) in the 6-digit form: hh-mm-ss, where hh is hours (00 to 23), mm is minutes (00 to 59), and ss is seconds (00 to 59). For example, 2:34 pm is 14-34-00.
<vldty>	Validity of the performance monitoring data.

Autonomous Messages

Autonomous messages are sent out when an alarm or event occurs. Two types of autonomous messages are used:

■ Report Alarm: reports alarms

■ Report Event: reports events that are not alarms, or that have not yet become alarms

Autonomous messages are listed on the following pages. After the message name, a definition of the message is given.

Report Alarm

This autonomous message appears when an alarm is raised, and appears again when the alarm is cleared.

Message:

```
^^^<sid> <date> <time>
M^^<almcde> <atag> REPT ALM EQPT <modifier>
^^^"<aid>:<ntfcncde>,<condtype>,<srveff>,
        <ocrdat>,<ocrtm>,,,:\"<conddescr>\
        "[:<dgntype>]"
```

Note: Refer to Table 4-1 for parameter definitions.

Report Event

This autonomous message appears when an event is raised, and again when the event is cleared; also appears when a transient event occurs. An event is a state of the TimeSource 3500 that does not cause an alarm.

Message:

```
^^^<sid> <date> <time>
M^^<atag> REPT EVT EQPT <modifier>
^^^"<aid>:<condtype>,<condeff>,<ocrdat>,<ocrtm>
        ,,,,:\"<conddescr>\"[:<dgntype>]"
```

Note: Refer to Table 4-1 for parameter definitions.

Tasks/Commands

To perform each task, use the command listed beside that task in Table 4-2.

Table 4-2. Commands for Tasks

Task	Command	Page
Log user onto system	Activate User	118
Log user off of system	Cancel User	118
Copy software program or database	Copy Memory	119
Delete equipment from the database	Delete Equipment	121
Delete a user from system	Delete User Security	121
Change communication port parameters	Edit Communication	122
Change the system date and time	Edit Date	125
Change equipment parameters	Edit Equipment	127

Table 4-2. Commands for Tasks (Continued)

Task	Command	Page
Enter equipment into the database and allow the equipment to be used for monitoring	Enter Equipment	133
Enter a new user and configure the new user's user name, password, and access level	Enter User Security	134
Reset the alarm log	Initialize Log	134
Reset to zero all performance monitoring parameters associated with a given aid	Initialize Register	135
Reset the system processor or GPS receiver processor	Initialize System	135
Deactivate the audible office alarm	Operate Alarm Cutoff All	136
Display current system alarms	Retrieve Alarm All	136
Display current alarms for specific equipment	Retrieve Alarm Equipment	137
Display current communication port parameter settings	Retrieve Communication	137
Display current system alarms and events	Retrieve Condition All	140
Display current alarms and events for specific equipment	Retrieve Condition Equipment	140
Display parameter settings of equipment	Retrieve Equipment	141
Display GPS status information	Retrieve GPS Status	147
Display header information	Retrieve Header	148
Display information about equipment	Retrieve Inventory	149
Display alarm log data	Retrieve Log	150
Display performance monitoring data	Retrieve Performance Monitoring	151
Display security parameters for a single user or for all users	Retrieve User Security	160
Display users logged in to each active port	Retrieve Status Security	159
Set the name of the equipment	Set Source Identifier	160

Commands

The commands used with the TimeSource 3500 are listed on the following pages. After the command name, a definition of the command is given. The definition is followed by the actual command, followed by the variables that can be used with the command.

The response format shows how the response will appear, with additional definitions of the response parameters where required.

Activate User

This command logs the user onto the system, and begins a session. The factory-set user name is "TELECOM", and the factory-set password is "TS3000!!". The user name and password are not case sensitive (either uppercase or lowercase can be used). The command format is:

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

Parameter	Parameter Description
<uid>	Assigned user name
<pid>	Assigned password

Command Example:
```
ACT-USER::TELECOM:<ctag>::TS3000!!;
```

Response Format:
```
    <sid> <date> <time>
M   <ctag> COMPLD
    /*LINK:<link>,CMD:<command>*/
;
```

Cancel User

This command logs the current user off the system, and logs other users off the system as well, provided the current user has access rights of 5. The user name is not case sensitive, but must otherwise be entered exactly as assigned.

To cancel another user, type the command with the UID as the user name to be logged out.

The command format is:

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

Parameter	Parameter Description
<uid>	Assigned user name

Command Example:
```
CANC-USER::TELECOM:<ctag>;
```

Response Format:
```
    <sid> <date> <time>
M   <ctag> COMPLD
    /*LINK:<link>,CMD:<command>*/
;
```

Copy Memory

This command copies a software program from an external computer to the TimeSource 3500, or copies the system database to nonvolatile memory.

Notes:

1. The Software Release Document (included with this software release) contains detailed instructions for copying programs from an external computer to nonvolatile memory.
2. Clear any existing alarms before using this command.
3. The database is automatically copied to nonvolatile memory once per hour. However, if power to the TimeSource 3500 is interrupted before the automatic copying occurs, changes made since the last automatic copy will be lost. To avoid the possibility of losing database changes, the Copy Memory command may be used to copy database changes to nonvolatile memory after any changes are made.

To copy a program from an external computer to nonvolatile memory within the TimeSource 3500, the command format is:

```
CPY-MEM:[<tid>]:<aid>:<ctag>::AUX,,WKG:PGM;
```

Aid	Item Addressed
TS3000	System software
GPS	GPS receiver software
DEV1	TimeSource 3500 (standard) (990-72050-01 systems) or TimeSource 3500 with two T1 outputs and eight composite clock outputs (990-72050-03 systems)
DEV3	TimeSource 3500 with two TOD IRIG-B outputs (990-72050-05 systems)
DEV5	TimeSource 3500 with eight additional T1 outputs (990-72050-02 systems)
DEV9	TimeSource 3500 with eight mixed E1/T1 outputs (990-72050-06 systems)
DEV11	TimeSource 3500 with eight mixed T1/CCK outputs (990-72050-07)

Command Example:

```
CPY-MEM::TS3000:<ctag>::AUX,,WKG:PGM;
```

Response Format:

```
^^^<sid> <date> <time>
M^^<atag> REPT EVT <modifier>
^^^"<aid>:<condtype>,<condeff>,<ocrdat>,<ocrtm>
        ,,,,:\"<conddescr>\"[:<dgntype>]"
```

Note: Refer to Table 4-1 for parameter definitions.

To copy a database from volatile to nonvolatile memory within the TimeSource 3500, the command format is:

```
CPY-MEM:[<tid>]:<aid>:<ctag>::WKG,,AUX:DATA;
```

Aid	Item Addressed
TS3500	System Database

Command Example:
```
CPY-MEM::TS3500:<ctag>::WKG,,AUX:DATA;
```

Response Format:
```
    <sid> <date> <time>
M   <ctag> COMPLD
    /*LINK:<link>,CMD:<command>*/
;
```

Delete Equipment

This command deletes the specified equipment from the database, removes the input from the ensembling algorithm, and stops the monitoring for that input. Alarms are not reported for deleted equipment. The command format is:

```
DLT-EQPT:[<tid>]:<aid>:<ctag>::<spec_block>
```

Aid	Value	Item Addressed
SPAN-a	a = A	T1 span A input
	a = B	T1 span B input

Command Example:
```
DLT-EQPT::SPAN-A:<ctag>;
```

Response Format:
```
    <sid> <date> <time>
M   <ctag> COMPLD
    /*LINK:<link>,CMD:<command>*/
;
```

Delete User Security

This command allows a system administrator to delete a user. The command format is:

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

Parameter	Parameter Description
<uid>	Assigned user name

Command Example:
```
DLT-USER-SECU::TELECOM:<ctag>;
```

Response Format:
```
    <sid> <date> <time>
M  <ctag> COMPLD
    /*LINK:<link>,CMD:<command>*/
;
```

Edit Communication

This command changes communication port parameters. The command format is:

```
ED-COM:[<tid>]:<aid>:<ctag>:::<spec_block>;
```

Aid	Value	Item Addressed
COM-a	a = 1	Serial communication port 1 (COM1)
	a = 2	Serial communication port 2 (COM2)
	a = 3	Serial communication port 3 (Craft)
	a = 5001	Ethernet user interface port 5001 (Note 1)
	a = 5002	Ethernet user interface port 5002 (Note 1)
	a = 5003	Ethernet user interface port 5003 (Note 1)
	a = 5004	Ethernet user interface port 5004 (Note 1)
	a = 5551	Ethernet element manager interface port 5551 (Note 2)

Notes:

1. Ethernet ports 5001, 5002, 5003, and 5004 are set up to act as serial communication ports, so that a terminal program on a computer connected to these ports can communicate effectively.
2. Ethernet port 5551 is set up to allow an element manager to connect with it for TL1 commands and responses. TL1 autonomous messages are sent through port 5550, which connects to an element manager to send one or a group of autonomous messages, then disconnects. Port 5550 is not to be reconfigured.

The parameters which can be entered in the <spec_block> are listed below. For any specific <aid> entered in a command, only certain parameters are valid. For each valid parameter, choose the appropriate value from the Value column. When entering multiple parameters, separate the parameters with commas.

Table 4-3. Edit Communication Port Spec Block Parameters

Aid	Parameter	Value	Description
COM-a	MONMSG=b	b = ALW	View messages from all ports
		b = INH	View messages from this port only
	KEEPALIVE=b	b = 1 to 255	Inactive minutes until the unit sends a COMPLD message to keep the connection from being closed
		b = 0	No COMPLD message is output
	ENDOFTEXT=b	b = 1 to 9F	Hex code at end of all responses
		b = 0	No hex code at end of responses
	ECHO=b	b = ALW	Echoes characters received so they appear on the user's screen as typed
		b = INH	Local echo is disabled
	COMPRI=b	b = ALW0	TL1 commands and responses, no autonomous messages sent
		b = ALW1	TL1 commands and responses, autonomous messages
		b = ALW2	TL1 commands and responses, autonomous messages whether logged on or not
		b = INH	Closes connection, logs off any user (if logged on), and keeps port from use. Releases a telnet session from an Ethernet port (a port cannot close itself)

Table 4-3. Edit Communication Port Spec Block Parameters (Continued)

Aid	Parameter	Value	Description
COM-a (cont'd)	AUTOLOGOFF=b	b = 1 to 255	Inactive minutes until the unit logs off the user, keeping the connection open
		b = 0	Autologoff is disabled
	HWCONTROL=b (See Note 4)	b = ALW	Serial port CTS/RTS flow control is enabled
		b = INH	Serial port CTS/RTS flow control is not enabled
	SWCONTROL=b (See Note 4)	b = ALW	XON/XOFF flow control is enabled
		b = INH	XON/XOFF flow control is not enabled
	BAUD=b (See Note 3)	b = 115	Serial port baud rate is 115 kbaud
		b = 57.6	Serial port baud rate is 57.6 kbaud
		b = 38.4	Serial port baud rate is 38.4 kbaud
		b = 19.2	Serial port baud rate is 19.2 kbaud
		b = 9600	Serial port baud rate is 9600 baud
		b = 4800	Serial port baud rate is 4800 baud
		b = 2400	Serial port baud rate is 2400 baud
		b = 1200	Serial port baud rate is 1200 baud
	PARITY=b (See Note 3)	b = EVEN	Even parity is enabled on serial port
		b = ODD	Odd parity is enabled on serial port
		b = NONE	No parity is enabled on serial port
	STOP=b (See Note 3)	b = 1	1 stop bit on serial port
		b = 2	2 stop bits on serial port

Note:

3. Baud rate, parity, and stop bits can only be configured on serial communication ports (1, 2, and 3).
4. Flow control is not implemented on communication port 3 (Craft port).
5. XON/XOFF flow control is simulated for Ethernet ports.

Command Example:

```
ED-COM::COM-1:<ctag>:::BAUD=9600,MONMSG=ALW,
KEEPALIVE=30,ENDOFTEXT=0,ECHO=ALW,
COMPRI=ALW1,AUTOLOGOFF=30,HWCONTROL=ALW,
SWCONTROL=ALW,PARITY=NONE,STOP=1;
```

Response Format:

```
    <sid> <date> <time>
M   <ctag> COMPLD
    /*LINK:<link>,CMD:<command>*/
    ;
```

Edit Date

This command changes the system date and time. The command format is:

```
ED-DAT:[<tid>]::<ctag>::<date>,[<time>]:[MODE=a];
```

Parameter	Value	Parameter Description
date in the format a-b-c	a = <year>	4-digit year
	b = 01 to 12	Month
	c = 01 to 31	Day
time in the format a-b-c (Note 1)	a = 00 to 23	Hour of the day
	b = 00 to 59	Minutes
	c = 00 to 59	Seconds
MODE=a	a = UTC (Note 2)	Uses Universal Coordinated Time from GPS (cannot set time by TL1 command)
	a = LOCAL	Uses local time for hours, UTC for minutes and seconds

Notes:

1. The <time> value can only be entered when MODE=LOCAL, or in the same command as MODE=LOCAL, otherwise the command is denied. A successful command with <time> changes the display of time to conform to the nearest 30 minutes, relative to UTC.

   For example, when the UTC time is 01:12:10, setting the local time to 18:50:30 will actually set the clock to 18:42:10, because 18:42:10 is the closest 30 minute jump, relative to UTC, from 18:50:30. This is done to accommodate 30-minute time zones and still keep the local time accurate to UTC.

2. If a command includes MODE=UTC, and the GPS signal is not present, the command is denied.

The date/time behavior is as follows:

- During warm-up:

  – The date/time displayed starts from 1970 and increments from there. If the ED-DAT command is used to set the time in local mode, the time is changed as specified in the command.

- After warm-up:

  – If the ED-DAT command has not been used to set the local mode time, then UTC date and time are displayed.

  – If the ED-DAT command has been used to set the local mode time, then it is changed in the manner described as follows.

  – The date given in the ED-DAT command is retained. The local hours, minutes, and seconds are set to the nearest 30-minute divisible difference from UTC. A few examples will help to clarify.

  – Example 1. UTC time = 01:00:00. Local time = 18:01:10 will set the local time to 18:00:00.

  – Example 2. UTC time = 01:00:00. Local time = 18:25:30 will set the local time to 18:30:00.

  – Example 3. UTC time = 01:12:10. Local time = 18:50:30 will set the local time to 18:42:10.

- During Holdover Event

  – The date/time continues to increment normally.

- During Holdover Alarm

  – The date/time continues to increment normally.

Example to set date without changing time or mode:

```
ED-DAT:::<ctag>::2000-08-13;
```

Example to change to local time:

```
ED-DAT:::<ctag>::2000-08-13,07-00-00:MODE=LOCAL;
```

Example to change from local to UTC time:

```
ED-DAT:::<ctag>::2000-08-13:MODE=UTC;
```

Response Format:

```
    <sid> <date> <time>
M  <ctag> COMPLD
    /*LINK:<link>,CMD:<command>*/
    ;
```

Edit Equipment

This command changes equipment parameters. Additionally, this command can cause an input to be ensembled. The command format is:

```
ED-EQPT:[<tid>]:<aid>:<ctag>:::<spec_block>;
```

Table 4-4. Edit Equipment

Aid	Value	Item Addressed
TS3500	—	System-wide configuration
GPS	—	GPS configuration
SPAN-a	a = A	T1 span A input
	a = B	T1 span B input
T1-a	a = A	T1 A output
	a = B	T1 B output
OPT-a	a = 1 to 8	T1 output module port number (990-72050-02, 990-72050-06, and 990-72050-07 systems only)

The parameters which can be entered in the <spec_block> are listed below. For any specific <aid> entered in a command, only certain parameters are valid. For each valid parameter, choose the appropriate value from the Value column. When entering multiple parameters, separate the parameters with commas.

Table 4-5. Edit Equipment Spec Block Parameters

Aid	Parameter	Value	Description
TS3500	TOD=a	a = CISCO	Serial message sent in Cisco format
		a = NTP4	Serial message sent in NTP Type 4 format
		a = NONE	No serial message sent
	ALMCOND =a	a = ALW	Alarm conditioning for T1, TOD, and IRIG-B outputs is enabled
		a = INH	Alarm conditioning for T1, TOD, and IRIG-B outputs is disabled
	IPNE=a.b.c.d (See Note 1)	a = 0 to 255	IP address of this TimeSource 3500 (command must be sent from COM1, COM2, or Craft port to set this parameter)
		b = 0 to 255	
		c = 0 to 255	
		d = 0 to 255	
	IPSUBNET=a.b.c.d (See Note 1)	a = 0 to 255	Subnet mask for this TimeSource 3500 (command must be sent from COM1, COM2, or Craft port to set this parameter)
		b = 0 to 255	
		c = 0 to 255	
		d = 0 to 255	
	ALARM=x	x = HOLDOVER	HOLDOVER alarm
		x = GPS	GPS alarm
SPAN A & B	ALARM=x	x = LOS	LOS alarm
		x = AIS	AIS alarm
		x = ERROR	ERROR alarm
TS3500, SPAN A & B	TIME=x	x = HH-MM	Hour (00-999) and minute (00-59) time to escalate alarm
		x = 0	No alarm escalation

Table 4-5. Edit Equipment Spec Block Parameters (Continued)

Aid	Parameter	Value	Description
TS3500, SPAN A & B (Cont.)	SEVERITY1=x (See Note 7)	x = CR	Severity of initial alarm prior to escalation
		x = MJ	
		x = MN	
		x = EV	
		x = NA	
	SEVERITY2=x (See Note 7)	x = CR	Severity of escalated alarm
		x = MJ	
		x = MN	
		x = EV	
		x = NA	
	SERAFF1=x (See Note 7)	x = SA	Service affecting state of initial alarm prior to escalation
		x = NSA	
	SERAFF2=x (See Note 7)	x = SA	Service affecting state of escalated alarm
		x = NSA	
	IPGATE=a.b.c.d (See Note 1)	a = 0 to 255	Default gateway IP address for this TimeSource 3500 (command must be sent from COM1, COM2, or Craft port to set this parameter)
		b = 0 to 255	
		c = 0 to 255	
		d = 0 to 255	
	IPEM1=a.b.c.d (See Notes 1, 2, 3)	a = 0 to 255	IP address of primary element manager (port 5550 connects to this element manager to send autonomous messages, disconnects when transmit is complete)
		b = 0 to 255	
		c = 0 to 255	
		d = 0 to 255	
	IPEM1PORT=a (See Notes 1, 2, 3)	a = 0 to 65535	Port address of primary element manager (port for IPEM1 address)
	IPEM2=a.b.c.d (See Notes 1, 2, 3)	a = 0 to 255	IP address of alternate element manager (if used) (port 5550 connects to this element manager if connection cannot be made to the primary element manager)
		b = 0 to 255	
		c = 0 to 255	
		d = 0 to 255	
	IPEM2PORT=a (See Notes 1, 2, 3)	a = 0 to 65535	Port address of alternate element manager (port for IPEM2 address)
	IPINACT=a (See Note 1)	a = 0 to 10000	Port 5550 closes the connection to the Element Manager if no autonomous messages are sent during this number of 100-ms units (0 to 10,000, where 0 deactivates the timer, for example, 100 = 10 s)

Table 4-5. Edit Equipment Spec Block Parameters (Continued)

Aid	Parameter	Value	Description
GPS	ANTCBLDLY=a (See Note 4)	a = 0 to 300	Antenna cable length (meters)
	ANTELEVMASK=a (See Note 4)	a = 0 to 45	Antenna elevation mask angle (degrees)
	ANTMODE=a	a = AUTO	Automatic survey-in mode (use only with roof antenna configuration)
		a = MANUAL	Manual survey-in mode (do not use with roof antenna configuration)
	MANLAT=a-b-c-d	a = N	North latitude
		a = S	South latitude
		b = 0 to 179	Degrees of latitude
		c = 0 to 59	Minutes of latitude
		d = 0 to 999	Decimal minutes of latitude
	MANLONG= a-b-c-d	a = E	East longitude
		a = W	West longitude
		b = 0 to 179	Degrees of longitude
		c = 0 to 59	Minutes of longitude
		d = 0 to 999	Decimal minutes of longitude
	MANELEVALT=a	a = 0 to 8000	Antenna elevation (meters)
	NTPPWD=x (See Note 5)	x = 6 ASCII characters	NTP Password (contact factory)
SPAN-a (See Note 7)	ENSEMBLER=b	b = ALW	Span is ensembled
		b = INH	Span is not ensembled
	SSM=b (See Note 6)	b = ALW	SSM qualifies span input
		b = INH	SSM does not qualify span input
T1-a	ALMOUT=b	b = AIS	Output is AIS during holdover alarm
		b = SQUELCH	No output during holdover alarm
		b = SSM	Outputs are at 'STU' quality level during holdover alarm (SSM requires ESF output framing)
	FRAMING=b	b = ESF	Output framing is ESF
		b = D4	Output framing is D4

Table 4-5. Edit Equipment Spec Block Parameters (Continued)

Aid	Parameter	Value	Description
OPT-a (Additional T1 ports on 990-72050-02 systems only)	ALMOUT=b	b = AIS	Output is AIS during holdover alarm
		b = SQUELCH	No output during holdover alarm
		b = SSM	Outputs are at 'STU' quality level during holdover alarm (SSM requires ESF output framing)
	FRAMING=b	b = ESF	Output framing is ESF
		b = D4	Output framing is D4
OPT-a (990-72050-06 systems only)	ALMOUT=b	b = AIS	Output is AIS during alarm
		b = SQUELCH	Output is squelched during alarm
		b = SSM	Outputs are at 'STU' quality level for ESF framing and at 'SSUT' quality level for CAS4 and CCS4 framing during holdover alarm (SSM requires CAS4, CCS4,or ESF output framing)
	FRAMING =b	b = CAS	Output framing is CAS
		b = CAS4	Output framing is CAS4
		b = CCS	Output framing is CCS
		b = CCS4	Output framing is CCS4
		b = D4	Output framing is D4
		b = ESF	Output framing is ESF
		b = NONE	Output framing is NONE (analog) (If ALMOUT is SQUELCH, the signal turns off during holdover alarm. Any other ALMOUT option does not affect output during alarm)
OPT-a (990-72050-07 systems only)	ALMOUT=b	b = AIS	Output is AIS during alarm
		b = SQUELCH	Output is squelched during alarm
		b = SSM	Outputs are at 'STU' quality level during holdover alarm (SSM requires ESF output framing)
	FRAMING =b	b = D4	Output framing is D4
		b = ESF	Output framing is ESF
		b = CCK	Output is Composite Clock. (ALMOUT is SQUELCH by default and need not be programmed. ALMOUT cannot be set to AIS or SSM. The signal turns off during holdover alarm.)

Table 4-5. Edit Equipment Spec Block Parameters (Continued)

Aid	Parameter	Value	Description
TS3500	DCDPASSTHRU	INH	DCD port communication is inhibited
		ALW1	COM1 is the DCD interface port
		ALW2	COM2 is the DCD interface port
	DCDUSERPORT=x (See Note 8)	x = 1	COM1
		x = 2	COM2
		x = 3 or 5001, 5002, 5003, 5004	COM3 or IP port 5001 to 5004

Notes:

1. This parameter affects all Ethernet ports. Close the Ethernet ports and log off all users before issuing a command with this parameter.
2. Port 5550 makes a connection to this element manager to send TL1 autonomous messages, and closes the connection when the transmission is complete.
3. Port 5551 accepts a connection from this element manager for TL1 commands and responses.
4. When the TimeSource 3500 uses a roof antenna, only the parameters ANTCBLDLY and ANTELEVMASK, and the mode ANTMODE=AUTO, are allowed.
5. If the dbinit jumper is changed, the NTP password has to be re-entered.
6. A span must have been put into service using the ENT-EQPT command before setting the ENSEMBLER and SSM parameters.
7. When setting alarm integration time (SEVERITY or SERAFF), the type of alarm (HOLDOVER, GPS, LOS, AIS, or ERROR) has to be specified. For example, ED-EQPT::TS3500:CTAG::: ALARM=HOLDOVER, TIME=72-00, SEVERITY1=EV, SERAFF1=NSA, SEVERITY2=MJ, SERAFF2=SA; will generate a holdover event as soon as the condition is detected with an NSA flag. Once this condition has existed for 72 hours, TS3500 will generate a major alarm with an SA flag. These parameters can then be verified using the RTRV-EQPT command.
8. All commands on DCDUSERPORT having TID which equals SID of the DCD are forwarded to the DCD. Similarly, the responses from the DCD are sent to the provisioned DCDUSERPORT.

Response Format:

```
    <sid> <date> <time>
M  <ctag> COMPLD
    /*LINK:<link>,CMD:<command>*/
;
```

Enter Equipment

This command puts optional inputs in service, and causes the selected input to be monitored. Additionally, this command can cause an input to be ensembled. All in-service inputs are monitored. The Delete Equipment command must be used to take an input out of service. The command format is:

```
ENT-EQPT:[<tid>]:<aid>:<ctag>:::<spec_block>;
```

Aid	Value	Item Addressed
SPAN-a	a = A	T1 span A input
	a = B	T1 span B input

The parameters which can be entered in the <spec_block> are listed below. For any specific <aid> entered in a command, only certain parameters are valid. For each valid parameter, choose the appropriate value from the Value column. When entering multiple parameters, separate the parameters with commas.

Aid	Parameter	Value	Description
SPAN-a	ENSEMBLER=b	b = ALW	Span is monitored and ensembled
		b = INH	Span is monitored, but not ensembled

Example to set an input to be monitored, but not ensembled:
```
ENT-EQPT:[<tid>]:SPAN-A:<ctag>;
```

Example to set an input to be monitored and ensembled:
```
ENT-EQPT:[<tid>]:SPAN-A:<ctag>:::ENSEMBLER=ALW;
```

Response Format:

```
    <sid> <date> <time>
M  <ctag> COMPLD
    /*LINK:<link>,CMD:<command>*/
;
```

Enter User Security

This command allows a system administrator to enter a new user, and the new user's user name, password, and access level. The command format is:

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

Parameter	Parameter Description
<uid>	User name – must start with an alpha character and have a maximum of 10 characters.
<pid>	Password – has to be a minimum of 8 characters and a maximum of 10 characters. It must contain at least one digit and one of the following characters: ! $ % ' ( ) * + . / < > ? @ Password cannot be the same as User ID even if extra characters are appended to password at the end.
<uap>	Access level (1 to 5). Levels 1 to 4 do not allow the user to enter or delete users. Level 5 allows the user to enter or delete users.

Command Example:
```
ENT-USER-SECU::TELECOM:<ctag>::TS3000!!,,1;
```

Response Format:

```
    <sid> <date> <time>
M  <ctag> COMPLD
    /*LINK:<link>,CMD:<command>*/
    ;
```

Initialize Log

This command clears the alarm log. The command format is:

```
INIT-LOG:[<tid>]::<ctag>::almlog;
```

Response Format:

```
    <sid> <date> <time>
M  <ctag> COMPLD
    /*LINK:<link>,CMD:<command>*/
    ;
```

Initialize Register

This command resets to zero all the performance monitoring associated with the entered aid. The command can be used to reset either span independently or both spans at the same time. The command format is:

```
INIT-REG-EQPT:[<tid>]:<aid>:<ctag>::ALL;
```

Aid	Value	Item Addressed
SPAN-a	a = A	T1 span A input
	a = B	T1 span B input
ALL	—	T1 span A and span B inputs

Response Format:
```
     <sid> <date> <time>
M  <ctag> COMPLD
     /*LINK:<link>,CMD:<command>*/
     ;
```

Initialize System

This command resets the specified processor.

⚠️ **Caution:** Using this command with an <aid> of TS3500 will cause a loss of outputs until GPS satellites are reacquired if ALMOUT is SQUELCH, or unstable outputs if ALMOUT is not SQUELCH.

The command format is:

```
INIT-SYS:[<tid>]:<aid>:<ctag>::1;
```

Aid	Item Addressed
TS3500	System software
GPS	GPS receiver software

Response Format:

```
    <sid> <date> <time>
M   <ctag> COMPLD
    /*LINK:<link>,CMD:<command>*/
    ;
```

Operate Alarm Cutoff All

This command deactivates (silences) the audible office alarm. The command format is:

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

Response Format:

```
    <sid> <date> <time>
M   <ctag> COMPLD
    /*LINK:<link>,CMD:<command>*/
    ;
```

Retrieve Alarm All

This command displays all current system alarms. The command format is:

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

If there are no alarms:
```
    <sid> <date> <time>
M   <ctag> COMPLD
    /*LINK:<link>,CMD:<command>*/
    ;
```

If there is at least one alarm:
```
    <sid> <date> <time>
M   <ctag> COMPLD
    "<aid>:<ntfcncde>,<condtype>,<srveff>,
<ocrdat>,<ocrtm>,,:\"<conddescr>\""...
    /*LINK:<link>,CMD:<command>*/
    ;
```

> **Note:** Refer to the Troubleshooting chapter for a list of all
> <conddescr> messages, and the recommended action.

Retrieve Alarm Equipment

This command displays current alarms for the specified equipment. The command format is:

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

Aid	Value	Item Addressed
TS3500	—	System (all TS3500 alarms)
SPAN-a	a = A	T1 span A input
	a = B	T1 span B input
GPS	—	GPS receiver

If there are no alarms:
```
    <sid> <date> <time>
M   <ctag> COMPLD
    /*LINK:<link>,CMD:<command>*/
;
```

If there is at least one alarm:
```
    <sid> <date> <time>
M   <ctag> COMPLD
    "<aid>:<ntfcncde>,<condtype>,<srveff>,
        <ocrdat>,<ocrtm>,,:\"<conddescr>\""...
    /*LINK:<link>,CMD:<command>*/
;
```

Note: Refer to the Troubleshooting chapter for a list of all <conddescr> messages, and the recommended action.

Retrieve Communication

This command displays communication port parameter settings. The command format is:

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

Aid	Value	Item Addressed
COM-a	a = 1	Serial communication port 1
	a = 2	Serial communication port 2
	a = 3	Serial communication port 3
	a = 5001	Ethernet user interface port 5001
	a = 5002	Ethernet user interface port 5002
	a = 5003	Ethernet user interface port 5003
	a = 5004	Ethernet user interface port 5004
	a = 5551	Ethernet element manager interface port 5551
ALL	—	All communication ports

Response Format:

```
    <sid> <date> <time>
M   <ctag> COMPLD
    "<aid>:::<spec_block>"...
    /*LINK:<link>,CMD:<command>*/
;
```

The parameters which may be displayed in the <spec_block> are listed below.

Table 4-6. Retrieve Communication Port Spec Block Parameters

Parameter	Value	Description
MONMSG=a	a = ALW	View messages from all ports
	a = INH	View messages from this port only
KEEPALIVE=a	a = 1 to 255	Inactive minutes until the unit sends a COMPLD message to keep the connection from being closed
	a = 0	No COMPLD message is output
ENDOFTEXT=a	a = 1 to 9F	Hex code at end of all responses
	a = 00	No hex code at end of responses
ECHO=a	a = ALW	Echoes characters received so they appear on the user's screen as typed
	a = INH	Local echo is disabled

Table 4-6. Retrieve Communication Port Spec Block Parameters (Continued)

Parameter	Value	Description
COMPRI=a	a = ALW0	TL1 commands and responses, no autonomous messages sent
	a = ALW1	TL1 commands and responses, sends autonomous messages
	a = ALW2	TL1 commands and responses, sends autonomous messages whether or not logged on
	a = INH	Closes connection, logs off a user (if logged on), and keeps port from use (a port cannot close itself)
AUTOLOGOFF=a	a = 1 to 255	Inactive minutes until the unit logs off the user, keeping the connection open
	a = 0	Autologoff is disabled
SWCONTROL=a	a = ALW	XON/XOFF flow control is enabled
	a = INH	XON/XOFF flow control is not enabled
HWCONTROL=a	a = ALW	Serial port CTS/RTS flow control is enabled
	a = INH	Serial port CTS/RTS flow control is not enabled
BAUD=a	a = 115	Serial port baud rate is 115 kbaud
	a = 57.6	Serial port baud rate is 57.6 kbaud
	a = 38.4	Serial port baud rate is 38.4 kbaud
	a = 19.2	Serial port baud rate is 19.2 kbaud
	a = 9600	Serial port baud rate is 9600 baud
	a = 4800	Serial port baud rate is 4800 baud
	a = 2400	Serial port baud rate is 2400 baud
PARITY=a	a = EVEN	Even parity bit is enabled
	a = ODD	Odd parity bit is enabled
	a = NONE	Parity bit is disabled
STOP=a	a = 1	1 stop bit
	a = 2	2 stop bits

Retrieve Condition All

This command displays all current system alarms and events. The command format is:

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

If there are no alarms or events:
```
    <sid> <date> <time>
M   <ctag> COMPLD
    /*LINK:<link>,CMD:<command>*/
;
```

If there is at least one alarm or event:
```
    <sid> <date> <time>
M   <ctag> COMPLD
    "<aid>:<ntfcncde>,<condtype>,<srveff>,
        <ocrdat>,<ocrtm>,,,:\"<conddescr>\""...
    /*LINK:<link>,CMD:<command>*/
;
```

Note: Refer to the Troubleshooting chapter for a list of all <conddescr> messages, and the recommended action.

Retrieve Condition Equipment

This command displays current alarms and events for the specified equipment. The command format is:

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

Aid	Value	Item Addressed
TS3500	—	System
SPAN-a	a = A	T1 span A input
	a = B	T1 span B input
GPS	—	GPS receiver

Command Example:
```
RTRV-COND-EQPT::TS3500:<ctag>;
```

If there are no alarms:
```
      <sid> <date> <time>
M  <ctag> COMPLD
   /*LINK:<link>,CMD:<command>*/
   ;
```

If there is at least one alarm:
```
      <sid> <date> <time>
M  <ctag> COMPLD
   "<aid>:<ntfcncde>,<condtype>,<srveff>,
<ocrdat>,<ocrtm>,,,\"<conddescr>\""...
   /*LINK:<link>,CMD:<command>*/
   ;
```

Note: Refer to the Troubleshooting chapter for a list of all <conddescr> messages, and the recommended action.

Retrieve Equipment

This command displays parameter settings for the specified equipment. The command format is:

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

Aid	Value	Item Addressed
ALL	—	All aids for this command
TS3500	—	System
GPS	—	GPS receiver
SPAN-a	a = A	Span A input
	a = B	Span B input
T1-a	a = A	T1 A output
	a = B	T1 B output
OPT-a	a = 1 to 8	T1 1 through 8 outputs option (990-72050-02 systems only) T1 or E1 outputs option (990-72050-06 systems only) T1 or CCK outputs option (990-72050-07 systems only)

Command Example:

```
RTRV-EQPT::ALL:G;
```

Response Format:

```
     <sid> <date> <time>
M  <ctag> COMPLD
     "<aid>::::<spec_block>"...
     /*LINK:<link>,CMD:<command>*/
;
```

The parameters which may be displayed in the <spec_block> are listed in
Figure 4-7.

Table 4-7. Retrieve Equipment Spec Block Parameters

Aid	Parameter	Value	Parameter Description
TS3500	TOD=a	a = CISCO	Serial message sent is Cisco format
		a = NTP4	Serial message sent is NTP Type 4 format
		a = NONE	No serial message is sent
	ALMCOND=a	a = ALW	Alarm conditioning for outputs is enabled
		a = INH	Alarm conditioning for outputs is disabled
	IPNE=a.b.c.d	a = 0 to 255	This unit's IP address
		b = 0 to 255	
		c = 0 to 255	
		d = 0 to 255	
	IPSUBNET=a.b.c.d	a = 0 to 255	Subnetwork mask
		b = 0 to 255	
		c = 0 to 255	
		d = 0 to 255	

Table 4-7. Retrieve Equipment Spec Block Parameters (Continued)

Aid	Parameter	Value	Parameter Description
	IPGATE=a.b.c.d	a = 0 to 255	Default gateway IP address
		b = 0 to 255	
		c = 0 to 255	
		d = 0 to 255	
	IPEM1=a.b.c.d	a = 0 to 255	Primary element manager IP address
		b = 0 to 255	
		c = 0 to 255	
		d = 0 to 255	
	IPEM1PORT=a	a = 0 to 65535	Primary element manager output port number
	IPEM2=a.b.c.d	a = 0 to 255	Alternate element manager IP address
		b = 0 to 255	
		c = 0 to 255	
		d = 0 to 255	
	IPEM2PORT=a	a = 0 to 65535	Alternate element manager port number
	IPINACT=a	a = 0 to 10000	Port 5550 closes the connection to the Element Manager if no autonomous messages are sent during this number of 100-ms units (0 to 10,000, where 0 deactivates the timer, for example, 100 = 10 s)
	IPNTP=a	a = ALW	SNTP feature activated
	DCDPASSTHRU	INH	DCD port communication is inhibited
		ALW1	COM1 is the DCD interface port
		ALW2	COM2 is the DCD interface port
	DCDUSERPORT=a (See Note 1)	a = 1	COM1
		a = 2	COM2
		a = 3 or 5001, 5002, 5003, 5004	COM3 or IP port 5001 to 5004

Table 4-7. Retrieve Equipment Spec Block Parameters (Continued)

Aid	Parameter	Value	Parameter Description
GPS	ANTCBLDLY=a	a = 0 to 330	Antenna cable length (meters)
	ANTELEVMASK=a	a = 0 to 45	Antenna elevation mask angle (degrees)
	ANTMODE=a	a = AUTO	Automatic survey-in mode
		a = MANUAL	Manual survey-in mode (do not use for roof antenna)
	MANLAT=a-b-c-d	a = N	North latitude
		a = S	South latitude
		b = 0 to 179	Degrees of latitude
		c = 0 to 59	Minutes of latitude
		d = 0 to 999	Decimal minutes of latitude
	MANLONG= a-b-c-d	a = E	East longitude
		a = W	West longitude
		b = 0 to 179	Degrees of longitude
		c = 0 to 59	Minutes of longitude
		d = 0 to 999	Decimal minutes of longitude
	MANELEV=a	a = 0 to 8000	Antenna elevation (meters)
SPAN-a	ENSEMBLER=b	b = ALW	T1 span is ensembled
		b = INH	T1 span is not ensembled
	MONITOR=b	b = ALW	T1 span is monitored
		b = INH	T1 span is not monitored
	SSM=b	b = ALW	SSM message is used to qualify input
		b = INH	SSM message is not used to qualify input
T1-a	FRAMING=b	b = ESF	Output framing is ESF
		b = D4	Output framing is D4
	ALMOUT=b	b = AIS	Output is AIS during alarm
		b = SQUELCH	Output is squelched during alarm
		b = SSM	Outputs are at 'STU' quality level during holdover alarm (SSM requires ESF output framing)

Table 4-7. Retrieve Equipment Spec Block Parameters (Continued)

Aid	Parameter	Value	Parameter Description
TS3500	ALARM=x	x = HOLDOVER	HOLDOVER alarm
		x = GPS	GPS alarm
SPAN A & B	ALARM=x	x = LOS	LOS alarm
		x = AIS	AIS alarm
		x = ERROR	ERROR alarm
TS3500, SPAN A & B	TIME=x	x = HH-MM	Hour (00-999) and minute (00-59) time to escalate alarm
		x = 0	No alarm escalation
	SEV1=x (See Note 2)	x = CR	Severity of initial alarm prior to escalation
		x = MJ	
		x = MN	
		x = EV	
		x = NA	
	SEV2=x (See Note 2)	x = CR	Severity of escalated alarm
		x = MJ	
		x = MN	
		x = EV	
		x = NA	
	SAFF1=x (See Note 2)	x = SA	Service affecting state of initial alarm prior to escalation
		x = NSA	
	SAFF2=x (See Note 2)	x = SA	Service affecting state of escalated alarm
		x = NSA	
OPT-a (990-72050-02 systems only)	ALMOUT=b	b = AIS	Output is AIS during alarm
		b = SQUELCH	Output is squelched during alarm
		b = SSM	Outputs are at 'STU' quality level during holdover alarm (SSM requires ESF output framing)
	FRAMING=b	b = ESF	Output framing is ESF
		b = D4	Output framing is D4

Table 4-7. Retrieve Equipment Spec Block Parameters (Continued)

Aid	Parameter	Value	Parameter Description
OPT-a (990-720 50-06 systems only)	ALMOUT=b	b = AIS	Output is AIS during alarm
		b = SQUELCH	Output is squelched during alarm
		b = SSM	Outputs are at 'STU' quality level for ESF framing and at 'SSUT' quality level for CAS4 and CCS4 framing during holdover alarm (SSM requires CAS4, CCS4,or ESF output framing)
	FRAMING =b	b = CAS	Output framing is CAS
		b = CAS4	Output framing is CAS4
		b = CCS	Output framing is CCS
		b = CCS4	Output framing is CCS4
		b = D4	Output framing is D4
		b = ESF	Output framing is ESF
		b = NONE	Output framing is NONE (analog) (If ALMOUT is SQUELCH, the signal turns off during holdover alarm. Any other ALMOUT option does not affect output during alarm)
OPT-a (990-720 50-07 systems only)	ALMOUT=b	b = AIS	Output is AIS during alarm
		b = SQUELCH	Output is squelched during alarm
		b = SSM	Outputs are at 'STU' quality level during holdover alarm (SSM requires ESF output framing)
	FRAMING =b	b = D4	Output framing is D4
		b = ESF	Output framing is ESF
		b = CCK	Output is Composite Clock. (ALMOUT is SQUELCH by default and need not be programmed. ALMOUT cannot be set to AIS or SSM. The signal turns off during holdover alarm.)

Notes:

1. All commands on DCDUSERPORT TID which equal SID of the DCD are forwarded to the DCD. Similarly, the responses from the DCD are sent to the provisioned DCDUSERPORT.

2. When setting alarm integration time (SEVERITY or SERAFF), the type of alarm (HOLDOVER, GPS, LOS, AIS, or ERROR) has to be specified. For example, ED-EQPT::TS3500:CTAG::: ALARM=HOLDOVER, TIME=72-00, SEVERITY1=EV, SERAFF1=NSA, SEVERITY2=MJ, SERAFF2=SA; will generate a holdover event as soon as the condition is detected with an NSA flag. Once this condition has existed for 72 hours, TS3500 will generate a major alarm with an SA flag. These parameters can then be verified using the RTRV-EQPT command.

Retrieve GPS Status

This command displays the position of the GPS receiver, UTC time, and status information for each of the GPS satellites in view. The command format is:

```
RTRV-GPS-STAT:[<tid>]:GPS:<ctag>;
```

Response Format:

```
   <sid> <date> <time>
M  <ctag> COMPLD
   "<aid>:LAT=a,LONG=a,ALT=a,UTC=a
   ANTMODE=a,MERIT=a,SUCCESS=a%

   SAT-a,USE=a,CNO=a,ELEV=a,AZ=a,
       LOCK=a..."
   /*LINK:<link>,CMD:<command>*/
;
```

Table 4-8. Retrieve GPS Status Parameter Descriptions

Parameter	Value	Description
LAT=a	a = dd.mm.fffN	Current latitude north in degrees, minutes, and decimal-fractions of a minute
	a = dd.mm.fffS	Current latitude south in degrees, minutes, and decimal-fractions of a minute

Table 4-8. Retrieve GPS Status Parameter Descriptions (Continued)

Parameter	Value	Description
LONG=a	a = ddd.mm.fffE	Current longitude east in degrees, minutes, and decimal-fractions of a minute
	a = ddd.mm.fffW	Current longitude west in degrees, minutes, and decimal-fractions of a minute
ALT=a	a = mm.mmm	Altitude in meters to the thousandth of a meter, referenced to mean sea level
UTC=a	a = hh-mm-ss	Universal Coordinated Time (UTC), where hh is hours (00 to 23), mm is minutes (00 to 59), and ss is seconds (00 to 59)
ANTMODE=a	a = AUTO	Automatic survey-in mode
	a = MANUAL	Manual survey-in mode
MERIT=a	a = bbb	Timing error estimate in ns
SUCCESS=a	a = bb	Percentage of time satellites are visible
SAT=a	a = 1 to 25	Satellite identification number
USE=a	a = Y	Satellite in use
	a = N	Satellite not in use
CNO=a	a = nn	Satellite carrier-to-noise ratio
ELEV=a	a = dd	Satellite elevation in degrees
AZ=a	a = ddd	Satellite azimuth in degrees
LOCK=a	a = 1 to 2500	Seconds since the receiver locked to the satellite carrier

Retrieve Header

This command allows for NMA integration to use as a keep alive message. The command format is:

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

Response Format:

```
RTRV-HDR:::114;
TELECOM1 97-12-08 15:04:13
M 114 COMPLD
```

Retrieve Inventory

This command displays information about the specified equipment. The command format is:

```
RTRV-INVENTORY:[<tid>]:TS3500:<ctag>;
```

Response Format:

```
     <sid> <date> <time>
M   <ctag> COMPLD
     "TS3500::::CARD=TS3500,
     MACID=a,
     TYPE=a,
     PART=a,
     SERIAL=a,
     SOFTVER_TS3000=a,
     SOFTVER_GPS=a,
     SOFTVER_DEV=a"
     /*LINK: x, CMD:<command>*/
 ;
```

Table 4-9. Retrieve Inventory Parameter Descriptions

Parameter	Value	Description
CARD=TS3500	—	System
MACID=a.b.c.d.e	a = 00 to FF in hexadecimal format	MAC address
	b = 00 to FF in hexadecimal format	
	c = 00 to FF in hexadecimal format	
	d = 00 to FF in hexadecimal format	
	e = 00 to FF in hexadecimal format	

Table 4-9. Retrieve Inventory Parameter Descriptions (Continued)

Parameter	Value	Description
TYPE=a	a = NO OPTION BOARD	TimeSource 3500 (standard) (990-72050-01 systems)
	a = T1 OPTION BOARD	TimeSource 3500 with eight additional T1 outputs (990-72050-02 systems)
	a = CCK OPTION BOARD	TimeSource 3500 with eight composite clock outputs (990-72050-03 systems)
	a = IRIG OPTION BOARD	TimeSource 3500 with two TOD IRIG-B outputs (990-72050-05 systems)
	a = MIXED E1/T1 OPTION BOARD	TimeSource 3500 with eight mixed E1/T1 outputs (990-72050-06 systems)
	a = MIXED T1/CCK OPTION BOARD	TimeSource 3500 with eight mixed T1/CCK outputs (990-72050-07 systems)
PART=a	—	a = Part number
SERIAL=a	—	a = Serial number
SOFTVER_ TS3000=a	a = bb.cc.dd	System software version
SOFTVER_GPS=a	a = bb.cc.dd	GPS receiver software version
SOFTVER_ DEV=a	a = bb.cc.dd or bb.cc.dd-ee.ff.gg	Device software version

Retrieve Log

This command retrieves the alarm log. The command format is:

```
RTRV-LOG:[<tid>]::<ctag>::almlog;
```

Response Format:

```
   <sid> <date> <time>
M  <ctag> COMPLD
   "<logtype>"
   "<aid>:<ntfcncde>,<condtype>,<srverff>,
   <ocrdat>,<ocrtm>,,[,]:<conddescr>,
        [:<dgntype>]"*/
   /*LINK:<link>,CMD:<command>*/
;
```

Parameter	Parameter Description
<ntfcncde>	Severity of alarm: critical, major, or minor
<condtype>	Single type of alarm condition being reported on this particular line, i.e., LOS, FAIL, TBD for each alarm
<srverff>	Alarm is service affecting (SA) or non-service affecting (NSA)
<ocrdat>	Occurrence date in MOY-DOM format, where MOY=1 to 12 and DOM=1 to 31
<ocrtm>	Occurrence Time of Day in HOD-MOH-SOM format, where HOD=0 to 23, MOH=0 to 59, SOM=0 to 59
<conddescr>	Text string of no more than 64 characters enclosed within a pair of escape quotes (\)
<dgntype>	TL1 identifier up to 16 characters in length

Retrieve Performance Monitoring

This command retrieves the performance monitoring data from the TimeSource 3500. This data includes MTIE, TDEV, PHASE1S, and PHASE1M. For current 24 hour data, MTIE, TDEV, and PHASE1S data are grouped every 15 minutes. In addition, there are 7 daily summaries of MTIE, TDEV, and PHASE1M. Each value type can be retrieved for both span inputs A and B.

MTIE data includes the following time intervals in seconds: 1, 4, 10, 40, 100, 300, 900, 1800, 3600, 7200, 14400, 28800, and 86400.

TDEV data includes the following time intervals in seconds: 1, 2, 4, 8, 16, 32, 64, 128, 256, 512, and 1024.

PHASE1S data includes 900 seconds of phase values.

PHASE1M data includes 60 minutes of phase values.

The command format is:

```
RTRV-PM-EQPT:[<tid>]:SPAN-a:<ctag>::<montype>
        ,,,,,[<mondat>][<montm>];
```

Parameter	Value	Description
SPAN-a	a = A	E1 span A input
	a = B	E1 span B input

Parameter	Value	Description
<montype>	MTIE	MTIE data reported
	TDEV	TDEV data reported
	PHASE1S	1-second phase data reported
	PHASE1M	1-minute phase data reported
<mondat>=x	x = 1 to 12	Monitor date, month of the year
	x = 1 to 31	Monitor date, day of the month
<montm>=x	x = 0 to 23	Monitor time, hour past midnight
	x = 0 to 59	Monitor time, minutes past the hour

MTIE Response Format:

```
     <sid> <date> <time>
M  <ctag>COMPLD
   "SPAN-a:MTIE-a,<monval>,<vldty>
              ,,,,<mondat>,<montm>"
           .      .     .
           .      .     .
           .      .     .
   "SPAN-a:MTIE-a,<monval>,<vldty>
              ,,,,<mondat>,<montm>"
   /*LINK:<link>,CMD:<command>*/
;
```

MTIE Data types:

■ One 15 minute bin from the last 24 hours of data. To select a 15 minute bin, enter mondat and montm. Any mondat/montm combination outside of the past 24 hour window is denied. Any time increment may be entered. The system rounds the value to the nearest bin. Entered minutes of 1 to 15 correspond to the first 15 minute bin, 16 to 30 correspond to the second 15 minute bin, etc.

■ One day summary from the last 7 days of daily summaries. To select one daily summary, enter mondat, but do not enter montm. Any mondat not in the previous 7 day window is denied.

Parameter	Value	Description
SPAN-a	a = A	E1 span A input
	a = B	E1 span B input

Parameter	Value	Description
MTIE-a	a = 1S, 2S, 4S, 10S, 40S, 100S, 300S, 900S, 1800S, 3600S, 7200S, 14400S, 28800S, or 86400S	MTIE monitored type, where a is time intervals in seconds
<monval>	One 15 min bin from the last 24 h of data	Monitored value
<vldty>	COMPL	Data is valid
	NA	Data is not valid
MONDAT=a-b	a = 1 to 12	Monitor date, month of the year
	b = 1 to 31	Monitor date, day of the month
MONTM=a-b	a = 0 to 23	Monitor time, hour of the day
	b = 0 to 59	Monitor time, minute of the hour

MTIE Response Example:
```
    TS3500-2009 2000-05-25 11:01:58
M   G COMPLD
    "SPAN-A:MTIE-1S,1,COMPL
        ,,,,,00-05-25,11-00-00"
    "SPAN-A:MTIE-4S,1,COMPL
        ,,,,,00-05-25,11-00-00"
    "SPAN-A:MTIE-10S,1,COMPL
        ,,,,,00-05-25,11-00-00"
    "SPAN-A:MTIE-40S,1,COMPL
        ,,,,,00-05-25,11-00-00"
    "SPAN-A:MTIE-100S,1,COMPL
        ,,,,,00-05-25,11-00-00"
    "SPAN-A:MTIE-300S,1,COMPL
        ,,,,,00-05-25,11-00-00"
    "SPAN-A:MTIE-900S,1,COMPL
        ,,,,,00-05-25,11-00-00"
    "SPAN-A:MTIE-1800S,1,COMPL
        ,,,,,00-05-25,11-00-00"
    "SPAN-A:MTIE-3600S,1,COMPL
        ,,,,,00-05-25,11-00-00"
    "SPAN-A:MTIE-7200S,1,COMPL
        ,,,,,00-05-25,11-00-00"
    "SPAN-A:MTIE-14400S,1,COMPL
        ,,,,,00-05-25,11-00-00"
    "SPAN-A:MTIE-28800S,1,COMPL
        ,,,,,00-05-25,11-00-00"
```

```
        "SPAN-A:MTIE-86400S,1,COMPL
               ,,,,,00-05-25,11-00-00"
        /*LINK:5002,CMD:RTRV-PM-EQPT::
               SPAN-A:G::MTIE*/
    ;
```

TDEV Response Format:

```
        <sid> <date> <time>
    M   <ctag>COMPLD
        "SPAN-a:TDEV-a,<monval>,<vldty>
                    ,,,,<mondat>,<montm>"
                .       .      .
                .       .      .
                .       .      .
        "SPAN-a:TDEV-a,<monval>,<vldty>
                    ,,,,<mondat>,<montm>"
        /*LINK:<link>,CMD:<command>*/
    ;
```

TDEV Data types:

- One 15 minute bin from the last 24 hours of data. To select a 15 minute bin, enter mondat and montm. Any mondat/montm combination outside of the past 24 hour window is denied. Any time increment may be entered. The system rounds the value to the nearest bin. Entered minutes of 1 to 15 correspond to the first 15 minute bin, 16 to 30 correspond to the second 15 minute bin, etc.

- One day summary from the last 7 days of daily summaries. To select one daily summary, enter mondat, but do not enter montm. Any mondat not in the previous 7 day window is denied.

Parameter	Value	Item Addressed
SPAN-a	a = A	E1 span A input
	a = B	E1 span B input
TDEV=a	a = 1S, 2S, 4S, 8S, 16S, 32S, 64S, 128S, 256S, 512S, or 1024S	TDEV monitored type, where a is time intervals in seconds
<monval>	One 15 min bin from the last 24 h of data	Monitored value
<vldty>	COMPL	Data is valid
	NA	Data is not valid
MONDAT=a-b	a = 1 to 12	Monitor date, month of the year
	b = 1 to 31	Monitor date, day of the month

Parameter	Value	Item Addressed
MONTM=a-b	a = 0 to 23	Monitor time, hour of the day
	b = 0 to 59	Monitor time, minute of the hour

TDEV Response Example:
```
      TS3500-2009 2000-05-25 11:01:58
   M  G COMPLD
      "SPAN-A:TDEV-1S,0,COMPL
           ,,,,,00-05-25,11-00-00"
      "SPAN-A:TDEV-2S,0,COMPL
           ,,,,,00-05-25,11-00-00"
      "SPAN-A:TDEV-4S,0,COMPL
           ,,,,,00-05-25,11-00-00"
      "SPAN-A:TDEV-8S,0,COMPL
           ,,,,,00-05-25,11-00-00"
      "SPAN-A:TDEV-16S,0,COMPL
           ,,,,,00-05-25,11-00-00"
      "SPAN-A:TDEV-32S,0,COMPL
           ,,,,,00-05-25,11-00-00"
      "SPAN-A:TDEV-64S,0,COMPL
           ,,,,,00-05-25,11-00-00"
      "SPAN-A:TDEV-128S,0,COMPL
           ,,,,,00-05-25,11-00-00"
      "SPAN-A:TDEV-256S,0,COMPL
           ,,,,,00-05-25,11-00-00"
      "SPAN-A:TDEV-512S,0,COMPL
           ,,,,,00-05-25,11-00-00"
      "SPAN-A:TDEV-1024S,0,COMPL
           ,,,,,00-05-25,11-00-00"
      /*LINK:5002,CMD:RTRV-PM-EQPT::
           SPAN-A:G::TDEV*/
   ;
```

PHASE1S Response Format:
```
      <sid> <date> <time>
   M  <ctag>COMPLD
      "SPAN-a:PHASE1S,<monval>,<Δ>,<Δ>,<Δ>,<Δ>,
   <Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,
   <Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,
   <Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,
   <Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,
   <Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,
   <Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,
   <Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,
   <Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,
   <Δ>,<Δ>,<Δ>,<vldty>,,,,
   <mondat>,<montm>"
              .    .    .
```

```
              .       .       .
              .       .       .
      "SPAN-a:PHASE1S,<monval>,<Δ>,<Δ>,<Δ>,<Δ>,
  <Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,
  <Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,
  <Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,
  <Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,
  <Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,
  <Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,
  <Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,
  <Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,
  <Δ>,<Δ>,<Δ>,<vldty>,,,,
  <mondat>,<montm>"
      ;
```

PHASE1S Data types:

- One 15 minute bin from the last 24 hours of data as 900 seconds of data. To select a 15 minute bin, enter mondat and montm. Any mondat/montm combination outside of the past 24 hour window is denied. Any time increment may be entered. The system rounds the value to the nearest bin.

- Entered minutes of 1 to 15 correspond to the first 15 minute bin, 16 to 30 correspond to the second 15 minute bin, etc.

- The first monitor value is the first second of the 900 second window.

- The 900 seconds of data is broken into 9 groups of 100 seconds. For each group of 100 seconds, the first value is the absolute 1 second phase for that group. The absolute 1 second phase value is followed by 99 seconds of delta phase values.

Parameter	Value	Item Addressed
SPAN-a	a = A	E1 span A input
	a = B	E1 span B input
PHASE1S	—	Phase 1S monitored type, which shows 900 s of phase values
<monval>	First s of the 100 s data group. There are 9 groups of 100 s.	Absolute monitored phase value
<Δ>	The difference (Δ) from the proceeding number	99 s of delta phase values which follow the absolute 1 s phase value
<vldty>	COMPL	Data is valid
	NA	Data is not valid

Parameter	Value	Item Addressed
MONDAT=a-b	a = 1 to 12	Monitor date, month of the year
	b = 1 to 31	Monitor date, day of the month
MONTM=a-b	a = 0 to 23	Monitor time, hour of the day
	b = 0 to 59	Monitor time, minute of the hour

PHASE1S Response Example:
```
     TS3500-2009 00-05-25 11:01:58
M  G COMPLD

"SPAN-A:PHASE1S,-325,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,1,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,1,0,0,0,0,0,0,0,
0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,COMPL,,,,0
0-10-13,12-45-00"

  "SPAN-A:PHASE1S,-323,0,0,0,0,0,0,0,1,0,0,0,0,0,
0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,0,0,0,0,0,COMPL,,,,00-10-13,12-46-40"

  "SPAN-A:PHASE1S,-321,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,1,0,0,0,0,0,0,0,0,0,
0,0,0,0,0,-1,0,0,0,0,0,0,0,
0,0,0,0,0,0,0,0,0,0,0,0,0,COMPL,,,,00-10-13,12-48-20"

  "SPAN-A:PHASE1S,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,NA,,,,00-1
0-13,12-50-00"

  "SPAN-A:PHASE1S,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,NA,,,,00-1
0-13,12-51-40"
```

PHASE1S Response Example (cont'd):
```
  "SPAN-A:PHASE1S,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,NA,,,,00-1
0-13,12-53-20"
```

```
    "SPAN-A:PHASE1S,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,NA,,,,00-1
0-13,12-55-00"

    "SPAN-A:PHASE1S,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,NA,,,,00-1
0-13,12-56-40"

    "SPAN-A:PHASE1S,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,NA,,,,00-1
0-13,12-58-20"

    /* LINK: 5001, CMD: RTRV-PM-EQPT::SPAN-A:C:: PHASE1S,,,,,
*/

;
```

PHASE1M Response Format:

```
    <sid> <date> <time>
M  <ctag>COMPLD
    "SPAN-a:PHASE1M,<monval>,<monval>,
        <monval>,<monval>,<monval>,<monval>,
             .    .    .
             .    .    .
             .    .    .
        <monval>,<monval>,<monval>,<monval>,
        <vldty>,,,,<mondat>,<montm>"
    /*LINK:<link>,CMD:<command>*/
;
```

PHASE 1M Data types:

- The TimeSource 3500 collects a full 7 days of 1 minute phase data.

- The 1 minute phase data is displayed in 1 hour groups. Each request for 1 minute phase is synchronized to the hour.

- Any mondat/montm combination outside of the past 7 day window is denied. Any time increment may be entered. The system rounds the value to the nearest hour, i.e., the minute and second field of the montm is ignored.

- The first value (monval) is the oldest value in the range selected. For example, if montm = 8:45:32, the first monval will exceed time 8:00:00 followed by the value at 8:01:00, etc.

Parameter	Value	Item Addressed
SPAN-a	a = A	E1 span A input
	a = B	E1 span B input
PHASE1M	—	Phase 1M monitored type, which shows 1 min phase data in 1 h groups of data
<monval>	Oldest value in the range selected from the <montm> value assigned in the command	Absolute monitored phase value
<vldty>	COMPL	Data is valid
	NA	Data is not valid
MONDAT=a-b	a = 1 to 12	Monitor date, month of the year
	b = 1 to 31	Monitor date, day of the month
MONTM=a-b	a = 0 to 23	Monitor time, hour of the day
	b = 0 to 59	Monitor time, minute of the hour

PHASE1M Response Example:

```
    TS3500-2009 2000-05-25 11:01:58
M  G COMPLD
   "SPAN-A:PHASE1M,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
          0,0,COMPL,,,,,00-05-25,100-00"
   /*LINK:5002,CMD:RTRV-PM-EQPT::
          SPAN-A:G::PHASE1M*/
;
```

Retrieve Status Security

This command allows a system administrator with level 5 access to identify the current users logged in to each port that is currently being used. The command format is:

```
    RTRV-STATUS-SECU:[<tid>]::<ctag>;
```

Response Format Example:

```
    [<tid>] 05-12-25   16:30:45
M  <ctag> COMPLD
"COM-1:<user name>"
"COM-2:<user name>"
"COM-3:<user name>"
"COM-5551:<user name>"
"COM-5001:<user name>"
"COM-5002:<user name>"
"COM-5003:<user name>"
"COM-5004:<user name>"
```

Retrieve User Security

This command allows a system administrator to retrieve security parameters for a single user or for all users. The command format is:

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

Parameter	Value	Item Addressed
<uid>	(user name)	Single user
	ALL	All users

Response Format:

```
    <sid> <date> <time>
M  <ctag> COMPLD
"<aid>:,<uap>;,UOUT=<uout>"...
/*LINK:<link>,CMD:<command>*/
;
```

Parameter	Parameter Description
<uap>	Access level (1 to 5)
<uout>	(Displayed, but not implemented) Password for this account expires in this number (0 to 180) of days of inactivity; 0 indicates no expiration

Set Source Identifier

This command sets the name of the equipment sending the message. The command format is:

```
SET-SID:[<tid>]::<ctag>::<sid>;
```

Parameter	Parameter Description
<sid>	Source identifier – can be up to 20 uppercase or lowercase ASCII characters

Response Format:

```
    <sid> <date> <time>
M  <ctag> COMPLD
    /*LINK:<link>,CMD:<command>*/
;
```

Chapter 5 Troubleshooting

This chapter provides troubleshooting information using front-panel lamps and error messages. It also describes how to replace a card, return equipment, get technical and/or sales assistance, and obtain manual updates.

In This Chapter

■ Troubleshooting with Front Panel Items

Troubleshooting with Front Panel Items

All front panel items are shown in Figure 5-1. The items are described in Table 5-1. Use Table 5-1 to troubleshoot the system based on the front-panel lamps.
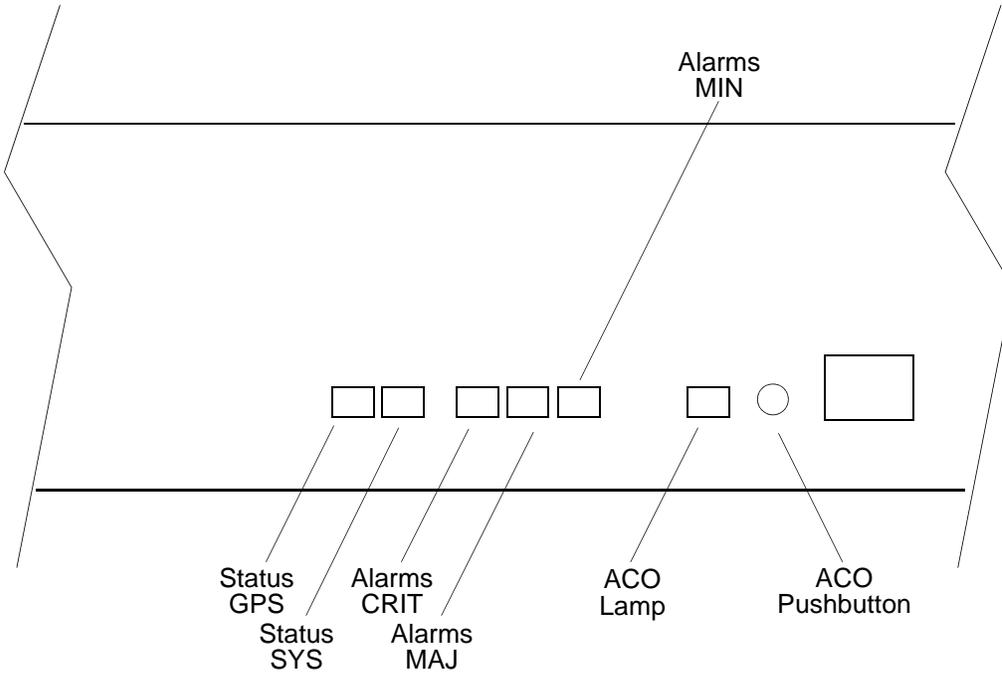
Figure 5-1.   Controls and Indicators

Table 5-1. Front Panel Items

Name	State	Description	Action
Status GPS	Off	System is not powered.	If in warm-up, none required.If there is no power, apply power.
	Green	GPS is successfully tracking satellites, or is in warm-up.	None required.
	Yellow	A GPS event has occurred.	None required.
	Red	A GPS event, which has existed per the user alarm setting, has escalated to a minor alarm.	Refer to Table 5-2 to determine which type and combination of antenna alarms exist, and the recommended action.

Table 5-1. Front Panel Items (Continued)

Name	State	Description	Action
Status SYS	Off	System is in warm-up mode or is not powered.	If in warm-up, none required. If there is no power, apply power.
	Green	The output signal is PRS.	None required.
	Red	The system has been in holdover per the user alarm setting, or there is a hardware fault.	Refer to Table 5-2 to determine which type and combination of alarms exist, and the recommended action.
Alarms CRIT	Off	There is no critical alarm.	None required.
	Red	A critical alarm has occurred because of a hardware failure.	Replace the plug-in card, using Card Replacement, on page 172.
Alarms MAJ	Off	There is no major alarm.	None required.
	Red	The system has been in holdover per the user alarm setting.	Refer to Table 5-2 to determine which type and combination of antenna alarms exist, and the recommended action.
Alarms MIN	Off	There is no minor alarm.	None required.
	Yellow	A minor alarm has occurred because Battery A or B has failed.	Troubleshoot and repair the specified –48 V battery input.
		A minor alarm has occurred because a software download is required.	Refer to Table 5-2 to determine which software needs to be downloaded and the recommended action.
		A minor alarm has occurred because an event (GPS error, temperature error, or span input problem) has escalated to a minor alarm.	Refer to Table 5-2 to determine which event occurred and the recommended action.
		A minor alarm has occurred because the antenna failed.	Refer to Table 5-2 to determine whether the minor alarm is due to antenna failure and the recommended action.
ACO (Lamp)	Off	The alarm cutoff function has not been activated.	None required. Press the ACO pushbutton to silence all audible alarms.
	Green	The alarm cutoff function has been activated.	None required.
ACO (Pushbutton)	—	Silences all audible alarms when pressed.	None required.

Troubleshooting with Error Messages

Use the information in Table 5-2 to troubleshoot the system based on the condition description (conddescr) parameter in a message.

Note: If only the character "C" is displayed on the terminal every few seconds, the TimeSource 3500 system has restarted with corrupt software. Download and install the system software again, using the procedure in the Software Release Document that came with the software.

Table 5-2. Message Troubleshooting

Message	Condition Type	Meaning	Action
CRITICAL ALARMS			
HARDWARE FAULT	ERROR	Failure detected on shelf hardware.	Replace the plug-in card.
MAJOR ALARMS			
HOLDOVER	STATE	All inputs (GPS signal and span inputs) are lost or unacceptable. The system is now using the internal oscillator.	Troubleshoot the GPS and SPAN x error messages.
MINOR ALARMS			
PWR x FAIL	PWR	The specified –48 V battery input has failed.	Troubleshoot, and repair, the specified –48 V battery input.
BT3 WARMUP	WARMUP	System is in a power-up state when it should not be.	Perform the same action as shown in GPS ERROR message.
DEVICE DOWNLOAD REQUIRED	DOWNLOAD	Hardware device software is corrupt or missing.	Download and install the appropriate hardware device (DEV) software, using the procedure in the Software Release Document that came with the software.

Table 5-2. Message Troubleshooting (Continued)

Message	Condition Type	Meaning	Action
GPS ERROR	ERROR	GPS receiver is reporting an error.	If installation includes a roof antenna, or if the message is accompanied by HIGH CURRENT FAULT or LOW CURRENT FAULT message, follow the recommended action for HIGH CURRENT FAULT or LOW CURRENT FAULT message.
			If installation includes a window or wall antenna:
			1. Note satellite tracking success rate reported by RTRV-GPS-STAT command.
			2. If success rate is better than 40%, follow recommended action for HIGH CURRENT FAULT or LOW CURRENT FAULT message.
			3. If success rate is less than 40%, ensure latitude, longitude, and altitude data (position data) are correct.
			4. If position data are correct and error repeats, move antenna to a location with improved view of sky.
			5. If error repeats, follow the recommended action for HIGH CURRENT FAULT or LOW CURRENT FAULT message.

Table 5-2. Message Troubleshooting (Continued)

Message	Condition Type	Meaning	Action
HIGH CURRENT FAULT	ANTENNA	Current to antenna is outside specification.	If not accompanied by the GPS ERROR alarm, none required. If accompanied by GPS ERROR alarm:
LOW CURRENT FAULT	ANTENNA		1. Check cable connections between TimeSource 3500 Shelf and antenna.
			2. If error repeats, remove antenna cable from rear of shelf, and measure dc voltage from the connector center pin to the connector housing on shelf TNC antenna connector.
			3. If voltage is not 24 Vdc ±2 Vdc, replace TimeSource 3500 card, using Card Replacement, on page 172.
			4. If voltage is 24 Vdc ±2 Vdc, measure current between the connector center pin and the connector housing on shelf TNC antenna connector.
			5. If current is less than 110 mA or more than 150 mA, replace TimeSource 3500 card, using Card Replacement, on page 172. If not (nominal current is 125 mA), re-connect antenna cable to rear of shelf.
			6. Remove antenna cable from antenna, and measure dc voltage and current from the connector center pin to the connector housing on cable connector.
			7. If readings are 24 Vdc and 125 mA, replace antenna. If not, verify the cable path. Replace cables, lightning suppressor, or IF converter as necessary.
			8. If the error repeats, replace antenna.
PWR x FAIL	PWR	The specified –48 V battery input has failed.	Troubleshoot, and repair, the specified –48 V battery input.

Table 5-2. Message Troubleshooting (Continued)

Message	Condition Type	Meaning	Action
BT3 WARMUP	WARMUP	System is in a power-up state when it should not be.	Perform the same action as shown in GPS ERROR message.
GPS DOWNLOAD REQUIRED	DOWNLOAD	GPS software is corrupt or missing.	Download, and install, the GPS receiver (GPS) software, using the procedure in the Software Release Document that came with the software.
SPAN x AIS	AIS	AIS received on the specified input span.	Troubleshoot the specified input span signal (check the source).
SPAN x ERROR	ERROR	Error detected on the specified input span.	Troubleshoot the specified input span signal (include checks for signal frequency and jitter).
SPAN x LOSS OF SIGNAL	LOS	Signal on specified input span has been lost.	Troubleshoot the specified input span signal (check the cable, connections, source).
TEMPERATURE ERROR	TEMPERR	Temperature error detected on the internal oscillator.	If this occurs momentarily during power-up, none required. If this does not occur during power-up: 1. Check that the ambient air temperature is within the TimeSource 3500 environmental specifications. If not, correct the ambient temperature with heating or air conditioning. 2. If the ambient air temperature is within the TimeSource 3500 environmental specifications, replace the plug-in card.
TS3500 DOWNLOAD REQUIRED	DOWNLOAD	System software is corrupt or missing.	Download and install the system (TimeSource 3500) software again, using the procedure in the Software Release Document that came with the software.
EVENTS			
BT3 WARMUP	WARMUP	System is in a power-up state.	Wait for the system to power up (20 min to several hours, depending on antenna placement and view of the sky).

Table 5-2. Message Troubleshooting (Continued)

Message	Condition Type	Meaning	Action
COM-x USER TIMEOUT LOGOFF	COMPORT	User was auto logged off.	If COM-x is the port this message was received on, retry logging in. If not, none required.
DISCONNECTED USER LOGOFF	COMPORT	User was logged off by system administrator.	None required.
HOLDOVER	STATE	All inputs (GPS signal, span inputs) are lost or unacceptable. The system is using the internal oscillator.	None required.
DOWNLOAD FAILED	DOWNLOAD	Software download has failed.	Retry the software download.
DOWNLOAD IN PROGRESS	DOWNLOAD	Software is being downloaded.	Wait until the download has been completed.
DOWNLOAD SUCCESSFUL	DOWNLOAD	Software downloaded successfully.	None required.
GPS ERROR	ERROR	GPS receiver is reporting an error.	None required.
CRITICAL ACO EVENT	ACO	ACO push button was pressed to deactivate a critical audible alarm.	None required.
MAJOR ACO EVENT	ACO	ACO push button was pressed to deactivate a major audible alarm.	None required.
MINOR ACO EVENT	ACO	ACO push button was pressed to deactivate a minor audible alarm.	None required.
POWER UP RESTART	MODE	System processor has just started up.	None required.
SETTLING PERIOD	BT3	System is between the power-up state and steady-state operation, and signals may be degraded.	None required.
SOFTWARE DOWNLOADING ON LINK	DOWNLOAD	Software is being downloaded at specified communication port.	None required.

Table 5-2. Message Troubleshooting (Continued)

Message	Condition Type	Meaning	Action
SPAN x AIS	AIS	AIS received on the specified input span.	Troubleshoot the specified input span (check the source).
SPAN x ERROR	ERROR	Error detected on specified input span.	Troubleshoot the specified input span (check the source).
SPAN x LOSS OF SIGNAL	LOS	Signal on specified span input was lost.	Troubleshoot the specified input span (check the source).
SPAN x SSM QUALITY DUS	SSM	Do not use for synchronization	Troubleshoot the specified input span (check the source)
SPAN x SSM QUALITY PRS	SSM	Quality level of signal detected on specified span is PRS	Make note of the specified input span
SPAN x SSM QUALITY SMC	SSM	Signal on specified input span has degraded to SSM quality level SMC	Troubleshoot the specified input span (check the source)
SPAN x SSM QUALITY ST2	SSM	Signal on specified span input has degraded to SSM quality level ST2.	Troubleshoot the specified input span (check the source).
SPAN x SSM QUALITY ST3E	SSM	Signal on specified span input has degraded to SSM quality level ST3E.	Troubleshoot the specified input span (check the source).
SPAN x SSM QUALITY ST3	SSM	Signal on specified span input has degraded to SSM quality level ST3.	Troubleshoot the specified input span (check the source).
SPAN x SSM QUALITY ST4	SSM	Signal on specified span input has degraded to SSM quality level ST4.	Troubleshoot the specified input span (check the source).
SPAN x SSM QUALITY STU	SSM	Synchronization traceability level is unknown.	Troubleshoot the specified input span (check the source).
TEMPERATURE ERROR	TEMPERR	Temperature error detected on internal oscillator.	Wait until this escalates to a minor alarm, or check that the ambient air temperature is within the TimeSource 3500 environmental specifications. If not, correct the ambient temperature with heating or air conditioning.

Card Replacement

To replace the plug-in card, use the following procedure and refer to Figure 5-2.

1. Put on an ESD wrist strap.

2. Plug the ESD wrist strap into the ESD jack on of the front panel of the shelf.

On the Faulty Card

3. Loosen the two retaining screws that secure the plug-in card in the shelf.

4. Pull out on the two latching levers to disconnect the card from the shelf connectors.

5. Pull the card completely out of the shelf.

On the Replacement Card

6. Pull out the latching levers at each end of the front panel of the card so that the levers are pointing directly out from the front panel of the card.

7. Insert the new card into the tracks at each side of the shelf, and slide the card into the shelf until the latching levers begin to move in.

8. Push the latching levers flat against the front panel of the card to complete the card insertion.

9. Tighten the knurled screw above each latching lever to secure the card in the shelf.

10. Unplug and remove the grounding wrist strap.

11. Reconfigure the system per application requirements.

ESD Jack

Retaining Screw   Retaining Screw

Latching Lever   Latching Lever
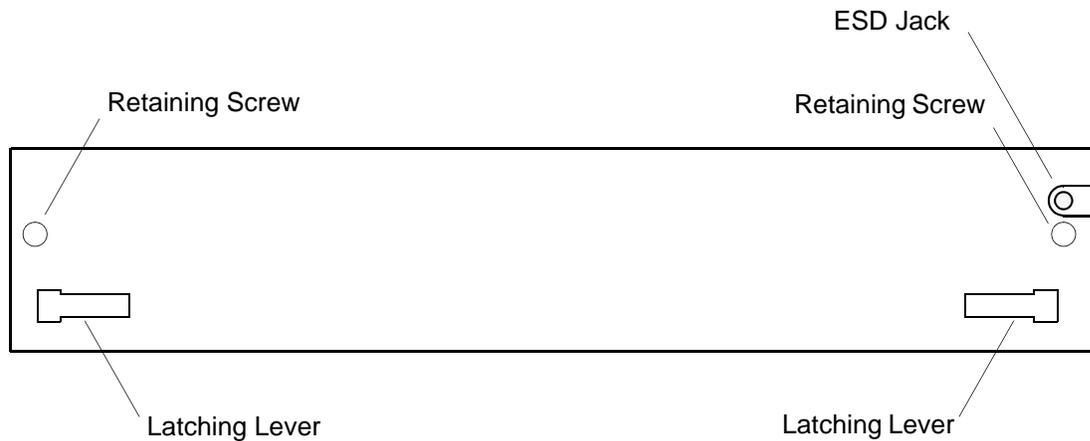
Figure 5-2.   Front of Shelf

Repair and Return

When returning defective equipment for factory repair, obtain the following information prior to calling Symmetricom:

- A complete description of the trouble (alarms, equipment behavior, etc.), part number, serial number, issue/revision level, and warranty expiration date.

- If the warranty has expired, a purchase order with "bill to" information.

- A customer field technical contact including address, phone number and FAX number.

- Return shipping information.

To return defective or damaged equipment, use the following procedure.

1. Call your local Symmetricom distributor or Symmetricom's Inside Sales (refer to Sales, on page 175), and obtain a Return Material Authorization (RMA) number and shipping address.

> **Note:** Retain the RMA number for future reference. The RMA number is used by Symmetricom for internal tracking of the unit. Reference the RMA number in all communications with Symmetricom regarding the unit.

2. Pack the defective equipment, including a list containing all the information obtained above, in the original packing material. If the original packing material is

not available, inform Symmetricom, and the appropriate shipping material will be provided.

Note: Equipment must be returned in the original packaging, or approved replacement packaging for the warranty to be honored.

3. Mark the RMA number and the equipment serial number on the outside of the shipping carton.

4. Ship the equipment prepaid and insured to one of the addresses below, as directed by the Customer Assistance Center:

Symmetricom
Attn.: Customer Service
2300 Orchard Parkway
San Jose, CA 95131

or

Symmetricom
Attn.: Repair and Return
Montana Industrial Park
Street B Lot 52
Aguadilla, Puerto Rico 00603

Note: Repaired equipment is typically shipped within 30 days of receipt by Symmetricom, or per contract terms. Shipping costs to Symmetricom are paid by the customer; shipping costs back to the customer are paid by Symmetricom.

Technical Assistance

For technical assistance, contact the following:

- Symmetricom, Inc.
- 2300 Orchard Parkway
- San Jose, CA 95131-1017
- U.S.A. Call Center:
- 1-888-367-7966 (from inside U.S.A. only – toll-free)
- 1-408-428-7907
- Fax: 1-408-428-7998
- Europe, Middle East, and Africa (EMEA) Call Center:

- +44 (0) 1189 699 799

- Fax: +44 (0) 1189 277 520

- E-mail: support@symmetricom.com

- Internet: http://www.symmetricom.com

Sales

For sales assistance, contact the following:

- Symmetricom, Inc.

- 2300 Orchard Parkway

- San Jose, CA 95131-1017

- U.S.A. Call Center:

- 1-888-367-7966 (from inside U.S.A. only – toll-free)

- 1-408-428-7907

- Europe, Middle East, and Africa (EMEA) Call Center:

- +44 (0) 1189 699 799

- Fax: 408-428-7998

- E-mail: info@symmetricom.com

- Internet: http://www.symmetricom.com

Manual Updates

From time to time, this manual may be updated. The updated version of the manual will be available for downloading in electronic form via the Internet. After downloading, the manual can be viewed on a computer or printed out.

Manual updates are available at:

http://www.symmetricom.com/support/login/login.php

Note: When going to the preceding Web address, it is necessary to register if you are a new user. If you are a currently registered user, enter your user name and password, and log in.

Chapter 6 Specifications

This chapter provides equipment specifications.

Roof Antenna

Type:	Active antenna, right-hand circular polarized, with proprietary IF interface
Cable Length:	Maximum 1,000 feet from antenna to shelf
Dimensions:	
Height:	6.5 in.
Diameter:	5.9 in.
Weight:	1.55 lbs.
Operating Temperature:	–30 °C to +80 °C
Storage Temperature:	–40 °C to +80 °C
Operating Humidity:	0% to 100% relative humidity

Mechanical Window Antenna

Type:	Patch antenna
Cable Length:	Maximum 1000 ft from antenna to shelf
Dimensions: (antenna, including mechanical mounting device)	
Height:	16 in.
Width:	2.2 in.
Depth:	1.3 in.
Weight:	18 oz

Wall Antenna

Type:	Patch antenna
Cable Length:	Maximum 1000 ft from antenna to shelf
Dimensions: (not including mounting and peripheral equipment)	
Height:	0.5 in. (12.5 mm)
Width:	1.5 in. (37 mm)
Depth:	1.8 in. (46 mm)
Weight:	1.1 oz (35 g)

Self-Adhesive Window Antenna

Type:	Patch antenna
Cable Length:	Maximum 1000 ft from antenna to shelf
Dimensions:	
Length:	4 in.
Width:	3 in.
Height:	1.5 in.
Weight:	5.3 oz

Communication Ports

Port 1

Connector Type:	25-pin, female D connector
Connector Label:	COM1
Connector Location:	Rear panel
Electrical Interface:	RS-232 (DTE equivalent)
Pin that transmits data:	2
Pin that receives data:	3
Baud Rate:	1200 b/s
	2400 b/s
	4800 b/s
	9600 b/s (factory default)
	19.2 kb/s
	38.4 kb/s
	57.6 kb/s
	115 kb/s
Data Bits:	8
Parity Bit:	None
	Even
	Odd
Stop Bits:	1
	2
Flow Control:	None
	Software (XON/XOFF)
	Hardware (CTS/RTS)

Port 2

Connector Type:	RJ-45
Connector Label:	COM2
Connector Location:	Rear panel
Electrical Interface:	RS-232 (DCE equivalent)
Pin that transmits data:	2
Pin that receives data:	3
Baud Rate:	1200 b/s
	2400 b/s
	4800 b/s
	9600 b/s (factory default)
	19.2 kb/s
	38.4 kb/s
	57.6 kb/s
	115 kb/s
Data Bits:	8
Parity Bit:	None
	Even
	Odd
Stop Bits:	1
	2
Flow Control:	None
	Software (XON/XOFF)
	Hardware (CTS/RTS)

Craft Port

Connector Type:	RJ-45
Connector Label:	Craft
Connector Location:	Front panel
Electrical Interface:	RS-232 (DTE equivalent)
Pin that transmits data:	2
Pin that receives data:	3
Baud Rate:	1200 b/s
	2400 b/s
	4800 b/s
	9600 b/s (factory default)
	19.2 kb/s

	38.4 kb/s
	57.6 kb/s
	115 kb/s
Data Bits:	8
Parity Bit:	None
	Even
	Odd
Stop Bits:	1
	2
Flow Control:	None

Ethernet Port

Connector Type:	RJ-45 (10Base-T)
Connector Label:	Ethernet
Connector Location:	Rear panel
Electrical Interface:	10Base-T Ethernet
Data Rate:	10Mb/s
Protocol:	TCP/IP (interface)
Setup Language:	TL1 (application layer)

Time of Day Outputs

Network Time Protocol (NTP), Type 4, Format 2 Driver Format

Connector Type:	RJ-45
Connector Label:	TOD
Connector Location:	Rear panel
Electrical Interface:	RS-485
Baud Rate:	9600 b/s
Data Bits:	8
Parity Bit:	None
Stop Bit:	1
Data Format:	See Figure 6-1

```
          1    2    3          4          5  6
```

Example: `␣␣ 00 225 21:05:29.060 ␣␣ S`
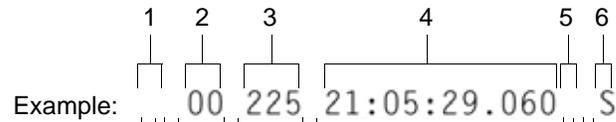
1   Alarm field: blank space = receiver has satellite availability; ? = no satellite available
2   Year (2000 in this example)
3   Day of year (the 225th day of the year in this example)
4   Hours:minutes:seconds:milliseconds
5   Leap second: blank space = no leap second; L = upcoming leap second
6   Daylight savings time indicator: S = standard time; D = daylight savings time

Figure 6-1.   NTP Type 4 Data Format

Cisco Systems

Connector Type:	RJ-45
Connector Label:	TOD
Connector Location:	Rear panel
Electrical Interface:	RS-485
Baud Rate:	9600 b/s
Bit Configuration:	8 data bits, No parity, 1 stop bit
Data Format:	See Figure 6-2

Example:

```
 1 2   3       4        5     6 7  8     9            10         11   12  13  14
*.A.51498,00/11/15,18:02:30,00000.0,37N22.130,121W55.180,+0042,MN GPS FLT
```
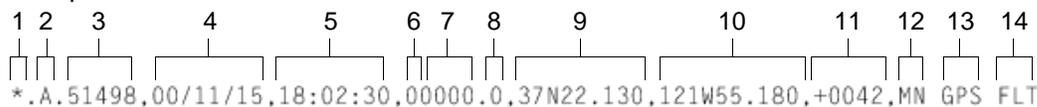
1   Satellite availability: * = valid, ! = not valid
2   Revision
3   Modified Julian date (number of days past midnight, Nov 17, 1858)
4   Year/month/day
5   Hours:minutes:seconds
6   Indicator of time zone offset (+, –, or 0)
7   Time zone offset
8   Leap second indicator
9   Latitude
10 Longitude
11 Altitude above mean sea level in meters
12 Alarm severity: EV = event, MN = minor, MJ = major, CL = critical
13 Alarm source
14 Alarm cause: holdover, BT3 warm-up, or hardware fault

Figure 6-2.   Cisco Systems Data Format

IRIG-B TOD Outputs (990-72050-05 System Only)

Connector Type:	BNC
Connector Labels:	OUT1
	OUT2
Connector Location:	OPTION I/O wire-wrap pins on rear panel and output module
Impedance:	600 Ω
Number of Outputs:	2
Type of Output:	Amplitude modulated
Amplitude:	6 V peak-to-peak maximum terminated with 600 Ω

Time Format:

Binary Coded Decimal (BCD):

Seconds:	0 – 59
Minutes:	0 – 59
Hours:	0 – 23
Days:	0 – 364
Years:	0 – 99

Non BCD:

Seconds of day:	0 – 86399

T1 Inputs

Connector Type:	Wire-wrap pins
Connector Label (2 sets):	T
	R
	S
Connector Location:	Rear panel
Impedance:	100 Ω ±5% balanced
Bit Rate:	1.544 Mb/s
Format:	DS1
Line Code:	Alternate mark inversion (AMI) with or without B8ZS
SSM State:	Enable
	Disable
Amplitude:	0 to –26 dB DSX
Framing:	ESF
	D4

1 PPS Output

Connector Type:	BNC
Connector Label:	TTL PPS
Connector Location:	Rear panel
Impedance:	50 Ω
Frequency:	1 pps
Amplitude:	Transistor-transistor logic (TTL) levels
Time Accuracy:	100 ns with respect to Universal Coordinated Time (UTC) when locked to GPS signal
GPS Holdover Time Error:	3 µs for 72 h (0 °C to +50 °C ± 5 °C) after one week of steady-state operation
Format:	Logic low with logic high pulse of 1 µs
Rise Time:	Less than 20 ns

T1 Outputs

Standard

Connector Type:	Wire-wrap pins
Connector Label:	T1 OUT A (T, R, S)
	T1 OUT B (T, R, S)
Connector Location:	Rear panel
Impedance:	100 Ω
Bit Rate:	1.544 Mb/s
Frequency Accuracy:	1×10^{-12}
GPS Holdover Stability:	1×10^{-11} for 72 h (0 °C to +50 °C ± 5 °C) after one week of steady-state operation
	1×10^{-10} for 30 days after one week of steady-state operation
Format:	DS1, framed all 1s
Line Code:	Alternate mark inversion (AMI)
Amplitude:	2.4 V to 3.6 V terminated with 100 Ω
Framing:	ESF
	D4
Output During Alarms:	AIS
	Squelch
	SSM

Additional T1 Outputs (990-72050-02 System Only)

Connector Type:	Wire-wrap pins
Connector Label:	1 (T, R, S)
	2 (T, R, S)
	3 (T, R, S)
	4 (T, R, S)
	5 (T, R, S)
	6 (T, R, S)
	7 (T, R, S)
	8 (T, R, S)
Connector Location:	OPTION I/O wire-wrap pins on rear panel
Impedance:	100 Ω
Bit Rate:	1.544 Mb/s
Frequency Accuracy:	1×10^{-12}
GPS Holdover Stability:	1×10^{-11} for 72 h (0 °C to +50 °C ± 5 °C) after one week of steady-state operation
	1×10^{-10} for 30 days after one week of steady-state operation
Format:	DS1, framed all 1s
Line Code:	Alternate mark inversion (AMI)
Amplitude:	2.4 V to 3.6 V terminated with 100 Ω
Framing:	ESF
	D4
Output During Alarms:	AIS
	Squelch
	SSM

Mixed E1/T1 Outputs (990-72050-06 System Only)

Note: For E1/T1 commonality, refer to the E1/T1 Common specifications. For E1, refer to the E1 Outputs specifications. For T1, refer to the T1 Outputs specifications.

E1/T1 Common

Connector Type:	Wire-wrap
Connector Label:	T, R, S
Connector Location:	OPTION I/O wire-wrap pins on rear panel
Frequency Accuracy:	1×10^{-12}
Output During Alarms:	AIS, Squelch, SSM

E1 Outputs

Impedance:	120 Ω balanced or 75 Ω unbalanced
Bit Rate:	2.048 Mb/s
Format:	Framed all 1s
Line Code:	HDB3
Amplitude:	3.0 V nominal terminated with 120 Ω balanced
Framing:	CAS, CAS4, CCS, CCS4
GPS Holdover Stability:	1×10^{-11} for 72 h (0 °C to +50 °C ± 5 °C) after one week of steady-state operation
	1×10^{-10} for 30 days after one week of steady-state operation

T1 Outputs

Impedance:	100 Ω
Bit Rate:	1.544 Mb/s
Format:	DS1, framed all 1s
Line Code:	Alternate mark inversion (AMI)
Amplitude:	2.4 V to 3.6 V terminated with 100 Ω
Framing:	ESF, D4
GPS Holdover Stability: (after one week of	1×10^{-10} per day
steady-state operation)	3.2×10^{-11} per day with span input meeting ANSI T1.101 network specification 99% probability (rubidium)
	1×10^{-11} per day over a 10 °C range between 0 °C and +50 °C with an ST2E remote oscillator input (quartz)

Mixed T1/CCK Outputs (990-72050-07 System Only)

Note: For T1/CCK commonality, refer to the T1/CCK Common specifications. For T1, refer to the T1 Outputs specifications. For CCK, refer to the CCK Outputs specifications.

T1/CCK Common

Connector Type:	Wire-wrap
Connector Label:	T, R, S
Connector Location:	OPTION I/O wire-wrap pins on rear panel

T1 Outputs

Impedance:	100 Ω
Bit Rate:	1.544 Mb/s
Format:	DS1, framed all 1s
Line Code:	Alternate mark inversion (AMI)
Amplitude:	2.4 V to 3.6 V terminated with 100 Ω
Framing:	ESF, D4
GPS Holdover Stability: (after one week of	1×10^{-10} per day
steady-state operation)	3.2×10^{-11} per day with span input meeting ANSI T1.101 network specification 99% probability (rubidium)
	1×10^{-11} per day over a 10 °C range between 0 °C and +50 °C with an ST2E remote oscillator input (quartz)

CCK Outputs

Impedance:	135 Ω balanced
Bit Rate:	64 kb/s
Waveform:	2.7 V to 5.5 peak, 3 V nominal; bipolar RTZ; all ones with BPV every eight pulse
Wave Shape:	Rectangular, rise time <500 ns, pulse width 9.8 µs ±5%, pulse interval 15.6 µs ±5%
Duty Cycle:	62.5%

Composite Clock Outputs (990-72050-03 System Only)

Connector Type:	Wire-wrap pins
Connector Label:	1 (T, R, S)
	2 (T, R, S)
	3 (T, R, S)
	4 (T, R, S)
	5 (T, R, S)
	6 (T, R, S)
	7 (T, R, S)
	8 (T, R, S)
Connector Location:	OPTION I/O wire-wrap pins on rear panel
Impedance:	135 Ω balanced
Bit Rate:	64 kb/s
Waveform:	2.7 V to 3.5 peak, 3 V nominal; bipolar RTZ; all ones with BPV every eight pulse
Wave Shape:	Rectangular, rise time <500 ns, pulse width 9.8 μs ±5%, pulse interval 15.6 μs ±5%
Duty Cycle:	62.5%

10 MHz Output

Connector Type:	BNC
Connector Label:	10 MHz
Connector Location:	Rear panel
Impedance:	50 Ω
Frequency:	10 MHz
Stability:	5 x 10^{-12} Root Allen Variance (RAV) at 10 s
Phase Noise:	−110 dBc @ 10 Hz
	−135 dBc @ 100 Hz
	−140 dBc @ 1 kHz
	−145 dBc @ 10 kHz
Harmonic Distortion:	−40 dBc
Spurious Distortion:	−70 dBc
Format:	Sine wave
Amplitude:	1 V peak-to-peak minimum, 50 Ω termination
	3.7 V peak-to-peak typical, 50 Ω termination

Office Alarms

Rear Panel Contacts

Connection:	Wire-wrap pins
Type:	Dry contact
Contact Rating:	1 A @ 30 V dc
	0.5 A @ 60 V dc
	0.5 A @ 125 V ac
Severity:	Critical
	Major
	Minor
State:	Normally open and normally closed
Style:	Audible and visible

Front Panel Lamps

Label:	Alarms (CRIT, MAJ, MIN, ACO)
	Status (GPS, SYS)
	Type: Light emitting diode

Front Panel Control

Label:	ACO
Type:	Push-button switch
Function:	Alarm cutoff (deactivates audible office alarms)

Simple Network Time Protocol

Protocol Type:	SNTP (Simple Network Time Protocol) compliant with RFC-1769 for unicast applications
SNTP Accuracy:	SNTP timestamp derived from UTC time via integrated GPS receiver within –300 microseconds
SNTP Alarm Indications:	1. SNTP packet will indicate Stratum 2 in NTP packet header if GPS is out of lock.
	2. The "ref id" field changes from GPS to at Stratum 1 to the IP address at Stratum 2 to signify that the reference is the TimeSource clock itself.

3. SNTP packet will indicate "clock not synchronized" in LI field as a "3" value after user defined alarm integration time.

Password Activated: Contact factory

Power

Connector Type: Terminal block

Connector Labels: TB1
TB2

Voltage: −40 V dc to −72 V dc (A & B feed)
Current: 750 mA maximum
Steady-State Power   30 W maximum
Recommended Fuse
for Battery Feed: 3 A

Shelf Mechanical

Rack Mounting: NEBS 19 in. rack
NEBS 23 in. rack
Mounting Positions: Flush
5 in. offset
Width: 19 in.
Height: 3.5 in. maximum (2 rack mounting units)
Depth: 12 in. maximum
Weight: 13 lb.

Shelf Environmental

Operating Temperature: 0 °C to +50 °C
Operating Humidity: Up to 95% non condensing
Electromagnetic: FCC Part 15, Sub-Part B, Class A
Safety   UL compliant
NEBS compliant

Index

Numerics

A

B

C

D

E

F

G

H

I