TimeSource 2500

GPS Primary Reference Source

097-71000-02
Issue 3

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Acronyms and Abbreviations

1 pps	one pulse per second
AIS	alarm indication signal
BITS	building integrated timing supply
BTMONitor	BesTime Monitoring
DS1	digital signal, level 1 (1.544 Mb/s)
ESD	electrostatic discharge
ESF	extended superframe
GPS	Global Positioning System
LOS	loss of signal
MDEV	mean time deviation
MPU	microprocessor
NTP	Network Time Protocol
ppb	parts per billion
ppm	parts per million
PRS	primary reference source
RO	remote oscillator
RU	rack unit (1.75 inches)
SSM	synchronization status messaging
T1	digital transmission (1.544 Mb/s)
TDEV	time deviation
TL1	Transaction Language 1
TOD	time of day
UTC	Universal Coordinated Time

FCC Regulatory Statement

Warning: This equipment generates, uses, and can radiate radio frequency energy, and if not used in accordance with the instruction manual, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart B of Part 15 of FCC rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference in which case the user at his own expense will be required to take whatever measures may be required to correct the interference.

Chapter 1

Description

This chapter provides an overview of the global positioning system, and a physical and functional description of the TimeSource 2500.

Introduction

The TimeSource 2500 is a Primary Reference Source (PRS) that receives and processes signals from GPS satellites, and outputs Stratum 1 synchronization signals traceable to UTC. The TimeSource 2500 is 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 2500 works in environments hostile to GPS by combining advancements in single-satellite GPS receiver technology, rubidium local oscillator and predictive holdover technology, and miniaturization of GPS antennas. Synchronization outputs are delivered in multi-format T1 signals, in a 10 MHz signal, and a Time of Day (TOD) signal.

The synchronization timing is traceable to the GPS, which provides the highest level of synchronization for telephony networks. The TimeSource 2500, with its GPS input, is a stand-alone PRS which meets network PRS performance specifications. The system is an ideal alternative to cesium systems for providing Stratum 1 timing to an office BITS system, or as a timing system for network edge and customer premises equipment.

Global Positioning System

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

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 may adversely impact the timing performance of a receiver.

The TimeSource 2500 optimizes timing performance during frequent GPS outages by anticipating the outages, and compensating for them with advanced local oscillator and holdover technology. BesTime-generated predictor values are used to bridge GPS outage periods and enhance holdover performance.

Physical Description

The TimeSource 2500 consists of a shelf, antenna, cables, mounting hardware, and software.

The shelf can be mounted on a wall or in an industry-standard 19 inch or 23 inch rack. In a rack, the shelf occupies two rack units (RU). All connectors and indicators, other than the GPS antenna, are at the front of the shelf. An optional wire-wrap panel for rear-access input and output occupies an additional two RU.

Two types of antennas are available: a window antenna or a wall antenna. The window antenna (Figure 1) uses self-stick hook-and-loop fabric fasteners (Velcro brand or equivalent) to attach to the inside of a window. The wall antenna (Figure 2) is mounted to a wall, outside the building, and the cable between the antenna and shelf is routed through the wall. In either configuration, a single coaxial cable carries signals and power between the antenna and the shelf.

Figure 1. Window Antenna

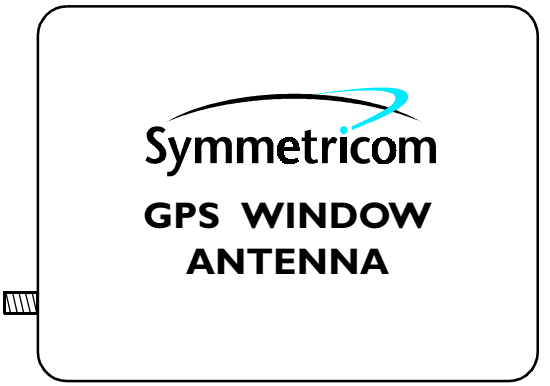
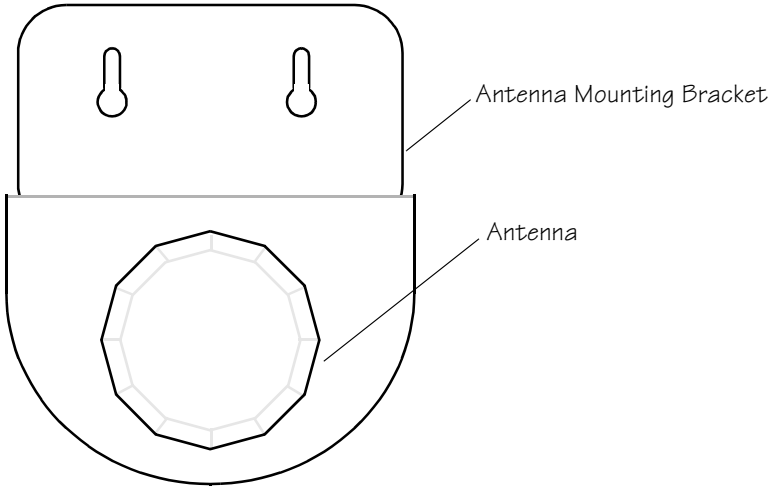


Figure 2. Wall Antenna



Functional Description

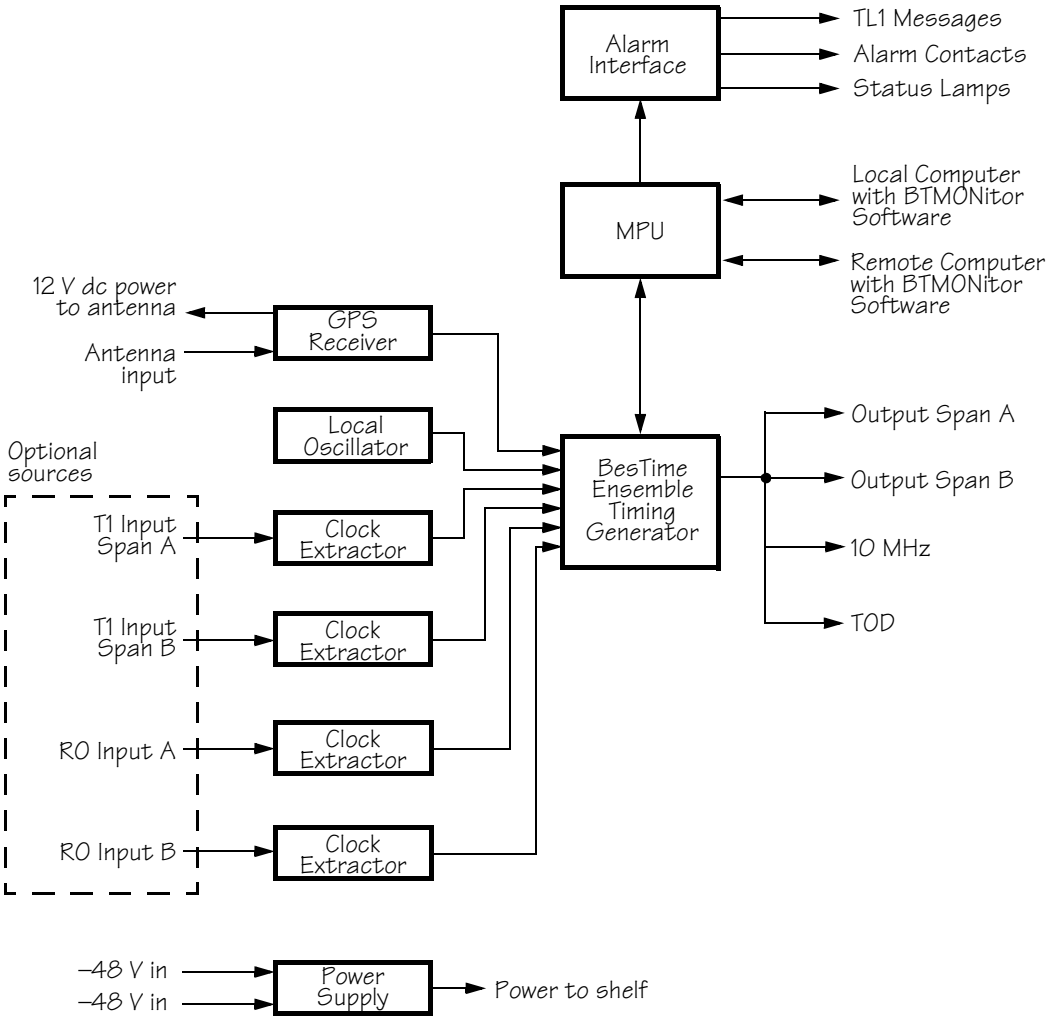
Overview

Figure 3 shows the main functions of the TimeSource 2500. The center of the TimeSource 2500 is the BesTime Ensemble Timing Generator. The BesTime Ensemble Timing Generator can receive multiple timing references, analyze their phase and frequency characteristics, and dynamically weight each input, to maximize the stability and accuracy of the timing outputs.

In the TimeSource 2500 application, the GPS input normally receives full weight, and actively disciplines the timing outputs. Because of the exceptional stability of the local rubidium oscillator, the optional span line and 5 MHz remote oscillator inputs are not normally used in the ensembled timing output solution. If any of the optional inputs are provisioned for ensembling, the BesTime algorithm continuously determines the optimum input weighting mix, and may use one or all of these references, by dynamically placing increasingly greater weighting values on the most stable input or inputs. Greater weighting values are not normally placed on the optional inputs, but if this is the case, it would occur during extended GPS outage periods.

Even if the optional inputs are not actively used in the output ensemble, the BesTime Ensemble Timing Generator continuously collects full timing statistics on each input, with respect to the output timing signal. These statistics can be used to verify the performance of the TimeSource 2500, or detect a timing problem on an incoming reference.

Figure 3. TimeSource 2500 Block Diagram



Antenna

The miniature GPS window antenna is packaged specifically for mounting on the inside of a window within the building housing the TimeSource 2500 Shelf, or on a wall outside the building. A single cable transports GPS satellite signals to the shelf, and provides 12 volts dc power from the shelf to the antenna assembly.

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

T1 signals (bridged or terminated) and remote oscillator signals can enter on the Input Span A and B connectors. These optional inputs can be monitored, or used as back-up inputs to the system, in case of a long-term loss of GPS input. A Clock Extractor circuit extracts a clock from each of these signals, and sends the clocks to the BesTime Ensemble Timing Generator.

Power Supply

A power converter filters and converts –48 volt dc power supplied to the shelf into the voltages required by the shelf. Dual power feeds are supplied through the Power A and B connectors.

BesTime Ensemble Timing Generator

The clock signals from the GPS Receiver, local oscillator, optional T1 span lines, and optional 5 MHz remote oscillators are used as sources by the BesTime algorithms in the Ensemble Timing Generator. The signals are analyzed for MDEV, TDEV, MTIE, and other phase and frequency characteristics.

The BesTime Ensemble Timing Generator uses standard statistical clock models to analyze each input signal and synthesize highly stable output timing signals.

T1 Output

The BesTime Ensemble Timing Generator provides the timing for the T1 timing signals available at the Output Span A and B connectors in a framed, all-ones format, which is selectable in either D4 or ESF framing. SSM is available with ESF framing.

10 MHz Output

The BesTime Ensemble Timing Generator provides the timing for the 10 MHz low-phase-noise timing signal, available at the 10 MHz Output connector, which can be used for local cellular frequency or testing purposes.

TOD Output

The BesTime Ensemble Timing Generator provides the timing for the TOD timing signal available at the TOD connector, which provides time code to devices compatible with NTP Type 4 or Cisco format. A 1 pps signal is also available at the TOD connector.

BTMONitor Software

BTMONitor (BesTime Monitoring) is a Windows 95/98/NT compatible craft software program, which provides system configuration, alarms, and diagnostics. BTMONitor resides on a user-provided PC, and interfaces to the TimeSource 2500 Shelf via the local (Craft) RJ-45 or remote (Remote) RS-232 communication port.

Alarm Interface

The MPU delivers major and minor alarms to dry-contact type connections at the Alarms connector. Alarms are also indicated by the front-panel status lamps, BTMONitor application, which provides extensive reports of alarm and status, and TL1 messages reported via the Craft communication port.

Chapter 2

Engineering & Ordering

This chapter provides antenna installation guidelines, shelf mounting configurations, computer requirements, and parts lists.

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.

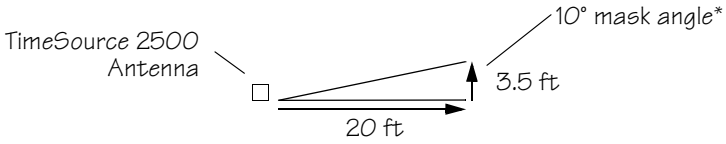
Due to the geometry of the GPS satellite orbits, more satellites are visible in the direction of the equator than the poles. If possible, select a window or wall which has a clear view toward the equator (toward the south in the northern hemisphere, or toward the north in the southern hemisphere). This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

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 4) and make a note of it. The mask angle, in degrees, will be entered during the initial setup.

Note: TimeSource 2500 does not detect satellites in the masked area.

Figure 4. Antenna Mask Angle



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

Cabling Considerations

The antenna assembly uses the same coaxial cable for power and antenna signals.

Warning: **Avoid small-radius turns and any unnecessary turns. The minimum radius of any bend must be six times the diameter of the cable.**

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

Window Antenna

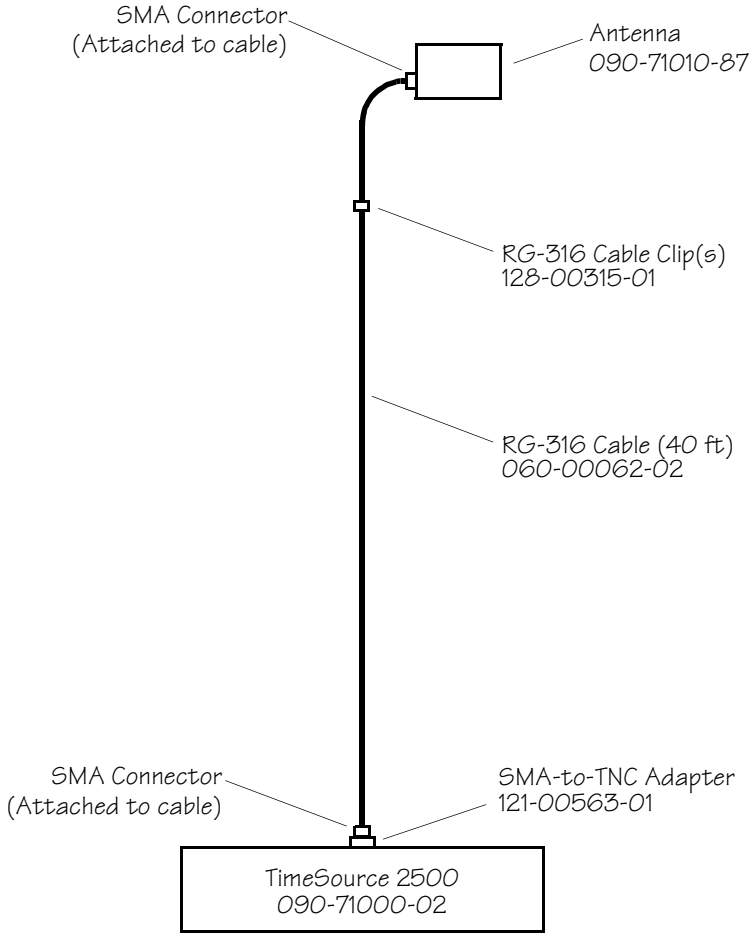
For TimeSource 2500 Systems with window antennas, use this section, and skip the "Wall Antenna" section. For TimeSource 2500 Systems with wall antennas, skip this section, and use the "Wall Antenna" section.

Caution: The antenna, when attached to the window, cannot reliably support more than 10 feet of RG-316 cable. Be sure the cable is supported within 10 feet of the antenna. Clips are supplied in the window antenna kit, to support the RG-316 cable. In addition, cable mounting brackets are included in cable kits 093-71240-10, 093-71400-15, and 093-71400-20, for supporting the LMR-240 and LMR-400 cable.

Antenna-to-Shelf Distance Up to 40 Feet

Figure 5 shows antenna-to-shelf cabling when the total length of the cable route is 40 feet or less. For this configuration, use cable kit 093-71316-04.

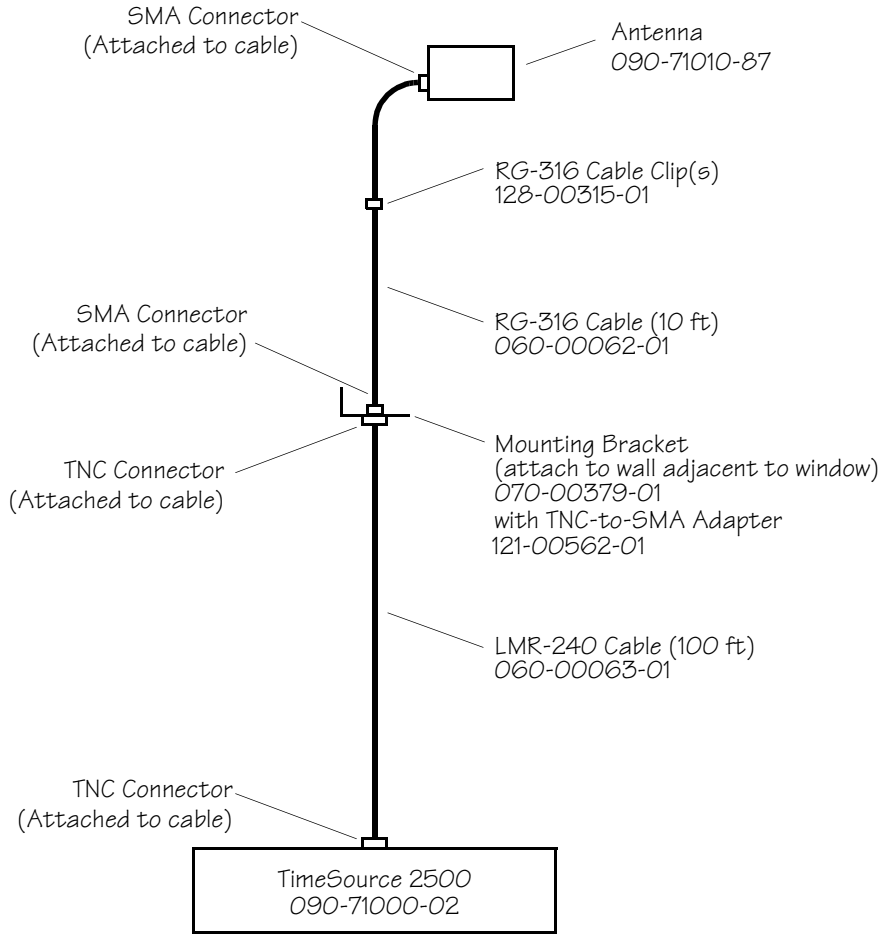
Figure 5. Window Antenna-to-Shelf Connection with Cable Kit 093-71316-04



Antenna-to-Shelf Distance Up to 100 Feet

Figure 6 shows antenna-to-shelf cabling when the total length of the cable route is between 40 feet and 100 feet. For this configuration, use cable kit 093-71240-10.

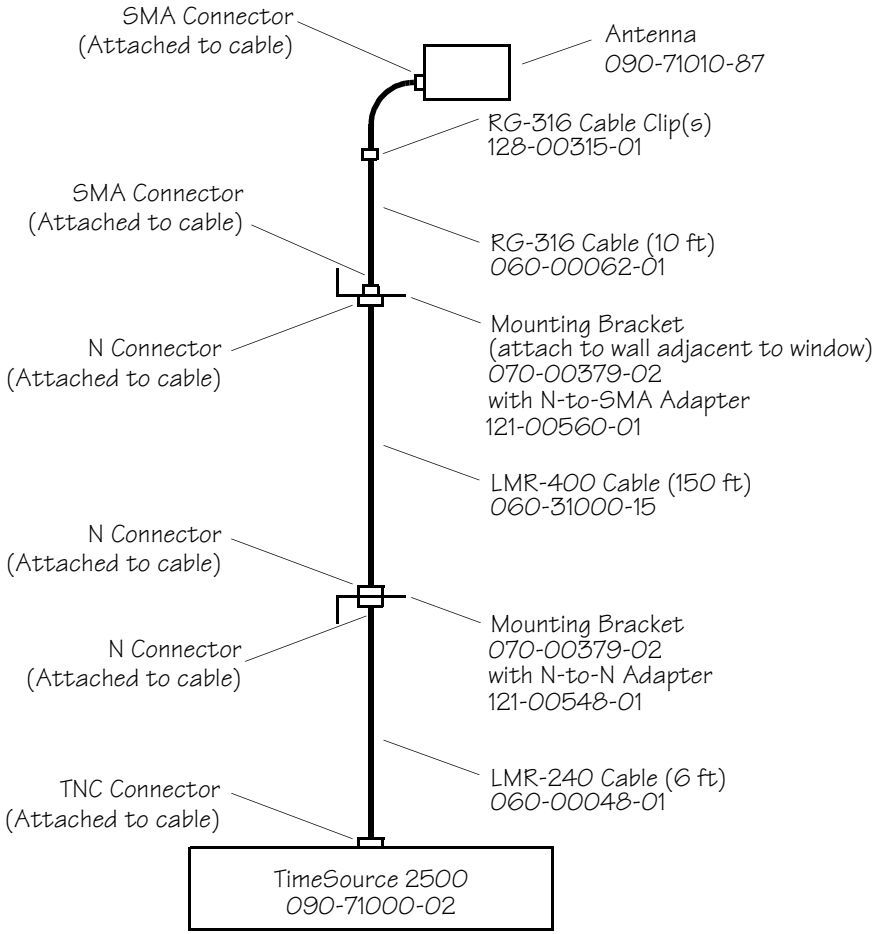
Figure 6. Window Antenna-to-Shelf Connection with Cable Kit 093-71240-10



Antenna-to-Shelf Distance Up to 150 Feet

Figure 7 shows window antenna-to-shelf cabling when the total length of the cable route is between 100 feet and 150 feet. For this configuration, use cable kit 093-71400-15.

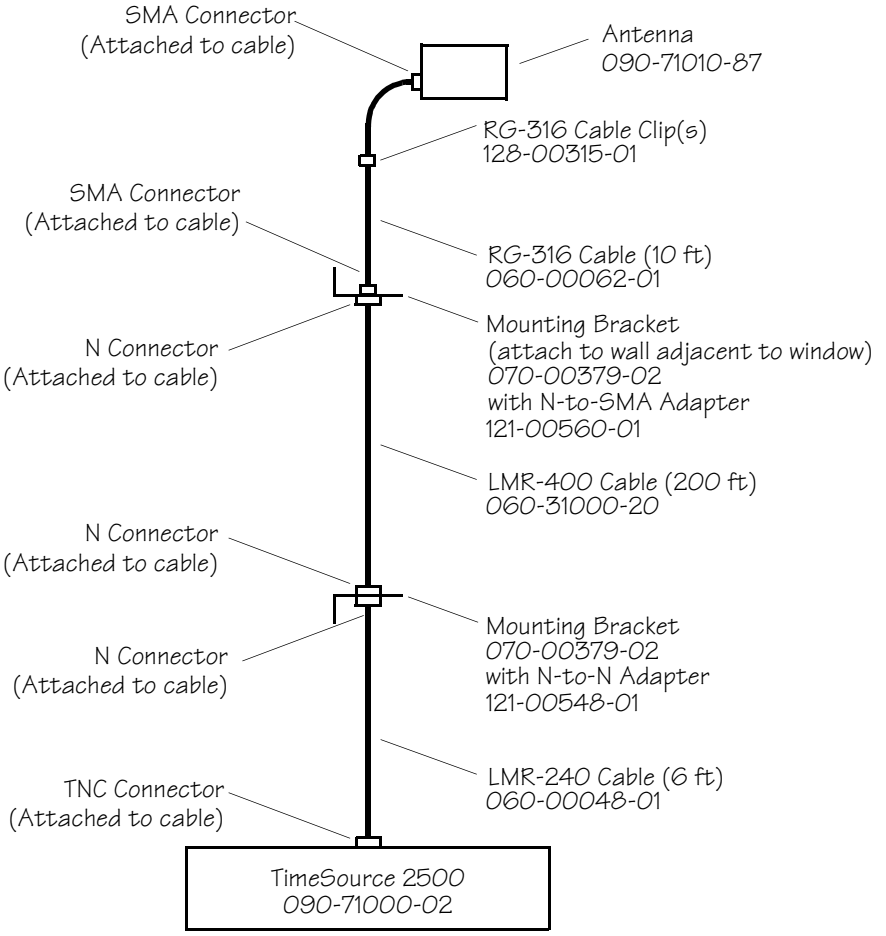
Figure 7. Window Antenna-to-Shelf Connection with Cable Kit 093-71400-15



Antenna-to-Shelf Distance Up to 200 Feet

Figure 8 shows window antenna-to-shelf cabling when the total length of the cable route is between 150 feet and 200 feet. For this configuration, use cable kit 093-71400-20.

Figure 8. Window Antenna-to-Shelf Connection with Cable Kit 093-71400-20



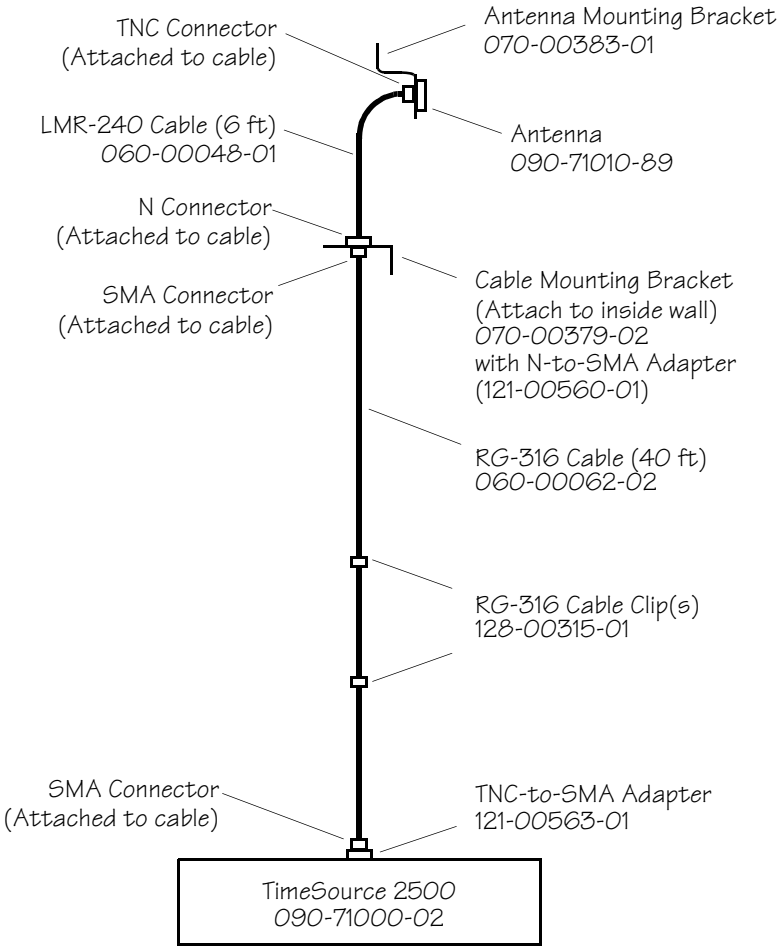
Wall Antenna

For TimeSource 2500 Systems with wall antennas, use this section. For TimeSource 2500 Systems with window antennas, use the “Window Antenna” section.

Antenna-to-Shelf Distance Up to 40 Feet

Figure 9 shows antenna-to-shelf cabling when the total length of the cable route is 40 feet or less. For this configuration, use cable kit 093-71317-04.

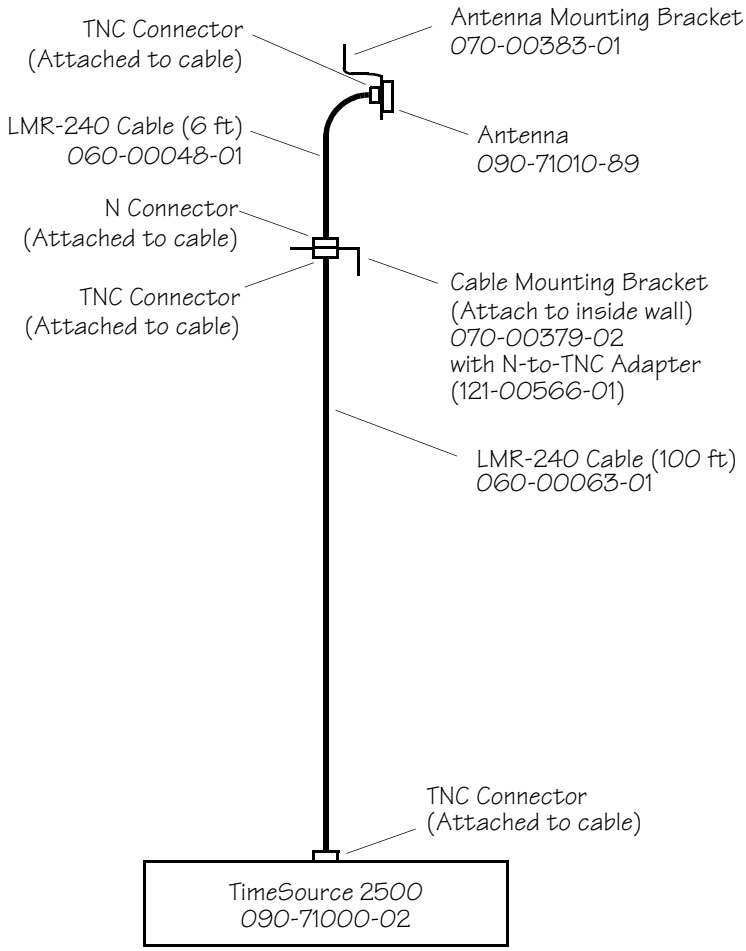
Figure 9. Antenna-to-Shelf Connection with Cable Kit 093-71317-04



Antenna-to-Shelf Distance Up to 100 Feet

Figure 10 shows antenna-to-shelf cabling when the total length of the cable route is between 40 feet and 100 feet. For this configuration, use cable kit 093-71241-10.

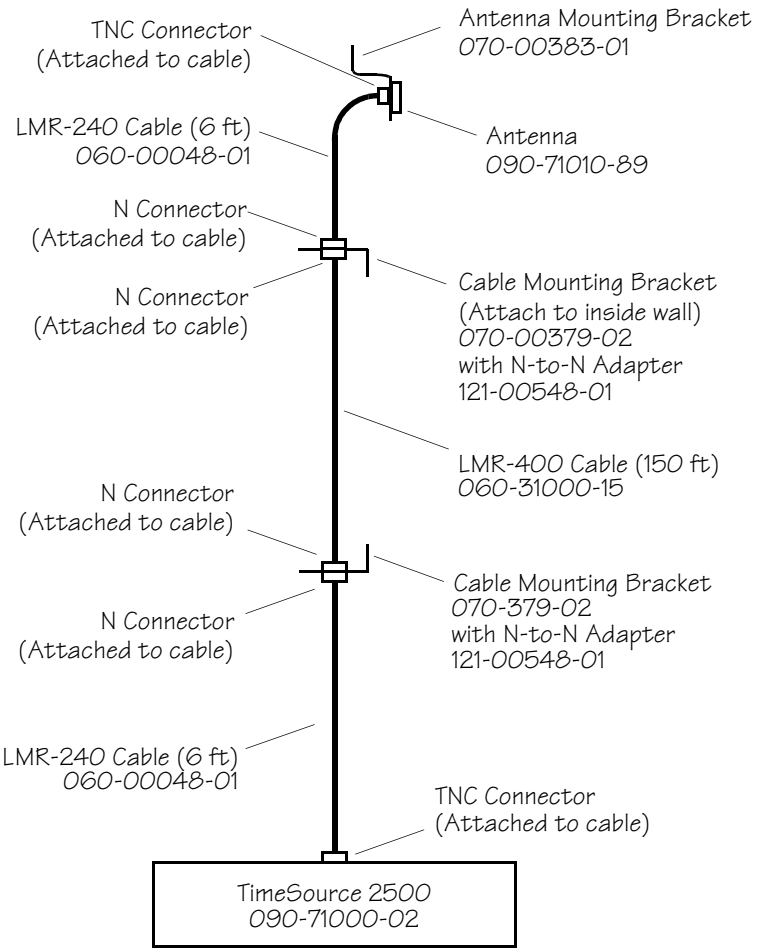
Figure 10. Antenna-to-Shelf Connection with Cable Kit 093-71241-10



Antenna-to-Shelf Distance Up to 150 Feet

Figure 11 shows antenna-to-shelf cabling when the total length of the cable route is between 100 feet and 150 feet. For this configuration, use cable kit 093-71401-15.

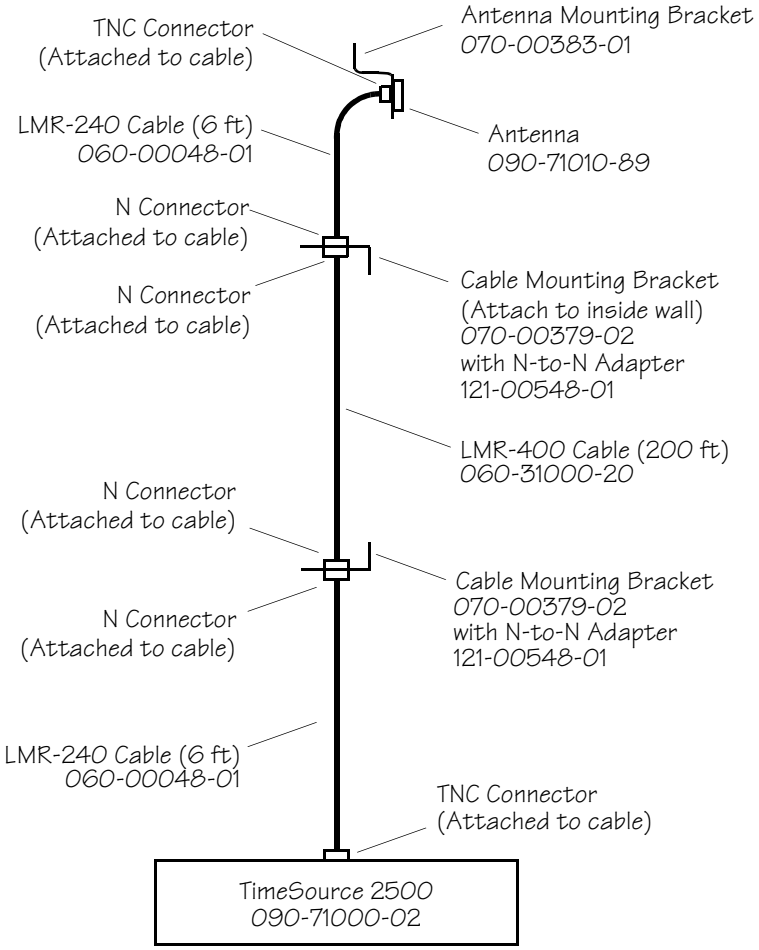
Figure 11. Antenna-to-Shelf Connection with Cable Kit 093-71401-15



Antenna-to-Shelf Distance Up to 200 Feet

Figure 12 shows antenna-to-shelf cabling when the total length of the cable route is between 150 feet and 200 feet. For this configuration, use cable kit 093-71401-20.

Figure 12. Antenna-to-Shelf Connection with Cable Kit 093-71401-20



Shelf Considerations

Rack Mounted

The TimeSource 2500 Shelf can be mounted in either a 19 inch or 23 inch rack. Supplied mounting ears can be positioned for flush or 5 inch offset mounting. Allow for two RUs (3-1/2 inches) of vertical space on the rack, per shelf.

To make power, input, output, and alarm connections from the rear of the rack, instead of the front of the shelf, a wire-wrap panel is available separately, as an option. The wire-wrap panel can be mounted below a rack-mounted shelf, in either a 19 inch or 23 inch rack. Mounting ears (supplied with the option) can be positioned for flush or 5 inch offset mounting. Allow for two RUs (3-1/2 inches) of vertical space on the rack, per wire-wrap panel.

Wall Mounted

The TimeSource 2500 can be attached to a wall or other surface by ordering the appropriate wall-mount configuration option.

Computer Requirements

A user-supplied computer is required to operate the TimeSource 2500 System. Minimum requirements are as follows:

- Operating system: Windows 95, Windows 98, or Windows NT 4.0
- CPU: x486 or equivalent, at 33 MHz
- RAM: 8 MB
- Serial communications port
- 3-1/2 inch floppy disk drive
- Recommended: spreadsheet application that can accept comma-delimited (.csv) data files, to process the logged files

Systems

Table A lists the parts included in TimeSource 2500 Systems which have window antennas. Table B lists the parts included in TimeSource 2500 Systems which have wall antennas. Both tables list parts included in TimeSource 2500 Systems with rack-mounted or wall-mounted shelves.

There are four antenna-to-shelf cable kits for TimeSource 2500 Systems which have window antennas (see Table A), and four antenna-to-shelf cable kits for TimeSource 2500 Systems which have wall antennas (see Table B). Consider the maximum antenna-to-shelf cable distance, and order a kit that equals or exceeds the cable distance required for the installation.

Table A. Parts Used with Window Antenna Installations

Part Number	Description
Rack-Mount Shelf (990-71000-02)	
090-71000-02	TimeSource 2500 Shelf
090-71010-87	Window antenna kit
093-71000-02	Hardware kit (mounting brackets [2 RU] and hardware for mounting in a 19 in. or 23 in. rack)
992-71000-01	BTMONitor software
997-71000-02	Manual
060-00067-01	Cable for connecting to a PC
Wall-Mount Shelf (990-71000-03)	
090-71000-02	TimeSource 2500 Shelf
090-71010-87	Window antenna kit
093-71000-03	Hardware kit (2 angle brackets and bracket mounting screws [user must supply screws for mounting shelf to a wall])
992-71000-01	BTMONitor software
997-71000-02	Manual
060-00067-01	Cable for connecting to a PC
Wire-Wrap Panel for Rack-Mount Shelf (Optional) (990-71000-11)	
090-71000-11	Wire-wrap panel
093-71000-11	Wire-wrap panel rack-mounting kit

Table A. Parts Used with Window Antenna Installations (cont'd)

Part Number	Description
40 ft Cable Kit (093-71316-04)	
060-00062-02	40 ft of RG-316 cable (SMA connectors attached)
121-00563-01	Connector adapter (SMA female to TNC male)
128-00315-01	Adhesive-backed clips (10)
100 ft Cable Kit (093-71240-10)	
060-00063-01	100 ft of LMR-240 cable (TNC male connectors attached)
060-00062-01	10 ft of RG-316 cable (SMA male connectors attached)
070-00379-01	Mounting bracket
121-00562-01	Connector adapter (SMA female to TNC female)
128-00315-01	Adhesive-backed clips (4)
150 ft Cable Kit (093-71400-15)	
060-31000-15	150 ft of LMR-400 cable (N connectors attached)
060-00062-01	10 ft of RG-316 cable (SMA male connectors attached)
060-00048-01	6 ft of LMR-240 cable (TNC and N male connectors attached)
070-00379-02	Mounting bracket (2) to support cable transitions
121-00548-01	Connector adapter (N female to N female)
121-00560-01	Connector adapter (SMA female to N female)
128-00315-01	Adhesive-backed clips (4)

Table A. Parts Used with Window Antenna Installations (cont'd)

Part Number	Description
200 ft Cable Kit (093-71400-20)	
060-31000-20	200 ft of LMR-400 cable (N connectors attached)
060-00062-01	10 ft of RG-316 cable (SMA male connectors attached)
060-00048-01	6 ft of LMR-240 cable (TNC and N male connectors attached)
070-00379-02	Mounting bracket (2) to support cable transitions
121-00548-01	Mounting bracket adapter (N female to N female)
121-00560-01	Connector adapter (SMA female to N female)
128-00315-01	Adhesive-backed clips (4)

Table B. Parts Used with Wall Antenna Installations

Part Number	Description
Rack-Mount Shelf (990-71000-04)	
090-71000-02	TimeSource 2500 Shelf
090-71010-89	Wall antenna kit
093-71000-02	Hardware kit (mounting brackets [2 RU] and hardware for mounting in a 19 in. or 23 in. rack)
992-71000-01	BTMONitor software
997-71000-02	Manual
060-00067-01	Cable for connecting to a PC
Wall-Mount Shelf (990-71000-05)	
090-71000-02	TimeSource 2500 Shelf
090-71010-89	Wall antenna kit
093-71000-03	Hardware kit (2 angle brackets and bracket mounting screws [user must supply screws for mounting shelf to a wall])
992-71000-01	BTMONitor software
997-71000-02	Manual
060-00067-01	Cable for connecting to a PC
Wire-Wrap Panel for Rack-Mount Shelf (Optional) (990-71000-11)	
090-71000-11	Wire-wrap panel
093-71000-11	Wire-wrap panel rack-mounting kit

Table B. Parts Used with Wall Antenna Installations (cont'd)

Part Number	Description
40 ft Cable Kit (093-71317-04)	
060-00062-02	40 ft of RG-316 cable (SMA connectors attached)
121-00563-01	Connector adapter (SMA female to TNC male)
060-00048-01	6 ft of LMR-240 cable (TNC and N male connectors attached)
121-00560-01	Connector adapter (N female to SMA female)
128-00315-01	Adhesive-backed clips (10)
070-00379-02	Mounting bracket
100 ft Cable Kit (093-71241-10)	
060-00063-01	100 ft of LMR-240 cable (TNC male connectors attached)
060-00048-01	6 ft of LMR-240 cable (TNC and N male connectors attached)
121-00566-01	Connector adapter (N female to TNC female)
070-00379-02	Mounting bracket

Table B. Parts Used with Wall Antenna Installations (cont'd)

Part Number	Description
150 ft Cable Kit (093-71401-15)	
060-31000-15	150 ft of LMR-400 cable (N connectors attached)
060-00048-01	6 ft of LMR-240 cable (2) (TNC and N male connectors attached)
121-00548-01	Connector adapter (2) (N female to N female)
070-00379-02	Mounting bracket (2)
200 ft Cable Kit (093-71401-20)	
060-31000-20	200 ft of LMR-400 cable (N connectors attached)
060-00048-01	6 ft of LMR-240 cable (2) (TNC and N male connectors attached)
121-00548-01	Connector adapter (2) (N female to N female)
070-00379-02	Mounting bracket (2)

Installation

Chapter 3

This chapter provides the steps required for installation and power-up.

Unpacking

Install the TimeSource 2500, using steps in the order given in this chapter. 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.

Warning: **When handling electronic equipment, use local office procedures regarding electrostatic discharge (ESD), 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

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

Window Antenna Installation

For TimeSource 2500 Systems with window antennas, use this section, and skip the "Wall Antenna Installation" section. For TimeSource 2500 Systems with through-the-wall antennas, skip this section, and use the "Wall Antenna Installation" section.

Antenna Mounting

To mount the antenna on the selected window (inside the building), follow Procedure A.

Procedure A. Window Antenna Mounting

Step	Action
1	Pull the Velcro brand hook-and-loop strips (located on one side of the antenna) apart.
2	On the strip that is not attached to the antenna, remove the tape from the strip.
3	Apply the sticky side of the strip to the center of the window, inside the building. Press firmly to remove any air pockets from between the strip and the window. The antenna must be oriented with the writing on the antenna box facing towards you. Do not rotate the antenna so that the writing is vertical or upside down.
4	Press the strip attached to the antenna to the strip attached to the window.

Antenna Cabling

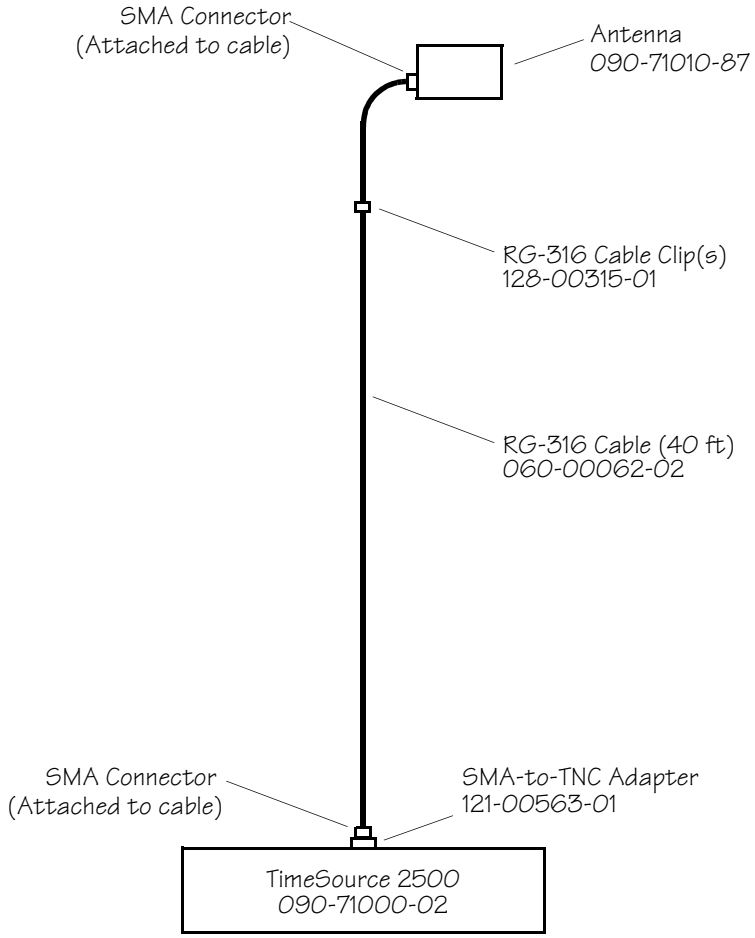
Antenna-to-Shelf Distance Up to 40 Feet

To install the cable when the total length of the cable route is 40 feet or less, use cable kit 093-71316-04, and follow Procedure B. Figure 13 shows the antenna-to-shelf cabling for this configuration.

Procedure B. Cable Installation–Maximum 40 Foot Cable

Step	Action
1	Attach one end of the RG-316 cable to the antenna.
2	Attach the other end of the cable to the SMA end of the SMA-to-TNC adapter.
3	Route the cable to the rear of where the TimeSource 2500 Shelf will be installed.
4	Secure the cable, using the adhesive-backed clip(s), so that no more than 10 ft of cable is left unsupported.

Figure 13. Window Antenna-to-Shelf Connection with Cable Kit 093-71316-04



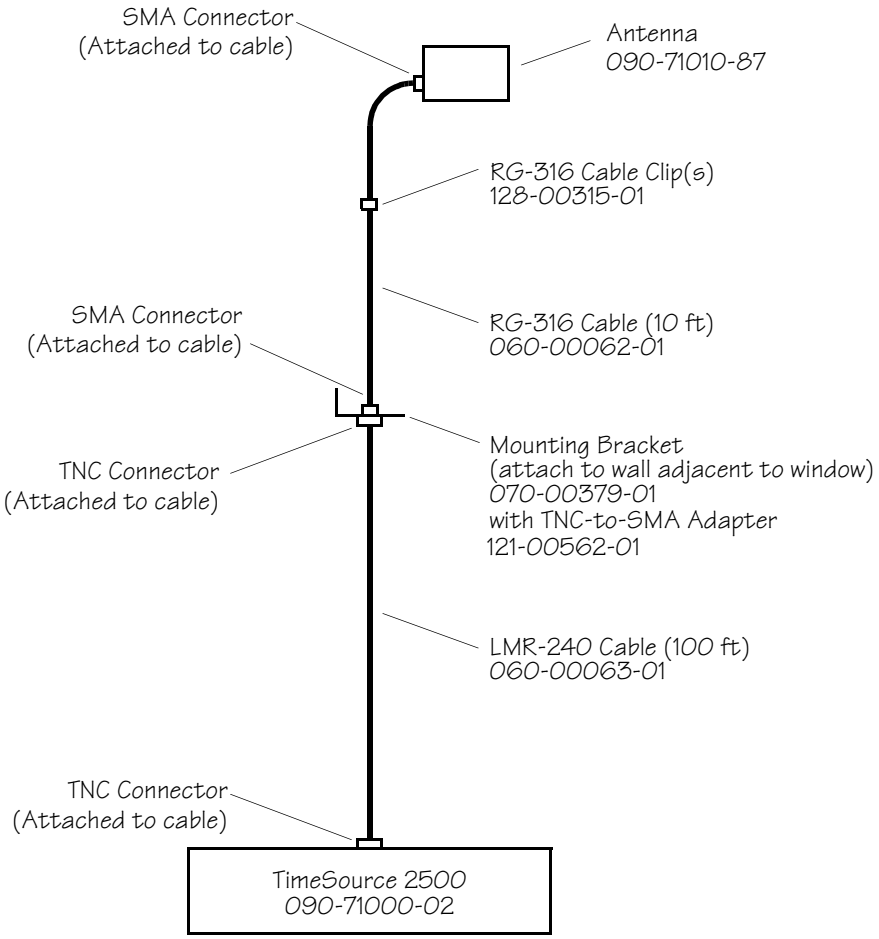
Antenna-to-Shelf Distance Up to 100 Feet

To install the cables when the total length of the cable route is between 40 feet and 100 feet, use cable kit 093-71240-10, and follow Procedure C. Figure 14 shows the antenna-to-shelf cabling for this configuration.

Procedure C. Cable Installation–Maximum 100 Foot Cable

Step	Action
1	Install the SMA-to-TNC adapter bracket to a wall within 10 ft of the antenna, using user-supplied bolts or screws.
2	Install the SMA-to-TNC adapter in the adapter bracket installed in Step 1.
3	Attach one end of the RG-316 cable to the antenna.
4	Attach the other end of the RG-316 cable to the SMA end of the adapter installed in Step 2.
5	Attach one end of the LMR-240 cable to the TNC end of the adapter installed in Step 2.
6	Route the LMR-240 cable to the rear of where the TimeSource 2500 Shelf will be installed.
7	Secure the RG-316 cable, using the adhesive-backed clip(s), so that no more than 10 ft of cable is left unsupported.

Figure 14. Window Antenna-to-Shelf Connection with Cable Kit 093-71240-10



Antenna-to-Shelf Distance Up to 150 Feet or 200 Feet

To install the cables when the total length of the cable route is between 100 feet and 150 feet, use cable kit 093-71400-15, follow Procedure D, and refer to Figure 15. Figure 15 shows the window antenna-to-shelf cabling for this configuration.

To install the cables when the total length of the cable route is between 150 feet and 200 feet, use cable kit 093-71400-20, follow Procedure D, and refer to Figure 16. Figure 16 shows the window antenna-to-shelf cabling for this configuration.

Procedure D. Cable Installation–Maximum 150 Foot or 200 Foot Cable

Step	Action
1	Install the SMA-to-N adapter bracket to a wall within 10 ft of the antenna, using user-supplied bolts or screws.
2	Install the SMA-to-N adapter in the adapter bracket installed in Step 1.
3	For a wall-mounted shelf, install the N-to-N adapter bracket to a wall within 6 ft of the TimeSource 2500 Shelf, using user-supplied bolts or screws. For a rack-mounted shelf, the N-to-N adapter mounting bracket may be mounted to the rack instead of the wall.
4	Install the N-to-N adapter in the adapter bracket installed in Step 3.
5	Attach one end of the RG-316 cable to the antenna.
6	Attach the other end of the RG-316 cable to the SMA end of the adapter installed in Step 2.
7	Connect the LMR-400 cable to the N end of the adapter installed in Step 2.
8	Connect the LMR-400 cable between the N ends of the adapters installed in Steps 2 and 4.
9	Attach the N end of the LMR-240 cable to the other side of the adapter installed in Step 4.
10	Route the LMR-240 cable to the rear of where the TimeSource 2500 Shelf will be installed.
11	Secure the RG-316 cable, using the adhesive-backed clip(s), so that no more than 10 ft of cable is left unsupported.

Figure 15. Window Antenna-to-Shelf Connection with Cable Kit 093-71400-15

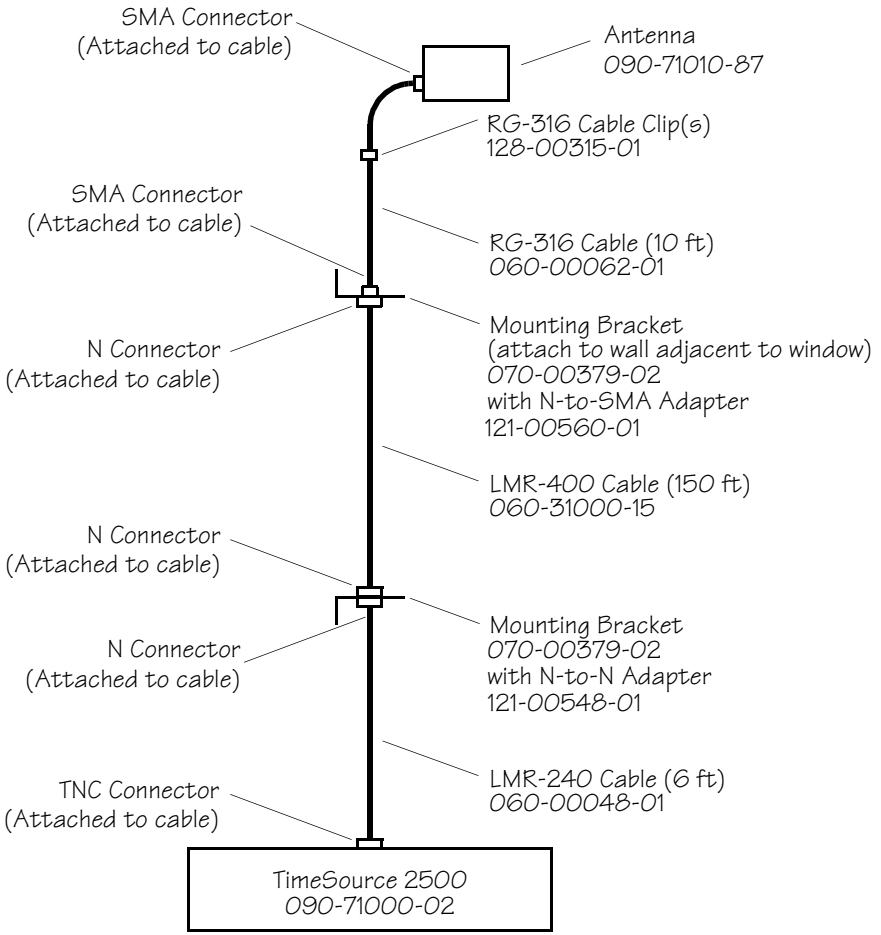
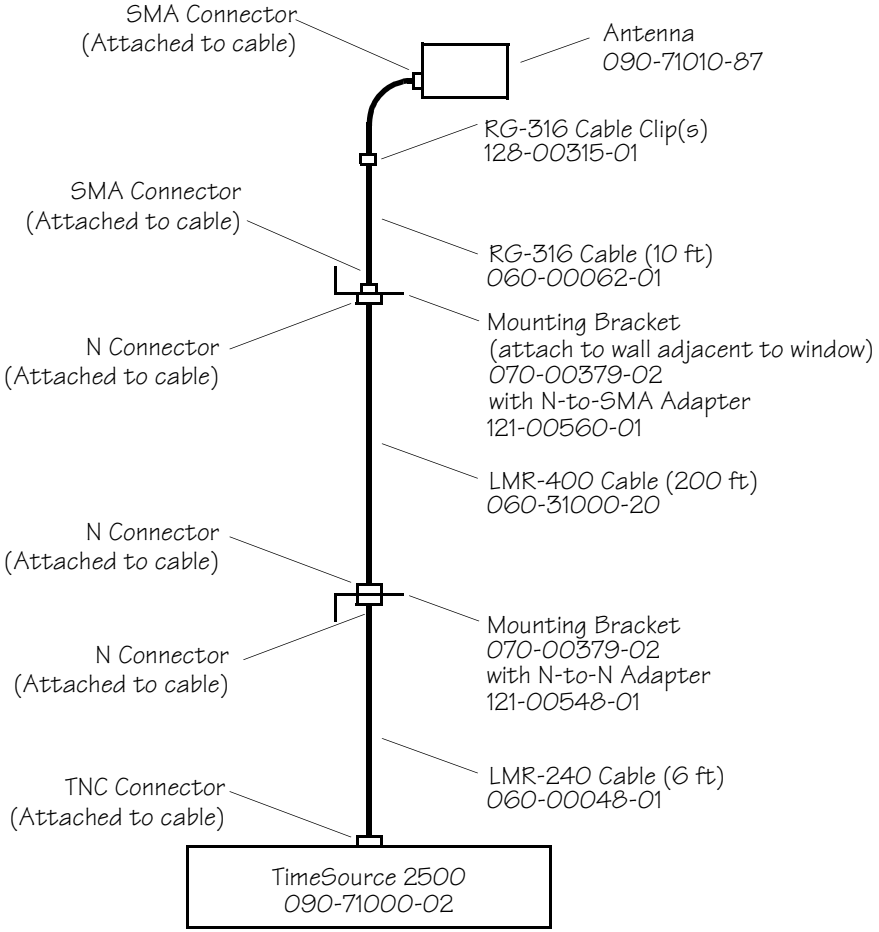


Figure 16. Window Antenna-to-Shelf Connection with Cable Kit 093-71400-20



Wall Antenna Installation

For TimeSource 2500 Systems with wall antennas, use this section. For TimeSource 2500 Systems with window antennas, use the "Window Antenna Installation" section.

Antenna Mounting

To mount the antenna through the wall, refer to Figures 17 and 18, and follow Procedure E.

Procedure E. Wall Antenna Mounting

Step	Action
1	Use Figure 17 to determine the spacing of the hole for the antenna cable, and the holes for the customer-supplied screws or bolts, which will be used to mount the antenna bracket assembly to the outside wall.
2	Drill a hole in the wall for the antenna cable. The diameter of the hole should be slightly larger than the outer diameter of the TNC connector, which will connect to the antenna connector.
3	Drill two pilot holes for the screws or bolts.
4	Remove the antenna from the mounting bracket (remove the plastic cap, nut, and washer, then remove the antenna).
5	Assemble the antenna and mounting bracket as follows: a. Slide the gasket, bracket, then washer, over the antenna connector, and position against the antenna. b. Screw the nut over the antenna connector, onto the assembly.
6	Using two screws or bolts, mount the antenna bracket assembly to the outside wall.

Figure 17. Hole Spacing

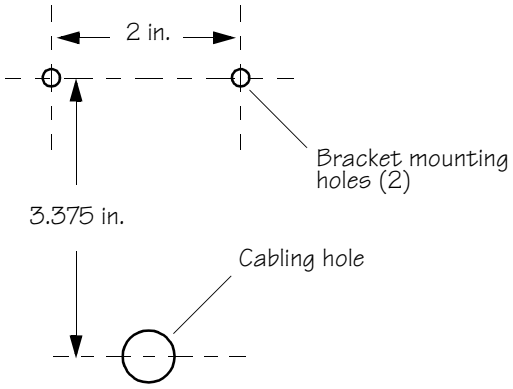
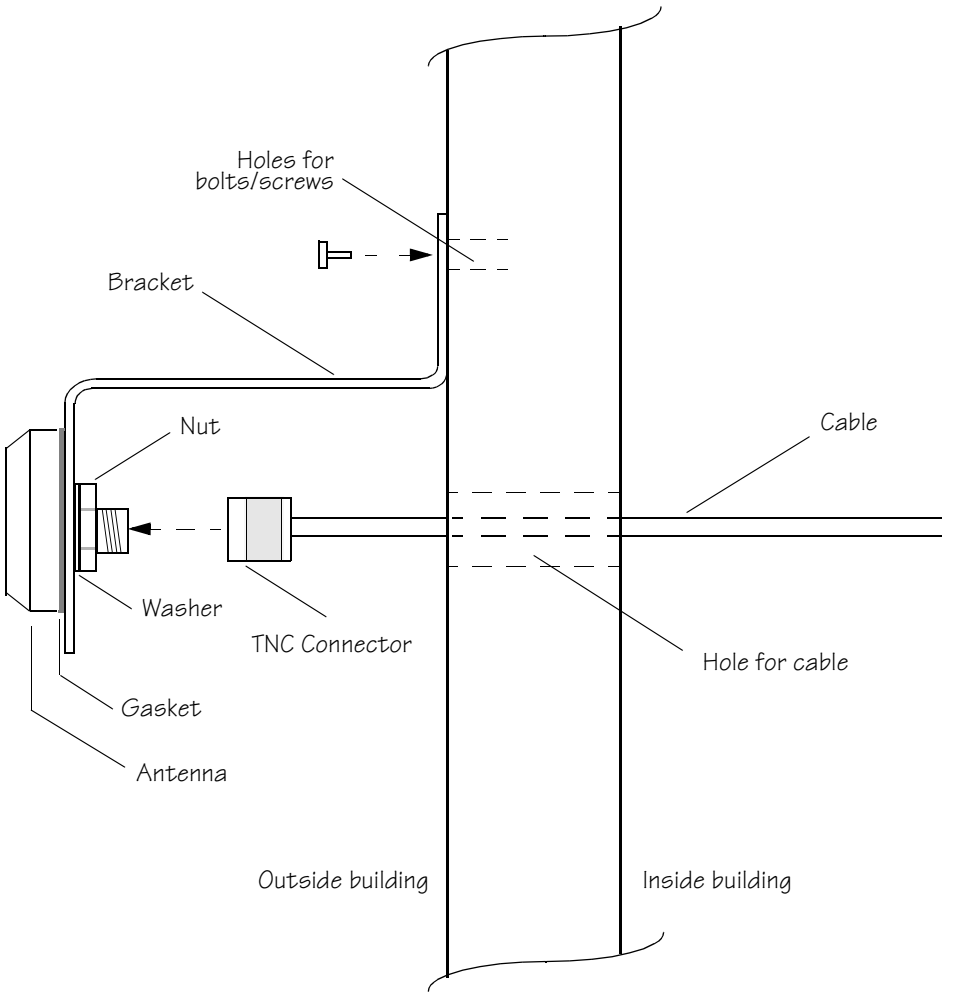


Figure 18. Wall Antenna Mounting



Antenna Cabling

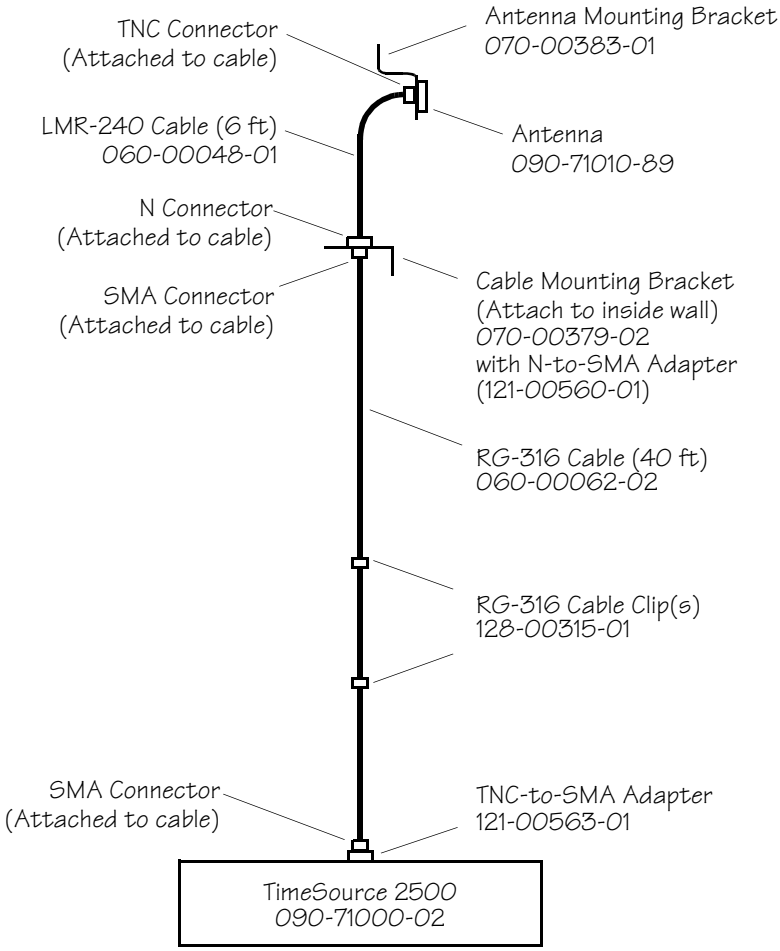
Antenna-to-Shelf Distance Up to 40 Feet

To install the cables when the total length of the cable route is 40 feet or less, use cable kit 093-71317-04, and follow Procedure F. Figure 19 shows the antenna-to-shelf cabling for this configuration.

Procedure F. Cable Installation–Maximum 40 Foot Cable

Step	Action
1	Install the N-to-SMA adapter bracket to the inside wall, within 6 ft of the antenna, using user-supplied bolts or screws.
2	Install the N-to-SMA adapter in the adapter bracket installed in Step 1.
3	Push the LMR-240 antenna cable through the hole drilled in the wall for the antenna cable, routing the TNC end of the cable to the antenna (see Figure 18).
4	Attach the TNC end of the LMR-240 cable to the antenna.
5	Use weatherproof caulking to seal the opening where the cable exits the building.
6	Attach the N end of the LMR-240 cable to the adapter installed in Step 2.
7	Attach the SMA end of the RG-316 cable to the adapter installed in Step 2.
8	Attach the other end of the RG-316 cable to the SMA end of the TNC-to-SMA adapter.
9	Route the RG-316 cable to the rear of where the TimeSource 2500 Shelf will be installed.
10	Secure the RG-316 cable, using the adhesive-backed clip(s), so that no more than 10 ft of cable is left unsupported.

Figure 19. Antenna-to-Shelf Connection with Cable Kit 093-71317-04



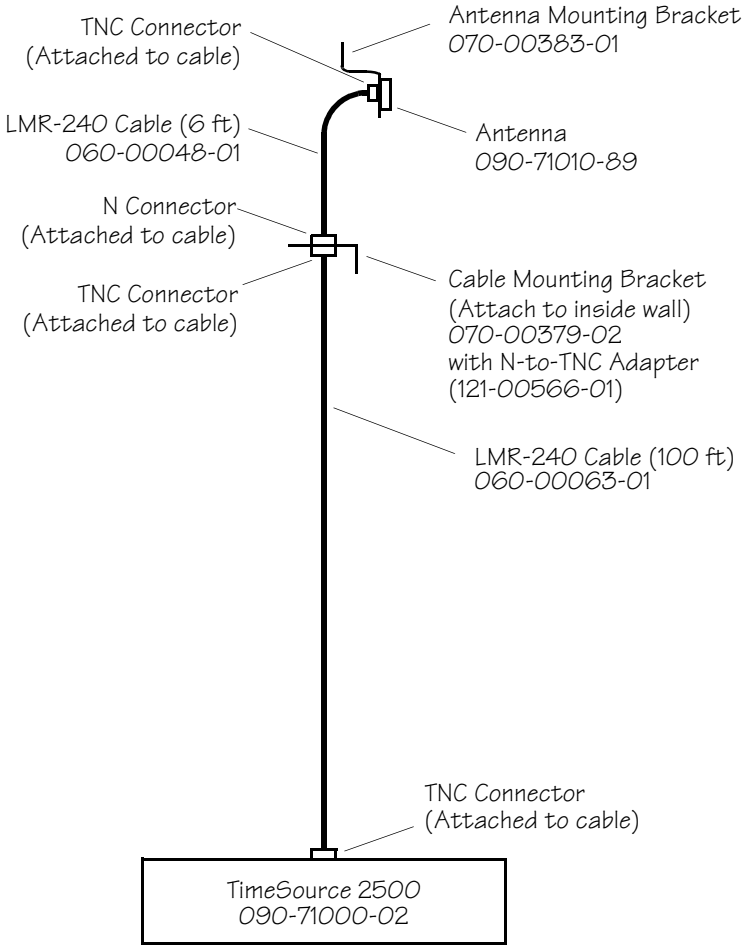
Antenna-to-Shelf Distance Up to 100 Feet

To install the cables when the total length of the cable route is between 40 feet and 100 feet, use cable kit 093-71241-10, and follow Procedure G. Figure 20 shows the antenna-to-shelf cabling for this configuration.

Procedure G. Cable Installation–Maximum 100 Foot Cable

Step	Action
1	Install the N-to-TNC adapter bracket to the inside wall within 6 ft of the antenna, using user-supplied bolts or screws.
2	Install the N-to-TNC adapter in the adapter bracket installed in Step 1.
3	Push the 6 ft LMR-240 antenna cable through the hole drilled in the wall for the antenna cable, routing the TNC end of the cable to the antenna (see Figure 18).
4	Attach the TNC end of the 6 ft LMR-240 cable to the antenna.
5	Use weatherproof caulking to seal the opening where the cable exits the building.
6	Attach the N end of the 6 ft LMR-240 cable to the adapter installed in Step 2.
7	Attach one end of the 100 ft LMR-240 cable to the TNC end of the adapter installed in Step 2.
8	Route the 100 ft LMR-240 cable to the rear of where the TimeSource 2500 Shelf will be installed.

Figure 20. Antenna-to-Shelf Connection with Cable Kit 093-71241-10



Antenna-to-Shelf Distance Up to 150 Feet or 200 Feet

To install the cables when the total length of the cable route is between 100 feet and 150 feet, use cable kit 093-71401-15, follow Procedure H, and refer to Figure 21. Figure 21 shows the antenna-to-shelf cabling for this configuration.

To install the cables when the total length of the cable route is between 150 feet and 200 feet, use cable kit 093-71401-20, follow Procedure H, and refer to Figure 22. Figure 22 shows the antenna-to-shelf cabling for this configuration.

Procedure H. Cable Installation–Maximum 150 Foot or 200 Foot Cable

Step	Action
1	Install one of the N-to-N adapter brackets to the inside wall within 6 ft of the antenna, using user-supplied bolts or screws.
2	Install one of the N-to-N adapters in the adapter bracket installed in Step 1.
3	For a wall-mounted shelf, install the other N-to-N adapter bracket to a wall within 6 ft of the TimeSource 2500 Shelf, using user-supplied bolts or screws. For a rack-mounted shelf, the other N-to-N adapter mounting bracket may be mounted to the rack instead of the wall.
4	Install the other N-to-N adapter in the adapter bracket installed in Step 3.
5	Push one of the LMR-240 antenna cables through the hole drilled in the wall for the antenna cable, routing the TNC end of the cable to the antenna (see Figure 18).
6	Attach the TNC end of the LMR-240 cable to the antenna.

Procedure H. Cable Installation–Maximum 150 Foot or 200 Foot Cable (cont'd)

Step	Action
7	Use weatherproof caulking to seal the opening where the cable exits the building.
8	Attach the other end of the same LMR-240 cable to the adapter installed in Step 2.
9	Connect one end of the LMR-400 cable to the adapter installed in Step 2.
10	Connect the other end of the LMR-400 cable to the adapter installed in Step 4.
11	Attach the N end of the other LMR-240 cable to the other side of the adapter installed in Step 4.
12	Route the same LMR-240 cable to the rear of where the TimeSource 2500 Shelf will be installed.

Figure 21. Antenna-to-Shelf Connection with Cable Kit 093-71401-15

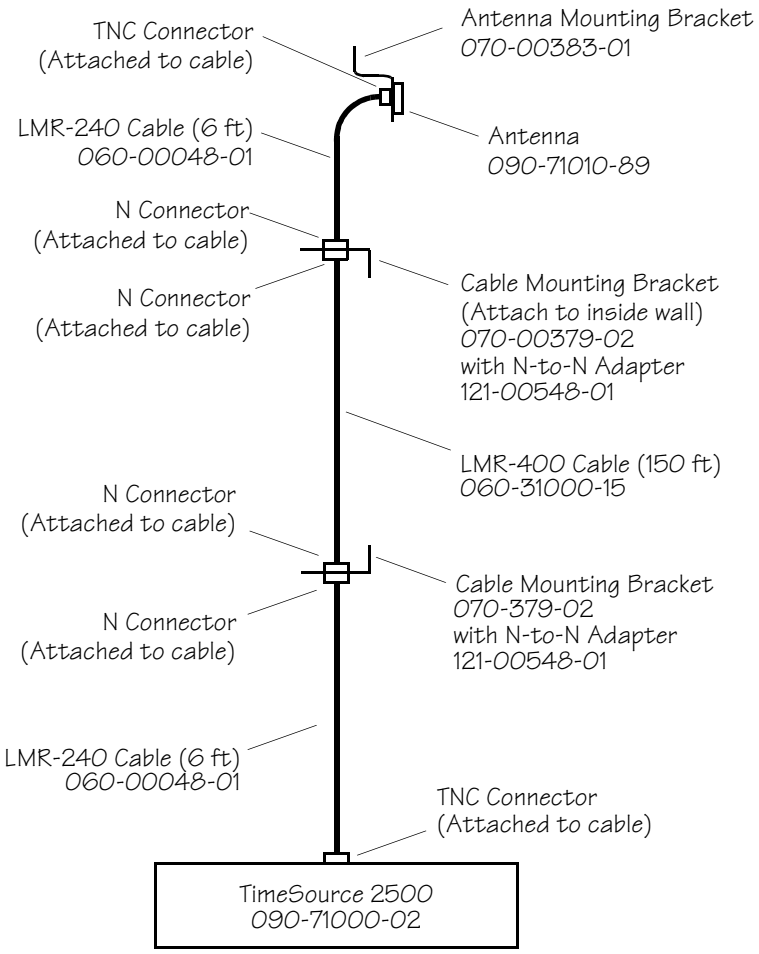
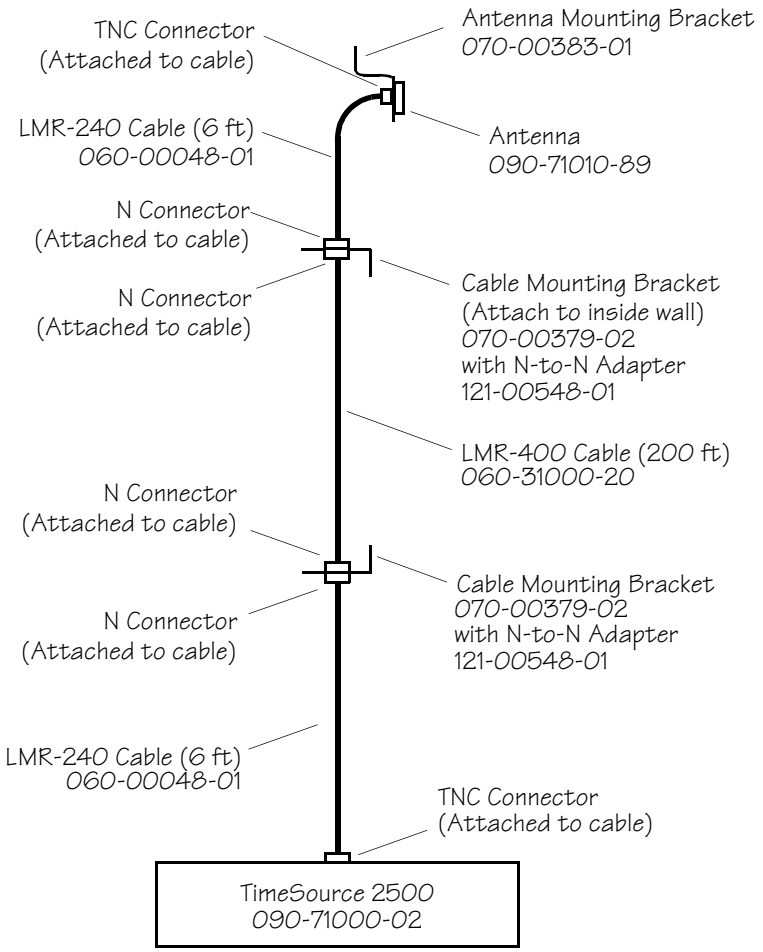


Figure 22. Antenna-to-Shelf Connection with Cable Kit 093-71401-20

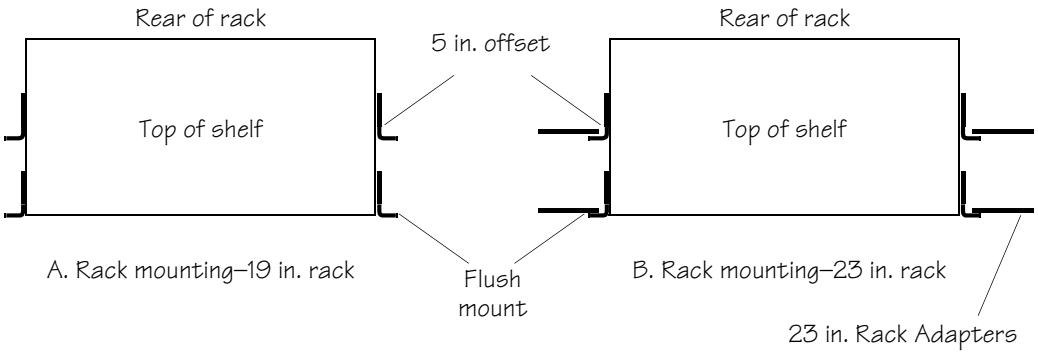


Shelf

Rack Mounting

The mounting ears, as shown in Figure 23, can be positioned for flush or 5 inch offset mounting, in either a 19 inch rack (Figure 23A) or a 23 inch rack (Figure 23B). To mount the shelf, follow Procedure I.

Figure 23. Rack Mounting Options



Procedure I. Rack Mounting

Step	Action
1	Position the mounting ears on the shelf for flush mounting or 5 in. offset mounting, as required. If mounting in a 23 in. rack, attach the 23 in. rack adapters.
2	Mount the shelf in the rack.
3	If a wire-wrap panel is not used, this procedure is completed. If using a wire-wrap panel, mount the panel (Figure 24) to the rack just below the TimeSource 2500.
4	Connect the cables (included in the wire-wrap panel kit) between the front panel connectors of the TimeSource 2500 and the connectors on the inside of the wire-wrap panel, as listed in Table C.

Figure 24. Rack Mounting with Wire-Wrap Panel

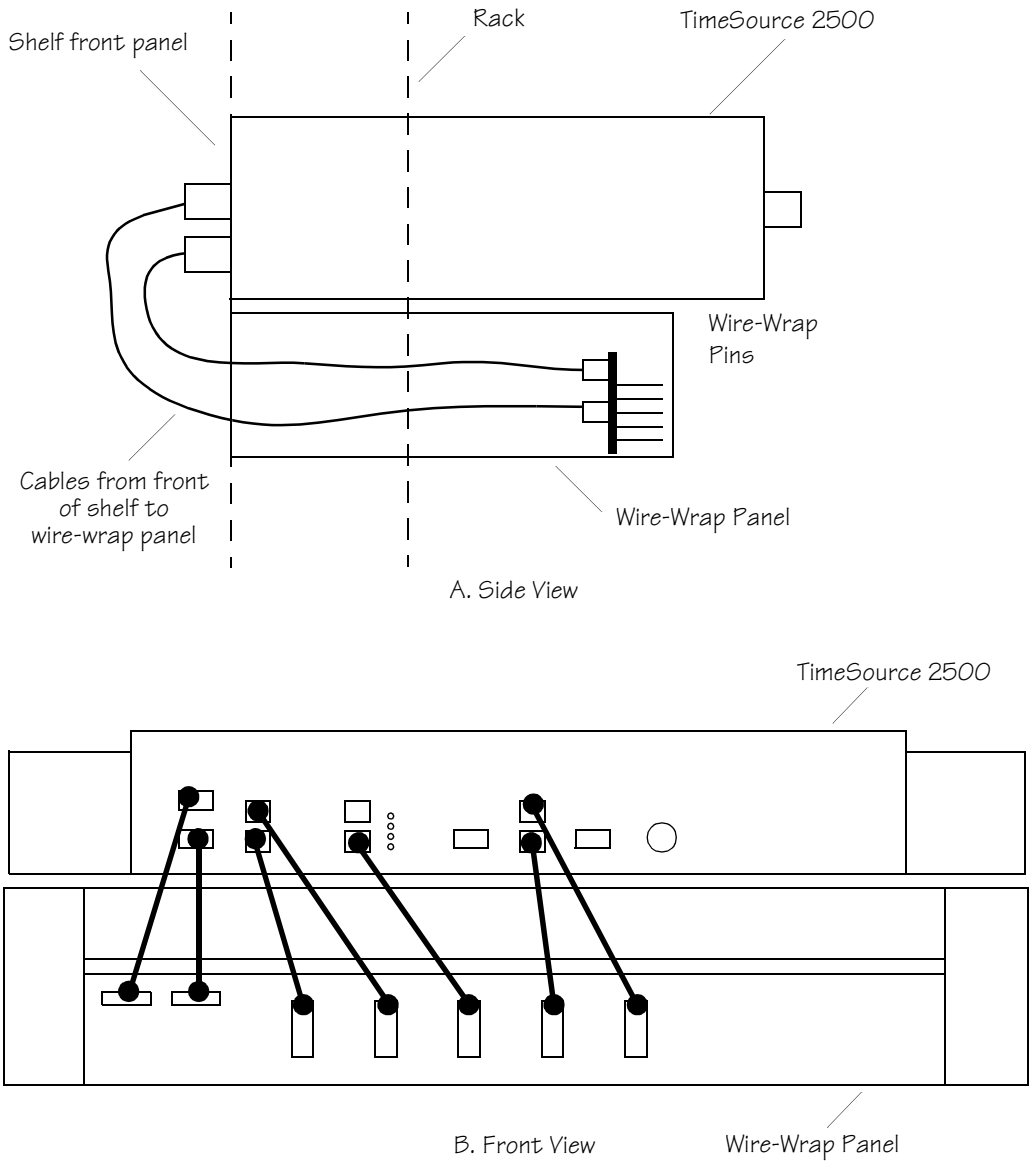


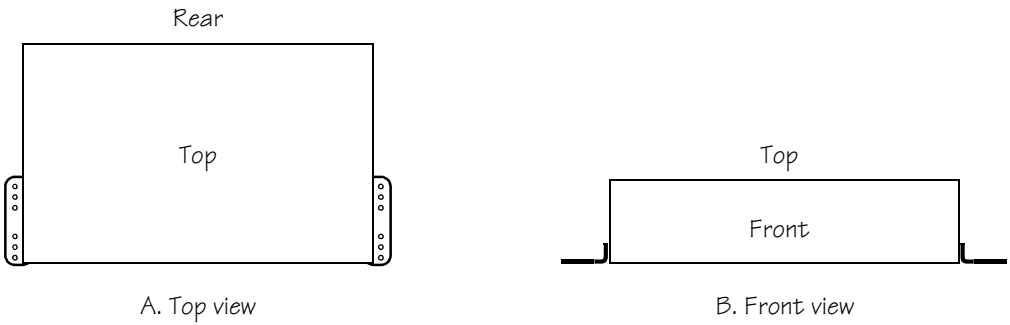
Table C. Cable Connections

TimeSource 2500	Wire-Wrap Panel	Cable Type
Power A	P1 PWR-A	DB9 – 3-pin Molex
Power B	P2 PWR-B	DB9 – 3-pin Molex
Output Span A	J3 OUTPUT A	RJ-45 – 5-pin Molex
Output Span B	J4 OUTPUT B	RJ-45 – 5-pin Molex
Alarms	J5 ALARM	RJ-45 – 5-pin Molex
Input Span A	J1 INPUT A	RJ-45 – 5-pin Molex
Input Span B	J2 INPUT B	RJ-45 – 5-pin Molex

Wall Mounting

The TimeSource 2500 can be attached to a wall or other surface. Attach the proper mounting ears, included with the TimeSource 2500, as shown in Figure 25, then use appropriate screws (not included) to attach to the chosen surface.

Figure 25. Wall Mounting



Cabling

The connection to the GPS antenna is on the rear of the TimeSource 2500 Shelf. All other connections are made on the front of the shelf. When installing the TimeSource 2500 in a rack with a wire-wrap panel, connections are made at the rear of the wire-wrap panel. Figure 26 shows the locations of the connectors on the front of the shelf, and Figure 27 shows the locations of the connectors on the rear of the wire-wrap panel.

Figure 26. Shelf Front Panel Connectors

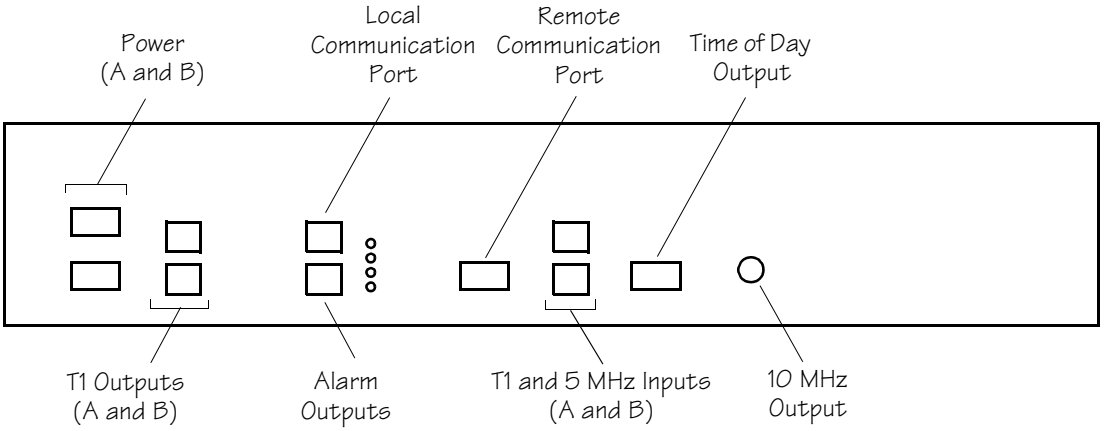
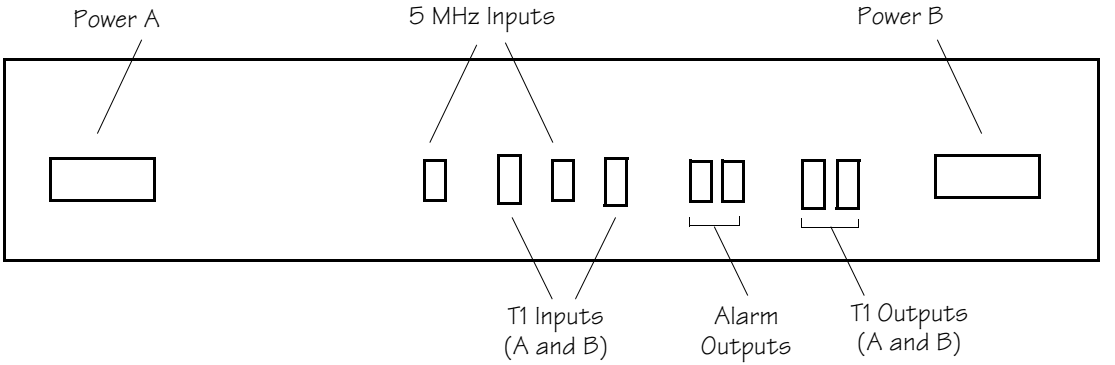


Figure 27. Wire-Wrap Rear Panel Connectors



Frame Ground

Shelf Front Panel

Frame ground enters through the Power A and Power B connectors. These are nine-pin male DB9 connectors. Refer to Figure 26 for the location of the connectors. The pinouts in the connectors are listed in Table D.

Ensure the frame ground wires are long enough to go from the shelf front panel to the frame ground connection. Solder the frame ground wires to pin 6 of customer-supplied female DB9 connectors.

Table D. Front Panel Frame Ground and Power Connector Pinouts

Pin	Signal
1	–48 V dc
2	Battery return
6	Frame ground

Note: Pins not listed are reserved for future use.

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 frame ground rod run vertically on each side of the rack. Use one of the following methods for connecting the wire from pin 6 of the DB9 connector to the 6 AWG rod.

- Crimp an appropriate-size spade lug to the ground wire from the DB9 connector, bend the lug around the 6 AWG rod, and solder.
- Strip enough insulation from the ground wire from the DB9 connector to permit three complete turns around the 6 AWG rod, and solder.

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

Without ground rod

Crimp an appropriate-sized spade lug to the wire from pin 6 of the DB9 connector, and secure the lug to a screw hole on the rack. Remove the paint, and sand the area around the screw hole, to ensure proper conductivity.

Wire-Wrap Rear Panel

Frame ground enters through the PWR-A and PWR-B terminal blocks. Refer to Figure 27 for the location of the terminal blocks. The terminals in the terminal blocks are listed in Table E.

Ensure the frame ground wires are long enough to go from the wire-wrap panel to the frame ground connection. Connect the frame ground wires to terminal F of the terminal blocks, using appropriate sized spade lugs.

Table E. Wire-Wrap Panel Frame Ground and Power Terminal Block Pinouts

Terminal	Signal
–	–48 V dc
+	Battery return
F	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 frame ground rod run vertically on each side of the rack. Use one of the following methods for connecting the wire from terminal F of the terminal block to the 6 AWG rod.

- Crimp an appropriate-size spade lug to the ground wire from the terminal block, bend the lug around the 6 AWG rod, and solder.
- Strip enough insulation from the ground wire from the terminal block to permit three complete turns around the 6 AWG rod, and solder.

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

Without ground rod

Crimp an appropriate-sized spade lug to the wire from terminal F of the terminal block, and secure the lug to a screw hole on the rack. Remove the paint, and sand the area around the screw hole, to ensure proper conductivity.

Power

Caution: ***Ensure the fuses in the fuse panel which will be used to power the TimeSource 2500 Shelf are removed before connecting power.***

Note: Input power is reverse polarity protected; there are no user replaceable fuses.

Shelf Front Panel

The –48 volt dc battery enters through the Power A and Power B connectors. These are nine-pin male DB9 connectors. Refer to Figure 26 for the location of the connectors. The pinouts in the connectors are listed in Table D.

If two office battery supplies (battery A and battery B) are not available, connect the single office battery to the Power A connector on the shelf front panel. This is not a recommended arrangement.

Ensure the power wires are long enough to go from the shelf front panel to the office battery source connection. Solder the power wires to customer-supplied female DB9 connectors, following the pinouts listed in Table D, then connect to the Power A and Power B connectors on the front panel.

Connect the power leads from pins 1 and 2 to the office battery source, but do not apply the office battery to the TimeSource 2500 at this time.

Wire-Wrap Rear Panel

The –48 volt dc battery enters through the PWR-A and PWR-B terminal blocks. Refer to Figure 27 for the location of the terminal blocks. The terminals in the terminal blocks are listed in Table E.

If two office battery supplies (battery A and battery B) are not available, connect the single office battery to the PWR-A terminal block on the rear of the wire-wrap panel. This is not a recommended arrangement.

To connect power, ensure the power wires are long enough to go from the wire-wrap panel to the office battery source connection. Connect the power wires to the terminals listed in Table E, using appropriate sized spade lugs.

Connect the leads from the – and + terminals to the office battery source, but do not apply the office battery to the TimeSource 2500 at this time.

T1 Outputs

Shelf Front Panel

Connect the T1 outputs to the two RJ45 connectors labeled Output Span A and Span B. Figure 26 shows the location of the connectors. The pinouts of each of the connectors (Output Span A and Span B) are listed in Table F.

Note: The shield is normally grounded only at the signal source. Grounding the shield at both ends is not recommended.

Table F. Front Panel T1 Output Connector Pinouts

Pin	Signal Name
4	Ring
5	Tip
7	Frame ground
8	Frame ground

Note: Pins not listed are reserved for future use. Use category 5 EIA/TIA 568 A or B compliant cable.

Wire-Wrap Rear Panel

Connect the T1 outputs to the two wire-wrap connectors labeled OUTPUT DS1-A and DS1-B. Table G shows the location of the connectors. The pinouts of each of the connectors (OUTPUT DS1-A and DS1-B) are listed in Table G.

Table G. Wire-Wrap Panel T1 Output Connector Pinouts

Pin	Signal Name
R	Ring
T	Tip
S	Frame ground

Local Communication Port

Make a direct connection to the TimeSource 2500 communication port at the RJ45 connector labeled Craft. Figure 26 shows the location of the connector. The pinouts of the connector are listed in Table H.

Note: TL1 messages are available only via the Craft port.

Table H. Local Communication Port Connector Pinouts

Pin	Signal	Abbreviation	Direction
2	Transmit data	TXD	From TimeSource 2500
3	Receive data	RXD	To TimeSource 2500
4	Data set ready	DSR	To TimeSource 2500
5	Signal ground	GND	—
6	Data terminal ready	DTR	From TimeSource 2500
7	Frame	—	—
8	Frame	—	—

Note: Pins not listed are reserved for future use.

Alarm Outputs

Shelf Front Panel

The RJ45 connector labeled Alarms provides dry-contact relay closure points. The relay contacts are normally open, and close when reporting an alarm. Figure 26 shows the location of the connector. Connect between the Major pins for a major alarm, and between the Minor pins for a minor alarm. The pinouts of the connector are listed in Table I.

Table I. Alarm Output Connector Pinouts

Pin	Alarm	Contacts During No Alarm	Contacts During Alarm	Contacts During Power Off
1	Major	Open	Closed	Closed
5				
2	Minor	Open	Closed	Open
4				

Note: Pins not listed are reserved for future use.

Wire-Wrap Rear Panel

The two wire-wrap connectors labeled ALARM MAJ and MIN provide dry-contact relay closure points. Figure 27 shows the location of the connectors. Connect between the MAJ connector + and – pins for a major alarm, and between the MIN connector + and – pins for a minor alarm.

Remote Communication Port

Make connections to the data terminal equipment (DTE) port at the connector labeled Remote RS-232. This is a nine-pin female DB9 connector. Figure 26 shows the location of the connector. The pinouts of the connector are listed in Table J.

Table J. Remote Communication Port Connector Pinouts

Pin	Signal	Abbreviation	Direction
1	Data carrier detect	DCD	To TimeSource 2500
2	Receive data	RXD	To TimeSource 2500
3	Transmit data	TXD	From TimeSource 2500
4	Data terminal ready	DTR	From TimeSource 2500
5	Return/signal ground	RTN	—
6	Data set ready	DSR	To TimeSource 2500
7	Request to send	RTS	From TimeSource 2500
8	Clear to send	CTS	To TimeSource 2500

Note: Pins not listed are reserved for future use.

T1 and 5 MHz Inputs

Shelf Front Panel

Connect the optional T1 inputs and the optional 5 MHz inputs to the two RJ45 connectors labeled Input Span A and Span B. Figure 26 shows the location of the connectors. The pinouts of each of the connectors are listed in Table K.

Note: The shield is normally grounded only at the signal source. Grounding the shield at both ends is not recommended.

Table K. Front Panel T1 and 5 MHz Input Connector Pinouts

Pin	Signal
1	Ring
2	Tip
3	5 MHz (positive)
6	5 MHz (negative)
7	Frame ground
8	Frame ground

Note: Pins not listed are reserved for future use.

Wire-Wrap Panel

Connect the optional T1 inputs to the two wire-wrap connectors labeled INPUT DS1-A and DS1-B. Figure 27 shows the location of the connectors. The pinouts of each of the connectors are listed in Table L.

Note: The shield is normally grounded only at the signal source. Grounding the shield at both ends is not recommended.

Table L. Rear Wire-Wrap Panel T1 Input Connector Pinouts

Pin	Signal
R	Ring
T	Tip
S	Frame ground

Connect the optional 5 MHz inputs to the two wire-wrap connectors labeled INPUT 5M A and 5M B. Figure 27 shows the location of the connectors. The pinouts of each of the connectors are listed in Table M.

Table M. Rear Wire-Wrap Panel 5 MHz Input Connector Pinouts

Pin	Signal
+	5 MHz (positive)
–	5 MHz (negative)

Time of Day Output

Connect the time of day (TOD) output to the connector labeled TOD RS-422. This is a nine-pin female DB9 connector. Figure 26 shows the location of the connector. The pinouts of the connector are listed in Table N.

Table N. TOD Output Connector Pinouts

Pin	Signal
1	1 pps output (positive)
3	Return for external 20 V NL
5	TXA output (positive)
6	1 pps output (negative)
7	External 20 V NL
9	TXA output (negative)

Note: Pins not listed are reserved for future use.

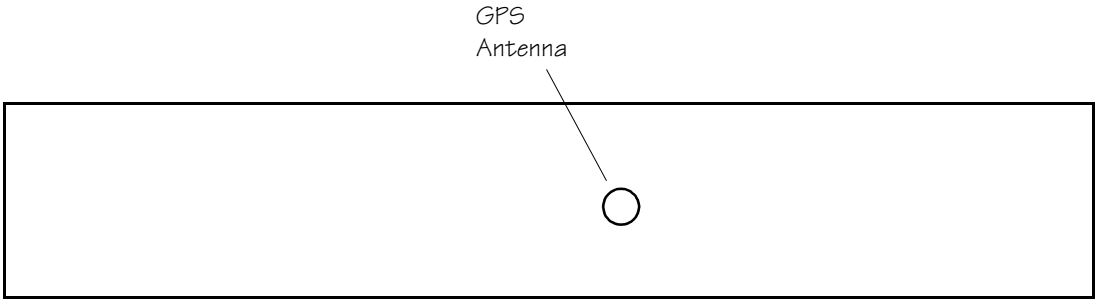
10 MHz Output

Connect a BNC connector from the connector labeled 10MHz Output to the equipment that will use the 10 MHz output signal. Refer to Figure 26 for the connector location.

GPS Antenna

Connect the cable from the GPS antenna to the TNC connector labeled GPS RF In. Refer to Figure 28 for the connector location.

Figure 28. Shelf Rear Panel Connection



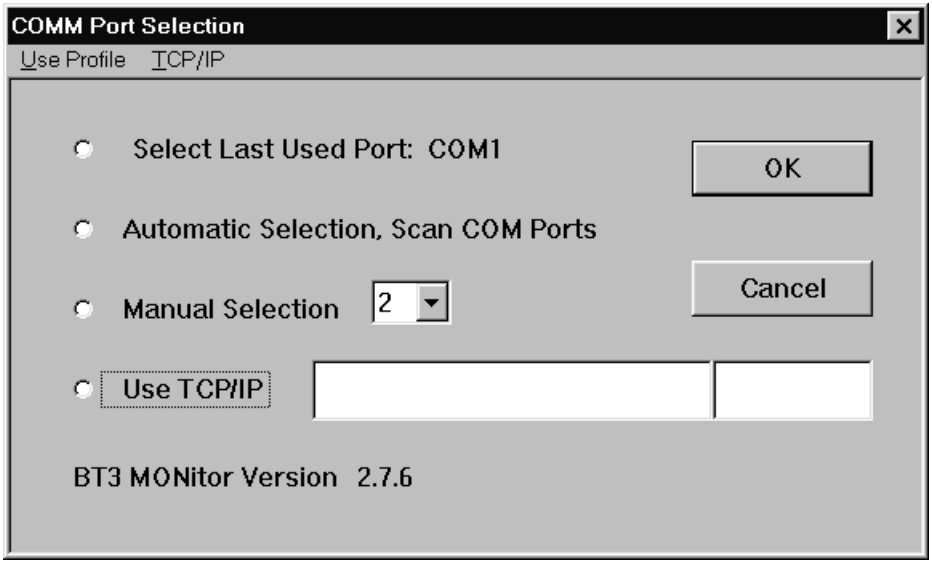
Power-Up

Use Procedure J to install BTMONitor at a site where the host computer is connected to the Craft connector of the TimeSource 2500 with a cable, and set up BTMONitor.

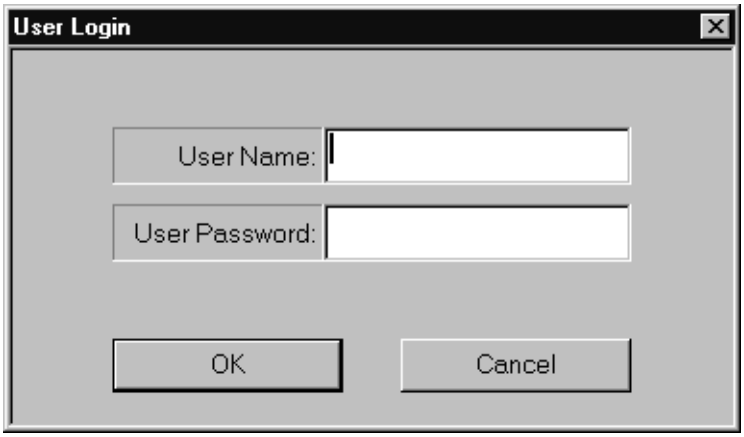
Procedure J. Power Up

Step	Action
1	Locate a directory, or create a new directory, on your hard disk, to store the BTMONitor application.
2	Copy the files from the BTMONitor disk to the directory.
3	Create a Windows shortcut to BTMONitor, and place the shortcut on the Windows Desktop. One method to accomplish this is to open Windows Explorer in an unmaximized window with some of the Desktop visible around it. Then, navigate to the BTMONitor file and drag the file to the Desktop. Click OK if Windows asks to make a shortcut file.
4	Connect the supplied serial communications cable between the TimeSource 2500 Craft connector and a serial communications port on the computer.
5	Install fuses in the fuse panel that powers the TimeSource 2500. On the front panel, when the Minor Alarm lamp is yellow, and the Locked lamp is blinking green, continue.

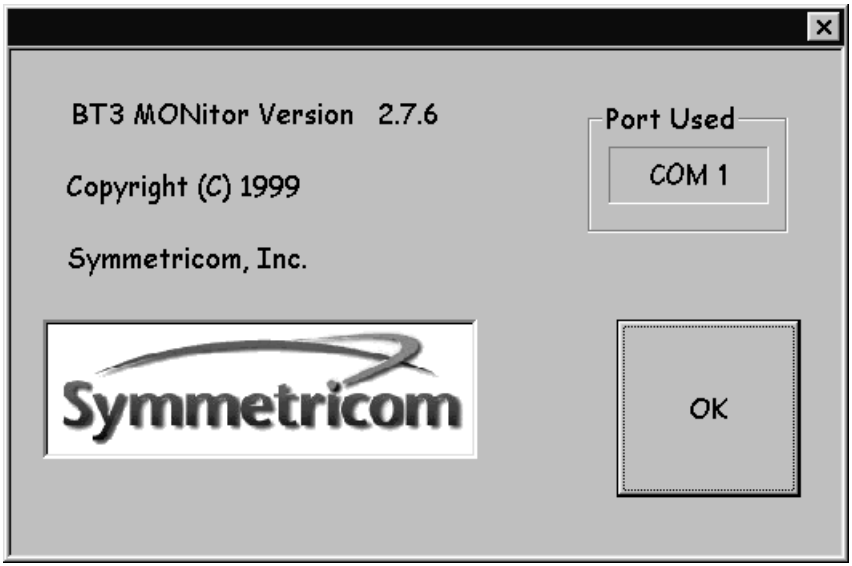
Procedure J. Power Up (cont'd)

Step	Action
6	Open the BTMONitor application. The COMM Port Selection screen appears. 
7	Choose a communications port by clicking one of the following: • Select Last Used Port: COMx:. This selection will use the named serial communications port, which BTMONitor identifies as the one used in the previous session, when the OK button is clicked. • Automatic Selection, Scan COM Ports. This selection will scan the serial communications ports on the host computer for the communications port connected to the TimeSource 2500, when the OK button is clicked. • Manual Selection: Allows the user to enter or choose the host computer communication port that is connected to the TimeSource 2500.

Procedure J. Power Up (cont'd)

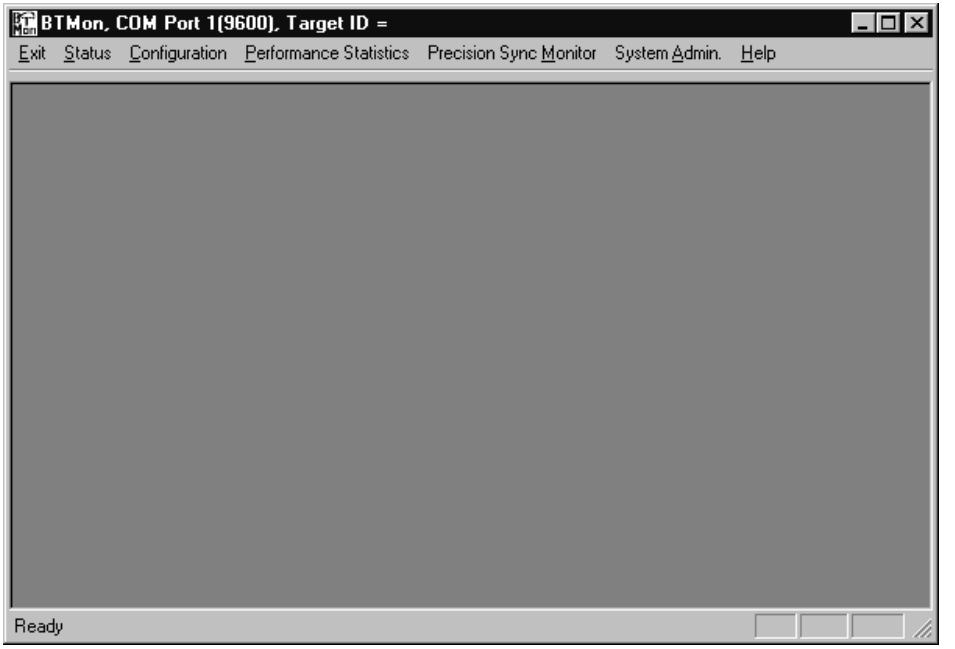
Step	Action
8	Click OK. Verify a User Login screen appears (shown below).  *Note:* If a dialog box appears stating, "Failed to Open COM Port" instead of the User Login screen, verify that the TimeSource 2500 is powered, and the serial communications are connected. Then click OK, and repeat Steps 7 and 8.

Procedure J. Power Up (cont'd)

Step	Action
9	Enter the user name and password for this installation, then click the OK button. A screen appears showing the version number, copyright date, and the serial port that communicates with the TimeSource 2500 (shown below). *Notes:* 1. The user name, "default1", is set at the factory, and the password, "TS2500:", is set at the factory. 2. The user name and password are case-sensitive. 3. If an incorrect user name and password are entered three consecutive times, the BTMONitor application exits and ends the attempted session. If this happens, re-open the application, and enter the correct user name and password. 

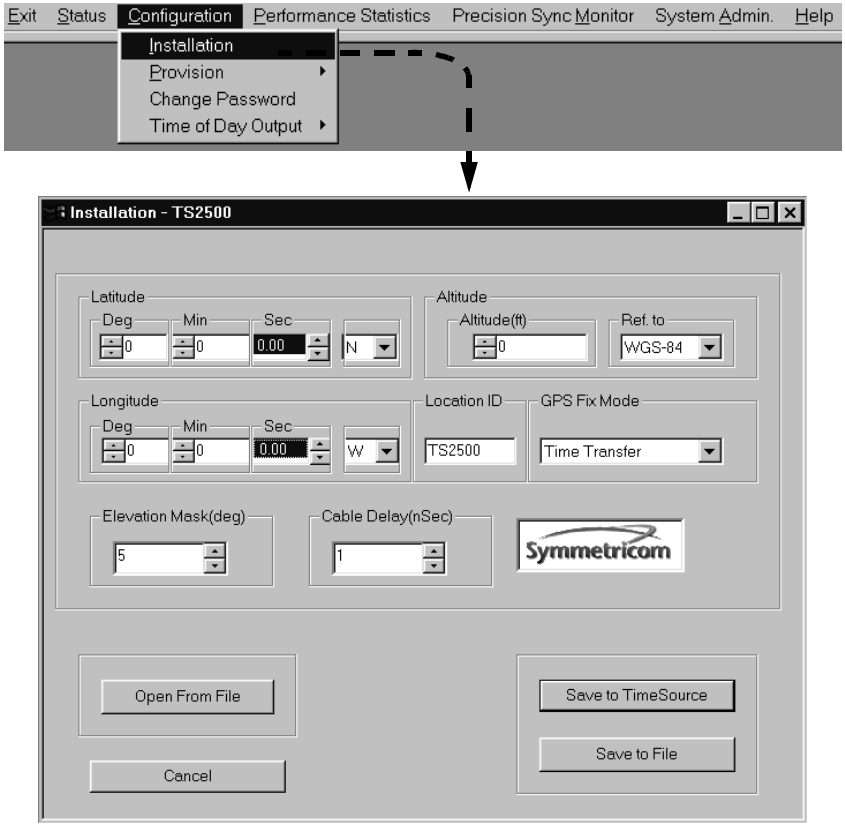
Procedure J. Power Up (cont'd)

Step	Action
10	Verify the correct version number and serial port, then click the OK button. The BTMONitor main screen appears (shown below).



Procedure J. Power Up (cont'd)

Step	Action
11	Select Configuration from the main screen, then select Installation, as shown below.



Note: Factory settings are shown for Latitude, Altitude, Longitude, Location ID, Elevation Mask, and Cable Delay.

Procedure J. Power Up (cont'd)

Step	Action
12	In the Latitude area: Enter the latitude of the TimeSource 2500 location. The latitude must be accurate to within 1/8 mi. Type, or use the up and down arrows on the side of each data entry box, to enter the degrees and minutes; the seconds must be entered using the up and down arrows only. Select N for latitudes north of the equator, and S for latitudes south of the equator. *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.* *Notes:* 1. The TimeSource 2500 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 also be used to obtain latitude and longitude. When the entered figures are within 1/8 mi of the actual coordinates, the TimeSource 2500 can deliver UTC traceable timing within 1 h of applying power. 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. 4. Some GPS hand-held receivers and mapping software indicate latitude and longitude in degrees and fractional minutes. To convert fractional minutes into seconds, multiply the fraction times 60. For example, 1.5 min = 1 min, 30 sec (0.5 x 60).

Procedure J. Power Up (cont'd)

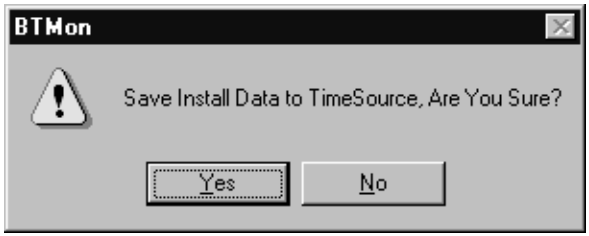
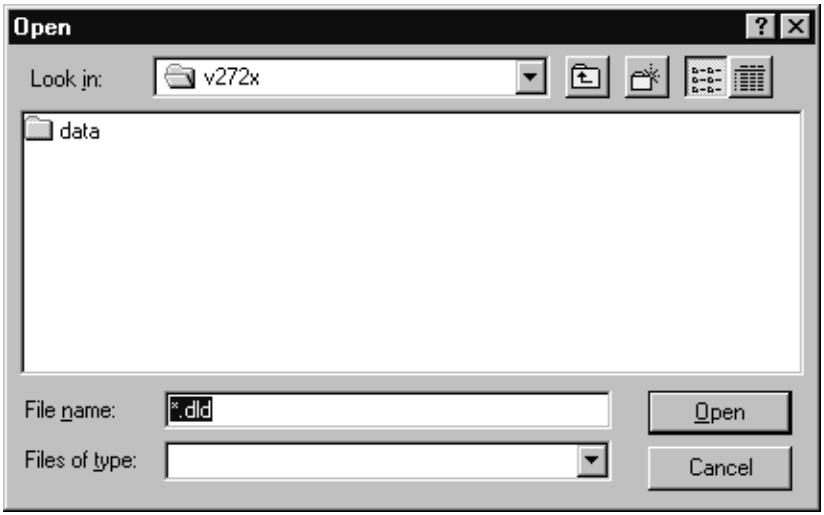
Step	Action
13	In the Longitude area: Enter the longitude of the TimeSource 2500 location. The longitude must be accurate to within 1/8 mi. Type, or use the up and down arrows on the side of each data entry box, to enter the degrees and minutes; the seconds must be entered using the up and down arrows only. Select W for longitudes west of the Greenwich meridian, and E for longitudes east of the Greenwich meridian.
14	In the Altitude area: Enter the altitude of the TimeSource 2500 in feet. Type, or use the up and down arrows on the left side of this data entry box. Use the adjacent Ref. to data entry box to identify the method of calculating the datum or reference point. *Notes:* 1. The factory-set WGS-84 (World Geodetic System 1984) selection is the same method of calculating the datum point used by most manufacturers of GPS hand-held receivers and mapping software. Essentially, GPS hand-held receivers and mapping software provide mean sea level altitude data. Do not change the Ref. to setting from WGS-84. 2. Altitude is usually obtained for ground (mean sea) level. If the TimeSource 2500 will be installed in a multi-story building, add approximately 10 ft per story from the ground level, to calculate the total altitude.
15	In the Location ID area: Enter two to eight alphanumeric characters for the TimeSource 2500 identification. The identification name can be used to identify this particular TimeSource 2500 among multiple TimeSource 2500 Systems. *Caution: A name must be entered. Do not leave this field blank.*
16	Verify GPS Fix Mode is set to Time Transfer.
17	In the Elevation Mask area: Enter the elevation mask. Type or use the up and down arrows on the right side of the data entry box. The receiver does not seek satellites from the horizon to this number of degrees above the horizon. The factory default setting is 5.

Procedure J. Power Up (cont'd)

Step	Action
18	In the Cable Delay area: Enter the number of ns corresponding to your cable kit part number from the list below. Type or use the up and down arrows on the right side of the data entry box.

Antenna Type	Cable Kit Part No.	Total Cable Length (ft)	Delay (ns)
Window	093-71316-04	40	65
Wall	093-71317-04		
Window	093-71240-10	100	158
Wall	093-71241-10		
Window	093-71400-15	150	242
Wall	093-71401-15		
Window	093-71400-20	200	320
Wall	093-71401-20		

Procedure J. Power Up (cont'd)

Step	Action
19	When the parameters are set as desired, click the Save to TimeSource button to save the information on this screen to the TimeSource 2500. A dialog box appears to confirm the action (see below). Click Yes to save the parameters to the TimeSource 2500. 
20	Click the Save to File button to save the contents of the screen to a file on a disk using a standard Windows File Save dialog box (shown below). *Note:* Saving the Installation screen information to a file may be useful for reinitializing the TimeSource 2500 if the unit loses critical memory or is taken out of service. 

Procedure J. Power Up (cont'd)

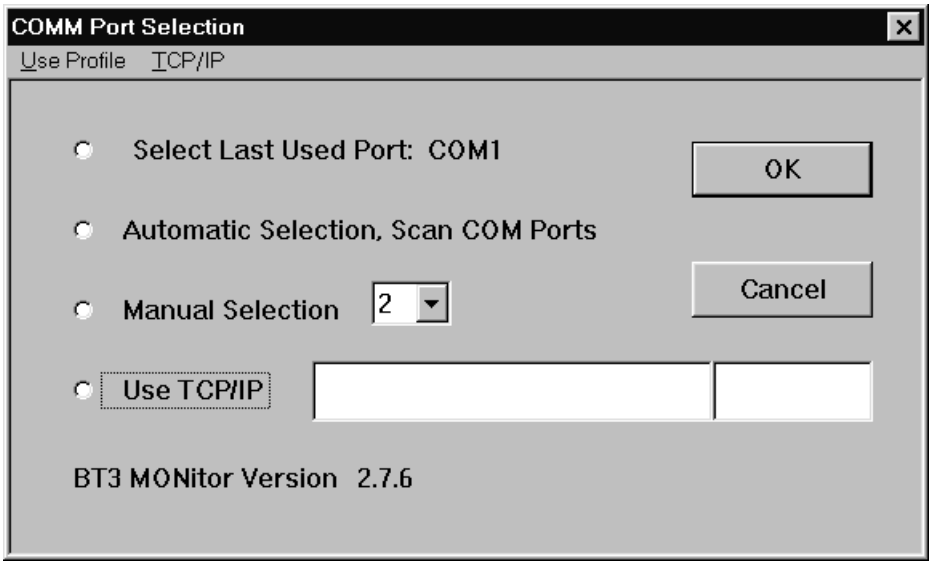
Step	Action
21	Choose a folder in the file system of your computer, enter a unique filename, and click the Open button.
22	Wait until the TimeSource 2500 front panel Locked lamp is lit green (steady), and all other lamps are off. (The system normally takes about 1 h to warm up, but may take up to 8 h to warm up, depending on the antenna location and other site-dependent specifics.)
23	The TimeSource 2500 System is now installed and providing Stratum 1 signals.

Remote Operation via a Modem (Optional)

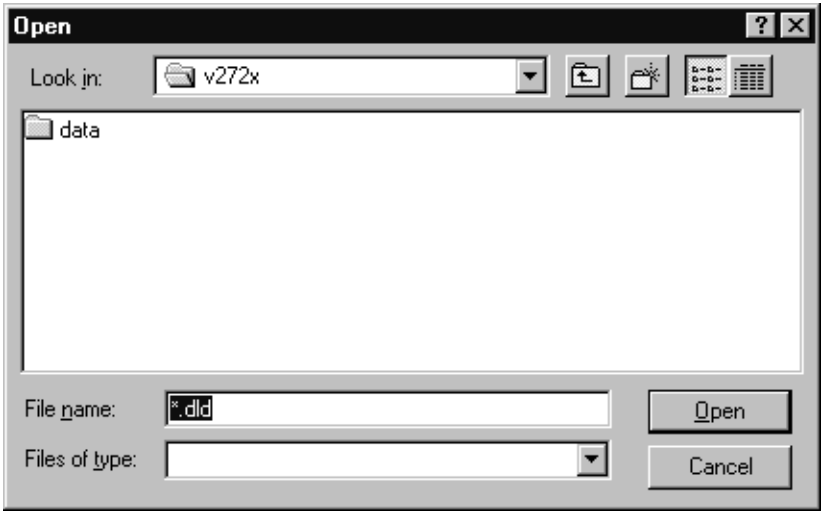
Use Procedure K to set up communications between BTMONitor and the TimeSource 2500 via a modem (Hayes compatible).

Procedure K. Installing BTMONitor Using a Modem

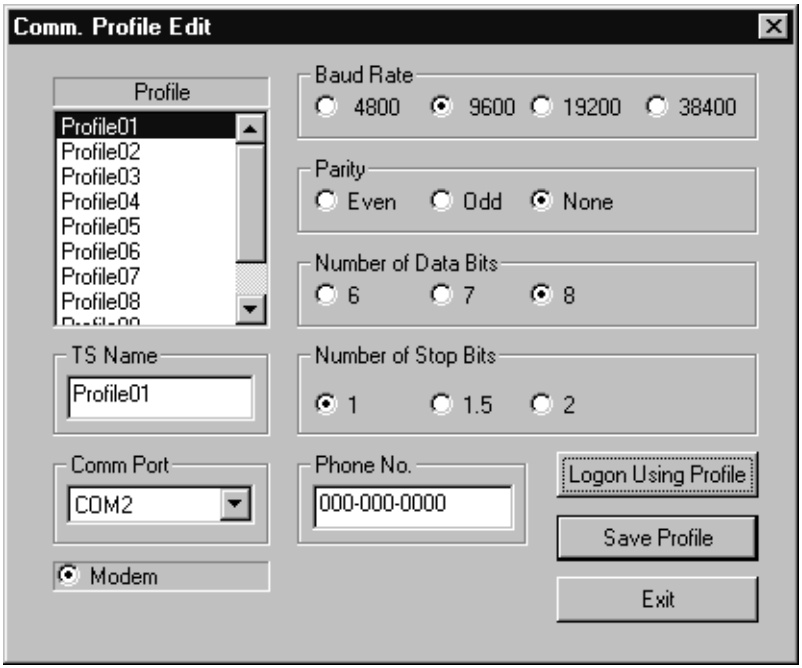
Step	Action
1	Connect a straight-through serial communications cable (user supplied) between the TimeSource 2500 Remote connector and serial communications port on the modem, and verify all links between the modem and the host computer are connected.
2	From the BTMONitor main screen, click Exit.
3	Open the BTMONitor application. The COMM Port Selection screen appears.



Procedure K. Installing BTMONitor Using a Modem (cont'd)

Step	Action
4	On the Comm Port Selection screen, click the User Profile option, on the left of the menu bar. A standard Windows Open File screen appears (shown below), set to open a file named profile.dat. If other profile files have already been created, they will appear in this window. *Note:* The profile.dat file contains up to 10 communication profiles. A communication profile contains modem settings, including phone number, for communicating with a TimeSource 2500 System. Instructions for creating a modem profile follow this paragraph. The profile.dat file can be copied and renamed, using standard Windows procedures (do not change the dat file extension). 

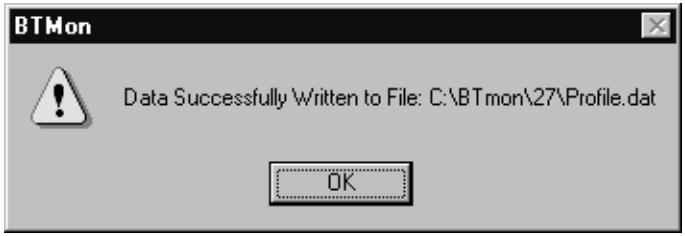
Procedure K. Installing BTMONitor Using a Modem (cont'd)

Step	Action
5	Click the Open button. If the file has not yet been created, a dialog box appears (shown below) that asks to create the file profile.dat. If the file has been created, the Comm. Profile Edit screen appears (shown in Step 6). 
6	Click the Yes button. The Comm. Profile Edit screen appears (shown below). 

Procedure K. Installing BTMONitor Using a Modem (cont'd)

Step	Action
7	On the upper left side of the screen, highlight one of the 10 profiles in the Profile list box. The highlighted selection appears in the TS Name box, below the Profile list box. *Note:* If an accurate profile exists, go to Step 16.
8	In the TS Name box, change the name of the modem profile, if desired. The TS name should reflect the name of the TimeSource 2500 Shelf to which the profile connects.
9	Check that the Comm Port window displays the communication port that is connected to the modem, and that the Modem button is selected.
10	On the right side of the screen, be sure the Baud Rate is 9600, the Parity is None, the Number of Data Bits is 8, and the Number of Stop Bits is 1. *Caution: Factory settings are displayed on the Comm. Profile Edit screen, and must be used.*
11	Enter the phone number for the modem to dial in the Phone No. box.
12	Click the Save Profile button to save the changes made on this screen as the profile named in the TS Name box. A standard Windows Open File screen appears (see Step 4). A file named profile.dat is set to be opened.

Procedure K. Installing BTMONitor Using a Modem (cont'd)

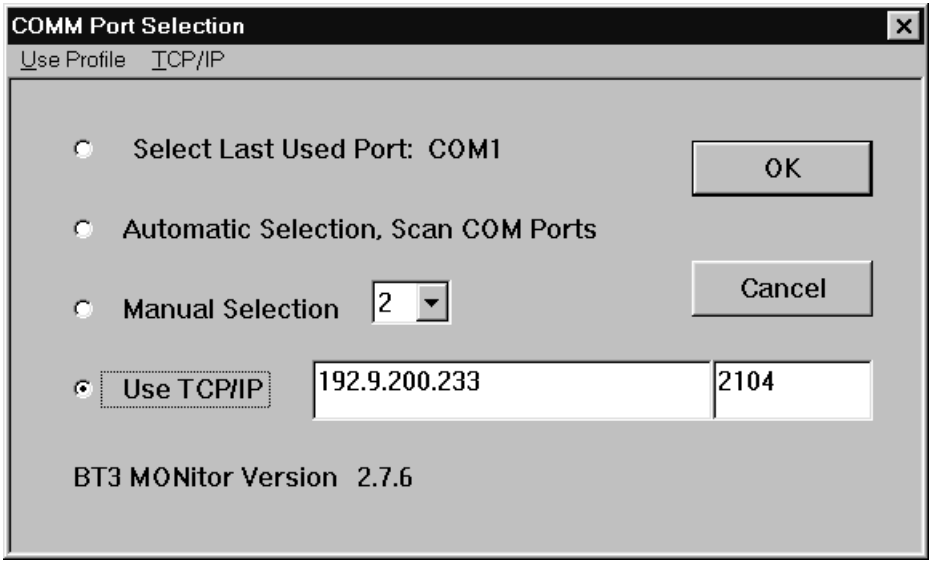
Step	Action
13	Click Open. BTMONitor opens the profile.dat file, enters data from the Comm. Profile Edit screen, and closes the profile.dat file. A confirmation screen appears (shown below). 
14	Click OK. BTMONitor is now set up to communicate with the TimeSource 2500 via the modem. The Comm. Profile Edit screen appears.
15	If desired, repeat Steps 7 through 14 to create another modem profile.
16	Highlight the appropriate profile and click the Logon Using Profile button. *Note:* Wait approximately 1 min for the connection to be made. After approximately 1 min, either the Successfully Connected or Timed Out (not connected) pop-up screen appears. If the Timed Out pop-up screen appears, check that the modem configuration procedure was correctly followed, then connect again.

Remote Operation via a Terminal Server (Optional)

Use Procedure L to set up communications between BTMONitor and the TimeSource 2500 via a terminal server. This allows the user to select and/or edit the terminal server number and the terminal server port number, to allow the TimeSource 2500 to communicate with the host computer via an LAN network. Consult your system administrator and the manual supplied with your terminal server to determine the server and port numbers.

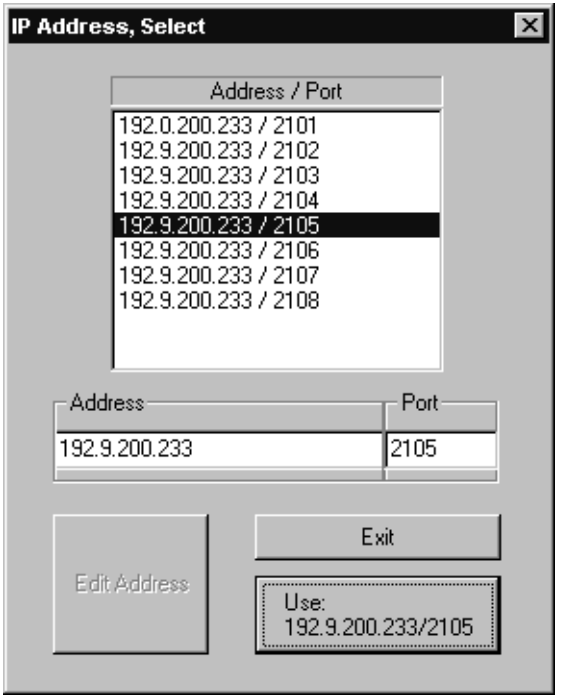
Note: The following procedure requires a terminal server and a TCP/IP address.

Procedure L. Remote Operation via a Terminal Server

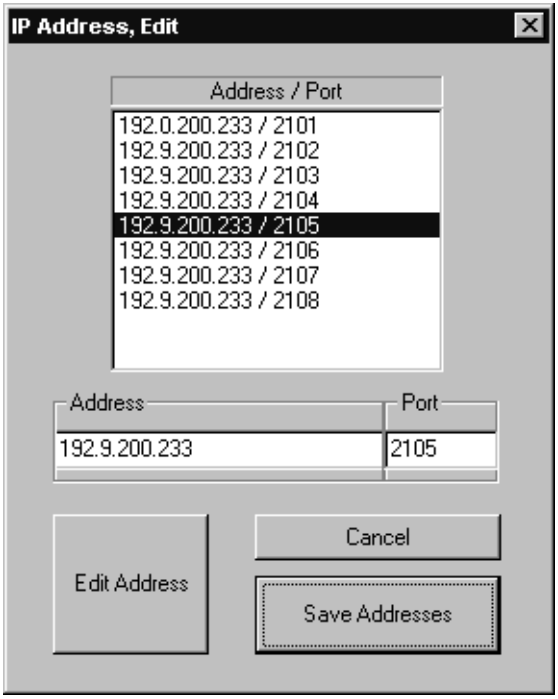
Step	Action
1	From the BTMONitor main screen, click Exit.
2	Open the BTMONitor application. The COMM Port Selection screen appears. 
3	Click Use TCP/IP.
4	Click the TCP/IP option, on the left of the menu bar.
5	Select or edit a terminal server and TCP/IP address by clicking one of the following: • Select: Selects a terminal server and TCP/IP address • Edit: Edits a terminal server and TCP/IP address. If you click Select, continue to the next step. If you click Edit, skip to Step 7.

Procedure L. Remote Operation via a Terminal Server (cont'd)

Step	Action
6	In the Address/Port area of the Select IP Address screen (see below), highlight the desired terminal server address and port, then click Use (the Use button will display the selected address and port). Skip to Step 11.

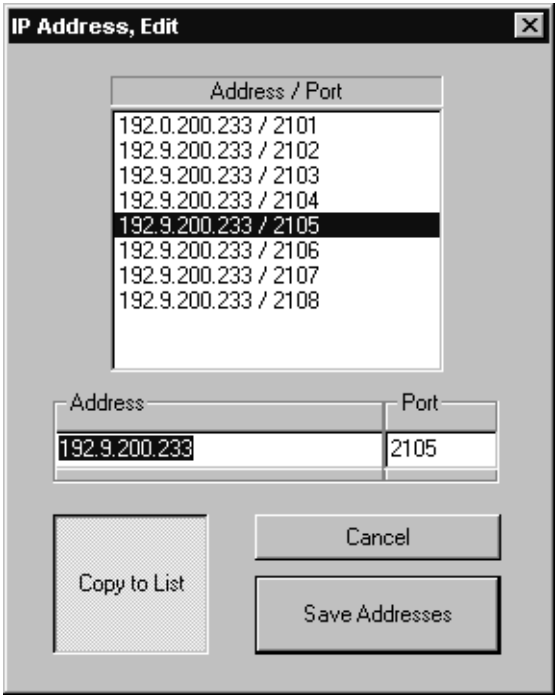


Procedure L. Remote Operation via a Terminal Server (cont'd)

Step	Action
7	In the Address/Port area of the Edit IP Address screen (see below), highlight the terminal server address and port to be edited, then click Edit Address (the Edit Address button will change to Copy to List). 
8	Type the address number, press the tab key, then type the port number.

Procedure L. Remote Operation via a Terminal Server (cont'd)

Step	Action
9	Click Copy to List, then click Save Addresses (see below).



Note: To select the terminal server address and port just edited, perform the following:

a. Click the TCP/IP option, on the left of the Comm Port Select screen menu bar, then click Select.

b. Highlight the desired terminal server address and port, then click Use.

Procedure L. Remote Operation via a Terminal Server (cont'd)

Step	Action
10	Click OK.
11	Enter the user name and password for this installation, then click OK.
12	Verify the correct version number and serial port, then click OK.

Operation

This chapter provides tasks which may be required to operate the TimeSource 2500.

Chapter 4

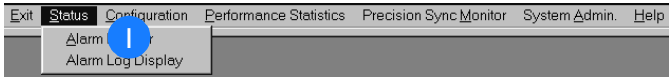
Introduction

The following pages have tasks which may be required to operate the TimeSource 2500.

The System Admin menu functions are only available to the administrator level of security.

View Alarms and Alarm Thresholds

1. Select Status > Alarm Monitor.



2. To determine the status of the GPS input, view the GPS LED:

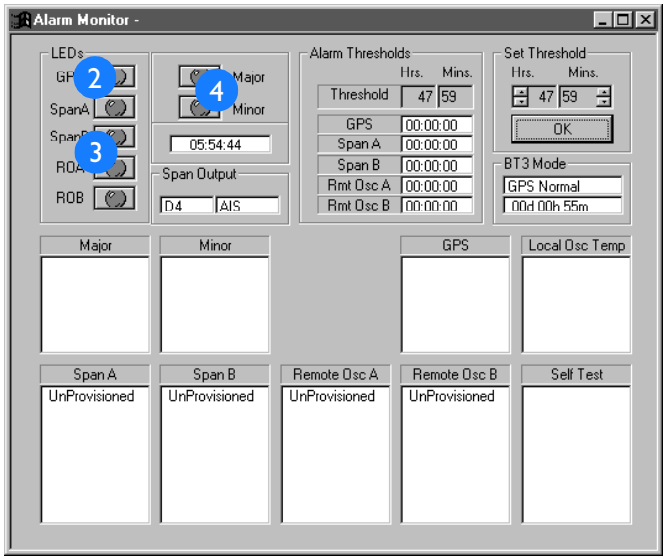
   - Green: indicates locked.
   - Yellow: indicates not locked.
   - Red: indicates warm-up.

3. To determine the status of the span and remote oscillator inputs, view the Span A, Span B, ROA, and ROB LEDs:

   - Gray: indicates not provisioned.
   - Yellow: indicates an alarm condition if the input is provisioned, but not ensembled.
   - Green: indicates OK.
   - Red: indicates an alarm condition.

4. To determine the alarm status, view the Major and Minor LEDs:

   - Major: red indicates a major alarm; off indicates no alarm.
   - Minor: yellow indicates a minor alarm; off indicates no alarm.



View Alarms and Alarm Thresholds (cont'd)

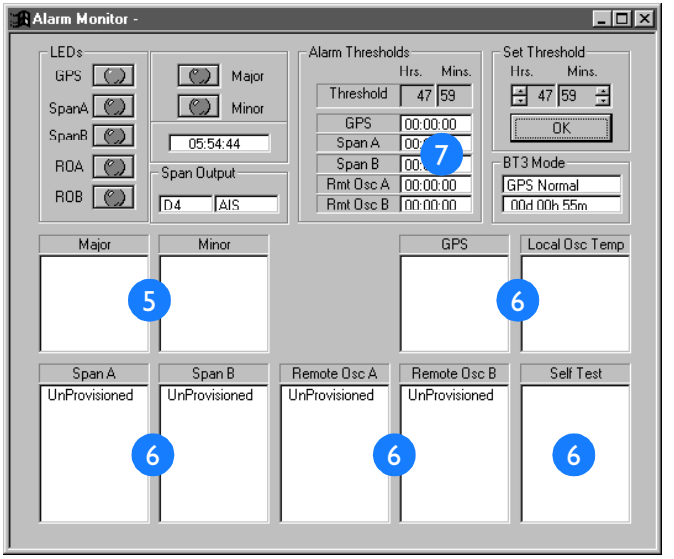
5. View the listing of major and/or minor alarm messages.

6. View the listing of transient events and alarm messages for the optional inputs, GPS, local oscillator temperature, and self-test.

   See the Troubleshooting chapter for explanations of the messages.

7. View the alarm thresholds.

   Threshold shows the amount of time a minor alarm exists before escalating to a major alarm. GPS, Span A, Span B, Rmt Osc A, and Rmt Osc show the amount of time an item has been in minor alarm.

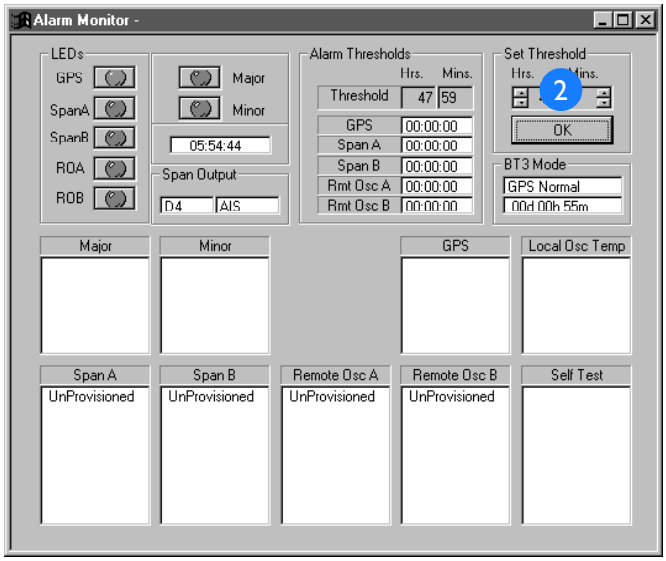


Change Alarm Thresholds

1. Select Status > Alarm Monitor.

2. To set the amount of time a minor alarm exists before becoming a major alarm, use the Hrs. and Mins. up and down arrows.

   For GPS inputs, this also sets the amount of time from the beginning of bridging mode to escalation to a minor alarm. The system stays in bridging mode for 25% of the programmed threshold. For example, if the threshold is 48 hours, and the GPS input is lost, the system stays in bridging mode for 12 hours (25% of 48 hours), then escalates to a minor alarm. If GPS input loss continues for 48 hours from the start of bridging mode, the system escalates to a major alarm.



Caution: Do not set the threshold to less than 12 hours — spurious alarms may result.

Notes:

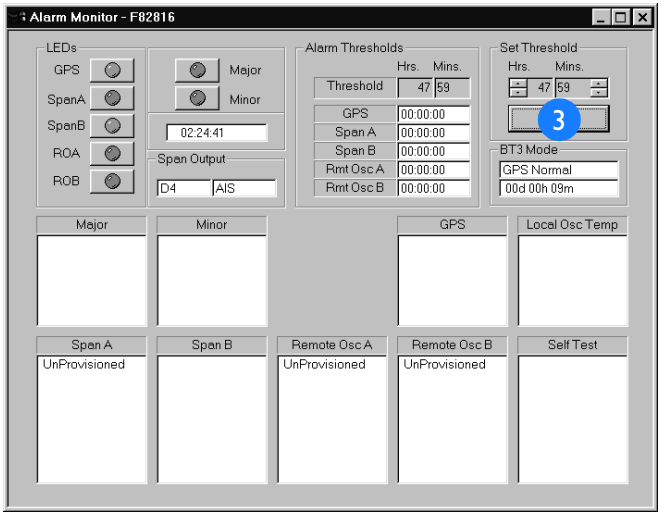
a. The recommended setting is 48 hours (factory setting).

b. The threshold setting only affects span and remote oscillator inputs if they are provisioned and ensembled.

4

Change Alarm Thresholds (cont'd)

3. To save the alarm threshold settings, click OK.

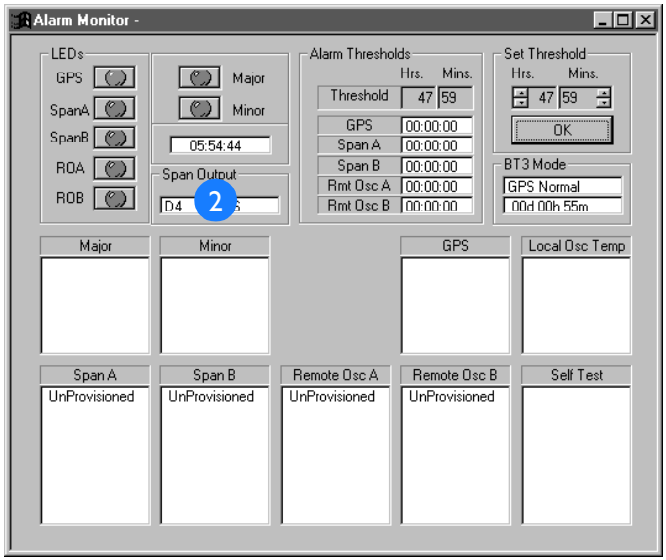


View Span Framing and Trouble Code Sent During Major Alarm

1. Select Status > Alarm Monitor.

2. View the framing type and trouble code that will be sent on Span A and B during a major alarm.

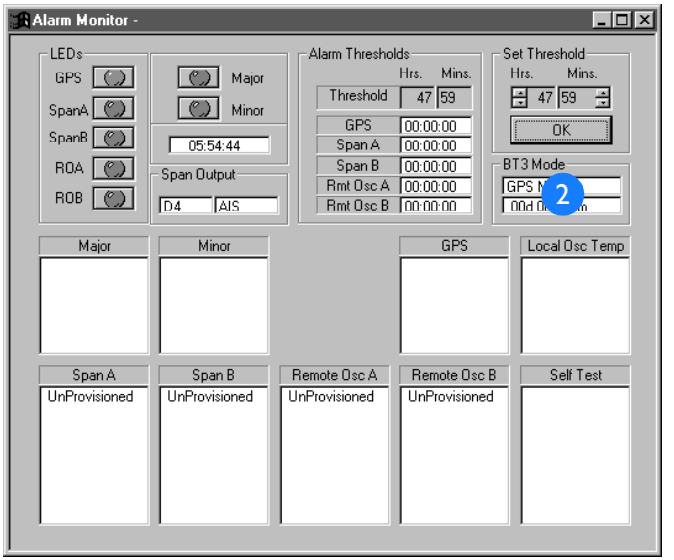
Note: Span Output does not indicate real-time activity or the current state of the outputs.



View BT3 (TimeSource 2500) Mode and Duration

1. Select Status > Alarm Monitor.

2. View the current BT3 (TimeSource 2500) mode, and the amount of time the unit has been in that mode.

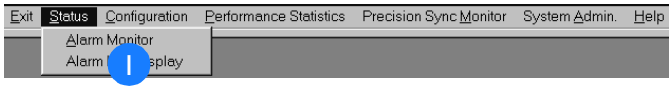


The TimeSource 2500 will be in one of four modes:

- GPS Normal: indicates the system is operating without any GPS events or alarm conditions.
- Bridging: indicates the system is operating with a transient GPS event. Bridging does not indicate a problem that requires maintenance.
- Holdover: occurs when a GPS event has escalated because the event has not cleared; i.e., bridging has escalated to holdover because the GPS event keeps occurring. Holdover also results in a minor alarm. Holdover does not indicate a loss of timing output quality until a major alarm is also declared.
- Warm-up: indicates the system is in a power-up state. Timing outputs will not be generated until the system exits warm-up.

View Alarm Log

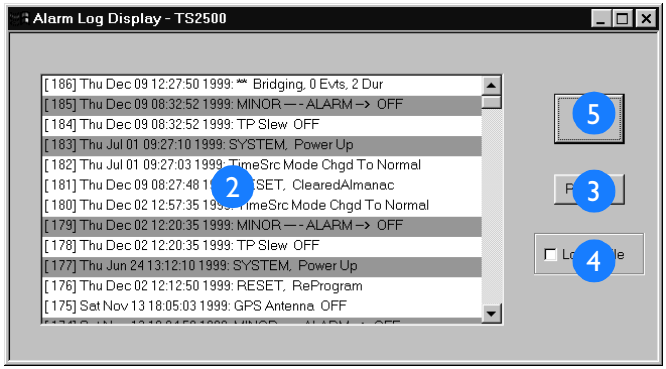
1. Select Status > Alarm Log Display.



2. View the most recent 512 alarms and events.

   Minor alarms are highlighted yellow, major alarms are highlighted red, and cleared alarms and power-up information are highlighted green.

   Refer to the Troubleshooting chapter for a list of messages that may appear in the log.



3. To update the log information, click Refresh.

4. To start or stop the log file for this screen, click Select Log to File.

   If checked, data from the screen is written to the file at every screen update. The log file may be opened and read during the logging process, however, the log file is read-only during the logging process. The log file is written in a comma-delimited (.csv) data format.

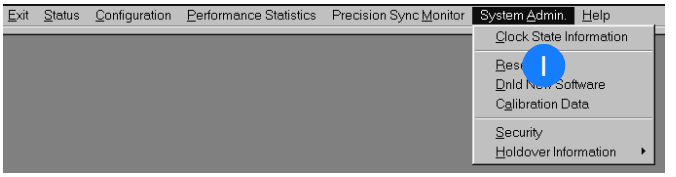
5. To exit, click Exit.

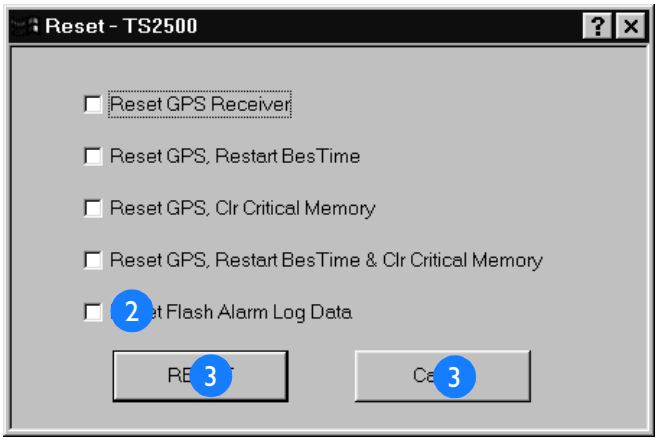
Clear Alarm Log

1. Select System Admin > Reset.

2. To clear the alarm log in the Alarm Log Display screen, select Reset Flash Alarm Log Data.

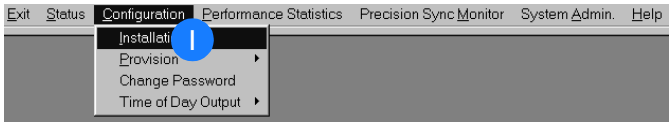
3. To reset the selected item, click RESET. To ignore any information, click Cancel.





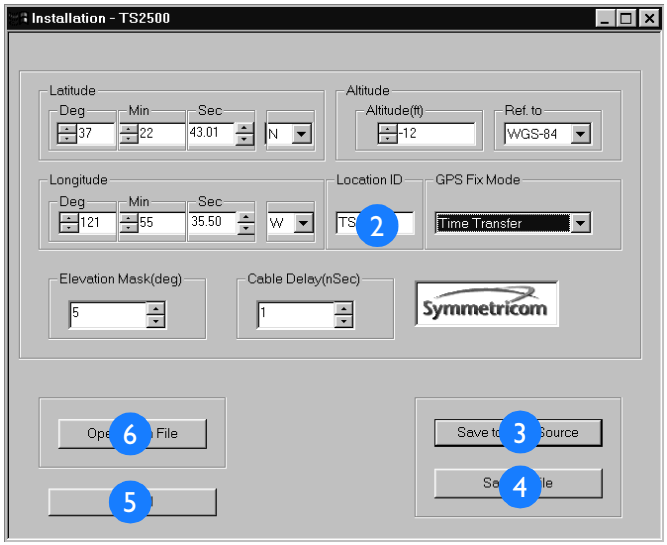
Change Location ID

1. Select Configuration > Installation.



2. Type in the TimeSource 2500 identification.

   The identification must be from two to eight alphanumeric characters. The identification name can be used to identify this particular TimeSource 2500 System among multiple TimeSource 2500 Systems.



3. To save the information on this screen to the TimeSource 2500, click Save to TimeSource.

4. To save the contents of the screen to a file, click Save to File.

5. To ignore any changed information and close this screen, click Cancel.

6. To open a saved installation configuration, click Open From File.

Change Elevation Mask

1. Select Configuration > Installation.

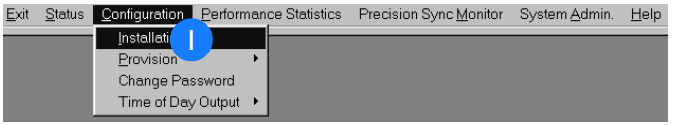
2. To set the antenna elevation mask from the horizon to this number of degrees, use the Elevation Mask(deg) arrow keys.

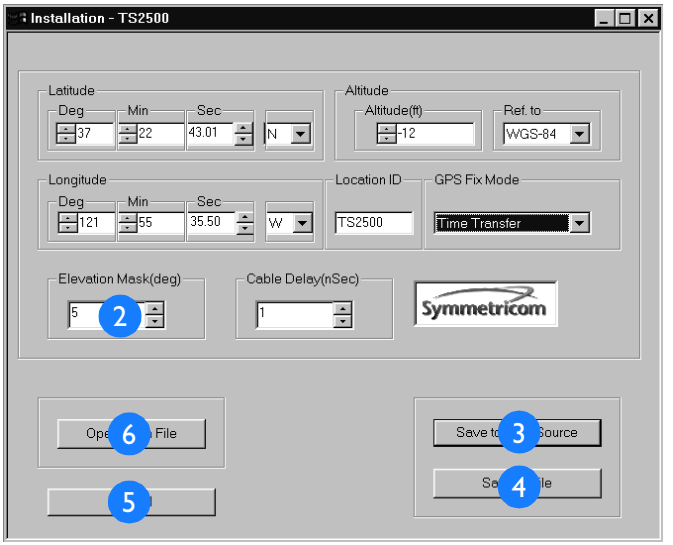
3. To save the information on this screen to the TimeSource 2500, click Save to TimeSource.

4. To save the contents of the screen to a file, click Save to File.

5. To ignore any changed information and close this screen, click Cancel.

6. To open a saved installation configuration, click Open From File.





Enable or Disable Inputs

1. Select Configuration > Provision > Inputs.

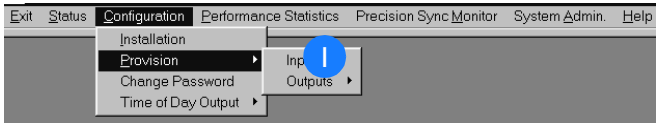
2. To enable (provision) or disable monitoring of an input, select or de-select any of the input source(s).

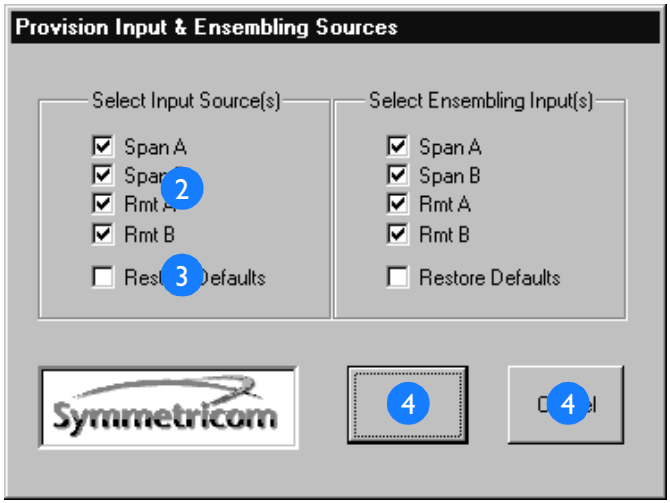
Caution: Do not select an unused input, otherwise, spurious alarms will be generated.

Note: An input must be provisioned before it can be ensembled.

3. To restore the factory settings, select Restore Defaults.

4. To save the input selections, click OK. To ignore any changed information, click Cancel.





Ensemble Inputs or Exclude Inputs from Ensemble

1. Select Configuration > Provision > Inputs.

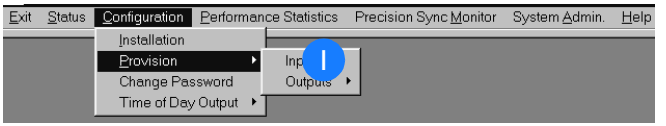
2. To include any of the enabled (provisioned) inputs in the BesTime output ensemble, select the input. To exclude from the ensemble, de-select.

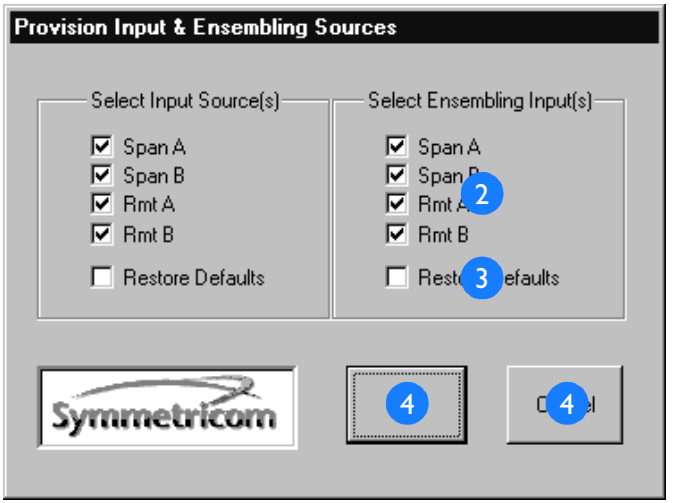
   Ensembling means the input(s) are used by the system to generate the timing outputs, and will impact the timing performance of the outputs.

Note: An input must be enabled (provisioned) before it can be ensembled.

3. To restore the factory settings, select Restore Defaults.

4. To save the ensembling selections, click OK. To ignore any changed information, click Cancel.





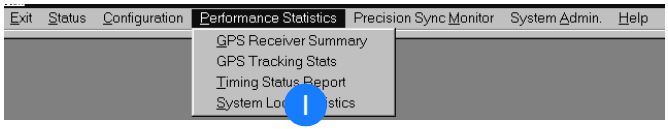
View Input Weighting and Gear

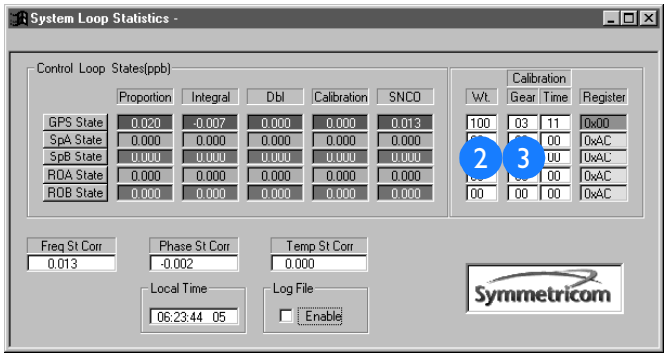
1. Select Performance Statistics > System Loop Statistics.

2. View the weight given to each input for BesTime ensembling computation.

3. View the stage (gear) in the time calculation process.

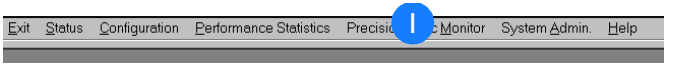
   Gears 1, 2, and 3 are warm-up processes after power-up. Gears 4, 5, and 6 indicate a settling period when the TimeSource 2500 outputs Stratum 1 signals. Gear 7 indicates steady-state operation.





View Input Performance Statistics

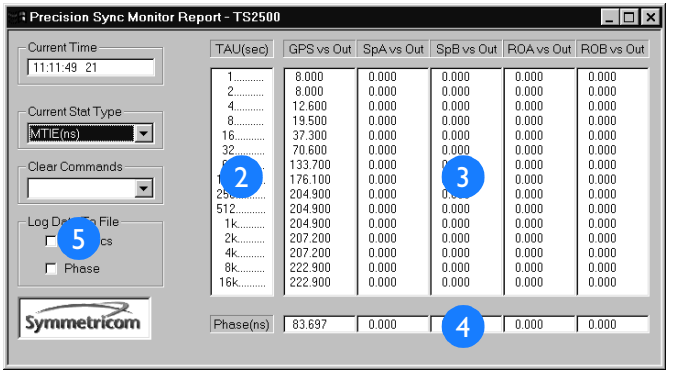
1. Select Precision Sync Monitor.



2. View the accumulation period for the data, in seconds.

3. View the statistics data, which is the report of the measurement difference between the provisioned inputs and the TimeSource 2500 output.

   This data can be plotted and compared against any one of several timing performance masks, to gauge the quality of the timing being received on the input(s). Timing performance mask(s) and spreadsheet software are not available from Symmetricom, and must be obtained from third party vendors.



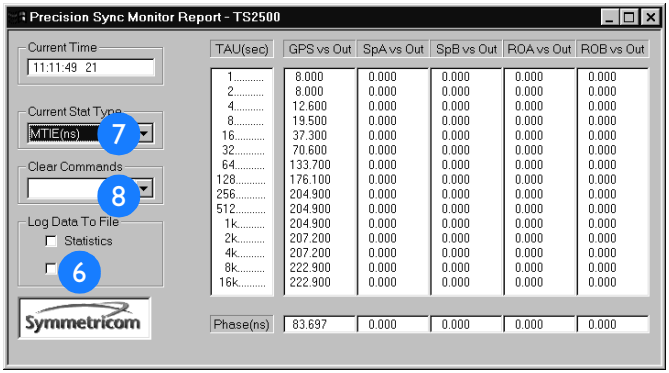
4. View the phase data, which is the phase offset, in ns, for each input used in the BesTime calculation.

5. To include statistics data in the log file, select Statistics.

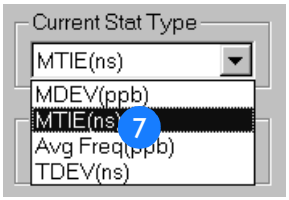
View Input Performance Statistics (cont'd)

6. To include phase data in the log file, select Phase.

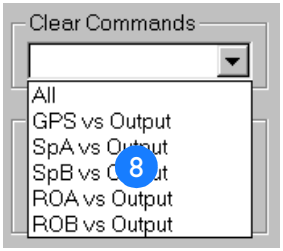
   Data from the screen is written to the file at every screen update. The log file may be opened and read during the logging process, however, the log file is read-only during the logging process. The log file is written in a comma-delimited (.csv) data format.



7. To set the type of measurement to show in the statistics data columns, use the Current Stat Type pull-down arrow.



8. To set the data to be cleared in the statistics data columns, use the Clear Commands pull-down arrow.



Set Span Framing and Trouble Code Sent During Major Alarm

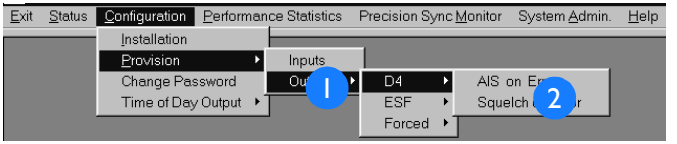
1. Select Configuration > Provision > Outputs.

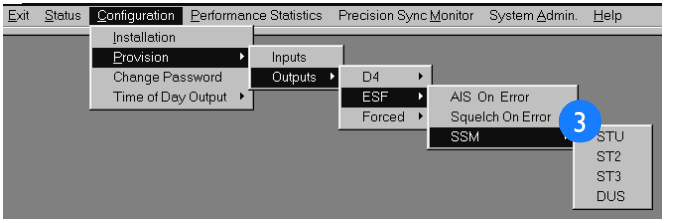
2. For D4 framing, select D4, then one of these:

- AIS on Error
- Squelch on Error

3. For ESF framing, select ESF, then one of these:

- AIS on Error
- Squelch on Error
- SSM, then one of these:
  - STU: Synchronization traceability unknown
  - ST2: Stratum 2
  - ST3: Stratum 3
  - DUS: Do not use for synchronization





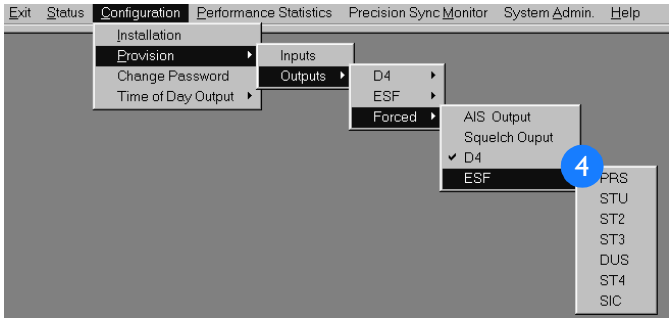
Notes:

a. If SSM is selected, the recommended setting is either STU or ST2.

b. SSM messages communicate to downstream network elements the timing performance received on an incoming signal.

Set Span Framing and Trouble Code Sent During Major Alarm (cont'd)

4. For a forced output, select Forced, then one of these:



- AIS Output
- Squelch Output
- D4
- ESF, then an SSM quality level:
  - PRS: Primary reference source
  - STU: Synchronization traceability unknown
  - ST2: Stratum 2
  - ST3: Stratum 3
  - DUS: Do not use for synchronization
  - ST4: Stratum 4
  - SIC: SONET internal clock 20 ppm

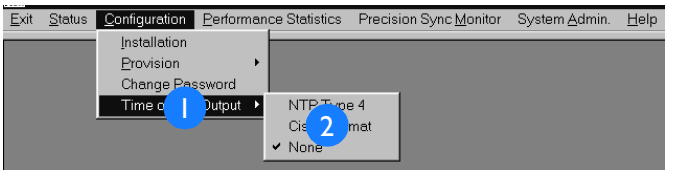
Any of the selections under Forced forces the Span A and B outputs into a particular mode. Forced mode may be useful for testing and troubleshooting. Forced mode may also be useful in applications where the outputs generated by the TimeSource 2500, even in major alarm, may be better than the alternative (e.g., offices without additional holdover clocks in a distribution shelf).

Set TOD Output Format

1. Select Configuration > Time of Day Output.

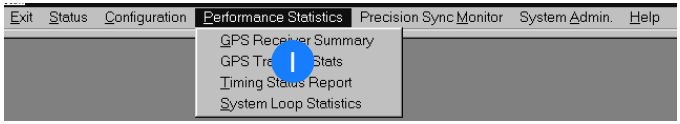
2. To set the desired TOD output format, select NTP Type 4, Cisco Format, or None.

Note: If None is selected, TOD will be disabled.



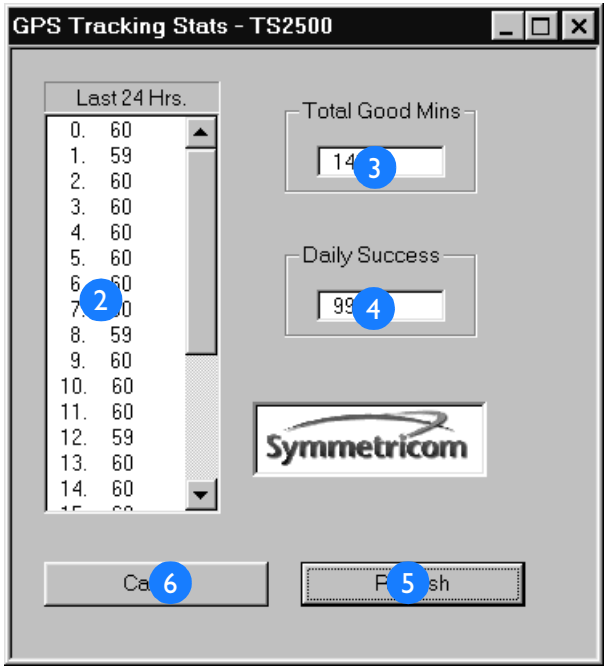
View GPS Tracking Statistics

1. Select Performance Statistics > GPS Tracking Stats.



2. View the number of minutes the receiver has been locked during each hour of the last 24 hours.

Note: On power-up, 60 minutes is shown for every hour. Actual data for each hour will appear, as the system cycles through the first 24 hours of operation after power-up.



3. View the number of minutes the TimeSource 2500 has been locked during the last 24 hours.

4. View the percentage of the last 24 hours that the TimeSource 2500 was locked to at least one satellite.

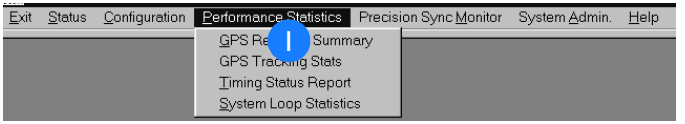
Note: The daily success rate must be greater than 40%. If not, refer to the Troubleshooting chapter.

5. To update the information, click Refresh.

6. To exit, click Cancel.

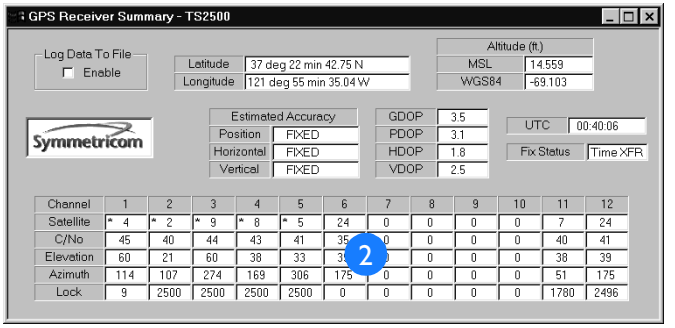
View GPS Satellite Information

1. Select Performance Statistics > GPS Receiver Summary.



2. View information about each GPS satellite currently being tracked.

- Satellite: Satellite number.
- C/No(dB): Carrier-to-noise ratio. Measurement of the strength of the satellite signal relative to noise.
- Elevation: position of the satellite in degrees above the horizon.
- Azimuth: position of the satellite in degrees clockwise from true north.
- Lock: Number of seconds since the TimeSource 2500 acquired lock on the satellite (count stops at 2500). Zero indicates the system is not locked to the satellite.



View GPS Satellite Information (cont'd)

3. To start or stop the log file for this screen, select Log Data To File.

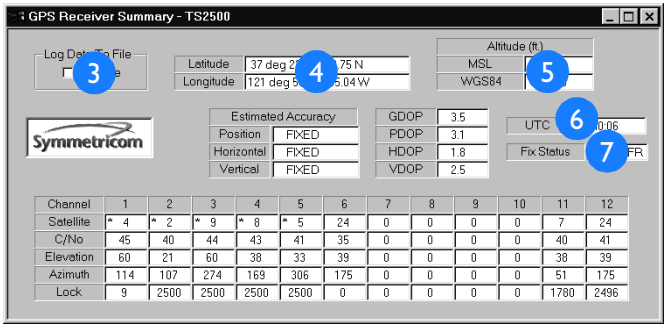
   Data from the screen is written to the file every 60 seconds while the box is checked. The log file may be opened and read during the logging process; however, the log file is read-only during the logging process. The log file is written to the host computer disk in a comma-delimited (.csv) data format.

4. View the latitude and longitude of the TimeSource 2500.

5. View the altitude (in feet) of the TimeSource 2500.

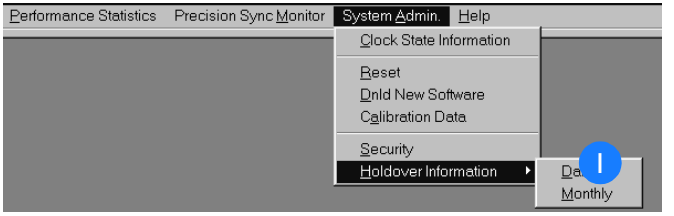
6. View the Universal Coordinated Time.

7. View the GPS receiver system mode of operation, as determined by the system. Time XFR indicates four or more satellites are in view of the TimeSource 2500. No Fix indicates less than four satellites are in view of the TimeSource 2500.



View Daily Holdover Information

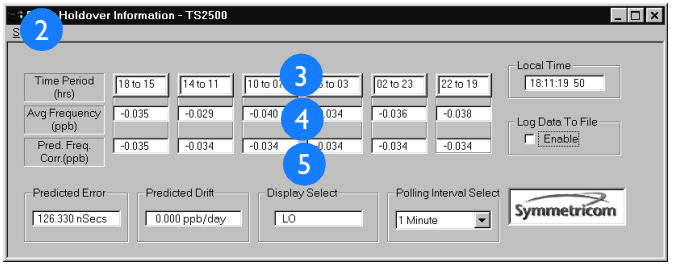
1. Select System Admin > Holdover Information > Daily.



2. To see the data for selected input, select Select > Display, then select the desired input.

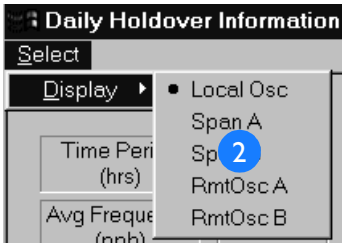
3. View the data of the 4 hour time period.

   The time is indicated as hours of a 24 hour clock.



4. View the average measured frequency offset during the 4 hour period, in parts per billion (ppb).

5. View the predicted frequency offset during the 4 hour period, in parts per billion (ppb).



View Daily Holdover Information (cont'd)

6. To start or stop the log file for this screen, select or de-select Log Data To File.

   Data from the screen is written to the file at every screen update while the box is checked. The log file may be opened and read during the logging process; however, the log file is read-only during the logging process. The log file is written in a comma-delimited (.csv) data format.

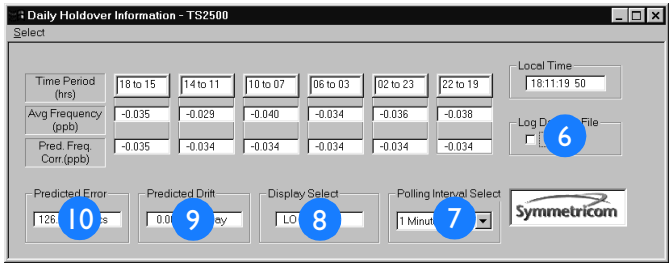
7. To set the number of minutes between screen updates, use the Polling Interval Select pull-down arrow.

8. View which input is being measured.

9. View the drift, in parts per billion per day, predicted for this input during the current 24 hour period.

10. View the predicted error in ns.

    This error can be held for up to 24 hours if the TimeSource 2500 goes into holdover.



View Monthly Holdover Information

1. Select System Admin > Holdover Information > Monthly.

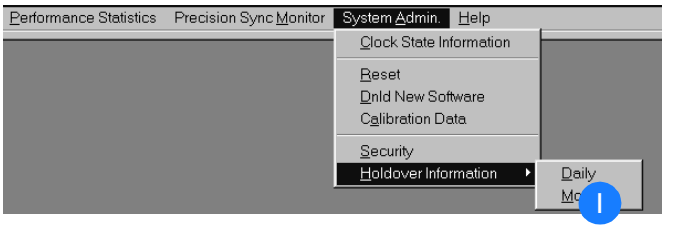
2. To see the data for the selected input, select Select > Display, then select the desired input.

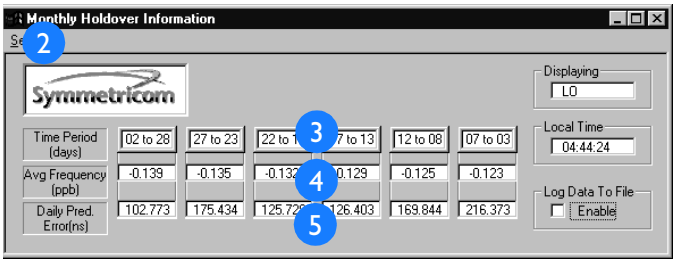
3. View the data of the 4 day time period.

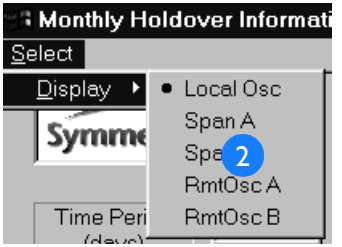
   The time is indicated as days of a 30 day month.

4. View the average measured frequency offset during the 4 day period, in parts per billion (ppb).

5. View the average predicted time error during the 4 day period, in nanoseconds (ns).





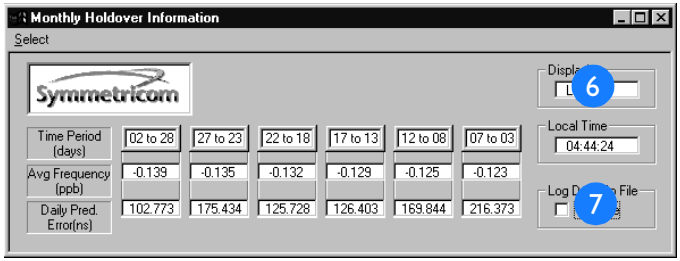


View Monthly Holdover Information (cont'd)

6. View which input is being measured.

7. To start or stop the log file for this screen, select or de-select Log Data To File.

   Data from the screen is written to the file at every screen update while the box is checked. The log file may be opened and read during the logging process; however, the log file is read-only during the logging process. The log file is written in a comma-delimited (.csv) data format.



Reset GPS Receiver and System

1. Select System Admin > Reset.

2. To reset the GPS receiver processor, and restart the satellite signal search, select Reset GPS Receiver.

3. To reset the system processor, select Reset GPS, Restart BesTime.

Caution: This will cause a disruption in service.

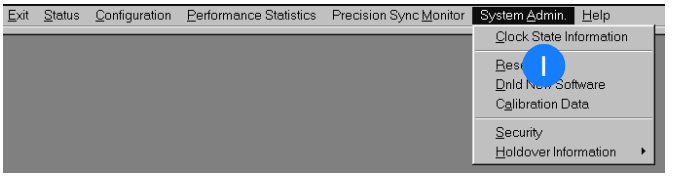
4. To reset the GPS receiver processor, and clear the critical memory, including the data entered on the Installation screen, select Reset GPS, Clr Critical Memory.

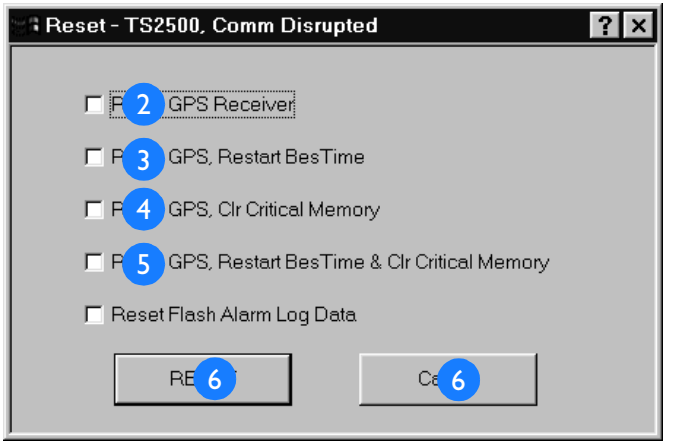
Caution: This will cause a disruption in service.

5. To reset the system processor, and clear the critical memory, including the data entered on the Installation screen, select Reset GPS, Restart BesTime & Clr Critical Memory.

Caution: This will cause a disruption in service.

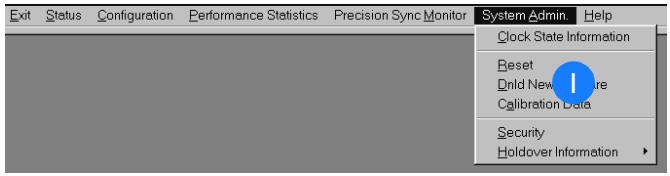
6. To reset the selected item, click RESET. To ignore any information, click Cancel.





Download New Software

1. Select System Admin > Dnld New Software.



Notes:

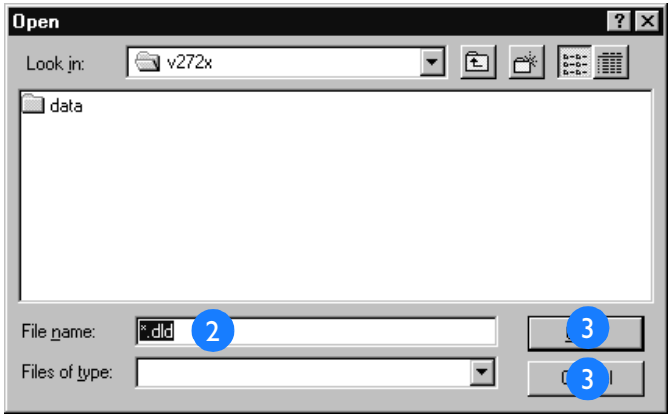
a. New software should not be downloaded over a modem connection. Use a direct connection only.

b. The TimeSource 2500 does not lose data during a software download/upgrade.

c. The TimeSource 2500 enters bridging mode during the software loading process, and exits bridging mode when it receives its first good GPS measurements after the download.

2. Select the name of the file to download to the Timesource 2500.

3. When the desired file is shown, click OK. To cancel the current operation, click Cancel.



4

Download New Software (cont'd)

4. Verify the file name is correct.

5. Verify the baud rate is set to 19200. Do not use any other baud rate.

6. To continue the downloading process, click Continue. To cancel the downloading process (if desired), click Cancel.

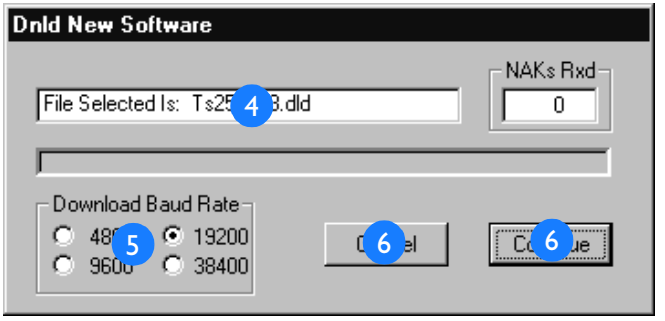
   A progress bar and messages track the download process.

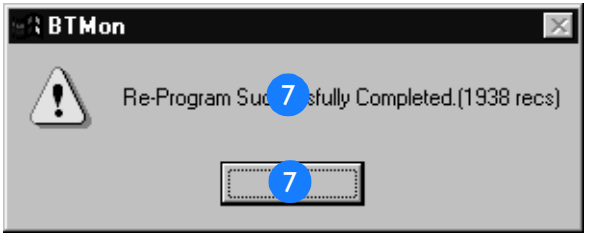
7. Once the download is complete, a message appears. Click OK.

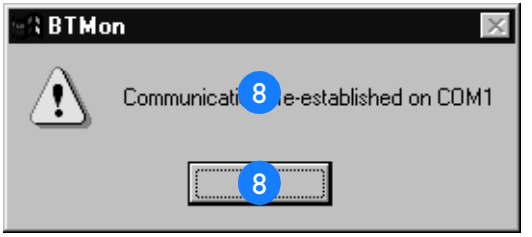
8. The TimeSource 2500 breaks, then reestablishes, communication with the host computer, and a message appears. Click OK.

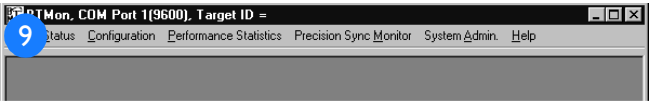
9. To exit the application, click Exit when the BTMONitor main screen appears.

10. To use the upgraded software, restart BTMONitor. (Double-click the BTMONitor icon on the desktop.)









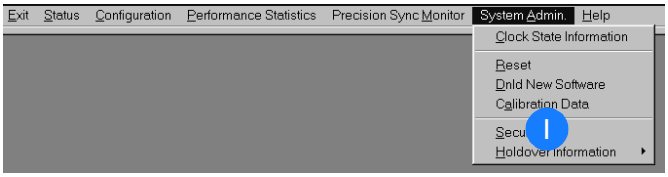
View User Accounts

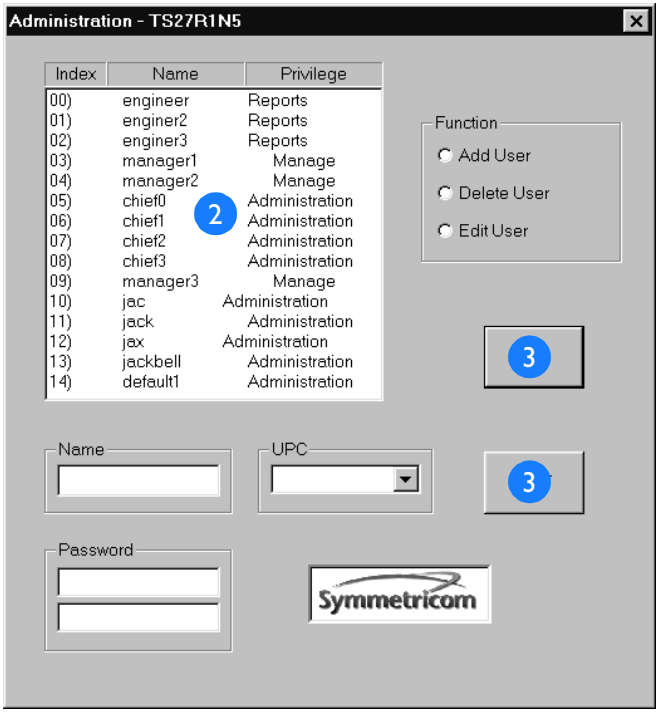
1. Select System Admin > Security.

2. View the list of system users and their privilege levels:

   - Administration: Allows a user to change any parameter or function.
   - Manage: Allows a user to view and change any parameter or function except: restart the system, download new firmware, and manage user security.
   - Reports: Allows a user to view, but not change, the operational parameters of the system.
   - None: Disables all privileges of a user, while keeping the user information.

3. To exit, Click OK or EXIT.





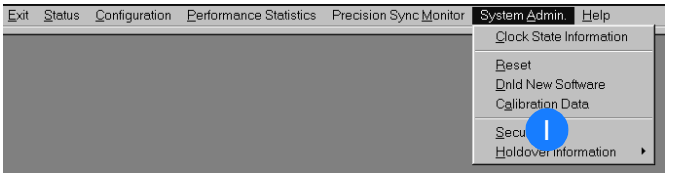
Add User Account

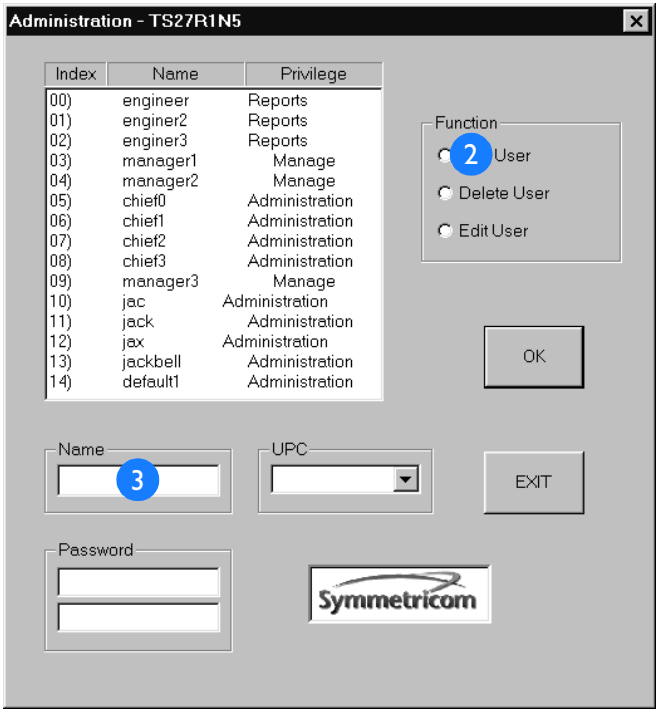
1. Select System Admin > Security.

2. Select Add User.

3. Type in a name for the new user account.

   No two users can have the same name. The name must have three to eight characters.

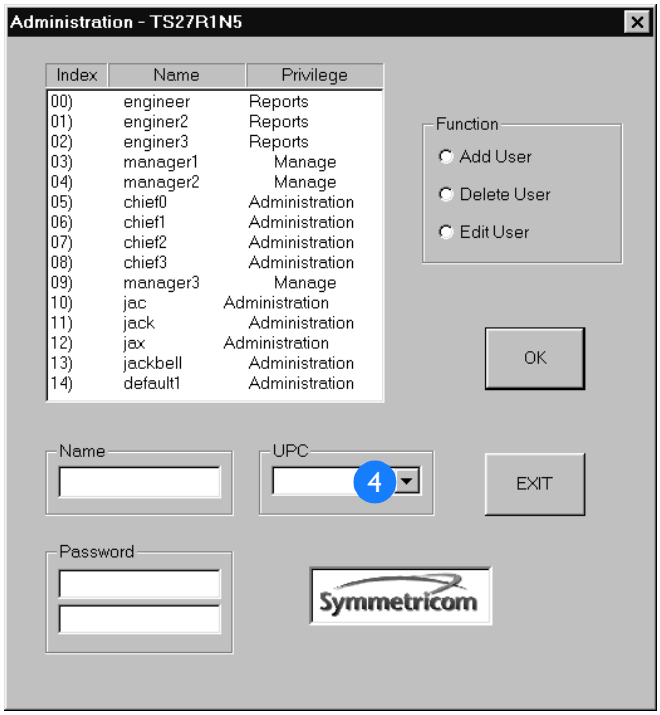




Add User Account (cont'd)

4. To select the privilege level for the new user account, use the UPC pull-down arrow:

- Administration: Allows a user to change any parameter or function.
- Manage: Allows a user to view and change any parameter or function except: restart the system, download new firmware, and manage user security.
- Reports: Allows a user to view, but not change, the operational parameters of the system.
- None: Disables all privileges of a user, while keeping the user information.

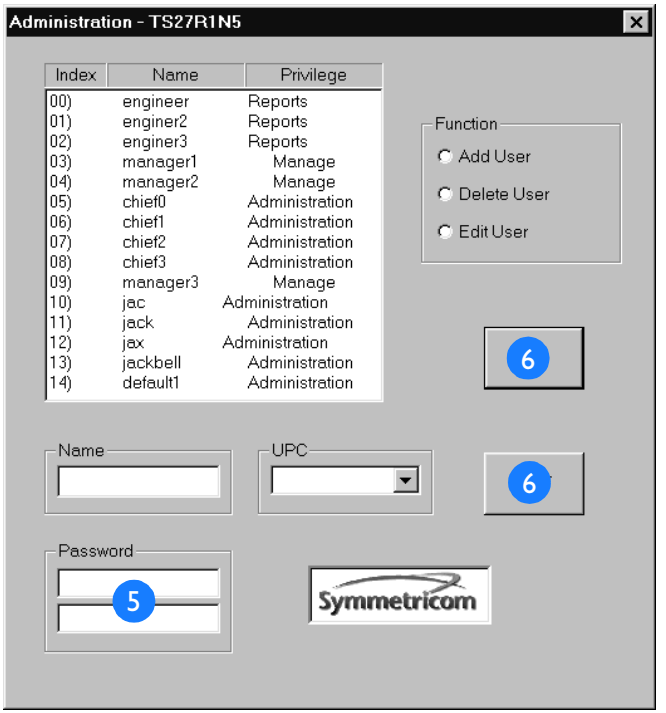


Add User Account (cont'd)

5. Type in the password for the new user account in both of the Password windows.

   A user name cannot be in the user's password. The password must be from six to eight characters, must include at least one alphabetic and one numeric character, and must contain at least one of the following special characters: ! " # $ % & ' ( ) * + , – . / : ; < = > ? @

6. To save the information to the TimeSource 2500, click OK. To ignore any changed information, click Exit.



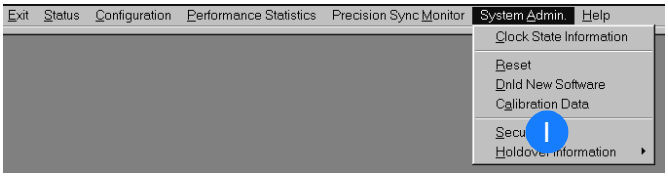
Delete User Account

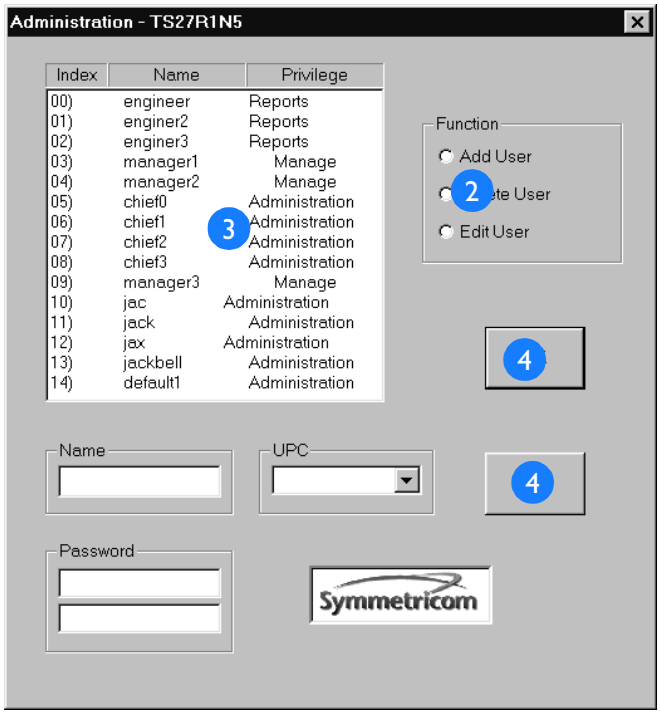
1. Select System Admin > Security.

2. Select Delete User.

3. Select the user account to be deleted.

4. To save the information, click OK. To ignore any changed information, click Exit.





Edit User Account

1. Select System Admin > Security.

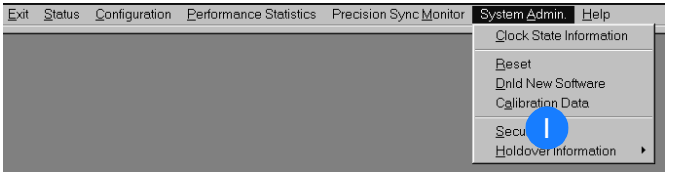
2. Select Edit User.

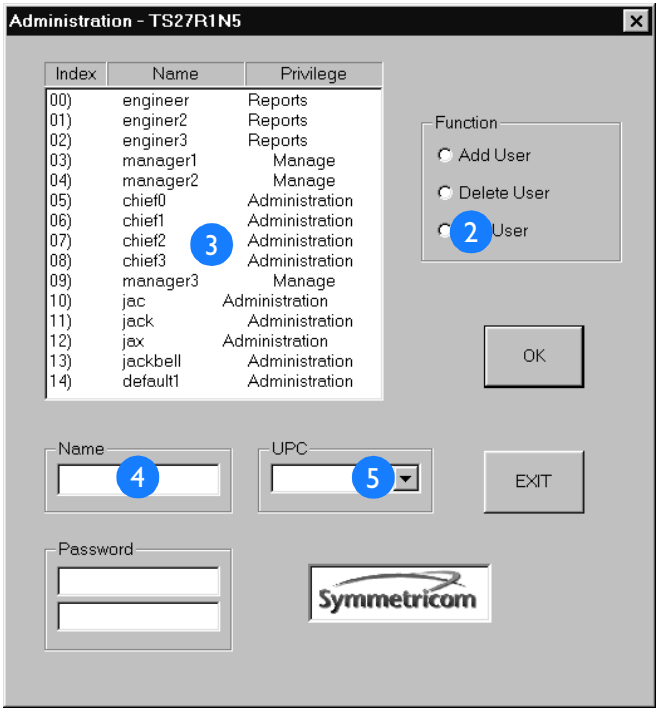
3. Select the user account to be edited.

4. If desired, type in a new name for the user account.

   No two users can have the same name. The name must have three to eight characters.

5. To select the new privilege level for the user account (if desired), use the UPC pull-down arrow.



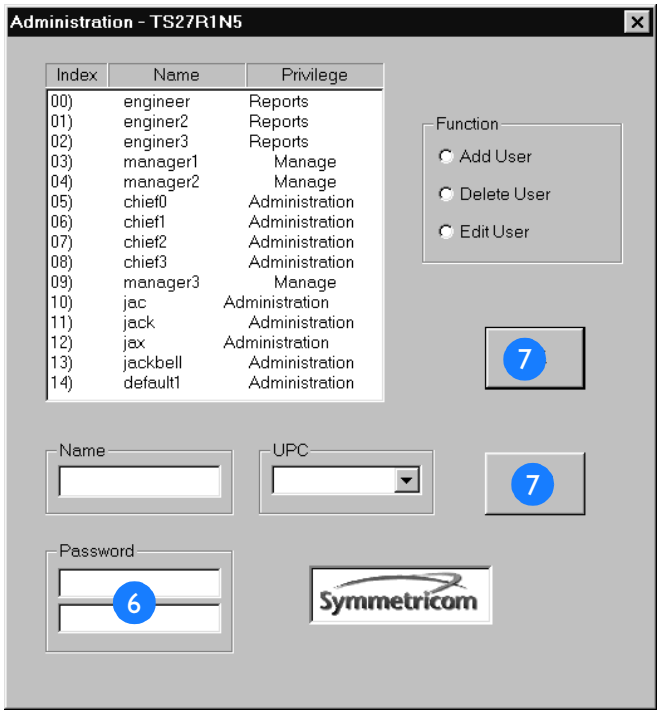


Edit User Account (cont'd)

6. If desired, type in the new password for the user account in both of the Password windows.

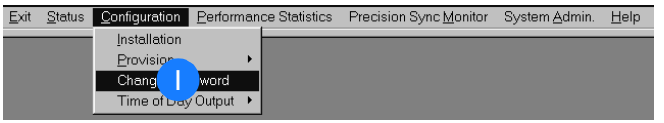
   A user name cannot be in the user's password. The password must be from six to eight characters, must include at least one alphabetic and one numeric character, and must contain at least one of the following special characters: ! " # $ % & ' ( ) * + , – . / : ; < = > ? @

7. To save the information, click OK. To ignore any changed information, click Exit.



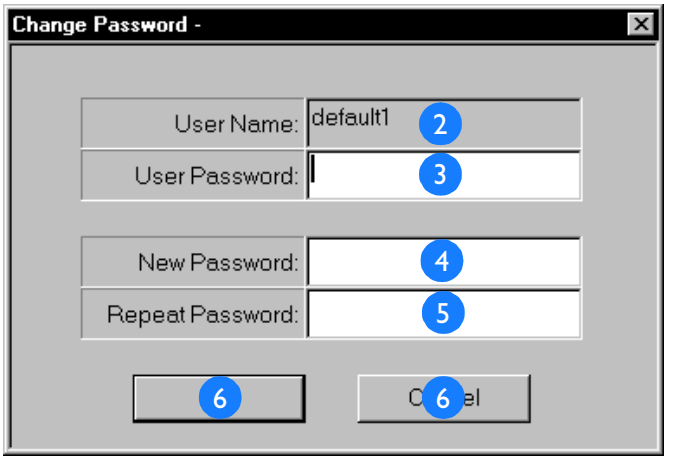
Change Password

1. Select Configuration > Change Password.



2. Type in the user name (case sensitive) for this system (factory-set to default1).

3. Type in the user password (case sensitive) for this system (factory-set to TS2500:).



4. Type in the new password.

   The password must be from six to eight characters, must include at least one alphabetic and one numeric character, and must contain at least one of the following special characters: ! " # $ % & ' ( ) * + , – . / : ; < = > ? @

5. Type in the new password again.

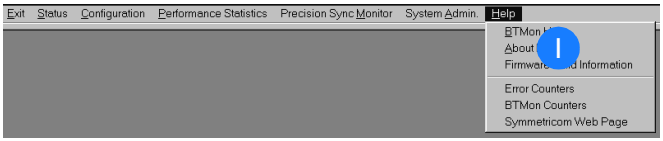
6. To save the information, click OK. To ignore any changed information, click Cancel.

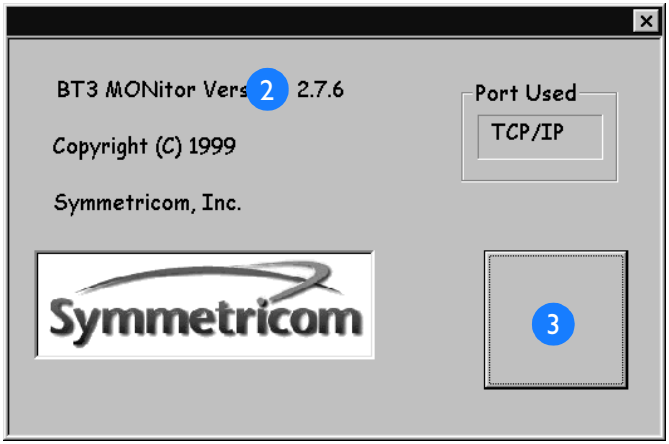
View BTMONitor Software Version

1. Select Help > About BTMon.

2. View the BTMONitor software version.

3. To exit, click OK.



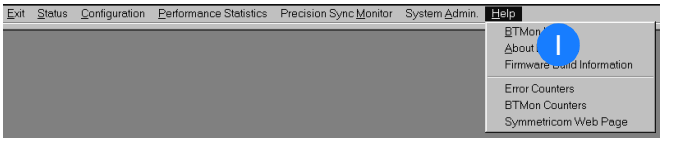


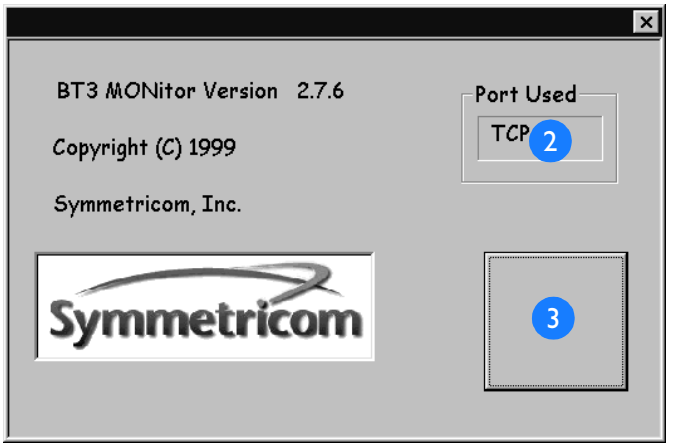
View Communication Information

1. Select Help > About BTMon.

2. View the active communication port.

3. To exit, click OK.



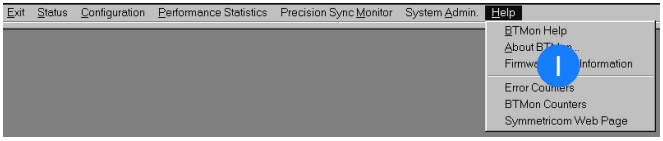


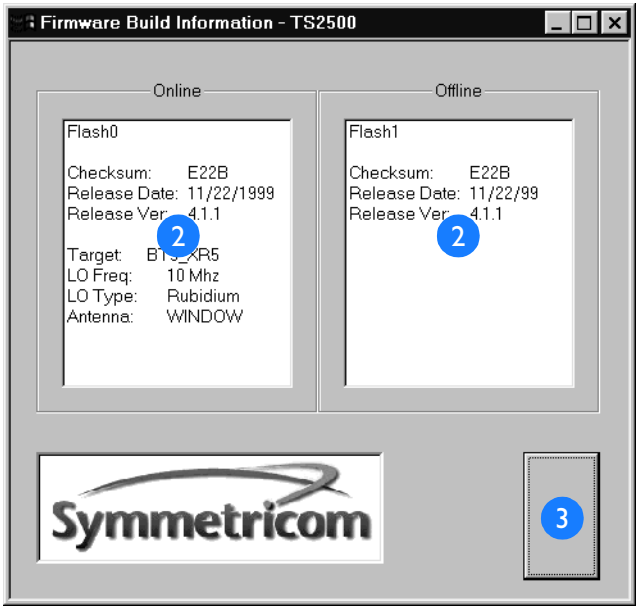
View System Firmware Information

1. Select Help > Firmware Build Information.

2. View the system firmware information.

3. To exit, click Exit.





Troubleshooting

This chapter provides troubleshooting information using front-panel lamps, alarms, and events. It also describes how to return equipment, get technical and sales assistance, and obtain manual updates.

Chapter 5

Front Panel Lamps

All front panel lamps are shown in Figure 29. The lamps are described in Table O.

Figure 29. Front Panel Indicators

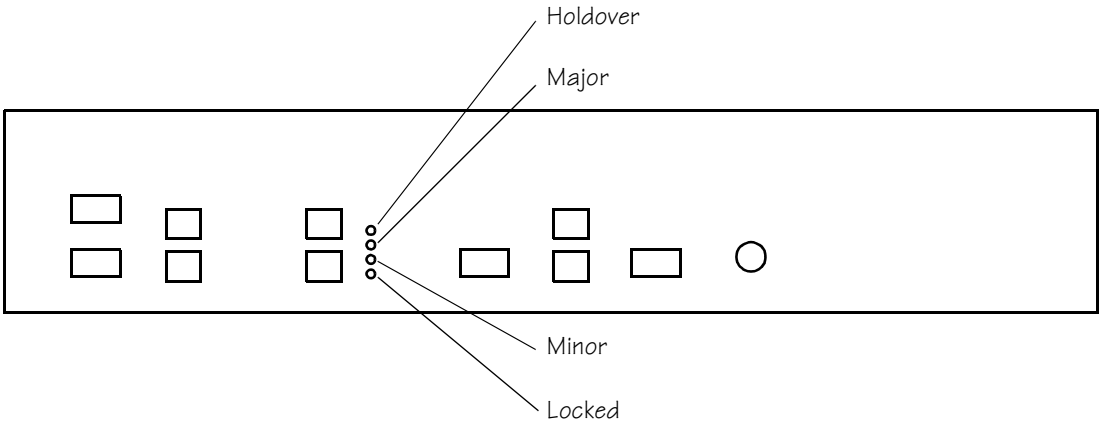


Table O. Lamp Descriptions

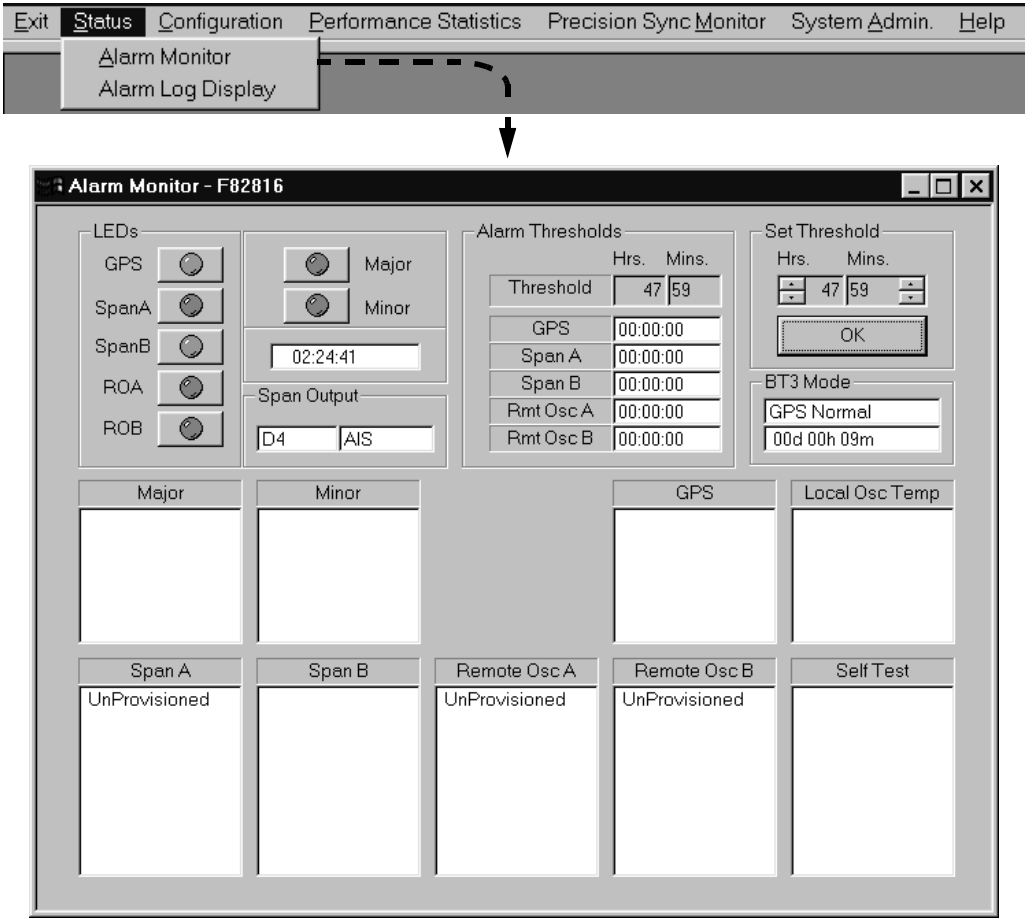
Lamp	Status	Description	Action
Holdover	Off	System is not in holdover	None
	Yellow	System is in holdover	Refer to the Alarm Monitor screen
Major	Off	System is not in major alarm	None
	Red	System is in major alarm	Refer to the Alarm Monitor screen
Minor	Off	System is not in minor alarm	None
	Yellow	System is in minor alarm	Refer to the Alarm Monitor screen
Locked	Off	System is not powered	Apply power, or check power source and connections
	Blinking Green	System is in warm-up	None, unless warm-up exists for more than 8 h (see note below)
	Green	System is providing Stratum 1 signals (if Major lamp is off)	None

Note: If the system does not exit the warm-up state, installation data may have not been entered, or may have been entered incorrectly. Check that the latitude, longitude, altitude, elevation mask, GPS fix mode, and cable delay information was correctly entered on the BTMONitor Installation screen. Entering latitude in the longitude window, and vice versa, are common errors. If the alarm persists, the window or wall may not a have a large enough view of the sky for the system to stabilize. If possible, move the antenna to a window or wall with an improved view of the sky.

Theory of Alarm Processing and Troubleshooting

The following pages describe the theory behind how events and alarms are processed, and how to troubleshoot the system, based on the event and alarm messages. Refer to Figure 30 for the Alarm Monitor screen, which may be referenced during the descriptions on the following pages.

Figure 30. Alarm Monitor Screen



The TimeSource 2500 provides an extensive source of information about system events and alarms, which is logged and reported to the user via front panel lamps, alarm relays, TL1 messages, and the BTMONitor Alarm Monitor and Alarm Log Display screens. The Alarm Monitor screen displays all active events and alarms, for monitoring the functionality and operation of the system. The Alarm Log Display screen displays the past 512 events, and alarm history.

The TimeSource 2500 reports two types of events: transient events and events. A transient event is an intermittent or short-term non-service-affecting condition outside the normal operating conditions in an input or critical internal subsystem. An event is a standing or persistent non-service-affecting condition outside the normal operating conditions in an input or critical internal subsystem.

Each TimeSource 2500 input and critical internal subsystem may produce reportable transient events, events, and alarms. All transient events are processed through leaky buckets to correctly clear the transient event, or to escalate it to an event or alarm. Alarms are escalated through a user-adjustable threshold. For span and remote oscillator inputs, the default threshold for a standing minor alarm to escalate to a major alarm is 48 hours. For GPS inputs, the default threshold for the amount of time from the beginning of bridging mode to the initiation of a major alarm is 48 hours. Service-impacting alarm conditions are reported directly as a major alarm.

Much of the transient event and event level information reported via the BTMONitor Alarm Monitor screen is normal activity, which does not impact the performance of the timing outputs, and is useful primarily as a system operation monitoring tool. For example, the TimeSource 2500 is designed to output PRS quality signals without any view of GPS satellites for as long as 14 hours on average per day. Therefore, it is common for the system to report events regarding GPS satellite tracking and drop-out activity, even though the activity will have no impact on the performance of the outputs.

In general, minor and major alarms should appear infrequently, and troubleshooting activity is not required, unless the system is in alarm. Otherwise, it is likely the condition is transient, will clear on its own, and will have had no impact on the quality of the timing outputs.

The TimeSource 2500 reports transient events, events, and alarms for the critical subsystems and inputs listed below:

- GPS
- Span Inputs
- Remote Oscillator Inputs
- Phase Locked Loop
- Local Oscillator Temperature

Table P lists the BTMONitor Alarm Monitor screen messages, descriptions of the messages, and the pages where the descriptions can be found.

Table P. BTMONitor Alarm Monitor Screen Messages

Message	Definition	Description Page No.
	GPS	
Tevt-Freq	GPS Frequency Transient Event	163
Evt-Freq	GPS Frequency Event	163
Alm-Freq	GPS Frequency Alarm	164
Tevt-Drift	GPS Drift Transient Event	164
Evt-Drift	GPS Drift Event	165
Alm-Drift	GPS Drift Alarm	165
Tevt-Timg Accur	GPS Timing Accuracy Transient Event	166
Tevt-Clk Bias	GPS Clock Bias Transient Event	166
Alm-Trk Succs	GPS Tracking Success Alarm	166
Alm-Antenna	Antenna Alarm	167
	Span A or Span B	
Tevt-Freq	Span Frequency Transient Event	168
Alm-Freq	Span Frequency Alarm	169
Tevt-Drift	Span Drift Transient Event	169
Alm-Drift	Span Drift Alarm	170
Tevt-Phase	Span Phase Transient Event	170
Alm-Phase	Span Phase Alarm	171
Alm-Jitter	Span Jitter Alarm	171

Table P. BTMONitor Alarm Monitor Screen Messages (cont'd)

Message	Definition	Description Page No.
Remote Osc A or Remote Osc B		
Tevt-Freq	RO Frequency Transient Event	172
Alm-Freq	RO Frequency Alarm	173
Tevt-Drift	RO Drift Transient Event	173
Alm-Drift	RO Drift Alarm	174
Tevt-Phase	RO Phase Transient Event	174
Alm-Phase	RO Phase Alarm	175
Alm-Jitter	RO Jitter Alarm	175
Self Test		
Evt-Step	PLL Step Event	176
Alm-Step	PLL Step Alarm	177
Evt-Range	PLL Range Event	177
Alm-Range	PLL Range Alarm	178
Alm-Jitter	PLL Jitter Alarm	178
Local Osc Temp		
Evt-Step	TP Step Event	179
Alm-Step	TP Step Alarm	179
Evt-Slew	TP Slew Event	180
Alm-Slew	TP Slew Alarm	180

GPS Event and Alarm Summary

It is normal for frequent GPS transient event activity to occur, depending on the antenna and window or wall location. When a transient event escalates to an event, the TimeSource 2500 enters bridging mode, and operates on its predictors, but will not report a minor or major alarm. In bridging mode, the TimeSource 2500 continues to provide Stratum 1 outputs. If the event condition persists, a minor alarm is generated. The TimeSource 2500 will not light the holdover lamp, unless a minor or major GPS alarm condition exists. Table Q shows the four GPS operating modes.

Table Q. GPS Operating Modes

Mode	Description
Warm up	System has recently been reset or powered up, and is establishing or re-establishing normal time and frequency output.
Normal	System is operating with valid GPS measurement data.
Bridging	System has temporarily lost GPS measurement, and is utilizing the prediction algorithm.
Holdover	A GPS loss has escalated to a minor/major alarm.

The transient event, event, and alarm messages on the following pages will appear in the window labeled GPS on the Alarm Monitor screen (Figure 30).

GPS Frequency Transient Event

The GPS receiver performs a complete update of the current time (clock bias) and frequency (clock drift) estimates every second. The TimeSource 2500 compares the current frequency estimate of the corrected local oscillator, with respect to GPS, and declares a GPS Frequency Event, if the magnitude of the offset is greater than the 0.02 ppm threshold.

Maintenance action required: None.

GPS Frequency Event

The GPS Frequency Transient Event data is processed through a leaky-bucket alarm manager, to control escalation to an event. GPS Clock Bias Transient Events and Time Accuracy Transient Events are included in this general frequency event category. A frequency event represents an error in the GPS receiver output state or a failed oscillator. The nominal time to escalate to an event condition is 2 minutes. The maximum time to retire an event is 5 minutes.

Maintenance action required: None.

GPS Frequency Alarm

The GPS Frequency Event data is processed through a leaky-bucket alarm manager, to control escalation to an alarm.

Maintenance action required:

1. Check that the latitude, longitude, altitude, elevation mask, and GPS fix mode information has been entered properly, via the BTMONitor Installation screen. Entering latitude in the longitude window, and vice versa, are common user errors. If the alarm persists, the window or wall may not a have a large enough view of the sky for the system to stabilize. If possible, move the antenna to a window or wall with an improved view of the sky.
2. If an antenna alarm is also present, the cable to the antenna may have become disconnected. Reconnect the antenna cable. If the condition persists, replace the antenna cable(s).
3. If a PLL alarm is also present, replace the shelf.

GPS Drift Transient Event

The rate of change of the GPS frequency estimate is calculated, to determine if the current slew rate is within the expected measurement window for GPS, given the effects of Selective Availability and dynamic changes in the number and elevation of tracked satellites.

Maintenance action required: None.

GPS Drift Event

GPS Drift Transient Event data is processed through a leaky-bucket alarm manager, to control escalation to an event. A drift event represents a small error in the GPS receiver output state outside the expected performance. Occasional drift events are normal in locations where there are antenna obstacles or sources of multipath. The nominal time to escalate to an event condition is 2 minutes. The maximum time to retire an event is 5 minutes.

Maintenance action required: None.

GPS Drift Alarm

The GPS Drift Event data is processed through a leaky-bucket alarm manager, to control escalation to an alarm.

Maintenance action required:

1. If a GPS Drift event escalates to an alarm, and there are no other GPS alarms, check that the latitude, longitude, altitude, elevation mask, and GPS fix mode information has been entered properly, via the BTMONitor Installation screen.
2. The TimeSource 2500 should not normally generate a GPS drift alarm because of multipath, even with a very limited view of the sky. However, it is possible to reduce the impact of low-elevation multipath, by increasing the elevation mask to exclude low-elevation satellites. Check the elevation mask in the BTMONitor Installation screen. Increase the elevation mask setting, and monitor the system for 24 hours, to see if the alarm clears. If the alarm persists, and the system performance is unacceptable, move the antenna to a window or wall with an improved view of the sky.

GPS Time Accuracy Transient Event

The GPS receiver estimates the current accuracy of the timing solution. The threshold for good timing solutions is 750 ns.

Maintenance action required: None.

GPS Clock Bias Transient Event

The clock bias transient event indicates the quality of the current timing solution data. The transient event is reported if there are no valid satellites to obtain a good timing solution, or if the current timing accuracy estimate exceeds the maximum threshold.

Maintenance action required: None.

GPS Tracking Success Alarm

This alarm indicates that the GPS receiver is not achieving an acceptable level of successful tracking. The system calculates a 24 hour average success rate every hour. This alarm is reported if the average daily success rate is less than 40 percent.

Maintenance action required: Check that the latitude, longitude, altitude, elevation mask, GPS fix mode, and cable delay information have been properly entered, via the Installation screen. Entering latitude in the longitude window, and vice versa, are common user errors. If the alarm condition persists, the window or wall may not a have a large enough view of the sky for the system to stabilize. If possible, move the antenna to a window or wall with an improved view of the sky.

Note: If the TimeSource 2500 suddenly stops tracking satellites, and does not reacquire any satellites for 24 hours or more, the system critical memory may have become corrupted. Reset the GPS receiver (using the Reset screen). If the condition persists, replace the shelf.

Antenna Alarm

This alarm indicates that the external antenna port is operating at an abnormal current level. This normally indicates a faulty cable, or antenna pre-amp. This condition is reported directly as a minor alarm.

Maintenance action required: Check and tighten all antenna cable connections. If the alarm persists, replace the antenna. If the alarm persists, replace the antenna cable(s).

Span Input Event and Alarm Summary

The TimeSource 2500 reports and escalates transient events, and events on any provisioned, but not ensembled, span line. Events on span lines not used in the BesTime output ensemble never escalate to an alarm, because the span line is not being used to generate the timing outputs. Span inputs used in the BesTime output ensemble report transient events which will escalate directly to an alarm, bypassing the event level, because of the potential of the span alarm activity to impact the quality of the timing outputs.

The following transient event, event, and alarm messages will appear in the window(s) labeled Span A and/or Span B on the Alarm Monitor screen.

Span Frequency Transient Event

The input span (carrier) frequency is measured with respect to the local oscillator frequency. This measurement includes the expected frequency error of the span line, and local oscillator, over a 15 second smoothing time constant. The threshold is set to 1.1 ppm, to accommodate the expected frequency range of the oscillator over the life of the product, to allow for Stratum 2 level traceability for the incoming span line, and to accommodate permitted network wander.

Maintenance action required: None.

Span Frequency Alarm

Span Frequency Transient event data is processed through a leaky-bucket alarm manager, to control escalation to an event, or directly to a minor alarm. The nominal time to escalate is 4 seconds, and the maximum time to retire is 75 seconds. Normal SONET pointer adjustments or network rearrangement transients will not produce an alarm. A span frequency alarm condition represents a significant frequency error on the incoming span line.

Maintenance action required: Timing on the incoming span line is not within network specifications. Troubleshoot the source of the timing for the incoming span line, or contact the span line service provider.

Span Drift Transient Event

The TimeSource 2500 measures the relative difference between the input frequency of a span and the output frequency. The input frequency is smoothed, using a smoothing filter, which detects and removes transients above the normal operating range of a span line. The drift event will be triggered by SONET pointer adjustments, and other network rearrangement-related transient events. This permits these transients to be detected and removed before they impact the system. The TimeSource 2500 checks for drift events every 4 seconds.

Maintenance action required: None.

Span Drift Alarm

Span drift event data is processed through a leaky-bucket alarm manager, to control escalation to an event, or directly to a minor alarm. Since occasional drift events are typical, the leaky bucket is set to ignore isolated pointer and network rearrangement events. The nominal time to escalate to an alarm is 4 minutes, and the maximum time to retire the alarm is 2.5 minutes.

Maintenance action required: Occasional span drift alarm activity may occur as a result of network maintenance. Persistent drift alarm activity is not normal. Check the BTMONitor Alarm Log screen, and if there are multiple events per day, the span line input should be considered suspect. Timing on the incoming span line is not within specification. Troubleshoot the source of the timing for the incoming span line, or contact the span line service provider.

Span Phase Transient Event

The phase event category is used to detect “fast” phase transient events. A fast event is usually related to a timing transient in the previous network element, as opposed to a slower event played out through upstream intermediate clocks. In general, all phase events will produce drift events. A phase event is observed over a 250 ms interval after removing network jitter. The default threshold for a span phase transient event is greater than 250 ns.

Maintenance action required: None.

Span Phase Alarm

Span phase transient event data is processed through a leaky-bucket alarm manager, to control escalation to an event or alarm. The nominal time to assert is 7 seconds, and the maximum time to retire is 3 minutes.

Maintenance action required: Occasional span phase alarm activity may occur as a result of network maintenance. Persistent phase alarm activity is not normal. Check the BTMONitor Alarm Log screen, and if there are multiple events per day, the span line input should be considered suspect. This indicates that timing on the incoming span line is not within specification. Troubleshoot the source of the timing for the incoming span line, or contact the span line service provider.

Span Jitter Alarm

Jitter is measured on the incoming span line with a resolution of 50 ns. If the peak-to-peak delta phase error exceeds the GR2830 1.6 ms threshold for a period of 100 ms, an input jitter alarm is declared. This alarm is also activated if there is a loss of span line input signal for a period greater than 100 ms.

Maintenance action required: The input span line cable may have become disconnected; check and tighten all cable connections. If the alarm persists, timing on the incoming span line is not within specification. Troubleshoot the source of the timing for the incoming span line, or contact the span line service provider. If the alarm persists, replace the cable.

Remote Oscillator (RO) Input Event and Alarm Summary

The TimeSource 2500 reports and escalates transient events, and events on any remote oscillator input that is provisioned, but not ensembled. Events on remote oscillator inputs not used in the BesTime output ensemble never escalate to an alarm because the remote oscillator inputs are not being used to generate the timing outputs. Remote oscillator inputs used in the BesTime output ensemble report transient events, which will escalate directly to an alarm, bypassing the event level, because of the potential of the remote oscillator input's alarm activity to impact the quality of the timing outputs.

The following transient event, event, and alarm messages will appear in the window(s) labeled Remote Osc A and/or Remote Osc B on the Alarm Monitor screen.

RO Frequency Transient Event

The input RO frequency is measured with respect to the local oscillator frequency. This measurement includes the expected frequency error of the RO, and the local oscillator, over a smoothing constant. The threshold is set to 2.0 ppm, to accommodate the expected frequency range of the local oscillator over the life of the product and the free-running accuracy of the remote oscillator.

Maintenance action required: None.

RO Frequency Alarm

RO frequency event data is processed through a leaky-bucket alarm manager, to control escalation to an event or an alarm. The nominal time to report is 4 seconds, and the maximum time to retire is 75 seconds. An RO frequency alarm condition represents a significant issue, and should normally not occur.

Maintenance action required: The remote oscillator input is outside the normal operating frequency range. Verify the cable connections are secure. Verify the input signal is RS-422 compatible, nominally ±1 volt differential into 100 ohms, with less than 7 volts common mode. If the signal looks good, troubleshoot the remote oscillator.

RO Drift Transient Event

The relative difference is measured between the input frequency and the current output frequency of the TimeSource 2500. The input frequency is smoothed, using an input smoothing filter. The threshold for this category is selected to detect and remove transients above the normal operating range of a remote oscillator. The threshold is 0.02 ppm. This permits these transients to be detected and removed before the system is impacted. The TimeSource 2500 checks for drift events every 15 seconds.

Maintenance action required: None.

RO Drift Alarm

RO drift transient event data is processed through a leaky-bucket alarm manager, to control escalation to an event or an alarm. Normally, drift alarms should not occur on remote oscillator inputs. The nominal time to report is 45 seconds, and the maximum time to retire is 7.5 minutes.

Maintenance action required: The remote oscillator input is experiencing abnormal jumps in frequency. Verify the cable connections are secure. Verify the input signal is RS-422 compatible, nominally ±1 volt differential into 100 ohms, with less than 7 volts common mode. If the signal looks good, troubleshoot the remote oscillator.

RO Phase Transient Event

The phase transient event category is used to detect “fast” phase transient events. The threshold for a phase transient is greater than 250 ns.

Maintenance action required: None

RO Phase Alarm

RO phase transient event data is processed through a leaky-bucket alarm manager, to control escalation to an event or alarm. The nominal time to assert an alarm is 7 seconds, and the maximum time to retire an alarm is 3 minutes.

Maintenance action required: The remote oscillator input is experiencing abnormal jumps in frequency. Verify the cable connections are secure. Verify the input signal is RS-422 compatible, nominally ±1 volt differential into 100 ohms, with less than 7 volts common mode. If the signal looks good, troubleshoot the remote oscillator.

RO Jitter Alarm

The TimeSource 2500 measures jitter on the Remote Oscillator input with a resolution of 470 ps. If the peak-to-peak delta phase error exceeds the 12 ns threshold for a period of 100 ms, an input jitter alarm is declared. This alarm is also activated if there is a loss of remote oscillator input signal for a period greater than 100 ms.

Maintenance action required: The remote oscillator input cable may have become disconnected; check and tighten all cable connections. If the alarm still persists, the timing being received from the remote oscillator is not within specification. Troubleshoot the remote oscillator. If the alarm persists, replace the cable.

Phase Locked Loop (PLL) Event and Alarm Summary

The PLL events and alarms report activity associated with the 60 MHz synthesizer PLL subsystem. In general, PLL alarms indicate a potential critical hardware fault in the system. Any alarm is immediately treated as a minor alarm. If a PLL alarm occurs with simultaneous alarm activity on all provisioned inputs, a major alarm is reported.

The following transient event, event, and alarm messages will appear in the window labeled Self Test on the Alarm Monitor screen.

PLL Step Event

The step event category is used to capture abnormal phase or frequency transient “pops” in the synthesizer PLL. A step event is the magnitude of the delta between successive 250 ms samples exceeding the threshold. The threshold is 0.5 percent of the total VCXO pull-in range (70 ppm minimal).

Maintenance action required: None.

PLL Step Alarm

A step event should not occur in a normal system after the first minute from a cold power-up. The PLL step event is processed through a leaky-bucket alarm manager, to control escalation to a minor alarm. The manager is set so that a single isolated event will not escalate to an alarm. The nominal time to escalate to an alarm is 750 ms. The maximum time to retire an alarm is 40 seconds.

Maintenance action required: If the system is not in warm-up, replace the shelf.

PLL Range Event

The range event category is used to report individual 250 ms samples that exceed the normal varactor range limits. The limits are at 90 percent of the total control range.

Maintenance action required: None.

PLL Range Alarm

A range event should not occur in a normally operating system after the first minute from a cold power-up. The PLL range event is processed through a leaky-bucket alarm manager, to control escalation to a minor alarm. The leaky-bucket manager is set so that a single isolated event will not escalate to an alarm. The nominal time to escalate to an alarm is 750 ms. The maximum time to retire an alarm is 40 seconds.

Maintenance action required: If the system is in warm-up, no action is required. If a PLL range alarm occurs without simultaneous input alarm activity, the VCXO may be at the end of its pull-in range, and the shelf requires immediate replacement. If the range PLL alarm occurs with some inputs operating alarm free, there is no immediate problem, but the shelf will soon require replacement.

PLL Jitter Alarm

If the jitter level exceeds 10 counts at 10 bits for nominally 100 ms, a PLL jitter alarm is reported.

Maintenance action required: Replace the shelf.

Temperature (TP) Event and Alarm Summary

Temperature event and alarm data reports temperature changes of the local oscillator oven. Step and jitter alarms are likely indications of a hardware fault. A problem with outside air (room) temperature is indicated by a standing slew alarm, if no other alarms are present.

The following transient event, event, and alarm messages will appear in the window labeled Local Osc Temp on the Alarm Monitor screen.

TP Step Event

The step event category is used to capture abnormal step changes in the oven current of the oscillator.

Maintenance action required: None.

TP Step Alarm

A step event should not occur in a normally operating system after the first minute from a cold power-up. The oven current step event is processed through a leaky-bucket alarm manager, to control escalation to a minor alarm. The manager is set so that a single event will not escalate to an alarm. The nominal time to escalate to an alarm is 900 ms. The maximum time to retire an alarm is 20 seconds.

Maintenance action required: If the system is not in warm-up, replace the shelf.

TP Slew Event

The slew event category detects abnormal slew rate changes in the oven current. A large slew in oven current is normal only during a power-up condition.

Maintenance action required: None.

TP Slew Alarm

Persistent oven current slew usually indicates an abnormal temperature environment. The TP Slew event is processed through a leaky-bucket alarm manager, to control escalation to a minor alarm. The manager is set so that a single event will not escalate to an alarm. The nominal time to escalate to an alarm is 7 minutes. The maximum time to retire an alarm is 10 minutes.

Maintenance action required:

1. Determine if the TimeSource 2500 Shelf is being exposed to an unusual amount of air flow variation (for example, the shelf is located next to a heating vent). If so, reposition the shelf.
2. Check the room temperature, repair the heating/air conditioning system. If the room temperature is within the specified operating range for the unit (0 degrees Celsius to 50 degrees Celsius), and the alarm persists, replace the shelf.

TL1 Messages

The TimeSource 2500 sends out two types of TL1 messages via the Craft communication port: alarms and events. The format of each of these are described below.

Formats

Alarms

Alarms are sent out as Report Alarm messages in the following format:

```
<cr> <lf> <lf>
<sid> <date> <time>
<almcode> <atag> REPT ALM <modifier>
"<aid>:<ntfcncde>,<condtype>,<srveff>,<ocrdat>,
<ocrtm>,,,:\"<conddescr>\""
<;>
```

Events

Events are sent out as Report Event messages in the following format:

```
<cr> <lf> <lf>
<sid> <date> <time>
<atag> REPT EVT <modifier>
"<aid>:<condtype>,<condeff>,<ocrdat>,
<ocrtm>,,,:\"<conddescr>\""
<;>
```

Parameters

The parameters used in the alarm and event messages are defined in Table R.

Table R. Parameter Definitions

Parameter	Definitions
aid	This parameter is the access identifier which is the equipment reporting the condition.
almcode	This parameter is the alarm code which identifies the severity of the alarm. If multiple alarms are reported, the value for almcde is the highest severity of those reported. Valid values are: ** = major alarm * = minor alarm A = event
atag	This parameter is the automatic message tag which is a decimal number with a maximum of three characters (001 through 999, after which numbering restarts at 001). It is assigned by the system to sequence and correlate automatic messages.
conddescr	This parameter is the condition description which is a text description of the condition reported by the system, enclosed within /* and */. The system returns one conddescr per message. Valid values are listed in Table S.
condeff	This parameter indicates the effect of the condition on the equipment. A transient condition does not change the basic state of the equipment. Valid values are: SC = standing condition raised CL = standing condition cleared TC = transient condition

Table R. Parameter Definitions (cont'd)

Parameter	Definitions
condtype	This parameter is the condition type. It indicates the type of condition being reported. Valid values are: MODE = the equipment is powering up or software downloading ERROR = there is an error in one of the signals being ensembled LOS = there is a loss of one of the signals being ensembled AIS = there is an alarm indication signal being received on one of the external span inputs STATE = there is a problem with the GPS signal
date	This parameter is the current date in the 8 digit form yyyy-mm-dd, where yyyy is year, mm is month (01–12), and dd is day (01–31).
modifier	Same as aid.
ntfcncde	This parameter is the notification code which indicates the severity of the condition. Valid values are: CL = cleared MJ = major alarm MN = minor alarm NA = not alarmed NR = not reported
ocrdat	This parameter is the date an event occurred.
ocrtm	This parameter is the time an event occurred.
sid	This parameter is the source identifier (site ID). It identifies the system sending the message and is the equipment's CLLI code. The sid is the same as the location on the Installation screen.

Table R. Parameter Definitions (cont'd)

Parameter	Definitions
srveff	This parameter identifies how the condition affects service. Valid values are: SA = service affecting NSA = not service affecting
time	This parameter is the current time in the 6 digit form hh-mm-ss where hh is hours (0–23), mm is minutes (0–59), and ss is seconds (0–59). The factory setting is GMT for local time.

Message Troubleshooting

To troubleshoot alarm and event messages, refer to Table S. Table S lists the messages, what the messages mean, and what action to take to troubleshoot the problem.

Table S. Message Troubleshooting

Message (conddescr)	Meaning	Recommended Action
	ALARMS	
HARDWARE FAILURE	A failure has been detected on the system hardware.	Replace the system.
HOLDOVER	All inputs (GPS signals, span inputs, and remote oscillator inputs) are lost or unacceptable, and the system is now using the internal oscillator.	Troubleshoot the GPS, SPAN x, and RO x error messages (check the cable, source, etc.).
GPS ERROR	The GPS receiver is reporting an error.	1. Check the view of the sky for obstructions. 2. Raise the antenna elevation mask setting, using the BTMONitor Installation screen. 3. Check the cable connections between the TimeSource 2500 Shelf and the antenna. 4. If the error repeats, replace the antenna. 5. If the error repeats, replace the cable.
RO x ERROR	An error has been detected on the specified remote oscillator input signal.	Troubleshoot the specified remote oscillator input (check signal frequency). Verify the input frequency matches the equipment configuration.
RO x LOSS OF SIGNAL	The specified remote oscillator input signal has been lost.	Troubleshoot the specified remote oscillator input (check the cable, connections, source).
SPAN x AIS	An alarm indication signal (AIS) has been received on the specified T1 input span.	Troubleshoot the specified T1 input span signal (check the source).
SPAN x ERROR	An error has been detected on the specified T1 input span.	Troubleshoot the specified T1 input span signal (include checks for signal frequency and jitter).

Table S. Message Troubleshooting (cont'd)

Message (conddescr)	Meaning	Recommended Action
SPAN x LOSS OF SIGNAL	The signal on the specified span input has been lost.	Troubleshoot the specified T1 input span signal (check the cable, connections, source).
TEMPERATURE ERROR	A temperature error has been 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 2500 environmental specifications. If not, correct the ambient temperature with heating or air conditioning. 2. If the ambient air temperature is within the TimeSource 2500 environmental specifications, replace the system.
EVENTS		
DOWNLOAD FAILED	The software download has failed.	Retry the software download.
DOWNLOAD IN PROGRESS	Software is being downloaded.	Wait until the download has been completed.
DOWNLOAD SUCCESSFUL	The software has been downloaded successfully.	None required.
GPS ERROR	The GPS receiver is reporting an error.	None required.
POWER UP RESTART	The system processor has just started up.	None required.
RO x ERROR	An error has been detected on the specified remote oscillator input signal.	Wait until this becomes a minor alarm, or start troubleshooting the specified remote oscillator input now (check the signal frequency).

Table S. Message Troubleshooting (cont'd)

Message (conddescr)	Meaning	Recommended Action
RO x LOSS OF SIGNAL	The specified remote oscillator input signal has been lost.	Wait until this becomes a minor alarm, or start troubleshooting the specified remote oscillator input now (check the cable, connections, source).
SPAN x AIS	An alarm indication signal (AIS) has been received on the specified T1 input span.	Wait until this becomes a minor alarm, or start troubleshooting the specified span input now (check the source).
SPAN x ERROR	An error has been detected on the specified T1 input span.	Wait until this becomes a minor alarm, or start troubleshooting the specified span input now (include checks for signal frequency and jitter).
SPAN x LOSS OF SIGNAL	The signal on the specified span input has been lost.	Wait until this becomes a minor alarm, or start troubleshooting the specified span input now (check the cable, connections, source).
BRIDGING	All inputs (GPS signals, span inputs, and remote oscillator inputs) are lost or unacceptable, and the system is using the internal oscillator.	None required.
TEMPERATURE ERROR	A temperature error has been detected on the internal oscillator.	If this occurs momentarily during power-up, none required. If this does not occur during power-up: check that the ambient air temperature is within the TimeSource 2500 environmental specifications. If not, correct the ambient temperature with heating or air conditioning.

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, follow Procedure M.

Procedure M. Equipment Return

Step	Action
1	Call your local Symmetricom distributor or Symmetricom's Inside Sales (refer to the Sales subsection), 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 Building 7 Aguada West Industrial Site Aguada, Puerto Rico 00602 *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:
888-367-7966 (from inside U.S.A. only – toll-free)
408-428-7907

U.K. Call Center:
+44.7000.111666
+44.1604.586740

Fax: 408-428-7998

E-mail: ctac@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:
888-367-7966 (from inside U.S.A. only – toll-free)
408-428-7907

U.K. Call Center:
+44.7000.111888
+44.1604.586740

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.

To register for access to the manual update site via the internet, send an e-mail with the following information to "manuals@symmetricom.com":

- Name
- Title
- Company
- Address

An e-mail will be returned, which will include the internet address of the update site, and a name and password necessary to access the site.

Chapter 6

Specifications

This chapter provides equipment specifications.

Antenna

Window

Voltage (via signal cable):	12 V dc nominal
Current (via signal cable):	20 mA
Gain:	26 dB
Connector:	SMA female
Dimensions:	
Length:	4 in.
Width:	3 in.
Height:	1.5 in.
Weight:	5.3 oz
Operating Temperature:	0 °C to 50 °C
Operating Humidity:	0% to 95% non-condensing

Wall

Voltage:	12 V
Gain:	26 dB
Connector:	TNC female
Dimensions: (including connector)	
Height:	1.14 in.
Diameter:	2.2 in.
Weight:	3.2 oz

Remote Communication Port

Connector Type:	9-pin, female DB9 connector
Connector Label:	Remote RS-232
Connector Location:	Front panel
Electrical Interface:	RS-232
Configuration:	Data terminal equipment (DTE)
Baud Rate:	9600 bps

Craft Communication Port

Connector Type:	RJ-45
Connector Label:	Craft
Connector Location:	Front panel
Electrical Interface:	RS-232
Baud Rate:	9600 bps

T1 Inputs

Connector Type:	RJ-45
Connector Label:	Input (Span A and Span B)
Connector Location:	Front panel
Frequency:	1.544 MHz
Impedance:	100 Ω ±5 Ω
Format:	DS1
Line Code:	Alternate mark inversion (AMI)
Signal Level:	1.5 V to 4.5 V base to peak (terminated) 0.15 V to 0.45 V base to peak (bridged)
Framing:	D4 ESF
Jitter Tolerance:	Meets GR-1244 requirements

Remote Oscillator Inputs

Connector Type:	RJ-45
Connector Label:	Input (Span A and Span B)
Connector Location:	Front panel
Impedance:	120 Ω
Frequency:	5 MHz
Format:	RS-422
Voltage:	Nominally ±1 V differential into 100 Ω

T1 Outputs

Connector Type:	RJ-45
Connector Label:	Output (Span A and Span B)
Connector Location:	Front panel
Frequency:	1.544 MHz
Impedance:	100 Ω
Format:	DS1
Payload	All ones
Line Code:	Alternate mark inversion (AMI)
Pulse Amplitude:	2.4 V to 3.6 V terminated into 100 Ω base to peak
Framing:	D4 ESF
Transmission During Alarms:	SSM (ESF only) AIS Squelch Forced

Time of Day Output

Connector Type:	9-pin, female DB9 connector
Connector Label:	TOD RS-422
Connector Location:	Front panel
Time of Day Data Format:	
Network Time Protocol (NTP), Type 4, Format 2 Driver:	
Time Format:	Year Julian-date hour:minute:second:millisecond
Alarm Fields:	First character, space = machine synchronized, First character, ? = machine out of synchronization
Cisco Systems:	
Time Format:	Year/month/day, hour:minute:second
Alarm Fields:	Alarm severity, source, and cause where the TOD alarm codes are defined as follows: Alarm severity: EV: event MN: minor alarm MJ: major alarm CL: critical alarm Alarm cause: Holdover BT3 Warm-up Hardware fault
Electrical Interface:	RS-485
Baud Rate:	9600 bps
1 pps:	
Level:	RS-485 Compliant
On-Time Edge:	Rising
Pulse Width:	100 µs nominal
UTC Accuracy:	±500 ns, positive pulse
Jitter:	Less than 1 ns peak-to-peak

10 MHz Output

Connector Type:	BNC
Connector Label:	10 MHz Output
Connector Location:	Front panel
Frequency:	10 MHz
Impedance:	50 Ω
Format:	Sine wave
Amplitude:	13 dBm ±2 dBm
Harmonic Spurious:	Less than –60 dBc
Phase Noise: (referenced at 10 MHz)	–120 dBc @ 100 Hz –135 dBc @ 1 kHz –135 dBc @ 10 kHz –135 dBc @ 100 kHz –135 dBc @ 1 MHz

Alarms

Connector Type:	RJ-45
Connector Label:	Alarms
Connector Location:	Front panel
Contact Type:	Dry
Contact Rating:	1 A @ 30 V dc 0.5 A @ 60 V dc 0.5 A @ 125 V ac
Severity Levels:	Major Minor
Major:	Closed when not powered, closed when powered and in Major alarm, open when powered and not in Major alarm
Minor:	Open when not powered, open when powered and not in Minor alarm, closed when powered and in Minor alarm

Indicators

Labels:	Holdover Major Minor Locked
Type:	Light emitting diode

Power

Connectors:	Male DB9 (both)
Connector Labels:	Power A Power B
Voltage:	–36 V dc to –60 V dc (each connector)
Current:	1.8 A cold start at –36 V 600 mA standard operation
Start Up Power:	Less than 70 W
Steady State Power: (25 °C)	27 W
Fuse for Battery Feed: (Recommended)	3 A

Shelf Mechanical

Mounting:	Wall 19 in. rack 23 in. rack
Rack Mounting Position:	Flush 5 in. offset
Width:	15.1 in.
Height:	2.8 in.
Depth:	9 in.
Weight:	7.5 lb

Wire-Wrap Panel Mechanical

Mounting:	19 in. rack 23 in. rack
Rack Mounting Position:	Flush 5 in. offset
Width:	17.1 in.
Height:	3.5 in.
Depth:	6.75 in.
Weight:	1 lb

Shelf and Wire-Wrap Panel Environmental

Operating Temperature:	0 °C to + 50 °C
Operating Humidity:	5 % to 85 % RH
Electromagnetic Compliance:	FCC Part 15, Sub Part B, Class A