Symmetricom

TimeSource 3600

GPS Primary Reference Source

097-72060-01
Issue 2

FCC Regulatory Notice

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.

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Acronyms and Abbreviations

AIS	alarm indication signal
E1	digital transmission (2.048 Mb/s)
ESD	electrostatic discharge
ESF	extended superframe
GPS	Global Positioning System
LOS	loss of signal
MDEV	mean time deviation
pps	pulse per second
PRS	primary reference source
RO	remote oscillator
SSM	synchronization status messaging
TDEV	time deviation
TOD	time of day
UTC	Universal Coordinated Time

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Chapter 1

Description

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

Overview

The TimeSource 3600 is a Primary Reference Source (PRS) that receives and processes signals from GPS satellites, and outputs Stratum 1 synchronization signals traceable to UTC. TimeSource 3600 applications include synchronization for central offices, wireless base stations, transmission nodes, and other cases where a primary reference source can improve the performance of a telecommunications network infrastructure.

The TimeSource 3600 is also ideal for installation in environments where receiving GPS signals is difficult. Examples of environments hostile to GPS signals include urban canyons which have a very limited view of the sky because of blockage from nearby buildings, and high interference zones where GPS signals are jammed by competing over-the-air signals.

The TimeSource 3600 creates timing outputs by ensembling signals from several sources. The sources include GPS signals, an onboard rubidium local oscillator, and optional E1 or analog. Timing outputs created from the ensemble are composed of the most stable and least noisy parts of each input. The performance of the E1 sources can be monitored and classified using standard measures. Synchronization outputs are delivered in a framed, all-ones, E1 format or 2.048 MHz analog signal, a 10 MHz signal, a 1 pps signal, and a choice of time of day (TOD) formats.

The TimeSource 3600 minimizes timing impairments, such as jitter and wander, that are created by network and transmission systems. The synchronization timing is traceable to the GPS, which provides the highest level of synchronization for telephony networks. The TimeSource 3600 with its GPS input is a stand-alone office PRS. With the optional inputs ensembled, holdover is extended if GPS signals are disrupted.

Global Positioning System

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

The satellites, circling the earth at approximately 20,197 km, are arranged in 6 orbits with 4 operational satellites in each orbit. Each satellite has an orbital period of approximately 12 hours. This configuration assures that a minimum of 4 satellites, and as many as 12, are in view anywhere in the world at all times.

The TimeSource 3600 tracks all satellites within its field of view. The performance of each tracked satellite is observed and compared to the others, and available for use in the timing solution. A satellite with unacceptable performance data is dropped from the timing solution.

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

The TimeSource 3600 bridges frequent GPS outage periods with BesTime algorithms, its ultra-stable Rubidium local oscillator and advanced holdover technology. The technology anticipates the outages and uses BesTime-generated predictor values to optimize the performance of timing without direct satellite input.

Physical Description

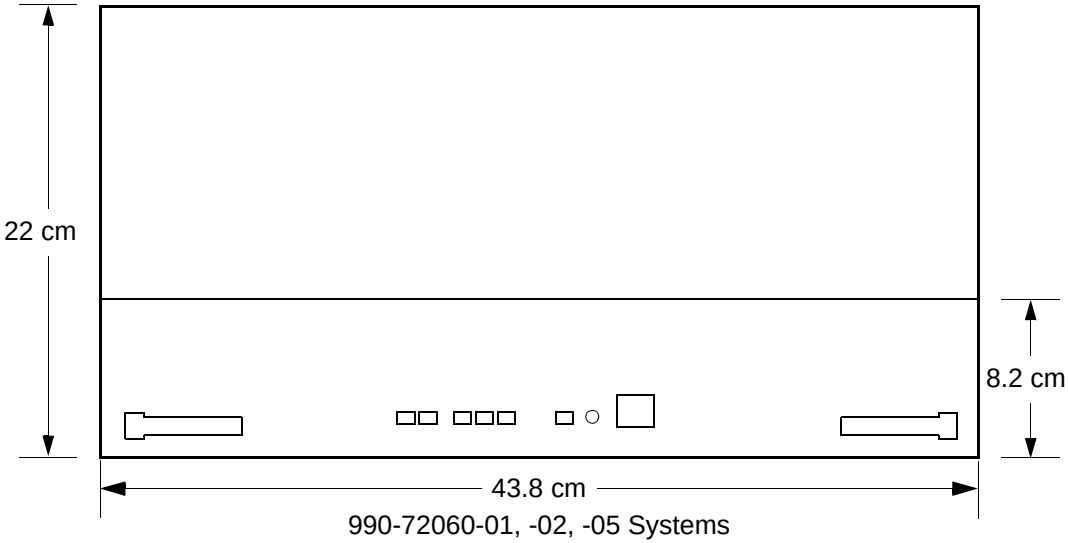
The TimeSource 3600 consists of a shelf, plug-in card, antenna, cables, hardware, and software. Optional system configurations include eight additional E1 or analog outputs, two E1 synchronous clock insertion unit (ESCIU) ports, or four IRIG-B TOD timing outputs.

The shelf (Figure 1) can be mounted in a 48 cm rack or an ETSI 53.5 cm rack. Other than a communications connector on the front panel, all connectors are at the connector panel.

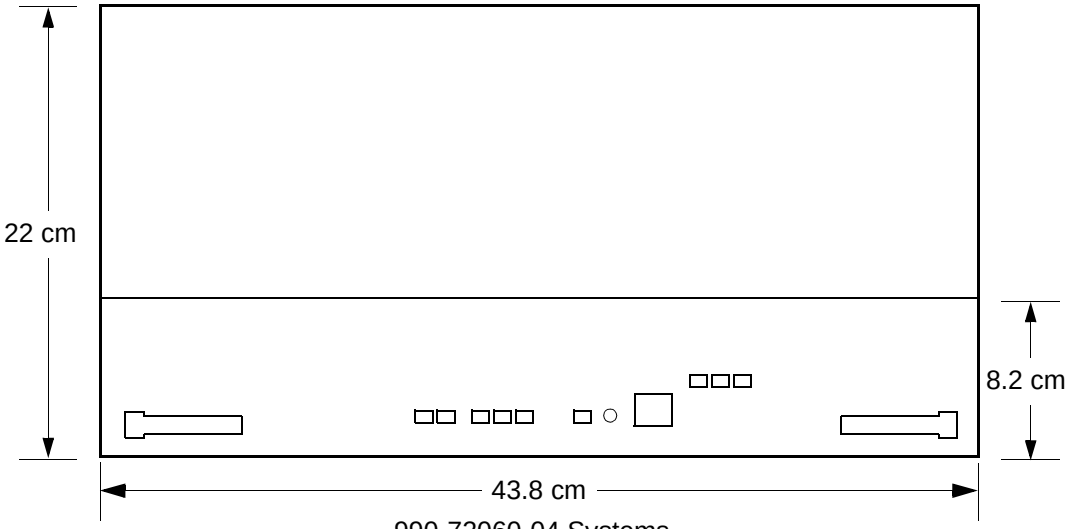
Four types of antennas are available:

- roof antenna for installation outdoors, usually on a roof
- mechanical antenna for installation indoors, mounted on a window sill or wall for reception through a window
- self-adhesive antenna for installation indoors, adhered directly to a window
- wall antenna for installation outdoors, through a hole in the wall

Figure 1. Shelf



990-72060-01, -02, -05 Systems

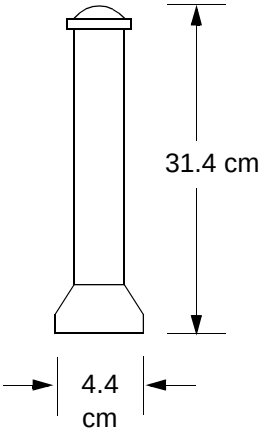


990-72060-04 Systems

Roof Antenna

The roof antenna (Figure 2) is encased in weather-resistant plastic housing for outdoor installation, usually on a roof. A single coaxial cable carries signals and power between the antenna and the shelf.

Figure 2. Roof Antenna

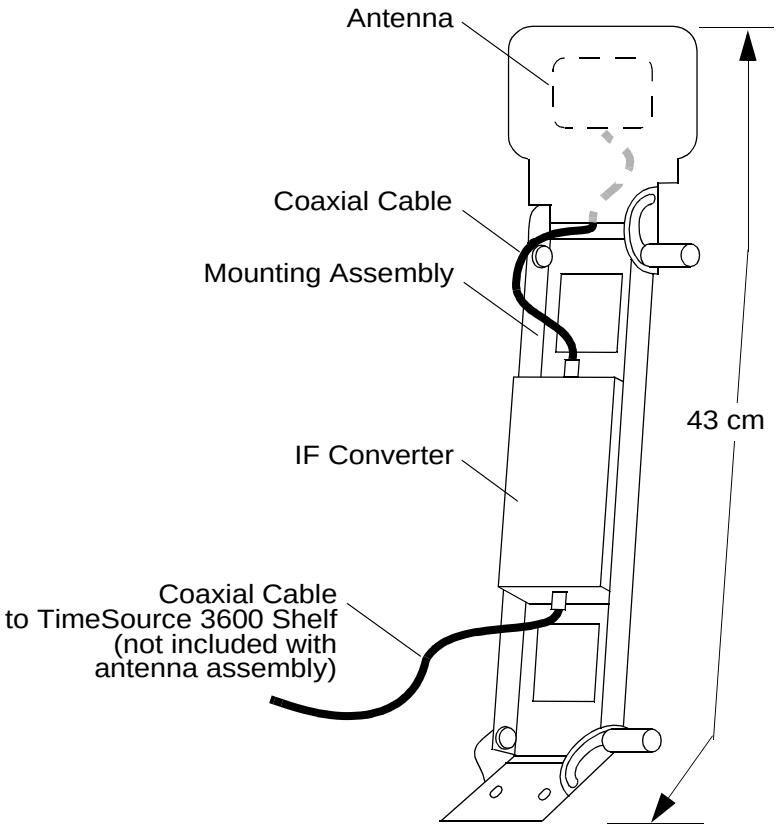


Mechanical Window Antenna

The mechanical window antenna (Figure 3) may be attached to a window sill or wall, in any position that allows the antenna to be moved flush against the window. The antenna can be swung away from the window for window maintenance, and returned to its original position.

A single length of coaxial cable carries signals and power between the antenna assembly and the shelf.

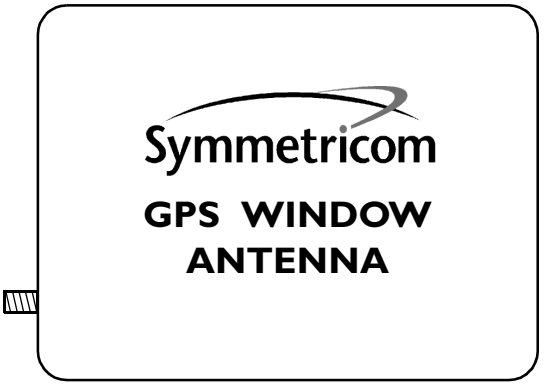
Figure 3. Mechanical Window Antenna



Self-Adhesive Window Antenna

The self-adhesive window antenna assembly (Figure 4) consists of the antenna and two pieces of self-stick hook-and-loop fabric fasteners (Velcro brand or equivalent). The hook-and-loop fabric attaches directly to a window. Coaxial cables carry signals and power between the antenna and the IF converter, and between the IF converter and the shelf.

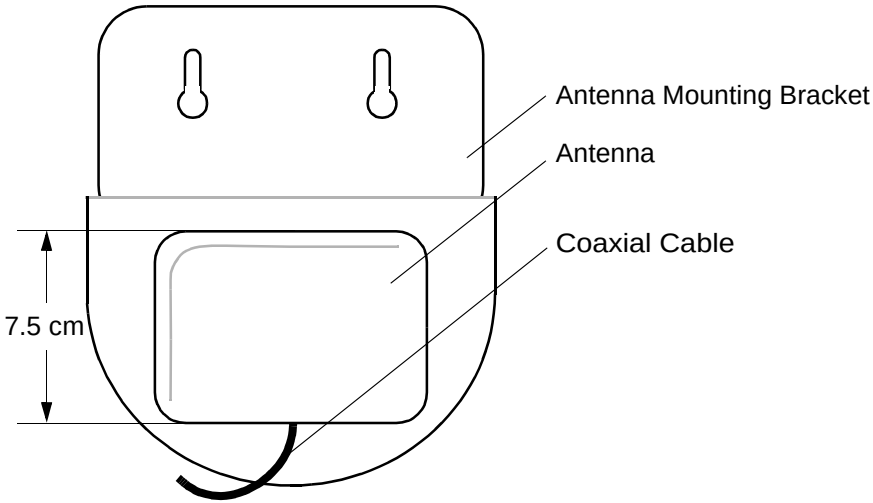
Figure 4. Self-Adhesive Window Antenna



Wall Antenna

The wall antenna (Figure 5) is mounted on the outside of a building wall. The antenna attaches magnetically to the mounting bracket. The cable from the antenna is routed through a hole drilled in the wall. Coaxial cables carry signals and power between the antenna and the IF converter, and between the IF converter and the shelf.

Figure 5. Wall Antenna



Functional Description

Overview

Figure 6 shows the main functions of the TimeSource 3600. The center of the TimeSource 3600 is the BesTime Ensemble Timing Generator, which uses the BesTime algorithm to analyze the phase and frequency relationships, individually and collectively, of the timing sources. Each type of timing source has a particular characteristic that gives it an advantage over other sources, as listed in Table A.

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

Figure 6. Block Diagram

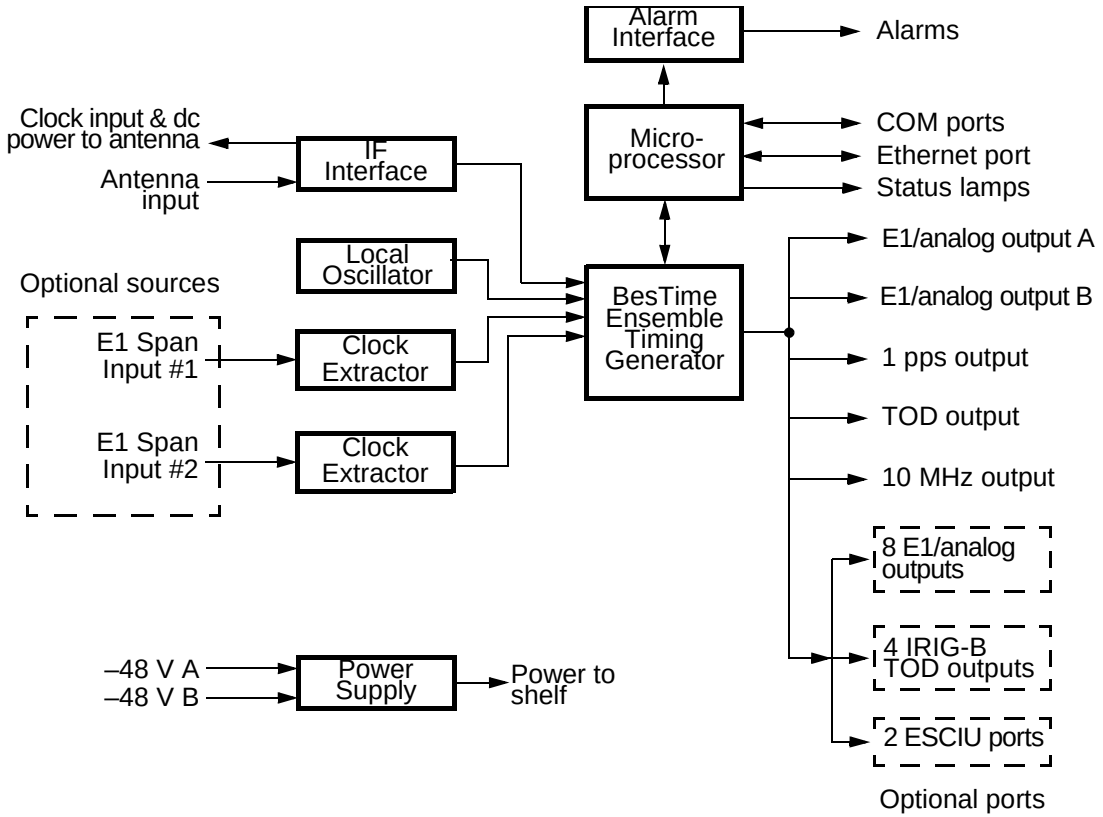


Table A. Timing Source Characteristics

Source	Characteristic
Local Oscillator	Short term stability
E1 Line	Intermediate term stability
GPS Signal	Long term stability

Antenna

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

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

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

IF Interface

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

GPS Receiver

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

Local Oscillator

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

Clock Extractors

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

Power Supply

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

BesTime Ensemble Timing Generator

Clock signals from the GPS antenna (via the IF interface), local oscillator, and two optional E1 span lines are used as sources by the BesTime algorithms in the BesTime Ensemble Timing Generator. The signals are analyzed for MDEV, TDEV, and other phase and frequency characteristics.

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

E1 or Analog Outputs

The BesTime Ensemble Timing Generator provides the timing for the E1 or analog (2.048 MHz) timing signal available at the E1 OUT A and B connectors. E1 is provided in a framed, all-ones format, which can be set to CAS, CAS4, CCS, or CCS4 framing. 2.048 MHz is provided in accordance with G.703/10.

Eight Additional E1 or Analog Outputs (990-72060-02 Systems Only)

This option provides a module for eight additional E1 or analog (2.048 MHz) outputs. The module mounts in the OPTIONS I/O mountings on the connector panel. These outputs function the same as the standard E1 outputs.

TOD Output

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

IRIG-B TOD Outputs (990-72060-05 Systems Only)

This option provides a module for four additional TOD outputs in IRIG-B format. The module mounts in the OPTIONS I/O mountings on the connector panel.

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

1 PPS Output

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

10 MHz Output

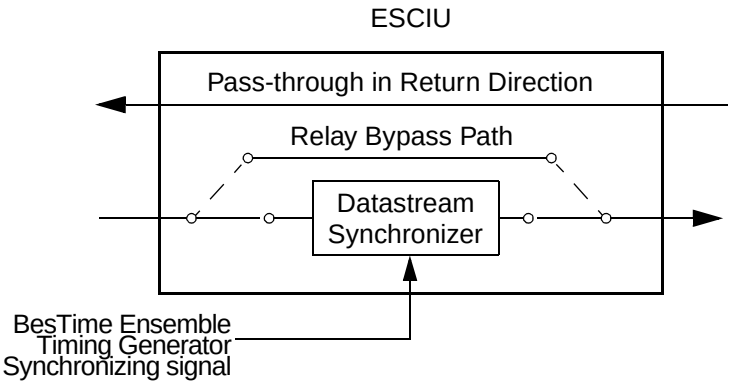
The BesTime Ensemble Timing Generator provides timing for the 10 MHz timing signal available at the 10 MHZ connector, which can be used for local cellular frequency or testing purposes. This signal is not squelched during an alarm.

Two ESCIU Ports (990-72060-04 Systems Only)

This option provides a module for two E1 ports. The module mounts in the OPTIONS I/O mountings on the connector panel. E1 traffic-carrying signals are synchronized using the Bestime ensemble timing generator. Jitter and wander are also removed before sending the E1 signals to network elements.

If an alarm condition or power failure occurs, relays allow the E1 signals to bypass the system. (See Figure 7.)

Figure 7. ESCIU Signals



Alarm Interface

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

Communication Ports

Three serial communication ports carry TL1 commands, responses, and autonomous messages between the TimeSource 3600 and an external terminal.

Ethernet

The TimeSource 3600 has six Ethernet ports to carry TL1 commands, responses, and autonomous messages between the TimeSource 3600 and an external terminal, or an Element Manager, or both. The user can configure the IP address, subnet mask, and gateway address for the Ethernet ports.

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

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

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Chapter 2

Engineering & Ordering

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

Antenna Guidelines

Perform a site survey as described in Procedure A before ordering the system. Use the guidelines and considerations in the Roof Antenna Location and Cabling Guidelines section and the Shelf Considerations section.

Procedure A. Site Survey

Step	Action
1	Determine the shelf location.
2	Determine the best location for mounting the antenna (less than 330 m of cable from the shelf). Use the guidelines and considerations in the Roof Antenna Location and Cabling Guidelines section.
3	If a roof-mounted antenna is installed, determine the location of the grounding point for the lightning suppressor, then determine the location of the lightning suppressor. The cable length between the lightning suppressor and the grounding point must be less than 4.6 m. If the grounding point is inside the building, the cable length between the grounding point and the cable entry must be less than 15 m. Valid lightning suppressor grounding points are: • Valid ring ground system (usually for roof-mounted lightning suppressors) • Structural steel of building (for interior-mounted or exterior-mounted lightning suppressors, attach with a cad weld) • Central Office ground plate (usually for interior-mounted lightning suppressors)
4	If a roof-mounted antenna is installed, two lengths of cable are required. Plan the cable route and measure the length of cable required between the antenna and the lightning suppressor, and between the lightning suppressor and the shelf.
5	If a window or wall-mounted antenna is installed, plan the cable route and measure the length of cable required between the antenna and the shelf.
6	Determine the two separate –48 V power sources for the shelf. If only one –48 V power source is available, it must be cabled to both TimeSource 3600 power inputs.

End of Procedure

Roof Antenna Location and Cabling Guidelines

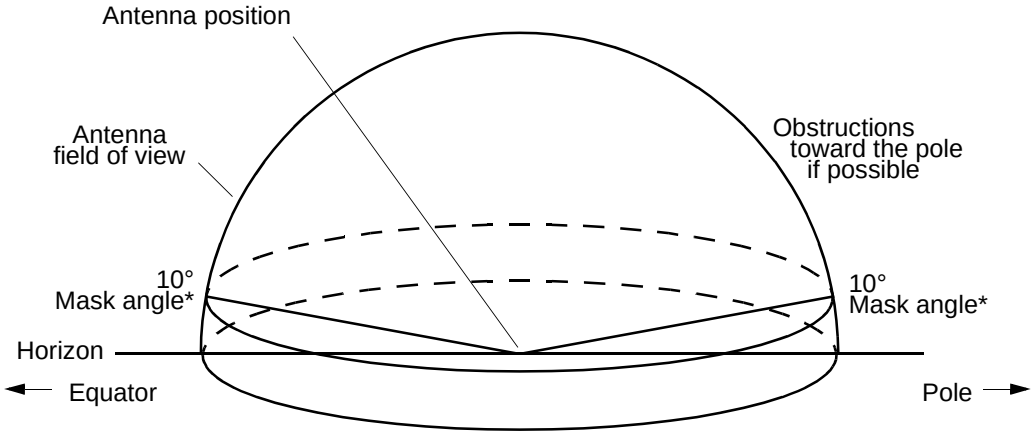
DANGER: ***Do not select an antenna location that could be an electrical or physical hazard to work persons or equipment. Avoid proximity to all high-voltage sources. Mount in an easily maintainable location.***

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

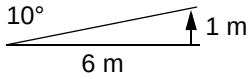
A compromise often must be made between location and satellite field of view. With a smaller the field of view, the TimeSource 3600 can use fewer satellites in the solution for GPS derived time. The TimeSource 3600 will operate with an average of one satellite in view for 40% of the time in a day.

Signals closer to the horizon are often subject to multipath effects, which degrade the timing solution. The TimeSource 3600 can be set to ignore, or mask, all signals from the horizon up to a chosen angle of elevation (mask angle). (See Figure 8.)

Figure 8. Antenna Field of View



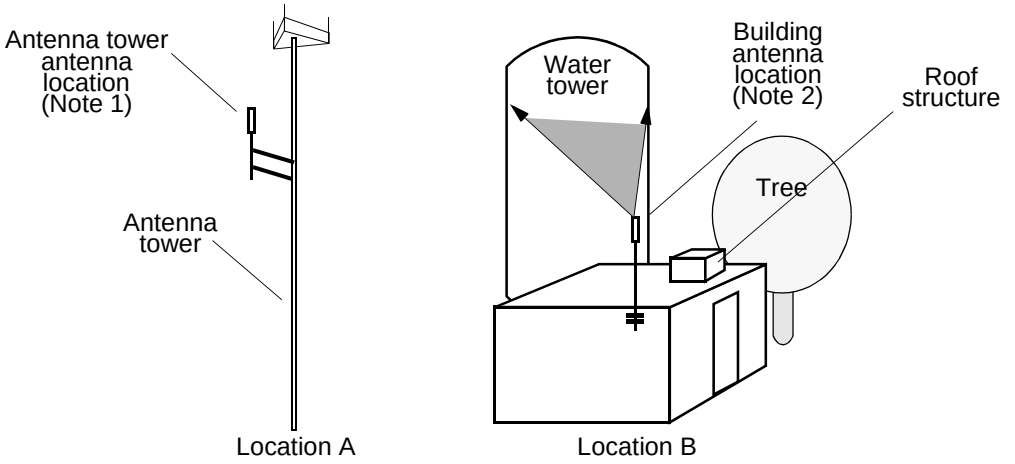
* An angle of 10° masks objects up to about 1 m above the horizon at 6 m from the antenna (illustration at right.)



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

The total of obstructions above the mask angle should not obscure more than 25 percent of the total field of view (90 degrees of azimuth) (Figure 9).

Figure 9. Antenna Location Examples



Notes:

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

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

The most important obstructions are within 400 meters of the antenna. Obstructions may include, but are not limited to, towers, buildings, other construction, trees, and high-voltage power lines.

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

The minimum horizontal distance from other receiving antennas is 1 meter.

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

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

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

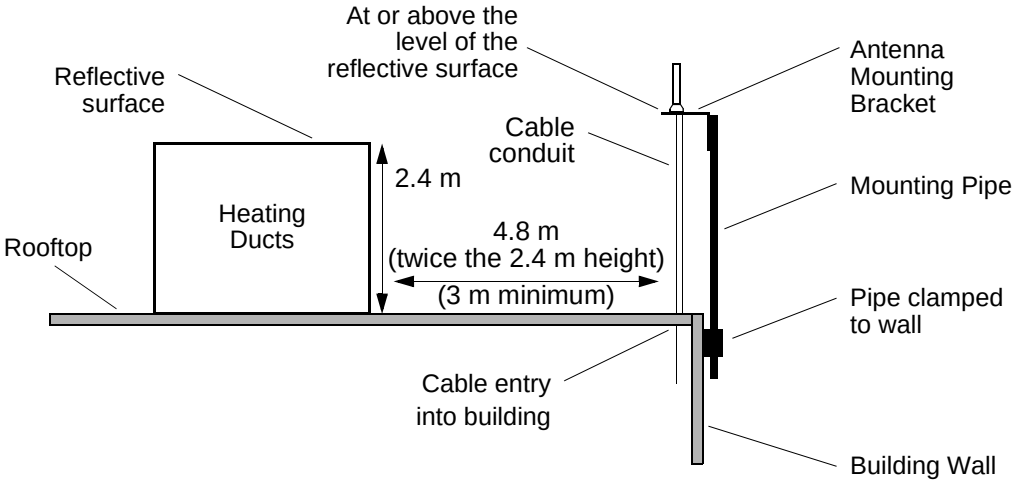
Note: Keep all impedances as low as possible. All cables should be routed in accordance with local company practices.

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

- Route cables as straight as possible (bends in the cable increase impedance at lightning frequencies), in accordance with local company practices.
- Any opening where conduit enters the building must be waterproofed per local company practices.
- Treat all exposed connections with an electrically conductive anti-corrosion compound (Kopr-Shield or equivalent).

Warning: ***Avoid small-radius turns and unnecessary turns.***

Figure 10. Sample Rooftop Antenna Mount



Note: This is an example only. Not all parts are available from Symmetricom.

Roof Antenna Earth Ground Location Guidelines

The roof ring ground system, a Central Office grounding plate, and building structural steel are examples of valid earth ground points. If the mounting plate cannot be bolted to a valid earth ground, or if the mounting plate is to be installed in a nonmetallic junction box, bolt the mounting plate to a point within 4.6 meters of the valid earth ground.

Roof Antenna Cable Choices

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

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

- 3 m cable (060-72010-01)
- 6 m cable (060-72010-02)
- 15 m cable (060-72010-05)
- 30 m cable (060-72010-10)
- 61 m cable (060-72010-20)
- 91 m cable (060-72010-30)
- 152 m cable (060-72010-50)
- 182 m cable (060-72010-60)
- 243 m cable (060-72010-80)
- 305 m cable (060-72010-99)

Two cables are required: one to connect the antenna to the lightning suppressor, and another to connect the lightning suppressor to the TimeSource 3600 Shelf.

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

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

- TNC connector kit (093-72010-98) includes:
  - TNC connectors for RG-59/U cables (8)
  - Rubber boots (8)
  - TNC adapter connectors (2)
- TNC crimp tool (154-00023-01)

Window and Wall Antenna Location Guidelines

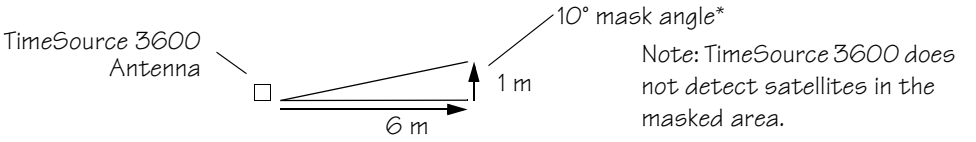
When selecting a window or wall in which to install the antenna, select the window or wall which has the maximum unobstructed view of the sky. Do not select a window or wall which has the view of the sky obstructed by trees, buildings, or towers. The smaller the field of view, the fewer the number of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

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

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

Note: A band of the sky from the horizon up to a point where a view of the sky begins is called a mask angle. The mask angle typically should not exceed 10 degrees (if the mask angle is set too high, too little of the sky is available to the receiver). Determine the mask angle for the selected antenna location (Figure 11) and make a note of it. The mask angle, in degrees, will be entered during the initial setup.

Figure 11. Antenna Mask Angle



*An angle of 10° masks objects up to about 1 m above the horizon at 6 m from the antenna.

Window and Wall Antenna Cable Choices

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

A separate cable is required to connect the IF converter to the TimeSource 3600 shelf. Two types of plenum-rated cable are available.

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

- 3 m cable (060-72010-01)
- 6 m cable (060-72010-02)
- 15 m cable (060-72010-05)
- 30 m cable (060-72010-10)
- 61 m cable (060-72010-20)
- 91 m cable (060-72010-30)
- 152 m cable (060-72010-50)
- 182 m cable (060-72010-60)
- 243 m cable (060-72010-80)
- 305 m cable (060-72010-99)

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

- 15 m (060-72050-05)
- 30 m (060-72050-10)
- 61 m (060-72050-20)
- 152 m cable (060-72010-50)

IRIG-B TOD (990-72060-05 System Only)

If using the IRIG-B TOD outputs (990-72060-05 TimeSource 3600 System), right-angle BNC connectors are provided to prevent small radius turns in the IRIG-B TOD cables. The right-angle BNC connectors may be attached to the IRIG-B BNC adapter (also provided) BNC connectors, to direct the cables from the shelf as desired.

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

RJ-422–to–RS-232 TOD Converter

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

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

Install the converter anywhere (for example, on unused space on a rack) within 305 cable meters of the TimeSource 3600 shelf, and within 15 cable meters of the device receiving the time code.

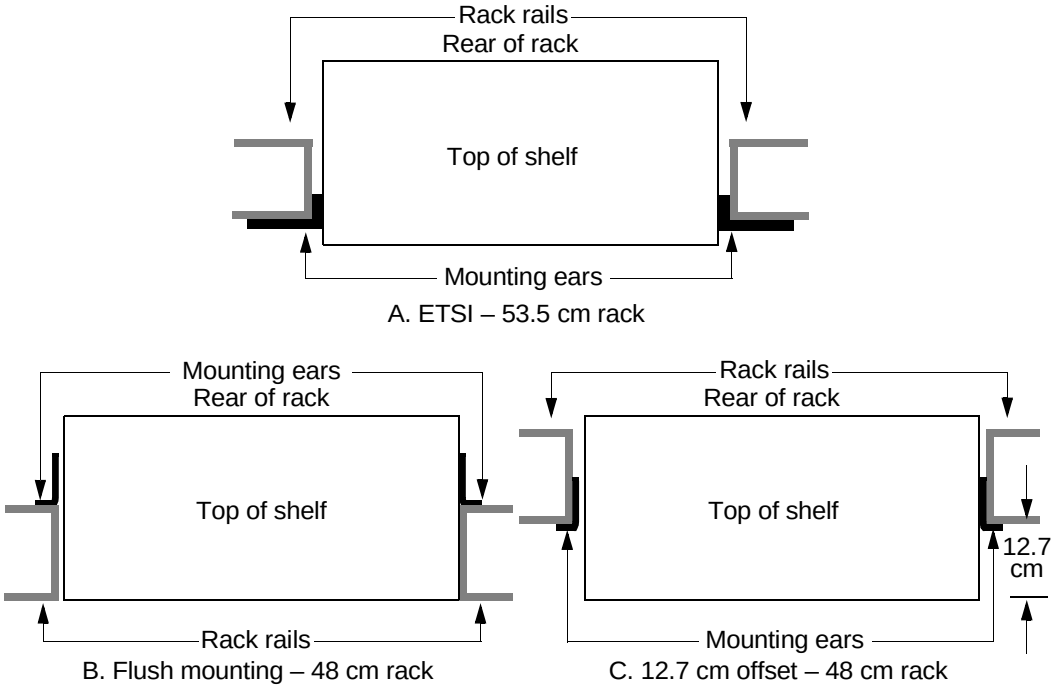
The user must supply two cables. One cable is a Category 5 four-pair RS-422 cable, 305 meter maximum, with RJ-45 connectors on each end. Route this cable between the TimeSource 3600 Shelf and the converter.

The other cable is an RS-232 data communications cable, 15 meters maximum, with a 25-pin male D-type connector and another connector determined by the device receiving the time code. Route this cable between the converter and the device receiving the time code.

Shelf Considerations

The TimeSource 3600 Shelf can be mounted in an ETSI 53.5 cm rack or a 48 cm rack. The shelf is shipped with supplied mounting ears positioned for flush mounting on an ETSI 53.5 cm rack. Attach the mounting ears, as shown in Figure 12, for flush mounting or 12.7 cm offset mounting. Attach the long side of the mounting ear to the shelf for an ETSI 53.5 cm rack, and attach the short side of a mounting ear to the shelf for a 48 cm rack. Mount the shelf in the rack according to standard company practices.

Figure 12. Rack Mounting Options



Systems

The TimeSource 3600 Systems available are listed below. The antenna must be ordered separately.

Standard System (Two E1 Outputs)

This system (990-72060-01) includes:

- TimeSource 3100 Shelf (090-72000-11)
- TimeSource 3600 card (090-72060-01)
- Hardware kit (093-72060-87)
- System software compact disc (CD) (992-72060-xx) Version 1.04.02 or higher
- TimeScan Craft software compact disc (CD) (992-46750-xx) Version 7.0.1 or higher
- TimeScan Craft connection key (020-46700-001)

With Eight Additional E1 or 2.048 MHz Outputs

This system (990-72060-02) includes:

- TimeSource 3100 Shelf (090-72000-11)
- TimeSource 3600 card with additional E1 or 2.048 MHz outputs (090-72060-02)
- Hardware kit (093-72060-87)
- System software compact disc (CD) (992-72060-xx) Version 1.04.02 or higher
- TimeScan Craft software compact disc (CD) (992-46750-xx) Version 7.0.1 or higher
- TimeScan Craft connection key (020-46700-001)

With Two E1 Synchronization Insertion (ESCIU) Ports

This system (990-72060-04) includes:

- TimeSource 3100 Shelf (090-72000-11)
- TimeSource 3600 card with ESCIU ports (090-72060-04)
- Hardware kit (093-72060-87)
- System software compact disc (CD) (992-72060-xx) Version 1.04.02 or higher
- TimeScan Craft software compact disc (CD) (992-46750-xx) Version 7.0.1 or higher
- TimeScan Craft connection key (020-46700-001)

With Four IRIG-B TOD Outputs

This system (990-72060-05) includes:

- TimeSource 3100 Shelf (090-72000-11)
- TimeSource 3600 card with IRIG-B TOD outputs (090-72060-05)
- Hardware kit (093-72060-87)
- System software compact disc (CD) (992-72060-xx) Version 1.04.02 or higher
- TimeScan Craft software compact disc (CD) (992-46750-xx) Version 7.0.1 or higher
- TimeScan Craft connection key (020-46700-001)

Antennas

The antennas available are listed below. A TimeSource 3600 System must be ordered separately.

Roof Antenna

This antenna kit (990-72050-96) includes:

- IF antenna assembly (090-72010-97)
- Rooftop antenna installation kit (093-72050-96) includes:
  - Antenna cable bracket kit (093-00001-01)
  - Mounting bracket for surge suppressor (070-00300-02)
  - Surge suppressor (143-00018-01)
  - Miscellaneous installation parts

Mechanical Window Antenna

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

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

Self-Adhesive Window Antenna

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

- Antenna (090-72010-87)
- IF converter (090-72050-97)
- Self-adhesive window antenna installation kit (093-72050-98) includes:
  - RG316 cable, 3 m (060-00062-01)
  - Cable tie mounts (128-00302-02) and cable ties (128-00500-05)

Wall Antenna

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

- IF converter (090-72050-97)
- Wall antenna kit (093-72050-99) includes:
  - Antenna, with 5.8 m of cable and SMA connector attached (112-00013-01)
  - Antenna mounting bracket (070-00413-01)
  - Cable tie mounts (128-00302-02) and cable ties (128-00500-05)

User-Supplied Tools and Materials

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

For Roof Antenna Installation

- 2.5 cm diameter galvanized metal pipe, used as a mast to mount the antenna. Mast should be long enough to position the antenna above any metal object on the roof
- Screws to attach the lightning suppressor mounting plate
- Plumb line or bubble level
- Nonmetallic junction box for lightning suppressor (optional if lightning suppressor mounted indoors)
- 2.5 cm diameter PVC pipe as conduit for outdoor cables
- PVC fittings appropriate to the installation and cable route
- Appropriate tools and materials for cutting, shaping, and connecting PVC pipe
- 4.115 mm (6 AWG) ground wire
- Spade lugs for 4.115 mm (6 AWG) ground wire
- Crimp tool for 4.115 mm (6 AWG) spade lugs
- Hardware to attach the ground wire to a valid earth ground
- Fire-stopping material to seal conduit hole in roof or wall
- Electrically conductive antioxidant compound (Kopr-Shield or equivalent) to coat exposed connections to prevent oxidation
- Tool to cut cable, if installation requires custom lengths of cable

For Mechanical Window Antenna Installation

- Drill with bit of appropriate size and type to make pilot holes for the mounting screws
- 2 screws of appropriate size and type to attach the foot of the mechanical chassis to a window sill or wall near a window.
- Screwdriver
- Cable ties or other method of securing cable
- GPS handheld receiver, personal computer with GPS location software, or other method of determining latitude, longitude, and altitude

For Self-Adhesive Window Antenna Installation

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

For Wall Antenna Installation

- Ladder, or safe method of reaching the antenna location on the exterior wall
- Drill with bits of appropriate size and type to make pilot holes for the antenna mounting bracket screws, and to make a hole through the wall for the antenna cable

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

For Shelf Installation

- A Phillips-head screwdriver for installing the TimeSource 3600 Shelf in a rack
- Four screws to mount the shelf in a rack

Outputs, Power, and Miscellaneous

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

Installation

Chapter 3

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

Unpacking

Use the procedures in the order they appear in this chapter to install the TimeSource 3600. 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

Roof Antenna

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

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

To install the antenna, refer to Figure 13 and perform Procedure B. Ensure all user-supplied materials are available.

Warning: **Ensure that the lightning suppressor is placed away from electrical devices or cabling that may induce arcing.**

Notes:

1. Recommended grounding points:

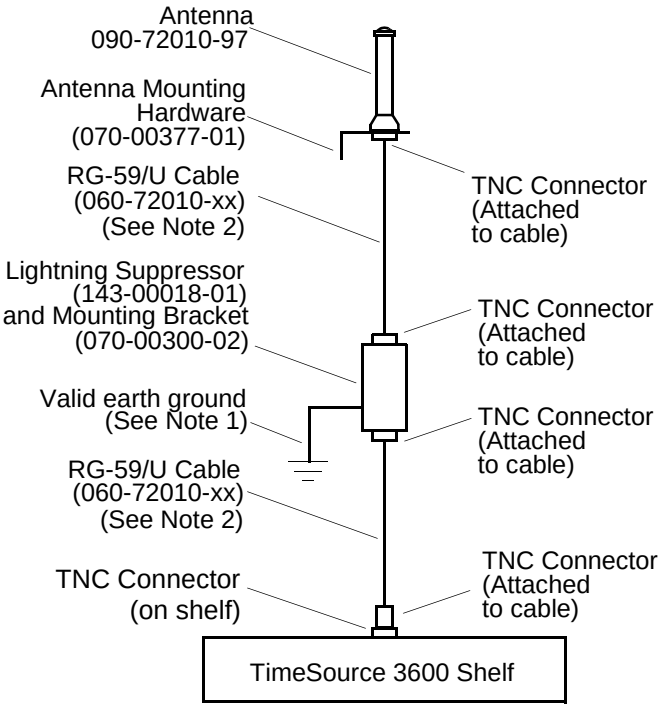
   a. Valid roof ring ground system.

   b. Cad weld to building structural steel.

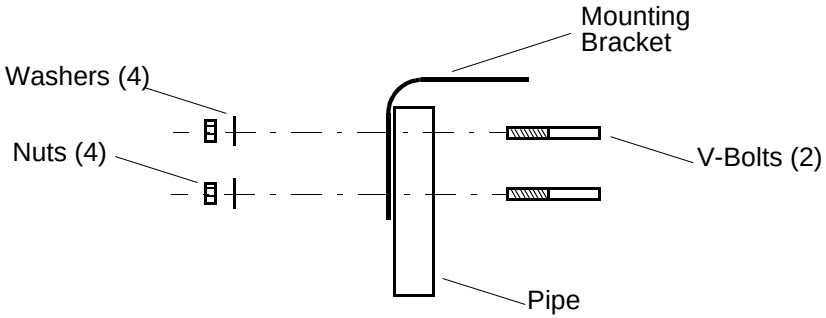
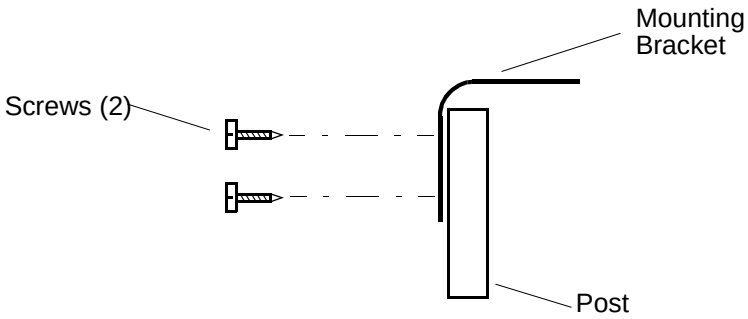
   c. Central office ground plate within 15 m of antenna cable entrance into building.

2. Order two cables or a single cable run can be made from the antenna to the TimeSource Shelf. The cable can then be cut at the lightning suppressor location, and TNC connectors attached to the cut ends of the cable. The “xx” in the part number indicates the cable length.

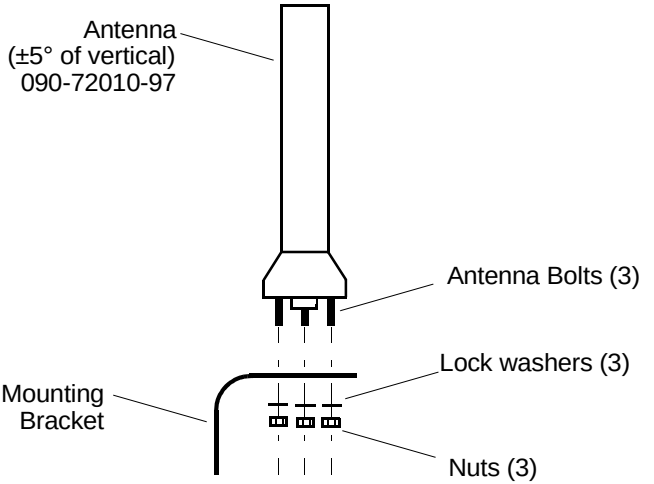
Figure 13. Roof Antenna-to-Shelf Cabling



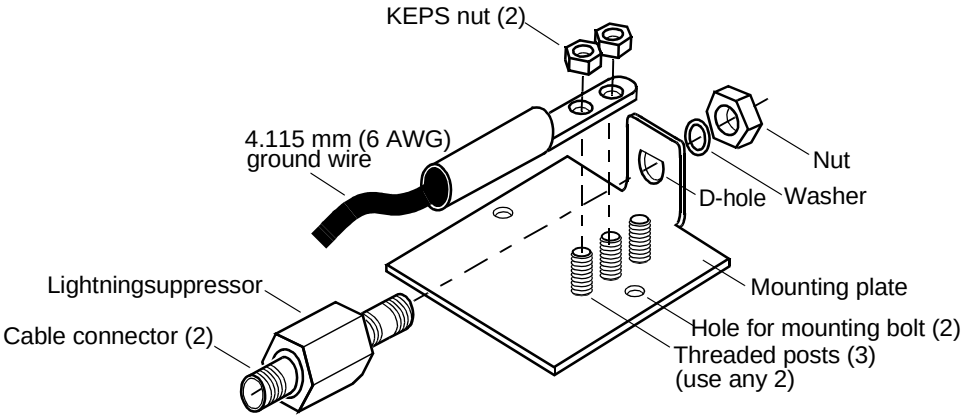
Procedure B. Roof Antenna Mounting and Cable Connection

Step	Procedure
1	Attach the antenna mounting bracket to a pipe (2.5 cm diameter) or a wood post. • If mounting the bracket to a pipe, slide the two V-bolts over the pipe, and through the mounting bracket slots; then place the provided four washers and four nuts over the V-bolts, against the mounting bracket. Leave the V-bolts loose enough to allow for final adjustments.  • If mounting the bracket to a wood post, use the provided two self-tapping screws in two diagonally positioned mounting bracket slots, and attach to the post. 

Procedure B. Roof Antenna Mounting and Cable Connection (cont'd)

Step	Procedure
2	Slide the antenna bolts through the holes in the mounting bracket, then attach the antenna to the bracket, using the provided three nuts and three lockwashers. 
3	Using a plumb line or bubble level, ensure the antenna is within 5° of vertical (perpendicular to the horizon), and tighten the mounting bracket bolts.
4	Bolt the lightning suppressor mounting plate to a flange that is attached to a valid earth ground. The roof ring ground system, a Central Office grounding plate, and building structural steel are examples of valid earth ground points. If the mounting plate cannot be bolted to a valid earth ground, bolt the mounting plate to a point within 4.6 m of the chosen valid earth ground. If the mounting plate is to be installed in a nonmetallic junction box, perform the installation, and bolt the assembly near the chosen valid earth ground.

Procedure B. Roof Antenna Mounting and Cable Connection (cont'd)

Step	Procedure
5	Slide the longer bolt of the lightning suppressor through the D-hole, and attach with a nut and a washer (provided). 
6	Install 2.5 cm nonmetallic conduit from the antenna to the lightning suppressor, and from the lightning suppressor to the cable entrance into the building.
7	Install a user-supplied bracket, preferably non-metallic, to support the vertical section of conduit to the antenna.
8	Connect a cable to the antenna, route the cable through the conduit, and connect the cable to the lightning suppressor.
9	Connect a cable to the lightning suppressor, route the cable through the conduit into the building, and route the cable through the building to the TimeSource 3600 Shelf location.
10	If the lightning suppressor was not mounted directly to a valid earth ground, crimp a length of 4.115 mm (6 AWG) ground cable to the two-hole terminal, slide the terminal over two of the three threaded posts on the lightning suppressor mounting plate, and attach the terminal to the mounting plate with two KEPS nuts. Use the two posts that allow the least bending of the 4.115 mm (6 AWG) ground cable.

Procedure B. Roof Antenna Mounting and Cable Connection (cont'd)

Step	Procedure
11	Attach the other end of the cable to a valid earth ground.
12	Install fire-stopping material in all holes opened in the roof and/or walls during this procedure.
13	Check all connections for tightness to prevent arcing and intermittent operation.
14	Coat all exposed connectors with an electrically conductive antioxidant compound (e.g., Kopr-Shield spray).

End of Procedure

Mechanical Window Antenna

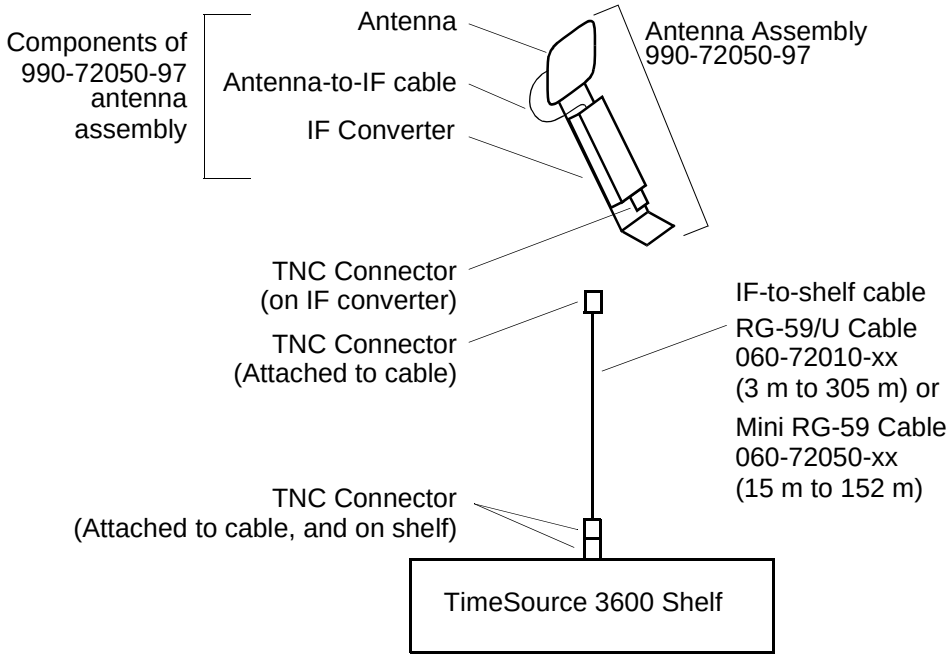
Installation procedures are to follow local company procedures and the Installation Job Specification.

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

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

To install the antenna, refer to Figure 14 and perform Procedure C.

Figure 14. Mechanical Window Antenna-to-Shelf Cabling



Procedure C. Mechanical Window Antenna Mounting and Cable Connection

Step	Procedure
	Prerequisite: Observe all guidelines, considerations, Dangers, Warnings, Cautions, and Notes in the Engineering and Ordering chapter. Symmetricom Parts • Mechanical Window Antenna (990-72050-97) • A length of RG-59/U plenum-rated coaxial cable (060-72010-xx), or • A length of Mini RG-59/U plenum-rated coaxial cable (060-72050-xx) User-Supplied Materials: For Mechanical Window Antenna Installation • Drill with bit of appropriate size and type to make pilot holes for the mounting screws • 2 screws of appropriate size and type to attach the foot of the mechanical chassis to a window sill or wall near a window. • Screwdriver • Cable ties or other method of securing cable • GPS handheld receiver, personal computer with GPS location software, or other method of determining latitude, longitude, and altitude
1	At the window chosen in Chapter 2, Engineering and Ordering, attach the base of the mechanical window antenna to the chosen location (sill, wall, etc.) using user-supplied screws (Figure 15).
2	Use the pivots on the mechanical window antenna to place the antenna section flat against the window.
3	Tighten the pivot screws to secure the antenna (Figure 16).
4	Connect the antenna cable to the IF downconverter on the mechanical window antenna assembly and route the cable to the TimeSource 3600 Shelf location.
5	Secure the cable using local company procedures.
6	Check all connections for tightness to prevent intermittent operation.

End of Procedure

Figure 15. Attaching the Mechanical Window Antenna

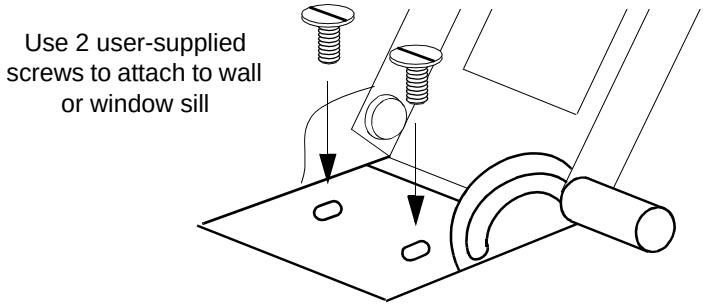
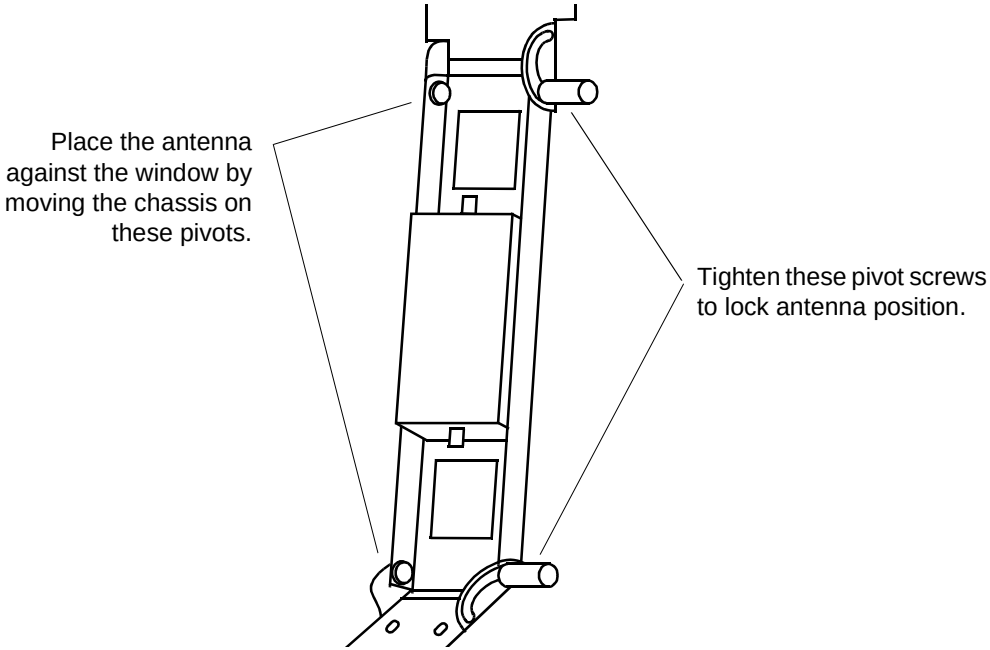


Figure 16. Mechanical Window Antenna Pivot Screws



Self-Adhesive Window Antenna

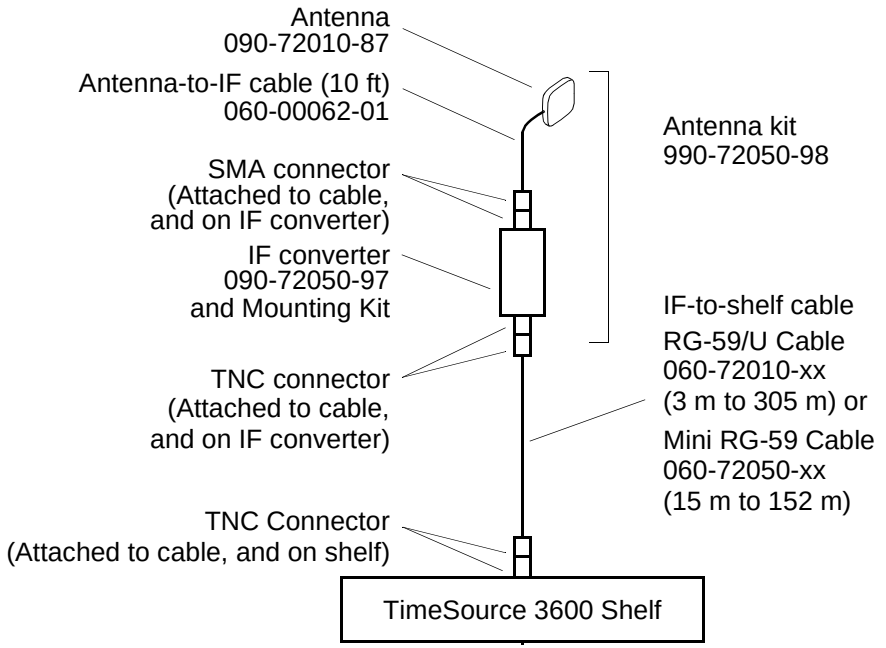
Prior to installing the antenna, the site, antenna location, cable route, and all other details should have been planned.

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

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

To install the antenna, refer to Figure 17 and perform Procedure D.

Figure 17. Self-Adhesive Window Antenna-to-Shelf Cabling



Procedure D. Self-Adhesive Window Antenna Mounting and Cable Connection

Step	Procedure
	Prerequisite: Observe all guidelines, considerations, Dangers, Warnings, Cautions, and Notes in the Engineering and Ordering chapter. Symmetricom Parts: • Self-Adhesive Window Antenna Kit (990-72050-98) • A length of RG-59/U plenum-rated coaxial cable (060-72010-xx), or • A length of Mini RG-59/U plenum-rated coaxial cable (060-72050-xx) For Self-Adhesive Window Antenna Installation • Drill with bit of appropriate size and type to make pilot holes for the mounting screws • 4 screws of appropriate size and type to attach the IF converter to a wall or other mounting surface. • Screwdriver • GPS handheld receiver, personal computer with GPS location software, or other method of determining latitude, longitude, and altitude
1	Peel off the backing of one of the self-adhesive hook-and-loop strips and stick the strip to the antenna.
2	Attach the hook-and-loop side of the other strip to the hook-and-loop side of the strip on the antenna.
3	Peel off the backing and stick the antenna to the position on the window selected in Chapter 2, Engineering & Ordering.
4	Use user-supplied screws to mount the IF downconverter to a suitable wall or other structure (Figure 18). Be sure the distance along the cable route between the IF downconverter and the antenna is no more than 3 m.
5	Route and connect the antenna cable to the antenna side of the IF downconverter.
6	Connect a cable to the TimeSource 3600 shelf side of the IF downconverter and route the cable to the shelf location.
7	Secure the cable using local company procedures.

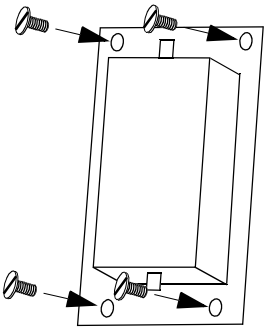
Procedure D. Self-Adhesive Window Antenna Mounting and Cable Connection (cont'd)

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

End of Procedure

Figure 18. Attaching the IF Converter

Use 4 user-supplied screws to attach to a wall or other structure.



Wall Antenna

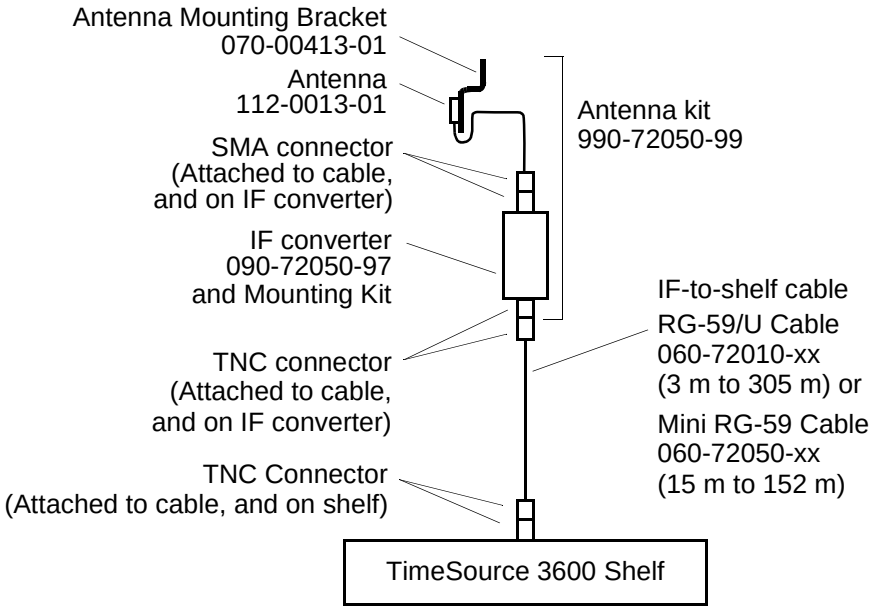
Prior to installing the antenna, the site, antenna location, cable route, and all other details should have been planned.

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

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

To mount the antenna through the wall, refer to Figure 19 and follow Procedure E.

Figure 19. Wall Antenna-to-Shelf Cabling



Procedure E. Wall Antenna Installation

Step	Action
	Prerequisite: Observe all guidelines, considerations, Dangers, Warnings, Cautions, and Notes in the Engineering and Ordering chapter. Symmetricom Parts: • Wall Antenna Kit (990-72050-99) • A length of RG-59/U plenum-rated coaxial cable (060-72010-xx), or • A length of Mini RG-59/U plenum-rated coaxial cable (060-72050-xx) User-Supplied Materials: • Ladder, or safe method of reaching the antenna location on the exterior wall • Drill with bits of appropriate size and type to make pilot holes for the antenna mounting bracket screws, and to make a hole through the wall for the antenna cable • Two screws of appropriate size and type to attach the antenna mounting bracket to an exterior wall • Screwdriver • Electrically conductive antioxidant compound (Kopr-Shield or equivalent) to coat exposed connections to prevent oxidation • Fire stopping material to seal the hole in the wall • GPS handheld receiver, personal computer with GPS location software, or other method of determining latitude, longitude, and altitude
1	Attach the IF downconverter (Figure 18) inside the building to a suitable wall or other structure. Be sure the distance along the cable route between the IF converter and the antenna is no more than 5.8 m. Include allowances for the drip loop and local company procedures for cable routing.
2	Use Figure 20 to determine the spacing of the 2 holes for mounting the bracket, and the distance to the hole for passing the cable into the building.
3	Drill a 10-mm diameter hole through the wall for the antenna cable. The diameter of the hole should be larger than the outer diameter of the SMA connector on the antenna cable, which will pass through the hole from the antenna to the inside of the building.
4	Drill two pilot holes for the user-supplied screws or bolts that attach the mounting bracket to the outside wall.
5	Using two screws or bolts, mount the antenna bracket assembly to the outside wall.

Procedure E. Wall Antenna Installation (cont'd)

Step	Action
6	Place the magnetic side of the antenna on the outside of the mounting bracket.
7	Push the SMA connector of the antenna cable through the hole drilled in the wall in Step 3. Be sure the antenna cable forms a drip loop between the antenna and the cable entry into the building (Figure 21).
8	Route the antenna cable to the antenna side of the IF converter and connect the cable.
9	Connect a cable to the TimeSource 3600 shelf side of the IF downconverter and route the cable to the shelf location.
10	Secure the cable using local company procedures.
11	Install fire-stopping material in all holes opened in the roof and/or walls during this procedure.
12	Check all connections for tightness to prevent intermittent operation.
13	Coat all exposed connectors with an electrically conductive antioxidant compound (e.g., Kopr-Shield spray).

End of Procedure

Figure 20. Hole Spacing

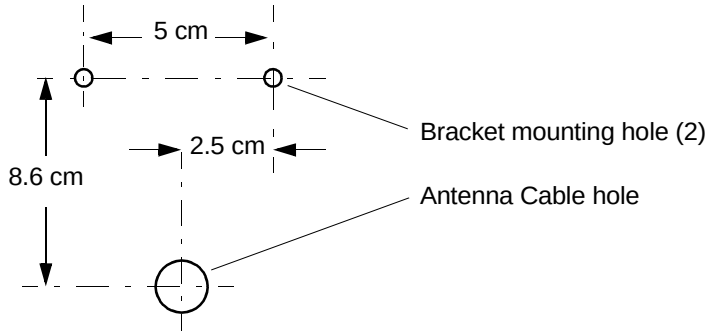
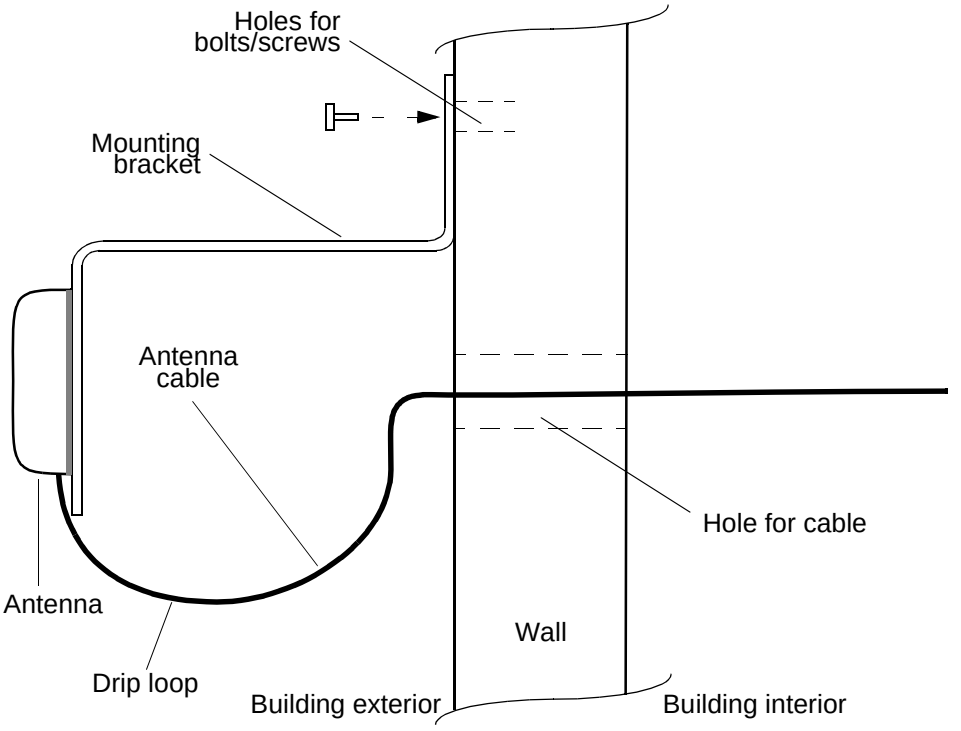


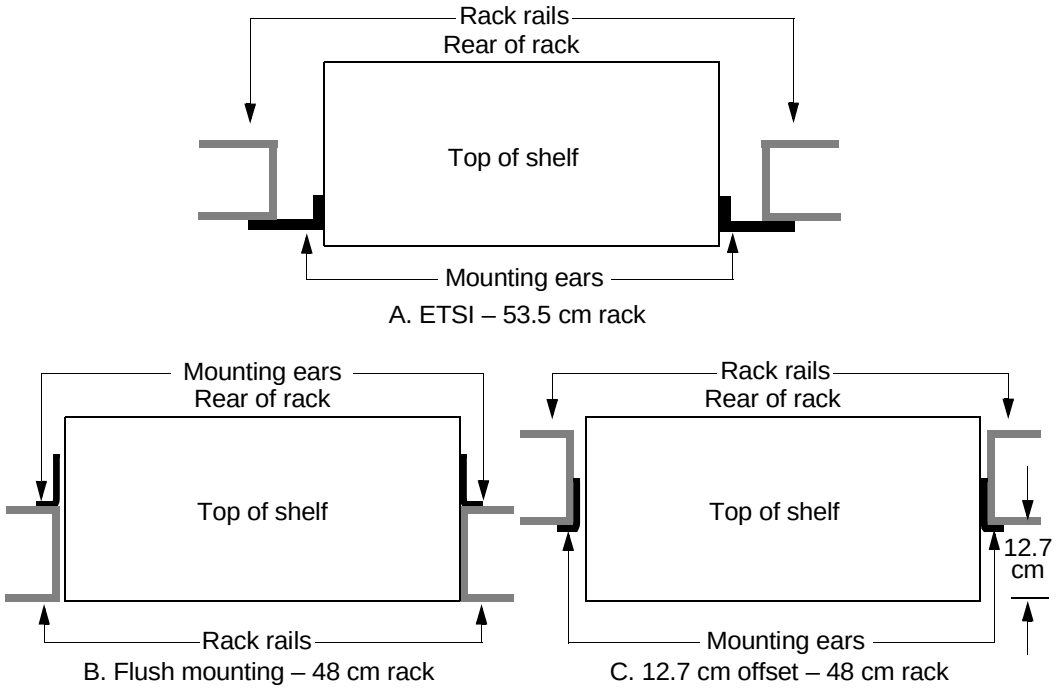
Figure 21. Wall Antenna Mounting



Rack Mounting

The shelf is shipped with the ears positioned for ETSI 53.5 cm mounting (Figure 22A). For 48 cm racks, the shelf can be positioned to the rear of the rack rail for flush mounting (Figure 22B) or to the front of the rack rail for 12.7 cm offset mounting (Figure 22C). Leave 1 RU (4.4 cm) of air space above the TimeSource 3600 Shelf for proper ventilation. Mount the shelf in the rack according to standard company practices.

Figure 22. Rack Mounting Options



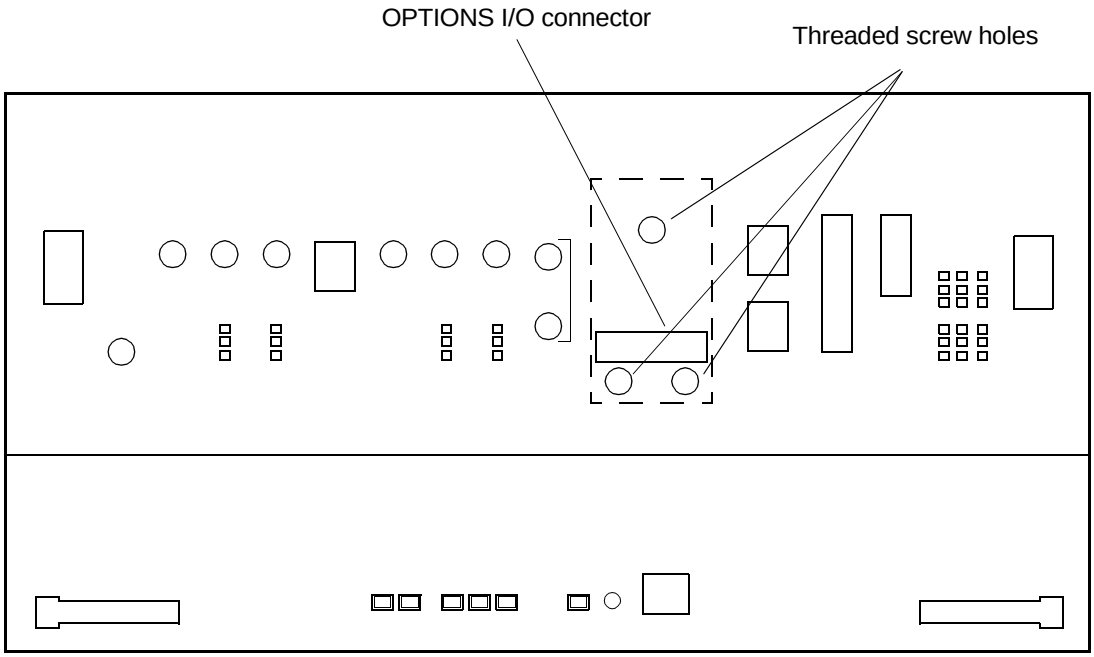
Output Module Installation

Warning: **The circuitry on the plug-in circuit board is subject to electrostatic discharge (ESD) damage. Be sure to wear an ESD wrist strap when making connections to the connector panel. Failure to observe this warning may result in equipment damage.**

If an E1 8-output module, a IRIG-B 4-output module, or a ESCIU 2-port module is supplied with the system, install the module as follows:

1. Remove the shelf cover to access the shelf connector panel.
2. Plug the module into the OPTIONS I/O connector on the connector panel (refer to Figure 23).
3. Align the three spring-loaded screws on the module with the threaded holes on the panel.
4. Use a medium flat-blade screwdriver to lock each screw in place. Torque the screws evenly to prevent skewing the module.

Figure 23. Options I/O Connector



Power and Signal Cabling

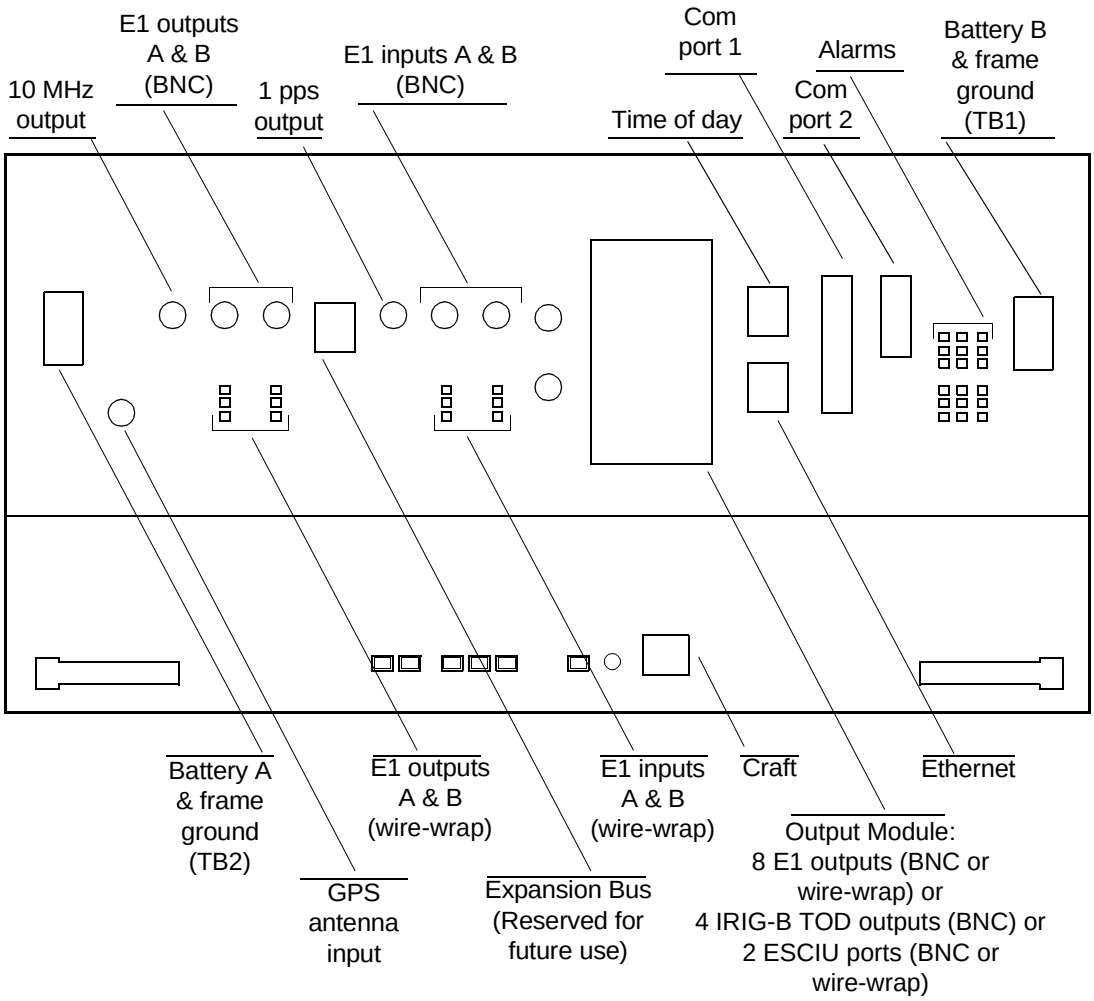
Warning: **The circuitry on the plug-in circuit board is subject to electrostatic discharge (ESD) damage. Be sure to wear an ESD wrist strap when making connections to the connector panel. Failure to observe this warning may result in equipment damage.**

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

The Craft connection is made at the shelf front panel. All other connections are made at the shelf connector panel. To access the shelf connector panel, remove its cover.

Figure 24 shows the connectors on the front panel and connector panel.

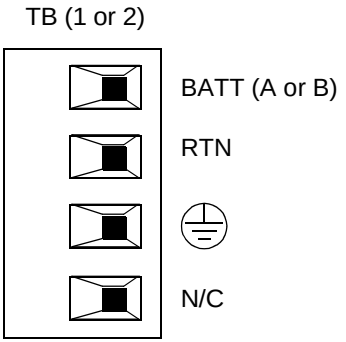
Figure 24. Connector Panel and Front Panel Connectors



Frame Ground

Frame ground connections are made on power terminal blocks TB1 and TB2. Refer to Figure 24 for the location of the terminals on the rear of the shelf, and refer to Figure 25 for the terminal connections.

Figure 25. Connector Panel Terminal Block Connections



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

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

With ground rod:

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

- Crimp an appropriate-size spade lug (user-supplied) to the 1.47 mm (16 AWG) wire, bend the lug around the 4.115 mm (6 AWG) rod, and solder.
- Strip enough insulation from the 1.47 mm (16 AWG) wire to permit three complete turns around the 4.115 mm (6 AWG) rod, and solder.

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

Without ground rod:

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

Crimp the supplied spade lug to the other end of the 1.47 mm (16 AWG) wire, and connect it to the ⏚ terminals on TB1 and TB2 (Figure 25).

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

Power

Warning: **This equipment is intended for installation in a restricted access location. Power source protective fusing must be provided as part of the installation.**

Caution: *Do not apply power to the TimeSource 3600 before instructed in this procedure. Before connecting the power cables to the TimeSource 3600, ensure the fuses are removed from the fuse panel that supplies power to the power cables.*

Note: Input power is reverse polarity protected; there are no user replaceable fuses in the TimeSource 3600.

Power connections are made on power terminal blocks TB1 and TB2. Refer to Figure 24 for the location of the terminals on the rear of the shelf, and refer to Figure 25 for the terminal connections.

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

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

Use two 1.47mm (16 AWG) stranded wires for the power connection, one with red insulation (BATT), and the other with black insulation (RTN). Crimp a supplied spade lug to each wire.

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

Replace the protective covers on the terminal blocks.

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

GPS Antenna

Use the supplied 90 degree adapter to connect the coaxial cable from the lightning suppressor or IF downconverter to the TNC connector labeled GPS ANT. Refer to Figure 24 for the connector location.

10 MHz Output

Connect a user-supplied RG-58 coaxial cable from the connector labeled 10 MHz to the equipment that will use the 10 MHz output signal. See Figure 24 for the connector location.

E1 or Analog Synchronization Outputs

Warning: **Because the E1 output circuits do not provide lightning protection, do not connect the E1 output line directly to a point outside the building. Failure to observe this warning may result in equipment damage.**

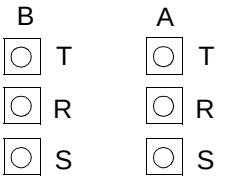
Connect the E1 or analog synchronization outputs at the wire-wrap pins or BNC connectors labeled E1 OUT A and E1 OUT B. If using the wire-wrap pins, connect the tip wire to the pins labeled T, the ring wire to the pins labeled R, and the shield to the pins labeled S. See Figure 24 for the location of the connectors and pins, and Figure 26 for the wire-wrap connections.

Notes:

1. For wire-wrap connections, the shield pin is provided to ground the cable shield at the shelf, if required. Normally, the shield is grounded at the source. Grounding the shield at both ends is not recommended.

2. A BNC connector can be used for one output, and a wire-wrap connector can be used for the other output, but do not use the BNC and wire-wrap connectors of the same output simultaneously. For example, a BNC connector can be used for output A and the wire-wrap pins for output B, but do not use the output A BNC connector with the output A wire-wrap connector.

Figure 26. E1 or Analog Output Wire-Wrap Connections



Expansion Bus

Reserved for future use.

1 PPS Output

Connect a user-supplied RG-58 coaxial cable from the connector labeled TTL PPS to the equipment that will use the 1 pulse-per-second TTL output signal. See Figure 24 for the connector location.

E1 or Analog Reference Inputs

Warning: **Because the E1 input circuits do not provide lightning protection, do not connect the E1 input line directly to a point outside the building. Failure to observe this warning may result in equipment damage.**

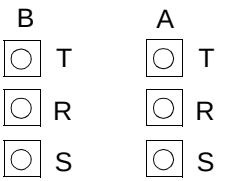
E1 or analog reference sources, traceable to an independent Stratum 1 source, can be connected to further increase holdover stability, or to be monitored by the TimeSource 3600. In either case, connect reference inputs to the wire-wrap pins or BNC connectors labeled SPAN IN A and SPAN IN B. If using the wire-wrap pins, connect the tip wire to the pin labeled T, the ring wire to the pin labeled R, and the shield (if connected at the TimeSource 3600) to the pin labeled S. See Figure 24 for the location of the connectors and pins, and Figure 27 for the wire-wrap connections.

Notes:

1. The shield pin is capacitively coupled to ground. Normally, the shield is grounded at the source. Grounding the shield at both ends is not recommended.

2. A BNC connector can be used for one input, and a wire-wrap connector can be used for the other input, but do not use the BNC and wire-wrap connectors of the same input simultaneously. For example, a BNC connector can be used for input A and the wire-wrap pins for input B, but do not use the input A BNC connector with the input A wire-wrap connector.

Figure 27. E1 or Analog Input Wire-Wrap Connections

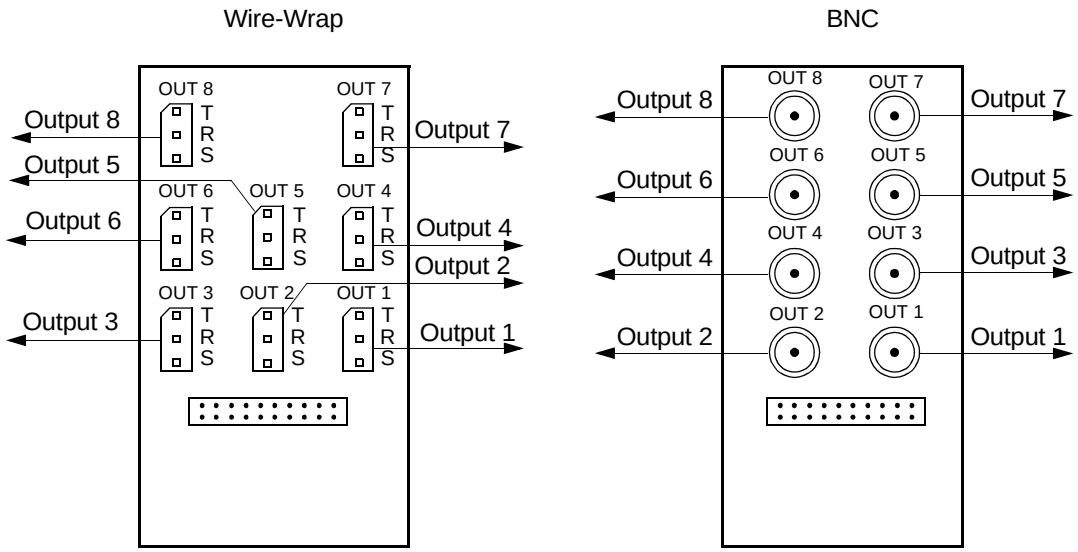


Module for Additional E1 or Analog Outputs (990-72060-02 System Only)

Connect up to eight optional E1 or analog outputs at the wire-wrap or BNC output module. See Figure 24 for the connector location, and Figure 28 for the connections.

Note: The shield pin is capacitively coupled to ground, therefore, the shield must be connected at the source end. The shield may also be connected at the TimeSource 3600 end for additional longitudinal noise protection.

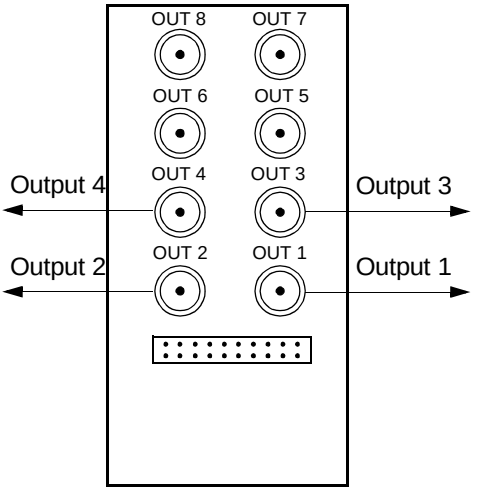
Figure 28. Eight E1 or Analog Outputs Connections



Module for IRIG-B TOD Outputs (990-72060-05 System Only)

Connect up to four optional IRIG-B TOD outputs at the output module. See Figure 24 for the connector location, and Figure 29 for the connections.

Figure 29. IRIG-B TOD Output Connections



Note: Note: Outputs 5, 6, 7 and 8 are not used

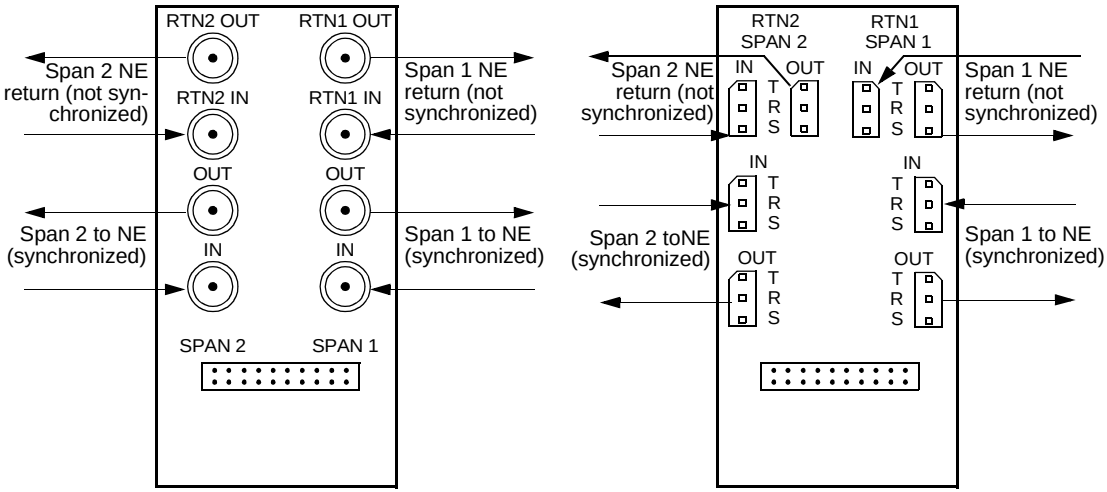
Module for ESCIU Ports (990-72060-04 System Only)

The ESCIU ports (Figure 30) have a different function than the synchronization outputs. A synchronization output provides an all-ones reference clock signals for network elements. An ESCIU port carries live E1 traffic, and synchronizes the live traffic as it passes through. The ESCIU module can synchronize 2 spans in one direction. The return direction passes through as it is.

The ESCIU ports can connect at the digital distribution frame (DDF). The network elements receiving the ESCIU output signal must be able to receive E1 signals that conform to CCITT G.703 paragraph 6 specifications. The network element can be configured to extract its timing from the live E1 traffic signal.

A bypass relay directs E1 traffic around the ESCIU circuitry to maintain span continuity if a TimeSource 3600 fault occurs.

Figure 30. Connector Layout of ESCIU Modules



Cutover Procedures for Out-of-Service Equipment

If DDF access jack sets *are not* cabled to the ESCIU module, the following out-of-service cutover procedure must be used. Consult the local company Installation Job Specifications to ensure that the network element to be retimed is connected to the ESCIU module correctly. Refer to Figure 31 for the following procedure:

1. Remove from service (turn down) the traffic trunks on the E1 system to be cutover to the ESCIU module.

2. Remove the existing cabling in both directions between the transmit (OUT) and receive (IN) terminals of the NEs that will connect to the ESCIU module.

3. In the direction not to be synchronized by the ESCIU module, connect new cables from the ESCIU module RTNx IN connector to the NE transmit (OUT) terminal, and connect from the ESCIU module RTNx OUT connector to the NE receive (IN) terminal.

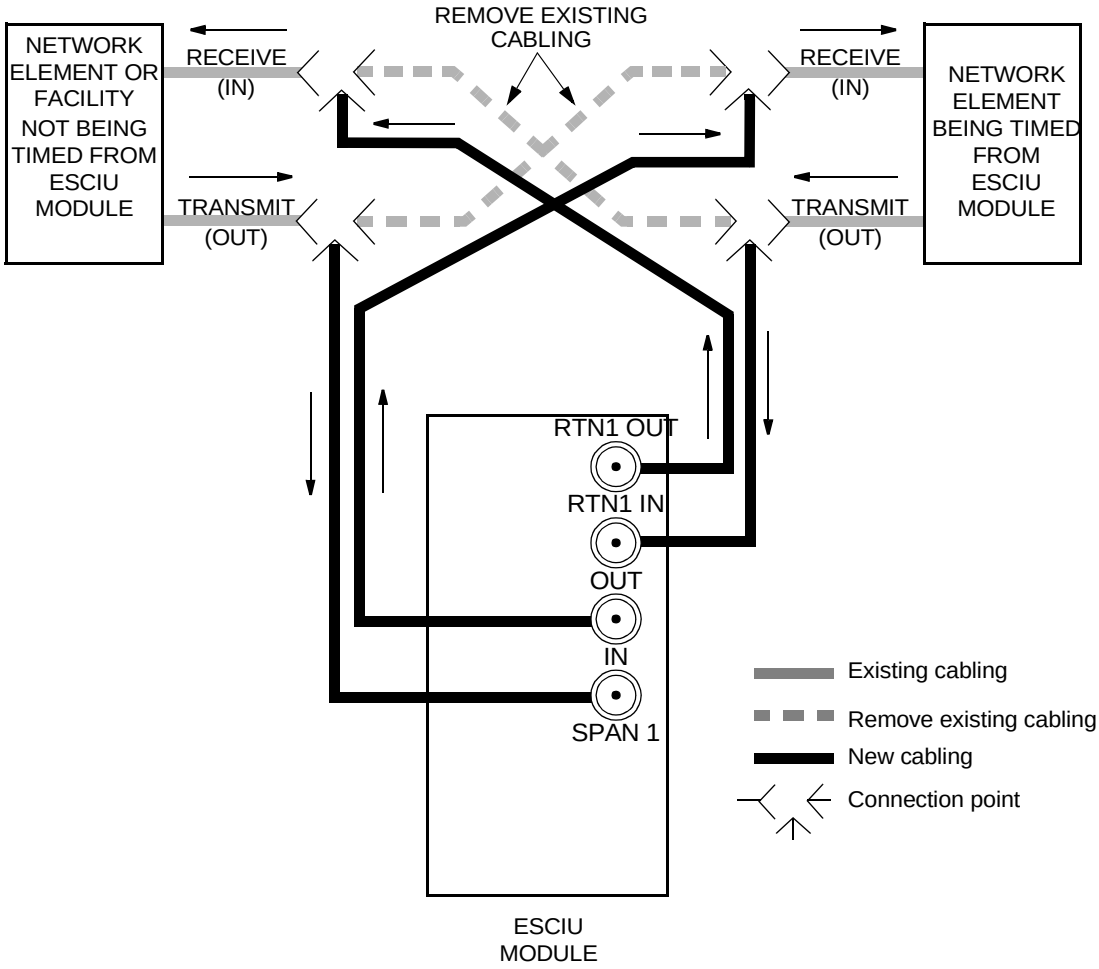
4. In the direction to be synchronized by the ESCIU module, connect new cables from the ESCIU module IN connector to the NE transmit (OUT) terminal, and connect from the ESCIU module OUT connector to the NE receive (IN) terminal.

5. Verify that there are no alarms on the NEs on the E1 system. If there are alarms, recheck the new cabling between the NEs and the ESCIU module.

Note: If the TimeSource 3600 is still in warm-up or searching for GPS satellites, alarms may be present. All synchronization-related alarms should clear while the TimeSource 3600 is in steady-state operation.

6. Restore (turn up) the traffic trunks to service.

Figure 31. ESCIU Cutover without Jacks (Out-of-Service)



Cutover Procedures for In-Service Equipment

If standard digital signal level access jack sets, such as DDF or DSX-1 jacks, were cabled to the ESCIU module, the following in-service cutover procedure must be used. Consult the local company Installation Job Specifications to ensure that the network element to be retimed from the ESCIU module is connected to the ESCIU module A OUT terminals. Refer to Figure 32 for the following procedure:

1. Patch a bridging repeater from the MON jack of one NE to the IN jack of the other NE in both directions of transmission on the E1 system to be cutover. Place a 75 Ω termination plug in the OUT jack in each direction.

2. Remove the cross-connect wiring from the OUT and IN jacks (off-normal side of jacks) in both directions of transmission.

3. In the direction not to be synchronized by the ESCIU module, connect new cables from the ESCIU module RTNx IN connector to the NE transmit (OUT) terminal, and connect from the ESCIU module RTNx OUT connector to the NE receive (IN) terminal.

4. In the direction to be synchronized by the ESCIU module, connect new cables from the ESCIU module IN connector to the NE transmit (OUT) terminal, and connect from the ESCIU module OUT connector to the NE receive (IN) terminal.

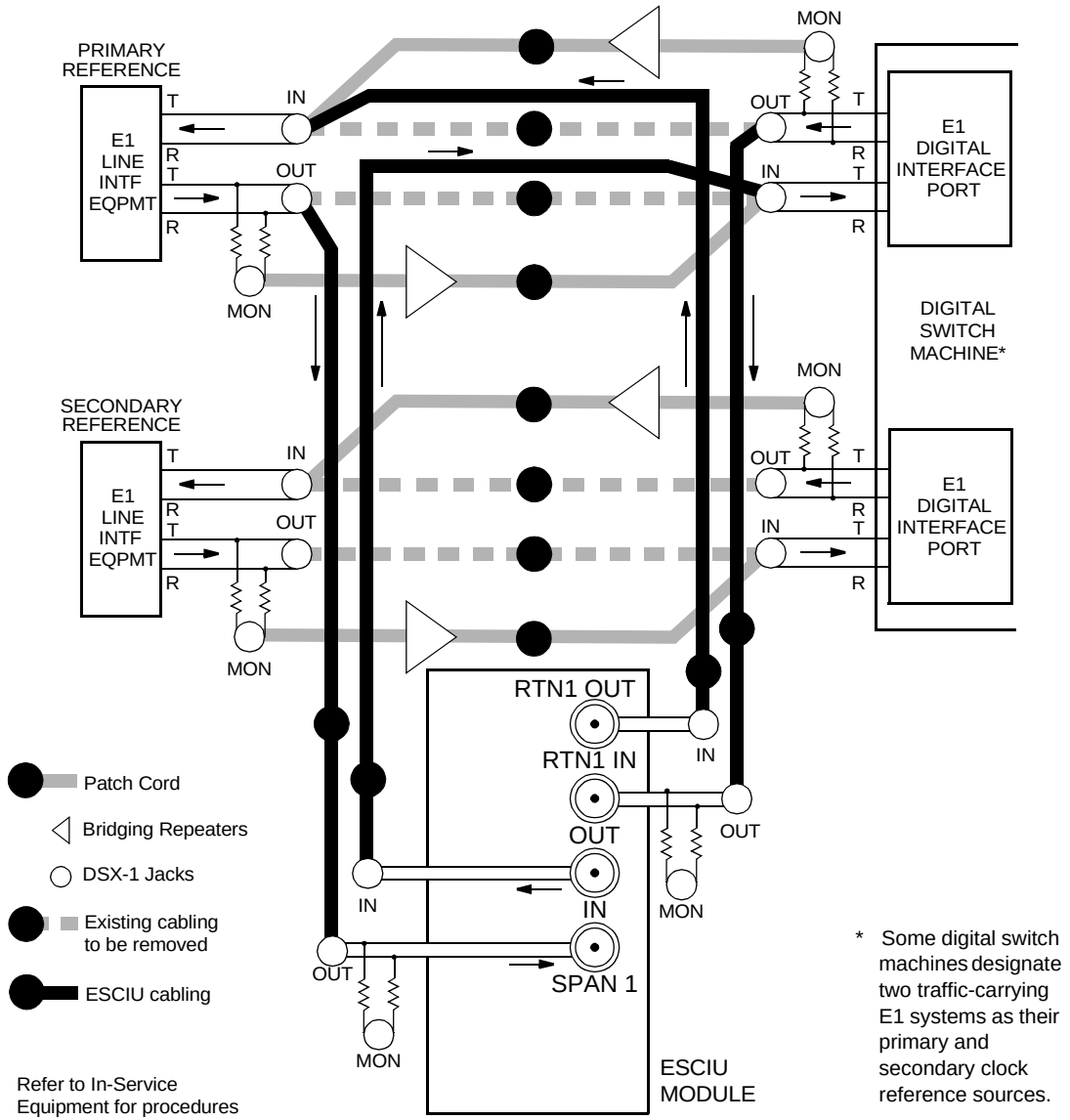
5. Remove the 75 Ω (E1) termination plug from the OUT jack and patch cords from the NE IN jack. The E1 system bitstream is now going through the ESCIU module.

6. Verify that there are no alarms on the NEs on the E1 system. If there are alarms, repeat Step 1 and recheck the cross-connect wiring. Repeat Step 5.

Note: If the TimeSource 3600 is still in warm-up or searching for GPS satellites, alarms may be present. All synchronization-related alarms should clear while the TimeSource 3600 is in steady-state operation.

7. Remove the remaining patch cords from the NE MON jack.

Figure 32. ESCIU Cutover with Jacks (In-Service)



Time of Day Output

Connect a time of day (TOD) output at the female RJ-45 connector labeled TOD. See Figure 24 for the connector location, and Table B for the connector pinouts.

Table B. TOD Connector Pinouts

Pin	Signal	Abbreviation	Direction
1	1 pps A	TOD PPS +	From TimeSource 3600
2	1 pps B	TOD PPS –	From TimeSource 3600
3	12 V power source	TOD P12V	—
4	Receive data B	TOD RXD –	To TimeSource 3600
5	Receive data A	TOD RXD +	To TimeSource 3600
6	Circuit ground	TOD GND	—
7	Transmit data A	TOD TXD +	From TimeSource 3600
8	Transmit data B	TOD TXD –	From TimeSource 3600

Note: Pins not listed are reserved for future use.

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

Note: Before performing Procedure F, ensure that the appropriate Cisco router or NTP Type 4 compatible device is installed, and power applied, per manufacturer's instructions.

Procedure F. RJ-422–to–RS-232 TOD Converter Installation

Step	Procedure
1	Secure the provided mounting plate to the RS-422–to–RS-232 TOD converter, using the two provided screws. The plate may be attached to the top or front of the converter, depending on the desired surface (for example, a rack or cabinet) to which the converter will be mounted (see Figure 33). *Notes:* 1. Due to distance constraints, the converter must be placed no more than 305 m from the TimeSource 3600 Shelf, and no more than 15 m from the device receiving the time code. 2. The converter dimensions are 7.5 cm by 3.8 cm by 2.5 cm. 3. The mounting plate dimensions are 7.5 cm by 5 cm.
2	Secure the converter to the desired surface, using the slots in the plate and user-supplied bolts.
3	Install a user-supplied Category 5 four-pair RS-422 cable, with RJ-45 connectors on each end, between the TimeSource 3600 Shelf and the converter (see Figure 34).
4	Install a user-supplied RS-232 cable, with DB-25 connectors on each end, between the converter and the device receiving the time code (see Figure 34). See Table Table C for the DB-25 connector pinouts.

End of Procedure

Figure 33. RS-422–to–RS-232 TOD Converter Mounting Plate

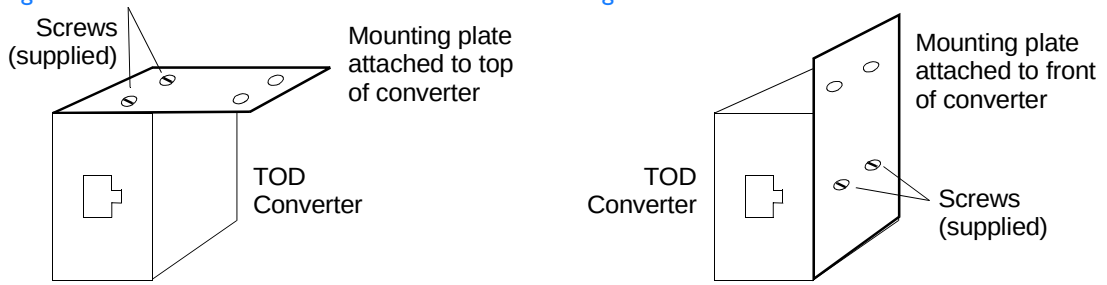


Figure 34. RS-422–to–RS-232 TOD Converter Connections

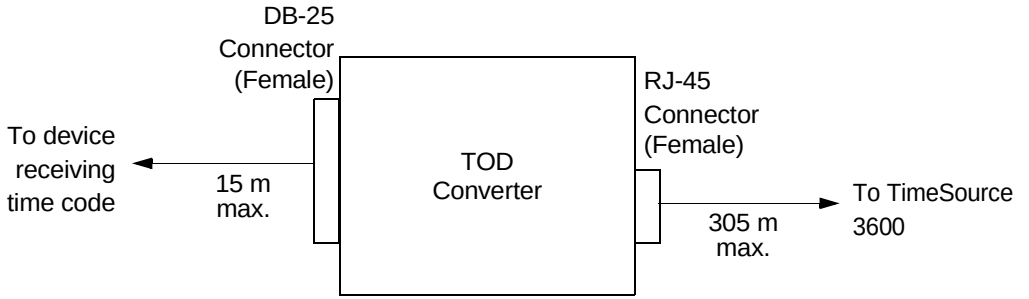


Table C. Converter DB-25 Connector Pinouts

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

Note: Pins not listed are reserved for future use.

Ethernet

Connect a user-supplied Ethernet cable from the network to the 10base-T Ethernet connector labeled E-NET. See Figure 24 for the connector location, and Table D for the connector pinouts.

Table D. Ethernet 10base-T RJ-45 Connector Pinouts

Pin	Signal	Abbreviation	Direction
1	Transmit data +	TXD +	From TimeSource 3600
2	Transmit data –	TXD –	From TimeSource 3600
3	Receive data +	RXD +	To TimeSource 3600
4	—	—	—
5	—	—	—
6	Receive data –	RXD –	To TimeSource 3600
7	—	—	—
8	—	—	—

Communication Port 1

To provide an RS-232 link for TL1 command access to the TimeSource 3600, connect to port 1 at the female 25-pin D connector labeled COM1. See Figure 24 for the location of the connector. See Table E for the connector pinouts.

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

Table E. COM1 Connector Pinouts

Pin	Signal	Abbreviation	Direction
2	Transmit data	TXD	From TimeSource 3600
3	Receive data	RXD	To TimeSource 3600
4	Request to send	RTS	From TimeSource 3600
5	Clear to send	CTS	To TimeSource 3600
7	Signal ground	GND	—
20	Data terminal ready	DTR	From TimeSource 3600

Note: Pins not listed are reserved for future use.

Communication Port 2

To provide an RS-232 link for TL1 command access to the TimeSource 3600, connect to port 2 at the female 9-pin D connector labeled COM2. See Figure 24 for the location of the connector, and Table F for the connector pinouts.

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

Table F. COM2 Connector Pinouts

Pin	Signal	Abbreviation	Direction
2	Receive data	RXD	To TimeSource 3600
3	Transmit data	TXD	From TimeSource 3600
4	Data terminal ready	DTR	From TimeSource 3600
5	Signal ground	GND	—
7	Request to send	RTS	From TimeSource 3600
8	Clear to send	CTS	To TimeSource 3600

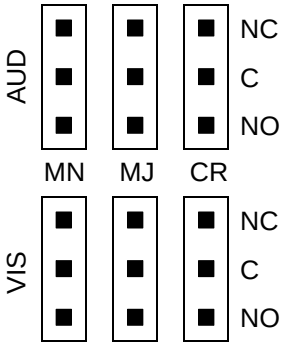
Note: Pins not listed are reserved for future use.

Alarms

Connect the TimeSource 3600 alarms to the office alarm panel at the critical (CR), major (MJ), and minor (MN) wire-wrap pins. See Figure 24 for the location of the alarm pins, and Figure 35 for the connections.

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

Figure 35. Alarm Connections



Craft Port

To provide an RS-232 link for TL1 command access to the TimeSource 3600, connect to the craft port at the female RJ-45 connector labeled Craft on the front panel. A Craft-port-to-PC cable is supplied with the TimeSource 3600 for making this connection. See Figure 24 for the location of the connector, and Table G for the connector pinouts.

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

Table G. Craft Terminal Connector Pinouts

Pin	Signal	Abbreviation	Direction
2	Transmit data	TXD	From TimeSource 3600
3	Receive data	RXD	To TimeSource 3600
5	Signal ground	GND	—
6	Data terminal ready	DTR	From TimeSource 3600

Note: Pins not listed are reserved for future use.

Power-Up

To power the TimeSource 3600, follow the steps in Procedure G. Before starting this procedure, be sure the antenna, shelf, and all connections appropriate for this installation have been installed, and that the host computer is set to communicate with the TimeSource 3600.

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

Procedure G. Power Up

Step	Procedure
Test Equipment: • Grounding wrist strap • Digital multimeter (Fluke 77 or equivalent) • Laptop computer with communications software (e.g., Windows Hyperterminal, ProComm Plus, CrossTalk)	
1	On the computer connected to the TimeSource 3600, start a VT100 terminal mode session via communication software that supports the Y-modem protocol (such as Hyperterminal, or a commercial package such as PROCOMM PLUS or CrossTalk).
2	On the computer connected to the TimeSource 3600, set the communication software to communicate with the port that is connected to the TimeSource 3600.
3	On the computer connected to the TimeSource 3600, set the RS-232 communication parameters to 8 data bits, no parity bit, 1 stop bit, and 9600 baud.
4	On the computer connected to the TimeSource 3600, connect the computer communication port to the COM1, COM2, or Craft port on the TimeSource 3600. A craft port-to-PC communication cable is provided in the hardware kit for this purpose.

Procedure G. Power Up (cont'd)

Step	Procedure
5	Ensure that the TimeSource 3600 plug-in card is not installed in the shelf.
6	Ensure that all fuses that supply power to the TimeSource 3600 Shelf are removed from the fuse panel.
7	At the shelf end of the battery leads, use the multimeter to measure the voltage between the following: Test Point — Test Point — Result Battery A lead — Battery B lead — 0 V Battery A lead — TB1: RTN A — 0 V Battery A lead — TB1: ⏚ — 0 V Battery B lead — TB2: RTN B — 0 V Battery B lead — TB2: ⏚ — 0 V
8	Attach a grounding wrist strap to the wrist, and plug the other end into the ground jack at the upper-right corner of the front of the plug-in card.
9	Pull out the latching levers at each end of the front panel so that the levers are pointing directly out from the front panel.
10	Push the card into the shelf until the latching levers begin to move in.
11	Push the latching levers flat against the front panel to complete the card insertion.
12	Tighten the knurled screw above each latching lever to secure the card in the shelf.
13	Replace the connector panel cover.
14	Unplug and remove the grounding wrist strap.

Procedure G. Power Up (cont'd)

Step	Procedure
15	Install the battery source fuse(s) in the rack fuse bay that supplies power to the TimeSource 3600. The TimeSource 3600 enters its warm-up mode after approximately 60 s when power is applied. During the warm-up period, the following conditions exist: • Status GPS lamp is green • Status SYS lamp is off • E1 outputs are squelched, sending AIS (factory setting), or sending an SSM message, as specified in the ED-EQPT command • Additional eight E1 outputs (if equipped) are squelched, sending AIS (factory setting), or sending an SSM message, as specified in the ED-EQPT command • 10 MHz and 1 pps outputs are on (unreliable while Status SYS lamp is off) • ESCIU ports (if equipped) are on (unreliable while Status SYS lamp is off) *Notes:* 1. The CRIT lamp and other alarm indication lamps may light. The host computer may display transient and standing alarm condition messages. Ignore alarms while the Status SYS lamp is off during warm-up, unless alarms apply to inputs and outputs that were previously entered. 2. TL1 commands may be entered during warm-up. Inputs and outputs can be enabled, and system parameters can be set or changed.

Procedure G. Power Up (cont'd)

Step	Procedure

16	Skip this step if the current unit is equipped with a roof antenna.
	
	Note: If using the TimeScan Craft software program for the power-up procedure, see the TimeScan Craft manual (contained on the TimeScan Craft CD) for the appropriate TimeScan commands to use in place of the TL1 commands. Follow the steps of this procedure, substituting the TimeScan Craft commands. Use the Activate User command to log onto the system.
	
	`ACT-USER::TELECOM:<CTAG>::TS3000!!;`
	
	Use the Edit Equipment command to change the antenna locating mode to manual and to enter the latitude, longitude, and altitude. In manual mode, the survey process used to determine the antenna's exact position starts with this information.
	
	Caution: Enter data carefully. When entering degrees, an error of a single degree will cause the system location accuracy to be off by as much as 100 km.
	
	`ED-EQPT::GPS:<ctag>:::ANTMODE=MANUAL,MANLAT=a-b-c-d,`
	`MANLONG=e-f-g-h,MANELEVALT=i;`
	
	a = north (a = N) or south (a = S) of the equator
	b = degrees of latitude (b = 0 to 60)
	c = minutes of the degree (c = 0 to 60)
	d = decimal fraction of the minute (d = 000 to 999)
	e = east (e = E) or west (e = W) of the Greenwich Meridian
	f = degrees of longitude (f = 0 to 180)
	g = minutes of the degree (g = 0 to 60)
	h = decimal fraction of the minute (h = 000 to 999)
	i = elevation, or altitude, of the antenna in meters
	Example command to set the latitude, longitude, and altitude of the antenna:
	
	`ED-EQPT::GPS:<ctag>:::ANTMODE=MANUAL,MANLAT=N-37-19-016,`
	`MANLONG=W-121-59-246,MANELEVALT=12;`

Procedure G. Power Up (cont'd)

Step	Procedure
16 (cont'd)	*Notes:* 1. The TimeSource 3600 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 200 m) required for the system to perform to specification. It is recommended that the information be obtained and manually entered by the user. 2. Latitude, longitude, and altitude data can be obtained through the use of a GPS hand-held receiver (user supplied). Location mapping software is also available for personal computers, which can be used to obtain latitude and longitude. When the entered figures are within 200 m of the actual coordinates, the TimeSource 3600 typically delivers UTC traceable timing within 1 h of applying power. Warm-up times vary greatly depending on the window location and antenna placement. 3. Obtain latitude, longitude, and altitude outdoors when using a GPS hand-held receiver, to ensure an accurate reading. Do not use the GPS hand-held receiver inside the building near the window or wall where the antenna will be installed. GPS hand-held receivers do not provide an accurate location reading when used indoors.

17	If UTC time is desired, skip to Step 18. Use the Edit Date command to set the local date and time.
	`ED-DAT:::<ctag>::yyyy-mm-dd,hh-mm-ss:MODE=LOCAL;`
	yyyy= year (yyyy = 1998 to 2096)
	mm = month (mm = 01 to 12)
	dd = day (dd = 01 to 31)
	hh = hours (hh = 00 to 23)
	mm = minutes (mm = 00 to 59)
	ss = seconds (ss = 00 to 59)
	Example command to set local time:
	`ED-DAT:::123::2000-06-15,14-25-00:MODE=LOCAL;`

Procedure G. Power Up (cont'd)

Step	Procedure

18	If UTC time is not desired, skip to Step 19. Use the Edit Date command to set the system for UTC time.
	
	`ED-DAT:::<ctag>::yyyy-mm-dd:MODE=UTC;`
	
	yyyy= year (yyyy = 2000 to 2099)
	mm = month (mm = 01 to 12)
	dd = day (dd = 01 to 31)
	
	Example command to set UTC time:
	
	`ED-DAT:::123::2000-06-15:MODE=UTC;`

19	Use the Retrieve Equipment command to identify whether and how the inputs have been provisioned. `RTRV-EQPT::ALL:<ctag>;` *Notes:* 1. Observe those results with an <aid> of SPAN-a. If MONITOR=ALW appears for an input, that input has previously been entered. If ENSEMBLER=ALW appears for an input, that input has been set to be ensembled. 2. Note the results of the Retrieve Equipment command to set the remaining parameters in this procedure. 3. Factory default settings are found at the end of this Power Up procedure section.
20	If the results of Step 19 indicate the span inputs (if used) are set as desired, skip to Step 24. Use the Enter Equipment command to monitor each available span input, and to specify whether those inputs are to be ensembled. `ENT-EQPT::SPAN-a:<ctag>:::ENSEMBLER=b;` a = span input (a = A or B) b = whether this input is ensembled (b = ALW ensembles the input; b = INH inhibits the input from being ensembled)

Procedure G. Power Up (cont'd)

Step	Procedure
21	Use the Edit Equipment command to set the output signal framing format for the two standard E1 outputs, and set the mode for each E1 output during an alarm. `ED-EQPT::E1-a:<ctag>:::FRAMING=b,ALMOUT=c;` a = E1 output (a = A or B) b = framing format (b = CAS, CAS4, CCS, or CCS4, or NONE for analog) c = E1 output during alarm (c = AIS, SQUELCH, or SSM) (for SSM, framing format must be CAS4 or CCS4)
22	If not using a 990-72060-02 system, skip this step. Use the Edit Equipment command to set the output signal framing format for each additional E1 output, and set the mode for each E1 output during an alarm. `ED-EQPT::OPT-a:<ctag>:::FRAMING=b,ALMOUT=c;` a = E1 output module port (a = 1 to 8) b = framing format (b = CAS, CAS4, CCS, CCS4, or NONE) c = E1 output during alarm (c = AIS, SQUELCH, or SSM) (for SSM, framing format must be CAS4 or CCS4)
23	If not using performance monitoring, skip to Step 24. Use the Initialize Register command to reset the performance monitoring data to zero for all input E1 spans. `INIT-REG-EQPT::ALL:<ctag>::ALL;`

Procedure G. Power Up (cont'd)

Step	Procedure

24	If not using Ethernet, go to Step 28. Use the Edit Equipment command while connected to COM1, COM2, or the CRAFT port to set the IP address, subnetwork mask, and gateway address for the current TimeSource 3600 unit, as required for proper operation in the managed element network. (These parameters affect all Ethernet ports. The Ethernet port should be closed and all users logged off before issuing this command.)
	
	`ED-EQPT::TS3600:<ctag>:::IPNE=a,IPSUBNET=a,`
	`IPGATE=a;`
	
	IPNE=a = This unit's IP address in the form a.a.a.a (each a is an independent value of 0 to 255)
	IPSUBNET=a = Subnet mask in the form a.a.a.a (each a is an independent value of 0 to 255)
	IPGATE=a = Gateway IP address in the form a.a.a.a (each a is an independent value of 0 to 255)

Step	Procedure
25	Ports 5001, 5002, 5003 and 5004 on the TimeSource 3600 are used as though they were serial TL1 communication ports. The following values are set at the factory and appear at reset: MONMSG=INH (monitors only the current port for messages) KEEPALIVE=0 (does not send a COMPLD message to keep connection open) ENDOFTEXT=0 (does not include an end-of-text code with a TL1 message) ECHO=ALW (echoes characters back to the sending terminal) COMPRI=ALW1 (normal communication, including autonomous messages) AUTOLOGOFF=0 (does not log off the user during inactivity) SWCONTROL=INH (uses no flow control) If these values require change, use the Edit Communications command to set communications parameters for TL1 communications. `ED-COM::COM-a:<ctag>:::[MONMSG=b[,]][KEEPALIVE=c[,]] [ENDOFTEXT=d[,]][ECHO=b[,]][COMPRI=e[,]][AUTOLOGOFF=c[,] ][SWCONTROL=b];` COM-a = User IP port (a = 5001, 5002, 5003 or 5004) MONMSG=b = Monitors messages on all ports (b = ALW), or current port (b = INH) KEEPALIVE=c = Inactive minutes until the unit sends a COMPLD message to keep the connection from being closed (c = 0 to 255) ENDOFTEXT=d = Hex code added to responses before semicolon (d = 0 (disabled) to 9F) ECHO=b = Echoes characters received so they appear on the user's screen as typed (b = ALW), or inhibits echo (b = INH) COMPRI=e = Sets the communication port capabilities as follows: ALW0=normal communication, no autonomous messages ALW1=normal communication, autonomous messages ALW2=autonomous messages received, logged on or not INH =closes connection and keeps port from use (command must come from another port) (if the port is in use, this command also logs off the user) AUTOLOGOFF=c = Inactive minutes until the unit logs off the user, keeping the connection open (c = 0 to 255) SWCONTROL=b = uses software (XON/XOFF) flow control (b = ALW), or no flow control (b = INH)

Procedure G. Power Up (cont'd)

Step	Procedure
26	If not using an Element Manager, skip to Step 28. If not using a separate port to send autonomous messages to an Element Manager, skip to Step 27. Use the Edit Equipment command to set the IP address and port address of the Element Manager. Port 5550 connects to this address when the TimeSource 3600 develops a TL1 autonomous message, sends any messages, and closes the connection. An alternate Element Manager may be set up in case port 5550 cannot make a connection to the primary Element Manager. `ED-EQPT::TS3600:<ctag>:::IPEM1=a,IPEM1PORT=b[,IPEM2=a][,IPEM2PORT=b][,IPINACT=c];` IPEM1=a = Primary Element Manager's IP address in the form a.a.a.a (each a is an independent value of 0 to 255) IPEM1PORT=b = Primary Element Manager's Ethernet port address (b = 0 to 65535) IPEM2=a = Alternate Element Manager's IP address in the form a.a.a.a (each a is an independent value of 0 to 255) IPEM2PORT=b = Alternate Element Manager's Ethernet port address (b = 0 to 65535) IPINACT=c = Disconnects from the Element Manager if an autonomous message is not developed during this number of 100-ms units of inactivity (0 to 10,000, where 0 deactivates the timer)

Procedure G. Power Up (cont'd)

Step	Procedure
27	Use the Edit Communications command to set the communications parameters of port 5551. An Element Manager connects to port 5551 for TL1 command and response messages. The following values for port 5551 are set at the factory and appear at reset: MONMSG=INH (monitors only the current port for messages) KEEPALIVE=0 (does not send a COMPLD message to keep connection open) ENDOFTEXT=0 (does not include an end-of-text code with a TL1 message) ECHO=INH (does not echo characters received) COMPRI=ALW1 (normal communication, including autonomous messages) AUTOLOGOFF=0 (does not log off the user during inactivity) SWCONTROL=INH (uses no flow control) If these values require change, use the Edit Communications command to set communications parameters for TL1 communications. `ED-COM::COM-5551:<ctag>:::[MONMSG=b[,]][KEEPALIVE=c[,]][ENDOFTEXT=d[,]][ECHO=b[,]][COMPRI=e[,]][AUTOLOGOFF=c[,]][SWCONTROL=b];` MONMSG=b = Monitors messages on all ports (b = ALW), or current port (b = INH) KEEPALIVE=c = Inactive minutes until the unit sends a COMPLD message to keep the connection from being closed (c = 0 to 255) ENDOFTEXT=d = Hex code added to responses before semicolon (d = 0 (disabled) to 9F) ECHO=b = Echoes characters received so they appear on the user's screen as typed (b = ALW), or inhibits echo (b = INH) COMPRI=e = Sets the communication port capabilities as follows: ALW0 = normal communication, no autonomous messages ALW1 = normal communication, autonomous messages ALW2 = autonomous messages received, logged on or not INH = closes connection and keeps port from use (command must go to another port) (if the port is in use, this command also logs off the user) AUTOLOGOFF=c = Inactive minutes until the unit logs off the user, keeping the connection open (c = 0 to 255) SWCONTROL=b = uses software (XON/XOFF) flow control (b = ALW), or no flow control (b = INH)

Procedure G. Power Up (cont'd)

Step	Procedure
28	If not using ESCIU ports, skip to Step 30. Use the Edit Equipment command to specify how the ESCIU performs during holdover: `ED-EQPT::TS3600:<ctag>:::BYPASS=a;` a = E1 traffic bypasses the ESCIU circuitry (a = ALW) or continues to be synchronized during holdover (a = INH).
29	Use the Edit Equipment command to specify how the ESCIU performs with a loss-of-signal (LOS) alarm on the incoming span: `ED-EQPT::OPT-a:<ctag>:::ALMOUT=b;` a = Directs this command to the ESCIU span 1 (a = 1) or 2 (a = 2) b = If LOS is detected on the incoming span, the ESCIU passes AIS downstream (b = AIS), or passes the alignment sequence through to the NE with the original input alarm (b = PASSTHRU).
30	If the results of Step 19 indicate the antenna cable delay and elevation mask are set as desired, skip to Step 34. Use the Edit Equipment command to set the length of cable between the antenna and the TimeSource 3600 Shelf. This number should have been recorded during installation. Use the same command to set the antenna elevation mask angle. `ED-EQPT::GPS:<ctag>:::ANTCBLDLY=a,ANTELEVMASK=b;` a = antenna cable delay in meters (a = 0 to 330) b = antenna elevation mask angle in degrees (b = 0 to 45) (see note below) *Note:* The antenna elevation mask is that portion of the sky from which the TimeSource 3600 masks out satellite signals, measured as an angle of elevation from the horizon. Reflections or other anomalies may disturb signals received from an area of the sky that has obstructions, usually the area near the ground. Masking that part of the sky may allow the receiver to acquire GPS signals more quickly and accurately. Factory setting is 10.

Procedure G. Power Up (cont'd)

Step	Procedure
31	If not using the TOD output, skip to Step 32. Use the Edit Equipment command to set the TOD output. `ED-EQPT::TS3600:<ctag>:::TOD=b;` b = TOD format (b = Cisco or NTP4)
32	Use the Edit Equipment command to allow or inhibit alarm conditioning on the outputs. Inhibiting the alarm conditioning forces the TimeSource 3600 to continue to output valid timing signals while in major alarm. This may be useful when testing, troubleshooting, or in installations where a TimeSource 3600 that is in major alarm may produce better timing signals than other sources (for example, offices without additional holdover clocks in a distribution shelf). `ED-EQPT::TS3600:<ctag>:::ALMCOND=b;` b = alarm conditioning of the outputs (b = ALW or INH)
33	Use the Copy Memory command to copy the database from volatile to nonvolatile memory within the TimeSource 3600. `CPY-MEM:[tid]:TS3600:<ctag>::WKG,,AUX:DATA;` *Note:* Although the database is automatically copied to nonvolatile memory once per hour, it is recommended that the Copy Memory command be executed each time the database is changed.

Procedure G. Power Up (cont'd)

Step	Procedure
34	When the GPS signals have been acquired and the outputs are stable enough to output a signal, the TimeSource enters a settling period. During the settling period, the following conditions exist: • Status GPS lamp is green • Status SYS lamp is green • Any Span lamp is green when its input is connected, entered, contains valid framing, and is usable for ensembling • All outputs are functioning according to specifications or in a slightly degraded mode • A TL1 autonomous "settling period" event message exists. *Notes:* 1. In roof antenna installations, the nominal time to reach normal operation (output a PRS signal) is 20 min. If normal operation has not been reached after 40 min, refer to the Troubleshooting chapter. 2. The settling period is the condition where this clock is beyond the warm-up state but not yet in steady state operation. Steady state operation is indicated by the clearing of the "settling period" event. 3. In window or wall antenna installations, the nominal time to reach normal operation (output a PRS signal) is variable, depending on the view of the sky and the satellite positions at the time of power-up, and may take up to several hours. If normal operation is not reached, refer to the Troubleshooting chapter. 4. The TimeSource 3600 develops and sends timing within the PRS specification during normal operation and during any event or minor alarm, but not during a major or critical alarm.

End of Procedure

Factory-Set Values

The parameter values initially set at the factory are shown in Table H.

Table H. Parameter Factory Settings

<aid>	Parameter Setting
TS3600	TOD=NONE ALMCOND=ALW IPNE=0.0.0.0 IPSUBNET=255.255.255.255 IPGATE=0.0.0.0 IPEM1=0.0.0.0 IPEM1PORT=0 IPEM2=0.0.0.0 IPEM2PORT=0 IPINACT=0 BYPASS=ALW (990-72060-04 systems only)
GPS	ANTCBLDLY=0 ANTELEVMASK=10 ANTMODE=AUTO MANLAT=N-0-0-0 MANLONG=W-0-0-0 MANELEV=0
SPAN-A, SPAN-B	ENSEMBLER=INH MONITOR=INH SSM=INH SIGNAL=DIGITAL SSMCHANNEL=4
E1-A, E1-B	FRAMING=CAS4 ALMOUT=AIS

Table H. Parameter Factory Settings (cont'd)

<aid>	Parameter Setting
COM-1, COM-2, COM-3	BAUD=9600 MONMSG=INH KEEPALIVE=0 ENDOFTEXT=00 ECHO=ALW COMPRI=ALW1 AUTOLOGOFF=0 HWCONTROL=INH SWCONTROL=INH PARITY=NONE STOP=1
COM-5001, COM-5002, COM-5003, COM-5004	MONMSG=INH KEEPALIVE=0 ENDOF TEXT=00 ECHO=ALW COMPRI=ALW1 AUTOLOGOFF=0 SWCONTROL=INH
COM-5551	MONMSG=INH KEEPALIVE=0 ENDOFTEXT=00 ECHO=INH COMPRI=ALW1 AUTOLOGOFF=0 SWCONTROL=INH
OPT-1, OPT-2, OPT-3, OPT-4, OPT-5, OPT-6, OPT-7, OPT-8 (990-72060-02 systems only)	FRAMING=CAS4 ALMOUT=AIS
OPT-1, OPT-2 (990-72060-04 systems only)	ALMOUT=AIS

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TL1 Reference

This chapter provides information for using the TL1 language.

Chapter 4

Conventions

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

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

[ ]	encloses an optional parameter
{ }	encloses a group of parameters, at least one of which must be entered
|	separates alternatives in a group of parameters, at least one of which must be entered

^	indicates a space (used in the description of the response format, but not used in the command responses)
–	separates command code fields
:	separates parameter blocks
,	separates parameters within a block
;	terminates a command, and causes execution
" "	encloses text to be parsed by a machine
/* */	encloses comments for humans
< >	encloses a TL1 named variable
\" \"	encloses a description of a condition
...	indicates the previous line in a response may be repeated as required

Command Format

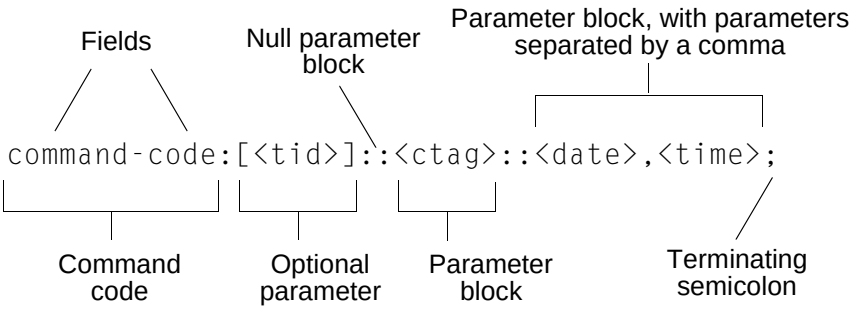
A command consists of a command code of up to three fields separated by hyphens, followed by parameter blocks separated by colons. Figure 36 shows the command format. Parameter blocks consist of one or more parameters separated by commas.

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

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

Entering a semicolon at the end of the command indicates that the command statement is completed to the interpreter, and executes the command.

Figure 36. Command Format



Response Format

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

Figure 37 shows the completed response format. COMPLD indicates that the command was completed without error.

Figure 38 shows the denied response format. DENY indicates that the command was denied due to an error. The <errcde> parameter indicates the corresponding error type, or cause of the error.

Figure 37. Completed Response Format

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

Note: If the command was a query, additional information would be displayed before the semicolon.

Figure 38. Deny Response Format

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

Parameters

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

Table I. Parameter Definitions

Parameter	Definition
<aid>	Access identifier for the object of the command or message. It may have more than one part.
<almcde>	Alarm code. Identifies the severity of the alarm based on its priority of action. If multiple alarms are reported, almcde is the highest severity of those reported.
<atag>	Automatic message tag. It is incremented by one for each autonomous message. The <atag> value is a whole number from 001 through 999, which is reset to 001 at reset or when it rolls over.
<command>	Echo of the entered command.
<conddescr>	Text description of the condition. The <conddescr> value is limited to 64 characters starting and ending with a backslash and a double quotation mark (\"). Refer to the Troubleshooting chapter of this manual for the list of values.
<condeff>	Effect on the condition of the equipment.
<condtype>	Type of alarm condition.
<ctag>	Correlation tag used to correlate input and response messages. The ctag contains 1 to 6 characters. It must be included in a command, and the same ctag is returned in the response.
<date>	Date in the 8-digit form: yyyy-mm-dd (command) or yyyy:mm:dd (response or message), where yyyy is the year, mm is the month (01 to 12), and dd is the day of the month (01 to 31). For example, May 3, 2000 is 2000-05-03.

Table I. Parameter Definitions (cont'd)

Parameter	Definition
<errcde>	Four-character mnemonic error code, which is one of the following: EFON = equipment feature option not provided ENEQ = not equipped ICNV = command not valid IDNV = invalid data in command IDRG = invalid data range in command IIAC = invalid aid in command IICT = invalid correlation tag IIDT = invalid data parameter in command IISP = invalid syntax or punctuation IITA = invalid tid PIUI = invalid or duplicate uid or pid (privileged users only) RALB = All units of requested type are busy RCBY = circuit is busy SCSN = invalid command sequence SDBE = internal database error SNIS = not in service SNVS = not in a valid state SRCN = requested condition currently exists SRQN = request invalid SWFA = working unit failed
<error message>	Error code text message.
<link>	Communication link identifier.
<modifier>	Equipment initiating the alarm or event message, which is one of the following: TS3600 = system software GPS = GPS receiver software SPAN-x = T1 span input
<mondat>	Date of the performance monitoring data.
<montm>	Time of the performance monitoring data.
<montype>	Data type of the performance monitoring data.

Table I. Parameter Definitions (cont'd)

Parameter	Definition
<monval>	Value of the performance monitoring data.
<ntfcncde>	Notification code showing the alarm severity, which is one of the following: CR = critical MJ = major MN = minor
<ocrdat>	Occurrence date in the 8-digit form: yyyy-mm-dd (command) or yyyy:mm:dd (response or message), where yyyy is the year, mm is the month (01 to 12), and dd is the day of the month (01 to 31). For example, May 3, 2000 is 2000-05-03.
<ocrtm>	Occurrence time in the 6-digit form: hh-mm-ss (command) or hh:mm:ss (response or message), where hh is hours (00 to 23), mm is minutes (00 to 59), and ss is seconds (00 to 59). For example, 2:34 pm is 14:34:00.
<pid>	Private identifier, factory-set to "TS3000!!". It is the initial password for the TELECOM <uid>. Passwords are encrypted when stored in the TimeSource 3600, and are never transmitted from the shelf. The pid contains a case-insensitive string of 8 to 10 ASCII characters, and must include at least one letter, one numeral, and one special character from the following: ! " $ % & ' ( ) * + - . / < > ? @
<sid>	Source identifier of the equipment sending the message. The <sid> may contain a maximum of 20 characters (limited to letters, digits, and hyphens), and may begin with a letter. The <sid> is recommended to be the equipment's CLLI code.
<spec_block>	Replaced by a number of parameters within the command. Parameters are in the format <name>=<value>, may be entered in any order, and must be separated by a comma.
<srveff>	Identifies whether the alarm condition is service affecting: SA = service affecting NSA = not service affecting

Table I. Parameter Definitions (cont'd)

Parameter	Definition
<tid>	Target identifier of the equipment to which the command is directed. The tid must be a valid TL1 identifier of a maximum of 20 characters (limited to letters, digits, and hyphens) beginning with a letter. The <tid> is recommended to be the target's CLLI code, and can also be used as the <sid>. The <tid> can be null if the OS directly interfaces to the target. The <tid> can be omitted only if connection is made directly to a single TimeSource 3600 Shelf.
<time>	Current time in the six-digit form: hh-mm-ss (command) or hh:mm:ss (response or message), where hh is hours (00 to 23), mm is minutes (00 to 59), and ss is seconds (00 to 59). For example, 5:11:49 a.m. is 05:11:49.
<uap>	User access level, used by a system administrator to assign a given level of access to system users. User access level ranges from 1 to 5, with 1 being the lowest access level, and 5 being the highest access level.
<uid>	User identifier, factory-set to TELECOM. The <uid> contains alphanumeric, case-insensitive strings of 6 to 10 characters provisioned as valid login IDs.
<uout>	User inactivity password which indicates the number of days a system user has not logged on to the system. The user inactivity timeout range is 0 to 180 days, with 0 indicating no timeout.
<utc>	Universal Coordinated Time (UTC) in the 6-digit form: hh-mm-ss, where hh is hours (00 to 23), mm is minutes (00 to 59), and ss is seconds (00 to 59). For example, 2:34 pm is 14-34-00.
<vldty>	Validity of the performance monitoring data.

Autonomous Messages

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

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

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

Report Alarm

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

Message:

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

Note: Refer to Table Table I for parameter definitions.

Report Event

This autonomous message appears when an event is raised, and again when the event is cleared; also appears when a transient event occurs. An event is a state of the TimeSource 3600 that does not cause an alarm.

Message:

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

Note: Refer to Table Table I for parameter definitions.

Tasks/Commands

To perform each task, use the command listed beside that task in Table J.

Table J. Commands for Tasks

Task	Command	Page
Log user onto system	Activate User	137
Log user off of system	Cancel User	138
Copy software program or database	Copy Memory	139
Delete equipment from the database	Delete Equipment	142
Delete a user from system	Delete User Security	143
Change communication port parameters	Edit Communication	144
Change the system date and time	Edit Date	148
Change equipment parameters	Edit Equipment	150
Enter equipment into the database and allow the equipment to be used for monitoring	Enter Equipment	158
Enter a new user and configure the new user's user name, password, and access level	Enter User Security	160
Reset to zero all performance monitoring parameters associated with a given aid	Initialize Register	161

Table J. Commands for Tasks (cont'd)

Task	Command	Page
Reset the system processor or GPS receiver processor	Initialize System	162
Deactivate the audible office alarm	Operate Alarm Cutoff All	163
Display current system alarms	Retrieve Alarm All	164
Display current alarms for specific equipment	Retrieve Alarm Equipment	165
Display current communication port parameter settings	Retrieve Communication	167
Display current system alarms and events	Retrieve Condition All	170
Display current alarms and events for specific equipment	Retrieve Condition Equipment	171
Display parameter settings of equipment	Retrieve Equipment	173
Display GPS status information	Retrieve GPS Status	180
Display information about equipment	Retrieve Inventory	182
Display performance monitoring data	Retrieve Performance Monitoring	184
Display security parameters for a single user or for all users	Retrieve User Security	200
Set the name of the equipment	Set Source Identifier	201

Commands

The commands used with the TimeSource 3600 are listed on the following pages. After the command name, a definition of the command is given. The definition is followed by the actual command, followed by the variables that can be used with the command.

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

Activate User

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

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

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

Command Example:

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

Response Format:

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

Cancel User

This command logs the user off the system, and ends a session. The user name is not case sensitive, but must otherwise be entered exactly as assigned. The command format is:

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

Parameter	Parameter Description
<uid>	Assigned user name

Command Example:

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

Response Format:

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

Copy Memory

This command copies a software program from an external computer to the TimeSource 3600, or copies the system database to nonvolatile memory.

Notes:

1. The Software Release Document (included with this software release) contains detailed instructions for copying programs from an external computer to nonvolatile memory.

2. Clear any existing alarms before using this command.

3. The database is automatically copied to nonvolatile memory once per hour. However, if power to the TimeSource 3600 is interrupted before the automatic copying occurs, changes made since the last automatic copy will be lost. To avoid the possibility of losing database changes, the Copy Memory command may be used to copy database changes to nonvolatile memory after any changes are made.

To copy a program from an external computer to nonvolatile memory within the TimeSource 3600, the command format is:

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

Copy Memory (cont'd)

Aid	Item Addressed
TS3600	System software
GPS	GPS receiver software
DEV2	TimeSource 3600 (standard) (990-72060-01 systems)
DEV4	TimeSource 3600 with four TOD IRIG-B outputs (990-72060-05 systems)
DEV6	TimeSource 3600 with eight additional E1 or 2.048 MHz outputs (990-72060-02 systems)
DEV8	TimeSource 3600 with two ESCIU ports (990-72060-04 systems)

Copy Memory (cont'd)

Command Example:

```
CPY-MEM::TS3600:<ctag>::AUX,,WKG:PGM;
```

Response Format:

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

To copy a database from volatile to nonvolatile memory within the TimeSource 3600, the command format is:

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

Aid	Item Addressed
TS3600	System software

Command Example:

```
CPY-MEM::TS3600:<ctag>::WKG,,AUX:DATA;
```

Response Format:

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

Delete Equipment

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

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

Aid	Value	Item Addressed
SPAN-a	a = A	E1 span A input
	a = B	E1 span B input
OPT-a	a = 1	ESCIU port 1 (990-72060-04 systems only)
	a = 2	ESCIU port 2 (990-72060-04 systems only)

Command Example:

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

Response Format:

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

Delete User Security

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

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

Parameter	Parameter Description
<uid>	Assigned user name

Command Example:

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

Response Format:

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

Edit Communication

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

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

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

Notes:

1. Ethernet ports 5001, 5002, 5003, and 5004 are set up to act as serial communication ports, so that a terminal program on a computer connected to these ports can communicate effectively.

2. Ethernet port 5551 is set up to allow an element manager to connect with it for TL1 commands and responses. TL1 autonomous messages are sent through port 5550, which connects to an element manager to send one or a group of autonomous messages, then disconnects. Port 5550 is not to be reconfigured.

Edit Communication (cont'd)

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

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

Edit Communication (cont'd)

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

Edit Communication (cont'd)

Notes:

1. Baud rate, parity, and stop bits can only be configured on serial communication ports (1, 2, and 3).

2. Flow control is not implemented on communication port 3 (Craft port).

3. XON/XOFF flow control is simulated for Ethernet ports.

Command Example:

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

Response Format:

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

Edit Date

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

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

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

Notes:

1. The <time> value can only be entered when MODE=LOCAL, or in the same command as MODE=LOCAL, otherwise the command is denied. A successful command with <time> changes the display of the hours. Minutes and seconds continue to conform with UTC.

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

Edit Date (cont'd)

Example to set date without changing time or mode:

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

Example to change to local time:

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

Example to change from local to UTC time:

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

Response Format:

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

Edit Equipment

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

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

Aid	Value	Item Addressed
TS3600	—	System-wide configuration
GPS	—	GPS configuration
SPAN-a	a = A	Span A input
	a = B	Span B input
E1-a	a = A	E1 A output
	a = B	E1 B input
OPT-a (990-72060-02 systems only)	a = 1 to 8	E1 option outputs: 1 through 8
OPT-a (990-72060-04 systems only)	a = 1 to 2	ESCIU option ports: 1 or 2

Edit Equipment (cont'd)

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

Aid	Parameter	Value	Description
TS3600	TOD=a	a = CISCO	Serial message sent in Cisco format
		a = NTP4	Serial message sent in NTP Type 4 format
		a = NONE	No serial message sent
	ALMCOND =a	a = ALW	Alarm conditioning for E1, TOD, and IRIG-B outputs is enabled
		a = INH	Alarm conditioning for E1, TOD, and IRIG-B outputs is disabled
	IPNE=a.b.c.d (See Note 1)	a = 0 to 255	IP address of this TimeSource 3600 (command must be sent from COM1, COM2, or Craft port to set this parameter)
		b = 0 to 255	
		c = 0 to 255	
		d = 0 to 255	
	IPSUBNET=a.b.c.d (See Note 1)	a = 0 to 255	Subnet mask for this TimeSource 3600 (command must be sent from COM1, COM2, or Craft port to set this parameter)
		b = 0 to 255	
		c = 0 to 255	
		d = 0 to 255	
	BYPASS=a (990-72060-04 systems only)	a = AIS	When the ESCIU detects an LOS on an input spans, AIS is output to the NE (the E1 alignment sequence is blocked)
		a = PASSTHRU	When the ESCIU detects an LOS on one of its input spans, the E1 alignment sequence is passed through to the NE with the original input alarm

Edit Equipment (cont'd)

Aid	Parameter	Value	Description
TS3600 (cont'd)	IPGATE=a.b.c.d (See Note 1)	a = 0 to 255	Default gateway IP address for this TimeSource 3600 (command must be sent from COM1, COM2, or Craft port to set this parameter)
		b = 0 to 255	
		c = 0 to 255	
		d = 0 to 255	
	IPEM1=a.b.c.d (See Notes 1, 2, 3)	a = 0 to 255	IP address of primary element manager (port 5550 connects to this element manager to send autonomous messages, disconnects when transmit is complete)
		b = 0 to 255	
		c = 0 to 255	
		d = 0 to 255	
	IPEM1PORT=a (See Notes 1, 2, 3)	a = 0 to 65535	Port address of primary element manager (port for IPEM1 address)
	IPEM2=a.b.c.d (See Notes 1, 2, 3)	a = 0 to 255	IP address of alternate element manager (if used) (port 5550 connects to this element manager if connection cannot be made to the primary element manager)
		b = 0 to 255	
		c = 0 to 255	
		d = 0 to 255	
	IPEM2PORT=a (See Notes 1, 2, 3)	a = 0 to 65535	Port address of alternate element manager (port for IPEM2 address)
	IPINACT=a (See Note 1)	a = 0 to 10000	Port 5550 closes the connection to the Element Manager if no autonomous messages are sent during this number of 100-ms units (0 to 10,000, where 0 deactivates the timer, for example, 100 = 10 s)

Edit Equipment (cont'd)

Aid	Parameter	Value	Description
GPS	ANTCBLDLY=a (See Note 4)	a = 0 to 300	Antenna cable length (meters)
	ANTELEVMASK=a (See Notes 4, 5)	a = 0 to 45	Antenna elevation mask angle (degrees)
	ANTMODE=a	a = AUTO	Automatic survey-in mode (use only with roof antenna configuration)
		a = MANUAL	Manual survey-in mode (do not use with roof antenna configuration)
	MANLAT=a-b-c-d (See Note 5)	a = N	North latitude
		a = S	South latitude
		b = 0 to 180	Degrees of latitude
		c = 1 to 59	Minutes of latitude
		d = 1 to 999	Decimal minutes of latitude
	MANLONG= a-b-c-d (See Note 5)	a = E	East longitude
		a = W	West longitude
		b = 1 to 180	Degrees of longitude
		c = 1 to 59	Minutes of longitude
		d = 1 to 999	Decimal minutes of longitude
	MANELEV=a (See Note 5)	a = –1000 to 8000	Antenna elevation (meters)

Edit Equipment (cont'd)

Aid	Parameter	Value	Description
SPAN-a	ENSEMBLER=b	b = ALW	Span is ensembled
		b = INH	Span is not ensembled
	SSM=b (See Notes 7, 8)	b = ALW	SSM qualifies span input
		b = INH	SSM does not qualify span input
	SIGNAL=b (See Note 6)	b = ANALOG	Span input signal is 2.048 MHz (analog)
		b = DIGITAL	Span input signal is 2.048 Mb/s (digital)
	SSMCHANNEL=b (See Notes 7, 8)	b = 4	Uses Sa4 bit
		b = 5	Uses Sa5 bit
		b = 6	Uses Sa6 bit
		b = 7	Uses Sa7 bit
		b = 8	Uses Sa8 bit
E1-a	ALMOUT=b	b = AIS	Output is AIS during holdover alarm
		b = SQUELCH	No output during holdover alarm
		b = SSM	Output includes SSM during holdover alarm (SSM requires either CAS4 or CCS4 output framing)
	FRAMING=b	b = CAS	Output framing is CAS
		b = CAS4	Output framing is CAS4
		b = CCS	Output framing is CCS .
		b = CCS4	Output framing is CCS4
		b = NONE	No framing (analog)

Edit Equipment (cont'd)

Aid	Parameter	Value	Description
OPT-a (Additional E1 outputs on 990-72060-02 systems only)	ALMOUT=b	b = AIS	Output is AIS during holdover alarm
		b = SQUELCH	No output during holdover alarm
		b = SSM	Output includes SSM during alarm (SSM requires either CAS4 or CCS4 output framing)
	FRAMING=b	b = CAS	Output framing is CAS
		b = CAS4	Output framing is CAS4
		b = CCS	Output framing is CCS .
		b = CCS4	Output framing is CCS4
		b = NONE	No framing (analog)
OPT-a (ESCIU ports on 990-72060-04 systems only)	ALMOUT=b	b = AIS	When the ESCIU detects LOS on an input span, an all-ones signal (AIS), without the E1 frame alignment sequence, is output to the downstream network element
		b = PASSTHRU	All traffic passes through to the downstream network element, including the LOS alarm signal

Edit Equipment (cont'd)

Notes:

1. This parameter affects all Ethernet ports. Close the Ethernet ports and log off all users before issuing a command with this parameter.

2. Port 5550 makes a connection to this element manager to send TL1 autonomous messages, and closes the connection when the transmission is complete.

3. Port 5551 accepts a connection from this element manager for TL1 commands and responses.

4. When the TimeSource 3600 uses a roof antenna, only the parameters ANTCBLDLY and ANTELEVMASK, and the mode ANTMODE=AUTO, are allowed.

5. The TimeSource 3600 uses the MANLAT, MANLONG, and MANELEV values for latitude, longitude, and elevation when ANTMODE=MANUAL becomes active. The TimeSource 3600 uses these values as starting points for processing the antenna position. Changes to these values are ignored while the TimeSource 3600 is in the AUTO mode.

6. A span must have been put into service using the ENT-EQPT command before setting the ENSEMBLER and SSM parameters.

7. The span must be put into service using the ENT-EQPT command before using this parameter.

8. The span input must be a digital 2.048 Mb/s E1 signal to use SSM. If not, the command is denied.

Edit Equipment (cont'd)

Response Format:

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

Enter Equipment

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

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

Aid	Value	Item Addressed
SPAN-a	a = A	E1 span A input
	a = B	E1 span B input
OPT-a (990-72060-04 systems only)	a = 1	ESCIU port 1
	a = 2	ESCIU port 2

Enter Equipment (cont'd)

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

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

Example to set an input to be monitored, but not ensembled:

```
ENT-EQPT:[<tid>]:SPAN-A:<ctag>;
```

Example to set an input to be monitored and ensembled:

```
ENT-EQPT:[<tid>]:SPAN-A:<ctag>:::ENSEMBLER=ALW;
```

Response Format:

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

Enter User Security

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

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

Parameter	Parameter Description
<uid>	User name – must start with an alpha character and have a maximum of 10 characters.
<pid>	Password – can be up to 10 alphanumeric characters, must include at least two non-alphabetic characters, and must contain at least one of the following special characters: ! $ % & ' ( ) * + . / < > ? @
<uap>	Access level (1 to 5). Levels 1 to 4 do not allow the user to enter or delete users. Level 5 allows the user to enter or delete users.

Command Example:

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

Response Format:

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

Initialize Register

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

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

Aid	Value	Item Addressed
SPAN-a	a = A	E1 span A input
	a = B	E1 span B input
ALL	—	E1 span A and span B inputs

Response Format:

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

Initialize System

This command resets the specified processor.

Caution: Using this command with an <aid> of TS3600 will cause a loss of outputs until GPS satellites are reacquired if ALMOUT is SQUELCH, or unstable outputs if ALMOUT is not SQUELCH.

The command format is:

```
INIT-SYS:[<tid>]:<aid>:<ctag>::1;
```

Aid	Item Addressed
TS3600	System software
GPS	GPS receiver software

Response Format:

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

Operate Alarm Cutoff All

This command deactivates (silences) the audible office alarm. The command format is:

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

Response Format:

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

Retrieve Alarm All

This command displays all current system alarms. The command format is:

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

If there are no alarms:

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

If there is at least one alarm:

```
   <sid> <date> <time>
M  <ctag> COMPLD
   "<aid>:<ntfcncde>,<condtype>,<srveff>,
<ocrdat>,<ocrtm>,,:\"<conddescr>\""...
   /*LINK:<link>,CMD:<command>*/
;
```

Note: Refer to the Troubleshooting chapter for a list of all <conddescr> messages, and the recommended action.

Retrieve Alarm Equipment

This command displays current alarms for the specified equipment. The command format is:

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

Aid	Value	Item Addressed
TS3600	—	System (all TS3600 alarms)
SPAN-a	a = A	E1 span A input
	a = B	E1 span B input
GPS	—	GPS receiver

Retrieve Alarm Equipment (cont'd)

If there are no alarms:

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

If there is at least one alarm:

```
    <sid> <date> <time>
M   <ctag> COMPLD
    "<aid>:<ntfcncde>,<condtype>,<srveff>,
        <ocrdat>,<ocrtm>,,:\"<conddescr>\""...
    /*LINK:<link>,CMD:<command>*/
;
```

Note: **Refer to the Troubleshooting chapter for a list of all <conddescr> messages, and the recommended action.**

Retrieve Communication

This command displays communication port parameter settings. The command format is:

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

Aid	Value	Item Addressed
COM-a	a = 1	Serial communication port 1
	a = 2	Serial communication port 2
	a = 3	Serial communication port 3
	a = 5001	Ethernet user interface port 5001
	a = 5002	Ethernet user interface port 5002
	a = 5003	Ethernet user interface port 5003
	a = 5004	Ethernet user interface port 5004
	a = 5551	Ethernet element manager interface port 5551
ALL	—	All communication ports

Response Format:

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

Retrieve Communication (cont'd)

The parameters which may be displayed in the <spec_block> are listed below.

Parameter	Value	Description
MONMSG=a	a = ALW	View messages from all ports
	a = INH	View messages from this port only
KEEPALIVE=a	a = 1 to 255	Inactive minutes until the unit sends a COMPLD message to keep the connection from being closed
	a = 0	No COMPLD message is output
ENDOFTEXT=a	a = 1 to 9F	Hex code at end of all responses
	a = 00	No hex code at end of responses
ECHO=a	a = ALW	Echoes characters received so they appear on the user's screen as typed
	a = INH	Local echo is disabled
COMPRI=a	a = ALW0	TL1 commands and responses, no autonomous messages sent
	a = ALW1	TL1 commands and responses, sends autonomous messages
	a = ALW2	TL1 commands and responses, sends autonomous messages whether or not logged on
	a = INH	Closes connection, logs off a user (if logged on), and keeps port from use (a port cannot close itself)

Retrieve Communication (cont'd)

Parameter	Value	Parameter Description
AUTOLOGOFF=a	a = 1 to 255	Inactive minutes until the unit logs off the user, keeping the connection open
	a = 0	Autologoff is disabled
SWCONTROL=a	a = ALW	XON/XOFF flow control is enabled
	a = INH	XON/XOFF flow control is not enabled
HWCONTROL=a	a = ALW	Serial port CTS/RTS flow control is enabled
	a = INH	Serial port CTS/RTS flow control is not enabled
BAUD=a	a = 115	Serial port baud rate is 115 kbaud
	a = 57.6	Serial port baud rate is 57.6 kbaud
	a = 38.4	Serial port baud rate is 38.4 kbaud
	a = 19.2	Serial port baud rate is 19.2 kbaud
	a = 9600	Serial port baud rate is 9600 baud
	a = 4800	Serial port baud rate is 4800 baud
	a = 2400	Serial port baud rate is 2400 baud
PARITY=a	a = EVEN	Even parity bit is enabled
	a = ODD	Odd parity bit is enabled
	a = NONE	Parity bit is disabled
STOP=a	a = 1	1 stop bit
	a = 2	2 stop bits

Retrieve Condition All

This command displays all current system alarms and events. The command format is:

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

If there are no alarms or events:

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

If there is at least one alarm or event:

```
    <sid> <date> <time>
M   <ctag> COMPLD
    "<aid>:<ntfcncde>,<condtype>,<srveff>,
       <ocrdat>,<ocrtm>,,,:\"<conddescr>\""...
    /*LINK:<link>,CMD:<command>*/
;
```

Note: Refer to the Troubleshooting chapter for a list of all <conddescr> messages, and the recommended action.

Retrieve Condition Equipment

This command displays current alarms and events for the specified equipment. The command format is:

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

Aid	Value	Item Addressed
TS3600	—	System
SPAN-a	a = A	E1 span A input
	a = B	E1 span B input
GPS	—	GPS receiver

Command Example:

```
RTRV-COND-EQPT::TS3600:<ctag>;
```

Retrieve Condition Equipment (cont'd)

If there are no alarms:

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

If there is at least one alarm:

```
    <sid> <date> <time>
M   <ctag> COMPLD
    "<aid>:<ntfcncde>,<condtype>,<srveff>,
<ocrdat>,<ocrtm>,,,\"<conddescr>\""...
    /*LINK:<link>,CMD:<command>*/
;
```

Note: **Refer to the Troubleshooting chapter for a list of all <conddescr> messages, and the recommended action.**

Retrieve Equipment

This command displays parameter settings for the specified equipment. The command format is:

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

Aid	Value	Item Addressed
ALL	—	All aids for this command
TS3600	—	System
GPS	—	GPS receiver
SPAN-a	a = A	Span A input
	a = B	Span B input
E1-a	a = A	E1 A output
	a = B	E1 B output
OPT-a	a = 1 to 8	Additional E1 outputs: 1 through 8 (990-72020-02 systems only)
	a = 1 or 2	ESCIU ports: 1 or 2 (990-72020-04 systems only)

Command Example:

```
RTRV-EQPT::ALL:G;
```

Retrieve Equipment (cont'd)

Response Format:

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

The parameters which may be displayed in the <spec_block> are listed below.

Aid	Parameter	Value	Parameter Description
TS3600	BYPASS=a (990-72060-04 systems only)	a = AIS	When the ESCIU detects LOS on an input span, an all-ones signal (AIS), without the E1 alignment sequence, is output to the downstream network element
		a = PASSTHRU	When the ESCIU detects LOS on an input span, the LOS alarm signal, with the E1 alignment sequence, is passed through to the downstream network element
	TOD=a	a = CISCO	Serial message sent is Cisco format
		a = NTP4	Serial message sent is NTP Type 4 format
		a = NONE	No serial message is sent
	ALMCOND=a	a = ALW	Alarm conditioning for outputs is enabled
		a = INH	Alarm conditioning for outputs is disabled

Retrieve Equipment (cont'd)

Aid	Parameter	Value	Parameter Description
TS3600 (cont'd)	IPNE=a.b.c.d	a = 0 to 255	This unit's IP address
		b = 0 to 255	
		c = 0 to 255	
		d = 0 to 255	
	IPSUBNET=a.b.c.d	a = 0 to 255	Subnetwork mask
		b = 0 to 255	
		c = 0 to 255	
		d = 0 to 255	
	IPGATE=a.b.c.d	a = 0 to 255	Default gateway IP address
		b = 0 to 255	
		c = 0 to 255	
		d = 0 to 255	
	IPEM1=a.b.c.d	a = 0 to 255	Primary element manager IP address
		b = 0 to 255	
		c = 0 to 255	
		d = 0 to 255	
	IPEM1PORT=a	a = 0 to 65535	Primary element manager port address
	IPEM2=a.b.c.d	a = 0 to 255	Alternate element manager IP address
		b = 0 to 255	
		c = 0 to 255	
		d = 0 to 255	

Retrieve Equipment (cont'd)

Aid	Parameter	Value	Parameter Description
TS3600 (cont'd)	IPEM2PORT=a	a = 0 to 65535	Secondary element manager port address
	IPINACT=a	a = 0 to 10000	Inactivity timer length (units of 100 ms, for example, 1000 = 100 ms)
GPS	ANTCBLDLY=a	a = 0 to 305	Antenna cable length (meters)
	ANTELEVMASK=a	a = 0 to 45	Antenna elevation mask angle (degrees)
	ANTMODE=a	a = AUTO	Automatic survey-in mode
		a = MANUAL	Manual survey-in mode (do not use for roof antenna)
	MANLAT=a-b-c-d	a = N	North latitude
		a = S	South latitude
		b = 1 to 180	Degrees of latitude
		c = 1 to 60	Minutes of latitude
		d = 1 to 1000	Decimal minutes of latitude
	MANLONG= a-b-c-d	a = E	East longitude
		a = W	West longitude
		b = 1 to 180	Degrees of longitude
		c = 1 to 60	Minutes of longitude
		d = 1 to 1000	Decimal minutes of longitude
	MANELEV=a	a = –1000 to 8000	Antenna elevation (meters)

Retrieve Equipment (cont'd)

Aid	Parameter	Value	Parameter Description
SPAN-a	ENSEMBLER=b	b = ALW	E1 span is ensembled
		b = INH	E1 span is not ensembled
	MONITOR=b	b = ALW	E1 span is monitored
		b = INH	E1 span is not monitored
	SSM=b	b = ALW	SSM message is used to qualify input
		b = INH	SSM message is not used to qualify input
	SIGNAL=b	b = ANALOG	Span input signal is 2.048 MHz
		b = DIGITAL	Span input signal is 2.048 Mb/s
	SSMCHANNEL=b	b = 4	Uses Sa4 bit
		b = 5	Uses Sa5 bit
		b = 6	Uses Sa6 bit
		b = 7	Uses Sa7 bit
		b = 8	Uses Sa8 bit

Retrieve Equipment (cont'd)

Aid	Parameter	Value	Parameter Description
E1-a	FRAMING=b	b = CAS	Output framing is CAS
		b = CAS4	Output framing is CAS4
		b = CCS,	Output framing is CCS
		b = NONE	Output framing is NONE (if an analog signal).
	ALMOUT=b	b = AIS	Output during holdover alarm is AIS
		b = SQUELCH	No output during holdover alarm
		b = SSM	Output during holdover alarm is SSM (SSM requires output framing of CAS4 or CCS4)
OPT-a (990-72060-02 systems only)	FRAMING=b	b = CAS	Output framing is CAS
		b = CAS4	Output framing is CAS4
		b = CCS,	Output framing is CCS
		b = NONE	Output framing is NONE (if an analog signal).
	ALMOUT=b	b = AIS	Output during holdover alarm is AIS
		b = SQUELCH	No output during holdover alarm
		b = SSM	Output during holdover alarm is SSM (SSM requires output framing of CAS4 or CCS4)

Retrieve Equipment (cont'd)

Aid	Parameter	Value	Parameter Description
OPT-a (990-72060-04 systems only)	MONITOR=b	b = ALW	TimeSource 3600 uses monitoring information to generate an alarm
		b = INH	TimeSource 3600 uses monitoring information to generate an alarm
	ALMOUT=b	b = AIS	When the ESCIU detects LOS on an input span, an all-ones signal (AIS), without the E1 alignment sequence, is output to the downstream network element
		b = PASSTHRU	When the ESCIU detects LOS on an input span, the LOS alarm signal, with the E1 alignment sequence, is passed through to the downstream network element

Retrieve GPS Status

This command displays the position of the GPS receiver, UTC time, and status information for each of the GPS satellites in view. The command format is:

```
RTRV-GPS-STAT:[<tid>]:GPS:<ctag>;
```

Response Format:

```
        <sid> <date> <time>
    M   <ctag> COMPLD
        "<aid>:LAT=a,LONG=a,ALT=a,UTC=a
        ANTMODE=a,MERIT=a,SUCCESS=a%
        SAT-a,USE=a,CNO=a,ELEV=a,AZ=a,
              LOCK=a..."
        /*LINK:<link>,CMD:<command>*/
    ;
```

Retrieve GPS Status (cont'd)

Parameter	Value	Description
LAT=a	a = dd.mm.fffN	Current latitude north in degrees, minutes, and decimal-fractions of a minute
	a = dd.mm.fffS	Current latitude south in degrees, minutes, and decimal-fractions of a minute
LONG=a	a = ddd.mm.fffE	Current longitude east in degrees, minutes, and decimal-fractions of a minute
	a = ddd.mm.fffW	Current longitude west in degrees, minutes, and decimal-fractions of a minute
ALT=a	a = mm.mmm	Altitude in meters to the thousandth of a meter, referenced to mean sea level
UTC=a	a = hh-mm-ss	Universal Coordinated Time (UTC), where hh is hours (00 to 23), mm is minutes (00 to 59), and ss is seconds (00 to 59)
ANTMODE=a	a = AUTO	Automatic survey-in mode
	a = MANUAL	Manual survey-in mode
MERIT=a	a = bbb	Timing error estimate in ns
SUCCESS=a	a = bb	Percentage of time satellites are visible
SAT=a	a = 1 to 25	Satellite identification number
USE=a	a = Y	Satellite in use
	a = N	Satellite not in use
CNO=a	a = nn	Satellite carrier-to-noise ratio
ELEV=a	a = dd	Satellite elevation in degrees
AZ=a	a = ddd	Satellite azimuth in degrees
LOCK=a	a = 1 to 2500	Seconds since the receiver locked to the satellite carrier

Retrieve Inventory

This command displays information about the specified equipment. The command format is:

```
RTRV-INVENTORY:[<tid>]:TS3600:<ctag>;
```

Response Format:

```
       <sid> <date> <time>
   M   <ctag> COMPLD
       "TS3600::::CARD=TS3600,
       MACID=a,
       TYPE=E1,a
       PART=a,
       SERIAL=a,
       SOFTVER_TS3000=a,
       SOFTVER_GPS=a,
       SOFTVER_DEV=a"
       /*LINK: x, CMD:<command>*/
   ;
```

Retrieve Inventory (cont'd)

Parameter	Value	Description
CARD=TS3600	—	System
MACID=a.b.c.d.e	a = 00 to FF in hexadecimal format	MAC address
	b = 00 to FF in hexadecimal format	
	c = 00 to FF in hexadecimal format	
	d = 00 to FF in hexadecimal format	
	e = 00 to FF in hexadecimal format	
TYPE=E1,a	a = NO OPTION BOARD	TimeSource 3600 (standard) (990-72060-01 systems)
	a = E1 OPTION BOARD	TimeSource 3600 with 8 additional E1 outputs (990-72060-02 systems)
	a = SCIU OPTION BOARD	TimeSource 3600 with 2 ESCIU ports (990-72060-04 systems)
	a = IRIG OPTION BOARD	TimeSource 3600 with 4 TOD IRIG-B outputs (990-72060-05 systems)
PART=a	—	a = Part number
SERIAL=a	—	a = Serial number
SOFTVER_ TS3000=a	a = bb.cc.dd	System software version
SOFTVER_GPS=a	a = bb.cc.dd	GPS receiver software version
SOFTVER_ DEV=a	a = bb.cc.dd or bb.cc.dd-ee.ff.gg	Device software version

Retrieve Performance Monitoring

This command retrieves the performance monitoring data from the TimeSource 3600. This data includes MTIE, TDEV, Phase 1S, and Phase 1M. For current 24 hour data, MTIE, TDEV, and Phase 1S data are grouped every 15 minutes. In addition, there are 7 daily summaries of MTIE, TDEV, and Phase 1M. Each value type can be retrieved for both span inputs A and B.

MTIE data includes the following time intervals in seconds: 1, 4, 10, 40, 100, 300, 900, 1800, 3600, 7200, 14400, 28800, and 86400.

TDEV data includes the following time intervals in seconds: 1, 2, 4, 8, 16, 32, 64, 128, 256, 512, and 1024.

Phase 1S data includes 900 seconds of phase values.

Phase 1M data includes 60 minutes of phase values.

The command format is:

```
RTRV-PM-EQPT:[<tid>]:SPAN-a:<ctag>::<montype>
                    ,,,,,[<mondat>][<montm>];
```

Retrieve Performance Monitoring (cont'd)

Parameter	Value	Description
SPAN-a	a = A	E1 span A input
	a = B	E1 span B input
<montype>	MTIE	MTIE data reported
	TDEV	TDEV data reported
	PHASE1S	1-second phase data reported
	PHASE1M	1-minute phase data reported
<mondat>	yyyy-mm-dd	Date of monitored data
<montm>	hh-mm	Time of monitored data

MTIE Response Format:

```
     <sid> <date> <time>
M    <ctag>COMPLD
     "SPAN-a:MTIE-a,<monval>,<vldty>
                ,,,,<mondat>,<montm>"
           .          .          .
           .          .          .
           .          .          .
     "SPAN-a:MTIE-a,<monval>,<vldty>
                ,,,,<mondat>,<montm>"
     /*LINK:<link>,CMD:<command>*/
;
```

Retrieve Performance Monitoring (cont'd)

Note: MTIE Data types:

- One 15 minute bin from the last 24 hours of data. To select a 15 minute bin, enter mondat and montm. Any mondat/montm combination outside of the past 24 hour window is denied. Any time increment may be entered. The system rounds the value to the nearest bin. Entered minutes of 1 to 15 correspond to the first 15 minute bin, 16 to 30 correspond to the second 15 minute bin, etc.

- One day summary from the last 7 days of daily summaries. To select one daily summary, enter mondat, but do not enter montm. Any mondat not in the previous 7 day window is denied.

- Entering the date or time is optional. Type a semicolon after montype to display the most recent statistics for the specified montype.

Retrieve Performance Monitoring (cont'd)

Parameter	Value	Description
SPAN-a	a = A	E1 span A input
	a = B	E1 span B input
MTIE-a	a = 1S, 2S, 4S, 10S, 40S, 100S, 300S, 900S, 1800S, 3600S, 7200S, 14400S, 28800S, or 86400S	MTIE monitored type, where a is time intervals in seconds
<monval>	One 15 min bin from the last 24 h of data	Monitored value
<vldty>	COMPL	Data is valid
	NA	Data is not valid
<mondat>	yyyy-mm-dd	Date of monitored data
<montm>	hh-mm-ss	Time of monitored data

Retrieve Performance Monitoring (cont'd)

MTIE Response Example:

```
    TS3600-2009 2000-05-25 11:01:58
M   G COMPLD
    "SPAN-A:MTIE-1S,1,COMPL
                ,,,,,2000-05-25,11-00-00"
    "SPAN-A:MTIE-4S,1,COMPL
                ,,,,,2000-05-25,11-00-00"
    "SPAN-A:MTIE-10S,1,COMPL
                ,,,,,2000-05-25,11-00-00"
    "SPAN-A:MTIE-40S,1,COMPL
                ,,,,,2000-05-25,11-00-00"
    "SPAN-A:MTIE-100S,1,COMPL
                ,,,,,2000-05-25,11-00-00"
    "SPAN-A:MTIE-300S,1,COMPL
                ,,,,,2000-05-25,11-00-00"
    "SPAN-A:MTIE-900S,1,COMPL
                ,,,,,2000-05-25,11-00-00"
    "SPAN-A:MTIE-1800S,1,COMPL
                ,,,,,2000-05-25,11-00-00"
    "SPAN-A:MTIE-3600S,1,COMPL
                ,,,,,2000-05-25,11-00-00"
    "SPAN-A:MTIE-7200S,1,COMPL
                ,,,,,2000-05-25,11-00-00"
    "SPAN-A:MTIE-14400S,1,COMPL
                ,,,,,2000-05-25,11-00-00"
    "SPAN-A:MTIE-28800S,1,COMPL
                ,,,,,2000-05-25,11-00-00"
    "SPAN-A:MTIE-86400S,1,COMPL
                ,,,,,2000-05-25,11-00-00"
    /*LINK:5002,CMD:RTRV-PM-EQPT::
                SPAN-A:G::MTIE*/
;
```

Retrieve Performance Monitoring (cont'd)

TDEV Response Format:

```
    <sid> <date> <time>
M   <ctag>COMPLD
    "SPAN-a:TDEV-a,<monval>,<vldty>
                ,,,,<mondat>,<montm>"
          .           .           .
          .           .           .
          .           .           .
    "SPAN-a:TDEV-a,<monval>,<vldty>
                ,,,,<mondat>,<montm>"
    /*LINK:<link>,CMD:<command>*/
;
```

Note: TDEV Data types:

- One 15 minute bin from the last 24 hours of data. To select a 15 minute bin, enter mondat and montm. Any mondat/montm combination outside of the past 24 hour window is denied. Any time increment may be entered. The system rounds the value to the nearest bin. Entered minutes of 1 to 15 correspond to the first 15 minute bin, 16 to 30 correspond to the second 15 minute bin, etc.

- One day summary from the last 7 days of daily summaries. To select one daily summary, enter mondat, but do not enter montm. Any mondat not in the previous 7 day window is denied.

- Entering the date or time is optional. Type a semicolon after montype to display the most recent statistics for the specified montype.

Retrieve Performance Monitoring (cont'd)

Parameter	Value	Item Addressed
SPAN-a	a = A	E1 span A input
	a = B	E1 span B input
TDEV=a	a = 1S, 2S, 4S, 8S, 16S, 32S, 64S, 128S, 256S, 512S, or 1024S	TDEV monitored type, where a is time intervals in seconds
<monval>	One 15 min bin from the last 24 h of data	Monitored value
<vldty>	COMPL	Data is valid
	NA	Data is not valid
<mondat>	yyyy-mm-dd	Date of monitored data
<montm>	hh-mm-ss	Time of monitored data

Retrieve Performance Monitoring (cont'd)

TDEV Response Example:

```
    TS3600-2009 2000-05-25 11:01:58
M   G COMPLD
    "SPAN-A:TDEV-1S,0,COMPL
                ,,,,,2000-05-25,11-00-00"
    "SPAN-A:TDEV-2S,0,COMPL
                ,,,,,2000-05-25,11-00-00"
    "SPAN-A:TDEV-4S,0,COMPL
                ,,,,,2000-05-25,11-00-00"
    "SPAN-A:TDEV-8S,0,COMPL
                ,,,,,2000-05-25,11-00-00"
    "SPAN-A:TDEV-16S,0,COMPL
                ,,,,,2000-05-25,11-00-00"
    "SPAN-A:TDEV-32S,0,COMPL
                ,,,,,2000-05-25,11-00-00"
    "SPAN-A:TDEV-64S,0,COMPL
                ,,,,,2000-05-25,11-00-00"
    "SPAN-A:TDEV-128S,0,COMPL
                ,,,,,2000-05-25,11-00-00"
    "SPAN-A:TDEV-256S,0,COMPL
                ,,,,,2000-05-25,11-00-00"
    "SPAN-A:TDEV-512S,0,COMPL
                ,,,,,2000-05-25,11-00-00"
    "SPAN-A:TDEV-1024S,0,COMPL
                ,,,,,2000-05-25,11-00-00"
    /*LINK:5002,CMD:RTRV-PM-EQPT::
                SPAN-A:G::TDEV*/
;
```

Retrieve Performance Monitoring (cont'd)

PHASE1S Response Format:

```
    <sid> <date> <time>
M   <ctag>COMPLD
    "SPAN-a:PHASE1S,<monval>,<Δ>,<Δ>,<Δ>,<Δ>,
<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,
<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,
<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,
<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,
<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,
<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,
<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,
<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<vldty>,,,,
<mondat>,<montm>"
          .          .          .
          .          .          .
          .          .          .
    "SPAN-a:PHASE1S,<monval>,<Δ>,<Δ>,<Δ>,<Δ>,
<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,
<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,
<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,
<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,
<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,
<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,
<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,
<Δ>,<Δ>,<Δ>,<Δ>,<Δ>,<vldty>,,,,
<mondat>,<montm>"
;
```

Retrieve Performance Monitoring (cont'd)

Note: PHASE 1S Data types:

- One 15 minute bin from the last 24 hours of data as 900 seconds of data. To select a 15 minute bin, enter mondat and montm. Any mondat/montm combination outside of the past 24 hour window is denied. Any time increment may be entered. The system rounds the value to the nearest bin. Entered minutes of 1 to 15 correspond to the first 15 minute bin, 16 to 30 correspond to the second 15 minute bin, etc.

- The first monitor value is the first second of the 900 second window.

- The 900 seconds of data is broken into 9 groups of 100 seconds. For each group of 100 seconds, the first value is the absolute 1 second phase for that group. The absolute 1 second phase value is followed by 99 seconds of delta phase values.

- Entering the date or time is optional. Type a semicolon after montype to display the most recent statistics for the specified montype.

Retrieve Performance Monitoring (cont'd)

Parameter	Value	Item Addressed
SPAN-a	a = A	E1 span A input
	a = B	E1 span B input
PHASE1S	—	Phase 1S monitored type, which shows 900 s of phase values
<monval>	First s of the 100 s data group. There are 9 groups of 100 s.	Absolute monitored phase value
<Δ>	The difference (Δ) from the proceeding number	99 s of delta phase values which follow the absolute 1 s phase value
<vldty>	COMPL	Data is valid
	NA	Data is not valid
<mondat>	yyyy-mm-dd	Date of monitored data
<montm>	hh-mm-ss	Time of monitored data

Retrieve Performance Monitoring (cont'd)

PHASE 1S Response Example:

```
    TS3600-2009 2000-05-25 11:01:58
M  G COMPLD

"SPAN-A:PHASE1S,-325,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,1,0,0,0,0,0,0,0
,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,0,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0,0,0,0,0,COMPL,,,,2000-10-13,12-45-
00"

  "SPAN-A:PHASE1S,-323,0,0,0,0,0,0,1,0,0,0,0,0,
0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0,0,0,0,0,0,COMPL,,,,2000-10-13,12-
46-40"

  "SPAN-A:PHASE1S,-321,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,-1,0,0,0,0,0,0,0,
0,0,0,0,0,0,0,0,0,0,0,0,0,0,COMPL,,,,2000-10-13,12-
48-20"

   "SPAN-A:PHASE1S,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0,0,0,0,0,NA,,,,2000-10-13,12-50-00"

   "SPAN-A:PHASE1S,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0,0,0,0,0,NA,,,,2000-10-13,12-51-40"
```

Retrieve Performance Monitoring (cont'd)

PHASE 1S Response Example (cont'd):

```
"SPAN-A:PHASE1S,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0,0,0,0,0,NA,,,,2000-10-13,12-53-20"

   "SPAN-A:PHASE1S,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0,0,0,0,0,NA,,,,2000-10-13,12-55-00"

   "SPAN-A:PHASE1S,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0,0,0,0,0,NA,,,,2000-10-13,12-56-40"

   "SPAN-A:PHASE1S,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0,0,0,0,0,NA,,,,2000-10-13,12-58-20"

   /* LINK: 5001, CMD: RTRV-PM-EQPT::SPAN-A:C::
PHASE1S,,,,, */

;
```

Retrieve Performance Monitoring (cont'd)

PHASE1M Response Format:

```
     <sid> <date> <time>
M    <ctag>COMPLD
     "SPAN-a:PHASE1M,<monval>,<monval>,
          <monval>,<monval>,<monval>,<monval>,
                .          .          .
                .          .          .
                .          .          .
          <monval>,<monval>,<monval>,<monval>,
          <vldty>,,,,<mondat>,<montm>"
     /*LINK:<link>,CMD:<command>*/
;
```

Retrieve Performance Monitoring (cont'd)

Note: PHASE 1M Data types:

- The TimeSource 3600 collects a full 7 days of 1 minute phase data.
- The 1 minute phase data is displayed in 1 hour groups. Each request for 1 minute phase is synchronized to the hour.
- Any mondat/montm combination outside of the past 7 day window is denied. Any time increment may be entered. The system rounds the value to the nearest hour, i.e., the minute and second field of the montm is ignored.
- The first value (monval) is the oldest value in the range selected. For example, if montm = 8:45:32, the first monval will exceed time 8:00:00 followed by the value at 8:01:00, etc.
- Entering the date or time is optional. Type a semicolon after montype to display the most recent statistics for the specified montype.

Retrieve Performance Monitoring (cont'd)

Parameter	Value	Item Addressed
SPAN-a	a = A	E1 span A input
	a = B	E1 span B input
PHASE1M	—	Phase 1M monitored type, which shows 1 min phase data in 1 h groups of data
<monval>	Oldest value in the range selected from the <montm> value assigned in the command	Absolute monitored phase value
<vldty>	COMPL	Data is valid
	NA	Data is not valid
<mondat>	yyyy-mm-dd	Date of monitored data
<montm>	hh-mm-ss	Time of monitored data

PHASE1M Response Example:

```
    TS3600-2009 2000-05-25 11:01:58
M  G COMPLD
   "SPAN-A:PHASE1M,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,0,0,0,0,0,0,0,0,0,0,
```

Retrieve User Security

This command allows a system administrator to retrieve security parameters for a single user or for all users. The command format is:

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

Parameter	Value	Item Addressed
<uid>	(user name)	Single user
	ALL	All users

Response Format:

```
     <sid> <date> <time>
M    <ctag> COMPLD
     "<aid>:,<uap>;,UOUT=<uout>"...
     /*LINK:<link>,CMD:<command>*/
;
```

Parameter	Parameter Description
<uap>	Access level (1 to 5)
<uout>	(Displayed, but not implemented) Password for this account expires in this number (0 to 180) of days of inactivity; 0 indicates no expiration

Set Source Identifier

This command sets the name of the equipment sending the message. The command format is:

```
SET-SID:[<tid>]::<ctag>::<sid>;
```

Parameter	Parameter Description
<sid>	Source identifier – can be up to 20 uppercase or lowercase ASCII characters

Response Format:

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

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Troubleshooting

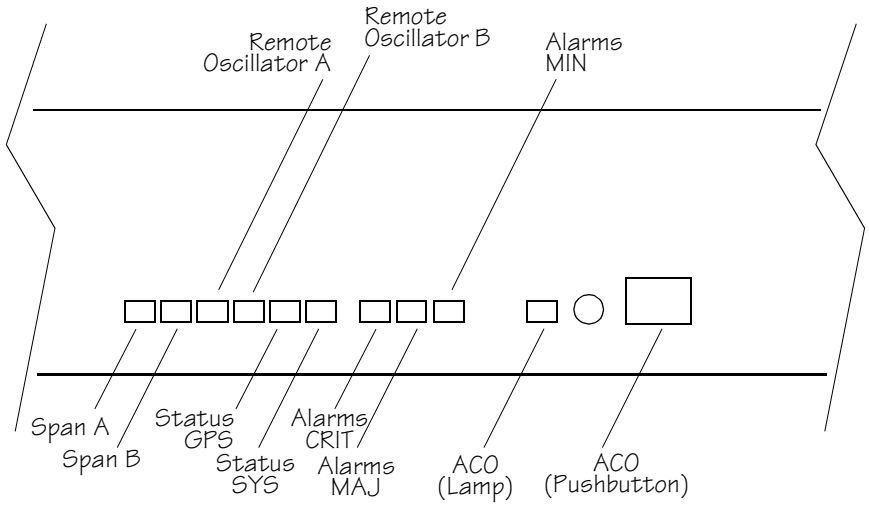
This chapter provides troubleshooting information using front-panel lamps and error messages. It also describes how to replace a card, return equipment, get technical and/or sales assistance, and obtain manual updates.

Chapter 5

Troubleshooting with Front Panel Items

All front panel items are shown in Figure 39. The items are described in Table K. Use Table K to troubleshoot the system based on the front-panel lamps.

Figure 39. Controls and Indicators



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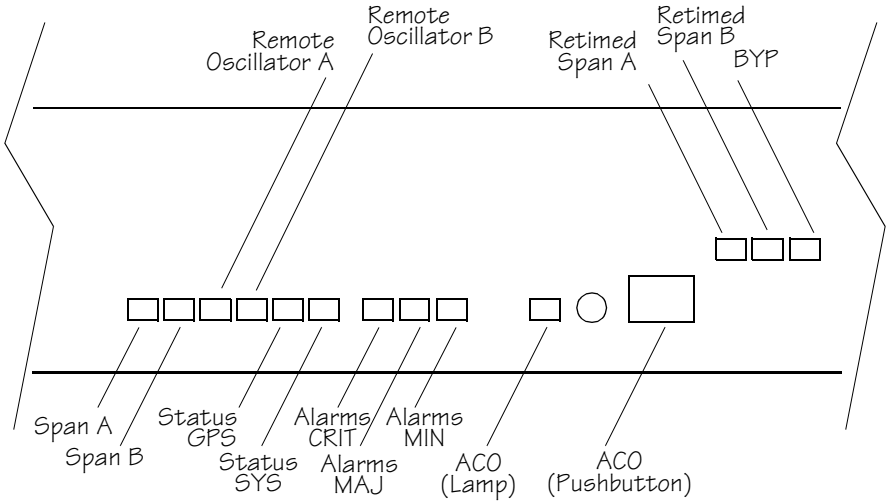


990-72060-04 Systems

Table K. Front Panel Items

Name	Status	Description	Action
Status GPS	Off	System is not powered.	If in warm-up, none required. If there is no power, apply power.
	Green	GPS is successfully tracking satellites, or is in warm-up.	None required.
	Yellow	A GPS event has occurred.	None required. This event becomes a minor alarm after 10 h.
	Red	A GPS event, which has existed for more than 10 h, has escalated to a minor alarm.	Refer to Table Table L to determine which type and combination of antenna alarms exist, and the recommended action.
Status SYS	Off	System is in warm-up mode or is not powered.	If in warm-up, none required. If there is no power, apply power.
	Green	The output signal is PRS.	None required.
	Red	The system has been in holdover for more than 72 h, or there is a hardware fault.	Refer to Table Table L to determine which type and combination of alarms exist, and the recommended action.
Alarms CRIT	Off	There is no critical alarm.	None required.
	Red	A critical alarm has occurred because of a hardware failure.	Replace the plug-in card, using Procedure Procedure H.
Alarms MAJ	Off	There is no major alarm.	None required.
	Red	The system has been in holdover for more than 72 h.	Refer to Table Table L to determine which type and combination of antenna alarms exist, and the recommended action.

Table K. Front Panel Items (cont'd)

Name	Status	Description	Action
Alarms MIN	Off	There is no minor alarm.	None required.
	Yellow	A minor alarm has occurred because Battery A or B has failed.	Troubleshoot and repair the specified –48 V battery input.
		A minor alarm has occurred because a software download is required.	Refer to Table Table L to determine which software needs to be downloaded and the recommended action.
		A minor alarm has occurred because an event (GPS error, temperature error, or span input problem) has escalated to a minor alarm.	Refer to Table Table L to determine which event occurred and the recommended action.
		A minor alarm has occurred because the antenna failed.	Refer to Table Table L to determine whether the minor alarm is due to antenna failure and the recommended action.
ACO (Lamp)	Off	The alarm cutoff function has not been activated.	None required. Press the ACO pushbutton to silence all audible alarms.
	Green	The alarm cutoff function has been activated.	None required.
ACO (Pushbutton)	—	Silences all audible alarms when pressed.	None required.
Retimed Span A or B (990-72060-04 systems only)	Off	This port has not been entered via the Enter Equipment command.	None required. If desired, enter this port via the Enter Equipment command.
	Green	This port has been entered via the Enter Equipment command, and no alarms are present.	None required.

Table K. Front Panel Items (cont'd)

Name	Status	Description	Action
Retimed Span A or B (990-72060-04 systems only)	Red	An event (loss of signal) has occurred on this port	Troubleshoot the traffic-carrying span input signal source; check the ESCIU port cable and connections.
BYP (990-72060-04 systems only)	Off	Traffic-carrying E1 data stream is being retimed by the TimeSource 3600 System.	None required.
	Red	Traffic-carrying E1 data stream is bypassing the TimeSource 3600 System and not being retimed because the system is in holdover.	Refer to Table L to troubleshoot the GPS, SPAN x, and RO x error messages.

Troubleshooting with Error Messages

Use the information in Table L to troubleshoot the system based on the condition description (conddescr) parameter in a message.

Note: If only the character "C" is displayed on the terminal every few seconds, the TimeSource 3600 system has restarted with corrupt software. Download and install the system software again, using the procedure in the Software Release Document that came with the software.

Table L. Message Troubleshooting

Message	Meaning	Action
CRITICAL ALARMS		
HARDWARE FAULT	A failure has been detected on the shelf hardware.	Replace the plug-in card.
MAJOR ALARMS		
HOLDOVER	All inputs (GPS signal and span inputs) are lost or unacceptable, and the system is now using the internal oscillator.	Troubleshoot the GPS and SPAN x error messages. Check cable, source, etc.
MINOR ALARMS		
BATTERY x FAIL	The specified –48 V battery input has failed.	Troubleshoot, and repair, the specified –48 V battery input.
BT3 WARMUP	The system is in a power-up state when it should not be.	Perform the same action as shown in GPS ERROR message.

Table L. Message Troubleshooting (cont'd)

Message	Meaning	Action
DEVICE DOWNLOAD REQUIRED	The hardware device software is corrupt or missing.	Download and install the appropriate hardware device (DEV) software, using the procedure in the Software Release Document that came with the software.
GPS ERROR	The GPS receiver is reporting an error.	If the installation includes a roof antenna, or if the message is accompanied by the HIGH CURRENT FAULT or LOW CURRENT FAULT message, follow the recommended action for the HIGH CURRENT FAULT or LOW CURRENT FAULT message. If the installation includes a window or wall antenna: 1. Note the satellite tracking success rate reported by the RTRV-GPS-STAT command. 2. If the success rate is better than 40%, follow the recommended action for the HIGH CURRENT FAULT or LOW CURRENT FAULT message. 3. If the success rate is less than 40%, check that the latitude, longitude, and altitude data (position data) are correct. 4. If the position data are correct and the error repeats, move the antenna to a location with an improved view of the sky. 5. If the error repeats, follow the recommended action for the HIGH CURRENT FAULT or LOW CURRENT FAULT message.
GPS DOWNLOAD REQUIRED	The GPS software is corrupt or missing.	Download and install the GPS receiver (GPS) software, using the procedure in the Software Release Document that came with the software.

Table L. Message Troubleshooting (cont'd)

Message	Meaning	Action
HIGH CURRENT FAULT LOW CURRENT FAULT	Current to antenna is outside specification.	If not accompanied by the GPS ERROR alarm, none required. If accompanied by the GPS ERROR alarm: 1. Check the cable connections between the TimeSource 3600 Shelf and the antenna. 2. If the error repeats, remove the antenna cable from the rear of the shelf, and measure the dc voltage from the connector center pin to the connector housing on the shelf TNC antenna connector. 3. If the voltage is not 18 V dc ±2 V dc, replace the TimeSource 3600 card, using Procedure Procedure H. 4. If the voltage is 18 V dc ±2 V dc, measure the current between the antenna connector center pin and the connector housing on the shelf TNC antenna connector. 5. If the current is less than 5 mA or more than 500 mA, replace the TimeSource 3600 card, using Procedure Procedure H. If not (nominal current is 125 mA), re-connect the antenna cable to the rear of the shelf. 6. Remove the antenna cable from the antenna, and measure dc voltage and current from the connector center pin to the connector housing on the cable connector. 7. If the readings are 18 V dc and 125 mA, replace the antenna. If not, verify the cable path. Replace cables, lightning suppressor, or IF converter as necessary. 8. If the error repeats, replace the antenna.

Table L. Message Troubleshooting (cont'd)

Message	Meaning	Action
SPAN x AIS	An AIS has been received on the specified input span.	Troubleshoot the specified input span signal (check source).
SPAN x ERROR	An error has been detected on the specified input span.	Troubleshoot the specified input span signal (include checks for signal frequency and jitter).
SPAN x LOSS OF SIGNAL	The signal on the specified input span has been lost.	Troubleshoot the specified input span signal (check 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 occurs during steady state operation: 1. Check that the ambient air temperature is within the TimeSource 3600 environmental specifications. If not, correct the ambient temperature with heating or air conditioning. 2. If the ambient air temperature is within the TimeSource 3600 environmental specifications, replace the plug-in card.
TS3600 DOWNLOAD REQUIRED	The system software is corrupt or missing.	Download and install the system (TimeSource 3600) software again, using the procedure in the Software Release Document that came with the software.
EVENTS		
BT3 WARMUP	The system is in a power-up state.	Wait for the system to power up (20 min to several hours, depending on antenna placement and view of the sky).

Table L. Message Troubleshooting (cont'd)

Message	Meaning	Action
COM-x USER TIMEOUT LOGOFF	The user was auto logged off.	If COM-x is the port this message was received on, retry logging in. If not, none required.
DISCONNECTED USER LOGOFF	A user was logged off by the system administrator.	None required.
HOLDOVER	All inputs (GPS signal, span inputs) are lost or unacceptable. The system is using the internal oscillator.	None required. Becomes major alarm after 72 h.
CRITICAL ACO EVENT	The ACO pushbutton has been pressed to deactivate a critical audible alarm.	None required.
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. Becomes minor alarm after 10 h.
MAJOR ACO EVENT	The ACO pushbutton has been pressed to deactivate a major audible alarm.	None required.
MINOR ACO EVENT	The ACO pushbutton has been pressed to deactivate a minor audible alarm.	None required.
POWER UP RESTART	The system processor has just started up.	None required.

Table L. Message Troubleshooting (cont'd)

Message	Meaning	Action
SCIU x LOSS OF SIGNAL	The signal on the specified ESCIU port has been lost.	Troubleshoot the traffic-carrying span input signal source, ESCIU port cable, and ESCIU port connections.
SCIU x SLIP	The specified ESCIU port has a frame slip.	Troubleshoot the traffic-carrying span input signal source.
SETTLING PERIOD	The system is between the power-up state and steady-state operation, and signals may be degraded.	None required.
SOFTWARE DOWNLOADING ON LINK	Software is being downloaded at specified communication port.	None required.
SPAN x AIS	An AIS has been received on the specified input span.	Troubleshoot the specified input span (check the source). Becomes minor alarm after 24 h.
SPAN x ERROR	An error has been detected on the specified input span.	Troubleshoot the specified input span (check the source). Becomes minor alarm after 24 h.
SPAN x LOSS OF SIGNAL	The signal on the specified span input has been lost.	Troubleshoot the specified input span (check the source). Becomes minor alarm after 24 h.
SPAN x SSM QUALITY SEC	The signal on the specified span input has degraded to an SSM quality level of SEC.	Troubleshoot the specified input span (check the source). Becomes minor alarm after 24 h.
SPAN x SSM QUALITY SSUL	The signal on the specified span input has degraded to an SSM quality level of SSUL.	Troubleshoot the specified input span (check the source). Becomes minor alarm after 24 h.
SPAN x SSM QUALITY SSUT	The signal on the specified span input has degraded to an SSM quality level of SSUT.	Troubleshoot the specified input span (check the source). Becomes minor alarm after 24 h.

Table L. Message Troubleshooting (cont'd)

Message	Meaning	Action
TEMPERATURE ERROR	A temperature error has been detected on the internal oscillator.	Wait until this escalates to a minor alarm, or check that the ambient air temperature is within the TimeSource 3600 environmental specifications. If not, correct the ambient temperature with heating or air conditioning. Becomes minor alarm after 10 h.

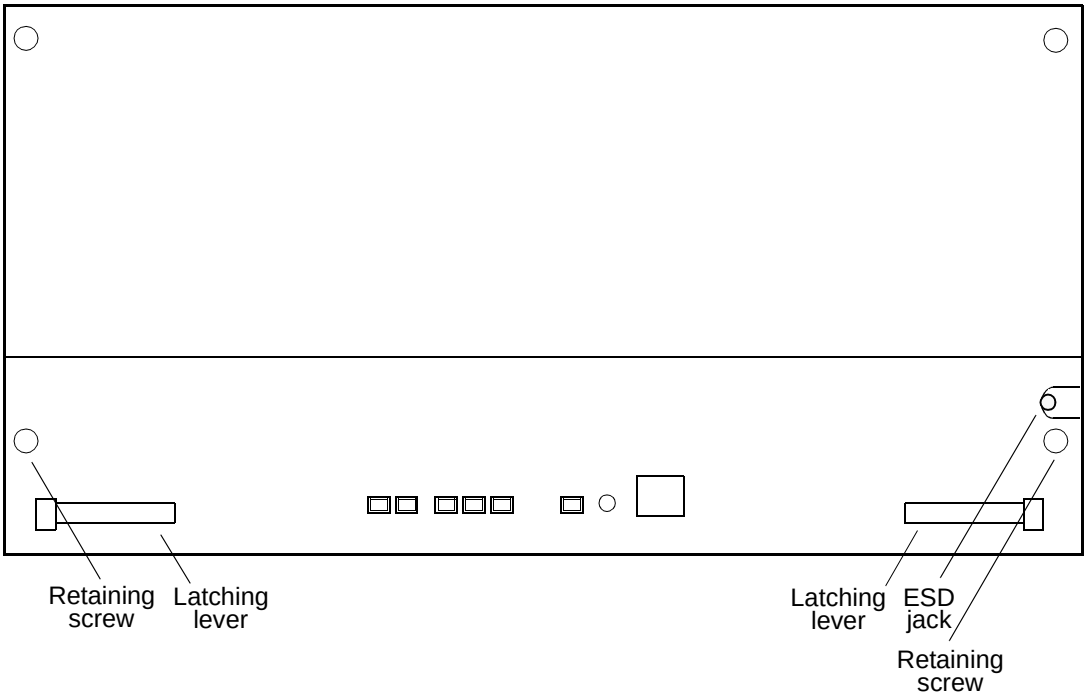
Card Replacement

To replace the plug-in card, follow the steps in Procedure H, and refer to Figure 40.

Procedure H. Card Replacement

Step	Procedure
1	Put on an ESD wrist strap.
2	Plug the ESD wrist strap into the ESD jack on of the front panel of the shelf.
	On the Faulty Card
3	Loosen the two retaining screws that secure the plug-in card in the shelf.
4	Pull out on the two latching levers to disconnect the card from the shelf connectors.
5	Pull the card completely out of the shelf.
	On the Replacement Card
6	Pull out the latching levers at each end of the front panel of the card so that the levers are pointing directly out from the front panel of the card.
7	Insert the new card into the tracks at each side of the shelf, and slide the card into the shelf until the latching levers begin to move in.
8	Push the latching levers flat against the front panel of the card to complete the card insertion.
9	Tighten the knurled screw above each latching lever to secure the card in the shelf.
10	Unplug and remove the grounding wrist strap.
11	Reconfigure the system per application requirements.
	End of Procedure

Figure 40. Front of Shelf



Repair and Return

When returning defective equipment for factory repair, obtain the following information prior to calling Symmetricom:

- A complete description of the trouble (alarms, equipment behavior, etc.), part number, serial number, issue/revision level, and warranty expiration date.
- If the warranty has expired, a purchase order with “bill to” information.
- A customer field technical contact including address, phone number and FAX number.
- Return shipping information.

To return defective or damaged equipment, use Procedure I.

Procedure I. Equipment Return

Step	Procedure
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.

End of Procedure

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
Fax: 408-428-7998

Europe, Middle East, and Africa (EMEA) Call Center:
+44.7000.111.666
Fax: +44.7000.666.111

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

Europe, Middle East, and Africa (EMEA) Call Center:
+44.7000.111888
+44.1483.510300

Fax: 408-428-7998

E-mail: info@symmetricom.com

Internet: http://www.symmetricom.com

Manual Updates

From time to time, this manual may be updated. The updated version of the manual will be available for downloading in electronic form via the internet. After downloading, the manual can be viewed on a computer or printed out.

Manual updates are available at: http://www.symmetricom.com.

Chapter 6

Specifications

This chapter provides equipment specifications.

Antenna

Roof Antenna

Type:	Active volute antenna, right-hand circular polarized, with proprietary IF interface
Cable Length:	Maximum 330 m from antenna to shelf
Dimensions: (excluding mount)	
Height:	28 cm
Diameter:	11 cm
Weight:	255 g
Operating Temperature:	–30 °C to +80 °C
Storage Temperature:	–40 °C to + 80 °C
Operating Humidity:	0% to 100% relative humidity

Mechanical Window Antenna

Type:	Patch antenna and proprietary IF interface
Cable Length:	Maximum 305 m from antenna to shelf
Dimensions:	
Height:	45.7 cm
Width:	7.9 cm
Depth:	6.9 cm
Weight:	510 g

Antennas (cont'd)

Wall Antenna

Type:	Patch antenna and proprietary IF interface
Cable Length:	Maximum 305 m from antenna to shelf
Dimensions:	
Height:	12.5 mm
Width:	37 mm
Depth:	46 mm
Weight:	35 g

Self-Adhesive Antenna

Type:	Patch antenna and proprietary IF interface
Cable Length:	Maximum 305 m from antenna to shelf
Dimensions:	
Height:	7.6 cm
Width:	10.2 cm
Depth:	4.3 cm
Weight:	170 g

Communication Ports

Port 1

Connector Type:	25-pin, female D connector
Connector Label:	COM1
Connector Location:	Connector panel
Electrical Interface:	RS-232 (DTE equivalent)
Pin that transmits data:	2
Pin that receives data:	3
Baud Rate:	1200 b/s 2400 b/s 4800 b/s 9600 b/s (factory default) 19.2 kb/s 38.4 kb/s 57.6 kb/s 115 kb/s
Data Bits:	8
Parity Bit:	None Even Odd
Stop Bits:	1 2
Flow Control:	None Software (XON/XOFF) Hardware (CTS/RTS)

Communication Ports (cont'd)

Port 2

Connector Type:	9-pin, female D connector
Connector Label:	COM2
Connector Location:	Connector panel
Electrical Interface:	RS-232 (DCE equivalent)
Pin that transmits data:	3
Pin that receives data:	2
Baud Rate:	1200 b/s 2400 b/s 4800 b/s 9600 b/s (factory default) 19.2 kb/s 38.4 kb/s 57.6 kb/s 115 kb/s
Data Bits:	8
Parity Bit:	None Even Odd
Stop Bits:	1 2
Flow Control:	None Software (XON/XOFF) Hardware (CTS/RTS)

Communication Ports (cont'd)

Craft Port

Connector Type:	RJ-45
Connector Label:	Craft
Connector Location:	Front panel
Electrical Interface:	RS-232 (DTE equivalent)
Pin that transmits data:	2
Pin that receives data:	3
Baud Rate:	1200 b/s 2400 b/s 4800 b/s 9600 b/s (factory default) 19.2 kb/s 38.4 kb/s 57.6 kb/s 115 kb/s
Data Bits:	8
Parity Bit:	None Even Odd
Stop Bits:	1 2
Flow Control:	XON/XOFF CTS/RTS

Ethernet Port

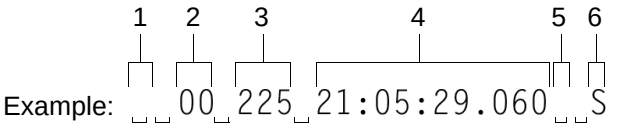
Connector Type:	RJ-45 (10Base-T)
Connector Label:	Ethernet
Connector Location:	Connector panel
Electrical Interface:	10base-T Ethernet
Data Rate:	10Mb/s
Protocol:	TCP/IP (interface)
Setup Language:	TL1 (application layer)

Time of Day Outputs

Network Time Protocol (NTP),vt Type 4, Format 2 Driver Format

Connector Type:	RJ-45
Connector Label:	TOD
Connector Location:	Connector panel
Electrical Interface:	RS-485
Baud Rate:	9600 bps
Data Bits:	8
Parity Bit:	None
Stop Bit:	1
Data Format:	See Figure 41

Figure 41. NTP Type 4 Data Format



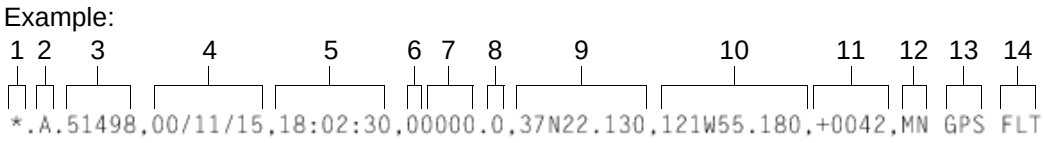
1 Alarm field: blank space = receiver has satellite availability; ? = no satellite available
2 Year (2000 in this example)
3 Day of year (the 225th day of the year in this example)
4 Hours:minutes:seconds:milliseconds
5 Leap second: blank space = no leap second; L = upcoming leap second
6 Daylight savings time indicator: S = standard time; D = daylight savings time

Time of Day Outputs (cont'd)

Cisco Systems Format

Connector Type:	RJ-45
Connector Label:	TOD
Connector Location:	Connector panel
Electrical Interface:	RS-485
Baud Rate:	9600 b/s
Bit Configuration:	8 data bits, No parity, 1 stop bit
Data Format:	See Figure 42

Figure 42. Cisco Systems Data Format



1 Satellite availability: * = valid, ! = not valid
2 Revision
3 Modified Julian date (number of days past midnight, Nov 17, 1858)
4 Year/month/day
5 Hours:minutes:seconds
6 Indicator of time zone offset (+, –, or 0)
7 Time zone offset
8 Leap second indicator
9 Latitude
10 Longitude
11 Altitude above mean sea level in meters
12 Alarm severity: EV = event, MN = minor, MJ = major, CL = critical
13 Alarm source
14 Alarm cause: holdover, BT3 warm-up, or hardware fault

Time of Day Outputs (cont'd)

IRIG-B TOD Outputs (990-72060-05 System Only)

Connector Type:	BNC	
Connector Labels:	OUT1 OUT2	
Connector Location:	Connector panel output module	
Impedance:	600 Ω	
Number of Outputs:	2	
Type of Output:	Amplitude modulated	
Amplitude:	6 V peak-to-peak maximum terminated with 600 Ω	
Time Format:		
Binary Coded Decimal (BCD):	Seconds:	0 – 59
	Minutes:	0 – 59
	Hours:	0 – 23
	Days:	0 – 364
	Years:	0 – 99
Non BCD:	Seconds of day:	0 – 86399

E1 Inputs

Connector Type:	Wire-wrap pins for 120 Ω balanced terminations BNC for 75 Ω unbalanced terminations (Use only BNC or only wire-wrap connector, not both, for one input.)
Connector Label:	
BNC:	SPAN IN A SPAN IN B
Wire-Wrap (2 sets):	T R S
Connector Location:	Connector panel
Impedance:	120 Ω ±5% balanced or 75 Ω ±5% unbalanced
Bit Rate:	2.048 Mb/s
Format:	E1
Framing:	CAS CAS4 CCS CCS4
Line Code:	HDB3
SSM:	
State:	Enable Disable
Framing:	CAS4 CCS4
Channels:	Sa4 Sa5 Sa6 Sa7 Sa8
Amplitude:	+3 dB to –33 dB

Analog 2.048 MHz Inputs

Connector Type:	Wire-wrap pins for 120 Ω balanced terminations BNC for 75 Ω unbalanced terminations (Use only BNC or only wire-wrap connector, not both, for one input.)
Connector Label:	
BNC:	SPAN IN A SPAN IN B
Wire-Wrap (2 sets):	T R S
Connector Location:	Connector panel
Impedance:	120 Ω ±5% balanced or 75 Ω ±5% unbalanced
Frequency:	2.048 MHz
Format:	Analog

1 PPS Output

Connector Type:	BNC
Connector Label:	TTL PPS
Connector Location:	Connector panel
Impedance:	50 Ω
Frequency:	1 pps
Amplitude:	Transistor-transistor logic (TTL) levels
Time Accuracy:	100 ns with respect to Universal Coordinated Time (UTC) when locked to GPS signal
GPS Holdover Time Error:	3 µs for 72 h (0 °C to +50 °C ± 5 °C) after one week of steady-state operation
Format:	Logic low with logic high pulse of 1 µs
Rise Time:	Less than 20 ns

E1 Outputs

Standard

Connector Type:	Wire-wrap pins for 120 Ω balanced terminations BNC for 75 Ω unbalanced terminations (Use only BNC or only wire-wrap connector, not both, for one output.)
Connector Label:	
BNC:	E1 OUT A E1 OUT B
Wire-Wrap (2 sets):	T R S
Connector Location:	Connector panel
Impedance:	120 Ω balanced or 75 Ω unbalanced
Bit Rate:	2.048 Mb/s
Frequency Accuracy:	1×10^{-12}
GPS Holdover Stability:	1×10^{-11} for 72 h (0 °C to +50 °C ± 5 °C) after one week of steady-state operation 1×10^{-10} for 30 days after one week of steady-state operation
Format:	Framed all 1s
Line Code:	HDB3
Amplitude:	3.0 V nominal terminated with 120 Ω balanced 2.37 V nominal terminated with 75 Ω unbalanced

E1 Outputs (cont'd)

Standard (cont'd)

Framing:	CAS CAS4 CCS CCS4
Output During Alarms:	AIS Squelch SSM Forced
SSM:	
State:	Enable Disable
Framing:	CAS4 CCS4
Channels:	Sa4 Sa5 Sa6 Sa7 Sa8

E1 Outputs (cont'd)

Additional E1 Outputs (990-72060-02 System Only)

Connector Type:	Wire-wrap pins for 120 Ω balanced terminations BNC for 75 Ω unbalanced terminations
Connector Labels:	
Wire-Wrap (8 sets):	T R S
BNC:	OUT1 OUT2 OUT3 OUT4 OUT5 OUT6 OUT7 OUT8
Connector Location:	Connector panel output module
Impedance:	120 Ω balanced or 75 Ω unbalanced
Bit Rate:	2.048 Mb/s
Frequency Accuracy:	1×10^{-12}
GPS Holdover Stability:	1×10^{-11} for 72 h (0 °C to +50 °C ± 5 °C) after one week of steady-state operation 1×10^{-10} for 30 days after one week of steady-state operation
Format:	Framed all 1s

E1 Outputs (cont'd)

Additional E1 Outputs (cont'd) (990-72060-02 System Only)

Line Code:	HDB3
Amplitude:	3.0 V nominal terminated with 120 Ω balanced 2.37 V nominal terminated with 75 Ω unbalanced
Framing:	CAS CAS4 CCS CCS4
Output During Alarms:	AIS Squelch SSM Forced
SSM:	
State:	Enable Disable
Framing:	CAS4 CCS4
Channels:	Sa4 Sa5 Sa6 Sa7 Sa8

Analog 2.048 MHz Outputs

Standard

Connector Type:	Wire-wrap pins for 120 Ω balanced terminations BNC for 75 Ω unbalanced terminations (Use only BNC or wire-wrap connector for a single output.)
Connector Label:	
BNC:	E1 OUT A E1 OUT B
Wire-Wrap (2 sets):	T R S
Connector Location:	Connector panel
Impedance:	120 Ω balanced or 75 Ω unbalanced
Frequency:	2.048 MHz
Frequency Accuracy:	1×10^{-12}
GPS Holdover Stability:	1×10^{-11} for 72 h (0 °C to +50 °C ± 5 °C) after one week of steady-state operation 1×10^{-10} for 30 days after one week of steady-state operation
Format:	Square wave
Amplitude (nominal):	1.5 V terminated with 120 Ω balanced 1.18 V terminated with 75 Ω unbalanced

Analog 2.048 MHz Outputs (cont'd)

Additional Analog Outputs (990-72060-02 System Only)

Connector Type:	Wire-wrap pins (120 Ω balanced terminations) BNC (75 Ω unbalanced terminations)
Connector Labels:	
Wire-Wrap (8 sets):	T R S
BNC:	OUT1 OUT2 OUT3 OUT4 OUT5 OUT6 OUT7 OUT8
Connector Location:	Connector panel output module
Impedance:	120 Ω balanced or 75 Ω unbalanced
Frequency:	2.048 MHz
Frequency Accuracy:	1×10^{-12}
GPS Holdover Stability:	1×10^{-11} for 72 h (0 °C to +50 °C ± 5 °C) after one week of steady-state operation 1×10^{-10} for 30 days after one week of steady-state operation
Format:	Square wave
Amplitude (nominal):	1.5 V terminated with 120 Ω balanced 1.18 V terminated with 75 Ω unbalanced

10 MHz Output

Connector Type:	BNC
Connector Label:	10 MHz
Connector Location:	Connector panel
Impedance:	50 Ω
Frequency:	10 MHz
Stability:	5×10^{-12} Root Allen Variance (RAV) at 10 s
Phase Noise:	–110 dBc @ 10 Hz –135 dBc @ 100 Hz –140 dBc @ 1 kHz –145 dBc @ 10 kHz
Harmonic Distortion:	–40 dBc
Spurious Distortion:	–70 dBc
Format:	Sine wave
Amplitude:	1 V peak-to-peak minimum terminated with 50 Ω 3.5 V peak-to-peak typical terminated with 50 Ω

ESCIU Ports (990-72060-04 System Only)

Connector Type:		75Ω BNC 120 Ω Wire-wrap
Connector Labels:		
Wire-wrap:	SPAN 1:	RTN1 (T, R, S) (2 sets of pins) IN (T, R, S) OUT (T, R, S)
	SPAN 2:	RTN2 (T, R, S) (2 sets of pins) IN (T, R, S) OUT (T, R, S)
BNC:	SPAN 1:	RTN1 OUT RTN1 IN OUT IN
	SPAN 2:	RTN2 OUT RTN2 IN OUT IN
Connector Location:		Connector panel output module
Electrical Interface:		E1 (ITU G.703 and G.704)
Ports:		Two bidirectional: (E1 signals are buffered and retimed in forward direction, passed through in reverse direction)
Maximum cable length:		150 m (either direction, to or from DDF)
CSU Functionality:		None
Output During LOS Alarm:		AIS LOS
Input jitter tolerance:		ITU G.823 (1993) requirements
Input wander tolerance:		±125 µs

Office Alarms

Connector Panel Contacts

Connection:	Wire-wrap pins
Type:	Dry contact
Contact Rating:	1 A @ 30 V dc 0.5 A @ 60 V dc 0.5 A @ 125 V ac
Severity:	Critical Major Minor
State:	Normally open and normally closed
Style:	Audible and visible

Front Panel Lamps

Label:	Alarms: CRIT, MAJ, MIN, ACO Status: GPS, SYS
990-72060-04 System only:	Retimed Spans: A, B, BYP
Type:	Light emitting diode

Front Panel Control

Label:	ACO
Type:	Push button switch
Function:	Alarm cutoff (deactivates audible office alarms)

Power

Connector Type:	Terminal block
Connector Labels:	TB1 TB2
Voltage:	–40 V dc to –72 V dc (A & B feed)
Current:	750 mA maximum
Steady-State Power:	30 W maximum
Recommended Fuse for Battery Feed:	3 A

Shelf Mechanical

Rack Mounting:	48.5 cm rack 53.5 cm rack
Mounting Positions:	Flush 12.7 cm offset (48.5 cm rack only)
Width:	48.3 cm
Height:	22.2 cm maximum
Depth:	30.5 cm maximum
Weight:	5.9 kg

Shelf Environmental

Operating Temperature:	0 °C to +50 °C
Operating Humidity:	Up to 95% noncondensing
Electromagnetic Compliance:	CE

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