

OT-21 Primary Reference Receiver and Synchronization Supply Unit

SNTP Operator's Guide
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How to Use This Guide

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

In This Preface

- [Purpose of This Guide](#)
- [Who Should Read This Guide](#)
- [Structure of This Guide](#)
- [Conventions Used in this Guide](#)
- [Warnings, Cautions, Recommendations, and Notes](#)
- [Related Documents and Information](#)
- [What's New in This Guide](#)

Purpose of This Guide

The *OT-21 SNTP Operator's Guide* is a subset of the *OT-21 Primary Reference Receiver and Synchronization Supply Unit User Guide* item number 12713150-002-2 Revision D. The *OT-21 SNTP Operator's Guide* provides details on the OT-21's SNTP function and describes the procedures for unpacking, installing, using, maintaining, and troubleshooting the Unit. It also includes appendixes that describe SNTP related alarms and events, SNTP related commands of the languages used to communicate with the OT-21, default values, and other information. For details on the OT-21's clock input and output functions and other system configurations that are available, refer to the *OT-21 User Guide*.

Who Should Read This Guide

[Chapter 1, Product Overview](#), is written for non-technical audiences who need general information about the product. [Chapter 2, Functional Overview](#), and subsequent chapters contain technical information about the product. Other chapters and appendixes describe installation, maintenance, and configuration instructions or details primarily intended for qualified maintenance personnel.

Structure of This Guide

This guide contains the following sections:

Chapter, Title	Description
How to Use This Guide	Describes the audience, the features of this guide, and related information.
Chapter 1, Product Overview	Provides a high-level description of the OT-21, hardware and software requirements, product configurations, and product features.
Chapter 2, Functional Overview	Provides a functional description of the OT-21, including basic information applicable to the entire product, and a functional description of the component hardware and specifications.
Chapter 3, Installing the OT-21	Contains an overview of installing the OT-21 and installation and connection procedures for the OT-21 and antenna. The chapter concludes with the Installation Completeness Checklist.

Chapter, Title	Description
Chapter 4, Power-Up and Configuration	Contains an overview of the power-up sequence, connecting the OT-21 unit to a laptop, PC, or terminal for setting options and provisioning, and a guide to using the Interactive ASCII optioning interface and command language, including all commands, syntax, and usage examples that relate to the SNTP function.
Chapter 5, Commissioning Tests	Contains a commissioning acceptance test, the equipment required for testing, and the commissioning tests to perform on the installed OT-21. This chapter concludes with the Commissioning Test Data Sheet for recording test results.
Chapter 6, Maintenance	Provides information about preventive and corrective maintenance.
Chapter 7, Repair and Troubleshooting	Provides a list of alarm conditions, recorded events, and troubleshooting guidelines for the OT-21.
Appendix A, Regulatory Requirements and Reference Material	Contains safety and EMC standards and requirements and references to pertinent industry documentation for the OT-21.
Appendix B, OT-21 Specifications	Provides specifications for the OT-21 and for its functional components. Categories include: operating conditions, power inputs, indicators, EMC and safety standards, and chassis dimensions.
Appendix C, ICS Commands	Describes the operation of the Interactive ASCII mode for OT-21 communications.
Appendix D, TL1 Commands	Describes the operation of the TL1 mode for OT-21 communications.
Appendix E, Default Configuration Settings	Lists the OT-21 factory default settings.
Appendix F, Accessories and Ordering	Contains information and specifications required for ordering antennas, antenna accessories, mounting, and connectivity accessories.

Conventions Used in this Guide

This guide uses the following conventions:

- **Acronyms and Abbreviations** – Terms are spelled out the first time they appear in text. Thereafter, only the acronym or abbreviation is used.
- **Revision Control** – The title page lists the printing date and versions of the product this guide describes.

- **Typographical Conventions** – This guide uses the typographical conventions described in the table below.

When text appears this way...	... it means:
OT-21 User Guide	The title of a document.
CRITICAL PORT-A J1	An operating mode, alarm state, status, or chassis label.
Press Enter . Press Print Scrn .	A named keyboard key. The key name is shown as it appears on the keyboard. An explanation of the key's acronym or function immediately follows the first reference to the key, if required.
OT-21 Username:	Text in a source file or a system prompt or other text that appears on a screen.
ENGINE TDATA STATUS	A command you enter at a system prompt or text you enter in response to a program prompt. You must enter commands for case-sensitive operating systems exactly as shown.
A <i>re-timing</i> application	A word or term being emphasized.
It <i>is not</i> recommended to...	A word or term given special emphasis.

Warnings, Cautions, Recommendations, and Notes

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



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



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



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



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



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



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

Related Documents and Information

Other helpful documents and software tools are listed below.

- OT-21 Download Application, item number 12713224-000-2
- SynCraft management software
- TimePictra management software

What's New in This Guide

This guide is a subset of the *OT-21 Primary Reference Receiver and Synchronization Supply Unit User Guide* item number 12713150-002-2 Revision D. This guide provides information on SNTP related operation, software commands, and alarms and events.

Chapter 1 Product Overview

This chapter includes an overview of the physical and functional description of the unit and provides a list of product features.

In This Chapter

- [Introduction](#)
- [Communication and Software Interface](#)
- [Product Features](#)

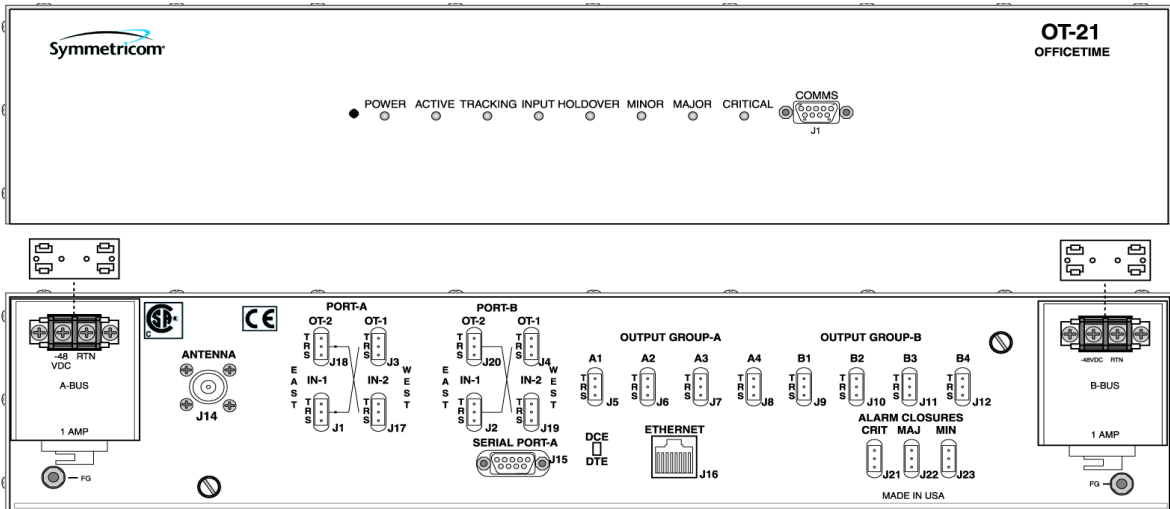
Introduction

The OT-21 family of network synchronization products provide timing solutions for central office (CO), end office, customer premises equipment room (CPE) sites, controlled environmental vaults (CEV), and telecommunications and data communications network operations.



Note: For a detailed description of the rear panel connectors labeled PORT-A, PORT-B, OUTPUT GROUP-A, and OUTPUT GROUP-B, refer to the *OT-21 User Guide*, part number 12713150-002-2 Revision D.

The Primary Reference Receiver (PRR) configuration features a highly accurate and reliable Primary Reference Source (PRS) that derives Stratum 1 timing from Global Positioning System (GPS) radio signals. Refer to [Figure 1-1](#) for the front and rear panel layout.



s2100004

Figure 1-1. OT-21 Front and Rear Panel



Note: The OT-21 with PRR function conforms to Telcordia Technologies, Inc. GR-2830 and ITU, ANSI, and ETSI requirements for a PRS.

Communication and Software Interface

The OT-21 Communications interface consists of two local EIA-232 ports and an Ethernet port. The EIA-232 communications ports are labeled COMMS J1 on the front panel and SERIAL PORT-A J15 on the rear panel. The Ethernet port is labeled Ethernet J16 on the rear panel.

The OT-21's two command protocol languages are the Interactive Command Set (ICS) and Transaction Language 1 (TL1). Both ICS and TL1 provide command sets to support all operation, administration, maintenance, and provisioning tasks required to maintain and control an OT-21 system. These tasks include configuring and provisioning security, monitoring system performance, configuring hardware, locating and handling faults, and performing equipment diagnosis and testing.

ICS is used to control an OT-21 from a terminal connected to one of the EIA-232 serial ports. ICS commands are designed in a more readable interface for users with an instructional help facility. Refer to [Appendix C, ICS Commands](#) for further details.

TL1 is specified as a standard man-machine language for controlling telecommunications network elements. Refer to [Appendix D, TL1 Commands](#) for further details.

Default factory settings are stored in FLASH ROM while current as well as previous saved configuration settings and the last 10 events are stored in NVRAM.

The OT-21 firmware can be updated in the field by downloading current versions to the unit's FLASH ROM using the Ethernet port. Refer to [Software Maintenance](#), on page 92 for details on updating the firmware.

Product Features

OT-21 features include the following:

- GPS radio receiver acquires multi-channel coarse acquisition (C/A) code signals to provide a reference signal used by the OT-21 to provide a fully UTC-traceable Stratum 1 output signal
- Multiple alarm levels
- Embedded firmware that can be updated or configured remotely using the Ethernet port
- Communications through two EIA-232 communications ports and one Ethernet 10BaseT port
- ICS and TL1 communications protocols for control and monitoring
- Simple Network Time Protocol (SNTP, Version 3, RFC 1305) capability using the Ethernet port

Chapter 2 Functional Overview

This chapter introduces you to the basic functionality and operation of the OT-21 family of products. Topics in this chapter discuss the basic theory of operation of the OT-21 hardware and software components, provide product configuration information, and present an overview of product functions.

In This Chapter

- [Product Operation Overview](#)
- [Hardware Operation](#)
- [Software Operation](#)

Product Operation Overview

The OT-21 family of products provides a Primary Reference Source (PRS) producing Stratum 1 traceable output signals and Stratum 1 frequency stability suitable for high-speed applications such as digital switches, SONET, and SDH transmission systems.

The unit conforms to Telcordia Technologies (formerly Bellcore) GR-378-CORE, GR-2830, ITU (G.811 – G.812 – G.823), ANSI (T1.101), and ETSI (300-462) PRS/SSU requirements that meet small office and controlled environment vault (CEV) needs.

The unit is available in multiple configurations, each of which provides two DS1/E1 output signals and eight additional clock output signals routed through the output cards.



Note: For a detailed description of OT-21 configuration options and input and output port operation, refer to the *OT-21 User Guide*, part number 12713150-002-2 Revision D.

Hardware Operation

The OT-21 consists of the main board, local oscillator, GPS radio receiver, dual output cards, front panel display, and rear panel.

The main board provides all power, MPU/memory, Direct Digital Synthesis (DDS), clock I/O, control functions, on-frequency system clock, user interface, and communications for the unit.

[Figure 2-1](#) is a block diagram of the stand-alone Stratum 1 supply unit using a GPS radio receiver to provide network synchronization signals.

The MPU provides system control and operation, stores data and configuration information, and provides the communications interface.

The unit can also achieve high-stability frequency holdover using temperature measurements and applying learned frequency corrections to the DDS. The unit performs this in less than twenty-four hours from a cold start using the factory default settings with little or no operator intervention.

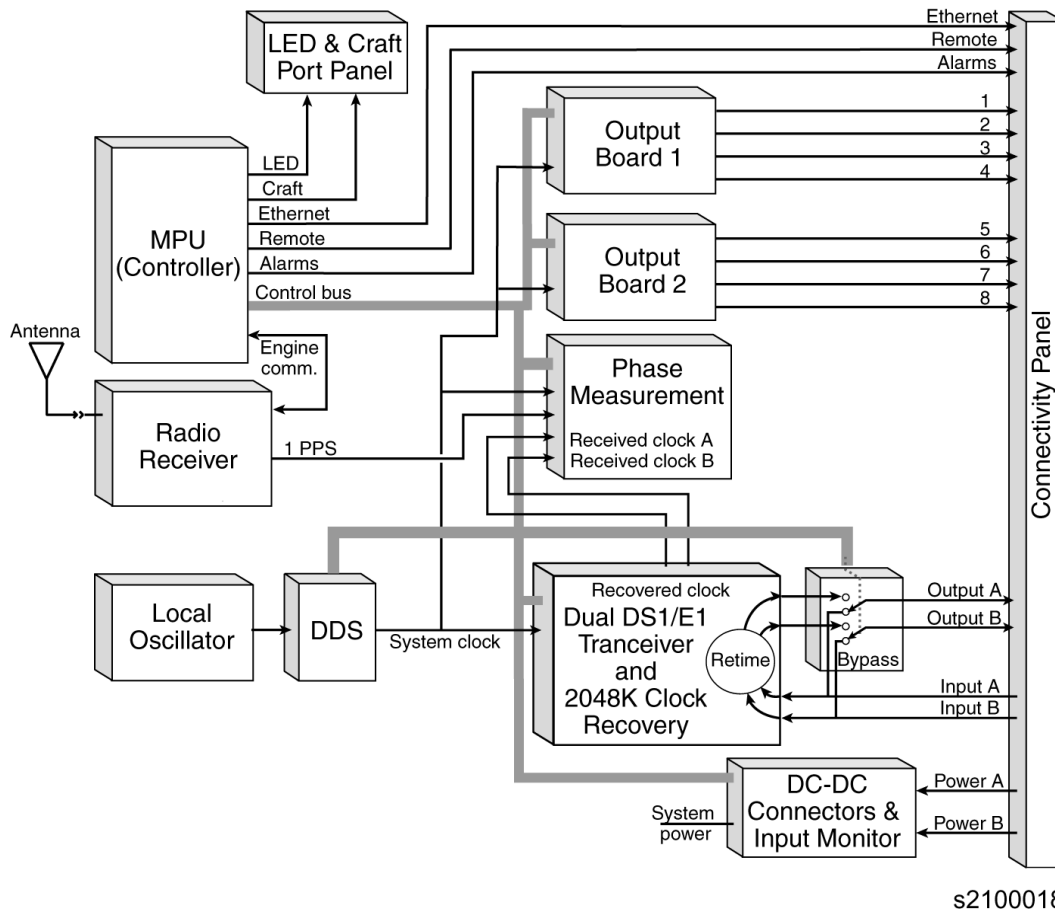


Figure 2-1. OT-21 Block Diagram

Power

The standard power input to the unit is DC. The unit accepts dual (redundant) isolated power (A-BUS and B-BUS) at -38 vDC to -65 vDC (-48 vDC nominal). Monitor circuits provide for an alarm upon failure of either input. Operators can retrieve the current power input status using software commands.

Microprocessor Unit (MPU)

The microprocessor unit (MPU) communicates with the radio receiver to control internal circuitry, perform measurements and calculations, monitor error thresholds, collect and store data and configuration information, and provides the operator interface for communicating with unit software and programmable hardware. The MPU enables power-up self-testing for verifying correct operation and periodic monitoring of hardware status to ensure that all components are functional. The unit stores setup information in NVRAM.

Memory

The unit uses the following three types of memory:

- Flash memory (Flash ROM) allows remote updating of programs
- Random Access Memory (RAM) stores an **image** of the Flash program
- Non-Volatile RAM (NVRAM) stores configuration parameters

Radio Receiver

The unit uses a GPS radio receiver to acquire a reference input. The GPS radio receiver has a nominal antenna feed output of +5 vDC with sufficient current to power a 48 dB antenna, and an in-line amplifier able to support a low-loss LMR-400 or equivalent antenna coaxial cable up to 1000 feet (305 m) in length.

Communications Interfaces

The EIA-232 COMMS local and Serial Port-A communications interfaces support software-settable baud rates (2400, 4800, 9600, 19200, or 38400), with fixed 8 data bits, 1 stop bit, and no parity. Both interfaces produce standard EIA-232 levels for all signal lines. The Ethernet interface provides network communications via TCP/IP.

- **COMMS (J1) Interface** – The COMMS local (J1) port, located on the front panel, is an EIA-232 communications interface. This interface is configured as Data Communications Equipment (DCE) and supports software or hardware handshaking.
- **SERIAL PORT-A (J15) Interface** – The communications Serial Port-A (J15) on the rear panel is an EIA-232 communications interface port. This interface supports switch-configurable DCE or Data Terminal Equipment (DTE), and also features full hardware or software handshaking.
- **Ethernet Port** – The Ethernet communications interface (J16) on the rear panel is implemented as 10BaseT. There are six defined Telnet sessions for the unit: four for ICS mode on port 23 and two for TL1 mode on port 2000. In addition, the Ethernet interface supports Simplified Network Time Protocol (SNTP). To configure SNTP parameters with ICS commands, see [Configuring Simplified Network Time Protocol \(SNTP\) Parameters](#), on page 64. To configure SNTP parameters with TL1 commands, see [Configuring SNTP Parameters](#), on page 73.



Note: The Telnet sessions in the OT-21 are partial implementations of the Telnet protocol in that no protocol negotiations occur.

Display Board

The display board provides the COMMS local serial port and the following LED indicators for viewing the operational status of the unit. This information is also available to the user through the communications ports. See [Table 2-1](#) for an explanation of the LEDs.

Table 2-1. Display LEDs

Indicator	Color/State	Description
Power	Green	Indicates that the unit is receiving power
	Off	Indicates that the unit is not receiving power
Active	Green	Indicates that the unit has been flagged as active with ICS or TL1 command ACTIVE ON and alarm 8 (frequency degraded) is not currently active
	Amber	Indicates that the unit has been flagged as active with the ICS or TL1 command ACTIVE ON and alarm 8 (frequency degraded) is currently active (Report, Minor, Major, Critical)
	Off	Indicates that the unit has been flagged as inactive with the ICS or TL1 command ACTIVE OFF
Tracking	Green	Indicates that the GPS radio receiver is tracking the GPS signal
	Amber	Indicates that the GPS has tracking errors
	Off	Indicates that the GPS radio receiver is not tracking the GPS signal
INPUT	Green	Indicates that the unit is tracking clock input signals and that they are selected as the reference
	Amber	Indicates that the clock input signals are selected as reference and there are clock errors
	Off	Indicates that the unit is not tracking clock input signals
HOLDOVER	Amber	Indicates the presence of one or more minor level active alarms
	Off	Indicates that the unit is operating normally
MINOR	Amber	Indicates the presence of one or more minor level active alarms
	Off	Indicates that the unit is operating normally
MAJOR	Amber	Indicates the presence of one or more major level active alarms
	Off	Indicates that the unit is operating normally
CRITICAL	Red	Indicates the presence of one or more critical level active alarms
	Off	Indicates that the unit is operating normally

Alarm Closures

ALARM CLOSURES on the rear panel for MINOR, MAJOR, and CRITICAL alarms indicate fault conditions. These alarm indications use Form-C relay closures provided on a 15-pin D-Type male connector for the DE9 panel, or three, 3-pin wire wrap connectors for the wire wrap panel. The CRITICAL alarm condition is active when the unit is powered down. This information is also available to the user through the communications ports.

Software Operation

The OT-21 system software handles communication to a GPS radio receiver and supports all operation, administration, maintenance, and provisioning tasks required to maintain and control an OT-21 system.

Communication Command Protocols

The OT-21 allows you to choose either the proprietary ICS or standard TL1 communications command protocols to interact with the software and programmable hardware of the unit. Either of the command protocols are available from the two EIA 232 communication ports and the Ethernet port.

- **Interactive Command Set (ICS) Protocol** – The Interactive Command Set (ICS) provides a basic communications language, via RS232 and Ethernet port 23. For a description of ICS commands, responses, and events, see [Appendix C, ICS Commands](#).
- **TL1 Communications Command Protocol** – The TL1 transaction language provides a telecommunications industry standard communications language for the unit through RS232 and Ethernet port 2000. For a description of TL1 commands, responses, and events, see [Appendix D, TL1 Commands](#).

Configuration Settings

The OT-21 saves three configuration settings in the internal non-volatile RAM: current, user default, and factory default. After power up self-tests are completed, the unit reverts to its previous configuration. The current configuration is saved whenever you make a configuration change and is restored during initialization. On user command, the current configuration can be saved as a new user default configuration, or the current configuration can be replaced by the user or factory defaults. Configuration information includes alarm settings, the user list, GPS position, and IP address. A history of ten events is also saved in non-volatile storage and reloaded during initialization.

Events

Events are changes in the units setting or status which are reported through the communications ports to all users. Events include a timestamp, event type, event/alarm level and a description of the condition causing the event.

Event History

All units maintain an event history of 400 events. When the four hundred and first event occurs, the oldest event is lost. The latest 10 events are stored in non-volatile memory. When power is removed from the unit, only those events stored in non-volatile memory are saved.

Alarms

Alarms are a subset of events which can be reported by the unit to indicate a condition that may require operator intervention or to indicate a degradation in the unit operation. Alarms have a severity level which is user settable. These levels are tied to front panel LEDs and relay closures (refer to [Display Board](#), on page 29 and [Alarm Closures](#), on page 30). Alarms may also be elevated after a user-defined time. The unit allows operators to set the following criteria:

- The initial alarm level to IGNORE, REPORT, MINOR, MAJOR, or CRITICAL
- The alarm activation and clear time to a value from zero to a 24-hour (86,400 seconds) delay for each alarm
- Time-out length for alarm elevation from 60 to 500,000 seconds for all alarms

Remote Updates

All units allow remote updating of the embedded firmware. Refer to [Software Maintenance](#), on page 92.

Security Features

The ICS command options available to you depend on the security access level assigned to you by the Administrator. Refer to [Configuring Users With ICS Commands](#), on page 63, or [Configuring Users With TL1 Commands](#), on page 71, for procedures to create the Administrator user.

Each higher security level grants access to all the rights of the lower levels, plus additional rights available only for that level. Check with your Administrator for information concerning your security level. Refer to the following security levels for an explanation of all user levels of security and some of the options available.

Idle (Level 0) – Security level 0 is available when no user is logged in. This level allows Idle level users to view a list of available commands such as Day of Year, Exit, Help, Unit ID, Login, Syntax and Software version number.

User (Level 1) – Security level 1 allow User-level users to perform level 0 functions and to view information about the current configuration and operation. Changes made by User remain in effect only until the user logs out.

Technician (Level 2) – Security level 2 allows Technician-level users to perform levels 0 through 1 functions, and to read or set all installation functions.

Supervisor (Level 3) – Security level 3 allows Supervisor-level users to perform levels 0 through 2 functions, and to read or set all functions with some additional commands.

Administrator (Level 4) – Security level 4 allows Administrator-level users to perform level 0 through 3 functions, to restart the unit, view and set software configurations, add, delete, or modify the user table, or log off any user from any port.

Chapter 3 Installing the OT-21

This Chapter provides installation procedures for the OT-21.

In This Chapter

- [Site Preparation](#)
- [Unpacking and Inspecting the Unit](#)
- [Installation Check List](#)
- [Installing the OT-21](#)
- [Installing the Cable Support Bars and Safety Shield](#)
- [Installing a GPS Antenna](#)
- [Completing the Installation Checklist](#)

Site Preparation

Before you begin installation, complete the pre-installation check described in [Pre-Installation Check](#), on page 34, and gather the necessary tools and materials described in [Installation Tools and Materials](#), on page 35.



Caution: To prevent ground loops that may damage equipment, all telecom signal wiring (including Ethernet) must be installed with shielded cabling only and appropriately grounded at both ends.

Cabling must be installed in compliance with intra-building surge, lightning, and EMC requirements.

Pre-Installation Check

Before installation, ensure that the following preparations are in place:

- The equipment rack is grounded
- Ensure a fused power panel is present (–48 vDC at 1 Amp)
- Remove the power supply fuse from the OT-21

Electromagnetic Compatibility (EMC) Considerations



Caution: To avoid electromagnetic interference with other devices, install the OT-21 using the following guidelines. Electromagnetic interference adversely affects the operation of nearby equipment.

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

- Use only shielded cable for all signal wiring, including I/O, clocks and Ethernet, and ground appropriately at both ends, or as required by local standards.
- Secure all cable screws to their corresponding connectors on the rear panel of the unit.
- Secure screws on the top and bottom of the chassis before operating the unit.

Installation Tools and Materials

These standard tools and materials are not supplied, but may be required for installing the OT-21:

- Standard tool kit
- Cable ties, waxed string or acceptable cable clamps
- No. 16 AWG (minimum) wire for –48 vDC, return, and Frame Ground
- Terminal lugs for 6-32 screws for connecting the power input
- Telecom signal wiring (including I/O, clock, and Ethernet) of the appropriate impedance required by the specific signal type
- Mating connectors for terminating signal wiring
- No. 22 AWG shielded twisted pair wire wrap cable of the appropriate impedance for the specific signal requirements
- Wire wrap tool (wire wrap chassis only)
- Fasteners for mounting the equipment in rack
- Digital Voltmeter (DVM)

Unpacking and Inspecting the Unit

The OT-21 and accessories are packaged to protect from normal shock, vibration, and handling damage.



ESD Caution: To avoid electrostatic discharge (ESD) damage to piece parts that are packaged in the OT-21, observe the following procedures.

Unpack and inspect the unit as follows:

1. Wear a properly grounded protective wrist strap or other ESD device.
2. Inspect the container for signs of damage. If the container appears to be damaged, notify both the carrier and your local distributor. Retain the shipping container and packing material for the carrier to inspect.
3. Open the container. Locate and set aside the printed information and paperwork that is included in the container. Locate and set aside small parts (such as transient eliminators) which are packed in the container.

4. Remove the unit, antenna (for units equipped with antenna), and accessories from the container. Remove the anti-static packaging from the unit, antenna, and accessories.
5. Verify that the model and item number shown on the shipping list agrees with the model and item number on the equipment. The item number can be found on a label affixed to the display panel. Contact your local distributor if the model or item number *do not* match.
6. Check the antenna cable and accessories against the shipping list. Check the GPS antenna part number to verify that the GPS antenna cable is the correct length.



Note: GPS antennas are available with several standard cable lengths and the cable length must match the OT-21 configuration. If the supplied cable is too short, contact your next level of Nortel Support for assistance.

Installation Check List

Use the following check list to confirm completion of each step of the OT-21 installation.

Table 3-1. Installation Check List

Procedure	Complete	Initial
Unpack and Inspect the Unit		
Install the Unit in Rack, Mounting the Unit , on page 38		
Install Power Connections, Installing Power Connections , on page 39		
Install Grounding Connections, Installing Grounding Connections , on page 41		
Verify Power and Ground Connections, Verifying Power and Grounding Connections , on page 42		
Install Cable Connections to the Communications Port COMMS local (J1) if required, Installing Cables to COMMS Local (J1) , on page 43		
Install Cable Connections to Serial Port A (J15), Installing Cable Connections to Serial Port A (J15) , on page 44		
Install Cable Connections to the Ethernet Port (J16) if required, Installing Connections to the Ethernet Port (J16) , on page 46		
Install the Alarm Closure Connections for the Wire Wrap Chassis, Installing Wire Wrap Alarm Closure Connections , on page 47		

Table 3-1. Installation Check List (Continued)

Procedure	Complete	Initial
Install the Cable Support Bars, Installing the Cable Support Bars , on page 48		
Install the Safety Shield, Installing the Safety Shield , on page 48		
Install the GPS Antenna, Installing a GPS Antenna , on page 49		
Mount the Roof-Mount GPS Antenna, Mounting the GPS Roof-Mount Antenna , on page 52		
Install the Transient Eliminator, Installing the Transient Eliminator , on page 54		
Check Installation with Completeness Checklist, Completing the Installation Checklist , on page 55		

Installing the OT-21

This section provides guidelines and procedures for installing the OT-21 unit. See [Installation Tools and Materials](#), on page 35 for a list of installation tools and materials that may be necessary to install the unit. These tools and materials are not supplied.



Caution: To avoid damage to the unit, ensure power is disconnected from the unit before beginning the OT-21 installation.



Recommendation: Follow all applicable local electrical codes when installing the OT-21.

Rack Mounting Considerations

The OT-21 measures 3.5 inches (8.89 cm) high by 17 inches (43.18 cm) wide by 11.4 inches (28.96 cm) deep.

The unit ships with a set of two 19-inch, pre-installed rack mounting ear brackets for direct installation into a standard 19-inch equipment rack. Two 23-inch rack mounting ear brackets are included to install the unit in a 23-inch equipment rack if needed. The brackets can be adjusted to accommodate multiple equipment rack depths.

To install or change the brackets and mount the unit to the equipment rack, follow the instructions in [Mounting the Unit](#), on page 38.



Recommendation: You should allow a 1U (1.75 inch) space above and below the chassis for optimum temperature control.

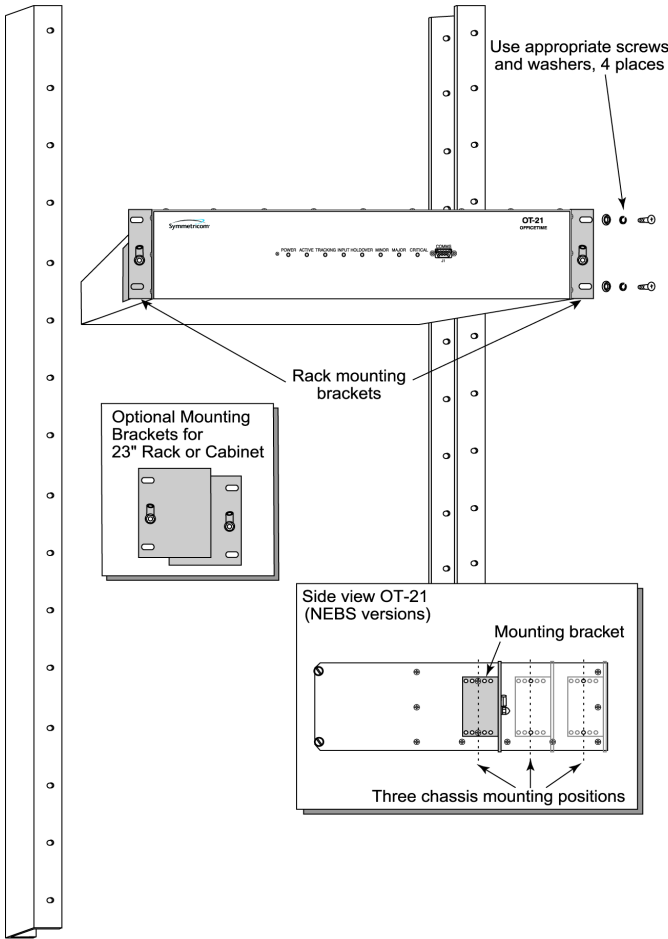
Mounting the Unit

The installation procedures described in the following sections provide general guidelines for installing the unit. Always follow applicable local electrical codes.



Note: OT-21 units are shipped with 19-inch mounting brackets installed. If you have a 19-inch equipment rack, see Step 3 below. If you have a 23-inch equipment rack, or you are changing the position of the brackets for mounting in a standard 19-inch equipment rack, follow Steps 1 and 2 below.

1. The brackets are attached to the unit with four 4-40 x 3/16-inch screws, two on each side. Remove and keep the screws for reuse.
2. Using the desired bracket to accommodate the equipment rack size, position each bracket as needed and attach the brackets using 4-40 x 3/16-inch screws. Ensure that both brackets are attached at equal distances from the front of the unit, see [Figure 3-1](#).
3. Mount the unit to the front of the equipment rack rails with four screws and associated hardware. Ensure that the screws mate with the equipment rack into which you install the unit. Use screws with a nylon washer.



s2100007

Figure 3-1. Unit Rack Mounting Diagram

Installing Power Connections



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



Warning: For continued fire protection replace fuse with specified type and rating. Fuse: GMT-1 (1A @ 60vDC).

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

The power connection for the unit is through the A-BUS and B-BUS two-position terminal blocks located on the left and right sides of the rear panel. Terminal positions are labeled A-BUS and B-BUS. For power input specifications, see [Table 3-2](#).

To install the OT-21 power connections:

1. Locate the A and B power terminal blocks on the left and right of the rear panel (see [Figure 3-2](#)).

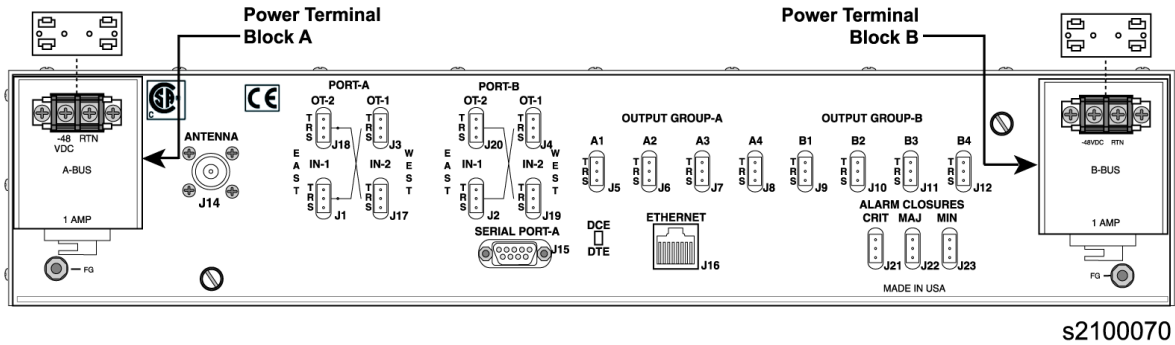


Figure 3-2. A and B Power Terminal Blocks

2. Connect one –48 vDC and one return to each of the A-BUS and B-BUS power input terminals.
3. Install the power terminal covers after connecting the –48 vDC power.

[Table 3-2](#) provides power connection information.

Table 3-2. Power Connections

Signal	Connection	Terminal
48 Volt Negative Lead	A-BUS	– (Negative)
48 Volt Positive Lead	A-BUS	+ (Positive)
Ground	A-BUS	FG-Post
48 Volt Negative Lead	B-BUS	– (Negative)
48 Volt Positive Lead	B-BUS	+ (Positive)
Ground	B-BUS	FG-Post

Installing Grounding Connections

After installing the OT-21 unit into the rack, make the grounding connections as follows.

To connect Chassis Ground:

1. Make the frame ground connections from each of the two 8-32 lugs (FG) located on the left and right of the rear panel.
2. Connect the frame grounds (FG) on left and right sides of the rear panel to the proper grounding zone or master ground bar.



Caution: To minimize the risk of shock, ensure that the power terminal covers are installed after connecting the -48 vDC power.

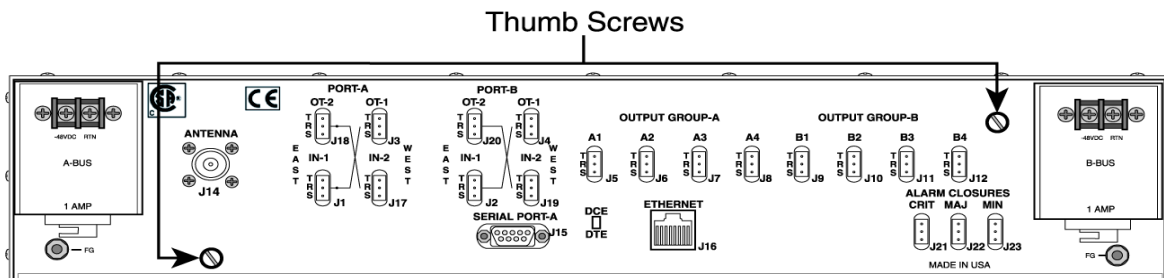


Recommendation: Although there are a number of methods for connecting the equipment to earth ground, it is recommended that you run a cable of the shortest possible length from each Frame Ground (FG) lug to earth ground.

Use the following procedure for applications requiring separate frame and logic ground connections.

To separate Frame and Logic Ground:

1. Remove the rear panel by removing the two thumb screws and removing the panel. Refer to [Figure 3-3](#).



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Figure 3-3. OT-21 Rear View (Rear Panel Installed)

2. The ground strap is located below the antenna input connector (J14). Loosen the two screws, remove the ground strap from the rear of the chassis and re-tighten the screws securely. Refer to [Figure 3-4](#).

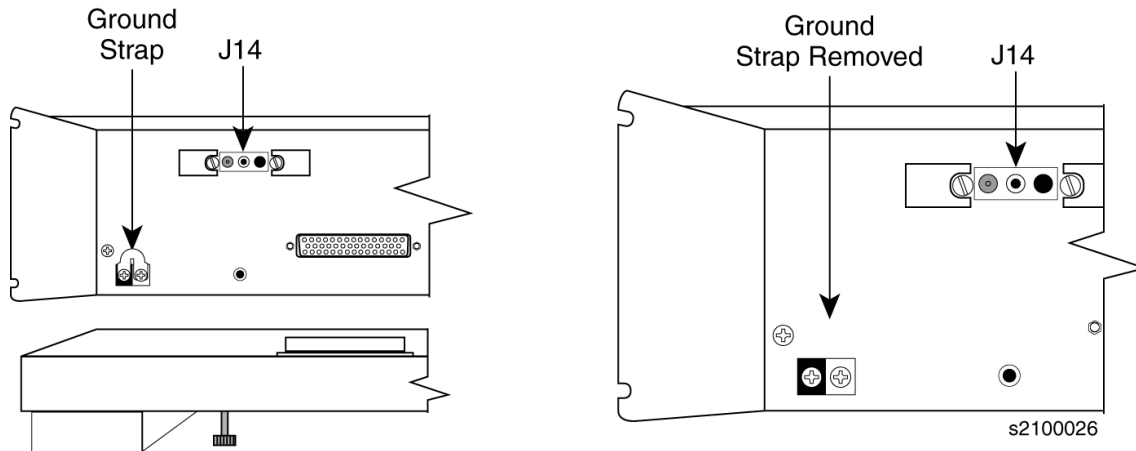


Figure 3-4. OT-21 Rear View (Rear Panel Removed)

3. Re-install the rear panel and tighten the two thumb screws securely.

Verifying Power and Grounding Connections

To verify power and grounding connections:

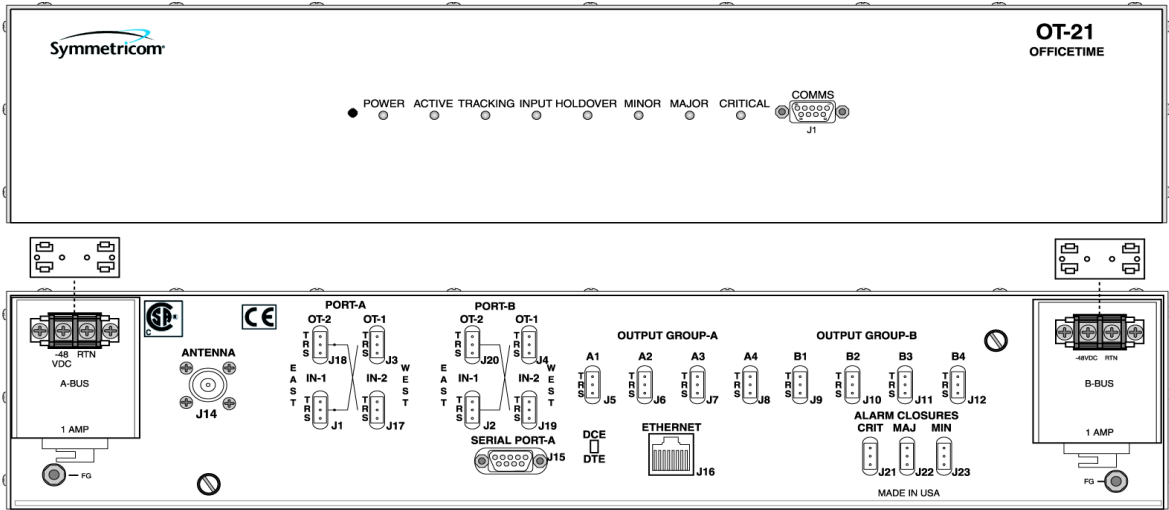
1. Using a DVM, measure the voltage at A-BUS -48 vDC and RTN and B-BUS -48 vDC and RTN.
2. Verify that voltage is -38 to -72.5 vDC.

The inputs are protected against reverse polarity.

Primary Reference Receiver (PRR) Wire Wrap Connections

Use the following information to make connections to the OT-21.

[Figure 3-5](#) shows the Wire Wrap rear panel.



s2100004

Figure 3-5. OT-21 with Wire Wrap Rear Panel



Note: In the Primary Reference Receiver (PRR) version, connectors J1, J2 and J17 through J20 are not used. Do not make connections to these connectors.



Note: If installation is an integrated ground environment, Shields are grounded to the respective “S” Wire Wrap terminal at the OT-21. If installation is in an isolated environment, ensure that the far end Shield is not grounded at the client equipment. Ensure that you comply with all local grounding practices.

Installing Cables to COMMS Local (J1)

To connect the communications interface for the communications port COMMS local (J1), perform the following steps:

1. Connect the serial 9-pin female connector (Figure 3-6) to J1.
2. Connect the other end of the cable with the DE9 connector to the serial port of the COMMS local terminal. The COMMS local terminal is used for control and monitoring of the OT-12.

The default settings for the serial port COMMS local (J1) are DCE, 9600 Baud, 8 bits, no parity, 1 stop bit, echo on, ICS mode and handshaking disabled.



Note: The DTE setting requires a *null modem* cable.

Table 3-3 lists the signal interface for the Communications Port COMMS local (J1).

Table 3-3. Communications Port COMMS local (J1) Interface

Signal	Pin
No Connect	1
RXD (Received Data)	2
TXD (Transmitted Data)	3
No Connect	4
Ground	5
No Connect	6
No Connect	7
No Connect	8
No Connect	9

Installing Cable Connections to Serial Port A (J15)

To connect the OT-21 communications interface for Serial Port A, perform the following steps:

1. Connect the serial 9-pin female connector (Figure 3-6) to the interface terminal Port-A (J15) on the rear panel. The terminal is used for control and monitoring of the unit. Factory default settings for Port-A (J15) are 9600 Baud, 8 data bits, no parity and 1 stop bit.

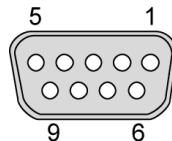


Figure 3-6. DE9S Connector

- Verify that the slide switch (Figure 3-7) is set to the appropriate equipment type, either Data Terminal Equipment (DTE) or Data Communications Equipment (DCE).



Note: The DCE setting allows direct connection of the unit to a standard PC communication port using a 1:1 cable. The DTE setting requires a *null modem cable*. If connecting to a modem, use DTE. The DCE/DTE switch reverses pins 2 and 3.

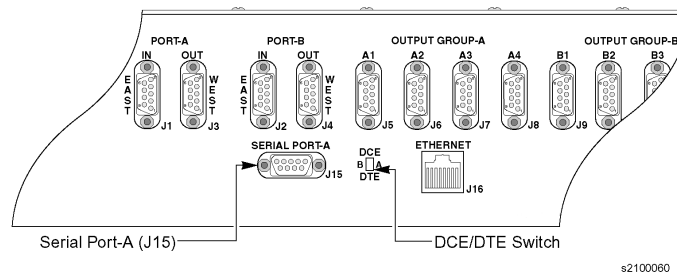


Figure 3-7. Location of Equipment Type Selection Switch and J15

Table 3-4 lists the signal interface for the serial communications Serial Port A (J15).

Table 3-4. Communications Serial Port A (J15) Interface

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

Changing Communications Settings

To change the default communication settings for the (J1) or (J15) ports:

1. Connect a PC or laptop with terminal emulation software, such as Microsoft® HyperTerminal™ or ProComm Plus™, to the port and login. For a complete description of this procedure, see [Connecting the Communications Equipment](#), on page 58.
2. Use the COMM command to change the communications settings for the port. See [Appendix C, ICS Commands](#) for descriptions of ICS and [Appendix D, TL1 Commands](#) for a description of TL1 commands.

Installing Connections to the Ethernet Port (J16)

To connect the OT-21 communications interface for the Ethernet port (J16) to a 10BaseT Ethernet network, perform the following steps:

1. Locate the shielded Ethernet 10BaseT receptacle (J16) on the rear panel.
2. Connect a standard unshielded twisted pair (UTP) Ethernet RJ-45 cable to J16.

[Table 3-5](#) lists the Ethernet communications port signal connections.

Table 3-5. Ethernet Communications Port Signal Connections

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

Installing Wire Wrap Alarm Closure Connections

To install alarm connections on the wire wrap chassis:

1. Locate the three wire wrap headers ALARM CLOSURES labeled CRIT (J21), MAJ (J22), and MIN (J23) on the rear panel.
2. Connect the wire wrap headers to the appropriate remote alarm indicator and alarm terminators.

[Table 3-6](#) provides the alarm closure connections for the wire wrap chassis.

Table 3-6. Alarm Contact Wire Wrap Pin Assignments (J13)

Signal	Pin
MINOR – Normally Open Contact	J23-NO
MINOR – Wiper Contact (Common)	J23-Com
MINOR – Normally Closed Contact	J23-NC
MAJOR – Normally Open Contact	J22-NO
MAJOR – Wiper Contact (Common)	J22-Com
MAJOR – Normally Closed Contact	J22-NC
CRITICAL – Normally Open Contact	J21-NO
CRITICAL – Wiper Contact (Common)	J21-Com
CRITICAL – Normally Closed Contact	J21-NC

Installing the Cable Support Bars and Safety Shield



Note: If the cable support bars and the safety shield are already assembled, disregard the installation procedures in [Installing the Cable Support Bars](#), on page 48 and [Installing the Safety Shield](#), on page 48.

Install the safety shield assembly by aligning the shield to the slots on the back of the OT-21 and tightening the thumb screws securely.

Installing the Cable Support Bars

To install the two cable support bars (item number 00112914-000-1) shipped with the unit to the rear panel, see [Figure 3-8](#), and follow the steps below for each bar:

1. There are two slots on each side of the unit, one near the top and one near the bottom. Align the bar to either the two top or bottom open slots on each side of the panel.
2. Fasten the bar to the side of the panel using the thumb screws.
3. After both bars are installed, secure the cables to the bars.

Installing the Safety Shield

To install the safety shield (item number 01213142-000-1) shipped with the unit to the rear panel, see [Figure 3-8](#), and follow the steps below:

1. Align the pre-drilled holes in the safety shield to the pre-drilled holes on each cable support bar.
2. Fasten the shield to the bars to the side of the panel using the screws and lock washers provided.

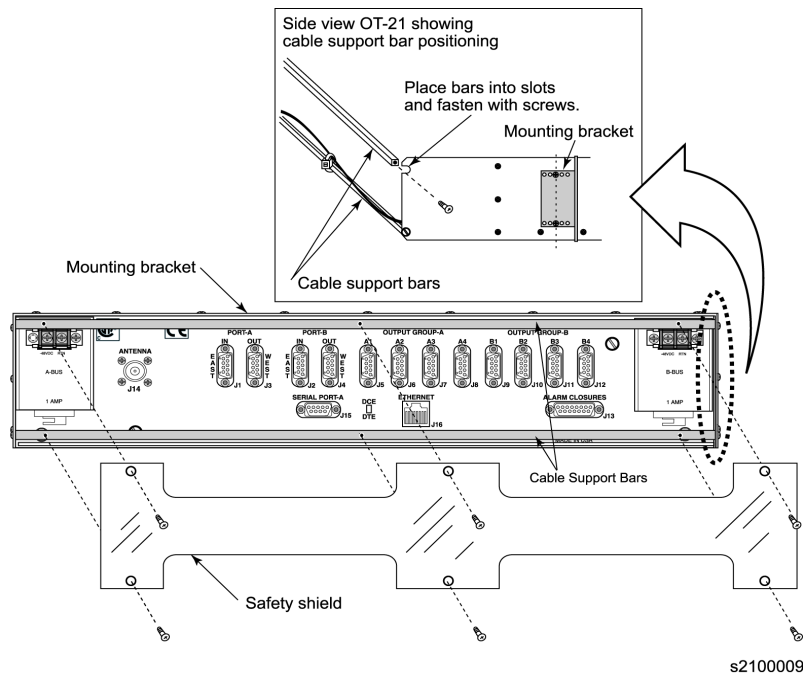


Figure 3-8. Cable Support Bars and Safety Shield Installation Diagram

Installing a GPS Antenna

This section provides procedures for installing the GPS antenna. For information about optional antennas, mounting and connecting accessories, coaxial cable and transient eliminator specifications, and compatible combinations, see [Appendix F, Accessories and Ordering](#).



Note: GPS antennas are available with several standard cable lengths; the cable length must match the OT-21 configuration. If the supplied cable is too short, contact your next level of Nortel Support for assistance.



Note: Follow local electrical codes for your area when installing the GPS antenna.

Antenna Installation Tools and Materials

These standard tools and materials are not supplied in the antenna kit, but may be required for installing the GPS antenna.

- Four each 0.25 inch (6 mm) fasteners for installing the antenna floor flange
- Extra cable ties, waxed string or acceptable cable clamps
- #10 AWG (minimum) copper ground wire
- Eight-foot (2.62 m) ground electrode
- Custom mounting plates, U-bolts, masonry bolt, and so forth, as needed for mounting to a tower or roof of a building
- A cable puller may be required for installing the antenna coaxial cable
- Digital voltmeter (DVM)



Caution: To prevent damage to connectors, exercise caution while pulling cable.

Preparing to Install the GPS Antenna

Before installing the antenna, determine a grounding scheme consistent with local building codes and consider the factors that affect the location and environment chosen for the antenna installation. These factors are addressed in the warnings, cautions and recommendations that follow.



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

- Use extreme caution when installing the GPS antenna near, under, or around high voltage lines.
 - Follow local electrical codes for grounding the antenna system that is used with the OT-21 unit.
-



Note: The in-line amplifier receives 5 vDC power from the OT-21 GPS radio receiver and is supplied on the center conductor of the LMR-400 or equivalent coaxial cable. If the application requires an in-line amplifier, connect the amplifier in line with the antenna coaxial cable.

Cutting the antenna cables provided in the GPS Antenna Kit is not recommended. If you must cut the cables, please ensure that the cabling and connectivity meet the requirements in [Establishing an Antenna Grounding Scheme](#), on page 51.



Caution: To avoid damage to the preamplifier of the antenna, do not place the antenna where high-power radio signals are beamed directly at the unit. Such signals can damage the preamplifier of the GPS antenna.



Recommendation: Consider the following location and environmental influences before installing the GPS antenna:

- If possible, locate the antenna with an unobstructed 360-degree view of the sky from the horizon.
- In general, do not allow obstructions that obscure the horizon (as viewed from the antenna) by more than 10 degrees.
- Locate the antenna well away from, and preferably in a plane above electrical equipment such as elevators, air conditioners or other machinery.
- To reduce the risk of lightning damage, *do not* place the antenna at the highest point of the building.
- Locate the GPS antenna at least 12 feet (4 m) from metallic objects, if possible.
- Locate the antenna high enough to avoid drifted snow.
- Locate the transient eliminator in a protected area to avoid contact with standing water.
- Locate the antenna within 30 feet (10 m) of the point at which the antenna cable enters the building.
- Allow at least 10 feet (3 m) of separation distance between GPS antennas.
- Surfaces above the plane of the unit that are between the antenna and the horizon can produce reflected (multi-path) signals, which can degrade the performance of the radio receiver.

Establishing an Antenna Grounding Scheme

In addition to determining where to locate and mount the antenna and cabling, you should develop a grounding scheme. The purpose of the grounding scheme is to provide some protection against voltage surges and static discharge. If you are using transient eliminators, connect them to the perimeter ground system or bulkhead entrance panel that is connected to the perimeter ground system.

Observe the following precautions when grounding the antenna:

- Avoid sharp bends in the ground conductors.
- Ensure that surface paint is removed from the grounding area before installing a transient eliminator or grounding clamps.
- Ensure that the ground conductors do not enter through an access hole and are bonded to the metal enclosure box, if used.
- Do not use soldered connections for grounding purposes.
- Secure all grounding connections with mechanical clamp-type connectors.

When deciding upon a grounding scheme to use to provide protection against voltage surges and static discharge, observe the following guidelines:

- In general, follow local building and electrical codes when selecting a grounding scheme, wire size, and installation used in the grounding scheme.
- Connect transient eliminators, if part of the grounding scheme, to earth ground through a conductor.



Note: *Do not* connect the outside transient eliminator ground to the inside equipment rack ground. Doing so can defeat the protection afforded by the transient eliminator.

For a detailed illustration of how you might install transient eliminators if local practice requires their use, see [Figure 3-9](#). For specifications and information about which transient eliminators you can use with the GPS antenna, see [Appendix F, Accessories and Ordering](#).

- Use #10 AWG copper ground wire



Note: Larger ground conductors provide better transient elimination. The larger the ground conductor, the less likely the chance of transient damage.

- Never connect antenna systems to the same earth ground connector as heating and cooling systems, elevator or pump motors or machinery which can induce noise in the antenna system.

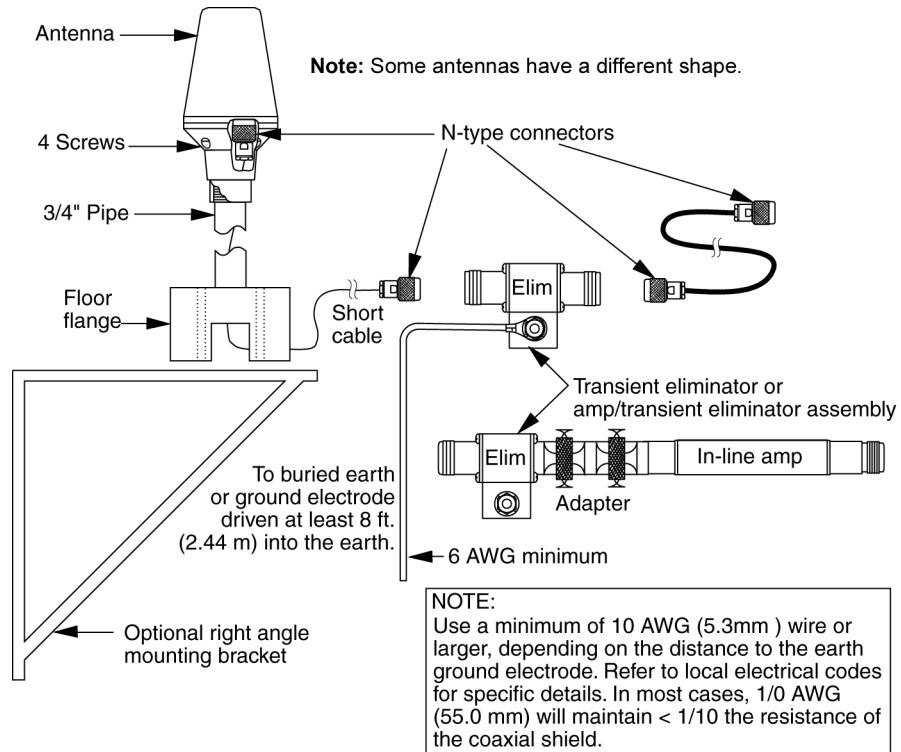
Mounting the GPS Roof-Mount Antenna

To mount the antenna to any stable flat surface, use the floor flanges supplied in the GPS Antenna Kit (refer to [Figure 3-9](#)). The mounting surface and the local building codes determine the type and number of fasteners, screws, bolts, and so forth, that may be required.

To mount the antenna on the side of a building or tower, use the optional right angle mounting bracket (item number 12010210-000-0).

Cabling the GPS Roof-Mount Antenna

To route the coaxial cable of the mounted antenna, refer to [Figure 3-9](#), and perform the following steps:



s2100002

Figure 3-9. GPS Roof-Mount Antenna



Note: GPS antennas are available with several standard cable lengths; the cable length must match the OT-21 configuration. If the supplied cable is too short, contact your next level of Nortel Support for assistance.

1. Loosen the four screws on the top of the antenna to gain access to the antenna connector.
2. Route the shorter antenna coaxial cable from the antenna through the floor flange (in the lower half of the antenna base) to the unit.



Recommendation: If at all possible, avoid bundling the coaxial cable with other cables and possible noise sources. Use appropriate cable-pulling devices when pulling the coaxial cable through conduit or a weather head.



Caution: To avoid damage to the cable, **do not** attach to the connectors to pull the coaxial cable.

3. Connect the cable to the antenna.



Caution: To prevent damage to internal solder connections, do not over-tighten the cable connector.

4. Secure the coaxial cable to the mast using one or more 8-inch cable ties, waxed string or appropriate cable clamps.
5. Re-install the four screws to the top of the antenna to secure it in place.

Installing the Transient Eliminator

If you are installing a transient eliminator, as shown in [Figure 3-9](#), follow these guidelines:

- Transient eliminators should be installed in accordance with your antenna system grounding scheme.
- Mount the transient eliminator within 30 feet of the GPS antenna.
- If required, mount a second transient eliminator near the GPS antenna.

To install the transient eliminator perform the following steps:

1. If necessary, cut the coaxial cable and install mating connectors.



Recommendation: Cutting the antenna cables provided in the GPS Antenna Kits is not recommended. If you must cut the cables please ensure that the following requirements are met.

Cable Requirements – The total cable length from the radio receiver to the antenna must not be shorter than the minimum cable lengths indicated in the GPS Antenna Kits see [Appendix F, Accessories and Ordering, Table F-2](#).

Connector Requirements – The cables provided with the GPS Antenna Kit have factory installed crimped connectors. If you cut these cables, you must supply and add a connector. You should use only crimp-style N-type connectors

2. Using the DVM, measure the resistance between the center conductor and shield to verify that the center conductor and shield are not shorted together.
3. Connect the longer GPS antenna coaxial cable to the transient eliminator.

4. Connect the ground wire between the transient eliminator and the proper grounding zone (building ground, master ground bar, or other) for the mounting location.



Recommendation: Soldered connections for grounding purposes are not recommended. All grounding connections should be secured with mechanical clamp connectors.

5. Wrap the RF connectors with weatherproof tape for added protection.



Note: [Step 6](#) below cannot be performed if you cut the cable as described in [Step 1](#). If you cut the cable in [Step 1](#), installation is complete.

6. Verify again that the antenna coaxial cable center conductor is not shorted to the shield of the cable.

Completing the Installation Checklist

To verify that the installation of the OT-21 unit is complete, perform the following checks and procedures in the *Installation Completeness Checklist* in [Table 3-7](#).

Table 3-7. Installation Completeness Checklist

Operation/Indication	Complete
Verify that all power and ground wires are installed correctly and securely.	
Verify that all communications cables are properly installed.	
Check that all antenna connectors are secure, tight, and weatherproofed.	
See the procedure for GPS Input Signal , on page 87 to verify the proper performance of the antenna and cables after installation.	

Installing the OT-21
Completing the Installation Checklist

Chapter 4 Power-Up and Configuration

This chapter describes the procedures for powering up the OT-21 unit and for changing the factory-installed basic configuration settings. This chapter also contains information about software options and command syntax, equipment status controls, indicators, and alarms. The chapter concludes with the *Operation Completion Checklist*, which should be used to verify the system condition after performing these tasks.

Before beginning the system power-up, verify that the installation procedures are complete and that all ground wires and all antenna connectors are secure as described in the Installation procedures in [Chapter 3, Installing the OT-21](#).

In This Chapter

- [Connecting the Communications Equipment](#)
- [Powering Up the OT-21](#)
- [Logging In to the Communications Interface](#)
- [Configuring With ICS Commands](#)
- [Configuring With TL1 Commands](#)
- [Operation Completion Checklist](#)

Connecting the Communications Equipment

This section provides information on how to connect the serial and Ethernet cables from the OT-21 to a computer or terminal. Refer to [Installing the OT-21](#), on page 37, for details on cable connections and setting the DCE/DTE switch.

Connecting the Serial Port Cable

To connect the unit using a direct serial connection to a peripheral device such as a PC or laptop for configuring, setting up user accounts, monitoring system parameters or troubleshooting, perform the following steps:

1. Securely connect one end of the direct serial cable to the OT-21 EIA-232 communications interface labeled COMMS (J1) or SERIAL PORT-A (J15).
2. Securely connect the other end of the serial cable to the serial port on the PC, laptop or ASCII terminal.

Connecting the Ethernet Cable

Perform the following steps to connect the OT-21 to a Local Area Network (LAN).



Note: The OT-21 can be controlled through a TCP/IP network connection, but before you can communicate with the OT-21, you must configure the Ethernet settings through a serial connection. Refer to [Configuring Ethernet Settings With ICS Commands](#), on page 64.

1. To connect the OT-21 to the LAN, connect one end of the RJ-45 cable to the LAN connector. Connect the other end of the cable to the Ethernet port (J16) on the OT-21.
2. To connect the PC or laptop to the LAN, connect one end of the RJ-45 cable to the Ethernet port of the PC or Laptop. Connect the other end of the cable to the LAN connector.



Note: You can also use a “crossover” Ethernet cable to connect a PC or laptop Ethernet port directly to the OT-21 Ethernet port.

Powering Up the OT-21

This section provides information on the power-up procedure, the front panel LEDs, and the rear panel contacts.

Applying Power

To power up the OT-21, insert the appropriate fuses into the fuse slots on the rear panel of the OT-21 unit as shown in [Figure 4-1](#). Depending on the site configuration, you may also have to insert the fuses into the power supplies for units supplying power to the OT-21.



Note: During power-up, the OT-21 issues various alarm messages. To view these messages, ensure that communications equipment such as a PC or terminal is connected to the OT-21 and that hardware and software settings are properly set. For ICS configuration information, see [Configuring With ICS Commands](#), on page 62. For TL1 configuration information, see [Configuring With TL1 Commands](#), on page 70.

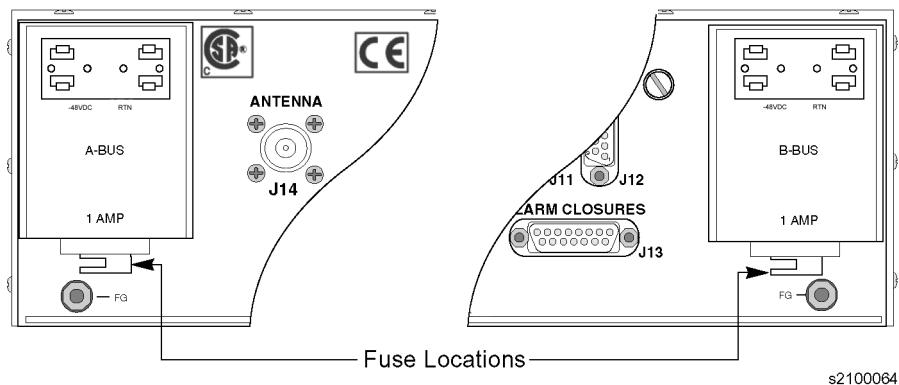


Figure 4-1. OT-21 Fuses

Verifying Power-up

After inserting the fuses, the unit begins the power-up process. The unit performs a self test that turns the LEDs on and off, cycling through both amber and green on dual color LEDs. Refer to [Table 4-1](#) for LED color and indication descriptions. After approximately 30 seconds the LEDs turn on as follows:

- An alarm condition (alarm 09 Output Time) occurs and the specified MINOR, MAJOR, or CRITICAL LED turns on (factory default is MINOR).

- The ACTIVE LED turns amber, an alarm condition (alarms 07, Holdover and 08, Output Freq) occurs, and the specified MINOR, MAJOR, or CRITICAL LED turns on (factory default is MAJOR).
- Alarm 09, Output Time, clears and the specified LED turns off.
- After the unit is warmed up, the ACTIVE LED turns green. The alarm condition (alarm 08 Output Freq) clears and the specified alarm LED turns off.
- If power-up is successful, the only LEDs that should be illuminated are POWER, ACTIVE (if enabled), and TRACKING (this may take 30 to 60 minutes or more).

If the MINOR, MAJOR, or CRITICAL LEDs remain on, refer to the ICS Alarm command in [Appendix C, ICS Commands](#), or the TL1 RTRV-ALARM command in [Appendix D, TL1 Commands](#).

Reading the LED Indicators

The OT-21 indicators provide a visual indication of the system status. The display panel LED indicators and functions are described in [Table 4-1](#).

Table 4-1. LED Indicators and Functions

Indicator	Color	Function
Power	Green	ON = Unit is receiving power OFF = Unit has no power
Active	Green/Amber	GREEN = Unit is active and the frequency degraded alarm (#8) is not currently active AMBER = Unit is active and the frequency degraded alarm (#8) is currently active OFF = Unit is inactive
Tracking	Green/Amber	GREEN = Unit is tracking GPS AMBER = GPS tracking errors OFF = Unit is not tracking GPS
Input	Green/Amber	GREEN = Unit is tracking clock input AMBER = Unit is selected as REF and has clock errors OFF = Unit is not tracking clock input
Holdover	Amber	ON = Unit is in holdover mode OFF = Unit is operating normally
MINOR Alarm	Amber	ON = Unit has one or more MINOR alarms active OFF = No alarm is active
MAJOR Alarm	Amber	ON = Unit has one or more MAJOR alarm active OFF = No alarm is active
CRITICAL Alarm	Red	ON = Unit has one or more CRITICAL alarms active OFF = No alarm is active

Rear Panel Contacts

Table 4-2 defines the states of the rear panel contacts in the various states of operation.

Table 4-2. Alarm Relay Closure States

Alarm	Normal		Fault		Power Off	
	N.O.	N.C.	N.O.	N.C.	N.O.	N.C.
MINOR	OPEN	CLOSED	CLOSED	OPEN	OPEN	CLOSED
MAJOR	OPEN	CLOSED	CLOSED	OPEN	OPEN	CLOSED
CRITICAL	OPEN	CLOSED	CLOSED	OPEN	CLOSED	OPEN

Logging In to the Communications Interface

Before logging in to the OT-21, ensure that your communications equipment is properly set up. Make connections as described in [Connecting the Communications Equipment](#), on page 58.

The factory default communications settings for Serial Port A (J15) and COMMS local port (J1) are:

- 9600 baud
- 8 data bits
- 1 stop bit
- no parity
- ICS mode
- hardware and software handshaking disabled
- echo on
- output line termination CRLF



Note: The settings for COMMS local port (J1) remain in effect for the duration of the session, but revert to defaults for each new session.

The settings for Serial Port-A (J15) are stored in NVRAM and remain in effect when the system is restarted, and until an operator changes them or enters the SETUP FACTORY command.

Serial Port-A (J15) and COMMS local port (J1) can be configured for ICS or TL1 with ICS as the default. Ethernet port 23 is ICS only and Ethernet port 2000 is TL1 only. If the serial ports are set to TL1, pressing **ESC** three times at the OT-21 prompt reverts the unit to ICS mode.

To log into the OT-21 communications interface from a PC, laptop, or ASCII terminal connected to the communications port COMMS local (J1), perform the following:

1. From a PC or laptop, open the terminal emulation program (such as HyperTerminal) and establish a direct connection to the selected communications port.
2. From an ASCII terminal, press **Enter** until the system prompt `OT-21>` displays.



Note: When you power up the OT-21 for the first time, the communications interface provides the default username of Symm with Administrator security level. The Administrator security level grants access to all system levels, allows you to add or delete users, read or set all other functions, and remains in effect until you have added user accounts. If you forget or lose your password you can use the “backdoor” password ADMIN. To configure users with ICS commands, see [User Access Levels](#), on page 122. To configure users with TL1 commands, see [User Access Levels](#), on page 144.

To continue configuring the OT-21 using ICS commands, go to [Configuring With ICS Commands](#), on page 62. To continue configuring using TL1 commands, go to [Configuring With TL1 Commands](#), on page 70.

Configuring With ICS Commands

This section provides information on configuring the OT-21 using ICS commands. For information on configuring the OT-21 with TL1 commands, see [Configuring With TL1 Commands](#), on page 70.

Configuring COMMS local and Serial Port-A Ports With ICS Commands

To display the settings for the ICS connected ports, at the system prompt type `COMM` and press **Enter**. You also use the `COMM` command to configure the COMMS local and Serial Port-A ports (refer to [Appendix C, ICS Commands](#), in this User Guide for more information on the `COMM` command). For example, to set the baud rate for the COMMS local port to 9600, type `COMM L BAUD 9600` and press **Enter**. Type `HELP COMM` and press **Enter** for more details on the `COMM` command.

Configuring Users With ICS Commands

If no users have been added to the system user table, you are automatically logged on as user `Symm` with no password at level 4, Administrator user. If users have been added, the default level 4 login is unavailable, and you must use a valid username and password to log in.

For a list of security access levels and description of privileges for each, see [Table C-2](#). For a list of ICS commands, organized by security level, see [ICS Command Descriptions and Access Levels](#), on page 126.



Note: The OT-21 software does not allow you to assign level 0 through level 3 users before the Administrator (level 4) user and password are assigned.

Assigning a Level 4 Administrator

To add an Administrator user to the OT-21:

1. Type `USERS ADD` and press **Enter**.
2. Type the Administrator username when prompted, and press **Enter**.
3. Type the Administrator password when prompted, and press **Enter**.
4. Type the Administrator password again when prompted, and press **Enter**.
5. Type the administrator security access level (4) when prompted, and press **Enter**.



Note: Valid username and password characters include numbers, upper and lowercase letters, and the character set `":;<=>?@"`. The semicolon functions properly only in ICS mode, and the colon must be enclosed in quotes in TL1 mode, as `"USER:NAME"` or `"PASS:WORD"`. To enter lowercase letters, enclose the input in quotes, as `"UserName"` or `"PassWord"`. *Do not* use spaces in usernames.

Adding Level 0 Through Level 3 Users and Establishing Security Access

To add level 0 through level 3 users to the system perform the following:

1. At the system prompt, type `USERS ADD [user id]` and press **Enter**.
2. Type a user password when prompted and press **Enter** (or press **Enter** to enter a blank password and cancel the command).
 - The system echoes the password entry as `'*'`.

- If the user ID already exists in the table, the software closes the option with an error message.
3. Type a user password again when prompted and press **Enter**.
 4. Type the user security access level and press **Enter**.

Modifying Your User Password (all levels)

To modify your user password perform the following:

1. At the system prompt type `USERS MODIFY [user id]` and press **Enter**.
2. Type a user password when prompted and press **Enter** (or press **Enter** to enter a blank password and cancel the command).
3. Type a user password again when prompted and press **Enter**.

Deleting a User (level 4, Administrator)

To delete a user, at the system prompt type `USERS DELETE [user id]` and press **Enter**.

Configuring Ethernet Settings With ICS Commands

The Ethernet configuration settings must be made through a serial port connection to the OT-21 before you can connect through the Ethernet port.

Configuring Basic IP Parameters (address, mask, gateway)

To configure the OT-21 IP address, mask, and gateway:

1. Establish a direct serial connection to the OT-21 unit (see [Logging In to the Communications Interface](#), on page 61).
2. At the system prompt, type `IP ADDR` followed by the IP address expressed in dotted decimal notation. For example, type `IP ADDR 192.168.0.1` and press **Enter**.
3. Type `IP MASK` followed by the mask in dotted notation. For example, type `IP MASK 255.255.0.0` for a class B network, or `255.255.255.0` for a class C network, and press **Enter**.
4. Type `IP GATE` followed by the IP address of the gateway expressed in dotted decimal notation. For example, type `IP GATE 192.168.0.1` and press **Enter**.

Configuring Simplified Network Time Protocol (SNTP) Parameters

To configure the OT-21 as an SNTP server, perform the following steps in accordance with your network system requirements.

Configuring for Passive Mode Broadcast

It is not necessary to configure the OT-21 for passive mode. The OT-21 operates in the passive mode once the OT-21 has been provisioned for basic TCP/IP connectivity.

Configuring for Active Mode Broadcast to a Single IP Address

1. Type `IP BROADCAST` and enter the specified broadcast mask to which the OT-21 will broadcast. For example, type `IP BROADCAST 192.168.0.1` and press **Enter**.
2. Type `IP INT` and enter the desired interval (in seconds) at which the OT-21 will broadcast (15 to 3600 sec.). For example, type `IP INT 255` and press **Enter**.

Configuring for Active Mode Broadcast to a Subnet

1. If the subnet mask is in the form of 255.255.0.0 (Class B Network) or 255.255.255.0 (Class C Network), then the broadcast mask is simply the network ID Bytes (first two bytes of IP address for a Class B Network, or first three bytes for a Class C Network), followed by one or two bytes with the value of 255. See the following examples:

- If on a Class B Network and the IP address of a device on subnet is: 192.168.12.3 and the Subnet Mask address is: 255.255.0.0, the OT21 would then be configured with a broadcast mask of 192.168.255.255. In this case, type the command:

```
IP BROADCAST 192.168.255.255 and press Enter
```

- If on a Class C Network and the IP address of a device on the subnet is: 192.168.12.3 and the Subnet Mask address is: 255.255.255.0, the OT21 would then be configured with a broadcast mask of 192.168.12.255. In this case type the command:

```
IP BROADCAST 192.168.12.255 and press Enter
```

- Determining the Broadcast Mask address is more complex if the subnet mask has values other than 255. To determine the Broadcast Mask address, perform the following:

For each bit set to 1 in the subnet mask, copy the corresponding bit from the IP address to the broadcast mask. For each bit set to 0 in the subnet mask, copy a 1 into the corresponding bit of the broadcast mask.

For example, if the IP address of a device on the subnet is 192.168.12.3 and the Subnet Mask address is 255.255.236.0 the Broadcast Mask address is 192.168.216.255. In this case type the command:

```
IP BROADCAST 192.168.216.255 and press Enter
```


Example:

```
OT-21>alarm all
alarm all
OT-21>
```

#	Alarm	Status	Level (*=Elev)	SETsec	CLRsec	SETcnt	CLRcnt
(00)	Rcvr Tracking	Yes	Minor	300	120	235	0
(01)	Rcvr Antenna	Connected	Major	Immed	Immed	0	86400
(02)	Antenna Load	Not Shorted	Minor	Immed	Immed	0	86400
(03)	Engine HW	Good	Ignore	Immed	Immed	0	86400
(04)	Engine System	Good	Minor	300	0	235	0
(05)	Receiver Posn	Good	Minor	Immed	Immed	235	0
(06)	Oscillator	Present	Critical	Immed	Immed	0	86400
(07)	Freq Control	No Holdover	Minor	300	30	0	187
(08)	Output Freq	OK	Major	600	300	0	86400
(09)	Output Time	OK	Minor	600	300	0	86400
(10)	Power Summary	Not Present		* Immed	Immed		
(10-1)	Power A	Not Present	Critical	* Immed	Immed	86400	0
(10-2)	Power B	Present	Minor	Immed	Immed	0	86400
(11)	Sys Clock PLL	Locked	Critical	Immed	Immed	0	86400
(12)	Rubidium PLL	Locked	Critical	Immed	Immed	0	86400
(13)	Freq Ctrl Range	OK	Major	300	120	0	86400
(14)	Unit HW	OK	Minor	Immed	Immed	0	86400
(15)	Eng. Stablty	OK	Minor	30	10	0	237
(17)	Port A Summary	Good		Immed	Immed		
(17-1)	Port A LOS	Good	Minor	10	5	0	86400
(17-2)	Port A AIS	Good	Minor	10	5	0	86400
(17-3)	Port A OOF	Good	Minor	10	5	0	86400
(17-4)	Port A BPV	Good	Minor	10	5	0	86400
(17-5)	Port A CRC	Good	Minor	10	5	0	86400
(17-6)	Port A PQL	OK	Minor	10	5	0	86400
(17-7)	Port A Stablty	Good	Minor	10	5	0	1
(17-8)	Port A Output	OK	Minor	Immed	Immed	0	13860
(18)	Port B Summary	Bad		* Immed	Immed		
(18-1)	Port B LOS	Bad	Major	* 10	5	86400	0
(18-2)	Port B AIS	Good	Minor	10	5	0	86400
(18-3)	Port B OOF	Good	Minor	10	5	0	86400
(18-4)	Port B BPV	Good	Minor	10	5	0	86400
(18-5)	Port B CRC	Good	Minor	10	5	0	86400
(18-6)	Port B PQL	OK	Minor	10	5	0	86400
(18-7)	Port B Stablty	Good	Minor	10	5	0	86400
(18-8)	Port B Output	OK	Minor	Immed	Immed	0	86400
(19)	HW Config	Invalid	Critical	Immed	Immed	86400	0
(20)	Output A	All OK		Immed	Immed		
(20-1)	Out-A:Line 1	OK	Minor	Immed	Immed	0	86400
(20-2)	Out-A:Line 2	OK	Minor	Immed	Immed	0	86400
(20-3)	Out-A:Line 3	OK	Minor	Immed	Immed	0	86400
(20-4)	Out-A:Line 4	OK	Minor	Immed	Immed	0	86400
(21)	Output B	All OK		Immed	Immed		
(21-1)	Out-B:Line 1	OK	Minor	Immed	Immed	0	86400

Disabling Unwanted Alarms

To disable unwanted alarms, use the `ALARM # IG` command where # is the alarm number and IG is ignore. In the previous example, Power B (alarm 10-2) is not present, which causes an alarm. To disable the alarm, type `ALARM 10-2 IG` and press **Enter**. This sets the alarm level to Ignore. It is important that you not set an alarm to Ignore if the alarm indicates degradation in the unit operation.

Changing Default Alarm Levels

To change alarm levels, use the `ALARM` `[{#}{Minor|Major|Critical|Report|Ignore}]` command, where # is the alarm number. For example, to change the Oscillator alarm from critical to major, type `ALARM 06 MA` and press **Enter**.

Changing Default Alarm Delay Times

Alarms with “Immed” values cannot be changed. To change the alarm set (on) and clear (off) delay time on alarms that can be changed, use the `ALARM` `[{#}{SET|CLR|DELAY time}]` command (where # is the alarm number and the time option is in seconds). For example, to change receiver tracking from 300 seconds to 150 seconds type `ALARM 00 SET DELAY 150` and press **Enter**. To change engine system from 0 seconds to 30 seconds type `ALARM 04 CLR DELAY 30` and press **Enter**.

Configuring a GPS Radio Receiver

GPS engines do not need to be configured. When the OT-21 is turned on, the engine automatically searches for and tracks satellites.

Verifying the Radio Receiver Input

To verify that the radio receiver is tracking or receiving, or to review radio receiver signal data, type `ENGINE TDATA` and press **Enter**.



Note: Type `ENGINE TDATA ON` to display a report of the tracking data every five seconds. Type `ENGINE TDATA OFF` to stop the tracking data reports.

A typical GPS report appears as follows:

```
1 17 029 OK      T08:00:00Z
2 25 000 Search
3 08 000 Search
4 02 078 OK
5 09 000 Search
6 30 041 OK
7 12 000 Search
8 10 000 Search
```

Saving and Printing Configuration Settings With ICS Commands

NVRAM stores factory default configuration settings, customer configuration settings, and current configuration settings. Commands are provided to restore factory and user settings. For details, see [SETUP](#), on page 138.

Saving Settings to USER Area of NVRAM

The OT-21 uses the CURRENT area of NVRAM for configuration settings. If you change the configuration settings, the new settings will be saved to the CURRENT NVRAM area and can then be backed up to the USER area of NVRAM using the SETUP SAVE command.

The SETUP command provides five ways to save and restore settings: SETUP SAVE, SETUP FACTORY, SETUP FACTORY ALL, SETUP USER, and SETUP USER ALL.

- After changing the factory (default) configuration settings, you can save the current settings as User Settings. At the system prompt, type `SETUP SAVE` and press **Enter**. This procedure requires security access level 4.
- To restore the unit to most of the factory default settings, at the system prompt, type `SETUP FACTORY` and press **Enter**. The unit's IP settings and user table remain unchanged. This procedure requires security access level 3 or higher.
- To restore the unit to all of the factory default settings, at the system prompt, type `SETUP FACTORY ALL` and press **Enter**. This procedure requires security access level 3 or higher.



Note: If you use the `SETUP FACTORY ALL` command to restore the unit to the factory default settings, the unit's IP settings must be restored because they are removed with this command. The user table is also cleared.

- To restore most of the previously stored user configuration settings, at the system prompt, type `SETUP USER` and press **Enter**
- To restore all of the previously stored user configuration settings, at the system prompt, type `SETUP USER ALL` and press **Enter**.



Note: To delete the list of user names, issue the `USER INITUSERTABLE` command.

[Table E-1](#) lists the factory default configuration settings.

Reporting on NVRAM Settings

The `SETUP REPORT {CURRENT | FACTORY | USER}` command allows you to retrieve reports on the `CURRENT`, `FACTORY`, and `USER` NVRAM areas.

To display the NVRAM areas:

- Type `SETUP REPORT CURRENT` and press **Enter** to retrieve the `CURRENT` NVRAM settings.



Note: Typing `SETUP` with no parameters also retrieves the `CURRENT` NVRAM settings.

- Type `SETUP REPORT FACTORY` and press **Enter** to retrieve the `FACTORY` NVRAM settings.
- Type `SETUP REPORT USER` and press **Enter** to retrieve the user NVRAM settings.

To print or capture the information that appears in the terminal window:

- From a terminal emulation program such as Microsoft's HyperTerminal or Symantec's PROCOMM, use the **Print** command or use the terminal software to capture the screen information to a file or buffer.
- From an ASCII terminal connected to a printer, press the **Print Screen** key to send the screen information to the default printer.

Logging Off With ICS Commands

To log out from the ICS port, use either the `BYE` or `EXIT` commands.

At the system prompt, type `BYE` and press **Enter**, or at the system prompt, type `EXIT` and press **Enter**.

Configuring With TL1 Commands

This section provides information on configuring the OT-21 using TL1 commands.



Note: The examples in this section are from a system with the name (`tid`) set to `OT-21`. When entering commands, use the unit's actual `tid`, as set with the `SET-NAME` command, and enter a valid `ctag` value.

Setting the OT-21 Serial Port to TL1 Mode

To set up the OT-21 front panel serial port, COMMS local, for TL1 communications, type `COMM MODE TL1` and press **Enter**.

To set up the OT-21 rear panel serial port, SERIAL PORT-A, for TL1 communications, type `COMM MODE TL1` and press **Enter**.



Note: The `COMM MODE TL1` command in the previous examples only works if your system is connected to the port you are trying to set up. To set Serial Port-A to TL1 when your system is connected to COMMS local, type `COMM A MODE TL1` and press **Enter**.

Configuring COMMS local and Serial Port-A Ports With TL1 Commands

To display the settings for the TL1 connected ports, at the system prompt, type `RTRV-PRMTR:::COMM;`

Use the `SET-PRMTR...COMM` command to configure the COMMS local and Serial Port-A ports. Options include:

`baud` – [1200 | 2400 | 4800 | 9600 | 19200 | 38400]

`echo` – [ON | OFF]

`eol` – [CR | LF | CRLF]

`ansi` – [ON | OFF]

`hard` – [HON | HOFF]

`soft` – [SON | SOFF]

`mode` – [ICS | TL1]

For example, to set the baud rate for the COMMS local port to 9600, type `SET-PRMTR:::COMM,9600;`

For more information, refer to [Appendix D, TL1 Commands](#) in this User Guide.

Configuring Users With TL1 Commands

If no users have been added to the system user table, you are automatically logged on as user Symm with no password at level 4, Administrator user. If users have been added, the default level 4 login is unavailable, and you must use a valid username and password to log in.

For a list of security access levels and description of privileges for each, see [Table C-2](#). For a list of ICS commands, organized by security level, see [ICS Command Descriptions and Access Levels](#), on page 126.



Note: The OT-21 software does not allow you to assign level 0 through level 3 users before the Administrator level 4 user and password are assigned.

Assigning a Level 4 Administrator

To add an Administrator user for the system, type
`SET-USER:::::ADD, "username", "password", 4;`

The system responds with the complied message.

Adding Level 0 Through Level 3 Users and Establishing Security Access

A user's security access is specified by the user level 0 through 4, with level 4 users being the Administrators. Only an Administrator (level 4) can add users. Type `SET-USER:::::ADD, "username", "password", X;`, where X is level 1 through level 4.



Note: Valid username and password characters include numbers, upper and lowercase letters, and the character set ";<=>?@". The semicolon functions properly only in ICS mode, and the colon must be enclosed in quotes in TL1 mode, as "USER:NAME" or "PASS:WORD". To enter lowercase letters, enclose the input in quotes, as "UserName" or "PassWord". *Do not* use spaces in usernames.

Modifying a User Password (all levels)

To modify a user password, type
`SET-USER:tid::ctag::MOD, "username", ["passwd"], [level];`

Deleting a User (level 4, Administrator)

To delete a user, type `SET-USER:tid::ctag::DEL, "username";`

Configuring Ethernet Settings With TL1 Commands

The Ethernet configuration settings must be made through a serial port connection to the OT-21.

Configuring Basic IP Parameters (address, mask, gateway)

To configure the OT-21 IP address, mask, and gateway:

1. Establish a direct serial connection to the OT-21 unit.
2. At the system prompt, type

```
SET-PRMTR:::::IP, [ipaddr], [ipmask], [gateaddr],  
[brdmsk], [intvl];
```

where:

`ipaddr` is the IP address expressed in dotted decimal notation, for example, 192.168.0.1

`ipmask` is the mask address, for example 255.255.0.0 for a class B network, or 255.255.255.0 for a class C network

`gateaddr` is the address of the gateway expressed in dotted decimal notation, for example 192.168.0.1

Configuring SNTP Parameters

To configure the OT-21 as an SNTP server, perform the following steps in accordance with your network system requirements.

Configuring for Passive Mode Broadcast

It is not necessary to configure the OT-21 for passive mode. The OT-21 operates in the passive mode without any intervention.

Configuring for Active Mode Broadcast to a Single IP Address

1. Establish a direct serial or Ethernet connection to the OT-21 unit.
2. Type

```
SET-PRMTR:::::IP,,, [brdmsk], [intvl];
```

, for example

```
...IP,,, 192.168.0.1, 255;
```

Configuring for Active Mode Broadcast to a Subnet

1. Establish a direct serial or Ethernet connection to the OT-21 unit.
2. If the subnet mask is in the form of 255.255.0.0 (Class B Network) or 255.255.255.0 (Class C Network), then the broadcast mask is simply the network ID Bytes (first two bytes of IP address for a Class B Network, or first three bytes for a Class C Network), followed by one or two bytes with the value of 255. See the following examples:


```
RTRV-PRMTR:[tid]::[ctag]::ALARM[:alm];
```

```
SET-PRMTR:[tid]::[ctag]::ALARM,alm,[level],[setd],[cleard];
```

Disabling Unwanted Alarms

To disable an unwanted alarm, use the SET-PRMTR:[tid]::[ctag]::ALARM,alm,[level]; command. Because the setd and cleard options are not needed in this example, they must be removed from the command, but the commas separating the removed options remain in place. The severity levels in this command include ignore (IG), report (RE), minor (MN), major (MJ), and critical (CR).

The following example error message (error 19) indicates that the hardware configuration is invalid and the severity level is set to critical.

```
"SYS:BAD,CR,19,SA,01-10-06,23-33-33:\"HW Config=Invalid\""
```

To disable the alarm type SET-PRMTR::::ALARM,19,IG;

The system responds with:

```
OT-21 01-10-08 18-31-33
```

```
A 000029 REPT EVNT
```

```
"SYS:NA,106,NSA,01-10-08,18-31-33:\"Alarm Set,level Ignore\""
```

Changing Default Critical Alarm Levels

To change the default critical alarm levels, use the SET-PRMTR:[tid]::[ctag]::ALARM,alm,[level]; command. Because the setd and cleard options are not needed in this example, they must be removed from the command, but the commas separating the removed options remain in place.

To change the default critical severity level of alarm 19 to minor, type

```
SET-PRMTR::::ALARM,19,MN;
```

The system responds with:

```
OT-21 01-10-08 19-00-36
```

```
M 0 COMPLD
```

```
;
```

```
OT-21 01-10-06,23-33-32
```

```
* 000036 REPT ALRM
```

```
"SYS:MN,19,NSA,01-10-06,23-33-32:\"HW Config=Invalid\""
```

```
;
```

```
OT-21 01-10-08 19-00-37

A 000035 REPT EVNT

"SYS:NA,106,NSA,01-10-08,19-00-37:\\"Alarm Set,level  Minor\\""

;
```

Changing Default Alarm ON and OFF Delay Times

To change the default alarm on and off delay times, use the SET-PRMTR:[tid]:[ctag]:ALARM,alm,,[setd],[cleard]; command. Because the level option is not needed in this example, it must be removed from the command. The comma separating the removed option remains in place.

Example:

To set alarm 0 (Rcvr Tracking) to a five-minute **annunciation** delay, type
SET-PRMTR:::001::ALARM,0,,300;

This sets how long the error must be present before the alarm is announced.

The system responds with:

```
OT-21 01-10-08 19-33-31

M 001 COMPLD

;

OT-21 01-10-08 19-36-40

A 000034 REPT EVNT

"SYS:NA,104,NSA,01-10-08,19-36-40:\\"Alarm Set,300 sec\\""

;
```

Example:

To set alarm 0 (Rcvr Tracking) to a 30-second **clearing** delay, type
SET-PRMTR:::002::ALARM,0,,,30;

This sets how long the error must no longer be present before the alarm is cleared.

The system responds with:

```
OT-21 01-10-08 19-36-39

M 002 COMPLD

;
```

```
OT-21 01-10-08 19-36-40
```

```
A 000037 REPT EVNT
```

```
"SYS:NA,104,NSA,01-10-08,19-36-40:\\"Alarm Set,30 sec\\""
```

Configuring the GPS Receiver

GPS engines do not need to be configured. When the OT-21 is turned on, the engine automatically searches for and tracks satellites.

Verifying the Radio Receiver Input

To verify that a GPS radio receiver is tracking or receiving, or to review GPS radio receiver signal data, type `RTRV-DATA:::001::GPS;`

The system responds with:

```
OT-21 01-10-08 19-54-09
```

```
M 001 COMPLD
```

```
"1 14 104 OK"
```

```
"2 22 074 OK"
```

```
"3 21 104 OK"
```

```
"4 11 083 OK"
```

```
"5 25 104 OK"
```

```
"6 29 117 OK"
```

```
"7 20 033 OK"
```

```
"8 30 117 OK"
```

```
;
```

OK indicates the radio receiver has acquired a proper signal. If `Search` appears, it indicates the radio receiver has not acquired a proper signal.

Saving and Printing Configuration Settings With TL1 Commands

NVRAM stores factory default configuration settings, customer configuration settings, and current configuration settings. Commands are provided to restore factory and user settings. For details, see [SET-PRMTR:\[tid\]::\[ctag\]::SETUP, \[fact \[,all\] | user \[,all\] | save\]](#), on page 178.

Saving Settings to USER Area of NVRAM

The OT-21 uses the CURRENT area of NVRAM for configuration settings. If you change the configuration settings, the new settings can be copied to the CURRENT NVRAM area and then backed up to the USER area of NVRAM using the SET-PRMTR...SETUP,SAVE command.

The SET-PRMTR...SETUP command provides five ways to install configuration settings into NVRAM: SET-PRMTR...SETUP SAVE, SET-PRMTR...SETUP FACT, SET-PRMTR...SETUP FACT ALL, SET-PRMTR...SETUP USER, and SET-PRMTR...SETUP USER ALL.

- After changing the factory (default) configuration settings, you can save the current settings as User Settings. Type `SET-PRMTR:::SETUP,SAVE;`
- To restore the unit to the factory default settings, type `SET-PRMTR:::SETUP,FACT,ALL;`



Note: You can also use the `SET-PRMTR:::SETUP,FACT,ALL;` command to restore the unit to the factory default settings, but the unit's IP settings must be restored because they are removed with this command.

- To restore most of the previously stored user configuration settings, type `SET-PRMTR:::SETUP,USER;`



Note: The unit's IP settings and user table remain unchanged.

- To restore all of the previously stored user configuration settings, type `SET-PRMTR:::SETUP,USER,ALL;`



Note: To delete the list of user names, use the `SET-USER:::INIT;` command.

[Table E-1](#) lists the factory default configuration settings.

Reporting on NVRAM Settings

The RTRV-PRMTR...SETUP command allows you to retrieve reports on the CURRENT, FACTORY, and USER (valid aid code) NVRAM areas.



Note: The examples in this section are from a system with the name [tid] set to OT-21. When entering commands, use the unit's actual tid, as set with the SET-NAME command, and enter a valid ctag value.

To display the NVRAM areas:

Type `RTRV-PRMTR::CURRENT:::SETUP;` to retrieve the current NVRAM settings.

Type `RTRV-PRMTR::FACTORY:::SETUP;` to retrieve the factory NVRAM settings.

Type `RTRV-PRMTR::USER:::SETUP;` to retrieve the user NVRAM settings.

To print or capture information that appears in the terminal window:

- From a terminal emulation program such as Microsoft HyperTerminal, use the **PRINT** command or use the terminal software to capture the screen information to a file or buffer.
- From an ASCII terminal connected to a printer, press the **Print Screen** key to send the screen information to the default printer.

Logging Off With TL1 Commands

To log out from the TL1 port, type `CANC-USER;` or type `EXIT;`

Operation Completion Checklist

After performing unit power-up, basic configuration, and verification of the radio receiver signal, verify the system condition and ensure that the procedures in [Table 4-3](#) have been verified and checked off.

Table 4-3. Operation Completion Checklist

Operation/Indication	Complete
All alarm indication lights are OFF.	
POWER and TRACKING indication lights are Green, indicating that the unit is tracking.	
Use ENGINE {TDATA} ICS command or RTRV-DATA...GPS TL1 commands to verify tracking.	
ACTIVE indication light is ON.	
Alarm 05 "Receiver position status" reports Position, Good .	

Power-Up and Configuration
Operation Completion Checklist

Chapter 5 Commissioning Tests

In This Chapter

- Introduction
- Testing Assumptions
- Equipment Requirements
- Setting Up Test Equipment
- Performing Commissioning Tests
- Recording Test Results
- Restoring the Unit to Site Specifications
- Commissioning Test Data Sheet

Introduction

The OT-21 commissioning tests are checklist-based operational tests that field engineers perform at the installation site after installation, system power-up, and optioning to verify the functionality and performance of the installed system. This chapter provides both ICS and TL1 command information for the procedures.

This section provides the commissioning test procedures that you follow to verify that the OT-21 unit is properly installed, configured, operating normally, and ready to place into service. Perform the instructions provided to complete the following tasks:

- Set up testing equipment for performing test procedures and verifying results
- Verify communications
- Test alarms
- Verify antenna signal
- Restore the unit to site specifications

Testing Assumptions

The tests in this section verify proper operation of the OT-21 as an installed system (see [Completing the Installation Checklist](#), on page 55). Test procedures assume that the OT-21 unit has received standard functional, qualification, factory acceptance, and manufacturing testing at the factory.

The test procedures further assume that:

- All interconnect wiring is properly connected
- Power has been applied and you have verified proper operation of the equipment
- The system is using factory default configuration settings

Equipment Requirements

The commissioning tests in this section require the following test equipment. You should set up the equipment before beginning the test procedures described in this section.

- Digital Voltmeter (DVM)
- PC or laptop with serial port and TCP/IP connectivity and terminal emulation software such as Microsoft HyperTerminal, Procomm Plus or ASCII terminal

Setting Up Test Equipment

Refer to [Chapter 4, Power-Up and Configuration](#), for information on how to connect a computer to the OT-21 for testing. The information in that chapter describes how to make the OT-21's serial and TCP/IP connections to a computer (PC, laptop, ASCII terminal), provides information on the power up procedure, explains the login procedure, and describes how to configure the unit either with ICS commands or TL1 commands.

Performing Commissioning Tests

To perform the tests described in this section, you must log in with a user security access Level 3 or above. Commissioning tests provide a method to verify the proper operation of the entire system. Before beginning these tests:

- For **ICS** operation, use the **SETUP** command to save your customized configuration to the non-volatile memory. Type `SETUP SAVE` and press **Enter** to transfer the current configuration into the stored USER settings. See [Appendix C, ICS Commands](#), for a complete list of command definitions and syntax.
- For **TL1** operation, use the `SET-PRMTR...SETUP` command to save your customized configuration to the non-volatile memory. Type `SET-PRMTR: ::::SETUP, SAVE;` to transfer the current configuration into the stored USER settings. See [Appendix D, TL1 Commands](#), for a complete list of command definitions and syntax.



Note: The examples in this section are from a system with the name (tid) set to OT-21. When entering commands, use the unit's actual tid, as set with the SET-NAME command, and enter a valid ctag value.

Recording Test Results

Use a copy of the [Commissioning Test Data Sheet](#), on page 89, to record test results.

Communications Interface

If you are testing the Ethernet connection to a network, set the IP address. See [Configuring Ethernet Settings With ICS Commands](#), on page 64, or [Configuring Ethernet Settings With TL1 Commands](#), on page 72.

EIA-232 COMMS Local Port Communication

To test the EIA-232 COMMS local port (J1) communications:

1. Connect the PC to EIA-232 COMMS local port (J1).
2. Type `HELP` and press **Enter**.
3. Verify that a list of commands is displayed.

EIA-232 SERIAL PORT-A Communications

To test the EIA-232 Serial Port-A (J15) communications:

1. Connect the PC to EIA-232 SERIAL PORT-A.
2. Type `HELP` and press **Enter**.
3. Verify that a list of commands is displayed.

Ethernet Port Communications

To test the Ethernet port communications, perform the following:

1. Connect the PC to the network; refer to [Connecting the Communications Equipment](#), on page 58.
2. Connect the OT-21 unit to the network.
3. Open a Telnet or other software emulation package session on the PC.
4. Using the IP address, connect the session to the OT-21 unit.
5. Type `HELP` and press **Enter**.
6. Verify that a list of commands is displayed.

To verify an NTP Output Signal:

1. Open an NTP client software session on the PC.
2. Using the IP address, request the time from the OT-21 unit.
3. Verify that the OT-21 time appears on the PC.

Alarms

This section provides step-by-step instructions to test the Critical, Major, and Minor alarm relay closures and software. Alarm indications from the alarm relays are dependent on the site facility alarm configuration.

CRITICAL Alarms

To test the CRITICAL alarm relay closures and software:

1. Enter the **ALARM 10-1 CR** command and subset, which sets Power A alarm 10-1 level to CRITICAL (CR):

For ICS, type `ALARM 10-1 CR` and press **Enter**.

For TL1, type `SET-PRMTR::::ALARM,10-1,CR;`

2. Remove power from the Power A input.
3. Verify that the CRITICAL alarm indicator is ON.
4. Verify that the CRITICAL alarm is reported to the communications terminal.
5. Enter the `EVENTS` command and verify that a CRITICAL alarm is logged into the event log:

For ICS, type `EVENTS REPORT` and press **Enter**.

For TL1, type `RTRV-EVENT::::,REPORT;`

6. Verify that the proper facility alarm is created from the critical alarm closure.
7. Restore power to the Power A input.
8. Verify that the alarm indicator goes OFF and that the alarm clear event is logged into the event log using the appropriate command in [Step 5](#).

MAJOR Alarms

To test the MAJOR alarm relay closures and software:

1. Enter the **ALARM 10-1 MA** command and subset, which sets Power A alarm (10-1) level to MAJOR (MA):

For ICS, type `ALARM 10-1 MA` and press **Enter**.

For TL1, type `SET-PRMTR::::ALARM,10-1,MA;`

2. Remove power from the Power A input.
3. Verify that the MAJOR alarm indicator is ON.

4. Verify that the MAJOR alarm is reported to the communications terminal.
5. Enter the **EVENTS** command and verify that a MAJOR alarm is logged into the event log.

For ICS, type `EVENTS REPORT` and press **Enter**.

For TL1, type `RTRV-EVENT:::::,,,,,,REPORT;`

6. Verify that the proper facility alarm is created from the major alarm closure.
7. Restore power to the Power A input.
8. Verify that the alarm indicator goes OFF and that the alarm clear event is logged into the event log using the appropriate command in [Step 5](#).

MINOR Alarms

To test the MINOR alarm relay closures and software, perform the following:

1. Enter the `ALARM 10-1 MI` command and subset, which sets Power A alarm (10-1) level to MINOR (MI):

For ICS, type `ALARM 10-1 MI` and press **Enter**.

For TL1, type `SET-PRMTR:::::ALARM,10-1,MI;`

2. Remove power from the Power A input.
3. Verify that the MINOR alarm indicator is ON.
4. Verify that the MINOR alarm is reported to the communications terminal.
5. Enter the `EVENTS` command and verify that a MINOR alarm is logged into the event log:

For ICS, type `EVENTS REPORT` and press **Enter**.

For TL1, type `RTRV-EVENT:::::,,,,,,REPORT;`

6. Verify that the proper facility alarm is created from the minor alarm closure.
7. Restore power to the Power A input.
8. Verify that the alarm indicator goes OFF and that the alarm clear event is logged into the event log using the appropriate command in [Step 5](#).

GPS Input Signal

This section provides instructions to test the GPS capabilities. While monitoring a GPS signal, when the automatic gain control (AGC) signal strength for a channel is greater than approximately 25 dB, verify that the signal is tracking and an `OK` message appears in a report returned to the screen. Otherwise, one of the following messages appears in the report.

In ICS mode, the messages are:

- **Search** – searching for signal from satellite
- **Acquire** – acquiring frequency lock
- **AGC Adjust** – adjusting receiver gain
- **Freq Lock** – locking to frequency offset from satellite
- **Code Lock** – locking to CA code from satellite
- **Message Decode** – decoding message sync from satellite
- **Establish Time** – setting time from satellite
- **Gather Ephemeris** – obtaining Ephemeris data from satellite
- **OK** – locked and tracking satellite

In TL1 mode, the messages are:

- **SRC** – searching for code from satellite
- **ACQ** – acquiring frequency lock
- **AGC** – adjusting receiver gain
- **FRQ** – locking to frequency offset from satellite
- **COD** – locking to CA code from satellite
- **MSG** – decoding message sync from satellite
- **TIM** – setting time from satellite
- **EPH** – obtaining Ephemeris data from satellite
- **OK** – locked and tracking satellite

The report columns from left to right include the GPS channel numbers, satellite identification numbers, automatic gain control (AGC) signal strength, and the response message. This report updates on the screen approximately every five seconds. To generate the report and verify that the signal is tracking:

1. Enter the ICS command `ENGINE TDATA` or the TL1 command `RTRV-DATA...GPS`:

For ICS, type `ENGINE TDATA` and press **Enter**.

A report similar to the following appears on the screen:

```
1 17 029 OK T08:00:00Z
2 25 000 Search
3 08 000 Search
4 02 078 OK
5 09 000 Search
6 30 041 OK
7 12 000 Search
8 10 000 Search
```

For TL1, type `RTRV-DATA::::GPS;`

A report similar to the following appears on the screen:

```
OT-21 02-06-11 16-07-05
M 0 COMPLD
"1,6,16,MSG"
"2,30,0,SRC"
"3,5,0,SRC"
"4,24,26,OK"
"5,29,0,SRC"
"6,10,23,OK"
"7,26,0,SRC"
"8,23,0,SRC"
;
```

2. Verify that the signal is tracking a satellite by observing OK in the report.
3. For ICS, type `ENGINE TDATA` and press **Enter** to turn off the report.

Restoring the Unit to Site Specifications

After completing all tests, restore the system to the proper configuration settings for the site.

1. Disconnect all test equipment except the PC or terminal.

2. Restore the saved configuration file:

– To restore the user configuration file:

For ICS mode, type `SETUP USER` and press **Enter**.

For TL1 mode, type `SET-PRMTR: : : : SETUP, USER, ALL;`

– To restore the factory default configuration file:

For ICS mode, type `SETUP FACTORY` and press **Enter**.

For TL1 mode, type `SET-PRMTR: : : : SETUP, FACT, ALL;`

3. Reconnect the PC or terminal to PORT A (J15) and the Ethernet port (J16).

Commissioning Test Data Sheet

Use this test data sheet during installation and acceptance tests of the OT-21 equipment. For each test category, record the results in the space provided.

Table 5-1. Commissioning Test Data Sheet

Test	Pass	Fail	N/A
EIA-232 COMMS LOCAL Port (J1) Communications			
EIA-232 Serial Port-A (J15) Communications			
Ethernet Port Communications			
MINOR Alarms			
MAJOR Alarms			
CRITICAL Alarms			
GPS Signals			

Commissioning Tests
Commissioning Test Data Sheet

Chapter 6 Maintenance

This chapter provides information about preventive and corrective maintenance.



Note: Please retain the original packaging of the unit for re-shipping the product as needed. If the original packaging has been discarded, contact your next level of Nortel Support for assistance.

In This Chapter

- [Software Maintenance](#)
- [Preventive Maintenance](#)
- [Corrective Maintenance](#)

Software Maintenance

This section provides the information needed to update OT-21 software using either ICS or TL1 commands.

Downloading New System Software

This section provides instructions on downloading and installing new system software in a OT-21. The software is located on Symmetricom's internet site, and customers must be registered to access the software.

Perform the following steps to download OT-21 software.

1. Point your web browser to Symmetricom's Home site at www.symmetricom.com.
2. Click **Online Support** in the **Support** drop down list (see [Figure 6-1](#)).

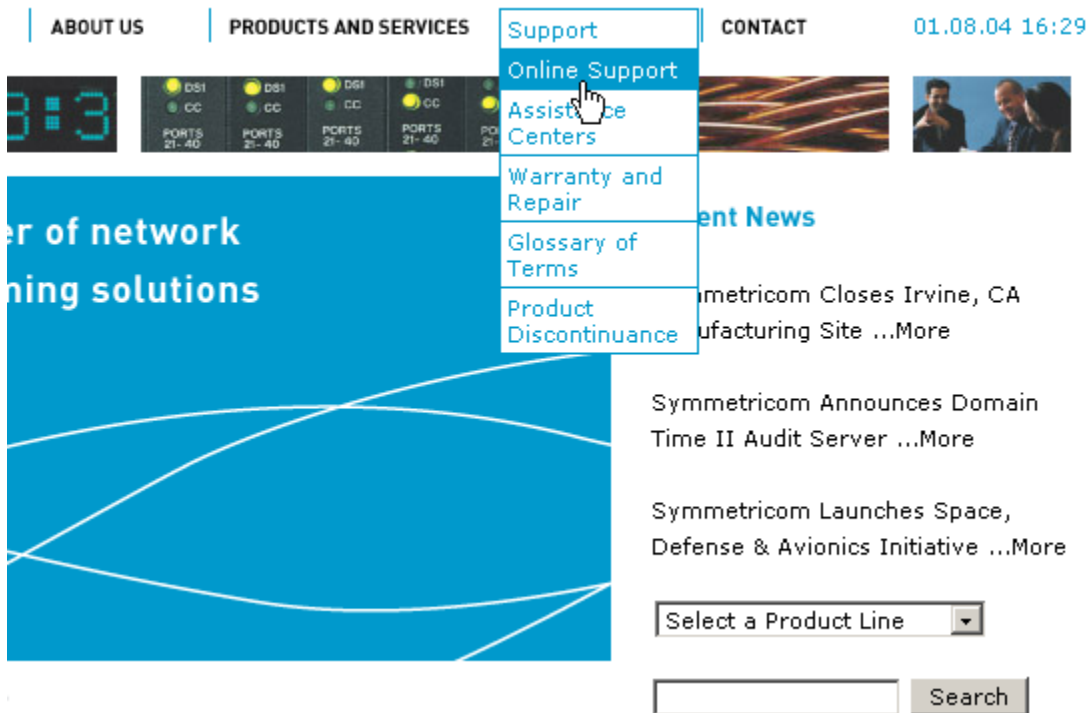


Figure 6-1. Online Support

3. If you are not a registered user, click **Register now** (see [Figure 6-2](#)) and follow the instructions on the screen. If you are a registered user, enter your **Username** and **Password** and click **Login**.

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Online Support

Login here for access to the Symmetricom Knowledge Database. The database contains support information for Symmetricom products including manuals, software downloads, Product Change Notices and Field Service Bulletins.

You must log in to view this page

Username: (case sensitive)

New User? [Register now](#)

Password: (case sensitive)

[Forgot your password?](#)

Login

Figure 6-2. Support Login

4. Select **Software Download** from the **Choose a category** drop down list, select a date category in the **Show date added** drop down list, choose a search method, enter a keyword (such as OfficeTime 21) and click **Search** (see [Figure 6-3](#)).



Support Knowledge Base

Critical information for owners of the DCD-LPR:

Field Service Bulletin (FSB) number [098-40620-118](#) issued to announce a Time of Day abnormality on some GTI cards.

Most information is provided in Adobe Portable Document Format (PDF). To view PDF files, you need the [Adobe Acrobat Reader](#).

Choose a category: Software Downloads

Show date added: All dates

Choose a search method: Match Any Words, Require All Words

Enter keywords (if any): OfficeTime-21

Search

Figure 6-3. Software Download Search Screen

5. Click the hyper linked text for the appropriate software version and follow the instructions on the screen to download system software.
6. When the download is complete, extract the compressed files.
7. Refer to the Software Release Document (extracted PDF document) for software installation instructions.

Installing New System Software

To install new firmware and update the OT-21's FLASH ROM you can use:

- the OT-21 Download Application
- the ICS LOAD "fileID ftpSite user password" command
- the TL1 LOAD command

The OT-21 Download Application (OTDA) is a seamless upgrade installation kit. The OTDA allows you to download new software to the OT-21 and provides its own communication interface to the OT-21 through an EIA/TIA-232-E serial port and an Ethernet 10BaseT port.



Note: Perform upgrades during maintenance windows to minimize network issues. Contact the next level of Nortel Support if assistance is required.

OT-21 Upgrade Using a Personal FTP Server Residing On Your Local Network

Once the new software has been transferred to the FTP server, ensure that you have the following information:

`filename.hex` – the name of the upgrade software, such as `OT21C00.hex`.



Note: If the file is not placed in the root directory of the FTP server, the filename must include the directory path to the file.

`ip_address` – the IP address of the FTP server.

`username` – the name assigned to have access to the FTP server.

`password` – the password assigned to have access to the FTP server.

To load the new software, perform the following steps:

1. Ensure the local computer is setup as a server and is connected to the local area network (LAN).
2. Place the upgrade file in the FTP server root directory.
3. Ensure the OT-21 is connected to the LAN.

- Using a terminal emulator, connect to the OT-21 that is to be upgraded and log into the system as an Administrator level user.
- Enter the LOAD command:

For **ICS**, type `LOAD "filename.hex ip_address username password"` and press **Enter**.

The download should finish in approximately 1 to 2 minutes. The following is displayed by the OT-21 during a successful download:

```
Downloading OT21B00.hex ...  
  
Loaded 1993086 bytes  
  
Validating file  
  
Erasing flash  
  
Programming Flash  
  
Complete  
  
OT-21>
```

After the OT-21 responds with `Complete`, type `Restart` and press **Enter** to restart the OT-21.

For **TL1**, type `LOAD::::ip_address,"username","password", filename.hex",OV;`



Note: The tid must be specified and must match before the command will be accepted.



Note: Valid username and password characters include numbers, upper and lowercase letters, and the character set `":;<=>?@"`. The semicolon functions properly only in ICS mode, and the colon must be enclosed in quotes in TL1 mode, as `"USER:NAME"` or `"PASS:WORD"`. To enter lowercase letters, enclose the input in quotes, as `"UserName"` or `"PassWord"`. *Do not* use spaces in usernames.

This download process should finish in approximately 1 to 2 minutes and the system responds with an in process (IP) indication and a complied message.

```
OT-21 01-11-02 16-04-21
```

```
IP
```

```
<
```

```
OT-21 01-11-02 16-04-46
```

```
M 0 COMPLD
```

```
;
```

After the OT-21 responds with `COMPLD`, type `RESET:::0,OV;` to restart the OT-21 with 0 seconds delay.

Preventive Maintenance

The OT-21 unit requires minimal preventive maintenance. Care should be taken to ensure the unit is not exposed to hazards such as direct sunlight, open windows, water, or extreme heat. See [Electromagnetic Compatibility \(EMC\) Considerations](#), on page 34, for electromagnetic compatibility conditions that may cause damage.



ESD Caution: To avoid electromagnetic discharge damage to the circuitry, never attempt to vacuum the OT-21.



Caution: To avoid damage, under no circumstances should the interior chassis of the OT-21 be allowed to come in contact with water.

[Table 6-1](#) lists preventive maintenance measures to be performed periodically. Do not disassemble components just for the purpose of inspection.

Table 6-1. Preventive Maintenance

Item	Inspection	Corrective Action	Interval
Chassis	Inspect for dirt or foreign material	Clean the exterior of chassis with a soft dry cloth	Periodically
Cables	Inspect for pinched, worn or damaged cable	Replace pinched, worn or damaged cable at the first opportunity	Periodically
Connectors	Inspect for loose or damaged connector	Tighten loose connectors. If damaged, replace the connector and/or cable at the first opportunity	Periodically
Input Power Fuses	Inspect for loose or damaged fuses	If loose, seat firmly. If damaged, replace fuse	Periodically
Unit Case Screws	Inspect for loose screws on the entire case of the unit to ensure that they are tight.	If loose, tighten securely	Periodically

Corrective Maintenance

[Table 6-2](#) lists the field replaceable units (FRU) for the OT-21 unit. This table also outlines possible component problems and corrective action.

Table 6-2. Corrective Action Table

Component	Corrective Action	Item Number
Fuse Replacement	Remove faulty fuse and replace with appropriate 1 Amp fuse	552005-0003
Defective GPS Antenna and Cable	Replace defective part	See Table F-2

Chapter 7 Repair and Troubleshooting

To alert you that a possible problem exists, the OT-21 uses event reporting, alarm lights located on the unit, and remote, local, or audio alarm connections. Alarms are a subset of the event reporting. All alarms are events; however, not all events are alarms. For example, a login is recorded as an event, but is not considered an alarm. This chapter provides a list of alarm conditions, recorded events, and troubleshooting guidelines for the OT-21 unit.

In This Chapter

- [Getting Started](#)
- [Diagnosing Alarms](#)
- [Troubleshooting Guidelines](#)

Getting Started

To perform troubleshooting for the OT-21 unit, you must establish a serial connection from SERIAL PORT-A (J15), COMMS local (J1), or a network connection from the Ethernet (J16) to a PC or laptop with terminal emulation software, or to an ASCII terminal. [Connecting the Communications Equipment](#), on page 58, provides instructions for connecting to the serial port.



Caution: To maintain EMC compliance, use only properly grounded, shielded cabling on all Telecom signal connectors.

Diagnosing Alarms

After connecting to the troubleshooting terminal (see [Connecting the Communications Equipment](#), on page 58), enter the ALARM command in either ICS or TL1 mode describe below to view the alarm status of the unit.

To display a list of active alarms in **ICS** mode, type `ALARM` and press **Enter**. The following example illustrates information that is displayed:

#	Alarm	Status	Level (*Elev)	Delay
(10)	Power	Not Present	Minor	Immed

To display a list of active alarms in **TL1** mode, type `RTRV-ALARM::ENG::;`. The following example illustrates information that is displayed. See [Table 7-1](#) for a list of all SNTP related alarms displayed in TL1 format. The alarm number column is for reference only.

```
OT-21 01-10-11 19-20-56

M  ENG COMPLD

"PWR:BAD,CR,10,SA,01-10-11,19-20-56:\"Power Summary=Not
Present,2ND ELEVATION\"

"PWR:BAD,CR,10-2,SA,01-10-08,23-43-49:\"Power B=Not
Present,2ND ELEVATION\"

"SYS:BAD,CR,19,SA,01-10-10,19-10-49:\"HW
Config=Invalid,2ND ELEVATION\"

;
```

Table 7-1. TL1 Alarm Displays

Alarm No.	Display
0	"ENG:OK,00,CL,NSA,04-03-25,20-26-51:\Rcvr Tracking=Yes\""
1	"ENG:OK,01,CL,NSA,04-03-25,20-24-24:\Rcvr Antenna=Connected\""
2	"ENG:OK,02,CL,NSA,04-05-04,21-53-52:\Antenna Load=Not Shorted\""
3	"ENG:OK,03,CL,NSA,04-05-04,21-53-52:\Engine HW=Good\""
4	"ENG:OK,04,CL,NSA,04-04-21,19-45-17:\Engine System=Good\""
5	"ENG:OK,05,CL,NSA,04-03-24,19-18-32:\Receiver Posn=Good\""
6	"SYS:OK,06,CL,NSA,04-05-04,21-53-52:\Oscillator=Present\""
7	"SYS:OK,07,CL,NSA,04-04-21,19-45-51:\Freq Control=No Holdover\""
8	"SYS:OK,08,CL,NSA,04-03-13,18-31-12:\Output Freq=OK\""
9	"SYS:OK,09,CL,NSA,04-02-17,15-36-50:\Output Time=OK\""
10	"PWR:OK,10,CL,NSA,04-05-04,21-53-52:\Power Summary=Present\""
10-1	"PWR:OK,10-1,CL,NSA,04-05-04,21-53-52:\Power A=Present\""
10-2	"PWR:OK,10-2,CL,NSA,04-05-04,21-53-52:\Power B=Present\""
11	"SYS:OK,11,CL,NSA,04-05-04,21-53-52:\Sys Clock PLL=Locked\""
12	"SYS:OK,12,CL,NSA,04-02-17,15-17-34:\Rubidium PLL=Locked\""
13	"SYS:OK,13,CL,NSA,04-05-04,21-53-52:\Freq Ctrl Range=OK\""
14	"SYS:OK,14,CL,NSA,04-05-04,21-53-52:\Unit HW=OK\""
15	"ENG:OK,15,CL,NSA,04-05-03,05-07-08:\Eng. Stabltly=OK\""
19	"SYS:OK,19,CL,NSA,04-05-04,21-53-52:\HW Config=OK\""
22	"SYS:OK,22,CL,NSA,04-05-04,21-53-52:\VCXO=OK\""



Note: See the alarm list in [Table 7-3](#) to diagnose the specific problem and apply the possible solutions to clear the alarm.

Troubleshooting Guidelines

This section provides OT-21 repair and troubleshooting information for the topics listed below:

- [Fault Indicators](#)
- [Alarms](#)
- [Events](#)

Fault Indicators

Most fault indicators indicate a hardware failure, such as a loss of signal or a detected input signal defect, or an input signal problem. Fault conditions light front panel LEDs and send a signal to a device attached to the alarm relay connector. [Table 7-2](#) provides a description of each indicator and its function. [Table 7-3](#) provides a list of corrective actions to take in case of a fault indication accompanied by an alarm condition.

Table 7-2. Indicators and Functions

Indicator	Color	Function
Power	Green	ON = Unit is receiving power OFF = Unit has no power
Active	Green/Amber	GREEN = Unit has been set to be active and the Out-of-Frequency alarm is not currently active AMBER = Unit is active and the Out-of-Frequency alarm is currently active OFF = Unit is inactive
Tracking	Green/Amber	GREEN = Unit is tracking GPS AMBER = GPS tracking errors OFF = Unit is not tracking GPS
Input	Green/Amber	GREEN = Unit is tracking clock input as reference AMBER = Unit is selected as REF and has clock errors OFF = Unit is not tracking clock input as reference
Holdover	Amber	ON = Unit is in holdover mode OFF = Unit is operating normally
MINOR Alarm	Amber	ON = Unit has one or more MINOR alarms active OFF = No alarm is active

Table 7-2. Indicators and Functions

Indicator	Color	Function
MAJOR Alarm	Amber	ON = Unit has one or more MAJOR alarm states OFF = No alarm is active
CRITICAL Alarm	Red	ON = Unit has one or more CRITICAL alarms active OFF = No alarm is active

Alarms

Alarms are a subset of events (see [Events](#), on page 108). [Table 7-3](#) lists each alarm number, the purpose of the alarm, possible event messages generated with the alarm, and corrective actions to take for each alarm condition. The format of an interactive event message for an alarm update is:

```
[yyyy-mm-dd][Thh:mm:ssZ][alarm number][alarm description] [current alarm status][current alarm level][debounce time]
```

where:

yyyy-mm-dd = year-month-day

hh:mm:ss = hours:minutes:seconds

T = time

Z = the time in Zulu if the time has been synchronized with the GPS receiver.

Otherwise, the Z will not be displayed.

Alarm number – refer to [Table 7-3](#).

Alarm description – refer to [Table 7-3](#).

Current alarm status – refer to [Table 7-3](#).

Current alarm level – If active refer to the Actions column of [Table 7-3](#).

Alarm debounce time – the number of seconds that have passed since the alarm occurred.

Alarm Levels

The five valid alarm levels are described below:

IGNORED – Set by the user. This alarm state allows reporting of the condition, but has no effect on the actual state of the alarm.

MINOR – An informational alarm that may or may not affect output. MINOR alarms may automatically elevate to conditions that would degrade the performance of the unit and should be addressed as soon as possible.

MAJOR – A failure within the unit that may require user intervention to clear the alarm. The output may be degraded.

CRITICAL – A failure within the unit that requires user intervention. Outputs are degraded.

REPORT – Annunciated but no LED or relay action.



Note: To establish communication with the unit and determine which alarm is active, use the ALARM command, see [Table 7-3](#).

Contact the next level of Nortel Support if assistance is required.

Table 7-3. Alarm Messages and Actions

Alarm No.	Alarm Name	Event Status non-active/active	Error Indication and Action
00	Receiver Tracking	Yes/No	<p>No indicates that the radio receiver is not tracking.</p> <p>Note: In first-time installations, this alarm may take up to 30 minutes to clear.</p> <p>Verify that the antenna and the antenna cable are properly connected.</p> <p>Verify that the antenna location allows for Line of Sight reception of the signal. The GPS antenna should not be indoors and should not have its location blocked by tall buildings.</p> <p>Disconnect the antenna cable at the OT-21 and measure the voltage. If it measures less than 4.7 vDC, check for an internal loose connection. If the connections are not loose, the problem is a defective GPS engine. Verify there are no large transmitters in the area that could cause interference.</p> <p>Check for other active alarms by issuing the ALARM command (see Diagnosing Alarms, on page 100).</p> <p>Verify that the radio receiver Engine Hardware alarm (alarm #3) is Good; if not Good, contact your Nortel Networks technical support representative.</p> <p>Use the ENGINE TDATA command to check engine progress.</p>

Table 7-3. Alarm Messages and Actions (Continued)

Alarm No.	Alarm Name	Event Status non-active/active	Error Indication and Action
01	Receiver Antenna	Connected/Not Connected	<p>Not Connected indicates that there is no antenna connection, or that the coaxial lead-in cable is open. Verify that the antenna coaxial lead-in is connected to the antenna connector on the rear of the unit. Verify that the antenna coaxial cable is connected to the antenna. Verify that the antenna coaxial cable is properly connected to the transient eliminator. Verify that the continuity of the antenna cable is not OPEN, and that the connectors are properly installed.</p>
02	Antenna Load	Not Shorted/Shorted	<p>Shorted indicates that the antenna has failed or the coaxial lead-in cable is shorted. Verify that the antenna coaxial cable is not shorted, connectors properly installed. Verify that the antenna is not drawing excessive current, or has failed. See Installing a GPS Antenna, on page 49.</p>
03	Engine Hardware	Good/Bad	<p>Bad indicates that the radio receiver hardware has failed. Contact your Nortel Networks technical support representative.</p>
04	Engine System	Good/Bad	<p>Bad indicates that the engine is reporting a system failure and the radio receiver is unable to report clock output control information.</p> <p>Note: This alarm may take up to 15 minutes to clear while satellite information is updating.</p> <p>Verify that the engine is tracking with the ENGINE TDATA command (see ENGINE, on page 130) – Verify engine tracking. (This is a toggle command. Enter the command again to disable it). If the engine is not tracking, refer to Alarm 00. Verify that the radio receiver position status has cleared. See Alarm 05.</p>

Table 7-3. Alarm Messages and Actions (Continued)

Alarm No.	Alarm Name	Event Status non-active/active	Error Indication and Action
05	Receiver Position	Good/ Unknown	<p>Unknown indicates that the current position has not been verified by the radio receiver. The radio receiver does not control clock outputs until this alarm is cleared.</p> <p>Note: For first-time installations, this alarm may take up to 10 minutes after the radio receiver begins tracking.</p> <p>Verify that the radio receiver is tracking.</p> <p>Verify that position updates are occurring and PDOP is below 5.0 with the POS command.</p> <p>If PDOP > 5.0, verify unit is tracking satellites in view with the AVAIL command.</p>
06	Oscillator	Present/ Not Present	<p>Not Present indicates that the radio receiver has lost the Local Oscillator output.</p> <p>Contact your Nortel Networks technical support representative.</p>
07	Frequency Control	No Holdover/ Holdover	<p>Frequency control indicates that the control loop has entered halt or holdover due to loss of phase measurement information or user command. It is set at power up until the local oscillator warm up is complete and a reference is selected.</p> <p>Verify that the unit has not been set into user holdover mode with the LOOP command.</p> <p>Verify that the Engine System Status alarm is cleared.</p> <p>Verify that there are valid phase measurements being generated using report #0.</p>
08	Output Frequency	OK/ Degraded	<p>Degraded indicates that the clock outputs are not guaranteed to meet Stratum 1 mask. It is set at power up, when the output correction is greater than 2×10^{-11} or if the system has had no reference for 24 hours or more. It clears when the output correction is less than 2×10^{-11} and the Tau is greater than 150 (St3E) or 320 (St2) seconds.</p> <p>Note: For first-time installations, this alarm can take up to one hour to clear after track and position status have been cleared.</p> <p>Verify the status of other possible alarm conditions, including Position, Local Oscillator, Engine System or System Clock PLL. If any of these alarms are active, the clock output can be degraded or disabled.</p> <p>Verify that the engine is tracking (use the ENGINE TDATA command).</p>

Table 7-3. Alarm Messages and Actions (Continued)

Alarm No.	Alarm Name	Event Status non-active/active	Error Indication and Action
09	Output Time	OK/ Degraded	Degraded indicates that the pulse output is not guaranteed to be within one microsecond of UTC, used for NTP. Note: For first-time installations, this alarm can take up to one hour to clear. Verify that the Output frequency quality alarm (alarm #8) is cleared. Verify that the pulse output is not timing anything unable to handle a large phase jump and enter the LOOP NORM command. This forces synchronization of the time output. If the unit is in recover mode, there is a large phase offset being removed.
10	Power Summary	Present/ Not Present	Provides a quick summary of the power input status. See Alarm Number 10-1 and Alarm Number 10-2.
10-1	Power A	Present/ Not Present	Not Present indicates that Power input A has faulted. Verify that the A-BUS is providing –48 vDC to the OT-21 unit. If no power is connected to the A-BUS input and there is no plan to connect power, enter the command AL 10-1 IG at the prompt. Verify that the fuse for A-BUS is properly installed and not OPEN.
10-2	Power B	Present/ Not Present	Not Present indicates that Power input B has faulted. Verify that the B-BUS is providing –48 vDC to the OT-21 unit. If no power is connected to the B-BUS input and there is no plan to connect power, enter the command AL 10-2 IG at the prompt. Verify that the fuse for B-BUS is properly installed and not OPEN.
11	System Clock Phase Locked Loop	Locked/ Not Locked	Not Locked indicates that the system PLL has not achieved lock to the Local Oscillator. Verify other alarm conditions for an indication that the LO is not present. Contact your Nortel Networks technical support representative.
12	Rubidium Phase Locked Loop	Locked/ Not Locked	Not Locked indicates that the internal rubidium frequency standard has not locked to the rubidium source. If the unit has been powered up for more than 30 minutes, contact your Nortel Networks technical support representative.

Table 7-3. Alarm Messages and Actions (Continued)

Alarm No.	Alarm Name	Event Status non-active/active	Error Indication and Action
13	Frequency Control Range	OK/ Out of Range	Out of Range indicates control range of the DDS is approaching maximum (within 10 percent) or minimum value. Verify that the Local Oscillator alarm is clear. Verify that the System Clock Phase Locked Loop is clear. If the problem reoccurs, contact your Nortel Networks technical support representative.
14	Unit Hardware	OK/Failed	Failed indicates that the programmable hardware within the unit has failed. Contact your Nortel Networks technical support representative.
15	Eng Stability	Good/Bad	Bad indicates the phase data stability exceeds the three sigma limit. Verify that the antenna and the antenna cable are properly connected.
19	Hardware Configuration	OK/Invalid	Invalid indicates that the unit was not properly configured at the factory. Contact your Nortel Networks technical support representative.
22	VCXO	OK/Fail	Fail indicates a hardware failure in the unit. Contact your Nortel Networks technical support representative.

Events

Table 7-4 lists each event that is not an alarm condition, the purpose of the event, and possible event messages generated with each event when it occurs.

The actual format of an event message record is:

```
[yyyy-mm-dd] [Thh:mm:ssZ] [event description] [event
origination], [additional event data]
```

where:

yyyy-mm-dd = year-month-day

hh:mm:ss = hours:minutes:seconds

T = time

Z = the time in Zulu if the time has been synchronized with the GPS receiver.

Otherwise, the Z will not be displayed.

The *event description* – refer to Table 7-4.

The *event origination* – the port at which the event originated.

The *additional event data* – refer to specific information of the Event Message and the Purpose columns in [Table 7-4](#).

Table 7-4. Events and Event Messages

Condtype	Event Message	Purpose
104	Alarm Set,<port id>,Alarm ##,CLR delay ## sec	For the selected alarm number, the clear delay time was set to the number of seconds shown
105	Alarm Set,<port id>,Alarm ##,level <IGNORE REPORT MINOR MAJOR CRITICAL>	For the selected alarm number, the initial alarm level was set to the level shown
106	Alarm Set,<port id>,Alarm ##,SET delay ## sec	A selected alarm delay to advance the level status has been set.
110	Comm Set,<port id>,Change <changed port>,HW Hand <ON OFF>	The COMM setting option of hardware handshaking has been set on/off
111	Comm Set,<port id>,Change <changed port>,Mode <ICS TL1>	The COMM language protocol setting option has been set to ICS/TL1
112	Comm Set,<port id>,Change <changed port>,New Baud <rate>	The COMM setting option of Baud rate has been changed
113	Comm Set,<port id>,Change <changed port>,SW Hand <ON OFF>	The COMM setting option of software handshaking has been set on/off
120	Elevation Mask Set,<port id>,## deg	The elevation masks for the receiver have been set in the specified number of degrees
121	Event Log Cleared,<port id>	The event log has been cleared
122	Factory settings restored,<port id>	The factory settings have been restored
128	IP Address Set failed	Could not change the IP address of the unit. Try again, if it fails, set the IP to another value then set it back to the desired value. If it fails again, contact your Nortel Networks technical support representative.
129	IP Address Set,<port id>,<IP address>	The IP address has been set
130	IP Broadcast Mask Set failed	Could not change the broadcast mask of the unit. Try again, if it fails, set the IP broadcast mask to another value then set it back to the desired value. If it fails again, contact your Nortel Networks technical support representative.
131	IP Broadcast Set,<port id>,<IP address>	The IP broadcast has been set

Table 7-4. Events and Event Messages (Continued)

Condtype	Event Message	Purpose
132	IP Gateway Set failed	Could not change the IP gateway of the unit. Try again, if it fails, set the IP gateway to another value then set it back to the desired value. If it fails again, contact your Nortel Networks technical support representative.
133	IP Gateway Set,<port id>,<IP address>	The IP gateway set has been set
134	IP Interval Set,<port id>,<IP address>	The IP interval set has been set
135	IP Mask Set failed	Could not change the IP mask set of the unit. Try again, if it fails, contact your Nortel Networks technical support representative.
136	IP Mask Set,<port id>,<IP address>	The IP mask set has been set
137	IP SNTP Broadcast Interval set failed	The IP broadcast interval set has not been set
138	Log In,<port id>,"<user id>",level: #	User logged in to selected port with user ID and level number access
139	Log Off,<port id>,"<user id>"	The specified user has logged off the unit
140	Loop set,<port id>,<value>	The loop value has been set on the specified port
141	Major->Critical Elevation Time Set,<port id>,<## sec	The alarm elevation time (ELEVTIME) from Major to Critical has been set to a specified time on the specified port
145	Port <port id> Cleared User Table	The user table was cleared from the specified port
146	Port <port id> Forced Log Off,<forced port>,"<forced user>"	The specified user was logged off
148	Position Average Count Set,<port id>,<## deg	The position average count set has been set to the specified number of degrees
149	Position Set,<port id>,<## deg	The position set has been set to the specified number of degrees
150	Restart Cancelled, <port id>	The restart has been cancelled on the specified port
151	Restart, <port id>,<# sec	The restart has been reset to the specified number of seconds
156	Timing Mask Set,<port id>,<## deg	For the specified port "a", the SSM Timing mask (ELMASK) set has been set to a specified number of degrees

Table 7-4. Events and Event Messages (Continued)

Condtype	Event Message	Purpose
157	User Added, <port id>,<user> Level #	A user has been added at the specified access level
158	User Deleted, <port id>,<user> Level #	A user has been deleted
159	User Modified, <port id>,<user> Level #	A specified user's password has been modified
160	User Msg, <port id>,"<text>"	A message (text) has been sent by a user
161	User settings restored,<port id>	A user's settings have been set up
162	User settings updated with current, <port id>	Current settings have been saved to the user area of NVRAM
176	OT21 Msg	Text sent using the MSG command to communicate with other users.

Appendix A Regulatory Requirements and Reference Material

This appendix provides information about safety and EMC standards and reference material.

In This Chapter

- [Safety and EMC Requirements](#)
- [Generic Requirements](#)
- [American National Standard Institute \(ANSI\) Documents](#)
- [Other Reference Documents](#)

Safety and EMC Requirements

The OT-21 unit is designed to meet the following requirements:

- EMC requirements of GR-1089-CORE Issue 2, 12-1997.
- SELV equipment requirements for product safety as specified in UL 1950/CSA C22.2, 7-1995.



Note: Bellcore, or Bell Communications Research, is now Telcordia Technologies, Inc. Many reference documents listed in this section were originally published by Bellcore, but are now available from Telcordia Technologies, Inc.

Generic Requirements

1. GR-63-CORE, *Network Equipment – Building System (NEBS) Requirements: Physical Protection*, Issue 1 (Bellcore, October 1995). (A module of LSSGR, FR-64, TSGR, FR-440, and NEBSFR, FR-2063.)
2. GR-378-CORE, *Generic Requirements for Timing Signal Generators*, Issue 2 (Bellcore, February 1999).
3. GR-831-CORE, *OTGR Section 12.1: Operations Application Messages – Language for Operations Application Messages*, Issue 1 (Bellcore, November 1996). (A module of OTGR, FR-439.)
4. GR-1089-CORE, Issue 2, Revision 1, 2-1999, *Electromagnetic Compatibility and Electrical Safety–Generic Criteria for Network Telecommunications Equipment*.

American National Standard Institute (ANSI) Documents

1. ANSI T1.101-1999, *Synchronization Interface Standards for Digital Networks*.
2. ANSI T1.102-1993, *Digital Hierarchy-Electrical Interfaces*.

Other Reference Documents

1. ITU-T Rec G.703.
2. ITU-T Rec G.704.
3. RFC 1305, *Network Time Protocol (Version 3), Specification, Implementation and Analysis*.

Appendix B OT-21 Specifications

This appendix provides specifications for the OT-21 and for its functional components, such as operating conditions, power inputs, indicators, EMC and safety standards, and chassis dimensions.

In This Chapter

- [General Specifications](#)
- [Operating Conditions Specifications](#)
- [Power Input and Grounding Specifications](#)
- [Chassis Dimensions](#)

General Specifications

The operating limits for the unit are set to factory default settings (see [Appendix E, Default Configuration Settings](#)).

[Table B-1](#) details the general specifications for the OT-21.

Table B-1. General Specifications

Characteristics	Specification
General	
Reference Signals	Determined by the GPS Radio Receiver
Ethernet Port	10BaseT
Event Log	Stores an event history of up to 400 events including timestamp, event type, event/alarm level, and condition causing the event. When the four hundred first event occurs, the oldest event is lost. Stores the last 10 events in non-volatile memory (NVRAM).
Configuration Data	NVRAM stores factory configuration, customer configuration, and current configuration. Commands are provided to restore factory and user settings. Card identification information is stored for comparing predicted components with components found.
Alarm Levels	Commands can set alarm level to IGNORE, REPORT, MINOR, MAJOR, and CRITICAL. MINOR and MAJOR alarms can be elevated to the next higher level after a user-defined time period.
Communications Ports	Three Communications Ports: <ul style="list-style-type: none"> ■ Serial PORT-A (J15) ■ (COMMS local) Serial port (J1) ■ Ethernet port with SNTP and Telnet
Alarm Closures	
MINOR	1 Amp Form C contact closure
MAJOR	1 Amp Form C contact closure
CRITICAL	1 Amp Form C contact closure
Chassis Power	
DC	-38 to -72.5 vDC, (-48 vDC nominal)
DC Power @ -48vDC	< 48 watts, per chassis

Table B-1. General Specifications (Continued)

Characteristics	Specification
Chassis Mechanical	
Width	17.0 inches (43.2 cm)
Depth	11.4 inches (28.96 cm)
Height	3.5 inches (8.9 cm)
Weight	< 12 lbs. (5.45 kg)
Chassis Environmental	
Temperature Operational Stratum Levels	+1.7°C to +49°C @ 8.3°C per hour max rate of change. GR-1244-CORE Sec. 2.2
Relative Humidity Operational	5% to 85% Non-condensing GR-63-CORE Sec. 4.1.2 ETS 300 019-1 Class 3.1
Temperature Operational Short Term Non-Stratum performance	-5°C to +50°C @ 30°C per hour max rate of change. Duration <96 hours GR-63-CORE Sec. 4.1.2 ETS 300 019-1 Class 3.1
Relative Humidity Operational Short Term	5% to 90% Non-condensing. Duration <96 hours GR-63-CORE Sec. 4.1.2 ETS 300 019-1 Class 3.1
Temperature Storage	-25°C to +55°C Duration <12 months GR-63-CORE Sec. 4.1.1 ETS 300 019-1 Class 1.2
Relative Humidity Storage	5% to 100% Non-condensing. Duration <12 months GR-63-CORE Sec. 4.1.1 ETS 300 019-1 Class 1.2
Temperature Transporting	-40°C to +70°C Duration <3 months GR-63-CORE Sec. 4.1.1 ETS 300 019-1 Class 2.3
Relative Humidity Transporting	5% to 100% Non-condensing. Duration <3 months GR-63-CORE Sec. 4.1.1 ETS 300 019-1 Class 2.3
Heat Dissipation	GR-63-CORE Sec. 4.1.4
Altitude	200 ft. (61 m) below to 13,000 ft. (3962 m) above sea level GR-63-CORE Sec. 4.1.3
Airborne Contaminants	GR-63-CORE Sec. 4.5.2.1
Shock Operational	ETS 300 019-2-3 Class T3.1
Sinusoidal Vibration Operational	GR-63-CORE Sec. 4.4.3
Seismic Vibration	GR-63-CORE Sec. 4.4.1 Earthquake Zone 4 ETS 300 019-2-3-A1

General Specifications

Table B-1. General Specifications (Continued)

Characteristics	Specification
Shock Transporting	ETS 300 019–2–2 Class T2.2
Sinusoidal Vibration Transporting	GR–63–CORE Sec. 4.4.4 fig. 4–3
Random Vibration Transporting	ETS 300 019–2–2 Class 2.1, 2.2, 2.3, and 2.3 special
Packaged Equipment Shock	GR–63–CORE Sec. 4.3.1.2
Unpackaged Equipment Shock	GR–63–CORE Sec. 4.3.2
Electrical Safety	GR–1089–CORE Sec. 7
Material/Component Fire Resistance	GR–1089–CORE Sec. 4.2.3.1
EMC	
Immunity/Resistibility ESD	EN 300 386–2 V1.1.3 Sec. 5.1.1.1 & 5.1.1.4 GR–1089–CORE Sec. 2
Immunity Radiated	EN 300 386–2 V1.1.3 Sec. 5.1.1.2 GR–1089–CORE Sec. 3.3.1 & 3.3.2
Immunity Fast Transient	EN 300 386–2 V1.1.3 Sec. 5.1.3.1 & 5.1.5.1
Immunity Surges	EN 300 386–2 V1.1.3 Sec. 5.1.3.2
Immunity Radio Freq. Conducted	EN 300 386–2 V1.1.3 Sec. 5.1.3.3 & 5.1.5.2 GR–1089–CORE Sec. 3.3.3
Emissions Radiated	EN 300 386–2 V1.1.3 Sec. 5.1.1.3 GR–1089–CORE Sec. 3.2.1 & 3.2.2
Emissions Radio Freq. Disturbance voltage	EN 300 386–2 V1.1.3 Sec. 5.1.5.3 GR–1089–CORE Sec. 3.2.4
Interface A (Power Input)	ETS 300 132–2 Part 2: Operated by direct current (dc)
Low-Impedance Plane (Grounding)	ETS 300 253 GR–1089–CORE Sec. 9
Intra-building Lighting	GR–1089–CORE Sec. 4.5.9
Antenna Output & Receiver Input	EN 61000–4–5 1 kV tested combination wave generator (1.2/50) – (8/20 μ s) 12 Ω impedance.

Table B-1. General Specifications (Continued)

Characteristics	Specification
Outdoor Operational Conditions	
(GPS Antenna Only)	ETS 300 019–1 Class 4.1E
GPS Antenna Environmental	
Temperature	–40°C to +75°C
Relative Humidity	100% Non-Immersed
Altitude	200 ft. (61 m) below sea level to 13,000 ft. (3962 m) above sea level

Operating Conditions Specifications

The unit operates at specified parameters in the operating conditions summarized in [Table B-2](#).

Table B-2. Normal Operating Conditions

Parameter	Minimum	Maximum	Units
Supply Voltage	–38	–65	Volts, DC
Temperature ¹	0	50	°C
Temperature Rate of Change	—	8.3	°C/Hr
Relative Humidity ²	5	85	%
Altitude ³	– 200 ft. (–61 m)	13,000 ft. (3962 m)	feet

Note:

- 1 Inlet air temperature, limited convection 15 ft./min.
- 2 Non-condensing.
- 3 The maximum operation ambient temperature shall be reduced by 2° C for every 984 ft. (300 m) altitude above 4,921 ft. (1500 m).

The unit is not damaged when exposed to the levels specified in [Table B-3](#), but performance is degraded. The unit returns to specified performance upon returning to specified operating conditions.

Power Input and Grounding Specifications

Table B-3. Exceptional Operating Conditions

Parameter	Minimum	Maximum	Units
Supply Voltage: (48 vDC) nominal ¹	-38	-75	Volts, DC
Temperature ²	-5	50	°C
Relative Humidity ³	5	90	%

Note:

- 1 The unit is not damaged if the polarity on the power leads is reversed.
- 2 At 30°C max/hour rate of change.
- 3 Non-condensing.

Power Input and Grounding Specifications

Table B-4 provides power input specifications.

Table B-4. Power Input Specifications

Parameter	Specification
Supply power ^{1, 2}	-38 to -72.5 vDC (-48 vDC nominal)
Power, maximum	48 watts at power on
Power, typical	<30 watts at normal operation
Connector ^{2, 3}	#6 Ring Terminal Block

Note:

- 1 Reversing the input polarity does not damage the unit.
- 2 Isolated power inputs are user-settable for positive or negative grounding schemes.
- 3 48 vDC return connected to the common ground plane at power source.

Chassis Dimensions

The overall dimensions of the unit are 3.5 inches high x 17 inches wide x 11.4 inches deep. Installers can mount the unit in a standard EIA 19-inch or 23-inch cabinet of standard NEBS depth.

Appendix C ICS Commands

This appendix describes the operation of the Interactive Command Set Language (ICS) for OT-21 communications.

In This Chapter

- [Overview of OT-21 Communications Language](#)
- [ICS Command Syntax](#)
- [ICS Command Descriptions and Access Levels](#)

Overview of OT-21 Communications Language

The OT-21 software interface allows operators to set operating modes and alarm parameters, manage alarm and report events, and customize the operating parameters of the unit to meet special requirements.

This section provides complete descriptions of software commands and syntax, security levels, and the provisions supplied by each option.

ICS software provides commands and parameters that operators use to:

- Interact with the unit hardware and software configuration
- Read and set operational parameters stored in NVRAM
- Monitor and control system status and event information

Using the commands, operators can control and monitor system users and security access, and generate reports or query the system logic for information about:

- Alarms and Event Logs
- Radio receiver status
- GPS Antenna position

The COMMS local (J1) port defaults to ICS mode upon startup. The factory default setting for Serial Port-A (J15) is also ICS. The communications settings for this port are stored in NVRAM, allowing the communication settings to remain in effect when the unit restarts.



Note: After five minutes of no user input or generated output in ICS mode with a remote connection (Telnet), the OT-21 automatically drops the connection.

User Access Levels

ICS mode uses an ASCII *parser* to translate the commands that you enter. In ICS mode the system default has the username Symmetricom, with login at Administrator level (4) and a null password. After the Administrator user creates the user table, you must enter a login name and a password to access the communications interfaces.

The password security level determines the options available. Each incremental security level incorporates all of the options from the lower numbered security levels. After logging in, use the WHO command to determine your security level, or the HELP command to display all commands available for your level.

Refer to [Configuring Users With ICS Commands](#), on page 63 for information on configuring users.

[Table C-1](#) summarizes each security access level, ID number, and operator privileges for each level. To change your security level, contact the OT-21 Administrator.

Table C-1. User Access (Security) Levels

Level	ID	Description
Idle	0	Security level 0 is available when no user is logged in. This level allows Idle users to view a list of available commands (HELP), syntax, software version number, unit id, or to login.
User	1	Security level 1 allows User-level users to perform level 0 functions and to view information about the current configuration and operation, and change communication settings such as line termination and echo. Changes made by User remain in effect only until User logs out.
Technician	2	Security level 2 allows Technician-level users (CRAFT persons) to perform levels 0 through 1 functions, and to read or set all installation functions.
Supervisor	3	Security level 3 allows Supervisor-level users to perform levels 0 through 2 functions, and to read or set all operational functions.
Administrator	4	Security level 4 allows Administrator-level users to perform levels 0 through 3 functions, and to restart the unit, load new software, add, delete, or modify the user table, or log off any user from any port.

ICS Command Syntax

This section explains option syntax conventions, including an overview of command parsing and EIA-232 operations. For a quick reference of all ICS commands, refer to [Table C-3](#).

Follow these general guidelines for entering commands and options at the system prompt:

- Enter the entire command and options on one line
- Separate each word of the command and options with one space

The structure and syntax of each command and option is as follows:

- Commands and options can be entered in upper or lower case, or any combination
- Abbreviated forms of commands are formed by the smallest unique string that distinguishes that command from all others. For example, the `BYE` command can be abbreviated as `B`, as no other command begins with the letter `B`. The `EVENT` command can be abbreviated `EV`, to distinguish it from the abbreviated form of the `ENGINE` command, `EN`
- Follow every command with an End of Line (EOL); that is, press Enter (or enter a carriage return, line feed, or combination of the two)
- Multiple commands can be entered on the same line
- Separate multiple commands with a semicolon (;) as a command separator
- Commands are executed in the order entered on receipt of the EOL

Table C-2 defines the ICS command syntax conventions used in this manual.

Table C-2. ICS Command Syntax Conventions

Convention	Definition
UPPERCASE	An option that must be entered exactly as shown.
lower case	The user must provide command-specific information.
() Parentheses	An option that can be repeated as needed.
[] Brackets	The enclosed information is optional.
{ } Braces	A set of information. Input must be from the enclosed information. Options are separated by a pipe. For example, {A B}.
Pipe	Separates options enclosed in braces { }.

Table C-3 summarizes the ICS command syntax conventions used in this guide.

Table C-3. ICS Command List

Command	Definition
<code>ALARM</code>	Provides a view of the current status of alarm indications on the unit. Only active alarm indications are displayed unless an option is specified.
<code>COMM</code>	Allows you to read and set options for the communications ports.

Table C-3. ICS Command List (Continued)

Command	Definition
CONFIG	Displays the current hardware configuration for the unit. If the location is passed then the command returns detailed information about the card.
DATE	Allows you to view or set the current date for the unit. The format returned is YYYY-MM-DD. The date cannot be set if it has been received from a GPS receiver.
ELEVTIME	Allows you to read/set the current time-out of an alarm before it is elevated to the next level alarm status.
ENGINE	Allows you to read and set information from the engine.
EVENTS	Allows you to view and generate a report on the latest events, all of the stored events, or query a certain number of events.
EXIT	Terminates a telnet session.
HELP	Provides a screen view of all available commands for the user's security level. When followed by a command, it also displays the syntax for the command followed by a description of the command and its options.
ID	Displays the fixed unit ID of the OT-21. This cannot be changed.
INFO	Shows current software version information about the unit, including manufacturer and service information.
IP	Allows reading or setting of the current Ethernet IP address, subnet mask, gateway, and SNTP broadcast mask.
LOAD	Allows you to load new firmware into the OT-21. Available only at Administrator level (4).
LOGIN	Allows you to log in to the unit to configure with options offered for the security level.
MSG	Allows sending a message to all ports. The message can be a maximum of 30 characters and will go to all ports and appears in the event log.
NAME	Allows you to read or set the current unit name. This is for unit identification. It also sets the TL1 TID; refer to Appendix D, TL1 Commands .
PING	Allows testing of the Ethernet connection by sending an ICMP ECHO REQUEST packet to a known address.
RESTART	Restarts the unit. Available only at Administrator level.
SETUP	Used to read or set the software configurations within the unit.
STATUS	Used to read the current overall status of the unit.
SYSTIME	Shows the length of time that the unit has been powered on.
TIME	Allows you to view or set the current time for the unit. The format returned is HH-MM-SS. The time cannot be set if it has been received from a GPS receiver.

Table C-3. ICS Command List (Continued)

Command	Definition
USERS	Lists of the current users at the current users level and below.
VER	Allows you to view the current version of all software in the unit.
WHO	Prints to the screen your system name and which communication port you are connected to.

ICS Command Descriptions and Access Levels

The following sections list of all ICS commands with syntax and options that are available for user level 0 through user level 4. User levels that have the same options for a command are combined into one list. Commands with options that are different for the various user levels appear as separate lists. Refer to [Table C-1](#) for descriptions of commands available at each level.

ALARM

Level 1 Level 2

Provides a view of the current status of alarm indications on the unit. Only active alarm indications are displayed unless an option is specified. Refer to [Table E-1](#) for a list of all alarms and their default settings.

Syntax

ALARM [ALL | #]

Options

ALL – Show the status of all alarm conditions, including sub-alarms.

– Show the current status of a specified alarm. Sub-alarms are indicated by separating them from the alarm number with a dash (-). For example, Alarm 10-2 indicates sub-alarm 2 for alarm #10.

Examples

To show the status of all alarm conditions including sub-alarms, type `ALARM ALL` and press **Enter**.

To show the current status of a specified sub-alarm, type `ALARM 10-2` and press **Enter**.

Level 3 Level 4

Allows you to read and set options of the current status of alarm indications on the unit. Only active alarm indications are displayed unless an option is specified. In addition this command allows changing the level of an alarm or sub-alarm. Refer to Table E-1 for a list of all alarms and their default settings.

Syntax

ALARM [{ALL | #} [{SET | CLR] DELAY time | IG | RE | MI | MA | CR}]

Options

ALL – Show the current status of all alarm conditions, including sub-alarms.

– Give the current status of the given alarm numbers and the status of any sub-alarms associated with it. Sub-alarms are indicated by separating them from the alarm number with a dash (-). For example, Alarm 10-2 indicates sub-alarm 2 for alarm #10.

SET – A prefix for the DELAY time to indicate that the delay for setting of the alarm is to be changed. See DELAY option for more information.

CLR – A prefix for the DELAY time to indicate that the delay for clearing of the alarm is to be changed. See DELAY option for more information.

DELAY – Set the length of time an alarm must be active, or inactive before an indication is given in hardware. This delay time is in seconds. If an alarm is of an 'immediate' type no delay time may be entered.

IGNORE – Ignore any alarm indication for this alarm or sub-alarm.

REPORT – Set the alarm level to report only for this alarm or sub-alarm.

MINOR – Set the alarm level to minor, not valid for sub-alarms.

MAJOR – Set the alarm level to major, not valid for sub-alarms.

CRITICAL – Set the alarm level to critical, not valid for sub-alarms.

Examples

To set alarm 0 (Rcvr Tracking) to a five-minute annunciation delay, type `ALARM 0 SET 300` and press **Enter**.

To set alarm 0 (Rcvr Tracking) to a 30-second clearing delay, type `ALARM 0 CLR 30` and press **Enter**.

To set alarm 19 (Hardware Configuration) to MAJOR level, type `ALARM 19 SET MJ` and press **Enter**.

COMM

Level 1

Allows you to read options for the communications port in use.

Syntax

COMM [ANSI {ON | OFF}] [ECHO {ON | OFF}] [EOL {CR | LF | CRLF}]

Options

ANSI {ON | OFF} – Enable or disable use of ANSI control characters for cursor movement.

ECHO {ON | OFF} – Enable or disable character echo.

EOL {CR | LF | CRLF} – Set the output line termination.

Level 2 Level 3 Level 4

Allows you to read and set options for any communications port. Settings for COMMS local serial port L and TIMEOUT OFF revert to factory defaults at power up or restart. Settings for other ports are stored in NVRAM.

Syntax

COMM [A | L] [ANSI {ON | OFF}] [BAUD {1200 | 2400 | 4800 | 9600 | 19200 | 38400}] [ECHO {ON | OFF}] [EOL {CR | LF | CRLF}] [HAND {OFF | HARD | SOFT}] [MODE {ICS | TL1}] [TIMEOUT OFF]

Options

A – Serial Port A (J15).

L – COMMS local Port (J1). Defaults to the current port.

ANSI {ON | OFF} – Enable or disable use of ANSI control characters for cursor movement.

BAUD – Set the communication speed.

ECHO {ON | OFF} – Enable or disable character echo.

EOL {CR | LF | CRLF} – Set the output line termination.

HAND {OFF | HARD | SOFT} – Disables handshaking, or enables hardware and software handshaking.

MODE ICS or TL1 – For COMM A or COMM L only, sets the communication mode to either ICS (interactive) or TL1. To exit TL1 enter 3 consecutive ESC characters. Comm A and L default to ICS. Ethernet Port 23 is always ICS. Ethernet Port 2000 is always TL1.

TIMEOUT OFF – Disables five minute timeout which automatically disconnects the session after five minutes of inactivity. Timeout is re-enabled on logout or exit.



Note: Output can be halted with control-S and restarted with control-Q.

Only ECHO, ANSI, EOL, HAND SOFT, and TIMEOUT OFF can be changed on an Ethernet connection.

Examples

To display the settings for the ICS connected ports, at the system prompt, type `COMM` and press **Enter**.

To set the baud rate for the COMMS local port to 9600, type `COMM L BAUD 9600` and press **Enter**.

CONFIG

Level 2 Level 3 Level 4

Displays the current hardware configuration for the unit.

Syntax

`CONFIG [ALL | MAIN | OUTA | OUTB]`

Options

ALL – Summary report on all components (default).

MAIN – Summary report on the Main board.

OUTA – Summary report on Output group 1.

OUTB – Summary report on Output group 2.

DATE

Level 1 Level 2 Level 3 Level 4

Allows you to view the current date for the unit. The format returned is YYYY-MM-DD. The engine sets the date.

Syntax

`DATE`

ELEVTIME

Level 2

Allows you to read the current time-out of an alarm before it is elevated to the next level alarm status.

Syntax

ELEVTIME

Level 3 Level 4

Allows you to Read/Set the current time-out (in seconds) before an alarm is elevated to the next level.

Syntax

ELEVTIME [MINOR time | MAJOR time]

Options

MINOR – Set delay before a minor alarm is elevated to a major alarm.

MAJOR – Set delay before a major alarm is elevated to a critical alarm.

Example

To set a time of five minutes before a minor alarm is elevated to a major alarm, type `ELEVTIME MINOR 300` and press **Enter**.

ENGINE

Level 1

Allows you to read information from the GPS engine.

Note: GPS available satellites, elevation masks, and position have been added to this command.

Syntax

ENGINE [TDATA | AV | EL | POS | FREQ]

Options

TDATA – Logs the GPS tracking data.

AV – Displays a list of currently available GPS satellites and information on them.

EL – Displays elevation masks for GPS tracking.

Examples

To start track data logging, type `ENG TDATA ON` and press **Enter**. To halt track data logging, type `ENG TDATA OFF` and press **Enter**. Current GPS tracking data is displayed every five seconds.

Level 2 Level 3 Level 4

Allows you to read and set GPS engine information.

Syntax For GPS Engine

ENGINE TDATA [ON | OFF]

ENGINE AV

ENGINE EL[P n | T n]

ENGINE POS [[lat lon ht] | AVG n]

Options

TDATA – Reports the GPS tracking data (one time).

TDATA ON – Starts reporting the GPS tracking data every five seconds.

TDATA [OFF] – reporting the GPS tracking data.

AV – a list of currently available GPS satellites and information on them.

EL – elevation masks for GPS tracking.

ELP n –the elevation mask for positioning.

ELT n – the elevation mask for normal tracking.

n – above horizon in degrees, integer from 0 to 60.

Responses

To ENG

```
GPS: n.n, yyyy-mm-dd
```

To ENG TDATA:

A table of current tracking information for up to 12 channels is displayed as follows:

```
c# sv# ss# [OK|??] Thh:mm:ssZ (only first line has
timestamp)
```

```
c# sv# ss# [OK|??]
```

```
c# Empty (if this channel is not tracking
```

```
c# sv# ss# ... (repeats for up to 12 channels)
```

where *c#* is engine channel number (1-12), *sv#* is the Satellite PN code ID, and *ss#* is the signal strength.

To ENG AV

A table of available satellite information is returned as follows:

```
SV Elev Azmth Hlth
-- ---- -
nn nn nnn xx
... (repeats for up to 12 available satellites)
```

- SV – Satellite PN code ID
- Elev – current elevation in degrees above the horizon
- Azmth – of the satellite, in degrees
- Hlth – ' ' for healthy or 'Unhealthy' for unhealthy satellites

To ENG EL

```
Position mask: nn deg
Timing mask: nn deg
```

To ENG POS

```
Lat: sdd:mm:ss.ss, Lon: sdd:mm:ss.ss, Ht: nnn.nn m, PDOP
n.n, nnn avg
```

where s is {+|-}, d is degrees, m is minutes, s is seconds with decimal fraction, and n is a number.

EVENTS

Level 1 Level 2

Allows you to view and generate a report on the latest events, all of the stored events, or events from a certain start number. The type of event returned can be specified as Alarm or Report only events.

Syntax

```
EVENTS [[ALL | {start number}] [{ALARM | REPORT}]]
```

Options

EVENTS – Retrieves the latest event.

ALL – Retrieve all of the stored events.

start number – “start” is the number of events to step back from the most recent event and “number” is the number of events to retrieve from the “start” point.

ALARM | REPORT – All of the above can be restricted to ALARM events or REPORT events.

Examples

To retrieve the last five events, type `EVENT 5` and press **Enter**.

To go back to the fifth event from the most recent and retrieve the fifth, fourth, and third events, type `EVENT 5 3` and press **Enter**.

To retrieve the oldest five alarms only out of the most recent 20 events, type `EVENT 20 5 ALARM` and press **Enter** (note that if only four alarms have occurred those four are displayed).

Level 3 Level 4

Allows you to view and generate a report on the latest events, all of the stored events, or events from a certain start number. The type of event returned can be specified by entering only Alarm or Report events.

Syntax

`EVENTS [[ALL | {start number}] [{ALARM | REPORT}]] | [CLR]`

Options

EVENTS – Retrieves the latest event.

ALL – Retrieve all of the stored events.

start number – “start” is the number of events to step back from the most recent event and “number” is the number of events to retrieve from the “start” point.

ALARM | REPORT – All of the above can be restricted to ALARM events or REPORT events.

CLR – Clears all events.



Note: The CLR option clears all events history from the unit.

EXIT

Level 0 Level 1 Level 2 Level 3 Level 4

Logs off the user and terminates the telnet session.

Syntax

EXIT

HELP

Level 0 Level 1 Level 2 Level 3 Level 4

Provides a screen view of all available commands for your security level.

Syntax

HELP (COMMAND)

To view a list of all commands available for your user level, type `HELP` and press **Enter**.

To get help information on a specific command, such as `PORT`, type `HELP PORT` and press **Enter**.



Note: Typing `?` is equivalent to typing `HELP` and pressing **Enter**.

ID

Level 0 Level 1 Level 2 Level 3 Level 4

Allows you to view the fixed unit ID of the OT-21.



Note: The unit ID cannot be changed; only the unit name can be changed.

Syntax

ID

INFO

Level 1 Level 2 Level 3 Level 4

Shows current software version information about the unit, including manufacturer and service information.

Syntax

INFO

IP

Level 1

Shows information on the current Ethernet Internet Protocol Address, subnet mask, gateway, SNTP broadcast mask and SNTP Broadcast Interval. The IP address, subnet mask, gateway, and SNTP broadcast mask each consists of four decimal numbers in dotted decimal notation, 0-255, separated with periods. This command also displays the hardware address and settings for the Ethernet port.

Syntax

IP

Level 2 Level 3 Level 4

Shows information on the current Ethernet IP address, subnet mask, gateway, SNTP broadcast mask and SNTP Broadcast Interval. The IP address, subnet mask, gateway, and SNTP broadcast mask each consists of four decimal numbers in dotted decimal notation, 0-255, separated with periods. This command also displays the hardware address and settings for the Ethernet port. Allows reading/setting of the current Ethernet settings. If BROADCAST is set to 0.0.0.0, no SNTP messages are broadcast, although the OT-21 still responds to requests for time when they are received.

Syntax

IP [{{ADDR | MASK | GATEWAY | BROADCAST} ip-address | INTERVAL n}]

Options

ADDR – Sets the unit's IP address.

MASK – Sets the subnet mask.

GATEWAY – Sets the default gateway IP address.

BROADCAST – Sets address to which SNTP messages will be broadcast.

ip-addresses | INTERVAL – sets the time interval (15-3600 seconds) between SNTP broadcast messages for a specified IP address in dotted decimal notation

When the unit is used as an SNTP broadcast server, the [INTERVAL n] option must be set so that the unit autonomously transmits the time every interval (sec) to the broadcast address

LOAD

Level 4

Loads a new program for the unit from an FTP site. The user must have a valid account on the FTP server. Note that the double quote (") MUST be present in order to preserve the lower case level of the entry.

Syntax

LOAD "fileID ftpSite user password

Options

fileID – The full path to the file name to be loaded from the site (note that FTP is case sensitive).

ftpSite – The site IP address in the form ddd.ddd.ddd.ddd.

user – The user name for the FTP site.

password – The password for 'user' on the FTP site.

Example

To load the OT21B.00 file from the OT-21 directory, type `LOAD "/OT-21/OT21B00.hex 192.1.1.1 "username" "password""` and press **Enter**.

LOGIN

Level 0 Level 1 Level 2 Level 3 Level 4

Allows you to log in to the unit to configure with options offered for the security level.

Log-in with the given user ID at the assigned access level. If the entered user ID and password match one stored in the unit you will be given access to the unit with an assigned access level. Your userid, password, and access level is assigned to you by the system Administrator.

Syntax

LOGIN [userid]

MSG

Level 2 Level 3 Level 4

Sends a message to all ports. The message can be a maximum of 30 characters. It goes to all ports and appears in the event log.

Syntax

MSG [message text]

Example

To send the message "This is a test.", type `MSG This is a test.` and press **Enter**.

NAME

Level 1 Level 2

Displays the current unit name.

Syntax

NAME

Level 3 Level 4

Read/Set the current unit name. The NAME command also sets the TID for TL1 commands, refer to [Appendix D, TL1 Commands](#). Maximum length is 20 characters and the name must start with a letter. No quotation marks are needed when entering a name that contains spaces.

Syntax

NAME [name]

Example

To set the unit name to OT-21, type `NAME OT-21` and press **Enter**.

PING

Level 2 Level 3 Level 4

Allow testing of the Ethernet connection by sending an ICMP ECHO REQUEST packet to a known address. IP-address is in dotted decimal format (four decimal numbers 0-255 separated by periods).

Syntax

PING [ip address]

RESTART

Level 4

Restarts the OT-21. Available only at the Administrator level (4).



Note: To cancel a RESTART session from the same port and session that initiated RESTART, press Ctrl+C.

Syntax

RESTART [n]

Options

[n] – Sets delay in seconds (0 to 600 seconds).

SETUP

Level 2

Used to read the current software configurations within the unit.

Syntax

SETUP

Level 3 Level 4

Read or set the software configurations within the unit.

Syntax

SETUP [FACTORY [ALL] | USER [ALL] | SAVE]

SETUP [REPORT {CURRENT | USER | FACTORY}]

Options

FACTORY – Sets the unit according to factory specifications.

USER – Sets the unit to the last stored USER settings.

[ALL] – Used in conjunction with FACTORY and USER options, sets all settings to original factory values. If this option is not specified the IP address, GPS position, user list, and the current port configuration parameters are left unchanged.

SAVE – Saves the current configuration into the stored USER settings.

REPORT { CURRENT | USER | FACTORY} – Lists all settings in the specified block of NVRAM.

STATUS

Level 1 Level 2 Level 3 Level 4

Displays the current overall status of the unit.

Syntax

STATUS

SYSTIME

Level 1 Level 2 Level 3 Level 4

Displays the length of time (System Running Time) that the unit has been powered on.

Syntax

SYSTIME

TIME

Level 1 Level 2 Level 3 Level 4

Displays the current time for the unit. The engine sets the time.

Syntax

TIME

USERS

Level 1 Level 2 Level 3

Lists the logged-on users at the current user level or below.

Syntax

USERS [MODIFY]

Options

MODIFY – Allows you to change your password.

Level 4

Lists all users and access levels.

Allows changing passwords and user levels with the MODIFY option.

Syntax

USERS [ADD | DELETE | MODIFY] [user id] | [INITUSERTABLE | LOGOFF]

Options

ADD – Userid level [password] Add a new user.

DELETE – Delete a user from the user table.

MODIFY – userid level [password] Modify an existing userid.

INITUSERTABLE – Removes ALL users from the table.

LOGOFF – Logs specified users off the other ports.

VER

Level 0 Level 1 Level 2 Level 3 Level 4

Allows you to view the Serial number, Item number, Firmware version, and Manufacture date of the OT-21.

Syntax

VER

WHO

Level 1 Level 2 Level 3 Level 4

Displays your system name, your access level, and which communication port you are connected to. This command also gives an indication of the status of the other ports on the unit; whether or not someone has logged in, or if the port is idle.

Syntax

WHO

Appendix D TL1 Commands

This appendix describes the operation of the Transaction Language 1 (TL1) for OT-21 communications. It includes a description of the TL1 commands and syntax implemented in the OT-21, followed by the associated response messages and a description of the options. The format for all autonomous reports generated by both events and alarms is also included.

In This Chapter

- [Overview of the TL1 Interface](#)
- [TL1 Security and User Access](#)
- [TL1 Command Interface](#)
- [RETRIEVE Commands and Responses](#)
- [SET Commands and Responses](#)
- [Other Commands](#)

Overview of the TL1 Interface

The OT-21 software interface allows operators to set operating modes and alarm parameters, manage alarm and report events, and customize the operating parameters of the unit to meet special requirements.

TL1 software provides commands and parameters that operators use to:

- Monitor and control system status and event information
- Read and set operational parameters stored in NVRAM
- Interact with the unit hardware and software configuration

Using the commands, operators can control and monitor system users and security access, and generate reports or query the system logic for information about:

- Alarms and Event Logs
- Radio receiver status
- GPS Antenna position

Default Mode Operation

The COMMS local (J1) port and SERIAL PORT-A (J15) default to ICS mode upon startup. For information on ICS commands, see [Appendix C, ICS Commands](#).



Note: When connecting by Ethernet, a TCP/IP connection to port 2000 (decimal) opens in TL1 mode and remains open until the operator terminates the session. If security is active on the unit, once connected in TL1 mode, operators must log in using the **ACT-USER** command with username and password (refer to [User Access Levels](#), on page 144).

Connecting to the TL1 Port

To set up the OT-21 front panel serial port COMMS local for TL1 communications, connect a serial cable from your computer to J1 (COMMS) on the OT-21 front panel and establish a serial connection to the OT-21. At the system prompt, type `COMM MODE TL1` and press **Enter**.

To set up the OT-21 rear panel serial port SERIAL PORT-A for TL1 communications, connect a serial cable from your computer to J15 (SERIAL PORT-A) on the OT-21 rear panel and establish a serial connection to the OT-21. At the system prompt, type `COMM MODE TL1` and press **Enter**.

The port remains in TL1 mode until the EXIT command is issued. The Serial Port-A port stores the setting for the mode in NVRAM, while the COMMS local port always resets to the ICS mode on startup.

For Ethernet connection use TCP/IP port 2000 (decimal) which is designated for a TL1 connection. Two TL1 connections are allowed to this port.

Confirming Network Elements

To return a description for the network element:

Type `RTRV-NETTYPE;`

The system responds with the TID, date, time of day, and a description of the network element as follows:

```
OT-21 01-12-21 15-26-23
```

```
M 0 COMPLD
"OT21"
;
```



Note: This command supports the SynCraft and SyncManager products.

Exiting from the TL1 Port

To discontinue use of a serial port for TL1 communications, press the ESC key three times. Or, enter one of the following commands:

Type `EXIT;`

Type `SET-PRMTR:::::COMM,,,,,,,,,ICS;.`

After receiving a comply response, the TL1 user is logged out and the port is reset to ICS mode. Also use these commands to terminate an Ethernet TL1 session or simply terminate your terminal emulation software connection.

TL1 Security and User Access

This section provides information on logging in, logging out canceling non-terminated inputs and active outputs, and user access levels.

TL1 Login Procedure

When the TL1 session is initially established, users are logged in at level zero. If the Administrator has created a user table, users must issue the ACT-USER command with username and password to gain access at a level above zero. This command can also be used to change current users.

```
ACT-USER::"username"::"pwd";
```



Note: Valid username and password characters include numbers, upper and lowercase letters, and the character set ";<=>?@". The semicolon functions properly only in ICS mode, and the colon must be enclosed in quotes in TL1 mode, as "USER:NAME" or "PASS:WORD". To enter lowercase letters, enclose the input in quotes, as "UserName" or "PassWord". *Do not* use spaces in usernames.

TL1 Logout Procedure

To log out a user and return that user to level zero, use the CANC-USER command (you must have Administrator level access). The connection is not affected in either connection type.

```
CANC-USER;
```

TL1 "Kill" Character

Ctrl-X (ASCII character 0x18) is the "kill" character. Use the "kill" character to cancel a partially entered command, or to stop receiving data. When the "kill" character is received, the OT-21 cancels any non-terminated input. If there is no non-terminated input, the OT-21 cancels any currently active output line (up to and including the first semicolon). If there is no non-terminated input and no currently active output line, this character is ignored.

User Access Levels

The password security level determines the options available. Each incremental security level incorporates all of the options from the lower numbered security levels. Refer to [Configuring With TL1 Commands](#), on page 70, for information on setting up security levels.

[Table D-1](#) summarizes each security access level, ID number, and operator privileges for each level. To determine your security level, contact your Administrator.

Table D-1. User Access (Security) Levels

Level	ID	Description
Idle	0	Security level 0 is available when no user is logged in. This level allows Idle-level users to view a list of available commands (HELP), syntax, software version number, unit id, or to login.
User	1	Security level 1 allows User-level users to perform level 0 functions and to view information about the current configuration and operation, and change communication settings such as line termination and echo. Changes made by User remain in effect only until User logs out.
Technician	2	Security level 2 allows Technician-level users (CRAFT persons) to perform levels 0 through 1 functions, and to read or set all installation functions.
Supervisor	3	Security level 3 allows Supervisor-level users to perform levels 0 through 2 functions, and to read or set all functions.
Administrator	4	Security level 4 allows Administrator-level users to perform levels 0 through 3 functions, and to restart the unit, view and set software configurations, add, delete, or modify the user table, or log off any user from any port.

TL1 Command Interface

This section describes the TL1 commands implemented in the OT-21, as well as the associated response messages generated. The format for all autonomous reports generated by events and alarms is also included.

The OT-21 accepts both lowercase and uppercase ASCII characters in TL1 commands. The OT-21 generally employs uppercase characters in its responses and autonomous messages. One major exception to this rule is in autonomous messages, where the alarm or event description is given in mixed case.

TL1 Command and Response Conventions

This section describes general and specific conventions for expressing TL1 command and response parameters for the four types of operations application messages.

- **Input Commands** – These determine the action that the OT-21 takes.

- **In-Process Acknowledgment** – The in-process acknowledgment (IP) response is sent when the OT-21 is unable to respond to a command within two seconds.
- **Output Response** – The output response indicates whether the command was complied with (**COMPLD**) or denied (**DENY**).
- **Autonomous Response or Report Message** – The autonomous response or report message is an output generated by the OT-21 due to an event such as an alarm or a change in the system status.

General Conventions

TL1 uses English-like acronyms and shorthand-style abbreviations in a format that can be easily recognized and composed.

Use the following general conventions for entering all TL1 parameters:

- Enter command characters in either upper-case or lower-case. In the command syntax, lower-case characters indicate parameters that you must supply.
- The **tid** can be omitted, but if it is specified it must match the assigned unit name.
- The **aid** is required, optional, or can be omitted depending on the command. Unless otherwise specified, omitting the **aid** is the same as specifying the ALL value.
- Any parameters following the **ctag** must be preceded with the **::** (general block field is not used). The **ctag** is optional. If omitted, the OT-21 responds with a **ctag** of 0.
- Terminate command lines with a terminating semicolon (;). The OT-21 executes the command when it receives the terminating semicolon in the command entry.
- **:** is a block separator character
- **,** is a parameter field separator
- **;** indicates the end of the command
- **<cr>** and **<lf>** or **<cr lf>** indicate the ASCII carriage return (CR) and line feed (LF) codes used to separate lines of response from the OT-21. They appear exactly as described in the response message.

The ASCII cancel code character 0x18 (Ctrl-x) can be used to cancel a partially sent command and clear the input buffer.

Input Command Conventions

Input commands are always followed by an acknowledgment or output response.

The format for all TL1 input commands is:

```
cmd:tid:aid:ctag:gblock:parms;
```

where:

cmd is a required command field.

tid is the name of the OT-21, which may be omitted but if specified must match the OT-21 name.

aid is the access identifier; valid values are determined based on the **cmd**.

ctag is the correlation tag, which must be the TL1 identifier or a non-zero decimal number; whatever value specified will be used in the response. The ctag is optional. If omitted, the OT-21 responds with a ctag of 0.

gblock is an unused field which should be left blank.

parms are optional fields determined by the cmd.

Unless otherwise specified, omitting a value for the aid is the same as specifying ALL. All commands terminate with a semicolon (;). Refer to [Table D-2](#) for a description of command fields.

Table D-2. Command Field Descriptions

Parameter	Valid Values	Description
cmd	Descriptive string describing the command to be performed	Command - Action to be taken
tid	tid may be omitted or up to 20 characters long, beginning with a character. If specified it must match the OT-21 name. If it does not match no output is generated from the unit.	Target Identifier - Name assigned to the unit
sid	Same as tid. Will be specified in autonomous messages.	Source Identifier - Returned ID
aid	ALL – all components in the unit SYS – OT-21 system COMM[-z] – serial port L or A ENG – the installed GPS engine PWR[-x] – unit power sources (where x = A or B, y = 1-4,z=A or L)	Access Identifier – Component within the unit the command is addressed to or the response applies to. It may be specific or ALL or omitted (omitted indicates ALL or not used). Within the aid, the hyphen (-) is used to separate entities. For example OUT-A refers to output card A. OUT-A-1 refers to output number 1 on card A.
ctag	TL1 identifier or a non-zero decimal number	Correlation Tag – Sent with the command and returned with the response for correlation
atag	6 numeric characters, 000001 ≤ atag ≤ 999999	Autonomous Correlation Tag. Increased each time an event is generated – wraps back to 000001 after reaching 999999
parms	Specific for the command, separated by commas	Parameters – input for the command

Table D-2. Command Field Descriptions (Continued)

Parameter	Valid Values	Description
almcde	* C critical alarms ** major alarms * A minor alarms A non-alarm events	Alarm Code sent with the autonomous reports
ntfcncde	CR critical alarms MJ major alarms MN minor alarms CL a cleared alarm IG ignored alarms NA not alarmed (events or reports only)	Notification Code for alarms or events
condtype	Valid event numbers	Event number
condscr	Text string	Condition Description for alarms or events
srveff	SA service affecting NSA non-service affecting	Service Affecting or Non Service Affecting
ocrdat	YY-MM-DD	Occurrence Date – (date of occurrence)
oortim	HH-MM-SS	Occurrence Time – (time of occurrence)
start or stop	MM-DD,HH-MM If the date is omitted but followed by a time, it defaults to the current date. If the start or stop time is omitted, but preceded by a date, it defaults to the current time. If the start date and time is omitted, it defaults to the start of the data. If the stop date and time is omitted, it defaults to the end of the data. The comma must be present to indicate an omitted start.	Start or Stop date/time for data. It specifies the month and day, hour and minute
alarm	Valid alarm numbers for the given aid	Alarm Number
ercd	ICNV – Command not valid IIAC – Invalid AID code IICT – Invalid CTAG IPEX – Extra parameter IPMS – Parameter missing IPNV – Parameter not valid SDNR – Data not ready IITA – Invalid Target Identifier	Error Codes for Deny Response messages

Table D-2. Command Field Descriptions (Continued)

Parameter	Valid Values	Description
EnaDis	ENA (enabled) or DIS (disabled)	Reports user configuration in RTRV-PRMTR responses
status	OK , DIS , FLT (faulted), TIM , BYP	Reports current status of PORT in RTRV-DATA responses

In Process Acknowledgment Conventions

Each command received with a valid **tid** generates a response within two seconds of receipt of a terminating semicolon. The response is either an In Process Acknowledgment followed later by an Output Response Message or just the Output Response. The output always begins with a carriage return and two line feed characters, then the header line of **^^^sid^date^time<cr><lf>**, where **sid** is the unit name and the **date^time** stamp is the current NE system time.

The IP (In Process) response is only sent if the OT-21 is unable to respond to the command within two seconds (currently, only the LOAD command uses IP). The requested response is sent in full when the data is available. This response terminates with the less than character (<) with no semicolon until after the requested output Response Message is sent. The format for an In Process Acknowledgment is:

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

Output Response Conventions

The output response indicates whether the OT-21 complied with (COMPLD) or denied (DENY) the input command.

The DENY Output Response Conventions

The DENY response contains a four-character error code (**ercd**) that describes the reason for the denied response. For example, the error code ICNV indicates *Input Command Not Valid*.

The OT-21 sends the DENY response if:

- the **cmd** is not valid
- the **aid** is not valid
- the **ctag** is not valid, indicated by a response containing the **ctag** set to a single zero character (0)
- the unit is unable to comply with the request for the reason indicated by the **ercd**

The format for a denied (DENY) output response is as follows:

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

where:

- **DENY** is the deny message.
- **ercd** (Error Code) is one of the following four-character error codes that explains the reason for the deny. Other error codes may be defined and used, if required.
 - **ICNV** – Command Not Valid
 - **IIAC** – Invalid **aid** Code
 - **IICT** – Invalid **ctag**
 - **IITA** – Invalid Target Identifier
 - **IPEX** – Extra Parameter
 - **IPMS** – Parameter Missing
 - **IPNV** – Parameter Not Valid
 - **SDNR** – Data Not Ready

The COMPLD Output Response Conventions

If the command is received correctly and can be processed by the OT-21 within two seconds, the complied response message is sent with data that was requested in the input command. The requested data is included in the response and is always enclosed in quotation marks.

The format for a complied (COMPLD) output response is:

```
<cr lf lf>
^^^sid^date^time <cr lf>
M^^ctag^COMPLD <cr lf>
[^^^"response message" <cr lf>]
[...]
;
```

where:

- **COMPLD** is the complied message.
- **“response message”** is the message line for complied messages. It always begins with three spaces (^^^) followed by the response message enclosed in quotation marks. It is terminated by <cr lf>. Multiple lines of response messages are allowed. Each command response is terminated by a semicolon following the last <cr lf>.

If the response content exceeds 4K bytes of information, the TL1 large data block syntax is used. This format divides the response into approximately 4K byte sized records each ending with a greater than sign "><cr><lf>". Currently no OT-21 response is more than 4K bytes in size.

The format is:

```

^^^sid^date^time<cr><lf>

M^^ctag^COMPLD<cr><lf>

(4K bytes of response information)

><cr><lf>

^^^sid^date^time<cr><lf>

M^^ctag^COMPLD<cr><lf>

(following 4K bytes of response information)

><cr><lf>

^^^sid^date^time<cr><lf>

M^^ctag^COMPLD<cr><lf>

(remaining information)

;

```

Autonomous Report Parameters

Autonomous reports are sent when the unit detects an alarm condition or status change. This correlates with the event messages generated and stored in the event log. The report has the following format:

```

<cr><lf><lf>

^^^sid^date^time<cr><lf>

almcde^atag^REPT^mod1<cr><lf>

^^^"[aid]:ntfcncde,condtype,srveff,ocrdat,ocrtim:"condscr\"
"<cr><lf>

;

```



Note: mod2 is never used by the OT-21.

The **almcde** reports the level of alarm or event and **atag** is a six-digit correlation tag that is incremented each time a message is sent. The modifier, **mod1**, is **ALRM** or **EVNT**. The second modifier, **mod2**, is always null. **EVNT** is used with **almcde A^** and **ntfcncde NA** and no **mod2**. The condition description **condscr** is added to further describe the alarm or event, for example: `\\"Freq Mode, Holdover\\"`.



Note: TL1 Alarms and Events strongly correlate to the ICS alarms and events. Only the format of the presentation differs. Both share the same numbering scheme and the same message texts.

The “condtype” field holds the alarm or event number. This field can be used to help correlate messages, if desired.

TL1 Autonomous Alarm Reports

Table D-3 lists the SNTP related autonomous alarm reports generated by the OT-21. The alarm number column is for reference only.

Table D-3. TL1 Alarm Displays

Alarm No.	Display
0	"ENG:OK,00,CL,NSA,04-03-25,20-26-51:\\"Rcvr Tracking=Yes\\""
1	"ENG:OK,01,CL,NSA,04-03-25,20-24-24:\\"Rcvr Antenna=Connected\\""
2	"ENG:OK,02,CL,NSA,04-05-04,21-53-52:\\"Antenna Load=Not Shorted\\""
3	"ENG:OK,03,CL,NSA,04-05-04,21-53-52:\\"Engine HW=Good\\""
4	"ENG:OK,04,CL,NSA,04-04-21,19-45-17:\\"Engine System=Good\\""
5	"ENG:OK,05,CL,NSA,04-03-24,19-18-32:\\"Receiver Posn=Good\\""
6	"SYS:OK,06,CL,NSA,04-05-04,21-53-52:\\"Oscillator=Present\\""
7	"SYS:OK,07,CL,NSA,04-04-21,19-45-51:\\"Freq Control=No Holdover\\""
8	"SYS:OK,08,CL,NSA,04-03-13,18-31-12:\\"Output Freq=OK\\""
9	"SYS:OK,09,CL,NSA,04-02-17,15-36-50:\\"Output Time=OK\\""
10	"PWR:OK,10,CL,NSA,04-05-04,21-53-52:\\"Power Summary=Present\\""
10-1	"PWR:OK,10-1,CL,NSA,04-05-04,21-53-52:\\"Power A=Present\\""

Table D-3. TL1 Alarm Displays (Continued)

Alarm No.	Display
10-2	"PWR:OK,10-2,CL,NSA,04-05-04,21-53-52:\\"Power B=Present\\""
11	"SYS:OK,11,CL,NSA,04-05-04,21-53-52:\\"Sys Clock PLL=Locked\\""
12	"SYS:OK,12,CL,NSA,04-02-17,15-17-34:\\"Rubidium PLL=Locked\\""
13	"SYS:OK,13,CL,NSA,04-05-04,21-53-52:\\"Freq Ctrl Range=OK\\""
14	"SYS:OK,14,CL,NSA,04-05-04,21-53-52:\\"Unit HW=OK\\""
15	"ENG:OK,15,CL,NSA,04-05-03,05-07-08:\\"Eng. Stabltly=OK\\""
19	"SYS:OK,19,CL,NSA,04-05-04,21-53-52:\\"HW Config=OK\\""
22	"SYS:OK,22,CL,NSA,04-05-04,21-53-52:\\"VCXO=OK\\""

The following example uses alarm #0 to show how the components are selected to build the specific autonomous alarm report. The basic template is:

```
almcde^atag^REPT^mod1<cr><lf>

^^^[aid]:ntfncde,condtype,srveff,ocrdat,ocrtim:
\"condscr\"<cr><lf>
```

Table D-4 describes each element in the autonomous alarm report. Table D-5 lists each alarm’s active status indicaton and aid.

Table D-4. Autonomous Alarm Report

Parameter	Description
almcde	one of the two-character codes *C, **, *^, or A^ (^ = space) <ul style="list-style-type: none"> ■ *C – critical alarm ■ ** – major alarm ■ *^ – minor alarm ■ A^ – non-alarm event
atag	six-digit autonomous correlation tag
mod1	always ALRM for autonomous alarm message
aid	comes from aid column in Table D-5
ntfncde	one of the two-character codes CR “critical”, MJ “major”, MN “minor”, CL “clear”, IG “ignore”

Table D-4. Autonomous Alarm Report (Continued)

Parameter	Description
condtype	the condtype number in Table D-5 (the alarm number)
srveff	NSA “non-service affecting” for cleared and minor alarms, SA “service affecting” for major and critical alarms
ocrdat – ocrtim	repeats the occurrence date and time information
condscr	<p><alarm description ≥ <current alarm status>, <debounce time> [, <elevation>]</p> <p>where:</p> <p><alarm description> ICS alarm description string</p> <p><current alarm status> ICS Event Message</p> <p><debounce time> “set” or “clr” time for the alarm (Immediate and '0' are the same)</p> <p><elevation> optional field. If present either "ELEVATED", or "2ND ELEVATION" depending on elevation levels that have occurred</p>

When alarm 0 first occurs the report is:

```
*^ 000001^REPT^ALRM<cr><lf>

^^^"ENG:MN,0,NSA,<date>,<time>:\Rcvr
Tracking=No,300\"<cr><lf>
```

If the alarm gets elevated, the OT-21 displays:

```
** 000002^REPT^ALRM<cr><lf>

^^^"ENG:MJ,0,SA,<date>,<time>:\Rcvr
Tracking=No,300,ELEVATED\"<cr><lf>
```

If the alarm is ignored long enough to be elevated again, the following text is displayed:

```
*C 000003^REPT^ALRM<cr><lf>

^^^"ENG:CR,0,SA,<date>,<time>:\Rcvr Tracking=No,300,2ND
ELEVATION\"<cr><lf>
```

When the alarm clears, the unit displays:

```
A^ 000004^REPT^ALRM<cr><lf>

^^^"ENG:CL,0,NSA,<date>,<time>:\Rcvr
Tracking=Yes,0\"<cr><lf>
```

Due to the redundant data in the message, there are several ways to interpret it. The **ntfncode** and **condtype** provide the alarm level (CR, MJ, MN, or CL) and the alarm number. However, the OT-21 correctly supplies all data required by this format.

Table D-5. TL1 Alarm Active Status Indication And Aid

Cond Type	Text	Default Level	Alarm Not Active	Alarm Active	Aid
0	Rcvr Tracking	Minor	Yes	No	ENG
1	Rcvr Antenna	Major	Connected	Not Connected	ENG
2	Antenna Load	Major	Not Shorted	Shorted	ENG
3	Engine HW	Major	Good	Bad	ENG
4	Engine System	Minor	Good	Bad	ENG
5	Receiver Posn	Minor	Good	Unknown	ENG
6	Oscillator	Critical	Present	Not Present	SYS
7	Freq Control	Minor	No Holdover	Holdover	SYS
8	Output Freq	Major	OK	Degraded	SYS
9	Output Time	Minor	OK	Degraded	SYS
10	Power Summary	Minor	Present	Not Present	PWR
10-1	Power A	Minor	Present	Not Present	PWR-A
10-2	Power B	Minor	Present	Not Present	PWR-B
11	Sys Clock PLL	Critical	Locked	Not Locked	SYS
12	Rubidium PLL	Critical	Locked	Not Locked	SYS
13	Freq Ctrl Range	Major	OK	Out of Range	SYS
14	Unit HW	Minor	OK	Failed	SYS
15	Eng Stability	Minor	Good	Bad	ENG
19	HW Config	Critical	OK	Invalid	SYS
22	VCXO	Critical	OK	Failed	SYS

TL1 Autonomous Event Reports

Table D-7 lists all the autonomous event reports generated by the OT-21.

The event template is:

```
almcde^atag^REPT^mod1<cr><lf>
^^^[aid]:ntfcncde,condtype,srveff,ocrdat,ocrtim:\"condscr\"
\"<cr><lf>
```

Table D-6 describes the elements in the autonomous event report.

Table D-6. Autonomous Event Report Parameter Descriptions

Parameter	Description
almcde	A^
atag	six-digit correlation tag
mod1	always EVNT
aid	comes from aid column in the table
ntfcncde	NA
condtype	the condtype number in the table (the alarm number)
srveff	NSA
ocrdat – ocrtim	repeats the date and time information
condscr	same as “Event Message” information in the ICS command set (in Table D-7, <port id> refers to the communications port that issued the command)

Example:

```
A^^000001^REPT^EVNT<cr><lf>
^^^SYS:NA,101,NSA,ocrdat,ocrtim:\"Active Set,On\"<cr><lf>
```

Table D-7. TL1 Events

condtype	Event Message	AIDs
104	Alarm Set,<port id>,Alarm ##, CLR delay ## sec	SYS
105	Alarm Set,<port id>Alarm ##,level {IGNORE REPORT MINOR MAJOR CRITICAL}	SYS

Table D-7. TL1 Events (Continued)

condtype	Event Message	AIDs
106	Alarm Set,<port id>,Alarm ##,SET delay ## sec	SYS
110	Comm Set,<port id>,Change <changed port>,HW Hand {On Off}	COMM-L, COMM-A
111	Comm Set,<port id>,Change <changed port>,Mode {ICS TL1}	COMM-L, COMM-A
112	Comm Set,<port id>,Change <changed port>,New Baud <rate>	COMM-L, COMM-A
113	Comm Set,<port id>,Change <changed port>,SW Hand {On Off}	COMM-L, COMM-A
120	Elevation Mask Set,<port id>,## deg	ENG
121	Event Log Cleared,<port id>	SYS
122	Factory Settings Restored,<port id>	SYS
128	IP Address Set Failed	SYS
129	IP Address Set,<port id>,<IP address>	SYS
130	IP Broadcast Mask Set Failed	SYS
131	IP Broadcast Mask Set,<port id>,<IP address>	SYS
132	IP Gateway Set Failed	SYS
133	IP Gateway Set,<port id>,<IP address>	SYS
134	IP Interval Set,<port id>,<IP address>	SYS
135	IP Mask Set Failed	SYS
136	IP Mask Set,<port id>,<IP address>	SYS
137	IP SNTP Broadcast Interval Set Failed	SYS
138	Log In,<port id>,"<user id>",level: #	SYS
139	Log Off,<port id>,"<user id>"	SYS
140	Loop Set,<port id>,<value>	SYS
141	Major->Critical Elevation Time Set,<port id>,## sec	SYS
142	Minor->Major Elevation Time Set,<port id>,## sec	SYS
145	User Table Cleared,<port id>	SYS
146	Forced Log Off,<port id>,<forced port>,"<forced user>"	SYS
148	Position Average Count Set,<port id>,##	ENG
149	Position Set,<port id>,<lat>,<lon>,<height>	ENG

Table D-7. TL1 Events (Continued)

condtype	Event Message	AIDs
150	Restart Cancelled,<port id>	SYS
151	Restart,<port id>,# sec	SYS
156	Timing Mask Set,<port id>,## deg	ENG
157	User Added,<port id>,<new user>,Level #	SYS
158	User Deleted,<port id>,<deleted user>,Level #	SYS
159	User Modified,<port id>,<mod user>,Level #	SYS
160	User Msg,<port id>,"<text>"	SYS
161	User Settings Restored,<port id>	SYS
162	User Settings Updated With Current,<port id>	SYS
176	OT21 Msg,"<text>"	SYS

RETRIEVE Commands and Responses

This section provides a list of all TL1 commands with definitions. For each valid RETRIEVE command, the unit responds with the COMPLD message and a response message containing the requested data, if any. This section describes the command parameters and the response message formats and parameter definitions. The response message may be multiple lines, each ending with <cr><lf> and a terminating semicolon at the end of the output.

RTRV-ALARM:[tid]:[aid]:[ctag]::[ALL | alarm];

Minimum user security level 1

Valid aid codes: ALL, ENG, INP[-x], OUT[-x], PWR, SYS

Valid modifiers: ALL or alarm number

Synonyms: RTRV-ALM, RTRV-ALRM

Also see [RTRV-PRMTR:\[tid\]::\[ctag\]::ALARM,\[alarm\];](#), on page 167 and [SET-PRMTR:\[tid\]::\[ctag\]::ALARM,alarm,\[level\], \[setd\],\[cleard\];](#), on page 174

This command returns a list of all currently active alarms, or through the use of the modifier, current status for the alarms.

When an aid other than ALL is used only the alarms for that component are reported. The response will be the COMPLD message followed by the alarm report message(s). There may be no lines in the RTRV-ALARM report, indicating that no alarms are active, or there may be multiple lines in the report.

The format is the **COMPLD** message followed by the same description line as for the alarm event:

```
^^^"aid:ntfcncde,condtype,srveff,ocrdat,ocrtim:\"condscr\""<
cr><lf>
```

- aid is listed in the “aid” column in [Table D-5](#)
- ntfncde is one of two character codes CR, MJ, MN, CL, IG
- condtype is the condtype number in [Table D-5](#) (the alarm number)
- srveff is NSA for cleared and minor alarms, SA for major and critical alarms
- ocrdat and ocrtim repeat the date and time information
- condscr is formatted as:

```
<alarm description ≥ <current alarm status>,<debounce time>[,<elevation>]
```

where:

<alarm description> is the alarm description string as given in ICS

<current alarm status> is the Event Message as given in ICS

<debounce time> is the 'set' or 'clr' time for the alarm. Immediate and '0' are the same and are not differentiated here

<elevation> is an optional field. If present it is either "ELEVATED" or "2ND ELEVATION" depending on how many elevation levels have actually occurred

Example of an alarm that is not currently in-alarm:

```
"SYS:MI,10-2,NSA,01-10-31,12-00-00:\"Power
B=Present,0\""<cr><lf>
```

Example of an alarm that has been elevated:

```
"SYS:MJ,0,SA,01-10-31,12-00-00:\"Rcvr Tracking=Not
Tracking,300,ELEVATED \"\"<cr><lf>
```



Note: If an alarm number is specified, it is recommended that you use aid=ALL.

RTRV-CONF:[tid]:[aid]:[ctag];

Minimum user security level 2

Valid aid codes: ALL

ICS equivalent: none, although similar to the CONFIG command

Synonyms: RTRV-CONFIG, RTRV-CONFIGURATION

This command returns the following configuration information:

- oscillator type
- engine type
- configuration
- output group A
- output group B

The response is a **COMPLD** message followed by:

```
^^^SYS:OT-21/<configuration>/<oscillator>/<engine><cr><lf>
^^^OUT-A:<group type><cr><lf>
^^^OUT-B:<group type><cr><lf>
```

For example:

```
^^^SYS:OT-21/PRR/2E/GPS<cr><lf>
^^^OUT-A:AMI<cr><lf>
^^^OUT-B:2048<cr><lf>
```

RTRV-DATA:[tid]::[ctag]::modifier;

Minimum user security level 1

Valid modifiers: GPS, GPS-AVAIL

Synonyms: RTRV-DAT

This command returns data generated by the OT-21. As such, it can be viewed but not modified, which distinguishes it from parameter (PRMTR) data which can be modified. The available modifiers are described in the following subsections.



Note: Do not confuse this command with the SET-DAT command, which allows setting of the current date and time.

RTRV-DATA:[tid]::[ctag]::GPS;

Minimum user security level 1

Valid aid code: none

This command returns the current satellites being tracked by satellite vehicle number with signal strength and status for each.

```
^^^"chan,SV#,snr,status"<cr><lf>
```

- chan is the channel number used to track the corresponding sv, $1 \leq \text{chan} \leq 32$ depending on type of engine
- SV# is the satellite vehicle number, $1 \leq \text{SV\#} \leq 32$
- snr is the signal-to-noise ratio, this is a three-digit number and $\text{snr} \geq 000$. Higher values of this number correlate to better signals
- status is the current tracking status: {SRC (searching) | COD (code locking) | FRQ (frequency locking) | TIM (setting time) | EPH (retrieving Ephemeris data) | OK (satellite being used in the timing solution) }

If no GPS engine installed, the OT-21 responds with the **ICNV** deny.

RTRV-DATA:[tid]::[ctag]::GPS-AVAIL;

Minimum user security level 1

Valid aid code: none

This command returns a list of the currently available satellites and their elevation, azimuth, and health information. The format for the valid response message is:

```
^^^"SV#,health,azimuth,elevation"<cr><lf>
```

- SV# is the satellite vehicle number, $1 \leq \text{SV\#} \leq 32$
- health is the current health of the satellite indicated by H (healthy) or U (unhealthy)
- azimuth is the calculated orientation of the satellite (bearing)
- elevation is the calculated orientation of the satellite (angle)

If the GPS engine has never tracked a satellite or if it has no GPS Almanac data, a message "NO ALMANAC INFORMATION AVAILABLE" is returned:

```
^^^\"NO ALMANAC INFORMATION AVAILABLE\"<cr><lf>
```

If no GPS engine installed, the OT-21 responds with the **ICNV** deny message.

RTRV-DOY:[tid]::[ctag];

Minimum user security level 0

Valid aid code: none

ICS equivalent: DOY

Reference: SET-DAT

This command returns current day of year. The format is the COMPLD message followed by:

```
^^^"doy,year"<cr><lf>
```

- **doy** is a 3-digit day of year – 001 to 366
- **year** is a 4-digit year, for example 2002

Example (2 Jan 2001):

```
^^^"002,2001"<cr><lf>
```

RTRV-EVENT:[tid]:[aid]:[ctag]::[count1], [count2],[startdate],[starttime],[stopdate], [stoptime],[REPORT | ALARM | ALL];

Minimum user security level 1

Valid aid codes: ALL, SYS, ENG, INP[-x], OUT[-x], PORT[-x], PWR, COMM[-x]

Excluded aid codes: PWR-x, OUT-x-y

Synonyms: RTRV-EVT, RTRV-EVNT, RTRV-EVENTLOG

This command returns stored data from the event log. Both alarms and report messages can be returned.

- **count1** is the number of events to be retrieved
- **count2** is the event reference point represented by the number of events prior to the time when the command is issued

- **startdate** is the starting date of a time interval, format: MM-DD
- **starttime** is the starting time of a time interval, format: HH-MM
- **stopdate** is the ending point of a time interval, format: MM-DD
- **stoptime** is the ending point of a time interval, format: HH-MM
- **REPORT** returns only reports (non-alarm events)
- **ALARM** returns only alarms
- **ALL** returns all events



Note: If REPORT, ALARM, or ALL are omitted, all events are returned.

Table D-8 summarizes how the six parameters interact to specify various subsets of alarms and events from the event log. The start and stop parameters specify an optional time interval for events to be retrieved. The start and stop times are specified in the format for a date in month and day and time in hours and minutes. The aid code is optional. If the aid is omitted or specified as ALL, event data for all aids (unit components) will be reported. One line containing the time stamp and message is returned for each entry in the log.

If a date is omitted, the current date is used. If the start time is omitted, it defaults to midnight (12:00:00 AM) of the startdate specified. If the stop time is omitted, it defaults to 11:59:59 PM of the stopdate specified.

Table D-8. RTRV-EVENT Count and Response

count 1	count 2	start	stop	Response
#	omitted	ignored	ignored	If count1 is valid and count2 is omitted: ignore start and stop, response is count1 number of events prior to the time when the command is issued.
#	#	ignored	ignored	If both count1 and count2 are valid: ignore start and stop, response is count1 number of events starting from count2 number of events prior to the time when the command is issued.
omitted	#	ignored	ignored	If count1 is omitted and count 2 is valid: ignore start and stop, response is one event sitting at count2 number of events prior to the time when the command is issued.
omitted	omitted	#	#	If both count1 and count2 are omitted and start and stop are valid: response is events between start and stop. If start > stop, respond with the IPNV deny.

RETRIEVE Commands and Responses

Table D-8. RTRV-EVENT Count and Response (Continued)

count 1	count 2	start	stop	Response
omitted	omitted	#	omitted	If both count1 and count2 are omitted and start is valid but stop is omitted: response is events from start to the time when the command is issued.
omitted	omitted	omitted	#	If count1, count2 and start are omitted, but stop is valid: response is events from the beginning of the table to the specific stop time.
omitted	omitted	omitted	omitted	If all parameters are omitted: response is the last event.
count1	count2	start	stop	Expected response

The format for event log responses is:

```
^^^[aid]:ntfcncde,condtype,srveff,ocrdat,ocrtim:"condscr\  
"<cr><lf>
```

```
^^"aid:sumStat,alm,ntfcncde,srvEff,ocrdat,ocrtim:"textEvent\  
nt\"<cr><lf>
```

- aid is most aids from [Table D-2](#), [Table D-5](#), and [Table D-7](#). Excluded are PWR-A, PWR-B, OUT-A-y, and OUT-B-y
- condtype is the alarm/event number
- ntfcncde is the current status – NA for events – {CR | MJ | MN | CL | IG | RE} for alarms
- srvEff is service effecting – SA or NSA for alarms and NSA for events
- ocrdat is the occurrence date
- ocrtim is the occurrence time
- condscr is the description string for the event (refer to the descriptions of condscr for the autonomous events)

Example:

To step back 20 events from the most recent and return the oldest five reports within those 20 events, type `RTRV-EVENT::ALL:::05,20,,,REPORT;`

The system responds with:

```
OT-21 02-05-29 20-54-49
```

```
M 0 COMPLD
```

```
"SYS:OK,140,NA,NSA,02-05-21,12-57-12:"Loop Set,Normal\""
```

```
"PORT-A:OK,144,NA,NSA,02-05-21,13-13-17:\\"Output SSM
Change,PQL 2\\""
```

```
"SYS:OK,152,NA,NSA,02-05-22,12-57-49:\\"Select
Reference,Receiver\\""
```

```
"SYS:OK,140,NA,NSA,02-05-22,12-57-59:\\"Loop
Set,Acquire\\""
```

```
"SYS:OK,140,NA,NSA,02-05-22,12-59-49:\\"Loop
Set,Recover\\""
```

Example of an alarm being annunciated:

```
"ENG:MN,0,NSA,01-10-31,12-02-00:\\"Rcvr
Tracking=No,300\\""<cr><lf>
```

Example of an alarm being cleared:

```
"ENG:CL,0,NSA,01-10-31,12-02-00:\\"Rcvr
Tracking=Yes\\""<cr><lf>
```

Example of a non-alarm event:

```
"SYS:NA,157,NSA,01-10-31,12-03-59:\\"User Added,JOE,Level
3\\""<cr><lf>
```

RTRV-HDR:[tid]::[ctag];

Minimum user security level 0

Valid aid code: none

Synonyms: RTRV-HEADER

Reference: [SET-NAME:\[tid\]::\[ctag\]::\[name\];](#), on page 174

Retrieve Header is used to verify system connectivity. The only action taken is to respond with the **COMPLD** message. This can also be used to query the current time for the unit as the **COMPLD** message contains the current date and time. The unit name (tid) can also be obtained from this message.

RTRV-INVENTORY:[tid]::[ctag];

Minimum user security level 1

Valid aid codes: none

Synonyms: RTRV-INV

This command returns information about the OT-21 relating to inventory management: serial number, the 254 part number, the 141 firmware level, and the date of manufacture. The response is a **COMPLD** message followed by serial number, 254 part number, 141 firmware level, and date of manufacture; for example:

```
OT-21 01-12-12 17-09-01

M 0 COMPLD

^^^"1234567890"

^^^"25413148-111-0,Rev C00"

^^^"14113142-000-0,Rev B00"

^^^"2001-12-04"

;
```

RTRV-NETYPE:[tid]::[ctag];

Minimum user security level 0

Valid aid code: none

This command returns The OT-21 Network Element type. It responds with a **COMPLD** message followed by:

```
^^^"OT21"<cr><lf>
```



Note: This command exists for SynCraft and any other external program that needs to know or display the front panel indicators.

RTRV-PRMTR:[tid]::[ctag]::modifier;

Minimum user security level 1

Valid modifiers: ALARM, COMM, ELTIME,GPS, IP

Synonyms: RTRV-PARA, RTRV-PARM, RTRV-PARAM, RTRV-PARAMETER

This command returns the current values of settable parameters of the OT-21. Refer to RTRV-DATA for values that are generated by the OT-21 but cannot be changed. This command is controlled by the modifier field. The available modifiers, messages, and responses are described in the following subsections.

RTRV-PRMTR:[tid]::[ctag]::ALARM,[alm];

Minimum user security level 1

Valid aid codes: none

Synonyms: ALM, ALRM

ICS equivalent: ALARM

Reference: [SET-PRMTR:\[tid\]::\[ctag\]::ALARM,alm,\[level\], \[setd\],\[cleard\];](#), on page 174

Also see [RTRV-ALARM:\[tid\]:\[aid\]:\[ctag\]::\[ALL | alm\];](#), on page 158

This command is used to display alarm parameters for all possible alarms, or for only one alarm based on the optional alarm number **alm**, where **alm** is the number reported in the alarm message. Refer to [Table D-5](#) for a list of all alarms.

The response is the **COMPLD** response followed by:

```
^^^"alm,ntfcncde,setd,cleard:\"text alarm\""<cr><lf>
```

- alm is the alarm number xx or xx-y, where xx is the basic alarm number and y is the optional alarm sub-number
- ntfncde is the severity level {IG | RE | MN | MJ | CR}
- setd is the alarm set delay in seconds
- cleard is the alarm clear delay in seconds
- textAlarm is a brief description of the alarm

If the alarm number is not valid for the specific OT-21e configuration, the response is the **IPNV** deny message.

If you request a summary alarm, the response is the summary alarm and all sub-alarms that compose the summary alarm.

RTRV-PRMTR:[tid]:[aid]:[ctag]::COMM;

Minimum user security level 1

Valid aid code: COMM-A, COMM-L, ALL

ICS equivalent: COMM [A | L]

Reference: [SET-PRMTR:\[tid\]:\[aid\]:\[ctag\]::COMM,\[baud\],\[echo\],\[eol\],\[ansi\],\[hard\],\[soft\],\[mode\];](#), on page 175

This command returns the serial communications port settings. The format is the COMPLD message followed by:

```
^^^"aid:baud,echo,eol,ansi,hard,soft,mode"<cr><lf>
```

- baud is { 1200 | 2400 | 4800 | 9600 | 19200 | 38400 }
- echo is { ON | OFF }
- eol is { CR | LF | CRLF }
- ansi is { ON | OFF }
- hard is hardware handshaking {HON | HOFF}
- soft is software handshaking {SON | SOFF}
- mode is { ICS | TL1 }

RTRV-PRMTR:[tid]::[ctag]::ELTIME;

Minimum user security level 1

Valid aid code: none

ICS equivalent: ELEVTIME

Reference: [SET-PRMTR:\[tid\]::\[ctag\]::ELTIME,\[elev1\],\[elev2\];](#), on page 176

This command returns elevation time setting for the alarms of the unit. The response is the COMPLD message followed by:

```
^^^"elev1,elev2"<cr><lf>
```

- elev1 is the alarm elevation time in seconds from minor to major,
 $60 \leq \text{elev1} \leq 172800$
- elev2 is the alarm elevation time in seconds from major to critical,
 $60 \leq \text{elev2} \leq 172800$

RTRV-PRMTR:[tid]::[ctag]::GPS;

Minimum user security level 1

Valid aid code: none

ICS equivalent: ENGINE

Reference: [SET-PRMTR:\[tid\]::\[ctag\]::GPS,\[lat\],\[lon\],\[hgt\],\[avg\],\[pose\],\[time\];](#), on page 177

This command returns the current latitude, longitude, height, elevation mask and time mask settings information. Latitude and longitude are reported in HH:MM:SS.ss format. Height is reported in meters. An * indicates that the position has not been verified as correct by the engine. When the position is verified, the * is not shown. Latitude is –90 to +90 with – latitude as South and + latitude as North. Longitude is –180 to +180 with – longitude as West and + longitude as East. The response is in the following format:

```
^^^"±lat,±lon,hgt,pdop,avg,pose1,timel,source*"<cr><lf>
```



Note: The position is the location of the antenna, not the OT-21.

- lat is the receiver current latitude [± 90 deg] in (DD)HH:MM:SS.ss format, for example +30:27:15.19 (+ is North, – is South)
- lon is the receiver current longitude [± 180 deg] in (DD)HH:MM:SS.ss format, for example -097:39:45.66 (+ is East, – is West)
- hgt is the receiver current height in meter, $-2000.0 \leq \text{hgt} \leq +20,000.0$, for example 237.57
- pdop is the current pdop $1.0 \leq \text{pdop} \leq 10.0$
- avg is the number of averages used from 10 to 3600
- pose1 is the minimum satellite elevation to use for positioning $0 \leq \text{pose1} \leq 60$ deg
- timel is the minimum satellite elevation to use for timing $0 \leq \text{timel} \leq 50$ deg
- source is the source of the position, either NONE (not positioned yet), ENG (set by the engine) or USER (set by user)

If no GPS engine is installed, the response is the **ICNV** deny message.



Note: If the position is user-entered, the pdop and avg fields are zero.

RTRV-PRMTR:[tid]::[ctag]::IP;

Minimum user security level 1

Valid aid code: none

ICS equivalent: IP

Reference: [SET-PRMTR:\[tid\]::\[ctag\]::IP,\[ipaddr\],\[ipmask\],\[gateaddr\],\[brdmsk\],\[intvl\];](#), on page 178

This command returns the current internet protocol settings for the unit. The format is the COMPLD message followed by:

```
^^^"ipaddr,ipmask,gateaddr,"<cr><lf>
```

```
^^^"broadcast mask,interval"<cr><lf>
```

```
^^^"ethAddr"<cr><lf>
```

```
^^^"ethConnect"<cr><lf>
```

- ipaddr is the unit's IP address in dotted decimal notation
- ipmask is the unit's IP mask in dotted decimal notation
- gateaddr is the unit's gateway address in dotted decimal notation
- broadcast mask is the SNTP broadcast mask in dotted decimal notation
- interval is the SNTP broadcast interval
- ethAddr is the unit MAC address, for example 00A06E000888
- ethConnect is the connect status, such as "Connected at 10 Mbps".

RTRV-USER:[tid]::[ctag];

Minimum user security level 1

Valid aid code: none

ICS equivalent: USERS

Reference: [SET-USER:\[tid\]::\[ctag\]::mode,\[username\],\[passwd\],\[level\];](#), on page 179

Also see [RTRV-WHO:\[tid\]::\[ctag\];](#), on page 171

This command returns the current user list. The format is the **COMPLD** message followed by:

```
^^^"username,level"<cr><lf>
```

- username is the assigned user
- level is access level 0 to 4

RTRV-VISUAL:[tid]::[ctag];

Minimum user security level 1

Valid aid code: none

ICS equivalent: none

Retrieve the current state of the eight LED indicators on the unit. The format is the **COMPLD** message followed by:

```
^^^"xxx,xxx,xxx,xxx,xxx,xxx,xxx,xxx"<cr><lf>
```

Each **xxx** is { Off | Grn | Amb | Red | GrnB | AmbB | RedB } where Off means the indicator is not lighted, Grn means lighted Green, Amb means lighted Amber, Red means lighted Red, and the colors followed with a B mean blinking in that color. The sequence follows the front panel arrangement of:

POWER, ACTIVE, TRACKING, INPUT, HOLDOVER, MINOR, MAJOR, CRITICAL.

Example of an OT-21 in a normal, non-alarm state:

```
"Grn, Grn, Grn, Off, Off, Off, Off, Off"<cr><lf>;
```



Note: This command returns the current state of the LED indicators. There is no equivalent SET command since the indicators are controlled by the unit hardware and software.

This command exists for SynCraft and other external programs that need to know or display the front panel indicators.

RTRV-WHO:[tid]::[ctag];

Minimum user security level 1

Valid aid code: none

ICS equivalent: WHO

Also see [RTRV-USER:\[tid\]::\[ctag\];](#), on page 170

This command returns the current user and port connections. The format is the **COMPLD** message followed by:

```
^^^"COML,username,level"
```

```
^^^"COMA,username,level"
```

SET Commands and Responses

```
^^^"TELA, username, level"
```

```
^^^"TELB, username, level"
```

```
^^^"TELC, username, level"
```

```
^^^"TELD, username, level"
```

```
^^^"TL1A, username, level"
```

```
^^^"TL1B, username, level"
```

- username is the assigned user, or IDLE if no one is logged in through that port
- level is access level 0 to 4

SET Commands and Responses

The commands in this section allow you to change certain values in the OT-21. Typically, the ability to use these "SET" commands requires a level 2, 3, or 4 user access.

A general rule for the SET commands is that, if multiple parameters *can* be specified they do not *have* to be specified. Parameters that are omitted are considered to mean "do not change this parameter's value." However, the comma delimiter must be specified. For example, in this command the set delay time is specified but the ntfncde and clear delay time is omitted, so only the set delay time will be changed:

```
SET-PRMTR...ALARM, almn, [ntfncde], [setDelay], [clrDelay];
```

```
SET-PRMTR...ALARM, 07, , 300;
```

It is possible to SET a parameter to its current value. For example, consider this sequence of commands:

```
SET-PRMTR...ALARM, 07, MJ
```

```
SET-PRMTR...ALARM, 07, MJ
```

In the second command, the parameters for Alarm 7 are being set to the same value as before. Both commands will receive a COMPLD message indicating that the SET command and all its parameters are valid.

However, if a SET command *changes* a parameter, an autonomous event message will also be generated. This event message informs you that the parameter has been changed in response to the SET command. In the sequence of commands shown above, the first message might trigger this event message, but the second message will not (because it does not change the value of any of the alarm parameters).

Another behavior of SET commands occurs when invalid parameters are specified. If you are familiar with the ICS operations you will have seen that invalid parameters generate helpful error messages that identify the particular piece of the command being questioned and often supply information identifying the specific problem. This is not the case with TL1 **DENY** responses. If you receive a **DENY** response, you will need to carefully examine the command to determine where the error is. You might try breaking down complex commands that set multiple parameters into a series of individual commands. You might try applying the same parameters through the ICS commands to see what error message(s) you receive.

This behavior applies to all the SET commands.

SET-DATE:[tid]::[ctag]::date,time;

Minimum user security level 1

Valid aid code: none

Synonyms: SET-DAT

ICS equivalent: DATE, TIME

Reference: [RTRV-DOY:\[tid\]::\[ctag\];](#), on page 162

The Set Date and Time command always has the aid omitted. The parameter field contains the date and time. The format of the date and time is YY-MM-DD,HH-MM-SS, with a comma separating the date and time. The system clock is set to the received date and time and a COMPLD message is returned with the new date/time in the header. The Day of Year is calculated from the date set.

Sample command, sets date to July 4th, 2001 and time to 1:15 pm:

```
SET-DATE:::001::01-07-04,13-15-00;
```

If the unit has not already acquired time from the GPS receiver engine, it responds with the message:

```
<cr><lf><lf>
^^^OT21^01-07-04^13-15-00<cr><lf>
M^^001^COMPLD<cr><lf>
;
```

This is a sample response. The date, time, sid, and ctag fields will be different for different SET-DATE commands.

This command returns the DENY message with an error code of SDNR if the unit has already acquired time from the radio receiver.



Note: Do not confuse this command with the RTRV-DAT (DATA) command. This command sets the date and time. RTRV-DAT (DATA) retrieves data values that cannot be changed.

SET-NAME:[tid]::[ctag]::[name];

Minimum user security level 1

Valid aid code: none

Synonyms: none

ICS equivalent: NAME

Reference: [RTRV-HDR:\[tid\]::\[ctag\];](#), on page 165

The Set Name command assigns a new name to the unit. The name may be omitted or up to 20 characters beginning with a letter (A – Z). The command **tid** and the returned **sid** in the COMPLD response message match the prior name. The new name is used as the **tid** and **sid** for all commands and responses following.

SET-PRMTR:[tid]::[ctag]::modifier,optionsList;

Minimum user security level 1

Valid modifiers: ALARM, COMM, ELTIME, GPS, IP, SETUP

Synonyms: SET-PARAM, SET-PARAMETER

This command sets the current values of settable parameters of the OT-21. Refer to [RTRV-PRMTR:\[tid\]::\[ctag\]::modifier;](#), on page 166, for message formats used to retrieve these values. Refer to [RTRV-DATA:\[tid\]::\[ctag\]::modifier;](#), on page 160, for values that are generated by the OT-21 but cannot be changed.

This command is controlled by the modifier field. The available modifiers, messages, and responses are described in the following sections.

SET-PRMTR:[tid]::[ctag]::ALARM,alm,[level],[setd],[cleard];

Minimum user security level 2

Valid aid codes: none

Synonyms: ALM, ALRM

ICS equivalent: ALARM

Reference: [RTRV-PRMTR:\[tid\]:\[ctag\]:ALARM,\[alm\]](#); on page 167

Also see [RTRV-ALARM:\[tid\]:\[aid\]:\[ctag\]:\[ALL | alm\]](#); on page 158

Set Parameter Alarm is used to set alarm parameters based on alarm number **alm**. Omit parameters that you do not want to change; be sure to insert a comma to replace omitted parameters. (see the examples below).

- **alm** is the alarm number **xx** or **xx-y**, where **xx** is the basic alarm number and **y** is the optional alarm
- **ntfncde** is the sub-number severity level [IG | RE | MN | MJ | CR]
- **setd** is the alarm set delay in seconds (00 to 86400)
- **cleard** is the alarm clear delay in seconds (00 to 86400)



Note: The **setd** and **cleard** times can be changed on some alarms, but not on others. See [Table D-5](#) for guidance.

Example: Set alarm 19 (Hardware Configuration) to MAJOR level.

```
SET-PRMTR:tid::001::ALARM,19,MJ;
```

Example: Set alarm 0 (Rcvr Tracking) to a five minute annunciation delay.

```
SET-PRMTR:tid::002::ALARM,0,,300;
```

Example: Set alarm 0 (Rcvr Tracking) to a 30 second clearing delay.

```
SET-PRMTR:tid::003::ALARM,0,,30;
```

Example: Set alarm 0 to CR, 10 minute annunciation delay, zero seconds clearing delay.

```
SET-PRMTR:tid::004::ALARM,0,CR,600,0;
```

The response to a successful SET...ALARM command is the **COMPLD** message. If the command actually changed one or more values, an autonomous event (see [Table D-6](#)) is used.

**SET-PRMTR:[tid]:[aid]:[ctag]:COMM,[baud],
[echo],[eol],[ansi],[hard],[soft],[mode];**

Minimum user security level 2

Valid aid code: ALL, COMM-A, or COMM-L

ICS equivalent: COMM

Reference: [RTRV-PRMTR:\[tid\]:\[aid\]:\[ctag\]::COMM;](#), on page 167

This command configures the serial communications port settings for the local port (L) or aux port (A). If no aid is specified, the command applies to both ports (L and A).

- baud is [1200 | 2400 | 4800 | 9600 | 19200 | 38400]
- echo is [ON | OFF]
- eol is [CR | LF | CRLF]
- ansi is [ON | OFF]
- hard is [HON | HOFF]
- soft is [SON | SOFF]
- mode is [ICS | TL1]

SET-PRMTR:[tid]::[ctag]::ELTIME,[elev1],[elev2];

Minimum user security level 2

Valid aid code: none

ICS equivalent: ELEVTIME

Reference: [RTRV-PRMTR:\[tid\]::\[ctag\]::ELTIME;](#), on page 168

This command sets elevation times for the alarms.

- elev1 is the alarm elevation time from minor to major,
 $60 \leq \text{elev1} \leq 172800$ (48 hours)
- elev2 is the alarm elevation time from major to critical,
 $60 \leq \text{elev2} \leq 172800$ (48 hours)

Examples:

To set the minor-to-major elevation time to 24 hours (86400 seconds):

```
SET-PRMTR:::123::ELTIME,86400;
```

To set the major-to-critical elevation time to 24 hours (86400 seconds):

```
SET-PRMTR:::123::ELTIME,,86400;
```

To set both times (minor-to-major = 3600, major-to-critical = 600):

```
SET-PRMTR:::123::ELTIME,3600,600;
```

The response to a successful command is the **COMPLD** message.

SET-PRMTR:[tid]::[ctag]::GPS,[lat],[lon],[hgt],[avg],[posel],[timel];

Minimum user security level 2

Valid aid code: none

ICS equivalent: POS

Reference: [RTRV-PRMTR:\[tid\]::\[ctag\]::GPS;](#), on page 168

This command sets the GPS related parameters including position and position masks.

- lat is receiver current latitude [\pm 90deg] in “HH:MM:SS.ss” format, for example +30:27:15.19 (+ indicates north, – indicates south) + = north is the default
- lon is receiver current longitude [\pm 180 deg] in “(DD)HH:MM:SS.ss” format, for example –097:39:45.66 (+ indicates east, – indicates west) + = east is the default.



Note: Command parameters that contain colons must be enclosed in quotes, as in “HH:MM:SS.ss”.

- hgt is the receiver current height in meters, $-2000.0 \leq \text{hgt} \leq +20,000.0$
- avg is the number of averages used from 10 to 3600
- posel is the minimum satellite elevation to use for positioning
 $0 \leq \text{posel} \leq 60$ degrees
- timel is the minimum satellite elevation to use for timing
 $0 \leq \text{timel} \leq 60$ degrees

To specify a position, all three components (lat, lon, hgt) must be specified in the same command. Otherwise the command generates a **DENY** response with an IPMS reason.

Latitude, longitude and height may not be set if position has been calculated based on radio-received information. If attempted, a **DENY** response with an ICNV reason is returned.

If no GPS engine is installed, the response is **DENY** with an ICNV reason.

SET-PRMTR:[tid]::[ctag]::IP,[ipaddr],[ipmask],[gateaddr],[brdmsk],[intvl];

Minimum user security level 2

Valid aid code: none

ICS equivalent: IP

Reference: [RTRV-PRMTR:\[tid\]::\[ctag\]::IP;](#), on page 169

This command sets values associated with the IP connectivity of the OT-21.

- ipaddr is the unit's IP address in dotted decimal notation
- ipmask is the unit's IP mask in dotted decimal notation
- gateaddr is the unit's gateway address in dotted decimal notation
- broadcast mask is the SNTP broadcast mask in dotted decimal notation
- interval is the SNTP broadcast interval, 15 – 3600 seconds

All addresses are in “dotted decimal” notation xxx.xxx.xxx.xxx, where each xxx is a value 0 through 255.

Example: to set the OT-21's IP address to 124.0.0.1:

```
SET-PRMTR:::123::IP,124.0.0.1;
```

**SET-PRMTR:[tid]::[ctag]::SETUP,
[fact [,all] | user [,all] | save]**

Minimum user security level 2 (saving to the user area requires Administrator security level 4 access)

Valid aid code: none

ICS equivalent: SETUP

This command configures NVRAM items.

To restore ALL factory settings:

```
SET-PRMTR:tid::ctag::SETUP,FACT,ALL;
```

To restore everything but the factory settings IP address, GPS position, and User List:

```
SET-PRMTR:tid::ctag::FACT;
```

To save the “current” settings into an area reserved for the “user”:

```
SET-PRMTR:tid::ctag::SAVE;
```

To restore ALL the settings from the “user” area to the “current” area:

```
SET-PRMTR:tid::ctag::SETUP,USER,ALL;
```

To restore everything but IP address, GPS position, and User List settings from the “user” area to the “current” area:

```
SET-PRMTR:tid::ctag::USER;
```

Items copied with the ALL parameter that are not copied without it are:

- IP addresses and related values
- GPS position
- USER list



Note: The commands FACT ALL and USER ALL cause Telnet to be dropped.

SET-USER:[tid]::[ctag]::mode,[username],[passwd],[level];

Minimum user security level 1 (to modify personal password)

Minimum user security level 4 (to add, modify, or delete passwords for all users)

Valid aid code: none

ICS equivalent: USER

Reference: [RTRV-USER:\[tid\]::\[ctag\];](#), on page 170

This command allows the Admin user to add and delete users (up to 40), to change passwords, and to log active users off the unit. With one exception, all these commands require Level-4 access to perform. The only exception is MOD, which can be performed by any user because it affects only that user’s password and level.



Note: Valid username and password characters include numbers, upper and lowercase letters, and the character set ";<=>?@". The semicolon functions properly only in ICS mode, and the colon must be enclosed in quotes in TL1 mode, as "USER:NAME" or "PASS:WORD". To enter lowercase letters, enclose the input in quotes, as "UserName" or "PassWord". *Do not* use spaces in usernames.

To add a new user:

```
SET-USER:tid::ctag::ADD,"username","passwd",level;
```

To delete an existing user:

```
SET-USER:tid::ctag::DEL,"username";
```

To modify the password or level of an existing user:

```
SET-USER:tid::ctag::MOD,"username",["passwd"],[level];
```

To erase all users:

```
SET-USER:tid::ctag::INIT;
```

To force logoff of a currently logged in user:

```
SET-USER:tid::ctag::LOGOFF,"username";
```

In each example:

- userName is the assigned user name (no spaces allowed)
- passwd is the assigned password (may be omitted)
- level is the assigned access level 1 through 4



Note: The OT-21 software will not allow you to assign level 0 through level 3 users before the Administrator level 4 user and password are assigned.

The following DENY reason codes can be generated by this command.

- **IPMS** inadequate number of fields in the command.
- **IPMS** the "mode" field (ADD, DEL, etc.) is blank.
- **IPMS** name or level field omitted for adding a user.
- **IPNV** user level not 1 through 4 or is higher than your level.
- **IPNV** adding an existing user; modifying or deleting a non-existing user.
- **SDNR** 40 users already defined, cannot add another.

Other Commands

RESET:tid::[ctag]::[delay],OV;

Minimum user security level 4

Valid aid code: none

ICS equivalent: RESET

This is a level 4 command. It restarts the unit in 'delay' seconds. If delay is not specified, it defaults to 5 seconds delay. One benefit of using RESET instead of cycling power is that the clocks are not disrupted and the reference engine (if one is present) is not reset.

- delay is the time delay from when the command is issued to when the unit restarts – $0 \leq \text{delay} \leq 600$ seconds

“OV” (OVERRIDE) must be included in the command. If it is omitted, the unit displays a **DENY** message with IPNV.



Note: This command requires that the **tid** be specified and it must match the unit **tid** before the command is accepted.

EXIT:[tid]::[ctag];

Minimum user security level 0

Valid aid code: none

ICS equivalent: EXIT

This is a level 0 command. This closes an Ethernet connection or sets a serial connection to ICS mode.

ACT-USER:[tid]:userName:[ctag]::pwd;

Minimum user security level 0

Valid aid codes: none, requires username instead.

ICS equivalent: LOG

This command allows user to log in with username and password.



Note: If pwd is defined as null, the correct password is also null.

CANC-USER:[tid]::[ctag];

Minimum user security level 0

Valid aid codes: none

ICS equivalent: BYE

This command logs off the TL1 user and returns the unit to security level 0.

LOAD:tid::[ctag]::ftpsite,user,passwd,fileID,OV;

Minimum user security level 4

Valid aid codes: none

ICS equivalent: LOAD

This command loads a new program for the unit from an FTP server. This requires access to an FTP server. The user must have a valid account on the server. Refer to [Software Maintenance](#), on page 92, for information on downloading software.

- fileID is the full path from the FTP root director to the file name to be loaded from the site, e.g. OT21B00.HEX
- ftpsite is the IP address for the site in dotted decimal notation (ddd.ddd.ddd.ddd)
- user is the user name for the FTP server
- passwd is the password for 'user' on the FTP server.



Note: This command requires that the **tid** be specified and it must match the unit **tid** before the command is accepted.



Note: To enter lowercase letters for ftpsite, user, passwd, and fileID, enclose the input in quotes, as "UserName" or "PassWord".

If any of the parameters are incorrect, it responds with the **DENY** message with IPNV reason. If the parameters are correct, the unit responds with an IP (In Process) message. Then, when the LOAD is complete, it responds with the **COMPLD** message.

Appendix E Default Configuration Settings

The OT-21 unit is fully configured at the factory and can be operated using the default hardware and software settings described in this Appendix.

In This Chapter

- [Factory Configuration Settings](#)
- [Factory System Configuration \(Default\) Settings](#)

Factory Configuration Settings

Table E-1 lists the factory-set alarm default parameter settings for the OT-21 configuration options. The table lists the settings by event numbers, and for each provides a description of the parameter level, and the default parameter value. The set delay and clear delay time can be set from 0 to 86,400 seconds (24 hours) unless the alarm is immediate. Alarms specified as Immediate cannot be changed.

Table E-1. Factory Alarm Configuration (Default) Settings

Alarm Event	Description	Default Settings		
		Level	Set Delay (s)	Clear Delay (s)
00	Tracking status of the receiver	Minor	300	0
01	Connection status of the receiver antenna	Major	Immediate	Immediate
02	Load indication of the receiver antenna	Major	Immediate	Immediate
03	Engine hardware status	Major	Immediate	Immediate
04	Engine system status	Minor	300	0
05	Receiver position status	Minor	Immediate	Immediate
06	Local oscillator output	Critical	Immediate	Immediate
07	Frequency control holdover status	Minor	300	Immediate
08	Output frequency quality	Major	600	0
09	Output time quality	Minor	600	0
10	Power input summary status	Minor	Immediate	Immediate
10-1	Power input A status	Minor	Immediate	Immediate
10-2	Power input B status	Minor	Immediate	Immediate
11	System clock Phase Locked Loop status	Critical	Immediate	Immediate
12	Rubidium Phase Locked Loop status	Critical	Immediate	Immediate
13	Frequency control range status	Major	300	0
14	Unit hardware status	Minor	Immediate	Immediate
15	Degraded phase data stability	Minor	30	10
19	Hardware configuration status	Critical	Immediate	Immediate
22	VCXO	Critical	Immediate	Immediate

Factory System Configuration (Default) Settings

Table E-2 lists the factory-set system default parameter settings for the OT-21 configuration options. The table provides a description of the parameter level and the default parameter value.

Table E-2. Factory System Configuration (Default) Settings

Description	Level	Parameter Value
Escalation Time	MINOR -> MAJOR	86,400 seconds
	MAJOR -> CRITICAL	86,400 seconds
GPS Settings	Position	N/A
	Position averaging count	300
	Force repositioning	True
	Positioning satellite elevation mask	5 degrees
	Time/Frequency control elevation mask	10 degrees

Factory System Configuration (Default) Settings

Appendix F Accessories and Ordering

This appendix provides information about optional antennas, mounting and connectivity accessories, and cabling requirements for the OT-21 units. For proper mounting and installation instructions, see [Chapter 3, Installing the OT-21](#).

In This Chapter

- [GPS Antenna with Internal Low Noise Amplifier \(LNA\)](#)
- [Transient Eliminators](#)
- [GPS L1 Inline Amplifier](#)
- [Coaxial Antenna Cables](#)
- [Optional Accessories](#)

GPS Antenna with Internal Low Noise Amplifier (LNA)

Three versions of GPS antennas are available with 26dB, 40dB, and 48dB internal LNAs. These antennas, compatible with most commercial GPS receivers, receive, amplify, and filter the L1 (1575.42 MHz) signal from GPS NAVSTAR satellites. With the appropriate antenna (see [Table F-2](#)), in-line amplifier, and coaxial cable, the antenna functions properly up to 1000 feet (305 m) from the radio receiver.

Selecting the Proper Gain Antenna

When installing the GPS radio receiver, it is important to select the proper gain antenna and coaxial cable that accounts for the insertion loss between the antenna and the radio receiver to avoid under-driving or over-driving the radio receiver antenna input. The OT-21 GPS engine requires the signal level at the antenna connector input of the chassis to be between 13.8 and 36.8 dB. This tolerance allows for the signal loss of the internal coaxial cable and connectors. The optimal signal level at the radio receiver input is 25.3 dB.

Antenna kits provide cable lengths from 10 to 1000 feet (3 to 305 m). These kits use LMR-400 or equivalent, a very low-loss flexible coaxial cable that provides excellent RF shielding and protection from interference.

All antenna kits include these items:

- GPS L1 antenna
- mounting pipe
- floor flange
- transient eliminator
- pre-assembled coaxial cable (for antenna to transient eliminator)
- one roll of weatherproof tape
- right angle adapter

All chassis, antennas, transient eliminators and in-line amplifiers have N-type connectors.

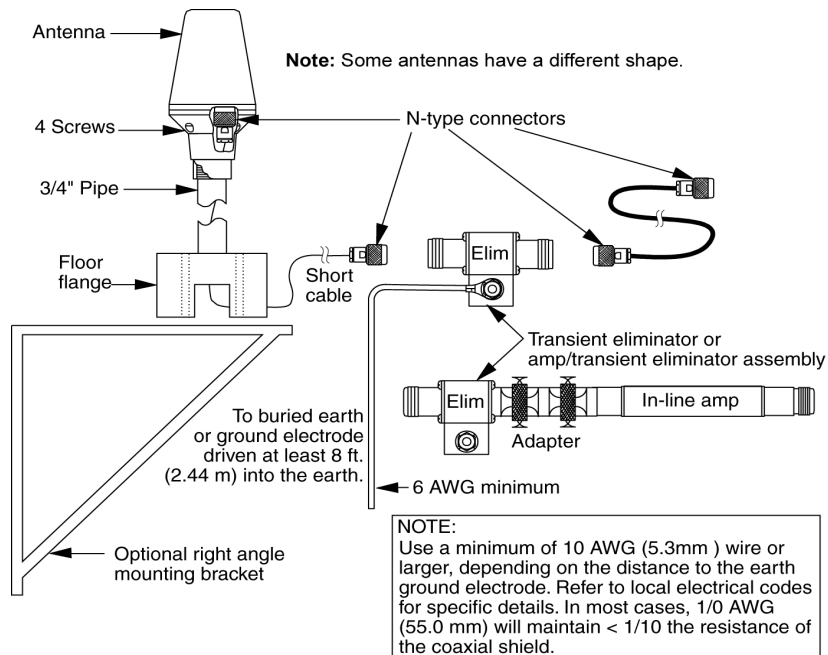
All antenna kits use LMR-400 (or equivalent) low-loss coaxial cable. Other types of coaxial cable are available for GPS antenna applications, but you must calculate the specific cable loss to ensure a signal level between 13.8 dB and 36.8 dB at the antenna connector input. The L1 signal loss of LMR-400 is 0.051 dB/foot (0.155 dB/m). The L1 signal loss of a 90 V transient eliminator is typically 0.25 dB.

When ordering a GPS antenna kit, specify the cable length desired for Eliminator-to-Receiver.

GPS Antenna With a Low Noise Amplifier, 26dB, 40dB, or 48dB

The 26dB, 40dB or 48dB GPS Antenna with a Low Noise Amplifier (LNA) receives the GPS signal from each satellite and amplifies the 1575 MHz (L1) signal and feeds it to the OT-21. The amplified L1 signal and 5 vDC power are carried over the coaxial antenna cable connecting the units. The antenna is housed in a weatherproof package suitable for permanent installation in an exposed location.

The antenna-to-radio receiver cable should be kept to the shortest reasonable length. [Figure F-1](#) illustrates a typical GPS antenna with an LNA installation. For additional transient eliminator protection requirements, you can install a 250B-90 Gas Tube transient eliminator in series with the antenna coaxial cable.



s2100002

Figure F-1. GPS Antenna with Internal LNA

Table F-1 provides specifications for the GPS antenna with internal LNA.

Table F-1. GPS Antennas with Internal LNA Specifications

Characteristic	Specification
Mechanical	
Mounting	4 holes, 1.75 inch x 1.75 inch centers, .25 inch mounting holes
Diameter	3.5 inches
Height	12.94 inches, including pipe mount
Weight	< 3 lbs.
Environmental	
Temperature	-40°C to +75°C
Relative Humidity	100% Non-immersed
Altitude	200 ft. below sea level to 13,000 ft. above sea level
Electrical	
Power	4.7 to 28 vDC (5 vDC Nominal)
Element	Right Hand Circular
Carrier	L1 (1545.42 MHz)
Bandwidth	10 MHz
Noise Figure	< 2.5 dB
Output Impedance	50 Ω
Gain	
26dB	26.5 dB ± 3 dB
40dB	40 dB minimum
48dB	48 dB minimum

Table F-2 lists antenna item numbers and provides a brief description of each antenna.

Table F-2. GPS Antenna Kit Item Numbers and Descriptions

GPS Antenna Kit Item No.	Total Cable Length	Description
990-13150-006	20 feet (6m)	Includes 26 dB L1 GPS Antenna, two LMR-400 3 meter cables ¹ , N-type connectors, transient eliminator
990-13150-013	43 feet (13m)	Includes 26 dB L1 GPS Antenna, one LMR-400 3 meter cable and one LMR-400 10 meter cable ¹ , N-type connectors, transient eliminator
990-13150-033	108 feet (33m)	Includes 26 dB L1 GPS Antenna, one LMR-400 3 meter cable and one LMR-400 30 meter cable ¹ , N-type connectors, transient eliminator
990-13150-048	157 feet (48m)	Includes 26 dB L1 GPS Antenna, one LMR-400 3 meter cable and one LMR-400 45 meter cable ¹ , N-type connectors, transient eliminator
990-13150-063	207 feet (63m)	Includes 40 dB L1 GPS Antenna, one LMR-400 9 meter cable and one LMR-400 54 meter cable ² , N-type connectors, transient eliminator
990-13150-120	394 feet (120m)	Includes 40 dB L1 GPS Antenna, one LMR-400 9 meter cable and one LMR-400 111 meter cable ² , N-type connectors, transient eliminator
990-13150-150	492 feet (150m)	Includes 40 dB L1 GPS Antenna, one LMR-400 9 meter cable and one LMR-400 141 meter cable ² , N-type connectors, transient eliminator
990-13150-180	590 feet (180m)	Includes 48 dB L1 GPS Antenna, one LMR-400 9 meter cable and one LMR-400 171 meter cable ² , N-type connectors, transient eliminator

Note:

- 1 Install 3 meter cable from antenna to transient eliminator and install additional cable from transient eliminator to OT-21.
- 2 Install 9 meter cable from antenna to transient eliminator and install additional cable from transient eliminator to OT-21.

Table F-4 through Table F-6 lists the item numbers and provides a brief description of the antenna accessories available for the L1 series antennas.

GPS Antenna with Internal Low Noise Amplifier (LNA)*Table F-3. Accessory Items Included With GPS Antenna Kits*

Item Number	Description
773000-0008	Transient Eliminator, 90 Volts, 1.5 GHz, N-Type
(See Table F-4 for cable length and item number)	Cable, LMR-400, N-Type
551100-6013	N-Jack to N-Plug Connector, right angle
400302-0500	Roll, Weatherproof Tape

Table F-4. Additional GPS Roof Mount Cables

Item Number	Description
58521A-001	1 meter LMR400 connectorized interconnect cable
58521A-002	2 meter LMR400 connectorized interconnect cable
58521A-005	5 meter LMR400 connectorized interconnect cable
58521A-010	10 meter LMR400 connectorized interconnect cable
58521A-015	15 meter LMR400 connectorized interconnect cable
58521A-030	30 meter LMR400 connectorized interconnect cable
58521A-060	60 meter LMR400 connectorized interconnect cable
58521A-110	110 meter LMR400 connectorized interconnect cable
58521A-220	220 meter LMR400 connectorized interconnect cable
58521A-330	330 meter LMR400 connectorized interconnect cable

Table F-5. Additional Available Accessories

Item Number	Description
12813080-000-0	Crimper Kit (see Table F-6)
12010210-000-0	Right Angle Mounting Bracket

Table F-6. Crimper Kit (For LMR-400)

Item Number	Description
551100-6007	Crimp tool (1ea)
551100-6008	Type N crimp connectors (10 ea.)
400302-0500	Roll Weatherproof tape (1 ea.)
551100-6009	LMR-400 Prep Tool (1 ea.)

Transient Eliminators

The FCC-250B-90-1.5NFNF Transient Eliminator is available for installations that require antenna coaxial lead-in protection. This transient eliminator passes DC power and frequencies in the 1.5 GHz range with non-down converter L1 GPS antennas. In most installations, the transient eliminator mounts near the point at which the antenna lead enters the facility. [Table F-7](#) provides the transient eliminator specifications.

Table F-7. Transient Eliminator FCC-250B-90-1.5NFNF Specifications

Type	Gas
Response Time	< 2 nanosecond
Impedance	50 Ω
Insertion Loss	< 0.25dB @ 1575 MHz
VSWR	< 1.6:1 @ 1575 MHz
DC Breakdown Voltage	90 Volts
Dissipation Capacity	10,000 Amperes, impulse 8/20 μsec
Connector Type	N-Type
Temperature	-55° C to + 70°C
Relative Humidity	100% Non-immersed
Altitude	200 ft. (61 m) below sea level to 13,000 ft. (4000 m) above sea level

GPS L1 Inline Amplifier

The GPS L1 In-line Amplifier (item number 570704-0002) option boosts the signal from the antenna for installation. The amplifier is required for LMR-400 cables longer than 650 feet and receives power from the GPS radio receiver through the antenna coaxial cable connections. [Table F-8](#) provides environmental, mechanical, and electrical specifications for the amplifier. The amplifier is normally connected in line with the antenna coaxial cable.

Table F-8. GPS L1 In-line Amplifier Specifications

Characteristic	Specification
Environmental	
Temperature	-40° C to +80° C
Mechanical	
Connectors, (In/Out)	N-Type
Gain	> 20 dB
Dimensions, includes connectors	Diameter .605 inches Length 3.8 inches
Electrical	
Power	+4.0 vDC to +28 vDC
Current	10 mA, typical, at 4 vDC
Input/Output Impedance (bandwidth at 3dB points)	50 Ω

Coaxial Antenna Cables

A low-loss LMR-400 or equivalent coaxial cable is available with N-type connectors on both ends.

- [Table F-9](#) lists the optional antenna coaxial cables.
- [Table F-10](#) lists the optional antenna coaxial cable crimper kit.
- [Table F-11](#) provides antenna cable specifications.

Table F-9. Optional Antenna Coaxial Cables

Item Number	Description
12012995-xxx-0	Cable, UHF/VHF (B-9913), with N-Type Connectors
12012994-xxx-0	Cable, UHF/VHF (B-89913), with N-Type Connectors
12012992-xxx-0	Cable, RG-213/U, with N-Type Connectors
12013076-xxx-0	Cable, LMR-400 or equivalent, with N-Type Connectors

Table F-10. Antenna Cable Crimper Kits

Item Number	Description
12813059-000-0	Crimp Kit for RG213 (10 each N-Type Connectors, crimp tool, weatherproof tape)
12813060-000-0	Crimp Kit for 9913 (10 each N-Type Connectors, crimp tool, weatherproof tape)
12813080-000-0	Crimp Kit for LMR-400 or equivalent (10 each N-Type connector, crimp tool, weatherproof tape)

Table F-11. Specifications, Antenna Cables

Cable Type	Measured Loss (@1575 GHz dB per foot)	DC Resistance (ohms per foot)	Type Center Conductor	Flammability
RG213/U (Beldon 8267)	0.093	0.0030	Stranded 13 AWG	U/L CSA
UHF/VHF (Beldon 9913)	0.058	0.0027	Solid 10 AWG	
UHF/VHF (Beldon 89913)	0.089	0.0027	Solid 10 AWG	Plenum U/L CSA
LMR-400	0.051	Shield .00165 Center .00139	Solid 0.109 inch	

Optional Accessories

Table F-12 provides a list of optional accessories which may be used to mount or install the OT-21.

Table F-12. *Optional Accessories*

Item Number	Description
551026-0038	Cable RS-232 shielded DB9P to DB9S, 5 ft. (1.5 m) included with unit
551021-0037	DA15S Alarm Closure Mating Connector
520094-0004	DA Alarm Closure Mating Connector, Backshell, Straight
551021-9011	DE9S Clock I/O Mating Connector
520094-0007	DE9 Clock I/O Mating Connector Ferrule, Backshell
520094-0006	DE9 Clock I/O Mating Connector, DE Backshell, Straight
12013204-000-0	DE9S to RJ48C (RJ45) Cable Adapter

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