OT-21

Primary Reference Receiver and Synchronization Supply Unit

Part Number 12713150-002-2
Revision D
April, 2003

FCC Regulatory Notice (Optional)

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

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How to Use This 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, Title	Description
Chapter 3, Installing the OT-21	Contains an overview of installing the OT-21, a guide to determining the configuration of the OT-21, and installation and connection procedures for the OT-21and antenna. The chapter concludes with the Installation Completeness Checklist.
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.
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, re-ordering subassemblies, accessories, and re-shipment of the product.
Chapter 7, Repair and Troubleshooting	Provides a list of alarm conditions, recorded events, and troubleshooting guidelines for the OT-21.
Appendix A, Regulatory Requirements	Contains safety and EMC standards and requirements for the OT-21.
Appendix B, OT-21 Configuration Options	Contains a table of software options that can be used to configure or customize the operation of the OT-21 hardware.
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.
Appendix G, Specifications	Provides specifications for the OT-21 and for its functional components. Categories include: operating conditions, power inputs, clock inputs and outputs, indicators, EMC and safety standards, and chassis dimensions.
Appendix H, Reference Material	Contains references to pertinent industry documentation.

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 *re-timing* application	A word or term being emphasized.
Symmetricom ***does not*** recommend...	A word or term given special emphasis.

Warnings, Cautions, Recommendations, and Notes

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

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

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

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

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

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

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

Related Documents and Information

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

- *OT-21 Warnings, Cautions, and Recommendations*, item number 12713150-102-2
- OT-21 Download Application, item number 12713224-000-2

Note: Symmetricom offers a number of applicable product training courses. Contact your Symmetricom representative or sales office for a complete list of courses and outlines.

Where to Find Answers to Product and Document Questions

For additional information about the products described in this guide, please contact your Symmetricom representative or local sales office. You may also complete and return the *Reader Comment Form* located in the back of this guide.

We appreciate your suggestions of ways to improve any part of this guide. Please make your suggestions on a copy of the affected page and include it with the reader comment form on page 311.

What's New in This Guide

This revision of the guide has the following changes from the previous revision:

- Added TL1 command interface information to all appropriate chapters
- Created Appendix D for TL1 command information
- Updated ICS command information in Appendix C

In this Chapter

Chapter 1 Product Overview

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

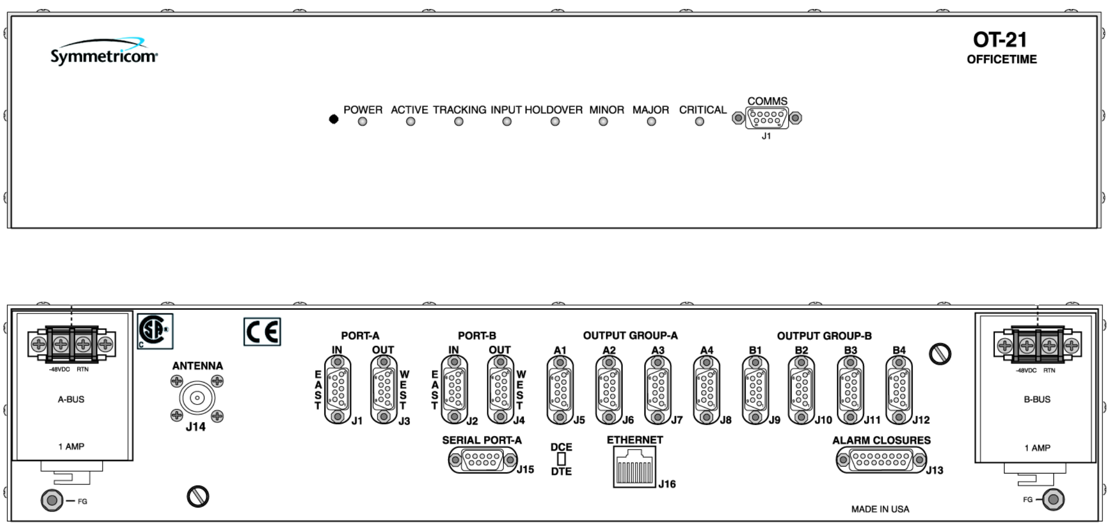

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Figure 1-1 OT-21 Front and Back View with DE9 Connectors

The OT-21 is available in a variety of configuration combinations and options, allowing the unit to be tailored to your specific needs. The Primary Reference Receiver (PRR) configuration features a highly accurate and reliable Primary Reference Source (PRS) that derives Stratum 1 timing from Code Division Multiple Access (CDMA) or Global Positioning System (GPS) radio signals. The Synchronization Supply Unit (SSU) configuration adds the ability to accept two input sources that can be re-timed to synchronize with the PRS signal. A variation of the SSU configuration eliminates the PRS and re-timing functionality and derives clocking from the input signals. The input signals can either be DS1, E1, or 2048 kHz.

Some of the optional features introduced in this chapter include:

- Chassis – DE9 or wire wrap connectors
- Outputs – Two DS1/E1 outputs plus two clock option cards. Each clock option card provides four outputs. Clock option cards are available for Composite Clock (CC), 2048 kHz, and DS1/E1 Alternate Mark Inversion (AMI).
- Oscillator – Rubidium (Stratum 2) or Quartz (Stratum 3E)

Note: The OT-21 with SSU function allows up to two DS1 or E1 input signals to be used as a reference source, or for re-timing functions.

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

1.1 System Description

The OT-21 is available in multiple configurations. OT-21 units are available with either a Stratum 3E quartz or Stratum 2 rubidium local oscillator and the chassis is available with DE9 or DE9 and RF metric coaxial connectors.

All OT-21 configurations can provide up to 10 outputs: two primary fixed outputs, and eight additional outputs in two sets of four identical outputs designated as Output Group A and Output Group B. Each set of four outputs provides identical clock output signals in one of these formats: Composite Clock, AMI DS1/E1 clock, or 2048 kHz.

Models with SSU function also provide two inputs for either DS1, E1, or 2048 kHz that can be used for clock recovery. A model with SSU function but without the radio receiver is also available.

Communication with the OT-21 unit is accomplished by the Interactive Command Set (ICS), or Transaction Language 1 (TL1) command protocol languages. Communication is either through the local EIA-232 communications ports or an Ethernet port.

Default factory settings are stored in FLASH ROM while current as well as previous saved configurations 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 Chapter 6.1, Software Maintenance.

1.2 Hardware Configurations

The OT-21 is available with a number of options, described in detail in Table B-1 and Table B-2. A label on the unit's rear panel provides the item number.

The OT-21 can be ordered in these factory-defined configurations:

- **Primary Reference Receiver (PRR)** – This configuration applies an output-only Primary Reference Source (PRS), utilizing a GPS or CDMA radio receiver as the timing reference to generate two DS1/E1 clock output signals and eight optional output clock signals.
- **Synchronization Supply Unit (SSU)** – This configuration applies an SSU and PRR using a GPS or CDMA radio receiver. This unit has the same functionality as a PRR, but also has two input channels that can be used as a reference source or for re-timing functions.
- **Synchronization Supply Unit without Radio Receiver** – This configuration provides the functionality of a Synchronization Supply Unit as described above, but uses the input channels as the timing reference since no radio receiver is available on this configuration.

Options available for each configuration include:

- Stratum 3E Quartz or Stratum 2 Rubidium Local Oscillator
- GPS or CDMA radio receiver
- Two optional quad-output cards allow the addition of two groups of four outputs. The two cards can be factory configured as two sets of four identical outputs, or any combination of DS1/E1, 2048 kHz or Composite Clock. The outputs are designated as Output Group A and Output Group B. Refer to Table B-1 and Table B-2 for specific item numbers.

1.3 Product Features

OT-21 products provide accurate and reliable Stratum 1 synchronization, using the radio receiver or an incoming clock to characterize and generate a corrected output frequency, which is used to generate all outputs, including *re*-timed outputs.

OT-21 features include the following:

- Direct Digital Synthesis (DDS) technology, providing high accuracy correction of frequency, eliminating manual local oscillator adjustments
- Internal crystal or rubidium local oscillator
- Units with SSU function have two input channels that can be used if the radio reference signal is lost or in re-timing applications
- GPS or CDMA tracking reference features
  - 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
  - CDMA radio receiver acquires and extracts timing from the CDMA pilot signal and synchronization channel, and is used by the OT-21 to provide a 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

IN THIS CHAPTER

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.

2.1 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. Units with SSU function can characterize and track incoming DS1 or E1 clocking signals for use as a reference, or re-time the data on those signals.

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.

Units with PRR function provide only PRS functionality. A GPS or CDMA engine provides a reference signal that is used to time the clock outputs of the unit. Units with SSU function can accept one or two DS1, E1, or 2048 kHz clock input signals. A unit with SSU function and without a radio receiver is also available for SSU/TSG applications. All units use either a quartz or rubidium internal oscillator as the local oscillator (LO).

Units with SSU function have a relay bypass mode feature that allows signals at input ports A and B to bypass the OT-21 circuits and go directly to output ports A and B, respectively. The relay bypass mode has a switch time of less than 50 msec and actuates either when power to the unit is removed, or through a user command.

2.2 Hardware Operation

The OT-21 consists of the main board, local oscillator, radio receiver (CDMA or GPS), 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 illustrates a block diagram of the stand-alone Stratum 1 supply unit using either a GPS or CDMA 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 OT-21 can provide high-stability outputs when it enters holdover. The unit calculates an average frequency offset while it tracks a reference input. If the reference has been tracked for at least twenty-four hours and then enters holdover operation, the twenty-four hour average is used to set the output frequency. In addition, ST3E units apply a calculated aging factor that extends the holdover performance.

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.

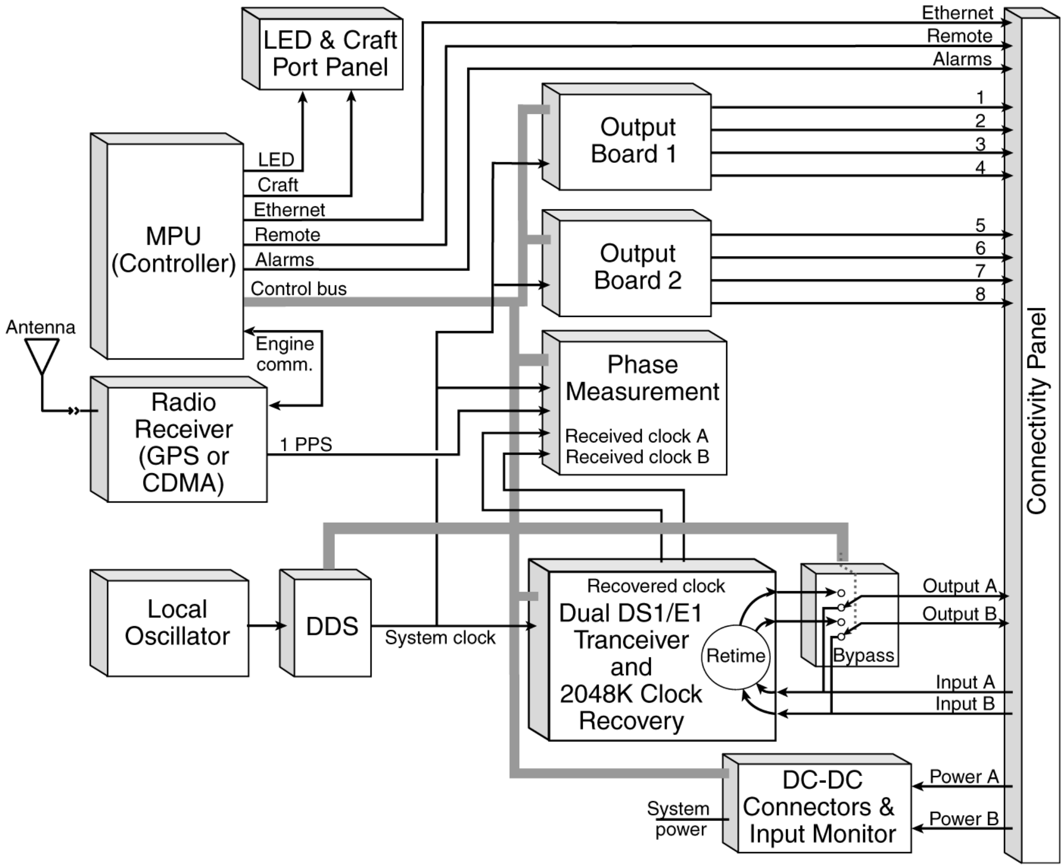


Figure 2-1 OT-21 Block Diagram

2.2.1 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.

2.2.2 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 such as communication parameters, synchronization quality for the re-timed outputs, clock input format and learned LO parameters.

2.2.3 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

2.2.4 System Clock

The internal system clock is the frequency source for all outputs of the unit. It derives long-term stability from the local oscillator and it sets it on frequency using phase measurements made against an external reference. This technique maintains the long-term frequency stability of the local oscillator, while providing the precise frequency offset necessary to set the system clock on frequency.

Local Oscillator

The unit employs either a Stratum 2 Rubidium Oscillator or a Stratum 3E Ovenized Crystal Oscillator as the internal local oscillator frequency source. The local oscillator provides the reference input to the DDS Circuit.

SSU units provide an oscillator failure mode. If the local oscillator fails (Oscillator alarm #6) the outputs are clocked from the Port A input if it is present or Port B input if A is not present. If the port A input returns while the system is failed over to B, the system reverts to A as the clock source. The unit does not automatically revert to normal operation if the oscillator begins working again; only a system restart ends failover operation.

Direct Digital Synthesizer (DDS) Circuitry

The DDS generates the highly precise frequency offset necessary to bring the system clock on frequency based on the external reference signal. The DDS circuitry includes a Numerically Controlled Oscillator (NCO) Phase-Locked Loop (PLL), and Voltage Controlled Crystal Oscillator (VCXO). The PLL locks the internal VCXO to the Local Oscillator. The frequency offset necessary to bring the system clock on frequency is applied to the VCXO by the NCO. The DDS can be set to a precise frequency with a resolution of 2 E^{-14}.

Phase Measurement

The phase measurement circuit determines the current frequency of the system clock, and ultimately the frequency of the local oscillator, as compared to the external reference. This provides the frequency offset necessary to align the system clock precisely on frequency. The phase measurements are obtained using a digital counter that measures the signal derived from the external reference source. The phase measurement has a resolution of 12.5 ns.

Three sources can provide the external reference. The primary source is a reference signal output by the GPS or CDMA Radio Receiver. The other two sources are the clock input signals provided in the SSU version of the unit.

2.2.5 Radio Receiver

The unit uses either a CDMA or GPS radio receiver to acquire a reference input. The unit uses a reference signal from the radio receiver to determine the frequency of the LO.

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. The CDMA radio receiver uses a passive antenna with up to 200 (61 m) feet of coaxial cable (see Appendix F.5, Coaxial Antenna Cables).

Note: Units with SSU function can omit the radio receiver. The radio receiver is optional in the SSU configuration.

2.2.6 Ports A and B

The unit has two ports labeled on the rear panel as Port A and Port B. Each port has an input connector and an output connector. The input is used as a timing reference only on SSU units.The two input channels provide additional references if the radio receiver is unusable. For the output-only PRR two DS1/E1 clock output signals are generated.

When a unit with SSU function is powered off or during powering up but before initialization is complete, the unit is in bypass mode. In bypass mode the unit passes through the signal on Port A and Port B inputs to the Port A and Port B outputs. After initialization is complete, the port mode reverts to the prior settings.

Units with SSU function can be used in applications in which the control information for site switches is carried on the incoming line. In such applications, the DS1/E1 transceiver interface can be configured to re-time the input data and pass it to the corresponding output channel. The unit can receive Synchronization Status Messages (SSMs) on the input channels and generate SSMs on the output channel using settings specified by software. For units with PRR function only, the MPU supplies the SSM for the clock outputs.

SSMs are transmitted in the DS1 ESF Facilities Data Link (FDL) channel or in the E1 time slot zero (TS0) Sa byte. The unit software provides an editable Priority Quality Level (PQL) table with which to customize SSM settings.

Note: Normally, editing the PQL table is not necessary. Edits may be required, however, if ANSI or ITU-T SSM standards are changed.

Refer to the “PQLTABLE” command in Appendix C, ICS Commands, and in Appendix D, TL1 Commands.

The framing mode of the two ports can be set independently as DS1, E1, or 2048 kHz. Port inputs and outputs have the same framing mode. When the framing mode is 2048 kHz, the output is off (port outputs are AMI only). On SSU units, the port can be used in timing insertion mode (TIM), retiming the data from the input and routing it to the output. The ability to track and measure incoming signal stability is retained in retiming mode.

Recommendation: If the port is in 2048 kHz mode, the output must be terminated to meet EMC requirements while power is off.

2.2.7 Groups A and B Output Signals

The unit contains two output cards, each of which provides four identical clock output signals. These cards provide composite clock (CC), 2048 kHz and AMI (DS1, E1) combinations, all fully configurable.

2.2.8 Output Control

For port outputs and AMI output cards, the output can be set to generate AIS (alarm indication signal). When AIS mode is enabled, an output will be set to AIS if either the Frequency Degraded alarm (#8), Sys Clock PLL alarm (#11), Rubidium PLL alarm (#12) or VCXO alarm (#22) is annunciated (active) and if the level for these alarms is minor, major, or critical.

When SQUELCH mode is enabled, the output will be turned off (squelched) if the Frequency Control alarm (#7) is annunciated (active) and its level is minor, major, or critical. SQUELCH has priority over AIS.

2.2.9 Communications Interfaces

The EIA-232 COMMS local and serial 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.

- **COMM A (J15) Interface** –The communications 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 Optional Simplified Network Time Protocol (SNTP) Parameters. To configure SNTP parameters with TL1 commands, see Configuring Optional SNTP Parameters.

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

2.2.10 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 or CDMA radio receiver is tracking the GPS or pilot signal
	Amber	Indicates that the GPS or CDMA has tracking errors
	Off	Indicates that the GPS or CDMA radio receiver is not tracking the GPS or pilot signal

Table 2-1 Display LEDs (Continued)

Indicator	Color/State	Description
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

2.2.11 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.

2.2.12 Rear Panel

The rear panel is used to connect the unit's internal inputs and outputs to site equipment. The modular panel allows future custom interconnect configurations. The rear panel is available with either DE9 or wire wrap connectors.

2.3 Software Operation

The OT-21 system software handles communication to a GPS or CDMA radio receiver and uses the information from the radio receiver to generate a traceable reference using DDS technology. In addition, the software can switch the reference to an external clock signal in the event of a loss of engine output. The unit is able to learn the frequency offset and aging characteristics of the internal Local Oscillator.

2.3.1 Communication Command Protocols

All units allow 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 complete description of the 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 complete description of the TL1 commands, responses, and events, see Appendix D, TL1 Commands.

2.3.2 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 port, output and 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.

2.3.3 SSU Reference Selection

Units with SSU capability select their reference based on one of two user-selected priority schemes: Engine priority (default) or Port priority. Using Engine priority, the OT-21 selects the Engine as the reference if it is usable. If the engine is not usable, it chooses the Port A input, and if neither the Engine nor the Port A input is usable it uses the Port B input. Under Port priority, the OT-21 selects the Port A input as the reference if it is usable. If Port A input is not usable, it chooses the Port B input, and if neither Port A nor Port B input is usable it uses the Engine as the reference.

Reference selection is revertive, that is, if a higher-priority input becomes usable the OT-21 automatically choose it as the reference, selecting the highest priority usable input as its reference. However, it will not switch references more often than once every 30 seconds; if the current input becomes unusable or if a higher priority input becomes usable the system will wait 30 seconds before switching to the new reference.

The engine is usable as a reference as long as it has no Tracking or System alarm (and positioning is completed for a GPS engine) and as long as it does not have a Degraded Stability alarm.

A Port input is usable as a reference if it is enabled, is not in Bypass, has no LOS, AIS, OOF, Degraded PQL, or Degraded Stability alarm and if the PQL is equal to or better than the PQL of the Local Oscillator (5 for Stratum 2 or 8 for Stratum 3E). A port input is not usable if a BPV or CRC alarm is annunciated (active) and its level is Major or Critical. See Table 7-2 for more information on alarms.

2.3.4 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 Section 2.2.10, Display Board and Section 2.2.11, Alarm Closures). 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

2.3.5 Remote Updates

All units allow for remote updating of the embedded firmware. Refer to Section 6.1, Software Maintenance.

2.3.6 Security Features

The ICS command options available to you depend on the security access level assigned to you by the Administrator. Refer to Section 4.4.2, Configuring Users With ICS Commands, or Section 4.5.3, Configuring Users With TL1 Commands, 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.

IN THIS CHAPTER

Chapter 3 Installing the OT-21

This Chapter provides complete installation procedures for all configurations of the OT-21 product family.

3.1 Site Preparation

Before beginning installation, complete the pre-installation check described in Section 3.1.1, Pre-Installation Check, and gather the necessary tools and materials described in Section 3.1.3, Installation Tools and Materials.

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

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

3.1.1 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

3.1.2 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.

3.1.3 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
- For wire wrap connections only: 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)

3.2 Unpacking and Inspecting the Unit

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

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. For units with GPS antenna, 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. If the antenna cable is not the correct length or if the accessories *do not* match the shipping list, contact Symmetricom TSD.

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 sales representative or Symmetricom Global Services (SGS).

CDMA antennas have a 15-foot (4.57 m) standard fixed length cable attached.

For a complete listing of OT-21 item numbers and configuration options, see Appendix B, Table B.1.

3.3 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, Section 3.4.2		
Install Power Connections, Section 3.4.3		
Install Grounding Connections, Section 3.4.4		
Verify Power and Ground Connections, Section 3.4.5		
Install Input and Output Connections, Section 3.4.6		
Install Cable Connections to the Communications Port COMMS local (J1) if required, Section 3.4.7		
Install Cable Connections to Serial Port A (J15), Section 3.4.8		
Install Cable Connections to the Ethernet Port (J16) if required, Section 3.4.10		
Install the Alarm Closure Connections for the DE9 Chassis, Section 3.4.11		
Install the Alarm Closure Connections for the Wire Wrap Chassis, Section 3.4.12		
Install the Cable Support Bars, Section 3.5.1		
Install the Safety Shield, Section 3.5.2		
Install the GPS Antenna, Section 3.6		
Mount the Roof-Mount GPS Antenna, Section 3.6.4		
Mount the Wall-Mount GPS Antenna, Section 3.6.5		
Install the Transient Eliminator, Section 3.6.6		
Install the CDMA Antenna, Section 3.7.2		
Check Installation with Completeness Checklist, Section 3.8		

3.4 Installing the OT-21

This section provides guidelines and procedures for installing the OT-21 unit. See Section 3.1.3, Installation Tools and Materials 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.

3.4.1 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 Section 3.4.2, Mounting the Unit.

Recommendation: Symmetricom recommends allowing a 1U (1.75 inch) space above and below the chassis for optimum temperature control.

3.4.2 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.

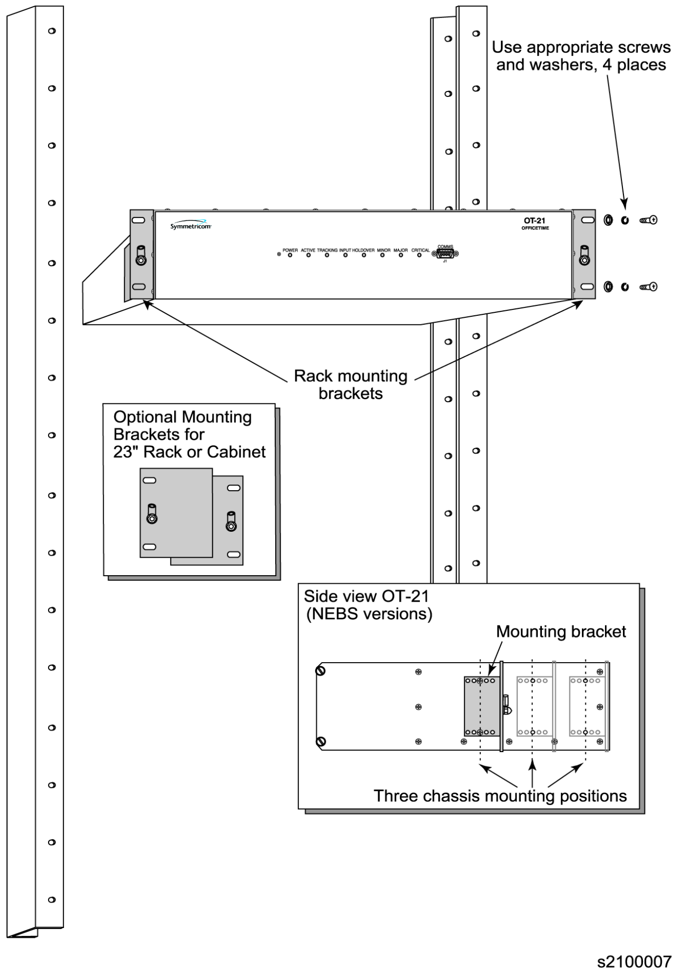


Figure 3-1 Unit Rack Mounting Diagram

3.4.3 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).

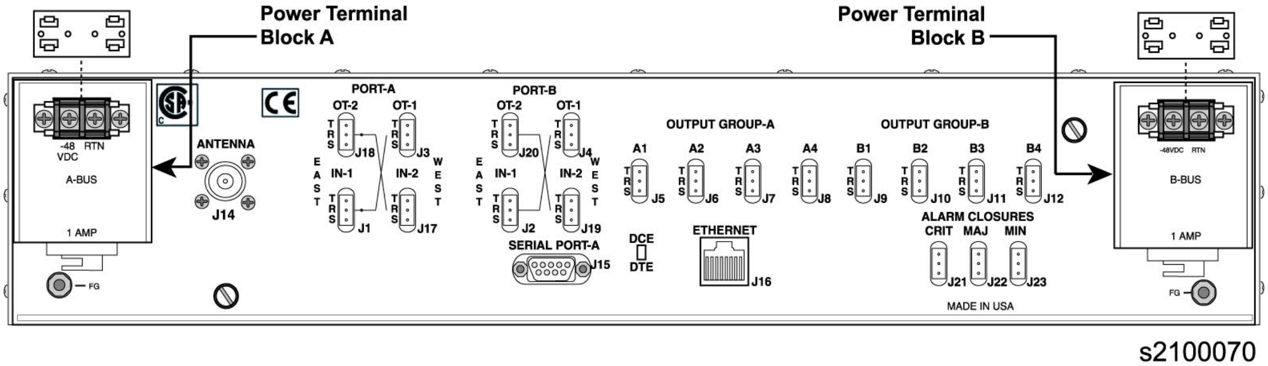


Figure 3-2 A and B Power Terminal Blocks

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

3.4.4 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, Symmetricom recommends running 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.

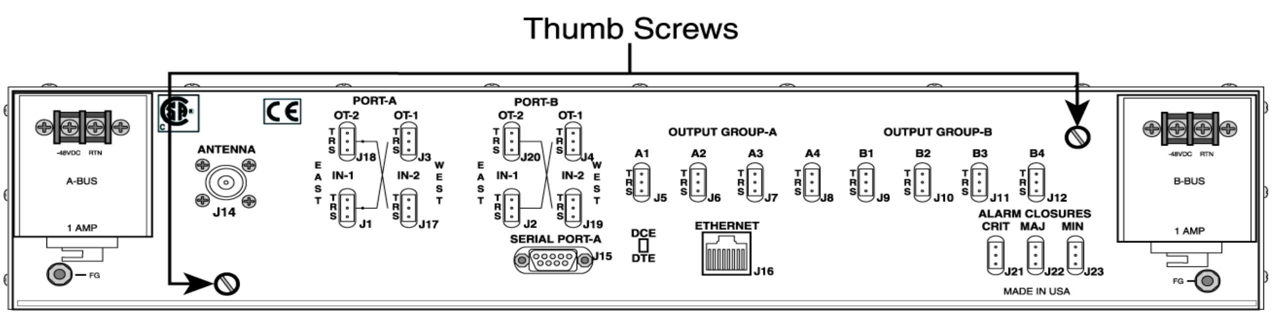


Figure 3-3 OT-21 Rear View (Rear Panel Installed)

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.

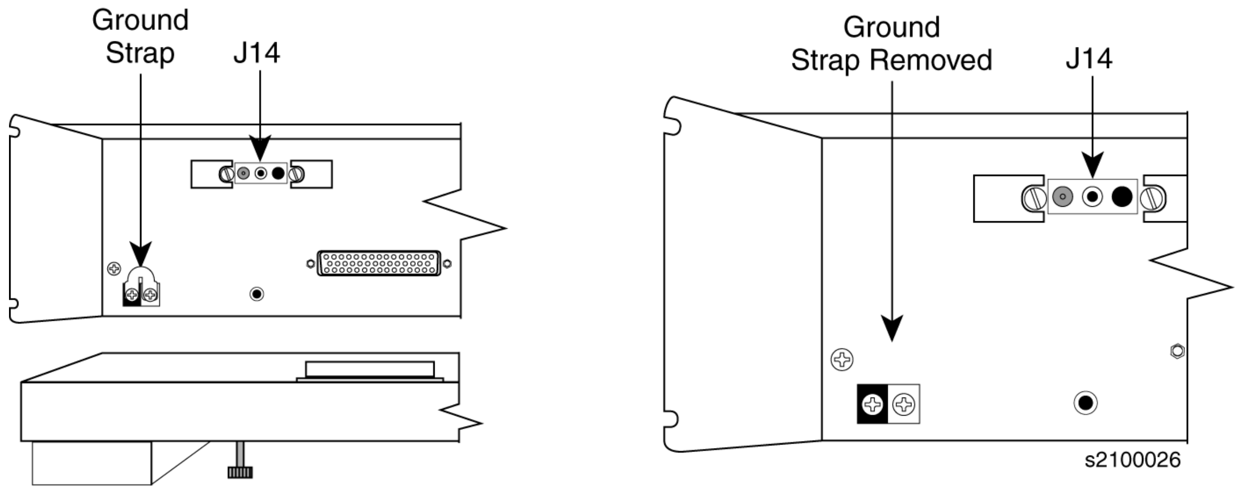


Figure 3-4 OT-21 Rear View (Rear Panel Removed)

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

3.4.5 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.

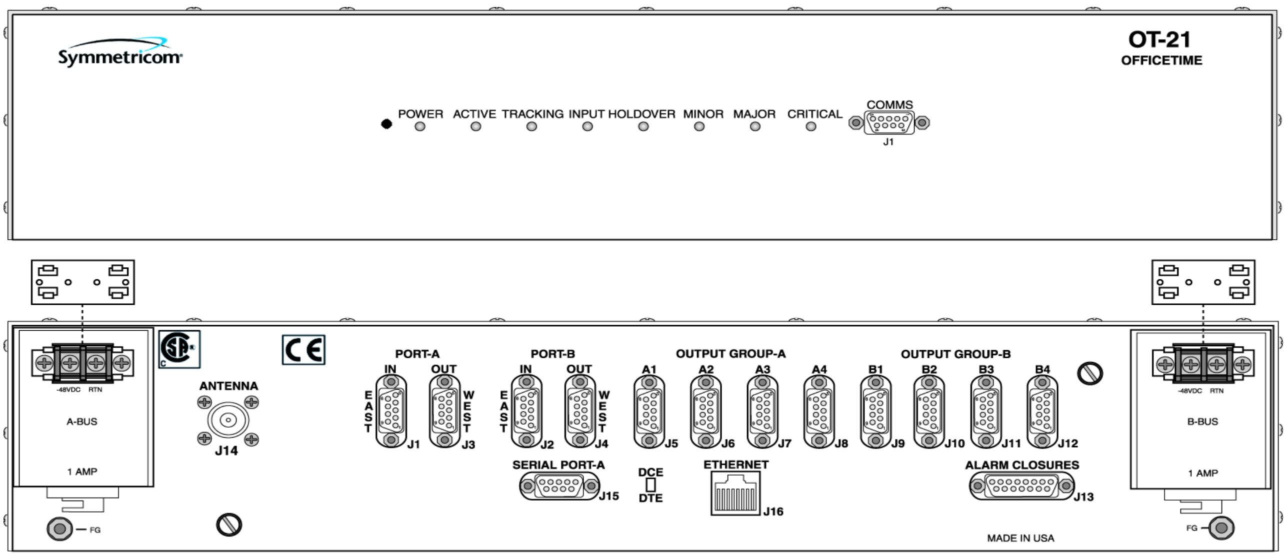
3.4.6 Installing Input and Output Connections

To correctly install the input and output connections to the OT-21, you must first determine the unit configuration. The item number shown on the label affixed to the unit's display panel provides a guide to determining the configuration for each unit. Table B-1 and Table B-2 in Appendix B provide a matrix of OT-21 options and functions listed by item number and categorized by chassis style. Determine the configuration of your unit by comparing the item number on the label to the item number in the table.

DE9 Primary Reference Receiver (PRR) Connections

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

Figure 3-5 shows the DE9 rear panel.



s2100003

Figure 3-5 OT-21 Unit with DE9 Rear Panel

The output-only PRS version of the PRR generates two DS1/E1 clock output signals: one through Port-A J3 and one through Port-B J4. Eight optional distribution output clock signals are routed through OUTPUT GROUP-A (J5 through J8) and OUTPUT GROUP-B (J9 through J12).

To connect the output signals:

1. Identify your signal requirements.

2. Determine the OT-21's configuration. See Section 3.4.6, Installing Input and Output Connections, and Table B-1 in Appendix B, OT-21 Configuration Options.

3. Make the appropriate connections for your signal requirements to J3 through J12.

Refer to Table 3-3 for the Telecommunications Clock output connections for J3 through J12.

Table 3-3 Outputs for Connectors J3 through J12

Signal	Pin
Clock Output Tip	2
Clock Output Ring	6
Clock Output Sleeve	1

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

Note: If installation is an integrated ground environment, shields are grounded 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.

Synchronization Supply Unit (SSU) With DE9 Connections

Use the following information to make East/West Four-Wire Connections to the OT-21.

In East/West signal terminology, East refers to wiring connections made to and from the outside world. West refers to wiring connections made to and from office equipment. The following information describes the signal logic flow of a four-wire connection:

- "In" East → Retimer → "Out" West
- "In" West → Pass Through → "Out" East

Figure 3-6 shows a typical block diagram for a DS1/E1 four-wire system connection.

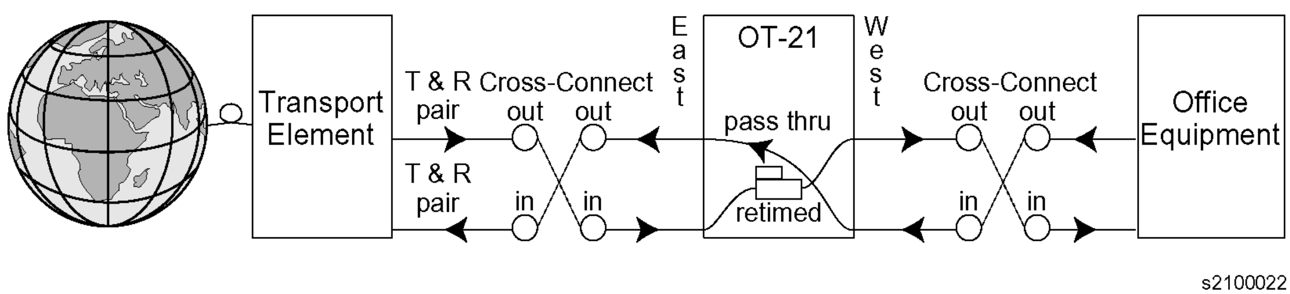


Figure 3-6 Four-Wire Connection Block Diagram

The SSU configurations have two DS1/E1 retiming circuits. In these circuits, both directions of the DS1/E1 signals must be connected through the OT-21 from the cross connect panel. These circuits are internally connected from a pair of East connections (World facing) to the West connector pair (office equipment facing).

The East input signal can be routed through the Primary Port-A J1 to the West output Port-A J3. The East input signal can also be routed through the Secondary Port-B J2 to West output Port-B J4, as shown in Figure 3-7.

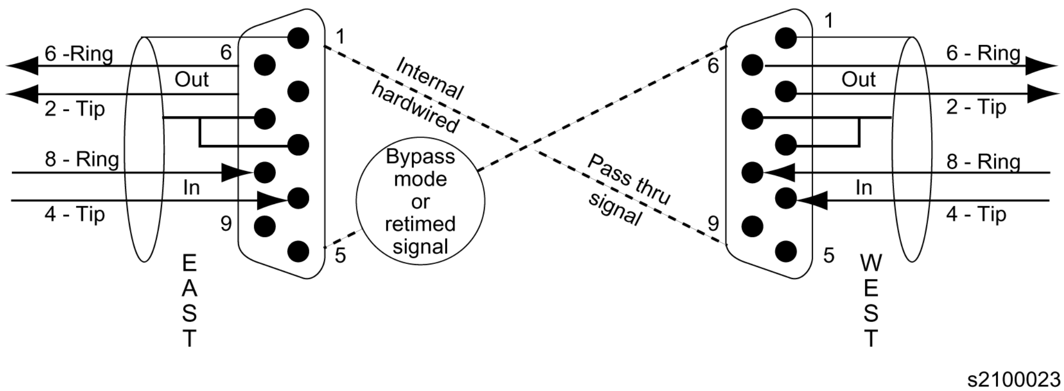


Figure 3-7 Port A and Port B DE9 Connectivity

To connect the input and output signals:

1. Identify your signal requirements.
2. Determine the OT-21's configuration. See Section 3.4.6, Installing Input and Output Connections, and Table B-1 in Appendix B, OT-21 Configuration Options.
3. Make the appropriate connections for your signal requirements to J1 through J12.

Table 3-4 lists the telecommunications clock four-wire pass-through connections for connector J1 to J3 and J2 to J4 for the OT-21 with the DE9 chassis. All other output connections are made from pin 2 (Tip), pin 6 (Ring) and pin 1 (Shield/Sleeve) of connectors J5 through J12, see Table 3-5.

Table 3-4 Four-Wire Pass-Through DE9 Connections

Port	Signal	Pin	Signal	Pin
A	DS1/E1 Tip East Input	J1-4	DS1/E1 Tip West Output	J3-2
A	DS1/E1 Ring East Input	J1-8	DS1/E1 Ring West Output	J3-6
A	DS1/E1 Sleeve East Input	J1-7, 3	DS1/E1 Sleeve West Output	J3-1

Table 3-4 Four-Wire Pass-Through DE9 Connections (Continued)

Port	Signal	Pin	Signal	Pin
A	DS1/E1 Tip East Output	J1-2	DS1/E1 Tip West Input	J3-4
A	DS1/E1 Ring East Output	J1-6	DS1/E1 Ring West Input	J3-8
A	DS1/E1 Sleeve East Output	J1-1	DS1/E1 Sleeve West Input	J3-7, 3
B	DS1/E1 Tip East Input	J2-4	DS1/E1 Tip West Output	J3-2
B	DS1/E1 Ring East Input	J2-8	DS1/E1 Ring West Output	J3-6
B	DS1/E1 Sleeve East Input	J2-7, 3	DS1/E1 Sleeve West Output	J3-1
B	DS1/E1 Tip East Output	J2-2	DS1/E1 Tip West Input	J4-4
B	DS1/E1 Ring East Output	J2-6	DS1/E1 Ring West Input	J4-8
B	DS1/E1 Sleeve East Output	J2-1	DS1/E1 Sleeve West Input	J4-7, 3

Table 3-5 Inputs and Outputs for Connectors J5 through J20

Signal	Pin
Clock Output Tip	2
Clock Output Ring	6
Clock Output Sleeve	1

Note: If installation is an integrated ground environment, shields are grounded 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.

Primary Reference Receiver (PRR) With Wire Wrap Connections

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

Figure 3-8 shows the Wire Wrap rear panel.

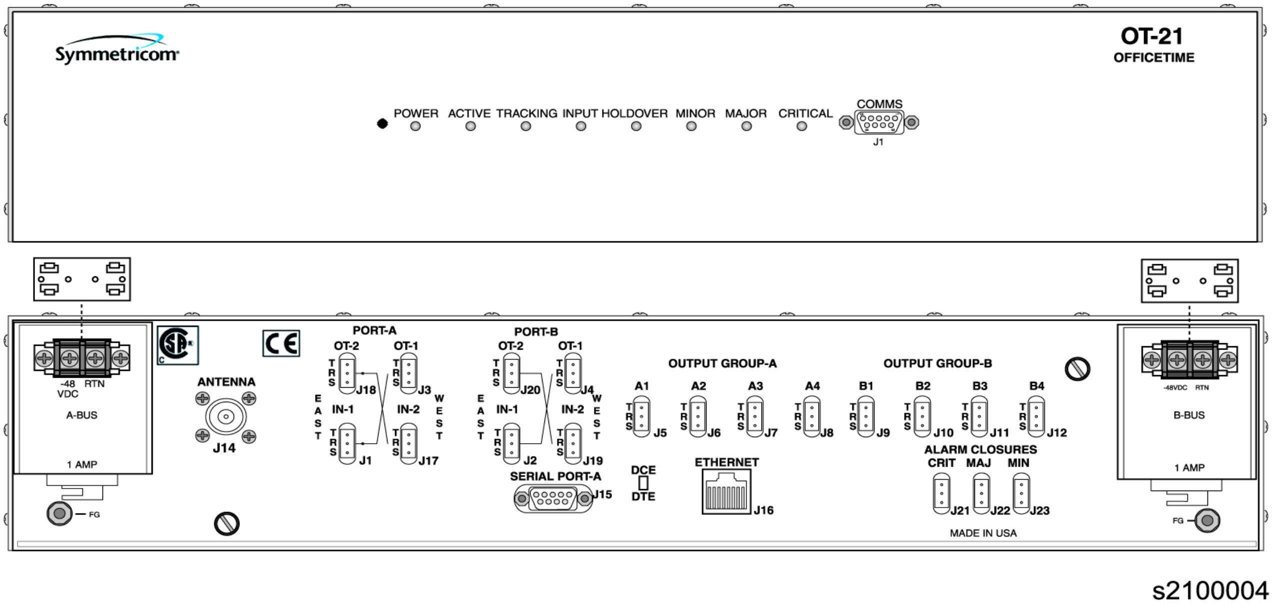


Figure 3-8 OT-21 with Wire Wrap Rear Panel

The output-only PRS version of the PRR generates two DS1/E1 clock output signals: one through Port-A J3 and one through Port-B J4. Eight optional distribution output clock signals are routed through OUTPUT GROUP-A (J5 through J8) and OUTPUT GROUP-B (J9 through J12).

To connect the output signals:

1. Identify your signal requirements.

2. Determine the OT-21's configuration. See Section 3.4.6, Installing Input and Output Connections, and Table B-2 in Appendix B, OT-21 Configuration Options.

3. Make the appropriate connections for your signal requirements to J3 through J12.

Refer to Table 3-6 for the Telecommunications Clock output connections for J3 through J12.

Table 3-6 Outputs for Wire Wrap Chassis

Signal	Pin
Clock Output Tip	T
Clock Output Ring	R
Clock Output Sleeve	S

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.

Synchronization Supply Unit (SSU) with Wire Wrap Connections

Use the following information to make East/West four-wire connections to the OT-21.

In East/West signal terminology, East refers to wiring connections made to and from the outside world. West refers to wiring connections made to and from office equipment. The following information describes the signal logic flow of a four-wire connection:

- “In” East → Retimer → “Out” West.
- “In” West → Pass Through → “Out” East.

Figure 3-6 shows a typical block diagram for a DS1/E1 four-wire system connection.

In the SSU models, the unit is provided with two DS1/E1 retiming circuits. In these circuits both directions of the DS1/E1 signals must be connected through the OT-21 from the cross connect panel. These circuits are internally connected from a pair of East connections (World facing) to the West connector pair (office equipment facing).

The East input signal can be routed through the Primary Wire Wrap header Port-A J1 to the West output Port-A J3. The East input signal can also be routed through the Secondary Wire Wrap header Port-B J2 to West output Port-B J4, see Figure 3-9.

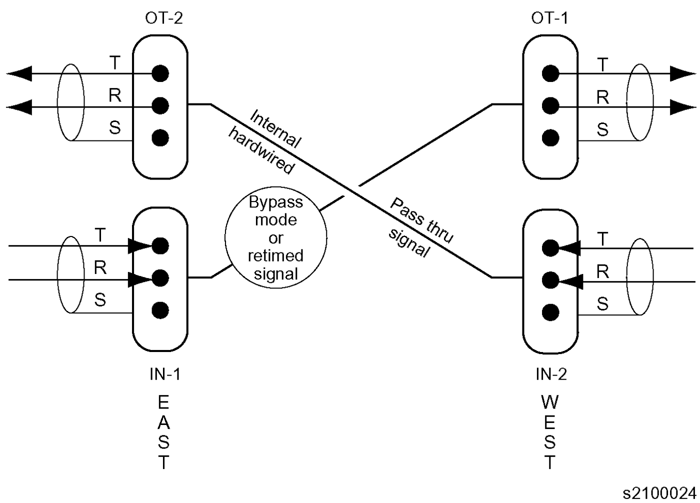


Figure 3-9 Port A and B Wire Wrap Connectivity

For the Wire Wrap rear panel, connections are made using 22 AWG twisted pair shielded cable with single-stranded wire.

To connect the input and output signals:

1. Identify your signal requirements.

2. Determine the OT-21's configuration. See Section 3.4.6, Installing Input and Output Connections, and Table B-2 in Appendix B, OT-21 Configuration Options.

3. Make the appropriate connections for your signal requirements to J1 through J12.

Table 3-7 lists the telecommunications clock four-wire pass-through connections for J1 to J3 and J2 to J4 for the Wire Wrap chassis. All other connections are made from the Tip and Ring of connectors J5 through J12.

Table 3-7 Four-Wire Pass-Through Connections for Wire Wrap Chassis

Port	Signal	Pin	Signal	Pin
A	DS1/E1 Tip East Input	J1-T	DS1/E1 Tip West Output	J3-T
A	DS1/E1 Ring East Input	J1-R	DS1/E1 Ring West Output	J3-R
A	DS1/E1 Sleeve East Input	J1-S	DS1/E1 Sleeve West Output	J3-S
A	DS1/E1 Tip East Output	J18-T	DS1/E1 Tip West Input	J17-T
A	DS1/E1 Ring East Output	J18-R	DS1/E1 Ring West Input	J17-R
A	DS1/E1 Sleeve East Output	J18-S	DS1/E1 Sleeve West Input	J17-S

Table 3-7 Four-Wire Pass-Through Connections for Wire Wrap Chassis (Continued)

Port	Signal	Pin	Signal	Pin
B	DS1/E1 Tip East Input	J2-T	DS1/E1 Tip West Output	J4-T
B	DS1/E1 Ring East Input	J2-R	DS1/E1 Ring West Output	J4-R
B	DS1/E1 Sleeve East Input	J2-S	DS1/E1 Sleeve West Output	J4-S
B	DS1/E1 Tip East Output	J20-R	DS1/E1 Tip West Input	J19-T
B	DS1/E1 Ring East Output	J20-R	DS1/E1 Ring West Input	J19-R
B	DS1/E1 Sleeve East Output	J20-S	DS1/E1 Sleeve West Input	J19-S

Note: If installation is in 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.

Note: Input signals must be terminated. Termination may be internal or external to the unit. Use the ICS PORT command (see Appendix C, ICS Commands) or the TL1 SET-PRMTR:[tid]:[aid]:[ctag]::PORT command (see Appendix D, TL1 Commands) to configure internal or external terminations.

For internal termination, a 100 ohm resistor is selected for DS1 and a 120 ohm resistor is selected for E1.

3.4.7 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 3-10) 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 3-8 lists the signal interface for the Communications Port COMMS local (J1).

Table 3-8 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

3.4.8 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 3-10) 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.

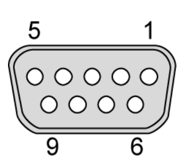


Figure 3-10 DE9S Connector

2. Verify that the slide switch (Figure 3-11) 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.

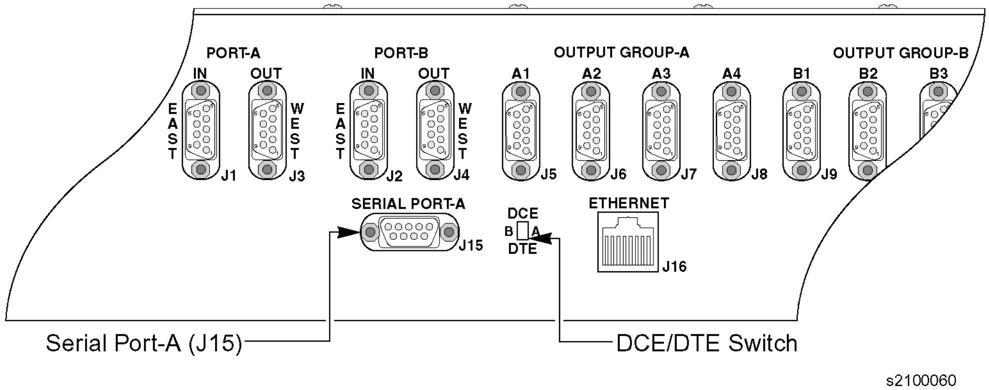


Figure 3-11 Location of Equipment Type Selection Switch and J15

Table 3-9 lists the signal interface for the serial communications Serial Port A (J15).

Table 3-9 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

3.4.9 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 Section 4.1, Connecting the Communications Equipment.

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.

3.4.10 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 3-10 lists the Ethernet communications port signal connections.

Table 3-10 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

3.4.11 Installing DE9 Chassis Alarm Closure Connections

To install the unit alarm connections for the DE9 chassis:

1. Locate the ALARM CLOSURES connector (J13) on the rear panel.

2. Connect the 15-pin D-type connector to the remote alarm indicator and alarm terminator.

Table 3-11 provides the alarm closure connections for the DE9 chassis.

Table 3-11 Alarm Contact Pin Assignments (J13)

Signal	Pin
MINOR – Normally Open Contact	7
MINOR – Wiper Contact (Common)	15
MINOR – Normally Closed Contact	8
MAJOR – Normally Open Contact	4
MAJOR – Wiper Contact (Common)	12
MAJOR – Normally Closed Contact	5
CRITICAL – Normally Open Contact	1
CRITICAL – Wiper Contact (Common)	9
CRITICAL – Normally Closed Contact	2
Frame Ground	10
Frame Ground	11
Frame Ground	13
Not Used	3
Not Used	6

3.4.12 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 3-12 provides the alarm closure connections for the wire wrap chassis.

Table 3-12 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

Table 3-12 Alarm Contact Wire Wrap Pin Assignments (J13) (Continued)

Signal	Pin
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

3.5 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 section Section 3.5.1, Installing the Cable Support Bars and Section 3.5.2, Installing the Safety Shield.

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.

3.5.1 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 3-12, 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.

3.5.2 Installing the Safety Shield

To install the safety shield (item number 01213142-000-1) shipped with the unit to the rear panel, see Figure 3-12, 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.

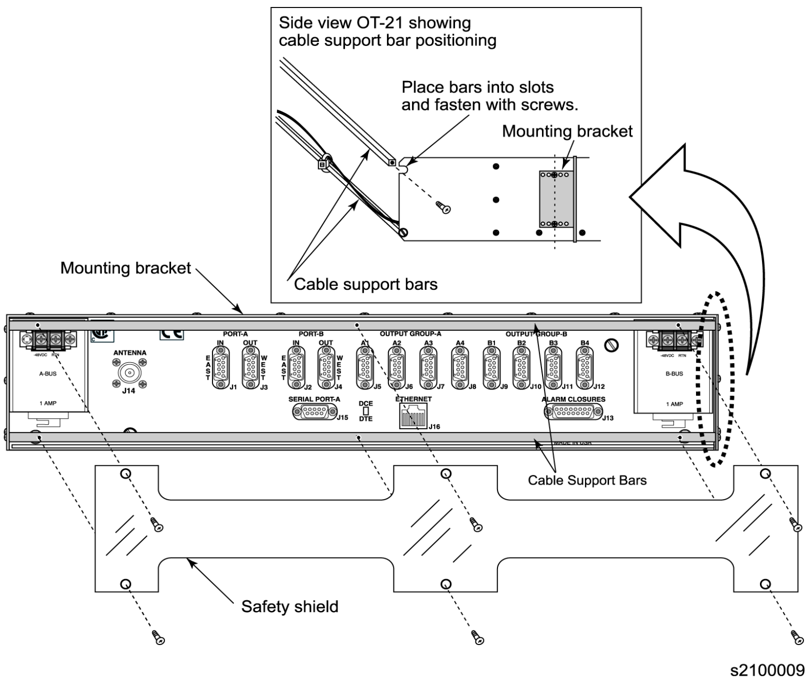


Figure 3-12 Cable Support Bars and Safety Shield Installation Diagram

3.6 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 sales representative or Symmetricom Global Services (SGS) at 888-367-7966 (toll-free in USA only), 1-405-428-7907, or +44 (0) 1189 699 799 in Europe, Middle East, or Africa.

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

3.6.1 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 (roof-mount antenna)
- 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, roof or wall 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.

3.6.2 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.

Symmetricom does not recommend cutting the antenna cables provided in the GPS Antenna Kit. If you must cut the cables, please ensure that the cabling and connectivity meet the requirements in Section 3.6.3, Establishing an Antenna Grounding Scheme.

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.

3.6.3 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.

Symmetricom makes no recommendation as whether or not to install transient eliminators. Symmetricom can provide suitable transient eliminators as an option.

For a detailed illustration of how you might install transient eliminators if local practice requires their use, see Figure 3-13. 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.

3.6.4 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 3-13, GPS Roof-Mount Antenna). 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 3-16, and perform the following steps:

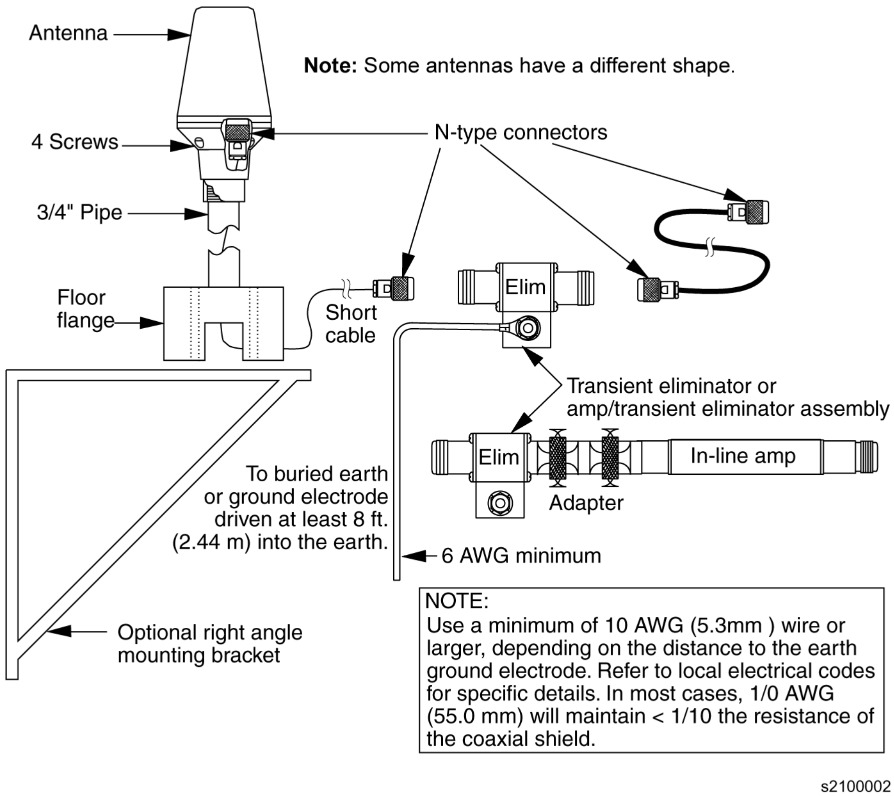


Figure 3-13 GPS Roof-Mount Antenna

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 sales representative or Symmetricom Global Services (SGS).

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.

3.6.5 Mounting the GPS Wall-Mount Antenna

Before you begin the installation, determine the best antenna location and cable route. Avoid mounting the antenna where it is obscured by buildings, trees, or other obstacles. Mount the antenna where it has the best view of the GPS constellation.

Note: These instructions require you to drill through your building's wall for access to the outside surface. Follow your company procedures and installation specifications to avoid damage to electrical wires, telephone wires and water pipes.

Figure 3-14 shows how a GPS antenna and wall-mount bracket are attached to a wall. Figure 3-15 provides the dimensions for hole size and location for the wall-mount bracket.

To install the wall-mount antenna:

1. Use Figure 3-15 to determine the spacing of the three bracket mounting holes and the cable access hole.

2. Drill a hole in the wall for the customer-supplied antenna cable conduit. The antenna cable conduit is optional if not required by your building code standards.

Note: Ensure the conduit outside diameter is one inch maximum and the inside diameter is large enough for the cable connector to pass through.

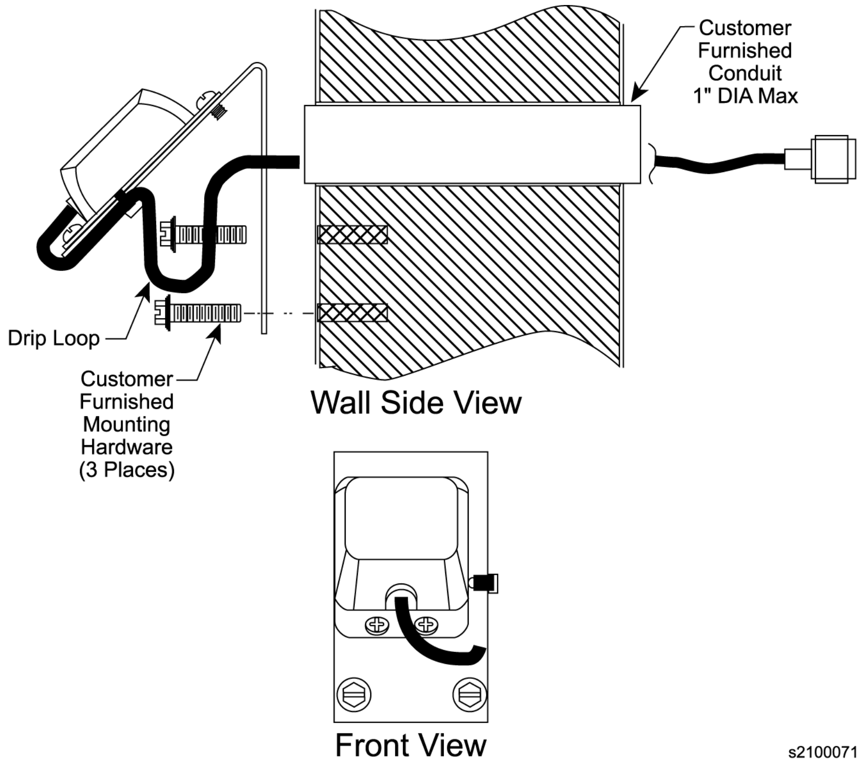


Figure 3-14 GPS Wall-Mount Bracket Assembly

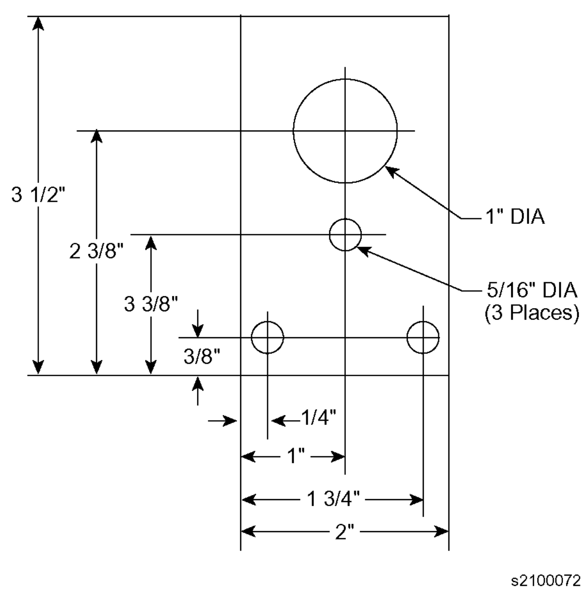


Figure 3-15 Mounting Dimensions

3. Drill three holes for the customer supplied screws used to attach the mounting bracket to the outside wall.

Note: Ensure the screws are the appropriate size for the mounting bracket holes. Also ensure the holes are the appropriate size for the screws to securely hold the bracket to the wall.

4. If a conduit is used, insert it into the cable access hole and seal it according to your company standards.

5. Insert the antenna cable through the conduit and mount the antenna bracket to the outside wall using the customer supplied screws.

Cabling the GPS Wall-Mount Antenna

To connect the GPS antenna cable to the OT-21, use the following procedure:

1. Before connecting the antenna coaxial cable to the OT-21, test the DC resistance between the center conductor and the shield using an ohmmeter. The reading should be greater than 1000 ohms but less than 40 Megaohms for an active GPS antenna. If there is an in-line amplifier installed, the reading may be as low as 140 ohms.

   If the actual reading is incorrect, you may have a shorted or open cable or transient eliminator (if installed). Therefore, apply the same measurements directly to the GPS antenna. This requires disconnecting the antenna cable at the antenna.

Note: The open-circuit range of ohmmeters can cause readings to vary from one meter to the next. It may be necessary to verify a reading using a second ohmmeter if the first reading is out of range.

2. Secure the free end of the antenna cable to the OT-21 antenna connector (J14) using the right angle adapter provided with the antenna cable.

Recommendation: Symmetricom recommends coiling excess cable to avoid gain mismatch between the GPS antenna and the radio receiver. Coiling the excess cable also allows you to use the factory-installed crimped connector. For more information about using the crimped connector, see Section 3.6.3, Establishing an Antenna Grounding Scheme.

Table 3-13 lists the antenna connections.

Table 3-13 Antenna Connections (J14)

Type	Name	Connector	Pin
RF	ANT-CTR	J14	A
RF Return	ANT-RTN	J14	B

3.6.6 Installing the Transient Eliminator

If you are installing a transient eliminator, as shown in Figure 3-13, 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: Symmetricom does not recommend cutting the antenna cables provided in the GPS Antenna Kits. 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-1.

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. Symmetricom recommends that you use only crimp-style N-type connectors supplied in the Symmetricom Crimper Kit for this application (see Table F-3, Table F-4, and Table F-5).

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: Symmetricom does not recommend soldered connections for grounding purposes. All grounding connections should be secured with mechanical clamp connectors.

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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.

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

3.7 Installing a CDMA Antenna

This section provides guidelines and procedures for installing the CDMA antenna.

Note: The maximum length for CDMA antenna cable is 200 feet (~61 m). Symmetricom recommends using only LMR 400 or equivalent cable.

3.7.1 Assembling the CDMA Antenna

The CDMA antenna parts are described in Figure 3-16.

Caution: To avoid damaging the magnet base, do not over-tighten the molded whip.

To assemble the CDMA antenna, assemble the molded whip (KRDM1994Z) onto the magnet base as shown in Figure 3-16, and tighten securely by hand.

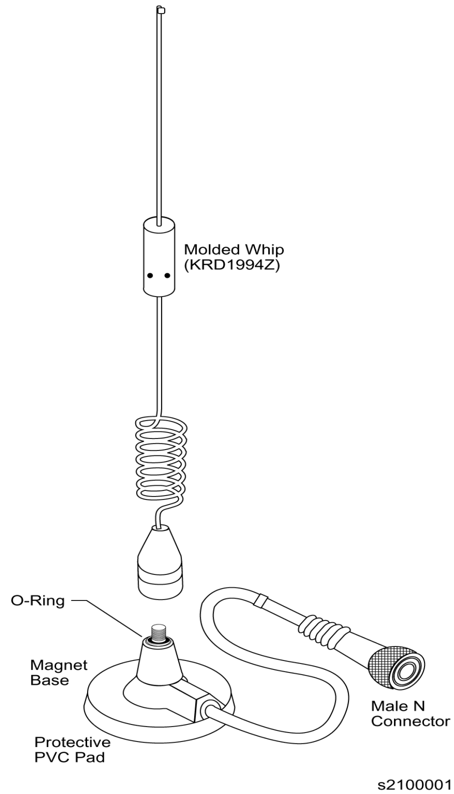

Figure 3-16   CDMA Antenna Parts for Assembly

3.7.2 Mounting the CDMA Antenna

The assembled CDMA antenna's magnetic base allows you to attach the antenna to any metal surface attracted to a magnetic force. CDMA antennas can be mounted either inside or outside buildings. Use the following guidelines to mount the CDMA antenna for best reception in your facility.

- Position the antenna as close to the outside of the building as possible. Signals become weaker the farther inside a building they travel.
- Position the antenna as high as possible. The lower the antenna, the more susceptible it is to interference and echoes from furnishings and movement.
- If you have multiple OT-21s in the same room, try to position the antennas at least three feet apart.

Note: The CDMA antenna does not require tuning or adjusting.

Note: Do not remove the plastic from the bottom of the magnetic base. If necessary, clean the bottom of the antenna mount and the mounting location with mild soapy water and let dry completely before mounting.

1. Mount the CDMA antenna by holding the antenna directly above the mounting location and carefully lowering it into place.

2. Attach the antenna connector to the antenna input connector (J14) on the OT-21.

3.8 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 3-14.

Table 3-14 Installation Completeness Checklist

Operation/Indication	Complete
Verify that all power and ground wires are installed correctly and securely.	
Verify that all input and output cables are properly installed.	
Check that all antenna connectors are secure, tight, and weatherproofed.	
See the procedure in Section 5.6.3 to verify the proper performance of the antenna and cables after installation.	

IN THIS CHAPTER

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, that all ground wires, input and output cables are installed, and that all antenna connectors are secure as described in the Installation procedures in Chapter 3, Installing the OT-21.

4.1 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 Chapter 3, Installing the OT-21, for details on cable connections and setting the DCE/DTE switch.

4.1.1 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 local (J1) or COMM A (J15).

2. Securely connect the other end of the serial cable to the serial port on the PC, laptop or ASCII terminal.

4.1.2 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 Section 4.4.3, Configuring Ethernet Settings With ICS Commands.

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1. To connect the OT-21 to the LAN, connect one end of the RJ45 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.

4.2 Powering Up the OT-21

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

4.2.1 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 Section 4.4, Configuring With ICS Commands. For TL1 configuration information, see Section 4.5, Configuring With TL1 Commands.

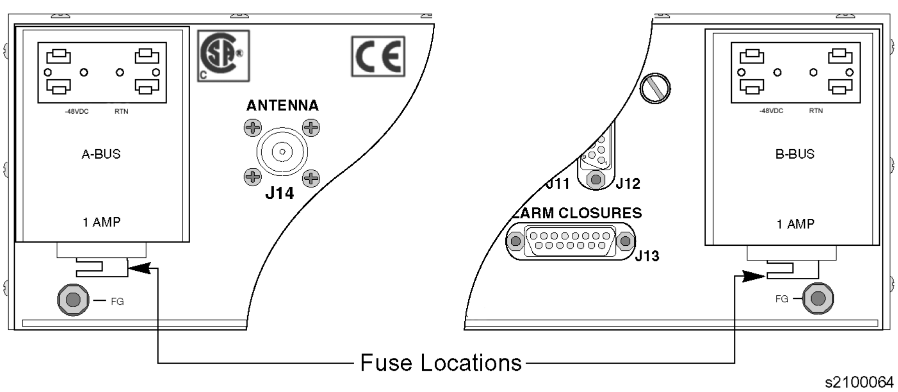

Figure 4-1 OT-21 Fuses

4.2.2 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 or CDMA AMBER = GPS or CDMA tracking errors OFF = Unit is not tracking GPS or CDMA

Table 4-1 LED Indicators and Functions (Continued)

Indicator	Color	Function
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

4.3 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 Section 4.1, Connecting the Communications Equipment.

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. See Appendix C.1.1 and Appendix D.2.4 for more information on user levels.

To continue configuring the OT-21 using ICS commands, go to Section 4.4, Configuring With ICS Commands. To continue configuring using TL1 commands, go to Section 4.5, Configuring With TL1 Commands.

4.4 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 Section 4.5, Configuring With TL1 Commands.

4.4.1 Configuring COMMS local and COMM 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 COMM 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.

4.4.2 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 Appendix C.3, ICS Command Descriptions and Access Levels.

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**.

4.4.3 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 (Section 4.3, Logging In to the Communications Interface).
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 Optional Simplified Network Time Protocol (SNTP) Parameters

To configure the OT-21 as a 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**

Refer to the following table to see how each Byte is converted from the Subnet Mask address to make up the Broadcast Mask address.

											Network																Mask						
Subnet Mask	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	255.255.236.0
IP Address	1	1	0	0	0	0	0	0	1	0	1	0	1	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1	1	192.168.12.3
Broadcast Mask	1	1	0	0	0	0	0	0	1	0	1	0	1	0	0	0	1	1	0	1	1	0	0	0	1	1	1	1	1	1	1	1	192.168.216.255
			Byte 1								Byte 2									Byte 3							Byte 4						

2. Type `IP INT` and enter the desired interval that the OT-21 will broadcast at (15 to 3600 sec.). For example, type `IP INT 255` and press **Enter.**

4.4.4 Configuring Alarms With ICS Commands

The Alarm command allows you to read and set options of the current status of alarm indications on the unit. To change the alarm setting for an operation or to set up an operation for an alarm number, you must have Supervisor or Administrator level security access. Refer to Appendix C, ICS Commands, for information on the ALARM command. When you enter the alarm command, only active alarm indications are displayed unless an option is specified. To display all alarms that apply to your unit, type `ALARM ALL` and press **Enter**.

Note: Certain alarms do not apply to various OT-21 configurations. The `ALARM ALL` command returns only alarms that apply to the unit being accessed.

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
(21-2) Out-B:Line 2   OK             Minor          Immed  Immed      0  86400
(21-3) Out-B:Line 3   OK             Minor          Immed  Immed      0  86400
(21-4) Out-B:Line 4   OK             Minor          Immed  Immed      0  86400
(21-5) Out-B:Lock 4   OK             Minor          Immed  Immed      0  86400
 (22)  VCXO           OK             Ignore         Immed  Immed      0  86400
OT-21>
```

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**.

4.4.5 Configuring the Radio Receiver With ICS Commands

This section provides information on setting up an OT-21 with a GPS engine, a CDMA engine, or a unit with no engine.

Configuring a GPS Engine

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

Configuring a CDMA Engine

Table 4-3 lists the 32 factory default CDMA engine frequencies. You can replace any one or all 32 factory default frequencies with user selected frequencies, see Appendix C.3.9. When a new OT-21 is first powered up, it examines these frequencies to find a station from which it can extract time of day.

Note: When the OT-21 selects a CDMA signal, the unit stops scanning for that specific frequency when the engine can extract the time of day from that signal.

With 32 frequencies in the default table, it can take over two hours to scan and it is possible that none of these frequencies will be detected. An alternative is to determine which frequencies you need to use and scan only those frequencies. Use one of the following methods to determine which frequencies you can use.

- If you have your own network of towers, you'll most likely want to use the frequencies of those towers to extract time of day and 1pps information. Delete the frequency list with ENGINE FREQ DEL ALL. Manually add the appropriate frequencies using the command ENGINE FREQ ADD freq [#nn], where freq is the frequency (in format xxx.xxx or xxxx.xxx in MHz) and #nn is the slot number.
- From a site survey using a CDMA scanning device such as a Hummingbird, you may already know which frequencies you can receive. Delete the frequency list using the command ENGINE FREQ DEL ALL. Manually add the appropriate frequencies using the command ENGINE FREQ ADD freq [#nn], where freq is the frequency (in format xxx.xxx or xxxx.xxx in MHz) and #nn is the slot number.
- You may have the OT-21 scan all possible base station frequencies and select the ones strong enough to provide time of day information. Use the ENGINE FREQ SCAN command, described in Examples 2, 3 and 4 to scan for these frequencies.

Note: Symmetricom recommends that you scan for only two or three frequencies to save time during installation and during operation if the "main" signal is lost. For detailed information on how to use the CDMA engine commands, refer to Appendix C, ICS Commands.

Table 4-3 CDMA Default Frequencies

Slot	Frequency	Slot	Frequency	Slot	Frequency	Slot	Frequency
1	1931.250	9	1948.750	17	1966.250	25	1978.750
2	1932.500	10	1951.250	18	1967.500	26	878.490
3	1933.750	11	1952.500	19	1968.750	27	881.520
4	1935.000	12	1953.750	20	1971.250	28	882.360
5	1937.500	13	1955.000	21	1972.500	29	882.420
6	1940.000	14	1960.000	22	1973.750	30	882.750
7	1946.250	15	1961.250	23	1976.250	31	890.730
8	1947.500	16	1962.500	24	1977.500	32	893.310

Refer to the following examples for details on how to add, delete, and scan for frequencies.

Example 1:

Type `ENGINE FREQ DEL ALL` and press **Enter** to delete all frequencies in the ENGINE FREQ list.

Example 2:

Type `ENGINE FREQ SCAN CELL 2` and press **Enter** to scan for the first two CELL frequencies strong enough to provide a time of day signal.

Example 3:

Type `ENGINE FREQ SCAN PCS 2` and press **Enter** to scan for the first two PCS frequencies. The frequencies are placed in the list based on the highest ranked estimated signal value.

Example 4:

Type `ENGINE FREQ SCAN START` and press **Enter** to scan for all CELL and PCS frequencies strong enough to provide a time of day signal.

Example 5:

To add the frequency 1955.000 to slot 1, type `ENGINE FREQ ADD 1955.000 #1` and press **Enter**.

Configuring a Unit with No Engine

Ensure the appropriate clock connections are made to INP-A and INP-B and configure the framed clock options using the PORT command (see Appendix C, ICS Commands). Refer to the following example for a description of how to set the framed clock option.

Example:

Type `PORT` and press **Enter**. The unit responds with:

```
-----Output Settings------ ----Input Settings----
Port Frame ZS  CRC Line-Comp  SSM Bit AIS Squ SSM Bit PRV TIM Term
---- ----- --- --- ---------- --- --- --- --- --- --- --- --- ------
  A   ESF  On  n/a 0-133 Ft   On  n/a Off Off On  n/a 10  Off EXT
  B   ESF  On  n/a 0-133 Ft   On  n/a Off Off On  n/a 10  Off EXT

     -Output-   --------------- Input Status -------------
Port Stat PQL   Sta PQL LOS  AIS  OOF  BPV  CRC  PQL  Stb
---- ---- ---   --- --- ---  ---  ---  ---  ---  ---  ---
  A  Ok   2     Alm 4   Ok   Ok   Alm  Ok   Ok   Ok   Ok
  B  Ok   2     Alm 10  Alm  Ok   Ok   Ok   Ok   Ok   Ok
OT-21>
```

To change the framed clock option on PORT A from ESF to D4, type `PORT A FRAME D4` and press **Enter**. The unit responds with:

```
Report: 2001-10-17T15:14:30Z 123 Framing Type Set,COMM L,Port A,D4
```

Type `PORT` and press **Enter**. The unit responds with:

```
-----Output Settings------ ----Input Settings----
Port Frame ZS  CRC Line-Comp  SSM Bit AIS Squ SSM Bit PRV TIM Term
---- ----- --- --- ---------- --- --- --- --- --- --- --- --- ------
  A   D4   On  n/a 0-133 Ft   On  n/a Off Off On  n/a 10  Off EXT
  B   ESF  On  n/a 0-133 Ft   On  n/a Off Off On  n/a 10  Off EXT

     -Output-   --------------- Input Status -------------
Port Stat PQL   Sta PQL LOS  AIS  OOF  BPV  CRC  PQL  Stb
---- ---- ---   --- --- ---  ---  ---  ---  ---  ---  ---
  A  Ok   2     Alm 4   Ok   Ok   Alm  Ok   Ok   Ok   Ok
  B  Ok   2     Alm 10  Alm  Ok   Ok   Ok   Ok   Ok   Ok
OT-21>
```

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
```

A typical CDMA engine report is:

```
1937.500 850 OK T08:00:00Z
```

or:

```
1948.750 794 Search
```

“`OK`” indicates the radio receiver has acquired a proper signal and “`Search` “indicates the radio receiver has not acquired a proper signal.

4.4.6 Configuring Clock Inputs and Outputs With ICS Commands

Configuring PQLTABLE

The Priority Quality Level (PQL) table provides the translation from the internal PQL to the Sync Status Message (SSM) for the various framing types. The PQLTABLE command allows you to configure the PQLTABLE to accommodate non-standard systems. For details, see Appendix C, ICS Commands.

Note: Normally, editing the PQL table is not necessary. Edits may be required, however, if ANSI or ITU-T SSM standards are changed.

To set the PQL table to the factory default settings, type `PQL FACTORY` and press **Enter**.

The following example shows the factory default PQL table configuration.

```
DS1                       E1
PQL  SSM S    DS1 Desc     SSM S    E1 Desc
--- ---- - -------------- ---- - --------------
  1 0xFF                  0xFF
  2 0x04 S PRS            0x02
  3 0x04                  0x02 S PRC/G.811
  4 0x08 S STU            0x00 S STU
  5 0x0C S ST2            0x04   Type II
  6 0x78 S Type V         0x04 S Type V
  7 0xFF   Type I         0xFF   Type I
  8 0x7C S ST3E           0x08   Type III
  9 0x10   Type VI        0x08 S Type VI
 10 0x10 S ST3            0x0B   Type IV
 11 0x22                  0x0B S G.813 Opt 1
 12 0x22 S SMC            0x0F   G.813 Opt 2
 13 0x28 S ST4            0x0F
 14 0x40 S Reserved       0x0F
 15 0x30 S DUS            0x0F S DUS
 16 0x7E S ?              0x0F   ?
```

To change the PQL table settings, use the PQL command (refer to the following syntax and explanation of the command).

PQL pql# [DS1 | E1] [SSM n] [DESC str] [STD {ON | OFF}]

where:

PQL is the command you enter at the system prompt.

pql# refers to one of the pql “slots” numbered 1 through 16. You must specify a slot number in your command.

[DS1 | E1] is optional. If you do not specify it, your command applies to both the DS1 and E1 “sides” of the PQL table. If you do specify DS1 or E1, your command only affects that side.

Once you have specified which part of the table to change, there are three items that can be changed, all of which are optional. If you don't specify anything, you'll get the message "`No options specified to modify the table`."

[SSM nn] changes the SSM value to 0xnn, a hexadecimal number in the range 0x00 to 0xFF.

[DESC str] changes the description text to str. The str can be up to 14 characters in length. By default, all characters are converted to uppercase. If you would like to have lowercase letters in your description, enclose the str in double-quote marks (“str”).

[STD {ON | OFF}] sets the standard setting ON or OFF. Only “standard” entries are matched for input.

Use the following examples as a guide on how to enter PQL commands.

Example: to change the SSM value for DS1 slot 1 to hexadecimal 0xEE type `PQL 1 DS1 SSM 0xEE` and press **Enter**.

Example: to change the standard flag for both DS1 and E1 slot 4 to OFF type `PQL 4 STD OFF` and press **Enter**.

Example: to change the description for E1 slot 14 to match the DS1 value type `PQL 14 E1 DESC “Reserved”` and press **Enter**.

After entering these commands, the PQL table would appear as follows.

```
DS1                   E1
PQL  SSM S    DS1 Desc     SSM S    E1 Desc
--- ---- - ------------- ---- - --------------
  1 0xEE                 0xFF
  2 0x04 S PRS           0x02
  3 0x04                 0x02 S PRC/G.811
  4 0x08   STU           0x00   STU
  5 0x0C S ST2           0x04   Type II
  6 0x78 S Type V        0x04 S Type V
  7 0xFF   Type I        0xFF   Type I
  8 0x7C S ST3E          0x08   Type III
  9 0x10   Type VI       0x08 S Type VI
 10 0x10 S ST3           0x0B   Type IV
 11 0x22                 0x0B S G.813 Opt 1
 12 0x22 S SMC           0x0F   G.813 Opt 2
 13 0x28 S ST4           0x0F
 14 0x40 S Reserved      0x0F   Reserved
 15 0x30 S DUS           0x0F S DUS
 16 0x7E S ?             0x0F   ?
```

Configuring Port Outputs

This section describes how to use the PORT command to read and set the framed clock output options for the OT-21 (see the following example). For details on the PORT command, see Appendix C, ICS Commands.

Example

```
OT-21>port
-----Output Settings------ ----Input Settings----
Port Frame ZS  CRC Line-Comp  SSM Bit AIS Squ SSM Bit PRV TIM Term
---- ----- --- --- ---------- --- --- --- --- --- --- --- --- ------
  A   D4   On  On 0-133 Ft    On  n/a Off Off On  n/a 10  Off EXT
  B   ESF  On  On 0-133 Ft    On  n/a Off Off On  n/a 10  Off EXT

     -Output-   --------------- Input Status -------------
Port Stat PQL   Sta PQL LOS  AIS  OOF  BPV  CRC  PQL  Stb
---- ---- ---   --- --- ---  ---  ---  ---  ---  ---  ---
  A  Ok   2     Alm 4   Ok   Ok   Alm  Ok   Ok   Ok   Ok
  B  Ok   2     Alm 10  Alm  Ok   Ok   Ok   Ok   Ok   Ok
OT-21>
```

Refer to the following command syntax, explanations, and examples for information on the port command.

PORT [A | B][port options]

where:

[A | B] is optional. If you do not specify it, the command applies to both the A and B ports. If you specify A or B, the command only affects the specified port.

After specifying the port or ports, there are several “port options” that can be set, all of which are optional.

AIS {ON | OFF} turns on or off the Alarm Indication Signal for degraded frequency output.

COMP {133FT | 266FT | 399FT | 533FT | 655FT | 75OHM | 120OHM} sets the compensation for the cable used to connect the OT-21 to the Network Element being synchronized. The “FT” setting is for DS1 outputs and “OHM” setting is for E1 outputs.

CRC {ON | OFF} turns CRC generation on or off.

FRAME {D4 | ESF | CAS | CCS | 2048K} selects the framing type for the port. D4 and ESF set DS1 framing. CAS and CCS set E1 framing. 2048K selects 2048 kHz clock input with no framing and output is turned off. The 2048K option is only available on Ports A and B of SSU versions. Inputs are not available in the PRS version. Default is ESF.

ISOLATE {ON | OFF} turns on or off isolated-ones test pattern output.

SSM [OUT] {ON | OFF | BIT {ALL | n}} turns on or off the insertion of the SSM information on the output. For E1 mode, the bit position of the output may also be set. The SSM reflects the current Stratum Level of the clock at all times.

SQUELCH {ON | OFF} - Enable (On) or disable (Off) squelching of the output from the port. This turns off the output signal whenever the holdover alarm is active. Otherwise, the output is unchanged when in holdover except for the SSM. Default is squelching off (output always on).

TERM {EXT | INT | 75 | 100 | 120} sets input termination as external or internal choice in Ohms. Default is internal, 100 Ohms for DS1, 120 Ohms for E1.

ZS {ON | OFF} turns on or off zero suppression.

Use the following examples as a guide on how to enter PORT commands.

Example: to change the AIS for both ports, type `PORT AIS ON` and press **Enter**.

Example: to change the LINE-COMP for PORT A, type `PORT A COMP 266FT` and press **Enter**.

Example: to change the CRC for both ports, type `PORT CRC OFF` and press **Enter**.

Example: to change the FRAME type for PORT B, type `PORT B FRAME D4` and press **Enter**.

Example: to change the SSM value for PORT B, type `PORT B SSM OFF` and press **Enter**.

Example: to turn off zero suppression for PORT A, type `PORT A ZS OFF` and press **Enter**.

After entering these commands, PORT A and PORT B appears as follows:

```
OT-21>port
-----Output Settings------ ----Input Settings----
Port Frame ZS  CRC Line-Comp  SSM Bit AIS Squ SSM Bit PRV TIM Term
---- ----- --- --- ---------- --- --- --- --- --- --- --- --- ------
  A   D4   Off Off 134-266 Ft On  n/a On  Off On  n/a 10  Off EXT
  B   D4   On  Off 0-133 Ft   Off n/a On  Off On  n/a 10  Off EXT

     -Output-   --------------- Input Status -------------
Port Stat PQL   Sta PQL LOS  AIS  OOF  BPV  CRC  PQL  Stb
---- ---- ---   --- --- ---  ---  ---  ---  ---  ---  ---
  A  Ok   2     Alm 4   Ok   Ok   Alm  Ok   Ok   Ok   Ok
  B  Ok   2     Alm 10  Alm  Ok   Ok   Ok   Ok   Ok   Ok
OT-21>
```

Configuring Port Inputs (SSU only)

This section describes how to use the PORT command to read and set the framed clock input options for the OT-21 (see the following example). For details on the PORT command, see Appendix C, ICS Commands.

Example

```
OT-21>port
-----Output Settings------ ----Input Settings----
Port Frame ZS  CRC Line-Comp  SSM Bit AIS Squ SSM Bit PRV TIM Term
---- ----- --- --- ---------- --- --- --- --- --- --- --- --- ------
  A   D4   On  On 0-133 Ft    On  n/a Off Off On  n/a 10  Off EXT
  B   ESF  On  On 0-133 Ft    On  n/a Off Off On  n/a 10  Off EXT

     -Output-   --------------- Input Status -------------
Port Stat PQL   Sta PQL LOS  AIS  OOF  BPV  CRC  PQL  Stb
---- ---- ---   --- --- ---  ---  ---  ---  ---  ---  ---
  A  Ok   2     Alm 4   Ok   Ok   Alm  Ok   Ok   Ok   Ok
  B  Ok   2     Alm 10  Alm  Ok   Ok   Ok   Ok   Ok   Ok
OT-21>
```

Refer to the following command syntax, explanations, and examples for information on the port command.

PORT [A | B][port options]

where:

[A | B] is optional. If you do not specify it, the command applies to both the A and B ports. If you specify A or B, the command only affects the specified port.

After specifying the port or ports, there are several “port options” relating to port input that can be set, all of which are optional. You can specify one or more of them in any order.

CRC {ON | OFF} turns on or off CRC generation.

FRAME {D4 | ESF | CAS | CCS | 2048K} selects the framing type for the port. D4 and ESF set DS1 framing. CAS and CCS set E1 framing. 2048K selects 2048 kHz clock input with no framing and output is turned off. The 2048K option is only available on Ports A and B of SSU versions. Inputs are not available in the PRS version. Default is ESF.

ISOLATE {ON | OFF} turns on or off isolated-ones test pattern output.

SSM [OUT] {ON | OFF | BIT {ALL | n}} turns on or off the insertion of the SSM information on the output. The SSM reflects the current Stratum Level of the clock at all times.

TERM {EXT | INT | 75 | 100 | 120} sets input termination as external or internal choice in Ohms. Default is internal, 100 Ohms for DS1, 120 Ohms for E1.

ZS {ON | OFF} turns on or off zero suppression.

TIM {ON | OFF} turns on or off Time Interval.

Use the following examples as a guide on how to enter PORT commands.

Example: to change the AIS for both ports, type `PORT AIS ON` and press **Enter**.

Example: to change the CRC for both ports, type `PORT CRC OFF` and press **Enter**.

Example: to change the FRAME type for PORT A, type `PORT A FRAME ESF` and press **Enter**.

Example: to change the SSM value for both ports, type `PORT SSM OFF` and press **Enter**.

Example: to turn off zero suppression for PORT A, type `PORT A ZS OFF` and press **Enter**.

After entering these commands, PORT A and PORT B appears as follows:

```
OT-21>port
-----Output Settings------ ----Input Settings----
Port Frame ZS  CRC Line-Comp  SSM Bit AIS Squ SSM Bit PRV TIM Term
---- ----- --- --- ---------- --- --- --- --- --- --- --- --- ------
  A   ESF  Off Off 0-133 Ft   Off n/a On  Off Off n/a 10  Off EXT
  B   ESF  On  Off 0-133 Ft   Off n/a On  Off Off n/a 10  Off EXT

     -Output-   --------------- Input Status -------------
Port Stat PQL   Sta PQL LOS  AIS  OOF  BPV  CRC  PQL  Stb
---- ---- ---   --- --- ---  ---  ---  ---  ---  ---  ---
  A  Ok   2     Alm 4   Ok   Ok   Alm  Ok   Ok   Ok   Ok
  B  Ok   2     Alm 10  Alm  Ok   Ok   Ok   Ok   Ok   Ok
OT-21>
```

Configuring OUTPUT Groups

The OUTPUT command reads or sets the current setup information for the optional output cards. For details on the OUTPUT command, see Appendix C, ICS Commands.

Example for AMI Card:

In this example, use the OUTPUT command to set the framing type for the output card, turn Zero Suppression on or off, set the line compensation, turn SSM generation on or off, and turn Alarm Indication Status on or off.

```
OT-21>OUTPUT
Output Board A: Framed AMI
Framing: ESF  ZS: On   CRC: On   SSM: On   Bit: N/A  PQL: 2   AIS: Off
Port Comp         Stat
---- ------------ ----
A-1  0-133 Ft     Ok
A-2  0-133 Ft     Ok
A-3  0-133 Ft     Ok
A-4  0-133 Ft     Ok
OT-21>
```

Refer to the following command syntax, explanations, and examples for information on the OUTPUT command.

OUTPUT [{ A [1 | 2 | 3 | 4 }] | {B [1 | 2 | 3 | 4 }] [ENABLE | DISABLE]

where:

[A | B] is optional and only some of the options allow for channel access. If you do not specify it, the command applies to both the A and B output cards. If you do specify A or B, the command only affects the specified output card.

After specifying the output card or cards, there are several “options” relating to card outputs that can be set, all of which are optional. You can specify one or more of them in any order.

FRAME {D4 | ESF | CAS | CCS} selects the framing type for the output card. D4 and ESF set DS1 framing. CAS and CCS set E1 framing.

ZS {ON | OFF} turns on or off zero suppression.

COMP {133FT | 266FT | 399FT | 533FT | 655FT | 75OHM | 120OHM} sets the compensation for the cable used to connect the OT-21 to the Network Element being synchronized. The “FT” settings are for DS1 outputs and “OHM” settings are for E1 outputs.

SSM [OUT] {ON | OFF | BIT {ALL | n}} turns on or off the insertion of the SSM information on the output. For E1 mode, the bit position of the output may also be set. The SSM reflects the current Stratum Level of the clock at all times.

AIS {ON | OFF} turns on or off the Alarm Indication Signal for degraded frequency output.

Use the following examples as a guide on how to enter OUTPUT commands.

Example: to change the FRAME type for output card A, type `OUTPUT A FRAME D4` and press **Enter**.

Example: to turn off zero suppression for output card A, type `OUTPUT A ZS OFF` and press **Enter**.

Example: to change the SSM value for output card A, type `OUTPUT A SSM OFF` and press **Enter**.

Example: to change the AIS for output card A, type `OUTPUT A AIS ON` and press **Enter**.

Example: to change the COMP for output card A, type `OUTPUT A COMP 266FT` and press **Enter**.

After entering these commands, output card A appears as follows:

```
OT-21>OUTPUT
Output Board A: Framed AMI
Framing: D4 ZS: Off CRC: Off SSM: Off Bit: N/A  PQL: 2   AIS: On
Port Comp         Stat
---- ------------ ----
A-1  134-266 Ft   Ok
A-2  0-133 Ft     Ok
A-3  0-133 Ft     Ok
A-4  0-133 Ft     Ok

OT-21>
```

Example for Composite Clock Card

In this example, use the OUTPUT command to set the line compensation for a composite clock output card and port.

```
Output Board B: Composite Clock
Port Comp                              Stat
---- --------------------------------  ----
B-1  5/8 Duty cycle, 0 offset          Ok
B-2  5/8 Duty cycle, 0 offset          Ok
B-3  5/8 Duty cycle, 0 offset          Ok
B-4  5/8 Duty cycle, 0 offset          Ok
OT-21>
```

Refer to the following command syntax, explanations, and example for information on the OUTPUT command.

OUTPUT [A | B] COMP n

where:

[A | B] is optional. If you do not specify it, the command applies to both the A and B output cards. If you do specify A or B, the command only affects the specified output card.

COMP n sets the line compensation, n is a number from 0 to 7, see Table 4-4.

Table 4-4 Composite Clock Compensation

Compensation Number (n)	Function
0	5/8 Duty cycle, 0 offset
1	5/8 Duty cycle, 700 ns offset
2	5/8 Duty cycle, 1400 ns offset
3	5/8 Duty cycle, 2100 ns offset
4	1/2 Duty cycle, 0 offset
5	1/2 Duty cycle, 700 ns offset
6	1/2 Duty cycle, 1400 ns offset
7	1/2 Duty cycle, 2100 ns offset

Use the following example as a guide on how to enter OUTPUT commands.

Example: to change the COMP for output card B from 0 offset to 700 offset, type `OUTPUT B COMP 1` and press **Enter**.

After entering the command, output card B would appear as follows:

```
Output Board B: Composite Clock
Port Comp                               Stat
---- --------------------------------   ----
B-1  5/8 Duty cycle, 700 offset         Ok
B-2  5/8 Duty cycle, 700 offset         Ok
B-3  5/8 Duty cycle, 700 offset         Ok
B-4  5/8 Duty cycle, 700 offset         Ok
OT-21>
```

Example for 2048 Card

In this example, use the OUTPUT command to check the status of a 2048 output card and channel.

Refer to the following command syntax, explanations, and example for information on the OUTPUT command.

OUTPUT [A | B]

where:

[A | B] is optional. If you do not specify it, the command applies to both the A and B output cards. If you do specify A or B, the command only affects the specified output card.

Use the following example as a guide on how to enter OUTPUT commands.

Example: to check the status for output card B, type `OUTPUT B` and press **Enter**.

After entering the command, the following information is displayed:

```
Output Board B: 2048
Port     Stat
----     -----
B-1      Ok
B-2      Ok
B-3      Ok
B-4      Ok
OT-21>
```

4.4.7 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 Appendix C.3.31, SETUP.

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.

4.4.8 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**.

4.5 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.

4.5.1 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, COMM 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 COMM A to TL1 when your system is connected to serial port COMMS Local, type `COMM A MODE TL1` and press **Enter**.

4.5.2 Configuring COMMS local and COMM 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 COMM 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.

4.5.3 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 Appendix C.3, ICS Command Descriptions and Access Levels.

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";`

4.5.4 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 Optional 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:

   – 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 `SET-PRMTR::::IP,,,,192.168.255.255;`

– 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 `SET-PRMTR::::IP,,,,192.168.12.255;`

– 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 `SET-PRMTR::::IP,,,,192.168.216.255;`

  Refer to the following table to see how each Byte is converted from the Subnet Mask address to make up the Broadcast Mask address.

											Network																Mask						
Subnet Mask	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	255.255.236.0
IP Address	1	1	0	0	0	0	0	0	1	0	1	0	1	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1	1	192.168.12.3
Broadcast Mask	1	1	0	0	0	0	0	0	1	0	1	0	1	0	0	0	1	1	0	1	1	0	0	0	1	1	1	1	1	1	1	1	192.168.216.255
			Byte 1								Byte 2										Byte 3							Byte 4					

3. Type `SET-PRMTR::::IP,,,,[intvl];` where intvl is the desired interval at which the OT-21 will broadcast (15 to 3600 sec.).

4.5.5 Configuring Alarms With 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.

The following alarm commands allows you to read and set options for the current status of alarm indications on the unit.

RTRV-ALARM:[tid]:[aid]:[ctag]::[ALL | alrm];

RTRV-PRMTR:[tid]::[ctag]::ALARM[:alrm];

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

Disabling Unwanted Alarms

To disable an unwanted alarm, use the SET-PRMTR:[tid]::[ctag]::ALARM,alrm,[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,alrm,[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,alrm,,[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\""
```

4.5.6 Configuring the Radio Receiver With TL1 Commands

Configuring a GPS Engine

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

Configuring a CDMA Engine

Table 4-5 lists the factory default CDMA engine frequencies. There are 32 factory default frequencies provided, but CDMA units allow up to 32 frequencies to be stored: one in each of the 32 frequency “slots”. When a new OT-21 is first powered up, it examines these frequencies to find a station from which it can extract time of day.

Note: During a frequency scan, when the OT-21 selects a CDMA signal, the unit performs a five minute evaluation to calculate an estimated signal value.

With 32 frequencies in the table, it can take over two hours to scan and it is possible that none of these frequencies will be detected. An alternative is to determine what frequencies you need to use and scan only those frequencies. Use one of the following methods to determine which frequencies you can use.

- If you have your own network of towers, you will most likely want to use the frequency of those towers to extract time of day and 1pps information. Delete the frequency list by typing `SET-PRMTR::::CDMA,DELALL;`. Manually add the appropriate frequencies by typing `SET-PRMTR::::CDMA,ADD,freq,[entry];`, where `freq` is the frequency (in format xxx.xxx or xxxx.xxx in MHz) and `[entry]` is the number from 1 to 32.
- From a site survey using a CDMA scanning device such as a Hummingbird, you may already know which frequencies you can receive. Delete the frequency list by typing `SET-PRMTR::::CDMA,DELALL;`. Manually add the appropriate frequencies by typing `SET-PRMTR::::CDMA,ADD,freq,[entry];`, where `freq` is the frequency (in format xxx.xxx or xxxx.xxx in MHz) and `[entry]` is the number from 1 to 32.
- You may have the OT-21 scan all possible base station frequencies and select the ones strong enough to provide time of day information. Use the commands described in the following Examples 2, 3 and 4 to scan for these frequencies.

Note: Symmetricom recommends that you scan for only two or three frequencies to save time during installation and during operation if the "main" signal is lost. For detailed information on how to use the CDMA engine commands, refer to Appendix D, TL1 Commands.

Table 4-5 CDMA Default Frequencies

Slot	Frequency	Slot	Frequency	Slot	Frequency	Slot	Frequency
1	1931.250	9	1948.750	17	1966.250	25	1978.750
2	1932.500	10	1951.250	18	1967.500	26	878.490
3	1933.750	11	1952.500	19	1968.750	27	881.520
4	1935.000	12	1953.750	20	1971.250	28	882.360
5	1937.500	13	1955.000	21	1972.500	29	882.420
6	1940.000	14	1960.000	22	1973.750	30	882.750
7	1946.250	15	1961.250	23	1976.250	31	890.730
8	1947.500	16	1962.500	24	1977.500	32	893.310

Refer to the following examples for details on how to add, delete, and scan for frequencies.

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.

Example 1:

Type `SET-PRMTR:::::CDMA,DELALL;` to delete the factory default frequency list.

Example 2:

Type `SET-PRMTR:::::CDMA,CELL,2;` to scan for the first two CELL frequencies strong enough to provide a time of day signal.

Example 3:

Type `SET-PRMTR:::::CDMA,PCS,2;` to scan for the first two PCS frequencies strong enough to provide a time of day signal.

Example 4:

Type `SET-PRMTR::::CDMA,START;` to scan for both CELL and PCS frequencies strong enough to provide a time of day signal.

Example 5:

To add the frequency 1955.000 MHz to slot 1, type `SET-PRMTR::::CDMA, ADD,1955.000,1;`

Configuring a Unit with No Engine

Ensure the appropriate clock connections are made to INP-A and INP-B and configure the framed clock options using the SET-PRMTR...INP command (see Appendix D, TL1 Commands). Refer to the following example for a description of how to set the framed clock option.

Example:

`Type RTRV-PRMTR::::INP;`

The unit responds with:

```
OT-21 01-10-18 15-09-06
M   0 COMPLD
   "INP-A:ENA,ESF,INT,OFF,ON,OFF,N/A,4"
   "INP-B:ENA,ESF,EXT,ON,ON,OFF,N/A,4"
;
```

To change the framed clock option on INP-A from ESF to D4, type `SET-PRMTR::INP-A:::INP,,D4;`

The unit responds with:

```
OT-21 01-10-18 15-09-06
M   0 COMPLD
   "INP-A:ENA,D4,INT,OFF,ON,OFF,N/A,4"
   "INP-B:ENA,ESF,EXT,ON,ON,OFF,N/A,4"
;
```

Verifying the Radio Receiver Input

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

The system responds with:

```
   OT-21 01-10-08 19-54-09
M   001 COMPLD
   "1955.000,2289,Ok"
;
```

or:

```
OT-21 01-10-08 19-54-09
M   001 COMPLD
   "1948.750 794 Search"
;
```

`OK` indicates the radio receiver has acquired a proper signal. `Search` indicates the radio receiver has not acquired a proper signal.

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.

4.5.7 Configuring Clock Inputs and Outputs With TL1 Commands

Configuring PQLTABLE

The Priority Quality Level (PQL) table provides the translation from the internal PQL to the Sync Status Message (SSM) for the various framing types. The SET-PRMTR:[tid]::[ctag]::PQL command allows you to configure the PQLTABLE to accommodate non-standard systems. For details, see Appendix D, TL1 Commands.

Note: Normally, editing the PQL table is not necessary. Edits may be required, however, if ANSI or ITU-T SSM standards are changed.

The following example shows the factory default configuration. Table 4-6 is an ASCII version of the table used here to show the column entries more clearly.

Type `rtrv-prmtr:OT-21::::pql;`

```
   OT-21 02-03-25 15-27-23
M  0 COMPLD
   "01,0xEE,,"",0xFF,,"""
   "02,0x04,S,"PRS",0x02,,"""
   "03,0x04,,"",0x02,S,"PRC/G.811""
   "04,0x08,S,"STU",0x00,S,"STU""
   "05,0x0C,S,"ST2",0x04,,"Type II""
   "06,0x78,S,"Type V",0x04,S,"Type V""
   "07,0xFF,,"Type I",0xFF,,"Type I""
   "08,0x7C,S,"ST3E",0x08,,"Type III""
   "09,0x10,,"Type VI",0x08,S,"Type VI""
   "10,0x10,S,"ST3",0x0B,,"Type IV""
   "11,0x22,,"",0x0B,S,"G.813 Opt 1""
   "12,0x22,S,"SMC",0x0F,,"G.813 Opt 2""
   "13,0x28,S,"ST4",0x0F,,"""
   "14,0x40,S,"Reserved",0x0F,,"""
   "15,0x30,S,"DUS",0x0F,S,"DUS""
   "16,0x7E,S,"?",0x0F,,"?""

;
```

Table 4-6 PQL Table Column Organization

```
     DS1                   E1
PQL  SSM S    DS1 Desc     SSM S    E1 Desc
--- ---- - -------------- ---- - --------------
  1 0xEE                  0xFF
  2 0x04 S PRS            0x02
  3 0x04                  0x02 S PRC/G.811
  4 0x08 S STU            0x00 S STU
  5 0x0C S ST2            0x04   Type II
  6 0x78 S Type V         0x04 S Type V
  7 0xFF   Type I         0xFF   Type I
  8 0x7C S ST3E           0x08   Type III
  9 0x10   Type VI        0x08 S Type VI
 10 0x10 S ST3            0x0B   Type IV
 11 0x22                  0x0B S G.813 Opt 1
 12 0x22 S SMC            0x0F   G.813 Opt 2
 13 0x28 S ST4            0x0F
 14 0x40 S Reserved       0x0F
 15 0x30 S DUS            0x0F S DUS
 16 0x7E S ?              0x0F   ?
```

To change the PQL table settings, refer to the following syntax explanations and examples.

SET-PRMTR:[tid]::[ctag]::PQL,[pqln],[ds1ff],[std1],[desc1],[e1ff],[std2],[desc2];

- **pqln** pql number (1 to 16) or FACTORY
- **ds1ff - e1ff** SSM in hex format
  DS1 typically uses values in the range 0 to 127 decimal, 0x00 to 7F hex
  E1 typically uses values in the range 0 to 15 decimal, 0x00 to 0F hex
- **std1 - std2** “standard” indicators {ON | OFF}
- **desc1 - desc2** description up to fourteen characters. May be enclosed in double-quotes (“). Use the value ““ to blank the description.

Use the following examples as a guide on how to enter the SET-PRMTR:[tid]::[ctag]::PQL,[pqln],[ds1ff],[std1],[desc1],[e1ff],[std2],[desc2]; command.

Example: to change the SSM value for DS1 slot 1 to hexadecimal EE, type
`SET-PRMTR::::PQL,1,EE;`

Example: to change the standard flag for both DS1 and E1 slot 4 to OFF, type
`SET-PRMTR::::PQL,4,,OFF,,,,OFF;`

Example: to change the description for E1 slot 14 to match the DS1 value, type
`SET-PRMTR::::PQL,14,,,,,,Reserved;`

Type `rtrv-prmtr:OT-21::::pql;` to display the PQL table.

```
OT-21 02-03-25 15-27-23
M  0 COMPLD
   "01,0xEE,,"",0xFF,,"""
   "02,0x04,S,"PRS",0x02,,"""
   "03,0x04,,"",0x02,S,"PRC/G.811""
   "04,0x08,,"STU",0x00,,"STU""
   "05,0x0C,S,"ST2",0x04,,"Type II""
   "06,0x78,S,"Type V",0x04,S,"Type V""
   "07,0xFF,,"Type I",0xFF,,"Type I""
   "08,0x7C,S,"ST3E",0x08,,"Type III""
   "09,0x10,,"Type VI",0x08,S,"Type VI""
   "10,0x10,S,"ST3",0x0B,,"Type IV""
   "11,0x22,,"",0x0B,S,"G.813 Opt 1""
   "12,0x22,S,"SMC",0x0F,,"G.813 Opt 2""
   "13,0x28,S,"ST4",0x0F,,"""
   "14,0x40,S,"Reserved",0x0F,,"Reserved""
   "15,0x30,S,"DUS",0x0F,S,"DUS""
   "16,0x7E,S,"?",0x0F,,"?""
;
```

Configuring Port Outputs

This section describes how to use the SET-PRMTR::::PORT command to set the framed clock output options for the OT-21 (see the following example). For details on this command, see Appendix D, TL1 Commands.

Example: type `RTRV-PRMTR::::PORT;` to display the current port status.

```
OT-21 01-10-08 22-08-55
M  0 COMPLD
   "PORT-A:ENA,D4,266,OFF,ON,OFF,N/A,2,OFF,OFF"
   "PORT-B:ENA,ESF,133,ON,ON,ON,N/A,2,OFF,OFF"
;
```

In the command SET-PRMTR:::::PORT;, PORT A and PORT B (aid) is optional. If you do not specify it, the command applies to both the A and B ports. If you do specify A or B, the command only affects the specified port.

After specifying the port or ports, you can set any or all of the following eight channel options.

- EnaDis {ENA | DIS} enables or disables the input port.
- FRAME {D4 | ESF | CAS | CCS} selects the framing type for the port. D4 & ESF set DS1 framing. CAS and CCS set E1 framing.
- COMP {133 | 266 | 399 | 533 | 655} sets the compensation in feet for the cable used to connect the OT-21 to the Network Element being synchronized.
- ZS {ON | OFF} turns on or off zero suppression.
- CRC {ON | OFF} turns on or off CRC generation.
- SSM {ON | OFF} turns on or off the insertion of the SSM information on the output. For E1 the bit position of the output may also be set. The SSM reflects the current Stratum Level of the clock at all times.
- BIT {4 | 5 | 6 | 7 | 8 | ALL} valid for E1 type output to change the SSM channel assignment, or SAn bit location where n is 4, 5, 6, 7, or 8.
- AIS {ON | OFF} turns on or off the Alarm Indication Signal for degraded frequency output.
- SQUELCH {ON | OFF} enables (On) or disables (Off) squelching of the output from the port. This turns off the output signal whenever the holdover alarm is active. Otherwise, the output is unchanged when in holdover except for the SSM. Default is squelching off (output always on).

Use the following examples as a guide on how to enter SET-PRMTR...PORT commands.

Example: to set the FRAME type to ESF for PORT A, type
`SET-PRMTR::PORT-A:::PORT,,ESF;`

Example: to set the COMP to 133 for PORT A, type
`SET-PRMTR::PORT-A:::PORT,,,133;`

Example: to turn on zero suppression for PORT A, type
`SET-PRMTR::PORT-A:::PORT,,,,ON;`

Example: to set the CRC to off for both ports, type
`SET-PRMTR::ALL:::PORT,,,,,OFF;`

Example: to turn the SSM on for PORT A, type
`SET-PRMTR::PORT-A:::PORT,,,,,,ON;`

Example: to set the BIT to 4 for PORT A, type
`SET-PRMTR::PORT-A:::PORT,,,,,,,4;`

Example: to turn the AIS on for PORT A, type
`SET-PRMTR::PORT-A:::PORT,,,,,,,,ON;`

Example: to turn the SQUELCH off for PORT A, type
`SET-PRMTR::PORT-A:::PORT,,,,,,,,,OFF;`

Type `RTRV-PRMTR::::PORT;` to display the port configuration.

```
OT-21 01-10-08 22-08-55
M  0 COMPLD
   "PORT-A:ENA,ESF,133,ON,OFF,ON,4,2,ON,OFF"
   "PORT-B:ENA,ESF,133,ON,OFF,ON,N/A,2,OFF,OFF"
;
```

Configuring INP-x Inputs (SSU only)

This section describes how to use the SET-PRMTR:::::INP command to set the input options for the OT-21. For details on this command, see Appendix D, TL1 Commands.

Refer to the following command syntax, explanations, and examples for information on the SET-PRMTR...INP command.

INP-A and INP-B are optional and specified as aid code: ALL, INP-A and INP-B. If you do not specify it, the command applies to both INP-A and INP-B. If you do specify INP-A or INP-B, the command only affects the specified INP.

After specifying the INP, you can set any or all of the following eight parameter options.

- EnaDis {ENA | DIS} enables or disables the clock on the specified INP.
- FRAME {D4 | ESF | CAS | CCS} selects the framing type for the INP. D4 and ESF set DS1 framing. CAS and CCS set E1 framing.
- TERM {EXT | INT} to set termination for either internal or external.

- ZS {ON | OFF} turns on or off zero suppression.
- CRC {ON | OFF} turns on or off CRC generation.
- SSM {ON | OFF} can only be set if framing is E1. Turns on or off the insertion of the SSM information on the output. For E1 the bit position of the output may also be set. The SSM reflects the current Stratum Level of the clock at all times.
- BIT {4 | 5 | 6 | 7 | 8 | ALL} valid for E1 type output to change the SSM channel assignment, or SAn bit location, where n is 4, 5, 6, 7, or 8.
- PQL {1..16} to provision the value for the port's Priority Quality Level.

Use the following examples as a guide on how to enter SET-PRMTR...INP commands.

Example: to set the FRAME type to D4 for INP-A, type
`SET-PRMTR::INP-A:::INP,,D4;`

Example: to set the termination to internal for INP-A, type
`SET-PRMTR::INP-A:::INP,,,INT;`

Example: to turn zero suppression off for INP-A, type
`SET-PRMTR::INP-A:::INP,,,,OFF;`

Example: to turn the CRC on for INP-A, type
`SET-PRMTR::INP-A:::INP,,,,,ON;`

Example: to turn the SSM off for INP-A, type
`SET-PRMTR::INP-A:::INP,,,,,,OFF;`

Example: to set the PQL to 4 for INP-A, type
`SET-PRMTR::INP-A:::INP,,,,,,,,4;`

Type `RTRV-PRMTR::::INP;` to display the port configuration.

```
OT-21 01-10-16 16-08-32
M   0 COMPLD
   "INP-A:FLT,D4,INT,OFF,ON,OFF,N/A,4"
   "INP-B:FLT,ESF,EXT,ON,ON,OFF,N/A,4"
;
```

Configuring OUT-x Groups

This section describes how to use the SET-PRMTR::::OUT command to set the output card options for the OT-21. For details on this command, see Appendix D, TL1 Commands.

Example for AMI Card

In this example, use the SET-PRMTR...OUT command sets the framing type for the output card, set the line compensation, turn Zero Suppression on or off, turn SSM generation on or off, and turn Alarm Indication Status on or off.

Type `RTRV-PRMTR::::OUT;` to display the output status.

```
OT-21 01-10-09 18-05-14
M  0 COMPLD
   "OUT-A-1:ENA,ESF,133,ON,ON,ON,N/A,OFF,OFF"
   "OUT-A-2:ENA,ESF,133,ON,ON,ON,N/A,OFF,OFF"
   "OUT-A-3:ENA,ESF,133,ON,ON,ON,N/A,OFF,OFF"
   "OUT-A-4:ENA,ESF,133,ON,ON,ON,N/A,OFF,OFF"
;
```

Refer to the following command syntax, explanations, and examples for information on the SET-PRMTR...OUT command.

OUT-A and OUT-B are optional specified as aid code: ALL, OUT-A[-y] and OUT-B[-y], where y = {1 | 2 | 3 | 4}. If you do not specify it, the command applies to both the A and B groups, but if A and B are different output types the unit responds with `DENY`. If you do specify OUT-A or OUT-B, the command only affects the specified group.

After specifying the OUT, you can set any or all of the following eight options.

- EnaDis {ENA | DIS} enables or disables the clock on the specified OUT.
- FRAME {D4 | ESF | CAS | CCS} selects the framing type for the port. D4 and ESF set DS1 framing. CAS and CCS set E1 framing.
- COMP {133 | 266 | 399 | 533 | 655} sets the compensation in feet for the cable used to connect the OT-21 to the Network Element being synchronized.
- ZS {ON | OFF} turns on or off zero suppression.
- SSM {ON | OFF} can only be set if framing is E1. Turns on or off the insertion of the SSM information on the output. For E1 the bit position of the output may also be set. The SSM reflects the current Stratum Level of the clock at all times.
- BIT {4 | 5 | 6 | 7 | 8 | ALL} valid for E1 type output to change the SSM channel assignment, or SAn bit location where n is 4, 5, 6, 7, or 8.
- AIS {ON | OFF} turns on or off the Alarm Indication Signal for degraded frequency output.
- SQUELCH {ON | OFF} - enables (On) or disables (Off) squelching of the output from the port. This turns off the output signal whenever the holdover alarm is active. Otherwise, the output is unchanged when in holdover except for the SSM. Default is squelching off (output always on).

Use the following examples as a guide on how to enter SET-PRMTR...OUT commands.

Example: to change the FRAME type for OUT-A line number 1 of 4, type
`SET-PRMTR::OUT-A-1:::OUT,,D4;`

Example: to change the COMP for OUT-A line number 1 of 4, type
`SET-PRMTR::OUT-A-1:::OUT,,,266;`

Example: to turn off zero suppression for OUT-A line number 1 of 4, type
`SET-PRMTR::OUT-A-1:::OUT,,,,OFF;`

Example: to change the SSM for OUT-A line number 1 of 4, type
`SET-PRMTR::OUT-A-1:::OUT,,,,,,OFF;`

Example: to change the BIT for OUT-A line number 1 of 4, type
`SET-PRMTR::OUT-A-1:::OUT,,,,,,,4;`

Example: to change the AIS for OUT-A line number 1 of 4, type
`SET-PRMTR::OUT-A-1:::OUT,,,,,,,,ON;`

Type `RTRV-PRMTR::::OUT;` to display the OUT configuration.

```
OT-21 01-10-09 18-05-14
M  0 COMPLD
   "OUT-A-1:ENA,D4,266,OFF,OFF,OFF,4,ON,ON"
   "OUT-A-2:ENA,ESF,133,ON,ON,ON,N/A,OFF,ON"
   "OUT-A-3:ENA,ESF,133,ON,ON,ON,N/A,OFF,ON"
   "OUT-A-4:ENA,ESF,133,ON,ON,ON,N/A,OFF,ON"
;
```

Example for Composite Clock Card

In this example, use the OUT command sets the line compensation for a composite clock output card and channel.

Type `RTRV-PRMTR::OUT-B:::OUT;` to display the output status.

```
OT-21 01-10-09 18-05-14
M  0 COMPLD
   "OUT-B-1:ENA,CC,1,,,,,"
   "OUT-B-2:ENA,CC,1,,,,,"
   "OUT-B-3:ENA,CC,1,,,,,"
   "OUT-B-4:ENA,CC,1,,,,,"
```

Refer to the following command syntax, explanations, and examples for information on the SET-PRMTR...OUT command.

OUT-A and OUT-B are optional specified as aid code: ALL, OUT-A[-y] and OUT-B[-y], where y = {1 | 2 | 3 | 4}. If you do not specify it, your command applies to both the A and B groups. If you specify A or B, your command only affects the specified group.

After specifying the groups, you can set any or all of the following three options.

- EnaDis {ENA | DIS} to enable or disable the clock on the specified OUT line number.
- FRAME {CC} or can be left blank.
- COMP {0,1,2,3,4,5,6,7} sets the compensation for the cable used to connect the OT-21 to the Network Element being synchronized.

All other options should be left blank.

Use the following examples as a guide on how to enter SET-PRMTR...OUT commands.

Example: to set the FRAME type for OUT-B line number 1 of 4, type
`SET-PRMTR::::OUT,,CC;`

Example: to change the COMP for OUT-B number 1 of 4, type
`SET-PRMTR::OUT-B-1:::OUT,,,2;`

Type `RTRV-PRMTR::OUT-B:::OUT;` to display the output status.

```
OT-21 01-10-09 18-05-14
M  0 COMPLD
   "OUT-B-1:ENA,CC,2,,,,,"
   "OUT-B-2:ENA,CC,1,,,,,"
   "OUT-B-3:ENA,CC,1,,,,,"
   "OUT-B-4:ENA,CC,1,,,,,"
```

Example for 2048 Card

Type `RTRV-PRMTR::OUT-B:::OUT;` to display the status of a 2048 output card and channel.

```
OT-21 01-10-09 18-05-14
M  0 COMPLD
   "OUT-B-1:ENA,2048"
   "OUT-B-2:ENA,2048"
   "OUT-B-3:ENA,2048"
   "OUT-B-4:ENA,2048"
```

Refer to the following command syntax, explanations, and examples for information on the SET-PRMTR...OUT command.

OUT-A and OUT-B are optional and specified as aid code: ALL, OUT-A[-y] and OUT-B[-y], where y = {1 | 2 | 3 | 4}. If you do not specify it, the command applies to both the A and B groups. If you specify A or B, the command only affects the specified group.

4.5.8 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 Appendix D.5.15, SET-PRMTR:[tid]::[ctag]::SETUP, [fact [,all] | user [,all] | save].

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.

4.5.9 Logging Off With TL1 Commands

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

4.6 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 4-7 have been verified and checked off.

Table 4-7 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…CDMA or RTRV-DATA…GPS TL1 commands to verify tracking.	
ACTIVE indication light is ON.	
For units with GPS, alarm 05 “Receiver position status” reports **Position, Good**.	
For units with rubidium local oscillator only, alarm 12 “Rb Phase Lock Loop Status” reports **Rb, Lock, Locked**.	
Frequency and time degraded alarms indicate correctly.	
HOLDOVER indication light is OFF.	

IN THIS CHAPTER

Chapter 5 Commissioning Tests

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.

Note: You must use another Stratum 1 PRS to verify that the OT-21 meets the accuracy specifications it was designed to meet. If you need to verify compliance to the design specifications before deploying this product, please contact Symmetricom at 888-367-7966 (toll-free in USA only), 408-428-7907, or +44 (0) 1189 699 799 in Europe, Middle East, or Africa to schedule a Factory Acceptance Test.

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
- Test inputs and outputs
- Restore the unit to site specifications

5.1 Equipment to Be Tested

The commissioning tests in this section verify that all of the components of an OT-21 unit with SSU are functioning. The test instructions are organized by components to allow selective testing for various unit configurations. Perform the test procedures that apply to the unit you are testing.

Note: If you are using an additional PRS source for stability testing, please call Symmetricom Global Services (SGS) for assistance at 888-367-7966 (toll-free in USA only), 408-428-7907, or +44 1189 699 799 in Europe, Middle East, or Africa.

5.2 Testing Assumptions

The tests in this section verify proper operation of the OT-21 as an installed system. 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 (see Section 3.8)
- Power has been applied and you have verified proper operation of the equipment (see the *Operation Completion Checklist* in Section 4.6)
- The system is using factory default configuration settings

5.3 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)
- Communications analyzer to check for correct framing, Synchronous Status Messaging (SSM), and line coding
- Oscilloscope with correct load terminations and cables to verify outputs

Note: If the communications analyzer is used to test the pulse mask, an oscilloscope is not required.

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

5.4 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.

5.5 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.

5.6 Recording Test Results

Use a copy of the *Commissioning Test Data Sheet* located in Section 5.8, Commissioning Test Data Sheet, to record test results.

5.6.1 Communications Interface

If you are testing the Ethernet connection to a network, set the IP address. See Section 4.4.3, Configuring Ethernet Settings With ICS Commands, to configure the Ethernet settings with ICS commands. See Section 4.5.4, Configuring Ethernet Settings With TL1 Commands, to configure the Ethernet settings with TL1 commands.

EIA-232 COMMS Local Port Communication

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

1. Connect the PC to EIA-232 COMMS local port.
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 Section 4.1, Connecting the Communications Equipment.
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.

5.6.2 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.

5.6.3 Input Signals

This section provides instructions to test the GPS and CDMA capabilities for the OT-21 units with a radio receiver installed and to test the input reference signals for the OT-21 with SSU functions.

GPS Signals

The following test procedure applies to units with a GPS radio receiver installed. While monitoring the 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:

```
SYMMETRICOM 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.

CDMA Input Signals

The following test procedure applies to units with a CDMA radio receiver installed. When the signal strength (SNR) for a base station frequency is greater than 500, the signal is tracking and an `OK` message appears in the report returned to the screen. Otherwise, an `SRC` message appears indicating that the unit is searching for a signal.

The report columns from left to right include the base station frequency, 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...CDMA:

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

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

   A report similar to the following appears on the screen:

```
1951.250 2459 Ok T14:17:50Z
1951.250 2171 Ok T14:17:56Z
1951.250 2081 Ok T14:18:00Z
```

2. Verify that the signal is tracking a base station by observing `OK` in the report. If `SRC` appears, it indicates that the unit is searching for a signal.

3. For ICS, type `ENGINE TDATA` and press **Enter** to turn off the report.

Reference Input Signals

The following test procedures only apply to SSU versions with input clock signals present.

1. Verify the presence of input signals returned with no alarms:

   For ICS, type `ALARM 17` and press **Enter** then type `ALARM 18` and press **Enter**.

   For TL1, type `RTRV-ALARM::::17;` and `RTRV-ALARM::::18;`

2. Remove the inputs, wait 20 seconds, and verify that LOS is reported.

3. Restore the inputs and verify that alarm cleared.

4. Verify that these alarm commands are recorded in the event log, and that the event log displays `LOS` or `LOS restoring`.

   For ICS, type `EVENT` and press **Enter**.

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

5.6.4 Output Signals

To test each clock output signal, follow the instructions below and record the test results in the *Commissioning Test Data Sheet* located in Section 5.8.

- Check the dash number in Table B.1 and Table B.2 for available outputs.
- See Chapter 3, Installing the OT-21, to verify the pin connections for the outputs.
- Use an analyzer to test framed DS1 (1544 kbits) and E1 (2048 kbits) signal outputs.
- Use an oscilloscope to test the Composite Clock and the 2048 kHz signal outputs.
- Use the ICS OUTPUT command (see Appendix C, ICS Commands) or the TL1 SET-PRMTR...OUT command (see Appendix D, TL1 Commands) to view and set the clock I/O options.

5.7 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).

5.8 Commissioning Test Data Sheet

Use this test data sheet during installation and acceptance tests of the Symmetricom 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			
CDMA Signals			
SSU Reference Input Signals			
DS1/E1 Clock Output Signals (PORT-A and PORT-B) (J1 through J4)			
Optional Ports (J5 through J12)			
DS1 Clock Output Signal			
E1 Clock Output Signal			
Composite Clock Output Signal			
2.048 MHz Clock Output Signal (card # 1)			
2.048 MHz Clock Output Signal (card # 2)			

IN THIS CHAPTER

Chapter 6 Maintenance

This chapter provides information about preventive and corrective maintenance, reordering subassemblies, accessories, and reshipment of the product.

Note: Please retain the original packaging of the unit for re-shipping the product as needed. If the original packaging has been discarded, contact Symmetricom Global Services (SGS) for assistance.

6.1 Software Maintenance

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

To download 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

6.1.1 OT-21 Download Application

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. Please contact Symmetricom Global Services (SGS) to order this product. The installation kit includes the OTDA application (on CD), the current revision of OT-21 firmware (on CD), cables, and a User Guide.

6.1.2 Installing New Software Using ICS or TL1 Commands

For assistance installing new upgrade software contact Symmetricom Global Services (SGS) at 888-367-7966 (toll-free in USA only), 408-428-7907, or +44 1189 699 799 in Europe, Middle East, or Africa.

Note: Perform upgrades during maintenance windows to minimize network issues.

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 `OT21B00.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.

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

5. 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.

Note: Restarting the OT-21 will **not** turn off outputs from the system. Timing outputs will continue to work as they were previously provisioned.

   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.

Note: Restarting the OT-21 will **not** turn off outputs from the system. Timing outputs will continue to work as they were previously provisioned.

6.2 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 Chapter 3.1.2, Electromagnetic Compatibility (EMC) Considerations, for electromagnetic compatibility conditions that may cause damage.

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

Table 6-1 Preventive Maintenance (Continued)

Item	Inspection	Corrective Action	Interval
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

6.3 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. Refer to Section 6.4 through Section 6.6 for information on re-ordering, re-packing or returning equipment to the factory.

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 CDMA Antenna and Cable	Replace defective part	570701-9999
Defective GPS Antenna and Cable	Replace defective part	See Table F-1

6.4 Re-Ordering Information

Contact your local Symmetricom sales office to re-order any subassembly or accessory or to obtain a current list of subassemblies, accessories, and item numbers. Supply the subassembly or accessory name and its item number along with the purchase order number to our sales office.

6.5 Product Return Shipping

Return all units in the original packaging. Use standard packing procedures for products being returned for repair to protect the equipment during shipment. Connectors should be protected with connector covers or the equipment should be wrapped in plastic before packaging. Ensure that the display and rear panels are protected when packaged.

6.6 Product Return Procedures

To return equipment to the factory or local representative for repair:

1. Call Symmetricom Global Services (SGS) at 888-367-7966 (toll-free in USA only) or 408-428-7907, or +44 (0) 1189 699 799 in Europe, Middle East, and Africa, to obtain a return material authorization number (RMA) before returning the product for service.

2. Provide a description of the problem, product item number, serial number and warranty expiration date.

3. Provide the return shipping information (customer field contact, address, telephone number and so forth.)

4. Ship the product to Symmetricom, transportation prepaid and insured, with the Return Material Authorization (RMA) number and item numbers or part numbers clearly marked on the outside of the container to the following address:

Attn: Global Services
Symmetricom, Inc.
Aguadilla Site
Montana Industrial Park
Street B, Lot 52
Aguadilla, PR 00603
Tel: 787-658-3535
Fax: 787-658-3560

IN THIS CHAPTER

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.

7.1 Getting Started

To perform troubleshooting for the OT-21 unit, you must establish a serial connection from 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. Section 4.1, Connecting the Communications Equipment, provides instructions for connecting to the serial port.

See Section 7.2, Diagnosing Alarms, to diagnose problem conditions using a serial or network connection.

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

7.2 Diagnosing Alarms

After connecting to the troubleshooting terminal (see Section 4.1, Connecting the Communications Equipment), enter the ALARM command to view the alarm status of the unit. To view the alarm status and generate an active alarm list perform the following procedure.

1. To display a list of active alarms:

   For **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
```

   For **TL1** mode, type `RTRV-ALARM::ENG::;`. The following example illustrates information that is displayed:

```
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\""
;
```

2. See the alarm list in Table 7-2 to diagnose the specific problem and apply the possible solutions to clear the alarm.

7.3 Troubleshooting Guidelines

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

- Fault Indicators
- Alarms
- Events

7.3.1 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 7-1 provides a description of each indicator and its function. Table 7-2 provides a list of corrective actions to take in case of a fault indication accompanied by an alarm condition.

Table 7-1 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 or CDMA AMBER = GPS or CDMA tracking errors OFF = Unit is not tracking GPS or CDMA
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
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

7.3.2 Alarms

Alarms are a subset of events (see Section 7.3.3, Events). Table 7-2 lists each alarm number (events 00 through 22), the purpose of the alarm, possible event messages generated with the alarm, and corrective actions to take for each alarm condition. The actual 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 or the CDMA receiver. Otherwise, the Z will not be displayed.

Alarm number – refer to Table 7-2.

Alarm description – refer to Table 7-2.

Current alarm status – refer to Table 7-2.

Current alarm level – If active refer to the Actions column of Table 7-2.

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 7-2.

NOTE: Symmetricom offers a 24-hour technical support line. For Symmetricom Global Services, call 888-367-7966 (toll-free in USA only), 408-428-7907, or +44 (0) 1189 699 799 in Europe, MIddle East, and Africa.

Table 7-2 Alarm Messages and Actions

Alarm No.	Alarm Name	Event Status non-active/active	Error Indication and Action
00	Receiver Tracking	Yes/No	No indicates that the radio receiver is not tracking. **Note:** In first-time installations, this alarm may take up to 30 minutes to clear. Verify that the antenna and the antenna cable are properly connected. For GPS, 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. For GPS, 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. Contact Symmetricom Global Services. Verify there are no large transmitters in the area that could cause interference. Check for other active alarms by issuing the ALARM command (see Section 7.2, Diagnosing Alarms). Verify that the radio receiver Engine Hardware alarm (alarm #3) is Good; if not Good, contact Symmetricom Global Services. Use the ENGINE TDATA command to check engine progress.

Table 7-2 Alarm Messages and Actions (Continued)

Alarm No.	Alarm Name	Event Status non-active/active	Error Indication and Action
01	Receiver Antenna	Connected/Not Connected	**For GPS only** 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.
02	Antenna Load	Not Shorted/ Shorted	**For GPS only** 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 Section 3.6, Installing a GPS Antenna.
03	Engine Hardware	Good/Bad	Bad indicates that the radio receiver hardware has failed. Contact Symmetricom Global Services.
04	Engine System	Good/Bad	Bad indicates that the engine is reporting a system failure and the radio receiver is unable to report clock output control information. Note: This alarm may take up to 15 minutes to clear while satellite information is updating. Verify that the engine is tracking with the ENGINE TDATA command (see Appendix C.3.9, ENGINE) – 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. If this is a GPS unit, verify that the radio receiver position status has cleared. See Alarm 05.

Table 7-2 Alarm Messages and Actions (Continued)

Alarm No.	Alarm Name	Event Status non-active/active	Error Indication and Action
05	Receiver Position	Good/ Unknown	**For GPS only** 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. **Note:** For first-time installations, this alarm may take up to 10 minutes after the radio receiver begins tracking. Verify that the radio receiver is tracking. Verify that position updates are occurring and PDOP is below 5.0 with the POS command. If PDOP > 5.0, verify unit is tracking satellites in view with the AVAIL command.
06	Oscillator	Present/ Not Present	Not Present indicates that the radio receiver has lost the Local Oscillator output. Contact Symmetricom Global Services.
07	Frequency Control	No Holdover/ Holdover	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. Verify that the unit has not been set into user holdover mode with the LOOP command. Verify that the Engine System Status alarm is cleared. If the unit is an SSU, verify that there is a valid input signal present on input A or input B and the appropriate clock input summary alarm is clear. Verify that there are valid phase measurements being generated using report #0.

Table 7-2 Alarm Messages and Actions (Continued)

Alarm No.	Alarm Name	Event Status non-active/active	Error Indication and Action
08	Output Frequency	OK/ Degraded	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 x 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 x 10^{-11} and the Tau is greater than 150 (St3E) or 320 (St2) seconds. **Note:** For first-time installations, this alarm can take up to one hour to clear after track and position status have been cleared. 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. Verify that the engine is tracking (use the ENGINE TDATA command).
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.

Table 7-2 Alarm Messages and Actions (Continued)

Alarm No.	Alarm Name	Event Status non-active/active	Error Indication and Action
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 Symmetricom Global Services.
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 Symmetricom Global Services.
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 Symmetricom Global Services.
14	Unit Hardware	OK/Failed	Failed indicates that the programmable hardware within the unit has failed. Contact Symmetricom Global Services.
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.
17	Port A Summary	Good/Bad	Provides a quick summary of Port Input A status. See Alarm Numbers 17-1 through 17-8.
17-1	Port A Loss Of Signal	Good/Bad	Bad indicates that the unit is unable to detect a valid signal. Verify that there is a valid signal connected to Clock Input A. Verify that input A is properly configured for the input type.
17-2	Port A Alarm Indication Status	Good/Bad	Bad indicates that the unit is detecting AIS. Verify that input A is not in AIS.

Table 7-2 Alarm Messages and Actions (Continued)

Alarm No.	Alarm Name	Event Status non-active/active	Error Indication and Action
17-3	Port A Out Of Frame	Good/Bad	Bad indicates that the unit is unable to detect valid framing. Verify that there is a valid signal connected to Clock Input A. Verify that the framing type for is equivalent to the framing provisioned for in input signal A.
17-4	Port A Bipolar Violation	Good/Bad	Bad indicates that the unit is detecting bipolar violations. Verify that the CRC and zero suppression settings are equivalent to those provisioned for in input signal A.
17-5	Port A Cyclic Redundancy Checksum	Good/Bad	Bad indicates that the unit is failing CRC. Verify that the CRC setting is equivalent to that provisioned for in input signal A. Disable the CRC setting.
17-6	Port A PQL	Good/Bad	Bad indicates the input PQL is below the provisioned PQL, or the input SSM was lost. Verify that the PQL settings are correct and the received signal is correct.
17-7	Port A STA	Good/Bad	Bad indicates degraded phase data stability. Phase data has exceeded the three sigma limit. Verify a valid signal source is connected.
17-8	Port A OUT	Good/Bad	Bad indicates the framer or LIU is reporting an output fault. Verify the output wiring and termination is correct.
18	Port B Summary	Good/Bad	Provides a quick summary of Port Input B status. See Alarm Numbers 18-1 through 18-8.
18-1	Port B Loss Of Signal	Good/Bad	Bad indicates that the unit is unable to detect a valid signal. Verify that there is a valid signal connected to Clock Input B. Verify that input B is properly configured for the input type.
18-2	Port B Alarm Indication Status	Good/Bad	Bad indicates that the unit is detecting AIS. Verify that input B is not in AIS.
18-3	Port B Out Of Frame	Good/Bad	Bad indicates that the unit is unable to detect valid framing. Verify that there is a valid signal connected to Clock Input B. Verify that the framing type is equivalent to the framing provisioned for in input signal B.
18-4	Port B Bipolar Violation	Good/Bad	Bad indicates that the unit is detecting bipolar violations. Verify that the CRC and zero suppression settings are equivalent to those provisioned for in input signal B.

Table 7-2 Alarm Messages and Actions (Continued)

Alarm No.	Alarm Name	Event Status non-active/active	Error Indication and Action
18-5	Port B Cyclic Redundancy Checksum	Good/Bad	Bad indicates that the unit is failing CRC. Verify that the CRC setting is equivalent to that of input signal B. Disable the CRC setting.
18-6	Port B PQL	Good/Bad	Bad indicates the input PQL is below the provisioned PQL, or the input SSM was lost. Verify that the PQL settings are correct and the received signal is correct.
18-7	Port B STA	Good/Bad	Bad indicates degraded phase data stability. Phase data has exceeded the three sigma limit. Verify a valid signal source is connected.
18-8	Port B OUT	Good/Bad	Bad indicates the framer or LIU is reporting an output fault. Verify the output wiring and termination is correct.
19	Hardware Configuration	OK/Invalid	Invalid indicates that the unit was not properly configured at the factory. Contact Symmetricom Global Services.
20	Out-A	ALL OK/ Fault(s)	Summarizes status of output cards. See Alarm Numbers 20-1 through 20-5.
20-1	Out-A: Line 1	OK/Fault	Fault indicates a problem with a specific clock output. Action: for CC and 2048, contact Symmetricom Global Services. The output card must be replaced. Action: for AMI (DS1/E1), the alarm could indicate a short on the line. If no short is found, contact Symmetricom Global Services to replace the output card.
20-2	Out-A: Line 2	OK/Fault	
20-3	Out-A: Line 3	OK/Fault	
20-4	Out-A: Line 4	OK/Fault	
20-5	Out-A: Lock	OK/Unlock	Unlock indicates the on-board frequency monitoring logic is no longer synchronized with the main board frequency signal. Contact Symmetricom Global Services to replace the output card.
21	Out-B	ALL OK/ Fault(s)	Summarizes status of output cards. See Alarm Numbers 21-1 through 21-5.

Table 7-2 Alarm Messages and Actions (Continued)

Alarm No.	Alarm Name	Event Status non-active/active	Error Indication and Action
21-1	Out-B: Line 1	OK/Fault	Fault indicates a problem with a specific clock output. Action: for CC and 2048, contact Symmetricom Global Services to replace the output card. Action: for AMI (DS1/E1), the alarm could indicate a short on the line. If no short is found, contact Symmetricom Global Services to replace the output card.
21-2	Out-B: Line 2	OK/Fault	
21-3	Out-B: Line 3	OK/Fault	
21-4	Out-B: Line 4	OK/Fault	
21-5	Out-B: Lock	OK/Unlock	Unlock indicates the on-board frequency monitoring logic is no longer synchronized with the main board frequency signal (CC and 2048 only). Contact Symmetricom Global Services to replace the output card.
22	VCXO	OK/Fail	Fail indicates a hardware failure in the unit. Contact Symmetricom Global Services.

7.3.3 Events

Table 7-3 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 or the CDMA receiver. Otherwise, the Z will not be displayed.

The *event description* – refer to Table 7-3.

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 7-3.

Table 7-3 Events and Event Messages

Condtype	Event Message	Purpose
101	Active Set,<port id>,<ON | OFF>	The active LED has been enabled/disabled
102	Added CDMA Freq,<port id>,####.###	The CDMA frequency has been added to the frequency scan list
103	AIS Generation Set,<port id>,Port A | B, <On | Off>	AIS has been enabled/disabled (for E1/DS1 outputs only)
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.
107	CC Compensation Set,<port id>,Port a,<value>	For the specified port, the composite clock compensation was set to the value shown
108	Change DS1 PQL table,<port id>,PQL # Used | Unused Standard | Non-standard 0xXX	The PQL table has been changed for the following DS1 entries: This option marked the entry as used or unused in the table The standard/Non-standard input type has been set. Only 'standard' entries are matched for input
109	Change E1 PQL table,<port id>,PQL # Used | Unused Standard | Non-standard 0xXX	The PQL table has been changed on the selected port for the following E1 entries: This option marked the entry as used or unused in the table The Standard/Non-standard input type has been set. Only 'standard' entries are matched for input
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

Table 7-3 Events and Event Messages (Continued)

Condtype	Event Message	Purpose
114	CRC Set,<port id>,Port a,<On | Off>	On port A the CRC flag generation (and detection) has been enabled/disabled
115	Deleted CDMA Freq,<port id>,####.###	A specific frequency has been deleted for for the CDMA freq scan list
116	DS1 Compensation Set,<port id>, Port A | B | C | D,<compensation value>	For the specified port, DS1 compensation changed to a specified value
117	E1 Compensation Set,<port id>, Port A | B | C | D,<compensation value>	For the specified port, E1 compensation changed to a specified value
118	E1 SSM In Bit Set,<port id>, Port a,<value>	For the specified port “a”, E1 SSM In Bit has been set to a specified value
119	E1 SSM Out Bit Set,<port id>, Port A | B, <setting>	For the specified port “a”, E1 SSM Out Bit has been set to a specified value
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
123	Framing Type Set,<port id>,Port a, <framing type>	The framing type has been set to a specified value (D4, ESF, CAS, CCS), for the specified port
124	Incoming SSM change,<port id>,PQL <value>	For the specified port, the SSM change to the PQL value has been deleted
125	Input Prov PQL Set,<port id>,Port a, <value>	For the specified port, the input provision PQL value has been set to a value
126	Input Set,<port id>,Port a, <Enabled | Disabled>	For the specified port “a”, the input has been enabled/disabled
127	Input Term Set,<port id>,Port a,<value>	For the specified port “a”, the length termination has been set to Int/Ext
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 Symmetricom Global Services
129	IP Address Set,<port id>,<IP address>	The IP address has been set

Table 7-3 Events and Event Messages (Continued)

Condtype	Event Message	Purpose
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 Symmetricom Global Services
131	IP Broadcast Set,<port id>,<IP address>	The IP broadcast has been set
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 Symmetricom Global Services
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 Symmetricom Global Services (SGS)
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
142	Minor->Major Elevation Time Set,<port id>,## sec	The alarm elevation time (ELEVTIME) from Minor to Major has been set to a specified time on the specified port
143	Output Drive Set,<port id>,Port a, <Enabled | Disabled>	The output drive set on the specified port has been enabled/disabled
144	Output SSM change, PQL ##	The output SSM has been changed to PQL number
145	Port <port id> Cleared User Table	The user table was cleared from the specified port

Table 7-3 Events and Event Messages (Continued)

Condtype	Event Message	Purpose
146	Port <port id> Forced Log Off,<forced port>,"<forced user>"	The specified user was logged off
147	Port Bypass Set,<port id>,Port a, <Enabled | Disabled>	For the specified port "a", the port bypass has been enabled/disabled
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
152	Select Reference, <Receiver | Input A | Input B>	The port is now using the specified control loop as its clock reference source
153	SSM Generation Set,<port id>,Port a, <Enabled | Disabled>	For the specified port "a", the SSM generation set has been enabled/disabled
154	SSM Reading Set,<port id>,Port a, <Enabled | Disabled>	For the specified port "a", the SSM reading set has been enabled/disabled
155	TIM Function Set,<port id>,Port a, <Enabled | Disabled>	For the specified port "a", the SSM TIM function set has been enabled/disabled
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
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
163	Zero Suppression Set,<port id>, Port A | B, <On | Off>	For the specified port "a | b", the zero suppression set has been enabled/disabled

Table 7-3 Events and Event Messages (Continued)

Condtype	Event Message	Purpose
164	Reserved	
165	AIS Generation Set,<port id>, OUT A | B, <On | Off>	AIS has been enabled/disabled, (for E1/DS1 outputs only)
166	CRC Set,<port id>,OUT A | B,<On | Off>	On OUT A | B the CRC flag has been enabled/disabled
167	DS1 Compensation Set,<port id>, OUT A | B, <compensation value>	For the specified port, DS1 compensation has been changed to a specified value
168	E1 Compensation Set,<port id>, OUT A | B, <compensation value>	For the specified port, E1 compensation has been changed to a specified value
169	E1 SSM Out Bit Set,<port id>, OUT A | B, <setting>	For the specified port, E1 SSM Out Bit has been set to a specified value
170	Framing Type Set,<port id>, OUT A | B, <framing type>	The framing type has been set to a specified value (D4, ESF, CAS, CCS), for the specified port
171	Output Drive Set,<port id>, OUT A | B,<Enabled | Disabled>	The output drive set on the specified port has been enabled/disabled
172	Output SSM change, PQL ##, OUT A | B,<number>	The output SSM has been changed to PQL number
173	SSM Generation Set,<port id>, OUT A | B,<Enabled | Disabled>	For the specified port, the SSM generation set has been enabled/disabled
174	Zero Suppression Set,<port id>, OUT A | B,<On | Off>	For the specified port, the zero suppression set has been enabled/disabled
175	Framing Type Set,<port id>, INP A | B,<framing type>	The framing type has been set to a specified value (D4, ESF, CAS, CCS), for the specified port
176	OT21 Msg	Text sent using the MSG command to communicate with other users.
177	Reference Priority Set	The Reference Priority has changed.
178	Output Squelch Set	Port Squelch setting has changed.
179	Output Squelch Set	Output Squelch setting has changed.

In this Appendix

Appendix A Regulatory Requirements

This appendix provides information about safety and EMC standards and requirements for the OT-21.

The OT-21 unit is designed to meet these safety and EMC 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.

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Appendix B OT-21 Configuration Options

Recommendation: The OT-21 microprocessor allows operators to save the current configuration as a user-defined default and store it in NVRAM. After setting the software options, Symmetricom recommends saving your customized configuration settings so they may be easily restored after commissioning testing.

B.1 Overview

The OT-21 is available in a variety of configuration combinations and options, allowing the unit to be tailored to your specific needs. The Primary Reference Receiver (PRR) configuration features a highly accurate and reliable Primary Reference Source (PRS) that derives Stratum 1 timing from CDMA (patent pending) or GPS. The Synchronization Supply Unit (SSU) configuration adds the ability to accept two DS1/E1 input sources which can be retimed to synchronize with the PRS signal. A variation of the SSU configuration eliminates the PRS and re-timing functionality. It derives clocking from the input DS1/E1 signals. Some of the optional features introduced in this appendix include:

- Chassis – DE9 or wire wrap connectors.
- Outputs – Two DS1/E1 outputs plus two clock option cards. Each clock option card provides four outputs. Clock option cards are available for Composite Clock (CC), 2048 kHz, and DS1/E1 (AMI).
- Oscillator – Rubidium (Stratum 2) or Quartz (Stratum 3E).

B.2 Configuration Features and Options by Item Number

Table B-1 provides information about the OT-21 item numbering for available configurations, features, and options. The OT-21 product name is shown on the display panel of each unit. An item number is shown on a label affixed to the display panel:

xxxxxxxx-xxx-x
(1) (2)

- The first eight digits of item number (1) represent the chassis style (25413150 or 25413151).
- The next three digits (2) represent the options and features:
  - 0xx through Axx represent the PRR, SSU, local oscillator, and radio receiver functions.
  - x0x through x4x represent the A1 Quad Output Card options.
  - xx0 through xx4 represent the A2 Quad Output Card options.

For example, item number 25413150-011-0 is a OT-21 NEBS Chassis with DE9 connectivity, PRR-21, 2E Rubidium local oscillator, GPS radio receiver, and two AMI DS1-DS1/E1 Quad Output cards.

To determine the configuration of your unit, find the item number in the tables below arranged by chassis type.

Table B-1 NEBS DE9 Configurations I/N 25413150-xxx-0

Item Number	PRR/SSU	Local Oscillator	Radio Receiver	Output Cards	
				Group A	Group B
25413150-011-0	PRR	2E Rb	GPS	AMI	AMI
25413150-021-0	PRR	2E Rb	GPS	AMI	2048 kHz
25413150-022-0	PRR	2E Rb	GPS	2048 kHz	2048 kHz
25413150-031-0	PRR	2E Rb	GPS	AMI	CC
25413150-111-0	PRR	3E Quartz	GPS	AMI	AMI
25413150-121-0	PRR	3E Quartz	GPS	AMI	2048 kHz
25413150-122-0	PRR	3E Quartz	GPS	2048 kHz	2048 kHz
25413150-131-0	PRR	3E Quartz	GPS	AMI	CC
25413150-211-0	PRR	2E Rb	CDMA	AMI	AMI

Table B-1 NEBS DE9 Configurations I/N 25413150-xxx-0 (Continued)

Item Number	PRR/SSU	Local Oscillator	Radio Receiver	Output Cards	
				Group A	Group B
25413150-221-0	PRR	2E Rb	CDMA	AMI	2048 kHz
25413150-222-0	PRR	2E Rb	CDMA	2048 kHz	2048 kHz
25413150-231-0	PRR	2E Rb	CDMA	AMI	CC
25413150-311-0	PRR	3E Quartz	CDMA	AMI	AMI
25413150-321-0	PRR	3E Quartz	CDMA	AMI	2048 kHz
25413150-322-0	PRR	3E Quartz	CDMA	2048 kHz	2048 kHz
25413150-331-0	PRR	3E Quartz	CDMA	AMI	CC
25413150-411-0	SSU	2E Rb	GPS	AMI	AMI
25413150-421-0	SSU	2E Rb	GPS	AMI	2048 kHz
25413150-422-0	SSU	2E Rb	GPS	2048 kHz	2048 kHz
25413150-431-0	SSU	2E Rb	GPS	AMI	CC
25413150-511-0	SSU	3E Quartz	GPS	AMI	AMI
25413150-521-0	SSU	3E Quartz	GPS	AMI	2048 kHz
25413150-522-0	SSU	3E Quartz	GPS	2048 kHz	2048 kHz
25413150-531-0	SSU	3E Quartz	GPS	AMI	CC
25413150-611-0	SSU	2E Rb	CDMA	AMI	AMI
25413150-621-0	SSU	2E Rb	CDMA	AMI	2048 kHz
25413150-622-0	SSU	2E Rb	CDMA	2048 kHz	2048 kHz
25413150-631-0	SSU	2E Rb	CDMA	AMI	CC
25413150-711-0	SSU	3E Quartz	CDMA	AMI	AMI
25413150-721-0	SSU	3E Quartz	CDMA	AMI	2048 kHz
25413150-722-0	SSU	3E Quartz	CDMA	2048 kHz	2048 kHz
25413150-731-0	SSU	3E Quartz	CDMA	AMI	CC
25413150-811-0	SSU	2E Rb	Not Used	AMI	AMI

Table B-1 NEBS DE9 Configurations I/N 25413150-xxx-0 (Continued)

Item Number	PRR/SSU	Local Oscillator	Radio Receiver	Output Cards	
				Group A	Group B
25413150-821-0	SSU	2E Rb	Not Used	AMI	2048 kHz
25413150-822-0	SSU	2E Rb	Not Used	2048 kHz	2048 kHz
25413150-831-0	SSU	2E Rb	Not Used	AMI	CC
25413150-911-0	SSU	3E Quartz	Not Used	AMI	AMI
25413150-921-0	SSU	3E Quartz	Not Used	AMI	2048 kHz
25413150-922-0	SSU	3E Quartz	Not Used	2048 kHz	2048 kHz
25413150-931-0	SSU	3E Quartz	Not Used	AMI	CC

Table B-2 Configurations NEBS Wire Wrap I/N 25413151-xxx-0

Item Number	PRR/SSU	Local Oscillator	Radio Receiver	Output Cards	
				Group A	Group B
25413151-011-0	PRR	2E Rb	GPS	AMI	AMI
25413151-021-0	PRR	2E Rb	GPS	AMI	2048 kHz
25413151-022-0	PRR	2E Rb	GPS	2048 kHz	2048 kHz
25413151-031-0	PRR	2E Rb	GPS	AMI	CC
25413151-111-0	PRR	3E Quartz	GPS	AMI	AMI
25413151-121-0	PRR	3E Quartz	GPS	AMI	2048 kHz
25413151-122-0	PRR	3E Quartz	GPS	2048 kHz	2048 kHz
25413151-131-0	PRR	3E Quartz	GPS	AMI	CC
25413151-211-0	PRR	2E Rb	CDMA	AMI	AMI
25413151-221-0	PRR	2E Rb	CDMA	AMI	2048 kHz
25413151-222-0	PRR	2E Rb	CDMA	2048 kHz	2048 kHz
25413151-231-0	PRR	2E Rb	CDMA	AMI	CC
25413151-311-0	PRR	3E Quartz	CDMA	AMI	AMI
25413151-321-0	PRR	3E Quartz	CDMA	AMI	2048 kHz
25413151-322-0	PRR	3E Quartz	CDMA	2048 kHz	2048 kHz

Table B-2 Configurations NEBS Wire Wrap I/N 25413151-xxx-0 (Continued)

Item Number	PRR/SSU	Local Oscillator	Radio Receiver	Output Cards	
				Group A	Group B
25413151-331-0	PRR	3E Quartz	CDMA	AMI	CC
25413151-411-0	SSU	2E Rb	GPS	AMI	AMI
25413151-421-0	SSU	2E Rb	GPS	AMI	2048 kHz
25413151-422-0	SSU	2E Rb	GPS	2048 kHz	2048 kHz
25413151-431-0	SSU	2E Rb	GPS	AMI	CC
25413151-433-0	SSU	2E Rb	GPS	CC	CC
25413151-511-0	SSU	3E Quartz	GPS	AMI	AMI
25413151-521-0	SSU	3E Quartz	GPS	AMI	2048 kHz
25413151-522-0	SSU	3E Quartz	GPS	2048 kHz	2048 kHz
25413151-531-0	SSU	3E Quartz	GPS	AMI	CC
25413151-533-0	SSU	3E Quartz	GPS	CC	CC
25413151-611-0	SSU	2E Rb	CDMA	AMI	AMI
25413151-621-0	SSU	2E Rb	CDMA	AMI	2048 kHz
25413151-622-0	SSU	2E Rb	CDMA	2048 kHz	2048 kHz
25413151-631-0	SSU	2E Rb	CDMA	AMI	CC
25413151-711-0	SSU	3E Quartz	CDMA	AMI	AMI
25413151-721-0	SSU	3E Quartz	CDMA	AMI	2048 kHz
25413151-722-0	SSU	3E Quartz	CDMA	2048 kHz	2048 kHz
25413151-731-0	SSU	3E Quartz	CDMA	AMI	CC
25413151-811-0	SSU	2E Rb	Not Used	AMI	AMI
25413151-821-0	SSU	2E Rb	Not Used	AMI	2048 kHz
25413151-822-0	SSU	2E Rb	Not Used	2048 kHz	2048 kHz
25413151-831-0	SSU	2E Rb	Not Used	AMI	CC
25413151-911-0	SSU	3E Quartz	Not Used	AMI	AMI
25413151-921-0	SSU	3E Quartz	Not Used	AMI	2048 kHz
25413151-922-0	SSU	3E Quartz	Not Used	2048 kHz	2048 kHz
25413151-931-0	SSU	3E Quartz	Not Used	AMI	CC

IN THIS APPENDIX

Appendix C ICS Commands

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

C.1 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
- Port and Output Status

- Port and Output Configurations
- Radio receiver status
- GPS Antenna position
- Signal formats
- Frequency and PLL control information
- Input signal variance calculations
- Local oscillator frequencies
- Selections and faults for outputs

The COMMS local (J1) port defaults to ICS mode upon startup. The factory default setting for 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.

C.1.1 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 Section 4.4.2, Configuring Users With ICS Commands 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.

C.2 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 `ENABLE` 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
ACTIVE	Used to Read/Set the current active indication on the unit.
ALARM	Provides a view of the current status of alarm indications on the unit. Only active alarm indications are displayed unless an option is specified.
BYE	Returns the unit to an idle access level on ports A and L. Returns the unit to an idle access level on ports A and L. Terminates a Telnet session connection through Ethernet.
CLS	This command clears the screen if the communications port is configured for ANSI mode operation.

Table C-3 ICS Command List (Continued)

Command	Definition
COMM	Allows you to read and set options for the communications ports.
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 or CDMA 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.
FREQ	Provides a view of the current frequency control values.
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.
IVAR	Displays the current variance calculation information for the given input source.
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.
LOOP	Allows you to read or set the current frequency control loop status.
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.
OUTPUT	Used to read or set up the optional output cards. When setting options with this command, specify the port and output card. If no port is given, the settings and status for both cards is given.

Table C-3 ICS Command List (Continued)

Command	Definition
PING	Allows testing of the Ethernet connection by sending an ICMP ECHO REQUEST packet to a known address.
PORT	Used to read or set the framed clock options for the instrument. Ports A or B may be addressed. If no port is given, then both are implied.
PRIORITY	Used to read or set the priority setting for reference selection. This selects the first choice for reference with automatic switchover to the second and third choices. Operation is revertive when the higher choice returns.
PQLTABLE	Used to read or set the current PQL translation table information. This table provides the translation from the internal Priority Quality Level (PQL) to the Sync Status Message (SSM) for the various framing types.
REFERENCE	Displays the current clock reference source.
REFERENCE	Used to read or set the current report status for the unit. Report enabling is a toggle function. The first time it is entered reporting is enabled, the next time it is disabled, etc.
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.
SYNTAX	Allows you to obtain a list of available commands on the unit. If a command is entered, the syntax for the command is provided.
SYSTIME	Shows the length of time that the unit has been powered on.
TEMP	Shows the current system temperature.
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 or CDMA receiver.
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.

C.3 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.

C.3.1 ACTIVE

Level 1

Allows you to read the current system status of the ACTIVE LED.

Syntax

ACTIVE

Level 2 Level 3 Level 4

Allows you to read or set the current system status of the ACTIVE LED.

Syntax

ACTIVE [ON | OFF]

Options

ON – Sets the ACTIVE LED on

OFF – Sets the ACTIVE LED Off

Example

To set the ACTIVE LED on, type `ACTIVE ON` and press **Enter**.

C.3.2 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**.

C.3.3 BYE

Level 1 Level 2 Level 3 Level 4

Logs off the user and returns the unit to access level 0 (Idle) on Port A and COMMS local port. Terminates a Telnet connection (Ethernet).

Syntax

BYE

C.3.4 CLS

Level 1 Level 2 Level 3 Level 4

Clears the screen if the communications terminal is operating in ANSI mode.

Syntax

CLS

C.3.5 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**.

C.3.6 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.

C.3.7 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. In SSU units with no engine the user sets the date. If an engine is present the engine sets the date. When setting the date, the two century digits and leading zeros are optional.

Syntax

DATE

Example

To set the date in an SSU unit with no engine, type `DATE 02-06-04` or type `DATE 2-6-4` and press **Enter**.

C.3.8 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**.

C.3.9 ENGINE

Level 1

Allows you to read information from the GPS or CDMA 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.

FREQ – List the current frequency list for CDMA engines.

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 and CDMA 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.

Syntax For CDMA Engine

ENGINE TDATA [ON | OFF]

ENGINE FREQ [{ADD | DEL} f [#]

ENGINE FREQ SCAN {START | CELL | PCS} [#]

ENGINE FREQ SCAN STOP

ENGINE BUMP

Options

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

TDATA ON – reporting the tracking data every five seconds.

TDATA [OFF] – reporting the tracking data.

FREQ – the current CDMA frequency list.

FREQ {ADD | DEL} f [#] – Used to add or delete a frequency in the frequency list. The "f" is a number xxx.xxx specifying a cellular frequency in the range 820.000 to 860.000 MHz, or a number xxxx.xxx specifying a PCS frequency in the range 1920.000 to 1999.000 MHz. The " # " indicates the frequency list slot number from 1 to 32. If “#” is not specified, it goes in the next available slot. If the table is full, the frequency is not added.

FREQ SCAN {START | CELL | PCS} [#] – Used to scan for CELL or PCS or both (START) frequencies. Entering a number (#) forces the scan to stop after finding that number of strong base stations.

FREQ SCAN STOP – Used to stop a scan in progress and return to normal tracking.

BUMP – Used to force the next frequency in the frequency list into the CDMA engine.

Responses

To ENG

```
CDMA: n.nn, yyyy-mm-dd
```

To ENG TDATA

```
xxxx.xxx nnnn Ok Thh:mm:ssZ
```

To ENG FREQ

A list of the current frequencies is displayed as follows:

```
Current Frequency List:
#01 1935.000   #09    -.-    #17    -.-    #25    -.-
#02 1937.500   #10    -.-    #18    -.-    #26    -.-
#03    -.-     #11    -.-    #19    -.-    #27    -.-
#04    -.-     #12    -.-    #20    -.-    #28    -.-
#05    -.-     #13    -.-    #21    -.-    #29    -.-
#06    -.-     #14    -.-    #22    -.-    #30    -.-
#07    -.-     #15    -.-    #23    -.-    #31    -.-
#08    -.-     #16    -.-    #24    -.-    #32    -.-
```

Examples

To add a frequency such as 1931.250 to slot 1 in the frequency list (up to 32 entries maximum) in a unit with a CDMA engine, type `ENG FREQ ADD 1931.250 1` and press **Enter**.

To start scanning for three cellular or PCS band frequencies that the OT-21 can extract timing information from, type `ENG FREQ SCAN START 3` and press **Enter**.

To stop a scan before it is completed, type `ENG FREQ SCAN STOP` and press **Enter**.

To replace the current engine frequency with the next frequency in the list, type `ENG BUMP` and press **Enter**.

C.3.10 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.

C.3.11 EXIT

Level 0 Level 1 Level 2 Level 3 Level 4

Logs off the user and terminates the telnet session.

Syntax

EXIT

C.3.12 FREQ

Level 1 Level 2 Level 3 Level 4

Provides a view of the current frequency control values.

Syntax

FREQ [AVG]

Options

AVG – Show the current 24-hour averaging values for frequency offset and aging of the Local Oscillator.

C.3.13 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**.

C.3.14 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

C.3.15 INFO

Level 1 Level 2 Level 3 Level 4

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

Syntax

INFO

C.3.16 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

C.3.17 IVAR

Level 2 Level 3 Level 4

Displays the current variance calculation information for the given input source.

Syntax

IVAR [{A | B}]

Options

A – Clock input #1 (SSU only).

B – Clock input #2 (SSU only).

C.3.18 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**.

C.3.19 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]

C.3.20 LOOP

Level 3 Level 4

Allows you to read or set the current frequency control loop status.

Syntax

LOOP [WARM [n] | ACQ | HOLD | NORM]

Options

WARM – Put the control loop into warm-up. In this mode the loop waits for the time-out period before going into the acquisition mode. If 'n' is entered this is the warm-up time, in seconds.

ACQ – Put the control loop into the acquisition mode. In this mode the loop widens its bandwidth and attempts to lock onto the signal. Going into this mode may cause the unit to go into an alarm condition (depending on the noise levels of the input). The unit will automatically change to the NORM mode after acquisition is completed.

HOLD – Hold the current frequency updates. This places the unit into holdover mode, which means that the 24 hour average of the frequency control is used as the frequency offset for the oscillator. This may be used to test the holdover modes of a system. If the unit has not established a 24 hour average, the system enters the Halt mode.

NORM – Put the control loop into normal, locked mode.

RECOVER mode cannot be set. It indicates that Frequency is locked but time is being re-synchronized with the reference engine.

Examples

To set the loop warm-up mode to ten minutes, type `LOOP WARM 600` and press **Enter**.

To set the loop to holdover mode, type `LOOP HOLD` and press **Enter**.

C.3.21 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**.

C.3.22 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**.

C.3.23 OUTPUT

Level 1

Displays the current setup information for the optional output cards. If no port is given, the settings and status for both cards is given.

Syntax

OUTPUT [A | B]

Options

A – Displays the setup for output card A.

B – Displays the setup for output card B

Level 2 Level 3 Level 4

Used to read or set up the optional output cards. If no channel is given, the settings and status for both cards is given. The selectors allow for card level or channel level access to the output option modules. Only some of the options allow for channel access; these are noted in their description. Card options are dependent on the type of card.

Syntax

OUTPUT [{A [1 | 2 | 3 | 4}] | {B [1 | 2 | 3 | 4}] [ENABLE | DISABLE] (output card specific options)

Options

[ENABLE | DISABLE] – Enable/Disable the card from the card/channel. This allows for unused outputs from the unit to be disabled. The default is that all cards are enabled.

Framed AMI Output Cards

Syntax

OUTPUT [{A [1 | 2 | 3 | 4}] | {B [1 | 2 | 3 | 4}] [ENABLE | DISABLE] (AMI card options)

Options (AMI output cards)

FRAME {D4 | ESF | CAS | CCS} – Set the framing type for the output card (channel access is not allowed).

- D4 – One of the DS1 style framing types. If the user selects D4 SSM information is automatically turned off.
- ESF – Extended Super Frame, one of the DS1 style framing types. This framing type allows for SSM generation.
- CAS – Common Associated Signaling, one of the E1 style framing types.
- CCS – Common Channel Signaling, one of the E1 style framing types.

Note: ESF and CSF are the default frame types.

ZS {ON | OFF} – Turn On or Off the Zero Suppression for output from card (channel access is not allowed). Default is ZS ON.

COMP {133FT | 266FT | 399FT | 533FT | 655FT | 75OHM | 120OHM} – Set the line compensation for the output from the card/channel. xxxFT is valid only if the framing type is one of the DS1 style framing types (D4 or ESF), while 75OHM and 120OHM are used for the E1 types. Default is 133FT, or 120 ohms.

SSM {ON | OFF | BIT {ALL | n}} – Turn On or Off the SSM generation for the card (channel access is not allowed). Turning on SSM in DS1 automatically forces the framing type to ESF (the only framing type that can have SSM information in DS1). If the framing type is one of the E1 types (CAS or CCS) the user can also indicate the bit location of the SSM information within the message. Valid entries are 4 through 8,or ALL, meaning that the SSM information is placed in all output bit channels. Default is SSM On for both input and output, Bit Position 4.

AIS {ON | OFF} – Turn On or Off the Alarm Indication Status information from the card (channel access is not allowed). This is an unframed all ones signal generated by the unit. This output is generated whenever the frequency output from the unit is degraded. If the output frequency is not degraded then the output is the normal framed output. This enables network switching to another reference signal if the connected equipment does not have the ability to utilize SSM information. Default is Off.

SQUELCH {ON|OFF} – Enables (On) or disable (Off) squelching of the output from the port. When squelch is on and the holdover alarm is active, the output signal is turned off. When squelch is off and the holdover alarm is active, the output is unchanged except for the SSM. Default is squelching off (output always on).

Composite Clock Output Cards

Syntax

OUTPUT [{A [1 | 2 | 3 | 4}] | {B [1 | 2 | 3 | 4}] [ENABLE | DISABLE] COMP n

Options (Composite Clock output cards)

COMP n – Sets the line compensation for the output card/channel. It is possible to change all of the outputs for the card by accessing only the card level (no channel suffix). Table C-4 lists the functions associated with COMP numbers.

Table C-4 COMP Number Functions

COMP Number	Function
0	5/8 Duty cycle, 0 offset
1	5/8 Duty cycle, 700 ns offset
2	5/8 Duty cycle, 1400 ns offset
3	5/8 Duty cycle, 2100 ns offset
4	1/2 Duty cycle, 0 offset
5	1/2 Duty cycle, 700 ns offset
6	1/2 Duty cycle, 1400 ns offset
7	1/2 Duty cycle, 2100 ns offset

C.3.24 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]

C.3.25 PORT

Level 1

Display the I/O port options for the unit. If no port is given, both ports A and B are displayed.

Syntax

PORT [A | B]

Options

A-B - Displays the option settings for reference Port A or B.

Level 2 Level 3 Level 4

Display or set the I/O port options for the unit. If no port is given, both ports A and B are implied. Some settings affect both the input and output. In the PRS version, only outputs are set, no inputs are available.

Syntax

PORT [A | B] [port options]

Options

Port options can be any one or more of the following and are separated by spaces:

ENABLE|DISABLE – Enables or disables the port input. Disable turns off all alarms and measurements from the port and it cannot be selected as a reference or used for oscillator failure bypass. Default is enabled.

BYPASS {ON|OFF} – Turns on or off the direct (relay) bypass of input to output. Not available for 2048 inputs. When enabled, all alarms and measurements from the port are turned off and it cannot be selected as a reference or used for oscillator failure bypass. Default is off.

ISOLATE {ON|OFF} – Enables (On) or disables (Off) isolated-ones test pattern output used for waveform testing only. Applies only to the data channels in DS1 and E1 signals. Default is off.

AIS {ON|OFF} – When AIS is on, the unit generates an Alarm Indication Signal (AIS) on the output in the event of a degraded frequency alarm. With AIS off, the output is unchanged except for the SSM when in alarm. Default is off.

Note: AIS and SQUELCH operation are independent, but SQUELCH overrides AIS.

SQUELCH {ON|OFF} – Enables (On) or disable (Off) squelching of the output from the port. When squelch is on and the holdover alarm is active, the output signal is turned off. When squelch is off and the holdover alarm is active, the output is unchanged except for the SSM. Default is squelching off (output always on).

COMP {133FT|266FT|399FT|533FT|655FT|75OHM|120OHM} – Sets the output signal waveshape. The 'FT' settings are for DS1 outputs while the 'OHM' settings are for E1 outputs. Defaults are 133 feet or 120 Ohms.

CRC {ON|OFF} – Enables (On) or disables (Off) CRC checking and generation on E1 signals. Default is on.

FRAME {D4|ESF|CAS|CCS|2048K} – Selects the framing type for the port. This applies to both port input and output. D4 and ESF set DS1 signal and framing. CAS and CCS set E1 signal and framing. 2048K selects 2048 kHz clock input with no framing and output is turned off. The 2048K option is only available on Ports A and B of the SSU version. Inputs are not available in the PRS version. Default is ESF.

PROV {1..16} – Sets the input provisioned PQL level from 1 to 16. The provisioned value is used when no SSM is available. Available on the SSU version only. Default is PQL 4 (STU).

SSM [IN|OUT] {ON|OFF|BIT {ALL|n}} – IN sets up reading of the sync status message on inputs. OUT enables/disables insertion of the SSM information on the output. For E1, the bit position of the SSM can also be set. ALL specifies the message is in bits 4 through 8, or n specifies only the selected bit 4 through 8. The output SSM reports the current PQL level of the control loop. Default is SSM on and E1 bit 8.

TERM {EXT|INT|75|100|120} – sets input termination as external or internal choice in Ohms. Default is internal, 100 Ohms for DS1, 120 Ohms for E1.

TIM {ON|OFF} – Sets Timing Insertion Mode (TIM) on or off. This applies to outputs of the reference ports in the SSU version only. When enabled, the input data channels are passed through to the output data with timing provided by the internal clock. SSU default is off.

ZS {ON|OFF} – Enables/Disables zero suppression. This applies to both port input and output. Format is B8ZS for DS1 or HDB3 for E1 signals. Default is on.

Response

Displays the option settings that apply to the installed ports.

C.3.26 PRIORITY

Level 1

Displays the priority setting for reference selection.

Syntax

PRIORITY

Options

none

Level 2 Level 3 Level 4

Display or set the priority setting for reference selection. This selects the first choice for reference with automatic switchover to the second and third choices. Operation is revertive when higher choice returns.

Syntax

PRIORITY [ENG | PORT]

Options

ENG – select the Engine as first priority for the control loop reference. (default if an engine is present)

PORT – select the input ports as first priority for the control loop reference. Port A is the first choice with switchover to B if it fails.

Response

Reference Priority: [Engine | Ports]

C.3.27 PQLTABLE

Level 2 Level 3 Level 4

Read/Set the current Priority Quality Level Table translation information. This table provides the translation between the internal Priority Quality Level (PQL) to the Sync Status Message (SSM) for the various framing types. Refer to Section 4.4.6, Configuring Clock Inputs and Outputs With ICS Commands, for more information on the PQL table.

Syntax

PQLTABLE [FACTORY | pql# [DS1 | E1] {UNUSED | [SSM n] [DESC str] [STD {ON | OFF}]}]

Options

FACTORY – Set the factory defaults for the table. No other parameters may be used.

pql# – PQL number for entry (1 through 16). Other parameters must be present to identify DS1 or E1 entry type and the associated information.

DS1 | E1 – Which entry to be affected. If not given, both entries are assumed.

UNUSED – Marks this entry as unused in the table.

SSM n – Set the SSM value. This is the value that will actually be used for the framing type. This must be specified as a hex number by proceeding it with '0x'.

DESC str – Set the descriptive text string for this entry. Max of 14 characters. Note that the string may be enclosed in double quotes to allow entry of spaces and lower-case letters.

STD – Set/Clear this entry as the standard input type. Only 'standard' entries are matched for input.

C.3.28 REFERENCE

Level 1 Level 2 Level 3 Level 4

Display the current clock reference source.

Syntax

REFERENCE

C.3.29 REPORTS

Level 2 Level 3 Level 4

Read/Set the current report outputs for the unit. Reports are system information that is not as important an event, but may be useful or interesting. Report enabling is a toggle function. The first time it is entered, reporting is enabled; the next time it is disabled, etc.

Syntax

REPORTS [#]

Options

[#] – The number of the report requested.

Valid report numbers are:

- 0 (Phase samples) – Show the reference phase samples and unit temperature each second.
- 1 (Frequency control) – Updates to the DDS circuitry are reported every five seconds.
- 2 (Periodic Output) – Generates an output from the unit every five minutes to keep the communication ports active.
- 3 (Position Updates) – Show the position updates as they are calculated.

C.3.30 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).

C.3.31 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.

C.3.32 STATUS

Level 1 Level 2 Level 3 Level 4

Displays the current overall status of the unit.

Syntax

STATUS

C.3.33 SYNTAX

Displays a list of available commands on the unit for your user level and their syntax.

Level 0 Level 1 Level 2 Level 3 Level 4

Syntax

SYNTAX (COMMAND)

Examples

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

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

C.3.34 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

C.3.35 TEMP

Level 1 Level 2 Level 3 Level 4

Displays the current system temperature.

Syntax

TEMP

C.3.36 TIME

Level 1 Level 2 Level 3 Level 4

Displays the current time for the unit. In SSU units with no engine the user sets the time. If an engine is present the engine sets the time.

Syntax

TIME

C.3.37 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.

C.3.38 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

C.3.39 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

IN THIS APPENDIX

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.

D.1 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
- Port and Output Status
- INP, Port, and Output Configurations
- Radio receiver status
- GPS Antenna position
- Signal formats
- Frequency and PLL control information
- Input signal variance calculations
- Local oscillator frequencies
- Selections and faults for outputs

D.1.1 Default Mode Operation

The COMMS local (J1) port and 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 Section D.2.4, User Access Levels).

D.1.2 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 COMM A for TL1 communications, connect a serial cable from your computer to J15 (COMM 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 COMM 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.

D.1.3 Confirming Network Elements

To return a description for the network element:

Type `RTRV-NETYPE;`

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.

D.1.4 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.

D.2 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.

D.2.1 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.

D.2.2 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;
```

D.2.3 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.

D.2.4 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 Section 4.5, Configuring With TL1 Commands, 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.

D.3 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.

D.3.1 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

Table D-2 Command Field Descriptions (Continued)

Parameter	Valid Values	Description
aid	**ALL** – all components in the unit **SYS** – OT-21 system **COMM[-z]** – serial port L or A **ENG** – the installed GPS or CDMA engine **INP-x** – input port x **PORT-x** – output channel x **OUT[-x [-y]]** – the y-th output on output group x **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
almcde	***C** critical alarms ****** major alarms ***^** 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

Table D-2 Command Field Descriptions (Continued)

Parameter	Valid Values	Description
ocrdat	YY-MM-DD	Occurrence Date – (date of occurrence)
ocrtim	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
alrm	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
EnaDis	**ENA** (enabled) or **DIS** (disabled)	Reports user configuration in RTRV-PRMTR responses
status	**OK**, **DIS**, **FL**T (faulted), **TIM**, **BYP**	Reports current status of INP, PORT, and OUT 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 **alrmcde 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-4 lists the autonomous alarm reports generated by the OT-21. 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]:ntfcncde,condtype,srveff,ocrdat,ocrtim:
\"condscr\""<cr><lf>
```

Table D-3 describes each element in the autonomous alarm report.

Table D-3 Autonomous Alarm Report

Parameter	Description
almcde	one of the two-character codes *C, **, *^, or A^ (^ = space) ■ *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-4
ntfcncde	one of the two-character codes CR “critical”, MJ “major”, MN “minor”, CL “clear”, IG “ignore”
condtype	the condtype number in Table D-4 (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	<alarm description ≥ <current alarm status>, <debounce time> [,<elevation>] where: <alarm description> ICS alarm description string <current alarm status> ICS Event Message <debounce time> “set” or “clr” time for the alarm (Immediate and '0' are the same) <elevation> optional field. If present either "ELEVATED", or "2ND ELEVATION" depending on elevation levels that have occurred

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 **ntfcncde** 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-4 TL1 Alarms

Cond Type	Text	Alarm Not Active	Alarm Active	Default Settings			Aid
				On	Off	Alarm Level	
0	Rcvr Tracking	Yes	No	300	0	MINOR	ENG
1	Rcvr Antenna	Connected	Not Connected	0	0	MAJOR	ENG
2	Antenna Load	Not Shorted	Shorted	0	0	MAJOR	ENG
3	Engine HW	Good	Bad	0	0	MAJOR	ENG
4	Engine System	Good	Bad	300	0	MINOR	ENG
5	Receiver Posn	Good	Unknown	0*	0*	MINOR	ENG
6	Oscillator	Present	Not Present	0*	0*	CRITICAL	SYS
7	Freq Control	No Holdover	Holdover	300	0*	MINOR	SYS
8	Output Freq	OK	Degraded	600	0	MAJOR	SYS

Table D-4 TL1 Alarms (Continued)

Cond Type	Text	Alarm Not Active	Alarm Active	Default Settings			Aid
				On	Off	Alarm Level	
9	Output Time	OK	Degraded	600	0	MINOR	SYS
10	Power Summary	Present	Not Present	0*	0*	MINOR	PWR
10-1	Power A	Present	Not Present	0*	0*	MINOR	PWR-A
10-2	Power B	Present	Not Present	0*	0*	MINOR	PWR-B
11	Sys Clock PLL	Locked	Not Locked	0*	0*	CRITICAL	SYS
12	Rubidium PLL	Locked	Not Locked	0*	0*	CRITICAL	SYS
13	Freq Ctrl Range	OK	Out of Range	300	0	MAJOR	SYS
14	Unit HW	OK	Failed	0*	0*	MINOR	SYS
15	Eng Stability	Good	Bad	30	10	MINOR	ENG
17	Port A Summary	Good	Bad	0*	0*	MINOR	INP-A
17-1	Port A LOS	Good	Bad	10	5	MINOR	INP-A
17-2	Port A AIS	Good	Bad	12	5	MINOR	INP-A
17-3	Port A OOF	Good	Bad	14	5	MINOR	INP-A
17-4	Port A BPV	Good	Bad	16	5	MINOR	INP-A
17-5	Port A CRC	Good	Bad	16	5	MINOR	INP-A
17-6	Port A PQL	Good	Bad	10	5	MINOR	INP-A
17-7	Port A STA	Good	Bad	10	5	MINOR	INP-A
17-8	Port A OUT	Good	Bad	0*	o*	MINOR	INP-A
18	Port B Summary	Good	Bad	0*	0*	MINOR	INP-B
18-1	Port B LOS	Good	Bad	10	5	MINOR	INP-B
18-2	Port B AIS	Good	Bad	12	5	MINOR	INP-B
18-3	Port B OOF	Good	Bad	14	5	MINOR	INP-B
18-4	Port B BPV	Good	Bad	16	5	MINOR	INP-B
18-5	Port B CRC	Good	Bad	16	5	MINOR	INP-B
18-6	Port B PQL	Good	Bad	10	5	MINOR	INP-B
18-7	Port B STA	Good	Bad	10	5	MINOR	INP-B

Table D-4 TL1 Alarms (Continued)

Cond Type	Text	Alarm Not Active	Alarm Active	Default Settings			Aid
				On	Off	Alarm Level	
18-8	Port B OUT	Good	Bad	0*	o*	MINOR	INP-B
19	HW Config	OK	Invalid	0*	0*	CRITICAL	SYS
20	Output A	All OK	Fault(s)	0*	0*	MINOR	OUT-A
20-1	Out-A:Line 1	OK	Fault	0*	0*	MINOR	OUT-A-1
20-2	Out-A:Line 2	OK	Fault	0*	0*	MINOR	OUT-A-2
20-3	Out-A:Line 3	OK	Fault	0*	0*	MINOR	OUT-A-3
20-4	Out-A:Line 4	OK	Fault	0*	0*	MINOR	OUT-A-4
20-5	Out-A:Lock	OK	Unlocked	0*	0*	MINOR	OUT-A
21	Output B	All OK	Fault(s)	0*	0*	MINOR	OUT-B
21-1	Out-B:Line 1	OK	Fault	0*	0*	MINOR	OUT-B-1
21-2	Out-B:Line 2	OK	Fault	0*	0*	MINOR	OUT-B-2
21-3	Out-B:Line 3	OK	Fault	0*	0*	MINOR	OUT-B-3
21-4	Out-B:Line 4	OK	Fault	0*	0*	MINOR	OUT-B-4
21-5	Out-B:Lock	OK	Unlocked	0*	0*	MINOR	OUT-B
22	VCXO	OK	Failed	0*	0*	CRITICAL	SYS
Note: * indicates on/off times that are fixed at zero and cannot be changed.							

D.3.2 TL1 Autonomous Event Reports

Table D-6 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-5 describes the elements in the autonomous event report.

Table D-5 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-6, <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-6 TL1 Events

condtype	Event Message	AIDs
101	Active Set,<port id>,{On | Off}	SYS
102	Added CDMA Freq,<port id>,####.###	ENG
103	AIS Generation Set,<port id>,Port {A | B},{On | Off}	PORT-A, PORT-B
104	Alarm Set,<port id>,Alarm ##, CLR delay ## sec	SYS
105	Alarm Set,<port id>Alarm ##,level {IGNORE | REPORT | MINOR | MAJOR | CRITICAL}	SYS
106	Alarm Set,<port id>,Alarm ##,SET delay ## sec	SYS
107	CC Compensation Set,<port id>,Port {A | B}-{1 | 2 | 3 | 4},<value>	OUT-A-y, OUT-B-y

Table D-6 TL1 Events (Continued)

condtype	Event Message	AIDs
108	Change DS1 PQL Table,<port id>,PQL #,{Used | Unused},{Standard | Non-standard},0xXX	SYS
109	Change E1 PQL Table,<port id>,PQL #,{Used | Unused},{Standard | Non-standard},0xXX	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
114	CRC Set,<port id>, Port {A | B},{On | Off}	PORT-A, PORT-B
115	Deleted CDMA Freq,<port id>,####.###	ENG
116	DS1 Compensation Set,<port id>,Port {A | B},<compensation value>	PORT-A, PORT-B
117	E1 Compensation Set,<port id>,Port {A | B},<compensation value>	PORT-A, PORT-B
118	E1 SSM In Bit Set,<port id>,Port {A | B},<value>	INP-A, INP-B
119	E1 SSM Out Bit Set,<port id>,Port {A | B},<value>	PORT-A, PORT-B
120	Elevation Mask Set,<port id>,## deg	ENG
121	Event Log Cleared,<port id>	SYS
122	Factory Settings Restored,<port id>	SYS
123	Framing Type Set,<port id>,Port {A | B},{D4 | ESF | CAS | CCS}	PORT-A, PORT-B
124	Incoming SSM Change,Port {A | B},PQL <value>	INP-A, INP-B
125	Input Prov PQL Set,<port id>,Port {A | B},<value>	INP-A, INP-B
126	Input Set,<port id>,Port {A | B},{Enabled | Disabled}	INP-A, INP-B

Table D-6 TL1 Events (Continued)

condtype	Event Message	AIDs
127	Input Term Set,<port id>,Port {A | B},<value>	INP-A, INP-B
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
143	Output Drive Set<port id>,Port {A | B},{Enabled | Disabled}	PORT-A, PORT-B
144	Output SSM Change,PQL ##	PORT-A, PORT-B
145	User Table Cleared,<port id>	SYS
146	Forced Log Off,<port id>,<forced port>,"<forced user>”	SYS
147	Port Bypass Set,<port id>,Port {A | B},{Enabled | Disabled}	INP-A, INP-B
148	Position Average Count Set<port id>,##	ENG
149	Position Set,<port id>,<lat>,<lon>,<height>	ENG
150	Restart Cancelled,<port id>	SYS
151	Restart,<port id>,# sec	SYS
152	Select Reference,{Received | Input A | Input B}	SYS

Table D-6 TL1 Events (Continued)

<table>
<tr><th>condtype</th><th>Event Message</th><th>AIDs</th></tr>
<tr><td>153</td><td>SSM Generation Set,<port id>,Port {A | B},{Enabled | Disabled}</td><td>PORT-A, PORT-B</td></tr>
<tr><td>154</td><td>SSM Reading Set,<port id>,Port {A | B},{Enabled | Disabled}</td><td>INP-A, INP-B</td></tr>
<tr><td>155</td><td>TIM Function Set,<port id>,Port {A | B},{Enabled | Disabled}</td><td>INP-A, INP-B</td></tr>
<tr><td>156</td><td>Timing Mask Set,<port id>,## deg</td><td>ENG</td></tr>
<tr><td>157</td><td>User Added,<port id>,<new user>,Level #</td><td>SYS</td></tr>
<tr><td>158</td><td>User Deleted,<port id>,<deleted user>,Level #</td><td>SYS</td></tr>
<tr><td>159</td><td>User Modified,<port id>,<mod user>,Level #</td><td>SYS</td></tr>
<tr><td>160</td><td>User Msg,<port id>,"<text>”</td><td>SYS</td></tr>
<tr><td>161</td><td>User Settings Restored,<port id></td><td>SYS</td></tr>
<tr><td>162</td><td>User Settings Updated With Current,<port id></td><td>SYS</td></tr>
<tr><td>163</td><td>Zero Suppression Set,<port id>,Port {A | B},{On | Off}</td><td>PORT-A, PORT-B</td></tr>
<tr><td>164</td><td>Reserved</td><td></td></tr>
<tr><td>165</td><td>AIS Generation Set,<port id>,Out {A | B},{On | Off}</td><td>OUT-A, OUT-B</td></tr>
<tr><td>166</td><td>CRC Set,<port id>,Out {A | B},{On | Off}</td><td>OUT-A, OUT-B</td></tr>
<tr><td>167</td><td>DS1 Compensation Set,<port id>,Out {A | B},<compensation value></td><td>OUT-A, OUT-B</td></tr>
<tr><td>168</td><td>E1 Compensation Set,<port id>,Out {A | B},<compensation value></td><td>OUT-A, OUT-B</td></tr>
<tr><td>169</td><td>E1 SSM Out Bit Set,<port id>,Out {A | B},<setting></td><td>OUT-A, OUT-B</td></tr>
<tr><td>170</td><td>Framing Type Set,<port id>,Out {A | B},{D4 | ESF | CAS | CCS}</td><td>OUT-A, OUT-B</td></tr>
<tr><td>171</td><td>Output Drive Set,<port id>,Out {A | B},{Enabled | Disabled}</td><td>OUT-A, OUT-B</td></tr>
<tr><td>172</td><td>Output SSM Change,PQL ##,Out {A | B}</td><td>OUT-A, OUT-B</td></tr>
</table>

Table D-6 TL1 Events (Continued)

condtype	Event Message	AIDs
173	SSM Generation Set,<port id>,Out {A | B},{Enabled | Disabled}	OUT-A, OUT-B
174	Zero Suppression Set,<port id>,Out {A | B},{On | Off}	OUT-A, OUT-B
175	Framing Type Set,<port id>,Port {A | B},{D4 | ESF | CAS | CCS}	INP-A, INP-B
176	OT21 Msg,"<text>"	SYS

D.4 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.

D.4.1 RTRV-ALARM:[tid]:[aid]:[ctag]::[ALL | alrm];

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 Section D.4.16, RTRV-PRMTR:[tid]::[ctag]::ALARM,[alrm]; and Section D.5.4, SET-PRMTR:[tid]::[ctag]::ALARM,alrm,[level], [setd],[cleard];

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-4
- ntfcncde is one of two character codes CR, MJ, MN, CL, IG
- condtype is the condtype number in Table D-4 (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, Symmetricom recommends that you use aid=ALL.

D.4.2 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 2E or 3E
- engine type CDMA, GPS, or none
- configuration PRR or SSU
- output group A type AMI, CC, 2048, or NONE
- output group B type AMI, CC, 2048, or NONE.

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>
```

Note: The OT-21 has no way to directly determine if the back panel is NEBS or ETSI, so that information is not reported in its response.

D.4.3 RTRV-DATA:[tid]::[ctag]::modifier;

Minimum user security level 1

Valid modifiers: CDMA, GPS, GPS-AVAIL, INP[-x], PORT[-x], OUT[-x]

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.

D.4.4 RTRV-DATA:[tid]::[ctag]::CDMA;

Minimum user security level 1

Valid aid code: none

ICS equivalent: ENGINE TDATA (one line only, not a continuous report)

This command returns the current pilot frequency being tracked along with signal strength and status information. The response(s) are in the following format:

```
^^^"xxxx.xxx,ss,status"<cr><lf>
```

- xxxx.xxx is the frequency being tracked in MHz, 860.000 ≤ xxxx.xxx ≤ 910.000 or 1920.000 ≤ xxxx.xxx ≤ 1999.000
- ss is the signal strength ss ≥ 0
- status is the current tracking status: { SRC | ACQ | Ok | ?? }

If no CDMA engine is installed, the OT-21 responds with the **ICNV** deny message.

If the CDMA engine is not initialized, the OT-21 responds with the **SDNR** deny message.

D.4.5 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 ≤ chan ≤ 32 depending on type of engine
- SV# is the satellite vehicle number, 1 ≤ SV# ≤ 32
- snr is the signal-to-noise ratio, this is a three-digit number and snr ≥ 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.

D.4.6 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 ≤ SV# ≤ 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.

D.4.7 RTRV-DATA:[tid]::[ctag]::INP;

Minimum user security level 1

Valid aid code: ALL, INP-A, INP-B

This command returns the current error and clear counts for LOS, AIS, OOF, CRC, BPV, PQL, STA, and OUT alarms, plus the provisioned PQL and current status. The response(s) are in the following format:

```
^^^"aid:loss,losc,aiss,aisc,oofs,oofc,crcs,crcc,bpvs,bpvc,prov,status
pqls,pqlc,stas,stac,outs,outc"<cr><lf>
```

- loss is the current LOS error set counter value
- losc is the current LOS error clear counter value
- aiss is the current AIS error set counter value
- aisc is the current AIS error clear counter value
- oofs is the current OOF error set counter value
- oofc is the current OOF error clear counter value

- crcs is the current CRC error set counter value
- crcc is the current CRC error clear counter value
- bpvs is the current BPV error set counter value
- bpvc is the current BPV error clear counter value
- prov is the provisioned PQL value 1 – 16
- status is the input status – OK, DIS (disabled), or FLT (faulted)

If OT-21 unit is a PRR model (as opposed to an SSU model), it responds with an **ICNV** deny message.

Note: If TIM is ON for this port, the OT-21 will not consider it as a possible reference source. Use the RTRV-PRMTR...INP command to check TIM.

D.4.8 RTRV-DATA:[tid]:[aid]:[ctag]::OUT;

Minimum user security level 1

Valid aid code: ALL, OUT-A, OUT-B

This command returns the current pql# and SSM description for each line of the requested output group(s). The response is the **COMPLD** message followed by:

```
^^^"aid:outType,status,pql#,\"ssmDesc\""
```

- aid is OUT-A or OUT-B
- outType is the card type – AMI, CC, or 2048
- status is the output card status – OK, DIS, or FLT
- pql# is the output pql number – 1 to 16
- ssmDesc is the SSM description in the PQL table

Example:

```
^^^"OUT-A-1:AMI,OK,4,\"STU\""<cr><lf>
^^^"OUT-A-2:AMI,DIS,4,\"STU\""<cr><lf>
^^^"OUT-A-3:AMI,OK,4,\"STU\""<cr><lf>
^^^"OUT-A-4:AMI,OK,4,\"STU\""<cr><lf>
^^^"OUT-B-1:CC,OK,,<cr><lf>
^^^"OUT-B-2:CC,OK,,<cr><lf>
^^^"OUT-B-3:CC,DIS,,<cr><lf>
^^^"OUT-B-4:CC,OK,,<cr><lf>
```

D.4.9 RTRV-DATA:[tid]:[aid]:[ctag]::PORT;

Minimum user security level 1

Valid aid code: ALL, PORT-A, PORT-B

This command returns the current pql#, SSM description, and status for each output port. The response is the **COMPLD** message followed by:

```
^^^"aid:outType,status,pql#,\"ssmDesc\""<cr><lf>
```

- aid is PORT-A or PORT-B
- outType is AMI
- status is Ok
- pql# is the output pql number – 1 to 16
- ssmDesc is the SSM description in the PQL table

Example:

```
^^^"PORT-A:AMI,OK,4,\"STU\""<cr><lf>
^^^"PORT-B:AMI,OK,4,\"STU\""<cr><lf>
```

D.4.10 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>
```

D.4.11 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-7 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-7 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.
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,alrm,ntfcncde,srvEff,ocrdat,ocrtim:\"textEvent\""<cr><lf>
```

- aid is most aids from Table D-2, Table D-4, and Table D-6. 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>
```

D.4.12 RTRV-HDR:[tid]::[ctag];

Minimum user security level 0

Valid aid code: none

Synonyms: RTRV-HEADER

Reference: Section D.5.2, SET-NAME:[tid]::[ctag]::[name];

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.

D.4.13 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"
;
```

D.4.14 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.

D.4.15 RTRV-PRMTR:[tid]::[ctag]::modifier;

Minimum user security level 1

Valid modifiers: ALARM, BYP, CDMA, COMM, ELTIME,GPS, INP, IP, OUT, PORT, PQL, SETUP, TIM

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.

D.4.16 RTRV-PRMTR:[tid]::[ctag]::ALARM,[alrm];

Minimum user security level 1

Valid aid codes: none

Synonyms: ALM, ALRM

ICS equivalent: ALARM

Reference: Section D.5.4, SET-PRMTR:[tid]::[ctag]::ALARM,alrm,[level],[setd],[cleard];

Also see Section D.4.1, RTRV-ALARM:[tid]:[aid]:[ctag]::[ALL | alrm];

This command is used to display alarm parameters for all possible alarms, or for only one alarm based on the optional alarm number **alrm**, where **alrm** is the number reported in the alarm message. Refer to Table D-4 for a list of all alarms.

The response is the **COMPLD** response followed by:

```
^^^"alrm,ntfcncde,setd,cleard:\"text alarm\""<cr><lf>
```

- alrm is the alarm number xx or xx-y, where xx is the basic alarm number and y is the optional alarm sub-number
- ntfcncde 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.

D.4.17 RTRV-PRMTR:[tid]:[aid]:[ctag]::BYP;

Minimum user security level 1

Valid aid codes: none, INP-A, INP-B, ALL

Reference: Section D.5.5, SET-PRMTR:[tid]:[aid]:[ctag]::BYP,{ON | OFF};

This command is used to retrieve the BYP (bypass) setting for the specified INP(s). The response is COMPLD followed by:

```
^^^"aid:BYP,setting"<cr><lf>
```

- aid is INP-A, INP-B
- setting is ON, OFF.

If the OT-21 is a PRR configuration and not an SSU configuration, the response is the ICNV deny message.

D.4.18 RTRV-PRMTR:[tid]::[ctag]::CDMA;

Minimum user security level 1

Valid aid code: none

ICS equivalent: ENGINE

Reference: Section D.5.6, SET-PRMTR:[tid]::[ctag]::CDMA,mode,[freq], [entry];

This command returns a list of the currently available frequencies. There is one line for each frequency. The response(s) is in the following format:

```
^^^"ENG:xxxx.xxx"<cr><lf>
```

- xxxx.xxx is the available frequency in MHz

If there is no entry in the frequency list, the following message is returned:

```
^^^"\"ENG:FREQUENCY LIST IS EMPTY\""<cr><lf>
```

If no CDMA engine is installed, the response is the **ICNV** deny message.

Note: Unlike the equivalent command in ICS [ENGINE FREQ], the response to this command does not show slot numbers.

D.4.19 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: Section D.5.7, SET-PRMTR:[tid]:[aid]:[ctag]::COMM,[baud],[echo],[eol],[ansi],[hard],[soft],[mode];

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 }

D.4.20 RTRV-PRMTR:[tid]::[ctag]::ELTIME;

Minimum user security level 1

Valid aid code: none

ICS equivalent: ELEVTIME

Reference: Section D.5.8, SET-PRMTR:[tid]::[ctag]::ELTIME,[elev1],[elev2];

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, $60 \leq \text{elev2} \leq 172800$

D.4.21 RTRV-PRMTR:[tid]::[ctag]::GPS;

Minimum user security level 1

Valid aid code: none

ICS equivalent: ENGINE

Reference: Section D.5.9, SET-PRMTR:[tid]::[ctag]::GPS,[lat],[lon],[hgt],[avg],[posel],[timel];

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,posel,timel,source*"<cr><lf>
```

Note: The position is the location of the antenna, not the OT-21.

- lat is the receiver current latitude [± 90deg] 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, $-2000.0 \le$ hgt $\le +20{,}000.0$, for example 237.57
- pdop is the current pdop $1.0 \le$ pdop ≤ 10.0
- avg is the number of averages used from 10 to 3600
- posel is the minimum satellite elevation to use for positioning $0 \le$ posel ≤ 60 deg
- timel is the minimum satellite elevation to use for timing $0 \le$ timel ≤ 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.

D.4.22 RTRV-PRMTR:[tid]:[aid]:[ctag]::INP;

Minimum user security level 1

Valid aid code: none, ALL, INP-A and INP-B

ICS equivalent: PORT [A | B]

Reference: Section D.5.10, SET-PRMTR:[tid]:[aid]:[ctag]::INP,[EnaDis],[framing],[term],[zs],[crc],[ssm],[bit],[pql];

This command returns the input port settings for the input port(s). The format is the **COMPLD** message followed by:

^^^"aid:EnaDis,framing,term,zs,crc,ssm,bit,pql"<cr><lf>

- EnaDis is {ENA | DIS }
- framing is {ESF | D4 | CAS | CCS | 2048K}
- term is {EXT | INT |75 | 100 | 120}
- zs is {ON | OFF}
- crc is {ON | OFF}
- ssm is {ON | OFF}
- bit is {4 | 5 | 6 | 7 | 8 | ALL | N/A}
- pql is {1..16}

If the OT-21 is a PRR configuration, the response is the **ICNV** deny message.

Note: If framing is DS1 (D4 or ESF), the bit field is "N/A".

Use RTRV-PRMTR…BYP to determine BYP setting.
Use RTRV-PRMTR…TIM to determine TIM setting.
Use RTRV-DATA…INP to determine current status of this device.

D.4.23 RTRV-PRMTR:[tid]::[ctag]::IP;

Minimum user security level 1

Valid aid code: none

ICS equivalent: IP

Reference: Section D.5.11, SET-PRMTR:[tid]::[ctag]::IP,[ipaddr],[ipmask],[gateaddr],[brdmsk],[intvl];

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".

D.4.24 RTRV-PRMTR:[tid]:[aid]:[ctag]::OUT;

Minimum user security level 1

Valid aid code: none, ALL, OUT-A[-y] and OUT-B[-y], where y = {1 | 2 | 3 | 4}

ICS equivalent: OUT [A | B]

Reference: Section D.5.12, SET-PRMTR:[tid]:[aid]:[ctag]::OUT,[EnaDis],[framing],[comp],[zs],[crc],[ssm],[bit],[ais], [squelch];

This command returns the output option card settings and current status for each output line on the given option card. If no aid is given, then data for both cards are returned. The format for the response is the **COMPLD** message followed by the messages that depend on the type of output card installed in the OT-21.

AMI: If the output card is framed AMI type output, the message has the following format:

```
^^^"aid:EnaDis,framing,comp,zs,crc,ssm,bit,ais"<cr><lf>
```

- aid is OUT-x-y
- EnaDis is {ENA | DIS }
- framing is {ESF | D4 | CAS | CCS}
- comp is {133 | 266 | 399 | 533 | 655} in units of feet for DS1 outputs
- comp is {75|120} in units of Ohms for E1 outputs

- zs is {ON | OFF}
- crc is {ON | OFF}
- ssm is {ON | OFF}
- bit is {4 | 5 | 6 | 7 | 8 | ALL}
- ais is {ON | OFF}

Composite Clock: If the output card is composite clock type output, the message has the following format:

```
^^^"aid:EnaDis,CC,comp,,,,,"<cr><lf>
```

- aid is OUT-x-y
- EnaDis is {ENA | DIS }
- CC is Composite Clock framing
- comp is {0..7}, (duty cycle and offset are defined with these numbers; see Table 4-4)

2048 kHz: If the output card is 2048 kHz clock type output, the message has the following format:

```
^^^"aid:EnaDis,2048, ,,,,,"<cr><lf>
```

- aid is OUT-x-y
- EnaDis is {ENA | DIS }
- 2048 is 2048 kHz framing
- squelch is {ON | OFF}

Missing card: If the output card is missing or not installed, the message has the following format:

```
^^^"aid:NONE,,,,,,,"<cr><lf>
```

- aid is OUT-x

Example:

```
"OUT-A-1:OK,ESF,133,ON,ON,ON,N/A,OFF"
"OUT-A-2:OK,ESF,133,ON,ON,ON,N/A,OFF"
"OUT-A-3:OK,ESF,133,ON,ON,ON,N/A,OFF"
"OUT-A-4:OK,ESF,133,ON,ON,ON,N/A,OFF"
"OUT-B-1:OK,CC,0,,,,,"
"OUT-B-2:OK,CC,0,,,,,"
"OUT-B-3:OK,CC,0,,,,,"
"OUT-B-4:OK,CC,0,,,,,"
```

D.4.25 RTRV-PRMTR:[tid]:[aid]:[ctag]::PORT;

Minimum user security level 1

Valid aid code: none, ALL, PORT-A and PORT-B

ICS equivalent: PORT [A | B]

Reference: Section D.5.13, SET-PRMTR:[tid]:[aid]:[ctag]::PORT,[EnaDis],[framing],[comp],[zs],[crc],[ssm],[bit],[ais],[byps];

This command returns the output port settings for the given port designated by aid. The format is the **COMPLD** messaged followed by:

```
^^^"aid:EnaDis,framing,comp,zs,crc,ssm,bit,pql,ais"<cr><lf>
```

- EnaDis is {ENA | DIS }
- framing is {ESF | D4 | CAS | CCS | 2048K}
- comp is {133 | 266 | 399 | 533 | 655} in units of feet for DS1 outputs
- comp is {75|120} in units of Ohms for E1 outputs
- zs is {ON | OFF}
- crc is {ON | OFF}
- ssm is {ON | OFF}
- bit is {4 | 5 | 6 | 7 | 8 | ALL | NA}
- pql is {1..16} (current output PQL from the unit is returned)
- ais is {ON | OFF}
- squelch is {ON | OFF}

Example:

```
"PORT-A:ENA,ESF,133,ON,ON,ON,N/A,4,OFF"
```

Note: If the OT-21 is an SSU configuration, use RTRV-PRMTR...BYP to determine the BYP setting. Use RTRV-PRMTR...TIM to determine the TIM setting.

D.4.26 RTRV-PRMTR:[tid]::[ctag]::PQL;

Minimum user security level 1

Valid aid code: none

ICS equivalent: PQL

Reference: Section D.5.14, SET-PRMTR:[tid]::[ctag]::PQL,[pqln],[ds1ff],[std1],[desc1],[e1ff],[std2],[desc2];

This command returns the PQL table settings. The format is the COMPLD message followed by:

```
^^^"pqln,ff,s,"ccccc",ff,s,"ccccc""<cr><lf>
```

- pqln is the pql number (1 to 16)
- ff is the SSM in hex format
- s is the “standard” indicator
- ccccc is the description

The first set of values is the DS1 (ANSI T1.101) message, and the second set is the E1 (ITU-T) message. Sixteen lines are returned, one for each pql value.

D.4.27 RTRV-PRMTR:[tid]:[aid]:[ctag]::SETUP;

Minimum user security level 1

Valid aid code: CURRENT, USER, FACTORY. Default is CURRENT

ICS equivalent: SETUP

This command reports on the NVRAM parameter settings. The format is the **COMPLD** message followed by a series of lines identifying and defining the various parameter settings. The message compiles the data from the various “retrieve” commands available with the OT-21.

```
"SETUP REPORT, xxxxx: date time.\"
```

where xxxxx is {CURRENT | USER | FACTORY}

RTRV-NETYPE

```
^^^"OT21"
```

RTRV-INVENTORY

```
^^^"serial number"
^^^"254 part number"
^^^"141 firmware level"
^^^"date of manufacture"
```

RTRV-PRMTR…IP

```
^^^"ipaddr,ipmask,gateaddr"
^^^"broadcast mask,interval"
^^^"ethAddr"
^^^"ethConnect"
```

RTRV-PRMTR. . .PQL

```
^^^"1,ff,s,"ccccc" ff,s,"ccccc""
. . .
^^^"16,ff,s,"ccccc" ff,s,"ccccc""
```

RTRV-PRMTR. . .ELTIME

```
^^^"elev1,elev2"
```

RTRV-PRMTR. . .ALARM

```
^^^"alrm,ntfcncde,setd,cleard:\"text alarm\""
. . . for every possible alarm.
```

RTRV-PRMTR. . .COMM

```
^^^"COMM-L:baud,echo,eol.ansi,hard,soft,mode"
^^^"COMM-A:baud,echo,eol.ansi,hard,soft,mode"
```

Select one of the following three engine types:

RTRV-PRMTR. . .no engine

```
^^^"ENG:No engine"
```

RTRV-PRMTR. . .CDMA

```
^^^"ENG:FREQUENCY LIST IS EMPTY"   -- or --
^^^"ENG:xxxx.xxx" repeated for up to 32 entries in the ENG FREQ list.
```

RTRV-PRMTR. . .GPS

```
^^^"ENG:lat,lon,hgt,pdop,avg,posEl,timEl,source"
```

RTRV-PRMTR. . .INP

```
^^^"INP-A:EnaDis,framing,term,zs,crc,ssm,bit,pql"
^^^"INP-B:EnaDis,framing,term,zs,crc,ssm,bit,pql"
```

RTRV-PRMTR. . .PORT

```
^^^"PORT-A:EnaDis,framing,comp,zs,crc,ssm,bit,pql,ais,squelch"
^^^"PORT-B:EnaDis,framing,comp,zs,crc,ssm,bit,pql,ais,squelch"
```

RTRV-PRMTR. . .BYP

```
^^^"PORT-A:BYP,setting"
^^^"PORT-B:BYP,setting"
```

RTRV-PRMTR. . .TIM

```
^^^"PORT-A:TIM,setting"
^^^"PORT-B:TIM,setting"
```

Format based on the type of OUT card

RTRV-PRMTR. . .OUT

No Card

```
^^^"OUT-x:NONE,,,,,,,"
```

AMI

```
^^^"OUT-x:EnaDis,framing,comp,zs,crc,ssm,bit,ais,squelch"
```

2048

```
^^^"OUT-x:EnaDis,2048,comp,,,,,,squelch"
```

CC

```
^^^"OUT-x:EnaDis,CC,,,,,,"
```

RTRV-USER

```
^^^"username,level"
... repeat for up to 40 users.
```

D.4.28 RTRV-PRMTR:[tid]:[aid]:[ctag]::TIM;

Minimum user security level 1

Valid aid codes: none, INP-A, INP-B, ALL

Reference: SET-PRMTR…TIM

This command is used to retrieve the TIM (Timing Insertion Mode) setting for the specified INP(s). The response is COMPLD followed by:

```
^^^"aid:TIM,setting"<cr><lf>
```

where:

- aid is INP-A, INP-B
- setting is ON, OFF

If the OT-21 is a PRR configuration and not an SSU configuration, the response is the ICNV deny message.

D.4.29 RTRV-REF:[tid]::[ctag];

Minimum user security level 1

Valid aid code: none

ICS equivalent: REF

Synonym: RTRV-REFERENCE

This command returns the current source for the reference. Valid values are ENG (CDMA or GPS), INP-A (SSU only), INP-B (SSU only). The response format is the **COMPLD** message followed by:

```
^^^"description"<cr><lf>
```

D.4.30 RTRV-USER:[tid]::[ctag];

Minimum user security level 1

Valid aid code: none

ICS equivalent: USERS

Reference: Section D.5.17, SET-USER:[tid]::[ctag]::mode,[username],[passwd],[level];

Also see Section D.4.32, RTRV-WHO:[tid]::[ctag];

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

D.4.31 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.

D.4.32 RTRV-WHO:[tid]::[ctag];

Minimum user security level 1

Valid aid code: none

ICS equivalent: WHO

Also see Section D.4.30, RTRV-USER:[tid]::[ctag];

This command returns the current user and port connections. The format is the **COMPLD** messaged followed by:

```
^^^"COML,username,level"
^^^"COMA,username,level"
^^^"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

D.5 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 ntfcncde and clear delay time is omitted, so only the set delay time will be changed:

```
SET-PRMTR…ALARM,almn,[ntfcncde],[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.

D.5.1 SET-DATE:[tid]::[ctag]::date,time;

Minimum user security level 1

Valid aid code: none

Synonyms: SET-DAT

ICS equivalent: DATE, TIME

Reference: Section D.4.10, RTRV-DOY:[tid]::[ctag];

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 receiver engine (CDMA or GPS), it will respond 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.

D.5.2 SET-NAME:[tid]::[ctag]::[name];

Minimum user security level 1

Valid aid code: none

Synonyms: none

ICS equivalent: NAME

Reference: Section D.4.12, RTRV-HDR:[tid]::[ctag];

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.

D.5.3 SET-PRMTR:[tid]::[ctag]::modifier,optionsList;

Minimum user security level 1

Valid modifiers: ALARM, BYP, CDMA, COMM, ELTIME, GPS, INP, IP, OUT, PORT, PQL, SETUP, TIM

Synonyms: SET-PARAM, SET-PARAMETER

This command sets the current values of settable parameters of the OT-21. Refer to Section D.4.15, RTRV-PRMTR:[tid]::[ctag]::modifier;, for message formats used to retrieve these values. Refer to Section D.4.3, RTRV-DATA:[tid]::[ctag]::modifier;, 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.

D.5.4 SET-PRMTR:[tid]::[ctag]::ALARM,alrm,[level],[setd],[cleard];

Minimum user security level 2

Valid aid codes: none

Synonyms: ALM, ALRM

ICS equivalent: ALARM

Reference: Section D.4.16, RTRV-PRMTR:[tid]::[ctag]::ALARM,[alrm];

Also see Section D.4.1, RTRV-ALARM:[tid]:[aid]:[ctag]::[ALL | alrm];

Set Parameter Alarm is used to set alarm parameters based on alarm number **alrm**. Omit parameters that you do not want to change; be sure to insert a comma to replace omitted parameters. (see the examples below).

- alrm is the alarm number xx or xx-y, where xx is the basic alarm number and y is the optional alarm
- ntfcncde 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-4 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-5) is used.

D.5.5 SET-PRMTR:[tid]:[aid]:[ctag]::BYP,{ON | OFF};

Minimum user security level 2

Valid aid code: ALL, INP-A, INP-B

ICS equivalent: PORT [A | B] TIM

Reference: Section D.4.17, RTRV-PRMTR:[tid]:[aid]:[ctag]::BYP;

This command enables and disables the hardware relay BYP (bypass) for the specified INP(s). The response to a successful command is the COMPLD response.

If the OT-21 is not an SSU, it responds with the DENY message with reason ICNV.

D.5.6 SET-PRMTR:[tid]::[ctag]::CDMA,mode,[freq],[entry];

Minimum user security level 2

Valid aid code: none

ICS equivalent: ENGINE FREQ

Reference: Section D.4.18, RTRV-PRMTR:[tid]::[ctag]::CDMA;

This command controls the entries in the CDMA frequency list and how the OT-21 uses this list. There are a number of modes that can be used. In each of these descriptions:

freq is a number xxx.xxx specifying a cellular frequency in the range 820.000 to 860.000 MHz or a number xxxx.xxx specifying a PCS frequency in the range 1920.000 to 1999.000 MHz.

entry is a number 1 – 32.

Note: If entry is specified and would create a "gap" in the frequency list, the OT-21 automatically removes that gap. For example, if building from an empty list, adding (1920.000,1) and (1921.000,5) would result in 1920.000 in slot 1 and 1921.000 in slot 2.

To add a frequency to the list (up to 32 entries maximum):

```
SET-PRMTR::::CDMA,ADD,freq,[entry];
```

To delete a frequency from the list:

```
SET-PRMTR::::CDMA,DEL,freq;
SET-PRMTR::::CDMA,DEL,,entry;
```

To delete all frequencies from the list:

```
SET-PRMTR::::CDMA,DELALL;
```

To replace the current engine frequency with the next frequency in the list:

```
SET-PRMTR::::CDMA,BUMP;
```

To start scanning for cellular band frequencies that the OT-21 can extract timing information from:

```
SET-PRMTR::::CDMA,CELL,[count];
```

To start scanning for PCS band frequencies that the OT-21 can extract timing information from:

```
SET-PRMTR::::CDMA,PCS,[count];
```

To start scanning both cellular and PCS band frequencies:

```
SET-PRMTR::::CDMA,START,[count];
```

To stop a scan before it is completed:

```
SET-PRMTR::::CDMA,STOP;
```

The OK response to these commands is the **COMPLD** response. Commands with errors receive the **DENY** response with IPNV.

Note that scanning causes the OT-21 to go into holdover or halt mode while scanning is taking place.

D.5.7 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: Section D.4.19, RTRV-PRMTR:[tid]:[aid]:[ctag]::COMM;

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]

D.5.8 SET-PRMTR:[tid]::[ctag]::ELTIME,[elev1],[elev2];

Minimum user security level 2

Valid aid code: none

ICS equivalent: ELEVTIME

Reference: Section D.4.20, RTRV-PRMTR:[tid]::[ctag]::ELTIME;

This command sets elevation times for the alarms.

- elev1 is the alarm elevation time from minor to major,
  $60 \leq$ elev1 ≤ 172800 (48 hours)
- elev2 is the alarm elevation time from major to critical,
  $60 \leq$ elev2 ≤ 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.

D.5.9 SET-PRMTR:[tid]::[ctag]::GPS,[lat],[lon],[hgt],[avg],[posel],[timel];

Minimum user security level 2

Valid aid code: none

ICS equivalent: POS

Reference: Section D.4.21, RTRV-PRMTR:[tid]::[ctag]::GPS;

This command sets the GPS related parameters including position and position masks.

- lat is receiver current latitude [± 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 [± 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, $-2000.0 \leq hgt \leq +20{,}000.0$
- avg is the number of averages used from 10 to 3600
- posel is the minimum satellite elevation to use for positioning
  $0 \leq posel \leq 60$ degrees
- timel is the minimum satellite elevation to use for timing
  $0 \leq timel \leq 60$ 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.

D.5.10 SET-PRMTR:[tid]:[aid]:[ctag]::INP,[EnaDis],[framing],[term],[zs],[crc],[ssm],[bit],[pql];

Minimum user security level 2

Valid aid code: ALL, INP-A and INP-B

ICS equivalent: PORT [A | B]

Reference: Section D.4.22, RTRV-PRMTR:[tid]:[aid]:[ctag]::INP;

This command configures the input port settings. Note that when the current state is “disabled” the remaining parameters have no visible effect.

- EnaDis is {ENA | DIS}
- framing is {ESF | D4 | CAS | CCS}
- term is {EXT | INT}
- zs is {ON | OFF}
- crc is {ON | OFF} Cannot be set OFF if framing is ESF
- ssm is {ON | OFF}
- bit is {4 | 5 | 6 | 7 | 8 | ALL}
- pql is {1..16}

If framing is ESF, CRC is automatically set to ON.

The response to a successful command is a **COMPLD** message. If the command changes one or more values, an autonomous event is generated indicating the change(s). Note that if the framing is changed, the event indicates a PORT-x aid, not an INP-x aid.

Note: Some of these items are duplicated in the SET-PRMTR…PORT command, specifically, framing, zs, and crc. If these are changed here, the event message announcing the change reports PORT-x instead of INP-x.

Use RTRV-PRMTR…BYP to determine BYP setting; use SET-PRMTR…BYP to change it. Use RTRV-PRMTR…TIM to determine TIM setting; use SET-PRMTR…TIM to change it. Use RTRV-DATA…INP to determine current status of this device.

D.5.11 SET-PRMTR:[tid]::[ctag]::IP,[ipaddr],[ipmask],[gateaddr],[brdmsk],[intvl];

Minimum user security level 2

Valid aid code: none

ICS equivalent: IP

Reference: Section D.4.23, RTRV-PRMTR:[tid]::[ctag]::IP;

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;
```

D.5.12 SET-PRMTR:[tid]:[aid]:[ctag]::OUT,[EnaDis],[framing],[comp],[zs],[crc],[ssm],[bit],[ais],[squelch];

Minimum user security level 2

Valid aid code: ALL, OUT-A[-y] and OUT-B[-y], where y = {1 | 2 | 3 | 4}

ICS equivalent: OUT

Reference: Section D.4.24, RTRV-PRMTR:[tid]:[aid]:[ctag]::OUT;

This command configures the optional output cards. The aid code allows for card level or channel level access to the output cards. If no aid is specified, the command affects both OUT A and OUT B. If no aid or ALL is specified, both cards must be of the same type (AMI, Composite Clock, or 2048 kHz). If they are not the same type, the unit responds with the deny message with an IPNV reason.

For AMI output option cards:

- EnaDis is {ENA | DIS}
- framing is {ESF | D4 | CAS | CCS}; ESF and D4 is valid for DS1, CAS and CCS for E1
- comp is {133 | 266 | 399 | 533 | 655} in units of feet for DS1 outputs
- comp {75|120} in units of Ohms for E1 outputs
- zs is {ON | OFF}
- crc is {ON | OFF} Cannot be set OFF if framing is ESF
- ssm is {ON | OFF}
- bit is {4 | 5 | 6 | 7 | 8 | ALL} valid for E1 type output
- ais is {ON | OFF}
- squelch is {ON | OFF}

SSM and BIT can only be set if framing is E1 (CAS or CCS).

For Composite Clock output option cards:

- EnaDis is {ENA | DIS}
- framing is {CC} (or may be left blank)
- comp is {0 to 7} valid for Composite Clock output
- zs (leave blank for Composite Clock cards)
- crc (leave blank for Composite Clock cards)
- ssm (leave blank for Composite Clock cards)
- bit (leave blank for Composite Clock cards)
- ais (leave blank for Composite Clock cards)

For 2048 kHz output option cards:

- EnaDis is ENA/DIS
- framing is 2048 (or may be left blank)
- comp (leave blank for 2048 kHz cards)
- zs (leave blank for 2048 kHz cards)
- crc (leave blank for 2048 kHz cards)
- ssm (leave blank for 2048 kHz cards)
- bit (leave blank for 2048 kHz cards)
- ais (leave blank for 2048 kHz cards)
- squelch is {ON | OFF}

D.5.13 SET-PRMTR:[tid]:[aid]:[ctag]::PORT,[EnaDis],[framing],[comp],[zs],[crc],[ssm],[bit],[ais],[byps];

Minimum user security level 2

Valid aid code: ALL, PORT-A and PORT-B

ICS equivalent: PORT

Reference: Section D.4.25, RTRV-PRMTR:[tid]:[aid]:[ctag]::PORT; and Section D.5.16, SET-PRMTR:[tid]::[ctag]::TIM,{ON | OFF};

This command configures the output channel settings. If no aid is specified, the command affects both ports A and B.

- EnaDis is {ENA | DIS}
- framing is {ESF | D4 | CAS | CCS}
- comp is {133 | 266 | 399 | 533 | 655} in units of feet for DS1 outputs
- comp {75|120} in units of Ohms for E1 outputs
- zs is {ON | OFF}
- crc is {ON | OFF}
- ssm is {ON | OFF}
- bit is {4 | 5 | 6 | 7 | 8 | ALL}
- ais is {ON | OFF}
- squelch is {ON | OFF}

The response to a successful command is the **COMPLD** message. If one or more values are changed, an autonomous event message is generated.

Note: Use RTRV-PRMTR…BYP to determine BYP setting; use SET-PRMTR…BYP to change it. Use RTRV-PRMTR…TIM to determine TIM setting; use SET-PRMTR…TIM to change it.

Note: Some items are duplicated with the SET-PRMTR…INP command.

D.5.14 SET-PRMTR:[tid]::[ctag]::PQL,[pqln],[ds1ff],[std1],[desc1],[e1ff],[std2],[desc2];

Minimum user security level 2

Valid aid code: none

ICS equivalent: PQL

Reference: Section D.4.26, RTRV-PRMTR:[tid]::[ctag]::PQL;

The command changes the PQL table settings. The first set of values is the DS1 (ANSI T1.101) message, and the second set is the E1 (ITU-T) message. Each line of the PQL table must be changed using a separate command.

- **pqln** pql number (1 to 16) or FACTORY
- **ds1ff - e1ff** SSM in hex format
  DS1 typically uses values in the range 0 to 127 decimal (0x00 – 7F hex)
  E1 typically uses values in the range 0 to 15 decimal (0x00 to 0F hex)
- **std1 - std2** “standard” indicators {ON | OFF}
- **desc1 - desc2** description up to fourteen characters. May be enclosed in double-quotes (“). Use the value ““ to blank the description.

D.5.15 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.

D.5.16 SET-PRMTR:[tid]::[ctag]::TIM,{ON | OFF};

Minimum user security level 2

Valid aid code: none, ALL, INP-A, INP-B

ICS equivalent: PORT [A | B] TIM

Reference: Section D.4.28, RTRV-PRMTR:[tid]:[aid]:[ctag]::TIM;

This command enables and disables Timing Insertion Mode (TIM) on the specified INP(s). The response to a successful command is the **COMPLD** response.

If the OT-21 is not an SSU, it responds with the **DENY** message with reason ICNV.

Note: If TIM is ON for an INP, the OT-21 does not consider the port as a possible reference source. Use the RTRV-PRMTR...INP command to check TIM.

D.5.17 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: Section D.4.30, RTRV-USER:[tid]::[ctag];

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.

D.5.18 SET-VISUAL:[tid]::ctag::ACTIVE,{ON|OFF};

Valid aid code: none

ICS equivalent: ACTIVE

Related: RTRV-VISUAL

This command sets the state of the ACTIVE indicator on the unit. The color of the indicator is determined by the operating state of the unit. The response is the COMPLD message.

D.6 Other Commands

D.6.1 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 ≤ delay ≤ 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.

D.6.2 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.

D.6.3 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.

D.6.4 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.

D.6.5 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 Section 6.1, Software Maintenance, 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.

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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 and the default PQL values described in this Appendix.

E.1 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.

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

Table E-1 Factory Alarm Configuration (Default) Settings (Continued)

Alarm Event	Description	Default Settings		
		Level	Set Delay (s)	Clear Delay (s)
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
17	Port A summary status	Minor	Immediate	Immediate
17-1	Port A Loss of Signal status	Minor	10	5
17-2	Port A Loss of Framing status	Minor	12	5
17-3	Port A Alarm Indication Status	Minor	14	5
17-4	Port A Bipolar Violation status	Minor	16	5
17-5	Port A Cyclic Redundancy Checksum Status	Minor	16	5
17-6	Port A Degraded PQL or the input SSM was lost	Minor	10	5
17-7	Port A Degraded Phase Data stability	Minor	10	5
17-8	Port A framer or LIU is reporting an output fault	Minor	Immediate	Immediate
18	Port B summary status	Minor	Immediate	Immediate
18-1	Port B Loss of Signal status	Minor	10	5

Table E-1 Factory Alarm Configuration (Default) Settings (Continued)

Alarm Event	Description	Default Settings		
		Level	**Set Delay (s)**	**Clear Delay (s)**
18-2	Port B Loss of Framing status	Minor	12	5
18-3	Port B Alarm Indication Status	Minor	14	5
18-4	Clock input B Bipolar Violation status	Minor	16	5
18-5	Port B Cyclic Redundancy Checksum Status	Minor	16	5
18-6	Port B Degraded PQL or the input SSM was lost	Minor	10	5
18-7	Port B Degraded Phase Data stability	Minor	10	5
18-8	Port B framer or LIU is reporting an output fault	Minor	Immediate	Immediate
19	Hardware configuration status	Critical	Immediate	Immediate
20	Output A fault	Minor	Immediate	Immediate
20-1	Output A: Line 1 Problem with a specific clock output	Minor	Immediate	Immediate
20-2	Output A: Line 2 Problem with a specific clock output	Minor	Immediate	Immediate
20-3	Output A: Line 3 problem with a specific clock output	Minor	Immediate	Immediate
20-4	Output A: Line 4 problem with a specific clock output	Minor	Immediate	Immediate
20-5	Output A: Lock Loss of sync with the main board frequency signal	Minor	Immediate	Immediate
21	Output B fault	Minor	Immediate	Immediate
21-1	Output A Line 1	Minor	Immediate	Immediate
21-2	Output A Line 2	Minor	Immediate	Immediate
21-3	Output A: Line 3	Minor	Immediate	Immediate
21-4	Output A: Line 4	Minor	Immediate	Immediate
21-5	Output A: Lock	Minor	Immediate	Immediate
22	VCXO	Critical	Immediate	Immediate

E.2 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
AMI Output Card	Enable/Disable Output	ON
	D4/ESF | CAS/CCS framing types	ESF
	Enable/Disable Zero suppression	ON
	CRC	ON
	SSM Enable/Disable	ON
	SSM Bit Location	8
	AIS	OFF
	Line Compensation	133 Ft.
CC Output Card	Enable/Disable Output	On
	Compensation COMP n	5/8 Duty cycle, 0 Offset
2048 Output Card	Enable/Disable Output	On

Table E-2 Factory System Configuration (Default) Settings (Continued)

Description	Level	Parameter Value
AMI On-board Framed Outputs	D4/ESF | CAS/CCS framing types	ESF
	Enable/Disable Zero suppression	ON
	CRC	ON
	Line Compensation	133 Ft.
	SSM Enable/Disable	ON
	SSM Bit Location	8
	PQL Table Setting #	2
	AIS	OFF
On-board Framed Inputs (SSU Only)	D4/ESF | CAS/CCS framing types	ESF
	SSM Enable/Disable	ON
	SSM Bit Location	8
	Provisioning Enable/Disable	Disable
	Timing Insertion Mode ON/OFF	OFF
	Termination Internal/External	External
	Bypass	OFF
Time/Frequency Control	Oscillator warm-up time	30 seconds
Front Panel Controls	Active light indication	ON
Communication Ports	Baud rate	9600
	Enable/disable hardware handshaking	Disabled
	Enable/disable software handshaking	On
	Enable/disable echo	On
	Change output line termination	CRLF
Security	Users	None
	Access level	Administrator (Level 4)

E.3 Factory Default PQL Settings

DS1 signals use Extended SuperFrame Format (ESF), Facilities Data Link (FDL), and E1 for Sync Status Messaging (SSM). SSM indicates the synchronization status of the signal and the traceability of the signal to UTC. A PQL translation table correlates the internal Priority Quality Level (PQL) to the SSM for framing types. The PQL may come from the SSM in the input signal or from a provisioned value. Operators may view or provision the current PQL settings using the `PQLTABLE` command.

Note: Normally, editing the PQL table is not necessary. Edits may be required, however, if ANSI or ITU-T SSM standards are changed.

For a description of the ICS command and options, see Appendix C, ICS Commands. For TL1 commands, see Appendix D, TL1 Commands.

Table E-3 provides a reference for PQL Table Management default values.

Table E-3 Default PQL Table Management

PQL	DS1 SSM	S	DS1 Description	E1 SSM	S	E1 Description
1	N/A	N/A	Unused	N/A	N/A	Unused
2	0x04	S	PRS	0x02	N/A	Unused
3	0x04	N/A	Unused	0x02	S	PRC/G.811
4	0x08	S	STU	0x00	S	STU
5	0x0C	S	ST2	0x04	N/A	Type II
6	0x78	S	Type V	0x04	S	Type V
7	N/A	N/A	Unused	N/A	N/A	Unused
8	0x7C	S	ST3E	0x08	N/A	Type III
9	0x10	N/A	Type VI	0x08	S	Type VI
10	0x10	S	ST3	0x0B	N/A	Type IV
11	0x22	N/A	Unused	0x0B	N/A	G.813 Opt 1
12	0x22	N/A	SMC	0x0F	N/A	G.813 Opt 2
13	0x28	S	ST4	0x0F	N/A	Unused

Table E-3 Default PQL Table Management (Continued)

PQL	DS1 SSM	S	DS1 Description	E1 SSM	S	E1 Description
14	0x40	S	Reserved	0x0F	N/A	Unused
15	0x30	S	DUS	0x0F	S	DUS
16	0x7E		Unused	0x0F	N/A	Unused

IN THIS APPENDIX

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.

F.1 GPS Antenna with Internal Low Noise Amplifier (LNA)

Symmetricom offers three versions of GPS antennas with 26dB, 40dB, and 48dB internal LNAs. While there are three versions of antenna, there are four antenna kits: 26dB, 40dB, 48dB, and a 68dB which is a 48dB antenna with a 20dB amplifier. 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-1), in-line amplifier, and coaxial cable, the antenna functions properly up to 1000 feet (305 m) from the radio receiver.

F.1.1 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.

Symmetricom 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 3M® 2150 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.

F.1.2 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.

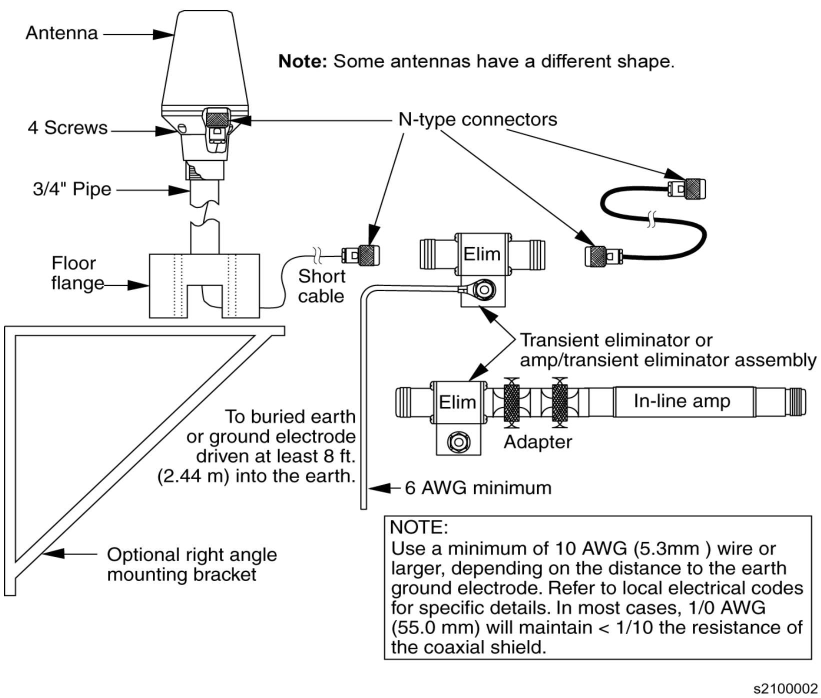

Figure F-1 GPS Antenna with Internal LNA

Table F-1 lists antenna item numbers and provides a brief description of each antenna.

Table F-1 GPS Antenna Kit Part Numbers and Descriptions

GPS Antenna Kit Item No.	Description	Minimum Cable Length
13813150-026-0[1]	For 10 to 200 foot cable lengths. Includes 26 dB L1 GPS Antenna, LMR-400, 10 foot, N-type connectors, transient eliminator, LMR-400 (specify length from 10 to 190 feet, P/N 120130076-***xxx***-0, where ***xxx*** is length)	10 ft. (3 m)
13813150-040-0	For 100 to 400 foot cable lengths, includes 40 dB L1 GPS Antenna, LMR-400, 30 feet, N-type connectors, transient eliminator, LMR-400 (specify lengths from 70 to 370 feet, P/N 12013076-***xxx***-0, where ***xxx*** is length)	100 ft. (30 m)
13813150-048-0	For 250 to 650 foot cable lengths, includes 48 dB L1 GPS Antenna, LMR-400, 30 feet, N-type connectors, transient eliminator, LMR-400 (specify length from 220 to 620 feet, P/N 12013076-***xxx***-0, where ***xxx*** is length)	250 ft. (76 m)
13813150-068-0[2][3]	For 650 to 1000 foot cable lengths, includes 48 dB L1 GPS Antenna, LMR-400, 30 feet, N-type connectors, transient eliminator, LMR-400 (specify length from 620 to 970 feet, P/N 12013076-***xxx***-0, where ***xxx*** is length)	650 ft. (198 m)

NOTES:

1. GPS Antenna item number 13813150-026-0 is designed for short cable applications and includes one 10-foot antenna-to-transient eliminator cable. All other kits have a 30-foot (9 m) cable.
2. GPS Antenna item number 13813150-068-0 includes an in-line 20 dB amplifier and an N-type adapter to allow the amplifier to be connected in line with the antenna coaxial cable.
3. The coaxial cable that connects from the transient eliminator or in-line amplifier to the OT-21 unit can be supplied in 10-foot increments. The dash number of the cable part number is the length in feet of the cable. For example: item number 12013076-100-0 is 100-feet (30 m) in length.

Table F-2 provides specifications for the GPS antenna with internal LNA.

Table F-2 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

Table F-2 GPS Antennas with Internal LNA Specifications (Continued)

Characteristic	Specification
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 40dB 48dB	 26.5 dB ± 3 dB 40 dB minimum 48 dB minimum

Table F-3 through Table F-5 lists the item numbers and provides a brief description of the antenna accessories available for the L1 series antennas.

Table F-3 26dB L1 GPS Antenna Accessory Kit

Item Number	Description
12013076-xxx-0 (xxx = length in feet)	Cable, LMR-400, 10 ft. to maximum of 190 ft.
773000-0008	Transient Eliminator, 90 Volts, 1.5 GHz, N-Type
12013076-010-0	Cable, LMR-400, 10 ft., N-Type
551100-6013	N-Jack to N-Plug Connector, right angle

Table F-3 26dB L1 GPS Antenna Accessory Kit (Continued)

Item Number	Description
400302-0500	Roll, 3M 2150 Weatherproof Tape
12813080-000-0	Crimper Kit, LMR-400 (crimp tool, 2150 tape, LMR preptool, 10 each crimp N-type connectors)

Table F-4 40dB L1 GPS Antenna Accessory Kit

Item Number	Description
12013076-xxx-0 (xxx = length in feet)	Cable, LMR-400, 70 ft. to maximum of 370 ft.
773000-0008	Transient Eliminator, 90 Volts, 1.5 GHz, N-Type
12013076-030-0	Cable, LMR-400, 30 ft., N-Type
551100-6013	N-Jack to N-Plug Connector, right angle
12010210-000-0	Bracket Assembly, Antenna Mount Right Angle
400302-0500	Roll, 3M 2150 Weatherproof Tape
12813080-000-0	Crimper Kit, LMR-400 (crimp tool, 2150 tape, LMR preptool, 10 each crimp N-type connectors)

Table F-5 48 and 68dB L1 GPS Antenna Accessory Kits

Item Number	Description
12013076-xxx-0 (xxx = length in feet)	Cable, LMR-400, 650 ft. to maximum of 970 ft.
773000-0008	Transient Eliminator, 90 Volts, 1.5 GHz, N-Type
12013076-030-0	Cable, LMR-400, 30 ft., N-Type
551100-6013	N-Jack to N-Plug Connector, right angle
12010210-000-0	Bracket Assembly, Antenna Mount Right Angle
570704-0002 (68dB Output Only)	GPS L1 20dB in-line amplifier, N-Type (required for lengths > 650 ft.)
400302-0500	Roll, 3M 2150 Weatherproof Tape
12813080-000-0	Crimper Kit, LMR-400 (crimp tool, 2150 tape, LMR preptool, 10 each crimp N-type connectors)

F.2 CDMA Antenna

Symmetricom TSD provides a CDMA antenna for OT-21 products. The tables and figure listed below provide the following information about the antenna:

- Table F-6 provides the CDMA antenna item number and description.
- Figure F-2 illustrates the CDMA antenna and parts to be assembled.
- Table F-7 provides the mechanical and electrical specifications for the CDMA antenna.

Table F-6 CDMA Antenna

Item Number	Description
13813151-000-0	Dual Band CDMA Antenna Kit 15 ft.
570700-9999	Dual Band Cellular Antenna, N Connector

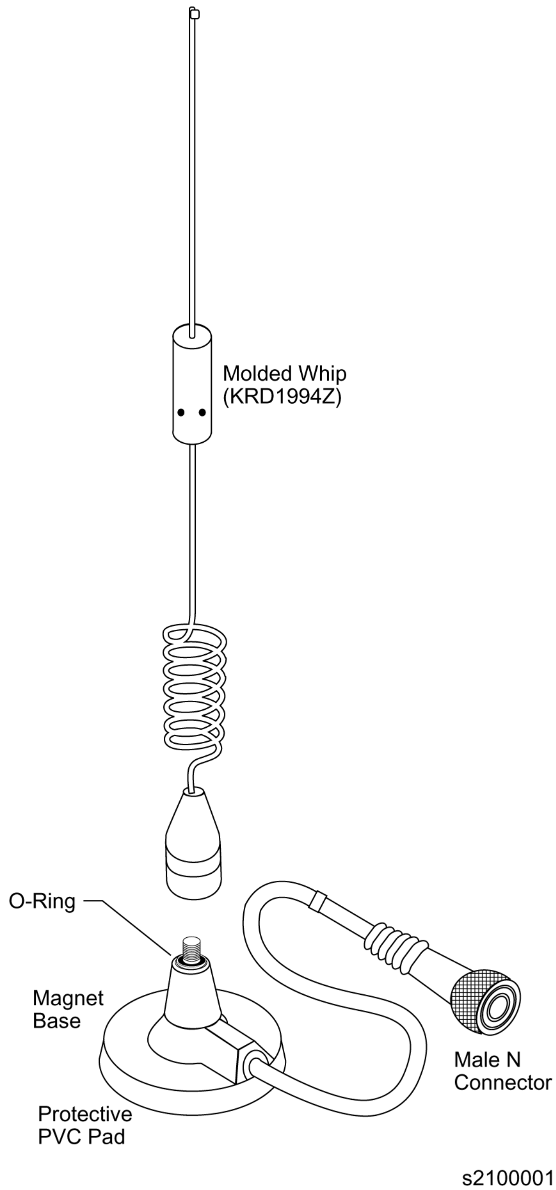

Figure F-2 CDMA Antenna Accessories

Table F-7 CDMA Antenna Specifications

Characteristic	Specification
Mechanical	
Diameter, base	2.5 inches magnetic
Height	13.75 inches
Weight	< 1 lb.

Table F-7 CDMA Antenna Specifications (Continued)

Characteristic	Specification
Cable	15 ft. (4.5 m) with N connector
Electrical	
Power	Passive
Gain	3 dB Cellular/3dB PCS

F.3 Transient Eliminators

Symmetricom TSD offers the FCC-250B-90-1.5NFNF Transient Eliminator 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-8 provides the transient eliminator specifications.

Table F-8 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

F.4 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-9 provides environmental, mechanical, and electrical specifications for the amplifier. The amplifier is normally connected in line with the antenna coaxial cable.

Table F-9 GPS L1 Inline 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

F.5 Coaxial Antenna Cables

Symmetricom TSD provides a low-loss LMR-400 or equivalent coaxial cable with N-type connectors on both ends.

- Table F-10 lists the optional antenna coaxial cables.
- Table F-11 lists the optional antenna coaxial cable crimper kit.
- Table F-12 provides antenna cable specifications.

Table F-10 Optional Antenna Coaxial Cables

Item Number	Description
12012995-xxx-0[(1)]	Cable, UHF/VHF (B-9913), with N-Type Connectors
12012994-xxx-0[(1)]	Cable, UHF/VHF (B-89913), with N-Type Connectors
12012992-xxx-0[(1)]	Cable, RG-213/U, with N-Type Connectors
12013076-xxx-0	Cable, LMR-400 or equivalent, with N-Type Connectors

NOTES:

1. Contact Symmetricom sales agent for available cable lengths and specific cable item dash number.

Table F-11 Optional Antenna Coaxial 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-12 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	

F.6 Optional Accessories

Table F-13 provides a list of optional accessories which may be used to mount or install the OT-21.

Table F-13 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

IN THIS APPENDIX

Appendix G Specifications

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

G.1 General Specifications

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

Table G-1 details the general specifications for the complete unit configured with SSU function. Inputs apply only to the SSU function.

Table G-1 General Specifications

Characteristics	Specification
General	
Long Term Frequency	Stratum 1 PRS per ANSI T1.101 and ITU-T G.811
Clock Performance	Meets requirements of the Telcordia Technologies (formerly Bellcore) document GR-1244-CORE
Reference Signals	Determined by the type of Radio Receiver: GPS navigation signal ■ CDMA signal ■ PORT-A-IN: DS1/E1-A clock input channel (SSU only) ■ PORT-B-IN: DS1/E1-B clock input channel (SSU only)

Table G-1 General Specifications (Continued)

Characteristics	Specification
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: ■ 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
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

Table G-1 General Specifications (Continued)

Characteristics	Specification
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
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

Table G-1 General Specifications (Continued)

Characteristics	Specification
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 μs) 12 Ω impedance.
Outdoor Operational Conditions	
(GPS Antenna Only)	ETS 300 019–1 Class 4.1E
GPS Antenna Environmental	
Temperature	–40°C to +75°C

Table G-1 General Specifications (Continued)

Characteristics	Specification
Relative Humidity	100% Non-Immersed
Altitude	200 ft. (61 m) below sea level to 13,000 ft. (3962 m) above sea level

G.2 Operating Conditions Specifications

The unit operates at specified parameters in the operating conditions summarized in Table G-2.

Table G-2 Normal Operating Conditions

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

NOTES:

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 G-3, but performance is degraded. The unit returns to specified performance upon returning to specified operating conditions.

Table G-3 Exceptional Operating Conditions

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

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.

G.3 Power Input and Grounding Specifications

Table G-4 provides power input specifications.

Table G-4 Power Input Specifications

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

Notes:

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.

G.4 Clock Output Signal Specifications

Table G-5 provides clock output signal specifications.

Table G-5 Clock Output Signal Specifications

Parameter	Specification
DS1 Outputs	
Signal	Framed, all ones, Alternate Mark Inversion (AMI) Per ANSI T1.403 (1995)
Format	Each output D4/Super Frame (SF) or Extended Super Frame (ESF)
Waveshape Rise Time Pulse Width Pulse Interval Duty Cycle	Per ANSI T1.403 (1995) < 100 nsecs < 324 nsecs, nominal 648 nsecs, nominal 50%
Pulse Amplitude	2.4 to 3.6 volts into 100 Ω
Output Jitter	< 0.03 UI
Drive Capability	0 to 655 feet, 22 AWG ABAM cable or similar
Number of Outputs	4
Termination Impedance	100 Ω ± 5%
E1 Outputs	
Signal	Framed, all ones, Alternate Mark Inversion (AMI) Per ITU Rec. G.703/9
Format	HDB3 Per ITU-T Rec. G.704
Waveshape Rise Time Pulse Width Pulse Interval Duty Cycle	< 100 nsecs < 244 nsecs, nominal 488 nsecs, nominal 50%
Pulse Amplitude	2.2 to 3.3 volts
Output Jitter	< 0.03 UI
Number of Outputs	4

Table G-5 Clock Output Signal Specifications (Continued)

Parameter	Specification
Termination Impedance	75 and 120 Ω ± 5%
Composite Clock Outputs (64 kb/sec.)	
Waveshape Rise Time Pulse Width Pulse Interval	Rectangular (62.5% or 50/50 duty cycle), software selectable **5/8 (62.5%)** **50/50** < 500 nsecs < 500 nsecs 9.8 µS ±5% 7.8125 µS ±5% 15.625 µS ±5% 15.625 µS ±5%
Amplitude	2.7 to 5.5 V peak (3.5 V peak nominal)
Drive Capability	Zero to 1500 feet, 22 AWG ABAM cable
Number of Outputs	4
Termination Impedance	133 Ω ±5%
2048 kHz Clock Output	
Signal	Per ITU Rec. G.703/13 (1998)
Waveshape Rise Time Fall Time Duty Cycle	Squarewave < 50 nsecs < 50 nsecs 50% ±5%
Amplitude	1.5 to 1.9 Volts peak
Jitter	< 0.03 UI
Number of Outputs	4
Termination Impedance	75 and 120 Ω ± 5%

G.5 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.

IN THIS APPENDIX

Appendix H Reference Material

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.

H.1 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.*

H.2 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.

H.3 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*.

Glossary

AIS
Alarm Indication Signal

AMI
Alternate Mark Inversion

ANSI
American National Standards Institute

ASCII
American Standard Code for Information Interchange

AWG
American Wire Gauge

BITS
Building Integrated Timing Supply

Bits Clock
Building Integrated Timing Supply

BOM
Bit-Oriented Messaging

BPV
Bipolar Violation

CDMA
Code Division Multiple Access.

CEV
Controlled Environmental Vault

CO
Central Office

CRC
Cyclic Redundancy Check

DCE
Data Communications Equipment

DDS
Direct Digital Synthesis

DS1
Digital Signal, level 1

DTE
Data Terminal Equipment

DUS
Do not Use for Sync

EIA-232
See RS-232

EMC
Electromagnetic Compatibility

EMI
Electromagnetic Interference

ESF
Extended SuperFrame Format

ETSI
European Telecommunications Standards Institute

FG
Frame Ground

Flash ROM
Flash Read Only Memory

FLL
Frequency Lock Loop

ITU
International Telecommunication Union

ITU-T
International Telecommunications Union-Telecommunications Standardization Sector

LED
Light Emitting Diode

LNA
Low Noise Amplifier

LO
Local Oscillator

LOF
Loss of Frame

LOS
Loss of Signal

Mbps
Megabits per second

NCO
Numerically Controlled Oscillator

NE
Network Element

NEBS
Network Equipment Building Standards

NTP
Network Time Protocol

NVRAM
Nonvolatile Random Access Memory

OOF
Out-of-Frame Error

PDOP
Position Dilution Of Precision

PLD
Programmable Logic Device

PLL
Phase Lock Loop

PQL
Priority Quality Level

PRC
Primary Reference Clock

PRR
Primary Reference Receiver

PRS
Primary Reference Source

RO
Remote Oscillator

SDH
Synchronous Digital Hierarchy

SNTP
Simplified Network Time Protocol

SSM
Synchronization Status Messages

TCP/IP
Transmission Control Protocol/Internet Protocol

TSG
Timing Signal Generator

UTC
Universal Time Coordinated

UTP
Unshielded Twisted Pair

VCXO
Voltage Controlled Crystal Oscillator. Typically a component of a hardware PLL or FLL

vDC
Volts Direct Current. Also see Direct Current

1PPS
One pulse per second, which equates to approximately 86,400 times per day.

10BaseT
Ethernet local area network (LAN) using twisted pair wiring, the most commonly installed LAN.

Alarm Indication Signal (AIS)
Signal transmitted downstream to inform that an upstream failure has been detected. Replaces normal traffic signal when a maintenance alarm indication is activated.

Alternate Mark Inversion (AMI)
Signaling protocol in which ones are indicated by either a positive or a negative pulse, and zeros by no pulse. The ones alternate between positive going and negative going.

American National Standards Institute (ANSI)
Standards-setting, non-government organization that develops and publishes standard for transmission codes, protocols, and high-level languages for *voluntary* use in the United States.

American Standard Code for Information Interchange (ASCII)
The most popular character representation method used by personal computers to communicate with each other.

Ampere
The unit of measurement of electric current or the flow of electrons, mathematically equal to watts divided by volts.

Antenna Gain
Ratio, usually expressed in decibels, of the power required at the input of a loss-free reference antenna to the power supplied to the input of the given antenna to produce, in a given direction, the same field strength or same irradiance, at the same distance. Unless specified otherwise, gain refers to the direction of the maximum radiation.

Bellcore
Originally, Bell Communications Research, now Telcordia Technologies, Inc. An organization established by the AT&T divestiture, representing and funded by the Regional Bell operating companies for the purposes of establishing telephone-network standard, training materials and standards, and quality procedures.

Bipolar Violation
In the T carrier line coding system that inverts the polarity of alternate one bits, a bipolar violation (BPV) indicates the presence on the carrier line of two consecutive one bits of the same polarity.

Building Integrated Timing Supply (BITS)
A synchronization method in which the best clock in an office is designated to receive timing from references outside the office, while all other clocks in the office are timed from the designated BITS clock. The BITS clock provides a pulse stream (1-0-1-0-1-0-1-0) that synchronizes a SONET network

Bypass Relay Assembly
Used to bypass the normal electrical route should the power, signal, or other equipment fail.

Central Office (CO)
In telephony, the Local Exchange Carrier (LEC) switching facility. Also called Local Exchange or wire center. Refers to Class 5 switching office, at which subscribers' local loops terminate. The Central Office handles a specific geographic area, identified by the first three digits of the local telephone.

Clock
Internal timing device that creates a signal, generated by an oscillator. The oscillator creates a uniform electrical frequency from which digital pulses can be created. The clock signal provides a timing reference or base for sampling of signal elements in a transmission link; creates signals to be used in a transmission system to control the timing of certain functions; generate periodic, precisely spaced signals that can be used for timing, relating processor operations, or generating interrupts.

Clock accuracy
The level of agreement of the frequency of a clock with the ideal frequency, specified as the magnitude of the fractional frequency offset from the ideal frequency. The fractional frequency offset is defined as the difference between the actual and ideal frequency divided by the ideal frequency. The frequency in this definition is generally the frequency averaged over a sufficiently long observation time (typically on the order of one hour to one day) to adequately determine the frequency.

Clocking
In synchronous communication, a periodic signal used to synchronize transmission and reception of data and control characters.

Clock signal
Uniform electrical frequency from which digital pulses can be created to provide a reference for transmission signal elements and for timing functions.

Coaxial Cable
Copper-wire cable consisting of a central wire conductor surrounded by dielectric insulator and encased in a wire mesh. Coaxial cable provides excellent high frequency transmission (50-100 MHz) and data rates to 45Mb/s. Commonly used as CATV transmission cable, 56kb/s data cables and Ethernet LAN connections.

Code Division Multiple Access (CDMA)
New form of digital cellular phone service. CDMA is a spread spectrum technology that combines the original information signal with a correlating code, resulting in a signal which occupies a much greater bandwidth than the original but allows several simultaneous *conversations* to share the same frequency allocation.

Configuration
Hardware and software arrangements that define a system and thus determine the system functionality and performance.

Connector
Device for electrically connecting wires or fibers in cable to equipment or other wires or fibers.

Controlled Environmental Vault (CEV)
Below ground temperature- and humidity-controlled housing for electronic or optical equipment.

Critical Alarm
Alarm message which signifies that the output reference is invalid or that the output cards have no clock source, unless otherwise specified by the user. If specified, a critical alarm activates the major alarm relays and the CRITICAL LED.

Cyclic Redundancy Check (CRC)
When a block of data is transmitted, a CRC character is attached. The CRC character is based on the hexidecimal value of the number of ones in that block of data. When received, the receiver calculates the hexidecimal value of the number of ones in the block of data. If the value does not match the attached CRC character value, the receiver requests retransmission of the block of data.

D4
The fourth-generation interface (between T-1 carrier system and analog premises device) in T-1 transmission technology.

D4 Framing
A T-1 framing format that uses the D-4 framing bit to identify both channel and signaling frame.

Data Communications Equipment (DCE)
As defined in the RS-232 specification, equipment to which DTE (Data Terminal Equipment) is connected, often to enable access to network facilities.

Data Terminal Equipment (DTE)
As defined in the RS-232 specification, equipment to which DCE (Data Communications Equipment) is connected, often to enable access to network facilities.

Decibel (dB)
A unit of measure of signal strength, usually the relationship between a transmitted signal and a standard signal source.

Delay
Time between events, such as the time between when an event occurs and when an alarm is generated.

Digital Signal, Level 1 (DS1)
Digital signal consisting of 24 DS-0s and a framing bit (193 bits) transmitted 8000 times per second, which may be carried on T1 or other transmission medium; 1.544 million bits per second in North America, and 2.048 million bits per second elsewhere (where it is called E-1).

Direct Current (DC)
A flow of electricity always in the same direction. Contrast with alternate current (AC). See *Volt*.

Direct Digital Synthesis (DDS)
DDS circuitry uses oscillator frequency to generate an analog output waveform of a specific frequency from a stable reference clock.

Download
To receive data into a computer or ROM from another computer, for example, a network element receiving updated software from a host computer into the OT-21 Flash ROM.

Do not Use for Sync
An SSM (sync status message) parameter not generated by the OT-21, but may be emitted in bypass mode.

E-1
European equivalent of North American DS1. DS1 carries information at the rate of 1.544 million bits per second (Mbps) T-1. E-1 carries information at the rate of 2.048 Mbps.

Earth Ground
The connection of an electrical system to earth. This connection is necessary to provide lightning and static protection and to establish the zero-voltage reference for the system.

Electromagnetic compatibility (EMC)
The ability of equipment or systems to be used in their intended environments within designed efficiency levels without causing or receiving degradation due to unintentional EMI (electromagnetic interference). EMI can be reduced by using proper shielding techniques and grounding.

Electromagnetic Interference (EMI)
Occurs when one device emits unwanted electrical noise, adversely affecting the operation of another device. EMI is reduced by copper shielding.

Ethernet
A medium often used as a local area network to connect computers printers, terminals, servers, and other network devices within the same building or campus. Ethernet operates over twisted wire and over coaxial cable at speeds up to 100 Mbps.

European Telecommunications Standards Institute (ETSI)
European counterpart to the American National Standards Institute (ANSI), founded in 1988 as a result of an initiative of the European Commission, established to produce telecommunications standards for users, manufacturers, suppliers, Administrators, and Post Telephone and Telegraph (PTT) administrations.

Event History
Historical record of activities on a device, comprised of event messages indicating a change in the physical or logical state of the device or transmission.

Extended SuperFrame Format (ESF)
A modification of the Superframe (sometimes called D4) framing scheme for DS1. ESF extends the framing pattern from 12 frames to 24 frames. A frame is 192 data bits and one frame bit. The 24 frame bits are a unique pattern of 1s and 0s that allows for terminal alignment, frame count, CRC bits, and a 2K data channel. Framing allows receiving equipment to identify the start and sequence of data in the binary 1.544Mbps DS1 stream.

Facilities Data Link (FDL)
ESF allows 4 Kbps to be used for a facilities data link which supports the communication of various types of monitoring or diagnostic network information used for provisioning and maintenance. OT-21 units use FDL for PQL settings.

Fault
Hard failure or performance degradation serious enough to threaten network function.

Firmware
Software that is stored in semipermanent memory, so-called because it shares characteristics of software and hardware. Usually stored on Programmable Read Only Memory (PROMs) or Electrical (or Erasable) PROMs. The software code is said to be burned into a chip.

Flash Read Only Memory (Flash ROM)
Flash ROM (or Flash Memory) contains software known as firmware. FlashROM can be erased and reprogrammed but persists when power to the device is turned off. FlashROM can be updated by downloading new firmware into the FlashROM.

Form-C
Relay configuration consisting of a wiper, a normally open (NO) contact, and a normally closed (NC) contact. These terms typically refer to the non-energized state; the wiper close the NO contact and opens the NC contact when energized.

Frame Generator
Frame generators accept input SQL from the reference input and convert it to the appropriate sync status message (SSM) for output.

Frame Ground (FG)
Connected to the equipment chassis to provides protective grounding.

Framing
Error control procedure which inserts bits which can be used by the receiver to identify the time slots allocated to each sub-channel in multiplexed digital channels. Framing bits may also carry alarm signals.

Framing Error
Error which occurs when a receiver does not interpret frame bits correctly.

Frequency
Rate at which electromagnetic waveform alternates.

Frequency Lock Loop (FLL)
Mechanism whereby a generated signal is locked to a precise frequency relationship with a reference clock signal. See *PLL*.

G.703
ITU-T Recommendation G.703, “Physical/Electrical Characteristics of Hierarchical Digital Interfaces." The G recommendations are a series of standards defined by the ITU-T for transmission facilities.

Generic Requirement (GR)
Telcordia Technologies (formerly Bellcore) document type that replaces Framework Technical Advisory (FA), Technical Advisory (TA), and Technical Reference (TR) document types. The GR is a living document representing Telcordia Technologies' current view of a technology.

Global Positioning System (GPS)
System of satellites, that transmits its position and time (derived from on-board celestial navigation equipment and atomic clocks), and a pseudo random noise code (PRN).

Holdover Mode
Mode of operation in which an internal clock provides the synchronization reference in the event that the internal reference is lost and another suitable reference is not available.

Insertion Loss
The difference in the amount of power received before and after something is inserted into the circuit. In a coaxial cable, insertion loss is the power loss due to all causes, usually expressed as dB per foot. The loss varies depending on frequency and cable type.

Interactive ASCII Mode
Instrument control protocol whereby a user issues commands and the instrument responds.

International Telecommunication Union (ITU)
A United Nations Specialized Agency in the field of telecommunications.

International Telecommunications Union-Telecommunications Standardization Sector (ITU-T)
A permanent organ of the ITU. The ITU-T is responsible for studying technical, operating, and tariff questions and issuing recommendations of each with a view to standardizing telecommunications on a worldwide basis.

Jumper
Strictly speaking, a wire connection between equipment and cable on a distribution frame. This term has come to be used for the adapters located on a chassis, to which standard connections are made to the internal logic and circuits.

Keep Alive Signal
Signal transmitted when a circuit is idle to prevent the logical connections from timing out.

Light Emitting Diode (LED)
The OT-21 chassis has a number of LEDs which provide a visual indication of the current status or condition of a system component.

Local Oscillator (LO)
The internal oscillator. See *Oscillator.*

Locked Mode (Normal)
An operational mode in which the processor controls DDS on the clock inputs in order to maintain the output frequency with respect to the input reference. The processor measures the phase of each input and adjusts the control value based on phase changes of the reference. The processor also monitors all input signals for frequency and input signal errors such as Loss of Signal (LOS) or Out-of-Frame (OOF).

Login
Process by which users identify and authenticate themselves to a network system or interface. Users typically enter their username and password.

Loss of Frame (LOF)
Generic term which is used specifically in different signal domains. For example, in the SONET domain, LOF is a condition that indicates that a valid framing pattern could not be obtained.

Loss of Signal (LOS)
Generic term which is used specifically in different signal domains. For example, in the SONET domain, LOS is a loss of signal condition which is detected physically at the receiver.

Low Noise Amplifier (LNA)
Typically a parametric amplifier.

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

Microprocessor Unit (MPU)
Electronic circuit, usually on a chip, which uses internal memory to perform arithmetic, log, and control operations.

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

Network Element (NE)
Processor controlled entities of the telecommunications network that primarily provide switching and transport network functions and contain network operations functions.

Network Equipment Building Standards (NEBS)
Defines a rigid and extensive set of performance, quality, environmental and safety requirements developed by Telcordia Technologies (formerly Bellcore), a research and development standards organization.

Network Time Protocol (NTP)
Developed to enable world-wide Internet systems to use a common time relative to Greenwich Mean Time (GMT).

Nonvolatile Random Access Memory (NVRAM)
RAM that does not lose its memory when power to it is turned OFF.

Null Modem Cable
Crossover or cross-pinned wiring of an RS-232 cable such that a DTE (Data Terminal Equipment) device (such as a PC) can talk to another such device without the use of a modem, hence the term *null*, which means *amounting to nothing*. A null modem cable allows one PC to connect directly to another PC for transfer over maximum distances of 50 to 100 feet (depending on the quality of the cable) without the use of either a modem or a line driver. A null modem cable also can be used to connect one DCE (Data Communications Equipment) device to another. Essentially, a null modem cable reverses the TX (Transmit) and RX (Receive) signals and some handshaking lines on an RS-232 cable.

Oscillator
Device for generating an analog test signal or electronic circuit that creates a single typically precise frequency signal.

Out-of-Frame Error (OOF)
OOF (Out of Frame) designates an error condition in framing bits, declared when 2 of 4 or 2 of 5 framing bits are missed.

Output card
An optional card with four secondary clock signal outputs. The OT-21 may have up to two optional output cards installed at the factory.

Password
Word or string of characters which a user or system Administrator associates with a username, and which is entered by the user to authenticate the username login to the network.

Phase Lock Loop (PLL)
Mechanism whereby a generated clock is locked to a precise phase relationship to a reference clock. A signal that is *phase locked* is also *frequency locked*. See *FLL*.

Phase measurement

The relative position between two signals within one cycle of a waveform, usually quantified in units of degrees or radians in the scientific literature. In telecom phase is usually expressed in units of time, and may also be called time delay or time interval. It is the measured time difference between the significant instants (e.g., zero level crossings) of the signal waveform under test and those of a reference signal. Phase measurements are often used to find Time Interval Error (TIE), which is a history of phase reading over a measurement period, indicating the deviation from the desired phase. TIE is used to calculate frequency offset and stability of a timing signal.

Position Dilution Of Precision (PDOP)

Measure of the position accuracy available due to the geometrical configuration of GPS satellites. A PDOP value of 1 indicates optimum satellite positions for high-quality data. Data quality decreases as the PDOP value increases.

Primary Reference Clock (PRC)

Any device that provides a PRS quality output signal.

Primary Reference Source (PRS)

1. A timing signal with ANSI and Stratum 1, or ITU and ETSI PRC accuracy and stability.
2. A master clocking source in a system or network from which other distributed devices derive their clocking and which enables the system or network to maintain synchronization.

Primary Reference Receiver (PRR)

A radio receiver that provides a PRS quality output signal.

Priority Quality Level (PQL)

The PQL settings provide an editable translation table for provisioning Sync Status Messages. In the OT-21, PQL information is carried in the FDL of the ESF.

PRV

Abbreviation used by the OT-21 when displaying PORT data. The command associated with the "PRV" field is PORT [x] PROV [#].

Rack

Aluminum or steel rack onto which equipment is mounted. The telecom industry standard rack size is 19 inches (480 mm) wide at the front. Telecom equipment is mounted on the rack and cables are laid in and fastened to the rack.

Rack mounting ears

Adjustable brackets which attach to the sides of the equipment chassis to allow a 19-inch chassis to be mounted in a standard 23-inch rack.

Radio Frequency (RF)
Electromagnetic waves operating between 10 kHz and 3 MHz propagated without a guide such a wire or cable, that is, in free space.

Restart
Interactive ASCII command for restarting the unit.

RJ-45
The 9-pin connector used for data transmission over flat or twisted standard telephone wire. Flat wire is used for serial data communications up to 19.2 Kbps to PBX, modems, printers, or printer buffers. Twisted wire is used for connecting to a 10BaseT local area network. Connectors are keyed or non-keyed. Keyed male connectors have a *key* or small square bump on the end; keyed female connectors are shaped to accommodate the key.

RS-232
Also known as EIA/TIA-232-E. A set of standards specifying electrical, functional, and mechanical interfaces for communicating between computers, terminals, and modems. The interface established by EIA to specify functions of interchange circuits, electrical characteristics, and connectors.

S/A
Selective Availability. Refers to the ability of the Department of Defense (DOD) to purposely degrade the accuracy of GPS coarse acquisition codes to an accuracy of about 100 meters. OT-21 units use software PLL with a dynamic loop tau to minimize selective S/A from the GPS satellites and environmental effects of the unit.

Security access level
One of five access levels associated with each username that grants rights to some set of ASCII command functionality. The levels range from Idle (level 0), which grants rudimentary rights and login privileges, to Administrator (level 4), the highest level, which grants complete access to all system functions. Each higher security access level grants privileges of all lower levels and additional privileges available only to that level.

Shield
Metallic layer surrounding insulated conductors. Shielding reduces stray electrical fields, and provides a measure of safety for personnel handling cables.

Sine wave
Analog wave which varies continuously in terms of amplitude and frequency.

Simplified Network Time Protocol (SNTP)
Protocol that assumes the clock is always Stratum 1 or unavailable.

Slave Clock
A clock which is locked to a reference timing signal.

Software configurable
Hardware options which operators can set by entering software commands via a communications interface.

Square wave
Digital signal which is binary in nature (in contrast to an analog sine wave which varies continuously in terms of amplitude and frequency).

Stratum 1
A timing signal whose long term accuracy is maintained at 1×10^{-11} or better with verification to coordinated universal time (UTC), and which may be used as the basis of reference for the control of other clocks within a network. Equipment which produces a Stratum 1 timing signal is also called a Primary Reference Source (PRS) or a Primary Reference Clock (PRC).

Stratum Levels
Clocks in a synchronization network are classified into four level based on their performance in terms of accuracy and stability. Stratum 1 is the highest and Stratum 4 the lowest level of performance.

Synchronization
Timing of network transmissions by a master clock.

Synchronous Digital Hierarchy (SDH)
A fiber-optic-based serial standards for use with SONET and ATM in Europe.

Synchronization Status Messages (SSM)
Identifiers embedded within the reference signals, and used as synchronization sources for Timing Signal Generators (TSGs) and other network elements (NEs). The identifiers carry information about the quality of the synchronization source to which the particular synchronization signal is traceable. Identifiers also indicate whether the signal is available for use as a synchronization source. SSMs are especially useful in avoiding timing loops, while allowing the TSG or NE to autonomously reconfigure to the most suitable synchronization source available.

Synchronization Supply Unit (SSU)
A logical function of reference timing signal selection, processing, and distribution that provides the frequency characteristics of slave clocks for telecommunications synchronization.

Synchronous Optical NETwork (SONET)
Optical interface standard that allows transmission products from vendors to work together. The SONET design standard defines fiber-optic transmission rates for transporting digital signals of different capacities.

Timing Signal Generator
Device which generates and distributes network synchronization signals, generally in a variety of waveforms.

Tip and Ring
Two wires, positive and negative, needed for a connection.

Transaction Language 1 (TL1)
A machine to machine language that is a subset of ITU-T's man machine language.

Transmission Control Protocol/Internet Protocol (TCP/IP)
Two of the protocols from a suite of networking standards developed by the U.S. Department of Defense in the 1970s to support a global system of interconnected networks.

Turn up
Power up.

Universal Time Coordinated (UTC)
Also known as UCT, Universal Coordinated Time. In the U.S., the official UTC is kept by the U.S. Naval Observatory. Globally, UTC is kept by a number of laboratories cooperating in the determination of UTC.

Unshielded Twisted Pair (UTP)
Transmission medium in which a pair of copper conductors, twisted around each other at intervals, are separately insulated, generally with plastic, to prevent shorting.

User Interface
Software-defined boundary mediating between machine and user.

Username
The name by which each user is known in the network administration. Each user must enter a username when logging in to identify the user to the network. Each username is also associated with a password, which validates the username, and an access level which determines the degree of access granted to the user.

Watchdog timer
Mechanism used to trigger an event or an escape from a process unless a timer is periodically reset. For example, a time may indicate the maximum period of time that a network connection will remain open before expiring.

Wire Wrap
Wire wrap adapters are designed to provide a temporary connection using standard jumper wire to cross-connect between a standard jumper header and a wire wrap post.

Evaluation

Company:	
Name:	Title and Department:
Telephone:	email:
Job Responsibility:	

Please indicate your evaluation of this manual. Attach additional sheets with comments as needed.

1. How and when do you use this manual?	☐ Read entire manual before attempting task ☐ Read selected sections before attempting task ☐ Read while attempting task ☐ Attempt task first ☐ Read as last resort
2. How well is the manual's content *organized*? Please explain.	☐ Excellent – parallels product's operation, very usable ☐ Good – representative of the product's operation, usable ☐ Average – usable but can be improved ☐ **Fair** — not very usable, must be improved ☐ **Poor** — not usable, must be improved
Understandable	Applicable
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5. Describe the *amount* of usable information in this manual including tables. Please explain.	☐ Too much information – not all required to perform task ☐ Proper amount provided – not too much or too little ☐ Too little information – needed additional information to perform task ☐ No Opinion

	Sections	Index	
6. How well is information *cross-referenced* in the manual's individual section and index? Please explain.	☐	☐	Excellent – very easy to locate information, extremely usable
	☐	☐	Good – easy to locate information, very usable
	☐	☐	Average – fairly easy to locate information, usable
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	☐	☐	No Opinion

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