TimeProvider 5000
IEEE 1588 Grand Master Clock / NTP Server

User's Guide

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How to Use This Guide

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

In This Preface

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

Purpose of This Guide

The *TimeProvider 5000 User's Guide* describes the procedures for unpacking, installing, using, maintaining, and troubleshooting the Symmetricom TimeProvider 5000 Precision Timing Protocol Grand Master / NTP Server (TimeProvider 5000). It also includes appendixes that describe alarms and events, the languages that you use to communicate with the TimeProvider 5000, default values, and other information.

Who Should Read This Guide

Chapter 1, Overview, is written for non-technical audiences who need general information about the product. 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.

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

- **Systems Engineers** – Chapter 1 provides an introduction to the TimeProvider 5000. Cross-references in this chapter direct you to detailed system information in other chapters as appropriate.
- **Installation Engineers** – Chapter 2 through Chapter 6 and the appendixes provide detailed information and procedures to ensure proper installation, operation, configuration, and testing of the TimeProvider 5000.
- **Maintenance Engineers** – Chapter 6 and the appendices provide preventive and corrective maintenance guidelines, as well as procedures for diagnosing and troubleshooting fault indications and alarms.

Chapter 1 is written for non-technical audiences who need information about the TimeProvider 5000 system. Chapters 2 through 6 contain detailed information and instructions which are intended to be performed by *qualified personnel* only.

Structure of This Guide

This guide contains the following sections and appendixes:

Chapter, Title	Description
Chapter 1, Overview	Provides an overview of the product, describes the major hardware and software features, and lists the system specifications.
Chapter 2, Installing	Contains procedures for unpacking and installing the system, and for powering up the unit.
Chapter 3, CLI Commands and SNMP	Describes the CLI command conventions, functions, and features and the SNMP protocol option.
Chapter 4, Provisioning	Describes the commands and procedures required to provision the TimeProvider 5000 after installing the unit.
Chapter 5, Operating	Provides basic information and procedures for proper system operation, including PTP Management.
Chapter 6, Maintenance and Troubleshooting	Contains preventive and corrective maintenance, and troubleshooting procedures for the product. Contains technical support contact information. Also contains part number and ordering information and procedures for returning the TP5000.
Appendix A, System Messages	Lists the alarms and events and provides basic indications of the source of the alarm.
Appendix B, Specifications and Factory Defaults	Lists the specifications and factory defaults for the TimeProvider 5000.
Appendix C, Installing the GPS Antenna	Provides details about GPS Antenna kits and procedures for installing the GPS antenna.
Appendix D, Redundant IOC Cards	Provides details about using redundant IOC cards.
Appendix E, Software Licenses	Contains licensing information for third party software.
Index	Provides references to individual topics within this guide.

Conventions Used in This Guide

This guide uses the following conventions:

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

When text appears this way...	... it means:
TimeProvider 5000 User's Guide	The title of a document.
CRITICAL	An operating mode, alarm state, status, or chassis label.
Select **File**, **Open**...	Click the Open option on the File menu.
Press **Enter** Press**;**	A named keyboard key. The key name is shown as it appears on the keyboard. An explanation of the key's acronym or function immediately follows the first reference to the key, if required.
`Username:`	Text in a source file or a system prompt or other text that appears on a screen.
`ping` `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.
qualified personnel	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

See your Symmetricom representative or sales office for a complete list of available documentation.

Where to Find Answers to Product and Document Questions

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

What's New In This Guide

TimeProvider 5000 Release	User's Guide Revision Level	User's Guide Revision Date
2.1	G1	October, 2012
	G	July, 2012
2.0	F	May, 2012
	E	September, 2011

The following corrections and additions have been made to the TimeProvider 5000 User's Guide with Rev. G1:

- Corrected connector description errors in Chapter 1, Chapter 2, and Chapter 6.
- Removed incorrect power fuse information from Repairing the TimeProvider 5000, on page 406.
- Corrected DSCP values that exceeded range in Provisioning an IOC Port as NTP Server, on page 325 .
- Modified information about GPS Antenna Kits in Table 6-9 and Table C-1 to include minimum and maximum cable length.
- Added recommendations for mini-SMB mating connectors in Chapter 2.
- Added User's Guide revision table to What's New In This Guide.

The following corrections and additions have been made to the TimeProvider 5000 User's Guide with Rev. G:

- Modified the `set input state` and `set output state` command so that enabling the input state for a programmable I/O port will also set that port as an input port and set the output state for that port to Disable.
- Modified the `set output state` command so that enabling the output state for a programmable I/O port will also set that port as an output port and set the input state for that port to Disable.
- Modified the `set authentication` command to allow the user to change the port used for RADIUS authentication
- Added the vendor-specific attribute "Symm-User-Level" for configuring a RADIUS server to indicate the security access level for each authorized TP 5000 user. Examples and description have been added to Chapter 4.
- Added procedure showing how to add support for the Symmetricom-specific attribute in a Cisco Access Control Server (ACS).

The following corrections and additions have been made to the TimeProvider 5000 User's Guide with Rev. F:

- Expanded descriptions of Timeprovider E10 and E30 expansion shelves in Chapter 1, added installation instruction in Chapter 2, and added specifications and default values in Appendix B
- Added cable and connector details to Chapter 2 and Appendix B
- Corrected Probe data format details in Appendix F
- Updated Firmware Upgrade procedures in Chapter 6

Note: The documents TimeProvider E10 User's Guide (098-00360-000) and TimeProvider E30 User's Guide (098-00364-000) have been obsoleted. The contents from these documents have been incorporated into this User's Guide.

The following corrections and additions have been made to the TimeProvider 5000 User's Guide with Rev. E:

- Added description of high capacity NTP server capability with hardware timestamping in Chapter 1, and provisioning details in Chapter 4
- Added description of Timeprovider E10 and E30 expansion shelves in Chapter 1, installation instruction in Chapter 2, and provisioning details in Chapter 4.

- Added new CLI commands, modified existing CLI commands in Chapter 3 to support NTP server capability, expansion shelves, PTP probe option, and other new features. See Figure 3-1 for a summary of CLI commands.
- Added sections in Chapter 1 describing Software Options and Security Features
- Added procedures for provisioning as NTP server
- Added Appendix F: PTP Probe Option
- Moved Contacting Technical Support from Appendix C to Chapter 6

Chapter 1 Overview

This chapter provides introductory information for the TimeProvider 5000.

In This Chapter

- Overview
  - TimeProvider 5000 Features
  - Software Options
  - Security Features
- TimeProvider 5000 Connections
- Physical Description
- Functional Description
- Configuration Management
- Alarms

Expansion Shelf

- TimeProvider 5000 Expansion Shelf System
  - TP E10 Expansion Shelf System Outputs
  - TP E30 Expansion Shelf System Outputs
  - Expansion Shelf ID Switch
  - Expansion Shelf LEDs

Overview

The TimeProvider 5000 is a Next Generation Network (NGN) packet-based timing and frequency device that combines the functionality of a highly-accurate, IEEE 1588 2008 Grand Master Clock and/or NTP server with T1/E1 I/O ports, 1PPS/10MHz and expansion (DTI) interconnect ports, and 1PPS+TOD inputs. The TimeProvider 5000, available with either a Quartz or Rubidium oscillator, incorporates hardware-based time stamping to provide the highest level of timing and frequency accuracy over a broad range of wireline and wireless application.

The TimeProvider 5000 system consists of a TP5000, a new TimeProvider E10 output expansion shelf with Gigabit SyncE/PTP, and a new TimeProvider E30 output expansion shelf with E1 and 1PPS+TOD ports. This document describes the TimeProvider 5000 system.

A new functionality for the TimeProvider 5000 is NTP (v3 and v4) server capability, which supports up to a maximum of 120,000 NTP transactions/second in unicast mode. The TimeProvider 5000 can be purchased as either a dedicated NTP server or as a unit which supports both PTP and NTP.

TimeProvider 5000 Features

- TimeProvider E30 E1 / 1PPS+TOD expansion shelf (optional)
- TimeProvider E10 PTP / SyncE expansion shelf (optional)
- Beidou navigation satellite RF input option on IMC card
- 1PPS+TOD input option on I/O card
- Expansion server ports on I/O card
- Expansion DTI / Ethernet management port on IMC card
- Compact 1 RU Footprint
- ETSI Compliant: Front Access for all Connectors
- Dual –48 VDC Power Connectors
- Up to 2 E1/T1 Legacy Inputs
- Up to 4 Legacy Outputs
- 2 SFP Connectors on each IOC
- 1 L1 GPS Input on the IMC (2 GPS Inputs are optional)
- 1 Ethernet Mgmt Port on the IMC
- 1 EIA-232 Serial (Craft) Port on the IMC
- LED indicators on the IOC and IMC
- Hardware Protected

- CLI and SNMP Management
- Unicast, multicast, and multicast-hybrid PTP profile support
- Unicast and multicast management addressing mode support

Software Options

The TimeProvider 5000 also provides several software options. An activation key is required to access these options. Table 1-1 lists all options for the TP 5000.

Table 1-1. TP 5000 Software Options

FW Version	Available Software Options	Notes
1.0	■ SNMP	Keys for options in v1.0 are 6 characters
1.2	■ SNMP ■ PTP Multicast & 2-step clock	40-character activation key for PTP option 6 character activation key for SNMP option
2.0 and **2.1**	■ SNMP ■ NTP w/20,000 TPS Capacity for PTP IMC ■ R1.2 PTP Multicast & 2-step clock ■ R2.0 500 VLAN (16 base + extended 484) ■ PTP Probe ■ NTP w/120,000 TPS capacity for NTP IMC ■ TPE10 PTP/SyncE 16 ports license (Adds availability of Ports 9-16 to standard 8 ports)	40-character activation key for all options in the v2.0 release 6-character activation key supported for SNMP option from v1.0 or v1.2

There is no expiration date for option keys, with the exception of a demo license that was offered for the v1.2 release.

Keys are associated with the serial number of the device on which the keys are stored and travel with that device. This is the IMC card for all software options, except for the 16-port option for a TP E10 Ethernet expansion shelf. When an IMC is replaced, keys in the old IMC do not transfer to the replacement IMC. The new IMC will need its own keys for the desired software options releases. The 16-port group key for a TP E10 Ethernet expansion shelf, which is based on the serial number of the expansion shelf, will stay with the expansion shelf on which it is installed.

The user must manually enter key(s) with CLI commands to gain access to the licensed software options.

Security Features

The TP5000 was designed to provide a high level of security on the Ethernet ports. The protocols running on the module run behind an internal firewall on the module. This allows access to the UDP ports to be limited or completely inaccessible by other systems.

Each of the service ports only allows NTP, PTP, ICMP, and IGMP. The IMC allows user-configuration of the firewall, which includes ICMP, FTP, SFTP, SSH, telnet, and SNMP.

If a service port is configured to run PTP, then it will ignore NTP packets and vice-versa. If the port is configured for unicast service, then multicast packets are ignored.

The service ports do not support routing protocols between the ports. This prevents a malicious attack on Port 1 (network 1) to be used to send a malicious attack via Port 2 (network 2) or vice-versa. This applies to both on the IOC modules and also the 16 ports on the TP E10 expansion shelf.

The service ports also include a hardware traffic limiter. If the number of packets per second exceeds the limit, the module will generate an alarm indicating excessive traffic is being seen. This could be an indication of a malicious attack or it could also be a large number of clients requesting service from the server. The system will drop packets received in excess of the limit. Packets received below the limit will be handled normally.

If the service ports do come under attack, only the module under attack will be affected due to the system's architecture. The IMC will continue to provide all management facilities for the system during this type of attack. To minimize system resource usage and deter denial of service attacks, the system is configured to allow a maximum ICMP ping request rate of 1 per second.

Conclusions

- The TP5000's architecture isolates functional areas such as user interfaces, the module-to-module interface, and output signal generation to minimize the possible corruption of time and frequency outputs.
- Only service specific UDP protocols are enabled on the IMC or IOC modules, or the TP E10 expansion shelves.
- From a system security perspective the TP5000 provides the highest level of security while providing very accurate time and frequency outputs. However, it also requires that the user implement best-practice security safeguards in their networks for the most robust levels of security.

TimeProvider 5000 Connections

Figure 1-1 is a front view of the TimeProvider 5000 showing connectors and LEDs. Connections for the GPS/GNSS input signal, Ethernet Management, and EIA-232 serial connection are located on the IMC module. Small Form-factor Pluggable (SFP) connectors are located on the IOC modules. UTI, E1, T1, 1PPS+TOD, or 10 MHz/1pps, and I/O ports are located on the I/O module. The 1PPS/10MHz ports are optional. Customers can order units with either

- two E1 I/O ports and two E1 Outputs
- two E1 I/O ports and 10MHz and 1PPS ports.
- two T1 I/O ports and 10MHz and 1PPS ports
- two E1 I/O ports and two 1PPS+TOD input ports

Figure 1-1. TimeProvider 5000 Connectors and LEDs

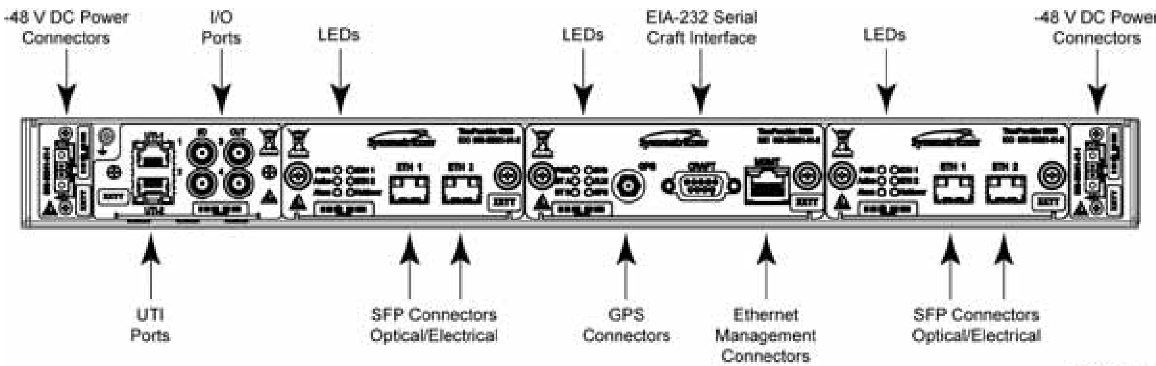
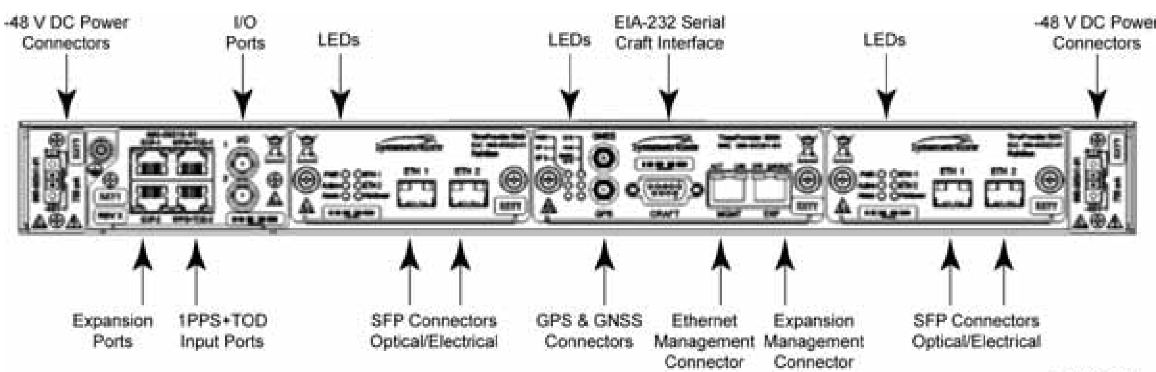


Figure 1-2. TimeProvider 5000 - Expansion Version Connectors and LEDs



UTI Input and Output Connections

UTI ports are available in the 090-50311-01, 090-50312-01, and 090-50314-01 I/O modules. The UTI ports use standard DTI pin-outs, as shown in Table 1-2.

These ports can be used to connect to expansion shelves, TimeProvider E10 or E30, with a custom cable. This custom cable should be built with twisted-pair cable, CAT5 or better, with RJ-45 connectors and the pinouts in Table 1-3.

Note: The 090-50315-01 I/O card has a different pin assignment and uses a standard twisted-pair RJ45 CAT5 cable. A custom cable should not be used with the 090-50315-01 I/O card.

Table 1-2. UTI Connector Pin Assignments

Pin	Signal	Comment
1	DTI+	DTI
2	DTI–	DTI
3	No connection	
4	No connection	
5	No connection	
6	No connection	
7	No connection	
8	No connection	

Table 1-3. Custom Cable RJ-45 Wiring Connections: UTI Port to Expansion Shelf EXP Port

UTI Port on I/O Card Mating Connector Pins	Signal	EXP Port on Expansion Shelf Mating Connector Pins
1	DTI+	7
2	DTI–	8

Communications Connections

The IMC allows user control of the TimeProvider 5000 through either the Ethernet Management port or the EIA-232 serial port.

Ethernet Management Port

The Ethernet Management port on the IMC is standard 10/100Base-T shielded RJ-45 receptacle. To connect the TimeProvider 5000 to an Ethernet network, use a standard twisted-pair Ethernet RJ-45 cable (CAT5 minimum).

Expansion Management Port

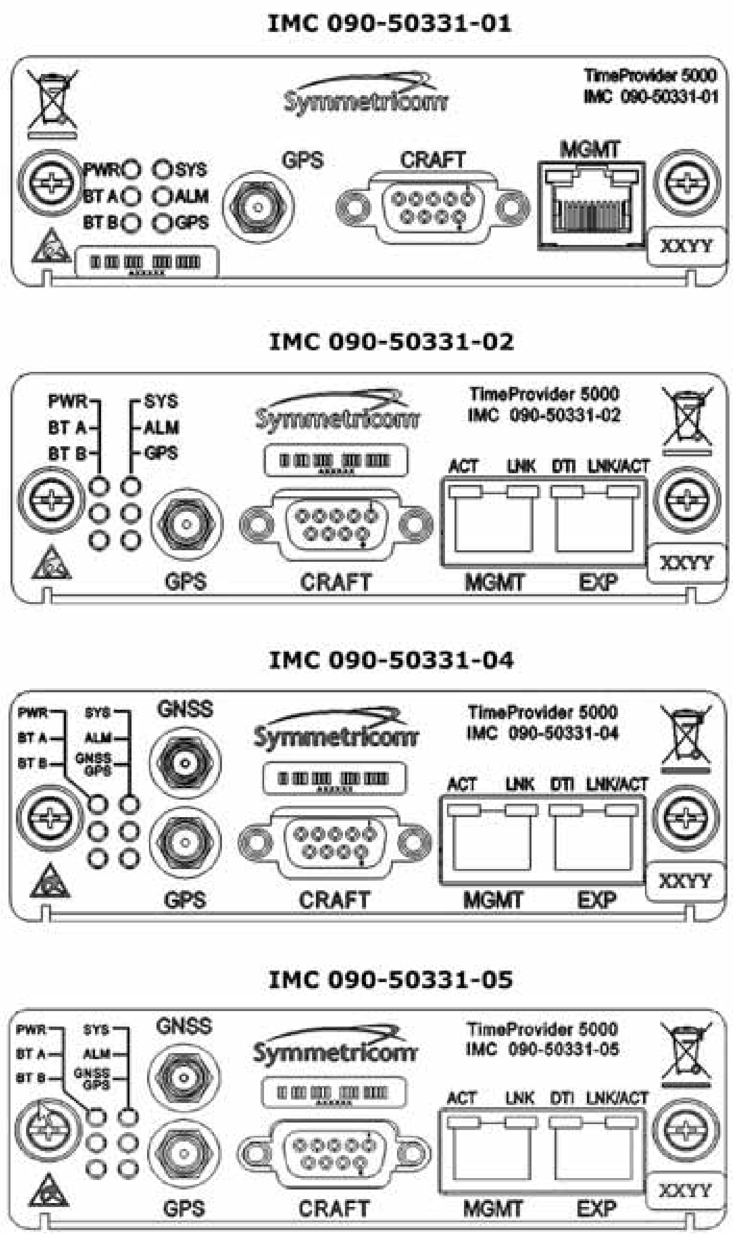
The expansion Management port on the IMC is a standard 10/100Base-T shielded RJ-45 receptacle. To connect the TimeProvider 5000 to a TP E10 or TP E30 expansion shelf, use a standard twisted-pair Ethernet RJ-45 cable (CAT5 minimum).

The connector pinouts for the expansion Management port, and all expansion ports, are listed in Table 1-4.

Table 1-4. Expansion RJ-45 Connector Pin Assignments

Pin	Signal	Comment
1	RX+ (Receive positive)	Ethernet (10/100Base-T)
2	RX– (Receive negative)	Ethernet (10/100Base-T)
3	TX+ (Transmit positive)	Ethernet (10/100Base-T)
4	Reserved	
5	Reserved	
6	TX– (Transmit negative)	Ethernet (10/100Base-T)
7	DTI+	DTI
8	DTI–	DTI

Figure 1-3. IMC Module: Versions -01 through -05



EIA-232 Serial (Craft) Port

The EIA-232 serial port connection is made through a DE-9 female connector on the IMC. This port allow you to connect to a terminal or computer using a terminal emulation software package. When connecting to this port, use a shielded EIA-232 direct connect cable.

Table 1-5 describes the DE-9 connector pin assignments for the CRAFT serial port on the IMC card.

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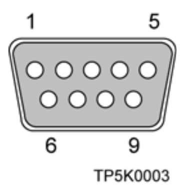
Table 1-5. IMC Serial Port Connector Pin Assignments

CRAFT Port Pin	Signal	Abbreviation	Signal Direction
2	Transmit data	TXD	From TP5000
3	Receive data	RXD	To TP5000
5	Signal ground	GND	-

Figure 1-4 shows the pin assignments for the DE-9 male connector that mates with the serial port on the IMC card.

Figure 1-4. Serial Port Male Mating Connector Pins



Output Connections

Programmable E1 Output Connections

Two of the traditional telecom synchronization mini-BNC ports (Port1 and Port2) on the 090-50311-01, 090-50312-01, and 090-50315-01 versions of the I/O module (Figure 1-5) are software configurable as E1 output ports, with the following signal types:

- 2.048 Mb/s (G.703/9)
- 2.048 MHz (G.703/13)

These ports can also be software configured as E1 inputs.

E1 Output Connections

Two of the four traditional telecom synchronization mini-BNC ports (Port3 and Port4) on the 090-50311-01 version of the I/O module (Figure 1-5) are dedicated E1 output ports, with the following signal types:

- 2.048 Mb/s (G.703/9)
- 2.048 MHz (G.703/13)

Programmable T1 Output Connections

Two of the RJ-48C ports (I/O-1 and I/O-2) on the 090-50314-01 version of the I/O module (Figure 1-6) are software configurable as T1 output ports, with the following signal types:

- 1.544 Mb/s (G.703)
- 1.544 MHz (G.703)

These ports can also be software configured as T1 outputs .

Note: The T1 ports on the 090-50314-01 version of the I/O module can also be configured as E1 and 2048 kHz inputs or outputs which meet the G.703 mask for impedance of 120 ohms, balanced.

Table 1-6 shows the pin assignments for the RJ-48C connectors for the programmable T1 input/output ports.

Table 1-6. T1 Input/Output Port Pin-Outs - RJ48C Connector

Pin	Signal
1	Rx Ring
2	Rx Tip
3	NC
4	Tx Ring
5	Tx Tip
6	NC
7	NC
8	NC

10MHz & 1PPS Output Connections

Two of the four mini-BNC ports (Port3 and Port4) on the 090-50312-01 version of the I/O module are 1PPS and 10MHz output ports. See Figure 1-5.

Mini-BNC Port3 and Port4 on the 090-50314-01 version of the I/O module are also 1PPS and 10MHz dedicated output ports. See Figure 1-6.

Note: Units that provide 1PPS and 10MHz outputs must be ordered from the factory; they cannot be reconfigured in the field. One port provides 1PPS output and one port provides 10 MHz output.

Expansion Output Connections

The expansion output ports (EXP-1 and EXP-2) on the expansion version of the I/O module (Figure 1-6) are standard 10/100Base-T shielded RJ-45 receptacles. To connect the EXP ports of the I/O module to an expansion shelf (TP E10 or TP E30), use a standard twisted-pair RJ-45 cable (CAT5 minimum). To connect the UTI ports (UTI-1 and UTI-2) of the I/O module to an expansion shelf, use a custom twisted-pair RJ-45 cable (CAT5 minimum) with the pinouts shown in Table 1-3.

The RJ-45 pin assignments for the UTI/EXP ports are shown in Table 2-6 and Table 2-7.

Figure 1-5. E1 Versions of I/O Module

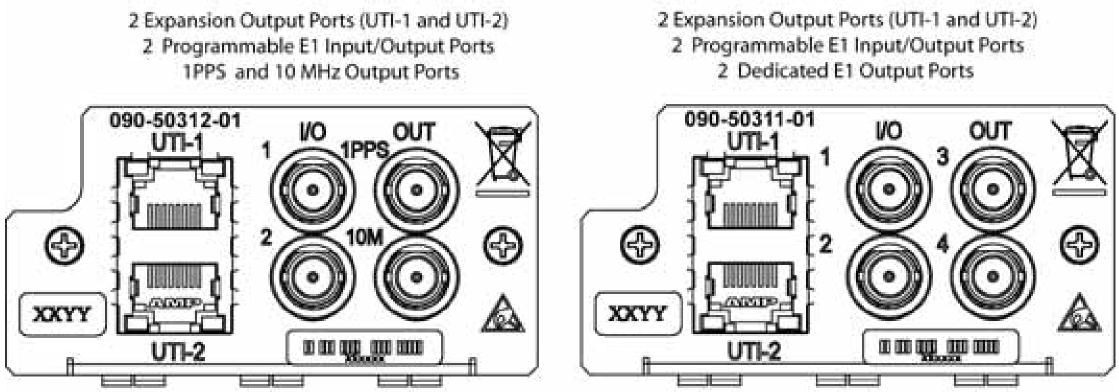
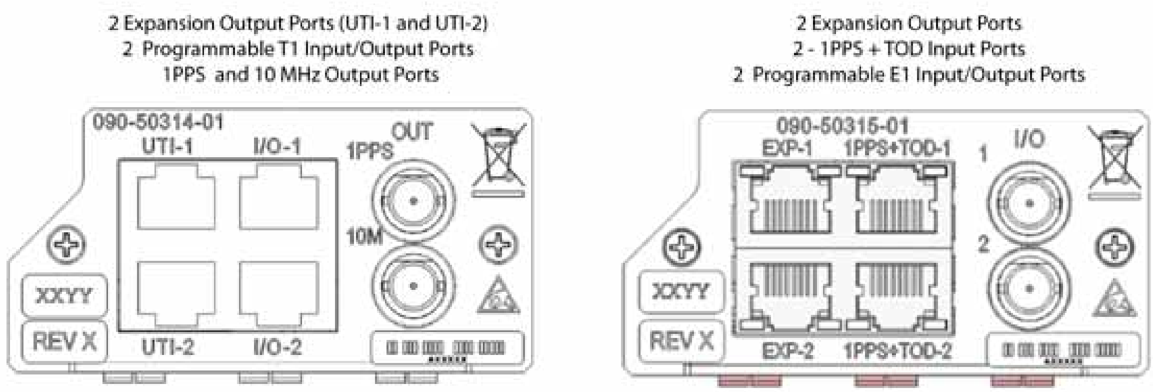


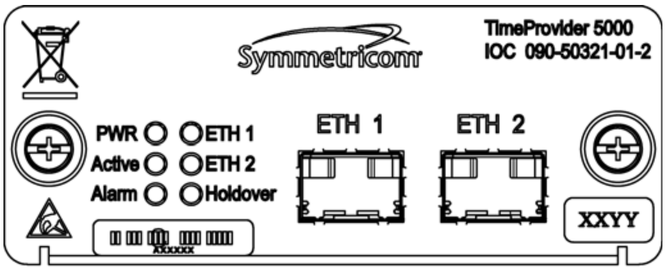
Figure 1-6. T1 and Expansion Versions of I/O Module



PTP / NTP Output Connections

The TimeProvider 5000 provides two Ethernet 100/1000 Small-form Factor Pluggable (SFP) connections on each IOC (see Figure 1-5) module. In PTP (IEEE 1588v2) grand-master mode, the TimeProvider 5000 supports many slaves per system in unicast mode, multicast mode, or multicast-hybrid mode. In NTP server mode, the TimeProvider 5000 supports 20,000 transactions/second (120,000 transactions/second with high-capacity NTP option).

Figure 1-7. PTP Output Connections



Input Connections

E1 Input Connections

Ports 1 and 2 of the I/O module (see Figure 1-5), which are mini-BNC on the 090-50311-01 and 090-50312-01 versions and mini-SMB on the 090-50315-01, are software configurable as traditional telecom input ports with the following signal types:

- 2.048 Mb/s (G.703/9)
- 2.048 MHz (G.703/13)

These ports can also be software configured as E1 outputs.

T1 Input Connections

Two of the RJ-48C ports (I/O-1 and I/O-2) on the 090-50314-01 version of the I/O module (Figure 1-6) are software configurable as traditional T1 telecom input ports with the following signal types:

- 1.544 Mb/s (G.703)
- 1.544 MHz (G.703)

These ports can also be software configured as T1 outputs.

Note: The T1 ports on the 090-50314-01 version of the I/O module can also be configured as E1 and 2048 kHz inputs or outputs which meet the G.703 mask for impedance of 120 ohms, balanced.

1PPS+TOD Input Connections

Two of the RJ-45 ports (1PPS+TOD-1 and 1PPS+TOD-2) on the 090-50315-01 expansion version of the I/O module (Figure 1-6) are input ports for 1PPS and TOD information transmitted at RS-422 level. See Table 1-7 for pin-outs for the 1PPS+TOD connectors.

GNSS Connection

The IMC (versions 090-50331-04 and 090-50331-05) has an SMA connector for input from GPS (090-50331-05) and Beidou/GPS (090-50331-04) navigation satellites to provide a frequency and time reference (see Figure 1-3). This port supports input from both GPS and Beidou satellites for the 090-50331-04 version of the IMC and input from GPS satellites for the 090-50331-05 version.

GPS Connection

The IMC (versions 090-50331-01, 090-50331-02, 090-50331-04, and 090-50331-05) has an SMA connector for GPS input to provide a frequency and time reference (see Figure 1-3).

Table 1-7. 1PPS+TOD Port Pin-Outs - RJ45 Connector

Pin	Signal	Comment
1	No Connection	Default state is open (high impedance)
2	No Connection	Default state is open (high impedance)
3	422_1_N	1PPS
4	GND	RS422 GND
5	GND	RS422 GND
6	422_1_P	1PPS
7	422_2_N	TOD time information
8	422_2_P	TOD time information

Power and Ground Connections

The TimeProvider 5000 uses –48 VDC power and is not equipped with a Power switch; DC power is controlled by a power distribution panel connected to the power connectors. Frame ground connections on the TP 5000 are made on the grounding stud located on the left side of the front panel, as identified with the international Ground marking, as shown in Figure 1-8. Frame ground connections on the TP E10 and TP E30 expansion shelves are made on the grounding stud located on the right side of the front panel (see Figure 1-9 and Figure 1-10).

Warning: To avoid serious personal injury or death, exercise caution when working near high voltage lines and follow local building electrical codes for grounding the chassis.

Figure 1-8. TimeProvider 5000 Power and Ground

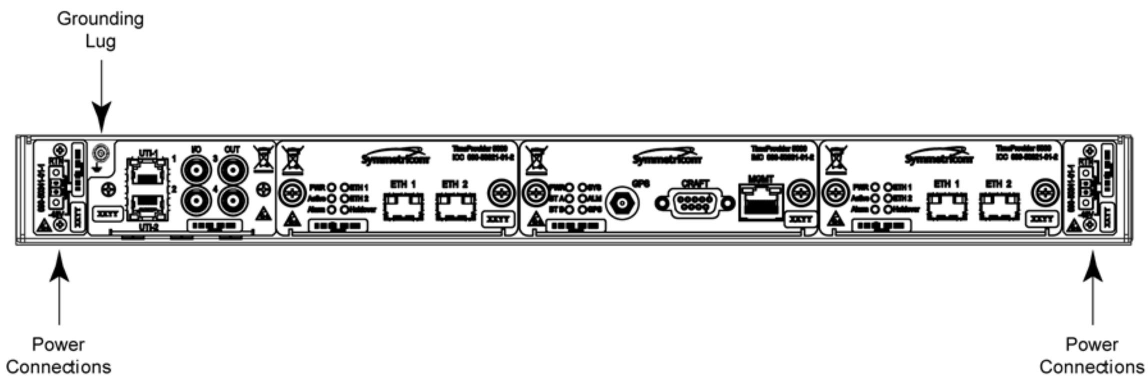


Figure 1-9. TimeProvider E10 Power and Ground

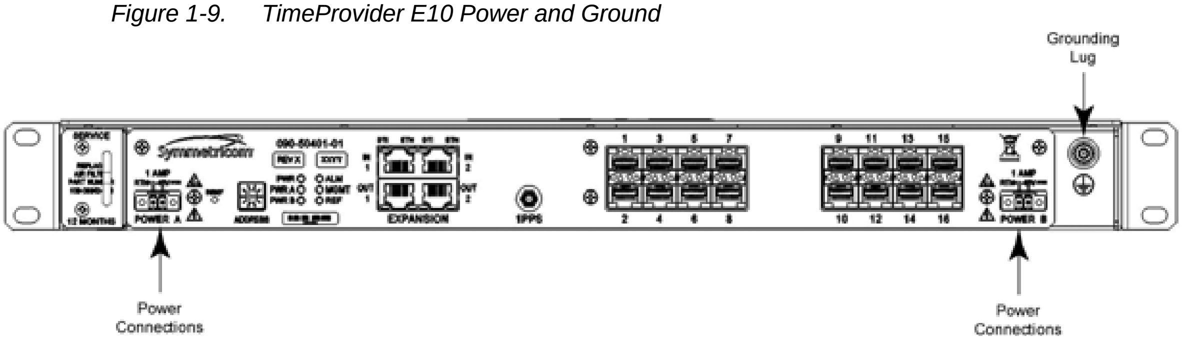
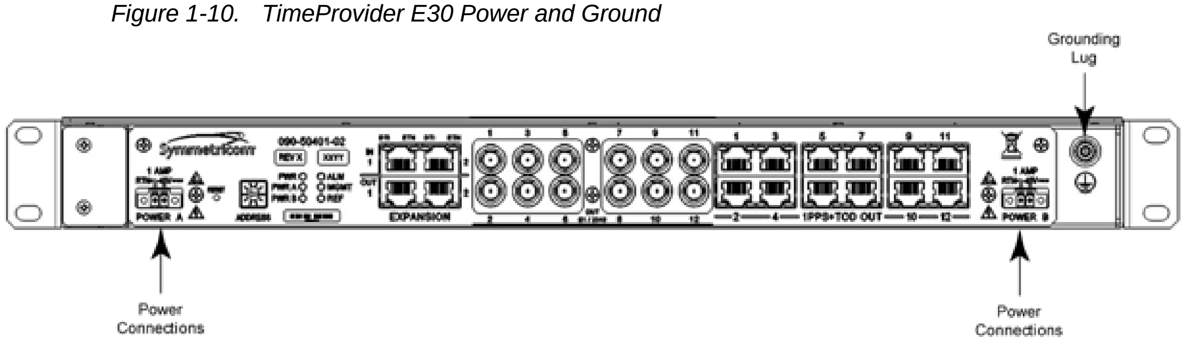


Figure 1-10. TimeProvider E30 Power and Ground



Physical Description

The TimeProvider 5000 consists of a 19-inch (48 cm) rack mount chassis, plug-in modules, and hardware. The TP E10 and TP E30 each consist of a 19-inch (48 cm) rack mount chassis and hardware.

Note: The TP 5000, TP E10, and TP E30 comes equipped with 19-inch rack mounting brackets. 23-inch (58.42 cm) rack mounting adapters are also available as a separately ordered item. 21-inch (ETSI) rack mounting adapters are available as a separately ordered item.

The TimeProvider 5000 has one I/O module slot, two IOC module slots, and one IMC module slot. The grounding lug is located near the I/O module and the power supply connectors are located on both sides of the chassis (see Figure 1-11). The minimum configuration is an I/O module, an IOC module, and an IMC module. The second IOC module slot is available for redundancy. See TimeProvider 5000 Part Numbers, on page 420.

The TimeProvider E10 SyncE/PTP expansion shelf has one block of RJ-45 expansion connectors (2 Input ports, 2 Output ports), two blocks of Gigabit SFP connectors (16 ports), and a mini-SMB connector. The shelf also has six LEDs located on the left side of the front panel. The shelf features a recessed rotary switch with 10 positions that is used to set the shelf ID and a recessed reset switch. The grounding lug is located on the right side of the front panel. The power supply connectors are located on both sides of the chassis (see Figure 1-12).

The TimeProvider E30 E1/1PPS+TOD expansion shelf has one block of RJ-45 expansion Input/Output connectors (2 Input ports, 2 Output ports), two blocks of mini-SMB output connectors (12 ports), and three blocks of RJ-45 output connectors (12 ports). The shelf also has six LEDs located on the left side of the front panel. The grounding lug is located on the right side of the front panel. The power supply connectors are located on both sides of the chassis (see Figure 1-13).

Figure 1-11. TimeProvider 5000 Modules and Power Connections

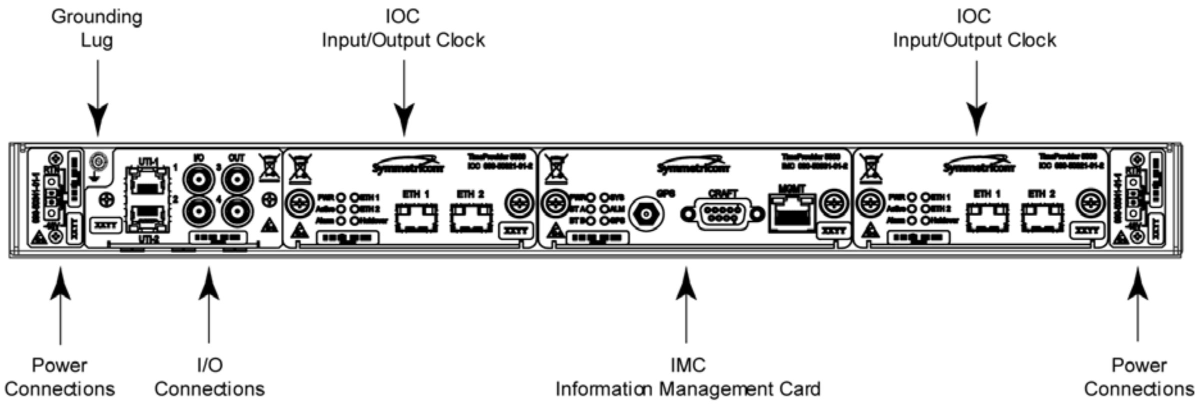


Figure 1-12. TimeProvider E10 Expansion Shelf Connections

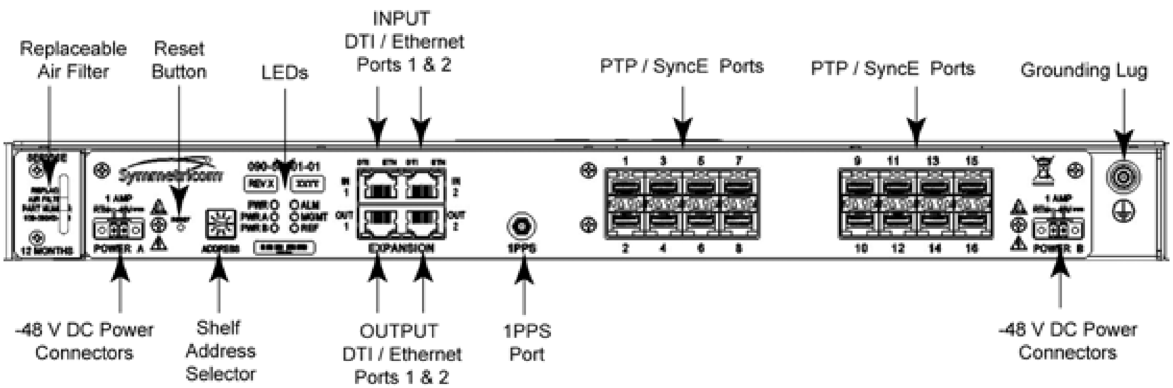
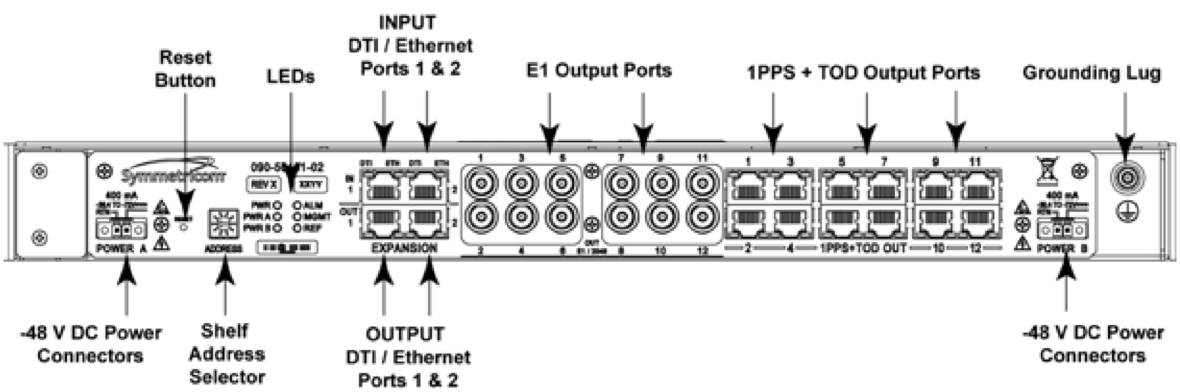


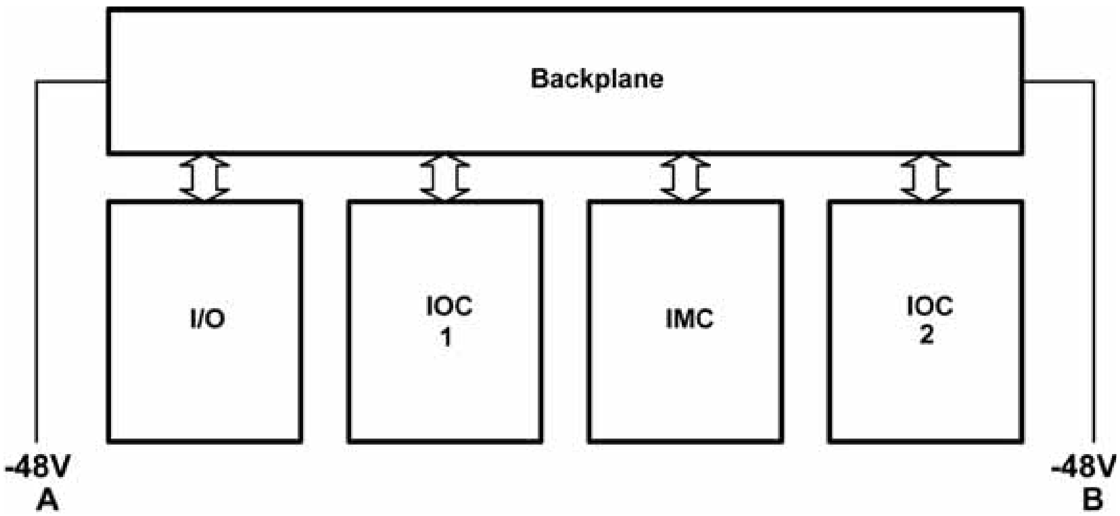
Figure 1-13. TimeProvider E30 Expansion Shelf Connections



Functional Description

See Figure 1-14 below for a block diagram of the TimeProvider 5000.

Figure 1-14. TimeProvider 5000 Block Diagram



TimeProvider 5000 Expansion Shelf System

The TimeProvider 5000 expansion shelf system consists of a TP5000 with expansion versions of the IMC and I/O cards, a new TimeProvider E10 output expansion shelf with Gigabit SyncE/PTP ports, and a new TimeProvider E30 output expansion shelf with E1 and 1PPS+TOD ports.

The TP 5000 expansion shelf system supports two IOC cards in 1+1 redundant configuration. These two IOC cards track one or more of the time and frequency reference inputs and provide the stable time and frequency signals that are used to generate output synchronization signals. The 090-50331-04 version of the IMC supports the Beidou satellite system. The 090-50301-02 chassis, 090-50315-01 I/O module and the 090-50331-02, 090-50331-04, and 090-50331-05 versions of the IMC will support 1PPS+TOD inputs. The 090-50331-02, 090-50331-04, and 090-50331-05 versions of the IMC support the expansion shelves.

Functionally the TimeProvider 5000 system can be thought of as a BITS or SSU in a central office or a secondary office. It accepts time and frequency reference inputs in multiple formats, and it provides time and frequency synchronization signals to the network equipment in the office.

Figure 1-16 shows the physical interfaces of a typical TimeProvider 5000 expansion shelf system that consists of a TP5000 and two output expansion shelves.

The TP5000 has four primary functions in the system:

- Input shelf for the system
- Timing synchronization source to expansion shelves using DTI
- External management interface
- Controller for the expansion shelves in the system.

In the TimeProvider 5000 expansion shelf system, expansion shelves are primarily output shelves. They use the time and frequency information from the TP5000 and convert them to different synchronization signal formats. Symmetricom offers two types of expansion shelves for the TP5000: the TimeProvider E30 expansion shelf provides E1 and 1PPS+TOD outputs and the TimeProvider E10 expansion shelf provides PTP and SyncE outputs. More outputs can be added by adding appropriate expansion shelves.

Expansion Connections

The TP 5000 provides time and frequency to the expansion shelves through DTI links in the expansion interface. The TP5000 controls and manages the expansion shelves through Ethernet in the expansion interface. The Ethernet management link and the DTI links share the same physical RJ-45 connector but they are logically two separate networks.

Figure 1-15. Expansion Connector on Expansion Shelf

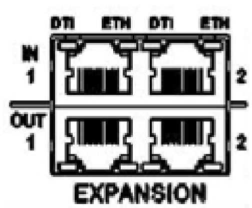


Figure 1-15 shows the Expansion connector on the expansion shelves. Figure 1-18 is a block diagram of the TimeProvider E30 E1/1PPS+TOD expansion shelf. Figure 1-17 is a block diagram of the TimeProvider E10 SyncE/PTP expansion shelf.

Figure 1-16. Physical Interfaces of TP 5000 with Two Expansion Shelves

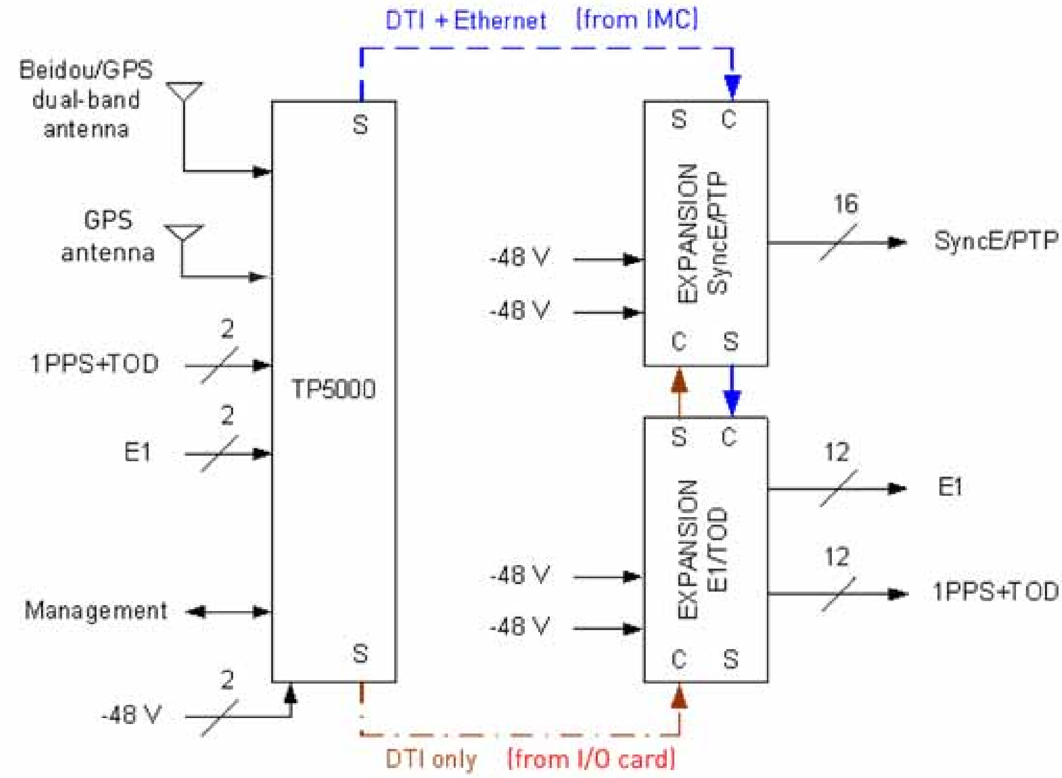


Figure 1-17. TimeProvider E10 SyncE/PTP Expansion Shelf Block Diagram

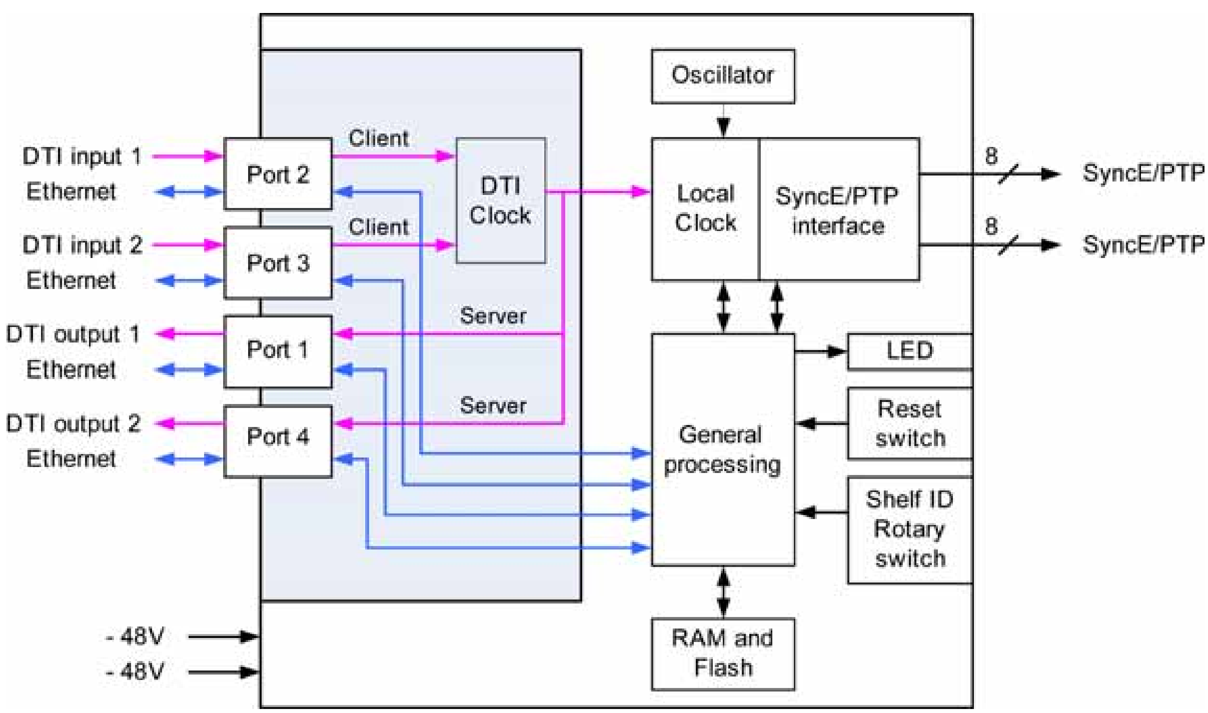
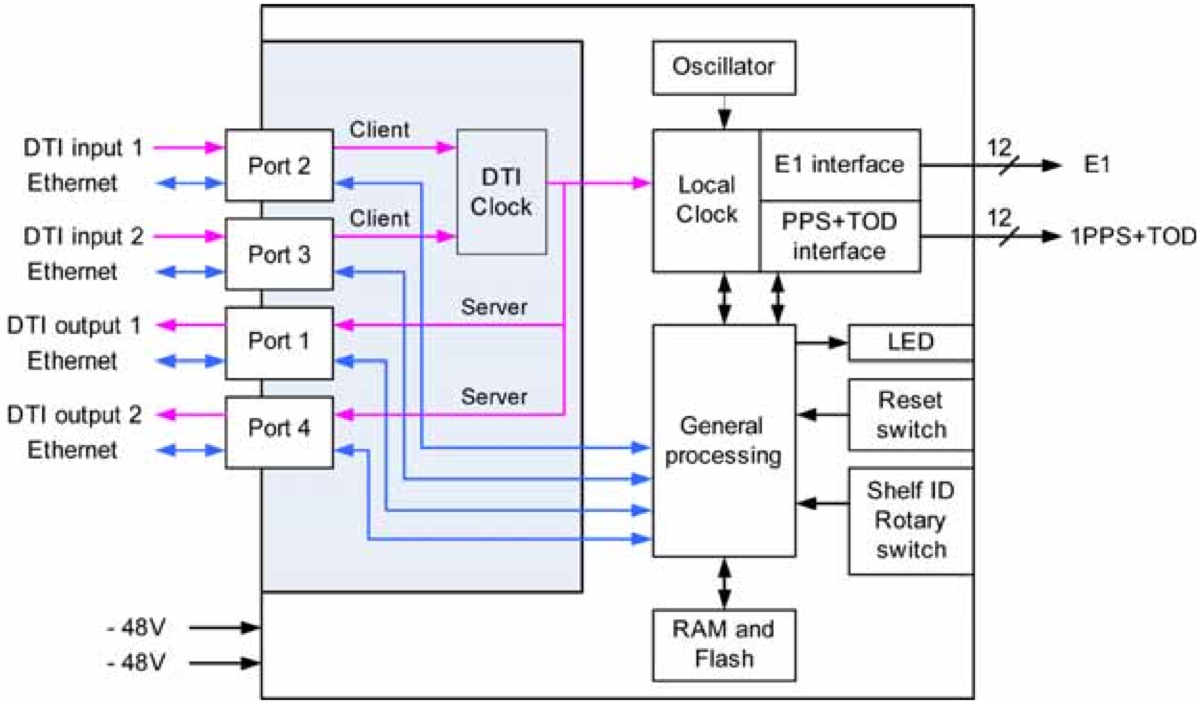


Figure 1-18. TimeProvider E30 E1/1PPS+TOD Expansion Shelf Block Diagram



The following actions must be performed to support the use of expansion shelves with the TP 5000.

- Enable ETH on TP 5000 IMC module's DTI / ETH connector to allow communication with the expansion shelves
- Set a unique ID (0-9) for each expansion shelf using the rotary switch on its front panel
- Enable DTI
  - TP 5000 - IMC
  - TP 5000 - I/O
  - Expansion shelf
- Provision output signals for each expansion shelf
- Enable state(s) of output(s)

The following actions must be performed to support the use of expansion shelves with the TP 5000.

- Enable ETH on TP 5000 IMC module's DTI / ETH connector to allow communication with the expansion shelves
- Set a unique ID (0-9) for each expansion shelf using the rotary switch on its front panel
- Enable DTI

- TP 5000 - IMC
- TP 5000 - I/O
- Expansion shelf

- Provision output signals for each expansion shelf
- Enable state(s) of output(s)

Figure 1-19 is a diagram of the expansion connections for a TP 5000 with one expansion shelf. Figure 1-20 is a diagram of the expansion connections for a TP 5000 with five expansion shelves.

Note: If using UTI ports from I/O module 090-50311-01, 090-50312-01, or 090-50314-01, a custom cable must be used between the I/O module and the expansion shelf. See Table 2-9 for details.

Figure 1-19. Expansion Connections for TP 5000 with a Single Expansion Shelf

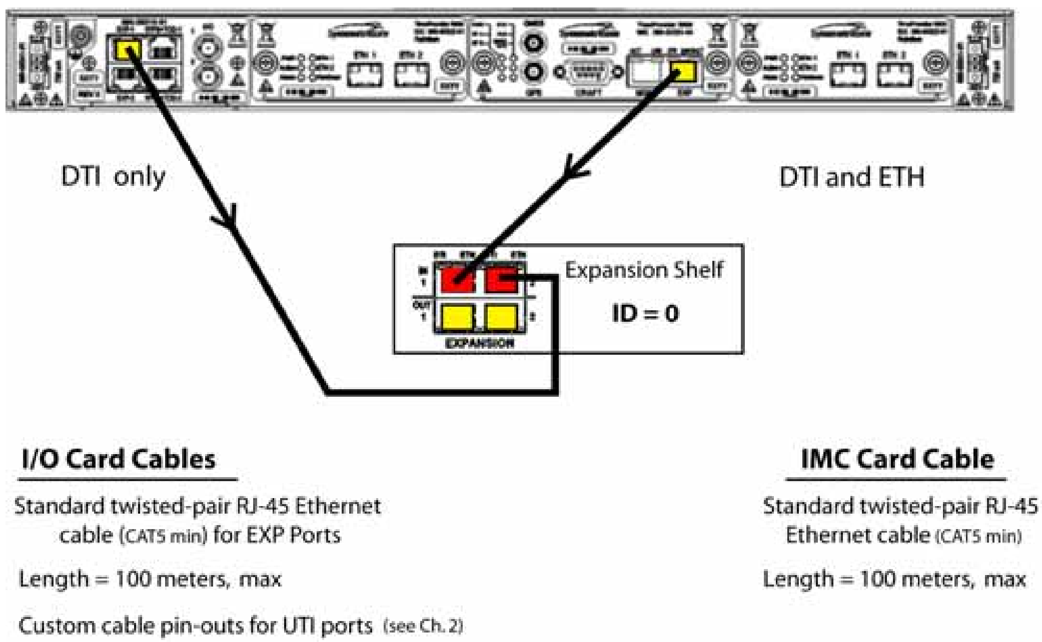
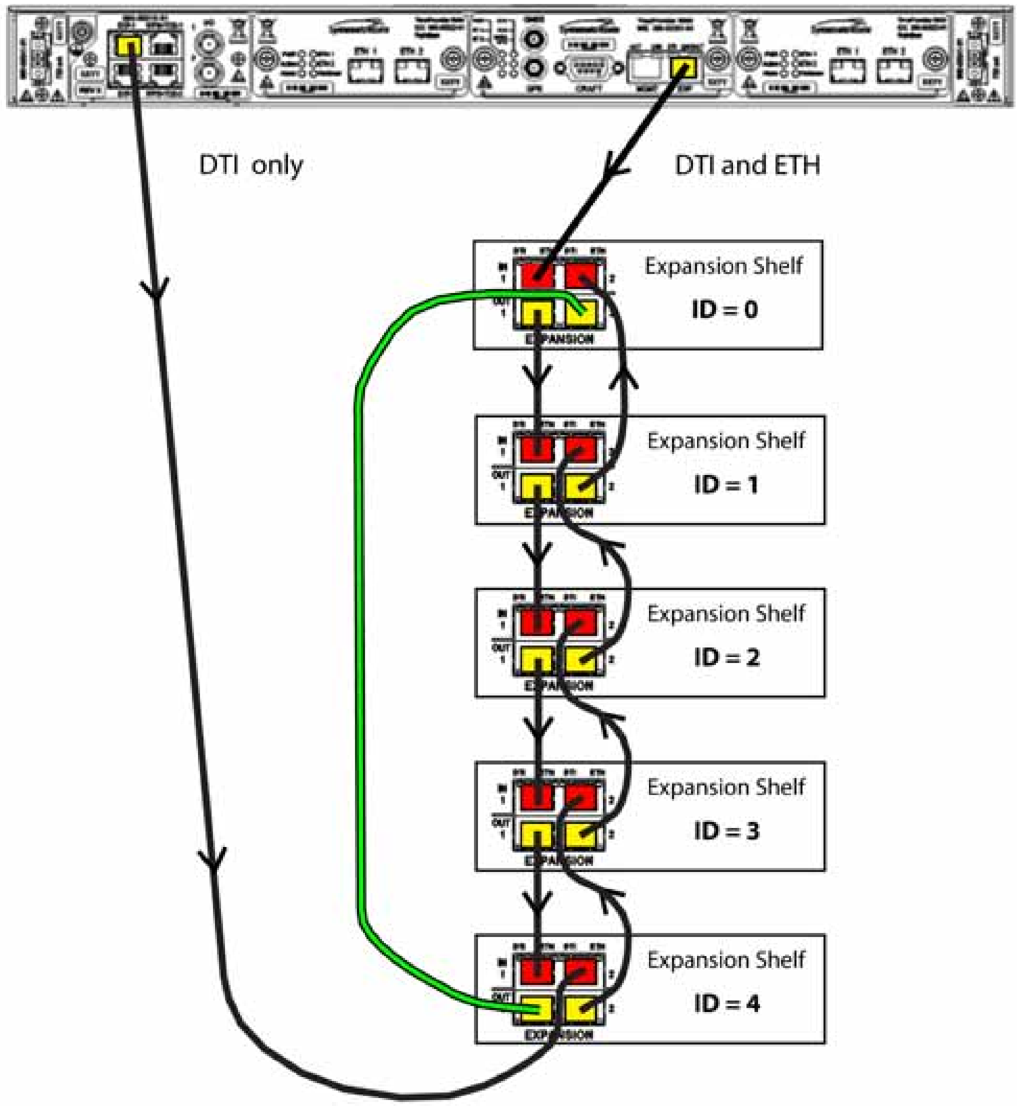


Figure 1-20. Expansion Connections for TP 5000 with 5 Expansion Shelves



I/O Card Cables

Standard twisted-pair RJ-45 Ethernet cable (CAT5 min) for EXP Ports

Length = 100 meters, max

Custom cable pin-outs for UTI ports (see Ch. 2 for pin-outs)

Cables Between Expansion Shelves

Standard twisted-pair RJ-45 Ethernet cable (CAT5 min)

Length = 3 meters, max

IMC Card Cable

Standard twisted-pair RJ-45 Ethernet cable (CAT5 min)

Length = 100 meters, max

IMC Module LEDs

The IMC module provides connectors for 10/100 Ethernet management, EIA-232 serial management, and the GPS/GNSS Timing Antenna. The IMC's LEDs indicate the following:

- Power Module Status
- Battery A & B Status
- System Health Status
- Alarm Status
- GPS/GNSS Signal Status

IOC Module LEDs

The IOC module also has two PTP Grand Master 100/1000 Ethernet SFP ports with LEDs that indicate link and link speed. The IOC module has LED status indicators and test outputs for the system. The LEDs indicate:

- Power Status
- Active Status
- Ethernet Status
- Alarm Status
- Holdover Status

Expansion Shelf LEDs

The TP E10 expansion shelf has sixteen (16) 100/1000 Ethernet SFP ports with LEDs that indicate link and link speed. The TP E30 has twelve (12) 1PPS ports with LEDs that indicate port enable state. The TP E10 and TP E30 also each have LED status indicators. The LEDs indicate:

- Power Status
- Active Status
- Ethernet Status
- Alarm Status
- Holdover Status

Communication Ports

Communications ports on the IMC allow you to provision, monitor, and troubleshoot the chassis. You can communicate with the TimeProvider 5000 using either CLI or SNMP protocols.

Note: The SNMP feature can either be ordered in a new system, or added to a previously ordered system as a field upgrade (see Table 6-7 for part number). Contact your Symmetricom representative for more information.

Local Craft Serial Port

The EIA-232 port supports local control; you can configure the TimeProvider 5000 with CLI commands using a terminal or computer with terminal emulation software. The connector is located on the IMC module. The Local port is configured as a DCE interface and the default settings are as follows:

- Baud = 57.6K
- Data Bits = 8 bits
- Parity = 0
- Stop bits = 1
- Flow Control, None

Management Ethernet Port

The Management Ethernet connector provides connectivity to an Ethernet local area network. Each Ethernet port has a unique internet protocol (IP) address and once the IP address is set and a connection is made to a LAN, you can access the TimeProvider 5000.

Synchronization and Timing Inputs

The TimeProvider 5000 can use either GPS, Beidou, E1, T1, or 1PPS+TOD signals as external input references. The GPS and GPS/Beidou references connect to SMA connectors on the IMC card. The GPS/Beidou port is labeled "GNSS". The E1 and T1 inputs are configurable ports located on the I/O module. The 1PPS+TOD input ports are located on the 090-50315-01 version of the I/O module.

Synchronization and Timing Outputs

The TimeProvider 5000 has four GbE timing outputs (2 per IOC card), which can be configured as either Precision Timing Protocol (PTP) or Network Timing Protocol (NTP) outputs. The expansion version of the I/O card, 090-50315-01, also features two DTI timing outputs that are used to provide timing to expansion shelves.

System Inputs and Outputs

Programmable Input/Output Ports

The TimeProvider 5000 has two mini-BNC ports on the 090-50311-01 and 090-50312-01 versions of the I/O module, and two mini-SMB ports on the 090-50315-01 version, that are software configurable as either E1 input or output ports. They can provide or receive the following signal types:

- 2.048 Mb/s (G.703/9)
- 2.048 MHz (G.703/13)

The 090-50314-01 version of the I/O module has two RJ-48C ports that are software configurable as either T1 input or output ports. They can provide or receive the following signal types:

- 1.544 Mb/s (G.703)
- 1.544 MHz (G.703)

The 090-50315-01 version of the I/O module has two RJ-45 input ports for 1PPS and TOD information transmitted at RS-422 level

Dedicated Output Ports

The 090-50311-01 version of the I/O module (Figure 1-5) also has two mini-BNC ports that are dedicated E1 output ports with the following signal types:

- 2.048 Mb/s (G.703/9)
- 2.048 MHz (G.703/13)

The 090-50312-01 (see Figure 1-5) and 090-50314-01 (see Figure 1-6) versions of the I/O module also have two mini-BNC ports that are dedicated output ports with the following signal types:

- 1PPS
- 10 MHz

Note: Units that provide 1PPS/10MHz output must be configured at the factory when ordered; they cannot be reconfigured in the field. One port provides 1PPS output and one port provides 10MHz output.

TP E10 Expansion Shelf System Outputs

PTP/SyncE Output Ports

The TP E10 expansion shelf features 16 SFP output ports with SyncE/PTP signals.

1PPS Output Port

The TP E10 expansion shelf includes one 1PPS mini-SMB output port.

TP E30 Expansion Shelf System Outputs

E1 Output Ports

The TP E30 expansion shelf features 12 mini-SMB dedicated E1 output ports with the following signal types:

- 2.048 Mb/s (G.703/9)
- 2.048 MHz (G.703/13)

1PPS+TOD Output Ports

The TP E30 expansion shelf features 12 RJ-45 1PPS+TOD output ports. 1PPS and TOD information is transmitted at RS-422 level.

Expansion Shelf ID Switch

Each expansion shelf must have a unique user-defined shelf ID. There can be up to 10 shelf IDs (0 to 9) in the system. The user can set the shelf ID using a mechanical rotary switch on the front panel.

Figure 1-21. Shelf ID Selector

Configuration Management

The Command Line Interface (CLI), also called the ASCII command set, can be used to control the TimeProvider 5000 from a terminal connected to the EIA-232 serial port, or the Ethernet port. Refer to Chapter 3, CLI Commands and SNMP for further details.

Note: Before you can communicate with the TimeProvider 5000 through an Ethernet connection, you must first configure the Ethernet port using the serial connection (see Provisioning the Ethernet Ports, on page 295).

Alarms

The TP5000 uses alarms to notify you when certain conditions are deteriorating below specified levels. Expansion shelf alarms are reported to the TP 5000 that controls the shelf. These alarms are indicated by module status LEDs and by SNMP traps. You can provision the alarm to either be enabled or disabled and the current alarm state can be obtained via the communication ports. For more information, see Provisioning Alarms, on page 364 and Appendix A, System Messages.

Chapter 2 Installing

This chapter describes the procedures for installing the TimeProvider 5000, as well as the TimeProvider E10 and TimeProvider E30 expansion shelves.

In This Chapter

- Getting Started
- Unpacking the Unit
- Rack Mounting the Chassis
  - Rack Mounting the TimeProvider 5000 Main Shelf
  - Rack Mounting the TP E10 & TP E30 Expansion Shelves
- Working With Modules
- Signal Connections
  - Communications Connections
  - TP 5000 Synchronization and Timing Connections
  - TimeProvider E10 Synchronization and Timing Connections
  - TimeProvider E30 Synchronization and Timing Connections
- Connecting the GPS/GNSS Antenna
- Making Ground and Power Connections
- Installation Check List
- Applying Power to the TimeProvider 5000

Getting Started

Before you begin to install the TimeProvider 5000, TimeProvider E10 or TimeProvider E30, review the information in this section.

If you encounter any difficulties during the installation process, contact Symmetricom Global Services (SGS). See Contacting Technical Support, on page 427 for telephone numbers. Contact SGS - Product Technical Support for technical information. Contact Customer Service for information about your order, RMAs, and other information.

Security Considerations for TP5000 Installation

- The TP 5000, TP E10 and TP E30 should be installed in a physically secure location.
- The TP 5000's IMC Module's Ethernet port should be installed behind the company's firewall to prevent public access.
- Whenever possible, the TP 5000's Ethernet service ports should be installed behind the company's firewall to prevent public access.

Site Survey

Before you begin installation, determine the chassis location, ensure the appropriate power source is available (–48 VDC), and ensure that the equipment rack is properly grounded.

The TimeProvider 5000 is designed to mount in a 19-inch (48 cm) rack, occupies 1.75 in (4.5 cm, 1 RU) of vertical rack space, and has a depth of 18 in (45.7 cm). The TimeProvider E10 and TimeProvider E30 expansion shelves are also designed to mount in a 19-inch (48 cm) rack, and each occupies 1.75 in (4.5 cm, 1 RU) of vertical rack space, and has a depth of 10 in (25.4 cm). .

Note: 1RU above the TimeProvider 5000 must be left unoccupied for heat dissipation

Note: 23-inch (58.42 cm) rack mounting adapters are also available as a separately ordered item. 21-inch (ETSI) rack mounting adapters are available as a separately ordered item.

The TimeProvider 5000 is to be installed into a rack with permanent connection to the -48VDC mains. This connection is to be made to a branch over-current, short-circuit protection device with replaceable fusing of 5 amps, maximum. For permanently connected equipment a readily accessible disconnect device shall be incorporated in the building installation wiring.

The TimeProvider E10 expansion shelf is to be installed into a rack with permanent connection to the -48VDC mains. This connection is to be made to a branch over-current, short-circuit protection device with replaceable fusing of 2 amps, maximum. For permanently connected equipment a readily accessible disconnect device shall be incorporated in the building installation wiring.

The TimeProvider E30 expansion shelf is to be installed into a rack with permanent connection to the -48VDC mains. This connection is to be made to a branch over-current, short-circuit protection device with replaceable fusing of 1 amp, maximum. For permanently connected equipment a readily accessible disconnect device shall be incorporated in the building installation wiring.

Environmental Requirements

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

- Operating temperature: 23° F to 113° F (–5° C to 45° C) for TP 5000
  23° F to 131° F (–5° C to 55° C) for TP E10 and TP E30
- Operating Humidity: 90% to 100% RH, maximum, w/condensation
- Use only shielded cable for all signal wiring, including I/O, clocks and Ethernet. Ground appropriately at both ends, or as required by local standards.
- Secure all cable screws to their corresponding connectors.

Caution: To avoid interference, you must consider the electromagnetic compatibility (EMC) of nearby equipment when you install the TP 5000, TP E10 and TP E30.

Electromagnetic interference can adversely affect the operation of nearby equipment.

Installation Tools and Equipment

You will need the following tools and equipment to install the TimeProvider 5000:

- Standard tool kit
- Cable ties, waxed string or acceptable cable clamps
- 1 mm² / 18 AWG (minimum) stranded wire at 300 volt insulation for –48 VDC
- 1 mm² / 16 AWG wire to connect grounding lug to permanent earth ground
- Two U.L listed Ring Lugs for grounding connections
- Crimping tool to crimp the ring lug

- Shielded cabling of the appropriate impedance required by the specific signal type for signal wiring (including GPS, and Ethernet)
- Mating connectors for terminating signal wiring
- ESD wrist strap for installing modules
- Fasteners for mounting the equipment in rack
- Digital multimeter or standard Voltmeter for verifying power connections to the chassis
- Laptop computer with communications software (e.g., Microsoft Hyperterminal, ProComm Plus or EmTec ZOC) for setting system parameters

Unpacking the Unit

The TimeProvider 5000, TimeProvider E10 and TimeProvider E30 are packaged to protect them from normal shock, vibration and handling damage. (Each unit is packaged separately.)

Caution: To avoid electrostatic discharge (ESD) damage to parts that are packaged with the TP 5000, TP E10 and TP E30, 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 Symmetricom distributor. Retain the shipping container and packing material for the carrier to inspect.
3. Open the container, being careful to cut only the packaging tape.
4. Locate and set aside the CD, printed information, and paperwork that is included in the container.
5. Remove the unit from the container and place it on an anti-static surface.
6. Locate and set aside small parts which may be packed in the container.
7. Remove the accessories from the container.
8. Remove the anti-static packaging from the unit and accessories.
9. 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 top of the unit, front and center. See Figure 2-1 for the location of the label on the TP 5000. See Figure 2-2 for the location of the label on the TP

E10. See Figure 2-3 for the location of the label on the TP E30. Contact your Symmetricom distributor if the model or item number do not match.

For a complete listing of item numbers, see Table 6-7 and Table 6-8.

Figure 2-1. TP 5000 - Location of Product Label

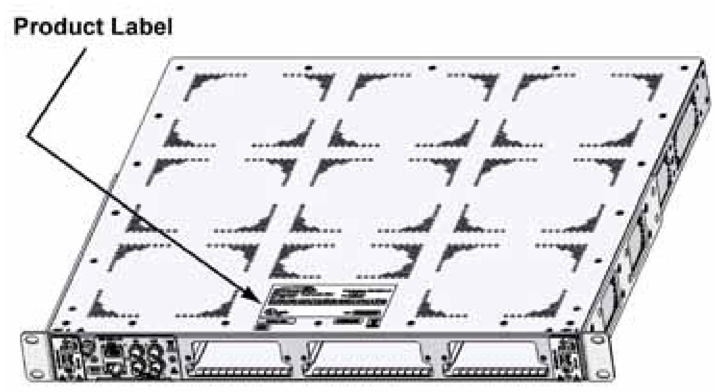


Figure 2-2. TP E10 - Location of Product Label

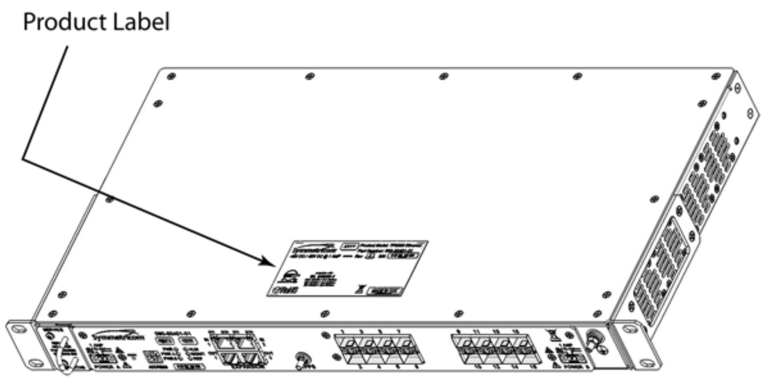
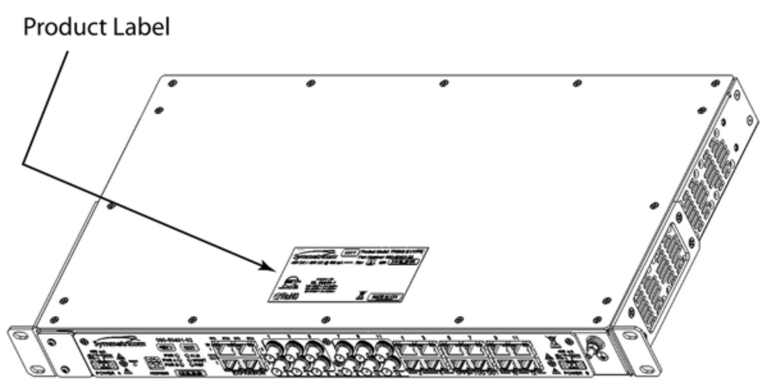


Figure 2-3. TP E30 - Location of Product Label



Rack Mounting the Chassis

The installation procedure described in this section provides general guidelines for installing the TimeProvider 5000, as well as the TimeProvider E10 and TimeProvider E30 expansion shelves. Always follow applicable local electrical standards.

Rack Mounting the TimeProvider 5000 Main Shelf

Use the following steps to mount the TimeProvider 5000 in a rack.

Note: 1RU above the TimeProvider 5000 must be left unoccupied for heat dissipation.

Note: The TimeProvider 5000 comes equipped with 19-inch rack mounting brackets. 23-inch (58.42 cm) rack mounting adapters are also available as a separately ordered item. 21-inch (ETSI) rack mounting adapters are available as a separately ordered item.

1. TimeProvider 5000 is shipped with rack mounting brackets attached. The rack mounting brackets can be removed and reattached in a different orientation, if desired. See Figure 2-4 for mounting hole placements. See Figure 2-5 and Figure 2-6 for chassis dimensions. Ensure that the mounting brackets on both sides are attached to the chassis at equal distances from the front of the unit (see Figure 2-7) using 6-32 x 1/4-inch screws.

2. Mount the chassis to the front of the equipment rack rails with four screws and associated hardware. Use the proper screws for the equipment rack.

Figure 2-4. TP 5000 Mounting Hole Placements

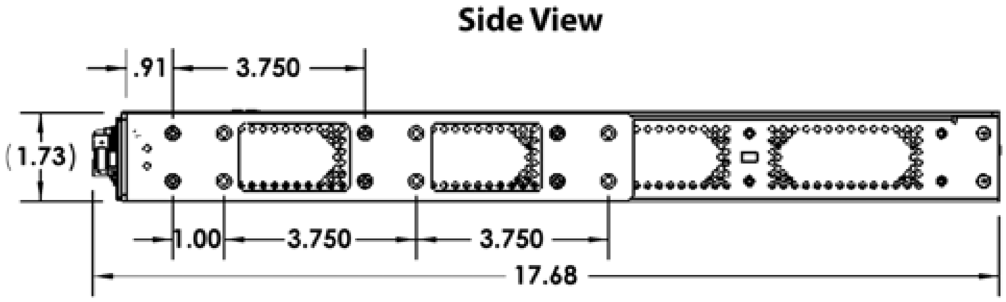


Figure 2-5. TP 5000 Chassis Dimensions – Front View

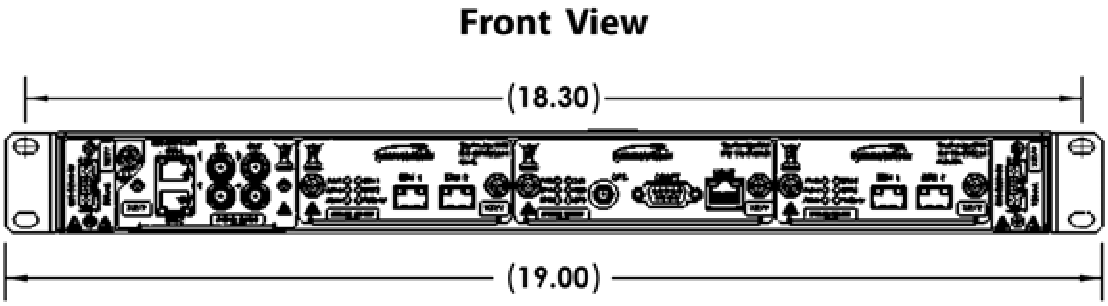


Figure 2-6. TP 5000 Chassis Dimensions – Top View

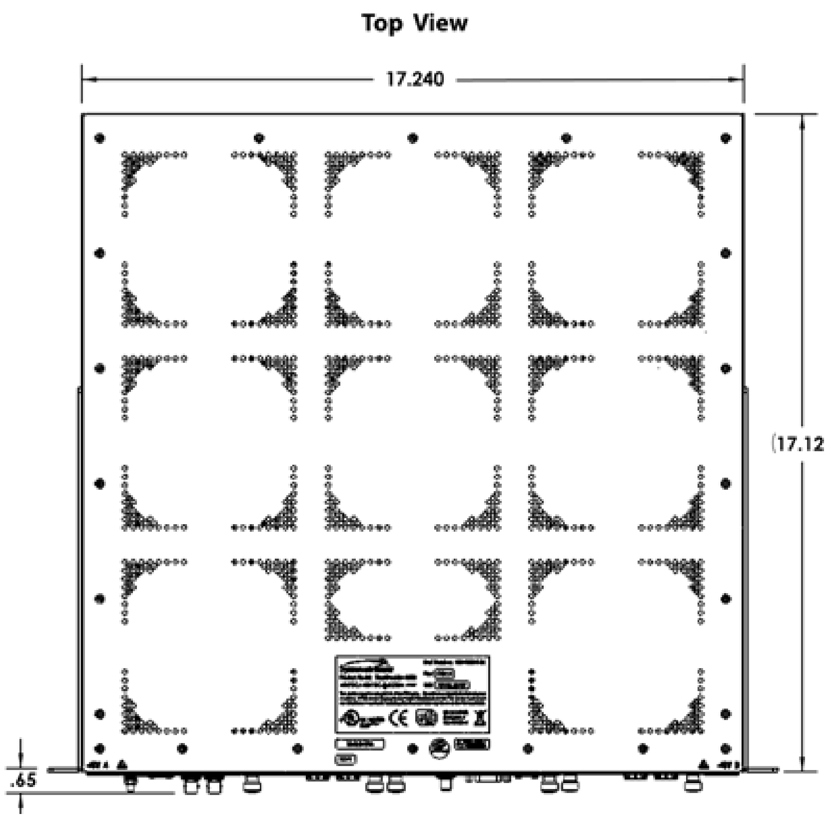
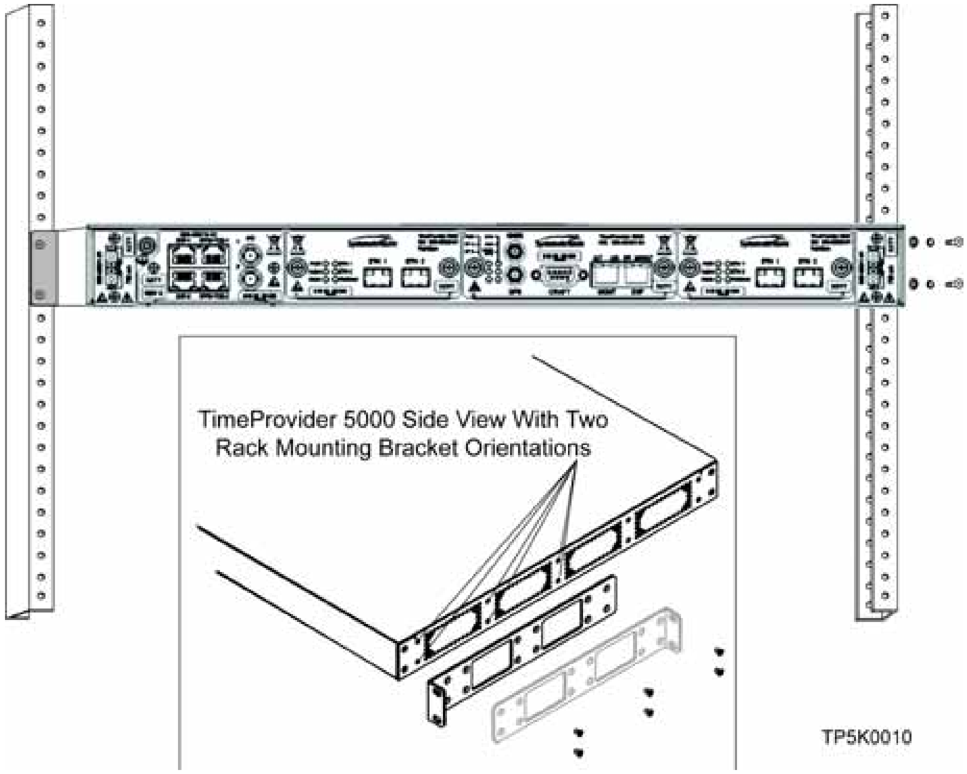


Figure 2-7. Rack Mounting the TimeProvider 5000



Rack Mounting the TP E10 & TP E30 Expansion Shelves

Use the following steps to mount the TP E10 or TP E30 expansion shelf in a rack.

Note: The TP E10 and TP E30 come equipped with 19-inch rack mounting brackets. 23-inch (58.42 cm) rack mounting adapters are also available as a separately ordered item. 21-inch (ETSI) rack mounting adapters are available as a separately ordered item.

1. The TP E10 and TP E30 are shipped with rack mounting brackets attached. The rack mounting brackets can be removed and reattached in a different orientation, if desired. See Figure 2-8 for mounting hole placements. See Figure 2-9, Figure 2-10 and Figure 2-11 for chassis dimensions. Ensure that the mounting brackets on both sides are attached to the chassis at equal distances from the front of the unit (see Figure 2-12 for the TP E10, Figure 2-13 for the TP E30) using 6-32 x 1/4-inch screws.

2. Mount the chassis to the front of the equipment rack rails with four screws and associated hardware. Use the proper screws for the equipment rack.

Figure 2-8. TP E10 and TP E30 Mounting Hole Placements - Side View

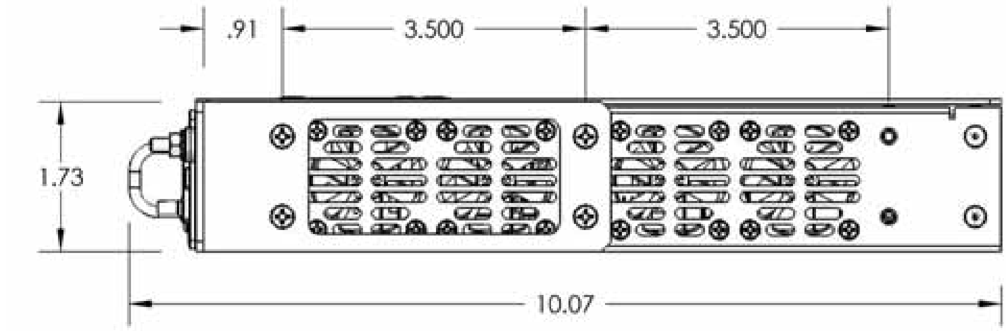


Figure 2-9. TP E10 Chassis Dimensions - Front View

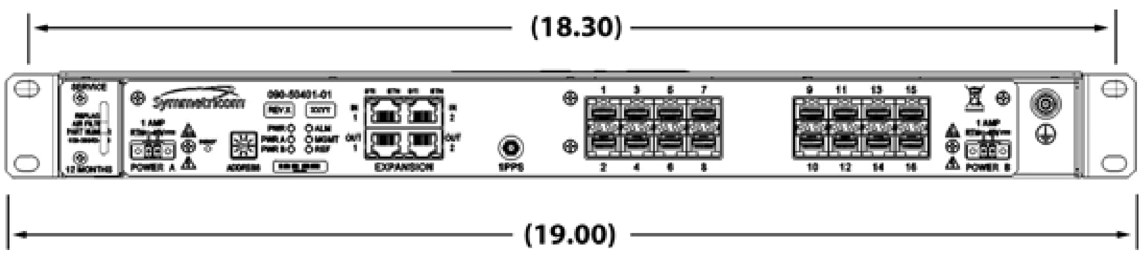


Figure 2-10. TP E30 Chassis Dimensions - Front View

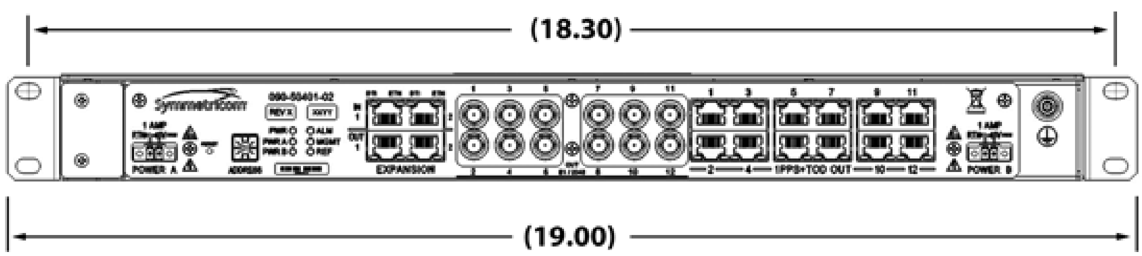


Figure 2-11. TP E10 and TP E30 Chassis Dimensions - Top View

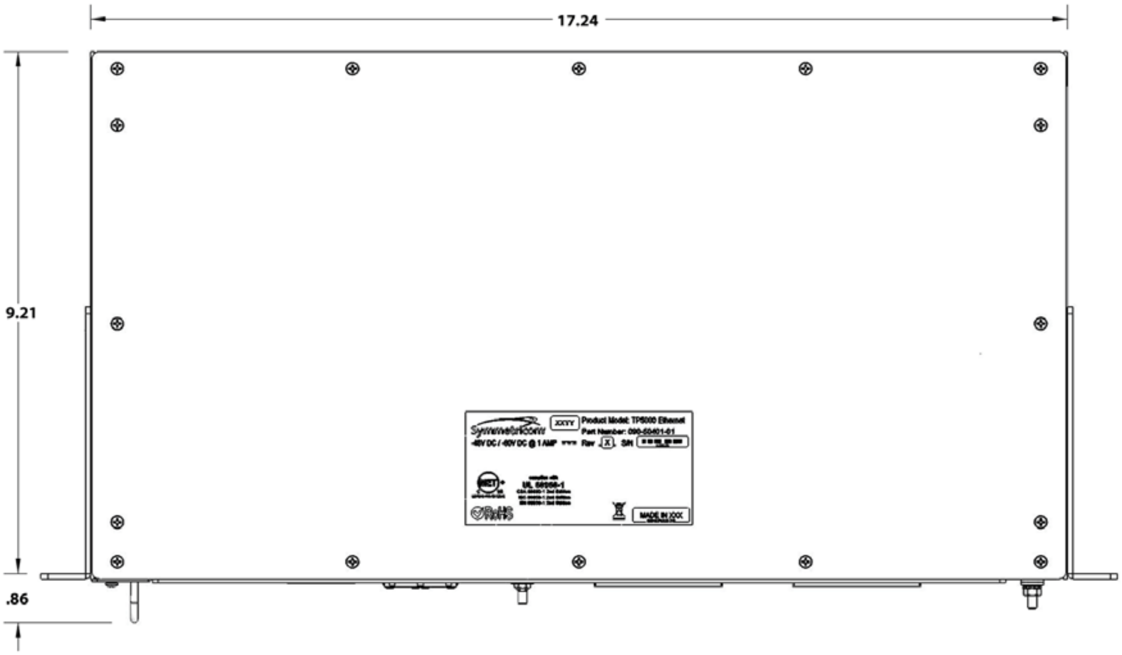


Figure 2-12. Rack Mounting the TP E10 Expansion Shelf

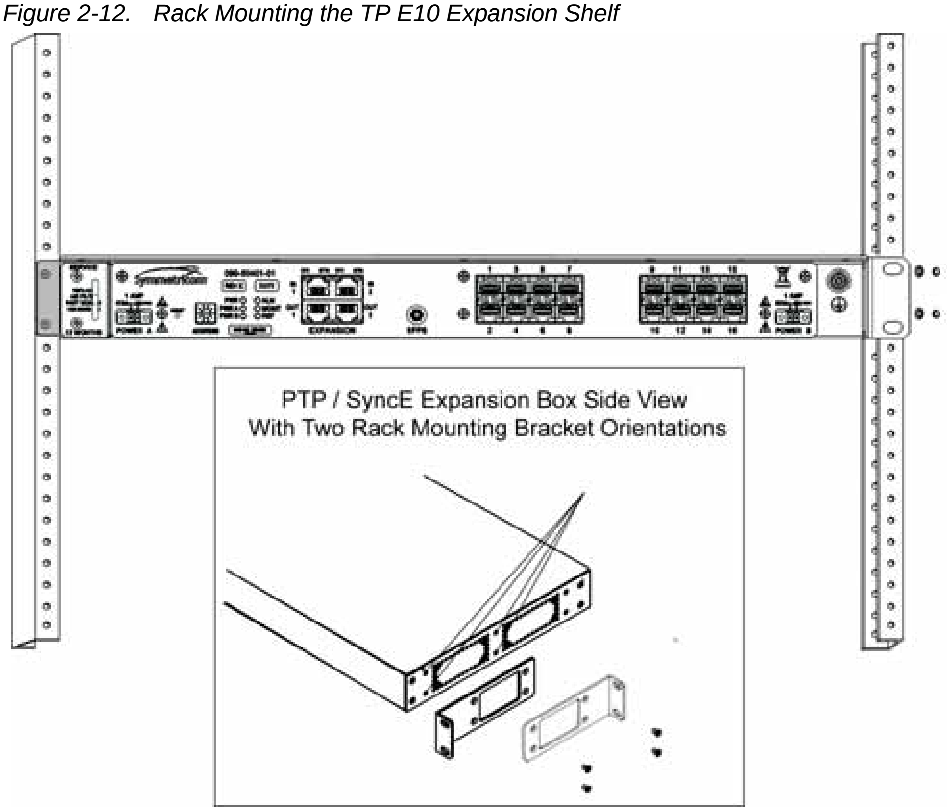
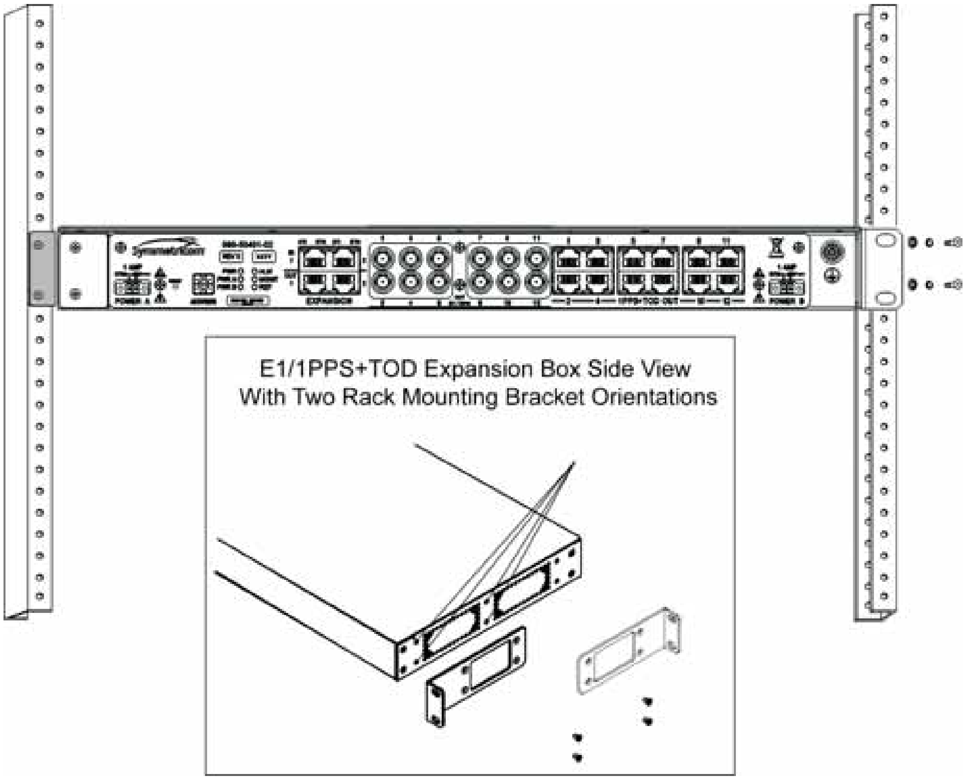


Figure 2-13. Rack Mounting the TP E30 Expansion Shelf



Working With Modules

This section describes how to install, remove, and handle the modules associated with the TimeProvider 5000.

Handling Modules

When handling any of the modules, observe the following precautions:

1. Use proper static control precautions when handling modules! Protect the equipment against ESD (electrostatic discharge) by using a grounded protective wrist strap and normal equipment grounding.

2. Avoid touching component leads and edge connectors.

3. Avoid placing the module on an ungrounded surface.

4. Avoid allowing the module to come in contact with insulated surfaces.

Inserting Modules

This procedure is common for all modules in the TimeProvider 5000.

Caution: All modules can be removed and inserted while system power is supplied without damaging modules; however, system performance may be affected.

Use the following procedure to insert a module into the chassis:

1. Align the module edges within the guides of the selected slot.
2. Slide the module into the chassis and press firmly until it seats fully into its backplane edge connector.
3. Tighten the captive screws located on each side of the panel.

Note: The I/O card does not have captive screws and requires a Phillips screwdriver.

Caution: To avoid possible damage or intermittent failures, ensure that you have completely inserted the module into the chassis and that you have securely tightened the captive screws.

Removing Modules

To remove a module from the TimeProvider 5000, loosen the screws and then pull out the module. Be sure to place the module on a static-free surface.

Caution: You must disconnect the antenna (GPS and/or Beidou) before removing the IMC module.

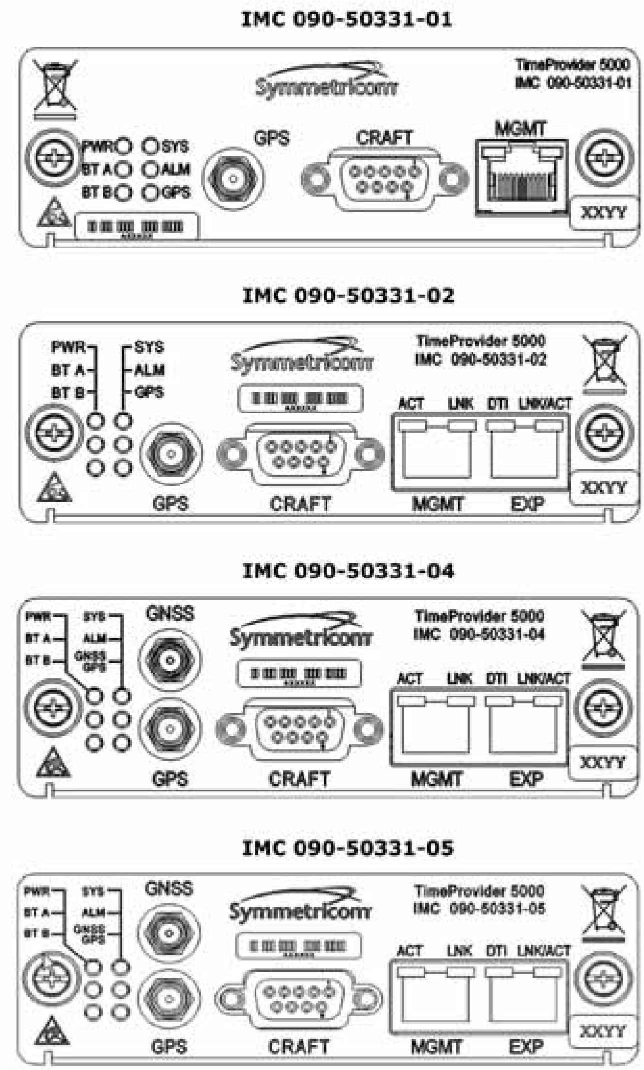
Signal Connections

The connectors for the GPS and GNSS input signal, Ethernet management, expansion connections, and EIA-232 serial connection are located on the IMC module. The PTP output connectors are located on the IOC module. The E1, T1, 1PPS+TOD, 10 MHz, 1PPS, Expansion, and UTI connectors are located on different versions of the I/O module.

Communications Connections

The IMC allows user control of the TimeProvider 5000. The EIA-232 serial port and Ethernet Management port are located on the IMC as shown in Figure 2-14. See Working With Modules, on page 67 for module installation instructions.

Figure 2-14. IMC Module Versions -01 through -05



System Management (MGMT) Port

The System Management port is standard 10/100Base-T shielded RJ-45 receptacle. To connect the TimeProvider 5000 to an Ethernet network, use an Ethernet RJ-45 cable. See Table 2-1 for connector pinouts.

Table 2-1. System Management Ethernet Connector Pin Assignments

Signal Name	Pin
TX+ (Transmit positive)	1
TX- (Transmit negative)	2
RX- (Receive negative)	3
RX+ (Receive positive)	6
Not Used	4, 5, 7, 8

Expansion Port

The expansion ports are standard 10/100Base-T shielded RJ-45 receptacles. To connect the TimeProvider 5000 to an expansion shelf (TP E30 E1/1PPS+TOD or TP E10 SyncE/PTP, use a standard twisted pair Ethernet RJ-45 cable (CAT5 minimum). The Ethernet management link and the DTI links share the same physical RJ-45 connector, as shown in Figure 2-14, but they are logically two separate networks. The expansion port from the IMC must always be used when using expansion shelves to provide management messages via Ethernet. (The expansion ports on the I/O card only provide DTI.)

Figure 2-20 shows the expansion connections for a TP 5000 with a single expansion shelf, with redundant DTI connections from the expansion ports on the IMC and I/O cards. Figure 2-21 shows the expansion connections for a TP 5000 with five expansion shelves. Redundant DTI connections for the IN1 and IN2 ports on each expansion shelf are used to protect against various failure scenarios.

The connector pinouts are listed in Table 2-2.

Table 2-2. DTI/Ethernet RJ-45 Connector Pin Assignments

Pin	Signal	Comment
1	RX+ (Receive positive)	Ethernet (10/100Base-T)
2	RX– (Receive negative)	Ethernet (10/100Base-T)
3	TX+ (Transmit positive)	Ethernet (10/100Base-T)
4	Reserved	
5	Reserved	

Table 2-2. DTI/Ethernet RJ-45 Connector Pin Assignments (Continued)

Pin	Signal	Comment
6	TX– (Transmit negative)	Ethernet (10/100Base-T)
7	DTI+	DTI
8	DTI–	DTI

EIA-232 Serial (Craft) Port

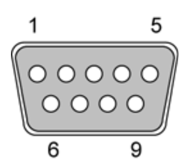
The EIA-232 serial port connection is made through a DE-9 female connector on the IMC. This ports allow you to connect to a terminal or computer using a terminal emulation software package for remote monitoring and control. When connecting to this port, use a shielded EIA-232 direct connect cable. Table 2-3 describes the DE-9 connector pin assignments for the serial port on the IMC card.

Table 2-3. IMC Serial Port Connector Pin Assignments

CRAFT Port Pin	Signal	Abbreviation	Signal Direction
2	Transmit data	TXD	From TP5000
3	Receive data	RXD	To TP5000
5	Signal ground	GND	-

Figure 2-15 shows the DE-9 male connector that mates with the serial port on the IMC card.

Figure 2-15. Serial Port Male Mating Connector Pins



TP 5000 Synchronization and Timing Connections

The basic version TimeProvider 5000 has one GPS input on the IMC module and two redundant PTP timing outputs on each IOC module. There are also four connections on the I/O module, two of which can be outputs or inputs and two connections that are dedicated outputs. The version of the I/O module determines the configuration of the I/O connections:

- The 090-50311-01, 090-50312-01, and 090-50315-01 (see Figure 2-18) versions of the I/O module have two programmable E1 input/output connections, while the 090-50314-01 (see Figure 2-19) version of the I/O module has two programmable T1 input/output connections.
- The 090-50311-01 version of the I/O module has two dedicated E1 output connections, while the 090-50312-01 (see Figure 2-18) and 090-50314-01 (see Figure 2-19) versions of the I/O module have two dedicated output connections, 10MHz and 1PPS.

GPS Connections

To connect a GPS signal, you must install a GPS antenna. See Connecting the GPS/GNSS Antenna, on page 85. Also see Working With Modules, on page 67 for module installation instructions.

Caution: The GPS cable should only be connected while the unit is properly Earth grounded.

GNSS Connections

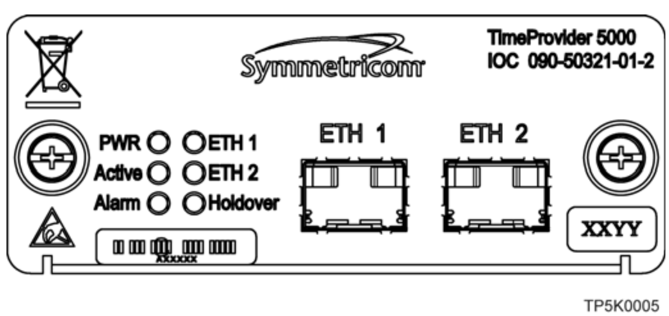
To connect a GNSS signal, you must install a Beidou or GPS antenna. See Connecting the GPS/GNSS Antenna, on page 85. Also see Working With Modules, on page 67 for module installation instructions.

Caution: The GNSS cable should only be connected while the unit is properly Earth grounded.

PTP / NTP Connections

The two Ethernet 100/1000 Small-form Factor Pluggable (SFP) connections on each IOC provide redundant PTP outputs. See Figure 2-16.

Figure 2-16. PTP Output Connections



Only the SFP transceivers in Table 2-4 are recommended and supported. Other SFP transceivers are not supported and may cause the TimeProvider 5000 to not comply with regulatory requirements. Figure 2-17 shows a typical optical SFP transceiver.

Figure 2-17. Optical SFP Transceiver

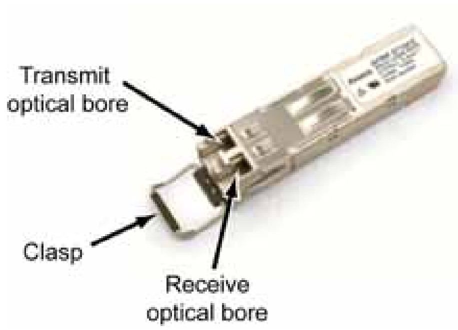


Table 2-4. Recommended and Supported SFP Transceivers

Type	Transceiver
Optical 1000 Base-LX Single-Mode Ethernet 1310nm (Symmetricom 121-20621-10-2)	Avago AFCT-5701PZ Finisar FTLF1319P1BTL
Optical 1000 Base-SX Multi-Mode Ethernet 850nm (Symmetricom 121-20621-11-2)	Avago AFBR-5710PZ Finisar FTLF8519P2BNL
RJ45 100/1000/1GbE Base-T Full-Duplex (Symmetricom 121-20621-12-2)	Avago ABCU-5710RZ

Note: Recommended and supported SFP connectors comply with FDA radiation performance standards, 21 CFR Subchapter J.

Figure 2-18. Output Connections for E1 Versions of I/O Module

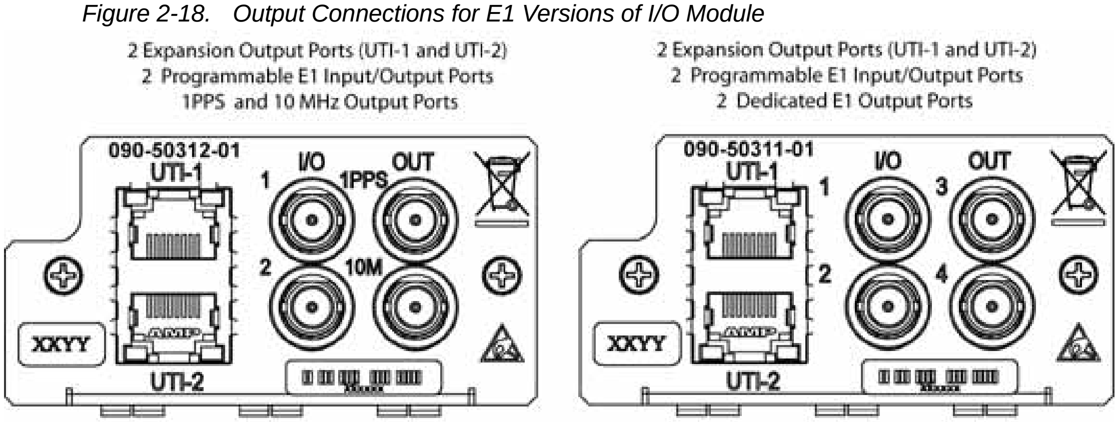
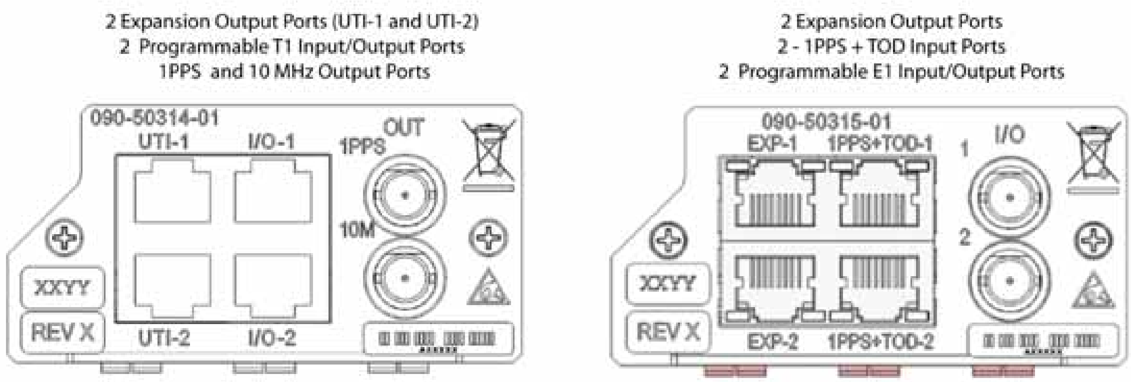


Figure 2-19. Output Connections for T1 and Expansion Versions of I/O Module



E1 Connections

Two of the four coaxial ports on the 090-50311-01 and 090-50312-01, and 090-50315-01 versions of the I/O module (see Figure 2-18 and Figure 2-19) are software configurable as either E1 input or output ports. These are mini-BNC ports, except for the 090-50315-01, which uses mini-SMB connectors. They can provide or receive the following signal types:

- 2.048 Mb/s (G.703/9)
- 2.048 MHz (G.703/13)

The 090-50311-01 version of the I/O module (Figure 2-18) also has two mini-BNC ports that are dedicated E1 output ports with the following signal types:

- 2.048 Mb/s (G.703/9)
- 2.048 MHz (G.703/13)

Note: Amphenol mini-BNC connectors (031-70261) can be used to create cables. Alternatively, Symmetricom sells a kit of 4 mini-BNC to BNC adapter cables (093-00068-000).

Note: Symmetricom recommends the following Amphenol mini-SMB connectors to mate with the the mini-SMB connectors on the I/O module (090-50315-01).

- 903-586P-71A (right angle on RG-179/B cable)
- 903-605P-71S (straight on RG-179/U cable)
- 903-600P-71S (straight on RG-179/B cable)

.

T1 Connections

The 090-50314-01 version of the I/O module has two RJ-48C ports that are software configurable as either T1 input or output ports (see Figure 2-19). They can provide or receive the following signal types:

- 1.544 Mb/s (G.703)
- 1.544 MHz (G.703)

Note: The T1 ports on the 090-50314-01 version of the I/O module can also be configured as E1 and 2048 kHz inputs or outputs which meet the G.703 mask for impedance of 120 ohms, balanced.

Table 2-5. T1 Input/Output Port Pin-Outs - RJ48C Connector

Pin	Signal
1	Rx Ring
2	Rx Tip
3	NC
4	Tx Ring
5	Tx Tip
6	NC
7	NC
8	NC

1PPS & 10MHz Connections

The 090-50312-01 (see Figure 2-18) and 090-50314-01 (see Figure 2-19) versions of the I/O module also have two mini-BNC ports that are dedicated output ports with the following signal types:

- 1PPS
- 10 MHz

Note: Units that provide 1PPS/10MHz output must be configured at the factory when ordered; they cannot be reconfigured in the field. One port provides 1PPS output and one port provides 10MHz output.

Expansion Connections

The TP5000 provides timing to the expansion shelves through two DTI links. The 090-50315-01 version of the I/O card features two standard shielded RJ-45 receptacles, labeled EXP-1 and EXP-2, as shown in Figure 2-19. The 090-50311-01, 090-50312-01, 090-50314-01 versions of the I/O card feature two standard shielded RJ-45 receptacles, labeled UTI-1 and UTI-2, as shown in Figure 2-18 and Figure 2-19, which are also used for DTI signals. The expansion shelves use the time and frequency information from the TP5000 and convert them to different synchronization signal formats.

To connect the expansion (EXP) ports on the 090-50315-01 version of the TP 5000 I/O card to an expansion shelf (TP E10 or TP E30), use a standard twisted pair Ethernet RJ-45 cable, CAT5 or better. See Table 2-6 for pin-outs for the EXP expansion RJ-45 connectors on the I/O card.

To connect the expansion (UTI) ports on the 090-50311-01, 090-50312-01, and 090-50314-01 versions of the TP 5000 I/O card to an expansion shelf (TP E10 or TP E30), use a custom cable. See Table 2-7 for pin-outs for the UTI expansion RJ-45 connectors on the I/O card. See Table 2-8 for pin-outs for the EXP expansion RJ-45 connectors on the expansion shelves. The custom cable should be built with twisted-pair cable, CAT5 or better, with RJ-45 connectors and the custom mating connector pinouts in Table 2-9.

Figure 2-20 shows the expansion connections for a TP 5000 with a single expansion shelf, with redundant DTI connections from the expansion ports on the IMC and I/O cards. Figure 2-21 shows the expansion connections for a TP 5000 with five expansion shelves. Redundant DTI connections for the IN1 and IN2 ports on each expansion shelf are used to protect against various failure scenarios.

Note: If using UTI ports from I/O module 090-50311-01, 090-50312-01, or 090-50314-01, a custom cable must be used between the I/O module and the expansion shelf. See Table 2-9 for details.

The expansion port from the IMC must always be used when using expansion shelves to provide management messages via Ethernet. (The expansion ports on the I/O card only provide DTI.)

Table 2-6. Expansion Port (EXP) RJ-45 Connector Pin Assignments - I/O Card

Pin	Signal	Comment
1	No connection	
2	No connection	
3	No connection	
4	No connection	

Table 2-6. Expansion Port (EXP) RJ-45 Connector Pin Assignments - I/O Card (Continued)

Pin	Signal	Comment
5	No connection	
6	No connection	
7	DTI+	DTI
8	DTI–	DTI

.

Table 2-7. UTI Port RJ-45 Connector Pin Assignments - I/O Card

Pin	Signal	Comment
1	DTI+	DTI
2	DTI–	DTI
3	No connection	
4	No connection	
5	No connection	
6	No connection	
7	No connection	
8	No connection	

.

Table 2-8. EXP Port RJ-45 Connector Pin Assignments - TP E10 & TP E30 Expansion Shelves

Pin	Signal	Comment
1	RX+ (Receive positive)	Ethernet (10/100Base-T)
2	RX– (Receive negative)	Ethernet (10/100Base-T)
3	TX+ (Transmit positive)	Ethernet (10/100Base-T)
4	Reserved	
5	Reserved	

Table 2-8. EXP Port RJ-45 Connector Pin Assignments - TP E10 & TP E30 Expansion Shelves

Pin	Signal	Comment
6	TX– (Transmit negative)	Ethernet (10/100Base-T)
7	DTI+	DTI
8	DTI–	DTI

Table 2-9. Custom Cable RJ-45 Wiring Connections: UTI Port to Expansion Shelf EXP Port

UTI Port on I/O Card Mating Connector Pins	Signal	EXP Port on Expansion Shelf Mating Connector Pins
1	DTI+	7
2	DTI–	8

Figure 2-20. DTI and DTI/ETH Connection for TP 5000 and One Expansion Shelf

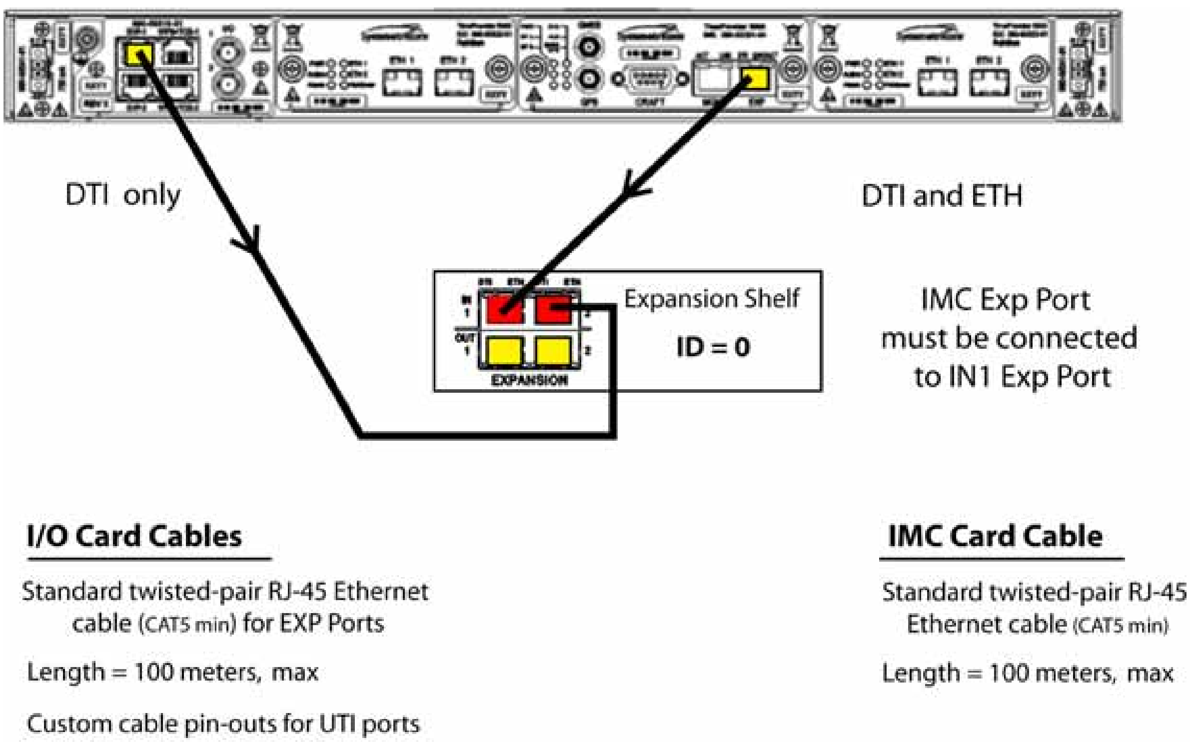
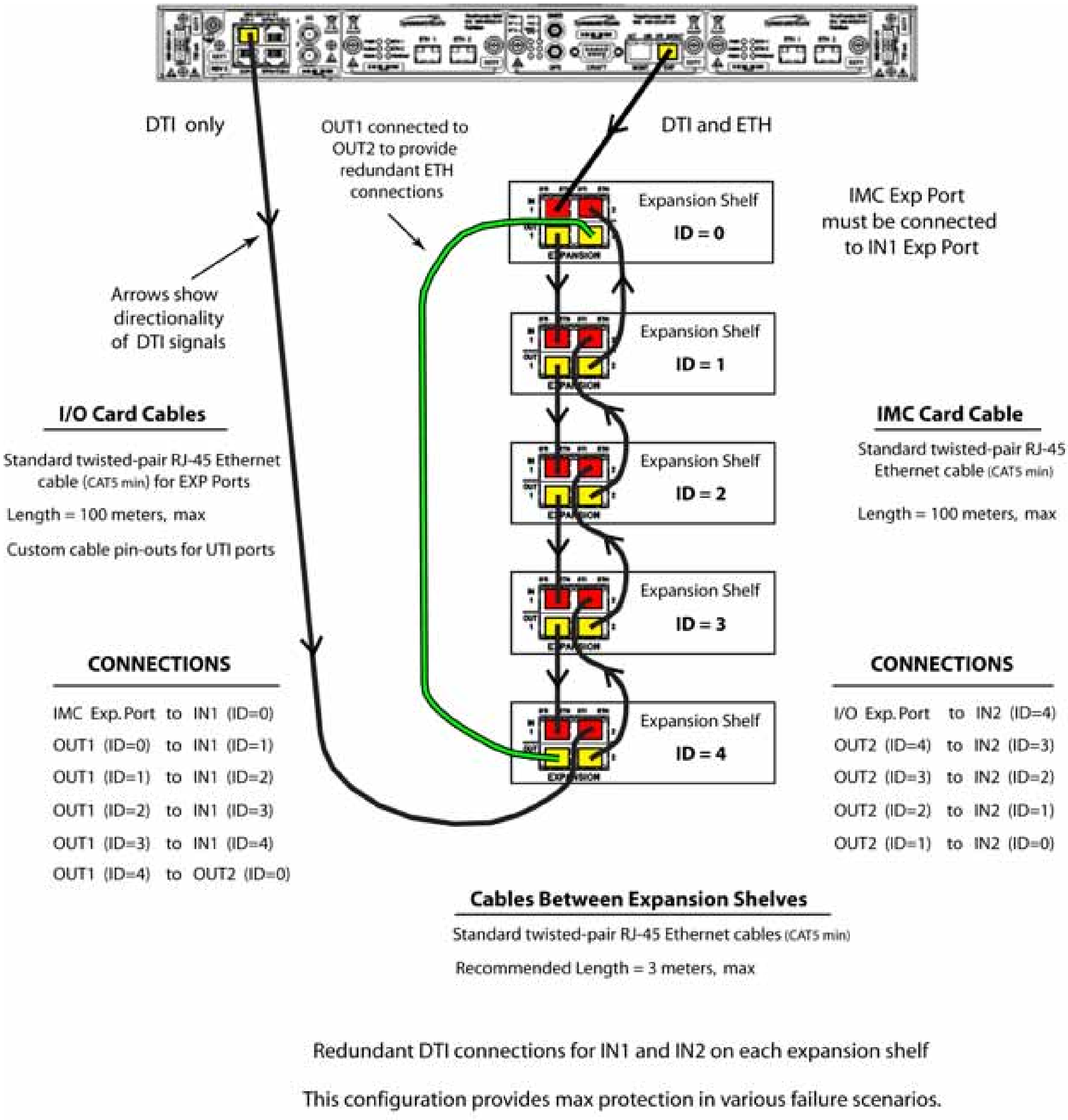


Figure 2-21. DTI and DTI/ETH Connection for TP 5000 and Five Expansion Shelves



1PPS +TOD Connections

The expansion version of the I/O card, p/n 090-50315-01, features 2 RJ-45 connectors, as shown in Figure 2-18. These ports are dedicated input ports with 1PPS+TOD signals. See Table 2-10 for pin-outs for these RJ-45 connectors. See Table 2-11 for TOD default parameters.

Table 2-10. 1PPS+TOD Port Pin-Outs - RJ45 Connector

Pin	Signal	Comment
1	No Connection	Default state is open (high impedance)
2	No Connection	Default state is open (high impedance)
3	422_1_N	1PPS
4	GND	RS422 GND
5	GND	RS422 GND
6	422_1_P	1PPS
7	422_2_N	TOD time information
8	422_2_P	TOD time information

Table 2-11. Default Parameters for TOD Information Transmission

Pin	Default	Comment
Baud Rate	9600	Cannot be changed
Parity Check	None	
Start Bit	1 (low level)	
Stop Bit	1 (high level)	
Idle Frame	High level	
Data Bits	8	

TimeProvider E10 Synchronization and Timing Connections

The TimeProvider E10 features 16 SFP output ports (see Figure 2-22). These ports can provide the following signal types:

- PTP (IEEE-1588 2008)
- SyncE (only accessible with optical SFP)

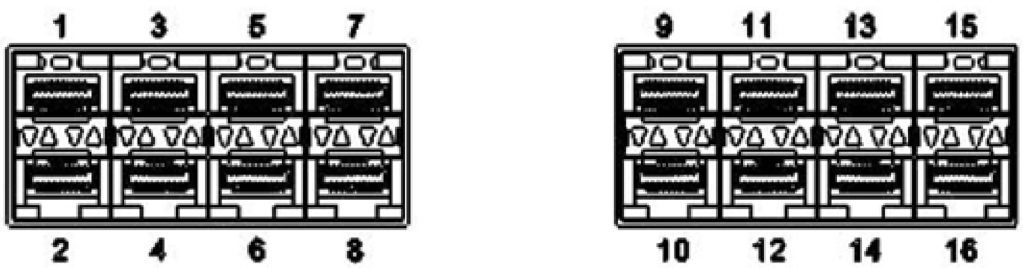
TP E10 - PTP/SyncE Connections

The TP E10 expansion shelf features 16 SFP output ports (see Figure 2-22). These ports can provide the following signal types:

- PTP (IEEE-1588 2008)
- SyncE (only accessible with optical SFP)

These ports are dedicated output ports with PTP signals that meet the IEEE-1588 v2 specifications. As with the two PTP ports on each TP 5000 IOC card, these 16 ports require Ethernet SFP connectors.

Figure 2-22. TP E10 - Output Connections for PTP/SyncE



Only the SFP transceivers in Table 2-4 are recommended and supported. Other SFP transceivers are not supported and may cause the TP E10 expansion shelf to not comply with regulatory requirements. SyncE is only available with optical SFP transceivers.

Since the TP E10 expansion shelf uses PTP multicast, all 16 ports should be on isolated Ethernet networks. Otherwise, only one of the ports will be the active grandmaster due to the IEEE-1588 BMC algorithm.

TP E10 - 1PPS Connection

The TP E10 expansion shelf also has a mini-SMB connector that is a dedicated output port with a 1PPS signal.

Figure 2-23. TP E10 - Output Connection for 1PPS Signal

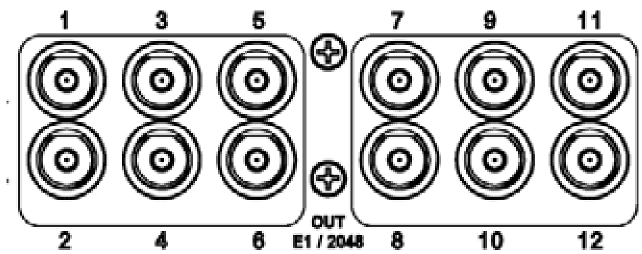
TimeProvider E30 Synchronization and Timing Connections

TP E30 - E1 Connections

The TP E30 expansion shelf features 12 mini-SMB output ports (see Figure 2-18). These ports can provide the following signal types:

- 2.048 Mb/s (G.703/9, G.704)
- 2.048 MHz (G.703/13, G.704)

Figure 2-24. TP E30 - Output Connections for E1 Signals



Note: Symmetricom recommends the following Amphenol mini-SMB connectors to mate with the the mini-SMB connectors on the TP E10 and TP E30.

- 903-586P-71A (right angle on RG-179/B cable)
- 903-605P-71S (straight on RG-179/U cable)
- 903-600P-71S (straight on RG-179/B cable)

TP E30 - 1PPS +TOD Connections

The TP E30 expansion shelf features 12 RJ-45 connectors, as shown in Figure 2-18. See Table 2-5 for pin-outs for these RJ-45 connectors. See Table 2-11 for TOD default parameters.

Figure 2-25. TP E30 - Output Connections for 1PPS+TOD

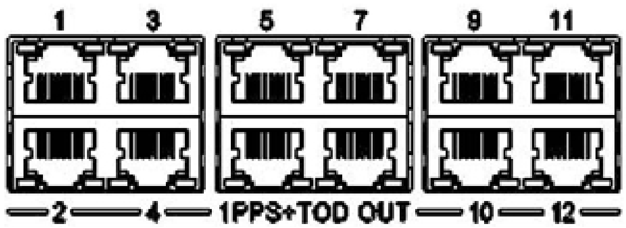


Table 2-12. TP E30 - 1PPS+TOD Port Pin-Outs - RJ45 Connector

Pin	Signal	Comment
1	No Connection	Default state is open (high impedance)
2	No Connection	Default state is open (high impedance)
3	422_1_N	1PPS
4	GND	RS422 GND
5	GND	RS422 GND
6	422_1_P	1PPS
7	422_2_N	TOD time information
8	422_2_P	TOD time information

Table 2-13. TP E30 - Default Parameters for TOD Information Transmission

Pin	Default	Comment
Baud Rate	9600	
Parity Check	None	
Start Bit	1 (low level)	
Stop Bit	1 (high level)	
Idle Frame	High level	
Data Bits	8	

See Appendix B, Specifications and Factory Defaults for additional information about the TOD signal.

Connecting the GPS/GNSS Antenna

Caution: The GPS and GNSS cables should only be connected while the unit is properly Earth grounded.

The antenna connections for the TP 5000 are made at the IMC module SMA connector labeled GPS or GNSS. Allow at least one hour for the unit to track and lock to GPS/GNSS.

Proper cable, grounding techniques, and lightning arrestors should be used. Mount the antenna outside, preferably on the roof with a clear view of the sky. *Do not* mount the antenna near a wall or other obstruction blocking part of the sky. Mount the antenna well above roads or parking lots.

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

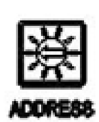
- Use extreme caution when installing the antenna near, under, or around high voltage lines.
- Follow local building electrical codes for grounding the chassis.

Setting Shelf ID on Expansion Shelves

Set the shelf ID on the TP E10 or TP E30 expansion shelf using a small flat-blade screwdriver to turn the mechanical rotary switch on the front panel. See Figure 2-26. Each expansion shelf must be provided a unique user-defined shelf ID. There can be up to 10 shelf IDs (0 to 9) in the system.

Note: If 2 systems are assigned the same shelf ID, then management capability will be lost and an alarm will be generated on the TP 5000 shelf.

Figure 2-26. Shelf ID Selector



Making Ground and Power Connections

Warning: To avoid accidental power-up of the chassis, remove the A and B fuses on the branch over-current protection unit before beginning installation of the TP 5000, TP E10, and/or TP E30. These units are not equipped with a power on/off switch.

The TimeProvider 5000 has two –48 VDC power connectors for redundant operation, which are located on the right and left sides of the front panel (see Figure 2-27). A separate frame ground terminal is on the left side of the front panel.

The TP E10 and TP E30 expansion shelves each have two –48 VDC power connectors for redundant operation, which are located on the right and left sides of the front panel (see Figure 2-28 and Figure 2-29). A separate frame ground terminal is provided on the right side of the front panel.

Ground Connections

Frame ground connections are made using the M4 Grounding Terminal Stud, which is marked with the universal ground symbol, as shown in Figure 2-30. This stud is located on the left side of the front panel for the TP 5000, and on the right side of the front panel for the TP E10 and TP E30.

Figure 2-27. TimeProvider 5000 Power Connections

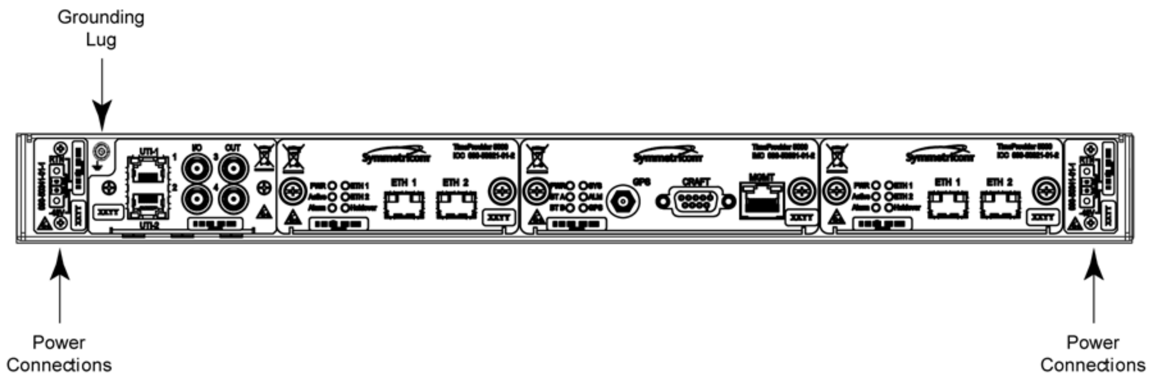


Figure 2-28. TimeProvider E10 Power Connections

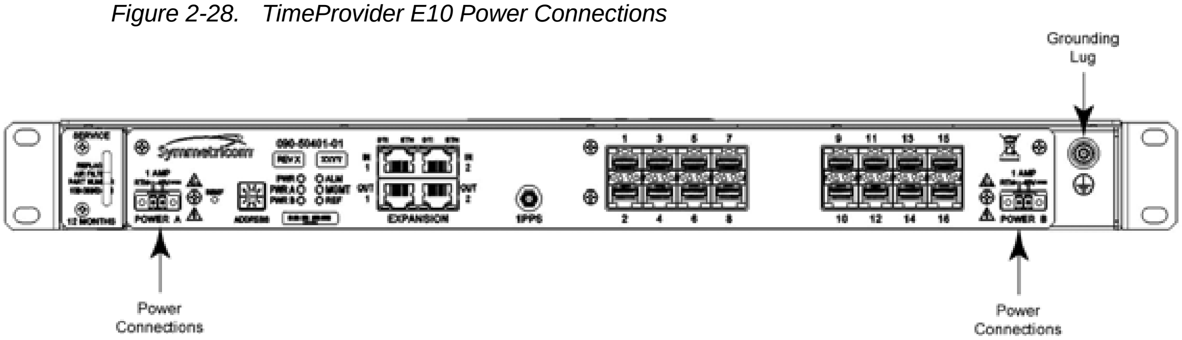


Figure 2-29. TimeProvider E30 Power Connections

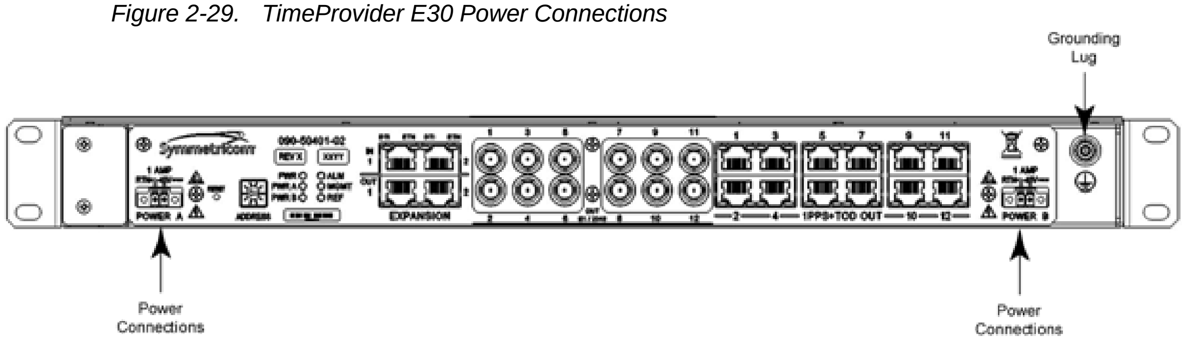
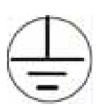


Figure 2-30. Universal Ground Symbol



After installing the TimeProvider 5000 into the rack, connect the chassis to the proper grounding zone or master ground bar. Run a 16 AWG green/yellow-striped insulated wire from the TimeProvider 5000 grounding terminal to the Earth Ground on the rack. The rack grounding method is below.

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 the ground lug to earth ground.

1. Crimp the customer-supplied UL listed Ring Lug to one end of the 16 AWG wire and connect it to the ground terminal on the left side of the front panel using the supplied M4 Kept machine nut. The surface of the TimeProvider 5000 Earth grounding terminal must be clean of contaminants and oxidation.

2. Crimp the appropriate customer-supplied UL listed Ring Lug to the other end of the 1 mm^2 / 16 AWG green/yellow-striped wire. Remove the paint and sand the area around the screw hole to ensure the proper conductivity. Coat the connection with an electrically conductive antioxidant compound such as Kopr-shield spray. Connect this Ring Lug to the rack with appropriate customer supplied screws and external star lock washers.

3. Using a digital voltmeter, measure between the ground and chassis and verify that no voltage exists between them.

Power Connections

Use the following procedure to make the power connections:

Warning: To avoid possible damage to equipment, you must provide power source protective fusing as part of the installation. The TimeProvider 5000, TimeProvider E10 and TimeProvider E30 are intended for installation in a restricted-access location.

Caution: To avoid damage to the unit, remove the fuses in the fuse panel which provides power to the TimeProvider 5000, TimeProvider E10 and TimeProvider E30 before making power connections.

1. Ensure the power source is turned off.

2. Connect the frame ground terminal to earth ground.

3. Locate the power connectors included in the installation kit, Phoenix Contact p/n MC 1,5/2-STF-3,81.

4. Using 1 mm² / 18 AWG (minimum) stranded wire, connect primary power to the connectors per the polarity markings. Use the polarity markings of "-48V" and "RTN" as a reference for the proper polarity connection..

Note: The -48VDC power must be connected with the proper polarity. The unit will not be damaged by reverse polarity, but the unit will not operate if the polarity is reversed.

---

5. Insert the connectors into the power connections in the chassis. See Figure 2-31. Tighten screws in the connector

Figure 2-31. TimeProvider 5000 Power Connector

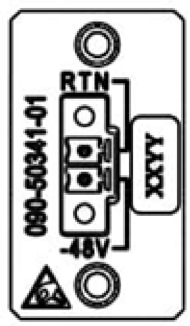


Figure 2-32. TP E10 and TP E30 - Power Connector A

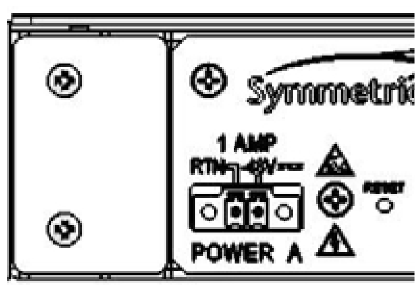
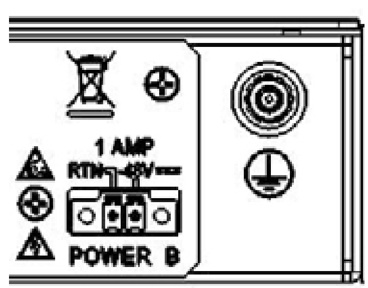


Figure 2-33. TP E10 and TP E30 - Power Connector B



Testing Power Connections

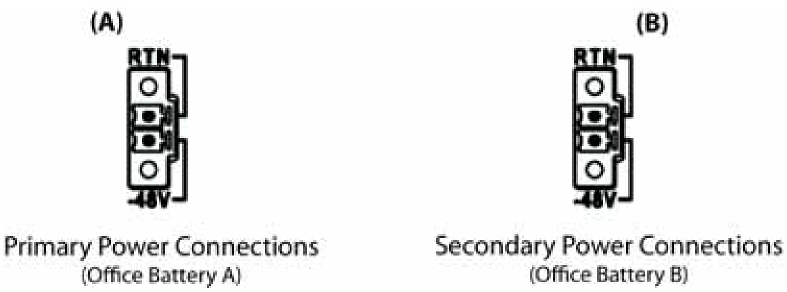
To verify that the power connections to the TimeProvider 5000 are correct, follow the steps in this section. The connections on the primary power module of the TP 5000 are referred to as Power A and Return A. The connections on the secondary power module are referred to as Power B and Return B. Use a digital multimeter (Fluke 77 or equivalent) to make the measurements.

1. Remove all fuses that supply power to the unit from the fuse panel.

2. Ensure that no IOC or IMC modules are installed in the unit.

3. Disconnect the -48V battery leads from the unit's power connector terminals. See the primary and secondary power connections in Figure 2-34. Leave the Return battery leads connected to the unit.

Figure 2-34. Power and Ground Connections on the TimeProvider 5000



4. At the chassis end of the battery leads, use the multimeter to measure the voltage between the following test points:

Test Point	Test Point	Result
Battery A lead	Battery B lead	0 V
Battery A lead	Primary: Return A	0 V
Battery A lead	Earth Ground	0 V
Battery B lead	Secondary: Return B	0 V
Battery B lead	Earth Ground	0 V

5. Reconnect the –48V battery A and battery B leads to the –48V A and –48V B terminal connectors.

6. Install the A fuse in the power source fuse panel.

7. Measure the voltage between the –48V A and Return terminals on the primary power module. The multimeter should indicate –42 VDC to –56 VDC.

8. Install the B fuse in the power source fuse panel.

9. Measure the voltage between the –48V B and Return terminals on the secondary power module. The multimeter should indicate –42 VDC to –56 VDC.

The unit is now powered up.

Installation Check List

To verify that the installation of the TimeProvider 5000 is complete, perform the checks and procedures in Table 2-14.

Table 2-14. Installation Completeness Checklist

Operation	Complete
Ensure the TimeProvider 5000 chassis is securely attached to mounting rack	
Ensure that the appropriate modules (and filler panels if needed) are installed	
Verify that all power and ground wires are installed correctly and securely	
Verify that all communications cables are properly installed	
Verify that all input and output cables are properly installed	

Applying Power to the TimeProvider 5000

The TimeProvider 5000 is not equipped with a Power switch. DC power is controlled by a power distribution panel. After installing the unit in a rack and making the necessary connections described in previous sections, turn on power at the distribution panel.

The TP E10 and TP E30 expansion shelves are not equipped with Power switches. DC power is controlled by a power distribution panel. After installing a unit in a rack and making the necessary connections described in previous sections, turn on power at the distribution panel.

Normal Power Up Indications

As the TimeProvider 5000 powers up and begins normal operation, the IOC module and IMC module LEDs all turn on. After the module self-test is complete and the module firmware is operational, the LED states may change to indicate the appropriate state or status.

As the TP E10 or TP E30 expansion shelves powers up and begins normal operation, the LEDs all turn on. After the self-test is complete and expansion shelf firmware is operational, LED states may change to indicate appropriate state or status.

Table 2-15 provides a description of the module LEDs. Table 2-16 provides a description of the expansion shelf LEDs.

Table 2-15. Module LED Descriptions

LED	Label	Description
		IMC Module
Power Module Power Indicator	PWR	**Green** - Module power available **Off** - Module power not available
-48V A-Bus A-Bus Battery Indicator	BT A	**Off** - A-Bus power OK **Red** - A-Bus power failed
-48V B-Bus B-Bus Battery Indicator	BT B	**Off** - B-Bus power OK **Red** - B-Bus power failed
System Health Aggregation of system alarms indicator	SYS	**Off** - System operating normally **Amber** - System operational Minor Alarm(s) **Red** - System operational Major or Critical Alarm(s)
IMC Alarm IMC module alarm/fault indicator	ALM	**Off** - IMC operating normally **Amber** - IMC operational Minor Alarm(s) **Red** - IMC operational Major/Critical Alarm(s) **Flashing Green** - Software starting up
GNSS/GPS Status GPS engine status indicator	GNSS/ GPS	**Green** - GPS enabled and GPS engine/interface is operating normally **Amber** - GPS enabled and GPS engine or antenna interface has operational issues **Off** - GPS disabled
Ethernet Management Port LEDs on the Ethernet connector	MGMT	**Left Flashing Amber** - Activity **Left Off** - No Activity **Right Green** - Link has been established **Right Off** - Link has not been established
Expansion Port LEDs on the RJ48 connector	EXP	**Left OFF** - No DTI client detected **Left Amber** - DTI client detected **Left Green** - DTI client detected and ready **Right OFF**- Link has not been established **Right Green** - Link has been established **Right Flashing Green** - Activity
		IOC Module
Power Module Power Indicator	PWR	**Green** - Module power available **Off** - Module power not available

Table 2-15. Module LED Descriptions (Continued)

LED	Label	Description
Active Indicates which IOC is responsible for generating PTP, Telecom, 10MHz, and 1PPS outputs	ACT	**Off** - Standby IOC or System Startup **Green** - Active IOC
IOC Alarm IOC module alarm/fault indicator	ALM	**Off** - IOC operating normally **Amber** - IOC operational Minor Alarm(s) **Red** - IOC has Failed or has Major/Critical Alarm(s) **Flashing Green** - Software starting up
Ethernet Port 1 ETH1 link/activity indicator	ETH1	**Green** - Link has been established **Flashing Green** - Link activity **Off** - Link has not been established
Ethernet Port 2 ETH2 port link/activity indicator	ETH2	**Green** - Link has been established **Flashing Green** - Link activity **Off** - Link has not been established
Local Oscillator State Indicates the current mode of operation of the LO servo	HOLD	**Off** - Oscillator is operating in Locked mode **Amber** - Oscillator is operating in Holdover or Acquire modes **Flashing Amber** - Oscillator is operating in Warm-up mode
Expansion Port LEDs on the RJ48 connector	EXP-1/ EXP-2	**Left OFF** - No DTI client detected **Left Amber** - DTI client detected **Left Green** - DTI client detected and ready

Table 2-16. Expansion Shelf LED Descriptions

LED	Label	Description
Power Module Power Indicator	PWR	**Green** - Power available **Off** - Power not available
-48V A-Bus A-Bus Battery Indicator	BT A	**Green** - A-Bus power OK **Red** - A-Bus power failed
-48V B-Bus B-Bus Battery Indicator	BT B	**Green** - B-Bus power OK **Red** - B-Bus power failed
Alarm Alarm/fault indicator	ALM	**Off** - Operating normally **Amber** - Operational Minor Alarm(s) **Red** - Operational Major/Critical Alarm(s)
Ethernet Management Port	MGMT	This LED is not used. See LED labeled “MGMT “ on TP5000 IMC card.

Table 2-16. Expansion Shelf LED Descriptions (Continued)

LED	Label	Description
Reference Indicator	REF	**Off** - Oscillator is operating in Locked mode **Amber** - Oscillator is operating in Holdover or Acquire modes **Flashing Amber** - Oscillator is operating in Warm-up mode
Expansion Ports LEDs on the RJ48 connectors	EXPAN -SION	<u>Input Ports</u> **Left OFF** - No DTI signal **Left Green** - Link has been established , DTI signal valid and stable **Left Flashing Green -** Active, DTI signal stable and qualified **Left Amber** - DTI signal detected but not stable **Left Flashing Amber -** DTI signal detected but not selected **Right OFF**- Link has not been established **Right Green** - Link has been established **Right Flashing Green** - Activity <u>Output Ports</u> **Left OFF** - No DTI client detected **Left Amber** - DTI client detected **Left Green** - DTI client detected and ready **Right OFF**- Link has not been established **Right Green** - Link has been established **Right Flashing Green** - Activity

Chapter 3 CLI Commands and SNMP

This chapter describes the CLI command conventions, the prompts, line editing functions, and command syntax. The CLI command functions and features are organized by user security access levels and are listed alphabetically. This chapter also describes the SNMP option.

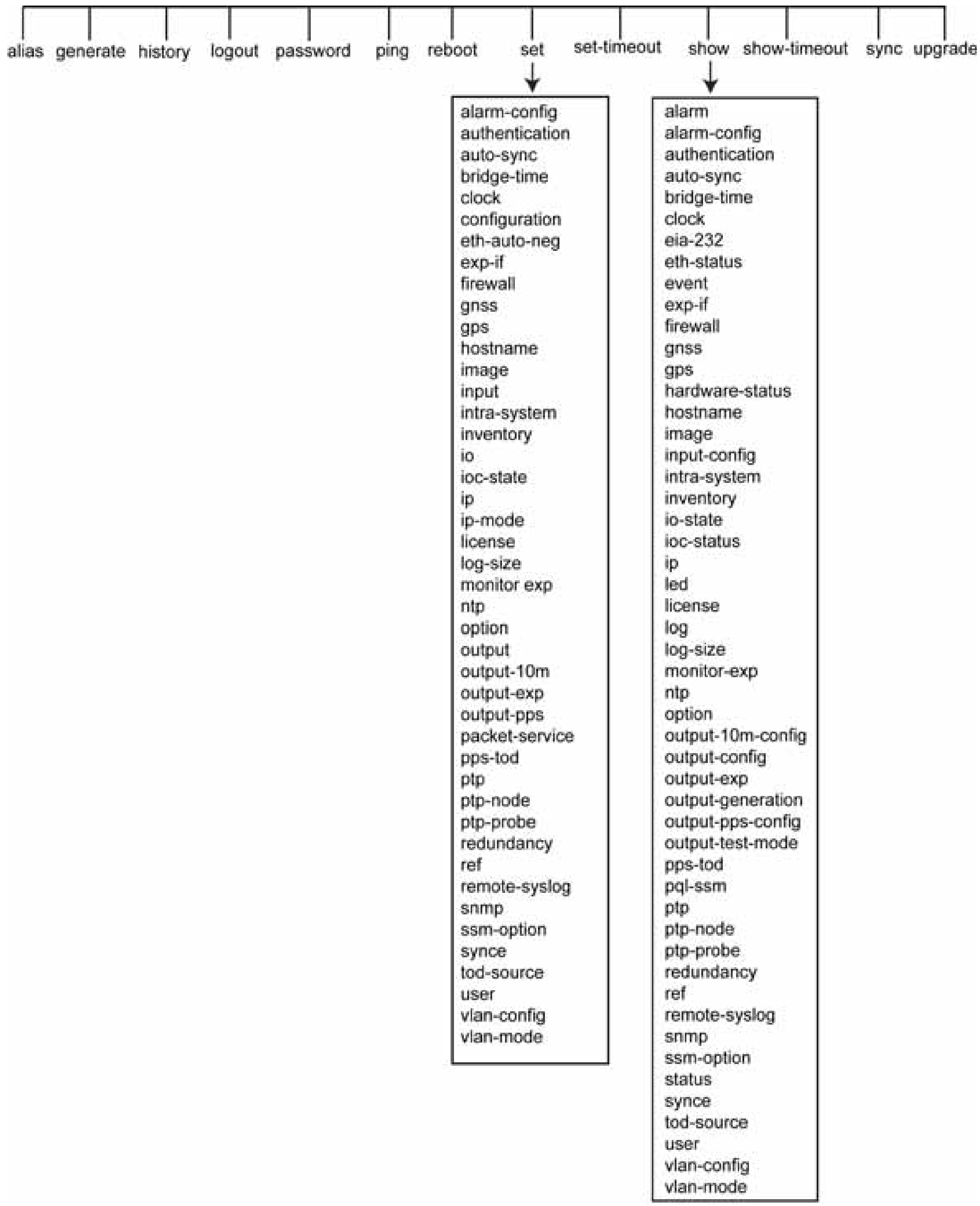
In This Appendix

- CLI Overview
- TimeProvider 5000 CLI Command Set
- Simple Network Management Protocol (SNMP)

CLI Overview

The Command Line Interface (CLI), also called the ASCII command set, can be used to control the TimeProvider 5000 from a terminal connected to the EIA-232 serial port, or the Ethernet port. See Figure 3-1 below for an overview of the TP5000 command set.

Figure 3-1. TimeProvider 5000 CLI Command Set



TimeProvider 5000 CLI Command Conventions

The following are conventions used for the TimeProvider 5000 CLI command set .

- Commands are case sensitive
- { } – Braces indicate more than one parameter data option. When entering options in the CLI command, enter one option from those available within the braces. Options within braces { } are separated by a pipe (|).
- [ ] – Brackets provide information about the allowed range. The first value is the minimum, and the last value is the maximum.
- **Bold** highlights keywords in the command syntax
- *Italics* indicate variable options.

CLI Command Keyboard Usage

- You must press the SPACE key, and then press the TAB key after entering a CLI command. Also, after entering a command, you may see <enter>. This is a prompt for you to press ENTER to execute the command that you entered.
- The interface has built-in features for navigating within the CLI command hierarchy, which are as follows:
- The TAB key can be used at any time while typing a command (including at the prompt) to provide continuation options. Press the TAB key to display a list of the available commands. Press the TAB key at any time while typing a command – TimeProvider 5000 will respond with the completion of the keyword or available completion choices based on the letters you typed.
- The ? (SHIFT+QUESTION MARK) accesses the CLI online help. It can be used at any time while typing a command (including at the prompt) to provide continuation options. These options include brief descriptions of commands, or data type, format, and range.
- If typing of a keyword is partially complete, the completion will display if it is unique, otherwise, the completion choices will be available.
- If the keyword is complete, and you press the TAB key or ? (SHIFT+QUESTION MARK), the choices for the next syntax element will display.

  In the following example, if you press the TAB key, or the ? (SHIFT+QUESTION MARK), after typing s, the CLI commands `set`, `set-timeout`, `show`, and `sync` display.

  Typing s at the prompt:

  ```
  tp5000> s
  ```

  Then pressing the TAB key :

  ```
  set     set-timeout   show    sync
  ```

Or pressing the `? (SHIFT+QUESTION MARK)`will display the available commands that start with s (for this example) and brief descriptions of those commands:

```
set        -Set TP5000 information or setting

show       -Display TP5000 information or setting

sync       -Synchronize the TOD source

set-timeout-Set the inactivity timeout to the defined seconds
```

- Previously typed commands can be recalled by using the UP ARROW key. You can recall up to five previously typed commands. Continually pressing the UP ARROW key will cycle you through the five previously typed commands. After pressing the UP ARROW key five times, you will go back to the last command you previously typed. Use the DOWN ARROW key to cycle the five prior typed commands in the opposite direction.
- You can use the BACKSPACE to correct keystroke errors, or to reuse parts of a previously typed command. When using BACKSPACE, the removed characters will still appear on the screen, but they have been removed to the position shown by the cursor. When you start typing, the removed characters are overwritten.

Command Line Format

The command line format is as follows:

```
[Verb] Command [Parameter] [Data] EOL
```

- **Verb** - the type of action to be taken with the command.
  - **Set** - enables you to provision a defined parameter.
  - **Show** - enables you to display the provisioned state of a parameter.
- **Parameter** - command input that defines the particular command element to be shown or modified.
- **Data** - the data input for the parameter.
- **EOL** - this parser responds only to <CR Return>. When the parser receives <CR Return>, the input is terminated, and the command line entry is processed.

For all commands that indicate a specific port on an IOC card, the port will be referred to as IOC-[y] or IOC1-[y] in the command description, where y=1 or 2. If port redundancy is enabled, the bonded port will use the configuration for port 1 (y=1) for all commands.

Note: If a script is used to execute CLI commands, wait for the prompt to be returned before issuing the next command. Some commands may have additional requirements - see command descriptions in this chapter for details.

Command User Levels

The TimeProvider 5000 provides a hierarchy of CLI command user levels that permit an increasing level of access to system parameters. This allows the system administrator to add users who can only view but not change system parameters and users who can view *and* change system parameters.

The users assigned to each security level have access options available as follows:

- Level 1 - user class, with read-only rights
- Level 2 - config user class, with read-write rights
- Level 3 - administrator user class, with read-write rights and can also configure users and upgrade firmware

TimeProvider 5000 CLI Command Set

This section provides an alphabetical listing and details of all CLI commands.

show alarm

Displays the system's standing (active) alarms and events.

Command Syntax:

```
show {alarm | event}
```

Example:

```
tp5000> show alarm
```

Response:

```
ID   Mod  Severity Date-Time            Descriptions
---------------------------------------------------------
7    IOC  Minor    2009-06-08 23:38:59  ETH2 Port link down
```

Remarks: The information displayed is expected to be identical to an entry in the Event/Alarm Log File.

Level : User, Config, and Admin

show alarm-config

Displays the alarm ID, level, state, description, and reporting delay time for the TP5000 alarms. This also displays if the alarm is transitory.

Command Syntax:

```
show alarm-config
```

Example:

```
tp5000> show alarm-config
```

Response :

```
------------------------------------------------------------------------------
|ID  |Level    |Delay  |State   |Descriptions
|----|---------|-------|--------|---------------------------------------------
|0   |critical |0      |enable  |Communication to peer card failed
|....|.........|.......|........|.............................................
|1   |minor    |0      |enable  |GNSS/GPS receiver communications failed
|....|.........|.......|........|.............................................
|2   |minor    |0      |enable  |GNSS/GPS receiver not tracking satellite
|....|.........|.......|........|.............................................
|3   |major    |0      |enable  |System time invalid
|....|.........|.......|........|.............................................
|4   |event    |0      |enable  |System time has been set by reference
|....|.........|.......|........|.............................................
|5   |event    |0      |enable  |System log time has been updated
|....|.........|.......|........|.............................................
|6   |minor    |0      |enable  |Management port link down
|....|.........|.......|........|.............................................
|7   |minor    |0      |disable |Ethernet port link down
|....|.........|.......|........|.............................................
|8   |minor    |0      |enable  |Manual sync IOC time to IMC required
|....|.........|.......|........|.............................................
|9   |critical |0      |enable  |Power out of range
|....|.........|.......|........|.............................................
|10  |major    |0      |enable  |GPS antenna voltage out of range
|....|.........|.......|........|.............................................
|11  |major    |0      |enable  |GPS antenna current out of range
|....|.........|.......|........|.............................................
|12  |minor    |0      |enable  |GNSS/GPS antenna short-circuit
|....|.........|.......|........|.............................................
|13  |minor    |0      |enable  |GNSS/GPS antenna open-circuit
|....|.........|.......|........|.............................................
|14  |major    |0      |disable |Battery(-48V)-A failure
|....|.........|.......|........|.............................................
|15  |major    |0      |disable |Battery(-48V)-B failure
|....|.........|.......|........|.............................................
|16  |critical |0      |enable  |FPGA access failure
|....|.........|.......|........|.............................................
|17  |critical |0      |enable  |Flash partition failure
|....|.........|.......|........|.............................................
|18  |critical |0      |enable  |PLL unlock error
|....|.........|.......|........|.............................................
```

```
|19  |critical |0      |enable  |Internal communication error
|....|.........|.......|........|.............................................
|20  |minor    |0      |enable  |Temperature exceed limit
|....|.........|.......|........|.............................................
|21  |minor    |0      |enable  |IOC detected but none of them active
|....|.........|.......|........|.............................................
|22  |event    |0      |enable  |Module reboot
|....|.........|.......|........|.............................................
|23  |major    |0      |enable  |RTE communication to peer error
|....|.........|.......|........|.............................................
|24  |minor    |0      |enable  |Entered warmup mode
|....|.........|.......|........|.............................................
|25  |event    |0      |enable  |Entered freerun mode
|....|.........|.......|........|.............................................
|26  |event    |0      |enable  |Entered fast-track mode
|....|.........|.......|........|.............................................
|27  |event    |0      |enable  |Entered normal-track mode
|....|.........|.......|........|.............................................
|28  |event    |0      |enable  |Entered bridging mode
|....|.........|.......|........|.............................................
|29  |minor    |0      |enable  |Entered holdover mode
|....|.........|.......|........|.............................................
|30  |major    |0      |enable  |In holdover mode for extended period
|....|.........|.......|........|.............................................
|31  |critical |0      |enable  |Operational failure
|....|.........|.......|........|.............................................
|32  |event    |0      |enable  |Input active
|....|.........|.......|........|.............................................
|33  |major    |0      |enable  |IOC-to-IOC sync fault
|....|.........|.......|........|.............................................
|34  |minor    |0      |enable  |Input disqualified as system reference
|....|.........|.......|........|.............................................
|35  |minor    |0      |enable  |Input loss of signal
|....|.........|.......|........|.............................................
|36  |minor    |0      |enable  |Input phase error
|....|.........|.......|........|.............................................
|37  |minor    |0      |enable  |Input PLL not settled
|....|.........|.......|........|.............................................
|38  |minor    |0      |enable  |Input frequency error
|....|.........|.......|........|.............................................
|39  |minor    |0      |enable  |Input out of frame
|....|.........|.......|........|.............................................
|40  |minor    |0      |enable  |Input alarm indication signal
|....|.........|.......|........|.............................................
|41  |minor    |0      |enable  |PTP server near packet limit
|....|.........|.......|........|.............................................
|42  |minor    |0      |enable  |PTP server near client limit
|....|.........|.......|........|.............................................
|43  |event    |0      |enable  |PTP client unreachable
|....|.........|.......|........|.............................................
|44  |minor    |0      |enable  |Hardware-Software incompatible
|....|.........|.......|........|.............................................
|45  |minor    |0      |enable  |IMC-IOC Software incompatible
|....|.........|.......|........|.............................................
|46  |minor    |0      |enable  |IOC-IOC Software incompatible
|....|.........|.......|........|.............................................
|47  |event    |0      |enable  |Obsolete
|....|.........|.......|........|.............................................
|48  |event    |0      |enable  |IOC not present
```

49	minor	0	enable	No IOC present
50	event	0	enable	Transitioned to active state
51	event	0	enable	Transitioned to standby state
52	minor	0	enable	Input software loop not settled
53	critical	0	enable	Input PPS loss
54	event	0	enable	User configuration lost
55	minor	0	enable	Primary image failed. Running backup image
56	critical	0	enable	Production configuration data error
57	minor	0	enable	Direct access image error. Use JFFS2 image
58	critical	0	enable	IMC-IOC FPGA link failed
59	minor	0	enable	Excessive traffic on Ethernet port
60	minor	0	enable	Unsupported SFP on Ethernet port
61	minor	0	enable	Input poor SSM
62	event	0	enable	Input SSM changed
63	minor	0	enable	Time input not tracking
64	minor	0	enable	Internal reference data loss
65	event	0	enable	Obsolete
66	event	0	enable	IO module not present
67	major	0	enable	Redundancy data transfer error
68	critical	0	enable	PTP client critical alarm
69	major	0	enable	PTP client major alarm
70	minor	0	enable	PTP client minor alarm
71	event	0	enable	PTP client event
72	event	0	enable	PTP client transient event
73	critical	0	enable	PLL unlock
74	critical	0	enable	Rubidium unlock
75	event	0	enable	Sync IOC time
76	major	0	enable	Configuration data sync error
77	major	0	enable	RTE voltage out of range

```
|78  |minor    |0      |enable  |GNSS/GPS signal low
|....|.........|.......|........|.............................................
|79  |event    |0      |enable  |PTP client dropped from client list
|....|.........|.......|........|.............................................
|80  |event    |0      |enable  |PTP client added to client list
|....|.........|.......|........|.............................................
|81  |event    |0      |enable  |PTP client IP address to be changed
|....|.........|.......|........|.............................................
|82  |event    |0      |enable  |PTP client changed to new IP address
|....|.........|.......|........|.............................................
|83  |event    |0      |enable  |PTP client list refreshed
|....|.........|.......|........|.............................................
|84  |critical |0      |enable  |FPGA in failed state
|....|.........|.......|........|.............................................
|85  |event    |0      |enable  |PTP port state changed to master
|....|.........|.......|........|.............................................
|86  |event    |0      |enable  |PTP port state changed to passive
|....|.........|.......|........|.............................................
|87  |event    |0      |enable  |PTP port state changed to listening
|....|.........|.......|........|.............................................
|88  |event    |0      |enable  |PTP port state changed to disabled
|....|.........|.......|........|.............................................
|89  |major    |0      |enable  |DTI input port lost of signal
|....|.........|.......|........|.............................................
|90  |major    |0      |enable  |DTI input port invalid
|....|.........|.......|........|.............................................
|91  |event    |0      |enable  |DTI input port active
|....|.........|.......|........|.............................................
|92  |event    |0      |enable  |EXP connected
|....|.........|.......|........|.............................................
|93  |event    |0      |enable  |EXP disconnected
|....|.........|.......|........|.............................................
|94  |event    |0      |enable  |Shelf ID changed
|....|.........|.......|........|.............................................
|95  |minor    |0      |enable  |Exp-Interface link down
|....|.........|.......|........|.............................................
|96  |major    |0      |enable  |EXP has duplicated shelf ID
|....|.........|.......|........|.............................................
|97  |minor    |0      |enable  |IMC-EXP Software incompatible
|....|.........|.......|........|.............................................
|98  |event    |0      |enable  |GNSS receiver change track mode
|....|.........|.......|........|.............................................
|99  |minor    |0      |enable  |Fan failure
|....|.........|.......|........|.............................................
|100 |major    |0      |enable  |Multiple fans failure
|....|.........|.......|........|.............................................
|101 |major    |0      |enable  |PPS-TOD input communication error
|....|.........|.......|........|.............................................
|102 |minor    |0      |enable  |PPS-TOD input unusable
|....|.........|.......|........|.............................................
|103 |minor    |0      |enable  |Time and phase questionable
|....|.........|.......|........|...............................................|
|104 |minor    |0      |enable  |NTP server near packet limit
------------------------------------------------------------------------------
```

Level : User, Config, and Admin

set alarm-config

Provisions the alarm state, alarm level, and reporting delay time for the specified alarms.

Command Syntax:

- To provision the state of the specified alarm number:

```
set alarm-config state {alarm [0 to max-alarm-id] | all}
{enable | disable}
```

- To provision the Level of the specified Alarm number:

```
set alarm-config level {alarm [0 to max-alarm-id] | all}
{2 |3 | 4 | 5}
```

where:

2 - Critical
3 - Major
4 - Minor
5 - Event

- To provision the reporting delay of the specified Alarm number in seconds:

```
set alarm-config delay {alarm [0 to max-alarm-id] | all}
[0 to 500000]
```

Note: Use “show alarm-config” command to view the max-alarm-id of current TP5000 release.

Range: Delay - 0 to 500,000 seconds

Default: Delay - 0 seconds

Example 1:

To Disable alarm #35 –

```
tp5000> set alarm-config state alarm 35 disable
```

Example 2:

To set the level of alarm #31 to Error - major (3) –

```
tp5000> set alarm-config level alarm 31 3
```

Remarks: The severity level and delay of transitory events cannot be changed.

Level : Config and Admin only

alias

This command is used to assign an alias for a CLI command (or any character string). The alias can then be used as a convenient substitution for the CLI command to which it has been assigned.

The alias command can also be used to display all defined aliases and the commands to which they have been assigned.

Command Syntax:

- To assign an alias name to a command (or any portion of a command):

```
alias <user-defined-alias> "<character-string>"
```

- To display all defined aliases and the commands to which they have been assigned:

```
alias
```

Example 1:

To set the alias "abc" for the command `show ip status ioc`. The command string must be contained within double quote marks ("")–

```
tp5000> alias abc "show ip status ioc"
```

Example 1a:

To use the alias "abc" to execute the command `show ip status ioc` –

```
tp5000> abc
```

Response 1a:

```
ETH1        Link encap:Ethernet  HWaddr 00:B0:AE:01:32:49

            inet addr:192.168.1.11  Bcast:192.168.1.255  Mask:255.255.255.0

            UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1

            RX packets:0 errors:0 dropped:0 overruns:0 frame:0

            TX packets:32 errors:0 dropped:0 overruns:0 carrier:0

            collisions:0 txqueuelen:1000

            RX bytes:0 (0.0 B)  TX bytes:1920 (1.8 KiB)


ETH2        Link encap:Ethernet  HWaddr 00:B0:AE:01:32:4A

            inet addr:192.168.2.11  Bcast:192.168.2.255  Mask:255.255.255.0
```

```
UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
RX packets:6 errors:0 dropped:0 overruns:0 frame:0
TX packets:32 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:1000
RX bytes:360 (360.0 B)  TX bytes:1920 (1.8 KiB)
```

Example 2:

To display the aliases assigned for the TP5000 –

```
tp5000> alias
```

Response 2:

```
alias    show ip status ioc='ABC'
```

Level : User, Config, and Admin

show authentication

Displays how the system authenticates users.

If applicable, displays RADIUS server IP address or hostname and key.

Command Syntax:

```
show authentication
```

Example:

```
tp5000> show authentication
```

Response:

```
Authentication Info:

Radius server addr            - 0.0.0.0
Radius server key             - 0
Radius server port            - 0

Radius server state           - disable
```

Remarks: Authentication can be local or RADIUS

Level : Admin only

set authentication

Provisions the authentication source for user logins. This command can also be used to change the port used for RADIUS authentication.

Command Syntax:

- To provision the state for RADIUS authentication:

```
set authentication radius {enable | disable}
```

- To provision the RADIUS server IP address or hostname and key and the port used for RADIUS authentication (optional).

```
set authentication radius address <ip_addr> key <key_value>
[port <udp_port>]
```

Example 1:

To set the RADIUS server IP address 192.168.4.53, with a key of A12F34B56 (standard port 1812 is used):

```
tp5000> set authentication radius address 192.168.4.53 key
A12F34B56
```

Example 2:

To provision the state for RADIUS authentication:

```
tp5000> set authentication radius enable
```

Example 3:

To change the RADIUS port to 1850 (port 1812 is standard) and to set the RADIUS server IP address 192.168.4.53, with a key of A12F34B56:

```
tp5000> set authentication radius address 192.168.4.53 key
A12F34B56 port 1850
```

Remarks: Only one server is supported. Only one key is supported.

Level : Admin only

show auto-sync

Displays the auto sync state

Command Syntax:

```
show auto-sync
```

Example:

```
tp5000> show auto-sync
```

Response:

```
AUTO-SYNC                      - enable
```

Level : User, Config, and Admin

set auto-sync

Provisions the auto sync IOC time to IMC time. This parameter is used only when the reference is set to time mode after the IOC has passed the warm-up state. When auto sync is enabled, IOC time will be synchronized to IMC time if they are different. If auto sync is disabled and IOC time is different from IMC time, an alarm will be generated. The user can then use the "Sync TOD-Source now" command to manually synchronize IOC time to IMC time.

Command Syntax:

```
set auto-sync {enable | disable}
```

Example:

```
tp5000> set auto-sync enable
```

Remarks: When the system is in warm-up state, IMC time and IOC time are always synced automatically regardless of whether auto sync is enabled or not. Auto-sync is not used in the frequency reference mode.

Level : Config and Admin only

show bridge-time

Displays the bridging time that is used to allow the frequency servo to coast through short periods when the system does not have qualified reference. The bridging time is in seconds.

Command Syntax:

```
show bridge-time
```

Example:

```
tp5000> show bridge-time
```

Response:

```
Bridging Time                  - 900
```

Remarks: If the system has not qualified a ToD Source (frequency reference) within the specified bridging time the system transitions into holdover mode of operation.

Level : User, Config, and Admin

set bridge-time

Provisions the amount of time, in seconds, the system remains in bridging mode before transitioning into the holdover mode of operation.

Note: Updates to the bridging-time value are only used at the start of the next bridging event. Any changes to this value while the unit is in bridging mode will not be implemented until the next bridging event.

Command Syntax:

```
set bridge-time <bridging-time>
```

Range: 100 to 100000 seconds

Default: 900 seconds

Example:

```
tp5000> set bridge-time 1000
```

Level : Config and Admin only

show clock

Displays the date, time, and leapseconds in several formats.

– Current IMC time as a date and time
– Current IOC time as a date and time
– Accumulated leapseconds between TAI and UTC time
– Pending leapseconds

Command Syntax:

```
show clock
```

Example:

```
tp5000> show clock
```

Response 1:

```
IMC time: 2009-06-09 22:35:24
IOC time: 2009-06-09 22:35:24
Leap sec: 34
Leap pend: 0
```

Response 2:

When the ToD source is GPS, and the system has never been locked to GPS, the response will be as follows:

```
IMC time: 2009-06-09 22:35:24 (not validated)
IOC time: 2009-06-09 22:35:24 (not validated)
Leap sec: 34
Leap pend: 0
```

Level : User, Config, and Admin

set clock

Provisions the user-assigned Date, Time, and accumulated leapseconds. The reference mode must be set to the frequency mode with the `set ref mode frequency` command in order to change any clock settings.

Command Syntax:

- To set the Date and Time –

```
set clock date-time <date-time>
```

- To set the Accumulated leapseconds –

```
set clock leapseconds <value>
```

Range: Accumulated leapseconds – 20 to 255 seconds

Enter date and time in YYYY-MM-DD,HH:MM:SS format (UTC)

Example 1:

```
To set date to June 09 2009, and time to 10:35 PM and 24 sec.(UTC)–

        tp5000> set clock date-time 2009-06-09,22:35:24

        tp5000> sync tod-source now
```

Example 2:

```
To set the accumulated leapseconds to 29 seconds –

        tp5000> set clock leapseconds 29
```

Remarks: The reference mode must be frequency in order to change date, time or leapseconds. If the reference mode is time, the user is not allowed to overwrite the date, time, or leapseconds. See Set REF command.

The “set clock” command only sets time on the IMC card. The "sync tod-source now" command must be sent after setting the time in order to sync IOC time to the IMC time.

Level : Config and Admin only

set configuration

Use this command to backup the current configuration, restore the current configuration from a backup copy, or set the current configuration to factory default values.

Command Syntax:

- To set the current configuration, including imc, ioc and expansion shelves, to factory or default values

```
set configuration {default | factory}
```

  – Default preserves user logins and communication attributes, such as ip addresses of MGMT port on IMC.

  – Factory resets all attributes, including user logins.

- To backup the current configuration

```
set configuration backup {imc-to-ioc | ioc-to-imc | local
| exp[0-9]-to-IMC}
```

  – Backup “imc-to-ioc” saves the configuration from the IMC module to both IOC modules.

  – Backup “ioc-to-imc” saves the configuration from the active IOC module to the IMC module.

  – Backup “local” saves the configuration to local non-volatile storage immediately.

  – Backup “exp[0-9]-to-imc” saves the configuration for the specified expansion shelf to the IMC module.

- To backup the current configuration from the IMC, active IOC, or expansion shelf to remote storage

```
set configuration backup remote {ioc | imc | exp[0-9]}
<file name> [sftp:]<ip address>  <user name>
```

After pressing Enter, the system prompts for the password

```
Password: <password>
```

Note: For remote storage, path names should be specified as appropriate for the FTP/SFTP server and the operating system it is running on. This includes whether the entire path should be specified and whether "/" or "\" characters should be used.

- To restore the current configuration:

```
set configuration restore {imc-from-ioc | ioc-from-imc
| exp[0-9]-from-imc}
```

– Restore “ioc-from-imc” restores the IOC module configuration from the stored backup on the IMC module.

– Restore “imc-from-ioc” restores the IMC module configuration from the stored backup on the active IOC module.

– Restore “exp[0-9]-from-imc” restores the configuration for the specified expansion shelf from the stored backup on the IMC module.

- To restore the current configuration from remote storage:

```
set configuration restore remote {ioc | imc | exp[0-9]}
<file name> [sftp:]<ip address>  <user name>
```

After pressing Enter, the system prompts for the password

```
Password: <password>
```

Note: For remote storage, path names should be specified as appropriate for the FTP/SFTP server and the operating system it is running on. This includes whether the entire path should be specified and whether "/" or "\" characters should be used.

Example 1:

To set the configuration, including IMC, IOC and expansion shelves, to default values:

```
tp5000> set configuration default
```

Example 2:

To back up the configuration for both IOC modules to the IMC module:

```
tp5000> set configuration backup ioc-to-imc
```

Example 3:

To back up the system configuration data to local non-volatile storage:

```
tp5000> set configuration backup local
```

Example 4:

To restore the configuration for both IOC modules from the IMC module:

```
set configuration restore ioc-from-imc
```

Example 5:

To back up the configuration data of IOC to a remote site, which is an SFTP server with the IP address of 172.16.33.33, id: tp5000, password: backup, with a file name for backup data of “tp5k_ioc_backup.txt”:

Note: For remote storage, path names should be specified as appropriate for the FTP/SFTP server and the operating system it is running on. This includes whether the entire path should be specified and whether "/" or "\" characters should be used.

```
tp5000> set configuration backup remote ioc
tp5k_ioc_backup.txt sftp:172.16.33.33 tp5000
```

Enter the password at the prompt and press Enter:

```
Password: backup
```

Example 6:

To restore the configuration data with a file name of tp5k_ioc_backup.txt for IOC from a remote site, which is an SFTP server with the IP address of 172.16.33.33, id: tp5000, password: backup:

Note: For remote storage, path names should be specified as appropriate for the FTP/SFTP server and the operating system it is running on. This includes whether the entire path should be specified and whether "/" or "\" characters should be used.

```
tp5000> set configuration restore remote ioc
tp5k_ioc_backup.txt sftp:172.16.33.33 tp5000
```

Enter the password at the prompt and press Enter:

```
Password: backup
```

Example 7:

To back up the configuration data for an expansion shelf with ID=6 to a remote site, which is an SFTP server with the IP address of 172.16.33.33, id: tp5000, password: backup, with a file name for backup data of “tp5k_exp6_backup.txt”:

Note: For remote storage, path names should be specified as appropriate for the FTP/SFTP server and the operating system it is running on. This includes whether the entire path should be specified and whether "/" or "\" characters should be used.

```
tp5000> set configuration backup remote exp6
tp5k_exp6_backup.txt sftp:172.16.33.33 tp5000
```

Enter the password at the prompt and press Enter:

```
Password: backup
```

Example 8:

To restore the configuration data file tp5k_exp6_backup.txt back to an expansion shelf with ID=6 from the SFTP server with the IP address of 172.16.33.33, id: tp5000, password: backup:

Note: For remote storage, path names should be specified as appropriate for the FTP/SFTP server and the operating system it is running on. This includes whether the entire path should be specified and whether "/" or "\" characters should be used.

```
tp5000> set configuration restore remote exp6
tp5k_exp6_backup.txt sftp:172.16.33.33 tp5000
```

Enter the password at the prompt and press Enter:

```
Password: backup
```

Remarks:

- Setting the configuration to Default will not overwrite all user login information or current IP address of MGMT port on IMC. However, IP addresses for IOC will be set to default.
- For remote storage, the configuration files should not be modified on the external storage device. If the configuration files are modified on the external storage device, TimeProvider 5000 will not import the revised configuration files.
- When backing up configuration to an external storage device, user name and password settings are not included in the configuration file for security reasons. The user name and password are only backed up locally.
- The following settings are unique to the unit and will not be backed up to an external storage device:
  – Option and license keys
  – Asset name
- When restoring configuration files from the external storage device, the following settings are not restored:
  – IMC IP mode and IP address setting
  – IMC firewall setting
  – Intra-system setting

  The reason these settings are not restored is, if changed, the user could lose the management port connection to the TimeProvider 5000 system.

- The IOC module IP address is part of the configuration file. When restoring the IOC module configuration file to a different TimeProvider 5000, the user must set the IOC module IP address to avoid conflict with TimeProvider 5000 units that had the configuration file before being exported for backup. See the set ip command.
- When restoring configuration files to a different TimeProvider 5000, the PTP Clock ID must be reinitialized back to its default setting. To re-initialize the PTP Clock ID use the following command:

```
tp5000> set ptp clockid ioc1-[x] ff:ff:ff:ff:ff:ff:ff:ff
<enter>
```

- Use SFTP when exporting or importing the IMC module and IOC module configuration files. SFTP is the same mechanism used for TimeProvider 5000 firmware downloads.
- For remote storage, path names should be specified as appropriate for the FTP/SFTP server and the operating system it is running on. This includes whether the entire path should be specified and whether "/" or "\" characters should be used.

Level : Admin only

show eia-232

This command displays the serial port's operating parameters: baud rate, parity, word length, and stop bits.

Command Syntax:

```
show eia-232
```

Example:

```
tp5000> show eia-232
```

Response:

```
Baud rate- 57600
Stop bit - 1
Parity   - 0
Data length- 8
Flow control- none
```

Remarks: The system's serial interface is fixed at 57.6K, 0, 8, 1; there is no handshaking. There is no associated Set command.

Level : User, Config, and Admin

set eth-auto-neg

The Set Ethernet Auto Negotiation command configures the Ethernet auto-negotiation feature for connection speed of the Ethernet ports on the IOC modules.

When Ethernet auto-negotiation is enabled, the TP5000 will advertise connection speeds of 100M, 1000M, or 100/1000M. The user can specify a connection speed for a port, 100 MB, 1000 MB, or All, to configure speed used by auto-negotiation. If auto negotiation is disabled, the Ethernet connection speed will be forced to 100M for Electrical SFPs and to 1000M for Optical SFPs

Command Syntax:

- To set the state for Ethernet Auto Negotiation:

```
set eth-auto-neg state {ioc1-[y]|exp[0-9] {port [1-16] |
all} {enable|disable}
```

- To set the advertised speed for Ethernet Auto Negotiation:

```
set eth-auto-neg speed {ioc1-[y]|exp[0-9] {port [1-16] |
all} {100m|1000m|all}
```

y=1 | 2, where y is the port number on the IOC

Defaults:

The default for auto-negotiation state is “enable”. The default value for auto-negotiation speed is “All”..

Note: See PTP / NTP Connections for information about optical and electrical SFPs.

Example 1:

To set the advertised speed for Ethernet auto negotiation speed to “all” for Port 1 on IOC card 1 –

```
tp5000> set eth-auto-neg speed ioc1-1 all
```

Example 2:

To provision the Ethernet auto negotiation state for Port 1 on IOC card 1 –

```
tp5000> set eth-auto-neg state ioc1-1 enable
```

Example 3:

To set the advertised speed for Ethernet auto negotiation speed to "all" for Port 1 on

Exp shelf 9 (id=exp8) –

```
tp5000> set eth-auto-neg speed exp8 port 1 all
```

Example 4:

To provision the Ethernet auto negotiation state for Port 3 on Exp shelf 8 (id=exp7)–

```
tp5000> set eth-auto-neg state exp7 port 3 enable
```

Level : Config and Admin

show eth config

The Show Ethernet Configuration command displays the Ethernet auto-negotiation state and speed for the ports on the specified IOC module or expansion shelf.

Command Syntax:

```
show eth config {ioc1 | exp[0-9]}
```

Example 1:

To display the current configuration for the Ethernet ports on the IOC modules –

```
tp5000> show eth config ioc1
```

Response 1:

```
eth1 auto-neg state: enable
eth1 auto-neg speed: all
eth2 auto-neg state: enable
eth2 auto-neg speed: all
```

Example 2:

To display the current configuration for the Ethernet ports on expansion shelf ID=4 –

```
tp5000> show eth config exp4
```

Response 2:

```
eth configuration information in expansion shelf ID=4:
          port1  speed   :    all
          port2  speed   :    all
          port3  speed   :    all
          port4  speed   :    all
          port5  speed   :    all
          port6  speed   :    all
          port7  speed   :    all
          port8  speed   :    all
          port9  speed   :    all
          port10 speed   :    all
          port11 speed   :    all
          port12 speed   :    all
          port13 speed   :    all
          port14 speed   :    100M
          port15 speed   :    1000M
          port16 speed   :    all

          port1  state   :    enable
          port2  state   :    enable
          port3  state   :    enable
          port4  state   :    enable
          port5  state   :    enable
          port6  state   :    enable
          port7  state   :    enable
          port8  state   :    enable
          port9  state   :    enable
          port10 state   :    enable
          port11 state   :    enable
          port12 state   :    enable
          port13 state   :    enable
          port14 state   :    enable
          port15 state   :    enable
          port16 state   :    enable
```

Level : User, Config, and Admin

show eth-status

The Show Ethernet Status command displays the current speed for the Ethernet ports on all IOC modules or expansion shelf ports.

Command Syntax:

```
show eth-status {ioc | exp[0-9]}
```

Example 1:

To display the current speed for the Ethernet ports on the IOC modules –

```
tp5000> show eth-status ioc
```

Response 1:

```
IOC1 eth1 current speed:       none
IOC1 eth2 current speed:       100M

IOC2 eth1 current speed:       100M
IOC2 eth2 current speed:       none
```

Example 2:

To display the current speed for the Ethernet ports on expansion shelf 5 (id= 4) –

```
tp5000> show eth-status exp4
```

Response 2:

```
Eth-status information in expansion shelf ID=4:

    port1 current speed       :    all
    port2 current speed       :    all
    port3 current speed       :    all
    port4 current speed       :    all
    port5 current speed       :    all
    port6 current speed       :    all
    port7 current speed       :    all
    port8 current speed       :    all
    port9 current speed       :    all
    port10 current speed      :    all
    port11 current speed      :    all
    port12 current speed      :    all
    port13 current speed      :    all
    port14 current speed      :    all
    port15 current speed      :    all
    port16 current speed      :    all
```

Level : User, Config, and Admin

show event

This command displays the current events.

Command Syntax:

```
show event
```

Example:

```
tp5000> show event
```

Response:

```
------------------------------------------------------------------
|ID |Mod |Date-Time          |Descriptions ......................|
|---|----|-------------------|-----------------------------------|
|...|....|...................|...................................|
|27 |ioc1|2009-06-09 21:32:16|Entered normal-track mode ...........|
|...|....|...................|...................................|
|32 |ioc1|2009-06-09 20:54:19|GPS active ........................|
|...|....|...................|...................................|
|32 |ioc2|2009-06-09 20:53:31|GPS active ........................|
------------------------------------------------------------------
```

Level : User, Config, and Admin

show exp-if config

Use this command to display the configurations of DTI and Ethernet port on IMC and IO cards and expansion shelves.

Command Syntax:

```
show exp-if config {imc | io | exp[0-9]}
```

Example 1:

To display the

```
tp5000> show exp-if config imc
```

Response 1:

To display the configurations of DTI and Ethernet on the IMC expansion port –

```
imc-exp eth state: enable
imc-exp dti state: enable
```

Example 2:

To display the configurations of DTI and Ethernet on the IO expansion port –

```
tp5000> show exp-if config io
```

Response 2:

```
io-exp-1 state: enable
io-exp-2 state: enable
```

Example 3:

To display the configurations of DTI and Ethernet on expansion shelf 1 (id= 0) expansion port –

```
tp5000> show exp-if config exp0
```

Response 3:

```
EXP-DTI in1 state         : enable
EXP-DTI in2 state         : enable
```

Level : User, Config and Admin

show exp-if status

Use this command to display the status of DTI and Ethernet expansion ports on IMC card, IO card (DTI only), and expansion shelves.

Command Syntax:

```
show exp-if status {imc | io | exp[0-9]}
```

Example 1:

To display the status of DTI and Ethernet on the IMC expansion port –

```
tp5000> show exp-if status imc
```

Response 1a:

```
IMC-EXP DTI status        : up
IMC-EXP ETH status        : up
```

Response 1b:

```
IMC-EXP DTI status        : down
IMC-EXP ETH status        : down
```

Example 2:

To display the status of expansion ports on the IO card –

```
tp5000> show exp-if status io
```

Response 2a:

```
io-exp-1:        up
io-exp-2:        disabled
```

Response 2b:

```
io-exp-1:         down
io-exp-2:         up
```

Example 3:

To display the status of DTI and Ethernet on expansion shelf ID=3 expansion port –

```
tp5000> show exp-if status exp3
```

Response 3a:

```
Port      dti link     dti status       eth link
-----------------------------------------------------------
in1:      up           active           up
in2:      disabled     standby          down
out1:     up           active           up
out2:     down         disconnected     up
```

Response 3b:

```
Port     dti link       dti status       eth link
---------------------------------------------------------
in1:     down           disqualified     down
in2:     up             disqualified     up
out1:    up             active           up
out2:    down           disconnected     up

Level :  DTI input port status of "active" means the port is
selected as reference
```

Level : User, Config and Admin

Table 3-1. Expansion Port Status

Status	Input/Output	Description
Active	Input and Output	An input is qualified and also selected. An output that is determined to be "active", "standby", or "redundant" by the downstream input.
Standby	Input only	An input is qualified but not selected. If the active input is disqualified, the standby input will be selected after several seconds.
Redundant	Input only	An input that could have been qualified, except that a timing loop condition existed. If the other input is disqualified, the redundant input will be selected after a delay to allow stabilization of the system.
Disqualified	Input only	An input that is disqualified
Disconnected	Output only	A DTI output that is not connected to a DTI input

set exp-if dti

Use this command to enable or disable the DTI port between the IMC and expansion shelf, or the DTI ports in expansion shelf. that is used to connect to an expansion shelf. This command is typically used to disable the DTI port when there are no expansion shelves being used with the TP5000.

Command Syntax:

```
set exp-if dti {imc-exp | io-exp-1 | io-exp-2 |
{exp[0-9] {in1|in2}}} {enable | disable}
```

Example 1:

To disable the DTI interface IN 1 port on expansion shelf ID=2 -

```
tp5000> set exp-if dti exp2 in1 disable
```

Example 2:

To enable the DTI interface port on the IMC card -

```
tp5000> set exp-if dti imc-exp enable
```

Example 3:

To enable the DTI interface port 1 on the IO card -

```
tp5000> set exp-if dti io-exp-1 enable
```

Remark : The `imc-exp` is the DTI port located on the IMC card. The `dti-exp-1` and `dti-exp-2` are the DTI ports located on the IO module. The `exp[0-9] in1` and `exp[0-9] in2` are the DTI IN 1 and DTI IN 2 ports located on the expansion shelves.

Level : Config, and Admin

set exp-if eth

Use this command to enable or disable the Ethernet port on the IMC that is used to connect to an expansion shelf. This command is typically used to disable the Ethernet port when there are no expansion shelves being used with the TP5000.

Command Syntax:

```
set exp-if eth imc-exp state {enable | disable}
```

Example:

To disable the Ethernet port on the exp-if interface on the IMC -

```
tp5000> set exp-if eth imc-exp state enable
```

Level : Config, and Admin

show firewall

This command displays the firewall configuration.

Command Syntax:

```
show firewall
```

Example:

```
tp5000> show firewall
```

Response:

```
ICMP Firewall                   - allow
TELNET Firewall                 - block
SSH Firewall                    - allow
SFTP Firewall                   - allow
SNMP Firewall                   - allow
FTP Firewall                    - block
```

Level : User, Config and Admin

set firewall

Use this command to configure the system's Ethernet port firewall. The firewall can control Telnet, SSH, FTP, SFTP, ICMP, and SNMP on the IMC.

Command Syntax:

```
set firewall imc telnet {allow|block}
set firewall imc ssh {allow|block}
set firewall imc ftp {allow|block}
set firewall imc sftp {allow|block}
set firewall imc snmp {allow|block}
set firewall imc icmp {allow|block}
```

Example:

```
set firewall imc telnet allow
```

Remarks: Telnet and FTP are disabled by default on IMC. On IOC, all ports are blocked except ICMP and PTP. The IOC firewall configuration cannot be changed.

Level : Admin only

generate

This command generates all possible event and alarm messages. This command is for testing only.

Command Syntax:

```
generate message
```

Example:

```
tp5000> generate message
```

Response:

Level : Admin only

show gnss

This command displays the GNSS port state, priority, position (latitude, longitude, height), elevation mask value (positioning filter), mode of operation (manual or automatic), and GPS or Beidou satellite tracking status. It also displays information for all satellite vehicles being tracked: vehicle number, health, noise ratio, satellite elevation, satellite azimuth.

Command Syntax:

- To show the GPS configuration on the GNSS port -

```
show gnss config
```

- To show the GPS status on the GNSS port -

```
show gnss status
```

Example 1:

```
tp5000>show gnss config
```

Response 1 :

```
State     - enable
Priority  - 1
Mode      - auto
GNSS Track-mode - gps
Mask      - 10
Antenna Delay - 0
PQL State - disable
PQL Value - 1



GNSS manual position

Latitude  - N37:22:42.900
Longitude - W121:55:34.571
Height    - 15.4
```

Example 2:

```
tp5000>show gnss status
```

Response 2 :

```
Current Position Mode          - manual

GNSS Status

Current Tracked-GNSS           - GPS
```

```
Current Position Mode          - manual

Latitude                       - N22:22:31.984
Longitude                      - E11:12:21.996
Height                         - 249.1




gps satellite status

----------------------------------------------------------

|Index |No.   |SNR   |Health     |Azimuth    |Elevation  |

|------|----- |----- |---------- |---------- |---------  |
|1     |3     |37    |healthy    |313        |23         |
|......|..... |..... |.........  |.......... |.........  |
|2     |6     |38    |healthy    |309        |35         |
|......|..... |..... |.........  |........   |.........  |
|3     |15    |43    |healthy    |57         |31         |
|......|..... |..... |.........  |........   |.........  |
|4     |16    |39    |healthy    |259        |24         |
|......|..... |..... |.........  |........   |.........  |
|5     |18    |39    |healthy    |300        |82         |
|......|..... |..... |.........  |........   |.........  |
|6     |21    |42    |healthy    |36         |67         |
|......|..... |..... |.........  |........   |.........  |
|7     |22    |42    |healthy    |240        |47         |
|......|..... |..... |.........  |........   |.........  |
|8     |24    |42    |healthy    |85         |29         |
|......|..... |..... |.........  |........   |.........  |
|9     |26    |38    |healthy    |42         |18         |
|......|..... |..... |.........  |........   |.........  |
|10    |29    |42    |healthy    |150        |26         |
|------|----- |----- |---------- |---------  |---------  |

Beidou satellite status

--------------------------------------------------------
|Index |No.   |SNR   |Health     |Azimuth    |Elevation  |
|......|..... |..... |.........  |.......... |.......... |
|1     |3     |37    |healthy    |313        |23         |
|......|..... |..... |.........  |.......... |.......... |
|2     |6     |38    |healthy    |309        |35         |
|......|..... |..... |.........  |.......... |.......... |
|3     |15    |43    |healthy    |57         |31         |
--------------------------------------------------------
```

set gnss

Use this command to configure the GNSS port state, priority, positioning mode, mask, track mode, PQL state, and PQL value. Possible track modes for the GNSS port are:

- forced GPS
- forced Beidou
- GPS priority over Beidou, switch automatically
- Beidou priority over GPS, switch automatically

Command Syntax:

- To change GNSS mode on the GNSS port:

```
set gnss mode { auto | manual [latitude <lat-value>
longitude <lon-value> height<height-value>]}
```

  – Position can only be provisioned manually when GNSS mode is “manual”.

Where

Latitude is in the format N|Sddd:mm:ss.sss, for example:
N37:22:45.123
S48:33:67.456

Longitude is in the format E|Wddd:mm:ss.sss, for example:
W121:55:36.123
E157:33:47.456

Height is in meters with one digit after the decimal point, for example:
17.5

Note: Symmetricom recommends that the Auto mode be used. Any error in the manually-specified system position will generate timing errors.

- To change GNSS track mode on the GNSS port:

```
set gnss track-mode { beidou | gps | priority_beidou |
priority_gps}
```

- To enable or disable GNSS on the GNSS port:

```
set gnss state {enable|disable}
```

- To set the priority on the GNSS port

```
set gnss priority <priority-value>
```

- To set the GNSS mask value

```
set gnss mask <mask-value>
```

- To set the GNSS cable-delay value

```
set gnss cable-delay <delay-value>
```

- To set the forced PQL state for the GNSS port

```
set gnss pql-state {enable | disable}
```

- To set the forced PQL value for the GNSS port

```
set gnss pql-value <pql-value>
```

Range: Height: -999.9 to 18000.0 meters
Mask: 5 to 45 degrees
Cable Delay: 0 to 65485 nanoseconds
Priority: 1 to 16, where 1 is highest priority and 16 is lowest
PQL Value: 1 to 3

Default: Mask: 10 degrees
Cable Delay: 0 nanoseconds
PQL State: Disable
PQL Value: 1

Example 1:

To set GNSS to auto mode –

```
–tp5000>set gnss mode auto
```

Example 2:

To manually set the GNSS to manual mode, with a system position of latitude of N37:22:45.123, longitude of W121:55:36.123, and a height 17.5 meters–

```
tp5000>set gnss mode manual latitude N37:22:45.123 longitude
W121:55:36.123 height 17.5
```

Example 3:

To enable GNSS on the GNSS port –

```
–tp5000>set gnss state enable
```

Example 4:

To set GNSS priority on the GNSS port to a value of 3 –

```
–tp5000>set gnss priority 3
```

Example 5:

To set the GNSS mask to a value of 25 degrees –

```
tp5000>set gnss mask 25
```

Example 6:

To set the GNSS cable delay to a value of 220 nanoseconds –

```
tp5000>set gnss cable-delay 220
```

Restrictions: The system must have the GNSS mode of operation provisioned as manual before you can successfully provision the position manually.

Level : Config and Admin only

show gps

This command displays the position (latitude, longitude, height), elevation mask value (positioning filter), mode of operation (manual or automatic), and GPS satellite tracking status. It also displays information for all satellite vehicles being tracked: vehicle number, health, noise ratio, satellite elevation, satellite azimuth.

Command Syntax:

- To display the GPS configuration on the GPS port:

```
show gps config
```

- To display the GPS status on the GPS port:

```
show gps status
```

Example 1:

```
tp5000>show GPS config
```

Response 1:

```
GPS Configuration

State                           - enable
Priority                        - 2
Mode                            - auto
Mask                            - 10
Antenna Delay                   - 0
PQL State                       - disable
PQL Value                       - 1



GPS manual position

Latitude                        - N37:22:43.425
Longitude                       - W121:55:34.815
Height                          - 13.7
```

Example 2:

```
tp5000>show gps status
```

Response 2:

```
GPS Status
```

```
Current Position Mode          - position hold
Latitude                       - N37:22:42.867
Longitude                      - W121:55:34.552
Height                         - 17.3


GPS Satellites Status

----------------------------------------------------
|Index |No.      |SNR      |Health   |Azimuth  |Elevation|
|------|---------|---------|---------|---------|---------|
|1     |3        |37       |healthy  |313      |23       |
|......|.........|.........|.........|.........|.........|
|2     |6        |38       |healthy  |309      |35       |
|......|.........|.........|.........|.........|.........|
|3     |15       |43       |healthy  |57       |31       |
|......|.........|.........|.........|.........|.........|
|4     |16       |39       |healthy  |259      |24       |
|......|.........|.........|.........|.........|.........|
|5     |18       |39       |healthy  |300      |82       |
|......|.........|.........|.........|.........|.........|
|6     |21       |42       |healthy  |36       |67       |
|......|.........|.........|.........|.........|.........|
|7     |22       |42       |healthy  |240      |47       |
|......|.........|.........|.........|.........|.........|
|8     |24       |42       |healthy  |85       |29       |
|......|.........|.........|.........|.........|.........|
|9     |26       |38       |healthy  |42       |18       |
|......|.........|.........|.........|.........|.........|
|10    |29       |42       |healthy  |150      |26       |
----------------------------------------------------
```

Level : User, Config, and Admin

set gps

Use this command to provision the GPS port for mode of operation, position, and positioning elevation mask. With this command, you can provision the GPS to use either automatic or manual mode to determine the system's position. You can provision the GPS position if the system is provisioned for Manual mode of operation. You can also provision the elevation mask to provide a method of filtering satellites to be used by the system.

Note: Latitude and Longitude are entered as pddd:mm:ss.sss, where p is N or S for latitude and E or W for longitude, ddd is degrees, mm is minutes, and ss.sss is seconds. For example: N59:20:3.458 or W121:31:42.69. Height is in meters, with a range of -999.9 to 40000.0 meters

Command Syntax:

- To set the GPS mode

```
set gps mode {auto|manual} [latitude <lat-value> longitude
<lon-value> height<height-value>]
```

  – Position can only be provisioned manually when GPS mode is “manual”.

    Where

    Latitude is in the format N|Sddd:mm:ss.sss, for example:
    `N37:22:45.123`
    `S48:33:67.456`

    Longitude is in the format E|Wddd:mm:ss.sss, for example:
    `W121:55:36.123`
    `E157:33:47.456`

    Height is in meters with one digit after the decimal point, for example:
    17.5

Note: Symmetricom recommends that the Auto mode be used. Any error in the manually-specified system position will generate timing errors.

- To enable or disable GPS

```
set gps state {enable|disable}
```

- To set the GPS priority

```
set gps priority <priority-value>
```

- To set the GPS mask value

```
set gps mask <mask-value>
```

- To set the GPS cable-delay value

```
set gps cable-delay <delay-value>
```

- To set the forced PQL state for the GPS port

```
set gps pql-state {enable | disable}
```

- To set the forced PQL value for the GPS port

```
set gps pql-value <pql-value>
```

Range: Height: -999.9 to 40000.0 meters
Mask: 5 to 45 degrees
Cable Delay: 0 to 999999 nanoseconds
Priority: 1 to 16, where 1 is highest priority and 16 is lowest
PQL-Value: 1 to 3

Default: Mask: 10 degrees
Cable Delay: 0 nanoseconds

Example 1:

To set GPS to auto mode –

```
tp5000>set GPS mode auto
```

Example 2:

To manually set the GPS to manual mode, with a system position of latitude of N37:22:45.123, longitude of W121:55:36.123, and a height 17.5 meters–

```
tp5000>set GPS mode manual latitude N37:22:45.123 longitude
W121:55:36.123 height 17.5
```

Example 3:

To enable GPS –

```
–tp5000>set gps state enable
```

Example 4:

To set GPS priority to a value of 2 –

```
–tp5000>set gps priority 2
```

Example 3:

To set the GPS mask to a value of 25 degrees –

```
tp5000>set GPS mask 25
```

Example 4:

To set the GPS cable delay to a value of 220 nanoseconds –

```
tp5000>set GPS cable-delay 220
```

Restrictions: The system must have the GPS mode of operation provisioned as manual before you can successfully provision the position manually.

Level : Config and Admin only

show hardware-status

This command displays the status of the specified hardware.

Command Syntax:

```
show hardware-status {imc | ioc1 | ioc2 | exp[0-9]}
```

Example 1:

To show the hardware status for IMC card –

```
tp5000> show hardware-status imc
```

Response 1:

```
-48V-A          :     ok
-48V-B          :     ok
+1.2V           :     1.211V
+1.8V           :     1.843V
+2.5V           :     2.526V
+5.5V           :     5.490V
VCXO            :     2.526V
GPS Power       :     5.464V
GPS Current     :     24mA
GPS Antenna     :     ok
FPGA            :     ok
```

Example 2:

To show the hardware status for IOC1 –

```
tp5000> show hardware-status ioc1
```

Response 2:

```
+1.8V           :     1.805V
10M EFC         :     1.116V
20M EFC         :     0.872V
25M EFC         :     1.155V
24.5M EFC       :     1.155V
24.7M EFC       :     1.253V
OSC Current     :     173mA
FPGA VCCint     :     1.005V
FPGA VCCaux     :     2.499V
FPGA Temp       :     60C
FPGA Temp High :      61C
FPGA Temp Low   :     54C
```

Example 3:

To show the hardware status for PTP/SyncE expansion shelf ID=3

```
tp5000> show hardware-status exp3
```

Response 3:

```
-48V-A          :     failed
-48V-B          :     ok
VCXO            :     1.701V
12V             :     11.807V
1.8V            :     1.778V
2.5V            :     2.487V
1.2V            :     1.173V
0.9V            :     0.889V
1.0V            :     0.992V
F1.1V           :     1.082V
F1.5V           :     1.482V
F2.5V           :     2.101V
G1.1V           :     1.082V
G1.5V           :     1.482V
G2.5V           :     2.462V
FPGA            :     ok
Temp            :     35C
Temp High       :     41C
Temp Low        :     35C
```

Level : User, Config, and Admin

history

This command shows the command history for the current session.

Command Syntax:

```
history
```

Example:

```
tp5000> history
```

Response:

```
0 2009-06-10 00:11:28 show eth-status
1 2009-06-10 00:12:24 show event
2 2009-06-10 00:13:15 show firewall
3 2009-06-10 00:16:02 set firewall imc sftp
4 2009-06-10 00:16:31 generate message
5 2009-06-10 00:17:07 show gps
6 2009-06-10 00:19:59 set gps mode auto
7 2009-06-10 00:21:49 set gps mask 10
8 2009-06-10 00:22:40 set gps cable-delay 1
9 2009-06-10 00:22:48 set gps cable-delay 0
10 2009-06-10 00:23:47 show hardware-status imc
11 2009-06-10 00:24:14 show hardware-status ioc1
12 2009-06-10 00:25:19 history
```

Level : User, Config, and Admin

show hostname

This command displays the host name for the TimeProvider 5000.

Command Syntax:

```
show hostname
```

Example:

```
tp5000> show hostname
```

Response

```
Host name                      - TP5000
```

Level : User, Config, and Admin

set hostname

This command sets the host name for the TimeProvider 5000. Hostname can contain up to 20 characters.

Command Syntax:

```
set hostname <hostname_string>
```

Example:

To set the hostname to “PTPhost3” –

```
tp5000> set hostname PTPhost3
```

Level : Config and Admin only

Note: The hostname will be used for the SNMP sysName object. However, if sysName is changed via SNMP, SNMP will then use the updated value until the next restart of SNMP, but hostname will not be changed.

show image

This command displays the firmware image used by each module in the system and the firmware version.

Command Syntax:

```
show image
```

Example:

```
tp5000> show image
```

Response:

```
IMC IMAGE DETAILS

Active image: 2 1.0.4_200811040901
Backup image: 1 1.0.2_200810231325
Next boot image: 2

IOC1 IMAGE DETAILS

Active image: 2 1.0.4_200811040858
Backup image: 1 1.0.2_200810231322
Next boot image: 2

IOC2 IMAGE DETAILS

Active image: 2 1.0.4_200811040858
Backup image: 1 1.0.4_200811040858
Next boot image: 2

Exp0 IMAGE DETAILS

Active image: 2 1.0.4_200811040901
Backup image: 1 1.0.2_200810231325
Next boot image: 2

Exp4 IMAGE DETAILS

Active image: 2 1.0.4_200811040901
Backup image: 1 1.0.2_200810231325
Next boot image: 2

. . .

Exp8 IMAGE DETAILS

Active image: 2 1.0.4_200811040901
Backup image: 1 1.0.2_200810231325
Next boot image: 2
```

Level : User, Config, and Admin

set image

Use this command to provision the module firmware image from which to boot. The backup image is the inactive (non-boot) image.

Note: Each image has it's own set of configuration data. If Image 1 is set as the boot image, the configuration data for Image 1 is applied when the TP 5000 is rebooted. If Image 2 is set as the boot image, the configuration data for Image 2 is applied when the TP 5000 is rebooted.

A firmware upgrade is applied to the backup image, and the backup image is set to be the next boot image. The TP 5000 copies the currently running configuration data to the data used with the next boot. Therefore, the configuration should be the same after rebooting, except for changes due to differences in supported configuration items between firmware revisions..

Command Syntax:

```
set image {imc|ioc1|ioc2|exp[0-9]}[1|2]
```

Example 1:

To set the IMC to boot image 1 –

```
tp5000> set image imc 1
```

Example 2:

To set expansion shelf 4 (id=3) to boot image 2 –

```
tp5000> set image exp3 2
```

Example 3:

To set IOC1 to boot image 2 –

```
tp5000> set image ioc1 2
```

Remark: The module must be rebooted to implement the boot image.

Level : Admin only

show input-config

This command displays the input port's state, priority, framing type, CRC, SSM state, SSM Bit, user-assigned SSM PQL value and whether the configuration settings for the port are used. The settings will not be used if the port is configured as an output..

Note: Setting the Time of Day source to GPS with the set tod-source command will also set the input reference port state to Disable.

Command Syntax:

```
show input-config
```

Example:

```
tp5000> show input-config
```

Response:

```
-------------------------------------------------------------------------------
|Port ID| State |Prio|Frame Type |CRC St |SSM St |SSM Bit|PQL Val|Config Used|
|-------|-------|----|-----------|-------|-------|-------|-------|-----------|
| port1 |disable| 1  |cas        |disable|disable| 8     | 3     | no        |
|.......|.......|....|...........|.......|.......|.......|.......|...........|
| port2 |disable| 2  |freq2048khz|disable|disable| 8     | 3     | yes       |
|.......|.......|....|...........|.......|.......|.......|.......|...........|
```

```
Note: See 'show io-status' for current port status and
direction.
```

Level : User, Config, and Admin

set input

Use this command to provision the System's Input Port(s) for the following:

- Priority
- State
- Framing Type
- CRC state for E1 signals
- Forced PQL state for port
- PQL Bit position for E1/T1 signals
- Forced PQL-value (this value is used if SSM is disabled)

Priority Quality Level (PQL) values are listed in the following table.

Quality Level	DS1 SSM	E1 SSM	Description
1	0x04	0x02	Stratum 1/PRS/PRC
2	0x08	0x00	STU, Stratum Unknown (presumed ST1)
3	0x0C	0x04	Stratum 2/Type II
4	0x0C	0x04	Type I
5	0x78	0x04	Transit Node/Type V
6	0x7C	0x08	Type III/Stratum 3E
7	0x10	0x0B	Type IV/Stratum 3
8	0x22	0x0F	G.813OPT2/SMC
9	0x30	0x0F	DUS, Do not Use for Sync
15	---	---	Did not receive valid SSM

Command Syntax:

- To set the priority for the specified input port:

```
set input priority port[1|2] [1-16]
```

- To provision the state for the specified input port:

```
set input state port[1|2] [enable|disable]
```

Note: Enabling the input state for a programmable I/O port with the "set input state" command will also set that port as an input port and set the output state for that port to Disable.

Enabling the output state for a programmable I/O port with the "Set Output state" command will also set that port as an output port and set the input state for that port to Disable.

Note: Setting the Time of Day source to GPS with the set tod-source command will also set the input reference port state to Disable.

- To set the frame type for the specified input port:

```
set input frametype port[1|2]
[d4|esf|ccs|cas|freq2048khz|freq1544khz]
```

Note: The default input frame type is freq2048khz.

- To provision the CRC state for the specified input port:

```
set input crc port[1|2] [enable|disable]
```

- To provision the SSM state for the specified input port:

```
set input ssm port[1|2] [enable|disable]
```

Note: Synchronization Status Message (SSM) is only supported for the frametypes ESF, CAS with CRC4 and CCS with CRC4. SSM should not be enabled for other input frame types.

If SSM is enabled for an input port and the frametype does not support SSM or is not sending a valid SSM, then the input will be disqualified and the input SSM will be set to 15 (invalid). The system will go to holdover if there is not another qualified reference to switch to.

- To provision the SSM Bit position for E1 signals for the specified input port (used only for ESF, CCS or CAS framing type):

```
set input ssm-bit port[1|2] [4|5|6|7|8]
```

- To set the forced PQL value for the specified input port:

```
set input pql-value port[1|2] <pql-value>
```

where `pql-value` is from 1 to 9

Example 1:

To set the priority to 1 for input port 2:

```
tp5000> set input priority port2 1
```

Example 2:

To provision the state to Enable for input port 1:

```
tp5000> set input state port1 enable
```

Note: Enabling the input state for a programmable I/O port with the "set input state" command will also set that port as an input port and set the output state for that port to Disable.

Example 3:

To set the frame type to 2048 kHz for input port1:

```
tp5000> set input frametype port1 freq2048khz
```

Example 4:

To provision the CRC state to Enable for input port2:

```
tp5000> set input crc port2 enable
```

Example 5:

To provision the forced PQL state to Disable for input port1:

```
tp5000> set input pql-state port1 disable
```

Example 6:

To provision the SSM PQL Bit value for E1 signals to 6 for input port2:

```
tp5000> set input ssm-bit port2 6
```

Example 7:

To set the SSM PQL value to 3 (Stratum 2/Type II) for input port1:

```
tp5000> set input pql-value port1 3
```

Level : Config and Admin only

show intra-system

Use this command to display which Class of network and IP addresses are used for IMC-to-IOC and IOC-to-IOC communications.

Command Syntax:

```
show intra-system
```

Example:

```
tp5000> show intra-system
```

Response:

```
Intra-communication IP set     - setB
```

Level : Config and Admin only

set intra-system

Use this command to provision which Class of network and IP addresses are used for IMC-to-IOC and IOC-to-IOC communications.

Command Syntax:

```
set intra-system [a|b|c]
```

where

A: IP address range 10.0.250.8 to 10.0.250.63
B: IP address range 172.16.250.8 to 172.16.250.63
C: IP address range 192.168.250.8 to 192.168.250.63

Example:

To set the intra-system IP addresses to range 3 for IMC-to-IOC and IOC-to-IOC communications –

```
tp5000> set intra-system c
```

Remarks: These addresses can't be used for external Ethernet ports.

Level : Config and Admin only

show inventory

This command displays the installed module inventory information as follows:

- model number
- user-assigned asset number
- IMC and IOC module part numbers
- IMC and IOC module CLEI numbers
- IMC and IOC module serial numbers
- IMC and IOC module hardware versions
- IMC and IOC module FPGA versions
- IMC and IOC module compatibility mask
- IMC and IOC module firmware versions
- Exp shelf part number
- Exp shelf CLEI number
- Exp shelf serial number
- Exp shelf hardware version
- Exp shelf FPGA version (clock FPGA)
- Exp shelf compatibility mask
- Exp shelf firmware version

The compatibility information allows the user to verify the compatibility between the hardware and software for each card. To be compatible, the hex numerical string displayed for the hardware (HW) of a card must match the numerical string displayed for the software (SW) of that card. See Figure 3-2.These hex numerical strings are generated from a compatibility algorithm.

For IMC-to-IOC compatibility, the numerical strings for the IMC and IOC cards must match. See Figure 3-2. For IOC-to-IOC compatibility, the numerical strings for the IOC cards must match.

Figure 3-2. Checking HW / SW and Card-to-Card Compatibility

```
------------------------------------------------------------------------
|Mod |HW Compatibility|SW Compatibility|IMC-IOC Compati.|IOC-IOC Compati.|
|----|----------------|----------------|----------------|----------------|
|imc |0x00000000      |0x00000000      |0x00000001      |n/a             |
|....|................|................|................|................|
|ioc1|0x00000000      |0x00000000      |0x00000001      |0x00000001      |
|....|................|................|................|................|
|ioc2|0x00000000      |0x00000000      |0x00000001      |0x00000001      |
------------------------------------------------------------------------
```

Command Syntax:

```
show inventory
```

Example:

```
tp5000> show inventory
```

Response:

```
General Inventory Info:


System Model                - TimeProvider 5000

Chassis Type                - front-access(090-50301-01)

I/O Module Type             - 2-port E1 plus TOD input I/O module(090-50315-01)

Asset Number                - 19




Module Inventory Info:


-------------------------------------------------------------------------------

|Mod |Slot  |Part Num        |CLEI Num   |Serial  |HW Ver |FPGA   |SW Version|

|----|------|----------------|-----------|--------|-------|-------|----------|

|imc |middle|090-50331-02    |unknown    |R75541  |unknown|0x1E   |2.0.4     |

|....|......|................|...........|........|.......|.......|..........|

|ioc1|left  |090-50321-01    |unknown    |R74829  |B/D    |0x5B   |0.0.261   |

-------------------------------------------------------------------------------


Compatibility Info:


---------------------------------------------------------------------------

|Mod |HW Compatibility|SW Compatibility|IMC-IOC Compati.|IOC-IOC Compati.|

|----|----------------|----------------|----------------|----------------|

|imc |0x00000000      |0x00000000      |0x00000006      |n/a             |

|....|................|................|................|................|
```

```
|ioc1|0x00000000      |0x00000000      |0x00000006      |0x00000007      |
-------------------------------------------------------------------------


---------------------------------------------------------
|Mod |HW Compatibility|SW Compatibility|IMC-EXP Compati.|
|----|----------------|----------------|----------------|
|imc |0x00000000      |0x00000000      |0x00000003      |
---------------------------------------------------------
```

Remarks: Only the asset number can be modified.

Level : User, Config, and Admin

set inventory

Use this command to provision the system's user-assigned asset value information.

Command Syntax:

```
set inventory asset <asset-value>
```

Range: Enter user-assigned asset value from 1 to 20 characters.

Example:

To set the inventory asset to a value of “tcb121” –

```
tp5000> set inventory asset tcb121
```

Level : Config and Admin only

set io

This command provisions the system's I/O module port configuration.

Note: The "set io" command is related to the "set input" and "set output" commands. Setting the io to input will set the output state to Disable. Setting the io to output will set the input state to Disable.

Enabling the input state for a programmable I/O port with the "set input state" command will also set that port as an input port and set the output state for that port to Disable.

Enabling the output state for a programmable I/O port with the "Set Output state" command will also set that port as an output port and set the input state for that port to Disable.

Command Syntax:

```
set io port[1|2] {input | output}
```

Example 1:

To set Port 1 of the I/O module as an Input –

```
tp5000> set io port1 input
```

Example 2:

To set Port 2 of the I/O module as an Output –

```
tp5000> set io port2 output
```

Related : show io-status,

Level : Config, and Admin

show ioc-state

This command displays the state of both the active and standby IOC module. If either IOC module cannot assume the active or standby state, the state indicates NOT AVAILABLE.

Command Syntax:

```
show ioc-state
```

Example:

```
tp5000> show ioc-state
```

Response:

```
---------------------------------
|Module ID      |State          |
|---------------|---------------|
|ioc1           |active         |
|...............|...............|
|ioc2           |standby        |
---------------------------------
```

Level : User, Config, and Admin

set ioc-state

Use this command to provision the standby module to become the active module. IOC1 refers the IOC module to the left of the IMC and IOC2 refers to the IOC module to the right of the IMC.

Command Syntax:

```
set ioc-state {ioc1 | ioc2} active
```

Example:

```
tp5000> set ioc-state ioc2 active
```

Note: When executing the command "set ioc-state iocx", wait 30 seconds after the prompt returns before issuing the next command.

Remarks :

Switchover to the standby IOC will be prohibited if the standby IOC has alarms of higher severity than the active IOC, or if the standby IOC is still in warm-up. Check system status and alarms if the command fails.

Level : Config and Admin only

show io-status

This command displays the system's I/O module port configuration and status. It also displays the current SSM value for both inputs and outputs. The current SSM value is displayed for all outputs, even if SSM is not applicable for that type of output. If the current SSM is unknown, due to an unknown SSM code or inappropriate frametype, then an SSM value of 15 will be displayed.

Command Syntax:

```
show io-status
```

Example:

```
tp5000> show io-status
```

Response:

```
-------------------------------------------------------------
|Port ID | I/O Type | Signal Type | Current Status | Current SSM |
|--------|----------|-------------|----------------|-------------|
| port1  | Output   |T1pulse      | ON             | 1           |
|........|..........|.............|................|.............|
| port2  | Input    |E1/2.048MHz  | OFF            | 15          |
|........|..........|.............|................|.............|
| port3  | Output   |1PPS         | ON             | 15          |
|........|..........|.............|................|.............|
| port4  | Output   |10MHz        | ON             | 15          |
|........|..........|.............|................|.............|

Note: See 'show input-config' or 'show output-config' for
port configuration.
```

Level : User, Config, and Admin

show ip

This command displays the Host, Mask, and Gateway IP addresses for Ethernet interfaces on the specified module. It also indicates if DHCP is enabled and if the port is enabled.

Command Syntax:

- To show the configuration of the Ethernet interfaces for the specified module (some settings will only be implemented after restarting the IP interface):

```
show ip config {imc | ioc1 | exp[0-9]}
```

- To show the current status of the Ethernet interfaces for the specified module:

```
show ip status {imc | ioc1 | exp[0-9]} [vlan-id <vlan>]
```

Note: Packet and byte counts do not include most PTP and NTP packets.

Defaults:

See Table B-21 for default IP address for the IMC module.
See Table B-27 for default IP address for IOC1 and IOC2 modules.

Example 1:

To display the configuration of the Ethernet interfaces for the IMC module –

```
tp5000> show ip config imc
```

Response 1:

```
MGMT PORT PARAMETERS

IP mode   :    dhcp
IP state  :    enable
```

Example 2:

To display the configuration of the Ethernet interfaces for the IOC1 module –

```
tp5000> show ip config ioc1
```

Response 2:

```
ETH1 PORT PARAMETERS
```

```
IP address:    192.168.1.11
IP mask   :    255.255.255.0
IP gateway:    0.0.0.0
IP state  :    enable


ETH2 PORT PARAMETERS

IP address:    192.168.2.11
IP mask   :    255.255.255.0
IP gateway:    0.0.0.0
IP state  :    enable
```

Example 3:

To display the status of the Ethernet interfaces for the IMC module –

```
tp5000> show ip status imc
```

Response 3:

```
MGMT       Link encap:Ethernet  HWaddr 00:B0:AE:00:00:05

           inet addr:192.168.5.14  Bcast:192.168.5.255  Mask:255.255.255.0

           UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1

           RX packets:70867 errors:0 dropped:0 overruns:0 frame:0

           TX packets:1986 errors:0 dropped:0 overruns:0 carrier:0

           collisions:0 txqueuelen:1000

           RX bytes:4511319 (4.3 MiB)  TX bytes:162895 (159.0 KiB)

           Interrupt:21 Base address:0xe000
```

Example 4:

To display the status of the Ethernet interfaces for the IOC module –

```
tp5000> show ip status ioc
```

Response 4:

```
ETH1       Link encap:Ethernet  HWaddr 00:B0:AE:01:32:49

           inet addr:192.168.1.11  Bcast:192.168.1.255  Mask:255.255.255.0

           UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1

           RX packets:0 errors:0 dropped:0 overruns:0 frame:0

           TX packets:32 errors:0 dropped:0 overruns:0 carrier:0
```

```
          collisions:0 txqueuelen:1000

          RX bytes:0 (0.0 B)  TX bytes:1920 (1.8 KiB)


ETH2      Link encap:Ethernet  HWaddr 00:B0:AE:01:32:4A

          inet addr:192.168.2.11  Bcast:192.168.2.255  Mask:255.255.255.0

          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1

          RX packets:6 errors:0 dropped:0 overruns:0 frame:0

          TX packets:32 errors:0 dropped:0 overruns:0 carrier:0

          collisions:0 txqueuelen:1000

          RX bytes:360 (360.0 B)  TX bytes:1920 (1.8 KiB)
```

Level : User, Config, and Admin

set ip

Use this command to provision the Host, Mask, and Gateway IP addresses for IMC and IOC Ethernet interfaces.

Note: To configure a VLAN, use the command set vlan to provision the IP addresses.

The special value of 0.0.0.0 should be used for the gateway value if a gateway router is not required.

Command Syntax:

- To provision the state of the Ethernet interfaces for the specified module and port:

```
set ip {imc|ioc1-1|ioc1-2|exp[0-9] port<1-16>}
[enable|disable|restart]
```

- To set the address, mask and gateway of the Ethernet interfaces for the specified module and port:

```
set ip (imc|ioc1-1|ioc1-2|exp[0-9] port<1-16>} address
<addr_value> netmask <mask_value> gateway <gateway value>
```

Note: In order for the configuration change to take affect, the interface must be restarted with the "set ip {imc|ioc1-1|ioc1-2|exp[0-9] port<1-16>} restart" command.

Example 1:

To restart the IMC module Ethernet interface:

```
tp5000> set ip imc restart
```

Example 2:

To Enable the IP interface for Port 2 of the active card:

```
tp5000> set ip ioc1-2 enable
```

Example 3:

To set the IP address for the IMC module to 192.168.2.11, the mask to 255.255.255.0, and the gateway 192.168.2.1:

```
tp5000> set ip imc address 192.168.2.11 mask 255.255.255.0
        gateway 192.168.2.1

tp5000> set ip imc restart
```

Example 4:

To set the IP address for Port 2 on the IOC card to 192.168.2.3, the mask to 255.255.255.0, and the gateway 192.168.2.1:

```
tp5000> set ip ioc1-2 address 192.168.2.3 mask 255.255.255.0
        gateway 192.168.2.1

tp5000> set ip ioc1-2 restart
```

Example 5:

To set the IP address for Port 2 on expansion shelf 4 (id: exp3) to 192.168.2.3, the mask to 255.255.255.0, and no gateway:

```
tp5000> set ip exp3 port 2 address 192.168.2.3 mask 255.255.255.0
        gateway 0.0.0.0

tp5000> set ip exp3 port 2 restart
```

Remarks: The address format allows IPv4 multiple octet formats. Restart the interface after configuring the system in order to implement the new settings.

Note: PTP will be restarted after the IP interface is restarted for the IOC modules.

Level : Config and Admin only

set ip-mode

Use this command to set the DHCP mode for the IMC Ethernet interface. You can set up the interface to use either DHCP or a static IP.

Command Syntax:

```
set ip-mode imc {dhcp|static}
```

Example:

```
tp5000> set ip-mode imc dhcp
```

Remarks: Use `set ip` to restart the interface after configuring the system.

Level : Config and Admin only

show led

This command displays the LED status for each of the modules. See Table 3-2 for LED descriptions for the main shelf. See Table 3-3 for LED descriptions for the expansion shelves.

Command Syntax:

```
show led {main | exp[0-9]}
```

Example 1:

```
tp5000> show led main
```

Response 1:

```
-------------------------------------------
|Index|Module ID|LED         |LED Status  |
|-----|---------|------------|------------|
|1    |imc      |bta         |off         |
|.....|.........|............|............|
|2    |imc      |btb         |off         |
|.....|.........|............|............|
|3    |imc      |sys         |red         |
|.....|.........|............|............|
|4    |imc      |alm         |off         |
|.....|.........|............|............|
|5    |imc      |gps         |green       |
|.....|.........|............|............|
|6    |imc      |mgmt        |green       |
|.....|.........|............|............|
|7    |ioc1     |active      |green       |
|.....|.........|............|............|
|8    |ioc1     |alarm       |amber       |
|.....|.........|............|............|
|9    |ioc1     |eth1        |off         |
|.....|.........|............|............|
|10   |ioc1     |eth2        |green       |
|.....|.........|............|............|
|11   |ioc1     |holdover    |off         |
|.....|.........|............|............|
|12   |ioc2     |active      |off         |
|.....|.........|............|............|
|13   |ioc2     |alarm       |red         |
|.....|.........|............|............|
|14   |ioc2     |eth1        |green       |
|.....|.........|............|............|
|15   |ioc2     |eth2        |off         |
|.....|.........|............|............|
|16   |ioc2     |holdover    |off         |
-------------------------------------------
```

Example 2:

To display the LED status for expansion shelf 4 (id=exp3) –

```
tp5000> show led exp3
```

Response 2:

```
-------------------------------------------
|Index|Module ID |   LED      |LED Status |
|-----|---------|------------|------------|
|  1  | exp5    | pwra        |off |
|.....|........|..............|............|
|  2  | exp5    | pwrb       |red |
|.....|........|..............|............|
|  3  | exp5    | alm        |off |
|.....|........|..............|............|
|  4  | exp5    |  mgmt      |green |
|.....|........|..............|............|
|  5  | exp5    |  ref       |green |
-------------------------------------------
```

Level : User, Config, and Admin

Table 3-2. LED Descriptions for Main Shelf

LED	Label	Description
IMC Module		
Power Module Power Indicator	PWR	**Green** - Module power available **Off** - Module power not available
-48V A-Bus A-Bus Battery Indicator	BT A	**Off** - A-Bus power OK **Red** - A-Bus power failed
-48V B-Bus B-Bus Battery Indicator	BT B	**Off** - B-Bus power OK **Red** - B-Bus power failed
System Health Aggregation of system alarms indicator	SYS	**Off** - System operating normally **Amber** - System operational Minor Alarm(s) **Red** - System operational Major or Critical Alarm(s)
IMC Alarm IMC module alarm/fault indicator	ALM	**Off** - IMC operating normally **Amber** - IMC operational Minor Alarm(s) **Red** - IMC operational Major/Critical Alarm(s) **Flashing Green** - Software starting up
GNSS/GPS Status GPS engine status indicator	GNSS/ GPS	**Green** - GPS enabled and GPS engine/interface is operating normally **Amber** - GPS enabled and GPS engine or antenna interface has operational issues **Off** - GPS disabled
Ethernet Management Port LEDs on the Ethernet connector	MGMT	**Left Amber Flash** - Activity **Left Off** - No Activity **Right Green** - Link has been established **Right Off** - Link has not been established
IOC Module		
Power Module Power Indicator	PWR	**Green** - Module power available **Off** - Module power not available
Active Indicates which IOC is responsible for generating PTP, Telecom, 10MHz, and 1PPS outputs	ACT	**Off** - Standby IOC or System Startup **Green** - Active IOC
IOC Alarm IOC module alarm/fault indicator	ALM	**Off** - IOC operating normally **Amber** - IOC operational Minor Alarm(s) **Red** - IOC has Failed or has Major/Critical Alarm(s) **Flashing Green** - Software starting up

Table 3-2. LED Descriptions for Main Shelf (Continued)

LED	Label	Description
Ethernet Port 1 ETH1 link/activity indicator	ETH1	**Green** - Link has been established **Flashing Green** - Link activity **Off** - Link has not been established
Ethernet Port 2 ETH2 port link/activity indicator	ETH2	**Green** - Link has been established **Flashing Green** - Link activity **Off** - Link has not been established
Local Oscillator State Indicates the current mode of operation of the LO servo	HOLD	**Off** - Oscillator is operating in Locked mode **Amber** - Oscillator is operating in Holdover or Acquire modes **Flashing Amber** - Oscillator is operating in Warm-up mode

Table 3-3. LED Descriptions for Expansion Shelves

LED Name	Color	Description
PWR A	Red	Power A is absent
	Off	Power A is normal
PWR B	Red	Power B is absent
	Off	Power B is normal
ALM	Red	There are active alarms
	Off	There are no active alarms
MGMT	Green	Management port is connected
	Blinking Green	Management power has activity
	Red	Management is not connected
REF	Green	Valid reference
	Amber	No valid reference
	Off	Inputs disabled
	Blinking Amber	Warm up

show license

Use this command to display the current feature-level license and all option licenses. This command also displays all previous feature-level licenses.

Command Syntax:

- To display the current feature-level license and all option licenses:

```
show license current
```

Note: Use the show option command to display 6-character option keys and their status.

- To display all feature-level licenses and option licenses (excluding old 6-character option keys) that were ever added to the TP5000, including those that have been deleted :

```
show license history
```

Example:

```
tp5000> show license current
```

Response:

```
--------------------------------------------------------------------
|No. | Feature/Option          | License Key          | Serial Number |
|----|-------------------------|----------------------|---------------|
|1   | Feature 1.4             | ****************95ef | M12269        |
|....|.........................|......................|...............|
|2   | Feature 2.0             | ****************89f5 | M12269        |
|....|.........................|......................|...............|
|3   | Option ptp-probe        | ****************3af9 | M12269        |
|....|.........................|......................|...............|
|4   | Option ntp-probe        | ****************981b | M12269        |
|....|.........................|......................|...............|
|5   | Option ntp-server       | ****************601a | M12269        |
|....|.........................|......................|...............|
|6   | Option ntp-server-120k  | ****************dd7e | M12269        |
|....|.........................|......................|...............|
|7   | Option ptp-gm           | ****************12b3 | M12269        |
|....|.........................|......................|...............|
|8   | Option eth-16-ports     | ****************9e51 | U27210        |
|....|.........................|......................|...............|
|9   | Option eth-16-ports     | ****************76fd | U27285        |
|....|.........................|......................|...............|
|10  | Option snmp             | ****************3b07 | M12269        |
|....|.........................|......................|...............|
|11  | Feature 1.2             | ****************36f1 | M12269        |
|....|.........................|......................|...............|
```

Remarks :

Level : User, Config, and Admin

set license

Use this command to enter the 40-character license key for new features or options, and to delete features or options.

Licensing is used with TP5000 versions 1.2 and later. New features and options are activated with a 40-character key. If the user has a 6-character key, the "set option" command is used to enter the key. If the user has a 40-character key, the "set license" command is used to enter the key. The license is associated with the serial number of the card or module being licensed, which is usually the IMC card. The 16 port option for the Ethernet expansion shelf is associated with the expansion shelf serial number. System-level features or options are normally associated with the IMC card serial number.

Command Syntax:

- To enter a license key for new features or options:

```
set license add
```

  The TP 5000 will prompt for the license key.

- To remove an installed feature license:

```
set license delete feature <feature-level>
```

The TP5000 will respond with all installed features that can be deleted.

- To remove options, including older options with 6-character keys:

```
set license delete option
```

The TP5000 will respond with all installed options that can be deleted. The user chooses from the list for the option to delete

Note: When an option license is deleted, the option will still function until the next reboot.

Example 1:

To add a feature with a license key value of "ABCDEFGHIJ1234567890KLMNOPQRST0987654321":

```
tp5000> set license add
```

The TP 5000 will prompt for the license key:

```
License key: ABCDEFGHIJ1234567890KLMNOPQRST0987654321
```

Note: Feature and option licenses require a valid key. The key shown in this example is only intended to illustrate the concept.

Example 2:

To delete the 1.2 feature license:

```
tp5000> set license delete feature 1.2
```

Example 3:

To delete the SNMP option license:

```
tp5000> set license delete option
```

The TP5000 will prompt the user with a list of options that can be deleted.

```
Please enter 0~6 to select an option from the list:

0)  -  snmp : SNMP Agent
1)  -  ptp-probe : PTP Probe
2)  -  ntp-probe : NTP Probe
3)  -  eth-16-ports : Ethernet Port9-16 on Expansion
4)  -  ntp-server : NTP Server Default
5)  -  ntp-server-120k : NTP Server 120K
6)  -  ptp-gm : PTP Grandmaster

>0
```

Type `0` and press **Enter**.

Remarks :

Level : Admin only

show log

This command displays the specified log file from the local storage. The Index parameter selects one of the seven rotated log files. The Head parameter, along with the count value, displays the specified number of events from the beginning of the file. The Tail parameter, along with the count value, displays the specified number of events from the end of the file. If the Index is not specified or set to zero, the current log file is displayed. If neither Head nor Tail parameter is issued, the 20 most recent entries are displayed. The log files are:

- Alarm Log
- Event Log
- Command Log
- Security Log

Command Syntax:

```
show log {alarm|event|command|security} [<index-value>][{head|tail}
<number-of-lines>]
```

Example 1:

To display the first 5 entries of the alarm log (5 lines from the head of current log) –

```
tp5000> show log alarm head 5
```

Response:

```
Jan 01 00:00:10 TP5000 alarmd: 002,000,MINOR, IMC: GPS
engine not tracking satellite

Jan 01 00:00:34 TP5000 alarmd: 003,000,MAJOR, IMC: TOD
source GPS invalid

Jan 01 00:01:06 TP5000 alarmd: 049,000,MINOR, IMC: No IOC
present

Jan 01 00:01:08 TP5000 alarmd: 006,000,MINOR, IMC:
Management port link down

Jan 01 00:01:09 TP5000 alarmd: 011,000,MAJOR, IMC: GPS
antenna current out of range (6mA)
```

Example 2:

To display the last 10 entries of the event log (10 lines from the tail of current log) –

```
tp5000> show log event tail 10
```

Example 3:

To display the latest 20 entries from the current alarm log –

```
tp5000> show log alarm
```

Level : User, Config, and Admin

show log-size

Use this command to display the specified log buffer, the maximum number of kilobytes stored in the file before it is rotated.

Command Syntax:

```
show log-size {alarm|event|command|security}
```

Example:

```
tp5000> show log-size alarm
```

Response:

```
Log size of alarm log is  :  100 kilobytes
```

Level : User, Config, and Admin

set log-size

Use this command to provision the specified log file buffer size, the maximum number of kilobytes to be stored in the file before it is rotated.

Command Syntax:

```
set log-size {alarm|event|command|security} <size-value>
```

Range: 0 to 100 kilobytes

Default: 100 kilobytes

Remarks: Provisioning a log file size to zero disables the logging of that type of data.

Example:

```
tp5000> set log-size alarm 100
```

Level : Config and Admin only

logout

This command terminates the current user connection.

Command Syntax:

```
logout
```

Example:

```
tp5000> logout
```

Level : User, Config, and Admin

show monitor-exp

Use this command to display the monitor configuration for expansion shelves. If the monitor in an expansion shelf is enabled, it means that if communication is lost to this expansion shelf, alarm #0 (communication to peer card failed) will be reported by the IMC.

Command Syntax:

```
show monitor-exp
```

Example:

```
tp5000> show monitor-exp
```

Response:

```
---------------------------
|Shelf Id|Monitor State   |
|--------|----------------|
|exp0    |enable          |
|........|................|
|exp1    |disable         |
|........|................|
|exp2    |disable         |
|........|................|
|exp3    |disable         |
|........|................|
|exp4    |disable         |
|........|................|
|exp5    |disable         |
|........|................|
|exp6    |disable         |
|........|................|
|exp7    |disable         |
|........|................|
|exp8    |disable         |
|........|................|
|exp9    |disable         |
---------------------------
```

Level : User, Config, and Admin

set monitor-exp

Use this command to specify the monitoring mode for the expansion shelf with specified ID. If an expansion shelf has monitoring enabled, then a loss of communication with that expansion shelf will cause an alarm. If an expansion shelf has monitoring disabled, alarm #0 (communication to peer card failed) will be cleared, and loss of communication to that shelf will just cause an event.

Command Syntax:

```
set monitor-exp exp[0-9] {enable | disable}
```

Example:

To disable monitoring for expansion shelf exp0 -

```
tp5000> set monitor-exp exp0 disable
```

Level : Config, and Admin

show ntp

This command displays the NTP configuration and status data for Ethernet interfaces on the IOC module. Configuration data includes state, DSCP state and value, TTL value and VLAN ID. Status data includes state, version, mode, leap status, stratum level, root dispersion and packet load..

Command Syntax:

- To show the NTP configuration of the specified port:

```
show ntp config ioc-x
```

- To show the NTP status of the specified port:

```
show ntp status ioc-x
```

Example 1:

To display NTP configuration of the port 1 Ethernet interface on the IOC module –

```
tp5000> show ntp config ioc-1
```

Response 1:

```
NTP State                       enabled
NTP DSCP                        0
NTP DSCP State                  disabled
NTP TTL                         64
NTP VLAN Id                     2
NTP Packet Limit                20000
```

Example 2:

To display NTP status of the port 1 Ethernet interface on the IOC module –

```
tp5000> show ntp status ioc-1
```

Response 2:

```
Port enabled:           yes
Version:                4
Mode:                   server
Leap status:            no warning
Stratum level:          1
Root dispersion:        0.0 sec
Packet load:            5%
```

Level : User, Config, and Admin

set ntp

Use the `set ntp` command to configure the NTP parameters for the specified port . This command allows the user to set the NTP and DSCP (DiffServ Code Point) states, and to enter the desired values for TTL and DSCP for use in NTP packets.

Command Syntax

- To enable or disable NTP on the specified port:

```
set ntp state ioc1-x {enable | disable}
```

- To set the TTL field in NTP packets:

```
set ntp ttl ioc1-x <1-255>
```

- To set the value of DSCP to use in NTP packets:

```
set ntp dscp ioc1-x <0-63>
```

- To enable or disable the DSCP (DiffServ Code Point) field in NTP packets:

```
set ntp dscp-state ioc1-x {enable | disable}
```

- To set the VLAN ID for the NTP server on the specified port:

```
set ntp vlan-id ioc1-x <1-4094>
```

Example 1:

To enable NTP on port 1 of the IOC card:

```
tp5000> set ntp state ioc1-1 enable
```

Example 2:

To configure port 1 of the IOC card with a TTL value of 50 to use in NTP packets:

```
tp5000> set ntp ttl ioc1-1 50
```

Example 3:

To configure port 1 with a DSCP value of 25 to use in NTP packets:

```
tp5000> set ntp dscp ioc1-1 25
```

Example 4:

To enable the DSCP field in NTP packets on port 1:

```
tp5000> set ntp dscp-state ioc1-1 enable
```

Level : Config and Admin

show option

This command displays the option mode and key information.

Command Syntax:

```
show option
```

Example:

```
tp5000> show option
```

Response:

```
OPTION SERVICE      OPTION KEY         KEY VALIDITY
--------------      ----------         ------------
SNMP                not available      invalid
PTP PROBE           not available      invalid
```

Level : User, Config, and Admin

set option

This command sets the option mode and key information. The 6-character key is printed on the Symmetricom-issued certificate for the unit.

A new license model is used with TP5000 versions 1.2 and later. New features and options are activated with a 40-character MD5 key. If the user has a 6-character key, the “set option” command is used to enter the key. If the user has a 40-character key, the “set license” command is used to enter the key.

Note: The SNMP feature can either be ordered in a new system, or added to a previously ordered system as a field upgrade. Contact your Symmetricom representative for more information.

Command Syntax:

```
set option snmp <key>
```

Example:

To enable the snmp option with an authentication key of “ABCDEF”,

```
tp5000> set option snmp ABCDEF
```

Level : Config and Admin only

show output-config

This command displays the System's output settings and whether the settings for a port are used. The output settings will not be used if the port is configured as an input, is a dedicated 10MHz or 1PPS output, or the port has been configured for test mode. Ports 1 and 2 are programmable I/O ports. Ports 3 and 4 are dedicated output ports.

Note: For version 090-50311-01 of the I/O module, Ports 3 and 4 are dedicated E1 outputs ports. For versions 090-50312-01 and 090-50314-01 of the I/O module, Ports 3 and 4 are dedicated 1PPS and 10M outputs ports.

Command Syntax:

```
show output-config
```

Example:

```
tp5000> show output-config
```

Response:

```
------------------------------------------------------------------
|Port ID | State | Frame Type |CRC St |SSM St |SSM Bit|Config Used|
|--------|-------|------------|-------|-------|-------|-----------|
| port1  |enable |freq2048khz |disable|disable| 8     | T1pulse   |
|........|.......|............|.......|.......|.......|...........|
| port2  |enable |freq2048khz |disable|disable| 8     | no        |
|........|.......|............|.......|.......|.......|...........|
| port3  |enable |freq2048khz |disable|disable| 8     | no        |
|........|.......|............|.......|.......|.......|...........|
| port4  |enable |freq2048khz |disable|disable| 8     | no        |
|........|.......|............|.......|.......|.......|...........|


Note: See 'show io-status' for current port status and direction.
```

Related : Show Output-10M-config, Show Output-PPS-config

Level : User, Config, and Admin

set output

Use this command to provision the system's output ports. This command allows you to provision:

- state

- frame type
- CRC (for CAS or CCS frametypes only)
- SSM (for frame type ESF, CCS with CRC, or CAS with CRC)
- SSM-bit (for frame type ESF, CCS with CRC, or CAS with CRC)
- output generation behavior in warm-up, free-run, fast-track, and holdover states
- test-mode (creates a T1-isolated pulse on the selected output port)

Note: If the 1PPS and 10M I/O module is installed (version 090-50312-01 or 090-50314-01), configuration updates for port 3 and port 4 will be accepted but not used.

Priority Quality Level (PQL) values are listed in the following table.

Quality Level	DS1 SSM	E1 SSM	Description
1	0x04	0x02	Stratum 1/PRS/PRC
2	0x08	0x00	STU, Stratum Unknown (presumed ST1)
3	0x0C	0x04	Stratum 2/Type II
4	0x0C	0x04	Type I
5	0x78	0x04	Transit Node/Type V
6	0x7C	0x08	Type III/Stratum 3E
7	0x10	0x0B	Type IV/Stratum 3
8	0x22	0x0F	G.813OPT3/SMC
9	0x30	0x0F	DUS, Do not Use for Sync
15	---	---	Did not receive valid SSM

If the output frame type supports SSM and SSM is enabled for the output port, then the output signal will contain the system SSM value. The table below shows the output SSM value based on the clock state of the TP5000

Clock State	Output SSM
Warm-up	PQL=9 - Do not use for Sync (DUS)
Free-run	PQL of oscillator
Fast-lock	PQL of oscillator
Normal	PQL of reference

Clock State	Output SSM
Bridging	Last PQL of reference
Holdover	PQL of oscillator

Command Syntax:

- To provision the state for the specified output port:

```
set output state {port1|port2|port3|port4} {enable|disable}
```

Note: Enabling the output state for a programmable I/O port with the "Set Output state" command will also set that port as an output port and set the input state for that port to Disable.

Enabling the input state for a programmable I/O port with the "set input state" command will also set that port as an input port and set the output state for that port to Disable.

- To provision the output frame type:

```
set output frametype {port1|port2|port3|port4}
         {ccs|cas|freq2048khz|d4|esf|freq1544khz}
```

Note: The default output frame type is freq2048khz.

Note: The T1 isolated pulse mode has precedence over other frame types. This setting is not stored in non-volatile memory.

- To provision the CRC output:

```
set output crc {port1|port2|port3|port4} {enable|disable}
```

- To provision the SSM output:

```
set output ssm {port1|port2|port3|port4} {enable|disable}
```

- To provision the output ssm-bit:

```
set output ssm-bit {port1|port2|port3|port4} [4 thru 8]
```

- To provision the output behavior during the warm-up state:

```
set output warm-up {port1|port2|port3|port4}
{on|squelch|ais}
```

- To provision the output behavior during the free-run state:

```
set output free-run {port1|port2|port3|port4}
{on|squelch|ais}
```

- To provision the output behavior during the holdover state:

```
set output holdover {port1|port2|port3|port4}
{on|squelch|ais}
```

- To provision the output behavior during the fast-track state:

```
set output fast-track {port1|port2|port3|port4}
{on|squelch|ais}
```

- To enable the output test mode:

```
set output-test-mode {port1|port2|port3|port4}
[t1pulse|disable]
```

Example 1:

To Enable output Port 2:

```
tp5000> set output state port2 enable
```

Example 2:

To set the frame type to 2048 kHz for output Port 1:

```
tp5000> set output frametype port1 freq2048khz
```

Example 3:

To Enable CRC for output Port 3:

```
tp5000> set output crc port3 enable
```

Example 4:

To Enable SSM for output Port 2:

```
tp5000> set output ssm port2 enable
```

Example 5:

To provision the SSM Bit value for E1 signals to 6 for output port2:

```
tp5000> set output ssm-bit port2 6
```

Example 6:

To provision the output behavior to squelch during the warm-up state for port2:

```
tp5000> set output warm-up port2 squelch
```

Example 7:

To provision the output behavior to squelch during the free-run state for port2:

```
tp5000> set output free-run port2 squelch
```

Example 8:

To provision the output behavior to ON during the holdover state for port2:

```
tp5000> set output holdover port2 on
```

Example 9:

To provision the output behavior to ON during the fast-track state for port2:

```
tp5000> set output fast-track port2 on
```

Example 10:

To generate a T1-isolated pulse on the selected output port:

```
tp5000> set output test-mode port2 t1pulse
```

Level : Config and Admin only

show output-10m-config

This command displays the System's 10 MHz Output Port state, as well as the provisioned behavior of the 10 MHz Output Port during the warm-up, free-run, and holdover states.

Command Syntax:

```
show output-10m-config
```

Example:

```
tp5000> show output-10m-config
```

Response:

```
10MHz output configuration:

Port status                       - enable
10MHz generation warm-up          - squelch
10MHz generation free-run         - squelch
10MHz generation fast-track       - on
10MHz generation holdover         - on
```

Level : User, Config, and Admin

set output-10m

Use this command to provision the System's 10 MHz Output Port state. It is also used to provision the behavior of the 10 MHz Output Port during the warm-up, free-run, and holdover states.

Command Syntax:

- To provision the state of the the 10 MHz output port:

  ```
  set output-10m state [enable|disable]
  ```

- To provision the output behavior during the warm-up state:

  ```
  set output-10m warm-up {on|squelch}
  ```

- To provision the output behavior during the free-run state:

  ```
  set output-10m free-run {on|squelch}
  ```

- To provision the output behavior during the fast-track state:

  ```
  set output-10m fast-track {on|squelch}
  ```

- To provision the output behavior during the holdover state:

```
set output-10m holdover {on|squelch}
```

Example 1:

To Enable the 10MHz output port –

```
tp5000> set output-10m state enable
```

Example 2:

To provision the output behavior to squelch during the warm-up state for the dedicated 10MHz output port:

```
tp5000> set output-10m warm-up squelch
```

Example 3:

To provision the output behavior to squelch during the free-run state for the dedicated 10MHz output port:

```
tp5000> set output-10m free-run squelch
```

Example 4:

To provision the output behavior to ON during the fast-track state for the dedicated 10MHz output port:

```
tp5000> set output-10m fast-track on
```

Example 5:

To provision the output behavior to ON during the holdover state for the dedicated 10MHz output port:

```
tp5000> set output-10m holdover on
```

Level : Config and Admin only

show output-exp

This command displays the E1 or 1PPS+TOD output port configuration and status in E1-TOD expansion shelf.

Command Syntax:

```
show output-exp { e1 | pps-tod } exp[0-9]
```

Example:

```
tp5000> show output-exp e1 exp0
```

Level : User, Config, and Admin

set output-exp

Use this command to provision the E1 and 1PPS+TOD output ports on the expansion shelf. This command allows you to provision:

- state
- frame type
- CRC (for CAS or CCS frametypes only)
- SSM (for frame type ESF, CCS with CRC, or CAS with CRC)
- SSM-bit (for frame type ESF, CCS with CRC, or CAS with CRC)
- output generation behavior in warm-up, free-run, fast-track, and holdover states

Priority Quality Level (PQL) values are listed in the following table.

Quality Level	DS1 SSM	E1 SSM	Description
1	0x04	0x02	Stratum 1/PRS/PRC
2	0x08	0x00	STU, Stratum Unknown (presumed ST1)
3	0x0C	0x04	Stratum 2/Type II
4	0x0C	0x04	Type I
5	0x78	0x04	Transit Node/Type V
6	0x7C	0x08	Type III/Stratum 3E

Quality Level	DS1 SSM	E1 SSM	Description
7	0x10	0x0B	Type IV/Stratum 3
8	0x22	0x0F	G.813OPT3/SMC
9	0x30	0x0F	DUS, Do not Use for Sync
15	---	---	Did not receive valid SSM

If the output frame type supports SSM and SSM is enabled for the output port, then the output signal will contain the system SSM value. The table below shows the output SSM value based on the clock state of the TP5000

Clock State	Output SSM
Warm-up	PQL=9 - Do not use for Sync (DUS)
Free-run	PQL of oscillator
Fast-lock	PQL of reference or PRS for GPS mode
Normal	PQL of reference or PRS for GPS mode
Bridging	Last PQL of reference
Holdover	PQL of reference

Command Syntax:

- To provision the state for the specified E1 or 1PPS+TOD output port:

```
set output-exp {e1| pps-tod} state exp[0-9] {port [1-12] |
all} {enable | disable}
```

- To provision the framework for the specified E1 output port:

```
set output-exp e1 frametype exp[0-9] {port [1-12] | all}
{freq2048khz|cas|ccs}
```

Note: The default output frame type is freq2048khz.

Note: The T1 isolated pulse mode has precedence over other frame types. This setting is not stored in non-volatile memory.

- To provision the CRC output for the specified E1 output port:

```
set output-exp e1 crc exp[0-9] {port [1-12] | all}
{enable|disable}
```

- To provision the SSM output for the specified E1 output port:

```
set output-exp e1 ssm exp[0-9] {port [1-12] | all}
{enable|disable}
```

- To provision the output ssm-bit for the specified E1 output port:

```
set output-exp e1 ssm-bit exp[0-9] {port [1-12] | all}
[4|5|6|7|8]
```

- To provision the output behavior during the warm-up state for the specified E1 output port::

```
set output-exp e1 warm-up exp[0-9] {port [1-12] | all}
{on|squelch|ais}
```

- To provision the output behavior during the free-run state for the specified E1 output port::

```
set output-exp e1 free-run exp[0-9] {port [1-12] | all}
{on|squelch|ais}
```

- To provision the output behavior during the holdover state:

```
set output-exp e1 holdover exp[0-9] {port [1-12] | all}
{on|squelch|ais}
```

- To provision the output behavior during the fast-track state:

```
set output-exp e1 fast-track exp[0-9] {port [1-12] | all}
{on|squelch|ais}
```

- To provision the output behavior during the warm-up state for the specified 1PPS+TOD output port::

```
set output-exp pps-tod warm-up exp[0-9] {port [1-12] | all}
{on|squelch}
```

- To provision the output behavior during the free-run state for the specified 1PPS+TOD output port:

```
set output-exp pps-tod free-run exp[0-9] {port [1-12] | all}
{on|squelch}
```

- To provision the output behavior during the holdover state for the specified 1PPS+TOD output port:

```
set output-exp pps-tod holdover exp[0-9] {port [1-12] | all}
{on|squelch}
```

- To provision the output behavior during the fast-track state for the specified 1PPS+TOD output port:

```
set output-exp pps-tod fast-track exp[0-9] {port [1-12] |
all} {on|squelch}
```

Example 1:

To Enable all E1 output ports on expansion shelf 3 (id=exp2):

```
tp5000> set output-exp e1 exp2 all enable
```

Example 1a:

To Enable 1PPS+TOD output port #6 on expansion shelf 3 (id=exp2):

```
tp5000> set output-exp pps-tod exp2 port6 enable
```

Example 2:

To set the frame type to 2048 kHz for E1 output Port 10 on expansion shelf 5 (id=exp4):

```
tp5000> set output-exp e1 frametype exp4 port10 freq2048khz
```

Example 3:

To Enable CRC for E1 output Port 3 on expansion shelf 4 (id=exp3):

```
tp5000> set output-exp e1 crc exp3 port3 enable
```

Example 4:

To Enable SSM for E1 output Port 9 on expansion shelf 8 (id=exp7):

```
tp5000> set output-exp e1 ssm exp7 port9 enable
```

Example 5:

To provision the SSM Bit value to 6 for E1 output Port 9 on expansion shelf 8 (id=exp7):

```
tp5000> set output-exp e1 ssm-bit exp7 port9 6
```

Example 6:

To provision the output behavior to squelch during the warm-up state for E1 output Port 9 on expansion shelf 8 (id=exp7):

```
tp5000> set output-exp e1 warm-up exp7 port9 squelch
```

Example 7:

To provision the output behavior to squelch during the free-run state for E1 output Port 9 on expansion shelf 8 (id=exp7):

```
tp5000> set output-exp e1 free-run exp7 port9 squelch
```

Example 8:

To provision the output behavior to ON during the holdover state for E1 output Port 9 on expansion shelf 8 (id=exp7):

```
tp5000> set output-exp e1 holdover exp7 port9 on
```

Example 9:

To provision the output behavior to ON during the fast-track state for E1 output Port 9 on expansion shelf 8 (id=exp7):

```
tp5000> set output-exp e1 fast-track exp7 port9 on
```

Example 10:

To provision the output behavior to squelch during the warm-up state for E1 output Port 9 on expansion shelf 8 (id=exp7):

```
tp5000> set output-exp e1 warm-up exp7 port9 squelch
```

Example 11:

To provision the output behavior to squelch during the free-run state for E1 output Port 9 on expansion shelf 8 (id=exp7):

```
tp5000> set output-exp e1 free-run exp7 port9 squelch
```

Example 12:

To provision the output behavior to ON during the holdover state for E1 output Port 9 on expansion shelf 8 (id=exp7):

```
tp5000> set output-exp e1 holdover exp7 port9 on
```

Example 13:

To provision the output behavior to ON during the fast-track state for E1 output Port 9 on expansion shelf 8 (id=exp7):

```
tp5000> set output-exp e1 fast-track exp7 port9 on
```

Level : Config and Admin only

show output-pps-config

This command displays the System's 1PPS Output Port state, as well as the provisioned behavior of the 1PPS Output Port during the warm-up, free-run, and holdover states.

Command Syntax:

```
show output-pps-config
```

Example:

```
tp5000> show output-pps-config
```

Response:

```
1PPS output configuration:

Port state                        - enable
1pps generation warm-up           - squelch
1pps generation free-run          - squelch
1pps generation fast-track        - on
1pps generation holdover          - on
```

Level : User, Config, and Admin

set output-pps

Use this command to provision the System's 1PPS Output Port state. It is also used to provision the behavior of the 1PPS Output Port during the warm-up, free-run, and holdover states.

Command Syntax:

- To provision the state of the the 1PPS output port:
  ```
  set output-pps state [enable|disable]
  ```
- To provision the output behavior during the warm-up state:
  ```
  set output-pps warm-up {on|squelch
  ```
- To provision the output behavior during the free-run state:
  ```
  set output-pps free-run {on|squelch}
  ```
- To provision the output behavior during the fast-track state:
  ```
  set output-pps fast-track {on|squelch}
  ```
- To provision the output behavior during the holdover state:
  ```
  set output-pps holdover {on|squelch}
  ```

Example 1:

To Enable the 1PPS output port –

```
tp5000> set output-pps state enable
```

Example 2:

To provision the output behavior to squelch during the warm-up state for the dedicated 1PPS output port:

```
tp5000> set output-pps warm-up squelch
```

Example 3:

To provision the output behavior to squelch during the free-run state for the dedicated 1PPS output port:

```
tp5000> set output-pps free-run squelch
```

Example 4:

To provision the output behavior to ON during the fast-track state for the dedicated 1PPS output port:

```
tp5000> set output-pps fast-track on
```

Example 5:

To provision the output behavior to ON during the holdover state for the dedicated 1PPS output port:

```
tp5000> set output-pps holdover on
```

Level : Config and Admin only

show output-test-mode

This command displays the status of the output test mode for all output ports.

Command Syntax:

```
show output-test-mode
```

Example:

```
tp5000> show output-test-mode
```

Response:

```
Port 1 test mode            - disable
Port 2 test mode            - disable
Port 3 test mode            - disable
Port 4 test mode            - disable
```

Related : Show Output-config, Set Output test-mode, Show Output-10M-config, Show Output-PPS-config

Level : User, Config, and Admin

set packet-service

Use the `set packet-service` command to configure the specified port as either a PTP grandmaster, an NTP server, or a PTP probe. A license is required for a packet service other than PTP grandmaster. The packet-service mode for IOC ports can be set independently, with one port operating in PTP grandmaster mode while the other port is configured for ptp-probe mode (IP addresses must be set to different subnets).

Command Syntax:

```
set packet-service ioc1-x {ptp-gm | ntp-server | ptp-probe |
ntp-probe}
```

Note: PTP-probe and NTP-server each require a separate license.

NTP-probe is shown as a packet -service choice, however, it is an internal feature reserved for Symmetricom use.

Example 1:

To configure port 2 of the IOC card as a PTP grandmaster:

```
set packet-service ioc1-2 ptp-gm
```

Example 2:

To configure port 1 of the IOC card as an NTP server:

```
set packet-service ioc1-1 ntp-server
```

Example 3:

To configure port 2 of the IOC card as a PTP probe:

```
set packet-service ioc1-1 ptp-probe
```

Note: The `set packet-service` command deprecates the `set ptp-probe-mode {enable|disable}` command.

Level : Admin only

password

Use this command to modify the password of the current user.

Command Syntax:

```
password
```

Example:

```
tp5000> password
```

Response:

```
Prompt for password

Prompt for password confirmation
```

Level : User, Config, and Admin

Note: Be sure to not lose or forget the password. Contact Symmetricom support for the password recovery procedure if all admin-level user passwords are lost.

ping

Use this command to ping the host specified by the address (xxx.xxx.xxx.xxx) and display ping statistics.

Note: To minimize system resource usage and deter denial of service attacks, the system is configured to allow a maximum ICMP ping request rate of 1 per second.

Command Syntax:

```
ping {imc|ioc-1|ioc-2|exp[0-9} port{1-16]} [<vlan-id>]
<ip-address>
```

Example 1:

For IMC address of 192.168.5.100 –

```
tp5000> ping imc 192.168.5.100 <enter>
```

Response 1:

```
Ping imc success
```

Example 2:

For port 1 on the active IOC card, IP address 192.168.5.110, with VLAN ID of 23 –

```
tp5000> ping ioc-1 23 192.168.5.110
```

Response 2:

```
Ping ioc-1 success
```

Example 3:

For port 2 on the active IOC card, IP address 192.168.5.112, with no VLAN –

```
tp5000> ping ioc-2 192.168.5.112
```

Response 3:

```
Error: Action failed.
Ping ioc-2 failed
```

Example 4:

For port 16 on the expansion shelf 4 (module id: exp3), IP address 192.168.5.110, with VLAN ID of 23 –

```
tp5000> ping exp3 port 6 23 192.168.5.110
```

Response 4:

```
Ping exp3 port 6 success
```

Level : User, Config, and Admin

show pps-tod

This command displays the pps-tod input ports (port1 and port 2) configuration and status information.

Command Syntax:

- To show pps-tod input ports configuration:

```
show pps-tod config
```

- To show pps-tod input ports status:

```
show pps-tod status
```

Example 1:

```
tp5000>show pps-tod config
```

Response 1:

```
PPS-TOD Input Ports Configuration

---------------------------------------------------------------------
| Port ID | State   | Priority | Cable Delay | PQL State | PQL Value |
|.........|.........|..........|.............|...........|...........|
| Port 1  | enable  | 3        | 0           | disable   | 1         |
|.........|.........|..........|.............|...........|...........|
| Port 2  | enable  | 4        | 0           | disable   | 1         |
|.........|.........|..........|.............|...........|...........|
```

Example 2:

```
tp5000>show pps-tod status
```

Response 2:

```
PPS-TOD Input Ports Status
```

```
-------------------------------------------------------------
|    Status          |         Port 1         |       Port 2      |
|-------------------------------------------|-------------------|
|    Port status     |         normal         |   disabled|error  |
|....................|........................|...................|
|    PPS status      |         normal         |        n/a        |
|....................|........................|...................|
|PPS phase offset(ns)|           10           |        n/a        |
|....................|........................|...................|
| Clock source type  |          0x00          |        n/a        |
|....................|........................|...................|
| Clock source status|          0x00          |        n/a        |
|....................|........................|...................|
|   Accuracy         |        <value>         |        n/a        |
|....................|........................|...................|
|   Alarm            |          0x00          |        n/a        |
|....................|........................|...................|
```

Level : User, Config, and Admin

set pps-tod

Function: to configure the pps-tod input ports state, the priority level, the cable-delay compensation.

Command Syntax:

- To provision the state for the specified 1PPS+TOD port:

```
set pps-tod  state  {port1 | port2} {enable | disable}
```

- To provision the priority of the 1PPS+TOD input port:

```
set pps-tod  priority {port1 | port2} <1 - 16 >
```

- To provision the cable-delay of pps-tod port:

```
set pps-tod  cable-delay {port1 | port2} <value>
```

- To set the forced PQL state for the specified 1PPS+TOD port

```
set pps-tod pql-state {port1 | port2} {enable | disable}
```

- To set the forced PQL value for the specified 1PPS+TOD port

```
set pps-tod pql-value port {port1 | port2} <pql-value>
```

Ranges:

```
priority = 1 – 16
cable-delay = 0 – 200000 ns, 12.5 ns resolution
pql-value= 1 – 3
```

Example 1:

To enable 1PPS-TOD port 1–

```
set pps-tod  state  port1 enable
```

Example 2:

To provision the priority of the 1PPS+TOD input port 1 to a value of 5 –

```
tp5000> set pps-tod  priority port1 5
```

Example 3:

To provision the cable delay value for the 1PPS+TOD input port 1 to a value of 2500 ns –

```
tp5000> set pps-tod  cable-delay port1 2500
```

Example 4:

To enable the 1PPS+TOD input port for a forced pql-value –

```
tp5000> set pps-tod  pql-state port1 enable
```

Example 5:

To provision the 1PPS+TOD input port 1 to a forced pql-value of 3 –

```
tp5000> set pps-tod pql-value port1 3
```

Level: Config, and Admin only

show pql-ssm

This command displays the Priority Quality Level (PQL) values for reference input signal types. The PQL corresponds to the "ssm-value" parameter that is used with the "set input" command. The PQL is a representation of traceability for the signal presented at the input ports, where a PQL value of 15 represents an invalid SSM. If SSM is disabled for an input port, then the TP5000 will use the user-assigned SSM-value (PQL) for that input port.

Note: SSM during bridging will be the last SSM value of input reference while clock was in normal lock state.

Command Syntax:

```
show pql-ssm
```

Example:

```
tp5000> show pql-ssm
```

Response:

```
Option 1 Table

---------------------------------------------------------
| Option 1 SSM hex | Clock QL     | PTP clockClass | PQL |
|------------------|--------------|----------------|-----|
| 0x02             | QL-PRC       | 84             | 1   |
|..................|..............|................|.....|
| 0x00             | STU          | 82             | 2   |
|..................|..............|................|.....|
| 0x04             | QL-SSU-A     | 90             | 3   |
|..................|..............|................|.....|
| 0x04             | Type I       | 90             | 4   |
|..................|..............|................|.....|
| 0x08             | QL-SSU-B     | 96             | 6   |
|..................|..............|................|.....|
| 0x0B             | QL-SEC/EEC1  | 104            | 7   |
|..................|..............|................|.....|
| 0x0F             | QL-DNU       | 110            | 9   |
|..................|..............|................|.....|
| Others(or absent)| Invalid      | n/a            | 15  |
---------------------------------------------------------


  Option 2 Table
```

Option 2 SSM hex	Clock QL	PTP clockClass	PQL
0x04FF	QL-PRS	80	1
0x08FF	QL-STU	82	2
0x0CFF	QL-ST2	86	3
0x0CFF	Type I	86	4
0x78FF	QL-TNC	90	5
0x7CFF	QL-ST3E	100	6
0x10FF	QL-ST3/EEC2	102	7
0x22FF	QL-SMC	106	8
0x30FF	QL-DUS	110	9
Others(or absent)	Invalid	n/a	15

Related : set input, Set Output

Level : User, Config, and Admin

set ptp

Use this command to provision the PTP port's common provisioned attributes, multicast-specific attributes, and unicast-specific attributes.

Common Provisioned Attributes:

PTP Profile, Management Addressing mode (Multicast/Unicast), Two-step Clock mode, Alternate Master flag, IP Header Time to Live (TTL) field, Timescale, PTP state, Clock ID, Priority 1, Priority 2, Domain, Diffserv State, Diffserv Code Point, Dither, Maximum clients, Announce limit, Synchronization limit, Delay limit. See Figure 4-10, Figure 4-11, and Figure 4-12 for diagrams of the hierarchy for the PTP-Common commands.

See Table 4-11 for descriptions of the common provisioned attributes.

Multicast Specific Attributes:

Announce Message Timeout, Client Timeout, VLAN ID, Sync Message Interval, Announce Message Interval, Delay Interval. See Figure 4-13 for a diagram of the hierchy for the PTP Multicast commands.

See Table 4-12 for descriptions of the attributes specific to Multicast.

Unicast Specific Attributes – Non-Fixed:

Unicast Negotiation state, Dynamic Lease Interval. See Figure 4-14 for a diagram of the hierchy for the PTP Unicast – Non-Fixed commands.

See Table 4-13 for descriptions of the attributes specific to Unicast – Non-Fixed.

Unicast Specific Attributes - Static:

Unicast IP addresses (up to 10), Unicast State, Unicast Clock ID, VLAN ID, Sync Message Interval, Announce Message Interval, Delay Interval. See Figure 4-15 for a diagram of the hierchy for the Unicast - Static commands.

See Table 4-14 for descriptions of the attributes specific to Unicast -Static.

Note: This is a special mode which allows the TP5000 user to pre-allocate service for up to designated 10 clients, rather than using dynamic unicast negotiation of leases.

Expansion Shelf-Specific Attributes:

State, Timescale, Two-step Clock mode, Alternate-Master, Priority 1, Priority 2, Domain, Dither, and Clock ID

Command Syntax:

Common Attributes:

- To provision the PTP profile for the grandmaster:

```
set ptp profile ioc1-[y] {default | hybrid | itu-g8265-1 |
telecom-2008}
```

Note: The `ptp profile` command replaces the `ptp addr-mode` command.

- To provision the management addressing mode as Multicast or Unicast:

```
set ptp mgmt-addr-mode ioc1-[y] {unicast | multicast}
```

Note: Management addressing mode controls whether PTP management messages use Multicast or Unicast. This is independent of the `set ptp profile` command. For example, management addressing can be set for Multicast while PTP synchronization is using Unicast. For multicast management, the client must be in the TP5000's client list.

- To provision the state of the Two-Step Clock mode:

```
set ptp two-step {ioc1-1 | ioc1-2 | exp[0-9]} {enable |
disable}
```

  – If the Two-Step Clock state is Disable, a One-Step Clock is used.

- To provision the timescale for IOC1 or expansion shelf 1 -10 (id= exp0 - exp9) to Automatic, Arbitrary or PTP:

```
set ptp timescale {ioc1 | exp[0-9]} {auto| arb | ptp}
```

  – If the timescale is set to “auto”, the TP5000 will make the decision based on the input. The TP5000 will set the timescale to “ptp” if the unit is locked to gps. The TP5000 will set the timescale to “arb” if the unit is locked to any other reference besides gps (i.e. E1 and T1).

- To provision the Alternate Master mode:

```
set ptp alternative-master {ioc1-1 | ioc1-2 | exp[0-9]}
{enable | disable}
```

Note: If the Alternate Master mode is set to Enable, the alternate master flag will be set in the PTP messages.

- To provision the state for the specified PTP port on the IOC card or expansion shelf:

```
set ptp state {ioc1-1 | ioc1-2 | exp[0-9]} {enable | disable}
```

- To provision the IP Header Time to Live (TTL) field for PTP packets:

```
set ptp ttl {ioc1-1 | ioc1-2} <TTL-value>
```

- To provision the PTP maximum number of clients:

```
set ptp max-client {ioc1-1 | ioc1-2} <max-client value>
```

- To provision the announce limit, the minimum interval (maximum rate) between PTP announce messages:

```
set ptp announce-limit {ioc1-1 | ioc1-2} <announce-limit
value>
```

  – The interval is 2^z seconds, where z= <announce-limit-value>.

- To provision the synchronization limit, the minimum interval (maximum rate) between PTP synchronization messages:

```
set ptp sync-limit {ioc1-1 | ioc1-2} <sync-limit value>
```

  – The interval is 2^z seconds, where z= <sync-limit-value>.

- To provision the delay limit, the minimum interval (maximum rate) between PTP delay response messages:

```
set ptp delay-limit {ioc1-1 | ioc1-2} <delay-limit value>
```

  – The interval is 2^z seconds, where z= <delay-limit-value>.

- To provision the PTP priority-1:

```
set ptp priority-1 {ioc1-1 | ioc1-2 | exp[0-9]} <priority-1
value>
```

- To provision the PTP priority-2:

```
set ptp priority-2 {ioc1-1 | ioc1-2 | exp[0-9]} <priority-2
value>
```

- To provision the PTP domain:

```
set ptp domain {ioc1-1 | ioc1-2 | exp[0-9]} <domain-value>
```

- To provision the PTP Diffserv Code Point value:

```
set ptp dscp ioc1-[y] <dscp-value>
```

- To provision the PTP Diffserv Code Point state:

```
set ptp dscp-state ioc1-[y] {enable | disable}
```

- To provision the PTP dither:

```
set ptp dither {ioc1-1 | ioc1-2 | exp[0-9]} {enable |
disable}
```

- To provision the PTP master Clock ID:

```
set ptp clockid {ioc1-1 | ioc1-2 | exp[0-9]} <clockid>
```

  where the Clock ID is in the form xx:xx:xx:xx:xx:xx:xx:xx

Multicast Specific Attributes - TP 5000:

- To provision the PTP Multicast client timeout value:

```
set ptp multicast client-timeout {ioc1-1 | ioc1-2 |
exp[0-9]} <timeout-value>
```

- To provision the PTP Multicast announce timeout value:

```
set ptp multicast announce-timeout {ioc1-1 | ioc1-2 |
exp[0-9] port<1-16>} <timeout-value>
```

where

y= 1|2, the port number

- To provision the PTP Multicast VLAN ID:

```
set ptp multicast vlanid {ioc1-1 | ioc1-2} <vlanid-value>
```

Note: The VLAN must be configured with the set vlan command.

- To provision the interval between announce messages for PTP Multicast:

```
set ptp multicast announce-int {ioc1-1 | ioc1-2 | exp[0-9]
port<1-16>} <announce-int-value>
```

  – The interval is 2^z seconds, where z= <announce-int-value>.

- To provision the interval between synchronization messages for PTP Multicast:

```
set ptp multicast sync-int {ioc1-1 | ioc1-2 | exp[0-9]
port<1-16>} <sync-int-value>
```

  – The interval is 2^z seconds, where z= <sync-int-value>.

- To provision the interval between delay response messages for PTP Multicast:

```
set ptp multicast delay-int {ioc1-1 | ioc1-2 | exp[0-9]
port<1-16>} <delay-int-value>
```

  – The interval is 2^z seconds, where z= <sync-int-value>.

Unicast Specific Attributes – Non-Fixed:

- To provision the PTP unicast dynamic negotiation state:

```
set ptp unicast dynamic negotiate {ioc1-1 | ioc1-2}
{enable|disable}
```

where

y= 1|2, the port number

- To set the PTP unicast dynamic maximum lease duration value:

```
set ptp unicast dynamic lease-duration {ioc1-1 | ioc1-2}
<lease-duration value>
```

Unicast Specific Attributes - Static:

- To provision the state for the specified IOC module and port in PTP Unicast static mode:

```
set ptp unicast static state {ioc1-1 | ioc1-2} index [1 - 10]
[enable|disable]
```

where

index = client number.

- To set the PTP Unicast static IP address:

```
set ptp unicast static address {ioc1-1 | ioc1-2}
{add|remove} index [1 - 10] address <IP-address>
```

- To provision the PTP Unicast static clock ID:

```
set ptp unicast static clockid {ioc1-1 | ioc1-2} index [1 -
10] <clock-id>
```

where the Clock ID is in the form xx:xx:xx:xx:xx:xx:xx:xx

- To set the PTP Unicast static VLAN ID:

```
set ptp unicast static vlanid {ioc1-1 | ioc1-2} index [1 -
10] <VLAN-ID>
```

Note: The VLAN must be configured with the set vlan command.

- To set the interval between synchronization messages for PTP Unicast static:

```
set ptp unicast static sync-int {ioc1-1 | ioc1-2}
index [1 - 10] <sync-int-value>
```

  – The interval is 2^z seconds, where z= <sync-int-value>.

- To set the interval between announce messages for PTP Unicast static:

```
set ptp unicast static announce-int {ioc1-1 | ioc1-2}
index [1 - 10] <announce-int-value>
```

– The interval is 2^z seconds, where z= <announce-int-value>.

- To provision the interval between delay response messages for PTP Unicast static:

```
set ptp unicast static delay-int {ioc1-1 | ioc1-2}
index [1 - 10] <delay-int-value>
```

– The interval is 2^z seconds, where z= <delay-limit-value>.

Expansion Shelf Attributes (Multicast):

- To provision the state of the PTP outputs for the PTP/Synce expansion shelf:

```
set ptp state exp[0-9] [port[1-16] | all] [enable | disable]
```

- To provision the PTP timescale for the PTP/Synce expansion shelf:

```
set ptp timescale exp[0-9] [auto | arb | ptp]
```

- To provision the PTP clock to two-step or one-step mode for the PTP/Synce expansion shelf:

```
set ptp two-step exp[0-9] [enable | disable]
```

- To provision the PTP alternate-master for the PTP/Synce expansion shelf:

```
set ptp alternate-master exp[0-9] [enable | disable]
```

- To provision the Priority 1 value for the PTP/Synce expansion shelf:

```
set ptp priority1 exp[0-9] <priority1-value>
```

- To provision the Priority 2 value for the PTP/Synce expansion shelf:

```
set ptp priority2 exp[0-9] <priority2-value>
```

- To provision domain for the PTP/Synce expansion shelf:

```
set ptp domain exp[0-9] <domain-value>
```

- To provision the dither for the for the PTP/Synce expansion shelf:

```
set ptp dither exp[0-9] [enable | disable]
```

- To provision the clock ID for the PTP/Synce expansion shelf:

```
set ptp clockid exp[0-9] <clockid-value>
```

Note: : If the Alternate Master mode is set to Enable, the alternate master flag will be set in the PTP messages. If the alternate master flag is set, the TP5000 will not run the Best Master Clock (BMC) algorithm and will stay in master mode.

Note: See Factory Defaults, on page 472 in Appendix B for defaults values and ranges for PTP parameters.

Example 1 – Common Attributes:

To set the PTP profile for port 1 of IOC1 to hybrid:

```
tp5000> set ptp profile ioc1-1 hybrid
```

Example 2 – Common Attributes:

To set the PTP profile for port 2 of IOC1 to Telecom-2008 (unicast):

```
tp5000> set ptp profile ioc1-1 telecom-2008
```

Note: Management addressing mode controls whether PTP management messages use Multicast or Unicast. This is independent of the `set ptp profile` command. For example, management addressing can be set for Multicast while PTP synchronization is using the Telecom-2008 (Unicast). For multicast management, the client must be in the TP5000's client list.

Example 3 – Common Attributes:

To set the maximum number of clients to “100” for port 1 of IOC1:

```
tp5000> set ptp max-client ioc1-1 100
```

Example 4 – Common Attributes:

To set the timescale for IOC1 to PTP:

```
tp5000> set ptp timescale ioc1 ptp
```

Example 5 – Common Attributes:

To Enable the alternate master mode for IOC1:

```
tp5000> set ptp alternative-master ioc1 enable
```

Note: If the Alternate Master mode is set to Enable, the alternate master flag will be set in the PTP messages.

Example 6 – Common Attributes:

To Enable port 1 of IOC1 for PTP:

```
tp5000> set ptp state ioc1-1 enable
```

Example 7 – Common Attributes:

To set the IP Header Time to Live (TTL) for IOC1 to a value of 6:

```
tp5000> set ptp ttl ioc1-1 6
```

Example 8 – Common Attributes:

To set the maximum number of clients to “100” for port 1 of IOC1:

```
tp5000> set ptp max-client ioc1-1 100
```

Example 9 – Common Attributes:

To set the PTP announce limit to no less than 0.5 seconds (2^{-1}) for port 1:

```
tp5000> set ptp announce-limit ioc1-1 -1
```

Example 10 – Common Attributes:

To set the PTP sync limit to no less than 0.125 seconds (2^{-3}) for port 2:

```
tp5000> set ptp sync-limit ioc1-2 -3
```

Example 11 – Common Attributes:

To set the PTP delay limit to no less than 0.250 seconds (2^{-2}) for port 1:

```
tp5000> set ptp delay-limit ioc1-1 -2
```

Example 12 – Common Attributes:

To provision PTP priority-1 for port 1 to a value of 160:

```
tp5000> set ptp priority-1 ioc1-1 160
```

Example 13 – Common Attributes:

To provision PTP priority-2 for port 2 to a value of 192:

```
tp5000> set ptp priority-2 ioc1-2 192
```

Example 14 – Common Attributes:

To set the PTP domain for port 1 to a value of 12:

```
tp5000> set ptp domain ioc1-1 12
```

Example 15 – Common Attributes:

To set the PTP Diffserv Code Point value for port 2 to a value of 21:

```
tp5000> set ptp dscp ioc1-2 21
```

Example 16** – **Common Attributes:

To Enable the PTP Diffserv Code Point for port 1:

```
tp5000> set ptp dscp-state ioc1-1 enable
```

Example 17** – **Common Attributes:

To Enable dither for port 1:

```
tp5000> set ptp dither ioc1-1 enable
```

Example 18** – **Common Attributes:

To set the PTP master Clock ID for Port 1 to a value of AA:BB:11:22:33:44:55:66

```
tp5000> set ptp clockid ioc1-1 aa:bb:11:22:33:44:55:66
```

Example 19** – **Multicast Attributes:

To set the PTP Multicast client timeout to 900 seconds for Port 1:

```
set ptp multicast client-timeout ioc1-1 900
```

Example 20** – **Multicast Attributes:

To provision the PTP Multicast announce timeout to 5 for Port 1:

```
set ptp multicast announce-timeout ioc1-1 5
```

Example 21** – **Multicast Attributes:

To provision the PTP Multicast VLAN ID to 12 for Port 1:

```
set ptp multicast vlanid ioc1-1 12
```

Example 22** – **Multicast Attributes:

To provision the interval between announce messages to -6 (0.015625 seconds) for PTP Multicast on Port 2:

```
set ptp multicast announce-int ioc1-2 -6
```

Example 23** – **Multicast Attributes:

To provision the interval between synchronization messages to -5 (0.03125 seconds) for PTP Multicast on Port 2:

```
set ptp multicast sync-int ioc1-2 -5
```

Example 24 – Multicast Attributes:

To provision the interval between delay response messages to -4 (0.0625 seconds) for PTP Multicast on Port 2:

```
set ptp multicast delay-int ioc1-2 -4
```

Example 25 – Unicast - Dynamic:

To Enable PTP Unicast dynamic negotiation for port 1:

```
tp5000> set ptp unicast dynamic negotiate ioc1-1 enable
```

Example 26 – Unicast - Dynamic:

To set the PTP Unicast dynamic maximum lease duration value to 500 seconds:

```
tp5000> set ptp unicast dynamic lease-duration ioc1-1 500
```

Example 27 – Unicast - Static:

Use the following procedure to configure IOC1, Port 1 for 2 Unicast Static clients:

Client 1: `10.11.11.101,` VLAN ID=10, index=1, Clock ID: 0A:11:22:33:44:55:66:77,
Synchronization interval rate = 16 per second (`sync-int` value = -4) ,
Announce interval rate = 1 per second (`announce-int` value = 0),
Delay interval rate = 8 per second (`delay-int` value = -3)

Client 2: `10.21.21.101,` VLAN ID=20, index=2, Clock ID: 0A:22:33:44:55:66:77:88
Synchronization interval rate = 32 per second (`sync-int` value = -5) ,
Announce interval rate = 1 per second (`announce-int` value = 0),
Delay interval rate = 16 per second (`delay-int` value = -4)

Note: Each VLAN must be configured on a separate subnet. See Provisioning VLAN and the set vlan command for details.

```
tp5000> set ptp profile ioc1-1 telecom-2008

tp5000> set ptp unicast static address ioc1-1 add index 1
        10.11.11.101

tp5000> set ptp unicast static vlanid ioc1-1 index 1 vlanid 10

tp5000> set ptp unicast static clockid ioc1-1 index 1
        0A:11:22:33:44:55:66:77

tp5000> set ptp unicast static sync-int ioc1-1 index 1 -4
```

```
tp5000> set ptp unicast static announce-int ioc1-1 index 1 0

tp5000> set ptp unicast static delay-int ioc1-1 index 1 -3

tp5000> set ptp unicast static state ioc1-1 index 1 enable

tp5000> set ptp unicast static address ioc1-1 add index 2
        10.21.21.101

tp5000> set ptp unicast static vlanid ioc1-1 index 2 vlanid 20

tp5000> set ptp unicast static clockid ioc1-1 add index 2
        0A:22:33:44:55:66:77:88

tp5000> set ptp unicast static sync-int ioc1-1 index 2 -5

tp5000> set ptp unicast static announce-int ioc1-1 index 2 0
```

Level : Config and Admin only

show ptp client

Use this command to display the PTP client attributes:

Note: The TP5000 uses a proprietary technique to create a list of clients in the multicast mode. A maximum of 500 clients can be added to the list.

In multicast mode, the TP5000 creates a client list by examining the received PTP delay request messages. In order for a client to be reliably added to the client list and not removed, the TP5000 needs to receive several hundred delay request messages during the client timeout period. If delay requests are sent at a slow rate, then the client-timeout value must be increased. Since one-way PTP operation does not use delay request and delay response messages, the client list will not be populated in this mode.

Command Syntax:

- To display the attributes for the specified PTP client for the specified PTP port :

```
show ptp client ioc-[y] address <ip-address>
```

- To display the attributes for all PTP clients for the specified PTP port :

```
show ptp client { ioc-1 | ioc-2 | exp[0-9] port <1-16>} all
```

Example 1:

To show the PTP client attributes for the client on port 1 of the active IOC module at IP address 192.168.5.132:

```
tp5000> show ptp client ioc-1 address 192.168.5.33
```

Response 1:

```
IP Address        VLAN  PRI Clock Id                 Mode Ann  Sync Delay
192.168.5.33      0     0   00:B0:AE:FF:FE:01:1A:85  D    0    0    -6
```

Example 2:

To show the PTP client attributes for all clients on port 1 of the active IOC module:

```
tp5000> show ptp client ioc-1 all
```

Response 2:

```
IP Address        VLAN  PRI Clock Id                 Mode Ann  Sync Delay
```

```
192.168.5.13     0     0   00:B0:AE:FF:FE:01:1A:85  D    0    0    -6
192.168.5.23     0     0   00:B0:AE:FF:FE:01:1B:85  D    0    0    -6
192.168.5.33     0     0   00:B0:AE:FF:FE:01:1C:85  D    0    0    -6
```

Example 3:

To show the PTP client attributes for all clients on port 10 of the expansion shelf ID=9, and the PTP is in L2 mode:

```
tp5000> show ptp client exp9 port 10 all
```

Response 3:

```
IP Address VLAN PRI        Clock Id           Mode Ann Sync Delay
0.0.0.0     0    0 00:B0:AE:FF:FE:01:1A:85 D   0    0    -6
0.0.0.0     0    0 00:B0:AE:FF:FE:01:1B:85 D   0    0    -6
0.0.0.0     0    0 00:B0:AE:FF:FE:01:1C:85 D   0    0    -6
```

Note: Only Ethernet L2 is supported in expansion shelves until future release, and the IP address field is filled as 0.0.0.0

Level : Config and Admin only

set ptp client-disconnect

Use this command to disconnect a PTP client using its clock ID,

Command Syntax:

```
set ptp client-disconnect ioc-[x] <client-clock-ID-value>
```

Example:

To disconnect the PTP client on IOC1-1 with clock ID value of 0A:11:22:33:44:55:66:77:

```
tp5000> set ptp client-disconnect ioc-1
0A:11:22:33:44:55:66:77
```

Level : Config and Admin

show ptp-config

Use these commands to display the PTP port's common provisioned attributes, multicast-specific attributes, and unicast-specific attributes.

Common Provisioned Attributes:

PTP Address Mode, Management Address Mode, TTL, Alternate Master, Clock ID, PTP state, two-step, priority1, priority2, domain, DiffServ code point, maximum number of clients, sync limit, announce limit, delay limit, unicast negotiation, unicast lease interval, dither

Multicast Specific Attributes:

Announce Message Timeout, Client Timeout, VLAN ID, Sync Message Interval, Announce Message Interval, Delay Message Interval

Unicast-Static Specific Attributes:

Unicast IP addresses, VLAN ID, Sync Message Interval, Announce Message Interval, Delay Interval, Clock ID

Command Syntax:

- To display the specified PTP port's common provisioned attributes:

```
show ptp config common { ioc1-1 | ioc1-2 | exp[0-9] port
<1-16>}
```

- To display the specified PTP port's multicast provisioned attributes:

```
show ptp config multicast { ioc1-1 | ioc1-2 | exp[0-9] port
<1-16>}
```

- To display the specified PTP port's unicast-static provisioned attributes:

```
show ptp config unicast {ioc1-1 | ioc1-2} index [1-10]
```

where

index= client number

Example 1:

To show the PTP Common mode configuration for Port 1 on the active IOC –

```
tp5000> show ptp config common ioc1-1
```

Response 1:

```
PTP Timescale                  AUTO
PTP State                      enabled
PTP Max Number Clients         500
PTP Profile                    itu-8265-1
PTP ClockId                    00:B0:AE:FF:FE:01:32:70
PTP Priority 1                 128
PTP Priority 2                 128
PTP Domain                     0
PTP DSCP                       0
PTP DSCP State                 disabled
PTP Sync Limit                 -7
PTP Announce Limit             -3
PTP Delay Limit                -7
PTP Unicast Negotiation        enabled
PTP Unicast Lease Duration     1000
PTP Dither                     disabled
PTP Two Step                   enabled
PTP TTL                        16
PTP Mgmt Addressing Mode       multicast
PTP Alternate Master           disabled
```

Example 2:

To show the PTP Multicast mode configuration for Port 1 on the active IOC –

```
tp5000> show ptp config multicast ioc1-1
```

Response 2:

```
PTP Multicast VlanId           35
PTP Multicast Sync Intv        0
PTP Multicast Announce Intv    0
PTP Multicast Delay Intv       -6
PTP Multicast Announce Timeout 3
PTP Multicast Client Timeout   1000
```

Example 3:

To show the PTP Unicast-static mode configuration for client 3 of Port 1 on active IOC –

```
tp5000> show ptp config unicast ioc1-1
```

Response 3:

```
-----------------------------------------------------------------------
|Index|State   |Address        |VlanId|ClockId                 |Sync|Ann |Delay|
|.....|........|...............|......|........................|....|....|.....|
|1    |disabled|0.0.0.0        |5     |FF:FF:FF:FF:FF:FF:FF:FF |0   |1   |-3   |
|.....|........|...............|......|........................|....|....|.....|
|2    |disabled|0.0.0.0        |0     |FF:FF:FF:FF:FF:FF:FF:FF |0   |1   |-3   |
|.....|........|...............|......|........................|....|....|.....|
|3    |disabled|0.0.0.0        |0     |FF:FF:FF:FF:FF:FF:FF:FF |0   |1   |-3   |
|.....|........|...............|......|........................|....|....|.....|
```

```
|4    |disabled|0.0.0.0        |0     |FF:FF:FF:FF:FF:FF:FF:FF |0   |1   |-3   |
|.....|........|...............|......|........................|....|....|.....|
|5    |disabled|0.0.0.0        |0     |FF:FF:FF:FF:FF:FF:FF:FF |0   |1   |-3   |
|.....|........|...............|......|........................|....|....|.....|
|6    |disabled|0.0.0.0        |0     |FF:FF:FF:FF:FF:FF:FF:FF |0   |1   |-3   |
|.....|........|...............|......|........................|....|....|.....|
|7    |disabled|0.0.0.0        |0     |FF:FF:FF:FF:FF:FF:FF:FF |0   |1   |-3   |
|.....|........|...............|......|........................|....|....|.....|
|8    |disabled|0.0.0.0        |0     |FF:FF:FF:FF:FF:FF:FF:FF |0   |1   |-3   |
|.....|........|...............|......|........................|....|....|.....|
|9    |disabled|0.0.0.0        |0     |FF:FF:FF:FF:FF:FF:FF:FF |0   |1   |-3   |
|.....|........|...............|......|........................|....|....|.....|
|10   |disabled|0.0.0.0        |0     |FF:FF:FF:FF:FF:FF:FF:FF |0   |1   |-3   |
|.....|........|...............|......|........................|....|....|.....|
```

Example 4:

To show the PTP Common mode configuration for Port 1 on the expansion shelf 7 (exp6) –

```
tp5000> show ptp config common exp6 port 1
```

Response 4:

```
PTP Timescale            AUTO
PTP State                enabled
PTP Addressing Mode      multicast
PTP ClockId              00:B0:AE:FF:FE:01:32:70
PTP Priority 1           128
PTP Priority 2           128
PTP Domain               0
PTP Dither               disabled
PTP Two Step             enabled
PTP Alternate Master     disabled
```

Example 5:

To show the PTP Multicast mode configuration for Port 1 on the expansion shelf 7 (exp6) –

```
tp5000> show ptp config multicast exp6 port 1
```

Response 5:

```
PTP Multicast Sync Int 0
PTP Multicast Announce Int 0
PTP Multicast Delay Intv -6
PTP Multicast Announce Timeout 3
PTP Multicast Client Timeout 1000
```

Level : Config and Admin only

show ptp-node

This command sends a request for the Acceptable Master list, clock description, or client status to the TP500 found at the <client_ip> address.

This command can also send a NULL_MANAGEMENT message to the TP500 found at the <client_ip> address. If the targeted TP500 is successfully reached, the command response will indicate that the TP500 has acknowledged the message. This command performs a function similar to ping.

> **Note:** Per IEEE-1588-2008, the management TLV data field is of zero length. No action affecting data sets or state shall result from receiving this TLV. The receipt of a NULL_MANAGEMENT message shall adhere to the requirements of the actionField; see 15.4.1.6 in IEEE-1588-2008.
>
> NULL_MANAGEMENT messages are typically used to test implementations by exercising the management handlers without producing any change in protocol operation. For example, such a message can be sent to test whether received management messages are being recorded in an implementation-specific event log.

The acceptable master list, clock description, and null-management commands can also be used with other PTP clients that support PTP management messages.

Command Syntax:

- To display the IP and VLAN address for the Acceptable Master for the specified PTP port and client:

```
show ptp-node acc-master ioc-[y] address <client_ip>
[vlan-id <vlan>]
```

- To display the clock description for the specified PTP port and client:

```
show ptp-node clock-description ioc-[y] address <client_ip>
[vlan-id <vlan>]
```

- To display the null management for the specified PTP port and client:

```
show ptp-node null-mgmt ioc-[y] address <client_ip> [vlan-id
<vlan>]
```

- To display the status of the specified client connected to the specified port:

```
show ptp-node status ioc-[y] address <client_ip> [vlan-id
<vlan>]
```

where

y= 1|2, the port number on the IOC

`vlan-id` = the VLAN on the Grandmaster Ethernet port connecting to the client .

Examples 1:

To display Acceptable Master info for the Port 1 client at IP address 192.168.106.99, VLAN ID 4094 –

```
tp5000> show ptp-node acc-master ioc-1 address
         192.168.106.99 vlan-id 4094
```

Response 1:

```
Acceptable table from:

ptp client ip address                     : 192.168.106.99
ptp client vlan id                        : 4094
ptp client clock id                       : 00:b0:ae:ff:ff:01:22:99



The detailed acceptable master table:

Master1 protocol type                     : IPv4
Master1 ip address                        : 192.168.106.14
Master1 priority1                         : 0
Master2 protocol type                     : IPv4
Master2 ip address                        : 192.168.2.11
Master2 priority1                         : 0
```

Examples 2:

To display the clock description info for the Port 1 client at IP address 192.168.106.99, VLAN ID 4094 –

```
tp5000> show ptp-node clock-description ioc-1 address
         192.168.106.99 vlan-id 4094
```

Response 2:

```
Clock description report from:

ptp client ip address                     : 192.168.106.99
ptp client vlan id                        : 4094
ptp client clock id                       : 00:b0:ae:ff:ff:01:22:99



The detailed clock description:

Clock type                                : Ordinary clock
Physical layer protocol                   : IEEE 802.3
Physical address                          : 00:b0:ae:01:22:99
Protocol address                          : 192.168.106.99
Manufacture identifier                    : ac:de:48
```

```
Product description                         :
                              SYMMETRICOM;TP500;090-03863-01##
Revision data                               : I0:2.0.2,I1:1.0.28
User description                            :
Profile identity                            : 00:1b:19:01:00:00
```

Examples 3:

To display the null management info for the Port 1 client at IP address 192.168.106.99, VLAN ID 4094 –

```
tp5000> show ptp-node null-mgmt ioc-1 address
          192.168.106.99 vlan-id 4094
```

Response 3:

```
Null ACK message from:

ptp client ip address                       : 192.168.106.99
ptp client vlan id                          : 4094
ptp client clock id                         : 00:b0:ae:ff:ff:01:22:99
```

Examples 4:

To display the status info for the Port 1 client at IP address 192.168.106.99, VLAN ID 4094 –

```
tp5000> show ptp-node status ioc-1 address
          192.168.106.99 vlan-id 4094
```

Response 4:

```
Status report from:

ptp client ip address                              : 192.168.106.99
ptp client vlan id                                 : 4094
ptp client clock id                                : 00:b0:ae:ff:ff:01:22:99



The detailed status:

Current time is                                :  23:34:52 09/21/2009
Current FLL State                              :  Fast FLL
FLL State Duration (minutes)                   :  65
Forward Flow Weight (%)                        :  19.99
Forward Flow Transient-free (out of 900 s)     :  899
Forward Flow Transient-free (out of 3600 s)    :  3578
Forward Flow Transactions Used (%)             :  99.99
Forward Flow Operational Min TDEV (ns)         :  112.84
Forward Flow Min Cluster Width (ns)            :  100.00
Forward Flow Mode Width (ns)                   :  100.00
Reverse Flow Weight (%)                        :  80.00
Reverse Flow Transient-free (out of 900 s)     :  899
Reverse Flow Transient-free (out of 3600 s)    :  3578
Reverse Flow Transactions Used (%)             :  99.99
```

```
Reverse Flow Operational Min TDEV (ns)       :  114.16
Reverse Flow Min Cluster Width (ns)          :  100.00
Reverse Flow Mode Width (ns)                 :  2148.00
Correction Frequency (ppb)                   :  11.86
Phase correction (ppb)                       :  0.00
Output TDEV Estimate (ns)                    :  0.00
Residual phase error (ns)                    :  0.00
Minimal RTD (us)                             :  2.14
Operational Temperature Max (deg C)          :  46.06
Operational Temperature Min (deg C)          :  45.93
Operational Temperature Min (deg C)          :  45.93
5  Minute Temperature Stability (mdeg C)     :  216.75
60 Minute Temperature Stability (mdeg C)     :  481.95
Timing Packet Rate GM1 (pkts/s)              :  64
Timing Packet Rate GM2 (pkts/s)              :  0
Timing Packet Rate Delay (pkts/s)            :  64
Observation Interval (min)                   :  1
IPDV Threshold (usec)                        :  50.000
Pacing Factor for Jitter Computation         :  16
Forward IPDV % Below Threshold               :  100.0
Forward Maximum IPDV (usec)                  :  0.103
Forward InterPkt Jitter (usec)               :  0.027
Reverse IPDV % Below Threshold               :  100.0
Reverse Maximum IPDV (usec)                  :  0.111
Reverse InterPkt Jitter (usec)               :  0.028
Reference                                    :  192.168.106.14
GM1 Flow State                               :  Normal
GM2 Flow State    :  Waiting for GM to respond to signaling
GM1 Clock id      :  00:b0:ae:ff:fe:01:90:68
GM2 Clock id      :  00:00:00:00:00:00:00:00
Last Firmware Upgrade status:  No upgrade since powered
```

Level : Config and Admin only

set ptp-node

This command allows the user to provide a new Acceptable Master list to the TP500 client found at a specified IP address. If the targeted TP500 is reached, and certain conditions are met, the TP500 client will accept the new acceptable-master list.

The acceptable master list command can also be sent to other clients that support PTP management messages.

This command allows the user to upgrade the firmware on a targeted TP500 client.

This command can also be used to reboot the targeted TP500 client.

Command Syntax:

- To set a new Acceptable Master list for the specified PTP port and client (master 2 is optional):

```
set ptp-node acc-master ioc-[y] address <client_ip> [vlan-id
<vlan>] master1ip <gm-ip> priority <priority-value>
[master2ip <gm-ip> priority <priority-value>]
```

- To upgrade the firmware for the specified client on the specified PTP port:

```
set ptp-node upgrade ioc-[y] address <client_ip> [vlan-id
<vlan>] <filepath> FTP:<server_ip> <user_name>
```

Where

y= 1|2, the port number on the IOC

<file_path> = path (including filename) to the upgrade file that is to be used once logged onto server

<server_ip> = address of the server where the upgrade file should be found.

<user name>= user name to use for logging onto the server.

This command prompts for the password. The VLAN-ID is optional, needed only if this TP5K is on a VLAN subnet.

- To reboot the specified client on the specified PTP port:

```
set ptp-node reboot ioc-[y] address <client_ip> [vlan-id
<vlan>]
```

Examples 1:

To set the Acceptable Master info for the Port 1 client at IP address 192.168.5.177, VLAN ID 15, Master1 IP address 192.168.5.15 and priority value of 0, with no Master2 –

```
tp5000> set ptp-node acc-master ioc-1 address 192.168.5.177
vlan-id 15 master1ip 192.168.5.15 priority 0
```

Note: A priority value of 0 causes the PTP client to use the priority value sent from the grandmaster, rather than overriding the value.

Examples 2:

To set the Acceptable Master info for the Port 1 client at IP address 192.168.5.177, no VLAN, Master1 IP address 192.168.5.15 priority 0, Master2 IP address 192.168.5.20 and priority value of 0 –

```
tp5000> set ptp-node acc-master ioc-1 address 192.168.5.177
vlan-id 15 master1ip 192.168.5.15 priority 0 master2ip
192.168.5.20 priority 0
```

Examples 3:

For a client on port 1, client IP address of 192.168.5.64, an FTP server with IP address 192.168.5.100, a user name of “user1”, and an upgrade file path of “upgradefiles\ver2.bin” –

```
tp5000> set ptp-node upgrade ioc-1 address 192.168.5.64
upgradefiles\ver2.bin ftp:192.168.5.100 user1
```

Response 3:

```
Password:
```

Examples 4:

To reboot the port 1 client at IP address 192.168.5.64, no VLAN –

```
tp5000> set ptp-node reboot ioc-1 address 192.168.5.64
```

Level : Config and Admin only

show ptp-probe

This command is used to begin PTP packet measurements. This command can also be used to display the Probe configuration, which includes Grandmaster Clock ID, IP address and VLAN (if applicable), interval rate, and lease duration.

Note: The Probe option must be purchased to enable the functionality of all “ptp-probe” commands.

Command Syntax:

- To display the probe configuration data:

```
show ptp-probe config ioc1-[y]
```

- To begin gathering data with the probe:

```
show ptp-probe data ioc1-[y]
```

where

y= 1|2, the port number on IOC1

To stop gathering data with the probe, press the **Enter** key.

Example 1:

To display the configuration data of the Probe on port 2–

```
tp5000> show ptp-probe config ioc1-2
```

Example 2:

To display the test data from port 1 of the Probe –

```
tp5000> show ptp-probe data ioc-1
```

Response :

```
F,00011,1229541029,099868364,1229541029,099881920,0000000000,
B,00011,1229541029,562553320,1229541029,562539700,0000000000,
F,00012,1229541030,099868364,1229541030,099881776,0000000000,
B,00012,1229541030,562553320,1229541030,562539700,0000000000,
F,00013,1229541031,099868364,1229541031,099881936,0000000000,
B,00013,1229541031,562553288,1229541031,562539700,0000000000,
F,00014,1229541032,099868364,1229541032,099881776,0000000000,
B,00014,1229541032,562553288,1229541032,562539700,0000000000,
```

Level : User, Config and Admin

set ptp-probe

Use this command with a TP 5000 that is configured in Probe mode to specify the Grandmaster IP address and Clock ID. This command is used to set the PTP profile, interval rate for Sync and Delay Requests and the lease duration for the specified Probe IOC card and port. This command is also used to restart the specified Probe IOC card and port.

The PTP probe mode supports three profiles:

- Default: Multicast – Layer 3 of 7-layer model
- Ethernet-Default: Multicast – Layer 2 of 7-layer model
- Telecom-2008: Unicast.

Note: The PTP probe option must be purchased to enable the functionality of all “ptp-probe” commands.

Note: PTP probe is not supported through SNMP..

Command Syntax:

- To set the IP address and Clock ID for the Grandmaster being tested by the Probe:

```
set ptp-probe ioc1-[y] active-probe gm-clock-id <clock-id>
gm-ip <addr> [vlan-id <vlan>]
```

where

y = 1|2, the port number on the IOC
<clock-id> is in the form “xx:xx:xx:xx:xx:xx:xx:xx”

- To set the PTP profile for the Probe:

```
set ptp-probe ioc1-[y] active-probe profile {default |
telecom-2008 | Ethernet-default}
```

where

y = 1|2, the port number on the IOC
<clock-id> is in the form “xx:xx:xx:xx:xx:xx:xx:xx”

- To set the interval rate for Sync and Delay Requests from the Probe:

```
set ptp-probe ioc1-y active-probe interval <int-value>
```

The interval is 2^z seconds, where z is <int-value>.

- To set the maximum lease duration for the Probe:

```
set ptp-probe ioc1-[y] active-probe duration <dur-value>
```

Example 1:

For a Grandmaster Clock ID of 00:B0:AE:FF:FE:00:00:06, Grandmaster IP address of 192.168.1.11, and probe VLAN ID of 35:

```
tp5000>set ptp-probe ioc1-1 active-probe gm-clock-id
00:B0:AE:FF:FE:00:00:06 gm-ip 192.168.1.11 vlan-id 35
```

For a Grandmaster Clock ID of 00:B0:AE:FF:FE:00:00:06, GrandmasterIP address of 192.168.1.11, and no VLAN:

```
tp5000> set ptp-probe ioc1-1 active-probe gm-clock-id
00:B0:AE:FF:FE:00:00:06 gm-ip 192.168.1.11 <enter>
```

Example 2:

For an interval of 0.25 seconds (-2) on Port 1 of IOC1:

```
tp5000> set ptp-probe ioc1-1 active-probe interval -2
```

Example 3:

For a duration of 500 seconds on Port 1 of IOC1:

```
tp5000> set ptp-probe ioc1-1 active-probe duration 500
```

Level : Config and Admin only

show ptp status

Use these commands to display the PTP GrandMaster status for the selected port.

Command Syntax:

```
show ptp status { ioc-1 | ioc-2 | exp[0-9] port <1-16>}
```

Example 1:

```
tp5000> show ptp status ioc-1
```

Response 1:

```
Grandmaster status information:

Port enabled   :     yes
Clock Id       :     00:B0:AE:FF:FE:01:CC:44, 1
Profile        :     default
Port state     :     master
Clock class    :     7
Clock accuracy :     within 10us
Timescale      :     PTP
Num clients    :     0
Client load    :     0%
```

Example 2:

To show the PTP status of the PTP port in expansion shelf 9 (id=exp8), port 15

```
tp5000> show ptp status exp8 port 15
```

Response 2:

```
Grandmaster status information:

Port enabled : yes
Clock Id : 00:B0:AE:FF:FE:01:32:70, 15
Profile : ethernet-default
Port state : master [passive | listening |disabled]
Clock class : locked to reference
Clock accuracy : within 100ns
Timescale : ptp
Num clients : 1
Client load : 0%
```

Level : User, Config, and Admin

reboot

This command restarts one or more of the modules. Using this command can cause a loss of outputs.

Command Syntax:

```
reboot {system|imc|ioc1|ioc2|exp[0-9]}
```

Remarks: Selecting `system` restarts all system modules and expansion shelves. Selecting `system`, or the only IOC, or an expansion shelf disrupts the system outputs.

Example 1:

```
tp5000> reboot imc
```

Response 1:

```
The system is going down NOW!
Sending SIGTERM to all processes

Sending SIGKILL to all processes
Requesting system reboot
Restarting system.

U-Boot 1.1.6 (Oct 23 2008 - 13:17:59) MPC83XX

Symmetricom Time Provider 5000 (TP5000) IMC

Clock configuration:
   Coherent System Bus:  166 MHz
   Core:                 333 MHz
   Local Bus Controller: 166 MHz
   Local Bus:             41 MHz
   DDR:                  333 MHz
   SEC:                   55 MHz
   I2C1:                 166 MHz
   I2C2:                 166 MHz
   TSEC1:                166 MHz
   TSEC2:                166 MHz
   USB MPH:                0 MHz
   USB DR:                55 MHz

CPU: MPC8313E, Rev: 10 at 333.333 MHz
INFO: Initializing IOMEM for regset 0
DRAM:  256 MB
NAND:  256 MiB
Using default environment
........................................

Symmetricom  tp5000_imc
```

```
login:
```

Example 2:

To Reboot IOC1

```
tp5000> reboot ioc1
```

Response 2:

```
NO MESSAGE.
NO INDICATION.
LED ALARM GREEN BLINKING

tp5000>
```

Example 3:

For defective IOC or no IOC -

```
tp5000> reboot ioc2
```

Response 3:

```
Error
IOC is not present.

tp5000>
```

Example 4:

To reboot expansion shelf 1 (module id=exp0), which is PTP/SyncE -

```
tp5000> reboot exp0
```

Response 4:

```
<No response message>

tp5000>
```

Example 5:

To reboot expansion shelf 6 (module id=exp5), which is E1/1PPS+TOD -:

```
tp5000> reboot exp5
```

Response 5:

```
<No response message>

tp5000>
```

Level : Admin only

show redundancy

This command displays the IOC redundancy configuration: Port Bonding and IOC Module.

Command Syntax:

- To display the port redundancy configuration for the specified IOC module:

```
show redundancy port ioc1
```

- To display the redundancy port status:

```
show redundancy active-port
```

Example 1:

```
tp5000> show redundancy port ioc1
```

Response 1:

```
Port redundancy : enabled
```

Example 2:

```
tp5000> show redundancy active-port
```

Response 2:

```
IOC active port: eth1
```

Response 2a:

If redundancy is disabled, the response to this command is:

```
IOC active port  :  no active port, redundancy disabled
```

Level : User, Config, and Admin

set redundancy

Use this command to provision the redundancy configuration for the Ethernet ports on the IOC module.

Command Syntax:

```
set redundancy port ioc1 {enable|disable}
set redundancy active-port ioc-[y]
```

where

y= 1|2, the port number on the active IOC module

Example 1:

To enable port redundancy on IOC1 module –

```
tp5000> set redundancy port ioc1 enable
```

Note: When executing the command "set redundancy port ioc1", wait 30 seconds after the prompt returns before issuing the next command.

Example 2:

To set Port 1 as the active port in the redundancy configuration –

```
tp5000> set redundancy active-port ioc-1
```

Level : Config and Admin only

show ref

Use this command to display the system's reference mode and manual input reference.

Command Syntax:

```
show ref
```

Example:

```
tp5000> show ref
```

Response:

```
Reference Info



--------------------------------------------------------------------------------
| Reference |  Ref  | Priority |  PQL  | PQL Config | PQL Input |  Reference   |
|           | State |          | State |   Value    |   Value   |    Status    |
|-----------|-------|----------|-------|------------|-----------|-------------|
| GNSS      |enable | 1        |disable| 1          | 1         |disqualified |
|...........|.......|..........|.......|............|...........|.............|
| GPS       |enable | 2        |disable| 1          | 1         |selected     |
|...........|.......|..........|.......|............|...........|.............|
| PPS-TOD-1 |enable | 3        |disable| 1          | 1         |disqualified |
|...........|.......|..........|.......|............|...........|.............|
| PPS-TOD-2 |enable | 4        |disable| 1          | 1         |disqualified |
|...........|.......|..........|.......|............|...........|.............|
| Input-1   |enable | 7        |disable| 3          | 15        |disqualified |
|...........|.......|..........|.......|............|...........|.............|
| Input-2   |enable | 8        |disable| 3          | 15        |disqualified |
|...........|.......|..........|.......|............|...........|.............|


Reference Mode                  - time
Reference Criteria              - priority
```

Level : User, Config, and Admin

set ref

Use this command to provision the system's reference mode and reference selection criteria. It allows the user to select the reference mode as timing mode or frequency mode. In Timing Mode, timing reference will have higher priority than frequency reference. If all timing references are not available (disabled or disqualified), the frequency reference will be used to assist timing holdover. The Timing Reference includes GNSS (GPS/Beidou) inputs and TOD/1PPS inputs. In Frequency Mode, both timing reference and frequency reference can be used for frequency lockup. The system will not do phase lockup in frequency mode even if there is valid timing reference. The frequency references are the E1/T1 inputs.

When switching reference mode, the system selects the new reference based on REF CRITERIA. When Ref Criteria is set to PRIORITY, the system selects the reference based on the priority setting of the inputs. When Ref Criteria is set to SSM, the system selects the reference based on the SSM (received or provisioned) of the inputs.

Command Syntax:

- To set the criteria for how to switch references:

```
set ref criteria {priority | ssm}
```

Note: The reference criterion MANUAL is no longer supported. Only PRIORITY and SSM are supported for reference selection.

Manual selection of a reference input can be done by disabling all reference input ports except the desired one.

The “set ref override” command is no longer supported.

- To set the reference to timing mode or frequency mode:

```
set ref mode {time | frequency}
```

Note: Command “`set ref mode time`” has the same meaning as “`set tod-source GPS`” and “`set ref mode frequency`” has the same meaning as “`set tod-source sys`”. See set tod-source command.

Note: Commands to change the reference mode should not be repeatedly sent to the TP5000, especially before the reference has been qualified.

Example 1:

To set the reference mode to time –

```
tp5000> set ref mode time
```

Example 2:

To set the reference mode to frequency –

```
tp5000> set ref mode frequency
```

Example 3:

To set the reference to be selected based on the priority setting –

```
tp5000> set ref criteria priority
```

Level : Config and Admin only

show remote-syslog

This command displays the remote syslog server that log messages are sent to from the TimeProvider 5000.

Command Syntax:

```
show remote-syslog
```

Example:

```
tp5000> show remote-syslog
```

Response:

```
State                              - disable
Remote Address                     - 0.0.0.0
```

Level : User, Config, and Admin

set remote-syslog

This command is used to configure a remote syslog server to receive log messages from the TimeProvider 5000.

Command Syntax:

```
set remote-syslog {enable <host-addr>|disable}
}
```

Example:

To enable a remote syslog server at IP address 192.168.5.141 –

```
tp5000> set remote-syslog enable 192.168.5.141
```

Level : Config and Admin only

show snmp

Use these commands to display the SNMP Manager assigned to the agent, all assigned users (username only), and the SNMP trap version and SNMP trap user.

Command Syntax:

- To display the SNMP manager assignment:

  `show snmp manager`

- To display the SNMPv3 user configuration:

  `show snmp user`

- To display the SNMP TRAP user information (user names only):

  `show snmp trapuser`

- To display the SNMP v2-community information:

  `show snmp v2-community`

- To display the SNMP TRAP version information:

  `show snmp trapversion`

- To display the SNMP V2 state:

  `show snmp state-v2`

- To display the SNMP trap MIB has been selected:

  `show snmp trap-mib`

- To display which SNMP MIB version, 1.2 or 2.0, has been selected:

  `show snmp sys-obj-mib`

Example 1:

```
tp5000> show snmp manager
```

Response 1:

```
----------------------------------------------------------------------
|Index|Manager ID     |Manager Addr        |Engine ID                      |
|-----|---------------|--------------------|-------------------------------|
|1    |m192.168.5.187 |192.168.5.187       |0x63000000a1c0a805bb           |
|.....|...............|....................|...............................|
|2    |m192.168.5.144 |192.168.5.144       |0x0123456789010384             |
|.....|...............|....................|...............................|
|3    |m192.168.5.171 |192.168.5.171       |0x63000000a1c0a805bb           |
|-----------------------------------------------------------------------
```

```
Example 2:
```

```
tp5000> show snmp user
```

Response 2:

```
-------------------------------------------------------------------------
|Index|User Name           |User Type    |Auth. Key      |Priv. Key      |
|-----|--------------------|-------------|---------------|---------------|
|1    |test                |snmpnoauth   |**********     |**********     |
|.....|....................|.............|...............|...............|
|2    |harsha              |snmpshades   |**********     |**********     |
-------------------------------------------------------------------------
```

Example 3:

```
tp5000> show snmp trapuser
```

Response 3:

```
No SNMP trap user configured.
```

Example 4:

```
tp5000> show snmp v2-community
```

Response 4:

```
-----------------------------------------
|Index|Community Name      |Access Level|
|-----|--------------------|------------|
|1    |test                |readwrite   |
|.....|....................|............|
|2    |testteam            |readwrite   |
-----------------------------------------
```

Example 5:

```
tp5000> show snmp trapversion
```

Response 5:

```
Trap version                - v2c
```

Example 6:

```
tp5000> show snmp state-v2
```

Response 6:

```
SNMP v2 state                - enable
```

Example 7:

```
tp5000> show snmp trap-mib
```

Response 7:

```
SNMP Trap MIB Version   -   2.0
```

Example 8:

```
tp5000> show snmp sys-obj-mib
```

Response 8:

```
SNMP System MIB Object ID Version   -   2.0
```

Level : User, Config, and Admin

set snmp

Use this command to provision the SNMP v2 state, trap version, user assignment, manager assignment, and trapuser and v2 community assignments.

Role	Max Number
SNMP User	10
Trapuser	3
Manager	3
v2 Community	10

Command Syntax:

- To add an SNMP user or trapuser:

```
set snmp add {user | trapuser} <name> securelvl {noauth |
auth | priv}
```

- To add an SNMP v2-community:

```
set snmp add v2-community <name> secureLvl {read-only|
read-write}
```

- To add an SNMP manager:

```
set snmp add manager <ip-address> engineid <engine-id>
```

- To delete an SNMP user, trapuser, or v2-community:

```
set snmp delete {user | trapuser | v2-community} <name>
```

- To delete an SNMP manager:

```
set snmp delete manager <ip-address>
```

- To set the SNMP trap version to either v2c or v3:

```
set snmp trapversion {2|3}
```

- To provision the state of SNMP v2 communities:

  ```
  set snmp state-v2 {enable | disable}
  ```

- To set the SNMP sys-obj MIB version to either 1.2 or 2.0:

  ```
  set snmp sys-obj-mib {1.2 | 2.0}
  ```

- To set the SNMP trap MIB version to either 1.2 or 2.0:

  ```
  set snmp trap-mib {1.2 | 2.0}
  ```

Example 1:

To add SNMP user named “maynard”, with a security level of “`priv`”:

```
tp5000> set snmp add user maynard securelvl priv
```

Response 1:

For security level of `priv`, the TP5000 will prompt for:

```
Authentication protocol (MD5 or SHA):
Authentication key [Only chars {a-z,A-Z,0-9,! ( )- _ . ? ~ * @ ^ +
= : / %} are accepted] :
Privacy protocol (DES or AES):
Privacy key [Only chars {a-z,A-Z,0-9,! ( )- _ . ? ~ * @ ^ + = : / %}
are accepted]:
```

If the security level is `auth`, the TP5000 will prompt for:

```
authkey <authkey-value>

authtype {MD5 | SHA}
```

Example 2:

To add SNMP v2-community named “groupv2”, with a security level of read-write:

```
tp5000> set snmp add v2-community groupv2 securelvl
read-write
```

Example 3:

To add SNMP manager with the IP address 192.168.5.177 and engine ID of 0x12345678901234:

```
set snmp add manager 192.168.5.177 engineid 0x12345678901234
```

Example 4:

To delete SNMP trap user named “george3”:

```
set snmp delete trapuser george3
```

Example 5:

To delete SNMP manager at IP address 192.168.5.177:

```
tp5000> set snmp delete manager 192.168.5.177
```

Example 6:

To set the trap version to SNMP v3:

```
tp5000> set snmp trapversion 3
```

Example 7:

To enable SNMP v2 on the TP5000:

```
tp5000> set snmp state-v2 enable
```

Example 8:

To set the sys-obj MIB to version 2.0:

```
tp5000> set snmp sys-obj-mib 2.0
```

Example 9:

To set the trap MIB to version 2.0:

```
tp5000> set snmp trap-mib 2.0
```

Level : Admin only

show ssm-option

Use this command to display whether the E1 or T1 sync network option is selected, as defined in G.781, for the IOCs and expansion shelves.

Command Syntax:

```
show ssm-option
```

Example:

```
tp5000> show ssm-option
```

Response:

```
Module or Shelf         SSM Option
-------------------------------------
IOC                     ITU option I
EXP0                    ITU option I
EXP1                    ITU option I
EXP3                    ITU option I
```

set ssm-option

Use this command to select either E1 or T1 sync network options as defined in G.781:

Command Syntax:

```
set ssm-option {all | ioc1 | exp<0-9>} {option1 | option2}
```

Example:

To set the ssm-option for all to option1 –

```
tp5000> set ssm-option all option1
```

Note: The ssm-option only applies to syncE and the G.8265.1 profile of PTP.

show status

Use this command to display the following system status information:

- Assigned System Name
- Warm-up Status
  - Current Stage
  - Number of Stages
  - Time in Current Stage While in Warmup
- Uptime For The IMC
- System Date And Time
- Number Of Standing System Alarms
- Uptime for each IOC
- State of each IOC
- Currently Selected ToD Source
- Reference Input
- Servo Control Status For The Active IOC Module
- PTP Packet Service: GrandMaster, NTP Server, or PTP Probe
- Phase Offset Value (Valid in fast-lock and normal states, for GPS mode)

Command Syntax:

```
show status
```

Example 1:

To show status for the main shelf –

```
tp5000> show status
```

Response 1:

```
System name                :   TP5000
IMC time                   :   2010-03-08 20:33:30
IMC uptime                 :   7 days 2 hrs 18 mins
IOC1 warmup status         :   complete (total 1651 secs)
IOC1 state                 :   active
IOC1 uptime                :   7 days 2 hrs 18 mins
IOC2 warmup status         :   n/a
IOC2 state                 :   card not present
IOC2 uptime                :   card not present
Reference Mode             :   time
```

```
Current reference input    :   GPS
Clock status               :   normal track
Phase Offset               :   0 ns
Packet service eth1        :   ptp grandmaster
Packet service eth2        :   ptp grandmaster
Active alarms              :   1
Exp connections             :   1, 3, 6, 9
```

Example 2:

To display the status of PTP/SyncE expansion shelf 8 (id=exp7) –

```
tp5000> show status exp7
```

Response 2:

```
Expansion shelf: PTP-SyncE
Shelf time: 2010-03-08 20:33:30
Shelf uptime: 7 days 2 hrs 18 mins
Main Clock status: normal track
Shelf clock status: normal track
Combined Clock status: normal track
Phase Offset: 0 ns
Packet Service: ptp grandmaster
SyncE output PQL: 2
```

Note: the value of "SyncE output PQL" is the PQL level defined in PQL-SSM table. See response of command "SHOW PQL-SSM" for the descriptions of the PQL level.

Example 3:

To display the status of E1/1PPS+TOD expansion shelf 3 (id=exp2) –

```
tp5000> show status exp2
```

Response 3:

```
Expansion shelf: E1-TOD
shelf time : 2010-03-08 20:33:30
shelf uptime : 7 days 2 hrs 18 mins
Main Clock status : normal track
Shelf clock status: normal track
Combined Clock status: normal track
Phase Offset : 0 ns
E1 output PQL: 2
```

Note: The value of "E1 output PQL" is the PQL level defined in PQL-SSM table. See response of command "SHOW PQL-SSM" for the descriptions of the PQL level.

Remarks : See Table 3-4 below for IOC Clock Status descriptions.

Level : User, Config, and Admin

Table 3-4. IOC Clock Status

IOC Clock Status	Description	Possible Next State	Conditions Required for Next Transition State
Warmup	This IOC is warming up.	Freerun	Ref mode = frequency Warm-up complete
		Fast-track	Ref mode = time GPS qualified Warm-up complete
Freerun	This IOC is operating without a reference	Freerun	Ref mode changed from frequency to time
		Fast-track	Input becomes qualified
Fast-track	This IOC has a qualified input and clock is stabilizing.	Bridging	This IOC no longer has a qualified input.
		Normal-track	Clock stabilized
Normal	This IOC has a qualified input and meets all specifications.	Fast-track	Clock not stabilized adequately
		Bridging	This IOC no longer has a qualified input.
Bridging	This IOC no longer has a qualified reference, but remains operating within specification associated with normal_track operation.	Holdover	Bridging time exceeded
		Fast-track	Input reference re-qualified in less than bridging time.
Holdover	This IOC no longer has a qualified reference	Fast-track	Input becomes qualified
Fail	Hardware failure detected on this IOC	none	N/A

show synce

Use this command to display SyncE status, configuration, and Ethernet Synchronization Messaging Channel (ESMC) state for the specified expansion shelf.

Command Syntax:

- To display the SyncE status for the specified expansion shelf:

```
show synce status exp[0-9]
```

- To display the SyncE configuration parameters for the specified expansion shelf:

```
show synce config exp[0-9]
```

Example 1:

To display the SyncE status for expansion shelf 10 (id=exp9):

```
tp5000> show synce status exp9
```

Response 1:

```
tp5000> show synce status exp0


SyncE Status


 ------------------------------------------------------------------

 | Port ID | Direction | Ethernet Mode    | ESMC Status | Rx PQL | Tx PQL |
|---------|-----------|-----------------|-------------|--------|--------|
| Port1   | output    | asynchronous     | off         | 0x0f   | 0x0f   |
|.........|...........|.................|.............|........|........|
| Port2   | output    | asynchronous     | off         | 0x0f   | 0x0f   |
|.........|...........|.................|.............|........|........|
| Port3   | output    | asynchronous     | off         | 0x0f   | 0x0f   |
|.........|...........|.................|.............|........|........|
| Port4   | output    | asynchronous     | off         | 0x0f   | 0x0f   |
|.........|...........|.................|.............|........|........|
| Port5   | output    | asynchronous     | off         | 0x0f   | 0x0f   |
|.........|...........|.................|.............|........|........|
| Port6   | output    | asynchronous     | off         | 0x0f   | 0x0f   |
|.........|...........|.................|.............|........|........|
| Port7   | output    | asynchronous     | off         | 0x0f   | 0x0f   |
|.........|...........|.................|.............|........|........|
| Port8   | output    | asynchronous     | off         | 0x0f   | 0x0f   |
|.........|...........|.................|.............|........|........|
| Port9   | output    | asynchronous     | off         | 0x0f   | 0x0f   |
|.........|...........|.................|.............|........|........|
| Port10  | output    | asynchronous     | off         | 0x0f   | 0x0f   |
```

```
|.........|...........|..................|.............|........|........|
| Port11  | output    | asynchronous     | off         | 0x0f   | 0x0f   |
|.........|...........|..................|.............|........|........|
| Port12  | output    | asynchronous     | off         | 0x0f   | 0x0f   |
|.........|...........|..................|.............|........|........|
| Port13  | output    | asynchronous     | off         | 0x0f   | 0x0f   |
|.........|...........|..................|.............|........|........|
| Port14  | output    | asynchronous     | off         | 0x0f   | 0x0f   |
|.........|...........|..................|.............|........|........|
| Port15  | output    | asynchronous     | off         | 0x0f   | 0x0f   |
|.........|...........|..................|.............|........|........|
| Port16  | output    | asynchronous     | off         | 0x0f   | 0x0f   |
|.........|...........|..................|.............|........|........|
```

Example 2:

To display the SyncE configuration for expansion shelf 10 (id=exp9):

```
tp5000> show synce config exp9
```

Response 2:

```
SyncE Configuration

-------------------------------------------------------------------------------
| Port ID | Direction | ESMC State | QL State | Output QL Mode | Forced Input |
|         |           |            |          |                | QL Value     |
|---------|-----------|------------|----------|----------------|--------------|
| Port1   | output    | disable    | enable   | unidirectional | n/a          |
|.........|...........|............|..........|................|..............|
| Port2   | output    | disable    | enable   | unidirectional | n/a          |
|.........|...........|............|..........|................|..............|
| Port3   | output    | disable    | enable   | unidirectional | n/a          |
|.........|...........|............|..........|................|..............|
| Port4   | output    | disable    | enable   | unidirectional | n/a          |
|.........|...........|............|..........|................|..............|
| Port5   | output    | disable    | enable   | unidirectional | n/a          |
|.........|...........|............|..........|................|..............|
| Port6   | output    | disable    | enable   | unidirectional | n/a          |
|.........|...........|............|..........|................|..............|
| Port7   | output    | disable    | enable   | unidirectional | n/a          |
|.........|...........|............|..........|................|..............|
| Port8   | output    | disable    | enable   | unidirectional | n/a          |
|.........|...........|............|..........|................|..............|
| Port9   | output    | disable    | enable   | unidirectional | n/a          |
|.........|...........|............|..........|................|..............|
| Port10  | output    | disable    | enable   | unidirectional | n/a          |
|.........|...........|............|..........|................|..............|
| Port11  | output    | disable    | enable   | unidirectional | n/a          |
|.........|...........|............|..........|................|..............|
| Port12  | output    | disable    | enable   | unidirectional | n/a          |
|.........|...........|............|..........|................|..............|
| Port13  | output    | disable    | enable   | unidirectional | n/a          |
|.........|...........|............|..........|................|..............|
| Port14  | output    | disable    | enable   | unidirectional | n/a          |
```

```
|.........|...........|............|..........|................|..............|
| Port15  | output    | disable    | enable   | unidirectional | n/a          |
|.........|...........|............|..........|................|..............|
| Port16  | output    | disable    | enable   | unidirectional | n/a          |
|.........|...........|............|..........|................|..............|
```

set synce

Use these commands to:

- enable or disable the Ethernet Synchronization Messaging Channel (ESMC) state in PTP-SyncE ports on expansion shelves
- enable or disable the SSM/QL state for PTP-SyncE ports on expansion shelves
- set the SSM/QL directional mode for PTP-SyncE ports on expansion shelves

Command Syntax:

- To set the ESMC state for the specified SyncE expansion shelf :port

```
set synce esmc exp[0-9] {port <1-16> | all} {enable |
disable}
```

- To set the SyncE SSM/QL state for the specified expansion shelf port :

```
set synce ql-state exp[0-9] {port <1-16> | all} {enable |
disable}
```

- To set the SyncE SSM/QL directional mode for the specified expansion shelf output:

```
set synce output-ql-mode exp[0-9] {port <1-16> | all}
{unidirectional | bidirectional}
```

Defaults: SyncE Output SSM/QL Mode = Unidirectional

Example 1:

To enable ESMC for Port 7 on expansion shelf 5 (id=exp4):

```
tp5000> set synce esmc exp4 port 7 enable
```

Example 2:

To disable ESMC for Port 16 on expansion shelf 1 (id=exp0):

```
tp5000> set synce esmc exp0 port 16 disable
```

Example 3:

To enable SSM/QL for all ports on expansion shelf 1 (id=exp0):

```
tp5000> set synce ql-state exp0 all enable
```

Example 4:

To set the SSM/QL directional mode to bidirectional for all ports on expansion shelf 1 (id=exp0):

```
tp5000> set synce output-ql-mode exp0 all bidirectional
```

Remarks: This command only applies to PTP/SyncE expansion shelves.

Level : Config and Admin only

set-timeout

This command sets the inactivity timeout to the defined time interval, in seconds. This setting is only used for the current session.

Command Syntax:

```
set-timeout
```

Range: 0 to 86400 seconds

Default: 0 seconds

Example:

```
tp5000> set-timeout
```

Response:

```
(Prompt for value)

Timeout ( 0 - 86400 sec): 1800

1800 sec timeout set successfully
```

Level : User, Config, and Admin

show-timeout

This command displays the inactivity timeout to the defined time interval, in seconds.

Command Syntax:

```
show-timeout
```

Example:

```
tp5000> show-timeout
```

Response:

```
The current session timeout            - 900 sec
```

Level : User, Config, and Admin

show tod-source

This command displays the Time of Day Source.

Command Syntax:

```
show tod-source
```

Example:

```
tp5000> show tod-source
```

Response:

```
ToD Source                    - gps
```

Level : User, Config, and Admin

set tod-source

Use this command to provision the ToD Source to be provided by GPS or the System.

The `set ref mode` command replaces the `set tod-source` command. The `set tod-source` command is supported for backward-compatibility.

Command Syntax:

```
set tod-source {gps|sys}
```

Note: Setting the Time of Day source to GPS with the `set tod-source` command will also set the input reference port state to Disable.

Note: Commands to change the reference mode should not be repeatedly sent to the TP5000, especially before the reference has been qualified.

Example 1:

```
tp5000> set tod-source gps
```

Remarks: Command `set tod-source GPS` has the same meaning as `set ref mode time` and `set tod-source sys` has the same meaning as `set ref mode frequency`. See Set REF command.

Level : Config and Admin only

sync tod-source

Use this command to force the system to synchronize the phase and time to the current reference. This command is required to clear alarmID 8 (manual sync IOC to IMC required).

Command Syntax:

```
sync tod-source now
```

Example:

```
tp5000> sync tod-source now
```

Remarks: This command can cause jitter or jump of 1PPS output.

Level : Config and Admin only

upgrade

Use this command to upgrade the specified modules firmware with the specified filename. If the IP address, username, and password is provided, the system will FTP the filename from the specified server (IP or name) and then upgrade the specified module.

Command Syntax:

```
upgrade {imc | ioc1 | ioc2 | exp[0-9]} <filepath>
[ftp: | sftp:] <ftp-ip-address> <username>
```

Note: The FTP firewall is set to “Block” by default. Use the following command to set the IMC firewall to “Allow” for ftp communications:

```
set firewall imc ftp allow
```

Note: The TimeProvider 5000 only supports active FTP; it does not support passive (PASV) mode.

Note: For SFTP, both the SFTP and SSH firewalls must be set to “Allow”. They are both set to “Allow” by default.

Note: If an SFTP server is used, the protocol does not need to be included with the address.

```
ftp:192.168.5.64
[sftp:]192.168.5.64
```

Remarks: Firmware upgrades will not be implemented until the specified module is rebooted.

Example 1:

To upgrade the IMC using the upgrade file path of “/symm/tp5000/current_imc_upd”, FTP server IP address 192.168.5.56, and a user name of “bob321”.

```
tp5000> upgrade imc /symm/tp5000/current_imc_upd
ftp:192.168.5.56 bob321
```

Response 1:

```
Password:

Upgrade of imc is in progress
```

```
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!

Upgrade of imc is successfully completed
```

Example 2:

To upgrade the IMC using the upgrade file path of “/symm/tp5000/current_imc_upd”, SFTP server IP address 192.168.5.57, and a user name of “bob321”.

```
tp5000> upgrade imc /symm/tp5000/current_imc_upd
sftp:192.168.5.57 bob321

or

tp5000> upgrade imc /symm/tp5000/current_imc_upd
192.168.5.57 bob321
```

Response 2:

See Response 1.

Example 3:

To upgrade the PTP-SyncE expansion shelf ID=4 using the upgrade file path of "/symm/tp5000/current_ptp_exp_upd", FTP server IP address 192.168.5.56, and a user name of "bob321", Password: "bob123!" –

```
tp5000> upgrade exp4 /symm/tp5000/current_ptp_exp_upd
ftp:192.168.5.56 bob321
```

Response 3:

```
Password: bob123! <enter>



Upgrade of exp4 is in progress

!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!

Upgrade of exp4 is successfully completed
```

Example 4:

To upgrade the E1-TOD expansion shelf ID=0 using the upgrade file path of “/symm/tp5000/current_e1_exp_upd", FTP server IP address 192.168.5.56, and a user name of "bob321". Password: "bob123!" –

```
tp5000> upgrade exp0 /symm/tp5000/current_e1_exp_upd
ftp:192.168.5.56 bob321
```

Response 4:

```
Password: bob123! <enter>

Upgrade of exp0 is in progress

!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!

Upgrade of exp0 is successfully completed
```

Level : Admin only

show user

This command displays the list of users assigned access privileges to the system.

Command Syntax:

```
show user
```

Example:

```
tp5000> show user
```

Response:

```
-----------------------------------------
|Index|User Name           |Access Level|
|-----|--------------------|------------|
|1    |admin               |admin       |
|.....|....................|............|
|2    |bobo                |admin       |
-----------------------------------------
```

Level : User, Config, and Admin

set user

Use this command to provision the local user password and access level, to delete the specified user, to modify the password of a specified user.

Command Syntax:

- To add a new user:

```
set user add name <username> access-level {user | config |
admin}
```

- To modify the password of an existing user:

```
set user modify <username> password
```

- To delete a user:

```
set user delete <username>
```

Example 1:

To add a new user “tester123” with an access level of “config” –

```
tp5000> set user add name tester123 access-level config
```

Response 1:

```
Prompt for password

Prompt for password confirmation
```

Example 2:

To modify the password for user “tester123” –

```
tp5000> set user modify tester123 password
```

Response 2:

```
Prompt for new password

Prompt for password confirmation
```

Example 3:

To delete user “tester123” –

```
tp5000> set user delete tester123
```

Level : Admin only

Note: Take care to avoid losing admin passwords or deleting all admin users. Adding new users requires at least one admin user. Contact Symmetricom support for the password recovery procedure if all admin-level user passwords are lost.

show vlan-config

Use this command to display the VLAN configuration for a specified service port in IOC and expansion shelf, including VLAN ID, Index value, priority, state, and Host, Netmask, and Gateway IP address. This command also can be used to display the VLAN mode for an IOC port or an expansion shelf.

Command Syntax:

- To display the VLAN configuration for the specified port:

```
show vlan-config {ioc1-1 | ioc1-2 | exp[0-9]}
```

- To display the VLAN mode:

```
show vlan-mode {ioc1 | exp[0-9]}
```

Example 1:

To display the VLAN configuration info for port 1 on IOC1 -

```
tp5000> show vlan-config ioc1-1
```

Results 1:

```
Idx   VID    P    StT   Address          Netmask        Gateway/NextHop    Destnetwork

1     21     0    en    10.11.11.101     255.255.255.0       10.10.10.1    10.10.10.0/24
2     22     0    en    10.21.21.101     255.255.255.0       20.20.20.1    20.20.20.0/24
3     23     0    en    10.31.31.101     255.255.255.0       30.30.30.1    30.30.30.0/24
4     24     0    en    10.41.41.101     255.255.255.0       40.40.40.1    40.40.40.0/24
5     25     0    en    10.51.51.101     255.255.255.0       50.50.50.1    50.50.50.0/24
6     26     0    en    10.61.61.101     255.255.255.0       60.60.60.1    60.60.60.0/24
7     27     0    en    10.71.71.101     255.255.255.0       70.70.70.1    70.70.70.0/24
8     82     0    en    10.81.81.101     255.255.255.0       80.80.80.1    80.80.80.0/24
9     29     0    en    10.91.91.101     255.255.255.0       90.90.90.1    90.90.90.0/24
10    30     0    en    10.101.101.101   255.255.255.0    100.100.100.1    100.100.100.0/24
11    31     0    en    10.111.111.101   255.255.255.0     10.110.110.1    10.110.110.0/24
12    32     0    en    10.121.121.101   255.255.255.0     10.120.120.1    10.120.120.0/24
13    33     0    en    10.131.131.101   255.255.255.0     10.130.130.1    10.130.130.0/24
14    34     0    en    10.141.141.101   255.255.255.0     10.140.140.1    10.140.140.0/24
15    35     0    en    10.151.151.101   255.255.255.0     10.150.150.1    10.150.150.0/24
16    36     0    en    10.161.161.101   255.255.255.0     10.160.160.1    10.160.160.0/24
```

Example 2:

To display the VLAN mode info for IOC1 –

```
tp5000> show vlan-mode ioc1
```

Results 2:

```
VLAN Mode Configuration:

ETH1:           enable
ETH2:           disable
```

Example 3:

To display the VLAN mode info for expansion shelf 3 (id=exp2) –

```
tp5000> show vlan-mode exp2
```

Results 3:

```
vlan-mode: enable
```

Example 4:

To display the VLAN configuration info for expansion shelf 3 (id=exp2) –

```
tp5000> show vlan-config exp2
```

Results 4:

```
Vlan configuration for exp2

PortID VLAN-ID  Pri  State    Address          Netmask          Gateway

1      2        0    enable   192.168.121.11   255.255.255.0    0.0.0.0
2      2        0    enable   192.168.122.11   255.255.255.0    0.0.0.0
3      2        0    enable   192.168.123.11   255.255.255.0    0.0.0.0
4      2        0    enable   192.168.124.11   255.255.255.0    0.0.0.0
5      2        0    enable   192.168.125.11   255.255.255.0    0.0.0.0
6      2        0    enable   192.168.126.11   255.255.255.0    0.0.0.0
7      2        0    enable   192.168.127.11   255.255.255.0    0.0.0.0
8      2        0    enable   192.168.128.11   255.255.255.0    0.0.0.0
9      2        0    enable   192.168.129.11   255.255.255.0    0.0.0.0
10     2        0    enable   192.168.130.11   255.255.255.0    0.0.0.0
11     2        0    enable   192.168.131.11   255.255.255.0    0.0.0.0
12     2        0    enable   192.168.132.11   255.255.255.0    0.0.0.0
13     2        0    enable   192.168.133.11   255.255.255.0    0.0.0.0
14     2        0    enable   192.168.134.11   255.255.255.0    0.0.0.0
15     2        0    enable   192.168.135.11   255.255.255.0    0.0.0.0
16     2        0    enable   192.168.136.11   255.255.255.0    0.0.0.0
```

Level : Config and Admin only

set vlan

This command is used to provision the VLAN mode for an Ethernet port , as well as to provision the state for a defined VLAN configuration.

Use this command to add a new VLAN configuration to an Ethernet port and provision its Host, Mask, and Gateway IP addresses. This command also can be used to modify or delete an existing VLAN configuration. Each VLAN must be configured with its own IP address on a separate subnet.

Note: If the Ethernet interface is not to be part of a VLAN, use the command set ip, on page 162 to provision the IP addresses instead.

- IOC ports, ETH1 and ETH2, can support up to 500 VLANs each
- Bonded IOC ports can support 500 VLANs total, using the ETH1 VLAN configuration.
- The first 16 VLANs (Index = 1 to 16) can be configured with default gateway
- The non-fixed VLANs (up to 484) can be configured with one static route.
- Ethernet expansion shelf supports 1 VLAN per port.

When a non-fixed VLAN is removed, the route will be automatically deleted.

Command Syntax:

- To provision the VLAN mode for the specified port or expansion shelf:

```
set vlan-mode {ioc1-1 | ioc1-2 | exp[0-9]} {enable |
disable}
```

Note: When executing the command "set vlan-mode", wait 30 seconds after the prompt returns before issuing the next command.

- To add a fixed VLAN for the specified port:

```
set vlan-config add {ioc1-1 | ioc1-2} index {1 thru 16}
vlan-id <vlan-id> priority <priority> address <ip-address>
netmask <mask> gateway <gateway>
```

Note: If a gateway router is not required, then set the gateway value to the special value of 0.0.0.0

Note: When executing the command "set vlan-config", wait 30 seconds after the prompt returns before issuing the next command.

Note: When using VLANs, the network administrator should configure the Ethernet switches and/or router to handle the VLANs.

- To add a non-fixed VLAN:

```
set vlan-config add {ioc1-1 | ioc1-2} non-fixed vlan-id
<vlan-id> priority <priority> address <ip-address> next-hop
<ip-addr> dest-network <network-prefix/prefix-length>
```

- To modify the IP address, netmask, or gateway for an existing fixed VLAN configuration on the specified port:

```
set vlan-config modify ioc1-[y] index {1 thru 16} address
<ip-address> netmask <mask> gateway <gateway>
```

- To modify the IP address, netmask, or gateway for an existing non-fixed VLAN configuration on the specified port:

```
set vlan-config modify ioc1-[y] non-fixed vlan-id< vlan-id>
address <ip-address> netmask <mask> next-hop <ip-addr>
dest-network <network-prefix/prefix-length>
```

- To delete a fixed VLAN configuration for the specified index on the specified port:

```
set vlan-config delete {ioc1-1 | ioc1-2} index {1 thru 16}
```

- To delete a non-fixed VLAN configuration for the specified VLAN ID on the specified port:

```
set vlan-config delete {ioc1-1 | ioc1-2} non-fixed vlan-id
<vlan-id>
```

- To provision the state of the fixed VLAN for the specified index on the specified port:

```
set vlan-config state {ioc1-1 | ioc1-2} index {1 thru 16}
{enable | disable}
```

- To provision the state of the non-fixed VLAN for the specified VLAN ID on the specified port:

```
set vlan-config state {ioc1-1 | ioc1-2} non-fixed vlan-id
<vlan-id> {enable | disable}
```

- To provision the fixed VLAN for the specified port on an expansion shelf:

```
set vlan-config expansion exp[0-9] port <1-16> vlan-id <id>
priority <priority-value> {layer2 | address <IP> netmask
<mask> gateway <gway>}
```

Use `set ip <port> restart` after modifying VLAN configuration using the command “.`set vlan-config modify...`”.

Note: Each VLAN must be configured on a separate subnet.

Range: Index = 1 thru 16 (for VLAN table index)
vlan-id = 1 thru 4094
priority = 0 thru 7

Default: No VLAN configured

Example 1:

To Enable the VLAN on port 1 of IOC1 –

```
tp5000> set vlan-mode ioc1-1 enable
```

Note: In order to Enable the VLAN mode for a port, at least one VLAN (indexed or non-fixed) must be already be configured and Enabled on the VLAN for that port. See the `set vlan-config state` command.

Note: When executing the command "set vlan-mode", wait 30 seconds after the prompt returns before issuing the next command.

Example 2:

To add a fixed VLAN on IOC1-1 with VLAN ID = 25, Index=3, Priority=0, where the IP address= 192.168.1.5 Netmask=255.255.255.0, and Gateway=192.168.1.1 –

```
tp5000> set vlan-config add ioc1-1 index 3 vlan-id 25
priority 0 address 192.168.1.5 netmask 255.255.255.0 gateway
192.168.1.1
```

Note: When executing the command "set vlan-config", wait 30 seconds after the prompt returns before issuing the next command.

Example 2a:

To add a non-fixed VLAN on IOC1-1 with VLAN ID = 99, Priority=5, where the IP address= 192.168.3.20, Netmask=255.255.255.0, Next Hop=192.168.3.1 and Destination Network/Net-Prefix=192.168.3.0/24–

```
tp5000> set vlan-config add ioc1-1 non-fixed vlan-id 99
priority 5 address 192.168.3.20 netmask 255.255.255.0
next-hop 192.168.3.1 dest-network 192.168.3.0/24
```

Example 3:

To modify Index 3 on an existing fixed VLAN on IOC1-1 with the new IP address of 192.168.1.7, Netmask=255.255.255.0, and Gateway=192.168.1.1 –

```
tp5000> set vlan-config modify ioc1-1 index 3 address
192.168.1.7 netmask 255.255.255.0 gateway 192.168.1.1
```

Example 3a:

To modify the existing non-fixed VLAN with VLAN ID of 99 on IOC1-1 with the new IP address of 192.168.3.35, Netmask=255.255.255.0, Next Hop=192.168.3.1 and Destination Network/Net-Prefix=192.168.3.0/24 –

```
tp5000> set vlan-config modify ioc1-1 non-fixed vlan-id 99
address 192.168.3.35 netmask 255.255.255.0 next-hop
192.168.3.1 dest-network 192.168.3.0/24
```

Example 4:

To Delete the fixed VLAN configuration for Index 4 on port 1 of IOC1 –

```
tp5000> set vlan-config delete ioc1-1 index 4
```

Example 4a:

To Delete the non-fixed VLAN configuration for VLAN ID=75 on port 1 of IOC1 –

```
tp5000> set vlan-config delete ioc1-1 non-fixed vlan-id 75
```

Example 5:

To Enable the fixed VLAN configuration for Index 5 on port 1 of IOC1 –

```
tp5000> set vlan-config state ioc1-1 index 5 enable
```

Example 5a:

To Enable the non-fixed VLAN configuration for VLAN ID=75on port 1 of IOC1 –

```
tp5000> set vlan-config state ioc1-1 non-fixed vlan-id 99
        enable
```

Example 6:

To Enable the VLAN for expansion shelf 1 (id=exp0) –

```
tp5000> set vlan-mode exp0 enable
```

Example 7:

To configure a VLAN on port 3 of expansion shelf 5 (id: exp4) with VLAN ID = 25, Priority=0, layer 2 –

```
tp5000> set vlan-config expansion exp4 port 3 vlan-id 25
priority  0 layer2
```

Level : Admin only

Simple Network Management Protocol (SNMP)

The Simple Network Management Protocol (SNMP) is an application layer protocol that allows you to manage network devices. SNMP is based on a client-server query-response mode that requires an Ethernet connection. A manager application (software installed on a computer) is the client generating the queries, and an agent (software on the TimeProvider 5000) is the server generating responses. The TimeProvider 5000 SNMP supports most existing functions.

TimeProvider 5000 supports SNMPv2c and SNMPv3. SNMPv3 provides additional security features not available in SNMPv2c. In addition to the functions of SNMPv2c, SNMPv3 allows user and trapuser levels that are based on authentication and privacy settings. The authentication algorithm is either HMAC-SHA-1-96 or MD5, with a 20-character key. The privacy settings are based on either the CBC-DES or AES encryption standard, with a 16-character key. All keys are uppercase.

If SNMP is present, port 161 becomes the port of standard SNMP interactive communications and port 162 becomes the trap port.

SNMP is an optional feature for the TP5000 that must be enabled to function. See Provisioning for SNMP, on page 372 for details..

Note: The SNMP feature can either be ordered in a new system, or added to a previously ordered system as a field upgrade. Contact your Symmetricom representative for more information.

Management Information Base

The Management Information Base (MIB) is a virtual database of managed objects, their object identifiers, and variables. Typical MIB object identifiers include the TimeProvider 5000, its modules, module features, input ports, output ports, etc. and variables that include settings and measurements.

The MIB is controlled by the TimeProvider 5000's SNMP agent. The SNMP agent is a server program that sends TimeProvider 5000 status (stored in the MIB database) to the network manager when the manager transmits GET or GETNEXT messages. The manager can also transmit SET messages that instruct the agent to set MIB variables to new values. The TRAP message is used by the server to send the manager indications of MIB occurrences, such as a fault condition.

The MIB data bases are included on the CD included with the TP5000. A MIB browser is required to view the MIBs.

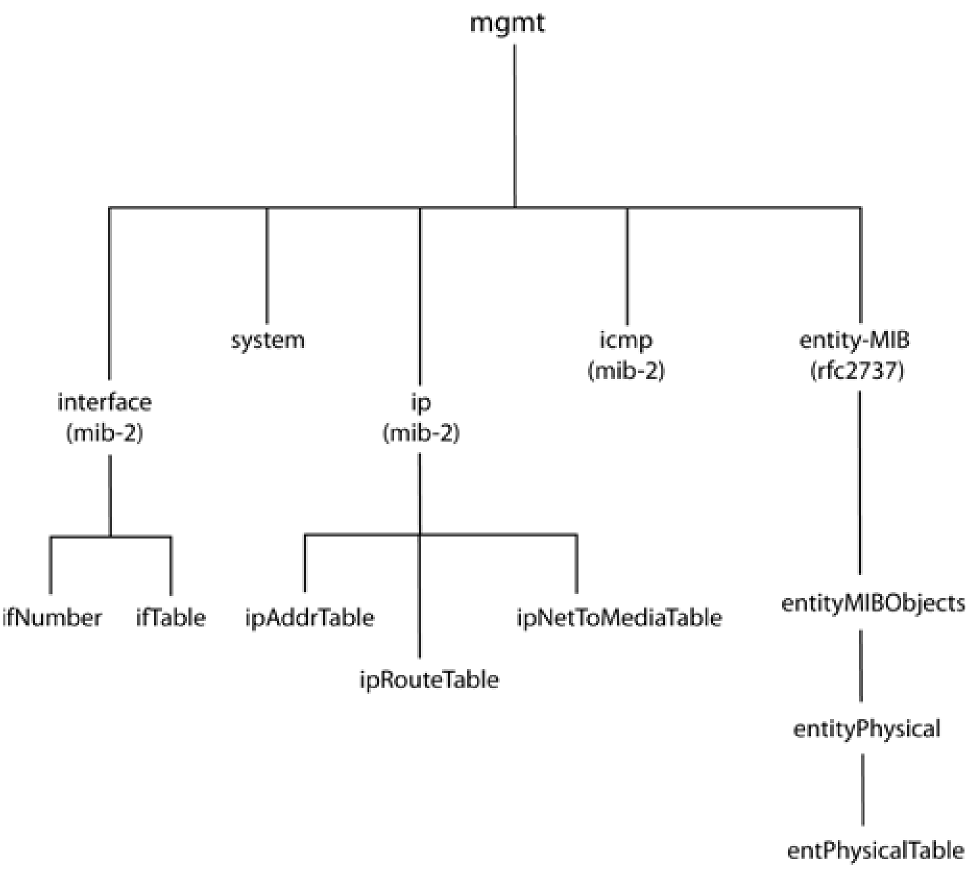
The entire MIB structure used for the TP 5000 SNMP agent is composed of the existing tp5000 MIB (with two new tables), and the new MIB structure. The new structure consists of several public MIBs, the symmCommon MIBs, the tp5000e MIB, and the framework which ties all of them together.

Public MIBs

The Symmetricom implementation of SNMP uses the definitions of MIB II variables described in RFC 1213 and definitions of SNMP traps described in RFC 1215. Symmetricom provides its own private MIB extensions with every system that is licensed for the SNMP option. Symmetricom private MIBs comply with the guidelines described in the relevant RFCs unless otherwise noted in the documentation.

Figure 3-3 shows the Public MIBs used with the TP 5000 SNMP agent. See the TimeProvider 5000 SNMP Agent User's Guide (098-00385-000) for details.

Figure 3-3. Hierarchy of Public MIBs for Used With TimeProvider 5000

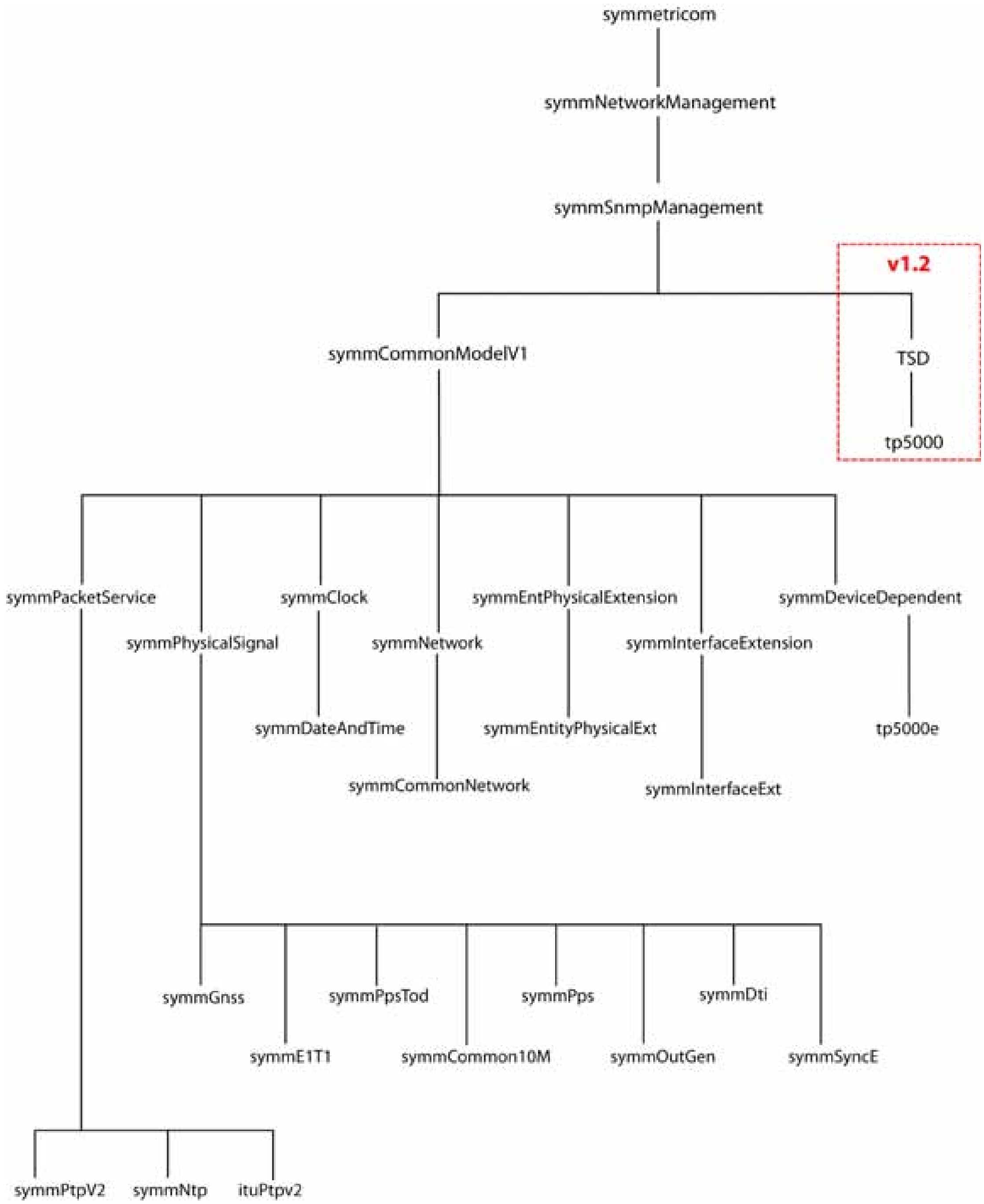


Private MIBs

symmCommonModelV1

The new Private MIB, symmCommonModelv1 Private MIB and its MIB modules, is rooted in the Symmetricom directory. Figure 3-4 shows the top level objects for the symmCommonModelV1 Private MIB module. See the TP 5000 SNMP Agent User's Guide (098-00385-000) for the functions and details of these objects.

Figure 3-4. Hierarchy of Symmetricom Private MIBs for TimeProvider 5000



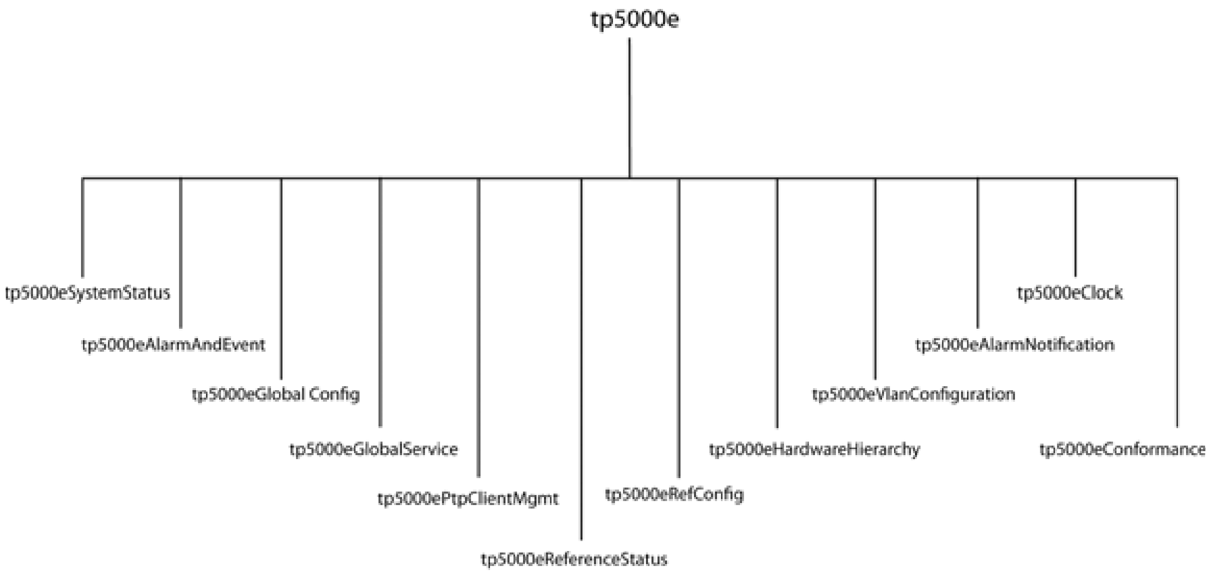
TP 5000e MIB

The tp5000e MIB module is part of the symmCommonModelV1 MIB, but it is described in its own separate chapter in the TP 5000 SNMP Agent User's Guide (098-00385-000). Figure 3-5 shows the top level hierarchy for the tp5000e MIB.

TP 5000 MIB

The original MIB for the TP5000, tp5000, is kept to maintain full backward compatibility with TP5000 release v1.2. Most of the functions in the tp5000 MIB are already duplicated in the new private MIB modules. The tp5000 MIB is only used for a few remaining functions: alarm management, PTP client management, and SNMP administration. The tp5000 MIB will be deprecated when these remaining functions are implemented in the new MIBs. See the TP 5000 SNMP Agent User's Guide (098-00385-000) for details.

Figure 3-5. Top Level Hierarchy of tp5000e Private MIB



Chapter 4 Provisioning

This chapter describes the procedures for provisioning the TimeProvider 5000. Use the procedures in this chapter after you have installed and powered up the TimeProvider 5000 (see Chapter 2, Installing).

In This Chapter

- Establishing a Connection to the TimeProvider 5000
- Managing the User Access List
- Provisioning for a RADIUS Server
- Provisioning IMC Ethernet Port
- Provisioning IOC Ethernet Ports
  - Redundant Ethernet Ports
  - Independent Ethernet Ports
  - Ethernet Auto-Negotiation
- Provisioning VLAN
- Provisioning PTP
- Provisioning NTP
- Provisioning the Input Reference
  - Setting GPS Port as Reference
  - Setting GNSS Port as Reference
  - Setting an E1/T1 Input as Reference
  - Setting a 1PPS+TOD Input as Reference
- Provisioning the Programmable E1/T1 Inputs
- Provisioning the 1PPS+TOD Inputs
- Provisioning the Programmable E1/T1 Outputs
- Provisioning the Dedicated Outputs
- Provisioning the 10MHz & 1PPS Outputs
- Setting the System Date and Time
- Provisioning Alarms
- Saving and Restoring Provisioning Data
- Provisioning for SNMP

Provisioning for Expansion Shelves

- Provisioning TP 5000 for Expansion Shelf
- Provisioning Expansion Shelf E1 / 1PPS+TOD Outputs
- Provisioning Expansion Shelf PTP/SyncE Outputs

Establishing a Connection to the TimeProvider 5000

To set up and manage the TimeProvider 5000 with a terminal or a computer with terminal emulation, you must establish either a serial connection or an Ethernet connection. To connect through the serial port, see Communicating Through the Serial Port, on page 274. If the TimeProvider 5000 is connected to an Ethernet LAN, use the procedure described in Communicating Through the Ethernet Port, on page 275.

Note: Before you can communicate with the TimeProvider 5000 through an Ethernet connection, you must first configure the Ethernet port using the serial connection.

Communicating Through the Serial Port

An EIA-232 serial port is available on the IMC module for a direct serial connection to a terminal or a computer with terminal emulation. Use the following procedure to connect the TimeProvider 5000 to a terminal or a computer with terminal emulation via a straight through serial cable:

Note: For information on restricting user access, see Managing the User Access List, on page 276.

1. Connect one end of a straight through serial cable to the serial port on the computer or terminal and the other end to the EIA-232 connector on the IMC.
2. Configure the emulation software for 8 data bits, 1 stop bit, no parity, 57600 baud rate, and no flow control.
3. Start the terminal emulation software and press **Enter**. The system prompt should appear. If it does not, recheck each step in this procedure.
4. Type your user name and press **Enter**. The system prompts for a password.
5. Type your password and press **Enter**. The system prompt appears.

Note: The unit's default user name is “admin” and the default password is “symmadmin**”.

Communicating Through the Ethernet Port

To communicate with the TimeProvider 5000 using an Ethernet LAN connection, you must first configure the Ethernet port through the EIA-232 serial port.

Configuring the Ethernet Port

Use the following procedures to configure the TimeProvider 5000 Ethernet parameters (IP Address, Subnet Mask, and Gateway Address).

Note: The TimeProvider 5000 default IP address is 192.168.0.100, the subnet mask is 255.255.255.0, and the gateway address is 0.0.0.0 (no gateway). If these defaults are acceptable, the following procedure using the serial port is not required.

1. Establish a direct serial connection to the TimeProvider 5000 as described in Communicating Through the Serial Port, on page 274.

2. Provision the IP, Gateway, and Subnet Mask addresses for the TimeProvider 5000. The IT department or site administrator for your location can recommend specific addresses for these parameters. Use the dotted decimal format xxx.xxx.xxx.xxx to enter the address parameters with the following commands:

Note: The telnet firewall is set to Block by default. Use the following command to set the IMC firewall to Allow for telnet communications:

```
set firewall imc telnet allow
```

Example 1 – Using Static IP:

```
tp5000> set ip imc address 192.168.0.10 netmask 255.255.255.0
        gateway 192.168.0.254
tp5000> set ip imc restart
```

Example 2 – Using DHCP:

```
tp5000> set ip-mode imc dhcp
```

Connecting Through an Ethernet LAN

1. Ensure that the TimeProvider 5000 is connected to a LAN (see Communications Connections, on page 69 for details).

2. Telnet from your computer to the IP address assigned to the TimeProvider 5000 (see Configuring the Ethernet Port, on page 275).

Note: SSH can be used to connect to the TP5000. The SSH firewall is set to Allow by default.

3. Type your user name and press **Enter**. If you are not assigned as a user in the system, contact the system administrator or see Adding a User, on page 277.

4. Type your assigned password and press **Enter**. The system prompt appears.

Managing the User Access List

When you are logged in at the Admin level you can add, edit, or delete user names in the user access list. The user list can contain up to 20 names and users can be set to one of three different security levels described in Table 4-1. Users are required to enter a user name and password to log in to the system. Users can access or modify only the parameter settings allowed by their assigned security level.

Caution: To avoid a possible service call, do not lose or misplace the user name and password of the Admin-level user.

Table 4-1. User Level and Access

Security Level	Description
User	Users can edit their password and show information, or access any command at the User security level.
Config	Users are allowed to change configuration and issue User-level commands.
Admin	Users are allowed to modify the security database or download new firmware and issue commands at any level.

Use the procedures in this section to manage user access to the TimeProvider 5000.

Logging In

Use the following procedure to log in to the system at the admin level.

1. Ensure that the TimeProvider 5000 is connected to a LAN, or directly connected to a computer through the EIA-232 serial port. See Communications Connections, on page 69.

2. If the TimeProvider 5000 is connected to a LAN, Telnet or SSH from your computer to the assigned IP address.

Note: The telnet firewall is set to Block by default. Use the following command to set the IMC firewall to Allow for telnet communications:

```
set firewall imc telnet allow
```

If the TimeProvider 5000 is connected to a computer directly through the serial port, start a Terminal session and press **Enter**.

3. Type your user name and press **Enter**. The system prompts for a password.

4. Type your password and press **Enter**. The system prompt appears.

Note: The unit's default user name is "admin" and the default password is "symmadmin**". To avoid unauthorized access, you should change the default password.

Adding a User

Use the following procedure to add a user to the system access list.

Note:

User passwords can consist of alphanumeric characters, "~", "*", "(", ")", "!", "?", "-", "_", and "." with a minimum of 8 characters and a maximum of 32 characters.

Usernames can consist of numbers, upper and lower case letters, dash "-", and underscore "_", with a maximum of 20 characters. Usernames cannot use a leading dash "-" or underscore "_" as the first character.

For a description of user access levels, see Managing the User Access List, on page 276.

1. Login at the Admin level (see Logging In, on page 277).

2. Type `show user` and press **Enter** to view the current list of users.

3. Type `set user add` and press **TAB** twice. The system prompts you for a user name.

4. Type a user name and press **SPACE** and then **TAB**. The name you enter will be the log-in name for the user. The system prompts you for the access-level for the user.

5. Type in the desired access-level (user, config, or admin) and press **Enter**. The system prompts you for a password.

6. Type a password and press **Enter**. The password you enter will be the log-in password for the user. The system responds with the confirm password prompt.

7. Retype the password and press **Enter**. The system indicates that "`CLI user has been added: <user>`".

8. Type `show user` and press **Enter** to verify that the account exists.

9. Repeat steps 3 through 8 of this procedure to add other users.

Deleting A User

Use the following procedure to delete user ABCD1234 from the system access list. Do not delete the default username and password.

1. Login at the Admin level (see Logging In, on page 277).

2. Type `show user` and press **Enter** to view the current list of users.

3. Type `set user delete ABCD1234` and press **Enter**.

Displaying Current Users and User Access Levels

Use the following procedure to show a list of all assigned users and their access levels.

1. Login at the Admin level (see Logging In, on page 277).

2. Type `show user` and press **Enter**. The system displays the current list of users.

Changing a User's Password

Use the following procedure to change a user's password.

Note:

User passwords can consist of alphanumeric characters, "~", "*", "(", ")", "!", "?", "-", "_", and "." with a minimum of 8 characters and a maximum of 32 characters.

Usernames can consist of numbers, upper and lower case letters, dash "-", and underscore "_", with a maximum of 20 characters. Usernames cannot use a leading dash "-" or underscore "_" as the first character.

For a description of user access levels, see Managing the User Access List, on page 276.

1. Login at the Admin level (see Logging In, on page 277).
2. Type show user and press **Enter** to view the current list of users.
3. Type set user modify <user name> password and press **Enter**.

   Follow the prompts. Change the password when prompted.
4. Repeat Steps 2 and 3 to modify other user passwords.

Changing a User’s Access Level

To change a user’s access level you must delete and then re-create the user. This also provides an opportunity to change the password, if desired. Use the following procedure to change the access level.

Note:

User passwords can consist of alphanumeric characters, “~”, “*”, “(“, “)”, “!”, “?”, “-”, “_”, and “.” with a minimum of 8 characters and a maximum of 32 characters.

Usernames can consist of numbers, upper and lower case letters, dash "-", and underscore "_", with a maximum of 20 characters. Usernames cannot use a leading dash “-” or underscore "_" as the first character.

For a description of user access levels, see Managing the User Access List, on page 276.

---

1. Login at the Admin level (see Logging In, on page 277).
2. Type `show user` and press **Enter** to view the current list of users.
3. Type `set user delete <user name>` and press **Enter**.
4. Type `set user add` and press **TAB** twice. The system prompts you for a user name.
5. Type a user name and press **SPACE** and then **TAB**. The name you enter will be the log-in name for the user. The system prompts you for the access-level for the user.
6. Type in the desired access-level (user, config, or admin) and press **Enter**. The system prompts you for a password.
7. Type a password and press **Enter**. The password you enter will be the log-in password for the user. The system responds with the confirm password prompt.
8. Retype the password and press **Enter**. The system indicates that “`CLI user has been added: <user>`”.
9. Type `show user` and press **Enter** to verify that the account exists.
10. Repeat Steps 3 through 9 to modify other user access levels.

Provisioning for a RADIUS Server

To authenticate TP5000 users with a Remote Access Dial In User Server (RADIUS), the TP5000 must be provisioned to allow remote authentication and the RADIUS server must be properly configured. The usernames, passwords, and security level of the remotely-authenticated users can then be controlled from the RADIUS server.

Provisioning the TP5000 for Remote Authentication

The authentication scheme used in the TimeProvider 5000 requires you to provision a RADIUS server IP address and authentication key(s) to allow the TP5000 access to the desired RADIUS server. The RADIUS server authentication feature must also be enabled.

Note: The TP5000 allows local login, even if RADIUS login authentication is enabled, for those users on the TP5000's user access list. (See Adding a User, on page 277.)

To provision the RADIUS server IP address and authentication key for server access:

1. Type `set authentication radius address <address> key <key>` and press **Enter** (address is the server IP address, for example 192.168.0.10, key is up to 32 ASCII characters).

2. Type `set authentication radius enable` and press **Enter**.

Details on configuring a FreeRADIUS server and a Cisco Access Control Server (ACS) are given. For other RADIUS servers, see the appropriate user documentation for information on how to configure the server.

Configuring a FreeRADIUS Server

A FreeRadius server can be configured in two different ways to indicate the security access level for each authorized TP 5000 user. Use either the pre-defined RADIUS server attribute "User-Name" or the vendor-specific attribute "Symm-User-Level".

Using Pre-defined “User-Name” Attribute

For a FreeRADIUS server, configuration requires placing the TP5000 user information in the file “/etc/raddb/users”. The "User-Name" attribute from the RADIUS server is used by the TP5000 to indicate the security level for each authorized user, as described in Table 4-2.

Table 4-2. Security Levels vs. RADIUS Server User-Name Attribute Settings

TP5000 Security Level	RADIUS Server “User-Name” Attribute Setting
User	“remote_user”
Config	“remote_config”
Admin	“remote_admin”

Listed below are example configurations for the file “/etc/raddb/users” for the FreeRADIUS server.

<u>Example 1</u>: “Admin”-Level User

For user “usr_a” with a password of “test1a”:

```
usr_a Auth-Type := Local, User-Password == "test1a"
Reply-Message = "Level 1 access granted\n",
User-Name=remote_admin
```

<u>Example 2</u>: “Config”-Level User

For user “usr_c” with a password of “test2b”:

```
usr_c Auth-Type := Local, User-Password == "test2b"
Reply-Message = "Level 2 access granted\n",
User-Name=remote_config
```

<u>Example 3</u>: “User”-Level User

For user “usr_u” with a password of “test3c”:

```
usr_u Auth-Type := Local, User-Password == "test3c"
Reply-Message = "Level 3 access granted\n",
User-Name=remote_user
```

The secret key must also be configured in the RADIUS server. For a FreeRADIUS server, this is configured in the "/etc/raddb/clients.conf" file.

Using Vendor-Specific Attribute “Symm-User-Level”

This section describes how to add support for the Symmetricom-specific attribute “Symm-User-Level” in a FreeRADIUS server. Support for the vendor-specific attribute was added in release 2.1 and later.

A FreeRADIUS server requires placing the TP5000 user information in the file “/etc/raddb/users”. The Symm-User-Level attribute defines the security access level for each authorized user, as described in Table 4-3.

Table 4-3. Security Levels vs. RADIUS Server Symm-User-Level Attribute Settings

TP5000 Security Level	RADIUS Server “Symm-User-Level” Attribute Setting
User	“remote_user”
Config	“remote_config”
Admin	“remote_admin”

1. .Edit the file /etc/raddb/dictionary to add these 4 lines at the end of the file:

```
VENDOR       Symmetricom      9070
BEGIN-VENDOR Symmetricom
ATTRIBUTE    Symm-User-Level  1     string
END-VENDOR   Symmetricom
```

2. Define Symm-User-Level attribute for the user to be authenticated by RADIUS in /etc/raddb/users. The following examples define admin, config and user configurations.

<u>Example 1</u>: “Admin” Symm-Level-User

For user “radmin” with a password of “testr4”:

```
radmin Auth-Type := Local, user-password := "testr4"
Reply-Message = "Hello radmin",
Symm-User-Level = "remote_admin"
```

<u>Example 2</u>: “Config” Symm-Level-User

For user “rconfig” with a password of “testc4”:

```
rconfig  Auth-Type := Local, user-password := "testc4"
         Reply-Message = "Hello rconfig",
         Symm-User-Level = "remote_config"
```

<u>Example 3</u>: “User” Symm-Level-User

For user “ruser” with a password of “testu4”:

```
ruser    Auth-Type := Local, user-password := "testu4
         Reply-Message = "Hello ruser",
         Symm-User-Level = "remote_user"
```

3. Configure the secret key in the "/etc/raddb/clients.conf" file

4. Restart FreeRADIUS daemon.

Configuring a Cisco ACS

Vendor -specific attribute support was added for TP5000 release 2.1 and later. This section how to add support for the Symmetricom-specific attribute in a Cisco Access Control Server (ACS).

There may be alternative configurations, but the following procedure is one example of configuring a Cisco ACS to support user-authentication for a TP 5000.

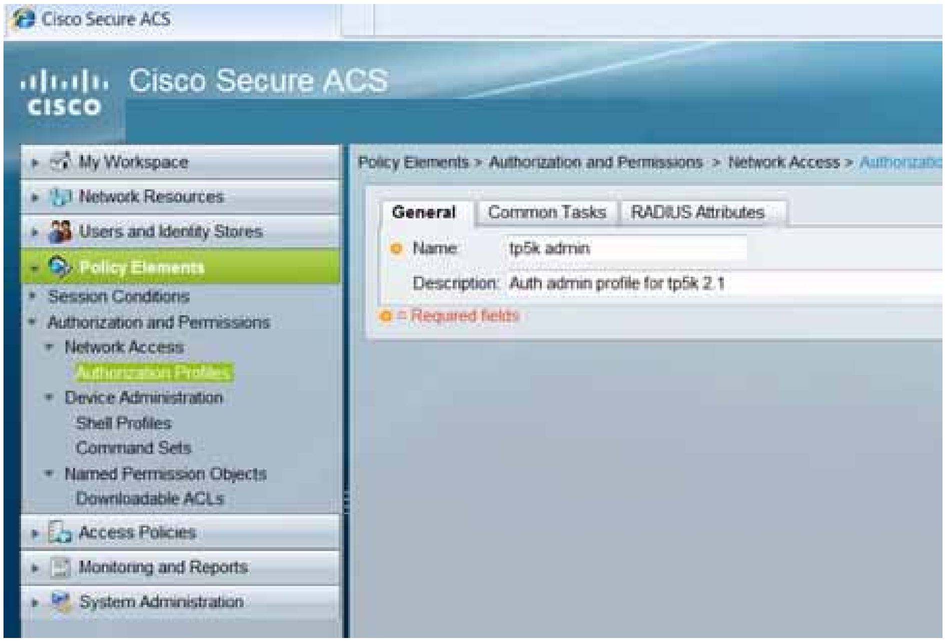
1. Create a different identity group for each of the 3 access levels (Users and Identity Stores->Identity Groups)

2. Create users and assign an identity group to control the access level for each user (Users and Identity Stores->Internal Identity Stores->Users)

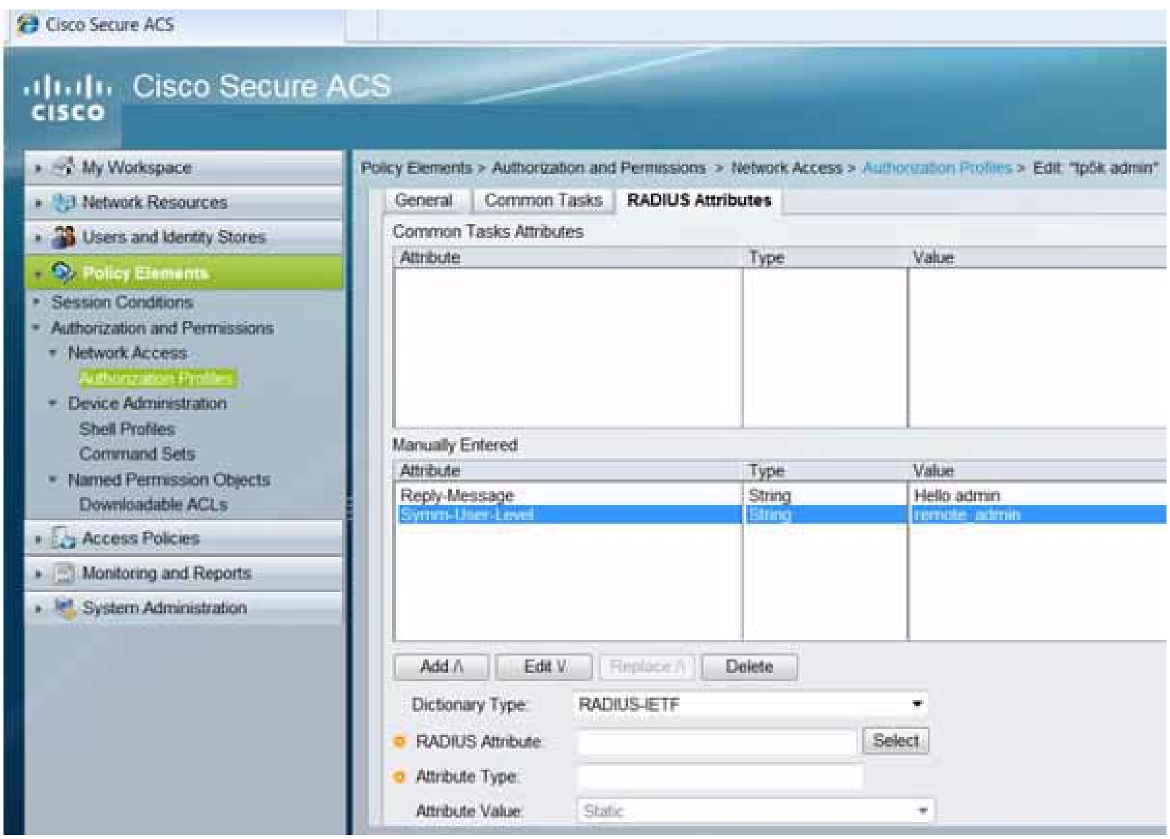
3. Create authorization profile for each of the 3 access levels and set the RADIUS attributes (Policy Elements->Authorization and Permissions->Network Access->Authorization Profiles

a. Create admin authorization profile. Add RADIUS attribute "Symm-User-Level" with value of "remote_admin"

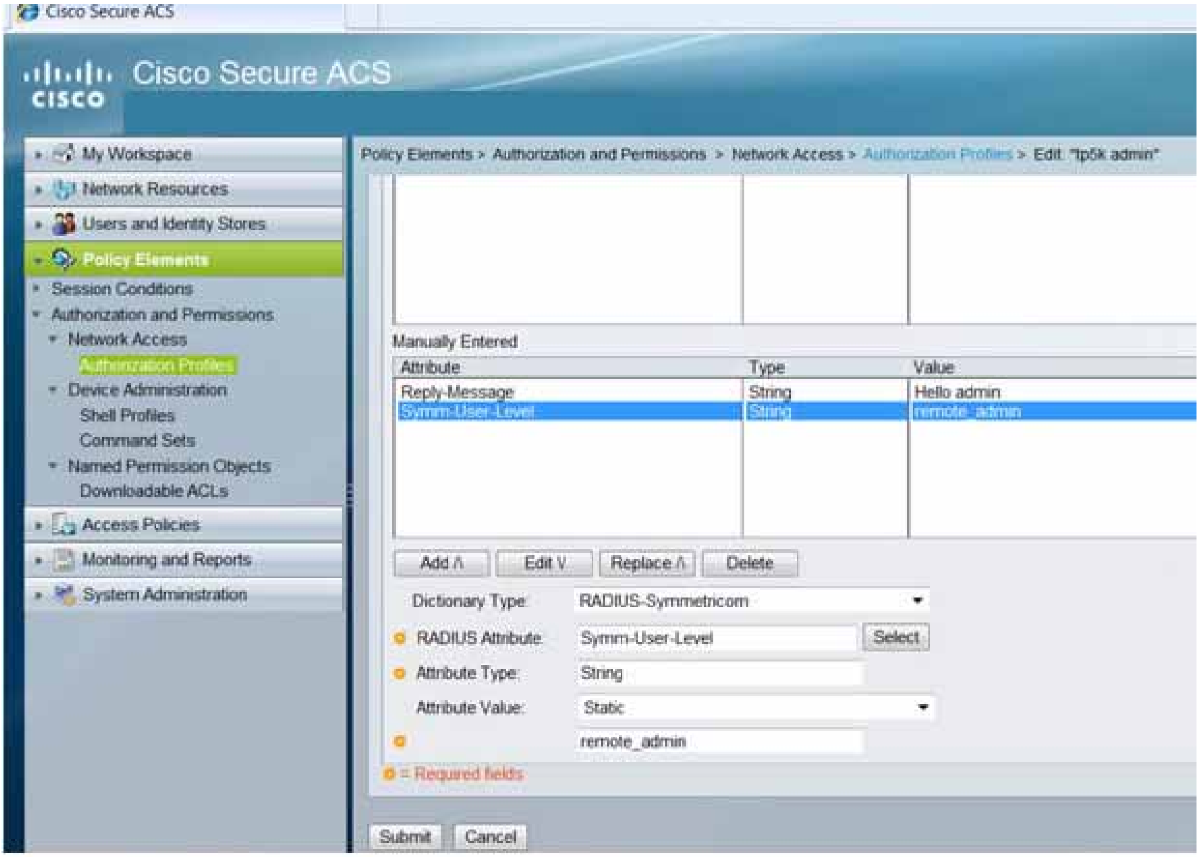
Screen 1



Screen 2



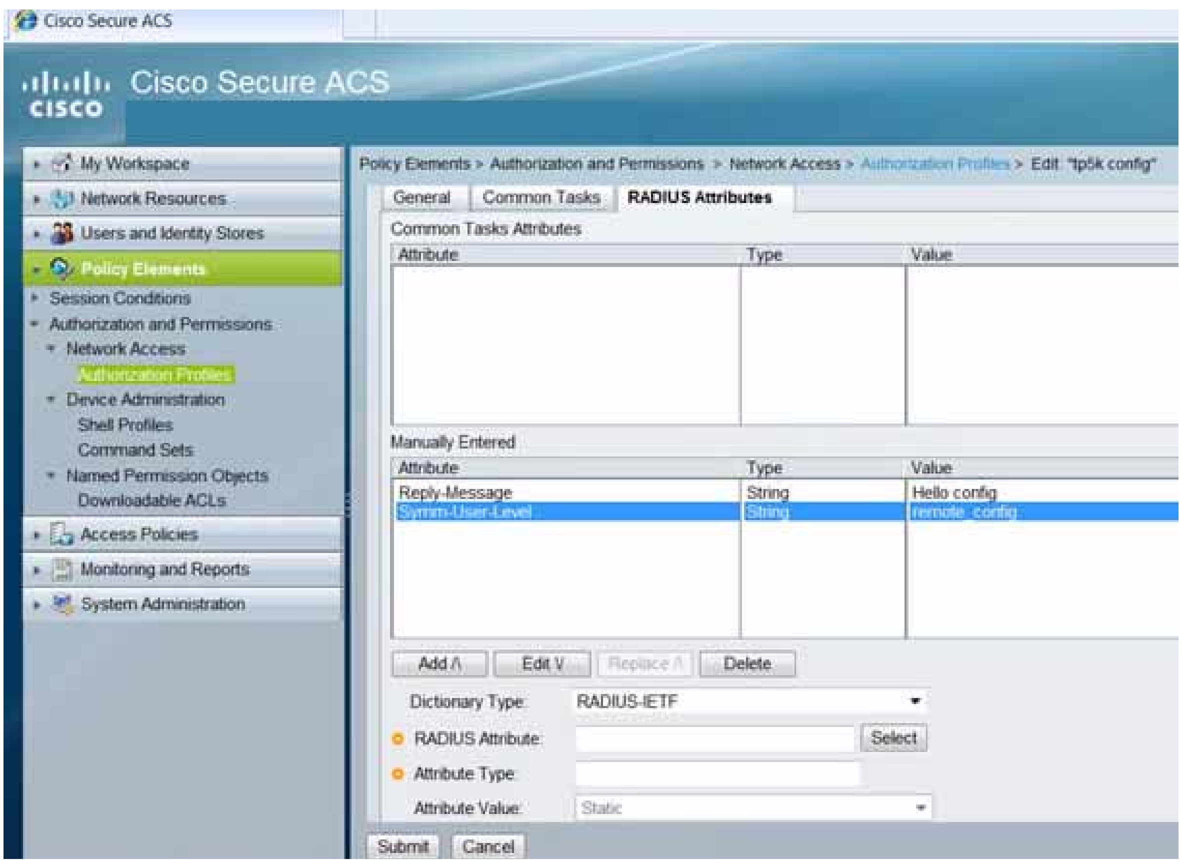
Screen 3



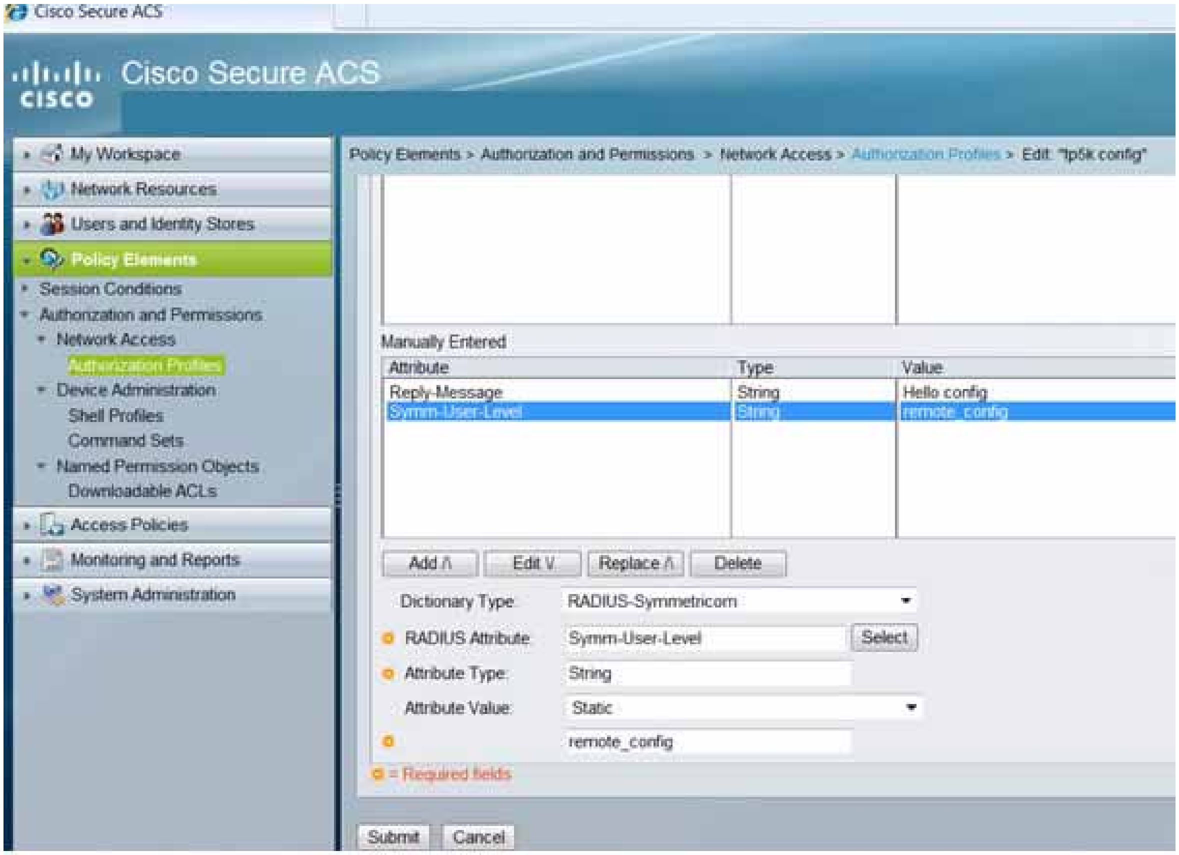
b. Create config authorization profile. Add RADIUS attribute "Symm-User-Level" with value of "remote_config"

Screen 1.

Screen 2

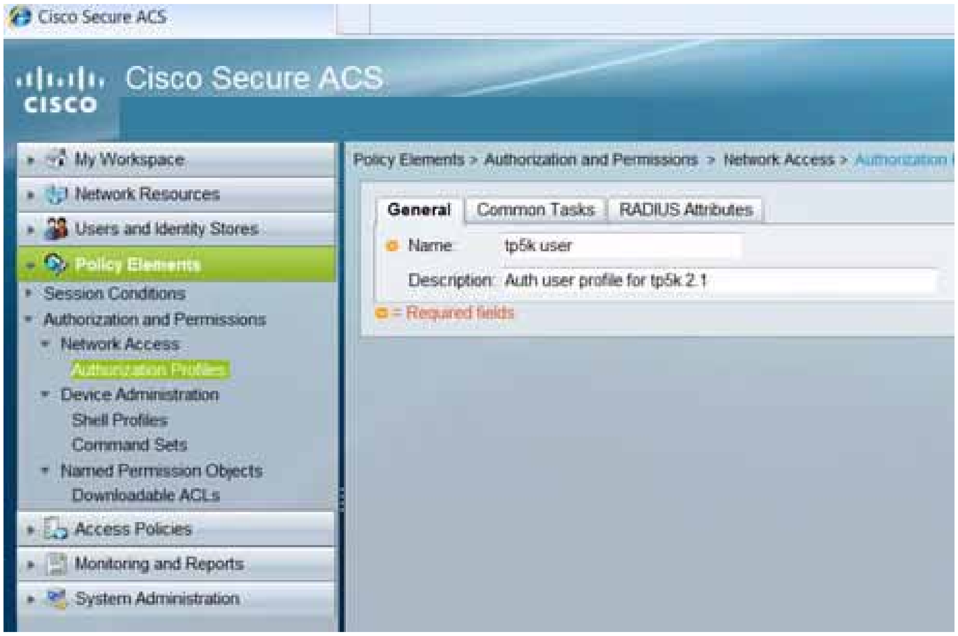


Screen 3

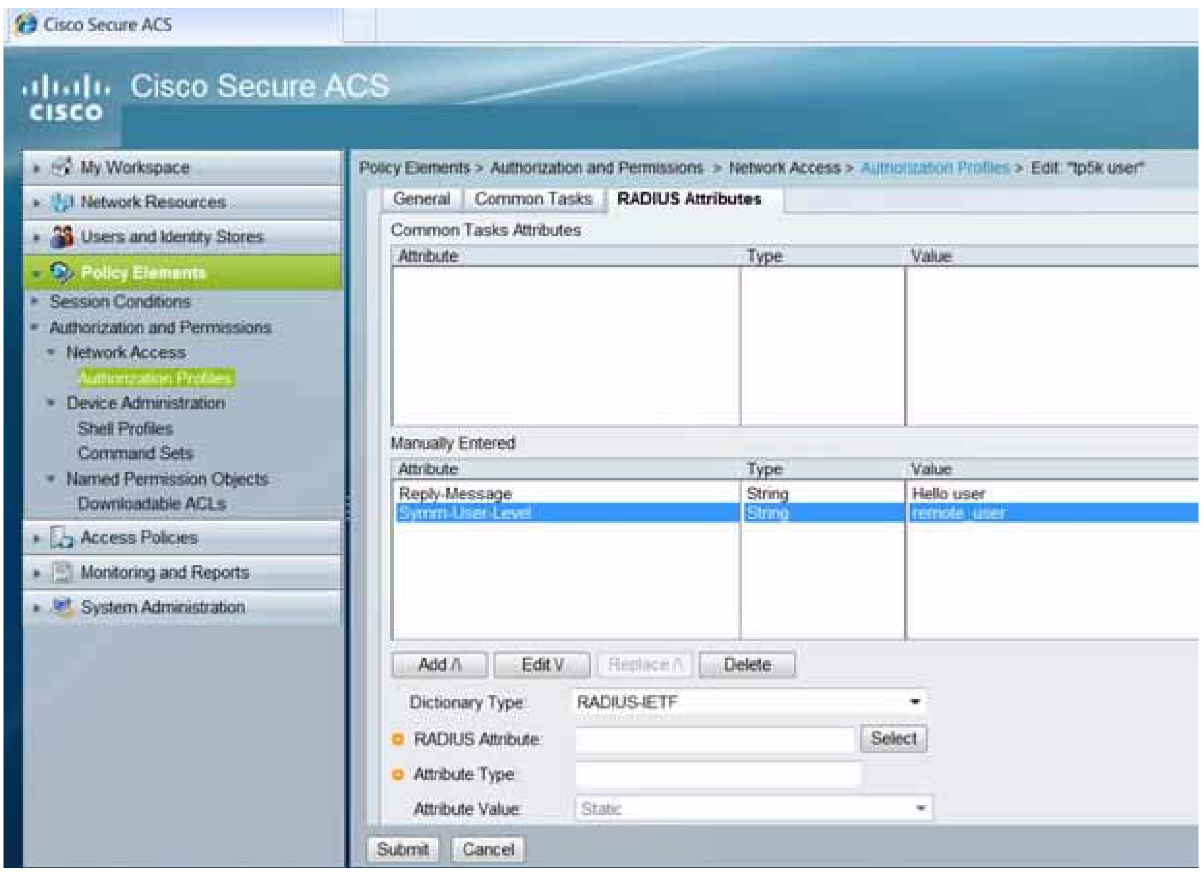


c. Create user authorization profile. Add RADIUS attribute "Symm-User-Level" with value of "remote_user".

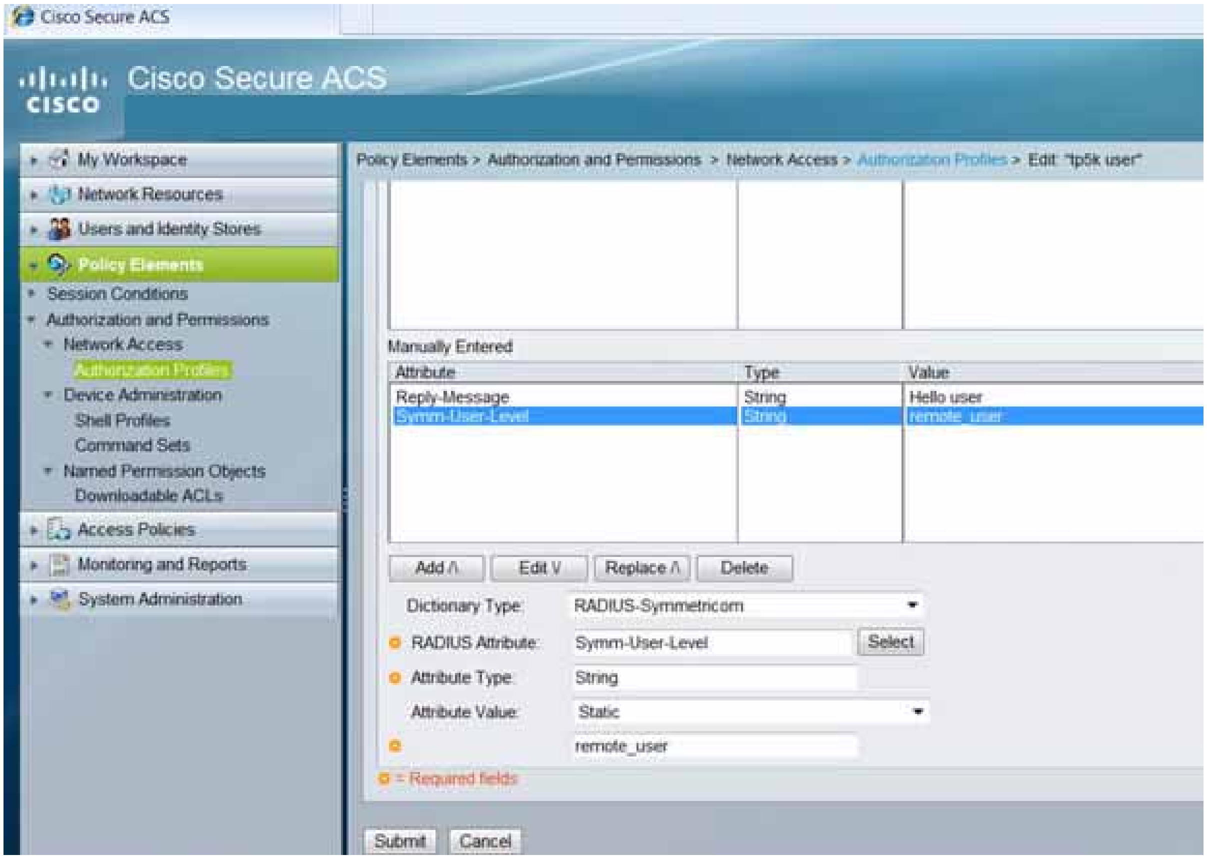
Screen 1



Screen 2

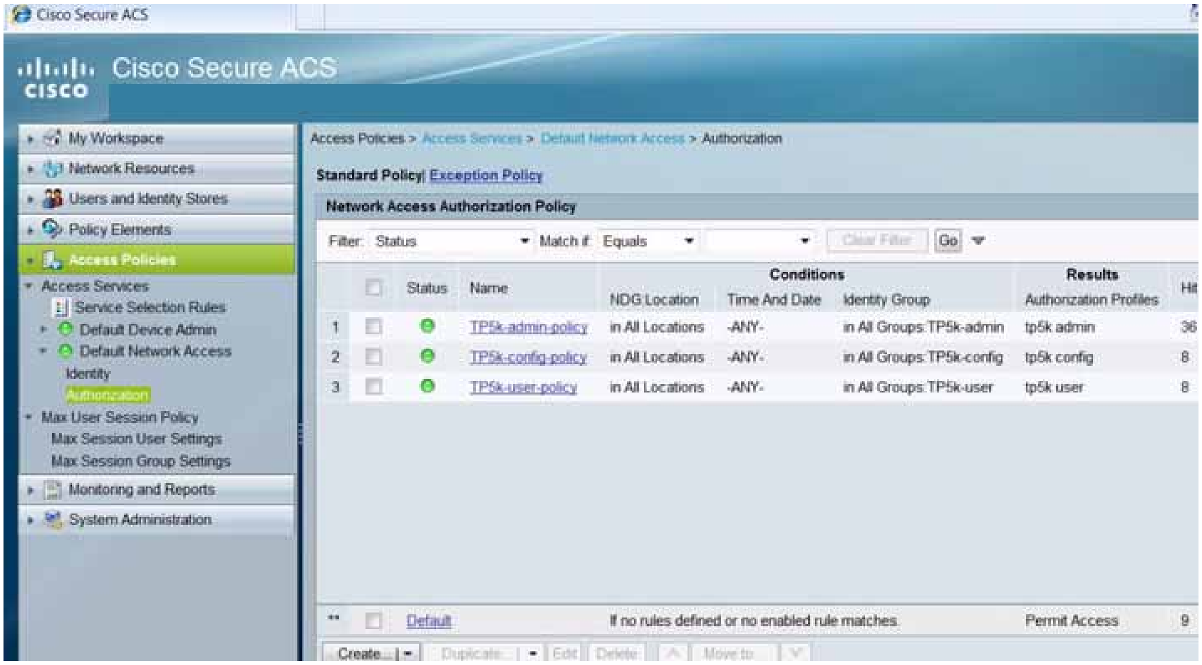


Screen 3



4. Create authorization policies to associate identity group with authorization profile (Access Policies->Access Services->Default Network Access->Authorization). There should be at least one policy for each of the 3 access levels of the TP5000.

Additional constraints such as time and location can be added to the policy if desired.



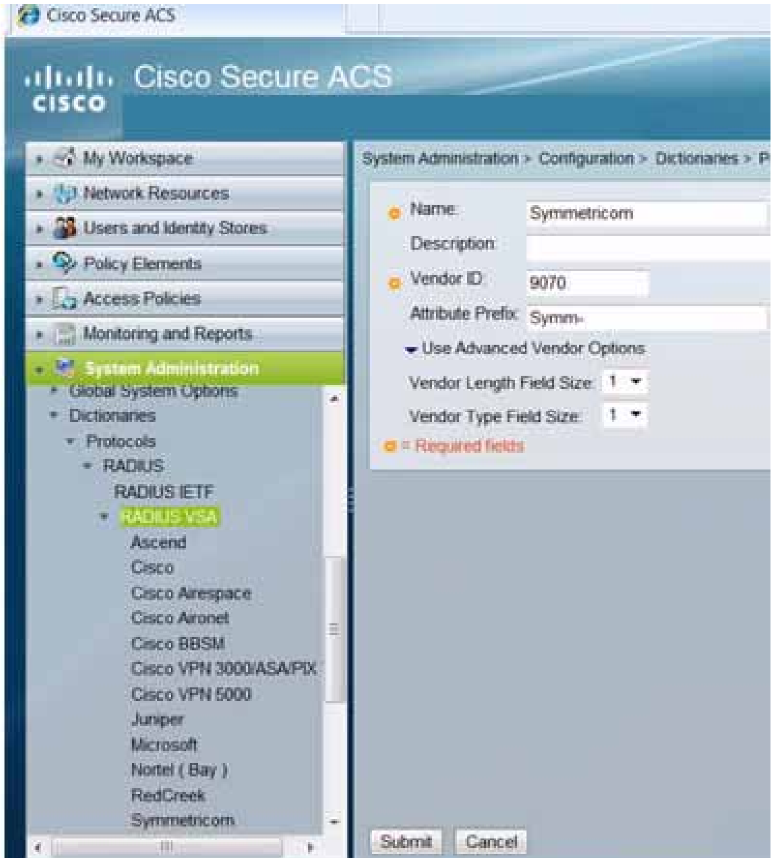
5. Create Symm-User-Level attribute in Symmetricom VSA RADIUS dictionary (System Administration->Configuration->Dictionaries->Protocols->RADIUS->RADIUS VSA)

   a. Create Symmetricom dictionary, with vendor ID of 9070.

Screen 1


Cisco Secure ACS
cisco
Cisco Secure ACS
My Workspace
Network Resources
Users and Identity Stores
Policy Elements
Access Policies
Monitoring and Reports
System Administration
Global System Options
Dictionaries
Protocols
RADIUS
RADIUS IETF
RADIUS VSA
Ascend
Cisco
Cisco Airespace
Cisco Aironet
Cisco BBSM
Cisco VPN 3000/ASA/PIX
Cisco VPN 5000
Juniper
Microsoft
Nortel (Bay)
RedCreek
Symmetricom
System Administration > Configuration > Dictionaries > Protocols > RADIUS >
Vendor Specific Dictionary
Filter:
Match if:
Go
Vendor
Vendor ID
Description
Ascend 529
Cisco 9
Cisco Airespace 14179
Cisco Aironet 5842
Cisco BBSM 5263
Cisco VPN 3000/ASA/PIX 7.x 3076
Cisco VPN 5000 255
Juniper 2636
Microsoft 311
Nortel (Bay) 1584
RedCreek 1958
Symmetricom 9070
US Robotics 429
Create
Duplicate
Edit
Delete
Show Vendor Attributes

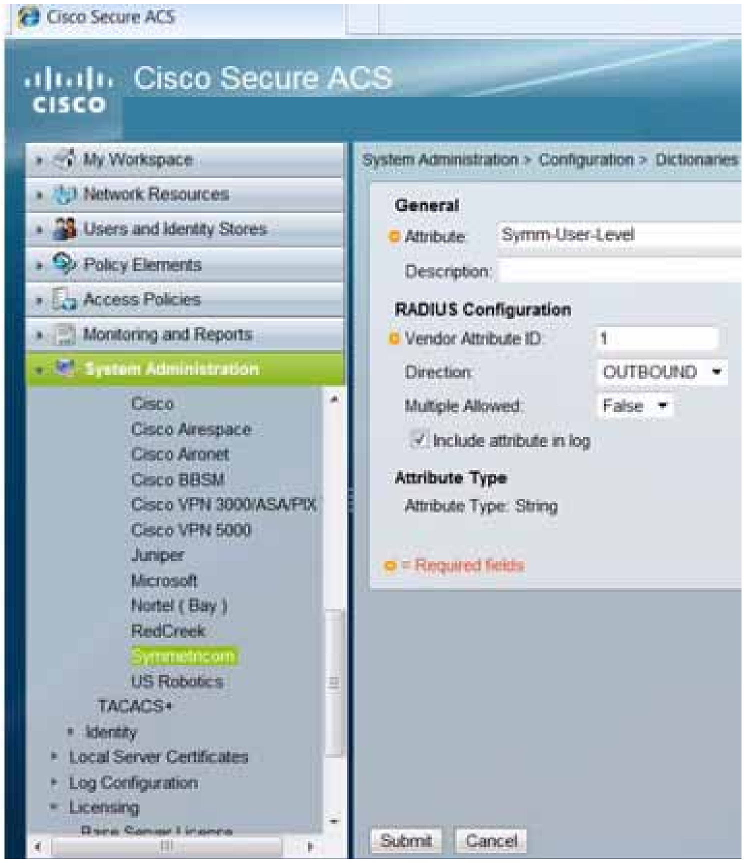
Screen 2



b. Create Symm-User-Level VSA, with ID of 1 and type "string"

Screen 1

Screen 2



Provisioning the Ethernet Ports

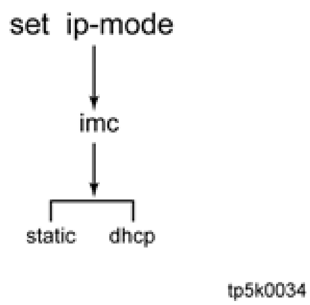
Provisioning IMC Ethernet Port

The TimeProvider 5000 supports static as well as dynamically allocated IP addresses on the MGMT (Management) port. The dynamically allocated address requires a connection to a DHCP server. When provisioning the unit for static IP address, you can set the Host address, Mask address, and Gateway address, or you can set the addresses to the factory default. See Appendix B, Specifications and Factory Defaults for addresses.

DHCP Mode

You can either enable or disable DHCP mode on the MGMT port. See Figure 4-1. Use the following procedure to configure the TimeProvider 5000 to enable DHCP on the MGMT port.

Figure 4-1. Set IP-Mode Command



Example

1. Login at the Admin or Config-user level (see Logging In, on page 277).
2. Type `set ip-mode imc dhcp` and press **Enter**.
3. Type `set ip imc restart` and press **Enter**.

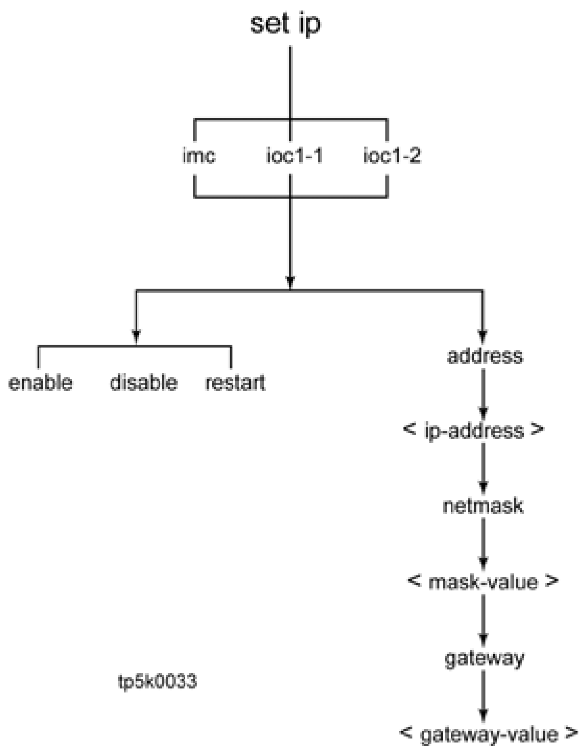
Static IP Mode

Use the following procedure to configure the TimeProvider 5000 IP parameters (Host Address, Subnet Mask, and Gateway Address) in Static IP mode on the MGMT port. Use the dot-decimal notation format xxx.xxx.xxx.xxx to enter the address parameter. See Figure 4-2.

Example

1. Login at the Admin or Config-user level (see Logging In, on page 277).
2. Type `set ip-mode imc static` and press **Enter**.
3. Type `set ip imc address 192.168.0.10 netmask 255.255.255.0 gateway 192.168.0.1` and press **Enter**.
4. Type `set ip imc restart`.

Figure 4-2. Set IP Command Hierarchy



Provisioning IOC Ethernet Ports

The IOC Ethernet ports can only be configured with static IP addresses. The two Ethernet ports on an IOC card can be bonded to active/standby mode as a redundant pair or configured as independent ports. Independent ports must be in different subnets. The default condition for Ethernet ports on an IOC card is Port Redundancy OFF.

Note: No alarm or error is generated if independent ports are configured in the same subnet, but the ports will not function correctly.

The redundant port uses the ETH1 port configuration. Therefore, the redundant ports share the same IP address and MAC address. See Figure 4-3. The TP5000 allows VLAN over the redundant port as well as over independent ports.

Enabling or disabling port redundancy does not require the user to issue the "`set IP restart`" command.

The TP5000 also supports redundant IOC cards (see Appendix D, Redundant IOC Cards). Both IOC cards will have the same IP addresses for the Ethernet ports, but the MAC addresses will be different for each IOC card. See Figure 4-5 for an example of redundant IOC cards with independent ports. See Figure 4-4 for an example of redundant IOC cards with redundant ports. If the TP5000 is configured with two IOC cards, one card is active and drives outputs, while the other is in standby mode. Both cards share the same configuration, which is IOC1. Neither card is primary. Switching is non-revertive. The configuration and state is synchronized between cards automatically. See Parameters with IOC Card Redundancy, on page 507 for a thorough description of IP addresses, MAC addresses, and Clock IDs.

On system power-up, IOC1 will be active. After initial warm-up, the Rb IOC (in a mixed Rb IOC, Qtz IOC-card configuration) will be active. If the active IOC card fails or loses its Ethernet connection, the TP5000 will switch over to the standby card within 10 seconds. The active IOC card sends a gratuitous ARP after switchover. Manual switchover is also supported. See Causes of Switchovers Between IOC Cards, on page 509 for a thorough description of TP5000 behavior with redundant IOC cards.

Figure 4-3. IOC Ethernet Ports Configured as Redundant Pair

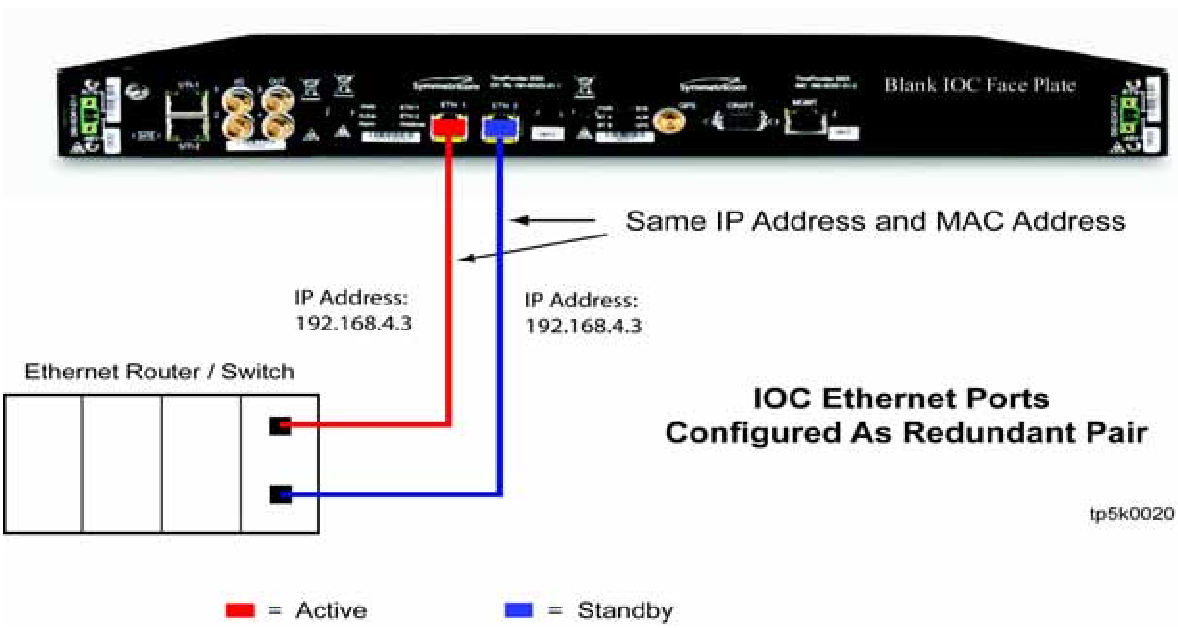
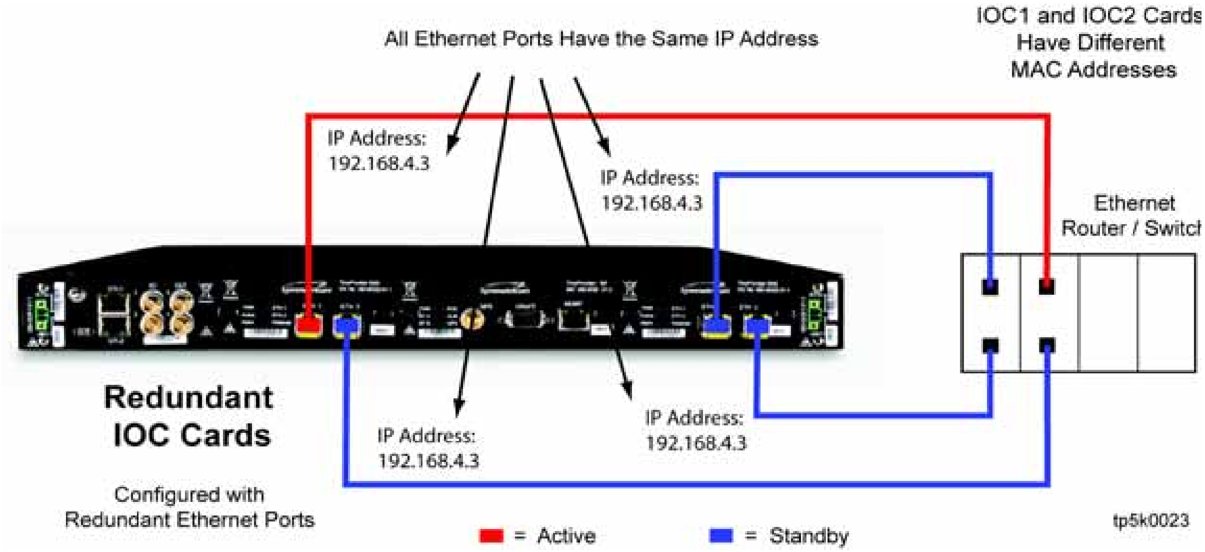


Figure 4-4. Redundant IOC Cards with Redundant Ethernet Ports



Redundant Ethernet Ports

The TP5000 allows auto switchover or manual switchover between redundant ports. The IOC card sends a gratuitous ARP after switchover between ports.

The redundant port uses the ETH1 port configuration. Therefore, the redundant ports share the same IP address and MAC address.

For all commands that indicate a specific port on an IOC card, the port will be referred to as IOC-[y] or IOC1-[y] in the command description, where y=1 or 2. If port redundancy is enabled, then y=1 for all commands.

Use the following procedure to configure ports on IOC1 as a redundant pair.

1. Login at the admin or Config-user level.

2. Type `set redundancy port ioc1 enable` and press **Enter**.

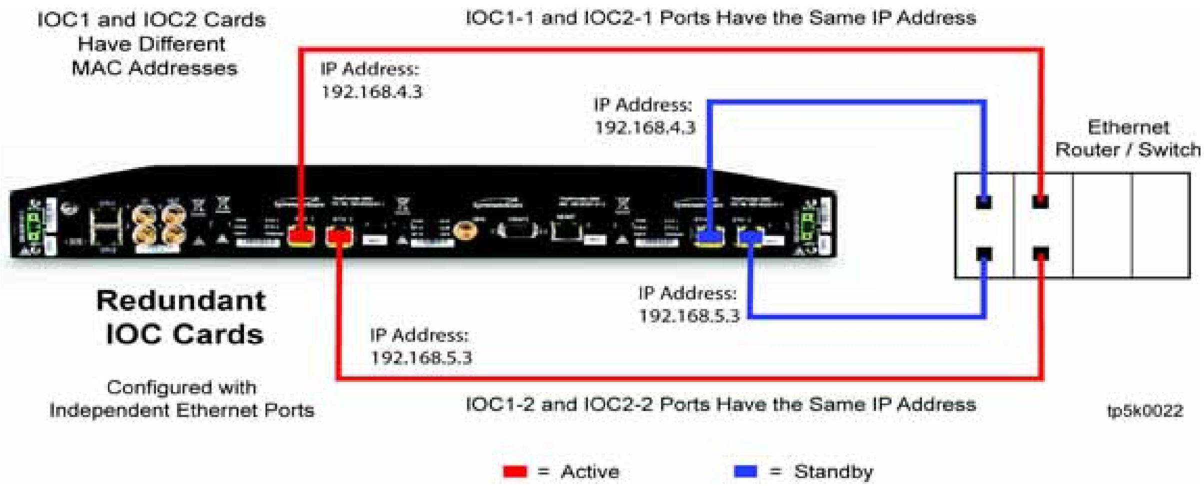
Note: When executing the command "set redundancy port", wait 30 seconds after the prompt returns before issuing the next command.

---

3. Type `set ip ioc1-1 address 192.168.2.10 netmask 255.255.255.0 gateway 192.168.2.1` and press **Enter**.

4. Type `set ip ioc1-1 restart` and press **Enter**.

Figure 4-5. Redundant IOC Cards with Independent Ethernet Ports



Independent Ethernet Ports

Disabling port redundancy returns the IOC Ethernet ports to independent status. Independent ports must be in different subnets.

Use the following procedure to configure the ports on IOC 1 as independent ports.

1. Login at the admin or Config-user level.
2. Type `set redundancy port ioc1 disable` and press **Enter**.

Note: When executing the command "set redundancy port", wait 30 seconds after the prompt returns before issuing the next command.

3. Type `set ip ioc1-1` address `192.168.1.10 netmask 255.255.255.0 gateway 192.168.1.1` and press **Enter**.
4. Type `set ip ioc1-1 restart` and press **Enter**.
5. Type `set ip ioc1-2` address `192.168.2.12 netmask 255.255.255.0 gateway 192.168.2.1` and press **Enter**.
6. Type `set ip ioc1-2 restart` and press **Enter**.

Ethernet Auto-Negotiation

The Ethernet ports on IOC modules can be configured to allow automatic negotiation of their connection speeds. When Ethernet auto-negotiation is enabled, the TP5000 will advertise connection speeds of 100/1000M for electrical SFP and 1000M for optical SFP. The user can also specify a connection speed for a port, 100M, 1000M, or All, to configure the speed used by auto-negotiation. The default for auto-negotiation state is “enable”. The default value for auto-negotiation speed is “All”.

If auto negotiation is disabled, the Ethernet connection speed will be forced to 100M for Electrical SFPs and to 1000M for Optical SFPs.

Use the following procedure to configure both independent ports on IOC 1 to allow Ethernet auto-negotiation. In this example, Port 1 allows all connection speeds, and Port 2 only allows a connection speed of 100 M.

1. Login at the admin or Config-user level.
2. Type `set eth-auto-neg state ioc1-1 enable` and press **Enter**.
3. Type `set eth-auto-neg speed ioc1-1 all` and press **Enter**.
4. Type `set eth-auto-neg state ioc1-2 enable` and press **Enter**.
5. Type `set eth-auto-neg speed ioc1-2 100m` and press **Enter**.

Provisioning VLAN

The TP 5000 supports up to 500 VLANs on each port of an IOC card, ETH1 and ETH2. In bonding mode, the bonding port support 500 VLANs, using the ETH1 VLAN configuration. Each VLAN must have its own address and subnet. There is no default VLAN configuration. Figure 4-7 shows the command for enabling VLAN mode for the IOC ports.

There are 16 VLANs that can accessed by index. These VLANs can be configured with a default gateway and are considered “fixed” VLANs. These VLANs can be deleted with the “set vlan delete ioc1-x index” command. The command hierarchy for configuring fixed VLANs is shown in Figure 4-7. Fixed VLANs include a gateway address.

The remaining 484 VLANs are considered to be “non-fixed” VLANs, each of which can be configured with one static route. When a non-fixed VLAN is removed, the route will be automatically deleted whether the TP 5000 is in bonding or non-bonding mode. A non-fixed VLAN can also be deleted by the user with the “set vlan delete ioc1-x non-fixed” command. The command hierarchy for configuring non-fixed VLANs is shown in Figure 4-8. Non-fixed VLANs require specification of an IP address for the “next hop” and network prefix/prefix length for the destination network, instead of the gateway address.

Ethernet expansion shelves can support 1 multicast VLAN per port.

Figure 4-6. Set Vlan-Mode Command Hierarchy

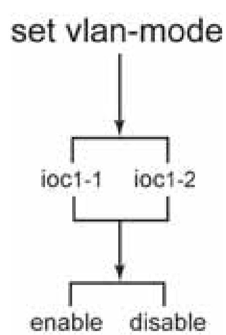


Figure 4-7. Fixed VLAN — Set Vlan-Config Commands

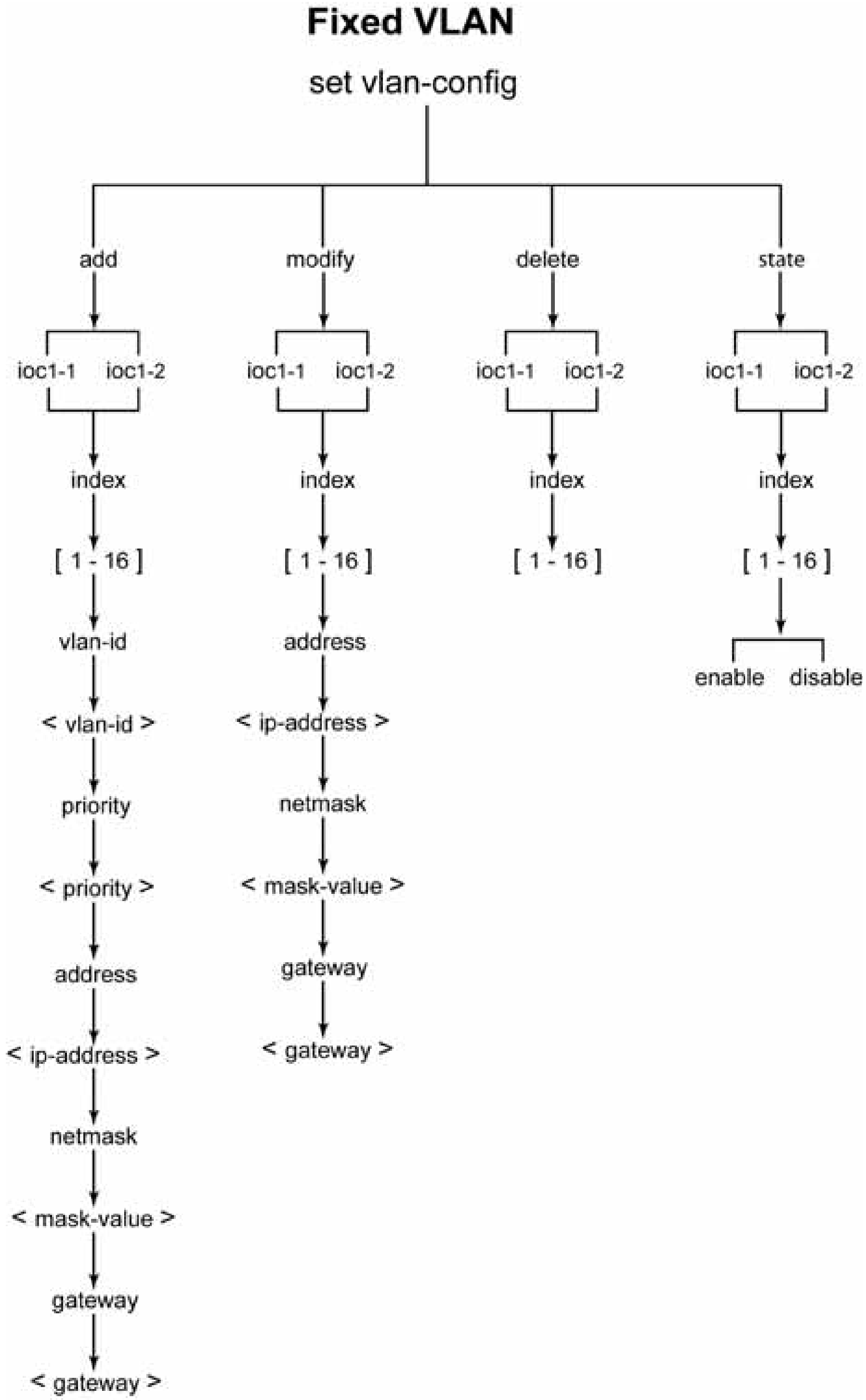
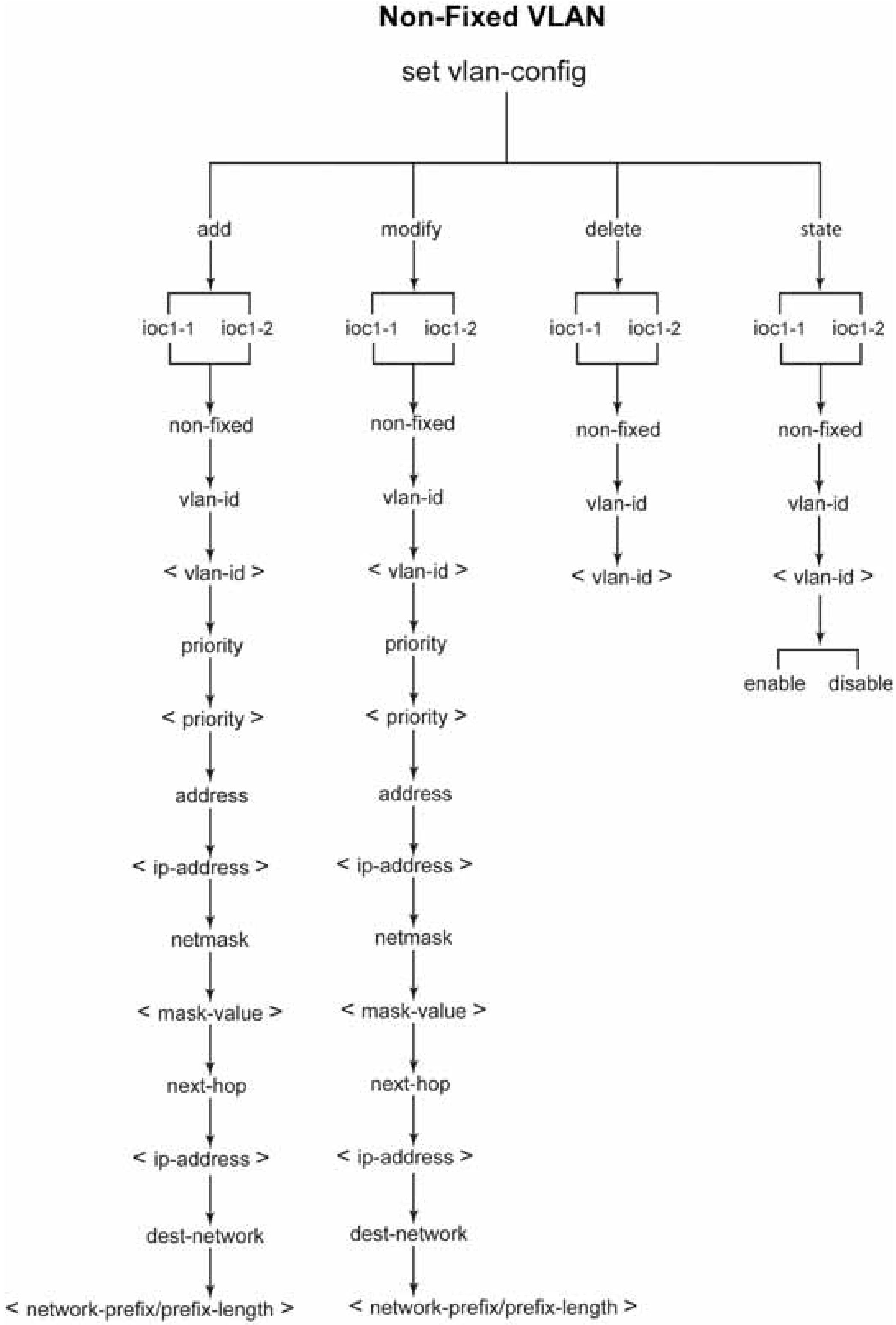


Figure 4-8. Non-Fixed VLAN — Set Vlan Commands



Example

Use the following procedure to configure a fixed VLAN with an ID of 2 and priority of 3:

1. Login at the Admin or Config-user level.
2. Type `set vlan-config add ioc1-1 index 1 vlan-id 2 priority 3 address 192.168.3.20 netmask 255.255.255.0 gateway 192.168.3.1` and press **Enter**.

> **Note:** When executing the command "set vlan-config", wait 30 seconds after the prompt returns before issuing the next command.

3. Type `set vlan-config state ioc1-1 index 1 enable` and press **Enter**.
4. Type `set vlan-mode ioc1-1 enable` and press **Enter**.

> **Note:** When executing the command "set vlan-mode", wait 30 seconds after the prompt returns before issuing the next command.

5. Type `show vlan-config ioc1-1` and press **Enter** to verify the configuration.
6. Type `show ip status ioc-1` and press **Enter** to verify VLAN is up.

Example

Use the following procedure to configure a non-fixed VLAN on ETH1 with VLAN ID of 99, priority of 5, next hop IP address of 192.168.3.1 and Destination Network/Net-Prefix=192.168.4.0/24:

1. Login at the Admin or Config-user level.
2. Type `set vlan-config add ioc1-1 non-fixed vlan-id 99 priority 5 address 192.168.3.20 netmask 255.255.255.0 next-hop 192.168.3.1 dest-network 192.168.4.0/24` and press **Enter**.

> **Note:** When executing the command "set vlan-config", wait 30 seconds after the prompt returns before issuing the next command.

3. Type `set vlan-config state ioc1-1 non-fixed vlan-id 99 enable` and press **Enter**.

Note: When executing the command "set vlan-config", wait 30 seconds after the prompt returns before issuing the next command.

4. Type `set vlan-mode ioc1-1 enable` and press **Enter**.

Note: When executing the command "set vlan-mode", wait 30 seconds after the prompt returns before issuing the next command.

5. Type `show vlan-config ioc1-1` and press **Enter** to verify the configuration.

6. Type `show ip status ioc-1` and press **Enter** to verify VLAN is up.

Provisioning PTP

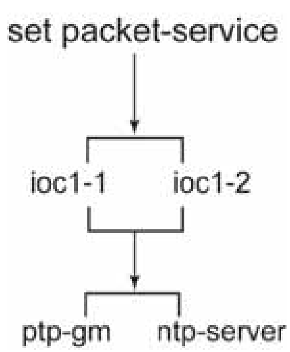
By default, the TP5000 is provisioned as a PTP grandmaster enabled for PTP unicast dynamic negotiation, except for versions that are purchased as dedicated NTP servers. The TP5000 also supports up to 10 unicast static clients per port. The "set ptp" command is used to provision PTP parameters common to Default (multicast), Hybrid (multicast-hybrid), Telecom-2008 (unicast), and ITU-G.8265.1 configurations. See Figure 4-10, Figure 4-11 and Figure 4-12 for the hierarchy of the "set ptp" commands. SeeTable 4-11 for descriptions of the Common parameters and Table B-32 for defaults and ranges. including those commands for setting the ptp profile, management addressing mode and two-step clock mode.

Packet Service Modes

Each Ethernet port on the TP5000 IOC module can be configured as either a PTP grandmaster or as an NTP server, with PTP grandmaster as the default. The exception is for versions that are purchased as dedicated NTP servers. See Figure 4-9.

Note: The set packet-service command also allows the user to configure the TP5000 as a PTP probe or NTP probe. A separate option license is required to enable the TP5000 to support either type of probe functionality.

Figure 4-9. Set Packet-Service Command Hierarchy



Use the following procedure to configure Port 1 of IOC1 as a PTP grandmaster:

1. Login at the Admin.

2. Type `set packet-service ioc1-1 ptp-gm` and press **Enter**.

PTP Profiles

The TP5000 Grandmaster can be configured to run with one of four PTP profiles, as described in Table 4-4. Each PTP port can run only one of these profiles at one time. However, if the Ethernet ports are configured for independent operation, each port can operate with a different profile. For example, ETH1 can run the Telecom-2008 profile while ETH2 is configured to run the ITU-G.8265-1 profile.

The TP5000 requires a v1.2 license key to unlock the Default (multicast) and Hybrid (multicast-hybrid) profiles. Use the show license command to display the current license...

Table 4-4. PTP Profiles for the TP 5000

PTP Profile	Mapping to Address Mode (addr-mode in prev release)	Description
Default	Multicast	Default profile in IEEE1588-2008 Annex J, multicast over UDP/IP. See Table 4-6
Hybrid	Multicast-hybrid	PTP transport over UDP/IP, mix of unicast /multicast packets. See Table 4-8 Proprietary implementation.
Telecom-2008	Unicast	Generic unicast profile for telecom before ITU-T G.8265-1. See Table 4-7 Proprietary implementation.
ITU G.8265-1	n/a	Telecom profile for frequency sync. See Table 4-5for details about TP 5000 compliance to this profile. See ITU-T G.8265.1 for details.

Note: The Ethernet expansion shelf supports the ethernet-default profile. This is the profile defined in IEEE1588-2008 Annex F, multicast over Ethernet.

Table 4-5 shows the output state of the TP5000 main shelf relative to the clock state and clockClass when using the Default (multicast) profile.

SSM Mapping to PTP Clock Class

The Default, Hybrid, and Telecom-2008 PTP profiles (Unicast, Multicast and Multicast-hybrid address mode) for the TP5000 were implemented before the ITU approved the PTP telecom profile in 2010.

To be fully compliant to the ITU telecom profile, a PTP protocol must support the mapping between SSM and PTP clockClass as defined in G. 8265.1. The SSM QL value, defined in ITU-T G.781, is transferred through the Clock Class attribute carried in PTP Announce messages. This mapping is explicitly defined for frequency synchronization, but Symmetricom's implementation assumes it is applicable to time synchronization. See Table 4-9 and Table 4-10 for Symmetricom's implementation of the G.8265.1 SSM-clockClass mapping table.

Table 4-5 shows the compliance of the ITU-8265.1 PTP profile for the TP5000 to the ITU 8265.1 standard.

Table 4-6 shows the compliance of the Default (multicast) PTP profile for the TP5000 to IEEE 1588-2008 Annex J.

Table 4-7 and Table 4-8 show the attributes for the proprietary Telecom-2008 (unicast) and Hybrid (multicast-hybrid) PTP profiles, respectively.

Table 4-5. ITU-T G.8265-1 Profile Compliance

Attribute	Default for ITU-T G.8265-1	Default for TP 5000	Range for ITU-T G.8265-1	Range for TP 5000
clockClass	Not defined	Not defined	80 to 110	80 to 110
Domain	4	4	4 to 23	0 to 255

Table 4-6. Default Profile (Multicast) Compliance - IEEE1588-2008 Annex J

Attribute	Default for Annex J	Default for TP 5000	Range for Annex J	Range for TP 5000
clockClass		n/a		6, 7, 13, 14, 52, 58, 248
Announce Interval	1	1	0 to +4	-4 to +4
Sync Interval	0	-1	-1 to +1	-7 to +7
Domain	0	0	Not defined	0 to 255

Table 4-7. Telecom-2008 (Unicast) Proprietary Profile

Attribute	Default for TP 5000	Range for TP 5000
clockClass	Not defined	6, 7, 13, 14, 2, 58, 248
Domain	4	0 to 255

Table 4-8. Hybrid (Multicast-Hybrid) Proprietary Profile

Attribute	Default for TP 5000	Range for TP 5000
clockClass	Not defined	6, 7, 13, 14, 52, 58, 248
Announce Interval	-3	-4 to +4
Sync Interval	-7	-7 to +7
Domain	4	0 to 255

Table 4-9. Option 1 - SSM Mapping to QL and clockClass per G.781 and G.8265-1

Option 1 SSM (hex)	Clock QL	PTP clockClass	PQL
04FF	QL-PRC	84	1
08FF	STU	82	2
0CFF	QL-SSU-A	90	3
0CFF	Type I	90	4
78FF	QL-SSU-B	96	6
10FF	QL-SEC/EEC1	104	7
30FF	QL-DNU	110	9
Others (or absent)	Invalid	n/a	15

Table 4-10. Option 2 - SSM Mapping to QL and clockClass per G.781 and G.8265-1

Option 2 SSM (hex)	Clock QL	PTP clockClass	PQL
04FF	QL-PRS	80	1
08FF	QL-STU	82	2
0CFF	QL-ST2	86	3
0CFF	Type I	86	4
78FF	QL-TNC	90	5
7CFF	QL-ST3E	100	6
10FF	QL-ST3E/EEC2	102	7

Table 4-10. Option 2 - SSM Mapping to QL and clockClass per G.781 and G.8265-1 (Continued)

Option 2 SSM (hex)	Clock QL	PTP clockClass	PQL
22FF	QL-SMC	106	8
30FF	QL-DUS	110	9
Others (or absent)	Invalid	n/a	15

PTP Parameters

Unicast (Telecom-20008 and ITU-G.8265.1)

The “set ptp unicast dynamic” command is used to provision parameters specific to unicast dynamic. See Figure 4-14 for the hierarchy of the “set ptp unicast dynamic” commands. SeeTable 4-13 for descriptions of the Unicast – Dynamic parameters, and Table B-33 for defaults and ranges.

The “set ptp unicast static” command is used to provision parameters specific to unicast static. See Figure 4-15 for the hierarchy of the “set ptp unicast static” commands. See Table 4-14 for descriptions of the Unicast – Static parameters, and Table B-33 for defaults and ranges.

The TP5000 can be configured with both dynamically-allocated and static clients at the same time.

Unicast - Dynamic

The default condition for Unicast negotiate is “Enable”, with a lease duration of 1000 seconds.

Use the following procedure to configure Port 1 of IOC1 for PTP Unicast dynamic clients, with a lease duration of 250 seconds:

1. Login at the Admin or Config-user level.

2. Type `set ptp profile ioc1-1 telecom-2008` and press **Enter**.

3. Type `set ptp unicast dynamic negotiate ioc1-1 enable` and press **Enter**.

4. Type `set ptp unicast dynamic lease-duration ioc1-1 250` and press **Enter**.

Unicast - Static

The default condition for Unicast Static is “Disable”. See Table B-32 for default values for other Unicast Static parameters.

Use the following procedure to configure IOC1, Port 1 for 2 Unicast Static clients:

Client 1: `10.11.11.101,` VLAN ID=10, index=1, Clock ID: 0A:11:22:33:44:55:66:77,
Synchronization interval rate = 16 per second (`sync-int` value = -4) ,
Announce interval rate = 1 per second (`announce-int` value = 0),
Delay interval rate = 8 per second (`delay-int` value = -3)

Client 2: `10.21.21.101,` VLAN ID=20, index=2, Clock ID: 0A:22:33:44:55:66:77:88
Synchronization interval rate = 32 per second (`sync-int` value = -5) ,
Announce interval rate = 1 per second (`announce-int` value = 0),
Delay interval rate = 16 per second (`delay-int` value = -4)

Note: Each VLAN must be configured on a separate subnet. See Provisioning VLAN and the set vlan command for details.

Note: The TP5000 uses the clock ID as a unique identifier for PTP clients and can only allow for one instance of the clock id to be serviced. If a PTP client with a single clock ID requests service using two different IP addresses or VLANs, the TP5000 will use the IP address/VLAN of the latest request.

1. Login at the Admin or Config-user level.
2. Type `set ptp profile ioc1-1 telecom-2008` and press **Enter**.
3. Type `set ptp unicast static address ioc1-1 index 1 10.11.11.101` and press **Enter**.
4. Type `set ptp unicast static vlanid ioc1-1 index 1 add 10` and press **Enter**.
5. Type `set ptp unicast static clockid ioc1-1 index 1 0A:11:22:33:44:55:66:77` and press **Enter**.
6. Type `set ptp unicast static sync-int ioc1-1 index 1 -4` and press **Enter**.
7. Type `set ptp unicast static announce-int ioc1-1 index 1 0` and press **Enter**.
8. Type `set ptp unicast static delay-int ioc1-1 index 1 -3` and press **Enter**.

9. Type `set ptp unicast static state ioc1-1 index 1 enable` and press **Enter**.

10. Type `set ptp unicast static address ioc1-1 add index 2 10.21.21.101` and press **Enter**.

11. Type `set ptp unicast static vlanid ioc1-1 index 2 vlanid 20` and press **Enter**.

12. Type `set ptp unicast static clockid ioc1-1 add index 2 0A:22:33:44:55:66:77:88` and press **Enter**.

13. Type `set ptp unicast static sync-int ioc1-1 index 2 -5` and press **Enter**.

14. Type `set ptp unicast static announce-int ioc1-1 index 2 0` and press **Enter**.

15. Type `set ptp unicast static delay-int ioc1-1 index 2 -4` and press **Enter**.

16. Type `set ptp unicast static state ioc1-1 index 2 enable` and press **Enter**.

Note: If the client is not reachable, the "set ptp unicast static state" command will fail.

Multicast (Default)

The TP5000 grandmaster operates per the multicast communication model, which specifies that each PTP message sent from the grandmaster is capable of being received and processed by all PTP ports on the same PTP communication path. The "set ptp multicast" command is used to provision parameters specific to multicast addressing mode (hybrid or Default profile). See Figure 4-13 for the hierarchy of the "set ptp multicast" commands and Table 4-12 for defaults and ranges.

Note: The TP5000 requires a 1.2 feature license key to unlock the multicast addressing mode feature. Use the show license current command to display the current license.

In multicast mode, there are no client leases or client limits. All delay requests will be responded to. There is no limit applied to the number of delay responses supported, other than the maximum capacity of the Ethernet link and the packet engine.

Note: The TP5000 uses the clock ID as a unique identifier for PTP clients and can only allow for one instance of the clock id to be serviced. If a PTP client with a single clock ID requests service using two different IP addresses or VLANs, the TP5000 will use the IP address/VLAN of the latest request.

In multicast mode, the TP5000 creates a client list by examining the received PTP delay request messages. In order for a client to be reliably added to the client list and not removed, the TP5000 needs to receive several hundred delay request messages during the client timeout period. If delay requests are sent at a slow rate, then the client-timeout value must be increased. Since one-way PTP operation does not use delay request and delay response messages, the client list will not be populated in this mode.

Only one VLAN will be supported in multicast mode.

Use the following procedure to configure Port 1 of IOC1 for multicast addressing mode:

1. Login at the Admin or Config-user level.

2. Type `set ptp profile ioc1-1 default` and press **Enter**.

Multicast-Hybrid (Hybrid)

The Hybrid profile (multicast-hybrid) sends sync and announce messages using multicast, but sends delay request and delay response messages using unicast. This minimizes the amount of network traffic.

The TP5000 will support unicast negotiation for the delay requests. If the client limit is reached, then the unicast negotiation request will be denied.

Note: The TP5000 requires a current license key to unlock the Hybrid (multicast-hybrid) PTP profile feature. Use the show license command to display the current license.

The TP5000 will also support lease-less clients. These clients will operate in multicast-hybrid mode, but will not request a lease via unicast negotiation. To support this, the TP5000 will respond to all delay requests, regardless of whether there is a lease for that client. The “set ptp multicast” command is used to provision parameters specific to the Hybrid PTP profile. See Figure 4-13 for the hierarchy of the “set ptp multicast” commands and Table 4-12 for defaults and ranges.

The TP5000 will automatically learn lease-less clients. When the combined total of clients (unicast-negotiated and lease-less clients) reaches 500, the TP5000 will not grant new leases to unicast negotiation requests but it will respond to all new lease-less clients.

Note: The TP5000 uses the clock ID as a unique identifier for PTP clients and can only allow for one instance of the clock id to be serviced. If a PTP client with a single clock ID requests service using two different IP addresses or VLANs, the TP5000 will use the IP address/VLAN of the latest request.

Only one VLAN will be supported in multicast-hybrid mode. See Provisioning VLAN, on page 302 for details.

Use the following procedure to configure Port 2 of IOC1 for Hybrid (multicast-hybrid) PTP profile:

1. Login at the Admin or Config-user level.

2. Type `set ptp profile ioc1-2 hybrid` and press **Enter**.

Management Addressing Mode

The TP5000 allows user to configure whether management messages are sent to clients via Unicast or Multicast addresses. If the parameter is set to multicast, then all ptp management messages directed to clients will be sent using the PTP multicast IP address. The management addressing mode is independent of the PTP synchronization addressing mode.

Note: The TP5000 requires a current license key to unlock the multicast management addressing mode feature. Use the show license command to display the current license.

Use the “set ptp mgmt-addr-mode IOC1-y { multicast | unicast}” command to configure the TP5000 for multicast or unicast management address mode. The default management address mode is unicast.

Only one VLAN is supported in multicast mode. See Provisioning VLAN, on page 302 for details.

Use the following procedure to configure Port 1 of IOC 1 for unicast management address mode and Port 2 of IOC1 for multicast management addressing mode:

1. Login at the Admin or Config-user level.

2. Type `set ptp mgmt-addr-mode ioc1-1 unicast` and press **Enter**.

3. Type `set ptp mgmt-addr-mode ioc1-2 multicast` and press **Enter**.

Two-Step Clock Mode

A two-step clock includes a follow-up packet after the Sync packet from the grandmaster, as shown in Figure 4-16. Use the “set ptp two-step IOC1-y enable” command to enable the grandmaster for two-step clock mode on the specified port.

> **Note:** The TP5000 requires a current license key to unlock the two-step clock mode feature. Use the show license command to display the current license.

A one-step clock does not include a follow-up packet after the Sync packet from the grandmaster, as shown in Figure 4-17. If two-step clock mode is disabled, the grandmaster uses one-step clock mode.

Two-step clock mode is disabled by default.

Use the following procedure to configure Port 1 of IOC1 for two-step clock mode:

1. Login at the Admin or Config-user level.

2. Type `set ptp two-step ioc1-1 enable` and press **Enter**.

Figure 4-10. Set PTP Command Hierarchy – Common

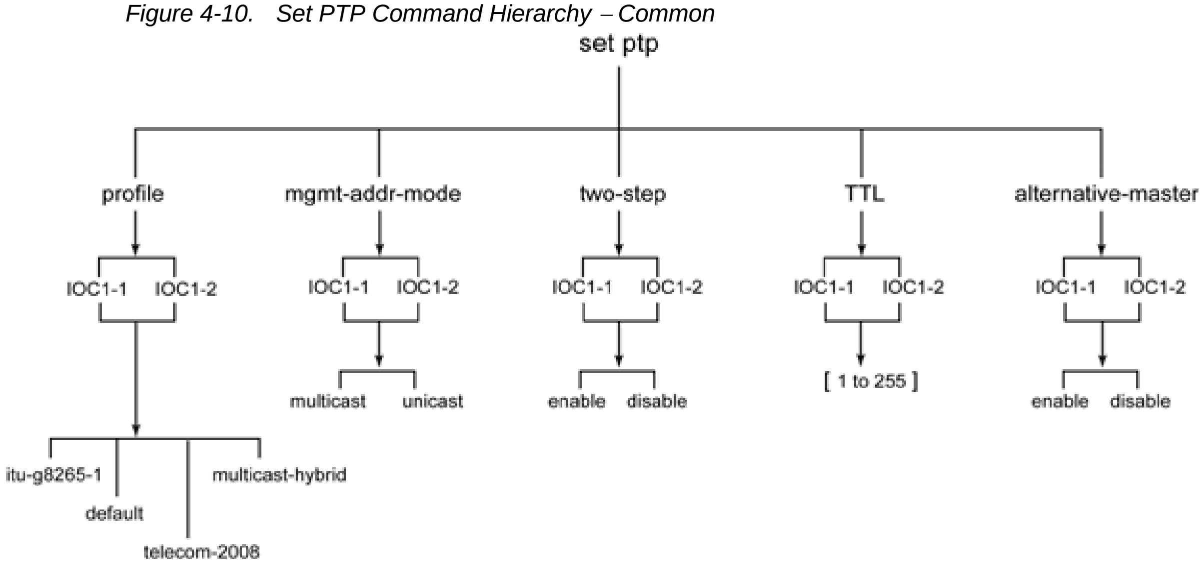


Figure 4-11. Set PTP Command Hierarchy – Common

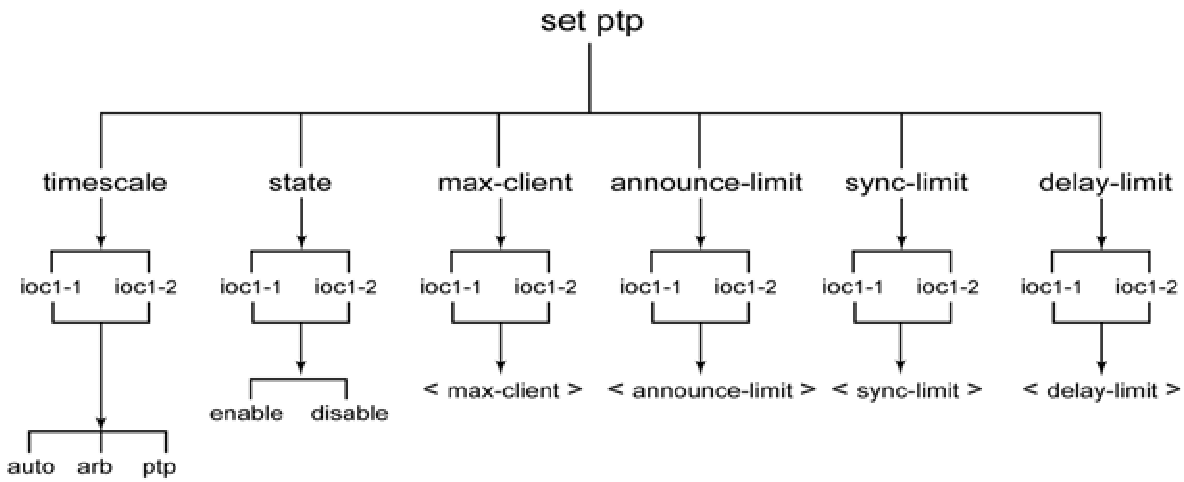


Figure 4-12. Set PTP Command Hierarchy – Common (cont'd)

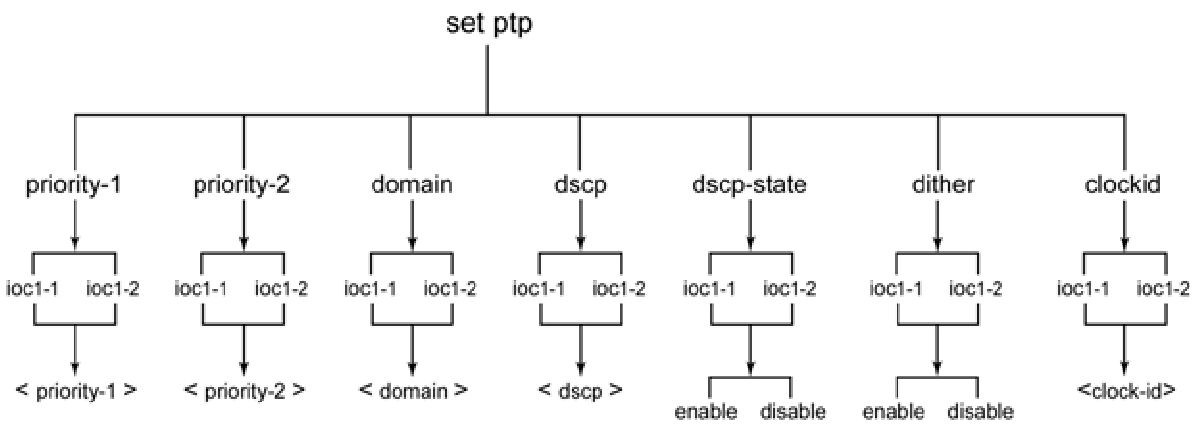


Figure 4-13. Set PTP Multicast Hierarchy

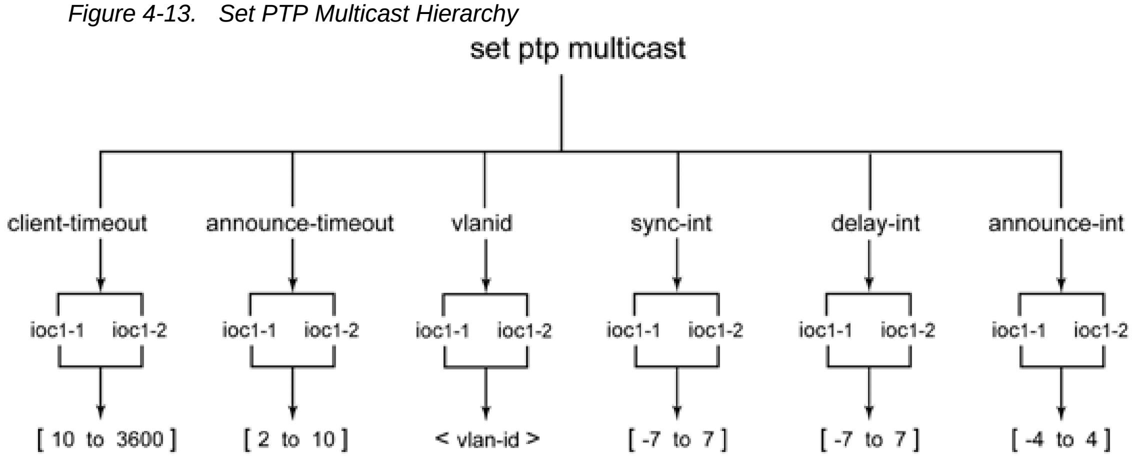


Figure 4-14. Set PTP Command Hierarchy – Unicast Dynamic

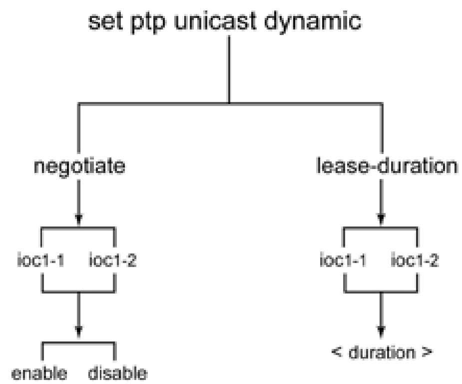


Figure 4-15. Set PTP Command Hierarchy – Unicast Static

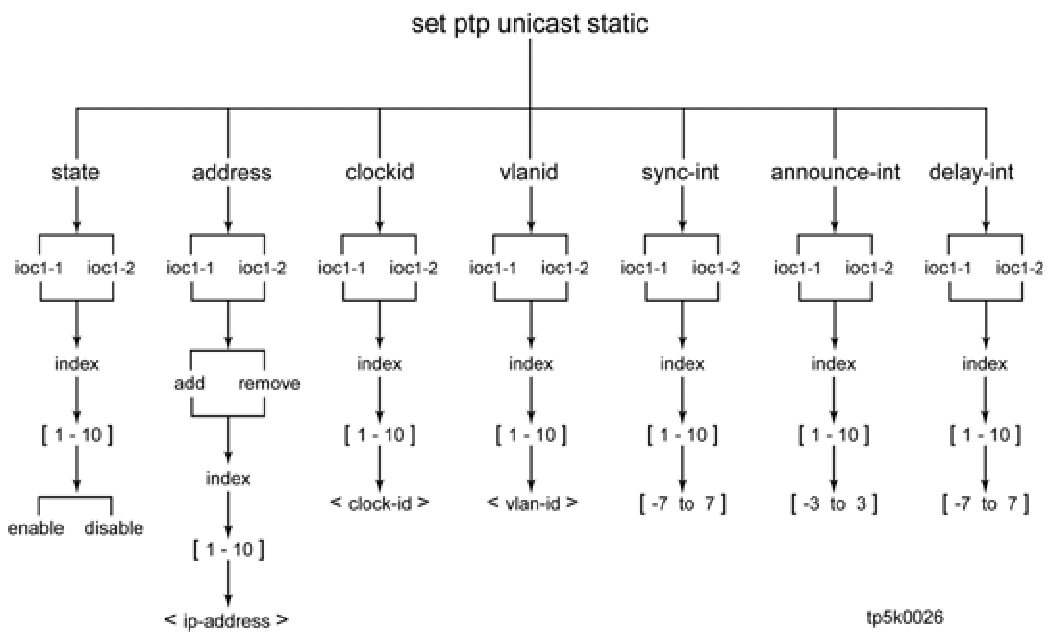


Table 4-11. PTP – Common Parameter Descriptions

Parameter	Description
profile	Use to control whether Grandmaster operates with Default (Multicast), Hybrid (Multicast-hybrid), Telecom-2008 (Unicast), or ITU-G.8265-1 profile for the specified port.
mgmt-addr-mode	Use to control whether PTP management messages should use unicast or multicast. This setting is independent of the addr-mode. For example, management can be set for multicast while PTP synchronization is using unicast. For multicast management, the client must be in the client list.

Table 4-11. PTP – Common Parameter Descriptions (Continued)

Parameter	Description
two-step	Use to enable the grandmaster for two-step clock mode on the specified port. If two-step clock mode is disabled, the grandmaster uses one-step clock mode.
timescale	Use to select the timescale for the selected port. Use the PTP timescale if the Grandmaster has a GPS connection for the clock. Use the ARB timescale if the Grandmaster has an E1 or T1 signal for the clock. Use the AUTO setting (recommended) to have the Grandmaster automatically set the timescale based on the selected clock source, GPS, T1 or E1.
state	Use to enable or disable PTP functionality for the specified port.
ttl	Use to set the IP header Time-to-Live value This field is used to limit how many hops a packet will be transmitted in a network. This is especially useful with multicast.
alternate-master	Use to set the alternate master flag. If the alternate master flag is set, the TP5000 will not run the BMC algorithm and will always be master.
max-client	Sets the maximum number of PTP clients the user chooses to allow for the specified port. The TP5000 has a capacity for up to 500 clients per port.
announce-limit	Use to limit the minimum interval between announcements (maximum rate) from the specified TP5000. This is a way to restrict how network resources will be utilized. The interval is 2^z seconds, where z= <announce-limit-value>.
sync-limit	Use to limit the minimum interval between synchronization messages (maximum rate) from the specified TP5000 port. This is a way to restrict how network resources will be utilized. The interval is 2^z seconds, where z= <sync-limit-value>.
delay-limit	Use to limit the minimum interval between between delay requests for the specified TP5000 port. This is a way to restrict how network resources will be utilized. The interval is 2^z seconds, where z= <delay-limit-value>.

Table 4-11. PTP – Common Parameter Descriptions (Continued)

Parameter	Description
priority-1	Sets the advertised Priority 1 value for the Grandmaster for the specified port. PTP clients use the Best Master Clock (BMC) algorithm to determine which Grandmaster provides the best signal by first comparing Priority 1 values, then dynamic elements from the Grandmasters (such as clock class, accuracy and variance), and then Priority 2 values.
priority-2	Sets the advertised Priority 2 value for the Grandmaster for the specified port. Clients use the Best Master Clock (BMC) algorithm to determine which Grandmaster provides the best signal by first comparing Priority 1 values, then dynamic elements from the Grandmasters (such as clock class, accuracy and variance), and then Priority 2 values.
domain	Sets the domain value for the Grandmaster clock. IEEE-1588-2008 defines a domain as a logical grouping of clocks that synchronize to each other using the protocol, but that are not necessarily synchronized to clocks in another domain.
dscp	The Differentiated Services Code Point is an 6-bit field in the 8-bit Differentiated Services (DS) field of the IP packet header to specify what classes of traffic will be provided, what guarantees are needed for each class, and how much data will be sent for each class. When used with the TP5000, it provides a way to prioritize packets for PTP traffic.
dscp-state	This is to enable or disable the use of DSCP.
dither	This is an advanced feature in which an intentionally applied form of noise is used to randomize quantization error, and thus to break up any undesirable synchronizing effects with the network. With dither enabled, the TP5000 varies the T1 timestamp by a pseudo-random sequence with peak variations of no more than +/- 800 μsec.
clockid	This is the PTP master Clock ID for the specified PTP port. The Clock ID for a PTP port on Symmetricom's TP5000 is typically based on the MAC value for that port, with FF:FE inserted in the middle of the MAC address. This command allows the user to manually set the Clock ID to a desired value. The Clock ID is in the form xx:xx:xx:xx:xx:xx:xx:xx

Table 4-12. PTP – Multicast Addressing Mode Parameter Descriptions

Parameter	Description
client-timeout	Sets the client timeout value. If less than several hundred delay request messages have been received from a client before the specified client timeout value, the Grandmaster removes that client from the client list. If delay requests are sent at a slow rate, then the client-timeout value must be increased. Applies to Default (Multicast) and Hybrid (Multicast-Hybrid) ptp profiles.
announce-timeout	Sets the announce timeout value for Multicast address mode. This should be set to a consistent value in the PTP domain.
vlanid	Sets the VLAN ID for the Grandmaster in Multicast address mode. A VLAN ID of 0 is used to specify that no VLAN is being used. Only one VLAN will be supported in Default (Multicast) and Hybrid PTP profiles.
announce-int	Sets the announce interval for the TP5000 Grandmaster, how often to send announce messages to clients on the specified port. Applies to Default (Multicast) and Hybrid PTP profiles The interval is 2^z seconds, where z= <announce-int-value>.
sync-int	Sets the synchronization interval for the TP5000 Grandmaster, how often to send synchronization messages to clients on the specified port. Applies to Default (Multicast) and Hybrid PTP profiles. The interval is 2^z seconds, where z= <sync-int-value>.
delay-int	Sets the delay interval for the TP5000 Grandmaster, how often to send delay response messages to clients on the specified port. Applies to Default (Multicast) and Hybrid PTP profiles. The interval is 2^z seconds, where z= <delay-int-value>.

Table 4-13. PTP – Unicast Dynamic Addressing Mode Parameter Descriptions

Parameter	Description
negotiate	Use to enable or disable the Grandmaster’s ability to dynamically negotiate with clients for IP addresses in Unicast mode.
lease-duration	Sets the maximum duration of the lease for clients that have dynamically negotiated for IP addresses in Unicast mode.

Table 4-14. PTP – Unicast Static Addressing Mode Parameter Descriptions

Parameter	Description
state	Use to enable or disable Unicast - Static mode on the TP5000 on the specified port.
address	Sets the static IP address for a client for the specified port.
clock-id	Use to enter the clock ID for the specified client.
vlanid	Use to enter the VLAN ID to be used for the specified client on the specified port. The VLAN must configured and enabled in order to use this. (See Provisioning VLAN, on page 302)
sync-int	Sets the synchronization interval for the TP5000 Grandmaster, how often to send synchronization messages (T1) to clients on the specified port. The interval is 2^z seconds, where z= <sync-int-value>.
announce-int	Sets the announce interval for the TP5000 Grandmaster, how often to send announce messages to clients on specified port. The interval is 2^z seconds, where z= <announce-int-value>.
delay-int	Sets the delay interval for the TP5000 Grandmaster, how often to expect to receive delay request messages (T3 - T4) from clients on the specified port. The interval is 2^z seconds, where z= <delay-limit-value>.

Figure 4-16. Two-Step Clock

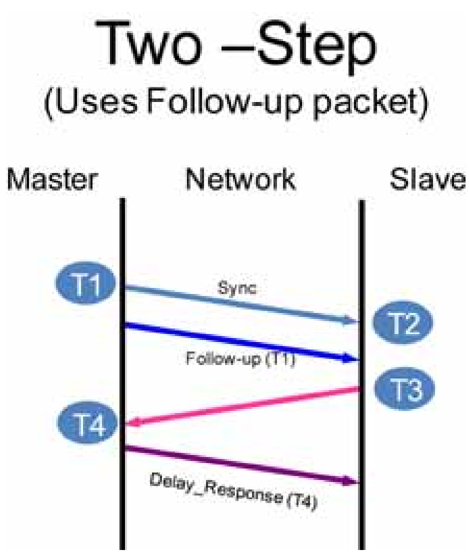
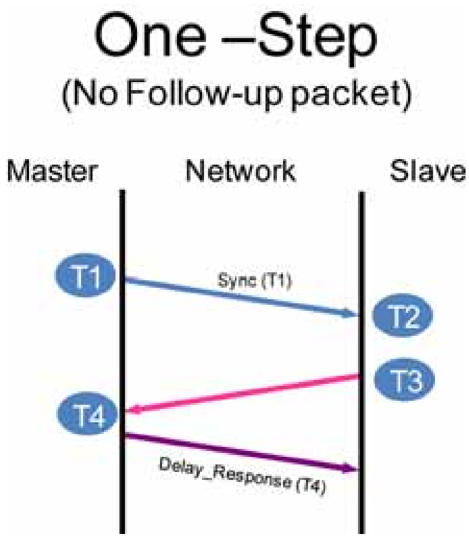


Figure 4-17. One-Step Clock



Provisioning NTP

Each Ethernet port on the TP5000 IOC module can be configured as either a PTP grandmaster or as an NTP server, with PTP grandmaster as the default mode. The exception is for versions that are purchased as dedicated NTP servers.

Use the set packet-service command to configure the IOC port with a packet-service mode of NTP server. See Figure 4-9 for the set packet-service command hierarchy.

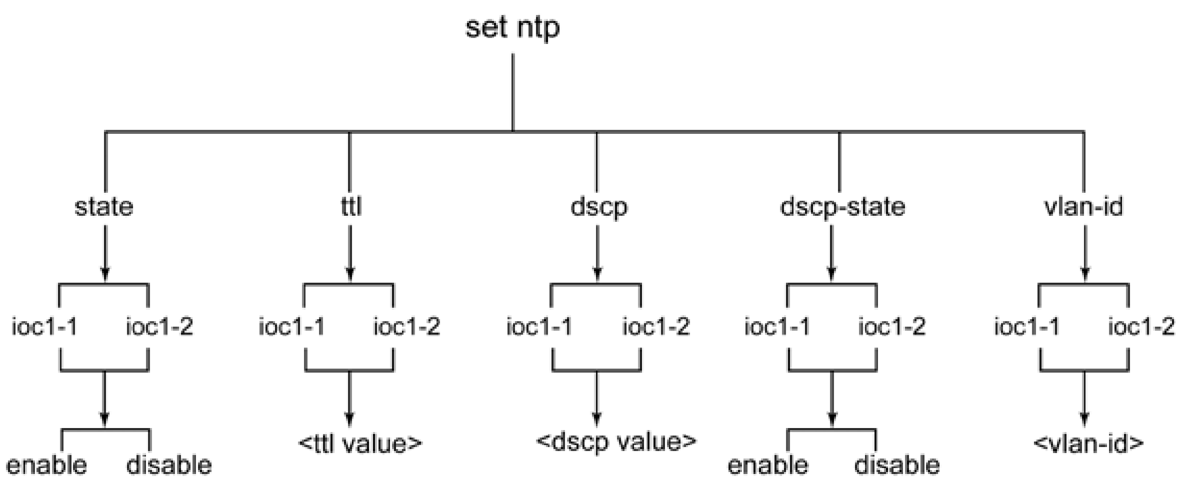
Use the set ntp command to enable NTP on an IOC port and to configure the DSCP and TTL parameters. See Figure 4-18 for the set ntp command hierarchy.

Note: The NTP Server feature can either be ordered in a new system, or added to a previously ordered system as a field upgrade. Field upgrades require a license activation key. Contact your Symmetricom representative for more information.

Note: The IP address for the IOC port is configured with the set ip command whether the port is configured as an NTP server or PTP grandmaster.

Use the command `set packet-service ioc1-x ptp-gm` to return an IOC port to a packet service mode of PTP grandmaster.

Figure 4-18. Set NTP Command Hierarchy



Provisioning an IOC Port as NTP Server

Use the following procedure to configure and enable Port 2 of IOC1 as an NTP server, with DSCP enabled, a DSCP value of 63 and TTL value of 25:

1. Login at the Admin or Config-user level.
2. Type `show ntp config ioc-2` to check current NTP status.
3. Type `set packet-service ioc1-2 ntp-server` and press **Enter**.
4. Type `set ntp dscp-state ioc1-2 enable` and press **Enter**.
5. Type `set ntp dscp ioc1-2 63` and press **Enter**.
6. Type `set ntp ttl ioc1-2 25` and press **Enter**.
7. Type `set ntp state ioc1-2 enable` and press **Enter**.
8. Type `show ntp config ioc-2` to verify the changes.

Provisioning the Input Reference

When operating in normal (locked) mode, the TimeProvider 5000 uses an external reference (such as GPS) to acquire the system's frequency and/or TOD alignment. Table 4-15 shows the configurable parameters for reference selection.

Table 4-15. Configurable Parameters for Reference Selection

Parameter	Value Range	Description/Notes
Reference Mode	■ Time ■ Frequency	Selecting "Time" means some outputs need to track reference time and phase. Selecting "Frequency" means it is not necessary for the outputs to track reference time and phase.
Reference Criteria	■ Priority ■ SSM	See Setting Reference Criteria, on page 327.
Network Option	■ Option I ■ Option II	■ SSM Option 1 is for E1 sync networks, ■ SSM Option 2 is for T1 sync networks. As defined in ITU G.781 and G.8265.1 See Synchronization Status Message (SSM), on page 335 for details about Network SSM Options
Priority (per port)	1 to 16	See Setting Input Priority Values, on page 328
QL (per port)	1 to 9	GNSS and PPS-TOD ports are hardcoded with QL value that correspond to PRC/PRS. See Table 4-16
Reference Port State (per port)	■ Enable ■ Disable	

Setting Reference Mode

The TP 5000 can be in either Time mode or Frequency mode for reference selection. GPS, GNSS and 1PPS+TOD references inputs are time references. The E1 and T1 reference inputs are frequency references.

Time Mode

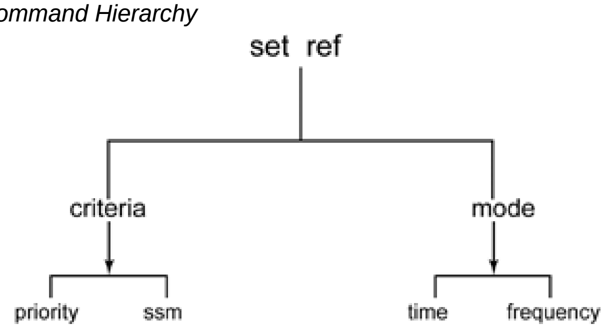
In Time mode with a time reference, the system will track the phase of the input and the system time will be set from the time of the input reference. With a frequency input reference, the system will only track the frequency of the reference.

Frequency Mode

In Frequency mode, the system will track the frequency of the input reference. Any phase or time information from a time reference will not be used in Frequency mode.

Note: The command "`set ref mode time`" has the same meaning as "`set tod-source GPS`" and "`set ref mode frequency`" has the same meaning as "`set tod-source sys`". The set tod-source command is deprecated.

Figure 4-19. Set Ref Command Hierarchy



Example

1. Login at the Admin or Config-user level (see Logging In, on page 277).
2. Type `set ref mode time` and press **Enter**.

Note: The reference criterion MANUAL is no longer supported. Only PRIORITY and SSM are supported for reference selection.

Manual selection of a reference input can be done by disabling all reference input ports except the desired one.

The "set ref override" command is no longer supported.

Setting Reference Criteria

The TP 5000 can use either the Priority settings or the SSM settings for each qualified input port to determine which input port to use as the reference.

Example

1. Login at the Admin or Config-user level (see Logging In, on page 277).
2. Type `set ref criteria priority` and press **Enter**.

Example

1. Type `set ref criteria ssm` and press **Enter**.

Setting Input Priority Values

The TP 5000 uses the Priority settings for each qualified input port to determine which input port to use as the reference. Priority values can be from 1 to 16, where 1 is the highest priority level. If two input ports are set to the same priority value and both are qualified, the predefined preference is used (see Table 4-16). Predefined preference has the same value as the default priority value, but cannot be changed. Reference selection among inputs with the same priority is non-revertive.

In Time mode, time references are selected first, even if a frequency reference has a higher priority setting than the time references. In Time mode, there must be at least one qualified time reference for the system to get out of the warm-up state and into normal track state. If all time references are disabled or disqualified after the system gets to a normal track state, a frequency reference will be used for time holdover.

In Frequency mode, all reference inputs (time reference and frequency reference) are used. The reference selection is based only on priority.

Note: With the 090-50331-04 version of the IMC card, the GNSS port can receive Beidou and GPS satellite RF input. The GNSS track-mode parameter is used to specify the tracking priority for signals to the GNSS port. See Figure 4-21 for details or see set gnss command.

Example

1. Login at the Admin or Config-user level (see Logging In, on page 277).
2. Type `set ref criteria priority` and press **Enter**.
3. Type `set gps priority 1` and press **Enter**.
4. Type `set gnss priority 2` and press **Enter**.
5. Type `set pps-tod priority port1 3` and press **Enter**.
6. Type `set pps-tod priority port2 4` and press **Enter**.
7. Type `set input priority port1 5` and press **Enter**.

8. Type `set input priority port2 6` and press **Enter**.

9. Type `show ref` and press **Enter** to verify that Priority values have been set to the desired values.

Table 4-16. Reference Modes and Priorities

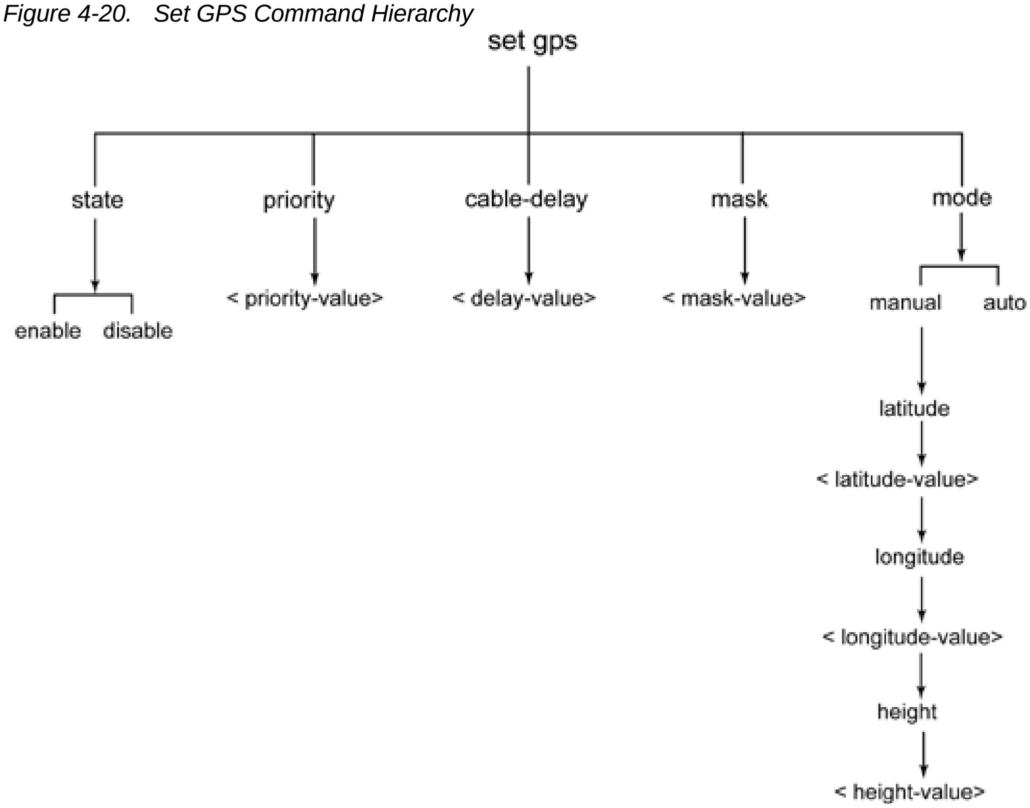
Input Port	Card	Ref. Type	Reference Criteria	Priority (Default)	Predefined Preference	PQL (Default)
GNSS	IMC	Time	Priority	1	1	1
GPS	IMC	Time	Priority	2	2	1
1PPS+TOD – Port 1	I/O	Time	Priority	3	3	1
1PPS+TOD – Port 2	I/O	Time	Priority	4	4	1
E1 / T1 – Port 1	I/O	Frequency	Priority	7	7	3
E1 / T1 – Port 2	I/O	Frequency	Priority	8	8	3

Setting GPS Port as Reference

When the GPS reference is enabled, you can set the satellite position parameters either automatically or manually. The GPS reference input is enabled by default. In manual mode, you must specify the latitude, longitude, and height. You can also specify the elevation mask which filters the satellites used by the system.

Note: Manual mode should not be used unless antenna location has been accurately surveyed. See the set gps command description for for details about setting GPS position parameters manually.

Figure 4-20. Set GPS Command Hierarchy



Example

To provision the TimeProvider 5000 for a GPS reference in auto mode, perform the following steps:

1. Login at the Admin or Config-user level (see Logging In, on page 277).
2. Type `set ref mode time` and press **Enter**.
3. Type `set gps mode auto` and press **Enter**.
4. Type `set gps state enable` and press **Enter**.
5. Type `show ref` and press **Enter** to verify that the reference mode has been set to Time.

Setting GNSS Port as Reference

To provision the TimeProvider 5000 for GNSS, use the `set ref mode time` command to select a Time mode. Use the `set gnss` command to provision the GNSS port state and GNSS parameters.

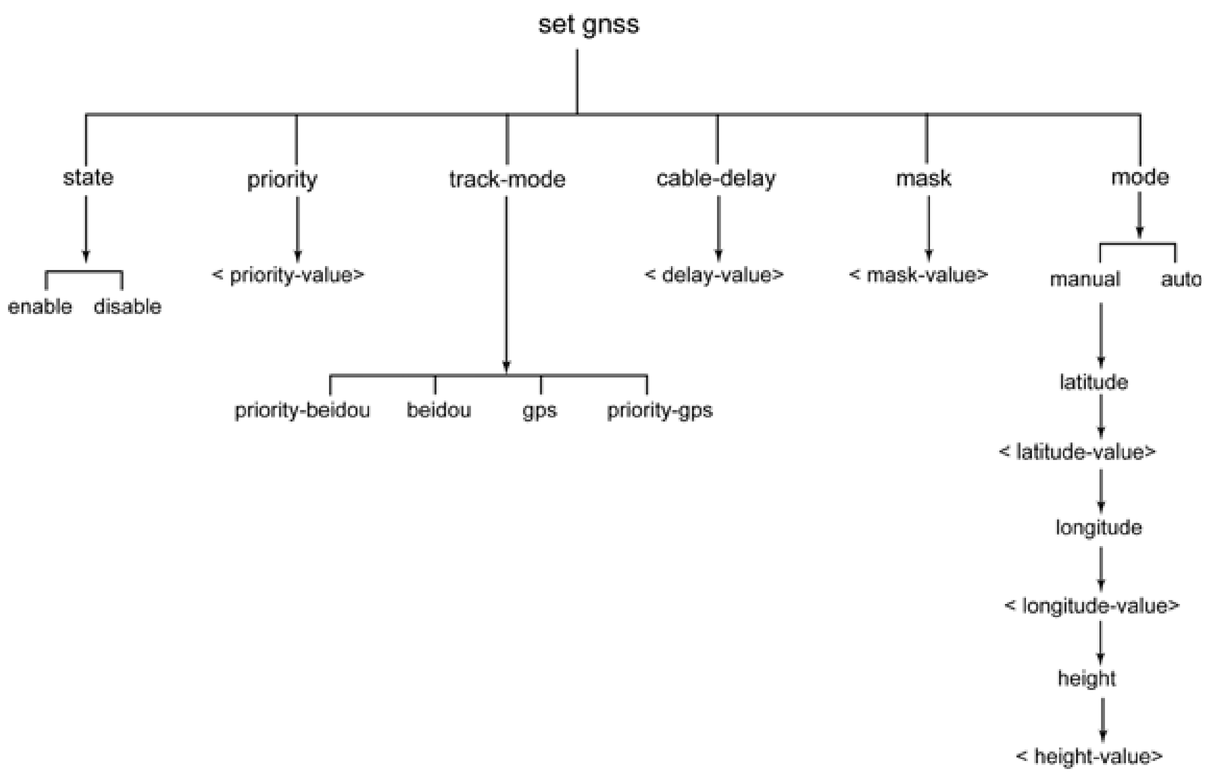
Note: Manual mode should not be used unless antenna location has been accurately surveyed. See the set gnss command description for for details about setting GNSS position parameters manually.

Track-Mode

The Priority setting for GNSS is for the GNSS port itself. However, the GNSS port for the 090-50331-04 can receive Beidou and GPS satellite RF inputs. (Future implementations of the IMC card may support RF inputs from other satellites.) The GNSS track-mode parameter is used to specify the tracking priority for the GNSS port.

- GPS: Only checks for qualified GPS on this port
- Beidou: Only checks for qualified Beidou on this port
- Priority-beidou: Checks for qualified Beidou signal before checking for GPS
- Priority-gps : Checks for qualified GPS signal before checking for Beidou

Figure 4-21. Set GNSS Command Hierarchy



Example

To provision the TimeProvider 5000 for a GNSS reference in auto mode, with a track-mode of Priority-beidou, perform the following steps:

1. Login at the Admin or Config-user level (see Logging In, on page 277).
2. Type `set ref mode time` and press **Enter**.
3. Type `set gnss mode auto` and press **Enter**.
4. Type `set gnss track-mode priority-beidou` and press **Enter**.
5. Type `set gnss state enable` and press **Enter**.
6. Type `show ref` and press **Enter** to verify that the reference mode has been set to Time.

Setting a 1PPS+TOD Input as Reference

Ports 1 and 2 on the 090-50315-01 version of the I/O module are 1PPS+TOD inputs. Use the following procedure to set these ports as reference inputs and to enable the inputs.

Note: Disabling the input port will clear all alarms and events related to this port.

Example

To provision the TimeProvider 5000 for a 1PPS+TOD input reference, perform the following steps:

1. Login at the Admin or Config-user level.
2. Type `set ref mode time` and press **Enter**

Note: Command "`set ref mode time`" has the same meaning as "`set tod-source GPS`" and "`set ref mode frequency`" has the same meaning as "`set tod-source sys`". The set tod-source command has been deprecated.

3. Type `set pps-tod state port1 enable` and press **Enter**.
4. Type `set pps-tod state port2 enable` and press **Enter**.
5. Type `show ref` and press **Enter** to verify that the reference mode has been set to Time.

Setting an E1/T1 Input as Reference

An E1 or T1 input can be configured as a frequency reference. For details about configuring the E1 or T1 input parameters, see Provisioning the Programmable E1/T1 Inputs, on page 334.

Example

To provision I/O ports 1 and 2 as inputs and use either as the reference, perform the following steps:

1. Login at the Admin or Config-user level (see Logging In, on page 277).

2. Type `set ref mode frequency` and press **Enter**.

Note: Command "`set ref mode time`" has the same meaning as "`set tod-source GPS`" and the command "`set ref mode frequency`" has the same meaning as "`set tod-source sys`". The set tod-source command has been deprecated.

---

3. Type `set ref criteria priority` and press **Enter**.

Note: The reference criterion MANUAL is no longer supported. Only PRIORITY and SSM are supported for reference selection.

Manual selection of a reference input can be done by disabling all reference input ports except the desired one.

The "set ref override" command is no longer supported.

---

4. Type `set io port1 input` and press **Enter**.

5. Type `set io port2 input` and press **Enter**.

6. Type `set input state port1 enable` and press **Enter**.

Note: Enabling the input state for a programmable I/O port with the "set input state" command will also set that port as an input port and set the output state for that port to Disable.

---

7. Type `set input state port2 enable` and press **Enter**.

8. Type `show ref` and press **Enter** to verify that the reference mode has been set to Frequency..

Note: Disabling the input port will clear all alarms and events related to this port.

Provisioning the Programmable E1/T1 Inputs

Two I/O ports on the I/O module (versions 090-50311-01, 090-50312-01, and 090-50315-01), Port1 and Port 2, are software configurable as E1 inputs. Two RJ-48 I/O ports on the I/O module (p/n 090-50314-01), Port1 and Port 2, are software configurable as T1 inputs. The "set io" command is used to set Ports 1 and 2 as inputs. See Figure 4-22. The "set input" command is used to provision the ports as E1 or T1 inputs. See Figure 4-23.

Figure 4-22. Set IO Command Hierarchy

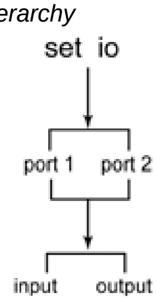
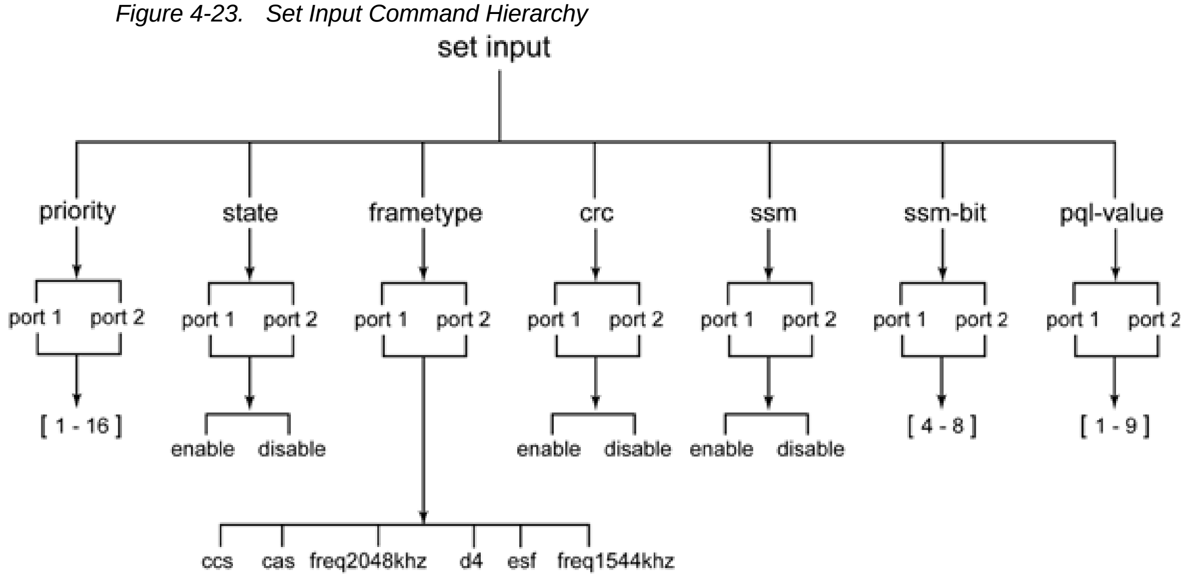


Figure 4-23. Set Input Command Hierarchy



Synchronization Status Message (SSM)

Synchronization Status Message (SSM) is a means by which elements in a synchronization network can communicate the traceability of their sync quality level. SSM is only supported for the frametypes ESF, CAS with CRC4 and CCS with CRC4. SSM should not be enabled for other input frame types. The messages will be decoded and used for reference input qualification if SSM is enabled for the input port.

If SSM is enabled for an input port and the frametype does not support SSM or is not sending a valid SSM, then the input will be disqualified and the input SSM-value will be set to 15 (invalid). If there is not another qualified reference to switch to, the system will go to holdover. See Table 4-17 for examples.

- If input SSM for a port has a worse quality level than the IOC oscillator - Type II for Rb IOC and Type 1 for Quartz IOC -the input port will be disqualified
- If SSM is enabled for an input port and the signal does not support SSM or is not sending a valid SSM, then the input will be disqualified. The SSM-value for the input will be set to 15 (invalid). If there is not another qualified reference to switch to, the system will go to holdover.
- If any of the following conditions are detected at an input port, that input signal will be disqualified: Loss of signal (LOS), Out-of-framing (OOF), or Alarm indication signal (AIS)

Table 4-17 illustrates some example situations. The Output PQL values shown assume that no other references are available

Table 4-17. Input Frametypes: SSM-States and SSM-values

Selected Input Signal	SSM State		Current PQL value	Disqualify Signal Based on SSM?	Output PQL value
1544kHz	Disable		User-value	Allow	User-value
	Enable		15	Disqualify	OSC (holdover)
D4	Disable		User-value	Allow	User-value
	Enable		15	Disqualify	OSC (holdover)
ESF	Disable		User-value	Allow	User-value
	Enable	with valid SSM	Input SSM	Allow	Input SSM
		with no SSM	15	Disqualify	OSC (holdover)
		with unsupported SSM code	15	Disqualify	OSC (holdover)
		with STU code	2 (STU)	Allow	2 (STU)
		with DUS code	9 (DUS)	Disqualify	OSC (holdover)

PQL-Value

The “PQL value” parameter that is used with the “set input” command corresponds to the Priority Quality Level (PQL) values for reference input signal types, as shown in Table 4-18. The PQL is a representation of traceability for the signal presented at the input ports, where a PQL value of 15 represents an invalid SSM. If SSM is disabled for an input port, then the TP5000 will use the user-assigned PQL value for that input port.

Note: SSM during bridging will be the last SSM value of input reference while clock was in normal lock state.

SSM Bit

The SSM bit indicates which bit of the framing signal carries the SSM.

Note: The SSM bit is not applicable to T1 signals. The TP5000 will allow the user to set the SSM bit parameter for T1 signals, but it will have no effect.

Table 4-18. Priority Quality Levels

Priority Quality Level (PQL)	DS1 (T1) SSM	E1 SSM	Description
1	0x04	0x02	Stratum 1/PRS/PRC
2	0x08	0x00	STU, Stratum Unknown (presumed ST1)
3	0x0C	0x04	Stratum 2/Type II
4	0x0C	0x04	Type I
5	0x78	0x04	Transit Node/Type V
6	0x7C	0x08	Type III/Stratum 3E
7	0x10	0x0B	Type IV/Stratum 3
8	0x22	0x0F	G.813OPT3/SMC
9	0x30	0x0F	DUS, Do not Use for Sync
15	---	---	Did not receive valid SSM

CRC State

CRC is a cyclic redundancy checking protocol which is applicable for E1 signals. CRC must be enabled for the input port in order to use SSM with the CAS or CCS framing types for that port.

Note: CRC is not applicable to T1 signals. The TP5000 will allow the user to enable CRC for an input port configured for T1, but it will have no effect.

Provisioning E1 Inputs

Use the following procedures to provision Port 1 or 2 as an E1 input.

Note: Disabling the input port will clear all alarms and events related to this port.

2048kHz Frame Type

To provision Port 1 as an input port with a frametype of 2048kHz, CRC disabled, SSM disabled, a PQL-value of 3, a Priority value of 1, and to enable the port:

1. Login at the Admin or Config-user level.
2. Type `set io port1 input` and press **Enter**.
3. Type `set input frametype port1 freq2048khz` and press **Enter**.
4. Type `set input crc port1 disable` and press **Enter**.
5. Type `set input ssm port1 disable` and press **Enter**.
6. Type `set input pql-value port1 3` and press **Enter**.
7. Type `set input priority port1 1` and press **Enter**.
8. Type `set input state port1 enable` and press **Enter**.

Note: Enabling the input state for a programmable I/O port with the "set input state" command will now also set that port as an input port and set the output state for that port to Disable.

CCS Frame Type

To provision Port 2 as an input port with a frametype of CCS, with CRC enabled, SSM enabled, SSM-bit of 8, Priority value of 2, and enable the port:

1. Login at the Admin or Config-user level.
2. Type `set io port2 input` and press **Enter**.
3. Type `set input frametype port2 ccs` and press **Enter**.
4. Type `set input crc port2 enable` and press **Enter**.
5. Type `set input ssm port2 enable` and press **Enter**.
6. Type `set input ssm-bit port2 8` and press **Enter**.
7. Type `set input priority port2 2` and press **Enter**.

8. Type `set input state port2 enable` and press **Enter**.

> **Note:** Enabling the input state for a programmable I/O port with the "set input state" command will now also set that port as an input port and set the output state for that port to Disable.

CAS Frame Type

To provision Port 2 as an input port with a frametype of CAS, with CRC enabled, SSM enabled, SSM-bit of 7, Priority value of 1, and enable the port:

1. Login at the Admin or Config-user level.
2. Type `set io port2 input` and press **Enter**.
3. Type `set input frametype port2 cas` and press **Enter**.
4. Type `set input crc port2 enable` and press **Enter**.
5. Type `set input ssm port2 enable` and press **Enter**.
6. Type `set input ssm-bit port2 7` and press **Enter**.
7. Type `set input priority port2 1` and press **Enter**.
8. Type `set input state port2 enable` and press **Enter**.

Provisioning T1 Inputs

Use the following procedures to provision I/O-1 or I/O-2 (RJ-48 ports) as a T1 input (applies only to I/O module 090-50314-01).

> **Note:** Disabling the input port will clear all alarms and events related to this port.

> **Note:** The T1 ports on the 090-50314-01 version of the I/O module can also be configured as E1 and 2048 kHz inputs or outputs which meet the G.703 mask for impedance of 120 ohms, balanced.

1544kHz Frame Type

To provision Port 1 as an input port with a frametype of 1544kHz, SSM disabled, a Priority value of 1, and to enable the port:

1. Login at the Admin or Config-user level.
2. Type `set io port1 input` and press **Enter**.
3. Type `set input frametype port1 freq1544khz` and press **Enter**.
4. Type `set input ssm port1 disable` and press **Enter**.
5. Type `set input priority port1 1` and press **Enter**.
6. Type `set input state port1 enable` and press **Enter**.

Note: Enabling the input state for a programmable I/O port with the "set input state" command will now also set that port as an input port and set the output state for that port to Disable.

D4 Frame Type

To provision Port 2 as an input port with a frametype of D4, SSM disabled, a Priority value of 2, and to enable the port:

1. Login at the Admin or Config-user level.
2. Type `set io port2 input` and press **Enter**.
3. Type `set input frametype port2 d4` and press **Enter**.
4. Type `set input ssm port2 disable` and press **Enter**.
5. Type `set input priority port2 2` and press **Enter**.
6. Type `set input state port2 enable` and press **Enter**.

ESF Frame Type

To provision Port 2 as an input port with a frametype of ESF, SSM enabled, Priority value of 1, and to enable the port:

1. Login at the Admin or Config-user level.
2. Type `set io port2 input` and press **Enter**.

3. Type `set input frametype port2 esf` and press **Enter**.
4. Type `set input ssm port2 enable` and press **Enter**.
5. Type `set input priority port2 1` and press **Enter**.
6. Type `set input state port2 enable` and press **Enter**.

Provisioning the 1PPS+TOD Inputs

Ports 1 and 2 on the 090-50315-01 version of the I/O module are 1PPS+TOD inputs.

Note: Disabling the input port will clear all alarms and events related to this port.

Use the following procedure to set the priority value for these ports, set the cable delay value, and to enable the inputs (Priority=5, cable delay=2500 ns in this example).

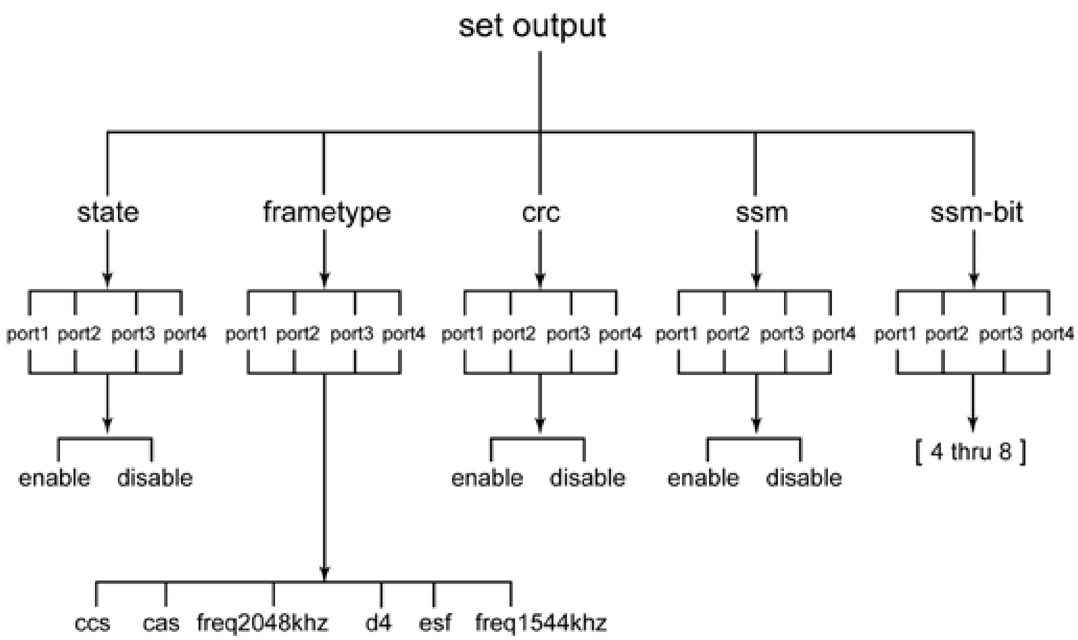
1. Login at the Admin or Config-user level.
2. Type `set pps-tod priority port1 5` and press **Enter**.
3. Type `set pps-tod cable-delay port1 2500` and press **Enter**.
4. Type `set pps-tod state port1 enable` and press **Enter**.

Provisioning the Programmable E1/T1 Outputs

Two I/O ports on versions 090-50311-01, 090-50312-01, and 090-50315-01 of the I/O module, Port1 and Port 2, are software configurable as E1 outputs. Two I/O ports on version 090-50314-01 of the I/O module, Port1 (I/O-1) and Port 2 (I/O-2), are software configurable as T1 outputs. The “set io” command is used to set Ports 1 and 2 as outputs. See Figure 4-22. The “set output” command is used to provision the E1 output characteristics. See Figure 4-24.

Note: Enabling the output state for a programmable I/O port with the “Set Output state” command will also set that port as an output port and set the input state for that port to Disable.

Figure 4-24. Set Output Command Hierarchy



Note: SSM is only supported for the frametypes ESF, CAS with CRC4 and CCS with CRC4. SSM should not be enabled for other output frame types

If the output frame type supports SSM and SSM is enabled for the output port, then the output signal will contain the system SSM value. Table 4-19 shows the output SSM value based on the clock state of the TP5000.

Table 4-19. Output SSM-value vs. Clock State

Clock State	Output SSM-value
Warm-up	PQL=9 - Do not use for Sync (DUS)
Free-run	PQL of oscillator
Fast-lock	PQL of oscillator
Normal	PQL of reference
Bridging	Last PQL of reference
Holdover	PQL of oscillator

2048kHz Frame Type

To provision Port 1 as an output port with a frametype of 2048kHz, CRC disabled, SSM disabled, and to enable the port:

1. Login at the Admin or Config-user level.
2. Type `set io port1 output` and press **Enter**.
3. Type `set output frametype port1 freq2048khz` and press **Enter**.
4. Type `set output crc port1 disable` and press **Enter**.
5. Type `set output ssm port1 disable` and press **Enter**.
6. Type `set output state port1 enable` and press **Enter**.

Note: Enabling the output state for a programmable I/O port with the "Set Output state" command will also set that port as an output port and set the input state for that port to Disable.

CCS Frame Type

To provision Port 2 as an output port with a frametype of CCS, CRC enabled, SSM enabled, SSM-bit of 4, and to enable the port:

1. Login at the Admin or Config-user level.
2. Type `set io port2 output` and press **Enter**.
3. Type `set output frametype port2 ccs` and press **Enter**.
4. Type `set output crc port2 enable` and press **Enter**.
5. Type `set output ssm port2 enable` and press **Enter**.
6. Type `set output ssm-bit port2 4` and press **Enter**.
7. Type `set output state port2 enable` and press **Enter**.

Note: Enabling the output state for a programmable I/O port with the "Set Output state" command will also set that port as an output port and set the input state for that port to Disable.

CAS Frame Type

To provision Port 1 as an output port with a frametype of CAS, CRC enabled, SSM-bit of 4, and to enable the port:

1. Login at the Admin or Config-user level.
2. Type `set io port1 output` and press **Enter**.
3. Type `set output frametype port1 cas` and press **Enter**.
4. Type `set output crc port1 enable` and press **Enter**.
5. Type `set output ssm port1 enable` and press **Enter**.
6. Type `set output ssm-bit port1 5` and press **Enter**.
7. Type `set output state port1 enable` and press **Enter**.

Provisioning T1 Outputs

Use the following procedures to provision I/O-1 or I/O-2 (RJ-48 ports) as a T1 output.

Note: The T1 ports on the 090-50314-01 version of the I/O module can also be configured as E1 and 2048 kHz inputs or outputs which meet the G.703 mask for impedance of 120 ohms, balanced.

1544kHz Frame Type

To provision Port 1 as an output port with a frametype of 1544kHz, SSM disabled, and to enable the port:

1. Login at the Admin or Config-user level.
2. Type `set io port1 output` and press **Enter**.
3. Type `set output frametype port1 freq1544khz` and press **Enter**.
4. Type `set output ssm port1 disable` and press **Enter**.
5. Type `set output state port1 enable` and press **Enter**.

Note: Enabling the output state for a programmable I/O port with the "Set Output state" command will also set that port as an output port and set the input state for that port to Disable.

D4 Frame Type

To provision Port 2 as an output port with a frametype of D4, SSM disabled, and to enable the port:

1. Login at the Admin or Config-user level.
2. Type `set io port2 output` and press **Enter**.
3. Type `set output frametype port2 d4` and press **Enter**.
4. Type `set output ssm port2 disable` and press **Enter**.
5. Type `set output state port2 enable` and press **Enter**.

ESF Frame Type

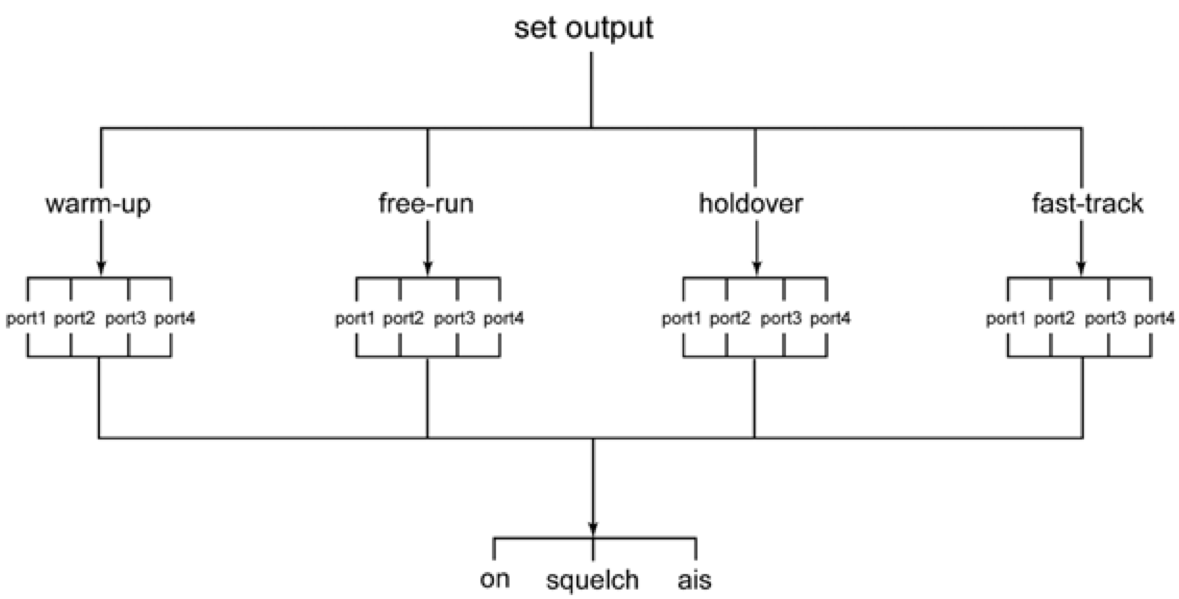
To provision Port 2 as an output port with a frametype of ESF, SSM enabled, SSM-bit of 6, and to enable the port:

1. Login at the Admin or Config-user level.
2. Type `set io port2 output` and press **Enter**.
3. Type `set output frametype port2 esf` and press **Enter**.
4. Type `set output ssm port2 enable` and press **Enter**.
5. Type `set output ssm-bit port2 6` and press **Enter**.
6. Type `set output state port2 enable` and press **Enter**.

Provisioning Output Generation Behavior

The behavior of the output ports during warm-up, free-run, and holdover states can be provisioned using the “set output warm-up”, “set output free-run”, and “set output holdover” commands, as shown in Figure 4-25.

Figure 4-25. Output Generation Behavior Commands



Example:

To provision the port 1 output behavior as squelch for the warm-up state, AIS for the free-run state, and AIS for the holdover state:

1. Login at the Admin or Config-user level.
2. Type `set output warm-up port1 squelch` and press **Enter**.
3. Type `set output free-run port1 ais` and press **Enter**.
4. Type `set output holdover port1 ais` and press **Enter**.
5. Type `set output fast-track port1 ais` and press **Enter**.

Note: For the 090-50312-01 and 090-50314-01 versions of the IOC card, Port 3 and Port 4 are configured as dedicated 1PPS and 10 MHz output ports, respectively. Use the "set output-10m" (Figure 4-24) and "set output-pps"(Figure 4-24) commands to provision the output generation behavior for Port 3 and Port 4 for these versions of the IOC card.

Provisioning the Dedicated Outputs

Provisioning E1 Outputs

Port 3 and Port 4, the two dedicated output ports on the 090-50311-01 version of the I/O module, must be provisioned for the type of output signal. The "set output" command is used to provision the dedicated E1 output characteristics. See Figure 4-24.

Note: Units that provide dedicated E1 outputs must be ordered from the factory; they cannot be reconfigured in the field.

Note: SSM is only supported for the frametypes ESF, CAS with CRC4 and CCS with CRC4. SSM should not be enabled for other output frame types

2048kHz Frame Type

To provision the dedicated output Port 3 for a frametype of 2048kHz, CRC disabled, SSM disabled, and to enable the port:

1. Login at the Admin or Config-user level.
2. Type `set output frametype port3 freq2048khz` and press **Enter**.

3. Type `set output crc port3 disable` and press **Enter**.
4. Type `set output ssm port3 disable` and press **Enter**.
5. Type `set output state port3 enable` and press **Enter**.

CCS Frame Type

To provision output Port 4 with a frametype of CCS, CRC enabled, SSM enabled, SSM-bit of 6, and to enable the port:

1. Login at the Admin or Config-user level.
2. Type `set output frametype port4 ccs` and press **Enter**.
3. Type `set output crc port4 enable` and press **Enter**.
4. Type `set output ssm port4 enable` and press **Enter**.
5. Type `set output ssm-bit port4 6` and press **Enter**.
6. Type `set output state port4 enable` and press **Enter**.

CAS Frame Type

To provision output Port 4 with a frametype of CAS, CRC enabled, SSM-bit of 8, and to enable the port:

1. Login at the Admin or Config-user level.
2. Type `set output frametype port4 cas` and press **Enter**.
3. Type `set output crc port4 enable` and press **Enter**.
4. Type `set output ssm port4 enable` and press **Enter**.
5. Type `set output ssm-bit port4 8` and press **Enter**.
6. Type `set output state port4 enable` and press **Enter**.

Provisioning Output Generation Behavior

The behavior of the dedicated output ports during warm-up, free-run, fast-track and holdover states can be provisioned using the “set output warm-up”, “set output free-run”, “set output fast-track” and “set output holdover” commands, as shown in Figure 4-25.

1. Login at the Admin or Config-user level.
2. Type `set output warm-up port4 squelch` and press **Enter**.
3. Type `set output free-run port4 on` and press **Enter**.
4. Type `set output holdover port4 on` and press **Enter**.
5. Type `set output fast-track port4 squelch` and press **Enter**.

Provisioning the 10MHz & 1PPS Outputs

The I/O module is also available with 1PPS and 10MHz dedicated output ports (p/n 090-50312-01 and 090-50314-01) rather than the dedicated E1 output ports (p/n 090-50311-01). The `set output-pps` command is used to provision the 1 PPS output. See Figure 4-26. The `set output-10m` command is used to provision the 10MHz output. See Figure 4-27. These commands can also be used to provision the behavior of the 10 MHz and 1PPS output ports during warm-up, free-run, and holdover states,

Note: Units that provide 1PPS and 10MHz outputs must be ordered from the factory; they cannot be reconfigured in the field. Port 3 provides 1PPS output and Port 4 provides 10 MHz output.

Figure 4-26. Set Output-PPS Commands

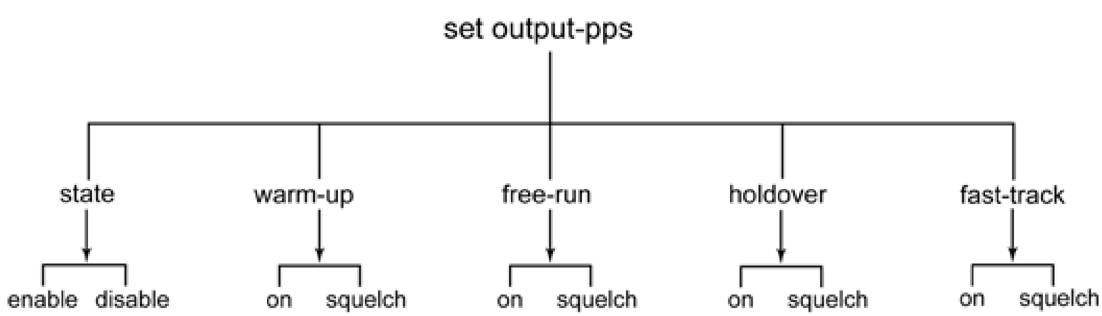
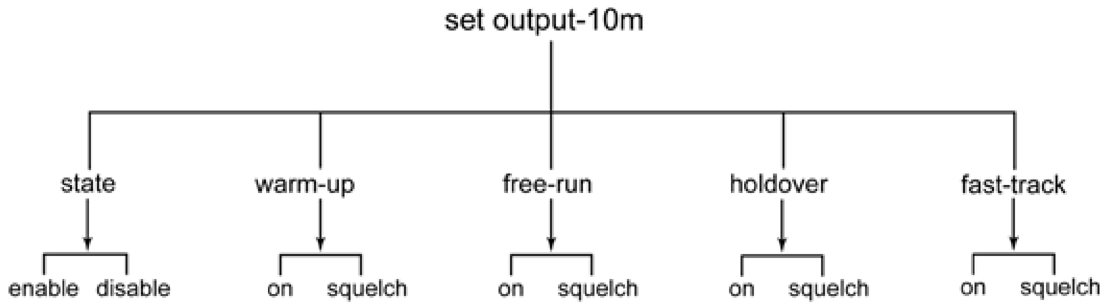


Figure 4-27. Set Output-10M Commands



Provisioning 1PPS Port

To enable the 1PPS output port and provision its output behavior as Squelch for the warm-up state, On for the free-run state, and On for the holdover state, use the following procedure:

1. Login at the Admin or Config-user level.
2. Type `set output-pps warm-up squelch` and press **Enter**.
3. Type `set output-pps free-run on` and press **Enter**.
4. Type `set output-pps holdover on` and press **Enter**.
5. Type `set output-pps fast-track squelch` and press **Enter**.
6. Type `set output-pps state enable` and press **Enter**.

Provisioning 10 MHz Port

To enable the 10 MHz output port and provision its output behavior as Squelch for the warm-up state, on for the free-run state, and Squelch for the holdover state, use the following procedure:

1. Login at the Admin or Config-user level.
2. Type `set output-10m warm-up squelch` and press **Enter**.
3. Type `set output-10m free-run on` and press **Enter**.
4. Type `set output-10m holdover squelch` and press **Enter**.
5. Type `set output-10m fast-track squelch` and press **Enter**.
6. Type `set output-10m state enable` and press **Enter**.

Provisioning TP 5000 for Expansion Shelf

Verify that the TP 5000 and expansion are connected as shown in Figure 2-21.

It is critical that each expansion shelf be configured with a unique shelf ID (0-9) using the rotary switch on its front panel.

The following actions are required to provision the TP 5000 to support the operation of expansion shelves:

- Enable ETH on TP 5000 IMC module's DTI / ETH connector to allow communication with the expansion shelves
- Enable DTI on the IMC module
- Enable DTI on the I/O module

Verify Expansion Configuration

Symmetricom recommends that users verify the configuration of the DTI / ETH ports before provisioning.

1. Login at the Admin, Config, or User level.
2. Type `show exp-if config imc` and press **Enter**.
3. Type `show exp-if config io` and press **Enter**.
4. Type `show exp-if config exp0` and press **Enter**.

Provisioning DTI / Ethernet Port on IMC Card

To Enable

To enable DTI and Ethernet on the IMC module, use the following procedure.

1. Login at the Admin or Config-user level.
2. Type `set exp-if eth imc-exp state enable` and press **Enter**.
3. Type `set exp-if dti imc-exp enable` and press **Enter**.

To Disable

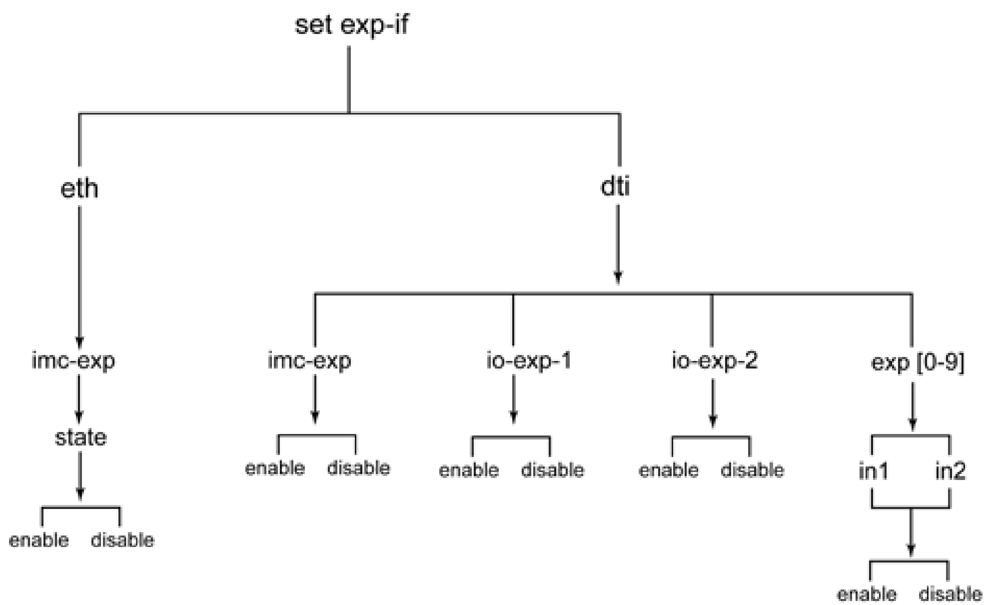
If there are no expansion shelves being used with the TP5000, Symmetricom recommends that the Ethernet port of the exp-if interface be disabled. The DTI port of this interface can also be disabled, however, it is not necessary to do so. Use the following procedure to disable the Ethernet and DTI ports of the exp-if interface on the IMC card.

1. Login at the Admin or Config-user level.
2. Type `set exp-if eth imc-exp state disable` and press **Enter**.
3. Type `set exp-if dti imc-exp disable` and press **Enter**.

Provisioning DTI Ports on IO Card

1. Login at the Admin or Config-user level.
2. Type `set exp-if dti io-exp-1 enable` and press **Enter**.
3. Type `set exp-if dti io-exp-2 enable` and press **Enter**.

Figure 4-28. DTI / Ethernet Port Command Hierarchy



Provisioning Expansion Shelf E1 / 1PPS+TOD Outputs

The following actions are required to provision an expansion shelf:

- Enable DTI for each expansion shelf
- Provision output signals for each expansion shelf
- Enable state(s) of output(s)

Provisioning DTI for an Expansion Shelf

1. Login at the Admin or Config-user level.
2. Type `set exp-if dti exp0 in1 enable` and press **Enter**.
3. Type `set exp-if dti exp0 in2 enable` and press **Enter**.

Provisioning E1 Output Signals for Expansion Shelf

The TP E30 expansion shelf supports three frame types for the E1 outputs: freq2048khz, CCS and CAS. The following parameters can also be configured:

- CRC
- SSM
- SSM-bit
- State

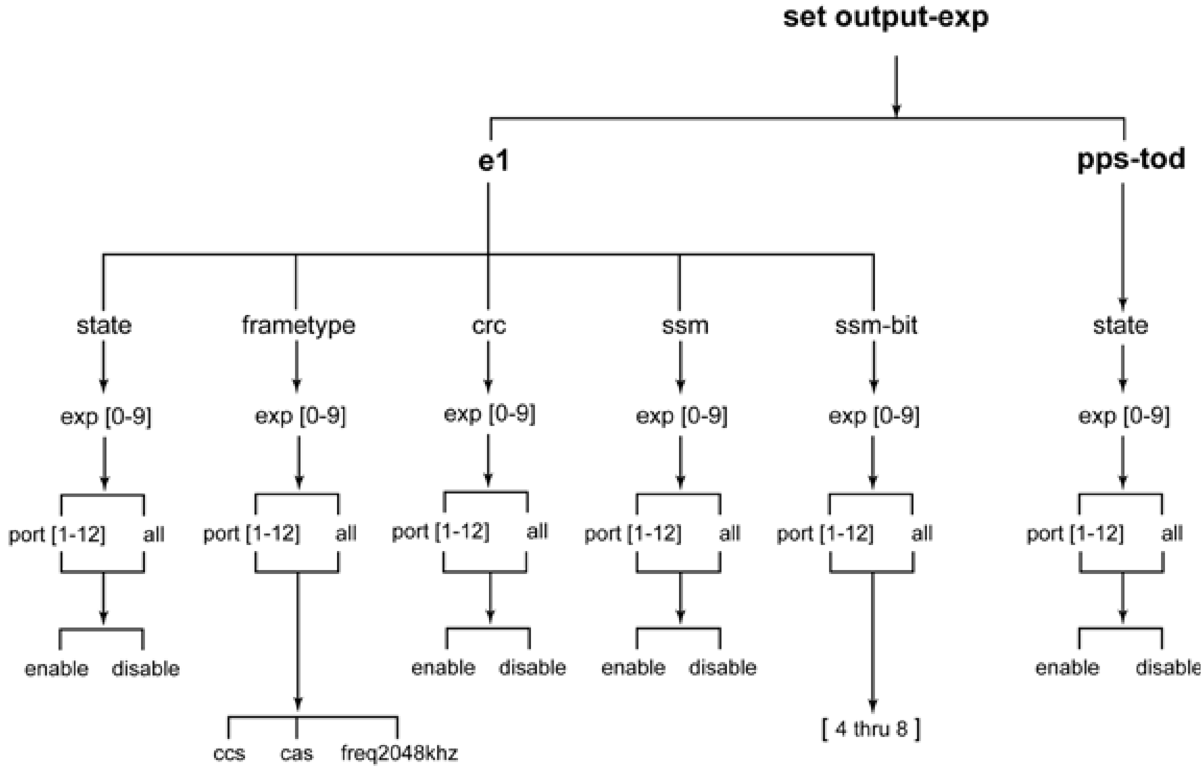
See Figure 4-29 for the hierarchy of commands to provision the expansion shelf E1 outputs.

The output generation behavior can be provisioned for fast-track, warm-up, free-run and holdover conditions. See Figure 4-30 for the hierarchy of commands to provision expansion shelf E1 output generation behavior.

Note: SSM is only supported for the frametypes CAS with CRC4 and CCS with CRC4. SSM should not be enabled for other output frame types

If the outputs are enabled and the telecom outputs are provisioned to generate SSMs, the output SSM should be set to the LO's SSM value, e.g. TYPE I (TNC) or TYPE III (ST3E).

Figure 4-29. Expansion Shelf - Set Output-Exp Command Hierarchy



2048kHz Frame Type

To provision the E1 output Port 3 on expansion shelf 1 (ID=exp0) for a frametype of 2048kHz, CRC disabled, SSM disabled, and to enable the port:

1. Login at the Admin or Config-user level.
2. Type `set output-exp e1 frametype exp0 port3 frqe2048khz` and press **Enter**.
3. Type `set output-exp e1 crc exp0 port 3 disable` and press **Enter**.
4. Type `set output-exp e1 ssm exp0 port 3 disable` and press **Enter**.
5. Type `set output-exp e1 state exp0 port 3 enable` and press **Enter**.

CCS Frame Type

To provision E1 output Port 4 on expansion shelf 1 (ID=exp0) with a frametype of CCS, CRC enabled, SSM enabled, SSM-bit of 6, and to enable the port:

1. Login at the Admin or Config-user level.
2. Type `set output-exp e1 frametype exp0 port 4 ccs` and press **Enter**.
3. Type `set output-exp e1 crc exp0 port 4 enable` and press **Enter**.
4. Type `set output-exp e1 ssm exp0 port 4 enable` and press **Enter**.
5. Type `set output-exp e1 ssm-bit exp0 port 4 6` and press **Enter**.
6. Type `set output-exp e1 state exp0 port 4 enable` and press **Enter**.

CAS Frame Type

To provision E1 output Port 4 on expansion shelf 1 (ID=exp0) with a frametype of CAS, CRC enabled, SSM-bit of 8, and to enable the port:

1. Login at the Admin or Config-user level.
2. Type `set output-exp e1 frametype exp0 port 4 cas` and press **Enter**.
3. Type `set output-exp e1 crc exp0 port 4 enable` and press **Enter**.
4. Type `set output-exp e1 ssm exp0 port 4 enable` and press **Enter**.
5. Type `set output-exp e1 ssm-bit exp0 port 4 8` and press **Enter**.
6. Type `set output-exp e1 state exp0 port 4 enable` and press **Enter**.

Output Generation Behavior

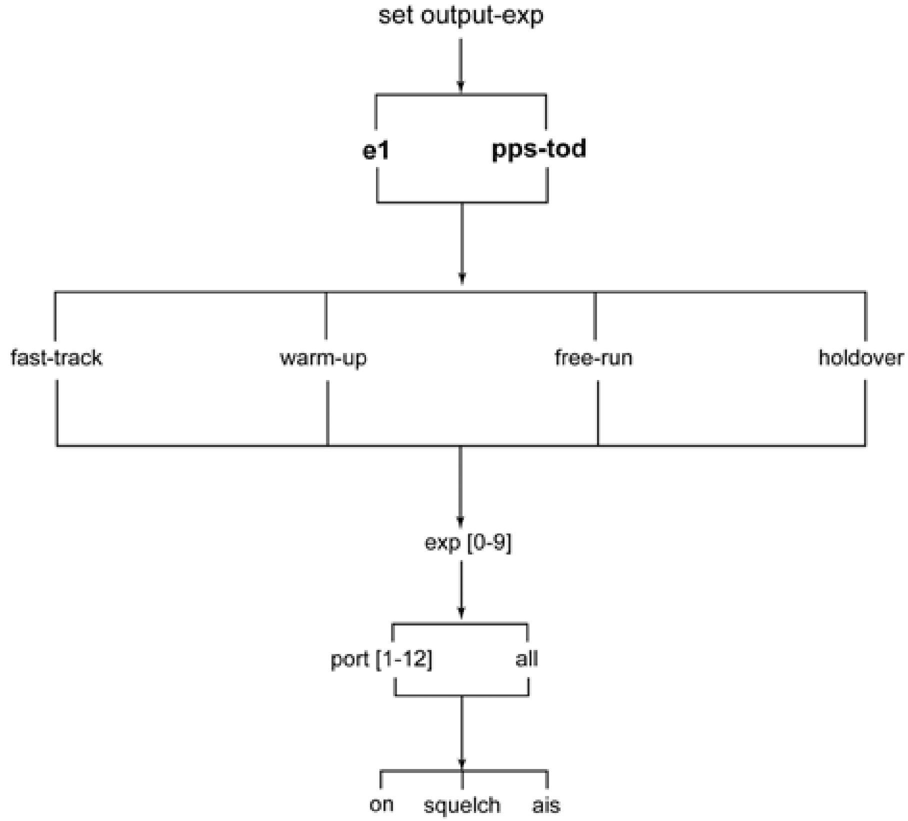
Output generation behavior can be configured independently for individual ports or the same behavior can be configured for all E1 ports on the specified expansion shelf.

1. Login at the Admin or Config-user level.
2. Type `set output-exp e1 warm-up exp0 all squelch` and press **Enter**.
3. Type `set output-exp e1 free-run exp0 all ais` and press **Enter**.

4. Type `set output-exp e1 holdover exp0 all on` and press **Enter**.

5. Type `set output-exp e1 fast-track exp0 all ais` and press **Enter**.

Figure 4-30. Expansion Shelf - Set Output-Exp Generation Command Hierarchy



Provisioning 1PPS +TOD Outputs for Expansion Shelf

The state of the 1PPS+TOD outputs can be provisioned on the TP E30 E1/1PPS+TOD expansion shelf, as well as the output generation behavior for each 1PPS+TOD port.

See Figure 4-29 and Figure 4-30 for the hierarchy of commands to provision the expansion shelf 1PPS+TOD outputs.

State of Output Ports

The state of output ports can be configured independently for individual ports on the specified expansion shelf or all 1PPS+TOD ports can be set to the same state on the specified expansion shelf with a single command.

1. Login at the Admin or Config-user level.

2. Type `set output-exp pps-tod state exp0 port 4 enable` and press **Enter**.

3. Type `set output-exp pps-tod state exp1 all enable` and press **Enter**.

Output Generation Behavior

Output generation behavior can be configured independently for individual ports or the same behavior can be configured for all 1PPS+TOD ports on the specified expansion shelf.

1. Login at the Admin or Config-user level.
2. Type `set output-exp pps-tod warm-up exp0 all squelch` and press **Enter**.
3. Type `set output-exp pps-tod free-run exp0 port 7 squelch` and press **Enter**.
4. Type `set output-exp pps-tod holdover exp0 all on` and press **Enter**.
5. Type `set output-exp pps-tod fast-track exp0 port 5 squelch` and press **Enter**.

Provisioning Expansion Shelf PTP/SyncE Outputs

The following actions are required to provision an expansion shelf:

- Enable DTI for each expansion shelf
- Provision output signals for each expansion shelf
- Enable state(s) of output(s)

Provisioning DTI for an Expansion Shelf

1. Login at the Admin or Config-user level.
2. Type `set exp-if dti exp0 in1 enable` and press **Enter**.
3. Type `set exp-if dti exp0 in2 enable` and press **Enter**.

Provisioning PTP Outputs for the Expansion Shelf

The following parameters can be provisioned for the PTP outputs on the TP E10 PTP/SyncE expansion shelf:

- State
- Timescale
- Clock Mode (One Step vs. Two Step)
- Alternative Master
- Priority Level
- Domain
- Dither
- Clock ID

The TP E10 expansion shelf only supports the Default (multicast) PTP profile. The TP E10 operates per the multicast communication model, which specifies that each PTP message sent from the expansion shelf PTP output ports is capable of being received and processed by all PTP ports on the same PTP communication path. The PTP transport for the expansion shelf is Ethernet, because the expansion shelf is implemented using Layer 2. The transport for PTP outputs on the TP 5000 IOC cards is IPv4, because the default implementation is Layer 3. Unicast, static or dynamic, is not supported for the TP E10 PTP/SyncE expansion shelf outputs.

The “set ptp” command is used to provision PTP parameters for the TP E10 PTP/SyncE expansion shelf. See Figure 4-31 and Figure 4-32 for the hierarchy of the “set ptp” commands that apply to the TP E10 PTP/SyncE expansion shelf. SeeTable 4-11 for descriptions of the Common parameters and Table B-32 for defaults and ranges.

Note: The TP5000 requires a current license key to unlock the multicast addressing mode feature. Use the show license current command to display the current license.

In multicast mode, there are no client leases or client limits. All delay requests will be responded to. There is no limit applied to the number of delay responses supported, other than the maximum capacity of the Ethernet link and the packet engine.

In multicast mode, the TP5000 creates a client list by examining the received PTP delay request messages. In order for a client to be reliably added to the client list and not removed, the TP5000 needs to receive several hundred delay request messages during the client timeout period. If delay requests are sent at a slow rate, then the client-timeout value must be increased. Since one-way PTP operation does not use delay request and delay response messages, the client list will not be populated in this mode.

Only one VLAN is supported in multicast mode. See Provisioning VLAN, on page 302 for details.

PTP Parameters for Expansion Shelf

Use the following procedure to provision expansion shelf 0 for one-step clock mode, PTP timescale, alternate-master disabled, Priority 1 set to 2, Priority 2 set to 5, dither enabled, and the domain set to a value of 225:

1. Login at the Admin or Config-user level.
2. Type `set ptp timescale exp0 ptp` and press **Enter**
3. Type `set ptp two-step exp0 disable` and press **Enter.**
4. Type `set ptp alternative-master exp0 disable` and press **Enter.**

Note: : If the Alternate Master mode is set to Enable, the alternate master flag will be set in the PTP messages. If the alternate master flag is set, the TP5000 will not run the Best Master Clock (BMC) algorithm and will stay in master mode.

5. Type `set ptp priority-1 exp0 2` and press **Enter.**
6. Type `set ptp priority-2 exp0 5` and press **Enter.**

7. Type `set ptp dither exp0 enable` and press **Enter.**

8. Type `set ptp domain exp0 225` and press **Enter.**

9. Type `set ptp clockid exp0 aa:bb:11:22:33:44:55:66` and press **Enter.**

10. Type `set ptp state exp0 port1 enable` and press **Enter.**

Figure 4-31. Set PTP Command Hierarchy for PTP Expansion Shelf

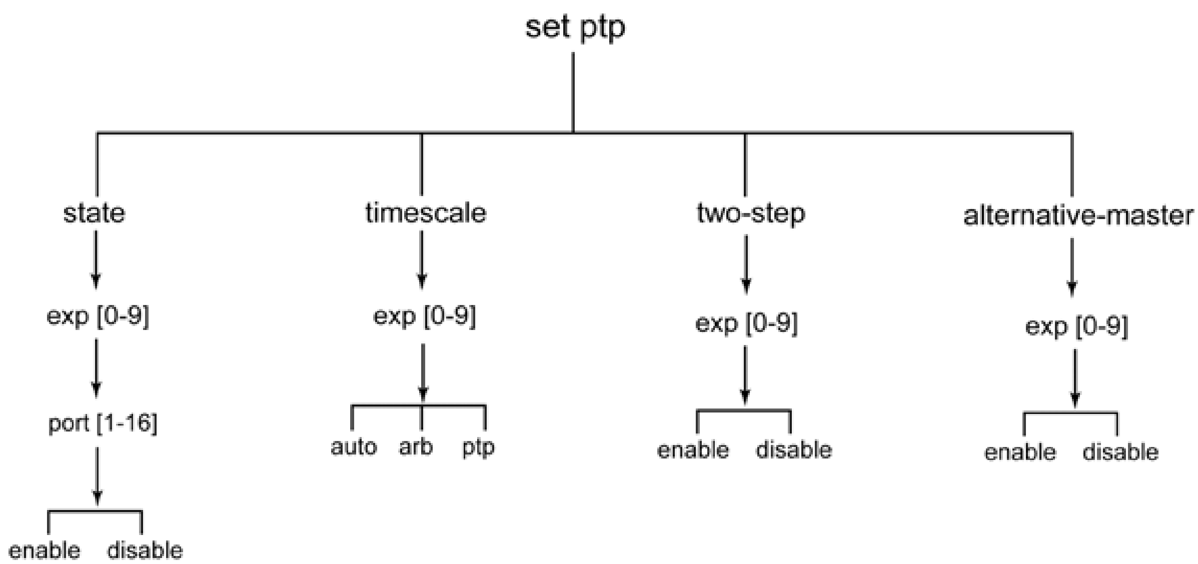
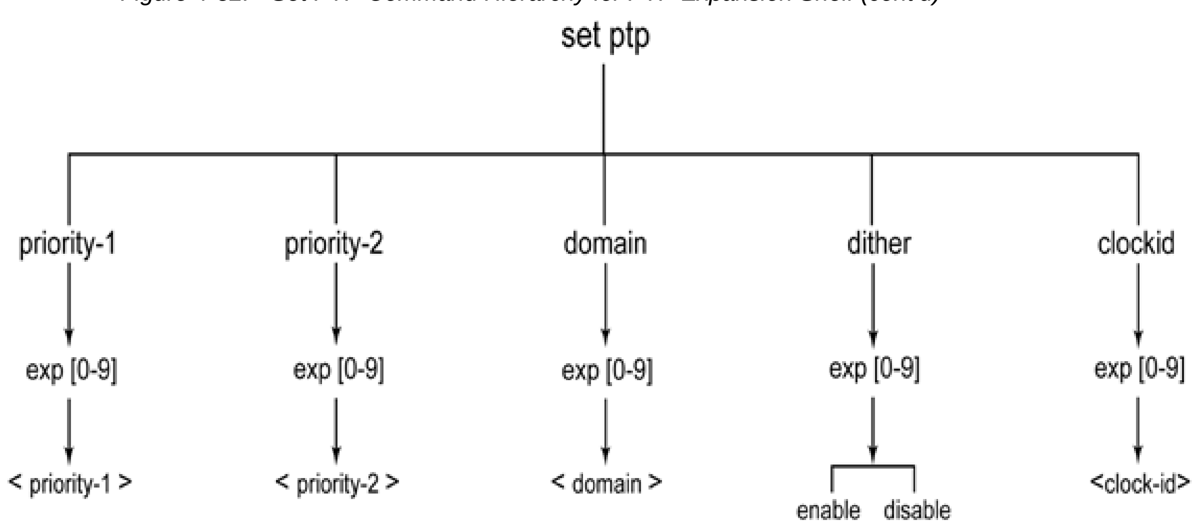


Figure 4-32. Set PTP Command Hierarchy for PTP Expansion Shelf (cont'd)



Provisioning SyncE Outputs for the Expansion Shelf

Synchronous Ethernet (syncE) provides a method of distributing timing using the physical layer of Ethernet devices. All intermediate nodes must have hardware and software support for syncE. SyncE is used to distribute frequency through the network. Synchronization Status Messaging (SSM) is passed between nodes in ESMC messages. This allows nodes to determine the quality level of the upstream node, to prevent timing loops, and also to reconfigure the timing path. The TP5000 provides the master function of providing synchronization via syncE .

Ethernet can be run in either asynchronous or synchronous modes. Electrical SFP do not support the transmission of timing and therefore are asynchronous. Optical SFP support synchronous operation and therefore can be used with syncE.

Normally, syncE nodes use the ESMC messages. However, if the downstream devices do not use the ESMC messages, then the messages can be disabled.

The system PQL value is normally sent in the QL -value (SSM) field in the ESMC message. If desired, this can be disabled and a value of DNU will be inserted in the ESMC message.

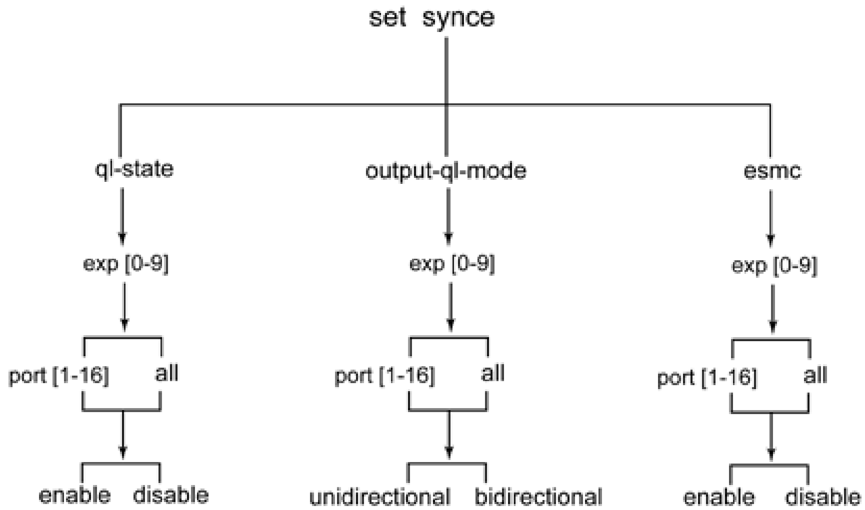
The user should set the appropriate SSM option with the set ssm-option command. This can be configured to either option 1 or option 2.

Figure 4-33 shows the command hierarchy for provisioning SyncE.

Two output QL modes are supported to accommodate network switch variations:

- **Unidirectional:** SyncE output port supports a reduced SyncE, i.e. it transmits ESMC messages and ignores ESMC messages from the downstream SyncE NE. This is the default mode.
- **Bidirectional**: SyncE output port checks the SSM of the received ESMC messages from the downstream NE. When the received SSM has the same QL value as the TP 5000 internal QL, SyncE output port will set the outgoing SSM to DNU. This mode accommodates SyncE switches that do not allow transmit and receive sides of a traffic port to have the same SSM value.

Figure 4-33. Set SyncE Command Hierarchy



QL State for SyncE Outputs

1. Login at the Admin or Config-user level.
2. Type `set synce ql-state exp0 all enable` and press **Enter**

QL Mode for SyncE Outputs

1. Login at the Admin or Config-user level.
2. Type `set synce output-ql-mode exp0 port 1 bidirectional` and press **Enter**

ESMC for SyncE Outputs

1. Login at the Admin or Config-user level.
2. Type `set synce esmc exp0 port 1 enable` and press **Enter**

Setting the System Date and Time

The TimeProvider 5000 Time of Day can be set either by an external source, or manually with the “set clock” command. You can set the time and date only in the frequency reference mode (or SYS tod-source mode), but if the reference mode has been set to time (default) or if TOD source has been set to GPS (default)], it is not possible to set the time manually.

Note: The `set tod-source` command has been deprecated , but can still be used as an alternate approach.

Example

1. Login at the Admin or Config-user level (see Logging In, on page 277).
2. Type show ref and press **Enter** to check the reference mode.
3. Type set ref mode frequency and press **Enter**.
4. Type set clock date-time <value> and press **Enter**. Enter the value in format yyyy-mm-dd,hh:mm:ss.
5. Type sync tod-source now and press Enter.

Provisioning Alarms

This section describes the commands used to provision and manage alarms in the TimeProvider 5000. The user can provision the alarms to be enabled or disabled and set thresholds to turn the alarms on and off. For a list of all alarms, see Appendix A, System Messages.

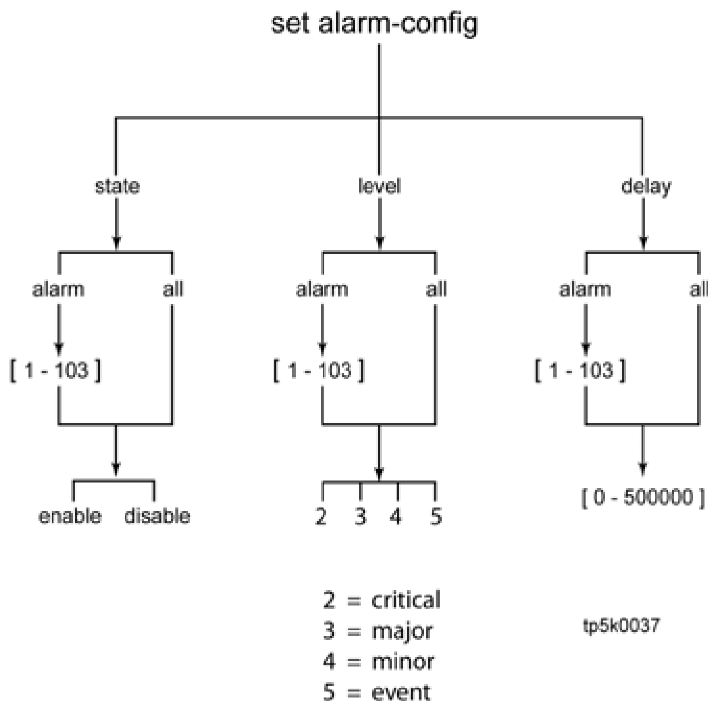
Software commands allow you to perform the following:

- Provision the severity level
- Provision the alarm (enable or disable)
- Show current alarm settings
- Show current alarms
- Display alarm status

Alarms are also indicated by LEDs on the IOC and IMC modules.

Note: Disabling an input port will clear all alarms and events related to the port.

Figure 4-34. Set Alarm-Config Commands



Disabling Specific Alarms

The Set Alarm-Config command allows you to enable or disable specified alarms.

Example

To disable the GNSS/GPS antenna open-circuit alarm (alarm #13), enter the following:

1. Login at the Admin or Config-user level (see Logging In, on page 277).

2. Type `set alarm-config state alarm 13 disable` and press **Enter**.

Showing Current Alarm Settings

The Show Alarm-Config command displays the set and clear alarm thresholds for every alarm type.

Example

To display the configuration for all alarm types, enter the following:

1. Type `show alarm-config` and press **Enter**.

Showing Current Alarms

The Show Alarm command displays all current alarms.

Example

To display a list of all current alarms enter the following:

1. Type `show alarm` and press **Enter**.

Displaying Alarm and Unit Status

The Show Status command displays the system status information as follows:

- Assigned System Name
- Uptime for the IMC card and IOC card
- System date and time
- Number of standing system alarms
- Active IOC card
- Standby IOC card
- Currently selected reference mode
- Reference Input
- Clock status of active IOC card
- PTP Service Mode (GrandMaster or Probe)
- Expansion shelf connections

Note: Probe mode is only available with the TP5000 platform as part of the TimeAnalyzer 7x00.

Example

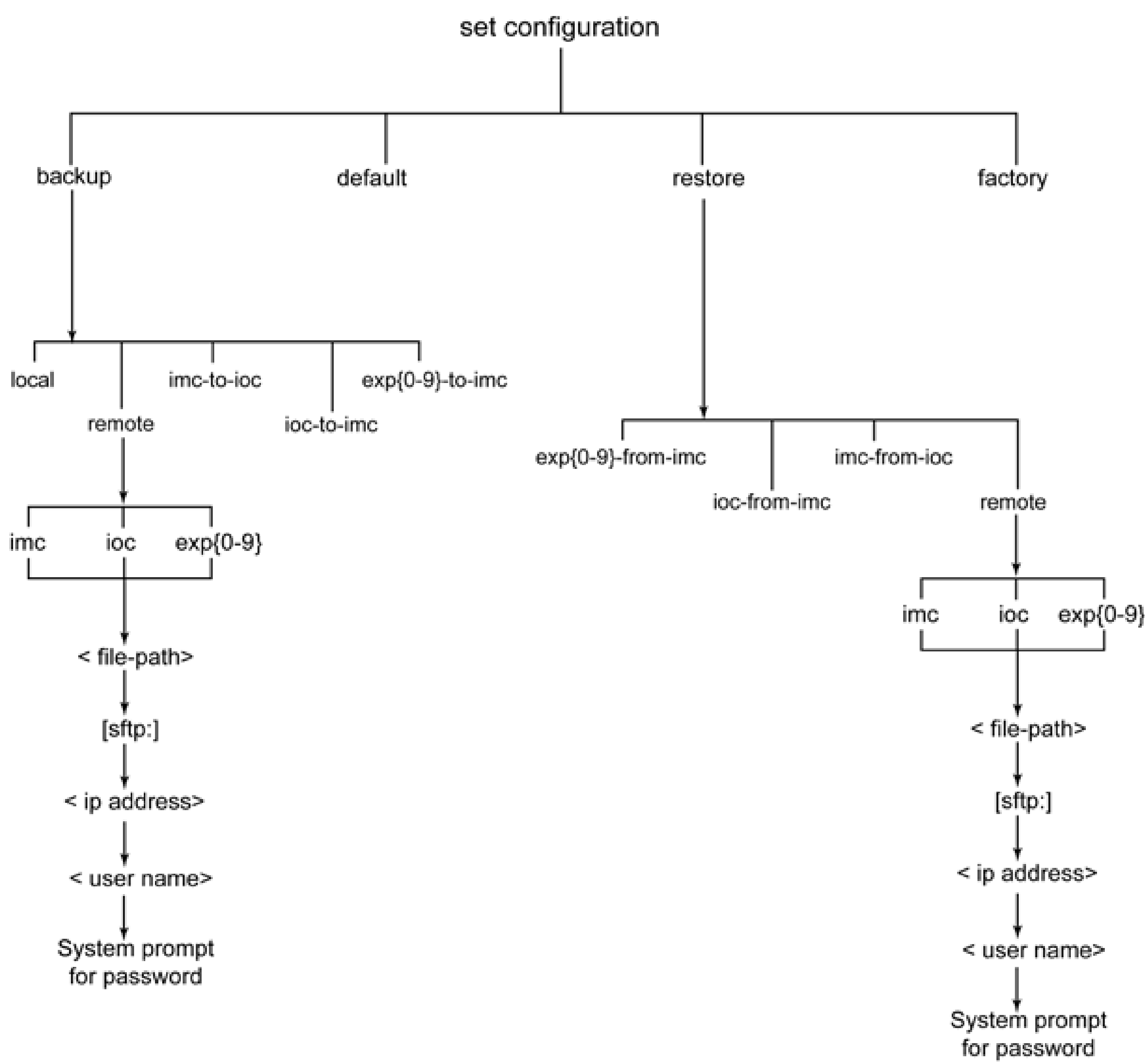
To display the system status, enter the following:

1. Type `show status` and press **Enter**.

Saving and Restoring Provisioning Data

Symmetricom recommends that you keep an electronic version and/or a written version of the provisioning changes you make to the TimeProvider 5000. Use the set configuration command to back up or restore provisioning data. See Figure 4-35.

Figure 4-35. Set Configuration Command Hierarchy



Backing up Provisioning Data

The configuration is automatically backed up one minute after a configuration change.

Example 1

To backup up the current configuration immediately, enter the following:

1. Type `set configuration backup local` and press **Enter**.

Example 2

To backup up the current configuration of the IMC card to the active IOC card, enter the following:

1. Type `set configuration backup imc-to-ioc` and press **Enter**.

Example 3

To backup up the current configuration of expansion shelf with ID=3 to the IMC card, enter the following:

1. Type `set configuration backup exp3-to-imc` and press **Enter**.

Example 4

To back up the configuration data of the active IOC to a remote site, which is an SFTP server with the IP address of 172.16.33.33, id: tp5000, password: backup, with a file name for backup data of “tp5k_ioc_backup.txt”:

1. Type `set configuration backup remote ioc tp5k_ioc_backup.txt sftp:172.16.33.33 tp5000` and press **Enter**.
2. The system will prompt for the password. Enter the password and press **Enter**.

Note: For remote storage, path names should be specified as appropriate for the FTP/SFTP server and the operating system on which it is running. This includes whether the entire path should be specified and whether "/" or "\" characters should be used.

Example 5

To back up the configuration data for an expansion shelf with ID=6 to a remote site, which is an SFTP server with the IP address of 172.16.33.33, id: tp5000, password: backup, with a file path for backup data of “c:\sftp\tp5k_exp6_backup.txt”:

1. Type `set configuration backup remote exp6 c:\sftp\tp5k_exp6_backup.txt sftp:172.16.33.33 tp5000` and press **Enter**.

2. The system will prompt for the password. Enter the password and press **Enter**.

Restoring Provisioning Data

Example 1

To change the current configuration to factory default while preserving user and IP information, enter the following:

1. Type `set configuration default` and press **Enter**.

Example 2

To change the current configuration to the factory default, enter the following:

1. Type `set configuration factory` and press **Enter**.

Notes: Setting the configuration to `default` will not overwrite the user login information or the IP address of MGMT port of IMC. Setting the configuration to `factory` will overwrite the user login information and return the IP address of MGMT port of IMC to the factory set address.

Example 3

To restore the expansion shelf with ID=3 with its stored configuration from the IMC card, enter the following:

1. Type `set configuration restore exp3-from-imc` and press **Enter**.

Example 4

To restore the configuration data with a file name of tp5k_ioc_backup.txt for the active IOC from a remote site, which is an SFTP server with the IP address of 172.16.33.33, id: tp5000, password: backup:

1. Type `set configuration restore remote ioc c:\sftp\tp5k_ioc_backup.txt sftp:172.16.33.33 tp5000` and press **Enter**.
2. The system will prompt for the password. Enter the password and press **Enter**.

Note: For remote storage, path names should be specified as appropriate for the FTP/SFTP server and the operating system on which it is running. This includes whether the entire path should be specified and whether "/" or "\" characters should be used.

Example 5

To restore the configuration data file tp5k_exp6_backup.txt back to an expansion shelf with ID=6 from the SFTP server with the IP address of 172.16.33.33, id: tp5000, password: backup:

1. Type `set configuration restore remote exp6 tp5k_exp6_backup.txt sftp:172.16.33.33 tp5000` and press **Enter**.

2. The system will prompt for the password. Enter the password and press **Enter**.

Provisioning for SNMP

The Simple Network Management Protocol (SNMP) is an application layer protocol that allows you to manage network devices. SNMP is based on a client-server query-response mode that requires an Ethernet connection. A manager application (software installed on a computer) is the client generating the queries, and an agent (software on the TimeProvider 5000) is the server generating responses. The TimeProvider 5000 SNMP supports all existing functions. TimeProvider 5000 supports SNMPv2c and SNMPv3.

If SNMP is present, port 161 becomes the port of standard SNMP interactive communications and port 162 becomes the trap port.

SNMP functionality is provisioned on the TP5000 using the CLI command "set snmp" (see Figure 4-36).

Note: The SNMP feature can either be ordered in a new system, or added to a previously ordered system as a field upgrade. Contact your Symmetricom representative for more information.

Note: For redundant IOC systems, the IOC1 configuration is used for both IOC cards, regardless of which IOC is active.

The TimeProvider 5000 MIB has one SNMP container OID for alarms and one SNMP container OID for events. All alarms are reported from the same OID. The object tp5000TrapAlarm, 1.3.6.1.4.1.9070.1.2.4.6.2.2.3, is the container OID used to report alarms via SNMP trap. All events are reported from the same OID. The object tp5000TrapEvent, 1.3.6.1.4.1.9070.1.2.4.6.2.2.4, is the container OID used to report events via SNMP trap

Each container contains the following sub-info in its own OID:

- Module ID (IMC, IOC1, IOC2)
- Alarm/Event ID
- Date&Time
- Severity
- Alarm/Event Description

The elements are defined in the activeAlarmTable and activeEventTable objects. The object activeAlarmTable, 1.3.6.1.4.1.9070.1.2.4.6.2.2.1, is a table containing the active alarms and can be used to poll the active alarms. The object activeEventTable, 1.3.6.1.4.1.9070.1.2.4.6.2.2.2, is a table containing the active events and can be used to poll the active events

The Alarm/Event ID element should be used to determine which alarm or event was generated. Alarm and Event IDs are listed in Appendix A, System Messages.

Enabling the SNMP License

SNMP is an optional feature on the TP5000. It must be enabled. To enable this feature, use the “set license add” command with the 40-character key printed on the Symmetricom-issued certificate for the unit.

Note: If the user has a 6-character key, the “set option” command is used to enter the key.

Example

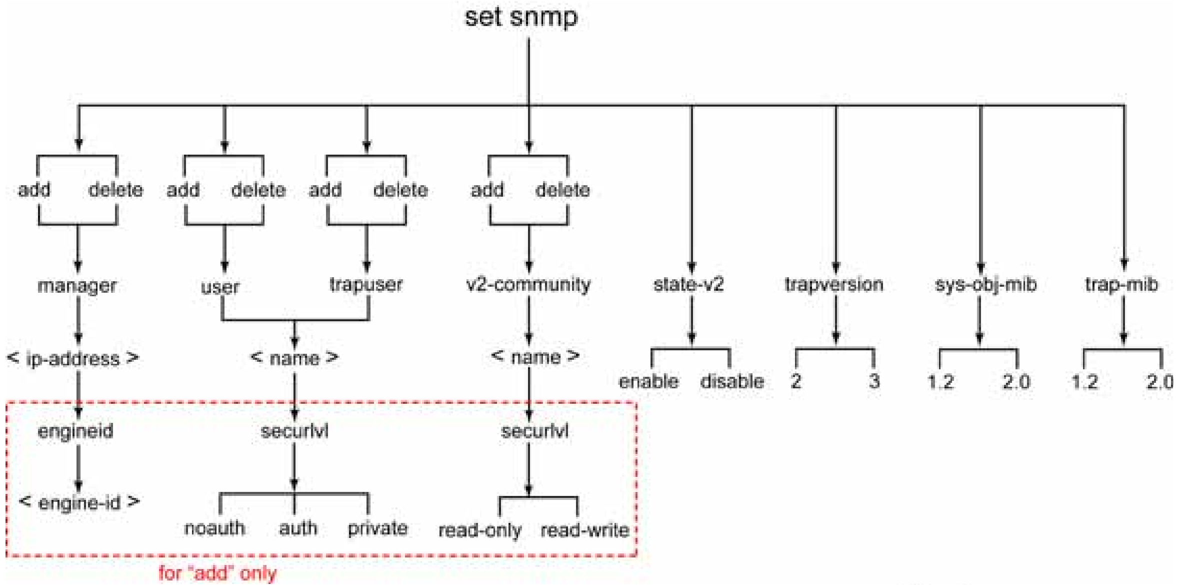
To enable the SNMP option, with a license key of “ABCDEFGHIJ1234567890KLMNOPQRST0987654321”:

1. Type `set license add` then press **Enter**.

2. Enter the license key when prompted by the TP5000 and press **Enter**.

```
License key: ABCDEFGHIJ1234567890KLMNOPQRST0987654321
```

Figure 4-36. Set SNMP Commands



Selecting MIB Versions

Use the “set snmp trap-mib” and “set snmp sys-obj-mib” commands to select the MIB version to be used for traps and system, respectively.

Example:

To select the v2.0 trap MIB and v2.0 sys-obj MIB.:

1. Type `set snmp trap-mib 2.0` then press **Enter**.

2. Type `set snmp sys-obj-mib 2.0` then press **Enter**.

Adding or Deleting a Manager IP Address

Use the “set snmp add manager” command to add a manager IP address. Use the “set snmp delete manager” command to delete a manager IP address. The TP5000 will support a maximum of 3 manager IP addresses.

Example:

To add the SNMP manager IP address `192.100.100.100,` using an engineID `0x12345678901234567890`:

1. Type `set snmp add manager 192.100.100.100 engineid 0x12345678901234567890` then press **Enter**.

Provisioning to Generate v2 Traps

Use the “set snmp trapversion” command to provision the trap version to v2.

The default trap version is v2. By default, therefore, the TP5000 will generate v2 traps if the SNMP option is activated.

Example:

1. Type `set snmp trapversion 2` then press **Enter**.

Provisioning to Generate v3 Traps

Use the “set snmp trapversion” command to provision the trap version to v3.

Example

1. Type `set snmp trapversion 3` then press **Enter**.

Adding and Removing v2 Communities

Use the “set snmp add v2-community” command to add a SNMP v2 community. Use the “set snmp delete v2-community” command to remove an existing SNMP v2 community. The TP5000 will support a maximum of 10 v2 communities.

Note: To use v2 communities, the v2 state must be set to Enable using the command “set snmp state-v2 enable”.

Example

To add a v2 community named “tech27”, with a security level of “read-only” and remove an existing v2 community named “bob321”:

1. Type `set snmp add v2-community tech27 securlvl read-only` then press **Enter**.

2. Type `set snmp delete v2-community bob321` then press **Enter**

Adding and Removing SNMP v3 Users

SNMPv3 provides additional security features not available in SNMPv2c. In addition to the functions of SNMPv2c, SNMPv3 allows user and trapuser levels that are based on authentication and privacy settings. The authentication algorithm is either HMAC-SHA-1-96 or MD5, with a key up to 32 characters in length. The privacy settings are based on either the CBC-DES or AES encryption standard, with a with a key up to 32 characters in length. All keys are uppercase.

Use the “set snmp add user” command to add a v3 user. Use the “set snmp delete user” command to remove an existing v3 user. The TP5000 will support a maximum of 10 v3 users.

Example - Add User

To add a user named “test12”, with a security level of “priv”, with a 20-character MD5 authentication key “123456789ABCDEFGHIJK” and a 16-character DES privacy key “ABCDEFG123456789”:

1. Type `set snmp add user test12 securlvl priv` then press **Enter**.
2. Enter `MD5` at the authentication protocol prompt.
3. Enter `123456789ABCDEFGHIJK` at the authentication key prompt
4. Enter `DES` at the privacy protocol prompt
5. Enter `ABCDEFG123456789` at the privacy key prompt

Note: Do not use spaces within keys.
Only characters {a-z,A-Z,0-9,! ( ) - _ . ? ~ * @ ^ + = : / %} are accepted for SNMP authentication or privacy keys.

Example - Remove User

To remove an existing user named “dave123”:

1. Type `set snmp delete user dave123` then press **Enter**

Adding and Removing SNMP v3 Trap Users

Use the “set snmp add user” command to add a v3 trap user. Use the “set snmp delete trapuser” command to remove an existing v3 trap user. The TP5000 will support a maximum of 3 v3 trap users.

Note: In order to access trap information, a trap user must also be added as a user. The same name, authentication protocol, authentication key, privacy protocol, and privacy key must be used for both the user and trap user.

Example - Add Trap User

To add a trap user named “test12” with a security level of “priv”, with the 20-character MD5 authentication key “123456789ABCDEFGHIJK” and 16-character DES privacy key “ABCDEFG123456789”:

1. Type `set snmp add trapuser test12 securlvl priv` then press **Enter**.
2. Enter `MD5` at the authentication protocol prompt.
3. Enter `123456789ABCDEFGHIJK` at the authentication key prompt
4. Enter `DES` at the privacy protocol prompt
5. Enter `ABCDEFG123456789` at the privacy key prompt

Example - Remove Trap User

To remove an existing trapuser named “dave123”:

1. Type `set snmp delete trapuser dave123` then press **Enter**

Input Provisioning Table

Table 4-20. Input Provisioning Tasks and Commands

Input Type	Task	COMMAND			
		CLI	TL1	SNMP	Web Server
GPS / GNSS	Set State	set gps state set gnss state	n/a		
	Set Cable-Delay	set gps cable-delay set gnss cable-delay	n/a		
	Set position manually	set gps mode manual	n/a		
	Set Input Priority	set gps priority set gnss priority	n/a		
	Set Mask	set gps mask	n/a		
T1	Set State	set input state	n/a		
	Set Frame Type	set input frametype	n/a		
	Set Input Priority	set input priority	n/a		
	Set SSM	set input ssm	n/a		
E1	Set State	set input state	n/a		
	Set Frame Type	set input frametype	n/a		
	Set Input Priority	set input priority	n/a		
	Set SSM	set input ssm	n/a		
	Set Input PQL-value	Set Input PQL-value	n/a		

Table 4-20. Input Provisioning Tasks and Commands

Input Type	Task	COMMAND			
		CLI	TL1	SNMP	Web Server
1PPS	Set State	set pps-tod state	n/a		
	Set Cable Delay	set pps-tod cable-delay	n/a		
	Set Input Priority	set pps-tod priority	n/a		
10MHz	Set State		n/a		
	Set Cable Delay		n/a		
	Set Input Priority		n/a		

Chapter 5 Operating

This chapter provides guidelines for operating the TimeProvider 5000.

In This Chapter

- Logging In And Out
- Adding And Deleting Users
- Saving Present Configuration To Non-volatile Memory
- Restoring Default Configuration
- Determining Status
- Forcing Unit To Send New Time in Time Reference Mode
- Switching Active And Standby IOC Cards
- Displaying Alarms Log
- Displaying Events Log
- Managing PTP Clients
  - Configuring PTP Clients
  - Monitoring PTP Client Performance
  - Monitoring PTP Client Alarm / Event Information
  - Upgrading PTP Client Firmware

Logging In And Out

The default administrator user name is “admin” with password “symmadmin**”

To login:

```
tp5000> login
User: <user name>
Password: <password>
```

To logout:

```
tp5000> logout
```

Adding And Deleting Users

Only a security-level admin user can add or delete users.

Users can be added or removed with the following commands:

```
set user add <username>

set user delete <username>
```

Saving Present Configuration To Non-volatile Memory

Use the following commands to save IMC module settings to the IOC memory and to save the active IOC module settings in the IMC memory:

```
set configuration backup imc-to-ioc

set configuration backup ioc-to-imc
```

Restoring Default Configuration

The user can restore the TimeProvider 5000 to Symmetricom factory default values in two ways. The `default` mode preserves user login information and IP addresses of the MGMT port of the IMC, and is set with the following command:

```
set configuration default
```

The `factory` mode overwrites all user login information and IP addresses of the MGMT port of the IMC, and is set with the following command:

```
set configuration factory
```

Determining Status

`show alarm` (displays presently active alarms)

`show gps status` (displays GPS information)

`show inventory` (displays details for IMC and IOC cards)

`show status` (displays general status of unit)

Forcing Unit To Send New Time in Time Reference Mode

Note: The "sync tod-source" command forces the TimeProvider 5000 to immediately start using the new reference time. The use of this command should be carefully planned since it may cause jitter in the 1PPS output of the TimeProvider 5000.

The user may need to manually sync the IOC time and phase to the time reference's time and phase if there is any difference. After the reference mode is changed to time and the system is locked to the reference, the TP5000 response depends on whether Auto-Sync is enabled and whether the TP5000 has left warm-up. The possible system responses are shown in Table 5-1 below.

Table 5-1. Force Unit to Send New TIme vs. Auto Sync

Condition of TP5000	Auto-Sync State	System Response
Unit is still in warm-up	Enabled	Time and phase will automatically sync to the time reference
Unit is still in warm-up	Disabled	Time and phase will automatically sync to the time reference
Unit has left warm-up	Enabled	Time and phase will automatically sync to the time reference
Unit has left warm-up	Disabled	Alarm ID #8 (Manual sync IOC time to IMC required) will be generated. Use the command “sync tod-source now” to manually sync IOC time and phase to the time reference and clear the alarm

Switching Active And Standby IOC Cards

Active and standby IOC cards may be switched automatically or manually. See Appendix D, Redundant IOC Cards for additional details.

Manually Switching IOC Cards

Use the “set ioc-state” command to switch the standby IOC module to become the active module. IOC1 refers the IOC module to the left of the IMC and IOC2 refers to the IOC module to the right of the IMC, as shown in Figure 5-1 below..

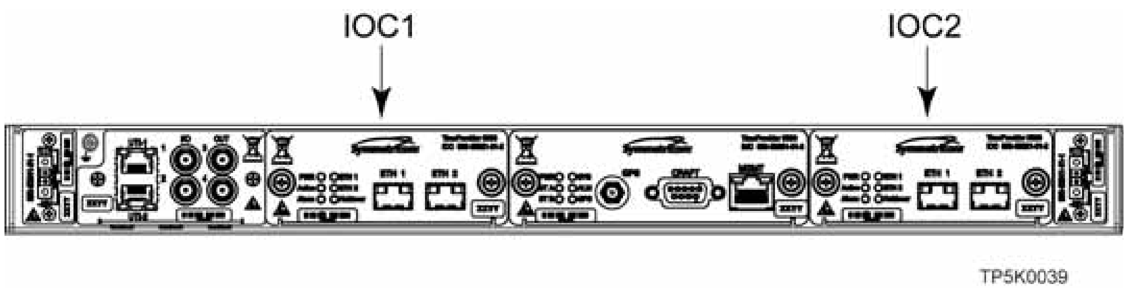


Figure 5-1. IOC1 and IOC2 Modules

Example:

If IOC1 is the active card, IOC2 is the standby card. This example demonstrates switching IOC2 to be the active card, then using the “show ioc-state” command to verify the switch.

```
tp5000> set ioc-state ioc2 active
```

Note: When executing the command "set ioc-state iocx", wait 30 seconds after the prompt returns before issuing the next command.

```
tp5000> show ioc-state
```

Note: Switchover to the standby IOC will be prohibited if the standby IOC has alarms of higher severity than the active IOC or if the standby IOC is still in warm-up. Check system status and alarms if the command fails.

Automatic IOC Card Switches

The active card continually assesses its own health level compared with the health level of the standby card. If the active card should become unhealthier than the standby card, then a switch will occur. See Causes of Switchovers Between IOC Cards, on page 509.

If the detected condition of an IOC card is of "fail" level, the card is taken completely out of service. If the failed card is the active card at the time of the failure, the standby card then becomes active. The failed card will not become standby because it is now nonfunctional. This situation then becomes analogous to the user removing the active IOC module, which forces a switchover. The active IOC module will go to fail regardless of the state (or existence) of the other IOC module.

Removing the active IOC card also forces an automatic switchover to the standby card.

Note: Removing the active card is not recommended. Before removing the active card, manually switch the active IOC card to standby using the procedure in the section above.

Impact of IOC Card Switches on IO Card Outputs

Switching active and standby IOC cards will have the following impact on the various output signals on the IO card.

- During switchover, the PTP outputs may be interrupted for a maximum of 10 seconds.
- All continuous outputs, 10MHz, 1PPS, and E1, will not exhibit any loss of signal during switchover, but may exhibit phase movement of up to 240 ns.

Displaying Logs

This section describes the commands used to display the TP5000 alarm and event logs.

Displaying Alarms Log

The “show log alarm” command displays all local alarms in the alarm log in chronological order (first in - first out).

Example

1. Type `show log alarm` and press **Enter**.

Displaying Events Log

The “show log event” command displays all local events in the event log in chronological order (first in - first out). The event log contains the 1000 most recent alarmed and non-alarmed events.

Example

1. Type `show log event` and press **Enter**.

Restarting the TimeProvider 5000

The system can be restarted via the `reboot system` command. Since reference output signals will be lost, it is not recommended to restart the entire system unless required. Only the admin user can issue the reboot command. The `reboot imc` command restarts the IMC card, and no output will be lost. If the system has two IOC modules, each IOC can be rebooted separately to preserve the output.

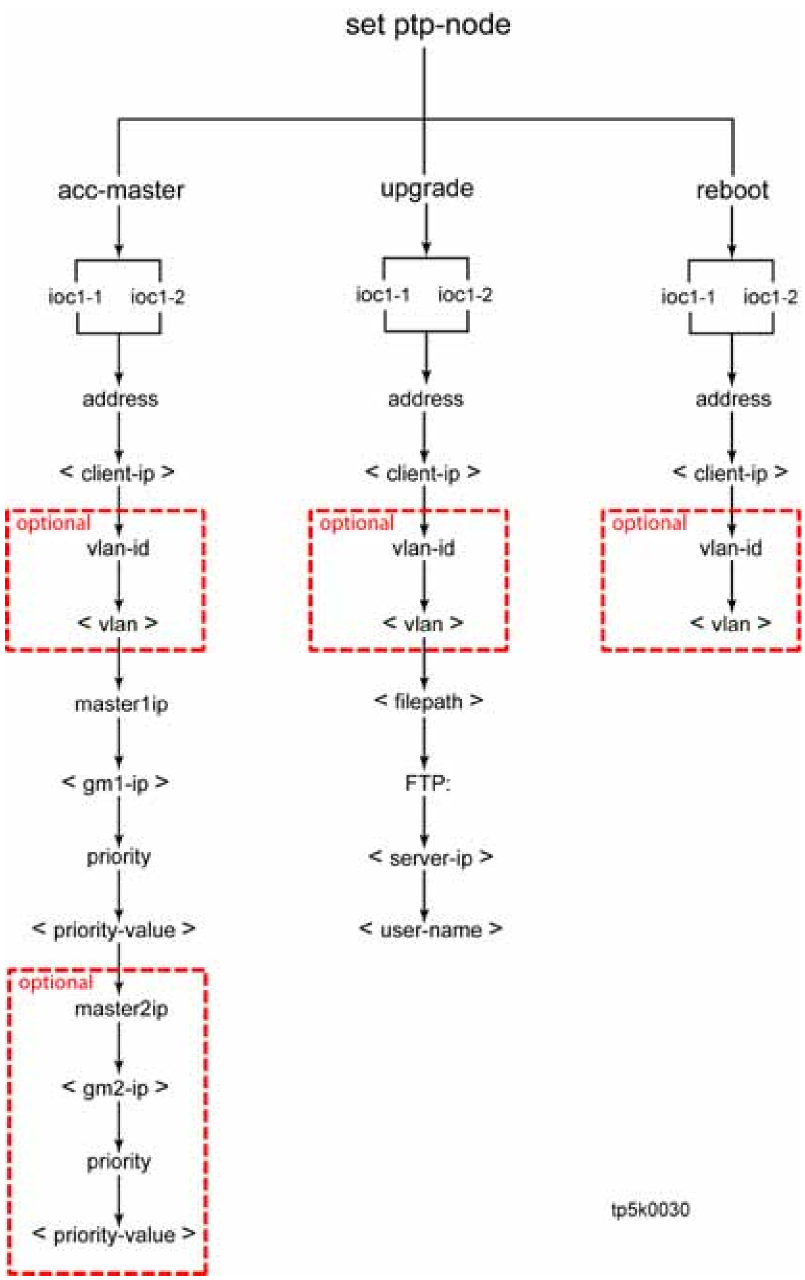
Example:

1. Type `reboot imc` and press **Enter**.
2. Type `reboot ioc1` and press **Enter**.
3. Type `show status` and press **Enter** to check the status of IOC1.
4. After IOC1 has entered the standby state, type `reboot ioc2` and press **Enter** (if applicable).

Managing PTP Clients

The TimeProvider 5000 GrandMaster supports four different aspects of PTP management for TimeProvider 500 clients. The “set ptp-node” command is used to provision the acceptable master clocks, reboot, and upgrade the firmware for TP500 clients through the TP5000 GrandMaster. See Figure 5-2. The “show ptp-node status” command is used to monitor TP500 client performance. The TimeProvider 5000 also offers a means to monitor alarm and event information for TimeProvider 500 clients using Simple Network Management Protocol (SNMP).

Figure 5-2. PTP Management Commands



Configuring PTP Clients

The TimeProvider 5000 Grandmaster provides a way to perform limited configuration of PTP clients (TimeProvider 500 clients only). This consists of allowing a user to set the acceptable master clocks for a client via PTP messages issued from the TP5000.

The TimeProvider 500 PTP client supports a capability to select from one of two master clocks. Use of this feature is easily enabled by providing target addresses for two master clocks. When both are configured to non-zero IP addresses, the TimeProvider 500 will attempt to establish PTP flow with both. If a flow problem persists, or no flow can established at all with one of the candidate masters, then the other one will be used as long as it has acceptable PTP flow.

How to Set PTP Client Acceptable Master Clocks

The example is for Port 1 on the active IOC card, with the following additional parameters:

– Client IP Address:	192.168.1.220
– Acceptable Master 1 IP Address:	192.168.12.23
– Acceptable Master 1 Priority:	5
– Acceptable Master 2 IP Address:	192.168.12.30
– Acceptable Master 2 Priority:	20
– VLAN	None

1. Login at the Admin level (see Logging In And Out, on page 382).
2. Type `set ptp-node acc-master IOC-1 address 192.168.1.220 master1ip 192.168.12.23 priority 5 master2ip 192.168.12.30 priority 20` and press **Enter**.

Monitoring PTP Client Performance

The TimeProvider 5000 Grandmaster provides a way to monitor performance of clients (TimeProvider 500 clients only). The “show ptp-node status” command allows the user to view the current status of a specific client. Figure 5-3 shows a typical status response from a TP500 client.

Figure 5-3. Client Status Information

```
Status report from:
ptp client ip address                            : 192.168.106.99
ptp client vlan id                               : 4094
ptp client clock id                              : 00:b0:ae:ff:ff:01:22:99

The detailed status:
Current time is                                  :  23:34:52 09/21/2009
Current FLL State                                :  Fast FLL
FLL State Duration (minutes)                     :  65
Forward Flow Weight (%)                          :  19.99
Forward Flow Transient-free (out of 900 s)       :  899
Forward Flow Transient-free (out of 3600 s)      :  3578
Forward Flow Transactions Used (%)               :  99.99
Forward Flow Operational Min TDEV (ns)           :  112.84
Forward Flow Min Cluster Width (ns)              :  100.00
Forward Flow Mode Width (ns)                     :  100.00
Reverse Flow Weight (%)                          :  80.00
Reverse Flow Transient-free (out of 900 s)       :  899
Reverse Flow Transient-free (out of 3600 s)      :  3578
Reverse Flow Transactions Used (%)               :  99.99
Reverse Flow Operational Min TDEV (ns)           :  114.16
Reverse Flow Min Cluster Width (ns)              :  100.00
Reverse Flow Mode Width (ns)                     :  2148.00
Correction Frequency (ppb)                       :  11.86
Phase correction (ppb)                           :  0.00
Output TDEV Estimate (ns)                        :  0.00
Residual phase error (ns)                        :  0.00
Minimal RTD (us)                                 :  2.14
Operational Temperature Max (deg C)              :  46.06
Operational Temperature Min (deg C)              :  45.93
Operational Temperature Min (deg C)              :  45.93
5  Minute Temperature Stability (mdeg C)         :  216.75
60 Minute Temperature Stability (mdeg C)         :  481.95
Timing Packet Rate GM1 (pkts/s)                  :  64
Timing Packet Rate GM2 (pkts/s)                  :  0
Timing Packet Rate Delay (pkts/s)                :  64
Observation Interval (min)                       :  1
IPDV Threshold (usec)                            :  50.000
Pacing Factor for Jitter Computation             :  16
Forward IPDV % Below Threshold                   :  100.0
Forward Maximum IPDV (usec)                      :  0.103
Forward InterPkt Jitter (usec)                   :  0.027
Reverse IPDV % Below Threshold                   :  100.0
Reverse Maximum IPDV (usec)                      :  0.111
Reverse InterPkt Jitter (usec)                   :  0.028
Reference                                        :  192.168.106.14
GM1 Flow State                                   :  Normal
GM2 Flow State                                   :  Waiting for GM to respond to signaling
GM1 Clock id                                     :  00:b0:ae:ff:fe:01:90:68
GM2 Clock id                                     :  00:00:00:00:00:00:00:00
Last Firmware Upgrade status                     :  No upgrade since powered
```

How to Check Client Status

The example is for Port 1 on the active IOC card, with Client IP Address of 192.168.1.200 and no VLAN.

1. Login at the Admin level, Config or User level (see Logging In And Out, on page 382).

2. Type `show ptp-node status IOC-1 address 192.168.1.200` and press **Enter**.

See Figure 5-3 for a typical response for a status request from a TP500 client.

Monitoring PTP Client Alarm / Event Information

TimeProvider 500 IEEE-1588 clients pass alarm and event information to the TimeProvider 5000 IEEE-1588 Grandmaster via PTP communication. Event IDs 68 through 70 correspond to TP500 client alarms based on severity (user -configurable at the client level). Event IDs 71 and 72 are indications of TP500 client events. See Table A-1 and Table A-2. The TimeProvider 5000 offers a means to monitor alarm and event information for TimeProvider 500 clients via Simple Network Management Protocol (SNMP), which is available as an option. The TimeProvider 5000 supports SNMPv2c and SNMPv3. Client alarm and event information is not accessible through the TP5000 with CLI commands..

Note: The SNMP feature can either be ordered in a new system, or added to a previously ordered system as a field upgrade. Contact your Symmetricom representative for more information.

SNMP is an application layer protocol that allows you to manage network devices. SNMP is based on a client-server query-response mode that requires an Ethernet connection. A manager application (software installed on a computer) is the client generating the queries, and an agent (software on the TimeProvider 5000) is the server generating responses. The TimeProvider 5000 SNMP supports most existing functions.

In order to manage PTP client alarms and events with the TP5000, the alarms and events must be monitored as SNMP traps. SNMP traps are configured using the SNMP manager application. Consult the documentation for the SNMP manager application for details about how to set up traps.

Note: If SNMP is activated on the TP5000, port 161 becomes the port of standard SNMP interactive communications and port 162 becomes the trap port.

Upgrading PTP Client Firmware

The TimeProvider 5000 Grandmaster provides a way to remotely upgrade the firmware of PTP clients (TimeProvider 500 clients only). See set ptp-node, on page 225 for command details.

How to Upgrade Client Firmware

1. Login at the Admin level (see Logging In And Out, on page 382).

2. Type `set ptp-node upgrade IOC-y address <client_ip> [vlan-id <vlan>] <filepath> FTP:<server_ip> <user_name>` and press **Enter**.

   Example - FTP: For an FTP server with IP address 192.168.5.64, no VLAN, Port 1 of the active IOC card, client IP address of 192.168.1.200, a user name of “user1” on the FTP server, and an upgrade file named “Maincode.bin” the command is:

   ```
   set ptp-node upgrade ioc-1 address 192.168.1.200
   Maincode.bin ftp:192.168.5.64 user1
   ```

3. When prompted, enter the password for the server. The new software is loaded into the client.

4. Type `set ptp-node reboot IOC-1 address 192.168.1.220` and press **Enter** to reboot the client.

The firmware update will not be implemented until after the client has been rebooted.

Note: TP500 clients send autonomous messages about the upgrade process status at the start and finish of the process. These messages will generate SNMP traps from the TP5000 if the SNMP option is activated and enabled for the TP5000, and if SNMP traps are configured.

Chapter 6 Maintenance and Troubleshooting

This chapter describes maintenance and troubleshooting procedures for the TimeProvider 5000.

In This Chapter

- Preventive Maintenance
- Safety Considerations
- ESD Considerations
- Troubleshooting
  – Diagnosing the IOC - Reading LED Conditions
  – Diagnosing the IMC - Reading LED Conditions
- Repairing the TimeProvider 5000
  – Removing the IOC
  – Replacing the IOC
  – Replacing the IMC
- Upgrading the Firmware
  – TP5000 Upgrade - Loss of Outputs
  – TP5000 with Redundant IOC Modules v1.2.3 - No Loss of Outputs
  – TP5000 with Redundant IOC Modules v1.1.8 - No Loss of Outputs
  – Upgrading an Expansion Shelf
- Downgrading the Firmware
- TimeProvider 5000 Part Numbers
- Returning the TimeProvider 5000
- User’s Guide Updates
- Contacting Technical Support

Preventive Maintenance

The TimeProvider 5000 requires minimal preventive maintenance. Ensure the unit is not exposed to hazards such as direct sunlight, open windows, water, or extreme heat. See Environmental Requirements, on page 59, for electromagnetic compatibility conditions that may cause damage.

Caution: To avoid electromagnetic discharge damage to the circuitry, never attempt to vacuum the TimeProvider 5000.

Caution: To avoid damage, under no circumstances should the interior chassis of the TimeProvider 5000 be allowed to come in contact with water.

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

Table 6-1. Preventive Maintenance

Item	Inspection	Corrective Action	Interval
Chassis	Inspect for dirt or foreign material	Clean the exterior of chassis with a soft dry cloth	Periodically
Cables	Inspect for pinched, worn or damaged cable	Replace pinched, worn or damaged cable at the first opportunity	Periodically
Connectors	Inspect for loose or damaged connector	Tighten loose connectors. If damaged, replace the connector and/or cable at the first opportunity	Periodically

Safety Considerations

Follow your company's safety guidelines and policies when working on or around live equipment.

ESD Considerations

Maintenance personnel should wear ESD wrist straps when installing or working on all TimeProvider 5000 equipment and modules. Plug the user-supplied wrist strap into the TimeProvider 5000. Place IMC and IOC modules into static-free bags when not in use.

Troubleshooting

Symptoms, LEDs, and System Messages can all be very helpful in troubleshooting the TP5000. Use the “show alarm” and “show event” commands to view system messages.

Table 6-2 presents troubleshooting information for the TP5000 based on symptoms. Table 6-3 presents diagnostic information for the IOC card using on front panel LEDs. Table 6-4 presents diagnostic information for the IMC card based on front panel LEDs. See Table A-1 in Appendix A, System Messages for Event IDs, system messages and associated corrective actions.

Table 6-2. Troubleshooting Symptoms

Symptom	Probable Cause	Troubleshooting Procedure / Corrective Action
No LED lit on any module	No power to unit	Check power supply Check to ensure that UPS (if applicable) is operating correctly
	Both A and B fuses on the branch over-current protection unit are blown	Remove both fuses and replace
	Loss of ground	Re-attach ground wires
	Loose power cabling to unit	Check that power cables to unit are securely fastened
	Chassis is faulty	Contact Symmetricom Global Services
No PTP flow between TP5000 Grandmaster and client (If LED for port is OFF:)	Cable connections	Check the cable connections and SFP connections. Verify that SFP connector models are recommended and supported.
	Ethernet Auto Negotiation settings	Check that either Ethernet Auto Negotiation is enabled or that speed has been set to a compatible level with the connecting network element (show eth config command). Make sure that only full-duplex network devices are used. The TP5000 does not support half-duplex devices, such as hubs, for PTP connections.

Table 6-2. Troubleshooting Symptoms

Symptom	Probable Cause	Troubleshooting Procedure / Corrective Action
No PTP flow between TP5000 Grandmaster and client (If LED for port is ON and ping to client is unsuccessful:)	VLAN / non-VLAN configuration is incorrect or IP address configuration is incorrect	Verify that IP configuration is correct with "show ip config ioc1" Verify that VLAN configuration is correct with “show vlan-config ioc1” Verify that IP status is correct with "show ip status ioc" If status does not look correct, restart interface with "set ip ioc1-1 restart" or "set ip ioc1-2 restart", as appropriate
No PTP flow between TP5000 Grandmaster and client (If LED for port is ON and ping to client is successful:)	Client configuration for acceptable Grandmaster is incorrect	Check acceptable Grandmaster setting of client.
	PTP state set to Disable	Change PTP state to Enable with “set ptp state” command for the port.
	PTP Max Clients setting for TP5000 exceeded	If number of clients exceeds max setting for TP5000, extra clients are ignored. Change max clients setting with “set ptp max-client” command
	PTP domain setting for GM does not match client’s domain	Verify domain setting for GM matches the domain setting for the client. Check GM domain setting with “show ptp-config common” command for the port.
	PTP Unicast - Dynamic negotiation disabled on GM , with Unicast -Dynamic clients	Check Unicast - Dynamic negotiation setting of GM with “show ptp-config common” command for the port. Use the “set ptp unicast dynamic negotiate ioc1-[y] enable” command for the port.
	PTP max allowable rate settings for sync and delay less than values of client	Check sync-limit and delay-limit settings of GM with “show ptp-config common” command for the port. If max allowable rates of GM are less than those of client, use the “set ptp sync-limit” and “set ptp delay-limit” commands to increase rates to meet or exceed rate values for clients. Or decrease rate settings for client to a value less than or equal to settings of GM.

Table 6-2. Troubleshooting Symptoms

Symptom	Probable Cause	Troubleshooting Procedure / Corrective Action
Upgrading firmware retrieving file failed	Firewall set to “Block” for FTP or SFTP	Use “show firewall” command to check firewall settings. Use “set firewall” command to change firewall settings.
	FTP/SFTP server file path configured incorrectly	Ensure that the file name and path in the command line string exactly matches the file name, including extension name, and path to the upgrade file.
	User name / password	Verify that the user name and password for the FTP/SFTP server is correct. Retry
	Passive (PASV) FTP mode being used.	Enable active mode on FTP server. The TimeProvider 5000 only supports active FTP. Linux, Windows, and other third-party FTP servers can be used in the upgrade process of the TP5000.
	Using Up and Left arrows to move the cursor in terminal program	Some terminal programs produce unreadable characters when using the Up and Left arrow buttons to retrieve and modify previous commands. Type commands in directly with alpha-numeric keys.
Upgrading firmware failed	Attempting to upgrade the IMC with IOC file or vice-versa.	Verify path to correct file for upgrade. Ensure that upgrade file is for the same card-type being upgraded. Try upgrade again with correct file path.
	Flash memory failed	Retry upgrade. If upgrade fails again, contact Symmetricom.
System in Holdover GPS not tracking (GPS LED is Amber)	No visible satellites	Check if GPS is set to auto or manual using show gps command. If set to manual, verify that latitude and longitude settings are correct. Try setting GPS to auto mode with set gps command.
	Wrong antenna type, cable length, or power level into GPS port on IMC card	Check GPS antenna for approved power ratings, cabling for approved lengths, and actual power level into GPS port on IMC card, as per Chapter C, Installing the GPS Antenna. The GPS engine requires a gain at the antenna connector input of the chassis to be between 25 dB and 35 dB.

Table 6-2. Troubleshooting Symptoms

Symptom	Probable Cause	Troubleshooting Procedure / Corrective Action
System in Holdover Not tracking E1 Input (GPS LED is OFF)	Loss of Signal (LOS) of E1 Input	Check connection for E1 input Check E1 input source
	Alarm Indication Signal (AIS)	Check E1 input source
	Out of Frame (OOF)	Check E1 input source
	Signal amplitude level	Check E1 input source. Check cables
System stays in warm-up	ToD source (GPS or E1) invalid	Check Input source. Check alarms with “show alarm-config” command.
	Warm-up still in progress	Typical warm-up time for the Active card is: Quartz 30 – 40 minutes Rubidium 50 – 60 minutes Standby IOC starts locking to Active IOC after Active IOC enters normal track. Allow an additional ~20 minutes for Standby card to completes warm-up.

Diagnosing the IOC – Reading LED Conditions

Table 6-3 shows the function of the LED indicators on the IOC.

Table 6-3. LED Conditions for the IOC

Indicator	Label	Description	Corrective Action
Power Module Power Indicator	PWR	Green - Module power available	n/a
		Off - Module power not available	Check power supply See Table 6-2 ,“No LED lit on any module” for probable causes and more corrective actions.

Table 6-3. LED Conditions for the IOC (Continued)

Indicator	Label	Description	Corrective Action
Active Indicates which IOC is responsible for generating PTP, Telecom, 10MHz, and 1PPS outputs	ACT	Off - Standby IOC or System Startup or card failed	If dual IOC cards, then the IOC is in Startup or in Standby, or card failed If single IOC card, then IOC is in Startup or card failed. See Table 6-2 ,“No LED lit on any module” for probable causes and more corrective actions. Check alarms with “show alarm-config” commands.
		Green - Active IOC	n/a
IOC Alarm IOC module alarm/fault indicator	ALM	Off - IOC operating normally	n/a
		Flashing Green - Software starting up	Wait for IOC to finish booting.
		Amber - IOC operational Minor Alarm(s)	Use “show alarm” command to view alarm IDs and descriptions. See Table A-1 in Appendix A, System Messages for corrective actions.
		Red - IOC has Failed or has Major/Critical Alarm(s)	Use “show alarm” command to view alarm IDs and descriptions. See Table A-1 in Appendix A, System Messages for corrective actions. After taking corrective actions, use “reboot ioc” command.

Table 6-3. LED Conditions for the IOC (Continued)

Indicator	Label	Description	Corrective Action
Ethernet Port 1 ETH1 port link/activity indicator	ETH1	Green - Link has been established	n/a
		Flashing Green - Link activity	n/a
		Off - Link has not been established	Check the cable connections and SFP connections. Verify that interface is enabled. with “show ip config ioc1” command. Verify that SFP connector models are recommended and supported. Check that either Ethernet Auto Negotiation is enabled or that speed has been set to a compatible level with the connecting network element with “show eth config” command. Make sure that only full-duplex network devices are used. The TP5000 does not support half-duplex devices, such as hubs, for PTP connections.

Table 6-3. LED Conditions for the IOC (Continued)

Indicator	Label	Description	Corrective Action
Ethernet Port 2 ETH2 port link/activity indicator	ETH2	Green - Link has been established	n/a
		Flashing Green - Link activity	n/a
		Off - Link has not been established	Check the cable connections and SFP connections. Verify that interface is enabled. with “show ip config ioc1” command Verify that SFP connector models are recommended and supported. Check that either Ethernet Auto Negotiation is enabled or that speed has been set to a compatible level with the connecting network element with “show eth config” command. Make sure that only full-duplex network devices are used. The TP5000 does not support half-duplex devices, such as hubs, for PTP connections.
Local Oscillator State Indicates the current mode of operation of the LO servo	HOLD	Off - Oscillator is operating in Locked mode	n/a
		Amber - Oscillator is operating in Holdover or Acquire modes	Check the reference input source to verify that it is connected and operational.
		Flashing Amber - Oscillator is operating in Warm-up mode	Typical warm-up time for the Active card is: Quartz 30 – 40 minutes Rubidium 50 – 60 minutes Standby IOC starts locking to Active IOC after Active IOC enters normal track. Allow an additional ~20 minutes for Standby card to completes warm-up.

Diagnosing the IMC – Reading LED Conditions

Table 6-4 shows the function of the LED indicators on the front panel of the IMC.

Table 6-4. LED Conditions for the IMC

Indicator	Label	Description	Corrective Action
Power Indicator (IOC and IMC)	PWR	Green - Module power available	n/a
		Off - Module power not available	Check power supply See Table 6-2 ,“No LED lit on any module” for probable causes and more corrective actions.
-48V A-Bus A-Bus Battery Indicator (IMC)	BT A	Off - A-Bus power OK	n/a
		Red - A-Bus power failed	Check power level from power supply to power module A. Check connections to primary power module A. Check ground connections. Check A fuse on the branch over-current protection unit, and replace if it is blown.
-48V B-Bus B-Bus Battery Indicator (IMC)	BT B	Off - B-Bus power OK	n/a
		Red - B-Bus power failed	Check power level from power supply to power module B. Check connections to primary power module B. Check ground connections. Check B fuse on the branch over-current protection unit, and replace if it is blown.

Table 6-4. LED Conditions for the IMC (Continued)

Indicator	Label	Description	Corrective Action
System Health Aggregation of system alarms indicator	SYS	Off - IMC, IOC operating normally	n/a
		Amber - IMC, IOC operational Minor Alarm(s)	Use “show alarm” command to view alarm IDs and descriptions. See Table A-1 in Appendix A, System Messages for corrective actions.
		Red - IMC, IOC operational Major or Critical Alarm(s)	Use “show alarm” command to view alarm IDs and descriptions. See Table A-1 in Appendix A, System Messages for corrective actions. After taking corrective actions, use “reboot” command to reboot the card that had the major or critical alarm..
IMC Alarm IMC module alarm/fault indicator	ALM	Off - IMC operating normally	n/a
		Flashing Green - Software starting up	Wait for IMC to finish booting.
		Amber - IMC operational Minor Alarm(s)	Use “show alarm” command to view alarm IDs and descriptions. See Table A-1 in Appendix A, System Messages for corrective actions.
		Red - IMC operational Major/Critical Alarm(s)	Use “show alarm” command to view alarm IDs and descriptions. See Table A-1 in Appendix A, System Messages for corrective actions. After taking corrective actions, use “reboot imc” command.

Table 6-4. LED Conditions for the IMC (Continued)

Indicator	Label	Description	Corrective Action
GPS Status GPS engine status indicator	GPS	Green - ToD source is GPS and GPS engine/interface is operating normally	n/a
		Amber - ToD source is GPS and GPS engine or antenna is not tracking satellite	Use “show alarm” command to view alarm IDs and descriptions. See Table A-1 in Appendix A, System Messages for corrective actions. Use “show GPS” command to see detected satellites and their signal levels.
		Off - ToD source is not GPS	This LED should only be OFF if the TP5000 is not using GPS.
Ethernet Management Port LEDs on the Ethernet connector	MGMT	Left Amber Flash - Activity	n/a
		Left Off - No Activity	n/a
		Right Green - Link has been established	n/a
		Right Off - Link has not been established	Check cable and connections

Diagnosing the Expansion Shelf– Reading LED Conditions

Table 6-5 shows the function of the LED indicators on the front panel of an expansion shelf.

Table 6-5. LED Conditions for the Expansion Shelf

Indicator	Label	Description	Corrective Action
Power Indicator	PWR	Green - Shelf power available	n/a
		Off - Shelf power not available	Check power supply See Table 6-2 ,“No LED lit on any module” for probable causes and more corrective actions.

Table 6-5. LED Conditions for the Expansion Shelf (Continued)

Indicator	Label	Description	Corrective Action
-48V A-Bus A-Bus Battery Indicator)	BT A	Off - A-Bus power OK	n/a
		Red - A-Bus power failed	Check power level from power supply to power module A. Check connections to primary power module A. Check ground connections. Check A fuse on the branch over-current protection unit, and replace if it is blown.
-48V B-Bus B-Bus Battery Indicator (IMC)	BT B	Off - B-Bus power OK	n/a
		Red - B-Bus power failed	Check power level from power supply to power module B. Check connections to primary power module B. Check ground connections. Check B fuse on the branch over-current protection unit, and replace if it is blown.
Expansion Shelf alarm/fault indicator	ALM	Off - Expansion shelf operating normally	n/a
		Flashing Green - Software starting up	Wait for expansion shelf to finish booting.
		Amber -Expansion shelf operational Minor Alarm(s)	Use "show alarm" command to view alarm IDs and descriptions. See Table A-1 in Appendix A, System Messages for corrective actions.
		Red - Expansion shelf operational Major/Critical Alarm(s)	Use "show alarm" command to view alarm IDs and descriptions. See Table A-1 in Appendix A, System Messages for corrective actions. After taking corrective actions, use "reboot imc" command.

Table 6-5. LED Conditions for the Expansion Shelf (Continued)

Indicator	Label	Description	Corrective Action
DTI/ETH Expansion shelf Port LEDs on the Ethernet connector	MGMT	Green - Activity on link to TP 5000 IMC DTI/ETH expansion port	n/a
		Green Flash - Link to TP 5000 IMC DTI/ETH expansion port has been established	n/a
		Off - Link to TP 5000 IMC DTI/ETH expansion port has not been established	Check cable and connections
GPS Status GPS engine status indicator	REF	Green - Exp clock is in fast tracking or normal tracking	n/a
		Amber - Expansion clock is in holdover or acquire mode	Use “show alarm” command to view alarm IDs and descriptions. See Table A-1 in Appendix A, System Messages for corrective actions. Use “show GPS” command to see detected satellites and their signal levels.
		Amber Flash - Expansion clock is in warm-up	n/a

Repairing the TimeProvider 5000

Repairing the TimeProvider 5000 is limited to replacing modules. Refer to Working With Modules, on page 67, for information on how to properly handle modules to prevent electrostatic or physical damage.

There are no field-serviceable fuses in the TimeProvider 5000. If a fuse blows in a TimeProvider 5000, the unit must be returned to the factory for repair.

Removing the IOC

You can remove either of two IOCs in a chassis without affecting outputs. If you need to remove the only IOC in a chassis, or remove both IOCs from a chassis, outputs are interrupted and will resume once one IOC has achieved normal operating state.

Removing the Only IOC in a Chassis

To remove the only IOC in a chassis, use the following procedure. Output signals will be interrupted; they will resume once the IOC has achieved normal operating state.

1. Save the contents of the IOC memory in the IMC by issuing the following command:

   Type `set configuration backup ioc-to-imc` and press **Enter**.

2. Attach a wrist grounding strap and connect it to the TimeProvider 5000 chassis.

3. Loosen the captive retaining screws and pull out on them to unseat the IOC from the chassis.

Warning: To avoid possible electrostatic damage to the IOC, place it in a static-free bag or on a static-free surface.

4. Place the IOC in a static-free bag or on a static-free surface.

Install a new IOC using the appropriate procedure in Replacing the IOC, on page 407.

Replacing the IOC

This section contains procedures for replacing IOC in three circumstances:

- Replacing the only IOC in a chassis
- Replacing one of two IOCs in a chassis
- Replacing both IOCs in a chassis

Replacing the Only IOC In a Chassis

To replace the IOC in a chassis, use the following procedure. Output signals will resume once the IOC has achieved normal operating state. This procedure assumes that you have stored the contents of the IOC memory in the IMC using the `Set Configuration Backup` command.

1. Attach a wrist grounding strap and connect it to the TimeProvider 5000 chassis.
2. Remove the IOC module using the procedure above.
3. Align the new IOC module's edges within the guides of the selected slot.
4. Slide the IOC module into the chassis and press firmly until it seats fully into its backplane edge connector.
5. Tighten the captive screws located on each side of the panel
6. Copy the contents of the IOC memory stored in the IMC by issuing the following command.

   Type `set configuration restore ioc` and press **Enter**.

If you have not stored the contents of the IOC memory in the IMC, then provision the IOC using the procedures and commands described in Chapter 4, Provisioning.

4. Wait for the IOC to reboot and achieve normal operating state.

Replacing One of Two IOCs In a Chassis

Ensure that the IOC card that is to be replaced is the standby card before removing it.

Note: Removing the active card is not recommended. Before removing the active card, manually switch the active IOC card to standby using steps 2 and 3 in the procedure below.

For this example, assume that IOC1 is the card that is to be replaced, and that it is the active card. Therefore, IOC2 is the standby card. This example demonstrates switching IOC2 to be the active card, then using the "show ioc-state" command to verify the switch.

1. Attach a wrist grounding strap and connect it to the TimeProvider 5000 chassis.
2. Type `set ioc-state ioc2 active` and press **Enter**.
3. Type `show ioc-state` and press **Enter** to verify that the standby card has been switched to active.

Note: Switchover to the standby IOC will be prohibited if the standby IOC has alarms of higher severity than the active IOC or if the standby IOC is still in warm-up. Check system status and alarms if the command fails.

4. Loosen the screws and then pull out the IOC. Be sure to place the IOC on a static-free surface.

5. Align the new IOC module’s edges within the guides of the selected slot.

6. Slide the IOC module into the chassis and press firmly until it seats fully into its backplane edge connector.

7. Tighten the captive screws located on each side of the panel

8. The configuration of the newly-installed IOC will be set from the active IOC in the system. Wait for the new IOC to reboot and achieve normal operating state.

9. To switch the new IOC card as the active card, type `set ioc-state ioc1 active` and press **Enter**.

Note: When executing the command "set ioc-state iocx", wait 30 seconds after the prompt returns before issuing the next command.

10. Type `show ioc-state` and press **Enter** to verify that the standby card has been switched to active.

Replacing Both IOCs In a Chassis

To avoid interrupting outputs in a redundant system, replace the standby module first. Install the new module, then wait until it leaves warm-up before making it active. Then replace the other module.

Note: Removing the active card is not recommended. Before removing the active card, manually switch the active IOC card to standby using steps 2 and 3 in the procedure below.

If it does not matter whether outputs are interrupted, use the Replacing the Only IOC In a Chassis procedure above to replace each IOC module.

For this example, assume that IOC1 is the card that is to be replaced first, and that it is the active card. Therefore, IOC2 is the standby card. This example demonstrates switching IOC2 to be the active card, then using the “show ioc-state” command to verify the switch.

1. Attach a wrist grounding strap and connect it to the TimeProvider 5000 chassis.

2. Type `set ioc-state ioc2 active` and press **Enter**.

Note: When executing the command "set ioc-state iocx", wait 30 seconds after the prompt returns before issuing the next command.

3. Type `show ioc-state` and press **Enter** to verify that the standby card has been switched to active.

> **Note:** Switchover to the standby IOC will be prohibited if the standby IOC has alarms of higher severity than the active IOC or if the standby IOC is still in warm-up. Check system status and alarms if the command fails.

4. Loosen the screws and then pull out IOC1. Be sure to place the IOC on a static-free surface.

5. Align the new IOC module's edges within the guides of the IOC1 slot.

6. Slide the IOC module into the chassis and press firmly until it seats fully into its backplane edge connector.

7. Tighten the captive screws located on each side of the panel

8. The configuration of the newly-installed IOC will be set from the active IOC in the system. Before replacing the second IOC, wait for the first IOC to reboot and leave the warm-up state.

9. To switch the first new IOC card as the active card, type `set ioc-state ioc1 active` and press **Enter**.

10. Type `show ioc-state` and press **Enter** to verify that the standby card has been switched to active.

11. Repeat steps 4 through 8 of this procedure for IOC2.

Replacing the IMC

> **Caution:** You must disconnect the GPS antenna cable before removing the IMC module.'

You can remove the IMC from the chassis and replace it without affecting outputs.

1. Save the contents of the IMC memory in an IOC (example is for IOC1) by issuing the following command:

   Type `set configuration backup imc-to-ioc1` and press **Enter**.

2. Attach a wrist grounding strap and connect it to the TimeProvider 5000 chassis.

3. Remove the IMC by loosening the captive screws and pulling the IMC from the chassis.

Warning: To avoid possible electrostatic damage to the IMC, place it in a static-free bag or on a static-free surface.

4. Place the IMC in a static-free bag or on a static-free surface.

5. Insert another IMC into the chassis and tighten the captive screws.

6. Reload the IMC memory from the IOC by issuing the following command:

   Type `set configuration restore imc-from-ioc1` and press **Enter**..

Warning: To avoid possible electrostatic damage to the module or panel, place it in a static-free bag or on a static-free surface.

Upgrading the Firmware

You can upgrade the firmware in the IMC, IOC or redundant IOCs, or expansion shelves using CLI commands and software available from Symmetricom. Only users with Admin level access can execute the “upgrade” command. The command places the IMC in the firmware download mode and prevents all other sessions from making changes to the configuration. During the upgrade process, no new sessions are allowed. Refer to Chapter 3, CLI Commands and SNMP and the command upgrade, on page 257 for details on the upgrade process.

The upgrade procedure to be used to upgrade the TP 5000 is based on the configuration of the TP 5000, firmware version from which the unit is being upgraded, and whether loss of outputs is acceptable.

- TP5000 with a single IOC module upgrading from 1.1.8 or 1.2.3 release to 2.x, please follow the procedure TP5000 Upgrade - Loss of Outputs below.
- TP5000 with Redundant IOC modules upgrading from 1.1.8 release to 2.x, please follow the step-by-step procedure TP5000 with Redundant IOC Modules v1.1.8 - No Loss of Outputs below.
- TP5000 with Redundant IOC modules upgrading from 1.2.3 release to 2.x, please follow the step-by-step procedure TP5000 with Redundant IOC Modules v1.2.3 - No Loss of Outputs below.

- All systems: When upgrading from released versions prior to 1.1.8, the upgrade process must be performed in two steps. The TP5000 must be upgraded to 1.1.8 first and then upgraded to 2.x using the relevant procedure below. See page 258 in Rev. D of the TimeProvider User's Guide (098-00028-000 Rev. D) for the procedure "Upgrading from TP5000 v1.0 to v1.1 or Higher".

Upon receipt of any new/repaired equipment, perform the relevant software upgrade procedure below prior to putting the shelf into service.

Note: If a PTP probe license is installed, follow the procedure TP5000 Upgrade - Loss of Outputs. The system will enable PTP probe mode (default) when different firmware versions are operating within the system. This will occur during the system upgrade of a TP5000 with redundant IOC modules, and the system must be returned to the grandmaster mode to restore outputs. Use the commands "`set packet-service ioc1-1 ptp-gm`" and "`set packet-service ioc1-2 ptp-gm`" to return to grandmaster mode.

Caution: To avoid a possible service call, do not issue a command to the TimeProvider 5000, do not remove power from the TimeProvider 5000, and do not remove an IOC or IMC from the chassis during the upgrade process. Doing so could corrupt the flash memory in a module, disabling the TimeProvider 5000.

Note: Linux, Windows, and other third-party FTP servers can be used in the upgrade process of the TP5000.

Note: If you need assistance selecting an SFTP server application, contact Symmetricom Global Services. See Contacting Technical Support, on page 427.

TP5000 Upgrade - Loss of Outputs

This method is the easiest and quickest upgrade method, but there will be Loss of Service (LOS) at reboot. The IMC and IOC must be rebooted together after all components are upgraded.

1. Verify that SSH or telnet connection to IMC is available
2. Upgrade IMC to 2.x using the command "upgrade imc <filepath> [ftp: | sftp:] <ftp-ip-address> <username>", but **DO NOT** reboot

---

Note: The FTP firewall is set to “Block” by default. Use the following command to set the IMC firewall to “Allow” for telnet communications:

```
set firewall imc ftp allow
```

Note: The TimeProvider 5000 only supports active FTP; it does not support passive (PASV) mode.

Note: For SFTP, both the SFTP and SSH firewalls must be set to “Allow”. They are both set to “Allow” by default.

Note: If an SFTP server is used, the protocol does not need to be included with the address.

```
ftp:192.168.5.64
[sftp:]192.168.5.64
```

---

3. Upgrade IOC1 to 2.x, and if present, IOC2. Use the command "upgrade iocx <filepath> [ftp: | sftp:] <ftp-ip-address> <username>" (where x is either 1 or 2), but **DO NOT** reboot
4. Reboot system with "reboot system" CLI command
5. Verify that the TimeProvider 5000 is running correctly by issuing commands "show status", "show alarm", and "show inventory". If the system is showing an alarm for a setting that is disabled, re-enable and disable that setting and the alarm will be cleared.

TP5000 with Redundant IOC Modules v1.2.3 - No Loss of Outputs

This approach should be used to avoid LOS for a TP5000 with redundant IOC modules. It is critical that the IMC is rebooted immediately after the IOC. Since there are two IOCs present within the shelf, the IMC will be rebooted twice.

1. Verify that SSH or telnet connection to IMC is available. Verify that a PTP probe option is not installed. This requires using both the "show license" and "show option" CLI commands. If there is a probe license, you must follow the procedure TP5000 Upgrade - Loss of Outputs.

2. Verify that both IOC outputs on the active card are functioning properly by checking the active alarms with the "show alarm" CLI command. If any alarms are present, resolve these issues first before proceeding.

3. Upgrade IMC to 2.x using the command "upgrade imc <filepath> [ftp: | sftp:] <ftp-ip-address> <username>", but **DO NOT** reboot

---

Note: The FTP firewall is set to "Block" by default. Use the following command to set the IMC firewall to "Allow" for telnet communications:

```
set firewall imc ftp allow
```

Note: The TimeProvider 5000 only supports active FTP; it does not support passive (PASV) mode.

Note: For SFTP, both the SFTP and SSH firewalls must be set to "Allow". They are both set to "Allow" by default.

Note: If an SFTP server is used, the protocol does not need to be included with the address.

```
ftp:192.168.5.64
[sftp:]192.168.5.64
```

---

4. Upgrade both IOCs to 2.x using the command "upgrade iocx <filepath> [ftp: | sftp:] <ftp-ip-address> <username>" (where x is either 1 or 2), but **DO NOT** reboot

5. Once all modules have been loaded with the correct 2.x revision, issue the "show status" command, taking note as to which IOC module is standby and which is active.

6. Reboot the standby IOC module by issuing the command "`reboot iocx`" (where the `x` is the standby IOC position, either 1 or 2). Immediately after the Tp5000> prompt returns from this command, issue the command "`reboot imc`".

7. Allow both the standby IOC and the IMC to fully reboot and then log into the TimeProvider 5000.

8. Issue the command "`show status`". The current reference input and the phase offset fields may be incorrect - this is temporary. Please ignore this.

   Issue the command "`show alarm`". At this point in the upgrade procedure there may be alarms present that are invalid- this is temporary. Please ignore this. Wait until the standby IOC changes from standby warm-up mode to standby.

9. Make standby IOC active with the command "`set ioc-state iocx active`" (where `x` is the standby IOC, either 1 or 2).

Note: When executing the command "set ioc-state iocx", wait 30 seconds after the prompt returns before issuing the next command.

10. Verify IOC switch state with "`show ioc-state`" CLI command. Also verify that the current standby IOC is running the previous firmware version with "show inventory".

11. Reboot standby IOC with "`reboot iocx`" (where the `x` is the standby IOC position, either 1 or 2). Immediately after the prompt returns, reboot IMC with "reboot imc".

12. After the standby IOC module and IMC module return to service, log into the TimeProvider 5000 and issue the command "show inventory". Make sure all of the modules are now at the desired 2.x revision.

13. Issue the command "show ref". All of the input references that are not being used must be disabled. Choose the appropriate commands from the list below for the input references that need to be disabled:

```
set gnss state disable
set gps state disable
set input state port1 disable
set input state port2 disable
set pps-tod state port1 disable
set pps-tod state port2 disable
```

14. Verify that the TimeProvider 5000 is running correctly by issuing commands "show status", "show alarm", and "show inventory".

TP5000 with Redundant IOC Modules v1.1.8 - No Loss of Outputs

This approach should be used to avoid LOS with a TP5000 with redundant IOC modules. It is critical that the IMC is rebooted immediately after the IOC. Since there are two IOCs present within the shelf, the IMC will be rebooted twice.

1. Verify that SSH or telnet connection to IMC is available.

2. Verify that both IOC outputs on the active card are functioning properly by checking the active alarms with the "show alarm" CLI command. If any alarms are present, resolve these issues first before proceeding.

3. Upgrade IMC to 2.x using the command "upgrade imc <filepath> [ftp: | sftp:] <ftp-ip-address> <username>", but **DO NOT** reboot

---

Note: The FTP firewall is set to “Block” by default. Use the following command to set the IMC firewall to “Allow” for telnet communications:

```
set firewall imc ftp allow
```

Note: The TimeProvider 5000 only supports active FTP; it does not support passive (PASV) mode.

Note: For SFTP, both the SFTP and SSH firewalls must be set to “Allow”. They are both set to “Allow” by default.

Note: If an SFTP server is used, the protocol does not need to be included with the address.

```
ftp:192.168.5.64
[sftp:]192.168.5.64
```

---

4. Upgrade both IOCs to 2.x using the command "upgrade iocx <filepath> [ftp: | sftp:] <ftp-ip-address> <username>" (where x is either 1 or 2), but **DO NOT** reboot

5. Once all modules have been loaded with the correct 2.x revision, issue the "show status" command, taking note as to which IOC module is standby and which is active.

6. Reboot the standby IOC module by issuing the command "reboot iocx" (where the x is the standby IOC position, either 1 or 2). Immediately after the Tp5000> prompt returns from this command issue the command "reboot imc".

Allow both the standby IOC and the IMC to fully reboot and return to service. Once you are able to log back into the TimeProvider 5000, issue the command "`show status`". The current reference input and the phase offset fields may be incorrect - this is temporary. Please ignore this.

Issue the command "`show alarm`". At this point in the upgrade procedure, there may be alarms present that are invalid- this is temporary. Please ignore this. Wait until the standby IOC changes from standby warm-up to standby.

7. Make standby IOC active with the command "`set ioc-state iocx active`" (where `x` is the current standby IOC, either 1 or 2).

Note: When executing the command "set ioc-state iocx", wait 30 seconds after the prompt returns before issuing the next command.

---

8. There will be a temporary gap in the PTP flow. To minimize the gap, immediately restart IP interfaces on IOC:

   a. Use the command "`set ip ioc1-1 restart`"
   b. Use the command "`set ip ioc1-2 restart`"

9. Verify IOC switch state with the command "`show ioc-state`". Also verify that the current standby IOC is running the previous firmware version with "`show inventory`".

10. Reboot standby IOC with "`reboot iocx`" (where the x is the standby IOC position, either 1 or 2). Immediately after the prompt returns, reboot IMC with "reboot imc".

11. After the standby IOC module and IMC module return to service, log into the TimeProvider 5000 and issue the command "`show inventory`". Make sure all of the modules are now at the desired 2.x revision.

12. Issue the command "`show ref`". All of the input references that are not being used must be disabled. Choose the appropriate commands from the list below for the input references that need to be disabled:

```
set gnss state disable
set gps state disable
set input state port1 disable
set input state port2 disable
set pps-tod state port1 disable
set pps-tod state port2 disable
```

13. Verify that the TimeProvider 5000 is running correctly by issuing commands "`show status`", "`show alarm`", and "`show inventory`".

Upgrading an Expansion Shelf

To upgrade the software in an expansion shelf with ID=4, for example, use the following procedure:

1. Login at the Admin level (see Logging In And Out, on page 382).

2. Type set configuration backup exp4-to-imc and press **Enter** to save the contents of the expansion shelf configuration to the IMC card.

3. Type upgrade exp{0-9] <filepath> <ftp-server> <user name> (use the IP address of the FTP server) and press **Enter**.

Note: The FTP firewall is set to “Block” by default. Use the following command to set the IMC firewall to “Allow” for telnet communications:

```
set firewall imc ftp allow
```

Note: The TimeProvider 5000 only supports active FTP; it does not support passive (PASV) mode.

Note: For SFTP, both the SFTP and SSH firewalls must be set to “Allow”. They are both set to “Allow” by default.

Note: If an SFTP server is used, the protocol does not need to be included with the address.

```
ftp:192.168.5.64
[sftp:]192.168.5.64
```

Example - FTP: For a TP E10 PTP/SyncE expansion shelf with ID=4, FTP server with IP address 192.168.5.64, a user name of “user1”, and an upgrade path of “/ver2.bin” the command is:

```
upgrade exp4 /ver2.bin ftp:192.168.5.64 user1
```

Example - SFTP: For a TP E30 E1/1PPS+TOD expansion shelf with ID=4, an SFTP server with IP address 192.168.5.65, a user name of “user1”, and a upgrade file path of “/ver2.bin” the command is:

```
upgrade exp4 /ver2.bin 192.168.5.65 user1
```

4. When prompted, enter the password for the server. The new software is loaded into the expansion shelf with the specified ID.

Note: The system will transfer the file from the specified server and then upgrade the expansion shelf.

5. The TimeProvider 5000 validates the received file, and if the file is valid it updates the flash memory in the expansion shelf.

Note: If the file is not valid, the TimeProvider 5000 will reject it.

Downgrading the Firmware

You can also downgrade the firmware in the IMC, IOC or redundant IOCs, or expansion shelves to an earlier version using “upgrade” and other CLI commands and software available from Symmetricom. Only users with Admin level access can execute the “upgrade” command.

Note: To avoid incompatibility issues, you must use configuration files created with the firmware release version to which the unit has been downgraded. Symmetricom does not recommend downgrading a system which is in service.

Note: Check the hardware compatibility matrix in Table 6-6 before downgrading.

This section describes the downgrade procedure. There will be loss of outputs at reboot and the configuration **must** be set to factory defaults.

1. Verify that SSH or telnet connection to IMC is available

2. Downgrade IMC using the command "upgrade imc <filepath> [ftp: | sftp:] <ftp-ip-address> <username>", but **DO NOT** reboot

Note: The FTP firewall is set to “Block” by default. Use the following command to set the IMC firewall to “Allow” for telnet communications:

```
set firewall imc ftp allow
```

Note: The TimeProvider 5000 only supports active FTP; it does not support passive (PASV) mode.

Note: For SFTP, both the SFTP and SSH firewalls must be set to “Allow”. They are both set to “Allow” by default.

Note: If an SFTP server is used, the protocol does not need to be included with the address.

```
ftp:192.168.5.64
[sftp:]192.168.5.64
```

3. Downgrade IOC1 and if present, IOC2. Use the command "upgrade iocx <filepath> [ftp: | sftp:] <ftp-ip-address> <username>" (where x is either 1 or 2), but **DO NOT** reboot

4. Reboot system with "reboot system" CLI command

5. Set factory defaults with “set configuration factory” CLI command

6. Verify that the TimeProvider 5000 is running correctly by issuing commands "show status", "show alarm", and "show inventory". If the system is showing an alarm for a setting that is disabled, re-enable and disable that setting and the alarm will be cleared.

TimeProvider 5000 Part Numbers

The TimeProvider 5000 can operate in either a basic configuration, or in a redundant configuration in one chassis. Basic configuration consists of the following components:

- 1 Chassis
- 1 IMC module
- 1 IOC module

Note: When operating in basic configuration, blank panels are available to cover the vacant module slots in the chassis.

Redundant configuration consists of the following components:

- 1 Chassis

- 1 IMC module
- 2 IOC modules

See System and Accessory Part Numbers, on page 422.

See Table 6-6 for the minimum firmware revisions required for TP 5000 hardware.

Compatibility Matrix

Table 6-6 below describes the minimum firmware revision required for TP 5000 hardware. The IMC, IOC and expansion shelves must contain the same firmware revision (see Upgrading the Firmware, on page 411)..

Table 6-6. Compatibility Matrix - TP5000 Hardware and Firmware

Description	P/N	HW Rev.	Minimum FW Rev.	Notes
IMC Module	090-50331-01	Rev L or higher	1.2.3	This module can't distinguish between 090-50301-01 and 090-50301-02 chassis.
		Rev K or lower	1.0.6	This module can't distinguish between 090-50301-01 and 090-50301-02 chassis.
	090-50331-02		2.0.4*	
	090-50331-04		2.0.4*	
	090-50331-05		2.0.4*	
IMC Module - NTP	090-50332-01		2.0.4*	This module can't distinguish between 090-50301-01 and 090-50301-02 chassis.
I/O Module	090-50311-01		1.0.6**	
	090-50312-01		1.0.6**	
	090-50314-01		1.2.3**	
	090-50315-01		2.0.4*, **	Should be used w/ 090-50301-02 chassis
IOC Module, Quartz	090-50321-01	Rev L or higher	1.2.3	
		Rev K or lower	1.0.6	
IOC Module, Rubidium	090-50322-01	Rev M or higher	1.2.3	
		Rev L or lower	1.0.6	

Table 6-6. Compatibility Matrix - TP5000 Hardware and Firmware

Description	P/N	HW Rev.	Minimum FW Rev.	Notes
Main Chassis	990-50301-01		1.0.6	
Main Chassis	990-50301-02		2.0.4*	Chassis can be used by older firmware, but p/n can't be identified by "show inventory"
TimeProvider E10 Expansion Shelf SyncE/Ethernet	990-50401-01		2.0.4*	Must be used w/ 090-50331-02, 090-50331-04, 090-50331-05
TimeProvider E30 Expansion Shelf E1 & PPS-TOD	990-50401-02		2.0.4*	Must be used with 090-50331-02, 090-50331-04, 090-50331-05

* These items are also supported by firmware release 1.3.8 for China region.
** The FW revision for the I/O module refers to the IMC/IOC firmware revision.

System and Accessory Part Numbers

This section provides part numbers and descriptions for the system and accessories available for the TimeProvider 5000. Also available as separately ordered items are 23-inch (58.42 cm) rack mounting adapters and 21-inch (ETSI) rack mounting adapters. See Table 6-7 for component part numbers and Table 6-8 for connection accessories.

Table 6-7. Component Part Numbers

Item	Part Number
Base Units	
TimeProvider 5000 Front Access ETSI Chassis –includes User’s Documentation CD and Installation Kit	990-50301-01
Spare TimeProvider 5000 Front Access ETSI Chassis	090-50301-01
I/O Modules	
I/O Module with 4x E1 Ports and 2x UTI Ports	090-50311-01
I/O Module with 2x E1 Ports, 1PPS/10MHz Ports and 2x UTI Ports	090-50312-01

Table 6-7. Component Part Numbers (Continued)

Item	Part Number
I/O Module with 2x T1 Ports, 1PPS/10MHz Ports and 2x UTI Ports	090-50314-01
I/O Module with 2x DTI expansion ports, 2x 1PPS+TOD Ports, 2x E1 ports	090-50315-01
Blank I/O Face Plate	090-50312-99
IOC and IMC Modules	
Quartz IOC Module	090-50321-01
Rubidium IOC Module	090-50322-01
Blank IOC Module Face Plate	090-50322-99
IMC Card w/ Integrated GPS	090-50331-01
IMC Card w/ Integrated GPS & expansion control	090-50331-02
IMC Card w/ Integrated GPS & GNSS (GPS/Beidou) & expansion control	090-50331-04
IMC Card w/ Integrated GPS & GNSS (GPS only) & expansion control	090-50331-05
NTP IMC Module with Integrated GPS	090-50332-01
Expansion Shelves	
TimeProvider E10 Ethernet expansion shelf with user documentation and installation hardware	990-50401-01
TimeProvider E30 E1/1PPS+TOD expansion shelf with user documentation and installation hardware	990-50401-02
Air filter replacement kit for TimeProvider E10 PTP/SyncE expansion shelf	093-01206-000
Installation and Rack Mounting Adaptor Kits	
Hardware Installation Kit (included in 990-50301-01)	093-00050-000
21-inch (ETSI) Bracket Rack Mounting Adaptor Kit	093-00011-000
23-inch (58.42 cm) Bracket Rack Mounting Adaptor Kit	093-00012-000
Software Licenses	
SNMP License	920-50370-01
TP5000 NTP w/20,000 TPS Capacity for PTP IMC	920-50370-05
TP5000 R1.2 Multicast & 2-step clock	920-50380-01
TP5000 R2.0 500 VLAN (16 base + extended 484)	920-50380-02

Table 6-7. Component Part Numbers (Continued)

Item	Part Number
TP5000 PTP Probe	920-50375-01
TP5000 NTP w/120,000 TPS capacity for NTP IMC	920-50370-02
TPE10 PTP/SyncE 16 ports license (Adds availability of Ports 9-16 to standard 8 ports)	920-50470-01

Note: A blank face plate is required for EMC compliance if a slot is empty

Table 6-8. Connection Accessories

Item	Part Number
Optical 1000 Base-LX Single-Mode Ethernet 1310nm SFP Transceiver	121-20621-10-2
Optical 1000 Base-SX Multi-Mode Ethernet 850nm SFP Transceiver	121-20621-11-2
RJ45 100/1000 Base-T Full-Duplex SFP Transceiver	121-20621-12-2
Mini-BNC-to-BNC Adaptor Cable Kit (4 cables)	093-00068-000

GPS Antenna

Table 6-9 lists the GPS antenna kits. Table 6-7 lists the cables available for the GPS antenna.

Table 6-9. GPS Antenna Kits

Antenna Kit	Part Number	40 dB Antenna	48 dB Antenna	20 dB Amp	Cable Length (meters)	
					min	max
70M 40dB Antenna	990-13073-070	X			20	70
120M 48dB Antenna	990-13074-120		X		70	120
230M 48dB Antenna/ 20dB Amp	990-13075-230		X	X	190	230

.

Table 6-10. GPS Roof Mount Cables (spares and replacements only)

Part Number	Description
58521A-001	1 Meter, LMR400 Interconnect Cable, connectorized
58521A-002	2 Meter, LMR400 Interconnect Cable, connectorized
58521A-005	5 Meter, LMR400 Interconnect Cable, connectorized
58521A-010	10 Meter, LMR400 Interconnect Cable, connectorized
58521A-015	15 Meter, LMR400 Interconnect Cable, connectorized
58521A-030	30 Meter, LMR400 Interconnect Cable, connectorized
58521A-060	60 Meter, LMR400 Interconnect Cable, connectorized
58521A-110	110 Meter, LMR400 Interconnect Cable, connectorized
58521A-220	220 Meter, LMR400 Interconnect Cable, connectorized

Returning the TimeProvider 5000

You should return the equipment to Symmetricom only after you have exhausted the troubleshooting procedures described earlier in this chapter, or if Symmetricom Global Services has advised you to return the unit.

Note: Please retain the original packaging for re-shipping the product. If the original packaging is not available, contact Symmetricom Global Services (SGS) for assistance.

Repacking the Unit

Return all units in the original packaging. If the original packaging is not available, contact Symmetricom Global Services. 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 connectivity panels are protected when packaged.

Equipment Return Procedure

To return equipment to Symmetricom for repair:

1. Call Symmetricom Global Services (SGS) at 888-367-7966 (toll-free in USA only), 408-428-7907, or +49 700 3288 6435 in Europe, Middle East, or Africa to obtain a return material authorization number (RMA) before returning the product for service.

   You can request an RMA on the internet at www.symmetricom.com/Support/req_repair.htm.

   Retain the assigned RMA number for future reference.

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 address given with the RMA.

   Repaired equipment is returned to you with shipping costs prepaid by Symmetricom.

User's Guide Updates

When this manual is updated the updated version will be available for downloading from Symmetricom's internet web site. Manuals are provided in PDF format for ease of use. After downloading, you can view the manual on a computer or print it using Adobe Acrobat Reader.

Manual updates are available at:

www.symmetricom.com

Note: If you are downloading a product manual for the first time, you will need to register with Symmetricom for a username and password. If you are currently registered, login and download the manual update.

Contacting Technical Support

To order any accessory, contact the Symmetricom Sales Department. See http://www.symmetricom.com/company/contact-information/sales-offices for sales support contact information.

If you encounter any difficulties installing or using the product, contact Symmetricom Global Services:

USA and Canada

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

Toll-free in North America: 1-888-367-7966
Telephone: 408-428-7907
Fax: 408-428-7998
email: us_canada_sales@symmetricom.com
Internet: www.symmetricom.com

Europe, Middle East, and Africa (EMEA)

Symmetricom Global Services EMEA
Altlaufstrasse 42
85635 Hoehenkirchen-Siegertsbrunn Germany
Telephone: +49 700 3288 6435
Fax: +49 8102 8961 533
E-mail: emeasupport@symmetricom.com
emea_sales@symmetricom.com

Appendix A System Messages

This section provides information about the system messages that are displayed in response to a provisioning event or to an alarm that occurs when an associated threshold or timer is outside of the provisioned setting. These system messages apply to the TimeProvider 5000, as well as the TimeProvider E10 and TimeProvider E30 expansion shelves.

In This Appendix

- Message provisioning
- System Notification Messages

Message provisioning

The TimeProvider 5000 and its expansion shelves support logging of events using syslog defined facility and severity codes and system defined facility codes as follows:

Facility codes

4 Security/authorization messages

20 Time Provider 5000 Messages (events and alarms)

21 TimeProvider 5000 Command History

22 TimeProvider 500 Messages (events and alarms)

Severity codes

2 (critical) Critical: critical conditions

3 (major) Error: error conditions

4 (minor) Warning: warning conditions

5 (event) Notice: normal but significant condition

Notes:

1. Severity codes 2, 3, and 4, are also indicated by the Alarm LED(s) on the IMC and IOC modules.
2. Severity Code 2 indicate Critical Alarms.
3. Severity Code 3 indicates Major Alarms.
4. Severity Code 4 indicates Minor Alarms.
5. Severity Code 5 indicates Events and does not affect the Alarm LED.

The syslog message format is as follows:

```
Mmm dd  hh:mm:ss
host_name Process-name AlarmID,Index,Severity, MsgText
```

Where:

- Mmm = Month; dd = date; hh:mm:ss = system time

- host_name = hostname
- process-name = alarmd
- AlarmID = 000 thru Max_AlarmID
- Index = 0 thru 63
- Severity = Event | Minor | Major | Critical (defined by severity code)
- MsgText = (see tables)

The following is an example syslog message showing Input Port 1 loss of signal:

```
Aug 19 21:23:12 TP5000 alarmd: 035,003,Minor, IOC1: Input
Port-1 Loss of Signal
```

Syslog messages are stored according to facility code and/or severity:

- Syslog messages with facility code 4 are stored in the Security Log.
- Syslog messages with facility code 20 and a severity of 2 | 3 | 4 are stored in the Alarm Log.
- Syslog messages with facility code 20 and a severity of 5 are stored in the Event Log.
- Syslog messages with facility code 21 are stored in the Command Log.
- Syslog messages with facility code 22 are not stored in the TP5000. They can be forwarded to the remote syslog server.

System Notification Messages

Table A-1 provides a list of system notification messages. These messages are logged and sent to a remote syslog server if configured. Alarms will also generate an SNMP trap.

Table A-1. System Notification Messages

Description	Comp ID	Event ID	MsgLevel	Trans-itory	MsgText	Corrective Action
Communication to peer card failed (See Table A-2 for Secondary Index Info)	IMC IOC	0	Critical	No	Communication to <card> failed Communication to <card> failure cleared	Troubleshoot any existing system alarms None required
GNSS/GPS receiver communications failed (See Table A-2 for Secondary Index Info)	IMC	1	Minor	No	GNSS/GPS receiver communications failed GNSS/GPS receiver communications failure cleared	Check for any system alarms and rectify as needed None required
GNSS/GPS receiver not tracking satellite (See Table A-2 for Secondary Index Info)	IMC	2	Minor	No	GNSS/GPS receiver not tracking satellite GNSS/GPS receiver not tracking satellite cleared	Check antenna and connections None required
System time invalid (See Table A-2 for Secondary Index Info)	IMC	3	Major	No	System time <source> invalid System time <source> invalid cleared	Troubleshoot TOD source None required
System time has been set by reference (See Table A-2 for Secondary Index Info)	IMC	4	Event	Yes	System time has been set by reference <source>	None required
System log time has been updated	IMC	5	Event	Yes	System log time has been updated	None required
Management port link down	IMC	6	Minor	No	Management port link down Management port link down cleared	Check network connections None required

Table A-1. System Notification Messages (Continued)

Description	Comp ID	Event ID	MsgLevel	Trans-itory	MsgText	Corrective Action
Ethernet port (ETH1 or ETH2) link down (See Table A-2 for Secondary Index Info)	IOC1 IOC2 EXPx *x* = 0–9	7	Minor	No	<port> Ethernet port link down <port> PTP Ethernet port link down cleared	Check network connections None required
Manual sync IOC time to IMC required	IMC	8	Minor	No	Manual sync IOC time to IMC required Manual sync IOC time to IMC not required	Sync IOC time to clear alarm with “sync tod-source now” command None required
Power out of range (See Table A-2 for Secondary Index Info)	IMC EXPx *x* = 0–9	9	Critical	No	<*x.x* V> power out of range (voltage value) <*x.x* V> power out of range cleared (voltage value)	Hardware failure - Replace module None required
GNSS/GPS antenna voltage out of range	IMC	10	Major	No	GNSS/GPS antenna voltage out of range (voltage value) GNSS/GPS antenna voltage out of range cleared (voltage value)	Check antenna connections None required
GNSS/GPS antenna current out of range	IMC	11	Major	No	GNSS/GPS antenna current out of range (current value) GNSS/GPS antenna current within range (current value)	Check all cable and antenna connections, check voltage suppressor None required
GNSS/GPS antenna short-circuit (See Table A-2 for Secondary Index Info)	IMC	12	Minor	No	GNSS/GPS antenna short-circuit (voltage value) GNSS/GPS antenna short-circuit cleared (voltage value)	Check all cable and antenna connections, check voltage suppressor None required

Table A-1. System Notification Messages (Continued)

Description	Comp ID	Event ID	MsgLevel	Trans-itory	MsgText	Corrective Action
GNSS/GPS antenna open-circuit (See Table A-2 for Secondary Index Info)	IMC	13	Minor	No	GNSS/GPS antenna open-circuit GNSS/GPS antenna open- circuit cleared	Check all cable and antenna connections, check voltage suppressor None required
Battery(-48V)-A failure	IMC EXPx *x* = 0–9	14	Major	No	Battery (-48V) -A failure Battery (-48V) -A failure cleared	Troubleshoot the -48V power supply. Check voltage supply to A side of shelf None required
Battery(-48V)-B failure	IMC EXPx *x* = 0–9	15	Major	No	Battery (-48V) -B failure Battery (-48V) -B failure cleared	Troubleshoot the -48V power supply. Check voltage supply to B side of shelf None required
FPGA access failure	IMC IOC1 IOC2 EXPx *x* = 0–9	16	Critical	No	FPGA access failure FPGA access failure cleared	Hardware fault -Replace module None required
Flash partition failure (See Table A-2 for Secondary Index Info)	IMC IOC1 IOC2 EXPx *x* = 0–9	17	Critical	No	Flash partition failure Flash partition failure cleared	Hardware fault -Replace module None required
Phase-lock-loop (PLL) unlock error	IMC	18	Critical	No	PLL unlock error PLL unlock error cleared	Reboot System - If alarm remains, replace module None required

Table A-1. System Notification Messages (Continued)

Description	Comp ID	Event ID	MsgLevel	Trans-itory	MsgText	Corrective Action
Internal communication error (See Table A-2 for Secondary Index Info)	IOC	19	Critical	No	Internal communication error Internal communication error cleared	Reboot System - If alarm remains, replace module None required
FPGA temperature exceed limit	IOC1 IOC2 EXPx *x* = 0–9	20	Minor	No	FPGA temperature exceed limit FPGA temperature exceed limit cleared	Check room temperature setting. None required
IOC detected but none of them active	IMC	21	Major	No	IOC detected but none of them active Active IOC detected	Reboot system None required
Module reboot	IMC IOC1 IOC2 EXPx *x* = 0–9	22	Event	Yes	Module reboot	None required
Real Time Engine (RTE) communication to peer error	IOC	23	Major	No	RTE communication to peer error RTE communication to peer error cleared	Reboot System - If alarm remains, replace IOC module None required
Entered warmup mode	IOC1 IOC2 EXPx *x* = 0–9	24	Minor	No	Entered warmup mode Transitioned out of warmup mode	None required - If still present after 30 min. check other system alarms None required
Entered freerun mode	IOC1 IOC2 EXPx *x* = 0–9	25	Event	No	Entered freerun mode Transitioned out of freerun mode	If freerun mode not desired, check system input reference None required

Table A-1. System Notification Messages (Continued)

Description	Comp ID	Event ID	MsgLevel	Trans-itory	MsgText	Corrective Action
Entered fast-track mode	IOC1 IOC2 EXPx *x* = 0–9	26	Event	No	Entered fast-track mode Transitioned out of fast-track mode	None required None required
Entered normal-track mode	IOC1 IOC2 EXPx *x* = 0–9	27	Event	No	Entered normal-track mode Transitioned out of normal-track mode	None required None required
Entered bridging mode	IOC1 IOC2 EXPx *x* = 0–9	28	Event	No	Entered bridging mode Transitioned out of bridging mode	Check input system reference None required
Entered holdover mode	IOC1 IOC2 EXPx *x* = 0–9	29	Minor	No	Entered holdover mode Transitioned out of holdover mode	Check input system reference None required
In holdover mode for extended period	IOC	30	Major	No	In holdover mode for extended period Transitioned out of extended holdover mode	Check input system reference None required
Operational failure (See Table A-2 for Secondary Index Info)	IMC IOC	31	Critical	No	Operational failure Operational failure cleared	Check system alarms-troubleshoot as required to determine recommended action None required
Input active (See Table A-2 for Secondary Index Info)	IMC IOC	32	Event	No	<input> active <input>inactive	None required Check state of input port

Table A-1. System Notification Messages (Continued)

Description	Comp ID	Event ID	MsgLevel	Trans-itory	MsgText	Corrective Action
IOC-to-IOC sync fault	IOC	33	Major	No	IOC-to-IOC sync fault IOC-to-IOC sync fault cleared	Hardware fault -Replace module None required
Input disqualified as system reference (See Table A-2 for Secondary Index Info)	IOC	34	Minor	No	<input> disqualified as system reference <input> disqualification cleared	Check system input reference None required
Input loss of signal (See Table A-2 for Secondary Index Info)	IOC	35	Minor	No	<input> loss of signal <input> loss of signal cleared	Check system input reference None required
Input phase error (See Table A-2 for Secondary Index Info)	IMC IOC	36	Minor	No	<input> phase error <input> phase error cleared	Check system input reference None required
Internal phase-lock-loop (IPLL) to Input not settled (See Table A-2 for Secondary Index Info)	IMC IOC	37	Minor	No	<input> IPLL not settled <input> IPLL settled	Check system input reference None required
Input frequency error (See Table A-2 for Secondary Index Info)	IMC IOC	38	Minor	No	<input> frequency error <input> frequency error cleared	Check system input reference None required
Input out of frame (See Table A-2 for Secondary Index Info)	IOC	39	Minor	No	<input> out of frame <input> out of frame cleared	Check system input reference None required

Table A-1. System Notification Messages (Continued)

Description	Comp ID	Event ID	MsgLevel	Trans-itory	MsgText	Corrective Action
Input alarm indication signal (See Table A-2 for Secondary Index Info)	IOC	40	Minor	No	<input> alarm indication signal <input> alarm indication signal cleared	Check system input reference None required
PTP server near packet limit (See Table A-2 for Secondary Index Info)	IOC	41	Minor	No	PTP server exceeded <*x*%> of packet limit on <port> PTP server near packet limit cleared on <port>	Reduce number of clients or client request rate None required
PTP server near client limit (See Table A-2 for Secondary Index Info)	IOC	42	Minor	No	PTP server exceeded <*x*%> of client limit on <port> PTP server near client limit cleared on <port>	Increase number of clients allowed or reduce number of clients total None required
PTP client is unreachable (See Table A-2 for Secondary Index Info)	IOC	43	Event	No	PTP client <IP address> unreachable PTP client <IP address> unreachable cleared	Check IP address for correct configuration, possible network problems. Check for client down- if yes, enable client None required
Hardware-software incompatible (See Table A-2 for Secondary Index Info)	IMC IOC1 IOC2 EXPx *x* = 0–9	44	Minor	No	Hardware-software incompatible Hardware-software incompatible cleared	Software upgrade required None required

Table A-1. System Notification Messages (Continued)

Description	Comp ID	Event ID	MsgLevel	Trans-itory	MsgText	Corrective Action
IMC-IOC Software incompatible	IMC IOC	45	Minor	No	IMC-IOC Software incompatible IMC-IOC Software incompatible cleared	Software upgrade required None required
IOC-IOC Software incompatible (See Table A-2 for Secondary Index Info)	IOC	46	Minor	No	IOC-IOC Software incompatible (code) IOC-IOC Software incompatible cleared (code)	Software upgrade required None required
OBSOLETE	n/a	47	n/a	n/a	n/a	n/a
IOC not present (See Table A-2 for Secondary Index Info)	IMC	48	Event	No	<IOC> not present <IOC> present	Check IOC slot in shelf for module None required
No IOC present	IMC	49	Minor	No	No IOC present At least one IOC present	Check IOC slot in shelf for module None required
Transitioned to active state	IOC	50	Event	Yes	Transitioned to active state	None required
Transitioned to standby state	IOC	51	Event	Yes	Transitioned to standby state	None required
Input software loop not settled (proprietary algorithm) (See Table A-2 for Secondary Index Info)	IOC	52	Minor	No	<input> software loop not settled <input> software loop settled	Check system input reference None required
Loss of Input PPS signal (from GPS to IMC or from IMC to IOC)	IMC IOC	53	Critical	No	Input PPS loss Input PPS loss cleared	Hardware fault-replace IOC first - If alarm is still present, replace IMC None required

Table A-1. System Notification Messages (Continued)

Description	Comp ID	Event ID	MsgLevel	Trans-itory	MsgText	Corrective Action
User configuration lost (See Table A-2 for Secondary Index Info)	IMC IOC1 IOC2 EXPx *x* = 0–9	54	Event	Yes	User configuration lost	Reconfigure system then backup
Primary image failed. Running backup image (See Table A-2 for Secondary Index Info)	IMC IOC1 IOC2 EXPx *x* = 0–9	55	Minor	No	Primary image failed (code). Running backup image	Image in primary partition of flash corrupted. Run upgrade to recover the image
Production configuration data error	IMC IOC1 IOC2 EXPx *x* = 0–9	56	Critical	No	Production configuration data error	Hardware failure-replace module
Direct access image error. Use JFFS2 image (See Table A-2 for Secondary Index Info)	IMC IOC1 IOC2 EXPx *x* = 0–9	57	Minor	No	Direct access image error. Use JFFS2 image	Direct access image corrupted. Run upgrade to recover the image
IMC-IOC FPGA link failed	IMC IOC	58	Critical	No	IMC-IOC FPGA link failed IMC-IOC FPGA link failure cleared	Hardware failure-replace module None required
Excessive traffic on Ethernet port (See Table A-2 for Secondary Index Info)	IOC1 IOC2 EXPx *x* = 0–9	59	Minor	No	Excessive traffic on port ETHx Excessive traffic cleared on port ETHx	Check traffic level on network (See Footnote 1) None required
Unsupported SFP on Ethernet port (See Table A-2 for Secondary Index Info)	IOC1 IOC2 EXPx *x* = 0–9	60	Minor	No	Unsupported SFP (vendor Id) on ETHx Unsupported SFP cleared on ETHx	Replace SFP with Symmetricom approved SFP listed in User Guide None required

Table A-1. System Notification Messages (Continued)

Description	Comp ID	Event ID	MsgLevel	Trans-itory	MsgText	Corrective Action
Input poor SSM (See Table A-2 for Secondary Index Info)	IOC	61	Minor	No	<input> poor SSM <input> poor SSM cleared	Check system input reference quality level None required
Input SSM changed (See Table A-2 for Secondary Index Info)	IOC	62	Event	Yes	<input> SSM changed	None required
Time input not tracking	IOC	63	Minor	No	Time input not tracking Time input not tracking cleared	Check GNSS antenna location, cable connections None required
Internal reference data loss	IOC	64	Minor	No	Internal reference data loss Internal reference data loss cleared	This alarm could occur during configuration. If the alarm still present 1 minute after configuration, reboot system. If alarm still present, replace IOC module None required
OBSOLETE	n/a	65	n/a	n/a	n/a	n/a
IO module not present	IMC	66	Event	Nos	IO module not present IO module present	Check IO module slot None required
Redundancy data transfer error (See Table A-2 for Secondary Index Info)	IOC	67	Major	No	Redundancy data transfer error (code) Redundancy data transfer error (code) cleared	Reboot IOC that is showing alarm. If alarm is still present, contact Symmetricom Technical Support

Table A-1. System Notification Messages (Continued)

Description	Comp ID	Event ID	MsgLevel	Trans-itory	MsgText	Corrective Action
PTP client critical alarm (See Table A-2 for Secondary Index Info)	IOC	68	Critical	No	PTP client <IP address> <message>	Refer to Client for Troubleshooting
PTP client major alarm (See Table A-2 for Secondary Index Info)	IOC	69	Major	No	PTP client <IP address> <message>	Refer to Client for Troubleshooting
PTP client minor alarm (See Table A-2 for Secondary Index Info)	IOC	70	Minor	No	PTP client <IP address> <message>	Refer to Client for Troubleshooting
PTP client event (See Table A-2 for Secondary Index Info)	IOC	71	Event	No	PTP client <IP address> <message>	Refer to Client for Troubleshooting
PTP client transient event (See Table A-2 for Secondary Index Info)	IOC	72	Event	Yes	PTP client <IP address> <message>	Refer to Client for Troubleshooting
Real Time Engine (RTE) phase-lock-loop (PLL) to input signal unlock (See Table A-2 for Secondary Index Info)	IOC1 IOC2 EXPx *x* = 0–9	73	Critical	No	RTE PLL unlock RTE PLL unlock cleared	Reboot IOC that is showing alarm. If alarm is still present, replace IOC module.
Real Time Engine (RTE) phase-lock-loop (PLL) to rubidium unlock	IOC1 IOC2 EXPx *x* = 0–9	74	Critical	No	RTE rubidium unlock RTE rubidium unlock cleared	Reboot IOC that is showing alarm. If alarm is still present, replace IOC module.
Sync IOC time	IMC	75	Event	Yes	Sync IOC time (reason)	None required

Table A-1. System Notification Messages (Continued)

Description	Comp ID	Event ID	MsgLevel	Trans-itory	MsgText	Corrective Action
Configuration data sync error	IOC	76	Major	No	Configuration data sync error Configuration data sync error cleared	Reboot IOC that is showing alarm. If alarm is still present, replace IOC module.
Voltage to RTE microprocessor out of specified range	IOC	77	Major	No	RTE <x.x V or xMHz EFC> out of range RTE voltage out of range cleared	Replace IOC that is reporting alarm.
GNSS/GPS signal low	IMC	78	Minor	No	GNSS/GPS signal low GNSS/GPS signal normal	Check GNSS/GPS
PTP client dropped from client list (See Table A-2 for Secondary Index Info)	IOC	79	Event	No	PTP client dropped from client list	None required
PTP client added to client list (See Table A-2 for Secondary Index Info)	IOC	80	Event	No	PTP client added to client list	None required
PTP client IP address to be changed (See Table A-2 for Secondary Index Info)	IOC	81	Event	No	PTP client IP address to be changed	None required
PTP client changed to new address (See Table A-2 for Secondary Index Info)	IOC	82	Event	No	PTP client changed to new address	None required
PTP client list refreshed	IOC	83	Event	No	PTP client list refreshed	None required
FPGA in failed state	IOC	84	Critical	No	FPGA in failed state	Reboot IOC with alarm. If alarm persists, then replace IOC

Table A-1. System Notification Messages (Continued)

Description	Comp ID	Event ID	MsgLevel	Trans-itory	MsgText	Corrective Action
PTP state - master (See Table A-2 for Secondary Index Info)	IOC1 IOC2 EXPx *x* = 0–9	85	Event	Yes	PTP port state on <port> changed to master	None required
PTP state - passive (See Table A-2 for Secondary Index Info)	IOC1 IOC2 EXPx *x* = 0–9	86	Event	Yes	PTP port state on <port> changed to passive	None required
PTP state - listening (See Table A-2 for Secondary Index Info)	IOC1 IOC2 EXPx *x* = 0–9	87	Event	Yes	PTP port state on <port> changed to listening	None required
PTP state - disabled (See Table A-2 for Secondary Index Info)	IOC1 IOC2 EXPx *x* = 0–9	88	Event	Yes	PTP port state on <port> changed to disabled	None required
DTI Loss of signal (See Table A-2 for Secondary Index Info)	EXPx *x* = 0–9	89	Major	No	DTI Loss of signal DTI Loss of signal cleared	Check expansion cable connection Check expansion cable Check DTI output configuration on main shelf (IMC and I/O cards)
DTI reference input error (See Table A-2 for Secondary Index Info)	EXPx *x* = 0–9	90	Major	No	DTI reference input error DTI reference input error cleared	Check expansion cable connection Check expansion cable Check DTI output configuration on main shelf (IMC and I/O cards)

Table A-1. System Notification Messages (Continued)

Description	Comp ID	Event ID	MsgLevel	Trans-itory	MsgText	Corrective Action
DTI input port active (See Table A-2 for Secondary Index Info)	EXPx *x* = 0–9	91	Event	No	DTI input port active DTI input port inactive	None required
EXP connected (See Table A-2 for Secondary Index Info)	IMC	92	Event	Yes	EXP connected n/a	None required
EXP disconnected (See Table A-2 for Secondary Index Info)	IMC	93	Event	Yes	EXP disconnected n/a	None required
EXP ID changed (See Table A-2 for Secondary Index Info)	IMC	94	Event	Yes	EXP ID changed n/a	None required
Exp-Interface link down (See Table A-2 for Secondary Index Info)	IMC EXPx *x* = 0–9	95	Minor	No	Exp-Interface link down Exp-Interface link down cleared	Check expansion cable connection Check expansion cable Check IMC EXP-IF ETH state configuration
EXP has duplicated shelf ID (See Table A-2 for Secondary Index Info)	IMC	96	Major	No	EXP has duplicated shelf ID EXP has duplicated shelf ID cleared	Check rotary switch of all expansion shelves to make sure there are no duplicate shelf ID numbers

Table A-1. System Notification Messages (Continued)

Description	Comp ID	Event ID	MsgLevel	Trans-itory	MsgText	Corrective Action
IMC-EXP Software incompatible (See Table A-2 for Secondary Index Info)	IMC	97	Minor	No	IMC-EXP Software incompatible IMC-EXP Software incompatible cleared	Upgrade firmware
GNSS mode changed (See Table A-2 for Secondary Index Info)	IMC	98	Event	No	GNSS mode changed n/a	None required
Fan failure (See Table A-2 for Secondary Index Info)	EXPx *x* = 0–9	99	Minor	No	Fan failure Fan failure cleared	If single fan failed, system will operate properly. If multiple fans failed (alarm ID 100), the expansion shelf needs to be repaired
Multiple fans failure	EXPx *x* = 0–9	100	Major	No	Multiple fans failure Multiple fans failure cleared	The expansion shelf needs to be repaired
PPS-TOD input communication error	IMC	101	Major	No	PPS-TOD input communication err PPS-TOD input communication err cleared	Check 1PPS+TOD connection Check 1PPS+TOD cable Check 1PPS+TOD source

Table A-1. System Notification Messages (Continued)

Description	Comp ID	Event ID	MsgLevel	Trans-itory	MsgText	Corrective Action
PPS-TOD input unusable	IMC	102	Minor	No	PPS-TOD input unusable PPS-TOD input unusable cleared	Check 1PPS+TOD connection Check 1PPS+TOD cable Check 1PPS+TOD source
Time and phase questionable	IMC	103	Minor	No	Time and phase questionable Time and phase questionable	There should be other alarms regarding the time reference source. Fixing those other alarms will clear this alarm.
NTP server near packet limit	IOC	104	Minor	No	NTP server near packet limit	Reduce rate of NTP transactions

1. The excessive traffic alarm is set if the count of Ethernet packets received in one second exceeds a threshold. All traffic received by the TP5000 IOC ports is counted, such as ARP, ICMP, IGMP, PTP unicast signaling, and PTP management messages. In unicast mode, PTP delay requests are not counted. In multicast mode, all PTP announce messages are counted, and less than 1% of the PTP delay requests are also counted toward the limit. PTP sync and delay response messages are never counted. NTP requests are not counted.

   Threshold:
   - Main shelf for releases 1.2 between 2.0, inclusive: 512 packets/sec for each port, or 1024 packets/sec with port redundancy enabled
   - Expansion shelf: 512 packets/sec for each group of 8 ports (1-8 and 9-16)

Table A-2. Secondary Index Descriptions for System Notification Messages

Event ID	Description	Secondary Index	Secondary Index Description
0	Communication to peer card failed	0 - 2	0=IOC1, 1=IOC2
1	GNSS/GPS receiver communications failed	0 - 1	0=GPS, 1=GNSS
2	GNSS/GPS receiver not tracking satellite	0 - 1	0=GPS, 1=GNSS

Table A-2. Secondary Index Descriptions for System Notification Messages

Event ID	Description	Secondary Index	Secondary Index Description
3	System time invalid	0 - 1	0=Time , 1=Freq
4	System time has been set by reference	0 - 4	0=GPS, 1=SYS, 2=GNSS, 3=PPS_TOD-1, 4=PPS_TOD-2
5	System log time has been updated	n/a	n/a
6	Management port link down	n/a	n/a
7	Ethernet port (ETH1 or ETH2) link down	0 - 1	0=ETH1, 1=ETH2
8	Manual sync IOC time to IMC required	n/a	n/a
9	Power out of range	0 - 5	* index is internal code
10	GNSS/GPS antenna voltage out of range	n/a	n/a
11	GNSS/GPS antenna current out of range	n/a	n/a
12	GNSS/GPS antenna short-circuit	0 - 1	0=GPS, 1=GNSS
13	GNSS/GPS antenna open-circuit	0 - 1	0=GPS, 1=GNSS
14	Battery(-48V)-A failure	n/a	n/a
15	Battery(-48V)-B failure	n/a	n/a
16	FPGA access failure	n/a	n/a
17	Flash partition failure	0 - 3	* index is internal code
18	PLL unlock error	n/a	n/a
19	Internal communication error	0 - 2	* index is internal code
20	FPGA temperature exceed limit	n/a	n/a
21	IOC detected but none of them active	n/a	n/a
22	Module reboot	n/a	n/a
23	RTE communication to peer error	n/a	n/a
24	Entered warmup mode	n/a	n/a
25	Entered freerun mode	n/a	n/a

Table A-2. Secondary Index Descriptions for System Notification Messages

Event ID	Description	Secondary Index	Secondary Index Description
26	Entered fast-track mode	n/a	n/a
27	Entered normal-track mode	n/a	n/a
28	Entered bridging mode	n/a	n/a
29	Entered holdover mode	n/a	n/a
30	In holdover mode for extended period	n/a	n/a
31	Operational failure	0 - 9	* index is internal code
32	Input active	0 - 7	0=GPS, 3=INPUT-1, 4=INPUT-2, 5=GNSS, 6=PPS_TOD-1, 7=PPS_TOD-2
33	IOC-to-IOC sync fault	n/a	n/a
34	Input disqualified as system reference	0 - 4	0=GPS, 3=INPUT-1, 4=INPUT-2
35	Input loss of signal	3 - 7	3=INPUT-1, 4=INPUT-2, 6=PPS_TOD-1, 7=PPS_TOD-2
36	Input phase error	0 - 4	0=Time, 3=INPUT-1, 4=INPUT-2
37	Input IPLL not settled	3 - 4	3=INPUT-1, 4=INPUT-2
38	Input frequency error	3 - 4	3=INPUT-1, 4=INPUT-2
39	Input out of frame	3 - 4	3=INPUT-1, 4=INPUT-2
40	Input alarm indication signal	3 - 4	3=INPUT-1, 4=INPUT-2
41	PTP server near packet limit	0 - 1, 255	0=ETH1, 1=ETH2, 255=redundant-port-pair
42	PTP server near client limit	0 - 1, 255	0=ETH1, 1=ETH2, 255=redundant-port-pair
43	PTP client is unreachable	0 - 9	index is static client index
44	Hardware-software incompatible	n/a	n/a
45	IMC-IOC Software incompatible	n/a	n/a
46	IOC-IOC Software incompatible	0 - 1	* index is internal code

Table A-2. Secondary Index Descriptions for System Notification Messages

Event ID	Description	Secondary Index	Secondary Index Description
47	IOC present	0 - 1	0=IOC1, 1=IOC2
48	IOC not present	0 - 1	0=IOC1, 1=IOC2
49	No IOC present	n/a	n/a
50	Transitioned to active state	n/a	n/a
51	Transitioned to standby state	n/a	n/a
52	Input software loop not settled	0 - 7	0=GPS, 3=INPUT-1, 4=INPUT-2, 5=GNSS, 6=PPS_TOD-1, 7=PPS_TOD-2
53	Input PPS Loss	n/a	n/a
54	User configuration lost	0 - 1	0=config1 1=config2
55	Primary image failed. Running backup image	0 - 8	* index is internal code
56	Production configuration data error	n/a	n/a
57	Direct access image error. Use JFFS2 image	0 - 1	0=fatal-bad-uImage1 1=fatal-bad-uImage2
58	IMC-IOC FPGA link failed	n/a	n/a
59	Excessive traffic on Ethernet port	0 - 254?	
60	Unsupported SFP on Ethernet port	0 - 1	ETHy y=1-16
61	Input poor SSM	0 - 4	0=GPS, 3=Input1, 4=Input2
62	Input SSM changed	0 - 4	0=GPS, 3=Input1, 4=Input2
63	Time input not tracking	n/a	n/a
64	Internal reference data loss	n/a	n/a
65	IO module present	n/a	n/a
66	IO module not present	n/a	n/a
67	Redundancy data transfer error	1 - 3	* index is internal code
68	PTP client critical alarm	0 - n	index is client error code

Table A-2. Secondary Index Descriptions for System Notification Messages

Event ID	Description	Secondary Index	Secondary Index Description
69	PTP client major alarm	0 - n	index is client error code
70	PTP client minor alarm	0 - n	index is client error code
71	PTP client event	0 - n	index is client error code
72	PTP client transient event	0 - n	index is client error code
73	RTE PLL unlock	0 - 4	* index is internal code
74	RTE rubidium unlock	n/a	n/a
75	Sync IOC time	n/a	n/a
76	Configuration data sync error	n/a	n/a
77	RTE voltage out of range	n/a	n/a
78	GNSS/GPS signal low	0 - 1	0=GPS, 1=GNSS
79	PTP client dropped from client list	0 - 1, 255	0=ETH1, 1=ETH2, 255=redundant-port-pair
80	PTP client added to client list	0 - 1, 255	0=ETH1, 1=ETH2, 255=redundant-port-pair
81	PTP client IP address to be changed	0 - 1, 255	0=ETH1, 1=ETH2, 255=redundant-port-pair
82	PTP client changed to new address	0 - 1, 255	0=ETH1, 1=ETH2, 255=redundant-port-pair
83	PTP client list refreshed	n/a	n/a
84	FPGA in failed state	n/a	n/a
85	PTP state - master	0 - 15, 255	0=ETH1, 1=ETH2.....15=ETH16, , 255=redundant-port-pair
86	PTP state - passive	0 - 16	0=ETH1, 1=ETH2.....15=ETH16
87	PTP state - listening	0 - 16	0=ETH1, 1=ETH2.....15=ETH16
88	PTP state - disabled	0 - 1	0=ETH1, 1=ETH2.....15=ETH16
89	DTI Loss of Signal	0 – 1	0=Port 1, 1=Port 2
90	DTI Reference Input Error	0 – 1	0=Port 1, 1=Port 2

Table A-2. Secondary Index Descriptions for System Notification Messages

Event ID	Description	Secondary Index	Secondary Index Description
91	DTI input port active	0 – 1	0=Port 1, 1=Port 2
92	EXP connected	0 – 9	index is expansion shelf ID number
93	EXP disconnected	0 – 9	index is expansion shelf ID number
94	EXP ID changed	0 – 9	index is expansion shelf ID number
95	EXP interface link down	0 – 3	0=ETH1, 1=ETH2 2=ETH3, 3=ETH4
96	EXP has duplicated shelf ID	????	index is shelf ID
97	IMC-EXP software incompatible	0 – 9	index is expansion shelf ID number
98	GNSS mode changed	0 – 1	0= to GPS, 1= to Beidou
99	Fan failure	0 – 3	0=fan 1, 1=fan 2 2=fan 3, 3=fan 4
100	Multiple fans failure	n/a	n/a
101	PPS-TOD input communication error	0 – 1	0= PPS_TOD-1 1 = PPS_TOD-2
102	PPS-TOD input unusable	0 – 1	0= PPS_TOD-1 1 = PPS_TOD-2
103	Time and phase questionable	n/a	n/a
104	NTP server near packet limit	0 – 1	0=ETH1, 1=ETH2

***** Index is a code used for trouble shooting at Symmetricom facility.

Appendix B Specifications and Factory Defaults

This appendix provides mechanical and electrical specifications and factory defaults for the TimeProvider 5000, as well as for the TimeProvider E10 and TimeProvider E30 expansion shelves.

In This Appendix

- Specifications

  including:
  - TP 5000 Main Shelf Output Signal Specifications
  - TP E10 Expansion Shelf Output Signal Specifications
  - TP E30 Expansion Shelf Output Signal Specifications
- Factory Defaults
  - TP 5000 Main Shelf Defaults
  - TP E10 Expansion Shelf Defaults
  - TP E30 Expansion Shelf Defaults

Specifications

This section provides the specifications for the TimeProvider 5000 components and input and output signals. This section also provides the specifications for the TimeProvider E10 and TimeProvider E30 expansion shelves and their output signals.

Mechanical

Table B-1. TimeProvider 5000, TP E10, and TP E30 Mechanical Specifications

Parameter	Description
Mounting	19 in. Rack
Rack Mounting Position	For front mounting location unit protrudes 0.65 in / 1.651 cm See Figure 2-5, Figure 2-6, and Figure 2-7 for drawings with detailed chassis dimensions.
Width	17.24 in. / 438 mm
Height	1.73 in. / 44 mm
Depth	17.12 in. / 435 mm – TP 5000 9.37 in. / 236 mm – TP E10 & TP E30
Weight	9.6 lb. / 4.4 kg fully loaded – TP 5000 8.4 lb. / 3.8 kg – TP E10 & TP E30

Environmental

Table B-2. TimeProvider 5000, TP E10, and TP E30 Environmental Specifications

Parameter	Description
Operating Temperature	-5° to 45° C, 23° to 113° F – TP 5000 -5° to 55° C, 23° to 131° F – TP E10 & TP E30
Storage Temperature	–25° to 70 ° C, –13° to 158° F
Operating Humidity	90% to 100% RH, maximum, w/condensation
Storage Humidity	5% to 100% RH w/condensation

Power

TimeProvider 5000 Main Shelf Power Specifications

Parameter	Description
DC Input Power	–48 VDC / –60 VDC nominal, 0.75 A typical (0.6A for -60VDC)
DC Recommended Battery Feed Fuse	5 A, maximum
DC Power	43 W, typical

Table B-3. TimeProvider E10 Expansion Shelf Power Specifications

Parameter	Description
DC Input Power	–48 VDC / –60 VDC nominal, 0.75 A typical (0.6A for -60VDC) –38.4 VDC min, –72 VDC max
DC Recommended Battery Feed Fuse	2 A, maximum
DC Power	36 W, typical

Table B-4. TimeProvider E30 Expansion Shelf Power Specifications

Parameter	Description
DC Input Power	–48 VDC / –60 VDC nominal, 0.45 A typical (0.35 A for -60VDC) –38.4 VDC min, –72 VDC max
DC Recommended Battery Feed Fuse	1 A, maximum
DC Power	20 W, typical

Serial Port

Table B-5. TimeProvider 5000 Main Shelf - Serial Port Specifications

Item	Description
Connector Type	9-pin, female D connector
Connector Label	Craft
Interface	RS-232
Baud Rate	57.6 Kbps
Data Bits	8
Parity Bit	None
Stop Bits	1
Flow Control	None

LAN Port

Table B-6. TimeProvider 5000 Main Shelf LAN Port Specifications

Connector	Description
MGMT	RJ-45 (10Base-T/100 Base-T) - Supports telnet sessions and SSH sessions over TCP/IP.

Input Signals

Table B-7. TimeProvider 5000 Main Shelf Input Signal Specifications

Parameter	Specification
GPS	
Requirement	Total gain should be between 25 dB and 38 dB, including gain of antenna and loss of cable
Antenna Power	5V, typical
Interface	SMA connector
GNSS	
Requirement	Total gain should be between 25 dB and 38 dB, including gain of antenna and loss of cable

Table B-7. TimeProvider 5000 Main Shelf Input Signal Specifications (Continued)

Parameter	Specification
Antenna Power	5V, typical
Interface	SMA connector
E1	
Type	G.703 Section 9 Framed E1 or G.703 Section 13 2048 kHz
Format	CAS or CCS, CRC4 enable/disable
Impedance	75 ohms
Connector	Mini-BNC coaxial Mini-SMB for 090-50315-01
1PPS+TOD	
Timing Relationship between 1PPS and TOD	Transmission of a TOD message starts 1 ms after the rising edge of 1PPS signal, and the transmission is completed within 500 ms, as shown in Figure B-1. This TOD message indicates the time of the current 1 PPS rising edge, and is sent at a rate of once per second.
Rise Time -1PPS Pulse	50 ns
Pulse Width	50 ms < Pulse width < 200 ms
TOD Frame	TOD messages use whole 8-bit bytes for transmission, with check sum protection. Message type and message ID are used to clarify messages. Follows Big Endian convention when a field is longer than one byte, where bit 0 represents the least significant bit (LSB), and bit 0 of each byte is transmitted first. See Figure B-2. See Table B-8 for TOD frame field descriptions.
TOD Transmission Parameters	Baud Rate: 9600 Parity Check: None Start Bit: 1 (low level) Stop Bit: 1 (high level) Idle Frame: High level Data Bits: 8
TOD Message Encoding	Binary

Figure B-1.   TP 5000 - Timing Relationship Between 1PPS and TOD for 1 PPS+TOD Input

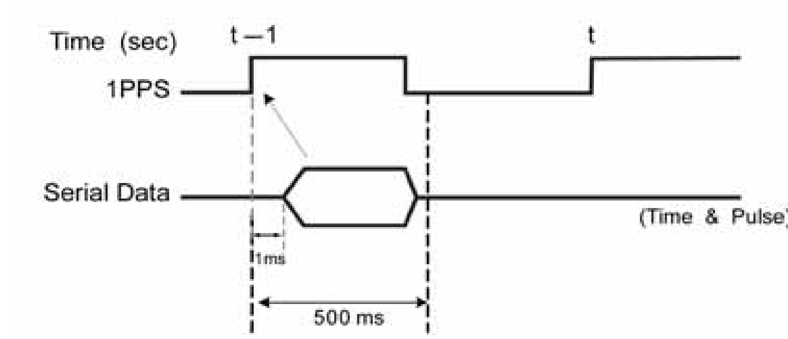


Figure B-2.   TP 5000 - TOD Frame Structure for 1 PPS+TOD Input

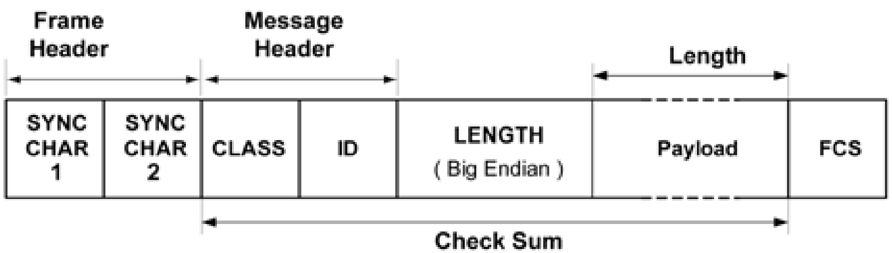


Table B-8. TP 5000 - TOD Frame Field Descriptions for 1PPS+TOD Input

Field Name	Field Length	Description
Sync Char 1	1 byte	Part of Frame Header 0x43 = ASCII character “C”
Sync Char 2	1 byte	Part of Frame Header 0x4D = ASCII character “M”
Class	1 byte	Basic classification of TOD message
ID	1 byte	Serial number of of TOD message
Length	2 bytes	Length of payload only (Does **not** include Frame Header, Message Header, Length Field itself, or FCS)

Table B-8. TP 5000 - TOD Frame Field Descriptions for 1PPS+TOD Input

Field Name	Field Length	Description
Payload	16 bytes	Contains the message content. See Table B-9 for Time Message details. Two TOD messages have been defined: ■ Time Information Message (see Table B-10 for payload contents) ■ Time Status Message (see Table B-11 for payload contents) See Table B-12 for TOD message data type definitions
Frame Check Sequence (FCS)	1 byte	Generating polynomial FCS is: $G(x) = \mathbf{x}^8 + \mathbf{x}^5 + \mathbf{x}^4 + 1$ Initial value of FCS is set to 0xFF, and there is no need to negate the input data. Checksum calculation uses right-shift calculation, and there is no need to negate the output frame check data. When the frame check sequence is transmitted, the LSB (bit 0) is transmitted first.

Table B-9. Time Message Details for 1PPS+TOD Input

Message Type	Class	ID	Length (bytes)
Time Information	0x01	0x20	16
Time Status	0x01	0x03	16

Table B-10. TP 5000 - Time Information Message Payload Contents for 1PPS+TOD Input

Byte Offset	Data Type	Name	Units	Notes
0	U4	Time of Week (TOW)	seconds	GPS Second time of week
4	I4	Reserved	–	Reserved
8	U2	Week Number	–	GPS week (GPS time), 16 bits Whole weeks since 1980-01-06
10	I1	LeapS	seconds	Leap Seconds (GPS-UTC)
11	U1	1PPS Status	–	0x00 = normal 0x01 = Time sync equipment (atomic clock) in holdover mode) 0x02 = do not use 0x03 = Time sync equipment (high-stability crystal clock) in holdover mode) 0x04 = Transport carrier equipment in holdover mode) Other values are reserved
12	U1	TAcc	–	PPS jitter category (0 – 255): 0 = 0 ns 1 = 15 ns 2 = 30 ns 3 = 45 ns . . . . 255 =not defined **Note:** This value is fixed to 255 for transmission and base station equipment
13	U1	Reserved	–	Reserved
14	U1	Reserved	–	Reserved
15	U1	Reserved	–	Reserved

Table B-11. TP 5000 - Time Status Message Payload Contents for 1PPS+TOD Input

Byte Offset	Data Type	Name	Units	Notes
0	U1	Clock source type	–	0x00 = Beidou 0x01 = GPS 0x02 = IEEE-1588 0x03 = Other
1	U2	Status of the clock source	–	GPS fix type, range = 0 to 3 0x00 = No fix 0x01 = Dead reckoning only 0x02 = 2D fix 0x03 = 3D fix 0x04 = GPS + dead reckoning combined 0x05 = time-only fix 0x06 – 0xff= reserved
3	U2	Monitor alarm	–	Clock source status alarms: Bit 0: not used Bit 1: Antenna open Bit 2: Antenna shorted Bit 3: Not tracking satellites Bit 4: not used Bit 5: Survey in progress Bit 6: No stored position Bit 7: Leap second pending Bit 8: In test mode Bit 9: Position is questionable Bit 10: not used Bit 11: Almanac not complete Bit 12: PPS was not generated
5	I1	Reserved	–	Reserved
6	U1	Reserved	–	Reserved
7	U1	Reserved	–	Reserved
8	U4	Reserved	–	Reserved
12	U4	Reserved	–	Reserved

Table B-12. TP 5000 - TOD Message Data Type Definitions for 1PPS+TOD Input

Short	Type	Size (bytes)	Range	Resolution	Comments
U1	Unsigned Char	1	0 to 255	1	
I1	Signed Char	1	-128 to 127	1	2’s complement
U2	Unsigned Short	2	0 to 65535	1	
I2	Signed Short	2	-32768 to 32767	1	2’s complement
U4	Unsigned Long	4	0 to 4,294,967,295	1	
I4	Signed Long	4	-2,147,483,648 to 2,147,483,647	1	
R4	IEEE 754 Single Precision	4	-1×2^{127} to 2×2^{127}	Value x 2^{-24}	
R8	IEEE 754 Double Precision	8	-1×2^{1023} to 2×2^{1023}	Value x 2^{-53}	
CH	ASCII / ISO 8859.1 Encoding	1			

Output Signals

TP 5000 Main Shelf Output Signal Specifications

TP 5000 Main Shelf Output Signal Specifications

Parameter	Specification
PTP	
Ports	Ethernet Small Form-factor Pluggable (SFP) Optical 1000 Base-X Electrical 100/1000 Base-T
E1	
Type	G.703 Section 9 Framed E1 or G.703 Section 13 2048 kHz
Format	CAS or CCS, CRC4 enable/disable
Impedance	75 ohms
Connector	Mini-BNC (090-50311-01, 090-50312-01) Mini-SMB (090-50315-01)
10 MHz	
Impedance	50 Ω unbalanced
Amplitude	1.5 dBm to 4.5 dBm
Signal type	Sine
Connector	Mini-BNC
Long-term Frequency Stability	<0.01 ppb, when locked to PRC/GPS
Phase Noise (minimum)	■ 1 Hz: –60 dBc/Hz ■ 10 Hz: –80 dBc/Hz ■ 100 Hz: –100 dBc/Hz ■ 1 kHz: –110 dBc/Hz ■ 10 kHz: –140 dBc/Hz ■ 100 kHz: –145 dBc/Hz
1PPS	
Impedance	50 Ω unbalanced
Amplitude	2.0 Vpp
Signal type	Square Wave
Rise Time	< 20 ns
Connector	Mini-BNC

TP 5000 Main Shelf Output Signal Specifications (Continued)

Parameter	Specification
Pulse Width	5 μs ±10%
Long-term Frequency Stability	<0.01 ppb, when locked to PRC/GPS
Phase Error	<100 ns, when locked to GPS

TP E10 Expansion Shelf Output Signal Specifications

Table B-13. TP E10 Expansion Shelf Output Signal Specifications

Parameter	Specification
PTP	
Ports	Ethernet Small Form-factor Pluggable (SFP) Optical 1000 Base-X Electrical 100/1000 Base-T
Accuracy System tracking GPS or Beidou GNSS System tracking 1PPS+TOD input	■ The difference between the PTP outputs and UTC time < 200 ns ■ The difference between the PTP outputs and input time < 50 ns
SyncE	
Ports	Ethernet Small Form-factor Pluggable (SFP) Optical 1000 Base-X (SyncE is only accessible on Ports 1-16 with optical SFP)
1PPS	
Impedance	50 Ω unbalanced
Amplitude	2.0 Vpp
Signal type	Square Wave
Rise Time	< 20 ns
Connector	Mini-SMB
Pulse Width	5 μs ±10%
Long-term Frequency Stability	<0.01 ppb, when locked to PRC/GPS
1PPS Output Stability System tracking GPS or Beidou GNSS System tracking 1PPS+TOD input	■ MTIE and TDEV meet the specifications defined in ITU-T G.811, with observation time of 10,000 seconds. ■ MTIE and TDEV meet the specifications defined for Type I clock in ITU-T G.812, with observation time of 10,000 seconds.
Phase Error	<100 ns, when locked to GPS

TP E30 Expansion Shelf Output Signal Specifications

Table B-14. TP E30 Expansion Shelf Output Signal Specifications

Parameter	Specification
E1	
Type	G.703 Section 9 Framed E1 or G.703 Section 13 2048 kHz
Format	CAS or CCS, CRC4 enable/disable
Impedance	75 ohms
Connector	Mini-SMB coaxial, unbalanced
1PPS+TOD	
Timing Relationship between 1PPS and TOD	Transmission of a TOD message starts 1 ms after the rising edge of 1PPS signal, and the transmission is completed within 500 ms, as shown in Figure B-3. This TOD message indicates the time of the current 1 PPS rising edge, and is sent at a rate of once per second.
Rise Time -1PPS Pulse	50 ns
Pulse Width	50 ms < Pulse width < 200 ms
TOD Frame	TOD messages use whole 8-bit bytes for transmission, with check sum protection. Message type and message ID are used to clarify messages. Follows Big Endian convention when a field is longer than one byte, where bit 0 represents the least significant bit (LSB), and bit 0 of each byte is transmitted first. See Figure B-4. See Table B-15 for TOD frame field descriptions.
TOD Transmission Parameters	Baud Rate: 9600 Parity Check: None Start Bit: 1 (low level) Stop Bit: 1 (high level) Idle Frame: High level Data Bits: 8
Connector	RJ-45

Figure B-3. TP E30 - Timing Relationship Between 1PPS and TOD for 1 PPS+TOD Outputs

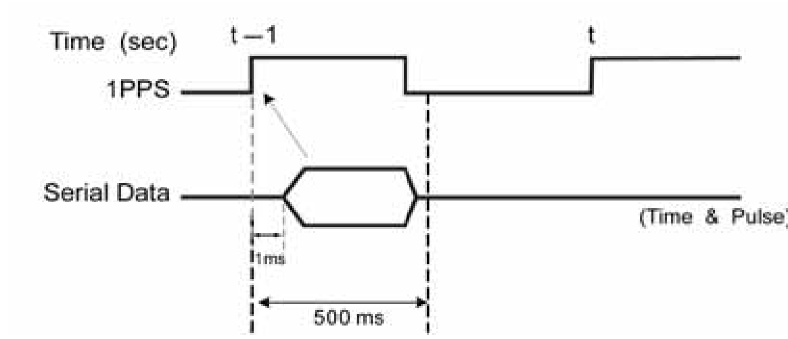


Figure B-4. TP E30 - TOD Frame Structure for 1 PPS+TOD Outputs

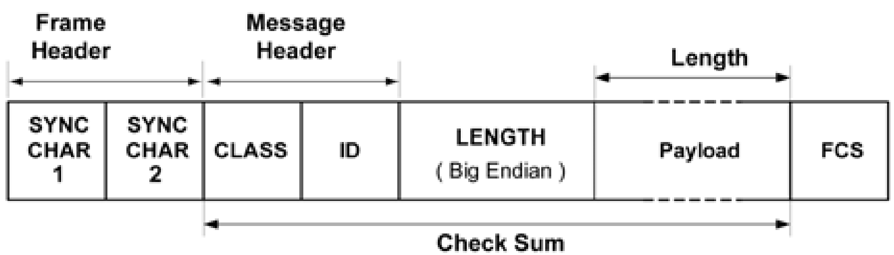


Table B-15. TP E30 - TOD Frame Field Descriptions for 1PPS+TOD Output

Field Name	Field Length	Description
Sync Char 1	1 byte	Part of Frame Header 0x43 = ASCII character “C”
Sync Char 2	1 byte	Part of Frame Header 0x4D = ASCII character “M”
Class	1 byte	Basic classification of TOD message
ID	1 byte	Serial number of of TOD message
Length	2 bytes	Length of payload only (Does **not** include Frame Header, Message Header, Length Field itself, or FCS)

Table B-15. TP E30 - TOD Frame Field Descriptions for 1PPS+TOD Output

Field Name	Field Length	Description
Payload	16 bytes	Contains the message content See Table B-16 for Time Message details. Two TOD messages have been defined: ■ Time Information Message (see Table B-17 for payload contents) ■ Time Status Message (see Table B-18 for payload contents) See Table B-19 for TOD message data type definitions
Frame Check Sequence (FCS)	1 byte	Generating polynomial FCS is: $G(x) = \mathbf{x}^8 + \mathbf{x}^5 + \mathbf{x}^4 + 1$ Initial value of FCS is set to 0xFF, and there is no need to negate the input data. Checksum calculation uses right-shift calculation, and there is no need to negate the output frame check data. When the frame check sequence is transmitted, the LSB (bit 0) is transmitted first.

Table B-16. Time Message Details for 1PPS+TOD Outputs

Message Type	Class	ID	Length (bytes)
Time Information	0x01	0x20	16
Time Status	0x01	0x03	16

Table B-17. TP E30 - Time Information Message Payload Contents for 1PPS+TOD Outputs

Byte Offset	Data Type	Name	Units	Notes
0	U4	Time of Week (TOW)	seconds	GPS Second time of week
4	I4	Reserved	–	Reserved
8	U2	Week Number	–	GPS week (GPS time), 16 bits Whole weeks since 1980-01-06
10	I1	LeapS	seconds	Leap Seconds (GPS-UTC)
11	U1	1PPS Status	–	0x00 = normal 0x01 = Time sync equipment (atomic clock) in holdover mode) 0x02 = do not use 0x03 = Time sync equipment (high-stability crystal clock) in holdover mode) 0x04 = Transport carrier equipment in holdover mode) Other values are reserved
12	U1	TAcc	–	PPS jitter category (0 – 255): 0 = 0 ns 1 = 15 ns 2 = 30 ns 3 = 45 ns . . . . 255 =not defined **Note:** This value is fixed to 255 for transmission and base station equipment
13	U1	Reserved	–	Reserved
14	U1	Reserved	–	Reserved
15	U1	Reserved	–	Reserved

Table B-18. TP E30 - Time Status Message Payload Contents for 1PPS+TOD Outputs

Byte Offset	Data Type	Name	Units	Notes
0	U1	Clock source type	–	0x00 = Beidou 0x01 = GPS 0x02 = IEEE-1588 0x03 = Other
1	U2	Status of the clock source	–	GPS fix type, range = 0 to 3 0x00 = No fix 0x01 = Dead reckoning only 0x02 = 2D fix 0x03 = 3D fix 0x04 = GPS + dead reckoning combined 0x05 = time-only fix 0x06 – 0xff= reserved
3	U2	Monitor alarm	–	Clock source status alarms: Bit 0: not used Bit 1: Antenna open Bit 2: Antenna shorted Bit 3: Not tracking satellites Bit 4: not used Bit 5: Survey in progress Bit 6: No stored position Bit 7: Leap second pending Bit 8: In test mode Bit 9: Position is questionable Bit 10: not used Bit 11: Almanac not complete Bit 12: PPS was not generated
5	U1	Reserved	–	Reserved
6	U1	Reserved	–	Reserved
7	U1	Reserved	–	Reserved
8	U4	Reserved	–	Reserved
12	U4	Reserved	–	Reserved

Table B-19. TP E30 - TOD Message Data Type Definitions for 1PPS+TOD Outputs

Short	Type	Size (bytes)	Range	Resolution	Comments
U1	Unsigned Char	1	0 to 255	1	
I1	Signed Char	1	-128 to 127	1	2's complement
U2	Unsigned Short	2	0 to 65535	1	
I2	Signed Short	2	-32768 to 32767	1	2's complement
U4	Unsigned Long	4	0 to 4,294,967,295	1	
I4	Signed Long	4	-2,147,483,648 to 2,147,483,647	1	2's complement
R4	IEEE 754 Single Precision	4	-1×2^{127} to 2×2^{127}	Value x 2^{-24}	
R8	IEEE 754 Double Precision	8	-1×2^{1023} to 2×2^{1023}	Value x 2^{-53}	
CH	ASCII / ISO 8859.1 Encoding	1			

Clocks

Table B-20. TimeProvider 5000 IOC Clock Specifications

Parameter	Description
Quartz (Type I)	
Holdover	< 1 x 10^{-10}/day or 10 μsec over 1 day
Rubidium (Type II)	
Holdover	< 1 x 10^{-11}/day or 10 μsec over 5 days

Factory Defaults

TP 5000 Main Shelf Defaults

Table B-21. General and Communication Parameters

Description	Default Value	Value Range
Reference Mode (Replaces Time-of-Day Source)	Time	Time | Frequency
Time-of-Day Source (This parameter has been deprecated and will be removed in v2.0)	GPS	GPS | SYS
Telnet Firewall	Block	Allow | Block
ICMP Firewall	Allow	Allow | Block
SSH Firewall	Allow	Allow | Block
SNMP Firewall	Allow	Allow | Block
FTP Firewall	Block	Allow | Block
SFTP Firewall	Allow	Allow | Block
User #1 Name	admin	20 ASCII Characters
User #1 Password	symmadmin**	32 ASCII Characters, a Minimum of 8
User #1 Access level	admin	user | config |admin
IMC EIA-232 Port	57.6k-8-N-1	fixed
IMC IP Mode	Static	DHCP | Static
IMC IP State	Enable	Enable | Disable
IMC IP Address	192.168.0.100	Valid IPv4 Address
IMC Gateway Address	0.0.0.0	Valid IPv4 Address, where value of 0.0.0.0 is used for no gateway
IMC Network Mask	255.255.255.0	Valid IPv4 Mask
Intra-System Communication Class	B: 172.16.250.8 to 172.16.250.63	IP address ranges: A: 10.0.250.8 to 10.0.250.63 B: to 172.16.250.63 C: 192.168.250.8 to 192.168.250.63
IMC Exp-IF ETH State	Enable (v1.3) Disable (v2.0)	Enable | Disable
IMC Exp-IF DTI State	Enable	Enable | Disable

Table B-21. General and Communication Parameters (Continued)

Description	Default Value	Value Range
IMC Monitor (Exp0 - Exp9)	Disable	Enable | Disable
Hostname	TP5000	20 ASCII Characters
Image	None	1, 2
Asset Number	None	20 ASCII Characters
SNMP Manager (Up to 3)	None	Address: Valid IPv4 Address Engine ID: Max of 32 ASCII Characters
SNMP User (Up to 10)	None	Username: Max of 20 ASCII Characters Security Level: noauth, auth, priv Auth Type: MD5, SHA Auth Key: Max of 32 ASCII Characters, Min of 8 ASCII Characters Privacy Protocol: DES, AES Privacy Key : Max of 32 ASCII Characters, Minimum of 8
SNMP Trap User (Up to 3)	None	Username: Max of 20 ASCII Characters Security Level: noauth, auth, private Auth Type: MD5, SHA Auth Key: Max of 32 ASCII Characters Min of 8 ASCII Characters Privacy Protocol: DES, AES Privacy Key : Max of 32 ASCII Characters, Minimum of 8
SNMP v2 Community (Up to 10)	None	Name: Max of 20 ASCII Characters Access: read-only | read-write
SNMP Trap Version	2	2, 3
SNMP v2 State	Enable	Enable | Disable
SNMP Trap MIB Version	1.2	1.2 | 2.0
SNMP SYS OBJ MIB	2.0	1.2 | 2.0
UTC to TAI offset	34	20 to 255
RADIUS Authentication	Disable	Enable | Disable
RADIUS Server IP Address	0.0.0.0	Valid IPv4 Address
RADIUS Server Key	None	Max of 32 ASCII characters
RADIUS UDP Port	1812	1024 to 65535
Remote Syslog Host	0.0.0.0	Valid IPv4 Address

Table B-21. General and Communication Parameters (Continued)

Description	Default Value	Value Range
Remote Syslog State	Disable	Enable | Disable
Local Alarm Log Buffer Size	100	0 to 100 Kbytes
Local Event Log Buffer Size	100	0 to 100 Kbytes
Local Command Log Buffer Size	100	0 to 100 Kbytes
Local Security Log Buffer Size	100	0 to 100 Kbytes
Auto-Sync	Enable	Enable | Disable
Bridging Time	900	100 to 100000

Table B-22. GPS, GNSS, and Input Port Parameters

Description	Default Value	Value Range
GPS State	Enable	Enable | Disable
GPS Priority	2	1 to 16
GPS Antenna Cable Delay	0	0 to 999,999 ns
GPS Position Mode	Auto	Auto | Manual
GPS Position	Lat - N37:22:43.425 Long - W121:55:34.815 Elevation - 13.7m	LAT = Ndd:mm:ss.ss or Sdd:mm:ss.sss LONG = Eddd:mm:ss.ss or Wddd:mm:ss.sss ELEV= ±hhhh.h height in meters, -999.9 to 40,000.0 meters
GPS Elevation Mask	10	5 to 45 degrees
GPS PQL State	Disable	Enable | Disable
GPS PQL Value	1	1 to 3
GNSS State	Enable	Enable | Disable
GNSS Priority	1	1 to 16
GNSS Antenna Cable Delay	0	0 to 65,485 ns
GNSS Position Mode	Auto	Auto | Manual

Table B-22. GPS, GNSS, and Input Port Parameters (Continued)

Description	Default Value	Value Range
GNSS Position	Lat - N37:22:43.425 Long - W121:55:34.815 Elevation - 13.7m	LAT = Ndd:mm:ss.ss or Sdd:mm:ss.sss LONG = Eddd:mm:ss.ss or Wddd:mm:ss.sss ELEV= ±hhhh.h height in meters, -999.9 to 40,000.0 meters
GNSS Elevation Mask	10	5 to 45 degrees
GNSS Track Mode	Priority-GPS	Beidou | GPS | Priority-GPS | Priority Beidou
GNSS PQL State	Disable	Enable | Disable
GNSS PQL Value	1	1 to 3
1PPS+TOD Input Port 1 State	Enable	Enable | Disable
1PPS+TOD Input Port 1 Priority	3	1 - 16
1PPS+TOD Input Port 1 PQL State	Disable	Enable | Disable
1PPS+TOD Input Port 1 PQL Value	1	1 to 3
1PPS+TOD Input Port 1 Cable Delay	0	0 - 200,000 ns
1PPS+TOD Input Port 2 State	Enable	Enable | Disable
1PPS+TOD Input Port 2 Priority	4	1 - 16
1PPS+TOD Input Port 2 PQL State	Disable	Enable | Disable
1PPS+TOD Input Port 2 PQL Value	1	1 to 3
1PPS+TOD Input Port 2 Cable Delay	0	0 - 200,000 ns
Reference Criteria	Priority	Priority | SSM (see note below)
Telecom Input Port 1 State	Enable	Enable | Disable
Telecom Input Port 1 Priority	7	1 - 16
Telecom Input Port 1 Frame Type	freq2048khz	D4 | ESF | CCS | CAS | freq2048khz | freq1544khz
Telecom Input Port 1 CRC	Disable	Enable | Disable
Telecom Input Port 1 SSM State	Disable	Enable | Disable (see note below)

Table B-22. GPS, GNSS, and Input Port Parameters (Continued)

Description	Default Value	Value Range
Telecom Input Port 1 SSM Bit	8	4 | 5 | 6 | 7 | 8
Telecom Input Port 1 SSM PQL Value	3	1 to 9
Telecom Input Port 2 State	Enable	Enable | Disable
Telecom Input Port 2 Priority	8	1 to 16
Telecom Input Port 2 Frame Type	freq2048khz	D4 | ESF | CCS | CAS | freq2048khz | freq1544khz
Telecom Input Port 2 CRC	Disable	Enable | Disable
Telecom Input Port 2 SSM State	Disable	Enable | Disable (see note below)
Telecom Input Port 2 SSM Bit	8	4 | 5 | 6 | 7 | 8
Telecom Input Port 2 SSM PQL Value	3	1 to 9

Note: The reference criterion MANUAL is no longer supported. Only PRIORITY and SSM are supported for reference selection.

Manual selection of a reference input can be done by disabling all reference input ports except the desired one.

The “set ref override” command is no longer supported.

Table B-23. Telecom Input / Output Parameters

Description	Default Value	Value Range
Telecom IO Port 1	Input	Input | Output
Telecom IO Port 2	Input	Input | Output

Table B-24. I/O Card Expansion Port Output Parameters

Description	Default Value	Value Range
I/O Exp. Port 1 - DTI Output .State	Enable	Enable | Disable
I/O Exp. Port 2 - DTI Output State	Enable	Enable | Disable

Table B-25. Telecom Output Port Parameters

Description	Default Value	Value Range
Telecom Output Port State	Enable	Enable | Disable
Telecom Output Port Frame Type (mini-BNC connector)	freq2048khz	CCS | CAS | freq2048khz
Telecom Output Port Frame Type (RJ-45 connector)	freq2048khz	D4 | ESF | freq1544khz
Telecom Output Port CRC	Disable	Enable | Disable
Telecom Output Port SSM	Disable	Enable | Disable
Telecom Output Port SSM Bit	8	4 | 5 | 6 | 7 | 8
Output Generation – Warm-up	Squelch	Squelch | On | AIS
Output Generation – Free-run	Squelch	Squelch | On | AIS
Output Generation – Holdover	On	Squelch | On | AIS
Output Generation – Fast-track	On	Squelch | On | AIS

Table B-26. Output Port Parameters

Description	Default Value	Value range
10 MHz Output Port State	Enable	Enable | Disable
10 MHz Output Generation – Warm-up	Squelch	Squelch | On
10 MHz Output Generation – Free-run	Squelch	Squelch | On
10 MHz Output Generation – Holdover	On	Squelch | On
10 MHz Output Generation – Fast-track	On	Squelch | On

Table B-26. Output Port Parameters (Continued)

Description	Default Value	Value range
1PPS Output Port State	Enable	Enable | Disable
1PPS Output Generation – Warm-up	Squelch	Squelch | On
1PPS Output Generation – Free-run	Squelch	Squelch | On
1PPS Output Generation – Holdover	On	Squelch | On
1PPS Output Generation – Fast-track	On	Squelch | On

Table B-27. PTP Grand Master Port IP Parameters

Description	Default Value	Value Range
IOC1-y IP Address IOC_{1-1} IOC_{1-2}	 192.168.1.11 192.168.2.11	Valid IPv4 Address
IOC1-y IP Mask	255.255.255.0	Valid IPv4 Mask
IOC1-y IP Gateway	0.0.0.0	Valid IPv4 Address, special value of 0.0.0.0 is used for no gateway
IOC1 Port Redundancy (Bonding)	Disable	Enable | Disable
IOC IP State	Enable	Enable | Disable

Table B-28. VLAN Parameters - Fixed Index (1–16)

Description	Default Value	Value Range
IOCx-y Address IOC_{1-1} IOC_{1-2}	No VLAN configured	Valid IPv4 Address
IOC1-y Mask	No VLAN configured	Valid IPv4 Mask
IOC1-y Gateway	No VLAN configured	Valid IPv4 Address
ID	0 (not visible in VLAN table)	1 to 4094

Table B-28. VLAN Parameters - Fixed Index (1–16)

Description	Default Value	Value Range
Priority	0	0 to 7
Mode	Disable	Enable | Disable
State	Disable	Enable | Disable

Table B-29. VLAN Parameters - Non-Fixed

Description	Default Value	Value Range
Ethernet Port Address (expansion shelf)	No VLAN configured	Valid IPv4 Address
Ethernet Port Mask	No VLAN configured	Valid IPv4 Mask
Ethernet Port Gateway	No VLAN configured	Valid IPv4 Address
ID	0 (not visible in VLAN table)	1 to 4094
Priority	0	0 to 7
Mode	Disable	Enable | Disable
State	Disable	Enable | Disable

Table B-30. Ethernet Link Auto-negotiation Parameters

Description	Default Value	Value Range
Auto-negotiation state	Enable	Enable | Disable
Auto-negotiation speed	All	100M | 1000M | All

Table B-31. Packet Service Parameters

Description	Default Value	Value Range
Packet Service	ptp-gm for PTP product ntp-server for NTP product	ptp-gm | ptp-probe | ntp-probe | ntp-server

Table B-32. PTP Grand Master Common Parameters

Description	Default Value	Value Range
PTP IOC1-y Timescale	Auto	Auto | PTP | Arb
PTP IOC1-y Clock Identity	MAC-based value (i.e. FF:FE inserted in the middle of MAC address)	64-bit value
PTP IOC1-y Priority 1	128	0 to 255
PTP IOC1-y Priority 2	128	0 to 255
PTP IOC1-y Domain	4 for ITU-G.8265.1 profile 0 for all other profiles	0 to 255
PTP IOC1-y TTL Value	64	1 to 255
PTP IOC1-y DSCP State	Disable	Enable | Disable
PTP IOC1-y DSCP Value	0	0 to 63
PTP Sync Limit	–7	–7 to 7
PTP Announce Limit	–3	–4 to 4
PTP Delay Limit	–7	–7 to 7
PTP State	Enable	Enable | Disable
PTP Max Number of Clients	500 per port	1 to 500 per port (or 1000 if bonded ports or if other port is not running ptp-gm)
PTP Dither	Disable	Enable | Disable
PTP Profile	Telecom-2008	telecom-2008 | default | hybrid | itu-g8265-1
PTP Two Step	Disable	Enable | Disable
PTP MGMT Addr Mode	Unicast	Unicast | Multicast
PTP Alternate Master	Disable	Enable | Disable

Table B-33. PTP Grand Master Unicast Parameters

Description	Default Value	Value Range
PTP IOCx-y Dynamic Unicast Negotiation	Enable	Enable | Disable
PTP IOCx-y Dynamic Unicast Lease Duration	1000	10 to 1000 seconds
PTP IOCx-y Static Unicast State (A maximum of 10 clients can be assigned)	Disable	Enable | Disable
PTP IOCx-y Static Unicast IP Address	0.0.0.0	Valid IPv4 Address
PTP IOCx-y Static Unicast Clock ID	ff:ff:ff:ff:ff:ff:ff:ff	64-bit Value
PTP IOCx-y Static Unicast VLAN ID	0	1 to 4094, 0 is used to signify no VLAN
PTP IOCx-y Static Unicast Sync Message Rate (2^y)	–3	–7 to 7
PTP IOCx-y Static Unicast Announce Message Rate (2^y)	1	–4 to 4
PTP IOCx-y Static Unicast Delay Response Message Rate (2^y)	–3	–7 to 7

Table B-34. PTP Grand Master Multicast Parameters

Description	Default Value	Value Range
PTP IOCx-y Multicast Client Timeout	300	10 to 3600 seconds
PTP IOCx-y Multicast Announce Timeout	3	2 to 10
PTP IOCx-y Multicast VLAN ID	0	0 to 4094, 0 is used to signify no VLAN
PTP IOCx-y Multicast Sync Message Rate (2^y)	–1 for default profile –6 for hybrid profile	–7 to 7

Table B-34. PTP Grand Master Multicast Parameters

Description	Default Value	Value Range
PTP IOCx-y Multicast Announce Message Rate (2^y)	1	–4 to 4
PTP IOCx-y Multicast Delay Response Message Rate (2^y)	–7	–7 to 7

Table B-35. NTP Server Parameters

Description	Default Value	Value Range
NTP IOC1-y State	Enable	Enable | Disable
NTP IOC1-y TTL Value	64	1 to 255
NTP IOC1-y DSCP State	Disable	Enable | Disable
NTP IOC1-y DSCP Value	0	0 to 63
NTP IOC1-y Transaction Rate Limit	20,000 transactions/second	120,000 or 20,000 NTP transactions/second by license
NTP VLAN ID	2	1 to 4094

Note: The NTP Server feature can either be ordered in a new system, or added to a previously ordered system as a field upgrade. Field upgrades require a license activation key. Contact your Symmetricom representative for more information.

Table B-36. PTP Grand Master Multicast Parameters

Description	Default Value	Value Range
Active Probe GM IP IOC$_{1-1}$ IOC$_{1-2}$	192.168.1.11 192.168.2.11	Valid IPv4 Address
Active Probe VLAN ID	No VLAN	1 - 4094
Active Probe GM Clock ID	ff:ff:ff:ff:ff:ff:ff:ff	64-bit value

Table B-36. PTP Grand Master Multicast Parameters (Continued)

Description	Default Value	Value Range
Active Probe Interval	-6 if using CLI commands 0 in TimeMonitor PDV (2^0 =1)	-6 to 7
Active Probe Duration	300	10 to 1000 seconds

Table B-37. SSM Settings

Description	Default Value	Value Range
SSM Option	Option 1	Option 1 **|** Option 2

TP E10 Expansion Shelf Defaults

Table B-38. TP E10 - Expansion Port Parameters

Description	Default Value	Value Range
Exp-IF DTI Port State	Enable	Enable **|** Disable

Table B-39. TP E10 - PTP Output Port IP Parameters

Description	Default Value	Value Range
IP Address Port 1 Port 2 Port 3 Port 4 Port 5 Port 6 Port 7 Port 8 Port 9 Port 10 Port 11 Port 12 Port 13 Port 14 Port 15 Port 16	 192.168.21.11 192.168.22.11 192.168.23.11 192.168.24.11 192.168.25.11 192.168.26.11 192.168.27.11 192.168.28.11 192.168.29.11 192.168.30.11 192.168.31.11 192.168.32.11 192.168.33.11 192.168.34.11 192.168.35.11 192.168.36.11	Valid IPv4 Address
Port x IP Mask	255.255.255.0	Valid IPv4 Mask
Port x IP Gateway	0.0.0.0	Valid IPv4 Address
Port x IP State	Enable	Enable | Disable

Table B-40. TP E10 - VLAN Parameters

Description	Default Value	Value Range
Port x Address x= 1 - 16	 192.168.21.11 192.168.22.11 192.168.23.11 192.168.24.11 192.168.25.11 192.168.26.11 192.168.27.11 192.168.28.11 192.168.29.11 192.168.30.11 192.168.31.11 192.168.32.11 192.168.33.11 192.168.34.11 192.168.35.11 192.168.36.11	Valid IPv4 Address
Port x Mask	255.255.255.0	Valid IPv4 Mask
Port x Gateway	0.0.0.0	Valid IPv4 Address
ID	2	1 to 4094
Priority	0	0 to 7
Mode	Disable	Enable | Disable

Table B-41. TP E10 - Ethernet Auto Negotiation Parameters

Description	Default Value	Value Range
ETH Auto Negotiation State	Enable	Enable | Disable
ETH Auto Negotiation Speed	All	100M | 1000M | All

Table B-42. TP E10 - Expansion Shelf PTP Parameters

Description	Default Value	Value Range
PTP Port x State	Enable	Enable | Disable
PTP Timescale	Auto	PTP | ARB | Auto
PTP Two-Step Clock	Disable	Enable | Disable
PTP Alternative Master	Disable	Enable | Disable
PTP Priority 1	128	0 to 255
PTP Priority 2	128	0 to 255
PTP Domain	0	0 to 255
PTP Dither	Disable	Enable | Disable
PTP Clock Identity	MAC-based value (i.e. FF:FE inserted in the middle of MAC address)	64-bit value
PTP Multicast Sync Interval	0	–7 to 7
PTP Multicast Announce Interval	1	–4 to 4
PTP Multicast Delay Interval	–7	–7 to 7
PTP Multicast Announce Timeout	3	2 to 10
PTP Multicast Client Timeout	300	10 to 3600 sec

Table B-43. TP E10 - Output Port Parameters

Description	Default Value	Value range
SyncE Ethernet Synchronization Messaging Channel (ESMC)	Disable	Enable | Disable
Enabled SyncE/PTP ports	8 ports (Port 1-8)	8 ports | 16 ports

Note: The second set of SyncE/PTP ports (Ports 9-16) for the TP E10 expansion shelf are available as a purchasable option.

TP E30 Expansion Shelf Defaults

Table B-44. TP E30 - E1 Output Port Parameters

Description	Default Value	Value Range
E1 Output Port x State x = 1 - 16	Enable	Enable | Disable
E1 Output Port x Frame Type (mini-SMB connector)	freq2048khz	CCS | CAS | freq2048khz
E1 Output Port x CRC	Disable	Enable | Disable
E1 Output Port x SSM	Disable	Enable | Disable
E1 Output Port x SSM Bit	8	4 | 5 | 6 | 7 | 8
Output Generation – Warm-up	Squelch	Squelch | On | AIS
Output Generation – Free-run	Squelch	Squelch | On | AIS
Output Generation – Holdover	On	Squelch | On | AIS
Output Generation – Fast-track	On	Squelch | On | AIS

Table B-45. TP E30 - 1PPS+TOD Output Port Parameters

Description	Default Value	Value range
1PPS+TOD Output Port State	Enable	Enable | Disable
1PPS+TOD Output Generation – Warm-up	Squelch	Squelch | On
1PPS+TOD Output Generation – Free-run	Squelch	Squelch | On
1PPS+TOD Output Generation – Holdover	On	Squelch | On
1PPS+TOD Output Generation – Fast-track	On	Squelch | On

Alarm Default Values

Table B-46. GPS Port Alarm Parameters

Description	Default Value	Value Range
Alarm Delay Time	0	0 to 500000
Alarm State (for each alarm)	Enable	Enable | Disable
Alarm Severity Level	See System Notification Messages, on page 431	2 to 5

Appendix C Installing the GPS Antenna

The GPS L1 Reference Antenna is one component of a complete line of GPS accessories for your GPS antenna system provided by Symmetricom. These accessories are designed to deliver precise GPS signals over a wide temperature range and in harsh environmental conditions.

In This Document

- Antenna Kits and Accessories
- Installing the Antenna

Antenna Kits and Accessories

This section provides a list of antenna kits and accessories as well as descriptions and associated part numbers.

To order any accessory, contact the Symmetricom Sales Department. See http://www.symmetricom.com/company/contact-information/sales-offices for sales support contact information.

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 gain required at 1575 MHz for a GPS radio receiver input is the manufacturer's specification for the radio receiver to acquire satellites, with some level of signal degradation allowed.

L1 Antenna gains are usually specified as the minimum effective gain. Such antenna gains can have 4.5 to 10 dB more signal strength at different satellite azimuths and elevations, depending on their reception pattern. The GPS engine requires a net gain at the antenna connector input of the chassis (GPS or GNSS port) to be between 25 dB and 38 dB. This tolerance allows for the signal loss of the internal and external coaxial cable and connectors. The optimal gain at the GPS radio receiver input is 32 dB. The total gain is the gain of the GPS antenna less the loss of the transient eliminator, connectors, and cables.

All antenna kits include the GPS L1 antenna, mounting pipe, floor flange, transient eliminator, pre-assembled coaxial cable (for antenna to transient eliminator), roll of 3M 2150 weatherproof tape, and a right angle adapter. The antennas, transient eliminators, and in-line amplifiers have N-type connectors.

All antenna kits supplied use LMR-400, or equivalent, low-loss coaxial cable. Other types of coaxial cable are available for GPS antenna applications; however, it is imperative that you calculate the specific cable loss to ensure a gain between 25 dB and 38 dB at the antenna connector input. The L1 signal loss of LMR-400 is 0.167 dB/meter. The L1 signal loss of a 90 V transient eliminator is typically 0.25 dB.

GPS Antenna Kits With Low Noise Amplifiers, 40 or 48 dB

Symmetricom offers two versions of GPS antennas, with 40 or 48 dB total Low Noise Amplifier (LNA) gain. These antenna kits, which are compatible with most commercial GPS receivers, receive, amplify, and filter the L1 (1575.42 MHz) signal from GPS satellites. The antenna is housed in a weatherproof package suitable for permanent installation in an exposed location. For additional transient eliminator protection requirements, you can install a 250B-90 Gas Tube transient eliminator in series with the antenna coaxial cable.

The cable between the antenna and the TimeProvider 5000 cable should be kept to the shortest reasonable length. Before using additional cables, verify that the total antenna system gain is acceptable as described in the Selecting the Proper Gain Antenna section of Appendix D. The tables listed below provide information about the antenna:

- Table C-1 lists the item number and provides a brief description of each antenna
- Table C-2 provides specification information for GPS antenna with internal LNA
- Table C-3 lists the item numbers and provides a brief description of the antenna accessories available for the GPS series antennas.

Table C-1. GPS Antenna with LNA

Antenna Kit	Part Number	40 dB Antenna	48 dB Antenna	20 dB Amp	Cable Length (meters)	
					min	max
70M 40dB Antenna	990-13073-070	X			20	70
120M 48dB Antenna	990-13074-120		X		70	120
230M 48dB Antenna/ 20dB Amp	990-13075-230		X	X	190	230

Table C-2 provides specifications for GPS antennas with internal LNA.

Table C-2. Specifications for GPS Antennas with Internal LNA

Characteristic	Specification
Mechanical	
Mounting	4 holes, 1.75 in x 1.75 in (4.445 cm x 4.445 cm) centers, 0.25 in (0.635 cm) mounting holes
Diameter	3.5 in (88.9 mm)
Height	12.94 in (328.7 mm), including pipe mount
Weight	< 3 lbs (1.4 kg)
Environmental	
Temperature	–40°C to +75°C
Relative Humidity	100% Non-Immersed
Altitude	200 ft. (60 m) below sea level to 13,000 ft. (3962 m) above sea level

Table C-2. Specifications for GPS Antennas with Internal LNA (Continued)

Characteristic	Specification
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 Marine 40 Marine 50	 40 dB minimum 48 dB minimum

Table C-3 lists the available accessories for GPS antennas with internal LNA.

Table C-3. 26 dB L1 GPS Antenna Accessory Kit

Part Number	Description
112-43400-00-3	Transient Eliminator, 90 Volts, 1.5 GHz, N-Type
12010210-000-0	Bracket Assembly, Antenna Mount Right Angle
12813080-000-0	Crimper Kit, LMR-400 (crimp tool, 2150 tape, LMR preptool, 10 each crimp N-type connectors)

Transient Eliminators

Symmetricom offers the FCC-250B-90-1.5NFNF Transient Eliminator for installations that require antenna coaxial lead-in protection. The FCC-250B- 90-1.5NFNF Transient Eliminator passes DC power and frequencies in the 1.5 GHz range with non-downconverter L1 GPS antennas. In most installations, the transient eliminator mounts near the point at which the antenna lead enters the facility. Table C-4 provides the transient eliminator specifications.

Table C-4. FCC-250B-90-1.5NFNF Specifications

Characteristic	Specification
Type	Gas
Response Time	< 2 nanoseconds
Impedance	50 Ω
Insertion Loss	< 0.25dB @ 1,575 MHz
VSWR	< 1.6:1 @ 1,575 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. (60 m) below sea level to 13 000 ft. (3962 m) above sea level

GPS L1 Inline Amplifier

The GPS L1 Inline Amplifier (570704-0002) option boosts the signal from the antenna. Use this amplifier on LMR-400 cables that are longer than 650 feet; it receives power from the GPS radio receiver through the antenna coaxial cable connections. Table C-5 provides mechanical and electrical specifications for the amplifier.

Table C-5. GPS L1 Inline Amplifier Specifications

Characteristic	Specification
Mechanical	
Connectors, (In/Out)	N-Type
Gain	20 dB ± 2 dB

Table C-5. GPS L1 Inline Amplifier Specifications (Continued)

Characteristic	Specification
Dimensions, includes connectors	Length: 3.77 in (9.6 cm)
Electrical	
Power	+4 VDC to +28 VDC
Current	< 10 mA
Noise Factor	< 3 dB

Antenna Coaxial Cables

Symmetricom provides several low-loss cable types, as well as LMR-400 with N-type connectors on both ends. Before using additional cables, verify that the total antenna system gain is acceptable as described in the Selecting the Proper Gain Antenna section of Appendix D.

- Table 6-10 in Chapter 6 of this User's Guide lists the optional antenna coaxial cables
- Table C-6 provides antenna cable specifications

Table C-6. Antenna Cable Specifications

Cable Type	Measured Loss (@1.575 GHz dB per foot)	DC Resistance (Ω per foot)	Type Center Conductor	Flammability
RG213/U (Belden 8267)	0.093 dB	0.0030	Stranded 13 AWG	U/L CSA
RG213/U (Belden 8267)	0.093 dB	0.0030	Stranded 2.62 mm^2	U/L CSA
UHF/VHF (Belden 9913)	0.058 dB	0.0027	Solid 10 AWG	
UHF/VHF (Belden 9913)	0.058 dB	0.0027	5.26 mm^2	
UHF/VHF (Belden 89913)	0.089 dB	0.0027	Solid 10 AWG	Plenum U/L CSA
UHF/VHF (Belden 89913)	0.089 dB	0.0027	5.26 mm^2	Plenum U/L CSA

Table C-6. Antenna Cable Specifications (Continued)

Cable Type	Measured Loss (@1.575 GHz dB per foot)	DC Resistance (Ω per foot)	Type Center Conductor	Flammability
LMR-400	0.051 dB	Shield – 0.00165 Center – 0.00139	0.109 inch Solid	
LMR-400	0.051 dB	Shield – 0.00165 Center – 0.00139	0.27686 cm^2 Solid	

Antenna Installation

This section provides a procedure for installing a GPS antenna. Before beginning the installation, review Planning the Installation, on page 495, and gather the necessary tools and materials described in Antenna Installation Tools and Materials, on page 498

Antenna Connection Overview

The TimeProvider 5000 chassis has one antenna connection located on the front of the IMC module. The antenna connection is made via a SMA connector, labeled GPS. The connectors are DC isolated and AC bypassed to frame ground. This connection is used for a radio receiver antenna connection only. Installation procedures for GPS antennas are outlined below.

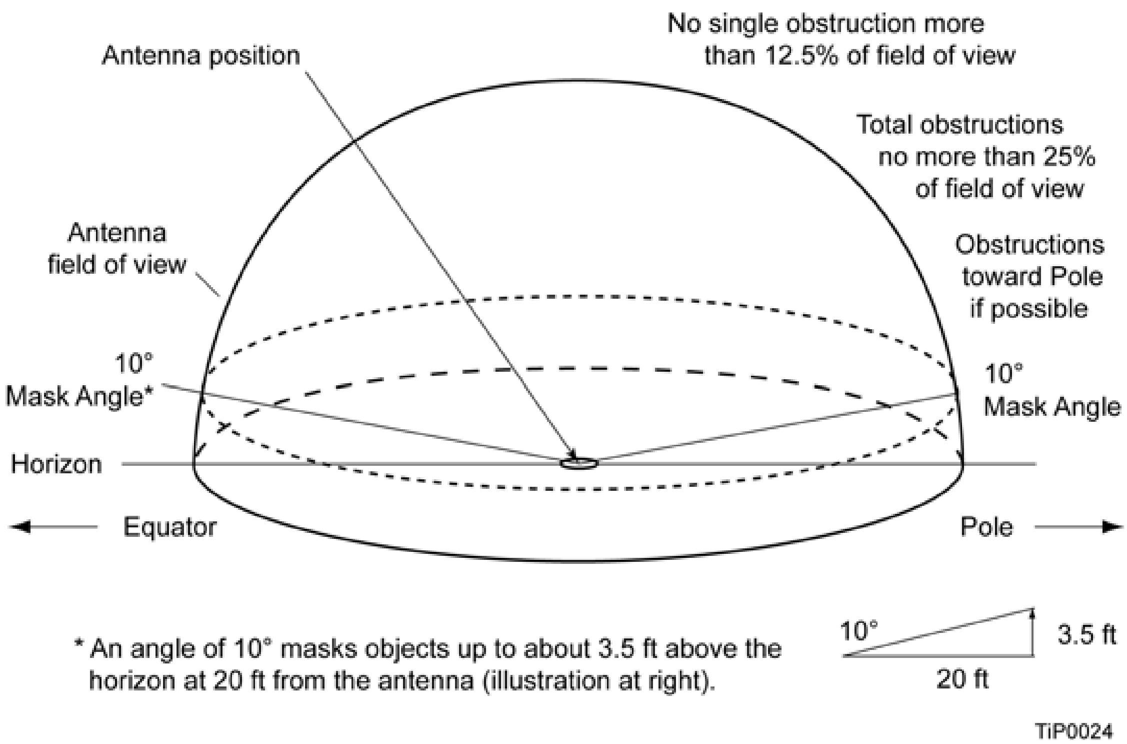
Planning the Installation

Prior to installing the antenna, you should plan the site, antenna location, grounding scheme, cable route, and all other details.

Locating the Antenna

Use Figure C-1 as a guide to locating the antenna.

Figure C-1.   Locating the GPS Antenna



Caution: To avoid damage to the GPS 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.

Warning: To avoid serious injury to personnel or damage to equipment, 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 building electrical codes for grounding using the frame ground lug on the TimeProvider 5000 chassis.
- The in-line amplifier receives 5 VDC power from the 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, mount the amplifier/plate assembly where the transient eliminator would normally be mounted.
- Symmetricom does not recommend cutting the antenna cables provided in the GPS Antenna Kit.

Recommendation: Symmetricom recommends that you consider the following location and environment influences before installing the GPS antenna:

- If possible, provide 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, as shown in Figure C-1.
- 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 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 of the point at which the antenna cable enters the building.
- Allow at least 10 feet 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.

Developing a 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 transient eliminators are used, they also need to be connected to the perimeter ground system or bulkhead entrance panel that is connected to the perimeter ground system.

Caution: To ensure proper grounding, observe these precautions when installing the antenna:

- Allow no sharp bends in the ground conductors.
- Ensure that no painted surface insulates the transient eliminator or grounding clamps.
- Ensure that ground conductors are bonded to the metal enclosure box (if used) and do not enter through an access hole.
- Do not use soldered connections for grounding purposes.
- Secure all grounding connections with mechanical clamp type connectors.

- In general, follow local building codes when selecting a grounding scheme, wire size, and installation.

  Use #6 AWG (13.3 mm) copper ground wire or larger, depending on the distance to the earth ground electrode. Refer to your local electrical codes for specific details. In most cases, 1/0 AWG (55.0 mm) ground wire will maintain 1/10 the resistance of the coaxial shied..

Note: Larger ground conductors provide better transient elimination; that is, the larger the ground conductor, the less likely the chance of transients.

- Connect transient eliminators, if part of the grounding scheme, to earth ground through a conductor.

  Symmetricom makes no recommendation as to whether to install transient eliminators. Symmetricom can provide suitable transient eliminators as an option.

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.

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

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. For a list of antenna kit contents, see Table C-1.

- Four each 0.25 in (6 mm) fasteners for installing the antenna floor flange
- Extra cable ties or acceptable cable clamps
- #6 AWG (minimum) copper ground wire
- Eight-foot (2.9 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, use caution while pulling cable.

Caution: To avoid damage to the connectors, do not use the connectors to pull the cable. 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.

Cutting Antenna Cables

Symmetricom recommends that you coil 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.

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.

Be aware of these cable and connector requirements before cutting antenna cables:

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 Table C-1).

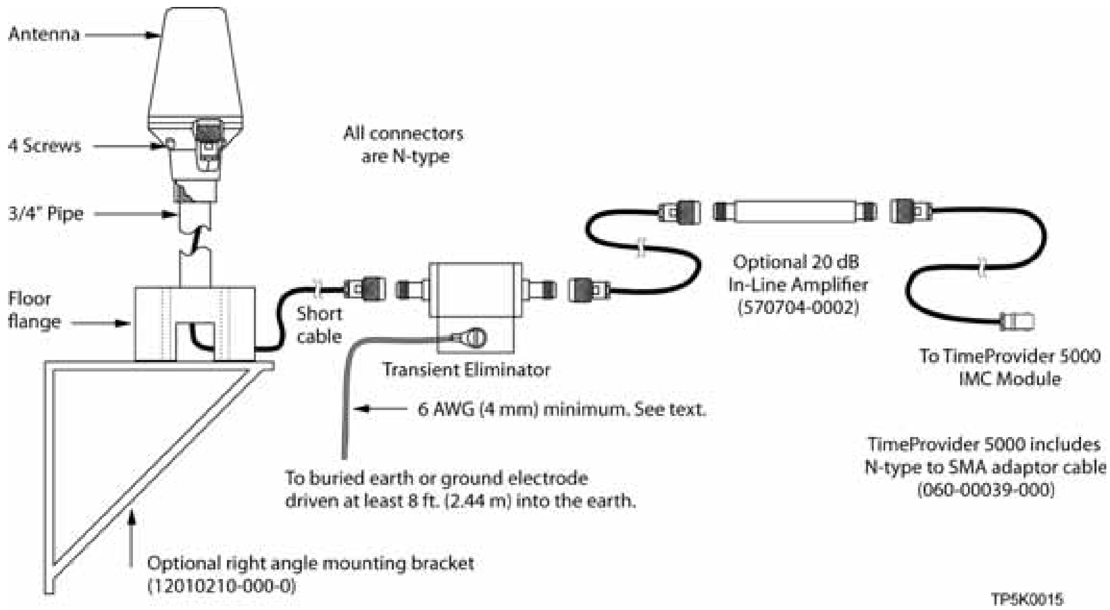
Connector Requirements – The cables provided with the GPS Antenna Kit have factory installed crimped connectors. If you cut these cables, you must supply and add a connector. Symmetricom recommends that you use only crimp-style N-type connectors in the Crimper Kit for this application.

Installing the Antenna

This section provides installation procedures for installing the GPS antenna.

Note: Follow local building electrical codes when installing the GPS antenna.

Figure C-2. GPS Antenna Installation



To mount the GPS antenna:

- To mount the antenna to any stable flat surface, use the floor flange supplied in the GPS Antenna Kit. 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 (part number 12010210-000-0).
- To secure the coaxial cable to the mast, use one or more 8-inch cable ties or appropriate cable clamps.

Connecting the Cable to the Antenna

To connect the coaxial cable to the mounted antenna (see Figure C-2):

1. Loosen the four screws securing the top of the antenna in place to gain access to the 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.

Caution: To avoid damage to the connectors, do not use the connectors to pull the cable. 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.

3. Connect the cable to the antenna and run the cable from the antenna through the slot of the floor flange.

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

4. Replace the four screws to secure the top of the antenna in place with the cable connected.

Installing the Transient Eliminator

If you are installing a transient eliminator, follow these guidelines:

- Transient eliminators should be installed in accordance with your antenna system grounding scheme
- Mount the transient eliminator within 30 feet (9 m) of the GPS antenna
- If required, mount a second transient eliminator near the GPS antenna

To install the transient eliminator:

Note: Step 6 in the following procedure cannot be done if you cut the cable (as described in Step 1).

1. If necessary, cut the coaxial cable and install mating connectors (see Cutting Antenna Cables, on page 499).

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.

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

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

Installing the Antenna Cable

You should install the antenna cable from the transient eliminator to the TimeProvider 5000 using the shortest route possible. Follow all applicable building and electrical codes to ensure a water-tight and fire-resistant installation. .

Caution: To avoid damage to the connectors, do not use the connectors to pull the cable. If at all possible, avoid bundling the cable with other cables (and possible noise sources). Use appropriate cable-pulling devices when pulling the cable through conduit or a weather head.

Connecting the GPS Antenna

Before connecting the GPS antenna to the TimeProvider 5000, see Antenna Connection Overview, on page 495. Then, follow the instructions below.

1. Verify that the center conductor is not shorted to the shield.

   If the reading shows a short or open, 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 an individual ohmmeter can cause readings to vary among meters.

2. Secure the free end of the antenna cable to the appropriate antenna connector on the rear panel of the TimeProvider 5000 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 TimeProvider 5000. Coiling the excess cable also allows you to use the factory-installed crimped connector.

Antenna Installation Completeness Checklist

To verify that antenna installation is complete:

- Verify that all power and ground wires are installed correctly and securely fastened.
- Verify that all input and output cables are properly installed.
- Verify that all antenna connectors are secure, tight, and weatherproofed.

Appendix D Redundant IOC Cards

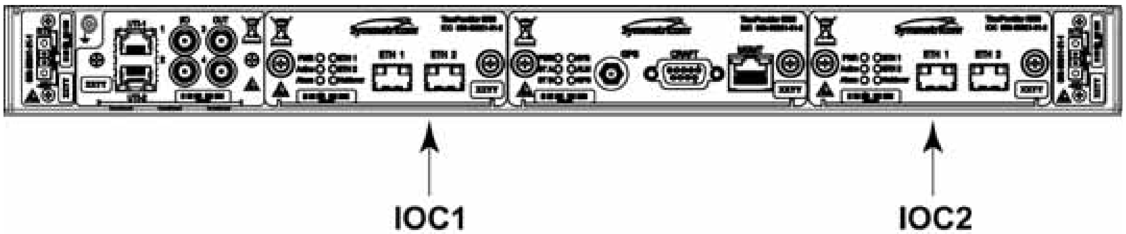
In This Appendix

- Overview
- Parameters with IOC Card Redundancy
- Causes of Switchovers Between IOC Cards
- Setting the Active IOC Card at Power Up
- Output Performance During Switchover
- IOC Card Redundancy-Related CLI Commands

Overview

The TimeProvider 5000 chassis has two IOC card slots, IOC1 and IOC2, as shown in Figure D-1. In v1.0, the TP5000 could only support a single IOC card, which had to be installed in the IOC1 position. In v1.1, the Redundant IOC Cards feature was introduced to the TP5000.

Figure D-1.   IOC Card Placements in TP5000 Chassis



If the TP5000 v1.1 is configured with two IOC cards, the IOC cards will automatically operate redundantly. (There is no capability for the user to disable redundancy.) With redundancy, one card is Active and drives outputs, while the other is in Standby mode. Both cards share the same configuration, IOC1, so both IOC cards will have the same IP addresses and Clock IDs for the Ethernet ports on either card, but with different MAC addresses for each IOC card. Neither card is primary and redundancy is not revertive. However, IOC1 will be the active IOC if the entire system is rebooted or powered-up, and preference is given to a Rb IOC on initial warmup.

If the TP5000 v1.1 is configured with one IOC card, the card can be located in either the IOC1 or IOC2 position.

On system power-up, IOC1 will be active. After initial warm-up of both cards is complete, the IOC with the Rb oscillator will be active, even if it is IOC2. If the active IOC card fails, exhibits certain diminished health conditions, or loses its Ethernet connection, the TP5000 will switch over to the standby card within 10 seconds. The configuration and state is synchronized between cards automatically. The user can also use a CLI command or SNMP (if SNMP option is purchased) to initiate a manual switchover.

Note: The IOC with the Rb oscillator is initially selected as the Active IOC after power-up of the system, regardless of its position as IOC1 or IOC2.

Parameters with IOC Card Redundancy

Both of the redundant IOC cards share the same configuration, IOC1, so both IOC cards will have the same IP addresses and Clock IDs for the Ethernet ports on either card. Each PTP port on each IOC card has a unique MAC address, but it may not be used in the port redundancy mode.

IP Addresses and MAC Addresses with Independent Ports

The IP address for the ETH1 port will be the same for IOC1 and IOC2, as shown in Figure D-2.

The IP address for the ETH2 port will be the same for IOC1 and IOC2.

Each port on each IOC card will retain a unique MAC address, regardless of IOC redundancy. See Figure D-2

IP Addresses and MAC Addresses with Port Redundancy

If Port Redundancy (Bonding) is enabled, interface bond0 will be added on both redundant IOCs. ETH1 and ETH2 will become the slave interface of bond0. Interface bond0 will use the ETH1 MAC address and ETH1 IP address. As slave interfaces, ETH1 and ETH2 will not carry an IP address. ETH1 will use its own MAC address, while ETH2 will use the ETH1 MAC address. The redundant IOC bond0 interface will have the same IP address as the active IOC. However, the MAC addresses of bond0, ETH1, and ETH2 will use the MAC address of ETH1 of its own card. See Figure D-3.

Note: To avoid unexpected behavior if port redundancy is disabled, assign the IP addresses for ETH1 and ETH2 to different subnets.

Clock IDs

Clock IDs normally self-generate for IOC ports using the MAC-based method described in IEEE-1588. Essentially, the Clock ID is generated by inserting the two bytes “FFFE” between the first 3 bytes and last 3 bytes of the MAC. For example, a MAC of “00:b0:ae:01:90:ea” will have a Clock ID of “00:b0:ae:ff:fe:01:90:ea”. In non-port-redundant mode, the independent ETH1 and ETH2 ports of an IOC use the Clock IDs associated with their individual MAC addresses. See Figure D-2.

With IOC card redundancy, the Clock IDs are generated from the MAC addresses for the ETH1 and ETH2 ports of the IOC card that was Active first. The first Active card is typically the card in the IOC1 slot, as described in the section Setting the Active IOC Card at Power Up, on page 511. If a switchover occurs, the Standby card will become the Active card and use the Clock ID of the original Active IOC.

As long as a TP5000 chassis continuously has a powered IOC module in it (assuming that the IOC has been powered long enough to take on Clock IDs), the chassis will maintain the same Clock IDs for ETH1 and ETH2.

The Clock ID can also be manually assigned by the user with the CLI command "set ptp clockid" command or via SNMP.

Clock IDs with IOC Card Redundancy and Port Redundancy

In port redundancy mode, IOC1 and IOC2 will share a single Clock ID. The bond0 port uses the MAC address of ETH1 and therefore the clock ID is based on the ETH1 MAC address. See Figure D-3. In such a case, the chassis will maintain a single Clock ID as long as a chassis continuously has a powered IOC module in it .

Figure D-2. Redundant IOC Cards With Independent Ethernet Ports

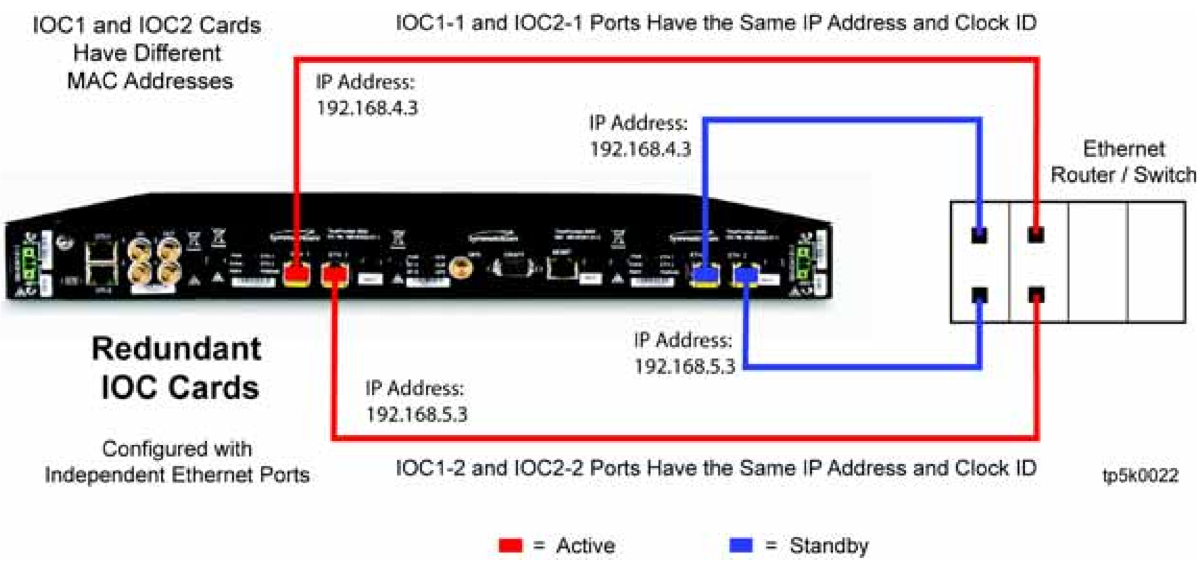
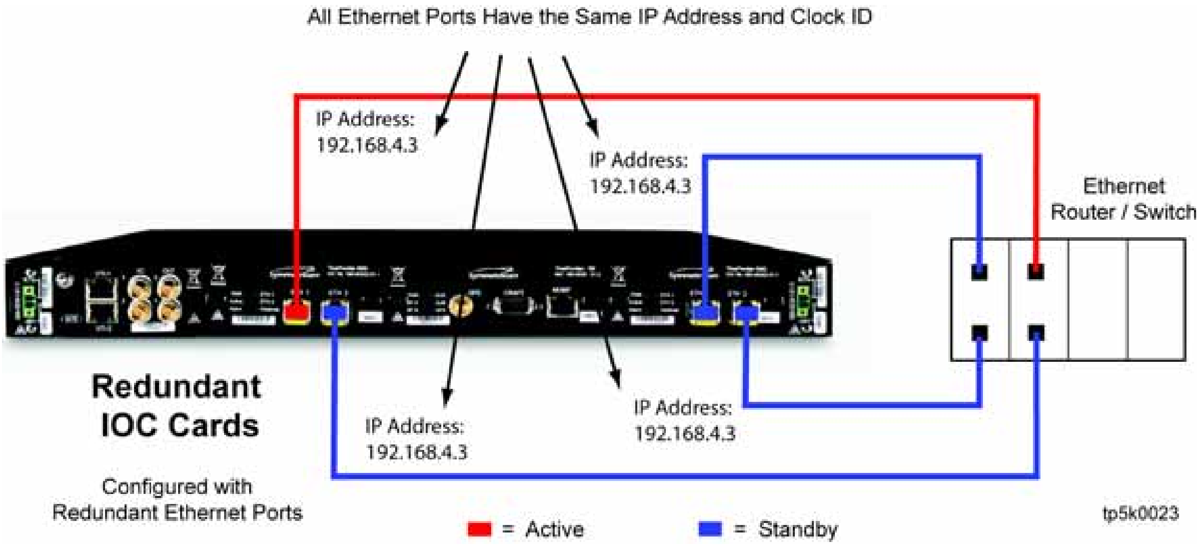


Figure D-3. Redundant IOC Cards With Redundant (Bonded) Ethernet Ports



Possible Conflicts With Clock IDs and IP Addresses

As previously described, when the chassis contains two IOCs, the standby IOC takes on general configuration from the active IOC, including the Clock ID associated with the active IOC. In the event that one IOC card is removed and installed as a single IOC card in a different TP5000 chassis, a conflict can ensue because both TP5000s will be using the same Clock IDs and IP addresses. (If the IOC is placed in a TP5000 chassis that already has an Active IOC, the inserted IOC will take on the Clock IDs and IP addresses of the Active IOC.)

This issue can be avoided by issuing the “set configuration default” command to the TP5000 with the newly installed IOC card before putting the unit into service as a Grandmaster. All IOC parameters will be reset to default values (see Appendix B of the TP5000 User’s Guide for descriptions of default values), but user logins and communication attributes, such as IP addresses of the MGMT port on the IMC, will be preserved. The Clock ID will be generated from the MAC addresses for the ETH1 and ETH2 ports of the active IOC card. The IP addresses for ETH1 and ETH2 will need to be reconfigured, as well as the PTP parameters

Causes of Switchovers Between IOC Cards

A switchover is when the TP5000 switches the active card to the standby state, while also switching the standby card to the active state. The active IOC card sends a gratuitous ARP after switchover. Switchovers between IOC cards are non-revertive.

There are two possible causes for switchovers between IOC cards on the TP5000: emergency/health situations and planned switchovers.

Emergency Switchovers

The TP5000 continuously monitors the health of both the active and standby IOC cards. The TP5000's switchover algorithms associate certain priority ranks (Symmetricom-assigned) for different health conditions to determine which IOC is healthiest at any time. If the TP5000 determines that the health of the IOC in the Active state is worse than the health of the IOC in the Standby state, the TP5000 will switch over the Active card to Standby, and vice-versa. The TP5000 will complete the switch over to the standby card within 10 seconds. If the detected condition for an Active card has a priority rank of "Failed", the Standby card will be switched to Active, but the Active card will be not become the Standby card because it has become non-functional.

The TP5000 uses the Symmetricom-assigned priority ranks for the conditions or alarms to determine switchover. The IOC switchover process will not be affected by user changes to the alarm enable/disable state or severity.

The top priority rank category includes failures that are not recoverable. Items that are ranked as lower priority include internal conditions or alarms that may recover. The lowest priority rank includes loss-of-link of the IOC Ethernet ports. The Ethernet link status is the only external condition that will cause an automatic switchover.

Planned Switchovers

By Command

The user can also manually initiate a change to switch the states of the Active and Standby cards.

First, use the command show ioc-state to display which IOC card is in the Active state.

Example:

```
tp5000> show ioc-state
```

Response:

```
---------------------------------
|Module ID      |State          |
|---------------|---------------|
|ioc1           |active         |
|...............|...............|
|ioc2           |standby        |
---------------------------------
```

Next, use the command set ioc-state to switch over the Standby card to an Active state.

Note: If an Active IOC is physically removed from a TP5000 that has a redundant IOC configuration, two transient events will be generated in the event log:

IOCx NOT PRESENT

IOCx TRANSITIONED TO ACTIVE STATE.

There will be no alarms.

Example:

If IOC2 is in a Standby state, the command to change it to an Active state is –

```
tp5000> set ioc-state ioc2 active
```

Rubidium "One-Time" Switchover

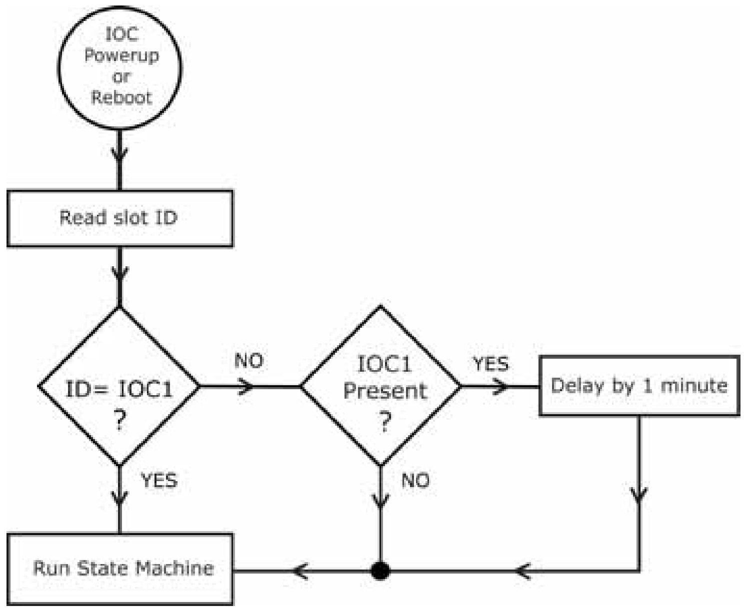
Another type of planned switchover can occur in a mixed-performance IOC TP5000, where one IOC card has a Rb oscillator and the other IOC has an OCXO. Symmetricom assumes that the user prefers the higher-performance Rb IOC to be active in such a case. If a lower-performance IOC is Active when an Rb IOC card first becomes capable of normal operation (whether from power-up or reboot), the TP5000 will perform a one-time switchover to make the IOC with a Rb oscillator become the Active card.

Setting the Active IOC Card at Power Up

If an IOC card is installed in the IOC1 slot of the TP5000 chassis, the TP5000 will start the state machine for the IOC1 card to determine its appropriate state. If two IOC cards are installed in a TP5000 at power-up, the TP5000 will start the start the state machine for IOC2 one minute after starting the state machine IOC1, as shown in Figure D-4. IOC1 will normally complete the warm-up process before IOC2, barring any health issues with IOC1, which means that IOC1 will initially be the Active card.

After the IOC2 card has completed the warm-up process, the TP5000 will select the IOC with the Rb oscillator as the Active IOC. If IOC1 has the Rb oscillator, there will be no switchover. If IOC2 has the Rb oscillator, rather than OCXO, the TP5000 will initiate a switchover to make IOC2 the Active card.

Figure D-4. IOC Condition at Power Up



IOC States

The possible states for an IOC card are Active, Standby, Active Warmup, Standby Warmup, Fail, Non-existent, and Disabled.

The TP5000's IOC state machine uses proprietary algorithms to determine the proper state for an IOC card. Table D-1 describes aspects of the state machine, such as possible IOC states, the next possible state, and the conditions required for the next state transition.

Table D-1. IOC States and Related Conditions

IOC STATE	Description	Possible Next State	Conditions Required For Next State Transition	Allowed State of Other IOC
Initial (Not an actual state)	The IOC has powered up or rebooted and is ready to decide its first state.	Active Warmup	The IOC State of other IOC card is: ■ Standby Warmup ■ Standby ■ Fail ■ Non-existent	-------------
		Standby Warmup	The IOC State of other IOC card is: ■ Active Warmup ■ Active	

Table D-1. IOC States and Related Conditions (Continued)

IOC STATE	Description	Possible Next State	Conditions Required For Next State Transition	Allowed State of Other IOC
Active Warmup	This IOC is warming up and will become the active IOC	Active	■ Oscillator warmup completion criteria attained ■ If GPS is selected reference, all GPS validation has been completed and time has been set	■ Standby Warmup ■ Fail ■ Non-existent
Standby Warmup	This IOC is warming up and will become the standby IOC	Standby	■ IOC has synchronized its configuration from the other IOC ■ Oscillator warmup completion criteria attained ■ If GPS is selected reference, all GPS validation has been completed and time has been set ■ Other IOC is Active	Active Warmup
		Active Warmup	Other IOC State = Standby Warmup, Standby, Fail, or Non-existent	
Active	This IOC is in a normal operating mode. It is actually providing all IOC user input- and output-related functions.	Standby	■ Internally generated health reason ■ User-issued command to switch	■ Standby Warmup ■ Standby ■ Fail ■ Non-existent
Standby	This IOC is in a normal operating mode. It is capable of providing all IOC user input- and output-related functions, but it is not Active.	Active	■ Internally generated health reason ■ User-issued command to switch	Active

Table D-1. IOC States and Related Conditions (Continued)

IOC STATE	Description	Possible Next State	Conditions Required For Next State Transition	Allowed State of Other IOC
Fail	This IOC has experienced a serious health condition and is not operating	------------	Internal detection of serious health condition	■ Active Warmup ■ Active ■ Fail ■ Non-existent
Non -existent	There is no IOC card in this physical slot	See Initial IOC State in this table	Insertion of IOC into this physical slot	■ Active Warmup ■ Active ■ Fail ■ Non-existent
Disabled	The user has taken action to soft-reboot this IOC. This condition will temporarily exist while the IOC prepares to reboot. In this transient state, the IOC is not available to become active.	See Initial IOC State in this table	Completion of reboot process and state decision made in Initial IOC state.	■ Active Warmup ■ Active ■ Fail ■ Non-existent

Output Performance During Switchover

During switchover, the PTP outputs may be interrupted for a maximum of 10 seconds.

All continuous outputs, 10MHz, 1PPS, and E1, will not exhibit any loss of signal during switchover, but may exhibit phase movement of up to 240 ns.

IOC Card Redundancy-Related CLI Commands

The following CLI commands are related to IOC card redundancy.

- show ioc-state
- set ioc-state
- set ptp clockid
- Show PTP-config common clock-id

Appendix E Software Licenses

This product contains licensed third party software, including software available under the GPL licensing scheme. The text of each license is available in the "License" folder located on the Product Information CDROM that is supplied with the TimeProvider 5000. Additionally, you can obtain these licenses and the open-source software by contacting Symmetricom Technical support at the following numbers:

- Worldwide (Main Number): 1-408-428-7907
- USA, Canada, Latin America including Caribbean, Pacific Rim including Asia, Australia and New Zealand: 1-408-428-7907
- USA toll-free: 1-888-367-7966 (1-888-FOR-SYMM)
- Europe, Middle East & Africa: 49 700 32886435

An administrative fee may be charged to obtain the source code.

By using the TimeProvider 5000, the user agrees to the terms of these licenses.

In This Appendix

- Third-Party Software

Third-Party Software

The following is a list of third-party software applications provided with the TimeProvider 5000.

- busybox
- dropbear
- dtc
- elfutils-libelf-libs
- ethtool
- expect
- glibc
- iproute
- iptables
- libgcc
- libpcap-libs
- libxml
- linux-2.6.20
- logrotate
- mtd-utils
- net-snmp
- openssl
- pam-libs
- pam-modules
- pam_radius
- popt-libs
- sudo
- syslogd
- tcl-dev
- tcpdump
- tftpd-hpa
- u-boot
- wget
- zlib-libs

Appendix F PTP Probe Option

This appendix describes the procedures for installing, provisioning, and operating the TimeProvider 5000 in Probe mode.

In This Appendix

- Overview
- Requirements for Measurements
- Installing the Probe
- Controlling the Probe With TimeMonitor PDV
- Provisioning the Probe
  - Enable the Probe Option on the TP 5000
  - Enable Port as a PTP Probe
  - Return Port to Grandmaster Mode
  - Set the IP Address for Probe MGMT Port
  - Set Probe IP Address
  - Set Grandmaster PTP IP Address
  - Set Synchronization Interval
  - Set Lease Duration
- Operating the Probe
- Probe Data
- Analyzing Probe Data

Overview

The Precision Time Protocol (PTP) is a time-transfer protocol defined in the IEEE 1588-2008 standard that allows distribution of time and frequency over packet switched networks. A PTP server (master) and PTP client (slave) devices exchange synchronization messages at regular intervals. These messages are time-stamped by the server and clients, so each client can recompute the offset between its clock and the server's clock. See Figure F-1.

Symmetricom's TP 5000 PTP Probe (an optional operational mode of the TP 5000) provides a way to examine the packet delay of synchronization messages passing through a packet switched network. Using a hardware time-stamp processor that delivers nanosecond caliber-timing accuracy, a comprehensive computation engine, and TimeMonitor software, the TP 5000 PTP Probe collects PTP data and analyzes in real-time and off-line graphical displays. See Figure F-2. The Probe simulates a PTP client device. It negotiates with the Grandmaster server for PTP flows, follows the PTP protocol as a client device, and sends delay-request packets. Unlike a normal client, it does not adjust its clock, but only time stamps the received packets using its own clock. Performance of the network can be measured relative to the location of the Probe device and traffic conditions. By measuring Packet Delay Variation (PDV), users can characterize a network and determine its suitability for delivering sync packets. Measurements include PDV and packet Minimum Time Deviation (MinTDEV).

The PTP probe mode supports three profiles:

- Default: Multicast – Layer 3 of 7-layer model
- Ethernet-Default: Multicast – Layer 2 of 7-layer model
- Telecom-2008: Unicast

The PDV module of the TimeMonitor software suite also features a set of six masks in the packet domain that correspond to the masks in the synchronization domain, as defined by Telecommunication standards. The six masks available for packetTDEV and packetZTIE analysis cover application requirements ranging from synchronization interface requirements, to traffic interface requirements, to wireless backhaul frequency offset requirements. Four of the masks apply to the packetZTIE calculation and two of the masks apply to the packetTDEV calculation. These masks help determine if the PTP packet flow delivered over the network meets the synchronization criteria for the application, and allow TimeMonitor PDV to present a very intuitive and user-friendly PASS/FAIL result for the given conditions. TimeMonitor is included with the Probe option.

The Probe function is an optional feature of the TimeProvider 5000. The Probe function is enabled via a special software key. If a TimeProvider 5000 is configured in Probe mode, it cannot be used in Grandmaster mode at the same time.

Note: The PTP probe option must be purchased to enable the functionality of all "ptp-probe" commands.

Figure F-1. IEEE-1588 Grandmaster Server and Client

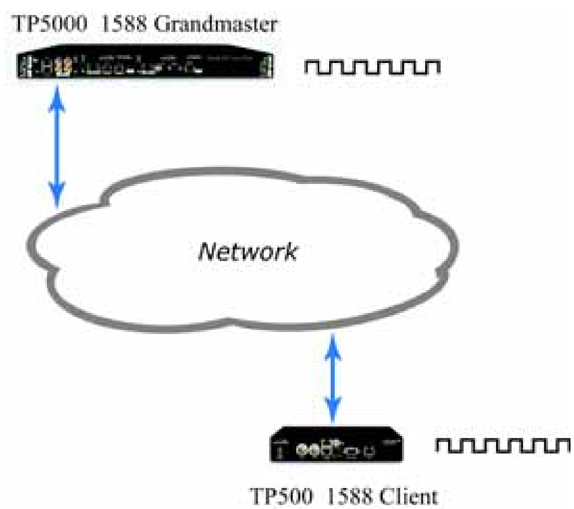
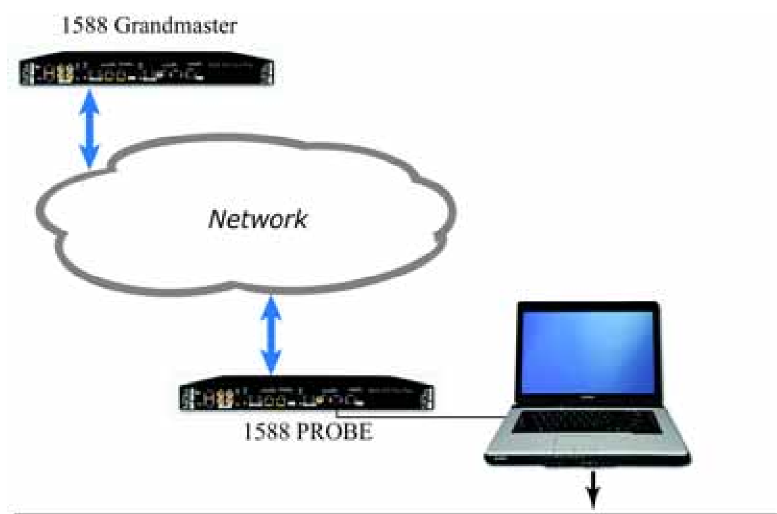


Figure F-2. IEEE-1588 Grandmaster Server and Probe




```
tp5000> show ptp-probe data ioc-1

f,00011,1229541029,099868364,1229541029,099881920,+0000000000,00b0aefffe01c9ed
b,00011,1229541029,562553320,1229541029,562539700,+0000000000,00b0aefffe01c9ed
f,00012,1229541030,099868364,1229541030,099881776,+0000000000,00b0aefffe01c9ed
b,00012,1229541030,562553320,1229541030,562539700,+0000000000,00b0aefffe01c9ed
f,00013,1229541031,099868364,1229541031,099881936,+0000000000,00b0aefffe01c9ed
b,00013,1229541031,562553288,1229541031,562539700,+0000000000,00b0aefffe01c9ed
f,00014,1229541032,099868364,1229541032,099881776,+0000000000,00b0aefffe01c9ed
b,00014,1229541032,562553288,1229541032,562539700,+0000000000,00b0aefffe01c9ed
```

Requirements for Measurements

The TP 5000 1588 Probe is an active probe. No additional counters or other instruments are necessary to make measurements in packet networks. The following are required:

- TimeProvider 5000 Grandmaster (or other 1588 Server with Unicast and 1-step clock)
- TimeMonitor software suite (or other tools for analyzing PDV data)
- Computer (terminal function or TimeMonitor)
- Ethernet network connections

Optional Equipment

Traffic simulator for lab-based measurements

Installing the Probe

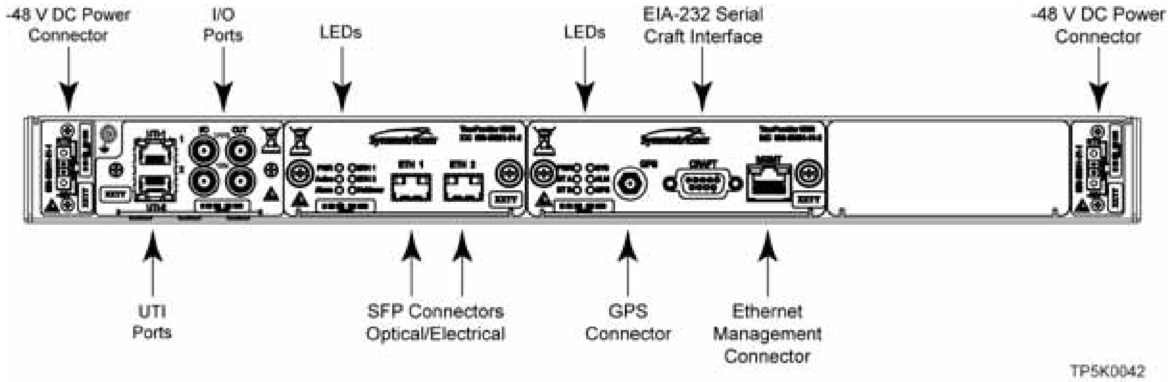
See Figure F-3 and Figure F-4 below for TP 5000 Probe connectors and LEDs. To physically install the TP 5000 Probe, use the following procedures from Chapter 2, Installing:

- Rack Mounting the Chassis
- Ground Connections
- Power Connections
- Control /Management Connection
  - EIA-232 Serial (Craft) Port
  - Ethernet Management Port
- GPS Connections

See Figure F-5 for a diagram of the test setup for the TP 5000 Probe and grandmaster.

Note: Symmetricom recommends the use of GPS as the time-of-day reference for the Probe and for the Grandmaster (or other 1588 server). This will allow for sub-microsecond end-to-end analysis.

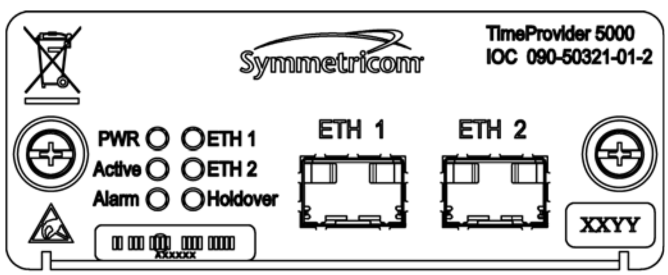
Figure F-3. TP 5000 PTP Probe Connectors and LEDs



Connecting PTP Signals to Measure

The two Ethernet 100/1000 Small-form Factor Pluggable (SFP) connections on the IOC module provide PTP inputs to the TP 5000 Probe. See Figure F-4. It is possible to monitor two different subnets, one on each port. Only the SFP transceivers in Table F-1 are recommended and supported. Other SFP transceivers are not supported and may cause the TimeProvider 5000 to not comply with regulatory requirements.

Figure F-4. Probe Input Connections - IOC Module



.

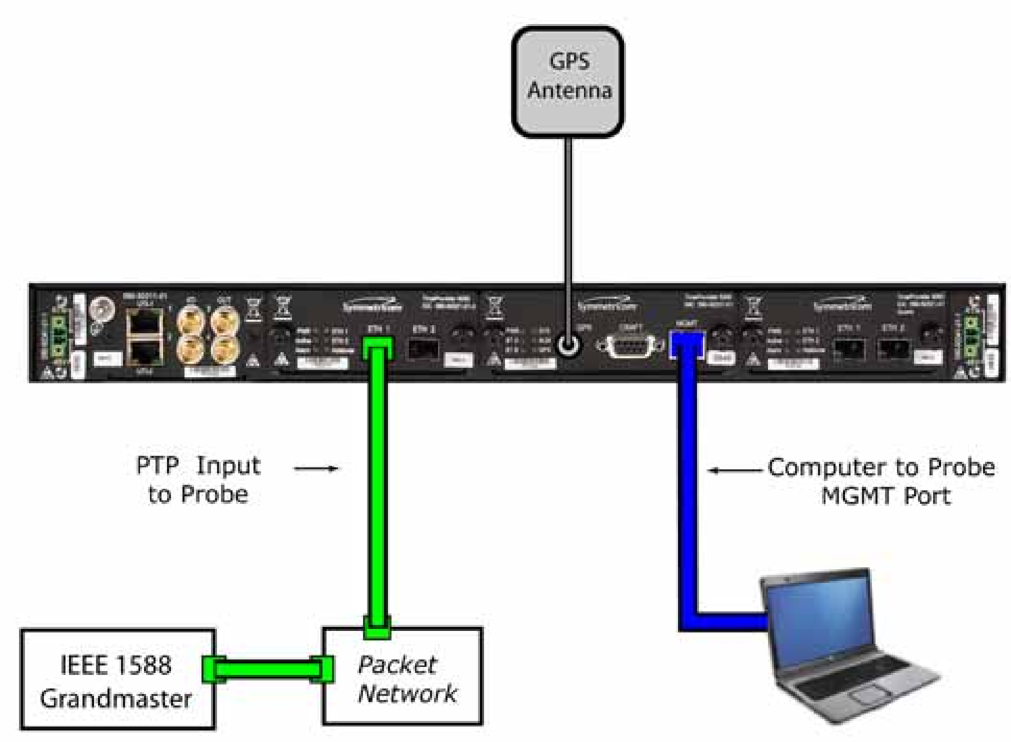
Table F-1. Recommended and Supported SFP Transceivers

Type	Transceiver
Optical 1000 Base-LX Single-Mode Ethernet 1310nm (Symmetricom 121-20621-10-2)	Avago AFCT-5701PZ Finisar FTLF1319P1BTL
Optical 1000 Base-SX Multi-Mode Ethernet 850nm (Symmetricom 121-20621-11-2)	Avago AFBR-5710PZ Finisar FTLF8519P2BNL
RJ45 100/1000 Base-T Full-Duplex (Symmetricom 121-20621-12-2)	Avago ABCU-5710RZ

Use the following procedure to make the connections for PTP measurements:

1. Plug the SFP transceiver into the ETH1 or ETH2 port on the IOC module of the TP 5000 probe.
2. Plug an Ethernet cable into the SFP transceiver.
3. Plug the other end of the Ethernet cable directly into the packet network, as shown in Figure F-5.

Figure F-5. Test Setup for TP 5000 Probe (power connections not shown)



Controlling the Probe With TimeMonitor PDV

The TP 5000 Probe can also be provisioned and operated with the TimeMonitor PDV software module.

The TimeMonitor PDV Software has three major functions:

- Configure the TP 5000 probe for PTP packet-timing measurement data collection.
- Collect packet timing data. The file of collected data contains packet timestamps between the TP 5000 Probe and a PTP grandmaster.

- Analyze a probe data file using packetTDEV and packetZTIE, and give a pass/fail indication using built-in masks.

When TimeMonitor PDV is launched, the main screen will appear.

Anatomy of the GUI Main Screen

The GUI main screen for TimeMonitor PDV is shown in Figure F-6, with numeric markers at the various buttons, fields and boxes. Descriptions for these buttons fields and boxes, corresponding to the numerical markers, are presented in Table F-2.

All examples for provisioning and operating the Probe will include instructions for both TimeMonitor PDV and CLI.

Figure F-6. TimeMonitor PDV GUI – Main Screen

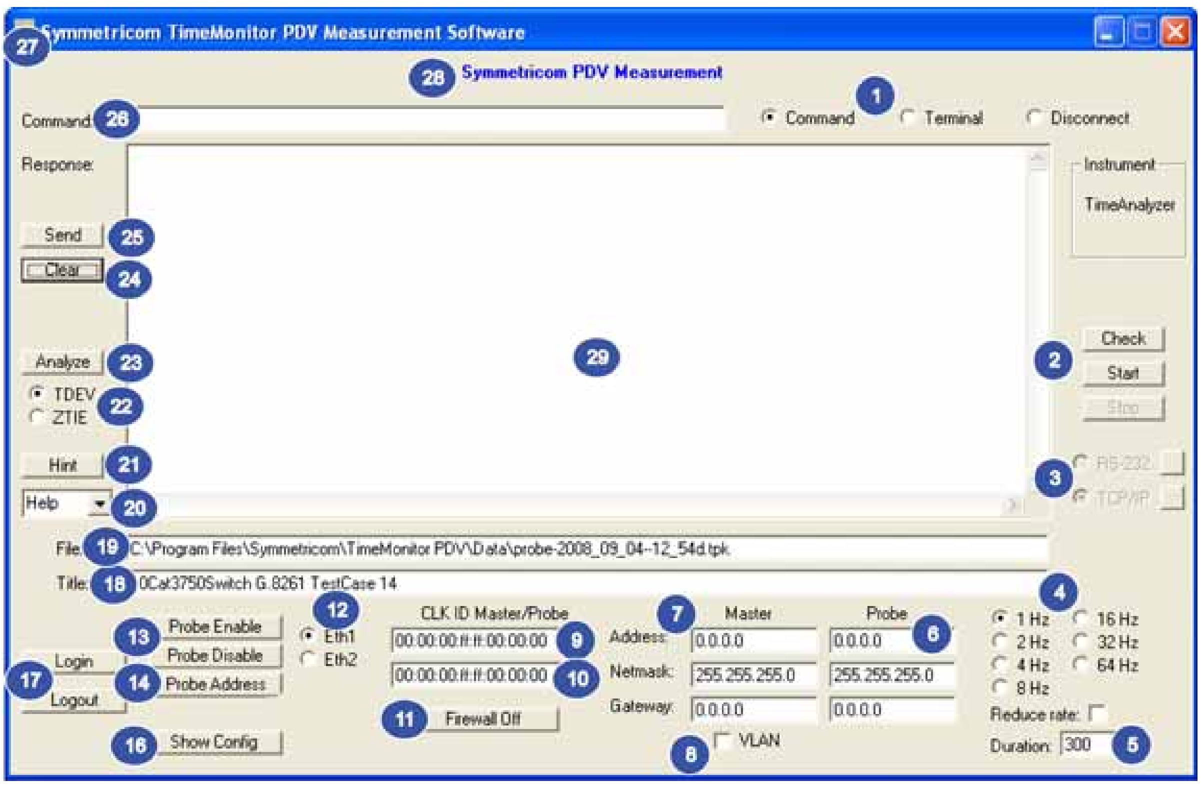


Table F-2. Descriptions of TimeMonitor PDV GUI – Main Screen

Item	Label	Description
1	Command	Sets TimeMonitor PDV to Command mode. Interaction with TimeAnalyzer's TP 5000 probe is through the buttons and fields of the GUI. Commands are issued either with buttons or the "Command" text box (see item 26). In Command mode, for example, the Login button can be used to login to TimeAnalyzer's TP 5000 probe or the Probe Address button can be used with the Probe Address/Netmask/Gateway fields (see item 6) to change the address for the selected Probe port.
	Terminal	Sets TimeMonitor PDV to Terminal mode. The interface will act as a simplified terminal. Commands and responses are shown in the Main Display (see Item 29). All other fields and buttons will be grayed out, except for Check, Start, and Clear buttons.
	Disconnect	Sets TimeMonitor PDV to Disconnect mode. Use as a quick means to Logout from TimeAnalyzer's TP 5000 probe. Must be in Disconnect mode to change between RS-232 and TCP/IP for communicating with probe, or to change communication settings (see Item 3).
2	Check	Click Check button to verify the test setup before beginning the PDV measurements for the selected port.
	Start	Click Start button to start PDV measurements for the selected port.
	Stop	Click Stop button to stop PDV measurements for the selected port.
3	RS-232 TCP / IP	Use these radio buttons to select the type of connection for command and control of the TP 5000 probe. Clicking the button to the right of the connection type will display the dialog box to configure the connection. TCP/IP should be used for making measurements. Either TCP/IP or RS-232 can be used for configuration.
4	Interval	Use these radio buttons to select the desired interval rate for Sync and Delay Requests from the TP 5000 probe.
5	Duration	Use this field to enter the desired lease duration for the TP 5000 probe
6	Probe's IP Address Netmask Gateway	Enter the IP address information for the selected TP 5000 probe port. The Command mode or Disconnect mode (see Item 1) must be selected in order to enter this data. Click the Probe Address button (see Item 14) to send this address information to the TP 5000 probe.

Table F-2. Descriptions of TimeMonitor PDV GUI – Main Screen (Continued)

Item	Label	Description
7	Grandmaster's IP Address	Enter the Grandmaster connection information for the selected port. The Command mode (see Item 1) or Disconnect must be selected in order to enter this data. (Note: Netmask and Gateway information are not necessary for the Grandmaster.)
8	VLAN	Click the check box if the Grandmaster has a VLAN address. Enter the appropriate VLAN ID in the field.
9	Clock ID - Master	Enter the Clock ID of the Grandmaster for the selected port.
10	Clock ID - Probe	Enter the Clock ID for the selected TP 5000 probe port. (Note: It is not necessary to fill in the Clock ID field for the TP 5000 probe, but it is recommended.)
11	Firewall Off	Use this button to set the Telnet firewall for the Probe to "Allow". The default firewall state for Telnet is "Block". The Command mode (see Item 1) must be selected in order to use this button, and the user must be logged in to the TP 5000 probe.
12	Eth1 Eth 2	Use these radio buttons to select the TP 5000 probe Ethernet port for measurements or configuration.
13	Probe Enable Probe Disable	Use these buttons to Enable or Disable the Probe Mode for the selected port. The Command mode (see Item 1) must be selected in order to use these buttons, and user must be logged in to the TP 5000 probe.
14	Probe Address	This button is used to set the IP address for the selected TP 5000 probe Ethernet port using the info in the Address fields for the TP 5000 probe (see Item 6). Changes to the TP 5000 probe IP address will not be sent to the TP 5000 probe until this button is clicked. The Command mode (see Item1) must be selected in order to use this button, and user must be logged in to the TP 5000 probe.
16	Show Config	Use this button to display the Probe configuration for both ports. The Command mode (see Item 1) must be selected in order to use this button, and user must be logged in to the TP 5000 probe.
17	Login Logout	Use these buttons to login or logout from the TP 5000 probe. The Command mode (see Item 1) must be selected in order to use this button.
18	File	The File text box is used to specify file name and destination directory. The name need only be specified once because the software will reuse a file name for new files and add on a date and time to the file name if the file already exists.

Table F-2. Descriptions of TimeMonitor PDV GUI – Main Screen (Continued)

Item	Label	Description
19	Title	Enter title for packet delay data file.
20	Help	The Help drop-down box is used to access the Help file (this file), and get the revision level of the Symmetricom TimeMonitor PDV software. All the information about the Help Menu is in this section and can be read by clicking on one of the subjects below to jump to a topic directly. Information about other menus can be read by selecting the menu item in the left pane and jumping to the selected topic directly. You can also click on the (<=Back) Help button to move to the most recently viewed topic. **HELP**: Opens the HELP file. This file is not context sensitive. Opening the Help file will always initially display the Help with the first topic, "Introduction", in view. **README**: This file contains important information about the Symmetricom TimeMonitor Measurement Software. The topics covered are either not found in other documentation or are judged to be important enough to warrant restatement. **ABOUT**: Displays the Version and Revision number and other information about the Symmetricom TimeMonitor PDV Software. **SETUP**: Selecting this menu item brings up a dialog box which can be used to adjust the maximum number of samples for analysis. The default is 1,000,000 samples. If the number of points in the file exceeds the maximum, the set of data is decimated to a value equal or lower than the maximum points setting.
21	Hint	Provides command hints when manually entering CLI commands.
22	TDEV ZTIE	Use these radio buttons to select the type of analysis to be performed, either packetTDEV or packetZTIE.
23	Analyze	Use this button to initiate analysis of the current file.
24	Clear	Click this button to clear the CLI command info from the Main Display field (see Item 29).
25	Send	Click this button to send the CLI command from the Command field (see Item 26) to the Probe.

Table F-2. Descriptions of TimeMonitor PDV GUI – Main Screen (Continued)

Item	Label	Description
26	Command	This field is used to manually enter CLI commands for the Probe. TimeMonitor PDV must be in Command mode (see Item 1) to use this feature. Click the Send button (see Item 25) to send the command to the Probe.
27	Title Bar	Shows the product name. The cursor has a pointer shape in this area.
28	Message	If live data is being collected, then the Elapsed Time is shown.
29	Main Display	Probe measurement data points are displayed in this section when the Check button (see Item 2) is pressed, as well as any responses or messages from the TP 5000 probe during a CLI session.

Functions of TimeMonitor PDV

TimeMonitor PDV has four basic functions:

1. Connect
2. Configure
3. Measure
4. Analyze

These functions are shown in Figure F-7 and described in Table F-3:

Figure F-7. TimeMonitor PDV Functionality Groupings

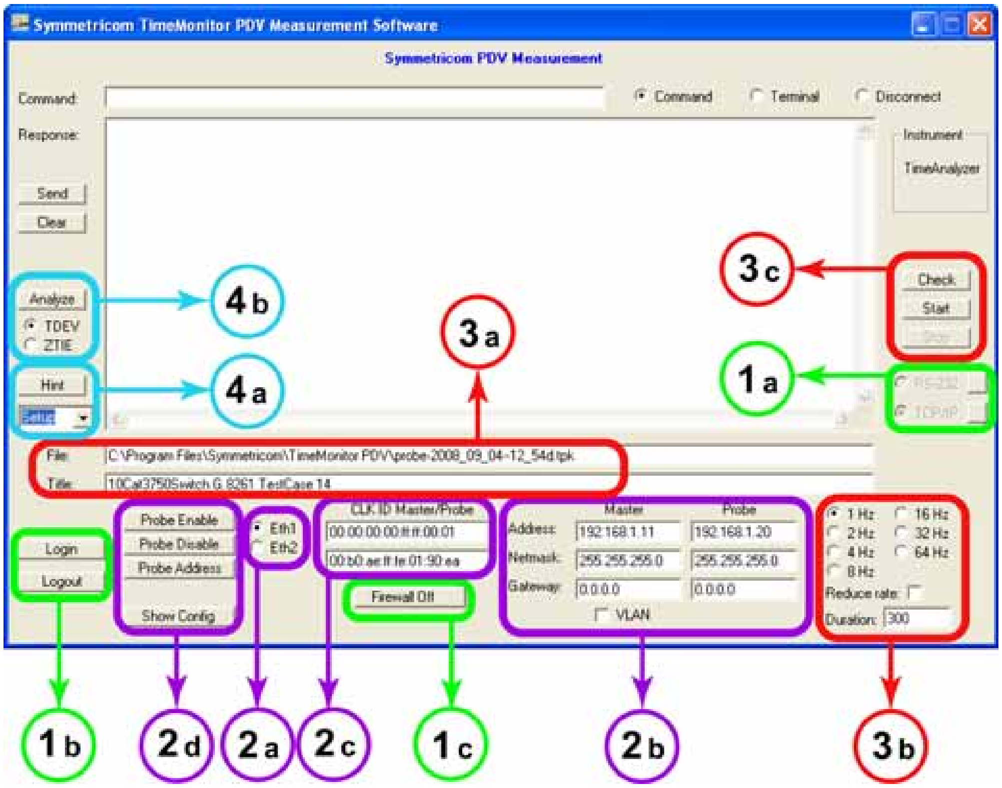


Table F-3. Descriptions of TimeMonitor PDV Functionality

Function	Description
1	**Connect** to TP 5000 probe. a. Select RS-232 or TCP/IP (Disconnect mode). First time connection to a network requires connection via RS-232 to change IP address of MGMT port for TP 5000 Probe. b. Login to TP 5000 Probe (Command mode). c. Turn off Telnet firewall of TP 5000 Probe (Command mode, logged in).
2	**Configure** TimeMonitor and TP 5000 Probe address (Command mode). a. Select Probe port. b. Enter Grandmaster IP address and Probe IP address. c. Enter Clock ID for Grandmaster. d. Enable Probe for selected port and change Probe IP address per entry in 2b.
3	**Measure** packet delay between Grandmaster and TP 5000 Probe. a. Enter file name and title for PDV measurement data. b. Select sync rate for measurement and lease duration. c. Start and Stop measurement (Command mode, logged in)
4	**Analyze** data file (Command or Disconnect mode) a. Set the max number of samples for measurement plot. b. Select type of measurement plot and start analysis.

Entering CLI Commands Manually with TimeMonitor PDV

The TP 5000 Probe can also be configured and operated with Command Line Interface (CLI) commands via a telnet session over TCP/IP. In addition to the GUI, the TimeMonitor PDV software provides two ways to manually enter CLI commands to the TP 5000 PTP Probe. In Command mode, commands can be entered in the Command field and sent to the TP 5000 probe by clicking the Send button.

In Terminal mode, the main display area of the TM PDV interface will function as a simplified terminal.

Complete commands, with proper syntax, must be used with either approach. The Tab completion feature for TP 5000 CLI commands is not available through the TimeMonitor PDV interface in either Terminal or Command mode.

See the TimeProvider 5000 User's Guide for details about CLI commands and associated syntax.

Command Mode

Use the following procedure to enter CLI commands manually with TimeMonitor PDV in Command mode:

1. Select the radio button for the Command mode.

2. Click the **Login** button to login to the TP 5000 probe.

3. Enter the Username and Password for the TP 5000 probe when prompted in the main display area of the screen.
4. In the Command field, enter the desired CLI command, as the following example image illustrates.

5. Click the **Send** button to send the command to the TP 5000 probe for execution. Any response will be shown in the main display area of the screen.

Terminal Mode

To display the IP address for the MGMT port on the TP 5000 Probe's IMC card, enter the command "show ip status imc". Use the following procedure to enter CLI commands manually with TimeMonitor PDV in Terminal mode:

1. Select the radio button for the Command mode.

   The "Login:" prompt will appear in the main display. All other fields and buttons are greyed out, except for the Check, Start, and Clear buttons.

2. Enter the Username for the TP 5000 Probe at the prompt in the main display. Click the **Enter** button on user's computer.

3. Enter the Password for the TP 5000 Probe at the prompt in the main display. Click the **Enter** button on the user's computer. The TP 5000 prompt will appear.

   ```
   tp5000>
   ```

4. Enter the command at the TP 5000 prompt and click **Enter**.

   Example:

```
Symmetricom  tp5000_imc
login: admin
Password:

tp5000> show ip status imc
MGMT      Link encap:Ethernet  HWaddr 00:B0:AE:01:1D:80
          inet addr:192.168.106.16  Bcast:192.168.106.255  Mask:255.255.255.0
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:293903 errors:0 dropped:0 overruns:0 frame:0
          TX packets:91429 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:22314278 (21.2 MiB)  TX bytes:11137157 (10.6 MiB)
          Interrupt:21 Base address:0xe000
tp5000> |
```

Installing TimeMonitor

Refer to the TimeMonitor PDV User's Guide for instructions on installing the TimeMonitor software suite.

Provisioning the Probe

Establish a Connection to the TP 5000 Probe

When using TimeMonitor PDV to provision the TP 5000, the first step is to connect the serial port of the computer to the Craft port on the IMC module.

The MGMT port on the IMC can also be used for the initial connection, assuming that the default IP address of the MGMT port does not conflict with the network. Use an Ethernet cable to connect the MGMT port of the TP 5000 to the network.

See Chapter 2 of the TP 5000 User's Guide for Installation details. See Chapter 4 of the TP 5000 User's Guide for details about provisioning the TP 5000 using CLI commands.

Note: The default IP address for the IMC MGMT port of the TP 5000 is:

IP Address:	192.168.0.100
Gateway:	0.0.0.0
Netmask:	255.255.255.0

Note: The unit's default user name is "admin" and the default password is "symmadmin**".

Enable the Probe Option on the TP 5000

The probe option must be enabled with the Symmetricom authentication key in order to use the TP 5000 as a probe.

Use the show license command to check if the probe option has been enabled yet for the TP 5000. Use the set license command to enter the authentication key for

Example:
To enable the probe option with an authentication key of "ABCDEFGHIJ1234567890KLMNOPQRST0987654321":

```
tp5000> set license add
```

The TP 5000 will prompt for the license key:

```
License key: ABCDEFGHIJ1234567890KLMNOPQRST0987654321,
```

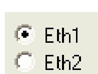
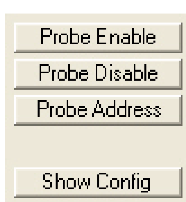
Enable Port as a PTP Probe

The packet- service for a port must be set to ptp-probe to use that TP 5000 IOC port as a probe. The packet-service mode for IOC ports can be set independently, with one port operating in PTP grandmaster mode while the other port is configured for ptp-probe mode (IP addresses must be set to different subnets).

See Table F-4 for procedures.

.

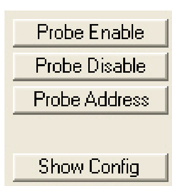
Table F-4. Enable Port as PTP Probe Procedure

TimeMonitor PDV	CLI Command
1. Click on the **Command** radio button to put TimeMonitor PDV into the proper mode for making Probe changes.  2. Click the Login button to login to the Probe. The Probe will prompt for Username and Password.  3. Select the desired Probe port using the radio buttons .  4. Click on the **Probe Enable** button.  	Use the command : `set packet-service ioc1-1 ptp-probe` <u>Example</u>: To enable port 1 of IOC1 as a PTP probe 1. Login at the Admin or Config-user level. 2. Type `set packet-service ioc1-1 ptp-probe` and press **Enter**.

Return Port to Grandmaster Mode

The packet- service for a port must be set to ptp-gm or ntp-server to change that TP 5000 IOC port out of PTP probe mode. See Table F-5.

Table F-5. Return to Grandmaster Mode Procedure

TimeMonitor PDV	CLI Command
1. Click on the **Command** radio button to put TimeMonitor PDV into the proper mode for making Probe changes.  2. Click the Login button to login to the Probe. The Probe will prompt for Username and Password.  3. Select the desired Probe port using the radio buttons (see Item 2). 4. Click on the **Probe Disable** button.  	Use the command: `set packet-service ioc1-1 {ptp-gm | ntp-server | ptp-probe}` <u>Example</u>: To return port 1 of IOC1 to PTP grandmaster mode: 1. Login at the Admin or Config-user level. 2. Type `set packet-service ioc1-1 ptp-gm` and press **Enter**.

Set the IP Address for Probe MGMT Port

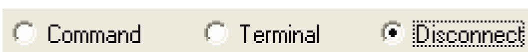
The TP 5000 probe can be controlled through the Craft port or through the MGMT port of the IMC module. The MGMT port may be more effective for gathering data with the Probe because it can support higher data rates than the Craft port. The Craft port can only support SYNC Interval settings of 0.5 seconds (2 Hz) or slower.

The IP address for the MGMT port can only be set with CLI commands. It may be necessary to connect to the TP 5000 via the Craft port to set the IP address.

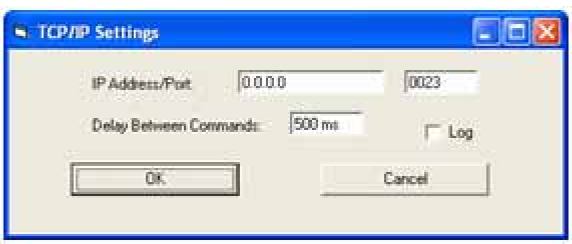
Use the following CLI procedure in Table F-6 to configure the TimeProvider 5000 MGMT port IP parameters (Host Address, Subnet Mask, and Gateway Address). Use the dot-decimal notation format xxx.xxx.xxx.xxx to enter the address parameter. Use the TimeMonitor PDV procedure in Table F-6 to enter the IP address that TimeMonitor PDV will use to connect to the MGMT port..

Table F-6. Set MGMT Port IP Address Procedures

<table>
<tr><th>TimeMonitor PDV</th><th>CLI Command</th></tr>
<tr><td>
This procedure describes how to enter the IP address that TimeMonitor PDV will use to connect to the MGMT port.

1. Click on the Disconnect radio button to put TimeMonitor PDV into the proper mode for making MGMT port changes.


2. Click on the TCP/IP radio button.


3. Click on the button on the right side of “TCP/IP” to bring up the TCP/IP Settings dialog box.


4. Enter the IP Address that was set with CLI commands and the Port number.

5. Click the **OK** button to return to the main screen.
</td><td>
This procedure describes how to set the IP address for the MGMT port on the Probe.

Use the command:

set ip IMC address <addr_value> netmask <mask_value> gateway <gateway value>

<u>Example:</u>

For following settings on IMC:
Address = 192.168.2.10
Netmask = 255.255.255.0
Gateway = 192.168.2.1

1. Login at the Admin or Config-user level.

2. Type set ip-mode imc static and press **Enter**.

3. Type set ip imc address 192.168.0.10 netmask 255.255.255.0 gateway 192.168.0.1 and press **Enter**.

4. Type set ip imc restart.

NOTE: The IMC card must be restarted to implement the IP address change
</td></tr>
</table>

Set Probe IP Address

The two Ethernet ports on the Probe IOC module can be configured as independent 1588 Probe ports or bonded to active/standby mode as a redundant pair. As with the TP 5000 when it is in Grandmaster mode, the redundant port uses the ETH1 port configuration. Therefore, the redundant ports share the same IP address and MAC address. The default condition for Ethernet ports on an IOC card is Port Redundancy OFF. However, Symmetricom does not recommend using the TP 5000 as a Probe with redundant ports.

The IOC Ethernet ports can only be configured with static IP addresses.

The TP 5000 allows VLAN over the redundant port as well as over independent ports. .

Note: The VLAN must first be configured with the "set vlan" command. VLAN can only be configured using CLI commands through a terminal.

Enabling or disabling redundancy does not require the user to issue the "set IP restart" command.

See Table F-7 for procedures to set the Probe IP address

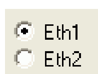
Table F-7. Set Probe IP Address Procedures

<table>
<tr><th>TimeMonitor PDV</th><th>CLI Command</th></tr>
<tr><td>

1. Click on the **Command** radio button to put TimeMonitor PDV into the proper mode for making Probe changes.

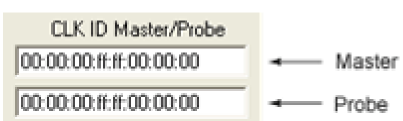
2. Click the Login button to login to the Probe. The Probe will prompt for Username and Password.

3. Select the desired Probe port using the radio buttons .

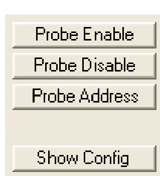


4. Enter the desired IP address, Netmask and Gateway for the selected Probe port

5. Enter the Clock ID for the selected Probe port. (optional). Use the show ptp-probe command to find the clock ID.



6. Click the **Probe Address** button to send the address information to the Probe.



7. Repeat steps 3 through 6 for the other port.

</td><td>

Use the command:

`set ip IOC1-x address <addr_value> netmask <mask_value> gateway <gateway value>`

Example - Independent Probe Ports:

1. Login at the admin or Config-user level.
2. Type `set ip ioc1-1 address 192.168.1.10 netmask 255.255.255.0 gateway 192.168.2.1` and press **Enter**.
3. Type `set ip ioc1-2 address 192.168.2.12 netmask 255.255.255.0 gateway 192.168.2.1` and press **Enter**.
4. Type `set redundancy port ioc1 disable` and press **Enter**.

Note: It is possible to set the TP 5000 for redundant probe ports, but this configuration is not recommended.

</td></tr>
</table>

Set Grandmaster PTP IP Address

To specify the Grandmaster to be used with the Probe the following parameters be provisioned. See Table F-8 for procedures to set the Grandmaster PTP IP address:

- Grandmaster Clock ID
- Grandmaster IP Address
- Grandmaster VLAN Address (if any).

Table F-8. Set Grandmaster PTP IP Address Procedures

TimeMonitor PDV	CLI Command
1. Click on the **Command** radio button to put TimeMonitor PDV into the proper mode for making Probe changes.  2. Click the Login button to login to the Probe, which will prompt for Username and Password.  3. Select desired Probe port using radio buttons.  4. Enter the IP address, Netmask and Gateway for the 1588 Master server for selected port.  5. If Master is part of a VLAN, click VLAN check box. Enter VLAN ID in the box that appears. 6. Enter the Clock ID for the Master server.  **NOTE**: For a TP 5000 Grandmaster, use the `show ptp-status` command to find clock ID . 7. Repeat steps 3 through 6 for the other port.	Use the command: `set ptp-probe IOC1-x active-probe gm-clock-id <clock-id> gm-ip <addr> [vlan-id <vlan>]` where x is the port number on the IOC <u>Example</u>: For following Grandmaster specs: Clock ID = 00:B0:AE:FF:FE:00:00:06 IP address = 192.168.1.11 VLAN ID = 35: 1. Login at the Admin or Config-user level. 2. Type `set ptp-probe ioc1-1 active-probe gm-clock-id 00:B0:AE:FF:FE:00:00:06 gm-ip 192.168.1.11 vlan-id 35` and press **Enter**. 3. If there is no VLAN for the Grandmaster, type `set ptp-probe ioc1-1 active-probe gm-clock-id 00:B0:AE:FF:FE:00:00:06 gm-ip 192.168.1.11` and press **Enter**.

Set Synchronization Interval

The Interval parameter specifies the interval rate for Sync and Delay Requests. The range is 0.015625 seconds (64 Hz) to 128 seconds (0.0078125 Hz). The default value is 1 second (1 Hz) in the TimeMonitor PDV GUI. The default value is 0.015625 seconds (int-value = -6) if using the CLI command to set.

See Table F-9 for procedures to set the synchronization interval.

Table F-9. Set Synchronization Interval Procedures

TimeMonitor PDV	CLI Command
1. Click on the **Command** radio button (see Item 1 in Figure F-6) to put TimeMonitor PDV into the proper mode for making Probe changes.  2. Click the Login button to login to the Probe. The Probe will prompt for Username and Password.  3. Click on the radio button that corresponds to the desired SYNC rate.  	Use the command: `set ptp-probe IOC1-x active-probe interval <int-value>` where x is the port number on the IOC card. The interval is 2^z seconds, where z is the int-value specified in the command. The range for this value is -6 to 7. The default value is -6 if set using the CLI command. *Example:* For an interval of `-2 (0.25 seconds) on Port 1 of IOC1:` 1. Login at the Admin or Config-user level. 2. Type `set ptp-probe ioc1-1 active-probe interval -2` and press **Enter**.

Set Lease Duration

The Duration parameter specifies the maximum lease duration for the Probe. The range is 10 to 1000 seconds. The default value is 300 seconds.

See Table F-10 for procedures to set the lease duration.

Table F-10. Set Lease Duration Procedures

TimeMonitor PDV	CLI Command
1. Click on the **Command** radio button to put TimeMonitor PDV into the proper mode for making Probe changes.  2. Click the Login button to login to the Probe. The Probe will prompt for Username and Password.  3. In the Duration box (see Item 5), enter the desired value for the lease duration in seconds. 	Use the command: `set ptp-probe IOC1-x active-probe duration <value>` where x is the port number on the IOC card *Example:* For a duration of 500 on Port 1 of IOC1: 1. Login at the Admin or Config-user level. 2. Type `set ptp-probe ioc1-1 active-probe duration 500` and press **Enter**.

Operating the Probe

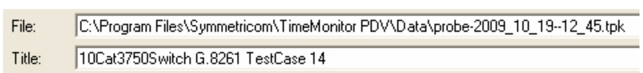
Table F-11. Measurement Procedures

<table>
<tr><th>TimeMonitor PDV</th><th>CLI Command</th></tr>
<tr>
<td>

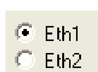
1. Click on the **Command** radio button to put TimeMonitor PDV into the proper mode for making Probe changes.

2. Click the Login button. The Probe will prompt for Username and Password.

3. Enter the desired file name and destination directory. The software will reuse a file name for new files and add on date and time to the file name if the file already exists. Also enter the desired title for file.



4. Select the radio button for the desired probe port.



5. Click on the **Check** button to preview PTP data before beginning measurement (optional).

The top of the main screen will display the message:

If the setup is configured correctly info like that shown Figure F-8 in will appear in display.

6. Click on the **Start** button to start the measurement process. The top of main screen will display the elapsed time of measurement

7. Click on the **Stop** button to stop measurement.

</td>
<td>

Symmetricom recommends that users ping from the probe to the grandmaster's PTP IP address to verify the network connection before attempting to gather data. Improper network setup and configuration is the most common error encountered with the TP 5000 Probe.

Use the CLI command `ping [imc | ioc1-1 | ioc1-2] [<vlan-id>] <IP address>` to specify the IP address to ping and the Probe port from which to send the ping.

See Chapter 3, CLI Commands and SNMP for additional info.

Example:
To ping the grandmaster at IP address 192.168.5.120, no VLAN from port IOC1-1 of the TP 5000 Probe:

- Type `ping ioc1-1 192.168.5.120` and press **Enter**.

To begin the measurement:

`show ptp-probe data ioc-[y]`

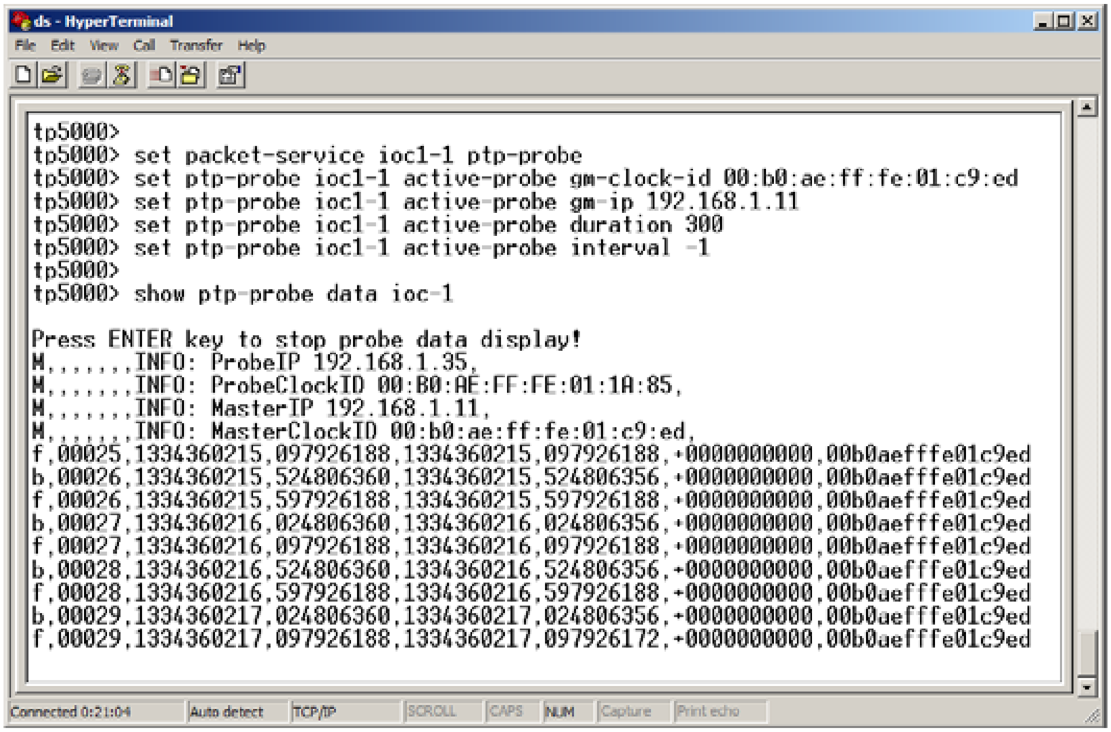
where y is the port number.

Example:

1. Login at the Admin or Config-user level.
2. Type `show ptp-probe data ioc-1` and press **Enter** to start the measurement process.
3. To stop the measurement process, press the **Enter** key again.

</td>
</tr>
</table>

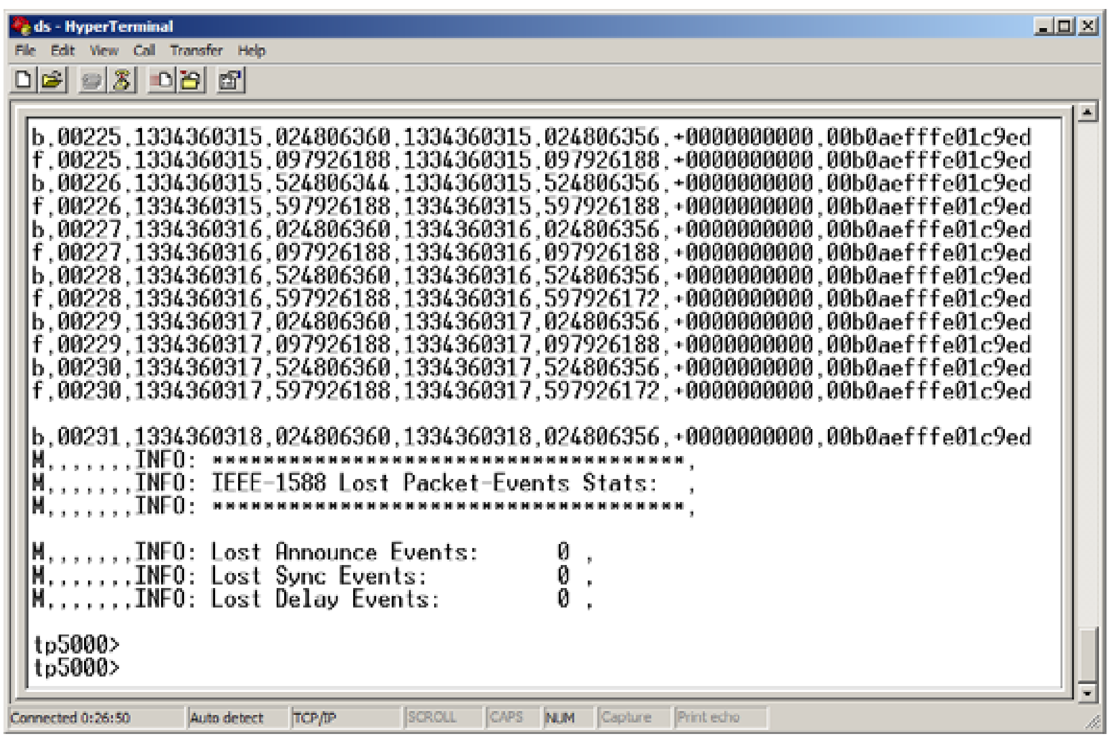
Figure F-8. Typical Probe Response if Setup Is Correctly Configured



```
tp5000>
tp5000> set packet-service iocl-1 ptp-probe
tp5000> set ptp-probe iocl-1 active-probe gm-clock-id 00:b0:ae:ff:fe:01:c9:ed
tp5000> set ptp-probe iocl-1 active-probe gm-ip 192.168.1.11
tp5000> set ptp-probe iocl-1 active-probe duration 300
tp5000> set ptp-probe iocl-1 active-probe interval -1
tp5000>
tp5000> show ptp-probe data ioc-1

Press ENTER key to stop probe data display!
M,,,,,,,INFO: ProbeIP 192.168.1.35,
M,,,,,,,INFO: ProbeClockID 00:B0:AE:FF:FE:01:1A:85,
M,,,,,,,INFO: MasterIP 192.168.1.11,
M,,,,,,,INFO: MasterClockID 00:b0:ae:ff:fe:01:c9:ed,
f,00025,1334360215,097926188,1334360215,097926188,+0000000000,00b0aefffe01c9ed
b,00026,1334360215,524806360,1334360215,524806356,+0000000000,00b0aefffe01c9ed
f,00026,1334360215,597926188,1334360215,597926188,+0000000000,00b0aefffe01c9ed
b,00027,1334360216,024806360,1334360216,024806356,+0000000000,00b0aefffe01c9ed
f,00027,1334360216,097926188,1334360216,097926188,+0000000000,00b0aefffe01c9ed
b,00028,1334360216,524806360,1334360216,524806356,+0000000000,00b0aefffe01c9ed
f,00028,1334360216,597926188,1334360216,597926188,+0000000000,00b0aefffe01c9ed
b,00029,1334360217,024806360,1334360217,024806356,+0000000000,00b0aefffe01c9ed
f,00029,1334360217,097926188,1334360217,097926172,+0000000000,00b0aefffe01c9ed
```

Figure F-9. Typical Probe Stats at End of Measurement



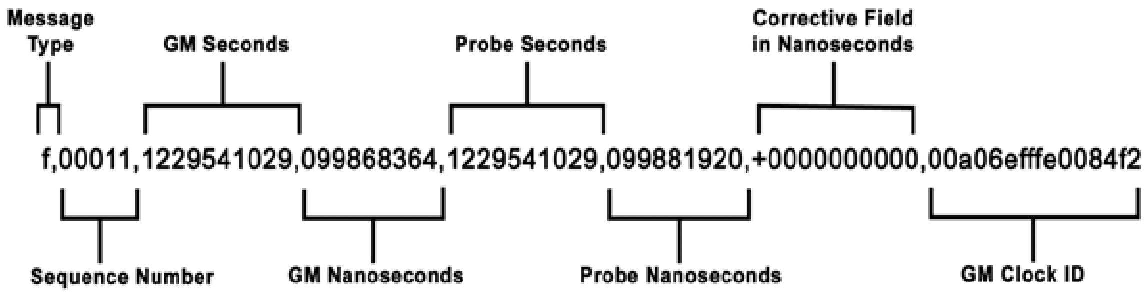
```
b,00225,1334360315,024806360,1334360315,024806356,+0000000000,00b0aefffe01c9ed
f,00225,1334360315,097926188,1334360315,097926188,+0000000000,00b0aefffe01c9ed
b,00226,1334360315,524806344,1334360315,524806356,+0000000000,00b0aefffe01c9ed
f,00226,1334360315,597926188,1334360315,597926188,+0000000000,00b0aefffe01c9ed
b,00227,1334360316,024806360,1334360316,024806356,+0000000000,00b0aefffe01c9ed
f,00227,1334360316,097926188,1334360316,097926188,+0000000000,00b0aefffe01c9ed
b,00228,1334360316,524806360,1334360316,524806356,+0000000000,00b0aefffe01c9ed
f,00228,1334360316,597926188,1334360316,597926172,+0000000000,00b0aefffe01c9ed
b,00229,1334360317,024806360,1334360317,024806356,+0000000000,00b0aefffe01c9ed
f,00229,1334360317,097926188,1334360317,097926188,+0000000000,00b0aefffe01c9ed
b,00230,1334360317,524806360,1334360317,524806356,+0000000000,00b0aefffe01c9ed
f,00230,1334360317,597926188,1334360317,597926172,+0000000000,00b0aefffe01c9ed

b,00231,1334360318,024806360,1334360318,024806356,+0000000000,00b0aefffe01c9ed
M,,,,,,,INFO: **************************************,
M,,,,,,,INFO: IEEE-1588 Lost Packet-Events Stats:   ,
M,,,,,,,INFO: **************************************,

M,,,,,,,INFO: Lost Announce Events:       0 ,
M,,,,,,,INFO: Lost Sync Events:           0 ,
M,,,,,,,INFO: Lost Delay Events:          0 ,

tp5000>
tp5000>
```

Figure F-10. Anatomy of a Probe Message



Probe Data

Probe data includes the following information:

- Message Type
- Sequence Number
- GM seconds
- GM nanoseconds
- Probe seconds
- Probe nanoseconds
- Correction field in nanoseconds
- GM Clock ID

See Figure F-10 for a description of the anatomy of a probe message. See Table F-12 and Table F-13 for descriptions of message types and message parameters.

See below for a typical stream of Probe data.

Example

```
f,00011,1229541029,099868364,1229541029,099881920,+0000000000,00a06efffe0084f2
b,00011,1229541029,562553320,1229541029,562539700,+0000000000,00a06efffe0084f2
f,00012,1229541030,099868364,1229541030,099881776,+0000000000,00a06efffe0084f2
b,00012,1229541030,562553320,1229541030,562539700,+0000000000,00a06efffe0084f2
f,00013,1229541031,099868364,1229541031,099881936,+0000000000,00a06efffe0084f2
b,00013,1229541031,562553288,1229541031,562539700,+0000000000,00a06efffe0084f2
f,00014,1229541032,099868364,1229541032,099881776,+0000000000,00a06efffe0084f2
b,00014,1229541032,562553288,1229541032,562539700,+0000000000,00a06efffe0084f2
```

The Probe can return three different types of messages, as shown in Table F-12. Each message includes a single letter, *m*, *f* or *b*, to indicate the type of message.

Table F-12. Message Types From The Probe

Letter	Message Type
m	Message, informational and errors
f	Forward Sync Messages
b	Backward Delay Messages

.

Table F-13. Sync and Delay Message Parameters

Parameter	Description
Sequence Number	The sequence number in the PTP packet
GM Seconds	The integer part of the timestamp from the GrandMaster, with units of seconds
GM Nanoseconds	The fractional part of the timestamp from the GrandMaster, with units of nanoseconds
Probe Seconds	The integer part of the timestamp from the Probe, with units of seconds
Probe Nanoseconds	The fractional part of the timestamp from the Probe with units of nanoseconds
Correction Field	The value of the correction field, as received by the Probe

Examples of informational messages are shown below.

Example

```
M,,,,,,,INFO: ProbeIP 192.168.1.25,
M,,,,,,,INFO: ProbeVLANID 35,
M,,,,,,,INFO: ProbeClockID 00:B0:AE:FF:FE:01:31:69,
M,,,,,,,INFO: MasterIP 192.168.1.11,
M,,,,,,,INFO: MasterClockID 00:B0:AE:FF:FE:00:00:06,
```

A typical error messages may look like the following:

```
M,,,,,,,Error: Grandmaster is unreachable,
```

Saving Probe Data

Refer to the TimeMonitor PDV User’s Guide or Help for instructions on how to save Probe data with TimeMonitor PDVsoftware.

If operating the TP 5000 Probe with the CLI command “show ptp-probe data ioc1-x” , capture or copy the data displayed in the terminal emulator and save or paste the data into a “.txt” file. Before loading the data file to TimeMonitor Analyzer for analysis, the extension of the file needs to be changed from “.txt” to “.tpk”.

Analyzing Probe Data

Refer to the TimeMonitor PDV and TimeMonitor Analyzer User’s Guides for instructions on how to analyze Probe data with TimeMonitor software.

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